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E3 Triple-axis Spectrometer

The E3 spectrometer was designed as one of the 4 triple-axis spectrometers at NRU. The triple-axis spectrometers at CRL are, by design, very versatile, configurable for various types of experiments and modes of operation. As a point of historical interest, the monochromator shielding drum of E3 is built from components used in the original Brockhouse Spectrometer.

E3 is usually equipped with a 32-wire position sensitive detector. Wire spacing is 2 mm which at E3 corresponds to $\sim 0.08^\circ$. The detector can also be used as a variable-width single-wire detector. The 32-wire detector can be replaced with a standard detector.

Typical Experiments

- residual strain/stress mapping
- crystallographic texture
- grain-interaction stresses
- precipitation and phase transformations
- inelastic scattering in triple-axis mode (eg phonons, magnons, solitons, correlations)
- elastic scattering in diffraction mode or triple-axis mode experiments (eg mapping of phase diagrams, magnetization measurements).

Ancillary Equipment Specifically Available to E3 Strain collimators:

- A large variety of slits and height limiters are available for defining the sampling volume for residual strain/stress mapping experiments.
- An Eulerian Cradle can be installed on E3 for full control of sample orientation. The addition of the cradle effectively transforms E3 into a 4-circle diffractometer. Primarily used for crystallographic texture and grain interaction measurements, but also useful for examination and pre-alignment of single-crystals.

Technical Specifications

Beam Size at sample position: 5 cm high \times 5 cm wide (maximum)

Available monochromators and analyzers:

- Be, Cu, Ge, graphite, Si available (these monochromating and analyzing crystals are shared among the spectrometers, several crystals of each type are available).

Monochromator take-off Angle: Continuously variable in 3 ranges, 0 – 30°, 30 – 60°, and 60 – 91°

Specimen scattering angle: Continuously variable from 0 – 120°

Collimators:

No source to monochromator collimator is installed, effective collimation is $\sim 0.6^\circ$. The remaining beam segments are soller slit adjustable with each soller channel having a minimum blade spacing of 0.050". Soller blades are available in 5.5", 8.0", 14.5" and 19" lengths. The maximum blade length in the beam segments are:

- monochromator to specimen, 19"
- specimen to analyzer, 14.5"
- analyzer to detector, 8"

Detector:

The standard configuration of E3 uses a 32-wire position sensitive detector. This detector can also be used as a variable-width single detector. When required, a true single detector can be installed.



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