AbstractID: 11692 Title: A Monte Carlo Study of Stray Neutron Background Produced in Ocular Therapy

Purpose: To study the neutron spectral fluence and neutron dose equivalent as a function of the off axis distance to isocenter in an ocular therapy beam line using the Monte Carlo technique and to compare the simulated neutron dose equivalent values with the measurements presented in X.Yan et al, Nuclear Instruments and Methods A 476, 2002. **Methods and Materials**: A Monte Carlo simulation of an ocular nozzle (Newhauser et al, Physics in Medicine and Biology, 2005) and a cylindrical Lucite phantom were carried out using the FLUKA radiation transport code. Mean initial kinetic energy of protons was159 MeV. The range of the proton beam was 2.5 cm in water. The neutron track length fluencies were tallied in 8 spherical cells of air of diameter 25.4 cm. The off axis distance to the tallies from the isocenter were between 25 cm and 75 cm. The neutron track length fluencies were converted in to ambient dose equivalent using the conversion coefficient given in ICRP 74. **Results**: The energy weighted neutron fluence spectra demonstrated characteristic low energy evaporation peak and high energy peak. The strengths of both peaks decreased as the distance from the isocenter increased. The neutron dose equivalent values decreased as the off axis distance from the isocenter increased. At a distance of 65 cm away from the isocenter, the neutron dose equivalent value was about 50% of that of at 25 cm. The neutron dose equivalent values from this study are roughly factor of 2 higher than that of measurements from Yan et al (Reported uncertainty of the measured data is 40%). Contribution to total neutron dose equivalent from high energy neutrons is higher than that from low energy neutrons. **Conclusions**: A detailed study of neutron background produced in ocular proton therapy is presented.