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Parallel Quantum-Enhanced Plasmonic Sensing[1] AYE WIN, MOHAMMADJAVAD DOWRAN, ASHOK KUMAR, University of Oklahoma, BENJAMIN J. LAWRIE, RAPHAEL C. POOSER, Oak Ridge National Laboratory, ALBERTO M. MARINO, University of Oklahoma — Quantum sensing takes advantage of quantum resources to enhance the sensitivity of a device beyond its standard quantum limit (SQL), which defines the minimum noise floor associated with classical resources. In principle, temporal and spatial quantum correlations can be used to enable a parallel sensing configuration that can beat the SQL. Here, we present our progress towards the use of highly multi-spatial mode twin beams generated via a four-wave mixing process in ^{85}Rb atomic vapor to implementing a parallel quantum-enhanced plasmonic sensing configuration. We have previously demonstrated a quantum-based enhancement of a single plasmonic sensor that allowed us to measure refractive index changes beyond the SQL. We now extend this configuration to a parallel sensing one by designing and fabricating an array of plasmonic sensors and detectors. The multi-spatial mode properties of the twin beams make it possible to independently probe each of the sensors in the array. Given that plasmonic sensors are ubiquitous in biology and chemical sensing applications, a parallel sensing configuration will enable a network that can detect local changes in refractive index to identify different bio-chemicals in parallel or to perform differential measurements.

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