Devil's staircase and supersolidity in one-dimensional dipolar Bose gases
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Cambridge University — The classical ground states of particles in a convex repulsive potential are known to have a phase portrait displaying a complete devil’s staircase structure. We consider a single-component gas of dipolar bosons confined in a one-dimensional optical lattice, where the dipoles are aligned such that the long-ranged dipolar interactions are maximally repulsive. Introducing a kinetic term tunes the system away from the classical limit and results in a phase diagram with a Mott-Hubbard lobe for each rational filling fraction. Tuning the on-site interaction away from convexity yields alternative commensurate states with double occupancies which can form a staircase of their own, as well as one-dimensional “supersolids” which simultaneously exhibit discrete broken symmetries and superfluidity.

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Date submitted: 20 Nov 2008

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