

AbstractID: 9348 Title: Direct RBE determination of therapeutic protons using a ΔE -E telescope

Purpose: A new monolithic silicon ΔE -E telescope was evaluated for hadron therapy applications by converting the physical data provided by the detector to relative biological effect (RBE) for both modulated and un-modulated therapeutic proton beams. **Method and Materials:** The ΔE -E telescope provides information on lineal energy and particle identification that is based on energy depositions within the ΔE and E stages of the detector, collected in coincidence. Thus, this detector provides additional information on the quality of radiation fields over existing microdosimetry systems. Since different particles with the same LET or lineal energy are known to have different RBE values, the combined lineal-energy particle identification data provided by the ΔE -E telescope is likely to be of radiobiological value. To investigate this, an RBE matrix based on established *in-vitro* V79 radiobiology data was developed linking the output of the device directly to radiobiological effect for two biological endpoints, RBE (10%) and low-dose-limit RBE(α). Experimental data was collected and analyzed for 100MeV modulated and un-modulated therapeutic proton beams within a homogeneous polystyrene phantom. **Results:** Proximal to the spread-out Bragg peak (SOBP), RBE(10%) and RBE(α) values of 1.2 and 3.2 respectively were determined from the measured response of the device. The high spatial resolution of the ΔE -E telescope allows for data collection in rapidly changing radiation fields, which is demonstrated with derived RBE(10%) and RBE(α) values of 1.82 and 4.85 obtained from the measured response of the device at the SOBP distal edge. **Conclusions:** This work has demonstrated the ability of the ΔE -E telescope to provide RBE data for proton radiation fields that is based on experimental *in-vitro* data for V79 cells. This system could have an application to both hadron therapy and radiation protection as it provides a means for estimation of RBE in "real-time" and verification of Monte Carlo simulations.