

Schutz 8.10

From eq. 8.32 we have

$$G_{\alpha\beta} = -\frac{1}{2} \left[\bar{h}_{\alpha\beta,\mu}{}^{,\mu} + \eta_{\alpha\beta} \bar{h}{}^{,\mu\nu}{}_{,\mu\nu} - \bar{h}_{\alpha\mu,\nu}{}^{,\nu} - \bar{h}_{\beta\mu,\alpha}{}^{,\mu} + O(h_{\alpha\beta}^2) \right]$$

$$\text{where } \bar{h}^{\alpha\beta} \equiv h^{\alpha\beta} - \frac{1}{2} \eta^{\alpha\beta} h.$$

Apply Lorenz Gauge condition

$$\bar{h}{}^{,\mu\nu}{}_{,\nu} = 0$$

$$G_{\alpha\beta} = -\frac{1}{2} \left[\bar{h}_{\alpha\beta,\mu}{}^{,\mu} + O(h_{\alpha\beta}^2) \right]$$

$$\approx \left[-\frac{1}{2} \square \bar{h}_{\alpha\beta} \right]$$

~~Davidson Chen~~

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