Physicists developing quantum-enhanced sensors for real-life applications

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A University of Oklahoma physicist, Alberto M. Marino, is developing quantum-enhanced sensors that could find their way into applications ranging from biomedical to chemical detection.

In a new study, Marino's team, in collaboration with the U.S. Department of Energy's Oak Ridge National Laboratory, demonstrates the ability of quantum states of light to enhance the sensitivities of state-of-the-art plasmonic sensors. The team presents the first implementation of a sensor with sensitivities considered state-of-the-art and shows how quantum-enhanced sensing can find its way into real-life applications.

"Quantum resources can enhance the sensitivity of a device beyond the classical shot noise limit and, as a result, revolutionize the field of metrology through the development of quantum enhanced sensors," said Marino, a professor in the Homer L. Dodge Department of Physics and Astronomy, OU College of Arts and Sciences. "In particular, plasmonic sensors offer a unique opportunity to enhance real-life devices."

Plasmonic sensors are currently used in a number of applications, such as biosensing, atmospheric monitoring, ultrasound diagnostics and chemical detection. These sensors can be probed with light and have been shown to operate at the shot noise limit. Thus, when interfaced with quantum states of light that exhibit reduced noise properties, the noise floor can be reduced below the classical shot noise limit. This makes it possible to obtain a quantum-based enhancement of the sensitivity.

A study on this project, "Quantum-Enhanced Plasmonic Sensing," has been published in the scientific journal *Optica*.

More information: Mohammadjavad Dowran et al. Quantum-enhanced plasmonic sensing, *Optica* (2018). DOI: 10.1364/OPTICA.5.000628 , arxiv.org/abs/1802.00410

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