

## Motion detection in diffraction tomography

**Speaker:** Michael Quellmalz, TU Berlin

**Abstract:** We study the mathematical imaging problem of optical diffraction tomography (ODT) for the scenario of a rigid particle rotating in a trap created by acoustic or optical forces. Under the influence of the inhomogeneous forces, the particle carries out a time-dependent smooth, but irregular motion. The rotation axis is not fixed, but continuously undergoes some variations, and the rotation angles are not equally spaced, which is in contrast to standard tomographic reconstruction assumptions. Once the time-dependent motion parameters are known, the particle's scattering potential can be reconstructed based on the Fourier diffraction theorem, considering it is compatible with making the first order Born or Rytov approximation.

The aim of this presentation is twofold: We first need to detect the motion parameters from the tomographic data by detecting common circles in the Fourier-transformed data. This can be seen as analogue to method of common lines from cryogenic electron microscopy (cryo-EM), which is based on the assumption that the light travels along straight lines. Then we can reconstruct the scattering potential of the object utilizing non-uniform Fourier methods.