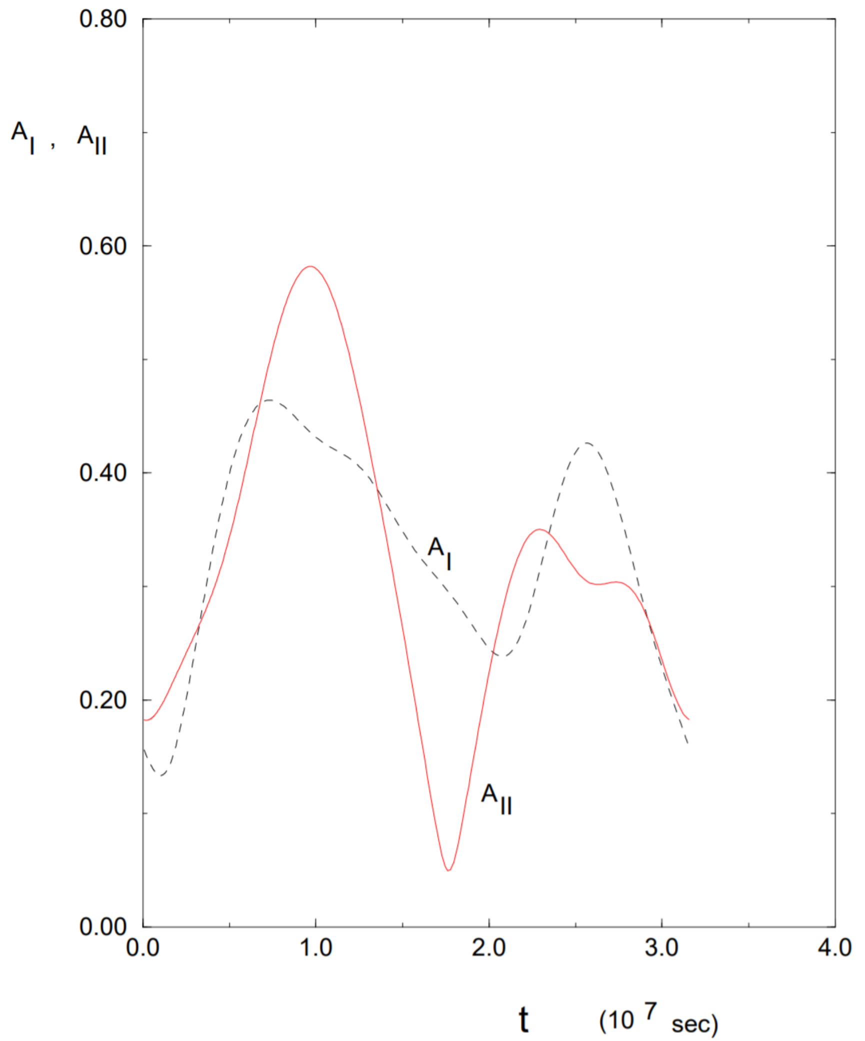
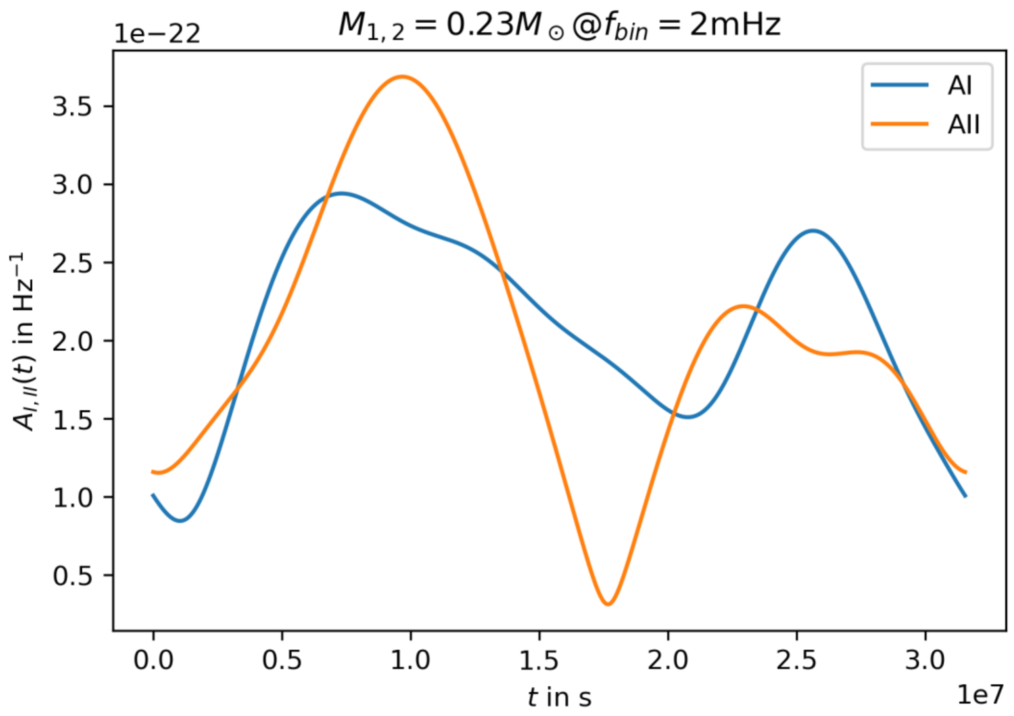


Cutler (1998) amplitude modulation for ecliptic coordinates of source: $\mu = \cos\theta = 0.3, \varphi = 5.0$ and angular momentum $\hat{\boldsymbol{L}}$ direction:
$\mu_L = \cos\theta_L = -0.2, \varphi_L = 4.0$



The implementation of Cutler works well!

From emission to detection

So far I‘ve implemented the strain as in Cutler:

$$h_{I,II}(t) = \frac{\sqrt{3}}{2} A_{I,II}(t) \cos\left[\Psi_{obs}(t) + \Phi^{(p)}_{I,II}(t) + \Phi_D(t)\right]$$

Quantity we want to measure for information on planetary orbital period and mass (lower bound)

Doppler phase induced by rotation around the sun

Different polarization basis especially for LISA setup (equilateral triangle)

Polarization phase induced by rotation of detector wrt. Source (spin 2 graviton)

Those terms are different for Ice Giant mission

Problem:

I‘ve also implemented:

From this we get via the one-sided spectral density noise $S_n(f_0)$ (stationary and gaussian noise) from [3] the *matched filtering approach*:

$$\left(\frac{S}{N}\right)^2 = \frac{2}{S_n(f_0)} \sum_{\alpha=I,II} \int_0^{T_0} dt\, h_\alpha(t) h_\alpha(t)$$

Gives different result than in reference yet [3]:

105.9 (Me) vs. 31.2 (LISA jupyter notebook)

-> Currently reading the respective Chapter in Maggiore

References

[1] Tamanini, N., Danielski, C. (2019). The gravitational-wave detection of exoplanets orbiting white dwarf binaries using LISA. *Nat Astron 3*, 858–866. https://doi.org/10.1038/s41550-019-0807-y

[2] Cutler, C. (1998). Angular resolution of the LISA gravitational wave detector. *Physical Review D, 57*, 7089-7102.

[3] Moore, C., Cole, R., Berry, C. (2015). Gravitational-wave sensitivity curves. *Class. Quantum Grav. 32, 015014*

[4] Maggiore, M. (2008). *Gravitational Waves Volume 1: Theory and Experiments*. Oxford University Press