

CWTe Research Retreat 2021

Opening and Introduction

Sonia Heemstra de Groot
2021020

Welcome
to the 12th CWTe
Research Retreat
On-line

Wireless Technology and COVID-19

- Major role of communication networks in limiting social and economic damage
- Wireless and mobile communications are key technological elements for a resilient society
 - Essential to remain connected
 - New forms of working, provide healthcare, distance learning, retailing
- Many verticals can benefit from further improvements of wireless technologies
 - Some will be provided by 5G
- New use cases and new applications are on the horizon
 - Some requiring performance figures beyond what 5G can support

New generation wireless networks (6G)

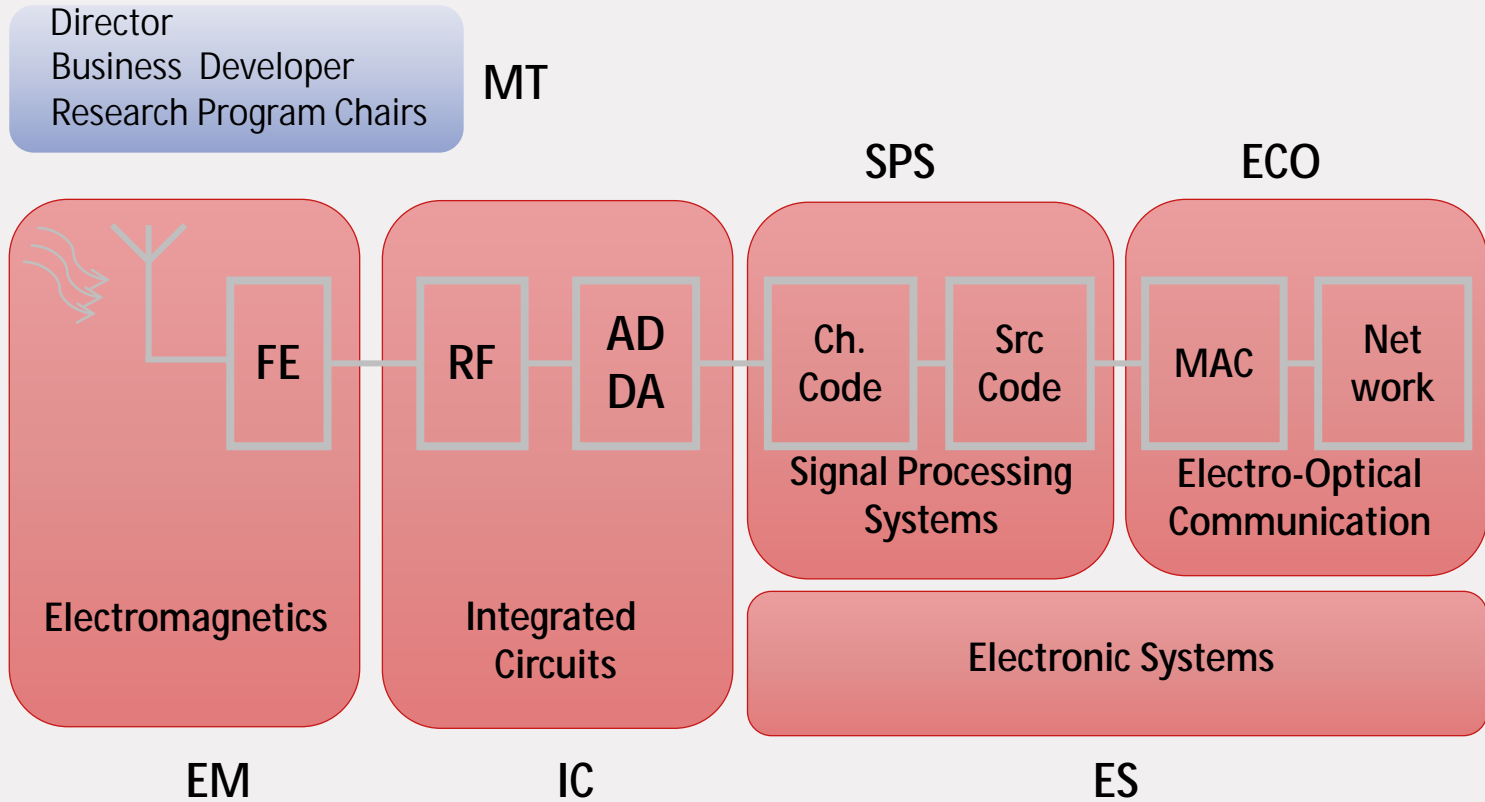
- Disruptive communication technologies
 - Higher spectrum technologies e.g. THz and optical wireless
- Innovative network architectures
 - 3D coverage, cell-free architectures, tight integration of different communication technologies
- Embedded network intelligence
 - Distributed intelligence, unsupervised learning and knowledge sharing

**Many challenges and new opportunities:
Focus of CWTe**

The image shows the interior of an anechoic chamber, characterized by a dense array of green, pyramidal-shaped electromagnetic absorbers designed to eliminate reflections. A red horizontal band is superimposed across the middle of the image, containing the text 'Center for Wireless Technology Eindhoven'.

Center for Wireless Technology Eindhoven

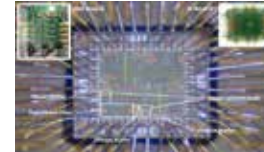
CWTe Structure



CWTe Research Programs

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

- High Frequencies (≥ 25 GHz) and very high data rates (1Tbps)
- Beamforming with many elements @ low cost
- Next generation RAN (RoF, (cell-free) M-MIMO, Dyn. Reconf.)



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



THz Systems and sensing (Chair: Dr. Dook van Mechelen)

- THz communication
- Small, low-cost, short range
- Radar



Radio Astronomy (Chair: Prof. Mark Bentum)

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



EM

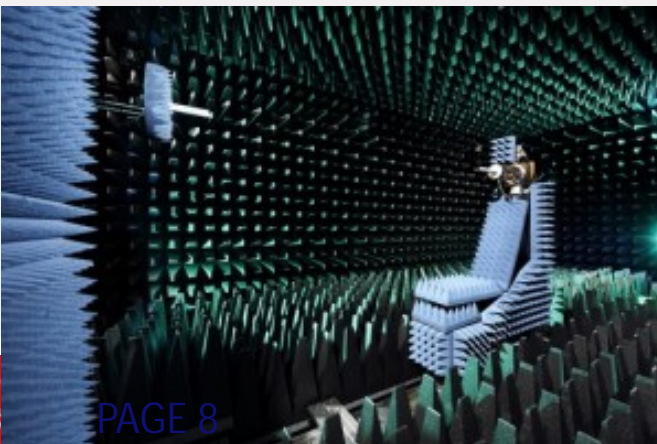
IC

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

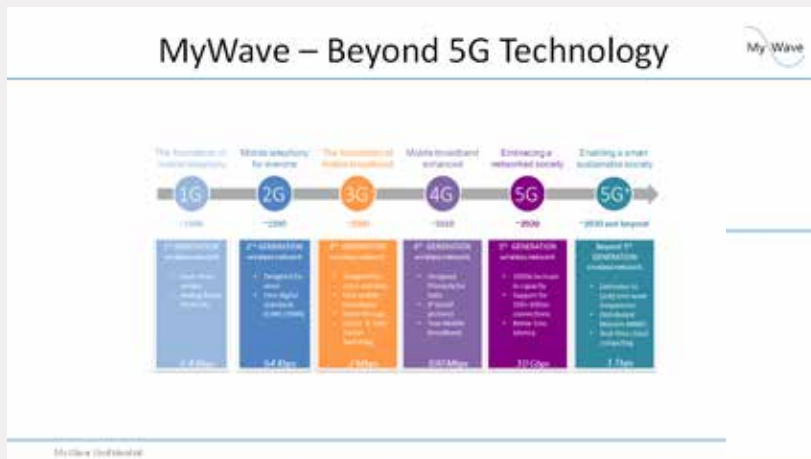
- 5G/6G Antenna systems, propagation, transceivers, mm and submm Wave, (15 projects)
- Optical wireless communications, hybrid optical/RF-based ultra-high data rate communication
- THz systems and car radar
- Ultra-reliable and low-latency communications
- Ultra-low-power, battery-less systems, exploration motes
- IoT, sensor networks, networked embedded systems
- Wireless intra-aircraft communications
- In-network intelligence
- Next generation radio telescopes, antenna research, satellite systems
- ...

CWTe Highlights 2021

- 30 Staff members and 50 PhDs and Postdocs
- Starting and recently granted projects
 - EU H2020 ADENEAS
 - EU ECSEL Next Perception
 - EU Penta HEFPA
 - OTP project ADAPTOR
 - EAISI Impuls project RAISE
 - Mini-Impuls My-RAYS
 - EU PENTA InnoStar
- Strengthening THz research at TU/e:
Center for Terahertz Science & Technology Eindhoven
- In the news, including many radio/ TV appearances

CWTe Highlights 2021: MyWave ITN

- EU European Innovative Training Network
- Aiming at Beyond 5G wireless communication, with a focus on antenna front-ends, electronics and signal processing
- 15 PhD students in three countries (NL, Sweden, Germany) and key industrial players in the area in the consortium



Welcome on Board

Distributed Massive MIMO

(A) Centralized: Shows a central base station connected to multiple antennas.

(B) Distributed: Shows multiple base stations connected to multiple antennas.

CWTe Highlights 2021: 6G vision workshop

- National and international speakers
- Large (international) attendance



Agenda
CWTe 6G Vision Workshop

Wednesday, 31st of March 2021
Online event

Hosted by: Center for Wireless Technology Eindhoven

10.30 - Getting connected with home made coffee
Morning program

10.35 Opening and introduction
10.45 Why 6G?
11.10 Smart antenna systems for future 6G wireless communications

11.35 **Lunch break**

Afternoon program

13.00 State of 5G and Considerations for 6G
13.25 6G is about 4S: Spectrum, Speed, Safety and Security
13.50 **Break**
14.05 Implementation challenges in beyond-5G communication systems
14.30 AI role in the future networks
14.55 **Closing**

Sonia Heenstra de Groot (TU/e)
Marja Muttimäke-Bauer (Univ Oulu)
Bart Smolders (TU/e)

Bilel Jemoussi (ITU)
Rena'Wroom (Agentschap Telecom)

LIF Gustavsson (Ericsson)
Mostafa Essa (Vodafone)
Sonia Heenstra de Groot (TU/e)

www.tue.nl/cwte

CWTe
CENTER FOR WIRELESS TECHNOLOGY EINDHOVEN

TU/e

CWTe Highlights 2021: Antennex

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



The team



Anechoic chamber



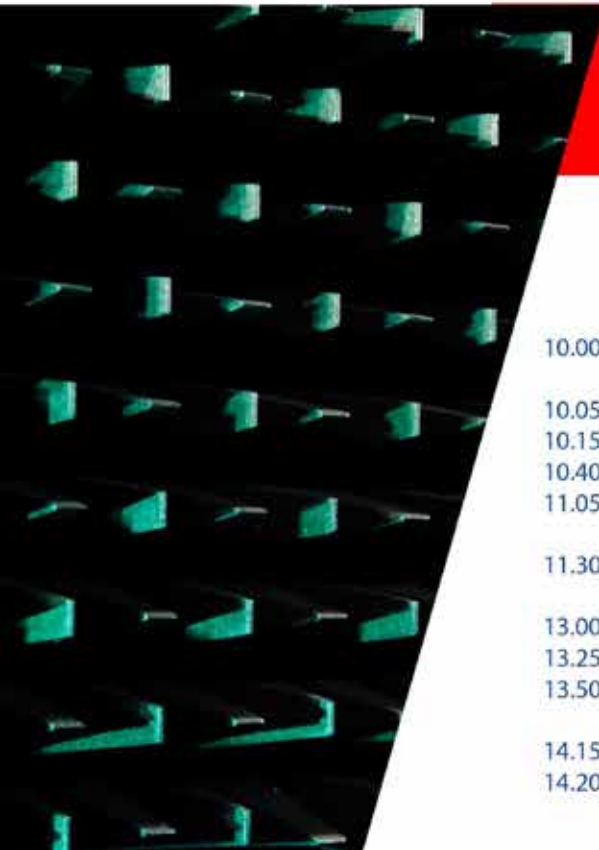
Reverberation chamber



Dielectric characterization system

CWTe Research Retreat 2021

Program



Invitation

CWTe 2021 Research Retreat

CWTe
CENTER
FOR WIRELESS
TECHNOLOGY
EINDHOVEN

TU/e

Wednesday, 20th of October 2021
Online event

Hosted by: Center for Wireless Technology Eindhoven

- | | | |
|-------|---|--------------------------------|
| 10.00 | - Getting connected with home made coffee | |
| | Morning program | |
| 10.05 | Opening and introduction | Sonia Heemstra de Groot (TU/e) |
| 10.15 | How to become a robot | Dirk Heylen (UT) |
| 10.40 | Link quality does not matter if you're too late... | Kees Moerman (NXP) |
| 11.05 | The road to THz applications with societal relevance | Dook van Mechelen (TU/e) |
| | Lunch break | |
| 11.30 | - Home made lunch | |
| | Afternoon program | |
| 13.00 | Poster pitches | various speakers |
| 13.25 | Will cellular networks compete with wi-fi for indoor usage? | Frans Panken (SURF) |
| 13.50 | (Low cost, low power IoT connectivity) | Maarten Engelen (Hiber) |
| | Closing | |
| 14.15 | Closing words | Sonia Heemstra de Groot (TU/e) |
| 14.20 | - End | |

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Center for Wireless Technology Eindhoven