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Quantumness versus entanglement in quantum measurements[1]
GERARDO ADESSO, School of Mathematical Sciences, The University of Nottingham, MARCO PIANI, Institute for Quantum Computing and Department of Physics and Astronomy, University of Waterloo — We analyze a hierarchy of quantumness measures for composite systems, defined in terms of the entanglement necessarily created between systems and apparata during local measurements. We prove that the quantumness so defined is always greater than intra-systems entanglement, establishing a firm ordering relation between different non-classical features of correlations. We analyze qualitatively and quantitatively the flow of correlations in iterated measurements, showing that quantumness and entanglement can never decrease along von Neumann chains. Our results provide a comprehensive framework to understand and quantify general signatures of quantumness in multipartite states, and prove how useful the broader study of the quantumness of correlations can be to shed light on issues in quantum information processing, in the quantum theory of measurement and in quantum foundations.

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