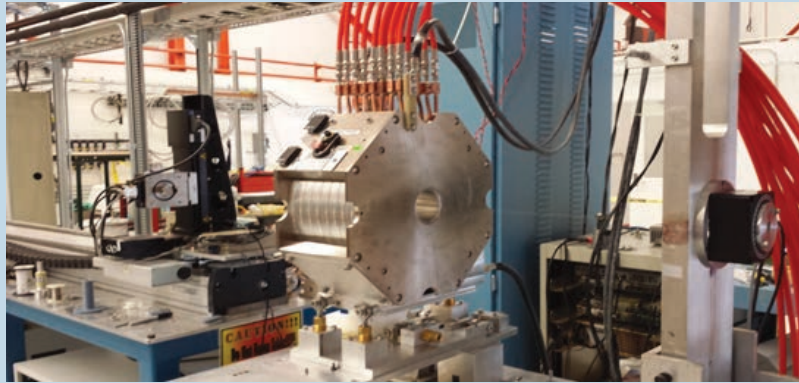


## Magnet Measurement Test Stand for Multipole Magnets



**Multipole measurement system measuring a solenoid magnet**

A multipole magnetic measurement system is operational in Building 314. The system utilizes a single-turn, stretched-wire rotating coil or Hall probe mapping.

### The rotating coil system features:

- Continuous coil rotation without slip rings
- Coil radius and length easily implemented via moveable stages and coil holding fixtures that can be easily produced on three-dimensional (3-D) printers
- Quasi-real-time measurements of individual multipole components using a lock-in amplifier
- Measurement of the integrated magnetic field strength, multipole coefficients, magnetic-center offsets, and magnetic angle
- Sub-micron, short-term magnetic center repeatability
- Automatic alignment of quadrupole and sextupole magnet positions relative to the center of rotation of the coil via a 5-axis magnet support table

### Hall probe mapping:

- Mapping range: longitudinal 3.5 m, transverse 100 mm.
- Hall sensors: Multi-axis Hall sensors can be used to measure simultaneous one-dimensional, two-dimensional, or 3-D field values with on-the-fly data acquisition; scan velocities of up to 30 mm/sec with 0.2 mm between readings with field resolution of 0.1 G are typical specifications
- Power supply control: Current control and read-back via analog signals, gpib, or RS-232 are easily configured through LabView software

### Superconducting undulator magnetic measurement system:

The superconducting undulator magnetic measurement system has the following capabilities:

- Scanning Hall probe
  - On-the-fly Hall probe measurements (2 cm/sec,  $\Delta z$  0.1 mm) to determine local field errors and phase errors
  - Three-sensor Hall probe (attached to carbon fiber tubing and driven by linear stage) to measure  $B_y$  and  $B_x$  simultaneously and determine the mid-plane field regardless of sensor vertical offset from magnetic mid-plane
  - Hall probes can be rotated to any fixed angle with  $0.01^\circ$  absolute accuracy; the probes could also be rotated through  $360^\circ$  at a fixed Z location

*Multipole Magnets cont'd. on next page*



**Superconducting undulator cryomodule during magnetic measurement and cryogenic testing**

- Stretched wire coil
  - Stretched-wire rectangular and figure-8 coils to determine first- and second-field integrals
  - Rotary stages on upstream end of cryostat, as well as on the Z axis linear stage, to provide synchronized rotary motion for stretch coils
  - Integral coil measurements can be done by rotating through 360° and triggering at fixed angular positions, or can be rotated continuously to provide for lock-in amplifier capability
  - Coils can be translated along X axis approximately  $\pm 1$  cm to measure integrated multipoles
- Miscellaneous
  - Ability to measure dynamic first- and second-field integrals, magnet coil voltages, and current during a quench
  - Control main and corrector power supplies with accurate current read-back
  - Ability to measure the LHe level and temperature sensors
  - Perform excitation measurements with fixed Hall probe position