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Title: Quasiparticle approach to molecules rotating in quantum solvents

Abstract:

My group works at the interface between chemical and condensed-matter physics and aims to develop relatively simple theoretical models in order to get insight into chemical processes. One of our main focuses has been on quantum far-from-equilibrium dynamics of molecules in solvents, describing which pushes the limits of state-of-the-art computational techniques.

Recently we have shown that the description of molecular rotation in a quantum environment (be it a solvent, a crystal lattice, or an ultracold gas) can be drastically simplified by introducing a new quasiparticle, that we termed the "angulon" [1,2]. Soon thereafter we have shown that molecules rotating in superfluid helium-4 can be described as angulons in good agreement with experiment, both in and out of equilibrium [3,4,5].

In my talk, I am going to introduce the concept of angulon quasiparticles and to demonstrate how complex problems of far-from-equilibrium many-body dynamics can be tackled using this concept.

In addition, I aim to show that using simple theoretical models allows to bridge seemingly disconnected fields of research, such as spectroscopy of molecules in solvents and non-equilibrium magnetism in solids.

Literature:

[1] R. Schmidt, M. Lemeshko, Phys. Rev. Lett. 114, 203001 (2015); [2] R. Schmidt, M. Lemeshko, Phys. Rev. X 6, 011012 (2016); [3] M. Lemeshko, Phys. Rev. Lett., 118, 095301 (2017); [4] B. Shepperson et. al, Phys. Rev. Lett. 118, 203203 (2017); [5] Cherepanov et. al. arXiv:1906.12238