June 29, 2021

ERRATA FOR

RADIATION DETECTION AND MEASUREMENT: CONCEPTS, METHODS, AND DEVICES

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NOTE: Listed are errors found for the first printing of the first edition.

Location (Discoverer)	**As Is**	**Change to**
Chapter 3		
p. 57, Eq. 3.42 (DSM)	$\frac{d^2\psi(x)}{dX^2} - k^2\psi(x) = 0$	$\frac{d^2\psi(x)}{dx^2} - \phi^2\psi(x) = 0$
p. 57, Eq. 3.43 (DSM)	$\frac{d^2\psi(x)}{dX^2} + \phi^2\alpha^2\psi(x) = 0$	$\frac{d^2\psi(x)}{dx^2} + k^2\psi(x) = 0$
p. 57, Eq. 3.44 (DSM)	$\psi_1(x) = Ae^{kx} + Be^{-kx}$	$\psi_1(x) = Ae^{\phi x} + Be^{-\phi x}$
p. 57, Eq. 3.45 (DSM)	$\psi_3(x) = Fe^{kx} + Ge^{-kx}$	$\psi_3(x) = Fe^{\phi x} + Ge^{-\phi x}$
Chapter 6		
p. 240, Prob. 7, line 2 (DSM)	$\sigma_n = \frac{1}{N}\sqrt{\sum_{i=1}^{N}\left(\frac{G_i}{t_{G_i}^2} + \frac{B_i}{t_{B_i}^2}\right)}$	$\sigma_n = \frac{1}{N}\sqrt{\sum_{i=1}^{N}\left(\frac{G_i}{t_G^2} + \frac{B_i}{t_B^2}\right)}$
Chapter 12		
p. 454, Ex. 12.2, line 12 (J. Beavers)	$+\frac{\hbar^2}{3m_t^*}(k_x^2 + k_y^2 + k_z^2$	$+\frac{\hbar^2}{3m_t^*}(k_x^2 + k_y^2 + k_z^2$
	$-2k_xk_y - 2k_xk_z - 2k_yk_z)$	$-k_xk_y - k_xk_z - k_yk_z)$
p. 454, Ex. 12.2, line 12 (J. Beavers)	(all non-diagonal) $-\frac{1}{3}\left(\frac{2}{\mathbf{m_t^*}} - \frac{1}{\mathbf{m_l^*}}\right)$	(all non-diagonal) $-\frac{1}{3}\left(\frac{1}{\mathbf{m_t^*}} - \frac{1}{\mathbf{m_l^*}}\right)$
p. 461, para 4, line 9 (J. Beavers)	Here $N_C \equiv 2[2\pi m_e^* kT]/h^2]^{3/2}$ is ...	Here $N_C \equiv 2[[2\pi m_e^* kT]/h^2]^{3/2}$ is ...
p. 470, Ex. 12.3, line 10 (DSM)	Substitution into Eq. (12.141) gives	Substitution into Eq. (12.138) gives
Chapter 13		
p. 488, Eq. 13.9 (DSM)	$\Delta\lambda = \frac{4\pi S\omega c\hbar^2}{E_o^2 - (2\hbar\omega)^2}$	$\Delta\lambda = \frac{4\pi S\omega c\hbar^2}{E_o^2 - (S\hbar\omega)^2}$
Chapter 14		
p. 573, Eq. 14.11 (DSM)	$T(\lambda) = [(1 - R(\lambda))^2]\ldots$	$\tau(\lambda) = T(\lambda) = [(1 - R(\lambda))^2\ldots$
p. 576, Table 14.2, line 8 (for S-24), column 2 (J. Terrell)	$SbCs_3$	Na_2KSb
p. 576, Table 14.2, line 8 (for S-24), column 4 (J. Terrell)	640	620
p. 578, Eq. 14.17 (DSM)	$= \frac{\pi}{3}\left(\frac{2m_eE_F}{h^2}\right)^{3/2}$	$= \frac{8\pi}{3}\left(\frac{2m_eE_F}{h^2}\right)^{3/2}$
Chapter 15		
p. 634, Eq. 15.44 (J. Beavers)	$p(x) = p_o + \Delta p \exp\left[\frac{-x}{\sqrt{D_n\tau_n}}\right]$	$p(x) = p_o + \Delta p \exp\left[\frac{-x}{\sqrt{D_p\tau_p}}\right]$
p. 644, Ex. 15.2, last line (DSM)	4.04×10^{-14} amperes	4.04×10^{-10} amperes cm^{-2}
Chapter 17		
p. 820, Sec.17.2.5, line 7 (D. Nichols)	$^{113}Cd(n,\gamma)^{113}Cd$	$^{113}Cd(n,\gamma)^{114}Cd$
p. 820, Sec.17.2.5, line 11 (D. Nichols)	$^{113}Cd(n,\gamma)^{113}Cd$	$^{113}Cd(n,\gamma)^{114}Cd$
p. 821, para 2, line 1 (D. Nichols)	$^{113}Cd(n,\gamma)^{113}Cd$	$^{113}Cd(n,\gamma)^{114}Cd$

(cont.)

Location (Discoverer)	**As Is**	**Change to**
Chapter 20		
p. 1048, Fig. 20.9 (DSM)	. . . the product ^{22}Na transitions . . .	. . . the product ^{22}Ne transitions . . .
p. 1054, Eq. 20.41 (DSM)	$A = \sum_{n=n_1}^{n_2} \left[C(n) - (n_2 - n_1) \frac{C(n_1)+C(n_2)}{2} \right].$	$A = \sum_{n=n_1}^{n_2} C(n) - \left[(n_2 - n_1) \frac{C(n_1)+C(n_2)}{2} \right].$
p. 1064, Eq. 20.90 (JKS)	$\frac{dy(x\|\mathbf{a})}{dB} = f(x, \mu, \tau),$	$\frac{dy(x\|\mathbf{a})}{dB} = g(x, \mu, \tau),$
p. 1064, Eq. 20.90 (JKS)	$\frac{dy(x\|\mathbf{a})}{d\mu} = Bf(x, \mu, \tau)\frac{2(x-\mu)}{\tau^2},$	$\frac{dy(x\|\mathbf{a})}{d\mu} = Bg(x, \mu, \tau)\frac{2(x-\mu)}{\tau^2},$
p. 1064, Eq. 20.90 (JKS)	$\frac{dy(x\|\mathbf{a})}{d\tau} = f(x, \mu, \tau)\frac{2(x-\mu)^2}{\tau^3},$	$\frac{dy(x\|\mathbf{a})}{d\tau} = g(x, \mu, \tau)\frac{2(x-\mu)^2}{\tau^3},$
p. 1066, Eq. 20.98 (JKS)	$\frac{dy(x\|\mathbf{a})}{dB_i} = f(x, \mu_i, \tau_i),$	$\frac{dy(x\|\mathbf{a})}{dB_i} = g(x, \mu_i, \tau_i),$
p. 1066, Eq. 20.98 (JKS)	$\frac{dy(x\|\mathbf{a})}{d\mu_i} = Bf(x, \mu_i, \tau_i)\frac{2(x-\mu_i)}{\tau_i^2},$	$\frac{dy(x\|\mathbf{a})}{d\mu_i} = Bg(x, \mu_i, \tau_i)\frac{2(x-\mu_i)}{\tau_i^2},$
p. 1066, Eq. 20.98 (JKS)	$\frac{dy(x\|\mathbf{a})}{d\tau_i} = f(x, \mu_i, \tau_i)\frac{2(x-\mu_i)^2}{\tau_i^3},$	$\frac{dy(x\|\mathbf{a})}{d\tau_i} = g(x, \mu_i, \tau_i)\frac{2(x-\mu_i)^2}{\tau_i^3},$
p. 1066, in solution, line 6 (JKS)	$\mu_1 = 140.$	$\mu_2 = 140.$
p. 1066, in solution, line 10 (JKS)	$\sigma_1 = 2.1298 \pm 0.0157$	$\tau_1 = 2.1298 \pm 0.0157$
p. 1067, in solution, top line (JKS)	$\sigma_2 = 2.8700 \pm 0.0138$	$\tau_2 = 2.8700 \pm 0.0138$
Chapter 22		
p. 1170, Eq 22.61 (DSM)	$\frac{dv_{in}}{dt} - \frac{dv_{out}(t)}{dt} = \frac{1}{C}\frac{dQ(t)}{dt}$	$\frac{dv_{in}(t)}{dt} - \frac{dv_{out}(t)}{dt} = \frac{1}{C}\frac{dQ(t)}{dt}$
p. 1170, line 10 (DSM)	frequencies $\omega \ll 1$, $G(\omega) \simeq \omega$ so v_{out} . . .	frequencies $\omega \ll 1$ and $G(\omega) \simeq \omega\tau$ so v_{out} . . .

(cont.)

Minor Typos

Location (Discoverer)	**As Is**	**Change to**
Chapter 1		
p. 5, para 3, line 2 (DSM)	...a gold foil electroscope...	...an electroscope...
p. 5, para 3, line 6 (DSM)	...of the gold foils...	...of the electroscope needle...
Chapter 3		
p. 59, Eq. 3.57 (DSM)	$\frac{k}{\phi}\left(\left(\frac{kC}{\phi}\sin(ka) - C\cos(ka)\right) =\right.$	$\frac{k}{\phi}\left(\frac{kC}{\phi}\sin(ka) - C\cos(ka)\right) =$
p. 68, Sec. 3.5.4, line 3 (JKS)		The definition of N_a changed in May 2019. See Appendix A.1 for details.
Chapter 6		
p. 193, Ex. 6.6, line 3 (DSM)	...to ove use...	...to over use...
p. 193, Ex. 6.6, line 4 (DSM)	...possible due...	...possibly due...
p. 230, Eq. 6.101, line 1 (DSM)	$L_D = L_C + k_\beta \sigma_N =$	$L_D = L_C + k_\beta \sigma_{N_s} =$
p. 230, Eq. 6.102, line 1 (DSM)	$L_D = k_\alpha \sigma_B + k_\beta \sigma_N =$	$L_D = k_\alpha \sigma_0 + k_\beta \sigma_{N_s} =$
p. 230, para 5, line 3 (DSM)	$(N \ll B)$	$(N_s \ll B)$
p. 230, Eq. 6.103 (DSM)	$L_D = L_C + k_\beta \sigma_N =$	$L_D = L_C + k_\beta \sigma_{N_s} =$
Chapter 9		
p. 320, Ex. 9.1, Line 13 (DSM)	$fN_{O_2} = f\rho_{O_2} N_a / A_{O_2}$	$f_V N_{O_2} = f_V \rho_{O_2} N_a / A_{O_2}$
p. 338, Fig. 9.20 abscissa (DSM)	...arbitray...	...arbitrary...
Chapter 10		
p. 399, Prob. 10.7, line 1 (DSM)	...12.5mm.	...12.5 mm.
Chapter 11		
p. 422, Refs., lines 12,15,18,19 (DSM)	...Elektronenzhlrohr...	...Elektronenzählrohr...
Chapter 12		
p. 437, Eq.12.42 (DSM)	$ig(Ae^{iga} - Be^{-iga}$	$ig(Ae^{iga} - Be^{-iga})$
p. 457, Para 2, line 8 (D. Watson)	...and E_o is...	...and $\mathcal{E}_o$ is ...
p. 471, Ex. 12.3, lines 9, 11, 13 (J.Beavers)	cm^3.	cm^{-3}.
p. 477, Ex. 12.4, line 1 (J.Beavers)	eV = 1.42 eV	$E_g = 1.42$ eV
p. 479, Fig. 12.47 (D. Watson)	point O missing	locate O at origin of *abc*

(cont.)

Minor Typos

Location (Discoverer)	**As Is**	**Change to**
Chapter 14		
p. 624, Prob. 1, line 1 (DSM)	...Corning 7044 borosilicate window	...Corning 7740 borosilicate window
p. 624, Prob. 3, line 3 (DSM)	$T(\lambda) = \dots$	$\tau(\lambda) = T(\lambda) = \dots$
p. 624, Prob. 9, line 2 (DSM)	...from the photodiode?	from the photocathode?
Chapter 15		
p. 639, Para 2, line 5 (D. Watson)	...$= kT \ln\left(\frac{n_n p_n}{{n_i}^2}\right)$	...$= kT \ln\left(\frac{n_n p_p}{{n_i}^2}\right)$
p. 641, third from last line, (J. Beavers)	...n_{po} is the minority hole concentration...	...n_{po} is the minority electron concentration...
p. 644, Ex. 15.2, line 3 (DSM)	mobilities are and...	mobilities are...
p. 645, Fig. 15.11, line 1 (S. Sharma)	...material regiobs...	...material regions...
p. 672, Fig. 15.38, line 2 (DSM)	...yields n =...	...yields $\breve{n}$ =...
p. 672, para 3, line 1 (DSM)	...of n,...	...of $\breve{n}$,...
p. 683, para 5, 2nd to last line (S. Sharma)	...knowledge of $\mu_e \tau_h$ so...	...knowledge of $\mu_e \tau_e^*$ so...
p. 701, problem 13, line 1 (DSM)	...values of 50, 25, 0.5, 2.5, 0.5 and 0.05.	...values of 50, 25, 5.0, 2.5, 0.5 and 0.05.
Chapter 16		
p. 726, Ex. 16.1, line 2 (DSM)	...14 to 15 microns...	...16 to 15 microns...
p. 737, Ex. 16.2, line 6 (J. Beavers)	$= \frac{(3.9)(8.854\times10^{-14}\text{ F cm}^{-1}}{2\times10^{-5}\text{ cm}} =$	$= \frac{(3.9)(8.854\times10^{-14}\text{ F cm}^{-1})}{2\times10^{-5}\text{ cm}} =$
p. 737, Ex. 16.2, line 8 (DSM)	$Q_{max} = -C_o\,(V_G - V_T)$	$Q_{max}A = -C_o\,(V_G - V_T)\,A$
p. 737, Ex. 16.2, line 8 (DSM)	$= 6.9 \times 10^{-13}$ C	$= -6.9 \times 10^{-13}$ C
p. 798, Prob. 10, line 3, (DSM)	electron mobility = 80 cm^2 V^{-1} s^{-1},	hole mobility = 80 cm^2 V^{-1} s^{-1},
p. 804, Ref. Hofker (1966), line 2, (DSM)	J.E.J. O-SC BERSKI,	J.E.J. OBERSKI,
p. 805, Ref. C.K. Kim (2009), line 3, (DSM)	2009	1979
p. 809, Ref. Redus, R., (1997), line 1 (DSM)	V. JSC ORDANOV	V. JORDANOV
Chapter 17		
p. 832, Eq.17.31 (DSM)	...$I_o \exp[-x\sigma_a N_a] = I_0 \exp[-x\Sigma_a]$.	...$I_0 \exp[-x\sigma_a N_a] = I_0 \exp[-x\Sigma_a]$.
p. 856, Fig. 30 (right), in key (DSM)	^{6}LiF	^{6}Li

(cont.)

Minor Typos

Location (Discoverer)	**As Is**	**Change to**
Chapter 19		
p. 957, para 1, line 16 (DSM)	...glow curvs...	...glow curve...
p. 963, para 4, line 6 (DSM)	...generally dosimetry...	...general dosimetry...
p. 965, para 5, line 9 (DSM)	...glow curve ..	...glow curves...
p. 965, para 5, line 10 (DSM)	...ions is significantly different because a glow...	...ions are significantly different because a larger glow...
p. 971, para 1, line 1 (DSM)	...$\times 10^5$ R.	...10^6 R.
p. 972, para 7, line 4 (DSM)	...265° that...	...265°C that...
p. 989, footnote 17, line 3 (DSM)	...and the process...	...and the latter process...
p. 1002, para 3, line 2 (DSM)	...particles a shown...	...particles as shown...
p. 1010, para 1, line 1 (DSM)	...so that temperature...	...so that the temperature...
p. 1010, para 2, line 15 (DSM)	...of a radiation interactions...	...of a radiation interaction...
p. 1010, Fig. 19.54, caption (DSM)	...has a absorber...	...has an absorber...
p. 1025, para 3, line 4 (DSM)	...centimete...	...centimeter...
Chapter 20		
p. 1043, line 4 (DSM)	...energy lost from the...	...energy absorbed in the...
p. 1054, para 3, line 3 (DSM)	[Price 2020]	[Press et al. 1992]
p. 1056, para 4, line 4 (DSM)	[Price et al. 1992]	[Press et al. 1992]
p. 1060, para 2, line 2 (DSM)	...rounded to 520 keV...	...rounded to 352 keV...
p. 1073, Fig. 20.17, abscissa (DSM)	Gamma-Ray Energy	Gamma-Ray Energy (keV)
p. 1076, Ex. 20.5, line 6 (DSM)	$= B_L - (n - n_R)\frac{B_L - B_L}{n_R - n_L} =$	$= B_L - (n - n_R)\frac{B_L - B_R}{n_R - n_L} =$
p. 1092, Eq. 20.149 (DSM)	$C_2 - C_1 = [k_1\sigma(C_2) + k_2\sigma(C_1)]$	$C_2 - C_1 = [k_1\sigma(C_1) + k_2\sigma(C_2)]$
Chapter 22		
p. 1212, para 1, line 4 (DSM)	...detector. while...	...detector, while...
p. 1234, punctuation after eq. 22.226 (DSM)	$P_{max} = \frac{V_{max}^2}{2Z_0}.$	$P_{max} = \frac{V_{max}^2}{2Z_0},$
p. 1242, Sec A.2, line 7 (JKS)	...is given...	...are given...

(cont.)

Problem Adjustments

To improve the learning experience, these problems are modified to the following:

Problem 10.2 A coaxial detector is backfilled with P-10 gas to 0.5 atm. The detector has an anode wire with a radius of 25 microns and cathode radius of 1.5 cm. Determine r_c for an applied voltage of 1500 volts. If the pressure is increased to 2 atm, what is r_c?

Problem 13.7 Suppose you have a NaI:Tl detector with 7% FWHM energy resolution when operated with a 1 μs shaping time at 300 K. What is the expected energy resolution if the temperature is increased to 325 K? Increased to 350 K? Decreased to 250 K?

Problem 14.5 Determine the thermionic emission current density for a S-11 response PMT at a temperature of 32°C and compare it to that of a S-24 response PMT. Assume that $A(1-\alpha_r) \simeq 120$ A cm^{-2} K^{-2}.

Problem 15.7 You have a Si $p\nu n$ junction device that is 150 microns wide with $\nu = 10^{13}$ cm^{-3}. Determine the punch through voltage. Determine the breakdown voltage and the punch through breakdown voltage.

Problem 15.9 Given a 1.2-micron sample of CdS with a shallow trap density of 10^{15} cm^{-3}, what is the expected value of V_{TFL}? For CdS, the literature value of $\kappa = \epsilon_s/\epsilon_0 = 8.9$.

Problem 21.5 Potassium and sodium are both Group I elements and thus have similar chemical properties. As a consequence, K is a natural impurity found in NaI:Tl crystals. Estimate the concentration of K in ppm (by mass) to produce two cps in a 4 in × 5 in (10.16 cm × 12.7 cm) NaI:Tl detector.

Problem 21.5 Consider a two-storied house 20×20 m in size with walls 8 m high and a basement 3 m deep. The basement floor and walls are of concrete 30-cm thick, and the outside walls are brick 10-cm thick. Plaster 1-cm-thick lines along all walls and the ceilings. Estimate the activity in Bq of ^{40}K, ^{226}Ra, and ^{232}Th in the structural material of the house.

Corrected Figures

The following figures are described in the erratum above, but for clarity they are reproduced here.

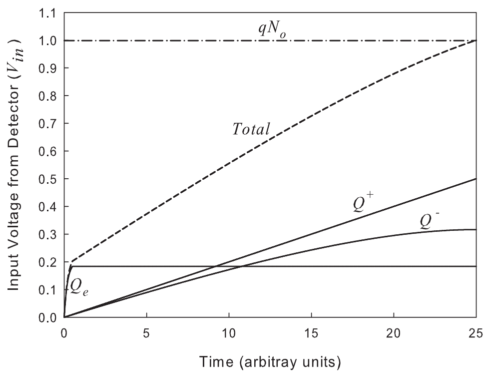
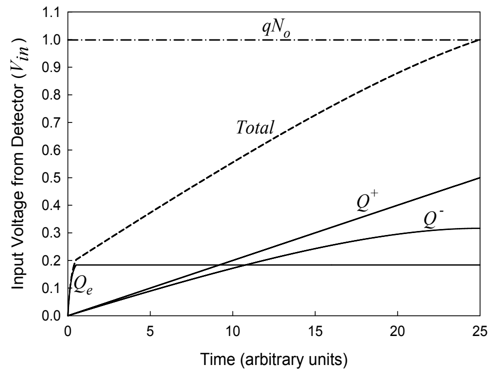


Figure 9.20



corrected Figure 9.20

Found by DSM.

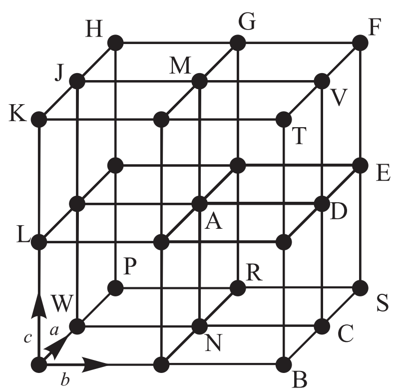
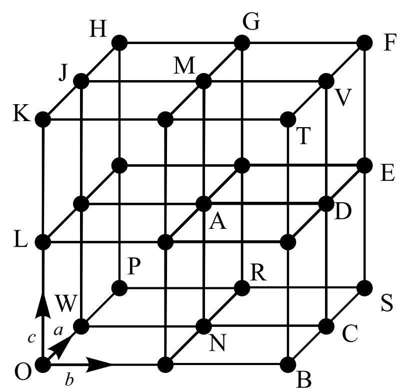


Figure 12.47



corrected Figure 12.47

Found by D. Watson.

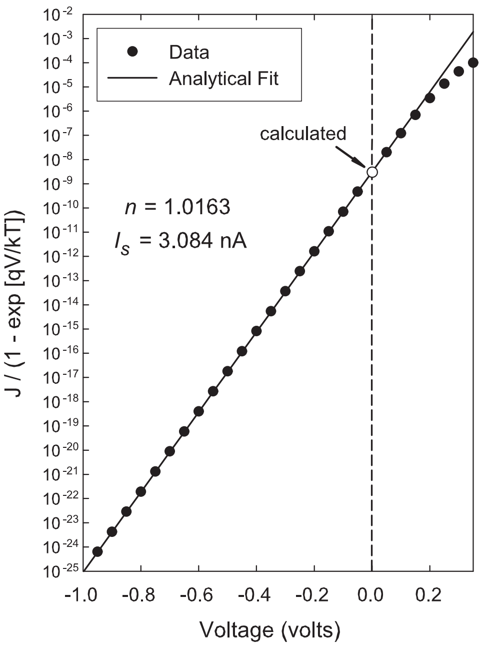
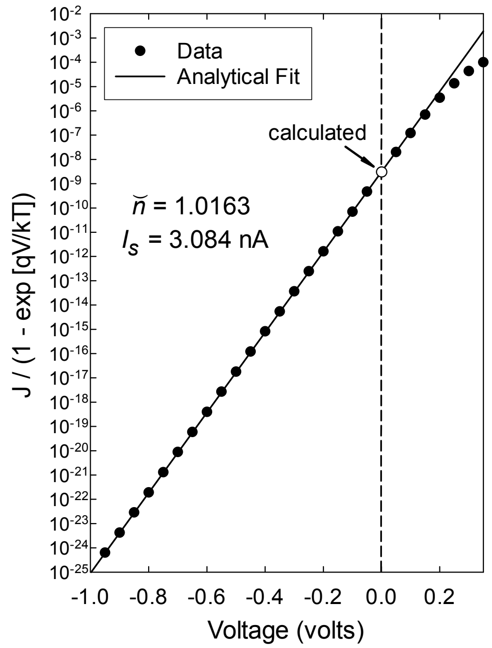


Figure 15.38



corrected Figure 15.38

Found by DSM.

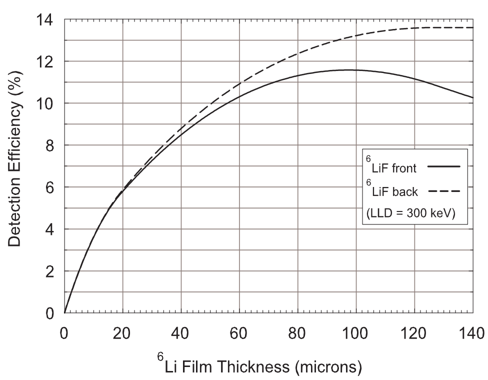
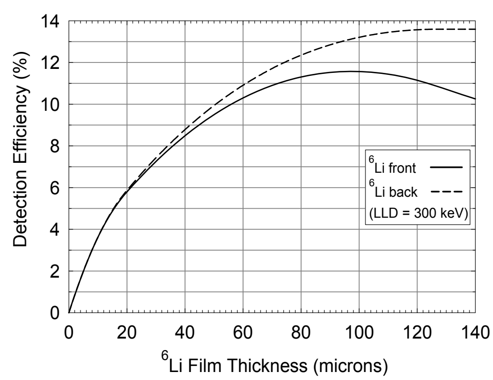
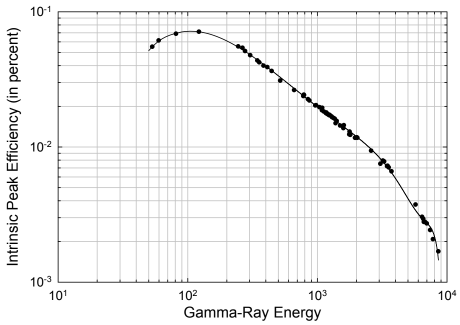


Figure 17.30 (right)



corrected Figure 17.30 (right)

Found by DSM.



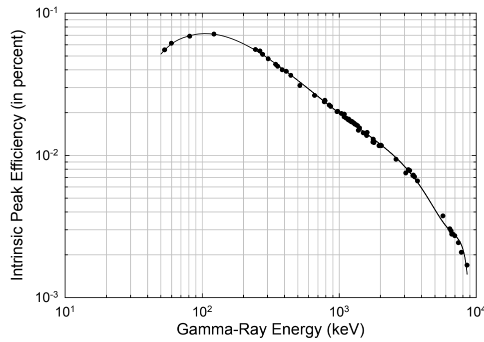


Figure 20.17 **corrected Figure 20.17**

Found by DSM.