

Erratum: Near-Deterministic Discrimination of All Bell States with Linear Optics [Phys. Rev. Lett. 107, 080403 (2011)]

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(Received 23 August 2011; published 14 November 2011)

DOI: 10.1103/PhysRevLett.107.219901

PACS numbers: 03.65.Ud, 03.67.Hk, 03.67.Lx, 42.50.-p, 99.10.Cd

A miscalculation occurred. HWP(0) clashed with Eq. (9). I removed it and recalculated all. The main idea of the Letter remains about the same. The results are different for Ψ^+ photons and stay the same for $\Phi^\pm$ ones. Their separation is rising slower now, but no longer requires an exponentially growing number of Mach-Zehnder (MZ) interferometers. The total efficiency remains about the same.

Page 2, left column, 2nd and 3rd lines from the top: the sentence “From . . . together” should read, “From the first MZ, all Ψ^+ photons will exit from one side of the second BS bunched together.” 5th and 6th lines: “15/16 . . . so on.” should read, “ Ψ^+ photons will always exit from only one side and are then directed to the next MZ, and $\Phi^\pm$ photons will either go (1/2) to the next MZ or exit from the other side of each MZ and be collected at port e^2 (see Fig. 1).” 7th line: “75%, 94%, 98%, etc.” should read “50%, 75%, 87.5%, 93.75%, etc.” Second terms in each line of Eq. (4) should read, $\hat{b}_{2H}^\dagger = (\hat{a}_{2H}^\dagger - \hat{a}_{1H}^\dagger)/\sqrt{2}$ and $\hat{b}_{2V}^\dagger = (\hat{a}_{2V}^\dagger - \hat{a}_{1V}^\dagger)/\sqrt{2}$. Figure 1 shown here should be substituted for the original one.

Page 2, right column, 5th line from the top: “together with a HWP(0)” should be deleted. The 3rd–5th paragraphs, 7th–38th lines, should be deleted and the following text should be inserted instead, “ Ψ^+ photons disentangle at BS_{ab} and at MZ₁’s we have $\hat{b}_{1V}^\dagger \hat{b}_{1H}^\dagger \rightarrow \hat{a}_{2V}^\dagger \hat{a}_{2H}^\dagger$ and $\hat{b}_{2V}^\dagger \hat{b}_{2H}^\dagger \rightarrow \hat{a}_{1V}^\dagger \hat{a}_{1H}^\dagger$ [as follows from Eq. (4)]. This means that Ψ^+ photons always go left (right) at each MZ, split at PBSs, and exit through $e_L^l, e_R^l, e_L^r, e_R^r$ ports (see Fig. 1).” 3rd line from the bottom: “[which the HWP(0)s will not change]” should be deleted.

Page 3, left column, 8th line from top: “ $(|\Phi^\pm\rangle_{d-11} + \frac{1}{2}|\Phi^\pm\rangle_{d-22})/2$ ” should read, “ $(|\Phi^\pm\rangle_{d-11} + |\Phi^\pm\rangle_{d-22})/2$ ”; 14th line: “ $(|\Phi^\pm\rangle_{d-11} - \frac{1}{2}|\Phi^\pm\rangle_{d-22})/2$ ” should read “ $(|\Phi^\pm\rangle_{d-11} - |\Phi^\pm\rangle_{d-22})/2$ ”; 29th line: “the last MZ_m” should read, “ports e^2 ”; 2nd line from the bottom: “five” should read “six.”

Page 3, right column, 5th line from top: “and a . . . e_R ” should read, “, say one at e_R^l , and one at e_R^r ”; 5th and 6th lines: “The third and a fourth” should read “Two”; 7th line: “the fourth and a fifth” should read “that latter one and a sixth.” Table I “ $m = 3$ ” and “95.3%” should be “ $m = 4$ ” and “90%”; $|\Psi^+\rangle$ rows: “ j ” and “ l ” should be “ l ” and “ r ”; last row: “ $i, j, l = 1, \dots, 2^m; j \neq l$ ” should be “ $i, j = 2, l, r$.”

Page 4, left column, 22nd–24th lines from the top: sentence starting with “For MZ₁ . . .” and ending with “. . . 0.92.” should be deleted; the following sentence should be inserted instead: “For MZ₁ for $\Phi^\pm$ photons we have the following probability of their appearance $0.5 \times 0.98 = 0.49$, for MZ₂ we have $0.49 + 0.49 \times 0.5 \times 0.98 \approx 0.73$, for MZ₃ 0.85, for MZ₄ 0.91, and for MZ₅ 0.93. Ψ^+ photons emerge with the following probability from MZ₁: 0.98; . . . , from MZ₄: $0.98^4 \approx 0.92$, and from MZ₅: $0.98^5 \approx 0.90$.” 26th and 28th lines: “94%” should read “91%.” 30th–32nd lines: sentence starting with “If we” should be deleted and the following one substituted for it: “This means an overall realistic efficiency $>90\%$ for a postselection experiment.”

Page 4, left column, 1st line from the bottom to right column 6th line from the top: Text from “Alice’s” to “100%.” should be deleted and the following inserted: “for $m = 6$, 1.6% of $\Phi^\pm$ photons is “eaten” by e^l and e^r detectors. The efficiencies of detecting $|\Psi^\pm\rangle$ states are 100%.”

We thank Yu-Bo Sheng (Tsinghua University and Beijing Normal University, Beijing, China) for bringing this error to our attention.

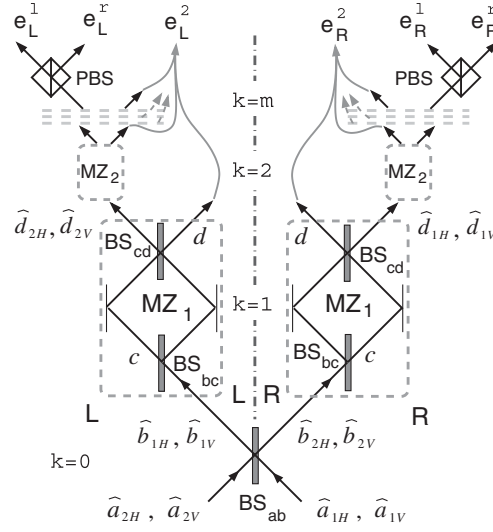


FIG. 1. Schematic of $\rightarrow 100\%$ discrimination of all four Bell states. In MZ_1 $|\Psi^+\rangle$ photons exit from one exit only and are directed to $MZ_2, MZ_3, \dots, MZ_m$. $|\Phi^\pm\rangle$ bunch together at both exits of each MZ, but we collected them only from one side of each MZ (a “non- Ψ^+ side”) and direct them all to e^2 ports.