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Development of a micromechanical proof-of-principle experiment for measuring the gravitational force of milligram masses

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Abstract

The presented research addresses a simple question: how small can one make a gravitational source mass and still detect its gravitational coupling to a nearby test mass? I describe an experimental scheme based on micromechanical sensing to observe gravity between milligram-scale source masses, thereby improving the current smallest source mass values by three orders of magnitude and possibly even more. Further, I discuss the implications of such measurements both for improved precision measurements of Newton's constant and for a new generation of experiments at the interface between quantum physics and gravity.