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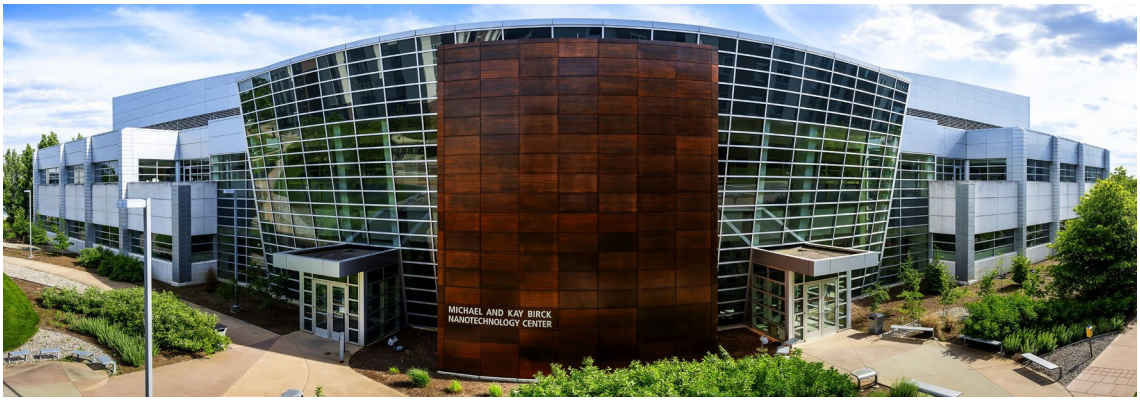
Birck Nanotechnology Center



Seminar on

Quantum Electro-Optics

with Dr. Rishabh Sahu

(from the Institute of Science and Technology Austria)

Where: **BRK 2001** or Online

When: Friday, **Oct. 6th, 12:15 PM – 1:30 PM**

Pizza will be provided!

Zoom Link: https://purdue-edu.zoom.us/j/96908339780

Abstract:

In the last few decades, a myriad of physical systems such as photons, atoms, ions and spins have been explored for various different quantum technologies such as computation, communication and meteorology. Until now, no single physical system has been suitable for all the different quantum applications. As a result, in the future, we can expect a quantum network of spatially separated quantum processing, memory or sensing nodes - all connected via flying qubits or optical photons. Many quantum systems such as solid-state qubits and trapped ion qubits have already been successful in entangling multiple nodes separated by long distances owing to optical transitions in these systems which make it easy to bridge these local nodes with optics. However, microwave technologies such as superconducting qubits have been left behind in this matter. This is mostly because of the huge challenge posed by incompatibility of microwave and optical technologies - high energy optics not only thermally heats up the microwave circuitry but also breaks the cooper pairs in the superconducting metal breaking their superconductivity. As a result, it has been hard to establish a quantum bridge between these two frequency domains. In this talk, I will present our bridge between microwave and optical frequencies which is based on electrooptical nonlinearity. I will talk about many important results which show the viability of this platform in future quantum networking applications involving microwave technologies.

Bio:

Rishabh completed his bachelor's and master's degree in physics at the Indian Institute of Technology, Kanpur. His research mainly involved studying orbital angular momentum of light, in particular, sorting photons in this basis to get a multidimensional basis for photons. His master's thesis involved simulating Maxwell's equation using Finite Difference Time Domain (FDTD) method. Rishabh started graduate school at ISTA in fall of 2018 and joined the Fink group in 2019. He graduated in 2023 and works now as a postdoc on new cavity electrooptics experiments.

Relevant Publication: Sahu, R. et al. Entangling microwaves with light. Science 380, 718–721 (2023).