Sonderseminar

Universität Konstanz

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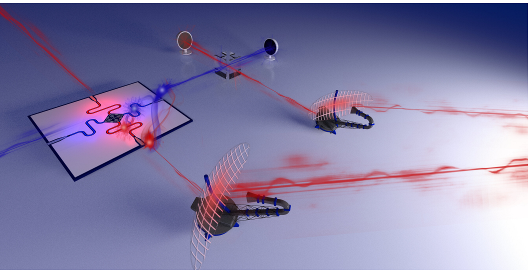
Continous variable entanglement generation and its application in microwave quantum illumination



Entanglement is the essential resource that defines this new paradigm of quantum-enabled devices. Here I confirm the long-standing prediction that a parametrically driven mechanical oscillator can entangle electromagnetic fields. We observe stationary emission of path-entangled microwave radiation from a micro-machined silicon nanostring oscillator, squeezing the joint field operators of two thermal modes by 3.40(37)~dB below the vacuum level. This entanglement can be used to implement Quantum Illumination. Quantum illumination is a powerful sensing technique that employs entangled photons to boost the detection of low-reflectivity objects in environments with bright thermal noise. The promised advantage over classical strategies is particularly evident at low signal photon flux, a feature which makes the protocol an ideal prototype for non-invasive biomedical scanning or low-power short-range radar detection. In this work, we experimentally demonstrate quantum illumination at microwave frequencies. We generate entangled fields using a Josephson parametric converter at millikelvin temperatures to illuminate a room-temperature object at a distance of 1 meter in a proof of principle bistatic radar setup.