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**Continuous Laser-Driven Ion Acceleration through Two-Stage Boosting**[1] JOOHWAN KIM, University of California, San Diego, DEREK MARISCAL, SCOTT WILKS, ANDREAS KEMP, TAMMY MA, LLNL, FARHAT BEG, UCSD — Laser-driven ion beams have made significant increases in recent times and maximizing yield and energy of ions for a given laser configuration would be beneficial. However, there exist limitations to enhancing ion beams that are due to technical challenges such as limited laser energy, intensity, and pulse duration. Here, we present computational studies on a new feasible scheme of laser-driven ion acceleration that utilizes the synergetic effects of laser-induced target transparency and continuous field acceleration. By employing precisely shaped or double laser pulses, the onset of target transparency and driving a continuous electric field can be efficiently achieved compared to using a single pulse. Once a target becomes transparent by the first pulse, a longer pulse, lower intensity, second pulse is beneficial to generate super-ponderomotive electrons, since the pulse can interact with largely developed under-dense plasma. With this enhanced electron temperature, a strong electric field continuously accelerates ions. This results in an increase of maximum ion energy by a factor of 2.5-3 compared to a typical TNSA for the given laser intensity. Detailed simulation results including systematic comparison with different laser parameters will be presented.

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