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Observation and exploitation of quantum discord in many-body systems

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Quantum correlations between parts of a composite system most clearly reveal themselves through entanglement. Designing, maintaining, and controlling entangled systems is very demanding, which raises the stakes for understanding the efficacy of entanglement-free, yet quantum, correlations, exemplified by quantum discord. Discord is defined via conditional mutual entropies of parts of a composite system, and its direct measurement is hardly possible even via full tomographic characterization of the system state. Here we design a simple protocol to detect quantum discord and characterize a discorded state in an unentangled bipartite system. Our protocol relies on a characteristic of discord that can be extracted from repeated direct measurements of current correlations between subsystems. The proposed protocol opens a way for extending experimental studies of discord to many-body correlated systems.

Metrological applications of quantum correlations are defined by the Fisher information which can be linked to the quantum geometric discord. Some measurements can be devised to exploit quantum discord and not the entanglement. The amplitude of oscillations of the probability distribution function, used to construct the Fisher Information, is bound from above by the geometric discord. This means that metrological advantage may be achieved with discorded untangled states which are more robust against environmental effects.

Is this abstract from experiment?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

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https://research.aston.ac.uk/en/persons/igor-yurkevich

Internet talk

No

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