AbstractID: 13615 Title: Design and verification of a phantom for accurate delivery of prostate treatment plans to cells in-vitro

Purpose: *In-vitro* investigations are typically performed using a single beam of radiation normally at kV energies. Emerging data has raised questions over whether this methodology results in outcomes that are representative for advanced radiation oncology delivery techniques such as IMRT and VMAT. It is important that cellular studies are undertaken in clinically relevant configurations. This requires the design of suitable phantoms and careful verification of the dosimetric accuracy of the delivery of different IMRT and VMAT techniques to the cells.

Method and Materials: A PMMA phantom with an insert for a media filled T75 flask was designed and constructed. Conformal, IMRT and VMAT plans were created using Oncentra MasterPlan v3.3sp1 (Nucletron, BV) such that a uniform dose encapsulated the cell layer. All plans were subsequently recalculated on a CT scan set of a) a Farmer ionization chamber and b) a 2D ionization chamber array (IBA MatriXX Evolution) positioned between slabs of 30x30cm solid water. A constant dose-rate was assumed during the planning process and a Varian 600CD with 120 leaf millennium MLC at 6MV used. Calculated and measured plans were compared using gamma criteria of 3%/3mm for the 2D array. Each plan was delivered to the phantom with Gafchromic EBT film placed at the bottom of the flask. Film measurements were compared with those calculated.

Results: Ion chamber results were within 1.8% of the expected value for all plans. All plans resulted in more than 98.7% pixels passing the gamma criteria. Gafchromic EBT film measurements were within 1.7% of those planned.

Conclusion: A PMMA phantom has been constructed which has minimal air gaps and ensures accurate and uniform delivery of dose to cells within a T75 flask. This phantom can be used for *in-vitro* studies of complex delivery modalities to cells.