Colliding Plane Waves in General Relativity

by **J. B. Griffiths**
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Errata

Please correct the following equations and references to the forms given below:

Page 18: Line 6 of §4.2 $\ldots \Psi_4$ and $\Phi_{22} \ldots$

Page 37:

$$\xi^i{}_{,u} = -(\mu^\circ - iG^\circ)\xi^i - \bar{\lambda}^\circ \bar{\xi}^i \tag{6.15c}$$

Page 51, line 8: Papacostas and Xanthopoulos (1989).

Page 75, line 3 from bottom: $a = 0$.

Page 82:

$$f = \tfrac{1}{2} - u^2\Theta(u), \qquad g = \tfrac{1}{2} - v^2\Theta(v). \tag{10.46}$$

Page 86:

$$\begin{aligned} S = \text{const} + \tfrac{1}{4}a^2\log(t^2 - z^2) - \tfrac{1}{4}a^2\log(1-t^2) - \tfrac{1}{4}a^2(1-z^2) \\ - \tfrac{1}{4}a^2(1-z^2)\log\left(\frac{1+t}{1-t}\right)\left(\tfrac{1}{4}(1-t^2)\log\left(\frac{1+t}{1-t}\right) + t\right). \end{aligned} \tag{10.58}$$

Page 87:

$$\dot{S} = -\tfrac{1}{2}\tilde{t}\left(\dot{V}^2 + V'^2\right), \qquad S' = -\tilde{t}\,\dot{V}V' \tag{10.63}$$

Page 88:

$$a + \sum d_i = \pm 1. \tag{10.66}$$

Page 91:

$$\begin{aligned} V_A &= \sum_{n=0}^{\infty} 2^n (fg)^{n/2}\left(a_n i^n P_n\left(\frac{i(g-f)}{2\sqrt{fg}}\right) + b_n(-i)^{n+1}Q_n\left(\frac{i(g-f)}{2\sqrt{fg}}\right)\right) \\ V_B &= \sum_{n=0}^{\infty} 2^n(-fg)^{n/2}\left(a_n P_n\left(\frac{(f-g)}{2\sqrt{-fg}}\right) + b_n Q_n\left(\frac{(f-g)}{2\sqrt{-fg}}\right)\right). \end{aligned} \tag{10.76}$$

Page 96:

$$\Psi_2^\circ = \frac{\bar{Z}_u Z_v}{(Z+\bar{Z})^2} - \frac{U_u U_v}{4} \tag{11.10}$$

Page 97:

$$\Psi_2^\circ = \frac{\bar{E}_u E_v}{(1 - E\bar{E})} - \frac{U_u U_v}{4} \tag{11.15}$$

Page 99:

$$\begin{aligned}\lim_{\substack{v\to 0\\u\to 0}}\left[\frac{2}{n_2(n_2-1)v^{n_2-2}}\frac{Z_v\bar{Z}_v}{(Z+\bar{Z})^2}\right]&=c_2^{n_2}\\\lim_{\substack{u\to 0\\v\to 0}}\left[\frac{2}{n_1(n_1-1)u^{n_1-2}}\frac{Z_u\bar{Z}_u}{(Z+\bar{Z})^2}\right]&=c_1^{n_1}.\end{aligned}\tag{11.22}$$

and

$$\begin{aligned}\lim_{\substack{v\to 0\\u\to 0}}\left[\frac{2}{n_2(n_2-1)v^{n_2-2}}\frac{E_v\bar{E}_v}{(1-E\bar{E})^2}\right]&=c_2^{n_2}\\\lim_{\substack{u\to 0\\v\to 0}}\left[\frac{2}{n_1(n_1-1)u^{n_1-2}}\frac{E_u\bar{E}_u}{(1-E\bar{E})^2}\right]&=c_1^{n_1}\end{aligned}\tag{11.24}$$

Page 138. After (15.8) insert "where $2ab=1/q^2$,"

Page 147:

$$(Z_\mathrm{o}+\bar{Z}_\mathrm{o})H_{uv}+Z_{\mathrm{o}v}H_u+\bar{Z}_{\mathrm{o}u}H_v=0.\tag{16.10}$$

Page 184:

$$T_{\mu\nu}=\frac{1}{8\pi}\left(\phi_{,\mu}\bar{\phi}_{,\nu}+\phi_{,\nu}\bar{\phi}_{,\mu}-g_{\mu\nu}\phi_{,\alpha}\bar{\phi}^{,\alpha}\right).\tag{20.2}$$

Page 187

$$\Phi_{00}=2\pi(\rho+p)b^2,\qquad \Phi_{22}=2\pi(\rho+p)a^2.\tag{20.10}$$

Page 193:

$$f=\tfrac{1}{2}-(2u-u^2)\Theta(u),\qquad g=\tfrac{1}{2}-v^2\Theta(v).\tag{20.20}$$

Page 195:

$$\Phi_{02}=-8\pi i\left[\psi\delta\bar{\phi}-\bar{\phi}\delta\psi+\sigma\phi\bar{\phi}+(\bar{\alpha}+\beta)\psi\bar{\phi}+\bar{\lambda}\psi\bar{\psi}\right]\tag{20.26c}$$

Page 198:

$$\begin{aligned}\phi&=\frac{1}{4\sqrt{\pi}}\sqrt{\frac{f'}{(f+g)}}\exp[\tfrac{1}{4}i\log(f+g)-\tfrac{1}{2}i\log f']\\\psi&=\frac{1}{4\sqrt{\pi}}\sqrt{\frac{g'}{(f+g)}}\exp[\tfrac{1}{4}i\log(f+g)-\tfrac{1}{2}i\log g'].\end{aligned}\tag{20.34}$$

Page 221: Griffiths, J. B. (1987). *Class. Quantum Grav.*, **4**, 957–66.