NEUTRON EXPOSURE FROM ELECTRON LINEAR ACCELERATORS AND A PROTON ACCELERATOR: MEASUREMENTS AND SIMULATIONS

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ABSTRACT

The risk of developing radiation induced secondary cancers in patients undergoing external beam radiotherapy is a concern; particularly from secondary neutrons generated during delivery of high energy photon and proton beams. This work also investigated the effectiveness of several shielding materials commonly used for neutron shielding. It was found that high density concretes with higher concentrations of hydrogenous materials to be more suitable for space-restricted environments.

This work studied neutron production around two photon linear accelerators using measurements. It was found that ambient neutron dose equivalents from Elekta accelerator were significant lower than from Varian accelerator, especially for 18MV beams.

Neutron dose equivalent per therapeutic dose (H/D) around the MEVION S250 Proton Therapy System were evaluated using measurements and MCNPX calculations. It was found that H/D decreased as field sizes increased, and with distance from isocenter. The neutron production from the MEVION S250 was found to be comparable with other passive scattering systems.