

AbstractID: 10150 Title: Brachytherapy TPS QA using EBT model GafChromic film

Purpose: We describe a method for quality assurance (QA) test that assesses all steps of conformal CT-based high dose rate (HDR) brachytherapy. A procedure was developed to compare dose distribution generated by the treatment planning system and measured by the EBT model GAFCHROMICTM film within a dedicated brachytherapy QA phantom.

Method and Materials: A phantom consists of 3 catheters embedded in a surface plane of 2 cm thick slab of solid water (SW) mimicking the Fletcher GYN applicator set. Additional slabs of solid water were added above and below this slab to provide full scattering conditions. A single sheet of EBT model GAFCHROMICTM film was placed 2 cm below the plane containing the catheters. Dose distribution, mimicking the GYN treatment, was calculated in OnCentra Brachy treatment planning software and dose distribution within the film plane was exported in DICOM format. Same plan was delivered to the phantom containing the film, and dose distribution was measured using our novel extended range radiochromic film dosimetry protocol, which employs all three channels of the film absorption spectrum and can measure dose in the range from 0.02 to 100 Gy. Calculated and measured dose distributions were compared within FilmQA software in terms of gamma function. Comparison was made over region of interest (ROI), defined by region containing isodose $\geq 5\%$ of prescription dose.

Results: Based on recommendations given in the commissioning of brachytherapy treatment planning systems section from IAEA TRS-430 report, we have established a 5% dose/2 mm distance criterion for gamma function. We found that 95% of points within ROI were passing this criterion.

Conclusions: QA method described provides a comprehensive verification of all the steps involved in CT-based HDR brachytherapy. We recommend the method to be used during commissioning process and once a year as a part of brachytherapy QA program.