

AbstractID: 2809 Title: Measurement of photon and neutron doses outside the treatment field for prostate patients undergoing 18 MV IMRT

Purpose: For IMRT treatments 6 MV photons are typically used, however, for deep seated tumors in the pelvic region, higher photon energies are increasingly being employed. IMRT treatments require more monitor units (MUs) to deliver the same dose as conformal treatments, causing increased secondary radiation from leakage and scatter, as well as a possible increase in the neutron dose from photon interactions in the machine head. Here we provide in-vivo and phantom measurements of the photon secondary radiation and the neutron dose equivalent for 18 MV IMRT treatments.

Method and Materials: We use different detectors with various photon and neutron sensitivities: TLD 600 and TLD 700 chips, a Neutrak detector containing Al_2O_3 to detect photons using optically stimulated radiation and a CR-39 plastic sheet using track etching for neutrons from Landauer, and a separate CR-39 detector from Argonne National Labs. In vivo patient measurements were obtained outside the field edge for 9 prostate patients undergoing 18 MV IMRT on two different commercial accelerators. We also compared the secondary photon dose for 6 prostate patients undergoing 6 MV IMRT with that for 18 MV IMRT. Additionally, a 25.4 cm diameter Bonner sphere containing TLD 700 and TLD 600 was used to compare the out of field secondary doses for typical 18 MV IMRT and 18 MV six-field conformal prostate treatments.

Results: The patient measurements showed photon doses approximately 12 and 7 times greater than the neutron dose equivalent at 10 and 20 cm from the field edge, respectively. Initial Bonner sphere measurements showed neutron doses for IMRT greater than for conformal treatments.

Conclusion: For prostate treatment the photon secondary dose for 18 MV and 6 MV IMRT are similar, and the neutron dose is higher than the dose from 18 MV conformal treatments by about the ratio of MUs.