AbstractID: 5203 Title: Comparison of film based IMRT verification with EPID based fluence verification

Purpose:
With increasing application of IMRT, its QA should become much more time-efficient. This work compares patient specific QA procedures based on absolute EPID dosimetry with EDR2 absolute film dosimetry. A gamma value acceptance protocol is assessed for both methods.

Method and Materials:
Our patient specific QA method is a fluence check of the dynamic IMRT fields. With film dosimetry, each field is delivered on film perpendicular to the beam at 3cm depth in polystyrene. Gamma values are calculated to compare measurement and TPS calculation. For EPID, a commercial portal dosimetry system was used. The fluence distribution calculated with a portal dose prediction algorithm was compared with the measurement.
As the gradients in the EPID signal are much steeper than phantom dose distributions, the gamma value calculation algorithm was adapted for taking into account the interplay between quantization and high gradients.
For the 70 fields of the reference set (14 patients) gamma values were calculated for 81 constraint pair combinations (1mm to 5mm,1% to 5%). An agreement score (AS) was calculated as the percentage of pixels in the field aperture having gamma values smaller than 1. Agreement was considered perfect for AS>99%. Sensitivity of the procedure was set by applying an acceptance level of 90% perfect agreement on the reference set.

Results:
The 90% acceptance is reached at 3.6%\3.6mm for denoised film dosimetry and at 3.1%\3.1mm for EPID dosimetry. Noise in the measured film dose distribution pulls the iso-sensitivity lines to lower values of the % constraint. The 90% acceptance is reached at 2.76%\2.76mm.

Conclusion:
There is confirmation for the important influence of noise on gamma value based acceptance protocols for film dosimetry. The results show that in order to have equal sensitivity for EPID and film QA, different gamma value constraint pairs should be used.