PRINCESS:

Prediction of gravitational wave observations

- 09th May 2023 -

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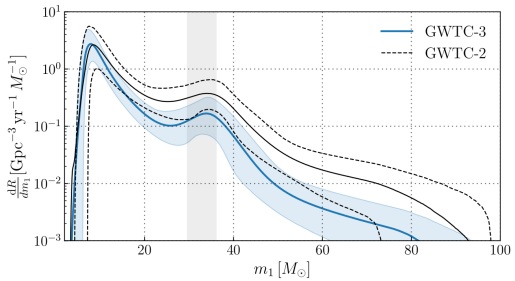
XIII ET Symposium - Cagliari

Princess: Observation of compact binary mergers

Detectors

Simulations

PRINCESS



$$\Omega_{gw}(f) = \frac{f}{\rho_c}\frac{d\rho_{GW}}{df}$$

Individual events

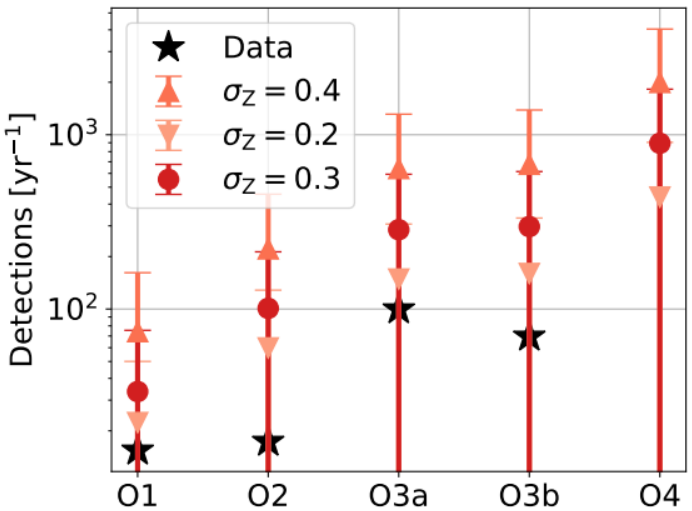
Astrophysical background

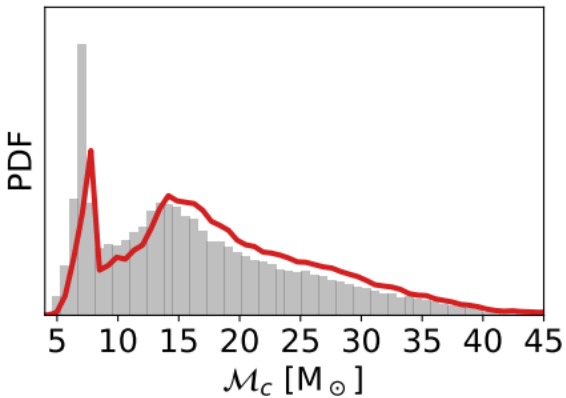
Individual events

```
In [ ]: ET = Detection.Detector(det_name = 'ET', origin = 'Princess', configuration = 'ET', psd_file = 'EinsteinTelescope')
        CE1 = Detection.Detector(det_name = 'CE1', origin = 'Pycbc', configuration = 'H', psd_file = 'CosmicExplorer')
        CE1 = Detection.Detector(det_name = 'CE2', origin = 'Pycbc', configuration = 'L', psd_file = 'CosmicExplorer')

In [ ]: ET2CE = Detection.Network(net_name='ET2CE', compo=[ET,CE1,CE2], pic_file='AuxiliaryFiles/PICs/ET2CE.txt',SNR_thrs=12)

In [ ]: Analysis.Full_Analysis(Model = ModelField, update_file = False)
```





	$\sigma_Z = 0.2$	$\sigma_Z = 0.3$	$\sigma_Z = 0.4$
ET	61570 (76.2%)	93545 (79.0%)	145867 (81.5%)
2CE	78598 (97.3%)	115714 (97.7%)	175428 (98.0%)
ET+2CE	80074 (99.1%)	117596 (99.3%)	177906(99.5%)
Total	80762	118429	178883

Background prediction

Périgois 2023 a, In prep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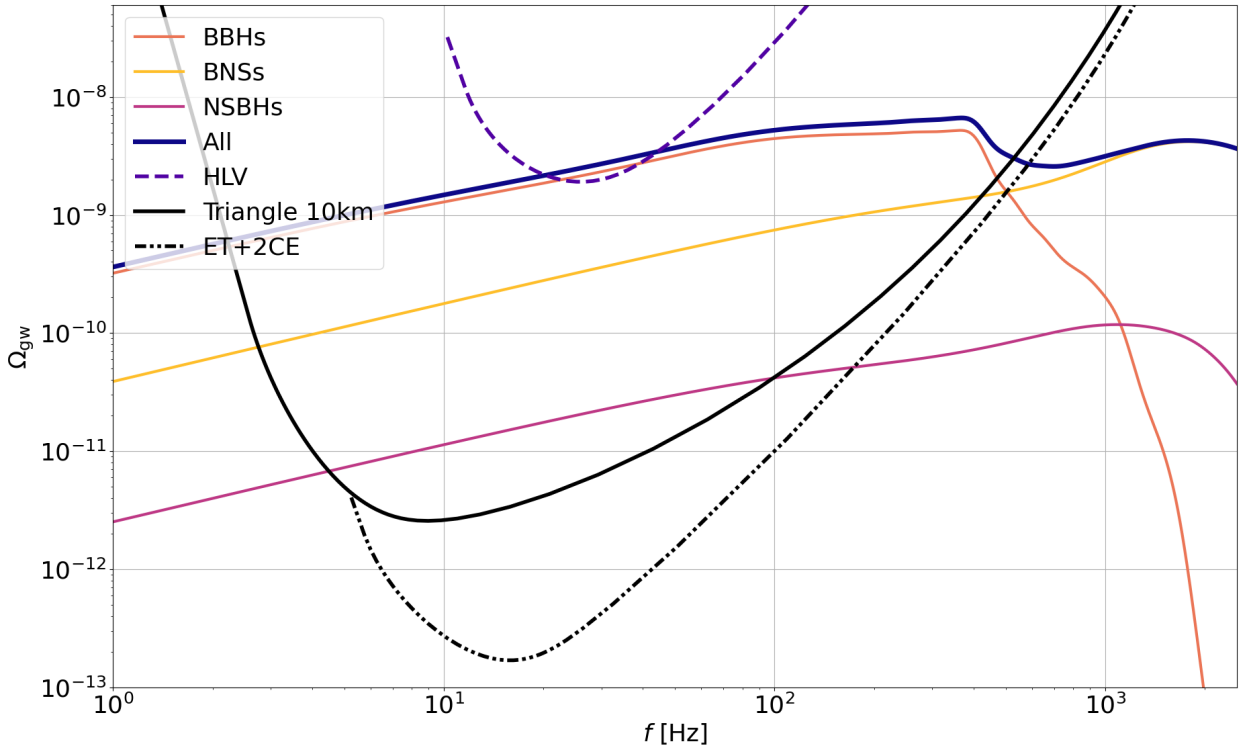
In [ ]: Background.Omega_pycbc(Model = astromodel1, Networks = [ET, ET2CE])
```

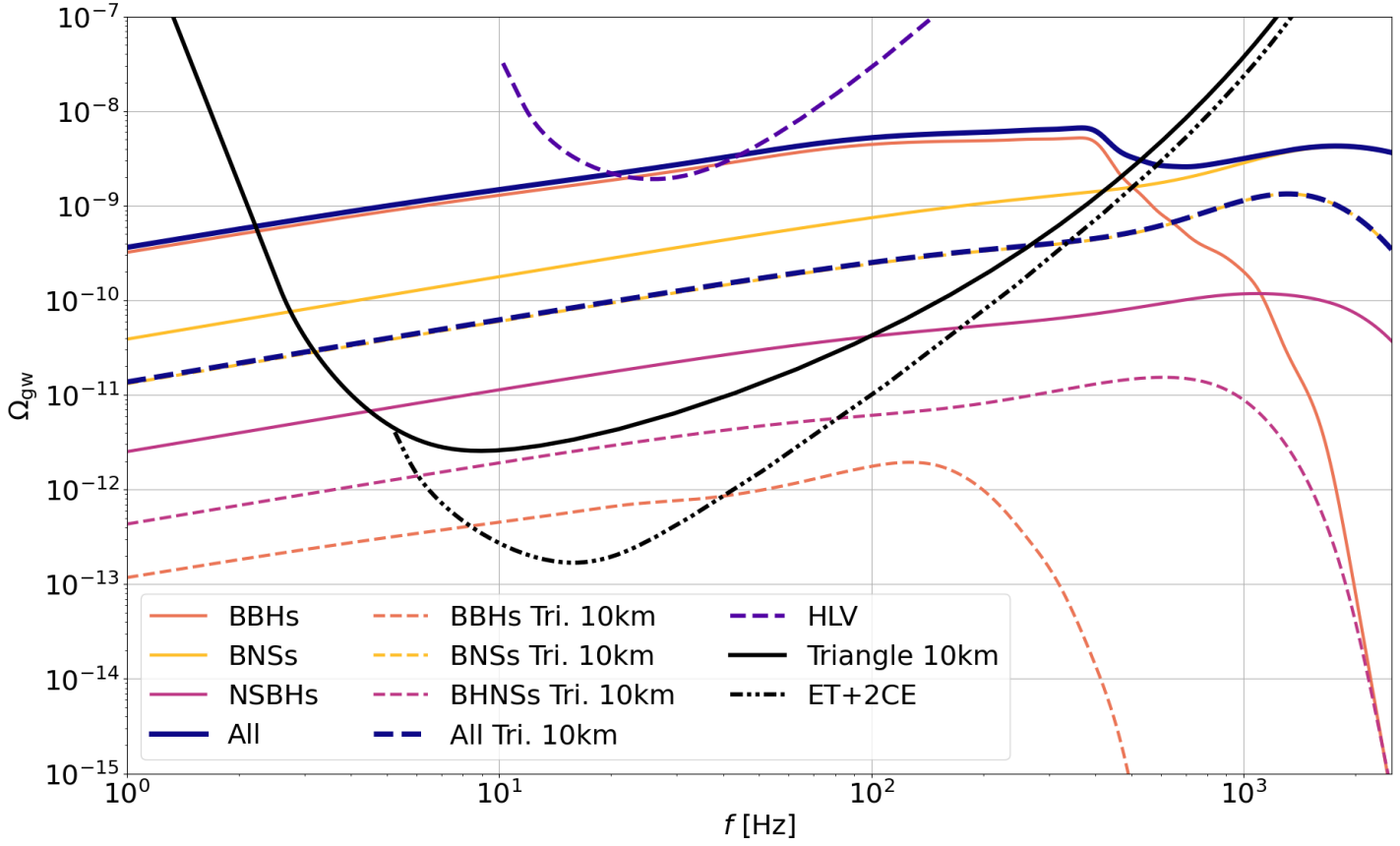


Residual background

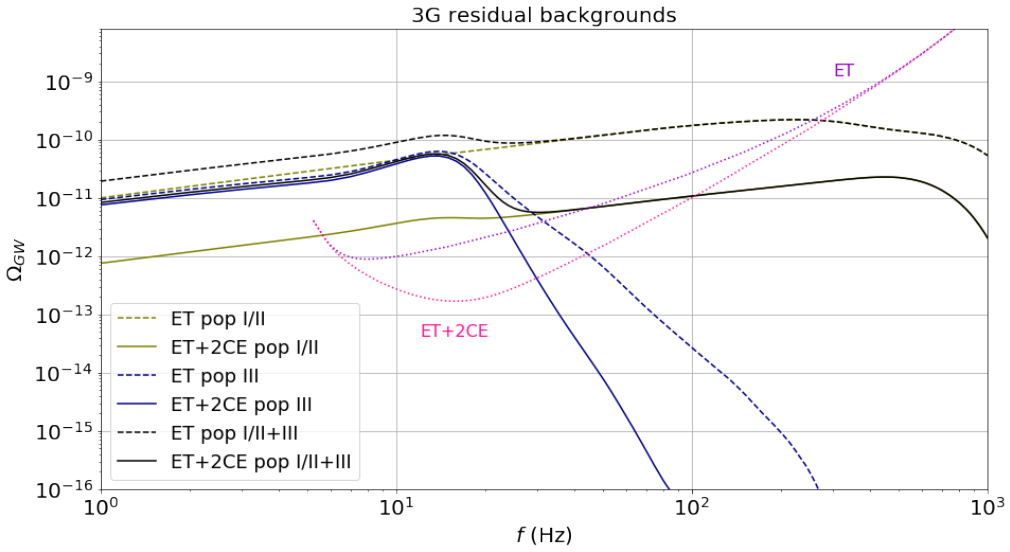
Subtraction of sources with SNR<12

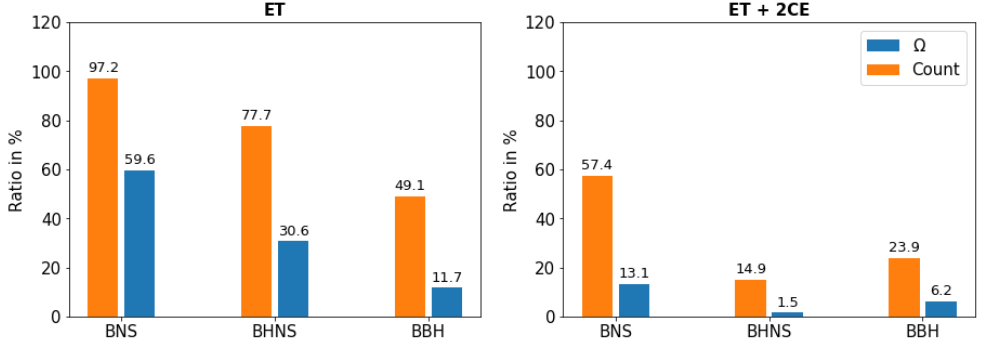
Background dominated by BNS

Background still visible with
ET : SNR ~ 10
ET+2CE : SNR ~ 100

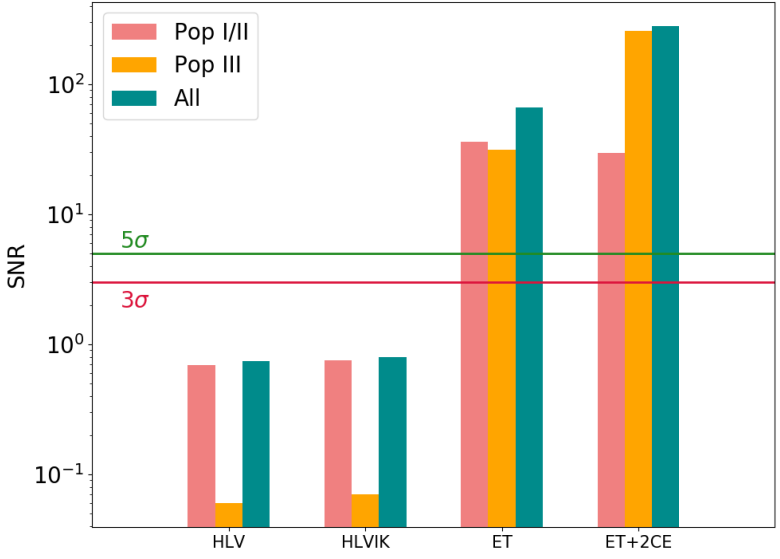


Residual background Pop. III



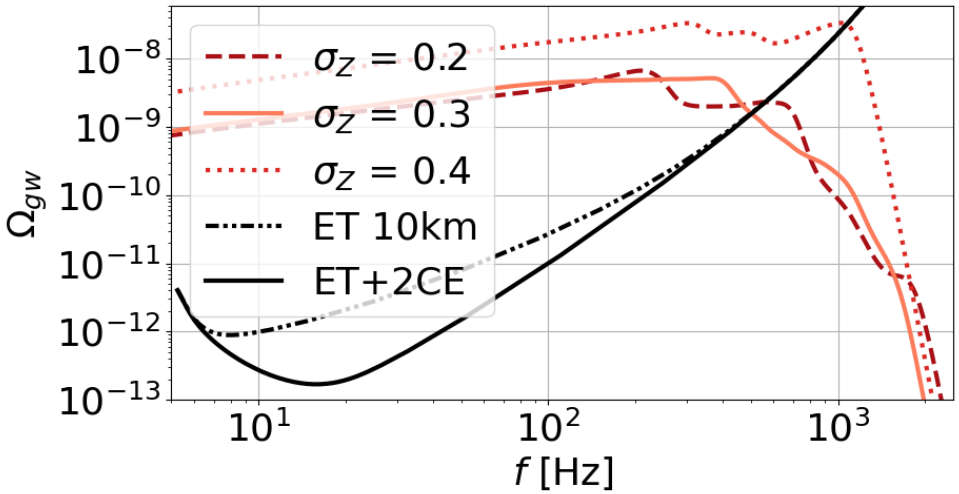


Périgois et al, Phys.Rev.D 103 (2021) 4, 043002 • e-Print: 2008.04890 [astro-ph.CO]
Martinovic, Perigois, et al. Astrophys.J. 940 (2022) 1, 29 • e-Print: 2109.09779 [astro-ph.SR]



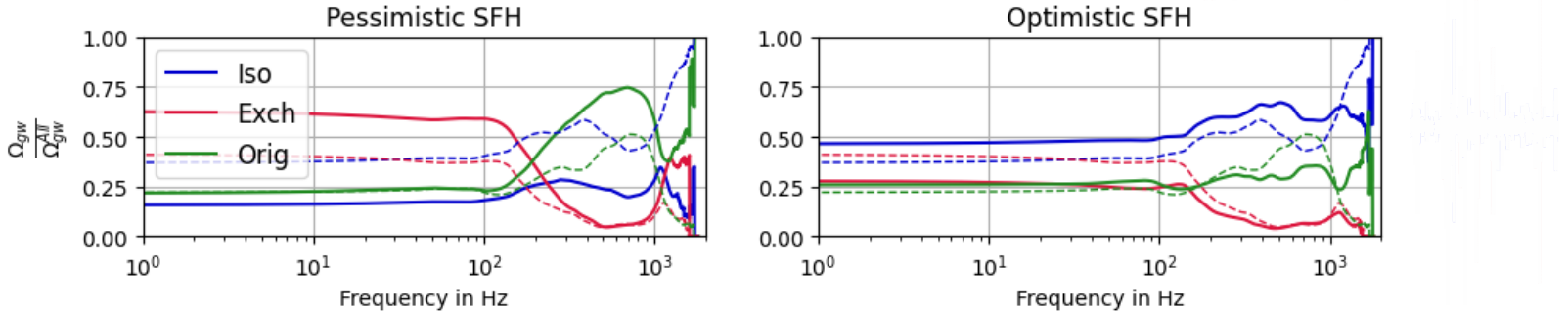

```
In [ ]: Background.Analysis(Model = astromodel1, Networks = [ET, ET2CE])
```

Impact of formation channel



Background for different BBHs formation channels

Princess paper in prep.



Contribution of evolution channel to the background spectrum

Perigois et al., Phys.Rev.D 105 (2022) 10, 103032 • e-Print: 2112.01119 [astro-ph.CO]

Take home message

https://github.com/Cperigois/Princess
https://gitlab.com/Cperigois/Princess

PRINCESS is already available on github !

Stay tune!
PRINCESS will be submit in the next weeks to the ET collaboration.

We will se an astrophysical background with 3G and this background shape will be impacted from astrophysical modelling.

We have a lot of populations to study there, any collaboration are more than welcome.

Thank you for your attention

Residual background