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A system's wave function is uniquely determined by its underlying physical state – corrigendum

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In the published version of this article [1] there is an omission in the intermediate calculation in Appendix B that makes it difficult to verify the bound of Equation (5). Furthermore, the form of $|\zeta_j^k\rangle$ written in the displayed equation above Equation (B1) in [1] is erroneous. We stress though that the bound (5) is correct and hence the conclusion of the paper is unaffected.

The issue arises because we write $(\hat{Z}_d)^{\frac{k}{2n}}$ without stating which of the roots of $\hat{Z}_d$ is taken. Furthermore, not all choices work. To state carefully a choice that works, we define $\mathrm{sh}_A[v]$ to be the number in $(-1/2, 1/2]$ that is equal to $v+m$ for some $m \in \mathbb{Z}$ and $\mathrm{sh}_B[v]$ to be the number in $[-1/2, 1/2)$ that is equal to $v+m$ for some $m \in \mathbb{Z}$. For $x \in \{0, \ldots, d-1\}$ and $a \in \{0, 2, \ldots, 2n-2\}$, the projectors Π_x^a are along the vectors $|\zeta_x^a\rangle = U_d Z_{n,d}[a] U_d^\dagger |x\rangle$, where

$$Z_{n,d}[a] := \sum_{j=0}^{d-1} \exp\left[\pi i \, \mathrm{sh}_A[j/d] \frac{a}{n}\right] |j\rangle\langle j|,$$

while for $y \in \{0, \ldots, d-1\}$ and $b \in \{1, 3, \ldots, 2n-1\}$, the projectors Π_y^b are along the vectors $|\zeta_y^b\rangle = U_d Z'_{n,d}[b] U_d^\dagger |y\rangle$, where

$$Z'_{n,d}[b] := \sum_{j=0}^{d-1} \exp\left[\pi i \, \mathrm{sh}_B[j/d] \frac{b}{n}\right] |j\rangle\langle j|.$$

These lead to the bound given in Equation (5). For details of the rest of the calculation we refer to Appendix B of [2].

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[1] R. Colbeck and R. Renner, A system's wave function is uniquely determined by its underlying physical state, *New J. Phys.* **19** 013016 (2017).
[2] R. Colbeck and R. Renner, A system's wave function is uniquely determined by its underlying physical state, arXiv:1312.7353v2 (2017).

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