Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Experimental study of vibrational and optical whispering-gallery modes of levitated superfluid drops. MEHDI NAMAZI, Yale Quantum Institute, Yale University, New Haven, CT, 06520, USA, CHARLES BROWN, Department of Physics, Yale University, New Haven, CT, 06520, USA, YIQI WANG, Department of Applied Physics, Yale University, New Haven, CT, 06520, USA, MEHMETTUNA UYSAL, GLEN HARRIS, JACK HARRIS, Department of Physics, Yale University, New Haven, CT, 06520, USA — Interaction of light with the vibrational motion of various materials provides a powerful tool to study the quantum behavior of microscopic objects. On the other hand, superfluid liquid helium is an unique material with which one can access new regimes of quantum opto-mechanics, due to its extremely low optical and mechanical dissipation, its high thermal conductivity, its ability cool itself via evaporation, and its unconventional degrees of freedom (such as ripplons and vortices). To minimize dissipative coupling to the environment, it is possible to magnetically levitate mm-scale drops of liquid helium in high vacuum. Here we present our latest results on the characterization of vibrational and optical whispering-gallery modes in levitated drops of various size. These preliminary results demonstrate a promising path towards high optical quality factors and strong opto-mechanical couplings in massive objects.

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Date submitted: 01 Feb 2019 Electronic form version 1.4