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Observing acceleration induced emission of Unruh deWitt Detector

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Some of the most prominent theoretical predictions of modern times, e.g., the Unruh effect, Hawking radiation, and gravity-assisted particle creation, are supported by the fact that various quantum constructs like particle content and vacuum fluctuations of a quantum field are observer-dependent. Despite being fundamental in nature, these predictions have not yet been experimentally verified because one needs extremely strong gravity (or acceleration) to bring them within the existing experimental resolution. We demonstrate that non-inertially moving Unruh deWitt Detectors along with optimized cavity experiences strongly modified quantum fluctuations in the inertial vacuum due to their non-inertial motions. As a result, the emission rate of an excited atom gets enhanced significantly along with a shift in the emission spectrum. We propose cavity based optomechanical set-ups capable of realizing such acceleration-induced particle creation with current technology. This approach provides a novel and potentially feasible experimental proposal for the direct detection of noninertial quantum field theoretic effects such as the Unruh effect.

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