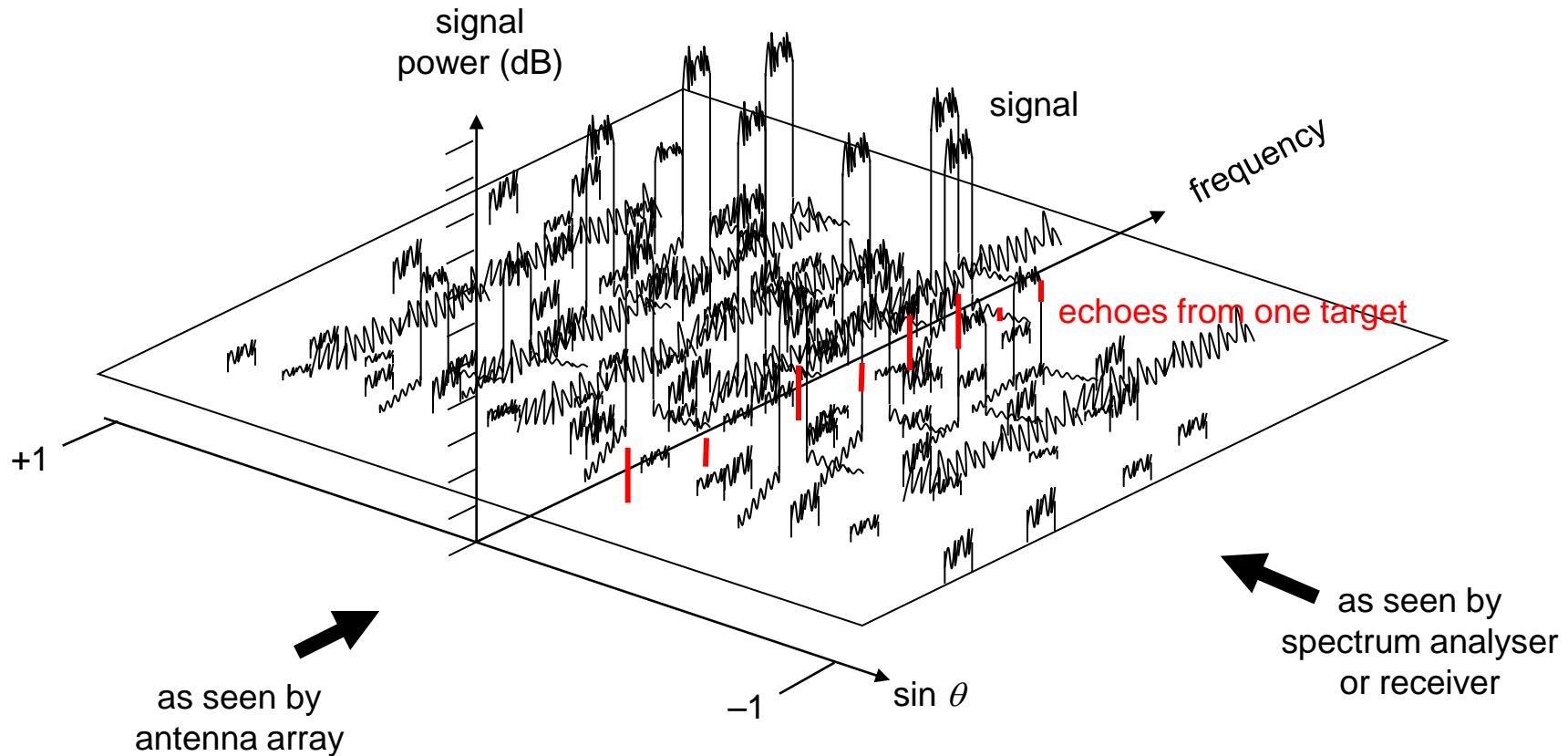


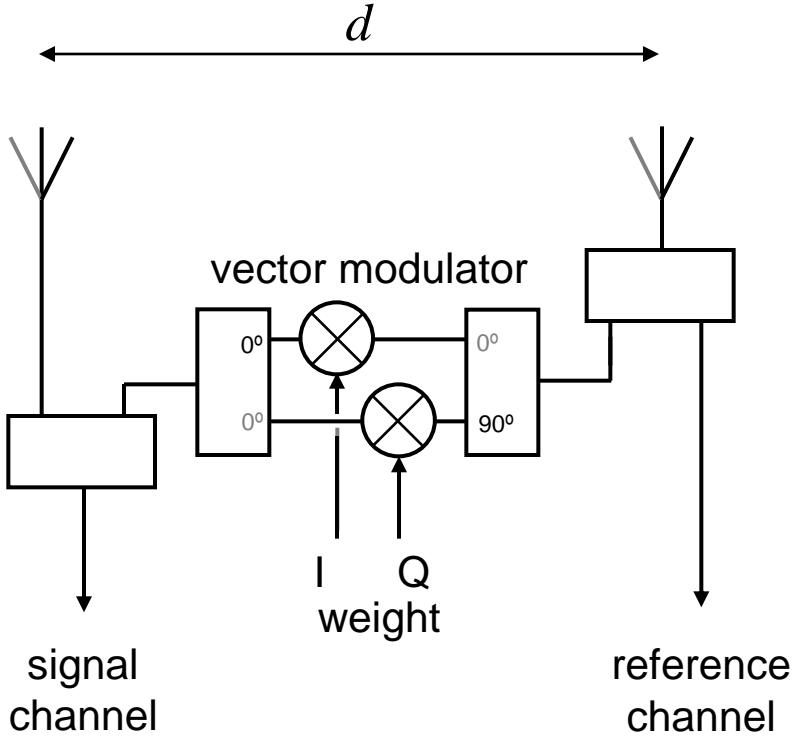
5.1 MatLab session on *Direct signal cancellation*

1. The interference environment
2. Analogue cancellation
3. The Colone algorithm
4. Implementation methods

Noise and interference



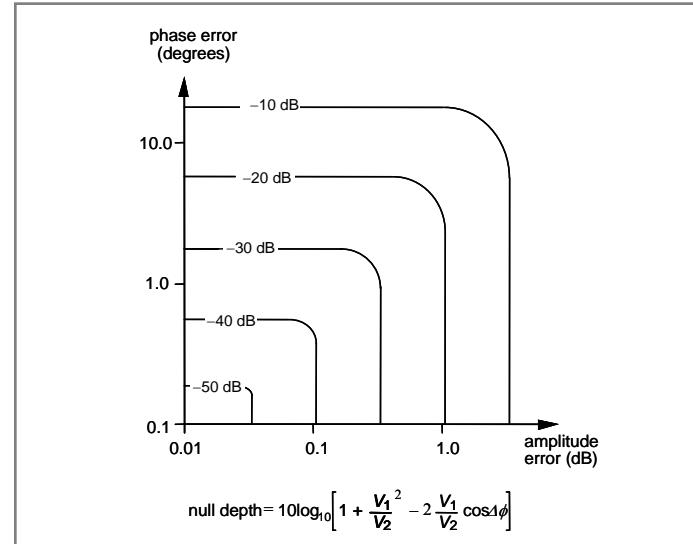
Null steering



$$\hat{W} = -\exp\left(-j \frac{2\pi d}{\lambda} \sin \theta_B\right)$$

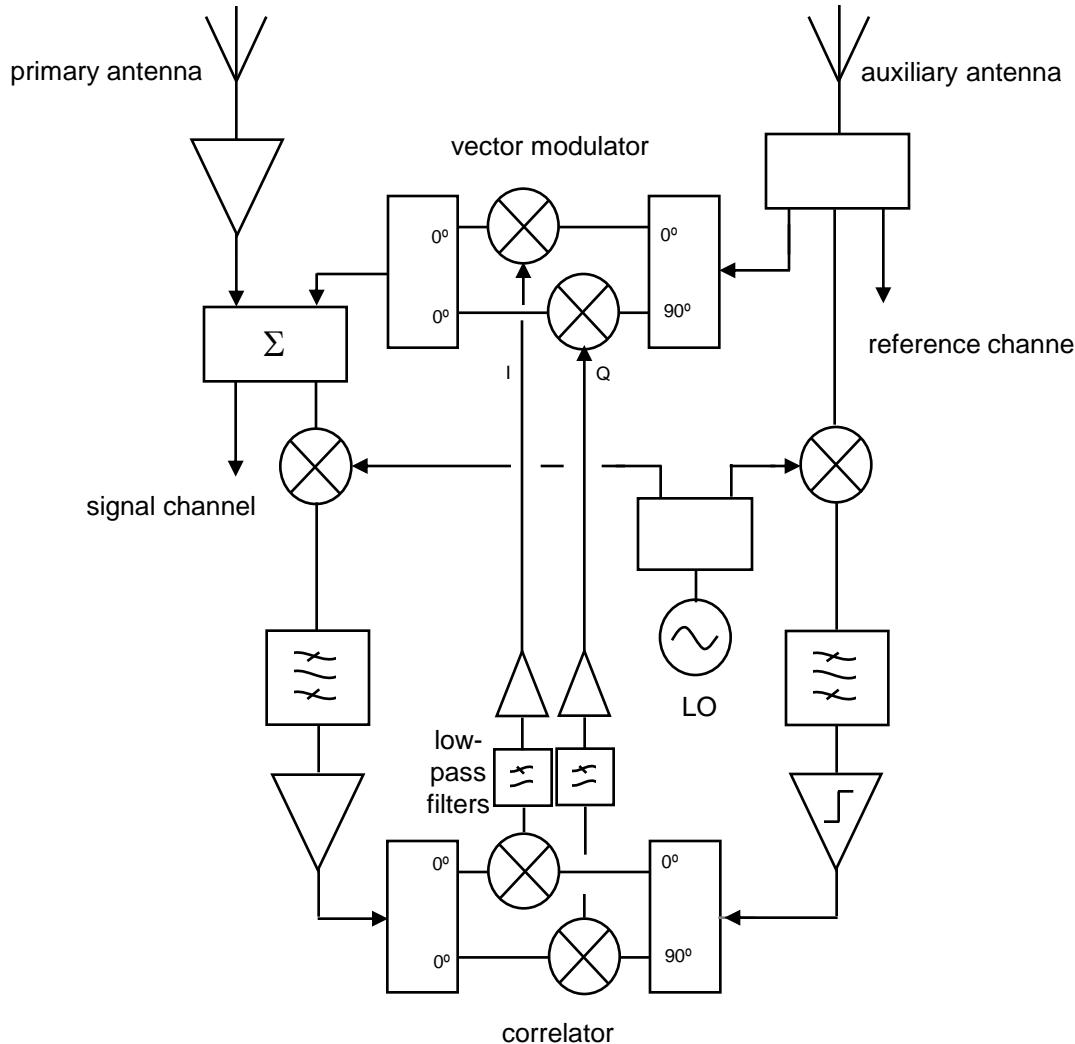
$$\begin{aligned} F(\theta) &= 1 + \hat{W} \exp\left(j \frac{2\pi d}{\lambda} \sin \theta\right) \\ &= 1 - \exp\left[j \frac{2\pi d}{\lambda} (\sin \theta - \sin \theta_B)\right] \\ &= 2 j \sin\left[\frac{\pi d}{\lambda} (\sin \theta - \sin \theta_B)\right] \end{aligned}$$

cardioid pattern
with null at $\theta = \theta_B$



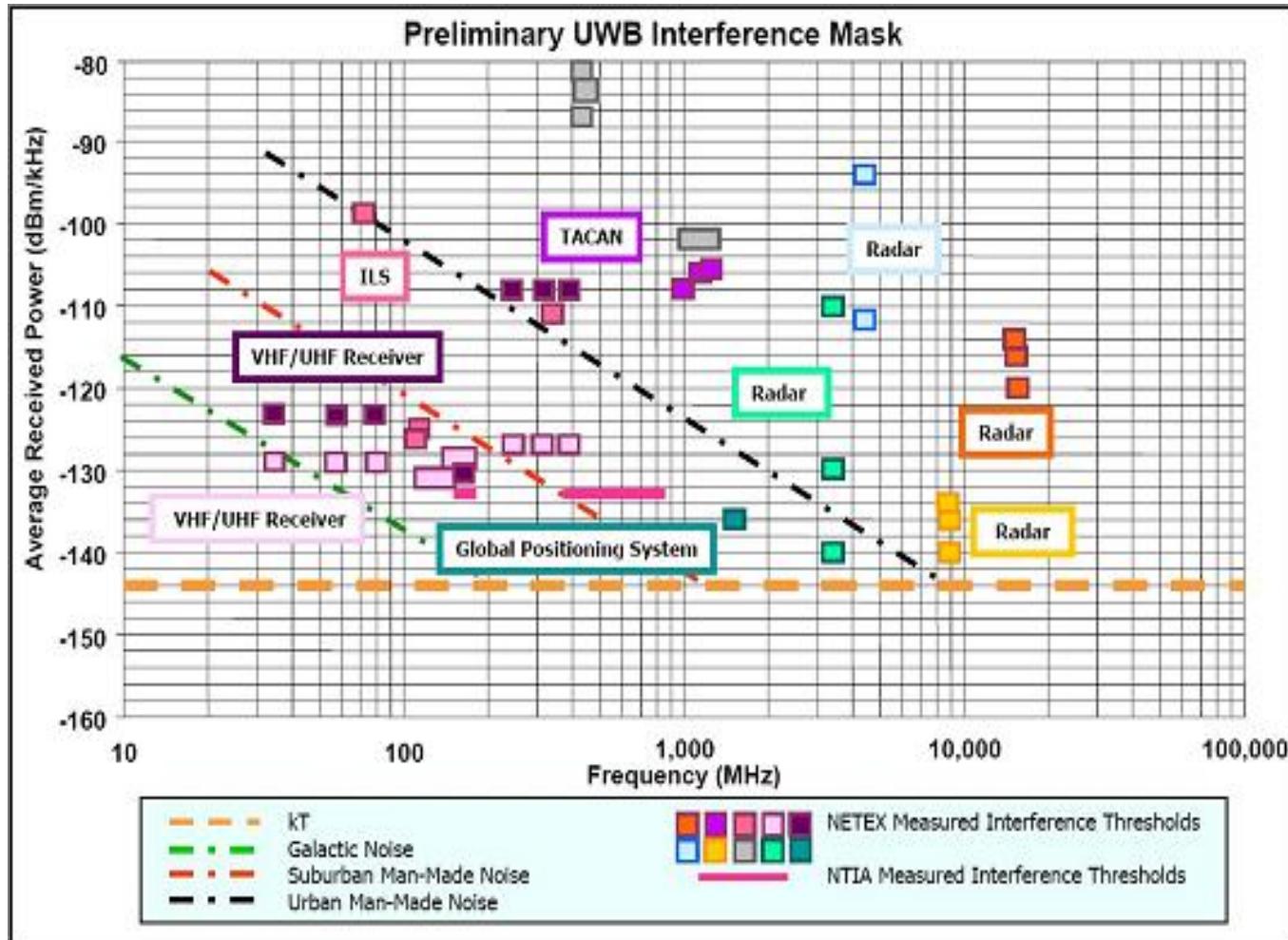
null depth vs weight accuracy

Null steering – Howells-Applebaum correlation loop



- Can use a circular antenna array to give full 360° coverage, using phase modes as inputs to processor rather than element signals
- Readily extended to more than one degree of freedom

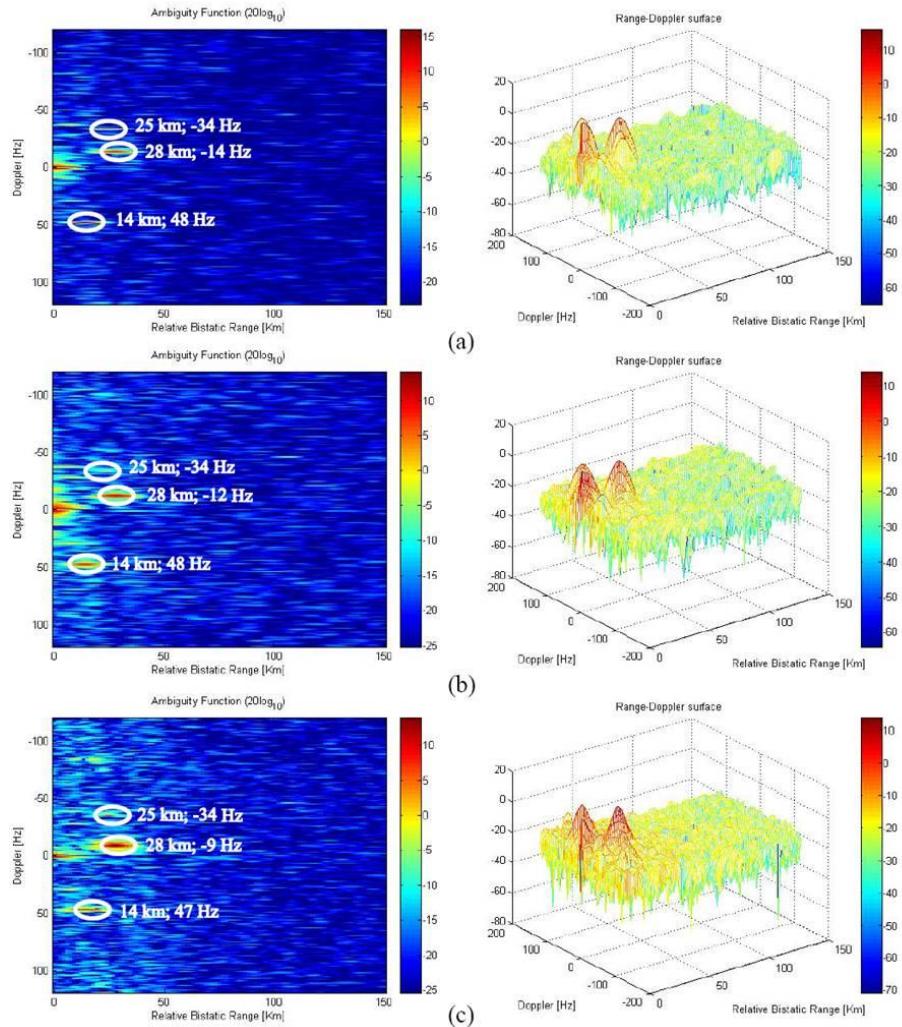
Noise and interference



Direct Signal Suppression

Here we explore one well-known algorithm for Direct Signal Suppression – due to Colone et al.

The approach may be understood by visualizing the signal and multipath environment in the range-Doppler plane. It is assumed that a clean reference version of the direct signal is obtained via a separate antenna and receiver which is free of multipath.



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