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CORRECTION

Correction to: Entanglement-assisted quantum error-correcting codes over arbitrary finite fields

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The parameters of the codes in Section 4 of our article [1] are not correctly stated. The inequality in Proposition 5 should be with respect to the dual code $C^{\perp_s}$. The correct statement of Proposition 5 is

Proposition 5 *Assume that a positive integer c satisfies* $2c \leq d_H(C^{\perp_s} \setminus \{\mathbf{0}\}) - 1$, *then*

$$\dim_{\mathbb{F}_q} P(C) = \dim_{\mathbb{F}_q} C, \quad \textit{and}$$

$$\dim_{\mathbb{F}_q} P(C) \cap P(C)^{\perp_s} = \dim_{\mathbb{F}_q} S(C) = \dim_{\mathbb{F}_q} C - 2c.$$

The original article can be found online at https://doi.org/10.1007/s11128-019-2234-5.

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This affects the corresponding inequalities in the statement of Theorem 7, Theorem 8 and Theorem 9. Moreover, the dimension of the codes was erroneously displayed. The correct statements of the above theorems are the following:

Theorem 7 *Let $C \subseteq \mathbb{F}_q^{2n}$ be an $\mathbb{F}_q$-linear code with $\dim_{\mathbb{F}_q} C = n - k$ and $C \subseteq C^{\perp_s}$. Assume that a positive integer c satisfies $2c \leq d_H(C^{\perp_s} \setminus \{\mathbf{0}\}) - 1$, then the punctured code $P(C)$ provides an*

$$[[n - c, k, \geq d_s(C^{\perp_s} \setminus C); c]]_q$$

entanglement-assisted code.

Theorem 8 *Let $C \subseteq \mathbb{F}_{q^2}^n$ be an $\mathbb{F}_{q^2}$-linear code with $\dim_{\mathbb{F}_{q^2}} C = (n - k)/2$, and suppose that $C \subseteq C^{\perp_h}$. Let c be a positive integer such that $c \leq d_H(C^{\perp_h} \setminus \{\mathbf{0}\}) - 1$, then the punctured code $P_h(C)$ provides an*

$$[[n - c, k, \geq d_H(C^{\perp_h} \setminus C); c]]_q$$

entanglement-assisted code.

Theorem 9 *Let $C_2 \subseteq C_1 \subseteq \mathbb{F}_q^n$ be two $\mathbb{F}_q$-linear codes such that $\dim C_i = k_i$, $1 \leq i \leq 2$. The standard construction of CSS codes uses $C_2 \times C_1^\perp$ as the stabilizer. Assume that c is a positive integer such that*

$$c \leq \min \left\{ d_H(C_2^\perp \setminus \{\mathbf{0}\}), d_H(C_1 \setminus \{\mathbf{0}\}) \right\} - 1,$$

then the punctured code $P_h(C_2) \times P_h(C_1^\perp)$ provides an

$$[[n - c, k_1 - k_2, \geq \min \left\{ d_H(C_1 \setminus C_2), d_H(C_2^\perp \setminus C_1^\perp) \right\}; c]]_q$$

entanglement-assisted code.

Proofs are the same with the exception that $c \leq d_H(C \setminus \{\mathbf{0}\}) - 1$ should be replaced by $c \leq d_H(C^{\perp_h} \setminus \{\mathbf{0}\}) - 1$, in the proof of Theorem 8 and

$$c \leq \min\{d_H(C_2 \setminus \{\mathbf{0}\}, d_H(C_1^\perp \setminus \{\mathbf{0}\}\} - 1$$

should be replaced by

$$c \leq \min \left\{ d_H(C_2^\perp \setminus \{\mathbf{0}\}), d_H(C_1 \setminus \{\mathbf{0}\}) \right\} - 1,$$

in the first line of the proof of Theorem 9.

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Reference

1. Galindo, C., Hernando, F., Matsumoto, R., Ruano, D.: Entanglement-assisted quantum error-correcting codes over arbitrary finite fields. Quantum Inf. Process. **18**, 116 (2019)