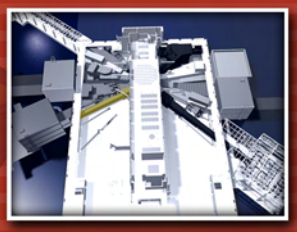
Instrument Fact Sheet

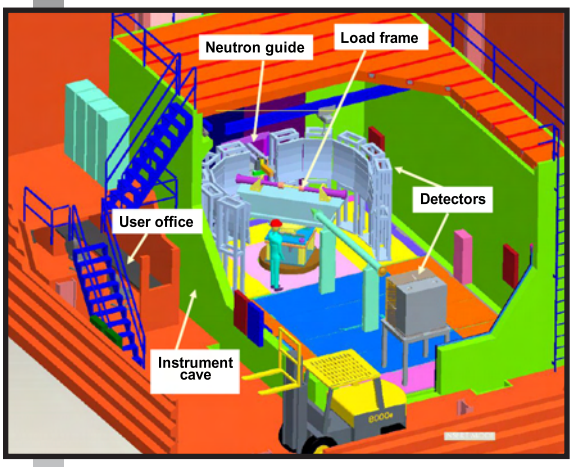
BEAM LINE 7

SPALLATION NEUTRON SOURCE



VULCAN – ENGINEERING MATERIALS DIFFRACTOMETER

VULCAN helps users understand a broad range of engineering and materials science problems. Characteristics of the instrument include stress mapping of engineering components with a 1-mm³ sampling volume, in situ loading with 10 to 20 reflections, and real-time studies of the kinetics of materials on subsecond time scales. The basic design allows users to determine stress distribution in engineering components and to understand more about the deformation of materials under multiaxial loading. VULCAN can help scientists and engineers test the reliability of structural components and better understand how materials deform. The flux on sample will reach 1 x 10^8 neutrons/cm^2/s, providing a high intensity for fast kinetic studies. The instrument team plans to have a small-angle detector to allow users to conduct simultaneous measurements of small-angle scattering, thereby enabling studies of the evolution of material structures at multiple-length scales.



SPECIFICATIONS

Moderator	Decoupled poisoned water
Source-to-sample distance	43.5 m
Sample-to-detector distance	1.5–2 m
Detector angular coverage	60° < 2θ < 150°
Wavelength bandwidth	~1.3 Å
Resolution	0.2% in high-resolution mode
Flux on sample (n/s/cm^2)	3 x 10^7 in high-resolution mode 1.2 x 10^8 in high-intensity mode
Gauge volume	3D strain mapping: 1 mm³ 1D strain mapping: 0.1 mm
SANS Q range	0.01–0.2 (Å^{-1})

Status:
To be commissioned in 2008

APPLICATIONS

VULCAN is designed to tackle a variety of problems in materials science and engineering, ranging from determining residual stress in engineering components to understanding the fundamental aspects of materials behaviors during processing and use. Although it is difficult to predict the kinds of new science that will be enabled by instruments like VULCAN, some research areas that VULCAN could benefit include the following:

- In situ studies of materials behavior during processing: temperature distribution, texture changes, stress development, precipitation
- In situ loading studies at high or cryogenic temperatures: fatigue damage, deformation in nanostructured materials, creep behaviors, piezoelectric and shape-memory alloys
- Residual stress and microstructure changes in surface-engineered materials
- Deformation in amorphous materials
- Phase transformation kinetics

FOR MORE INFORMATION, CONTACT

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http://neutrons.ornl.gov/instrument_systems/beamline_07_vulcan

SNS

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