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No-relationship Between Impossibility of Faster-Than-Light Quantum Communication and Distinction of Ensembles with the Same Density Matrix

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Abstract: It has been claimed in the literature that impossibility of faster-than-light quantum communication has an origin of indistinguishability of ensembles with the same density matrix. We show that the two concepts are not related. We argue that even with an ideal single-atom-precision measurement, it is generally impossible to produce two ensembles with exactly the same density matrix; or to produce ensembles with the same density matrix, classical communication is necessary. Hence the impossibility of faster-than-light communication does not imply the indistinguishability of ensembles with the same density matrix.

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