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Effects of laser polarization on electrostatic shock ion acceleration in near-critical plasmas[1] YOUNG-KUK KIM, TEYOUN KANG, MIN SUP HUR, Ulsan Natl Inst of Sci Tech — Ion acceleration from laser-driven collisionless electrostatic shock (CES) is attracting much attention, as quasi-monoenergetic, tens of MeV ion beams are expected to be available from relatively moderate laser power and near-critical density plasmas. For generation of a high-speed shock by a laser pulse, it is important to compress a high-contrast density layer by hole-boring process, and to heat the electrons in the upstream, where the hole-boring speed should match the Mach number condition 1.5 <M <3.7. In this presentation, we compare the formation of CES and shock ion acceleration by ultrashort LP and CP pulses using PIC simulations. Owing to the better ability of CP pulses in density compression, the CP-driven shock is generated more efficiently even in low density plasmas than the LP-driven shocks. As the hole-boring speed is higher in lower density plasmas, we observed consistently higher speed of the shock and accelerated ion energy when driven by CP pulses. Interesting point is that the CP-shock generation is determined predominantly by the transmittance only, while the LP-shock formation depends on other parameters such as plasma scale length. In 2D simulations, we found that Weibel instability is less effective in CP than LP, which enables more stable shock formation for given conditions of the laser and plasma.

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