universität innsbruck

Department of Theoretical Physics

Theory Colloquium

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"Two-dimensional supersolidity in a dipolar quantum gas"

Abstract

Cooled to nano-Kelvin temperatures, Bose-Einstein condensates of highly-magnetic atoms are now possible. These dipolar condensates – constructed from rare-earth elements such as dysprosium and erbium – can be thought of as quantum gases of tiny bar magnets. Remarkably, while remaining extremely dilute, they possess several properties reminiscent of conventional condensed matter systems such as ordinary liquids, ferrofluids, and superfluid helium. Supersolidity – a quantum-mechanical phenomenon characterized by the presence of both superfluidity and crystalline order – was initially envisioned in the context of solid helium, as a possible answer to the question of whether a solid could have superfluid properties. While supersolidity has not been observed in helium (despite much effort), ultracold atomic gases have provided a fundamentally new approach, recently enabling the observation and study of supersolids with dipolar condensates. However, unlike the proposed phenomena in helium, these gaseous systems have so far only shown supersolidity along a single direction. In an experiment-theory collaboration, we demonstrate the extension of supersolid properties into two dimensions, providing an important step closer to the bulk situation envisioned in helium.

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Zoom link:
https://us02web.zoom.us/j/85741470196?pwd=QnBRMm5Tb3dIRjQ5bDRMdHplejU5UT09

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