Abstract Submitted
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Achieving Stable Radiation Pressure Acceleration of Heavy Ions via Successive Electron Replenishment from Ionization of a High-Z Material Coating[1] X. F. SHEN, B. QIAO, H. X. CHANG, Peking University, S. KAR, Queen's University of Belfast, C. T. ZHOU, Peking University, M. BORGHESI, Queen's University of Belfast, X. T. HE, Peking University — Generation of monoenergetic heavy ion beams aroused more scientific interest in recent years. Radiation pressure acceleration (RPA) is an ideal mechanism for obtaining high-quality heavy ion beams, in principle. However, to achieve the same energy per nucleon (velocity) as protons, heavy ions undergo much more serious Rayleigh-Taylor-like (RT) instability and afterwards much worse Coulomb explosion due to loss of co-moving electrons. This leads to premature acceleration termination of heavy ions and very low energy attained in experiment. The utilization of a high-Z coating in front of the target may suppress the RT instability and Coulomb explosion by continuously replenishing the accelerating heavy ion foil with co-moving electrons due to its successive ionization under laser fields with Gaussian temporal and spatial profiles. Thus stable RPA can be realized. Two-dimensional and three-dimensional particles-in-cell simulations with dynamic ionization show that a monoenergetic Al^{13+} beam with peak energy 4.0GeV and particle number 10^{10} (charge $>$ 20nC) can be obtained at intensity 10^{22} W/cm^2.

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