



# X-Ray Optics and Instrumentation



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Research Article

## Direct Fan-Beam Reconstruction Algorithm via Filtered Backprojection for Differential Phase-Contrast Computed Tomography

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### Abstract

Recently, a novel data acquisition method has been proposed and experimentally implemented for differential phase-contrast computed tomography (DPC-CT), in which a conventional X-ray tube and a Talbot-Lau-type interferometer were utilized in data acquisition. The divergent nature of the data acquisition system requires a divergent-beam image reconstruction algorithm for DPC-CT. This paper focuses on addressing this image reconstruction issue. We have developed a filtered backprojection algorithm to directly reconstruct the DPC-CT images from acquired fan-beam data. The developed algorithm allows one to directly reconstruct the decrement of the real part of the refractive index from the measured data. In order to accurately reconstruct an image, the data need to be acquired over an angular range of at least  $180^\circ$  plus the fan angle. As opposed to the parallel beam data acquisition and reconstruction methods, a  $180^\circ$ -rotation angle for the data acquisition system does not provide sufficient data for an accurate reconstruction of the entire field of view. Numerical simulations have been conducted to validate the image reconstruction algorithm.

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