4D imaging at TOMCAT

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We present the latest development in 4D microtomography. With a dedicated fast tomographic endstation at the TOMCAT beamline a full set of tomographic images can now be acquired in a fraction of a second with voxel sizes of 1-11 micrometers [1]. The large field of view ensures that statistically relevant volumes can be analyzed [2]. Tomograms at 20 Hz frequency can be achieved. In addition to attenuation contrast, advanced processing of the datasets results in retrieving the phase shift of the X-rays interacting with the sample. In this way the 3D volume reconstructions of noisy projections (exposure time as short as 100 microseconds) show high contrast to noise ratio and can be segmented and labeled to form an input to the quantitative analysis toolbox that was developed for large time series of tomographic datasets (4D data) [3]. To overcome the usual problem of limited collection time of fast tomographic datasets, a detector capable of continuous recording at 8 GB/s was developed. The exploration of the dynamics of many new systems becomes possible with the new data acquisition capabilities.

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