

AbstractID: 2047 Title: Exploring Stray Radiation Dose to Photon Radiation Therapy Patients with MCNPX

Advances in radiation treatment technology and multi-modality treatment translate into a better outcome for cancer patients. Longer surviving patients may face the risk of late effects due to previous radiation treatments. These effects have been discussed in numerous publications. The risk of developing secondary malignancies is a subject not without controversy. The aim of this work is to develop and evaluate a methodology to simulate photon radiation treatments with Monte Carlo techniques, to estimate stray out-of-field radiation dose and use it to evaluate its risk of causing secondary malignancies. A detailed model of a photon treatment head was used to simulate external photon irradiations based on MCNPX v2.5d. Following a session of benchmark simulations using a water phantom at several photon energies and field sizes, the calculations included a simple mathematical patient model, consisting of rectangular water blocks resembling the a patient at the age of 14, and a simplified model of a multi-leaf collimator. A bi-lateral brain irradiation was simulated to generate out-of-field doses for different energies and field sizes. Comparison of the resulting dose distribution in the sagittal plane of the phantom shows very good agreement with published measurements of out-of-field photon dose as a function of distance from the treatment field edge. The neutron dose equivalent delivered to the head, neck, torso and limbs of the phantom was determined from the calculated neutron spectral fluences and also show a promising agreement with measured data.