

Signatures of quantumness in composite systems

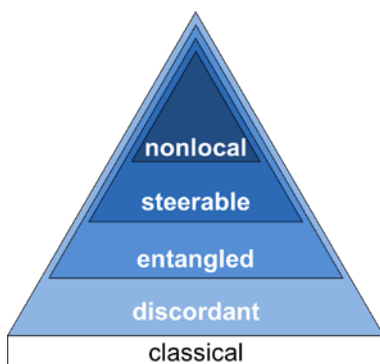
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Coherence, discord-type correlations, and entanglement are all fundamental manifestations of quantum theory and are all useful resources for certain quantum technological tasks. In this Colloquium I show how these different signatures of quantumness can be activated into each other and interpreted under a common framework. I first review the rigorous mapping between discord-type measures and entanglement measures by means of premeasurement interactions [1,2], recently implemented experimentally [3]. I then focus on the interplay between each of these two forms of quantum correlations and quantum coherence [4] in single and composite systems. On the one hand, discord-type correlations are interpreted as minimum coherence in all local bases [1,5,6]. On the other hand, an exact equivalence between coherence and entanglement is established within their respective resource theories [7]. Namely, for any entanglement monotone, the maximum amount of entanglement that can be created by incoherent operations on an input system and an incoherent ancilla, defines a corresponding coherence monotone for the input state of the system. Overall this presentation provides a comprehensive picture of the various shades of quantumness in mixed states of composite systems and their general interrelations.



Hierarchy of quantum correlations



Equivalence between quantum coherence and entanglement

References

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