Constrainig the distance to inspiraling binares with Einstein Telescope

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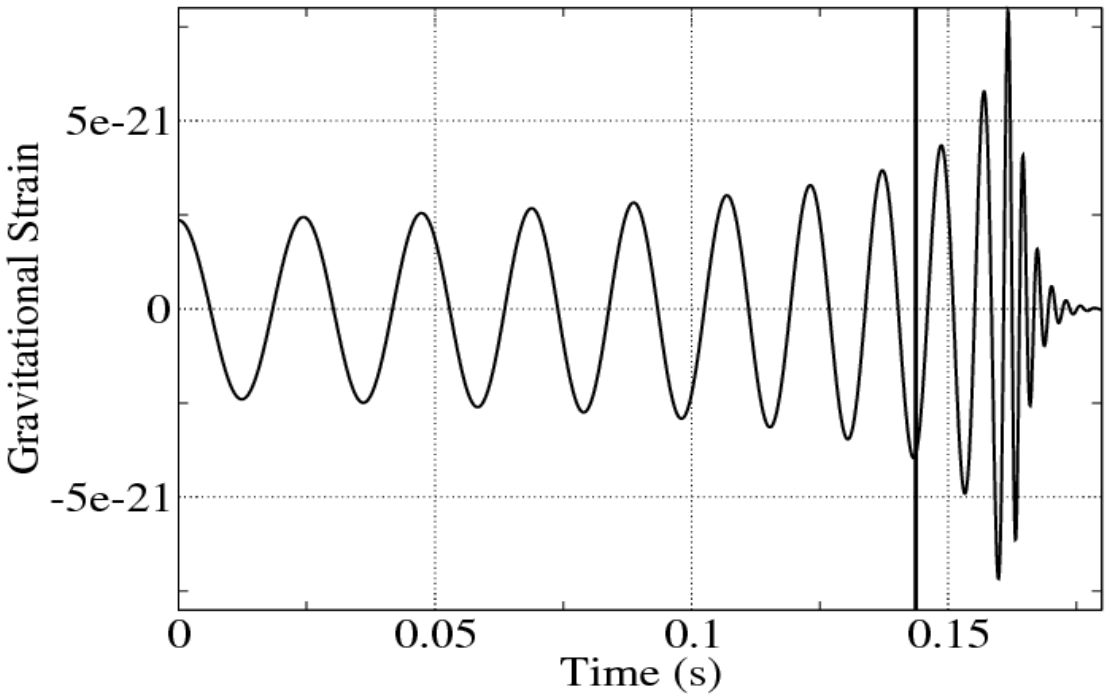
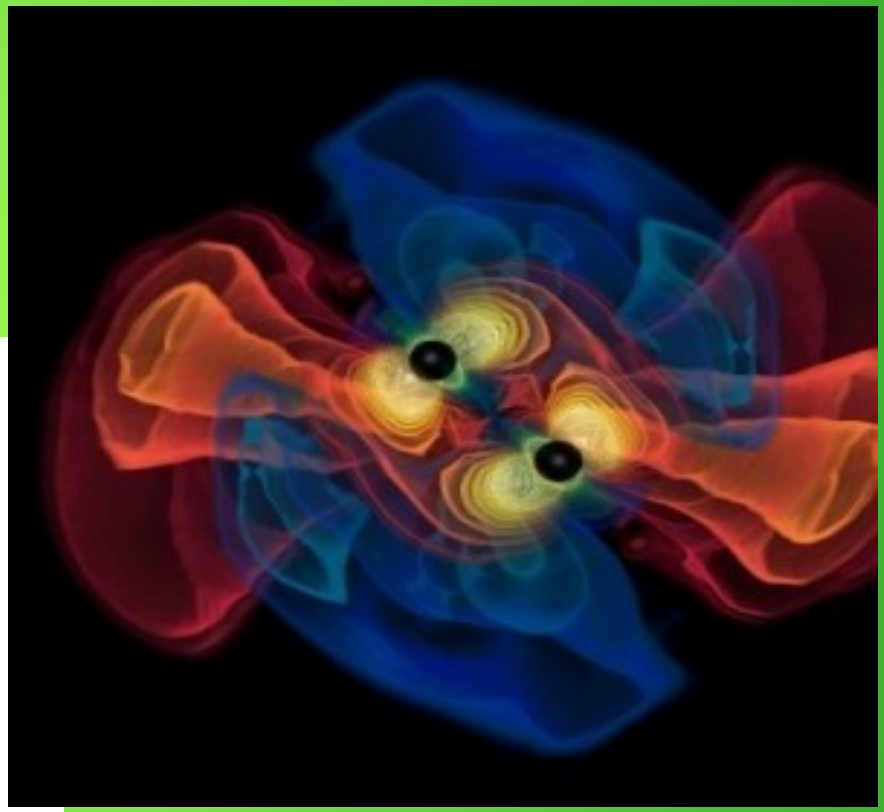
Gravitational waves from compact binares



(Abadie, J. et al.) Phys.Rev. D83 (2011) 122005



Max Planck Institute for Gravitational Physics

Signal to noise ratio

$$SNR \sim \frac{\Theta}{d_L} \left(M_{chirp,z} \right)^{(5/6)} \xi(z)$$

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Luminosity distance

Signal to noise ratio

Signal/detector window

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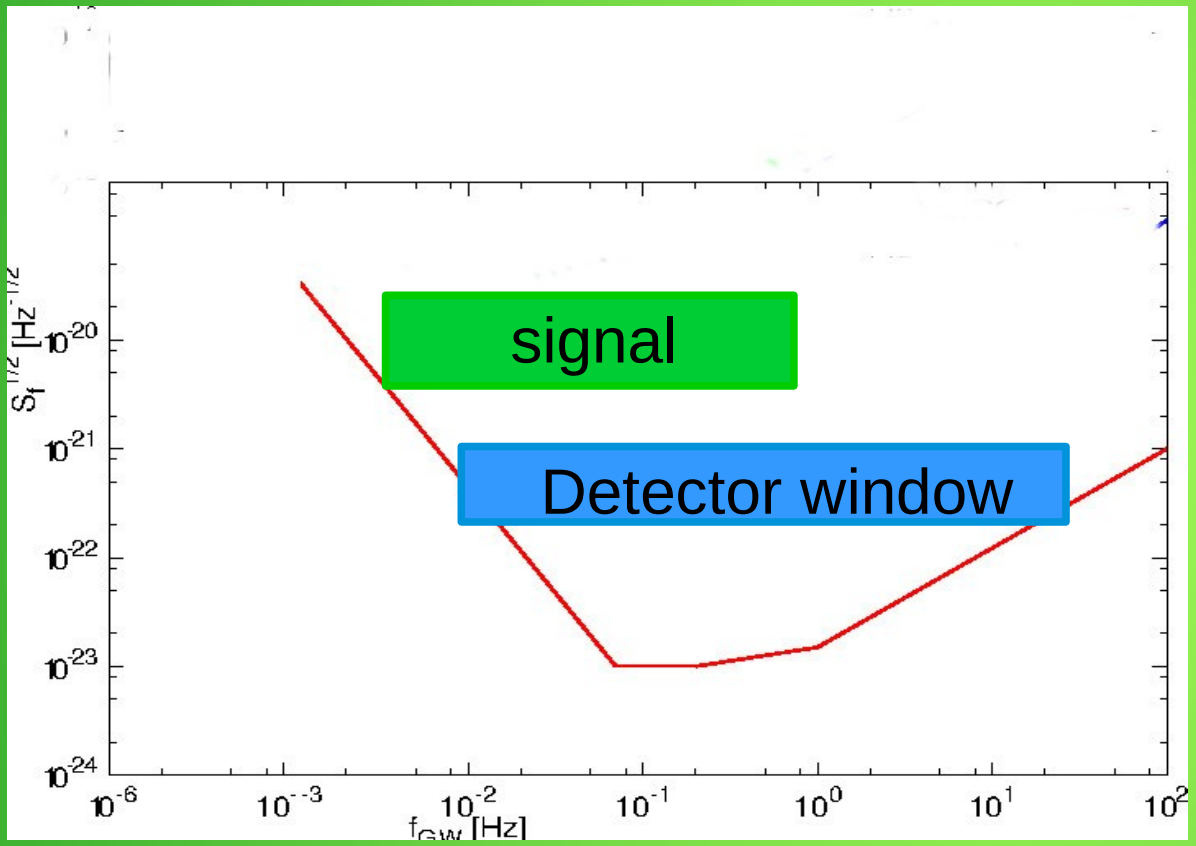


Signal/detector window

$$z)^{(5/6)}\,\xi(z)$$

Luminosity distance

Signal to noise ratio

Signal/detector window

$$SNR \sim \frac{\Theta}{d_L} \left(M_{chirp,z} \right)^{(5/6)} \xi(z)$$

$$\left(1+z\right) M_{chirp}$$

Luminosity distance

$$M_{chirp} = 1.2\, M_{sun}$$

Signal to noise ratio

$$\Theta(\vartheta, \varphi, \Psi, i)$$

Signal/detector window

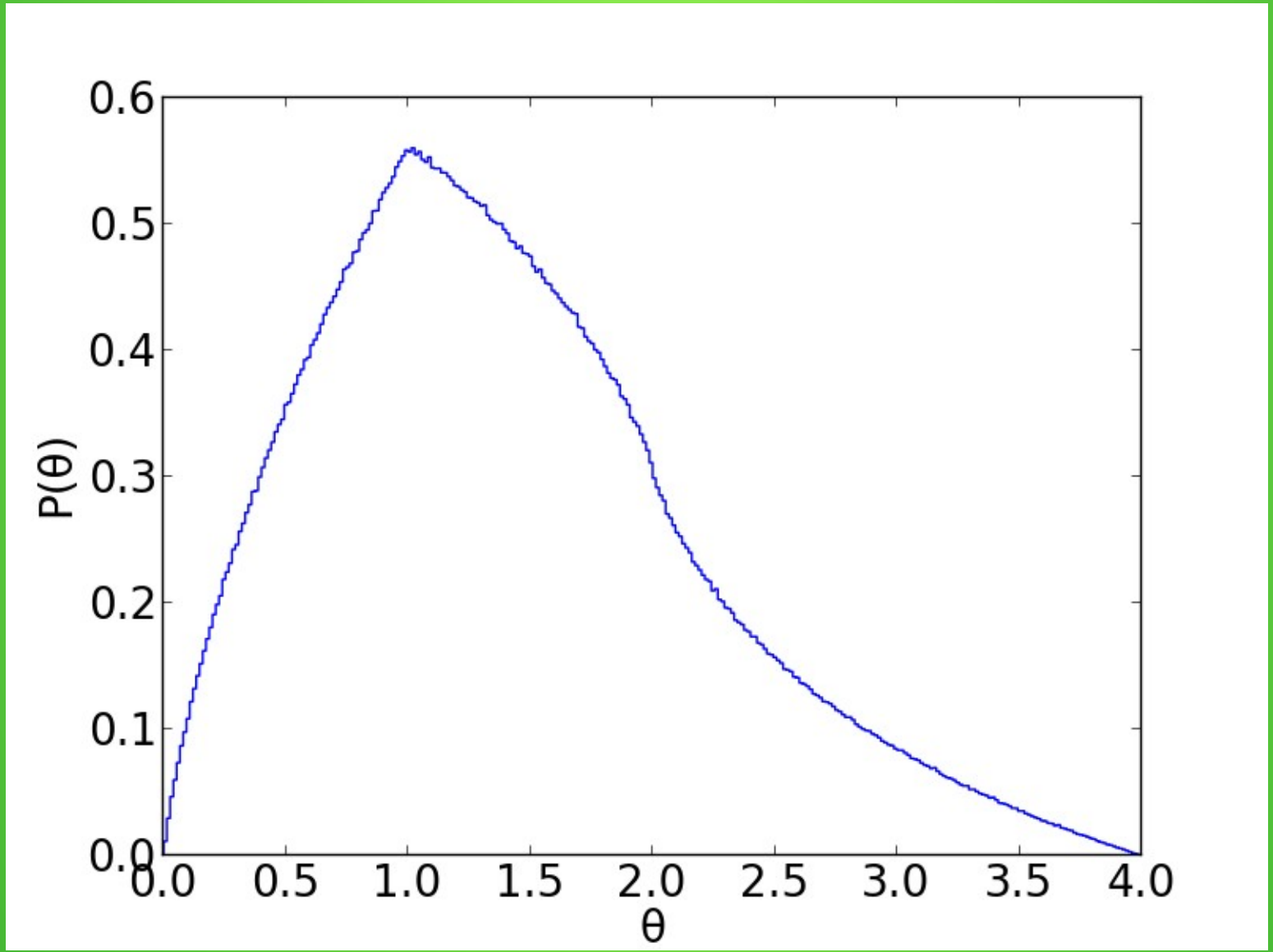
$$SNR \sim \frac{\Theta}{d_L} \left(M_{chirp,z}\right)^{(5/6)} \xi(z)$$

$$(1+z) M_{chirp}$$

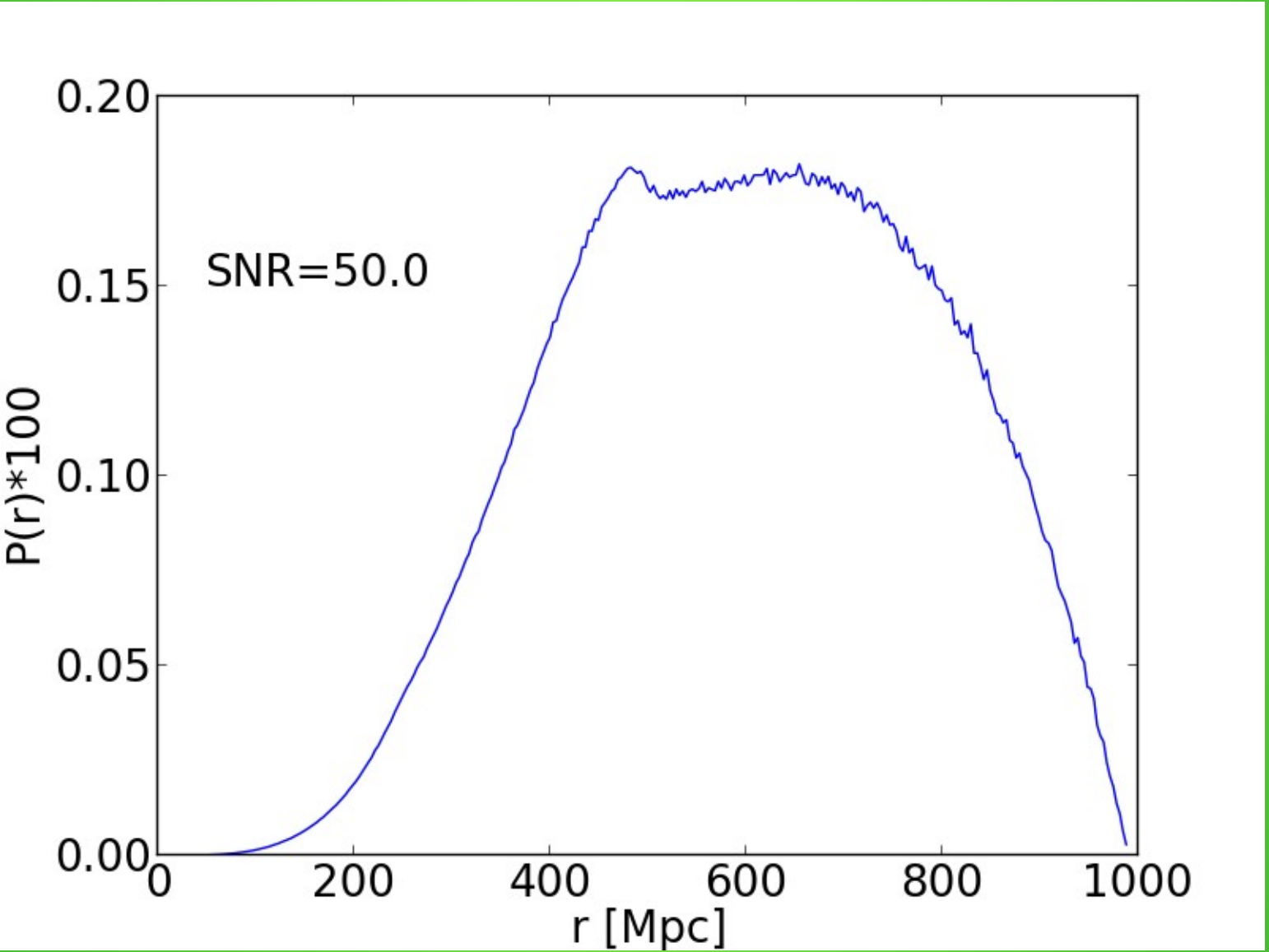
Luminosity distance

$$M_{chirp} = 1.2\, M_{sun}$$

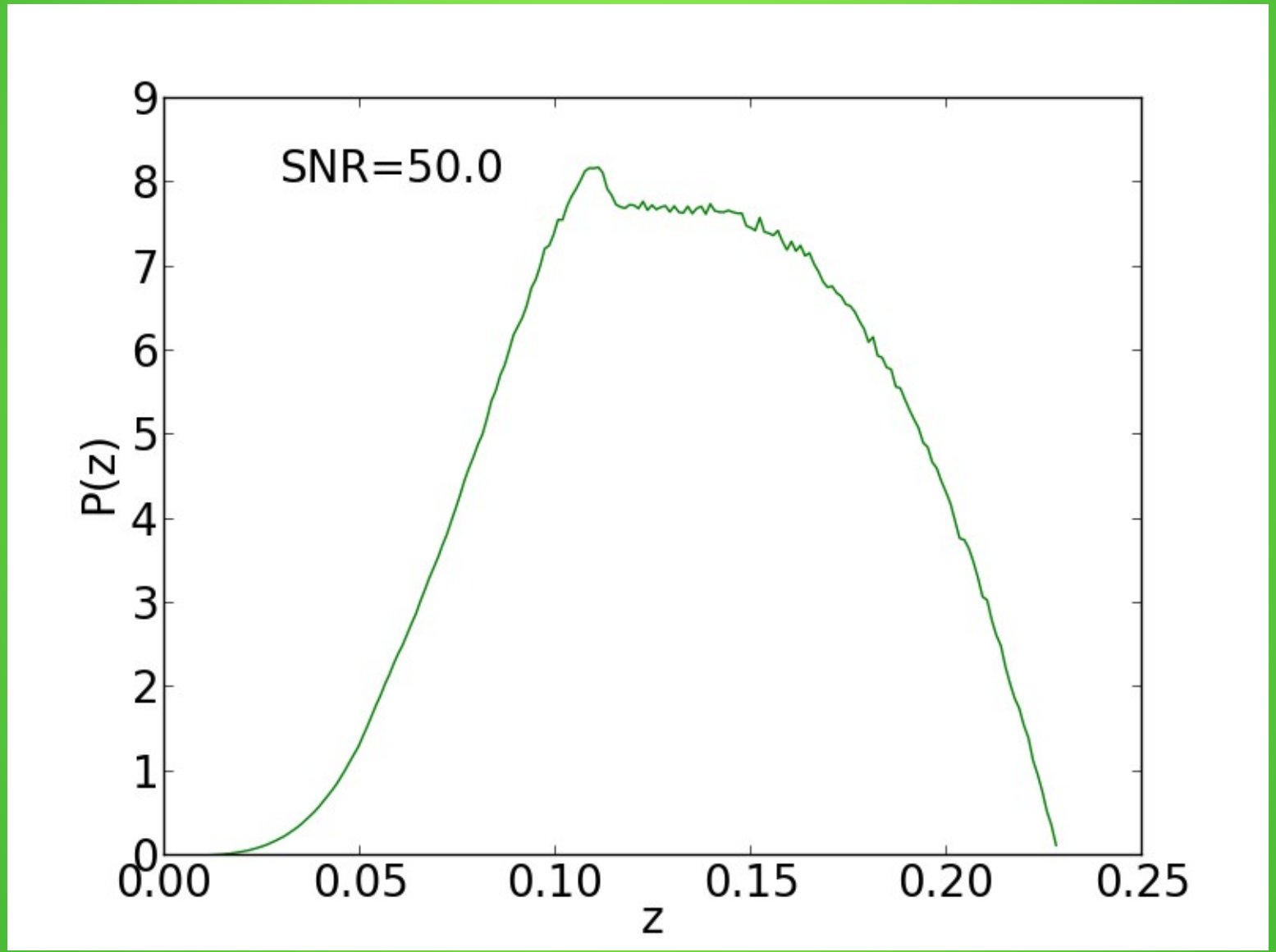
Θ distribution



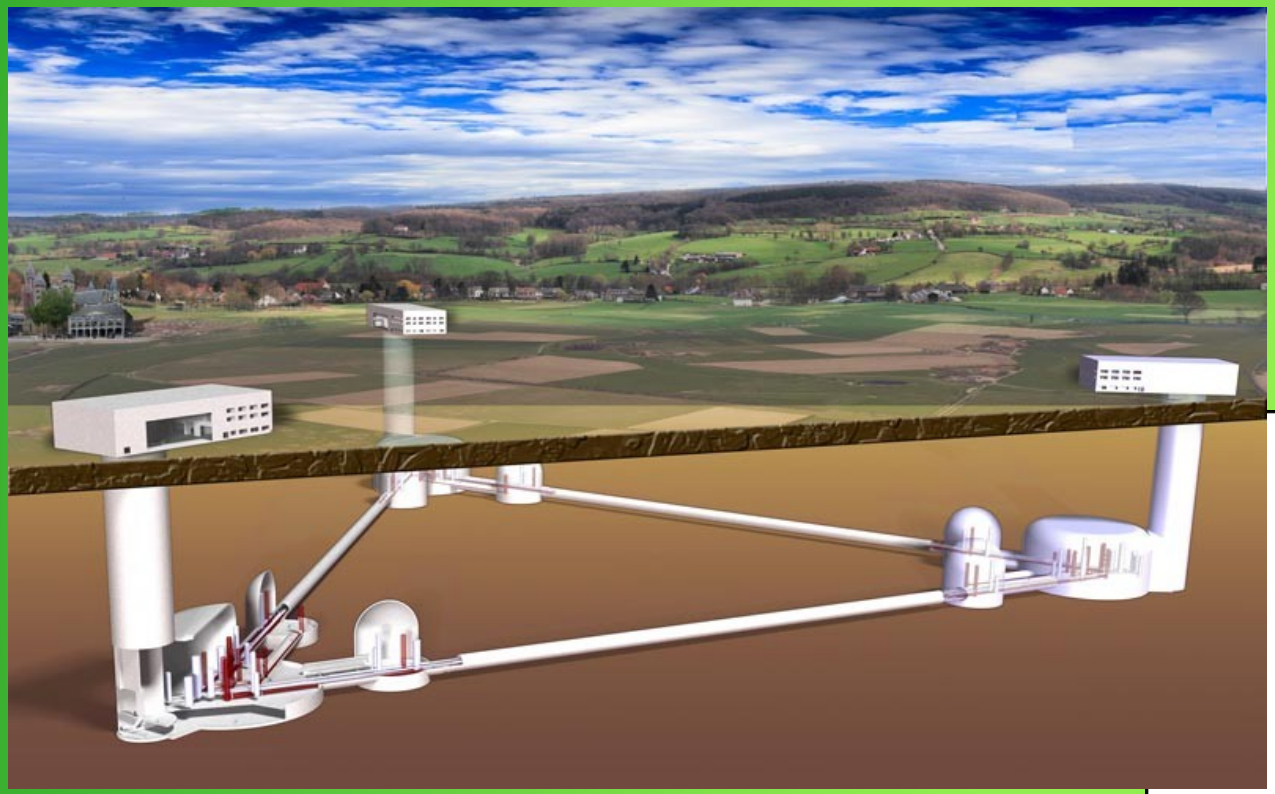
Distance distribution

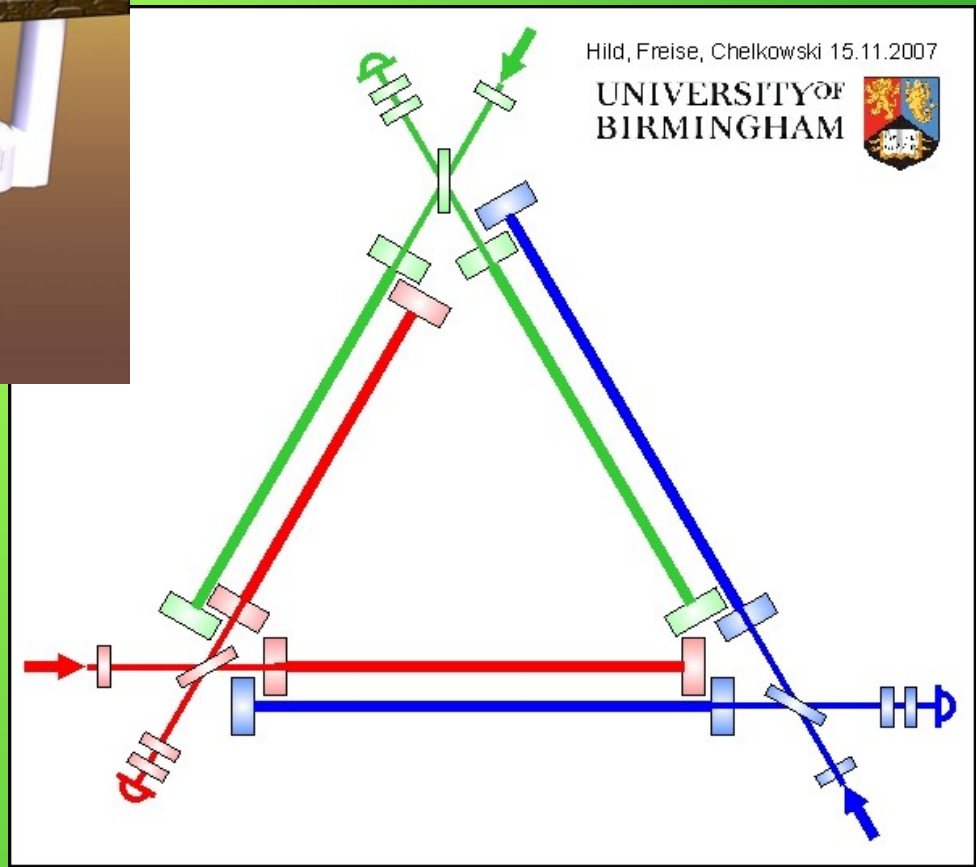


Distance distribution



Einstein Telescope





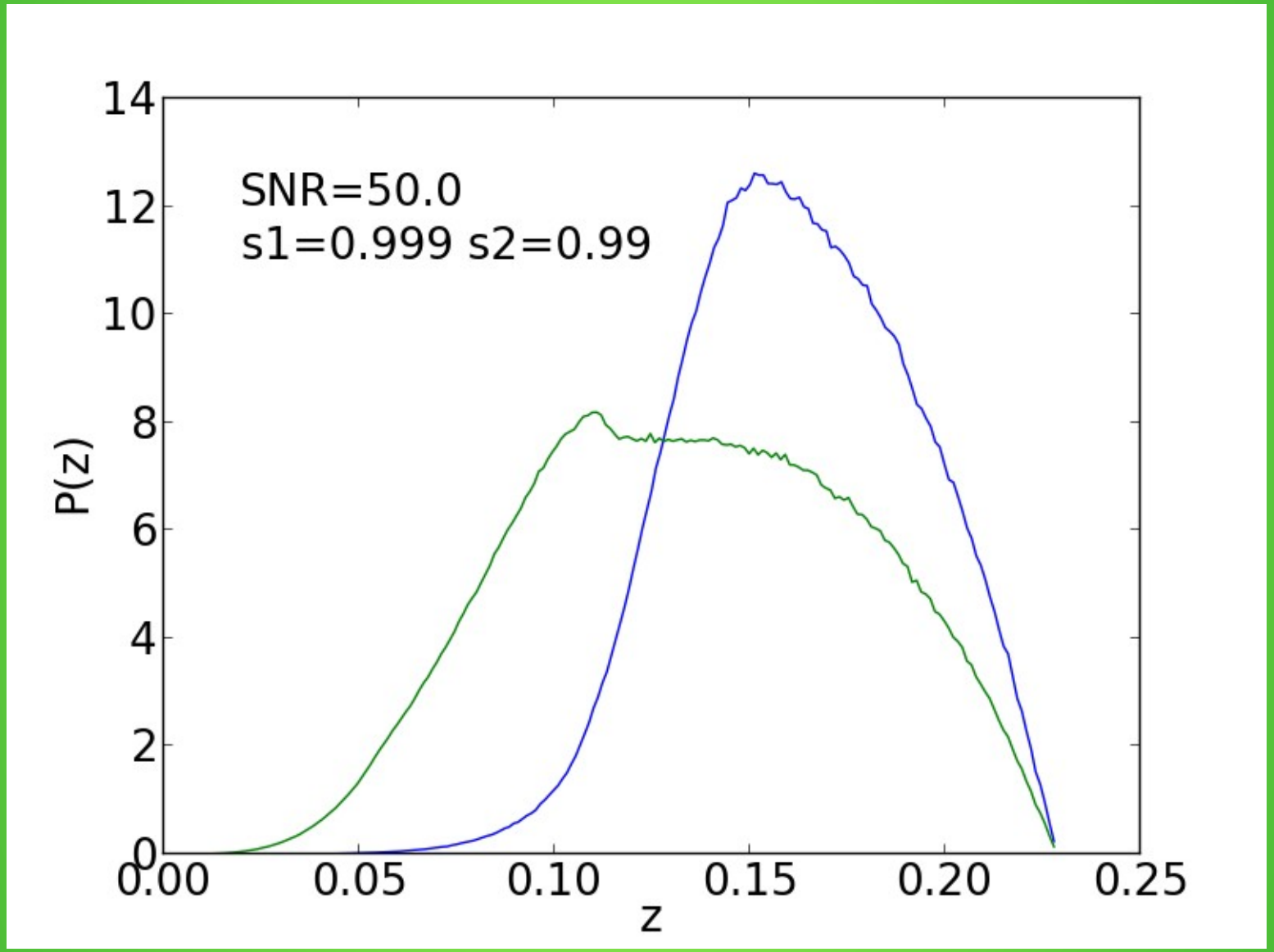
DETECTION

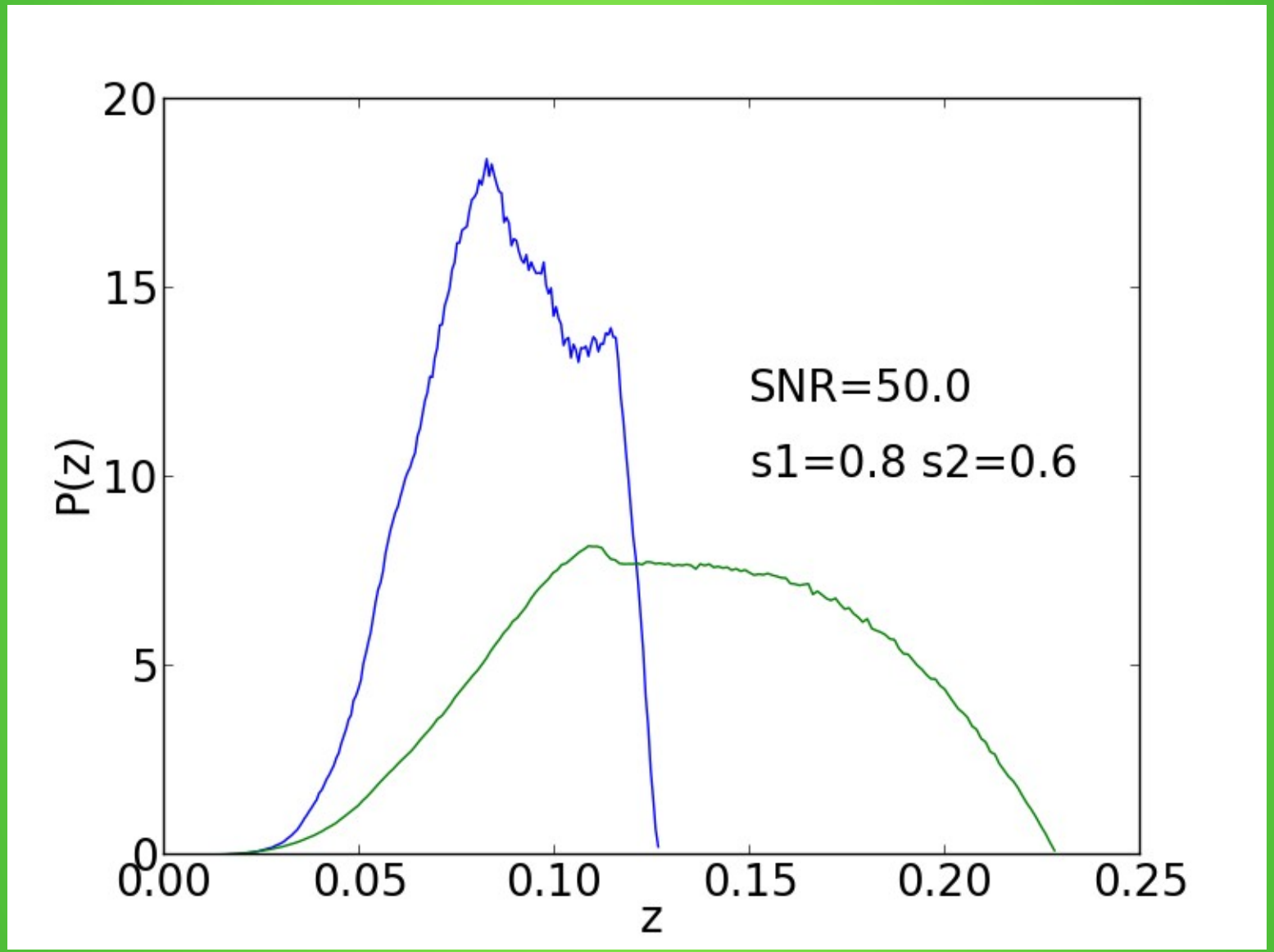
SNR1, SNR2, SNR3

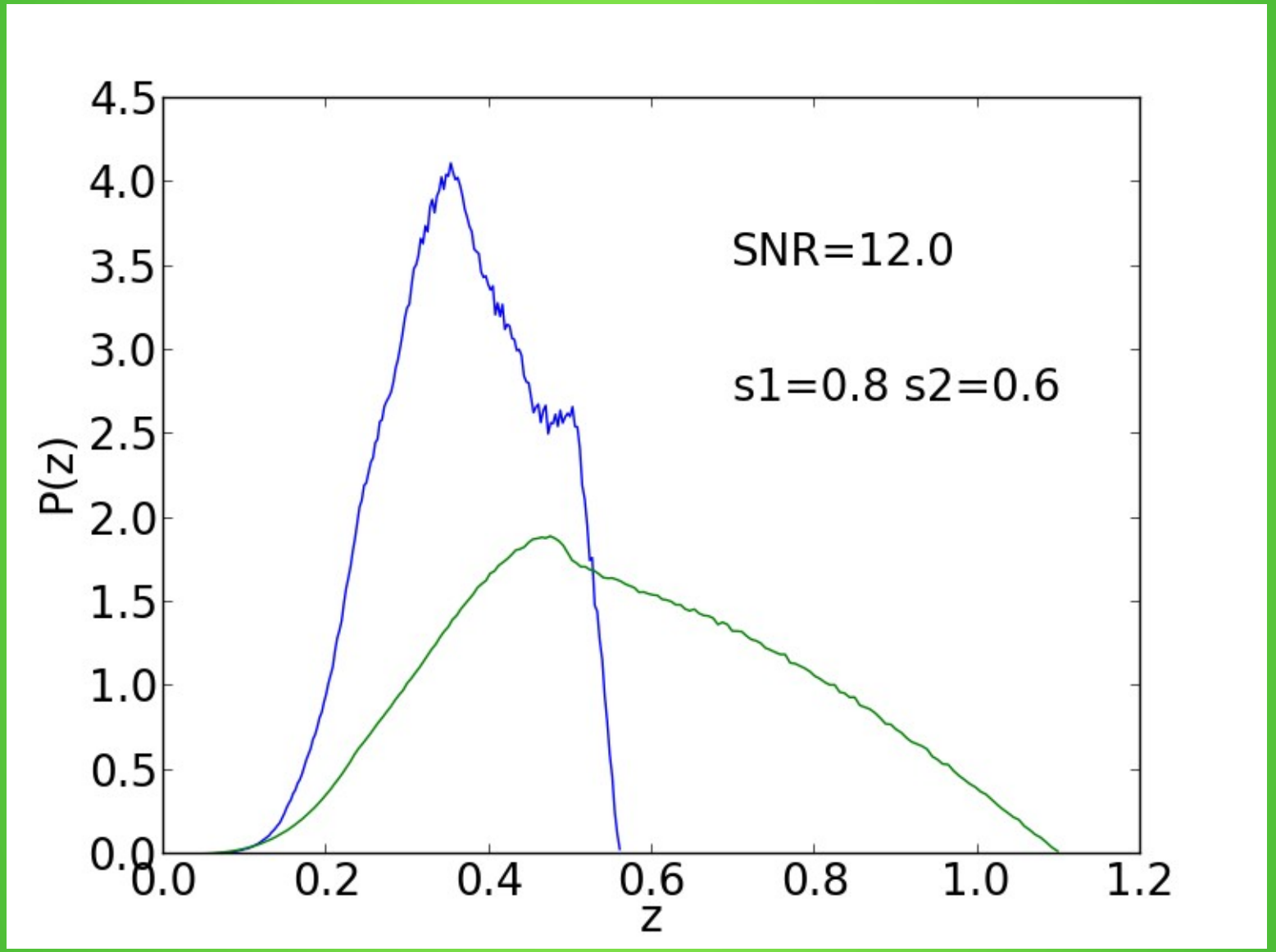
SNRa > SNRb > SNRc

$$s1 = \frac{SNRb}{SNRa}$$

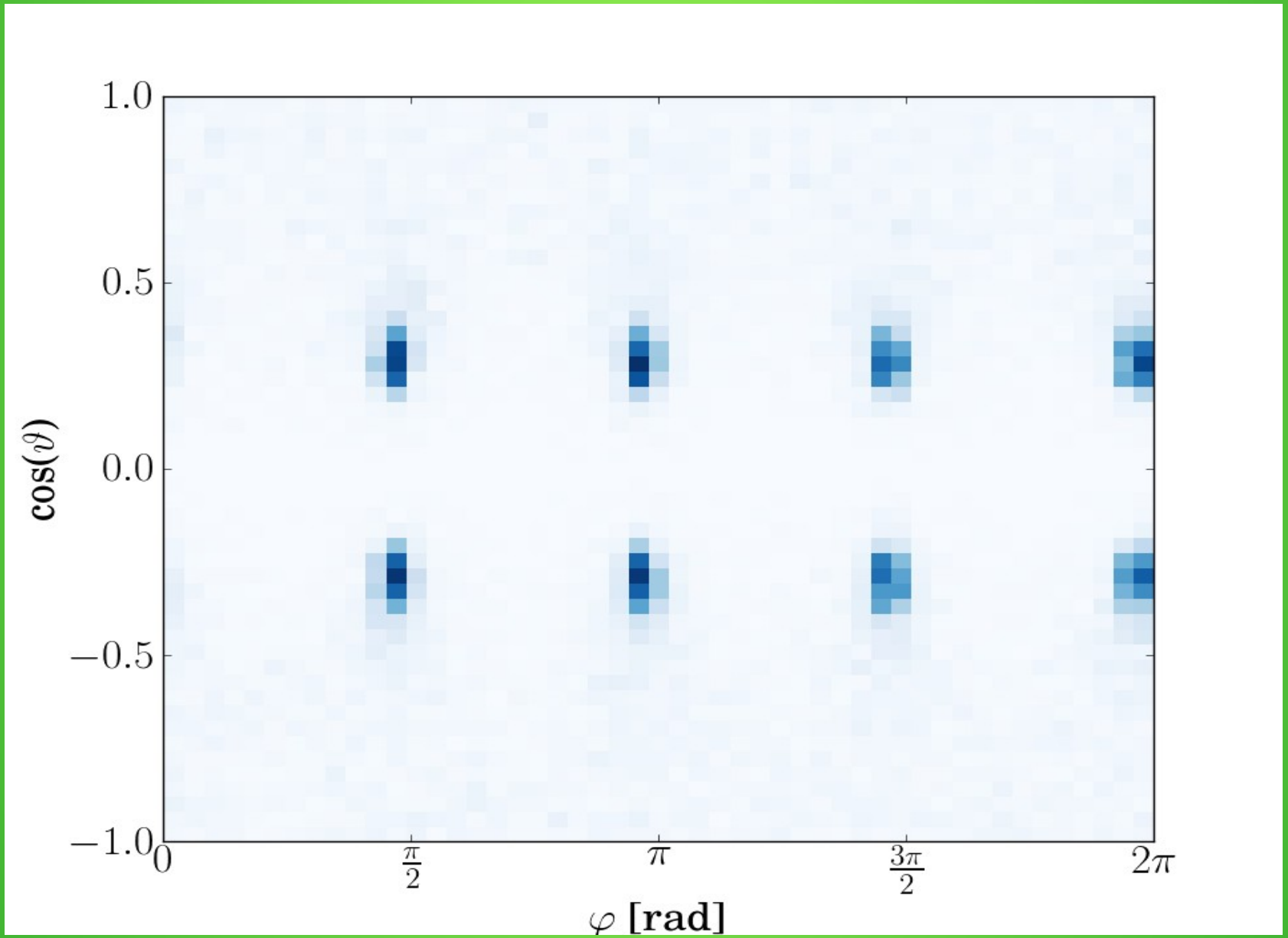
$$s2 = \frac{SNRc}{SNRa}$$


SNR=50.0
s1=0.999 s2=0.99
P(z)
z
0
2
4
6
8
10
12
14
0.00
0.05
0.10
0.15
0.20
0.25


20
15
10
5
0
P(z)
0.00
0.05
0.10
0.15
0.20
0.25
z
SNR=50.0
s1=0.8 s2=0.6


SNR=12.0
s1=0.8 s2=0.6
P(z)
z
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
0.0
0.2
0.4
0.6
0.8
1.0
1.2

Sky localization



Conclusions

- By using 3 colocated interferometers we are able to constrain distance distribution by a factor of 2
- We can constrain possible sky localizations.