

AbstractID: 14051 Title: 3D dosimetric verification of Ir-192 HDR brachytherapy source irradiation

Purpose: Experimental verification of brachytherapy dose distributions, especially closer than 1 cm from the source, is very difficult with current dosimetry tools. PRESAGE, a 3D radio-chromic plastic, has already shown promise in the realm of high energy clinical radiation dosimetry. We present a 3D verification of an IR-192 HDR brachytherapy dose distribution based on the PRESAGE/Optical-CT dosimetry system.

Method and Materials: A 6cm diameter by 10cm height cylinder of PRESAGE was made with a 7cm long by 2mm diameter channel in the center. Irradiation took place using a GammaMed 12i HDR source, and one dwell position for total irradiation time of 37.8 seconds. Measurement of the dose distribution consisted of using an in-house optical-CT scanner with reconstructed pixel size of .6mm. The following parameters were used for image acquisition: 900 projections at .2 degree spacing, 5 exposure averages per projection, and 0.0774mm pixel size. Reconstructed resolution was 1.2mm. Comparisons were made of the measured dose distribution from PRESAGE with Eclipse treatment plan for a single dwell irradiation.

Results: Eclipse data and PRESAGE data were normalized to relative dose distributions to the point 1cm from the transverse bisector. PRESAGE profiles in transverse plane agree with Eclipse profiles to ~5% between .6 cm and 2 cm from the source position. There was a loss in PRESAGE measurement data due to edge reconstruction artifacts extending to 3mm on either side of the channel.

Conclusion: We have shown that the PRESAGE/Optical-CT system is capable of providing a 3D dose distribution Eclipse verification of a simple Ir-192 HDR irradiation. The unique features of the system are very high spatial resolution isotropically in 3D, simplicity (lack of need for an external container) and robustness (e.g. lack of sensitivity to oxygen contamination).

Conflict of Interest (only if applicable): None.