AbstractID: 5471 Title: Developing a comprehensive and patient-specific QA procedure for IMRT

Purpose: To develop a comprehensive patient-specific IMRT quality assurance (QA) procedure that verifies both dose calculation and dose delivery.

Method and Materials: IMRT plan delivery is well described by actual gantry angles, collimator angles, jaw settings, MUs, and couch angles, which are output from Record and Verify system (R/V), as well as actual MLC leaf positions and fractional MUs recorded in MLC log files. MLC log files are used to rebuild leaf sequence files for actual leaf motion. The rebuilt leaf sequence files and the R/V output are used in the Monte Carlo simulation with patient CT to verify both dose calculation and dose delivery before treatment. Ion chamber or film measurement can be used to further investigate other causes when large errors are encountered. Post-treatment QA can be performed with EPID that records the intensity maps behind the patient which include the dosimetric and patient setup information during treatment. The intensity maps above and behind the patient are re-constructed using phase space data and compared with the measured EPID images to verify the dose delivered in the patient.

Results: This method was tested with ion chamber measurement for four real prostate plans and the agreement was within 2%. A linear correlation between average leaf position error and target dose error was found. Average leaf position error of 0.2mm resulted in about 1% error in target dose. Eight IMRT prostate plans were used in this study and the errors caused by dose calculation and delivery did not cause significant errors in the dose delivered (<2.0%).

Conclusions: We are developing a comprehensive patient-specific IMRT QA procedure utilizing the Monte Carlo simulation, MLC log files, R/V output and EPID. This method can be used to verify both dose calculation and dose delivery for pre- and post-treatment IMRT QA.