Flight Path 1

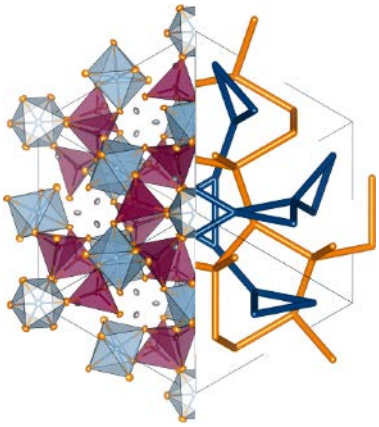
NPDF Fact Sheet Neutron Powder Diffractometer

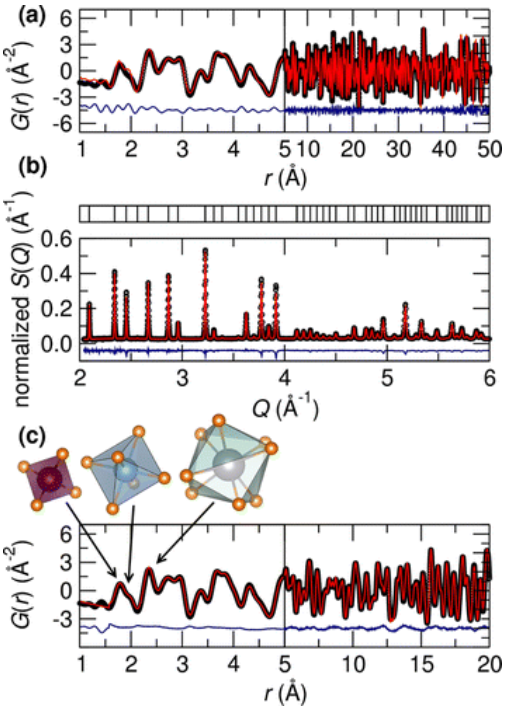
FOR MORE INFORMATION, CONTACT:

Olivier Gourdon
(505) 667 9426

gourdono@lanl.gov

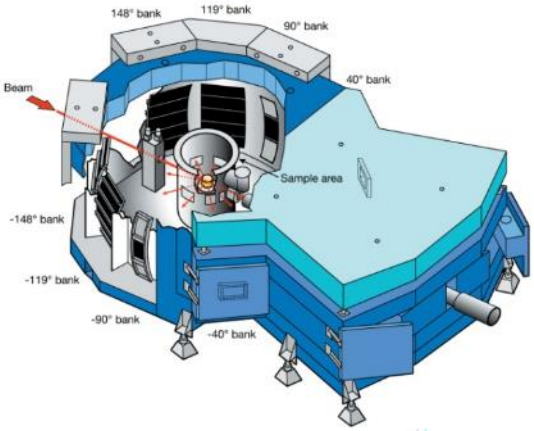
The Neutron Powder Diffractometer (NPDF) is a high-resolution total-scattering powder diffractometer located at Flight Path 1, 32 meters from the spallation neutron target. It has 20 detector panels with 160 position-sensitive detectors in the backscattering region of the instrument. These specifications give the instrument a high resolution and a large *Q*-range, and together with low and stable background scattering, position NPDF as a world-leader in pair distribution function (PDF) studies of disordered and nano-crystalline materials. It is equally well-suited for high-resolution crystallographic studies. A standard data set suitable for either analysis can be obtained in two hours. NPDF experiments have resulted in more than 180 peer-reviewed journal articles since the instrument shutter opened in 2002, 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 techniques.





(Right) NPDF data provides access to multiple structural length scales in the canonical phosphor material $Y_{2.91}Ce_{0.09}Al_5O_{12}$ (depicted above). (a) PDFgui least-squares fits of *G*(*r*) , and reverse Monte Carlo fits of (b) *S*(*Q*) and (c) *G*(*r*) aid in revealing compression of the Ce^{3+} local environments by the rigid YAG structure, which gives rise to its unusually large crystal-field splitting. From N. C. George, A. J. Pell, G. Dantelle, K. Page , A. Llobet, M. Balasubramanian , G. Pintacuda , B. F. Chmelka , and R. Seshadri, *Chem. Mater*. 25 (2013) 3979–3995.

Specifications				
Moderator	Chilled Water (283 K)			
Flight path	Primary: 32 m, secondary: 1.5 m			
Beam Size	5 cm high x 1 cm wide			
Detector Bank Information				
Bank	± 45°	± 90°	± 119°	± 148°
d-spacing	0.25 - 7.2 Å	0.17 - 4.2 Å	0.14 - 3.4 Å	0.24 - 3.0 Å
Q	0.8 - 25.0 Å^{-1}	1.5 - 37.6 Å^{-1}	1.8 - 45.8 Å^{-1}	2.1 - 51.1 Å^{-1}
Δd/d	0.70 %	0.31 %	0.28 %	0.15 %
Detector type	62 ^{3}He Tubes	62 ^{3}He Tubes	80 ^{3}He Tubes	80 ^{3}He Tubes
Pixels	62	62	4000	4000
Pixel size (w x h)	0.5" x 12"	0.5" x 12"	0.5" x 12"	0.5" x 12"
Ancillary Equipment				
Displex	15 - 600 K (closed cycle refridegerator)			
Furnace	RT - 1100 °C			
Other	Contact instrument scientist			



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