AbstractID: 5803 Title: Feasibility of using a 2D diode array system for clinical electron beam measurements

Purpose: To investigate the feasibility of using a 2D diode array system for clinical electron beam measurements

Method and Materials: Dose distributions were measured for electron beams (EBs) generated on an Elekta Synergy LINAC (Elekta Ltd., UK). Beam data were measured using the Blue Phantom and converted on OmniPro-Accept (Scanditronix Wellhöfer, Bartlett, TN) according to AAPM TG 51. These data were used to commission Eclipse TPS (Varian, Mountain View, CA). MapCheck Model 1175 (Sun Nuclear, Melbourne, FL), a 2D diode array system, was exposed using largest applicator size 20cm×20cm at SSD 123.5cm for array calibration. Central axis dose was also calibrated. Plans were generated and measured by MapCheck for several different geometries. Exported plans were compared with measured dose map using comparison criteria of ±3% difference and ±3mm distance-to-agreement (DTA) within 10% isodose-line threshold. Set-ups include different cone sizes (field sizes) and energies at different SSD's, irregular surface, and different depths. Direct comparisons between MapCheck and ion chamber results were also performed.

Results: Output factors measured with MapCheck and ion chamber agree within 1.3%. Comparison of measured and planned electron beam dose maps for 9MeV EB with 14cm×14cm applicator, SSD=100cm, depth=2cm showed 99.7% passing rate for stated criteria. Central axis dose differed by 1.6%. Passing rates and central axis dose differences for two electron applicators (10×10 and 14×14) at different SSD's (95.4, 100, and 104.4) were also summarized. Overall, >90% passing rates and <3% central axis dose differences can be achieved. Most of the failed points are at the edge. A stepped phantom was also tested and is under further investigation.

Conclusions: Preliminary results show that MapCheck can be used to perform quick and relatively accurate electron beam dose map comparison. It may also prove useful for electron beam intensity-modulated radiotherapy (EB-IMRT) measurements in the future.