Device-independent quantification of steerability and measurement incompatibility

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We introduce the concept of *assemblage moment matrices*, i.e., a collection of matrices of expectation values, each associated with a conditional quantum state obtained in a steering experiment. We demonstrate how it can be used for quantum states and measurements characterization in a device-independent manner, i.e., without invoking any assumption about the measurement or the preparation device. Specifically, we show how the method can be used to lower bound the steerability of an underlying quantum state directly from the observed correlation between measurement outcomes. Combining such device-independent quantifications with earlier results established by Piani and Watrous [Phys. Rev. Lett. 114, 060404 (2015)], our approach immediately provides a device-independent lower bound on the generalized robustness of entanglement, as well as the usefulness of the underlying quantum state for a type of subchannel discrimination problem. In addition, by proving a quantitative relationship between steering robustness and the recently introduced incompatibility robustness, our approach also allows for a device-independent quantification of the incompatibility between various measurements performed in a Bell-type experiment.

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