Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Medical Implication of Quasi-monoenergetic Proton Generated from Laser Acceleration of Ultra-thin Multi-Ion Foil TUNG-CHANG LIU, XI SHAO, JAO-JANG SU, CHUAN-SHENG LIU, MINQING HE, BENGT ELIASSON, ROALD SAGDEEV, University of Maryland, College Park — Recent work by Liu et al. [2011] (presented in this conference) shows that high quality quasi-monoenergetic proton beams can be generated in laser acceleration of an ultra-thin multi-ion, i.e. carbon-proton, foil. The proton acceleration is due to the combination of radiation pressure and heavy-ion Coulomb repulsion. Using a normalized peak laser amplitude of $a_0 = 5$ and a carbon-proton target with 10% protons, our PIC simulation shows that the resulting quasi-monoenergetic (energy spread $< 10\%$) proton energy is ~ 70 MeV. To assess the feasibility of laser-proton cancer therapy with such a proton accelerator, simulations are carried out to model the interaction of protons with water and determine the radiation dosage deposition for particle beams produced from the PIC simulation of laser acceleration of multi-ion target. We used the SRIM code to calculate the depth and lateral dose distribution of protons energized by laser radiation pressure. The overall dosage deposition map from the proton beam is derived by superposing the radiation dosage contributed from each particle fed from the PIC simulation. Comparison between the dosage map produced from quasi-monoenergetic protons generated from laser acceleration of single ion and multi-ion targets is also presented.

Tung-Chang Liu
University of Maryland, College Park

Date submitted: 15 Jul 2011 Electronic form version 1.4