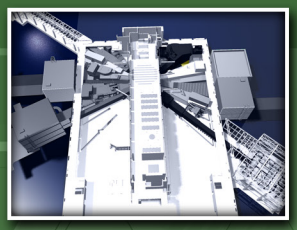
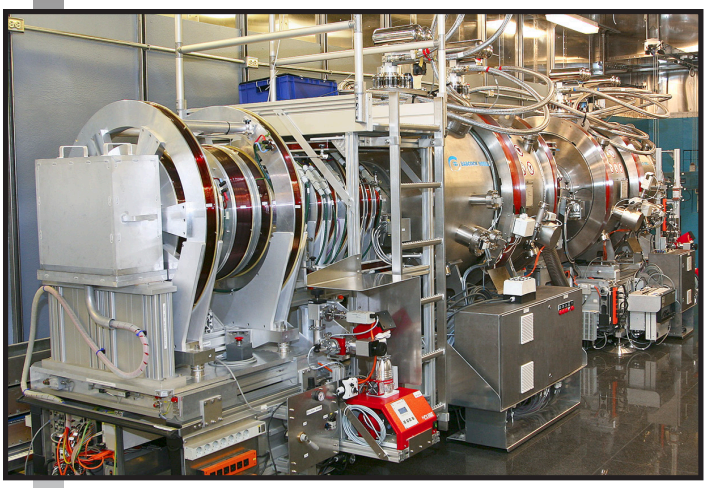
Spallation Neutron Source

Instrument Beam Line 15



NSE – Neutron Spin Echo Spectrometer

Neutron Spin Echo spectrometers provide the highest energy resolution and the widest dynamical range achievable with neutron scattering. The manipulation of neutron spin allows the use of an intense beam of neutrons with a broad wavelength distribution at the same time sensitive to neutrons velocity changes of less than 10^{-4}. Exploiting superconducting technology with high-magnetic-field homogeneity, state-of-the-art field correction elements, novel polarizing benders and location at the Spallation Neutron Source, the SNS-NSE spectrometer achieves high data collection efficiency, allowing nearly gapless coverage of a broad wave-vector time range with only a few scattering angle settings. For a maximum wavelength span of 2 Å < λ < 17 Å, the SNS-NSE spectrometer yields an unprecedented dynamical range of six decades, from 1 ps < τ < 300 ns. These values represent the maximum limits of the spectrometer and are achievable only under special experimental conditions. Routinely, the NSE spectrometer at SNS operates over a wavelength span of 5 Å < λ < 11 Å, in two operation modes, using a simultaneous wavelength frame of 2.4 Å–3.1 Å, and delivers Fourier times of over 1 ps < τ < 130 ns for a wide q range of 0.05 Å–2.5 Å. Performance of the SNS-NSE is also extended by a position-sensitive, two-dimensional ^{3}He detector with a broad detection region.



SNS-NSE is built and operated by the Research Center Jülich, in collaboration with Oak Ridge National Laboratory.

Applications

The SNS-NSE instrument is particularly suitable to investigate slow dynamical processes and unravel molecular motions and mobility at nanoscopic and mesoscopic scale. The instrument is primarily used for research applications in soft matter (the molecular rheology of polymer melts; related dynamics phenomena in networks and rubbers; interface fluctuations in complex fluids and polyelectrolytes; transport processes in polymeric electrolytes and gel systems) and biophysics (the domain dynamics of proteins and enzymes; studies of lipid systems and biological membranes; disruptive effects of anti-inflammatory medication on membrane cell organization; transport process through cell membranes). The SNS-NSE instrument can also aid studies in a variety of fields like condensed matter physics, materials science, and magnetism.

Specifications

Main precession	Superconducting coils
Shielding	mu metal shielding factor 137
Maximum field integral	J = 0.56 Tm
Moderator	Cold-coupled hydrogen
Neutron guide h × b	Ni coated, 4 × 8 cm^2
Wavelength selection	System of four choppers
Wavelength frame (routine operation)	5 Å < λ < 11 Å (BW 2.4 Å–3.1 Å)
Dynamic range	1 ps < τ < 130 ns
Scattering angle coverage	3°–40° / 79.5° (configuration dependent)
Configuration	Four moderator-detector distances 18 m, 21 m, 24 m, 27 m
Window/ sample size	30 × 30 mm^2
Analyzer	m = three rotatable supermirrors
Detector	He DENEX detector 30 x 30 cm active area
Temperature range	TFS: - 80°C + 375°C Cryo-furnace: 5 K to 650 K

Status: Available to users

For more information, contact

Instrument Scientist: Laura Stingaciu, stingaciulr@ornl.gov, 865.576.9125
Instrument Scientist: Piotr Zolnierczuk, zolnierczukp@ornl.gov, 865.241.0092

neutrons.ornl.gov/nse

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