AbstractID: 10300 Title: Evaluation of a beam model applicable to small fields in TomoTherapy delivered dose distributions

Purpose: Helical TomoTherapy, as many other state-of-the-art delivery systems, uses the superposition of small fields to achieve a homogeneous and conformal target covering. We have developed and validated a beam model applicable to narrow beams that can predict dose distributions in water delivered with the helical TomoTherapy system. **Method and Materials:** This model takes into consideration the two main effects influencing the dose distributions for narrow beams: (i) the extension of the radiation source and (ii) the non-equilibrium conditions within the field. The shape of the radiation source is determined by a combination of a "slit-method" reconstruction and a collimator factor fitting procedure. The non-equilibrium conditions are taken into account by the use of the polyenergetic pencil beam kernel. The validation was performed in a 6 MV beam of a Siemens linac. It consisted in the comparison of measured output factors and planar dose profiles with those calculated, for circular and squared fields. The performance of the model was evaluated for simple static and dynamic TomoTherapy delivered distributions. **Results:** Validation tests showed good agreement (2%, 2 mm), between modeled and measured dose distributions for all the studied cases. The same result was observed in the TomoTherapy tests. **Conclusion:** As successfully validated, the model offers an alternative to the conventional dosimetry of small fields. Furthermore, it can be used as an independent dose verification tool for TomoTherapy dose distributions delivered in water.