



Special seminar

Friday, September 12, 2025

1:00 pm

WSI, Seminar room S 101

Exclusively in person

“Two-photon entanglement for quantum imaging and metrology”

Photon entanglement is a core resource in quantum technologies. During this talk, I will introduce the generation of various two-photon entangled states across different degrees of freedom, including polarization, orbital angular momentum (OAM), path-photon number (NOON), energy-time, and time-bin, using two distinct experimental platforms. The first is a solid-state quantum dot (QD) system where we utilize inelastic scattering between photons and a two-level emitter to create energy-time entangled photon pairs. We are also developing entanglement between a QD spin and a photonic time-bin qubit. The second platform is based on spontaneous parametric down-conversion (SPDC). We increase OAM entanglement dimensions by shaping the pump beam profile. Regarding exploring applications, we employ NOON states within a birefringent interferometer to demonstrate beating-type phase super-resolution, enabling a single-shot measurement of a KTP crystal's biaxial thermo-optic coefficients. Combining polarization entanglement with metasurface imaging system, we have developed a novel quantum imaging scheme for non-local, switchable edge detection, allowing the imaging mode to be controlled remotely without altering the imaging setup. Furthermore, real-time heralded quantum edge enhanced imaging is demonstrated, offering a high signal-to-noise ratio advantage in low-light conditions.

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