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Scintillator's effect and characterization for ultra-high resolution in digital X-ray flat-panel detectors

Indirect flat-panel detectors typically uses amorphous silicon thin film transistor (TFT) or silicon CMOS (complementary metal oxide semiconductor) matrix arrays combined with scintillation screen for a large X-ray imaging application. Conversion of incoming X-rays into electric signals in flat-panel detector is implemented through a scintillator that emits visible lights under X-ray exposure. Because the visible light is emitted in scintillator isotropically and photodiode array converts it in electric signal, the light spread and attenuation in scintillator grains play an important role for final high image quality.
In this work, different scintillation screens such as granular type Gd2O2S:Tb(GOS) materials with different 50-100um thickness on thin plastic substrates were used to prepared for ultra-high spatial resolution X-ray imaging detectors. The used high resolution CMOS flat panel detector is consisted of photodiode array surface with 1246(width) x 1650(height) pixels and 20μm pixel pitch (theoretical resolution limit: 25 lp/mm).
Their X-ray imaging performance of high resolution CMOS imager in conjunction with different high resolution scintillation screens was investigated in terms of the relative light-output to given X-ray exposure dose, modulation transfer function (MTF) and practical X-ray imaging with a phantom. The ultra-high resolution X-ray imaging could be implemented through the experimental results by using a CMOS imaging detector using different high resolution screens with thin GOS materials.We expect that this technology will open potential for excellent image quality improvement with ultra-high spatial resolution in practical imaging fields.

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