**Material and Methods:** Six ionization chambers, essentially identical in design but varying in radius of the sensitive volume from 0.1 cm to 0.6 cm, were modelled using the C++ class library egspp of the Monte Carlo code EGSnrc [Kawrakow 2009]. In order to calculate the beam quality factors, Monte Carlo simulations were performed placing the chamber models into a water phantom at 10 cm depth using a Siemens PRIMUS phase space [Pena 2007] and at 5 cm water depth using a 60Co-spectrum [Rogers 1987]. The perturbation factors were determined following the process described by [Wulff 2008]. For the calculations, magnetic field strengths from 0.0 T to 3.0 T were used.

**Results:** The beam quality factors of all chambers differ from the values without magnetic field with a maximum of ±3% depending on the magnetic field strength. The highest influence on the beam quality factor can be found for the replacement and the central electrode perturbation factor. Moreover, these two factors show the highest dependency on the magnetic field strength.

**Conclusion:** Magnetic field specific perturbation and beam quality factors of six different Farmer chambers were calculated. The results indicate that chambers with a small sensitive volume show less influence of the magnetic field. In order to measure dose with ionization chambers in a magnetic field correctly, beam quality factors have to be determined for every individual chamber and every magnetic field strength.

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**PO-0815**

**Impact of digitizer response and time averaging de-noising in radiochromic film dosimetry**

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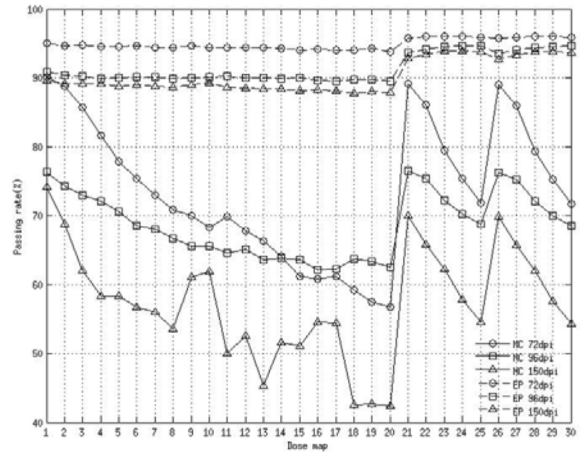
**Purpose or Objective:** To study how noise and digitizer response affect radiochromic film dosimetry. The variations introduced because of these factors in gamma scores is determined.

**Material and Methods:** Five VMAT treatment plans were analyzed in this work. Two dose planes (coronal and saggital) were verified for every treatment plan, they were irradiated in a MULTICUBE phantom (IBA, dosimetry), measured with the Matrixx chamber array (IBA, Dosimetry) and analyzed with the Omnipro I'm RT (IBA, Dosimetry). Once the plans were accepted for clinical treatment, the analysis of the same dose planes was carried out with radiochromic films and two different algoritms: the multichannel protocol of Mayer et al (MC), that corrects the lateral effect of the digitizer and minimize the amount of noise, and the efficient protocol of Lewis et al (EP), that keeps the corrections included in the multichannel protocol and corrects the digitizer variability with a two point recalibration. Radiochromic film dosimetry is affected by knwon factors as digitizer lateral effect, noise and variability in digitizer response. These factors affect the gamma scores. In particular, when the dose plan obtained from the film is used as the reference distribution in the gamma analysis, the amount of noise and changes in digitizer response may give rise to wrong gamma evaluations. Every film was digitized with three different resolutions (72, 96 and 150 ppp), and twenty digitalizations were obtained for every resolution. For every single digitized image a dose map was obtained with the two mentioned algorithms and, in addition, dose maps from averaged images were analyzed (dose maps 21 to 25) and averaged dose maps were also analyzed (dose maps 26 to 30)

**Results:** In the figure, results of the passing rate of a prostate VMAT coronal dose plane evaluated with radiochromic film are shown for the 2mm, 2% criteria.




**Conclusion:** The multichannel protocol is not able to compensate variability in digitizer response, and this is a central issue for radiochromic film dosimetry. The efficient protocol compensates variations of digitizer response, so parameters of the gamma analysis become more stable. The compensation of variability in digitizer response by the efficient protocol may be used for de-noising by time averaging and gamma analysis results may be improved for all resolutions.

**PO-0816**

**Sensitivity and reproducibility of the portal imaging panel for routine FFF QC measurements**

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**Purpose or Objective:** The purpose of this work was to see if the EPID is a viable alternative to other QA devices for routine FFF QA measurements.

**Material and Methods:** Sensitivity measurements were made to assess response to small changes in field size, beam steering, and energy. A series of QA plans were created where field size was varied from baseline values in small increments. Field size: (5-5.5cm, 20-20.5cm) 1mm increments. Beam steering was adjusted by manually altering values in service mode. Beam steering: (Symmetry 0-3%) 1% increments. Symmetry was defined using the maximum variation method (Dx-D-x)max. Energy was varied by placing small quantities of Perspex into the beam path (0-6cm), 2cm blocks. These plans were then measured using the portal imager (aS1200 DMI panel), QA3 (Sun Nuclear), and Starcheck Maxi (PTW). EPID beam data was taken from the Portal Dosimetry module in ARIA and exported into Excel for processing; FFF beam parameters as stated in Fogliata et al [1] were calculated. Starcheck data was also exported to allow for similar analysis. The increment measured by each of the devices was compared to the known increment set by looking at the differences between the baseline (no increment) measurement and the incremented one.
Constancy measurements were then taken on an ad-hoc basis over a period of 5 weeks using all 3 QC devices to measure a MLC defined 20x20cm field and the results were recorded.

**Results:** Overall the EPID and the Starcheck performed better at detecting changes in field size (Average difference from set offset: EPID = 0.28mm, Starcheck = 0.33mm, QA3 = 0.88mm), with the QA3 performing better when detecting changes in beam symmetry (Average difference from set offset: EPID = 0.10%, Starcheck = 0.20%, QA3 = 0.07%). Energy changes were looked at using the slope parameter (EPID - range 0.295-0.309 %/mm for 0-6cm of Perspex), (Starcheck - range 0.31-0.315 %/mm) or the Energy parameter (QA3 - range 104.7-109.1%).