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Tunable-Bandwidth Monochromator for Hard X-rays with Wavefront Preserving Crystal Optics

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A new monochromator concept has been developed that allows tuning the bandwidth of the hard X-rays. The design is based on the 4f Fourier pulse shaping principles used in the table-top optical laser field. Very briefly, the X-ray beam is spatio-spectrally dispersed at the Fourier plane, where high-precision slits define the bandwidth that is encoded along the dispersive direction. The monochromator spans a 40-meter space along the beam path, which is required to achieve the necessary resolving power and to recover the transform-limited pulse durations without wavefront tilt or distortions.

The monochromator covers a wide spectral range between 5 keV and 20 keV without swapping crystals and delivers a tunable bandwidth as narrow as a few meV across the entire range. The upper boundary of the continuously tunable bandwidth range is between a few tens of meV and hundreds of meV, depending on the photon energy. This monochromator will be supporting the inelastic X-ray scattering and X-ray photon correlation spectroscopy experiments after the LCLS-II-HE upgrade at SLAC National Accelerator Laboratory in California.

I plan to submit also conference proceedings

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