High Magnetic Field Sector for X-Ray Scattering

We propose a world-class beamline for x-ray scattering studies of novel states of electronic matter under an applied DC magnetic field reaching 25 T. The use of high-resolution diffraction, resonant scattering, and enhanced capabilities of coherent techniques due to the MBA upgrade, on materials subject to high DC fields will vastly expand our knowledge of many problems in contemporary condensed matter physics. Although they are limited in scope due to short dwell time in high field, we have glimpsed of such discoveries in some favorable systems using recent pulsed-magnet x-ray experiments, which demonstrated the symmetry-breaking role of nematic order in pnictides, shed light on the magneto-elastics of a spin liquid, and revealed charge-density waves in a high-temperature superconductor. These pioneering studies only expose the tip of new physics, but to properly study it, a DC magnet is required. With its year-round availability this facility, long recommended by National Research Council, is essential to BES Grand Challenge Sciences, including Superconductivity and Extreme Conditions.

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