# AbstractID: 13185 Title: Performance evaluation of a new-model p-type Si diode for small field dosimetry

**Purpose:** Accurate small field characterization affects patient safety and success in stereotactic radiosurgery (SRS). This study provides critical characterization data for clinical implementation of a new *p*-type Si scanning diode, the Exradin SD1, for SRS dosimetry.

**Method and Materials:** SD1 performance was compared against the Scanditronix-Wellhöfer SFD stereotactic diode and PTW PinPoint® ionization chamber for a 6 MV beam. Percent depth dose (PDD) curves for square, jaw-shaped fields (12, 24, 40, 80, and 98 mm) and diagonal profiles at 5, 14, 25, 50, 100, 200, and 350-mm depths (98×98-$mm^2$ field) were attained in a large water phantom. Scatter factors were calculated from output measurements in a 30×30×30-$cm^3$ water tank at 100-cm SSD, 5-cm depth for MLC-shaped square field sizes of 6, 12, 18, 24, 36, 42, 60, and 80 mm (98×98-$mm^2$ reference field).

**Results:** SD1 PDD data agrees well with SFD diode and pinpoint chamber data at depths $\geq d_{max}$ for all measured fields. The SD1 over-estimates dose in the buildup region, likely because its design includes a 3.5 mm dome of buildup material over the active detector. Displacement of the effective measurement point from the SFD diode surface is 0.7 mm. Both SD1 and SFD diodes over-estimate PDD for fields ≥40 mm, likely from silicon's increased sensitivity to low-energy scatter. All three dosimeters produced similar beam profiles at all depths, excepting minor disagreement in the tail regions. The SD1 diode exhibited no drift (change in response over time), possibly due to higher outputs yielding smaller percentage drift. SD1-measured scatter factors trend higher than their ion chamber-measured counterparts with poor agreement for the smallest (6mm) field size evidenced by large absolute differences in measured values between all three dosimeters.

**Conclusion:** Exradin SD1 performance for small field measurements has been evaluated, providing critical characterization data for its clinical implementation for SRS dosimetry.