Laser Physics — Known errors

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Chapter 3

1. On page 28, below eqn (3.3), it is stated that the amplitude of the electromagnetic wave radiated by a dipole is proportional to $\dot{\boldsymbol{p}}$, which is incorrect. To correct this error, the $\cos\omega_0 t$ terms in eqns (3.2) and (3.3) should be replaced by $\sin\omega_0 t$ and the paragraph below eqn (3.2) should be replaced by:

   "At distances large compared to the wavelength, the electric field radiated by an oscillating dipole is proportional to $\omega_0^2\boldsymbol{p}(t)$, and hence we may write the electric field at some distant point as,". Equation (3.4), and those following it, are then correct.

Chapter 5

1. On p. 63, the penultimate sentence of the first paragraph should read: "In this case the ... recovery time (divided by $[1+(g_2/g_1)](I/I_\mathrm{s})$)." I.e. the right-hand square bracket is in the wrong place.
2. The right-hand side of eqn (5.40) should read $N^*\sigma_{21}I$.
3. The lowest level in Fig. 5.11 should be labelled "1", not "0".
4. In Exercise 5.9(b) the given result should read:

$$\Delta\alpha_\mathrm{I}^\mathrm{D}(\omega-\omega_0) = -\frac{\pi}{2}\frac{\Delta\omega_\mathrm{H}^2}{\Delta\omega_\mathrm{s}}\frac{I}{I_\mathrm{s}(0)}\alpha_0^\mathrm{D}(0)\times\int_0^\infty g_\mathrm{L}(\omega-\omega_\mathrm{c})g_\mathrm{s}(\omega_\mathrm{L}-\omega_\mathrm{c})\mathrm{d}\omega_\mathrm{c},$$

   i.e. on the RHS the subscript to $\alpha^\mathrm{D}(0)$ should be '0' not 'I'.

Chapter 6

1. In Eqn (6.2) the final term on the left-hand side should be

$$\left(\frac{\lambda_{lmp}}{2L_z}p\right)^2,$$

   i.e. L_z not L_x.
2. The mirror radii given in Exercise 6.11(f) are normalized values.
3. In Exercise 6.12(d) the term $\Delta\delta_{1/2}$ should be replaced by $\frac{\Delta\delta_{1/2}}{2}$ so that the question reads: "Show that the values of the .... $\delta_\mathrm{rt} = 2\pi p \pm \frac{\Delta\delta_{1/2}}{2}$, where

$$\sin^2\left(\frac{\Delta\delta_{1/2}}{4}\right) = \frac{1}{F}. \qquad ''$$

Chapter 8

1. In eqn(8.39) the term N_th should be replaced by N_th^* to read,

$$P_\mathrm{p} = \ldots\frac{N_\mathrm{th}^*\hbar\omega_\mathrm{L}V_\mathrm{g}}{\beta\tau_\mathrm{c}}(r-1-\ln r)$$

2. Sidenote 28 on page 216 should refer to Fig 8.10(a).

3. The first sentence of Exercise 8.6(b) the word "diameter" should be deleted so that it reads: "Suppose that within the Ti:sapphire crystal the beam is focused to a spot size $w = 50\,\mu$m."

Chapter 10

1. The condition given in the problem is incorrect, it should be "provided that $\beta^2 r_0^2 \ll 1$, *not* 'provided $L \gg \beta r_0^2$'.

Chapter 14

1. In Exercise (14.1)(a) the required result should be $\epsilon(\lambda) = 2.615 \times 10^{20} \sigma_{\rm a}(\lambda)$.

Chapter 15

1. LHS each of the equations (15.82) (15.83) and (15.84) as stated in the book should read: $\frac{1}{2\epsilon_0} P_x^{\rm NL}$, $\frac{1}{2\epsilon_0} P_y^{\rm NL}$, and $\frac{1}{2\epsilon_0} P_z^{\rm NL}$ respectively.

2. The LHS of the eqn (15.86) should read $\frac{P^{\rm NL}(2\omega)}{2\epsilon_0}$.

Chapter 16

1. In Fig. 16.11 the top figure should be labelled (a) and the bottom figure (b).

2. On page 453 the reference to Fig. 16.11(c) should be to Fig. 16.11(b).

3. In Exercise 16.2(c), the two minus signs on the right-hand sides of eqn(16.42) should be deleted.

4. In Exercise 16.4(e), the RHS of eqn (16.57) should be multiplied by a factor of $\exp(\mathrm{i}\phi_3)$.

5. In Exercise 16.6, the first line of eqn(16.66) should be

$$R_{\rm sp} = \frac{N_2/N^*}{\bar{n} + N_2/N^*} \frac{\bar{n}}{\tau_{\rm c}}.$$

   The second line is correct.

Chapter 17

1. In Table 17.1, the symbol for TOD should be $\phi^{(3)}$ not $\phi^{(2)}$.

2. The term $I(z)$ should be removed from eqn (17.35) and from the first (but not the second) term on the right-hand side of eqn (17.36).

3. In Exercise 17.4(b), assume the thickness of the BK7 window to be 10 mm.

4. In Exercise 17.7(d) the result should be,

$$a(z) \to \frac{a_0}{\left[2b_0\phi^{(2)}\right]^2}.$$

5. In Exercise 17.11(d) the required result should be,

$$\Delta\omega_{\rm p} = \Delta\omega_{\rm p0} \left[1 + \frac{2\alpha_{\rm p}\ell_{\rm g}}{\ln 2} \left(\frac{\Delta\omega_{\rm p0}}{\Delta\omega_{\rm H}}\right)^2\right]^{-1/2}.$$

Chapter 18

1. The inline formula at the bottom of page 510 for the classical electron radius is missing a factor of ϵ_0, and the units of the given numerical value are 'metres', not 'femtometres'. The inline equation should read $r_\mathrm{e} = e^2/(4\pi\epsilon_0 m_\mathrm{e} c^2) \approx 2.818 \times 10^{-15}\mathrm{m}$.

2. Problem 18.5(d): the expression given for the intensity is incorrect, it should be $I = (\mu_0 c)^{-1}\overline{\boldsymbol{E}^2}$.

Appendix C

1. There is a factor of 2 missing on RHS of eqn (C.1). This equation should read,

$$\begin{bmatrix} P_x^{NL} \\ P_y^{NL} \\ P_z^{NL} \end{bmatrix} = 2\epsilon_0 \begin{bmatrix} d_{11} & d_{12} & d_{13} & d_{14} & d_{15} & d_{16} \\ d_{21} & d_{22} & d_{23} & d_{24} & d_{25} & d_{26} \\ d_{31} & d_{32} & d_{33} & d_{34} & d_{35} & d_{36} \end{bmatrix} \begin{bmatrix} E_x^2 \\ E_y^2 \\ E_z^2 \\ 2E_yE_z \\ 2E_xE_z \\ 2E_xE_y \end{bmatrix}.$$