

Advanced imaging methodologies

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The nearly ideal characteristics of X-rays produced at modern synchrotron radiation facilities (intense, coherent, monochromatic, tunable) has had an enormous impact on the development of novel imaging modalities. From propagation-based phase-contrast imaging, to holography and ptychography, to various scanning methods, synchrotron facility users have nowadays a broad range of techniques available to address their sample characterization requirements.

This lecture will provide an overview of the modern X-ray imaging methods currently in use at synchrotrons, with a special focus on those methods that strive to exploit maximally the synchrotron radiation characteristics, most often at the cost of computationally intensive reconstruction techniques. Such techniques include ptychography, in its far-field and near-field modality, coherent diffractive imaging, and holography.

Generally, these techniques are used in conjunction with tomography to obtain quantitative three-dimensional maps of the scanned objects. The lecture will also provide a brief account of tomography's fundamental principles.