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Integrated control systems for time-resolved RIXS at LCLS-II: design and operational challenges

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The newly enhanced LCLS-II X-ray laser at SLAC National Accelerator Laboratory represents a major advancement in X-ray science, providing unprecedented capabilities for probing ultrafast dynamics in chemistry, materials science, biology, and beyond. Among the new beamlines, the Resonant Inelastic X-ray Scattering (RIX) beamline leverages the high repetition rate of LCLS-II to investigate the energy distribution and evolution of occupied and unoccupied molecular orbitals in complex and catalytic systems, particularly in liquid environments. This beamline features two dedicated endstations—qRIXS (upstream) and chemRIXS (downstream)—each optimized for distinct scientific goals. This talk will detail the design and implementation of the experimental controls and data systems that unify beamline hardware and instrument automation. Additionally, this talk will discuss the challenges of synchronizing operations across two endstations on a single beamline for time-resolved spectroscopy under demanding experimental conditions.

Footnotes

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