

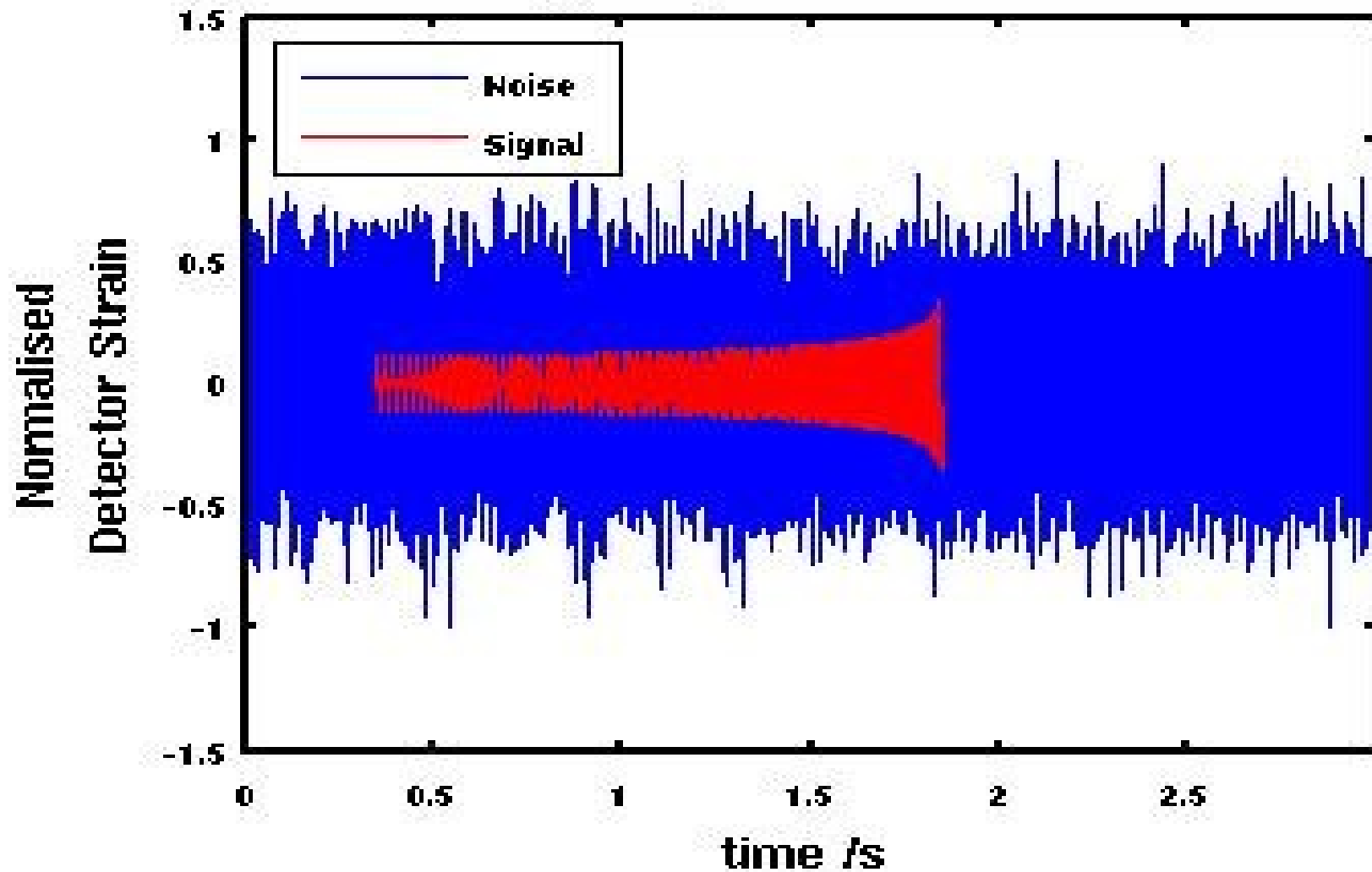
# Gravitational waves background from compact binaries

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Spała, 03.07.2014

# Chirp

The signal's position in the noise.

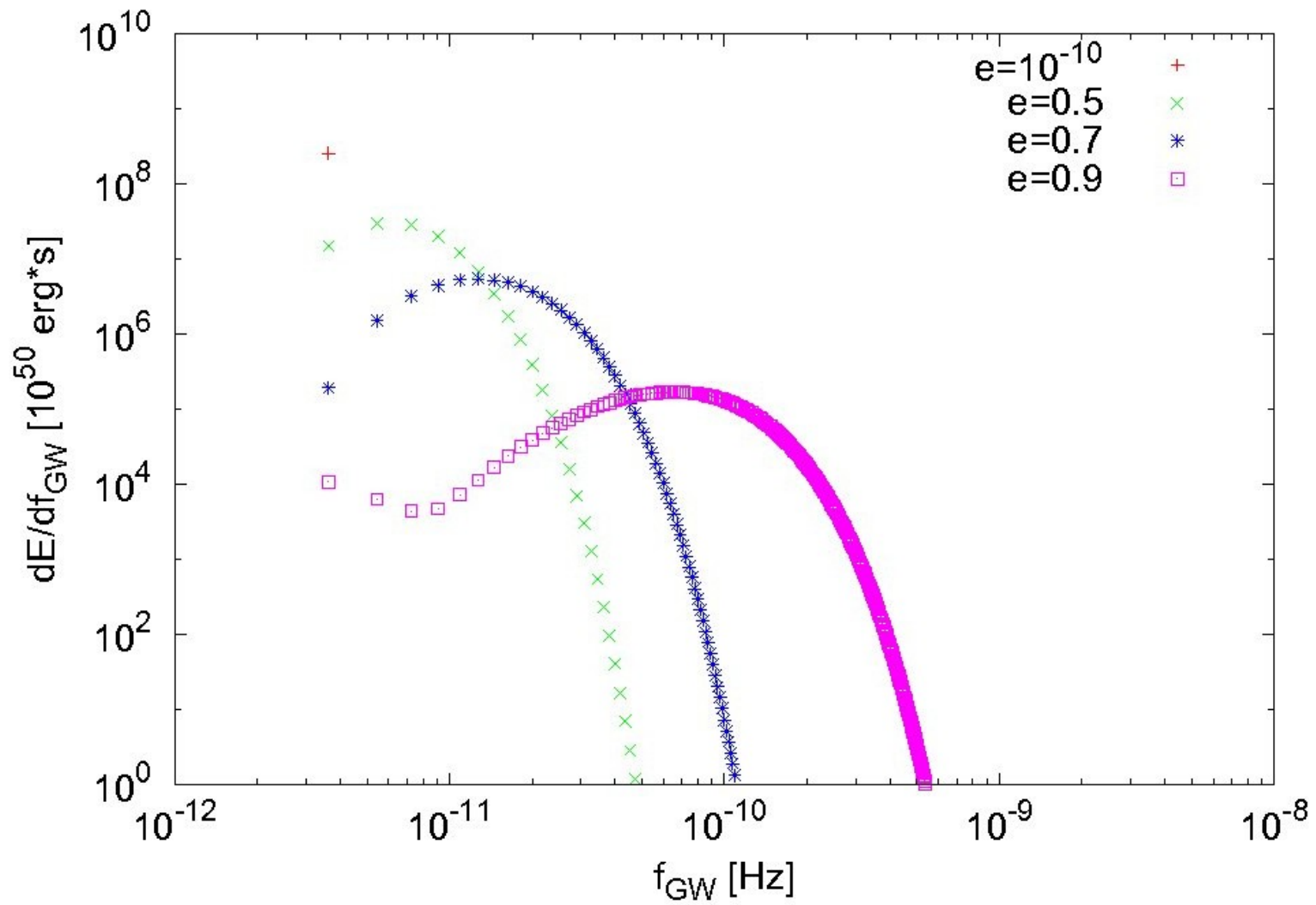


# GW signal from a binary

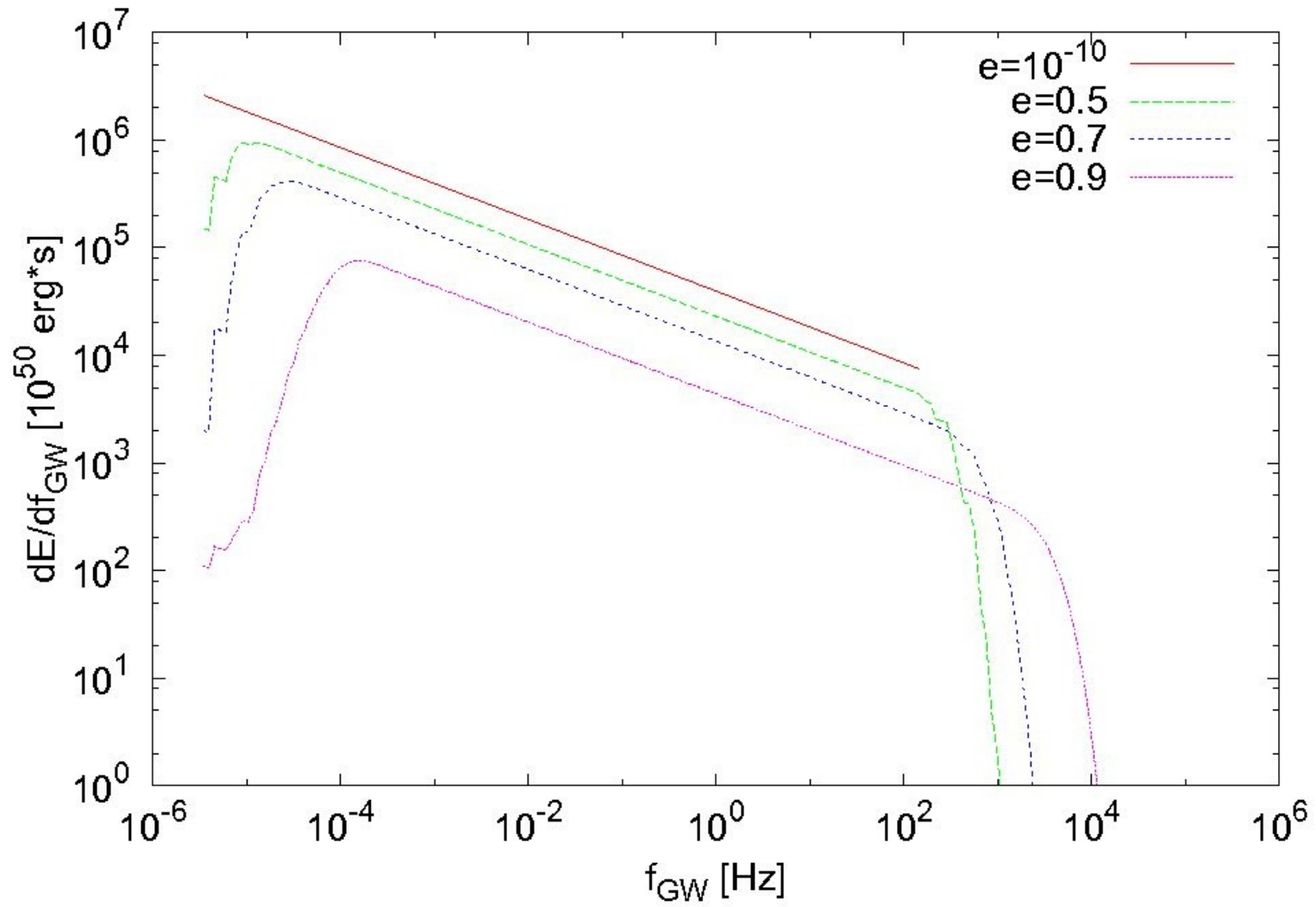
$$\frac{dE}{df_{gw}^n} = \frac{\pi}{3} \frac{1}{G} \left(\frac{4}{n^2}\right)^{1/3} \frac{(GM_{chirp})^{5/3}}{(f_{gw}^n \pi)^{1/3}} \frac{g(n, e)}{\Psi(e)}$$

$$\Psi(e) = \frac{1 + \frac{73}{24}e^2 + \frac{37}{96}e^4}{(1 - e^2)^{7/2}}$$

$$T_{\text{merg}} > T_{\text{H}}$$



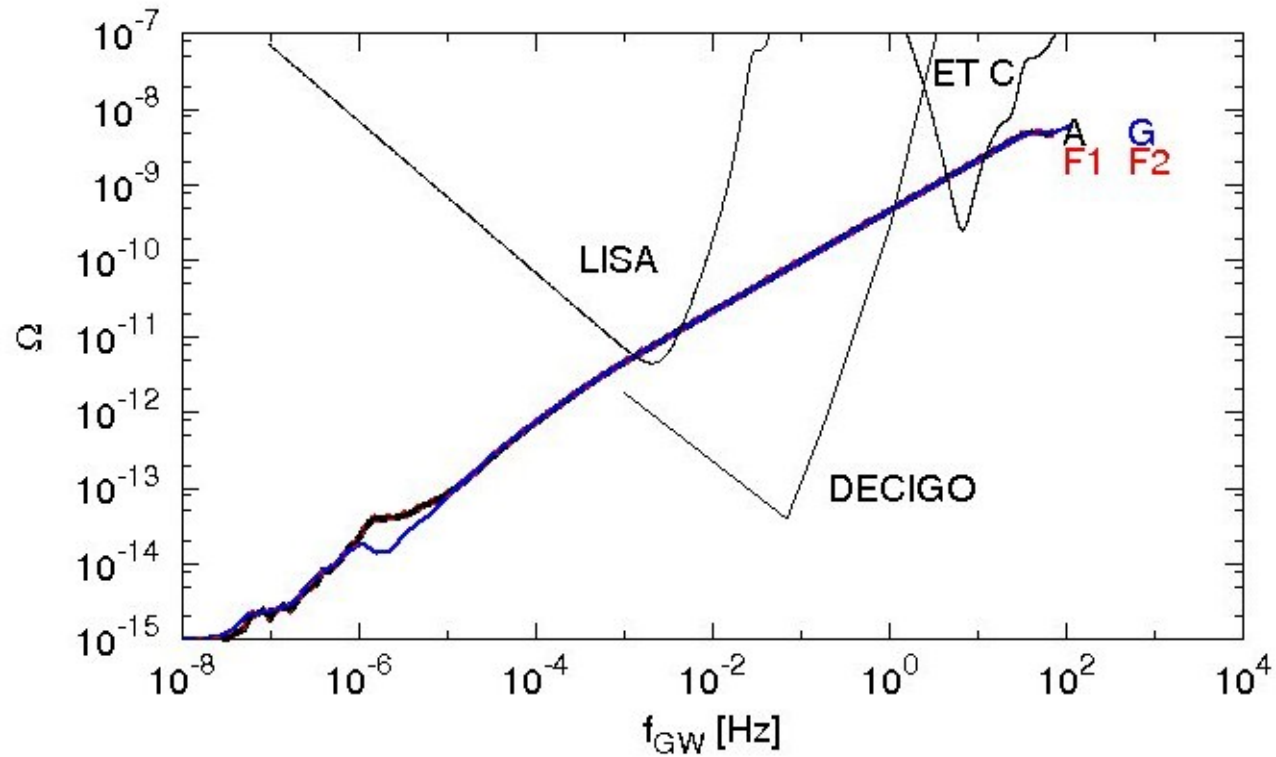
$$T_{\text{merg}} < T_{\text{H}}$$



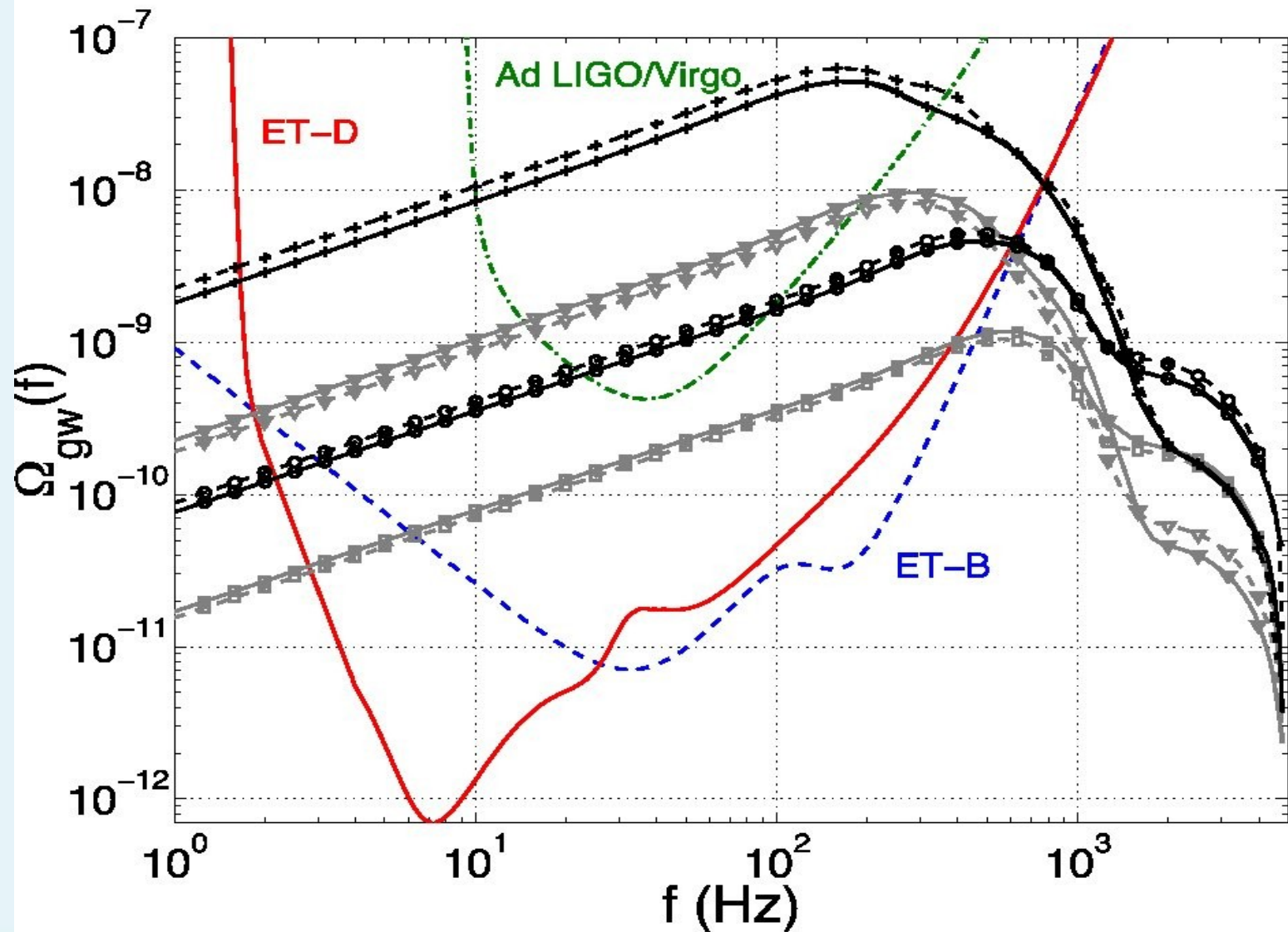
# Stellar populations

- Population synthesis code StarTrack (Belczyński et al. 2008)
- Evolution of a single star (from ZAMS to SN) and binary interactions (common envelope, mass transfer)
- Different metallicities (metal free, 10%  $Z_{\text{sun}}$ ,  $Z_{\text{sun}}$ )

# Population III



# Population II and I







# Conclusions

- Gravitational waves background from different stellar populations will be visible in future detectors.
- Population III can be one of the main sources of noise for DECIGO.
- AdvLIGO/Virgo should exclude some of the stellar evolution models.