AbstractID: 6542 Title: Modeling an aSi portal imager response using a commercial treatment planning software

Purpose*:* Quality assurance (QA) for intensity modulated radiation therapy (IMRT) plans is substantially more complex and time consuming than for conventional plans. Electronic portal imaging devices (EPIDs) can be employed to improve the efficiency of the QA process. The major objective of this work was to model the EPID as a machine, which is used to calculate the planar dose from an IMRT field. This planar dose can be compared directly to the measured EPID image for the purpose of pre-treatment dosimetric verification of an IMRT field.

Materials and methods*:* The investigations were performed for a 6MV photon beam and an aS500 type EPID attached to a Varian Clinac 21EX linear accelerator (Varian Medical Systems, Palo Alto, CA). Planar portal images were acquired, with the EPID positioned at 100 cm source to axis distance, for a variety of fields defined by jaws and multi-leaf collimators. From the measured planar portal images, cross-plane and in-plane profiles were derived. Similarly, relative output factors, defined as the ratio of greyscale in a central 1 cm square region of interest for an arbitrary field to the greyscale in a reference 10 cm square field, were extracted. Using physics commissioning tools, the data were used in Pinnacle$^{3®}$ (Philips Medical Systems, Madison, WI) treatment planning software to model the response of the EPID at a single depth. The EPID model was tested and then clinically used to calculate pre-treatment portal images of individual beams for the IMRT test plan.

Results and conclusions: The Varian EPID was successfully modeled as a machine in Pinnacle$^{3®}$ to calculate a planar dose map of an IMRT field at isocentre under 3cm of water that corresponds directly to the EPID image. The model was tested with various IMRT patterns, giving good agreement between calculated and imaged dose maps.