Abstract Submitted
for the FWS19 Meeting of
The American Physical Society

**Towards room-temperature optomechanical squeezing in a kilogram-scale suspended interferometer** GAUTAM VENUGOPALAN, KEVIN KUNS, KOJI ARAI, RANA ADHIKARI, CALIFORNIA INSTITUTE OF TECHNOLOGY — The sensitivity of future gravitational wave interferometers is expected to be limited throughout the detection band by quantum vacuum fluctuations, which can be reduced by quantum nondemolition methods such as squeezed vacuum injection. Currently, non-linear crystals are used to generate the aforementioned squeezed vacuum field. An alternative method exploits the radiation-pressure mediated interaction between the mirrors forming the optical cavity and the resonant laser field. This technique has been successfully demonstrated in the field of nanoscale cavity optomechanics, but not at the kilogram mass scale and at audio frequencies where it would be useful for quantum noise evasion in terrestrial kilometer scale gravitational wave detectors. In this work, we describe the experimental design and analysis of fundamental and technical noise sources of a prototype 40 m interferometer with 250 g mirrors that can produce an optomechanically squeezed vacuum field at $\approx 100$ Hz.

Gautam Venugopalan
CALIFORNIA INSTITUTE OF TECHNOLOGY

Date submitted: 04 Oct 2019 Electronic form version 1.4