Abstract Submitted
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Proton acceleration from short pulse lasers interacting with ultrathin foil[1] GEORGE PETROV, Naval Research Laboratory, CHRISTOPHER MCGUFFEY, University of California-San Diego, ALEC THOMAS, KARL KRUSHELNICK, University of Michigan, Ann Arbor, FARHAT BEG, University of California-San Diego — Two-dimensional particle-in-cell simulations using 50 nm Si_3N_4 and DLC foils are compared to published experimental data of proton acceleration from ultra-thin foils (<1 μm) irradiated by short pulse lasers (30-50 fs), and some underlying physics issues pertinent to proton acceleration have been addressed. 2D particle-in-cell simulations show that the maximum proton energy scales as $I^{2/3}$, stronger than Target Normal Sheath Acceleration for thick foils (>1 μm), which is typically between $I^{1/3}$ [1] and $I^{1/2}$ [2]. Published experimental data were found to depend primarily on the laser energy and scale as $E^{2/3}$. The different scaling laws for thick (>1 μm) and ultra-thin (<1 μm) foils are explained qualitatively as transitioning from Target Normal Sheath Acceleration to more advanced acceleration schemes such as Radiation-Induced Transparency and Radiation Pressure Acceleration regimes. This work was performed with the support of the Air Force Office of Scientific Research under grant FA9550-14-1-0282.

[1] F. N. Beg, et. al., Phys. Plasmas **4**, 447 (1997)
[2] K. Krushelnick, et. al., Plasma Phys. Control. Fusion **47**, B451 (2005)

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