AbstractID: 13924 Title: Dosimetric performance of the plastic scintillation detector for radiosurgery quality assurance

Purpose: To compare the performance of a plastic scintillation detector (PSD) for quality assurance (QA) in stereotactic radiosurgery to micro-chamber, gafchromic films, shielded and unshielded diodes. **Method and Materials:** The PSD consists of a 1 mm diameter by 1 mm long scintillating fiber (BCF-60, Saint-Gobain Inc.) coupled to a polymethyl-methacrylate optical fiber (Eska premier, Mitsubitshi). Output factors and dose profiles for apertures used in radiosurgery ranging from 4 mm to 40 mm in diameter have been measured with the PSD, a micro-chamber (MC) (A16, Exradin), a shielded diode (SD) (type 60008, PTW), an unshielded diode (UD) (SFD stereotactic, IBA Dosimetry) and gafchromic EBT films. Moreover, a typical stereotactic radiosurgery treatment using 4 non-coplanar arcs was delivered on a spherical phantom in which UD, MC or PSD was placed. Using the Xknife planning system (Radionics), 15 Gy was prescribed at the isocenter, where each detector was positioned. **Results:** The output factors measured with the PSD are within a maximum discrepancy of 3.5% compared to UD for the small apertures when normalized to the 35 mm cone. For larger cones the PSD is within 1.3% compared to the SD and the MC. When done with a 35 mm cone, the measured dose for an entire typical stereotactic plan by the PSD is within 1.8% of the measurement performed using the MC and within 1% of the planning system. Volume averaging of the MC can be observed for the 5 mm aperture, where the PSD measurement differs by as much as 9.1%. **Conclusion:** For stereotactic radiosurgery treatment verification, the PSD gives accurate results compared to the MC once the output factor ratio of both dosimeters are taken into account to correct for the averaging effect of the MC. The PSD shows great potential for stereotactic radiosurgery QA measurements.