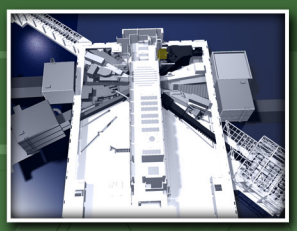
Spallation Neutron Source

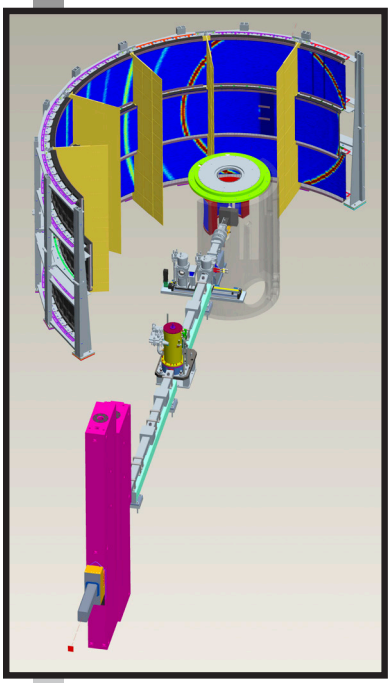
Instrument

Beam Line 18



ARCS – Wide Angular-Range Chopper Spectrometer

ARCS is optimized to provide a high neutron flux at the sample and a large solid angle of detector coverage. This spectrometer is capable of selecting incident energies over the full energy spectrum of neutrons, making it useful for studies of excitations from a few to several hundred milli-electron volts. An elliptically shaped supermirror guide in the incident flight path boosts the performance at the lower end of this range. The sample and detector vacuum chambers provide a window-free final flight path and incorporate a large gate valve to allow rapid sample changeout. A T_0 chopper blocks prompt radiation from the source and eliminates unwanted neutrons. An oscillating radial collimator can reduce the background from complex sample environment equipment.



Engineering model of ARCS with neutron powder diffraction data superimposed on the large detector array.

Applications

The increased sensitivity of ARCS offers new opportunities for scientific studies in the following areas.

Lattice Dynamics

- Entropy and the effects of vibrational modes on stability and phase transitions of solids
- Excitations in disordered materials; effects of nanoscale features on vibrational entropy and thermodynamic stability
- Equations-of-state from the measured phonon density-of-states versus temperature and pressure
- Phonons in correlated-electron materials; coupling of lattice and electronic degrees of freedom in high-Tc, heavy-fermion, and mixed-valence materials

Magnetic Dynamics

- High-temperature superconductivity; spin dynamics in superconductors and precursor compounds and crystal field spectroscopy
- Low-dimensional systems; one-dimensional quantum magnets and low-dimensional conductors
- Magnetism in actinide materials; heavy-fermion magnetism and superconductivity

Chemical Physics

- Deep inelastic neutron scattering studies of hydrogen and helium

Specifications

Moderator	Decoupled ambient water
Source-to-Fermi chopper distance	11.6 m
Chopper-to-sample distance	2.0 m
Sample-to-detector distance	3.0 to 3.4 m cylindrical geometry
Incident energy range	20–1500 meV
Resolution (elastic)	3–5% E_i
Detector coverage horizontal	-28–135°
Detector coverage vertical	-27–26°
Minimum detector angle	3°

Status: Available to users

For more information, contact

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