

AbstractID: 9356 Title: Characterization of a small photon beam for radiosurgery using GafChromic EBT film in a water phantom

Purpose:

According to the literature radiochromic film GafChromic EBT® (ISP Corp., USA) is an excellent detector to be used for small beam dosimetry. By using the fact that these films can be immersed in water for radiation measurements, this work investigates its performance in a water phantom for small beam measurements.

Method and Materials:

Tissue maximum ratios (TMR), total output factors (OF) and off axis ratios (OARs) were measured in a water phantom (MP3XS, PTW-Freiburg, Germany) using GafChromic EBT® film and a shielded solid state detector (PFD^{3G}, IBA-dosimetry, Germany). Circular collimators (4 to 20 mm in diameter) coupled to a dedicated 6 MV linear accelerator (Novalis®, BrainLAB, Germany) were used. Films were calibrated against an ionization chamber at d_{max} covering a dose range from 0.01 to 450 cGy. Analysis was performed using a commercial flat bed scanner (Microtek 9600XL) in transmission mode at 100 dpi and 48 bit color depth (RGB format). The films were carefully handled and analyzed following the recommendations of the TG55 report and those proposed by others authors. The measurements using both detectors were compared to evaluate accuracy and reproducibility.

Results:

The reproducibility of the EBT film is reported to be within 1-2% using a commercial flat bed scanner. The highest differences between GafChromic EBT film and diode measurements for all circular collimators were 0.87%, 2.69% and 7.61% for OAR, OF and TMR, respectively.

Conclusion:

The use of GafChromic EBT immersed in a water phantom allowed reliable dose measurements. Although differences are present in the TMR values, the fact that the diode is not tissue equivalent as the film may explain these differences. The use of Monte Carlo simulations may be helpful to enlighten this issue.

Conflict of Interest (only if applicable):

None