

Abstract Submitted  
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**Adaptive Mode matching in stable recycling cavities in Advanced LIGO**<sup>1</sup> G. MUELLER, M.A. ARAIN, V. QUETSCHKE, D.H. REITZE, D.B. TANNER, University of Florida — The Laser Interferometer Gravitational-Wave Observatory has reached its design sensitivity and is currently in its fifth science run (S5). One of the main obstacles in reaching the design sensitivity was the imbalance of the RF-sidebands inside the unstable and thermally loaded recycling cavity, requiring the implementation of external thermal compensation and ultra-stable RF oscillators to overcome this problem. These effects will be amplified in Advanced LIGO, which will operate at 15 times greater laser power. Thermal deformations excite higher order spatial modes which are resonantly enhanced for the RF-sidebands and the gravitational-wave-induced signal sidebands. This may lead to signal loss and perhaps to instabilities which could prevent high power operation. We propose to develop stable recycling cavities and compensate the remaining thermally driven losses with an adaptive mode-matching system. We will discuss the physics behind these effects, describe how the system is analyzed, and discuss the current status of the analysis. .

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