Dipolar lattice bosons in the presence of long-range hopping
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— We report on numerical results based on quantum Monte Carlo simulations of
a system of two-dimensional hard-core lattice bosons in the presence of long-range
hopping and long-range two-body interactions resulting from dipole-dipole interac-
tions. This is equivalent to the XXZ model in the presence of dipolar interactions
which can be realized by a lattice gas of polar molecules, creating a flexible plat-
form for the study of quantum magnetism. The system features three phases: a
superfluid, a supersolid, and a checkerboard solid. Next we mimic the current ex-
perimental conditions, that is a lattice of polar molecules away from unit filling, by
adding static disorder. Under these conditions we study the localization of particles
and the stabilization of a disorder-induced insulating phase.

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