# FCC
# RF Test Report

**Product Name: Mobile WiFi**

**Model Number: HWD37**

**Report No.: SYBH(Z-RF)20180903005001-2001**

**FCC ID：QISRUCOLA**


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

**(Global Compliance and Testing Center of Huawei Technologies Co., Ltd)**

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## Notice

1. The Reliability Laboratory of Huawei Technologies Co., Ltd has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01

2. The Laboratory of Sporton International (Shenzhen) Inc has passed the accreditation by National Voluntary Laboratory Accreditation Program (NVLAP). The NVLAP LAB CODE is 600156-0.

3. The Reliability Laboratory of Huawei Technologies Co., Ltd has been recognized by the US Federal Communications Commission (FCC) to perform compliance testing subject to the Commission's Certification rules. The Designation Number is CN1173, and the Test Firm Registration Number is 294140.

4. The Laboratory of Sporton International (Shenzhen) Inc has been recognized by the US Federal Communications Commission (FCC) to perform compliance testing subject to the Commission's Certification rules. The Designation Number is CN5018, and the Test Firm Registration Number is 251365.

5. The Reliability Laboratory of Huawei Technologies Co., Ltd has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1.

6. The Reliability Laboratory of Huawei Technologies Co., Ltd is also named “Global Compliance and Testing Center of Huawei Technologies Co., Ltd”, the both names have coexisted since 2009.

7. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

8. The test report is invalid if there is any evidence of erasure and/or falsification.

9. The test report is only valid for the test samples.

10. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

| | |
|---|---|
| **Applicant:** | Huawei Technologies Co., Ltd. |
| **Address:** | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C |

| | |
|---|---|
| **Date of Receipt Sample:** | 2018-09-13 |
| **Start Date of Test:** | 2018-09-20 |
| **End Date of Test:** | 2018-10-23 |

| | |
|---|---|
| **Test Result:** | Pass |

| | | | |
|---|---|---|---|
| **Approved by Senior Engineer:** | 2018-10-23 | He Hao | He Hao |
| | Date | Name | Signature |

| | | | |
|---|---|---|---|
| **Prepared by:** | 2018-10-23 | ZhouLingbo | Zhou Ling bo |
| | Date | Name | Signature |

# CONTENT

# 1 General Information

## 1.1 Applied Standard

| | |
|---|---|
| Applied Rules: | 47 CFR FCC Part 02<br>47 CFR FCC Part 22<br>47 CFR FCC Part 24<br>47 CFR FCC Part 27 |
| Test Method: | FCC KDB 971168 D01 Power Meas License Digital Systems v03r01<br>ANSI C63.26 |

## 1.2 Test Location

| | |
|---|---|
| Test Location : | Reliability Laboratory of Huawei Technologies Co., Ltd. |
| Address1: | No.2 New City Avenue Songshan Lake Sci. &Tech. Industry Park, Dongguan, Guangdong, P.R.C |
| Address2: | Sporton International (Shenzhen) Inc<br>1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province |

## 1.3 Test Environment Condition

| | |
|---|---|
| Ambient Temperature: | 0 to 35 °C |
| Ambient Relative Humidity: | 40 to 55 % |
| Atmospheric Pressure: | Not applicable |

# 2 Test Summary

## 2.1 Cellular Band (824-849 MHz paired with 869-894 MHz)

| Test Item | FCC Rule No. | Requirements | Test Result | Verdict （Note1） | Test Address |
|---|---|---|---|---|---|
| Effective (Isotropic) Radiated Power Output Data | §2.1046, §22.913 | ERP ≤ 7 W. | Appendix A | Pass | Location 1 |
| Peak-Average Ratio | --- | Limit≤13 dB | Appendix B | Pass | Location 1 |
| Modulation Characteristics | §2.1047 | Digital modulation | Appendix C | Pass | Location 1 |
| Bandwidth | §2.1049 | OBW: No limit.<br>EBW: No limit. | Appendix D | Pass | Location 1 |
| Band Edges Compliance | §2.1051, §22.917 | ≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.<br>_____<br>Note 1): EBW is -26 dBc EBW. | Appendix E | Pass | Location 1 |
| Spurious Emission at Antenna Terminals | §2.1051, §22.917 | ≤ -13 dBm/RefBW, from max( lowest internal frequency, 9 kHz ) to min( 10 * highest fundamental frequency, 40 GHz), after 1 MHz bands immediately outside and adjacent to the frequency block. (RefBW: ≥100 kHz for frequency below 1 GHz, and =1 MHz above 1 GHz) | Appendix F | Pass | Location 1 |
| Field Strength of Spurious Radiation | §2.1053, §22.917 | ≤ -13 dBm/RefBW, from max( lowest internal frequency, 9 kHz ) to min( 10 * highest fundamental frequency, 40 GHz), after 1 MHz bands immediately outside and adjacent to the frequency block. (RefBW: ≥100 kHz for frequency below 1 GHz, and =1 MHz above 1 GHz) | Appendix G | Pass | Location 1(above 30MHz)&2(9K-30MHz) |
| Frequency Stability | §2.1055, §22.355 | ≤ ±2.5ppm | Appendix H | Pass | Location 1 |

## 2.2 PCS Band (1850-1910 MHz paired with 1930-1990 MHz)

| Test Item | FCC Rule No. | Requirements | Test Result | Verdict (Note1) | Test Address |
|---|---|---|---|---|---|
| Effective (Isotropic) Radiated Power Output Data | §2.1046, §24.232 | EIRP ≤ 2 W | Appendix A | Pass | Location 1 |
| Peak-Average Ratio | §2.1046, §24.232 | Limit≤13 dB | Appendix B | Pass | Location 1 |
| Modulation Characteristics | §2.1047 | Digital modulation | Appendix C | Pass | Location 1 |
| Bandwidth | §2.1049 | OBW: No limit.<br>EBW: No limit. | Appendix D | Pass | Location 1 |
| Band Edges Compliance | §2.1051, §24.238 | ≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.<br>_____<br>Note 1): EBW is -26 dBc EBW. | Appendix E | Pass | Location 1 |
| Spurious Emission at Antenna Terminals | §2.1051, §24.238 | ≤ -13 dBm/1 MHz, from max( lowest internal frequency, 9 kHz ) to min( 10 * highest fundamental frequency, 40 GHz) but outside authorized operating frequency blocks. | Appendix F | Pass | Location 1 |
| Field Strength of Spurious Radiation | §2.1053, §24.238 | ≤ -13 dBm/1 MHz, from max( lowest internal frequency, 9 kHz ) to min( 10 * highest fundamental frequency, 40 GHz) but outside authorized operating frequency blocks. | Appendix G | Pass | Location 1(above 30MHz)&2(9K-30MHz) |
| Frequency Stability | §2.1055, §24.235 | Within authorized bands of operation/frequency block. | Appendix H | Pass | Location 1 |

## 2.3 Band17 (704-716MHz paired with 734-746 MHz)

| Test Item | FCC Rule No. | Requirements | Test Result | Verdict （Note1） | Test Address |
|---|---|---|---|---|---|
| Effective (Isotropic) Radiated Power Output Data | §27.50(c). | ERP ≤ 3 W. | Appendix A | Pass | Location 1 |
| Peak-Average Ratio | §2.1046, §27.50(c) | Limit≤13 dB | Appendix B | Pass | Location 1 |
| Modulation Characteristics | §2.1047 | Digital modulation | Appendix C | Pass | Location 1 |
| Bandwidth | §2.1049 | OBW: No limit.<br>EBW: No limit. | Appendix D | Pass | Location 1 |
| Band Edges Compliance | §2.1051, §27.53(g) | ≤ -13 dBm/30 kHz, in 100 kHz bands immediately outside and adjacent to the frequency blocks. | Appendix E | Pass | Location 1 |
| Spurious Emission at Antenna Terminals | §2.1051, §27.53(g) | ≤ -13 dBm/100 kHz, from 9 kHz to 10$^{th}$ harmonics but outside authorized operating frequency ranges. | Appendix F | Pass | Location 1 |
| Field Strength of Spurious Radiation | §2.1051, §27.53(g) | ≤ -13 dBm/100 kHz. | Appendix G | Pass | Location 1(above 30MHz)&2(9K-30MHz) |
| Frequency Stability | §2.1055, §27.54 | Within authorized bands of operation/frequency block. | Appendix H | Pass | Location 1 |

# 3 Description of the Equipment under Test (EUT)

## 3.1 General Description

HWD37 which supports LTE B5,B17,and DC-HSDPA/HSPA+/HSDPA/HSUPA/WCDMA band2/B5 is subscriber equipment in the LTE/WCDMA system HWD37 implement such functions as RF signal receiving/ transmitting, LTE/UMTS protocol processing, data service etc, and it can act as a Wi-Fi hotspot for user accessing to internet. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface.
The WiFi is 2X2 and the frequency are 2.4GHz HWD37 support BLE.

Note: Only UMTS B2 and B5, LTE B5 and B17 bands test data included in this report.

## 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 | | |
|---|---|---|
| Description | Hardware Version | Software Version |
| Main Board | CL2KD20M VER. B | 8.0.1.31(H25SP5C824) |

### 3.2.2 Sub-Assembly

| Sub-Assembly | | | |
|---|---|---|---|
| Sub-Assembly Name | Model | Manufacturer | Description |
| Rechargeable Li-ion | HB494590EBC-B | Huawei Technologies Co.,Ltd | Rated capacity: 3000mAh<br>Nominal Voltage: ⎓ +3.80V<br>Charging Voltage: ⎓ +4.35V |

## 3.3 Technical Specification

| Characteristics | Description | |
|---|---|---|
| Radio System Type | ☒ UMTS<br>☒ LTE | |
| Supported Frequency Range | WCDMA850 | Transmission (TX): 824 to 849 MHz |
| | | Receiving (RX): 869 to 894 MHz |
| | WCDMA1900 | Transmission (TX): 1850 to 1910 MHz |
| | | Receiving (RX): 1930 to 1990 MHz |
| | LTE BAND5 | Transmission (TX): 824 to 849 MHz |
| | | Receiving (RX): 869 to 894 MHz |
| | LTE BAND17 | Transmission (TX): 704 to 716 MHz |
| | | Receiving (RX): 734 to 746 MHz |
| TX and RX Antenna Ports | TX & RX port: | 1 |
| | TX-only port: | 0 |
| | RX-only port: | 1 |
| Target TX Output Power | UMTS850 22.5dBm<br>UMTS1900: 22.5dBm<br>LTE BAND5: 22.5dBm<br>LTE BAND17: 22.5dBm | |
| Supported Channel Bandwidth | UMTS system: | ☒ 5 MHz |
| | LTE band 5 | ☒5MHz, ☒10MHz |
| | LTE band 17 | ☒5MHz, ☒10MHz |
| 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.) | UMTS850: | 4M16F9W |
| | UMTS1900: | 4M17F9W |
| | LTE BAND5: | 4M52G7D (5 MHz QPSK modulation),<br>4M52W7D (5 MHz 16QAM modulation)<br>9M01G7D (10 MHz QPSK modulation),<br>9M00W7D (10 MHz 16QAM modulation) |
| | LTE BAND17: | 4M52G7D (5 MHz QPSK modulation),<br>4M53W7D (5 MHz 16QAM modulation)<br>8M99G7D (10 MHz QPSK modulation),<br>9M01W7D (10 MHz 16QAM modulation) |

# 4 General Test Conditions / Configurations

## 4.1 Test Modes

NOTE1: The test mode(s) are selected according to relevant radio technology specifications.

NOTE2: The power of LTE system 64QAM modulation is lower than that of 16QAM, so we did not test 64QAM modulation.

| Test Mode | Test Modes Description |
|---|---|
| UMTS/TM1 | WCDMA system, QPSK modulation |
| LTE/TM1 | LTE system, QPSK modulation |
| LTE/TM2 | LTE system, 16QAM modulation |

## 4.2 Test Environment

| Environment Parameter | Selected Values During Tests | |
|---|---|---|
| Relative Humidity | Ambient | |
| Temperature | TN | Ambient |
| Voltage | VL | 3.45V |
| | VN | 3.80V |
| | VH | 4.25V |

NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

## 4.3 Test Frequency

| Test Mode | TX / RX | RF Channel | | |
|---|---|---|---|---|
| | | Low (L) | Middle (M) | High (H) |
| GSM850 | TX | Channel 128 | Channel 190 | Channel 251 |
| | | 824.2MHz | 836.6MHz | 848.8MHz |
| | RX | Channel 128 | Channel 190 | Channel 251 |
| | | 869.2MHz | 881.6MHz | 893.8MHz |
| WCDMA850 | TX | Channel 4132 | Channel 4182 | Channel 4233 |
| | | 826.4MHz | 836.4MHz | 846.6MHz |
| | RX | Channel 4357 | Channel 4407 | Channel 4458 |
| | | 871.4MHz | 881.4MHz | 891.6MHz |
| Test Mode | TX / RX | RF Channel | | |
| | | Low (L) | Middle (M) | High (H) |
| GSM1900 | TX | Channel 512 | Channel 661 | Channel 810 |
| | | 1850.2MHz | 1880.0MHz | 1909.8MHz |
| | RX | Channel 512 | Channel 661 | Channel 810 |
| | | 1930.2 MHz | 1960.0 MHz | 1989.8 MHz |
| WCDMA1900 | TX | Channel 9262 | Channel9400 | Channel9538 |
| | | 1852.4MHz | 1880.0MHz | 1907.6MHz |
| | RX | Channel 9662 | Channel 9800 | Channel 9938 |
| | | 1932.4 MHz | 1960.0 MHz | 1987.6 MHz |

| Test Mode | TX / RX | RF Channel | | |
|---|---|---|---|---|
| | | Low (B) | Middle (M) | High (T) |
| LTE Band 5 | TX(5M) | Channel 20425 | Channel 20525 | Channel 20625 |

| Test Mode | TX / RX | RF Channel | | |
|---|---|---|---|---|
| | | Low (B) | Middle (M) | High (T) |
| | | 826.5 MHz | 836.5 MHz | 846.5 MHz |
| | TX(10M) | Channel 20450 | Channel 20525 | Channel 20600 |
| | | 829 MHz | 836.5 MHz | 844 MHz |
| | RX(5M) | Channel 2425 | Channel 2525 | Channel 2625 |
| | | 871.5 MHz | 881.5 MHz | 891.5 MHz |
| | RX (10M) | Channel 2450 | Channel 2525 | Channel 2600 |
| | | 874 MHz | 881.5 MHz | 889 MHz |

| Test Mode | TX / RX | RF Channel | | |
|---|---|---|---|---|
| | | Low (B) | Middle (M) | High (T) |
| LTE Band 17 | TX (5M) | Channel 23755 | Channel 23790 | Channel 23825 |
| | | 706.5 MHz | 710 MHz | 713.5 MHz |
| | TX (10M) | Channel 23780 | Channel 23790 | Channel 23800 |
| | | 709 MHz | 710 MHz | 711 MHz |
| | RX (5M) | Channel 5755 | Channel 5790 | Channel 5825 |
| | | 736.5 MHz | 740 MHz | 743.5 MHz |
| | RX (10M) | Channel 5780 | Channel 5790 | Channel 5800 |

## 4.4 DESCRIPTION OF TESTS

### 4.4.1 Radiated Power and Radiated Spurious Emissions

Radiated spurious emissions are investigated indoors in a full-anechoic chamber to determine the frequencies producing the worst case emissions. Final measurements for radiated power and radiated spurious emissions are performed on the 3 meter OATS per the guidelines of ANSI/TIA-603-E-2016. The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 150cm above the ground plane and 3 meters from the receive antenna. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Emissions are also investigated with the receive antenna horizontally and vertically polarized.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.

A half-wave dipole is then substituted in place of the EUT. For emissions above 3GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT.

The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, $P_d$ is the dipole equivalent power, $P_g$ is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB].

The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{[Watts]})$.

**Test Procedures Used**

KDB 971168 D01 v03r01-Section 5.2.2 / KDB 971168 D01 v03r01-Section 5.8

ANSI/TIA-603-E-2016-Section 2.2.17 / ANSI/TIA-603-E-2016-Section 2.2.12

Note: Reference test setup 3

### 4.4.2 Peak-Average Ratio

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth.

**Test Procedures Used**

KDB 971168 D01 v03r01-Section 5.7.2

**Test Settings**

1、The signal analyzer's CCDF measurement profile enabled

2、Frequency= carrier center frequency

3、Measurement BW > EBW of signal

4、for continuous transmissions, set to 1ms

5、Record the maximum PAPR level associated with a probability of 0.1%.

Note: Reference test setup 1

### 4.4.3 Occupied Bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

**Test Procedures Used**

KDB 971168 D01 v03r01-Section 4.3

**Test Settings**

1、SET RBW=1-5% of OBW

2、SET VBW ≥ 3*RBW

3、Detector: Peak

4、Trace mode= max hold.

5、Sweep= auto couple

6、Steps 1-5 were repeated after it is stable

Note: Reference test setup 1.

### 4.4.4 Band Edge Compliance

The test complies with the requirements in clause 2 of the present report according to test procedures in KDB 971168 D01 v03r01-Section 6 with corresponding test settings.

Note: Reference test setup 1.

### 4.4.5 Spurious and Harmonic Emissions at Antenna Terminal

The test complies with the requirements in clause 2 of the present report according to test procedures in KDB 971168 D01 v03r01-Section 6 with corresponding test settings.

Note: Reference test setup 1.

### 4.4.6 Frequency Stability / Temperature Variation

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

**Time Period and Procedure:**

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

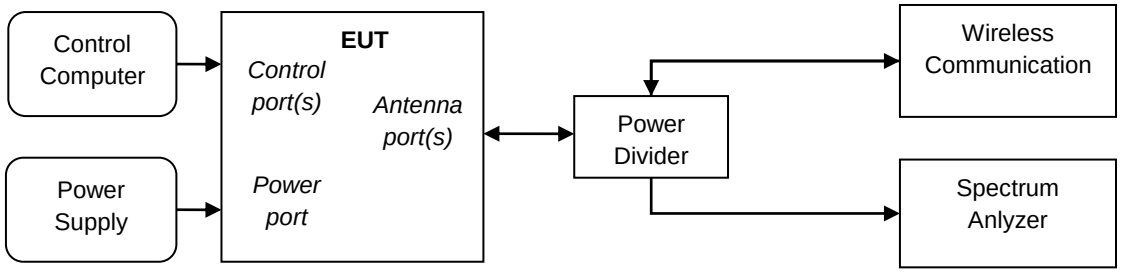
**Test Procedures Used**

ANSI/TIA-603-E-2016

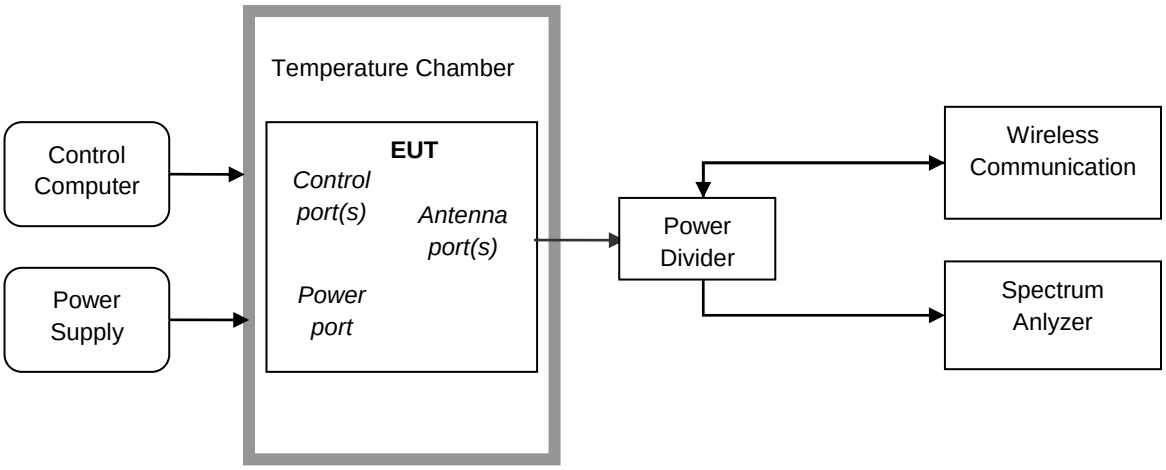
Note: Reference test setup 2.

## 4.5 Test Setups

### 4.5.1 Test Setup 1



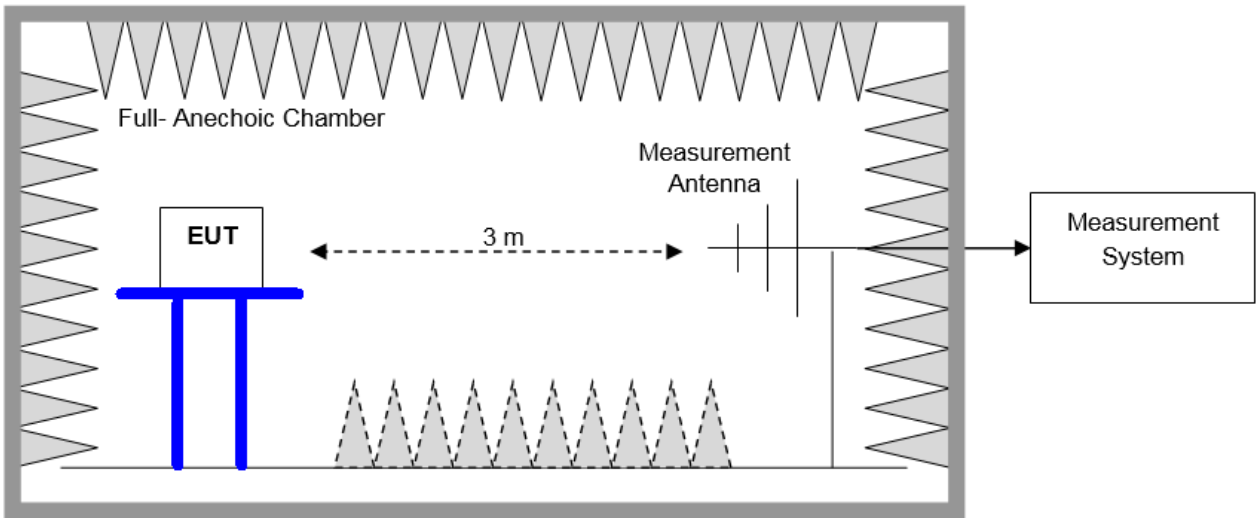
### 4.5.2 Test Setup 2



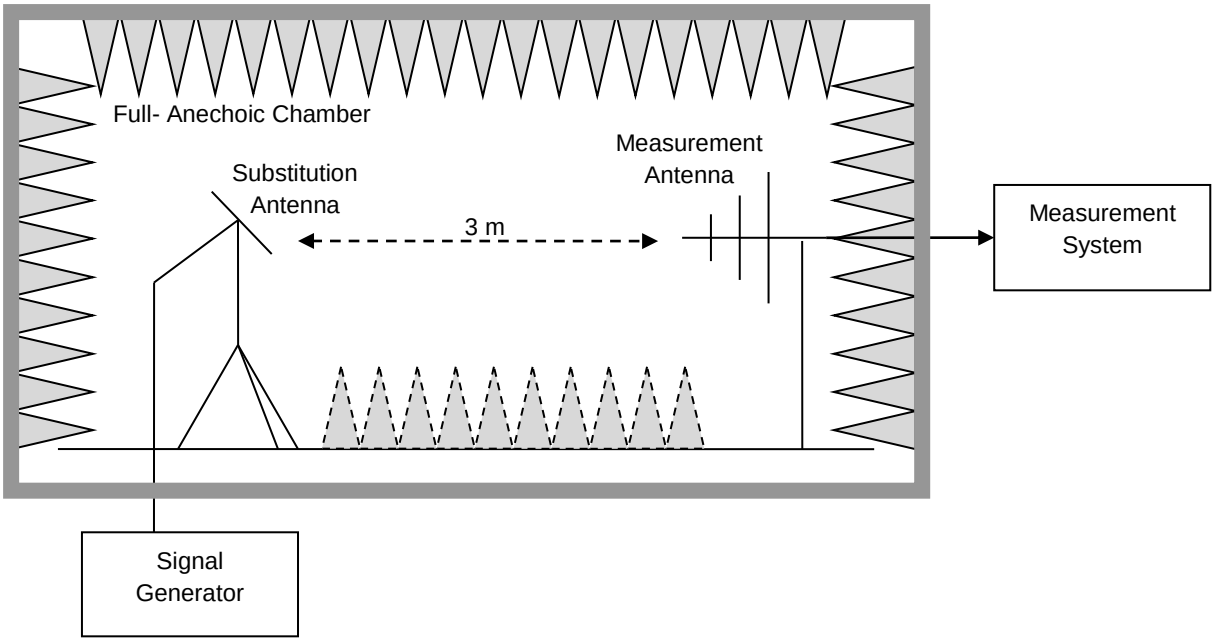
### 4.5.3 Test Setup 3

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

#### 4.5.3.1 Step 1: Pre-test




#### 4.5.3.2 Step 2: Substitution method to verify the maximum ERP/EIRP



## 4.6 Test Conditions

| Test Case | | Test Conditions | |
|---|---|---|---|
| Transmit Output Power Data | Average Power, Total | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| | Average Power, Spectral Density (if required) | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Peak-to-Average Ratio (if required) | | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Modulation Characteristics | | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | M (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Bandwidth | Occupied Bandwidth | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| | Emission Bandwidth (if required) | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Band Edges Compliance | | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, H (L= low channel, M= middle channel, H= high channel ) |
| | | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Spurious Emission at Antenna Terminals | | Test Env. | Ambient Climate & Rated Voltage |
| | | Test Setup | Test Setup 1 |
| | | RF Channels (TX) | L, M, H (L= low channel, M= middle channel, H= high channel ) |

| Test Case | Test Conditions | |
|---|---|---|
| | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |
| Field Strength of Spurious Radiation | Test Env. | Ambient Climate & Rated Voltage |
| | Test Setup | Test Setup 3 |
| | Test Mode | GSM/TM1,GSM/TM2,UMTS/TM1/TM2/TM3,LTE/TM1,LTE/TM2<br>NOTE: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected. |
| | RF Channels (TX) | L, M, H<br>(L= low channel, M= middle channel, H= high channel ) |
| Frequency Stability | Test Env. | (1) -30 °C to +50 °C with step 10 °C at Rated Voltage;<br>(2) VL, VN and VH of Rated Voltage at Ambient Climate. |
| | Test Setup | Test Setup 2 |
| | RF Channels (TX) | L, M, H<br>(L= low channel, M= middle channel, H= high channel ) |
| | Test Mode | UMTS/TM1,LTE/TM1,LTE/TM2 |

## 5 Main Test Instruments

Location 1:

**Conducted:**

| Main Test Equipments | | | | | |
|---|---|---|---|---|---|
| Equipment Name | Manufacturer | Model | Serial Number | Cal Date | Cal- Due |
| Power supply | KEITHLEY | 2303 | 1342889 | 2017/10/24 | 2018/10/24 |
| Universal Radio Communication Tester | R&S | CMU200 | 110932 | 2018/4/27 | 2019/4/27 |
| Universal Radio Communication Tester | R & S | CMW500 | 159302 | 2018/7/23 | 2019/7/23 |
| Signal Analyzer | R&S | FSQ31 | 200021 | 2018/7/23 | 2019/7/23 |
| Spectrum Analyzer | Agilent | N9030A | MY49431698 | 2018/7/23 | 2019/7/23 |
| Temperature Chamber | WEISS | WKL64 | 56246002940010 | 2017/12/13 | 2018/12/13 |
| Signal generator | Agilent | E8257D | MY49281095 | 2018/7/23 | 2019/7/23 |
| Vector Signal Generator | R&S | SMU200A | 104162 | 2018/7/23 | 2019/7/23 |
| Power Detecting & Samplig Unit | R&S | OSP-B157 | 101429 | 2018/7/23 | 2019/7/23 |
| Spectrum Analyzer | Keysight | N9040B | MY57212529 | 2018/6/28 | 2019/6/28 |

**Radiation:**

| **Main Test Equipments** | | | | | |
|---|---|---|---|---|---|
| Equipment Name | Manufacturer | Model | Serial Number | Cal Date | Cal- Due |
| Universal Radio Communication Tester | R&S | CMU200 | 117385 | 2018/05/08 | 2019/05/07 |
| Universal Radio Communication Tester | R&S | MT8821C | 6261760791 | 2018/04/02 | 2019/04/01 |
| Test receiver | R&S | ESU26 | 100387 | 2018/1/20 | 2019/1/19 |
| Test receiver | R&S | ESCI | 101163 | 2018/1/20 | 2019/1/19 |
| Test receiver | R&S | ESU26 | 100150 | 2018/1/20 | 2019/1/19 |
| Spectrum analyzer | R&S | FSU3 | 200474 | 2018/1/20 | 2019/1/19 |
| Spectrum analyzer | R&S | FSU43 | 100144 | 2018/1/20 | 2019/1/19 |
| LOOP Antennas(9kHz-30MHz) | R&S | HFH2-Z2 | 100262 | 2017/6/15 | 2019/6/14 |
| LOOP Antennas(9kHz-30MHz) | R&S | HFH2-Z2 | 100263 | 2017/8/21 | 2019/8/20 |
| Trilog Broadband Antenna (30M~3GHz) | SCHWARZBECK | VULB 9163 | 9163-490 | 2017/3/29 | 2019/3/28 |
| Trilog Broadband Antenna (30M~3GHz) | SCHWARZBECK | VULB 9163 | 9163-521 | 2018/4/9 | 2020/4/8 |
| Trilog Broadband Antenna | SCHWARZBECK | VULB | 9163-357 | 2017/4/21 | 2019/4/20 |

| | | | | | |
|---|---|---|---|---|---|
| (30M~3GHz) | | 9163 | | | |
| Double-Ridged Waveguide Horn Antenna (1G~18GHz) | R&S | HF907 | 100304 | 2017/5/27 | 2019/5/26 |
| double ridged horn antenna（0.8G-18GHz) | R&S | HF907 | 100305 | 2017/4/21 | 2019/4/20 |
| Pyramidal Horn Antenna(18GHz-26.5GHz) | ETS-Lindgren | 3160-09 | 5140299 | 2017/7/20 | 2019/7/19 |
| Pyramidal Horn Antenna(26.5GHz-40GHz) | ETS-Lindgren | 3160-10 | 00205695 | 2018/4/20 | 2020/4/19 |
| Pyramidal Horn Antenna(26.5GHz-40GHz) | ETS-Lindgren | 3160-10 | LM5947 | 2017/7/20 | 2019/7/19 |
| Artificial Main Network | R&S | ENV4200 | 100134 | 2018/5/8 | 2019/5/7 |
| Line Impedance Stabilization Network | R&S | ENV216 | 100382 | 2018/5/8 | 2019/5/7 |
| **Software Information** | | | | | |
| Test Item | Software Name | | Manufacturer | | Version |
| RSE | EMC32 | | R&S | | V8.40.0 |

Test Location 2:

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|
| EMI Test Receiver&SA | Agilent | N9038A | MY52260185 | 20Hz~26.5GHz | Aug. 30, 2018 | Aug.29, 2019 | Radiation (03CH01-SZ) |
| HF Amplifier | KEYSIGHT | 83017A | MY53270104 | 0.5GHz~26.5Ghz | Dec.27, 2017 | Dec 26, 2018 | Radiation (03CH01-SZ |
| Bilog Antenna | TeseQ | CBL6112D | 35407 | 30MHz-2GHz | Jun. 5, 2018 | Jun. 4, 2019 | *Radiation (03CH01-SZ*) |
| Double Ridge Horn Antenna | ETS Lindgren | 3117 | 119436 | 1GHz~18GHz | Jun. 28, 2018 | Jun. 27, 2019 | Radiation (03CH01-SZ) |
| SHF-EHF Horn | com-power | AH-840 | 101071 | 18Ghz-40GHz | Mar.30, 2018 | Mar.29, 2019 | Radiation (03CH01-SZ) |
| LF Amplifier | Burgeon | BPA-530 | 102209 | 0.01~3000Mhz | Apr. 20, 2018 | Apr.19, 2019 | Radiation (03CH01-SZ) |
| HF Amplifier | MITEQ | TTA1840-35-HG | 1871923 | 18GHz~40GHz | Jul.17.2018 | Jul.16.2019 | Radiation (03CH01-SZ) |
| AC Power Source | Chroma | 61601 | 616010001985 | N/A | NCR | NCR | Radiation (03CH01-SZ) |
| Turn Table | EM | EM1000 | N/A | 0~360 degree | NCR | NCR | Radiation (03CH01-SZ) |
| Antenna Mast | EM | EM1000 | N/A | 1 m~4 m | NCR | NCR | Radiation (03CH01-SZ) |

## 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 |
|---|---|---|
| Transmit Output Power Conducted | Power [dBm] | U = 0.64 dB |
| RF Power Density, Conducted | Power [dBm] | U = 0.64 dB |
| Bandwidth | Magnitude [kHz] | 200kHz: U＝9.06kHz<br>1.4MHz: U＝9.48kHz<br>3MHz: U＝10.86kHz<br>5MHz: U=13.84kHz<br>10MHz: U=22.32kHz<br>15MHz: U=31.9kHz<br>20MHz: U=41.78kHz |
| Band Edge Compliance | Disturbance Power [dBm] | U = 0.9 dB |
| Spurious Emissions, Conducted | Disturbance Power [dBm] | 20MHz~3.6GHz：U=0.88dB<br>3.6GHz~8.4GHz：U=1.08dB<br>8.4GHz~13.6GHz：U=1.24dB<br>13.6GHz~22GHz：U=1.34dB<br>22GHz~26.5GHz：U=1.36dB |
| Field Strength of Spurious Radiation | ERP/EIRP [dBm] | For 3 m Chamber:<br>U = 5.94 dB (30 MHz to 3GHz)<br>U = 5.54 dB (3GHz to 18GHz)<br>U = 4.94 dB (18GHz to 26.5GHz) |
| Frequency Stability | Frequency Accuracy [Hz] | 800MHz: U=24.08Hz<br>900MHz: U=24.54Hz<br>1900MHz: U=34.7Hz<br>2100MHz: U=36.96Hz<br>2300MHz: U=39.24Hz<br>2500MHz: U=41.58Hz<br>2600MHz: U=42.74Hz |

# 7 Appendixes

| Appendix No. | Description |
|---|---|
| SYBH(Z-RF)20180903005001-2001-A | Appendix_for_LTE Band5 |
| SYBH(Z-RF)20180903005001-2001-B | Appendix_for_LTE Band17 |
| SYBH(Z-RF)20180903005001-2001-C | Appendix_for_WCDMA |

| Appendix | Description |
|---|---|
| Appendix A | Effective (Isotropic) Radiated Power Output Data |
| Appendix B | Peak-Average Ratio |
| Appendix C | Modulation Characteristics |
| Appendix D | Bandwidth |
| Appendix E | Band Edges Compliance |
| Appendix F | Spurious Emission at Antenna Terminals |
| Appendix G | Field Strength of Spurious Radiation |
| Appendix H | Frequency Stability |

END