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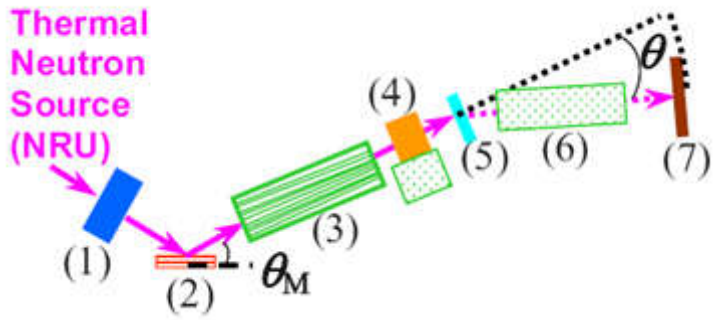
N5 Triple-Axis Spectrometer

The N5 triple-axis spectrometer is used for inelastic and elastic (2-axis) neutron scattering experiments, and extensively used in the study of biologically relevant materials. The N5 spectrometer can be used for small angle neutron scattering (SANS).

Typical Experiments

- inelastic scattering (e.g. phonons, magnons, solitons, correlations, membrane dynamics)
- elastic scattering (e.g. mapping of phase diagrams, magnetization measurements, location of molecules within biological membranes)
- SANS (e.g. unilamellar vesicles, domains)

The SANS capability is achieved through the use of Confocal Soller Collimator (CSC) which enhances the neutron flux on the sample by a factor of 20, compared to a single beam of the same spot size. Furthermore, smearing effects due to vertical divergence from the slit geometry were reduced through the use of Horizontal Soller Collimators (HSC). As a result, the modified N5 spectrometer enables SANS measurements to a minimum q value 0.006 Å–1 [Nieh et al., Rev. Sci. Instrum. 79, 095102 (2008)].



Schematic of the N5-SANS adapted from a triple-axis spectrometer to an instrument capable of SANS measurements. The components are as follows: (1) sapphire or Be filter. (2) Monochromator. (3) 23-channel CSC. (4) PG filter/21.6 cm long HSC/open. (5) Sample. (6) 48 cm long HSC. (7) 32-wire position sensitive detector.

Technical Specifications

Beam Size at sample position: 5 cm high × 5 cm wide (maximum)

Available monochromomators and analyzers: Be, Cu, Ge, pyrolitic graphite, Si

Monochromator take-off Angle: Continuously variable from 15- 120°

Specimen scattering angle: Continuously variable from 0 – 126°

Analyzer Take-off Angle: Continuously variable from -120 – 120°

Collimators:

No source-to-monochromator collimator is installed, effective collimation is ~ 0.6°. The remaining beam segments have adjustable soller slits with each soller channel having a minimum blade spacing of 0.050″. Soller blades are available in 26″, 19″, 14.5″, 8.0″ and 5.5″ lengths. The maximum blade length in each beam segment are:

- monochromator to specimen, 26″
- specimen to analyzer, 14.5″
- analyzer to detector, 8″

In the case of the SANS setup, please see the diagram above.

Detectors: Single or Multichannel ^{3}He