

# 'Unconventional' positioning

Global fit using all available data

## Input:

- Tower Base position (nominal from FUGRO report)
- Beacons positions (nominal from FUGRO report)
- TOAs from ACSA (no floor 8 – ECAP piezos)
- TSSC (Time Spectral Spread Codes) for beacons recognition
- Distances between hydrophones in the same floor (measured during integration)
- Sound velocity (CTDs data)
- Depth Floor 1 (CTD1)
- Depth Floor 7 (CTD7)

## Initial Guess:

All hydrophones placed at TowerBase center (in x-y plane) and expected depths (z from CTDs data)

The code finds iteratively a root (zero) of a system of nonlinear equations

**NO UNIQUE SOLUTION !!!**

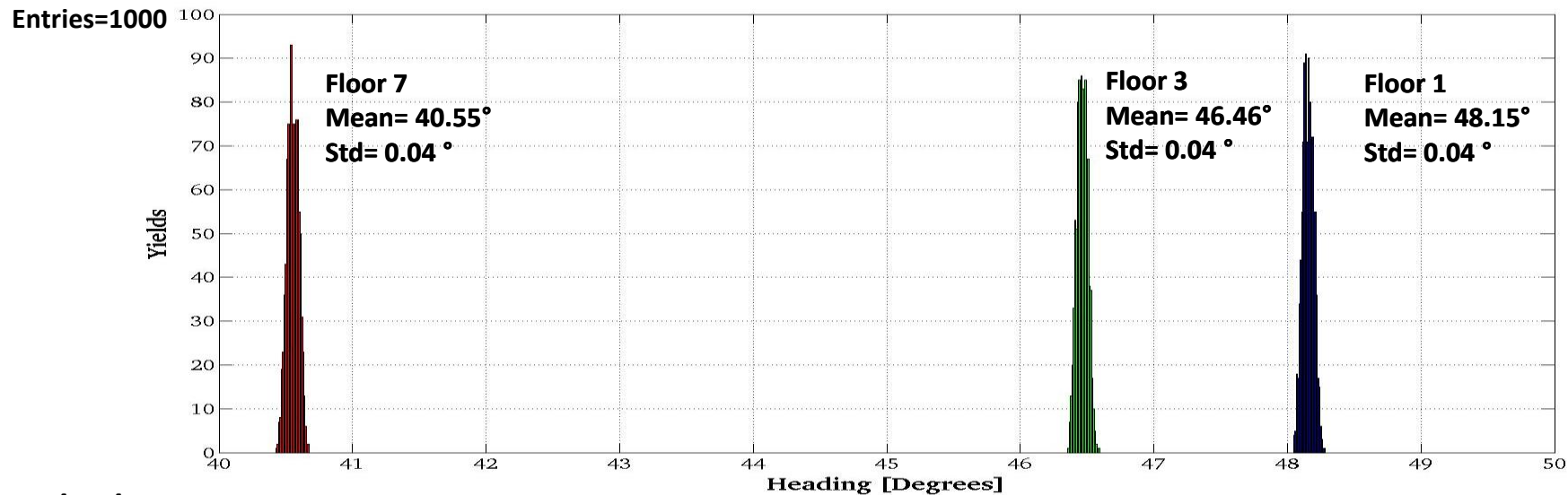
# Method #1: MonteCarlo on positioning accuracy

## Adding uncertainties... (optimistic)

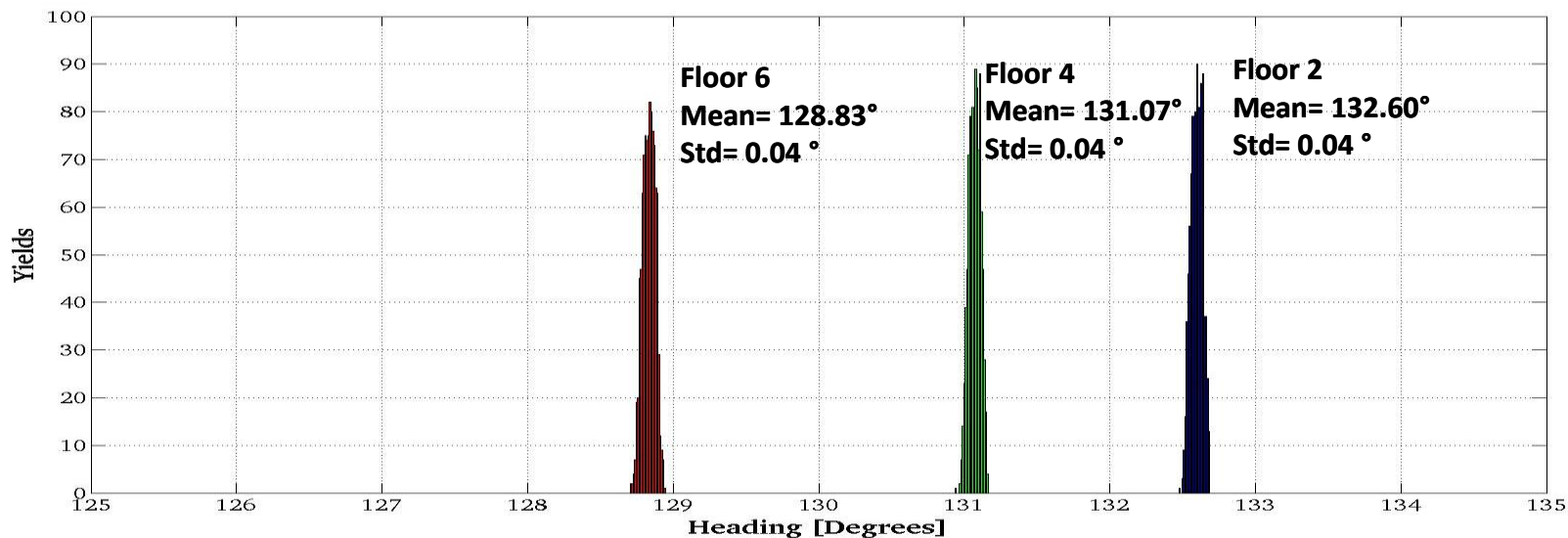
### Assumptions:

- External beacons position accuracy
  - Easting:  $\pm 0.5$  m
  - Northing:  $\pm 0.5$  m
  - Depth:  $\pm 0.5$  m
- Towerbase beacon position accuracy
  - Easting: /
  - Northing: /
  - Depth:  $\pm 0.5$  m
- Floor 1 depth error:  $\pm 0.5$  m
- Floor 7 depth error:  $\pm 0.5$  m
- Hydrophones distances on the same floor:  $\pm 0.01$  m

# Method #1: MC results for an optimistic case



16/09/2013  
00:00 UTC



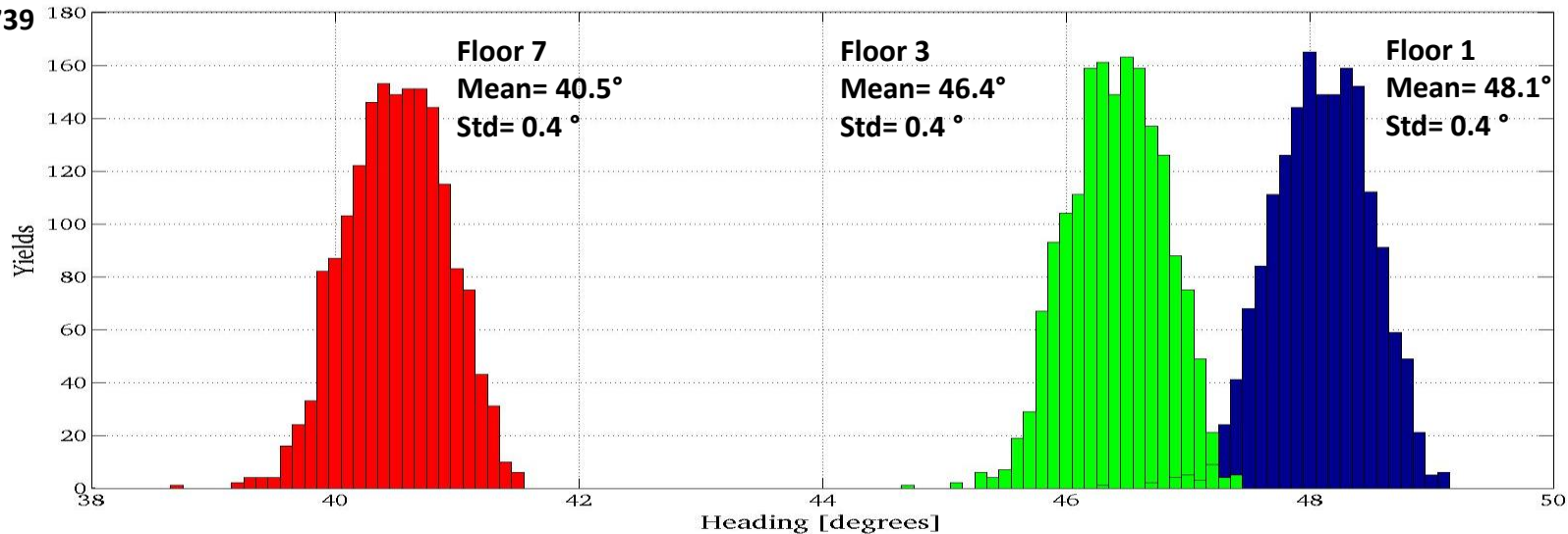
## Adding uncertainties... (pessimistic)

### Assumptions:

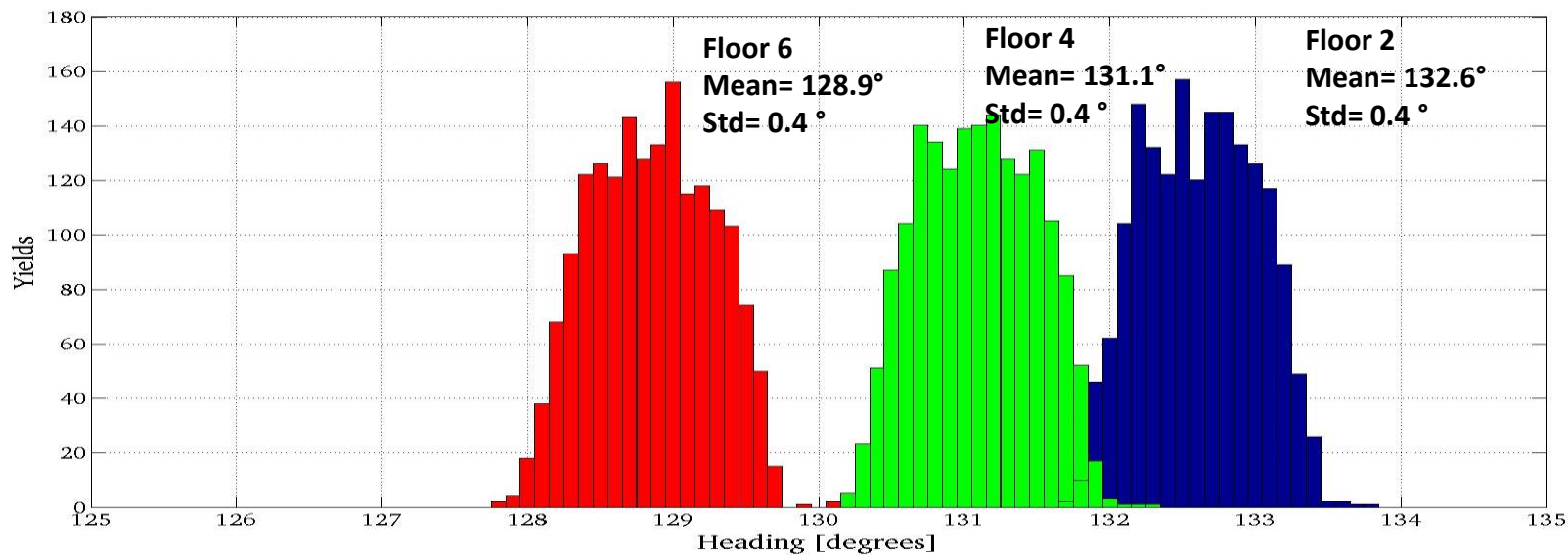
- External beacons position accuracy
  - Easting:  $\pm 5$  m
  - Northing:  $\pm 5$  m
  - Depth:  $\pm 5$  m
- Towerbase beacon position accuracy
  - Easting: /
  - Northing: /
  - Depth:  $\pm 0.5$  m
- Floor 1 depth error:  $\pm 3$  m
- Floor 7 depth error:  $\pm 3$  m
- Hydrophones distances on the same floor:  $\pm 0.01$  m

# Method #1: MC results for a pessimistic case

Entries=1739

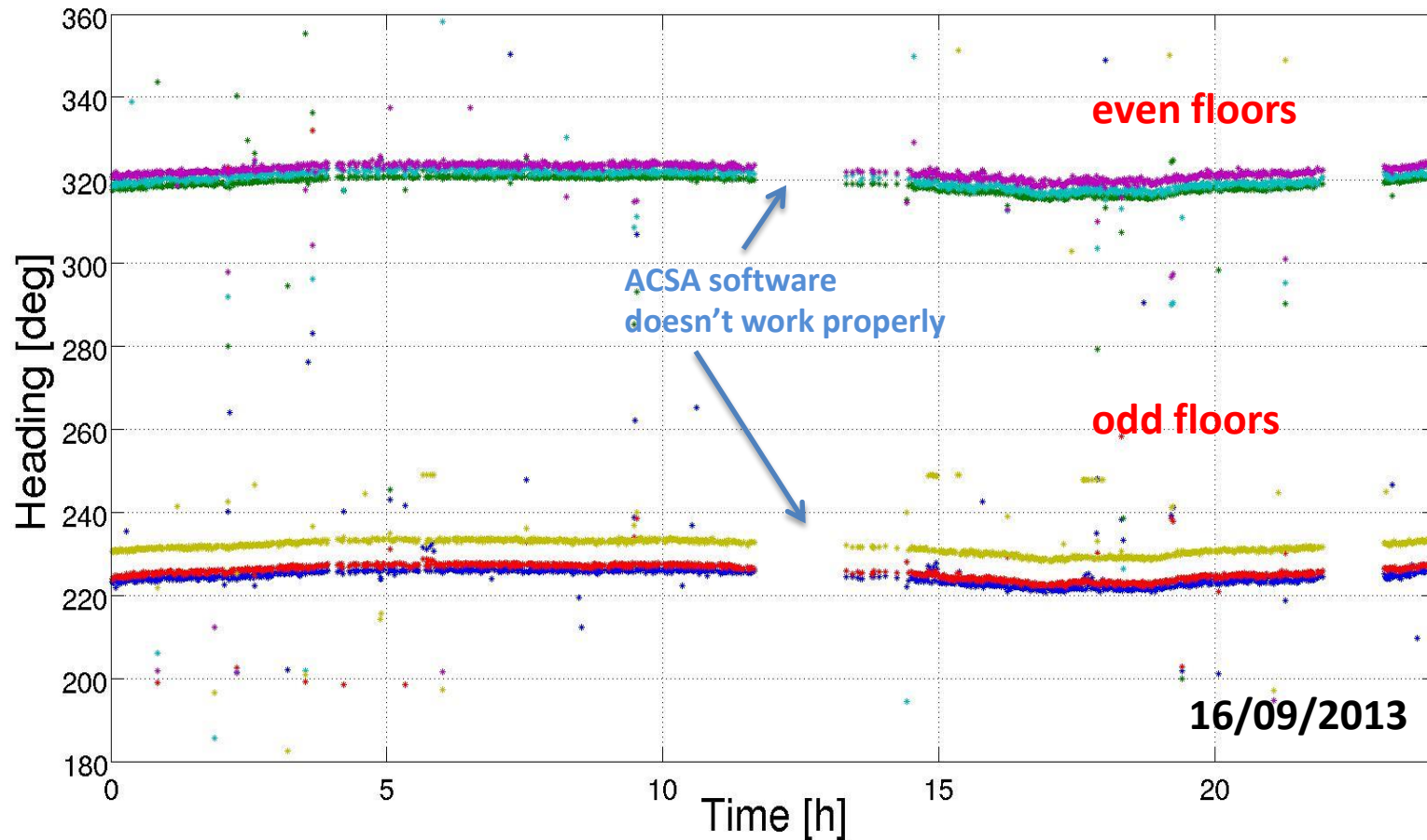


16/09/2013  
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# Acoustic reconstruction: heading

Floors heading from ACSA ToAs (Time of Arrival):



# Comparison with compass data

