Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Signatures of two-step impurity mediated vortex lattice melting in Bose-Einstein condensate[1] BISHWAJYOTI DEY, Department of Physics, SP Pune University, Pune 411007, India. — We study impurity mediated vortex lattice melting in a rotating two-dimensional Bose-Einstein condensate (BEC). Impurities are introduced either through a protocol in which vortex lattice is produced in an impurity potential or first creating the vortex lattice in the absence of random pinning and then cranking up the impurity potential. These two protocols have obvious relation with the two commonly known protocols of creating vortex lattice in a type-II superconductor: zero field cooling protocol and the field cooling protocol respectively. Time-splitting Crank-Nicolson method has been used to numerically simulate the vortex lattice dynamics. It is shown that the vortex lattice follows a two-step melting via loss of positional and orientational order. This vortex lattice melting process in BEC closely mimics the recently observed two-step melting of vortex matter in weakly pinned type-II superconductor Co-intercalated $NbSe_2$. Also, using numerical perturbation analysis, we compare between the states obtained in two protocols and show that the vortex lattice states are metastable and more disordered when impurities are introduced after the formation of an ordered vortex lattice.

[1]The author would like to thank SERB, Govt. of India and BCUD-SPPU for financial support through research grants.

Bishwajyoti Dey
Department of Physics, SP Pune University, Pune 411007, India.

Date submitted: 09 Jan 2017 Electronic form version 1.4