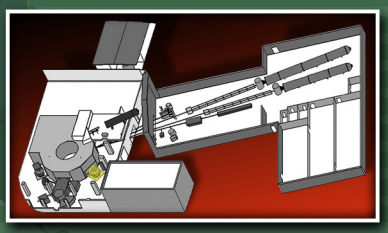
Instrument Fact Sheet

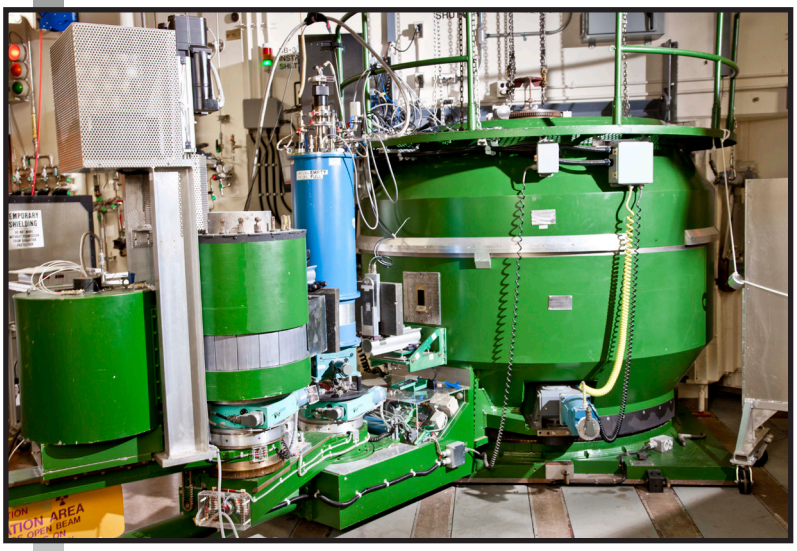
BEAM LINE **HB-3**

High Flux Isotope Reactor



Triple-Axis Spectrometer

HB-3 is a high-flux thermal neutron three-axis spectrometer designed for inelastic measurements on single crystals over a wide range of energy and momentum transfers. The energy and momentum range for measurements is quite large at HB-3. Because of its location directly at the end of the beam tube and the availability of a beryllium monochromator, the instrument is the ideal location for performing experiments at high-energy transfers (up to about 100 meV). The HB-3 monchromator provides three crystal choices (PG 002, Be 002, and Si 111) with variable vertical focus. This focus is calibrated to maintain a 2.54 cm beam height at the sample position, thus optimizing incident neutron flux as the incident energy varies. Of the three monochromators, pyrolitic graphite provides the highest neutron intensity as a result of its very high neutron reflectivity. The high-quality beryllium monochromator allows measurements with good energy resolution at higher energy transfers, whereas the silicon 111 monochromator has the advantage of an absent second-order reflection, providing a higher order contamination-free beam.



Applications

The availability of three different monochromator crystals makes HB-3 an extremely versatile instrument for studies of excitations in materials with energies ranging from 2 to 100 meV. Typical applications include spin and lattice dynamics in high-temperature superconductors and related compounds; low-dimensional magnetic model systems; magnetic excitations and phonons in colossal magnetoresistive materials, multiferroics, and ruthenates; and spin waves in magnetically ordered materials. The high incident neutron flux makes HB-3 well suited to studying samples that have a small volume or weak scattering characteristics.

Specifications

Beam spectrum	Thermal
Monochromators	Variable vertical focusing PG (002), Be (002), Si (111)
Analyzer	Fixed vertically focused PG (002), Si (111), Be (101)
Monochromator takeoff angle	$2\Theta_M$ = 12 to 88°
Sample angle	±180°
Scattering angle	-90–120°
Analyzer angle	-40–90°
Detector	Single ^{3}He gas counter
Resolution (elastic)	5-10% Ei (adjustable with collimators)
Collimations (FWHM)	Premonochromator: 30', 48' Monochromator–sample: 20', 40', 60', 80' Sample–analyzer: 20', 40', 60', 80' Analyzer–detector: 30', 70', 90', 120', 210', 240'

Status: Available to users

For more information, contact

Instrument Scientist: Songxue Chi, chis@ornl.gov, 865.576.3820

Instrument Scientist: Daniel Pajerowski, pajerowskidm@ornl.gov, 865.574.6276

neutrons.ornl.gov/hb3

OAK RIDGE National Laboratory

March 2015

06-G01670H/gim