

Experimental Schemes for the Saturation of Quantum Cramer Rao Bounds for Distributed Sensing

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Breaking the standard quantum limit in the sensing of parameters at different spatial locations, such as in a quantum network, is of great importance. Using the framework of quantum Fisher information, many strategies based on squeezed quantum probes and multipath multiphoton or multiqubit entangled states have been considered. In this context there is always the question- what is the measurement that would saturate quantum Cramer-Rao bound (QCRB). We bring out remarkable utility of generalized SU (1,1) interferometry in distributed sensing of fields and forces using squeezed light sources which are also optimum quantum probes. The generalized SU (1,1) interferometry is a combination of SU(m) and SU (1,1) elements, where m is the number of nodes in the network. The SU(m) element is used to produce distributed entanglement starting from a squeezed photonic or matter probe. We show how error sensitivity measurement of the photon number at just one output port of such an interferometer can saturate QCRB and thus results in Heisenberg sensitivity in distributed sensing.

References

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