REFLECTION ZONE PLATES FOR FREE ELECTRON LASER OPTICS

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Abstract

Elliptical zone plates fabricated on a mirror surface, so-called "reflection zone plate" (RZP), can be effectively used for an x-ray monochromatizsation and beam focusing at the photon energies below 1000 eV. This X-ray element can be applied in the beamlines with a specific beam conditions such as very high thermal and radiation load. To provide best energy and spatial resolution the RZP must be off-axis. Development of an off-axis RZP at BESSY closely connected with the ultra-high time resolved experimental beamline at the time-slicing undulator as well as new project of the BESSY low-energy free-electron laser facility. A prototype of the lenses is designed using the same software, as a Bragg-Fresnel lenses. A silicon substrate is covered by a gold layer with a thickness of 50 nm, the depth of profile 10 nm. The technology of the lens fabrication includes laser-beam lithography, made by Firma ML&C GmbH in Jena, and ion etching performed at the Leibniz-Institute for Surface Treatment (IOM), Leipzig. First XANES Absorption spectra obtained at the new BESSY femto-XANES beamline using reflection zone plates are reported.

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