

AbstractID: 13082 Title: New Small Volume Scanner for Radiosurgery Beam Data Collection

Purpose: To determine the minimum dimensions of a water tank for small field Radiosurgery (SRS) and Stereotactic Body Radiation Therapy (SBRT) beam data collection. In addition, to describe the use of the small-volume tank in its movement to measure direct SAD data, such as TMR/TPR. **Methods and Materials:** After several iterations in tank design, a cylindrical water tank with dimensions 20 cm diameter and 40 cm high was felt to have enough scatter volume to yield results to full size water tank for SRS and SBRT beam data collection. The entire tank movement is directed by the usual 3D drives (X,Y,Z). A separate vertical drive in the tank can move the detector probe independently of the external drive such that it can be synchronized with the external Z-drive to keep the detector at a fixed SAD to obtain direct TPR/TMR profiles. For radial, transverse and diagonal profiles, the whole tank is moved across the beam to accumulate cross profiles at various depths determined by the vertical drive in the tank. PDD measurements can also be obtained. **Results:** Complete sets of beam data for a CyberKnife® SRS treatment unit were obtained with the new scanner (Output factors, Off-Center Ratios and TPR data) and compared to data taken with a large water tank scanner. All data compared favorably, with the greatest deviation appearing for the 60 mm collimator and 300 mm depth, where the small tank showed values past the penumbra region of about 0.5% less. Total scanning time for a single collimator to obtain TPR data and 10 cross profiles at 5 depths was under 10 minutes. **Conclusion:** A small volume scanning system was found to yield beam scanning results virtually identical to those obtained with a large water tank for small fields, with less acquisition time.