

AbstractID: 3137 Title: Evaluation of implantable MOSFET dosimeters for conventional and intraoperative radiation therapy

Purpose: To test the applicability and reliability of the manufacturer's calibration of implantable MOSFET dosimeters for use under differing clinical conditions. These include conventional radiation therapy and intraoperative radiation therapy, where the need for sterilizable, wireless telemetric sensors may make these detectors the best candidates for *in vivo* dosimetry.

Method and Materials: The implantable dosimeters were manufactured and factory calibrated by Sixel Technologies, Inc. We tested these dosimeters for conventional radiotherapy beams, where the detectors were placed in a phantom and exposed to 20 treatment fractions with daily doses of 1, 2, or 4 Gy. We also tested the detectors for use in HDR-IORT, where the detectors were placed in a constant-temperature (37°C) water phantom and irradiated with an HDR Ir-192 source with single treatment fractions of 10, 12.5, or 15 Gy.

Results: Under calibration conditions with conventional radiotherapy beams, we found the dose measured by the detectors using the manufacturer's calibration to be within $\pm 3\%$ of the delivered dose, with a standard deviation of 2%. Preliminary results support the robustness of the calibration for conventional radiotherapy beams with both higher and lower daily doses, with an increase in error as the daily dose deviates from the calibrated dose. When an HDR Ir-192 source was used, the measured dose showed a linear deviation from the delivered dose due to differences in energy, dose rate, and total dose per fraction. These results suggest the need for additional correction factors when these detectors are used for HDR-IORT and most likely also for IOERT.

Conclusion: We have verified the manufacturer's calibration of these dosimeters for conventional radiotherapy. With additional correction, these dosimeters appear to be an ideal choice for IORT.

Conflict of Interest Information: ASB has a sponsored research agreement with Sixel Technologies, Inc.