

AbstractID: 1191 Title: Shielding evaluation of existing accelerator vaults under IMRT conditions

Intensity modulation radiation therapy (IMRT) can lead to an increase in leakage radiation. The total number of monitor units (MU) for IMRT can be 2-5 times that for conventional treatments or higher (the ratio of the two is called the modulation scaling factor, MSF). Shielding calculations for IMRT can be done by applying the MSF to measured exposures under conservative conditions (standard beam setup: 40 cm x 40 cm field, 45 degrees collimator angle) to account for the increased leakage. In this work, we verified this approach for two existing vaults housing a Siemens Primart 6 MV linac and a Varian 21Ex 10 MV linac. We measured the cumulative exposures at various locations around the vaults for typical IMRT cases and for the standard beam setup using the same MUs. For the standard beam setup, the IMRT gantry angles and 8 equally spaced angles were used. Estimations of weekly exposures for IMRT were carried out using exposure rates measured under standard beam setup and the MSF averaged over 20 treatment cases. The measured exposures under realistic IMRT conditions were 30-60% lower than the estimated values using equally-spaced gantry angles except for one location where the real IMRT leakage was higher than the estimated value by 10%. Measurements using the same gantry angles yielded similar results. Our results indicate that it is adequate to use the MSF and previously measured exposures to estimate the leakage increase due to IMRT for an existing vault.