AbstractID: 6834 Title: Can a wireless, implantable MOSFET dosimeter be used as fiducial in image guided SRS?

Purpose:
Implantable MOSFET dosimeters with wireless readout (DVS, Sicel Technologies, Morrisville, NC) are FDA approved for the prostate and could be used to provide in-vivo dosimetry in Cyberknife treatments.

Method and Materials:
A DVS marker was placed on a programmable respiratory motion phantom and a treatment planning CT was acquired. The DVS marker was identified as two fiducials, the readout being one fiducial and radio-opaque area around the MOSFET itself as second fiducial. All five gold seeds embedded in the phantom were identified as fiducials as well.
Two motion paths were run with the simulator, a sinusoidal motion with 15 mm amplitude in sup/inf and a patient motion. Both motion paths were treated with the DVS fiducial switched on, and then with the fiducial switched off as baseline. An image was taken at every non-blocked beam.

Results:
The software could track both radio-opaque areas within the MOSFET as fiducials. Only one in 35 images of both motion paths had a misidentified DVS fiducial, where the software identified a location between the radio-opaque areas as fiducial. In both incidences, the treatment delivery software created an ESTOP. The Synchrony correlation error for both motion paths and both fiducial tracking configurations was below 0.3 mm at all time, which is within the uncertainty of Synchrony tracking.

Conclusion:
The Cyberknife software can utilize the DVS marker as an additional fiducial marker. No differences between the Synchrony treatments with and without the DVS marker tracking switched on could be identified.
Further studies to test the tracking capabilities of the marker if oriented at different angles in the axial patient plane have to be done. Use of the DVS marker alone, without additional gold markers should be tested first in a solid phantom, and then in an anthropomorphic phantom to simulate soft tissue rotation and deformation.