

Erratum: Macroscopic Tunnel Splittings in Superconducting Phase Qubits [Phys. Rev. Lett. 94, 187004 (2005)]

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In our recent Letter [1], the Josephson critical current and modulation parameter used for Fig. 2 was erroneously reported in the text and caption due to a typographical error. The correct values used in the simulation for Fig. 1 were $I_c = 8.351 \mu\text{A}$ and $\beta = 4.263$. The discussion in the text is based upon the correct values.

We would like to clarify that, in the definition of the control parameter (bias) $J \equiv I/I_c$ in Eq. (1) of our Letter, I is not the total superconducting current. Explicitly, $I = \Phi_x/L$, where Φ_x is the externally applied flux coupled into the SQUID loop, and hence J is just the external flux in units of $I_c L$. Using $\Phi = (\Phi_0/2\pi)\gamma$, where Φ is the total flux in the SQUID loop, and the definitions of β , Φ_0 , E_c and E_J , one can see the equivalence (up to a constant) of Eq. (1) in our Letter to the Hamiltonian for an rf-SQUID:

$$H = \frac{p_\Phi^2}{2C} - \frac{I_c \Phi_0}{2\pi} \cos\left(\frac{2\pi\Phi}{\Phi_0}\right) + \frac{(\Phi - \Phi_x)^2}{2L}, \quad (1)$$

e.g., see Eqs. (2.24), (3.15), and (3.4) in [2]. The choice of variables in Eq. (1) of our Letter [1] is intended to highlight the use of the rf-SQUID circuit as a phase qubit, rather than as a flux qubit.

Finally, in the text we state that the “effective critical current is $I^* = I_c J > I_c$.” By *effective* critical current we mean the *measured* value of the *bias* $I = \Phi_x/L$ at which the device classically switches, i.e., when the left well of the SQUID’s double-well potential just vanishes and stable classical left well states no longer exist. The superconducting current through the junction, $I_s = I_c \sin\gamma$, never exceeds I_c .

We would like to thank Siyuan Han for drawing our attention to possible confusion created by our original discussion of the control parameter J and the effective critical current defined in Eq. (3) of our Letter. His comments also helped us discover the typographical error reported above.

- [1] Philip R. Johnson, William T. Parsons, Frederick W. Strauch, J. R. Anderson, Alex J. Dragt, C. J. Lobb, and F. C. Wellstood, Phys. Rev. Lett. **94**, 187004 (2005).
[2] A. J. Leggett, in *Chance and Matter*, edited by J. Souletie, J. Vannimenus, and R. Stora (Elsevier, New York, 1987), p. 395.