AbstractID: 3882 Title: Multi-Leaf-Collimator Quality Assurance Using the Electronic Portal Imaging Device

Purpose: To test the amorphous silicon (aSi) electronic portal imaging device (EPID) for quality assurance (QA) of the multi-leaf collimators (MLC) and to validate its use as a dynamic intensity-modulated radiation therapy (IMRT) QA device.

Method and Materials: Established MLC QA for IMRT utilizes dosimetric outputs from a single point in phantom with a chamber, and radiographic film to capture the density-pattern of the MLC. We propose using the aSi EPID 2D-density distribution to replace the chamber/film for MLC QA, and to verify the dosimetry and mechanics of the MLC for IMRT. A protocol was developed to acquire QA data from the aSi EPID to provide tests for high dose gradients, average output doses, mechanical leaf stability, speed and positioning. The effects of various EPID exposed areas (2×2, 4×4, 6×6 cm^2) were used for intercomparison measurements with ion chamber and film.

Results: Radiographic film output at gantry angle 270^o relative to 0^o varies by less than 2%, while the film measurements at other gantry/collimator angles agree within 1% with the ionization chamber. For the same conditions, EPID outputs vary by 1%-5% depending upon exposed area. Output variations may be due to mechanical shifts, gantry and EPID sag, or MLC drifts due to gravity. Minimizing these effects is under further investigation.

Conclusion: A method has been developed to utilize the aSi EPID for MLC QA. The 2D density distributions of the EPID offer the potential for more quantitative analysis, and this procedure can be integrated into a routine program for comprehensive dynamic MLC-based IMRT and EPID QA.

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