

Abstract Submitted
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On characterization of an ultracold ion source N. DEBERNARDI, W.J. ENGELEN, R.W.L. VAN VLIEMBERGEN, P.H.A. MUTSAERS, E.J.D. VREDENBREGT, O.J. LUITEN, Department of Applied Physics, Eindhoven University of Technology — The ultracold ion source (UCIS) is based on creating very cold ion beams ($T < 1$ mK) by near-threshold photo-ionization of a laser-cooled and trapped ^{85}Rb gas. The UCIS has the potential of producing ion beams with a brightness and current comparable to the liquid-metal ion source (LMIS), which is the current state-of-art for focused ion beam (FIB) technology. The brightness characterizes the source and is proportional to the ion current, the source temperature and the energy spread. We have already shown that the UCIS can provide much lower energy spread than LMIS, and may therefore offer a route toward 1-nm ion beam milling. The ultra low temperature of the source permits collimated bunches to be created at a low energy (down to few eV), which allows using time-dependent fields for accelerating and focusing. With this lens, a source temperature of (3 ± 2) mK has been measured. A dynamic model of the source describing its properties under pulsed operation has been developed and experiments have been started in order to validate it. The extracted current is the missing ingredient needed to characterize the brightness of the UCIS.

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