Institute of Applied Physics
Friedrich-Schiller-Universität Jena

Master thesis

in the subject area of

Nanoscale Ptychography on a table-top

Short wavelength (XUV and X-ray) light is well suited for imaging of smallest structures with only a few nanometer resolution. While conventional X-ray microscopes are limited in resolution by the employed optics (zone plates), coherent diffractive imaging relies on detecting the light diffracted by the sample and reconstructing its structure via iterative computer-algorithms. A particularly coherent imaging technique is Ptychography, which relies on recording multiple diffraction patterns when scanning across the sample. It relaxes the isolated sample restriction of conventional coherent diffractive imaging and provides robust reconstructions of the sample and the illuminating beam in amplitude and phase. While Ptychography has achieved ~10 nm resolution at large-scale synchrotron light sources, table-top implementations suffer from the low photon flux that is available from table-top coherent XUV and X-ray light sources. Nowadays modern femtosecond fiber lasers enable compact and powerful sources up to soft X-ray range with excellent beam quality and coherence properties which demonstrated record resolutions (<20 nm) with coherent diffractive imaging already.

You will design and operate a table-top ptychographic imaging setup with a state-of-the-art fiber-laser driven XUV light source and perform first measurements on nanoscale test samples including the reconstructions with available computer-codes. These experiments aim at record spatial resolution for 2D samples. In future, this approach will be extended to 3D tomography and provide unique details of 3D nanoscale objects.

Please, send your application preferably by email to

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