AbstractID: 3859 Title: Evaluating a 2D Proton Spotscanning Profile

Purpose: A quantitative analysis tool for the evaluation of 2-dimensional dose deposition profiles resulting from irradiation with scanned proton beams is presented. Analysis is performed by calculating a γ index originally proposed for use in intensity modulated photon therapy.

Methods and Materials: At the Proton Therapy Center in Houston, currently under construction, quality assurance of scanned proton beams will be carried out with a scintillation plate and a CCD camera. In the absence of beam, a 2-dimensional dose distribution is generated by superposition of Gaussian profiles. It is compared to a desired dose distribution derived from the treatment plan. The γ index was computed for various generated dose distributions using software written using LabVIEW® for the purpose of this study. The difference between the generated and the desired dose distributions consists in different weights being assigned to individual spots, variations in the spot shape (FWHM), and misalignments of individual spots.

Results: For the investigated spot arrangement containing 121 spots uniformly distributed an o grid of 10x10 cm^2, nominal width σ = 8 mm, the method invalidates the treatment delivery for misplacements of the Gaussian beam spots larger than 2 mm, variations on spot weight larger than 12%, and variations in the spot shape larger than 16%.

Conclusions: The “gamma method” shows promise as a quality assurance tool for spot scanned proton beam.