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Gain maximization in a probabilistic entanglement protocol[1] ANTONIO DI LORENZO, JOHNNY HEBERT ESTEVES DE QUEIROZ, Univ Federal de Uberlândia — Entanglement is a resource. We can therefore define gain as a monotonic function of entanglement $G(E)$. If a pair with entanglement E is produced with probability P, the net gain is $N = PG(E) - (1 - P)C$, where C is the cost of a failed attempt. We study a protocol where a pair of quantum systems is produced in a maximally entangled state ρ_m with probability P_m, while it is produced in a partially entangled state ρ_p with the complementary probability $1 - P_m$. We mix a fraction w of the partially entangled pairs with the maximally entangled ones, i.e. we take the state to be $\rho = (\rho_m + wU_{loc}\rho_p U_{loc}^{+})/(1 + w)$, where U_{loc} is an appropriate unitary local operation designed to maximize the entanglement of ρ. This procedure on one hand reduces the entanglement E, and hence the gain, but on the other hand it increases the probability of success to $P = P_m + w(1 - P_m)$, therefore the net gain N may increase. There may be hence, a priori, an optimal value for w, the fraction of failed attempts that we mix in. We show that, in the hypothesis of a linear gain $G(E) = E$, even assuming a vanishing cost $C \to 0$, the net gain N is increasing with w, therefore the best strategy is to always mix the partially entangled states.

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