



# Automatic RF Techniques Group

## 77<sup>th</sup> ARFTG Microwave Measurement Conference

Hilton Baltimore in Baltimore, Maryland

### TECHNICAL AGENDA

08:00 to 09:40 **Session 1: Measurement systems**

*Session Chair: Jon Martens, Anritsu*

**The Increasing Power of SW-Defined Modular Measurement Systems for RF & Microwave Applications (Invited)**

J. Bains, National Instruments, Santa Rosa, United States

**Hybrid active tuning load pull**

G. Simpson, Maury Microwave Corporation, Ontario, United States

**High-Speed Device Characterization Using an Active Load-Pull System and Waveform Engineering Postulator**

V. Carrubba, A. L. Clarke, S. P. Woodington, M. Akmal, J. Lees, S. C. Cripps, W. McGenn, P. J. Tasker, J. Benedikt, Cardiff University, Cardiff, United Kingdom

**High Speed Non-linear Device Characterization and Uniformity Investigations at X-Band Frequencies exploiting Behavioral Models**

R. S. Saini, J. W. Bell, T. A. Canning, S. P. Woodington, D. FitzPatrick, J. Lees, J. Benedikt, P. J. Tasker, Cardiff University, Cardiff, United Kingdom

09:40 to 10:40 **Break – Exhibits and Interactive Forum**

*Session Chair: Brett Grossman, Intel*

**Evaluation of Complex Residual Error in Vector Network Analyzer Measurement System in the Range of Millimeter-wave and Submillimeter-wave frequencies**

R. Kishikawa, M. Horibe, M. Shida, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

**A Simple Procedure for Characterizing Line-Stretcher Phase Shifters**

J. E. Zuñiga-Juarez<sup>1</sup>, J. A. Reynoso-Hernandez<sup>1</sup>, M. C. Maya-Sanchez<sup>1</sup>, J. R. Loo-Yau<sup>2</sup>, <sup>1</sup>Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), Ensenada, Mexico, <sup>2</sup>Centro de Investigación y Estudios Avanzados del I. P. N. Unidad Guadalajara, Zapopan, Mexico

**Traceable GMSK vector modulation error based on analog PM**

Z. Rui, Z. Feng, G. Long-Qing, L. Yao-Hua, China Academy of Telecommunication Research of Ministry of Industry and Information Technology(CATR), Beijing, China

**Contactless distance measurement method**

K. Hoffmann, Z. Skvor, Czech Technical University in Prague , Prague 6, Czech Republic

**Comparison of different methods for calculating uncertainties in the electrical properties of planar waveguides**

K. Kuhlmann, U. Arz, Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany

**Design Study of a Thermocouple Power Sensor as a Monolithic Fin-line**

M. Jones, J. Scott, University of Waikato, Hamilton, New Zealand

**An Automatic Measurement Setup for Outer Diameter of Inner Conductor in Coaxial Air Lines**

H. Huang<sup>1</sup>, M. X. Liu<sup>1</sup>, X. Lv<sup>2</sup>, <sup>1</sup>National Institute of Metrology, China, Beijing, China, <sup>2</sup>Beijing Institute of Technology, Beijing, China

**Analyses of RF impedance analyzer and LCR meter readout noise**

X. M. Liu<sup>2</sup>, H. Huang<sup>1</sup>, H. Xu<sup>1</sup>, <sup>1</sup>National Institute of Metrology, Beijing, China, <sup>2</sup>Beijing Institute of Technology, Beijing, China

**Adapter Evaluation Using Three-adapter Technique with ‘Thru-Line’ Two-tier Calibration in One-port Measurements**

J. Kim, J. Kang, J. Kwon, D. Kim, Korea Research Institute of Standards and Science, Daejeon, Republic of Korea

**attoF MOS Varactor RF Measurement VNA coupled with interferometer**

R. Debroucke<sup>2</sup>, D. Gloria<sup>1</sup>, D. Ducatteau<sup>2</sup>, D. Theron<sup>2</sup>, H. Tanbakuchi<sup>3</sup>, C. Gaquiere<sup>2</sup>, <sup>1</sup>STMicroelectronics, Crolles, France, <sup>2</sup>IEMN, Villeneuve d'ascq, France, <sup>3</sup>Agilent Technologies, Santa Rosa, United States

**Measurement and Evaluation of the WR28 Calorimeter**

X. Cui, Y. Li, X. Gao, M. Dai, D. Zhu, National Institute of Metrology of China, Beijing, China

**Real-Time Non-Linear De-embedding**

F. Vanaverbeke<sup>1</sup>, W. De Raedt<sup>1</sup>, D. Schreurs<sup>2</sup>, M. Vanden Bossche<sup>3</sup>, <sup>1</sup>Imec, Heverlee, Belgium, <sup>2</sup>KULeuven, Heverlee, Belgium, <sup>3</sup>nmdg NV, Bornem, Belgium

**Vector-Network-Analyzer Calibration Using Line and Multiple CPW Offset Short and Offset Open Circuits**

A.. Lewandowski<sup>1</sup>, W. Wiatr<sup>1</sup>, D. Gu<sup>2</sup>, N. Orloff<sup>2</sup>, P. Kabos<sup>2</sup>, <sup>1</sup>Warsaw University of Technology, Warsaw, Poland, <sup>2</sup>National Institute of Standards and Technology, Boulder, United States

**A Superior Solution to Control the Pin Gap and Coupling of Coaxial Airline Impedance Standards**

T. Roberts, Y. Lee, Anritsu Company, Morgan Hill, United States

**Application of Multimode TRL Technique for Accurate Balun Characterization and Estimation of its Impact on Measurement of Differential Devices**

V. E. Issakov, M. Wojnowski, G. Sommer, Infineon Technologies AG, Neubiberg, Germany

**Characterizations of non-symmetrical fixtures with a two-gate approach**

J. Dunsmore<sup>1</sup>, N. Cheng<sup>2</sup>, Y. Zhang<sup>2</sup>, <sup>1</sup>Agilent Technologies, Inc., Santa Rosa, United States, <sup>2</sup>Agilent Technologies, Inc., Beijing, China

10:40 to 12:00

**Session 2: Calibration issues and techniques**

*Session Chair: Uwe Arz, PTB*

**Fabrication of Calibration Standards for the Millimeter- and Submillimeter-Wave Ring-Centered Waveguide Flange**

Q. Yu<sup>1</sup>, J. Hesler<sup>3</sup>, A. Kerr<sup>2</sup>, H. Li<sup>1</sup>, R. Weilke II<sup>1</sup>, N. S. Barker<sup>1</sup>, <sup>1</sup>University of Virginia, Charlottesville, United States, <sup>2</sup>National Radio Astronomy Observatory, Charlottesville, United States, <sup>3</sup>Virginia Diodes, Inc., Charlottesville, United States

**New Calibration Technique for Coaxial Network Analyzer Reflection Measurements at Millimeter-wave Frequencies**

M. Horibe<sup>1</sup>, N. Ridler<sup>2</sup>, M. Salte<sup>2</sup>, C. Eio<sup>2</sup>, <sup>1</sup>National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, <sup>2</sup>National Physical Laboratory, Tedington, United Kingdom

## **Second-Order Waveguide Calibration of a One-Port Vector Network Analyzer**

R. H. Judaschke, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

## **Calibration Residual Error Propagation Analysis Using Conformal Mapping**

F. Lenk<sup>1</sup>, R. Doerner<sup>2</sup>, A. Rumiantsev<sup>3</sup>, M. Rudolph<sup>4</sup>, <sup>1</sup>Hochschule Lausitz (FH), Senftenberg, Germany, <sup>2</sup>Ferdinand-Braun-Institut (FBH), Berlin, Germany, <sup>3</sup>Cascade Microtech Dresden GmbH, Sacka, Germany, <sup>4</sup>Brandenburg University of Technology Cottbus, Cottbus, Germany

12:00 to 13:10    **Lunch and ARFTG Awards**

13:10 to 14:10    **Session 3: On-wafer methods and uncertainty analysis**

*Session Chair: Leonard Hayden, Cascade Microtech*

## **Wideband Relative Permittivity Extraction Based on CPW Phase Constant Measurements**

U. Arz<sup>1</sup>, M. Janezic<sup>2</sup>, W. Heinrich<sup>3</sup>, <sup>1</sup>PTB, Braunschweig, Germany, <sup>2</sup>NIST, Boulder, United States, <sup>3</sup>FBH, Berlin, Germany

## **MOS-16: A New Method for In-Fixture Calibration and Fixture Characterization**

M. Schramm<sup>1</sup>, M. Hrobak<sup>1</sup>, J. Schür<sup>1</sup>, L. Schmidt<sup>1</sup>, M. Konrad<sup>2</sup>, <sup>1</sup>University Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Konrad Technologies, Radolfzell, Germany

## **Uncertainty in Multiport S-parameters Measurements**

A. Ferrero<sup>1</sup>, M. Garelli<sup>3</sup>, B. Grossman<sup>2</sup>, S. Choon<sup>2</sup>, V. Tepatti<sup>1</sup>, <sup>1</sup>Politecnico di Torino, Torino, Italy, <sup>2</sup>Intel, Hillsboro, United States, <sup>3</sup>High Frequency Engineering Sagl, San Vittore, Switzerland

14:10 to 14:50    **Break – Exhibits and Continuation of the Interactive Forum**

*Session Chair: Brett Grossman, Intel*

14:50 to 15:50    **Session 4: Broadband and mm-wave techniques**

*Session Chair: Nick Ridler, NPL*

## **An improved stability broadband/mm-wave VNA structure**

J. Martens, K. Noujeim, T. Roberts, Anritsu Company, Morgan Hill, United States

## **Measurements of Micromachined Waveguide Devices at WR-3 Band using a T/R-T Module Based Network Analyzer**

Y. Wang, M. J. Lancaster, University of Birmingham, Birmingham, United Kingdom

## **Modification of Waveguide Flange Design for Millimeter and Submillimeter-wave measurements**

M. Horibe<sup>1</sup>, K. Noda<sup>2</sup>, <sup>1</sup>Advanced Industrial Science and Technology, Tsukuba, Japan, <sup>2</sup>Oshima Prototype Engineering Co., Musashino-shi, Japan



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