

LUMINESCENCE EFFICIENCY OF $\text{Lu}_2\text{SiO}_5:\text{Ce}$ (LSO) POWDER SCINTILLATOR FOR X-RAY MEDICAL RADIOGRAPHY APPLICATIONS

Adrianos Toutountzis¹, Stratos David¹, Christos Michail¹, Ioannis Valais^{1,2}, George S. Panagiotakis¹ and
Ioannis Kandarakis²

¹ Department of Medical Physics, Medical School
University of Patras
26500 Patras, Greece

² Department of Medical Instruments Technology
Technological Educational Institution of Athens
Ag. Spyridonos, Aigaleo, 122 10 Athens Greece

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Abstract. *The aim of the present study was to investigate the light emission efficiency of $\text{Lu}_2\text{SiO}_5:\text{Ce}$ (LSO) powder scintillator under X-ray radiographic imaging conditions. Powder LSO scintillator has never been previously used in X-ray imaging. For the purposes of the present study one scintillating screen with coating thickness of 108.4 mg/cm^2 , was prepared by sedimentation of LSO powder. Absolute luminescence efficiency (AE) measurements were performed within the radiographic X-ray tube voltages (40-140 kVp). A theoretical model, describing radiation and light transfer, was employed to fit experimental data and to estimate values of the intrinsic conversion efficiency and the light attenuation coefficients of the scintillating screen. Zero frequency detective quantum efficiency (DQE) was also calculated using the theoretical model. The spectral compatibility of the LSO powder scintillator to various radiographic optical detectors was determined by performing light emission spectrum measurements and by taking into account the spectral sensitivity of the optical sensors used in digital radiography detectors. LSO was found to exhibit higher X-ray energy absorption than currently employed scintillators in the range from 40 to 70 kVp. AE was found to increase with X-ray tube voltage up to 110 kVp. Results showed that the LSO screen may be of interest for use in radiographic applications.*

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