# Chapter 10

# Errata

**Version: 8 November 1999**

**p. 3, First and second line of Section 1.1.1** The sentence should read " ... and the data rate or bit rate $B_R$ required to transmit ... ", instead of " ... and the data rate required to transmit ... ".

**p. 4, Eq. 1.1.** Equation 1.1 should read "$B_R = S \times N \times \mathrm{BW}$" instead of "$\mathrm{DR} = S \times N \times \mathrm{BW}$".

**p. 4, Eq. 1.2.** Equation 1.2 should read "$B = B_R/2$" instead of "$B = DR/2$".

**p. 11, Two lines above Eq. 2.1.** The phrase "...makesan..." should be "...makes an ....".

**p. 15, Four line above Eq. 2.10.** The phrase "(Similar plots can obtained..." should be "(Similar plots can be obtained..."

**p. 15, Fig. 2.4.** The vertical axis of the figure should be labeled "$b = [(\beta/k) - n_2] \,/\, (n_1 - n_2)$" instead of "$b = [(\beta/k) - n_1] \,/\, (n_2 - n_1)$".

**p. 16, Eqs. 2.11 and 2.12.** The equations are missing the $n_1$ term and have the incorrect value of the core radius $a$. The equations should be

$$V = \frac{2\pi a}{\lambda} n_1 \sqrt{2\Delta} = \left( \frac{2\pi(25 \times 10^{-6})}{1550 \times 10^{-9}} \right) (1.45) \sqrt{2(0.009)} = 19.47 \tag{2.11}$$

and

$$V = \frac{2\pi a}{\lambda} n_1 \sqrt{2\Delta} = \left( \frac{2\pi(25 \times 10^{-6})}{1550 \times 10^{-9}} \right) (1.45) \sqrt{2(0.035)} = 38.9\,. \tag{2.12}$$

The number of modes ($N = V^2/2$), then, are 194 and 766, respectively.

**p. 18, Two lines above Eq. 2.14.** The original text is correct. Earlier versions of this errata made an erroneous change to the text.

**p. 18, Eq. 2.14.** The denominator of the left side of the equation should be "$P_{\mathrm{total}}$" instead of "$P_{\mathrm{core}}$". The correct equation is

$$\frac{P_{\mathrm{cladding}}}{P_{\mathrm{total}}} \approx \frac{4}{3\sqrt{N}} \qquad (V \text{ large})\,, \tag{2.14}$$

**p. 19, Fig. 2.7.** The top ray that transmits through the core-cladding interface to become a cladding mode should also have a reflected component back into the core.

**p. 21, Third part of Eq. 2.19.** The expression should equal $7.44\times10^{-2}$ instead of $7.44\times10^{-3}$.

**p. 25, Fig. 2.9.** The caption should read "...profile, (c) W profile,..." instead of "...profile, W profile,...".

**p. 27, Eq. 2.34.** The second "approximate" sign should be an "equals" sign.

$$N \approx \left(\frac{g}{g+2}\right)\left(\frac{4\pi^2 a^2 n_1^2 \Delta}{\lambda^2}\right) = \left(\frac{g}{g+2}\right)\left(\frac{V^2}{2}\right) \tag{2.34}$$

**p. 34, Fig. 3.1.** The vertical axis is incorrectly scaled. The correct scaling is shown in Fig. 3.1

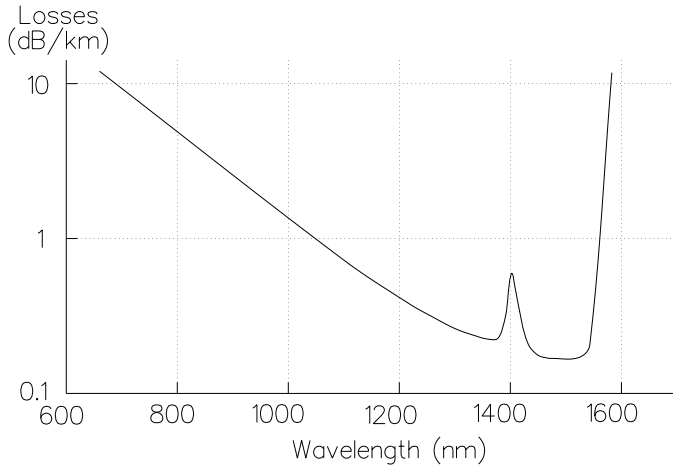


Figure 3.1: Corrected version of Figure 3.1.

**p. 39, Eq. 3.18.** Prime signs are missing on some of the variables; the first line of the equation should read

$$\frac{P_B}{P_R} = \frac{\left(17.6\times10^{-3}\right)a'^2\lambda'^2\alpha\Delta\nu'}{\left(23.6\times10^{-2}\right)a'^2\lambda'\alpha} = 0.0746\lambda'\Delta\nu' \tag{3.18}$$

**p. 46, Fig. 3.6.** The horizontal axes should both be labeled "t" or "time" as shown in Fig. 3.6

**p. 49, Eq. 3.42.** The "$n_2$" in the equation should be "$n_1$".

$$V = kan_1\sqrt{2\Delta} \tag{3.42}$$

**p. 50, Fig. 3.9.** The label on the middle curve should be "$d(Vb)/dV$" instead of "$d(Vb)/db$" as seen in Fig. 3.9. Also the plot of $b$ is incorrect in the figure in the text; the correct curve is shown in Fig. 3.9 of this errata.

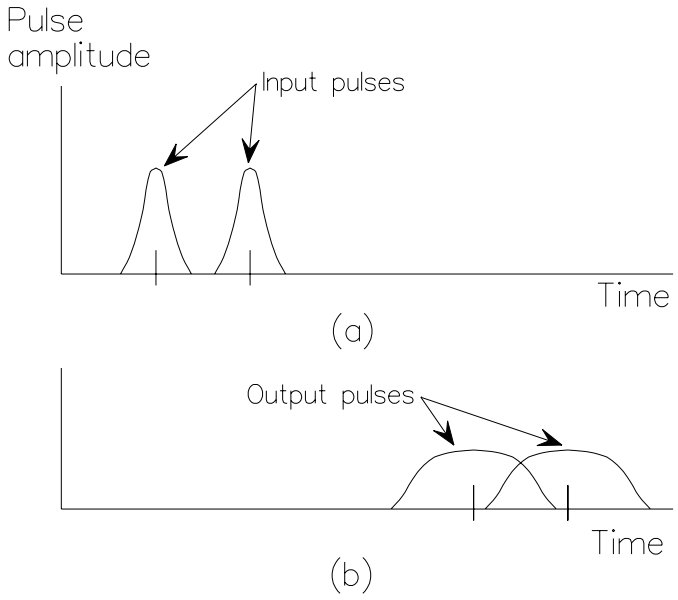


Figure 3.6: Corrected version of Figure 3.6.

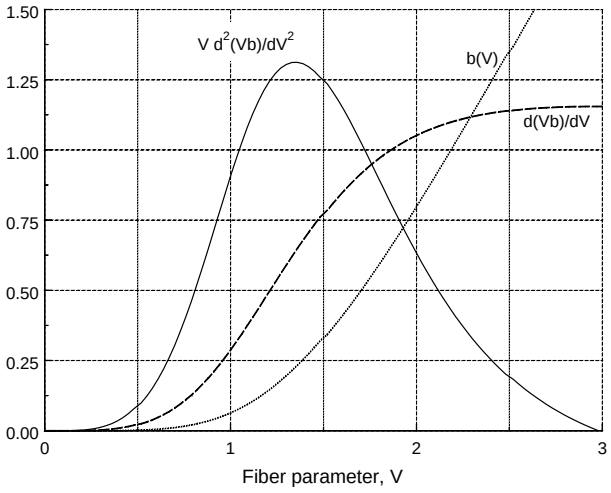


Figure 3.9: Corrected version of Figure 3.9.

**p. 50, First line.** The opening equation should be $V = 2\pi a n_1 \sqrt{2\Delta}\,/\lambda$ instead of $V = 2\pi a n_1 \sqrt{2\Delta}$.

**p. 50, Eq. 3.49.** The numerator of the middle expression should be $(\beta^2/k^2) - n_2^2$ instead of $(\beta^2/k^2) - n_2$.

**p. 51, Eq. 3.51.** The equation is incorrect; it should read

$$b(V) = 1 - \frac{5.83}{(V^4+4)^{0.5} + 2(V^4+4)^{0.25} + 1}\,. \tag{3.51}$$

**p. 51, Fig. 3.10.** The labels "2.2" and "2.3" on the x-axis are reversed.

**p. 52, Fig. 3.11.** The curves in Figure 3.11 are incorrect for the parameters given in the sample problem on p. 51 (and problem 3.15). The correct figure is shown Fig. 3.11.

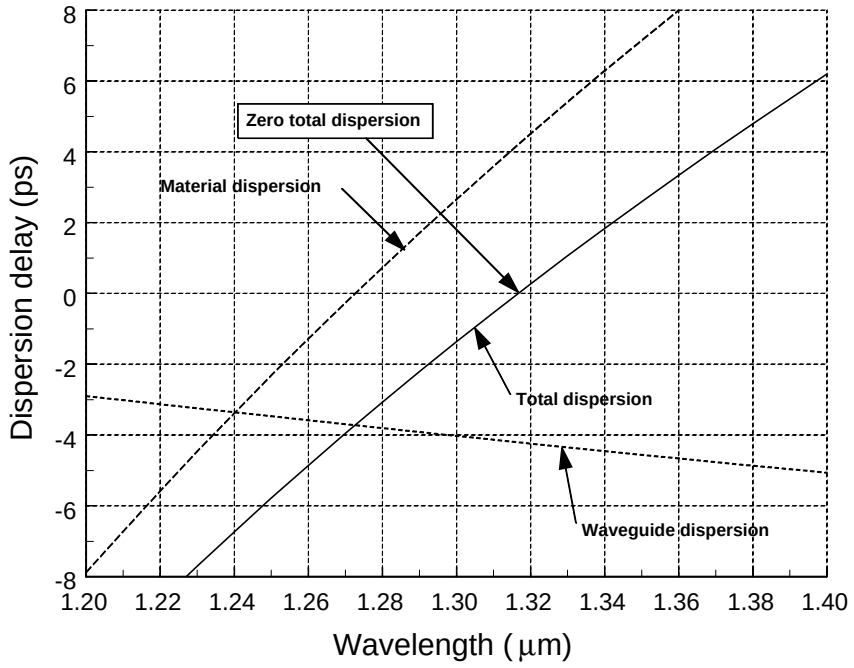


Figure 3.11: Corrected version of Figure 3.11.

**p. 53, Two lines immediately above Fig. 3.12.** The phrase "...(as in Fig. 3.12 and..." should have a closing parenthesis and be "...(as in Fig. 3.12) and...".

**p. 60, Eq. 3.72.** The right side of the equation needs a $n_1$ factor; the equation should read

$$\frac{n_1 \Delta\tau(\mathrm{GI})|_{g=g_{\mathrm{opt}}}}{L} \approx \frac{n_1 \Delta^2}{2c}\,. \tag{3.72}$$

**p. 61, Eq. 3.83.** The last term on the right should not be squared; the equation should read

$$\sigma_{\text{mat}} = \frac{L}{c}\frac{\sigma_\lambda}{\lambda}\left(\lambda^2\frac{d^2 n_1}{d\lambda^2}\right), \tag{3.83}$$

**p. 62, Eq. 3.86.** The exponent in the denominator should be "2" instead of "3", i.e., the equation should read

$$B_{R\max} = \frac{0.8\sqrt{3}\, n_1 c}{L\,(\text{NA})^2}. \tag{3.86}$$

**p. 63, End of section 3.3.7.** We also need an expression for RMS pulse spread due to waveguide dispersion. Keiser [28] gives

$$\sigma_{\text{wg}} = -\left(\frac{n_2 L\Delta}{c}\right)\left(\frac{\sigma_\lambda}{\lambda}\right)\left(V\frac{d^2(Vb)}{dV^2}\right), \tag{3.95}$$

where $\sigma_\lambda$ is the RMS spectral linewidth of the source.

**p. 66, Three lines below the "Stimulated Raman Scattering" heading near the bottom of the page.** The equation should read "... $h\nu_{\text{out}} = h\nu_{\text{in}} - h\nu_{\text{phonon}}$..." instead of "...$\nu_{\text{out}} = h\nu_{\text{in}} - h\nu_{\text{phonon}}$...".

**p. 67, Eq. 3.100.** The phrase should be "...for $I_2 \ll I_1$..." instead of "...for $I_1 \ll I_1$...".

**p. 68, One line above Eq. 3.101.** The first sentence should end as " ... will be 14 THz below the stimulating frequency." instead of " ... will be 14 THz below the stimulating wavelength."

**p. 68, Eq. 3.101.** The answer should be $3 \times 10^{14}$ Hz instead of $14 \times 10^{12}$.

**p. 68, First line below Eq. 3.103.** The sentence should read "...at 1.048 $\mu$m..." instead of ".....at 1.088 $\mu$m...".

**p. 68, Eq. 3.104.** The units of the answer are incorrect; the answer is "...$4.33 \times 10^{-14}$ m·W$^{-1}$...".

**p. 68, First line after Eq. 3.105.** The phrase "...at 1.049 $\mu$mm." should be "...at 1.048 $\mu$m."

**p. 71, Fig. 3.21.** The figure is incorrect; it should look like Fig. 3.21 shown here.

**p. 77, Next to the last line of the second paragraph.** The phrase "...limits the power that be carried..." should be "...limits the power that can be carried...".

**p. 78, Prob. 5.** The last term of the equation should be $e^{-\alpha_{\text{p}}\left(\frac{c}{n_1}\right)t_1}$ instead of $e^{-\alpha\left(\frac{c}{n_1}\right)t_1}$.

**p. 78, Prob 8.** The optical "splitter" that is mentioned in the problem is labeled as a "coupler" in Fig. 3.4.

**p. 79, Prob. 15, second line.** The phrase "Let $L = 1000$ and..." should be "Let $L = 1000$ m and...".

**p. 79, Prob. 16, part a.** The phrase "...effective length of the a long fiber..." should be "...effective length of a long fiber...".

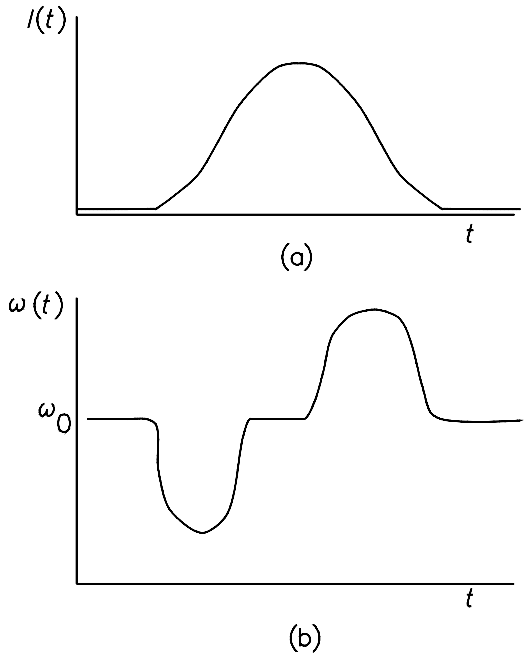


Figure 3.21: Correct version of Figure 3.21.

**p. 79, Prob. 17.** The fiber loss is missing; let it be 0.15 dB/km.

**p. 79, Prob. 18.** This problem is misplaced. It should be after Chapter 7.

**p. 80, Prob. 19.** Assume an operating wavelength of 1300 nm.

**p. 80, Prob. 20.** The MFD should be "...10 $\mu$m...", not "...10 m...".

**p. 80, Prob. 21.** Assume that the Brillouin linewidth is bigger than the source linewidth.

**p. 89, Eq. 4.14.** The argument of the $\cos^{-1}$ term should be $d/2a$ instead of $d/a$. The equation should read

$$\eta_{\text{SI}} = \frac{2}{\pi}\cos^{-1}\left(\frac{d}{2a}\right) - \frac{d}{\pi a}\sqrt{1-\left(\frac{d}{2a}\right)^2} \tag{4.14}$$

**p. 90, First bullet.** The text should begin "Longitudinal displacement effects...." instead of "Longitudinaldisplacement effects....".

**p. 90, "Longitudinal displacement effects" subsection.** All of the $\theta_c$'s in this discussion should be replaced by $\theta_{\max}$. So, Eq. 4.18 and following should be

$$\eta_{\text{SI}} = \left(\frac{1}{1+(s/a)\tan\theta_{\max}}\right)^2, \tag{4.18}$$

where $s$ is the separation distance between the fiber ends and $\theta_{\max}$ is the maximum angle of acceptance ($\theta_{\max} = \sin^{-1}\text{NA}$)."
Equation 4.19 should be

$$\theta_{\max} = \sin^{-1}(\text{NA}) = \sin^{-1}(0.2) = 11.54^\circ \tag{4.19}$$

and Eq. 4.20 should be

$$\eta_{\text{SI}} = \left(\frac{a}{a+s\tan\theta_{\max}}\right)^2 \tag{4.20}$$

**p. 91, Eq. 4.22.** The equation is incorrect. It should read

$$\eta = \frac{1}{1+\left(\dfrac{\sin\phi}{\sqrt{2\pi\Delta}}\right)\left(\dfrac{\Gamma\left(\frac{2}{g}+2\right)}{\Gamma\left(\frac{2}{g}+\frac{3}{2}\right)}\right)} \tag{4.22}$$

**p. 110, Prob. 2.** The phrase "Calculate the coupling coefficient..." should be "Calculate the coupling efficiency...".

**p. 117, Third line.** The mixture described by Eq. 5.6 is for a $\text{Ga}_{1-x}\text{Al}_x\text{As}$ blend instead of a $\text{Ga}_x\text{Al}_{1-x}\text{As}$ blend.

**p. 117, Last line.** The phrase "...p-type material below it." should be "...p-type material above it.".

**p. 121, Second line of Eq. 5.7.** The exponent on the left side of the second line of the equation should have a minus sign; it should read

$$10^{-10/10} = 0.1 = \cos^n 75^\circ$$

**p. 121, End of example problem.** Since the question asked for the full-angle beam divergence, we find it to be twice the calculated half-angle beam divergence or 96.6°.

**p. 124, Last paragraph, first sentence.** The sentence should read "We now want ... response of the LED." instead of "We now want ... response of the laser diode."

**p. 124, Eq. 5.11.** The numerator on the right side of the equation is incorrect; the equation should read

$$f_{(3-\text{db electrical})} = \frac{0.643}{2\pi\tau_{\text{lifetime}}}\,. \tag{5.11}$$

**p. 125, Two lines below the "LED Rise-Time" heading.** The beginning of the sentence should be "The rise-time of a device..." instead of "The rise time!device of a device...".

**p. 142, Two line above Fig. 5.21.** The sentence should begin "Typical median lifetimes for GaAlAs short-wavelength lasers ... " instead of "Typical median lifetimes for AlGaAs short-wavelength lasers ... ".

**p. 149, Next-to-last line.** The phrase "...butted up close to optical source." should be "...butted up close to an optical source.".

**p. 150, Fig. 5.28.** Both arrows are pointing to the circular pattern; the $(\cos\theta)^{120}$ arrow should be pointing to the flat elliptical pattern that is inside the circular pattern. The correct figure is shown in Fig. 5.28

**p. 153, Eq. 5.59.** The equation should read ...

$$\begin{aligned}\eta &= (\text{NA})^2(0)\left[1-\left(\frac{2}{g+2}\right)\left(\frac{r_s}{a}\right)^g\right] \qquad (5.59)\\ &= (0.2)^2\left[1-\left(\frac{2}{1.8+2}\right)\left(\frac{31.25}{50}\right)^1.8\right]\\ &= 0.0310 = 3.10\% \Rightarrow -15.09\ \text{dB}\,.\end{aligned}$$

**p. 156, third line.** The phrase "...is appreciably lower than a for the laser diode;..." should be "...is appreciably lower than for an LED;...".

**p. 170, Eq. 6.23.** The left side of the equation should be "$T_B = 1/B_R$ =...".

**p. 170, Eq. 6.24.** The answer should be $4.23 \times 10^{-11}$ W = 4.23 nW instead of 4.43 nW.

**p. 175, Eq. 6.40.** Equation 6.40 has the value of $M^{0.4} = 4.78$ entered twice. The answer, however, is correct. The equation should read

$$\begin{aligned}N_{\text{shot}} &= 2q(I_L + I_D)M^2F(M)B \qquad (6.40)\\ &= 2(1.6\times10^{-19})(3\times10^{-9}+10\times10^{-9})(50)^2\\ &\quad\times(4.78)\left(10\times10^6\right) = 4.97\times10^{-16}\ \ \text{A}^2\,.\end{aligned}$$

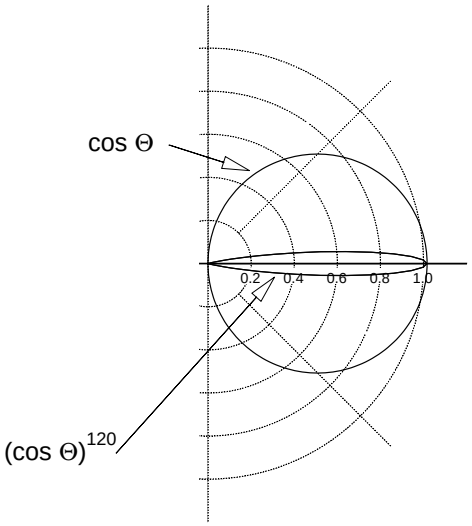


Figure 5.28: Corrected version of Figure 5.28.

**p. 179, Eq. 6.56.** The equation should read

$$< i_s|^2_{M=1} >= \frac{(m\mathcal{R}_0 P)^2}{2} \tag{6.56}$$

and the entire phrase in the parentheses (about explicitly including the gain term $M^2$) of the following two lines should be removed.

**p. 184, Eq. 6.77.** Equation 6.77 has incorrect arguments; it should be

$$P_e = \text{BER} = \frac{1}{4}\left[\text{erfc}\left(\frac{\overline{i(\mathbf{1})} - I_D}{\sigma_1\sqrt{2}}\right) + \text{erfc}\left(\frac{I_D - \overline{i(\mathbf{0})}}{\sigma_0\sqrt{2}}\right)\right] . \tag{6.77}$$

**p. 185, Eq. 6.79.** Equation 6.79 has an incorrect numerator; it should be

$$I_D = \frac{\sigma_0\overline{i(\mathbf{1})} + \sigma_1\overline{i(\mathbf{0})}}{\sigma_0 + \sigma_1} . \tag{6.79}$$

**p. 186, Third line of Sect. 6.3.1** The optimum location of the threshold is " ... $I_D = (\overline{i(\mathbf{1})} + \overline{i(\mathbf{0})})/2$ ... " instead of " ... $I_D = (\overline{i(\mathbf{0})} + \overline{i(\mathbf{0})})/2$ ... ".

**p. 187, x-axis label of Fig. 6.13.** The label should read "RMS signal-to-noise ratio in dB.". The caption should read as shown in the revised version of Fig. 6.13 included here.

**p. 187, Eq. 6.85.** This equation should be

$$\sqrt{< i_s^2 >_{\min}} = \sqrt{(S/N)_{\min}}\sqrt{< i_N^2 >} \tag{6.85}$$

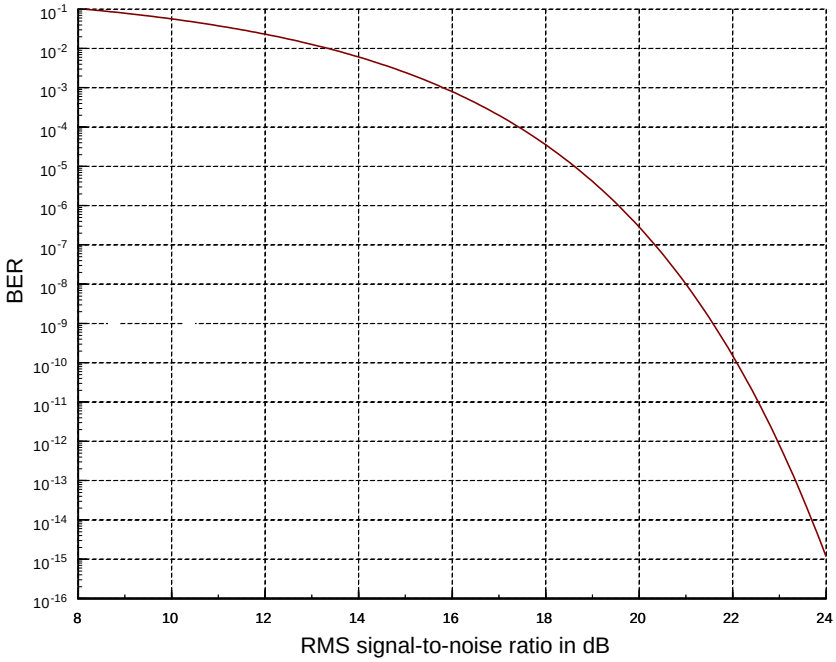


Figure 6.13: Bit error rate vs. RMS signal-to-noise ratio in dB (i.e., $\sqrt{< i_s^2 >}/\sqrt{< i_N^2 >}$ in dB or $20 \log \left( \sqrt{< i_s^2 >}/\sqrt{< i_N^2 >} \right)$) when $\sigma_0 = \sigma_1 = \sigma$ and $\overline{i(\mathbf{0})} = 0$. (Here, $\sqrt{< i_s^2 >} = \overline{i(\mathbf{1})}$)

instead of

$$< i_s >_{\min} = \sqrt{(S/N)_{\min}} \sqrt{< i_N^2 >} \, .$$

**p. 187, Eq. 6.87** should be

$$20 \log \left( \sqrt{< i_s^2 >} / \sqrt{< i_N^2 >} \right) = 19.6 \text{ dB} \, . \tag{6.87}$$

**p. 188, the unnumbered equation at top of page** should be

$$\left( \sqrt{< i_s^2 >} / \sqrt{< i_N^2 >} \right) = 10^{19.6/10} = 9.55 \, .$$

**p. 188, Top.** The line "Since...." should be replaced by "Hence," and the left side of Eq. 6.88 should begin "$\sqrt{< i_s^2 >} = \ldots$" instead of "$< i_s >= \ldots$".

**p. 188, Eq. 6.89.** Similarly Eq. 6.89 should read ...

$$P_{\min} = \frac{\sqrt{< i_s^2 >}}{\mathcal{R}_0} = \ldots \tag{6.89}$$

instead of

$$P_{\min} = \frac{< i_s^2 >}{\mathcal{R}_0} = \ldots$$

**p. 195, Third paragraph.** The beginning of the first sentence should be "The first term of Eq. 6.102 on the preceding page ... " instead of "The first term of Eq. 6.103 on the preceding page ... ".

**p. 196, Two lines below Eq. 6.104.** The phrase " ... by the fourth term of Eq. 6.103 on page 194, ... " should be " ... by the fourth term of Eq. 6.102 on page 194, ... ".

**p. 206, Prob. 6.9.** The problem should be to prove that

$$Q = \frac{1}{2} \sqrt{\frac{S}{N}} \, , \tag{6.128}$$

instead of $Q = (1/2)(S/N)$.

**p. 206, Prob. 6.12.** In this problem assume that the coding is NRZ and that the thermal noise is negligible.

**p. 206, Prob. 6.13.** In this problem assume that wavelength of the source is 1300 nm.

**p. 211, Table.** The first two entries in the "Baud rate" column are incorrect; the baud rate for the NRZ code should be "1x data rate" and the baud rate for the RZ code that is described should be "Variable (up to 2x data rate)". The "dc level" column entry for the NRZ row should be "No" instead of "Yes" and the entry for the Manchester row should be "Yes" instead of "No".

**p. 214, Top of page.** The sentence should be " ... approximately 0.1 dB per interface for a total loss of 0.2 dB at the receiver." instead of " ... approximately 0.2 dB per interface for a total loss of 0.4 dB at the receiver." Equation 7.6 then becomes

$$P_{\text{R fiber}} = -40 + 0.2 + 6 = -33.8 \text{ dBm}. \tag{7.6}$$

Equation 7.7 becomes

$$\alpha L = P_{\text{T fiber}} - P_{\text{R fiber}} = -25.1 - (-33.8) = 8.7 \text{ dB}. \tag{7.7}$$

**p. 218, Eq. 7.27.** The subscript on the summation sign should be a lower-case i instead of an upper-case I, i.e., the equation should be

$$\Delta t_{\text{sys}} = \sqrt{\sum_{i=1}^{N} \Delta t_i^2}. \tag{7.27}$$

**p. 219, Example problem at bottom.** The link distance (from the prior power budget analysis [Eq. 7.8 on page 214]) should be 1.74 km instead of the 2.5 km value that was used. The solution should read ...

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Solution: The pin diode might have a typical rise time of 10 ns.

For a silica fiber operating at 830 nm, the value of $\lambda^2(d^2n/d\lambda^2)$ is approximately 0.024 (from Fig. 3.8 on page 48). For a link distance of 1.74 km, the material-dispersion delay time is

$$\begin{aligned} \Delta t_{\text{mat}} &= -\frac{L}{c}\frac{\Delta\lambda}{\lambda}\left[\lambda^2\frac{d^2n}{d\lambda^2}\right] = -\left[\frac{1.74\times10^3}{3.0\times10^8}\right]\left[\frac{40}{830}\right](0.024) \\ &= -6.71\times10^{-9} \text{ s} = -6.17 \text{ ns}. \end{aligned} \tag{7.35}$$

A typical intermodal dispersion for graded-index fibers is 3.5 ns/km. Hence, a 1.74 km link has $\Delta t_{\text{modal}} = 6.09$ ns.

Calculating the system's rise time, we have

$$\begin{aligned} \Delta t_{\text{sys}} &= \sqrt{\Delta t_{\text{S}}^2 + \Delta t_{\text{R}}^2 + \Delta t_{\text{mat}}^2 + \Delta t_{\text{modal}}^2} \\ &= \sqrt{8^2 + 10^2 + 6.71^2 + 6.09^2} \text{ ns} = 15.69 \text{ ns}. \end{aligned} \tag{7.36}$$

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**p. 220, Example problem in middle.** The revised answers from the previous example problem should be used and the discussion of the results needs to be amended. The solution should read ...

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Example: The system rise time of the previous example was 15.69 ns. Using this value we can calculate the data rate that the system can support by inverting the previous equations:

Solution: For NRZ coding,

$$\begin{aligned} \Delta t_{\mathsf{sys}} &\leq 0.7 T_{\mathsf{B}} \qquad (7.38) \\ T_{\mathsf{B}} &\geq \frac{\Delta t_{\mathsf{sys}}}{0.7} \\ B_{\mathsf{R}} &\leq \frac{0.7}{\Delta t_{\mathsf{sys}}} \leq \frac{0.7}{15.69 \times 10^{-9}} \leq 44.6 \text{ Mb} \cdot \text{s}^{-1} . \end{aligned}$$

For RZ coding, we have

$$B_{\mathsf{R}} = \frac{0.35}{\Delta t_{\mathsf{sys}}} = \frac{0.35}{15.69 \times 10^{-9}} = 22.3 \text{ Mb} \cdot \text{s}^{-1} . \qquad (7.39)$$

Surprisingly, neither coding will support the desired 100 Mb·s$^{-1}$ data rate.

To consider possible solutions to this dilemma, we look at Eq. 7.36 on the facing page. Each term of the sum must individually be below the desired speed of response for the system (e.g., 7.0 ns for our 100 Mb/s rate and NRZ coding). Neither the source speed (8 ns) nor the detector speed (10 ns) is low enough; each must be replaced with a faster device. The material dispersion time (6.71 ns) and the modal dispersion time(6.09 ns) are individually (theoretically) fast enough, but require extremely low speeds of the other devices and are not fast enough to be used in combination. So, both the material dispersion and the modal dispersion should be lowered. For example, to reduce the material dispersion, inspection of Eq. 7.29 on page 218 reveals that one should reduce $\Delta\lambda$. Two methods of doing this would be

1. to use an LED with a longer wavelength (while keeping $\Delta\lambda$ constant), or
2. to use a laser source with its reduced value of $\Delta\lambda$. (The choice of a laser source would also allow increased distance in exchange for the increased cost and increased complexity.)

After choosing a new set of components, the power budget and timing analysis, need to be recalculated to ensure proper operation of the system.

$\infty$

**p. 223, Eq. 7.47 and following line.** The equation and following line should use $B'_R$ for bit rate (in Mb/s) instead of DR′; the equation and text should read " ...

$$P_R(\text{dBm}) = -65.0 + 20 \log \text{B}'_{\text{R}}[\text{Mb} \cdot \text{s}^{-1}] , \qquad (7.47)$$

to maintain a BER of $1 \times 10^{-9}$ where $B'_R$ is the data rate in Mb·s$^{-1}$."

**p. 223, Fig. 7.3.** The figure in the text is incorrect; the correct figure is shown Fig. 7.3.

**p. 225, Third bullet from the top.** A closing parenthesis should be inserted before the period, i.e., the ending should read " ... into amplifier gain)." instead of " ... into amplifier gain.".

**p. 225, Two line above Eq. 7.53.** The text should read " ... (and, hence, the overall gain coefficient of a given length ... " instead of " ... (and, hence, the overall gain of a given length ... ".

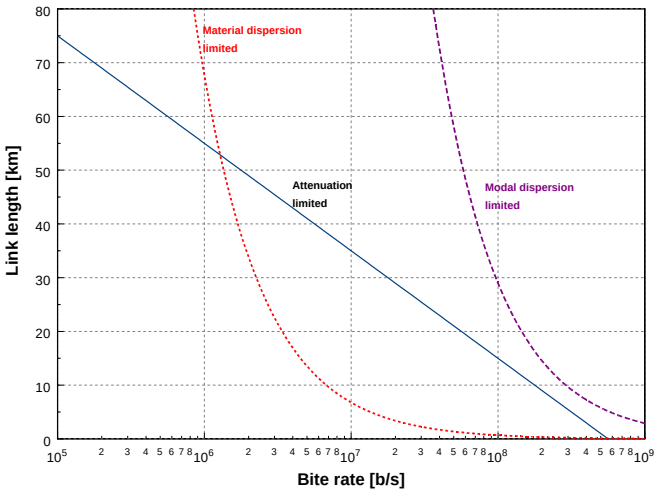


Figure 7.3: Corrected version of Figure 7.3.

**p. 227, Third line in the first paragraph of Sect. 7.8.1.** The sentence should be "Diode pumps operating at 980 and ... " instead of "Diode pumps operating at 950 and ... ".

**p. 227, Fourth line of Sect. 7.8.1.** The choice of pump lasers has swung to 980-nm sources. The text should read " ... using a 980-nm diode-laser source for a pump." instead of " ... using a 1480-nm diode-laser source for a pump."

**p. 230, Second and third lines below Eq. 7.58.** The sentence should begin with "In Eqs. 7.55 and 7.56 on the preceding page, ... " instead of "In Eq. 7.57 on the preceding page, ... ".

**p. 230, Second line of Eq. 7.59.** The subscript of the ASE power has a typo in the $P_{\mathrm{ASE}}$ term; the upper-case l should be a lower-case i. The line should read

$$= LG_i \left(P_{s,i-1,out} + P_{\mathrm{ASE},i-1,out}\right) + 2n_{sp}\left(G_i - 1\right) h\nu B_o \,. \tag{7.59}$$

**p. 230, One line above Eq. 7.60** The reference should be to Eq. 7.59 instead of Eq. 7.60.

**p. 230, Eq. 7.62** The answer should be 30.2 dB instead of 36.2 dB.

**p. 231, Line of text above Eq. 7.66** The line should be "The ASE power is found from Eq. 7.56 on page 229 and Eq. 7.57 on the facing page as ... " instead of "The ASE power is found from Eq. 7.57 on the preceding page as ... "

**p. 231, Line of text above Eq. 7.67** The text should read " ... by subtracting the power $P_{\mathrm{ASE,i,out}}$ ... " instead of " ... by subtracting the power $P_{\mathrm{s,i,out}}$ ... ".

**p. 232, Fig. 7.8.** The figure in the text is incorrect; the correct figure is shown Fig. 7.8

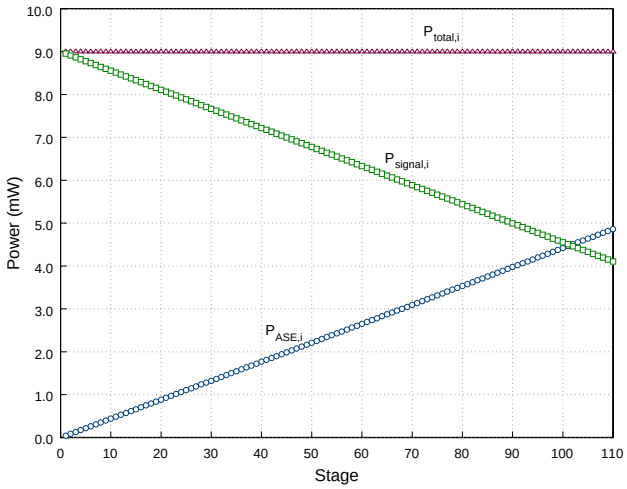


Figure 7.8: Corrected version of Figure 7.8.

**p. 232, Eqs. 7.68 and 7.69.** The left side of the equations have incorrect notation; the equations should read

$$< i_N^2 >_{\text{sig}-\text{ASE}} = 2 I_{\text{ASE}} I_{\text{sig}} \frac{B_e}{B_o} \tag{7.68}$$

$$< i_N^2 >_{\text{ASE}-\text{ASE}} = I_{\text{ASE}}^2 \frac{B_e}{B_o}\,, \tag{7.69}$$

**p. 233, last paragraph.** The text should state that " ... $R_{\text{ASE}}$ stays below 100% ... " instead of " ... $R_{\text{ASE}}$ stays below 70% ... ".

**p. 234, Fig. 7.9.** The figure in the text is incorrect; the correct figure is shown Fig. 7.9.

**p. 237, Eq. 7.80.** The equation is lacking a term; it should read ...

$$F_{\text{nl}} = \frac{A'_{\text{eff}}}{A_{\text{eff}}} \frac{\alpha'_p}{\alpha_p} \frac{(e^{\alpha_{\text{p}} L} - 1)^2}{e^{\alpha_{\text{p}} L}} \frac{e^{\alpha^{\emptyset}_{\text{p}} L^{\emptyset}}}{(e^{\alpha^{\emptyset}_{\text{p}} L^{\emptyset}} - 1)^2} \frac{D}{D'} \tag{7.80}$$

**p. 251, Prob. 11** The dispersion in the link fiber should be +25 ps·km$^{-1}$·nm$^{-1}$ instead of +85 +25 ps·km$^{-1}$·nm$^{-1}$. The dispersion in the compensating fiber should be −100 +25 ps·km$^{-1}$·nm$^{-1}$.

**p. 275, Eq. 8.16.** The numerator and denominator of the right term have the wrong signs; the equation should read ...

$$\text{Efficiency} = \frac{n(T - D)}{nT + D} = \frac{(200)(T - 2.02 \times 10^{-3})}{200T + 2.02 \times 10^{-3}}\,.$$

**p. 304, Fig. 9.1.** The figure in the text is incorrect; the correct figure is shown in Fig. 9.1.

**p. 305, Fig. 9.4.** The figure in the text is incorrect; the correct figure is shown in Fig. 9.4.

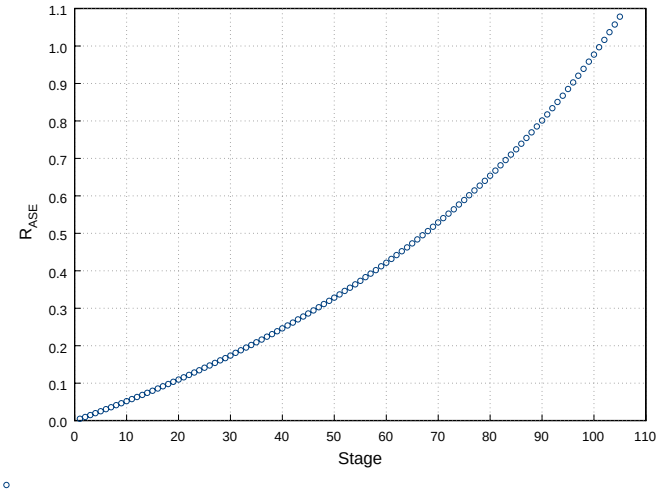


Figure 7.9: Corrected version of Figure 7.9.

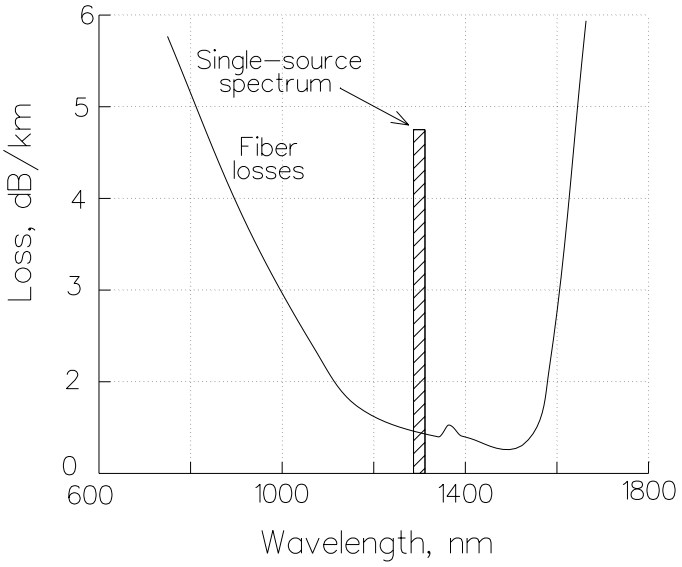


Figure 9.1: Corrected version of Figure 9.1.

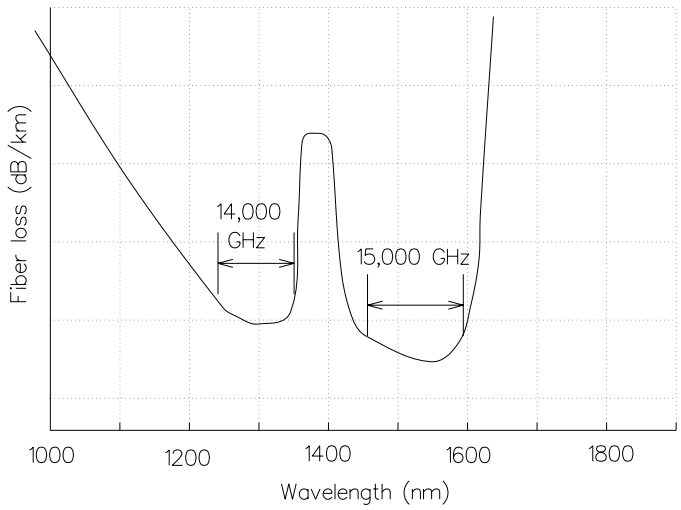


Figure 9.4: Corrected version of Figure 9.4.