

**Third ITU-T Study Group 11 Regional Workshop  
for Africa on "Counterfeit ICT Devices,  
Conformance and Interoperability Testing  
Challenges in Africa"  
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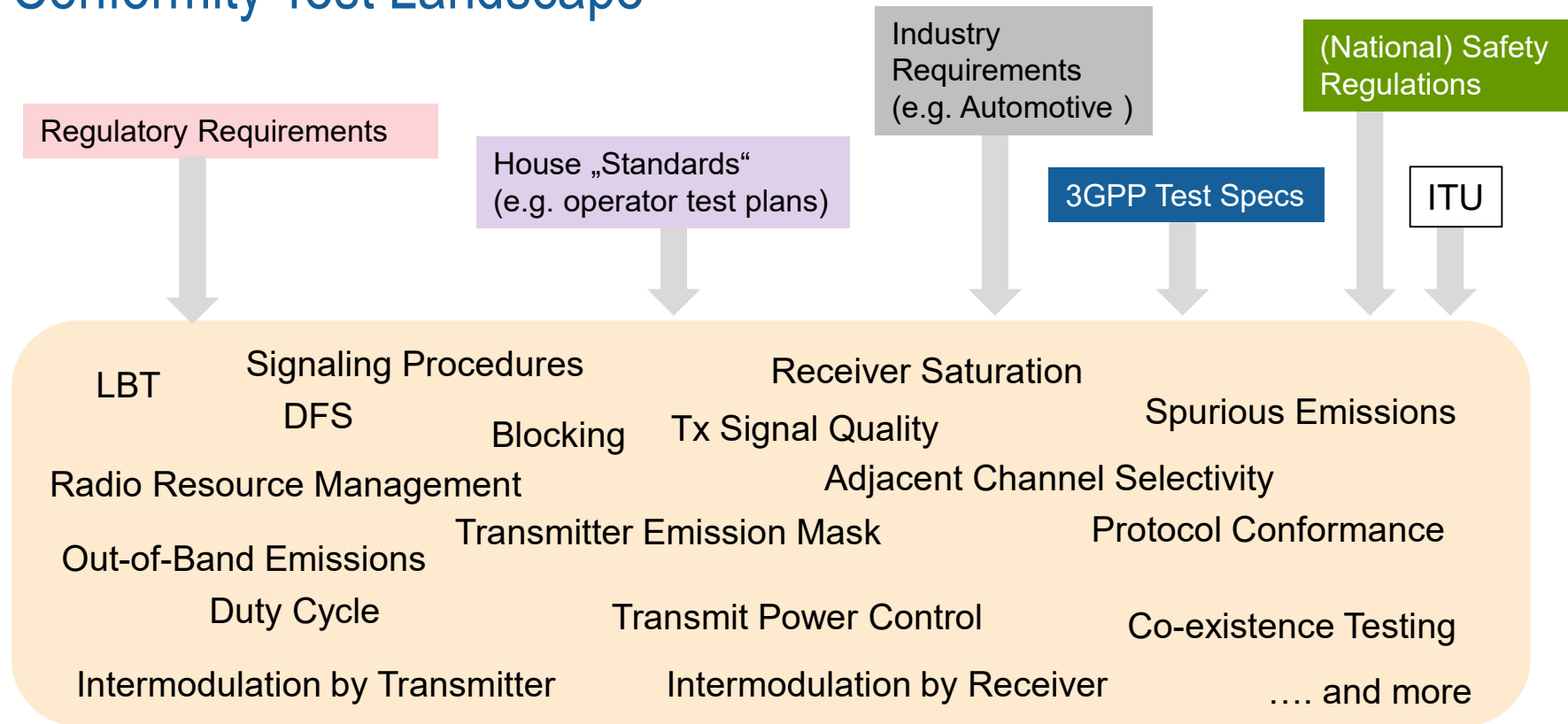
**ROHDE & SCHWARZ**

Make ideas real



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# Conformity Test Landscape



# Basic Conformity Areas for cellular/non cellular device

- EMC/EMI Conformance
- Radio Transmission and Reception Conformance
- Protocol Conformance
- Radio Resource Management
- OTA (Over The Air) Performance Testing
- SAR specific absorption rate
- RF Exposure Conformance
- Power consumption requirements
- Location Based Services / Emergency call
- *Application Testing*

# Conformity Assessment for Mobile Phones

- Regulatory Requirements / Market Introduction
  - RED (Radio Equipment Directive), EC Europe
  - MIC, Japan
  - FCC, USA
  - ...
- Industry Certification Groups
  - GCF (Global Certification Forum)
  - PTCRB
- Operator Test Plans and Network Approval

# Problems with Counterfeit Mobile Phones

- Low RF performance
- Unwanted Emissions
- Poor/Wrong Antenna Design
- Faulty or outdated protocol implementation
- Heating / Battery safety
- Missing RF Exposure measures
- Wrong Cell and Parameter Reporting
- Identity (IMEI Duplication)

# EMC/EMI Conformance

- Main topic is the conformance assessment for Unwanted Emission
  - Basic Requirements → ITU Recommendation SM.329
  - National Regulation
  - Radiated Requirement and Test
- Focus: Disturbance of other services
  - Not a metric for the service performance of a device
- Often the only coverage in tests for admission to a local market

# Conformance for radio transmission and reception / OTA performance

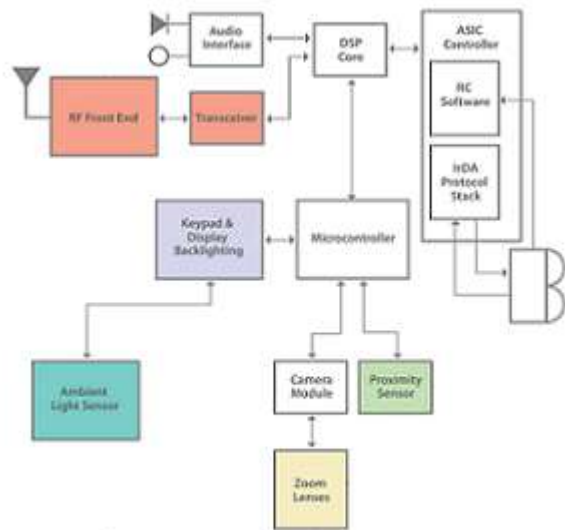
- Radio transmission and reception conformance defines the minimum RF characteristics and minimum performance requirements for mobile phones.
- Typical parameters are:
  - Maximum Transmission Power / Power dynamics
  - Unwanted Emissions
  - Modulation Quality
  - Receiver Sensitivity
  - Demodulation and Throughput Performance
- OTA performance includes the performance of the antenna of the device (Tx and Rx)
  - Total Radiated Power
  - Total Integrated Sensitivity
  - Overview in ITU-T contribution T17-SG11-C-0174

# Specs...

- The specs are good harmonized over all instances . ETSI/EN/3GPP
- 2G: TS51-010 chapter 12/13
- 3G: TS34-121 Chapter 6,7
- 4G: TS36-521 Chapter 5,6,7
- 5G: TS38-521 Chapter 6,7



# What is tested



## ■ Transmitter:

1. TX max Power
2. OCB
3. ACLR
4. EVM

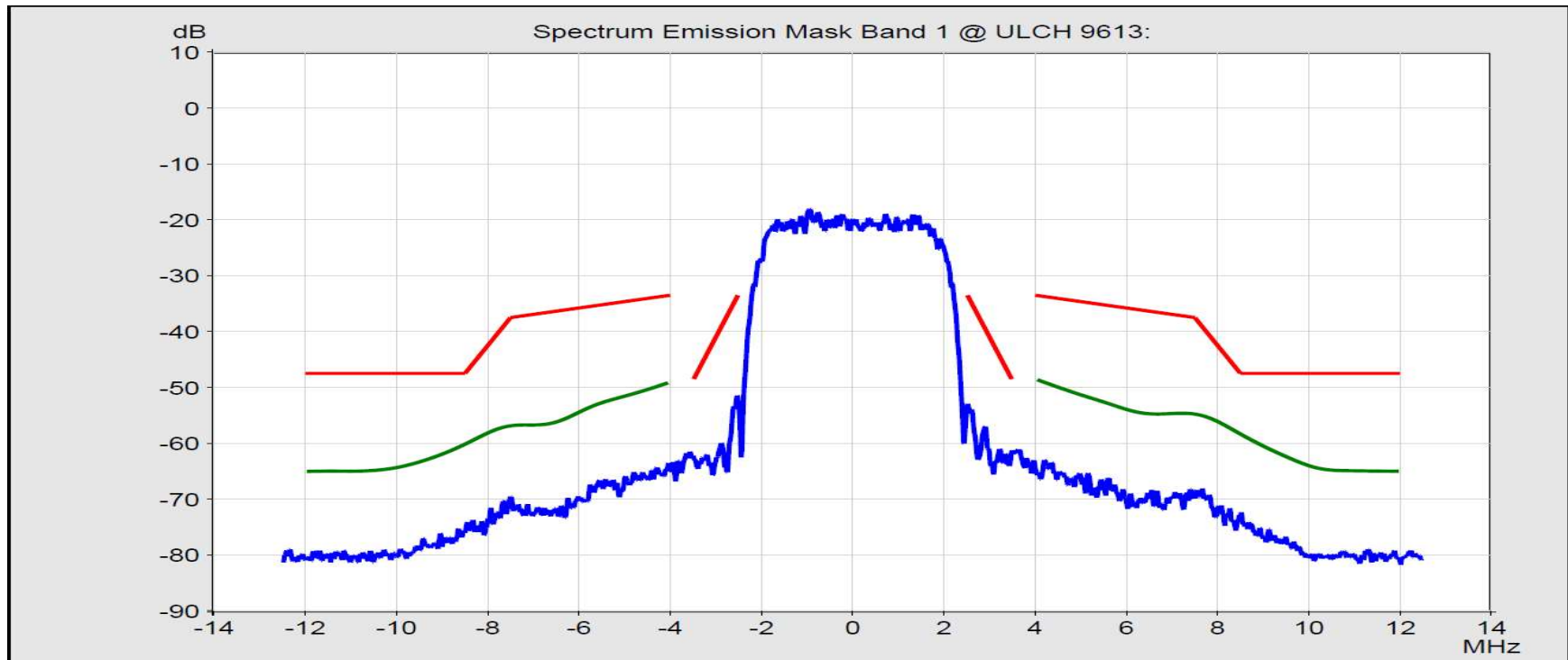
## ■ Receiver:

1. Sensitivity
2. ACS

## ■ Performance:

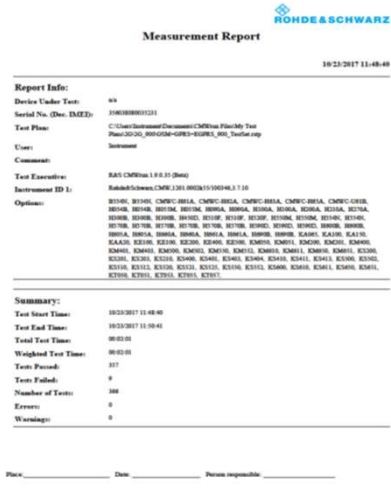
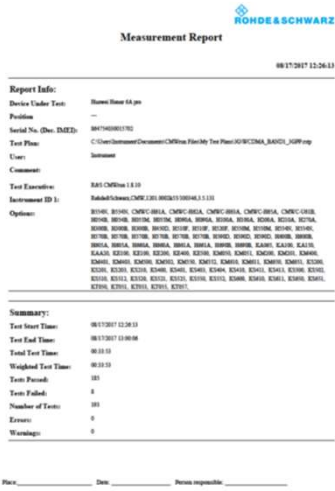
1. Blocking

# Typical conformity tests



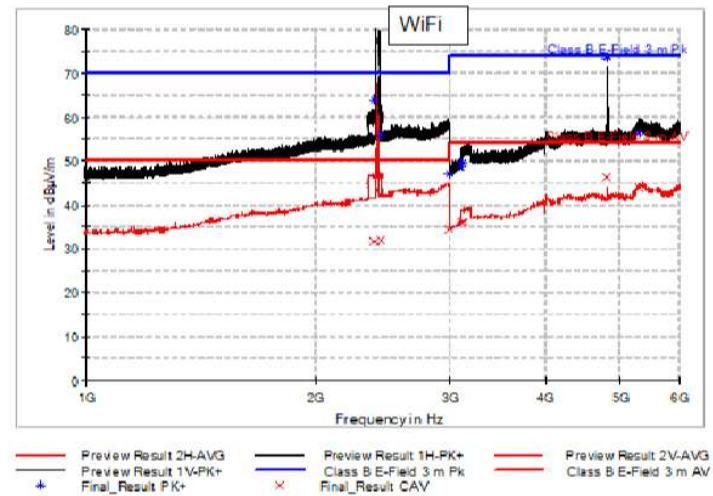
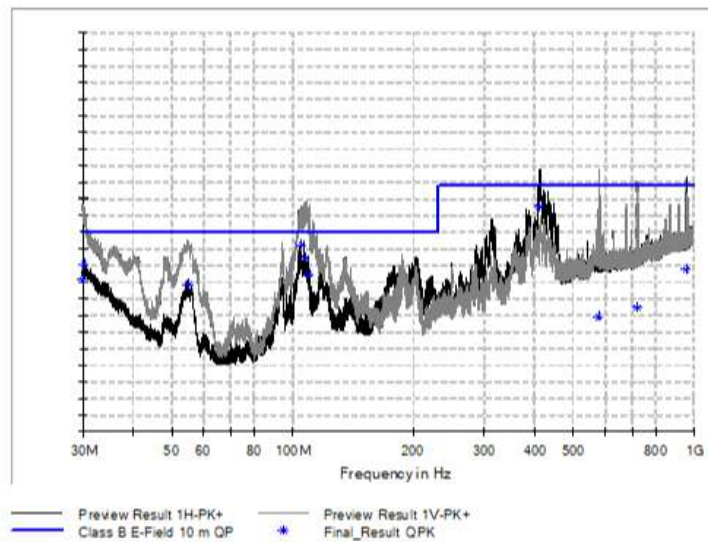
# Have a look on a test report

## ■ Check test reports

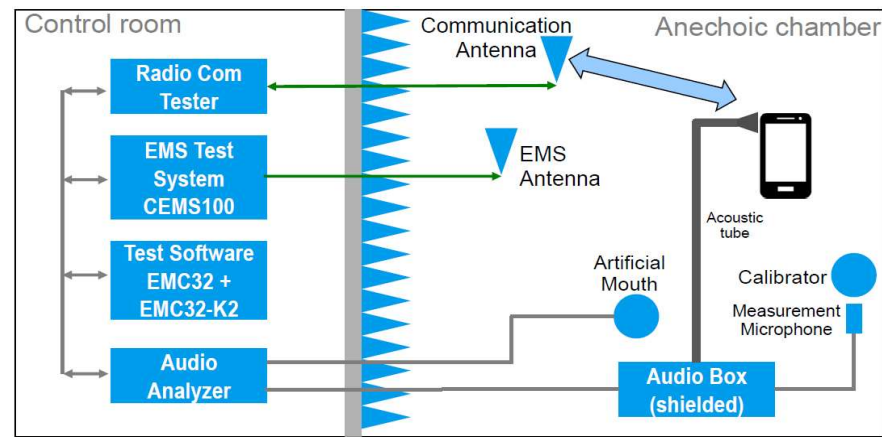
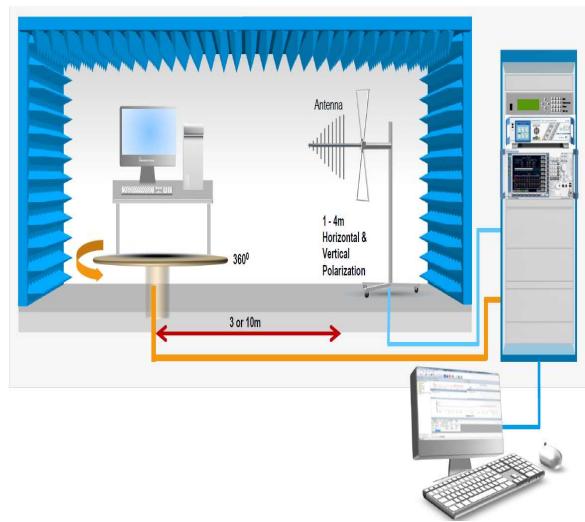


# EMC test: EMI Measurement radiated and conducted

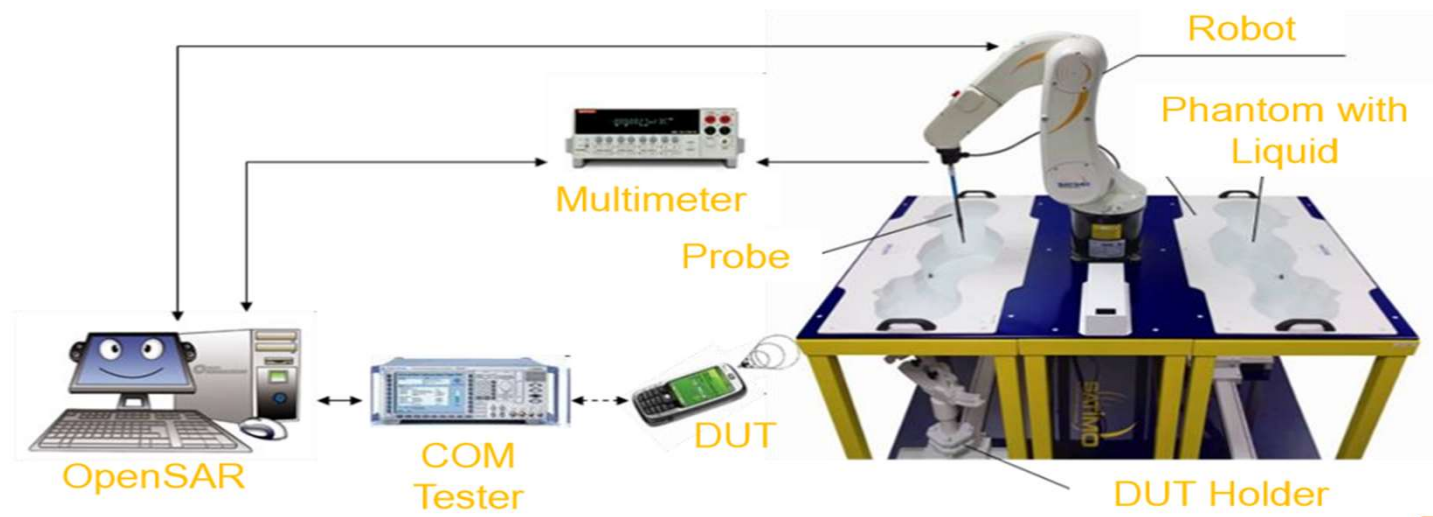
Search for unwanted emissions



# EMI/EMS setup example

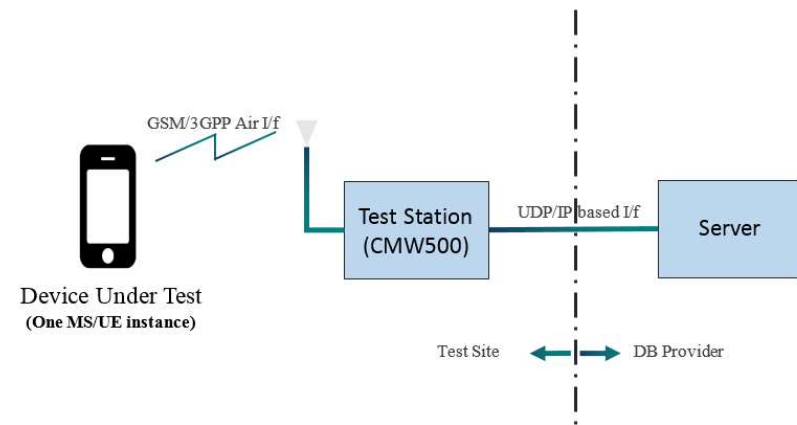


# SAR tests



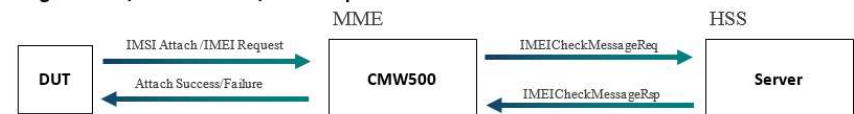
# IMEI verification

- IMEI procedure as per 3GPP air interface
  - GSM/WCDMA/TD-SCDMA/LTE
- Independent of network operator
  - Operation with Test-UICC
- Automation possible – Connection to IMEI Database



## Interaction Scenarios

### Registration / Initial Attach / IMEI Request



# Protocol Conformance

- Protocol and signaling conformance testing checks the conformant implementation of the radio protocol.
- Usually this is designed that the different test purposes per radio layer and the relevant procedures are tested.
  
- Essential for correct protocol function with the network
  - Transport Format Selection
  - Priority Handling
  - Data Transfer (ARQ Function)
  - Security
  - NAS (Non Access Stratum) procedures
  - ....
  
- Example of a LTE RRC (Radio Resource Control) procedure
  - TC 9.1.4.2 „Identification procedure, IMEI requested“ \*

\* as per ETSI TS136.523-1



Thank you!

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