Erratum: Witnessing quantum steering by means of the Fisher information [Phys. Rev. A 105, 022421 (2022)]

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(Received 20 February 2023; published 10 March 2023)

DOI: 10.1103/PhysRevA.107.039901

The original paper contains a material error in the calculation in the evaluation of

$$\Delta^2 H_{\text{est}} = \sum_{k,h} p(k,h|K,H)(\check{h}(k) - h)^2 \tag{1}$$

for the observables Y_B and X_B. The direct application of (1) delivers

$$\begin{aligned} \Delta^2 Y_{\text{est}} &= 2(1 - \langle Y_A Y_B \rangle), \\ \Delta^2 X_{\text{est}} &= 2(1 - \langle Z_A X_B \rangle), \end{aligned} \tag{2}$$

with a factor 2 missing in the original analysis. The original Figs. 3(b) and 4(b) are thus incorrect.

The bounds on the optimal variances $\Delta^2 H_{\text{opt}} \leqslant \Delta^2 H_{\text{est}}$ are loose, and cannot be employed to assess the violation of nonsteering conditions. Valid results can be retrieved by inspecting directly the conditional variances

$$\Delta^2 H_{\text{cond}} = \sum_{k} p(k|K) \Delta^2 H_{k|K}, \tag{3}$$

with specific choices of the observables K: $K = Y_A$ for Y_B, and $K = Z_A$ for X_B. By definition, $\Delta^2 H_{\text{opt}} \leqslant \Delta^2 H_{\text{cond}}$, ensuring the correct chain of inequalities. The experimental results showing the correct quantities are reported in Fig. 1.

The conclusions in the original paper thus remain valid.

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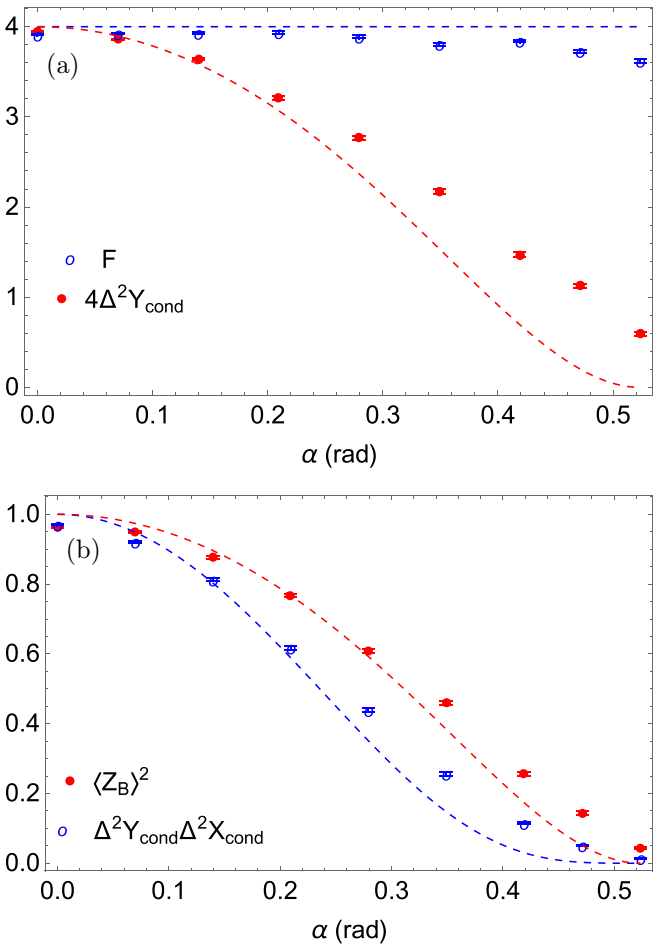

FIG. 1. Steering witness. (a) Test of the steering using Reid's criterion $\Delta^2 Y_{\text{cond}} \Delta^2 X_{\text{cond}} \geqslant \langle Z_B \rangle^2$. The product of the conditional variances (blue) is well below the nonsteerable measured bound (red), for almost every α. The points correspond to the measured values, while the dashed lines are predictions for the ideal state. (b) Measured variance $\Delta^2 Y_{\text{cond}}$ (red) and quantum Fisher information (blue) as a function of α: The points correspond to the measured values, while the dashed lines are predictions for the ideal state. In both panels, the errors are evaluated by propagation of the Poisson statistics of the registered counts, except for the Fisher information. For that, the errors are evaluated through a Monte Carlo routine with 100 runs.