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**The Implementation of Ultrahigh Intensity Laser Based Proton Accelerator for Proton Therapy** TEH LIN, Fox Chase Cancer Center, K. FLIPPO, Los Alamos National Lab, D. UMSTADTER, FOCUS, University of Michigan; University of Nebraska-Lincoln, I. VELTCHEV, J. FAN, W. LUO, E. FOURKAL, C.-M. MA, Fox Chase Cancer Center — The ultrahigh-intensity-laser based proton acceleration has attracted numerous attentions in many research fields, particularly proton therapy for cancer treatment, due to the potential cost-effectiveness and compactness of the laser based proton accelerator. We have investigated the primary implementation of the ultrahigh-intensity-laser based proton accelerator for proton therapy. A $10^{19}$W/cm$^2$peak intensity laser pulse with 5-order contrast is incident on aluminum targets at 30 degree. A 40 degree cone of protons is generated from the laser-overdense-plasma interaction with 13MeV maximum energy. Selected proton particles from a magnetic spectrometer are used to irradiate lung cancer cells situated on the surface of CR-39, which simultaneously detects the incident proton beam profile. Proton beams with different spectra, which involve different designs of the target and the particle selection methods, have been attempted to deliver to the cells. PIC model followed by Monte Carlo particle transport simulations are also performed to predict the possibility and the favorable conditions for the proton therapy implementation. This study provides the first design and predicts the optimal laser and target condition of proton therapy by ultrahigh-intensity-laser based proton accelerator.

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