

Quantum back action cancellation in the audio band

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1 Abstract

As gravitational wave measurements become more sensitive, they will start to be limited by quantum back action noise. Because effects like quantum radiation pressure noise have been previously measured, the next step is to remove these effects from measurement in a process called back action cancellation. Our system, consisting of a Fabry Perot cavity with a microfabricated movable mirror, is used to demonstrate cancellation of quantum back action. We first verify the presence of this back action by measuring the light in reflection of the cavity. The cancellation is then performed by splitting the transmitted light from the cavity, sending it to two photo detectors, and cross correlating the outputs. By showing that the cross correlated output and previous measurements of thermal noise are the same, we confirm that these quantum effects have been eliminated from the measurement (because thermal noise is the next limiting noise source). These cancellations demonstrate a significant step towards the reduction of quantum radiation pressure noise effects in aLIGO and future generation detectors.