

Physikalisches Kolloquium
Einladung

Physics Colloquium
Invitation

Monday, 27 April 2026

Lecture Hall **O25/H2**, at 16:15
Coffee and cookies will be served in front of the lecture hall from 16:00

Probing the gravity-quantum interface: from proper time interferometry to single graviton detection

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The unification of quantum theory and gravity remains a central open problem in physics, with very limited experimental guidance. Recent advances in quantum technologies, together with ideas from quantum information and foundations, now offer concrete routes to probe their interplay and even test the quantization of gravity.

In this talk, I will present two complementary research directions.

First, I will discuss how quantum systems can experience superpositions of proper time, with realizations in atomic clocks and entangled quantum networks that enable laboratory tests of quantum theory in curved spacetime. Second, I will turn to signatures of the quantum nature of gravity itself. While much recent work has focused on indirect probes, such as non-LOCC signatures of the Newtonian interaction, I will present a different approach based on direct graviton detection. I will explain why detecting a single graviton was long thought impossible, and how quantum sensing of energy in macroscopic systems now brings this goal within reach. This ability opens a route to probing linearized quantum gravity and the quantum statistics of gravitational radiation.

