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Scaling of laser-driven proton and electron acceleration as a function of pulse duration in the multi-ps regime[1] RASPBERRY SIMPSON, Massachusetts Institute of Technology MIT, GRAEME GORDON SCOTT, DEAN RUSBY, PAUL KING, LLNL, ELIZABETH SIMPSON GRACE, GATech, G. JACKSON WILLIAMS, DEREK MARISCAL, TAMMY MA, LLNL — A new class of multi-kilojoule, multi-picosecond short-pulse lasers such as NIF-ARC, OMEGA-EP, LMJ-PETAL and LFEX-GEKKO, enable exciting opportunities to produce high-brightness, high-energy laser-driven particle sources for applications in high-energy-density science. Recent results on this type of platform have demonstrated enhanced accelerated proton energies and electron temperatures when compared to established scaling laws. Motivated by these results, this work examines laser-driven proton and electron acceleration in the multi-picosecond regime (>1ps) at laser intensities of 10^{17} - 10^{19} W/cm^2. A detailed scaling study was performed on the TITAN laser at the Jupiter Laser Facility and found that the accelerated electrons and maximum proton energies exceeded the ponderomotive scaling in the multi-picosecond regime. The results are consistent with the accelerating sheath field being established a population of super-ponderomotive electrons. A new analytical scaling is presented to reflect this enhancement of the accelerated particle characteristics.

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