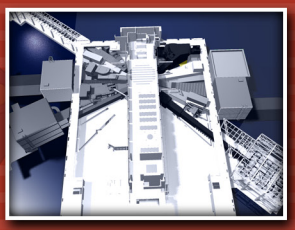
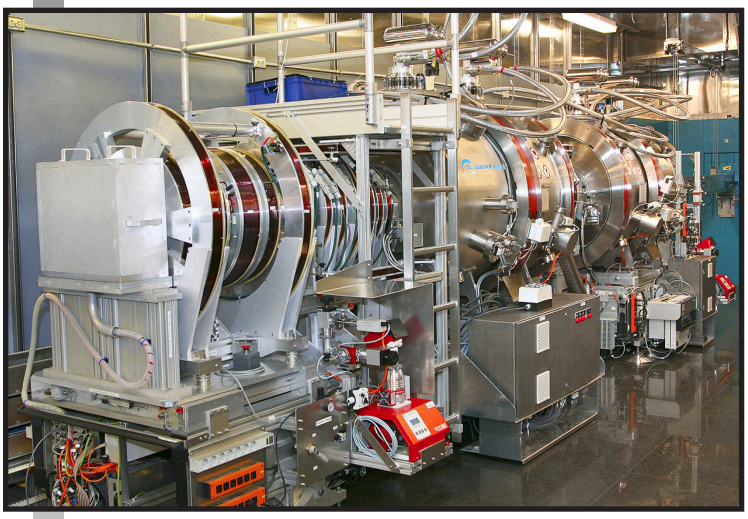
Instrument Fact Sheet

BEAM LINE 15
SPALLATION NEUTRON SOURCE



NSE – Neutron Spin Echo Spectrometer

Neutron spin echo spectrometers provide both the highest resolution and best dynamical range in neutron scattering. Exploiting superconducting technology and developing novel field correction elements, the NSE instrument aims at a maximum achievable Fourier time τ of at least 1 μs ($\Delta E \cong 0.7$ neV). Using wavelengths of 2 Å $< \lambda <$ 20 Å, this would yield an unprecedented dynamical range of six decades from 1 ps $< \tau <$ 1 μs. The design of the spectrometer takes advantage of recent progress in neutron optics and polarizing supermirror microbenders, resulting in considerable gains in polarized neutron flux over a wide wavelength range. Performance is also extended by a position-sensitive, two-dimensional detector with a broad detection region. As a result, the effective data rate will gain an additional factor of 5 in addition to the estimated time-averaged sample flux of 10^7 n/cm^2 s around $\lambda = 10$ Å. This yields the highest available data accumulation rate (especially at wavelengths up to 0.7 Å). In addition, the wavelength distribution width at any time is well below 0.5%, causing the resolution in momentum transfer to increase significantly compared with reactor instruments with 10% or more wavelength distribution width.



NSE is operated by a satellite office of the Jülich Center for Neutron Science.

Applications

Although the NSE spectrometer is designed primarily for soft-matter research, its capabilities also make it useful for all fields of modern condensed matter physics, materials science, and biophysics. This instrument is especially suited for analyzing slow dynamical processes and thereby unraveling molecular motions and mobilities at nanoscopic and mesoscopic levels. This feature is highly relevant to soft-matter problems in research on the molecular rheology of polymer melts, related phenomena in networks and rubbers, interface fluctuations in complex fluids and polyelectrolytes, and transport in polymeric electrolytes and gel systems. NSE could also aid studies in magnetism.

Specifications

Moderator	Cold-coupled hydrogen
Neutron guide h × b	Ni coated, 4 × 8 cm^2, m = 1.4
Wavelength selection	Chopper system consisting of four choppers and selecting wave length bands of up to 3.66 Å
Accessible wavelength frame	2 Å $< \lambda <$ 20 Å
Declination angle	3.5°
Maximum scattering angle	≅79.5°
Q range	0.05–3.5 Å
Maximum field integral	J = 1 Tm
Dynamic range	5 ps $< \tau <$ 400 ns
Typical sample size	30 × 30 mm^2
Analyzer	m=3 rotatable supermirror
Detector	2D ^{3}He counter (300 × 300 mm^2, 32 x 32 px)
Typical scanning time with 10% scatterer	5 hours/ spectrum

Status: Available to users

For more information, contact

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