



18

# Performance analysis of multisite radar systems



I. Iovkovic, D. Krauss, A. Vahine  
Delft University of Technology, The Netherlands  
E-mail: i.i.vovkovic@tudelft.nl, d.a.krauss@tudelft.nl, a.vahine@tudelft.nl

## 1. Problem

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



### Challenges

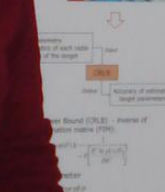
Nonlinear measurement accuracy  
Number of radars (system cost)  
Multiple parameters of optimization

### Scope

Decrease number of radars & use noncooperative mode  
Decrease number of radars & use cooperative mode

## 2. Approach

Performance metric



## 3. Results

Signal model

$$s(t) = e^{j2\pi f_c t} \sum_{k=1}^K a_k e^{j2\pi f_d t} e^{j2\pi f_r t}$$

$f_c$ : carrier frequency,  $f_d$ : Doppler shift,  $f_r$ : range rate,  $a_k$ : number of targets,  $K$ : total number

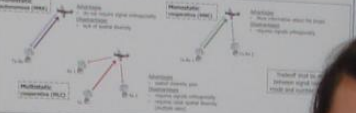
CRLB for FMCW radar

$$\text{Var}(t) = \frac{1}{8\pi^2 f_c^2 P_r \sigma^2}$$

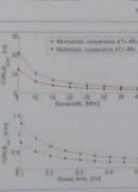
$$\text{Var}(R) = \frac{1}{4\pi^2 f_c^2 P_r \sigma^2}$$

signal fading is taken into account

### Case study



Maps of localization error distribution, [m]



## 4. Conclusions

- 1. Multisite system system presents up to 50% better measurement accuracy
- 2. Cooperative mode of signal reception shows up to 2 times better measurement accuracy
- 3. Change of parameters of each radar in the network allows increasing of system reception mode and configuration

TU Delft

Challenge the future

