AbstractID: 11264 Title: Measuring High Energy Neutrons at a 230 MeV Proton Therapy Facility

Purpose: Examine neutron field spectrum and angular distribution characteristic to medium-energy (230 MeV) proton accelerator facilities. Measure effectively the high energy neutron component of the radiation field. **Method and Materials:** Primary shielding walls in modern proton therapy facilities are typically made of an over 7' thick of ordinary (2.3 g/cm3) concrete. Our analysis demonstrate that behind such a thick wall in forward direction with respect to the proton beam neutrons with energies greater than 8 MeV still contribute considerably to the total dose. High energy neutron contribution in lateral direction is potentially even larger. Traditionally neutron rem-meters are designed to have their response function match well an appropriate (ICRP 1990, or NCRP-38) fluence-to-dose conversion function over an energy range extending from thermal (0.025 ev) to 10 MeV. We have performed over thirty measurements of the neutron dose equivalent at various locations in and around a state-of-the-art 230 MeV proton therapy facility using the Wide Energy Neutron Detection Instrument (WENDI) that has a useful energy response in the energy range from thermal to 5 GeV. **Results:** We have obtained neutron attenuation lengths in forward and lateral directions from our measurements most appropriate for use at 230 MeV proton therapy facilities (PTFs) and compared our results with some previously published values. We have also obtained a new parameterization for neutron attenuation in the maze suitable for modern PTFs. **Conclusion:** In surveying and area monitoring modern PTFs the neutron detector of choice must be capable of detecting with sufficient efficiency the high energy component of the neutron field to avoid large dose underestimation in an environment where greater than 8 MeV neutrons may have a significant contribution. New maze attenuation parameterization will provide for adequate maze design in these facilities, where previously used attenuation models provided at best for a marginal maze design.