

A one-step approach for retrieval and reconstruction of phase contrast X-ray data

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Abstract

Phase contrast X-ray imaging refers to the wide range of techniques which capture the changes in the phase of X-ray beams as they pass through an object. We focus on edge illumination as the method for acquiring X-ray phase contrast data. The edge illumination setup requires two masks, one in front of a sample and another at the detector. By moving the sample mask, one can vary the amount of illumination registered at the detector. These illumination changes form a Gaussian curve, the parameters of which can be retrieved as three information channels: attenuation, refraction and dark field. Refraction is the first order derivative of phase, so knowing refraction gives us the phase of the scanned sample. Normally, retrieval is performed prior to reconstruction in a two-step approach. In this work, we demonstrate a one-step approach which combines retrieval and reconstruction as a single model, and investigate appropriate subsampling schemes.