

Other goals that drive the CE facility design

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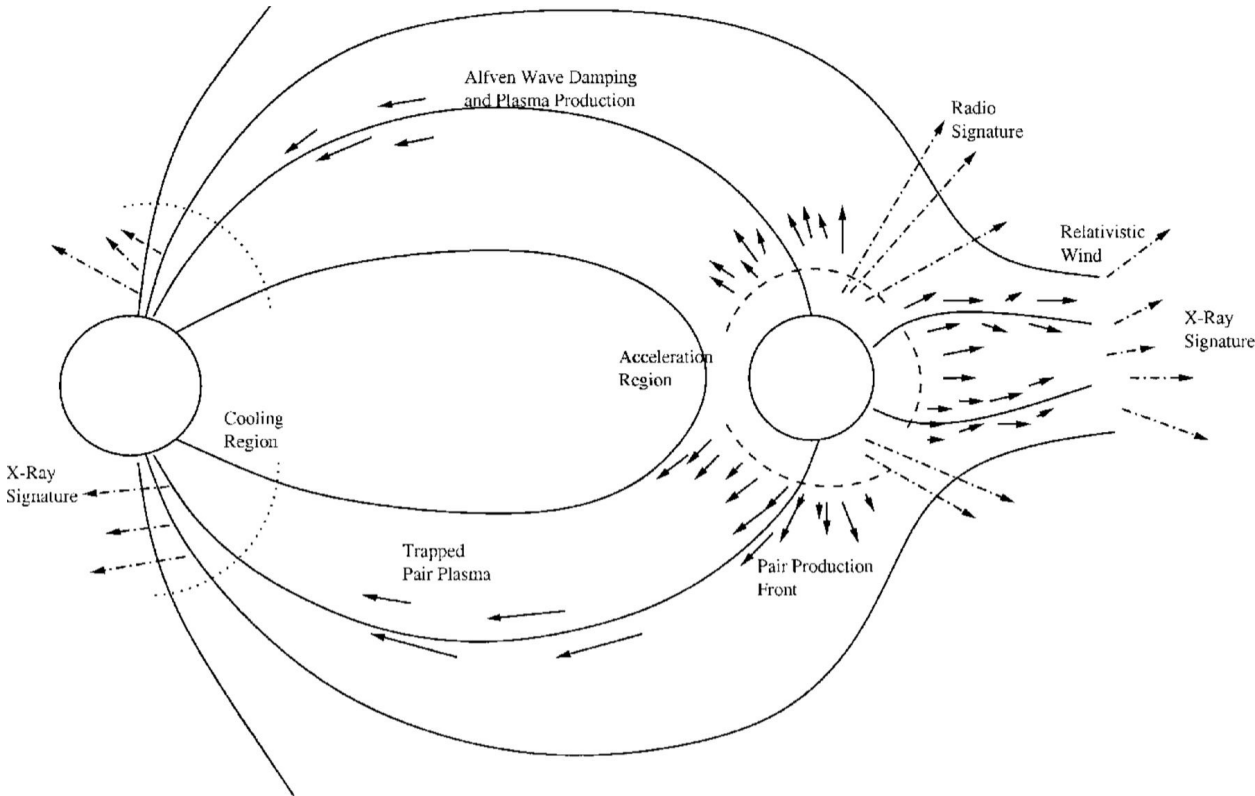
Summary

- White paper ([Evans+ 2306.13745](#)) and journal follow-up ([Gupta+ 2307.10421](#)) included science letter topics ([Vitale's talk](#)) plus:
 - **Continuous waves** ([Riles' talk](#))
 - **Core collapse supernovae** ([Radice's talk](#))
- Some important things not included ([Corsi+ 2402.13445](#)):
 - **Electromagnetic precursors** to compact binary mergers (seen in GRBs)
 - **Stochastic backgrounds** (astrophysical and cosmological)

A quick word on scalings and why CE

- Horizon distance (or \sim arm length) L , run time T
- Binary mergers (and some bursts)
 - No. of events goes as L^3T , so **invest in L more than T**
- Stochastic background
 - Signal-to-noise goes as $LT^{1/4}$, so **invest in L more than T**
- Continuous waves
 - Signal-to-noise goes as $LT^{1/2}$ to $LT^{1/4}$, so **invest in L more than T**

EM precursors: magnetospheric



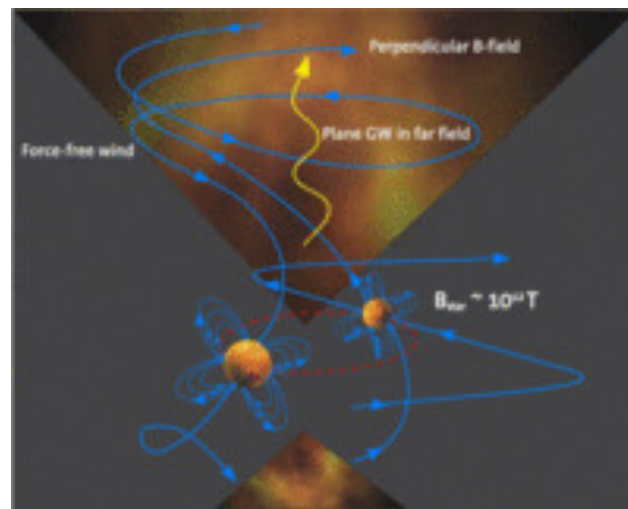
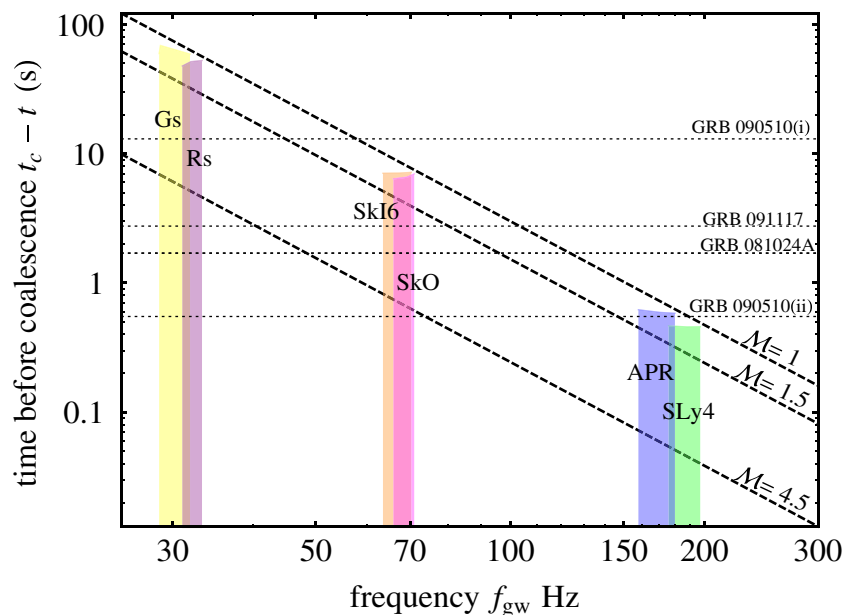
Hansen & Lyutikov 2001

- Each star (10^{11} - 10^{12} G magnet) moves through the other's magnetosphere & plasma
- MANY detailed mechanisms, including Io-Jupiter analog
- Radio, x-rays possible
- Observable up to \sim Gpc with next generation radio
- Repeating? Coherent?

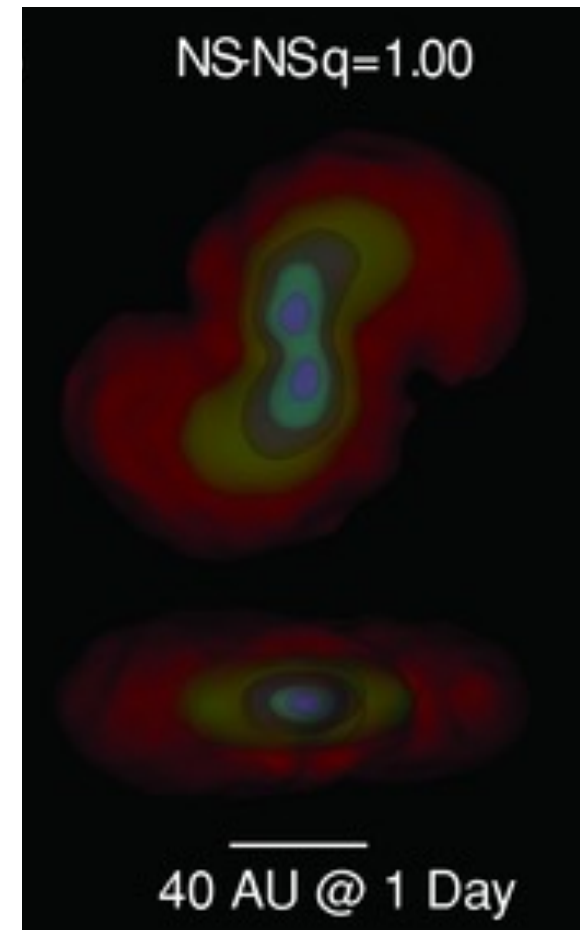
EM precursors: other mechanisms

- GWs excite plasma waves
- Nuclear decay in tidal tail
- Crust shattering

Tsang+ 2012



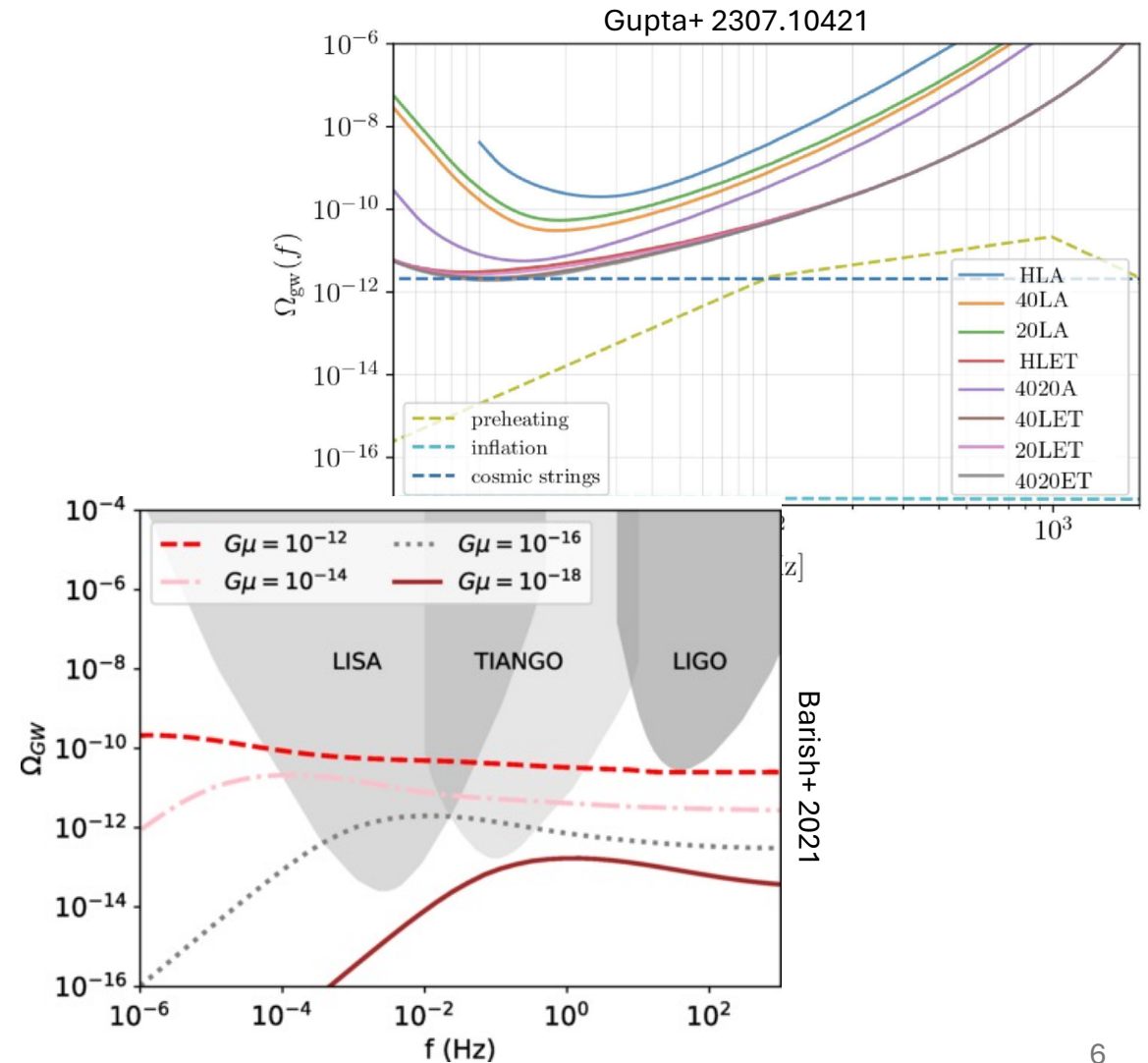
Mortgat & Kuijpers 2001



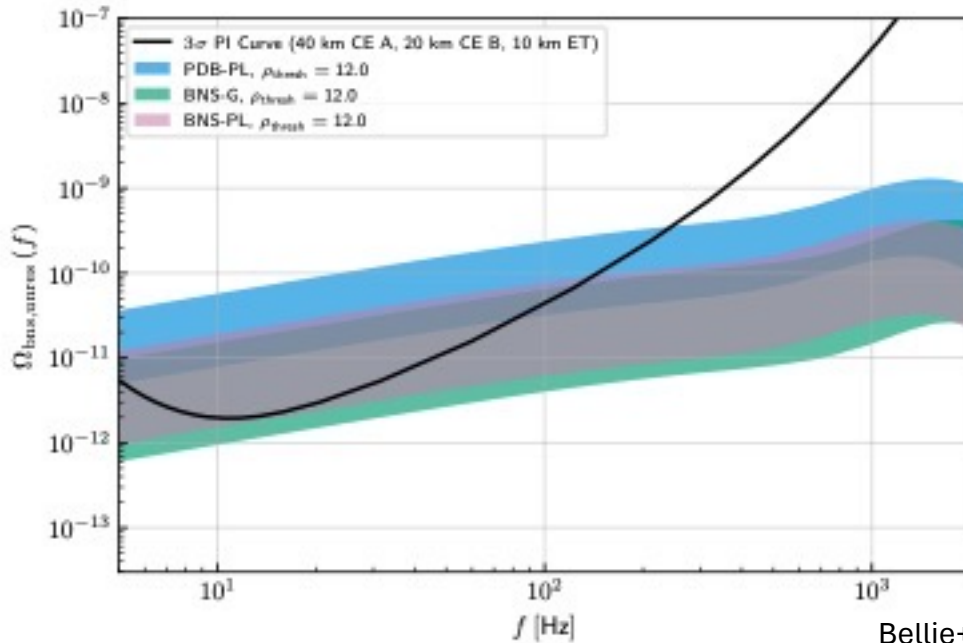
Roberts+ 2011

Stochastic backgrounds (cosmological)

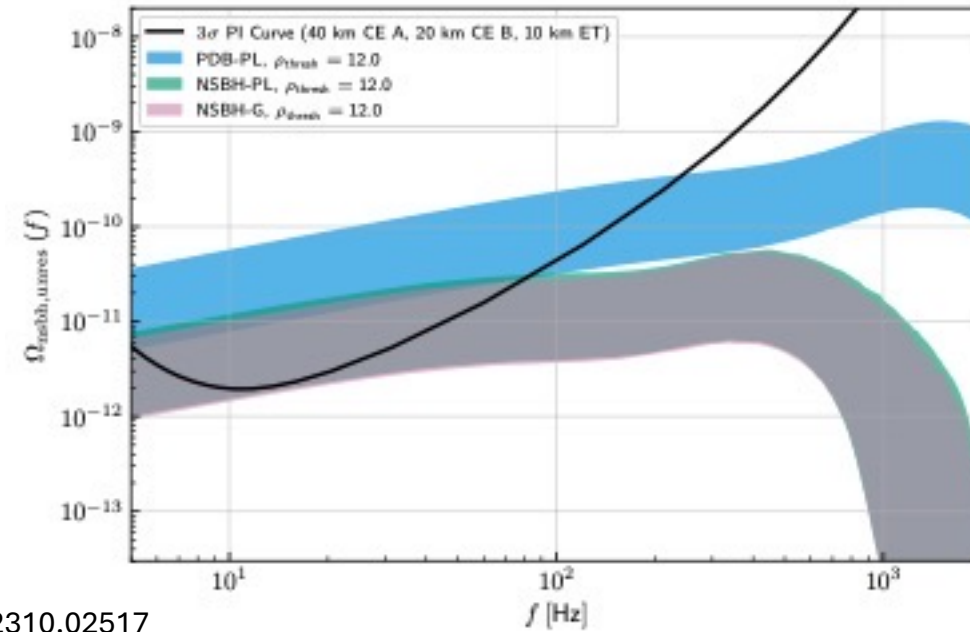
- Cross-correlation between detectors favors lower frequencies
- Some cosmic string models are accessible (high tension)
- ET looks good in spectrum, but noise is correlated
- Must subtract astrophysical foreground...



Stochastic backgrounds (astrophysical)



Bellie+ 2310.02517



- Even NSNS and NSBH backgrounds are likely to be very loud
- Less certain but exciting novelties: continuous wave sources, newborn magnetars, core collapse supernovae....

What else have we left out?

- Lower frequency aspects of post-merger
- Dark matter in NSs (and detectors)
- Lots of active open questions!