

## **APPLICATIONS OF MULTILAYER-COATED OPTICS IN FREE ELECTRON LASER EXPERIMENTS**

**Saša Bajt<sup>1\*</sup>, Henry Chapman<sup>2,3</sup>, Andrew Aquila<sup>1,2</sup>, Miriam Barthelmess<sup>1</sup>**

<sup>1</sup>Photon Science, DESY, 22607 Hamburg, Germany

<sup>2</sup>Center for Free-Electron Laser Science, DESY, 22607 Hamburg, Germany

<sup>3</sup>University of Hamburg, 22607 Hamburg, Germany

FLASH (Free Electron LASer at DESY in Hamburg, Germany) is the first, and still the only, free electron laser operating in VUV and soft X-ray regime. Its femtosecond pulses, high intensity, and coherence offer unique opportunities but also challenges for x-ray optical elements. We have carried out new science and developed methods and applications that make use of the unique FEL properties. X-ray multilayer coatings were the enabling technology for experiments. One of the primary goals of the Center for Free-Electron Laser Science (CFEL), which strongly collaborates with the X-ray multilayer laboratory at DESY, is to develop and exploit basic research and scientific applications using new radiation sources, such as FLASH, LCLS or the European XFEL.

In this presentation we will present applications and discuss x-ray multilayer coated optics that were used to focus, reflect, and filter the FLASH beam in different FEL experiments. We will also discuss current development of narrow-bandpass multilayers for pump-probe experiments.