AbstractID: 5356 Title: Measured and Simulated Non-target Whole-body Doses for selected IMRT and 3D-CRT Treatment Plans

Purpose:
A symposium at this year's APPM Summer Meeting calls for the attention to the non-target exposures during emerging modalities. The change from 3D-CRT to IMRT has been accompanied by many new challenges including a potential for an increase in second malignancies due to more fields and longer exposure times. The goal of this study is to establish a robust method for comparing in-phantom measurements and Monte Carlo simulations of whole body doses resulting from 3D-CRT and IMRT treatment plans.

Method and Materials:
Measurements using a RANDO phantom and MOSFET dosimeters were re-constructed to determine organ doses from three typical treatment plans, 4-field 3D-CRT, 6-Field 3D-CRT, and 7-Field IMRT for the prostate. Dose tally estimates using a segmented RANDO computational phantom were generated by MCNP5 and compared with experimental data.

Results:
The dosimeter readings show that the doses decrease as distances increase for all treatment plans. At 40 cm from the target, doses are reduced nearly 100%. At this location, the IMRT plan resulted in a dose that is a factor of 3-5 times higher than the two 3D-CRT plans. This is due to increase scattered radiation from the extended exposure time for IMRT treatment. Comparisons of organ doses will be done with ongoing studies of MCNP5 simulations for the above treatment plans.

Conclusion:
A method has been developed and tested to use MOSFET dosimeters to measure whole-body doses resulting from IMRT and 3D-CRT treatment plans. The case study for prostate shows that IMRT delivers higher out-of-field photon doses than 3D-CRT. By combining the Monte Carlo simulation of various accelerators and patient anatomy, the potential non-target doses can be better assessed than what is currently done, thus offering a practical way for the management of secondary exposures from emerging modalities.