

Selected research topics in Biomedical Engineering:

Medically Relevant Experiments with Synchrotron Radiation

Wednesday, November 18, 2020, 13:30-14:30, via zoom

Optimized density-resolution for microtomography

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Abstract. The Helmholtz-Zentrum Geesthacht is operating user experiments for microtomography at the beamlines P05 and P07 using the storage ring PETRA III. This positron-electron tandem-ring facility is the high-brilliance third-generation synchrotron radiation source located at DESY, Hamburg, Germany. Here, attenuation- and phase-contrast techniques have been developed to non-destructively visualize materials of technical, biological and medical relevance. The obtained three-dimensional data with isotropic micro- and even nanometer resolution exhibit unique contrast. This talk covers the efforts to push the density-resolution to its limits. The integration of large-area CMOS sensors also allows for an efficient visualization of sample alterations. The presentation includes an introduction to the experimental determination of spatial, density and temporal resolutions of selected examples from current research projects including their optimization. Synchrotron radiation-based tomography has become a vital research tool for imaging centimeter-sized objects in the fields of materials science, biology and medicine/dentistry.

Curriculum. Felix Beckmann studied physics at the University of Dortmund, Germany. In 1998, he obtained a Ph.D. for the development of a direct synchrotron-radiation based phase-contrast technique using an X-ray interferometer. As a postdoctoral research fellow at the Deutsches Elektronen-Synchrotron DESY, he established tomography as a user experiment. Since 2002, he has worked at the Institute of Materials Research, Helmholtz-Zentrum Geesthacht, Germany, to design, develop and operate tomographic techniques at the beamlines BW2, BW5 and W2, storage ring DORIS III. Furthermore, he established and operated the neutron tomography in Geesthacht, Germany. Since 2012, he has become responsible for the microtomography experiments at the third-generation storage ring PETRA III, where he is currently group leader for imaging with synchrotron radiation and neutrons within the German Engineering Materials Science Centre at the Institute of Materials Research at the Helmholtz-Zentrum Geesthacht, Germany. His research interests are the optimization of synchrotron radiation-based imaging techniques and their application in materials science, health and biology.