



**Telecommunication  
Development Bureau (BDT)**

Ref.: BDT/PKM/HCB/DM/089

Geneva, 10 August 2015

To:  
Administrations of ITU Member States,  
Regulators and ITU-D Sector Members and  
Academia of developing countries

Subject: **ITU/Rohde & Schwarz Face-to-Face Workshop on "RF Test and Measurement Fundamentals", Munich, Germany, 2 - 6 November 2015**

Dear Sir/Madam,

On behalf of the International Telecommunication Union, I am pleased to invite your organisation to participate in a face-to-face workshop for developing countries on **"RF Test and Measurement Fundamentals"** to be held **from 2 to 6 November 2015** in the "Technology Center" at Rohde & Schwarz (R&S) Headquarters, Munich, Germany. The workshop is being conducted within the framework of a capacity-building partnership entered into between ITU and Rohde & Schwarz GmbH & Co.

This training aims to introduce participants to the fundamental principles of RF Test and Measurement. Participants will be exposed to different methods and tools of measurement, and will be able to demonstrate different analysis features.

The workshop will, among other topics, focus on the following:

- General RF fundamentals;
- Signal Generation, analog modulation & Power Measurements
- Fundamentals & Measurements in the time domain (Oscilloscopes);
- Fundamentals & Measurements in the frequency domain (Spectrum Analysis);
- Fundamentals & Measurements on component test (Vector Network Analysis);
- Generation & Analysis of digital modulated signals (VSG, VSA);
- Theoretical training will be complemented by practical hands-on test exercises.

The draft agenda of the workshop is attached (Annex).

**Target group**

The workshop targets professional and technical staff from policymakers, operators and regulatory agencies of developing countries responsible for planning, implementation and operation of spectrum monitoring systems. Participants must have at least 3 years of professional experience in the area.

## Registration

There is no training fee charged for participating in this workshop. To register for the workshop, you are kindly requested to register online on the ITU Academy portal at: [https://academy.itu.int/index.php?option=com\\_joomla&view=coursescatalog&layout=default1&lang=en&Itemid=476&region=MUL](https://academy.itu.int/index.php?option=com_joomla&view=coursescatalog&layout=default1&lang=en&Itemid=476&region=MUL) no later than **2 October 2015** according to the instructions indicated in the form.

## Fellowship

I am pleased to inform you that ITU will provide one partial fellowship (covering only daily subsistence allowance) per Administration of Least Developed Countries (LDCs) and Low Income Countries (LIC), subject to availability of funds. Final selection of candidates will be carried out by ITU. Eligible participants are requested to apply by completing the Fellowship form available on the ITU Academy portal and returning it no later than **2 October 2015**. As ITU will provide a limited number of fellowships, these will be granted on a first-come, first-served basis.

## Additional information

Please note that the workshop will be conducted in English only and participants are therefore required to have a good working knowledge of this language.

Additional information on this workshop, including a list of recommended hotels, can be found on the ITU Academy portal at the aforementioned link. Mr. Mike Nxele ([mike.nxele@itu.int](mailto:mike.nxele@itu.int)), ITU HCB Officer and Mrs. Kerstin Jüttner ([Kerstin.juettner@rohde-schwarz.com](mailto:Kerstin.juettner@rohde-schwarz.com); fax no. +49 89 4129 6 3009), Focal Point, International Relations from Rohde & Schwarz are at your full disposal should you require any further information.

I am looking forward to your positive response and active participation in this workshop. I would highly appreciate if you could circulate this invitation among relevant stakeholders in your country that could benefit from this joint effort by ITU and R&S.

Yours faithfully,

[Original signed]

Brahima Sanou

Director

Annex: Draft programme



ITU / R&S Workshop on  
**“TEST & MEASUREMENT FUNDAMENTALS”**  
 Munich , Germany, 02 - 06 November 2015



**DRAFT PROGRAMME**

	Monday, 02 Nov 2015	Tuesday, 03 Nov 2015	Wednesday, 04 Nov 2015	Thursday, 05 Nov 2015	Friday, 06 Nov 2015
09:00 - 10:30	<b>Welcome</b> <b>Generation of analog signals</b> <ul style="list-style-type: none"> <li>  Frequency Synthesis</li> <li>  ALC</li> <li>  Power</li> </ul>	<b>Signal Analysis in the Time Domain:</b> <b>Oscilloscopes</b> <ul style="list-style-type: none"> <li>  Instrument architecture</li> <li>  Sampling / ADC</li> </ul>	<b>Signal Analysis in the Frequency Domain:</b> <b>Spectrum Analysis</b> <ul style="list-style-type: none"> <li>  Fundamentals</li> <li>  Heterodyne principle</li> </ul>	<b>Component Test:</b> <b>Vector Network Analysis</b> <ul style="list-style-type: none"> <li>  Fundamentals</li> <li>  S-Parameter</li> <li>  Instrument architecture</li> </ul>	<b>Generation &amp; Analysis of digital modulated signals</b> <ul style="list-style-type: none"> <li>  Digital modulation</li> <li>  Baseband</li> <li>  Coding</li> </ul>
15min	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>
10:45 - 12:15	<b>Signals in TD &amp; FD</b> <ul style="list-style-type: none"> <li>  CW / Noise / Pulse</li> </ul> <b>Intro: analog modulation</b> <ul style="list-style-type: none"> <li>  AM / FM / PM</li> <li>  Pulse Modulation</li> </ul>	<b>Oscilloscopes</b> <ul style="list-style-type: none"> <li>  Decimation</li> <li>  Detection</li> <li>  Trigger System</li> </ul> Passive / active probes	<b>Spectrum Analysis</b> <ul style="list-style-type: none"> <li>  Filtering: RBW / VBW</li> <li>  Detectors</li> <li>  Demodulation BW</li> </ul>	<b>Vector Network Analysis</b> <ul style="list-style-type: none"> <li>  Power calibration</li> <li>  System Error Correction</li> </ul>	<b>Generation &amp; Analysis of digital modulated signals</b> <ul style="list-style-type: none"> <li>  Intro: Fading / MIMO</li> <li>  Concept of VSG &amp; VSA</li> </ul>
1 hour	<b>LUNCH BREAK</b>				
13:15 - 14:15	<b>Effects on signal transmission</b> <ul style="list-style-type: none"> <li>  Reflection/ Transmission</li> <li>  Line impedance</li> <li>  Connector Care</li> </ul>	<b>Oscilloscopes</b> <ul style="list-style-type: none"> <li>  FFT</li> <li>  Bus analysis</li> <li>  Compliance testing</li> </ul>	<b>Spectrum Analysis</b> <ul style="list-style-type: none"> <li>  Typical measurements</li> </ul>	<b>Vector Network Analysis</b> <ul style="list-style-type: none"> <li>  Typical measurements</li> </ul>	<b>Generation &amp; Analysis of digital modulated signals</b> <ul style="list-style-type: none"> <li>  Typical measurements</li> </ul>
15min	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>	<b>Coffee / Tea Break</b>
14:30 - 17:00	<b>Power Measurements</b> <ul style="list-style-type: none"> <li>  Fundamentals</li> <li>  Sensor types</li> </ul> <b>Exercise / Practice</b>	<b>Oscilloscopes</b> <ul style="list-style-type: none"> <li>  Hands on</li> </ul>	<b>Spectrum Analysis</b> <ul style="list-style-type: none"> <li>  Hands on</li> </ul>	<b>Vector Network Analysis</b> <ul style="list-style-type: none"> <li>  Hands on</li> </ul>	<b>Generation &amp; Analysis of digital modulated signals</b> <ul style="list-style-type: none"> <li>  Hands on</li> </ul> <b>Summary / Conclusion</b>