AbstractID: 5270 Title: A systematic analysis of patient specific IMRT QA data

Purpose: This is a retrospective analysis of patient specific IMRT QA data. The goal is to systematically evaluate IMRT plans and analyze factors that influence quantitative differences between calculations and measurements.

Method and Materials: For each IMRT beam, planar dose is calculated using Pinnacle treatment planning system (TPS) at 10cm depth, 100 cm SAD in solid water with normal incidence of the gantry and Mapcheck measurement is performed accordingly. Absolute dose comparisons are performed between the planned and measured planar dose distributions with a 3% and 3mm criteria. A threshold is set at 10% of normalization point dose. The pass rates are categorized into the versions of TPS and delivery system. We also analyzed the outliers to see if we could *a priori* predict the differences between measured and calculated dose using a recently published Dose Uncertainty Model in Medical Physics.

Results: A total of 427 plans with 2246 beams were analyzed; 57.7% of all beams have passing rates of at least 95%; 36% are between 85% and 95%; 6.3% are below 85%. The passing rate correlates strongly with the accuracy of beam modeling in TPS. The TPS version that explicitly modeled the MLC characteristics (leaf-end and leaf-side effects) had a better passing rate than the TPS version that had a simpler MLC model (60.7% versus 52.7% of at least 95%). The QA failure rate increases with the complexity of intensity modulation in a treatment field and with larger uncertainty of MLC beam model in the TPS.

Conclusion: The accuracy of IMRT delivery is strongly correlated to the accuracy of MLC beam model in TPS. The pass rate for patient specific QA is strongly influenced by the complexity of the intensity modulation in a field. Strong relationship between position of failure and expected uncertainty was observed.