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Improving Einstein-Podolsky-Rosen steering inequalities with state information. (English)

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Phys. Lett., A 378, No. 10, 766-769 (2014).

Summary: We discuss the relationship between entropic Einstein-Podolsky-Rosen (EPR)-steering inequalities and their underlying uncertainty relations along with the hypothesis that improved uncertainty relations lead to tighter EPR-steering inequalities. In particular, we discuss how using information about the state of a quantum system affects one's ability to witness EPR-steering. As an example, we consider the recent improvement to the entropic uncertainty relation between pairs of discrete observables [*M. Berta* et al., "The uncertainty principle in the presence of quantum memory", Nat. Phys. 6, 659–662 (2010; doi:10.1038/nphys1734)]. By considering the assumptions that enter into the development of a steering inequality, we derive correct steering inequalities from these improved uncertainty relations and find that they are identical to ones already developed [*J. Schneeloch* et al., "Einstein-Podolsky-Rosen steering inequalities from entropic uncertainty relations", Phys. Rev. A (3) 87, No. 6, Article ID 062103 (2013; doi:10.1103/PhysRevA.87.062103)]. In addition, we consider how one can use state information to improve our ability to witness EPR-steering, and develop a new continuous variable symmetric EPR-steering inequality as a result.

MSC:

81P40 Quantum coherence, entanglement, quantum correlations
81P45 Quantum information, communication, networks (quantum-theoretic aspects)
94A17 Measures of information, entropy

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Keywords:

EPR-steering; entanglement; EPR-paradox; uncertainty relations; entropy

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