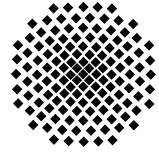


# Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme  
Max-Planck-Institut für Festkörperforschung  
Fachbereich Physik, Universität Stuttgart

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Dienstag, 14. Januar 2014

17.15 Uhr

Hörsaal 2 D5

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Gastgeber: Prof. Gisela Schütz, Max-Planck-Institut für Intelligente Systeme, Telefon: 0711 - 689-1950

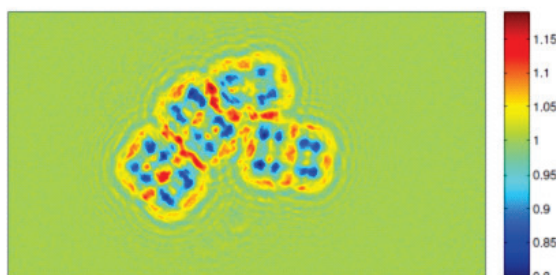
## X-ray imaging at the nanoscale

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### Abstract

X-rays deeply penetrate matter and thus provide information about the functional (interior) architecture of complex samples, from biological tissues and cells to novel composite materials. However, this potential of hard X-rays in view of penetration power, high spatial resolution, quantitative contrast, and compatibility with environmental conditions has to date not been fully developed, mainly due to significant challenges in X-ray optics. With the advent of highly brilliant radiation, coherent focusing, and lens-less diffractive imaging this situation has changed. We show how nano-focused coherent x-ray synchrotron beams can be used for scanning as well as full field X-ray imaging. The central challenge of inverting the coherent diffraction pattern of the recorded hologram is discussed. Examples of biological imaging are presented, ranging from bacterial and eukaryotic cells, to nerve tissue, up to the level of organs or small organisms.

In particular, we show how holographic projection images recorded by using the quasi-point source of an x-ray waveguide can be inverted to quantitative two and three dimensional images of the object. The experimental and conceptual aspects of image formation, object reconstruction, contrast transfer function and resolution will be discussed, and illustrated by different examples.



Hologram of bacterial cells