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Detecting single gravitons with quantum sensing

The quantization of gravity is widely believed to result in gravitons – particles of discrete energy that form gravitational waves. But their detection has so far been considered impossible, in particular Dyson recently analysed whether observing single graviton exchange between matter and gravitational waves is even possible in principle. Here we show that single graviton exchange can be observed in realistic, albeit challenging laboratory experiments. We show that stimulated and spontaneous single-graviton processes can become relevant for massive quantum acoustic resonators and that stimulated absorption can be resolved through continuous sensing of quantum jumps. In analogy to the discovery of the photo-electric effect for photons, such signatures can provide the first experimental evidence of the quantization of gravity.

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