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CORRIGENDUM

Corrigendum: Bipartite Bell inequalities with three ternary-outcome measurements—from theory to experiments (2016 *New J. Phys.* 18 035001)

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In our article [1], we claimed to have given the first example of a facet-defining Bell inequality where a genuine positive-operator-valued measure (POVM) is relevant. Specifically, we claimed that any quantum realization of the maximal quantum violation of the Bell inequality $\mathcal{I}_{12}^{\max}$ in the (minimal) qubit subspace necessarily requires the implementation of a genuine, nonprojective POVM. Recently, it has been brought to our attention by Armin Tavakoli that the maximal quantum violation of this Bell inequality can also be achieved using projective measurements.

Specifically, consider [2] the following POVM elements $\{M_{a|x}^A\}_{a,x}$ and $\{M_{b|y}^B\}_{b,y}$, respectively, for Alice's and Bob's measurements:

$$\begin{aligned} M_{1|0}^A &= M_{2|1}^A = M_{2|2}^A = M_{1|0}^B = M_{2|1}^B = M_{2|2}^B = \mathbf{0}_2, \\ M_{0|x}^A &= \tfrac{1}{2}(\mathbb{1}_2 + \hat{\eta}_x^A \cdot \vec{\sigma}), \quad M_{0|y}^B = \tfrac{1}{2}(\mathbb{1}_2 + \hat{\eta}_y^B \cdot \vec{\sigma}), \end{aligned} \tag{1}$$

where $\mathbf{0}_2$ and $\mathbb{1}_2$ are, respectively, the zero operator and the identity operator acting on a qubit Hilbert space, $\vec{\sigma} = (\sigma_x, \sigma_y, \sigma_z)$ is the vector of Pauli matrices, and

$$\hat{\eta}_0^A = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}, \quad \hat{\eta}_1^A = \begin{pmatrix} -0.5009 \\ -0.2634 \\ 0.8244 \end{pmatrix}, \quad \hat{\eta}_2^A = \begin{pmatrix} 0.8259 \\ 0.4400 \\ 0.3525 \end{pmatrix},$$
$$\hat{\eta}_0^B = \begin{pmatrix} 0.1916 \\ -0.1328 \\ 0.9724 \end{pmatrix}, \quad \hat{\eta}_1^B = \begin{pmatrix} 0.6907 \\ -0.3933 \\ 0.6069 \end{pmatrix}, \quad \hat{\eta}_2^B = \begin{pmatrix} -0.7767 \\ 0.4117 \\ 0.4767 \end{pmatrix}.$$

It is straightforward to verify that together with the quantum state

$$|\psi\rangle = (0.7244 + 0.0083\mathrm{i})|00\rangle + (0.0066 - 0.0131\mathrm{i})|01\rangle + (0.0054 - 0.0062\mathrm{i})|10\rangle + 0.6891|11\rangle,$$

one obtains 2.5820, which reproduces (within the numerical precision of our computation) the maximal quantum violation of $\mathcal{I}_{12}^{\max}$. Our claim is thus flawed. Our mistake arose from a flaw in the numerical computation of the maximal possible quantum violation when some of the POVM elements are assumed to be the zero operator.

Consequently, it remains an opened problem whether there exists a facet-defining Bell inequality whose maximal quantum violation can only be attained by employing a nonprojecitve measurement when one restricts to the smallest Hilbert space where this violation is achievable.

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