CWTe Research Retreat 2022

Opening and Introduction

Sonia Heemstra de Groot
20-OCT-2022

Welcome

to the 13th CWTe Research Retreat

CWTe CENTER FOR WIRELESS TECHNOLOGY EINDHOVEN

TU/e

TU/e

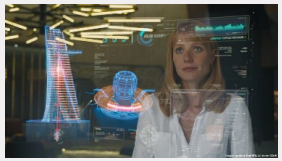
Wireless Technology

- Wireless and mobile communications are key technological elements for a resilient society
  - Essential to remain connected
  - New forms or working, provide healthcare, distance learning, retailing
- Many verticals can benefit from further improvements of wireless technologies
  - Some are already provided by 5G and WiFi6
- New use cases and new applications are on the horizon


Holographic watch


Internet of everything


Tele-presence


Extended reality


Haptic holography


Fully autonomous vehicles


In-body networks


Smart factories

Some requiring performance figures beyond current technologies can support

CWTe CENTER FOR WIRELESS TECHNOLOGY EINDHOVEN TU/e

TU/e

New generation wireless networks

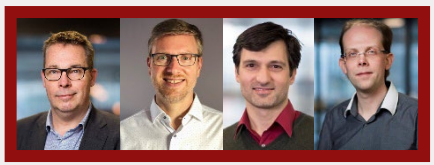
- Continue evaluation to improve performance and support new applications
- New frequency bands
  - Higher spectrum technologies e.g. THz and optical wireless
  - Use of many spectral bands
- Innovative network architectures
  - 3D coverage, non-terrestrial networks, cell-free architectures, tight integration of different communication technologies
- Embedded network intelligence
  - Distributed intelligence, unsupervised learning and knowledge sharing

Many challenges and new opportunities: Focus of CWTe

Center for Wireless Technology Eindhoven

TU/e

CWTe Structure



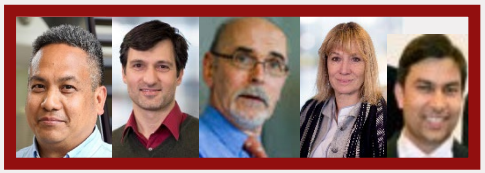
Program Board Chairs

Bus. Dev.

Director

MT

SPS



ECO

FE

RF

AD
DA

Ch.
Code

Src
Code

MAC

Net
work

Signal Processing
Systems

Electro-Optical
Communication

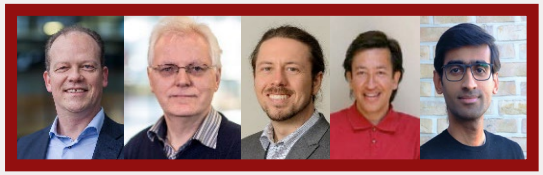
Electromagnetics

Integrated
Circuits

Electronic Systems

EM

IC

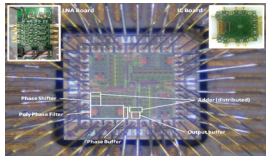


ES

CWTe Research Programs

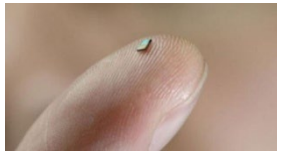
Ultra-high data rates (Chair: Dr. Sander Bronckers)

- High Frequencies (>= 30 GHz) and very high data rates (1Tbps)
- Smart antenna systems, phased arrays,
- Next generation RAN (cell-free M-MIMO, non-terrestrial networks)



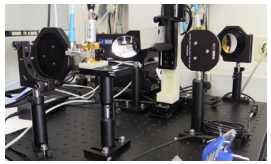
Ultra-dense ultra-scale AI-driven networks (Chair: Dr. George Exarchakos)

- Ultra small, ultra-low power and battery-less wireless systems
- Self-configuring networks, autonomous devices and AI
- High-reliability and ultra-low latency



Ranging and sensing (Chair: Dr. Dook van Mechelen)

- Accurate, cheap, low-energy, one-chip radar
- Sensing and positioning (3D, under water)
- All frequency bands

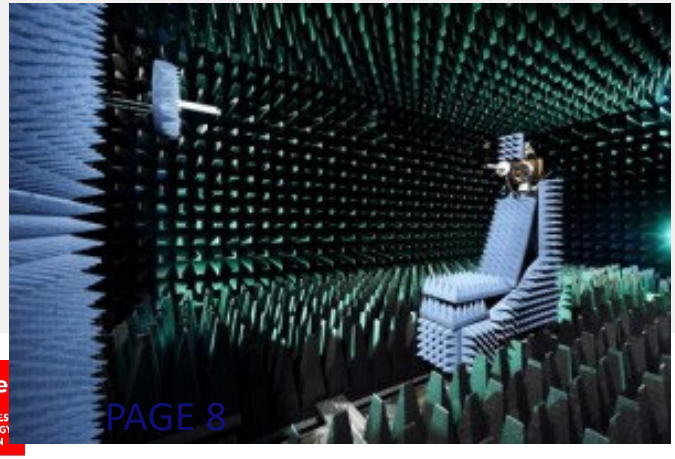


Radio Astronomy (Chair: Prof. Mark Bentum)

- Next generation radio telescopes
- Large antenna arrays
- Low frequency (<30 MHz)

EM **IC** **ES** **SPS** **ECO**

CWTe Labs in Flux



- Co-located and integrated laboratories, occupying about 700m² Labs for all different sub-disciplines of wireless systems
- Fully shielded
- Anechoic chambers
- On-wafer and PCB-level characterization

European and national projects

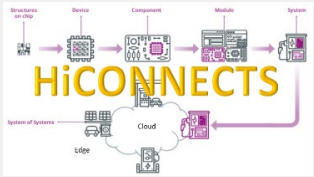
- 5G/6G Antenna systems, propagation, transceivers, mm and submm Wave,
- Communication and sensing
- Optical wireless communications, hybrid optical/RF-based ultra-high data rate communication
- THz systems and car radar
- Ultra-reliable and low-latency communications
- Ultra-low-power, battery-less systems, exploration motes
- IoT, sensor networks, networked embedded systems
- Wireless intra-aircraft communications
- In-network intelligence
- Next generation radio telescopes, antenna research, satellite systems
- …

CWTe Highlights 2022

TU/e

New granted and started projects (1)

- EU
  - MSCA ANTERRA
  - MSCA SCION
  - HE ETAIN
  - ECSEL DAIS
  - PENTA HEFPA
  - PENTA InnoStar
  - KDT HiCONNECTS
  - Xecs MID4automotive



New granted and started projects (2)

- TKI
  - EAISI RAISE project
  - HTSM Mi-RAYS mini-IMPULS project
  - HTSM-RAIDAR
- TSH Vliegtuigmaakindustrie – RHIADA
- NWO OTP
  - ADAPTOR
  - ShareWaves
- National Growth Fund Aerospace in Transition

Rijksdienst voor Ondernemend Nederland

RHIADA

NWO

ADAPTOR

LUCHTVAART in transitie

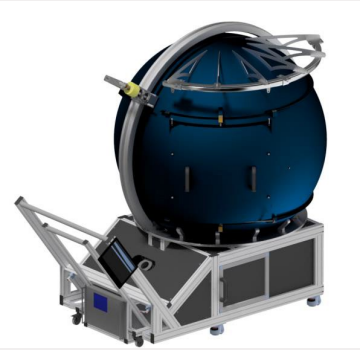
CWTe laboratories

- Lab upgrades towards 6G
  - IC lab with even higher frequency equipment
  - Upgrade mmwave anechoic chamber with up-converter
  - Upgrade mmwave reverberation chamber and material characterization set up with new VNA
  - Optical wireless communication testbed
  - Networking lab equipment for distributed massive MIMO

Spin-off AntenneX

- In-house antenna measurements and material characterization up to 100 GHz

ANTENNEX



Anechoic chamber

The team

Reverberation chamber

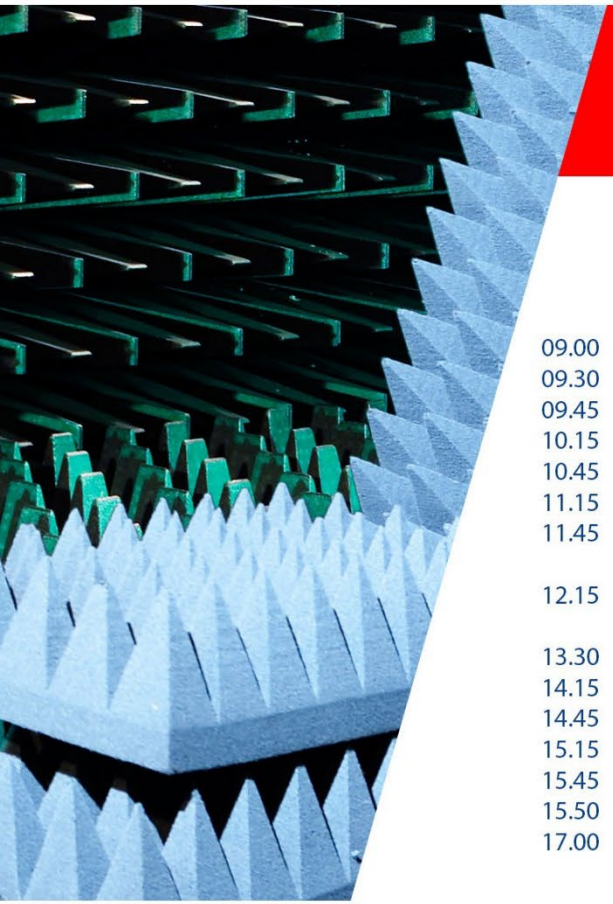
Dielectric characterization system

Other

- Education
  - MOOC on Microwave Engineering and Antennas (Coursera)
  - MOOC RF and millimeter-Wave Circuit Design (Coursera)
  - BOOST- OpenAir based 5G platform for student projects/ course support
- Standardization
  - 6G - IA membership (EU Smart Networks and Services WP)
  - EUROCAE WG-96
- Dissemination/ Colloquia
  - Bi-monthly colloquia
  - Research Retreat
  - Workshops
  - In the news: newspapers, many radio/ TV appearances

CWTe Research Retreat 2022

Program



Invitation
CWTe 2022 Research Retreat

CWTe
CENTER FOR WIRELESS TECHNOLOGY EINDHOVEN

TU/e

Thursday, 20th of October 2022
Zwarte Doos, 1st floor, TU Eindhoven

Hosted by: Center for Wireless Technology Eindhoven

09.00	- Welcome with coffee	
09.30	Opening and introduction	Sonia Heemstra de Groot (TU/e)
09.45	What will 6G bring us; a TNO vision on the next generation	Toon Norp (TNO)
10.15	Bluetooth chip development	Chris Smit (Renesas)
10.45	- Break	
11.15	B5G/6G Vision: Communications and Mobility	Marcel Geurts (NXP)
11.45	6G systems: What are you actually measuring?	Anouk Hubrechsen (AntenneX)
12.15	Lunch break	
13.30	Poster pitches	various speakers
14.15	- Break	
14.45	Dynamic Spectrum Sharing, the solution to the radio spectrum shortage	Ignas Niemegeers (TU/e)
15.15	ML-Assisted Algorithms for Non-Terrestrial Networks	Symeon Chatzinotas (Univ. Luxembourg)
15.45	Closing words	Sonia Heemstra de Groot (TU/e)
15.50	- Drinks	
17.00	- End	

CWTe
CENTER FOR WIRELESS TECHNOLOGY EINDHOVEN
TU/e

TU/e

CWTe Research Retreat 2022

Closing

Closing

Hope you enjoyed the retreat!

Thanks to:

Speakers

Poster pitch presenters

Audience

CWTe and EE Staff

CWTe partners

Jan Haagh

Next CWTe Research Retreat

You are invited to attend the next Research Retreat

October 2023

Details will be announced by email to all participants.

Center for Wireless Technology Eindhoven

TU/e