AbstractID: 3125 Title: In-vivo diode dosimetry for IMRT treatment dose verification

Purpose: To investigate how diodes respond to various IMRT beam conditions and to evaluate the feasibility of using in-vivo diode dosimetry for IMRT treatment delivery verification.

Method and Materials: A series of dynamic MLC files were created to simulate IMRT fields. Diodes and a Farmer chamber were used to measure IMRT doses at dmax in a phantom. Dose dependence on field size (FS), sliding window MLC leaf gap width, SSD and energy was investigated. In-vivo diode dosimetry was also used for patient IMRT treatment dose verification and compared with IMRT plan calculations.

Results: Measured doses decreased with decreasing FS and MLC leaf gap. Diode readings agreed with ion chamber at dmax to within 3%. All measured data points were fitted to a straight line of "Measured Dose" vs. "%Primary Beam", with a slope of 0.945, intercept 0.04 cGy/MU, and correlation coefficient 0.997. For a given FS and leaf gap, measured doses increased with decreasing SSD. SSD dependence for ion chamber agreed with Inverse Square Factor (ISF) to ~1%. Diode SSD dependence deviated ISF by 1~4%.

Conclusions: In measuring IMRT dose at dmax in phantom, diode readings agreed with ion chamber to within a few percent. Diode correction factors for SSD, FS, leaf gap, and energy dependence in IMRT treatment fields are small. Our study has shown that diode dosimetry can be used for in-vivo patient IMRT treatment delivery verification. In most cases, in-vivo diode measurements and IMRT plan calculations should agree to within ±7%. It is important to select a low dose gradient region from IMRT plan for diode placement. Larger discrepancies between measurements and calculations usually can be attributed to high dose gradient, errors in patient setup and diode positioning, and SSD change.