AbstractID: 11720 Title: Determination of neutron dose due to a therapeutic proton beam incident on a closed tungsten MLC using the dual hydrogenous/non-hydrogenous ionization chamber method.

Purpose: To measure neutron dose around a tungsten MLC used for proton beam therapy using the dual ionization chamber (IC) method. **Method and Materials:** ICs were constructed with large 10cc volumes to enable low dose measurements in the mGy range. The chambers are identical aside from wall, electrode, and guard-ring material with one constructed of A150 tissue-equivalent plastic (T) and filled with methane based tissue-equivalent gas and the other magnesium (U) and filled with argon gas. IC(T) has approximately the same sensitivity to neutrons and photons while the non-hydrogenous IC(U) exhibits a lower sensitivity to neutrons. The dose from neutrons and photons can be expressed as $D_N=(R_T-R_U)/(1-k_U)$ and $D_G=(R_U- k_UR_T)/(1-k_U)$ where R_U,R_T are IC readings and k_U is the relative sensitivity of IC(U) to neutrons which varies with energy. Measurements were made with 230MeV proton beams incident on a closed MLC with the ICs on the beam axis 21cm from the MLC. Open field measurements were made with attenuation by 0, 0.5, 2, 5, 9, and 10cm of solid water. The ICs were calibrated against a Farmer chamber in air with a 6MV beam and suitable buildup caps. **Results:** Initial analysis of the measurements suggests an average neutron energy of 2.6MeV corresponding to $k_U=0.033$. Measured neutron dose with the MLC closed and detector geometry stated above is 1.67mGy/Gy where IC(T) was used to determine dose in the open field. **Conclusion:** Initial measurements of neutron dose from a proton therapy beam incident on a MLC were performed which indicate the validity of the dual chamber method for determining neutron dose around a proton beam. This work was supported by the US Army Medical Research and Materiel Command under Contract Agreement No. DAMD17-W81XWH-07-2-0121. Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the US Army.