

Operation of a Versatile Compound Refractive Lens (CRL) Transfocator

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A versatile Compound Refractive Lens (CRL) transfocator to focus the monochromatic beam was designed by AXILON AG and implemented on GM/CA beamline 23-ID-D at the Advanced Photon Source (APS). It was designed to provide ~1 micron (FWHM) focus with low convergence for macromolecular crystallography (MX) over the energy range 5- 35keV. Beryllium paraboloid lenses with various radii of curvature (7×500-micron, 127×200-micron, and 31×50-micron) are arranged in 21 pneumatic actuators which can introduce the lenses into the beam by pressing them into a high-precision V-groove rail. The focal length of the CRLs is energy dependent, requiring more lenses with increasing energy. In addition, since the number of lenses is discrete, the system must be translated longitudinally to position the focus at the desired location. When changing energy, a subset of lenses and longitudinal translation is automatically selected to maintain a reference focal position by recursively calculating the focal positions for all possible combinations of lens stacks and choosing the configuration with the focal position closest to the reference. Measured beam sizes were used to validate this approach across the full energy range. The design, implementation, beam size validation, and MX diffraction will be presented.

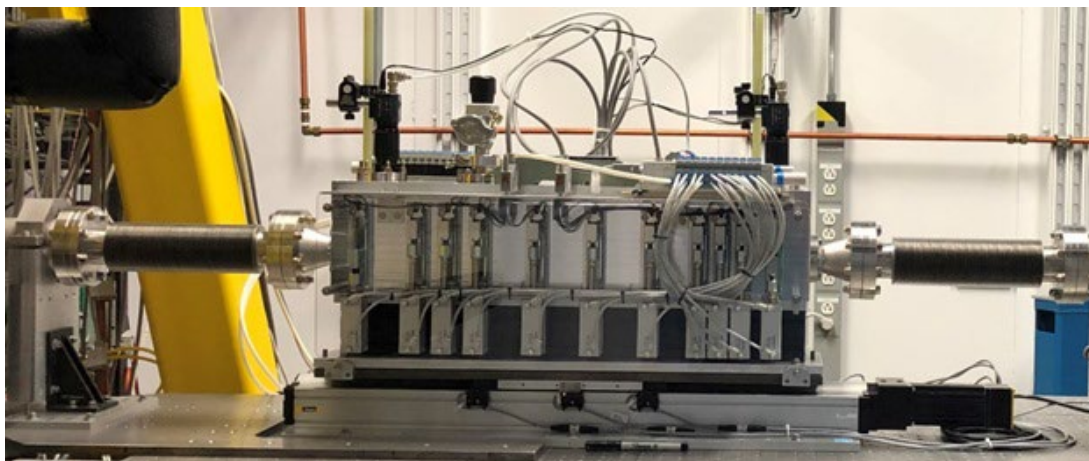


Figure 1