White Paper – A new beamline for coherent magnetic scattering and imaging in diverse sample environments

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Abstract

In this White Paper we outline a proposal to leverage the increased coherence and reduced beam dimensions resulting from the APS Upgrade MBA lattice with core capabilities of the APS magnetic and electronic imaging and spectroscopy programs. Integrating coherent diffraction imaging with our existing coupled electronic-structure research programs will enable nanometer scale electronic spatial resolution imaging correlated with structural behavior. The focus will be on developing resonant imaging and scattering in a reflection geometry, enabling improvements in spatial resolution over present capabilities by a factor of 20, and allowing for varied and diverse sample environments not presently available. By employing these techniques *in situ* and *operando* we will be capable of unraveling the underlying nature of non-equilibrium physics and inhomogeneity in highly correlated electron systems, including magnetic systems, battery materials, and complex oxides.