

**Purpose:** Evaluate the sensitivity of 2D and 3D dose arrays in detecting multileaf collimator (MLC) positional errors during Smart-Arc pre-treatment verification delivery.

**Materials and Methods:** Four Smart-Arc patient treatment plans of different tumor sites were delivered on three different phantoms: 1) Delta4, 2) Seven29 OCTAVIUS and 3) MatriXX. MLC files for each plan were exported to an in-house MATLAB program and two set of errors were introduced: 1) Systematic error: MLC bank shifted 1.0, 3.0 and 5.0mm and 2) Random error: Selected MLCs (ten leaf pairs) shifted 1.0, 3.0 and 5.0mm. The new sets of MLCs were used to create six additional plans. A total of seven plans were delivered for each of the patients. The original delivered plans were compared to the TPS plans and statistics acquired. After which, each of the error MLC plans were compared against the original TPS plan and statistics acquired. Finally, each of the error plans were compared against each other and statistics acquired.

**Results:** When the original plan was compared against the error plans, the 1.0mm and 3mm systematic error plans were not detected by any of the arrays: gamma analysis >95% (3%/3mm), 3.0mm gamma analysis >90% (3%,3mm) but bigger errors than 3mm were detected: 5mm <80% (3mm/3%). When comparing the original plan and random error plans all detector arrays failed all plans with gamma analysis <50% (3%/3mm). Finally, when comparing error plans against each other, all detector arrays were not able to differentiate between plans with systematic errors on it showing gamma analysis >97% (3%/3mm), but significant differences were observed between errors plans when random error plans were compared showing gamma analysis <60% (3%/3mm).

**Conclusions:** Detector arrays are able to detect randomized MLC type of error as well as large (>3.0mm) systematic type of error introduced in the MLC.