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Erratum: Frequency dependence of a ring laser with backscattering [Phys. Rev. A 34, 3932 (1986)]

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We wish to draw attention to an error in our paper. The steady-state solution to the Fokker-Planck equation for the ring laser given by Eqs. (14)–(16), and then used subsequently, is not exact under all conditions as claimed, but only under some conditions. However, when it is not exact, it is usually a good approximation to the correct solution, at least for a symmetric ring laser.

When Eqs. (14)–(16) are substituted back into the Fokker-Planck equation (13), the result is not zero but

$$= \frac{1}{2}\frac{p_s}{g_r}\{[a_1-a_2+(I_1-I_2)f_r(\xi-1)]\,\mathrm{Re}[E_1E_2^*(R_2-R_1^*)] + (I_1-I_2)f_i(\xi-1)\,\mathrm{Im}[E_1E_2^*(R_2+R_1^*)]+\tfrac{1}{2}(I_1-I_2)(|R_1|^2-|R_2|^2)\}\ . \tag{1}$$

The following conclusions can be drawn.

(a) The solution represented by Eqs. (14)–(16) is exact in the absence of backscattering ($R_1=0=R_2$).

(b) The solution represented by Eqs. (14)–(16) is exact in the absence of detuning ($\xi=1$) when $|R_1|=|R_2|$ and $a_1=a_2$.

(c) In other cases the solution represented by Eqs. (14)–(16) is not correct. But even when backscattering and detuning are both present, for a symmetric ring laser with $a_1=a_2$, $|R_1|=|R_2|$, Eqs. (14)–(16) are expected to be a good approximation to the correct solution for small relative detuning $[(\Delta\omega/\gamma)^2 \ll 1]$, because $f_r(\xi-1)$ is of order $(\Delta\omega/\gamma)^2$ and $f_i(\xi-1)$ is of order $(\Delta\omega/\gamma)^3$. We have compared Eqs. (14)–(16) with Monte Carlo solutions of the original equations of motion (9) and found very good agreement under these conditions. Presumably that is why the theory based on Eqs. (14)–(16) received such good confirmation in our recent experiments. It is not difficult to show generally that, within the domain in which the third-order laser theory is valid, $(\Delta\omega/\gamma)^2$ has to be small if the laser is not to shut off.

The errors in the "solution" given by Eqs. (14)–(16) are most significant for an asymmetric ring laser, when $|R_1|\neq|R_2|$ and $a_1\neq a_2$. We have compared the form of the joint probability density $\mathcal{P}(I_1,I_2)$ given by Eq. (20) with computer solutions of the equations of motion in several cases, and find that the difference is generally in the form of a translation of $\mathcal{P}(I_1,I_2)$ along the I_1 or I_2 axis, with little change of shape. This implies that Eq. (20) will yield a reasonable approximation to $\langle(\Delta I_1)^2\rangle$, $\langle(\Delta I_2)^2\rangle$, and $\langle\Delta I_1\Delta I_2\rangle$, but not to $\langle I_1\rangle$ and $\langle I_2\rangle$.

We are indebted to Professor Dr. Peter Hänggi for drawing our attention to the error in Eqs. (14)–(16).

Erratum: Electron-impact excitation of the resonance transition in Be^+: An *ab initio* treatment of core-correlation and -polarization effects [Phys. Rev. A 34, 4777 (1986)]

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Several entries in Table VIII are incorrect. The widths (Γ) of the resonance in the rows denoted "Present calculation" should be, from top to bottom: 1.7×10^{-5}, 7.8×10^{-8}, 1.0×10^{-5}, and 4.88×10^{-4}. The position of the resonance (ϵ) in the five-state calculation should be 0.0248 Ry. The conclusions drawn in the paper are in no substantial way affected by these corrections.