

# RF Test Report

**Product Name: Remote Radio Unit**

**Product Model: RRU3804 1900**

**Report Number: SYBH(R)01314849EB-1**

**FCC ID: QISRRU3804B2**

**IC: 6369A-3804B2**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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## Notice

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2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number for the test site located in Shenzhen is 97456, and the recognition numbers for the test site located in Shanghai is 684868.
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**Applicant:** Huawei Technologies Co., Ltd.  
**Address:** Administration Building, Headquarters of Huawei Technologies Co., Ltd.,  
Bantian, Longgang District, Shenzhen, 518129, P.R.C  
**Product Name:** Remote Radio Unit  
**Product Model:** RRU3804 1900

**Date of Receipt Sample:** 2014-03-31  
**Start Date of Test:** 2014-03-31  
**End Date of Test:** 2014-04-16

**Test Result:** Pass

**Approved by Senior**

2014-04-28

Zhang Xinghai

*Zhang Xing hai*

**Engineer:**

Date

Name

Signature

**Prepared by:**

2014-04-28

Hu Wei

*Hu Wei*

Date

Name

Signature



### Modification Record

| No. | Last Report No. | Modification Description |
|-----|-----------------|--------------------------|
| 1   | ---             | First report.            |



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## 1 General Information

### 1.1 Applied Standard

|                |                                                                                                                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applied Rules: | 47 CFR FCC Part 2 (10-1-13 Edition)<br>47 CFR FCC Part 24 (10-1-13 Edition)<br>IC RSS-Gen (Issue 3, December 2010)<br>IC RSS-133 (Issue 6, January 2013)                                                           |
| Test Method:   | FCC KDB 971168 D01 Power Meas License Digital Systems v02r01<br>FCC KDB 662911 D01 Multiple Transmitter Output v01r02 (if applicable)<br>FCC KDB 662911 D02 MIMO with Cross-Polarized Antennas v01 (if applicable) |

### 1.2 Test Location

|                        |                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Test Location 1 (TL1): | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                     |
| Address:               | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C |
| Test Location 2 (TL2): | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                     |
| Address:               | No.2222, Xin Jinqiao Road, Pudong New Area, Shanghai, 201206, P.R.C                                                         |
| Test Location 3 (TL3): | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                     |
| Address:               | Tianfu Software Park, 801#, Tianfu Road, High-Tech Zone, Chengdu, 610041, P.R.C                                             |

### 1.3 Test Environment Condition

|                       |                       |
|-----------------------|-----------------------|
| Temperature:          | 15 to 30 °C (Ambient) |
| Relative Humidity:    | 20 to 85 % (Ambient)  |
| Atmospheric Pressure: | Not applicable        |



## 2 Test Summary

### 2.1 PCS Band (1850-1915 MHz paired with 1930-1995 MHz)

#### 2.1.1 Measurement Technical Requirements

| Test Item                | FCC Rule         | IC Rule                                  | Requirements |                                                                                                 |                                                                                                                                                                                                                                 | Test Result | Verdict | Test Location |
|--------------------------|------------------|------------------------------------------|--------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------|---------------|
| Transmitter Output Power | §2.1046, §24.232 | RSS-Gen,§4.8; RSS-133,§6.4; RSS-133,§4.1 | FCC          | Base Station                                                                                    | <ul style="list-style-type: none"><li>Average EIRP Power ≤ 1640 W (for EBW ≤ 1 MHz).</li><li>Average EIRP PD ≤ 1640 W/MHz (for EBW &gt; 1 MHz).</li><li>PAPR ≤ 13 dB@0.1%.</li></ul>                                            | Annex A     | Pass    | TL1           |
|                          |                  |                                          |              | Mobile Station / Portable Station                                                               | <ul style="list-style-type: none"><li>Average EIRP ≤ 2 W.</li><li>PAPR ≤ 13 dB@0.1%.</li></ul>                                                                                                                                  |             |         |               |
|                          |                  |                                          | IC           | Base Station                                                                                    | <ul style="list-style-type: none"><li>Average EIRP Power ≤ 1640 W (for ChBW ≤ 1 MHz).</li><li>Average EIRP PD ≤ 1640 W/MHz (for ChBW &gt; 1 MHz).</li><li>Average Conducted Power ≤ 100 W.</li><li>PAPR ≤ 13 dB@0.1%.</li></ul> |             |         |               |
|                          |                  |                                          |              | Mobile Station / Hand-held Portable Station                                                     | <ul style="list-style-type: none"><li>Average EIRP Power ≤ 2 W.</li><li>PAPR ≤ 13 dB@0.1%.</li></ul>                                                                                                                            |             |         |               |
| Bandwidth                | §2.1049, §24.238 | RSS-Gen,§4.6; RSS-133,§2.3               | FCC          | <ul style="list-style-type: none"><li>OBW: No limit.</li><li>EBW (-26 dBc): No limit.</li></ul> |                                                                                                                                                                                                                                 | Annex B     | Pass    | TL1           |
|                          |                  |                                          | IC           | <ul style="list-style-type: none"><li>OBW: No limit, may in lieu of EBW (-20 dBc).</li></ul>    |                                                                                                                                                                                                                                 |             |         |               |

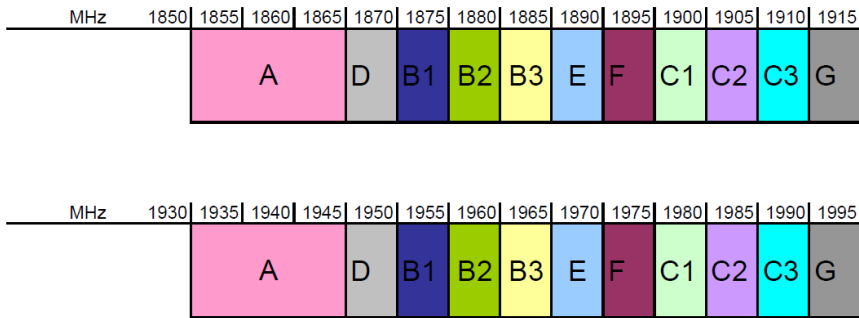


| Test Item                              | FCC Rule         | IC Rule                      | Requirements                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                     | Test Result | Verdict | Test Location |
|----------------------------------------|------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------|---------------|
|                                        |                  |                              |                                                                                                                   | <ul style="list-style-type: none"> <li>EBW (-20 dBc): No limit.</li> </ul>                                                                                                                                                                                                                                                                                                                          |             |         |               |
| Band Edges Compliance                  | §2.1051, §24.238 | RSS-Gen, §4.9; RSS-133, §6.5 | FCC                                                                                                               | $\leq -13$ dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.<br>(EBW is -26 dBc EBW)                                                                                                                                                                                                                                                                              | Annex C     | Pass    | TL1           |
|                                        |                  |                              | IC                                                                                                                | $\leq -13$ dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.<br>(EBW is -20 dBc EBW, or OBW)                                                                                                                                                                                                                                                                      |             |         |               |
| Spurious Emission at Antenna Terminals | §2.1051, §24.238 | RSS-Gen, §4.9; RSS-133, §6.5 | $\leq -13$ dBm/1 MHz, from 9 kHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency blocks. |                                                                                                                                                                                                                                                                                                                                                                                                     | Annex D     | Pass    | TL1           |
| Field Strength of Spurious Radiation   | §2.1053, §24.238 | RSS-Gen, §4.9; RSS-133, §6.5 | $\leq -13$ dBm/1 MHz.                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                     | Annex E     | Pass    | TL2           |
| Frequency Stability                    | §2.1055, §24.235 | RSS-Gen, §4.7; RSS-133, §6.3 | FCC                                                                                                               | <ul style="list-style-type: none"> <li>Test method: Fundamental emissions (Fc_meas) within the authorized frequency block.</li> <li>Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, <math>\pm 15\%</math>*NV.</li> </ul>                                                                                                                                                               | Annex F     | Pass    | TL1           |
|                                        |                  |                              | IC                                                                                                                | Base Station <ul style="list-style-type: none"> <li>Test method option #1:<br/>(Fc_meas - Fc_meas@20°C&amp;NV) / Fc_meas@20°C&amp;NV <math>\leq \pm 1.0</math> ppm.</li> <li>Test method option #2:<br/>EBW (EBW_lower to EBW_higher) within frequency block.</li> <li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, <math>\pm 15\%</math>*NV.<br/>(EBW is -20 dBc EBW, or OBW)</li> </ul> |             |         |               |
|                                        |                  |                              | IC                                                                                                                | Mobile Station <ul style="list-style-type: none"> <li>Test method option #1:<br/>(Fc_meas - Fc_meas@20°C&amp;NV) / Fc_meas@20°C&amp;NV <math>\leq \pm 2.5</math> ppm.</li> </ul>                                                                                                                                                                                                                    |             |         |               |



| Test Item                   | FCC Rule | IC Rule                | Requirements |  |                                                                                                                                                                                                                                           | Test Result | Verdict | Test Location |
|-----------------------------|----------|------------------------|--------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------|---------------|
|                             |          |                        |              |  | <ul style="list-style-type: none"><li>Test method option #2:<br/>EBW (EBW_lower to EBW_higher) within frequency block.</li><li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV.<br/>(EBW is -20 dBc EBW, or OBW)</li></ul> |             |         |               |
| Receiver Spurious Emissions | ---      | IC NOTICE 2012-DRS0126 | ---          |  |                                                                                                                                                                                                                                           | Annex G     | ---     | ---           |
| Photos of Test Setups       | ---      | ---                    | ---          |  |                                                                                                                                                                                                                                           | Annex H     | ---     | ---           |

## 2.1.2 Non-measurement Technical Requirements

| Description                | FCC Rule | IC Rule      | Requirements                                                                                                                    | Test Result                              | Verdict |
|----------------------------|----------|--------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------|
| Frequency Plan             | §24.229  | RSS-133,§6.1 | 1850-1915 MHz paired with 1930-1995 MHz:<br> | See technical specification description. | Comply  |
| Modulation Characteristics | §2.1047  | RSS-133,§6.2 | Digital modulation.                                                                                                             | See technical specification description. | Comply  |

### 3 Description of the Equipment under Test (EUT)

#### 3.1 General Description

The RRU3804 is the outdoor remote radio unit. It is installed close to the antenna.

The RRU3804 performs modulation, demodulation, data processing, and combination and division of baseband signals and RF signals.

#### 3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

##### 3.2.1 Board

| Board      |                  |                                                  |
|------------|------------------|--------------------------------------------------|
| Board Name | Hardware Version | Description                                      |
| WD32TRX8C  | Ver.B            | Multi-Carrier Transceiver Board,2.5G (for 1900M) |
| WD32TRXA1  | Ver.B            | Multi-Carrier Transceiver Board (for 1900M)      |

##### 3.2.2 Sub-Assembly

| Sub-Assembly      |        |              |                                                                                                                  |
|-------------------|--------|--------------|------------------------------------------------------------------------------------------------------------------|
| Sub-Assembly Name | Model  | Manufacturer | Description                                                                                                      |
| WMPT              | WMPT   | HUAWEI       | HERT BBU, WD22WMPT, WCDMA Main Processing & Transmission unit (4E1 + 2FE), 1*1                                   |
| WBBP              | WBBPb3 | HUAWEI       | BBU3900,QWL1WBBPB3,WCDMA BaseBand Processing&Interface Unit                                                      |
| LMPT              | LMPTc  | HUAWEI       | HERT BBU, WD22LMPT1, LTE Main Processing & Transmission Unit C(2*FE/GE RJ-45 or 2*FE/GE SFP), With M12M GPS Card |
| LBBP              | LBBPc  | HUAWEI       | HERT BBU,WD22LBBPD,HERT BBU Baseband Processing and Interface Unit,1*1                                           |

### 3.3 Technical Specification

| Characteristics             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radio System Type           | <div>Single Radio <input type="checkbox"/> GSM</div> <div>Access Technology (Single-RAT): <input checked="" type="checkbox"/> UMTS <input checked="" type="checkbox"/> LTE <input type="checkbox"/> CDMA <input type="checkbox"/> WiMAX</div> <div>Multi-Standard Radio (MSR): <input type="checkbox"/> GSM &amp; UMTS <input type="checkbox"/> GSM &amp; LTE <input type="checkbox"/> GSM &amp; UMTS &amp; LTE <input checked="" type="checkbox"/> UMTS &amp; LTE <input type="checkbox"/> WiMAX &amp; LTE <input type="checkbox"/> CDMA &amp; LTE</div>                                                              |
| Equipment Type              | <div>#1 <input checked="" type="checkbox"/> Base Station <input type="checkbox"/> CPE (Customer Premises Equipment) Station <input type="checkbox"/> Subscriber Station (User Equipment)</div> <div>#2 <input checked="" type="checkbox"/> Fixed Station <input type="checkbox"/> Mobile Station <input type="checkbox"/> Portable Station</div> <div>#3 <input type="checkbox"/> Indoor Station <input checked="" type="checkbox"/> Outdoor Station</div>                                                                                                                                                             |
| Supported Frequency Range   | <div>Transmission (TX): 1930 to 1990 MHz</div> <div>Receiving (RX): 1850 to 1910 MHz</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TX and RX Antenna Ports     | <div>TX &amp; RX port: 1</div> <div>TX-only port: 0</div> <div>RX-only port: 1</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Multiple Carrier Supported  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Maximum RF Bandwidth        | <div>UMTS: 20 MHz, 25 MHz(Optimized version)</div> <div>U&amp;L: 20 MHz</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| TX Output Power             | Max. 60 W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Supported Channel Bandwidth | <div>GSM system: <input type="checkbox"/> 200 kHz</div> <div>UMTS system: <input checked="" type="checkbox"/> 5 MHz</div> <div>LTE system: <input type="checkbox"/> 1.4 MHz, <input type="checkbox"/> 3 MHz, <input checked="" type="checkbox"/> 5 MHz, <input checked="" type="checkbox"/> 10 MHz, <input checked="" type="checkbox"/> 15 MHz, <input checked="" type="checkbox"/> 20 MHz</div> <div>CDMA system: <input type="checkbox"/> 1.23 MHz, <input type="checkbox"/> 1.25 MHz</div> <div>WiMAX system: <input type="checkbox"/> 5 MHz, <input type="checkbox"/> 7 MHz, <input type="checkbox"/> 10 MHz</div> |
| Modulation Type             | <div>GSM system: Not applicable</div> <div>UMTS system: Base-band: QPSK, 16QAM, 64QAM<br/>Carrier: CDMA</div> <div>LTE system: Base-band: QPSK, 16QAM, 64QAM<br/>Carrier: OFDM/OFDMA</div>                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Characteristics                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                 | CDMA system: Not applicable<br>WiMAX system: Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Designation of Emissions<br>(Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.) | GSM system: Not applicable<br>UMTS system: 4M17F9W<br>LTE system: 4M51D9W, 9M09D9W, 13M5D9W, 17M9D9W<br>CDMA system: Not applicable<br>WiMAX system: Not applicable                                                                                                                                                                                                                                                                                                                                              |
| Power Supply                                                                                                                                                                    | Power Supply Type: <input type="checkbox"/> External AC mains, <input checked="" type="checkbox"/> External DC mains, <input type="checkbox"/> AC/DC Adapter, <input type="checkbox"/> Powered over Ethernet (PoE)<br>Nominal Voltage, Input to EUT: -48 VDC<br>Voltage Range, Input to EUT: -36 to -57 VDC                                                                                                                                                                                                      |
| Antenna Assemblies                                                                                                                                                              | Antenna Type: <input checked="" type="checkbox"/> External <input type="checkbox"/> Integrated<br>Smart Antenna: <input type="checkbox"/> MIMO <input checked="" type="checkbox"/> Non MIMO<br>Antenna Gain: 17 dBi (per antenna port, max.)<br>Remark: When the EUT is put into service, the practical maximum antenna gain may exceed the value as described above, and if exceed, the combination of the practical output power and the practical antenna gain should NOT exceed the required ERP/EIRP limit. |



## 4 General Test Conditions / Configurations

### 4.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

| Test Mode | Test Modes Description                                                  |
|-----------|-------------------------------------------------------------------------|
| UMTS/TM1  | UMTS system, 3GPP TS 25.141 clause 6.1.1, Test Model 1, QPSK modulation |
| LTE/TM1.1 | LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.1                       |
| LTE/TM1.2 | LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.2                       |
| UL/TM1    | MSR system (UMTS/TM1; LTE/TM1.1)                                        |

## 4.2 EUT Configurations

### 4.2.1 General Configurations

| Configuration       | Description                                                                                                                                                                                                                                                                                       |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Antenna Ports  | Until otherwise specified, <ul style="list-style-type: none"> <li>All TX tests are ONLY performed at the main TX antenna port (e.g. TRXA, TXA or similar) of the EUT, and</li> <li>All RX tests are ONLY performed at the main RX antenna port (e.g. TRXA, RXB or similar) of the EUT.</li> </ul> |
| Multiple RF Sources | Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.                                                                                                                                                                                      |

### 4.2.2 Customized Configurations

NOTE: For the carrier configurations, the description of “n\*TxxxM(yyyW)@zzz” denotes the n \* multiple carriers of the radio system type T (G - GSM system, U - UMTS system, L - LTE system, C - CDMA system, W - WiMAX system), for which the channel bandwidth of each carrier is xxx MHz (applicable for T supporting various channel bandwidths) and the power level of each carrier is yyy Watts, at the antenna port zzz (if specified). While the combinations of several “n\*TxxxM(yyyW)@zzz”s denotes the carrier configurations of the MSR system.

| EUT Conf. | RF Ch. | RX Freq. [MHz] | TX Freq. [MHz] | Ch. BW [MHz] | Power Level [dBm] | Test Mode |
|-----------|--------|----------------|----------------|--------------|-------------------|-----------|
| 1L5M_B    | B      | 1852.5         | 1932.5         | 5            | 47.8              | LTE/TM1.1 |
| 1L5M_M    | M      | 1880           | 1960           | 5            | 47.8              | LTE/TM1.1 |
| 1L5M_T    | T      | 1907.5         | 1987.5         | 5            | 47.8              | LTE/TM1.1 |
| 1L10M_B   | B      | 1855           | 1935           | 10           | 47.8              | LTE/TM1.1 |
| 1L10M_M   | M      | 1880           | 1960           | 10           | 47.8              | LTE/TM1.1 |
| 1L10M_T   | T      | 1905           | 1985           | 10           | 47.8              | LTE/TM1.1 |
| 1L15M_B   | B      | 1857.5         | 1937.5         | 15           | 47.8              | LTE/TM1.1 |
| 1L15M_M   | M      | 1880           | 1960           | 15           | 47.8              | LTE/TM1.1 |
| 1L15M_T   | T      | 1902.5         | 1982.5         | 15           | 47.8              | LTE/TM1.1 |
| 1L20M_B   | B      | 1860           | 1940           | 20           | 47.8              | LTE/TM1.1 |
| 1L20M_M   | M      | 1880           | 1960           | 20           | 47.8              | LTE/TM1.1 |
| 1L20M_T   | T      | 1900           | 1980           | 20           | 47.8              | LTE/TM1.1 |
| 1U_B      | B      | 1852.4         | 1932.4         | 5            | 47.8              | UMTS/TM1  |
| 1U_M      | M      | 1880           | 1960           | 5            | 47.8              | UMTS/TM1  |
| 1U_T      | T      | 1907.6         | 1987.6         | 5            | 47.8              | UMTS/TM1  |
| 2U_20_B   | B      | 1852.4,1867.4  | 1932.4,1947.4  | 5,5          | 44.7,44.7         | UMTS/TM1  |
| 2U_20_M   | M      | 1872.4,1887.4  | 1952.4,1967.4  | 5,5          | 44.7,44.7         | UMTS/TM1  |
| 2U_20_T   | T      | 1892.6,1907.6  | 1972.6,1987.6  | 5,5          | 44.7,44.7         | UMTS/TM1  |



| EUT Conf.       | RF Ch. | RX Freq. [MHz]              | TX Freq. [MHz]              | Ch. BW [MHz] | Power Level [dBm]   | Test Mode |
|-----------------|--------|-----------------------------|-----------------------------|--------------|---------------------|-----------|
| 3U_20_B         | B      | 1852.4,1857.4,1867.4        | 1932.4,1937.4,1947.4        | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 3U_20_M         | M      | 1872.4,1877.4,1887.4        | 1952.4,1957.4,1967.4        | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 3U_20_T         | T      | 1892.6,1897.6,1907.6        | 1972.6,1977.6,1987.6        | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 4U_20_B         | B      | 1852.4,1857.4,1962.4,1867.4 | 1932.4,1937.4,1942.4,1947.4 | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 4U_20_M         | M      | 1872.4,1877.4,1882.4,1887.4 | 1952.4,1957.4,1962.4,1967.4 | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 4U_20_T         | T      | 1892.6,1897.6,1902.6,1907.6 | 1972.6,1977.6,1982.6,1987.6 | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 2U_25_B         | B      | 1852.4,1872.4               | 1932.4,1952.4               | 5,5          | 44.7,44.7           | UMTS/TM1  |
| 2U_25_M         | M      | 1870,1890                   | 1950,1970                   | 5,5          | 44.7,44.7           | UMTS/TM1  |
| 2U_25_T         | T      | 1887.6,1907.6               | 1967.6,1987.6               | 5,5          | 44.7,44.7           | UMTS/TM1  |
| 3U_25_B         | B      | 1852.4,1857.4,1872.4        | 1932.4,1937.4,1952.4        | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 3U_25_M         | M      | 1870,1875,1890              | 1950,1955,1970              | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 3U_25_T         | T      | 1887.6,1992.6,1907.6        | 1967.6,1972.6,1987.6        | 5,5,5        | 43,43,43            | UMTS/TM1  |
| 4U_25_B         | B      | 1852.4,1857.4,1862.4,1872.4 | 1932.4,1937.4,1942.4,1952.4 | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 4U_25_M         | M      | 1870,1875,1880,1890         | 1950,1955,1960,1970         | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 4U_25_T         | T      | 1887.6,1892.6,1897.6,1907.6 | 1967.6,1972.6,1977.6,1987.6 | 5,5,5,5      | 41.7,41.7,41.7,41.7 | UMTS/TM1  |
| 1U1L5M_30+30_B  | B      | 1852.4,1867.4               | 1932.4,1947.4               | 5,5          | 44.7,44.7           | UL/TM1    |
| 1U1L5M_30+30_M  | M      | 1872.4,1887.4               | 1952.4,1967.4               | 5,5          | 44.7,44.7           | UL/TM1    |
| 1U1L5M_30+30_T  | T      | 1892.6,1907.6               | 1972.6,1987.6               | 5,5          | 44.7,44.7           | UL/TM1    |
| 1U1L10M_30+30_B | B      | 1852.4,1864.9               | 1932.4,1944.9               | 5,10         | 44.7,44.7           | UL/TM1    |
| 1U1L10M_30+30_M | M      | 1872.4,1884.9               | 1952.4,1964.9               | 5,10         | 44.7,44.7           | UL/TM1    |
| 1U1L10M_30+30_T | T      | 1895.1,1907.6               | 1975.1,1987.6               | 10,5         | 44.7,44.7           | UL/TM1    |
| 1U1L15M_30+30_B | B      | 1852.4,1862.4               | 1932.4,1942.4               | 5,15         | 44.7,44.7           | UL/TM1    |
| 1U1L15M_30+30_M | M      | 1872.4,1882.4               | 1952.4,1962.4               | 5,15         | 44.7,44.7           | UL/TM1    |
| 1U1L15M_30+30_T | T      | 1897.6,1907.6               | 1977.6,1987.6               | 15,5         | 44.7,44.7           | UL/TM1    |
| 1U1L5M_20+40_B  | B      | 1852.4,1867.4               | 1932.4,1947.4               | 5,5          | 43,46               | UL/TM1    |
| 1U1L5M_20+40_M  | M      | 1872.4,1887.4               | 1952.4,1967.4               | 5,5          | 43,46               | UL/TM1    |
| 1U1L5M_20+40_T  | T      | 1892.6,1907.6               | 1972.6,1987.6               | 5,5          | 46,43               | UL/TM1    |
| 1U1L10M_20+40_B | B      | 1852.4,1864.9               | 1932.4,1944.9               | 5,10         | 43,46               | UL/TM1    |
| 1U1L10M_20+40_M | M      | 1872.4,1884.9               | 1952.4,1964.9               | 5,10         | 43,46               | UL/TM1    |
| 1U1L10M_20+40_T | T      | 1895.1,1907.6               | 1975.1,1987.6               | 10,5         | 46,43               | UL/TM1    |



| EUT Conf.       | RF Ch. | RX Freq. [MHz] | TX Freq. [MHz] | Ch. BW [MHz] | Power Level [dBm] | Test Mode |
|-----------------|--------|----------------|----------------|--------------|-------------------|-----------|
| 1U1L15M_20+40_B | B      | 1852.4,1862.4  | 1932.4,1942.4  | 5,15         | 43,46             | UL/TM1    |
| 1U1L15M_20+40_M | M      | 1872.4,1882.4  | 1952.4,1962.4  | 5,15         | 43,46             | UL/TM1    |
| 1U1L15M_20+40_T | T      | 1897.6,1907.6  | 1977.6,1987.6  | 15,5         | 46,43             | UL/TM1    |

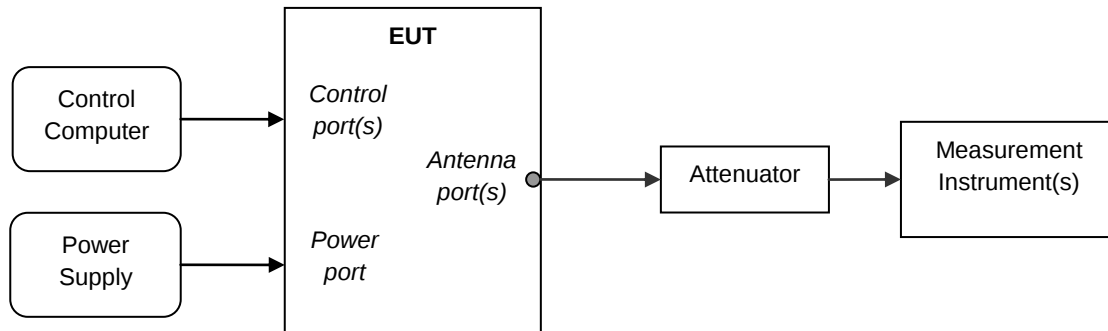


### 4.3 Test Environments

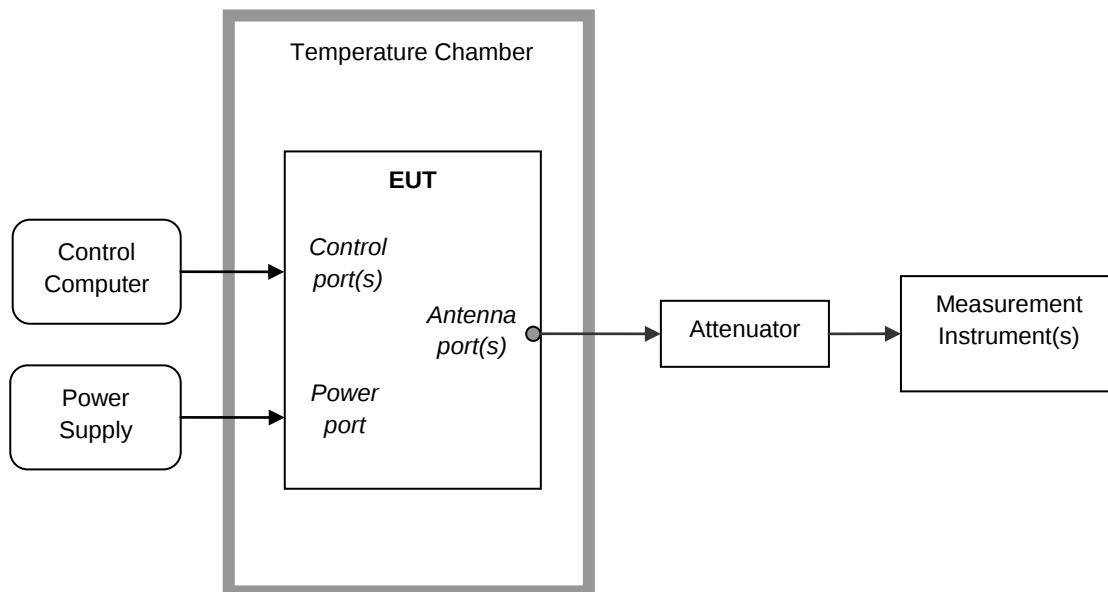
| Environment Parameter | Selected Values During Tests |         |                   |
|-----------------------|------------------------------|---------|-------------------|
|                       | Temperature                  | Voltage | Relative Humidity |
| Ambient Climate       | Ambient                      | ---     | Ambient           |
| Rated Voltage         | ---                          | -48 VDC | ---               |

## 4.4 Test Setups

### 4.4.1 Test Setup 1



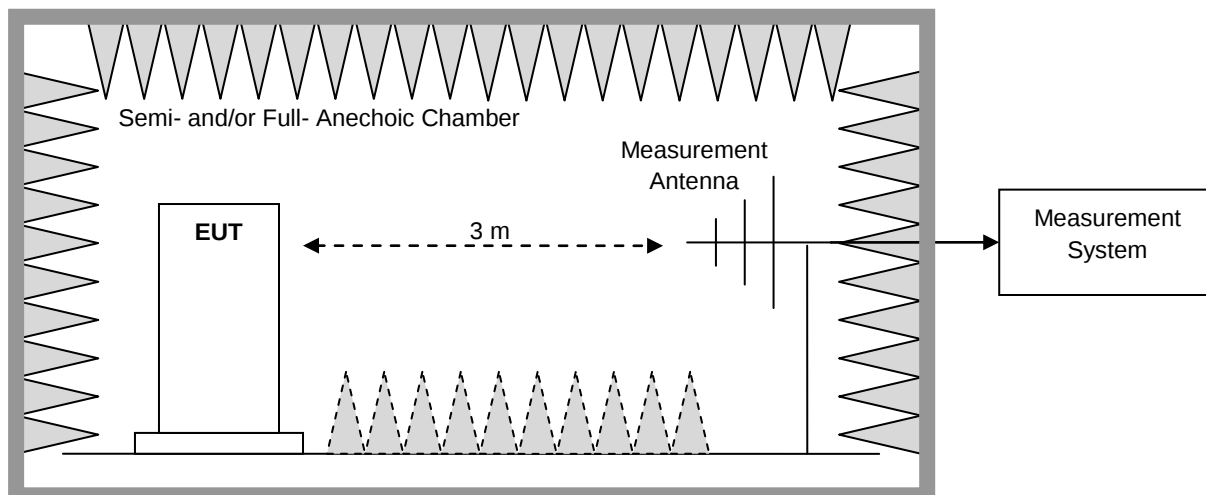
### 4.4.2 Test Setup 2



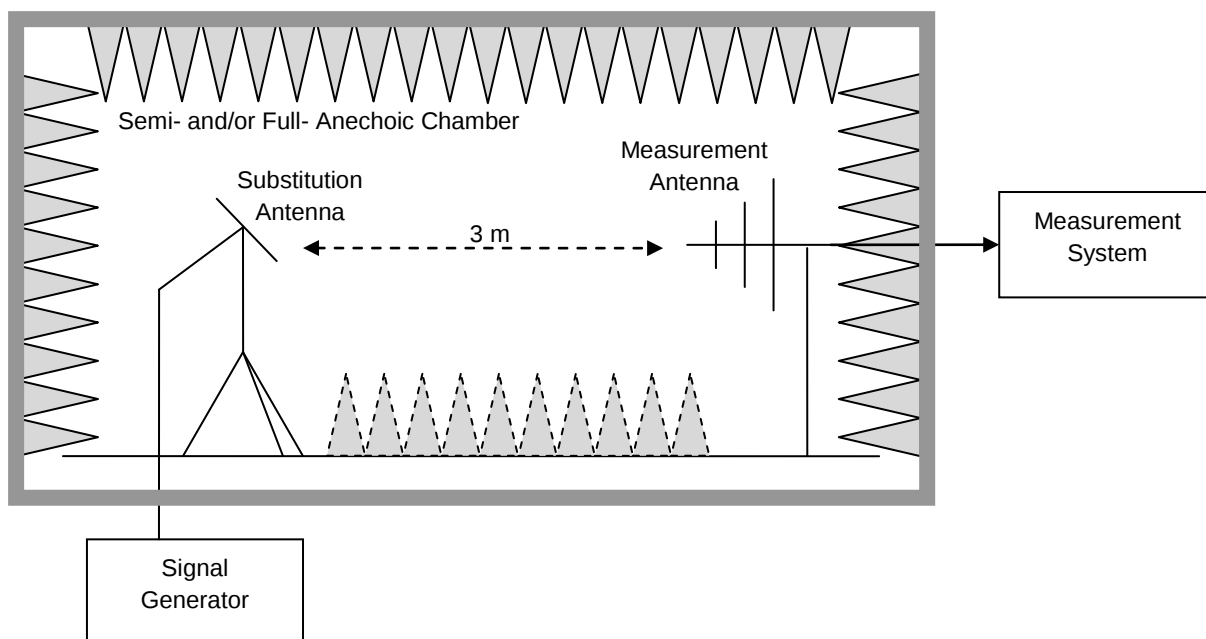
### 4.4.3 Test Setup 3

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

#### 4.4.3.1 Step 1: Pre-test



#### 4.4.3.2 Step 2: Substitution method to verify the maximum ERP



## 4.5 Test Conditions

| Test Case                      |                           | Test Conditions |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------|---------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmitter<br>Output<br>Power | Channel Power,<br>Total   | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                           | Test Setup      | Test Seup 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                |                           | EUT Conf.       | 1L5M_B,1L5M_M,1L5M_T<br>1L10M_B,1L10M_M,1L10M_T<br>1L15M_B,1L15M_M,1L15M_T<br>1L20M_B,1L20M_M,1L20M_T<br>1U_B,1U_M,1U_T<br>2U_20_B,2U_20_M,2U_20_T<br>3U_20_B,3U_20_M,3U_20_T<br>4U_20_B,4U_20_M,4U_20_T<br>2U_25_B,2U_25_M,2U_25_T<br>3U_25_B,3U_25_M,3U_25_T<br>4U_25_B,4U_25_M,4U_25_T<br>1U1L5M_30+30_B,1U1L5M_30+30_M,1U1L5M_30+30_T<br>1U1L10M_30+30_B,1U1L10M_30+30_M,1U1L10M_30+30_T<br>1U1L15M_30+30_B,1U1L15M_30+30_M,1U1L15M_30+30_T<br>1U1L5M_20+40_B,1U1L5M_20+40_M,1U1L5M_20+40_T<br>1U1L10M_20+40_B,1U1L10M_20+40_M,1U1L10M_20+40_T<br>1U1L15M_20+40_B,1U1L15M_20+40_M,1U1L15M_20+40_T |
|                                | Power Spectral<br>Density | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                           | Test Setup      | Test Seup 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                |                           | EUT Conf.       | 1L5M_B,1L5M_M,1L5M_T<br>1U_B,1U_M,1U_T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                | Peak-to-Average<br>Ratio  | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                           | Test Setup      | Test Seup 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                |                           | EUT Conf.       | 1L5M_B,1L5M_M,1L5M_T<br>1U_B,1U_M,1U_T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Bandwidth                      | Occupied<br>Bandwidth     | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                           | Test Setup      | Test Seup 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                |                           | EUT Conf.       | 1L5M_B,1L5M_M,1L5M_T<br>1L10M_B,1L10M_M,1L10M_T<br>1L15M_B,1L15M_M,1L15M_T<br>1L20M_B,1L20M_M,1L20M_T<br>1U_B,1U_M,1U_T                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                | Emission<br>Bandwidth     | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                           | Test Setup      | Test Seup 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                |                           | EUT Conf.       | 1L5M_B,1L5M_M,1L5M_T<br>1L10M_B,1L10M_M,1L10M_T<br>1L15M_B,1L15M_M,1L15M_T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Test Case                              |                               | Test Conditions |                                                                                                                                                          |
|----------------------------------------|-------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        |                               |                 | 1L20M_B,1L20M_M,1L20M_T<br>1U_B,1U_M,1U_T                                                                                                                |
| Band Edges Compliance                  |                               | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                          |
|                                        |                               | Test Setup      | Test Seup 1                                                                                                                                              |
|                                        |                               | EUT Conf.       | 1L5M_B, 1L5M_T<br>1L20M_B, 1L20M_T<br>1U_B, 1U_T<br>1U1L5M_30+30_B,1U1L5M_30+30_T<br>1U1L5M_20+40_B,1U1L5M_20+40_T                                       |
| Spurious Emission at Antenna Terminals |                               | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                          |
|                                        |                               | Test Setup      | Test Seup 1                                                                                                                                              |
|                                        |                               | EUT Conf.       | 1L5M_B,1L5M_T<br>1U_B,1U_T<br>1U1L5M_30+30_B,1U1L5M_30+30_T                                                                                              |
| Field Strength of Spurious Radiation   |                               | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                          |
|                                        |                               | Test Setup      | Test Seup 3                                                                                                                                              |
|                                        |                               | EUT Conf.       | 1L5M_M, 1U_M, 1U1L5M_30+30_M<br><br>NOTE: If applicable, the EUT Conf. that has maximum power density (based on the equivalent power level) is selected. |
| Frequency Stability                    | Frequency Error               | Test Env.       | (1) -30 °C to +50 °C with step 10 °C at Rated Voltage;<br>(2) 85%, 100% and 115% of Rated Voltage at Ambient Climate.                                    |
|                                        |                               | Test Setup      | Test Seup 2                                                                                                                                              |
|                                        |                               | EUT Conf.       | 1L5M_M<br><br>NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the standards/rules.           |
|                                        | Frequency Range (if required) | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                          |
|                                        |                               | Test Setup      | Test Seup 2                                                                                                                                              |
|                                        |                               | EUT Conf.       | Not applicable                                                                                                                                           |
| Receiver Spurious Emissions            |                               | Test Env.       | Ambient Climate & Rated Voltage                                                                                                                          |
|                                        |                               | Test Setup      | Test Seup 1                                                                                                                                              |
|                                        |                               | EUT Conf.       | Not applicable                                                                                                                                           |

## 5 Main Test Instruments

NOTE: Unless otherwise specified, the calibration intervals for test instruments were Annual (per year). The other intervals, if applicable, are marked with (##y), which denotes ## years calibration interval.

| Equipment Name          | Manufacturer | Model      | Serial Number | Cal. Due        |
|-------------------------|--------------|------------|---------------|-----------------|
| Test Setup 1 & 2        |              |            |               |                 |
| Spectrum Analyzer       | R&S          | FSQ26      | 200845        | 2014-12-06      |
| Spectrum Analyzer       | Agilent      | N9020A     | MY51240619    | 2015-02-18      |
| Vector Signal Generator | Agilent      | E8257D     | MY49281095    | 2014-09-21      |
| Temperature Chamber     | ESPEC        | EW0470S    | 12113066      | 2014-12-25      |
| Test Setup 3            |              |            |               |                 |
| EMI Test receiver       | R&S          | ESU40      | 100303/040    | 2015-01-12      |
| Bilog Antenna           | SCHWARZBECK  | VULB 9163  | 9163-480      | 2015-05-10 (2y) |
| Horn Antenna            | SCHWARZBECK  | BBHA 9120  | 9120D-878     | 2015-03-20 (2y) |
| Chamber _NSA            | Albatross    | 3m chamber | ---           | 2014-12-01 (3y) |

## 6 Measurement Uncertainty

For a 95% confidence level ( $k = 2$ ), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

| Test Item                            |                          | Extended Uncertainty                                                                                                                                        |
|--------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmitter Output Power             | Power [dBm]              | U = 0.39 dB                                                                                                                                                 |
| Bandwidth                            | Magnitude [%]            | U = 0.2%                                                                                                                                                    |
| Band Edge Compliance                 | Disturbance Power [dBm]  | U = 2.0 dB                                                                                                                                                  |
| Spurious Emissions, Conducted        | Disturbance Power [dBm]  | U = 2.0 dB                                                                                                                                                  |
| Field Strength of Spurious Radiation | ERP [dBm]                | For 3 m Chamber:<br>U = 4.6 dB (30 MHz to 1GHz)<br>U = 3.0 dB (above 1 GHz)<br>For 10 m Chamber:<br>U = 4.6 dB (30 MHz to 1GHz)<br>U = 3.0 dB (above 1 GHz) |
| Frequency Stability                  | Frequency Accuracy [ppm] | U = 0.21 ppm                                                                                                                                                |

END