AbstractID: 2959 Title: An Analytic Approach to Film Based Absolute Dosimetry for IMRT

Purpose: To analyze the uncertainties in film based absolute dosimetry for patient specific quality assurance in IMRT.

Method and Materials: In our institution, we use EDR2 film for the planar dose quality assurance measurements in patient specific IMRT. Our film dosimetry system was calibrated using a step wedge pattern for the linac and a step valley pattern for HiArt Tomotherapy machine. The dose to each step was measured using a calibrated ion chamber. All films were processed using a Kodak processor and subsequently scanned using the VXR-16 Vidar scanner driven by the RIT software. The film optical density to dose response curves for six months were collected and analyzed. A fitting equation was derived and a systematic analysis was performed to evaluate whether a film calibration needs to be performed daily for the film dosimetry system.

Results: Absolute dosimetry with film is subject to machine output fluctuations, film processing, film scanning and other sources of uncertainty. Based on our analysis, we found that the film processing error can be up to 7% (1SD), which corresponds to 1% (1SD) error in absolute dose (as determined from film dosimetry). The film scanner number can be correlated to absolute dose using a logarithmic fit to our measured data. Several step-and-shoot and TomoTherapy IMRT QA plans were evaluated using this method. The QA compares very well against the daily film calibration technique.

Conclusions: Absolute film dosimetry for IMRT is feasible, and when the processor is properly maintained, a less than 3% error can be achieved in the calculation of dose. Once several dose response curves for the film are collected, an analytical fitting curve can be used in lieu of daily film calibration.