

A dipolar quantum gas with supersolid properties (Q)

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Dipolar quantum gases are an extremely interesting playground for studies of quantum phase transitions in the presence of anisotropic, long-range interactions. We present here our recent observation that a dipolar quantum gas under proper conditions, due to the combination of the roton instability and the quantum stabilization, reveals supersolid properties [1]. We also show a study of collective oscillations in this system, which reflect the Goldstone modes associated with the spontaneous breaking of two continuous symmetries: the breaking of phase invariance, corresponding to the locking of the phase of the atomic wave functions at the origin of superfluid phenomena, and the breaking of translational invariance due to the lattice structure of the system. [2]. Our observations thus reveal that the dipolar supersolid has properties similar to those originally hypothesized for supersolid Helium.

1. Tanzi, L., Lucioni, E., Famà, F., Catani, J., Fioretti, A., Gabbanini, C., Bisset, R.N., Santos, L. & Modugno, G., Observation of a dipolar quantum gas with metastable supersolid properties, Phys. Rev. Lett. 122, 130405 (2019).
2. L. Tanzi, S. M. Roccuzzo, E. Lucioni, F. Famà, A. Fioretti, C. Gabbanini, G. Modugno, A. Recati, and S. Stringari, Supersolid symmetry breaking from compressional oscillations in a dipolar quantum gas, arXiv 1906.02791.

Summary

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Classifica Sessioni: Talks on specific topics

Classificazione della track: Quantum Gases