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What kind of assistance enables quantum cloning? KOJI AZUMA, Department of Applied Physics, University of Tokyo, MASATO KOASHI, NOBUYUKI IMOTO, CREST, Department of Materials Engineering Science, Osaka University — We investigate the cases where a set S of states $\{|\psi_i\rangle\}$ cannot be cloned by itself, but is clonable with the help of another system prepared in state $\hat{\rho}_i$. When S is pair-wise nonorthogonal, it is known that one can generate the copy from $\hat{\rho}_i$ alone, with no interaction with the original system. Here we show that a set containing orthogonal pairs exhibits a property forming a striking contrast; For any such set, there is a choice of $\hat{\rho}_i$ that enables cloning only when the two systems are interacted in a purely quantum manner that is not achievable via classical communication.

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