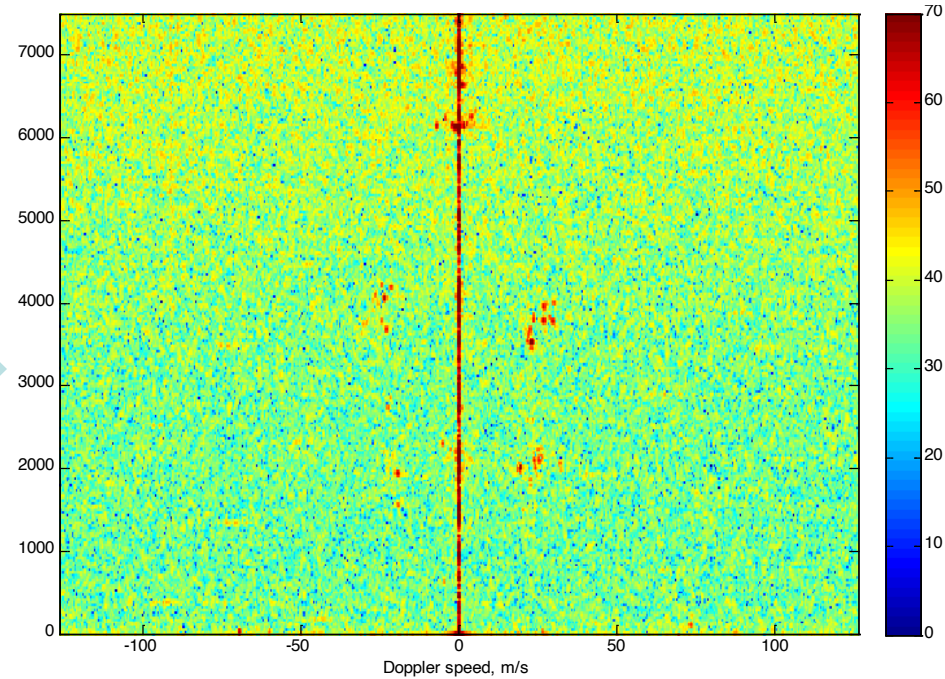
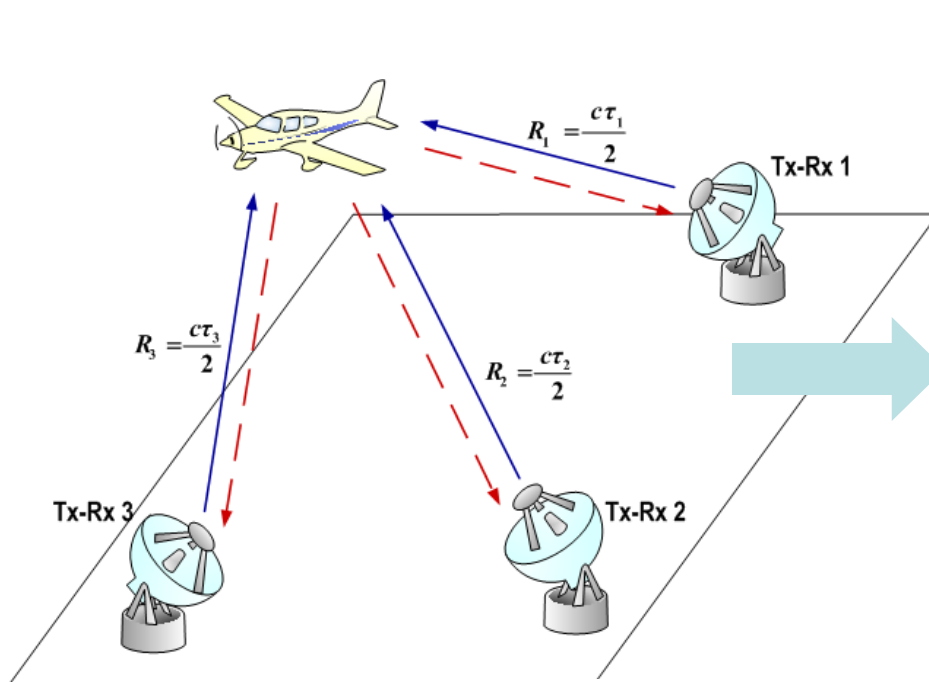


# **Forward Model of Radar Signals in the distributed radar system**

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05.10.2012*

# Forward Model of Radar Signals for every single node of the system



Given:

- \* radar system 3D geometry,
- \* targets 3D position and velocity,
- \* radar nodes characteristics

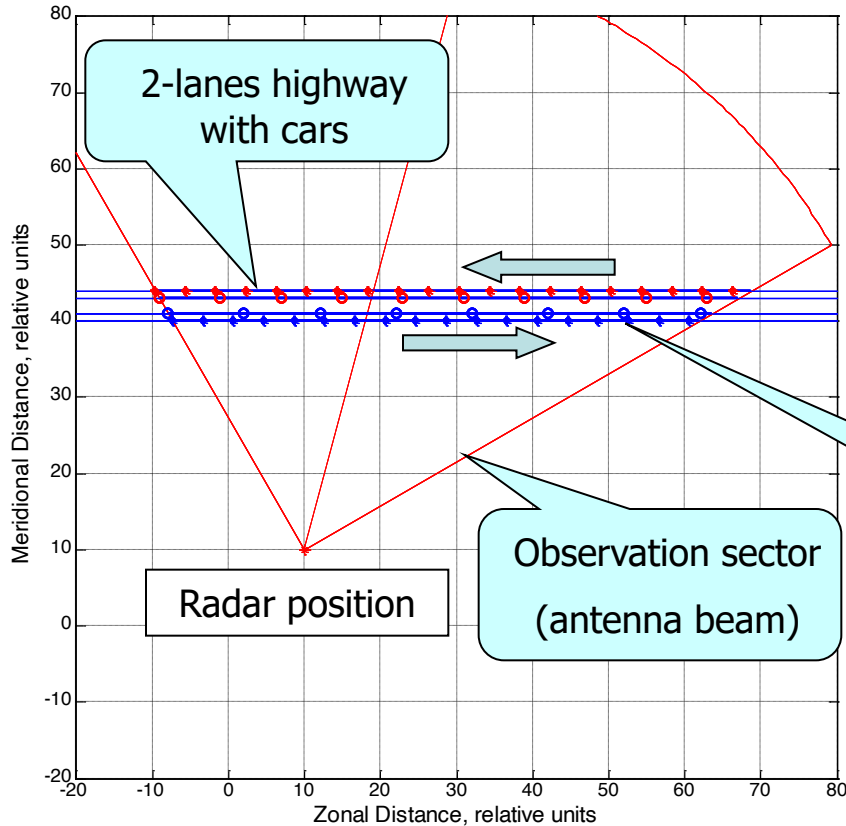
Goal:

- \* radar signals for every single node of the system
  - \* on Range-Doppler plane
  - \* input for raw-signals parameters

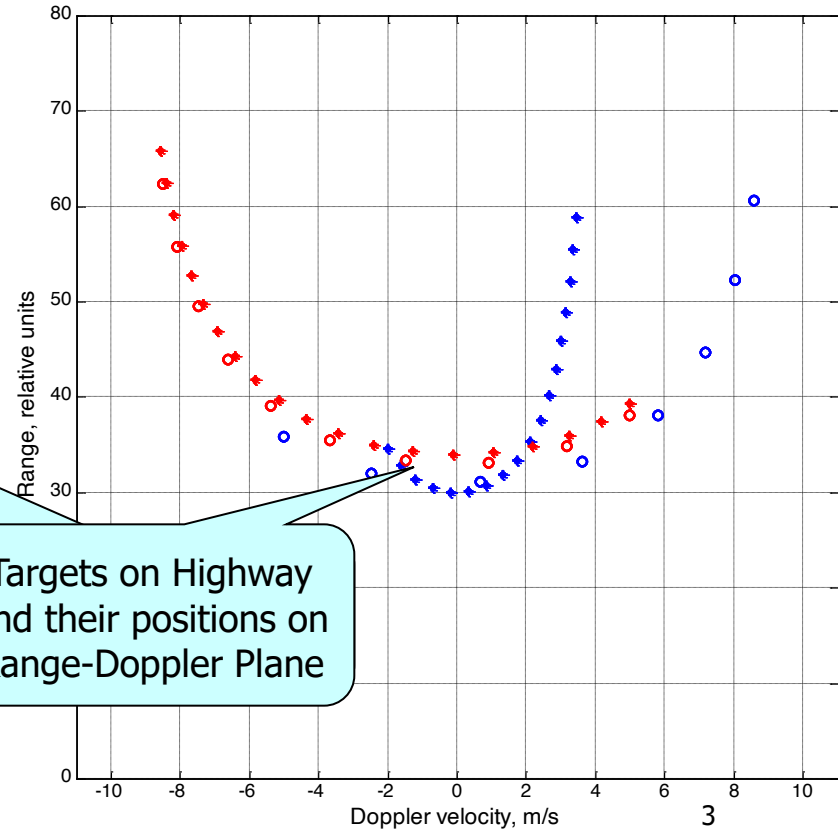
# Signal simulation: Step 1

## - ideal targets on Range-Doppler plane

### Model geometry



### Modeled targets on Range-Doppler velocity plane

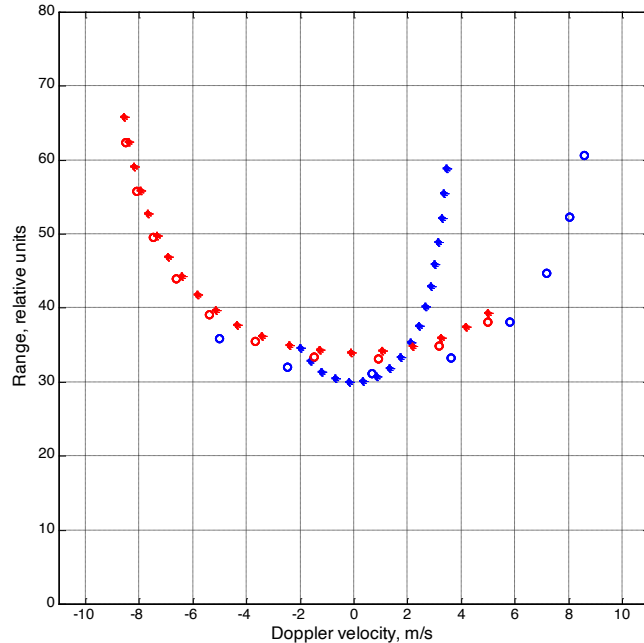


Note: these are continuous infinite axis

# Signal simulation: Step 2

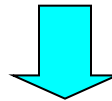
## - targets on radar's Range-Doppler plane

Modeled targets on continuous infinite  
Range - Doppler velocity plane

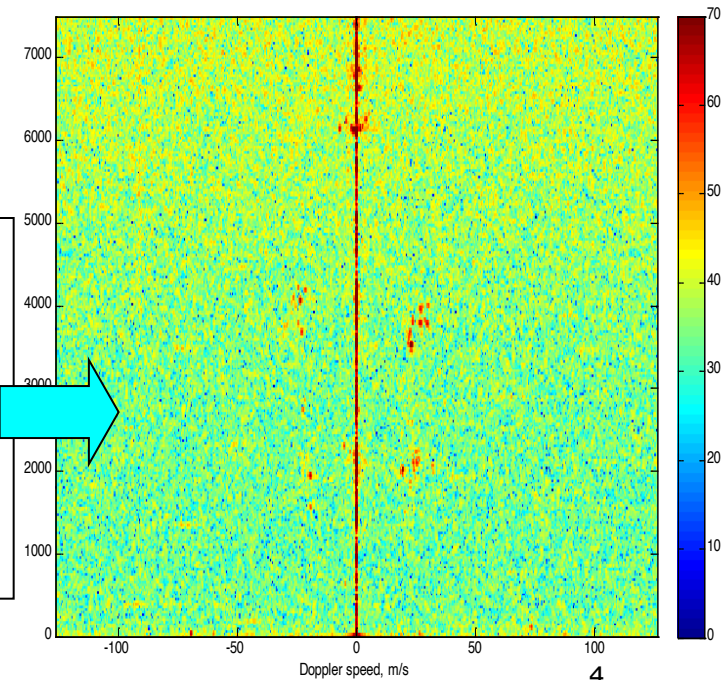
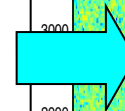


### Radar Node Parameters:

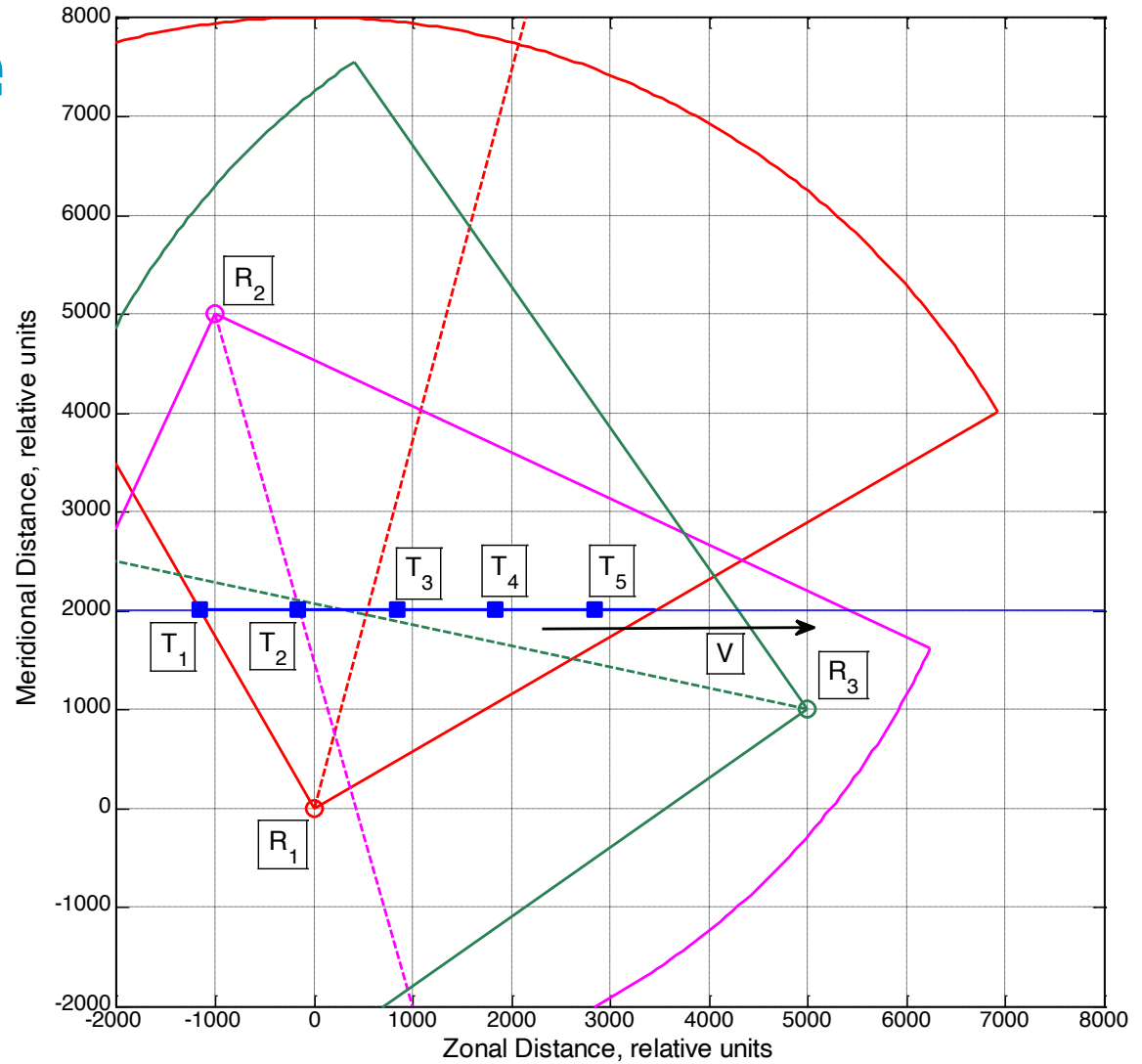
PRF;  
noise level;  
burst size;  
range resolution;  
dynamic range;



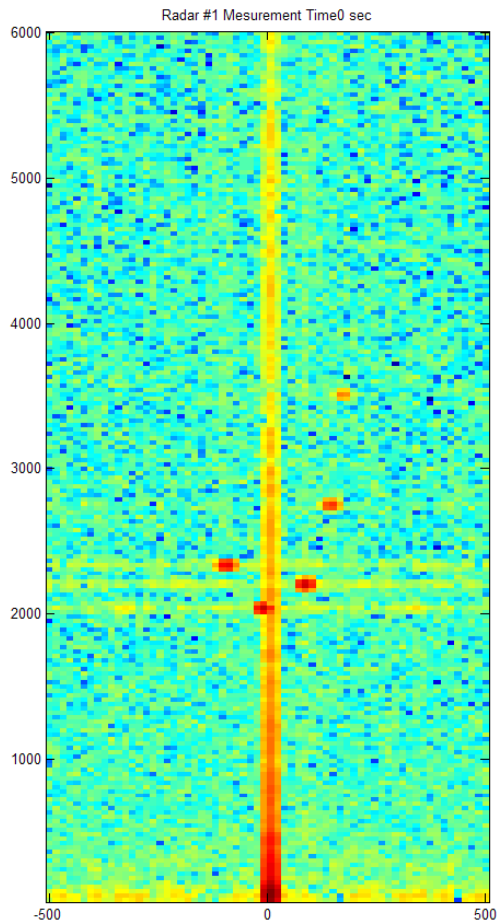
Doppler ambiguity;  
plane discretization;  
targets convolution  
with 2D impulse  
response function;  
added random  
noise



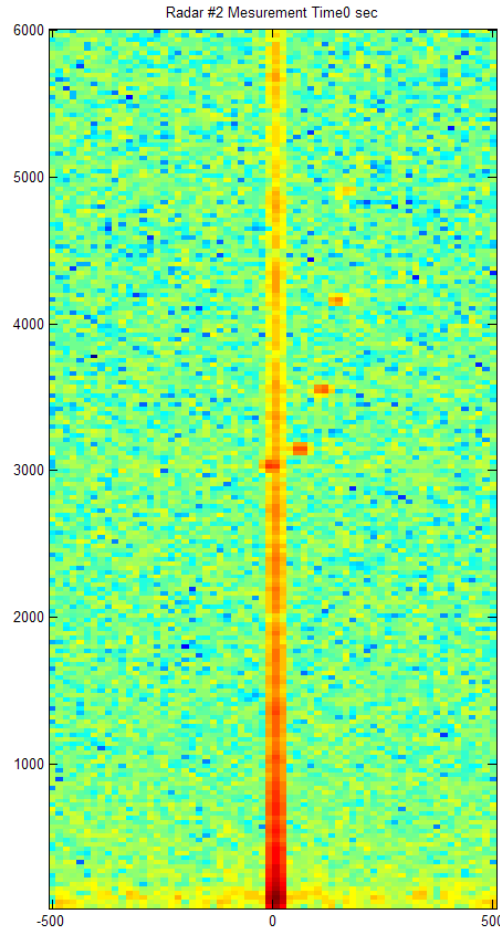
# Radar Scene



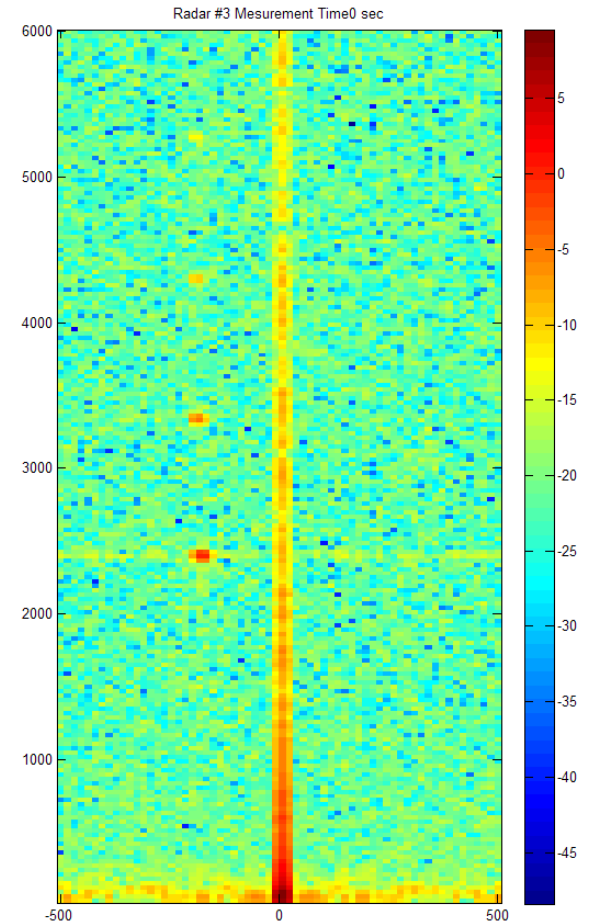
# Simulation results, $N_{\text{burst}} = 64$



Radar N1



Radar N2



Radar N3

# Localization results

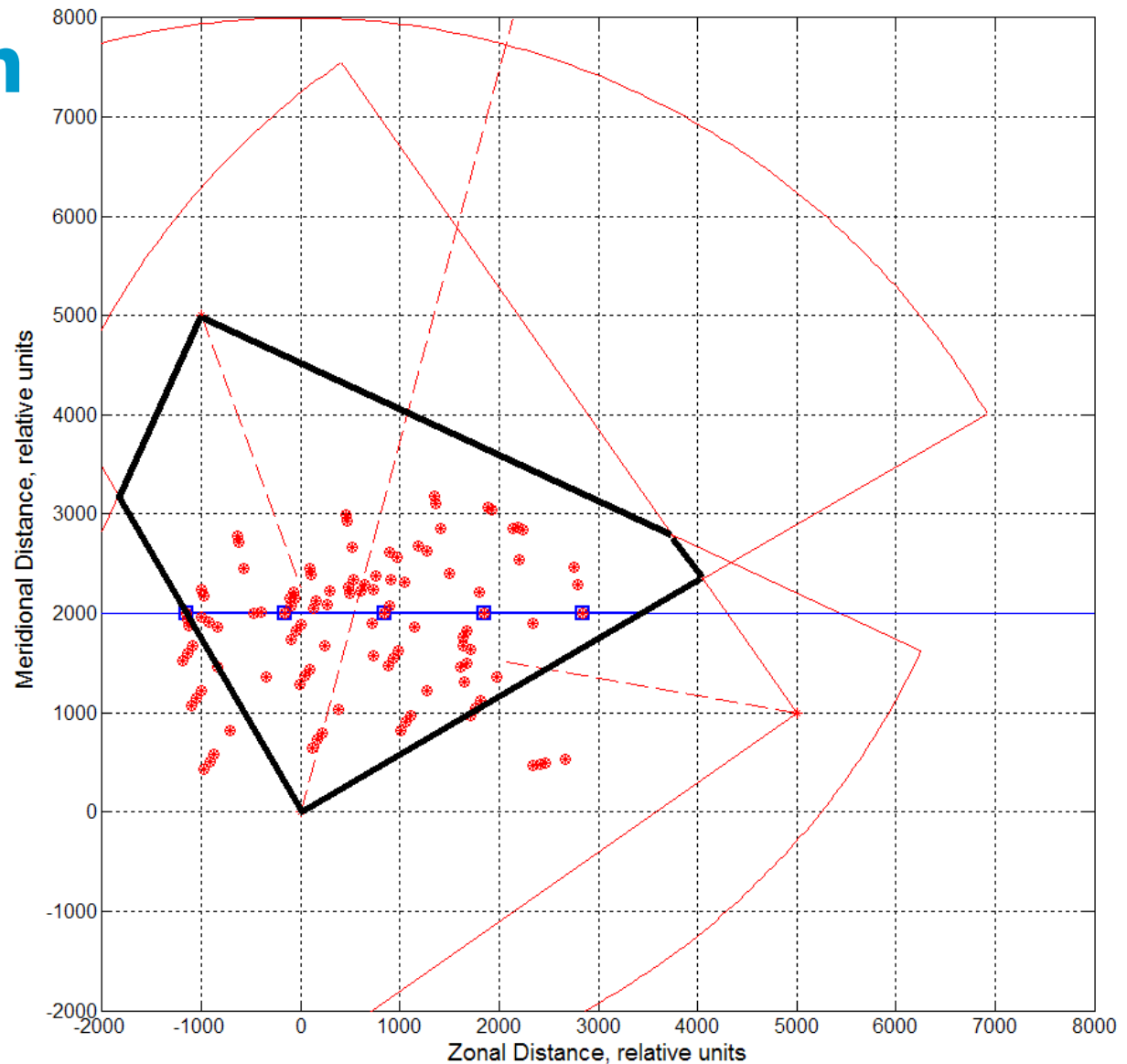
Simple triangulation algorithm that defines the intersection points of 3 3D spheres (Doppler not used)

No any targets associations – every detection processed with all others.  
As results total number of located targets =  $2 \times 5^3 = 2 \times 125$

Every red point show two results with different Z

Blue squares – true positions

Black polygon – area of antenna patterns overlap.





# Localization results

Filtered detected targets with  $|Z - Z_{\text{true}}| < 1 \text{ m}$

Still there are 2 x 33 ghost targets inside the detection polygon

De-ghosting is very important and necessary!

