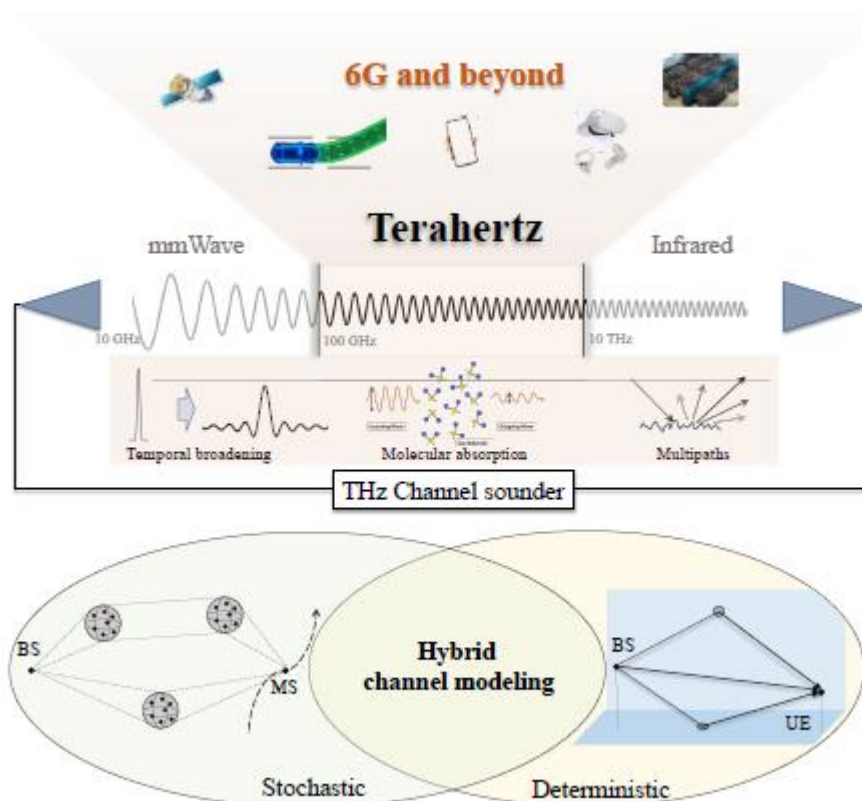


Terahertz Wireless Channels: Measurement, Modelling, and Analysis

Abstract

Terahertz (0.1-10 THz) communications are envisioned as a key technology for sixth generation (6G) and beyond wireless systems. The study of underlying THz wireless propagation channels provides the foundations for the development of reliable THz communication systems and their applications. Delivered by two leading experts of the field from academia and industry, this short course provides a comprehensive overview of the study of THz wireless channels, including measurements, models, simulators, and channel characteristics.

Graphical abstract



Recommended prerequisites

The course requires a basic knowledge on wireless channel propagation, measurement, modelling and characterization.

Learning objectives

Targeted attendees of the short course include but are not limited to academic researchers in the field of 5G and beyond, Terahertz band, millimeter waves, optical wireless communications, focusing on channel propagation and modeling.

After the course the participant will be able to

- Gain a fundamental understanding of the concepts and principles of THz wireless channels, as well as the importance for 6G and beyond wireless systems.
- Obtain critical comprehension of the state of the art in THz wireless channels, including THz channel sounder systems, THz channel modelling methodologies, THz channel characteristics, and future research directions.
- Understand the opportunities and challenges brought by THz communications to support the deployment of 6G and beyond wireless systems in the not distant future.

Course outline

1. Introduction

- Background and motivation of THz communications
- State-of-the-art of THz wireless channel studies
- Challenges of THz wireless channels

2. Channel sounding methodologies and measurement campaigns

- Frequency domain vector network analyser-based method
- Time domain sliding correlation method
- Direct pulse method
- Comparison and discussion

3. Channel modelling in the THz band

- Deterministic methods
- Statistical methods

- Hybrid methods

4. THz channel simulators

5. Channel analysis

- Data post-processing
- Large-scale and small-scale channel characteristics
- Channel characteristics in chip-scale and nano-scale networks
- Non-stationary properties

6. Open problems and future directions

Instructor 1 – biography



A/Prof. Chong Han is an outstanding early-career researcher in THz communications, as evidenced by his more than 90 publications in this area, which has been cited more than 4300 times. He has delivered seven tutorials at leading international conferences, such as IEEE ICC, WCNC, VTC, and PIMRC. In 2021 and 2022, he delivered five tutorials on THz communications at ICT 2021, EuCNC & 6G Summit, IEEE PIMRC 2021, IEEE VTC-Fall 2021, and IEEE WCNC2022. In addition, he has delivered more than 50 research talks on THz communications since 2019.

Notably, A/Prof. Han received the Elsevier Nano Communication Network Journal Young Investigator Award in 2018, for “his outstanding achievements in the area of THz wireless communications”. He has organized four special issues on THz communications at internationally leading journals. Also, he has been serving as the

TPC Co-Chair or Workshop Co-Chair of six International Workshops on Terahertz Communication, in conjunction with IEEE ICC/Globecom from 2019 to 2022. Furthermore, he is currently serving as a Vice Chair of IEEE ComSoc RCC Special Interest Group (SIG) on Terahertz Communications.

Link to video recordings of Han’s public lecture: <https://www.youtube.com/watch?v=8UOvPaWIK3w>

Instructor 2 – biography



Yi Chen is currently a senior engineer in the Huawei technologies Co., Ltd., China. He

received a Ph.D. degree from the University of Michigan-Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, Shanghai, China, in 2022. His research interests include Terahertz band networks, channel measurement and modelling. He has published more than twenty journal and conference papers, such as IEEE COMST, IEEE COMM MAG, IEEE TWC, IEEE TCOM, IEEE TAP, IEEE ICC, and IEEE GLOBECOM. Also, he has served as the TPC member of International Workshops on Terahertz Communication, in conjunction with IEEE GLOBECOM 2022 and IEEE ICC 2020.

Key bibliography

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