AbstractID: 10362 Title: Clinical application of MC-based non-iterative dose-reconstruction method for IMRT

Purpose: In the past, a dose reconstruction method was developed using Monte Carlo (MC)-based-response functions and non-iterative inversion. This study is to reconstruct in-vivo dose from portal dose using clinical fields and to investigate the effects of noises from random error and registration error. **Method and Materials:** A linear relationship exists between the beamlet intensity and the dose responses in a patient and on the electronic portal imaging device. Linear algebraic equations were derived using this relationship and solved inversely to reconstruct an in-vivo dose. The response functions were acquired using the pre-commissioned XVMC MC code based on the simulated phantoms and the MLC positions selected for this study. Square open fields and several IMRT fields of prostate cancer were selected with 6MV beams. Film measurements were performed to simulate an in-patient and portal dose. The reconstructed dose was compared with the in-patient dose. A sensitivity study was carried out to find the effects of noises on reconstruction accuracy using a computationally-generated dose distribution. **Results:** The comparisons between the reconstructed and the measured dose for selected fields showed that greater than 90% of dose distributions met the criteria of 3% dose difference or 3mm distance-to-agreement, even though fluctuations of the reconstructed dose at some open fields were observed due to measurement uncertainty and limited MC accuracy (i.e. 1%). As for the noises, the reconstructed distributions met the pass-rate of 90% for the portal dose given with maximum 5% random error and 4mm registration error. **Conclusions:** In-vivo dose for clinical fields was accurately reconstructed using MC-based-response functions, non-iteratively. The method employs known MLC and organ positions. It is particularly useful for quality assurance of the clinical site that does not involve large organ motions. **Conflict of Interest:** *US patent approved. In part supported by Varian medical systems, Inc.