McMaster Nuclear Reactor Beam Port #4

MacSANS

McMaster
Small – Angle
Neutron Scattering

DESIGN

Wavelength	2.6 – 23 Å
λ Resolution	Δλ/λ = 17%
Beam Diameter at Sample	10.0 – 76.2 mm with adjustable source and sample slits
Flux at Sample	~1x10^4 n/cm^2/sec at λ = 3 Å, Δλ/λ = 17%
Source-to-Sample Distance	15 m
Sample-to-Detector Distance	2 – 10 m continuously variable
Detector Offset	0 – 20 cm
Detector	^{3}He multiwire proportional counter 1 x 1 m^2
Detector Resolution	147 x 147 pixels at ~9 mm spatial resolution in each dimension
Q-range	0.005 < Q < 1.25 Å^{-1}
Length Scale	0.6 – 125 nm

McMaster Small-Angle Neutron Scattering (MacSANS) is a 24 m instrument optimized for studying nanostructured materials. It uses a thermal neutron beam optimized in the wavelength range of 3 – 6 Å as selected by a neutron velocity selector with 17% λ bandgap. The instrument resolution and flux can be tuned using a pair of variable source and sample slits, providing a maximum beam diameter of 76.2 mm on sample.

MacSANS has a 1 m^2 area detector that can translate to cover a sample-to-detector distance of 2 – 10 m (continuous) and can be vertically offset to extend the accessible Q-range. The sample area provides abundant space and a dedicated hoist to accommodate large and exotic sample environments.

MacSANS is a general-purpose instrument to probe structure-function relationships in a broad range of materials from biological membranes and polymers, metals and alloys, to quantum materials like superconductors and novel magnetics. Current sample environments include automatic sample changers (quartz banjo cells and demountable cells) to accommodate liquid, gel, and powder samples for measurement in the temperature range of 260 – 420 K, and a humidity chamber for subtracted-mounted thin films.

Available Sample Environments

- QNW NeutronIQ 3x3 sample holder (260-420K)
- Custom demountable cell holder 1x5 (4-80 ºC)
- Humidity Chamber for substrate-mounted films (4-80 ºC)

Instrument Contacts

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