**Announcing the Final Examination of Tianyi Guo for the degree of Doctor of Philosophy in Physics**

**Date:** November 6, 2023
**Time:** 2:30 p.m.
**Room:** CREOL Room 103
**Zoom:** https://ucf.zoom.us/j/97746110599

**Dissertation title:** Low Energy Photon Detection

**Abstract:**
Detection of long wave infrared (LWIR) light at room temperature has been a long-standing challenge due to the low energy of photons. A low-cost, high-performance LWIR detector or camera that operates under such conditions has been pursued for decades. The modern LWIR detectors can be categorized as cooled and uncooled detectors. Cooled detectors such as MCT detectors exhibit high detectivity and fast response time, however the requirement of cryogenic cooling significantly boosts its cost and limits its applications. The uncooled detectors such as microbolometers, on the other hand, can be operated at room temperature and are relatively cost effective, yet they exhibit lower detectivity and slower response time. In this work, I will demonstrate two approaches towards next generation LWIR detectors with high detectivity, fast response time and room temperature operation. The first approach is utilizing Dirac plasmon and the Seebeck effect in graphene to form a photo-thermoelectric detector. I will also introduce scanning near field microscopy to unveil the plasmons generated in graphene by both imaging and spectroscopy methods. The second approach is utilizing the modulation of frequency caused by Infrared illumination in an oscillating circuit with phase change materials. Finally, I will demonstrate the progress of integrating the graphene detectors to electronic readout circuits (ROIC) for the focal plane array formation of functional IR cameras.

**Outline of Studies:**
Major: Physics

**Educational Career:**
B. S. University of Science and Technology of China

**Committee in Charge:**
Dr. Debashis Chanda (Chair)
Dr. Eduardo Mucciolo
Dr. Arkadiy Lyakh
Dr. David Hagan (External Committee Member)

Approved for distribution by Dr. Debashis Chanda, Committee Chair, on October 26th, 2023.

The public is welcome to attend in-person or remotely.