

# **Physics Department Dissertation Defense**

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**Friday, September 30, 2022**

**2:00 PM in SE 319A**

## **Side-Channel-Free Quantum Key Distribution Source using a KTP Polarization Modulator and a Broadband Laser**

We developed a Decoy-State Quantum Key Distribution (QKD) source based on a polarization-modulator and a broadband laser in this effort. A three-state QKD protocol is achieved by modulating the polarization of the quantum state. The polarization-modulator-based QKD source improves security by eliminating several sources of side-channel attacks which are present when using multiple sources to produce different QKD states. The QKD source design is presented, along with an evaluation of critical subsystems. The performance is characterized, including Quantum Bit Error Rate (QBER), Quantum State Tomography, and achievable Key Rates. The QKD source is designed to operate under compact Size, Weight, and Power (SWaP) limitations. Applications of the Polarization-Modulator QKD source include deployment in future mobile quantum networks, including Unmanned-Aerial Vehicles (UAV) and autonomous vehicles, as well as fixed fiber-based quantum networks.