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Improving interferometric displacement detection with quantum correlations

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Interferometers enable ultrasensitive measurement in a wide array of applications from gravitational wave searches to force microscopes. We now have the ability to study interferometers in the interesting limit in which quantum backaction places constraints on measurement sensitivity for a solid-state object. To enter this new regime we have constructed micromechanical devices at cryogenic temperatures that respond appreciably to radiation pressure in an optical cavity. Our most recent experiments show we can access quantum correlations that improve upon the standard quantum limit for continuous displacement detection.