AbstractID: 8784 Title: Evaluation of PRESAGE/optical-CT 3D dosimetry for commissioning a Linac for IMRT

Purpose: PRESAGE is a novel radiochromic plastic which, in combination with optical-CT imaging, has been shown to have outstanding potential for high-resolution three-dimensional (3D) dosimetry. Here, the first application of PRESAGE/optical-CT to commissioning a new accelerator for IMRT treatment is presented. Commissioning was achieved using a modified Radiological Physics Center (RPC) IMRT credentialing phantom that enabled 3D dosimetry.

Methods: The RPC phantom was CT scanned twice, first with the standard insert and second with the modified PRESAGE insert. A 9-field IMRT plan was created in the Eclipse planning system to meet the credentialing requirements on the standard CT-scan, and to deliver 6.6Gy to the primary PTV. This plan was then recalculated on the second CT scan incorporating the PRESAGE insert. In the latter case, the prescription dose was reduced to 4Gy to avoid over-exposing the dosimeter. Consistent relative fluence between the plans was verified by MapCHECK and DynaLog file analysis. After irradiation, evaluation of the PRESAGE/optical-CT system was performed by comparison with the independent film and TLD measurements made at the RPC. Profile comparisons and gamma maps were generated to compare both sets of measurements with the eclipse planning dose distribution.

Results: An improved acquisition technique led to high quality low noise 3D data (<1% rms) achieved using the PRESAGE/optical-CT system. Excellent agreement was observed (gamma criteria of 3%, 2mm) between the PRESAGE and the Eclipse distributions. Similar agreement was observed between the corresponding EBT and Eclipse distributions.

Conclusion: Prior studies from the RPC have shown IMRT commissioning is non-trivial and prone to error. This work demonstrates successful integration of PRESAGE/optical-CT dosimetry in the RPC IMRT credentialing phantoms. The high quality of the 3D dosimetry data (noise ~1%, accurate to within 3%) represents a significant improvement over previous work with PRESAGE, and a new tool for comprehensive verification of IMRT treatments.