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On distance indicator of non-classicality of qudits

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Quasiprobability distributions associated to quantum states play the same role as the probability distribution functions in classical statistical physics, but with a key difference that quantum counterparts can take negative values for some states. Due to this fact, all states are divided into classes, the first one comprised of the "classical states", whose quasiprobability distributions are non-negative, and the second one which consists of the complement states, the carriers of a certain "quantumness". One possible way to quantify "quantumness-classicality" of states is based on the evaluation of their remoteness from a set of reference classical states. The paper studies this type of distance indicator of non-classicality in finite-dimensional quantum systems supposing that the classical states are those states whose Wigner function is non-negative. We prove the representation for the distance indicator of non-classicality as the piecewise function with support provided by the special Wigner quasiprobability non-negativity polytope in the simplex of a state's eigenvalues, discuss indicator's properties, and exemplify details of its evaluation for qubit and qutrit cases.

Summary

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