AbstractID: 13359 Title: Evaluation of Three IMRT QA techniques to detect MLC positioning errors

**Purpose:** This study evaluates the effectiveness of three IMRT quality assurance (QA) techniques in detecting errors in the positioning of multileaf collimator (MLC) leaves. **Method and Materials:** Systematic errors were introduced into patient specific IMRT plans; errors of ±1 mm, ±2 mm, and ±3 mm were introduced to one bank of the MLC leaves. Each plan was measured using a diode array for each the following QA techniques: single fields with beams normal to the detector; composite of all beams normal to the detector; and a simulated treatment using all gantry and table angles. The measured data was compared to the appropriate unaltered plan using distance-to-agreement (DTA) and γ index analysis with 3%/3mm criteria. **Results:** The mean passing rates for single field measurements were: 0mm error 94.8±2.5, +3mm error 84.5±5.5, and -3mm error 84.6±7.4. Composite measurements had a mean passing rate of: 0mm error 97.8±1.5, +3mm error 78.2±10.6, and -3mm error 82.0±12.3. Simulated treatment results have a mean of: 0mm error 95.1±2.9, +3mm error 74.0±14.6, and -3mm error 76.2±12.6. The mean deviations in passing rate from the unaltered measurements were: single field measurement for +3mm -0.11±0.05 and -3mm -0.11±0.07; composite measurement for +3mm -0.20±0.10 and -3mm -0.16±0.12; simulated treatment deviation for +3mm -0.22±0.15 and -3mm -0.20±0.11. Using ANOVA analysis demonstrates that the three plans are statistically identical in error detection for +1mm, +3mm, -2mm, and -3mm errors. Plans with +2mm and -1mm errors were statistically different but it was inconsistent which technique was more effective.
**Conclusion:** The altered and unaltered plan QA measurements had a wide distribution of passing rates indicating a high degree of variability from plan-to-plan. There was no technique that indicated a greater sensitivity to introduced errors.