



## FCC HAC (RF) Compliance Test Report

Project Name: LTE/UMTS Smart Phone

Model : HUAWEI Y301-A2, Y301-A2, HUAWEI Y301A2, Y301A2

FCC ID : QISY301-A2

Report No. : SYBH(Z-SAR)023052013-H1

|      | APPROVED<br>(Lab Manager) | CHECKED         | PREPARED           |
|------|---------------------------|-----------------|--------------------|
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| DATE | 2013-06-17                | 2013-06-17      | 2013-06-17         |

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※ ※ **Modified History** ※ ※

| REV.     | DESCRIPTION                 | ISSUED DATE | REMARK      |
|----------|-----------------------------|-------------|-------------|
| Rev. 1.0 | Initial Test Report Release | 2013-06-17  | Sun Shaobin |
|          |                             |             |             |
|          |                             |             |             |
|          |                             |             |             |
|          |                             |             |             |
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|          |                             |             |             |
|          |                             |             |             |
|          |                             |             |             |

## 1 General Information

### 1.1 Statement of Compliance

The M-rating of Hearing-Aid Compatibility (HAC) found during testing for HUAWEI Y301-A2, Y301-A2, HUAWEI Y301A2, Y301A2 are as below Table 1. So the M-rating of HUAWEI Y301-A2, Y301-A2, HUAWEI Y301A2, Y301A2 is **M3**.

| Band         | M-rating |
|--------------|----------|
| GSM850       | M3       |
| GSM1900      | M3       |
| UMTS Band II | M4       |
| UMTS Band IV | M4       |
| UMTS Band V  | M4       |

Table 1: Summary of test result

Note: This portable wireless equipment has been shown to be hearing-aid compatible under the above rated category, specified in ANSI/IEEE Std.C63.19-2007 and had been tested in accordance with the specified measurement procedures, Hear-Aid Compatibility is based on the assumption that all production units will be designed electrically identical to the device tested in this report. Test results reported herein relate only to the item(s) tested and are for North American Bands only.

### 1.2 ANSI C 63.19-2007 limits

| Category       |     | Telephone RF parameters<960MHz |     |                   |     |
|----------------|-----|--------------------------------|-----|-------------------|-----|
| Near field     | AWF | E-field emissions              |     | H-field emissions |     |
| Category M1/T1 | 0   | 631.0 to 1122.0                | V/m | 1.91 to 3.39      | A/m |
|                | -5  | 473.2 to 841.4                 | V/m | 1.43 to 2.54      | A/m |
| Category M2/T2 | 0   | 354.8 to 631.0                 | V/m | 1.07 to 1.91      | A/m |
|                | -5  | 266.1 to 473.2                 | V/m | 0.80 to 1.43      | A/m |
| Category M3/T3 | 0   | 199.5 to 354.8                 | V/m | 0.60 to 1.07      | A/m |
|                | -5  | 149.6 to 266.1                 | V/m | 0.45 to 0.80      | A/m |
| Category M4/T4 | 0   | < 199.5                        | V/m | < 0.60            | A/m |
|                | -5  | < 149.6                        | V/m | < 0.45            | A/m |
| Category       |     | Telephone RF parameters>960MHz |     |                   |     |
| Near field     | AWF | E-field emissions              |     | H-field emissions |     |
| Category M1/T1 | 0   | 199.5 to 354.8                 | V/m | 0.60 to 1.07      | A/m |
|                | -5  | 149.6 to 266.1                 | V/m | 0.45 to 0.80      | A/m |
| Category M2/T2 | 0   | 112.2 to 199.5                 | V/m | 0.34 to 0.60      | A/m |
|                | -5  | 84.1 to 149.6                  | V/m | 0.25 to 0.45      | A/m |
| Category M3/T3 | 0   | 63.1 to 112.2                  | V/m | 0.19 to 0.34      | A/m |
|                | -5  | 47.3 to 84.1                   | V/m | 0.14 to 0.25      | A/m |
| Category M4/T4 | 0   | < 63.1                         | V/m | < 0.19            | A/m |
|                | -5  | < 47.3                         | V/m | < 0.14            | A/m |

Table 2: Telephone near-field categories in linear units

| Technology         | Articulation Weighing Factor (AWF) |
|--------------------|------------------------------------|
| UMTS(WCDMA)        | 0                                  |
| CDMA               | 0                                  |
| TDMA(22 and 11 Hz) | 0                                  |
| GSM (217 Hz)       | -5                                 |

Table 3: Articulation Weighing Factors (AWF)

### 1.3 EUT Description

| Device Information:              |                                                                                                                                                                                                                                                                                                                                                                                       |           |           |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| DUT Name:                        | LTE/UMTS Smart Phone                                                                                                                                                                                                                                                                                                                                                                  |           |           |
| Type Identification:             | HUAWEI Y301-A2, Y301-A2, HUAWEI Y301A2, Y301A2                                                                                                                                                                                                                                                                                                                                        |           |           |
| FCC ID :                         | QISY301-A2                                                                                                                                                                                                                                                                                                                                                                            |           |           |
| IMEI No:                         | 860471020007698                                                                                                                                                                                                                                                                                                                                                                       |           |           |
| Device Type :                    | portable device                                                                                                                                                                                                                                                                                                                                                                       |           |           |
| Exposure Category:               | uncontrolled environment / general population                                                                                                                                                                                                                                                                                                                                         |           |           |
| Hardware Version :               | HL1Y301A2M                                                                                                                                                                                                                                                                                                                                                                            |           |           |
| Software Version :               | Y301-A2 V100R001C85B115                                                                                                                                                                                                                                                                                                                                                               |           |           |
| Antenna Type :                   | Internal                                                                                                                                                                                                                                                                                                                                                                              |           |           |
| Others Accessories               | Headset                                                                                                                                                                                                                                                                                                                                                                               |           |           |
| Battery Options :                | Huawei Technologies Co., Ltd.<br>Rechargeable Li-ion<br>Battery Model: HB4W1H<br>Rated capacity: 1750mAh<br>Nominal Voltage:  +3.7V<br>Charging Voltage:  +4.2V<br>1# SN: MAIC903XXX0091<br>2# SN: MPCCA13919100157 |           |           |
| Device Operating Configurations: |                                                                                                                                                                                                                                                                                                                                                                                       |           |           |
| Supporting Mode(s)               | GSM850/1900,UMTS Band II/IV/V(Tested);<br>LTE Band IV,WiFi,Bluetooth(Untested);                                                                                                                                                                                                                                                                                                       |           |           |
| Test Modulation                  | GSM(GMSK),UMTS(QPSK)                                                                                                                                                                                                                                                                                                                                                                  |           |           |
| Device Class                     | B                                                                                                                                                                                                                                                                                                                                                                                     |           |           |
| Operating Frequency Range(s)     | Band                                                                                                                                                                                                                                                                                                                                                                                  | Tx (MHz)  | Rx (MHz)  |
|                                  | GSM850                                                                                                                                                                                                                                                                                                                                                                                | 824-849   | 869 - 894 |
|                                  | GSM1900                                                                                                                                                                                                                                                                                                                                                                               | 1850-1910 | 1930-1990 |
|                                  | UMTS Band II                                                                                                                                                                                                                                                                                                                                                                          | 1850-1910 | 1930-1990 |
|                                  | UMTS Band IV                                                                                                                                                                                                                                                                                                                                                                          | 1713-1753 | 2113-2153 |
|                                  | UMTS Band V                                                                                                                                                                                                                                                                                                                                                                           | 824-849   | 869-894   |
|                                  | LTE Band IV                                                                                                                                                                                                                                                                                                                                                                           | 1710-1755 | 2110-2155 |
|                                  | WiFi                                                                                                                                                                                                                                                                                                                                                                                  | 2412-2462 |           |
|                                  | BT                                                                                                                                                                                                                                                                                                                                                                                    | 2402-2480 |           |
| Power Class :                    | 4,tested with power level 5(GSM850)                                                                                                                                                                                                                                                                                                                                                   |           |           |
|                                  | 1,tested with power level 0(GSM1900)                                                                                                                                                                                                                                                                                                                                                  |           |           |
|                                  | 3, tested with power control “all 1”(UMTS Band II)                                                                                                                                                                                                                                                                                                                                    |           |           |
|                                  | 3, tested with power control “all 1”(UMTS Band IV)                                                                                                                                                                                                                                                                                                                                    |           |           |
|                                  | 3, tested with power control “all 1”(UMTS Band V)                                                                                                                                                                                                                                                                                                                                     |           |           |
| Test Channels (low-mid-high) :   | 128-190-251 (GSM850)                                                                                                                                                                                                                                                                                                                                                                  |           |           |
|                                  | 512-661-810 (GSM1900)                                                                                                                                                                                                                                                                                                                                                                 |           |           |
|                                  | 9262-9400-9538 (UMTS Band II)                                                                                                                                                                                                                                                                                                                                                         |           |           |
|                                  | 1312-1413-1513 (UMTS Band IV)                                                                                                                                                                                                                                                                                                                                                         |           |           |
|                                  | 4132-4182-4233(UMTS Band V)                                                                                                                                                                                                                                                                                                                                                           |           |           |

Table 4: Device information and operating configuration

### 1.3.1 General Description

HUAWEI Y301-A2, Y301-A2, HUAWEI Y301A2, Y301A2 is subscriber equipment in the LTE/UMTS system. The HSPA/UMTS frequency band is Band II and Band IV and Band V. The LTE frequency band is Band 4. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port(to provide voice service) and Micro-SIM Card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

### 1.3.2 List of air interfaces/frequency bands

| Air Interface | Band(MHz) | Voice/Data | HAC tested | Concurrent HAC Tested | Reduced Power 20.19(c)(1) |
|---------------|-----------|------------|------------|-----------------------|---------------------------|
| GSM           | 850       | Voice      | Yes        | Not tested**          | No                        |
| GSM           | 1900      | Voice      | Yes        | Not tested**          | No                        |
| UMTS          | Band II   | Voice      | Yes        | Not tested**          | No                        |
| UMTS          | Band IV   | Voice      | Yes        | Not tested**          | No                        |
| UMTS          | Band V    | Voice      | Yes        | Not tested**          | No                        |
| LTE           | Band IV   | Data(*)    | No         | NA                    | No                        |
| WiFi          | 2450      | Data(*)    | No         | NA                    | No                        |
| BT            | 2450      | Data(*)    | No         | NA                    | No                        |

Note:

1)\*-The voice function maybe be activated via 3rd party software application.

2)\*\*- Non concurrent mode was found to be the Worst Case mode.

#### 1.4 Test specification(s)

|                  |                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------|
| ANSI C63.19-2007 | American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices |
| KDB 285076 D01   | HAC Guidance v03r01                                                                                           |

#### 1.5 Testing laboratory

|                        |                                                                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site              | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                                          |
| Test Location          | Zone K3, Huawei Industrial Base, Bantian Industry Area, Longgang District, Shenzhen, Guangdong, China                                            |
| Telephone              | +86-755-28785513                                                                                                                                 |
| Fax                    | +86-755-36834474                                                                                                                                 |
| State of accreditation | The Test laboratory (area of testing) is accredited according to ISO/IEC 17025.<br>CNAS Registration number: L0310<br>A2LA TESTING CERT #2174.01 |

#### 1.6 Applicant and Manufacturer

|              |                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| Company Name | HUAWEI TECHNOLOGIES CO., LTD                                                                                                |
| Address      | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C |

#### 1.7 Application details

|                    |            |
|--------------------|------------|
| Start Date of test | 2013-06-05 |
| End Date of test   | 2013-06-06 |

#### 1.8 Ambient Condition

|                     |             |
|---------------------|-------------|
| Ambient temperature | 20°C – 24°C |
| Relative Humidity   | 30% – 70%   |

## 2 HAC (RF) Measurement System

### 2.1 RF Measurement Set-up

These measurements are performed using the DASY5 NEO automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Stäubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor. The robot is a six-axis industrial robot performing precise movements. A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the HP Intel Core2 1.86 GHz computer with Windows XP system and HAC Measurement Software DASY5 NEO, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

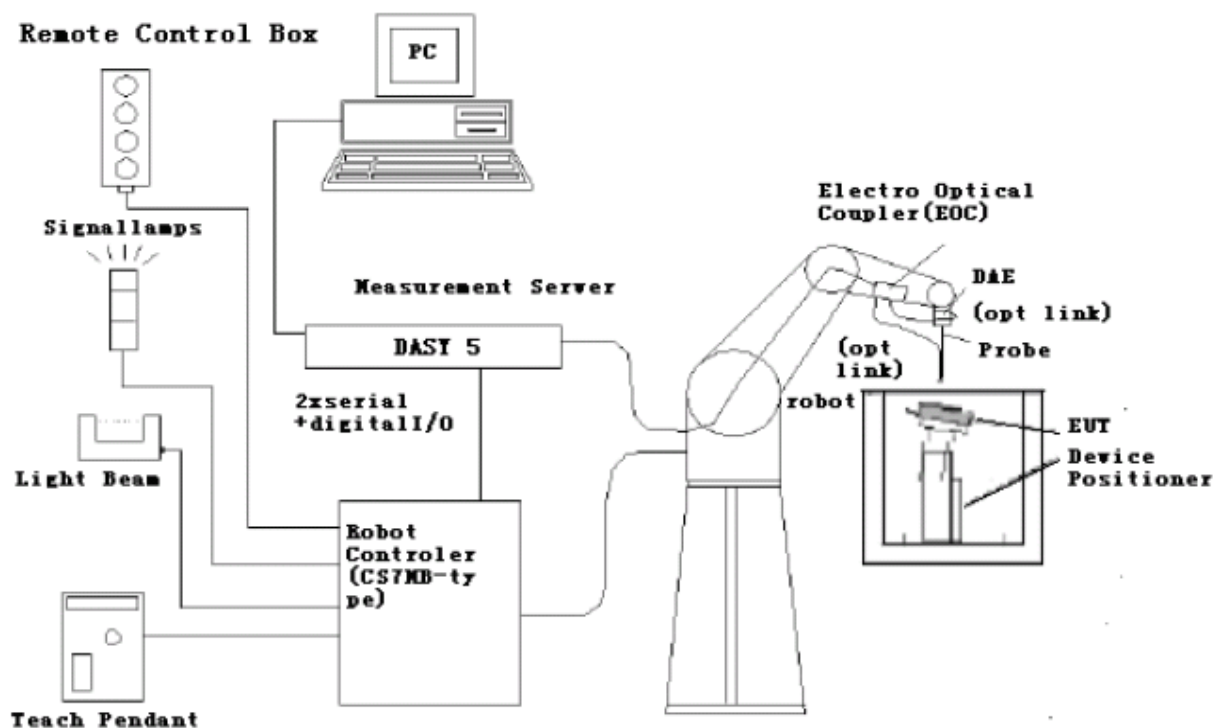


Fig. 1 HAC Test Measurement Set-up

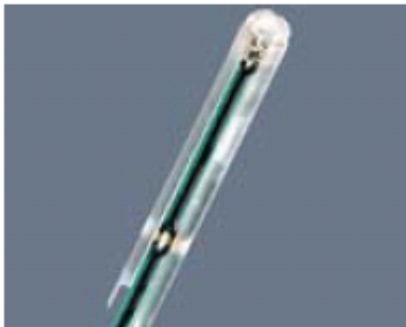
The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

## 2.2 Probe description

### E-Field Probe Description

|               |                                                                                                                               |                                                                                                            |
|---------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Construction  | One dipole parallel, two dipoles normal to probe axis<br>Built-in shielding against static charges<br>PEEK enclosure material |  <p><b>[ER3DV6]</b></p> |
| Calibration   | In air from 100 MHz to 3.0 GHz (absolute accuracy $\pm 6.0\%$ , $k=2$ )                                                       |                                                                                                            |
| Frequency     | 40 MHz to > 6 GHz (can be extended to < 20 MHz) Linearity: $\pm 0.2$ dB (100 MHz to 3 GHz)                                    |                                                                                                            |
| Directivity   | $\pm 0.2$ dB in air (rotation around probe axis)<br>$\pm 0.4$ dB in air (rotation normal to probe axis)                       |                                                                                                            |
| Dynamic range | 2 V/m to > 1000 V/m; Linearity: $\pm 0.2$ dB                                                                                  |                                                                                                            |
| Dimensions    | Overall length: 330 mm (Tip: 16 mm)<br>Tip diameter: 8 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.5 mm  |                                                                                                            |
| Application   | General near-field measurements up to 6 GHz<br>Field component measurements<br>Fast automatic scanning in phantoms            |                                                                                                            |

### H-Field Probe Description

|                      |                                                                                                                                                                                                                                               |                                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Construction         | Three concentric loop sensors with 3.8 mm loop diameters<br>Resistively loaded detector diodes for linear response<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., glycolether) |  <p><b>[H3DV6]</b></p> |
| Frequency            | 200 MHz to 3 GHz (absolute accuracy $\pm 6.0\%$ , $k=2$ ); Output linearized                                                                                                                                                                  |                                                                                                             |
| Directivity          | $\pm 0.2$ dB (spherical isotropy error)                                                                                                                                                                                                       |                                                                                                             |
| Dynamic range        | 10 mA/m to 2 A/m at 1 GHz                                                                                                                                                                                                                     |                                                                                                             |
| E-Field Interference | < 10% at 3 GHz (for plane wave)                                                                                                                                                                                                               |                                                                                                             |
| Dimensions           | Overall length: 330 mm (Tip: 40 mm)<br>Tip diameter: 6 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 3 mm                                                                                                                    |                                                                                                             |
| Application          | General magnetic near-field measurements up to 3 GHz (in air or liquids)<br>Field component measurements<br>Surface current measurements<br>Low interaction with the measured field                                                           |                                                                                                             |

## 2.3 Test Arch Phantom & Phone Positioner

The Test Arch phantom should be positioned horizontally on a stable surface. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. It enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot (Dimensions: 370 x 370 x 370 mm).

The Phone Positioner supports accurate and reliable positioning of any phone with effect on near field  $< \pm 0.5$  dB.

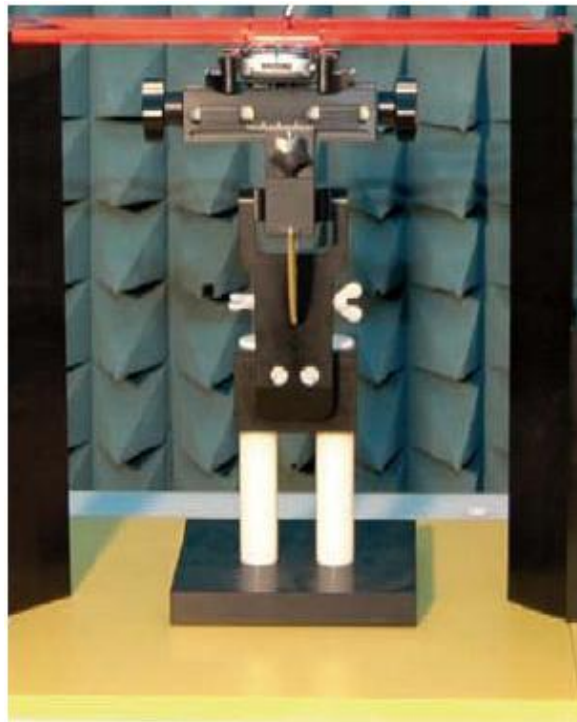
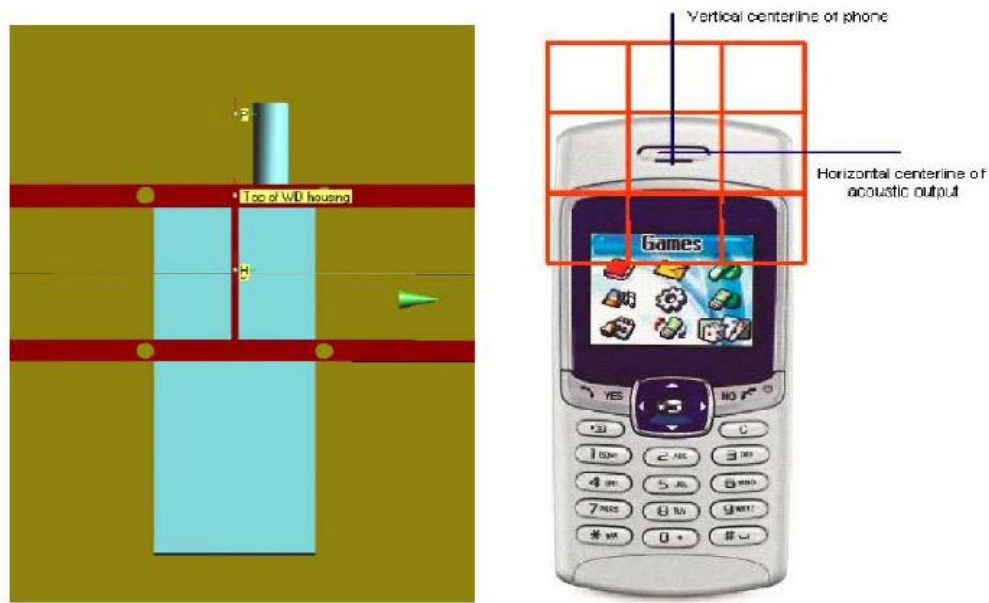


Fig. 2 HAC Phantom & Device Holder

## 2.4 WD RF Emission Measurements Reference and Plane

Figure 3 illustrates the references and reference plane that shall be used in the WD emissions measurement.

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
  - The grid is centered on the audio frequency output transducer of the WD (speaker or T-coil).
  - The grid is located by reference to a reference plane. This reference plane is the planar area that contains the highest point in the area of the WD that normally rests against the user's ear
  - The measurement plane is located parallel to the reference plane and 10 mm from it, out from the phone.
- The grid is located in the measurement plane.



**Fig. 3 WD reference and plane for RF emission measurements**

## 2.5 Test Equipment List

This table gives a complete overview of the HAC measurement equipment

Devices used during the test described are marked ☒

|   | Manufacturer  | Device                               | Type     | Serial number | Date of last calibration | Valid period |
|---|---------------|--------------------------------------|----------|---------------|--------------------------|--------------|
| ☒ | SPEAG         | Dosimetric E-Field Probe             | ER3DV6   | 2441          | 2012-11-26               | One year     |
| ☒ | SPEAG         | Dosimetric H-Field Probe             | H3DV6    | 6270          | 2012-11-26               | One year     |
| ☒ | SPEAG         | 835 MHz Dipole                       | CD835V3  | 1114          | 2012-11-26               | Three years  |
| ☒ | SPEAG         | 1880 MHz Dipole                      | CD1880V3 | 1100          | 2012-11-26               | Three years  |
| ☐ | SPEAG         | Data acquisition electronics         | DAE4     | 852           | 2012-11-22               | One year     |
| ☒ | SPEAG         | Data acquisition electronics         | DAE4     | 1305          | 2013-01-08               | One year     |
| ☒ | SPEAG         | HAC Test Arch                        | N/A      | 1102          | NCR                      | NCR          |
| ☒ | SPEAG         | Software                             | DASY 5   | N/A           | N/A                      | N/A          |
| ☒ | Agilent       | Power Meter Sensor                   | E9321A   | MY44420359    | 2013-02-26               | One year     |
| ☒ | Agilent       | Signal Generator                     | N5181A   | MY47420989    | 2013-02-27               | One year     |
| ☒ | MINI-CIRCUITS | Amplifier                            | ZHL-42W  | QA0746001     | N/A                      | N/A          |
| ☒ | Agilent       | Power Meter                          | E4417A   | MY45101339    | 2013-02-26               | One year     |
| ☒ | R & S         | Universal Radio Communication Tester | CMU200   | 111379        | 2012-08-13               | One year     |

## 2.6 Measurement Uncertainty Evaluation

| Error Description                         | Uncertainty Value | Probability Distribution | Divisor | ci E | ci H  | Standard Uncertainty E | Standard Uncertainty H |
|-------------------------------------------|-------------------|--------------------------|---------|------|-------|------------------------|------------------------|
| <b>Measurement System</b>                 |                   |                          |         |      |       |                        |                        |
| Probe calibration                         | ± 5.1%            | Normal                   | 1       | 1    | 1     | ± 5.1%                 | ± 5.1%                 |
| Axial isotropy                            | ± 4.7%            | Rectangular              | √3      | 1    | 1     | ± 2.7%                 | ± 2.7%                 |
| Sensor Displacement                       | ± 16.5%           | Rectangular              | √3      | 1    | 0.145 | ± 9.5%                 | ± 1.4%                 |
| Test Arch                                 | ± 7.2%            | Rectangular              | √3      | 1    | 0     | ± 4.1%                 | ± 0.0%                 |
| Linearity                                 | ± 4.7%            | Rectangular              | √3      | 1    | 1     | ± 2.7%                 | ± 2.7%                 |
| Scaling to Peak Envelope Power            | ± 0.0%            | Rectangular              | √3      | 1    | 1     | ± 0.0%                 | ± 0.0%                 |
| System Detection Limit                    | ± 1.0%            | Rectangular              | √3      | 1    | 1     | ± 0.6%                 | ± 0.6%                 |
| Readout Electronics                       | ± 0.3%            | Normal                   | 1       | 1    | 1     | ± 0.3%                 | ± 0.3%                 |
| Response Time                             | ± 0.8%            | Rectangular              | √3      | 1    | 1     | ± 0.5%                 | ± 0.5%                 |
| Integration Time                          | ± 2.6%            | Rectangular              | √3      | 1    | 1     | ± 1.5%                 | ± 1.5%                 |
| RF Ambient Conditions                     | ± 3.0%            | Rectangular              | √3      | 1    | 1     | ± 1.7%                 | ± 1.7%                 |
| RF Reflections                            | ± 12.0%           | Rectangular              | √3      | 1    | 1     | ± 6.9%                 | ± 6.9%                 |
| Probe positioner                          | ± 1.2%            | Rectangular              | √3      | 1    | 0.67  | ± 0.7%                 | ± 0.5%                 |
| Probe positioning                         | ± 4.7%            | Rectangular              | √3      | 1    | 0.67  | ± 2.7%                 | ± 1.8%                 |
| Extrap. and Interpolation                 | ± 1.0%            | Rectangular              | √3      | 1    | 1     | ± 0.6%                 | ± 0.6%                 |
| <b>Test Sample Related</b>                |                   |                          |         |      |       |                        |                        |
| Device Positioning Vertical               | ± 4.7%            | Rectangular              | √3      | 1    | 0.67  | ± 2.7%                 | ± 1.8%                 |
| Device Positioning Lateral                | ± 1.0%            | Rectangular              | 1       | 1    | 1     | ± 0.6%                 | ± 0.6%                 |
| Device Holder and Phantom                 | ± 2.4%            | Rectangular              | √3      | 1    | 1     | ± 1.4%                 | ± 1.4%                 |
| Power Drift                               | ± 5.0%            | Rectangular              | √3      | 1    | 1     | ± 2.9%                 | ± 2.9%                 |
| <b>Phantom and Set-up</b>                 |                   |                          |         |      |       |                        |                        |
| Phantom Thickness                         | ± 2.4%            | Rectangular              | √3      | 1    | 0.67  | ± 1.4%                 | ± 0.9%                 |
| <b>Combined Std. Uncertainty</b>          |                   |                          |         |      |       | <b>± 15.2%</b>         | <b>± 10.8%</b>         |
| <b>Expanded Std. Uncertainty on Power</b> |                   |                          |         |      |       | <b>± 30.4%</b>         | <b>± 21.6%</b>         |
| <b>Expanded Std. Uncertainty on Field</b> |                   |                          |         |      |       | <b>± 15.2%</b>         | <b>± 10.8%</b>         |

Table 5: Measurement uncertainties

NOTE: Worst-Case uncertainty budget for HAC free field assessment according to ANSI C63.19 [1], [2]. The budget is valid for the frequency range 800 MHz - 3 GHz and represents a worstcase analysis. For specific tests and configurations, the uncertainty could be considerably smaller.

### 3 System Verification Procedure

#### 3.1 System Check

Place a dipole antenna meeting the requirements given in ANSI C63.19 D.5 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical and magnetic output. Position the E-field and H-field probes so that:

- The probes and their cables are parallel to the coaxial feed of the dipole antenna
- The probe cables and the coaxial feed of the dipole antenna approach the measurement area from opposite directions
- The center point of the probe element(s) are 10 mm from the closest surface of the dipole elements.

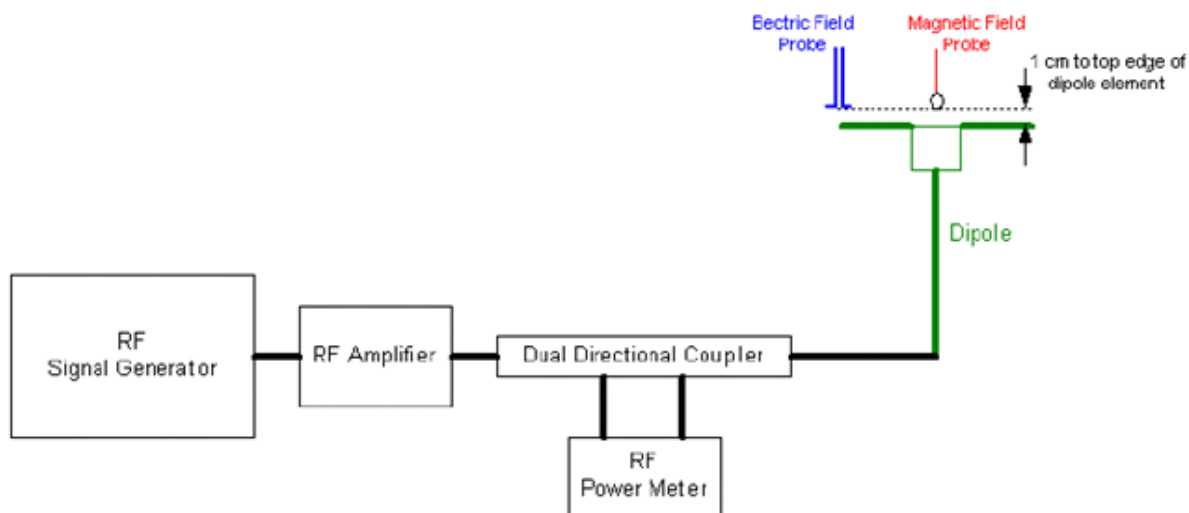


Fig. 4 Dipole Validation Setup

#### 3.2 Validation Result

| E-Field Scan |                 |                  |                                   |                                 |                            |                        |           |
|--------------|-----------------|------------------|-----------------------------------|---------------------------------|----------------------------|------------------------|-----------|
| Mode         | Frequency (MHz) | Input Power (mW) | Measured Value <sup>1</sup> (V/m) | Target Value <sup>2</sup> (V/m) | Deviation <sup>3</sup> (%) | Limit <sup>4</sup> (%) | Test Date |
| CW           | 835             | 100              | 150.6                             | 166.9                           | -9.77%                     | ±25%                   | 2013/6/5  |
| CW           | 1880            | 100              | 134.4                             | 137.1                           | -1.97%                     | ±25%                   | 2013/6/5  |
| H-Field Scan |                 |                  |                                   |                                 |                            |                        |           |
| Mode         | Frequency (MHz) | Input Power (mW) | Measured Value (A/m)              | Target Value (A/m)              | Deviation (%)              | Limit (%)              | Test Date |
| CW           | 835             | 100              | 0.451                             | 0.456                           | -1.10%                     | ±25%                   | 2013/6/5  |
| CW           | 1880            | 100              | 0.435                             | 0.465                           | -6.45%                     | ±25%                   | 2013/6/5  |

<sup>1</sup> Please refer to the attachment for detailed measurement data and plot.

<sup>2</sup> Target value is provided by SPEAD in the calibration certificate of specific dipoles.

<sup>3</sup> Deviation (%) = 100 \* (Measured value minus Target value) divided by Target value.

<sup>4</sup> ANSI C63.19 requires values within ± 25% are acceptable, of which 12% is deviation and 13% is measurement uncertainty. Values independently validated for the dipole actually used in the measurements should be used, when available.

### 3.3 Probe Modulation Factor

The Probe Modulation Factor (PMF) is defined as the ratio of the field readings for a CW and a modulated signal with the equivalent Field Envelope Peak as defined in ANSI C63.19 (Chapter C.3.1). Calibration shall be made of the modulation response of the probe and its instrumentation chain. This Calibration shall be performed with the field probe, attached to the instrumentation that is to be used with it during the measurement. The response of the probe system to a CW field at the frequency(s) of interest is compared to its response to a modulated signal with equal peak amplitude. The field level of the test signals shall be more than 10dB above the ambient level and the noise floor of the instrumentation being used. The ratio of the CW reading to that taken with a modulated field shall be applied to the readings taken of modulated fields of the specified type.

### 3.4 Modulation Factor Test Procedure

This may be done using the following procedure:

1. Fix the field probe in a set location relative to a field generating device, such as the reference dipole antenna, as illustrated in the following figure.
2. Illuminate the probe using the wireless device (EUT) connected to the reference dipole with a test signal at the intended measurement frequency, Ensure there is sufficient field coupling between the probe and the antenna so the resulting reading is greater than 10 dB above the probe system noise floor but within the systems operating range.
3. Record the amplitude applied to the antenna during transmission and the field strength measured by the E-field probe located near the tip of the dipole antenna.
4. Replace the wireless device with an RF signal generator producing an unmodulated CW signal and set to the wireless device operating frequency.
5. Set the amplitude of the unmodulated signal to equal that recorded from the wireless device.
6. Record the reading of the probe measurement system of the unmodulated signal.
7. The ratio, in linear units, of the probe reading in Step 6) to the reading in Step 3) is the E-field modulation factor.  $PMFE = ECW / Emod$  ( $PMFH = HCW / Hmod$ )
8. Repeat the previous steps using the H-field probe, except locate the probe at the center of the dipole.

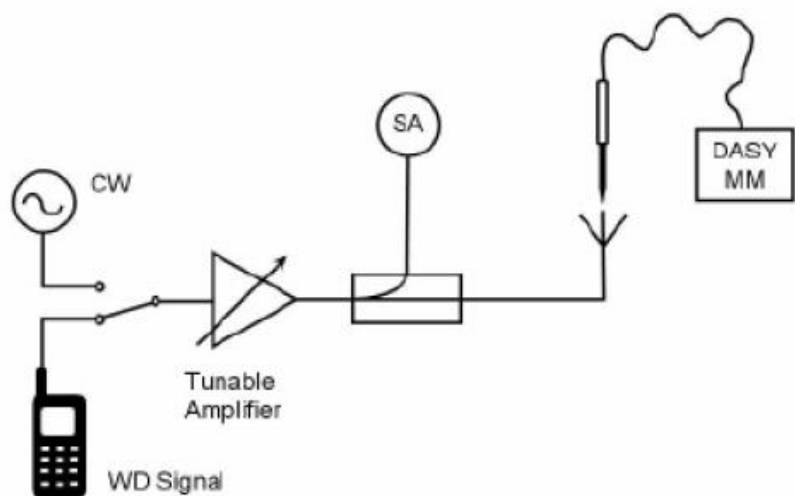


Fig. 6 Probe Modulation Factor Test Setup

### 3.5 Modulation Factor

| Band         | E-Field Probe Modulation Factor | H-Field Probe Modulation Factor |
|--------------|---------------------------------|---------------------------------|
| GSM850       | 2.83                            | 2.82                            |
| GSM1900      | 2.86                            | 2.83                            |
| UMTS Band II | 1.02                            | 1.01                            |
| UMTS Band IV | 1.02                            | 0.98                            |
| UMTS Band V  | 1.04                            | 1.02                            |

## 4 HAC Measurement Procedure

**The evaluation was performed with the following procedure:**

- 1) Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
- 2) Position the WD in its intended test position. The gauge block can simplify this positioning. Note that a separate E-field and H-field gauge block will be needed if the center of the probe sensor elements are at different distances from the tip of the probe.
- 3) Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters (e.g., test mode), as intended for the test. The battery was ensured to be fully charged before each test.
- 4) The center sub-grid shall be centered on the center of the T-Coil mode axial measurement point or the acoustic output, as appropriate. Locate the field probe at the initial test position in the 50 mm by 50 mm grid, which is contained in the measurement plane. If the field alignment method is used, align the probe for maximum field reception.
- 5) Record the reading.
- 6) Scan the entire 50 mm by 50 mm region in equally spaced increments and record the reading at each measurement point. The distance between measurement points shall be sufficient to assure the identification of the maximum reading.
- 7) Identify the five contiguous sub-grids around the center sub-grid with the lowest maximum field strength readings. Thus the six areas to be used to determine the WD's highest emissions are identified and outlined for the final manual scan. Please note that a maximum of five blocks can be excluded for both E-field and H-field measurements for the WD output being measured. Stated another way, the center sub-grid and three others must be common to both the E-field and H-field measurements.
- 8) Identify the maximum field reading within the non-excluded sub-grids identified in Step 7)
- 9) Convert the maximum field strength reading identified in Step 8) to V/m or A/m, as appropriate. For probes which require a probe modulation factor, this conversion shall be done using the appropriate probe modulation factor and the calibration.
- 10) Repeat Step 1) through Step 10) for both the E-field and H-field measurements.
- 11) Compare this reading to the categories in ANSI C63.19 Clause 7 and record the resulting category. The lowest category number listed in Table 6.2 and Table 6.3 obtained in Step 10) for either E- or H-field determines the M category for the audio coupling mode assessment. Record the WD category rating.

## **5 HAC Test Configuration**

### **5.1 General Description**

The phone was tested in all normal configurations for the ear use. The EUT is mounted in the device holder equivalent as for classic dosimeter measurements. The acoustic output of the EUT shall coincide with the center point of the area formed by the dielectric wire and the middle bar of the arch's top frame. The EUT shall be moved vertically upwards until it touches the frame. The fine adjustment is possible by sliding the complete. The EUT holder is on the yellow base plate of the Test Arch phantom. These test configurations are tested at the high, middle and low frequency channels of each applicable operating mode; for example, GSM, WCDMA(UMTS), CDMA and TDMA.

### **5.2 GSM/UMTS Test Configuration**

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radiofrequency Channel Number (ARFCN) is allocated to 128, 190 and 251 in the case of GSM850, to 512, 661 and 810 in the case of GSM1900, to 9262, 9400 and 9538 in the case of UMTS Band II, to 1312, 1413 and 1513 in the case of UMTS Band IV, to 4132, 4182 and 4233 in the case of UMTS Band V. The EUT is commanded to operate at maximum transmitting power. Using CMU200 the power level is set to "5" in HAC of GSM850, set to "0" in HAC of GSM1900. Set to all up bits for UMTS.

## 6 HAC RF Measurement Results

### 6.1 Conducted power measurements

| GSM850       | Test Mode    | Burst Average Power (dBm) |        |        |
|--------------|--------------|---------------------------|--------|--------|
|              |              | 128CH                     | 190CH  | 251CH  |
|              | GSM(CS)      | 32.97                     | 32.83  | 32.98  |
| GSM1900      | Test Mode    | Burst Average Power (dBm) |        |        |
|              |              | 512CH                     | 661CH  | 810CH  |
|              | GSM(CS)      | 30.06                     | 29.99  | 30.29  |
| UMTS Band II | Test Mode    | Average Power (dBm)       |        |        |
|              |              | 9262CH                    | 9400CH | 9538CH |
|              | 12.2kbps RMC | 24.35                     | 24.15  | 24.28  |
|              | 64kbps RMC   | 24.30                     | 24.12  | 24.25  |
|              | 144kbps RMC  | 24.25                     | 24.12  | 24.25  |
|              | 384kbps RMC  | 24.24                     | 24.12  | 24.25  |
| UMTS Band IV | Test Mode    | Average Power (dBm)       |        |        |
|              |              | 1312CH                    | 1413CH | 1513CH |
|              | 12.2kbps RMC | 24.02                     | 24.09  | 24.29  |
|              | 64kbps RMC   | 24.09                     | 24.09  | 24.31  |
|              | 144kbps RMC  | 24.05                     | 24.13  | 24.30  |
|              | 384kbps RMC  | 24.03                     | 24.11  | 24.31  |
| UMTS Band V  | Test Mode    | Average Power (dBm)       |        |        |
|              |              | 4132CH                    | 4182CH | 4233CH |
|              | 12.2kbps RMC | 24.49                     | 24.35  | 24.34  |
|              | 64kbps RMC   | 24.45                     | 24.32  | 24.31  |
|              | 144kbps RMC  | 24.45                     | 24.29  | 24.28  |
|              | 384kbps RMC  | 24.53                     | 24.30  | 24.27  |

Table 6: Test Result of Conducted power

## 6.2 E-Field Emissions

| Band         | Test Mode                                      | Test channel /Frequency | Measured Value (V/m) | Power Drift (dB) | M-Rating |
|--------------|------------------------------------------------|-------------------------|----------------------|------------------|----------|
| GSM850       | Test data with battery 1#                      |                         |                      |                  |          |
|              | GSM                                            | 251/848.8               | 201.1                | -0.07            | M3       |
|              |                                                | 190/836.6               | 205.7                | -0.01            | M3       |
|              |                                                | 128/824.2               | 200.3                | -0.06            | M3       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | GSM                                            | 190/836.6               | 207.2                | -0.05            | M3       |
| GSM1900      | Test data with battery 1#                      |                         |                      |                  |          |
|              | GSM                                            | 810/1909.8              | 82.18                | 0.01             | M3       |
|              |                                                | 661/1880                | 78.99                | -0.01            | M3       |
|              |                                                | 512/1850.2              | 76.30                | -0.09            | M3       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | GSM                                            | 810/1909.8              | 79.58                | 0.05             | M3       |
| UMTS Band II | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 9538/1907.6             | 38.05                | 0.05             | M4       |
|              |                                                | 9400/1880               | 40.68                | -0.04            | M4       |
|              |                                                | 9262/1852.4             | 39.21                | -0.10            | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 9400/1880               | 39.96                | -0.09            | M4       |
| UMTS Band IV | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 1513/1752.6             | 40.86                | -0.04            | M4       |
|              |                                                | 1413/1732.6             | 36.29                | -0.03            | M4       |
|              |                                                | 1312/1712.4             | 31.45                | 0.07             | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 1513/1752.6             | 40.50                | -0.03            | M4       |
| UMTS Band V  | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 4233/846.6              | 76.60                | 0.07             | M4       |
|              |                                                | 4182/836.4              | 75.26                | -0.05            | M4       |
|              |                                                | 4132/826.4              | 66.95                | -0.04            | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 4233/846.6              | 76.60                | -0.10            | M4       |

Table 7: Test Result of E-Field Emissions

Note:

- 1) There is no special HAC mode software on this DUT.
- 2) The volume is adjusted to the maximum level and the backlight turned off during the test.
- 3) WiFi and Bluetooth function is turned off during the test.

### 6.3 H-Field Emissions

| Band         | Test Mode                                      | Test channel /Frequency | Measured Value (A/m) | Power Drift (dB) | M-Rating |
|--------------|------------------------------------------------|-------------------------|----------------------|------------------|----------|
| GSM850       | Test data with battery 1#                      |                         |                      |                  |          |
|              | GSM                                            | 251/848.8               | 0.329                | -0.01            | M4       |
|              |                                                | 190/836.6               | 0.318                | -0.01            | M4       |
|              |                                                | 128/824.2               | 0.317                | -0.06            | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | GSM                                            | 251/848.8               | 0.313                | 0.080            | M4       |
| GSM1900      | Test data with battery 1#                      |                         |                      |                  |          |
|              | GSM                                            | 810/1909.8              | 0.230                | 0.01             | M3       |
|              |                                                | 661/1880                | 0.211                | 0.04             | M3       |
|              |                                                | 512/1850.2              | 0.198                | -0.01            | M3       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | GSM                                            | 810/1909.8              | 0.219                | 0.10             | M3       |
| UMTS Band II | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 9538/1907.6             | 0.099                | -0.03            | M4       |
|              |                                                | 9400/1880               | 0.102                | -0.03            | M4       |
|              |                                                | 9262/1852.4             | 0.096                | 0.06             | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 9400/1880               | 0.101                | 0.12             | M4       |
| UMTS Band IV | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 1513/1752.6             | 0.099                | 0.05             | M4       |
|              |                                                | 1413/1732.6             | 0.092                | 0.04             | M4       |
|              |                                                | 1312/1712.4             | 0.088                | -0.07            | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 1513/1752.6             | 0.100                | -0.13            | M4       |
| UMTS Band V  | Test data with battery 1#                      |                         |                      |                  |          |
|              | RMC                                            | 4233/846.6              | 0.117                | 0.00             | M4       |
|              |                                                | 4182/836.4              | 0.109                | -0.03            | M4       |
|              |                                                | 4132/826.4              | 0.102                | -0.05            | M4       |
|              | Test data at the worst channel with battery 2# |                         |                      |                  |          |
|              | RMC                                            | 4233/846.6              | 0.117                | 0.01             | M4       |

Table 8: Test Result of H-Field Emissions

Note:

- 1) There is no special HAC mode software on this DUT.
- 2) The volume is adjusted to the maximum level and the backlight turned off during the test.
- 3) WiFi and Bluetooth function is turned off during the test.

**Appendix A. System Check Plots**

(Please See Appendix A)

**Appendix B. HAC Measurement Plots**

(Please See Appendix B)

**Appendix C. Calibration Certificate**

(Please See Appendix C)

**Appendix D. Photo documentation**

(Please See Appendix D)

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**END**