

University of Miami, Physics Department Colloquium

Date: Wednesday, Oct 21, 2026

Time: 3:45 pm – 4:45 pm

Location: Physics Library – Rm 335, Knight Physics Building

Atomically Thin Optomechanical Resonators with Heterogeneous Integration for Resonant Sensing and Quantum Transduction

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Abstract

Emerging resonant nanoelectromechanical systems (NEMS) enabled by two-dimensional (2D) materials and their heterostructures offer exceptional responsivities and sensitivities for detecting minuscule events and variations in a wide range of applications. A compelling frontier is the heterogeneous integration of such 2D NEMS transducers on modern integrated photonic chips, toward scaling up and enabling novel systems with versatile functions. We analyze and design graphene trampoline 2D NEMS resonators with high opto-thermal-mechanical transduction responsivities, strong thermal isolation, and multiple high-Q nanomechanical resonances that are suitable for low-noise optical transduction and heterogeneous integration. In this talk, I will present my collaborative team's research endeavors and results focused on engineering atomically thin nanomechanical resonators, towards pushing the limits in nano-optomechanical resonant sensing and signal transduction. I will report on experimental demonstration and theoretical analysis of harnessing ultrathin 2D trampoline nano-optomechanical resonators with unique potential for uncooled ultrasensitive infrared (IR) detection, and their heterogeneous integration with high-performance photonic crystal cavities on state-of-the-art integrated photonic chips. Furthermore, I will also discuss the designs and feasibilities of harnessing the unconventional properties of high-Q 2D NEMS and optomechanical resonators, toward engineering new ultracompact NEMS capable of operating in quantum regime, and for enabling hybrid quantum systems and transduction schemes.

Biography



Philip Feng is currently a Wally Rhines Endowed Professor in Department of Electrical & Computer Engineering (ECE) and a Graduate Faculty Professor in Department of Physics at University of Florida (UF), Gainesville, FL, USA. He received his Ph.D. in Electrical Engineering from California Institute of Technology (Caltech) in 2007. His group's research has been primarily focused on device physics and engineering of resonant micro/nanoelectromechanical systems (MEMS/NEMS) and optomechanical transducers for information processing in both classical and quantum regimes, by harnessing properties of new materials and coherent signal transduction schemes, especially those in wide/ultrawide-bandgap (WBG/UWBG) materials, 2D materials and heterostructures. He has graduated 19 Ph.D. students, mentored >15 postdoctoral scholars, and supervised over 16 M.S. students with theses or research projects. His research and education endeavors have been recognized by various awards including the National Academy of Engineering (NAE) Grainger Foundation Frontiers of Engineering (FOE) Award, the National Science Foundation (NSF) CAREER Award, the Presidential Early Career Award for Scientists and Engineers (PECASE), and several Best Paper Awards (with his students) at IEEE, Hilton Head Workshop, and other international conferences. He's also received the UF ECE Excellence Awards in both Research and Service in recent years. He has served as the conference chair for IEEE MEMS 2021 and IEEE IFCS 2026. He has been an organizer and co-chair for the SiC+X Workshop (a forum focused on the frontiers of SiC & related materials, devices, & systems) since 2017. He co-organized and co-chaired the Florida Semiconductor Week 2023, the Florida Quantum Summit 2025, and the UF Quantum Day 2025. For more information, please see www.ece.ufl.edu/philip-feng and [Google Scholar](#).