



# Automatic RF Techniques Group

## 93<sup>rd</sup> ARFTG Microwave Measurement Symposium

### Measurement challenges for the upcoming RF and mm-wave communications and sensing systems

Boston, MA, USA, June 7, 2019

#### TECHNICAL AGENDA

Friday, June 7, 2019

8:00 to 8:10

[Welcome to the 93<sup>rd</sup> ARFTG Conference Introduction](#)

Conference Co-Chairs: Mohamed Sayed and David Blackham

TPC Co-Chairs: Marco Spirito and Patrick Roblin

### Session A: Non-linear measurement techniques

Session Chair: Marco Spirito and Patrick Roblin.

8:10 to 8:50

**KEYNOTE: Design of an On-Chip mmWave LSNA with Load Pull and Advanced Signal Sources**

Dylan Williams, Jerome Cheron, Richard Chamberlin, Tasshi Denis

*NIST*

A-1

8:50 to 9:10

**Characterizing Amplifier Modulation Distortion Using a Vector Network Analyzer**

Jan Verspecht, Augustine Stav, Sam Kusano, Jean-Pierre Teyssier,

*Keysight Technologies*

A-2

9:10 to 9:30

**Harmonic Cancellation Technique for Ultra-Wideband Filter-Less 5G Transmitter**

Girish Chandra Tripathi<sup>1</sup>, Meenakshi Rawat<sup>1</sup>, Patrick Roblin<sup>2</sup>

<sup>1</sup>Institute of Technology Roorkee, <sup>2</sup>The Ohio State University

A-3

9:30 to 9:50

**A Novel Modulated Rapid Load Pull System with Digital Pre-Distortion Capabilities**

Sattam Alsaahali<sup>1</sup>, Jonathan Lees<sup>1</sup>, Aamir Sheik<sup>2</sup>, Dragan Gecan<sup>2</sup>, Alexander Alt<sup>1</sup>, Guofeng Wang<sup>1</sup>, Simon Woodington<sup>2</sup>, Peng Chen<sup>1</sup>, Paul Tasker<sup>1</sup>

<sup>1</sup>Cardiff University, <sup>2</sup>MESURO

9:50 to 10:40

[Break – Exhibits and Interactive Forum](#)

### Session B: Mixed-Signal and MIMO systems calibration and measurements

Session Chair: Peter Aaen and Joe Gering

B-1

10:40 to 11:00

**Frequency response of real time digital oscilloscope with time-interleaving architecture**

Chihyun Cho, Dong-Joon Lee, Hyun-Jee Goo, Joo-Gwang Lee

*KRISS*

B-2

11:00 to 11:20

**Automatic vector signal generator calibration method suitable for multiport large-signal measurements**

Tibault Reveyrand, Alexis Courty, Morgane Portelance, Pierre Medrel, Philippe Bouysse, J. M. Nebus

*XLIM*

B-3

11:20 to 11:40

**Calibrated Digital Predistortion Using a Vector Network Analyzer as the Receiver**

Thaimí Niubó Alemán<sup>1,2</sup>, Yunsik Hahn<sup>2</sup>, Patrick Roblin<sup>2</sup>, Jean-Pierre Teyssier<sup>3</sup>, J. Apolinar Reynoso-Hernández<sup>1</sup>, Vanessa Chen<sup>2</sup>, Siddharth Rajan<sup>2</sup>

<sup>1</sup>CICESE, <sup>2</sup>The Ohio State University, <sup>3</sup>Keysight Technologies

B-4

11:40 to 12:00

**Over-the-Air Phase Measurement and Calibration Method for 5G mmW Phased Array Radio Transceiver**

Markku Jokinen, Olli Kursu, Nuutti Tervo, Jani Saloranta, Marko E. Leinonen, Aarno Pärssinen  
*University of Oulu*

12:00 to 13:30

## Awards Luncheon

### **Session C: Calibration and measurements from coaxial to on-wafer and from RF to (sub)mm-wave**

Session Chair: Leonard Hayden and Andrej Rumiantsev

**C-1**  
13:30 to 13:50

#### **Confidence and Prediction Intervals for Microwave Calibrations and Measurements**

Dylan Williams, Benjamin Jamroz, Jacob Rezac  
*NIST*

**C-2**  
13:50 to 14:10

#### **S-Parameter Definition for Adapters with a Dielectrically Loaded Connector**

Johannes Hoffmann, P. Huerlimann, M. Wollensack, J. Ruefenacht, M. Zeier  
*METAS*

**C-3**  
14:10 to 14:30

#### **TRL Error-box Split to Compensate for the Bias Dependency of ESD and Antenna Protection Diodes in mm-Wave**

Carmine De Martino, Eduard Malotau, Marco Spirito  
*TU Delft*

**C-4**  
14:30 to 14:50

#### **Electronic Calibration of One-Port Networks at Submillimeter Wavelengths using Schottky Diodes as On-Wafer Standards**

Linli Xie<sup>1</sup>, Matthew Bauwens<sup>2</sup>, Souheil Nadri<sup>1</sup>, Michael Cyberey<sup>1</sup>, Alexander Arsenovic<sup>3</sup>, Arthur Lichtenberger<sup>1</sup>, N. Scott Barker<sup>1</sup>, Robert M Weikle<sup>1</sup>  
<sup>1</sup>University of Virginia, <sup>2</sup>Dominion MicroProbes, <sup>3</sup>810 Labs

14:50 to 15:40

#### Break – Exhibits and Interactive Forum

### **Session D: Other areas of RF and microwave measurement techniques**

Session Chair: Jim Booth and Jeffrey Jargon

**D-1**  
15:40 to 16:00

#### **Differential noise measurements: sensitivities and uncertainties with direct correlation- and balun-based methods**

Jon Martens  
*Anritsu*

**D-2**  
16:00 to 16:20

#### **Experimental Verification and Imaging of Radiation Due to Coaxial-to-Microstrip Transitions**

Haris Votsi, Jonas Urbonas, Peter Aaen  
*University of Surrey*

**D-3**  
16:20 to 16:40

#### **The HF-VNA, an interferometric approach for the accurate measurement of extreme impedances**

Raffaele Romano<sup>1</sup>, Faisal Mubarak<sup>2</sup>, Marco Spirito<sup>3</sup>, Luca Galatro<sup>1,3</sup>  
<sup>1</sup>Vertigo, <sup>2</sup>VSL, <sup>3</sup>TU Delft

**D-4**  
16:40 to 17:00

#### **Non-Contact Characterization of Antenna Parameters via One-Port Open-Fixture Network Calibration**

Seckin Sahin, Niru Nahar, Kubilay Sertel  
*The Ohio State University*

### **Interactive Forum**

Session Chair: Rusty Myers

**P-1**  
9:50 to 15:40

#### **Investigating the Effects of IF Bandwidth and Averaging on Calibrated Scattering-Parameter Measurements**

Jeff Jargon, Amanda Koepke, Paul Hale  
*NIST*

- P-2**  
9:50 to 15:40 **Noise Power Ratio Prediction and Measurement of a Ku band GaN Power Amplifier**  
Matthew Cullen, Mark Cavin, Lowell Hoover, Alan Cherrette  
*Lockheed Martin*
- P-3**  
9:50 to 15:40 **Two-Tone Intermodulation Measurement of W-band Amplifiers based on High-Linearity Frequency Down-Conversion**  
Yuh-Jing Hwang  
*Academia Sinica*
- P-4**  
9:50 to 15:40 **Low-Cost & Light-Weight 6 GHz Band Resin Based Cavity for Dielectric Plate Characterizations using Additive Manufacturing Techniques**  
Takashi Shimizu, Yoshinori Kogami  
*Utsunomiya University*
- P-5**  
9:50 to 15:40 **Investigation of Waveguide Sensors for Ultra-Short-Distance Measurements**  
Aleksandra Baskakova, Karel Hoffmann  
*Czech Technical University in Prague*
- P-6**  
9:50 to 15:40 **Impact of RFIC Spurious Noise on Receiver of Cellular Handset in Communication State**  
Masafumi Iwaki<sup>1,3</sup>, Kazuhiro Matsumoto<sup>1</sup>, Kazuhiko Kobayashi<sup>1,2</sup>  
<sup>1</sup>Taiyo Yuden, <sup>2</sup>Taiyo Yuden Mobile Technology Co., <sup>3</sup>Chiba University
- P-7**  
9:50 to 15:40 **Identity Authentication System using a Support Vector Machine (SVM) on Radar Respiration Measurements**  
Shekh Md Mahmudul Islam<sup>1</sup>, Ashikur Rahman<sup>2</sup>, Narayana Santhanam<sup>1</sup>, Olga Boric-Lubecke<sup>1</sup>, Victor Lubecke<sup>1</sup>  
<sup>1</sup>University of Hawaii, <sup>2</sup>Aptiv
- P-8**  
9:50 to 15:40 **Machine Learning in a Quality Managed RF Measurement Workflow**  
Aric Sanders<sup>1</sup>, John M. Bass<sup>2</sup>, Arpita Bhutani<sup>3</sup>, MaryAnn S. Ho<sup>4</sup>, James C. Booth<sup>1</sup>  
<sup>1</sup>NIST, <sup>2</sup>Rose-Hulman Institute of Technology, <sup>3</sup>Peak to Peak Charter School, Lafayette, Co, <sup>4</sup>Fairview High School, Boulder Co.
- P-9**  
9:50 to 15:40 **Waveguide Method for Surface Impedance Measurements on Composite Material Substrates**  
Dimitrios Fakis<sup>1</sup>, Chris Worral<sup>2</sup>, Mihalis Kazilas<sup>3</sup>  
<sup>1</sup>Brunel University, <sup>2</sup>National Structural Integrity Research Center, <sup>3</sup>TWI
- P-10**  
9:50 to 15:40 **Methodology of Nanoscale Electrical Characterization for Wide-Range Dielectric Permittivity Materials by Scanning Microwave Microscopy**  
Masahiro Horibe, Iku Hirano  
*AIST*
- P-11**  
9:50 to 15:40 **Spectral Purity Measurement of Millimeter-Wave Signal Sources**  
Jae-Yong Kwon<sup>1,2</sup>, Aditia Nur Bakti<sup>2</sup>, No-Weon Kang<sup>1</sup>  
<sup>1</sup>KRISS, <sup>2</sup>University of Science and Technology, Daejeon
- P-12**  
9:50 to 15:40 **Challenges in Terahertz Fiber Based Inter-device Communications**  
Kathirvel Nallappan, Hichem Guerboukha, Yang Cao, Chahe Nerguizian, Maksim Skorobogatiy  
*Ecole Polytechnique de Montreal*

**Closing Notes. End of ARFTG-93rd Conference**