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Ion Acceleration from Near-Critical-Density Plasmas via Magnetic Vortex Acceleration using 2D and 3D Warp/Picsar Particle-in-cell Simulations

We explore laser-driven ion acceleration via the Magnetic Vortex Acceleration (MVA) scheme using 2D and 3D Warp+PICSAR particle-in-cell simulation codes. A high intensity ($I \sim 10^{23} W/\mathrm{cm}^2$) and short pulse (30 fs) laser beam irradiates a Near Critical Density (NCD) hydrogen target. We find an optimum condition to maximize the ion energy from different target thicknesses and target densities. The maximum ion energy in 3D is ~1/3 times lower than in 2D due to a smaller channel size in 3D and a different charge distribution between 2D and 3D. We also compare the results between the linear and the circular polarized laser beams in 3D simulations.

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