

A Concept Design of A Monochromator Based on Linear Varying Plane Grating

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Abstracts: *Based on a linear varying plane grating (LVG), a novel monochromator is designed and verified by the optical designing and simulation software X-LAB. The designed monochromator is composed of three optical elements: two spherical mirrors and one LVG. The monochromator offers high spectral resolving power at 12.4 nm~124 nm wavelength range. The grating periods of the LVG along the ruling direction are no longer constant but linear varying along the ruling direction. The LVG has two key parameters: the center grating period and the varying rate along the ruling direction.*

The developments of soft X-ray, especially for synchrotron radiation, free-electron-laser and even the laser-plasma sources, have opened up a fundamentally new research area. Also, the monochromators for soft X-ray are necessary for experiments requiring a high spectral resolution. Many kinds of monochromator with high spectral resolution have been proposed based on plane grating with in-plane or off-plane mount and varied-line-spacing plane grating.

However, all of these monochromators have their own disadvantages, such as requiring at least four X-ray optical elements, not easy for alignment or optical design. In this report, a concept design of a monochromator based on linear varying plane grating (LVG) was designed for 4B7B beamline in Beijing Synchrotron Radiation Facility and this design was verified by X-LAB which is developed for optical system design and simulation by Research Center of Laser Fusion. This monochromator offers high spectral resolving power at 12.4nm ~ 124nm wavelength ranges and the desirable wavelength is tunable just through pushing the VLG along the ruling direction to change the illustrated grating period. Only the X-LAB has the LVG optical element design library with two key parameters which are the center grating period and the varying rate. The proposed monochromator in this report is much easier in operation, mechanical fabrication, and cheaper in the cost than the traditional type. With the development of the micro-fabrication technology, this novel monochromator may become a popular and useful kind.

In the presentation, we will show the details of the design of the novel monochromator and simulation using X-LAB.