LISA

GasinAn

2022 年 1 月 15 日

1 Monochromatic Sources

$$\Gamma_{ij}=\frac{3}{4}S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}\left[\partial_i A_\alpha(t)\partial_j A_\alpha(t)+A_\alpha^2(t)\partial_i\chi_\alpha(t)\partial_j\chi_\alpha(t)\right]\,\mathrm{d}t.$$

$$A_\alpha(t)=\left[A_+^2F_{+,\alpha}^2(t)+A_\times^2F_{\times,\alpha}^2(t)\right]^{1/2}.$$

$$\chi_\alpha(t)=2\pi f_0 t+\varphi_0+\varphi_{\mathrm{p},\alpha}(t)+\varphi_{\mathrm{D}}(t).$$

$$\varphi_{\mathrm{p},\alpha}(t)=\arctan\left(-\frac{A_\times F_{\times,\alpha}(t)}{A_+F_{+,\alpha}(t)}\right).$$

$$\varphi_{\mathrm{D}}(t)=2\pi f_0 c^{-1}R\sin\bar\theta_{\mathrm{S}}\cos\left[\bar\phi(t)-\bar\phi_{\mathrm{S}}\right].$$

$$A_+=2e^{\ln\mathcal{A}}\left\{1+\left[\cos\bar\theta_L\cos\bar\theta_{\mathrm{S}}+\sin\bar\theta_L\sin\bar\theta_{\mathrm{S}}\cos(\bar\phi_L-\bar\phi_{\mathrm{S}})\right]^2\right\}.$$

$$A_\times=-4e^{\ln\mathcal{A}}\left[\cos\bar\theta_L\cos\bar\theta_{\mathrm{S}}+\sin\bar\theta_L\sin\bar\theta_{\mathrm{S}}\cos(\bar\phi_L-\bar\phi_{\mathrm{S}})\right].$$

$$F_{+,\mathrm{I}}(\theta_{\mathrm{S}},\phi_{\mathrm{S}},\psi_{\mathrm{S}})=\frac{1}{2}(1+\cos^2\theta_{\mathrm{S}})\cos2\phi_{\mathrm{S}}\cos2\psi_{\mathrm{S}}-\cos\theta_{\mathrm{S}}\sin2\phi_{\mathrm{S}}\sin2\psi_{\mathrm{S}}.$$

$$F_{\times,\mathrm{I}}(\theta_{\mathrm{S}},\phi_{\mathrm{S}},\psi_{\mathrm{S}})=\frac{1}{2}(1+\cos^2\theta_{\mathrm{S}})\cos2\phi_{\mathrm{S}}\sin2\psi_{\mathrm{S}}-\cos\theta_{\mathrm{S}}\sin2\phi_{\mathrm{S}}\cos2\psi_{\mathrm{S}}.$$

$$F_{+,\mathrm{II}}(\theta_{\mathrm{S}},\phi_{\mathrm{S}},\psi_{\mathrm{S}})=\frac{1}{2}(1+\cos^2\theta_{\mathrm{S}})\sin2\phi_{\mathrm{S}}\cos2\psi_{\mathrm{S}}+\cos\theta_{\mathrm{S}}\cos2\phi_{\mathrm{S}}\sin2\psi_{\mathrm{S}}.$$

$$F_{\times,\mathrm{II}}(\theta_{\mathrm{S}},\phi_{\mathrm{S}},\psi_{\mathrm{S}})=\frac{1}{2}(1+\cos^2\theta_{\mathrm{S}})\sin2\phi_{\mathrm{S}}\sin2\psi_{\mathrm{S}}+\cos\theta_{\mathrm{S}}\cos2\phi_{\mathrm{S}}\cos2\psi_{\mathrm{S}}.$$

$$\cos\theta_{\mathrm{S}}=\frac{1}{2}\cos\bar\theta_{\mathrm{S}}-\frac{\sqrt{3}}{2}\sin\bar\theta_{\mathrm{S}}\cos\left[\bar\phi(t)-\bar\phi_{\mathrm{S}}\right].$$

$$\phi_{\mathrm{S}}=2\pi t/T+\alpha_0+\arctan\left\{\frac{\sqrt{3}\cos\bar\theta_{\mathrm{S}}+\sin\bar\theta_{\mathrm{S}}\cos\left[\bar\phi(t)-\bar\phi_{\mathrm{S}}\right]}{2\sin\bar\theta_{\mathrm{S}}\sin\left[\bar\phi(t)-\bar\phi_{\mathrm{S}}\right]}\right\}.$$

$$\psi_{\mathrm{S}}=\arctan\left\{\frac{\frac{1}{2}\cos\bar\theta_L-\frac{\sqrt{3}}{2}\sin\bar\theta_L\cos\left[\bar\phi(t)-\bar\phi_L\right]-\left[\cos\bar\theta_L\cos\bar\theta_{\mathrm{S}}+\sin\bar\theta_L\sin\bar\theta_{\mathrm{S}}\cos(\bar\phi_L-\bar\phi_{\mathrm{S}})\right]\cos\theta_{\mathrm{S}}}{\frac{1}{2}\sin\bar\theta_L\sin\bar\theta_{\mathrm{S}}\sin(\bar\phi_L-\bar\phi_{\mathrm{S}})-\frac{\sqrt{3}}{2}(\cos\bar\theta_L\sin\bar\theta_{\mathrm{S}}\sin\bar\phi_{\mathrm{S}}-\cos\bar\theta_{\mathrm{S}}\sin\bar\theta_L\sin\bar\phi_L)\cos\bar\phi(t)-\frac{\sqrt{3}}{2}(\cos\bar\theta_{\mathrm{S}}\sin\bar\theta_L\cos\bar\phi_L-\cos\bar\theta_L\sin\bar\theta_{\mathrm{S}}\cos\bar\phi_L)\sin\bar\phi(t)}\right\}$$

$$\bar\phi(t)=\bar\phi_0+2\pi t/T.$$

$$\alpha_0=0,\quad\bar\phi_0=0.$$

$$\Gamma_{1j}=\frac{3}{4}S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}A_\alpha(t)\partial_j A_\alpha(t)\,\mathrm{d}t.$$

$$\Gamma_{2j}=\frac{3}{4}S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}A_\alpha^2(t)\partial_j\chi_\alpha(t)\,\mathrm{d}t.$$

$$\Gamma_{3j}=\frac{3}{4}S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}A_\alpha^2(t)2\pi t\partial_j\chi_\alpha(t)\,\mathrm{d}t.$$

$$\ln\mathcal{A}:=0,\quad\bar\phi_0:=0.$$

$$\frac{\Gamma_{ij}}{\Gamma_{ij,\ln\mathcal{A}=0}}=\frac{(S/N)}{(S/N)_{\ln\mathcal{A}=0}}=\frac{10}{(S/N)_{\ln\mathcal{A}=0}}.$$

$$(S/N)^2=2S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}\left[\int_{-\infty}^{\infty}e^{2\pi ift_1}h_\alpha(t)\,\mathrm{d}t_1\right]\left[\int_{-\infty}^{\infty}e^{-2\pi ift_2}h_\alpha(t)\,\mathrm{d}t_2\right]\,\mathrm{d}f.$$

$$(S/N)^2=2S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}\tilde h_\alpha(f)\tilde h_\alpha^*(f)\,\mathrm{d}f.$$

$$(S/N)^2=2S_n(f_0)^{-1}\sum_{\alpha=\mathrm{I,II}}\int_{-\infty}^{\infty}h_\alpha^2(t)\,\mathrm{d}t.$$