Crystalline phases of bosons in harmonic traps[1] IGOR RO-
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Physics, Georgia Institute of Technology — Strongly repelling bosons in two-
dimensional harmonic traps are described through breaking of rotational symmetry
at the Hartree- Fock level and subsequent symmetry restoration via projection tech-
niques, thus incorporating correlations beyond the Gross- Pitaevskii (GP) solution.
The bosons localize and form polygonal-ring-like crystalline patterns, both for a
repulsive contact potential and a Coulomb interaction, as revealed via conditional-
probability-distribution analysis. For neutral bosons, the total energy of the crys-
talline phase saturates in contrast to the GP solution, and its spatial extent becomes
smaller than that of the GP condensate. For charged bosons, the total energy and
dimensions approach the values of classical point-like charges in their equilibrium
configuration. For neutral bosons, the present work describes a 2D generalization of
the 1D Tonks-Girardeau regime of impenetrable bosons.[2]

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