AbstractID: 2360 Title: Performance Evaluation of HgI2 Photoconductors for Radiation Therapy Imaging

Active matrix flat-panel imager (AMFPI) technology has recently been introduced to clinical radiation-therapy imaging, providing large improvements in digital image quality. However, since commercial indirect detection imagers based on Gd_2O_2S:Tb phosphors capture less than 2% of the incident radiation, the corresponding DQEs are only on the order of 1%. The use of thicker phosphors can improve detection efficiency, but at the cost of reduced spatial resolution and increased Swank noise. To overcome these limitations, high radiation-stopping-power photoconductors composed of HgI_2 are being investigated as a means of increasing the DQE by up to an order of magnitude. In this paper, we report on the performance of detectors incorporating HgI_2 created by screen print and by physical vapor deposition methods. Depositions of various thicknesses of the photoconductor were performed on several, prototype, direct detection AMFPI arrays. The resulting imagers were operated in synchronization with pulsed megavoltage radiation. For comparison, the performance of a conventional indirect-detection AMFPI based on a 512x512 pixel array with a 508µm pitch, and employing a 133mg/cm^2 Gd_2O_2S:Tb phosphor screen (FAST-B), was evaluated under similar conditions. In addition, independent measurements of the material in the form of simple detectors, consisting of HgI_2 sandwiched between electrodes on glass substrates, provided valuable, complementary information. Dark current, signal, sensitivity, and radiation damage tolerance will be presented and, in the case of the imagers, observer-independent performance variables (MTF, NPS, and DQE) will be reported. This work is supported by NIH grant R01-CA51397.