

Tobias Westphal tobias.westphal@univie.ac.at

Dr. rer. nat. Tobias Westphal

Quantum Optics, Quantum Nanophysics, Quantum Information

Faculty of Physics, University of Vienna

Boltzmannngasse 5, A-1090 Vienna, Austria

Email: tobias.westphal@univie.ac.at

QUANTUM MECHANICS AND GENERAL RELATIVITY BOTH describe the world around us extraordinarily well on their respective scales. Yet they firmly resist being unified. In particular, nobody knows how a quantum system might gravitate.

Our team addresses a simple question: how small can one make a gravitational source mass and still detect its gravitational field by means of minuscule acceleration of a nearby test mass? A major challenge is to exclude other, non-gravitational forces. This implies identifying current technical limitations such as electrostatic interaction or thermal noise and developing new technologies to mitigate them.

With our current experiment we strive for an improvement of the current smallest source mass values by about three orders of magnitude – on the order of 100mg. Future iterations will push towards the interface between quantum physics and gravity, while the same techniques are applicable for measurements of the gravitational constant for extremely small masses as well.