

## **Backaction Evasion for PT-Symmetric Interferometer**

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In gravitational wave research, one of the challenges for conventional detectors is that we need to sacrifice peak sensitivity to obtain a larger bandwidth in the noise spectrum. White Light Cavities (WLC) enable us to improve the bandwidth without sacrificing the peak sensitivity. In our project, we consider a PT-symmetric interferometer consisting of an arm cavity, a test mass attached to the arm cavity, a filter cavity, and a mechanical oscillator which is the end mirror of the filter cavity. This interferometer with coherent quantum feedback yields a stabilized WLC (sWLC). However, the backaction noise due to radiation pressure on the test mass reduces the sensitivity of the system in the lower frequency range. In this project, we introduce an effective negative mass to cancel the backaction noise and obtain a larger bandwidth by sacrificing less of the sensitivity compared to a conventional detector. We achieve the negative mass by attaching an optical mode to the mechanical oscillator of the system and applying blue-detuned pumping, red-detuned pumping, and detuning.