



EXHIBITOR WORKSHOPS AND SEMINARS

Rohde & Schwarz tutorial seminars and technical workshops

– Free to attend –

For more information, details and registration, visit

<http://www.rohde-schwarz.com/eumw>

Location: ICC Capital Suite – Level 3 – Room 3

Tutorial seminars – RF test and measurement basics

Tutorial abstract:

Advances in 5G and mmWave communications are making major changes to the world of cellular and non-cellular communications. Technologies in the automotive industry and Internet of Things have had a significant impact on mmWave engineering and the design of new products. Modern communications technologies, telemetry applications, radar technologies and industrial assembly of mmWave circuits have all increased cross-disciplinary collaboration.

Nowadays, mmWave engineers also face the challenge of mastering RF signal technologies and digital communications. Every mmWave engineer needs a sound understanding of RF and mmWave testing methods to implement solutions and designs in RF and mmWave circuits.

The Rohde & Schwarz seminars covering RF test and measurement basics will familiarize you with the fundamental aspects of signal generators, power sensors, spectrum analyzers and network analyzers. You will learn the benefits of our highly flexible T&M equipment when designing RF and mmWave circuits.

Monday, 4th April, 2022

9:30 to 10:45: Fundamentals of signal generators and oscillators (YIG vs. VCO)
11:00 to 12:15: Fundamentals of power measurements

Tuesday, 5th April, 2022

9:30 to 10:45: Fundamentals of spectrum analysis
11:00 to 12:15: Fundamentals of phase noise testing

Wednesday, 6th April, 2022

9:30 to 10:45: Fundamentals of vector network analysis
11:00 to 12:15: Calibration in vector network analysis



Technical workshops

Monday, 4th April, 2022, 13:30 to 15:30

mmWave and THz technology beyond 5G

Workshop chair: Dr. Taro Eichler, Market Segment Manager Wireless Communications, Rohde & Schwarz

Millimeterwave (mmWave) and THz technologies are key components when looking beyond 5G and 6G. The radio spectrum between 30 GHz and 300 GHz helps resolve spectrum crunch and enables ultrabroadband mobile communications up to the terabit range. The research and development of such systems creates new challenges for frontend, mixed signal and baseband technologies and new requirements for the test and measurement industry. Since highly integrated frontends with array antennas will be implemented, advanced over-the-air testing methods with a far greater frequency range up to 500 GHz will become mandatory. Furthermore, using extreme wideband channels up to several GHz will be a challenge for broadband signal generation and signal analyzers. These require an interdisciplinary approach with close collaboration between semiconductor, assembly and signal processing experts. This workshop gives an overview of recent developments in broadband mmWave and THz communications systems with a special focus on radio channel and OTA measurements as well as on hardware implementation issues.

13:30 – 14:00: The path towards 6G: from millimeter waves to THz

Presenter: Dr. Taro Eichler

In this introduction we will provide an overview of the anticipated 6G timeline and technology concepts which have to fulfil even more stringent requirements in comparison to 5G, such as ultra-high data rates, energy efficiency, global coverage and connectivity as well as extremely high reliability and low latency. The combination of communication and sensing (JCAS) – in various frequency ranges - is also one of the novel 6G research areas. To fully exploit the potential of the new frequency ranges it is also crucial to understand the propagation characteristics for the development of the future communication standards by performing channel measurements. We will highlight the characteristics of channel propagation in this frequency region and present new results from channel measurements at 158 GHz and 300 GHz.

14:15 to 14:45: Space THz receivers and sources for the next generation of ESA ice cloud imager (ICI) and planetary spectrometer (SWI) instruments

Presenter: Dr. Bertrand Thomas, Co-Authors: M. Philipp, T. Stangier, M. Brandt, G. Sonnabend, P. Krause, A. Kilian, N. Wehres, M. Trasatti, M. Schmitz, and A. Walber

Over the past 10 years, RPG has developed THz heterodyne receivers in the 183 - 664 GHz range for the Ice Cloud Imager (ICI), a conical scanning multi-channel radiometer developed by Airbus-ASE for the ESA/EUMETSAT MetOp-SG program and high-power sources in the 132-158 GHz range for the Submillimeter-Wave Instrument (SWI), a dual-channel 0.6-1.2 THz spectrometer developed by MPS for the ESA Jupiter Icy Moon Explorer (JUICE) program. The technology in both instruments relies heavily on GaAs semi-conductor devices (amplifiers, multipliers, mixers) and high precision manufacturing and assembly techniques (horn antennas, RF modules) which must meet very stringent requirements to qualify for these missions. We will show the state-of-the-art performance required for the delivered flight models, summarize the challenges during the qualification test campaigns, and explain the lessons learned for future highly integrated receivers.

15:00 to 15:30: Optoelectronic cw-THz systems and their use in wireless communication: Where are we, and what's next?

Presenter: Prof. Björn Globisch, Technical University Berlin

Optoelectronic continuous-wave terahertz generation relies on "photomixing", where dedicated semiconductor structures translate beat signals from two tunable lasers into terahertz radiation. This talk



reviews state-of-the-art laser and photomixer technology and presents initial work towards implementing this technique in wireless communications. We give an outlook how the application will benefit from further advances, especially in highly integrated on-chip concepts.

Tuesday, 5 April, 2022, 13:30 to 17:00

Modern RF frontend design and testing

Workshop chair: Markus Lörner, Market Segment Manager RF and Microwave Components, Rohde & Schwarz

5G is here. The focus is now on improving systems and enhancing them with mmWave technology, which is driving the growing integration of components and the creation of more efficient designs to minimize the form factor, improve energy efficiency and drive down overall costs. Multifunction RF components such as beamformers are used in 5G mmWave technology as well as in satellite communications and defense applications. High density of RF frontends for massive MIMO systems require unprecedented energy efficiency to minimize physical size while maintaining stable temperature conditions. When we look at RF frontend design, we start with realistic simulations using target application scenarios and digital predistortion in simulation and hardware verification.

The workshop will survey the latest RF frontend technologies and requirements, focusing on improved efficiency and enhanced integration. Test and measurement experts and industry partners will provide solutions to meet demanding requirements.

13:30 to 14:00: RF measurement uncertainty: how signals interact

Presenter: Tim Fountain, Rohde & Schwarz Application Segment Manager Aerospace & Defense.

In this practical session we review the importance of measurement uncertainty, its causes and delve into some key factors behind it, including signal to noise ratio, signal interactions and how hardware affects measurement uncertainty. We conclude with some basics for calculating measurement uncertainty.

14:15 to 14:45: From design to real RF device – connecting EDA simulation and hardware test

Presenter: Markus Lörner, Market Segment Manager RF and Microwave Components, Rohde & Schwarz

The development process for RF components and systems are being streamlined by using real signals in EDA system simulations and hardware tests. Simulating complex wideband signals in line with the latest 5G NR or Wi-Fi specifications allows for more realistic results. Using identical signal creation methods and analysis algorithms in subsequent hardware tests ensures a direct correlation between early design and implementation verification.

R&S@WinIQSIM2 and R&S@VSE signal generation and analysis tools have been integrated into the Cadence VSS simulation tool to do so. A demonstration of the upcoming R&S@VSESIM-VSS solution will illustrate the effectivity and efficiency of the new approach and its benefits.

15:00 to 15:30: Real-time frequency and time domain tuning for 5G and mm-Wave microwave filters

Presenter: Diamond Liu, Synmatrix

5G and mmWave applications are driving the demand for more RF microwave filters. Improving volume production yield and generating more consistent RF performance are major challenges for R&D cycle time and engineering costs. Post filter tuning during production can severely impact production cycle time and consume expensive manhours.

To help with post filter tuning challenges, this seminar introduces the SynMatrix – Rohde & Schwarz workflow, a complete test and tuning solution that features a real-time frequency and time domain tuning module for 5G and mmWave microwave filters. The guided workflow allows RF engineers and technicians to test and tune designs quickly and accurately. The seminar demonstrates the end-to-end process from specification analysis and design, to the test and tuning workflow using a Rohde & Schwarz ZNB vector



network analyzer and the SynMatrix application tool. Two tuning approaches are presented for bandpass filters with and without transmission zeros.

15:45 to 16:15: Frequency synthesizer design and testing

Presenter: Ian Collins Richardson RFPD and Kieran Barrett, ADI

Wideband voltage-controlled oscillators (VCO) cover a very wide frequency range from 10 – 20 GHz and users who wish to use them to maximize their capabilities, may need some additional testing beyond what that found in the published data sheet information. A VCO and phase noise tester are ideal with fast and easy measurement of VCO sensitivity (Kv) and phase noise for more detailed information.

This session discusses what to look for, why and how to do it.

16:30 to 17:00: Enabling mmWave 5G through antenna, IC, packaging and algorithm innovations

Presenter: Harish Krishnaswamy CTO, MixComm Inc.

5G promises ultra-high bandwidth and ultra-low latency, which will come from millimeter-wave (mmWave) technology. While early mmWave deployments are underway, several challenges still need to be overcome, including the limited range and stability of mmWave links as well as the cost and thermal challenges of current hardware solutions. This talk covers recent MixComm innovations that range from Antennas through ICs and Packaging to Algorithms to provide holistic solutions and enable practical and successful mmWave deployment.

The schedule is subject to change. The latest version can be downloaded at www.rohde-schwarz.com/eumw