AbstractID: 7233 Title: Validation of response function-based dose reconstruction

A method based on dose-response function was developed in the past, which verifies the beamlet weight of intensity modulated radiation therapy (IMRT) from dose image in electronic portal imaging device (EPID) and reconstructs dose in a patient. The establishment of a linear relationship between beamlets and dose responses in patient and in electronic portal imaging device (EPID) was the key to this methodology. The responses are to be predetermined by a full-scope Monte Carlo calculation in patient and EPID structures. In this study, the method was validated through measurement using in-phantom and exit film dosimetry which simulated in-patient and EPID measurements, respectively. The in-phantom film was inserted at 100 cm from the target and at 12.5 cm depth within a 25-cm thick phantom and the exit film was placed at 139.5 cm from the target and at 2 cm depth within a 4-cm thick EPID phantom. For the validation, a 6MV X-ray beam with the size of 6 x 6 cm^2 was perpendicularly exposed to the phantom. Responses to each beamlet (0.2 x 5 mm^2) within a phantom and an EPID phantom were then calculated. Using the calculated responses, the exit film dose was used to inversely reconstruct the in-phantom dose, which was then compared with the measured in-phantom dose. In a second study, an IMRT beam intensity reconstruction was investigated computationally. The dose comparison in patient showed a difference of less than 3 %. Some propagated noise was found in the reconstructed intensity distribution, suggesting the need for noise filtration prior to reconstruction. The reconstruction took less than 10 seconds of calculation time and 10 MB of memory. The method is accurate as well as effective for the dose reconstruction of IMRT. A follow-up study will include detailed modeling of a therapeutic beam and EPID and experiments.