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Speckle Interferometry at IMBL - First Results

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At IMBL inline phase-contrast imaging is typically used for imaging and tomography. This utilises Paganin's phase-retrival algorithm (Paganin et al. 2002) for boosting the signal to noise of the resultant images. However, this single-image algorithm does not permit the independent extraction of absorption and phase shift arising from a sample, nor can the dark-field signal be obtained.

A number of alternative imaging methods such as grating-based phase-contrast, edge-illumination and speckle interferometry enable the independent extraction absorption, phase and dark-field signals (Mayo & Endrizzi 2018). Grating-based methods and edge-illumination require careful alignment and relative movement of two sets of gratings, or of a grating and detector, with images acquired at a succession of positions to obtain high quality data. Speckle interferometry and related tracking methods are experimentally less demanding, requiring only a mask and the ability to move it repeatably to different positions.

The speckle mask creates a fine scale random pattern in the imaging plane and images are acquired with and without the sample in place. The local differences in intensity, position and contrast of the mask image with and without the sample are used to extract the different signals. For high-resolution speckle interferometry multiple image-pairs are acquired with the mask in different positions (Zdora et al. 2018). However, useful results at lower resolution can be achieved even with a single image pair (Berujon et al 2012).

Here we present preliminary results from our first attempts to implement speckle interferometry at IMBL, including testing of single-image and multi-image methods including tomography.

References

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Speakers Gender

Female

Travel Funding

No

Level of Expertise

Experienced Researcher

Do yo wish to take part in the poster slam

No

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