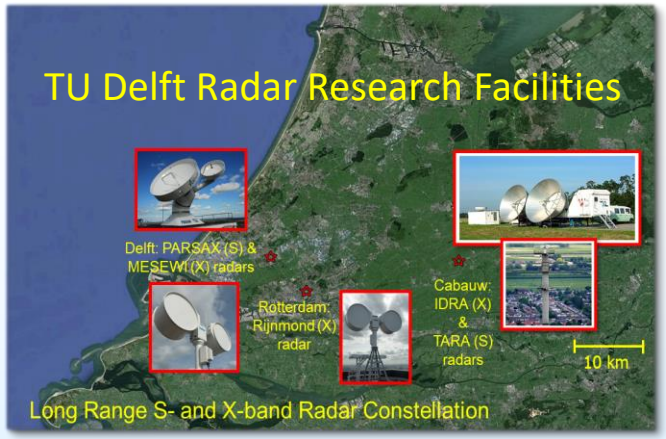
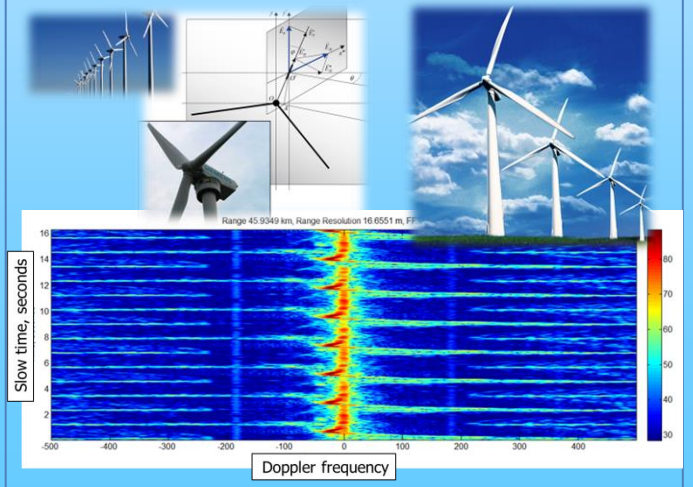
***The Microwave Sensing, Signals and Systems*** (MS3) group performs research on fundamental and applied aspects of microwave systems for surveillance and remote sensing. Using electromagnetics as the foundation, the group focuses its research on sensing waveforms and signal processing, antenna systems with near- and far-field focusing capabilities and radar resource management. Applications include area surveillance for safety and security applications, weather radar, ground-penetrating radar, automotive and traffic control applications and medical imaging.

The group includes the *Radar Labs* which consist of multi-sensor facilities on the roof of EEMCS, most importantly the fully reconfigurable polarimetric wideband radars PARSAX and MECEWI, radar facilities TARA and IDRA located at Cabauw, Raingain radar in Rotterdam, and the antenna measurement chamber DUCAT. The labs include also a distributed radar system for the surveillance of the lower airspace (RAEBELL), a millimetre-wave and UWB indoor laboratory, a multichannel transmission MIMO Radar, and a ground penetrating radar measurement site. This infrastructure is leading in Europe.




The MSc thesis work is usually performed in a project team on one of the research topics of the chair. As a result, students are involved in cutting-edge research work of the chair and build a solid foundation for their future career. Students can select their MSc thesis subject from a wide list of topics which include antennas and scattering, inverse problems and imaging, signal processing, radar modeling and design, radar sensor network. Contact person:

Prof. DSc. Alexander Yarovoy (A.Yarovoy@tudelft.nl).




***Possible MSc thesis projects*** cover the following areas:

- Design and study antenna arrays for different types of radars: ultra-wideband, reconfigurable, MIMO, sparse, mm-wave, automotive, nano- and micro-satellites
- FMCW on-chip radars signal processing for automotive application
- Classification of targets using polarimetric and micro-Doppler characteristics, often measured with the PARSAX radar
- Polarimetric Doppler radar signal processing for wind and turbulence 3D fields retrievals
- Distributed Radar Networks
- Hi-Res MRI medical imaging
- Object detection and recognition
- Design & microwave analysis of superconducting circuits

Actual projects are usually defined after discussion with the supervisor and/or host company.

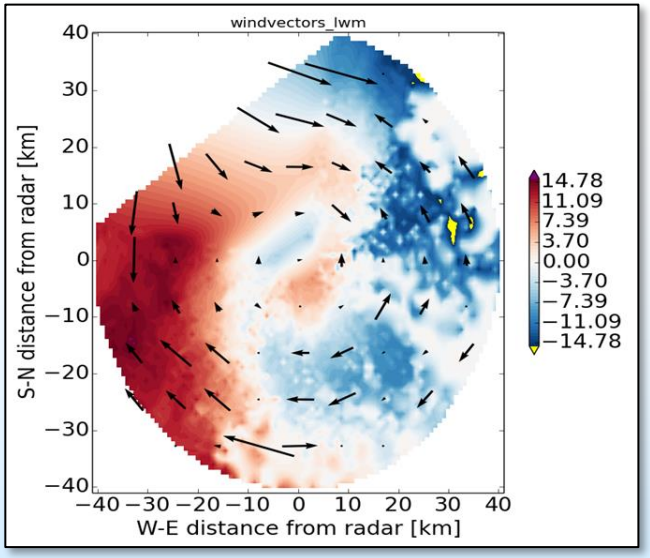
The MS3 group participates in the **MSc** tracks "*Wireless Communication & Sensing*" and "*Signals & Systems*" with the following courses, many with laboratory practicum included:

- EE4C05 Electromagnetics (5 ECTS)
- EE4565 Propagation and Scattering of EM waves (5 ECTS)
- ET4169 Radar I: From Basic Principles to Applications (5 ECTS)
- ET4016 Antenna systems (5 ECTS)
- ET4173 Introduction to UWB technology, systems and applications (4 ECTS)
- ET4175 Radar II: Theory and System Design (4 ECTS)
- EE5020 Sensor Signal and Data Processing (4 ECTS)
- EE4675 Object Classification with Radar (4 ECTS)

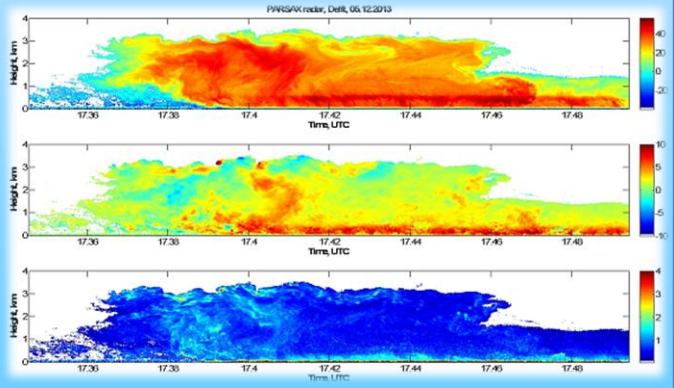
In the **Bachelor EE** we teach these electives:

- EEX03 Microwave Engineering (5 ECTS)
- EE2G1 EE 4 the Next Generation, sub-project on Communication & Sensing (10 ECTS)

***Some of our research partners***


Check the ***current weather and rain*** situation with our real-time ***Delft Multi-Sensor Information System for Situation Awareness***
*http://regenradar.tudelft.nl*




For latest news visit our site
*http://radar. tudelft.nl*

TU Delft

# Microwave Sensing, Signals and Systems (MS$^3$) group

Department of Microelectronics

Faculty of Electrical Engineering, Mathematics and Computer Science


Delft - 2024