

Abstract Submitted
for the CAL13 Meeting of
The American Physical Society

An Automated Photodetector Frequency Response Measurement System for LIGO¹ ALEXANDER COLE, Pomona Coll, ERIC GUSTAFSON, California Institute of Technology, LIGO COLLABORATION — LIGO will detect gravitational waves using laser interferometers that will be quantum noise limited over most of the apparatus's operating frequency range. To build an interferometric gravitational wave detector that works at the limits set by quantum mechanics, one must ensure that the detector can be controlled and read out optically. In the LIGO interferometers, several photodiodes are used to sense various degrees of freedom and provide feedback signals so that the cavities are in optical resonance. It is thus necessary to treat the photodiode and its readout electronics as systems whose performances, including frequency response, can change over time and with changing operating conditions. This project's purpose was to build an automatic frequency response measurement system for the interferometer's photodiodes. We use a modulated diode laser coupled through a fiber optic distribution system to illuminate the photodiodes, and then automatically and quickly measure the frequency response of each photoreceiver using a network analyzer and an RF switch to select the photodiodes one after another. The experiment was carried out at Caltech on the LIGO 40m prototype interferometer and designed with Advanced LIGO scalability in mind.

¹Funding: National Science Foundation (REU)

Alexander Cole
Pomona Coll

Date submitted: 03 Oct 2013

Electronic form version 1.4