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qBOUNCE: first results of the Ramsey-type GRS experiment

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This talk focuses on the control and understanding of a gravitationally interacting elementary quantum system using gravity resonance spectroscopy (GRS) with ultracold neutrons (UCN). This technique offers a new way of looking at gravitation at short distances based on quantum interference.

In the past years, the qBOUNCE collaboration has designed and built a new Ramsey-type GRS experiment at the Institut Laue-Langevin (Grenoble), which increases the achievable sensitivity by more than an order of magnitude with respect to previous implementations. In 2018 we were able to demonstrate gravitational state transitions. The new Ramsey-type implementation is not only sensitive to a range of hypothetical variations of Newton's potential at the microscale, but it can also be used to test the electric charge neutrality of the neutron. We present the results of first charge measurements performed in 2018 and give an outlook on further developments.

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