

Novel X-ray Microscopes for 3-D and fs-imaging at BESSY

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The full-field x-ray microscope installed at the 3rd generation electron storage ring BESSY II is dedicated for applications in life, environmental and materials sciences. It covers the photon energy range between 250 - 750 eV. Currently, the spatial resolution is about 20 nm. Due to the small numerical aperture of zone plates, X-ray objectives have a depth of focus on the order of several microns. By treating the X-ray microscopy images as projections of the sample absorption, computed tomography can be performed.

3-D x-ray microscopy - pioneered at the BESSY I electron storage ring using a full-field TXM and at the NSLS using a scanning TXM - has found numerous applications worldwide. To further improve 3-D x-ray imaging towards 10 nm spatial resolution and to increase the usable photon energy range into the hard x-ray region, progress has to be made in nanotechnology of the x-ray optics, the instrumentation and the theory for recovering the full 3-D information of an object at this resolution level. In the talk, the current status at synchrotron sources and future aspects of x-ray imaging with fs-pulses from Free Electron Lasers will be discussed. In Fig. 1, a bird's eye view of the BESSY site with the planned BESSY HGHG FEL is shown. It will provide 20 fs pulses for x-ray imaging in the photon energy range between 20 – 1000 eV.

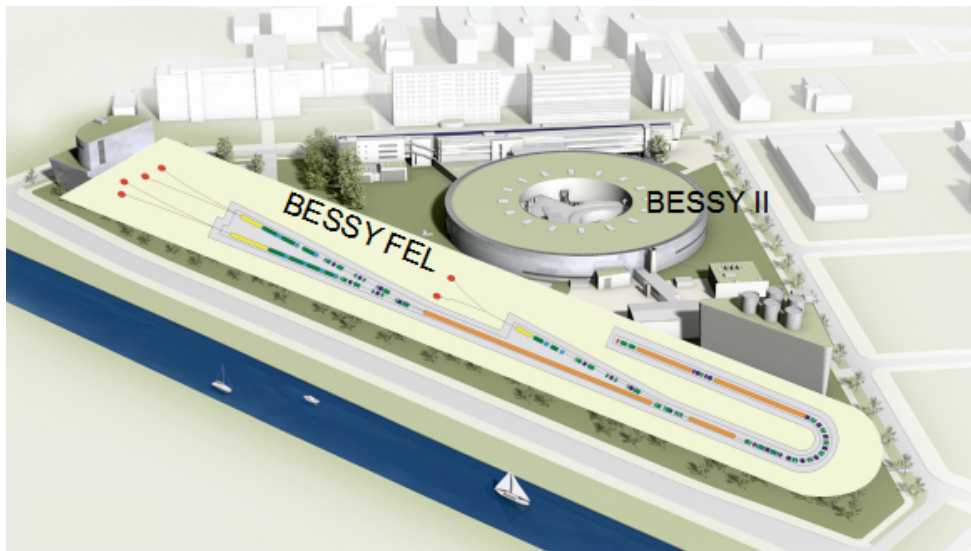


Fig. 1: The planned BESSY HGHG Free Electron Laser will be installed next to the BESSY II storage ring (see also www.BESSY.de).