European XFEL Science Seminar

Tuesday, 9th July 2019, 13:00
Campus Schenefeld, XHQ, room E1.173 (coffee & biscuits will be served from 12:30)

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Multilayer Laue lenses for extreme focusing

Intense, coherent and short X-ray pulses are essential for imaging of non-periodic matter at atomic resolution, new atomic physics, and studies of stimulated emission and scattering. Effective utilization of X-ray Free Electron Lasers (XFELs) and other novel x-ray sources requires a toolbox of optical elements and diagnostics similar to those developed for optical lasers. These include focusing optics, monochromators, and beamsplitters, but also the means to chirp or compress pulses and arbitrarily shape them in time. Many of these capabilities can be fulfilled with optics based on multilayer structures. These interference reflective structures can be designed almost for any wavelength within the spectral range extending from EUV to hard X-rays. We are pursuing two ways to achieve high intensities. One is to focus the beam to a very small spot and the other is to compress it in time. Multilayer Laue lenses (MLLs) are 3D nanostructures that can focus X-rays to nanometer spots with high efficiency. Our current MLLs can focus FEL pulses to sub-micron beam spots and intensities of 10^{20} W/cm^2.They are prepared from novel materials, are extremely robust and can survive XFEL beam with no noticeable damage or change. Latest results on the development and performance of MLLs as well as future outlook of other multilayer-based X-ray optics will be discussed.

Host: Karen Appel