

## AbstractID: 8298 Title: Investigation into the use of a MOSFET dosimeter as an implantable fiducial marker

**Purpose:** To evaluate the potential for an implantable dosimeter to be also used as an internal fiducial maker. Additionally, to evaluate the synergy of the dosimeter/fiducial capabilities.

**Method and Materials:** Two implantable MOSFET detectors (DVS®, Sixel Technologies, Inc.) were placed inside an acrylic pelvic phantom for which a wedged-field photon plan and an eight-field prostate treatment plan were developed. For each plan, conditions were simulated so that detectors were in their correct positions or slightly displaced to represent patient setup error and/or organ motion. Doses measured by the two detectors after irradiation were compared to those calculated by the treatment planning software. Additionally, using localization software (MarkerVision, Varian Medical Systems) and kilovoltage images of each setup, the displacement of the detectors from their correct locations was calculated and compared to the induced physical displacement.

**Results:** For all alignments and detector positions, measured and calculated doses showed an average disagreement of 2.7%. The detectors were easily visualized in AP and lateral radiographs, and the induced detector displacements were typically recognized by the localization software within 0.1 cm, and were recognized within 0.16 cm at worst. The relationship between the geometric displacement and measured dose was dependent on the positioning of the dosimeter and dose gradients. If the detector was placed in a uniform dose region then geometric displacements did not induce any dosimetric discrepancies. Alternately, if the detector was placed in a strong dose gradient then even high geometric accuracy resulted in dosimetric discrepancies.

**Conclusion:** The implantable detector functioned well as both an internal dosimeter and as an internal fiducial marker and thus may be useful as a clinical tool to localize the target volume and verify dose delivery *in vivo*.

**Conflict of Interest:** Research was supported by a grant from Varian Medical Systems.