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## A compact, high throughput SVLS spectrometer for LCLS-II

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A spherical variable line spacing (SVLS) grating spectrometer has been designed and commissioned for use at the ChemRIXS endstation at the Linac Coherent Light Source (LCLS), SLAC National Accelerator Laboratory. We present the design evolution, capabilities, and performance of the SVLS, which was developed to facilitate resonant inelastic X-ray scattering (RIXS) experiments across a broad range of photon energies (250–1200 eV) on the LCLS-II beam. The SVLS spectrometer leverages a spherical grating to achieve simultaneous imaging and spectral dispersion with high energy resolution, while maintaining a compact form factor. A key design feature is its modular architecture, consisting of three components: a grating chamber containing the optic and its conditioning units, slits, and a foil; a rotation arm housing the detector; and a vertical stage that drives the detector to its intended diffraction angles. The 36-megapixel sCMOS camera is inclined at a 20° grazing angle to maximize spatial resolution, resulting in a resolving power exceeding 2000 across the relevant photon energy range and offering more than 30× higher throughput compared to existing spectrometers at SLAC.

### Footnotes

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