



University of Miami, Physics Department Colloquium

Date: Wednesday, Jan 17, 2024
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Quantum Astrometry & X-ray Quantum Optics

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Abstract

I will first discuss the emergent field of quantum astrometry and quantum-enhanced telescopes. The idea of exploring quantum features of light to perform more precise astronomical measurements is a long-desired goal of both the optics and astronomy communities. Recently, some key advances were made in both theory and experiment. I will report on our project, including a proof-of-principle tabletop demonstration of a scheme for long-baseline telescopes assisted by quantum optics, and fast single-photon-sensitive spectrometers, which could be used in our project, but also could find many quantum applications. I will also discuss some of the astrophysics and cosmology motivations for our work.

In the second part of my talk, I will discuss X-ray quantum optics. The ability to produce, manipulate, and detect single photons has opened the way for many contemporary physics developments, including quantum computing, sensing, metrology, cryptography, and imaging. However, these techniques have generally been limited to the visible and IR parts of the electromagnetic spectrum. Our recent experiment addresses this critical challenge. I will report on our Spontaneous Parametric Down-Conversion (SPDC) experiment in the X-ray regime. This is, to the best of our knowledge, the world record for X-ray photon pair production. Our aim is to unlock new applications in imaging, and to work towards a quantum-enhanced X-ray microscope.