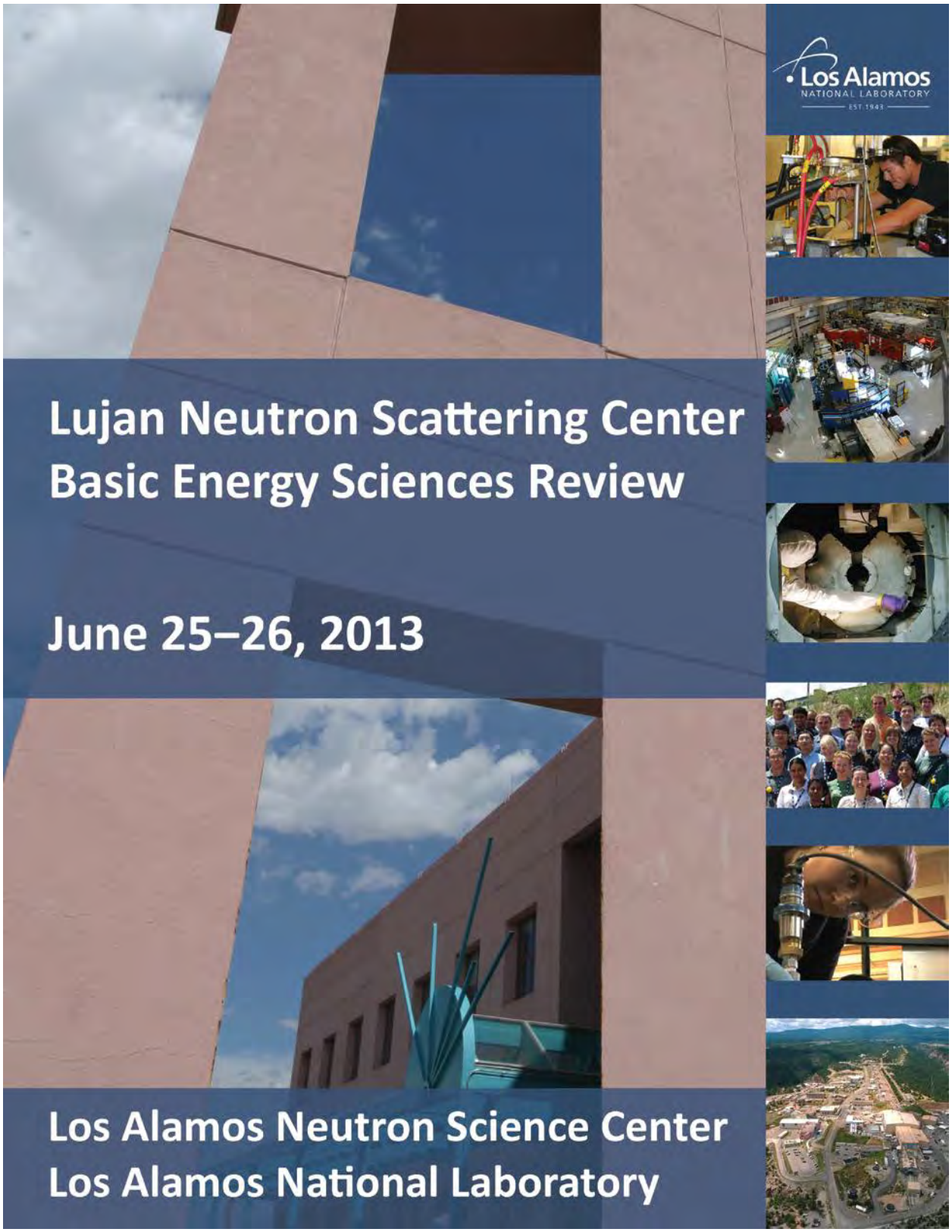

Lujan Neutron Scattering Center Basic Energy Sciences Review

June 25–26, 2013

Los Alamos Neutron Science Center
Los Alamos National Laboratory

LA-UR-13-24525
Operated by Los Alamos National Security Science, LLC for the U.S. Department of Energy's NNSA

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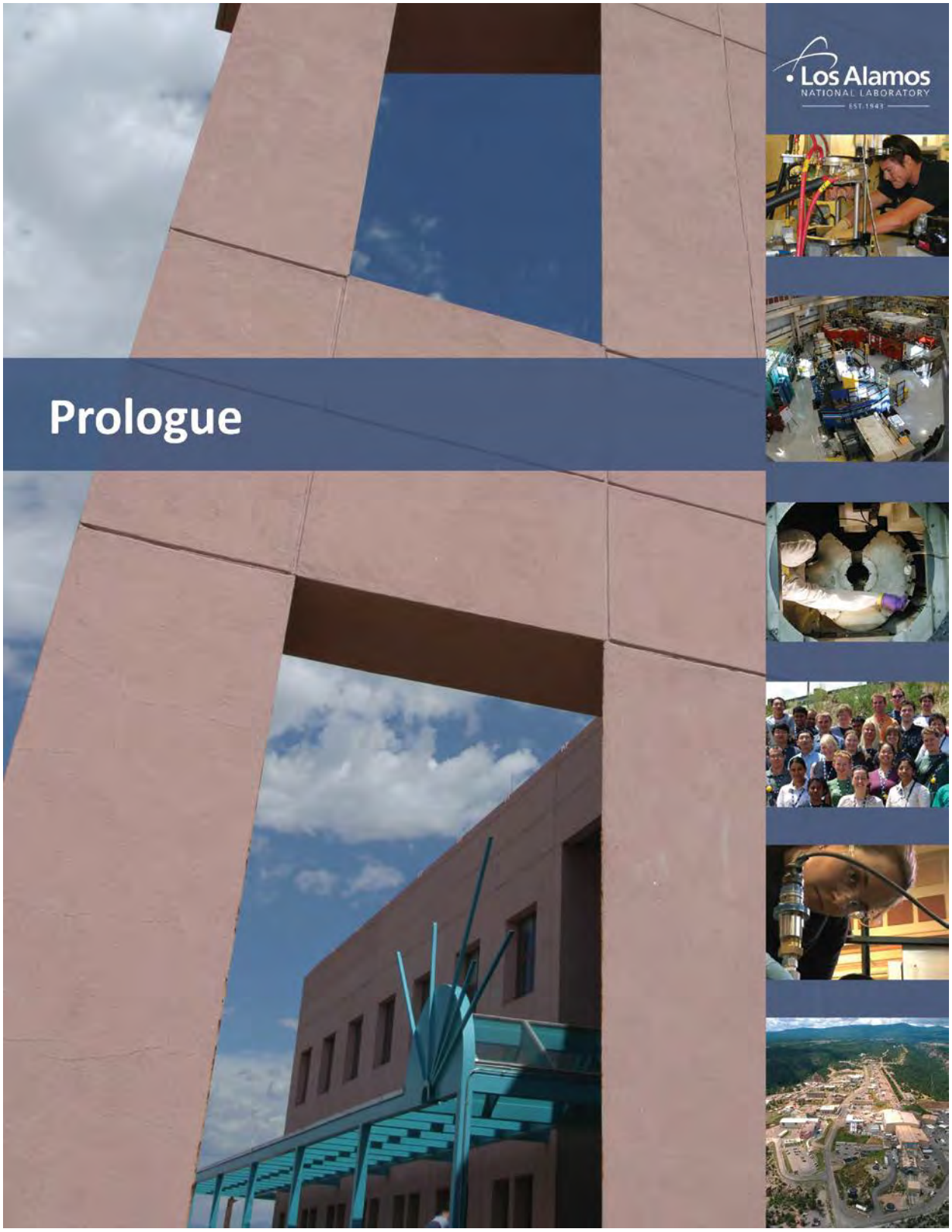

LA-UR-13-24525

Prologue

The Lujan Neutron Scattering Center (the Lujan Center, or MLNSC), located at Los Alamos National Laboratory (LANL), is an international center of excellence and innovation for basic and applied research in neutron scattering. It is operated as a Department of Energy Basic Energy Sciences (BES) user facility. The Lujan Center serves the United States (US) neutron scattering community through a user program, leadership in the development and use of neutron scattering instruments, and maintenance of a strong in-house research program. Since 2009, the Lujan Center has on average received 404 proposals per fiscal year, had a 2.4 average subscription rate in BES user instruments, produced 138 peer-reviewed publications, hosted 535 user visits, and engaged 70 new users per year. The Lujan Center is the preeminent center for national security neutron scattering research and a vital experimental facility for the National Nuclear Security Administration's (NNSA's) stockpile stewardship program.

The Lujan Center is one of five facilities that comprise the Los Alamos Neutron Science Center (LANSCE). Neutrons are produced by spallation driven by 800 MeV protons in two split tungsten targets. The accelerator operates at 100 kW, which enables a compact and efficient neutron source. Two distinguishing aspects are 20 Hz operation and a 300 ns proton pulse width. The former offers broad bandwidth, which is suited to studies of soft, condensed matter and pair distribution function analysis. In a novel partnership, LANSCE facility operations are supported by the NNSA, whereas the Lujan Center is supported by the BES.

Seven instruments are currently offered in the BES user program [the high-pressure-preferred orientation (HIPPO) diffractometer, filter difference spectrometer (FDS), surface profile analysis reflectometer (SPEAR), Asterix spectrometer, neutron powder diffractometer (NPDF), spectrometer for materials research at temperature and stress (SMARTS), and small-angle instrument (the low-Q diffractometer, or LQD)]. The Protein Crystallography Station (PCS) is partially funded by the Office of Science's Office of Biological and Environmental Research (BER). Three instruments [the high-intensity powder diffractometer (HIPD), high-resolution chopper spectrometer (Pharos), and single-crystal diffractometer (SCD)] were removed from the BES user program in 2011 because of funding constraints but remain available to users who can provide resources for operations. Three additional flight paths (FPs) support the NNSA's programmatic and nuclear physics research [FP-5, FP-12, and the Detector for Advanced Neutron Capture Experiments (FP-14, or DANCE)]. Finally, three FPs (8, 13, and 11b) are open for development. The Lujan Center offers a diverse range of sample environments complementing its instrument suite, including an 11 T magnet with 300 mK capability; a 10 GPa, 1500 K pressure cell; a humidity-controlled pressure cell; a 250 kN, 1800 K load frame; and a 2500 K furnace.

The Lujan Center's contribution to neutron scattering derives from its instruments, sample environment suite, and experienced and dedicated staff. Support laboratories, such as the deuteration laboratory, the sample preparation laboratory, and the sample characterization laboratories, allow users to prepare and work on samples onsite. Synergistic user programs are pursued with the collocated Center for Integrated Nanotechnologies (CINT) and the National Science Foundation (NSF) funded National High Magnetic Field Laboratory (NHMFL), as well as with Advanced Photon Source (APS). The collocation of the national security enterprise with the

Lujan BES user program means that people, resources, and ideas are traded between the two communities, leveraging, for example, LANL's materials mission and expertise (especially with respect to actinides). LANL capabilities in theory and computation enhance the impact of each of LANL's three user facilities (the Lujan Center, CINT, and NHMFL). Long-term planning at LANL includes the definition of a signature national user facility called MaRIE (the Matter-Radiation Interactions In Extremes experimental facility). MaRIE will be constructed at the LANSCE site, with a focus on the prediction and control of materials in extremes. Planning for MaRIE includes LANL's decadal commitment to and alignment with the Lujan Center mission.

Lujan Center Science Thrusts

The Lujan Center advances neutron science and enables the success of its users through its suite of instruments, associated sample environments and related infrastructure, and most importantly, its technical staff of leading neutron scattering scientists. In 2011, these resources were organized as the following science thrusts:

Local Structure, Magnetism, and Nanomaterials

Three diffractometers are used for crystal and magnetic structure determinations. NPDF provides local structure studies for amorphous, disordered, and nano materials, as well as for routine high-resolution powder diffraction. HIPD provides a high flux for parametric structural, magnetic, and local structure studies and the largest accessible d-spacing range required for the study of large crystal and magnetic structures. HIPPO provides time-resolved studies under a variety of extreme temperature, magnetic field, and pressure conditions.

Materials in Extreme Environments and Geoscience

SMARTS and HIPPO offer complementary capabilities focused on extreme conditions (temperature, stress, magnetic field, pressure, etc.), determining crystal structure, texture, and lattice strains. SMARTS is optimized for engineering and provides in situ deformation, with a unique loading capability of 250 kN in conjunction with temperatures from 77 K to 1800 K. HIPPO provides in situ texture measurements at temperatures from 10 K to 2500 K, as well as at pressures to 10 GPa and temperatures of 1500 K.

Surfaces and Interfaces

The Lujan Center has four instruments suitable for the study of interfaces, surfaces, and magnetism: Asterix for the study of magnetism using polarized neutrons; SPEAR for soft-matter and biological structures; LQD for the bulk measurement of particle and phase interfaces and enclosed morphologies; and NPDF for local-structure, atomistic-scale insight on nanoscale particles.

Chemical Spectroscopy and Protein Structures

Chemical spectroscopy provides information on bonding, structure, and motion at the atomic or molecular level and often complements information provided by structural or imaging probes. The primary instrument applied to these studies is FDS, which uses cooled beryllium filters and a crystal analyzer. Neutron protein crystallography provides insight into the function of biological macromolecules and enzyme mechanisms. PCS is funded by BER and is a unique (in North America) high-performance protein crystallography instrument (approximately 80%

counting efficiency) that has contributed almost 50% of all neutron structures deposited in the Protein Data Bank.

2009 BES Review of the Lujan Center

BES last reviewed the Lujan Center in 2009. As summarized by Pedro Montano**,** then head of the Scientific User Facilities Division**,** "*I would like to congratulate the MLNSC and LANSCE management for establishing the MLNSC as an important BES neutron scattering facility with a significant user population and scientific output*." Montano also noted that "*to bring the Lujan Center up to the ILL[1]/NIST[2] class requires a swift move on strategic hiring, successful implementation of a program to refurbish the LANSCE accelerator (LANSCE-R), and the continuous support from the LANSCE facility. In the absence of the implementation of these upgrade projects, its overall impact will be below that of its target cohort of world leading neutron facilities*."

More specifically, reviewers noted "*Lujan Center has been operating at a point of unstable equilibrium that is clearly unsustainable*" and that "*the scientific output is uneven across the instruments.*" Finally, BES requested a "*strategic plan that is based on the MLNSC strengths with SNS[3] operating*."

LANL's and NNSA's commitment to LANSCE and Lujan addresses these BES and reviewer concerns and are described in the next section, as is a high-level summary of Lujan's strategic planning. In essence, LANL and the NNSA have committed to operate LANSCE at high reliability and to make the necessary investments to ensure reliable operations well past the next decade. Unfortunately, BES investment in Lujan has not kept pace with these opportunities. The Lujan BES budget in fiscal year FY2012 is less than it was in FY2009. As a result, the Lujan Center made the tactical decision to remove three less highly subscribed instruments from the user program in 2011 and concentrate resources on the highest-impact instruments. In so doing, scientific productivity and user productivity on the remaining BES user instruments were not compromised by the funding shortfall.

The Tc-99 contamination event in August of 2012 revealed a weakness in our management and operational systems. Corrective actions have strengthened our operational processes and infrastructure and will ultimately benefit the broader user facility communities through lessons learned.[4] The Lujan Center resumed operations in January 2013 under a newly implemented operations plan. Operational experience and feedback from users and staff will be used to improve the operations plan for the upcoming run cycle starting in August 2013.

Lujan Center Opportunities in the Next Decade

In 2010, LANL and the NNSA, through an agreement among LANL's and the Department of Energy's (DOE's) three Undersecretaries, sealed their commitment to steward the LANSCE accelerator for the decadal future. Over the last 4 years, NNSA has invested $80M of an

[1] ILL = Institut Laue-Langevin.
[2] NIST = National Institute of Standards and Technology.
[3] SNS = Spallation Neutron Source.
[4] LANL new policy P372: "Research sample management for quality R&D."

anticipated $200M to reduce operational risk and enhance accelerator reliability (LANSCE Risk Mitigation). In addition, the NNSA supported the development and the installation, in 2010, of the Mark III Lujan spallation target. These investments are paying dividends in enhanced performance and beam delivery reliability (89.9% in 2012), with neutron flux increases greater than a factor of 2 realized on cold moderators. At the conclusion of LANSCE Risk Mitigation activities in 2019, the Lujan Center will offer its user community 4000 scheduled accelerator operation hours per year with greater than 90% reliability. With a reliable accelerator foundation, the Lujan Center staff is optimistic about the future. This optimism is grounded in emerging scientific opportunities, synergistic interactions with the SNS at Oak Ridge National Laboratory (ORNL), and the prospect of high-value enhancements to Lujan Center capabilities.

Scientific Opportunities

Total Scattering[5]

Total scattering and local structure determination are areas of excellence for the Lujan Center with the productivity of NPDF and HIPD. The NPDF is a world-class capability for the study of complex and nanostructured materials, materials in extremes, and energy materials. Over the last 5 years, a series of user workshops culminated in 2012 with a workshop titled "New Directions in Total Scattering Research at LANSCE." This workshop, which was attended by more than 50 users and many experts in the field, concluded that significant opportunities are available for instrumentation upgrades, as well as new sample environments.

Mesoscale Science[6]

Because of the strength of the Lujan Center in cold neutrons (derived from 20 Hz operation, as well as customized liquid hydrogen moderators), the reflectometers and small-angle-scattering instrument are well suited to probe the mesoscopically important length scales from nanometers to microns. LQD, SPEAR, and Asterix offer a range of capabilities to probe buried interfaces, spin, charge, and lattice degrees of freedom, as well as the assembly of three-dimensional (3D) heterostructures. Instrumentation developments on Asterix using high magnetic fields, low temperatures, and the application of stress to films have impacted the field of magnetic superconducting materials, such as complex oxide multilayers. SPEAR in the last 2 years has been used to study polymeric thin films, photovoltaic devices, bio-relevant polymeric coatings, corrosion-resistive coatings, living cells under flow stress (e.g., Alzheimer-related agents), and solid-state and actinide thin films. LQD has demonstrated a broad application to studies impacting energy programmatic applications, medical material research, and geoscience.

Extreme Environments and Radiography

The penetration ability of neutrons offers characterization in environments far from ambient and even far from equilibrium. Specific opportunities abound for the study of materials during

[5] "New Directions in Total Scattering Research at LANSCE," LANSCE User Group, 2012. "HIPD Instrument Advisory Team Meeting," 2009 ICNS, Knoxville, TN.

[6] "From Quanta to the Continuum: Opportunities for Mesoscale Science," Basic Energy Science advisory report, September 2012, science.energy.gov/~/media/bes/pdf/reports/files/OFMS_rpt.pdf.

synthesis (e.g., in situ high-temperature/high-pressure reactions), under accident conditions (e.g., nuclear fuels at high temperature with a controlled atmosphere or during core melt conditions), experiencing thermo-mechanical processing (strain and micro-structure evolution during high-temperature deformation), or indeed any conditions that offer new insight into solid state physics (such as low temperatures or magnetic fields).

To date, neutron radiography has been pursued primarily at continuous neutron sources because of flux demands. However, recent developments in detector technology have opened opportunities unique to pulsed sources. Area detectors with <50 µm spatial resolution and temporal resolution to 0.1 µs offer simultaneous resonance absorption spectroscopy, Bragg-edge transmission, and imaging in a single measurement. By collecting multiple data sets for tomographic interpretation, this technology offers the exciting possibility of 3D mapping of isotopic composition, microstructure, and macroscopic features. The Lujan Center's broad energy spectrum (20 Hz), short proton pulse (300 ns), and low background (split target) are well suited for this endeavor by enabling imaging in cold, thermal, and resonance regimes.

Synergy with SNS

The Lujan Center has set goals to provide both unique and complementary instrumentation to the user community, to co-develop accelerator technology and instrument concepts in partnership with the SNS and to develop neutron scattering science.[7] The overarching goal is to provide new generations of scientists access to state-of-the-art resources. Prospects for a second target station at SNS in the 2020s, as well as development of the European Spallation Source, point to growth and enthusiasm in the neutron science community. The Lujan Center is committed to enabling this growth.

For many measurements, the Lujan Center is a natural complement to the SNS. Measurements that require access to broad wavelength bandwidths and thus benefit from a low repetition rate are competitively performed at Lujan Center. If a measurement is not intensity limited or if the time taken to change an experimental condition (or setup) is long, then using a lower-power source is likely a productive use of resources. For powder diffraction, large sample volumes are not uncommon, and flux limitations rarely impede efficient and effective science productivity.

The Lujan Center's 100 kW power level means that radiation damage is less of a limiting feature for moderators and target components than for SNS. This power enables aggressive implementation of new moderator designs, as well as innovative moderator materials, such as methane instead of water or hydrogen. Lujan Center targets are redesigned and changed approximately every 5 years, which offers the flexibility to match moderator and instrument performance metrics for a holistic instrument design. In this light, the Lujan Center can adopt more technological risk than the SNS.

[7] "A Workshop on Enhanced National Capability for Neutron Scattering," September 2007, San Diego, California, http://www.osti.gov/bridge/product.biblio.jsp?osti_id=956507; "Lujan Center in the SNS Era, 2006, Santa Fe, NM.

Conclusions

Over the past decade, the Lujan Center has delivered leading neutron science, benefited from accelerator reliability, and experienced sustained financial commitment from the NNSA. The Lujan Center instrument suite includes world-class instruments, as well as instruments that require reinvestment to retain or regain competiveness. With the available budget, Lujan Center staff has achieved high scientific productivity and high user satisfaction ratings. However, the absence of additional budgetary support will result in the loss of instruments from the user program, with a concomitant reduction in total experiments run and the number of users accommodated. This reduction runs counter to increasing user demand as evidenced by an increasing number of user-driven proposals for Lujan Center instruments. On the other hand, a modestly enhanced BES investment in Lujan, when leveraged against NNSA's investment, offers significant gains in instrument and user capacity, as well as scientific output. This investment will strongly support a resurgence of domestic neutron scattering, in partnership with SNS and High-Flux Isotope Reactor (HFIR), as well as the NIST Center for Neutron Research (NCNR). This future state is one for which we strongly advocate in this review cycle.

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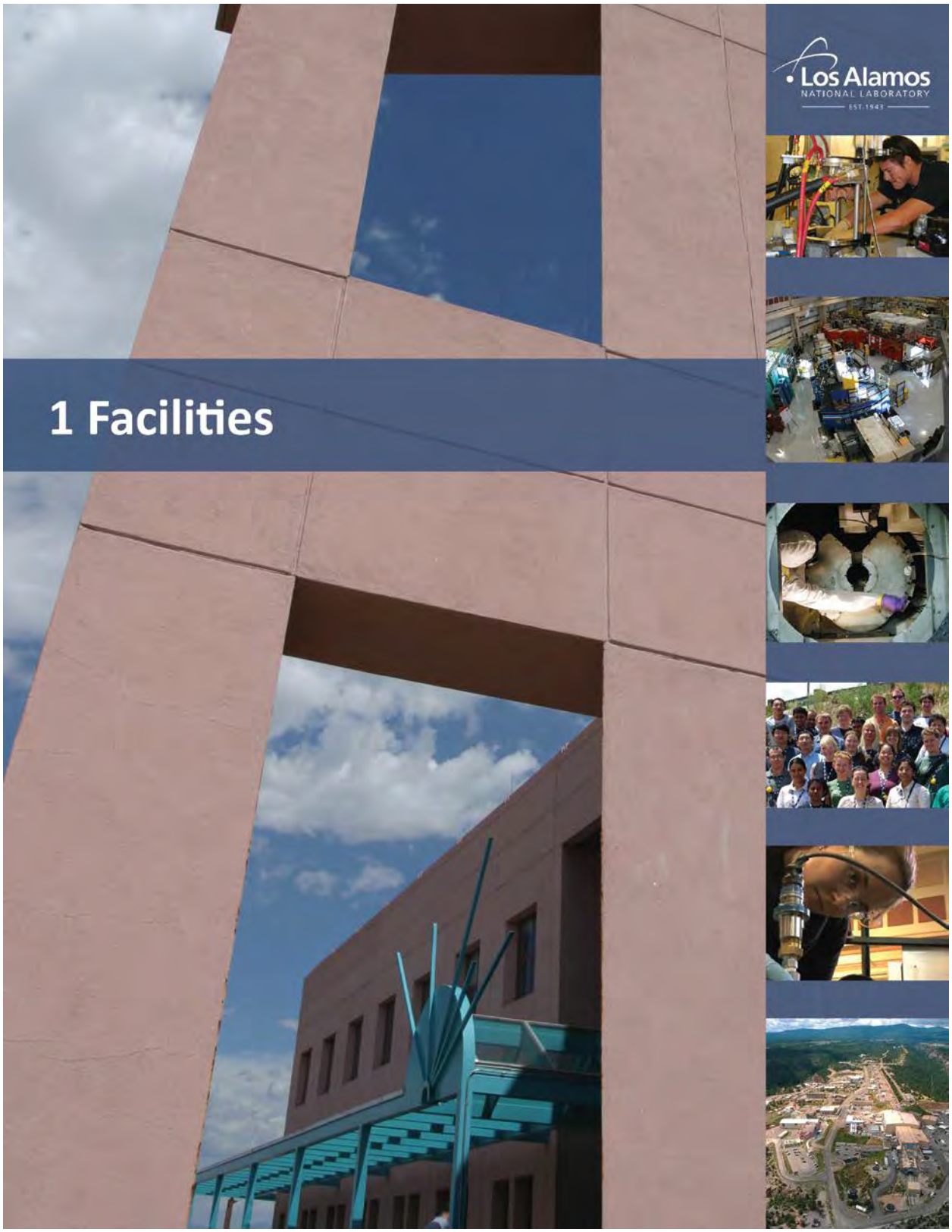

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1 Facility

1.1 Brief Description of the Facility

The Lujan Center is one of five facilities at LANSCE, an accelerator-based facility providing science for national security and fundamental scientific research. The heart of the facility is a one-half-mile-long, 800 MeV, high-intensity linear proton accelerator. The LANSCE accelerator simultaneously drives five unique research facilities: the Weapons Neutron Research (WNR) facility, the Lujan Neutron Scattering Center, the Proton Radiography (pRad) facility, the Ultra-Cold Neutrons (UCN) facility, and the Isotope Production Facility (IPF). Together they support programs in national security (including actinide and high-explosives science), nuclear medicine, materials science, nanotechnology, biomedical research, nuclear medicine, electronics testing, and fundamental nuclear physics.

Figure 1.1: Aerial view of LANSCE.

The Lujan Center is a designated national user facility for neutron scattering, hosting researchers from academia, national laboratories, and industry, as well as users from around the world. It offers neutron scattering for scientific research relevant to physics, geoscience, chemistry, engineering, nuclear energy, pharmaceutical science, biology, national security, and nuclear physics. The Lujan Center's highly optimized spallation target/moderator, operating at 20 Hz, is a system that provides a high-peak flux with a broad wavelength bandwidth per neutron pulse. Water and liquid hydrogen moderators provide neutron beams, spanning the spectrum from epithermal to cold neutrons. The cold neutron beams are ideally suited for reflectometry, inelastic scattering, and small-angle scattering. Moreover, for broad-bandwidth

instruments, the 20 Hz repetition rate mitigates the impact of frame overlap, allowing the collection of data over broad d-spacing or Q-ranges from each neutron pulse.

In May 2009, the SNS at ORNL and the Lujan Center reported to the BES–Scientific User Facility Division (BES-SUFD) a comparison of neutron fluxes at nominal sample positions.[8] Peak fluxes for both facilities operating at their full power were reported for the three moderator types installed at both facilities (high-resolution water moderator, coupled liquid hydrogen moderator, and high-intensity water moderator). The comparison shows that the peak flux for the high-resolution water moderator at the Lujan Center, serving NPDF, SMARTS, and Pharos, provides about 65% of the neutron flux at the equivalent moderator at SNS. The coupled liquid hydrogen moderator at the Lujan Center, serving SPEAR, LQD, and Asterix, yields a cold neutron flux of about 50% of the equivalent SNS moderator. The high-intensity water moderator at the Lujan Center serving PCS provides a peak flux almost twice as high as the equivalent moderator at the SNS. These figures show that the Lujan Center neutron source is highly competitive for instruments, depending on the peak flux performance.

The Lujan Center instrument suite (Figure 1.2) funded by BES-SUFD is described in Chapter 2.

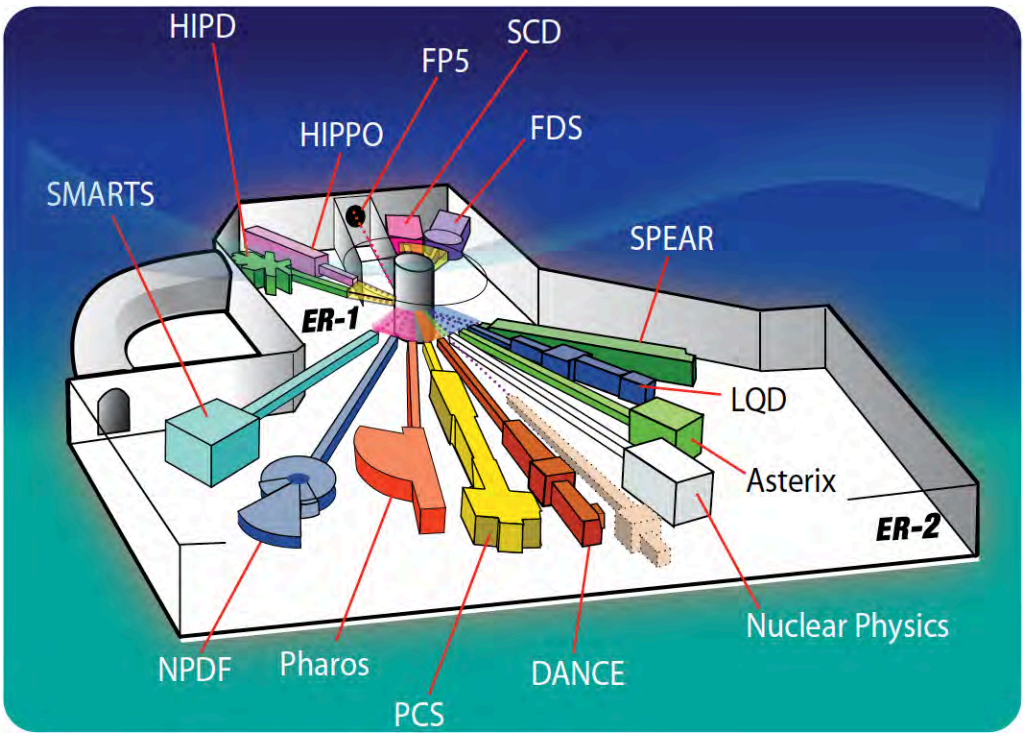


Figure 1.2: The Lujan Center's floor plan.

[8] Comparison of Flux numbers as reported by Dr. Ian Anderson (SNS Director at the time) via e-mail to BES-SUFD on May 14, 2009.

1.2 FY2009–FY2012 Budget Summary

The Lujan Center has a funding model that is unique among DOE user facilities. Under a DOE Memorandum of Understanding (MOU), the NNSA funds the production of neutrons (accelerator plus target), whereas BES supports the neutron scattering user program at the Lujan Center. The NNSA supports LANSCE Facility operations at approximately $60M per year, including construction and maintenance of the Lujan Center's neutron production target. NNSA funding is responsible for beam delivered to the instrument shutters.

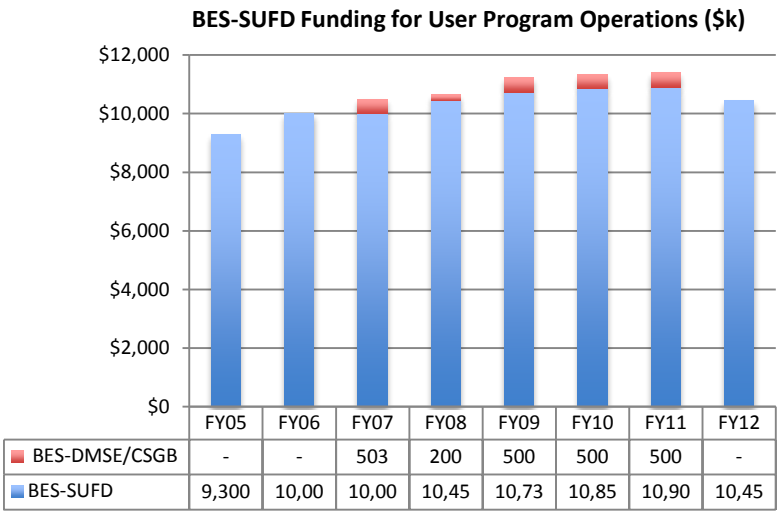


Figure 1.3: BES-SUFD funding history of the Lujan Center, including capital funding (since FY2005).

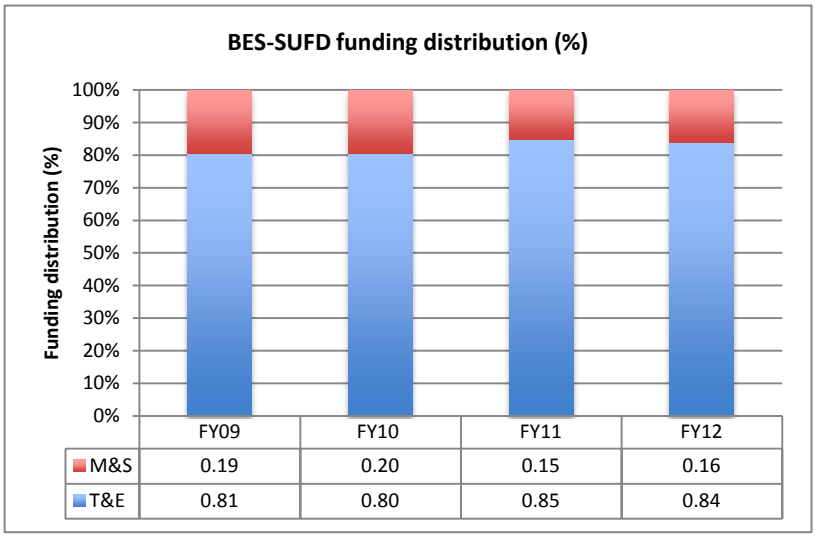


Figure 1.4: Funding distribution of BES-SUFD funds into salary [time and effort (T&E)] and non-salary [materials and supplies (M&S)]. No funds were allocated for electrical power.[9] (FY2009–FY2012)

[9] All funding allocations reported within this document are burdened, i.e., include LANL overhead cost.

Figure 1.3 and Figure 1.4 show the BES-SUFD funding history, including FY2009–FY2012, and the allocations for salary and non-salary expenses. Findings from the last two BES reviews (2006 and 2009) strongly recommended to BES the need for additional funds for the Lujan Center to operate at its full potential.[10] The decrease in BES funding has resulted in a reduction in user program staff and its ability to improve and maintain certain instruments. The Lujan Enhancement Project,[11] presented to BES in 2009, has been unfunded. To maintain operations within the allocated funding, three instruments in FY2009 and FY2010 were operated only 50% of the time in the BES user program (HIPD, SCD, and inelastic neutron spectrometer Pharos). In FY2011, those instruments were completely removed from the BES user program.

1.3 American Recovery and Reinvestment Act of 2009

No funds from the American Recovery and Reinvestment Act of 2009 benefited the Lujan Center.

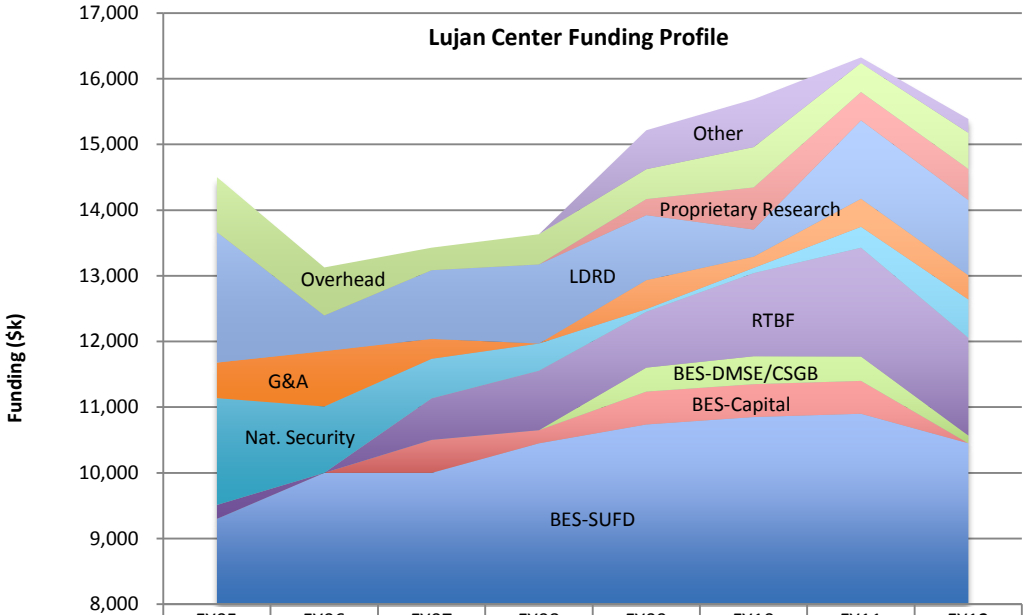
1.4 Other Funding Sources for FY2009–FY2012

Although the operation of the Lujan Center is primarily funded by BES-SUFD, funding also derives from other sources (26% in FY2009, 28% in FY2010, 30% in FY2011, and 32% in FY2012). These sources include BES Core Science programs [e.g., from the BES Division of Materials Science and Engineering (DMSE) and Chemical Sciences, Geosciences, and Biosciences Division (CSGB)], Laboratory-Directed Research and Development (LDRD), National Institutes of Health (NIH), University of California management fee grants, Laboratory General and Administrative (G&A) program development funds, NNSA Readiness in Technical Base and Facilities (RTBF) support, national security contracts, and industrial/proprietary research.

LANL funding contributes to Lujan Center management and administration. The diversity of funding has been important for the Lujan Center to maintain scientific and programmatic vitality. The distribution of the funding sources for the Lujan Center since FY2005 is shown in Figure 1.5.

[10] "*The Lujan Center has been operating at a point of unstable equilibrium that is clearly unsustainable. The biggest impact on the user program can be achieved by first adding more support staff and later the scientific staff, … .*" letter to Lujan Center Director A. J. Hurd from Pedro Montano, Director Scientific User Facilities Division, DOE-BES, June 19, 2009.

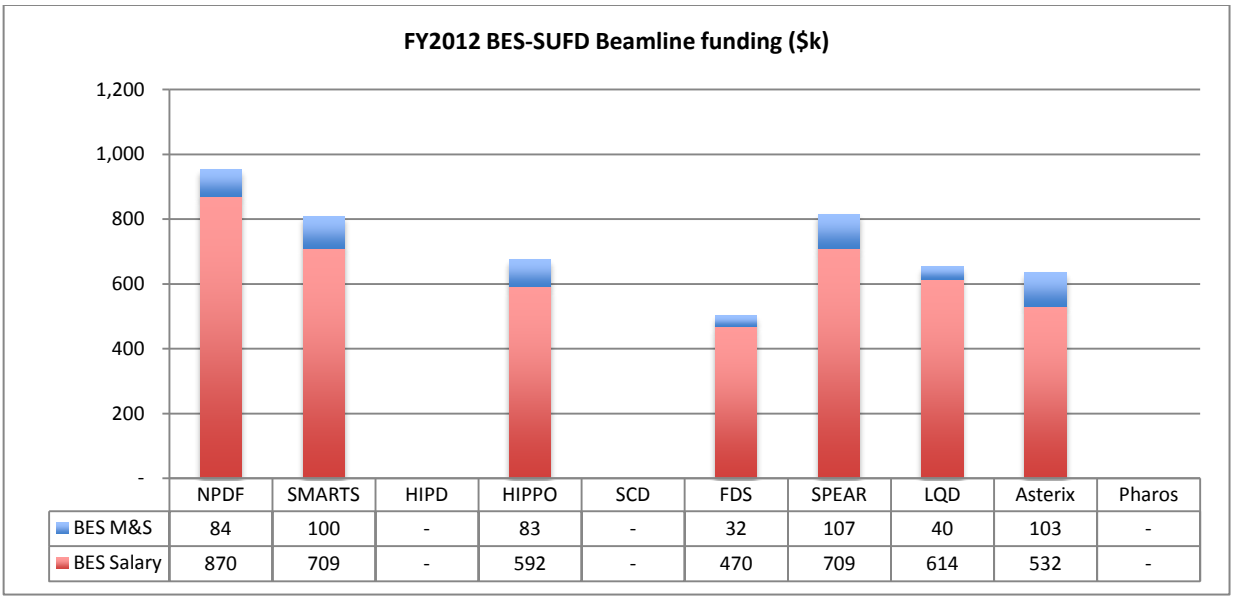
[11] "Enhanced Lujan Program," Los Alamos National Laboratory, 2009



	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
Other	-	-	-	-	593	728	85	211
Overhead	836	731	343	460	455	614	442	549
Proprietary Research	-	-	-	-	244	641	431	475
LDRD	1,987	543	1,045	1,204	989	412	1,193	1,144
G&A	541	842	303	-	441	172	427	369
Nat. Security	1,626	1,011	602	414	42	80	319	584
RTBF	212	-	632	905	850	1,265	1,656	1,488
BES-DMSE/CSGB	-	-	-	-	365	425	371	117
BES-Capital	-		503	200	500	500	500	-
BES-SUFD	9,300	10,000	10,000	10,450	10,737	10,850	10,900	10,451

Figure 1.5: Lujan Center funding (FY2005–FY2012).

Figure 1.6 shows the distribution of BES-SUFD funding for salaries and non-salaries per instrument for FY2012 (no redistribution of support staff and M&S was performed). The figures for FY2009–FY2012 are provided in the instrument information in the appendix. As previously noted, HIPD, SCD, and Pharos were removed from the BES user program in FY2011.

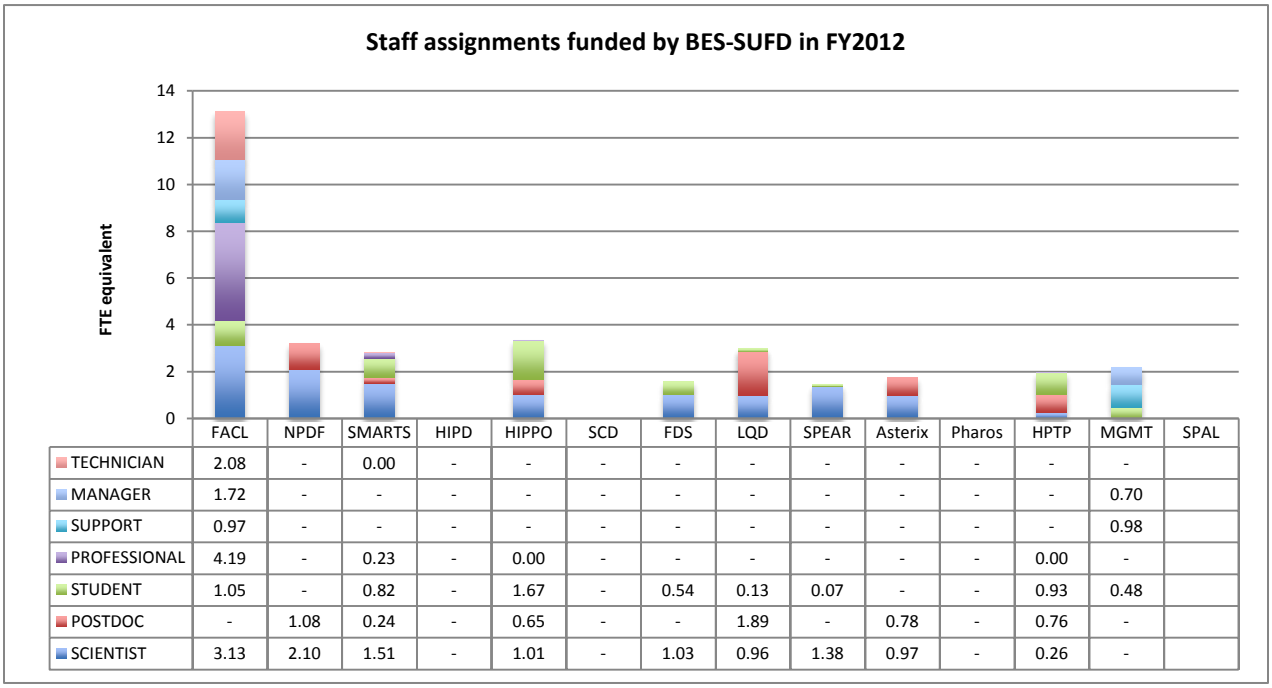


	NPDF	SMARTS	HIPD	HIPPO	SCD	FDS	SPEAR	LQD	Asterix	Pharos
BES M&S	84	100	-	83	-	32	107	40	103	-
BES Salary	870	709	-	592	-	470	709	614	532	-

Figure 1.6: BES-SUFD funding allocation by instrument (FY2012).

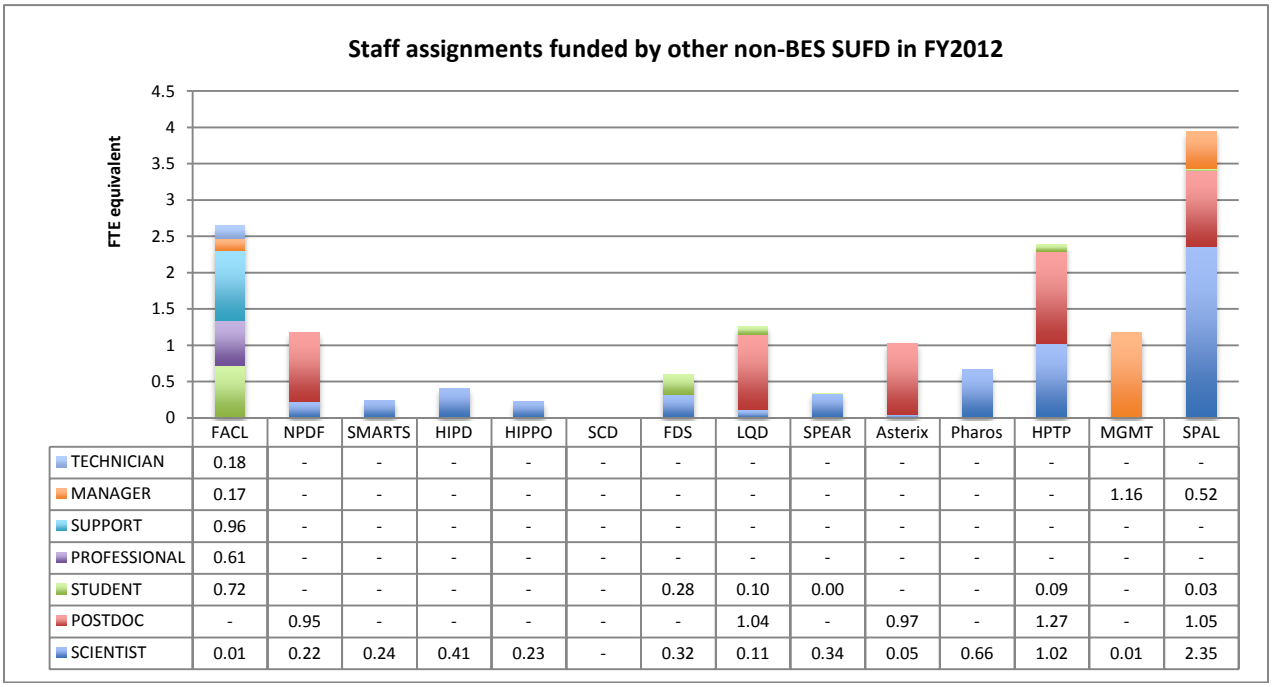
1.5 Staff Assignments and Funding

Figure 1.7 lists staff assignments, categories and funding in increments of full-time-employee (FTE) equivalent. The distribution is by beamline and reflects the following categories: Facility (FACL), High Pressure Team (HPTP), management (MGMT), and Spallation Physics Team (SPAL). The FACL category corresponds to distributed support functions, including the User Program and Experiment Coordinator's Office, Mechanical Team, Data Acquisition (DAQ) team, Sample Environment team, Engineering and Design team, Electrical Support team, Environmental Safety and Health (ESH), and rad-protection support, as well as special programs for visiting scientists. (Figure 1.8) BES-SUFD funding for management is predominantly used for operations, such as the Experimental Area Manager or team leaders of the Mechanical and DAQ teams.



	FACL	NPDF	SMARTS	HIPD	HIPPO	SCD	FDS	LQD	SPEAR	Asterix	Pharos	HPTP	MGMT	SPAL
TECHNICIAN	2.08	-	0.00	-	-	-	-	-	-	-	-	-	-	
MANAGER	1.72	-	-	-	-	-	-	-	-	-	-	-	0.70	
SUPPORT	0.97	-	-	-	-	-	-	-	-	-	-	-	0.98	
PROFESSIONAL	4.19	-	0.23	-	0.00	-	-	-	-	-	-	0.00	-	
STUDENT	1.05	-	0.82	-	1.67	-	0.54	0.13	0.07	-	-	0.93	0.48	
POSTDOC	-	1.08	0.24	-	0.65	-	-	1.89	-	0.78	-	0.76	-	
SCIENTIST	3.13	2.10	1.51	-	1.01	-	1.03	0.96	1.38	0.97	-	0.26	-	

(a)



	FACL	NPDF	SMARTS	HIPD	HIPPO	SCD	FDS	LQD	SPEAR	Asterix	Pharos	HPTP	MGMT	SPAL
TECHNICIAN	0.18	-	-	-	-	-	-	-	-	-	-	-	-	-
MANAGER	0.17	-	-	-	-	-	-	-	-	-	-	-	1.16	0.52
SUPPORT	0.96	-	-	-	-	-	-	-	-	-	-	-	-	-
PROFESSIONAL	0.61	-	-	-	-	-	-	-	-	-	-	-	-	-
STUDENT	0.72	-	-	-	-	-	0.28	0.10	0.00	-	-	0.09	-	0.03
POSTDOC	-	0.95	-	-	-	-	-	1.04	-	0.97	-	1.27	-	1.05
SCIENTIST	0.01	0.22	0.24	0.41	0.23	-	0.32	0.11	0.34	0.05	0.66	1.02	0.01	2.35

(b)

Figure 1.7: (a) Staff assignments by category and budget in FTE equivalents funded by BES-SUFD (FY2012). (b) Staff assignments by category and budget in FTE equivalents for funding other than BES-SUFD (FY2012).

Staffing categories are defined as follows:

- Manager: personnel responsible for managing the resources and productivity of specific facility operations or programs.

- Support: personnel contracted on a temporary basis to fulfill the support needs of the facility.

- Professional: personnel developing instruments, equipment and design, testing and fabrication of equipment or providing support in the areas of radioprotection, ESH/quality (Q), information technology (IT) support, and software development.

- Student: temporary staff working on completion of a high school or college degree assisting with research and development (R&D), technical, or administrative work.

- Postdoc: temporary scientific staff performing R&D activities at the facility under the supervision of a staff member.

- Technician: personnel working under the supervision of other qualified staff developing systems and components and assisting in the maintenance and repair processes at the facility.

- Scientist/Engineer: Personnel conducting R&D at the facility. Such position requires PhD or MS degrees or equivalent experience in the field.

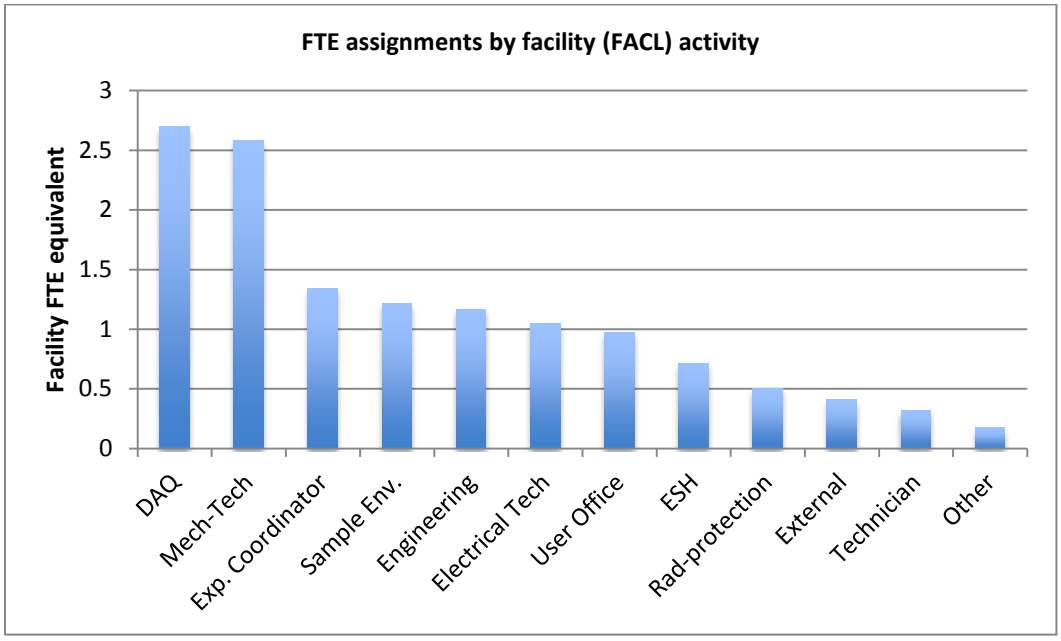


Figure 1.8: Facility related assignments by activities (FY2012).

Figure 1.9 displays the permanent vs. temporary staff allocations by category in FY2012.

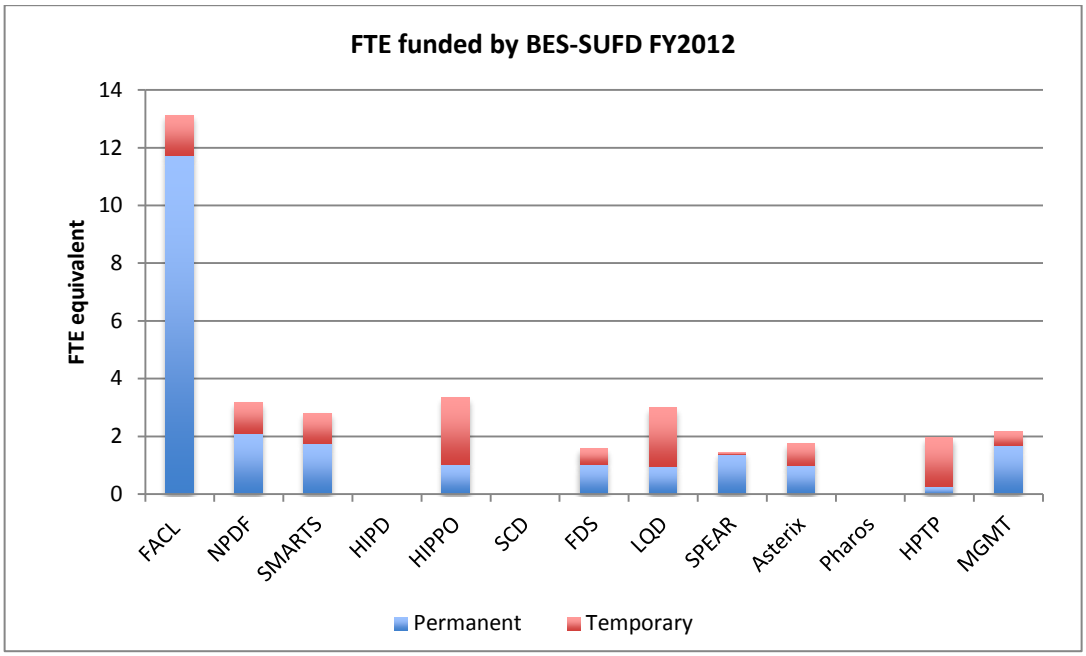


Figure 1.9: Permanent and temporary staff allocation by category (FY2012).

Table 1-1: Staff funded by BES-SUFD with assignments, budget allocations, and category (FY2012). (Except for students, funding to reach 1.0 FTE is provided by other sources.) Personnel listed include non-Lujan Center staff. Values >1.0 FTE are due to overtime. Instrument responsibilities are indicated with an asterisk (*).

Assignment	Name	Job Classification	FTE Equivalent
FP01/NPDF	Page, Katharine*	Scientist	0.66
FP01/NPDF	Llobet, Anna (formerly HIPD)	Scientist	0.63
FP01/NPDF	Siewenie, Joan	Scientist	0.81
FP01/NPDF	King, Graham (formerly HIPD)	Postdoc	1.01
FP01/NPDF	White, Claire	Postdoc	0.07
FP02/SMARTS	Clausen, Bjorn *	Scientist	0.75
FP02/SMARTS	Brown, Donald	Scientist	0.14
FP02/SMARTS	Sisneros, Thomas	Scientist	0.63

FP02/SMARTS	Balogh, Levente	Postdoc	0.24
FP02/SMARTS	Sheffield, Matthew	Student	0.22
FP02/SMARTS	Neal, John Avery	Student	0.44
FP02/SMARTS	Wynn, Thomas	Student	0.22
FP02/SMARTS	Mosbrucker, Paula	Student	0.16
FP04/HIPPO	Vogel, Sven*	Scientist	0.74
FP04/HIPPO	Zhang, Jianzhong	Scientist	0.27
FP04/HIPPO	Yu, Xiaohui	Postdoc	0.45
FP04/HIPPO	Han, Jiantao	Postdoc	0.20
FP04/HIPPO	Reiche, Helmut	Student	1.02
FP04/HIPPO	Losko, Adrian	Student	0.34
FP04/HIPPO	Lebrun, Robert	Student	0.25
FP04/HIPPO	Yu, Xiaohui	Student	0.06
FP07/FDS	Daemen, Luc *	Scientist	0.84
FP07/FDS	Hartl, Monika	Scientist	0.19
FP07/FDS	Labs, Sabrina	Student	0.25
FP07/FDS	Matlashova, Yuliya	Student	0.23
FP07/FDS	Howard, John	Student	0.06
FP09/SPEAR	Majewski, Jaroslaw *	Scientist	0.96
FP09/SPEAR	Junghans, Sylvia Ann	Postdoc	0.94
FP09/SPEAR	Singh, Saurabh	Postdoc	0.87
FP09/SPEAR	Wang, Peng	Postdoc	0.09
FP09/SPEAR	Barkhudarova, Sophia	Student	0.13
FP10/LQD	Hjelm, Rex *	Scientist	0.79
FP10/LQD	Hartl, Monika	Scientist	0.59
FP10/LQD	Labs, Sabrina	Student	0.05
FP10/LQD	Matlashova, Yuliya	Student	0.03
FP11/Asterix	Fitzsimmons, Michael *	Scientist	0.97
FP11/Asterix	Kim, Jae wook	Postdoc	0.30
FP11/Asterix	Singh, Surendra	Postdoc	0.28
FP11/Asterix	Wang, Qiang	Postdoc	0.20
HPTP/High Pressure	Xu, Hongwu	Scientist	0.26

HPTP/High Pressure	Yu, Xiaohui	Postdoc	0.45
HPTP/High Pressure	Han, Jiantao	Postdoc	0.31
HPTP/High Pressure	Wang, Shanmin	Student	0.76
HPTP/High Pressure	Labs, Sabrina	Student	0.11
HPTP/High Pressure	Yu, Xiaohui	Student	0.06
MGMT/Management	Bourke, Mark	Manager	0.17
MGMT/Management	Kelsey, Charles	Manager	0.13
MGMT/Management	Kerstiens, Eron	Manager	0.03
MGMT/Management	Lewis, Paul	Manager	0.23
MGMT/Management	Muhrer, Guenter	Manager	0.05
MGMT/Management	Rhyne, James	Manager	0.08
MGMT/Management	Espinosa, Aundrea	Support	0.98
MGMT/Management	Maes, Olivia	Student	0.48
TRGT/Spallation Physics	Muhrer, Guenter	Scientist	0.03
TRGT/Spallation Physics	Mocko, Michal	Scientist	0.03
FACL/DAQ	Barr, Dean	Manager	0.79
FACL/DAQ	Coleman, Thomas	Scientist	0.98
FACL/DAQ	Gurule, Robert	Scientist	0.43
FACL/DAQ	Cooper, Gary	Scientist	0.28
FACL/DAQ	Trouw, Frans	Scientist	0.21
FACL/DAQ	Gochanour, Jason	Computer Professional	0.09
FACL/Mech-Tech	Borrego, Melvin	Professional	0.92
FACL/Mech-Tech	Burkhart, Jason	Professional	0.99
FACL/Mech-Tech	Nakotte, Tom	Student	0.34
FACL/Mech-Tech	Torrez, Michael	Student	0.32
FACL/Experiment Coordinator	Conradson, Leilani	Professional	0.96
FACL/Experiment Coordinator	Reano, Jason	Student	0.35
FACL/Experiment Coordinator	Maes, Olivia	Student	0.03
FACL/Sample Environments	Fanelli, Victor	Scientist	0.8

FACL/Sample Environments	Shapiro, Alan	Professional	0.42
FACL/Engineering	Larson, Eric	Professional	0.69
FACL/Engineering	Taylor, Mark	Engineer	0.45
FACL/Electrical Tech	Knickerbocker, Kelly	Professional	1.05
FACL/User Office	Padilla, Lisa	Professional	0.97
FACL/ESH	Aull, Frances	Professional	0.71
FACL/Rad-Protection	Zambrano, Jonathan	Professional	0.21
FACL/Rad-Protection	Walker, Kathy	Professional	0.15
FACL/Rad-Protection	Lovato, Lorenzo	Professional	0.1
FACL/Rad-Protection	Walker, Lawrence	Professional	0.02
FACL/External	Noyan, Ismail	Scientist	0.4
FACL/Technician	Waltman, Mary Jo	Professional	0.26
FACL/Other	Martinez, Tommy	Student	0.03
FACL/Other	Wynn, Thomas Andrew Total	Professional	0.04

1.6 Organizational Chart of the Facility

Figure 1.10 provides the organizational chart of the Lujan Center. The Lujan Center is operated in the Associate Directorate for Experimental Physical Science (Associate Director, Susan Seestrom), which is part of the Principal Associate Directorate for Science, Technology, and Engineering (Principal Associate Director, Alan Bishop). The Lujan Center is part of LANSCE division (Leader, Kurt Schoenberg) (Figure 1.11). The Lujan Center is one of the five facilities that comprise LANSCE, which is under the leadership of the LANSCE User Facility Director (K. Schoenberg). The overall framework for LANSCE Facility operations, including the Lujan Center, is documented in the “TA-53 Operations Management Plan” (TA53-PL-320-001.2). Figure 1.11 shows the position of the Lujan Center within the organizational chart of the Science, Technology, and Engineering Directorate.

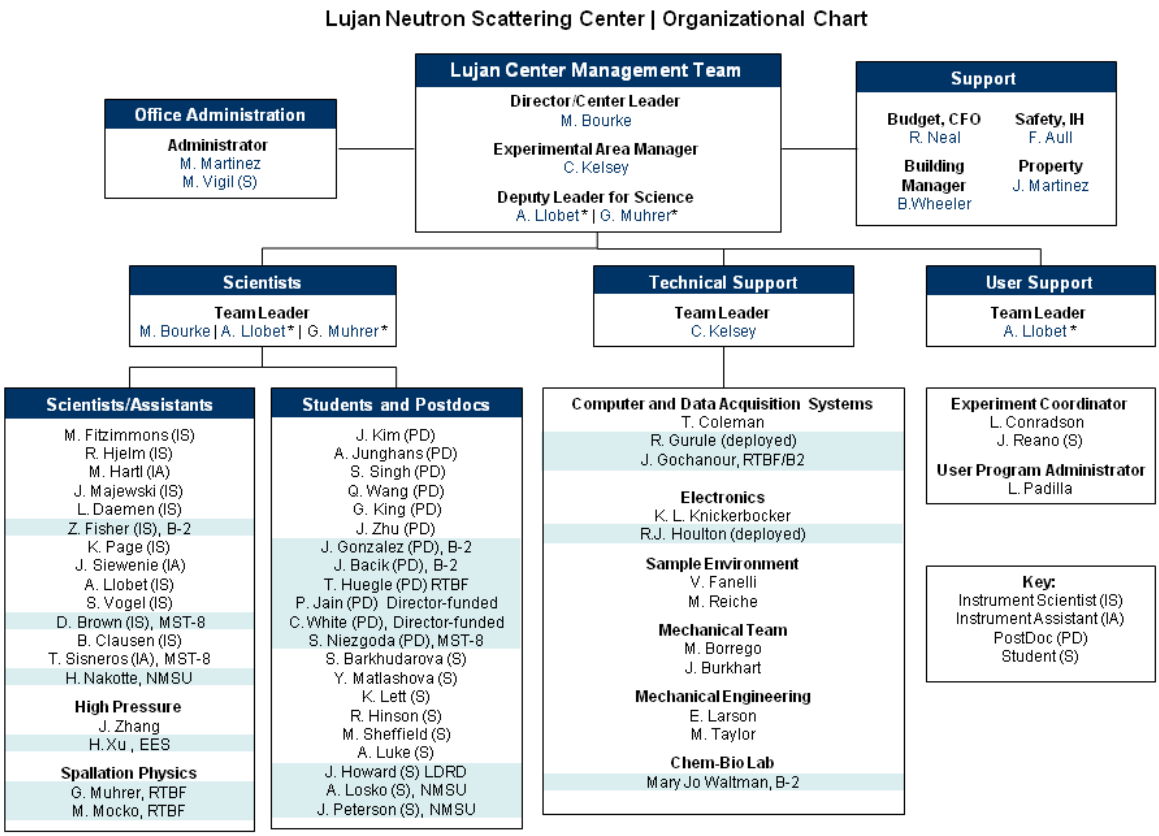


Figure 1.10: Organizational chart of the Lujan Center. Employees printed in blue are funded 50% or more from sources other than BES-SUFD (affiliation is provided). "IS", "IA", "PD", and "S" indicate instrument scientists, instrument assistants, postdocs, and students, respectively. Management team members with an asterisk are acting (May 2013).

In addition to the 34 FTEs funded by BES-SUFD, at least 8 FTEs that are funded by other LANL sources are permanently located at the Lujan Center.

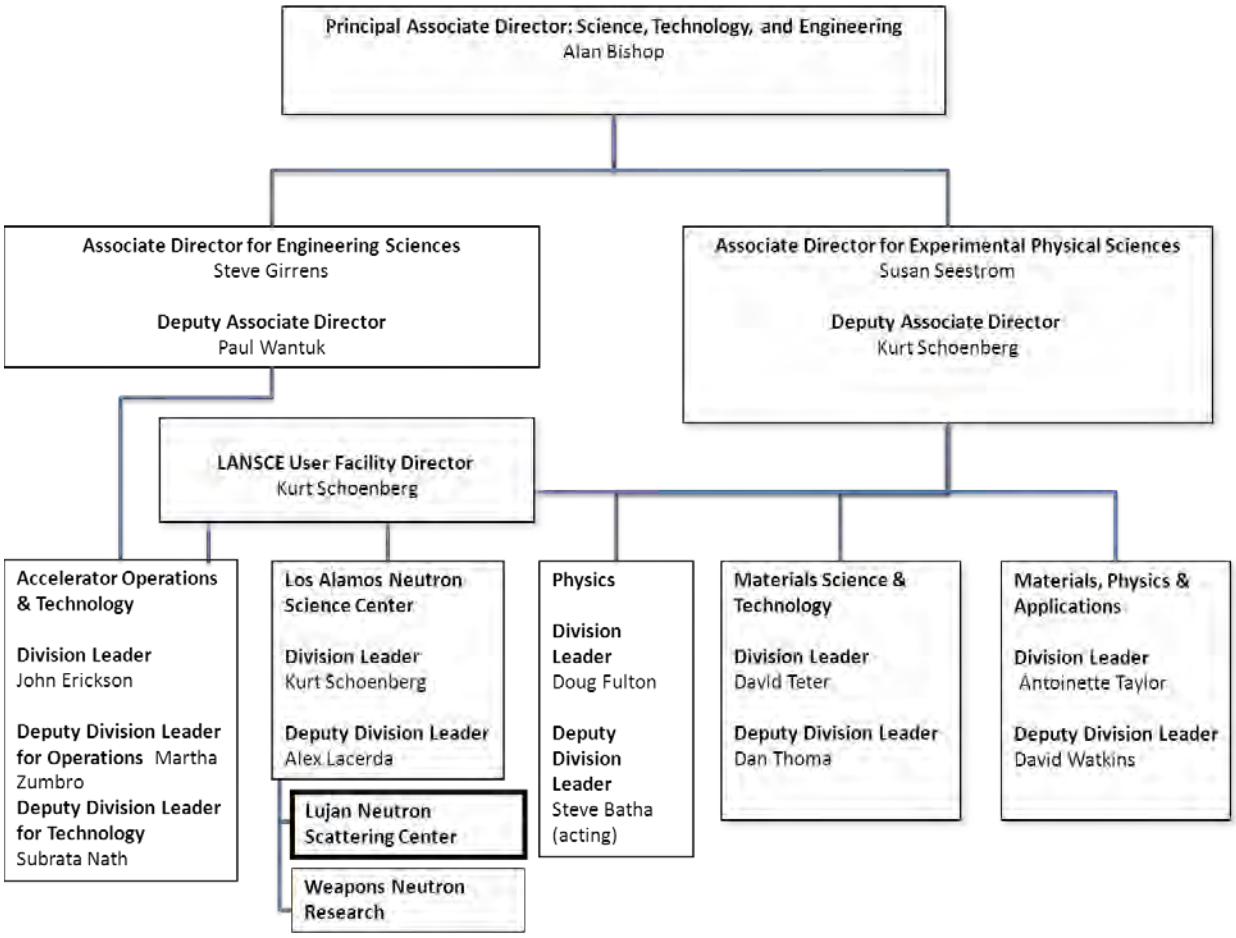
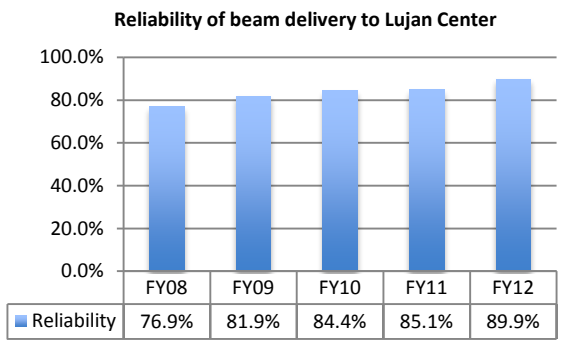


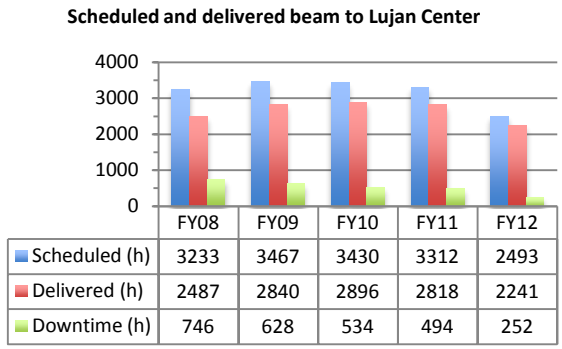
Figure 1.11: Organizational chart of the Science, Technology, and Engineering Directorate (2013).

1.7 Brief Description of Completed Accelerator and Instrument Improvements

The review period saw the approval and first implementations of the NNSA-funded LANSCE Risk Mitigation activities. The investment by the NNSA of $80M over the past 4 years out of an estimated total of $200M has already improved the beam reliability for the Lujan Center from 82% in FY2009 to 89.9% in FY2012. (Figure 1.12) Commitment of approximately $60M/year by LANL and the NNSA for Maintenance and Operations (M&O) of the LANSCE Facility provided preventive and corrective maintenance for the accelerator and associated beam transport systems (e.g., proton storage ring) to maintain high beam reliability for the Lujan Center. The Mark-III target-moderator system, entirely funded by the NNSA and installed in 2010, features tantalum cladding of the tungsten targets for a reduced corrosion and erosion risk. Improved moderator design provided cold flux ($\lambda > 4$Å) increases greater than a factor 2, benefiting SPEAR, Asterix, and LQD (Figure 1.13). The decrease in beam delivery in FY2012 shown in Figure 1.12(b) reflects the loss of beam resulting from the Tc-99 contamination event in August 2012.

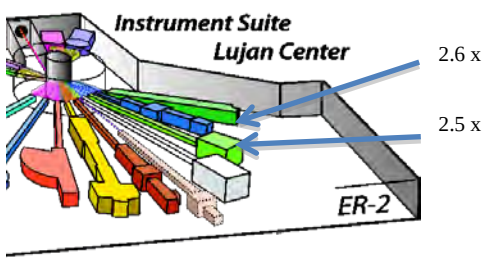


(a)

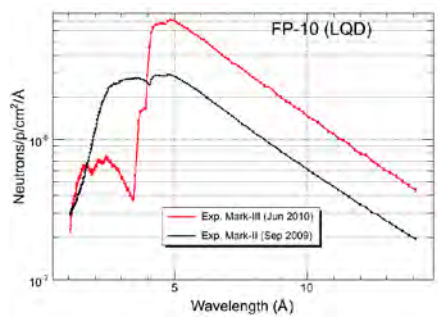


(b)

Figure 1.12: (a) Reliability of beam delivery to the Lujan Center from the LANSCE accelerator. (b) Beam scheduled vs delivered to the Lujan Center and downtime in hours (FY2008–FY2012).



(a)



(b)

Figure 1.13: (a) Flux increase measured on long length-scale instruments SPEAR, LQD, and Asterix resulting from the optimized moderator design of the MARK-III target/moderator system. (b) Measured spectrum for Mark III target (red) and Mark II target (black) for LQD.

Instrument improvements, including BES-SUFD and institutional support, completed during the review period include:

- FP-1/NPDF: Design and purchase of a 7 T cryomagnet (300 mK–800 K) for powder diffraction and total scattering measurements. It will enable local structure investigations and the study of atomic and magnetic structures under applied magnetic fields.

- FP-2/SMARTS: Implementation of in situ deformation studies under cryogenic temperatures and in magnetic fields. Development of a quenching furnace with a 1200°C maximum temperature and up to 20°C/second cooling rate.

- FP-4/HIPPO: Reconfiguration of the HIPPO detector system to increase the detector area between diffraction angles from 40° to 144° by approximately 45%. Commissioning of a high-temperature graphite furnace (T_{max}=2500 K) offering the highest temperature for neutron diffraction in a user program in the world), a high-temperature deformation furnace (1300 K, 2.5 kN), and a new six-axis robotic sample changer.

- FP-7/FDS: Replacement of beryllium-oxide filter by a beryllium filter, which doubled the instrument counting rate.

- FP-9/SPEAR: Development and construction of high-pressure/temperature cells for in situ reflectometry studies up to approximately 200 MPa on SPEAR, as well as construction and certification of a Bio-Safety-2 laboratory in the proximity of SPEAR, allowing investigations on living biological cells, which can chart a new direction in neutron reflectometry.

- FP-10/LQD: Development and construction of: (1) gas-mixing cell for the study of long length-scale aqueous solution structure of "dissolved" hydrophobic gases for the study of non-ideal aqueous gas mixing and the role of structure in "homogeneous" catalysis, (2) stress rig for in situ polymer response to tensile and compressive stress that measures time-dependent stress and strain concurrently with SANS, (3) Couette shear stress cell with improved mechanical stability and sample loading, (4) constant temperature humidity cell for the study of water uptake in geological samples and for fuel cell materials, and (5) a completely automated and programmable variable collimation system.

- FP-11/Asterix: Near completion of a midscale BES-DMSE-funded instrumentation upgrade ($880k) on Asterix, during which nearly all components of Asterix were improved or replaced. This upgrade also enables implementation of the Spin Echo Scattering Angle Measurement (SESAME) technique. Of this investment, $800k was awarded to Indiana University to upgrade the Asterix spectrometer ($80k was received by LANSCE to support the in-house design effort for the upgrade). Asterix was the only instrument at LANL to benefit from DOE's midscale instrumentation upgrade program.

- Data acquisition: Development of a new Linux-based data acquisition system. The system is fully operational, is reliable and has reduced data-save times by an order of magnitude. This system also provides event-mode data collection for Lujan Center instruments. (LQD and FDS are scheduled for conversion in 2013).

1.8 Brief Description of Ongoing Accelerator and Instrument Improvements

LANSCE Risk Mitigation (LRM) activities are planned through calendar year (CY)2018. CY2019 is the first year of 4000-hour beam delivery. Major LRM activities include full replacement of the 201 MHz radiofrequency drivers for the Drift Tube Linac, New 805 MHz klystrons and

refurbished power modulator systems, and a new Experimental Physics and Industrial Control System (EPICS) based control system. The Lujan Center user program will continue concurrently with LRM execution. Figure 1.14 provides the planned operation schedule through CY2019.

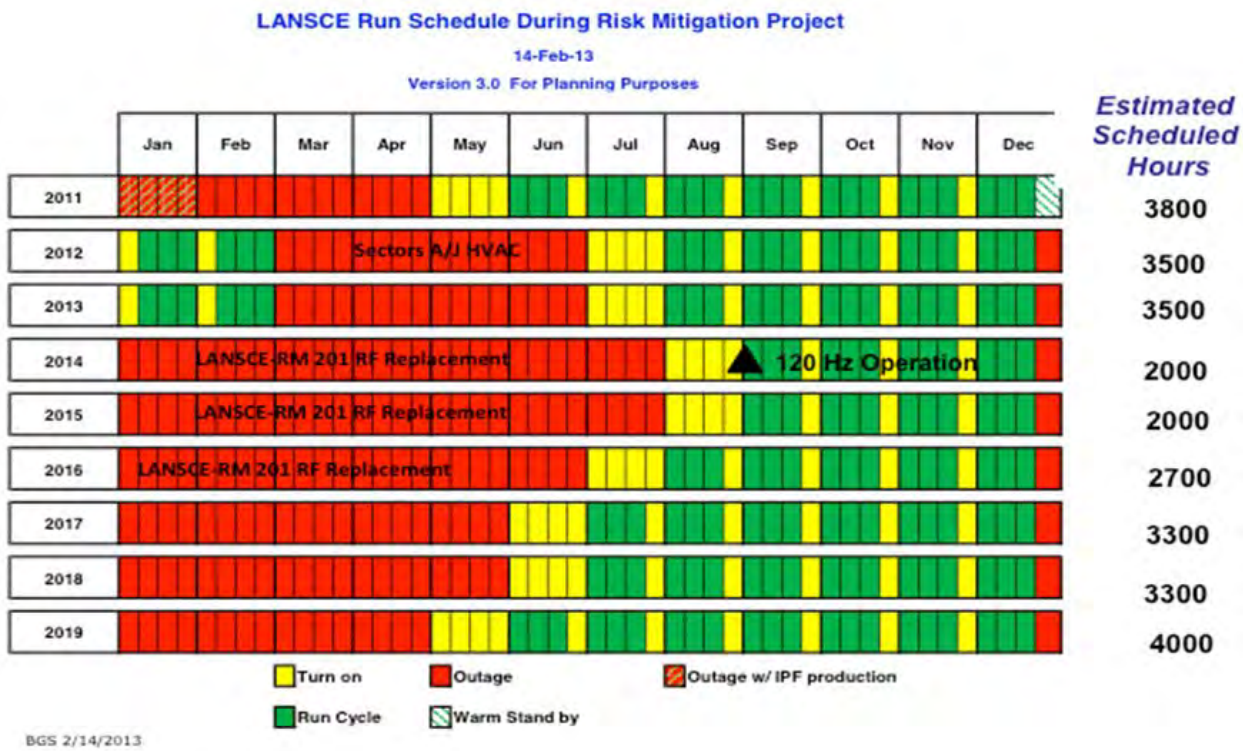


Figure 1.14: LANSCE estimated run schedule (through CY2019).

Ongoing and proposed instrument improvements, contingent on funding, include the following.

- FP-1/NPDF: Local structure studies under applied magnetic fields using the newly designed and under-construction 7 T/300 mK cryomagnet at high pressures with a set of total scattering compatible gas pressure cells designed for in situ operation on NPDF.

- FP-2/SMARTS: Expansion of the work on nuclear energy materials: in particular, irradiated materials, to characterize microstructural changes or changes of the deformation mechanisms due to radiation damage. This expansion will require new sample environments to handle highly radioactive materials, which may also benefit other relevant instruments (HIPPO, LQD, NPDF).

- FP-4/HIPPO: Expansion of the range of routinely available sample environments [e.g., quench furnace, radiofrequency (RF) furnace for 3000°C], and streamlining of the data analysis (automation, maximum entropy method) to increase value for non-experts in diffraction. Exploring combinations of neutron diffraction with neutron and proton

imaging methods is anticipated to open up new worldwide, unique research opportunities.

- FP-7/FDS: Installation of a radial collimator between the beryllium filters and the detector banks would improve FDS resolution and decrease background. Installation of a diffraction bank will allow for simultaneous inelastic neutron scattering and diffraction measurements, increasing the range of experiments that could be performed on FDS with samples prepared in situ (e.g., catalysis, surface chemistry). Both options would bring FDS on a par with the current best instrument of this class (TOSCA at ISIS).

- FP-9/SPEAR: In the immediate future, SPEAR requires a new, faster, more reliable two-dimensional (2D) time-of-flight (TOF) detector with better dynamic range and spatial resolution. Capabilities of SPEAR could be substantially improved with a new, user friendly data acquisition and reduction program to allow access to off-specular and grazing incidence neutron measurements. Some improvements in the neutron flux on the sample can be achieved by adding sections of neutron guides.

- FP-10/LQD: LQD will benefit from the installation of a vacuum detector tank, as well as a system that enables the motion of the detector to adapt the Q-range to the experiment. Additionally, the installation of a neutron guide would increase the flux of cold neutrons. An investment in equipment to allow time-dependent (kinetic) measurements would allow studies of several kinetic phenomena of interest to small-angle-scattering instrument users, including a fully functional stroboscopic system for pulsed-probe measurement of relaxation response to transient stresses.

- FP-11/Asterix: Asterix is nearing completion of a midscale instrumentation upgrade funded by DOE-DMSE. This funding was insufficient to replace the IPNS polarization analyzer, which does not analyze the polarization with sufficient uniformity to allow SESAME to produce reliable data. This polarization analyzer must be replaced; otherwise, the only instrument to perform SESAME (needed for studies of soft matter, membranes, etc.) will be off-specular at ISIS.

- Data acquisition: Installation and adaption of the new Linux-based data acquisition system on LQD and FDS is ongoing. Event-mode data collection, standard at SNS, requires adaption of data reduction software, which is also ongoing.

1.9 Brief Description of Scientific Staff Research Funded by the Facility

Lujan Center staff research is reported in Chapters 2 and 5. Facility-funded research efforts benefiting the user program included improving instruments, investing in new sample environments, investing in technique development, and improving data analysis techniques. The Lujan Center staff participated in or led the development of advanced data analysis methods using statistical methods, such as maximum entropy methods for diffraction data

(HIPPO) or inelastic scattering (FDS) data analysis, automation of data analysis (SMARTS and HIPPO), advanced data reduction, and analysis methods for total scattering, as well as statistical methods applied to data reduction (Asterix).

In-house experimental capability developments include various gas pressure cells (NPDF/HIPPO), a graphite tube furnace capable of >2500 K (HIPPO), gas-mixing cell for non-ideal thermodynamics and catalysis studies; controlled humidity cells for geo-science and energy storage applications, pressure (geoscience and polymers), shear and linear stress rigs for polymer mechanical response applications (LQD), a high-temperature load frame for texture studies (HIPPO), a mechanical jig to apply pure bending stress to thin films (Asterix), and pressure cells for reflectometry (SPEAR).

Considerable effort was spent on synthesis, in particular for deuterated or isotopically labeled analogues of sample materials. In this highly specialized field, the Lujan Center has expert chemists that enable many user experiments. Other areas of facility-funded research include improved theory to interpret data obtained in neutron scattering experiments. Recently, the Lujan Center staff explored opportunities offered by combining energy-dispersive neutron radiography with proton radiography to uniquely characterize materials and processes using a combination of Lujan Center neutron scattering and proton radiography at LANSCE.

1.10 External Input to the Facility

The Lujan Center participates in and receives advice from external panels on issues ranging from science to user operation to management. The main contributors are as follows.

LANSCE User Group (LUG) Executive Committee

The LUG-EC holds monthly conference calls and an onsite yearly meeting to manage LANSCE user group activities. The LUG Executive Committee is typically comprised of 12 members; 1 member is a student or postdoctoral researcher. The members are elected by the vote of the LUG membership, with candidates chosen to reflect the principal scientific activities at LANSCE.[12] The LUG-executive committee provides advice to the LANSCE Facility director on beamtime allocations, facility upgrades and new beamlines, experimental programs, user meetings, and the Rosen Prize for doctoral theses. Although the LUG executive committee represents the entire LANSCE Facility, in the upcoming year a smaller group focused exclusively in Lujan Center will be created to better address Lujan Center programs, beamlines, and upgrades.

LANSCE Advisory Board (LAB)

The LAB meets once per year to advise the Laboratory Director and the LANSCE Facility Director on management and technical issues associated with LANSCE. The LAB consists of approximately eight senior scientific leaders from the academic and national security sectors. The chair of the LUG is also a part of the LAB.

[12] For additional information regarding the LUG charter and composition, visit http://lansce.lanl.gov/users/lug.shtml.

LANSCE Executive Committee (LEC)
This committee is defined and mandated by the MOU between the NNSA and DOE-Office of Science (SC) and adjudicates high-level mission issues, stakeholder conflicts, and facility funding. The LEC meets approximately once per year; it is convened and chaired by the Deputy NNSA Administrator (NA10) as both Program Sponsor and Landlord. The LEC consists of major programmatic stakeholders in SC and Nuclear Energy (NE) at the assistant secretary level.

LANSCE Neutron Scattering School Advisory Committee
The annual LANSCE Neutron School has been successfully carried out with the support of BES, the National Science Foundation (NSF), and LANL for the last 10 years. The school has trained over 300 neutron scattering users and adopts topical themes based on the input from a committee of advisors.

Materials Program Advisory Committee (MPAC)
The MPAC comprises around 40 expert scientists in the scientific and engineering areas covered by the Lujan Center instruments. MPAC membership is reviewed annually and is recommended to the Lujan Center director by the Lujan Center scientists. The MPAC members perform scientific reviews of the submitted proposals and recommend the allocation of beamtime in Lujan Center instruments (see Chapter 4). Members of these committees are listed below.

An important element of the Lujan Center's facility strategic planning process is outreach to the user community aimed at soliciting input on instrument upgrades or the construction of future instruments. A list and description of organized and sponsored meetings and workshops are given in Table 1-2.

LANSCE Advisory Board (LAB)

Member	Affiliation
Arthur Kerman (Chair)	Professor, Massachusetts Institute of Technology
John Browne	Former Director, Los Alamos National Laboratory
Paul Fleury	Dean, Yale University
Don Frazier	Private Consultant
Raymond Juzaitis	CEO of NSTec, Nevada
Mark Bowden	Pacific Northwest National Laboratory
Brian Maple	Professor, University of California, San Diego
June Matthews	Professor, Massachusetts Institute of Technology
Robert McGreevy	Director, ISIS
Kelly J. Beierschmitt	Director, Neutron Sciences, Oak Ridge National Laboratory

LANSCE User Group (LUG) Executive Committee

Member	Affiliation	Representative
Mark Bowden	Pacific Northwest National Laboratory	Chair
Tyrel McQueen	John Hopkins University	Vice Chair
June Matthews	Massachusetts Institute of Technology	Ex Officio
Emil Bozin	Brookhaven National Laboratory	Lujan Center
Laura Dominik	Honeywell	Industry
Christopher Morris	Los Alamos National Laboratory	Proton Radiography
Meiring Nortier	Los Alamos National Laboratory	Isotope Production Facility
Luka Pocivavsek	University of Pittsburgh Medical Center	Lujan Center
Hillary Smith	California Institute of Technology	Student
Fredrik Tovesson	Los Alamos National Laboratory	Weapons Neutron Research Facility
Albert Young	North Carolina State University	Ultra-Cold Neutrons
Bryan Zeck	North Carolina State University	Student

2012 LANSCE Neutron Scattering School Advisory Committee

Board Member	Affiliation
Tonya Kuhl	University of California, Davis
Thomas Proffen	Oak Ridge National Laboratory
Roger Pynn	University of Indiana
Sunil Sinha	University of California, San Diego
Andrew Shreve	University of New Mexico
Suzanne te Velthuis	Argonne National Laboratory

Table 1-2. Organized and Sponsored Lujan Center Meeting and Workshop Summary

"New Directions in Total Scattering Research at LANSCE" LANSCE User Group Meeting Los Alamos, NM 2012
"Developing a Neutron Radiography Capability at LANSCE" LANSCE User Group Meeting Los Alamos, NM 2012
"HIPD Instrument Advisory Team Meeting" 2009 International Conference on Neutron Scattering Knoxville Convention Center, Knoxville, TN May 3, 2009
"Workshop on a New Time-of-flight Low-Q Instrument at the Lujan Center" International Conference on Neutron Scattering Knoxville Convention Center, Knoxville, TN May 3, 2009

1.11 Summary

Investments made by the NNSA through the LANSCE operations budget, the LANSCE risk mitigation effort, and the Mark-III target replacement have improved the reliability of beam delivery and the flux for the long length-scale instruments at the Lujan Center. LANSCE risk mitigation activities are planned through FY2018, with a total integrated investment of $200M. By FY2019, 4000 hours of reliable beam delivery at the Lujan Center is expected.

Over the last 4 years, BES-SUFD funding has remained almost unchanged and comparable with FY2007 levels. This flat funding drove tactical decisions in FY2009 and FY2011 to first reduce the availability of three instruments and subsequently to remove the three instruments from the user program. In so doing, resources were refocused on the remaining user program instruments, and their performance remained high. Overall, Lujan Center operations were aided by outreach performed by the Lujan Center staff that increased the non BES-SUFD funding portfolio. Nevertheless, the lack of additional SUFD support in the future will result in the loss of additional instruments to the user program, with a concomitant reduction in total experiments run and the number of users that can be accommodated.

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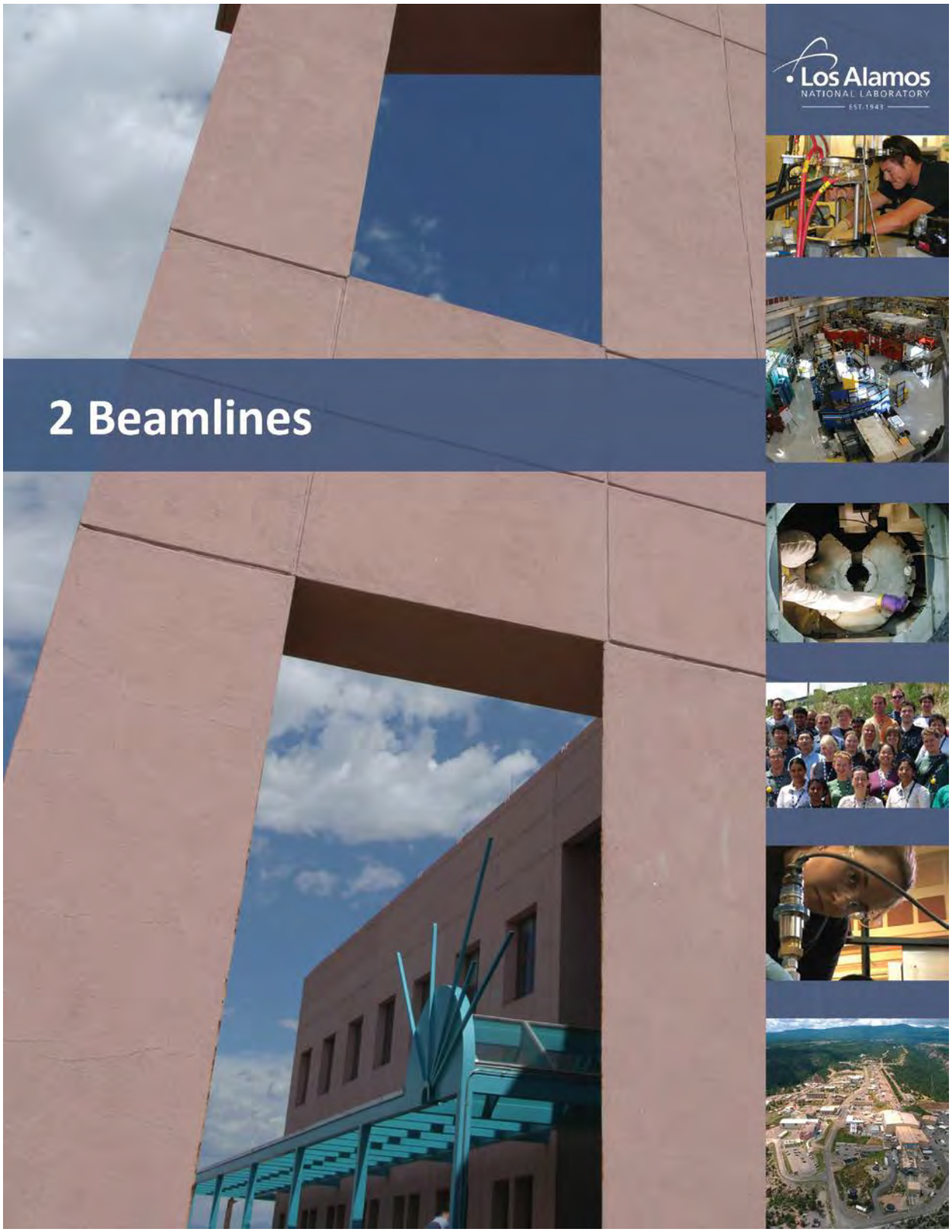

LA-UR-13-24525

2 Instrument Descriptions

This section describes the BES-SUFD funded instruments at the Lujan Center. For each instrument, a brief overview is given, followed by a science highlight. Unique capabilities of each instrument, including comparisons with similar instruments at other facilities, as well as instrument-specific research and development plans, are presented. The complete list of specifications, statistics, and publications addressing the BES Information Requests is included in the appendix.

2.1 NPDF
Instrument Scientist: Dr. Kate Page

Overview

The NPDF is a high-resolution total scattering powder diffractometer with a sample position 32 m from the spallation neutron target. It has 20 detector panels with 160 position-sensitive detectors in the backscattering region of the instrument (Figure 2.1). These specifications give the instrument a high resolution and a large Q range (0.8 to 51.1 $Å^{-1}$). This factor, together with a low and stable background, position NPDF as a world leader in pair distribution function (PDF) studies of disordered and nanocrystalline materials. A standard data set suitable for PDF analysis can be obtained in 2 to 6 hours. NPDF is equally well suited for high-resolution crystallographic studies. Research performed using NPDF has resulted in about 94 peer-reviewed journal articles since 2009, in fields as diverse as geochemistry, actinide research, complex oxides, bulk metallic glasses, and hydrogen storage materials. Additionally, NPDF serves a key role as a development platform for local structure analysis tools for disordered and nanostructured bulk materials, as well as finite nanomaterials.

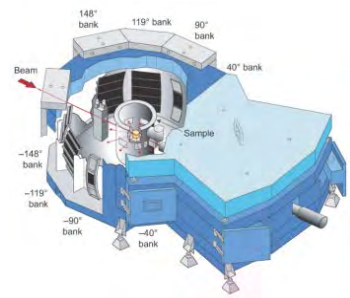

Figure 2.1: Schematic of NPDF.

Science Highlight

The observation of a novel paraelectric state in PbTe and the nature of its local dipoles give insight into what kind of materials will lead to optimized thermoelectric functionality. This study may ultimately improve our societal energy stewardship and was published in *Science* (Bozin et al., *Science* **330** (2010) 1660). (Figure 2.2)

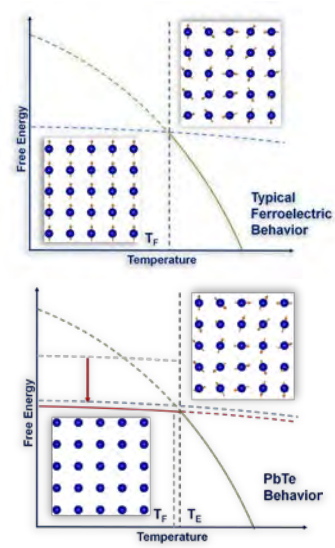

Figure 2.2: The structural dipoles of PbTe do not order upon cooling but disappear, resulting in an undistorted rock-salt ground state.

Unique Capabilities

The dedicated total scattering instrument, NPDF, provides both local structure studies for amorphous, disordered, and nano materials and high-resolution powder diffraction capabilities. In the last few years, the instrument has maintained elevated user demand (with subscription rates increasing over 300%), largely due to continued and high-impact work addressing local structure features in complex functional materials, such as superconductors, ferroelectrics, thermoelectrics, and frustrated systems. As the highest-resolution neutron total scattering instrument in the world, the instrument provides access to several hundred Å of atom-atom correlations in real space: a regime with emerging relevance to nano- and meso-scale science. The instrument is being applied to the characterization of finite size and shape effects in nanomaterials and the study of the nature and length scales of nanostructured domains in complex disordered materials. This world-best resolution, coupled with exceptionally low and stable instrument background and wide scattering vector coverage (high Q), has established NPDF as a benchmarking tool within the local structure community. It is used extensively for methods development and validation of instrument quality at sister facilities (recently installed NPDF counterparts at spallation neutron sources include the higher-flux but lower-resolution/higher-background instruments NOMAD at SNS and NOVA at J-PARC). NPDF's leadership role is continuing in the development of several novel sample environments at the Lujan Center, enabling in situ local structure determination (specifically, a 7 T magnet and range of gas pressure cells, all temperature controlled and fully compatible with total scattering data reduction). Furthermore, the NPDF instrument staff employs a diverse range of modeling expertise to support user experiments. Current capabilities span conventional (small-box) modeling methods and advanced Reverse Monte Carlo simulations, as well as unique developments in complex (multi-level) modeling for finite nanostructures and ab initio or force-field-coupled modeling approaches for disordered materials. Finally, the continuing impact of NPDF and the quality of the research program it enables is evidenced by a returning user base featuring world leaders in the total scattering field (Billinge, Egami, Levin, Louca, Proffen, Neder, and others), as well as a growing number of emerging leaders principally trained at the Lujan Center (Bozin, Llobet, McQueen, Page, Shoemaker, White, Neilson, and others).

R&D Plan and Upgrade Opportunities

In the upcoming years, NPDF will continue to change the way the world understands structure-property relationships in functional materials. A number of strategic research and development directions are mapped out for the instrument and program.

In particular:

1. As structures underpinning mesoscale phenomena grow in importance and relevance, NPDF will be increasingly applied to “intermediate-range” structure determination—for example, describing nanostructured domains in complex materials or size, shape, and architecture effects in nano and composite materials. NPDF and Lujan Center staff will play a central role in the development of integrated experiment and theory spanning the local atomic structure and small-angle-scattering regimes for multiple length-scale structure determination.

2. The Lujan Center's newly designed and purchased 7 T cryomagnet (300 mK to 800 K) for total scattering measurements will enable local structure studies under applied magnetic field. This novel capability will offer insights into how spin, charge, and lattice degrees of freedom interact in the solid state, revising our understanding of a host of systems and phenomena where the average picture of magnetism is sometimes insufficient (e.g., colossal magnetoresistance materials, multiferroics, magnetocaloric materials, and magnetic shape memory alloys). Users of the instrument will be able to address fundamental and applied questions, such as *How do local structural distortions develop and behave under applied magnetic field?* and *Is spin-phonon coupling essential to high-T_c superconductivity?*

3. A set of total scattering compatible gas pressure cells designed for in situ operation on NPDF will couple the study of local atomic structure with pressure-induced phenomena (amorphization, phase transitions, etc). Efforts will be applied toward understanding fluid/nanophase interfaces: for example, to optimize hydrocarbon extraction from oil and gas reservoirs, understand corrosion and scaling in nuclear reactors, and predict and follow clathrate hydrate formation at conditions analogous to deep ocean depths. In summary, each of these research directions will enable fundamentally new science at the Lujan Center and ultimately at other US neutron centers.

Specific upgrade opportunities for NPDF include expansion of detector coverage to lower angles and fully populate banks to improve efficiency and allow the study of magnetic systems and large unit cell systems such as metal organic frameworks. Expanded local structure sample environments for the user program include magnetic field capabilties [for colossal magnetoresistance (CMR) materials, multiferroics, mangetocaloric materials, and magnetic shape memory alloys under field], high-pressure/temperature capabilities (for studying gas clathrates, earth science at crustal conditions, nuclear reactor materials, etc.), and a gas handling system (for in situ studies of fuel cells and catalysis). A complementary opportunity exists in revitalizing Pharos to enhance the total scattering user program. Pharos would provide access to high d-spacing for magnetic scattering, provide sample environments compatible with NPDF and HIPPO, and offer PDFs from elastic scattering data for hydrogen containing systems, benefiting the polymer, organic chemistry, nanoparticle, hydrogen storage, and hydride communities. With additional developments, Pharos can be used to collect finite-energy-window PDFs to probe the dynamics of local structure phenomena in complex and disordered materials.

2.2 SMARTS
Instrument Scientist: Dr. Bjorn Clausen

Overview

SMARTS is a third-generation neutron diffractometer optimized for the study of engineering materials. With an extensive array of in situ capabilities for sample environments, it enables measurements on small (1 mm^3) or large (1 m^3) samples. Components with dimensions up to 1 m and weight up to 1,500 kg can be positioned precisely in the beam. Permanently mounted alignment theodolites provide a simple and efficient way to position samples or equipment to within 0.01 mm.

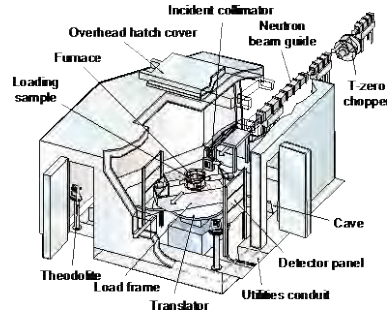

Figure 2.3: Schematic of SMARTS.

The furnace and load frame suite allows research on materials under extreme loads (250 kN) and at extreme temperatures (from cryogenic temperatures to 1,500°C). A magnetic field capability is also available to 1.5 T. In situ uni-axial loading on samples up to 1 cm in diameter at stresses of 2 GPa and with lower stresses at temperatures up to 1,500°C are routine. Recently, capabilities have been developed to accommodate investigations of radioactive materials, e.g., changes in ductility and deformation modes from in situ loading measurements on a zirconium alloy that has seen 7 years of service in a nuclear power reactor. (Figure 2.3)

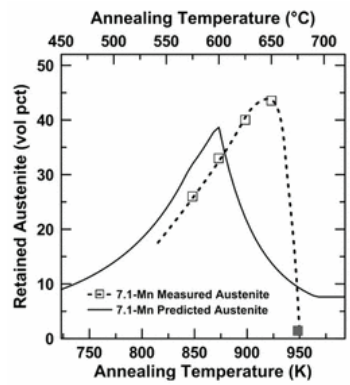

Figure 2.4: Residual austenite volume fraction as a function of annealing temperature as predicted by model and as measured on SMARTS (open symbols).

Science Highlight

Experiments on SMARTS provide unique strain and phase evolution data during loading of an advanced high-strength steel that experiences transformation-induced plasticity (TRIP). These advanced steel grades with improved property ranges are used for new automotive designs and are optimized for fuel efficiency and safety [Gibbs et al., *Met. Mater. Trans.* **42** (2011) 3691; this paper was awarded a finalist medal of the American Iron and Steel Institute in 2013]. (Figure 2.4)

Unique Capabilities

SMARTS provides unique experimental capabilities that include a 250 kN load frame with high- and low-temperature and magnetic field capabilities. The SMARTS scientific team has focused on the application of a mature technique on an increasing broad range of important societal problems and materials and the exploitation of the capabilities of unique environments (comparable instruments such as VULCAN at SNS or 1-ID at APS are more focused on instrument development and proof-of-principle experiments). Furthermore, the scientific team on SMARTS has developed strong collaborations with theorists and modelers. SMARTS

researchers have developed the capabilities and procedures to safely examine activated materials to address materials problems relevant to nuclear energy.

R&D Plan and Upgrade Opportunities

Nuclear energy materials and more irradiated materials provide important research opportunities for the future. Feasibility studies on moderately active materials have already been performed at SMARTS, including typical in situ loading measurements to determine changes in deformation mechanisms due to radiation, but also line profile analysis measurements to determine microstructural changes due to radiation. A part of our tactical plan will be to develop a capability to handle and investigate highly activated materials on SMARTS, which will require shielding casks to minimize exposure to personnel and potentially a remote handling capability for loading samples into the casks. This plan will include the development of a dedicated beamline at the Lujan Center for the investigation of highly radioactive materials with integrated remote handling. To maximize the use of the remote handling facility, this beamline must be capable of multiple measurement techniques (not necessarily simultaneously because optimum sample specifications differ), such as high-angle banks for peak profile analysis, 90° banks for strain measurements, and transmission detectors for tomography and small-angle scattering.

An ongoing upgrade that is nearing completion is the inclusion of a high-angle position-sensitive detector (PSD) that will provide better peak resolution than is currently achievable with the standard 90° detector banks. Preliminary data were taken using the new detector in the 2012 run cycle. This PSD detector will be used in two positions: one for high-angle measurements of peak profiles and one for low-angle measurements, providing a scattering vector almost out of the horizontal plane for in situ texture determination in materials with orthotropic texture (rolling, etc.). Further investment in detectors would allow simultaneous data collection from low- and high-angle detectors, increasing both the quality of the data and productivity.

2.3 HIPPO
Instrument Scientist: Dr. Sven Vogel

Overview

HIPPO is a general-purpose neutron TOF powder diffractometer. The short primary flight path provides a high neutron flux at the sample position. Presently, 1240 ^{3}He detector tubes are arranged on 53 detector panels on 5 rings with nominal diffraction angles between 40° to 144°. The combination of high flux and large detector coverage makes HIPPO very efficient for the acquisition of datasets for crystal structure refinements and allows for kinetic studies with temporal resolutions of the orders of minutes or better. The large number of detector panels probes many sample directions simultaneously, allowing measurement of the orientation distribution (texture) of grains in a polycrystalline aggregate with only two or three sample rotations around the vertical axis. A large number of sample environments for HIPPO allows investigations of crystal structure, phase composition, or texture at temperatures above and below room temperature, at high pressures, under applied uni-axial load or in a magnetic field. Besides conventional Rietveld analysis, PDF analysis or maximum entropy method (MEM) analysis has been successfully applied to HIPPO data. (Figure 2.5)

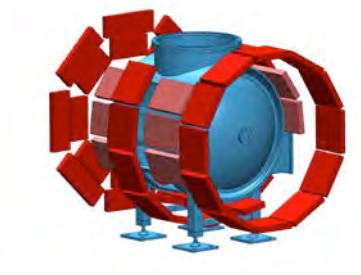

Figure 2.5: Schematic of HIPPO. Red areas are detectors; the sample chamber is shown in blue.

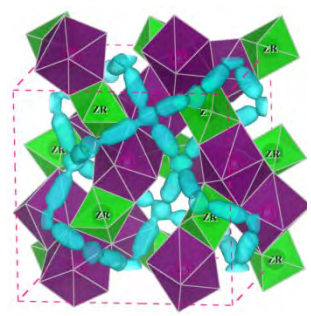

Figure 2.6: Diffusion path of Li ions (blue) within the solid-state electrolyte $Li_7La_3Zr_2O_{12}$.

Science Highlight

With the use of high-temperature neutron diffraction, the diffusion pathways of Li ions in $Li_7La_3Zr_2O_{12}$ could be reconstructed from the diffraction data using the maximum-entropy method. The 3D network of diffusion pathways explains the high conductivity in this material, making $Li_7La_3Zr_2O_{12}$ an excellent candidate for solid-state electrolytes [Han et al., Chem. Commun. **48** (2012) 9840–9842]. (Figure 2.6)

Unique Capabilities

The general-purpose neutron diffractometer HIPPO has one of the highest sample throughputs in the world and is the only neutron instrument in the world used for routine neutron texture measurements at ambient (high throughput) and non-ambient conditions (high and low temperature, stress, magnetic field, and a combination of low T plus magnetic field or high T plus stress). The high flux (>10^7 n/cm^2/s), resulting from the proximity to the source, and large detector coverage of HIPPO not only allows efficient crystal structure and texture measurements, but also allows for time-resolved studies (sub-minute time resolution) to be performed or for small samples to be taken (e.g., the texture of a 25 µm thick zirconium cladding layer encasing a U-10Mo metallic fuel strip was measured). Flux is comparable with or

exceeds other general powder diffractometers (e.g., Powgen at SNS reports 4 x 10^6 n/cm^2/s, Huq et al. 2011). The low repetition rate of 20 Hz in combination with the large detector coverage from 140° to 40° provides an exceptionally large accessible d-spacing range from 0.16 to 22 Å for each pulse without the need to change chopper settings. Beamline scientist Sven Vogel has contributed to data analysis methods for texture analysis, maximum entropy analysis of neutron diffraction data, and automation of powder diffraction analysis of large numbers of datasets, among other topics. Recent additions to HIPPO's sample environments include a high-temperature furnace (T>2500 K, the highest temperature offered routinely at any neutron facility in the world), a high-temperature deformation stage (2.5 kN at up to 1300 K, including sample rotation for texture measurements), and a new six-axis robot for more efficient sample changes and sample orientation in the beam.

Being located at LANL, the Lujan Center has the ability to work with radioactive materials to study radiation damage or the crystallography of nuclear fuels. The ability to handle such materials is absent at most neutron and (in particular) synchrotron facilities.

Many world leaders in various fields of science routinely use HIPPO, e.g., Barsoum (Ceramics, Drexel), Daymond (Deformation in metals and alloy, Queen's University, Kingston, Canada), Misture (SOFC materials, Alfred University), Monteiro (Concrete, Berkeley), Wenk (Textures, Berkeley), Winkler (High Temperature Synthesis, Goethe University, Frankfurt, Germany), and Zhao (High Pressure, UNLV). Several students and postdocs trained on HIPPO went on to become emerging leaders in their field, e.g., Carpenter (LANL), Lane (Drexel, now Intel), Wall (UTK, now EPRI & Georgia Institute of Technology), and Stebner (Northwestern, now Colorado School of Mines).

R&D Plan and Upgrade Opportunities

Meeting the DOE grand challenges requires the characterization of materials on the atomic scale to understand, for example, bonding mechanisms, material synthesis, operation of materials at their theoretical limits of strength and fracture resistance, or the behavior of materials far away from equilibrium. HIPPO's unique set of sample environments and the ability to characterize both crystal structure and micro-structural features, such as texture and dislocations, make HIPPO a unique and proven tool to address these challenges. We plan to expand these capabilities by optimizing data quality (e.g., background reduction), expand the range of routinely available sample environments (e.g., quench furnace and RF furnace for 3000°C), and streamlining the data analysis (automation, maximum entropy method). Exploring combinations of neutron diffraction with neutron and proton imaging methods is anticipated to open up new and unique research opportunities at LANSCE. We will continue the strategic growth of the HIPPO user base by continuing and intensifying our collaborations with nuclear programs (fuels, nuclear waste), mechanical engineering (light weight materials for aerospace and automotive applications), advanced materials (shape memory alloys, magneto-caloric materials, etc.) and energy materials (fuel cell materials).

Upgrade plans for the high-pressure program include extending the pressure and temperature ranges of the current anvil- and fluid-cell capabilities, as well as integrating imaging, calorimetry, and ultrasonics.

Specific plans include the following:

1. Developing double-toroidal anvil cells for TAP-98 to expand its high-pressure capability up to 20 GPa.

2. Building on the current Z-direction anvil press (ZAP) cell, developing in situ pressurization capability using a hydraulic ram and a motor-driven gear box for experiments at pressures up to 10 GPa and temperatures down to 20 K. This development was driven by users from magnetism and superconductivity communities and is expected to expand the user base in these areas.

3. Modifying and optimizing the current gas/fluid cell designs and extending their uses for various neutron scattering and imaging beamlines (other than HIPPO, e.g., NPDF, HIPD).

4. Developing high pressure-temperature (P-T) hydrothermal gas/liquid cells (10 kbar and 1200°C), which will be the first of its kind in the US. This new capability will have broad applications to the emerging energy/environmental research areas, such as carbon dioxide sequestration, salt repository, and geothermal energy.

5. Integrating neutron diffraction with differential thermal analysis (DTA) for simultaneous studies of crystal structure, phase transition, reaction kinetics, and thermodynamics (neutrons present several advantages over X-rays for the integration of DTA, such as the absence of radiation-induced heating and no complication in interpreting the DTA signals, significantly larger sample volume, and high penetration for the design of robust high-pressure cell assembly).

6. Integration of neutron diffraction with ultrasonic interferometry for simultaneous studies of crystal structure, phase transition, sound velocities, and elastic properties. Compared with conventional equations of state (EOS) derived from pressure-volume-temperature measurements, the ultrasonic technique allows direct measurements of both compressional and shear elastic properties. This capability is especially useful for the study of materials with complicated phase diagrams such as cerium and plutonium metals.

2.4 FDS
Instrument Scientist: Dr. Luke Daemen

Overview

The FDS is used for molecular vibrational spectroscopy by inelastic neutron scattering. The instrument is designed for high count rates by the use of detectors covering a large solid-angle. FDS is therefore most useful for measurements requiring high sensitivity, e.g., very dilute systems or molecules adsorbed on surfaces such as in catalysts. Other applications of this instrument include hydrogen-bonded molecular crystals, biomolecular model systems, and high explosives. Although most experiments are done on hydrogen-containing molecules, it is also possible to study molecular vibrations involving other atoms—for example, O in CMR materials. Vibrational spectra are obtained by neutron energy loss. During scattering from the sample, incoming neutrons excite molecular vibrations by giving up energy. FDS determines the change in energy by the use of low-energy band-pass filters between the sample and detector. These filters allow only neutrons of a certain energy to reach the detector. The scattered neutrons are sorted by their total TOF as they journey from the sample to the detector. From this information, their incident energies can then be determined. (Figure 2.7)

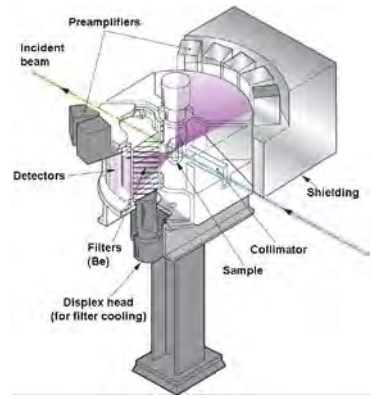

Figure 2.7: Schematic of FDS.

Science Highlight

In a collaboration with industry (Global Tungsten Powders, USA), FDS helped solve a 40 year-long debate on the composition-structure relationship of hexagonal molybdenum trioxide (h-MoO_3), an important precursor material for producing ultra-pure Mo powders used for batteries and sensors. Neutron spectroscopy strongly emphasizes vibrational modes connected to the movement of hydrogen and allowed to distinguish OH^-, H_2O and $(NH_4)^+$ species—which is not possible with common analytical tools [Lunk et al., *Inorganic Chemistry* **49** (2010) 9400]. (Figure 2.8)

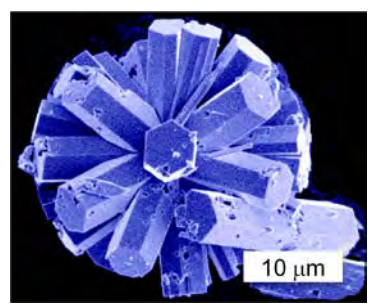

Figure 2.8: Molybdenum trioxide.

Unique Capabilities

FDS complements optical spectroscopy (no selection rules, sensitivity to hydrogen, isotopic substitution). The technique automatically averages over the entire Brillouin zone, allowing the measurement of true vibrational density of states and the collection of data over a dynamic range of 20 to 6000 cm^{-1} [e.g., the filter-analyzer neutron spectometer (FANS) at NIST, which needs several monochromators with different reflectivities to achieve the same result]. Compared with similar instruments at other facilities, FDS is a shorter instrument (13 m moderator-to-sample distance), viewing a high-intensity and moderate-resolution moderator. The maximum entropy method is used for data analysis. Gas cells to 5 kbar and a conductivity

cell for phonon measurements in AC electric fields are available, as is an automatic gas-dosing manifold. FDS is currently the only inverted geometry inelastic instrument for chemical spectroscopy in the US. FANS (NIST) has been taken out of the user program to support newer instruments in the new guide hall. VISION (SNS) is in the commissioning stage.

R&D Plan and Upgrade Opportunities

FDS is increasingly focusing on in situ measurements in the areas of renewable energies and multifunctional materials. Time-dependent measurements of chemical reactions associated with catalysis or photosynthesis require higher intensities to identify intermediate species and follow bond breaking and bond making in reacting systems (user groups Dr. J. Eckert, U South Florida; Prof. J. Larese, U Tennessee; Global Tungsten Powders; BASF; and others). Two of the rising research areas are battery materials and methane in shale gas reservoirs, both of which will benefit greatly from the simultaneous measurement of vibrational neutron spectroscopy and diffraction. Researchers from these fields (Dr. M. Ding, LANL; Prof. Y. Zhao, U Nevada) are increasingly interested in correlating changes in lattice dynamics and molecule-surface interactions (as reflected in neutron vibrational spectra) with structural changes imposed in situ upon modification of various physical parameters. Future R&D for FDS will reflect these trends for more sophisticated in situ experiments capable of monitoring as a function of time and physical/chemical conditions the evolution of materials for energy research and/or functional materials. So-called hyphenated techniques (the simultaneous use of several analytical techniques to obtain a global picture greater than the sum of its parts) have been common in analytical chemistry for several decades. Neutron scattering has seldom taken advantage of this approach; FDS will move in that direction over the next few years with the introduction of automated gas handling manifolds for adsorption-desorption, electrochemical cells, diffraction detectors, and photoexcitation cells.

Upgrades to FDS include the following:

1. Installation of radial collimators would provide improved resolution: FDS uses polycrystalline beryllium filters to select the final neutron energy. Currently, there are 10 filters and 60 detector tubes (6 tubes per filter). The filters are neutronically decoupled with cadmium. Neutron diffusion in the filters and a significant distribution of secondary neutron path lengths contribute to a decrease in resolution and an increase in background. A radial collimator placed between the filters (in fact, partially embedded in the filters) and the detector banks would improve the resoution of FDS and decrease the background. This action would bring FDS on a par with the current best instrument in its class (TOSCA at ISIS).

2. Installation of diffraction detector banks to determine the crystal structure in situ and simultaneously with the vibrational spectra. Such structural information is often needed for the interpretation of vibrational spectra. Occasionally, structure is known ahead of time or can be determined ex situ with X-rays or neutrons. However, numerous samples are prepared in situ on FDS. For such samples it is difficult or impossible to collect structural information (structure, phase transition, melting, etc.). A diffraction bank allowing

for simultaneous inelastic neutron scattering and diffraction would increase the range of experiments that can be performed on FDS with samples synthesized in situ (e.g., studies of catalysis and surface chemistry). Many inelastic instruments (TOSCA, IRIS, OSIRIS, VISION) include a diffraction bank for these reasons.

2.5 SPEAR
Instrument Scientist: Dr. Jarek Majewski

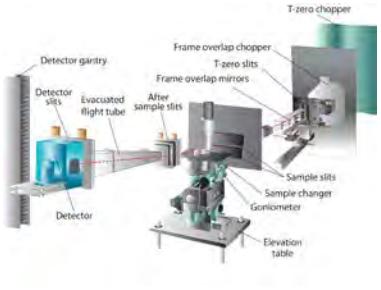

Figure 2.9: Schematic of SPEAR.

Overview

SPEAR is ideally suited to study thin (from 5 to 3000 Å) organic and inorganic layers in a variety of different environments. The instrument uses an unpolarized neutron beam to study a broad range of materials, including polymers, nano-engineered films, and biological systems. SPEAR is a TOF reflectometer using two choppers to define a typical wavelength range from 4.5 to 16 Å. With this polychromatic beam, a range of momentum transfer vectors (Q_z) can be measured without altering the angle of the incident beam. An important feature of SPEAR's design is that the beam is inclined to the horizon at 1.0° (±0.25°). This inclination allows for reflectivity measurements from liquid/air interfaces. Using a PSD, the TOF and reflected position of individual neutrons can be measured and converted to a wavelength and reflection angle. With this arrangement, statistics can be obtained down to a minimum reflectivity of about 5×10^{-7} in 2 to 3 hours. (Figure 2.9)

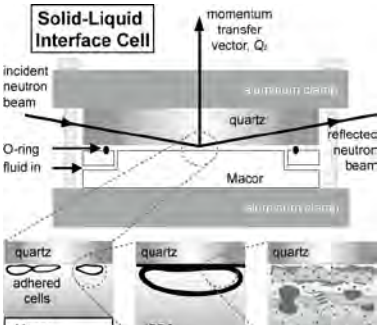

Figure 2.10: Experimental setup to study living cells on SPEAR.

Science Highlight

SPEAR accomplished the first successful demonstration that living objects (mouse fibroblast cell adhered to media-decorated walls) can be successfully studied by neutron reflectometry. These studies can initiate a new field in bio- and medical examination [Smith et al., *Biophys. J.* **98** (2010) 793]. (Figure 2.10)

Unique Capabilities

Using a one-dimensional (1D) Ordela position sensitive detector, the TOF and reflected positions of individual neutrons can be measured and converted to a wavelength and reflection angle. With this arrangement, statistics can be obtained down to a minimum reflectivity of about 5×10^{-7} and the Q_{zmax} of about 0.4 $Å^{-1}$ in 2 to 3 hours. Because of the 20 Hz repetition rate efficiency of the target assembly, the enhanced flux of neutrons at longer wavelengths (Be post-moderator), and general user-friendliness of its software and operations, SPEAR is fully competitive with SNS and NIST reflectometers. All of these instruments can reach similar values of Q_{zmax} vectors in approximately similar amounts of measurement times. SPEAR is equipped with variety of sample environments: high P/T cell, solid-liquid interface cells, Langmuir troughs, solid-liquid interface flow cells, gas-controlled cells, heating stages, etc. A recently constructed and certified Bio-Safety-2 laboratory in the proximity of SPEAR allows investigating living biological cells, which can substantially increase the capabilities of SPEAR and chart a new direction in neutron reflectometry. Over the last 2 decades, SPEAR has produced a diversity of neutron scattering results and a high number of high-impact publications.

R&D Plan and Upgrade Opportunities

For the next 5 years, several new and unique strategies in the field of neutron reflectometry can be implemented on SPEAR. These new directions will allow the Lujan Center to stay at the forefront of neutron science in bio-related, mesoscale, and dynamic systems.

These new directions include the following:

1. Measurements of living biological cells in dynamic (shear) conditions.

2. Bio-materials studied in high P/T conditions to probe “origin-of-life” concepts.

3. Mineral-liquid interfaces in high P/T to address deep gas and oil extraction, studies of thin actinide layers to understand their chemistry and behavior in contact with other materials (e.g., cladding) and environments (simulating nuclear reactor conditions including accident scenarios).

4. Interfacial behavior of composite high-energy materials (high explosives).

5. Dynamic behavior of polymeric systems using the pulse-probe concept and plane-cone rheometer.

SPEAR is more than 20 years old and has undergone incremental improvements over the past decade. In the immediate future, SPEAR requires a new, faster, more reliable 2D TOF detector with better dynamic range and spatial resolution. Capabilities of SPEAR could be substantially improved with a new, user friendly, data acquisition and reduction program to allow access to off-specular and grazing incidence neutron measurements. Some improvements in the neutron flux on the sample can be achieved adding sections of neutron guides. Long-term SPEAR upgrades will require substantial modification of its cave to host sample environments requiring larger footprints, new shielding to decrease the background, new choppers and associated control systems, exchanging of the liquid Hg shutter with mechanical shutters to allow neutron guide installation close to the target, a new coupled sample goniometer-detector assembly, better and more reliable slit packages and stepper-motor controllers. Such modifications will require prior extensive modeling and optimization of the instrument using neutron transmission codes.

2.6 LQD
Instrument Scientist: Dr. Rex Hjelm

Overview

The LQD is designed to study large-scale structures with dimensions from 10 to 1000 Å. Examples of problems that LQD can help solve include phase separation, morphology, and critical phenomena in hard and soft matter and in magnetic structures, colloid and polymer structure, biomolecular organization, and bubble formation in metals. A significant feature of the LQD is that it accesses a broad range of Q (0.003 to 0.35 $Å^{-1}$) in a single measurement by using the TOF technique without any changes to the instrument's physical configuration. This feature contrasts with the need for two to three configuration changes in monochromated reactor instruments or on the SNS low-Q instrument to cover the same Q domain. LQD uses neutrons in the range of 1 to 16 Å, from a cold source with very low background, making it competitive with existing other small-angle-scattering instruments, even at MW class pulsed sources. At 20 Hz, the cold neutron source is well adapted to the broad band requiements of low-Q measurements. (Figure 2.11)

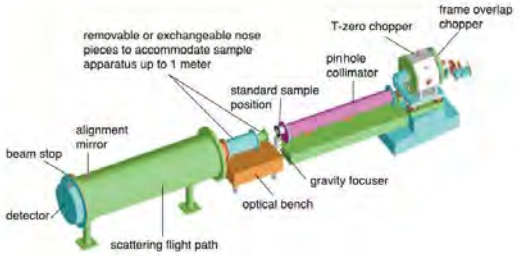

Figure 2.11: Schematic of LQD.

Science Highlight

LQD data demonstrated for the first time the profound effect of solvents on the structure of ionomer polymer dispersions used in the fabrication of commercial fuel cells, giving insight into the differences in performance and durability of cells produced from these dispersions [Welch et al., *ACS Macro Letters* **1** (2012) 1403]. (Figure 2.12)

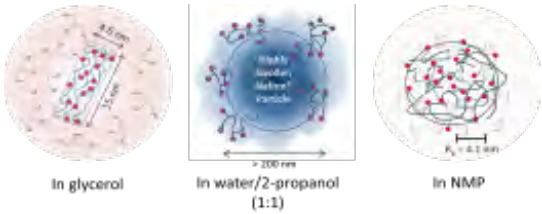

Figure 2.12: Nafion iomer micelle models in different solvents as determined on LQD.

Unique Capabilities

LQD features variable collimation from 2 to 10 mm in diameter to alter instrument geometric resolution and accommodate different sample sizes. A set of beryllium filters is used to attenuate the peak neutron flux of the TOF spectrum to better match the scattered neutron intensity to the count rate of the detector. The sample area uses a hutch concept, unlike many of its counterparts elsewhere. Various sample environments up to 1 m in length, height, and width can be accomodated. The hutch design allows easy access to the beam area. Most experiments can be set up on the optical bench provided using standard optical supports, making ad hoc setups easy and straightforward. LQD can accommodate any type of sample cell the user requires. For example, our multiple sample changer is programmed for cuvettes, banjo cells, and NIST-type cells and has provision for easy programming of any other type of multiple-sample configuration that the user needs.

LQD has specialized sample environments, some of which are unique to low-Q instruments. LQD has a 4-kbar pressure cell and constant temperature humdity cell. Unique to LQD is a high-torque, high-shear-rate, high-temperature-shear rheometer for the study of structural responses leading to nonlinear rheological behavior of glassy polymer melts. A linear stress rig for the study of polymer response to tensile and compressive stress is part of the mechanical suite of sample environments. Both the shear and linear stress rigs measure the stress and strain or the strain rate during the course of the SANS measurement. A gas mixing cell for the study of solution structures of hydrophobic gases is a novel development for LQD. This device is being used to explain the highly non-ideal thermodynamics of mixing of these gases with water. Users plan to use this device to study the effects of nano-scale phase domain structure in catalytic mechansms involving these gases.

R&D Plan and Upgrade Opportunities

The 20 Hz source frequency, the broad neutron wavelength bandwidth, and LQD's fixed geometry are ideal for the pulsed-probe measurements. Although current R&D developments are focused on transient mechanical relaxations in polymers, through further work on the neutron rheometer, other pulse probe methods will be developed to study relaxation in magnetic materials, piezoelectics, etc. A major short-term focus for LQD will be implementation of event-driven DAQ and its corresponding data reduction package.

Although LQD provides a broad Q range that can be explored without having to move the detector, LQD would benefit from a vacuum tank that allows the detector to to be placed at different distances from the sample. This setup would allow the instrument to be optimized for the Q domain of interest for indivdual users. Installation of a curved neutron guide to move the apparent source closer to the detector and remove the detector from the direct line of sight of the source would greatly improve the instrument's signal-to-noise ratio. Improved flexibility in sample environments, interchangeable instrument optics for polarized neutrons, and specialized encoding techniques, such as SESAME and MIEZE, could be accommodated by housing the instrument in an accessible enclosure for the primary and secondary flight paths. Investment in equipment to allow time-dependent (kinetic) measurements would allow studies of several kinetic phenomena of interest to small-angle scatterers.

2.7 Asterix
Instrument Scientist: Dr. Mike Fitzsimmons

Overview

Asterix is a reflectometer, diffractometer, grazing-incidence-SANS, and SESAME-enabled-SANS spectrometer primarily used for experiments requiring polarized neutron beams. Experiments involve studies of magnetic materials and, to a smaller yet growing extent, non-magnetic systems. Examples of programs using Asterix include polarized neutron reflectometry of magnetic materials (in low and 11 T magnetic fields), long-wavelength/large-d-spacing diffraction (d-spacing >2 Å), and measurements of pair correlation lengths up to 2 µm in soft matter. The use of non-magnetic materials in the neutron shielding ensures compatibility of the spectrometer with the 11 T superconducting magnet and has enabled the implementation of neutron spin-echo techniques. The 2.5 m long detector arm is readily configurable for polarization or energy analysis of the scattered neutron beam. Special sample environment capabilities exist, including, for example, the capability to simultaneously expose samples to infrared laser light, magnetic fields, and neutron beams in an "ILL orange cryostat" or 11 T superconducting cryomagnet. (Figure 2.13)

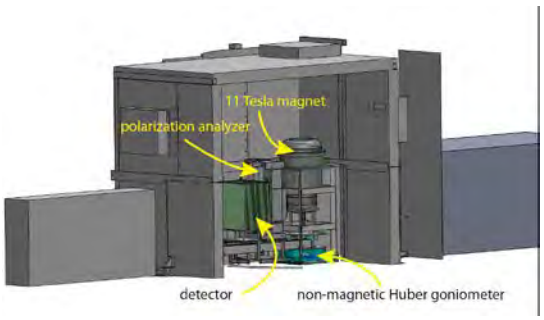

Figure 2.13: Schematic of Asterix.

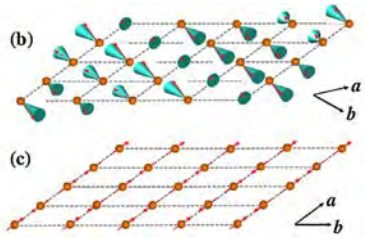

Figure 2.14: Asterix data revealed that the magnetic structure of α-Fe(Te,Se) is the one shown in (b) and not the one shown in (c).

Science Highlight

Previously, the antiferromagnetic structure of ferrous superconductors was predicted by a nesting spin density wave (SDW) mechanism. This structure is indistinguishable from a spiral structure using unpolarized neutron beam diffraction and incompatible with the nesting SDW mechanism. Polarized beam single-crystal diffraction of spin flip and non-spin flip channels of an antiferromagnetic Bragg reflection using Asterix conclusively showed that the antiferromagnetic structure was incommensurate with a substantial spiral component, invalidating the prevailing nesting Fermi surface mechanism for the α-Fe(Te,Se) ferrous superconductors [Bao et al., *Phys. Rev. Lett.* **102** (2009) 247001]. (Figure 2.14)

Unique Capabilities

Because of the investment of LDRD funds, M. Fitzsimmons and F. Mezei (LANL Wheatley Scholar at the time) developed and implemented technologies that allowed extraction and control of a polarized neutron beam having a divergence equal to FP11's nickel guide with a beam cross section measuring 2.5 cm by 6 cm [a cross section two times larger than that of the SNS reflectometer, V. Lauter et al., *Physica B* **404** (2009) 2543]. The wavelength range of Asterix is 4 to 13 Å. Asterix's polarization cavity does not affect the divergence of the incoming

unpolarized neutron beam for any wavelength. Asterix was designed and built to accommodate superconducting magnets. Consequently, neutron shielding in proximity to the magnet is made from non-ferromagnetic materials. Further, the selection of radiofrequency gradient field spin flippers and magnetic shielding enables operation with >99.9% flipping efficiency, even in strong stray magnetic fields. Efficient production of an intense polarized neutron beam with a large cross section, uncompromised divergence, and broad wavelength band has enabled a high degree of flexibility to configure Asterix to perform world-class neutron scattering experiments that go well beyond a single mission.

These experiments include the following:

1. Polarized neutron reflectometry with fields up to 11 T and temperatures between 260 mK and 300 K. Customized sample environment equipment to illuminate samples with circularly polarized laser light, to apply elastic bending stress to thin films, etc.

2. Single-crystal diffraction from bulk materials and thin films (the latter with masses of tens of μg) with fields up to 11 T and temperatures between 260 mK and 300 K.

3. Measurements of the 1D Patterson function of soft matter using the SESAME technique.

R&D Plan and Upgrade Opportunities

Asterix is nearing completion of a midscale instrumentation upgrade funded by BES-DMSE. Nearly all components of Asterix were improved or replaced. The upgrade also enables implementation of the SESAME technique.

Under the auspices of BES-DMSE funds, S. Singh (Postdoctoral Fellow at the time) and Fitzsimmons developed a scientific research program and a capability to apply pure bending stress to thin films using a four-point mechanical jig to be used during neutron reflectivity measurements [S. Singh et al., *Phys. Rev. Lett.* **108**, 077207 (2012); S. Singh et al., *Phys. Rev. B* **85**, 21440 (2012)]. Remarkably, even very small strain on the order of 0.01% is sufficient to produce dramatic changes in the conductivity and magnetization of at least one complex oxide film. The importance of strain in films of complex materials is undoubtedly ubiquitous [e.g., the recent discovery of a *ferroelectric ferromagnet*—$EuTiO_3$, J. H. Lee et al., *Nature* **466**, 954 (2010)]. Even still, the limit of 0.01% strain (for *ceramic* substates) achieved with the bending jig is small (higher strain may break the substrate). Clearly, there is a need to apply higher pressures to thin film samples and to study these systems at low temperatures and high fields. Thus, funding permitting, we propose to build a helium pressure cell for our 11 T superconducting magnet, which will be available to users after the testing and comissioning periods, enhancing the user program on Asterix.

The most ideal situation to do collaborative science happens when the instrument scientist and visiting researcher work together—in this way, the best experimental protocols can be made to test hypotheses as they evolve. Barring face-to-face contact, another solution needs to be developed. What we propose for Asterix is a real-time video conference capability at the beamline. With such a capability, the instrument scientist would be able to show the user the

data as they are collected and discussions between the instrument scientist and user facilitated to explore different methods of visualizing and interpreting the data in real time and to tailor the experimental protocol as it progresses.

Finally, we propose to explore a radical departure from the norm in how data are interpreted. Traditionally, data are collected and partitioned into TOF bins; the wavelength dependence of the spectrum then is removed, polarization and flipping efficiency corrections are applied, background is removed, etc. (though not necessarily in this order). The final result is a four-column output of wave vector transfer, signal (e.g., reflectivity), variance of the signal, and variance of the wave vector transfer. This result is very far removed from the raw data (i.e., virgin data). An expert in information technology or statistics will tell us that the traditional approach is wrong. Rather, the data should be left in their rawest form (e.g., a neutron detection event is described by TOF and position and possibly by spin state—the data will consist of a list of millions of events). The correct approach to draw conclusions from the data involves developing a model for the material scattering the neutron beam (the physics model), then applying corrections to this model to generate a list of millions of predicted events. A comparison of this list to the list of events guides changes to the physics model and possibly provides insight into assumptions made about the spectrum, polarization corrections, etc. Fitzsimmons and N. Hengartner (LANL, T Division) have successfully applied the “correct” approach once. There are many challenges to surmount, including significant computational challenges (whereas only a couple hundred calculations are needed to fit “binned” data, the new approach requires a calculation for every neutron detected, i.e., tens of millions of calculations).

2.8 HIPD
Not Currently in BES User Program

Overview

HIPD is a high-intensity powder diffractometer designed for studies of the atomic and magnetic structure of crystalline and non-crystalline powders. High counting rates are achieved because of its proximity to the neutron source (primary flight path is approximately 9 m). The beam size at the sample position is 1 cm wide and 3 cm high. HIPD detectors are located at ±153°, ±90°, ±40°, and ±14°, each covering ±5°, which allows over two decades of momentum transfer (0.2 to 60 $Å^{-1}$). The configuration of the instrument makes it suitable for local structure studies (PDF). (Figure 2.15)

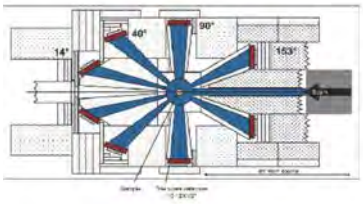

Figure 2.15: Schematic of HIPD.

Science Highlight

Improvements in fuel cell technology will depend on the development of ionic conductors with high conductivities at intermediate temperatures. For such materials, which have high concentrations of vacancies, it is imperative to characterize local distortions around these vacancies to understand how the ions move through the crystal lattice. Recent work on HIPD using the pair distribution function method has revealed the local coordination environments of the ions in several such materials. This type of information is not available by conventional structure determination methods [King et al., *Inorganic Chemistry* **51** (2012) 13060]. (Figure 2.16)

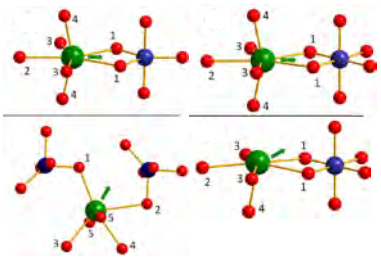

Figure 2.16: The local distortion in $Sr_3SbO_{5.5}$ away from the ideal perovskite structure as determined from PDF analysis.

Unique Capabilities

HIPD is a general-purpose neutron diffractometer. Designed and built 2 decades ago, it continues to deliver excellent science, and its high flux and medium resolution complements NPDF and HIPPO capabilities. Because of the low repetition rate of the spallation source and the configuration of HIPD's eight detector banks, the instrument provides access to the largest d-spacing range in the Lujan Center (0.25 to 38 Å for each neutron pulse). Additionally, its proximity to the target provides a neutron flux of $>10^7$ $n/cm^2/s$. Such a configuration is critical for the study of magnetic structures and large atomic unit-cell structures, such as metal organic frameworks, and is ideal for simultaneous parametric studies of local, magnetic, and atomic structure; the study of amorphous materials; and the probing of time-resolved processes. The acquisition of a dedicated 4 K–800 K top loading displex in 2010 allowed HIPD to increase productivity in the domain of condensed matter physics and magnetism. The complementarity of the high-flux HIPD and high-resolution NPDF instruments, together with Lujan Center staff expertise and teaming (Page, Llobet, and previously Proffen), have led to breakthrough science and enhanced publication metrics over the review period. The complementarity between

instruments and collaborations with users that span them can be an avenue for national user facility success.

R&D Plan and Upgrade Opportunities

Comparable with HIPPO in terms of proximity to target and moderator, unique in terms of maximum d-spacing range for magnetism, and complementary to NPDF with its suitability for crystalline, and amorphous structure total scattering experiments, HIPD has a bright future.

HIPD's upgrade would consist of the following:

1. Redesigning its shielding (which was designed for 20-µAmp operation) for increased worker safety and decreased instrument background.

2. Redesigning the instrument chamber to make it compatible with NPDF, HIPPO, and Pharos and their sample environments.

3. Installing additional detector banks to greatly increase the data collection rate for time-resolved studies and increasing the effective Q_{max} for improved total scattering data collection.

These three basic upgrades can immediately enhance the compatibility with complementary instruments such as HIPPO and NPDF and enable HIPD to access available sample environments for broader extreme environments (P, T, H, etc.). This upgrade will provide a critical instrument for the study of magnetic structures, large atomic structures, parametric studies, local structure, phase transitions under T/P/H conditions, and time-resolved processes.

2.9 SCD
Not Currently in BES User Program

Overview

The SCD is based on the TOF Laue technique, which combines the use of two large-area PSDs with a range of incident neutron wavelengths available from the pulsed neutron source. With a stationary sample and detector, a 3D sampling of reciprocal space is obtained that may contain hundreds of Bragg reflections. Simultaneously, all of the reciprocal space between the peaks is measured, making this technique highly advantageous for studying pressure- and temperature-dependent phase transitions. Measurements can be performed in the temperature range from 5 K to 800 K and under pressures from 0 to 5 kbar. Typical sample volumes are of the order of 1 mm, but smaller crystals will suffice for strong neutron scatterers. (Figure 2.17)

Figure 2.17: Schematic of SCD.

Science Highlight

Data from SCD and HIPPO were used to identify whether natural gold single crystals were actually single crystals or polycrystalline. This unique ability of neutrons to interrogate volumes of cubic centimeters can also be applied to verify the quality of synthetic single crystals grown, e.g., for property determination [Rakovan et al., *Rocks & Minerals* **84** (2009) 54]. (Figure 2.18)

Figure 2.18: 5.3 g gold crystal.

Unique Capabilities

SCD is the only general-purpose TOF single-crystal diffractometer in the US. The main advantage of the TOF technique is that one easily covers all of the reciprocal space, which is different from monochromatic-beam techniques used at reactor sources (such as HFIR or NIST), where only predetermined regions of reciprocal space are explored. Subsequently, the scattering response at unexpected positions can easily be missed, which may pose a serious problem for completely unknown structures. The TOPAZ instrument at SNS, once it becomes fully available in the SNS user program, will benefit from greater neutron flux and far larger detector coverage. Nevertheless, SCD, when compared with most other neutron diffractometers, is capable of measuring much smaller sample volumes, approaching sizes that are typical in X-ray diffraction. Measurements can be performed in a temperature range from approximately 5 K to 800 K and under pressures up to 1.5 kbar.

R&D Plan and Upgrade Opportunities

An SCD upgrade to complement TOPAZ and serve a different user community can be achieved by (1) instrument modifications to access an energy range or resolution that is not easily achieved in TOPAZ or (2) redesigning of the SCD sample space to fit sample environments that

cannot be accommodated in TOPAZ. With current moderators, neither SCD nor TOPAZ are optimized for measurements of d-spacing reflections above 5 Å. This is a drawback for magnetic materials (due to the magnetic form factor) and small molecules (due to large unit cells). By moving SCD to a cold moderator, it has the potential to surpass TOPAZ in those areas and to complement its capability. For example, SCD might serve a science community that is intermediate between PCS and TOPAZ.

For SCD, the main spatial limitations for sample environment are due to the existing flight-path cave. A redesign of the sample chamber would enable the use of existing LANSCE 11 or 7 T magnets, TAP-98, and ZAP high-pressure cell or the 100 mK dilution refrigerator. It is unlikely that TOPAZ will accommodate such large sample environments because TOPAZ's sample chamber design is far more rigid because of the much larger number of detectors.

We envision two focus areas for improvements:

1. Background reduction

2. Improved sample mounting and temperature control.

Background in SCD does not pose a problem for the data analysis (it is subtracted out), but it does cause overloads in the electronics. There are two contributions to the background in SCD: (1) neutron background (from the sample chamber and other materials in the beam) and (2) gamma background (mostly from the beamstop) due to neutron absorption. Gamma sensitivity of photomultipliers used to detect scintillation photons of the absorbed neutrons in the ^{6}Li detectors is a problem. Implementing an alternative design of the beamstop would greatly reduce gammas reaching the detectors. Because of the limited space available in the sample chamber, sample mounting in SCD is difficult but can be corrected with a redesign of the sample chamber.

2.10 Pharos
Not Currently in BES User Program

Overview

Pharos was designed for studies of fundamental excitations in condensed-matter systems. The instrument provides 2% to 4% incident energy resolution and uses a high-speed Fermi chopper to obtain monochromatic incident energies in the range from 10 meV to 2 eV. The sample is positioned 20 m from a chilled-water moderator. The spectrometer consists of an evacuated, shielded flight path with 10 m^2 of meter-long position-sensitive detectors located at a distance of 4 m from the sample and covering scattering angles between -10° and 145°. Low-angle detectors are available for use at distances between 4 and 10 m, with scattering angles down to 0.65°, thus making it suitable for high-resolution inelastic studies (<1% resolution) at low Q. (Figure 2.19)

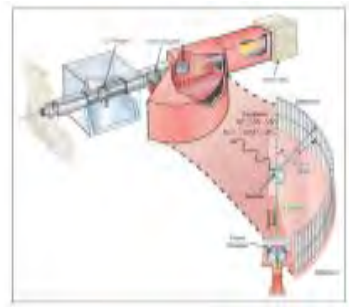

Figure 2.19: Schematic of Pharos.

Science Highlight

Inelastic neutron scattering measurements on Pharos of the high-temperature lattice excitations in NaI show that in thermal equilibrium at 555 K, an intrinsic mode exists that is localized in three dimensions. The mode occurs at a single frequency near the center of the spectral phonon gap and is polarized along [111]. At higher temperatures, the intrinsic localized mode gains intensity [M. Manley et. al., *Phys. Rev. B* **79** (2009) 134304].(Figure 2.20)

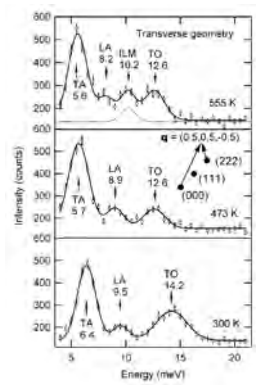

Figure 2.20: Inelastic neutron scattering spectra measured along [111] at the zone boundary of an NaI crystal.

Unique Capabilities

Because of its distance from the target, the flux on Pharos has rendered its inelastic capability noncompetitive with other inelastic instruments currently available elsewhere (ARCS and Sequoia at SNS, Merlin and MAPS at ISIS). However, Pharos detector banks have higher angular coverage: from -10° to 135° (compared with Sequoia -30° to 60° and ARCS -28° to 135°). In addition, Pharos has better-equipped low-angle detectors that can be positioned at 10 m, allowing a better resolution (down to <1%) at low Q. This resolution is useful in studying not only Brillouin scattering but also magnetic scattering with high-Q resolution. The 10 m maximum detector distance is larger than in Sequoia, where this distance is 5.5 m. The above mentioned spectrometers are all oversubscribed, with many experiments on single crystals of high-temperature superconductor oxides, the relatively new Fe/As superconductors, heavy fermions, systems with low-dimension spin systems, etc. Pharos has been used most effectively to measure polycrystalline samples to determine phonon density of states, crystal fields, and Kondo-esque spin fluctuations. Pharos is a critical instrument for the study of materials of particular interest to DOE, as in the case of the search for magnetic order

present in alpha or beta plutonium [Absence of Magnetic Moments in Plutonium, C. Lashley et. al., *Phys. Rev. B* **72**, (2005) 054416].

R&D Plan and Upgrade Opportunities

Because of Pharos' location (20 m from the target, same moderator as NPDF) and configuration (detector coverage approximately 10° to 145°), the Lujan Center user community has expressed enthusiastic interest in developing Pharos as a dual-use instrument with inelastic and elastic (E-Pharos) capabilities. The Pharos sample chamber is compatible with NPDF and HIPPO, enabling access to a variety of developed sample environments for diffraction studies. With the high demand for total scattering and with the increase in complexity of research performed on NPDF, the time available on NPDF is insufficient to both serve and continue growing the user community. In terms of uniqueness, the Pharos configuration provides access to very low angle banks and therefore to high d-spacing for the study of large unit cells (e.g., clathrates) or magnetic scattering currently unavailable at NPDF. Pharos could be the ideal platform for developing magnetic PDF methods for the study of diffuse magnetic scattering in complex, frustrated, and disordered magnetic and superconducting materials.

An even stronger uniqueness proposition for Pharos in a dual-use mode exists in utilizing its inelastic capability alongside a developed total scattering capability. The operational Fermi Chopper would allow performing PDF studies from purely elastic scattering data, advantageous for studying atomic disorder in hydrogen containing systems and impacting the polymer, organic chemistry, nanoparticle, hydrogen storage, and hydride communities. With further data reduction and analysis development, PDFs collected within finite-energy windows would allow users to probe the dynamics of local structure phenomena in complex and disordered materials. The first and only ever published use of dynamic total scattering was completed with Pharos in 2008. Progress in the field has been hindered by the lack of a dedicated instrument and data reduction and modeling programs for the user community. The Lujan Center and its total scattering user base are well positioned to lead the emerging field of dynamic PDF studies with Pharos.

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3 Support Facilities

3 Support Facilities

Approximately half of all Lujan Center users employ the support laboratories. Nearly every user employs sample environment capabilities at the beamlines. The following sections describe the support facilities that are available to users. Potential improvements are described but are contingent upon funding. Financial support for the facilities and resources are provided by the BES-SUFD budget unless otherwise noted.

3.1 Currently Available Support Facilities at the Lujan Center

3.1.1 Machine Shop

The Lujan Center maintains a supervised machine shop that can fabricate custom parts for instruments, sample environments, and experiments and provides experiment assembly/ disassembly and troubleshooting. Users routinely benefit from the in-house expertise of two full-time and highly qualified mechanical technicians when specialized parts and equipment need to be fabricated. Machine shop equipment includes a vertical mill and engine lathe, welding equipment (for steel, aluminum, and stainless steel), band saw, chop saw, sand blaster, sheet metal brake, and general-purpose equipment for drilling, tapping, brazing, grinding, torch cutting, etc. The mechanical team provides regular maintenance and fabrication for instruments and beamlines, including motor maintenance, vacuum assembly and service, plumbing, crane and forklift operations, shielding package fabrication, and sample holder fabrication.

3.1.2 X-Ray Laboratory

The Lujan Center maintains an X-ray diffraction laboratory, with three X-ray diffractometers and one X-ray fluorescence instrument. On an 18 kW Rigaku source, two beam ports can be used simultaneously for strain measurements/regular diffraction and reflectivity, respectively. The temperature stage operates between 4 K and 300 K, and copper, chromium, and molybdenum targets are available. The second source is a Rigaku X-ray powder diffraction (XRD) unit with a copper X-ray tube. On this instrument are located a variety of attachments, ranging from powder diffraction at various temperatures (-180°C to 800°C) to stages for reflectivity measurements of liquid and solid samples. The X-ray fluorescence instrument is used for the elemental analysis of samples. X-ray techniques are employed by many users and are of special interest to users to characterize samples before or after neutron experiments are performed.

A Rigaku HighFlux home source for cryogenic and room temperatures is available for X-ray data collection to enable joint refinement for PCS users. The X-ray machine is based on a standard rotating copper anode with the Micromax007 FH generator and an R-AXIS-IV++ image plate detector.

Table 3- shows the X-ray equipment available for users of the Lujan Center.

Table 3-1: X-Ray Laboratory Equipment

X-Ray Laboratory
18-kW Rigaku source, two-beam port and low-temperature capability for reflectometry, residual stress, and powder diffraction
Rigaku XRD unit, with a variety of attachments for powder diffraction, reflectivity from liquid and solid samples, and thermal environments
X-ray fluorescence instrument for elemental analysis
Rigaku HighFlux, copper anode with the Micromax007 FH generator and an R-AXIS-IV++ image plate detector (for PCS users)

3.1.3 Chemical, Analytical, and Spectroscopic Laboratory

The chemistry laboratory is equipped with standard glassware, hoods, glove boxes, ovens, balances, rotary evaporator, centrifuges, a refrigerator/freezer, ultrasonic baths, water baths, and other standard laboratory gear. Deionized water, standard solvents, and various chemicals also are available, as are a vacuum line and helium glove box for handling air- and moisture-sensitive samples, several furnaces, and environmental chambers. Analytical laboratory equipment includes Fourier transform infrared spectroscopy (FT-IR), atomic absorption spectroscopy (AAS), ultraviolet-visible (UV/Vis) spectroscopy, differential scanning calorimetry and thermogravimetry analysis (DSC/TGA) equipment, gas adsorption instruments (BET, H2-adsorption isotherms), and chromatography and residual gas analysis (RGA) equipment. Raman spectroscopy at ambient and high pressure is available, including equipment to prepare diamond-anvil cells for the Raman microscope. Several optical microscopes (with a digital camera attached) are available.

The chemistry laboratory is vital for the neutron scattering user program because users often need to fabricate samples. Users of the Lujan Center's neutron diffractometers (the NPDF, HIPD, and HIPPO diffractometer) frequently test samples for deuteration by using the FT-IR instrument. A portion of diffraction instrument users utilize the glove box, ovens, centrifuges, and desiccators to prepare and load powder samples for measurements. Users of the FDS heavily utilize the chemistry laboratory, very often completing DSC/TGA, FT-IR, and Raman as complimentary techniques. Users of the LQD and SPEAR use ultrasonic baths, spin coaters, water baths, and microscopy. A majority of Lujan Center users benefit from the expertise of chemist staff members and the in-house equipment in the chemistry laboratories (Table 3-).

Table 3-2: Chemistry Laboratory Equipment

Chemistry Laboratories		
Glove box - He atmosphere	High-purity water	pH/conductivity/ion selective electrode (ISE) meter
Tube and box furnaces	Ultrasonic bath	Thin-layer and liquid chromatography
Environmental chamber for sample annealing	Calorimetric bomb	Refrigerator/freezer
Solvent purification	Sublimator	Solvent extractor
Differential thermal analysis	Hardness indenter	Ball-milling machine (inert atmosphere)
Hoods	Diamond saw	Microscale lab equipment
Vacuum line	Polishing wheel	Autoclave for high-pressure synthesis
500-W ultrasonic horn	Desiccators	Distillation equipment
Atomic absorption spectrophotometer	Filtration devices	Vacuum and drying oven
UV/Vis spectrophotometer	Gas-handling equipment	All standard chemistry lab equipment (glassware, balances, stirrers, etc.)
Centrifuge	Blender or homogenizer	Various solvents (acetone, methanol, hexane, chloroform, etc.)
Optical microscope	Pressure regulators	

3.1.4 Biolaboratory and Deuteration Station

The Lujan Center biolaboratory is equipped with resources for handling and preparing biological samples for neutron experiments (laboratory benches, balances, pH meters, a centrifuge, etc.). The capabilities are mainly utilized by SPEAR, LQD, and PCS users. User support for the biolaboratory and deuteration station is 60% funded by DOE-BER. Specialized perdeuteration and protein expression capabilities are available. Resources include the Biodeuteration Laboratory (BDL), and Protein Purification and Crystallization Laboratory (PPCL). Access to radiochemistry and LANL's stable isotope resource is possible through collaboration.

3.1.4.1 Biodeuteration Laboratory (BDL)

The BDL is a fully operational protein expression laboratory for the perdeuteration of user proteins. The service offers full perdeuteration (approximately 99%) using in-house, algal-based media for bacterial growth. Also available are M9 minimal media made in D_2O for the expression of up to approximately 85% perdeuteration. Users can use the BDL in person or mail in a plasmid for Lujan Center staff to complete the expression. Standard protein expression equipment is available to users in the laboratory: a centrifuge for harvesting cells, a sonicator

for cell lysis, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) equipment, etc.

3.1.4.2 Protein Purification and Crystallization Lab (PPCL)

The PPCL is available for users of PCS. Two Akta/GE purifiers (the Akta Prime and Akta Purifier) and numerous chromatography media [anion/cation exchange, nickel, size-exclusion chromatography (SEC), etc.] are available. These purifiers and media have an Oryx8 liquid handling robot for coarse- and fine-screening crystallization conditions and maintain a fully stocked laboratory for all crystallization needs (trays, salts, solutions, etc.). For the storage and temperature control of trays, six incubators sets are available at different temperatures (4°C–20°C) to control nucleation and crystal growth. Materials and support are also provided for mounting large crystals for room temperature neutron and X-ray experiments.

3.1.5 Clean Room

A Class 1000 clean room (Table 3-1) houses sample preparation and characterization-facilities. The first group comprises: Millipore ultrapure water system, AirClean Laminar Flow Hood, spin coater, ultraviolet ozone (UVO) Cleaner Unit 342, Langmuir-Blodgett trough capable of accommodating 4-inch wafers and imaging microscope, variety of ultrasound machines and ovens, and a refrigerator and freezer. The second group includes: Zeiss AxioVisionImager optical microscope with fluorescence capabilities, newly available NimaKSV MicroBAM Brewster angle microscope, Langmuir troughs for monolayer characterization, and a contact angle measurement device. In addition, the clean room is also approved as a BSL-2 laboratory and is equipped with a Labconco Biological Safety Cabinet, Purifier Logic Series, and a Binder incubator, allowing cell culture and related activities to be performed on site. On demand, atomic force microscopy, electrochemical equipment, and various other Langmuir troughs with different geometries can be provided. The clean room facilities are heavily utilized by SPEAR and LQD users.

Table 3-1: Clean Room Equipment

Clean Room	
Laminar flow hood	Optical microscope
Langmuir troughs	Tensiometer
Atomic force microscope	Spin coater
Millipore ultrapure water system	Ovens (T_{max}= 300˚C)
Contact angle measurement device	Refrigerator and freezer
Brewster angle microscope	Ultrasound machines

3.1.6 High-Pressure Laboratory

The high-pressure laboratory provides setup space and houses apparatuses for fluid-driven neutron scattering cells with pressures up to 10 kbar. Capability includes Harwood gas- and liquid-medium pressure intensifiers; the Superpressure (Newport scientific) air-operated,

diaphragm-type compressors; and hand-operated gas pressure generators. The gas/liquid cells include cells made of different materials with various maximum pressures: 200 bar (vanadium), 6 kbar (aluminum), 8 kbar (copper beryllium), and 10 kbar (steel). A separate high-pressure area in Experimental Room 2 (ER-2) is used for anvil-cell preparation and high-pressure material synthesis. The types of anvil cells include a ZAP (up to 150 tons with the creep loading system), toroidal anvil press (TAP)-98 (10 GPa, 1500 K) for neutron diffraction, and Paris-Edinburg (P-E) cell for sample synthesis. In addition, the laboratory has several diamond-anvil cells for high-P Raman, infrared (IR), and XRD measurements, as well as various tools for pressure cell preparation. Equipment available in the high-pressure laboratory is summarized in Table 3-2.

Table 3-2: High-Pressure Laboratory Equipment

High-Pressure Laboratory
Medium-pressure clathrate synthesis setup (up to 4 kbar)
Newport air-operated diaphragm-type compressors (up to 2 kbar)
Harwood gas/liquid-medium pressure intensifiers (up to 14 kbar)
Creep loading system up to 150 tons for ZAP cell
240-ton P-E high-pressure cell for high pressure-temperature (P-T) materials synthesis
Diamond anvils for high-P Raman, IR, and XRD experiments
ZAP cell (for in situ diffraction at high P)
500-ton TAP-98 (can be used for neutron diffraction and materials synthesis at high P-T)
Hydrostatic pressure cells
Diamond saw
Polishing wheel
Binocular microscope
Hardness indenter
Ultrasonic interferometer and Raman spectroscopy

3.1.7 Computer Server for Materials Simulations

The 336 central processing units (CPUs) are used in two clusters at the Lujan Center for performing materials simulations and data analysis. The clusters support radionuclide inventory and neutron transfer calculations to assess target performance and next-generation target design performed by the spallation physics team. In addition, an 8-node (32-CPU) system with 64-GB operational memory is used for density functional theory (DFT) calculations, primarily supporting interpretation of spectra measured by the FDS.

3.1.8 Instrument Design and Beam Characteristic Capabilities

The Lujan Center employs a full-time mechanical designer with over 30 years of experience and a half-time licensed mechanical engineer to support the design and development of instrument sample environments and beamline components. The team has capabilities for 3D modeling (SolidWorks, Unigraphics, and AutoCAD) and finite-element analysis, as well as wide format scanning and printing capabilities.

Over the last 5 years, the spallation physics team at the Lujan Center has developed the experimental capability to measure the neutron energy spectra, neutron flux, and neutron time emission spectra at Lujan Center beamlines. These activities are funded by the NNSA RTBF program. Many neutron scattering experiments require precise knowledge of neutron beam characteristics, such as the energy spectrum, neutron intensity, and pulse shape. The neutron energy spectra is measured with calibrated low-efficiency (approximately 1% for thermal neutrons) planar BF_3 detectors (manufactured by LND, Inc.). Time emission spectra are measured by monochromating the neutron beam with a fluorinated mica (synthetic fluoroplogopite) crystal. The team uses a portable ORTEC® data acquisition system for the measurements. A neutron energy spectrum measurement can be completed in 2 to 6 hours, and the time emission spectrum measurement takes 12 to 24 hours.

3.1.9 Lujan Center Sample Environments

A suite of sample environment equipment is available, spanning low temperatures, high temperatures, high pressures, and high magnetic fields. Nearly every user experiment utilizes sample environment equipment. Effort has been made to enhance the availability and flexibility of the sample environments suite. In particular, low- and high-temperature capabilities for condensed matter physics or engineering applications are available to simulate synthesis, accident, or thermo-mechanical processing conditions. In 2011, a lead scientist was hired for sample environments, and in 2013, a full-time R&D engineer was added to the staff. The newer beamlines (HIPPO, NPDF, and Pharos) share specifications for the sample chamber flange diameter and bolt layout, as well as for the beam position relative to the flange, and therefore can share sample environments. Sample environments include both instrument-specific environments and general-use capabilities (listed in Table 3-3).

Many fluid-driven pressure cells (up to 10 kbar) are available for the Lujan Center user program. An Oxford Instruments 11-T cryomagnet is used on Asterix, providing a unique polarized-beam reflectivity capability up to its maximum field and over the temperature range of 1.5 K to 300 K. The temperature range has recently been extended down to 0.3 K by the installation of a ^{3}He insert magnet that can also be used on Pharos and NPDF. For experiments above room temperature, an ILL furnace (50°C to 1200°C) is used for diffraction on NPDF and HIPPO (50°C to 1600°C on Pharos). In addition, two closed-cycle refrigerators (CCRs) (4.2 K to 330 K) and two ILL-style orange cryostats (1.5 K–300 K) can be used on these instruments.

Sample environments associated with particular beamlines are highlighted below. The environments include a high-temperature deformation rig (1300 K, 2.5 kN), allowing the study of texture evolution on HIPPO; the TAP-98, a high-pressure anvil cell capable of 10 GPa at temperatures up to 1500 K; a 250 kN load frame for tension, compression, or tension/compression (100 kN) measurements on SMARTS; electrical conductivity and catalysis cells for FDS measurements; a steady-state shear cell for studies of complex liquids such as polymer solutions and melts for LQD and SPEAR; a polymer stress rig for tension and compression loading on LQD; and a Langmuir trough for measurements on SPEAR.

A comprehensive breakdown of available ancillary equipment is provided in Table 3-3.

Table 3-3: Sample Environment Equipment

Ancillary Equipment:		
Low-Temperature Equipment		
Equipment	**Specifications**	**Flight Path/Instrument Compatibility**
Displex CCRs	T_{min}= 4 K to 12 K	11 – Asterix; 04 – HIPPO; 03 - HIPD;
	T_{max}= 300 K to 340 K	10 – LQD; 02 – SMARTS
Top Loading CCR	T = 10 K to 500 K	07 – FDS
	Option of in situ gas adsorption cell	
Top Loading CCR	T = 15 K to 800 K	01 – NPDF
Top Loading CCR	T = 5 K to 800 K	03 – HIPD
Top Loading CCR	T= 25 K to 600 K	04 – HIPPO
	Optional rotating sample stick for texture	
ILL Orange Cryostats	T= 1.5 K to 300 K, 50- or 70-mm bore	11 – Asterix; 01 – NPDF; 02 – SMARTS
Liquid Nitrogen Flow	T = 100 K	15 - PCS
High-Temperature Equipment		
Equipment	**Specifications**	**Flight Path/Instrument Compatibility**
Induction Heater	300 K to 1000 K	02 – SMARTS
High-Temperature Vacuum Furnace	300 K to 2100 K	02 – SMARTS
High-Temperature Vacuum Furnace with Load Frame	300 K to 1773 K with 10 kN and 250 kN load cells	02 – SMARTS
High-Temperature Furnace	T_{max} = 2500 K	04 – HIPPO
	Optional rotating sample stick for texture	
High-Temperature Furnace with Creep Rig	T_{max} = 1273 K max load = 2.7 kN	04 – HIPPO
	Optional rotating sample stick for texture	
ILL Furnace	T_{max} = 1373 K	04 – HIPPO; 01 – NPDF
(Vanadium heating element)	Optional rotating sample stick for texture (on HIPPO)	
ILL Furnace	T_{max} = 1000 K	04 – HIPPO
(with controlled atmosphere)		
Quenching Furnace	T_{max} = 1473 K	04 – HIPPO; 02 – SMARTS
	Controlled atmosphere quench rate 20 K/s	
Cryofurnace	T_{max} = 600 K	11 – Asterix; 10 – LQD; 01 – NPDF;
	Fits most CCR displexes	15 - PCS; 02 – SMARTS
Single-Sample Heating Stage	Tmax = 473 K	10 – LQD

High-Pressure Equipment		
Equipment	**Specifications**	**Flight Path/Instrument Compatibility**
Vanadium Gas Cell	0 to 200 bar; 15 to 300 K	04 – HIPPO; 01 – NPDF
Al Gas Pressure Cell	0 to 6 kbar; 10 K to 300 K	04 – HIPPO
Al Gas Pressure Cell	0 to 8 kbar; 15 K to 300 K	07 – FDS
CuBe Gas Pressure Cell	0 to 8 kbar; 10 K to 300 K	04 – HIPPO
Steel Gas Pressure Cell	0 to 10 kbar; 20 to 300 K	04-HIPPO
LQD Hydrostatic Pressure Cell	0 to 4 kbar	10 – LQD
ZAP Pressure Cell	0 to 10 GPa; 20 K to 300 K	04 – HIPPO
TAP-98	0-10 GPa 300K to 1500 K	04 – HIPPO
(High-pressure anvil cell)		
Magnetic Field Equipment		
Equipment	**Specifications**	**Flight Path/Instrument Compatibility**
11-T Cryomagnet	Max field = 11 T	11 – Asterix
	VTI option: T= 1.6 K to 300 K	
	^{3}He insert: T = 270 mK to 80 K	
XYZ Cryomagnet	Max field (horiz) = 2 T	11 – Asterix
	T=1.7K to 300K	
1.2-T Electromagnet	T = 4 K to 300 K	11 – Asterix
1.5-T Electromagnet	Max field = 1.5 T	04 – HIPPO; 02 – SMARTS
	T = 20 K to 300 K	
	Optional rotation for texture	
Specialized Equipment		
Equipment	**Specifications**	**Flight Path/Instrument Compatibility**
Automated Gas-Dosing Manifold for In Situ Adsorption		07 – FDS; 10- LQD
SMARTS Load Frame	0 to 250 kN	02 – SMARTS
	Options: combined with high and low temperature	
1.5T Electromagnet and Load Frame	Max field = 1.5 T	02 – SMARTS
	Max load =10 kN	
CRATES HIPPO Load Frame	0 to 100 kN	04 – HIPPO
Stroboscopic Rheometer	Steady-state shear up to 200 Nm of torque	10 – LQD; 09 – SPEAR
Humidity Cell	T = 300 K to 500 K	10 – LQD
Circulating Water/Oil Bath	Water bath: 5 to 80°C	10 – LQD
	Oil bath: T = RT to 200°C	
Langmuir Trough	Surface pressure and subphase temperature control	09 – SPEAR
	Different size options	

Solid-Liquid Interface Cell	2" (51 mm)	09 – SPEAR
	3" (75 mm)	
	With liquid flow option	
Solid-Liquid Interface Cell	High-pressure (200 MPa)/high-temperature (300°C) neutron reflectivity measurements	09 – SPEAR
Electrochemical Cell		09 – SPEAR
(In Situ Study of Solid/Liquid Interface)		
Electrical Conductivity Cell	T =10 K to 400 K	07 – FDS
Catalysis Reactor/Flow Cell	In-situ catalysis	07 – FDS
Robotic Arm Sample Changer		04 – HIPPO
Sample Changer		04 –HIPPO
Sample Changer		10 – LQD
Infrared Furnace	T=300 K to 770 K	02 – SMARTS
Load Cell for Compression	0 to 1 kN	02 – SMARTS
Radial Collimator	0.5, 1, 2, 3 or 4 mm	02 – SMARTS
Goniometer/Rotation Stage		02 – SMARTS
Tension and Compression Loading Frame	0-7 kN load T= RT to 420 K	10 – LQD

3.2 Additional User Facilities at LANL

3.2.1 Center for Integrated Nanotechnologies

CINT is a BES-SUFD nanoscale science research center that is jointly operated by LANL and Sandia National Laboratories. The CINT gateway to the LANL facility, located at the center of the Materials Science Complex, features approximately 11,000 ft^2 of laboratory space for chemical and biological synthesis and characterization, biomaterials fabrication and characterization, optical microcopy and spectroscopy, physical synthesis, thin-film fabrication, spatially resolved scanned probe characterization, and advanced computation and visualization. The facility aims to synthesize and characterize nanostructured materials, theoretically model and simulate their performance, and integrate nanoscale materials into larger-scale systems in a flexible, clean-room environment. Capabilities open to users through a proposal process include the following:

- Materials Synthesis: Molecular beam epitaxy; physical and chemical vapor deposition; pulsed laser deposition; inorganic, organic, and polymer synthesis; nanoparticles and nanowires; thin-film deposition; membranes and monolayers; mesoporous materials; biomaterial synthesis; and biomolecular recognition.

- Characterization: Scanning probe microscopies, electron microscopies, optical spectroscopy and microscopy, single molecule spectroscopy, ultrafast laser spectroscopies, nano/micro-mechanics, Raman microscopy, terahertz spectroscopy, and transport.

- Nano-Micro Integration: Optical and electron beam lithography, soft nanolithography, focused ion beam; etching, and deposition.

- Theory and Simulation: Atomistic theory, predictive capability development, interpretation and design of experiments, multi-scale material modeling, and large-scale computing.

- Discovery Platforms™: Modular microlaboratories designed and batch fabricated expressly for the purpose of integrating nano- and micro-length scales and for studying the physical and chemical properties of nanoscale materials and devices.

The Lujan Center has a special relationship with CINT through several shared programmatic areas and linked websites. In particular, many grass roots efforts have led to shared research programs between the facilities. Examples include ongoing joint work on oxide thin films between Mike Fitzsimmons (Asterix) and Quanxi Jia at CINT, as well as planned collaboration between CINT's recently hired Soft Biological and Composite Nanostructures thrust leader Millicent Firestone and Lujan Center personnel spanning nanostructured and macromolecular materials science with Rex Hjelm (LQD), Jarek Majewski (SPEAR), and Katharine Page (NPDF).

3.2.2 National High Magnetic Field Laboratory

The Pulsed Field Facility at LANL is one of three campuses of the NHMFL, the other two being Florida State University, Tallahassee; and the University of Florida, Gainesville. The NHMFL is sponsored primarily by the NSF, Division of Materials Research, with additional support from the State of Florida and the US DOE. LANL provides unique resources to the Pulsed Magnetic Field Laboratory of the NHMFL in the form of a 1.4 GVA motor-generator for high field pulsed magnets. In addition to the 60 T long-pulse and 100 T short-pulse magnets, the NHMFL features capacitor-driven pulsed magnets. The NHMFL is a general user facility open to all researchers, on a proposal review basis, who wish to perform experiments in high magnetic fields. The great majority of experimental research conducted at the NHMFL is in the fields of materials science and condensed matter physics. Examples include quantum phase transitions (i.e., Bose-Einstein condensation in spin systems) and new ultra-high magnetic states, electronic structure of correlated electron systems (i.e., cuprate and iron-based superconductors and low-dimensional systems), and topologically protected states of matter. Pulsed magnets allow the researcher to reach higher magnetic fields than are possible with direct-current (dc) magnets. Capabilities supported by the pulsed field magnet systems include magneto-optics (IR through UV), magnetization, and magneto-transport from 350 mK to 300 K, pressure from 10 kbar to 100 kbar, gigahertz and megahertz conductivity, pulse echo ultrasound spectroscopy, and specific heat capability in 60 T and dilatometry up to 95 T. Capabilities supported with superconducting magnets include thermal expansion, specific heat, Tesla-hertz resistivity, and magnetometry in a range of temperatures from 20 mK to 600 K.

The Lujan Center is fostering expanded interaction with the NHMFL. Before being hired as the lead sample environment scientist at the Lujan Center in 2011, Victor Fanelli was a postdoctoral

researcher from the NHMFL. During his first year and a half at the Lujan Center, 25% of his time was devoted to continuing experimental work (elastic and dielectric properties of materials) at NHMFL reinforcing collaborative work between the two user facilities. In addition, Mike Fitzsimmons (Asterix) co-advises two postdoctoral researchers with Vivien Zapf of NHMFL. Dr. Jae Wook Kim is pursuing multiferroics in frustrated systems, and Dr. Prashant Jain (a LANL Director's Postdoctoral Fellow) is exploring multiferroic properties in metal organic frameworks jointly with NHMFL and the Lujan Center.

3.2.3 Theory and Simulation Capabilities at LANL

The close connection between theoretical and experimental materials characterization is a LANL institutional strength. Users and staff of the Lujan Center frequently collaborate with researchers from LANL's Theoretical Division and other high-performance computing groups to guide or validate experimental programs and results. In particular, the combination of several world-leading instruments and staff for texture analysis (HIPPO, Vogel), in situ deformation (SMARTS, Brown, Clausen) and world leaders in the field of deformation modeling (Tome, Lebensohn, Beyerlein) is unique. Many of the most cited Lujan Center publications result from this unique combination.

Recently, the Lujan Center's total scattering program co-sponsored Director's Postdoctoral Fellow Dr. Claire White with the Theoretical Division and its Center for Nonlinear Studies (CNLS). This research, focused on advancing atomistic simulations for neutron scattering data refinement, also used the High Performance Computing Program resources at LANL. Asterix staff has partnered with personnel from the Theory Division (Turab Lookman and Nick Hengartner) to produce a number of high-impact journal publications in the last 2 years.

3.2.4 Partner User Proposal with the Advanced Photon Source for Lujan Center Users

Approved and scheduled users of the NPDF instrument are offered access to complementary X-ray measurements at room temperature at the 11ID-B beamline located in sector 11 at the Advanced Photon Source at Argonne National Laboratory. The arrangement is made possible through a Partner User Proposal involving beamline staff at the two facilities [Katharine Page (NPDF, Lujan Center), Karena Chapman, and Peter Chupas (11ID-B, APS)]. The 11ID-B instrument uses an area detector, allowing x-ray PDFs to be collected in minutes or even seconds. To utilize the program, NPDF users prepare their samples at the Lujan Center and Lujan Center staff travel to the APS to perform measurements. Users receive reduced x-ray PDF data to accompany and support their neutron measurements. Neutron and x-ray total scattering experiments provide complementary information for many systems because of the radiation-specific differences in scattering powers of the elements present. The combination of information from multiple experimental sources is invaluable to enhance understanding of materials with increasingly complex structures and disorder. In the past 3 years, more than 100 user samples have been measured for Lujan Center users at the APS, resulting in several joint facility publications per year (with many more in progress). In addition, several principal investigators have applied for beamline access to the APS as a result of this gateway program, effectively expanding and maturing the total scattering user base at the sister facility.

3.2.5 Further Resources

The National Stable Isotope Resource (NSIR) is capable of chemically synthesizing isotopically labeled molecules: drugs, substrates, transition intermediates, etc. Lujan Center users and staff mainly use the services for perdeuteration, but capabilities span many isotopes, such as D, 13C, and 15N.

Characterization tools to study materials in extreme conditions are uniquely available at LANSCE. Tools such as proton radiography are complemented by the Lujan Center and make LANSCE a one-of-its-kind facility to study materials in extreme conditions. Recently initiated viscosity measurements at high pressures and temperatures, using falling sphere methods, are an example of this synergy. Proton radiography provides a unique tool to efficiently measure the viscosity of a material as a function of pressure and temperature. A determination of the PDF at selected pressures and temperatures by neutron scattering will elucidate the changes in the atomic arrangements in the liquids. Both techniques use the unique penetration ability of protons and neutrons to expose the materials to expose the desired P-T conditions. Additional LANSCE facilities of potential interest to Lujan Center users include the Isotope Production Facility, and WNR facility.

Additional facilities at LANL available to Lujan Center users under special arrangement include microscopes and scanning probes, high-resolution X-ray diffraction, hydrothermal reaction vessels for geomaterials research, nuclear magnetic resonance instruments, and hot cells for the preparation of radionuclide targets. These facilities are largely integrated through the characterization pillar of LANL's institutional materials strategy. Improved integration of the national user programs at the Lujan Center, Center for Integrated Nanotechnologies, and NHMFL is a major goal of advancing this strategy. As mentioned, grass roots endeavors among staff members are piloting these efforts.

3.3 Support Facilities Improvements

The Lujan Center's supporting experimental facilities and resources reflect changing demands and trends in science and engineering disciplines. Support facility development options, contingent upon funding, include additional or improved sample environments; improvements to the X-ray, chemical, and biological laboratories; and an enhanced integration to LANL's other national user facilities. Improvement and upgrade plans are largely driven by proposal submission and user support requests, including engagement with the external scientific community (workshops, LANSCE User Group, etc.) Many of these initiatives are in the final stages of completion.

3.3.1 Imminent Improvements

Over the last several years, the Lujan Center user program budget for support facilities was employed for maintenance and upkeep of current capabilities. In addition, many enhancements and upgrades have been enabled by various independently funded research programs, LANL institutional investments, or partnership with external users. Support facility improvements that will be completed in the near future are described below.

3.3.1.1 Sample Environment Improvements

Sample environments at the Lujan Center are often built or purchased with user input or funding. Examples include a Janis top-loading sample stick for the CCR cryostat on the NPDF (with support of users from Brookhaven National Laboratory) and the new robotic sample changer and furnaces for HIPPO (built with student involvement from New Mexico State University). The Lujan Center management and staff have successfully funded a set of new sample environment capabilities for neutron scattering experiments, with help from various sponsors and programs, which will be available to users in the 2013 or 2014 run cycles:

- 7 T cryomagnet: The total scattering team has purchased [with financial support from LANL general and administrative funds (G&A)] a 7 T cryomagnet (0.3 K—800 K) for total scattering measurements that will enable local structure studies under applied magnetic fields and at low temperatures. This new capability will open possibilities for understanding emergent phenomena at low temperatures, such as superconductivity and quantum criticality, and local lattice distortions under magnetic field, impacting understanding in multiferroic materials, magnetostrictive materials, and many others. This user program sample environment will be unique in the world.

- Zero-scattering gas pressure cells: The NPDF and sample environments team have designed and are building a suite of titanium zirconium zero-scattering gas pressure cells to couple the study of local atomic structure with pressure-induced materials phenomena between 15 K and 800 K and up to 1 kbar. The development has been funded with a LANL LDRD Early Career Award to Katharine Page.

- Oxford LN2 system: Expanded cryogenic capabilities have been approved and funded at the PCS through BER (a standard Oxford LN2 system for 100 K data collection) and will be installed by the end of 2013. Two attractive options are a helium flow system for freezing very large protein crystals and/or a high-pressure device that uses pressure and standard LN2 to circumvent the use of cryoprotectants for protein crystals freezing. This capability will make PCS the only beamline in the US with an innovative cryo system for large protein crystal freezing.

- Quench furnace: The SMARTS, HIPPO, and facility support team will complete quench furnace capabilities, with quench rates up to 20˚C/s. The quench furnace was purchased in 2012 with funding procured from a LANL capital equipment funding call by Don Brown.

- ZAP anvil cell: HIPPO/high-pressure team will complete commissioning the ZAP anvil cell in combination with a cooling setup and magnet to allow up to 10 GPa in pressure at approximately 20 K and in a magnetic field of 2 T.

- Rheometer: The LQD team, with funds from University of California (UC) laboratory management fees, is developing a uniquely capable rheometer of its design to provide transient stress and time-dependent stress-strain measurements. This team will enable

the uniquely suited 20 Hz pulsed source of the Lujan Center as a stroboscope to measure the relaxation time constants of different segments of linear polymers and polymers with complex architectures, opening an entirely new area of polymer physics through the use of neutron scattering techniques.

- Four-point bending jig: The Asterix team, with funds from BES DMSE, has built a four-point bending jig to apply stresses to thin-film samples in situ. The apparatus allows users to examine the coupling of ferromagnetism and ferroelectricity at the beamline.

Continuous effort by the Lujan Center's sample environment staff focuses on the integration and optimization of existing environments (i.e., pressure, temperature, and magnetic field) and adaptation of existing technologies to other instruments (e.g., modification of the 11 T magnet for use with total scattering). Ongoing developments anticipated over the next 3 years include optimization of the present HIPPO high-temperature furnace to reach even higher temperatures, adaption of an RF furnace for neutron experiments in excess of 3000˚C, and improvements of the controlled atmosphere setup for different gas mixtures and higher temperatures.

3.3.1.2 Improvements for Protein, Biological Membrane, and Macromolecular Experiments

For users interested in protein, biological membrane, or any macromolecular experiments, expansions and upgrades are anticipated for the next few years, primarily funded by DOE-BER.

- Procurement of a differential scanning calorimeter (Microcal) to measure protein stability, solubility, and interactions will support a number of instruments, including SPEAR, LQD, and PCS.

- Equipment upgrade/acquisition of the Gryphon and Alchemist from Rigaku which make, with high precision, custom buffers and crystallization solutions. The Gryphon is a liquid handling robot that can set up 96-well crystal screens in minutes. This system will allow a true high-throughput crystallization capacity, and the individual parts can be used by multiple users.

- The BDL and PPCL are moving to larger, more modern laboratory space. Staff and users of SPEAR and LQD will be able to also use the new space.

3.3.1.3 Expanded Computing Capabilities for Materials Simulations

DFT calculations provide an invaluable tool for the interpretation of spectra measured by the FDS and simulation of diverse structural models to interpret diffraction data from the powder diffraction suite. However, common DFT programs need extensive computing power and experienced users. Providing a terminal with which users can remotely access a cluster machine dedicated to DFT calculations, as well as the experience needed to prepare adequate input, will drastically increase both the quality and speed of user data analysis.

Currently, the FDS team is operating an 8-node (32-CPU) system with 64-GB operational memory. NNSA funding will be spent on HP ProLiant modules, which will allow the team to more than double their capacity. In addition, a user-accessible terminal equipped with common DFT software packages (Gaussian, Abinit, and Quantum Espresso), as well as programs allowing complementary data input (IR and Raman spectroscopy, X-ray diffraction, etc.) will be provided. This terminal will serve as a graphical interface between the users and the cluster machine.

3.3.1.4 Other Improvements

A number of additional support facility improvements are planned in the coming years. For example, the machine shop will soon have a computer numerical control (CNC) machine for high-precision machining, and the design/draft team is upgrading its wide-format scanning and printing capabilities.

3.3.2 Future Improvements

Contingent upon the level of funding received from BES-SUFD and from other funding sources, a variety of sample environment and support facilities improvements are envisioned to continue shaping our capabilities for the future.

3.3.2.1 Proposed Sample Environment Improvements

- The FDS team plans to develop a new sample environment cell for in situ photochemistry, citing new opportunities for solar energy research.

- The Asterix team will pursue a helium-gas pressure cell for the 11 T superconducting magnet to enable high-field and low-temperature measurements. Such a system would be designed for reflectometry and single-crystal diffraction experiments and would expand the Lujan Center's integration with the NHMFL.

- The SMARTS team is investigating equipment to handle activated materials, which will require a shielding cask and potentially remote handling capabilities. This development will enable in situ deformation tests in highly irradiated materials, determining changes in strength, ductility, and microstructure due to irradiation (recently demonstrated in the study of zirconium alloys seeing 7 years of service in a nuclear power reactor).

- The high-pressure/HIPPO team plans to design and fabricate a high P-T hydrothermal cell for neutron scattering and imaging measurements, which will have broad applications to in situ, time-resolved studies of materials syntheses and reactions.

- The NPDF and HIPPO teams envision a versatile furnace with a controlled atmosphere to follow the structural changes accompanying oxidation and reduction reactions in situ.

- The LQD and SPEAR teams will advance the newly available rheometer to enable pulsed-probe measurements. This would be used to measure relaxation of polymers and transient stress in the bulk and at interfaces.

3.3.2.2 X-Ray Laboratory Improvements

On the second port of the Lujan Center's rotating anode is a Huber goniometer suitable not only for regular X-ray diffraction but also for strain measurements. The detector is a single-channel detector, which would ideally be replaced with a charge-coupled device (CCD) area detector with a higher detection efficiency and better response time. The new detector will allow a higher diffraction throughput and, when coupled with goniometer programming, will enable single-crystal diffraction experiments. The Rigaku XRD unit can be equipped with a DSC/TG stage that allows the observation of thermal decomposition while simultaneously measuring X-ray diffraction. This capability will help determine structural transitions before neutron scattering user experiments are performed. These upgrades would benefit the single-crystal and powder diffraction users of several instruments.

3.3.2.3 Chemistry, Analytical, and Spectroscopy Laboratory Improvements

The addition of a CHNO analyzer to the instrument suite in the chemistry laboratory would allow users to characterize the carbon, hydrogen, nitrogen, oxygen, and sulfur content of their soft-matter or organic samples before and after neutron measurements. Additional sample environments for the FT-IR machine would expand already heavily used capabilities to determine the grade of deuteration and water content of samples for neutron diffraction, neutron spectroscopy, and small angle scattering. The purchase of a new attenuated total reflectance (ATR) stage would allow IR measurements to be taken without sample preparation and with flowing inert gas to prevent protonation during measurements. Additional high-pressure diamond anvil cells for the Raman system would be of great benefit to users. Over the past years, the interest in completing high-pressure neutron spectroscopy (FDS) has increased significantly. Many of these experiments would benefit from complimentary measurements on the Raman system at similar pressures. Another important use of high-pressure Raman spectroscopy is to test the pressures required for the neutron experiment before neutron experiments are performed. In addition, the purchase of a low-temperature DSC instrument (77 K to 350 K) complementing the existing DSC/TG (RT to 1000°C), would be of great benefit to many Lujan Center user experiments. In addition, hiring a chemical technician to support the operation and maintenance of instruments in the support laboratories and assist with standard laboratory setups for the users would have a positive impact on the user program.

3.4 Support Facilities Summary

The Lujan Center's shared support facilities, together with an experienced operation staff, provide a spectrum of user support spanning materials preparation, characterization, and analysis. The Lujan Center has judiciously applied BES financial support to maintaining and operating these support facilities, thus ensuring a quality research experience for the user. Lujan Center personnel have successfully captured funding and utilized support staff to enhance the neutron scattering user program over the review period. Future investments in the support facilities at the Lujan Center will expand capabilities toward unique sample environments and improved diagnostic and characterization tools in the support laboratories. The support facility resources ultimately enable and augment the vibrant neutron scattering user program at the Lujan Center and are helping to train the next generation of well-rounded and engaged scientists and engineers.

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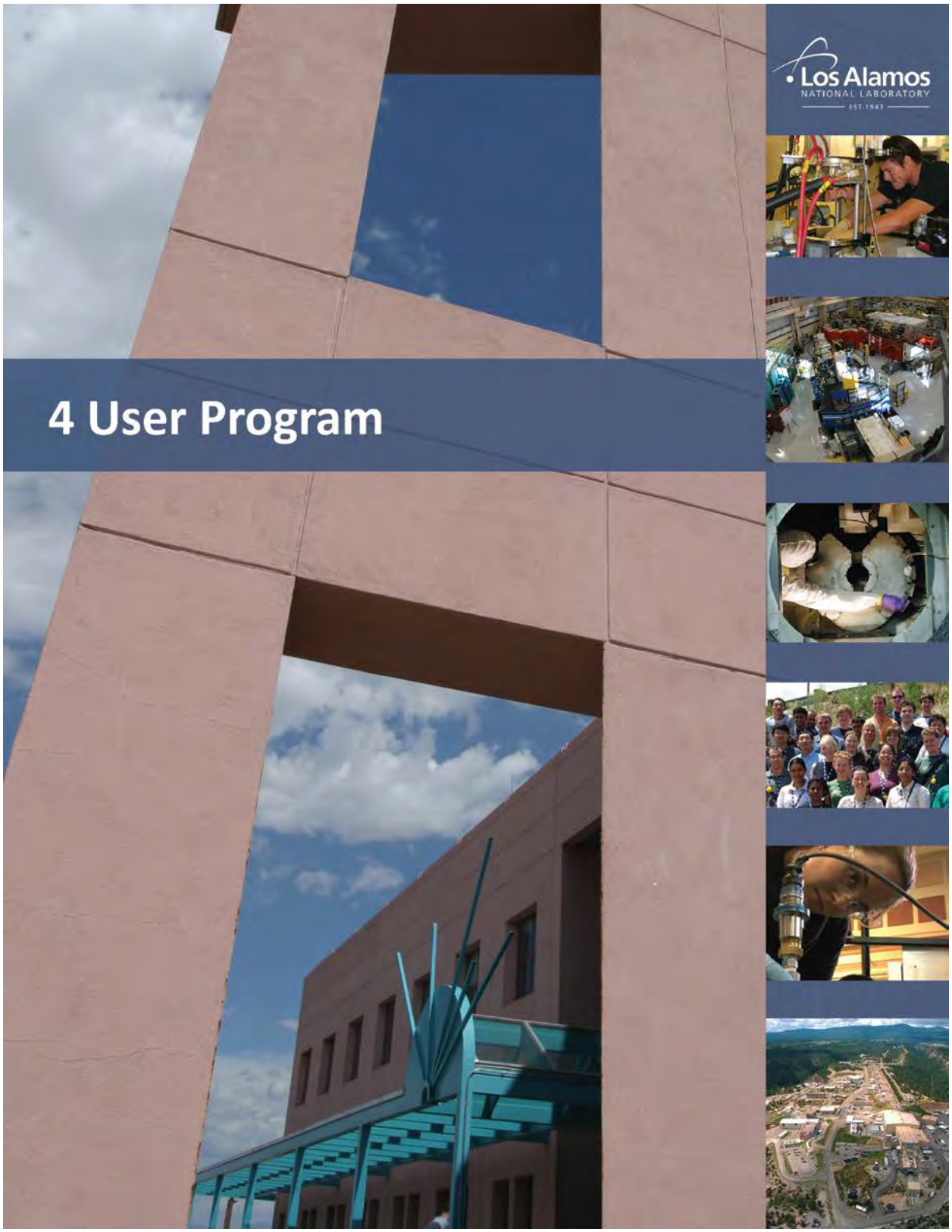
4 User Program



4 User Program

From FY2009 through FY2012, HFIR, SNS, and the Lujan Center hosted a total of 5,376 users (Figure 4.1). This number increased (Figure 4.2) as the instruments at SNS were brought on line, demonstrating latent demand.

The number of unique users performing experiments at the Lujan Center has remained at approximately 300 per annum over the past 10 years.[13] The number of proposals requesting beamtime has increased by 70% over the current review period. This substantial increase in the demand for beamtime at the Lujan Center is consistent with the high satisfaction ratings expressed by the users.

The high productivity of Lujan Center users is shown in Section 4.3. From FY2009–FY2012, the Lujan Center published 503 papers at average cost of $80k per publication (Figure 4.4). An additional productivity metric is the number of papers in refereed journals per instrument day, shown in Figure 4.5.

Over the current review period, the Lujan Center received an average of 404 submitted proposals per proposal call and hosted on average 535 user visits per year. The Lujan Center's User Office and the Experiment Coordinator enable and support these users and their experiments. Section 4.5 describes the operation of the Lujan Center User Program Office. Beamtime is allocated based on the merit of the proposals as judged by the MPAC (Section 4.6.2).

The Lujan Center provides resources for industrial and national security users, as described in Sections 4.7 and 4.8. Statistics for beamtime allocation and user demographics are provided in Sections 4.4 and 4.8. Ongoing efforts to increase and educate the user base, as well as efforts to solicit input for future facility enhancements based on the needs of the scientific community, are summarized in Section 4.10.

4.1 Basic Energy Sciences (BES) Neutron Scattering Facility Users

BES sponsors user facilities to provide experimental capabilities to scientists from universities, industry, national laboratories, and other organizations. The three BES-SUFD-funded neutron scattering facilities in the US are the Lujan Neutron Scattering Center, the SNS (ORNL), and the HFIR (ORNL). Between FY2009 and FY2012, these facilities hosted a total of 5,376 users. Users are defined as researchers who conduct experiments at a scientific user facility. Access to these facilities is free for work intended for publication in the open literature. Proprietary work is performed on a cost recovery basis. Facility time is awarded on the basis of peer-reviewed proposals. As shown in Figure 4.1, the Lujan Center hosted 1,298 users, accounting for 24% of the total users utilizing BES-SUFD neutron scattering facilities between FY2009 and FY2012.

[13] http://science.energy.gov/~/media/bes/suf/pdf/BES_Facilities_Number_of_Users.pdf.

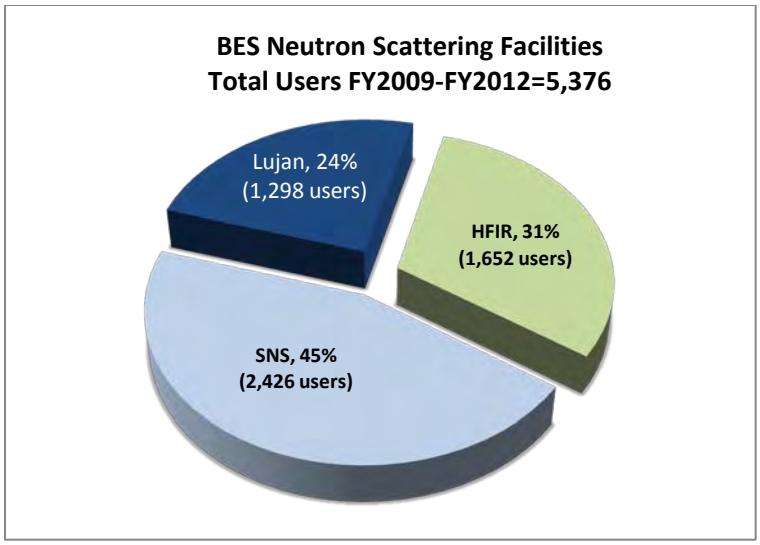


Figure 4.1: BES neutron scattering facility users.

Figure 4.2 and Table 4-1 show the number of unique (badged) users for FY2009–FY2012 as reported to BES. The number of user visits to the Lujan Center remained essentially constant at around 300 users per year. In FY2009, the Lujan Center absorbed a substantial number of the IPNS users due to its closure in 2008. The drop in Lujan Center users in FY2012 resulted from the closure of the Lujan Center due to the ^{99}Tc event.

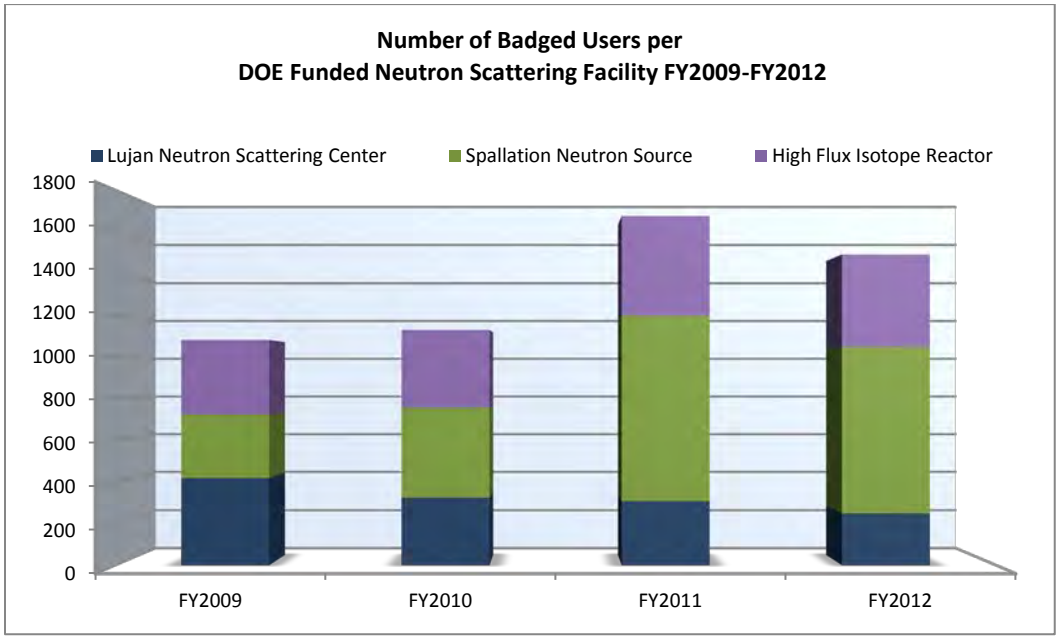


Figure 4.2: Number of badged users per DOE-funded neutron scattering facility, FY2009–FY2012.

Table 4-1: Number of badged Users per DOE-funded neutron scattering facility, FY2009–FY2012.

	FY2009	FY2010	FY2011	FY2012
Lujan Neutron Scattering Center	416	325	308	249
Spallation Neutron Source	307	430	890	799
High Flux Isotope Reactor	358	375	477	442
Total	1081	1130	1675	1490

4.2 User Satisfaction Surveys

At the end of each run cycle, satisfaction surveys are sent to users who performed experiments onsite. The results and comments are captured and documented in the BES facility questionnaire. The high level of user satisfaction is evident from survey results (Figure 4.3). The users reported an approximately 80% excellent rating for support by the beamline and facility staff, approximately 50% excellent rating for beam performance and schedule and service, and above 90% satisfactory or excellent rating for facility operation. The surveys indicate areas of improvement, such as training requirements and beam availability. Improvements are being addressed by the User Office and Lujan Center management.

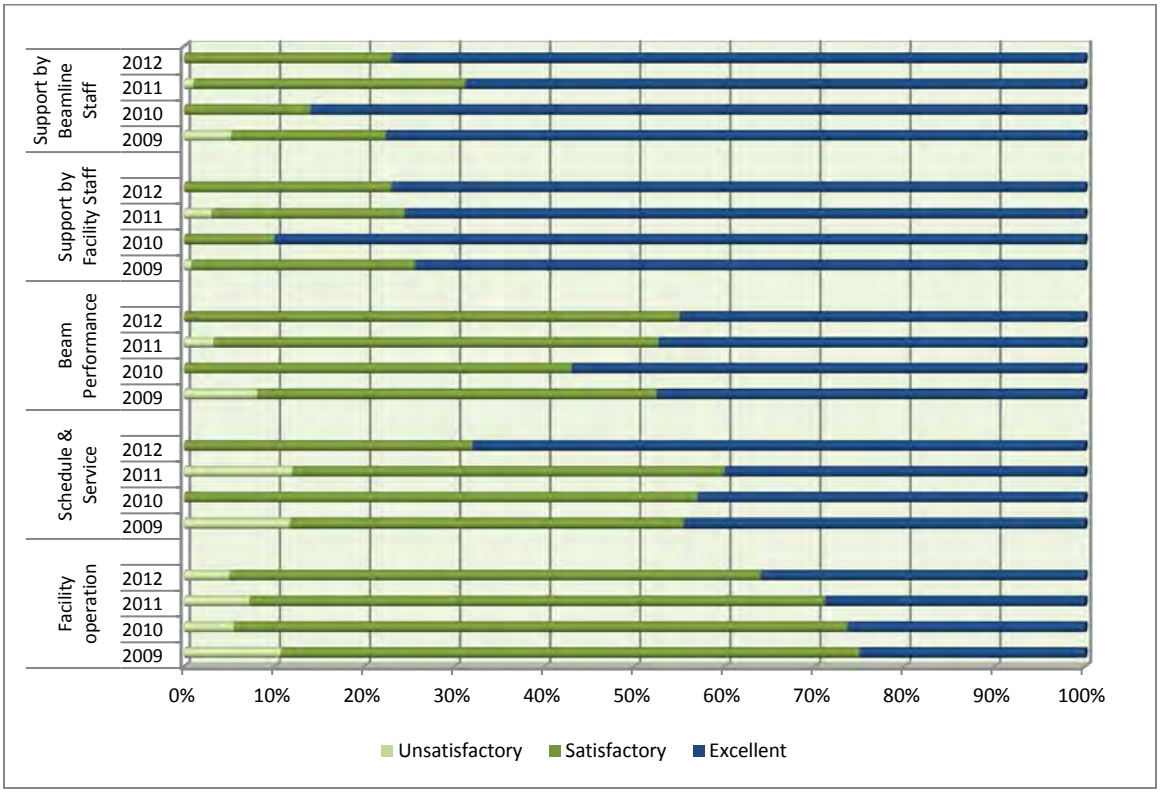


Figure 4.3: FY2009–FY2012 results of the user satisfaction surveys.

4.3 Cost Efficiency and Productivity of the User Program

As described in more detail in Chapter 6, the cost efficiency for BES-SUFD, measured by cost per refereed publication, is competitive (Figure 4.4). The number of publications normalized by available instruments and beam days (Figure 4.5) demonstrates Lujan Center's performance compared with leading neutron scattering facilities worldwide (it should be noted that this metric reflects the particular makeup of high- and low-throughput instruments).

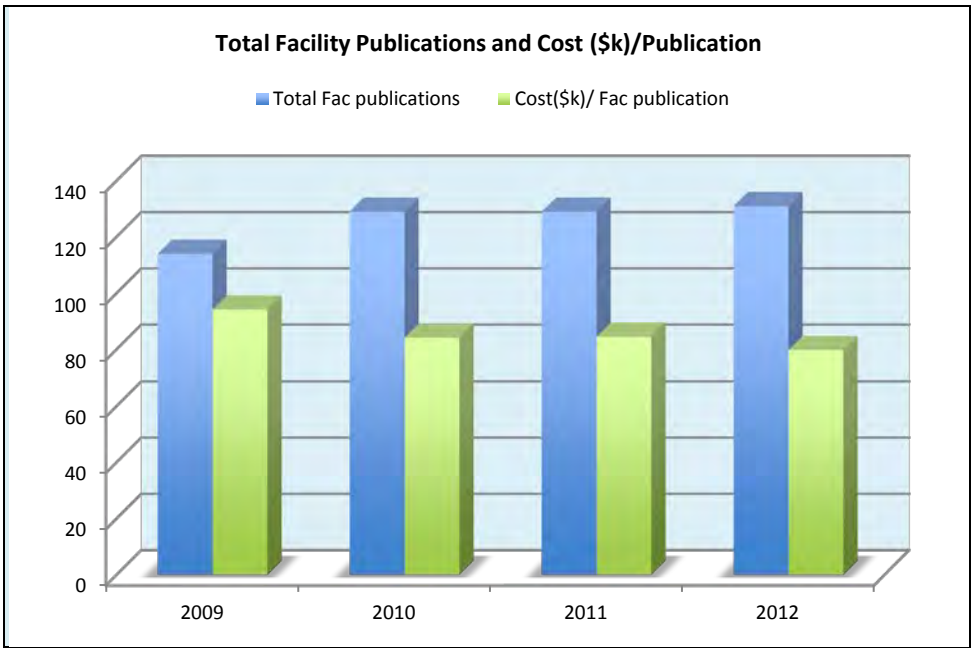


Figure 4.4: Cost per refereed journal publication per year.

Table 4-2: Cost per refereed journal publication per year.

	FY2009	FY2010	FY2011	FY2012
Cost of Facility Operations ($k)	10,737	10,850	10,900	10,451
Publications	114	129	129	131
Cost per Paper ($k)	94	84	84	80

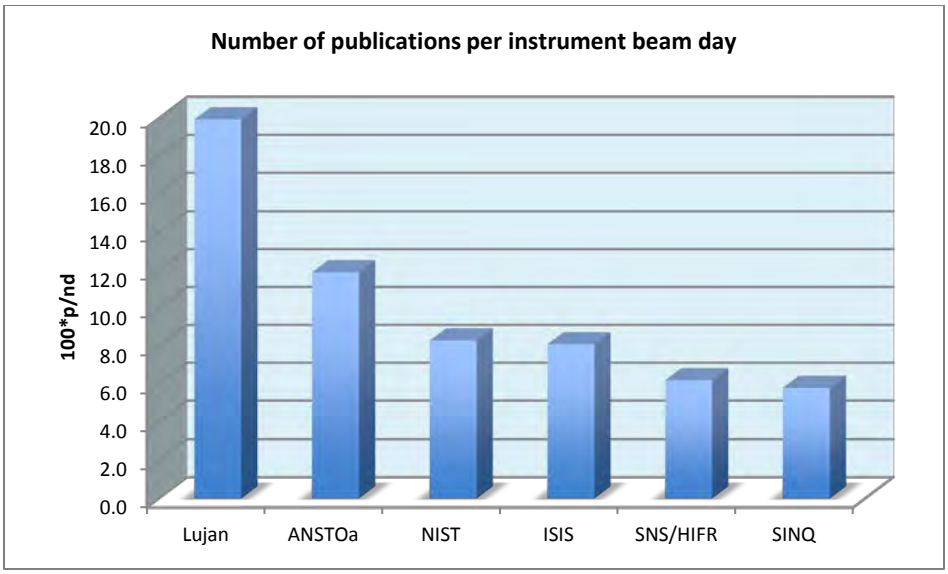


Figure 4.5: Productivity Index defined as 100*p/(n*d) [p: number of publications, n: number of instruments, d: number of delivered beam days] averaged over 2009 to 2012. For details see Chapter 6.

4.4 Beamtime Allocation Statistics

Figures 4.6 through 4.11 report beamtime allocations for the scheduled proposals. As shown in Figure 4.6, the Lujan Center supports users for a variety of scientific disciplines. A substantial amount of beamtime at the Lujan Center is allocated for engineering materials. Condensed and soft-matter sciences also receive substantial portions of beamtime. Magnetism, protein crystallography, and excitations are more limited to specialized instruments. Earth Sciences has exhibited growth over the review period.

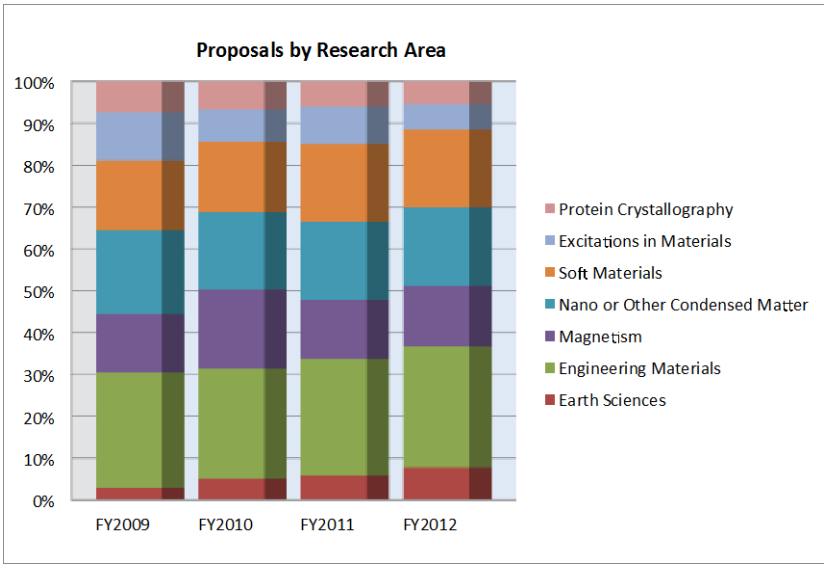


Figure 4.6: Distribution of proposals by research area.

User demand, measured by the number of proposals submitted, showed a continuous increase over the past 4 years (Figure 4.7). This increase occurred coincident with the growth in the SNS user program.

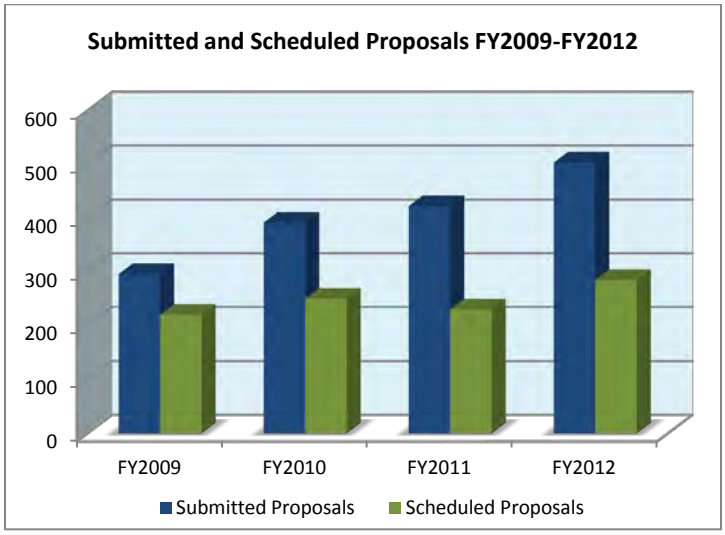


Figure 4.7: Number of submitted and scheduled user proposals for the facility.

The percentage of beam days allocated to instrument scientists, as either a principal investigator (PI) or co-PI of a proposal, is shown in Figure 4.8. Because of the strong scientific collaboration between the beamline staff and the users, many users listed a beamline staff member as a co-PI. Figure 4.9 shows the percentage of beam days allocated to Lujan Center staff as an experimental PI.

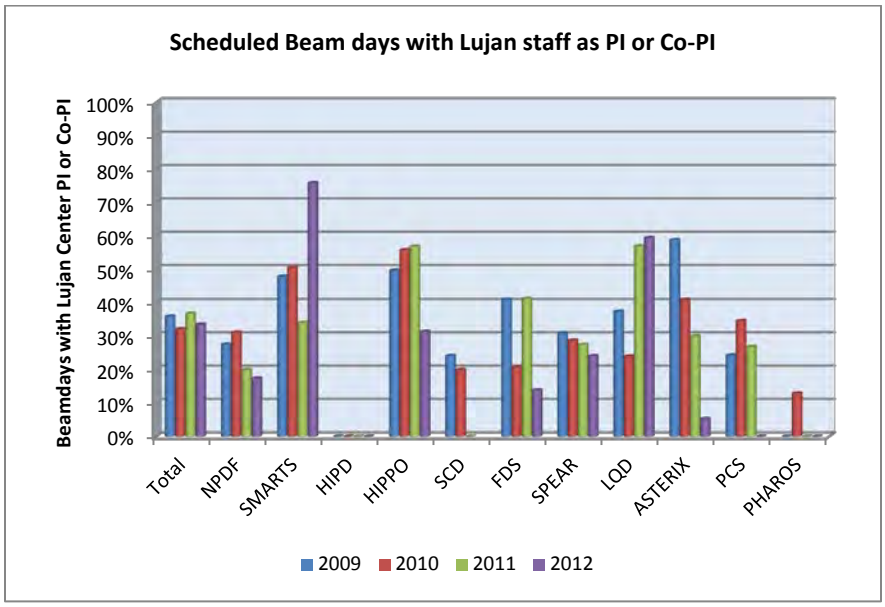


Figure 4.8: Percentage of beam days allocated to instrument scientists as either a PI or co-PI of a proposal.

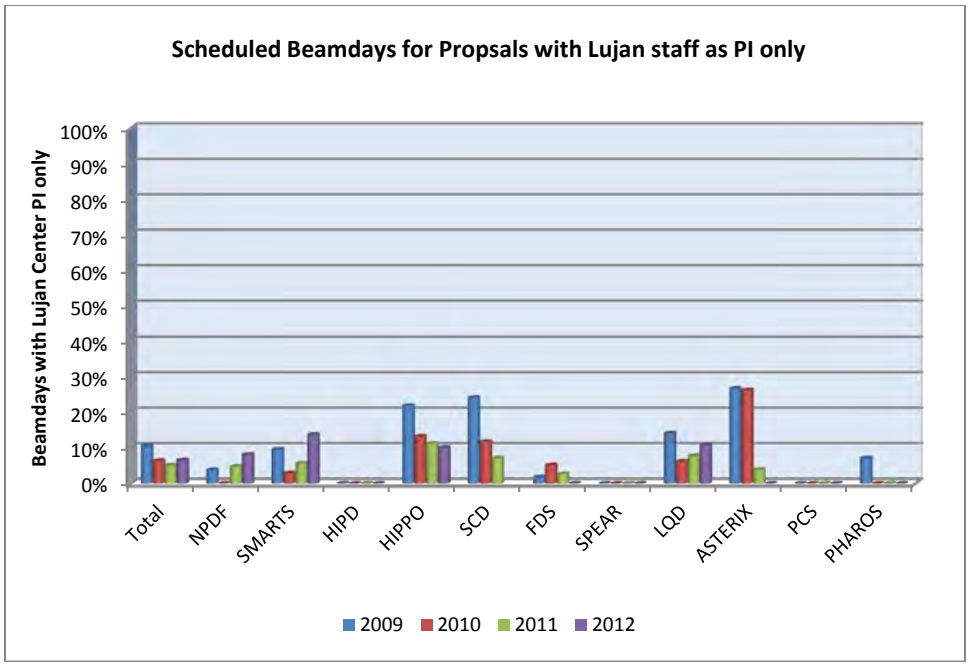


Figure 4.9: Percentage of beam days allocated to scientists as a PI only.

Figure 4.10 shows the subscription rate for each BES-SUFD-funded instrument throughout the review period. Subscription is defined as the number of beam days requested divided by the number of beam days available. The average subscription over all instruments for the review period was 2.4.

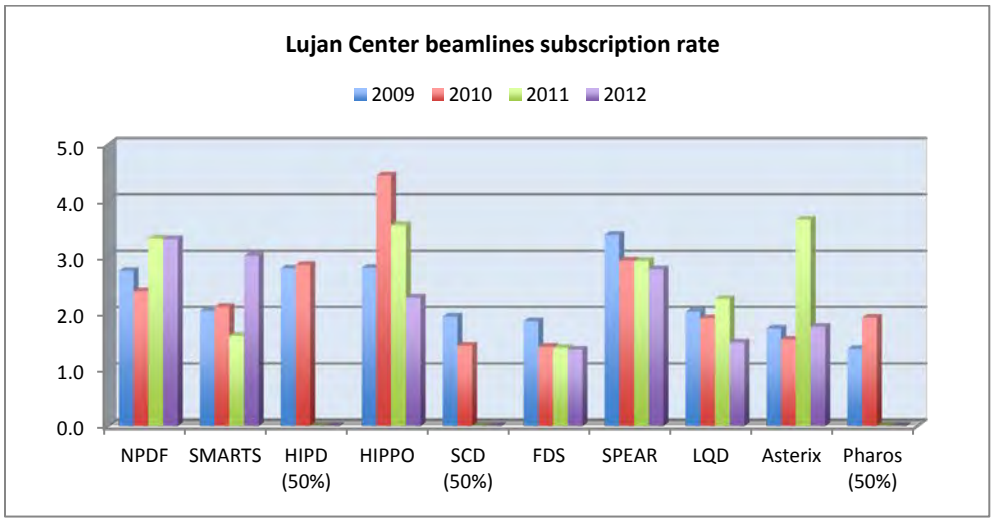


Figure 4.10: User program oversubscription percentages per flight path (FY2009–FY2012).

Figure 4.11 and Table 4-3 show the number of user visits and unique users normalized by instrument days. The number of unique users per instrument day remained essentially constant over the review period. The number of user visits per instrument day, as a measure of the number of multiple visits by the same user, has slightly declined over the review period.

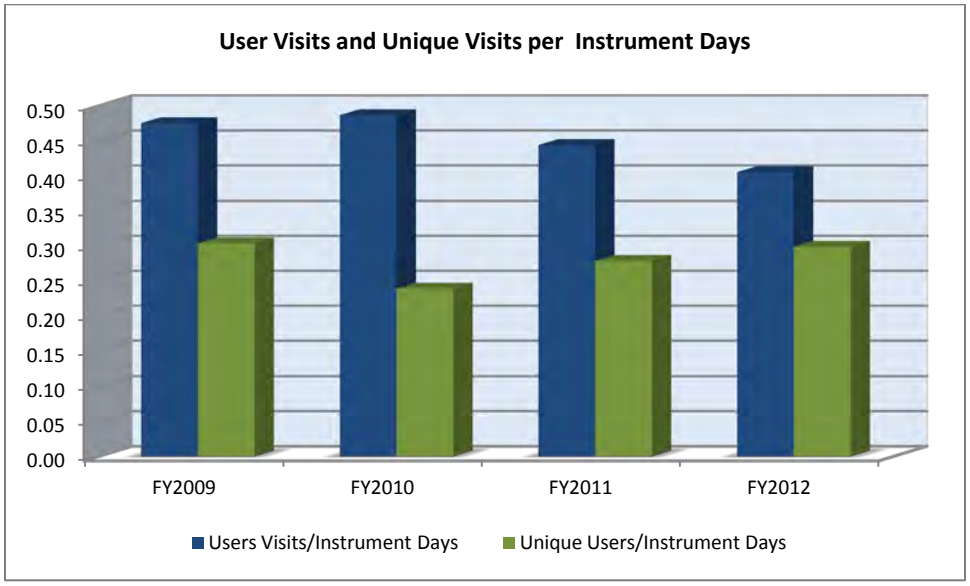


Figure 4.11: User visits (total number of visits made by users, including repeat visits by a single user) of the Lujan Center divided by the instrument days, and unique users (persons counted only once in a run cycle) divided by the instrument days.

Table 4-3: Data for Figure 4-11.

	FY2009	FY2010	FY2011	FY2012
User Visits	650	661	490	337
Unique Users	416	325	308	249
Beam Days	144	143	138	104
Instruments	9.5	9.5	8	8
Instrument Days	1372	1358	1104	831
Users Visits/Instrument Days	0.47	0.49	0.44	0.41
Unique Users/Instrument Days	0.30	0.24	0.28	0.30

4.5 User Office

The objective of the User Office is to provide a positive and productive experience for users. Special attention is given to users who are new to the Lujan Center and/or to neutron scattering. The user administrator and experiment coordinator serve as points of contact for all user experimental functions, such as chemical ordering and storage; incoming and outgoing

routine and hazardous user shipments; initiating collaborations with LANL staff (both at LANSCE and other locations at LANL); facilitating safe user experiments; interfacing users with the sample preparation laboratories; providing user access to the LANL computer network; and advising users on local restaurants, attractions, and their travel arrangements.

4.5.1 User Office Administration

The user office administrator's primary responsibilities are to provide proposal management, outreach communications, assistance with logistics of user visits, user training, site access, user agreements, industrial interactions, and classified proposals.

4.5.2 Experiment Coordinator

The experiment coordinator (EC) provides a single point of contact for all requests and needs from users, directing and optimizing user access to the scientific infrastructure offered by the Lujan Center while ensuring that all work complies with LANL and Lujan Center policies. The EC responsibilities include facilitating compliance with the Laboratory operational procedures, such as safety review approvals, sample custody, user laboratory requirements, appropriate integrated work document authorizations, and facility safety orientations. The EC also serves as the primary interface between the Lujan Center and the international user communities, including representing the Lujan Center at the National User Facility Organization (NUFO), maintaining close interactions with the LANSCE User Group, and providing metrics required by DOE and other organizations.

4.6 Beamtime Allocation Process

4.6.1 Call for Proposals

Approximately 4 months before each run cycle, a call for proposals is issued. Users and potential users are notified via the external LANSCE website and by emails to registered users and neutron and diffraction community mailing lists. The deadline for submission is 1 to 2 months after the call.

4.6.2 Reviews by the Instrument Scientist and Safety Review Committee

After proposals are collected via the Los Alamos Proposal Information System (LAPIS) web portal, they are reviewed by the instrument scientists for feasibility. The Lujan Center conducts work in accordance with the principles of integrated safety management (ISM) and integrated work management (IWM). To protect personnel and the environment and meet the requirements of DOE's Accelerator Safety Order (420.2c) and the LANSCE Accelerator Safety Envelope (ASE), LANSCE requires a documented experiment safety review of all beam-related experimental activities. The safety review committee, composed of an industrial hygienist, chemist, radiation health physicist, and the experimental area manager, reviews proposals for hazards. If needed, the safety review committee can appoint additional subject matter experts commensurate with specific hazards associated with the experiment. The outcome of the safety review is an experimental hazard classification and identification of procedures and controls to mitigate the hazards. Proposals deemed not scientifically feasible or which have safety issues that cannot be mitigated are eliminated from consideration.

Following the Tc-99 event in August 2012, the Lujan Center operations plan was modified to address the corrective actions that derived from the Accident Investigation as specified in TA53-PL-320-003.1, *Lujan Center Resumption and Operations Plan*. A flow diagram of the safety review process is illustrated in Figure 4.12.

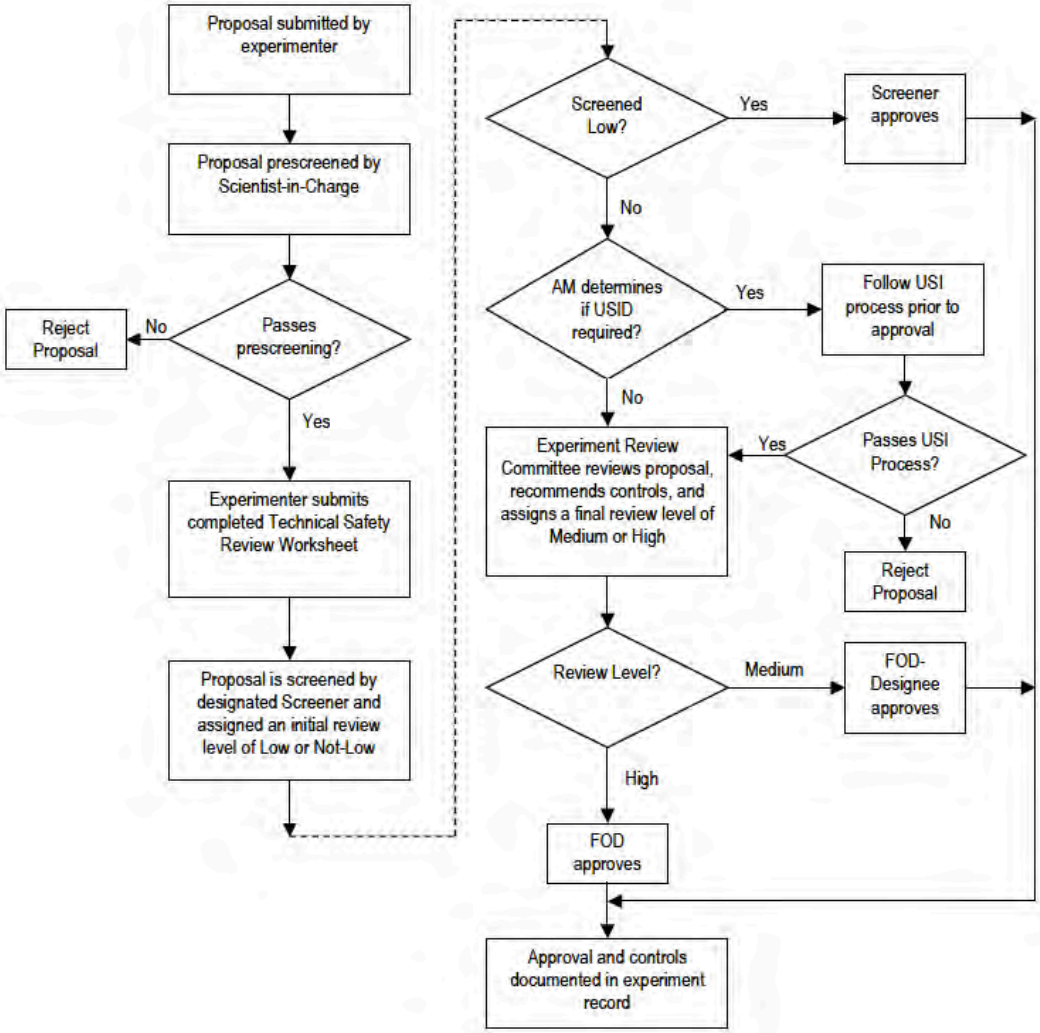


Figure 4.12: Experiment safety review process flowchart.
USID: Unreviewed Safety Issue Determination. FOD: Facility Operations Director.

4.6.3 Materials Program Advisory Committee (MPAC)

The MPAC consists of senior scientists in the scientific and engineering areas covered by the Lujan Center instruments (Figure 4.13). The MPAC is divided into six subcommittees, which users select upon proposal submissions: magnetism, condensed matter physics and nanomaterials, engineering materials, earth and geoscience, soft materials, and excitations in materials. A seventh subcommittee, national security science, has members drawn from the other subcommittees and provides input on the programmatic relevance of proposals in this

area. All nonproprietary proposals, including those relevant to nuclear weapons and other national security programs, are subject to external peer review by the MPAC. Classified reviews are performed as needed. MPAC membership is reviewed annually by the Lujan Center Director.

4.6.4 Review Process

Proposal scores are based on both the scientific significance of the problem proposed and the likelihood of success. Additional considerations are student involvement and the number of days requested, which may be corrected as part of the feasibility study performed by the instrument scientist before it is submitted to the MPAC. The rating system used by all subcommittees is as follows:

5.0 - **Excellent proposal**. The experiment should be carried out with highest priority.

4.0 - **Very good proposal.** The experiment should be carried out with high priority and receive beamtime during the upcoming operating period.

3.0 - **Good proposal.** The experiment should be carried out under normal conditions of demand for beamtime.

2.0 - **Fair proposal**. Although scientific or programmatic merit is not exceptionally high, the experiment can receive beamtime if it is available.

1.0 **- Poor proposal.** Scientific or programmatic merit or experiment feasibility is not convincingly documented. Beamtime should not be allocated.

Two MPAC members review each proposal and submit initial ratings and comments electronically via the LAPIS portal before the onsite meeting occurs. The MPAC meets on site to discuss the proposals, arrive at a consensus score, provide summary comments, and normalize the scores across the subcommittees. This information is subsequently transmitted to the proposer(s). Proposals designated as national security are reviewed by both the relevant materials subcommittee and by the defense science subcommittee, which may award up to 0.5 additional points based on programmatic relevance. “National security” encompasses weapons research and homeland defense topics, including chemical/biological threats, and critical infrastructure vulnerabilities, and energy security.

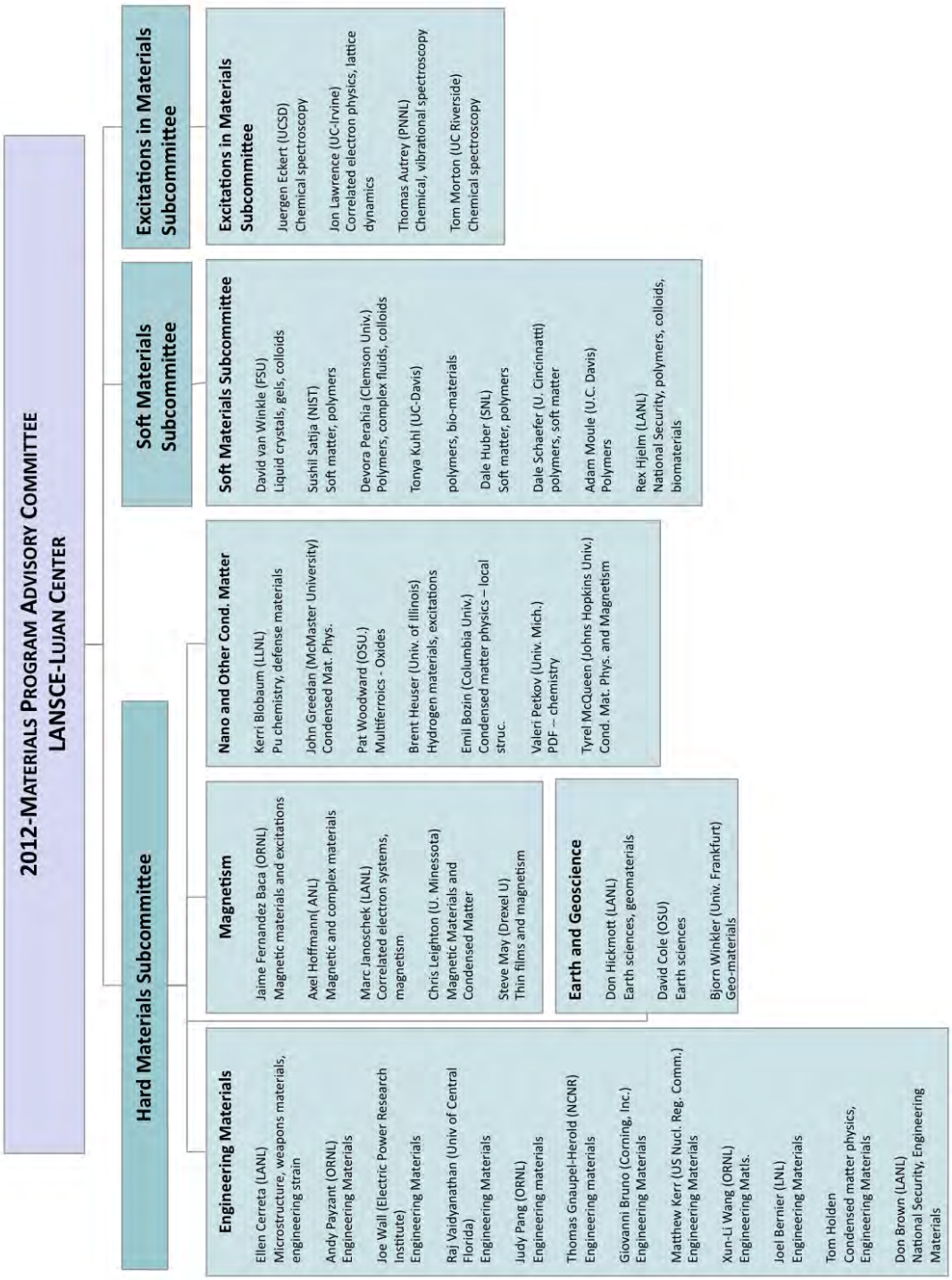


Figure 4.13: Materials Program Advisory Committee membership for 2012

4.6.5 Beamtime Allocations

The scores assigned by the MPAC are recommendations to the Lujan Center director, who in consultation with the LANSCE Facility Director, makes the final beamtime allocations. Of the available beamtime, 80% is allocated through the competitive peer-review process. The remaining 20% of the beam time is reserved for use by the instrument team for calibration, research that showcases instrument capabilities or "fast access" proposals, improvements and development.

4.6.6 Fast Access Proposals

Fast access proposals for time-critical or "scientifically hot" experiments may be submitted throughout the year. If deemed sufficiently urgent and feasible, fast access experiments are awarded beamtime and run as part of the 20% time reserved for the instrument team.

4.6.7 National Security Relevant Proposals

Typically, 10% to 15% of beamtime is allocated to national security proposals based on merit, as with any other proposal.

4.7 Industry Users

The Lujan Center has two means of supporting industry users. One is through its general user program and the other is through proprietary beamtime allocation. Corporate users can apply for beamtime through the standard proposal system if the results of the experiments are intended for publication in the open literature. Proprietary beamtime requests are accommodated within DOE guidelines, and full cost recovery is required. Proprietary research is managed through the LANL Technology Transfer Office.

The Lujan Center is an excellent location for proprietary work because of its similarity to the data protection aspects of its national security R&D portfolio. Systems are already in place to handle sensitive procedures, samples, and data.

4.7.1.1 Partial List of Industrial Users

- **Prieto Battery**—Photovoltaics and Hydrogen Storage Materials
- **IBM Almaden Research Center**—Information Storage Technology
- **Rolls Royce**—Residual Stress Analysis
- **Hill Engineering and Boeing**—Aerospace Structural Materials
- **Westinghouse**—Engineering Materials
- **CIBA Vision** (Proprietary)—Ophthalmic Materials
- **Corning, Inc.** (Proprietary)—Engineering Materials

4.8 User Demographics

Figure 4.14 through Figure 4.19 provide user demographic data for FY2009–FY2012. The data are based on input received from the users during proposal submission. Overall, the user data shows that (1) a significant number of user visits are made by postdoctoral researchers and

graduate students, which demonstrates the important role that the Lujan Center plays in training the nation's future generation of neutron scatterers (Figure 4.14); (2) half are US citizens (Figure 4.15); (3) nearly 20% are female (Figure 4.16); (4) most claim materials science as their discipline (Figure 4.17); (5) their funding primarily derives from DOE (Figure 4.18); and (6) approximately one-third of users are affiliated with US academic institutions (Figure 4.19).

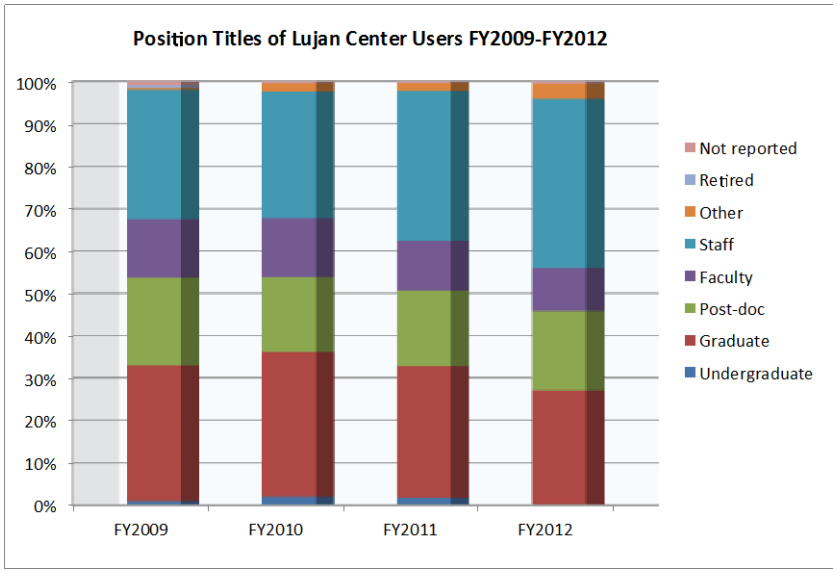


Figure 4.14: Position titles of Lujan Center users.

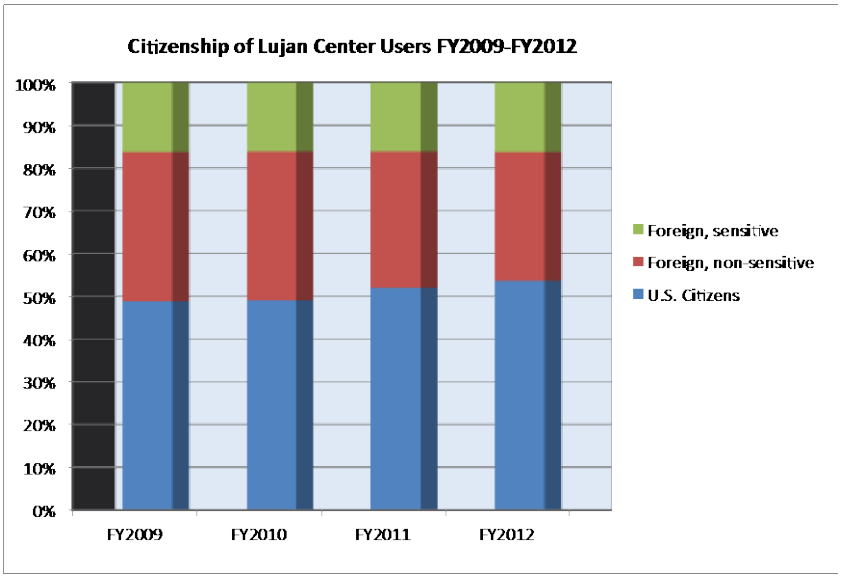


Figure 4.15: Citizenship of Lujan Center users.

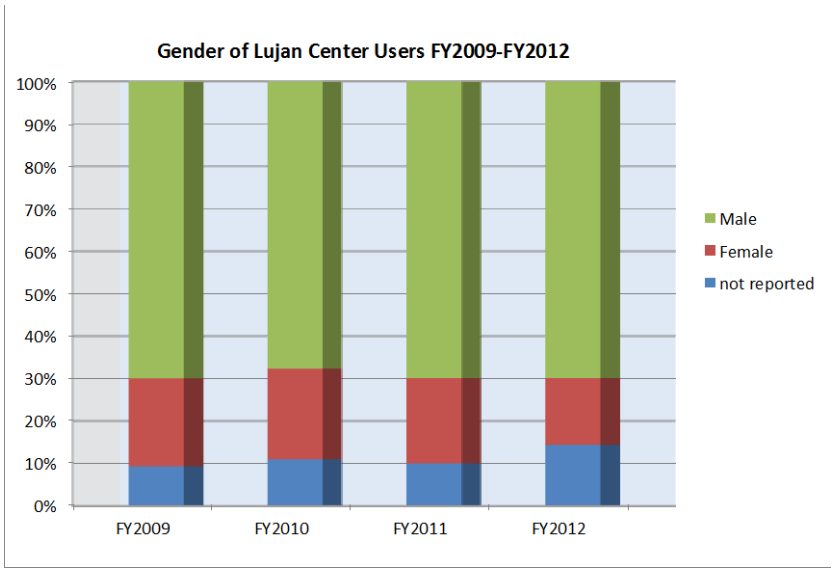


Figure 4.16: Gender of Lujan Center users.

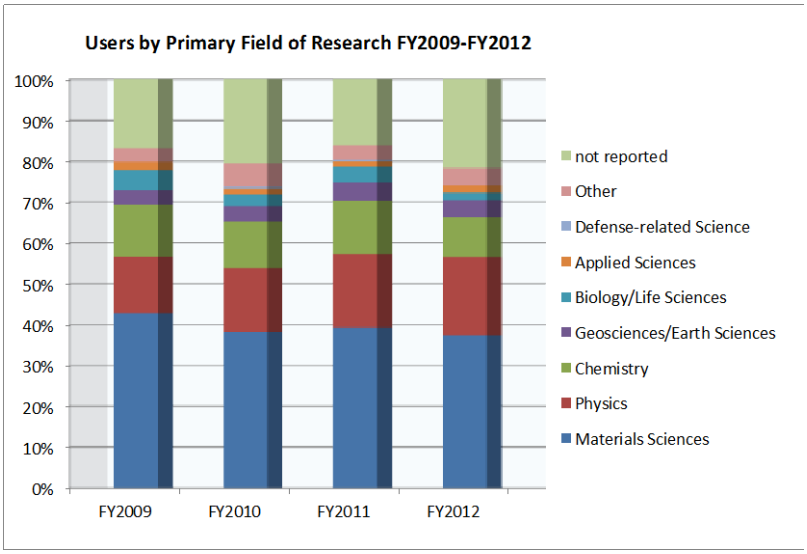


Figure 4.17: Users by primary field of research.

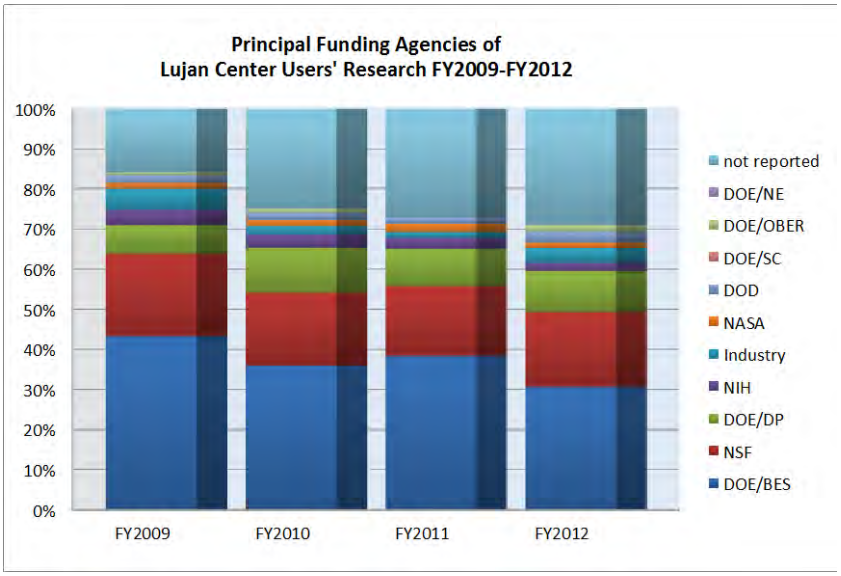


Figure 4.18: Principal funding agencies of Lujan Center users' research.

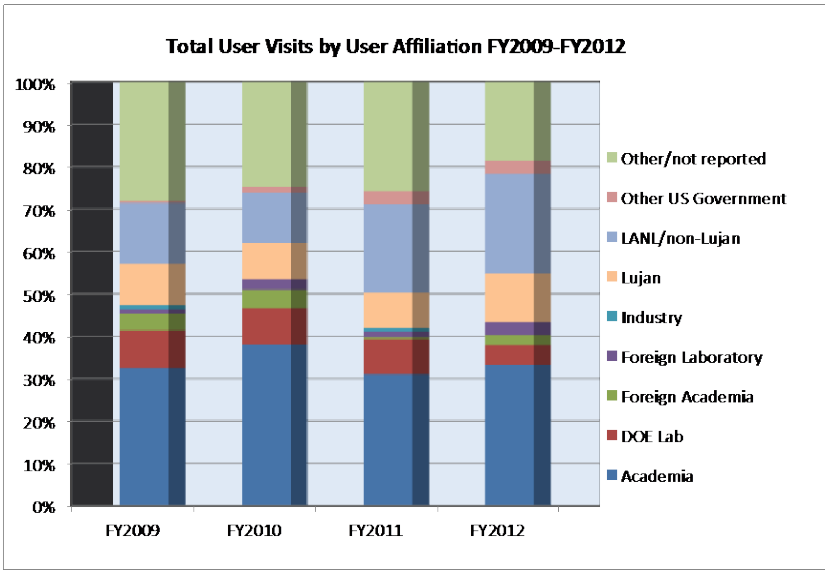


Figure 4.19: Total user visits by user affiliation.

4.9 Education and Outreach

A major focus of the Lujan Center is to expand and train the user base. Scientific meetings and conferences, as well as seminars at academic institutions and research facilities, are used by Lujan Center staff to recruit new users. Workshops are held to showcase Lujan Center capabilities and nucleate new collaborations, as well as to gather input for experimental needs of the scientific community. In this period, S. Vogel (Lujan Center) and R. Wenk (UC Berkeley)

successfully applied for a grant from UC to subsidize UC student and faculty travel to LANSCE through the Student Travel Opportunities for Neutron Experiments (STONE) program.

4.9.1 LANSCE Neutron Scattering School

The Lujan Center annually organizes the LANSCE Neutron Scattering School, which each year addresses a different scientific field in which neutron scattering makes a major impact. The school runs for 9 days and includes lectures by world-leading neutron scientists for that chosen theme. A significant part of the school is to provide an opportunity for the students to perform hands-on experiments at the Lujan Center under the guidance of the instrument scientist. Graduate students, advanced undergraduates, and postdoctoral researchers are encouraged to attend. (Figure 4.2) Financial support is provided for travel and local expenses. The application consists of reference letters and a statement of research interest that is used to select (from the applicant pool) the 30 students that can be accommodated. The school began in 2004 and is co-sponsored by the NSF and BES-DMSE.

4.9.1.1 Science Topics for Each School

- Soft Matter, 2012
- Energy and Environment, 2011
- Structural Materials, 2010
- Phase Transitions, 2009
- Magnetism and Nanomaterials, 2008
- Hydrogen in Materials, 2007
- Soft Condensed Matter and Structural Biology, 2006
- Structural Materials, 2005
- Magnetism, 2004

Figure 4.20: 2012 LANSCE Neutron Scattering School participants.

4.9.2 Student Travel Opportunities for Neutron Experiments (STONE) Program

The STONE program, funded by the UC Office of the President, provides financial assistance for UC students' and faculty's travel expenses to conduct experiments at LANSCE, with the objectives of broadening the LANSCE user community, fostering collaboration between UC and LANSCE, increasing access to instruments to students and faculty, and providing training to new student users in neutron scattering techniques.

Funds have been available from 2009–2012 for eligible students and faculty who have been allocated beamtime as part of an approved experimental team. In addition to these travel funds, LANSCE staff members provide students with training on the use of the spectrometers and FPs and assistance in experimental setup and data analysis. This high level of technical support allows professors the flexibility to bring in or send students to conduct experiments without impacting their research budget. Three workshops at UC Berkeley were partially funded by this program and resulted in several new collaborations, with some of them having a high impact for the Lujan Center. Unfortunately, the UC Office of the President did not approve a reapplication in 2012.

4.10 Meetings and Workshops

The Lujan Center organizes scientific meetings and workshops, partially listed in Table 4-4, to define frontiers of neutron science and to inform planning for future capability development.

Table 4-4: Meetings and workshops held 2009–2012.

2009	Title	Location
March 3, 2009	Future of HIPPO and SMARTS Workshop	Los Alamos, NM
March 3-6, 2009	LANSCE/CINT Users Conference	Santa Fe, NM
March 13, 2009	Protein Crystallography Program Advisory Meeting	Los Alamos, NM
May 3, 2009	"HIPD Instrument Advisory Team Meeting" 2009 International Conference on Neutron Scattering	Knoxville, TN
May 3, 2009	"Workshop on a New Time-of-flight Low-Q Instrument at the Lujan Center" 2009 International Conference on Neutron Scattering	Knoxville, TN
July 7-17, 2009	2009 LANSCE School on Neutron Scattering: "Phase Transitions"	Los Alamos, NM
October 1, 2009	HIPD Upgrade Breakout Session	Los Alamos, NM
October 25–28, 2009	International Conference on Neutrons in Biology	Santa Fe, NM
August 2–7, 2009	SAGAMORE XVI	Santa Fe, NM
2010	**Title**	**Location**
August 5-13, 2010	2010 LANSCE School on Neutron Scattering: "Structural Materials"	Los Alamos, NM
December 22, 2010	Applications of Neutron Scattering in Materials and Earth Sciences	Berkeley, CA
2011	**Title**	**Location**
May 19–20, 2011	Rosenfest: Honoring Louis Rosen	Los Alamos, NM
July 12-22, 2011	2011 LANSCE School on Neutron Scattering: "Energy	Los Alamos, NM

	and Environment”	
2012	**Title**	**Location**
January 9-10, 2012	New Directions in Total Scattering Research at LANSCE	Los Alamos, NM
January 9-10, 2012	Developing Neutron Radiography at LANSCE	Los Alamos, NM
September 12-21, 2012	2012 LANSCE School on Neutron Scattering: “Soft matter”	Los Alamos, NM
October 16-19, 2012	Advanced Simulation Techniques for Total Scattering Data	Santa Fe, NM
October 17–19, 2012	International Workshop on Scattering Techniques for Structural Materials at UC Berkeley	Berkeley, CA
December 8–9, 2012	Workshop on Texture Analysis from Diffraction Data	Berkeley, CA

5 Impact

LA-UR-13-24525

5 Impact

In the last 4 years, the Lujan Center has supported a vibrant user program and maintained an excellent publication record. This success is in great part due to the dedication of the Lujan Center staff, the strategic decisions taken to consolidate efforts in the most impactful scientific areas, and the funding from other sources to develop neutron scattering science. Since 2009, the Lujan Center has produced a total of 503 peer-reviewed publications, including 53 high-impact and 17 high-profile publications. Such scientific success is a reflection on the Lujan Center staff who, although numbering less than 40, have earned professional recognition with about 108 awards and 146 invited talks.

The Lujan Center has consistently taken an innovative approach to neutron scattering science. It has pioneered advances in numerous areas that have been adopted or emulated by other facilities. Contributions include GSAS, neutron PDF, dynamic PDF, repetition rate multiplication, SESAME, stress-strain frame, and protein crystallography to name a few. The Lujan Center has capitalized on highly specialized staff and invested in the training and mentoring of the next generation of US neutron scatterers.

The future vision for the Lujan Center is predicated on what we have learned from our current success. To increase our impact further, the Lujan Center will need a balance of support staff vs scientific staff and an increase in the number of scientific staff on the beamlines. This strategic staffing plan will (1) provide the best experimental user support, (2) provide the most impactful scientific user support through collaboration with beamline scientists, (3) provide means for further training of new generations of scientists, and (4) fully utilize the Lujan Center's capabilities.

5.1 Publications Summary

Measured by scientific output generated from CY2009–CY2012, the Lujan Center is a highly productive neutron scattering facility. Following BES charge letter guidance, only refereed journal publications will be reported and the following definitions will be used:

- *High-profile journal*: *Nature, Science, Physical Review Letters, Journal of the American Chemical Society,* and the *Proceedings of the National Academy of Sciences*.

- *High-impact journal*: includes all high-profile publications, along with *Advanced Materials, Angewandte Chemie International Edition, Nano Letters, Environmental Science and Technology, Applied Physics Letters,* and *Nature Materials*.

Figure 5.1 and Table 5-1 show the number of total refereed journal articles from research carried out on Lujan Center instruments each year, as well as statistics for several specific categories defined by BES: refereed journal articles with Lujan Center staff as authors or coauthors, high-profile journal articles, and high-impact articles.

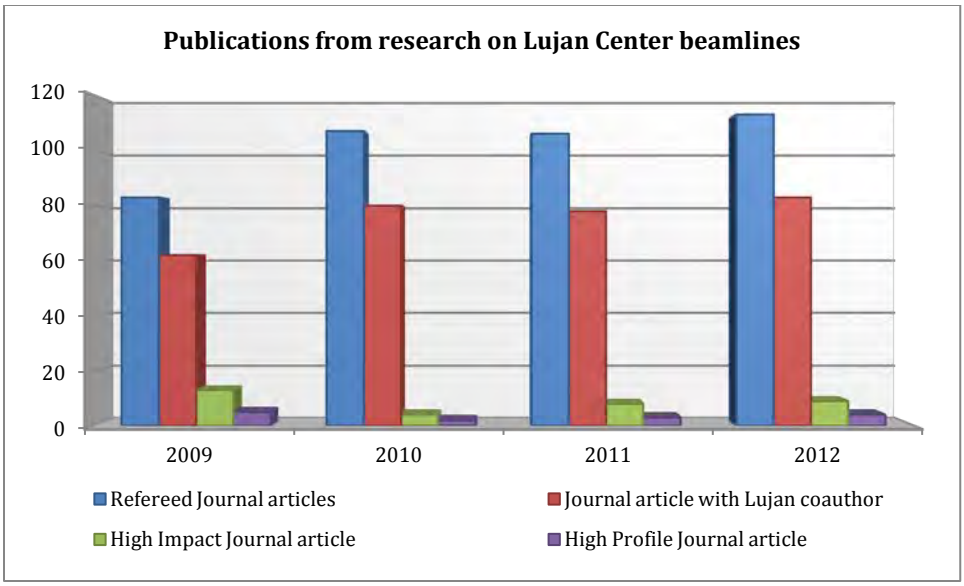


Figure 5.1: Refereed journal articles from research done on Lujan Center beamlines (total, high impact, with Lujan Center co-author and high profile). (2009–2012)

Table 5-1: Refereed journal articles from research performed on Lujan Center beamlines by type. (CY2009–CY2012)

CY	Total, Refereed Journal Articles (LC co-authors)	Number of High-Impact Publications (LC co-authors)	Number of High-Profile Publications (LC co-authors)
2009	83 (62)	13(11)	5 (5)
2010	107 (80)	4 (3)	2 (2)
2011	106 (78)	8 (5)	3 (3)
2012	113 (83)	9 (6)	4 (4)

Figure 5.2 and Table 5-2 display the total number of refereed journal articles by instrument during CY2009–CY2012. If data from two instruments were used, the paper is counted for each instrument. Here, the refereed articles are separated into those with and without Lujan Center staff in the author list.

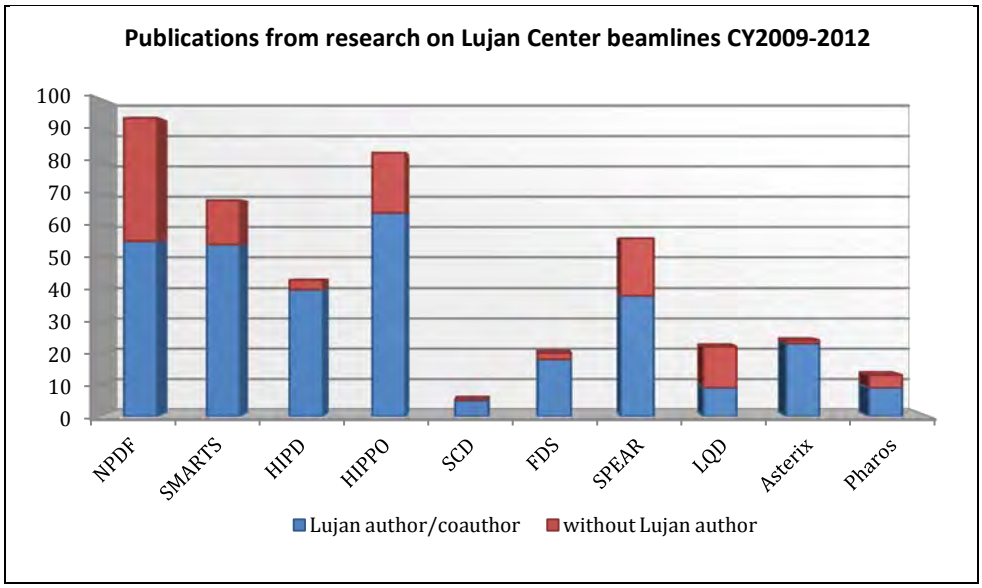


Figure 5.2: Refereed journal articles from research on Lujan Center beamlines with and without Lujan Center scientist co-authorship. (CY2009–CY2012)

Table 5-2: Refereed journal articles from research on Lujan Center beamlines with and without Lujan Center scientist co-authorship. (CY2009–CY2012)

	NPDF	SMARTS	HIPD	HIPPO	SCD	FDS	SPEAR	LQD	Asterix	Pharos
CY2009–CY2012 Refereed Journal Articles (Non LC—Co-author)	39	14	3	19	0	2	18	13	1	4
CY2009–CY2012 Refereed Journal Articles (LC—Co-author)	55	54	40	64	5	18	38	9	23	9

The scientific impact of the Lujan Center is not limited to neutron scattering. The Lujan Center's expert staff leads and contributes also in fields beyond neutron scattering. Figure 5.3 and Table 5-3 show the total refereed publications, high-impact and high-profile publications from Lujan Center beamlines, and also publications with Lujan Center staff from research not involving Lujan Center beamlines ("other").

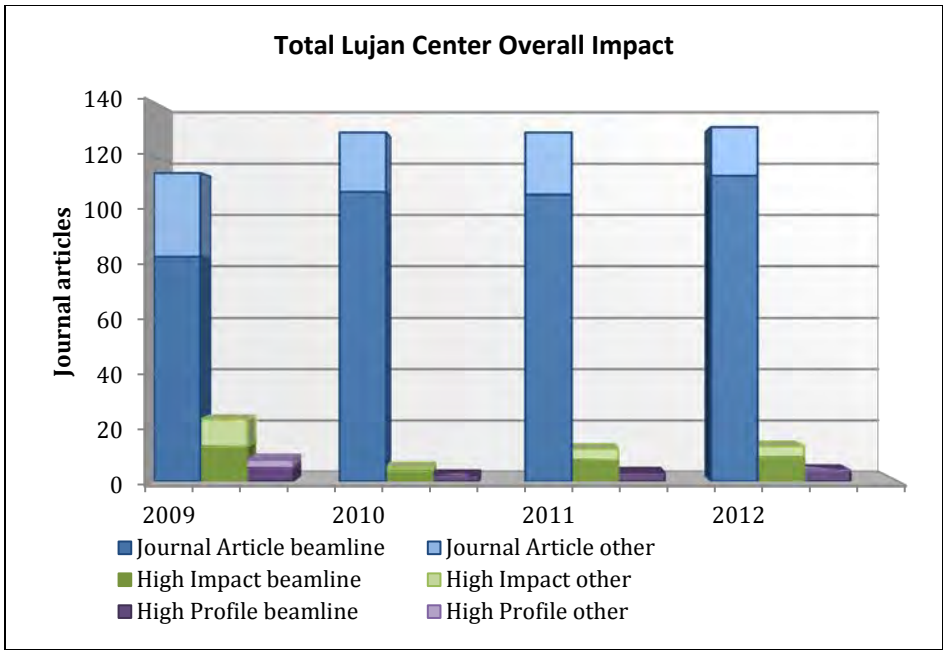


Figure 5.3: Refereed journal articles directly impacted by the Lujan Center either from research on Lujan Center instruments or from research involving Lujan Center staff. (2009–2012)

Table 5-3: Refereed articles from research on Lujan Center beamlines or from research involving Lujan Center staff but not involving Lujan Center beamline data. (2009–2012)

	2009	2010	2011	2012
Refereed Journal Beamlines	83	107	106	113
Refereed Journal Articles Other	31	22	23	18
High Impact Beamline	13	4	8	9
High Impact Other	10	1	4	4
High Profile Beamline	5	2	3	4
High Profile Other	3	0	0	0

5.2 Outstanding Research

Research originating from the Lujan Center appeared in numerous journals with high impact (as measured by the journal impact factors). Overall, the Lujan Center has contributed to 53 published articles between 2009 and 2012 in journals that are considered to be high-impact journals by BES (Table 5-4). Table 5-5 indicates the frequency of publication in different journals.

Table 5-4: Number of Lujan Center publications in high-impact journals (as defined by BES).

Journal Title	Number of Publications	Impact Factor
Nature Materials	1	32.8
Science	1	31.2
Advanced Materials	1	13.9
Angewandte Chemie International Edition	1	13.5
Nano Letters	1	13.2
Journal of the American Chemical Society	14	9.9
Proceedings of the National Academy of Sciences	5	9.7
Physical Review Letters	16	7.4
Environmental Science & Technology	1	5.2
Applied Physics Letters	12	3.8
Total	53	

Table 5-5: Lujan Center publication frequency distribution by journal (impact factors by Research Gate, May 2013). Journals considered high impact by BES are shown in italics.

Journal Title	Number of Publications	Impact Factor
Physical Review B	75	3.7
Acta Materialia	31	3.8
Journal of Applied Physics	22	2.2
Acta Crystallographica Section D: Biological Crystallography	17	12.6
Physical Review Letters	***16***	***7.4***
Materials Science and Engineering: A	15	2.0
Metallurgical and Materials Transactions A	16	1.5
Applied Physics Letters	***14***	***3.8***
Journal of the American Chemical Society	***14***	***9.9***
Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment	14	1.2
Chemistry of Materials	11	7.3
Journal of Applied Crystallography	11	5.2

Inorganic Chemistry	10	4.6
Biophysical Journal	9	3.7
Journal of Solid State Chemistry	9	2.2
Review of Scientific Instruments	9	1.4
Journal of Materials Chemistry	8	5.6
The Journal of Physical Chemistry C	8	4.8
International Journal of Plasticity	8	4.6
Scripta Materialia	8	2.7
Journal of Physics: Condensed Matter	8	2.6
Langmuir	7	4.2
JOM Journal of the Minerals, Metals and Materials Society	7	1.4
Acta Crystallographica Section F: Structural Biology and Crystallization Communications	7	0.5
Soft Matter	6	4.4

To illustrate the impact of Lujan Center publications further, Table 5-6 lists the journals with the 20 highest impact factors in which Lujan Center publications appeared during the review period.

Table 5-6: Number of Lujan Center publications ranked by journal impact factor (impact factor>5.0)

Journal Title	Number of Publications	Impact Factor
Chemical Reviews	1	40.2
Nature Materials	***1***	***32.8***
Science	***1***	***31.2***
Advanced Materials	***1***	***13.9***
Angewandte Chemie International Edition	***1***	***13.5***
Nano Letters	***1***	***13.2***
Acta Crystallographica Section D: Biological Crystallography	17	12.6
Advanced Functional Materials	1	10.2
Journal of the American Chemical Society	***14***	***9.9***
Proceedings of the National Academy of Sciences	***5***	***9.7***
Energy & Environmental Science	***1***	***9.6***
Physical Review Letters	***16***	***7.4***
Chemistry of Materials	11	7.3
International Materials Reviews	1	7.0
Structure	2	6.4
Chemical Communications	3	6.2
Journal of Materials Chemistry	8	6.0
Chemistry-A European Journal	3	5.9
Analytical Chemistry	1	5.9

Biomacromolecules	3	5.5
Carbon	1	5.4
Polymer Chemistry	1	5.3
Macromolecules	5	5.2
Journal of Applied Crystallography	11	5.2

Table 5-7 lists the top 20 publications from research performed on Lujan Center beamlines, with the highest impact based on the BES-SUFD metric.

To reflect the impact of Lujan Center science in a broader sense, Table 5-8, lists the 20 highest-cited publications (independent of impact factor).

Table 5-7: Top 20 high-impact (as defined by BES) publications from research on Lujan Center instruments.

Authors	Title	Journal	Citations	Citations per year
W. Bao, Y. Qiu, Q. Huang, M. A. Green, P. Zajdel, M.R. Fitzsimmons, M Zhernenkov, S. Chang, M. Fang, B. Qian, others	Tunable (dπ, dπ)-type antiferromagnetic order in α-Fe (Te, Se) superconductors	Physical Review Letters, 102, 247001 (2009)	323	81
C. E. Ashley, E. C. Carnes, G. K. Phillips, D. Padilla, P. N. Durfee, P. A. Brown, T. N. Hanna, J. Liu, B. Phillips, M. B Carter, others	The targeted delivery of multicomponent cargos to cancer cells by nanoporous particle-supported lipid bilayers	Nature materials, 10, 389-397 (2011)	143	72
N. Sundaram, Y. Jiang, I. E. Anderson, D. P. Belanger, C. H. Booth, F. Bridges, J. F. Mitchell, T. Proffen, H. Zheng	Local Structure of La1-xSrxCoO3 Determined from EXAFS and Neutron Pair Distribution Function Studies	Physical Review Letters, 102, 026401 (2009)	35	9
E. S. Bozin, C. D. Malliakas, P. Souvatzis, T. Proffen, N. A. Spaldin, M. G. Kanatzidis, S. J. L. Billinge	Entropically stabilized local dipole formation in lead chalcogenides	Science, 330, 1660-1663 (2010)	32	11
H. L. Smith, M. C. Howland, A. W. Szmodis, Q. Li, L. L. Daemen, A. N. Parikh, J. Majewski	Early stages of oxidative stress-induced membrane permeabilization: a neutron reflectometry study	Journal of the American Chemical Society, 131, 3631-3638 (2009)	29	7
M. Blum, M. Mustyakimov, H. Ruterjans, K. Kehe, B. P. Schoenborn, P. Langan, J. C-	Rapid determination of hydrogen positions and protonation states of	Proceedings of the National Academy of Sciences, 106,	28	7

H Chen	diisopropyl fluorophosphatase by joint neutron and X-ray diffraction refinement	713-718 (2009)		
E. E. Rodriguez, F. Poineau, A. Llobet, B. J. Kennedy, M. Avdeev, G. J. Thorogood, M. L. Carter, R. Seshadri, D. J. Singh, A. K. Cheetham	High Temperature Magnetic Ordering in the 4d Perovskite SrTcO3	Physical Review Letters, 106, 067201 (2011)	27	14
D. L. Wood III, J. Chlistunoff, J. Majewski, R. L. Borup	Nafion structural phenomena at platinum and carbon interfaces	Journal of the American Chemical Society, 131, 18096-18104 (2009)	25	6
H. L. Smith, M. S. Jablin, A. Vidyasagar, J. Saiz, E. Watkins, R. Toomey, A. J. Hurd, J. Majewski	Model lipid membranes on a tunable polymer cushion	Physical Review Letters, 102, 228102 (2009)	24	6
S. Cheng, A. D. Stoica, X-L Wang, Y. Ren, J. Almer, J. A. Horton, C. T. Liu, B. Clausen, D.W. Brown, P. K. Liaw, others	Deformation crossover: From nano-to mesoscale	Physical Review Letters, 103, 035502 (2009)	24	6
D. P. Shoemaker, J. Li, R. Seshadri	Unraveling Atomic Positions in an Oxide Spinel with Two Jahn- Teller Ions: Local Structure Investigation of CuMn2O4	Journal of the American Chemical Society, 131, 11450-11457 (2009)	17	4
M. K. Ratajczak, E. Y. Chi, S. L. Frey, K. D. Cao, L. M. Luther, K. Y. C. Lee, J. Majewski, K. Kjaer	Ordered nanoclusters in lipid-cholesterol membranes	Physical Review Letters, 103, 028103 (2009)	17	4
S. Qiu, V. B. Krishnan, S. A. Padula, R. D. Noebe, D. W. Brown, B. Clausen, R. Vaidyanathan	Measurement of the lattice plane strain and phase fraction evolution during heating and cooling in shape memory NiTi	Applied Physics Letters, 95, 141906-141906 (2009)	13	3
N. W. Ockwig, J. A. Greathouse, J. S. Durkin, R. T. Cygan, L. L. Daemen, T. M. Nenoff	Nanoconfined water in magnesium-rich 2: 1 phyllosilicates	Journal of the American Chemical Society, 131, 8155-8162 (2009)	13	3
D. Ma, A. D. Stoica, X-L Wang, Z. P. Lu, B. Clausen, D. W. Brown	Elastic moduli inheritance and the weakest link in bulk metallic glasses	Physical Review Letters, 108, 085501 (2012)	11	11
A. Y. Kovalevsky, B. L. Hanson, S. A. Mason, T. Yoshida, S. Z. Fisher, M. Mustyakimov, V. T. Forsyth,	Identification of the elusive hydronium ion exchanging roles with a proton in an enzyme at lower pH values	Angewandte Chemie International Edition, 50, 7520-	9	5

M. P. Blakeley, D. A. Keen, P. Langan		7523 (2011)		
J-C. Dai, S. Gupta, O. Gourdon, H-J. Kim, J. D. Corbett	BaHg2Tl2. An Unusual Polar Intermetallic Phase with Strong Differentiation between the Neighboring Elements Mercury and Thallium	Journal of the American Chemical Society, 131, 8677-8682 (2009)	9	2
M. R. Fitzsimmons, N. W. Hengartner, S. Singh, M. Zhernenkov, F. Y. Bruno, J. Santamaria, A. Brinkman, M. Huijben, H. J. A. Molegraaf, J. de La Venta, others	Upper Limit to Magnetism in LaAlO_ /SrTiO_ 3 Heterostructures	Physical Review Letters, 107, 217201 (2011)	9	5
V. G. Pol, S. V. Pol, A. Gedanken	Dry Autoclaving for the Nanofabrication of Sulfides, Selenides, Borides, Phosphides, Nitrides, Carbides, and Oxides	Advanced Materials, 23, 1179-1190 (2011)	8	4
S. Amini, J. M. Cordoba Gallego, L. L. Daemen, A. R. McGhie, C. Ni, L. Hultman, M. Oden, M. W. Barsoum	On the Stability of Mg Nanograins to Coarsening after Repeated Melting	Nano letters, 9, 3082-3086 (2009)	5	1

Table 5-8: Top 20 Highest-Cited Lujan Center Publications

Authors	Title	Journal	Instrument	Citations
W. Bao, Y. Qiu, Q. Huang, M. A. Green, P. Zajdel, M. R. Fitzsimmons, M. Zhernenkov, S. Chang, M. Fang, B. Qian, others	Tunable (dπ, dπ)-type antiferromagnetic order in α-Fe (Te, Se) superconductors	Physical review letters, 102, 247001 (2009)	ASTERIX	323
C. E. Ashley, E. C. Carnes, G. K. Phillips, D. Padilla, P. N. Durfee, P. A. Brown, T. N. Hanna, J. Liu, B. Phillips, M. B Carter, others	The targeted delivery of multicomponent cargos to cancer cells by nanoporous particle-supported lipid bilayers	Nature materials, 10, 389-397 (2011)	LQD SPEAR	143
T. Hugle, M. F. Kuhnel, D. Lentz	Hydrazine borane: a promising hydrogen storage material	Journal of the American Chemical Society, 131, 7444-7446 (2009)	Lujan Center Support Labs	58
H. Kim, A. Karkamkar, T.	Determination of	Journal of the	Total	42

Autrey, P. Chupas, T. Proffen	structure and phase transition of light element nanocomposites in mesoporous silica: case study of NH3BH3 in MCM-41	American Chemical Society, 131, 13749-13755 (2009)	Scattering	
M. E. Manley, A. J. Sievers, J. W. Lynn, S. A. Kiselev, N. I. Agladze, Y. Chen, A. Llobet, A. Alatas	Intrinsic localized modes observed in the high-temperature vibrational spectrum of NaI	Physical Review B, 79, 134304 (2009)	PHAROS	42
J. He, Z. Niu, R. Tangirala, J-Y. Wang, X. Wei, G. Kaur, Q. Wang, G. Jutz, A. Boker, B. Lee, others	Self-assembly of tobacco mosaic virus at oil/water interfaces	Langmuir, 25, 4979-4987 (2009)	LQD	39
M. E. Nixon, O. Cazacu, R. A. Lebensohn	Anisotropic response of high-purity ∃alpha ∃-titanium: Experimental characterization and constitutive modeling	International Journal of Plasticity, 26, 516-532 (2010)	HIPPO	39
N. Sundaram, Y. Jiang, I. E. Anderson, D. P. Belanger, C. H. Booth, F. Bridges, J. F. Mitchell, T. Proffen, H. Zheng	Local Structure of La1-xSrxCoO3 Determined from EXAFS and Neutron Pair Distribution Function Studies	Physical review letters, 102, 026401 (2009)	NPDF	35
A. Y. Kovalevsky, L. Hanson, S. Z. Fisher, M. Mustyakimov, S. A. Mason, V. T. Forsyth, M. P. Blakeley, D. A. Keen, T. Wagner, H. L. Carrell, others	Metal ion roles and the movement of hydrogen during reaction catalyzed by D-xylose isomerase: A joint X-ray and neutron diffraction study	Structure, 18, 688-699 (2010)	PCS	34
C. C. Aydiner, J. V. Bernier, B. Clausen, U. Lienert, C. N. Tome, D. W. Brown	Evolution of stress in individual grains and twins in a magnesium alloy aggregate	Physical Review B, 80, 024113 (2009)	BES Core	32
D. Louca, K. Horigane, A. Llobet, R. Arita, S. Ji, N. Katayama, S. Konbu, K. Nakamura, T-Y. Koo, P. Tong, others	Local atomic structure of superconducting FeSe_ 1- x Te_ x	Physical Review B, 81, 134524 (2010)	HIPD	32
E. S. Bozin, C. D. Malliakas, P. Souvatzis, T. Proffen, N. A. Spaldin, M. G. Kanatzidis, S. J. L. Billinge	Entropically stabilized local dipole formation in lead chalcogenides	Science, 330, 1660-1663 (2010)	NPDF	32
C. Jiang, Z. Lin, J. Zhang, Y. Zhao	First-principles prediction of mechanical	Applied Physics Letters,	High pressure	31

	properties of gamma-boron	94, 191906-191906 (2009)		
J. C. Palmer, A. Llobet, S-H Yeon, J. E. Fischer, Y. Shi, Y. Gogotsi, K. E. Gubbins	Modeling the structural evolution of carbide-derived carbons using quenched molecular dynamics	Carbon, 48, 1116-1123 (2010)	HIPD	31
I. Levin, V. Krayzman, J. C. Woicik, J. Karapetrova, T. Proffen, M. G. Tucker, I. M Reaney	Structural changes underlying the diffuse dielectric response in AgNbO3	Physical Review B, 79, 104113 (2009)	NPDF	30
N. J. Hess, G. K. Schenter, M. R. Hartman, L. L. Daemen, T. Proffen, S. M. Kathmann, C. J. Mundy, M. Hartl, D. J. Heldebrant, A. C. Stowe, others	Neutron Powder Diffraction and Molecular Simulation Study of the Structural Evolution of Ammonia Borane from 15 to 340 K	The Journal of Physical Chemistry A, 113, 5723-5735 (2009)	NPDF	29
H. L. Smith, M. C. Howland, A. W. Szmodis, Q. Li, L. L. Daemen, A. N. Parikh, J. Majewski	Early stages of oxidative stress-induced membrane permeabilization: a neutron reflectometry study	Journal of the American Chemical Society, 131, 3631-3638 (2009)	SPEAR	29
M-M. Blum, M. Mustyakimov, H. Ruterjans, K. Kehe, B. P. Schoenborn, P. Langan, J.C-H. Chen	Rapid determination of hydrogen positions and protonation states of diisopropyl fluorophosphatase by joint neutron and X-ray diffraction refinement	Proceedings of the National Academy of Sciences, 106, 713-718 (2009)	PCS	28
E. E Rodriguez, F. Poineau, A. Llobet, B. J. Kennedy, M. Avdeev, G. J. Thorogood, M. L. Carter, R. Seshadri, D. J. Singh, A. K. Cheetham	High Temperature Magnetic Ordering in the 4d Perovskite SrTcO3	Physical Review Letters, 106, 067201 (2011)	NPDF HIPD	27
C. J. Neil, J. A. Wollmershauser, B. Clausen, C. N. Tome, S. R. Agnew	Modeling lattice strain evolution at finite strains and experimental verification for copper and stainless steel using in situ neutron diffraction	International Journal of Plasticity, 26, 1772-1791 (2010)	SMARTS HIPPO	26

The Lujan Center has also engaged in research that:

1. broke new grounds of scientific research,
2. was selected for journal covers,
3. provided new evidence to long-standing problems, or
4. was "first-of-its-kind." Publications that illustrate these areas are listed Table 5-9.

Table 5-9: Other noteworthy Lujan Center publications.

Instrument	First Author	Citation	Title	Statement
Asterix	S. Singh	Phys. Rev. Lett. 108, 077207 (2012)	Thermal hysteresis and non-uniform magnetism of (La0.4Pr0.6)0.67Ca0.33 MnO3 thin films	Discovery of non-uniform magnetization profile in supposedly chemically uniform complex oxide film, emphasized the need for spatially selective probes of magnetism.
Asterix	M. Zhernenkov	Phys. Rev. B 82, 024420 (2010)	Electric field modification of magnetism in thin CoPd films	Discovered that the magnetization of the surface layer of a magnetic film could be enhanced when the film was in an electric field.
FDS	H-J. Lunk	Inorganic Chemistry 49 (2010) 9400	Hexagonal 'molybdenum trioxide' – known for 100 years and still a fount of new discoveries	Helped industry to solve a 40-year-old question. The filter difference spectrometer distinguished NH4+ from NH3 when nuclear magnetic resonance (NMR) failed to do so.
FDS	S. Stishov	Physical Review Letters, 105, 236403 (2010)	Lost Heat Capacity and Entropy in the Helical Magnet MnSi	FDS provided a vibrational spectrum averaged over the entire Brillouin zone (which optical spectroscopy cannot do). This is essential to calculate thermodynamic properties such as the phonon contribution to the specific heat. The FDS result benchmarked a DFT calculation.
HIPPO	M.E. Nixon	International Journal of Plasticity 26.4 (2010): 516-532	Deformation study, mechanical engineering	Underlined the relevance of bulk texture to deformation modeling—neither conventional nor synchrotron X-Ray data can provide comparable data
HIPPO	P. J. M. Monteiro	Cement and Concrete Composites, 31 2009, 577–584	Influence of texture of constituents of concrete on durability	One of the first texture investigations on concrete, a previously underappreciated micro-structural quantity for this complex class of materials. The number of citations from this specialized community within a few years illustrates the relevance.

HIPPO/High-pressure	J. Frantti	The Journal of Physical Chemistry B 113, no. 23 (2009): 7967-7972	The factors behind the morphotropic phase boundary in piezoelectric perovskites	Example of a high-Z/low-Z system for which neutrons provide unique high-pressure data to optimize future lead-free piezo-electrics.
LQD	H.Zhang	J. Am. Chem. Soc. 2012, 134, 15790−15804	Processing Pathway Dependence of Amorphous Silica Nanoparticle Toxicity: Colloidal vs Pyrolytic	University of California, Los Angeles (UCLA), University of New Mexico (UNM), Sandia Team used LQD to characterize the structure-chemical-properties relationships in silica particles with medical applications, in particular with an understanding of the toxicity of particles produced by different synthetic routes.
LQD	M.S. Kent	Biomacromolecules 2010, 11, 357-368	A Study of Enzymatic Digestion of Cellulose by Small Angle Neutron Scattering	Used LQD to identify for the first time the role of mixing in enhancing the digestion process of cellulose by fungal enzymes in biofuels processing.
Lujan Center support labs	T. Hüegle	J. Am. Chem. Soc. 2009, 131, 7444−7446	Hydrazine borane: a promising hydrogen storage material	Benefited from the Lujan Center support labs and resulted in invited paper on hydrogen storage.
PCS	S. Fisher	J. Am. Chem. Soc., (2012) 134, 14726-14729	Neutron Diffraction of Acetazolamide-Bound Human Carbonic Anhydrase II Reveals Atomic Details of Drug Binding	Showed how carbonic anhydrase (HCA), an enzyme found in all forms of life, binds acetazolamide (AZM), a clinically used carbonic anhydrase inhibitor drug for the treatment of a range of disorders, ranging from glaucoma to epilepsy to altitude sickness. The experiments demonstrate data on drug ionization and binding that will assist in structure-based drug design.
Pharos	M. Manley	Physicsal Review B, 79, 134304 (2009)	Intrinsic localized modes observed in the high-temperature vibrational spectrum of NaI	Inelastic neutron measurements of the high-temperature lattice excitations in NaI show that in thermal equilibrium at 555 K, an intrinsic mode, localized in three dimensions, occurs at a single frequency near the center of the spectral phonon gap, polarized along [111].
SMARTS	S. Cheng	Phys. Rev. Lett., vol. 103(3), 035502, 2009	Deformation Crossover: From Nano- to Mesoscale	In-situ measurements on SMARTS (and at APS) on nickel with grain sizes from nano- to micrometer size are used to show the size-dependent deformation behavior.

SMARTS	P. Gibbs	Metall. Mater. Trans. A, vol. 42(12), pp. 3691-3702, 2011	Austenite Stability Effects on Tensile Behavior of Manganese-Enriched-Austenite Transformation-Induced Plasticity Steel	Awarded an American Iron and Steel Institute (AISI) 2013 Finalist Medal (awarded for papers having special merit and importance in connection with the activities and interests of the iron and steel industry). The SMARTS measurements determined the phase fraction development during deformation of advanced high-strength steels that experience transformation-induced plasticity. The data are essential for new automotive designs optimized for fuel efficiency and safety, and the results were used to validate existing models.
SMARTS	G. Bruno	J. Mater. Sci., vol. 46(1), pp. 161-173, 2011	Connecting the Macro- and Microstrain Responses in Technical Porous Ceramics: Modeling and Experimental Validations	SMARTS (and ILL) measurements investigated deformation of porous ceramics. The data validated new predictive models for the mechanical behavior of porous ceramics.
SPEAR	H. L. Smith	Biophys. J., vol. 98, March 2010, 793-799.	Mouse fibroblast cell adhesion studied by neutron reflectometry	First neutron reflectometry measurements of living cell adhesion.
SPEAR	E. B. Watkins	Langmuir, Nov. 15th, 2011, Vol.27, iss.22, p.13618-13628	Structure and thermodynamics of lipid bilayers on polyethylene glycol cushions: Fact and fiction of PEG cushioned membranes	Image from this work was used as a cover for the Langmuir journal.
NPDF	C. E. White	Phys. Chem. Chem. Phys., 12(13), 3239-3245 (2010)	Combining density functional theory (DFT) and pair distribution function (PDF) analysis to solve the structure of metastable materials: the case of metakaolin	The local atomic structure structure of heavily disordered materials is characterized by coupling advanced simulation techniques (DFT) with neutron PDF data analysis. This work earned Dr. Claire White the inaugural Outstanding Student Research Prize from the Neutron Scattering Society of America Prize in 2012.
NPDF	K. Page	Journal of Applied Crystallography, 44, 532- 539 (2011)	Treatment of hydrogen background in bulk and nanocrystalline neutron total scattering experiments	A procedure for correcting incoherent inelastic scattering contributions from H in total scattering data has opened the door to probing the internal atomic structure of hydrides, organic molecules, hydrated minerals, and other functional materials when

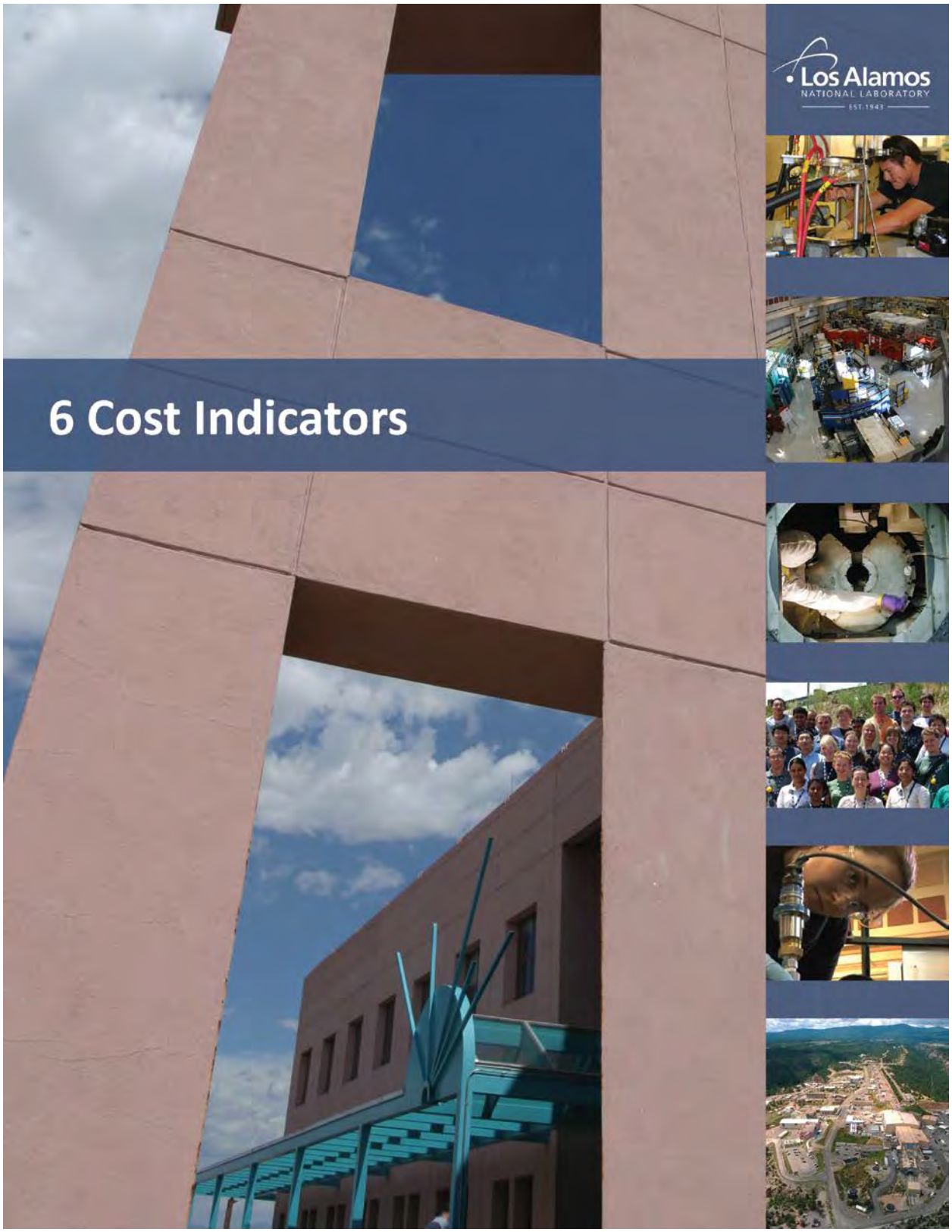
				deuteration is infeasible.
HIPD	D. J. Safarik	Physical Review B, 85, 014103 (2012)	Localized anharmonic rattling of Al atoms in VAl_ 10.1	The research showed that each Al guest rattles in a square-well-like interatomic potential akin to a quantum-mechanical particle-in-a-box. The huge anharmonicity of this vibration facilitates its strong coupling to the acoustic phonons and conduction electrons, which in turn impedes heat and electrical transport. It suggests that the particular shape of the anharmonic potential is important in determining the effect of rattling on the material's physical properties.

5.3 Invited Lectures and Major Awards for Facility Staff and Outside Users

The Lujan Center staff presented over 140 invited lectures during the review period, received over 108 awards and professional recognition, and contributed to 39 theses. The staff has received numerous awards and has served the scientific community as conference organizers, review committee members, and advisory board members for other institutions and in officer positions on national and international scientific organizations—these are reported in the appendix.

5.4 Summary

The Lujan Center continued to increase its scientific productivity in the review period, despite funding constrains and the removal of three instruments from the user program in FY2011. Scientific impact is reflected in the large number of high-impact (53) and high-profile (17) publications, as well as by the number of groundbreaking and impactful publications in fields not covered by the "high impact" designation (e.g., 17 publications in *Acta Crystallographica Section D: Biological Crystallography* since 2009 or 11 publications in *Chemistry of Materials*). The Lujan Center has continued to build a stable, productive, and independent user pool.



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6 Cost Indicators

This chapter reports cost and productivity indicators. In FY2009 the cost to BES per paper was $94k. In 2012 it was $80k. In the same period, the number of papers per beam day increased from 0.73 to 0.94. As discussed below, these metrics compare favorably with peer facilities that include ANSTO, ISIS, NIST, SNS/HIFR, and SINQ. Productivity has been maintained primarily by focusing BES-SUFD funding on labor and postponing instrument recapitalization. In this chapter, facility cost refers solely to funds provided by BES-SUFD. A beamline publication is defined as one that contains primary data collected on a neutron scattering instrument. It may or may not have a Lujan Center staff member on the author list. The total number of facility publications includes all publications with the Lujan Center staff. The number of badged users is the sum of all individuals that were processed by the Lujan Center user office. (PCS users and their publications have been included in the totals.)

6.1 Cost per Publication

Figure 6.1 and Table 6-1 show the total number of refereed journal publications (facility publications) for CY2009–CY2012 and the cost for each publication over this review period. Publications counted in Figure 6.1 and Table 6-1 include all publications by the Lujan Center staff, including those not based on Lujan Center experimental data (e.g., theoretical work and data analysis) and all publications based on primary data from Lujan Center instruments.[14]

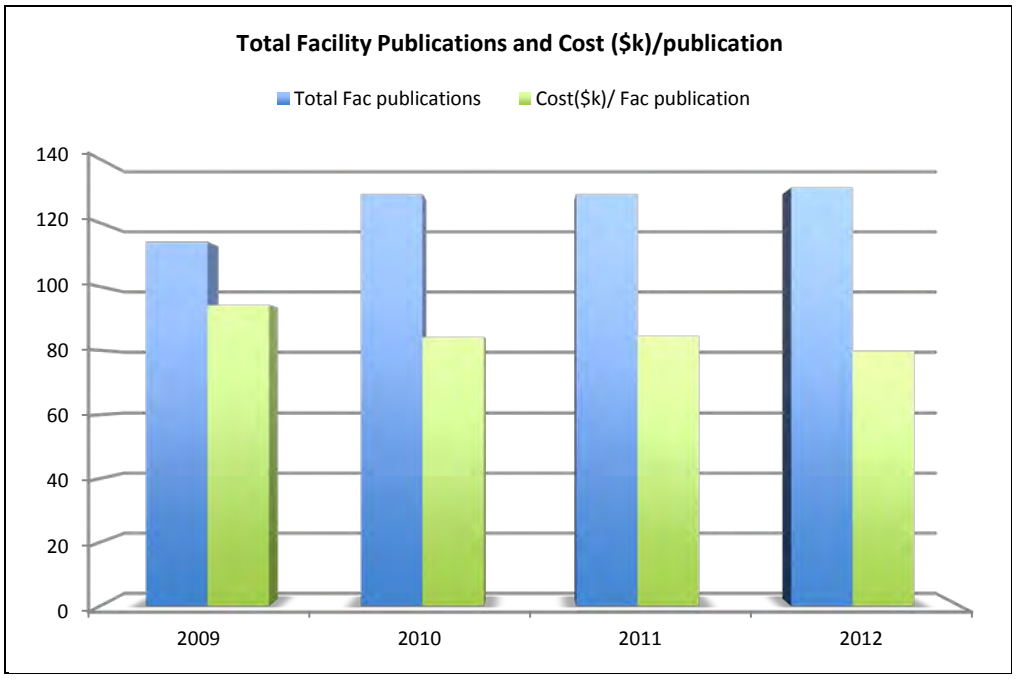
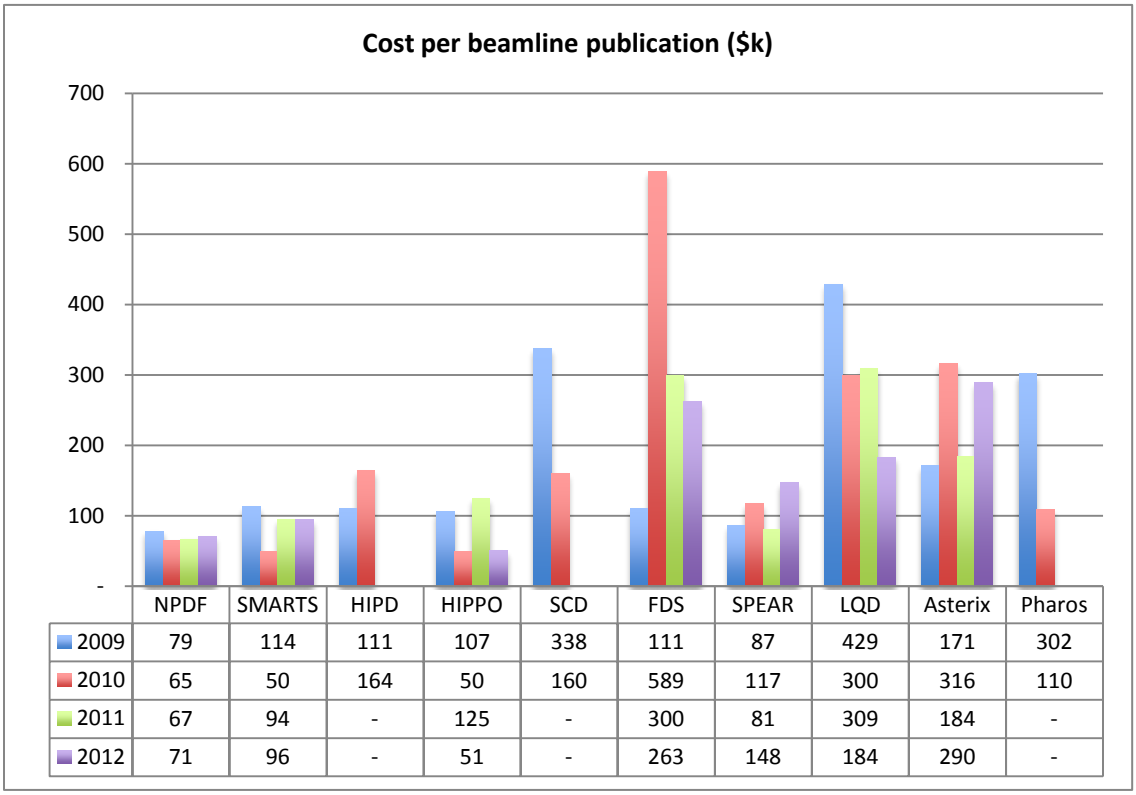


Figure 6.1: Cost per refereed journal publication per year.

[14] Lujan Center publications are reported by CY.

Table 6-1: Cost per refereed journal publication per year.

	FY2009	FY2010	FY2011	FY2012
Cost of Facility Operations [k$]	10,737	10,850	10,900	10,451
Publications	114	129	129	131
Cost per Paper [k$]	94	84	84	80



	NPDF	SMARTS	HIPD	HIPPO	SCD	FDS	SPEAR	LQD	Asterix	Pharos
2009	79	114	111	107	338	111	87	429	171	302
2010	65	50	164	50	160	589	117	300	316	110
2011	67	94	-	125	-	300	81	309	184	-
2012	71	96	-	51	-	263	148	184	290	-

Figure 6.2: Cost per refereed journal article (by instrument and year).

Figure 6.2 shows the cost per refereed article for the different instruments. The total publication cost reflects staff costs and consumables associated with each instrument, plus the distributed facility support cost, including but not limited to sample environment, safety, and radiation protection.

Figure 6.2 shows that the cost per paper for the diffraction instruments (NPDF, SMARTS, and HIPPO) is fairly constant and less than $100k per refereed publication on average. During the 2009 BES triennial review, the LQD cost per paper was found to be exceptionally high because, during the previous review period, LQD was extensively used for defense-related programmatic research. Starting in 2009, the science portfolio on the LQD was realigned and LQD was brought in line with other BES instruments. FDS went through an upgrade in FY2010, replacing the

beryllium oxide filters with beryllium filters and thereby doubling its count rate. This upgrade has positively affected productivity in 2011 and 2012.

6.2 Cost per Unique User

Figure 6.3 and Table 6-2 show the cost per unique user and the cost per unique user or co-proposer, defined as an "affected researcher."

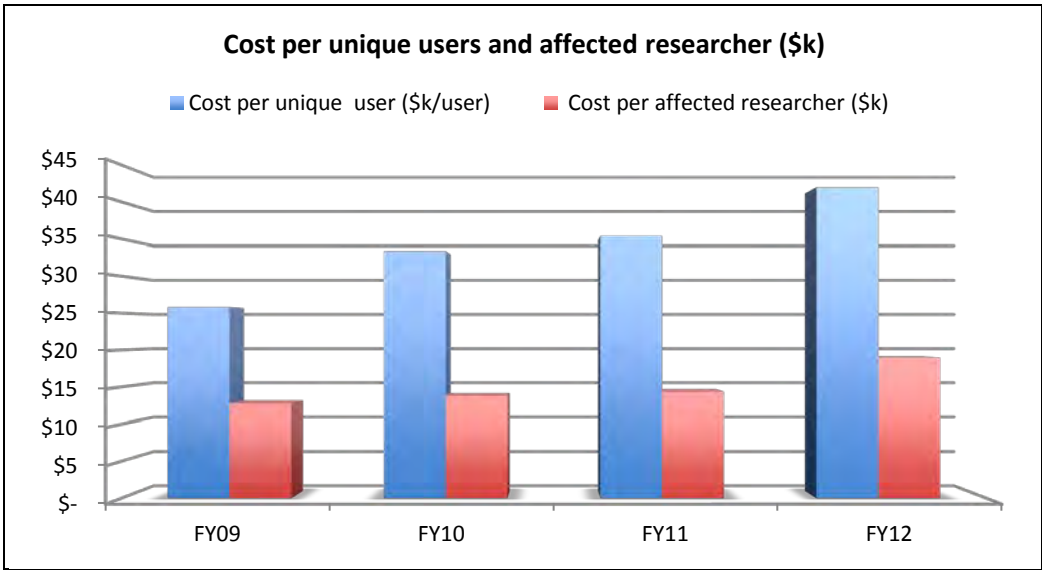


Figure 6.3: Cost per unique user. (FY2009–FY2012)

Table 6-2: Cost per unique and affected user per year. "Affected Researchers" is the number of unique users plus co-proposers not visiting the Lujan Center.

	FY2009	FY2010	FY2011	FY2012
Cost of Facility Operations ($k)	10,737	10,850	10,900	10,451
Unique Users	416	325	308	249
Affected Researchers	841	787	760	551
Cost per Unique User ($k)	26	33	35	42
Cost per Affected Researcher	13	14	14	19

6.3 CY Journal Publications per CY Beam Days

Figure 6.4 and Table 6-3 show the ratio of the number of beamline publications (in a given CY) to beam days delivered in the previous CY.

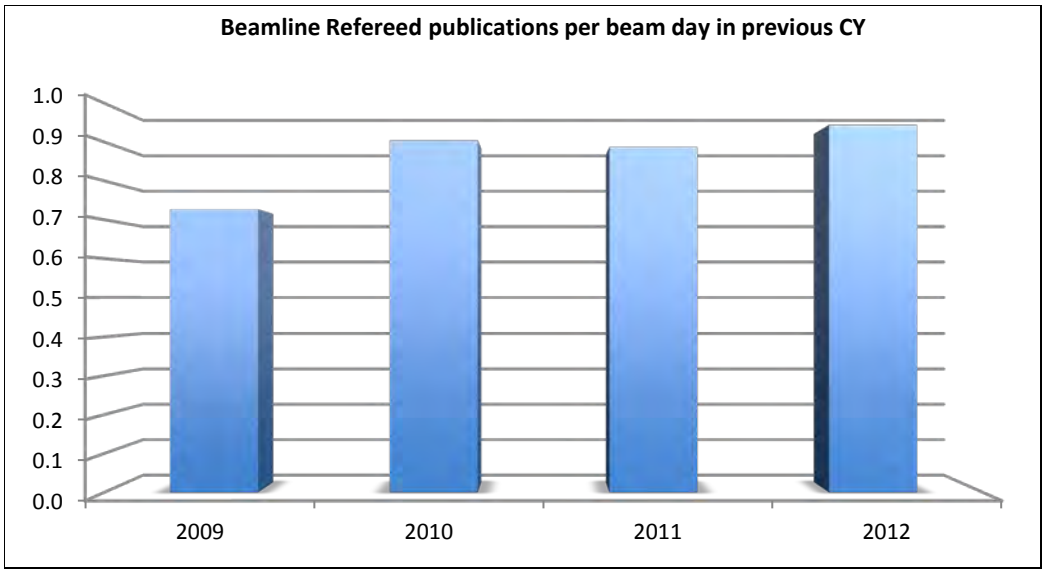


Figure 6.4: Ratio of number of refereed journal beamline articles to delivered beam days (CY2009–CY2012).

Table 6-3: Ratio of number of refereed beamline journal articles to delivered beam days (CY2009–CY2012).

	CY2009	CY2010	CY2011	CY2012
Publications	83	107	106	113
Number of Beam Days in Previous Year	114	118	120	120
Papers / Beam Day	0.73	0.90	0.89	0.94

6.4 Number of Publications per Instrument Beam Day

To compare the productivity between facilities with different number of instruments and beam availability, Figure 6.5 and Table 6-4 show the number of papers (*p*), per CY, normalized by the number of instrument-beam-days (*nd*) defined as the product of the number of available instruments (*n*) and the number of beam days (*d*). The numbers for other facilities were retrieved from the annual reports.[15] This productivity indicator does not explicitly acknowledge the distribution of elastic and inelastic instruments. Nevertheless, for the facilities listed by this measure, the Lujan Center is highly productive.

[15] ILL: http://www.ill.eu/quick-links/publications/annual-report/
NIST: http://www.ncnr.nist.gov/AnnualReport/
ANSTO: http://www.ansto.gov.au/Resources/Publications/index.htm
ISIS: http://www.isis.stfc.ac.uk/about-isis/aboutisis.html
SNS: BES report 2012
SINQ: http://www.psi.ch/info/scientific-reports

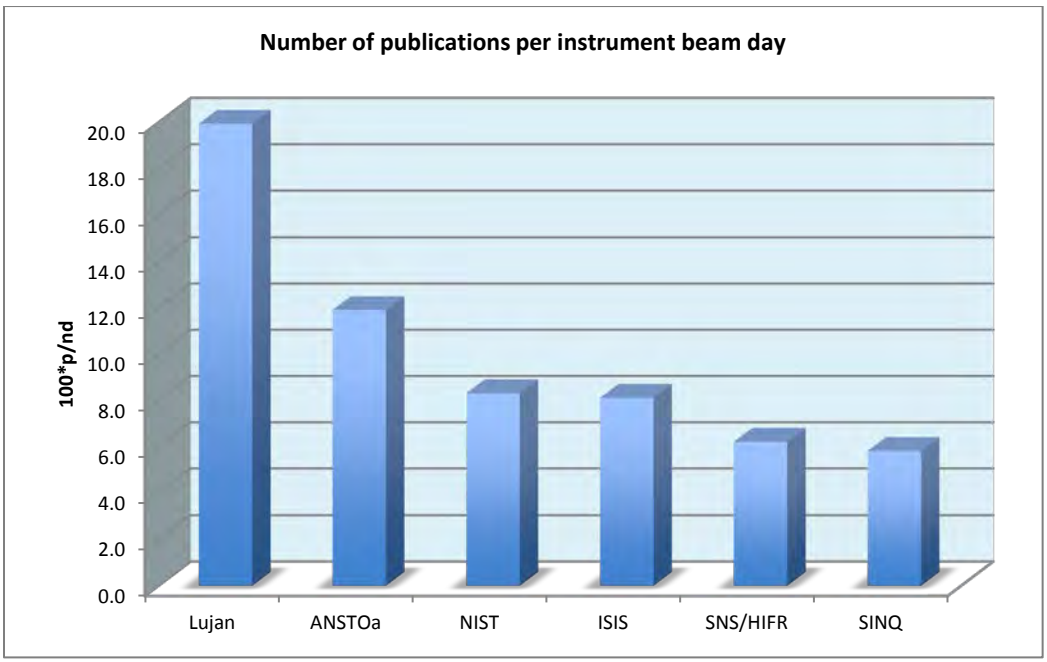


Figure 6.5: Productivity index defined as 100*p/(n*d) [p: number of publications, n: number of instruments, d: number of delivered beam days] (averaged 2009–2012).

Table 6-4: Productivity indicators for neutron facilities worldwide.

2009	ILL	NIST	ANSTO[a]	ISIS total	SNS/HIFR[b]	SINQ [b,c]	Lujan[d]
n Instruments	45	25	7	41			9.5
d Days of Beam	200	242	256	126			118
n*d	9000	6050	1792	5166	984	2019	1124
p Publications	635	394	201	403	72	114	114
100*p/nd	7.1	6.5	11.2	7.8	7.3	5.6	10.1
2010	**ILL**	**NIST**	**ANSTO[a]**	**ISIS total**	**SNS/HIFR[b]**	**SINQ [b,c]**	**Lujan[d]**
n Instruments	43	25	7	41			9.5
d Days of Beam	119	267	265	97			120
n*d	5117	6675	1855	3977	1813	2000	1135
p Publications	652	361	191	345	104	119	129
100*p/nd	12.7	5.4	10.3	8.7	5.7	6.0	11.4

2011	ILL	NIST	ANSTO[a]	ISIS total	SNS/HIFR[b]	SINQ [b,c]	Lujan[e]
n Instruments	41	21	7	41			8
d Days of Beam	196	142	294	125			120
n*d	8036	2982	2058	5125	3130	1936	957
p Publications	611	370	293	402	175	113	129
100*p/nd	7.6	12.4	14.2	7.8	5.6	5.8	13.5
2012	**ILL**	**NIST**	**ANSTO[a]**	**ISIS**	**SNS/HIFR**	**SINQ**	**Lujan[e]**
n Instruments	42	28	N/A	N/A	N/A	N/A	8
d Days of Beam	148	142	N/A	N/A	N/A	N/A	37
n*d	6216	3976					293
p Publications	552	350	N/A	N/A	N/A	N/A	131
100*p/nd	8.9	8.8					44.8
	ILL	**NIST**	**ANSTO[a]**	**ISIS**	**SNS/HIFR**	**SINQ**	**Lujan**
Average 2009-2012	**9.1**	**8.3**	**11.9**	**8.1**	**6.2**	**5.8**	**19.9**

[a] Number of publications includes OPAL nuclear reactor as well as ANTARES and STAR accelerators
[b] only provided n*d
[c] Publications include only "Laboratory for Neutron Scattering" (LNS)
[d] Lujan Center 2009/2010: 7 instruments fully funded, 3 instruments 50% funded, PCS (BER)
[e] Lujan Center 2011/2012: 7 instruments fully funded

6.5 Summary

The Lujan Center is productive and cost effective. Based on the productivity indicator, which is the number of published papers per instrument beam days, the Lujan Center compares favorably with: ANSTO, ILL, NIST, SINQ, ISIS, and SNS/HIFR.

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7 The Future

7 The Future

7.1 Preamble

Between 2009 and 2012, the Lujan Center hosted 25% of the BES-SUFD neutron users and produced approximately 50% of the BES-SUFD reported neutron scattering publications (including 53 high impact and 17 high profile),[16] doing so on approximately 4% of the BES-SUFD neutron scattering budget. These numbers emphasize both scientific productivity and a highly leveraged financial contribution provided by the NNSA. The Lujan mission focuses on producing unique, societally relevant, and cost-effective science based on insights that are possible with neutrons. Our goal is for the full utilization of instruments currently in the user program and added capability in response to user demand, consistent with the National Academy's call for "full utilization of available neutron sources."[17]

7.2 Uniqueness Proposition

The Lujan Center's uniqueness derives from the characteristics of its spallation source, its instruments optimized for this source, its staff, collocation with complementary research facilities at LANSCE and LANL, and more than 3 decades of experience with neutron scattering. The Lujan Center has an instrument suite that is optimized for 20 Hz operation, as well as an experienced and dedicated staff. The user base has a solid foundation of mature users. A wide range of sample environments exists, providing capabilities and attracting users from every continent. There are synergies between the Lujan Center and other user facilities at LANL, such as NHMFL and CINT. Recent user activity in energy-dispersive neutron radiography and proton radiography has exploited the combined characterization abilities of neutrons and protons. Three flight paths are available for immediate development (one on room temperature and two on liquid hydrogen moderators). Two of these flight paths include shutters, shielding, and interlock systems; thus, the development cost to implement new capability is substantially reduced compared with the development of a new beam line.

7.3 Trends

Throughout this review period, the Lujan Center has delivered leading neutron science. Building on the NNSA-funded beam delivery, the user program has benefitted from a beam reliability increased to 89.9%, showing the first return of investment from the NNSA commitment to refurbish the LANSCE accelerator. The number of user proposals submitted to the Lujan Center has increased every year since FY2009 (Figure 7.1). This trend continues, and subscription factors of 2 to 4 exist for all the BES-SUFD funded instruments for the upcoming 2013 run cycle.

[16] CY2009–CY2011, SNS/HFIR reported 351 publications, and the Lujan Center produced 405 publications. SNS/HFIR did not report publications for CY2012.

[17] "Condensed-Matter and Materials Physics: The Science of the World Around Us," National Research Council, 2010.

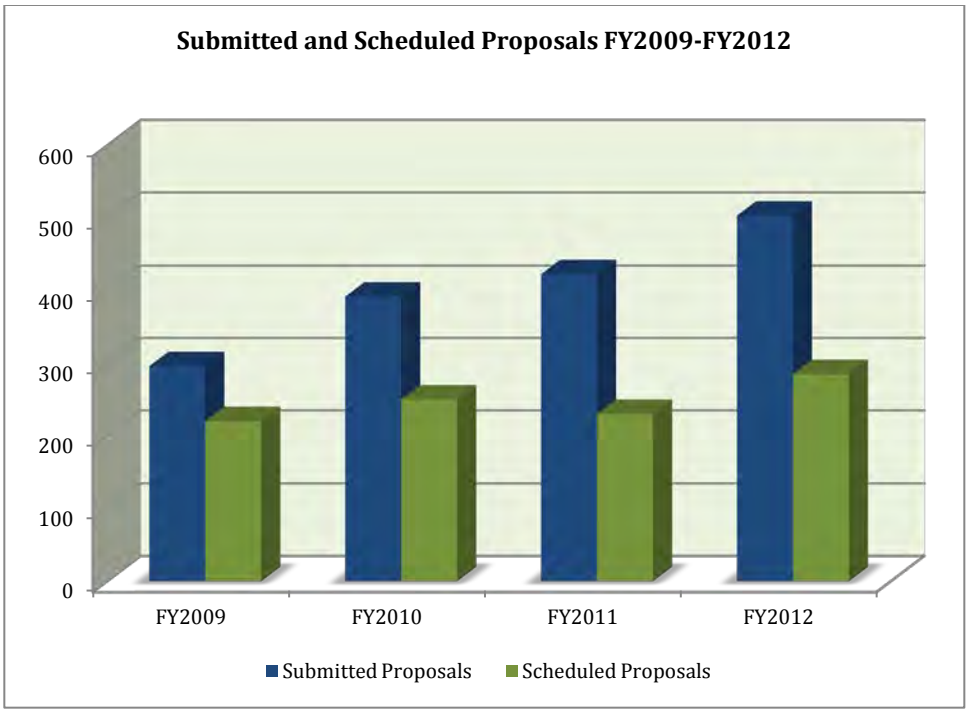

Figure 7.1: Lujan proposal submissions and scheduled proposals. (FY2009–FY2012)

The development of the European Spallation Source and recent BES Advisory Committee (BESAC) subcommittee prioritization of a second target station at SNS (projected for operation in the 2020s) both point to growth and enthusiasm in the global neutron science community. The Lujan Center is committed to supporting, stimulating, and enabling this growth. Investment in the Lujan Center, vetted by the external user community, offers enhanced capability and capacity, as well as the potential to pursue high-risk and high-impact science.

7.4 Strategy

Ongoing investment by the NNSA ensures reliable accelerator operations for the next decade. In 2019, 4000 hours of Lujan operation per year will be available. In this context, the Lujan strategy will, contingent on funding, focus on three opportunities. First, the Lujan Center will maintain and enhance its scientific portfolio for timely response to emerging scientific opportunities by augmenting staff. Second, an investment in existing instruments will enhance capabilities. Third, new instruments and target technologies will be developed that leverage the 20 Hz repetition rate and competiveness of the cold neutron moderators, anticipating by a decade the performance of the SNS's second target station. At the time of this writing, an MOU between the Lujan Center and ORNL is in process to establish and support mutual areas of interest and support.

The unique scattering characteristics of neutrons mean that a set of material science remains completely reliant on neutron scattering for insight. With this in mind, the choice of facility investment is a subtle convolution of instrument capability, staff experience, and national

context. Three areas of strategic focus present themselves for the Lujan Center in the next few years: total scattering measurements for local structure determination, long length-scale science (optimally enabled by 20 Hz cold moderators), and extreme environments stimulated by LANL's intrinsic programmatic predisposition to this subject, as discussed below.

Local Structure and Dynamics

- Scattering probes for static and dynamic local structure determination currently enjoy strong user interest as a result of their success in explaining structural effects in multifunctional materials and nano and amorphous systems, which exhibit disorder on a local scale. The Lujan Center capabilities in total scattering are well placed to serve this community because of the availability of NPDF and HIPD instruments. Staff expertise and user support for analysis and modeling of PDF studies are renowned. The high-resolution and high-Q total scattering instrument NPDF is operated within the BES-SUFD user program. The complementary HIPD instrument is used by collaborators for parametric studies of nuclear, magnetic, and local structures because of its large d-spacing range and high-incident flux. Modeling capabilities span conventional (small-box) modeling methods and advanced Reverse Monte Carlo simulations, as well as novel, complex (multi-level) refinement for finite nanostructures and *ab initio* or force-field-coupled modeling approaches for disordered materials.

- In addition to returning HIPD to the user program, another opportunity that has been enthusiastically supported by the user community is to reinstate Pharos into the user program. This action would offer a program for elastic and dynamic vs conventional energy-integrated PDF. Local atomic structure probes coupled with energy scales will improve our understanding of the nature of resonating valence bonds, valence bond solids, electron-spin-phonon coupling in cuprate and iron pnictide high-T_c superconductors, metal-metal bonding, and dynamic and static effects in topologically frustrated systems. Multilevel minimization schemes for nano to mesoscale structure determination and coupling of advanced atomic simulation techniques to local structure data refinement may be expected from this initiative. Instrumentation upgrades, new sample environments, and added analysis software capabilities were discussed at the 2012 (LANSCE) User Group Meeting. Investment options would include expansion of the NPDF low-angle detector coverage and fully populating existing banks to both improve efficiency and allow the study of a larger array of magnetic structures and large unit cell systems.

Mesoscale Science, Long-Length Scales

- The 20 Hz frequency of the Lujan Center source offers a competitive integrated fluence of long-wavelength neutrons. Consequently, a natural choice for investment will be instruments that require broad bandwidth on cold moderators. SPEAR, as well as LQD and the Asterix spectrometer, all view liquid hydrogen (lH_2) moderators. We propose to support areas of development that include pulsed-probe techniques in soft matter, magnetism, and mechanical-electrical response; spin-echo encoding techniques of ultra-long-length scales, and very-low-energy transfers. One possibility is to combine short-

range local structure data (from NPDF) with insights from LQD to address hierarchical interactions from atomistic to microstructural length scales. Thus, investments in cold neutron instrumentation will improve Lujan Center capabilities in addressing mesoscale science.[5]

- A recent investment of $800k (from BES-DMSE) supported science on the Asterix instrument. Simultaneous improvement in the quality of polarized neutron reflectivity measurements decreased the time needed to change between modes of operation and enabled measurement of mesoscale structure of bulk samples and surfaces over length scales that span 20 nm to 2 µm. Investment of similar scale on SPEAR and LQD could offer similar returns. Thus, we propose a staged investment to enhance the cold, long-wavelength capabilities of the Lujan Center. Improvements would include implementation of pulsed probe experiments, including multi-input, single-event data acquisition; full realization of spin echo encoding technology; new detectors with higher count rate capability; and the acquisition of new 2D detectors. R&D on pulsed probe experiments and in spin-echo-encoding techniques will enable access to long-time relaxation and large-length scale domains to connect with mesoscale structure and properties.

Extreme Environments

- The penetration ability of neutrons offers characterization in environments far from ambient and even far from equilibrium. Opportunities abound for studies of synthesis (e.g., in situ high-temperature/high-pressure reactions), accident conditions (e.g., nuclear fuels at high temperature with a controlled atmosphere or during core melt conditions), thermo-mechanical processing (strain and micro-structure evolution during high-temperature deformation), or indeed any conditions that offer new insight into solid state physics, such as low temperatures or magnetic fields.

- Developments over the next 3 years will include: (1) the optimization of high-temperature capability to reach 3000°C; (2) commissioning of a quench furnace with quench rates up to 20°C/s; (3) improvements of the controlled atmosphere set up for different gas mixtures and higher temperatures; (4) commissioning of TiZr zero-scattering gas pressure cells for PDF studies at pressures up to 5 kbar. The potential for simultaneous calorimetric or acoustic characterization will be examined, as well as the commissioning of a ZAP anvil cell capable of 10 GPa at approximately 20 K in a magnetic field of 2 T.

7.5 Tactics

Many areas of Lujan Center science are demonstrating success and national recognition. A few examples from the engineering program that are of societal import include measurements on Iowa fertilizer tanks, which will dictate heat treatment that will be applied to thousands of agricultural tanks. Load sharing measurements on suspension bridge cables have changed the basis for determining the reliability of aging infrastructure. Industrial measurements have

included small-angle neutron measurements with the potential to improve the performance and comfort of contact lenses.

In other initiatives, shared postdocs between NHMFL and the Lujan Center have worked to mutual benefit, and we are looking to reproduce this model with CINT. Continued support in capabilities such as the deuteration lab has been well received by users. Another initiative that is in its formative phase relates to data analysis. Many measurements require sophisticated interpretation techniques (large-box modeling of local structure data, simulation of inelastic spectra, and peak profile analysis), which are often beyond the user's expertise. The nascent concept is to offer a "data fest," in which the Lujan Center staff provides focused support and expertise to users as a group to extract the maximum of physically relevant information from an experiment.

7.6 Budget

The FY13 BES budget for operations at the Lujan Center enables seven instruments in the user program, as well as partial facility support for an eighth (PCS). Constant operations funding over the last 4 years has prevented the Lujan Center from addressing one of the identified concerns from the 2009 review: namely that *"The Lujan Center has been operating at a point of unstable equilibrium that is clearly unsustainable."* External reviews indicated that the Lujan Center is operating at a deficit of beamline and facility staff relative to international norms. This deficit remained true, even after the difficult 2011 decision was made to remove three instruments from the user program to concentrate resources on the remaining seven. Current funding levels prevent the full use of the Lujan Center instrument suite and constitute the main barrier to a vision of maximal Lujan Center impact. In the section below, two budget scenarios address this funding deficiency.

Scenarios 1 and 2 (Table 7-1 and 7-2) below illustrate the estimated financial requirements necessary to staff and support 7 and 10 existing instruments in the user program, respectively. Table 7.1 contrasts the FY13 budget with the Scenario 1 budget. The staffing levels and estimates of efficiency take into account the number and frequency of sample changes and the availability of the instrument scientist to provide data analysis support. At FY13 funding levels, the M&S allocation is sufficient only for critical repairs, but not for recapitalization. In Scenario 1, the total cost to BES of running seven instruments at full capacity is $17.6M, which is equivalent to $2.5M per instrument, which is comparable to other neutron user facilities in the US.

Table 7-1: FY2013 Lujan Center budget compared with Scenario 1 for seven instruments in the user program.

		FY13 BES Budget						Scenario 1: Full Utilization of 7 Flight Paths					
		staff (#)	staff cost (K$)	M&S (K$)	total cost (K$)	beam time efficiency	data analysis	staff (#)	staff cost (K$)	M&S (K$)	total cost (K$)	beam time efficiency	data analysis
FP01	NPDF	2.0	811	45	856	90%	78%	2.5	905	180	1085	100%	100%
FP02	SMARTS	2.8	903	65	968	90%	93%	3.0	975	260	1235	100%	100%
FP04	HIPPO	2.1	791	15	806	60%	42%	5.0	1255	300	1555	100%	100%
FP07	FDS	1.0	423	75	498	80%	48%	2.0	835	60	895	100%	100%
FP09	SPEAR	3.0	755	15	770	100%	100%	3.0	975	280	1255	100%	100%
FP10	LQD	1.2	518	15	533	80%	38%	3.0	975	170	1145	100%	100%
FP11	Asterix	2.0	591	70	661	100%	98%	2.0	835	340	1175	100%	100%
Instrument total		**13.9**	**4792**	**300**	**5092**			**20.5**	**6755**	**1590**	**8345**		
Facility staff total		**11.5**	**3995**	**500**	**4495**			**16.5**	**5508**	**1600**	**7108**		
recapitalization			0							800	800		
Facility total			**3995**	**500**	**4495**				**5508**	**2400**	**7908**		
management		0.8	405	50	455			0.8	405	100	505		
user office		1.5	435	20	455			2.5	795	40	835		
group office		0.0	0	0	0			0.0	0	0	0		
management total			840	70	910				1200	140	1340		
BES total			**9626**	**870**	**10496**				**13463**	**4130**	**17593**		
Overhead													
management		1.5	810	0	810			1.5	810	0	810		
user office		0.0	0	0	0			0.0	0	0	0		
group office		1.5	435	0	435			1.5	435	0	435		
Total in BES $			1245	0	1245				1245	0	1245		
Tax adjusted			415	0	415				415	0	415		
RTBF (spallation physics)													
management/ staff		3.5	1310	140	1450			3.5	1310	140	1450		
Grand total			**11351**	**1010**	**12361**				**15188**	**4270**	**19458**		

Table 7-2 proposes a budget for staffing 10 BES instruments in the user program at 100% efficiency and provides more detail on the staffing assumptions. This budget contains funds for the recapitalization of older instruments to ensure that all instruments remain upgraded with advances in technology in a timely fashion. The total cost to BES for Scenario 2 is $21.6M per year.

Table 7-2: Scenario 2, budget detail for 10 instruments in the user program.

		IS	IA	RT	Tec	Postdoc	T&E	M&S	total
FP01	NPDF	1	1	0	0	0.5	905	180	1085
FP02	SMARTS	1	1	0	0	1	975	260	1235
FP03	HIPD	1	1	0	0	0	835	60	895
FP04	HIPPO	1	1	0	0	3	1255	300	1555
FP06	SCD	1	1	0	0	0	835	60	895
FP07	FDS	1	1	0	0	0	835	60	895
FP09	SPEAR	1	1	0	0	1	975	280	1255
FP10	LQD	1	1	0	0	1	975	170	1145
FP11	Asterix	1	1	0	0	0	835	340	1175
FP16	Pharos	1	1	0	0	0	835	60	895
Instrument total							**9260**	**1770**	**11030**
sample environment		1	1	0	1		1095		1095
computer support		2	0	1	0		1255		1255
E-tech		0	0	2	0		610		610
mech tec		0	0	1	3		1085		1085
chem lab		0.5	0	1	0		543		543
bio lab		0	0	1	0		305		305
safety officer		0	0	1	0		305		305
designer		0	0.5	1	0		485		485
RCT		0	0	0	2		520		520
recapitalization								1000	1000
facility								2000	2000
Facility total							**6203**	**3000**	**9203**
		R&D manager	PSA	admin-4	admin-2				
management		0.75	0	0	0		405	100	505
user office		0	1	1	0.5		795	40	835
group office		0	0	0	0		0		0
management total							**1200**	**140**	**1340**
BES total							**16663**	**4910**	**21573**
		R&D manager	PSA	admin-4	admin-2				
management		1.5	0	0	0		810	0	810
user office		0	0	0	0		0	0	0
group office		0	0	1	0.5		435	0	435
Total in BES $							**1245**	**0**	**1245**
Tax adjusted							**415**		**415**
			LANL RTBF (spallation physics)						
		manager/IS		IA		Postdoc			
		1.5		1		1	1310	140	1450
BES+LANL Total							**18388**	**5050**	**23438**

7.7 Options for Increased Funding

In a constrained funding situation, there is a natural tension between adding capability and running existing capability more efficiently. At FY13 funding levels, the Lujan Center can support seven instruments in the user program, but flexibility for recapitalization is minimal. Users typically have to wait until the end of the run cycle for support in data analysis from subject matter experts.

The most pressing demands of the user community are to return HIPD and Pharos (in a dual-function mode) to the user program. These demands were most recently expressed in a workshop at the 2012 User Group meeting. The course of this action is supported by the maturity of this community, the value of these instruments in contrast with SNS, and the motivation and expertise of the Lujan Center's scientific personnel.

The availability of flight paths that have shielding, guide, and safety systems preinstalled offers a cost-effective opportunity for adding capability to the US neutron scattering portfolio. In 2006 and 2009, beamline investments were vetted and supported by the external user community in a series of workshops. To ensure the continued vitality of the science program, a decision for investment in new instruments is crucial. A BES competition for the user community akin to that from 1997, which resulted in the construction of HIPPO, SMARTS and PCS, would undoubtedly generate excellent options for the available flight paths that would lead to innovation and new fields of science.

7.8 Conclusion

The Lujan Center continues to demonstrate world-class productivity in neutron scattering as it has done for the last three BES reviews. The Lujan Center staff is highly accomplished and draws on 3 decades of institutional knowledge of spallation source neutron scattering. The experience, commitment, and professionalism of these human resources are the key to the success of the Lujan Center.

The opportunity for BES to leverage NNSA investment to add world-class neutron scattering capability for the user community is unparalleled. However, current operations funding is sufficiently low as to adversely affect the continued scientific vitality of this facility. Investing in new capability and staffing will prevent the loss by attrition of the national investment reported above. Options exist for upgrading instruments, returning instruments to the national user program, or developing new instruments. User demand indicates that an immediate priority should be to convert Pharos to a dual mode of operation and recommission it in the user program so that it can support both elastic scattering and inelastic experiments. A variety of new instrument options exist that would add exciting new capability: leading candidates include radiography, repetition rate multiplication, and high pressure. A BES competition to move one of these concepts to fruition could provide a scientific payoff for under $5M in less than 3 years.

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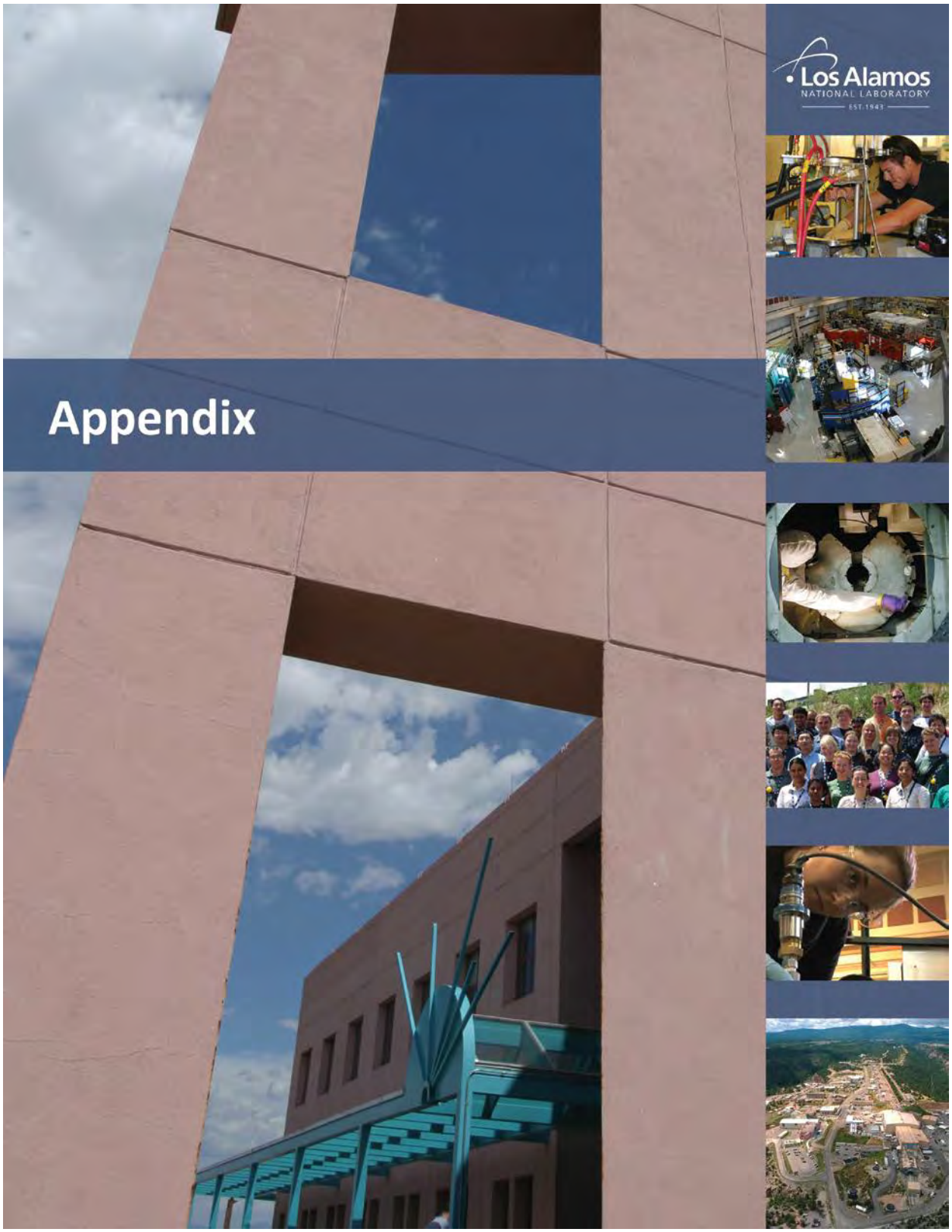


LA-UR-13-24525

Floorplan

Figure 8.1 shows the floorplan of the experimental areas ER-1 and ER-2 at the Lujan Center. Colors inside the bulk shield surrounding the 1-L target reflect the different moderator types.

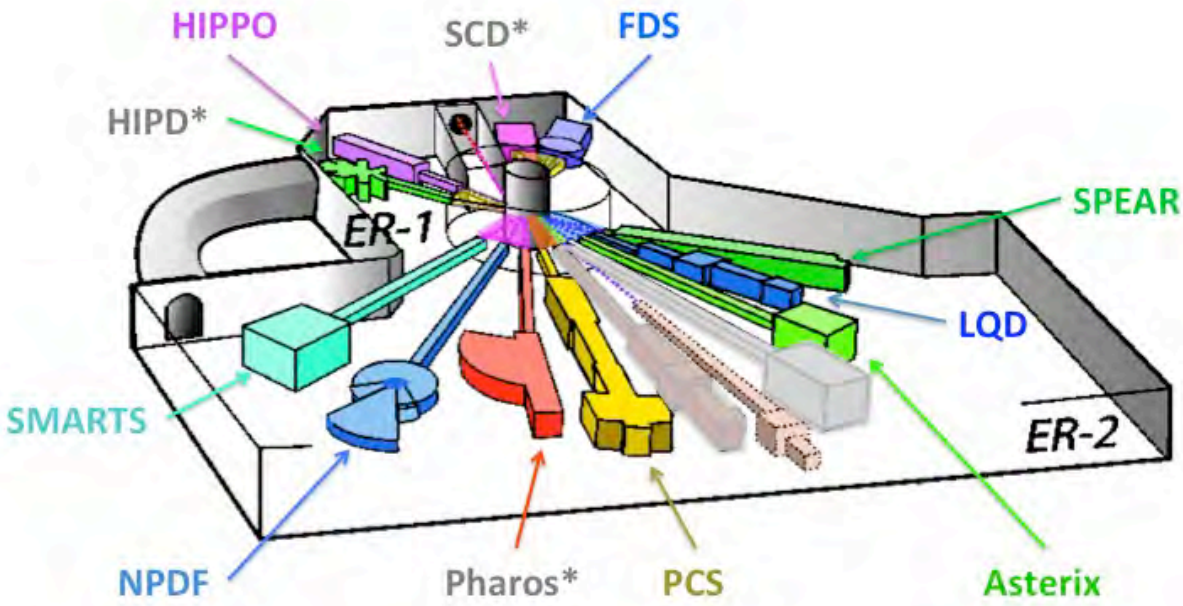


Figure 8.1: Floorplan of the Lujan Center instruments (* means not currently in the BES-SUFD user program).

Beamline Summary Table

Table 8-1: Beamline Summary

Beamline	Source Type	Areas of Research	Major Techniques	General User %	Beamline Staff %	Other Facility Staff %	Technical Quality Metric	Existing Staffing (FTE)	Optimal Staffing (FTE)	Funding (k$)				# of Unique Beamline users				All refereed Beamline publications [Total/with facility staff co-author]			
										Note: Total (FTE+M&S)				*Note: this only includes user visits*				*Note: this only includes publications using data from instrument*			
										2009	2010	2011	2012	2009	2010	2011	2012	2009	2010	2011	2012
NPDF-FP01	Thermal	C, M, P	Diffraction - Local Structure	80	20	6	0.6	2.1+ 1.1	3	1,571 (1,233 + 338)	1,304 (1,023 + 280)	1,944 (1,693 + 251)	1,769 (1,518 + 250)	28	44	37	30	20/14	20/12	29/17	25/12
SMARTS - FP02	Thermal	A	Engineering Diffraction	80	20	5	0.6	1.5+ 0.2	3	1,479 (1,171 + 308)	1,150 (895 + 255)	1,417 (1,167 + 250)	1,624 (1,358 + 266)	37	31	44	32	13/11	23/17	15/13	17/13
HIPD-FP03	Thermal	C, M, P	Diffraction-Magnetism - Local structure	0	100	0	0.4	0.0	2	553 (439 + 113)	656 (558 +98)	0	0	9	14	0	0	5/5	4/4	18/17	16/14
HIPPO-FP04	Thermal	C, G, M, A	Diffraction - Texture - Extreme environments	80	20	8	0.8	1.0+ 0.7	5	1,496 (1,190 +306)	1,454 (1,198 + 256)	1,379 (1,166 +213)	1,489 (1,240 +249)	42	29	53	28	14/10	29/22	11/6	29/26
SCD-FP06	Thermal	C, M	Single crystal diffractometer	0	100	0	0.4	0.0	2	338 (255 + 83)	320 (237 + 83)	0	0	1	8	0	0	1/1	2/2	1/1	1/1
FDS-FP07	Thermal	C, M	Vibrational Spectroscopy	80	20	4	0.6	1.0	2	996 (815 + 180)	1,178 (1,008 + 170)	1,199 (1,041 + 158)	1,316 (1,118 + 198)	10	7	14	4	9/8	2/2	4/4	5/4
SPEAR-FP09	Cold	C, L, M	Reflectometry	80	20	5	0.6	1.0+ 1.9	3	1,385 (1,135 + 250)	1,407 (1,139 + 269)	1,378 (1,136 + 242)	1,630 (1,358 +272)	38	39	48	29	16/10	12/7	17/12	11/9
LQD-FP10	Cold	C, L, M	Small Angle Neutron Scattering	80	20	16	0.4	1.4	3	1,717 (1,462 + 255)	1,498 (1,263 +235)	1,547 (1,335 +211)	1,469 (1,263 +206)	33	38	40	43	4/0	5/3	5/2	8/4
Asterix-FP11	Cold	M, P	Polarized Neutron Beams, Reflectometry, Diffraction	80	20	3	0.8	1.0+ 0.8	2	1,199 (944 + 255)	1,264 (923 +341)	1,471 (1,237 +234)	1,450 (1,180 +269)	14	14	17	19	7/7	4/4	8/7	5/5
Pharos-FP16	Thermal	C, M, P	Inelastic Scattering	0	100	0	0.4	0.0	2	604 (498 + 106)	548 (427 +121)	0	0	9	3	0	0	2/2	5/4	4/3	2/0

Notes for Beamline Sumary Table:

Area of Research:
A: Applied Sciences
C: Chemical Sciences
G: Geoscience and Molecular/ Environmental science
L: life Sciences
M: Materials Sciences
P: Physical Sciences

Technical Quality Metric:
1.0 = optimal performance
0.8 = minor upgrade required
0.6 = moderate upgrade required
0.4 = major upgrade required
0.2 = marginally useful
0.0 = not usable

- There were no Instrument Development Teams or Partner/Contributing Users established at the Lujan Center over the review period. Therefore, the only user categories are general users, beamline staff, and other facility staff.

- Existing staffing in FTE equivalents is based on staff funded by BES-SUFD as recorded in the T&E system for FY2012 and does include postdocs (second number) but no students.

- The funding consists of BES-SUFD-funded staff and M&S associated with instrument and cost of shared resources such as user office, ESH, rad-protection etc.

- The cost per publication per beamline is displayed graphically in Section 6.1.

- In general, 80% of instrument beamtime is available to general users and 20% is available for instrument team as discretionary beamtime. Discretionary beamtime is used for instrument development and fast access proposals from internal and external users.

Beamline Data

Figure 8.2 shows the number of refereed journal publications based on data from Lujan Center instruments.[19] If publications are based on data from multiple instruments, they are listed for each instrument.

The increase in publication numbers for HIPD after the instrument was removed from the user program can be explained by HIPD: (1) commissioning a top loading displex that increased its capability (4 K–800 K) in 2010; (2) having developed an instrument user base that took advantage of the higher flux of HIPD to perform parametric studies, local structure studies, or access to extended d-space range to study large unit cell systems and magnetism; and (3) using the highly experienced user base accessing the instrument through scientific collaboration with the Lujan Center staff in its limited operating mode

[19] Publications in this report are queried with Google Scholar, which allows querying only by year and not by date. Therefore, publication numbers are reported per CY of the publication.

(4) publication lag for data from previous years. The experiments required no direct BES-funded support. Clearly, this mode of operation, without any growth of the user base, is not desirable in the long term. However, the productivity of its current operating mode illustrates the great potential return of investment for this particular instrument in the future.

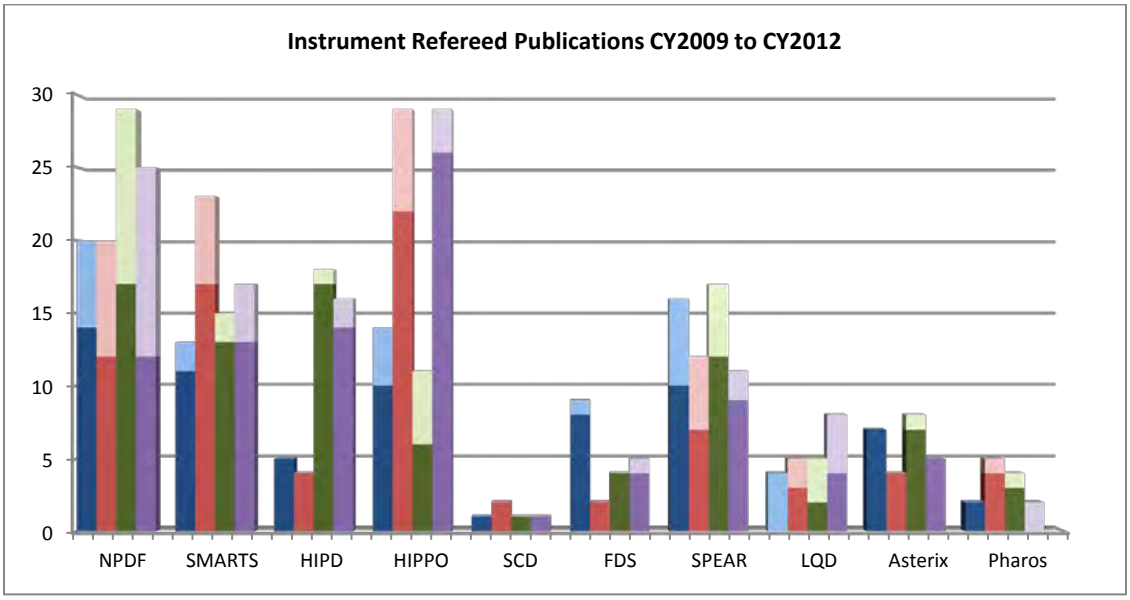


Figure 8.2: Total refereed publications per year and instrument (blue: CY2009, red: CY2010, green: CY2011, purple: CY2012). The dark colors indicate publications with Lujan Center staff as co-authors; the light colors are additional publications for each instrument without Lujan Center co-authors. The numbers are provided in the statistics for each beamline below.

Comments for the following beamline information:

- Flux density numbers are experimentally measured values published in peer-reviewed journals.

- The percentages of FTE equivalent for the beamline staff are based on FY2012 data reported in the LANL T&E system.

- The operating funds for FY2012 for each instrument include BES-SUFD-funded staff and M&S, as well as shared facility cost for the user office, ES&H, rad-protection, etc., as listed in Section 1.5.

- The historical funding trend in the graph for each instrument includes BES-SUFD-funded staff and M&S but not the shared facility cost for user office, ES&H, rad protection, etc.

- There were no instrument development teams or partner/contributing users established at the Lujan Center over the review period. Therefore, the only user categories of BES Information Request 2.iii.e are general users, beamline staff, and other facility staff.

- The "Beamtime Allocation to Staff and General Users" is based on actual scheduled beamtime in FY2012 and counted as:

  - "General User" when no Lujan Center staff member is listed as PI or co-investigator on the scheduled proposal.

  - "Beamline Staff" when a staff member affiliated with the beamline appears as PI or co-investigator on the scheduled proposal.

  - "Lujan Staff" if a Lujan Center staff member not affiliated with a beamline appears as PI or co-investigator on the scheduled proposal and none of the beamline staff members are listed as an investigator for the proposal.

- The "Beamtime Allocation per Research Area" is based on the research area selected by the user during proposal submission for a given scheduled beamtime.

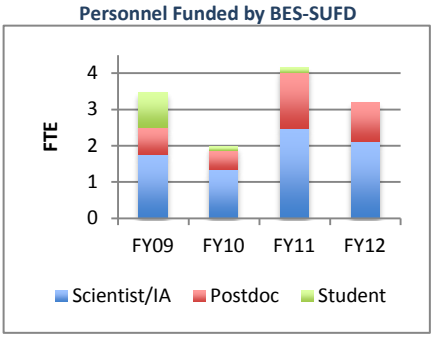
Flight Path 1—NPDF
Neutron Pair Distribution Function Diffractometer

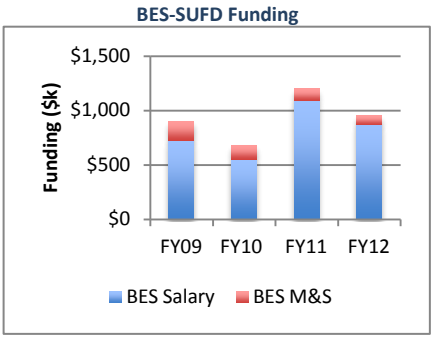
Beamline Description

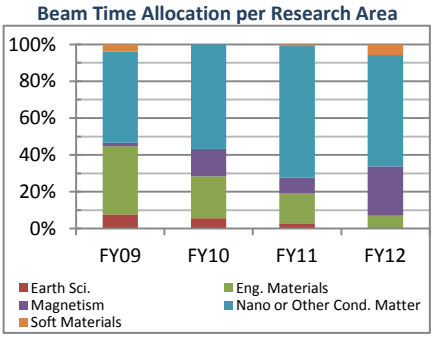
NPDF is a high-resolution, total-scattering powder diffractometer with a sample position 32 m from the spallation neutron target. It has 20 detector panels with 160 position-sensitive detectors in the backscattering region of the instrument. These specifications give the instrument a high resolution and a large Q-range (0.8 to 51.1 $Å^{-1}$). This factor, together with low and stable background, position NPDF as a world leader in PDF studies of disordered and nanocrystalline materials. A standard data set suitable for PDF analysis can be obtained in 2 to 6 hours. NPDF is equally well suited for high-resolution crystallographic studies. Research performed using NPDF has resulted in the publication of about 94 peer-reviewed journal articles since 2009, in fields as diverse as geochemistry, actinide research, complex oxides, bulk metallic glasses, and hydrogen storage materials. Additionally, NPDF serves a key role as a development platform for local structure analysis tools for disordered and nanostructured bulk materials, as well as finite nanomaterials.

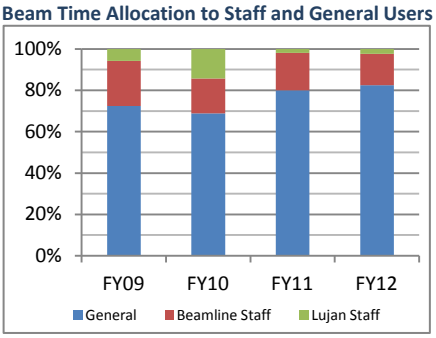
Target Scientific Audience

Condensed Matter Physics, Materials Science and Engineering, Nanoscience









Beamline Specifications

Moderator	Chilled water (273 K)/high resolution
Primary Flight Path	32 m
Secondary Flight Path	1. 5 m
Q range/λ range/d-range	0.8 $Å^{-1}$ < Q < 51.1 $Å^{-1}$
Resolution	Δd/d=0.7% to 0.15%
Beam Size	5 cm by 1 cm
Flux Density	8×10^5 $n/cm^2/s$
Instrument Scientist-I	Dr. Katharine Page (66%)
Instrument Scientist-II	Dr. Anna Llobet (63%)
Instrument Assistant	Joan Siewenie (81%)
Operating Funds 2012 (k$)	$1,769
Allocation Percentages (General User/Beamline Staff/Facility Staff)	76%/18%/6%
# Users/Year (4 Year Average, Total/Unique Users)	46/35
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	82/72/109/88

Summary of NPDF Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	20 (14)	2	0	1(1)	3(1)
2010	20 (12)	3	0	1(1)	1(1)
2011	29 (17)	1	1	1(1)	2(1)
2012	25 (12)	2	2	0(0)	2(1)
Total	**94 (55)**	**8**	**3**	**3(3)**	**8(4)**

Complete List of NPDF Refereed Publications, 2009–2012

#	Complete list of NPDF refereed publications	Citations	Publication type
1	N Sundaram, Y Jiang, IE Anderson, DP Belanger, CH Booth, F Bridges, JF Mitchell, Th Proffen, H Zheng, Local Structure of La1-xSrxCoO3 Determined from EXAFS and Neutron Pair Distribution Function Studies, Physical review letters, 102, 026401 (2009)	35	Journal article, High Impact, High Profile
2	Emil S Bozin, Christos D Malliakas, Petros Souvatzis, Thomas Proffen, Nicola A Spaldin, Mercouri G Kanatzidis, Simon JL Billinge, Entropically stabilized local dipole formation in lead chalcogenides, Science, 330, 1660-1663 (2010)	32	Journal article, High Impact, High Profile
3	Igor Levin, Victor Krayzman, Joseph C Woicik, Jenia Karapetrova, Thomas Proffen,	30	Journal article

	Matthew G Tucker, Ian M Reaney, Structural changes underlying the diffuse dielectric response in AgNbO3, Physical Review B, 79, 104113 (2009)		
4	Nancy J Hess, Gregory K Schenter, Michael R Hartman, Luc L Daemen, Thomas Proffen, Shawn M Kathmann, Christopher J Mundy, Monika Hartl, David J Heldebrant, Ashley C Stowe, others, Neutron Powder Diffraction and Molecular Simulation Study of the Structural Evolution of Ammonia Borane from 15 to 340 K, The Journal of Physical Chemistry A, 113, 5723-5735 (2009)	29	Journal article
5	Efrain E Rodriguez, Frederic Poineau, Anna Llobet, Brendan J Kennedy, Maxim Avdeev, Gordon J Thorogood, Melody L Carter, Ram Seshadri, David J Singh, Anthony K Cheetham, High Temperature Magnetic Ordering in the 4d Perovskite SrTcO3, Physical Review Letters, 106, 067201 (2011)	27	Journal article, High Impact, High Profile
6	JE Greedan, Delphine Gout, AD Lozano-Gorrin, Shahab Derahkshan, Th Proffen, H-J Kim, E Bozin, SJL Billinge, Local and average structures of the spin-glass pyrochlore Y2Mo2O7 from neutron diffraction and neutron pair distribution function analysis, Physical Review B, 79, 014427 (2009)	25	Journal article
7	Thomas Proffen, Hyunjeong Kim, Advances in total scattering analysis, Journal of Materials Chemistry, 19, 5078-5088 (2009)	22	Journal article
8	Claire E White, John L Provis, Thomas Proffen, Daniel P Riley, Jannie SJ van Deventer, Density functional modeling of the local structure of kaolinite subjected to thermal dehydroxylation, The Journal of Physical Chemistry A, 114, 4988-4996 (2010)	21	Journal article
9	Efrain E Rodriguez, Chris Stock, Pawel Zajdel, Kathryn L Krycka, Charles F Majkrzak, Peter Zavalij, Mark A Green, Magnetic-crystallographic phase diagram of the superconducting parent compound Fe[1+ x]Te, Physical Review B, 84, 064403 (2011)	21	Journal article
10	Katharine Page, Thomas Proffen, Markus Niederberger, Ram Seshadri, Probing local dipoles and ligand structure in BaTiO3 nanoparticles, Chemistry of Materials, 22, 4386-4391 (2010)	20	Journal article
11	N Hur, IK Jeong, MF Hundley, SB Kim, S-W Cheong, Giant magnetoelectric effect in multiferroic HoMnO3 with a high ferroelectric transition temperature, Physical Review B, 79, 134120 (2009)	19	Journal article
12	Claire E White, John L Provis, Thomas Proffen, Jannie SJ Van Deventer, The Effects of Temperature on the Local Structure of Metakaolin-Based Geopolymer Binder: A Neutron Pair Distribution Function Investigation, Journal of the American Ceramic Society, 93, 3486-3492 (2010)	19	Journal article
13	Claire E White, John L Provis, Thomas Proffen, Daniel P Riley, Jannie SJ van Deventer, Combining density functional theory (DFT) and pair distribution function (PDF) analysis to solve the structure of metastable materials: the case of metakaolin, Physical Chemistry Chemical Physics, 12, 3239-3245 (2010)	19	Journal article
14	Daniel P Shoemaker, Jun Li, Ram Seshadri, Unraveling Atomic Positions in an Oxide Spinel with Two Jahn- Teller Ions: Local Structure Investigation of CuMn2O4, Journal of the American Chemical Society, 131, 11450-11457 (2009)	17	Journal article, High Impact
15	Stefan Mebs, Simon Grabowsky, Diana Forster, Rainer Kickbusch, Monika Hartl, Luke L Daemen, Wolfgang Morgenroth, Peter Luger, Beate Paulus, Dieter Lentz, Charge Transfer via the Dative N- B Bond and Dihydrogen Contacts. Experimental and Theoretical Electron Density Studies of Small Lewis Acid- Base Adducts, The Journal of Physical Chemistry A, 114, 10185-10196 (2010)	16	Journal article
16	Daniel P Shoemaker, Ram Seshadri, Andrew L Hector, Anna Llobet, Thomas Proffen, Craig J Fennie, Atomic displacements in the charge ice pyrochlore Bi2Ti2O6O' studied by neutron total scattering, Physical Review B, 81, 144113 (2010)	15	Journal article
17	I-K Jeong, CY Park, JS Ahn, S Park, DJ Kim, Ferroelectric-relaxor crossover in Ba(Ti1-xZrx) O3 studied using neutron total scattering measurements and reverse Monte Carlo modeling, Physical Review B, 81, 214119 (2010)	12	Journal article
18	JM Caron, JR Neilson, DC Miller, A Llobet, TM McQueen, Iron displacements and magnetoelastic coupling in the antiferromagnetic spin-ladder compound BaFe2Se3, Physical Review B, 84, 180409 (2011)	12	Journal article
19	I-K Jeong, Temperature evolution of short-and medium-range ionic correlations in relaxor ferroelectric [Pb (Zn1/3Nb2/3)O31- x [PbTiO3]x (x= 0.05, 0.12), Physical Review	11	Journal article

	B, 79, 052101 (2009)		
20	Brent C Melot, Katharine Page, Ram Seshadri, EM Stoudenmire, Leon Balents, Doron L Bergman, Thomas Proffen, Magnetic frustration on the diamond lattice of the A-site magnetic spinels CoAl2- xGaxO4: The role of lattice expansion and site disorder, Physical Review B, 80, 104420 (2009)	10	Journal article
21	KA Ross, LR Yaraskavitch, Mark Laver, JS Gardner, JA Quilliam, S Meng, JB Kycia, DK Singh, Th Proffen, HA Dabkowska, others, Dimensional evolution of spin correlations in the magnetic pyrochlore Yb2T2O7, Physical Review B, 84, 174442 (2011)	10	Journal article
22	J Ropka, R Cerny, V Paul-Boncour, Th Proffen, Deuterium ordering in Laves-phase deuteride YFe2D4.2, Journal of Solid State Chemistry, 182, 1907-1912 (2009)	9	Journal article
23	Efrain E Rodriguez, Anna Llobet, Thomas Proffen, Brent C Melot, Ram Seshadri, Peter B Littlewood, Anthony K Cheetham, The role of static disorder in negative thermal expansion in ReO3, Journal of Applied Physics, 105, 114901-114901 (2009)	9	Journal article
24	James D Wilcox, Efrain E Rodriguez, Marca M Doeff, The Impact of Aluminum and Iron Substitution on the Structure and Electrochemistry of Li (Ni0. 4Co0. 2- y M y Mn0. 4) O2 Materials, Journal of The Electrochemical Society, 156, A1011-A1018 (2009)	9	Journal article
25	Jing-Cao Dai, Shalabh Gupta, Olivier Gourdon, Hyun-Jeong Kim, John D Corbett, BaHg2Tl2. An Unusual Polar Intermetallic Phase with Strong Differentiation between the Neighboring Elements Mercury and Thallium, Journal of the American Chemical Society, 131, 8677-8682 (2009)	9	Journal article, High Impact
26	Despina Louca, K Kamazawa, T Proffen, Formation of local electric dipoles with no unique polar axis in Tb3Fe5O12, Physical Review B, 80, 214406 (2009)	8	Journal article
27	Katharine Page, Taylor C Hood, Th Proffen, Reinhard B Neder, Building and refining complete nanoparticle structures with total scattering data, Journal of Applied Crystallography, 44, 327-336 (2011)	8	Journal article
28	Sang-Hwan Kim, P Shiv Halasyamani, Brent C Melot, Ram Seshadri, Mark A Green, Athena S Sefat, David Mandrus, Experimental and Computational Investigation of the Polar Ferrimagnet VOSe2O5, Chemistry of Materials, 22, 5074-5083 (2010)	8	Journal article
29	James R Neilson, Anna Llobet, Andreas V Stier, Liang Wu, Jiajia Wen, Jing Tao, Yimei Zhu, Zlatko B Tesanovic, NP Armitage, Tyrel M McQueen, Mixed-valence-driven heavy-fermion behavior and superconductivity in KNi2Se2, Physical Review B, 86, 054512 (2012)	7	Journal article
30	KA Ross, Th Proffen, HA Dabkowska, JA Quilliam, LR Yaraskavitch, JB Kycia, BD Gaulin, Lightly stuffed pyrochlore structure of single-crystalline Yb_ 2 Ti_ 2 O_ 7 grown by the optical floating zone technique, Physical Review B, 86, 174424 (2012)	7	Journal article
31	Lorenzo Malavasi, HyunJeong Kim, Thomas Proffen, Local and average structures of the proton conducting Y-doped BaCeO from neutron diffraction and neutron pair distribution function analysis, Journal of Applied Physics, 105, 123519 (2009)	6	Journal article
32	MH Braga, JJA Ferreira, J Siewenie, Th Proffen, SC Vogel, LL Daemen, Neutron powder diffraction and first-principles computational studies of CuLixMg2-x(x>0.08), CuMg2, and Cu2Mg, Journal of Solid State Chemistry, 183, 10-19 (2010)	5	Journal article
33	Claire E White, John L Provis, Laura E Gordon, Daniel P Riley, Thomas Proffen, Jannie SJ van Deventer, Effect of temperature on the local structure of kaolinite intercalated with potassium acetate, Chemistry of Materials, 23, 188-199 (2011)	5	Journal article
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35	Ilkyoung Jeong, Chang Yeol Park, Dong Jin Kim, Sun-hwa Kim, Byung Kee Moon, Ill Won Kim, Chang Won Ahn, Neutron total scattering studies on A-site disorder in lead-free ferroelectric Bi0. 5 (Na1-x K x) 0.5 TiO3, Zeitschrift fur Kristallographie, 226, 150-154 (2011)	5	Journal article
36	Lorenzo Malavasi, Alodia Orera, Peter R Slater, Pooja M Panchmatia, M Saiful Islam, Joan Siewenie, Local structure investigation of oxide ion and proton defects in Ge-apatites by pair distribution function analysis, Chemical Communications, 47, 250-252 (2011)	5	Journal article

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38	Caroline Wurden, Katharine Page, Anna Llobet, Claire E White, Th Proffen, Extracting differential pair distribution functions using MIXSCAT, Journal of Applied Crystallography, 43, 635-638 (2010)	4	Journal article
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42	Michael J Evans, Verina F Kranak, Francisco J Garcia-Garcia, Gregory P Holland, Luke L Daemen, Thomas Proffen, Myeong H Lee, Otto F Sankey, Ulrich Haussermann, Structural and Dynamic Properties of BaInGeH: A Rare Solid-State Indium Hydride, Inorganic chemistry, 48, 5602-5604 (2009)	4	Journal article
43	Hyunjeong Kim, Jin Nakamura, Huaiyu Shao, Yumiko Nakamura, Etsuo Akiba, Karena W Chapman, Peter J Chupas, Thomas Proffen, Insight into the Hydrogenation Properties of Mechanically Alloyed Mg50Co50 from the Local Structure, The Journal of Physical Chemistry C, 115, 20335-20341 (2011)	4	Journal article
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45	Yasushi IDEMOTO, Kenichiro UEKI, Naoto KITAMURA, Dependence of Average and Local Structures and Cathode Performance on Synthetic Condition of Li x (Mn 1/3 Co 1/3 Ni 1/3) O 2 as a Cathode Active Material for Li Ion Battery, Electrochemistry, 78, 475-481 (2010)	4	Journal article
46	Hyunjin Ko, Olivier Gourdon, Delphine Gout, Eun-Deok Mun, Srinivasa Thimmaiah, Gordon J Miller, Rhombohedrally Distorted gamma-Brasses Cr1- x Fe x Ga, Inorganic chemistry, 49, 11505-11515 (2010)	4	Journal article
47	Christopher L Farrow, Margaret Shaw, Hyunjeong Kim, Pavol Juhas, Simon JL Billinge, Nyquist-Shannon sampling theorem applied to refinements of the atomic pair distribution function, Physical Review B, 84, 134105 (2011)	4	Journal article
48	Verina F Kranak, Michael J Evans, Luke L Daemen, Thomas Proffen, Myeong H Lee, Otto F Sankey, Ulrich Haussermann, Structural and dynamic properties of the polyanionic hydrides SrAlGeH and BaAlGeH, Solid State Sciences, 11, 1847-1853 (2009)	3	Journal article
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51	Hyunjeong Kim, Jin Nakamura, Huaiyu Shao, Yumiko Nakamura, Etsuo Akiba, Karena W Chapman, Peter J Chupas, Thomas Proffen, Local Structural Evolution of Mechanically Alloyed Mg50Co50 Using Atomic Pair Distribution Function Analysis, The Journal of Physical Chemistry C, 115, 7723-7728 (2011)	3	Journal article
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53	Daniel P Shoemaker, Ram Seshadri, Makoto Tachibana, Andrew L Hector, Incoherent Bi off-centering in Bi2Ti2O6O' and Bi2Ru2O6O': Insulator versus metal, Physical Review B,	3	Journal article

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54	ES Bozin, P Juhas, W Zhou, MB Stone, DL Abernathy, A Huq, SJL Billinge, Atomic pair distribution function analysis from the ARCS chopper spectrometer at the Spallation Neutron Source, Journal of Applied Crystallography, 42, 724-725 (2009)	2	Journal article
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56	Claire E White, Pair distribution function analysis of amorphous geopolymer precursors and binders: the importance of complementary molecular simulations, Zeitschrift fur Kristallographie, 227, 304-312 (2012)	2	Journal article
57	Rick Ubic, Ganesanpotti Subodh, Delphine Gout, Mailadil T Sebastian, Thomas Proffen, Crystal Structure of Sr0. 4Ce0. 4TiO3 Ceramics, Chem. Mater, 21, 4706-4710 (2009)	2	Journal article
58	Farshid Ramezanipour, John E Greedan, Lachlan MD Cranswick, V Ovidiu Garlea, Ronald L Donaberger, Joan Siewenie, Systematic Study of Compositional and Synthetic Control of Vacancy and Magnetic Ordering in Oxygen-Deficient Perovskites Ca2Fe2--x Mn x O5+ y and CaSrFe2--x Mn x O5+ y (x= 1/2, 2/3, and 1; y= 0--1/2), Journal of the American Chemical Society, 134, 3215-3227 (2012)	2	Journal article, High Impact
59	Richard Harrington, Douglas B Hausner, Wenqian Xu, Narayan Bhandari, F Marc Michel, Gordon E Brown Jr, Daniel R Strongin, John B Parise, Neutron pair distribution function study of two-line ferrihydrite, Environmental science & technology, 45, 9883-9890 (2011)	2	Journal article, High Impact
60	Shin-Ichi Shamoto, Katsuaki Kodama, Satoshi Iikubo, Tomitsugu Taguchi, Total scattering of disordered crystalline functional materials, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 600, 229-231 (2009)	1	Journal article
61	Margit Fabian, Erzsebet Svab, Thomas Proffen, Erzsebet Veress, Neutron diffraction and reverse Monte Carlo modelling of v-B2O3 and 75B2O3-25Na2O glasses, Journal of Non-Crystalline Solids, 356, 441-446 (2010)	1	Journal article
62	Kenji Iwase, Kazuhiro Mori, Yukio Hishinuma, Yoshio Hasegawa, Shuji Iimura, Hiroaki Ishikawa, Takeshi Kamoshida, Toru Ishigaki, Development of sample holder forin situ neutron measurement of hydrogen absorbing alloy, International Journal of Hydrogen Energy, 36, 3062-3066 (2011)	1	Journal article
63	IK Jeong, S Park, Correlated Thermal Motion in Ferroelectric LiNbO3 Studied Using Neutron Total Scattering and a Rietveld Analysis, Journal of the Korean Physical Society, 59, 2756-2759 (2011)	1	Journal article
64	JE Greedan, Shahab Derakhshan, F Ramezanipour, J Siewenie, Th Proffen, A search for disorder in the spin glass double perovskites Sr2CaReO6 and Sr2MgReO6 using neutron diffraction and neutron pair distribution function analysis, Journal of Physics: Condensed Matter, 23, 164213 (2011)	1	Journal article
65	Ilkyoung Jeong, Temperature evolution of the local structure in relaxor ferroelectric Ba(Ti0.7Zr0.3)O3 studied using neutron total scattering analysis, Solid State Communications, 151, 1486-1489 (2011)	1	Journal article
66	I-K Jeong, JS Ahn, BG Kim, S Yoon, Satendra Pal Singh, Dhananjai Pandey, Short-and medium-range structure of multiferroic Pb(Fe1/2Nb1/2)O3 studied using neutron total scattering analysis, Physical Review B, 83, 064108 (2011)	1	Journal article
67	Levente Balogh, Donald W Brown, Paula Mosbrucker, Fei Long, Mark R Daymond, Dislocation structure evolution induced by irradiation and plastic deformation in the Zr--2.5 Nb nuclear structural material determined by neutron diffraction line profile analysis, Acta Materialia, 60, 5567-5577 (2012)	1	Journal article
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69	Chinnathambi Karthik, Thomas J Anderson, Delphine Gout, Rick Ubic, Transmission electron microscopic study of pyrochlore to defect-fluorite transition in rare-earth pyrohafnates, Journal of Solid State Chemistry, 194, 168-172 (2012)	1	Journal article

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71	Graham King, Artem M Abakumov, Patrick M Woodward, Anna Llobet, Alexander A Tsirlin, Dmitry Batuk, Evgeny V Antipov, The High-Temperature Polymorphs of K3AlF6, Inorganic chemistry, 50, 7792-7801 (2011)	1	Journal article
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73	Farshid Ramezanipour, John E Greedan, Lachlan MD Cranswick, V Ovidiu Garlea, Joan Siewenie, Graham King, Anna Llobet, Ronald L Donaberger, The effect of the B-site cation and oxygen stoichiometry on the local and average crystal and magnetic structures of Sr2Fe1. 9M0. 1O5+ y (M= Mn, Cr, Co; y= 0, 0.5), Journal of Materials Chemistry, 22, 9522-9538 (2012)	1	Journal article
74	I Levin, V Krayzman, C Chiu, K-W Moon, LA Bendersky, Local metal and deuterium ordering in the deuterated ZrTiNi C14 Laves phase, Acta Materialia, 60, 645-656 (2012)	1	Journal article
75	J Yu, D Phelan, Despina Louca, Spin-state tranitions in PrCoO3 investigated by neutron scattering, Physical Review B, 84, 132410 (2011)	1	Journal article
76	Peng Tian, Simon Billinge, Testing different methods for estimating uncertainties on Rietveld refined parameters using SrRietveld, Zeitschrift fur Kristallographie, 226, 898-904 (2011)	1	Journal article
77	Dong Ma, Alexandru Dan Stoica, X-L Wang, Zhao Ping Lu, T Proffen, In-situ neutron scattering study of crystallization in a Zr-based bulk metallic glass, Applied Physics A, 99, 537-542 (2010)	0	Journal article
78	Daniel P Shoemaker, Anna Llobet, Makoto Tachibana, Ram Seshadri, Reverse Monte Carlo neutron scattering study of the'ordered-ice'oxide pyrochlore Pb2Ru2O6. 5, Journal of Physics: Condensed Matter, 23, 315404 (2011)	0	Journal article
79	E Grzanka, S Stelmakh, B Palosz, S Gierlotka, Th Proffen, M Drygas, JF Janik, Core-Shell structure of nanocrystalline AlN in real and reciprocal spaces, Zeitschrift fur Kristallographie Proceedings, 2011, 235-240 (2011)	0	Journal article
80	I -K Jeong, Dhananjai Pandey, Erratum to: Local Structure of Lead-containing Mixed-ion Perovskite Ferroelectrics Studied Using Neutron Total Scattering Analysis, Journal of the Korean Physical Society, 61, 502-502 (2012)	0	Journal article
81	Th Proffen, Neutron Total Scattering Analysis of Nanoparticles, JOM, 64, 112-116 (2012)	0	Journal article
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83	G Campi, A Ricci, A Bianconi, Local Structure in Mg1- x Al x B2 System by High Resolution Neutron Diffraction, Journal of superconductivity and novel magnetism, 25, 1319-1322 (2012)	0	Journal article
84	ES Bozin, T Chatterji, Simon JL Billinge, Local structure of ReO3 at ambient pressure from neutron total-scattering study, Physical Review B, 86, 094110 (2012)	0	Journal article
85	S Avci, O Chmaissem, H Zheng, A Huq, DD Khalyavin, PW Stephens, MR Suchomel, P Manuel, JF Mitchell, Kinetic control of structural and magnetic states in LuBaCo4O7, Physical Review B, 85, 094414 (2012)	0	Journal article
86	Jennifer L Niedziela, Michael A McGuire, Takeshi Egami, Local structural variation as source of magnetic moment reduction in BaFe2As2, Physical Review B, 86, 174113 (2012)	0	Journal article
87	Graham King, Farshid Ramezanipour, Anna Llobet, John E Greedan, Local Structures of Sr2FeMnO5+ y(y= 0, 0.5) and Sr2Fe1.5Cr0.5O5 from Reverse Monte Carlo Modeling of Pair Distribution Function Data and Implications for Magnetic Order, Journal of Solid State Chemistry, null, 166-173 (2012)	0	Journal article

88	P Tong, Despina Louca, X-J Gu, SJ Poon, GJ Shiflet, T Proffen, Fluctuations of the Local Atomic Environment with Chemical Alloying in Fe Bulk Metallic Glasses, Metallurgical and Materials Transactions A, 42, 1481-1485 (2011)	0	Journal article
89	Tatyana Kardash, Ludmilla M Plyasova, Dmitry I Kochubey, Valentina M Bondareva, Reinhard B Neder, Development of the local and average structure of a V-Mo-Nb oxide catalyst with Mo5O14-like structure during synthesis from nanostructured precursors, Zeitschrift fur Kristallographie, 227, 288-298 (2012)	0	Journal article
90	P Tong, Despina Louca, Nara Lee, S-W Cheong, Oxygen displacements and magnetoelectric coupling in LuMnO3, Physical Review B, 86, 094419 (2012)	0	Journal article
91	Cang Fan, HG Yan, CT Liu, HQ Li, PK Liaw, Y Ren, T Egami, Changes in the atomic structure through glass transition observed by X-ray scattering, Intermetallics, 23, 111 (2012)	0	Journal article
92	Alessandro Mancini, Cristina Tealdi, Lorenzo Malavasi, Interstitial oxygen in the Ga-based melilite ion conductor: A neutron total scattering study, International Journal of Hydrogen Energy, 37, 8073-8080 (2012)	0	Journal article
93	Juan Yu, K Kamazawa, Despina Louca, Nature of magnetoelastic coupling with the isovalent substitution at the B-site in LaCo[1- y]ByO3, Physical Review B, 82, 224101 (2010)	0	Journal article
94	Shin-ichi Shamoto, Spherical Nanoparticle Effects on Atomic Pair Distribution Function, Journal of the Physical Society of Japan, 79, 4601 (2010)	0	Journal article

Flight Path 2—SMARTS
Spectrometer for Materials Research at Temperature and Stress

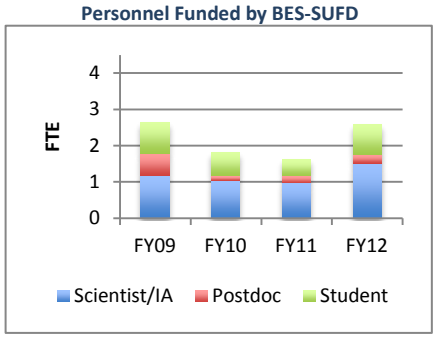
Beamline Description

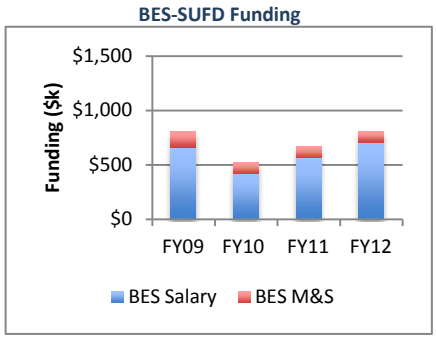
SMARTS is a third-generation neutron diffractometer optimized for the study of engineering materials. With an extensive array of in situ capabilities for sample environments, it enables measurements on small (1 mm^3) or large (1 m^3) samples. Components with dimensions up to 1 m and weight up to 1,500 kg can be positioned precisely in the beam. Permanently mounted alignment theodolites provide a simple and efficient way to position samples or equipment to within 0.01 mm.

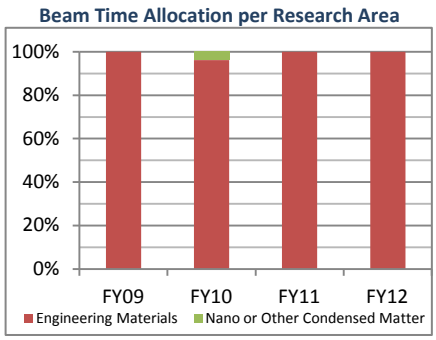
The furnace and load frame suite allows research on materials under extreme loads (250 kN) and at extreme temperatures (from cryogenic temperatures to 1,500°C). A magnetic field capability is also available to 1.5 T. In situ uni-axial loading on samples up to 1 cm in diameter at stresses of 2 GPa and with lower stresses at temperatures up to 1,500°C are routine. Recently, capabilities have been developed to accommodate investigations of radioactive materials, e.g., changes in ductility and deformation modes from in situ loading measurements on a zirconium alloy that has seen 7 years of service in a nuclear power reactor.

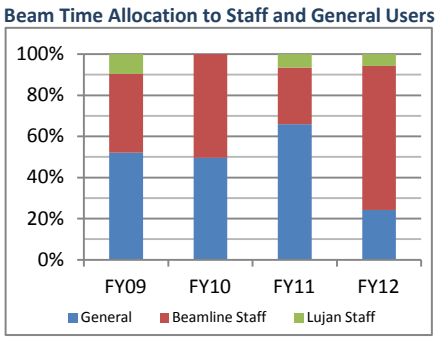
Target Scientific Audience

Materials Science, Engineering, National Security Science









Beamline Specifications

Moderator	Chilled water (273 K)/High resolution
Primary Flight Path	31 m
Secondary Flight Path	1.5 m
Q range/λ range/d-range	~0.5 Å < d < 4 Å
Resolution	~0.4% (FWHM at 90° and d ~2 Å)
Beam Size	2×2 mm^2 to 25×25 mm^2
Flux Density	2.4×10^6 $n/cm^2/s$
Instrument Scientist-I	Dr. Don Brown (14%)
Instrument Scientist-II	Dr. Bjorn Clausen (75%)
Instrument Assistant	Thomas Sisneros (63%)
Operating Funds 2012 (k$)	$1,624
Allocation Percentages (General User/Beamline Staff/Facility Staff)	48%/47%/5%
# Users/Year (4 Year Average, Total/Unique Users)	52/36
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	51/51/47/56

Summary of SMARTS Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	13 (11)	5	4	1(1)	2(2)
2010	23 (17)	3	2	0(0)	1(0)
2011	15 (13)	1	3	0(0)	0(0)
2012	17 (13)	3	0	1(1)	1(1)
Total	**68 (54)**	**12**	**9**	**2(2)**	**4(3)**

Complete List of SMARTS Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	CJ Neil, JA Wollmershauser, B Clausen, CN Tome, SR Agnew, Modeling lattice strain evolution at finite strains and experimental verification for copper and stainless steel using in situ neutron diffraction, International Journal of Plasticity, 26, 1772-1791 (2010)	26	Journal article
2	Sheng Cheng, Alexandru Dan Stoica, X-L Wang, Y Ren, J Almer, JA Horton, CT Liu, B Clausen, DW Brown, PK Liaw, others, Deformation crossover: From nano-to mesoscale, Physical review letters, 103, 035502 (2009)	24	Journal article, High Impact, High Profile
3	L Wu, SR Agnew, Y Ren, DW Brown, B Clausen, GM Stoica, HR Wenk, PK Liaw, The effects of texture and extension twinning on the low-cycle fatigue behavior of a rolled	22	Journal article

	magnesium alloy, AZ31B, Materials Science and Engineering: A, 527, 7057-7067 (2010)		
4	B Ye, BS Majumdar, I Dutta, Texture development and strain hysteresis in a NiTi shape-memory alloy during thermal cycling under load, Acta Materialia, 57, 2403-2417 (2009)	15	Journal article
5	Haim Waisman, Arturo Montoya, Raimondo Betti, IC Noyan, Load transfer and recovery length in parallel wires of suspension bridge cables, Journal of Engineering Mechanics, 137, 227-237 (2010)	14	Journal article
6	S Qiu, VB Krishnan, SA Padula, RD Noebe, DW Brown, B Clausen, R Vaidyanathan, Measurement of the lattice plane strain and phase fraction evolution during heating and cooling in shape memory NiTi, Applied Physics Letters, 95, 141906-141906 (2009)	13	Journal article, High Impact
7	JA Wollmershauser, S Kabra, SR Agnew, In situ neutron diffraction study of the plastic deformation mechanisms of B2 ordered intermetallic alloys: NiAl, CuZn, and CeAg, Acta Materialia, 57, 213-223 (2009)	12	Journal article
8	Giovanni Bruno, Alexander M Efremov, Bjorn Clausen, Anatoly M Balagurov, Valeriy N Simkin, Bryan R Wheaton, James E Webb, Donald W Brown, On the stress-free lattice expansion of porous cordierite, Acta Materialia, 58, 1994-2003 (2010)	12	Journal article
9	Jeremy Watts, Greg Hilmas, William G Fahrenholtz, Don Brown, Bjorn Clausen, Stress measurements in ZrB 2--SiC composites using Raman spectroscopy and neutron diffraction, Journal of the European Ceramic Society, 30, 2165-2171 (2010)	12	Journal article
10	E-Wen Huang, Rozaliya I Barabash, Bjorn Clausen, Yee-Lang Liu, Ji-Jung Kai, Gene E Ice, Kyle P Woods, Peter K Liaw, Fatigue-induced reversible/irreversible structural-transformations in a Ni-based superalloy, International Journal of Plasticity, 26, 1124-1137 (2010)	12	Journal article
11	S Qiu, B Clausen, SA Padula, RD Noebe, R Vaidyanathan, On elastic moduli and elastic anisotropy in polycrystalline martensitic NiTi, Acta Materialia, 59, 5055-5066 (2011)	11	Journal article
12	Giovanni Bruno, Alexander M Efremov, Andreyi N Levandovskyi, Bjorn Clausen, Connecting the macro-and microstrain responses in technical porous ceramics: modeling and experimental validations, Journal of Materials Science, 46, 161-173 (2011)	11	Journal article
13	Giovanni Bruno, Alexander M Efremov, Donald W Brown, Evidence for and calculation of micro-strain in porous synthetic cordierite, Scripta Materialia, 63, 285-288 (2010)	11	Journal article
14	D Ma, AD Stoica, X-L Wang, ZP Lu, B Clausen, DW Brown, Elastic moduli inheritance and the weakest link in bulk metallic glasses, Physical review letters, 108, 085501 (2012)	11	Journal article, High Impact, High Profile
15	Irina Pozdnyakova, Giovanni Bruno, Alexander M Efremov, Bjorn Clausen, Darren Hughes, Stress-Dependent Elastic Properties of Porous Microcracked Ceramics, Advanced Engineering Materials, 11, 1023-1029 (2009)	10	Journal article
16	DW Brown, MAM Bourke, B Clausen, DR Korzekwa, RC Korzekwa, RJ McCabe, TA Sisneros, DF Teter, Temperature and direction dependence of internal strain and texture evolution during deformation of uranium, Materials Science and Engineering: A, 512, 67-75 (2009)	10	Journal article
17	D Mari, B Clausen, MAM Bourke, K Buss, Measurement of residual thermal stress in WC--Co by neutron diffraction, International Journal of Refractory Metals and Hard Materials, 27, 282-287 (2009)	9	Journal article
18	Pierluigi Pagliaro, Michael B Prime, Bjorn Clausen, Manuel L Lovato, Bernardo Zuccarello, Known residual stress specimens using opposed indentation, Journal of Engineering Materials and Technology, 131, 031002 (2009)	9	Journal article
19	DW Brown, TA Sisneros, B Clausen, S Abeln, MAM Bourke, BG Smith, ML Steinzig, CN Tome, SC Vogel, Development of intergranular thermal residual stresses in beryllium during cooling from processing temperatures, Acta Materialia, 57, 972-979 (2009)	9	Journal article
20	P Pagliaro, MB Prime, JS Robinson, B Clausen, H Swenson, M Steinzig, B Zuccarello, Measuring inaccessible residual stresses using multiple methods and superposition, Experimental mechanics, 51, 1123-1134 (2011)	9	Journal article

21	S Cheng, J Xie, AD Stoica, X-L Wang, JA Horton, DW Brown, H Choo, PK Liaw, Cyclic deformation of nanocrystalline and ultrafine-grained nickel, Acta Materialia, 57, 1272-1280 (2009)	9	Journal article
22	AG Zhou, D Brown, S Vogel, O Yeheskel, MW Barsoum, On the kinking nonlinear elastic deformation of cobalt, Materials Science and Engineering: A, 527, 4664-4673 (2010)	9	Journal article
23	Sivom Manchiraju, Darrell Gaydosh, Othmane Benafan, Ronald Noebe, Raj Vaidyanathan, Peter M Anderson, Thermal cycling and isothermal deformation response of polycrystalline NiTi: Simulations vs. experiment, Acta Materialia, 59, 5238-5249 (2011)	9	Journal article
24	DW Brown, TM Holden, B Clausen, MB Prime, TA Sisneros, H Swenson, J Vaja, Critical comparison of two independent measurements of residual stress in an electron-beam welded uranium cylinder: neutron diffraction and the contour method, Acta Materialia, 59, 864-873 (2011)	8	Journal article
25	PJ Gibbs, E De Moor, MJ Merwin, B Clausen, JG Speer, DK Matlock, Austenite Stability Effects on Tensile Behavior of Manganese-Enriched-Austenite Transformation-Induced Plasticity Steel, Metallurgical and Materials Transactions A, 42, 3691-3702 (2011)	8	Journal article
26	SS Babu, Thermodynamic and kinetic models for describing microstructure evolution during joining of metals and alloys, International Materials Reviews, 54, 333-367 (2009)	8	Journal article
27	Gabor Ribarik, Tamas Ungar, Characterization of the microstructure in random and textured polycrystals and single crystals by diffraction line profile analysis, Materials Science and Engineering: A, 528, 112-121 (2010)	8	Journal article
28	G Bruno, AM Efremov, BR Wheaton, JE Webb, Microcrack orientation in porous aluminum titanate, Acta Materialia, 58, 6649-6655 (2010)	7	Journal article
29	Jeremy Watts, Greg Hilmas, William G Fahrenholtz, Don Brown, Bjorn Clausen, Measurement of thermal residual stresses in ZrB 2 --SiC composites, Journal of the European Ceramic Society, 31, 1811-1820 (2011)	7	Journal article
30	Wanchuck Woo, Tamas Ungar, Zhili Feng, Edward Kenik, Bjorn Clausen, X-ray and neutron diffraction measurements of dislocation density and subgrain size in a friction-stir-welded aluminum alloy, Metallurgical and Materials Transactions A, 41, 1210-1216 (2010)	6	Journal article
31	RM Manjeri, S Qiu, N Mara, A Misra, R Vaidyanathan, Superelastic response of [111] and [101] oriented NiTi micropillars, Journal of Applied Physics, 108, 023501-023501 (2010)	6	Journal article
32	Aaron Stebner, Xiujie Gao, Donald W Brown, L Catherine Brinson, Neutron diffraction studies and multivariant simulations of shape memory alloys: Empirical texture development--mechanical response relations of martensitic nickel--titanium, Acta Materialia, 59, 2841-2849 (2011)	6	Journal article
33	AK Kanjarla, RA Lebensohn, L Balogh, CN Tome, Study of internal lattice strain distributions in stainless steel using a full-field elasto-viscoplastic formulation based on fast Fourier transforms, Acta Materialia, 60, 3094-3106 (2012)	6	Journal article
34	GJ Fan, L Li, Bin Yang, H Choo, PK Liaw, TA Saleh, B Clausen, DW Brown, In situ neutron-diffraction study of tensile deformation of a bulk nanocrystalline alloy, Materials Science and Engineering: A, 506, 187-190 (2009)	5	Journal article
35	IC Noyan, A Brugger, R Betti, B Clausen, Measurement of strain/load transfer in parallel seven-wire strands with neutron diffraction, Experimental mechanics, 50, 265-272 (2010)	5	Journal article
36	W Woo, H Choo, Softening behaviour of friction stir welded Al 6061-T6 and Mg AZ31B alloys, Science and Technology of Welding & Joining, 16, 267-272 (2011)	5	Journal article
37	AD Krawitz, AM Venter, EF Drake, SB Luyckx, B Clausen, Phase response of WC--Ni to cyclic compressive loading and its relation to toughness, International Journal of Refractory Metals and Hard Materials, 27, 313-316 (2009)	4	Journal article
38	Zhenhua Luo, Bjorn Clausen, Sven C Vogel, Donald W Brown, Jennifer Russel, Mark	4	Journal article

	Hoffman, others, Dynamic processes of domain switching in lead zirconate titanate under cyclic mechanical loading by in situ neutron diffraction, Acta Materialia, 58, 1897-1908 (2010)		
39	G Proust, GC Kaschner, IJ Beyerlein, B Clausen, DW Brown, RJ McCabe, CN Tome, Detwinning of high-purity zirconium: in-situ neutron diffraction experiments, Experimental mechanics, 50, 125-133 (2010)	4	Journal article
40	D Balzar, NC Popa, S Vogel, Strain and stress tensors of rolled uranium plate by Rietveld refinement of TOF neutron-diffraction data, Materials Science and Engineering: A, 528, 122-126 (2010)	3	Journal article
41	JA Wollmershauser, CJ Neil, SR Agnew, Mechanisms of Ductility in CoTi and CoZr B2 Intermetallics, Metallurgical and Materials Transactions A, 41, 1217-1229 (2010)	3	Journal article
42	Xiujie Gao, Aaron Stebner, Donald W Brown, L Catherine Brinson, Neutron diffraction studies and multivariant simulations of shape memory alloys: Concurrent verification of texture development and mechanical response predictions, Acta Materialia, 59, 5924-5937 (2011)	3	Journal article
43	NA Mara, IJ Beyerlein, JS Carpenter, J Wang, Interfacially Driven Deformation Twinning in Bulk Ag-Cu Composites, JOM, 64, 1218-1226 (2012)	3	Journal article
44	TR Woodruff, VB Krishnan, B Clausen, T Sisneros, V Livescu, DW Brown, MAM Bourke, R Vaidyanathan, Design, implementation, and testing of a cryogenic loading capability on an engineering neutron diffractometer, Review of Scientific Instruments, 81, 063903-063903 (2010)	2	Journal article
45	E Garlea, B Clausen, EA Kenik, D Ciurchea, SC Vogel, JWL Pang, H Choo, Intergranular Strain Evolution in a Zircaloy-4 Alloy with Basketweave Morphology, Metallurgical and Materials Transactions A, 41, 1255-1260 (2010)	2	Journal article
46	RP Mulay, B Clausen, SR Agnew, In-Situ Neutron Diffraction Study of the Bauschinger Effect in B2 Structured CoZr, Metallurgical and Materials Transactions A, 42, 60-70 (2011)	2	Journal article
47	E-Wen Huang, Gabor Csiszar, Yu-Chieh Lo, Yu-Lih Huang, Wen-Jay Lee, Tamas Ungar, Peter K Liaw, Plastic Deformation of a Nano-Precipitate Strengthened Ni-Base Alloy Investigated by Complementary In Situ Neutron Diffraction Measurements and Molecular-Dynamics Simulations, Advanced Engineering Materials, 14, 902-908 (2012)	2	Journal article
48	JA Wollmershauser, B Clausen, SR Agnew, A slip system-based kinematic hardening model application to in situ neutron diffraction of cyclic deformation of austenitic stainless steel, International Journal of Fatigue, 36, 181-193 (2012)	2	Journal article
49	Elena Garlea, Hahn Choo, Gongyao Y Wang, Peter K Liaw, Bjorn Clausen, Donald W Brown, Jungwon Park, Philip D Rack, Edward A Kenik, Hydride-Phase Formation and its Influence on Fatigue Crack Propagation Behavior in a Zircaloy-4 Alloy, Metallurgical and Materials Transactions A, 41, 2816-2828 (2010)	2	Journal article
50	E-Wen Huang, Rozaliya I Barabash, Bjorn Clausen, Peter K Liaw, Cyclic-Loading Induced Lattice-Strain Asymmetry in Loading and Transverse Directions, Metallurgical and Materials Transactions A, 43, 1454-1461 (2012)	2	Journal article
51	Levente Balogh, Donald W Brown, Paula Mosbrucker, Fei Long, Mark R Daymond, Dislocation structure evolution induced by irradiation and plastic deformation in the Zr--2.5 Nb nuclear structural material determined by neutron diffraction line profile analysis, Acta Materialia, 60, 5567-5577 (2012)	1	Journal article
52	Ke An, Bjorn Clausen, Alexandru D Stoica, Beth L Armstrong, Harley D Skorpenske, Xun-Li Wang, In-situ neutron diffraction study of phase stress evolutions in a Ni-based porous anode solid oxide fuel cells under uniaxial load, Applied Physics A, 99, 579-584 (2010)	1	Journal article
53	Giovanni Bruno, Bryan R Wheaton, Bjorn Clausen, Thomas Sisneros, Micro-stress Partitioning in Porous and Microcracked Synthetic Cordierite, Scripta Materialia, null, 2-8 (2012)	1	Journal article
54	BD Poquette, TA Asare, JP Schultz, DW Brown, SL Kampe, Domain Reorientation as a Damping Mechanism in Ferroelastic-Reinforced Metal Matrix Composites, Metallurgical and Materials Transactions A, 42, 2833-2842 (2011)	1	Journal article

55	ZK Teng, Gautam Ghosh, Michael K Miller, Shenyan Huang, B Clausen, DW Brown, Peter K Liaw, Neutron-diffraction study and modeling of the lattice parameters of a NiAl-precipitate-strengthened Fe-based alloy, Acta Materialia, 60, 5362-5369 (2012)	1	Journal article
56	Catherine N Tupper, Don W Brown, Robert D Field, Thomas A Sisneros, Bjorn Clausen, Large Strain Deformation in Uranium 6 Wt Pct Niobium, Metallurgical and Materials Transactions A, 43, 520-530 (2012)	1	Journal article
57	O Benafan, SA Padula, RD Noebe, TA Sisneros, R Vaidyanathan, Role of B19 martensite deformation in stabilizing two-way shape memory behavior in NiTi, Journal of Applied Physics, 112, 093510-093510 (2012)	1	Journal article
58	AD Krawitz, EF Drake, B Clausen, The role of residual stress in the tension and compression response of WC--Ni, Materials Science and Engineering: A, 527, 3595-3601 (2010)	0	Journal article
59	M Shamma, V Presser, B Clausen, D Brown, O Yeheskel, S Amini, MW Barsoum, On the response of titanium sulfocarbide to stress studied by in situ neutron diffraction and the elastoplastic self-consistent approach, Scripta Materialia, 65, 573-576 (2011)	0	Journal article
60	Michael L Benson, Peter K Liaw, Hahn Choo, Donald W Brown, Mark R Daymond, Dwaine L Klarstrom, Strain-induced phase transformation in a cobalt-based superalloy during different loading modes, Materials Science and Engineering: A, 528, 6051-6058 (2011)	0	Journal article
61	B Clausen, DW Brown, MAM Bourke, TA Saleh, SA Maloy, In situ neutron diffraction and Elastic--Plastic Self-Consistent polycrystal modeling of HT-9, Journal of Nuclear Materials, 425, 228-232 (2012)	0	Journal article
62	W Woo, Z Feng, X--L Wang, K An, B Clausen, TA Sisneros, JS Jeong, In situ neutron diffraction analysis of grain structure during friction stir processing of an aluminum alloy, Materials Letters, null, 053901-053901 (2012)	0	Journal article
63	Saurabh Kabra, Donald W Brown, Ching-Fong Chen, Mr John O Milewski, Tim K Wong, Measurement and Simulation of Residual Strain in a Laser Welded Titanium Ring, Welding in the World, 56, 2-8 (2012)	0	Journal article
64	Shenyan Huang, Donald W Brown, Bjorn Clausen, Zhenke Teng, Yanfei Gao, Peter K Liaw, In Situ Neutron-Diffraction Studies on the Creep Behavior of a Ferritic Superalloy, Metallurgical and Materials Transactions A, 43, 1497-1508 (2012)	0	Journal article
65	VB Krishnan, SB Shmalo, CR Rathod, MAM Bourke, R. Vaidyanathan, Low temperature deformation of the R-phase in a NiTiFe shape memory alloy, Applied Physics Letters, 97, 091910 (2010)	0	Journal article, High Impact
66	ML Benson, B Reetz, PK Liaw, W Reimers, H Choo, DW Brown, TA Saleh, DL Klarstrom, Phase-transformation and subgrain-deformation characteristics in a cobalt-based superalloy, Materials Science and Engineering: A, 528, 1987-1993 (2011)	0	Journal article
67	O Benafan, RD Noebe, SA Padula II, R Vaidyanathan, Microstructural Response During Isothermal and Isobaric Loading of a Precipitation-Strengthened Ni-29.7 Ti-20Hf High-Temperature Shape Memory Alloy, Metallurgical and Materials Transactions A, 43, 4539-4552 (2012)	0	Journal article
68	RP Mulay, SR Agnew, Hard slip mechanisms in B2 CoTi, Acta Materialia, 60, 1784-1794 (2012)	0	Journal article

Flight Path 3—HIPD
High-Intensity Powder Diffractometer

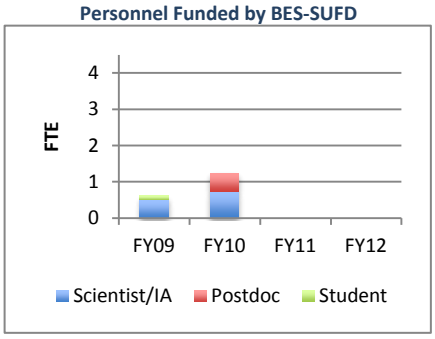
Beamline Description

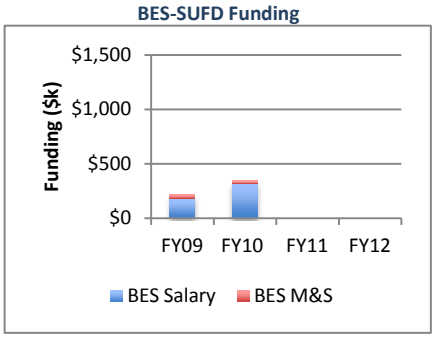
HIPD is a high-intensity powder diffractometer designed for studies of the atomic and magnetic structure of crystalline and noncrystalline powders. High counting rates are achieved because of its proximity to the neutron source (primary flight path approximately 9 m). The beam size at the sample position is 1 cm wide and 3 cm high. HIPD detectors are located at ±153°, ±90°, ±40° and ±14°, each covering ±5°, which allows over 2 decades of momentum transfer (0.2 to 60 $Å^{-1}$) and allows access to the largest d-spacings for powder diffraction at the Lujan Center. The configuration of the instrument, as well as its dedicated sample environment (e.g., 4 K–800 K top loading displex) makes it suitable for local structure studies (PDF) and ideal for study of magnetism, phase transitions, and large structure crystal studies, as well as parametric studies.

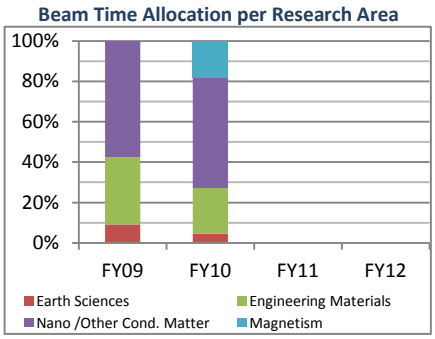
Note: Access to HIPD is limited to users who can provide their own support through scientific collaboration with Lujan Center staff.

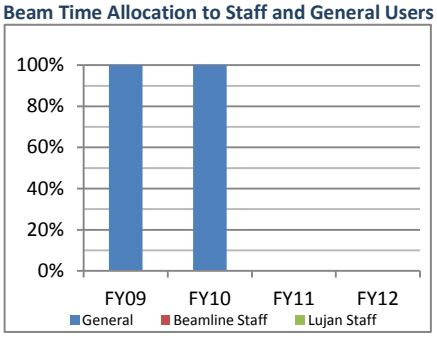
Target Scientific Audience

Condensed Matter Physics, Magnetism and Materials Sciences, Nanoscience and National Security Science, Solid State Chemistry









Beamline Specifications

Moderator	Chilled water (273 K), High intensity
Primary Flight Path	9 m
Secondary Flight Path	1 m
Q range/λ range/d-range	0.2 < Q < 60 $Å^{-1}$, 0.25 < d < 38 Å
Resolution	0.3-3%
Beam Size	1 ×x 3 cm^2
Flux Density	2.3×10^7 $n/cm^2/s$
Instrument Scientist-I	Dr. Anna Llobet (0%)
Instrument Scientist-II	
Instrument Assistant	
Operating Funds 2012 (k$)	$0
Allocation Percentages (General User/Beamline Staff/Facility Staff)	0%/0%/0%
# Users/Year (2 Year Average, Total/Unique Users)	13/12
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	42/44/0/0

Summary of HIPD Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	5 (5)	0	1	0(0)	0(0)
2010	4 (4)	5	3	0(0)	0(0)
2011	18 (17)	1	2	1(1)	1(1)
2012	16 (14)	3	0	0(0)	0(0)
Total	**43 (40)**	**9**	**6**	**1(1)**	**1(1)**

Complete List of HIPD Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Despina Louca, Kazumasa Horigane, Anna Llobet, Ryotaro Arita, Sungdae Ji, Naoyuki Katayama, Shun Konbu, Kazuma Nakamura, T-Y Koo, Peng Tong, others, Local atomic structure of superconducting FeSe_ 1- x Te_ x, Physical Review B, 81, 134524 (2010)	32	Journal article
2	JC Palmer, A Llobet, S-H Yeon, JE Fischer, Y Shi, Y Gogotsi, KE Gubbins, Modeling the structural evolution of carbide-derived carbons using quenched molecular dynamics, Carbon, 48, 1116-1123 (2010)	31	Journal article
3	Efrain E Rodriguez, Frederic Poineau, Anna Llobet, Brendan J Kennedy, Maxim Avdeev, Gordon J Thorogood, Melody L Carter, Ram Seshadri, David J Singh, Anthony K Cheetham, High Temperature Magnetic Ordering in the 4d Perovskite SrTcO3, Physical	27	Journal article, High Impact,

	Review Letters, 106, 067201 (2011)		High Profile
4	JM Caron, JR Neilson, DC Miller, A Llobet, TM McQueen, Iron displacements and magnetoelastic coupling in the antiferromagnetic spin-ladder compound BaFe2Se3, Physical Review B, 84, 180409 (2011)	12	Journal article
5	Claire E White, John L Provis, Anna Llobet, Thomas Proffen, Jannie SJ van Deventer, Evolution of Local Structure in Geopolymer Gels: An In Situ Neutron Pair Distribution Function Analysis, Journal of the American Ceramic Society, 94, 3532-3539 (2011)	10	Journal article
6	Efrain E Rodriguez, Anna Llobet, Thomas Proffen, Brent C Melot, Ram Seshadri, Peter B Littlewood, Anthony K Cheetham, The role of static disorder in negative thermal expansion in ReO3, Journal of Applied Physics, 105, 114901-114901 (2009)	9	Journal article
7	James R Neilson, Anna Llobet, Andreas V Stier, Liang Wu, Jiajia Wen, Jing Tao, Yimei Zhu, Zlatko B Tesanovic, NP Armitage, Tyrel M McQueen, Mixed-valence-driven heavy-fermion behavior and superconductivity in KNi2Se2, Physical Review B, 86, 054512 (2012)	7	Journal article
8	Daniel P Shoemaker, Efrain E Rodriguez, Ram Seshadri, Ivana Sabaj Abumohor, Thomas Proffen, Intrinsic exchange bias in Zn_ x Mn_ 3- x O_ 4(x 1) solid solutions, Physical Review B, 80, 144422 (2009)	7	Journal article
9	C Ma, JQ Yan, KW Dennis, A Llobet, RW McCallum, X Tan, Effect of oxygen content on the magnetic properties of multiferroic YMn2O5+ delta , Journal of Physics: Condensed Matter, 21, 346002 (2009)	6	Journal article
10	Claire E White, John L Provis, Laura E Gordon, Daniel P Riley, Thomas Proffen, Jannie SJ van Deventer, Effect of temperature on the local structure of kaolinite intercalated with potassium acetate, Chemistry of Materials, 23, 188-199 (2010)	5	Journal article
11	I Levin, JC Woicik, A Llobet, MG Tucker, V Krayzman, J Pokorny, IM Reaney, Displacive Ordering Transitions in Perovskite-Like AgNb1/2Ta1/2O3, Chemistry of Materials, 22, 4987-4995 (2010)	5	Journal article
12	Despina Louca, Jiaqiang Yan, Anna Llobet, Ryotaro Arita, Suppression of superconductivity in Fe chalcogenides by annealing: A reverse effect to pressure, Physical Review B, 84, 054522 (2011)	5	Journal article
13	JM Caron, JR Neilson, DC Miller, K Arpino, A Llobet, TM McQueen, Orbital-selective magnetism in the spin-ladder iron selenides Ba_ 1- x K_ x Fe_ 2 Se_ 3, Physical Review B, 85, 180405 (2012)	5	Journal article
14	Gunda Santosh Babu, Matjaz Valant, Katharine Page, Anna Llobet, Taras Kolodiazhnyi, Anna-Karin Axelsson, New (Bi1. 88Fe0. 12)(Fe1. 42Te0. 58) O6. 87 Pyrochlore with Spin-Glass Transition, Chemistry of Materials, 23, 2619-2625 (2011)	4	Journal article
15	DJ Safarik, T Klimczuk, A Llobet, DD Byler, JC Lashley, JR OBrien, NR Dilley, Localized anharmonic rattling of Al atoms in VAl_ 10.1, Physical Review B, 85, 014103 (2012)	4	Journal article
16	I-K Jeong, Seunghun Lee, Se-Young Jeong, CJ Won, N Hur, A Llobet, Structural evolution across the insulator-metal transition in oxygen-deficient BaTiO3-delta studied using neutron total scattering and Rietveld analysis, Physical Review B, 84, 064125 (2011)	3	Journal article
17	Haitao Gao, Anna Llobet, Joachim Barth, Jurgen Winterlik, Claudia Felser, Martin Panthofer, Wolfgang Tremel, Structure-property relations in the distorted ordered double perovskite Sr_ 2 InReO_ 6, Physical Review B, 83, 134406 (2011)	3	Journal article
18	J-Q Yan, J-S Zhou, JG Cheng, JB Goodenough, Y Ren, A Llobet, RJ McQueeney, Spin and orbital ordering in Y_ 1- x La_ x VO_ 3, Physical Review B, 84, 214405 (2011)	3	Journal article
19	Eric J Peterson, Barr Halevi, Boris Kiefer, Michael N Spilde, Abhaya K Datye, Joe Peterson, Luc Daemen, Anna Llobet, Heinz Nakotte, Aerosol synthesis and Rietveld analysis of tetragonal (beta _1_) PdZn, Journal of Alloys and Compounds, 509, 1463-1470 (2011)	3	Journal article
20	Yusheng Zhao, Jianzhong Zhang, Hongwu Xu, Konstantin A Lokshin, Duanwei He, Jiang Qian, Cristian Pantea, Luke L Daemen, Sven C Vogel, Yang Ding, others, High-pressure neutron diffraction studies at LANSCE, Applied Physics A, 99, 585-599 (2010)	2	Journal article
21	Joshua A Kurzman, Stephanie L Moffitt, Anna Llobet, Ram Seshadri, Neutron diffraction study of La _ 4LiAuO 8: Understanding Au< sup> 3+</sup> in an oxide	2	Journal article

	environment, Journal of Solid State Chemistry, 184, 1439-1444 (2011)		
22	James R Neilson, Daniel E Morse, Brent C Melot, Daniel P Shoemaker, Joshua A Kurzman, Ram Seshadri, Understanding complex magnetic order in disordered cobalt hydroxides through analysis of the local structure, Physical Review B, 83, 094418 (2011)	2	Journal article
23	Graham King, Rebecca A Ricciardo, Jennifer R Soliz, Patrick M Woodward, Anna Llobet, Linking local structure and properties in perovskites containing equal concentrations of manganese and ruthenium, Physical Review B, 83, 134123 (2011)	2	Journal article
24	Walid Dachraoui, Tao Yang, Chang Liu, Graham King, Joke Hadermann, Gustaaf Van Tendeloo, Anna Llobet, Martha Greenblatt, Short-Range Layered A-Site Ordering in Double Perovskites NaLaBB O6 (B= Mn, Fe; B= Nb, Ta), Chemistry of Materials, 23, 2398-2406 (2011)	2	Journal article
25	John L Provis, Ailar Hajimohammadi, Claire E White, Susan A Bernal, Rupert J Myers, Robert P Winarski, Volker Rose, Thomas E Proffen, Anna Llobet, Jannie SJ van Deventer, Nanostructural characterization of geopolymers by advanced beamline techniques, Cement and Concrete Composites, null, 054512 (2012)	2	Journal article
26	Daniel P Shoemaker, Duck Young Chung, Helmut Claus, Melanie C Francisco, Sevda Avci, Anna Llobet, Mercouri G Kanatzidis, Phase relations in K_ x Fe_ 2- y Se_ 2 and the structure of superconducting K_ x Fe_ 2 Se_ 2 via high-resolution synchrotron diffraction, Physical Review B, 86, 184511 (2012)	2	Journal article
27	Chinnathambi Karthik, Thomas J Anderson, Delphine Gout, Rick Ubic, Transmission electron microscopic study of pyrochlore to defect-fluorite transition in rare-earth pyrohafnates, Journal of Solid State Chemistry, 194, 168-172 (2012)	1	Journal article
28	Keeseong Park, Despina Louca, Anna Llobet, J-Q Yan, Evidence of local disorder in the overdoped regime of Ba (Fe_ 1-x Co_ x) _ 2 As_ 2, Physical Review B, 84, 024512 (2011)	1	Journal article
29	Jie Ma, J-Q Yan, SO Diallo, R Stevens, A Llobet, F Trouw, DL Abernathy, MB Stone, RJ McQueeney, Role of magnetic exchange energy on charge ordering in R_ 1/3 Sr_ 2/3 FeO_ 3(R= La, Pr, andNd), Physical Review B, 84, 224115 (2011)	1	Journal article
30	Wei Guo, Wojciech Dmowski, Ji-Yong Noh, Philip Rack, Peter K Liaw, Takeshi Egami, Local Atomic structure of a high-entropy alloy: an X-ray and neutron scattering study, Metallurgical and Materials Transactions A, null, 1-4 (2012)	1	Journal article
31	Wojtek Dmowski, Cristian I Contescu, Anna Llobet, Nidia C Gallego, Takeshi Egami, Local Atomic Density of Microporous Carbons, The Journal of Physical Chemistry C, 116, 2946-2951 (2012)	1	Journal article
32	Graham King, Kyle J Thomas, Anna Llobet, Drastic Differences between the Local and the Average Structures of Sr2MSbO5. 5 (M= Ca, Sr, Ba) Oxygen-Deficient Double Perovskites, Inorganic chemistry, 51, 13060-13068 (2012)	1	Journal article
33	T Klimczuk, CH Wang, Qiang Xu, J Lawrence, T Durakiewicz, F Ronning, A Llobet, ED Bauer, JC Griveau, W Sadowski, others, Crystal growth of CsCl-type Yb_0.24_ Sn_0.76_ Ru, Journal of Crystal Growth, 318, 1005-1008 (2011)	1	Journal article
34	DJ Safarik, A Llobet, JC Lashley, Harmonic Debye-Waller analysis of anharmonic vibrations, Physical Review B, 85, 174105 (2012)	1	Journal article
35	Graham King, Farshid Ramezanipour, Anna Llobet, John E Greedan, Local Structures of Sr2FeMnO5+ y(y= 0, 0.5) and Sr2Fe1.5Cr0.5O5 from Reverse Monte Carlo Modeling of Pair Distribution Function Data and Implications for Magnetic Order, Journal of Solid State Chemistry, null, 166-173 (2012)	0	Journal article
36	Karunakar Kothapalli, Farzana Nasreen, Joe Peterson, Heinz Nakotte, Sami El-Khatib, Sven C Vogel, Anna Llobet, Helmut Reiche, Ian Swainson, Ekkehard Bruck, Effect of temperature on hybridization and magnetism in UPdSn and UCuSn, Journal of Applied Physics, 105, 07E121-07E121 (2009)	0	Journal article
37	F Trouw, JJ Rhyne, JN Mitchell, Pu neutron scattering studies--Magnetism and structure, Journal of Nuclear Materials, 385, 35-37 (2009)	0	Journal article
38	T Klimczuk, CH Wang, JM Lawrence, Qiang Xu, T Durakiewicz, F Ronning, A Llobet, F Trouw, N Kurita, Y Tokiwa, others, Crystal fields, disorder, and antiferromagnetic	0	Journal article

	short-range order in Yb_ 0.24 Sn_ 0.76 Ru, Physical Review B, 84, 075152 (2011)		
39	I-K Jeong, Seunghun Lee, A Llobet, Local structural disorder in Zn0.9Co0.1 O nanocrystals studied using neutron total scattering analysis, Journal of Applied Physics, 112, 073523-073523 (2012)	0	Journal article
40	Ching-Fong Chen, Anna Llobet, Geoff L Brennecka, Robert T Forsyth, Dennis R Guidry, Pallas A Papin, Rodney J McCabe, Powder Synthesis and Hot-Pressing of a LiTaO3 Ceramic, Journal of the American Ceramic Society, 95, 2820-2826 (2012)	0	Journal article
41	Qing Jie, Rongwei Hu, Emil Bozin, A Llobet, I Zaliznyak, C Petrovic, Q Li, Electronic thermoelectric power factor and metal-insulator transition in FeSb_ 2, Physical Review B, 86, 115121 (2012)	0	Journal article
42	Peng Tong, Despina Louca, Gongyao Wang, Peter K Liaw, Yoshihiko Yokoyama, Anna Llobet, Hiroshi Kawaji, Yiming Qiu, Yunfeng Shi, Structural Irreversibility and Enhanced Brittleness under Fatigue in Zr-Based Amorphous Solids, Metals, 2, 529-539 (2012)	0	Journal article
43	I-K Jeong, Seunghun Lee, A Llobet, Local structural disorder in Zn0. 9Co0. 1O nanocrystals studied using neutron total scattering analysis, Journal of Applied Physics, 112, 073523 (2012)	0	Journal article

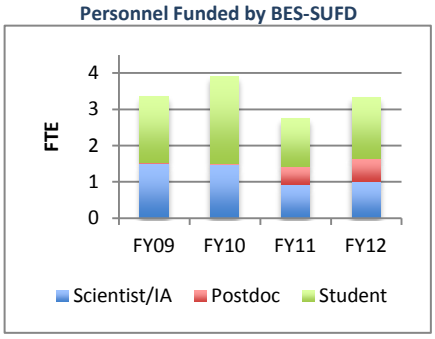
Flight Path 4—HIPPO
High-Pressure-Preferred Orientation Diffractometer

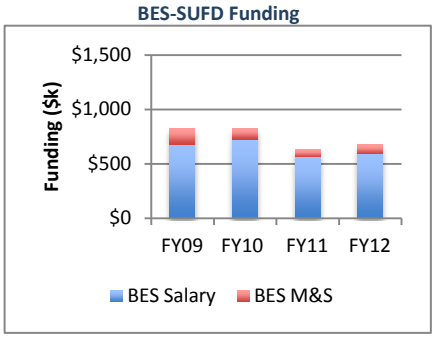
Beamline Description

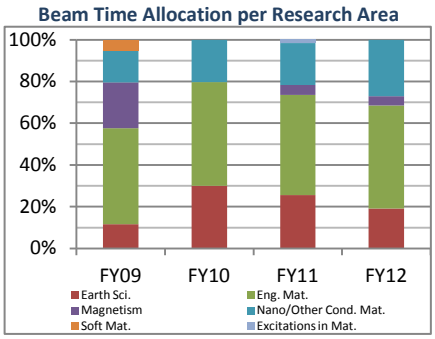
HIPPO is a general-purpose neutron TOF powder diffractometer. The short primary flight path provides a high neutron flux at the sample position. Presently, 1240 ^{3}He detector tubes are arranged on 53 detector panels on 5 rings with nominal diffraction angles between 40° to 144°. The combination of high flux and large detector coverage makes HIPPO very efficient for the acquisition of datasets for crystal structure refinements and allows for kinetic studies with temporal resolutions of the orders of minutes or better. The large number of detector panels probes many sample directions simultaneously, allowing measurement of the orientation distribution (texture) of grains in a polycrystalline aggregate with only two or three sample rotations around the vertical axis. A large number of sample environments for HIPPO allow investigations of crystal structure, phase composition, or texture at temperatures above and below room temperature, at high pressures, under applied uni-axial load, or in a magnetic field. Besides conventional Rietveld analysis, PDF analysis or MEM analysis has been successfully applied to HIPPO data.

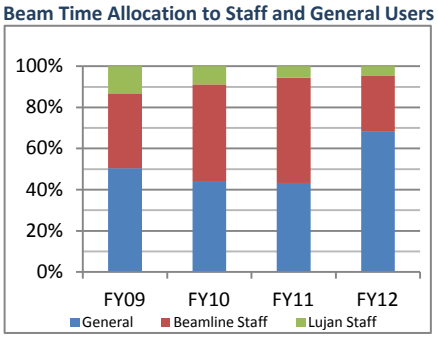
Target Scientific Audience

Condensed Matter Physics, Materials Sciences, National Security Science, Engineering Science, Geosciences, and Nanoscience









Beamline Specifications

Moderator	Chilled water (273 K), high intensity
Primary Flight Path	8.8 m
Secondary Flight Path	0.7-1 m
Q range/λ range/d-range	0.13Å < d < 22 Å
Resolution	0.4% to 9.2%
Beam Size	3-10 mm diameter
Flux Density	2.3×10^{7} n/cm2/s
Instrument Scientist-I	Dr. Sven Vogel (74%)
Instrument Scientist-II	Dr. Jianzhong Zhang (27%)
Instrument Assistant	
Operating Funds 2012 (k$)	$1,489
Allocation Percentages (General User/Beamline Staff/Facility Staff)	52%/40%/8%
# Users/Year (4 Year Average, Total/Unique Users)	59/38
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	72/90/98/65

Summary of HIPPO Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	14 (10)	2	1	0(0)	0(0)
2010	29 (22)	6	1	0(0)	0(0)
2011	11 (6)	5	2	0(0)	1(0)
2012	29 (26)	3	2	0(0)	1(0)
Total	**83 (64)**	**16**	**6**	**0(0)**	**2(0)**

Complete List of HIPPO Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Michael E Nixon, Oana Cazacu, Ricardo A Lebensohn, Anisotropic response of high-purity alpha -titanium: Experimental characterization and constitutive modeling, International Journal of Plasticity, 26, 516-532 (2010)	39	Journal article
2	CJ Neil, JA Wollmershauser, B Clausen, CN Tome, SR Agnew, Modeling lattice strain evolution at finite strains and experimental verification for copper and stainless steel using< i> in situ</i> neutron diffraction, International Journal of Plasticity, 26, 1772-1791 (2010)	26	Journal article
3	O Muransky, MR Barnett, DG Carr, SC Vogel, EC Oliver, Investigation of deformation twinning in a fine-grained and coarse-grained ZM20 Mg alloy: Combined< i> in situ</i> neutron diffraction and acoustic emission, Acta materialia, 58, 1503-1517	25	Journal article

	(2010)		
4	PJM Monteiro, AP Kirchheim, S Chae, Peter Fischer, AA MacDowell, Eirc Schaible, HR Wenk, Characterizing the nano and micro structure of concrete to improve its durability, Cement and Concrete Composites, 31, 577-584 (2009)	22	Journal article
5	P Hosemann, C Vieh, RR Greco, S Kabra, JA Valdez, MJ Cappiello, SA Maloy, Nanoindentation on ion irradiated steels, Journal of Nuclear Materials, 389, 239-247 (2009)	21	Journal article
6	H-R Wenk, L Lutterotti, SC Vogel, Rietveld texture analysis from TOF neutron diffraction data, Powder Diffraction, 25, 283-296 (2010)	21	Journal article
7	Pedro Gorria, David Martinez-Blanco, Maria J Perez, Jesus A Blanco, Antonio Hernando, Maria A Laguna-Marco, Daniel Haskel, N Souza-Neto, Ronald I Smith, William, WG Marshall, G Garbarino, M Mezouar, A Fernandez-Martinez, J Chaboy, LF Barquin, JAR Castrillon, M Moldovan, JIG Alonso, JH Zhang, Anna Llobet, JS Jiang, Stress-induced large Curie temperature enhancement in Fe_ 64 Ni_ 36 Invar alloy, Physical Review B, 80, 064421 (2009)	20	Journal article
8	DW Brown, IJ Beyerlein, TA Sisneros, B Clausen, CN Tome, Role of twinning and slip during compressive deformation of beryllium as a function of strain rate, International Journal of Plasticity, 29, 120-135 (2012)	19	Journal article
9	GG Yapici, CN Tome, IJ Beyerlein, I Karaman, SC Vogel, C Liu, Plastic flow anisotropy of pure zirconium after severe plastic deformation at room temperature, Acta Materialia, 57, 4855-4865 (2009)	16	Journal article
10	Q Ma, H El Kadiri, AL Oppedal, JC Baird, B Li, MF Horstemeyer, SC Vogel, Twinning effects in a rod-textured AM30 Magnesium alloy, International Journal of Plasticity, 29, 60-76 (2012)	16	Journal article
11	B Ye, BS Majumdar, I Dutta, Texture development and strain hysteresis in a NiTi shape-memory alloy during thermal cycling under load, Acta Materialia, 57, 2403-2417 (2009)	15	Journal article
12	O Muransky, MR Barnett, V Luzin, S Vogel, On the correlation between deformation twinning and Luders-like deformation in an extruded Mg alloy:< i> In situ</i> neutron diffraction and EPSC. 4 modelling, Materials Science and Engineering: A, 527, 1383-1394 (2010)	15	Journal article
13	JS Carpenter, SC Vogel, JE LeDonne, DL Hammon, IJ Beyerlein, NA Mara, Bulk texture evolution of Cuâ€"Nb nanolamellar composites during accumulative roll bonding, Acta Materialia, 60, 1576-1586 (2012)	15	Journal article
14	Zhenzhen Yu, Hahn Choo, Zhili Feng, Sven C Vogel, Influence of thermo-mechanical parameters on texture and tensile behavior of friction stir processed Mg alloy, Scripta Materialia, 63, 1112-1115 (2010)	13	Journal article
15	J Frantti, Y Fujioka, J Zhang, SC Vogel, Y Wang, Y Zhao, RM Nieminen, The factors behind the morphotropic phase boundary in piezoelectric perovskites, The Journal of Physical Chemistry B, 113, 7967-7972 (2009)	12	Journal article
16	MR Daymond, RA Holt, S Cai, P Mosbrucker, SC Vogel, Texture inheritance and variant selection through an hcp--bcc--hcp phase transformation, Acta Materialia, 58, 4053-4066 (2010)	12	Journal article
17	J Gomez Barreiro, JR Martinez Catalan, Dave Prior, H-R Wenk, S Vogel, F Diaz Garcia, R Arenas, S Sanchez Martinez, Ivan Lonardelli, Fabric development in a middle Devonian intraoceanic subduction regime: the Careon ophiolite (northwest Spain), The Journal of geology, 118, 163-186 (2010)	12	Journal article
18	S Cai, MR Daymond, RA Holt, MA Gharghouri, EC Oliver, Evolution of interphase and intergranular stresses in Zr--2.5 Nb during room temperature deformation, Materials Science and Engineering: A, 501, 166-181 (2009)	11	Journal article
19	DW Brown, MAM Bourke, B Clausen, DR Korzekwa, RC Korzekwa, RJ McCabe, TA Sisneros, DF Teter, Temperature and direction dependence of internal strain and texture evolution during deformation of uranium, Materials Science and Engineering: A, 512, 67-75 (2009)	10	Journal article
20	S Roy, E Blackburn, SM Valvidares, MR Fitzsimmons, SC Vogel, M Khan, I Dubenko, S	10	Journal article

	Stadler, N Ali, SK Sinha, others, Delocalization and hybridization enhance the magnetocaloric effect in Cu-doped Ni_ 2 MnGa, Physical Review B, 79, 235127 (2009)		
21	AL Oppedal, H El Kadiri, CN Tome, GC Kaschner, Sven C Vogel, JC Baird, MF Horstemeyer, Effect of dislocation transmutation on modeling hardening mechanisms by twinning in magnesium, International Journal of Plasticity, 30, 41-61 (2012)	10	Journal article
22	DW Brown, TA Sisneros, B Clausen, S Abeln, MAM Bourke, BG Smith, ML Steinzig, CN Tome, SC Vogel, Development of intergranular thermal residual stresses in beryllium during cooling from processing temperatures, Acta Materialia, 57, 972-979 (2009)	9	Journal article
23	AG Zhou, D Brown, S Vogel, O Yeheskel, MW Barsoum, On the kinking nonlinear elastic deformation of cobalt, Materials Science and Engineering: A, 527, 4664-4673 (2010)	9	Journal article
24	TA Sisneros, DW Brown, B Clausen, DC Donati, S Kabra, WR Blumenthal, SC Vogel, Influence of strain rate on mechanical properties and deformation texture of hot-pressed and rolled beryllium, Materials Science and Engineering: A, 527, 5181-5188 (2010)	9	Journal article
25	Mark A Rodriguez, Mark H Van Benthem, David Ingersoll, Sven C Vogel, Helmut M Reiche, In situ analysis of LiFePO4 batteries: Signal extraction by multivariate analysis, Powder Diffraction, 25, 143-148 (2010)	9	Journal article
26	Sivom Manchiraju, Darrell Gaydosh, Othmane Benafan, Ronald Noebe, Raj Vaidyanathan, Peter M Anderson, Thermal cycling and isothermal deformation response of polycrystalline NiTi: Simulations vs. experiment, Acta Materialia, 59, 5238-5249 (2011)	9	Journal article
27	Xiao-Ming Wang, Chun-Hai Wang, Xiao-Jun Kuang, Ru-Qiang Zou, Ying-Xia Wang, Xi-Ping Jing, Promising Oxonitridosilicate Phosphor Host Sr3Si2O4N2: Synthesis, Structure, and Luminescence Properties Activated by Eu2+ and Ce3+/Li+ for pc-LEDs, Inorganic chemistry, 51, 3540-3547 (2012)	9	Journal article
28	Hans-Rudolf Wenk, N Barton, M Bortolotti, SC Vogel, M Voltolini, GE Lloyd, GB Gonzalez, Dauphine twinning and texture memory in polycrystalline quartz. Part 3: texture memory during phase transformation, Physics and Chemistry of Minerals, 36, 567-583 (2009)	8	Journal article
29	Nina J Lane, Sven C Vogel, Michel W Barsoum, High-temperature neutron diffraction and the temperature-dependent crystal structures of the MAX phases Ti_ 3 SiC_ 2 and Ti_ 3 GeC_ 2, Physical Review B, 82, 174109 (2010)	8	Journal article
30	JS Carpenter, X Liu, A Darbal, NT Nuhfer, RJ McCabe, SC Vogel, JE LeDonne, AD Rollett, K Barmak, IJ Beyerlein, others, A Comparison of Texture Results Obtained using Precession Electron Diffraction and Neutron Diffraction Methods at Diminishing Length Scales in Ordered Bi-Metallic Nanolamellar Composites, Scripta Materialia, null, 41-61 (2012)	8	Journal article
31	Vilas G Pol, Swati V Pol, Aharon Gedanken, Dry Autoclaving for the Nanofabrication of Sulfides, Selenides, Borides, Phosphides, Nitrides, Carbides, and Oxides, Advanced Materials, 23, 1179-1190 (2011)	8	Journal article, High Impact
32	G Bruno, AM Efremov, BR Wheaton, JE Webb, Microcrack orientation in porous aluminum titanate, Acta Materialia, 58, 6649-6655 (2010)	7	Journal article
33	Ravhi S Kumar, Xuezhi Ke, Jianzhong Zhang, Zhijun Lin, Sven C Vogel, Monika Hartl, Stanislav Sinogeikin, Luke Daemen, Andrew L Cornelius, Changfeng Chen, others, Pressure induced structural changes in the potential hydrogen storage compound ammonia borane: A combined X-ray, neutron and theoretical investigation, Chemical Physics Letters, 495, 203-207 (2010)	7	Journal article
34	Nina J Lane, Sven C Vogel, Michel W Barsoum, Temperature-Dependent Crystal Structures of Ti2AlN and Cr2GeC as Determined from High Temperature Neutron Diffraction, Journal of the American Ceramic Society, 94, 3473-3479 (2011)	7	Journal article
35	Aaron Stebner, Xiujie Gao, Donald W Brown, L Catherine Brinson, Neutron diffraction studies and multivariant simulations of shape memory alloys: Empirical texture development--mechanical response relations of martensitic nickel--titanium,	6	Journal article

	Acta Materialia, 59, 2841-2849 (2011)		
36	F Stein, SC Vogel, M Eumann, M Palm, Determination of the crystal structure of the< i> </i> phase in the Fe--Al system by high-temperature neutron diffraction, Intermetallics, 18, 150-156 (2010)	6	Journal article
37	MH Braga, JJA Ferreira, J Siewenie, Th Proffen, SC Vogel, LL Daemen, Neutron powder diffraction and first-principles computational studies of CuLixMg2-x(x>0.08), CuMg2, and Cu2Mg, Journal of Solid State Chemistry, 183, 10-19 (2010)	5	Journal article
38	HM Reiche, SC Vogel, A versatile automated sample changer for texture measurements on the high pressure-preferred orientation neutron diffractometer, Review of Scientific Instruments, 81, 093302-093302 (2010)	5	Journal article
39	Sven C Vogel, Frank Stein, Martin Palm, Investigation of the varepsilon phase in the Fe--Al system by high-temperature neutron diffraction, Applied Physics A, 99, 607-611 (2010)	5	Journal article
40	Hongwu Xu, Yusheng Zhao, Sven C Vogel, Donald D Hickmott, Luke L Daemen, Monika A Hartl, Thermal expansion and decomposition of jarosite: a high-temperature neutron diffraction study, Physics and Chemistry of Minerals, 37, 73-82 (2010)	5	Journal article
41	Zhenhua Luo, Bjorn Clausen, Sven C Vogel, Donald W Brown, Jennifer Russel, Mark Hoffman, others, Dynamic processes of domain switching in lead zirconate titanate under cyclic mechanical loading by in situ neutron diffraction, Acta Materialia, 58, 1897-1908 (2010)	4	Journal article
42	Hans-Rudolf Wenk, Christoph Janssen, Thomas Kenkmann, Georg Dresen, Mechanical twinning in quartz: Shock experiments, impact, pseudotachylites and fault breccias, Tectonophysics, 510, 69-79 (2011)	4	Journal article
43	Rozaliya I Barabash, E-Wen Huang, James J Wall, James H Wilkerson, Yang Ren, Wenjun Liu, Sven C Vogel, Gene E Ice, Lee M Pike, Peter K Liaw, Texture crossover: Trace from multiple grains to a subgrain, Materials Science and Engineering: A, 528, 3-10 (2010)	4	Journal article
44	Shanmin Wang, Xiaohui Yu, Jianzhong Zhang, Miao Chen, Jinlong Zhu, Liping Wang, Duanwei He, Zhijun Lin, Ruifeng Zhang, Kurt Leinenweber, others, Experimental invalidation of phase-transition-induced elastic softening in CrN, Physical Review B, 86, 064111 (2012)	4	Journal article
45	HM Reiche, SC Vogel, P Mosbrucker, EJ Larson, MR Daymond, A furnace with rotating load frame for in situ high temperature deformation and creep experiments in a neutron diffraction beam line, Review of Scientific Instruments, 83, 053901-053901 (2012)	3	Journal article
46	D Balzar, NC Popa, S Vogel, Strain and stress tensors of rolled uranium plate by Rietveld refinement of TOF neutron-diffraction data, Materials Science and Engineering: A, 528, 122-126 (2010)	3	Journal article
47	JA Wollmershauser, CJ Neil, SR Agnew, Mechanisms of Ductility in CoTi and CoZr B2 Intermetallics, Metallurgical and Materials Transactions A, 41, 1217-1229 (2010)	3	Journal article
48	Xiujie Gao, Aaron Stebner, Donald W Brown, L Catherine Brinson, Neutron diffraction studies and multivariant simulations of shape memory alloys: Concurrent verification of texture development and mechanical response predictions, Acta Materialia, 59, 5924-5937 (2011)	3	Journal article
49	Alexander M Efremov, Giovanni Bruno, Bryan R Wheaton, Texture coefficients for the simulation of cordierite thermal expansion: A comparison of different approaches, Journal of the European Ceramic Society, 31, 281-290 (2011)	3	Journal article
50	JR Santisteban, MA Vicente-Alvarez, P Vizcaino, AD Banchik, SC Vogel, AS Tremsin, JV Vallerga, JB McPhate, E Lehmann, W Kockelmann, Texture imaging of zirconium based components by total neutron cross-section experiments, Journal of Nuclear Materials, 425, 218-227 (2012)	3	Journal article
51	RWL Fong, R Miller, HJ Saari, SC Vogel, Crystallographic Texture and Volume Fraction of alpha and beta Phases in Zr-2.5 Nb Pressure Tube Material During Heating and Cooling, Metallurgical and Materials Transactions A, 43, 806-821 (2012)	3	Journal article

52	E Garlea, B Clausen, EA Kenik, D Ciurchea, SC Vogel, JWL Pang, H Choo, Intergranular Strain Evolution in a Zircaloy-4 Alloy with Basketweave Morphology, Metallurgical and Materials Transactions A, 41, 1255-1260 (2010)	2	Journal article
53	RP Mulay, B Clausen, SR Agnew, In-Situ Neutron Diffraction Study of the Bauschinger Effect in B2 Structured CoZr, Metallurgical and Materials Transactions A, 42, 60-70 (2011)	2	Journal article
54	JA Wollmershauser, B Clausen, SR Agnew, A slip system-based kinematic hardening model application to in situ neutron diffraction of cyclic deformation of austenitic stainless steel, International Journal of Fatigue, 36, 181-193 (2012)	2	Journal article
55	Yusheng Zhao, Jianzhong Zhang, Hongwu Xu, Konstantin A Lokshin, Duanwei He, Jiang Qian, Cristian Pantea, Luke L Daemen, Sven C Vogel, Yang Ding, others, High-pressure neutron diffraction studies at LANSCE, Applied Physics A, 99, 585-599 (2010)	2	Journal article
56	Nadine Rademacher, Lkhamsuren Bayarjargal, Alexandra Friedrich, Wolfgang Morgenroth, Miguel Avalos-Borja, Sven C Vogel, Th Proffen, Bjorn Winkler, Decomposition of W (CO) 6 at high pressures and temperatures, Journal of Applied Crystallography, 44, 820-830 (2011)	2	Journal article
57	PG Xu, Y Tomota, SC Vogel, T Suzuki, M Yonemura, T Kamiyama, Transformation Strain and Texture Evolution during Diffusional Phase Transformation of Low Alloy Steels Studied by Neutron Diffraction, Reviews on Advanced Materials Science, 33, 820-830 (2012)	2	Journal article
58	H Wang, B Clausen, CN Tome, PD Wu, Studying the effect of stress relaxation and creep on lattice strain evolution of stainless steel under tension, Acta Materialia, null, 773-776 (2012)	2	Journal article
59	LM Keller, Michael Stipp, The single-slip hypothesis revisited: Crystal-preferred orientations of sheared quartz aggregates with increasing strain in nature and numerical simulation, Journal of Structural Geology, 33, 1491-1500 (2011)	2	Journal article
60	Jiantao Han, Jinlong Zhu, Yutao Li, Xiaohui Yu, Shanmin Wang, Gang Wu, Hui Xie, Sven C Vogel, Fujio Izumi, Koichi Momma, others, Experimental visualization of lithium conduction pathways in garnet-type Li7La3Zr2O12, Chemical Communications, 48, 9840-9842 (2012)	1	Journal article
61	H-R Wenk, RN Vasin, H Kern, S Matthies, SC Vogel, TI Ivankina, Revisiting elastic anisotropy of biotite gneiss from the Outokumpu scientific drill hole based on new texture measurements and texture-based velocity calculations, Tectonophysics, null, 9840-9842 (2012)	1	Journal article
62	Nina J Lane, Sven C Vogel, Gilles Hug, Atsushi Togo, Laurent Chaput, Lars Hultman, Michel W Barsoum, Neutron diffraction measurements and first-principles study of thermal motion of atoms in select M_ n+ 1 AX_ n and binary MX transition-metal carbide phases, Physical Review B, 86, 214301 (2012)	1	Journal article
63	M Fabian, E Svab, V Pamukchieva, A Szekeres, P Petrik, S Vogel, U Ruett, Study of AsSeTe glasses by neutron-, X-ray diffraction and optical spectroscopic methods, Journal of Non-Crystalline Solids, 358, 860 (2012)	1	Journal article
64	Yasushi Idemoto, Naoto Kitamura, Kenichiro Ueki, Sven C Vogel, Yoshiharu Uchimoto, Average and Local Structure Analyses of Li (Mn1/3Ni1/3Co1/3- xAlx) O2 Using Neutron and Synchrotron X-ray Sources, Journal of The Electrochemical Society, 159, A673-A677 (2012)	1	Journal article
65	J Frantti, Y Fujioka, J Zhang, S Wang, SC Vogel, RM Nieminen, AM Asiri, Y Zhao, AY Obaid, IA Mkhalid, High-pressure neutron study of the morphotropic lead-zirconate-titanate: Phase transitions in a two-phase system, Journal of Applied Physics, 112, 014104-014104 (2012)	1	Journal article
66	Yutao Li, Jian-Tao Han, Chang-An Wang, Sven C Vogel, Hui Xie, Maowen Xu, John B Goodenough, Ionic Distribution and Conductivity in Lithium Garnet Li_7_ La_3_ Zr_2_ O_12_, Journal of Power Sources, null, 806-821 (2012)	1	Journal article
67	Eric J Nichols, Jiawanjun Shi, Ashfia Huq, Sven C Vogel, Scott T Misture, Controlling structure distortions in 3-layer ferroelectric Aurivillius oxides, Journal of Solid State Chemistry, null, 806-821 (2012)	1	Journal article

68	P Hosemann, S Kabra, E Stergar, MJ Cappillo, SA Maloy, Micro-structural characterization of laboratory heats of the Ferric/Martensitic steels HT-9 and T91, Journal of Nuclear Materials, 403, 7-14 (2010)	1	Journal article
69	Hui Xie, Yutao Li, Jiantao Han, Youzhong Dong, M Parans Paranthaman, Long Wang, Maowen Xu, Asha Gupta, Zhonghe Bi, Craig A Bridges, others, Li6La3SnMO12 (M= Sb, Nb, Ta), a Family of Lithium Garnets with High Li-Ion Conductivity, Journal of The Electrochemical Society, 159, A1148-A1151 (2012)	1	Journal article
70	Yutao Li, Jian-Tao Han, Chang-An Wang, Hui Xie, John B Goodenough, Optimizing Li+ conductivity in a garnet framework, Journal of Materials Chemistry, 22, 15357-15361 (2012)	1	Journal article
71	Karunakar Kothapalli, Farzana Nasreen, Joe Peterson, Heinz Nakotte, Sami El-Khatib, Sven C Vogel, Anna Llobet, Helmut Reiche, Ian Swainson, Ekkehard Bruck, Effect of temperature on hybridization and magnetism in UPdSn and UCuSn, Journal of Applied Physics, 105, 07E121-07E121 (2009)	0	Journal article
72	John Rakovan, Nina Gasbarro, Heinz Nakotte, Karunakar Kothapalli, Sven C Vogel, Characterization of Gold Crystallinity by Diffraction Methods, Rocks & Minerals, 84, 54-62 (2009)	0	Journal article
73	Juan Gomez Barreiro, Jose Ramon Martinez Catalan, D Prior, HR Wenk, I Lonardelli, S Vogel, Florentino Diaz Garcia, Ricardo Arenas, Sonia Sanchez Martinez, Textural record of an intra-oceanic subduction: the Careon ophiolite (NW Spain), Trabajos de geologia, null, 303-304 (2009)	0	Journal article
74	Benjamin J Iverson, Elliott B Slamovich, Keith J Bowman, Preferential Substitution of Barium in Orthorhombic Lead Metaniobate, Ferroelectrics, 408, 9-19 (2010)	0	Journal article
75	Erick A Juarez-Arellano, Bjorn Winkler, Sven C Vogel, Anatoliy Senyshyn, Daniel R Kammler, Miguel Avalos-Borja, In situ observation of the reaction of scandium and carbon by neutron diffraction, Journal of Alloys and Compounds, 509, 1-5 (2011)	0	Journal article
76	Jinlong Zhu, Zhijun Lin, Jianzhong Zhang, Hongwu Xu, Sven C Vogel, Changqing Jin, Yusheng Zhao, High pressure neutron and synchrotron X-ray diffraction studies of tetragonal LaFeAsO0. 9F0. 1, High Pressure Research, 32, 405-411 (2012)	0	Journal article
77	Juan GOMEZ BARRERIRO, Fernando ALVAREZ LOBATO, Fabricas magneticas y analisis cuantitativo de texturas mediante difraccion neutronica de tiempo de vuelo: ejemplos en tectonitas (NO del Macizo Iberico, Espana), Fisica de la Tierra, 22, 143-162 (2010)	0	Journal article
78	Michelene E Miller, Scott T Misture, Idealizing gamma -Al2O3: In Situ Determination of Nonstoichiometric Spinel Defect Structure, The Journal of Physical Chemistry C, 114, 13039-13046 (2010)	0	Journal article
79	R Woracek, JR Bunn, D Penumadu, CR Hubbard, Method to determine hkl strains and shear moduli under torsion using neutron diffraction, Applied Physics Letters, 100, 191904-191904 (2012)	0	Journal article, High Impact
80	M Fabian, E Svab, V Pamukchieva, A Szekeres, P Petrik, S Vogel, U Ruett, Study of As?Se?Te glasses by neutron-, X-ray diffraction and optical spectroscopic methods, Journal of Non-Crystalline Solids, 358, 860-868 (2012)	0	Journal article
81	Rong Wang, Chengxu Yang, Min Fan, Meimei Wu, Chunhai Wang, Xiaohui Yu, Jinlong Zhu, Junrong Zhang, Guobao Li, Qingzhen Huang, others, Phase relationship of the TbO_1.81_-Mn_3_ O_4_-Fe_2_ O_3_ system synthesized at 1200 C, Journal of Alloys and Compounds, null, 15357-15361 (2012)	0	Journal article
82	Yasushi IDEMOTO, Tetsuya KASHIMA, Naoto KITAMURA, Investigation on Crystal and Electronic Structures of 0.5 Li 2 MnO 3-0.5 LiMn x Ni x Co (1- 2x) O 2 (x= 1/3, 5/12) Samples Heat-Treated under Vacuum Reducing Conditions, Electrochemistry, 80, 791-799 (2012)	0	Journal article
83	O Muransky, MR Daymond, D Bhattacharyya, O Zanellato, SC Vogel, L Edwards, Load partitioning and evidence of deformation twinning in dual-phase fine-grained Zr-2.5% Nb alloy, Materials Science and Engineering: A, null, 3540-3547 (2012)	0	Journal article

Flight Path 6—SCD
Single-Crystal Diffractometer

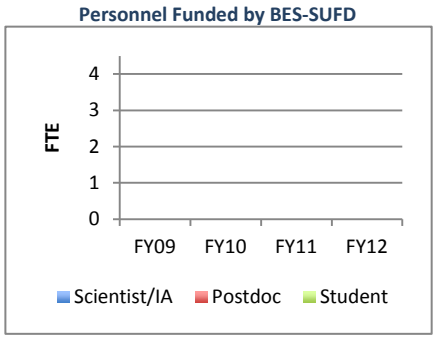
Beamline Description

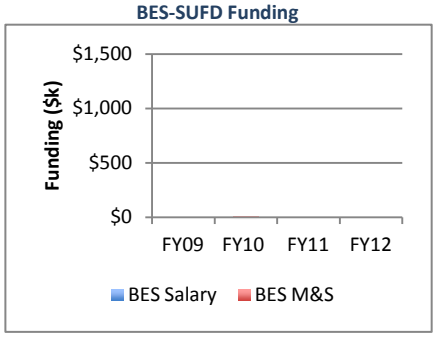
The SCD is based on the TOF Laue technique, which combines the use of two large-area PSDs with a range of incident neutron wavelengths available from the pulsed neutron source. With a stationary sample and detector, a 3D sampling of reciprocal space is obtained that may contain hundreds of Bragg reflections. Simultaneously, all of the reciprocal space between the peaks is measured, making this technique highly advantageous for studying pressure- and temperature-dependent phase transitions. Measurements can be performed in the temperature range from 5 K to 800 K and under pressures from 0 to 5 kbar. Typical sample volumes are of the order of 1 mm, but smaller crystals will suffice for strong neutron scatterers.

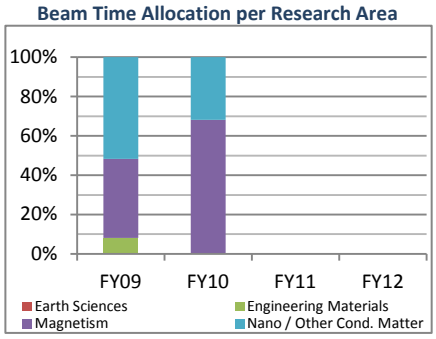
Note: Access to SCD is limited to users who can provide their own support through scientific collaboration with Lujan Center staff.

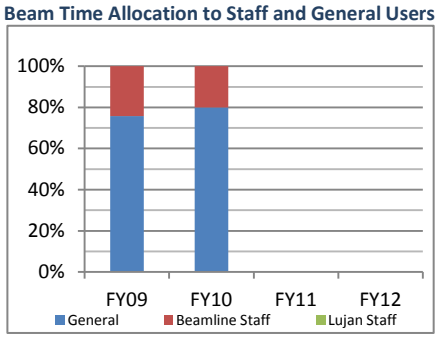
Target Scientific Audience

Condensed Matter Physics, Materials Sciences, Magnetism









Beamline Specifications

Moderator	Chilled water (283 K), High intensity
Primary Flight Path	6.3 m
Secondary Flight Path	35 cm
Q range/λ range/d-range	
Resolution	
Beam Size	1-5 mm
Flux Density	
Instrument Scientist-I	Prof. Heinz Nakotte (0%)
Instrument Scientist-II	
Instrument Assistant	
Operating Funds 2012 (k$)	$0
Allocation Percentages (General User/Beamline Staff/Facility Staff)	39%/11%/0%
# Users/Year (2 Year Average, Total/Unique Users)	7/7
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	18/13/0/0

Summary of SCD Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	1 (1)	0	0	0(0)	0(0)
2010	2 (2)	0	1	0(0)	0(0)
2011	1 (1)	0	1	0(0)	0(0)
2012	1 (1)	0	0	0(0)	0(0)
Total	**5 (5)**	**0**	**2**	**0(0)**	**0(0)**

Complete List of SCD Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Sebastian C Peter, Christos D Malliakas, Heinze Nakotte, Karunakar Kothapilli, Sudhindra Rayaprol, Arthur J Schultz, Mercouri G Kanatzidis, The polygallides: Yb_3_ Ga_7_ Ge_3_ and YbGa_4_ Ge_2_, Journal of Solid State Chemistry, 187, 200-207 (2012)	5	Journal article
2	CH Wang, JM Lawrence, ED Bauer, K Kothapalli, JS Gardner, F Ronning, K Gofryk, JD Thompson, H Nakotte, F Trouw, Unusual signatures of the ferromagnetic transition in the heavy fermion compound UMn_ 2 Al_ 20, Physical Review B, 82, 094406 (2010)	5	Journal article
3	JA Schlueter, H Park, JL Manson, H Nakotte, AJ Schultz, Effect of deuteration on the structural and magnetic properties of CuF_2_(H_2_ O)_2_(pyrazine), Physica B:	3	Journal article

	Condensed Matter, 405, S324-S326 (2010)		
4	MS Torikachvili, BK Davis, K Kothapalli, H Nakotte, AJ Schultz, ED Mun, SL Bud'Ko, Structural, electronic, magnetic, and thermal properties of single-crystalline UNi_ 0.5 Sb_ 2, Physical Review B, 84, 205114 (2011)	0	Journal article
5	John Rakovan, Nina Gasbarro, Heinz Nakotte, Karunakar Kothapalli, Sven C Vogel, Characterization of Gold Crystallinity by Diffraction Methods, Rocks & Minerals, 84, 54-62 (2009)	0	Journal article

Flight Path 7—FDS
Filter Difference Spectrometer

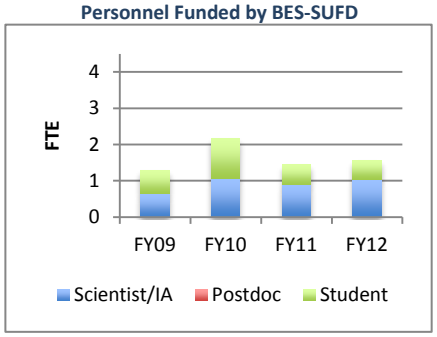
Beamline Description

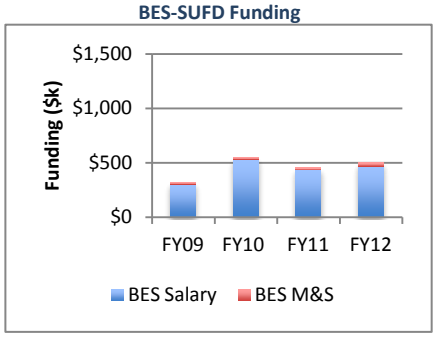
The FDS is used for molecular vibrational spectroscopy by inelastic neutron scattering. The instrument is designed for high count rates by the use of detectors covering a large solid angle. FDS is therefore most useful for measurements requiring high sensitivity, e.g., very dilute systems or molecules adsorbed on surfaces such as in catalysts. Other applications of this instrument include hydrogen-bonded molecular crystals, biomolecular model systems, and high explosives. Although most experiments are done on hydrogen-containing molecules, it is also possible to study molecular vibrations involving other atoms: for example, O in CMR materials.

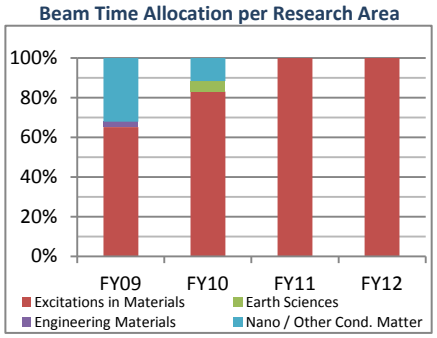
Vibrational spectra are obtained by neutron energy loss. During scattering from the sample, incoming neutrons excite molecular vibrations by giving up energy. FDS determines the change in energy by the use of low-energy band-pass filters between the sample and detector. These filters allow neutrons only of a certain energy to reach the detector. The scattered neutrons are sorted by their total TOF as they journey from the sample to the detector. From this information, their incident energies can then be determined.

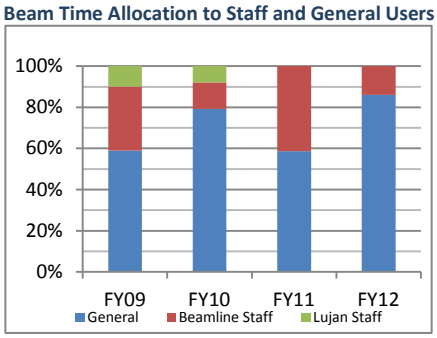
Target Scientific Audience

Chemistry, Geochemistry, Condensed Matter Physics, Catalysis









Beamline Specifications

Moderator	Chilled water (283 K), High resolution
Primary Flight Path	13 m
Secondary Flight Path	28 cm
Q range/λ range/d-range	N/A
Resolution	2% - 5% of the energy transfer.
Beam Size	10 cm high by 2.5 cm wide
Flux Density	~10^7 n/cm^2/s
Instrument Scientist-I	Dr. Luc Daemen (84%)
Instrument Scientist-II	Dr. Monika Hartl (19%)
Instrument Assistant	
Operating Funds 2012 (k$)	$1,316
Allocation Percentages (General User/Beamline Staff/Facility Staff)	71%/25%/4%
# users/year (4 year average)	12/9
Proposals submitted (2009/2010/2011/2012)	24/22/30/26

Summary of FDS Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	9 (8)	1	0	0(0)	2(2)
2010	2 (2)	3	0	1(1)	1(1)
2011	4 (4)	0	2	0(0)	0(0)
2012	5 (4)	0	0	0(0)	0(0)
Total	**20 (18)**	**4**	**2**	**1(1)**	**3(3)**

Complete List of FDS Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	PJM Monteiro, AP Kirchheim, S Chae, Peter Fischer, AA MacDowell, Eirc Schaible, HR Wenk, Characterizing the nano and micro structure of concrete to improve its durability, Cement and Concrete Composites, 31, 577-584 (2009)	22	Journal article
2	Shawn M Kathmann, Vencislav Parvanov, Gregory K Schenter, Ashley C Stowe, Luc L Daemen, Monika Hartl, John Linehan, Nancy J Hess, Abhi Karkamkar, Tom Autrey, Experimental and computational studies on collective hydrogen dynamics in ammonia borane: Incoherent inelastic neutron scattering, The Journal of chemical physics, 130, 024507 (2009)	19	Journal article

3	Nathan W Ockwig, Jeffery A Greathouse, Justin S Durkin, Randall T Cygan, Luke L Daemen, Tina M Nenoff, Nanoconfined water in magnesium-rich 2: 1 phyllosilicates, Journal of the American Chemical Society, 131, 8155-8162 (2009)	13	Journal article, High Impact
4	AI Acatrinei, MA Hartl, Juergen Eckert, Eduardo HL Falcao, G Chertkov, LL Daemen, Hydrogen adsorption in the Ti-doped mesoporous silicate SBA-15, The Journal of Physical Chemistry C, 113, 15634-15638 (2009)	8	Journal article
5	S Kong, AO Borissova, SB Lesnichin, M Hartl, LL Daemen, J Eckert, M Yu Antipin, IG Shenderovich, Geometry and Spectral Properties of the Protonated Homodimer of Pyridine in the Liquid and Solid States. A Combined NMR, X-ray Diffraction and Inelastic Neutron Scattering Study, The Journal of Physical Chemistry A, 115, 8041-8048 (2011)	6	Journal article
6	Shahram Amini, Jose M Cordoba Gallego, Luke Daemen, Andrew R McGhie, Chaoying Ni, Lars Hultman, Magnus Oden, Michel W Barsoum, On the Stability of Mg Nanograins to Coarsening after Repeated Melting, Nano letters, 9, 3082-3086 (2009)	5	Journal article, High Impact
7	Michael J Evans, Myeong H Lee, Gregory P Holland, Luke L Daemen, Otto F Sankey, Ulrich Haussermann, Vibrational properties of the gallium monohydrides SrGaGeH, BaGaSiH, BaGaGeH, and BaGaSnH, Journal of Solid State Chemistry, 182, 2068-2073 (2009)	4	Journal article
8	Michael J Evans, Verina F Kranak, Francisco J Garcia-Garcia, Gregory P Holland, Luke L Daemen, Thomas Proffen, Myeong H Lee, Otto F Sankey, Ulrich Haussermann, Structural and Dynamic Properties of BaInGeH: A Rare Solid-State Indium Hydride, Inorganic chemistry, 48, 5602-5604 (2009)	4	Journal article
9	Verina F Kranak, Michael J Evans, Luke L Daemen, Thomas Proffen, Myeong H Lee, Otto F Sankey, Ulrich Haussermann, Structural and dynamic properties of the polyanionic hydrides SrAlGeH and BaAlGeH, Solid State Sciences, 11, 1847-1853 (2009)	3	Journal article
10	Gregory JO Beran, Eric L Chronister, Luke L Daemen, Aaron R Moehlig, Leonard J Mueller, Jos Oomens, Andrew Rice, David R Santiago-Dieppa, Fook S Tham, Kelly Theel, others, Vibrations of a chelated proton in a protonated tertiary diamine, Physical Chemistry Chemical Physics, 13, 20380-20392 (2011)	3	Journal article
11	G Muhrer, M Hartl, L Daemen, F Tovesson, A Schnegg, M Russina, E Schachinger, Scattering law of a magnesium hydride moderator, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 629, 251-259 (2011)	2	Journal article
12	Jernej Stare, Monika Hartl, Luke Daemen, Juergen Eckert, The Very Short Hydrogen Bond in the Pyridine N-Oxide--Trichloroacetic Acid Complex: An Inelastic Neutron Scattering and Computational Study, Acta Chim. Slov, 58, 521-527 (2011)	2	Journal article
13	Gordon J Kearley, Jernej Stare, Ramzi Kutteh, Luke L Daemen, Monika A Hartl, Juergen Eckert, Methyl dynamics flattens barrier to proton transfer in crystalline tetraacetylethane, The Journal of Physical Chemistry A, 116, 2283-2291 (2012)	2	Journal article
14	Sergei M Stishov, Alla E Petrova, Anatoly A Shikov, Thomas A Lograsso, Eyvaz I Isaev, Borje Johansson, Luke L Daemen, Lost Heat Capacity and Entropy in the Helical Magnet MnSi, Physical review letters, 105, 236403 (2010)	2	Journal article, High Impact, High Profile
15	Hans-Joachim Lunk, Hans Hartl, Monika A Hartl, Martin JG Fait, Ilya G Shenderovich, Michael Feist, Timothy A Frisk, Luke L Daemen, Daniel Mauder, Reinhard Eckelt, others, Hexagonal Molybdenum Trioxide Known for 100 Years and Still a Fount of New Discoveries, Inorganic chemistry, 49, 9400-9408 (2010)	2	Journal article
16	G Muhrer, M Hartl, M Mocko, F Tovesson, L Daemen, Experimental and theoretical total neutron scattering cross-section of water confined in silica microspheres, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, null, 1463-1470 (2012)	1	Journal article
17	Ashley C Stowe, Ragaiy Zidan, Alice I Acatrinei, Monika A Hartl, Luke L Daemen, Neutron scattering and computational studies of the structure and dynamics of NaMgH3, Journal of Materials Science and Engineering, 3, 35-46+ (2009)	0	Journal article
18	MH Braga, JA Ferreira, MJ Wolverton, Study of the Cu--Li--Mg--H system by thermal analysis, Journal of thermal analysis and calorimetry, 108, 733-739 (2012)	0	Journal article

19	M Hartl, L Daemen, G Muhrer, Water trapped in silica microspheres, Microporous and Mesoporous Materials, null, 733-739 (2012)	0	Journal article
20	Sabrina Labs, Monika Hartl, Luke Daemen, Hildegard Curtius, Dirk Bosbach, others, Investigation of the Dehydration Process of Uranium Peroxide, Zeitschrift fur anorganische und allgemeine Chemie, 638, 1606-1606 (2012)	0	Journal article

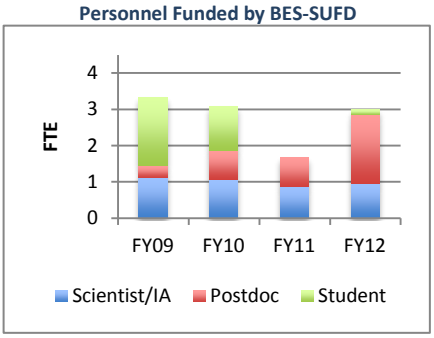
Flight Path 9—SPEAR
Surface Profile Analysis Reflectometer

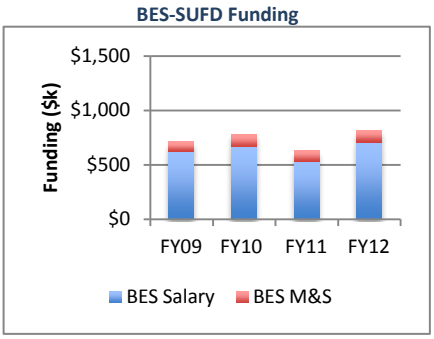
Beamline Description

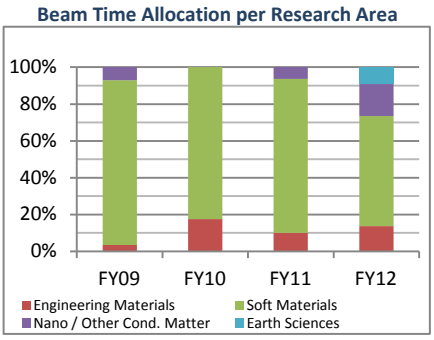
SPEAR is ideally suited to study thin (5- to 3000-Å) organic and inorganic layers in a variety of different environments. The instrument uses an unpolarized neutron beam to study a broad range of materials, including polymers, nano-engineered films, and biological systems. SPEAR is a TOF reflectometer using two choppers to define a typical wavelength range from 4.5 to 16 Å. With this polychromatic beam, a range of momentum transfer vectors (Q_z) can be measured without altering the angle of the incident beam. An important feature of SPEAR's design is that the beam is inclined to the horizon at 1.0° (±0.25°). This inclination allows for reflectivity measurements from liquid/air interfaces. Using a position-sensitive detector, the TOF and reflected position of individual neutrons can be measured and converted to a wavelength and reflection angle. With this arrangement, statistics can be obtained down to a minimum reflectivity of about 5×10^{-7} in 2 to 3 hours.

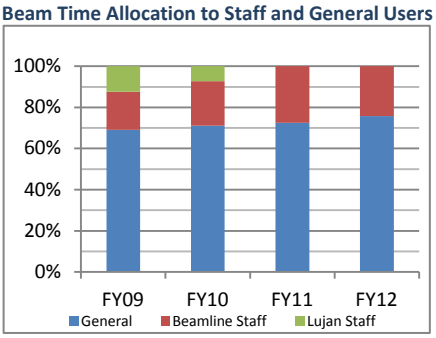
Target Scientific Audience

Biology, Polymer, Nanoscience, Complex Fluids, Thin Films









Beamline Specifications

Moderator	Partially coupled liquid hydrogen at 20 K with Be filter
Primary Flight Path	8.73 m
Secondary Flight Path	3.67
Q range/λ range/d-range	4.5 < λ < 16 Å or 16 < λ < 32 Å
Resolution	2 mm detector resolution
Beam Size	Max. 3 mm high by 30 mm wide
Flux Density	~3.4×10^6 n/cm^2/s for 4.5 < λ < 16 Å
Instrument Scientist-I	Dr. Jarek Majewski (96%)
Instrument Scientist-II	
Instrument Assistant	
Operating Funds 2012 (k$)	$1,630
Allocation Percentages (General User/Beamline Staff/Facility Staff)	72%/23%/5%
# Users/Year (4 Year Average, Total/Unique Users)	60/39
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	66/55/73/54

Summary of SPEAR Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	16 (10)	2	1	2(2)	4(4)
2010	12 (7)	3	0	0(0)	0(0)
2011	17 (12)	0	1	1(1)	3(2)
2012	11 (9)	0	0	0(0)	0(0)
Total	**56 (38)**	**5**	**2**	**3(3)**	**7(6)**

Complete List of SPEAR Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Carlee E Ashley, Eric C Carnes, Genevieve K Phillips, David Padilla, Paul N Durfee, Page A Brown, Tracey N Hanna, Juewen Liu, Brandy Phillips, Mark B Carter, others, The targeted delivery of multicomponent cargos to cancer cells by nanoporous particle-supported lipid bilayers, Nature materials, 10, 389-397 (2011)	143	Journal article, High Impact
2	Hillary L Smith, Michael C Howland, Alan W Szmodis, Qijuan Li, Luke L Daemen, Atul N Parikh, Jaroslaw Majewski, Early stages of oxidative stress-induced membrane permeabilization: a neutron reflectometry study, Journal of the American Chemical	29	Journal article, High Impact

	Society, 131, 3631-3638 (2009)		
3	David L Wood III, Jerzy Chlistunoff, Jaroslaw Majewski, Rodney L Borup, Nafion structural phenomena at platinum and carbon interfaces, Journal of the American Chemical Society, 131, 18096-18104 (2009)	25	Journal article, High Impact
4	Hillary L Smith, Michael S Jablin, Ajay Vidyasagar, Jessica Saiz, Erik Watkins, Ryan Toomey, Alan J Hurd, Jaroslaw Majewski, Model lipid membranes on a tunable polymer cushion, Physical review letters, 102, 228102 (2009)	24	Journal article, High Impact, High Profile
5	MWA Skoda, F Schreiber, RMJ Jacobs, JRP Webster, M Wolff, R Dahint, D Schwendel, M Grunze, Protein Density Profile at the Interface of Water with Oligo (ethylene glycol) Self-Assembled Monolayers, Langmuir, 25, 4056-4064 (2009)	22	Journal article
6	David M Huang, Scott A Mauger, Stephan Friedrich, Simon J George, Daniela Dumitriu-LaGrange, Sook Yoon, Adam J Moule, The consequences of interface mixing on organic photovoltaic device characteristics, Advanced Functional Materials, 21, 1657-1665 (2011)	17	Journal article
7	Maria K Ratajczak, Eva Y Chi, Shelli L Frey, Kathleen D Cao, Laura M Luther, Ka Yee C Lee, Jaroslaw Majewski, Kristian Kjaer, Ordered nanoclusters in lipid-cholesterol membranes, Physical review letters, 103, 028103 (2009)	17	Journal article, High Impact, High Profile
8	Ajay Vidyasagar, Hillary L Smith, Jaroslaw Majewski, Ryan G Toomey, Continuous and discontinuous volume-phase transitions in surface-tethered, photo-crosslinked poly (N-isopropylacrylamide) networks, Soft Matter, 5, 4733-4738 (2009)	16	Journal article
9	John R Ell, Dennis E Mulder, Roland Faller, Timothy E Patten, Tonya L Kuhl, Structural Determination of High Density, ATRP Grown Polystyrene Brushes by Neutron Reflectivity, Macromolecules, 42, 9523-9527 (2009)	9	Journal article
10	Gang Cheng, Zelin Liu, Jaclyn K Murton, Michael Jablin, Manish Dubey, Jaroslaw Majewski, Candice Halbert, James Browning, John Ankner, Bulent Akgun, others, Neutron reflectometry and QCM-D study of the interaction of cellulases with films of amorphous cellulose, Biomacromolecules, 12, 2216-2224 (2011)	9	Journal article
11	M Dubey, MS Jablin, P Wang, M Mocko, J Majewski, SPEARToF neutron reflectometer at the Los Alamos Neutron Science Center, The European Physical Journal Plus, 126, 1-11 (2011)	8	Journal article
12	Magdalena Brzozowska, Benjamin P Oberts, Gary J Blanchard, Jaroslaw Majewski, Pawel Krysinski, Design and Characterization of Novel Tether Layer for Coupling of a Bilayer Lipid Membrane to the Surface of Gold, Langmuir, 25, 9337-9345 (2009)	8	Journal article
13	Hiroki Ogawa, Toshiji Kanaya, Koji Nishida, Go Matsuba, Jaroslaw P Majewski, Erik Watkins, Time-resolved specular and off-specular neutron reflectivity measurements on deuterated polystyrene and poly (vinyl methyl ether) blend thin films during dewetting process, The Journal of Chemical Physics, 131, 104907 (2009)	7	Journal article
14	Ian G Elliott, Dennis E Mulder, Petra T Traskelin, John R Ell, Timothy E Patten, Tonya L Kuhl, Roland Faller, Confined polymer systems: synergies between simulations and neutron scattering experiments, Soft Matter, 5, 4612-4622 (2009)	7	Journal article
15	Xuecheng Dong, Peng Wang, Sandip Argekar, Dale W Schaefer, Structure and Composition of Trivalent Chromium Process (TCP) Films on Al Alloy, Langmuir, 26, 10833-10841 (2010)	7	Journal article
16	Yimin Wang, Peng Wang, Doug Kohls, William A Hamilton, Dale W Schaefer, Water absorption and transport in bis-silane films, Physical Chemistry Chemical Physics, 11, 161-166 (2009)	6	Journal article
17	Hillary L Smith, Joseph Hickey, Michael S Jablin, Antoinette Trujillo, James P Freyer, Jaroslaw Majewski, Mouse fibroblast cell adhesion studied by neutron reflectometry, Biophysical journal, 98, 793-799 (2010)	6	Journal article
18	Michael S Kent, Jaclyn K Murton, Darryl Y Sasaki, Sushil Satija, Bulent Akgun, Hirsh Nanda, Joseph E Curtis, Jaroslaw Majewski, Christopher R Morgan, John R Engen, Neutron reflectometry study of the conformation of HIV Nef bound to lipid membranes, Biophysical journal, 99, 1940-1948 (2010)	6	Journal article
19	Peng Wang, Xuecheng Dong, Dale W Schaefer, Structure and water-barrier properties of vanadate-based corrosion inhibitor films, Corrosion Science, 52, 943-949 (2010)	6	Journal article

20	Dennis John Mulder, Tonya Lynn Kuhl, Polymer brushes in restricted geometries, Soft Matter, 6, 5401-5407 (2010)	6	Journal article
21	Lilin He, Hillary L Smith, Jaroslaw Majewski, Cy H Fujimoto, Christopher J Cornelius, Dvora Perahia, Interfacial Effects on Water Penetration into Ultrathin Ionomer Films: An in Situ Study Using Neutron Reflectometry, Macromolecules, 42, 5745-5751 (2009)	5	Journal article
22	JD Yeager, M Dubey, MJ Wolverton, MS Jablin, J Majewski, DF Bahr, DE Hooks, Examining chemical structure at the interface between a polymer binder and a pharmaceutical crystal with neutron reflectometry, Polymer, 52, 3762-3768 (2011)	5	Journal article
23	Erik B Watkins, Rita J El-khouri, Chad E Miller, Brian G Seaby, Jaroslaw Majewski, Carlos M Marques, Tonya L Kuhl, Structure and Thermodynamics of Lipid Bilayers on Polyethylene Glycol Cushions: Fact and Fiction of PEG Cushioned Membranes, Langmuir, 27, 13618-13628 (2011)	5	Journal article
24	Christopher W Rochester, Scott A Mauger, Adam J Moule, Investigating the Morphology of Polymer/Fullerene Layers Coated Using Orthogonal Solvents, The Journal of Physical Chemistry C, 116, 7287-7292 (2012)	5	Journal article
25	Masaaki Hirayama, Masao YONEMURA, Kouta Suzuki, Naoya Torikai, Hillary SMITH, Erik WATKINSAND, Jarek Majewski, Ryoji KANNO, Surface Characterization of LiFePO 4 Epitaxial Thin Films by X-ray/Neutron Reflectometry, Electrochemistry, 78, 413-415 (2010)	4	Journal article
26	Michael S Jablin, Michal Flasinski, Manish Dubey, Dilru R Ratnaweera, Marcin Broniatowski, Patrycja Dynarowicz-Latka, Jaroslaw Majewski, Effects of beta Cyclodextrin on the Structure of Sphingomyelin/Cholesterol Model Membranes, Biophysical journal, 99, 1475-1481 (2010)	4	Journal article
27	Mikhail Zhernenkov, Michael S Jablin, Amit Misra, Michael Nastasi, Yongqiang Wang, Michael J Demkowicz, Jon K Baldwin, Jarek Majewski, Trapping of implanted He at Cu/Nb interfaces measured by neutron reflectometry, Applied Physics Letters, 98, 241913-241913 (2011)	4	Journal article, High Impact
28	M Mocko, G Muhrer, Ch T Kelsey, MA Duran, F Tovesson, Experimental measurement of the neutron time-emission spectra at the Manuel Lujan Jr. Neutron Scattering Center, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 632, 101-108 (2011)	3	Journal article
29	Peng Wang, Dale W Schaefer, Salt exclusion in silane-laced epoxy coatings, Langmuir, 26, 234-240 (2010)	3	Journal article
30	Manish Dubey, Michael S Jablin, Hillary Smith, Jaroslaw Majewski, Investigations of surrogate cellular membranes using neutron reflectometry, Acta Crystallographica Section D: Biological Crystallography, 66, 1237-1243 (2010)	3	Journal article
31	Michael S Jablin, Mikhail Zhernenkov, Boris P Toperverg, Manish Dubey, Hillary L Smith, Ajay Vidyasagar, Ryan Toomey, Alan J Hurd, Jaroslaw Majewski, In-plane correlations in a polymer-supported lipid membrane measured by off-specular neutron scattering, Physical review letters, 106, 138101 (2011)	3	Journal article, High Impact, High Profile
32	Michael S Jablin, Manish Dubey, Mikhail Zhernenkov, Ryan Toomey, Jaroslaw Majewski, Influence of Lipid Membrane Rigidity on Properties of Supporting Polymer, Biophysical journal, 101, 128-133 (2011)	3	Journal article
33	Luka Pocivavsek, Kseniya Gavrilov, Kathleen D Cao, Eva Y Chi, Dongxu Li, Binhua Lin, Mati Meron, Jaroslaw Majewski, Ka Yee C Lee, Glycerol-Induced Membrane Stiffening: The Role of Viscous Fluid Adlayers, Biophysical journal, 101, 118-127 (2011)	3	Journal article
34	Emmalee M Jones, Manish Dubey, Phillip J Camp, Briana C Vernon, Jacek Biernat, Eckhard Mandelkow, Jaroslaw Majewski, Eva Y Chi, Interaction of tau protein with model lipid membranes induces tau structural compaction and membrane disruption, Biochemistry, 51, 2539-2550 (2012)	3	Journal article
35	Peng Wang, Guirong Pan, William A Hamilton, Dale W Schaefer, Hydrothermal Degradation of Hydrophobic Organosilane Films Determined by Neutron Reflectometry, Silanes and other coupling agents, 5, 87 (2009)	2	Journal article
36	Peter A Chiarelli, Ding-Guo Liu, Erik B Watkins, Frans R Trouw, Jaroslaw Majewski, Joanna L Casson, Zhexiong Tang, Malkiat S Johal, Jeanne M Robinson, Hsing-Lin Wang,	2	Journal article

	Molecular order in Langmuir--Blodgett assembled films of an azobenzene amphiphile, Thin Solid Films, 517, 4638-4643 (2009)		
37	Daisuke Kawaguchi, Andrew Nelson, Yuichi Masubuchi, Jaroslaw P Majewski, Naoya Torikai, Norifumi L Yamada, AR Siti Sarah, Atsushi Takano, Yushu Matsushita, Precise analyses of short-time relaxation at asymmetric polystyrene interface in terms of molecular weight by time-resolved neutron reflectivity measurements, Macromolecules, 44, 9424-9433 (2011)	2	Journal article
38	Gang Cheng, Supratim Datta, Zelin Liu, Chao Wang, Jaclyn K Murton, Page A Brown, Michael S Jablin, Manish Dubey, Jaroslaw Majewski, Candice E Halbert, others, Interactions of Endoglucanases with Amorphous Cellulose Films Resolved by Neutron Reflectometry and Quartz Crystal Microbalance with Dissipation Monitoring, Langmuir, 28, 8348-8358 (2012)	2	Journal article
39	Wei-Po Liao, Tonya L Kuhl, Steric Forces of Tethered Polymer Chains as a Function of Grafting Density: Studies with a Single Diblock Molecular Weight, Macromolecules, 45, 5766-5772 (2012)	2	Journal article
40	BM Law, MD Brown, L Marchand, LB Lurio, WA Hamilton, I Kuzmenko, T Gog, S Satija, E Watkins, J Majewski, Adsorption at liquid interfaces: A comparison of multiple experimental techniques, The European Physical Journal Special Topics, 167, 127-132 (2009)	2	Journal article
41	Leslie A Sasa, Eric J Yearley, Cynthia F Welch, Mark A Taylor, Robert D Gilbertson, Christopher Hammeter, Jaroslaw Majewski, Rex P Hjelm, The Los Alamos Neutron Science Center neutron rheometer in the cone and plate geometry to examine tethered polymers/polymer melt interfaces via neutron reflectivity, Review of Scientific Instruments, 81, 055102-055102 (2010)	1	Journal article
42	M Mocko, G Muhrer, Fourth-generation spallation neutron target-moderator-reflector-shield assembly at the Manuel Lujan Jr. neutron scattering center, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, null, 118-127 (2012)	1	Journal article
43	John D Yeager, Kyle J Ramos, Changquan C Sun, Saurabh Singh, Manish Dubey, Jaroslaw Majewski, Daniel E Hooks, Probing Interfaces between Pharmaceutical Crystals and Polymers by Neutron Reflectometry, Molecular Pharmaceutics, 9, 1953-1961 (2012)	1	Journal article
44	Saurabh Singh, Ann Junghans, Mary J Waltman, Amber Nagy, Rashi Iyer, Jaroslaw Majewski, Neutron reflectometry characterization of PEI--PSS polyelectrolyte multilayers for cell culture, Soft Matter, 8, 11484-11491 (2012)	1	Journal article
45	JD Yeager, KJ Ramos, S Singh, ME Rutherford, J Majewski, DE Hooks, Nanoindentation of explosive polymer composites to simulate deformation and failure, Materials Science and Technology, 28, 9-10 (2012)	1	Journal article
46	Dale W Schaefer, Yimin Wang, Tammy L Metroke, Metal-Protective Films Based on Mixed Silane Coupling Agents, Silanes and Other Coupling Agents, null, 243 (2009)	0	Journal article
47	Peng Wang, Dale W Schaefer, Hygrothermal Aging of Silane-Laced Epoxy Coatings, Journal of Adhesion Science and Technology, 24, 699-708 (2010)	0	Journal article
48	Leslie A Sasa, Eric J Yearley, Michael S Jablin, Robert D Gilbertson, Adrienne S Lavine, Jaroslaw Majewski, Rex P Hjelm, Shear-induced metastable states of end-grafted polystyrene, Physical Review E, 84, 021803 (2011)	0	Journal article
49	Giovanna Fragneto, Alain Menelle, Progress in neutron reflectometry instrumentation, The European Physical Journal Plus, 126, 1-3 (2011)	0	Journal article
50	Ian J Burgess, Applications of Neutron Reflectivity in Bioelectrochemistry, Bioelectrochemistry, null, 1-3 (2011)	0	Journal article
51	Xuecheng Dong, Sandip Argekar, Peng Wang, Dale W Schaefer, In situ Evolution of Trivalent Chromium Process Passive Film on Al in a Corrosive Aqueous Environment, ACS Applied Materials & Interfaces, 3, 4206-4214 (2011)	0	Journal article
52	P Wang, AH Lerner, M Taylor, JK Baldwin, RK Grubbs, J Majewski, DD Hickmott, High-pressure and high-temperature neutron reflectometry cell for solid-fluid interface studies, The European Physical Journal Plus, 127, 1-15 (2012)	0	Journal article

53	Heming He, P Wang, DD Allred, Jaroslaw Majewski, MP Wilkerson, Kirk D Rector, Characterization of Chemical Speciation in Ultrathin Uranium Oxide Layered Films, Analytical chemistry, 84, 10380-10387 (2012)	0	Journal article
54	Scott A Mauger, Lilian Chang, Stephan Friedrich, Christopher W Rochester, David M Huang, Peng Wang, Adam J Moule, Self-Assembly of Selective Interfaces in Organic Photovoltaics, Advanced Functional Materials, null, 7287-7292 (2012)	0	Journal article
55	Philip Camp, Jacek Biernat, Eckhard Mandelkow, Jaroslaw Majewski, Eva Y Chi, Lipid-Membrane Mediated Tau Misfolding and Aggregation, Biophysical Journal, 98, 239a-240a (2010)	0	Journal article
	Candice E Halbert, John Francis Ankner, Michael S Kent, Murton K Jaclyn, Jim Browning, Gang Cheng, Zelin Liu, Jaroslaw Majewski, Datta Supratim, Jablin Michael, others, Neutron Reflectometry and QCM-D Study of the Interaction of Cellulase Enzymes with Films of Amorphous Cellulose, Biomacromolecules, 12, 2473 (2011)	0	Journal article

Flight Path 10—LQD
Low-Q Diffractometer

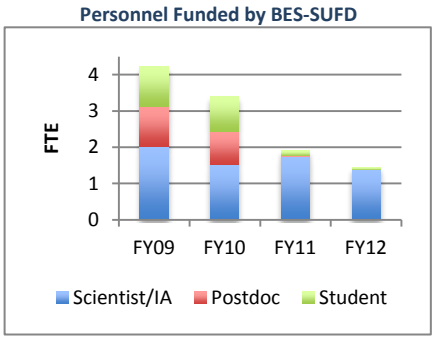
Beamline Description

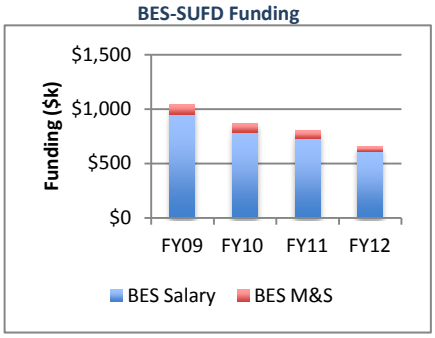
The LQD is designed to study large-scale structures with dimensions from 10 to 1000 Å. Examples of problems that the LQD can help solve include phase separation, morphology, and critical phenomena in hard and soft matter and in magnetic structures, colloid and polymer structure, biomolecular organization, and bubble formation in metals.

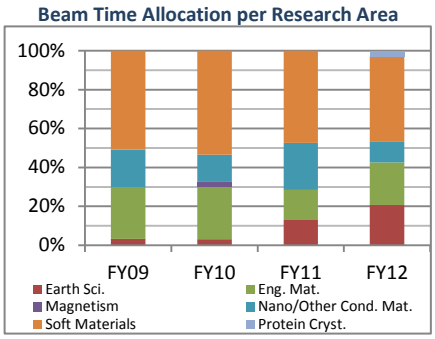
A significant feature of the LQD is that it accesses a broad range of Q (0.003 to 0.35 $Å^{-1}$) in a single measurement by using the TOF technique without any changes to the instrument's physical configuration. This feature contrasts with the need for two to three configuration changes in monochromated reactor instruments or on the SNS low-Q instrument to cover the same Q domain. The LQD uses neutrons with wavelengths of 1 to 16 Å, from a highly optimized cold source with very low background, making it very competitive with existing other small-angle-scattering instruments, even at MW class pulsed sources. At 20 Hz, the cold neutron source is well adapted to the broad band requirements of low-Q measurments.

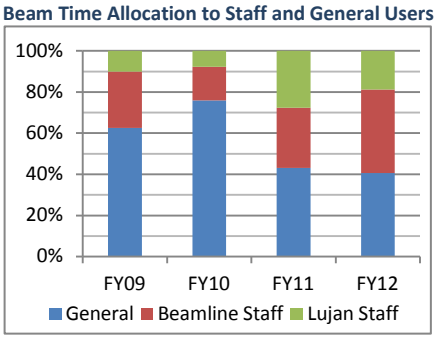
Target Scientific Audience

Biology, National Security Science, Complex Fluids, Geopolymers, Geochemistry, Nanoscience









Beamline Specifications

Moderator	Partially coupled liquid hydrogen at 20 K
Primary Flight Path	8.4 m
Secondary Flight Path	4.32 m
Q range/λ range/d-range	$0.003 < Q < 0.5A^{-1}$
Resolution	2-10 % (depending on collimation)
Beam Size	circular beamspot, 2-8 mm diameter
Flux Density	
Instrument Scientist-I	Dr. Rex Hjelm (79%)
Instrument Scientist-II	Dr. Monika Hartl (59%)
Instrument Assistant	
Operating Funds 2012 (k$)	$1,469
Allocation Percentages (General User/Beamline Staff/Facility Staff)	56%/28%/16%
# Users/Year (4 Year Average, Total/Unique Users)	55/39
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	59/49/73/34

Summary of LQD Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	4 (0)	0	0	0(0)	0(0)
2010	5 (3)	0	1	0(0)	0(0)
2011	5 (2)	0	0	0(0)	1(0)
2012	8 (4)	0	1	0(0)	1(0)
Total	**22 (9)**	**0**	**2**	**0(0)**	**2(0)**

Complete List of LQD Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Carlee E Ashley, Eric C Carnes, Genevieve K Phillips, David Padilla, Paul N Durfee, Page A Brown, Tracey N Hanna, Juewen Liu, Brandy Phillips, Mark B Carter, others, The targeted delivery of multicomponent cargos to cancer cells by nanoporous particle-supported lipid bilayers, Nature materials, 10, 389-397 (2011)	143	Journal article, High Impact
2	Jinbo He, Zhongwei Niu, Ravisubhash Tangirala, Jia-Yu Wang, Xinyu Wei, Gagandeep Kaur, Qian Wang, Gunther Jutz, Alexander Boker, Byeongdu Lee, others, Self-assembly of tobacco mosaic virus at oil/water interfaces, Langmuir, 25, 4979-4987 (2009)	39	Journal article
3	R Lapovok, D Tomus, J Mang, Y Estrin, TC Lowe, Evolution of nanoscale porosity during	20	Journal article

	equal-channel angular pressing of titanium, Acta Materialia, 57, 2909-2918 (2009)		
4	Chakkaravarthy Chidambareswarapattar, Zachary Larimore, Chariklia Sotiriou-Leventis, Joseph T Mang, Nicholas Leventis, One-step room-temperature synthesis of fibrous polyimide aerogels from anhydrides and isocyanates and conversion to isomorphic carbons, Journal of Materials Chemistry, 20, 9666-9678 (2010)	14	Journal article
5	Nicholas Leventis, Chariklia Sotiriou-Leventis, Naveen Chandrasekaran, Sudhir Mulik, Zachary J Larimore, Hongbing Lu, Gitogo Churu, Joseph T Mang, Multifunctional Polyurea Aerogels from Isocyanates and Water. A Structure- Property Case Study, Chemistry of Materials, 22, 6692-6710 (2010)	14	Journal article
6	MS Kent, G Cheng, JK Murton, EL Carles, DC Dibble, F Zendejas, MA Rodriquez, H Tran, B Holmes, BA Simmons, others, Study of enzymatic digestion of cellulose by small angle neutron scattering, Biomacromolecules, 11, 357-368 (2009)	13	Journal article
7	Nicholas Leventis, Chariklia Sotiriou-Leventis, Dhairyashil P Mohite, Zachary J Larimore, Joseph T Mang, Gitogo Churu, Hongbing Lu, Polyimide aerogels by ring-opening metathesis polymerization (ROMP), Chemistry of Materials, 23, 2250-2261 (2011)	10	Journal article
8	David B Robinson, Mary E Langham, Stephen J Fares, Markus D Ong, Benjamin W Jacobs, W Miles Clift, Jaclyn K Murton, Rex P Hjelm, Michael S Kent, Thermally stable nanoporous palladium alloy powders by hydrogen reduction in surfactant templates, International Journal of Hydrogen Energy, 35, 5423-5433 (2010)	9	Journal article
9	Lilin He, Cy H Fujimoto, Chris J Cornelius, Dvora Perahia, From solutions to membranes: structure studies of sulfonated polyphenylene ionomers, Macromolecules, 42, 7084-7090 (2009)	5	Journal article
10	Haiyuan Zhang, Darren R Dunphy, Xingmao Jiang, Huan Meng, Bingbing Sun, Derrick Tarn, Min Xue, Xiang Wang, Sijie Lin, Zhaoxia Ji, others, Processing Pathway Dependence of Amorphous Silica Nanoparticle Toxicity: Colloidal vs Pyrolytic, Journal of the American Chemical Society, 134, 15790-15804 (2012)	4	Journal article, High Impact
11	M Mocko, G Muhrer, Ch T Kelsey, MA Duran, F Tovesson, Experimental measurement of the neutron time-emission spectra at the Manuel Lujan Jr. Neutron Scattering Center, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 632, 101-108 (2011)	3	Journal article
12	Anand G Sadekar, Shruti S Mahadik, Abhishek N Bang, Zachary J Larimore, Clarissa A Wisner, Massimo F Bertino, A Kaan Kalkan, Joseph T Mang, Chariklia Sotiriou-Leventis, Nicholas Leventis, From GreenAerogels to Porous Graphite by Emulsion Gelation of Acrylonitrile, Chemistry of Materials, 24, 26-47 (2011)	3	Journal article
13	Dhairyashil P Mohite, Zachary J Larimore, H Lu, Joseph T Mang, Chariklia Sotiriou-Leventis, Nicholas Leventis, Monolithic Hierarchical Fractal Assemblies of Silica Nanoparticles Cross-Linked with Polynorbornene via ROMP: A Structure--Property Correlation from Molecular to Bulk through Nano, Chemistry of Materials, 24, 3434-3448 (2012)	2	Journal article
14	A Luk, NS Murthy, W Wang, R Rojas, J Kohn, Study of nanoscale structures in hydrated biomaterials using small-angle neutron scattering, Acta Biomaterialia, 8, 1459-1468 (2012)	2	Journal article
15	M Mocko, G Muhrer, Fourth-generation spallation neutron target-moderator-reflector-shield assembly at the Manuel Lujan Jr. neutron scattering center, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, null, 118-127 (2012)	1	Journal article
16	Eric J Yearley, Leslie A Sasa, Cynthia F Welch, Mark A Taylor, Kevin M Kupcho, Robert D Gilbertson, Rex P Hjelm, The Couette configuration of the Los Alamos Neutron Science Center Neutron Rheometer for the investigation of polymers in the bulk via small-angle neutron scattering, Review of Scientific Instruments, 81, 045109-045109 (2010)	1	Journal article
17	Osman Anderoglu, Joris Van den Bosch, Peter Hosemann, Erich Stergar, BH Sencer, Dhriti Bhattacharyya, Robert Dickerson, Patricia Dickerson, Monika Hartl, SA Maloy, Phase stability of an HT-9 duct irradiated in FFTF, Journal of Nuclear Materials, null, 1403-1407 (2012)	1	Journal article
18	M Hartl, L Daemen, G Muhrer, Water trapped in silica microspheres, Microporous and	0	Journal article

	Mesoporous Materials, null, 733-739 (2012)		
19	Rex P Hjelm, Deborah Bennett Stone, Robert J Fletterick, Robert A Mendelson, Decoration of microtubules in solution by the kinesin-14, Ncd, Acta Crystallographica Section D: Biological Crystallography, 66, 1218-1223 (2010)	0	Journal article
20	Joseph T Mang, Rex P Hjelm, Small-Angle Neutron Scattering and Contrast Variation Measurement of the Interfacial Surface Area in PBX 9501 as a Function of Pressing Intensity, Propellants, Explosives, Pyrotechnics, 36, 439-445 (2011)	0	Journal article
21	Cynthia Welch, Andrea Labouriau, Rex Hjelm, Bruce Orler, Christina Johnston, Yu Seung Kim, Nafion in Dilute Solvent Systems: Dispersion or Solution?, ACS Macro Letters, 1, 1403-1407 (2012)	0	Journal article
22	Dilru R Ratnaweera, Umesh M Shrestha, Naresh Osti, Chung-Mien Kuo, Stephen Clarson, Ken Littrell, Dvora Perahia, Self-assembly of a semi-fluorinated diblock copolymer in a selective solvent, Soft Matter, 8, 2176-2184 (2012)	0	Journal article

Flight Path 11—Asterix
Asterix

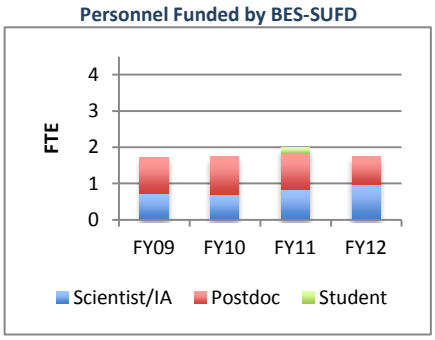
Beamline Description

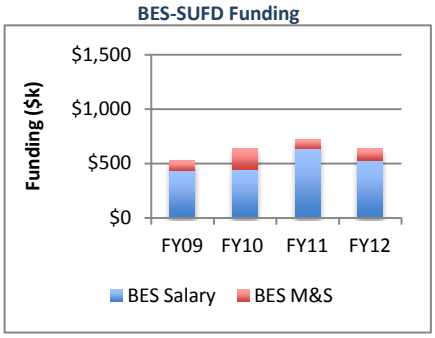
Asterix is a reflectometer, diffractometer, grazing-incidence-SANS, and SESAME-enabled-SANS spectrometer primarily used for experiments requiring polarized neutron beams. Experiments involve studies of magnetic materials and, to a smaller yet growing extent, non-magnetic systems. Examples of programs using Asterix include polarized neutron reflectometry of magnetic materials (in low and 11 T strong magnetic fields), long-wavelength/large-d-spacing diffraction (d-spacing >2 Å), and measurements of pair correlation lengths up to 2 µm in soft matter.

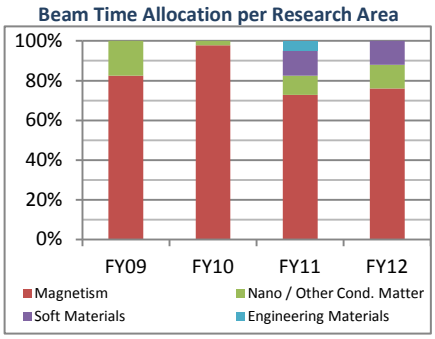
The use of non-magnetic materials in the neutron shielding ensures compatibility of the spectrometer with the 11T superconducting magnet and has enabled the implementation of neutron spin-echo techniques. The 2.5m-long detector arm is readily configurable for polarization or energy analysis of the scattered neutron beam. Special sample environment capabilities exist, including, for example, the capability to simultaneously expose samples to infrared laser light, magnetic fields, and neutron beams in an "ILL orange cryostat" or 11 T superconducting cryomagnet.

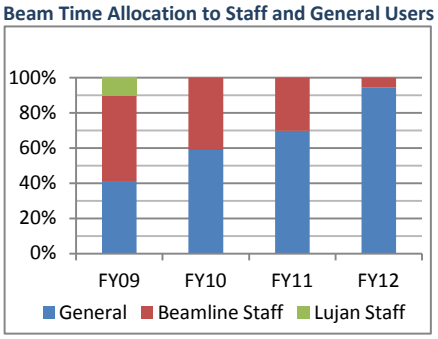
Target Scientific Audience

Magnetism, Condensed Matter Physics, Materials Science, Nanoscience









Beamline Specifications

Moderator	Lower-tier coupled liquid-hydrogen moderator
Primary Flight Path	18 m
Secondary Flight Path	0.5 to 2.5 m
Q range/λ range/d-range	4 < λ < 13 Å
Resolution	2% or better
Beam Size	Polarized:25 mm to 60 mm, unpolarized:60 mm by 60 mm
Flux Density	
Instrument Scientist-I	Dr. Mike Fitzsimmons (97%)
Instrument Scientist-II	
Instrument Assistant	
Operating Funds 2012 (k$)	$1,450
Allocation Percentages (General User/Beamline Staff/Facility Staff)	66%/31%/3%
# Users/Year (4 Year Average, Total/Unique Users)	25/16
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	21/22/53/26

Summary of Asterix Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	7 (7)	2	0	1(1)	1(1)
2010	4 (4)	1	0	0(0)	0(0)
2011	8 (7)	4	0	1(1)	1(1)
2012	5 (5)	2	2	3(3)	3(3)
Total	**24 (23)**	**9**	**2**	**5(5)**	**5(5)**

Complete List of Asterix Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	Wei Bao, Y Qiu, Q Huang, MA Green, P Zajdel, MR Fitzsimmons, M Zhernenkov, S Chang, Minghu Fang, B Qian, others, Tunable (delta pi , delta pi)-type antiferromagnetic order in alpha -Fe (Te, Se) superconductors, Physical review letters, 102, 247001 (2009)	323	Journal article, High Impact, High Profile
2	Mikhail Zhernenkov, MR Fitzsimmons, Jerzy Chlistunoff, Jaroslaw Majewski, Ioan Tudosa, EE Fullerton, Electric-field modification of magnetism in a thin CoPd film, Physical Review B, 82, 24420 (2010)	12	Journal article

3	J Mejia-Lopez, D Altbir, P Landeros, J Escrig, AH Romero, Igor V Roshchin, C-P Li, MR Fitzsimmons, X Batlle, Ivan K Schuller, Development of vortex state in circular magnetic nanodots: Theory and experiment, Physical Review B, 81, 184417 (2010)	11	Journal article
4	S Roy, E Blackburn, SM Valvidares, MR Fitzsimmons, SC Vogel, M Khan, I Dubenko, S Stadler, N Ali, SK Sinha, others, Delocalization and hybridization enhance the magnetocaloric effect in Cu-doped Ni_ 2 MnGa, Physical Review B, 79, 235127 (2009)	10	Journal article
5	Igor V Roshchin, Chang-Peng Li, Harry Suhl, Xavier Batlle, S Roy, Sunil K Sinha, S Park, Roger Pynn, MR Fitzsimmons, Jose Mejia-Lopez, others, Measurement of the vortex core in sub-100 nm Fe dots using polarized neutron scattering, EPL (Europhysics Letters), 86, 67008 (2009)	10	Journal article
6	C Visani, NM Nemes, M Rocci, Z Sefrioui, C Leon, SGE Te Velthuis, A Hoffmann, MR Fitzsimmons, F Simon, T Feher, others, Directionally controlled superconductivity in ferromagnet/superconductor/ferromagnet trilayers with biaxial easy axes, Physical Review B, 81, 094512 (2010)	10	Journal article
7	MR Fitzsimmons, NW Hengartner, S Singh, M Zhernenkov, FY Bruno, J Santamaria, A Brinkman, M Huijben, HJA Molegraaf, J de La Venta, others, Upper Limit to Magnetism in LaAlO_ 3/SrTiO_ 3 Heterostructures, Physical review letters, 107, 217201 (2011)	9	Journal article, High Impact, High Profile
8	MR Fitzsimmons, C Dufour, K Dumesnil, Jian Dou, Michael Pechan, Mechanisms of exchange bias in DyFe_ 2/YFe_ 2 exchange-coupled superlattices, Physical Review B, 79, 144425 (2009)	7	Journal article
9	Rana Ashkar, P Stonaha, AL Washington, VR Shah, MR Fitzsimmons, B Maranville, CF Majkrzak, WT Lee, WL Schaich, Roger Pynn, Dynamical theory calculations of spin-echo resolved grazing-incidence scattering from a diffraction grating, Journal of Applied Crystallography, 43, 455-465 (2010)	6	Journal article
10	Kineshma Munbodh, FA Perez, Cameron Keenan, David Lederman, Mikhail Zhernenkov, MR Fitzsimmons, Effects of hydrogen/deuterium absorption on the magnetic properties of Co/Pd multilayers, Physical Review B, 83, 094432 (2011)	6	Journal article
11	C Clavero, JR Skuza, Y Choi, D Haskel, C Sanchez-Hanke, R Loloee, M Zhernenkov, MR Fitzsimmons, RA Lukaszew, Enhancement of induced V polarization due to rough interfaces in polycrystalline V/Fe/V trilayers, Physical Review B, 80, 024418 (2009)	5	Journal article
12	A Hoffmann, SJ May, SGE Te Velthuis, S Park, MR Fitzsimmons, G Campillo, ME Gomez, Magnetic depth profile of a modulation-doped La_ 1- x Ca_ x MnO_ 3 exchange-biased system, Physical Review B, 80, 052403 (2009)	5	Journal article
13	Roger Pynn, MR Fitzsimmons, WT Lee, P Stonaha, VR Shah, AL Washington, BJ Kirby, CF Majkrzak, BB Maranville, Birefringent neutron prisms for spin echo scattering angle measurement, Physica B: Condensed Matter, 404, 2582-2584 (2009)	4	Journal article
14	C Visani, J Tornos, NM Nemes, M Rocci, C Leon, J Santamaria, SGE Te Velthuis, Yaohua Liu, A Hoffmann, JW Freeland, MR Fitzsimmons, others, Symmetrical interfacial reconstruction and magnetism in La_ 0.7 Ca_ 0.3 MnO_ 3/YBa_ 2 Cu_ 3 O_ 7/La_ 0.7 Ca_ 0.3 MnO_ 3 heterostructures, Physical Review B, 84, 060405 (2011)	4	Journal article
15	M Mocko, G Muhrer, Ch T Kelsey, MA Duran, F Tovesson, Experimental measurement of the neutron time-emission spectra at the Manuel Lujan Jr. Neutron Scattering Center, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 632, 101-108 (2011)	3	Journal article
16	Surendra Singh, MR Fitzsimmons, T Lookman, JD Thompson, Hyoung Jeen, A Biswas, MA Roldan, M Varela, Magnetic Nonuniformity and Thermal Hysteresis of Magnetism in a Manganite Thin Film, Physical review letters, 108, 077207 (2012)	3	Journal article, High Impact, High Profile
17	Yaohua Liu, C Visani, NM Nemes, MR Fitzsimmons, LY Zhu, J Tornos, M Garcia-Hernandez, M Zhernenkov, A Hoffmann, C Leon, others, Effect of Interface-Induced Exchange Fields on Cuprate-Manganite Spin Switches, Physical Review Letters, 108, 207205 (2012)	2	Journal article, High Impact, High Profile
18	Roger Pynn, Rana Ashkar, P Stonaha, AL Washington, Some recent results using spin echo resolved grazing incidence scattering (SERGIS), Physica B: Condensed Matter, 406, 2350-2353 (2011)	1	Journal article
19	Surendra Singh, MR Fitzsimmons, T Lookman, H Jeen, A Biswas, MA Roldan, M Varela, Role of elastic bending stress on magnetism of a manganite thin film studied by	1	Journal article

	polarized neutron reflectometry, Physical Review B, 85, 214440 (2012)		
20	Rana Ashkar, VO de Haan, AA van Well, R Dalgliesh, J Plomp, MR Fitzsimmons, WL Schaich, Roger Pynn, Comparison of dynamical theory and phase-object approximation for neutron scattering from periodic structures, Journal of Applied Crystallography, 44, 958-965 (2011)	0	Journal article
21	Yi Wang, Xi He, T Mukherjee, MR Fitzsimmons, S Sahoo, Ch Binek, Magnetometry and transport data complement polarized neutron reflectometry in magnetic depth profiling, Journal of Applied Physics, 110, 103914-103914 (2011)	0	Journal article
22	Kineshma Munbodh, Miyeon Cheon, David Lederman, MR Fitzsimmons, Neil R Dilley, Interfacial coupling between ferromagnets and random and dilute antiferromagnets, Physical Review B, 84, 214434 (2011)	0	Journal article
23	C He, AJ Grutter, M Gu, ND Browning, Y Takamura, BJ Kirby, JA Borchers, JW Kim, MR Fitzsimmons, X Zhai, others, Interfacial Ferromagnetism and Exchange Bias in CaRuO_ 3/CaMnO_ 3 Superlattices, Physical review letters, 109, 197202 (2012)	0	Journal article, High Impact, High Profile
24	Singh, Surendra, Chien, Te-Yu, Guest, J. R., Fitzsimmons, M. R., Correlation between surface rumpling and structural phase transformation in SrTiO{}_{3}, Physical Review B, 85, 115450 (2012)	0	Journal article

Flight Path 16—Pharos
Pharos

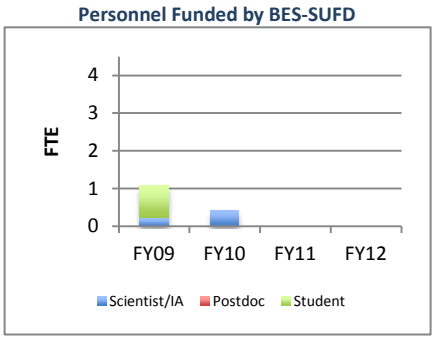
Beamline Description

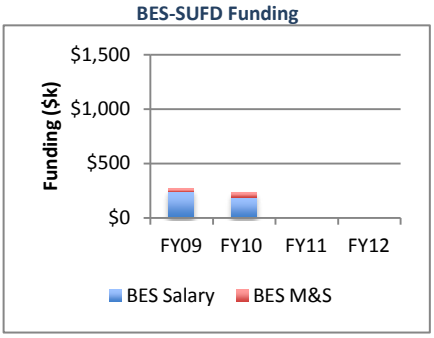
Pharos is designed for studies of fundamental excitations in condensed-matter systems. The instrument provides 2% to 4% incident energy resolution and uses a high-speed Fermi chopper to obtain monochromatic incident energies in the range from 10 meV to 2 eV. The sample is positioned 20 m from a chilled-water moderator. The spectrometer consists of an evacuated, shielded flight path with 10 m^2 of meter-long, position-sensitive detectors located at a distance of 4 m from the sample and covering scattering angles between -10° and 145°. Low-angle detectors are available for use at distances between 4 and 10 m, with scattering angles down to 0.65°, thus making it suitable for high-resolution inelastic studies (<1% resolution) at low Q.

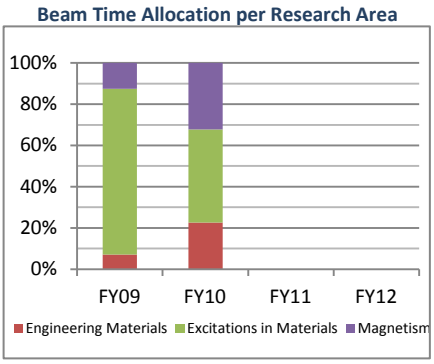
Note: Access to Pharos is limited to users who can provide their own support through scientific collaboration with Lujan Center staff.

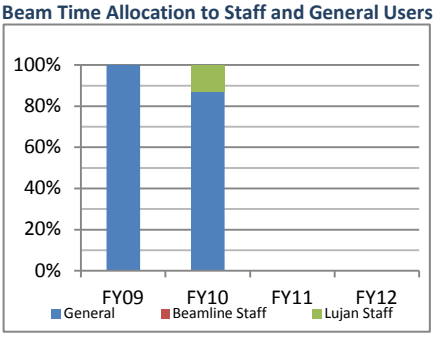
Target Scientific Audience

Condensed Matter Physics, National Security Science









Beamline Specifications

Moderator	Chilled water at 283 K
Primary Flight Path	18 m
Secondary Flight Path	
Q range/λ range/d-range	
Resolution	$\Delta E_i/E_i$ = 2% - 4%
Beam Size	5 cm x 7.5 cm
Flux Density	2.5×10^6 n/cm^2/s
Instrument Scientist-I	Dr. Victor Fanelli (0%)
Instrument Scientist-II	
Instrument Assistant	
Operating Funds 2012 (k$)	0
Allocation Percentages (General User/Beamline Staff/Facility Staff)	45%/0%/0%
# Users/Year (2 Year Average, Total/Unique Users)	6/6
Proposals Submitted (Run Cycle 2009/2010/2011/2012)	11/11/0/0

Summary of Pharos Publications

Year	Refereed Journal Publications (LC-co-author)	Refereed Conference Publications	Theses	High Profile	High Impact
2009	2 (2)	2	0	0(0)	0(0)
2010	5 (4)	0	0	0(0)	0(0)
2011	4 (3)	2	0	0(0)	0(0)
2012	2 (0)	0	0	0(0)	0(0)
Total	**13 (9)**	**4**	**0**	**0(0)**	**0(0)**

Complete List of Pharos Refereed Publications, 2009–2012

#	Publication	Citations	Publication type
1	ME Manley, AJ Sievers, JW Lynn, SA Kiselev, NI Agladze, Y Chen, A Llobet, A Alatas, Intrinsic localized modes observed in the high-temperature vibrational spectrum of NaI, Physical Review B, 79, 134304 (2009)	42	Journal article
2	Douglas L Abernathy, Matthew B Stone, MJ Loguillo, MS Lucas, O Delaire, Xiaoli Tang, JYY Lin, B Fultz, Design and operation of the wide angular-range chopper spectrometer ARCS at the Spallation Neutron Source, Review of Scientific Instruments, 83, 015114-015114 (2012)	19	Journal article

3	CH Wang, A. D. Christianson, JM Lawrence, ED Bauer, EA Goremychkin, AI Kolesnikov, F. Trouw, F. Ronning, JD Thompson, M. D. Lumsden, others, Neutron scattering and scaling behavior in URu_ 2 Zn_ 20 and YbFe_ 2 Zn_ 20, Physical Review B, 82, 184407 (2010)	8	Journal article
4	Keisuke Tomiyasu, Hiroshi Kageyama, Changhoon Lee, Mike H Whangbo, Yoshihiro Tsujimoto, Kazuyoshi Yoshimura, Jon W Taylor, Anna Llobet, Frans Trouw, Kazuhisa Kakurai, others, Magnetic Excitations in Infinite-Layer Antiferromagnetic Insulator, Journal of the Physical Society of Japan, 79, 144113 (2010)	5	Journal article
5	CH Wang, JM Lawrence, ED Bauer, K Kothapalli, JS Gardner, F Ronning, K Gofryk, JD Thompson, H Nakotte, F Trouw, Unusual signatures of the ferromagnetic transition in the heavy fermion compound UMn_ 2 Al_ 20, Physical Review B, 82, 094406 (2010)	5	Journal article
6	J. Eckert, F. R. Trouw, B. Mojet, P. Forster, R. Lobo, Interaction of Hydrogen with Extraframework Cations in Zeolite Hosts Probed by Inelastic Neutron Scattering Spectroscopy, Journal of Nanoscience and Nanotechnology, 10, 49-59 (2010)	3	Journal article
7	ME Manley, S Shapiro, Q Li, A Llobet, ME Hagen, Lattice dynamical origin of peak thermoelectric performance in AgPb_mSbTe_(2+m) observed by inelastic neutron scattering, Journal of Applied Physics, 109, 083722-083722 (2011)	2	Journal article
8	O Delaire, Studies of high-temperature electron--phonon interactions with inelastic neutron scattering and first-principles computations, Applied Physics A, 99, 523-529 (2010)	2	Journal article
9	Jie Ma, J-Q Yan, SO Diallo, R Stevens, A Llobet, F Trouw, DL Abernathy, MB Stone, RJ McQueeney, Role of magnetic exchange energy on charge ordering in R_ 1/3 Sr_ 2/3 FeO_ 3(R= La, Pr, andNd), Physical Review B, 84, 224115 (2011)	1	Journal article
10	F Trouw, JJ Rhyne, JN Mitchell, Pu neutron scattering studies--Magnetism and structure, Journal of Nuclear Materials, 385, 35-37 (2009)	0	Journal article
11	T Klimczuk, CH Wang, JM Lawrence, Qiang Xu, T Durakiewicz, F Ronning, A Llobet, F Trouw, N Kurita, Y Tokiwa, others, Crystal fields, disorder, and antiferromagnetic short-range order in Yb_ 0.24 Sn_ 0.76 Ru, Physical Review B, 84, 075152 (2011)	0	Journal article
12	DC Johnston, RJ McQueeney, B Lake, A Honecker, ME Zhitomirsky, R Nath, Y Furukawa, VP Antropov, Yogesh Singh, Magnetic exchange interactions in BaMn_ 2 As_ 2: A case study of the J_ 1-J_ 2-J_ c Heisenberg model, Physical Review B, 84, 094445 (2011)	0	Journal article
13	Xiao-Dong Wen, Richard L Martin, Thomas M Henderson, Gustavo E Scuseria, Density Functional Theory Studies of the Electronic Structure of Solid State Actinide Oxides, Chemical reviews, null, 015114-015114 (2012)	0	Journal article

Awards and Professional Recognition

Aksel, Elena: ACA Neutron Special Interest Group Etter Student Lecture Award Winner 2012

Billinge, Simon (NPDF User): J. D. Hanawalt Award of the International Union of Crystallography, 2010.

Bloomer, Breaunnah: LANL Symposium Winner 2011.

Brown, Donald W.: "Metallurgical Transactions A," Review Board Member, 2007–present.

Brown, Donald W.: SNS/HFIR Science Review Committee, Engineering Subcommittee, 2008–present.

Brown, Donald W.: Organizer, "Stress Measurement Using Neutron Diffraction," MECA SENS, Mito, Japan, 2009.

Brown, Donald W.: Chair of the Scientific Committee for MECA SENS, 2009–present.

Brown, Donald W.: Organizer, "Plasticity Probed with Neutron and X-Ray Scattering Techniques," Plasticity 2012, San Juan, Puerto Rico.

Brown, Donald W.: Co-Chair of the Residual Stress Measurement Session, Denver X-Ray Conference, 2012–present.

Brown, Donald W.: Lehman Review Committee of CD-2 Review of the APS Upgrade Project, 2012.

Brown, Donald W.: Los Alamos Awards Program: Project Advancement for HEDM on UO_2, Los Alamos, NM, USA, 2012.

Clausen, Bjorn: NeXus International Advisory Committee (NIAC), 2009–present.

Clausen, Bjorn and Sisneros, Thomas A.: Los Alamos Awards Program: For Preparation and In-Situ Loading Measurements on Activated Samples, Los Alamos, NM, USA, 2011.

Clausen, Bjorn: SNS/HFIR Science Review Committee, Engineering Subcommittee; Member 2012 and Chair 2013.

Clausen, Bjorn: Organizer, "Plasticity Probed with Neutron and X-Ray Scattering Techniques," Plasticity 2012, San Juan, Puerto Rico.

Egami, Tekashi (NPDF User): J. D. Hanawalt Award of the International Union of Crystallography, 2010.

Fanelli, Victor: Seaborg Postdoctoral Fellowship, GL Seaborg Institute, LANL, Los Alamos, NM, USA.

Fisher, Suzanne Z.: Postdoc Distinguished Performance Award, LANL, Los Alamos, NM, USA, 2010.

Fisher, Suzanne Z.: Travel Award to Attend the Structural Biology Keystone Conference, 2010.

Fisher, Suzanne Z.: Los Alamos Awards Program, BioScience Division, LANL, Los Alamos, NM, USA, 2012.

Fisher, Suzanne Z.: 2014 American Crystallographic Association Meeting, Albuquerque, NM, May 2014.

Fitzsimmons, Michael: Fellow of the American Physical Society, 2007.

Fitzsimmons, Michael: Visiting Professor/Researcher at the Laboratoire de Physique des Matériaux, Université H. Poincaré Vandoeuvre les Nancy, France from 2008-2011.

Fitzsimmons, Michael & Hjelm, Rex: Elected by the Board (Hjelm), Served as Treasurer (Fitzsimmons) of the Materials Research Society in 2009. Treasurer is one of five key officer positions of the MRS executive committee.

Hjelm, R.; Hartl, M.; Taylor, M.: Patent, "An Apparatus to Characterize the Structure of Gases in Solution Using Scattering," in process.

Hjelm, Rex: Committee Member, LANSCE Materials Program Advisory Committee, since 2003.

Hjelm, Rex: Committee Member & Mentor: Ph.D. Qualifying and Dissertation Committee, Department of Mechanical and Aerospace Engineering, University of California at Los Angeles, 2007–2011.

Hjelm, Rex: International Advisory Committee Member: International Meeting on Polymers in Automotive Applications, 2009.

Hjelm, Rex: United States Department of Energy, Office of Science Outstanding Mentor Award. For "…outstanding dedication…sharing knowledge…and training the next generation of scientists…," 2009.

Hjelm, Rex: Group Leader: Small-Angle Neutron Scatter/Ultra-Small-Angle Neutron Scatter Instrument Working Group, Workshop and Report Committee on Instrumentation at a Long Pulsed Neutron Source, Frascati, Italy, 2009.

Hjelm, Rex: Invited as an Organizer: Conference on "Thermodynamics, Kinetics and Structures of Molecular Motors," Santa Fe, NM, USA, May 2010.

Hjelm, Rex: Member, Advisory Committee on Soft Condensed Matter: American Conference on Neutron Scattering, Ottawa, Canada, June 2010.

Hjelm, Rex: Invited to serve on the International Advisory Committee: Conference on "Neutrons and Food: Addressing the Challenges of Food Science in an Evolving Global Environment Using Novel Methods," Sydney, Australia, November 2010.

Hjelm, Rex: Committee Member & Mentor: Ph.D. Qualifying and Dissertation Committee, Department of Chemical Engineering, University of California Santa Barbara, since 2011.

Hjelm, Rex: Instructor: American Physical Society Workshop on Scattering Methods, Dallas, Texas, 2011.

Hjelm, Rex: Organizer: V.M. Goldschmidt Conference: Session on "Smart" Materials for Energy and Environmental Applications, 2012.

Hood, Taylor: Distinguished Scholars Award from the Thurgood Marshall College Fund, 2011

Hurd, Alan J.: Selected as Meeting Co-Chair, IMRC 2009—XVIII International Materials Research Congress, The Mexican Materials Research Society (MRS-MEXICO), The Materials Research Society (MRS), and The NACE International Section Mexico, Aug. 2009.

Hurd, Alan J.: Co-Chair and Organizer, Second World Materials Summit, Suzhou China, Oct. 2009.

Jablin, Michael (SPEAR Student): Distinguished Student Performance Award, 2009, and Presentation Award, Los Alamos National Laboratory, 2009.

Llobet, Anna, Majewski, Jarek, Hjelm, Rex and others from Sandia National Laboratories and Oak Ridge National Laboratory: "Defense Programs Award of Excellence. For Significant Contributions to the Stockpile Stewardship Program: For Fostering the Application of Neutron Reflectivity Methods to Study Hydrogen in Thin Films for Stockpile Materials," 2009.

Losko, Adrian: "Award in Recognition of Achievement" for an outstanding start as a physics graduate student, 2011.

Losko, Adrian: "Outstanding Student Paper Award" for an outstanding graduate oral presentation at the Four Corners American Physics Society meeting in Socorro, 2012.

Majewski, Jarek: Fellow of the American Physical Society with the following citation: "For contribution to understand the structural properties of Langmuir films and model biomembranes at solid-liquid interfaces using x-ray and neutron scattering," 2005.

Majewski, Jarek: Editor of the Proceedings of the International Conference on Neutron Scattering (ICNS, Knoxville, TN, May 2009) Conference in the Journal of Physics Conference Series (JPCS).

Majewski, Jarek: Member of the Organizing Committee of the XVIII International Materials Research Congress Symposium: Advancing Frontiers in Materials Science through Scattering, Cancun, Mexico, August 2009.

Majewski, Jarek: Organizing Member of the "International Conference on Neutrons in Biology," Santa Fe, NM, USA, October 25-28, 2009.

Majewski, Jarek: Member of the International Advisory Board of the 10th International School and Symposium on Synchrotron Radiation in Natural Science, ISSRNS 2010, Szklarska Poreba, Poland, June 2010.

Majewski, Jarek; and Jablin, Michael: Fluorescence Microscopy Image of Polymer Supported Lipid Membrane from PRL paper was chosen by the American Physical Society to be included on their 2010 calendar, a document distributed to each of their approximately 47,000 members.

McCabe, Rodney; Clausen, Bjorn; Brown, Donald; Sisneros, Thomas et al.: Defense Programs Award of Excellence for "Deformation Physics Based Uranium Component Modeling (PREDICT)," Los Alamos, NM, USA, 2011.

Mocko, Michal: Programmatic Impact Award; for achievements in advancing the Laboratory's mission; Stand-Off Radiation Detection System (SORDS) program 2009.

Mocko, Michal: Defense Programs Award of Excellence; for significant contributions to the Stockpile Stewardship program; outstanding LANSCE reliability 2009.

Mocko, Michal: Los Alamos Achievement Award; for outstanding accomplishments and dedication; work on design and commissioning of 1L TMRS (Mark-III), Aug. 2010.

Muhrer, Guenter: Member of the SNS and HFIR Operations Review Team, ORNL, 2012.

Muhrer, Guenter: Program Advisory Committee, ICANS, 2010 and 2012.

Muhrer, Guenter: International Scientific Advisory Committee, ICANS, 2010.

Muhrer, Guenter: Member of the Executive/Scientific Committee of SATIF (Shielding Aspects of Accelerator, Targets and Irradiation Facilities), 2009–present.

Muhrer, Guenter: Founding member of the Executive Committee for MUG (Moderator User Group), 2009–present.

Muhrer, Guenter: Los Alamos Achievement Award, 2010 and 2011.

Muhrer, Guenter: Defense Programs Award of Excellence, 2009 and 2011.

Muhrer, Guenter: Most Valued Reviewers' Award for Nuclear Instrument and Methods A, 2010.

Muhrer, Guenter: Member of the Technical Program Committee for the "Accelerator Applications Division of the ANS" conferences: AccApp09, Vienna, Austria, 2009 and AccApp11, Knoxville, TN, USA, 2011.

Neilson, James (NPDF/HIPD User): "Graduate Student Silver Award," Materials Research Society, 2010.

Page, Katharine: The Postdoctoral Distinguished Performance Award Honorable Mention, 2010.

Page, Katharine: "Diffraction at Large Experimental Facilities," Organizer and Speaker, University of California, Santa Barbara, CA, September 2010.

Page, Katharine: Session Organizer and Speaker at "UC Sponsored Lujan Workshop: Applications of Neutron Scattering to Materials and Earth Sciences," Berkeley, CA, December 2010.

Page, Katharine: UC Santa Barbara Materials Research Laboratory External Advisory Board Member, Santa Barbara, CA, December 2010.

Page, Katharine: Outstanding Poster Award Winner, Los Alamos Postdoc Research Day, 2010.

Page, Katharine: ORNL Neutron Scattering Science Review Committee Member, Powder Diffraction Category, Oakridge, TN, October 2011.

Page, Katharine: Co-Session Chair of "Local Structure and Partially Ordered Systems" and Meeting "Workshop Instructor of Modeling and Refinement of Nanoparticle Structures from Diffraction Data," American Crystallographic Association Meeting, Boston, MA, July 2012.

Page, Katharine: Co-Organizer of "Advanced Simulation Techniques for Total Scattering Data Workshop," Santa Fe, NM, October 2012.

Page, Katharine: Session Chair of "Nanomaterial Structure from Diffraction Data—II: Experimental Advances," American Crystallographic Association Meeting, Honolulu, HI, July 2013.

Page, Katharine: Neutron Special Interest Group Chair, American Crystallographic Association, 2013.

Page, Katharine: American Crystallographic Association Meeting, Albuquerque, NM, May 2014.

Page, Katharine: Invited Committee Member, Workshop for POWGEN Users, Oak Ridge, TN, June 2014.

Sing, Saurabh: Session Chair at American Conference on Neutron Scattering (ACNS), Washington, DC, 2012.

Reiche, Helmut M.: “Honors Graduate,” in recognition of outstanding academic success, maintaining the highest graduate grade point average and graduation in the fall of 2012, New Mexico State University, Las Cruces, NM, USA, December 2012.

Rhyne, James J.: Scientific Advisory Board—VISTAS publication on LANL User Facilities, March 2009.

Rhyne, James J.: Member DOE-BES Review Committee for the SNS/HFIR, March 2009.

Rhyne, James J.: Member, International Advisory Committee, International Conference on Neutron Scattering, Knoxville, TN, May 2009.

Rhyne, James J.: Member, International Advisory Panel, Workshop on Inelastic Scattering (WINS), Oak Ridge National Laboratory, TN, May 2009.

Rhyne, James J.: Chair, Triple Axis Subcommittee, Science Review Committee, SNS/HFIR, 2009–present.

Rhyne, James J.: External Member, ORNL Neutron Sciences Directorate LDRD review board, May 2009–present.

Rhyne, James J.: Fellow, Neutron Scattering Society of America, conferred at the ACNS conference, June 2010, Ottawa, Canada.

Shoemaker, Daniel (NPDF/HIPD User): “Graduate Student Gold Award,” Materials Research Society, 2010.

Shoemaker, Daniel (NPDF/HIPD User): “23rd Louis Rosen Prize,” Los Alamos Neutron Science Center, 2011, Los Alamos, NM, USA.

Vogel, Sven C.: Instructor LANSCE Neutron Schools, Los Alamos, NM, USA, 2005-present.

Vogel, Sven C.: LANSCE User Facility Director’s Award 2009, Los Alamos, NM, August 2009.

Vogel, Sven C.: NNSA Award of excellence for significant contribution to stockpile and stewardship, 2009.

Vogel, Sven C.: Session Organizer THERMEC 2011 Conference, Quebec, Canada, September 2011.

Vogel, Sven C.: Appointed Adjunct Faculty at New Mexico Institute of Mining and Technology, Socorro, NM, 2011-present.

Vogel, Sven: Guest Editor Journal of Materials, Special Section on Materials Characterization with Neutron Scattering, Jan. 2012.

Vogel, Sven: Co-Organizer, International Workshop on Scattering Techniques for Structural Materials, Berkeley, CA, USA, October 2012.

Vogel, Sven: Co-Organizer, Workshop on Texture Analysis from Diffraction Data, ALS, Berkeley, December 2012.

Vogel, Sven C.: Ph.D. Committee Member for Helmut M. Reiche, New Mexico State University, Las Cruces, NM, 2012.

Vogel, Sven: Distributor of popLA texture analysis software since July 2011. The approximately 50 annual requests also led to recruits for HIPPO beamtime.

Vogel, Sven: Developed open source gsaslanguage to automate GSAS-based Rietveld analysis. The Google-hosted manual has been downloaded over 500 times to date, 2010.

Vogel, Sven C.: Session Organizer, THERMEC 2013 Conference, Las Vegas, NV, USA, December 2013.

Vogel, Sven C.: Outstanding Peer-Review for Metallurgical and Materials Transactions, April 2013.

Watkins, Erik (SPEAR Student): Participated in Lindau Nobel Laureate Meeting, 2009.

White, Claire: Outstanding Student Research Prize, Awarded by the Neutron Scattering Society of America in recognition of outstanding accomplishment in the area of neutron scattering, 2012.

Wurden, Caroline: LANL Symposium winner, 2010.

Xu, Hongwu: Associate Editor, American Mineralogist, 2005–present.

Xu, Hongwu: Neutron Science Review Committee, Oak Ridge National Laboratory, TN, 2008–2010.

Xu, Hongwu: Session Convener, “Neutron Scattering for the Geosciences,” American Geophysical Union 2009 Joint Assembly, Meeting of the Americas, May 24–27 2009, Toronto, Ontario, Canada.

Xu, Hongwu: Fellow of the Mineralogical Society of America, 2012.

Xu, Hongwu: Session Convener, "Earth Materials at the Mesoscale: Nature and Processes,” 2012 Fall American Geophysical Union Meeting, December 3-7, 2012, San Francisco, CA, USA.

Zhao, Yusheng: Chinese "National Thousand Talents Program" Award, 2010, China.

Zhao, Yusheng: Session Co-Chair for COMPRES Workshop on Long Range Plan for High Pressure Earth Sciences, March 2009, Tempe, AZ, USA.

Zhang, Jianzhong: Invited scientific reviewer for US neutron facilities of SNS and HFIR, Oak Ridge National Laboratory, 2008–2010.

Zhang, Jianzhong: Editorial Board for Advances in Materials Research, an International Journal, 2011–present.

Zhang, Jianzhong: Alternate Elector on behalf of Los Alamos National Laboratory for COMPRES, the US Consortium for Materials Properties Research in Earth Sciences, 2011–present.

Zhu, Jinlong: Assistant Professor at the Institute of Physics, CAS, Beijing, China, 2009–present.

Invited Talks

Billinge, S. J. L. (NPDF/HIPD user), 13th European Powder Diffraction Conference EPDIC 13 Grenoble France, October 28th-31st (2012).

Billinge, S. J. L. (NPDF/HIPD user), X-ray and neutron studies of nanoscale structural fluctuations in electronic materials, Phase separation and superstripes in high temperature superconductors and related materials, SUPERSTRIPES (2012), Erice Italy, July 11th-17th (2012).

Billinge, S. J. L. (NPDF/HIPD user), Nanostructure—from energy materials to pharmaceuticals, Zing Nanoscience Conference Lanzarote Spain, February 14-17 (2012).

Billinge, S. J. L. (NPDF/HIPD user), Structure of nanostructured materials using PDF methods at the ESRF and beyond, ESRF Users' meeting ESRF Grenoble France, February 7-8 (2012).

Billinge, S. J. L. (NPDF/HIPD user), Nanostructure from energy materials to pharmaceuticals: total scattering and the atomic pair distribution function method, two-day workshop on the applications of the NYU Bruker GADDS instrument NYU New York, June 15-16 (2011).

Billinge, S. J. L. (NPDF/HIPD user), Software Enabling Science: Nanostructure from diffraction, American Crystallographic Association annual meeting New Orleans LA, May 28th - June 2nd (2011).

Billinge, S. J. L. (NPDF/HIPD user), Material structure in the nano-world: The nanostructure problem and modern scattering methods for solving it, Gordon Research Conference on Clusters Nanocrystals & Nanostructures Mount Holyoke College in South Hadley MA, July 24th - 29th (2011).

Billinge, S. J. L. (NPDF/HIPD user), Complicated problems: complex materials and complex modeling, Workshop on the analysis of diffraction data in real-space (ADD2011) ESRF Grenoble, October 11th - 14th (2011).

Billinge, S. J. L. (NPDF/HIPD user), Material structure in the nano-world: The nanostructure problem and modern scattering methods for solving it, International Conference on Communication Computational skills and Nanotechnology Swami Ramanand Teerth Marathwada University Nanded Maharashtra State India, January 11th - 13th (2011).

Billinge, S. J. L. (NPDF/HIPD user), Pair Distribution function technique: principles and methods, diffraction at the nanoscale: nanocrystals defective and amorphous materials, Paul Scherrer Institute Villigen Switzerland, May 24th-30th (2010).

Billinge, S. J. L. (NPDF/HIPD user), Material structure in the nano-world: The nanostructure problem and modern scattering methods for solving it, 2009 Advances in X-Ray Scattering & Diffraction Workshop Delta Guelph Hotel and Conference Centre in Guelph Ontario, October 26th (2009).

Billinge, S. J. L. (NPDF/HIPD user), The importance of local structure in functional materials from atomic pair distribution function analysis measurements, Local distortions and physics of functional materials (LPF09) Frascati Italy, July 22nd - 24th (2009).

Billinge, S. J. L. (NPDF/HIPD user), Recent developments in atomic pair distribution function analysis applied to amorphous and nanocrystalline materials, Applications of Synchrotron Techniques in Glass Research, Brookhaven National Laboratory, April 6th - 7th (2009).

Billinge, S. J. L. (NPDF/HIPD user), Atomic pair distribution function (PDF) analysis for the study of structure at the nanoscale, 10th international school and workshop of crystallography of the Egyptian society of crystallography and its applications (ESCA), Ain Soukhna Egypt, February 1st - 5th (2009).

Billinge, S. J. L. (NPDF/HIPD user), Atomic pair distribution function (PDF) analysis hands-on tutorials PDFgetX2 and PDFgui, 10th international school and workshop of crystallography of the Egyptian society of crystallography and its applications (ESCA), Ain Soukhna Egypt, February 1st - 5th (2009).

Billinge, S. J. L. (NPDF/HIPD user), Material structure in the nano-world: The nanostructure problem and our efforts at solving it, invited talk iNANO 7th Annual meeting, Aarhus Denmark, January 21st (2009).

Billinge, S. J. L. (NPDF/HIPD user), Atomic pair distribution function analysis, invited talk, Analytical Approaches Workshop Center for Green Materials Chemistry, U. Oregon, Eugene, OR, January 12th (2009).

Bozin, Emil, (NPDF/HIPD user), Christos Malliakas, Petros Souvatzis, Thomas Proffen, Nicola Spaldin, Mercouri Kanatzidis and Simon Billinge, Incipient ferroelectricity in thermoelectric lead telluride, American Crystallographic Association Annual meeting, New Orleans, LA, May 28 - June 2 (2011).

Bozin, Emil (NPDF/HIPD user), Ahmad S. Masadeh, Yew S. Hor, John F. Mitchell and Simon J.L. Billinge , Local structural aspects of the metal-insulator transition in CuIr2S4 from total scattering x-ray study, EPDIC12 12th European Powder Diffraction Conference, Darmstadt Germany, August 27-31 (2010).

Brown, D. W.; Clausen, B.; Korzekwa, D.; Korzekwa, R.; Sisneros, T. A.; and Teter, D. F.: “Using Neutron Diffraction to Measure Residual Stresses: A Case Study of Uranium,” Departmental Colloquium at the Atomic Weapons Establishment, February 2009, Aldermasten, UK.

Brown, D. W.; Sisneros, T.; Donati, D.; Blumenthal, W.; Clausen, B.; Vogel, S.; Tome, C.; and Beyerlein, I.: “Neutron Diffraction Study of the Strain Rate Dependent Development of Microstructure in Beryllium,” TMS Annual Meeting, February 2009, San Francisco, CA, USA.

Brown, D. W.; Sisneros, T.A.; Kabra, S.; Lograsso, T.; and Schlagel, D.: “In-Situ Neutron Scattering Studies of Multi-Ferroics under Stress,” Temperature and Magnetic Fields, February 2009, San Francisco, CA, USA.

Brown, D. W.; Sisneros, T. A.; Vaidyanathan, R.; Tupper, C. N.; and Field, R. D.: “Monitoring the Development of the Texture and Phase of Shape Memory Alloys Using In-Situ Neutron Diffraction during Deformation and Thermal Cycling,” ACA Meeting, July 2009, Toronto, Canada.

Brown, D. W; Clausen, B.; Tomé, C. N.; and Vogel, S. C.: “Synchrotron X-Ray Studies of Deformation of Hexagonal Metals,” Denver X-Ray Conference, July 2009, Denver, CO, USA.

Brown, D. W.; Tupper, C.; Vaidyanathan, R.; Sisneros, T.; Clausen, B.; and Korzekwa, D.: “Deformation of Shape Memory Alloys under Biaxial Loading,” TMS Annual Meeting, Feb. 2010, Seattle, WA, USA.

Brown, D. W.: “Diffraction Measurement of Residual Stresses in Highly Anisotropic Materials: An Example of e-Beam Welded Uranium Rings,” European Conference on Residual Stress, June 25, 2010, Riva Del Garda, Italy.

Clausen, B.: “Engineering TOF Diffraction,” DANSCE Developers Meeting, 2009, Pasadena, CA, USA.

Clausen, B.: “Expectations,” VULCAN Load Frame Acceptance Test, 2009, Eden Prairie, MN, USA.

Clausen, B. et al.: “Measurements and Prediction of Residual Stress Profiles in Indented Disks,” THERMEC, 2009, Berlin, Germany.

Clausen, B. et al.: “In-Situ Neutron Diffraction Measurements at SMARTS,” MS&T, 2009, Pittsburg, PA, USA.

Clausen, B. et al.: “Large Strain EPSC Model with Dislocation Density Based Hardening Law,” MECA SENS, 2009, Mito, Japan.

Clausen, B. et al.: “Accounting for Twin Reorientation and Stress Relaxation in EPSC Simulations,” EPIM Workshop, 2010, Kingston, ON, Canada.

Clausen, B.: “The SMARTS Perspective,” VULCAN Inauguration Workshop, 2010, Oak Ridge, TN, USA.

Clausen, B. et al.: “Engineering Related Neutron Diffraction Measurements Probing Strains, Texture and Microstructure,” Risø International Symposium, 2010, Roskilde, Denmark.

Clausen, B. et al.: “Engineering Related Neutron Diffraction Measurements,” University of Virginia, 2011, Charlottesville, CT, USA.

Clausen, B. et al.: “Application of a Finite Strain Elastic-Plastic Self-Consistent Model to Deformation of Magnesium,” SEM, 2011, Uncasville, CT, USA.

Clausen, B. et al.: “EPSC Modeling and Neutron Diffraction Measurements,” TMS, 2011, San Diego, CA, USA.

Clausen, B. et al.: “Measurement and Prediction of Dislocation Density Development during Plastic Deformation,” Plasticity, 2012, San Juan, Puerto Rico.

Clausen, B. et al.: “Obtaining Material Parameters Using Neutron Diffraction Measurements and Numerical Modeling,” Nuclear Physics Institute, 2012, Rez, Czech Republic.

Clausen, B. et al.: “In-Situ Studies of Engineering Materials at SMARTS,” ESS Science Symposium, 2012, Prague, Czech Republic.

Clausen, B. et al.: “Phase Reversion during Compressive Loading of Shocked Alpha/Omega Zirconium,” TMS, 2013, San Antonio, TX, USA.

Clausen, B. et al.: “Deformation Behavior of Magnesium Alloys Investigated Using Diffraction Measurements and Self-Consistent Modeling,” TMS, 2013, San Antonio, TX, USA.

Fanelli, V.R.; Migliori, A.; Suzuki, Y.; and Betts, J.: “Elastic Moduli, Debye Waller and Electron Localization in Plutonium,” Plutonium Futures the Science, September 19-23, 2010, Keystone, CO, USA.

Fisher, S.Z.: “Joint Neutron/X-Ray Refinement of HCA II,” LANSCE User Group Meeting, 2009, Santa Fe, NM, USA.

Fisher, S.Z.: “Macromolecular Neutron Crystallography at the Protein Crystallography Station at LANSCE,” BioScience Colloquium Seminar, 2009, LANL, Los Alamos, NM, USA.

Fisher, S.Z.: “The Neutron Structure of Human Carbonic Anhydrase II: Implications for Catalysis,” Neutrons in Biology, 2009, Santa Fe, NM, USA.

Fisher, S.Z.: “Neutron Crystal Structures of Carbonic Anhydrase II at Different pH Reveal Implications for Catalysis,” Crystallographic Association, 2011, New Orleans, LA, USA.

Fisher, S.Z.: “Elucidating the Proton Transfer Mechanism of Carbonic Anhydrase Using Joint Neutron and X-Ray Crystallography,” DOE-OBER Grantor-grantee meeting, 2012, Bethesda, MD, USA.

Fisher, S.Z.: “Neutrons for Biofuels,” Structural Biology Neutron School, 2012, Oak Ridge National Laboratory, Oakridge, TN, USA.

Fisher, S.Z.: “Joint Neutron and X-Ray Crystallography of Carbonic Anhydrase,” Materials Research Congress, 2012, Cancun, Mexico.

Fisher, S.Z.: “Macromolecular Structure Determination by X-Ray and Neutron Diffraction,” Q-Bio Summer School, 2012, Santa Fe, NM, USA.

Fitzsimmons, M. R.: “How Can Polarized Neutron Reflectometry Help Us Understand Phantom Magnetism?” Helmholtz-Zentrum, May 2009, Berlin, Germany.

Fitzsimmons, M. R.: “How Can Polarized Neutron Reflectometry Help Us Understand Phantom Magnetism?” International Conference on Films and Surface Magnetism, July 2009, Berlin, Germany.

Fitzsimmons, M. R.: “Upper Limit to Magnetism in LaAlO3/SrTiO3 Heterostructures,” American Physical Society Meeting, Feb. 2012, Boston, MA, USA.

Fitzsimmons, M. R.: “Small Angle Neutron Scattering Using Polarized Neutron Beams from a User’s Perspective,” American Conference on Neutron Scattering, June 2012, Washington DC, USA.

Fitzsimmons, M. R.: “Magnetic Non-Uniformity in $(La_{0.4}Pr_{0.6})_{0.67}Ca_{0.33}MnO_3$ Films and Measurement of the Strain-Magnetization Coupling Coefficient,” Magnetic North III, June 2012, Banff, Canada.

Fitzsimmons, M. R.: “Role of Neutron Scattering in Studies of Emergent Behavior of Complex Oxide Heterostructures, Emergence or Materials Science?” Condensed Matter Physics Seminar, University of California, October 2012, San Diego, CA, USA.

Fitzsimmons, M. R.: 2nd International Symposium on Neutron Scattering, January 14-17, 2013, Mumbai, India (invited, did not attend because of insufficient funds).

Fitzsimmons, M. R.: ESS' Technical Advisory Panel (TAP) on Neutron Optics, February 12-15, 2013, Sweden (invited, did not attend because of insufficient funds).

Fitzsimmons, M. R.: “Advances in Polarized Neutron Reflectometry,” Satellite Workshop to the ICNS, July 3-4 2013, Ruhr-University Bochum, International Conference Center, Bochum, Germany (invited, will not attend because of insufficient funds).

Greedan, John (NPDF/HIPD user): “Much Ado About Nothing. Oxygen Vacancy Order and Disorder in Defect Perovskites:Local and Long Range Structure and Magnetism,” BIMR, McMaster Univ., November 14, 2011.

Greedan, John (NPDF/HIPD user): “Much Ado About Nothing. Oxygen Vacancy Order and Disorder in Defect Perovskites: Local and Long Range Structure and Magnetism,” Calif. State Univ., Long Beach, March 24, 2012

Greedan, John (NPDF/HIPD user): “Much Ado About Nothing. Oxygen Vacancy Order and Disorder in Defect Perovskites: Local and Long Range Structure and Magnetism,” Canadian Soc. for Chemistry, Calgary, Canada, May 29, 2012.

Hjelm, R.: “Plasticization in Complex, Phase-Separated Polymers,” plenary address, International Meeting on Polymeric Materials, April 2009, Brataslava, Slovak Republic.

Hjelm, R.: “The Mechanism of Helium Bubble Formation in Erbium Tritide Neutron Generator Films,” 10th International Conference on Applications of Nuclear Techniques, June 2009, Crete, Greece.

Hjelm, R.: “The Motive Mechanism of Mitotic Kinesin-14, Ncd,” Department of Biology, University of Padova, September 2009, Padova, Italy.

Hurd, A.J: “Research Opportunities at LANSCE in Neutron Scattering: The Legacy of Louie Rosen” APS Four-Corners Section Meeting, October 2009, Golden, CO, USA.

Léon,K. A. Hadril, M. Hoelzel, J. Wuttke (NPDF user): "Nanoscaled Materials for Hydrogen Storage," International Workshop “Neutrons for Global Energy Solutions,” Bonn, 26 September 2010.

Majewski, J.: “Neutron Reflectometry for Studying Bio-Related Soft Materials,” University of New Mexico, January 21, 2009, Dept. of Chemical & Nuclear Engineering, Center for Biomedical Engineering, Albuquerque, NM, USA.

Majewski, J.: “Neutron Reflectometry at SPEAR at LANSCE: Studying Bio-Related Materials,” Technical University Munich, April 6, 2009, FRM II Reactor Facility, Munich, Germany.

Majewski, J.: “Investigations of Lipidic Layers by Neutron and X-Ray Scattering,” Polish Chemical Society, April 20, 2009, Department of Chemistry, Jagellonian University, Krakow, Poland.

Majewski, J.: “Interactions of Proteins with Membranes: Neutron and X-Ray Studies,” Institute of High Pressures, April 24, 2009, Polish Academy of Sciences, Warsaw, Poland.

Majewski, J.: “Model Lipid Membranes on Thermoresponsive Surface-Tethered PNIPAAm Polymeric Network,” University of Warsaw, April 28, 2009, Department of Chemistry, Warsaw, Poland.

Majewski, J.: “Water Density at Hydrophobic Surfaces: Neutron Scattering Studies,” 13th IACIS, International Conference on Surface & Colloid Science, 83rd ACS Colloid & Surface Science Symposium, June 15-29, 2009, Columbia University, N.Y., USA.

Majewski, J.: “Neutron and X-Ray Scattering from Soft-Condensed Matter Including Bio-Membranes,” Polish Chemical Society, September 22, 2009, Department of Chemistry, University Marie Curie-Sklodowska, Lublin, Poland.

Majewski, J.: “Off-Specular Neutron Scattering from Supported Single Lipid Membrane,” JCNS Workshop, “Off-Spec 2009: Modeling and Data Analysis for Grazing Incidence and Off-Specular Scattering,” September 27-29, 2009, Munich-Feldafing, Germany.

Majewski, J.: “Thermo-Responsive Polymer Supports Single Lipid Bilayers: Neutron Scattering Studies,” International Conference on Neutrons in Biology, October 25-28, 2009, Santa Fe, NM.

Majewski, J.: “What Neutron and X-Ray Scattering Can Tell about Organization of Model Lipid Membranes: Reflectometry, Grazing Incidence In-Plane Diffraction and Off-Specular Scattering Studies,” Ben Gurion University of the Negev, March 3, 2010, Beer Sheva, Israel.

Majewski, J.: “Introduction to Neutron Scattering: Soft Condensed Matter and Structural Biology,” Ben Gurion University of the Negev, March 4, 2010, Beer Sheva, Israel.

Majewski, J.: “Mixed Sphingomyelin/Cholesterol Layers and Their Interactions with β-Cyclodextrine. X-Ray and Neutron Scattering Studies,” International Student Workshop on Lipid Domains, ISWOLD 2010, Weizmann Institute, March 7-12, 2010, Rehovot, Israel.

Majewski, J.: “Neutron and X-Ray Scattering from Single Supported Lipid Membranes: Reflectometry, Grazing Incidence Diffraction and Off-Specular Scattering,” American Physical Society, March 2010, Portland, OR, USA.

Majewski, J.: “Organization of Model Lipid Membranes Reviewed by Neutron Reflectometry: Mixed Sphingomyelin/Cholesterol Layers and Their Interactions with β-Cyclodextrin,” Computations in Science Seminar, University of Chicago, March 31, 2010, Chicago, IL, USA.

Majewski, J.: “Neutron Scattering from Lipid Membranes on Thermo-Responsive Polymer Cushion: Reflectometry and Off-Specular Scattering Studies,” Department of Chemical Engineering, UC Davis, April 6, 2010, Davis, CA, USA.

Majewski, J.: “Probing the Structure of Lipid Mono- and Bi-Layers with Neutron and X-Ray Scattering Methods,” CNLS, LANL, April 20, 2010, Los Alamos, NM, USA.

Majewski, J.: “Studies of Soft-Condensed Matter and Biological Systems by Neutron and X-Ray Scattering Methods,” Condensed Matter Science Seminar, LANL, May 26, 2010, Los Alamos, NM, USA.

Majewski, J.: “Neutron Reflectometry: From Model Biomembranes to Living Cell Adhesion” and “Early Stages of Oxidative Stress-Induced Lipid Membrane Permeabilization: A Neutron Reflectometry Study,” American Conference on Neutron Scattering, June 26-30, 2010, Ottawa, Canada.

Majewski, J.: “Interaction of Lipid Monolayers and Single Supported Bilayers with Proteins: X-Ray and Neutron Reflectometry, Off-Specular Scattering and Grazing Incidence Diffraction Studies,” Membrane & Associated Proteins session for the American Crystallographic Association Meeting, July 25, 2010, Chicago, IL, USA.

Majewski, J.: "Synchrotron X-Ray Scattering From Amphiphilic Self-Assembled Films at Solid-Liquid Interfaces: Reflectometry and Grazing Incidence In-Plane Diffraction," XIX International Materials Research Congress 2010, August 15-19, 2010, Cancun, Mexico.

Majewski, J.: "Neutron Reflectometry and Off-Specular Scattering Investigations of Lipid Membranes on Thermo-Responsive Polymer Cushion," 240th Am. Chem. Society National Meeting, August 22-26, 2010, Boston, MA, USA.

Majewski, J.: "Bio-Threat Agents: How X-Ray and Neutron Scattering Help to Understand Assault of Toxins on Cellular Membranes," EMRS Symposium, "Materials Sciences and Their Applications to Homeland Security," European Materials Research Society, September 14-16 2010, Warsaw, Poland.

Majewski, J.: "How X-Ray and Neutron Scattering Methods Help to Understand the Structure of Cellular Membranes and Their Interactions with Bio-Polymers," Interdisciplinary Center for Modeling, Sept. 16, 2010, Warsaw, Poland.

Majewski, J.: "Cellular Membranes and Their Interactions with Bio-Polymers," Department of Chemistry, Jagellonian University, September 20, 2010, Krakow, Poland.

Majewski, J.: "Introduction to Neutron Scattering: Studies of Soft-Condensed Materials," Department of Chemistry, University of Chicago, December 9, 2010, Chicago, IL, USA.

Majewski, J.: "Neutron Reflectivity and Off-Specular Scattering Studies of Single Lipid Bilayers Cushioned by Thermo-Responsive Polymer," Bilayers at the ILL Meeting, January 12-14, 2011, ILL, Grenoble, France.

Majewski, J.: "X-Ray and Neutron Scattering Methods to Study the Structure and Stability of Lipid Rafts," Institute of Biology and Biophysics, Polish Academy of Sciences, January 20, 2011, Warsaw, Poland.

Majewski, J.: "Studying the Structure and Dynamic of Bio-Membranes with Neutron Scattering," Faculty of Biology, Biophysics and Biotechnology, Jagellonian University, March 18, 2011, Krakow, Poland.

Majewski, J.: "Utilization of Neutron Surface Scattering Methods to Study Soft Matter Interfaces," Faculty of Physics and Applied Computer Science, Mining Academy (AGH), March 21, 2011, Krakow, Poland.

Majewski, J.: "Centennial Anniversary Lectures of Marie Sklodowska-Curie Nobel Prize in Chemistry: Novel Methods to Investigate Surface Structure and Dynamics," University of Maria Sklodowska-Curie, May 16-27, 2011, Lublin, Poland.

Majewski, J.: “Neutron Reflectometry Studies of the Interaction of Cellulases with Films of Amorphous Cellulose,” XX International Materials Research Congress: Renewable Energy and Sustainable Developments, August 14-19, 2011, MRS-Mexico, Cancun, Mexico.

Majewski, J.: “Biointerfaces: From Lipid Monolayers to Cell Membranes and Living Cell Adhesion,” 2011 CINT User Conference, September 15-16, 2011, Albuquerque, NM, USA.

Majewski, J.: “Thermo-Responsive Polymeric Nano-Coatings of Biological Relevance,” 6th International Conference on Surface Coatings and Nano-Structured Materials, NANOSMAT, October 17-20, 2011, Krakow, Poland.

Majewski, J.: “Investigations of Model Cellular Membranes and Their Interactions with Toxins Using Neutron and X-Ray Scattering Methods,” SELVITA, October 21, 2011, Krakow, Poland.

Majewski, J.: “Neutron Spallation Sources,” Institute of Physics Polish Academy of Sciences, October 25, 2011, Warsaw, Poland.

Majewski, J.: “Neutron Reflectometry Studies of Biologically Relevant Systems,” Bhabha Atomic Research Center, July 18, 2012, Mumbay, India.

Majewski, J.: “Neutron Scattering Studies of Biologically Relevant Systems,” Sandia National Laboratories at LLNL, August 9, 2012, Livermore, CA, USA.

Majewski, J.: “X-Ray and Neutron Scattering Investigations to Understand the Molecular Basis of Alzheimer Disease,” Laboratory of X-Ray and Electron Microscopy, Physics Polish Academy of Science, September 4, 2012, Warsaw, Poland.

Majewski, J.: “Neutron/X-Ray Scattering to Probe Thin Biological Layers,” New Mexico Consortium, October 2, 2012, Silver City, NM, USA.

Majewski, J.: “Neutron Scattering to Probe and Understand Biological Interfaces: From Model Systems to Living Objects,” Illinois Institute of Technology, October 24, 2012, Chicago, IL, USA.

Majewski, J.: “Probing the Structures of Biological Interfaces by Neutron Scattering,” “Frontriers in Neutron Structural Biology Workshop,” SNS, ORNL, April 16, 2013, Oak Ridge, TN, USA.

Majewski, J.: “X-Ray and Neutron Scattering Studies of Bio-Interfaces: From Lipid Monolayers to Cell Membranes and Living Cell Adhesion,” Worcester Polytechnic Institute, April 29, 2013, Worcester, MN, USA.

Mocko, M.: “Nuclear Cross-Section Measurements at LANSCE,” National Nuclear Data Center seminar, October 7, 2008, Upton, NY, USA.

Mocko, M.: “Blue Room Experiment,” Spallation Physics Group Meeting, December 11, 2008, Taos, NM, USA.

Mocko, M.: “The Design of the New Lujan Target,” LANSCE User Group meeting, October 1, 2009, Santa Fe, NM, USA.

Page, K.: “Probing Size Effects in Functional Metal Oxide Nanoparticles with the Pair Distribution Function,” Materials Research Society Spring Meeting, April 2009, San Francisco, CA, USA.

Page, K.: “Local Structure in Ferroelectric Perovskite Oxides, International Conference on Neutron Scattering,” May 2009, Knoxville, TN, USA.

Page, K.: “PDF Fitting: Practical Modeling Tutorial,” North American Solid State Chemistry Conference, June 2009, Columbus, OH, USA.

Page, K.: “Local Structure in Ferroelectric Perovskites, North American Solid State Chemistry Conference,” June 2009, Columbus, OH, USA.

Page, K.: “Local Structure Studies of Oxynitrides, Ferroelectric Perovskite Oxides and Related Materials,” Pittsburgh Diffraction Conference, October 2009, Athens, GA, USA.

Page, K.: “Probing Nanoscale Structural Features in Ferroelectric Perovskites with the Pair Distribution Function,” Electronic Materials and Applications, January 2010, Orlando, FL, USA.

Page, K.: “Probing Local Structure in Ferroelectric Perovskites,” NSLS User Group Meeting, May 2010, New York, USA.

Page, K.: “The Continued Impact of High Resolution Total Scattering,” Denver X-Ray Scattering Conference, July 2010, Denver, CO, USA.

Page, K.: “Probing Nanostructure in Functional Metal Oxides with X-Ray and Neutron Total Scattering,” MS&T Conference, October 2010, Houston, TX, USA.

Page, K.: “Probing Nanostructure in Functional Materials with Total Scattering,” The 21st International Offshore (Ocean) and Polar Engineering Conference, June 2011, Maui, HI, USA.

Page, K.: “Accelerating Nanoscale Research with Neutron Total Scattering: Linking Structure and Function in Finite Materials,” Annual Meeting of the Four Corners Section of the APS, October 2012, Socorro, NM, USA.

Page, K.: “Total Scattering Developments for Nanoscale Materials Characterization,” Advances in Powder Diffraction IV, April 2013, Gaithersburg, MD, USA.

Page, K.: “Linking Structure and Function in Finite Materials,” 22nd International Materials Research Congress, August 2013, Cancun, Mexico.

Proffen, T.: “Disordered Crystals—Diffuse Scattering to the Rescue,” Pittsburgh Diffraction Conference, 2009, Athens, GA, USA.

Proffen, T.: “R-Dependent Refinements: An Alternative to RMC?” RMC4 Conference, 2009, Budapest, Hungary.

Proffen, T.: “Local Structure and Crystallographic Phase Transitions,” Annual Meeting of American Crystallographic Association, 2009, Toronto, Canada.

Proffen, T.: “Total Scattering: The Key to Local and Medium Range Structure of Materials,” Chemistry Department, University of Sussex, 2009, Brighton, UK.

Proffen, T.: “Total Scattering: The Key to Local and Medium Range Structure of Materials,” TMS Meeting, 2009, San Francisco, CA, USA.

Seshadri, R. (NPDF/HIPD User): “Functional Nanoparticles and Phosphors Studied by Scattering and NMR Techniques International Workshop on Advanced Materials,” February 2011, Ras Al Khaimah, United Arab Emirates.

Seshadri, R. (NPDF/HIPD User): “Inorganic Phosphors for Solid State White Lighting: Understanding and Development,” Ric Kaner Award Symposium, March 2012, ACS Spring Meeting, San Diego, CA, USA.

Seshadri, R. (NPDF/HIPD User): “Neutron Total Scattering Studies of First- and Second-Order Jahn-Teller Phenomena in Oxide Pyrochlores and Spinels,” American Conference on Neutron Scattering, June 2012, Georgetown, Washington DC, USA.

Seshadri, R. (NPDF/HIPD User): “Experimental and Computational Studies of platinum- and Noble-Metal Ion Catalysts,” Chalmers-UCSB Workshop on Materials for Energy Applications and Catalysis, June 2012, Gothenberg, Sweden.

Seshadri, R. (NPDF/HIPD User): “Solid State Chemistry and Reactivity of Noble Metal Oxides: Pauling Electronegativities and Gold Chemistry,” Pauling Award Symposium, October 2012, University of Washington, Seattle, WA, USA.

Seshadri, R. (NPDF/HIPD User): Plenary Talk: “Structural Science of Inorganic Phosphor Materials,” Phosphor Safari, November 2012, Hsinchu, Taiwan.

Seshadri, R. (NPDF/HIPD User): “Interaction of Lone Pairs in Complex Transition Metal Oxides,” International Institute of Physics, Workshop on Novel Materials, December 2012, Natal, Brazil.

Seshadri, R. (NPDF/HIPD User): “Studying Local Structure and Lattice Rigidity in Inorganic Phosphors,” MRS Spring Meeting, April 2013, Symposium U, San Francisco, CA, USA.

van Deventer, J. S. J.; White, C. E.; and Provis, J. L.: “The Role of Molecular Research into the Commercialization of Geopolymer Concrete in Australia,” 12th International Ceramics Congress of Cimtec, June 6-11, 2010, Montecatini Terme, Italy.

White, C. E.: Plenary Presentation for Receiving the 2012 Prize for Outstanding Student Research, American Conference on Neutron Scattering, June 24–28, 2012, Washington D.C., USA.

White, C.E.; Provis, J. L.; Proffen, T.; Riley, D. P.; and van Deventer, J. S. J.: "Coupling Total Scattering and Density Functional Theory Computations to Solve the Structure of Complex Disordered Aluminosilicates," American Crystallographic Association, June 24-29, 2010, Chicago, IL, USA.

White, C.E.: "Amorphous Materials: Potential Avenues for Uncovering Their Atomic Structures," TMS Annual Meeting and Exhibition, March 3–7, 2013, San Antonio, TX, USA.

Xu, H.: "Neutron Applications to Geosciences," Sandia National Laboratories, January 31, 2012, Albuquerque, NM, USA.

Xu, H.: "Neutron Scattering, Imaging and Their Applications to Salt Repository Science," Actinide & Brine Chemistry in a Salt Repository Workshop (III), April 15-17, 2013, Santa Fe, NM, USA.

Zhernenkov, M. (Asterix User): "Neutron Reflectometry for Magnetism and Biology: Traditional Experiments and New Ideas," Australian Nuclear Science and Technology Organization, March 2009, ANSTO, Bragg Institute, Menai, Australia.

Zhao, Y.: "High-Pressure Neutron Diffraction Studies for Materials Sciences and Energy Sciences," TMS Annual Meeting, February 2009, San Francisco, CA, USA.

Zhao, Y.: "Synthesis and Characterization of Societally Important Materials: Ultra-Hard Materials, Hydrogen Storage Materials, Minerals for Nuclear Waste Disposal, and Fault Gouge," Session Co-Chair for COMPRES Workshop on Long Range Plan for High Pressure Earth Sciences, March 2009, Tempe, AZ, USA.

Zhao, Y.: "High Pressure Nano-Mechanics and Molecular-Physics," High Pressure Science and Engineering Center, University of Nevada, March 2009, Las Vegas, NV, USA.

Zhao, Y.: "High Pressure Study of Advanced Materials—NanoMechanics," Matter at Extreme Conditions, SMEC 2009 Conference, April 2009, Miami–Western Caribbean, USA.

Zhao, Y.: "Deformation and Yield of Nano-Materials at High Pressures," Session: Amorphous, Liquid, Non-Crystalline and Nanocrystalline Solids, the International Union of Crystallography (IUCr) Commission on High Pressure, July 2009, Harbin, China.

Zhao, Y.: "Synthesis and Characterization of Nanostructured Superhard Composites," Institute of Solid State Physics, University of Tokyo, July 2009, Tokyo, Japan.

Zhao, Y.: "Enhancement of Yield Strength in Zirconium Metals through High-Pressure Induced $\alpha - \omega$ Structural Phase Transition," Session: Novel Phase Transitions, Joint Conference 22nd AIRAPT and 50th HPCJ, July 2009, Tokyo, Japan.

Zhao, Y.: "High Pressure Neutron Diffraction Studies at LANSCE," J-PARC High-Pressure Beamline Advisory Committee meeting, J-PARC, July 2009, Tokai, Japan.

Zhao, Y.: "Science & Technology Challenges in Study of Energy and Environment," School of Physical Sciences, Sichuan University, September 2009, Chengdu, China.

Zhao, Y.: "Clathrate Hydrates Science and Technology for Energy Future," 2nd World Materials Summit on Advanced Energy Materials and Sustainable Society Development, October 2009, Suzhou, China.

Zhao, Y.: "Superhard and Ultratough NanoComposites Synthesis and Characterization," State Key Laboratory of Superhard Materials, Jilin University, October 2009, Changchun, China.

Zhao, Y.: "Clathrate Hydrate Science and Technology for Energy and Environmental Studies," Chinese Academy of Sciences, December 2009, Guanzhou GIEC and Beijing IoP, China.

Zhao, Y.: "High Pressure Problems in Energy and Environmental Science Studies," NSLS-II High-Pressure Beamline Preparation Workshop, Brookhaven National Laboratory, April 2010, Upton, NY, USA.

Zhao, Y.: "Nano-Synthesis and Nano-Mechanics of Diamond Composites and Its Drilling Applications," International Advanced Materials Summit, May 6-7, 2010, Chengdu, China.

Zhao, Y.: "Superhard and Ultratough Diamond Nano-Composites," 4th International Conference on New Diamond and Nano Carbons, May 16-20, 2010, Suzhou, China.

Zhao, Y.: "High-P/Low-T Neutron Diffraction Study of Gas Inclusion Compounds," PSI International Collaboration Workshop between CAS Institute of Physics and Swiss Paul Scherrer Institute, October 15, 2010, Villigen, Switzerland.

Zhao, Y.: "High-Pressure Neutron Diffraction Studies for Materials Sciences and Energy Sciences," Workshop on Applications of National Neutron Facilities, December 6, 2010, Zhuhai, Guangdong, China.

Zhao, Y.: "Ultratough and Thermally Stable Polycristalline Diamond/Carbide NanoComposites," Nanotechnology Innovation Showcase, Gaylord National Convention Center, December 8-9, 2010, Washington DC, USA.

Zhao, Y.: "The Formation of Zirconium Metallic Glass during a High P-T Phase Transition and Time-Revolved Re-Crystallization Process." Workshop: Dynamic Phenomena under Extremes, University of Texas, January 24-28, 2011, Austin, TX, USA.

Zhao, Y.: “High Pressure Neutron Diffraction Studies for Materials Science and Energy Science,” 4th Colloquium on Structure and Characteristics of Crystals at Extremely High Pressures and Temperatures, Bonifatiuskloster, February 28-March 2, 2011, Hünfeld, Germany.

Zhao, Y.: “High-Pressure Nano-Mechanics and Molecular Physics,” TMS Meeting, February 27-March 3, 2011, San Diego, CA, USA.

Zhao, Y.: “Materials Research in Energy Conversion, Storage, and Efficiency,” XDL2011 Science at the Hard X-Ray Diffraction Limit: Workshop 4—High-Pressure Science at the Edge of Feasibility, Robert Purcell Conference Center, Cornell University, June 23-24, 2011, Ithaca, NY, USA.

Zhao, Y.: “High P-T NanoMechanics—Diffraction Study of Constitutive Property and Elastic Modulus of Nano-/Micron- Crystalline Materials under High P-T Conditions,” AIRAPT-23 International Conference on High Pressure Science and Technology, Bhabha Atomic Research Centre, September 25 - 30, 2011, Mumbai, India.

Zhao, Y.: “Vehicle and Transportation—Frontier of the Energy Materials Study,” 2011 World Materials Summit, October 10, 2011, Washington DC, USA.

Theses with Substantial Contributions from the Lujan Center

(PhD unless otherwise indicated)

1. NPDF: Margit Fábián, "Structure Study of Sodium-Borosilicate Glasses: Neutron Diffraction and Reverse Monte Carlo Modelling," Eötvös Loránd University, Budapest, Hungary (2009).

2. SMARTS: Soo Yeol Lee, "Effects of Overload and Underload on Internal Strains/Stresses and Crack Closure during Fatigue-Crack Propagation," University of Tennessee, Knoxville, TN, USA (2009).

3. SMARTS: E-Wen Huang, "Fundamental Mechanical-Behavior Studies of Annealed and Nano-Particle-Strengthened Nickel-Based Alloys Using In-Situ Neutron-Diffraction Experiments," University of Tennessee, Knoxville, TN, USA (2009).

4. SMARTS: Liang Wu, "Mechanical Behavior and the Role of Deformation Twinning in Wrought Magnesium Alloys Investigated Using Neutron and Synchrotron X-Ray Diffraction," University of Tennessee, Knoxville, TN, USA (2009).

5. HIPD: Efrain E. Rodriguez: "Solid State Chemistry of Technetium and Rhenium Oxides," University of California, Santa Barbara, CA, USA (2009).

6. HIPPO/SMARTS: Scott H. Williams, "In-Situ Neutron Diffraction Analysis of Deformation Behavior of Ductile Rare-Earth Intermetallic YCu," Iowa State University, Ames, IA, USA (2009).

7. SPEAR: Peng Wang, "Morphology and Protection Mechanisms of Epoxy-Silane Anti-Corrosion Coatings," University of Cincinnati, OH, USA (2009).

8. NPDF/HIPD: Daniel Shoemaker, "Understanding Atomic Disorder in Polar and Magnetic Oxides," University of California, Santa Barbara, CA, USA (2010).

9. NPDF/HIPD: Brent C. Melot: "Competing Magnetic Interactions in Complex Oxides," University of California, Santa Barbara, CA, USA (2010).

10. SMARTS: Ivan Lonardelli, "Deformation Mechanisms in Bulk Nanostructured Aluminum Obtained after Cryomilling and Consolidation by Spark Plasma Sintering," University of Trento, Trento, Italy (2010).

11. SMARTS: Shipeng Qiu, "Investigation of Thermal, Elastic and Load-Biased Transformation Strains in NiTi Shape Memory Alloys," University of Central Florida, Orlando, FL, USA (2010).

12. HIPPO: Zhenzhen Yu, “Dependence of Microstructure Evolution, Texture, and Mechanical Behavior of a Mg Alloy on Thermo-Mechanical Input during Friction Stir Processing,” University of Tennessee, Knoxville, TN, USA (2010).

13. SCD/HIPD: Karunakar Kothapelli, “Effects of Hybridization in Some Uranium Intermetallic Compounds,” New Mexico State University, Las Cruces, NM, USA (2010).

14. LQD: Arnold Luk, “Poly (DTE-co-PEG Carbonate) as a Model System for Investigating the Effects of Physicochemical Polymer Characteristics on Protein Adsorption and Cell Attachment,” Rutgers, The State University of New Jersey, New Brunswick, NJ, USA (2010).

15. NPDF/HIPD: Claire E. White, “Atomic Structure Evolution in Amorphous Geopolymer Precursors and Gels,” The University of Melbourne, Melbourne, Australia (2011).

16. NPDF/FDS: Verina Franika Kranak (Master Thesis), “Superconductivity of SrAlGe and BaAlGe,” Arizona State University, Tucson, AZ, USA (2011).

17. SMARTS: Shenyan Huang, “Computational and Experimental Study of Structure-Property Relationships in NiAl Precipitate-Strengthened Ferritic Superalloys,” University of Tennessee, Knoxville, TN, USA (2011).

18. SMARTS: Zhenke Teng, “Processing, Microstructures, and Properties of Aluminide-Strengthened Ferritic Steels,” University of Tennessee, Knoxville, TN, USA (2011).

19. SMARTS/HIPPO: “Modeling the Coupling between Martensitic Phase Transformation and Plasticity in Shape Memory Alloys,” Ohio State University, Columbus, OH, USA (2011).

20. HIPD: James R. Neilson: “Kinetic Control of Aqueous Hydrolysis: Modulating Structure/Property Relationships in Inorganic Crystals,” University of California, Santa Barbara, CA, USA (2011).

21. HIPPO: Sivom Manchiraju, “Modeling the Coupling between Martensitic Phase Transformation and Plasticity in Shape Memory Alloys,” Ohio State University, Columbus, OH, USA (2011).

22. HIPPO: Cassie Witherspoon (Master Thesis), “Magnetic Field Induced Strain in Polycrystalline Magnetic Shape Memory Foam,” Boise State University, Boise, ID, USA (2011).

23. HIPPO: Xiaohui Yu, “High-Pressure and Nano-Mechanics of Metals and Ceramics,” University of Science and Technology of China, Institute of Physics, Chinese Academy of Science, China (2011).

24. SCD/HIPD: Sourav Adak, “Thermal Expansion in Prussian Blue Analogs: A Combined Neutron and X-Ray Scattering Study,” New Mexico State University, Las Cruces, NM, USA (2011).

25. FDS: Aaron Robert Moehlig, “Peptides, Diamines, and Nucleobases: Investigations in Ion Chemistry,” University of California, Riverside, CA, USA (2011).

26. SPEAR: John David Yeager, “Microstructural Characterization of Simulated Plastic-Bonded Explosives,” Washington State University, Pullman, WA, USA (2011).

27. HIPPO/NPDF: Mary B. Martucci, “Part 1: Synthesis and Characterization of Magentic Cr5Te8 Nanoparticles; Part 2: Local Atomic Structure Studies Using Theory to Simulate Polarons in Superconducting Cuprates and Experiment to Analyze Alternative Energy Materials,” Colorado State University, Fort Collins, CO, USA (2012).

28. HIPPO: Helmut M. Reiche, “Advanced Sample Environments for in situ Neutron Diffraction Studies of Nuclear Materials,” New Mexico State University, Las Cruces, NM, USA (2012).

29. LQD: Hongfeng Ren, “Synthesis and Characterization of Shape Memory Poly (Epsilon-Caprolactone) Polyurethane-Ureas,” Georgia Institute of Technology, Atlanta, GA, USA (2012).

30. ASTERIX: Sergiy A Kryukov, “Magnetic Properties of Nb/Ni Superconducting/ Ferromagnetic Multilayers,” University of Kentucky, Lexington, KY, USA (2012).

31. ASTERIX: Jonathan Leiner, “Exchange Coupling in the Ferromagnetic Semiconductor GaMnAs,” University of Notre Dame, Notre Dame, IN, USA (2012).

32. NPDF: Elena Aksel, Structure and Properties of Sodium Bismuth Titanate Ferroelectric Ceramics, Materials Science and Engineering, University of Florida (2012).

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	Year	Citation		citation #	
1	2009	Wei Bao, Y Qiu, Q Huang, MA Green, P Zajdel, MR Fitzsimmons, M Zhernenkov, S Chang, Minghu Fang, B Qian, others, Tunable (delta pi , delta pi)-type antiferromagnetic order in alpha -Fe (Te, Se) superconductors, Physical review letters, 102, 247001 (2009)	Journal article, High Impact, High Profile	323	ASTERIX
2	2009	Thomas Hugle, Moritz F Kuhnel, Dieter Lentz, Hydrazine borane: a promising hydrogen storage material, Journal of the American Chemical Society, 131, 7444-7446 (2009)	Journal article, High Impact	58	SPALLATION
3	2009	ME Manley, AJ Sievers, JW Lynn, SA Kiselev, NI Agladze, Y Chen, A Llobet, A Alatas, Intrinsic localized modes observed in the high-temperature vibrational spectrum of NaI, Physical Review B, 79, 134304 (2009)	Journal article	42	PHAROS
4	2009	Hyunjeong Kim, Abhi Karkamkar, Tom Autrey, Peter Chupas, Thomas Proffen, Determination of structure and phase transition of light element nanocomposites in mesoporous silica: case study of NH3BH3 in MCM-41, Journal of the American Chemical Society, 131, 13749-13755 (2009)	Journal article, High Impact	42	
5	2009	Jinbo He, Zhongwei Niu, Ravisubhash Tangirala, Jia-Yu Wang, Xinyu Wei, Gagandeep Kaur, Qian Wang, Gunther Jutz, Alexander Boker, Byeongdu Lee, others, Self-assembly of tobacco mosaic virus at oil/water interfaces, Langmuir, 25, 4979-4987 (2009)	Journal article	39	LQD
6	2009	Chao Jiang, Zhijun Lin, Yusheng Zhao, Thermodynamic and mechanical stabilities of tantalum nitride, Physical review letters, 103, 185501 (2009)	Journal article, High Impact, High Profile	39	
7	2009	Tongye Shen, Paul Langan, Alfred D French, Glenn P Johnson, S Gnanakaran, Conformational flexibility of soluble cellulose oligomers: chain length and temperature dependence, Journal of the American Chemical Society, 131, 14786-14794 (2009)	Journal article, High Impact	39	
8	2009	N Sundaram, Y Jiang, IE Anderson, DP Belanger, CH Booth, F Bridges, JF Mitchell, Th Proffen, H Zheng, Local Structure of La1-xSrxCoO3 Determined from EXAFS and Neutron Pair Distribution Function Studies, Physical review letters, 102, 026401 (2009)	Journal article, High Impact, High Profile	35	NPDF
9	2009	CC Aydiner, JV Bernier, B Clausen, U Lienert, CN Tome, DW Brown, Evolution of stress in individual grains and twins in a magnesium alloy aggregate, Physical Review B, 80, 024113 (2009)	Journal article	32	
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11	2009	D Bazin, RJ Charity, RT De Souza, MA Famiano, A Gade, V Henzl, D Henzlova, S Hudan, J Lee, S Lukyanov, others, Mechanisms in knockout reactions, Physical review letters, 102, 232501 (2009)	Journal article, High Impact, High	30	SPALLATION

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12	2009	Igor Levin, Victor Krayzman, Joseph C Woicik, Jenia Karapetrova, Thomas Proffen, Matthew G Tucker, Ian M Reaney, Structural changes underlying the diffuse dielectric response in AgNbO3, Physical Review B, 79, 104113 (2009)	Journal article	30	NPDF
13	2009	Nancy J Hess, Gregory K Schenter, Michael R Hartman, Luc L Daemen, Thomas Proffen, Shawn M Kathmann, Christopher J Mundy, Monika Hartl, David J Heldebrant, Ashley C Stowe, others, Neutron Powder Diffraction and Molecular Simulation Study of the Structural Evolution of Ammonia Borane from 15 to 340 K, The Journal of Physical Chemistry A, 113, 5723-5735 (2009)	Journal article	29	NPDF
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15	2009	Marc-Michael Blum, Marat Mustyakimov, Heinz Ruterjans, Kai Kehe, Benno P Schoenborn, Paul Langan, Julian C-H Chen, Rapid determination of hydrogen positions and protonation states of diisopropyl fluorophosphatase by joint neutron and X-ray diffraction refinement, Proceedings of the National Academy of Sciences, 106, 713-718 (2009)	Journal article, High Impact	28	PCS
16	2009	JE Greedan, Delphine Gout, AD Lozano-Gorrin, Shahab Derahkshan, Th Proffen, H-J Kim, E Bozin, SJL Billinge, Local and average structures of the spin-glass pyrochlore Y2Mo2O7 from neutron diffraction and neutron pair distribution function analysis, Physical Review B, 79, 014427 (2009)	Journal article	25	NPDF
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18	2009	S Zoe Fisher, Andrey Y Kovalevsky, John F Domsic, Marat Mustyakimov, Robert McKenna, David N Silverman, Paul A Langan, Neutron structure of human carbonic anhydrase II: implications for proton transfer, Biochemistry, 49, 415-421 (2009)	Journal article	25	PCS
19	2009	Sheng Cheng, Alexandru Dan Stoica, X-L Wang, Y Ren, J Almer, JA Horton, CT Liu, B Clausen, DW Brown, PK Liaw, others, Deformation crossover: From nano-to mesoscale, Physical review letters, 103, 035502 (2009)	Journal article, High Impact, High Profile	24	SMARTS
20	2009	Hillary L Smith, Michael S Jablin, Ajay Vidyasagar, Jessica Saiz, Erik Watkins, Ryan Toomey, Alan J Hurd, Jaroslaw Majewski, Model lipid membranes on a tunable polymer cushion, Physical review letters, 102, 228102 (2009)	Journal article, High Impact, High Profile	24	SPEAR
21	2009	C Pantea, I Mihut, H Ledbetter, JB Betts, Y Zhao, LL Daemen, H Cynn, A Migliori, Bulk modulus of osmium, 4--300K, Acta Materialia, 57, 544-548 (2009)	Journal article	23	
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23	2009	Thomas Proffen, Hyunjeong Kim, Advances in total scattering analysis, Journal of Materials Chemistry, 19, 5078-5088 (2009)	Journal article	22	NPDF
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25	2009	EB Watkins, CE Miller, DJ Mulder, TL Kuhl, J Majewski, Structure and orientational texture of self-organizing lipid bilayers, Physical review letters, 102, 238101 (2009)	Journal article, High Impact, High Profile	22	
26	2009	MWA Skoda, F Schreiber, RMJ Jacobs, JRP Webster, M Wolff, R Dahint, D Schwendel, M Grunze, Protein Density Profile at the Interface of Water with Oligo (ethylene glycol) Self-Assembled Monolayers, Langmuir, 25, 4056-4064 (2009)	Journal article	22	SPEAR
27	2009	P Hosemann, C Vieh, RR Greco, S Kabra, JA Valdez, MJ Cappiello, SA Maloy, Nanoindentation on ion irradiated steels, Journal of Nuclear Materials, 389, 239-247 (2009)	Journal article	21	HIPPO
28	2009	Pedro Gorria, David Martinez-Blanco, Maria J Perez, Jesus A Blanco, Antonio Hernando, Maria A Laguna-Marco, Daniel Haskel, N Souza-Neto, Ronald I Smith, William, WG Marshall, G Garbarino, M Mezouar, A Fernandez-Martinez, J Chaboy, LF Barquin, JAR Castrillon, M Moldovan, JIG Alonso, JH Zhang, Anna Llobet, JS Jiang, Stress-induced large Curie temperature enhancement in Fe_ 64 Ni_ 36 Invar alloy, Physical Review B, 80, 064421 (2009)	Journal article	20	HIPPO
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54	2009	S Roy, E Blackburn, SM Valvidares, MR Fitzsimmons, SC Vogel, M Khan, I Dubenko, S Stadler, N Ali, SK Sinha, others, Delocalization and hybridization enhance the magnetocaloric effect in Cu-doped Ni_ 2 MnGa, Physical Review B, 79, 235127 (2009)	Journal article	10	HIPPO ASTERIX
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56	2009	S Lukyanov, M Mocko, L Andronenko, M Andronenko, D Bazin, MA Famiano, A Gade, SP Lobastov, WG Lynch, AM Rogers, others, Projectile fragmentation of radioactive beams of68 Ni,69 Cu, and72 Zn, Physical Review C, 80, 014609 (2009)	Journal article	9	SPALLATIO N
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73	2009	SS Babu, Thermodynamic and kinetic models for describing microstructure evolution during joining of metals and alloys, International Materials Reviews, 54, 333-367 (2009)	Journal article	8	SMARTS
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474	2012	Miao Chen, Shanmin Wang, Jianzhong Zhang, Duanwei He, Yusheng Zhao, Synthesis of Stoichiometric and Bulk CrN through a Solid-State Ion-Exchange Reaction, Chemistry-A European Journal, 18, 15459-15463 (2012)	Journal article	0	
475	2012	Qiang Wei, Dali Yang, Toti Eric Larson, Tiffany L Kinnibrugh, Ruqiang Zou, Neil J Henson, Tatiana Timofeeva, Hongwu Xu, Yusheng Zhao, Benjamin R Mattes, Kinetic hysteresis in gas adsorption behavior for a rigid MOF arising from zig-zag channel structures, Journal of Materials Chemistry, 22, 10166-10171 (2012)	Journal article	0	
476	2012	MH Braga, JA Ferreira, MJ Wolverton, Study of the Cu--Li--Mg--H system by thermal analysis, Journal of thermal analysis and calorimetry, 108, 733-739 (2012)	Journal article	0	FDS
477	2012	M Hartl, L Daemen, G Muhrer, Water trapped in silica microspheres, Microporous and Mesoporous Materials, null, 733-739 (2012)	Journal article	0	FDS LQD
478	2012	P Wang, AH Lerner, M Taylor, JK Baldwin, RK Grubbs, J Majewski, DD Hickmott, High-pressure and high-temperature neutron reflectometry cell for solid-fluid interface studies, The European Physical Journal Plus, 127, 1-15 (2012)	Journal article	0	SPEAR
479	2012	Heming He, P Wang, DD Allred, Jaroslaw Majewski, MP Wilkerson, Kirk D Rector, Characterization of Chemical Speciation in Ultrathin Uranium Oxide Layered Films, Analytical chemistry, 84, 10380-10387 (2012)	Journal article	0	SPEAR
480	2012	Scott A Mauger, Lilian Chang, Stephan Friedrich, Christopher W Rochester, David M Huang, Peng Wang, Adam J Moule, Self-Assembly of Selective Interfaces in Organic Photovoltaics, Advanced Functional Materials, null, 7287-7292 (2012)	Journal article	0	SPEAR
481	2012	Cynthia Welch, Andrea Labouriau, Rex Hjelm, Bruce Orler, Christina Johnston, Yu Seung Kim, Nafion in Dilute Solvent Systems: Dispersion or Solution?, ACS Macro Letters, 1, 1403-1407 (2012)	Journal article	0	LQD
482	2012	Dilru R Ratnaweera, Umesh M Shrestha, Naresh Osti, Chung-Mien Kuo, Stephen Clarson, Ken Littrell, Dvora Perahia, Self-assembly of a semi-fluorinated diblock copolymer in a selective solvent, Soft Matter, 8, 2176-2184 (2012)	Journal article	0	LQD
483	2012	Xiao-Dong Wen, Richard L Martin, Thomas M Henderson, Gustavo E Scuseria, Density Functional Theory Studies of the Electronic Structure of Solid State Actinide Oxides, Chemical reviews, null, 015114-015114 (2012)	Journal article	0	PHAROS
484	2012	MH Lee, J. Das, DJ Sordelet, J. Eckert, AJ Hurd, Effect of tungsten metal particle sizes on the solubility of molten alloy melt: Experimental observation of Gibbs-Thomson effect in nanocomposites, Applied Physics Letters, 101, 124103-124103 (2012)	Journal article, High Impact	0	MANAGE MENT
485	2012	I-K Jeong, Seunghun Lee, A Llobet, Local structural disorder in Zn0. 9Co0. 1O nanocrystals studied using neutron total scattering analysis, Journal of Applied Physics, 112, 073523 (2012)	Journal article	0	HIPD
486	2012	Sabrina Labs, Monika Hartl, Luke Daemen, Hildegard Curtius, Dirk Bosbach, others, Investigation of the Dehydration Process of Uranium Peroxide, Zeitschrift fur anorganische und allgemeine Chemie, 638, 1606-1606 (2012)	Journal article	0	FDS
487	2012	Surendra Singh, MR Fitzsimmons, H Jeen, A Biswas, ME Hawley, Temperature dependence of nanometer-size metallic phase texture	Journal article,	0	

		and its correlation with bulk magnetic and transport properties and defects of a (La< inf> 0.4</inf> Pr< inf> 0.6</inf>)< inf> 0.67</inf> Ca< inf> 0.33</inf> MnO< inf> 3</inf> film, Applied Physics Letters, 101, 022404-022404 (2012)	High Impact		
488	2012	C He, AJ Grutter, M Gu, ND Browning, Y Takamura, BJ Kirby, JA Borchers, JW Kim, MR Fitzsimmons, X Zhai, others, Interfacial Ferromagnetism and Exchange Bias in CaRuO_ 3/CaMnO_ 3 Superlattices, Physical review letters, 109, 197202 (2012)	Journal article, High Impact, High Profile	0	ASTERIX
489	2012	David V Baxter, J Leung, Helmut Kaiser, S Ansell, G Muhrer, EB Iverson, PD Fergusson, Neutron Moderator Development Research at the Low Energy Neutron Source, Physics Procedia, 26, 117-123 (2012)	Journal article	0	SPALLATIO N
490	2012	Gregory E Dale, Dale A Dalmas, Michael J Gallegos, Kevin R Jackman, Charles T Kelsey IV, Iain May, Sean D Reilly, Gary M Stange, 99Mo Separation from High-Concentration Irradiated Uranium Nitrate and Uranium Sulfate Solutions, Industrial & Engineering Chemistry Research, 51, 13319-13322 (2012)	Journal article	0	SPALLATIO N
491	2012	Hyunjeong Kim, Jin Nakamura, Huaiyu Shao, Yumiko Nakamura, Etsuo Akiba, Karena W Chapman, Peter J Chupas, Thomas Proffen, Variation in the ratio of Mg2Co and MgCo2 in amorphous-like mechanically alloyed Mg x Co100-x using atomic pair distribution function analysis, Zeitschrift fur Kristallographie, 227, 299-303 (2012)	Journal article	0	
492	2012	Tatyana Kardash, Ludmilla M Plyasova, Dmitry I Kochubey, Valentina M Bondareva, Reinhard B Neder, Development of the local and average structure of a V-Mo-Nb oxide catalyst with Mo5O14-like structure during synthesis from nanostructured precursors, Zeitschrift fur Kristallographie, 227, 288-298 (2012)	Journal article	0	NPDF
493	2012	P Tong, Despina Louca, Nara Lee, S-W Cheong, Oxygen displacements and magnetoelectric coupling in LuMnO3, Physical Review B, 86, 094419 (2012)	Journal article	0	NPDF
494	2012	Cang Fan, HG Yan, CT Liu, HQ Li, PK Liaw, Y Ren, T Egami, Changes in the atomic structure through glass transition observed by X-ray scattering, Intermetallics, 23, 111 (2012)	Journal article	0	NPDF
495	2012	Alessandro Mancini, Cristina Tealdi, Lorenzo Malavasi, Interstitial oxygen in the Ga-based melilite ion conductor: A neutron total scattering study, International Journal of Hydrogen Energy, 37, 8073-8080 (2012)	Journal article	0	NPDF
496	2012	O Benafan, RD Noebe, SA Padula II, R Vaidyanathan, Microstructural Response During Isothermal and Isobaric Loading of a Precipitation-Strengthened Ni-29.7 Ti-20Hf High-Temperature Shape Memory Alloy, Metallurgical and Materials Transactions A, 43, 4539-4552 (2012)	Journal article	0	SMARTS
497	2012	RP Mulay, SR Agnew, Hard slip mechanisms in B2 CoTi, Acta Materialia, 60, 1784-1794 (2012)	Journal article	0	SMARTS
498	2012	R Woracek, JR Bunn, D Penumadu, CR Hubbard, Method to determine hkl strains and shear moduli under torsion using neutron diffraction, Applied Physics Letters, 100, 191904-191904 (2012)	Journal article, High Impact	0	HIPPO
499	2012	M Fabian, E Svab, V Pamukchieva, A Szekeres, P Petrik, S Vogel, U Ruett, Study of As?Se?Te glasses by neutron-, X-ray diffraction and optical spectroscopic methods, Journal of Non-Crystalline Solids, 358, 860-868 (2012)	Journal article	0	HIPPO
500	2012	Rong Wang, Chengxu Yang, Min Fan, Meimei Wu, Chunhai Wang, Xiaohui Yu, Jinlong Zhu, Junrong Zhang, Guobao Li, Qingzhen Huang,	Journal article	0	HIPPO

		others, Phase relationship of the TbO_1.81_-Mn_3_ O_4_-Fe_2_ O_3_ system synthesized at 1200 C, Journal of Alloys and Compounds, null, 15357-15361 (2012)			
501	2012	Yasushi IDEMOTO, Tetsuya KASHIMA, Naoto KITAMURA, Investigation on Crystal and Electronic Structures of 0.5 Li 2 MnO 3-0.5 LiMn x Ni x Co (1- 2x) O 2 (x= 1/3, 5/12) Samples Heat-Treated under Vacuum Reducing Conditions, Electrochemistry, 80, 791-799 (2012)	Journal article	0	HIPPO
502	2012	O Muransky, MR Daymond, D Bhattacharyya, O Zanellato, SC Vogel, L Edwards, Load partitioning and evidence of deformation twinning in dual-phase fine-grained Zr-2.5% Nb alloy, Materials Science and Engineering: A, null, 3540-3547 (2012)	Journal article	0	HIPPO
503	2012	Singh, Surendra, Chien, Te-Yu, Guest, J. R., Fitzsimmons, M. R., Correlation between surface rumpling and structural phase transformation in SrTiO{}_{3}, Physical Review B, 85, 115450 (2012)	Journal article	0	ASTERIX

Basic Energy Sciences Annual Facilities Questionnaire

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009 Date submitted: 14-Oct-09

SUMMARY DATA

Facility USERS this Fiscal Year (*Researchers who submitted a successful proposal—see definitions*)

Question Number — Add an asterisk (*) in this column next to any question that has additional information appended.

Question Number				Remote Access		Off-Site
1		360	Number of Badged Users			
2		56	Number of Other Users; Itemize:	56	plus	0
• **First-Time Users** (subset of Q. 1-2)						NSRCs only
3		63	Number of Badged Users			
4		0	Number of Other Users; Itemize:	0	plus	0
• **Researchers Associated with Experiments** (i.e., Facility Users, Q. 1-2, plus their co-proposers)						
5		841	Number of Badged Users and Co-Proposers			
6			Number of Other Users and Co-Proposers			

Obtain Specialty Services or Materials; Itemize (no research proposal; e.g., purchases)

7		0	Enter appropriate categories for your facility here
			For example
			Institutions that Utilize the Transplutonium Program
			Institutions that Obtain Medical Isotopes

Facility Configuration

8		14	Number of Beam Lines (*or analogue*) Available to Users
9		3	Number of Additional Beam Lines Possible.
10	*		Provide Facility Schematic Diagram(s) to Explain Above Configurations

Facility Hours of Operation for Users (366 days = 8,784 hours)

11		4,500	Maximum Number of Hours for Users (under optimal budget) (excludes machine research, operator training, accelerator physics, etc.)
12		3,467	Scheduled Hours of Operation for Users
13		2,840	Scheduled Hours Delivered to Users (may not exceed Q. 12)
14		0	Unscheduled Hours Delivered to Users
15	*	3,000	*Next Fiscal Year* - Planned Hours for Users (attach schedule)

Beam Line Hours of Operation for Users (from Q. 35)

16	n/a	Beam Line Hours Scheduled
17	n/a	Beam Line Hours Delivered
18	n/a	Beam Line Hours Used

Number of Scientific Publications

19	150	*Estimate* of Facility Publications for this Fiscal Year
20	?	*Final* Facility Publications for *Previous Calendar Year*

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009 Date submitted: 14-Oct-09

SUMMARY DATA

Facility USERS this Fiscal Year (*Researchers who submitted a successful proposal—see definitions*)

Question Number — Add an asterisk (*) in this column next to any question that has additional information appended.

Question Number				Remote Access		Off-Site
1		360	Number of Badged Users			
2		56	Number of Other Users; Itemize:	56	plus	0
• **First-Time Users** (subset of Q. 1-2)						NSRCs only
3		63	Number of Badged Users			
4		0	Number of Other Users; Itemize:	0	plus	0
• **Researchers Associated with Experiments** (i.e., Facility Users, Q. 1-2, plus their co-proposers)						
5		841	Number of Badged Users and Co-Proposers			
6			Number of Other Users and Co-Proposers			

Obtain Specialty Services or Materials; Itemize (no research proposal; e.g., purchases)

7		0	Enter appropriate categories for your facility here
			For example...
			Institutions that Utilize the Transplutonium Program
			Institutions that Obtain Medical Isotopes

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8		14	Number of Beam Lines (*or analogue*) Available to Users
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Facility Hours of Operation for Users (366 days = 8,784 hours)

11		4,500	Maximum Number of Hours for Users (under optimal budget) (excludes machine research, operator training, accelerator physics, etc.)
12		3,467	Scheduled Hours of Operation for Users
13		2,840	Scheduled Hours Delivered to Users (may not exceed Q 12)
14		0	Unscheduled Hours Delivered to Users
15	*	3,000	*Next Fiscal Year* - Planned Hours for Users (attach schedule)

Beam Line Hours of Operation for Users (from Q. 35)

16	n/a	Beam Line Hours Scheduled
17	n/a	Beam Line Hours Delivered
18	n/a	Beam Line Hours Used

Number of Scientific Publications

19	150	*Estimate* of Facility Publications for this Fiscal Year
20	?	*Final* Facility Publications for *Previous Calendar Year*

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center – LANSCE
Fiscal Year: 2009

User Demographics

Question Number		
	416	Number of Users (sum Q. 1 plus Q. 2)
Gender		
21	54	Female
	330	Male
	25	Information Not Available
Race/Ethnicity		
22	n/a	American Indians or Alaskan Natives
	n/a	Asians/Pacific Islanders
	n/a	Black, non-Hispanics
	n/a	Hispanics
	n/a	White, non-Hispanics
416	n/a	Information Not Available
Age		
23	1	Under 20 years
	30	20-29 years
	40	30-39 years
	15	40-49 years
	9	50-59 years
	6	60-69 years
	1	Over 69 years
	307	Information Not Available
Citizenship		
24	198	U.S. Citizen
	121	Foreign National, non-Sensitive Countries
	90	Foreign National, Sensitive Countries
	0	Terrorist-Sponsoring Nations (U.S. State Department's list)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center – LANSCE
Fiscal Year: 2009

User Affiliations

Question Number					
	416	Number of Users (sum Q. 1 and 2 or itemize them separately)			
Employer (User's Research Institution)					
25	167	U.S.	Academic		
	?		Host DOE laboratory – associated with host user facility		
	?		Host DOE laboratory – not associated with facility		
	34		Other DOE laboratories		
	1		Non-DOE federally funded institution		
	5		Industry		
	72		Other	279	Subtotal U.S.
	12	Foreign	Academic		
	2		National laboratory		
			Industry		
125			Other	14	Subtotal Foreign
Employment Level					
26	15	Undergraduate student			
	160	Graduate student			
	84	Postdoctoral research associate			
	148	Faculty member / professional staff / research scientist			
	1	Retired or self employed			
1	1	Other			
Type of User					
27	416	General User only			
	0	Partner User only			
0	0	Both a General User and a Partner User			
Proprietary Research					
28	0	Users conducting only nonproprietary research			
	0	Users conducting nonproprietary and proprietary research			
416	0	Users conducting only proprietary research			

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center – LANSCE
Fiscal Year: 2009

Geographic Distribution of U.S. User Institutions

279 Subtotal U.S. (from subtotal within Question 25)

Question Number

U.S. State of User's Research Institution (Must sum to "Subtotal U.S." for Question 25)

Question Number				
29	4	Alabama	4	Nevada
	0	Alaska	0	New Hampshire
	0	Arizona	4	New Jersey
	3	Arkansas	115	New Mexico
	37	California	11	New York
	0	Colorado	3	North Carolina
	3	Connecticut	0	North Dakota
	4	Delaware	17	Ohio
	15	Florida	0	Oklahoma
	6	Georgia	0	Oregon
	0	Hawaii	9	Pennsylvania
	4	Idaho	0	Rhode Island
	22	Illinois	7	South Carolina
	9	Indiana	0	South Dakota
	12	Iowa	11	Tennessee
	0	Kansas	9	Texas
	0	Kentucky	0	Utah
	0	Louisiana	0	Vermont
	0	Maine	7	Virginia
	8	Maryland	3	Washington
	7	Massachusetts	3	West Virginia
	16	Michigan	3	Wisconsin
	0	Minnesota	2	Wyoming
	0	Mississippi		
	5	Missouri	3	District of Columbia
	0	Montana	0	Puerto Rico
124	0	Nebraska	37	Other (itemize below)

Itemize other U.S. territories here.

	For example,
0	Guam
0	U.S. Virgin Islands

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center – LANSCE
Fiscal Year: 2009

Information Derived from Experiment Demographics

	416	Number of Users from Q. 1-8
Question Number		
Source of Support (number of users)		
30	140	DOE, Office of Basic Energy Sciences
	7	DOE, Office of Biological and Environmental Research
	42	NNSA
	21	DOE, other (includes LDRD)
		Homeland Security
	3	DOD
	32	NSF
	3	NIH
	4	NASA
		USDA
	1	Other U.S. Government
	8	Industry
	50	Foreign
15	30	Other
Subject of Experiment or Service (number of users)		
31	191	Materials sciences
	5	Physics (excludes condensed matter physics)
	81	Chemistry (excludes materials chemistry)
	24	Polymers
	2	Medical applications
	24	Biological and life sciences (excludes medical applications)
	10	Earth sciences
	6	Environmental sciences
	0	Optics
	45	Engineering
	7	User facility instrumentation or technique development
		Purchase of specialty services or materials
6	15	Other

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center – LANSCE
Fiscal Year: 2009

Budget Data

Question Number

Annual Budget ($ in thousands)

Question Number		
32	0	Utilities
	0	Maintenance / operations of sources
	467	ES&H
	0	Security
	0	Operators/Technicians
	9,553	R&D
	2,930	User support
	1,020	Facility administration
		Other (itemize)
	13,970	Total Annual Operating Budget (sum of above)
	500	Capital Equipment
		AIP
		GPP/GPE
	14,470	**Total Annual Budget** (sum of Operating, CE, AIP and GPP/GPE)

Sources of Funding for Annual Budget ($ in thousands)

Question Number				
33	10,700	DOE, BES - Division of Scientific User Facilities		
	370	Division of Materials Sciences and Engineering		
		Division of Chemical Sciences, Geosciences, and Biosciences		
	2,607	DOE (other)	LDRD	917
			Overhead	785
			RTBF	905
	793	Other	Japan	302
			Carry	591
	14,470	**Total Annual Budget** (same value as for Question 32)		

Facility Replacement Cost ($ in thousands)

Question Number			YEAR
34		Original cost of facility (then-year dollars) →	
		Replacement cost of original facility (this-year dollars)	

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Summary Table of Beam Line Usage

Question Number
35

To be completed by NSLS, SSRL, ALS, and APS

A		B	C	D	E	F
		Name of beam line	% of FY beam line was usable	# of hours **SCHEDULED** on beam line	# of hours **DELIVERED** to beam line	# of hours that researchers **USED** the delivered time
1						
2						
3						
4						
etc.						
			Facility Totals:			

For instructions, refer to: **BES_FY09_Sync_beamline_report.doc**

FY 2009 Supplemental Reporting Requirements
BES Synchrotron Radiation Light Sources

You may use your established format from previous years.
— you do not need to use this Excel worksheet.

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: A. USER FACILITY table (sums the data for all the beam lines)

36

7,279	Annual operating cost of the beam line ($ in thousands)
	- do not include costs of operating the facility itself;
	Itemize operating cost by source below:
7,279	BES Division of Scientific User Facilities
	BES, Materials Sciences and Engineering
	BES, Chemical Sciences, Geosciences, and Biosciences
	DOE, other (itemize)
	Other (itemize)
9	Number of instruments on beam line
900	Estimate of what percentage of beam line is instrumented
9	Number of end stations on beam line
41,592	End-station hours requested by users
24,140	End-station hours delivered to users
	Provide two types of itemizations below:
0	End-station hours delivered to partner users
24,140	End-station hours delivered to general users
24,140	End-station hours delivered for nonproprietary research
0	End-station hours delivered for proprietary research
	Total number of publications from this beam line
	Itemize:
	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: NPDF

36

931	Annual operating cost of the beam line ($ in thousands)
	- do not include costs of operating the facility itself;
	Itemize operating cost by source below:
931	BES Division of Scientific User Facilities
	BES, Materials Sciences and Engineering
	BES, Chemical Sciences, Geosciences, and Biosciences
	DOE, other (itemize)
	Other (itemize)
1	Number of instruments on beam line
100	Estimate of what percentage of beam line is instrumented
1	Number of end stations on beam line
6,447	End-station hours requested by users
2,840	End-station hours delivered to users
	Provide two types of itemizations below:
0	End-station hours delivered to partner users
2,840	End-station hours delivered to general users
2,840	End-station hours delivered for nonproprietary research
0	End-station hours delivered for proprietary research
	Total number of publications from this beam line
	Itemize:
	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SMARTS

Question Number		
36	978	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	978	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,459	End-station hours requested by users
	2,840	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,840	End-station hours delivered to general users
	2,840	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: HIPD

Question Number		
36	494	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	494	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	1,917	End-station hours requested by users
	1,420	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	1,420	End-station hours delivered to general users
	1,420	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: HIPPO

Question Number		
36	916	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself; Itemize operating cost by source below:
	916	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,317	End-station hours requested by users
	2,840	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,840	End-station hours delivered to general users
	2,840	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: FDS

36

662	Annual operating cost of the beam line ($ in thousands)
	- do not include costs of operating the facility itself;
	Itemize operating cost by source below:
662	BES Division of Scientific User Facilities
	BES, Materials Sciences and Engineering
	BES, Chemical Sciences, Geosciences, and Biosciences
	DOE, other (itemize)
	Other (itemize)
1	Number of instruments on beam line
100	Estimate of what percentage of beam line is instrumented
1	Number of end stations on beam line
4,942	End-station hours requested by users
2,840	End-station hours delivered to users
	Provide two types of itemizations below:
0	End-station hours delivered to partner users
2,840	End-station hours delivered to general users
2,840	End-station hours delivered for nonproprietary research
0	End-station hours delivered for proprietary research
	Total number of publications from this beam line
	Itemize:
	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SPEAR

Question Number		
36	875	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself; Itemize operating cost by source below:
	875	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	5,794	End-station hours requested by users
	2,840	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,840	End-station hours delivered to general users
	2,840	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: LQD

Question Number		
36	1,102	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,102	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,572	End-station hours requested by users
	2,840	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,840	End-station hours delivered to general users
	2,840	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: Asterix

36

788	Annual operating cost of the beam line ($ in thousands)
	- do not include costs of operating the facility itself;
	Itemize operating cost by source below:
788	BES Division of Scientific User Facilities
	BES, Materials Sciences and Engineering
	BES, Chemical Sciences, Geosciences, and Biosciences
	DOE, other (itemize)
	Other (itemize)
1	Number of instruments on beam line
100	Estimate of what percentage of beam line is instrumented
1	Number of end stations on beam line
4,374	End-station hours requested by users
2,840	End-station hours delivered to users
	Provide two types of itemizations below:
0	End-station hours delivered to partner users
2,840	End-station hours delivered to general users
2,840	End-station hours delivered for nonproprietary research
0	End-station hours delivered for proprietary research
	Total number of publications from this beam line
	Itemize:
	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: Pharos

Question Number		
36	533	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	533	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,771	End-station hours requested by users
	2,840	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,840	End-station hours delivered to general users
	2,840	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
		Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

USER SATISFACTION Mini-Survey

Question Number		
37	416	Number of Users (sum Q. 1 plus Q. 2)
		Number of Users who filled out a Mini-Survey

Please circle only one number for Questions 1-4 or mark NA if the question does not apply.

1 **How satisfied were you with the fraction of the year that the facility operates?**

100% = [ ] [ ] [ ] [ ] [ ] [ ] 0

5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

2 **How satisfied were you with the schedule or service (i.e., was the time or service delivered on schedule and was downtime kept to a minimum)?**

100% = [ ] [ ] [ ] [ ] [ ] [ ] 0

5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

3 **How satisfied were you with the performance (i.e., was beam or service maintained close to specifications)?**

100% = [ ] [ ] [ ] [ ] [ ] [ ] 0

5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4a. **How satisfied were you with the support for users provided by the facility staff?**

100% = [ ] [ ] [ ] [ ] [ ] [ ] 0

5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4b. **How satisfied were you with the support for users provided by the beam line staff?**

100% = [ ] [ ] [ ] [ ] [ ] [ ] 0

5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

5 **Please provide comments for any score rating of 1 or 2 on Questions 1-4 above.**

- Summarize responses succinctly on another sheet

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2009

USER SATISFACTION Mini-Survey (continued)

Question Number
37 (*continued*)

			#
6	**What was the subject of your use of this facility this year? (circle the subject that best applies)**		
	a.	Basic research	
	b.	Applied research	
	c.	Developed a new or improved product, process or technology	
7	**How do you intend on communicating the knowledge gained at this facility? (circle all answers that apply)**		
	a.	Publish in peer-reviewed open literature	
	b.	Present findings at professional society meeting	
	c.	Acquired a patent	
	d.	Other	
8	**What additional benefits did you gained at this facility? (circle all answers that apply)**		
	a.	Furthered the goals of the Department of Energy	
	b.	Obtained access to unique capabilities not available elsewhere (e.g., forefront experiments; one-of-a-kind instruments; distinctive materials or services)	
	c.	Facilitated collaborative interactions (e.g., stimulated new ideas for future experiments, increased multidisciplinary work; enabled a new approach within your discipline)	
	d.	Trained students (undergraduate, graduate or postdoctoral associate)	
*	e.	Other benefit(s); please specify.	

9 **Are the training and safety procedures appropriate? If not, how would you change them?**
* Summarize responses succinctly on another sheet.

10 **What would you like this facility to do differently?**
* Summarize responses succinctly on another sheet.

11 **Other comments.**
* Summarize responses succinctly on another sheet.

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE

Fiscal Year: 2010 Date submitted: 14-Oct-09

SUMMARY DATA

Facility USERS this Fiscal Year (*Researchers who submitted a successful proposal—see definitions*)

Question Number — Add an asterisk (*) in this column next to any question that has additional information appended

Question Number				Remote Access		On-Site
1		285	Number of Badged Users			
2		40	Number of Other Users; Itemize:	40	plus	0
• **First-Time Users** (subset of Q. 1-2)						NSRCs only
3		61	Number of Badged Users			
4		0	Number of Other Users; Itemize:	0	plus	0
• **Researchers Associated with Experiments** (i.e., Facility Users, Q. 1-2, plus their co-proposers)						
5		?	Number of Badged Users and Co-Proposers			
6		?	Number of Other Users and Co-Proposers			

Obtain Specialty Services or Materials; Itemize (no research proposal; e.g., purchases)

7		0	Enter appropriate categories for your facility here
			For example...
			Institutions that Utilize the Transplutonium Program
			Institutions that Obtain Medical Isotopes

Facility Configuration

8		13	Number of Beam Lines (*or analogue*) Available to Users
9		4	Number of Additional Beam Lines Possible.
10	*		Provide Facility Schematic Diagram(s) to Explain Above Configurations

Facility Hours of Operation for Users (366 days = 8,784 hours)

11		4,500	Maximum Number of Hours for Users (under optimal budget) (excludes machine research, operator training, accelerator physics, etc.)
12		3,430	Scheduled Hours of Operation for Users
13		2,905	Scheduled Hours Delivered to Users (may not exceed Q 12)
14		0	Unscheduled Hours Delivered to Users
15	*	3,000	*Next Fiscal Year* - Planned Hours for Users (attach schedule)

Beam Line Hours of Operation for Users (from Q. 35)

16	n/a	Beam Line Hours Scheduled
17	n/a	Beam Line Hours Delivered
18	n/a	Beam Line Hours Used

Number of Scientific Publications

19	110	*Estimate* of Facility Publications for this Fiscal Year
20	107	*Final* Facility Publications for *Previous Calendar Year*

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

User Demographics

Question Number		
	325	Number of Users (sum Q. 1 plus Q. 2)
Gender		
21	45	Female
	280	Male
0		Information Not Available
Race/Ethnicity		
22	n/a	American Indians or Alaskan Natives
	n/a	Asians/Pacific Islanders
	n/a	Black, non-Hispanics
	n/a	Hispanics
	n/a	White, non-Hispanics
325	n/a	Information Not Available
Age		
23	0	Under 20 years
	127	20-29 years
	103	30-39 years
	66	40-49 years
	27	50-59 years
	1	60-69 years
	1	Over 69 years
0		Information Not Available
Citizenship		
24	194	U.S. Citizen
	98	Foreign National, non-Sensitive Countries
	33	Foreign National, Sensitive Countries
0	0	Terrorist-Sponsoring Nations (U.S. State Department's list)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

User Affiliations

	325	Number of Users (sum Q. 1 and 2 or itemize them separately)			
Question Number					
Employer (User's Research Institution)					
25	162	U.S.	Academic		
	?		Host DOE laboratory -- associated with host user facility		
	?		Host DOE laboratory -- not associated with facility		
	42		Other DOE laboratories		
	1		Non-DOE federally funded institution		
	3		Industry		
	72		Other	280	Subtotal U.S.
	9	Foreign	Academic		
	5		National laboratory		
			Industry		
0	31		Other	45	Subtotal Foreign
Employment Level					
26	21	Undergraduate student			
	106	Graduate student			
	101	Postdoctoral research associate			
	96	Faculty member / professional staff / research scientist			
	1	Retired or self employed			
0	0	Other			
Type of User					
27	324	General User only			
	1	Partner User only			
0	0	Both a General User and a Partner User			
Proprietary Research					
28	0	Users conducting only nonproprietary research			
	0	Users conducting nonproprietary and proprietary research			
325	0	Users conducting only proprietary research			

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Geographic Distribution of U.S. User Institutions

280 Subtotal U.S. (from subtotal within Question 25)

Question Number

U.S. State of User's Research Institution (Must sum to "Subtotal U.S." for Question 25)

29

4	Alabama	3	Nevada
0	Alaska	0	New Hampshire
1	Arizona	0	New Jersey
0	Arkansas	74	New Mexico
35	California	16	New York
5	Colorado	0	North Carolina
0	Connecticut	0	North Dakota
2	Delaware	13	Ohio
7	Florida	0	Oklahoma
2	Georgia	0	Oregon
0	Hawaii	6	Pennsylvania
3	Idaho	0	Rhode Island
10	Illinois	9	South Carolina
8	Indiana	0	South Dakota
7	Iowa	25	Tennessee
0	Kansas	7	Texas
0	Kentucky	1	Utah
1	Louisiana	0	Vermont
0	Maine	3	Virginia
3	Maryland	2	Washington
2	Massachusetts	2	West Virginia
1	Michigan	0	Wisconsin
0	Minnesota	1	Wyoming
0	Mississippi		
1	Missouri	1	District of Columbia
0	Montana	0	Puerto Rico
0	Nebraska	25	Other (itemize below)

0

Itemize other U.S. territories here.

	For example
0	Guam
0	U.S. Virgin Islands

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Information Derived from Experiment Demographics

	325	Number of Users from Q. 1-8
Question Number		
Source of Support (number of users)		
30	101	DOE, Office of Basic Energy Sciences
	5	DOE, Office of Biological and Environmental Research
	33	NNSA
	25	DOE, other (includes LDRD)
		Homeland Security
	4	DOD
	37	NSF
	8	NIH
	5	NASA
		USDA
	17	Other U.S. Government
	4	Industry
	31	Foreign
0	55	Other
Subject of Experiment or Service (number of users)		
31	141	Materials sciences
	4	Physics (excludes condensed matter physics)
	48	Chemistry (excludes materials chemistry)
	28	Polymers
	3	Medical applications
	19	Biological and life sciences (excludes medical applications)
	11	Earth sciences
	14	Environmental sciences
	0	Optics
	43	Engineering
	7	User facility instrumentation or technique development
		Purchase of specialty services or materials
0	7	Other

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Budget Data

Question Number

Annual Budget ($ in thousands)

Question Number	Amount	Item
32	0	Utilities
	0	Maintenance / operations of sources
	716	ES&H
	0	Security
	0	Operators/Technicians
	785	R&D
	10,051	User support
	542	Facility administration
	1,065	Other (itemize) Management
	13,159	Total Annual Operating Budget (sum of above)
	883	Capital Equipment
		AIP
		GPP/GPE
	14,042	**Total Annual Budget** (sum of Operating, CE, AIP and GPP/GPE)

Sources of Funding for Annual Budget ($ in thousands)

Question Number	Amount	Source	Item	Amount
33	10,969	DOE, BES - Division of Scientific User Facilities		
	340	Division of Materials Sciences and Engineering		
		Division of Chemical Sciences, Geosciences, and Biosciences		
	1,624	DOE (other)	LDRD	219
			Overhead	500
			RTBF	905
	1,109	Other	Japan	138
			NIH	38
			Capital	883
0	14,042	**Total Annual Budget** (same value as for Question 32)		

Facility Replacement Cost ($ in thousands) YEAR

Question Number	Amount	Item
34		Original cost of facility (then-year dollars) → YEAR
		Replacement cost of original facility (this-year dollars)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Summary Table of Beam Line Usage

Question Number
35

To be completed by NSLS, SSRL, ALS, and APS

A		B	C	D	E	F
		Name of beam line	% of FY beam line was usable	# of hours **SCHEDULED** on beam line	# of hours **DELIVERED** to beam line	# of hours that researchers **USED** the delivered time
1						
2						
3						
4						
etc.						
...						
			Facility Totals:			

For instructions, refer to: **BES_FY09_Sync_beamline_report.doc**

FY 2009 Supplemental Reporting Requirements
BES Synchrotron Radiation Light Sources

You may use your established format from previous years.
— you do not need to use this Excel worksheet.

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number
Name of Beam Line: A. USER FACILITY table (sums the data for all the beam lines)

36	7,361	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	7,361	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	9	Number of instruments on beam line
	900	Estimate of what percentage of beam line is instrumented
	9	Number of end stations on beam line
	48,630	End-station hours requested by users
	26,145	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	26,145	End-station hours delivered to general users
	26,145	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	92	Total number of publications from this beam line
		Itemize:
	46	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	46	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: NPDF

Question Number		
36	1,013	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,013	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	7,030	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	12	Total number of publications from this beam line
		Itemize:
	6	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	6	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SMARTS

Question Number		
36	978	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	978	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	5,810	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	27	Total number of publications from this beam line
		Itemize:
	9	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	18	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: HIPD

Question Number		
36	494	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	494	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	2,324	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	5	Total number of publications from this beam line
		Itemize:
	3	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	2	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: HIPPO

Question Number		
36	916	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	916	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	13,566	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	28	Total number of publications from this beam line
		Itemize:
	20	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	8	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number	Name of Beam Line:	FDS	
36		662	Annual operating cost of the beam line ($ in thousands)
			- do not include costs of operating the facility itself;
			Itemize operating cost by source below:
		662	BES Division of Scientific User Facilities
			BES, Materials Sciences and Engineering
			BES, Chemical Sciences, Geosciences, and Biosciences
			DOE, other (itemize)
			Other (itemize)
		1	Number of instruments on beam line
		100	Estimate of what percentage of beam line is instrumented
		1	Number of end stations on beam line
		4,445	End-station hours requested by users
		2,905	End-station hours delivered to users
			Provide two types of itemizations below:
		0	End-station hours delivered to partner users
		2,905	End-station hours delivered to general users
		2,905	End-station hours delivered for nonproprietary research
		0	End-station hours delivered for proprietary research
		0	Total number of publications from this beam line
			Itemize:
		0	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		0	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SPEAR

Question Number		
36	875	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	875	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	6,943	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	7	Total number of publications from this beam line
		Itemize:
	1	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	6	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: LQD

36	1,102	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,102	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,951	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	4	Total number of publications from this beam line
		Itemize:
	2	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	2	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: Asterix

Question Number		
36	788	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	788	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,399	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	4	Total number of publications from this beam line
		Itemize:
	2	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	2	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: Pharos

Question Number		
36	533	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	533	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	1,162	End-station hours requested by users
	2,905	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,905	End-station hours delivered to general users
	2,905	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	5	Total number of publications from this beam line
		Itemize:
	3	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	2	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

USER SATISFACTION Mini-Survey

Question Number		
37	325	Number of Users (sum Q. 1 plus Q. 2)
		Number of Users who filled out a Mini-Survey

Please circle only one number for Questions 1-4 or mark NA if the question does not apply.

1 **How satisfied were you with the fraction of the year that the facility operates?**

	5 Very Satisfied	4 Satisfied	3 Neither Satisfied Nor Dissatisfied	2 Dissatisfied	1 Very Dissatisfied	NA Not Applicable	
100% =	5	12	1	1	0	2	21

2 **How satisfied were you with the schedule or service (i.e., was the time or service delivered on schedule and was downtime kept to a minimum)?**

	5 Very Satisfied	4 Satisfied	3 Neither Satisfied Nor Dissatisfied	2 Dissatisfied	1 Very Dissatisfied	NA Not Applicable	
100% =	9	11	1	0	0	0	21

3 **How satisfied were you with the performance (i.e., was beam or service maintained close to specifications)?**

	5 Very Satisfied	4 Satisfied	3 Neither Satisfied Nor Dissatisfied	2 Dissatisfied	1 Very Dissatisfied	NA Not Applicable	
100% =	12	9	0	0	0	0	21

4a. **How satisfied were you with the support for users provided by the facility staff?**

	5 Very Satisfied	4 Satisfied	3 Neither Satisfied Nor Dissatisfied	2 Dissatisfied	1 Very Dissatisfied	NA Not Applicable	
100% =	19	2	0	0	0	0	21

4b. **How satisfied were you with the support for users provided by the beam line staff?**

	5 Very Satisfied	4 Satisfied	3 Neither Satisfied Nor Dissatisfied	2 Dissatisfied	1 Very Dissatisfied	NA Not Applicable	
100% =	18	3	0	0	0	0	21

5 **Please provide comments for any score rating of 1 or 2 on Questions 1-4 above.**
* Summarize responses succinctly on another sheet.

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center -- LANSCE
Fiscal Year: 2010

USER SATISFACTION Mini-Survey (continued)

Question Number
37 (*continued*)

			#
6	**What was the subject of your use of this facility this year? (circle the subject that best applies)**		
	a.	Basic research	14
	b.	Applied research	7
	c.	Developed a new or improved product, process or technology	0
7	**How do you intend on communicating the knowledge gained at this facility? (circle all answers that apply)**		
	a.	Publish in peer-reviewed open literature	20
	b.	Present findings at professional society meeting	13
	c.	Acquired a patent	0
	d.	Other	1
8	**What additional benefits did you gained at this facility? (circle all answers that apply)**		
	a.	Furthered the goals of the Department of Energy	9
	b.	Obtained access to unique capabilities not available elsewhere (e.g., forefront experiments; one-of-a-kind instruments; distinctive materials or services)	14
	c.	Facilitated collaborative interactions (e.g., stimulated new ideas for future experiments, increased multidisciplinary work; enabled a new approach within your discipline)	16
	d.	Trained students (undergraduate, graduate or postdoctoral associate)	5
*	e.	Other benefit(s); please specify:	0

9 **Are the training and safety procedures appropriate? If not, how would you change them?**
* Summarize responses succinctly on another sheet.

10 **What would you like this facility to do differently?**
* Summarize responses succinctly on another sheet.

11 **Other comments.**
* Summarize responses succinctly on another sheet.

Summarized Answers of Survey

Questions 1-5		There is a need for more lab space for users. Frequently , most of the benchtop area and hood space is occupied. It would be helpful if users could mark off a section of the benchtop to keep as their work area during the duration of their visit. That is done at other user facilities and it is helpful.
Question 8	What additional benefits did you gained at this facility? (circle all answers that apply)	The experiments were in support of the Joint BioEnergy Institute (JBEI), one of the new bioenergy centers supported by the DOE.
Question 9	Are the training and safety procedures appropriate? If not, how would you change them?	Yes. Yes. The safety procedures were adequate, no immediate changes required. Yes yes Yes No problems with the training. Yes. They are appropriate. yes! all the training and safety procedures are appropriate. They are appropriate but need too much time. The training and safety procedures are very appropriate.

Question 10	What would you like this facility to do differently?	If possible, I hope to upgrade the HIPPO instrument further for evaluating the texture change during high temperature deformation. Keep up the good work. Based on my experience this year, the facility is performing at a high level. No problems with the facility. SMARTS is the best in the world. I also like LANSCE very much. They run a very successful program in the team set. More specifically, I attended the 2005 LANSCE winter school and then decided to do my phd dissertation facilitating neutron experiments. When I did the experiments, I had more than full support from the beamline scientists. We discussed in advance. We designed the experiments to investigate the topics, which I can not do in other facilities. I also discuss the results with the beamline scientists together for publications. That is the reason why I can have many successful experiments and publish papers. With that, I have only one thing to suggest. If LANL could have a website for the users to update our latest publications, presentations, and awards, it could help us to exchange the information and learn new features from other users. Above all, I would like to say THANK YOU!! Provide an online course on neutron diffraction and rietveld refinement that users can utilized prior to coming for experiments.

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q6R	Q7R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What was the subject of your use of this facility this year? a-Basic Research b-Applied Research c-Developed a new or improved	How do you intend on communicating the knowledge gained at this facility? a-Publish in peer-reviewed open literature b-Present findings at professional society
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	b	ab
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year :) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	a	ab
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	b	ab
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	a
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	a	ab
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	b	ab
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	abc
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	a	ab
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	abd
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	abc
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q6R	Q7R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What was the subject of your use of this facility this year? a-Basic Research b-Applied Research c-Developed a new or improved	How do you intend on communicating the knowledge gained at this facility? a-Publish in peer-reviewed open literature b-Present findings at professional society
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b	a
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	a	a
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF								
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	a
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	a	d
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	b	ab
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	a	ab
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b	a
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q6R	Q7R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications/	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What was the subject of your use of this facility this year? a-Basic Research b-Applied Research c-Developed a new or improved	How do you intend on communicating the knowledge gained at this facility? a-Publish in peer-reviewed open literature b-Present findings at professional society
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	a	ab
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	a	ab
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	a
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	a	a
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	b	abd
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	a
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	b	ab
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	b	ab
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b	ab
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			c	a
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	a
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time. It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	a	ab
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b	b
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b	a
SPEAR	Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	a	ab
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	a	ab
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	b	a
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	a	a
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	a	abcd
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			a	ab
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	a	ab
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Satisfied	a	a
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	a	a

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q6R	Q7R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What was the subject of your use of this facility this year? a-Basic Research b-Applied Research c-Developed a new or improved	How do you intend on communicating the knowledge gained at this facility? a-Publish in peer-reviewed open literature b-Present findings at professional society
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	b	ab
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist graciously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	b	ab
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was excellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	a	ab
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	c	ab
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	ab
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Dissatisfied		Very Satisfied	a	ab
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	c	ab
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	b	ab
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	a	a
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They need to be applauded for their service.	Very Satisfied	b	a
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	b	ad
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	a	abc
	Satisfied	Satisfied	Satisfied	Dissatisfied	Changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	a	a
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	ab
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a	ab
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	b	ab
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	d
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	a

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q6R	Q7R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e, was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What was the subject of your use of this facility this year? a-Basic Research b-Applied Research c-Developed a new or improved	How do you intend on communicating the knowledge gained at this facility? a-Publish in peer-reviewed open literature b-Present findings at professional society
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.	Neither Satisfied Nor Dissatisfied	a	a
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	c	a
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	abd
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	ab
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	a	ab
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	a	ab

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R How satisfied were you with the fraction of the year that the facility operates?	Q2R How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	Q3R How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	Q4R How satisfied were you with the support for users provided by the facility staff?	Q5A Please provide comments for any score rating of 1 or 2.	Q5R How satisfied were you with the support of users provided by the beam line staff?	Q8A Q8R question 6-Other Benefits
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year :) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Provided preliminary data for an NSF proposal.
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	Speedy access to an increasing rare resource in this country: routine neutron diffraction.
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	I always learn a lot from the staff. Sven Vogel and Luke Daemen have been instrumental in my ability to do my research. I think that in many ways the people are more important than the instrumentation, although obviously nothing happens without great instrumentation.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	We carried out high-pressure neutron powder diffraction experiments, which is very challenging area. Experimental neutron scattering facilities reaching pressures up to 10 GPa are indeed very. The TAP-98 facility and HIPPO diffractometer have been very crucial for our research as they provide experimental ways to test our computational models of technologically important piezoelectric lead-zirconate-titanate ceramics.
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Q8R question 6-Other Benefits
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		very Satisfied	
NPDF							
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Q8R question 6-Other Benefits
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time. It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	Enhance understanding of materials
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Q8R question 6-Other Benefits
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist graciously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was expellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	It was a good learning experience and a great opportunity to meet accomplished scientists at Los Alamos.
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Dissatisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Collaborative work with our UK counterparts at AWE was very productive.
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They need to be applauded for their service.	Very Satisfied	
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	
	Satisfied	Satisfied	Satisfied	Dissatisfied	Changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e, was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Q8R question e-Other Benefits
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.	Neither Satisfied Nor Dissatisfied	
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Enabled a student to complete his graduate thesis
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

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Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What further benefits did you gain at this facility? a-Furthered the goals of DOE b-Obtained access to unique capabilities not available elsewhere c-Facilitated collaborative interactions
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	bc
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcd
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year :) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	bcd
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	bd
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	cde
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	ac
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcd
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	abcde
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	bc
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abc
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	abce
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcd
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abc
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	abcd
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	c

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What further benefits did you gain at this facility? a-Furthered the goals of DOE b-Obtained access to unique capabilities not available elsewhere c-Facilitated collaborative interactions
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	bc
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	abc
NPDF							
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	abcd
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	bc.
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	bc
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	ab
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abc
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abc
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	c
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	b
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bcd

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications/	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What further benefits did you gain at this facility? a-Furthered the goals of DOE b-Obtained access to unique capabilities not available elsewhere c-Facilitated collaborative interactions
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	b
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	bd
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	b
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	a
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	abcd
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	bd
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	bc
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	abd
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			b
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	b
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time.	Very Satisfied	bd
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied	It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	bc
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	bc
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	cd
SPEAR	Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	abcd
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	abcde
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	ad
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	bd
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	abcd
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			abcd
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	abc
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Satisfied	a
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	a

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Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What further benefits did you gain at this facility? a-Furthered the goals of DOE b-Obtained access to unique capabilities not available elsewhere c-Facilitated collaborative interactions
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	bc
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist graciously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	abc
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was expellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	b
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	abc
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	bc
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Dissatisfied		Very Satisfied	c
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	bc
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcd
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	bcd
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	a
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	a
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They need to be applauded for their service.	Very Satisfied	bc
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	cd
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	abd
	Satisfied	Satisfied	Satisfied	Dissatisfied	Changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	abc
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	abc
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	abc
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	b
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	b

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q8R
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e, was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What further benefits did you gain at this facility? a-Furthered the goals of DOE b-Obtained access to unique capabilities not available elsewhere c-Facilitated collaborative interactions
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.	Neither Satisfied Nor Dissatisfied	
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	c
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcde
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	abcd
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	d
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	abcd

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q9A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Are the training and safety procedures appropriate? If not, how would you change them?
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	Yes.
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year !) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	yes
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	The online training did not save prior. So I had to retake it when I showed up.
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Procedures are adequate.
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes.
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	yes.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes.
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	Yes. I think they are extremely well handled. It would be handy to be able to do more safety training online before arriving in New Mexico if possible. That happens at other user facilities and might be possible for LANSCE, too.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes, they are very appropriate and also regularly updated.
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	very appropriate
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Yes.
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes, they are appropriate.

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q9A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Are the training and safety procedures appropriate? If not, how would you change them?
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	The training and safety procedures are appropriate.
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	For the most part, the procedures and training are appropriate and useful.
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	Initial training at the LANSCE welcome center wasn't as coordinated as I would have liked
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	The training procedures took us 1.5 days; thus some time was lost for the beamtime. It was not possible to finish the training at first day, because it was closed very early. It would make sense to clarify specific safety issues for the experiment together with people from safety group and instrument scientist while the common safety lecture could be much shorter. This would not only reduce time but would also be focused on the relevant safety issues for that experiment.
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	Both training and safety training were detailed and appropriate.
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	Yes
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	The training and safety procedures were appropriate and covered all details.
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes! As informative as necessary and as short as possible General safety training and beam line specific training are appropriate. I feel that some of the questions in the reviews of the general safety training stress too much the knowledge of local acronyms. These are difficult to remember -especially for foreign nationals- A fully worded name might convey more the reason for the specific safety officer etc and thus might actually provide better knowledge by the user.
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Very bureaucratic organization. I know Los Alamos National Labs is related to a Federal agency, but the bureaucracy related to safety training is staggering sometimes.
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q9A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Are the training and safety procedures appropriate? If not, how would you change them?
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	They are
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	Yes.
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	Training is well coordinated and very comprehensive
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	Simplify and combine.
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	Very appropriate, the staff and instrument scientists were very safety conscious and made sure that safety issues were reinforced.
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Yes.
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	They are appropriate given the type of experiments carried out there in the facility.
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Yes
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes. They are very detailed and appropriate.
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			Some of the tests are excessive. For example chemical safety test requirement is not really necessary as I was never in any contact with any chemials. May be test requirements can be streamlined and done on line ahead of time.
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time. It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	yes
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes.
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	The training and safety procedures are very important and interesting. For me information about this trainings should be e-mailed to users earlier then two weeks before visit in Lujan Center.
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes.
SPEAR	Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	They are as good as in every othr neutron source in the US.
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	yes
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	On line portions helpful. Excellent support from user office.
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			Yes
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	yes
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied		Satisfied	
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R How satisfied were you with the fraction of the year that the facility operates?	Q2R How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	Q3R How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	Q4R How satisfied were you with the support for users provided by the facility staff?	Q5A Please provide comments for any score rating of 1 or 2.	Q5R How satisfied were you with the support of users provided by the beam line staff?	Q9A Are the training and safety procedures appropriate? If not, how would you change them?
Flight Path							
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist graciously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	yes
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was expellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	Yes, they were
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	Yes.
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Dissatisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes.
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	yes
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	Yes, the training and safety procedures are appropriate.
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Typically the organization of the training office is a mess. You can't trust the information regarding which courses you will need to (re-)train for that you get by email ahead of your experiment. Better communication between user office and training office would be great.
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They need to be applauded for their service.	Very Satisfied	yes
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	yes
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	
	Satisfied	Satisfied	Satisfied	Dissatisfied	changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	yes
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Yes
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q9A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Are the training and safety procedures appropriate? If not, how would you change them?
					At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.		
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied		Neither Satisfied Nor Dissatisfied	
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	yes
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes, they were quite comprehensive but not burdensome.
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	Less redundancy in the training materials..
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Yes

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Flight Path	Q1R How satisfied were you with the fraction of the year that the facility operates?	Q2R How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	Q3R How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	Q4R How satisfied were you with the support for users provided by the facility staff?	Q5A Please provide comments for any score rating of 1 or 2.	Q5R How satisfied were you with the support of users provided by the beam line staff?	Q10A What would you like this facility to do differently?
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	I would like more information before I arrive about where to ar I ended up just driving to the general area the lab is in, and luck "Badge Office". I also didn't know that, as a student, I could be Knowing this beforehand would have prevented some worrying I had to rent one on my own, not knowing if I was covered via a for the entire cost.
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	The changes I would like to see would require additional budget since you asked, let me say that I think that Lujan needs more m at international level facilities such as the ILL have one technicia technicians for sample environment, detectors, data acquisition techs for the ensemble of its instruments, i.e. roughly 1/4 per in
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year :) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	HIPD should be re-included in the user program. Because of par she has been able to continue doing measurements for us. How expertise of Dr. Llobet should be available to the general user p in the country in which magnetic and local structures can be stu an instrument needs to be developed for studying local dynami dynamical pair-distribution function analysis). Pilot experiment however, these capabilities should be refined and upgraded to experiments to be performed.
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	HIPD should be re-included in the user program. HIPD is the onl magnetic and local structures can be studied in the same exper be developed for studying local dynamics and magnetism (i.e. r function analysis). Pilot experiments have been performed on P should be refined and upgraded to enable unique, and broadly Considering the quantity of exceptional publications that come it is quite incredible how short-staffed the Lujan center is in co facilities. The success is undoubtedly attributable to the top-quality scie that respect there are many things being done very well here. even further enhanced if the scientific staff were increased. Wi budget difficulties than it does facility operations, my personal the science done at the Lujan center, far exceeds that of the SN
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	beamline.
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	doing well as it is.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Improvements in the capability to measure strain (multiple dire coincident with the beam interaction volume would be a desirab
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	capabilities at the facility.
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	Other than my small comment about the training, I would like to and instrument conditions. Things were not updating when I w experiment without being on site all night.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	nothing
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

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Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q10A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What would you like this facility to do differently?
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	I would have liked to have more support from the staff while ru
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		very Satisfied	There should be more help or directions/Instructions on how sa paperwork/procedures are needed so the users know how far i
NPDF							
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	Have a sheet specifying what training classes were necessary
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	See 9 - the time for safety training could be reduced. The lab fo
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	It would be helpful if the facility had a "Guest House" on-site.
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	Have another beamline like NPDF
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	A dilution refrigerator for NPDF would be beneficial for expandi Instrument in order to look at magnetic scattering.
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	It would be helpful if there was an on-site guest house at LANL
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	-
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	Perhaps try to streamline the User experience a bit more. Neutr but I think that there are lessons to be learned from the X-ray sy make the User experience more productive.
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Nothing - other than build a second beamline

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Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q10A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What would you like this facility to do differently?
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	See comment in question 5.
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	Operate for more of the year, as stated above.
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	Less redtape once one arrives.
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	No comments.
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time. It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	nothing
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	Maintain better the sitting space provided to users in terms of li
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	It would be tremendously beneficial for reflectivity to go back to
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	more quality beam
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Satisfied	build a cleaner user's lab
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q10A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What would you like this facility to do differently?
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist gracously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	I enjoy being a Lujan user. The reliability of the beam is the only
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was expellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	Nothing
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	An upgrade of the beam for more reliable operation would tie w
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They needs to be applauded for their service.	Very Satisfied	more rigs and fixtures to hold specimens
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	
	Satisfied	Satisfied	Satisfied	Dissatisfied	Changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	Provide more funding to flight paths for equipment maintenanc The neutron source itself is reasonably stable. I like to see furth of the experimental environment. I have used high field superc some issues with it, like unexpected larger background, short pa failure of motor etc. We used a significant fraction of beam tim is that it costs much less research funding to improve the relia improve reliability of the neutron source; however, the improv upgrade the efficiency of the facility as well.
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	Q10A
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	What would you like this facility to do differently?
					At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.		
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied		Neither Satisfied Nor Dissatisfied	
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Operate more frequently. The Spallation Neutron Source at Oak time but Lujan has approximately 4.5 months down ("turn on" and a month of unusable beam time due to the IPF. That puts actual, general compared with ORNL at 80%. The BRAGG Institute in Australia i operate at 82% (300 days). Lujan is doing better than several of
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	More hands-on experience for the general users.
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Nothing. I truly had a fantastic experience working at the Lujan

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	AddlCmts
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Additional Comments
ASTERIX	Very Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
ASTERIX	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
ASTERIX	Dissatisfied	Very Satisfied	Very Satisfied	Dissatisfied	2) Of course, I'd be happy if Lujan got to run a larger fraction of the year !) 4a) My colleagues and I had numerous badging problems, including: not being on access list, guards not knowing if visitor badge allowed access to the facility, badge not being properly activated to open the front gate over the weekend.	Very Satisfied	Overall experience at Lujan was fantastic. Things work beautifully on FP11, and on rare occasions when th beamline and support staff were exceedingly responsive and he
ASTERIX	Satisfied	Satisfied	Very Satisfied	Very Satisfied	One of the network controllers at the beamline died, but it was promptly resolved	Very Satisfied	
FDS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	With regard to Item 7 above, a research paper presenting the re FDS experiments is in press in the Journal Physical Chemistry Ch
FDS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
HIPD	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPD	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Neither Satisfied Nor Dissatisfied		Very Satisfied	
HIPD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied	
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Neither Satisfied Nor Dissatisfied	Very Satisfied	Very Satisfied	Very Satisfied	I would love to see the beam up more of the year, but I know that is a big issue.	Very Satisfied	Thanks for another great experiment.
HIPPO	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	Experiments went very smoothly and we had fruitful discussion beamline scientists. The experiments were planned jointly and we are writing a manuscript. I am always pleased to visit Los Ala This facility should also be developed to do more specialized
HIPPO	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	in-situ experiments useful for DOE-NE
HIPPO	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	AddlCmts
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Additional Comments
LQD	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
LQD	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Neither Satisfied Nor Dissatisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	This is my first experience with neutron diffraction data collecti I hope there will be continuing interaction and help from the be on processing and analyses of the data collected. I am excited t useful structural insights about the samples through PDF.
NPDF							
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Satisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied		Despite spotty beam uptime, the staff was very helpful and accomodating!	Very Satisfied	
NPDF	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	
NPDF	N/A	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied		Very Satisfied	I thank the instrument staff Joanne and Thomas as well as Lelia colleagues for their great support!
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	
NPDF	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
NPDF	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
PCS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
PCS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	An excellent well maintained facility

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	AddlCmts
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Additional Comments
PCS	Dissatisfied	Satisfied	Very Satisfied		Obviously, in regard to number 1, I wish that the facility was operational for a longer part of the year. I'm sure there are things I do not understand, but what about having beam operational for 8 months of the year and maintenance time for 4 months. I'd be curious to hear the reason(s) why this is unfeasible.	Very Satisfied	Zoe Fisher is awesome
PCS	Dissatisfied	Very Satisfied	Satisfied	Satisfied	Would like to see the facility perhaps operating 9 out of 12 months of the year, as opposed to only 6-7 months of operation	Very Satisfied	Zoe Fisher is awesome
PHAROS	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	Very satisfied with experimental equipment and personnel. Have to high commend the support staff Lisa, Tanya and Lelani who were efficient, organised and very helpful.
SCD	N/A	Very Satisfied	Very Satisfied	Very Satisfied		N/A	
SMARTS	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	I attended the Neutron Scattering School in 2009, this experiem critical insight, contact with the instrument scientists, and unde neutron diffraction allowing me to effectively design a set of ex neutron diffraction. The benefit of that program can not be ov
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	N/A	N/A	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SMARTS	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
SMARTS	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was off about 1/3 of my allotted time. It was frustrating because the outages were caused by a water leak and a broken valve.	Very Satisfied	
SPEAR	Satisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
SPEAR	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied		Satisfied	
SPEAR	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	Lujan Team including their former leader, Dr. Alan Hurd, the cu leadership, the beam line teams and the administrative group, work towards optimizing the user productivity and overall experience at the facility.
SPEAR	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	There is a problem in overlapping data from different angles on SPEAR. It needs to be solved.	Very Satisfied	
SPEAR	Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Beam was great during this visit. Instrument operated well.	Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied			
	Dissatisfied	Satisfied	Satisfied	Very Satisfied	It would be better to run through the whole year with perhaps larger chunks of downtime, than having 5-6 month downtime every year.	Very Satisfied	
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Neither Satisfied Nor Dissatisfied	the user's labs the worst I have ever seen in terms of supply and equipment.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	AddlCmts
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Additional Comments
	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	For the experiment we conducted, the beam availability was not an issue. That said, if we were making time-sensitive measurements availability of the beam would have been a greater concern.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied	The beam was down extensively for my trip in June, but the instrument scientist graciously scheduled my experiments for additional days at the end of the run cycle, thus I am satisfied overall.	Very Satisfied	
	Very Satisfied	Satisfied	Satisfied	Very Satisfied	The assistance and support provided by the staff was expellent. We were able to get some good publication from the work done at Los Alamos	Very Satisfied	
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Very Satisfied		Very Satisfied	This is such an important facility. Please keep it running and run
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Neither Satisfied Nor Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Very Dissatisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	The resisarch collaboration (including experiments and theory) v very valuable for us and has resulted in many peer reviewed jo
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Dissatisfied	Dissatisfied	Very Satisfied	The beam was down for nearly 50% of the allocated time.	Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	N/A	Neither Satisfied Nor Dissatisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied		Dissatisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Support staff work so hard as a user I do not know how they keep it up all year round. They need to be applauded for their service.	Very Satisfied	great job by all involved in the experiment.
	Satisfied	Very Satisfied	Very Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Satisfied		Satisfied	
	Satisfied	Satisfied	Satisfied	Dissatisfied	changes made to the facility (new moderator) impacted the data acquisition in a negative manner. Because of the new neutron spectrum, standard background correction does not work, leaving artifacts in reduced data that impact analysis. The facility has a long history of enacting changes with apparent disregard for the impact on individual flight paths. Please consult individual flight path teams before making major changes or at least provide them with the resources to counter the negative impact brought about by such changes.	Satisfied	
	Neither Satisfied Nor Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Very Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	

Lujan Neutron Scattering Center - Los Alamos National Laboratory - FY11 User Satisfaction Surveys

Flight Path	Q1R	Q2R	Q3R	Q4R	Q5A	Q5R	AddlCmts
Flight Path	How satisfied were you with the fraction of the year that the facility operates?	How satisfied were you with the schedule or service (i.e. was the time or service delivered on schedule and was the	How satisfied were you with the performance (i.e., was beam or service maintained close to specifications?	How satisfied were you with the support for users provided by the facility staff?	Please provide comments for any score rating of 1 or 2.	How satisfied were you with the support of users provided by the beam line staff?	Additional Comments
					At the time of our beam time, it seems that the Lujan center is very understaffed, and with the amount of personnel can't support users as much as they need. The support we got was very good, but with the lack of manpower it made the beam time more difficult.		
	Satisfied	Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied		Neither Satisfied Nor Dissatisfied	
	Satisfied	Very Satisfied	Satisfied	Very Satisfied		Very Satisfied	fine facility
	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	My experience was good, the staff and scientists were helpful and friendly, and best of all my experiments were performed su
	Dissatisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	I fully plan on submitting proposals for each run cycle for the fc
	Satisfied	Satisfied	Satisfied	Satisfied		Very Satisfied	
	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied		Very Satisfied	

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)

Fiscal Year: 2011 Date submitted: 20-Oct-11

SUMMARY DATA

Facility USERS this Fiscal Year (*Researchers who submitted a successful proposal—see definitions*)

Question Number — Add an asterisk (*) in this column next to any question that has additional information appended.

Question Number				Remote Access		Off-Site
1		283	Number of Badged Users			
2		25	Number of Other Users; Itemize:	0	plus	25
• **First-Time Users** (subset of Q. 1-2)						NSRCs only
3		109	Number of Badged Users			
4		10	Number of Other Users; Itemize:	0	plus	10
• **Researchers Associated with Experiments** (i.e., Facility Users, Q. 1-2, plus their co-proposers)						
5		760	Number of Badged Users and Co-Proposers			
6		0	Number of Other Users and Co-Proposers			

Obtain Specialty Services or Materials; Itemize (no research proposal; e.g., purchases)

7		0	Enter appropriate categories for your facility here
			For example...
			Institutions that Utilize the Transplutonium Program
			Institutions that Obtain Medical Isotopes

Facility Configuration

8			Number of Beam Lines (*or analogue*) Available to Users
9			Number of Additional Beam Lines Possible.
10	*		Provide Facility Schematic Diagram(s) to Explain Above Configurations

Facility Hours of Operation for Users (365 days = 8,760 hours)

11			Maximum Number of Hours for Users (under optimal budget) (excludes machine research, operator training, accelerator physics, etc.)
12			Scheduled Hours of Operation for Users
13			Scheduled Hours Delivered to Users (may not exceed Q 12)
14			Unscheduled Hours Delivered to Users
15	*		*Next Fiscal Year* - Planned Hours for Users (attach schedule)

Beam Line Hours of Operation for Users (from Q. 35)

16			Beam Line Hours Scheduled
17			Beam Line Hours Delivered
18			Beam Line Hours Used

Number of Scientific Publications

19		150	*Estimate* of Facility Publications for this Fiscal Year
20			*Final* Facility Publications for *Previous Calendar Year*

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

User Demographics

Question Number		
	308	Number of Users (sum Q. 1 plus Q. 2)
Gender		
21	63	Female
	197	Male
	48	Information Not Available
Race/Ethnicity		
22		American Indians or Alaskan Natives
		Asians/Pacific Islanders
		Black, non-Hispanics
		Hispanics
		White, non-Hispanics
		Information Not Available
Age		
23	0	Under 20 years
	38	20-29 years
	14	30-39 years
	17	40-49 years
	4	50-59 years
	1	60-69 years
	1	Over 69 years
	233	Information Not Available
Citizenship		
24	142	U.S. Citizen
	96	Foreign National, non-Sensitive Countries
	45	Foreign National, Sensitive Countries
	0	Terrorist-Sponsoring Nations (U.S. State Department's list)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

User Affiliations

Question Number					
	308	Number of Users (sum Q. 1 and 2 or itemize them separately)			
Employer (User's Research Institution)					
25	107	U.S.	Academic		
	74		Host DOE laboratory – associated with host user facility		
			Host DOE laboratory – not associated with facility		
	19		Other DOE laboratories		
	7		Non-DOE federally funded institution		
	2		Industry		
			Other	209	Subtotal U.S.
	10	Foreign	Academic		
	3		National laboratory		
			Industry		
25	61		Other	74	Subtotal Foreign
Employment Level					
26	37	Undergraduate student			
	75	Graduate student			
	42	Postdoctoral research associate			
	89	Faculty member / professional staff / research scientist			
	0	Retired or self employed			
261	4	Other			
Type of User					
27	308	General User only			
		Partner User only			
0		Both a General User and a Partner User			
Proprietary Research					
28	308	Users conducting only nonproprietary research			
		Users conducting nonproprietary and proprietary research			
0		Users conducting only proprietary research			

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Geographic Distribution of U.S. User Institutions

209 Subtotal U.S. (from subtotal within Question 25)

Question Number

U.S. State of User's Research Institution (Must sum to "Subtotal U.S." for Question 25)

Question Number				
29	0	Alabama	1	Nevada
	0	Alaska	0	New Hampshire
	1	Arizona	0	New Jersey
	0	Arkansas	68	New Mexico
	31	California	9	New York
	2	Colorado	4	North Carolina
	0	Connecticut	0	North Dakota
	2	Delaware	10	Ohio
	7	Florida	0	Oklahoma
	0	Georgia	1	Oregon
	0	Hawaii	2	Pennsylvania
	2	Idaho	0	Rhode Island
	12	Illinois	9	South Carolina
	6	Indiana	0	South Dakota
	1	Iowa	7	Tennessee
	0	Kansas	8	Texas
	0	Kentucky	1	Utah
	1	Louisiana	0	Vermont
	0	Maine	0	Virginia
	8	Maryland	1	Washington
	8	Massachusetts	0	West Virginia
	4	Michigan	0	Wisconsin
	0	Minnesota	0	Wyoming
	0	Mississippi		
	2	Missouri	0	District of Columbia
	0	Montana	0	Puerto Rico
0	1	Nebraska		Other (itemize below)

Itemize other U.S. territories here

	For example
	Guam
	U.S. Virgin Islands

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Information Derived from Experiment Demographics

	308	Number of Users from Q. 1-8
Question Number		
Source of Support (number of users)		
30	71	DOE, Office of Basic Energy Sciences
	1	DOE, Office of Biological and Environmental Research
	17	NNSA
	25	DOE, other (includes LDRD)
		Homeland Security
	7	DOD
	27	NSF
	8	NIH
	4	NASA
		USDA
	12	Other U.S. Government
	6	Industry
	39	Foreign
	56	Other
Subject of Experiment or Service (number of users)		
31	159	Materials sciences
	14	Physics (excludes condensed matter physics)
	64	Chemistry (excludes materials chemistry)
	30	Polymers
	5	Medical applications
	25	Biological and life sciences (excludes medical applications)
	18	Earth sciences
	13	Environmental sciences
		Optics
	55	Engineering
	9	User facility instrumentation or technique development
		Purchase of specialty services or materials
	19	Other

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Budget Data

Question Number

Annual Budget ($ in thousands)

Question Number		
32		Utilities
		Maintenance / operations of sources
	601	ES&H
		Security
		Operators/Technicians
	1,893	R&D
	11,434	User support
	1,290	Facility administration
	547	Other (itemize) OS Tax
		Contracts
	15,765	Total Annual Operating Budget (sum of above)
	500	Capital Equipment
		AIP
		GPP/GPE
	16,265	**Total Annual Budget** (sum of Operating, CE, AIP and GPP/GPE)

Sources of Funding for Annual Budget ($ in thousands)

Question Number				
33	11,000	DOE, BES - Division of Scientific User Facilities		
	334	Division of Materials Sciences and Engineering		
	60	Division of Chemical Sciences, Geosciences, and Biosciences		
	3,906	DOE (other)	1,193	LDRD
			930	Overhead
			1,783	RTBF
	965	Other	56	NIH
			562	LANL-Defense
			347	UC - Japan
	16,265	**Total Annual Budget** (same value as for Question 31)		

Facility Replacement Cost ($ in thousands) YEAR

Question Number			
34		Original cost of facility (then-year dollars) →	
		Replacement cost of original facility (this-year dollars)	

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Summary Table of Beam Line Usage

Question Number
35

To be completed by NSLS, SSRL, ALS, APS, and LCLS

A		B	C	D	E	F
		Name of beam line	% of FY beam line was usable	# of hours **SCHEDULED** on beam line	# of hours **DELIVERED** to beam line	# of hours that researchers **USED** the delivered time
1						
2						
3						
4						
etc.						
			Facility Totals:			

For instructions, refer to: **BES_FY11_Sync_beamline_report.doc**

FY 2011 Supplemental Reporting Requirements
BES Synchrotron Radiation Light Sources

You may use your established format from previous years.
— you do not need to use this Excel worksheet.

DO NOT REFORMAT THIS EXCEL FORM

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number		
Name of Beam Line:		A. USER FACILITY table (sums the data for all the beam lines)
36	7,271	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	7,271	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	7	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	7	Number of end stations on beam line
	40,573	End-station hours requested by users
	18,312	End-station hours delivered to users
		Provide two types of itemizations below:
		End-station hours delivered to partner users
	18,312	End-station hours delivered to general users
	18,312	End-station hours delivered for nonproprietary research
		End-station hours delivered for proprietary research
	NA	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

DO NOT REFORMAT THIS EXCEL FORM

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number		
Name of Beam Line:		ASTERIX
36	881	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	881	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	6,864	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

DO NOT REFORMAT THIS EXCEL FORM

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SPEAR

Question Number		
36	937	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	937	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	6,077	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

DO NOT REFORMAT THIS EXCEL FORM

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: NPDF

36	1,170	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,170	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	5,652	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number		
Name of Beam Line:	HIPPO	
36	1,162	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,162	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	9,929	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SMARTS

Question Number		
36	1,088	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,088	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,301	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number		
Name of Beam Line:	LQD	
36	1,106	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,106	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,977	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number		
Name of Beam Line:		FDS
36	927	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	927	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,773	End-station hours requested by users
	2,616	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,616	End-station hours delivered to general users
	2,616	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

USER SATISFACTION Mini-Survey

Question Number		
37	308	Number of Users (sum Q. 1 plus Q. 2)
		Number of Users who filled out a Mini-Survey

Please circle only one number for Questions 1-4 or mark NA if the question does not apply.

1 **How satisfied were you with the fraction of the year that the facility operates?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

2 **How satisfied were you with the schedule or service (i.e., was the time or service delivered on schedule and was downtime kept to a minimum)?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

3 **How satisfied were you with the performance (i.e., was beam or service maintained close to specifications)?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4a. **How satisfied were you with the support for users provided by the facility staff?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4b. **How satisfied were you with the support for users provided by the beam line staff?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

5 **Please provide comments for any score rating of 1 or 2 on Questions 1-4 above.**

- Summarize responses succinctly on another sheet

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Enter Your Facility Name Here (ACRONYM)
Fiscal Year: 2011

USER SATISFACTION Mini-Survey (continued)

Question Number
37 (*continued*)

			#
6	**What was the subject of your use of this facility this year? (circle the subject that best applies)**		
	a.	Basic research	
	b.	Applied research	
	c.	Developed a new or improved product, process or technology	
7	**How do you intend on communicating the knowledge gained at this facility? (circle all answers that apply)**		
	a.	Publish in peer-reviewed open literature	
	b.	Present findings at professional society meeting	
	c.	Acquired a patent	
	d.	Other	
8	**What additional benefits did you gained at this facility? (circle all answers that apply)**		
	a.	Furthered the goals of the Department of Energy	
	b.	Obtained access to unique capabilities not available elsewhere (e.g., forefront experiments; one-of-a-kind instruments; distinctive materials or services)	
	c.	Facilitated collaborative interactions (e.g., stimulated new ideas for future experiments, increased multidisciplinary work; enabled a new approach within your discipline)	
	d.	Trained students (undergraduate, graduate or postdoctoral associate)	
*	e.	Other benefit(s); please specify.	
9	**Are the training and safety procedures appropriate? If not, how would you change them?**		
	*	Summarize responses succinctly on another sheet.	
10	**What would you like this facility to do differently?**		
	*	Summarize responses succinctly on another sheet.	
11	**Other comments.**		
	*	Summarize responses succinctly on another sheet.	

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012 Date submitted: 19-Oct-12

SUMMARY DATA

Facility USERS this Fiscal Year (*Researchers who submitted a successful proposal—see definitions*)

Question Number — Add an asterisk (*) in this column next to any question that has additional information appended

Question Number				Remote Access		Off-Site
1		229	Number of Badged Users			
2		20	Number of Other Users; Itemize:	0	plus	20
• **First-Time Users** (subset of Q. 1-2)						NSRCs only
3		72	Number of Badged Users			
4		8	Number of Other Users; Itemize:	0	plus	8
• **Researchers Associated with Experiments** (i.e., Facility Users, Q. 1-2, plus their co-proposers)						
5		551	Number of Badged Users and Co-Proposers			
6		0	Number of Other Users and Co-Proposers			

Obtain Specialty Services or Materials; Itemize (no research proposal; e.g., purchases)

7		0	Enter appropriate categories for your facility here
			For example...
			Institutions that Utilize the Transplutonium Program
			Institutions that Obtain Medical Isotopes

Facility Configuration

8		7	Number of Beam Lines (*or analogue*) Available to Users
9		5	Number of Additional Beam Lines Possible.
10	*		Provide Facility Schematic Diagram(s) to Explain Above Configurations

Facility Hours of Operation for Users (365 days = 8,760 hours)

11		4,500	Maximum Number of Hours for Users (under optimal budget) (excludes machine research, operator training, accelerator physics, etc.)
12		2,493	Scheduled Hours of Operation for Users
13		2,240	Scheduled Hours Delivered to Users (may not exceed Q 12)
14			Unscheduled Hours Delivered to Users
15	*	3,000	*Next Fiscal Year* - Planned Hours for Users (attach schedule)

Beam Line Hours of Operation for Users (from Q. 35)

16			Beam Line Hours Scheduled
17			Beam Line Hours Delivered
18			Beam Line Hours Used

Number of Scientific Publications

19		110	*Estimate* of Facility Publications for this Fiscal Year
20			*Final* Facility Publications for *Previous Calendar Year*

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

User Demographics

Question Number		
	249	Number of Users (sum Q. 1 plus Q. 2)
Gender		
21	36	Female
	165	Male
0	48	Information Not Available
Race/Ethnicity		
22		American Indians or Alaskan Natives
		Asians/Pacific Islanders
		Black, non-Hispanics
		Hispanics
		White, non-Hispanics
249		Information Not Available
Age		
23	0	Under 20 years
	37	20-29 years
	8	30-39 years
	9	40-49 years
	2	50-59 years
	1	60-69 years
	1	Over 69 years
0	191	Information Not Available
Citizenship		
24	138	U.S. Citizen
	70	Foreign National, non-Sensitive Countries
	41	Foreign National, Sensitive Countries
0	0	Terrorist-Sponsoring Nations (U.S. State Department's list)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

User Affiliations

Question Number					
	249	Number of Users (sum Q. 1 and 2 or itemize them separately)			
Employer (User's Research Institution)					
25	85	U.S.	Academic		
	32		Host DOE laboratory – associated with host user facility		
	52		Host DOE laboratory – not associated with facility		
	14		Other DOE laboratories		
	5		Non-DOE federally funded institution		
	5		Industry		
			Other	193	Subtotal U.S.
	6	Foreign	Academic		
	5		National laboratory		
			Industry		
0	45		Other	56	Subtotal Foreign
Employment Level					
26	0	Undergraduate student			
	68	Graduate student			
	62	Postdoctoral research associate			
	113	Faculty member / professional staff / research scientist			
	0	Retired or self employed			
0	6	Other			
Type of User					
27	249	General User only			
		Partner User only			
0		Both a General User and a Partner User			
Proprietary Research					
28	248	Users conducting only nonproprietary research			
	0	Users conducting nonproprietary and proprietary research			
0	1	Users conducting only proprietary research			

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Geographic Distribution of U.S. User Institutions

193 Subtotal U.S. (from subtotal within Question 25)

Question Number

U.S. State of User's Research Institution (Must sum to "Subtotal U.S." for Question 25)

Question Number				
29	0	Alabama	3	Nevada
	0	Alaska	0	New Hampshire
	0	Arizona	0	New Jersey
	0	Arkansas	79	New Mexico
	21	California	4	New York
	4	Colorado	1	North Carolina
	0	Connecticut	0	North Dakota
	0	Delaware	7	Ohio
	3	Florida	0	Oklahoma
	3	Georgia	1	Oregon
	0	Hawaii	2	Pennsylvania
	4	Idaho	0	Rhode Island
	3	Illinois	4	South Carolina
	4	Indiana	0	South Dakota
	1	Iowa	13	Tennessee
	0	Kansas	13	Texas
	0	Kentucky	0	Utah
	0	Louisiana	0	Vermont
	0	Maine	5	Virginia
	4	Maryland	2	Washington
	4	Massachusetts	0	West Virginia
	1	Michigan	1	Wisconsin
	0	Minnesota	2	Wyoming
	0	Mississippi		
	4	Missouri	0	District of Columbia
	0	Montana	0	Puerto Rico
0	0	Nebraska	0	Other (itemize below)

Itemize other U.S. territories here.

	For example,
	Guam
	U.S. Virgin Islands

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Information Derived from Experiment Demographics

	249	Number of Users from Q. 1-8
Question Number		
Source of Support (number of users)		
30	36	DOE, Office of Basic Energy Sciences
	2	DOE, Office of Biological and Environmental Research
	14	NNSA
	13	DOE, other (includes LDRD)
	1	Homeland Security
	25	DOD
	1	NSF
	5	NIH
	7	NASA
	6	USDA
	23	Other U.S. Government
	0	Industry
	0	Foreign
50	60	Other
Subject of Experiment or Service (number of users)		
31	94	Materials sciences
	4	Physics (excludes condensed matter physics)
	41	Chemistry (excludes materials chemistry)
	19	Polymers
	6	Medical applications
	17	Biological and life sciences (excludes medical applications)
	10	Earth sciences
	8	Environmental sciences
	42	Optics
	6	Engineering
	6	User facility instrumentation or technique development
	0	Purchase of specialty services or materials
40	1	Other

DO NOT REFORMAT THIS EXCEL FORM

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan - LANSCE
Fiscal Year: 2012

Budget Data

Question Number

Annual Budget ($ in thousands)

Question Number	Amount	Item		
32		Utilities		
	1,458	Maintenance / operations of sources		
	538	ES&H		
		Security		
		Operators/Technicians		
	1,857	R&D		2034
	9,022	User support		
	1,214	Facility administration		
	323	Other (itemize)	OS Tax	
	152		Contracts	
	14,564	Total Annual Operating Budget (sum of above)		
	0	Capital Equipment		
		AIP		
		GPP/GPE		
	14,564	**Total Annual Budget** (sum of Operating, CE, AIP and GPP/GPE)		

Sources of Funding for Annual Budget ($ in thousands)

Question Number	Amount	Source	Amount	Item
33	11,147	DOE, BES - Division of Scientific User Facilities		
		Division of Materials Sciences and Engineering		
		Division of Chemical Sciences, Geosciences, and Biosciences		
	3,005	DOE	1,101	LDRD (incl. DF postdoc)
		(other)	446	Overhead
			1,458	RTBF
	412	Other	165	Defense
			247	Other
0	14,564	**Total Annual Budget** (same value as for Question 31)		

Facility Replacement Cost ($ in thousands)

Question Number	Amount	Item	YEAR
34		Original cost of facility (then-year dollars) →	
		Replacement cost of original facility (this-year dollars)	

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Summary Table of Beam Line Usage

Question Number
35

To be completed by NSLS, SSRL, ALS, APS, and LCLS

A		B	C	D	E	F
		Name of beam line	% of FY beam line was usable	# of hours **SCHEDULED** on beam line	# of hours **DELIVERED** to beam line	# of hours that researchers **USED** the delivered time
1						
2						
3						
4						
etc.						
			Facility Totals:			

For instructions, refer to: **BES_FY11_Sync_beamline_report.doc**

FY 2011 Supplemental Reporting Requirements
BES Synchrotron Radiation Light Sources

You may use your established format from previous years.
— you do not need to use this Excel worksheet.

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: A. USER FACILITY table (sums the data for all the beam lines)

36

8,467	Annual operating cost of the beam line ($ in thousands)
	- do not include costs of operating the facility itself;
	Itemize operating cost by source below:
8,467	BES Division of Scientific User Facilities
	BES, Materials Sciences and Engineering
	BES, Chemical Sciences, Geosciences, and Biosciences
	DOE, other (itemize)
	Other (itemize)
7	Number of instruments on beam line
100	Estimate of what percentage of beam line is instrumented
1	Number of end stations on beam line
35,964	End-station hours requested by users
15,680	End-station hours delivered to users
	Provide two types of itemizations below:
	End-station hours delivered to partner users
15,680	End-station hours delivered to general users
15,680	End-station hours delivered for nonproprietary research
0	End-station hours delivered for proprietary research
NA	Total number of publications from this beam line
	Itemize:
	Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
	Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: ASTERIX

36	1,140	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,140	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	6,289	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number
Name of Beam Line: SPEAR

Question Number		
36	1,263	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,263	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	6,441	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: NPDF

36	1,526	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,526	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	7,860	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: HIPPO

Question Number		
36	1,080	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,080	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,315	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: SMARTS

36	1,243	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,243	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,354	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: LQD

36	1,159	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,159	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	4,532	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

Beam Line Statistics

A. Complete one USER FACILITY table which sums the data for all the beam lines.
*** B. Provide these data for EACH BEAM LINE (facility determines succinct format).**

Question Number

Name of Beam Line: FDS

36	1,056	Annual operating cost of the beam line ($ in thousands)
		- do not include costs of operating the facility itself;
		Itemize operating cost by source below:
	1,056	BES Division of Scientific User Facilities
		BES, Materials Sciences and Engineering
		BES, Chemical Sciences, Geosciences, and Biosciences
		DOE, other (itemize)
		Other (itemize)
	1	Number of instruments on beam line
	100	Estimate of what percentage of beam line is instrumented
	1	Number of end stations on beam line
	3,173	End-station hours requested by users
	2,240	End-station hours delivered to users
		Provide two types of itemizations below:
	0	End-station hours delivered to partner users
	2,240	End-station hours delivered to general users
	2,240	End-station hours delivered for nonproprietary research
	0	End-station hours delivered for proprietary research
	N/A	Total number of publications from this beam line
		Itemize:
		Number of publications authored/coauthored by a staff member of the facility (i.e., supported by a DOE FWP)
		Number of publications authored/coauthored by a non-staff member of the facility (i.e., not supported by the FWP)

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Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

USER SATISFACTION Mini-Survey

Question Number		
37	249	Number of Users (sum Q. 1 plus Q. 2)
		Number of Users who filled out a Mini-Survey

Please circle only one number for Questions 1-4 or mark NA if the question does not apply.

1 **How satisfied were you with the fraction of the year that the facility operates?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

2 **How satisfied were you with the schedule or service (i.e., was the time or service delivered on schedule and was downtime kept to a minimum)?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

3 **How satisfied were you with the performance (i.e., was beam or service maintained close to specifications)?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4a. **How satisfied were you with the support for users provided by the facility staff?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

4b. **How satisfied were you with the support for users provided by the beam line staff?**

100% =						0
5	4	3	2	1	NA
Very Satisfied	*Satisfied*	*Neither Satisfied Nor Dissatisfied*	*Dissatisfied*	*Very Dissatisfied*	Not Applicable

5 **Please provide comments for any score rating of 1 or 2 on Questions 1-4 above.**

- Summarize responses succinctly on another sheet

Basic Energy Sciences (BES) Annual Facilities Questionnaire

Facility: Lujan Center - LANSCE
Fiscal Year: 2012

USER SATISFACTION Mini-Survey (continued)

Question Number
37 (*continued*)

			#
6	**What was the subject of your use of this facility this year? (circle the subject that best applies)**		
	a.	Basic research	
	b.	Applied research	
	c.	Developed a new or improved product, process or technology	
7	**How do you intend on communicating the knowledge gained at this facility? (circle all answers that apply)**		
	a.	Publish in peer-reviewed open literature	
	b.	Present findings at professional society meeting	
	c.	Acquired a patent	
	d.	Other	
8	**What additional benefits did you gained at this facility? (circle all answers that apply)**		
	a.	Furthered the goals of the Department of Energy	
	b.	Obtained access to unique capabilities not available elsewhere (e.g., forefront experiments; one-of-a-kind instruments; distinctive materials or services)	
	c.	Facilitated collaborative interactions (e.g., stimulated new ideas for future experiments, increased multidisciplinary work; enabled a new approach within your discipline)	
	d.	Trained students (undergraduate, graduate or postdoctoral associate)	
*	e.	Other benefit(s); please specify.	
9	**Are the training and safety procedures appropriate? If not, how would you change them?**		
	*	Summarize responses succinctly on another sheet.	
10	**What would you like this facility to do differently?**		
	*	Summarize responses succinctly on another sheet.	
11	**Other comments.**		
	*	Summarize responses succinctly on another sheet.	

Lujan Center - BES Statistics – User Satisfaction FY2012

Question 5

Please provide comments for any score rating of 'Dissatisfied or Very Dissatisfied' on Questions 1-5 above.

-I was performing tensile tests on radioactive material at elevated temperature with in situ neutron diffraction. The equipment all performed very well, except for the thermocouple used to measure the temperature of the specimen. Because of the activity of the specimen, the thermocouple could not be welded on, and the temperature measurements were very imprecise. Next time I will know the specimens should be machined with a hole for a thermocouple.

-More neutron time is always better.

Lujan Center - BES Statistics – User Satisfaction FY2012

Question 9

Are the training and safety procedures appropriate? If not, how would you change them?

-Yes
-yes
-Yes
-To my understanding the procedures are appropriate.
-To my understanding the procedures are appropriate.
-Yes
-yes
-Yes
-To my understanding the procedures are appropriate.
-Yes
-Yes, they are fine.
-Yes, though clear distinctions of clothing requirements (steel toed shoes? Long pants?) would be nice to have.
-Yes
-appropriate
-Yes

Lujan Center - BES Statistics – User Satisfaction FY2012

Question 10

What would you like this facility to do differently?

-I was very satisfied with the beamtime, equipment, staff, and entire experience.
-more instruments, e.g. single crystal,
-None
-Providing more beam time

-The Lujan Center does a great job with the limited resources they have. Much more could be accomplished if they were given increased funding for additional beam line and support staff and for instrument upgrades (including sample environments).

-Invest in updating instrument running software. It is quite silly to have such expensive devices running on outdated, buggy graphic user interfaces. Also, a master list of all equipment available at the Lujan facility + the point of contact for each item would be nice. This includes smaller things like pipe cutters, soldering guns, and chemicals. More beam time is always better, though I realize technology can only do so much.

-Invest in updating instrument running software. It is quite silly to have such expensive devices running on outdated, buggy graphic user interfaces. Also, a master list of all equipment available at the Lujan facility + the point of contact for each item would be nice. This includes smaller things like pipe cutters, soldering guns, and chemicals.

-Additional resources should be allocated to operating the facility from continuous upgrades to instruments and sample and environments with a concomitant increase in staffing levels. The instruments are heavily oversubscribed. To meet the needs of the user community, the facility should operate all the instruments for 8 to 9 months each year.

Lujan Center - BES Statistics – User Satisfaction FY2012

Question 11

Other Comments

-Mike Fitzsimmons and his postdoc Surendra Singh have done a wonderful job. The results were beautiful. We are extremely excited about the PNR results.

-Mike Fitzsimmons was incredibly helpful, dedicated to completing the experiment, and an excellent teacher. This was my first neutron experiment and he made it successful.

-None

-Instrument research team works very efficiently. I am always happy to visit Los Alamos for conducting experiments.

-There were some hiccups when my experiment started, but it was nothing major. The support staff scientist: Don Brown, Bjorn Clausen and Thomas Sisneros were of great help.

-Hands down, the staff (facility and beam line) are the best and most rewarding part of using the Lujan Center.

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Acknowledgments

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