Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

A high brightness laser-cooled atomic beam for application in high resolution FIB STEINAR WOUTERS, BAS VAN DER GEER, GIJS TEN HAAF, BART JANSEN, PETER MUTSAERS, Eindhoven, University of Technology — A new type of high-brightness ion source is under development which employs transverse laser cooling and compression of a thermal atomic rubidium beam, followed by in-field photo-ionization. When attached to a focusing column, this Focused Ion Beam (FIB) has the advantage of supplying a higher current in a smaller spot compared to conventional LMIS-based FIBs, thus increasing both the resolution and the speed of the FIB. Furthermore, different types of ion species can be used, broadening the range of applications of the FIB. Simulations using a 10 cm long laser cooling and compression stage and a realistic ionization and acceleration structure, predict an achievable brightness for $^{87}Rb^{+}$ of order 10^{7} A/m^{2} sr eV at an energy spread of less than 1 eV and a current of tens of pA. This would lead to a spot size below 5 nm. Simulations and modeling on the ionization process have led to a better understanding of stochastic heating. Experimental realization of the compact ion source has recently started with the development of an efficient high-flux atom source and a 2D laser cooler and compressor. Progress on simulations and experimental results will be reported.

Steinar Wouters
Eindhoven, University of Technology

Date submitted: 22 Feb 2013 Electronic form version 1.4