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:

\[ \Delta \lambda \equiv \int_{f_{\text{low}}}^{f_{\text{high}}} \frac{f^{\alpha-7/3}}{S_h(f)} \, df \]

For chirp mass \( \alpha = -5/3 \).

- 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 $(\theta, \phi, \psi, \iota) = (\pi/2.3, \pi/5, \pi/3, \pi/6)$

Error in total mass: $100 \times \Delta v / v$

Error in mass ratio:
BNS at 180 Mpc ($\theta, \phi, \psi, \iota$)\(=\left(\frac{\pi}{2.3}, \frac{\pi}{5}, \frac{\pi}{3}, \frac{\pi}{6}\right)\)

Error in total mass: \(100 \times \Delta M/M\)
Signal-to-noise ratio build up in time for binary neutron stars: ALIGO/ADV

Face-on 200 Mpc, 40 s to merger SNR=8

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

Face on $z=0.4$, **75 s before merger** SNR=8

Single detector SNR
HILV Angular resolution 1 min before merger

$\Delta \Omega$ at ($f=30\text{Hz}, t_\text{c}=-60\text{s}, \tau=20\text{ deg}$) for HILV
OBSERVING SCENARIO

1. Gravitational wave detectors produce a trigger 30 s before merger.

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

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

4. XRT instruments follow-up prompt X-ray emission.