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Observation of an Optical Spring with a Beamsplitter[1] BENJAMIN LANE, JONATHAN CRIPE, Louisiana State University - Baton Rouge, BAYLEE DANZ, Brigham Young University - Idaho, THOMAS CORBITT, Louisiana State University - Baton Rouge — The current generation of gravitational wave detectors such as LIGO and VIRGO utilize high power lasers to reduce the shot noise within an interferometer. This high power creates a significant radiation pressure that couples the laser fields and the mechanical motion of the test masses opto-mechanically. This opto-mechanical coupling gives rise to an optical spring that changes the resonance of the interferometer, and thus should be studied. We present the observation of a stable optical spring without the use of an optical cavity. We used a Michelson-Sagnac interferometer with a GaAs microresonator as a common/end mirror. Our measurements were done using input powers up to 363mW and show that the shift of the optical spring frequency as a function of input power is in excellent agreement with theoretical predictions. We also show that the optical spring can keep the interferometer stable and locked without the use of external feedback.

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