area. Different analysis techniques have been proposed to increase the accuracy of radiochromic films dose distribution measurements.
The aim of this work is to compare the results obtained whit different analysis techniques in assessing dose distribution for IMRT photon beams pre-treatment verification.
Materials and Methods: Gafchromic®EBT3 films have been calibrated irradiating 5x5 cm film pieces with a 6 MV linac photon beam at different dose levels in a range from 10 to 400 cGy at 5cm depth in PMMA phantom and SSD 95 cm. Then 40 IMRT clinical beams have been verified by gafchromic films with the same irradiation setup. Films have been scanned with a Epson 10000XL flatbed scanner 24 hours after irradiation and dose distributions have been assessed using an home-made software. Our software allows to perform analysis in 4 different ways: red channel (R) analysis, red channel analysis with the correction for the scanner non-uniformities (RC), the red/blue channels (RB) analysis and the 3 channel (RGB) analysis using formulas proposed by Mayer (Med. Phys. 2012). The films absolute dose distributions obtained have been compared with the calculated ones by means of 3%(local)/3mm gamma analysis.
Results: Gamma analysis pass rates obtained with RGB analysis (98.0±2.7) are higher than pass rates obtained with all the other analysis approaches, while the lowest mean pass rate (88.9±13.3) has been obtained, as is was expected, evaluating the dose distribution using the R analysis. Comparing RB and RC techniques, the last one provide better results (96.5 ± 3.4 vs 94.1 ± 7.2). Moreover standard deviations of mean values are inversely proportional to gamma pass rates meaning that methods giving higher pass rates are also more consistent.
Conclusions: The newly proposed three channels analysis allows to take in account different source of inaccuracy increasing the gafchromic films capability to measure IMRT dose distributions.

PO-0789
MLC leaf position stability of a 160-leaf MLC measured using EPID.
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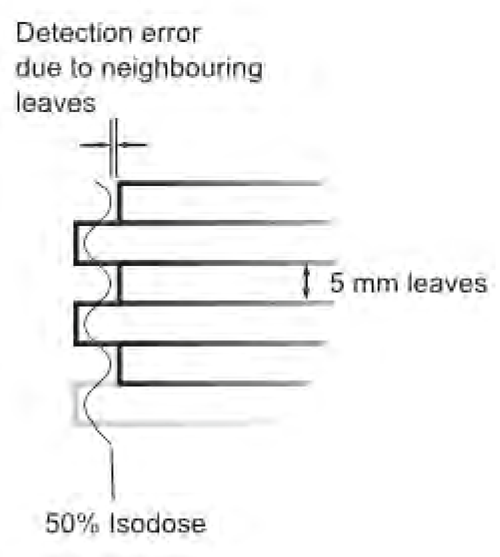
Purpose/Objective: Verification of the position of MLC leaves is an essential part of routine linac quality assurance. This is particularly true when more advanced treatment techniques such as VMAT/RapidArc and IMRT are used. These treatments are typically built up out of smaller, possibly abutting fields, amplifying the effect of any mispositioning of the leaves. The Elekta Agility MLC (Elekta, Crawley, UK) has 160 leaves, with 0.5 cm effective leaf width in the isocentre. It comes with an automated tool to calibrate the leaf position offsets and motion gains. This is a 'black-box', and direct control over leaf positioning is no longer possible, but independent verification is still essential. The aim of the research presented was twofold: 1. To test the MLCSoftEPID software (PTW, Freiburg, Germany) as a quick tool for routine MLC QA, as an alternative to detector arrays or film. 2. To test the positioning stability of the Elekta Agility MLC.
Materials and Methods: An Elekta Synergy linac fitted with an Agility MLC was used. The EPID used was an IviewGT amorphous silicon 1024x1024 pixel EPID, with a 41x41 cm detection area (Perkin-Elmer, Waltham Massachusetts, US). MLCSoftEPID software was used for analysis. This software package requires a standard set of EPID images to be acquired for accurate alignment of the coordinate system of the EPID panel in relation to the linac collimator, followed by a series of strip images from which the leaf positions are then determined, analogous to a picket-fence test. Measurements were compared to our institute's standard SLA-48 (PTW, Freiburg, Germany), a linear array of ionization chambers mounted on a stepper motor. To test whether the measurement of a leaf's position is influenced by the position of neighbouring leaves, images were also made with all odd-numbered leaves intentionally offset by 2 mm compared to even-numbered leaves. In this case, the 50% dose level is no longer directly beneath what would normally be considered the leaf position, due to the nonzero size of the point spread function (see figure). Positioning accuracy for each leaf was tracked biweekly over a period of multiple months.



Results: A routine leaf position QA check using MLCSoftEPID can be done within 10 minutes. Consecutive leaf position measurements using the EPID were found to be reproducible within 0.1mm every time, comparable to or better than traditional alternatives, and agree with conventional SLA-48 measurements within 0.3 mm. Over the 3 months during which leaf stability was measured, all individual leaf positions of the Agility deviated by less than 0.2mm. A non-negligible effect caused by a mispositioning of neighbouring leaves on the position of a leaf as measured by EPID was found. The size of this effect is on the order of 25% of the neighbouring leaf's offset.
Conclusions: The leaf positioning stability of the Elekta Agility is within 0.2mm, over a 3 month period half a year after installation. The MLCSoftEPID software is a useful alternative to current methods of leaf positioning QA used in our institute.

PO-0790
DVH measurements for VMAT
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Purpose/Objective: Due to the complexity of volumetric modulated arc therapy (VMAT), new verification techniques are required. Some new systems allow calculation of DVHs from the measured dose distribution. In this feasibility study we compare this feature in the commercially available 3DVH option of ArcCheck (SunNuclear) with the EPID based 3D dosimetry approach that was developed by the NKI-AVL in Amsterdam and that is being tested in our hospital.
Materials and Methods: For two different clinical VMAT cases (prostate & oesophagus) planned with MONACO (Elekta) we measured the clinical treatment plans on a cylindrical phantom with ArcCheck and a rectangular phantom with EPID dosimetry at a Synergy (Elekta) linac. ArcCheck translates deviations measured by the diodes at the outer boundary of the phantom to deviations in the delivered patient dose.The EPID dosimetry uses a back projection algorithm to convert doses measured at the EPID to 3D doses inside the patient or phantom. To study the sensitivity of both methods, two types of delivery errors have been introduced in the delivered treatment plans. Systematic errors in the leaf position calibration of 0.5, 1, 1.5, and 2mm (open or close) and fixing leaf positions during treatment (of 1 or 2 leaves). We have compared the gamma-statistics (3%/3mm) and the measured and planned DVHs.