LOW VS HIGH FREQUENCY SENSITIVITY

- Good high frequency sensitivity affects timing and hence improves localisation of gravitational wave transients

- However, most other parameters, e.g. chirp mass and mass ratio, are better measured with long inspirals:

- In fact, the merger part of the signal better measures the total mass and not the chirp mass

LOW VS HIGH FREQUENCY SENSITIVITY

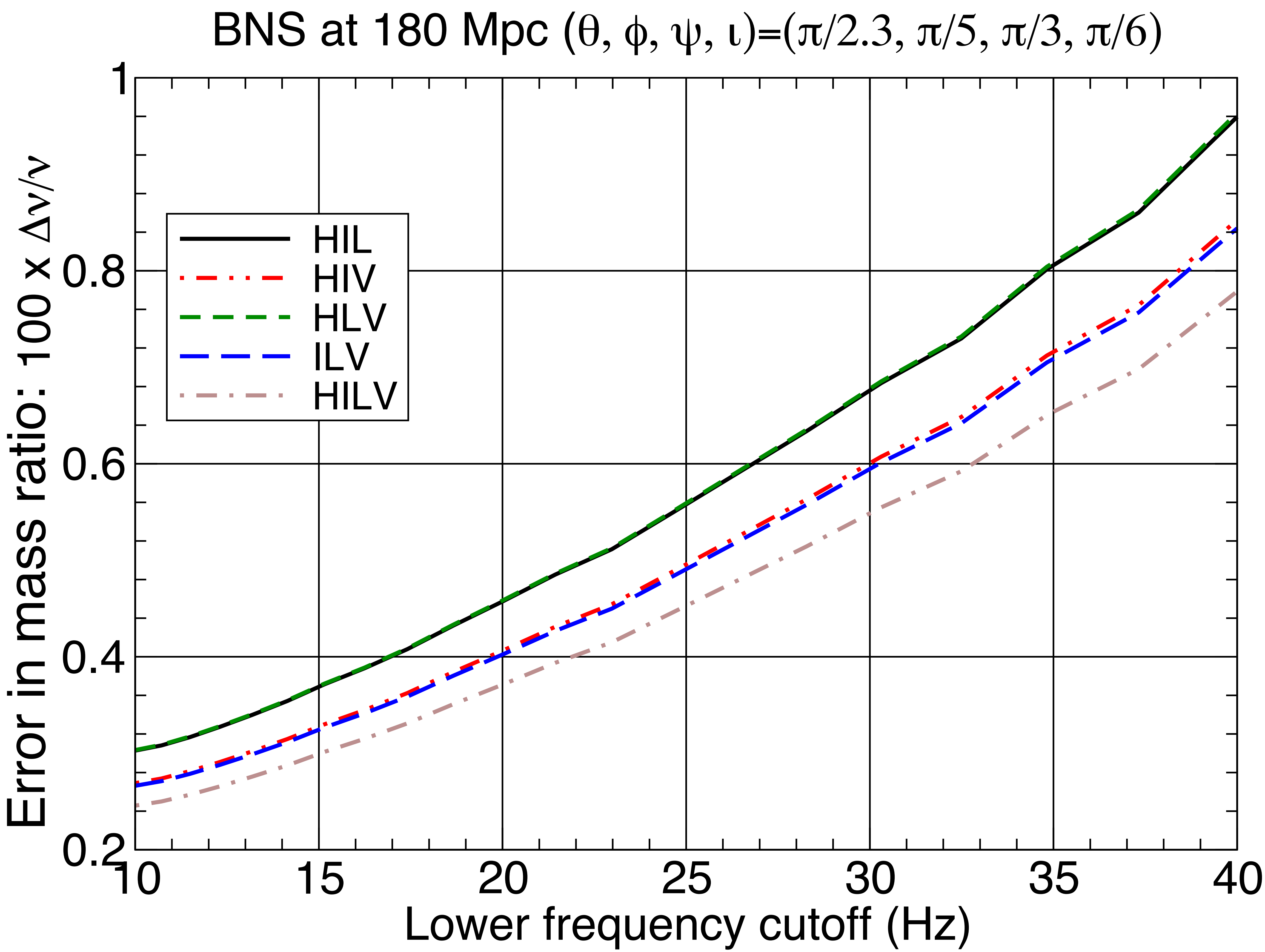
- Error in the estimation of a parameter scales as:

$$\Delta\lambda \equiv \int_{f_{\rm low}}^{f_{\rm high}} \frac{f^{\alpha-7/3}}{S_h(f)} \mathrm{d}f$$

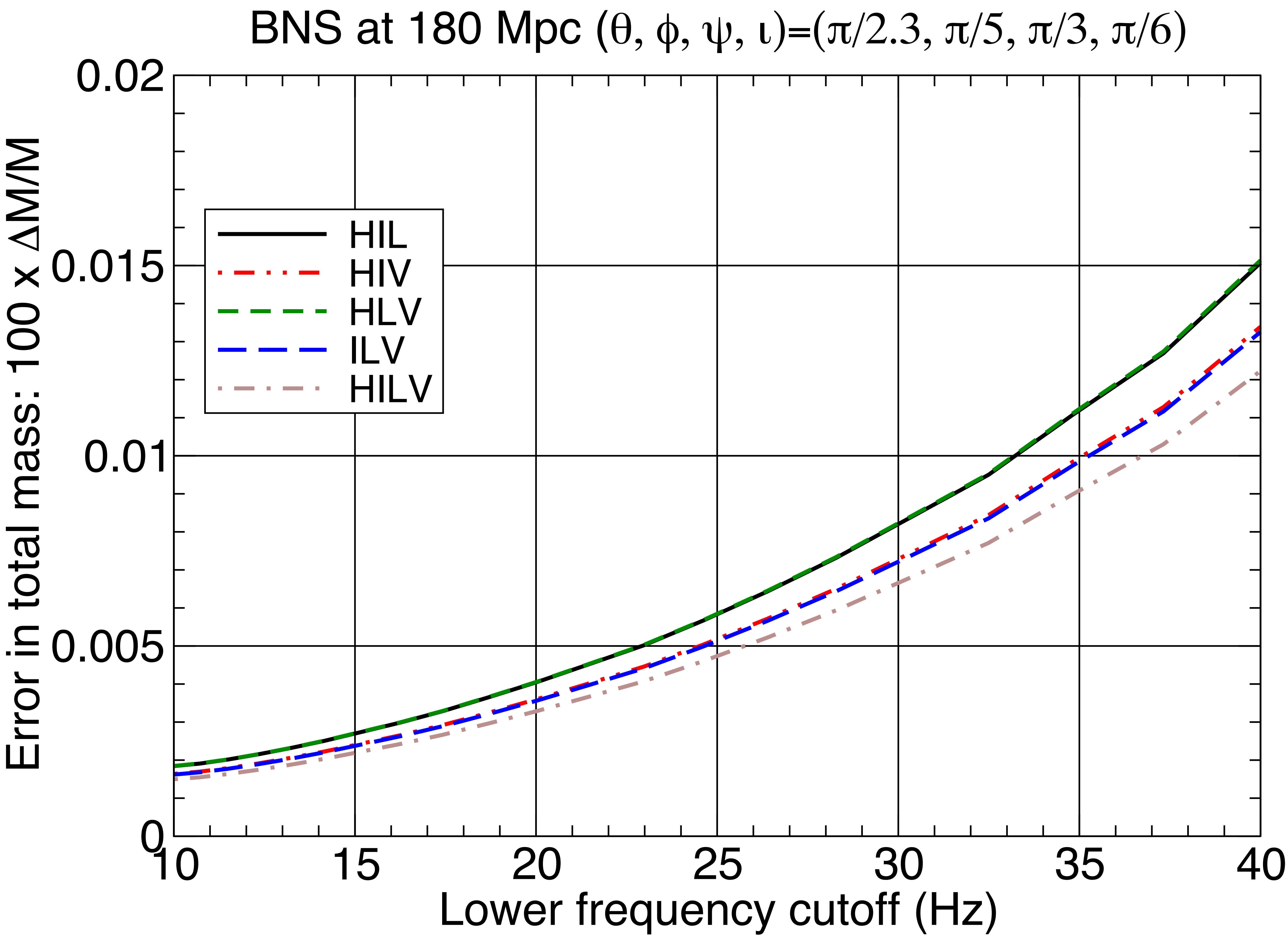
For chirpmass $\alpha = -5/3$.

- so lower frequencies contribute a lot to reducing the parameter accuracies.

- While testing GR we are essentially measuring lower order PN parameters and they are best determined by long inspirals.

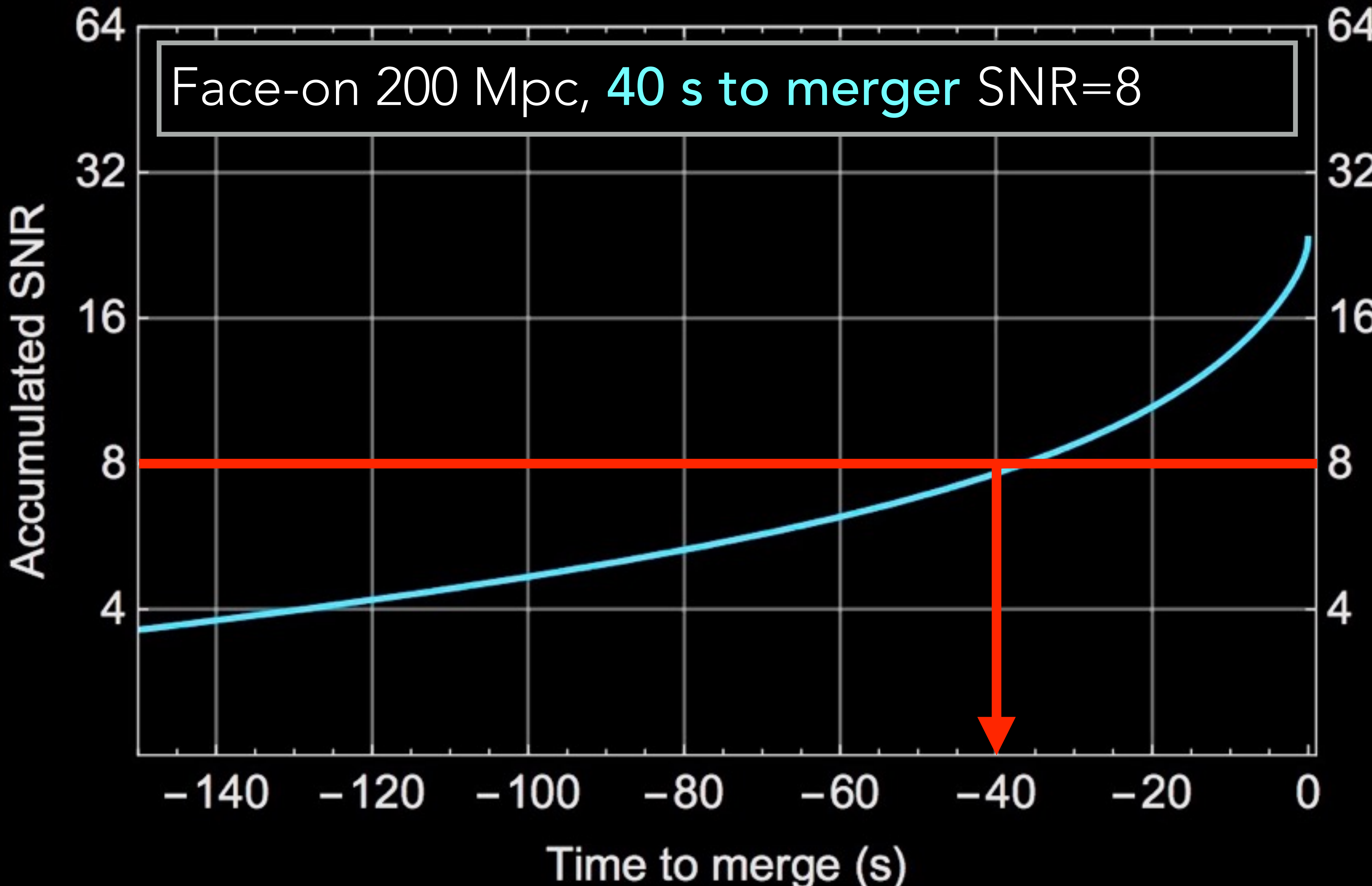


BNS at 180 Mpc (θ, φ, ψ, ι)=(π/2.3, π/5, π/3, π/6)
Error in mass ratio: 100 x Δν/ν
Lower frequency cutoff (Hz)
HIL
HIV
HLV
ILV
HILV
0.2
0.4
0.6
0.8
1
10
15
20
25
30
35
40



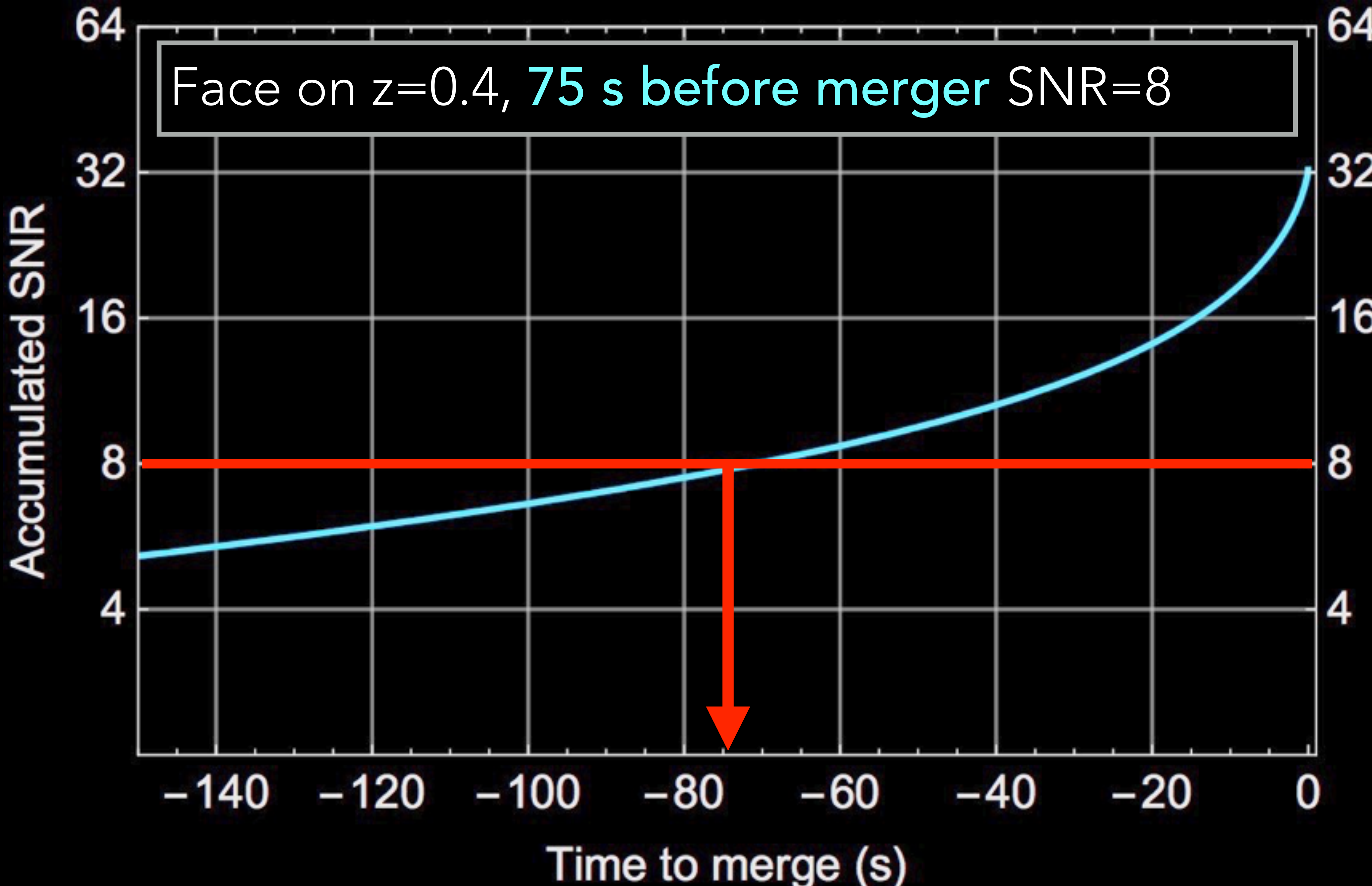
BNS at 180 Mpc (θ, φ, ψ, ι)=(π/2.3, π/5, π/3, π/6)
Error in total mass: 100 x ΔM/M
0.02
0.015
0.01
0.005
0
10
15
20
25
30
35
40
Lower frequency cutoff (Hz)
HIL
HIV
HLV
ILV
HILV

SIGNAL-TO-NOISE RATIO BUILD UP IN TIME FOR BINARY NEUTRON STARS: ALIGO/ADV



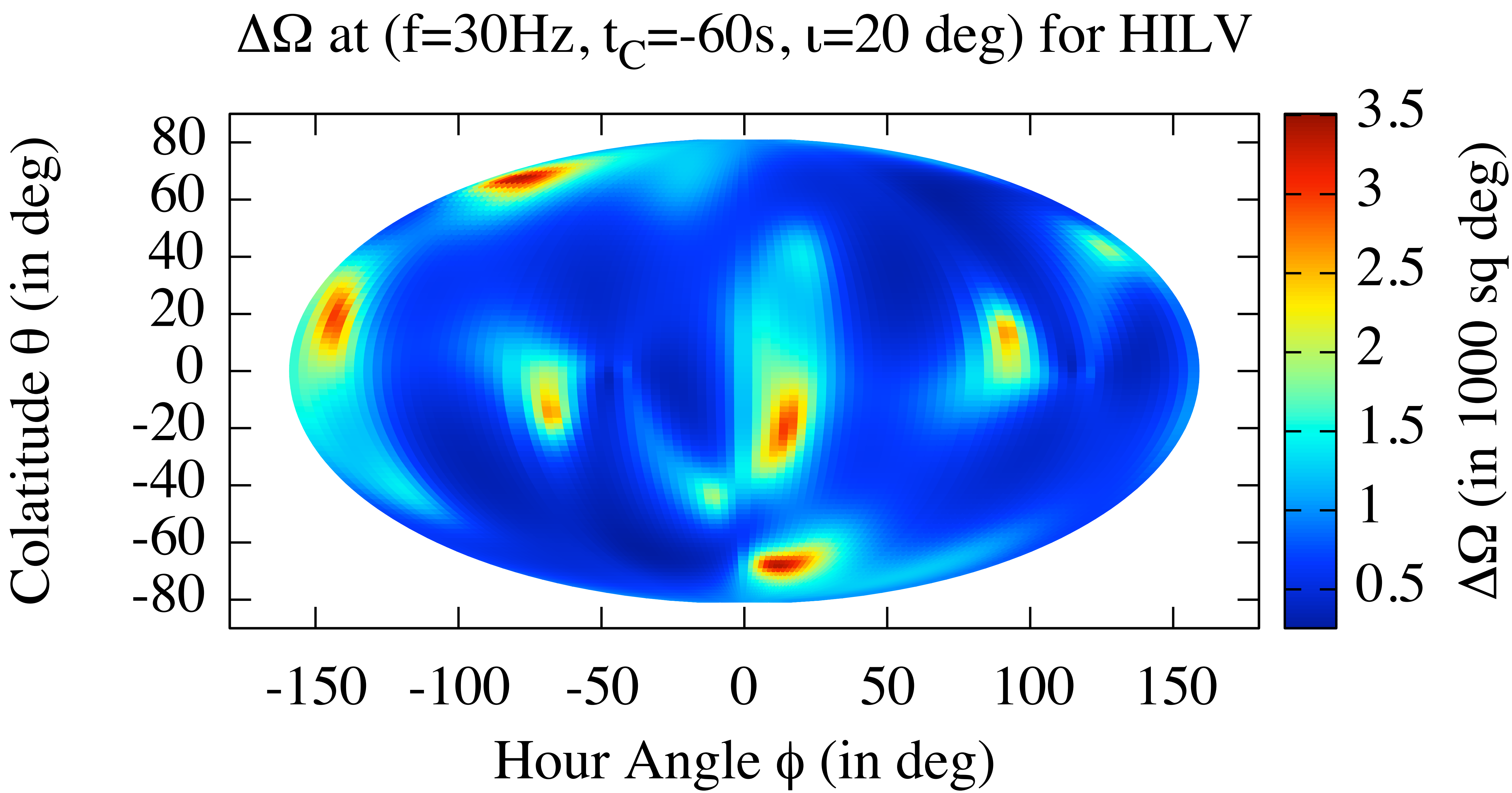
Single detector SNR

SIGNAL-TO-NOISE RATIO BUILD UP IN TIME FOR BINARY NEUTRON STARS: ETB



Single detector SNR

HILV Angular resolution 1 min before merger



OBSERVING SCENARIO

Gravitational wave detectors produce a trigger 30 s before merger

↓

A BAT-like detector is slewed to the sky patch predicted by GW network within 30 s

↓

BAT observes the prompt GRB emission and fixes the source within a sub-arc second sky patch

↓

XRT instruments follow-up prompt X-ray emission