

Phase Retrieval with Ptychography and X-ray Speckles

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In the last decade, a convergence between X-ray source quality, detector performance and algorithmic developments have led to new imaging schemes in which what is measured can be very different from what we want to see. In these schemes, natural processes such as wavefield propagation encode the information on samples and illuminating conditions, which is then decoded a posteriori. Far from being limiting, these approaches provide access to additional imaging channels and offer flexibility by lifting some experimental constraints. This talk will give an overview of recent developments for two such imaging strategies, ptychography and speckle-based imaging. These methods have demonstrated their potential for applications, from nanometre-scale computed tomography of materials and life science sample to at-wavelength wavefront sensing for X-ray free-electron lasers. Some of these results will be presented, with a special emphasis on the interesting and challenging theoretical and computational components of these approaches.