AbstractID: 8499 Title: Dosimetry Characteristics of the Discrete Spot Scanning Proton Beam at PTCH

Dosimetry Characteristics of the Discrete Spot Scanning Proton Beam at PTCH

Purpose: To present a summary of the dosimetry features of the discrete spot scanning proton beam at the Proton Therapy Center – Houston.

Method and Materials: Dose is painted spot by spot, layer by layer using narrow discrete spot proton beams. The maximum scan area at isocenter is 30 x 30 cm^2. Proton ranges (90% distal dose) span from 4.0 to 30.6 cm. Spot size depends on beam energy. The maximum and minimum monitor units per spot are 0.04 and 0.005. We have measured, using EBT film and ion chambers, the spot sizes in air, depth dose curve and profiles for various energies, and the linearity of the dose monitors. The absolute dose calibration standard for 1 cGy/MU has been established.

Results: As expected, the spot is asymmetric, due to the beam acceleration characteristics.
One sigma for the spot size in air varies from approximately 5 mm for 219 MeV to 15 mm for 72.5 MeV. The measured versus requested 90% depth dose agrees to within 1 millimeter over ranges of 10.5 cm to 30.6 cm. The dosimetry system is linear from 0.005 to 0.04 MUs. One MU is defined to deliver 1 cGy to 1 liter volume with 30.6 cm range for a 10 x 10 cm^2 field. The non-optimized spot plan penumbra at a depth of 25 cm for a beam with range 25.2 cm is approximately 1.5 cm and increases to approximately 1.7 cm at 10 cm depth for a beam with range of 10.5 cm. Spacing between spots to produce a $\pm$ 3% homogeneous dose volume has been studied.

Conclusions: The dosimetric characteristics of the discrete spot scanning proton beam have been collected as part of our clinical commissioning program.