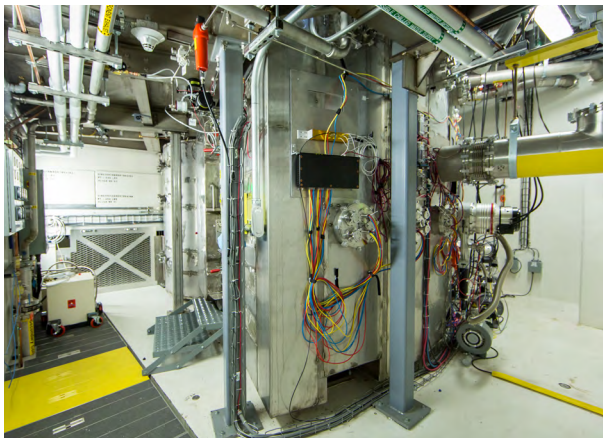
CORELLI

Elastic Diffuse Scattering Spectrometer

Spallation Neutron Source

BEAMLINE 9

CORELLI is a statistical chopper spectrometer with energy discrimination separating elastic and inelastic scattering. It is designed to collect diffuse scattering data from single crystalline samples in versatile sample environments. Diffuse neutron scattering is sensitive to both long- and short-range ordered structures, from nuclear and magnetic scattering. In particular, magnetic systems are a signature application of neutron scattering. Accurate modeling of the disorder and short-range order associated with the diffuse scattering requires measurements over large volumes of three-dimensional reciprocal space with sufficient momentum resolution to distinguish the diffuse signal from the strong Bragg peaks. This instrument combines the high efficiency of white-beam Laue diffraction with energy discrimination by modulating the incident beam with a statistical chopper. At the same time, CORELLI can host complex sample environments because of a large sample scattering vessel. A complete data set is collected in 30 to 90 individual measurements, depending on the crystal symmetry, scattering strength, sample size and resolution needed, resulting in an average experiment time of 2 days.



APPLICATIONS

- Nuclear and/or magnetic diffuse scattering in condensed matter and materials science, including high-temperature superconductors, geometrically frustrated magnetic systems, quantum critical phenomena, colossal magnetoresistance materials, ferroelectric relaxors, and fast ion conductors
- Diffuse scattering in molecular systems including molecular solids and microporous framework systems
- Diffraction experiments in complex conditions, including ultralow temperature, high magnetic and electric fields, and high pressure

SPECIFICATIONS

Moderator	Decoupled, poisoned, ambient H_2O
Source-to-sample distance	20 m
Sample-to-detector distance	2.5 m
Angular coverage	−21.9 to +148.2° horizontally ±28.5° vertically
Energy resolution	ΔE (FWHM) ~ 0.9 meV at E_{inc} = 25 meV
Momentum resolution	$\Delta Q/Q \leq 7x10^{-3}$ at 90° at Q=10 $Å^{-1}$
Incident energy range	10–200 meV
Momentum transfer	0.5–16 $Å^{-1}$
Beam size at sample position	~ 8 mm/width x 12 mm/height
Solid angle coverage	2.0 sr
Sample size	1 – 100 mm^3

SAMPLE ENVIRONMENT

Temperature	100 mK < T < 1600 K
Magnetic field	5 T vertical (1.6 K to 300 K)
Electric field	< 10 kV
Pressure	up to 2 GPa

21-G02318/jdh Dec 2021

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