Time-resolved Resonant Inelastic X-ray Scattering on Quantum Materials

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Resonant Inelastic X-ray Scattering (RIXS) is a powerful probe of excitations from the electronic ground state of correlated materials involving lattice, charge, orbital and spin degrees of freedom. Owing to its momentum sensitivity, RIXS has evolved as an important spectroscopic tool for accessing the dispersion of collective excitations in a diverse set of quantum materials. During the last years this advanced spectroscopy has been extended to the time-domain, in particular in experiments following pump-probe schemes. In this talk we illustrate the scientific capabilities of time-resolved soft X-ray RIXS by summarizing the results obtained at SXR/LCLS during recent experiments on the prototypical Mott-material V$_2$O$_3$ and the Spin-Peierls spin-chain CuGeO$_3$. Furthermore, we will give examples of classes of possible early science experiments that require in part only moderate resolution as well as for experiments that will take full advantage of the new capabilities for high resolution time-resolved soft X-ray momentum-resolved RIXS of collective modes in quantum materials at LCLS-II.