

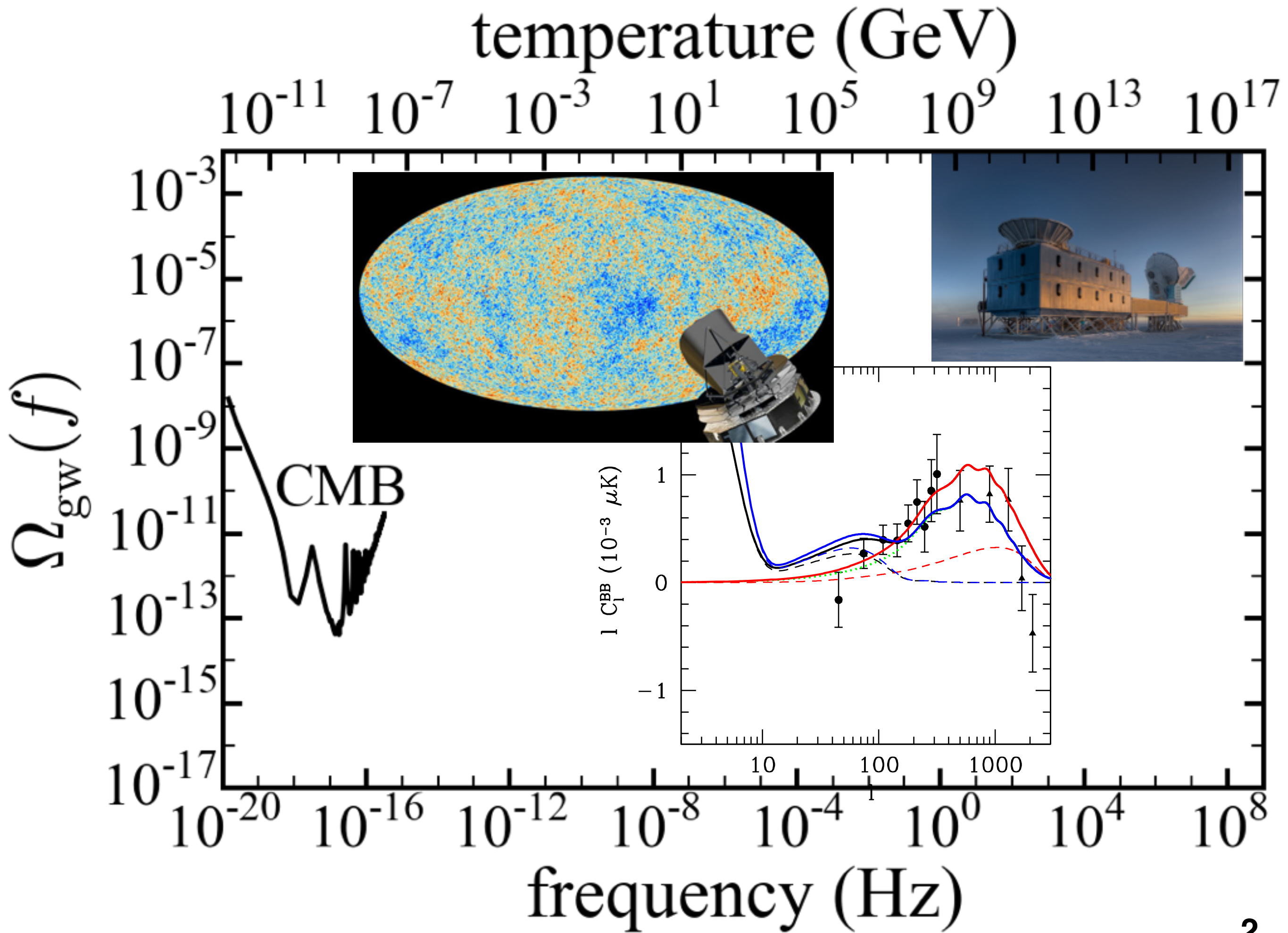
# Gravitational-wave cosmology over 29 decades in frequency

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**Chiara Mingarelli, Tristan Smith,  
Tom Giblin, Eric Thrane,  
Daniel Reardon, and the PPTA**







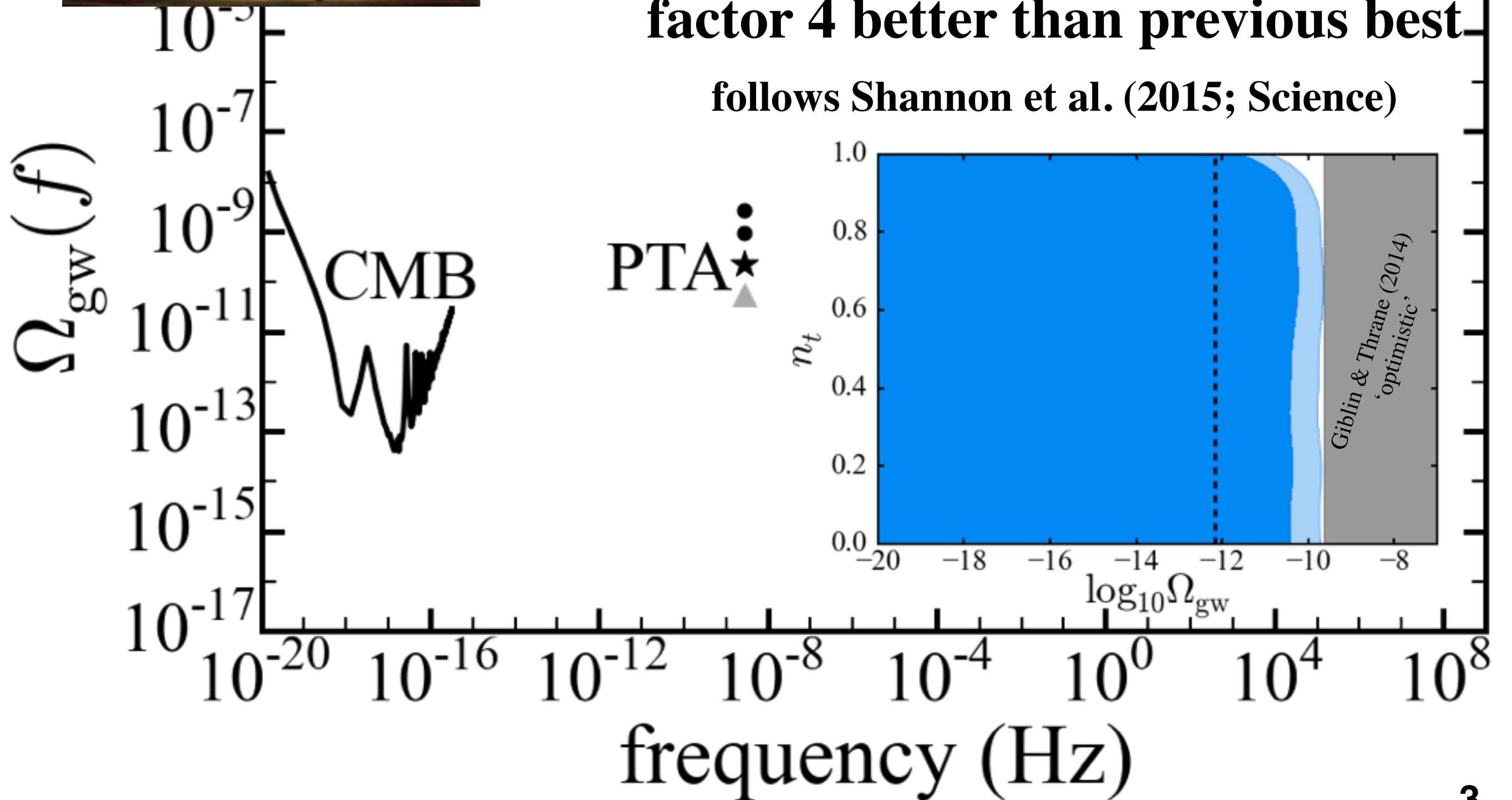
temperature (GeV)

$10^{-7}$   $10^{-3}$   $10^1$   $10^5$   $10^9$   $10^{13}$   $10^{17}$

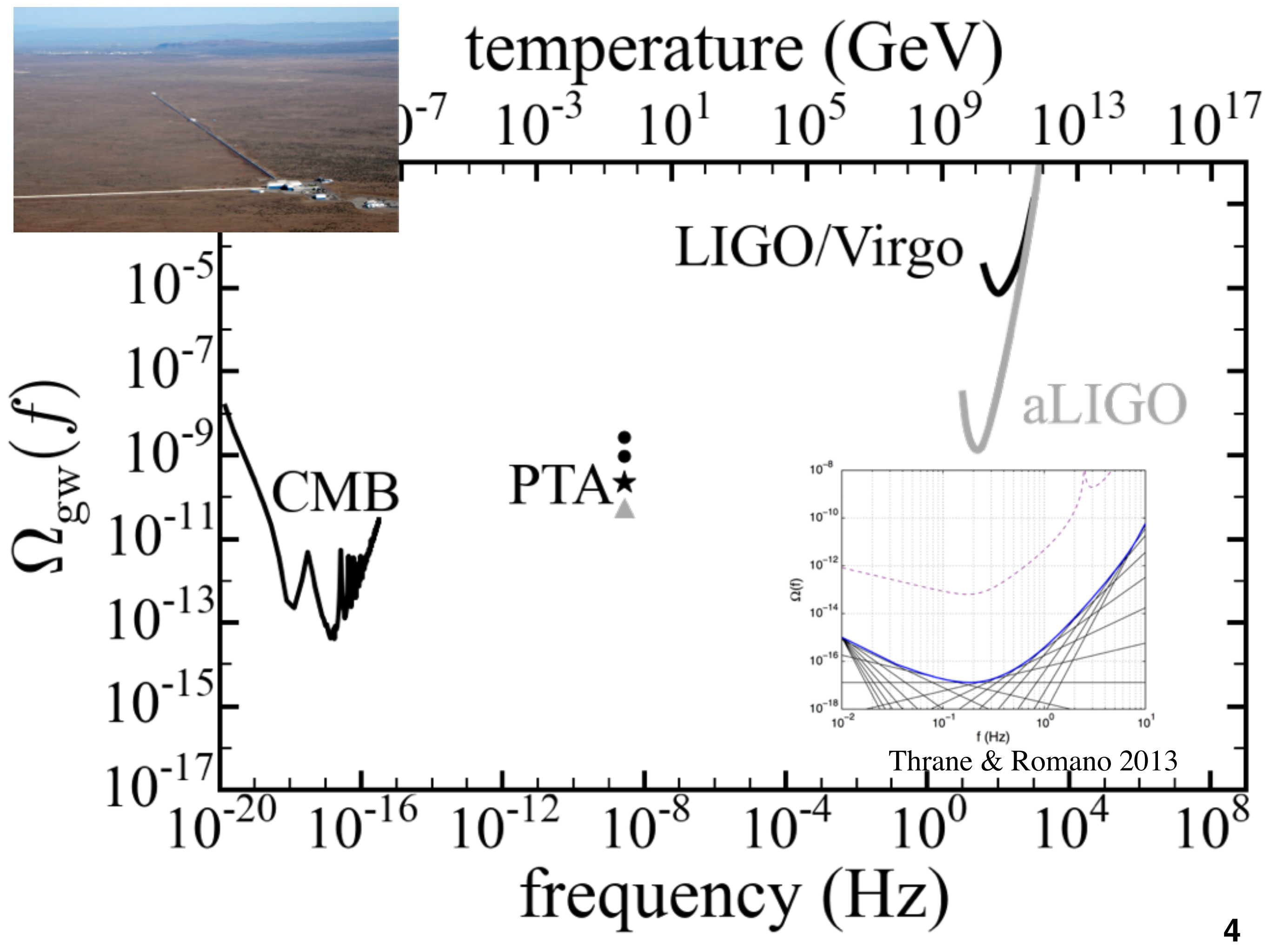
**New PPTA limit for inflation**

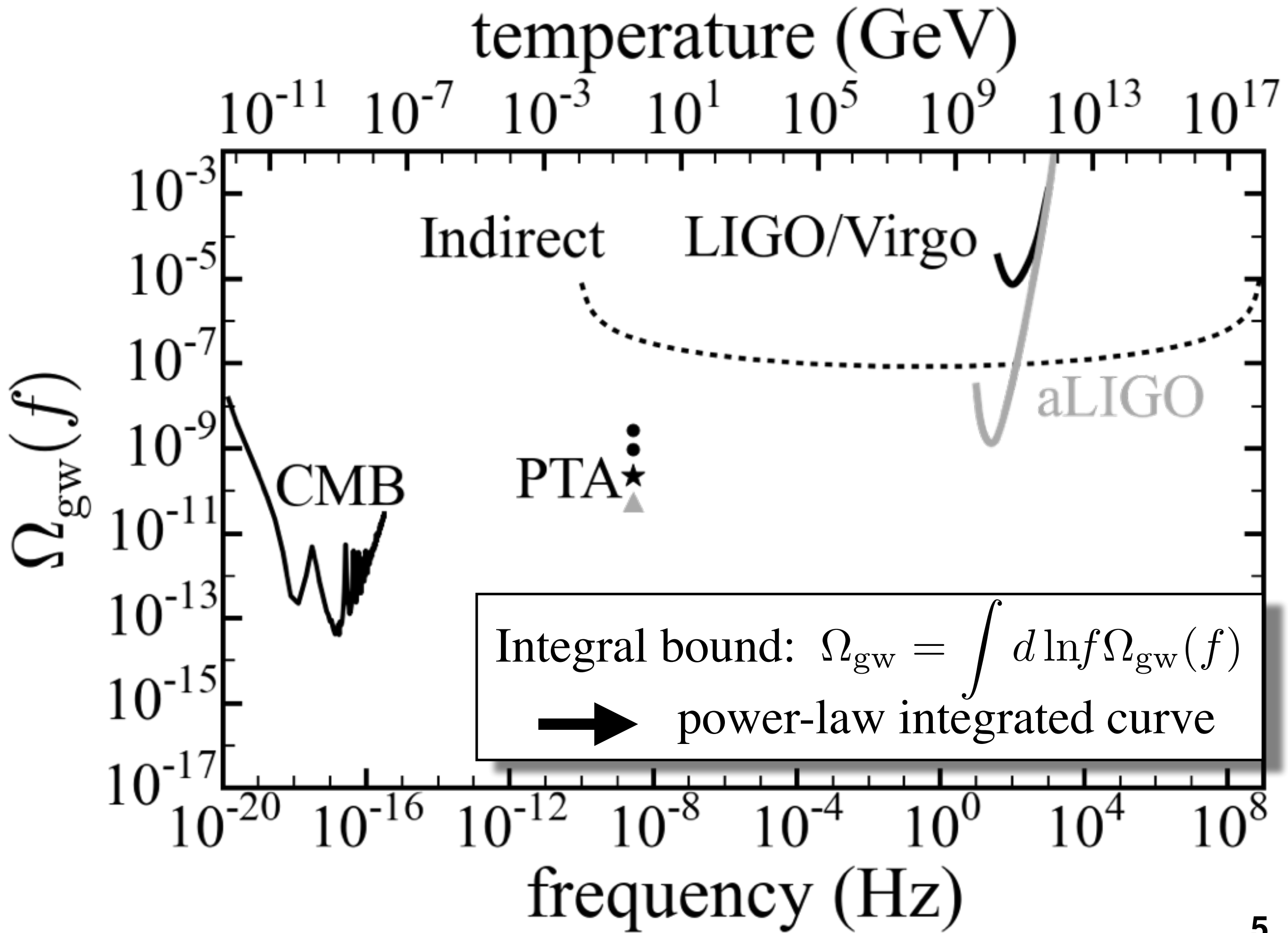
**factor 4 better than previous best**

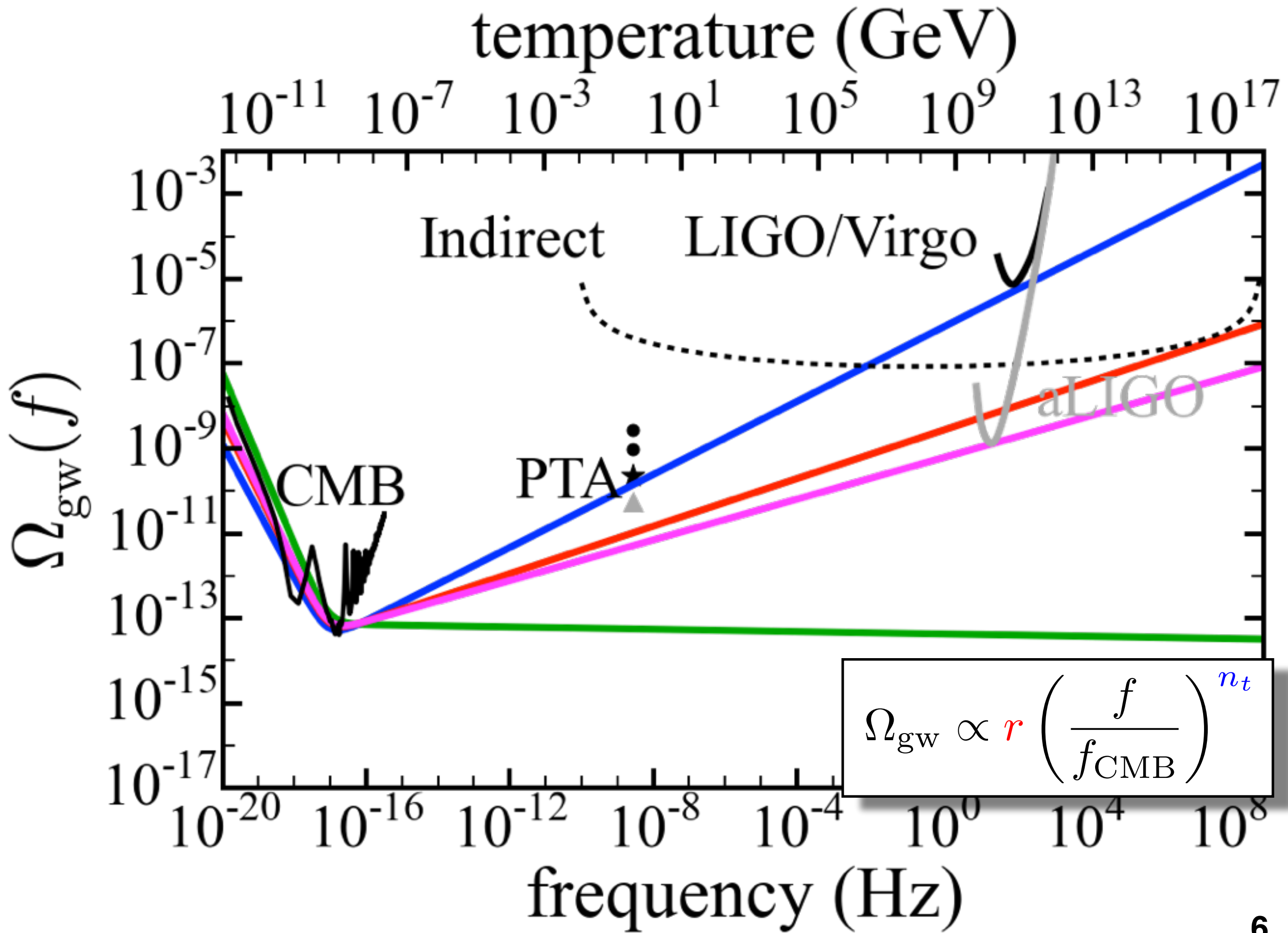
**follows Shannon et al. (2015; Science)**











# But... physics!?

Canonical inflation:

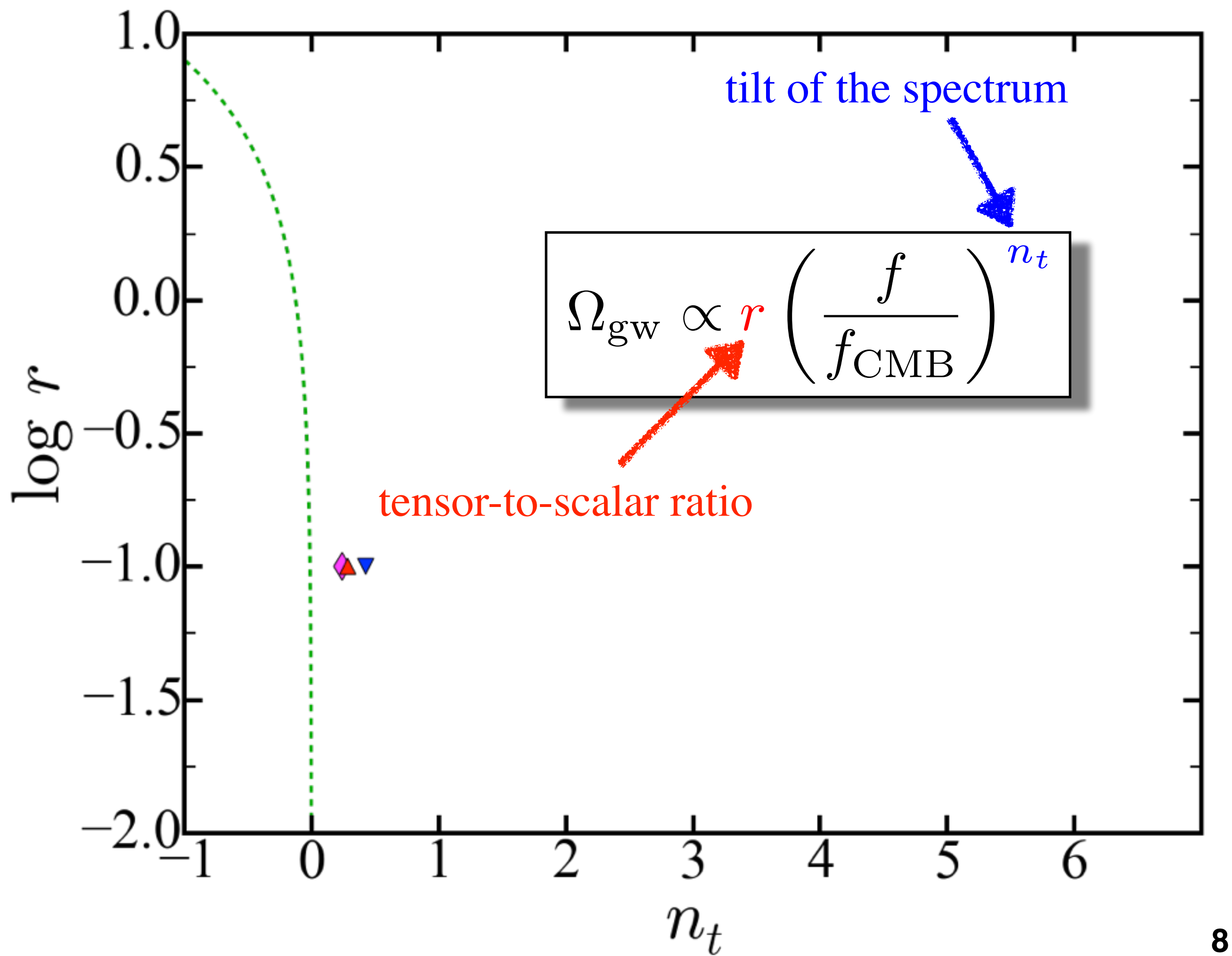
General relativity + spatially flat metric  $\longrightarrow$  red spectrum ( $n_t < 0$ )

Blue alternatives:

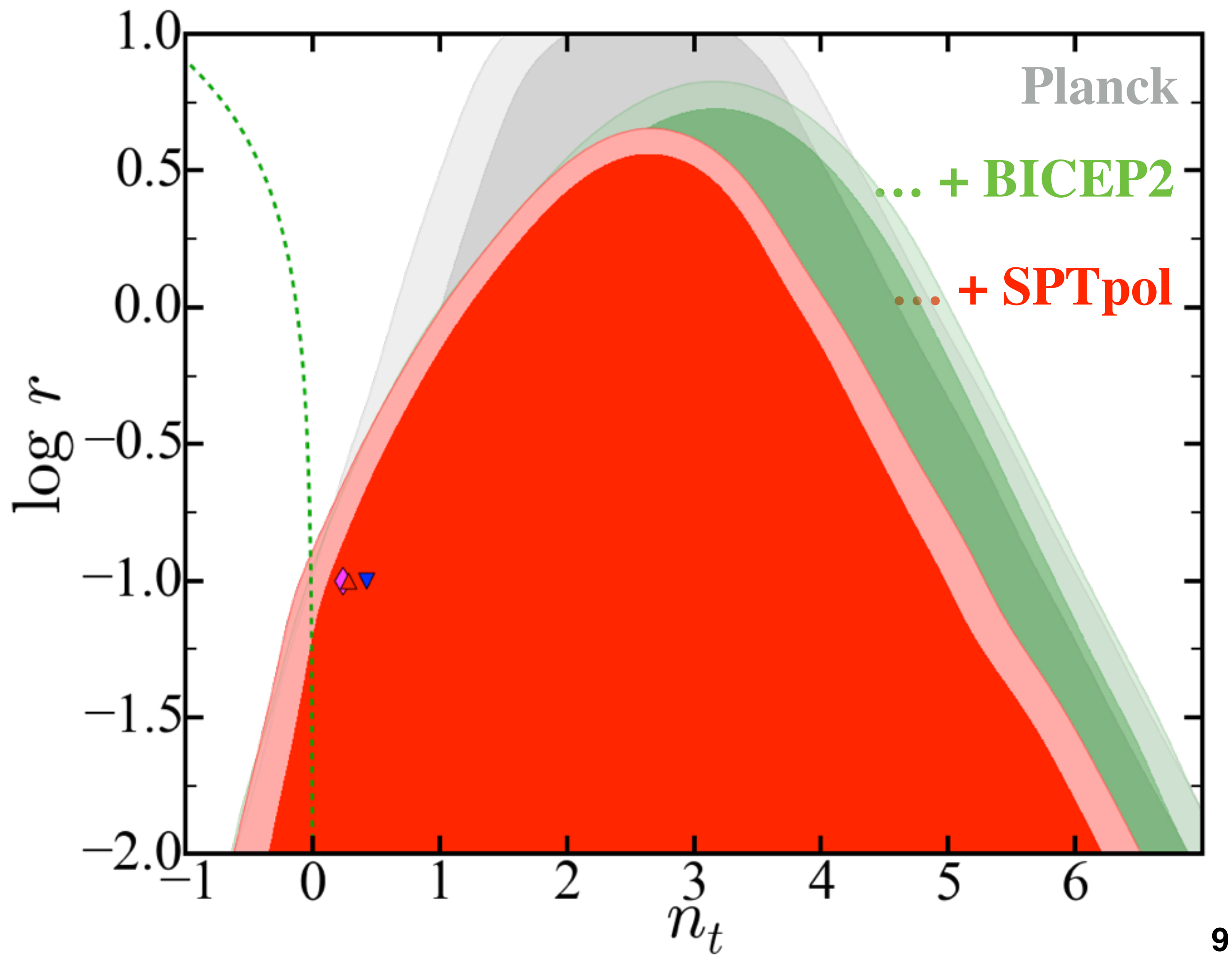
- ‘Super inflation’ (null energy violating field)
- string-gas cosmologies
- inflation with modified Einstein-Hilbert action
- ekpyrosis
- ...

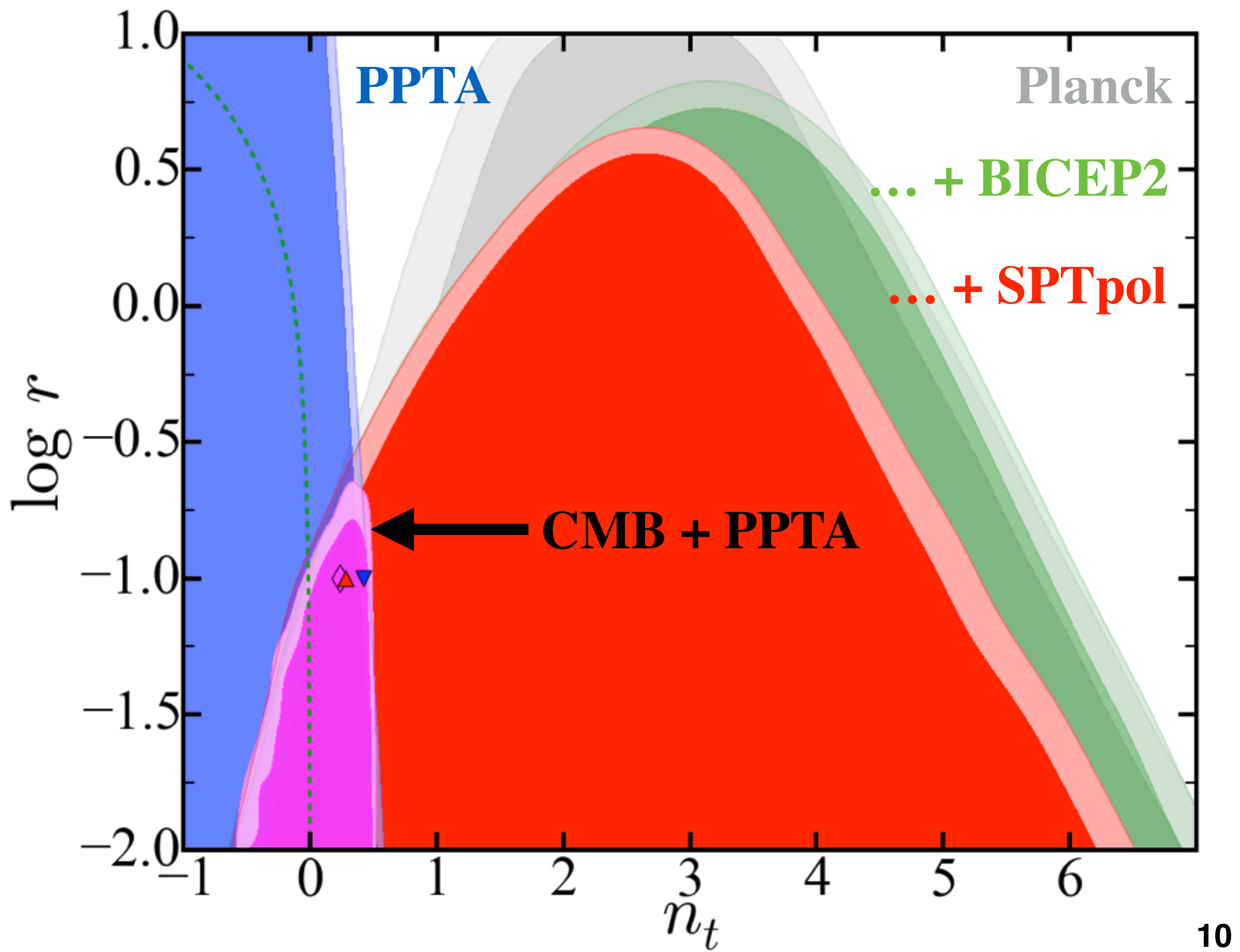
Our philosophy:

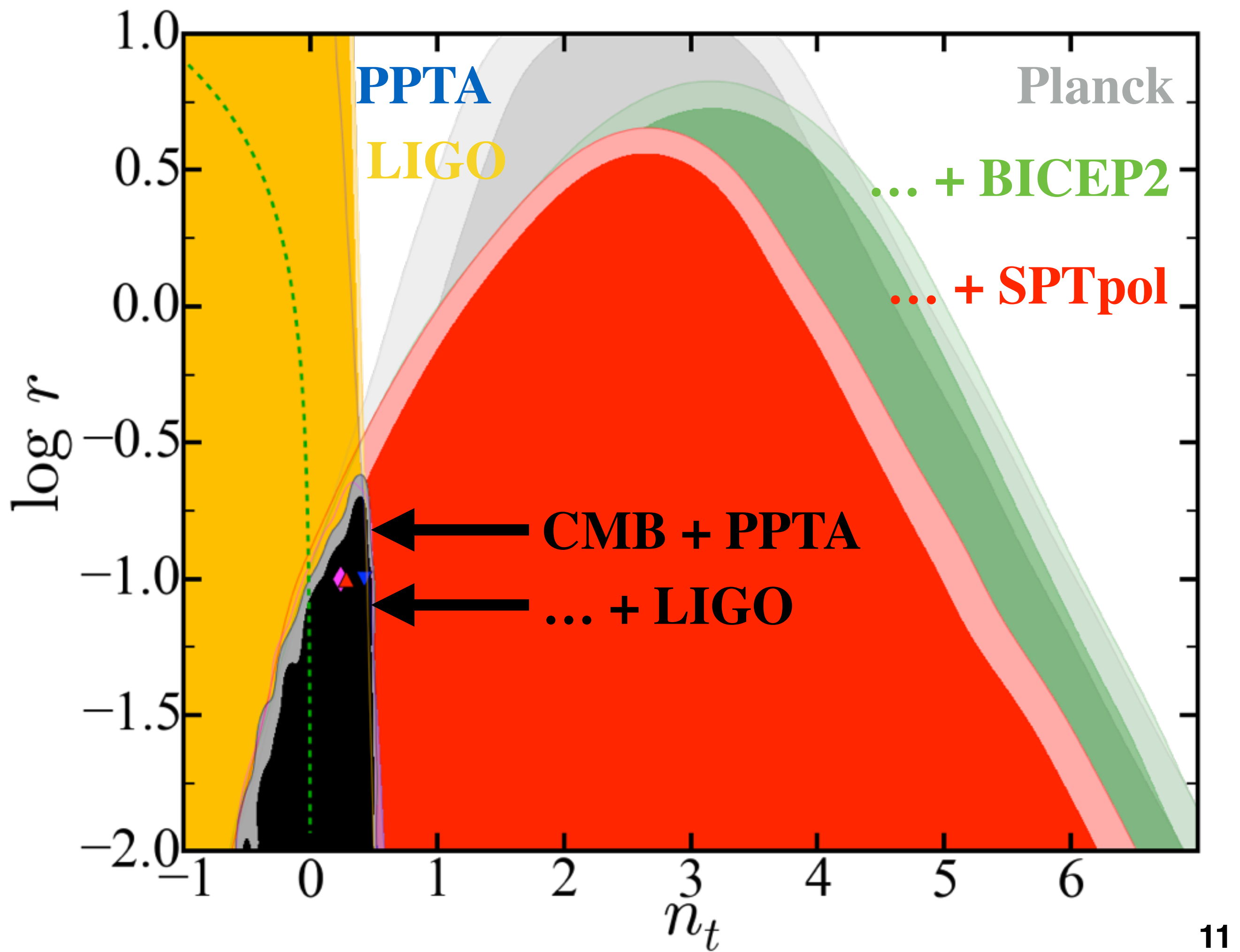
‘Let’s let the data decide!’

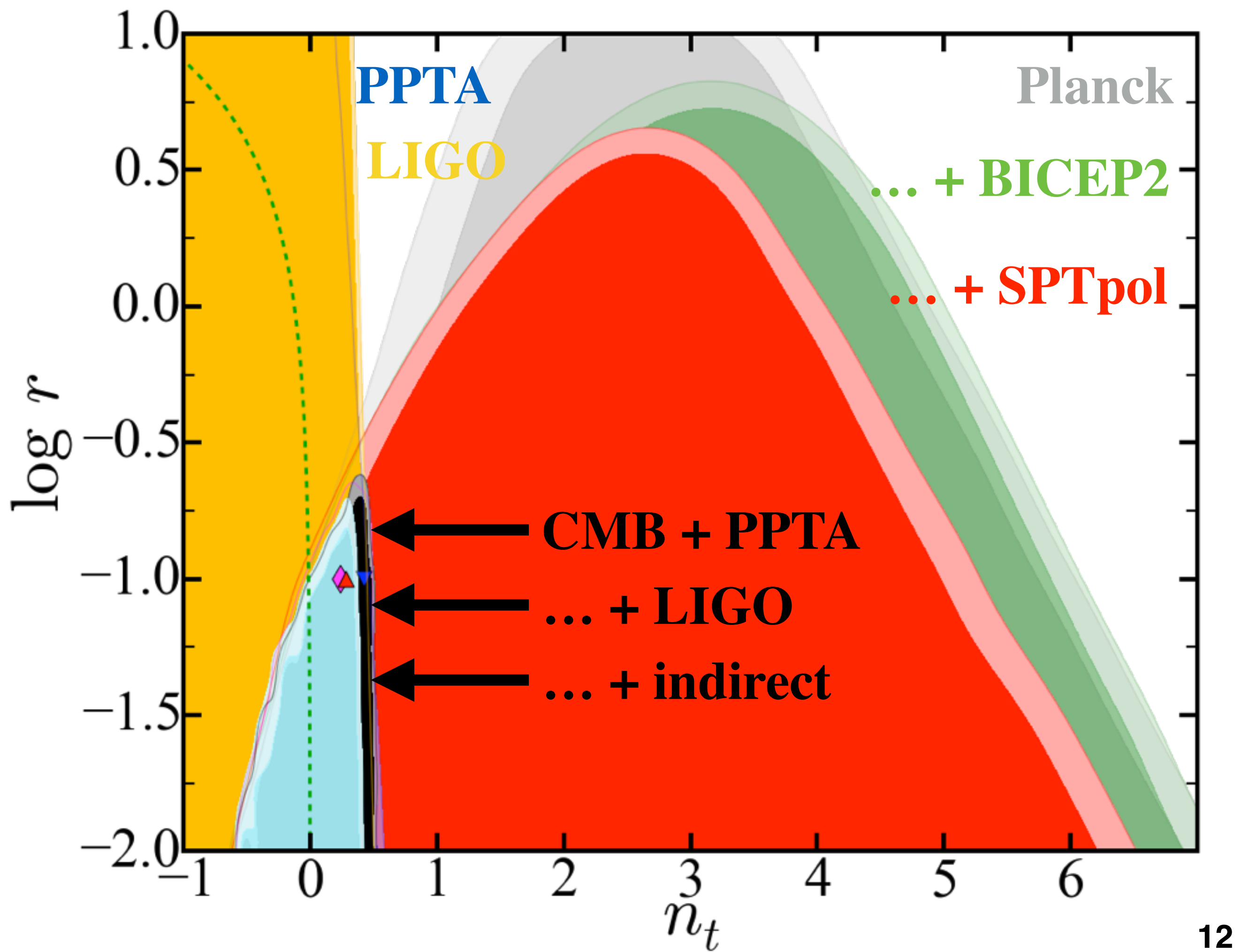




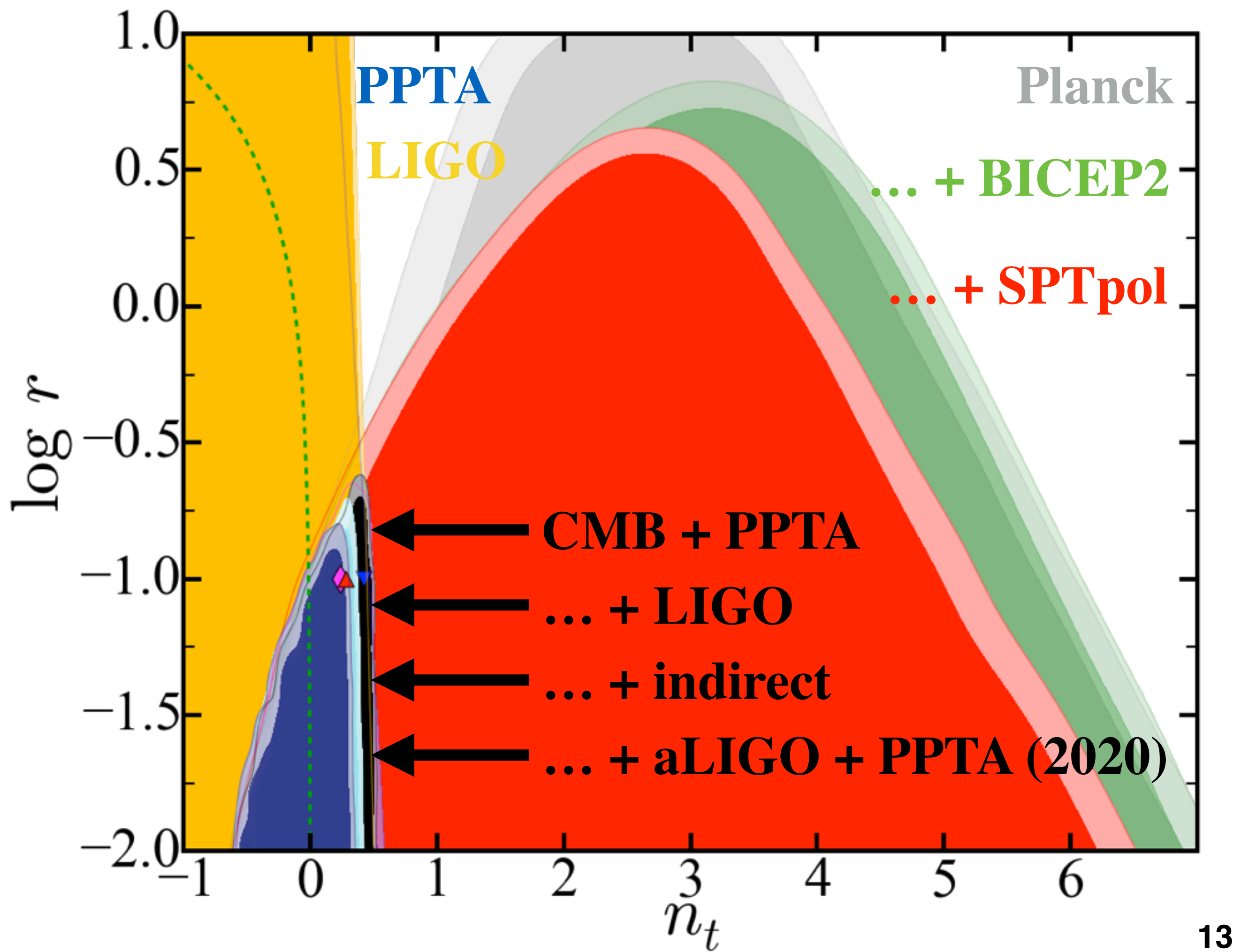


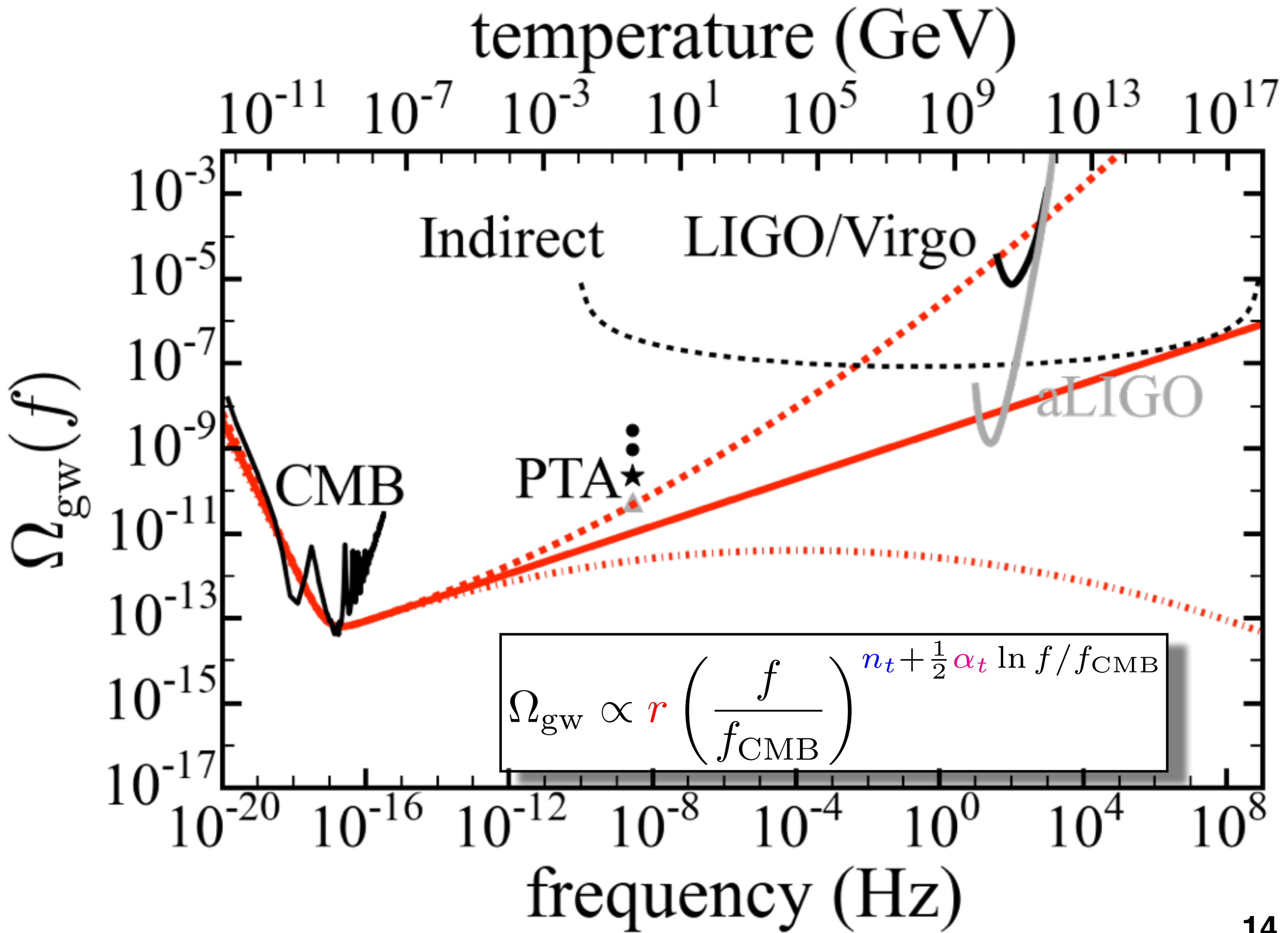












# Conclusions

- ◎ Doing gravitational-wave cosmology over 29 decades in frequency!
  - ◎ Only the combination of experiments can constrain this parameter space
- ◎ Not clear how important this parameter space is to theorists:
  - ◎ they have very little experimental data!
  - ◎ they have creative tendencies without data!