SQUEEZING LIGHT TO GET NON-CLASSICAL WORK IN QUANTUM ENGINES

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Light can be squeezed by reducing the quantum uncertainty of the electric field for some phases. We show how to use this purely-quantum effect to extract net mechanical work from radiation pressure in a simple quantum photon engine. Along the way, we demonstrate that the standard definition of work in quantum systems does not capture the extractable mechanical work, as it does not reflect the energy leaked to these quantum degrees of freedom. We use these results to design an Otto engine able to produce mechanical work from squeezing baths, in the absence of thermal gradient. Interestingly, while work extraction from squeezing generally improves for low temperatures, there exists a non-trivial squeezing-dependent temperature for which work production is maximal, demonstrating the complex interplay between thermal and squeezing effects.

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