

AbstractID: 6907 Title: Evaluation of the performance of an implantable dosimeter used in 4D-gated radiotherapy

Purpose: To evaluate the performance of an implantable dosimeter for treatment delivery and daily dose verification for 4D-gated radiotherapy

Method and Materials: The DVS® dosimeter from Sixel Technologies, Inc. measured doses delivered to a volume in a Quasar™ Respiratory Motion Phantom. DVS® measurements were compared to the Pinnacle's treatment planning results and to those made by a NIST-traceable calibrated ion chamber. Each dosimeter measured dose within the phantom's lung equivalent moving insert. The phantom was scanned on a GE Lightspeed RT-CT scanner using the 4D respiratory gating option. From the scans, a composite CT data set was built and an average GTV was defined within the lung equivalent moving insert. A treatment plan was created using the composite scans. Both the ion chamber and DVS® were used to track GTV dose. A second plan was created that uses a gated-beam able to deliver radiation to the GTV during the expiration breathing phases only.

Results: Both plans were created to deliver 200 cGy per fraction for 5 fractions to the GTV. The first plan included an average GTV that includes all the breathing phases. The DVS® and the ion chamber differed up to 3% from the Pinnacle average GTV plan. Measurements between the two dosimeters differed by 2.5%. Measurements made by the DVS® and the ion chamber for the gated-treatment are also comparable to those made using the treatment plan with all breathing phases.

Conclusions: The measurements made by the DVS® dosimeter falls within the device's specified accuracy of 3%. The Dose Verification System provides the ability to verify that the prescribed dose is delivered during 4D-gated treatments on a daily basis.

Conflicts of interest: Sixel Technologies, Inc provided the equipment and materials used in the study.