CONFORMANCE ASSESSMENT METHODS TO COMBAT COUNTERFEIT MOBILE PHONES

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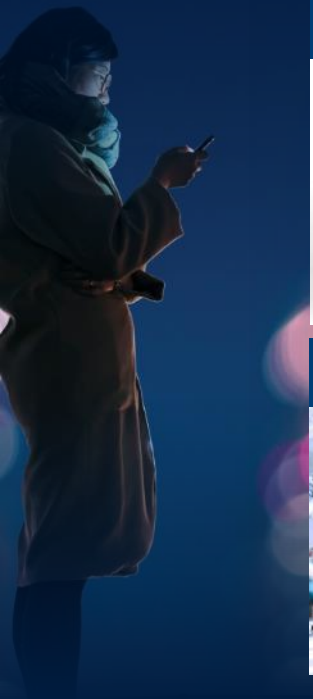
ROHDE&SCHWARZ

Make ideas real

Not only **smart phones**
Wireless Communication Devices are everywhere



Wearables	Smart Homes	Smart Cities	Healthcare	Automotive
				
Smart Buildings	**Asset Tracking**	**Retail**	**Drones**	**…..**
				

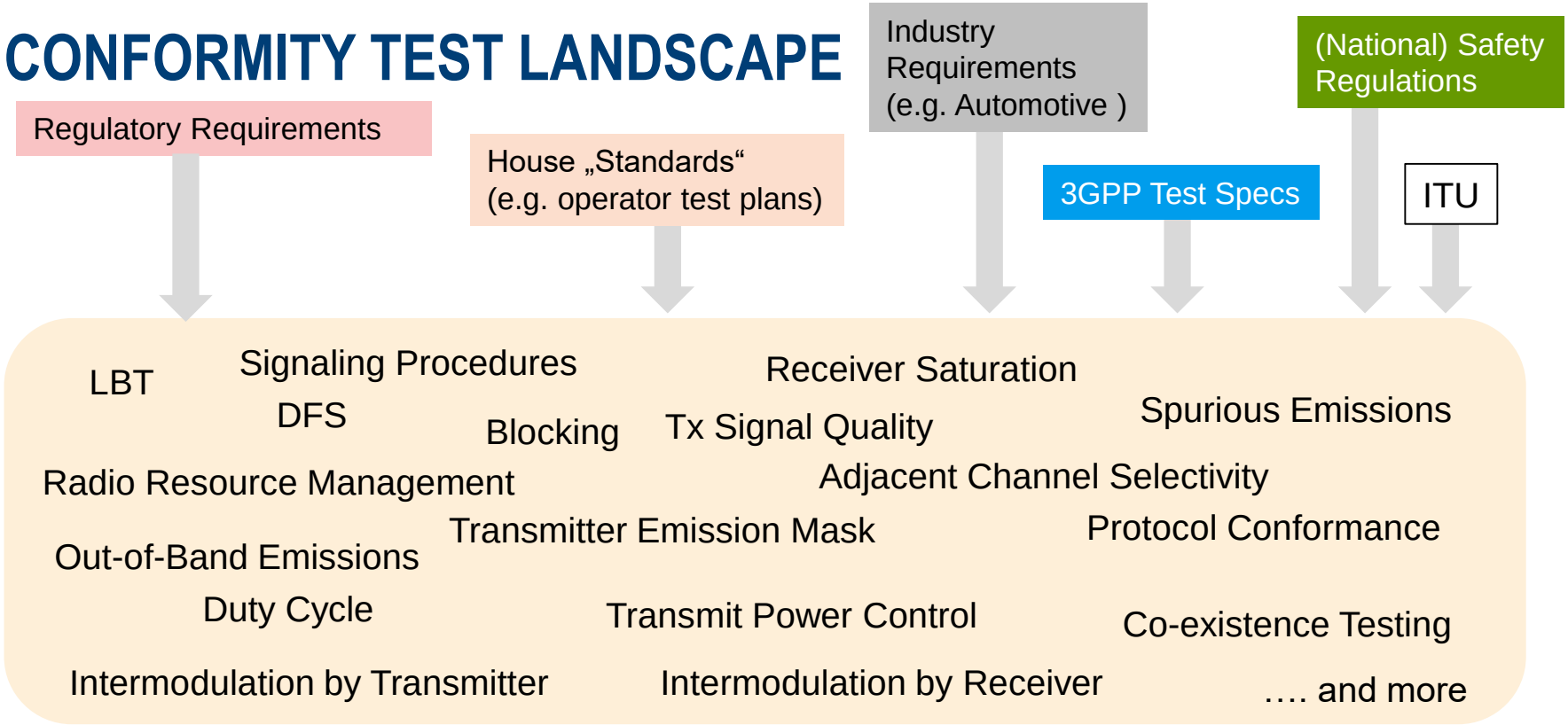
PROBLEMS WITH COUNTERFEIT MOBILE PHONES

- 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- Faulty or outdated protocol implementation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)

BASIC CONFORMITY AREAS FOR MOBILE PHONES

- EMC/EMI Conformance
- Radio Transmission and Reception Conformance/OTA Performance
- Protocol Conformance
- SAR Specific Absorption Rate
- RF Exposure Conformance
- Power consumption requirements
- Application Testing

CONFORMITY TEST LANDSCAPE



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

EMI/EMC CONFORMANCE

- to obtain the conformance assessment for Unwanted Emission
- to ensure that the devices operate correctly when exposed to external EM radiation
- to ensure that the devices do not emit “stray” EM radiation
- as per ITU Recommendation SM.329
- As per applicable FCC & CE RED EMC directive 2014/30/EU/Electromagnetic Compatibility Regulations
- **National Regulation – to regulate the products that is manufactured locally & imported as** well

CONFORMANCE FOR RADIO TRANSMISSION AND RECEPTION /OTA PERFORMANCE

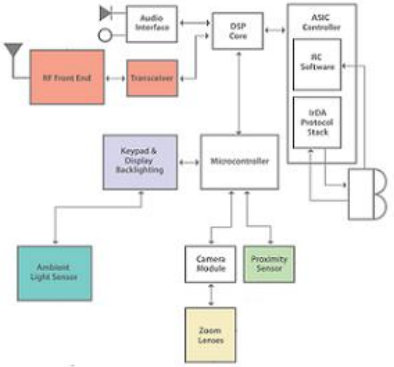
- Radio transmission and reception conformance defines the minimum RF characteristics and minimum performance requirements for mobile phones.
- Typical parameters are:
  - Maximum Transmission Power / Power dynamics
  - Unwanted Emissions
  - Modulation Quality
  - Receiver Sensitivity
  - Demodulation 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

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

Standard Developing Organisation and Test Standards for cellular Technologies



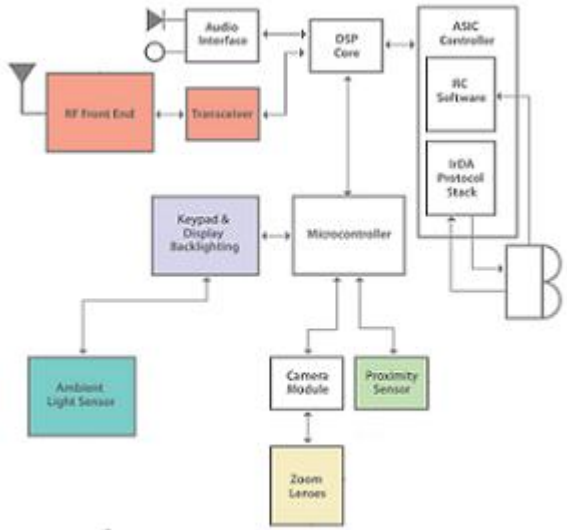
- For 2G: TS51-010 chapter 12/13
- For 3G: TS34-121 Chapter 6,7
- For 4G: TS36-521 Chapter 5,6,7
- For 5G: TS38-521 Chapter 6,7 RF testing for sub6GHz and mmWave

RF Conformance Test cases for Transmitter and Receiver


SGS

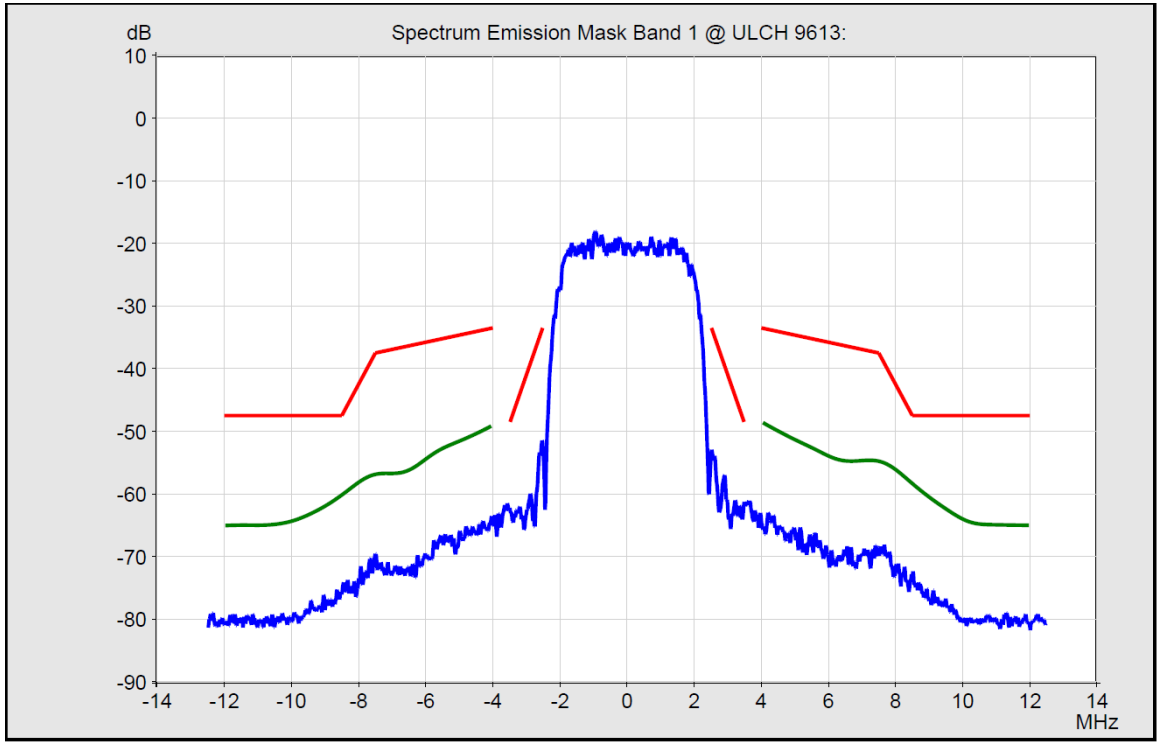
TEST REPORT

WHAT IS TESTED



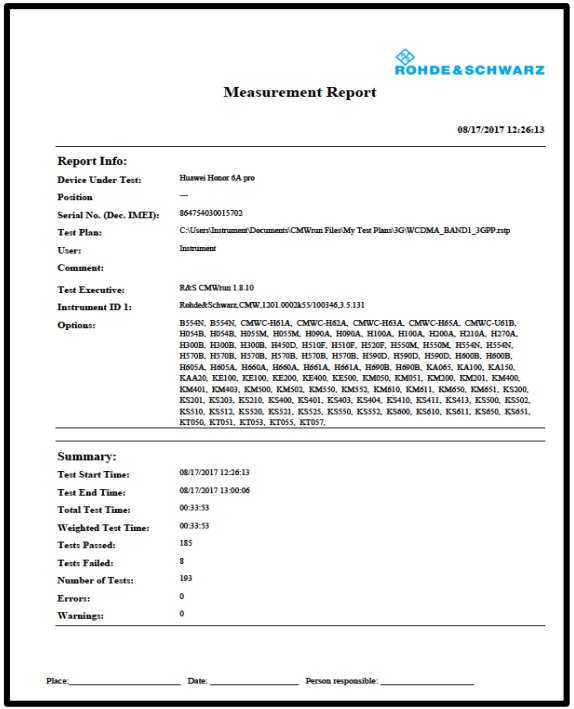
- ► Transmitter:
  1. TX max Power
  2. OCB
  3. ACLR
  4. EVM
- ► Reciever:
  1. Sensitivity
  2. ACS
- ► Performance:
  1. Blocking

TYPICAL CONFORMITY TESTS



HAVE A LOOK ON A TEST REPORT

- Check test reports



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Measurement Report

08/17/2017 12:26:13

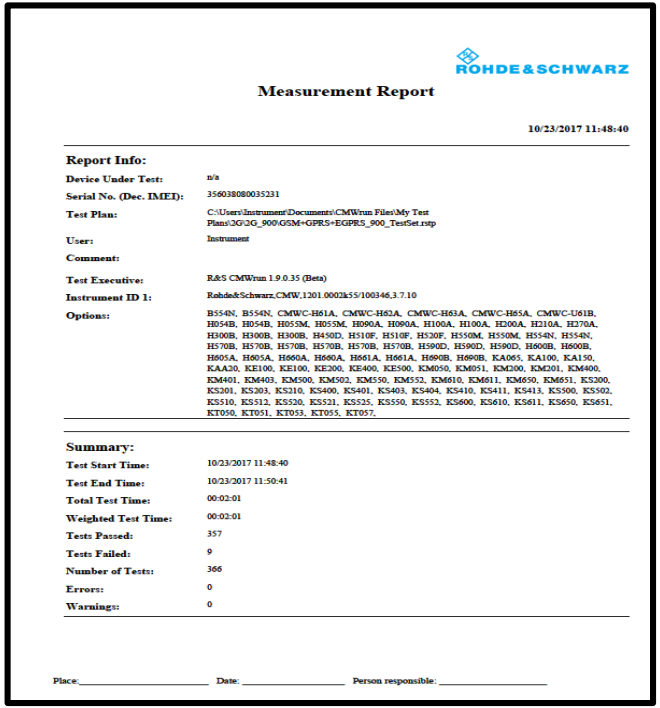
Report Info:

Device Under Test:	Huawei Honor 6A pro
Position	---
Serial No. (Dec. IMEI):	864754030015702
Test Plan:	C:\Users\Instrument\Documents\CMWrun Files\My Test Plans\3G\WCDMA_BAND1_3GPP.rstp
User:	Instrument
Comment:	
Test Executive:	R&S CMWrun 1.8.10
Instrument ID 1:	Rohde&Schwarz,CMW,1201.0002k55/100346,3.5.131
Options:	B554N, B554N, CMWC-H61A, CMWC-H62A, CMWC-H63A, CMWC-H65A, CMWC-U61B, H054B, H054B, H055M, H055M, H090A, H090A, H100A, H100A, H200A, H210A, H270A, H300B, H300B, H300B, H450D, H510F, H510F, H520F, H550M, H550M, H554N, H554N, H570B, H570B, H570B, H570B, H570B, H570B, H590D, H590D, H590D, H600B, H600B, H605A, H605A, H660A, H660A, H661A, H661A, H690B, H690B, KA065, KA100, KA150, KAA20, KE100, KE100, KE200, KE400, KE500, KM050, KM051, KM200, KM201, KM400, KM401, KM403, KM500, KM502, KM550, KM552, KM610, KM611, KM650, KM651, KS200, KS201, KS203, KS210, KS400, KS401, KS403, KS404, KS410, KS411, KS413, KS500, KS502, KS510, KS512, KS520, KS521, KS525, KS550, KS552, KS600, KS610, KS611, KS650, KS651, KT050, KT051, KT053, KT055, KT057,

Summary:

Test Start Time:	08/17/2017 12:26:13
Test End Time:	08/17/2017 13:00:06
Total Test Time:	00:33:53
Weighted Test Time:	00:33:53
Tests Passed:	185
Tests Failed:	8
Number of Tests:	193
Errors:	0
Warnings:	0

Place:_____ Date: _____ Person responsible: _____



ROHDE&SCHWARZ

Measurement Report

10/23/2017 11:48:40

Report Info:

Device Under Test:	n/a
Serial No. (Dec. IMEI):	356038080035231
Test Plan:	C:\Users\Instrument\Documents\CMWrun Files\My Test Plans\2G\2G_900\GSM+GPRS+EGPRS_900_TestSet.rstp
User:	Instrument
Comment:	
Test Executive:	R&S CMWrun 1.9.0.35 (Beta)
Instrument ID 1:	Rohde&Schwarz,CMW,1201.0002k55/100346,3.7.10
Options:	B554N, B554N, CMWC-H61A, CMWC-H62A, CMWC-H63A, CMWC-H65A, CMWC-U61B, H054B, H054B, H055M, H055M, H090A, H090A, H100A, H100A, H200A, H210A, H270A, H300B, H300B, H300B, H450D, H510F, H510F, H520F, H550M, H550M, H554N, H554N, H570B, H570B, H570B, H570B, H570B, H570B, H590D, H590D, H590D, H600B, H600B, H605A, H605A, H660A, H660A, H661A, H661A, H690B, H690B, KA065, KA100, KA150, KAA20, KE100, KE100, KE200, KE400, KE500, KM050, KM051, KM200, KM201, KM400, KM401, KM403, KM500, KM502, KM550, KM552, KM610, KM611, KM650, KM651, KS200, KS201, KS203, KS210, KS400, KS401, KS403, KS404, KS410, KS411, KS413, KS500, KS502, KS510, KS512, KS520, KS521, KS525, KS550, KS552, KS600, KS610, KS611, KS650, KS651, KT050, KT051, KT053, KT055, KT057,

Summary:

Test Start Time:	10/23/2017 11:48:40
Test End Time:	10/23/2017 11:50:41
Total Test Time:	00:02:01
Weighted Test Time:	00:02:01
Tests Passed:	357
Tests Failed:	9
Number of Tests:	366
Errors:	0
Warnings:	0

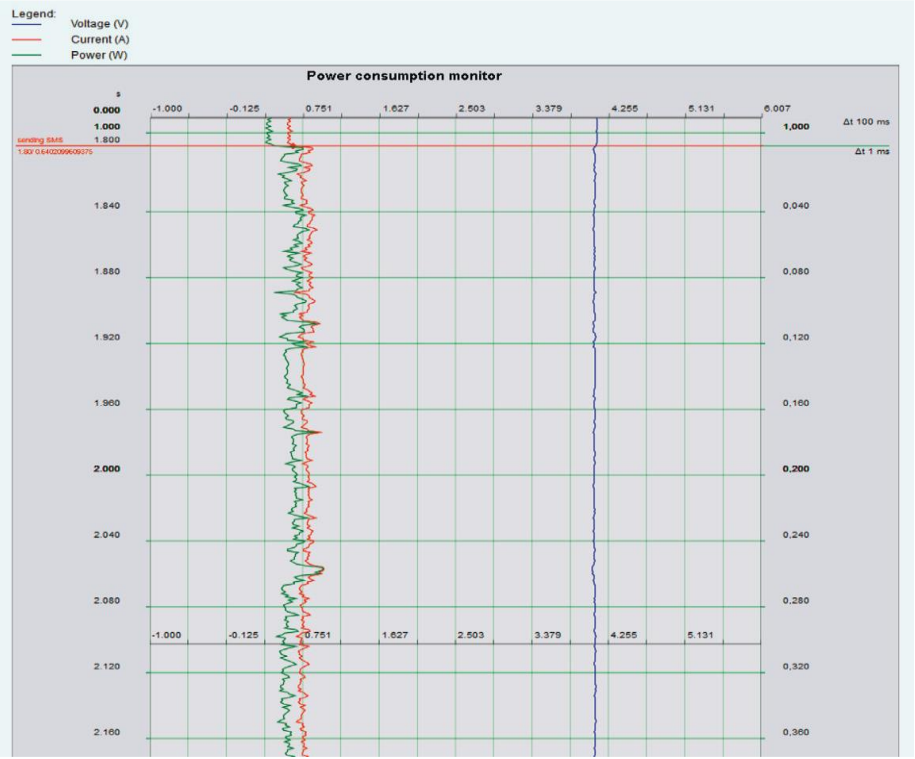
Place:_____ Date: _____ Person responsible: _____

Why SAR testing is important

- Specific absorption rate is a measure of the rate at which energy is absorbed per unit mass by a human body when exposed to a radio frequency electromagnetic field.
- It is defined as the power absorbed per mass of tissue and has units of watts per kilogram.
- The FCC (Federal Communications Commission) limit for public exposure from cellular telephones is an SAR level of 1.6 watts per kilogram (1.6 W/kg). Safe limit is 0.1 W/kg to 0.5 W/kg

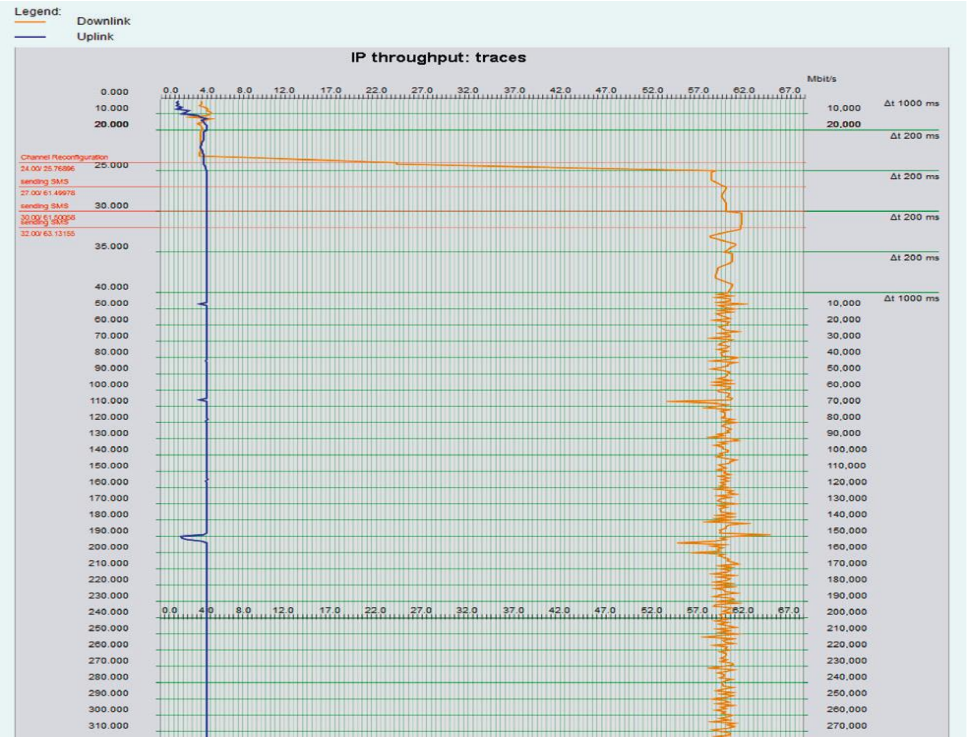
POWER CONSUMPTION – BATTERY LIFE TESTING

- Battery life testing becomes more important because of the diverse applications that require a battery charge for longer duration
- With more & more apps running on smartphones it is becoming crucial to test the latest features for reducing power consumption
- As per 3GPP standardization features such as power save mode (PSM) is implemented to reduce power consumption as much as possible



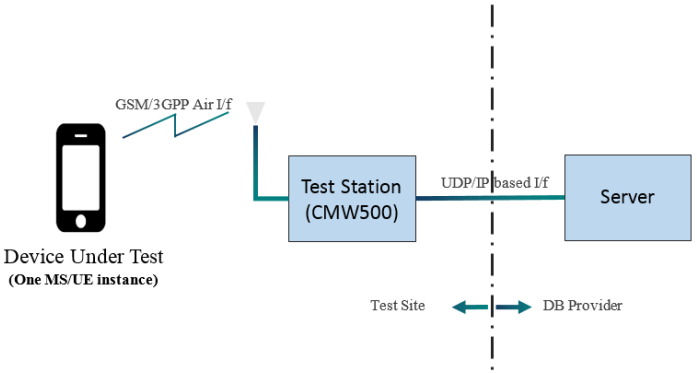
APPLICATION TESTING

- IP throughput testing
- Who generates how much and what E2E traffic, and is the traffic optimized for the various applications
- As per 3GPP standardization features such as power save mode (PSM) is implemented to reduce power consumption as much as possible



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

Regulatory Authority having set-up for Device Type Approval/EMC/SAR

UGANDA

EGYPT

KUWAIT

MAURITANIA

UAE

MALI

TANZANIA

GHANA

Benin

Guinea Konakry

CHAD

SENEGAL

TUNISIA

Thank you!