

## Detecting entanglement with tools from metrology

*Tuesday, 29 June 2021 17:00 (30 minutes)*

The central tool of quantum metrology, the quantum Fisher information (QFI), quantifies the sensitivity of quantum states under small perturbations. Besides identifying strategies to overcome classical precision limits, the QFI provides a versatile tool to detect and quantify multipartite entanglement and steering. We show how the QFI can reveal the structure of inseparable partitions, leading to a detailed characterization of multipartite entanglement beyond entanglement depth and  $k$ -separability. Furthermore, the QFI describes a complementarity relation that can be used to formulate the Einstein-Podolsky-Rosen (EPR) paradox in the framework of quantum metrology, leading to a witness for EPR steering. Metrological entanglement witnesses are more powerful than variance-based methods such as Reid's criterion or spin-squeezing coefficients and can be systematically optimized from a limited set of measurable observables.

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