

AbstractID: 6457 Title: Real-Time Tracking of HDR Source Position Using Emission Imaging with a Collimator and Flat-Panel Detector

**Purpose:** High dose rate (HDR) brachytherapy delivers rapidly a large, highly spatially varying dose. Consequently, precise quality assurance of source location and dwell time is important. Here, we propose that, with no additional radiation exposure to the patient, the same flat-panel X-ray detector (FPD) used for anatomical imaging during simulation can also be used for real-time emission imaging of Ir-192 brachytherapy source location.

**Method and Materials:** A standard parallel-hole, low-energy, gamma-camera collimator (weight 34 lbs) was placed on a FPD, in order to preferably accept those Ir-192-emitted photons which are directed perpendicular to the FPD surface. A 10 Ci Ir-192 source was advanced in 2-cm steps through a catheter positioned 20 cm from the collimator/FPD. FPD images were acquired continuously with 6 seconds per frame. Measurements were obtained with 3 different thicknesses (0, 10 cm, and 20 cm) of solid water between the Ir-192 source and the collimator/FPD.

**Results:** A hot spot corresponding to Ir-192 source location was clearly resolved, well above noise, in all images, even with 20 cm solid water. There were penetration patterns corresponding to collimator septal thickness. Imaged source locations tracked the 2 cm steps of the source.

**Conclusion:** A standard gamma-camera collimator provides directional selection of Ir-192-emitted photons that is sufficient to determine source location. The commercial FPD considered provides ample signal-to-noise ratio for imaging Ir-192-emitted HDR photons on the few-second time scale investigated. Thus HDR source location – along the 2 dimensions parallel to the FPD surface – can be determined by positioning a collimator over the same FPD used for transmission anatomical imaging.

**Conflict of Interest (only if applicable):**