AbstractID: 11598 Title: Investigation of an implantable dosimeter for beam range verification in proton therapy treatment

Purpose: A recent study suggested that in-vivo point dose measurements may be used for range verification in proton therapy treatment. We investigated a commercial implantable dosimeter for this particular application.

Method and Materials: The implantable dosimeter of the DVS system with wireless reading (Sicel Technologies, Morrisville, NC) has been used for treatment verification for prostate and other treatments by photon fields, but not yet for protons. In general, point dose measurement cannot verify a proton treatment. It was shown recently, however, that if the uniform proton dose distribution is delivered by two separate fields with oppositely "sloped" depth-dose profiles, the ratio between the two doses measured by a point dosimeter can provide the residual range of the beam at the dosimeter location (Lu, *Phys. Med. Biol*. 2008 53, N415). Our experiments used "sloped" fields generated by a passive-scattering beam delivery system with the technique of beam current modulation. The "sloped" dose profiles were measured and calibrated using an ion chamber. A number of DVS dosimeters were used at a number of given depths in a water tank. The water equivalent path lengths (WEPL) to the dosimeters were then derived from the measured dose ratios and the ion chamber calibration.

Results: The measurements provided consistent dose ratios over repeated tests, with a standard deviation less than 1.5%. The translated variations in WEPL are less than 4 mm, although this can be reduced substantially by using steeper slopes. Variations between different dosimeters have similar magnitude. Large, but trendy deviations are observed between the derived and given WEPL values, probably due to the well known LET dependence of MOSFET devices.

Conclusion: While the reproducibility of the dosimeter in measuring dose ratio is encouraging, the LET dependence requires further characterization.

Conflict of Interest: Project partially supported by Sicel Technologies Inc., Morrisville, NC