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Innovating quantum technologies

Quantum Enhanced Sensing with Light

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The University of Oklahoma

Wednesday, December 9, 10 a.m. ET.: Zoom Link

Alberto Marino is an Associate Professor at the University of Oklahoma. His research focuses on experimental quantum optics, with particular emphasis on its applications to quantum information science and quantum metrology. Before arriving to the University of Oklahoma, he held a postdoctoral position and then an Assistant Research Scientist position at the Joint Quantum Institute (NIST/University of Maryland). He obtained an M.S. and a Ph.D. in optics from the Institute of Optics at the University of Rochester. He is currently serving as the Interim Director for the Center for Quantum Research and Technology at the University of Oklahoma.

There is a significant effort to take advantage of quantum resources, such as entanglement and superposition, to enhance measurements and devices in a way not possible with classical resources. This has led to the development of the emerging area of quantum technologies. Quantum optics will play a significant role in this so called “Second Quantum Revolution” due to the precise control and characterization that can be achieved with light. In this talk I will give an overview on the use of quantum states of light to enhance optical based sensors beyond the shot noise limit. I will focus on our work on the interface between entangled twin beams of light and plasmonic sensors. With this system we have shown a quantum enhancement in sensitivity of 56% with respect to the shot noise limit. I will describe the fundamental limits to the quantum enhancement that can be achieved with these approaches. Finally, I will present our most recent work on the implementation of a parallel quantum enhanced sensing approach.