IEEE IMS 2022 RF BOOT CAMP COURSE ABSTRACT

This course will provide an introduction to RF basics, targeting newcomers to the microwave industry. The intended audience includes technicians, new engineers, engineers who may be changing their career path, marketing and sales professionals seeking a better understanding of microwave technology, as well as current college students looking to learn more about the practical aspects of RF and Microwave technology. The format of the RF Boot Camp is similar to that of a workshop or short course, with multiple presenters from industry and academia presenting on a variety of topics including: RF/Microwave systems basics, network and spectrum analysis, simulation and matching network design modulation and signal analysis, antennas and radar basics.

RF Boot Camp Agenda

08:00-8:30 Registration, Welcome & Introductions - Speakers and Participants

0830-0945 **The RF/Microwave Signal Chain** **(Joanne Mistler, Keysight Technologies)**

This section will introduce transmit/receive signal chains and important characteristics for design and measurement that will be discussed throughout the following modules.

Network Characteristics, Analysis and Measurement **(Joanne Mistler, Keysight Technologies)**

This section will cover transmission line basics, S-Parameters, and the Smith Chart. Transmit, receive and directivity paths will be described along with how dynamic range and accuracy can be optimized. Calibration and error correction will also be covered.

0945-1000 Break

1000-1040 **Fundamentals of RF Simulation** **(Dr. Wilfredo Rivas-Torres, Keysight Technologies)**

This talk will start by covering various RF simulation techniques and discuss why simulation is a must in modern day RF design. Simulation domains (time or frequency), design detail (circuit or system) will be covered. Simulation techniques will be compared to real designs and lab measurements and advantages and disadvantages of each will be covered. Various application areas served by RF simulations will be covered.

1040-1145 **Impedance Matching Basics**
(Dr. Larry Dunleavy, Modelithics and University of South Florida)

The basics of Impedance Matching basics will be covered. Various types of lumped and distributed matching network topologies and approaches will be introduced and related demonstrations will be performed using Keysight ADS.

1145-1230 Lunch

1230-1340 **Spectral Analysis and Receiver Technology**
(Joanne Mistler, Keysight Technologies, Larry Dunleavy, USF and Modelithics)

This section covers frequency and time domain sweep searching including RBW, VBW and dynamic range criteria for accurate measurements. Included will be an overview of the independent and integrated functioning of the various system blocks comprising a typical heterodyne down converting receiver, including mixing, amplification, image frequency filtering and adjacent channel filtering.

1340-1425 **Signal Generation (Joanne Mistler, Keysight Technologies)**

This section covers CW signal characteristics, including phase noise, VCO, VCO+PLL and synthesis techniques.

Modulation and Vector Signal Analysis (Joanne Mistler, Keysight Technologies)

This section covers analog amplitude, phase, frequency and pulsed modulation, composite modulation, polar and I-Q format, and digital modulation signal characteristics and measurement.

1425-1525 **Microwave Antenna Basics (Dr. Tom Weller, Oregon State University)**

This tutorial provides an overview of antenna topics that includes the fundamentals of microwave radiation, basic types of antennas that are commonly used for microwave applications, the most important functional requirements for antennas and a discussion of wireless propagation channels. Specific topics of discussion that are relevant to personal communications devices and emerging applications such as IoT include electrically small antennas, antenna arrays and reconfigurable antennas.

1525-1535 Break

1535-1625 **RFMW Application Focus (Bryan Goldstein, VP Aerospace Defense, Analog Devices)**

This session will follow the development of a microwave Transmit/Receive system, from concept to production. We will show how the system-level performance and environmental requirements drive the electrical and mechanical design specifications, packaging approach and materials selection. We will demonstrate modeling/simulation approaches from the device to the system level for both electrical and mechanical aspects and we will describe bread-boarding strategies to affirm simulation models and to minimize risk. Lastly, we will demonstrate production test strategies and methodologies to guarantee performance compliance of the deliverable product.

1625-1645 **Recap and Q&A session**