

Elements of Quantum Optics, Third Edition — Erratum

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(Dated: March 12, 2003)

The following misprints have been brought to our attention. We would very much appreciate your help in identifying further mistakes. Please email them to pierre.meystre@optics.arizona.edu.

Chapter 1 — Classical electromagnetic fields

Page 3, Eq. (1.8) should read

$$\mathbf{E}(\mathbf{r}, t) = \sum_k \mathbf{E}_k f_k(\mathbf{K}_k \cdot \mathbf{r} - \nu t).$$

Page 7, Eq. (1.35), there is a minus sign missing in the second equality.

Page 11, Eq. (1.55), third line should read, “ $e^2/2m\nu$ is replaced by \wp^2/\hbar .”

Page 15, second line, last sentence should read “In cgs units the $4\pi\epsilon_0$ is replaced by 1.”

Page 16, Eq. (1.78), the LHS should be $|E^+(\mathbf{r}, t)|^2$.

Page 30, Problem 1.9, first line, $t \rightarrow t' = t - z/c$.

Chapter 3 — Quantum mechanical background

Page 49, second line after Eq. (3.8), should read “[\hat{a}, \hat{b}] = $\hat{a}\hat{b} - \hat{b}\hat{a}$ is the commutator . . .”

Page 49, last line, the “-” sign should be an “=” sign.

Page 74, Eq. (3.124), the first element of the 2×2 matrix on the RHS of the equation should read

$$\cos(\mathcal{R}t/2) - i\delta\mathcal{R}^{-1} \sin(\mathcal{R}t/2)$$

Page 78, the RHS of Eq. (3.158) should read

$$\frac{1}{\sqrt{n!(2\hbar\Omega)^n}} \left(\Omega q - \hbar \frac{d}{dq} \right)^n u_0(q).$$

Page 79, Problem 3.13, second line, replace by: “Also show that $[p, e^{-\hbar K \partial / \partial p}] = +\hbar K e^{iKx}$.”

Chapter 4 — Mixtures and the density operator

Page 85, second line after Eq. (4.13b), $\rho_{ij} = \langle i|\rho|j\rangle$.

Page 88, first line of Eq. (4.25), the integrand of the double integral should be $\delta\omega(t')\delta\omega(t'')$.

Page 88, caption of Fig. 4.3, two lines from the bottom, should be $\int_0^t dt' \delta\omega(t')$.

Page 91, Eq. (4.33) should read

$$\dot{\rho}_{bb} = \Gamma(1 - \rho_{bb}) + [i\hbar^{-1}\mathcal{V}_{ab}\rho_{ba} + c.c.].$$

Page 95, three lines from bottom, should read “classical counterparts (1.56,57) . . .”

Chapter 5 — CW field interactions

Page 106, the lower limit of integration in Eq. (5.13) should be $-\infty$.

Page 106, Eq. (5.16), replace $-R$ by $+R$.

Page 114, Eq. (5.55), $e^{iK(2+\zeta)}$ should be $e^{iK(z+\zeta)}$.

Page 115, Eq. (5.58) should read

$$\mathcal{V}_{ab} = \frac{\wp}{2} [\mathcal{E}_+ e^{iKz} + \mathcal{E}_- e^{-iKz}] e^{-i\nu t}.$$

Chapter 6 — Mechanical effects of light

Page 142, 4 lines after Eq. (6.35), replace “ v_x ” by “ v_z ”.

Chapter 12 — Coherent transients

First line after Eq. (12.34). We note that χ is not real in general, but it is so if the inhomogeneous distribution is symmetric and in addition the laser frequency ν is tuned to the peak of the distribution $\mathcal{W}(\omega)$. This is further discussed in M Sargent III, M. O. Scully, and W. E. Lamb, Jr., *Laser Physics*, Addison-Wesley, Reading, MA (1974).

Chapter 13 — Field quantization

Page 274, Eqs. (13.63) to (13.66): Replace x by z in the arguments of the sine functions.

Page 282, second line after Eq. (13.103), replace (13.96) by (13.100).

Page 283, first line after Eq. (13.106), the orthonormality relation is $\int d^3r \varphi_n^*(\mathbf{r}) \varphi_m(\mathbf{r}) = \delta_{nm}$.

Chapter 14 — Interaction between atoms and quantized fields

Page 290, Eqs. (14.20), replace $(n + 1/2)$ by $(n + 1)$.

Page 299, first line of Eq. (14.54), replace α by a .

Page 303, first line of Eq. (14.68), replace $C_{c0}(0)$ by $C_{a0}(0)$.

Chapter 15 — System-reservoir interactions

Page 310, Eq. (15.17) should read

$$\rho_s(t - t_0) = e^{-i\mathcal{H}_s(t-t_0)/\hbar} \rho(t - t_0) e^{i\mathcal{H}_s(t-t_0)/\hbar}.$$

Page 311, Eq. (15.21), replace $P_{sr}(t)$ by $P_{sr}(t_0)$.

Page 312, Eq. (15.23) should read

$$F(\tau) = \sum_j g_j b_j e^{i(\Omega - \omega_j)\tau}.$$

Page 312, Eq. (15.24), there is no \hbar^2 at the denominator.

Page 318, 2 lines before Eq. (15.56): it should be Problem 15.7

Page 328, second line of Eq. (15.103), should read

$$+\delta p \sum_m \left(\frac{\delta p_m}{\delta p} \right) \sqrt{\frac{\delta t}{\delta p_m}} C_m |\psi(t)\rangle \sqrt{\frac{\delta t}{\delta p_m}} \langle \psi(t) | C_m^\dagger.$$

Chapter 16 — Resonance fluorescence

Page 338, Figure caption 16.2, replace $\Gamma = 35\gamma$ by $\gamma = 35\Gamma$.

Chapter 17 — Squeezed states of light

Page 360, second line, should be $\Delta A = \langle (A - \langle A \rangle)^2 \rangle^{1/2}$.

Chapter 18 — Cavity quantum electrodynamics

Page 378, Eq. (18.1) should read

$$\mathcal{H}_s = \hbar\delta\sigma_z + \hbar g \sin(Kz) [a^\dagger\sigma_- + a\sigma_+]$$

Chapter 19 — Quantum theory of a laser

Page 402, first line of last paragraph, (7.26) should be (19.26).

Page 407, Eq. (19.56) should read

$$p_n = \frac{p'_0}{(n+C)!} \left[\frac{N_a}{2T_1(\nu/Q)} \right]^{n+C} .$$