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Einstein-Podolsky-Rosen steering as a resource for quantum metrology

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Einstein-Podolsky-Rosen (EPR) steering is typically revealed from the possibility of predicting the results of non-commuting measurements with a precision that seems to violate the uncertainty principle. Quantum information recognises steering as an essential resource for a number of tasks but, contrary to entanglement, its role for metrology has so far remained unclear. In this talk I will present a formulation of the EPR paradox in the framework of quantum metrology, showing that it enables the precise estimation of a local phase shift and of its generating observable. We derive a criterion based on the quantum Fisher information that detects steering in a larger class of states than well-known uncertainty-based criteria. Our result identifies useful steering for quantum enhanced precision measurements and allows one to uncover steering of non-Gaussian states in state-of-the-art atomic and optical experiments.

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