numerator, and retain only the terms that depend on A_+ and $A_\times$, we can define a 'PowerFlux maximum likelihood statistic', $\mathcal{G}$, by

$$\mathcal{G} = \sum_\alpha \frac{\left[\left(A_+^2 F_{+\alpha}^2 + A_\times^2 F_{\times\alpha}^2\right) T_{\rm SFT} P_\alpha - 0.25\left(A_+^2 F_{+\alpha}^2 + A_\times^2 F_{\times\alpha}^2\right)^2 T_{\rm SFT}^2\right]}{S_\alpha^2}, \qquad (25)$$

where it is understood that A_+^2 and $A_\times^2$ are chosen to minimize g. For example, we can substitute equation (6) for A_+^2 and set $A_\times^2 = 0$, which gives

$$\mathcal{G} = 4T_{\rm SFT}^2 \left(\sum_\alpha \frac{F_{+\alpha}^2}{S_\alpha^2} \frac{|\tilde{x}_\alpha|^2}{T_{\rm SFT}^2}\right)^2 \Bigg/ \sum_\alpha \frac{F_{+\alpha}^4}{S_\alpha^2}. \qquad (26)$$

Here, $\mathcal{G}$ represents our definition of the 'maximum likelihood statistic' for linear PowerFlux. It is similar to the standard linear PowerFlux statistic given in equation (6); note, however, that the sum in the numerator is squared. Similar expressions for the circular and generalized PowerFlux methods, and indeed any method that computes either A_+^2 or $A_\times^2$, can be found using equation (25).

For future work we plan to investigate whether using the PowerFlux maximum likelihood statistic, $\mathcal{G}$, gives a better detection efficiency than the sum of the squared amplitudes, $A_+^2 + A_\times^2$, used in this paper. It would also be interesting to further understand why circular PowerFlux is so efficient (and under precisely which conditions this is so), and study whether this method or another one is mathematically the optimal filter of SFT power in the Neyman–Pearson sense, i.e. that maximizes the detection efficiency for a fixed false alarm rate.

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