Erratum: Hybrid quantum repeater based on resonant qubit-field interactions **[Phys. Rev. A **96**, 052329 (2017)]**

József Zsolt Bernád

(Received 25 May 2018; published 12 June 2018)

DOI: [10.1103/PhysRevA.97.069903](https://doi.org/10.1103/PhysRevA.97.069903)

Equation (14) should read

$$\hat{\rho}_{AB} = \frac{(1+x)|\Psi^-\rangle\langle\Psi^-| + (1-x)|\Phi_\phi^-\rangle\langle\Phi_\phi^-| + iy|\Phi_\phi^-\rangle\langle\Psi^-| - iy|\Psi^-\rangle\langle\Phi_\phi^-|}{2},$$

$$x = \exp\{-\bar{n}[1 - \cos(2\varphi)](1 - \eta e^{-\gamma T})\} \cos[\bar{n} \sin(2\varphi)(1 - \eta e^{-\gamma T})],$$

$$y = \exp\{-\bar{n}[1 - \cos(2\varphi)](1 - \eta e^{-\gamma T})\} \sin[\bar{n} \sin(2\varphi)(1 - \eta e^{-\gamma T})],$$
(1)

where the error came from a simple algebraic mistake. However, it does not affect the success probability P_{Gen} , which remains equal to 0.5. The concurrence of the state in Eq. (1) is now $\sqrt{x^2 + y^2}$.

Substituting the corrected state into the purification protocol of Sec. II B, we get

$$\hat{\rho}_{A_1, B_1}^{(1)} = \frac{(1+x)^2}{2+2x^2} |\Psi^-\rangle\langle\Psi^-| + \frac{(1-x)^2}{2+2x^2} |\Psi^+\rangle\langle\Psi^+| + \frac{y^2}{2+2x^2} |\Psi^-\rangle\langle\Psi^+| + \frac{y^2}{2+2x^2} |\Psi^+\rangle\langle\Psi^-|,$$

with a success probability of $(1+x^2)/4$. After repeating the protocol for N times we obtain

$$\hat{\rho}^{(N)} = f_{(N)}(x) |\Psi^-\rangle\langle\Psi^-| + g_{(N)}(x) |\Psi^+\rangle\langle\Psi^+| + h_{(N)}(x) (|\Psi^-\rangle\langle\Psi^+| + |\Psi^+\rangle\langle\Psi^-|),$$

with success probability,

$$P_{\text{Pur}} = [P_{(0)}]^{2^{N-1}} [P_{(1)}]^{2^{N-2}} \cdots [P_{(N-2)}]^2 P_{(N-1)},$$

$$P_{(k)} = \frac{f_{(k)}^2(x) + g_{(k)}^2(x)}{2},$$
(2)

where

$$f_{(k+1)}(x) = \frac{f_{(k)}^2(x)}{f_{(k)}^2(x) + g_{(k)}^2(x)}, \quad f_{(0)}(x) = \frac{1+x}{2},$$
(3)

$$g_{(k+1)}(x) = \frac{g_{(k)}^2(x)}{f_{(k)}^2(x) + g_{(k)}^2(x)}, \quad g_{(0)}(x) = \frac{1-x}{2},$$
(4)

$$h_{(k+1)}(x) = \frac{h_{(k)}^2(x)}{f_{(k)}^2(x) + g_{(k)}^2(x)}, \quad h_{(1)}(x) = \frac{y^2}{2+2x^2}.$$

In general, $h_{(N)}(x)$ tends to zero as N increases and stays constant at the value of 0.5 only when $y = 1$. However, when $y = 1$ then $x = 0$, which means that the state in Eq. (1) is not purifiable.

Equations (2)–(4) are the same as in the published version. Therefore, the main results on the repeater rates are unaffected, and all conclusions of the paper remain unchanged.