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Optimization of in-line X-ray phase-contrast tomographic imaging for breast cancer screening

The problem of optimising the experimental protocol and data analysis for in-vivo breast cancer screening was investigated using synchrotron-based in-line X-ray phase-contrast tomography. Results are presented of experiments conducted at the IMBL and SYRMEP beamlines of Australian and Elettra Synchrotrons using the propagation-based phase-contrast mammographic tomography method, which incorporates both absorption and X-ray phase information. The study aims to obtain images of full-size human breast tissue samples, with radiologically acceptable X-ray dose, in order to investigate the degree of improvement of the diagnostic image quality achievable using in-line phase-contrast image acquisition protocols via the incorporation of X-ray phase retrieval into the reconstruction pipeline. Parameters such as the X-ray energy, sample-to-detector distance and data processing methods were tested, evaluated and optimized (with respect to the estimated diagnostic value) using a mastectomy sample with a malignant lesion. The results of quantitative evaluation of images were obtained by means of radiological assessment carried out by experienced specialists. A comparative analysis was performed between corresponding X-ray and histological images of the specimen. The outcomes of this study provide the practical imaging conditions and the CT reconstruction procedures appropriate for low-dose phase-contrast mammographic screening of live patients at specially designed synchrotron beamlines.

Keywords or phrases (comma separated)

tomography x-ray phase-contrast breast cancer synchrotron

Are you a student?

Yes

Do you wish to take part in the Student Poster Slam?

No

Are you an ECR? (<5 yrs since PhD/Masters)

No

What is your gender?

Male

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