SCIENCE AND TECHNOLOGY ORGANIZATION

COLLABORATION SUPPORT OFFICE

Cooperative Navigation
in GNSS Degraded and Denied Environments (SET 275)
29 - 30 September, 2021

Radar-Assisted Relative Location of Multiple Targets and Collaborative Sharing of Location Information Between Multiple Radars

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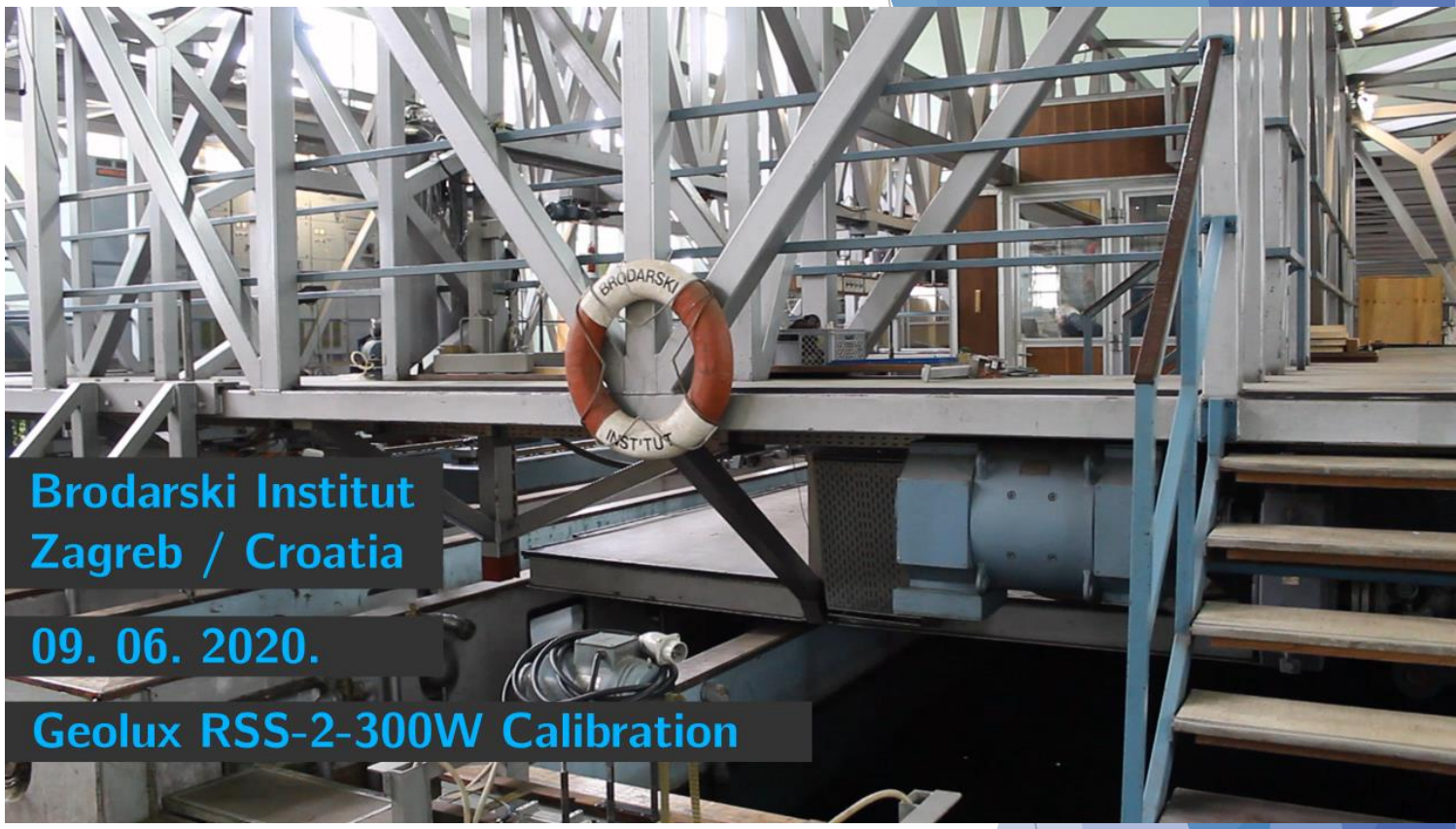
Radar measurements

- Precise speed measurement
  - up to 1 mm/s resolution
- Precise distance measurement
  - μm range



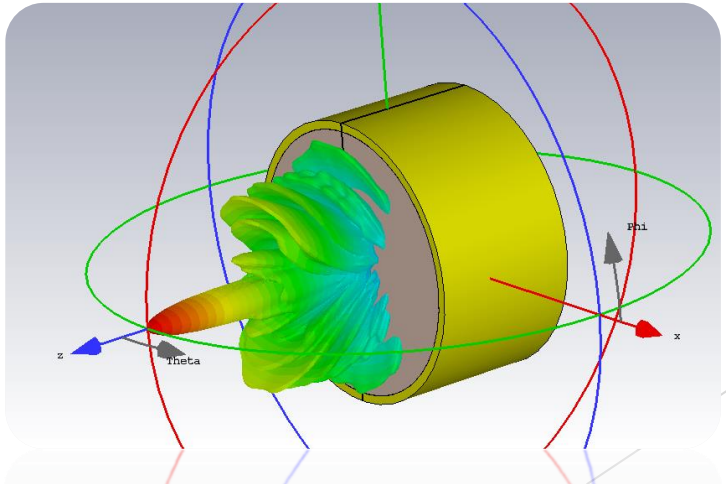
- Small size, low power consumption
- High sample rate >10Hz
- FMCW operation, 100mW transmitter power

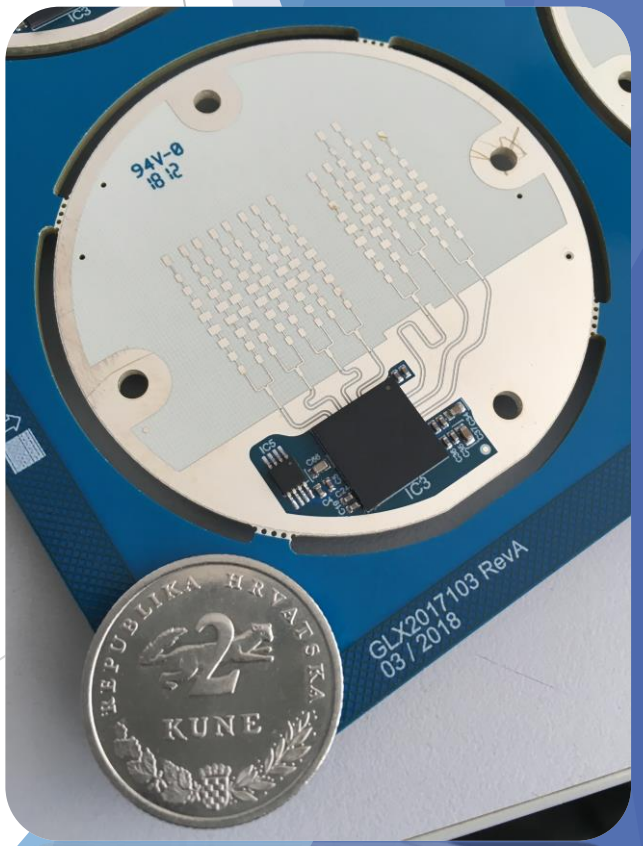
Precise speed measurement

- CW Doppler Radar K-band (24 GHz)
  - up to 1 mm/s resolution
  - 0,02 to 15 m/s (configurable)
  - 5 Hz sample rate

Precise distance measurement

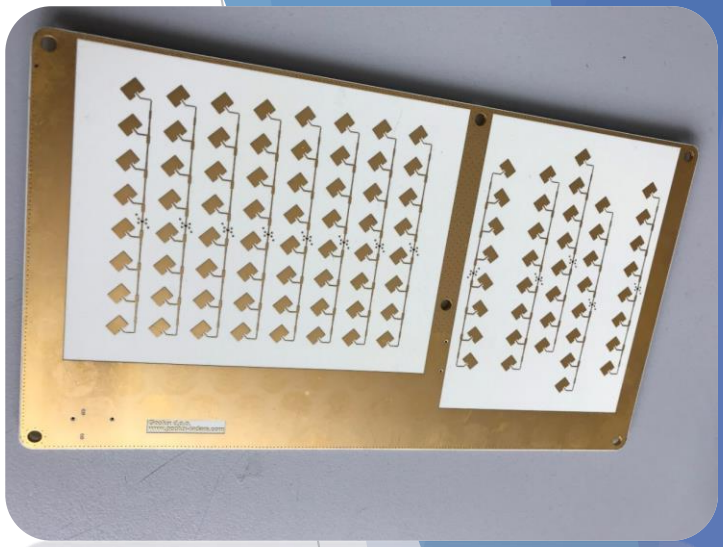
- FMCW radar W-band (77 – 81 GHz)
  - Standard version 0,1 mm resolution up to 30 m distance
  - Industrial version 10 μm resolution up to 8 m distance
  - Very good accuracy
  - Internal self calibration
  - 1 Hz sample rate (10 Hz optional)
  - ±2° beam width

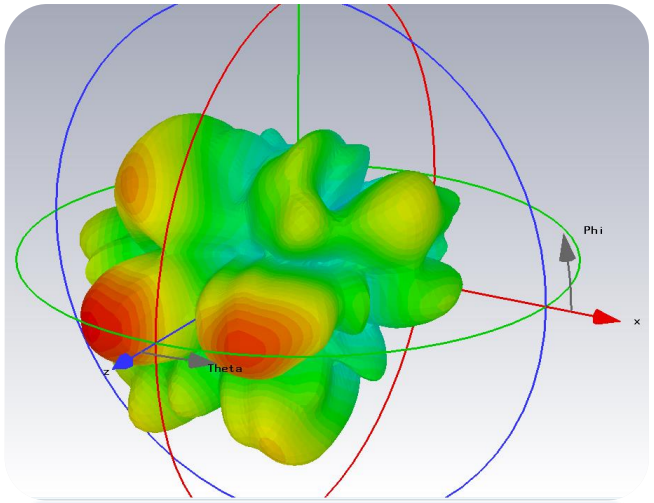


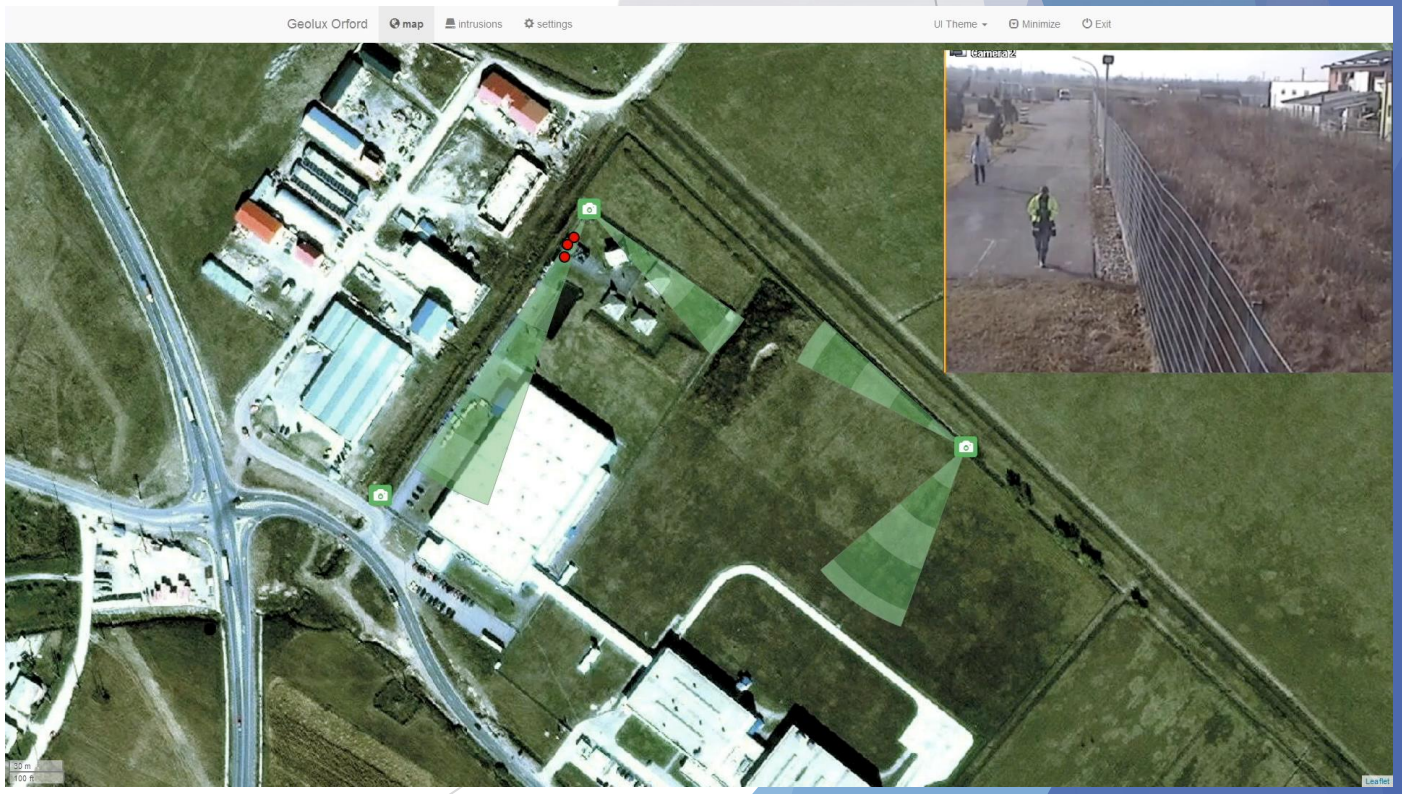


Target tracking

- FMCW radar K-band (24 GHz)
  - AESA design
  - Designed for short range and high accuracy
  - <0,5 m resolution for distance
  - ±0,5° angle resolution
  - ±0,25 m/s speed accuracy





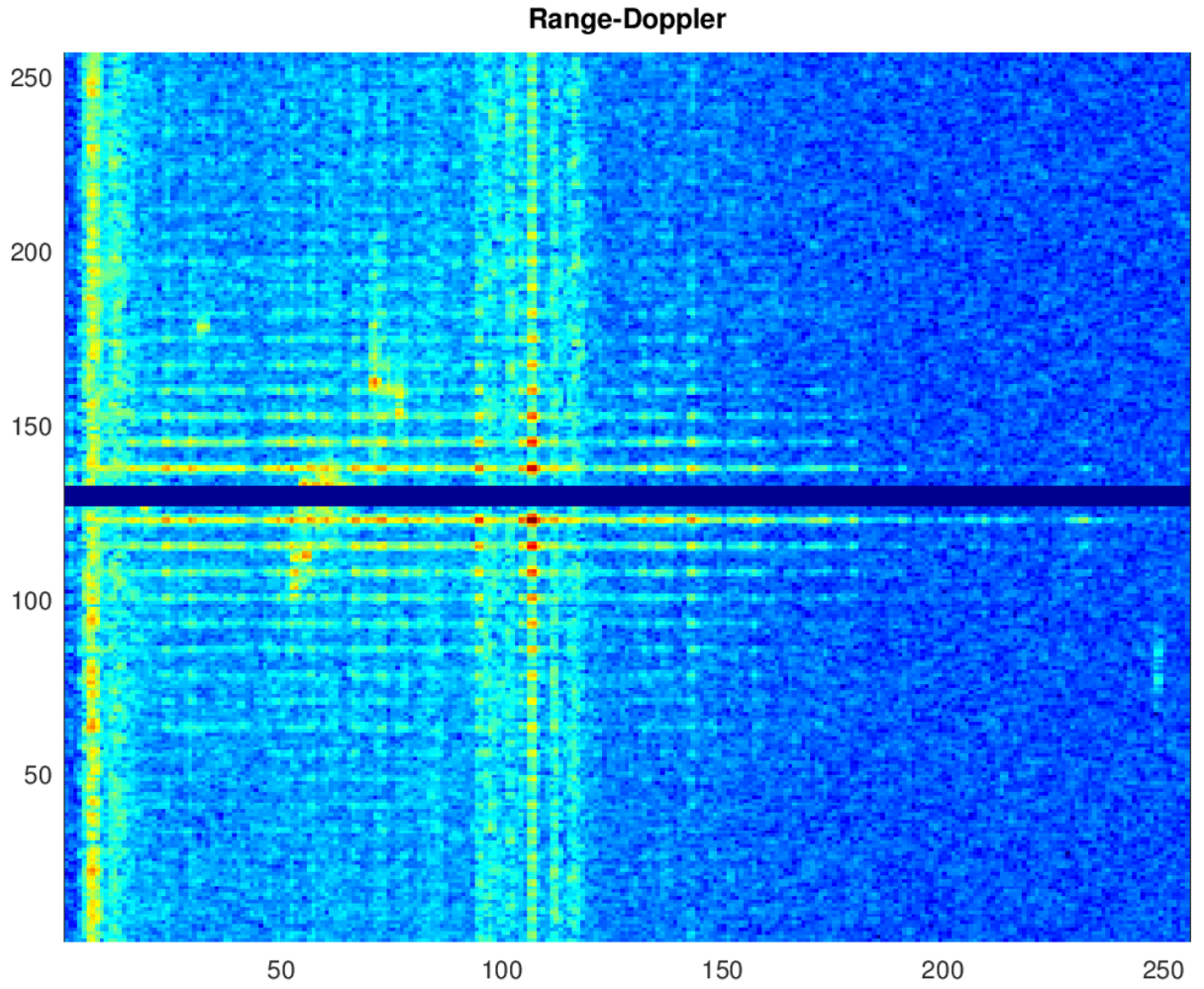


Sennybridge demonstration

demonstration

Target extraction & sharing

- Range-Doppler extractor
  - Correlation (signature) sharing
  - Timing accuracy
  - False detections minimization
  - Significant improvement



Conclusion

- Detection and tracking range up to 300 m for single walking human (RCS ≈0,75 m^2
- Detection range limited by transmitter power 100 mW
- Distance measurement accuracy limiter by bandwidth
  - K-band
    - 250 MHz – 24,0 GHz to 24,25 GHz
  - W-band
    - 4,0 GHz – 77,0 GHz to 81,0 GHz
- Angle measurement limited by number of TX / RX antennas