

AbstractID: 5605 Title: Dosimetric Evaluation of Proton Field Matching by a Robotic Patient Positioner

Purpose: The objective of this study is to evaluate the accuracy from a dosimetry point of view with which proton field matching can be accomplished.

Method and Materials: This proton therapy center currently treats patients with a nominal 208 MeV proton beam in a single Fixed Horizontal Beam Line (FHBL) room that employs a double passive beam spreading system with a fixed range modulator. The FHBL room takes advantage of a novel robotic patient positioner system (PPS) providing 6 degrees of freedom with a specified accuracy of 300 microns when transiting up to a 200 kg payload.

To investigate field matching doses three methods are used: calculations from a treatment planning system, film dosimetry measurements and scans using a miniature ionization chamber. The field delivery for this study consists of four proton fields matched by the robotic PPS. The measurements are performed in a solid water phantom for the film and a water phantom for the ionization chamber scans

Results: The planned dose delivery for the central field is normalized to 100%. The average relative dose values in the field junctions are 128%, 135% and 130% for the ionization chamber scans, film dosimetry and treatment planning calculation, respectively. In this case this was thought to be clinically acceptable as the volume lay entirely within the target.

Conclusion: Proton therapy is suitable for treating volumes of relatively large area and shallow depth. In this way the ranged property of the protons can spare underlying structures. The sharp proton penumbra and precision of a robotic patient positioner simplifies field matching. Further study is underway with a half beam block to investigate the range of junction doses that can be expected under a variety of field matching conditions.