



RF Test Report

Product Name: Remote Radio Unit

Product Model: RRU3201

Report Number: SYBH(R)01184062EB-1

FCC ID: QISRRU3201-B13

IC: 6369A-3201B13

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District,
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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 site recognition number is 97456.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1, 6369A-2 and 6369A-3.
5. The laboratory has been listed by the VCCI to perform EMC measurements. The accreditation numbers of test site No.1 are R-3892, G-415, C-4361, and T-1348, and the accreditation numbers of test site No.2 are R-3760, G-485, C-4210 and T-1237.
6. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
7. The test report is invalid if there is any evidence of erasure and/or falsification.
8. The test report is only valid for the test samples.
9. 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: RRU3201

Date of Receipt Sample: 2013-12-20
Start Date of Test: 2013-12-20
End Date of Test: 2014-02-17

Test Result: Pass

Approved by Senior Engineer:	2014-02-17	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

Prepared by:	2014-02-17	Hu Wei	<i>Hu Wei</i>
	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 (10-1-12 Edition)
47 CFR FCC Part 27 (10-1-12 Edition)
IC RSS-Gen (Issue 3, December 2010)
IC RSS-130 (Issue 1, October 2013)

Test Method: FCC KDB 971168 D01 Power Meas License Digital Systems v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v01r02 (if applicable)
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: 22 to 24 °C (Ambient)
Relative Humidity: 20 to 34 % (Ambient)
Atmospheric Pressure: Not applicable



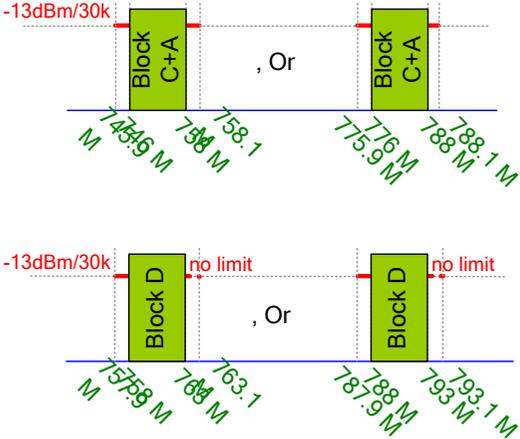
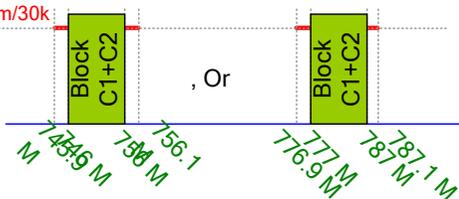
2 Test Summary

2.1 MBS 700 MHz Upper Band (746-806 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(b)	RSS-Gen,§4.8; RSS-130,§4.4	FCC	Fixed Station / Base Station	<ul style="list-style-type: none"> 746-757MHz, 758-763MHz, 776-787MHz and 788-793MHz (block C-, D-, C+, D+): Avg ERP Power ≤ 1000 W (for EBW ≤ 1 MHz). 746-757MHz, 758-763MHz, 776-787MHz and 788-793MHz (block C-, D-, C+, D+): Avg ERP PD ≤ 1000 W/MHz (for EBW > 1 MHz). 	Annex A	Pass	TL1
				Control Station / Mobile Station	746-757MHz, 758-763MHz, and 776-793MHz (block C-, D-, C+&A+&D+): Avg ERP Power ≤ 30 W.			
				Portable Station	746-757MHz, 758-763MHz, and 776-793MHz (block C-, D-, C+&A+&D+): Avg ERP Power ≤ 3 W.			
			IC	Fixed Station / Base Station	<ul style="list-style-type: none"> 746-756MHz (block C1-&C2-): Avg EIRP Power ≤ 1640 W (for ChBW ≤ 1 MHz). 746-756MHz (block C1-&C2-): Avg EIRP PD ≤ 1640 W/MHz (for ChBW > 1 MHz). PAPR ≤ 13 dB. 			
				Mobile Station / Fixed Subscriber Station (outdoor)	<ul style="list-style-type: none"> 777-787MHz (block C1+&C2+): Avg EIRP Power ≤ 50 W. PAPR ≤ 13 dB. 			
				Portable Station /	<ul style="list-style-type: none"> 777-787MHz (block C1+&C2+): 			

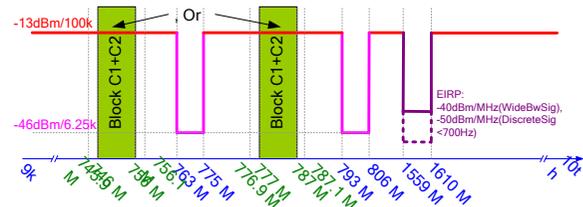
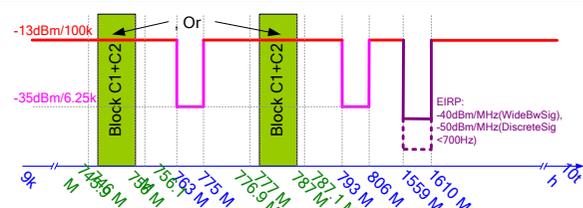


Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			Fixed Subscriber Station (indoor) <ul style="list-style-type: none"> Avg EIRP Power ≤ 5 W. PAPR ≤ 13 dB. 			
Bandwidth	§2.1049	RSS-Gen,§4.6	FCC <ul style="list-style-type: none"> OBW: No limit. EBW: No limit. IC <ul style="list-style-type: none"> OBW: No limit. 	Annex B	Pass	TL1
Band Edges Compliance	§2.1051, §27.53(c), §27.53(d), §27.53(f)	RSS-Gen,§4.9; RSS-130,§4.6	FCC  IC 	Annex C	Pass	TL1



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location	
Spurious Emission at Antenna Terminals	§2.1051, §27.53(c), §27.53(d), §27.53(f)	RSS-Gen, §4.9; RSS-130, §4.6	FCC Fixed Station / Base Station	<p>(1559-1610 EIRP: TX with antenna)</p>	Annex D	Pass	TL1
			Mobile Station / Portable Station	<p>(1559-1610 EIRP: TX with antenna)</p>			



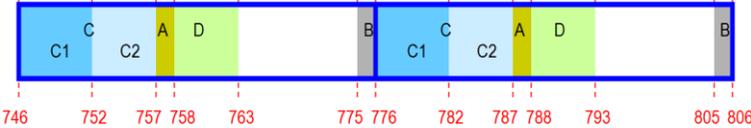
Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location
			IC	Fixed Station / Base Station  (1559-1610 EIRP: TX with antenna)			
				Mobile Station / Portable Station  (1559-1610 EIRP: TX with antenna)			
Field Strength of Spurious Radiation	§2.1051, §27.53(c), §27.53(d), §27.53(f)	RSS-Gen,§4.9; RSS-130,§4.6	≤ -13 dBm/100 kHz.		Annex E	Pass	TL3
Frequency Stability	§2.1055, §27.54	RSS-Gen,§4.7; RSS-130,§4.3	FCC	Within authorized bands of operation/frequency block.	Annex F	Pass	TL1
			IC	<ul style="list-style-type: none"> f(offset): no limit. fL – f(offset) > Operating Band Left Edge, fH + f(offset) < Operating Band Right Edge. 			

Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<p>The diagram shows two blue signal waveforms within a light blue shaded area representing the operating band. The band is bounded by frequencies f_L and f_H. A red horizontal line across the band is labeled $-13 \text{ dBm}/1\% \cdot \text{OBW}$. The left edge is labeled 'Lowest Channel' and the right edge is labeled 'Highest Channel'.</p>			
Receiver Spurious Emissions (Note 1, 2)	---	RSS-Gen, §4.10; RSS-Gen, §6	<ul style="list-style-type: none"> ● Radiated limit: RSS-Gen, §6.1 field strength limit. ● Conducted limit: $\leq -57 \text{ dBm}/120 \text{ kHz}$ (CISPR-QP), from 30 MHz to 1000 MHz, and $\leq -53 \text{ dBm}/1 \text{ MHz}$ (AV), from 1 GHz to 3rd harmonics. 	Annex G	---	---
Photos of Test Setups	---	---	---	Annex H	---	---
<p>Note 1: For Receiver Spurious Emissions, If the receiver has a detachable antenna of known impedance, antenna conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method is recommended. The antenna conducted test shall be performed with the antenna disconnected and the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna.</p> <p>Note 2: According to IC NOTICE 2012-DRS0126, only radio communication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to IC requirements. All other receivers are excluded from any IC certification, testing, labelling and reporting requirements.</p>						

2.1.2 Non-measurement Technical Requirements

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
Frequency Plan	§27.5(b),	RSS-130, §4.2	FCC 746-763 MHz, and 776-793 MHz:	See technical	Comply



Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
	§27.2(b)		 <p>(Block B - can not employ a cellular system architecture)</p>	specification description.	
		IC	<p>746-756 MHz, and 777-787 MHz:</p> 		
Modulation Characteristics	§2.1047	RSS-130,§4.1	Digital modulation.	See technical specification description.	Comply
Equipment with Multiple Antennas	---	RSS-130,§4.5	Multiple Antennas EIRP: Correlated transmission - Aggregate power + Gmax + 10 log10 N; Uncorrelated transmission - Aggregate power + Gmax.	Considered during "Transmitter Output Power" test.	Comply



3 Description of the Equipment under Test (EUT)

3.1 General Description

The RRU3201 is an outdoor remote radio unit. It is the radio frequency (RF) part of a distributed base station and can be located near antennas. The RRU3201 can modulate, demodulate, combine, and divide baseband and RF signals. It also processes baseband and RF signal data.

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
LRRU Power Amplifier Board	Ver.C	WD51IRA8D,LRRU PA BOARD(728~768,2*40W),1*1
IRF TRX Board	Ver.D	DBS3900,WD51IRX8D,IRF TRX Board,1*1
Duplexer	Ver.C	Duplexer,DBS3900 LTE,TX:746~757MHz,RX:776~787MHz,-1.15dB,-1.15dB,1.3,Din,WD5MILDU8D

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
LMPT	LMPT1	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,WD22LBBPC,HERT BBU Baseband Processing and Interface Unit,1*1



3.3 Technical Specification

Characteristics	Description
Radio System Type	Single Radio <input type="checkbox"/> GSM Access Technology <input type="checkbox"/> UMTS (Single-RAT): <input checked="" type="checkbox"/> LTE <input type="checkbox"/> CDMA <input type="checkbox"/> WiMAX Multi-Standard <input type="checkbox"/> GSM & UMTS Radio <input type="checkbox"/> GSM & LTE (MSR): <input type="checkbox"/> GSM & UMTS & LTE <input type="checkbox"/> WiMAX & LTE <input type="checkbox"/> CDMA & LTE
Equipment Type	#1 <input checked="" type="checkbox"/> Base Station <input type="checkbox"/> Subscriber Station #2 <input checked="" type="checkbox"/> Fixed Station <input type="checkbox"/> Mobile Station <input type="checkbox"/> Portable Station #3 <input type="checkbox"/> Indoor Station <input checked="" type="checkbox"/> Outdoor Station
Supported Frequency Range	Transmission (TX): 746 to 756 MHz Receiving (RX): 777 to 787 MHz
TX and RX Antenna Ports	TX & RX port: 2 TX-only port: 0 RX-only port: 0
Multiple Carrier Supported	1
Maximum RF Bandwidth	---
TX Output Power	Max. 40 W (per antenna port) Max. 80 W (two antenna ports)
Supported Channel Bandwidth	GSM system: <input type="checkbox"/> 200 kHz UMTS system: <input type="checkbox"/> 5 MHz LTE system: <input checked="" type="checkbox"/> 1.4 MHz, <input checked="" type="checkbox"/> 3 MHz, <input checked="" type="checkbox"/> 5 MHz, <input checked="" type="checkbox"/> 10 MHz, <input type="checkbox"/> 15 MHz, <input type="checkbox"/> 20 MHz CDMA system: <input type="checkbox"/> 1.23 MHz, <input type="checkbox"/> 1.25 MHz WiMAX system: <input type="checkbox"/> 5 MHz, <input type="checkbox"/> 7 MHz, <input type="checkbox"/> 10 MHz
Modulation Type	GSM system: --- UMTS system: --- LTE system: Base-band: QPSK, 16QAM, 64QAM Carrier: OFDM/OFDMA CDMA system: --- WiMAX system: ---
Designation of Emissions	GSM system: ---



Characteristics	Description
(Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	UMTS system: --- LTE system: 1M16D9W, 2M74D9W, 4M50D9W, 8M97D9W CDMA system: --- WiMAX system: ---
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) Nominal Voltage, Input to EUT: -48 VDC Voltage Range, Input to EUT: -36 to -57 VDC
Antenna Assembles	Antenna Type: <input checked="" type="checkbox"/> External <input type="checkbox"/> Integrated Smart Antenna: <input checked="" type="checkbox"/> MIMO <input type="checkbox"/> Non MIMO Antenna Gain: 11 dBi (per antenna port, max.) 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
LTE/TM1.1	LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.1

4.2 EUT Configurations

4.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, <ul style="list-style-type: none"> 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.

4.2.2 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.	Carrier Conf. Description	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1M4_B	B	1L*(40W)	746.7	777.7	1.4M	46	LTE/TM1.1
1M4_M	M	1L*(40W)	751	782	1.4M	46	LTE/TM1.1
1M4_T	T	1L*(40W)	755.3	786.3	1.4M	46	LTE/TM1.1
3M_B	B	1L*(40W)	747.5	778.5	3M	46	LTE/TM1.1
3M_M	M	1L*(40W)	751	782	3M	46	LTE/TM1.1
3M_T	T	1L*(40W)	754.5	785.5	3M	46	LTE/TM1.1
5M_B	B	1L*(40W)	748.5	779.5	5M	46	LTE/TM1.1
5M_T	T	1L*(40W)	753.5	784.5	5M	46	LTE/TM1.1
10M_M	M	1L*(40W)	751	782	10M	46	LTE/TM1.1

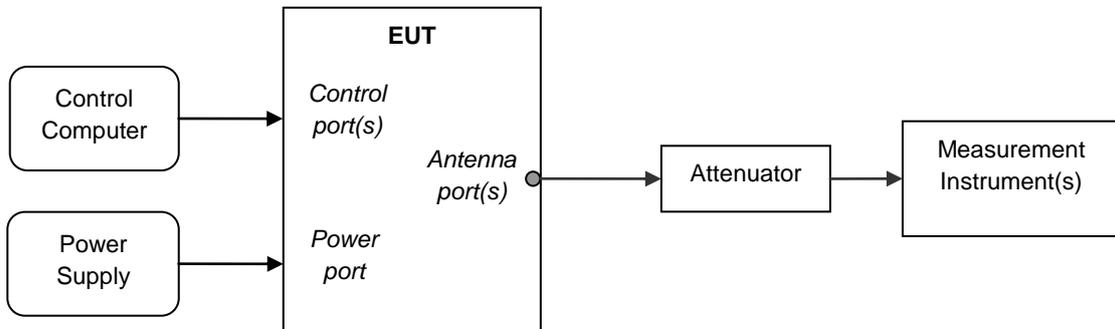


4.3 Test Environments

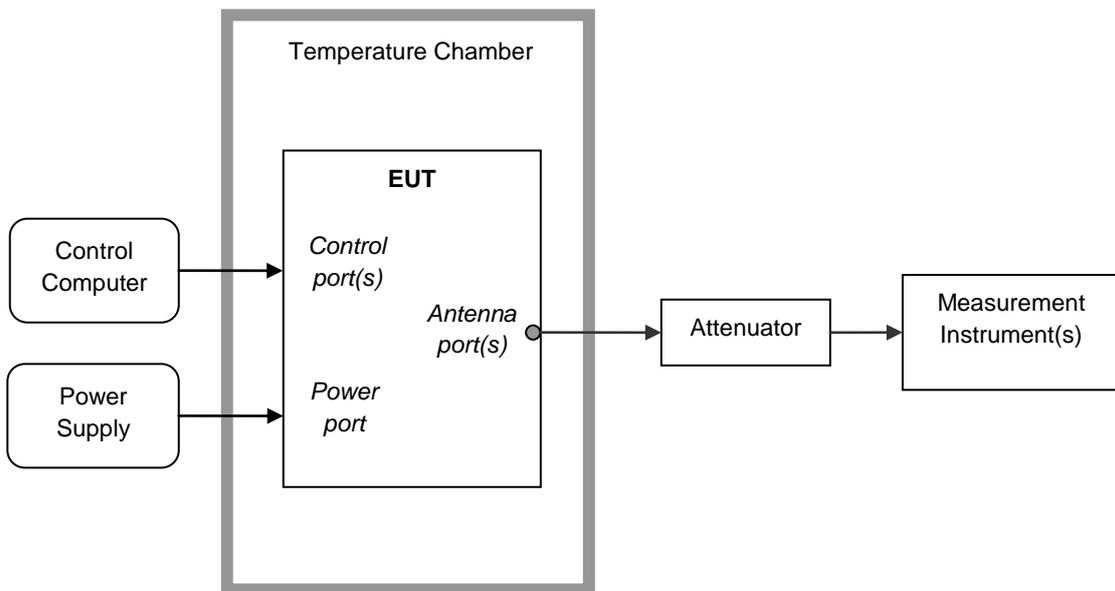
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

4.4 Test Setups

4.4.1 Test Setup 1



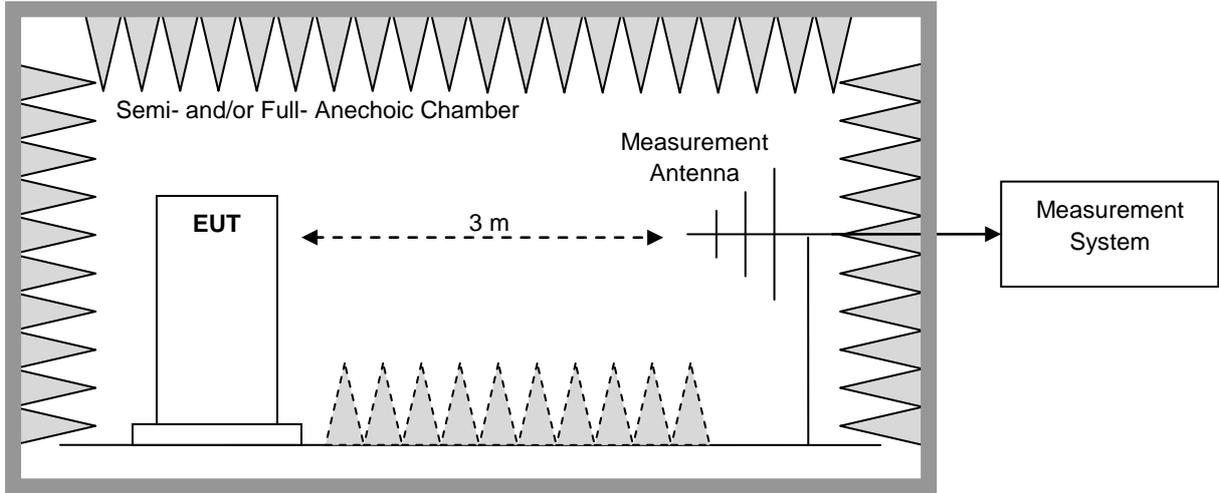
4.4.2 Test Setup 2



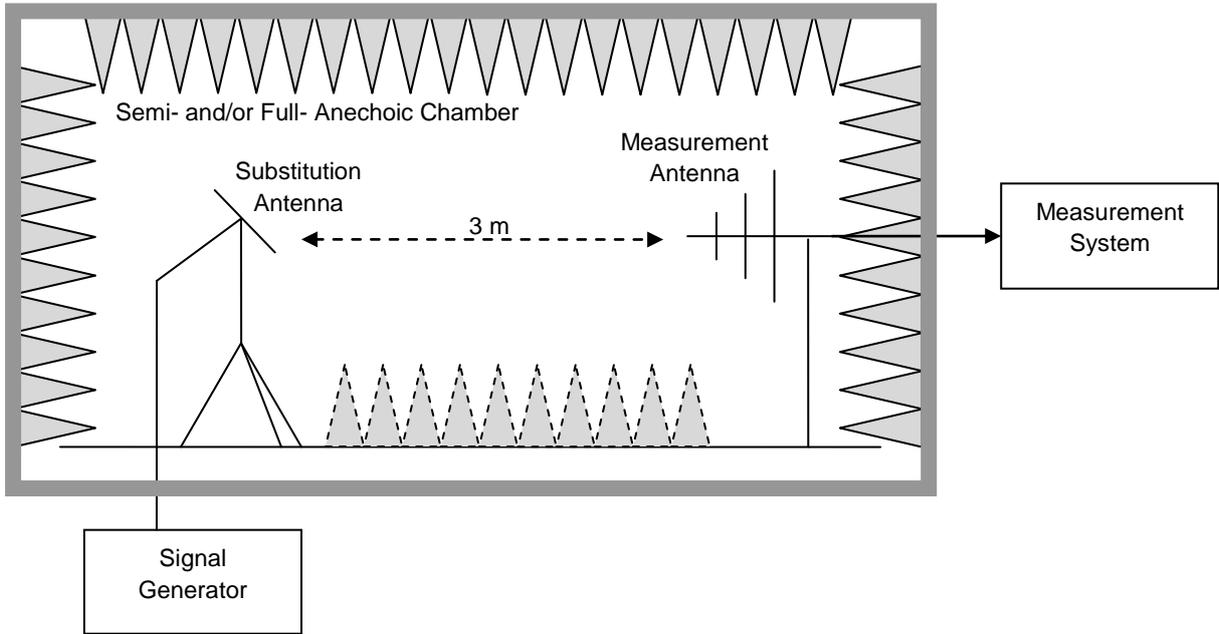
4.4.3 Test Setup 3

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 Output Power	Channel Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1M4_B,1M4_M,1M4_T 3M_B,3M_M,3M_T 5M_B,5M_T,10M_M
	Power Spectral Density	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1M4_B,1M4_M,1M4_T
	Peak-to-Average Ratio	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1M4_B,1M4_M,1M4_T
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1M4_B,1M4_M,1M4_T 3M_B,3M_M,3M_T 5M_B,5M_T,10M_M
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1M4_B,1M4_M,1M4_T 3M_B,3M_M,3M_T 5M_B,5M_T,10M_M
Band Edges Compliance	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	EUT Conf.	1M4_B, 1M4_T 10M_M	
Spurious Emission at Antenna Terminals	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	EUT Conf.	1M4_B, 1M4_T 10M_M	
Field Strength of Spurious Radiation	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 3	
	EUT Conf.	10M_M NOTE: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected.	
Frequency Stability	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	



Test Case	Test Conditions	
	EUT Conf.	1M4_B, 1M4_T 3M_B, 3M_T 5M_B,5M_T,10M_M NOTE: A representative EUT configuration was selected since the un-modulation carrier configuration was required by the standards/rules.
Receiver Spurious Emissions	Test Env.	Ambient Climate & Rated Voltage
	Test Setup	Test Seup 1
	EUT Conf.	---



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	201082	2014-03-25
Vector Network Measurement System	Anritsu	MS4622B	051604	2014-06-17
Temperature Chamber	Chongqing Yinhe	ESS/KWGDS61III	201000447	2014-03-25
Power Supply	Chroma	62024P-80-60	62024PA00950	2015-08-01
Test Setup 3				
EMI Test receiver	Agilent	N9038A	MY52260169	2014-12-01
Spectrum Analyzer	Agilent	N9010A	MY52220816	2014-12-01
Bilog Antenna	TESEQ	CBL6112B	35239	2015-12-01 (2y)
Horn Antenna	SWARZBECK	BBHA	1078	2015-12-01 (2y)



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: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz) For 10 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.21 ppm

END