Typos, Errata and Additions
Essential Graduate Electrodynamics
Lecture Notes
Bernd Berg, Fall 2016

p.11: After equation (1.38):

By reasons that will become clear in the later physical interpretation the variable ζ is called *rapidity*. For each value of d there is precisely one value of ζ and vice versa, because the hyperbolic sine performs a one to one mapping. Such a function is called *isomorphic* in calculus.

...

Using finally $\begin{pmatrix} x^0 \\ x^1 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ yields

$$\begin{aligned} 0 &= [\cosh(\zeta) - \sinh(\eta)]^2 - [-\sinh(\zeta) + \cosh(\eta)]^2 \\ &= -2\, \cosh(\zeta)\, \sinh(\eta) + 2\, \sinh(\zeta)\, \cosh(\eta) \\ &= -2\, \tanh(\eta) + 2\, \tanh(\zeta) \;\Rightarrow\; \zeta = \eta \,. \end{aligned} \tag{1.41}$$

p.28:

Consequently, we have

$$\lambda' = \lambda \sqrt{\frac{1+\beta}{1-\beta}} = \lambda \sqrt{\frac{\cosh\zeta + \sinh\zeta}{\cosh\zeta - \sinh\zeta}} = \lambda\, \exp(\zeta)\,. \tag{1.130}$$

p.70:

$$Y_l^{\;-l} \;=\; \sqrt{\frac{(2l+1)\,(2l)!}{4\pi}}\, \frac{\sin^l\theta}{2^l\, l!}\, e^{-il\phi}\,. \tag{2.154}$$

p.77:

The traceless *quadrupole* tensor is defined by

$$Q^{ij} = Q_S^{ij} - Q_D^{ij} \text{ with } Q_S^{ij} = 3\int x'^i x'^j \rho(\vec{x}\,')\, d^3x' \,,\ Q_D^{ij} = \int r'^2\, \delta^{ij}\, \rho(\vec{x}\,')\, d^3x' \tag{3.10}$$

so that $\sum_{i=1}^3 Q_S^{ii} = \sum_{i=1}^3 Q_D^{ii}$ holds.

p.80:

$$\Phi(\vec{x}\,) = \frac{\rho(\vec{x}\,')}{|\vec{x} - \vec{x}\,'|} + \frac{\vec{p}(\vec{x}\,')\cdot(\vec{x} - \vec{x}\,')}{|\vec{x} - \vec{x}\,'|^3} \,. \tag{3.22}$$

p.242:

The equation

$$\begin{aligned} 0 &= L_-\, Y_l^{\;-l} \;=\; L_-\, P_l^{\;-l}\, e^{-i\,l\,\phi} \\ &= e^{-i\,\phi}\left(-\frac{\partial}{\partial\theta} + i\,\cot\theta\,\frac{\partial}{\partial\phi}\right) P_l^{\;-l}\, e^{-i\,l\,\phi} \;, \end{aligned}$$

implies

p.256:

(3) Show that

$$\begin{aligned} \epsilon_{\alpha\beta_1\gamma_1\delta_1}\epsilon^{\alpha\beta_2\gamma_2\delta_2} \;=\; & -\delta_{\beta_1}^{\;\beta_2}\delta_{\gamma_1}^{\;\gamma_2}\delta_{\delta_1}^{\;\delta_2} - \delta_{\beta_1}^{\;\gamma_2}\delta_{\gamma_1}^{\;\delta_2}\delta_{\delta_1}^{\;\beta_2} - \delta_{\beta_1}^{\;\delta_2}\delta_{\gamma_1}^{\;\beta_2}\delta_{\delta_1}^{\;\gamma_2} \\ & + \delta_{\beta_1}^{\;\beta_2}\delta_{\gamma_1}^{\;\delta_2}\delta_{\delta_1}^{\;\gamma_2} + \delta_{\beta_1}^{\;\delta_2}\delta_{\gamma_1}^{\;\gamma_2}\delta_{\delta_1}^{\;\beta_2} + \delta_{\beta_1}^{\;\gamma_2}\delta_{\gamma_1}^{\;\beta_2}\delta_{\delta_1}^{\;\delta_2} \,. \end{aligned}$$