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A Picosecond Laser-Based Ion Source for Injection into a High Capacity EBIS in Both Accumulation and Single Pulsed Modes

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Ps-lasers have advantages for generation of low charge state ions compared to ns-lasers because the influence of heat conductivity on a solid target is negligible in the case of ps-laser ablation for laser pulse durations shorter than 10 ps. By using a laser with high rep-rate, it is possible to produce quasi continuous 1+ ion beams for periods up to tens of milliseconds, making it possible to take advantage of the ability of the EBIS to trap 1+ ions in accumulation injection mode. We studied the properties of Al, Ti, Cu, Nb, and Ta plasmas generated by a ps-laser with 1.27 mJ energy within an 8 ps pulse to investigate feasibility and specify parameters of a laser ion source for RHIC EBIS using accumulation injection mode. It is shown that a both accumulation and single pulsed injection modes are accessible with a single ion source geometry and single injection line, providing the most attractive option for an ion source for external injection into RHIC EBIS trap based on a ps-laser.

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