Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Effect of the band structure in a rigorous two-body model with long-range interactions in 1D optical lattices[1] TOM KRISTENSEN, ANDREA SIMONI, JEAN-MICHEL LAUNAY, Institut de Physique de Rennes, UMR 6251 du CNRS and University of Rennes 1, 35042 Rennes Cedex, France — We compute scattering and bound state properties for two ultracold molecules in a pure 1D optical lattice. We introduce reference functions with complex quasi-momentum that naturally account for the effect of excited energy bands. Our exact results for a short-range interaction are first compared with the simplest version of the standard Bose-Hubbard (BH) model. Such comparison allows us to highlight the effect of the excited bands, of the non-on-site interaction and of tunneling with distant neighbor, that are not taken into account in the BH model. The effective interaction can depend strongly on the particle quasi-momenta and can present a resonant behavior even in a deep lattice. As a second step, we study scattering of two polar particles in the optical lattice. Peculiar Wigner threshold laws stem from the interplay of the long range dipolar interaction and the presence of the energy bands. We finally assess the validity of an extended Bose-Hubbard model for dipolar gases based on our exact two-body calculations.

[1]This work was supported by the Agence Nationale de la Recherche (Contract No. ANR-12-BS04-0020-01)

Jean-Michel Launay
Institut de Physique de Rennes, UMR 6251 du CNRS and University of Rennes 1, 35042 Rennes Cedex, France

Date submitted: 28 Jan 2016 Electronic form version 1.4