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A Feasibility Study of X-Ray Phase-Contrast Mammographic Tomography at the IMBL of the Australian Synchrotron

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We present the results of our recent experiment at the Imaging and Medical beamline of the Australian synchrotron intended to contribute to the development and implementation of low-dose, high-sensitivity 3D mammographic phase-contrast imaging, initially at synchrotrons and subsequently in hospitals and medical imaging clinics. We have tested, quantified, evaluated and optimised the effect of such imaging parameters as X-ray energy, source size, detector resolution, sample-to-detector distance, scanning and processing strategies in the case of propagation-based phase-contrast CT, using a plastic phantom simulating relevant breast tissue characteristics. The data are collected using a Hamamatsu CMOS Flat Panel Sensor, utilised in partial scan mode, with the pixel size $100\mu\text{m} \times 100\mu\text{m}$. Analysis of the data revealed the presence of propagation-based phase contrast and demonstrated significant improvement of the quality of phase-contrast CT imaging, compared to conventional (absorption-based) CT, at medically acceptable radiation doses.

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