

AbstractID: 6760 Title: Dosimetric Evaluation of Radiophotoluminescent Glass Rod Detector; Measurement of Output Factors in Water for Cyberknife Stereotactic Radiosurgery System

Purpose: To evaluate the feasibility of the radiophotoluminescent glass rod detector (GRD) as a new dosimeter for measurement of the output factor in water for Cyberknife SRS system.

Method and Materials: In this study, GRD-301 glass rod dosimeter and FGD-1000 automatic reader are used. The output factor measurements with the GRD were compared with those with a PTW 60008 p-type silicon diode detector, PTW 31006 pinpoint chamber and a Gafchromic film (Type MD-55). The output measured with GRD, pinpoint chamber and diode was performed at a depth of 1.5 cm in water phantom. The GRD was irradiated in a water phantom using a holder stand, which was custom designed for this study. The holder is composed of the PMMA tube with a hole for GRD at 1.5 cm from its top. The center of the GRD was set to be the center of the radiation field by aligning with a point laser built into the LINAC. The film was placed at the depth in the polystyrene phantom at which the maximum dose was achieved.

Results: The measured output factors with four dosimeters show very similar results except for three smallest collimators (5, 7.5 and 10 mm). The mean value of the output factor for GRD in the 5 mm collimator is 0.705. The pinpoint chamber output is approximately 11% lower than the corresponding GRD values at the 5 mm collimator. The GRD output is 11% and 4.1% lower than pinpoint chamber and diode, respectively. The GRD results were in good agreement with those from the Gafchromic film for almost all the collimators.

Conclusion: The GRD represented a high accuracy dosimeter for small field dosimetry. Future study will be devoted to investigate for possibility of using GRD for quality assurance audit program of stereotactic radiosurgery units.