Physics Colloquium

Physics Faculty and Search Committee Candidate

Mehul Malik

Thursday, February 9nd at 4:10 pm in LL 316.
Refreshments available at 3:45.

High-Dimensional Quantum Photonics: Pushing the limits of Quantum Information Science

From large-scale quantum cryptographic networks to addressing quantum states of matter, photons are ubiquitous in the quantum technologies of today. However, most modern applications utilize very little of the enormous information-carrying potential that a photon has to offer. Fully exploiting the photonic spatial and temporal degrees of freedom promises noise-resistant quantum information systems with greater capacity and higher levels of security than ever before.

In this talk, Dr. Malik will present an overview of quantum photonics with structured light, and discuss recent work on high-dimensional quantum communication and multi-photon entanglement. The development of a high-dimensional beam splitter for twisted photons and its application for quantum state characterization and high-capacity quantum key distribution will be discussed. Then, we will dive into the creation of the first high-dimensionally entangled state of three photons, as well as a computational algorithm for designing new quantum experiments that generate a vast family of complex, multi-photon entangled states. Finally, this will lead to ideas for future prospects of high-dimensional quantum information science.

Dr. Mehul Malik *is a senior post-doctoral fellow at the Institute of Quantum Optics and Quantum Information (IQOQI) in Vienna, Austria. He graduated with a PhD in Optics from the University of Rochester in 2013, following which he received a Marie Curie post-doctoral fellowship from the European Commission to work with Prof. Anton Zeilinger at the University of Vienna. Mehul's research interests lie in the fields of experimental quantum photonics and quantum information science. In 2016, he created the first multi-particle entangled states in high dimensions using the orbital angular momentum property of light. Over the course of his research career, Mehul has published 29 peer-reviewed papers and has been invited to speak at 9 conferences around the world. Looking forward, Mehul's research aims to push the limits of photonic quantum entanglement with applications in high-capacity quantum communication, ultra-sensitive quantum imaging, and the simulation of complex quantum systems.*