Erratum

Momentum and Hamiltonian in complex action theory

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In Ref. 1, we have noticed that a dt -dependent normalization factor, say $\frac{1}{\alpha}$, should be inserted on the right-hand side of Eq. (77). The insertion does not influence the result of the manuscript, but rather provides us a new additional result: the Schrödinger equation is derived via the Feynman path integral in the complex action theory. Such a derivation of the Schrödinger equation is well known in the real action theory.² Accompanied with the insertion, the following points have to be corrected.

The factor $\frac{1}{\alpha}$ has to be inserted on the right-hand side of the first line and in the second line of Eq. (111), in the third to sixth lines of Eq. (117), in the second, fourth and fifth lines of Eq. (126), in the second and third lines of Eq. (128), and in the second, fourth, and seventh lines of Eq. (129). The following sentence should be inserted below Eq. (121): “Here we take $\alpha = \sqrt{\frac{2\pi i \hbar dt}{m}}$ so that both sides of Eq. (117) correspond to each other in the vanishing limit of dt .” The following sentences should be inserted after the last sentence of Subsec. 3.5.1: “In addition, Eq. (117) is reduced to $|\psi(t + dt)\rangle = e^{-\frac{i}{\hbar} \hat{H}_0 dt} |\psi(t)\rangle$. Thus we have derived the

Schrödinger equation.” The factor $\sqrt{\frac{2\pi i \hbar dt}{m}}$ in the last expressions of Eqs. (129) and (131) has to be deleted. After the sentence “Therefore . . . FPI.” below Eq. (132), the following sentences should be inserted: “In addition, Eq. (131) is reduced to $|\psi(t + dt)\rangle = e^{-\frac{i}{\hbar} \hat{H} dt} |\psi(t)\rangle$. Thus we have derived the Schrödinger equation.”

References

1. K. Nagao and H. B. Nielsen, *Int. J. Mod. Phys. A* **27**, 1250076 (2012).
2. R. P. Feynman, A. R. Hibbs and D. F. Styer, *Quantum Mechanics and Path Integrals*, emended edition (Dover Publications, 2010).