Devices and Protocols for Quantum Advantage in Sensing

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Abstract— LiDARs with entangled light sources (such as quantum illumination) have been reporting impressive enhancement over classical LiDARs in noise resilience and sensitivity. However, their low power quantum sources (single photon level at best) cannot offer the operating distance offered by high power classical sources which are deployed in, and indispensable for, practical far-reaching (km range operating distance of moving targets) LiDAR applications.

The quantum inspired LiDAR discussed in this talk inherits the advantages of quantum LiDAR while completely circumvents their power limitations. It is based on two novel principles simultaneously: (1) using high power classical time-frequency correlation that is closely related to non-classical time-frequency entanglement and (2) using a novel frequency conversion technique to analyze such correlation with unprecedented efficiency and accuracy.

Also in this paper polarization and hybrid entangled source of light which were built using a fully on-chip battery-powered source of entangled photons will be discussed. These devices use monolithically integrated Bragg reflection waveguide laser diode (BRL) enabling high fidelity, record flux, compact photon pairs to be generated via a type-II intracavity phase-matching process.

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