Binary NS coalescences 1.4Mo / 1.4 Mo

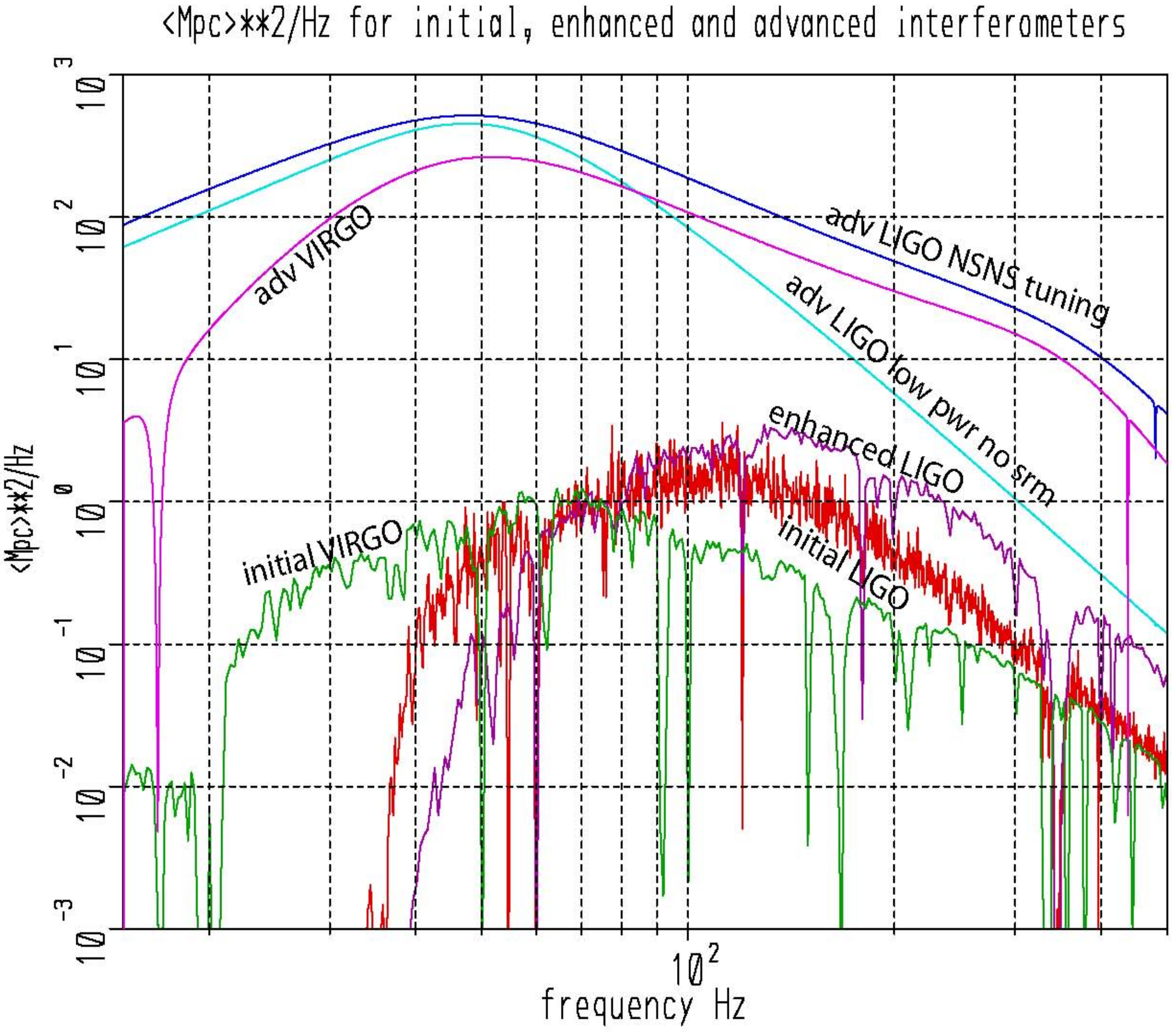
Strain vs time

$$h(t) = \frac{2G}{Rc^4}\left(\frac{m_1 m_2}{m_1 + m_2}\right)(\pi G(m_1 + m_2)f(t))^{\frac{2}{3}} = 1.8\times10^{-23} \quad f = 100\text{Hz} \quad R = 100\text{Mpc}$$

$$f(t) = \frac{1}{\pi}\left(\frac{5}{256\tau}\right)^{\frac{3}{8}}\left(\frac{c^3}{G\,M_{chirp}}\right)^{\frac{5}{8}} = \frac{134\text{Hz}}{\tau^{\frac{3}{8}}} \quad M_{chirp} = \frac{(m_1 m_2)^{\frac{3}{5}}}{(m_1 + m_2)^{\frac{1}{5}}} \quad \tau = (t_{end} - t)$$

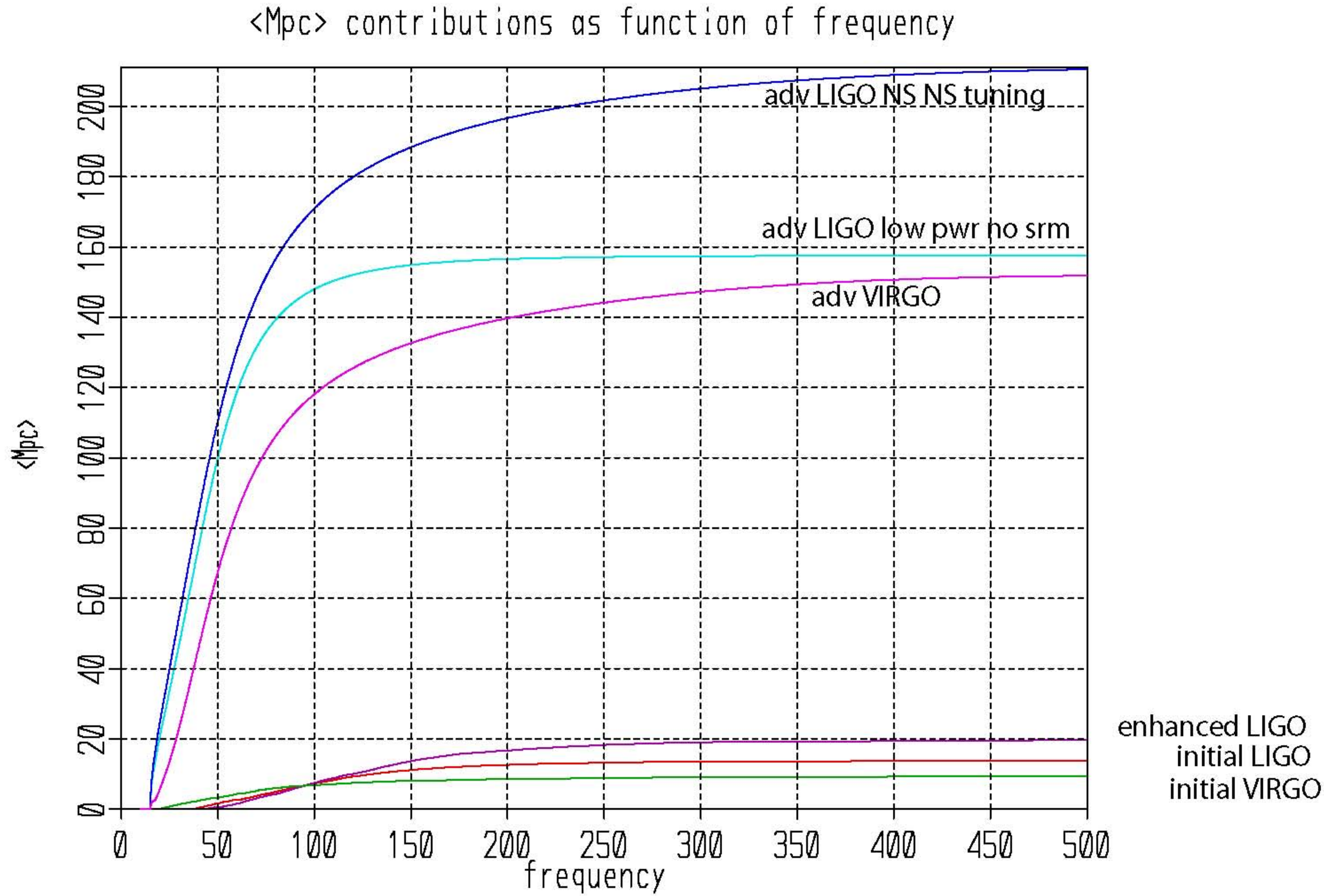
Frequency spectrum

$$h(f) = \frac{1}{\pi^{\frac{2}{3}}}\sqrt{\frac{5}{24}}\left(\frac{c}{R}\right)\left(\frac{G\,M_{chirp}}{c^3}\right)^{\frac{5}{6}}\left(\frac{1}{f^{\frac{7}{6}}}\right) = \frac{9.1\times10^{-22}}{f^{\frac{7}{6}}}\text{strain/Hz} \quad R = 100\text{Mpc}$$



$$h_{signal}(f) = \sqrt{h_x^2(f) + h_+^2(f)}$$

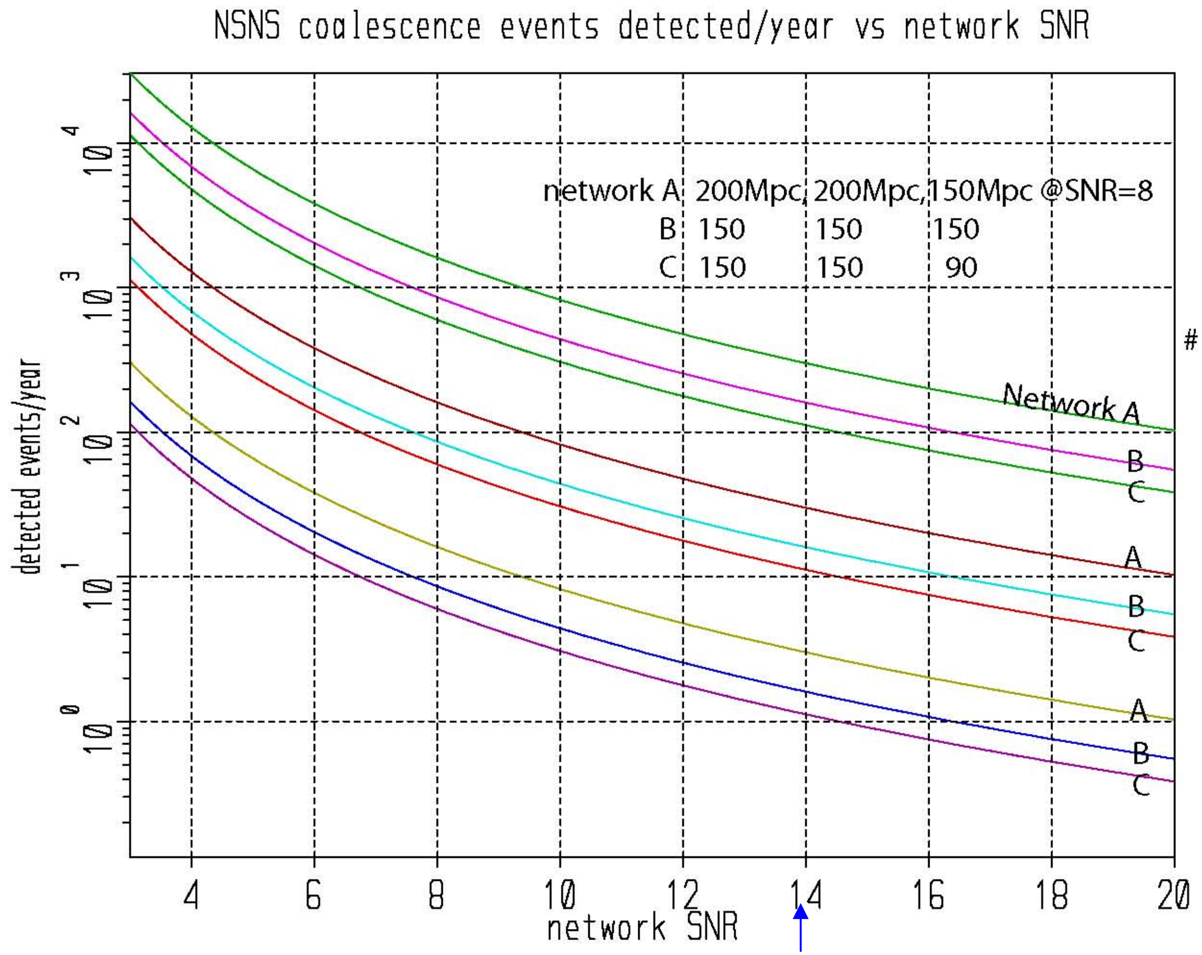
$$SNR^2 = 2\int_0^\infty \frac{h_{signal}^2(f)}{h_{noise}^2(f)} df$$


<Mpc> contributions as function of frequency
<Mpc>
0
20
40
60
80
100
120
140
160
180
200
0
50
100
150
200
250
300
350
400
450
500
frequency
adv LIGO NS NS tuning
adv LIGO low pwr no srm
adv VIRGO
enhanced LIGO
initial LIGO
initial VIRGO

Conditions:

False alarm rates reduced to Gaussian statistics.

Coherent detection



$MWEG/Mpc^3 = 0.012$

insp./MWEG/Myr

1000

100

10

SNR = 8/det

$$\text{NSNS events/year} = \frac{4\pi}{3}\left(\frac{8}{\text{SNR}_{\text{network}}}\sqrt{\sum_{1}^{n\,\text{det}}\langle \text{R(Mpc)}\rangle_{\text{SNR}=8}^{2}}\right)^{3}\left(\frac{\text{MWEG}}{\text{Mpc}^{3}}\right)\left(\frac{\#\text{NSNS insp}}{\text{MWEG/yr}}\right)$$