



International Journal of Biomedical Imaging

[About this Journal](#) [Submit a Manuscript](#) [Table of Contents](#)



Journal Menu

- Abstracting and Indexing
- Aims and Scope
- Article Processing Charges
- Articles in Press
- Author Guidelines
- Bibliographic Information
- Contact Information
- Editorial Board
- Editorial Workflow
- Reviewers Acknowledgment
- Subscription Information

- Open Special Issues
- Published Special Issues
- Special Issue Guidelines

Call for Proposals for Special Issues

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Research Article

Cone-Beam Composite-Circling Scan and Exact Image Reconstruction for a Quasi-Short Object

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- Abstract
- Full-Text PDF
- Linked References
- How to Cite this Article

Abstract

Here we propose a cone-beam composite-circling mode to solve the quasi-short object problem, which is to reconstruct a short portion of a long object from longitudinally truncated cone-beam data involving the short object. In contrast to the saddle curve cone-beam scanning, the proposed scanning mode requires that the X-ray focal spot undergoes a circular motion in a plane facing the short object, while the X-ray source is rotated in the gantry main plane. Because of the symmetry of the proposed mechanical rotations and the compatibility with the physiological conditions, this new mode has significant advantages over the saddle curve from perspectives of both engineering implementation and clinical applications. As a feasibility study, a backprojection filtration (BPF) algorithm is developed to reconstruct images from data collected along a composite-circling trajectory. The initial simulation results demonstrate the correctness of the proposed exact reconstruction method and the merits of the proposed mode.