Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Crystalline phases of bosons in rotating traps: Tonks-Girardeau gas on a ring.[1] IGOR ROMANOVSKY, Georgia Inst. of Technology, CONSTANTINE YANNOULEAS, Georgia Inst. of Technology, UZI LANDMAN, Georgia Inst. of Technology — We analyze the systems of strongly repelling bosons in two-dimensional harmonic and ring-shaped traps as a function of the rotational frequency of the trap for neutral atoms (and of an applied magnetic field for charged bosons). Our two-step approach consists of breaking the rotational symmetry at the Hartree-Fock level and of subsequent symmetry restoration via projection techniques, [2] thus taking into account correlations beyond the Gross-Pitaevskii (GP) solution. The bosons localize and form crystalline patterns both for a repulsive contact potential and a Coulomb interaction, as revealed via conditional probability distribution (CPD) analysis. This behavior of the bosons in the ring-shaped traps in the strong repulsion limit is similar to the behavior of fermions and is a manifestation of the fermionization phenomenon. We present calculations for the ground state energies as a function of the rotational frequency (or the strength of the magnetic field) and as a function of the repulsion strength.

[1]Supported by the US D.O.E. (FG05-86ER-45234)
[2]Phys. Rev. Lett.**93**, 230405 (2004)

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Date submitted: 30 Nov 2005 Electronic form version 1.4