Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Apparatus to image ultra-cold impurities in Bose-Einstein condensates[1] ANDREW CADOTTE, DAVID ANDERSON, RACHEL SAPIRO, STEPHANIE MILLER, GEORG RAITHEL, University of Michigan — We present an experimental apparatus with enhanced ion imaging capabilities relative to our previously used set-ups. The apparatus will be employed to study interactions between ultra-cold impurities and Bose-Einstein condensates (BEC). Atoms will first be loaded into a primary Magneto-optical trap (MOT), which loads a secondary MOT, and then into a quadrupole-Ioffe-configuration (QUIC) trap, where a BEC is formed. Free ultra-cold ions will be made by photoionizing a few atoms. Stray electric fields are canceled by an electrode package surrounding the BEC-ion interaction region. The electric field of a sharp needle (tip diameter 125 microns) is used to generate highly magnified ion images. In our poster, we will discuss expected phenomena, which include quantum charge diffusion [R. Cote, E. Bodo, P. Zhang, and A. Dalgarno], mesoscopic molecular ion formation [R. Cote, V. Kharchenko, and M.D. Lukin, Massignan, C.J. Pethick, and H. Smith], ion self-trapping [R.M. Kalas and D. Blume], and ultra-cold plasma expansion (in the classical domain). We will show details of the experimental apparatus, which is in its final assembly stage.

[1]We acknowledge support by the AFOSR and NSF.

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Date submitted: 27 Jan 2012 Electronic form version 1.4