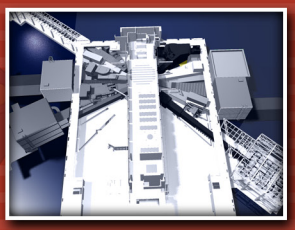
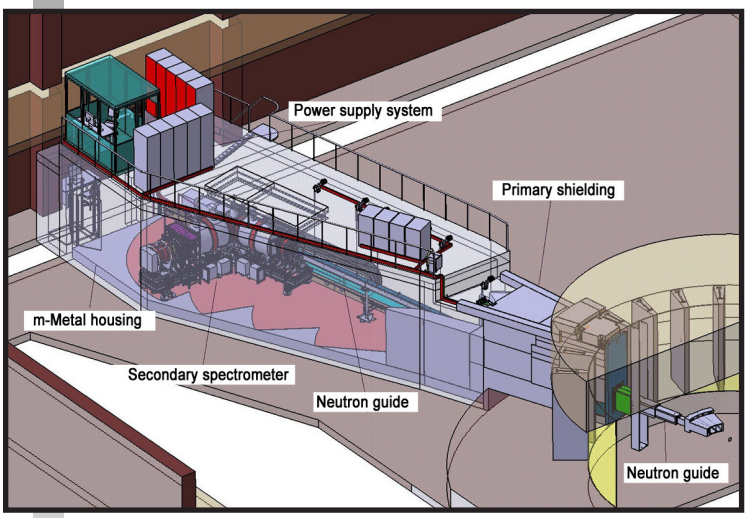
Instrument Fact Sheet

BEAM LINE 15
Spallation Neutron Source



NSE – Neutron Spin Echo Spectrometer

NSE is the best spectrometer of its class in both resolution and dynamical range. Exploiting superconducting technology and developing novel field correction elements, the maximum achievable Fourier time will be extended to at least 1 μs. Using wavelengths of $0.25 < \lambda/\text{nm} < 2.0$, an unprecedented dynamical range of six decades from 1 ps $< \tau$ to $\tau < 1$ μs might be achieved theoretically. 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 $\lambda = 1$ nm. This yields the highest available data accumulation rate. 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.



Specifications

Moderator	Cold-coupled hydrogen
Neutron guide $h \times b$	^{58}Ni coated, 4 × 8 cm^2, m = 1.2
Wavelength selection	Chopper system consisting of four choppers and selecting a wave length band up to 3.66 Å
Accessible wavelength frame	2 Å < λ < 20 Å
Declination angle	3.5°
Maximum scattering angle	≅34°
Q range	0.05–1.3 Å
Maximum field integral	J = 1.8 Tm
Dynamic range	5 ps < τ < 200 ns
Typical sample size	30 × 40 mm
Analyzer	m=3 rotatable supermirror
Detector	^{3}He counter (300 × 300 mm^2)
Typical scanning time with 10% scatterer	5 hours/ spectrum

Status: Available to users

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 and materials science. 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 biophysics and magnetism.

For more information, contact

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