Gain maximization in a probabilistic entanglement protocol\textsuperscript{1} ANTÓNIO 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 $\rho_m$ with probability $P_m$, while it is produced in a partially entangled state $\rho_p$ 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 $\rho = (P_m + wU_{loc}\rho_pU_{loc}^+)//(1 + w)$, where $U_{loc}$ is an appropriate unitary local operation designed to maximize the entanglement of $\rho$. 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.

\textsuperscript{1}Work supported by CNPq, Conselho Nacional de Desenvolvimento Científico e Tecnológico, proc. 311288/2014-6, and by FAPEMIG, Fundação de Amparo à Pesquisa de Minas Gerais, proc. IC-FAPEMIG2016-0269 and PPM-00607-16

Antonio Di Lorenzo
Univ Federal de Uberlândia

Date submitted: 10 Nov 2016  Electronic form version 1.4