Abstract Submitted
for the 4CF15 Meeting of
The American Physical Society

Measuring the Proton Range In-Vivo Using Prompt Gamma-Rays JASON HOLMES, DAVID BLYTH, RICARDO ALARCON, Arizona State University, MARTIN BUES, MIREK FATYGA, Mayo Clinic — Proton range uncertainty remains one of the most severe limiting factors in proton beam therapy (PBT). In this work we aim to reduce proton range uncertainty by measuring proton range during patient treatment. To measure the proton range, a collimated gamma detector array is being designed. An MCNPX simulation was first conducted which suggested the feasibility of such a design to measure the Bragg Peak with an uncertainty of 2 to 4 mm per spot. Many studies pertaining to the feasibility of in-vivo proton range verification via detection of prompt gamma radiation have been performed, but designing detectors for clinical use remains challenging. During patient treatment, fast neutrons generated in the PBT equipment, the patient and the detector produce significant background signal to the prompt gamma signal. Time of flight (TOF) has been shown to be a feasible method for eliminating the late arriving neutrons, however this method only applies to proton beams with well-defined timing information. Pulse shape discrimination (PSD) in thin CsI (Tl) scintillation crystals is being investigated as an alternative method to discriminate the neutron background. In this presentation, an update on the progress will be given focusing mainly on the PSD results so far.

Jason Holmes
Arizona State University

Date submitted: 10 Sep 2015 Electronic form version 1.4