

Neutron Beam Reflectometer



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Asterix is a multipurpose cold neutron time-of-flight (ToF) spectrometer focused on nano- to meso-scale surface scattering and cold neutron imaging. Scattering capabilities include reflectometry, grazing-incidence-SANS, and diffraction from surfaces. Imaging techniques include cold neutron radiography and phase-contrast-imaging. Asterix views an intense polychromatic neutron beam (4 to 13 Å) through a 36 cm² neutron guide. Located on Flight path 11 in ER-2, Asterix is ideally suited to study the in- and out-of-plane structures of condensed and soft matter thin films (from 5 - 5000 Å). With the ToF method a range of momentum transfer vectors (Q_z) can be measured without altering the angle of the incident beam. A special strength of Asterix is the ease with which a great variety of experimental requirements and sample environments can be accommodated. Examples of programs using Asterix include: studies of actinides (and other thin layers) and their chemical evolutions, metallic interfaces and corrosion, studies of composite polymeric materials, biological interfaces, studies of solid-liquid interfaces, electrochemical processes, long-wavelength/large- d -spacing diffraction (d -spacing > 2 Å), etc.



View of the Asterix experimental cave

Diverse sample environment capabilities exist:

- Cells with controlled gas content and temperature (up to 1200°C) to study chemical evolutions of thin films.
- Solid-liquid interface cells with shear flow capability.
- Cells to study electrochemical processes *in situ*.
- High pressure/temperature cell to study interfaces in contact with liquids up to 200 MPa and 200°C.
- Liquid shear flow cells to investigate the response of thin layers to mechanical stress.
- Clean room and for the fabrication, modification and characterization of samples are available to users.

SPECIFICATIONS

Moderator	Lower tier coupled liquid-hydrogen moderator
Beam cross-section	60 mm – 60mm
Primary flight path	Target to sample position 18 m
Secondary flight path	Sample to detector position: 0.5 – 2.5 m
Wavelength frame	4 to 13 Å
Resolution	Time-of-flight (wavelength) resolution 0.2 to 0.6 % Geometrical resolution > 0.04cotq(%)
Neutron detector (reflectometry)	One-dimensional PSD on a detector arm with range of motion from 6°- 40°. The PSD can be rotated 90° about the normal to the detector face
Neutron detector (diffraction)	Two-dimensional array of PSD tubes that can be placed anywhere inside the Asterix cave. Maximum scattering angle is 100°.
Neutron detector (imaging)	10x10 cm two-dimensional Li doped ZnS scintillator detector (125µm pixel size) 3x3 cm two-dimensional time resolved CCD detector (55 µm pixel size)