Contribution ID: **16**   Type: **Talk**

Quantum-enhanced multiparameter estimation and compressed sensing of a field

Wednesday, 13 September 2023 09:55 (35 minutes)

We show that a significant quantum gain corresponding to squeezed or over-squeezed spin states can be obtained in multiparameter estimation by measuring the Hadamard coefficients of a 1D or 2D signal. The physical platform we consider consists of two-level atoms in an optical lattice in a squeezed-Mott configuration, or more generally by correlated spins distributed in spatially separated modes. Our protocol requires the possibility to locally flip the spins, but relies on collective measurements. We give examples of applications to scalar or vector field mapping and compressed sensing.

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Session Classification: Quantum sensing

Track Classification: Other