



$$\Delta x = c \Delta t$$

$\Delta t$  is known  
 $d$  is known

$$\sin \theta = \frac{\Delta x}{d}$$

$$\cos \theta \delta \theta = \frac{\delta \Delta n}{d} \quad \cos \theta = \sqrt{1 - \frac{\Delta x^2}{d^2}}$$

$$\Rightarrow \delta \theta = \frac{\delta \Delta n}{d} \left(1 - \frac{\Delta x^2}{d^2}\right)^{-1/2}$$

Uncertainty in position

$$\chi^2 = d^T N^{-1} d - \text{SNR}^2$$

We want  $\Delta \chi^2 = 1$

Assuming that  $\chi^2$  changes only because of change in SNR



Moving the template slightly doesn't affect  $\chi^2$  very much

$$|\Delta x^2| = |\Delta \text{SNR}^2| \approx 1$$

find the time where  $\text{SNR}^2$  changes by 1. that's error for detector 1

$$\delta t_{\text{TOTAL}} = \sqrt{e_1^2 + e_2^2}$$