

1. Problem

Goal: satisfy requirements of single target localization by radar network for the entire strategic area



Challenges

3. Results

Signal model

$$s(t) = e^{j(\omega_c t + \frac{\omega_w}{T_s} t^2 - (k-1)T_s)}$$

ω_c - central frequency (rad/s)
 T_s - sweep time; SNR - signal to noise ratio;
 M - number of bursts; k - burst number

CRLB for FMCW radar

$$\text{Var}(r) = \frac{3}{8} \frac{1}{\lambda^2 \Delta f^2 \text{SNR}}$$

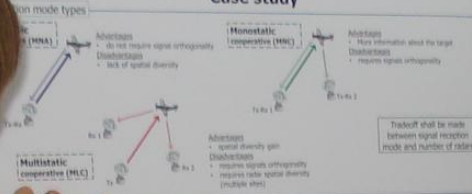
error variance of time delay measurement

$$\text{Var}(w_d) = \frac{6}{T_s^2 M^2 \text{SNR}}$$

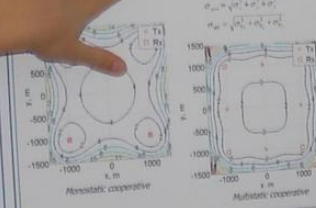
error variance of Doppler frequency measurement

signal fading is taken into account

Case study

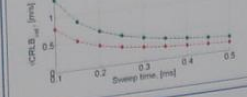
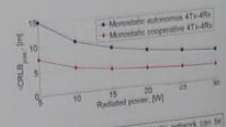
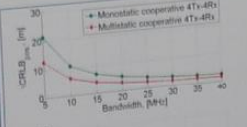


Localization error distribution, [m]



Ratio of localization errors for different types of the systems (for target heights 10-100 [m]):
 $\sigma_{MLC} / \sigma_{MNA} \approx 2$
 $\sigma_{MNC} / \sigma_{MNA} \approx 1.7$

Cooperative mode of signal reception allows increasing measurement accuracy
Spatial diversity in multistatic network allows increase measurement performance without increasing number of radars



Lack of spatial diversity in monostatic network can be compensated by optimization radar parameters
To compensate for cooperative signal reception increasing of radiated power can be applied

4. Conclusions

- We have shown that:
1. Multistatic system possesses up to 50% better measurement accuracy compared to monostatic one.
 2. Cooperative mode of signal reception gives up to 2 times less measurement error compared to autonomous one.
 3. Change of parameters of each radar in the network allows increasing of measurement accuracy without changing system reception mode and configuration.