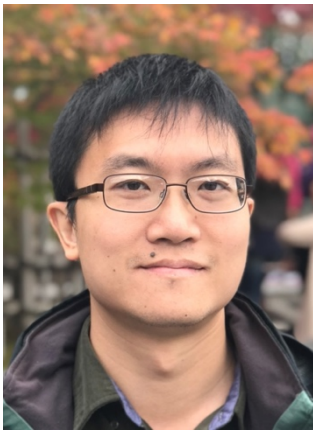




THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
COLLOQUIUM

Quantum-Fluctuations-Induced Heat Transfer between Nano-Mechanical Membranes

by



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Date: January 22, 2021 (Friday)

Time: 4:00 - 5:00 p.m.

Join ZOOM Meeting: <https://cuhk.zoom.us/j/93107104561>

ALL INTERESTED ARE WELCOME

Abstract

Quantum vacuum fluctuations is the underlying cause of a wide range of interesting physical phenomena, such as spontaneous emission, Lamb shift, Hawking radiation, and Casimir effect. Recent theory predicts that quantum fluctuations of electromagnetic fields can induce phonon tunneling between objects and thus provides a mechanism for heat transfer across vacuum [1]. In this presentation, I will talk about our first experimental observation of such a phenomenon [2]. We achieved Casimir strong phonon coupling between two nano-mechanical membranes and observed heat exchange between individual phonon modes through high precision optical interferometry. With control experiments, we unambiguously distinguished the contributions from other effects such as electrostatic interaction and thermal radiation. Our result reveals quantum fluctuations as a new heat transfer mechanism in addition to the convectional conduction, convection, and radiation. It also opens up new opportunities to utilize quantum vacuum in thermal engineering and studies of quantum thermodynamics.

[1] Phys. Rev. B 94, 075414 (2016).

[2] Nature 576, 243 (2019).

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