Feb 28
Tuesday

Phase Contrast Microtomography using Polychromatic Synchrotron Radiation and Single-distance Phase-retrieval Techniques

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XSD Presentation

401/A1100 @ 11:00 AM

View Description

Inline X-ray phase contrast is an attractive contrast mode for X-ray imaging techniques due to its increased sensitivity: by leaving an appropriate drift space between the sample and the imaging detector, interfaces within the probed specimen can be visualized. While this information is often useful for visual inspection, any further quantitative is not easily possible: the gray levels within the different materials regions are not necessarily different; they are just varying at the interfaces. But if the transmission radiographs are sent through a phase-retrieval process, the tomograms will exhibit 'area contrast' rather than edge-enhancing contrast.

In this presentation, the implementation and application the single-distance phase retrieval approach will be introduced [1, 2]. Advantages of this method are that it can be applied to any inline phase contrast tomographic data set; it allows phase-sensitive imaging without modification of existing experimental installations; it is extremely robust and user friendly; it can handle data from arbitrarily absorbing (multi-constituent) samples as well as tolerates polychromatic illumination. The latter is of crucial importance to progress towards higher data acquisition rates: when operating without monochromators, i.e. so-called pink beam or white beam configurations, the required exposure times can be reduced drastically. Microtomography in combination with pink-beam illumination and Paganin phase-retrieval has become the most demanded configuration at the ESRF beamline ID19: it covers now 30% of the ID19 data processing and about 80% for palaeontological studies.

[1] D. Paganin, et al.: "Simultaneous phase and amplitude extraction from a single defocused image of a homogeneous object", J.Microsc. 206 (1), 33 (2002).
[2] T. Weitkamp, A. Rack, et al.: "ANKAphase: software for single-distance phase-retrieval from inline X-ray phase contrast radiographs", J. Synchrotron Radiat. 18 (4), 617 (2011).

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