

GRASIAN: Towards the first demonstration of gravitational quantum states of atoms with a cryogenic hydrogen beam

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At very low energies, a light neutral particle above a horizontal surface can experience quantum reflection. The quantum reflection holds the particle against gravity and leads to gravitational quantum states (GQS). So far, GQS were only observed with neutrons as pioneered by Nesvizhevsky and his collaborators at ILL. However, the existence of GQS is predicted also for atoms.

The GRASIAN-collaboration pursues the first observation and studies of GQS of atomic hydrogen. We propose to use atoms in order to exploit the fact that orders of magnitude larger fluxes compared to those of neutrons are available. Moreover, recently the qBounce collaboration, performing GQS spectroscopy with neutrons, reported a discrepancy between theoretical calculations and experiment which deserves further investigations. For this purpose, we set up a cryogenic hydrogen beam at 6K. We report on our preliminary results, characterizing the hydrogen beam with pulsed laser ionization diagnostics at 243 nm.

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