AbstractID: 13976 Title: Liquid scintillator dosimetry for passive scattering proton beam quality assurance

Purpose: A liquid scintillator (LS) detection system has been developed for volumetric characterization of radiation beams. We describe the utility of this system for quality assurance of passively scattered proton beams.

Materials and Methods: The detector system consists of a 20x20x20 cm^3 volume of LS surrounded by a light tight housing. One side of the tank is transparent to allow viewing by a CCD camera, which is placed 80 cm from the center of the tank. Irradiations were performed at the Proton Therapy Center Houston (PTCH). The tank was irradiated with two spread-out Bragg peaks (SOBPs), one with 13 cm range and 6 cm width, and one with 28.5 cm range and 10 cm width. For the latter, 14 cm of solid water was added before the tank. A median filter was used to correct for radiation noise in the image. The light signal along the beam's central axis was compared to the percent depth dose data measured with an ionization chamber in a water phantom.

Results: Light-depth profiles obtained with the LS device are proportional to measured dose in the proximal build-up region of the beam. LET-dependent quenching artifacts decrease the light signal in the last few cm of the proton range, and optical artifacts decrease the signal near the edges of the tank. As a result, the light signal in the SOBP is not proportional to dose. However, the relative light signal can be obtained during quality assurance measurements and compared with baseline data.

Conclusion: SOBP light-depth profiles can be obtained by irradiating an LS device with passive proton beams. Despite a non-linear dose response in the SOBP, the device provides sufficient information to measure reliably beam range and SOBP width for daily quality assurance.