Prof. Giovanni Modugno

LENS and Dipartimento di Fisica e Astronomia, Università di Firenze; CNR-INO, sezione di Pisa

Wednesday 22\textsuperscript{nd} January - at 14:00
Polo Ferrari 1 – Room n. A204

Exploring the supersolid phase of matter with a dipolar quantum gas

Abstract:

The supersolid is a fundamental phase of matter that combines properties of solids and superfluids. It was theorized about 50 years ago and it has been searched intensively in solid helium, so far inconclusively. I will discuss how a Bose-Einstein condensate of strongly magnetic atoms realizes the supersolid. We have discovered that a trapped condensate with an appropriate combination of attractive and repulsive atom-atom interactions develops a periodic density modulation without losing the coherence of the wavefunction [1]. With experiments based on the study of the collective oscillations, we are exploring its combined superfluid and solid properties. With compressional oscillations we have tested the simultaneous breaking of gauge and translational symmetries, revealing the coexistence of fluid and solid natures [2]. With rotational oscillations we have measured a reduced moment of inertia, a direct evidence of superfluidity [3]. The high-degree of control of the magnetic condensates may allow to investigate in depth the properties of the supersolid phase of matter.