

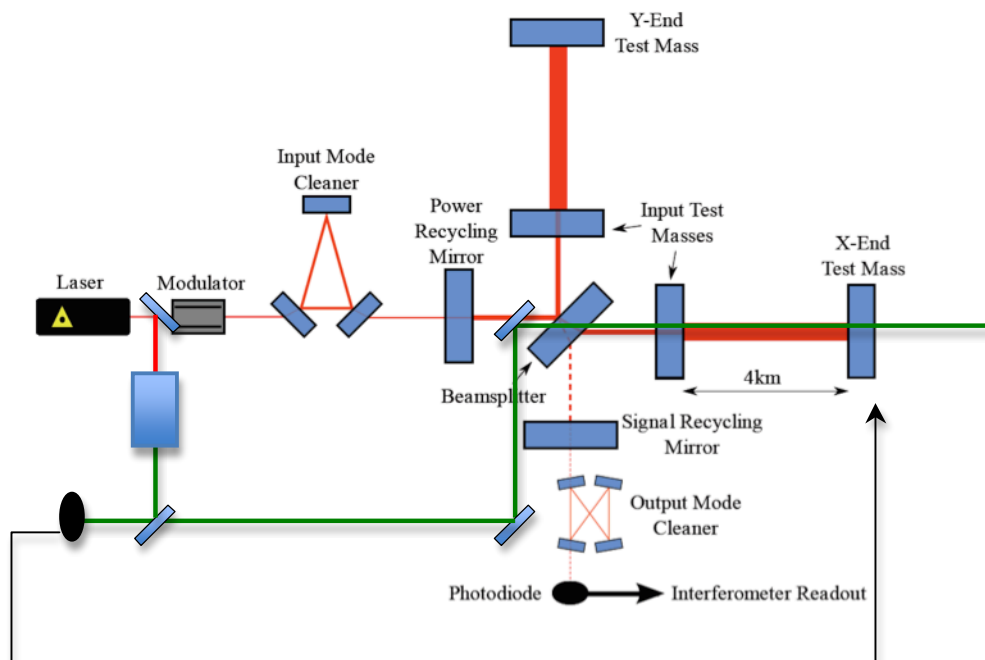
Auxiliary Locking Techniques in Second Generation Gravitational Wave Interferometers

Aidan Brooks, Kiwamu Izumi, David Yeaton-Massey and Rana Adhikari

California Institute of Technology, 1200 E California Blvd, Pasadena, CA 91125
brooks_a@ligo.caltech.edu

Abstract: The techniques used to stabilize and control a second-generation gravitational-wave (GW) interferometer are being investigated at the Caltech 40m Interferometer. We describe the process of using auxiliary lasers to decouple the optical cavities, dramatically simplifying the control problem.

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1. Introduction

- LIGO is built to detect GWs, etc
- Control of a suspended dual-recycled Fabry-Perot Michelson will be difficult
- Need to build a more deterministic locking system to maximize the operating time.
- Arm length stabilization

2. Arm Length Stabilization

- A secondary laser at 532nm is slaved to one to the Fabry-Perot arm cavities through the end mirror
- The transmission of green through the cavity beats with a frequency doubled pick-off of the main cavity laser
- The beat note between the two lasers provides a measure of the frequency drift of the cavity resonance for the main cavity laser.
- This error signal is used to stabilize the cavity length below 10Hz.

3. Conclusions

- We will report on the latest developments testing this control scheme at the 40m interferometer.