

## AbstractID: 8676 Title: Correction for directional response of a 2D ion chamber array for quality assurance of arc radiotherapy and IMRT

**Purpose:** To characterize the directional response of a 2D ion chamber array (PTW Seven29) and implement techniques for its use in dose verification of arc and IMRT radiotherapy.

**Method and Materials:** The directional response of the 27x27 ion chamber array was measured for 10cm, 7cm and 4cm square fields irradiated at a range of gantry angles from 0° to 180° relative to the vertical. For verification of IMRT or arc plans, two methods are proposed for using the Seven29 in combination with rectangular slabs of solid water. The first method requires adding an attenuation shell to the solid water in the treatment planning system (TPS) to compensate for the Seven29 directional response. The second method employs two Seven29 measurements with opposing orientations of the measuring device. The measured dose is estimated to be  $0.53 * [Dose_{up}(i,j) + Dose_{down}(j,i)]$  where the subscripts indicate the orientation of the Seven29 and  $i, j$  are indices of the ion chamber array. These methods were tested on an arc plan with a 5x5 cm<sup>2</sup> field size.

**Results:** Measurements of the Seven29 indicate a relatively flat response for gantry angles from 180° to 150° decreasing to about 97% at 135°. Posterior beams show a uniformly flat response of 89% across a range of beam angles. The directional response was found to be independent of the field size. Measured dose profiles of the arc plan were found to be 3.8% lower than the calculated dose without correction. Using method one, the agreement was within 1.4%. For method two, corrected chamber readings were within 1% of the TPS values.

**Conclusion:**

The Seven29 is a valuable tool for verification of arc and IMRT treatments. Through the characterization of its directional response, accurate 2D maps can be generated for quality assurance of the radiation delivery of complex IMRT or arc plans.