Gravitational coupling between millimetre-sized masses: prospects for a quantum Cavendish experiment

Thursday, 8 July 2021 10:40 (35 minutes)

Earth-based experiments have been continuously increasing their sensitivity to gravity phenomena at laboratory scales. A yet unexplored frontier is the regime of microscopic source masses, which enables studies of fundamental interactions and provides a path towards exploring the quantum nature of gravity. We have recently demonstrated gravitational coupling between a test mass and a 90mg gold sphere, the smallest source mass to date in table-top gravity experiments. The miniaturized torsion balance measurement achieves a systematic accuracy of 3e-11 m/s² and a statistical precision of 3e-12 m/s². We expect that further improvements will enable the isolation of gravity as a coupling force for objects well below the Planck mass. This is a practical prerequisite for future "quantum Cavendish" experiments that aim to probe gravitational phenomena originating from quantum superposition states of a source-mass configuration.

Primary author: Prof. ASPELMeyer, Markus
Presenter: Prof. ASPELMeyer, Markus
Session Classification: Thursday Plenary Session