AbstractID: 11640 Title: The Application of a Novel Three Dimensional Dosimetry System to the Acquisition of Commissioning Data of Small Photon Fields

Purpose: To investigate the application of a radiochromic plastic 3D dosimeter to the measurement of commissioning data in radiosurgery fields. **Method and Materials:** In order to measure total scatter factors, a single cylinder of a radiochromic plastic (PRESAGE) was irradiated with five different radiosurgery fields uniformly spaced in a circular geometry. These square fields were delivered with a Novalis Tx system equipped with a high definition multileaf collimator (HDMLC) and ranged from 40 mm to 5 mm. The radiation-induced change in optical density within the dosimeter was digitized using a first generation laser based optical CT system. Additionally, a cylinder of PRESAGE was irradiated in a water bath with one 10 mm beam to measure percent depth dose. This dosimeter was digitized using a novel in-house high-resolution CCD based optical CT system. Gafchromic EBT film was used to validate the assumption of negligible cross-field scatter associated with the combined field geometry. It also served as an independent check of all PRESAGE measurements. **Results:** The total scatter factor measurements made with PRESAGE agreed with radiosurgery mini-ion chamber commissioning measurements with a percent error of less than 3.2% for 30, 20, and 5 mm fields. The percent error for the 10 mm field was 5.5%. The scatter measurements made with radiochromic film confirmed the validity of the combined field geometry and agreed with the commissioning data within 2%. PDD measurements showed good agreement with the high-resolution diode commissioning measurements with a competitive level of resolution. **Conclusion:** The PRESAGE and optical CT dosimetry system presents a new approach for the commissioning of radiosurgery fields, with many advantages. These include high-resolution 3D beam data measured with energy, dose rate, and directional independence, as well as a reduction in placement and volume averaging errors.