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A micromechanical proof-of-principle experiment for measuring the gravitational force of milligram masses JONAS SCHMLE, MATHIAS DRAGOSITS, HANS HEPACH, TOBIAS WESTPHAL, MARKUS ASPELMEYER, Vienna Center for Quantum Science and Technology (VCQ), Faculty of Physics, University of Vienna — We address a simple question: how small can one make a gravitational source mass and still detect its gravitational coupling to a nearby test mass? We 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. We will discuss the present status of the experimental implementation and 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.

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