

AbstractID: 3338 Title: Performance Characterization of a New 41cm by 41cm a-Si Flat Panel X-ray Detector

Purpose: To quantify and report the performance of an a-Si flat panel X-ray detector with a new generation electronics design in terms of electronic noise, dynamic range and linearity, as well as to quantify the imaging performance such as MTF and DQE.

Method and Materials: The new detector was designed to provide low noise, wide dynamic range and programmable gain for a wide signal range. The signal readout chip has 128 channels, and each consists of a charge integration amplifier, followed by a correlated double sampling stage and a 128:1 multiplexer. The output voltage from the multiplexer is digitized by a 16-bit analog-to-digital converter. The programmable gain can provide settings ranging from the most sensitive of ~250 electrons per counts (e-/c) to the least sensitive ~4,000 (e-/c). The detector uses a 41cm by 41cm a-Si flat panel with 200 μ m pixel pitch and was coated with CsI(Tl). The MTF and DQE measurements were carried out in accordance with the IEC standard.

Results: The total detector electronic noise is ~3200 electrons (500 e-/c), dynamic range was 78.3dB and the non-linearity is +/- 1.5% over 10-90% of full signal scale range. The MTF and DQE were measured both with and without the protective front cover.

Conclusion: The detector with the new readout electronics has met all the major design goals and has raised detector performance to a higher level.