

Self-induced Josephson oscillations in a supersolid dipolar quantum gas

Supersolid is a state of matter in which coexist both a periodic modulation, characteristic of the solid state, and the ability of the superfluid to flow without any friction. Its theoretical prediction dates back to 1960s, but it was experimentally observed for the first time two years ago, in a dipolar quantum gas. My research work is based on the idea of searching for coherent tunneling phenomena such as Josephson oscillations in this dipolar supersolid, in order to prove the superfluidity of the system. This phenomenon usually needs an external potential barrier through which the tunneling arises, but the intrinsic modulation of the supersolid creates minima in the potential, which work as a self-induced barrier. In particular, I am studying the Josephson oscillations from a theoretical point of view, using a full 3D numerical simulation of an extended Gross-Pitaevskii equation, i.e. with the addition of first order quantum fluctuations.