

# 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 newly implemented Wollaston Prisms setup, ultra-high energy and Q resolution measurements have become possible (<https://fankangli.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 $45^\circ$
Sample angle	$\pm 180^\circ$
Scattering angle	$-90$ to $120^\circ$
Analyzer angle	$-40$ to $140^\circ$
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 $^3\text{He}$ gas counter
Resolution (elastic)	5–10% Ei (adjustable with collimators)

21-G02328/jdh Dec 2021

### For more information, contact

Masaaki Matsuda, [matsudam@ornl.gov](mailto:matsudam@ornl.gov), 865.574.6580

[neutrons.ornl.gov/ptax](https://neutrons.ornl.gov/ptax)