

PTAX

Polarized Triple-Axis Spectrometer

The HB-1 Polarized Triple-Axis Spectrometer is designed primarily for the study of excitations in crystalline solids at intermediate energies. Thanks to the vertical beam focusing and the very high time-averaged flux at HFIR, its geometry is optimal for investigating small samples and weak scattering in specific areas of energy-momentum space. The sample goniometers and a full software implementation of the three-dimensional sample orientation matrix allow measurements outside the traditional single-scattering plane. The unique capability of HB-1 is the polarized configuration for studies of excitations, phase transitions, structures, and density distributions in magnetic materials.

Using the Wollaston Prisms setup, ultra-high energy and Q resolution measurements have become possible (<https://fankangli.ornl.gov/>). The newly implemented spherical neutron polarimetry (SNP) enables the measurement of full polarization change in the scattering process, providing a unique way to study complex magnetic structures (jiangc@ornl.gov).



APPLICATIONS

- Spin and lattice excitations in hard condensed matters, including superconductors, quantum materials, frustrated materials, and topological materials
- Spin density distributions in magnetic compounds
- Detailed spin structure, including chirality
- Larmor Diffraction with ultra-high Q resolution ($\Delta d/d \sim 10^{-6}$ for thermal expansion and $\Delta d/d \sim 3 \times 10^{-4}$ for the measurements of split of Bragg peak)
- Inelastic Neutron Spin Echo with ultra-high energy resolution ($\sim 10 \mu\text{eV}$) for linewidth measurements

SPECIFICATIONS

Beam spectrum	Thermal
Monochromators	Unpolarized vertical focus PG(002) Polarized Vertical Focus Heusler(111)
Analyzers	Unpolarized fixed vertical focus PG(002), Be(101), Si(111) Polarized Heusler (111)
Monochromator angle	$2\Theta_M = 14$ to 45°
Sample angle	$\pm 180^\circ$
Scattering angle	-90 to 120°
Analyzer angle	-40 to 140°
Collimations (FWHM)	Premonochromator: 15', 30', 48' Monochromator-sample: 20', 40', 60', 80' Sample-analyzer: 20', 40', 60', 80' Analyzer-detector: 20', 70', 90', 120', 210', 240'
Detector	Single ^3He gas counter
Resolution (elastic)	5–10% E_i (adjustable with collimators)

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For more information, contact

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