AbstractID: 11258 Title: Transmission of a Passive Double-Scattered Proton Beam through Brass:

Purpose: To measure the depths reached in water by passive double-scattered proton beams of three different energies after their transmission through various thicknesses of brass, the material used for apertures, which shape and collimate beams for treatments. High, medium, and low energy beams are defined as beams that, after attenuation from the scatterers, reach depths in water of 25.7cm, 15.8cm, and 9.8cm respectively. The corresponding energies after attenuation are approximately 191.3MeV, 146MeV, and 112Mev (according to Webb "The Physics of Three-Dimensional Radiation Therapy"). **Methods and Materials**: Pristine and modulated passive double-scattered proton beams are delivered to a Wellhoefer water tank. A Markus chamber scans downstream, measuring the depth reached by each beam. The data are recorded by Wellhoefer software. Brass disks of varying thicknesses are placed at the face of the tank, and the depths of the beams are measured again. **Results**: For a beam of a given energy, there is a linear relationship between the depth in water of a pristine Bragg peak and the thickness of the added brass. The y-intercept of a plot of brass thickness vs. depth of a particular beam approximates the minimum thickness of brass required to stop that beam. For a high energy beam, the stopping thickness as a function of range is $y=-0.1764x+4.5199$. For the medium energy beam $y=-0.1766x+2.793$. Results are compared to Janni (1982) and to TRIM Monte Carlo calculations (J.F. Ziegler et al). **Conclusion**: Measured values of brass thickness required to stop medium and high energy beams agree with Janni. The thicknesses of the brass apertures used in treatments, 6.5cm for beams with ranges greater than or equal to 15.8cm and 3.8cm for lower range beams, exceed the minimum requirements to stop the passive double-scattered proton beams that are delivered during treatments.