

NEXT Endstation Scope Additions since August 2014 DOE Review

Following the August 2014 DOE Review of NEXT, a significant amount of NEXT project contingency funding has been committed to scope additions to enhance the capabilities of the five base-scope endstations (ESM, ISR, ISS, SIX, and SMI). The following is a listing of the principal NEXT endstation scope additions since August 2014. The key features are organized by beamline and each item is accompanied by a short description of the key capability it enables or enhances.

ESM, μ -ARPES endstation

- (1) Scienta model DA30 electron energy analyzer with spin detector
 - a. Provides high energy- and k-resolution ARPES, with or without spin resolution.
 - b. Can measure electrons in a full cone of 30 degrees opening angle.
 - c. Capability: can band map the full surface Brillouin zone without rotating the sample or analyzer.
- (2) Low temperature sample stage
 - a. Closed cycle LHe cryostat and xyz manipulator. Sample temperatures down to 4.7K.
 - b. Capability: ultra-high resolution ARPES from 1 micron spot.

ISR, 6-Circle Diffractometer endstation

- (3) Instrumented 6-circle diffractometer
 - a. Diffractometer provides vertical and horizontal plane scattering with small sphere of confusion, large q range, an dual 2θ arms for simultaneous mounting of area and point detectors.
 - b. Motorized xyz Displex mount with sub-micron resolution.
 - c. In-vacuum polarization analyzer, reduces undesirable air absorption.
 - d. Capability: high quality temperature-dependent x-ray scattering and grazing incidence diffraction measurements down to 2.4 keV photon energy.
- (4) Pixel array detector
 - a. Dectris Eiger-X 1M area detector.
 - b. Capability: high q -resolution scattering and diffraction measurements over large angular range.

ISS, primary endstation

- (5) Improved sample chamber design
 - a. Increased # of detector/spectrometer ports, from 14 to >20.
 - b. More flexible detection geometry, with larger solid angle per port.
 - c. Emission analyzer designs improved and interfaces to the sample chamber optimized.
 - d. Capability: increased detection sensitivity.

SIX, primary endstation

- (6) Large dynamic range, small pixel size soft x-ray CCD detector
 - a. Soft x-ray sensitive (~50 nm thickness entrance window) with 3 μ m FWHM spatial resolution obtained by single photon counting with centroiding analysis (XCAM)
 - b. Capability: increased detection sensitivity and energy resolution
- (7) Sample chamber
 - a. 6-axis UHV manipulator with low temperature cryostat
 - b. Triple rotating flange mechanism between sample chamber and emission spectrometer, to enable rotation of the spectrometer arm without breaking UHV.
 - c. Capability: Energy stability as the emission spectrometer rotates around the sample source point.

SMI, GISAXS/GIWAXS endstation

- (8) Pixel array detectors
 - a. Dectris Pilatus3 1M, customized for 2.1 keV and in-vacuum operation
 - b. Pilatus3 300K-W, customized for 2.1 keV
 - c. Capability: combined small- and wide-angle scattering throughout the 2.1 to 24 keV photon energy range