ID: 2127 - WEPSO56 Optical Design and Time-dependent Wavefront Propagation Simulation for a Hard X-Ray Split- and delay-unit for the European XFEL

Presenter Sebastian Roling (Universitaet Muenster, Muenster)

Authors Sebastian Roling, Björn Siemer, Frank Wahlert, Michael Wöstmann, Helmut Zacharias (Universitaet Muenster, Muenster), Oleg Chubar (BNL, Upton, Long Island, New York), Evgeny Schneidmiller, Mikhail Yurkov (DESY, Hamburg), Eric Ziegler (ESRF, Grenoble), Stefan Braun, Peter Gawlitza (Fraunhofer IWS, Dresden), Frank Siewert (HZB, Berlin), Liubov Samoylova, Harald Sinn (XFEL.EU, Hamburg)

Abstract For the European XFEL an x-ray split- and delay-unit (SDU) is built covering photon energies from 5 keV up to 20 keV. This SDU will enable time-resolved x-ray pump / x-ray probe experiments as well as sequential diffractive imaging on a femtosecond to picosecond time scale. The wavefront of the x-ray FEL pulses will be split by an edge of a silicon mirror coated with Mo/B4C and W/B4C multilayers. Both partial beams will then pass variable delay lines. For different wavelengths the angle of incidence onto the multilayer mirrors will be adjusted in order to match the Bragg condition. Hence, maximum delays between +/- 2.5 ps at hν = 20 keV and up to +/- 33 ps at hν = 5 keV will be possible. The time-dependent wave-optics simulations have been done with SRW software, for the fundamental and the 3rd harmonic. The XFEL radiation was simulated both in the Gaussian approximation as well as using an output of time-dependent SASE code FAST. Main features of the optical layout, including diffraction on the splitter edge, and optics imperfections were taken into account. Impact of these effects on the possibility to characterize spatial-temporal properties of FEL pulses are analyzed.

Type of Presentation Poster

Main Classification Applications of FELs