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MODELING THE IMAGING TRANSFER CHARACTERISTICS OF LSO POWDER SCINTILLATOR FOR USE IN X-RAY MAMMOGRAPHY

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Abstract. *The aim of the present study was to model the imaging transfer characteristics of Lu_2SiO_5:Ce (LSO:Ce) powder scintillator for use in X-ray mammography detectors. LSO:Ce scintillator is a high efficiency and fast emitting material. An LSO:Ce powder scintillating screen, with a coating thickness of 25 mg / cm^2, was prepared in our laboratory. The imaging performance of the screen was assessed by experimental determination of the modulation transfer function (MTF) and the detective quantum efficiency (DQE). An MTF mathematical relation derived by the theoretical model was fitted to experimental MTF values in order to estimate the light attenuation properties of the scintillator. Screen irradiation was performed under exposure conditions employed in mammographic applications (27 kVp, 63 mAs). MTF was determined by the square wave response function (SWRF) method whereas DQE was estimated by using: (a) the MTF curve, (b) the noise transfer function (NTF) and (c) K.E.R.M.A. measurements, according to IEC standard 62220-1. Results showed that LSO:Ce exhibits high MTF, which is comparable to that of the commercially used Gd2O2S: Tb powder scintillator. Considering our MTF results and the fast response of LSO:Ce scintillator screen (40 ns), this material can be considered for use in X-ray mammographic detectors.*

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