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Quantum networks reveal quantum nonlocality DANIEL CAVALCANTI, CQT-Centre for Quantum Technologies, MAFALDA ALMEIDA, VALERIO SCARANI, ANTONIO ACIN, CQT-ICFO COLLABORATION — The results of local measurements on some composite quantum systems cannot be reproduced classically. This impossibility, known as quantum nonlocality, represents a milestone in the foundations of quantum theory. Quantum nonlocality is also a valuable resource for information processing tasks, e.g. quantum communication, quantum key distribution, quantum state estimation, or randomness extraction. Still, deciding if a quantum state is nonlocal remains a challenging problem. Here we introduce a novel approach to this question: we study the nonlocal properties of quantum states when distributed and measured in networks. Using our framework, we show how any one-way entanglement distillable state leads to nonlocal correlations. Then, we prove that nonlocality is a non-additive resource, which can be activated. There exist states, local at the single-copy level, that become nonlocal when taking several copies of it. Our results imply that the nonlocality of quantum states strongly depends on the measurement context.

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