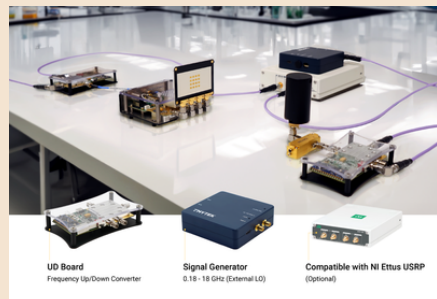


SC06- Advancing 5G/6G ORAN, MIMO and RIS Research and Development from FR2 Antenna Design to 5G/6G Testbeds

Abstract

As 5G advances, particularly within the FR2 frequency bands, training in mmWave technologies is crucial. The TMYTEK Developer Kit addresses the pressing need for affordable, comprehensive training tools. It equips educators and researchers with practical components and ready-made classes to teach mmWave principles, beamforming, and real-world applications like FWA and LEO satellites. This kit bridges the gap between theoretical knowledge and practical skills, preparing the next generation of engineers for the challenges of mmWave technology. It supports diverse educational levels, from entry-level courses to advanced research, enhancing the talent pipeline essential for the future of wireless communications..



Recommended prerequisites

Anyone can register for the course.

Learning objectives

The TMYTEK 5G mmWave Developer Kit includes signal source, array antenna, beamformer, amplifier, power detector, and RF cables to allow engineering students to set up a 5G communication system and observe beamforming results on instruments, conduct creative and innovative research on antenna design or protocol validation.

TMYTEK created a versatile 5G mmWave courseware and Labsheet to teach the principles behind beamforming and experiments to understand the propagation property of mmWave signals. The courseware introduces the sessions and offers the following benefits to students:

- Familiarize with millimeter-wave RF front-end
- Understand the link budget
- Understand constructive and destructive interference
- Verify the theory about phased array
- Hands-on experiment beamforming and beam control
- Beam pattern measurement

Course outline

Short course focuses on practical mmWave array antenna design.

Participants will begin with the fundamentals of mmWave, including the RF front end, array antenna link budget, and the basic principles of constructive and destructive interference in beamforming.

The course will progressively move into hands-on activities, covering phased array theory validation, beamforming, beam control, and beam pattern measurement. Attendees will observe beamforming results using instruments and engage in creative and innovative research on antenna design or protocol verification. They will understand beamforming principles and mmWave signal transmission, transforming theory into practice by operating the 5G mmWave Developer Kit and applying it to real-world scenarios.

Participants need to bring laptop

SC06- Hands-on Training: FR2 Antenna Design and Beamforming - From Theory to Experiments



Vincent Lee has been with TMY Technology Inc.(TMYTEK), the world's leading provider of 5G/ SATCOM beamforming solutions, since 2019. He works closely with European universities, delivering cutting-edge 5G mmWave prototyping platforms for antenna verification and wireless communication. Vincent's deep understanding of the industry's complexities and trends, combined with his commitment to expanding internet access using TMYTEK's state-of-the-art technology, makes him a valuable asset to the company's mission. Vincent's leadership and sales abilities have contributed to the growth and success of TMYTEK., earning him respect in the industry.

Guan-Long Huang earned his B.E. in electronic information engineering from Harbin Institute of Technology, China, in 2011, and his Ph.D. in electrical and computer engineering from the National University of Singapore in 2015.

Currently, he serves as a Distinguished Professor at Foshan University, China, and Director of the Smart Antenna and Microwave & Millimeter-Wave Engineering Technology Research Centre in Foshan City. He's a Fellow of IET. Prior to his current role, he held positions at Shenzhen University, Nokia Solutions and Networks System Technology, and Temasek Laboratories at the National University of Singapore, and adjunct positions at PengCheng National Laboratory, and Southern University of Science and Technology, from 2011 to 2020. He has authored/coauthored 2 books and over 200 papers, and he's been recognized with numerous awards, including the Raj Mittra Travel Grant in 2021 from IEEE AP-S, Best/Top Reviewer Award of IEEE TAP (2020, 2021, 2023) and IEEE AWPL (2019), and Young Scientist Award in 2021 from the Applied Computational Electromagnetics Society. He was ranked as one of the World's Top 2% Scientists by Stanford University in 2021 and 2022. His research focuses on high-performance antenna arrays, RF front-end devices, millimeter-wave technology, and antenna measurement techniques.



Emil Björnson (Fellow, IEEE) received the M.S. degree in engineering mathematics from Lund University, Sweden, in 2007, and the Ph.D. degree in telecommunications from the KTH Royal Institute of Technology, Sweden, in 2011. From 2012 to 2014, he was a Post-Doctoral Researcher with the Alcatel-Lucent Chair on Flexible Radio, SUPELEC, France. From 2014 to 2021, he held different professor positions at Linköping University, Sweden. He has been a Full Professor of Wireless Communication at KTH since 2020 and the Head of the Communication Systems division since 2024.