

Development of multilayer-based x-ray optics for Free Electron Lasers and synchrotron applications

Saša Bajt, Photon Sciences, DESY, Hamburg, Germany

High-intensity x-ray light sources, such as 3rd generation synchrotrons, HHG sources and FELs, offer new opportunities but also challenges for x-ray optics. Multilayer coatings are very versatile and can be designed to create optics and optical elements for a broad range of wavelengths extending from EUV to hard X-rays.

Current activities, in particular development of soft and hard x-ray focusing optics, will be presented. For example, with normal incidence multilayer-coated off-axis parabolas for 13.5 nm and 6.8 nm we generated sub-micron foci and achieved the highest intensities of pulses at FLASH. There is particular interest to develop focusing optics for the water window region where there is a natural contrast between water and carbon. Present activities include development of a multilayer for a normal incidence optic at 4.3 nm to be used in upcoming FLASH experiments. Among our recent achievements is the development and coating of Kirkpatrick-Baez substrates for focusing hard x-rays at PETRA III beamline. In parallel we are also exploring design and fabrication of novel high resolution diffraction optics based on thick multilayers.