RF Test Report

Product Name: Remote Radio Unit

Product Model: RRU3261 2300M

Report Number: SYBH(R)01863733EB-1

FCC ID: QISRRU32612G3

IC: 6369A-RRU32612G3

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

Tel: +86 755 28780808 Fax: +86 755 89652518

Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.

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 recognition number for the test site located in Shenzhen is 97456.
- The recognition number for the test site located in Shanghai is 684868.
- The recognition number for the test site located in Chengdu is 216797.

4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements.

- The recognition number for the test site located in Shenzhen is 6369A, which contains 6369A-1 (3m chamber in G2), 6369A-2 (3m chamber in K3) and 6369A-3 (10m chamber in K3).
- The recognition numbers for the test site located in Shanghai is 6369D, which contains 6369D-1 (3m chamber) and 6369D-2 (10m chamber).
- The recognition number for the test site located in Chengdu is 6369E-1.

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

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

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

8. 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
Product Name:	Remote Radio Unit
Product Model:	RRU3261 2300M

Date of Receipt Sample:	2015-06-08
Start Date of Test:	2015-06-12
End Date of Test:	2015-07-25

Test Result: Pass

Approved by Senior Engineer:	2015-07-27	Zhang Xinghai	Zhang Xing hai
	Date	Name	Signature

Prepared by:	2015-07-27	Li Guo	Li Guo
	Date	Name	Signature

Modification Record

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

CONTENT

1 General Information

1.1 Applied Standard

Applied Rules:	47 CFR FCC Part 2 (10-1-13 Edition) 47 CFR FCC Part 27 (10-1-13 Edition) IC RSS-Gen (Issue 4, November 2014) IC RSS-195 (Issue 2, April 2014)
Test Method: (if applicable)	FCC KDB 971168 D01 Power Meas License Digital Systems v02r02 FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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:	No.1899 Xiyuan Avenue, Hi-tech Western District, Chengdu, 611731, P.R.C

1.3 Test Environment Condition

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

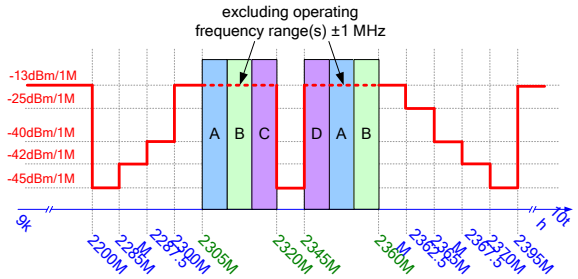
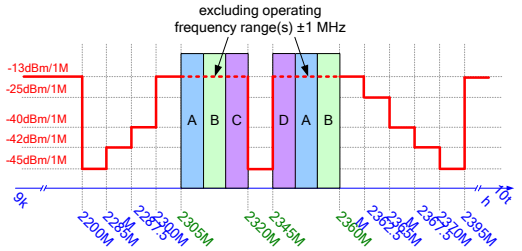
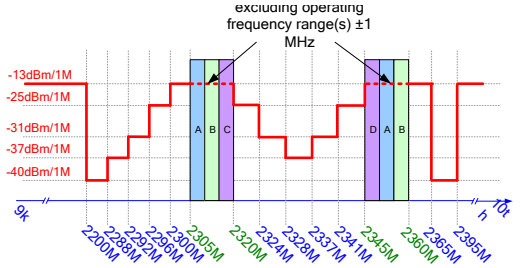
2 Test Summary

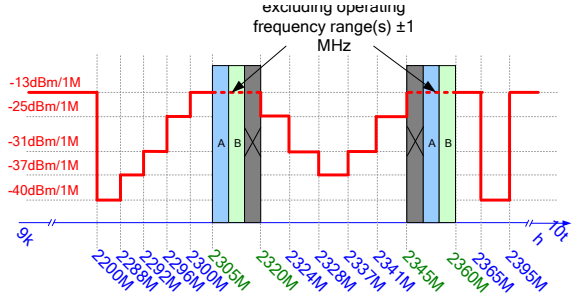
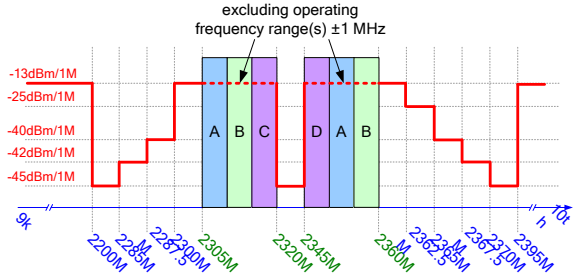
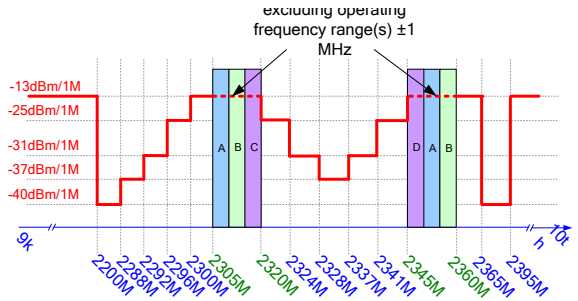
2.1 WCS 2.3G Band (2305-2320 MHz and 2345-2360 MHz)

2.1.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Transmitter Output Power	§2.1046, §27.50(a), §27.53(a)	RSS-Gen,§4.8; RSS-195,§5.5; RSS-195,§4.1	FCC	Base Station / Fixed Station	● Average EIRP PD ≤ 2000 W/5 MHz (for 2305-2315MHz, 2350-2360MHz). ● Average EIRP PD ≤ 400 W/1 MHz (for 2305-2315MHz, 2350-2360MHz). ● PAPR ≤ 13 dB@0.1% (for 2305-2315MHz, 2350-2360MHz). ● Peak EIRP Power ≤ 2000 W (for 2315-2320MHz, 2345-2350MHz).	Annex A	Pass	TL1
				Fixed CPE Station	● Peak EIRP PD ≤ 20 W/5 MHz (for 2305-2320MHz, 2345-2360MHz). ● Average EIRP PD/5 MHz: No limit. ● Duty Cycle ≤ 38% (for TDD).			
				Mobile Station / Portable Station	● Average EIRP PD ≤ 250 mW/5 MHz (for LTE; and for 2305-2315MHz, 2350-2360MHz). ● Average EIRP PD ≤ 50 mW/1 MHz (for other; and for 2305-2315MHz, 2350-2360MHz). ● Duty Cycle ≤ 38% (for TDD).			
			IC	Base Station / Fixed Station	● Average EIRP PD ≤ 2000 W/5 MHz (for 2305-2315MHz, 2350-2360MHz).			

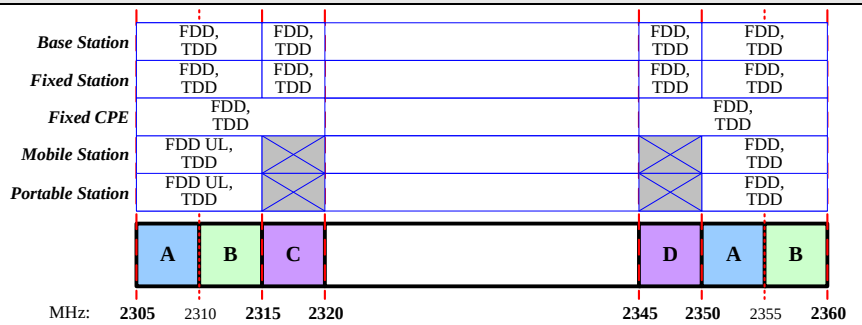
Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
					● Average EIRP PD ≤ 400 W/1 MHz (for 2305-2315MHz, 2350-2360MHz). ● PAPR ≤ 13 dB@0.1% (for 2305-2315MHz, 2350-2360MHz). ● Peak EIRP Power ≤ 2000 W (for 2315-2320MHz, 2345-2350MHz).			
				Fixed Subscriber Station	● Peak EIRP PD ≤ 20 W/5 MHz (for 2305-2320MHz, 2345-2360MHz). ● Average EIRP PD/5 MHz: No limit.			
				Mobile Station / Portable Station	● Average EIRP PD ≤ 250 mW/5 MHz (for LTE; and for 2305-2315MHz, 2350-2360MHz). ● Average EIRP PD ≤ 50 mW/1 MHz (for other; and for 2305-2315MHz, 2350-2360MHz).			
Bandwidth	§2.1049, §27.53(a)	RSS-Gen,§4.9; RSS-195,§5.6	FCC	● OBW: No limit. ● EBW (-26 dBc): No limit.		Annex B	Pass	TL1
			IC	● OBW: No limit.				
Band Edges Compliance / Emission Mask	§2.1051, §27.53(a)	RSS-Gen,§4.9; RSS-195,§5.6	FCC	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block. (EBW is -26 dBc EBW)		Annex C	Pass	TL1
			IC	≤ -13 dBm, in 1 MHz range (integrated with RBW ≥ 1%*OBW) outside operating frequency ranges.				

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Spurious Emission at Antenna Terminals	§2.1051, §27.53(a)	RSS-Gen,§4.9; RSS-195,§5.6	FCC	Base Station / Fixed Station		Annex D	Pass	TL1
				Fixed CPE Station	● For 2305-2320MHz, 2345-2360MHz; Average EIRP PD > 2 W/5 MHz:  ● For 2305-2320MHz, 2345-2360MHz; Average EIRP PD ≤ 2 W/5 MHz: 			

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
				Mobile Station / Portable Station				
			IC	Base Station / Fixed Station / High Power Fixed Subscriber Equipment				
				Mobile Station / Portable Station / Low Power Fixed Subscriber Equipment				
Field Strength of Spurious Radiation /	§2.1053, §27.53(a)	RSS-Gen,§4.9; RSS-195,§5.6	≤ -13 dBm/1 MHz.			Annex E	Pass	TL3

Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location
Radiated Spurious Emissions							
Frequency Stability	§2.1055, §27.54	RSS-Gen,§4.7; RSS-195,§5.4	FCC	● Test method: Fundamental emissions (Fc_meas) within the authorized bands of operation. ● Test conditions: (1) NV, -30°C/…/+50°C step=+10°C. (2) NT, ±15%*NV.	Annex F	Pass	TL1
			IC	● Test method: OBW (OBW_lower to OBW_higher) within ranges of operation frequency blocks. ● Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV.			
Receiver Spurious Emissions	---	IC NOTICE 2012-DRS0126	---		Annex G	---	---

2.1.2 Non-measurement Technical Requirements

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
Frequency Plan	§27.5(a)	RSS-195,§5.2; SRSP-516	 ● Paired Block A: 2305-2310 and 2350-2355 MHz. ● Paired Block B: 2310-2315 and 2355-2360 MHz. ● Unpaired Block C: 2315-2320 MHz. ● Unpaired Block D: 2345-2350 MHz.	See technical specification description.	Comply

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
Modulation Characteristics	§2.1047	RSS-195,§5.3	Digital modulation.	See technical specification description.	Comply
Automatic Transmit Power Control	§27.5(a)	RSS-195,§5.1	Mobile, portable and fixed subscriber equipment shall employ automatic transmit power control when operating so that the equipment shall operate with minimum power necessary for successful communication.	See technical specification description.	Comply
Prohibition on External Vehicle Mounted Antennas.	§27.5(a)	--- (SRSP-516)	The use of external vehicle-mounted antennas for mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band is prohibited.	Fixed and/or integrated antenna used. See technical specification description.	Comply
Fixed Subscriber Equipment Power Class	---	RSS-195,§2.3	High Power Fixed Subscriber Equipment: Average EIRP PD > 2 W/5 MHz. Low Power Fixed Subscriber Equipment: Average EIRP PD ≤ 2 W/5 MHz.	☐ High Power Class ☐ Low Power Class	---

3 Description of the Equipment under Test (EUT)

3.1 General Description

The RRU3261 is an outdoor remote radio unit which is powered by a power cabinet. It is the RF module of the distributed base station and is installed close to the antenna. The RRU3261 performs modulation, demodulation, data processing, and combination and division of baseband signals and RF signals. By using the software-defined radio (SDR) technology, the RRU3261 can work in 2300M (LTE).

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
WD5ALRX8V0	Ver.B	Manufactured Board,MARP RRU,WD5ALRX8V0,Transceiver Board,1*1
WD5ALRAGU0	Ver.B	Manufactured Board,MARP FDD,WD5ALRAGU0,Power Amplifier Board, 4T4R,2300M,1*1

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
UMPT	WD22UMPTa2	Huawei	BBU3900-WD22UMPTa2-Universal Main Processing & Transmission unit with 4E1 and 2FE/GE interface
UBBP	WD22LBBPD2	Huawei	Manufactured Board,BBU3900,WD22UBBPd1,Baseband Processing and Interface Unit ,1*1

3.3 Technical Specification

Characteristics	Description	
Radio System Type	☐ GSM (GO) ☐ UMTS (UO) ☒ LTE (LO) ☐ CDMA (CO) ☐ GSM & UMTS (GU) ☐ GSM & LTE (GL) ☐ GSM & UMTS & LTE (GUL) ☐ CDMA & LTE (CL) ☐ P2P	
Equipment Type	Type #1	☒ Base Station Equipment ☐ CPE (Customer Premises Equipment) Equipment ☐ Subscriber Equipment (User Equipment) ☐ Fixed Point-to-Point Equipment
	Type #2	☒ Fixed ☐ Mobile ☐ Portable
	Type #3	☐ Indoor ☒ Outdoor
Frequency Range (Transmission (TX) and Receiving (RX))	#1	TX: 2350 to 2360 MHz RX: 2305 to 2315 MHz
TX and RX Antenna Ports	TX & RX port: 4, TX-only port: 0, RX-only port: 0	
Multiple Carrier Supported	2	
Maximum RF Bandwidth	10 MHz	
TX Output Power	Max. 20 W (per antenna port) Max. 4*20 W (four antenna ports)	
Supported Channel Bandwidth	5 MHz, 10 MHz	
Modulation Type	LTE system:	Base-band: QPSK, 16QAM,64QAM Carrier: OFDM/OFDMA
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured	LTE system:	4M50D9W, 8M91D9W

Characteristics	Description	
occupied bandwidths for each type of channel bandwidth configuration.)		
Power Supply	Power Supply Type:	☐ External AC mains, ☒ External DC mains, ☐ AC/DC Adapter, ☐ Powered over Ethernet (PoE).
	Nominal Voltage, Input to EUT:	-48 VDC
	Voltage Range, Input to EUT:	-36 to -57 VDC

3.3.1 Antenna Assembles

NOTE 1: For the “external antenna” in the report:
(1) It refers to the antenna external to the equipment, using an antenna connector with a cable and which has been designed or developed for one or more specific types of equipment.
(2) It is the combination of external antenna and radio equipment that is expected to be compliant with the regulations. If the external antenna is not supplied by the equipment manufacturer, and also will not be equipped on sale, a typical or recommended configuration will be considered during lab testing. However, when the radio equipment is put into service, the practical maximum antenna gain may exceed the value as described; if this is the case, the combination of the practical output power (may be degraded) and the practical antenna gain should NOT exceed the required ERP/EIRP limit.

NOTE 2: The “integral antenna” in the report:
(1) It refers to the antenna designed as a fixed part of the equipment, without the use of an external connector and which cannot be disconnected from the equipment by a user with the intent to connect another antenna.
(2) For the testing purpose, a temporary RF connector may be provided.

NOTE 3: The antenna gain is the combination of basic gain (directional gain, G) and, if applicable, additional beam-forming gain (Y).

Characteristics	Description
Antenna Type	☒ External (antenna equipped on sale : ☐ yes, ☒no) ☐ Integral
Smart Antenna	☒ MIMO ☐ Non MIMO
Antenna Gain	☒ External: 18 dBi (per antenna port, typically)

4 General Test Conditions / Configurations

4.1 EUT Configurations

4.1.1 General

Configuration	Description
Test Antenna Ports	Until otherwise specified, ● All TX tests are ONLY performed at the main TX antenna port (e.g. TRXA, TXA or similar) of the EUT, and ● All RX tests are ONLY performed at the main RX antenna port (e.g. TRXA, RXB or similar) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

4.1.2 Test Modes

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

Test Mode	Test Modes Description
LTE/TM1.1	LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.1

4.1.3 Test Configurations

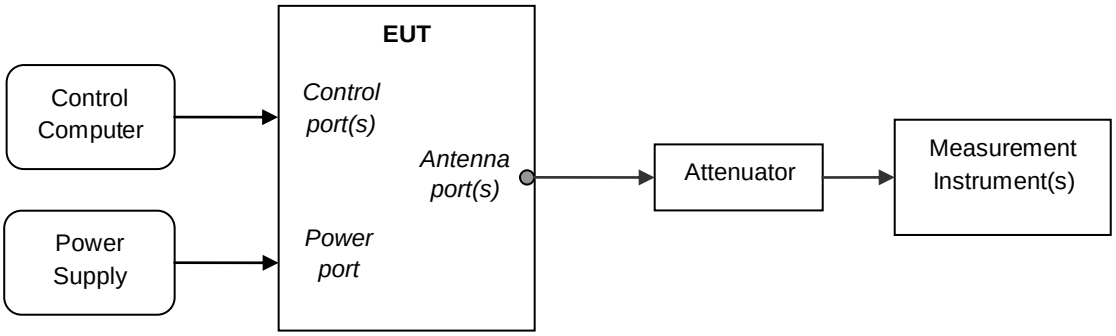
EUT Conf.	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1L_5M_TM1.1_B	B	2352.5	--	5	43.0	LTE/TM1.1
1L_5M_TM1.1_T	T	2357.5	--	5	43.0	LTE/TM1.1
1L_10M_TM1.1_M	M	2355	--	10	43.0	LTE/TM1.1
2L_5M_TM1.1_M	M	2352.5, 2357.5	--	5, 5	40.0, 40.0	LTE/TM1.1

4.2 Test Environments

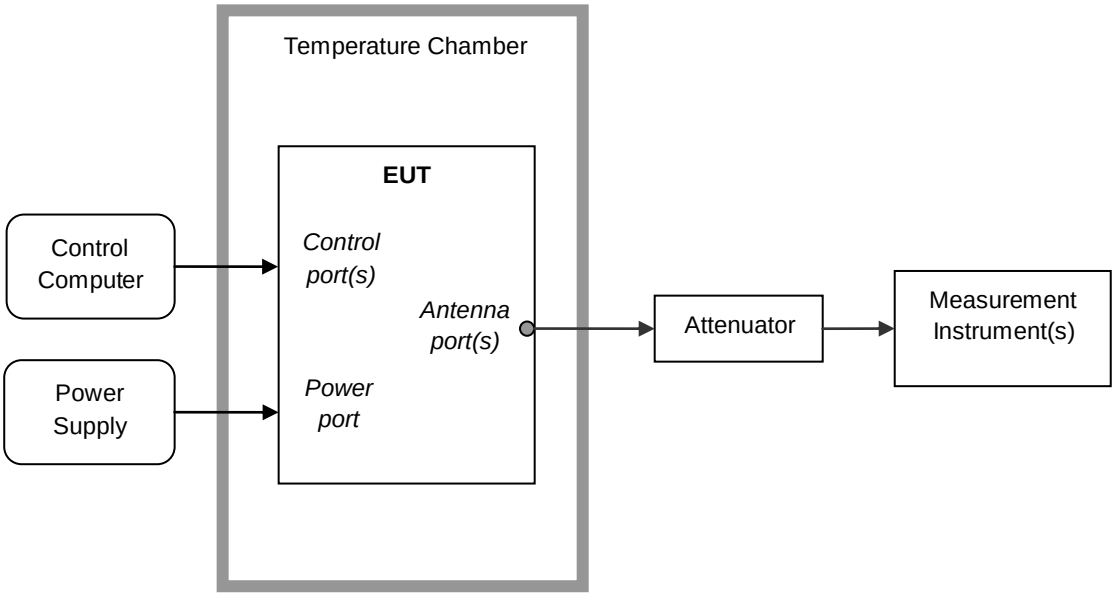
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate (See clause 1.3)	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

4.3 Test Setups

4.3.1 Test Setup 1



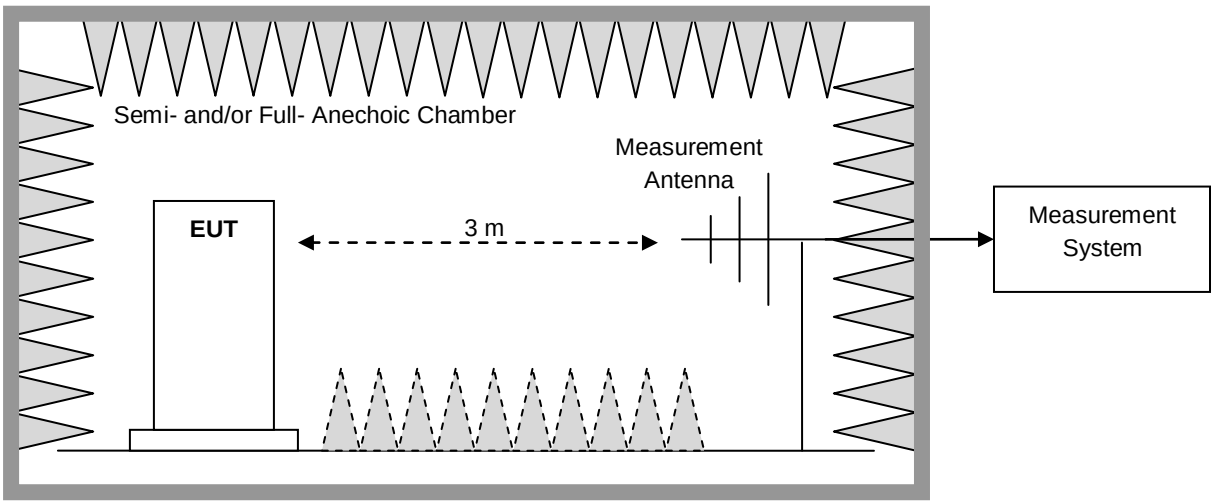
4.3.2 Test Setup 2



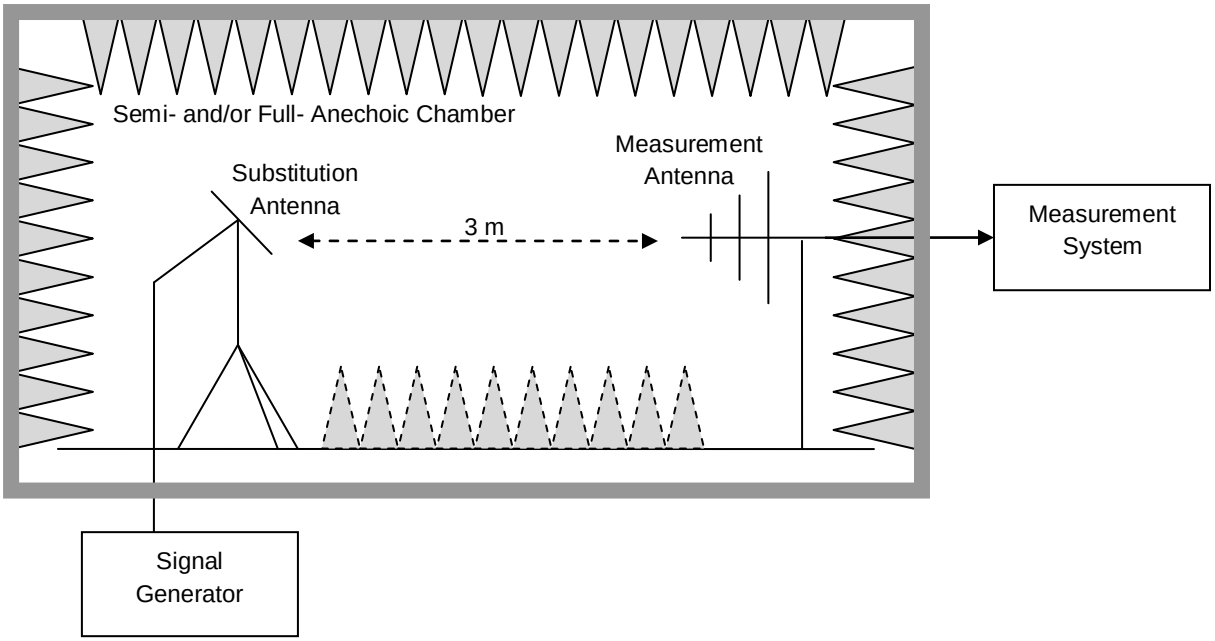
4.3.3 Test Setup 3

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

4.3.3.1 Step 1: Pre-test



4.3.3.2 Step 2: Substitution method to verify the maximum ERP



4.4 Test Conditions

Test Case		Test Conditions	
Transmitter Output Power	Channel Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M, 2L_5M_TM1.1_M,
	Power Spectral Density (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M,
	Peak-to-Average Ratio (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M,
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M,
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M,
Band Edges Compliance / Emission Mask		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M, 2L_5M_TM1.1_M,
Spurious Emission at Antenna Terminals		Test Type	☒ Conducted ☐ Radiated (go to test case of Field Strength of Spurious Radiation / Radiated Spurious Emissions) NOTE: According to FCC §2.1053 and KDB 971168 §6.1&§5.8, in the cases of the EUTs that are portable or hand-held devices utilizing one or more integral transmit antennas,

Test Case		Test Conditions	
			measurements cannot be performed in a conducted measurement configuration, it becomes necessary to perform the described compliance measurements in a radiated test arrangement.
		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M, 2L_5M_TM1.1_M,
Field Strength of Spurious Radiation / Radiated Spurious Emissions		Test Type	☐ Field Strength of Spurious Radiation ☒ Radiated Spurious Emissions NOTE: According to FCC §2.1053 and KDB 971168, when antenna-port conducted measurements (i.e. Spurious Emission at Antenna Terminals measurement) are performed to demonstrate compliance to the applicable unwanted emission limits, a separate radiated measurement (i.e. this Field Strength of Spurious Radiation measurement) is required to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation (, and with the transmit antenna port(s) terminated). Note that when radiated measurements for spurious emissions at antenna terminals are performed to demonstrate compliance to the unwanted emission limits (e.g., an EUT with integral transmit antenna), the field strength of spurious radiation measurement is not required.
		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 3
		EUT Conf.	2L_5M_TM1.1_M, 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; (2) 85%, 100% and 115% of Rated Voltage at Ambient Climate.
		Test Setup	Test Seup 2
		EUT Conf.	1L_5M_TM1.1_B, NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the

Test Case		Test Conditions	
			standards/rules.
	Frequency Range (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 2
		EUT Conf.	1L_5M_TM1.1_B, 1L_5M_TM1.1_T, 1L_10M_TM1.1_M,
Receiver Spurious Emissions		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	Not applicable.

5 Main Test Instruments

NOTE 1: NCR = No calibration required, VOU = Verified on use.

NOTE 2: 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				
Spectrum Analyzer	R&S	FSQ26	200988	2016-01-26
Climate chamber	Chongqing Yinhe	ESS-SDJ71	20070305	2015-09-10
Test Setup 2				
EMI test receiver	Agilent	N9038A	MY52260169	2015-11-23
Spectrum analyser	Agilent	N9010A	MY52220816	2016-03-17
Bilog antenna	TESEQ	CBL 6112B	35238	2015-12-01
Bilog antenna	TESEQ	CBL 6112B	35239	2015-12-01
Horn antenna	SWARZBECK	BBHA 9120D	1077	2015-12-01
Horn antenna	SWARZBECK	BBHA 9120D	1078	2015-12-01
Horn antenna	ETS	3160-09	00114886	2016-05-07
Horn antenna	ETS	3160-09	00117544	2015-12-26

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 / Radiated Spurious Emissions	Power [dBm] / Field Strength [dBµV/m]	For 3 m Chamber: U = 4.15 dB (30 MHz-1 GHz) U = 3.64 dB (1 GHz-18 GHz) U = 3.26 dB (18 GHz-26.5 GHz) U = 3.83 dB (26.5 GHz-40 GHz) For 10 m Chamber: U = 4.8 dB (30MHz to 1GHz) U = 4.3 dB (1 GHz to 26.5GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.21 ppm

END