AbstractID: 13109 Title: Investigation of intensity modulated compensator-based TBI for small children

Purpose: A study was performed to determine the feasibility of using inversely optimized solid modulators designed on a commercial treatment planning system for the purpose of total body irradiation (TBI) of small children. It is suggested that solid modulators will provide improved dose distributions relative to traditional TBI techniques as well as reduce errors in the setup of blocks since only a single device needs to be placed per field.

Method and Materials: A brass compensator model for a clinical 18 MV photon therapy beam was constructed for the purposes of intensity modulated radiation therapy. Using this model, two TBI treatment plans were constructed to deliver a single, AP beam to a small anthropomorphic phantom, representative of a six to twelve month old child. A third treatment plan was constructed using opposed AP/PA fields. Phantom irradiations proceeded according to these plans. TLD measurements were obtained at several anatomical positions for comparison to planned values, and traditional TBI plans were created for comparison to the intensity modulated plans. All plans used extended treatment distances.

Results: The TLD results indicate that dose delivery within +/- 5% of the planned value is achievable to all anatomical sites with the exception of the mediastinum and neck. This is attributed to the difficulty of providing full dose to the mediastinum, while reducing lung dose to acceptable levels. However, the compensator-based results are still clinically superior to the expected dose of standard TBI techniques.

Conclusion: Solid modulator-based TBI in small children can be successfully implemented using commercially available planning systems in either a single or dual field technique. Compared to traditional techniques, modulator-based TBI results in greater dose homogeneity, reduced hot spots, and the ability to more accurately reduce dose to selected anatomical areas while reducing the number of blocks required to uniformly deliver dose.