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Quantum Enhanced Plasmonic Sensing[1]

ALBERTO MARINO, University of Oklahoma

One of the long-standing goals of quantum optics has been the use of quantum states of light to enhance the sensitivity of devices. Plasmonic sensors, which are widely used in biological and chemical sensing applications and serve as a robust diagnostic tool, offer a unique opportunity to bring such an enhancement to real-life devices. In this talk I will describe our work on the interface between quantum states of light, known as twin beams, and plasmonic sensors that consist of an array of subwavelength nanoholes. In particular, I will present recent experiments that show that continuous-variable entanglement survives the transduction, or transfer from photons to plasmons and back to photons, through a plasmonic structure and that the reduced noise properties of the twin beams can enhance the sensitivity of plasmonic sensors for refractive index measurements. We have shown a quantum enhancement of 56% with respect to the shot noise limit for plasmonic sensors operating at the current state-of-the-art.

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