MAX PLANCK INSTITUTE
OF MICROSTRUCTURE PHYSICS

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IN-FIBER DIRECT GENERATION OF ENTANGLED AND HYPER-ENTANGLED PHOTON PAIRS

ABSTRACT

Entangled photon pair sources are crucial and indispensable components in quantum applications. Entangled photon sources based on nonlinear crystals or waveguides require bulky free-space optics and precision alignment. In contrast, fiber-based entangled photon sources, where entangled photon pairs are directly generated in an optical fiber, make quantum technologies less costly, more practical and accessible, as well as compatible with telecom fiber network infrastructure. In this talk, we review the development of fiber-based entangled and hyper-entangled photon pair sources based on the periodically-poled silica fiber (PPSF). We demonstrate practical and high quality entanglement sources at room temperature, compact and alignment free. The technology has now been commercialized. My talk will reveal the key technological advantages of using PPSF as a nonlinear material for entangled photon generation, as well as remaining challenges. If time permits, I will also briefly discuss the applications of polarization-frequency hyper-entanglement and characterization of high-dimensional entanglement systems, including deriving entanglement witnesses using machine learning.

JULY 18, 2023, 11:00 AM

LECTURE HALL