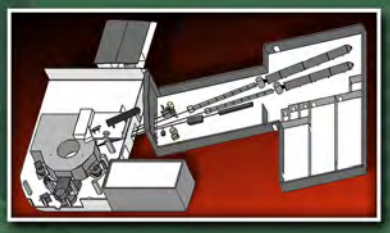
Instrument fact Sheet

BEAM LINE

CG-1D

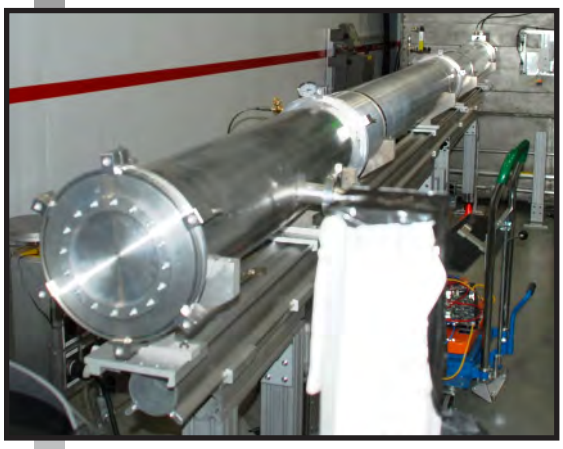
HIGH FLUX ISOTOPE REACTOR



Neutron Imaging Prototype Facility

The CG-1D beam is used for neutron imaging measurements and can be configured for white beam operation or can produce a pulsed beam when operating with a chopper. Apertures (with different diameters *D* (pinhole geometry) are used at the entrance of the helium-filled flight path to allow L/D variation from 400 to 800. *L* is the distance between the aperture and the detector (where the image is produced). Samples sit on a translation/rotation stage for alignment and tomography purposes. Detectors for CG-1D include charge-coupled device (CCD) cameras.

A micro-channel plate detector with a 40 micron spatial resolution is available upon request for time-of-flight neutron imaging experiments. ^{6}LiF/ZnS scintillators varying from 50 to 200 microns are available. Work on neutron imaging specifically supports the development of the future VENUS instrument at SNS, which will be dedicated to neutron imaging with an emphasis on Bragg-edge contrast imaging.



Helium-filled aluminum flight tubes.

Specifications

Wavelength	1.8 < λ < 6 Å
Wavelength resolution	Δλ/λ ~ 10%
Hightest spatial resolution	50 microns (FOV: 4 x 4 cm^2) and 100 microns (FOV: 6 x 6 cm^2)
Sample-to-detector distance	5 m
Detector	CCDs
Detector chip size	2048 x 2048 pixels
Detector resolution	5.2 x 5.2 (FOV: 4 x 4 cm^2) and 13.4 x 13.4 (FOV: 6 x 6 cm^2) microns^2 pixels
Detector frame rate	1 fps (1 to 5 min required per image)

Status: Available to users

Applications

Energy Storage

- Ion transport in energy storage materials; three-dimensional mapping of ions in electrodes

Technologies

- Particulate deposition in vehicle parts; two-phase transport in heat pipes; multi-phase constrained jet flows; metal casting; reservoir flow, creation, and production

Plant Systems Biology

- Partitioning, transport, and fate of carbon fixed by plants; carbon biosequestration; modeling impacts of rising CO_2 levels; modified bioenergy feedstock plants; cavitation and gas embolism in plants

Plant-Soil-Groundwater Systems

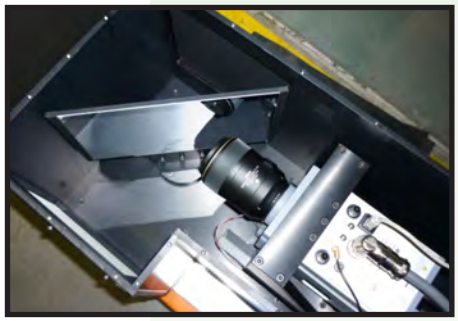
- Transport and interactions of fluids in porous media, water infiltration and aquifer recharge, plant-plant and plant-fungal interactions, change in pore structure and voids after repeated thawing and freezing of permafrost soil

Biological and Forensic Studies

- Structural, contrast agent, and cancer research

Food Science and Archeology

- Water migration and degradation through time



Detector housing for the CCD camera lens, mirror, and scintillator.

For more information, contact

Instrument Scientist: Hassina Bilheux, bilheuxhn@ornl.gov, 865.384.9630

neutrons.ornl.gov/instruments/HFIR/factsheets/Instrument-cg1d.pdf

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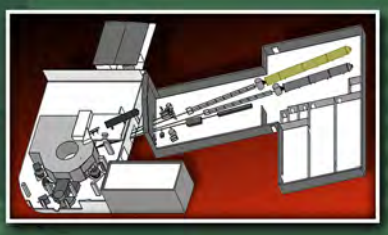
Instrument Fact Sheet

BEAM LINE **CG-2**

HIGH FLUX ISOTOPE REACTOR



General-Purpose SANS – Small-Angle Neutron Scattering Diffractometer

The general-purpose SANS diffractometer is optimized for providing information about structure and interactions in materials in the size range of 0.5–200 nm. It has a cold neutron flux on sample and capabilities comparable to those of the best SANS instruments worldwide, including a wide range of neutron wavelengths $\lambda = 4–25$ Å, resolution $\delta\lambda/\lambda = 9–45\%$, and a 1 m^2 area detector with 5 × 5 mm^2 pixel resolution with a maximum counting capability of up to 25 kHz. The sample-to-detector distance can be varied from 1 to 20 m, and the detector can be offset horizontally by up to 45 cm, allowing a total accessible Q range of from <0.001 to 1 $Å^{-1}$. The 2 m sample environment area accommodates large, special-purpose sample environments such as cryomagnets, furnaces, mechanical load frames, and shear cells.

Specifications

Beam spectrum	$\lambda = 4–25$ Å $\Delta\lambda/\lambda = 9–45\%$
Sample-detector distance	1.1–19.4 m
Detector offset	0–45 cm
Source-sample distance	1.8–17.4 m
Max flux on sample	$>2 \times 10^7$ n/cm²/s at $\lambda = 4.75$ Å, $\Delta\lambda/\lambda = 14\%$
Detector	2D linear position-sensitive detector
Detector resolution/ pixels	192 x 256
Momentum transfer range	Q = 0.0007 –1 $Å^{-1}$ Q_{max}/Q_{min} 10–20

Status: Available to users

Applications

- Soft condensed matter: molecular self-assembly and interactions in complex fluids; intermediate order in glassy systems, polymer solutions, gels and blends, colloids, micelles, and microemulsions
- Hard condensed matter: phase separation, grain growth, and orientation in metallurgical alloys, nanocomposites, advanced ceramics, and porous catalytic, adsorbent materials, geophysics and carbon-storage systems
- Magnetic systems: flux lattices in superconductors, ferrofluids, and the relationship between structural and magnetic domains and ordering

For more information, contact

Instrument Scientist: Ken Littrell, littrellkc@ornl.gov, 865.291.7583
Instrument Scientist: Yuri Melnichenko, melnichenkoy@ornl.gov, 865.576.7746

neutrons.ornl.gov/cg2

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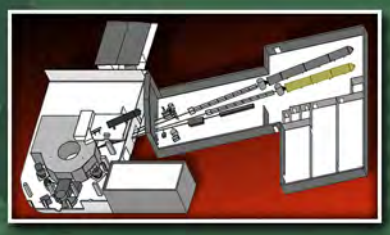
Instrument Fact Sheet

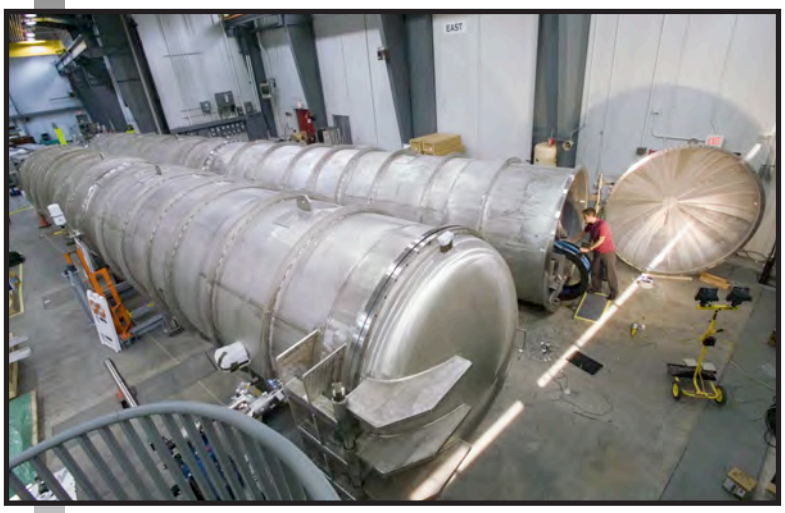
BEAM LINE **CG-3**

HIGH FLUX ISOTOPE REACTOR



BIO-SANS – BIOLOGICAL SMALL-ANGLE NEUTRON SCATTERING INSTRUMENT

The Bio-SANS instrument is optimized for analysis of the structure, function, and dynamics of complex biological systems. It is the cornerstone of the Center for Structural Molecular Biology (CSMB) at Oak Ridge National Laboratory. The Bio-SANS instrument is supported by additional CSMB capabilities that include development of advanced computational tools for neutron analysis and modeling, as well as biophysical characterization and x-ray scattering infrastructure. A dedicated biological sample preparation laboratory is located adjacent to the instrument.



Detector tanks for the SANS instruments at HFIR. The Bio-SANS detector is on the left.

Applications

- Bio-macromolecules and their assemblies
  - Protein complexes
  - Protein/DNA complexes
  - Lipids
  - Viruses
  - Carbohydrates
- Hierarchical biological structures
  - Gels
  - Fibers and fibrils
  - Vesicles
  - Microemulsions
- Membrane diffraction
- Biomimetic and bio-inspired systems

CG-3 Detector Array

User Access

Bio-SANS is operated as a user facility and is sponsored by DOE's Office of Biological and Environmental Research. The instrument is managed under the CSMB User Program.

Specifications

Wavelength	6< λ <25 Å
Wavelength resolution	Δλ/ λ = 9–45%
Q range	0.0009–0.8 $Å^{-1}$
Sample-to-detector distance	1.1–15.3 m
Detector	2–D linear position-sensitive detector
Detector size	1 x 1 m^2
Detector resolution/ pixels	192 x 256
Max count rate	1 MHz

Center Capabilities

X-ray scattering
Light scattering
Computational tools
Bio-support lab
Protein production + analysis
Bio-deuteration lab

Status: Available to users

http://www.csmb.ornl.gov

For more information, contact

Instrument Scientist: Volker Urban, urbanvs@ornl.gov, 865.576.2578
Instrument Scientist: Sai Venkatesh Pingali, pingalis@ornl.gov, 865.241-2424
Instrument Scientist: Shuo Qian, qians@ornl.gov 865.241.1934
Center Director: Paul Langan, langanpa@ornl.gov, 865.576.0666

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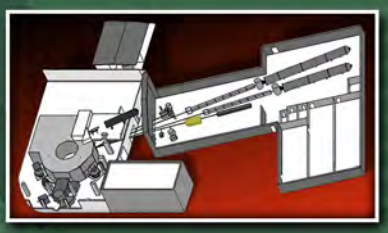
Instrument fact Sheet

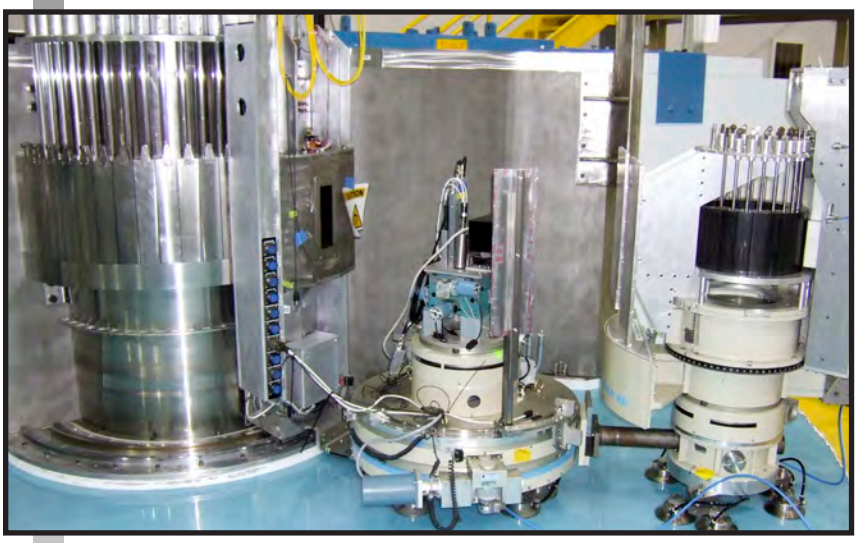
BEAM LINE **CG-4C**

HIGH FLUX ISOTOPE REACTOR



US/Japan Cold Neutron Triple-Axis Spectrometer

The US/Japan Cold Neutron Triple-Axis Spectrometer is a conventional triple-axis spectrometer with variable incident energy and variable monochromator-sample and sample-analyzer distances. The cold guide 4 bender and guide hall shielding reduce background levels at CG-4C, and the 15 cm tall guide profile is well exploited by CG-4C's vertically focusing monochromator PG (002). To enhance accommodation of strong magnetic fields at the sample position and to simplify future polarization analysis, the amount of ferromagnetic material has been minimized in the construction of this instrument.



CG-4C is a collaboration of the Neutron Scattering Science Division at Oak Ridge National Laboratory, the Neutron Scattering Group at Brookhaven National Laboratory, and the Neutron Science Laboratory, Institute for Solid State Physics, at the University of Tokyo.

Applications

- Investigations of the low-energy, atomic-scale dynamics of crystalline solids
- High-resolution measurement of low-energy excitations with high signal-to-noise ratios due to low background

Specifications

Incident energy range PG (002)	2–20 meV
Final energy range PG (002)	>2.8 meV
Monochro-mators	Variable vertical focusing PG (002)
Analyzer	>3.0 meV [fixed vertical focusing PG (002)]
Sample scattering angles	-15° ≤ 2Θs ≤ 115°, with additional restrictions depending on Ei
Analyzer angle	<110°
Collimations	Pre sample: 10', 20', 40', 80'; Pre analyzer: 20', 40', 80'; Pre detector: 80', 120', 240'
Detector	Single He^3 detector
Resolution	Best elastic energy resolution ~0.1 meV

Status: Available to users

For more information, contact

Instrument Scientist: Tao Hong, hongt@ornl.gov, 865.574.8659
Collaborator: Steve Shapiro, shapiro@bnl.gov, 631.344.3822
Collaborator: Hideki Yoshizawa, yoshi@issp.u-tokyo.ac.jp

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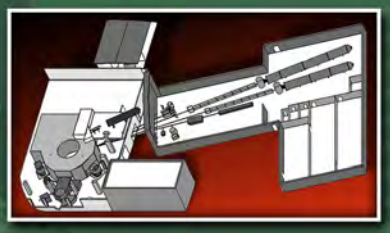
Instrument fact Sheet

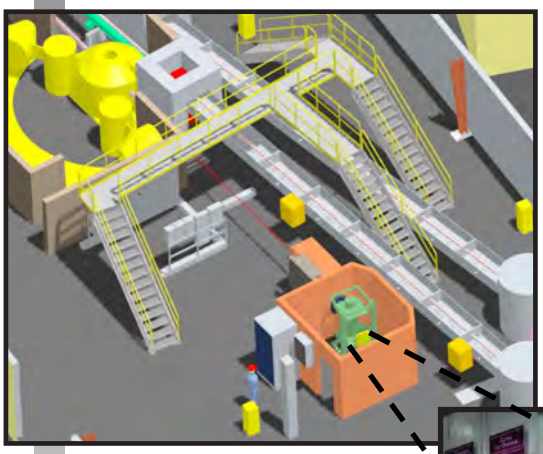
BEAM LINE **CG-4D**

HIGH FLUX ISOTOPE REACTOR



IMAGINE – Quasi-Laue Single-Crystal Diffractometer

IMAGINE is a state-of-the-art beam line for neutron diffraction analysis of advanced materials and macromolecules. IMAGINE has broad scientific application for the analysis of light atom positions in materials of interest across the diverse fields of structural biology, chemistry, condensed matter physics, and geological sciences. Neutron structures can be determined at or near atomic resolutions (1.5 Å) from crystals with volume < 1 mm^3 and with a unit cell edge of < 100 Å. IMAGINE is especially suited to pinpoint individual hydrogen atoms in protein structures. It is also designed to accommodate a range of additional sample environment equipment (furnaces, cryostats, and pressure cells) for analysis of materials under extreme environments.



Cold neutron guide hall.

MAATEL

IMAGINE optics are tunable and use an automated system of interchangeable flat mirrors and filters to select incident quasi-Laue wavelength and band pass characteristics that are best matched to the sample (λ min = 2, 3.3, and 3.8 Å, λ max = 3.5, 4.0, and 4.5 Å). Elliptical mirrors are used to deliver a highly focused and intense beam at the sample. The diffractometer uses neutron image plates mounted on a cylindrical detector drum, which allows hundreds of stimulated reflections to be simultaneously recorded.

Specifications

Flux	~10^8 n/s/cm^2
Cross section	2.0 x 3.0 mm
Wavelengths minimum	2.0, 3.3, 3.8 Å
Wavelengths maximum	3.5, 4.0, 4.5 Å
Detector	Neutron image plate
Detector size	1200 x 450 mm
Pixel size	125, 250, 500 μm
Sample-to-detector distance	200 mm
Goniometer	Single Phi rotation axis

Status: Under construction

Applications

Protein Structure-Function
- Hydrogen atoms in proteins
- Enzymology
- Ligand complexes
- Drug design

Supramolecular Crystallography
- Single-molecule magnets
- Metal-organic frameworks
- Polyoxometalates

Materials Chemistry
- Small molecules
- Minerals
- Pharmaceuticals

The acquisition and installation of IMAGINE is supported by a National Science Foundation consortium award to MTSU, NCSU, and HWI (NSF Award No. 0922719).

For more information, contact

Instrument Scientist: Flora Meilleur, meilleurf@ornl.gov, 865.242.5747

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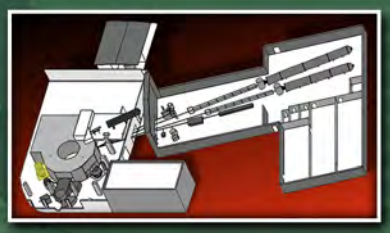
10-G00322D/gim

Instrument Fact Sheet

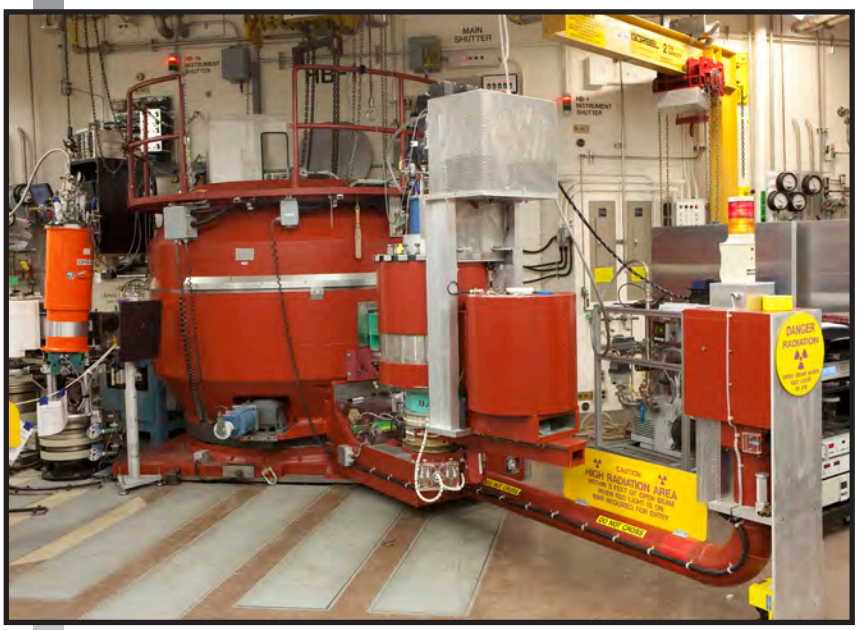
BEAM LINE **HB-1**

High Flux Isotope Reactor



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. Use of a beryllium low-pass filter makes the instrument suitable for hypothermal neutron measurements with incident or final energy below 5 meV.



Applications

- Spin waves in ordered magnetic materials
- Exotic excitations in low-dimensional, molecular, itinerate, and other "quantum" magnets
- Spin and lattice excitations in high-T_c superconductivity, colossal magnetoresistance materials, and multiferroic systems
- Spin density distributions in magnetic compounds
- Phonon dispersion curves in alloys and phonon-driven phase transitions

Specifications

Beam spectrum	Thermal
Monochromators	Unpolarized Vertical Focus PG(002) polarized commissioning
Analyzers	Unpolarized fixed vertical focus PG(002), Be(101), Si(111) Polarized Heusler (111)-commissioning
Monochromator angle	$2\Theta_M$ = 14 to 75°
Sample angle	±180°
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 ^{3}He gas counter
Resolution (elastic)	5–10% Ei (adjustable with collimators)

Status: Available to users

For more information, contact

Instrument Scientist: Masaaki Matsuda, matsudam@ornl.gov, 865.574.6580

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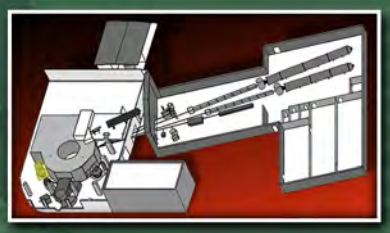
06-G01665G/gim

Instrument Fact Sheet

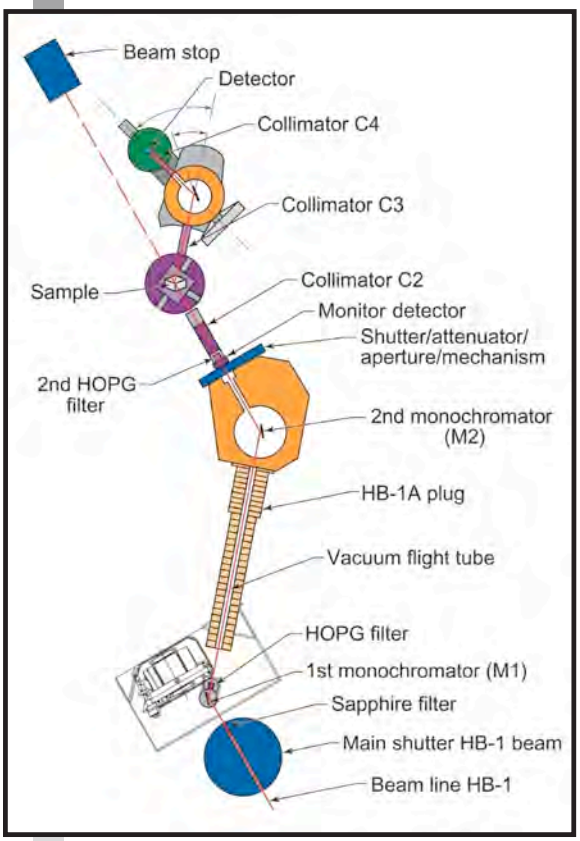
BEAM LINE **HB-1A**

HIGH FLUX ISOTOPE REACTOR



Fixed-Incident-Energy Triple-Axis Spectrometer

The Fixed-Incident-Energy (14.6 meV) Triple-Axis Spectrometer uses a double pyrolitic graphite monochromator system. The first monochromator is vertically focused, and the second can be either a vertically or doubly focused unit. Two highly oriented pyrolytic graphic filters (HOPG), one after each monochromator, are used to reduce λ/2 contamination. These filters, together with the double monochromator system, provide HB-1A with an exceptionally clean beam in terms of higher-order contamination neutrons: $I_{\lambda/2} \approx 10^{-4} \times I_{\lambda}$. This spectometer also has one of the most intense beams at this energy at HFIR, as well as a very low γ and fast neutron background. Typical energy resolution is ~1 meV, but, using the beryllium analyzer, the energy resolution width can be reduced to ~0.5 meV.



Recent experiments on this instrument include measurement of phonon dispersion curves in martensitic, shape-memory, and magnetostrictive alloys; crystallographic and magnetic structure determinations in giant magnetocaloric, magnetoresistive, and intermetallic alloys; magnetic structures and spin-density waves in thin films; magnetism in low-dimensional systems; and spin waves and magnetic structures in magnetoelectric materials.

HB-1A development and operation is a collaborative effort of the Oak Ridge National Laboratory and Ames Laboratory neutron scattering groups.

Applications

- Excitation spectra to ~35 meV using neutron energy, gain and low-lying excitations, 1–9 meV, using neutron energy loss
- Elastic studies on crystallographic and magnetic structures and transitions in a Q range of 0.2 to 4.9 $Å^{-1}$
- Elastic studies and excitations in thin films and other small-volume samples where high flux and very low higher-order contamination of the beam are critical

Specifications

Beam spectrum	Thermal
Monochromator	PG(002) double crystal
Monochromator takeoff angle	$2\Theta_M$ = 41.3° E, = 14.7 meV
Analyzers	PG(002), Be(101), Be(002), Si(111), Ge(111)
Sample angle	0 to 360°
Scattering angle	-5 to 135°
Analyzer angles	-60 to 120°
Collimations (FWHM)	Premonochromator: 48' Monochromator-sample: 10', 20', 30', 40' Sample-analyzer: 10', 20', 30', 40' Analyzer-detector: 70', 140'
Beam size	40 × 150 mm max
Filters	Sapphire premonochromator 2 HOPG; after M1 and M2
Flux at sample	~ 2 × 10^7 n/cm^2/s (est.)
Momentum range	0.2 to 4.9 $Å^{-1}$ (elastic configuration)
Energy transfer	~-35 to ~+11 meV at q = 3 $Å^{-1}$

Status: Available to users

For more information, contact

Instrument Scientist: Wei Tian, tianwn@ornl.gov, 865.574.6427
Instrument Scientist: Jerel Zarestky, zarestkyjl@ornl.gov, 865.574.4951
neutrons.ornl.gov/hb1a

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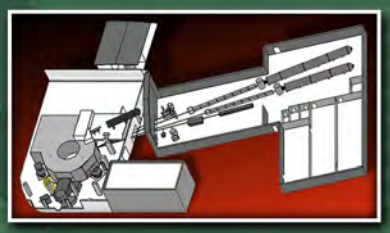
Instrument fact Sheet

BEAM LINE **HB-2A**

HIGH FLUX ISOTOPE REACTOR



Neutron Powder Diffractometer

The Neutron Powder Diffractometer has a Debye-Scherrer geometry. The detector bank has 44 ^{3}He tubes, each with 6 ft Soller collimators. A germanium wafer-stack monochromator is vertically focusing and provides one of three principal wavelengths, depending on which reflection is in the diffracting condition: (113) 2.41 Å, (115) 1.54 Å, and (117) 1.12 Å. The takeoff angle from the monochromator is fixed at 90°, and the minimum peak full width at half maximum (FWHM) is 0.2°. There are two choices of premonochromator collimation (α_1 = 12 ft or open) and three choices of presample collimation (α_2 = 16, 21, or 31 ft) that allow the operation of the instrument in high-resolution or high-intensity modes.

Applications

The HB-2A Neutron Powder Diffractometer is a workhorse instrument used to conduct crystal structural and magnetic structural studies of powdered and ceramic samples, particularly as a function of intensive conditions (T, P, H, etc.). Technologically important materials amenable to study by neutron powder diffraction include (but are not limited to) catalysts, ionic conductors, superconductors, alloys, intermetallic compounds, ceramics, cements, colossal magnetoresistance perovskites, magnets, minerals, waste forms, H-storage materials, thermoelectrics, zeolites, and pharmaceuticals. Powder diffraction data collected on this instrument are ideally suited for the Rietveld method. In addition to traditional crystal structural refinements, studies of phase transitions, thermal expansion, quantitative analysis, residual stress, and ab initio structure solution can be undertaken from the powder data. A full range of ancillary sample environments can be used, including cryofurnaces (4–800 K), furnaces (to 1800 K), cryostats (to 0.3 K), and cryomagnets (to 7 T).

Specifications

Beam spectrum	Thermal
Monochromator	Vertically focusing Ge (115)
Monochromator angle	$2\Theta_m = 90°$
Wavelengths	λ = 1.54 Å(115) 2.41 Å(113) 1.12 Å(117)
Sample angles	$0° < \omega < 360°$
Scattering angle	$1° < 2\Theta < 155°$
Collimations (FWHM)	Premonochromator (α_1): 12' or open (60' effective) Monochromator–Sample (α_2): 16', 21', or 31' Sample–detector (α_3): 6'
Detector bank	44 ^{3}He detectors
Beam size	25 x 25 mm^2 at sample position
Resolution	2 x 10^{-3} $\Delta d/d$

Status: Available to users

For more information, contact

Instrument Scientist: Ovidiu Garlea, garleao@ornl.gov, 865.574.5041
Instrument Scientist: Clarina Dela Cruz, delacruzcr@ornl.gov, 865.241.2431

neutrons.ornl.gov/hb2a

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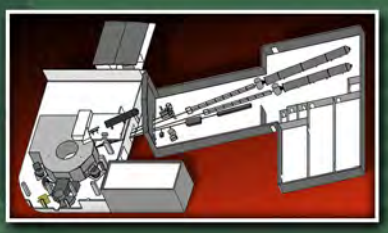
06-G01641I/gim

Instrument Fact Sheet

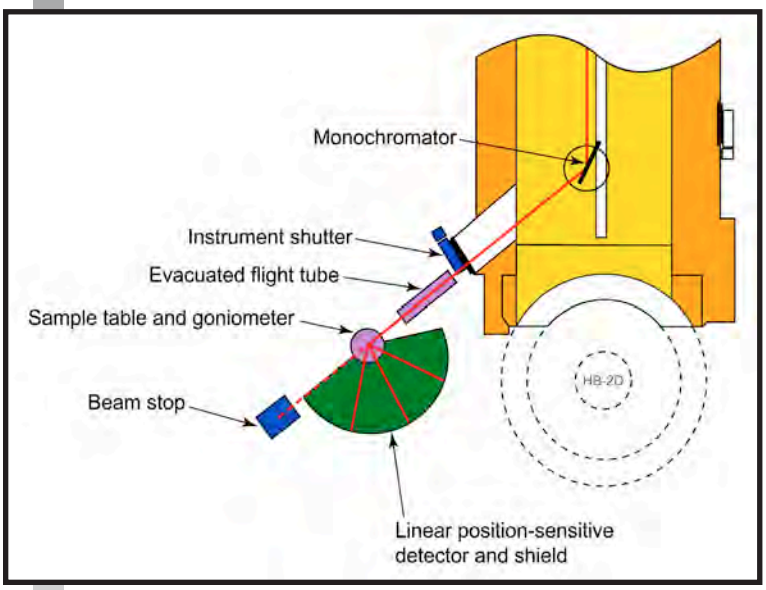
BEAM LINE HB-2c

High Flux Isotope Reactor



WAND – US/Japan Wide-Angle Neutron Diffractometer

The HFIR HB-2C WAND instrument was designed to provide two specialized data-collection capabilities: (1) fast measurements of medium-resolution powder-diffraction patterns and (2) measurements of diffuse scattering in single crystals using flat-cone geometry. For these purposes, this instrument is equipped with a curved, one-dimensional ^{3}He position-sensitive detector covering 125° of the scattering angle with the focal distance of 71 cm. The sample and detector can be tilted in the flat-cone geometry mode. These features enable measurement of single-crystal diffraction patterns in a short time over a wide range of the reciprocal space, as well as performance of time-resolved experiments for structural transformations having short time constants. The WAND detector (ORDELA 1410N) is a multianode type (624 anodes and a 0.2° pitch) ^{3}He gas counter specially designed for this instrument. This detector has an intrinsic angular resolution of 0.25° and a maximum counting rate per anode of 10^5 counts/s.



Specifications

Beam spectrum	Thermal
Monochromator	Vertically focused Ge(113). Ge(115) is also available to provide λ = 0.95 Å
Monochromator angle	$2\Theta_M$ = 52.0°
Wavelength	λ = 1.5 Å
Scattering angles	10° < 2Θ < 135°
Sample angles	0° < Ω < 135°
Collimations	Coarse oscillating collimator before the detector
Detector	Multiwire (624 anodes, 0.2° pitch) He^3 curved PSD
Resolution	2 mm spatial resolution

Status: Available to users

Applications

WAND is ideal for the study of time-resolved phenomena and for the study of diffuse scattering in single crystals. Research performed at WAND includes studies of the growth of ferroelectric ice-XI, hole and charge ordering in colossal magnetoresistance materials, and studies of magnetic structures and correlations in low-dimensional magnetic systems and other magnetic materials.

WAND is operated in collaboration with the Japan Atomic Energy Research Institute under the US/Japan Cooperative Program on Neutron Scattering Research.

For more information, contact

Instrument Scientist: Jaime Fernandez-Baca, fernandezbja@ornl.gov, 865.576.8659
Instrument Scientist: Bryan Chakoumakos, chakoumakobc@ornl.gov, 865.574.6268

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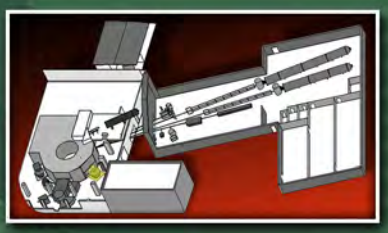
Instrument Fact Sheet

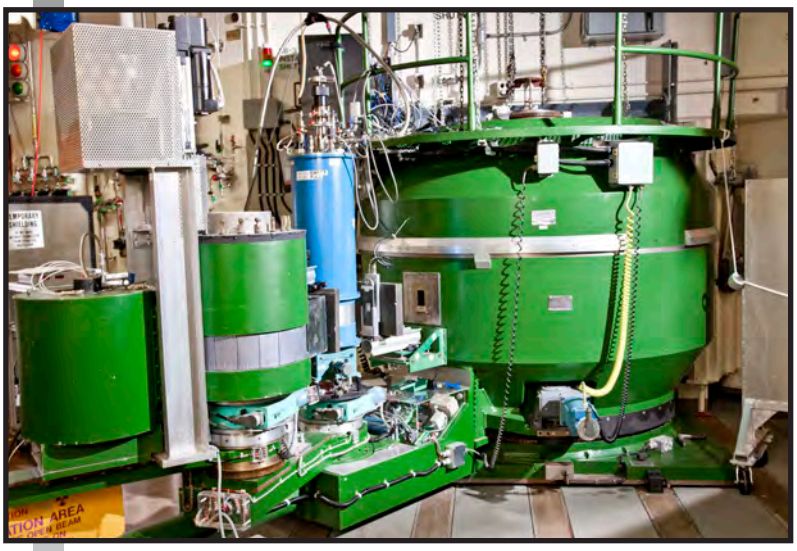
BEAM LINE **HB-3**

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	$2\Theta_M$ = 18 to 75°
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

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neutrons.ornl.gov/hb3

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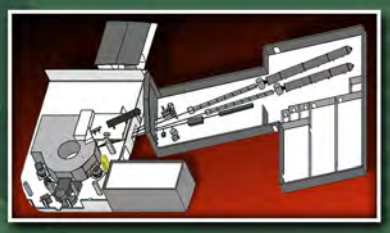
06-G01670F/gim

Instrument Fact Sheet

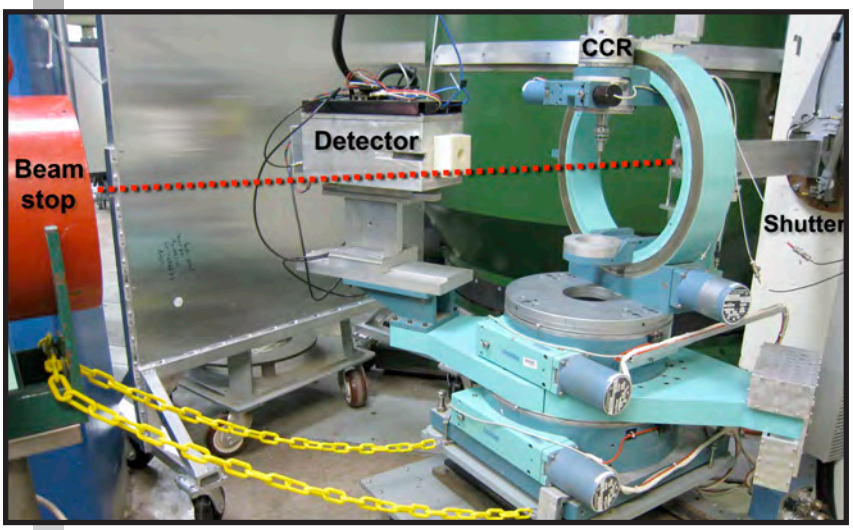
BEAM LINE **HB-3A**

HIGH FLUX ISOTOPE REACTOR



Four-Circle Diffractometer

The Four-Circle Diffractometer goniometer has a full χ circle with a 4 K closed-cycle helium refrigerator. The detector is ^{3}He with a 7-anode array in a honeycomb pattern. The upper 2Θ limit is 155°. A multilayer-[110]-wafer silicon monochromator with the reflection from planes of the <011> zone ensures sharp diffraction peaks in specified ranges of detector angles by control of the horizontal radius of curvature. Any plane from the <011> zone can be set in Bragg position, but only the (331), (220) with (044), and (111) with (333) reflections are of practical interest. For the fixed monochromator angle of 48°, these reflections provide principal incident wavelengths of 1.000, 1.536, and 2.540 Å, respectively. A PC-based system provides user-friendly diffractometer control and data acquisition. The beam size is 5 × 5 mm^2, and the minimum crystal size is 1 mm^3. The maximum crystal dimension is about 4 mm. The flux on the sample is up to 2.2 × 10^7 n/cm^2/s. Both high-resolution or high-intensity modes are possible by tuning the horizontal bending of the monochromator.



Specifications

Beam spectrum	Thermal
Monochro-mator	Silicon (fixed vertical focus with adjustable horizontal bending)
Monochro-mator angle	48°
Incident wavelengths	1.000 Å (331), 1.536 Å (220), 2.5405 Å (111)
Goniometer	Huber, full chi circle, with 4 – 450 K CCR
Scattering angles	2θ < 155°
Detector	7 anode ^{3}He (honeycomb pattern)
Crystal size requirement	>1 mm^3
Unit-cell size	<15,000 Å^3
q-resolution	Δq/q ~ 0.01
Flux at sample	>2.2 × 10^7 n cm^{-1} s^{-1}

Status: Available to users

Applications

This instrument is suitable for a wide range of small-unit-cell crystallography studies, from structure refinement and solution to charge and nuclear density mapping. Problems from chemistry, physics, materials science, and mineralogy can be addressed. Specific areas of study include hydrogen bonding and weak interactions, organometallics, supramolecular chemistry and crystal engineering, metal hydrides, charge density, pharmaceuticals, and magnetic structures. More general solid-state physics problems in magnetism, diffuse scattering, and ordering phenomena are also feasible. Unit cell volumes of less than ~7000 Å^3 are practical.

For more information, contact

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