AbstractID: 7189 Title: Dose Measurement Accuracy of TLD-100 in the Bragg Peak Region of a Therapeutic Proton Beam

Purpose: Measurements made in a proton beam indicated differences in dose calculated by the Eclipse (Varian, Milpitas, CA) treatment planning system and TLD measurements in a lung phantom. The differences were exceptionally large in the distal fall-off region of the spread out Bragg peak. This work investigates the accuracy of the TLD in regions of high LET as a potential cause for the dose differences seen.

Methods and Materials: All measurements were made along the central axis of an unmodulated 200 MeV proton beam, at a source-to-axis distance of 270 cm, 10x10 cm^2 field size, at varying depths along the Bragg peak. Measurements were made using TLD-100 powder flat packs, placed in a virtual water slab phantom. To validate our TLD results, the measurements were repeated using a parallel plate ionization chamber.

Results: The dose measurements using TLD-100 in a proton beam were accurate to within ±5.0% of the expected dose typically seen in photon and electron measurements. The ionization chamber and the TLD relative dose measurements agreed well with each other. Absolute dose measurements using TLD agreed with ionization chamber measurements to within ± 3.0 cGy for an exposure of 100 cGy.

Conclusion: The accuracy of the TLD is not a potential cause for the dose differences observed between the Eclipse calculations and our TLD measurements. This was further substantiated by the agreement of our ionization chamber measurements with TLD. Additional work must be done to identify the exact cause of dose discrepancy.