A 0.2-mm thick copper plate was used as the contrast object and placed on a LucAl chest phantom to measure the contrast-to-noise ratios for an aSi:H/CsI(Tl) flat-panel based digital chest system (Revolution XQ/i, GE Medical Systems). Automatic Exposure Control (AEC) was used to maintain the detector exposures at the same level with a 100% dose setting. A series of exposures were made with the kVp varied from 50 to 150 incrementing by 5 kVp. Phantom entrance exposures were measured separately with the AEC-determined mAs reproduced. Signal and noise were measured over the contrast object (copper plate) and neighboring region using a circular ROI of approximately 35-mm in diameter. The mean and standard deviation of pixel values were computed to measure the signal and noise levels. The contrast signal was calculated by subtracting the signal over the contrast object from that in the neighboring region. The contrast signal was then divided by the noise level in the background region to compute the CNR. The normalized image quality was measured as the ratio of the CNR squared to the phantom entrance exposure.

It was observed that while the absolute noise value increased with the kVp, the noise ratio remained about the same. Both the contrast-to-noise ratio and the phantom entrance exposure decreased with kVp as expected due to increase of Compton Scattering interactions at higher kVp. The normalized image quality increased as the kVp decreased. This increase tapered off at 70 kVp and reached an optimum between 50 and 60 kVp.