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Extraction of Converging Ion Beam from Laser Ion Source for Direct Plasma Injection Scheme

Laser ion sources are expected to be used in various applications of heavy ion beam technology. The plasma direct injection scheme (DPIS) is a method used to accelerate high-current ion beams extracted from a laser ion source, which are then injected into a radio frequency quadrupole (RFQ) linear accelerator. In this study, a new injection method was demonstrated that avoids the RF field of the RFQ linear accelerator affecting the ions in the beam extraction gap. In this method, an ion beam is extracted from a plasma using an electric field generated at a gap between an electrode that can extract a converging ion beam and a grounded aperture. The ion beam passes through the aperture and is then injected into the RFQ linear accelerator. This approach allows the use of a large-diameter extraction electrode, which is not limited by the spacing of the RFQ electrode rods. The proposed electrode was found to allow a larger ion beam current to be extracted than the conventional electrode. It was also shown that the current can be further increased by applying a solenoidal magnetic field to the laser-produced plasma. However, it was observed that the beam current depends on the inner diameter of the transport pipe leading to the gap for ion beam extraction.

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Yes

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