WPI Physics COLLOQUIUM

Join Us for Our Guest Speaker



Prof. Pankaj Jha

Assistant Professor, Electrical Engineering and Computer Science, Syracuse University, Syracuse, NY

Turning Up the Heat on Superconducting Photodetectors

Abstract:

Superconducting single-photon detectors combine high efficiency, speed, and low noise, making them essential tools for exploring fundamental quantum phenomena and developing emerging quantum technologies. That performance comes at a cost: most devices use conventional superconductors that must run near 4 K. The cryogenics needed to reach that temperature often dominate the system's size, weight, and power. Can we make these detectors work at higher temperatures without losing their speed?

In this talk, I will describe our work on Fe(Te,Se), an iron-based van der Waals superconductor with a transition temperature near 13 K. Under pulsed visible illumination, microbridges made from exfoliated, hBN-encapsulated Fe(Te,Se) flakes act as fast optical switches above liquid-helium temperature. They reset on their own in about 200–270 ps, with no shunt resistor or added inductor, and show timing jitter as low as 115 ps. We explain the bias- and temperature-dependent jitter with a photo-induced electrothermal-instability model. The present devices respond to optical energy above a threshold rather than to single photons. I will discuss what sets that threshold and the geometric scaling needed to reach single-photon sensitivity.

Bio:

Pankaj K. Jha has been an Assistant Professor of Electrical Engineering and Computer Science at Syracuse University since 2022, where he leads the Quantum Technology Laboratory. He received his PhD in Physics from Texas A&M University and was a postdoctoral scholar at UC Berkeley and Caltech before joining Syracuse. His research integrates 2D materials, metamaterials, and superconducting devices to advance quantum photonic technologies, with a focus on next-generation single-photon detectors. His work has been highlighted by Lawrence Berkeley National Laboratory, the Kavli Foundation, and the Moore Foundation. His recent honors include a 2023 Air Force Research Laboratory (AFRL) Visiting Faculty Research Program Fellowship and a 2023 Syracuse University Faculty Creative Activities and Research (FCAR) Grant. His research is supported by the NSF, AFRL, DARPA, and Google.

Monday 11/30/26

12:00-12:50pm in Room Innovation Studio 205