



RF Test Report

Product Name: Remote Radio Unit

Product Model: RRU3952 850M

Report Number: SYBH(R)01611335EB-1

FCC ID: QISRRU3952-850M

IC: 6369A-3952B850

Reliability Laboratory of Huawei Technologies Co., Ltd.

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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 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).
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 - The recognition number for the test site located in Chengdu is 6369E-1.
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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: RRU3952 850M

Date of Receipt Sample: 2015-01-10
Start Date of Test: 2015-01-15
End Date of Test: 2015-02-10

Test Result: Pass

Approved by Senior Engineer:	2015-02-10	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

Prepared by:	2015-02-10	Li Guo	<i>Li Guo</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 (10-1-13 Edition)
47 CFR FCC Part 22 (10-1-13 Edition)

IC RSS-Gen (Issue 4, November 2014)
IC RSS-132 (Issue 3, January 2013)

Test Method: FCC KDB 971168 D01 Power Meas License Digital Systems v02r02
(if applicable) 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 Cellular Band (824-849 MHz paired with 869-894 MHz)

2.1.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Transmitter Output Power	§2.1046, §22.913	RSS-Gen,§6.12; RSS-132,§5.4	FCC	Base Station	ERP Power ≤ 500 W.	Annex A	Pass	TL1
				Mobile Station	ERP Power ≤ 7 W.			
			IC	Base Station	<ul style="list-style-type: none"> Average EIRP Power ≤ 820 W. PAPR ≤ 13 dB@0.1%. 			
				Mobile Station	<ul style="list-style-type: none"> Average EIRP Power ≤ 11.5 W. PAPR ≤ 13 dB@0.1%. 			
Bandwidth	§2.1049, §22.917	RSS-Gen,§6.6	FCC	<ul style="list-style-type: none"> OBW: No limit. EBW (-26 dBc): No limit. 		Annex B	Pass	TL1
			IC	OBW: No limit.				
Band Edges Compliance / Emission Mask	§2.1051, §22.917	RSS-Gen,§6.13; RSS-132,§5.5	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/1%*OBW, in 1 MHz bands immediately outside and adjacent to the sub-bands.				
Spurious Emission at Antenna Terminals	§2.1051, §22.917	RSS-Gen,§6.13; RSS-132,§5.5	≤ -13 dBm/100 kHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges/sub-bands.			Annex D	Pass	TL1
Field Strength of Spurious Radiation / Radiated Spurious	§2.1053, §22.917	RSS-Gen,§6.13; RSS-132,§5.5	≤ -13 dBm/100 kHz.			Annex E	Pass	TL3



Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Emissions								
Frequency Stability	§2.1055, §22.355	RSS-Gen,§6.11; RSS-132,§5.3	FCC	Base Station	<ul style="list-style-type: none"> Test method: $(F_c_meas - F_c_rated) / F_c_rated \leq \pm 1.5$ ppm. Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, $\pm 15\% * NV$. 	Annex F	Pass	TL1
				Mobile Station	<ul style="list-style-type: none"> Test method: $(F_c_meas - F_c_rated) / F_c_rated \leq \pm 2.5$ ppm. Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, $\pm 15\% * NV$. 			
			IC	Base Station	<ul style="list-style-type: none"> Test method option #1: $(F_c_meas - F_c_meas@20^\circ C \& NV) / F_c_meas@20^\circ C \& NV \leq \pm 1.5$ ppm. Test method option #2: OBW (OBW_lower to OBW_higher) within each sub-band. Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, $\pm 15\% * NV$. 			
				Mobile Station	<ul style="list-style-type: none"> Test method option #1: $(F_c_meas - F_c_meas@20^\circ C \& NV) / F_c_meas@20^\circ C \& NV \leq \pm 2.5$ ppm. Test method option #2: OBW (OBW_lower to OBW_higher) within each sub-band. Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, $\pm 15\% * NV$. 			
Receiver Spurious	---	RSS-Gen,§5;	<ul style="list-style-type: none"> Radiated limit: RSS-Gen, §6.1 field strength limit. 			Annex G	Pass	TL1



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
Emissions (Note 1, 2)		RSS-Gen,§7; RSS-132,§5.6	<ul style="list-style-type: none"> Conducted limit: ≤ -57 dBm/120 kHz (CISPR-QP), from 30 MHz to 1000 MHz, and ≤ -53 dBm/1 MHz (AV), from 1 GHz to 3rd harmonics. 			
<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	§22.905	RSS-132,§5.1	(a) Channel Block A: 869-880 MHz paired with 824-835 MHz, and 890-891.5 MHz paired with 845-846.5 MHz. (b) Channel Block B: 880-890 MHz paired with 835-845 MHz, and 891.5-894 MHz paired with 846.5-849 MHz.	See technical specification description.	Comply
Modulation Characteristics	§2.1047	RSS-132,§5.2	Digital modulation.	See technical specification description.	Comply

3 Description of the Equipment under Test (EUT)

3.1 General Description

The RRU3952 is the outdoor remote radio unit which is powered by a power cabinet. It is the radio frequency (RF) module of the distributed base station (DBS) and is installed close to the antenna.

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
WD5DJRXC50	Ver.A	Manufactured Board,MARP RRU,WD5DJRXC50,Transceiver Board,2T4R,850M,1*1
WD5DJRAC50	Ver.B	Manufactured Board,MARP RRU,WD5DJRAC50,Power Amplifier Board,2T4R,850M,60W+80W,1*1

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
UMPT	03021VGH	HUAWEI	Universal Main Processing & Transmission unit
UBBP	03022HEM	HUAWEI	Baseband Processing and Interface Unit



3.3 Technical Specification

3.3.1 General Technical Description

Characteristics	Description	
Radio System Type	<input checked="" type="checkbox"/> GSM (GO) <input checked="" type="checkbox"/> UMTS (UO) <input checked="" type="checkbox"/> LTE (LO) <input type="checkbox"/> CDMA (CO) <input checked="" type="checkbox"/> GSM & UMTS (GU) <input checked="" type="checkbox"/> GSM & LTE (GL) <input checked="" type="checkbox"/> UMTS & LTE (UL) <input checked="" type="checkbox"/> GSM & UMTS & LTE (GUL) <input type="checkbox"/> CDMA & LTE (CL) <input type="checkbox"/> P2P	
Equipment Type	Type #1	<input checked="" type="checkbox"/> Base Station Equipment <input type="checkbox"/> CPE (Customer Premises Equipment) Equipment <input type="checkbox"/> Subscriber Equipment (User Equipment) <input type="checkbox"/> Fixed Point-to-Point Equipment
	Type #2	<input checked="" type="checkbox"/> Fixed <input type="checkbox"/> Mobile <input type="checkbox"/> Portable
	Type #3	<input type="checkbox"/> Indoor <input checked="" type="checkbox"/> Outdoor
Frequency Range (Transmission (TX) and Receiving (RX))	#1	TX: 869 to 894 MHz RX: 824 to 849 MHz
TX and RX Antenna Ports	TX & RX port: 2, TX-only port: 0, RX-only port: 2	
Multiple Carrier Supported	Supported	
Maximum RF Bandwidth	25 MHz	
TX Output Power	Max. 60 W (TRXA), Max. 80 W (TRXB), Max. 120 W (two antenna ports)	
Supported Channel Bandwidth	GSM system:	200 kHz
	UMTS system:	5 MHz
	LTE system:	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
Modulation Type	GSM system:	Base-band: GMSK, 8PSK Carrier: TDMA
	UMTS system:	Base-band: QPSK, 16QAM, 64QAM Carrier: CDMA



Characteristics	Description	
	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 occupied bandwidths for each type of channel bandwidth configuration.)	GSM system:	246KGXW, 245KG7W
	UMTS system:	4M16F9W
	LTE system:	1M10D9W, 2M71D9W, 4M51D9W, 9M00D9W, 13M5D9W, 18M0D9W
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"/> Detachable <input type="checkbox"/> Integrated (Internal) <input type="checkbox"/> Integrated (External)
	Smart Antenna:	<input checked="" type="checkbox"/> MIMO <input type="checkbox"/> Non MIMO
	Antenna Gain:	Directional Gain, Gmax: 7 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.

3.3.2 Transmit Power Description

3.3.2.1 GU MSR System

Carrier configuration	Transmit power (per antenna port)	
	Antenna Port A	Antenna Port B
1*G & 1*U	1*G(30W) & 1*U(30W)	1*G(40W) & 1*U(40W)
1*G & 2*U	1*G(20W) & 2*U(20W)	1*G(40W) & 2*U(20W)
2*G & 1*U	2*G(20W) & 1*U(20W)	2*G(30W) & 1*U(20W)
3*G & 1*U	3*G(13W) & 1*U(20W)	3*G(20W) & 1*U(20W)
2*G & 2*U	2*G(10W) & 2*U(20W)	2*G(20W) & 2*U(20W)

Note: in the table, the G means GSM,U means UMTS.

3.3.2.2 GL MSR System

Carrier configuration	Transmit power (per antenna port)	
	Antenna Port A	Antenna Port B
1*G & 1*L	1*G(30W) & 1*U(30W)	1*G(30W) & 1*U(30W)
2*G & 1*L	2*G(20W) & 1*L(20W)	2*G(20W) & 1*L(20W)
3*G & 1*L	3*G(12W) & 1*L(20W)	3*G(12W) & 1*L(20W)
2*G & 2*L	2*G(10W) & 2*L(20W)	2*G(10W) & 2*L(20W)

Note: in the table,the G means GSM, L means LTE.

3.3.2.3 UL MSR System

Carrier configuration	Transmit power (per antenna port)	
	Antenna Port A	Antenna Port B
1*U & 1*L	1*U(30W) & 1*L(30W)	1*U(30W) & 1*L(30W)
2*U & 1*L	2*U(20W) & 1*L(20W)	2*U(20W) & 1*L(20W)
3*U & 1*L	3*U(15W) & 1*L(15W)	3*U(15W) & 1*L(15W)
4*U & 1*L	4*U(10W) & 1*L(20W)	4*U(10W) & 1*L(20W)

Note: in the table, the U means UMTS, L means LTE.

3.3.2.4 GSM System

Carrier configuration	Transmit power (per antenna port)	
	Antenna Port A	Antenna Port B
1*G	1*47.8 dBm (GMSK) or 1*47.8 dBm (8PSK)	1*49.0 dBm (GMSK) or 1*49.0 dBm (8PSK)
2*G	2*44.8 dBm (GMSK) or 2*44.8 dBm (8PSK)	2*46.0 dBm (GMSK) or 2*46.0 dBm (8PSK)
3*G	3*43.0 dBm (GMSK) or 3*43.0 dBm (8PSK)	3*44.3 dBm (GMSK) or 3*44.3 dBm (GMSK)
4*G	4*41.8 dBm (GMSK) or 4*40.0 dBm (8PSK)	4*43.0 dBm (GMSK) or 4*41.2 dBm (8PSK)
5*G	---	5*42.0 dBm (GMSK) or 5*40.2 dBm (8PSK)
6*G	---	6*40.8 dBm (GMSK) or 6*39.0 dBm (8PSK)
7*G	---	7*37.8 dBm (GMSK) or 7*36.0 dBm (8PSK)
8*G	---	8*37.0 dBm (GMSK) or 8*35.2 dBm (8PSK)

Note: in the table,the G means GSM.
 When both antenna ports are GSM single-RAT carriers, the total power of two antenna ports is limited below 120W.

3.3.2.5 UMTS System

Carrier configuration	Transmit power (per antenna port)	
	Antenna Port A	Antenna Port B



1*U	1*47.8 dBm	1*49.0 dBm
2*U	2*44.8 dBm	2*46.0 dBm
3*U	3*43.0 dBm	3*44.0 dBm
4*U	4*41.8 dBm	4*43.0 dBm
Note: in the table,the U means UMTS. When both antenna ports are GSM single-RAT carriers, the total power of two antenna ports is limited below 120W.		

3.3.2.6 LTE System

Carrier configuration	Transmit power (per antenna port)
1*L	1*46.0 dBm (1.4MHz,3MHz) 1*47.8 dBm (5MHz, 10MHz, 15MHz, 20MHz)
2*L	2*44.8 dBm (1.4MHz,3MHz, 5MHz, 10MHz, 15MHz, 20MHz)
Note: in the table,the L means LTE.	

4 General Test Conditions / Configurations

4.1 EUT Configurations

4.1.1 General

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.

4.1.2 Test Modes

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

Test Mode	Test Modes Description
GSM/GMSK	GSM system, GSM/GPRS, GMSK modulation
GSM/8PSK	GSM system, EDGE, 8PSK modulation
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
GU/TM1	MSR system, 3GPP TS 37.141 clause 4.9.2 (GSM/GMSK; UMTS/TM1)
GL/TM1	MSR system, 3GPP TS 37.141 clause 4.9.2 (GSM/GMSK; LTE/TM1.1)
UL/TM1	MSR system, 3GPP TS 37.141 clause 4.9.2 (UMTS/TM1, LTE/TM1.1)

4.1.3 Test Configurations

EUT Conf.	RF Ch.	Carrier Conf. Description	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1G_TM1_B_ANTA	B	1*G	869.4	--	0.2	47.8	GSM/GMSK
1G_TM1_M_ANTA	M	1*G	881.6	--	0.2	47.8	GSM/GMSK
1G_TM1_T_ANTA	T	1*G	893.6	--	0.2	47.8	GSM/GMSK
1G_TM2_B_ANTA	B	1*G	869.4	--	0.2	47.8	GSM/8PSK
1G_TM2_M_ANTA	M	1*G	881.6	--	0.2	47.8	GSM/8PSK
1G_TM2_T_ANTA	T	1*G	893.6	--	0.2	47.8	GSM/8PSK
4G_TM1_M_ANTA	M	4*G	869.4, 870.0, 893.0, 893.6	--	0.2, 0.2, 0.2, 0.2	41.8, 41.8, 41.8, 41.8	GSM/GMSK



EUT Conf.	RF Ch.	Carrier Conf. Description	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1U_TM1_B_ANTA	B	1*U	871.4	--	5.0	47.8	UMTS/TM1
1U_TM1_M_ANTA	M	1*U	881.6	--	5.0	47.8	UMTS/TM1
1U_TM1_T_ANTA	T	1*U	891.6	--	5.0	47.8	UMTS/TM1
4U_TM1_M_ANTA	M	4*U	871.4, 876.4, 886.6, 891.6	--	5.0, 5.0, 5.0, 5.0	41.8, 41.8, 41.8, 41.8	UMTS/TM1
1L_1.4M_TM1_B_ANTA	B	1*L	869.7	--	1.4	46.0	LTE/TM1.1
1L_1.4M_TM1_M_ANTA	M	1*L	881.5	--	1.4	46.0	LTE/TM1.1
1L_1.4M_TM1_T_ANTA	T	1*L	893.3	--	1.4	46.0	LTE/TM1.1
1L_3M_TM1_B_ANTA	B	1*L	870.5	--	3.0	46.0	LTE/TM1.1
1L_3M_TM1_M_ANTA	M	1*L	881.5	--	3.0	46.0	LTE/TM1.1
1L_3M_TM1_T_ANTA	T	1*L	892.5	--	3.0	46.0	LTE/TM1.1
1L_5M_TM1_B_ANTA	B	1*L	871.5	--	5.0	47.8	LTE/TM1.1
1L_5M_TM1_M_ANTA	M	1*L	881.5	--	5.0	47.8	LTE/TM1.1
1L_5M_TM1_T_ANTA	T	1*L	891.5	--	5.0	47.8	LTE/TM1.1
1L_10M_TM1_B_ANTA	B	1*L	874	--	10	47.8	LTE/TM1.1
1L_10M_TM1_M_ANTA	M	1*L	881.5	--	10	47.8	LTE/TM1.1
1L_10M_TM1_T_ANTA	T	1*L	889.0	--	10	47.8	LTE/TM1.1
1L_15M_TM1_B_ANTA	B	1*L	876.5	--	15	47.8	LTE/TM1.1
1L_15M_TM1_M_ANTA	M	1*L	881.5	--	15	47.8	LTE/TM1.1
1L_15M_TM1_T_ANTA	T	1*L	886.5	--	15	47.8	LTE/TM1.1
1L_20M_TM1_B_ANTA	B	1*L	879.0	--	20	47.8	LTE/TM1.1
1L_20M_TM1_M_ANTA	M	1*L	881.5	--	20	47.8	LTE/TM1.1
1L_20M_TM1_T_ANTA	T	1*L	884.0	--	20	47.8	LTE/TM1.1
2L_5M_TM1_M_ANTA	M	2*L	871.5, 891.5	--	5.0, 5.0	44.8, 44.8	LTE/TM1.1
2G2U_TM1_M_ANTA	M	GUUG	869.4, 879.0, 884.0, 893.6	--	0.2, 5.0, 5.0, 0.2	41.8, 41.8, 41.8, 41.8	GU/TM1
2G2L_TM1_M_ANTA	M	GLLG	869.4, 879.0, 884.0, 893.6	--	0.2, 5.0, 5.0, 0.2	40.0, 43.0, 43.0, 40.0	GL/TM1
4U1L_TM1_M_ANTA	M	UUUUL	871.4, 876.4, 881.4, 886.4, 891.5	--	5.0, 5.0, 5.0, 5.0, 5.0	40.0, 40.0, 40.0, 40.0, 43.0	UL/TM1
1G_TM1_B_ANTB	B	1*G	869.4	--	0.2	49.0	GSM/GMSK
1G_TM1_M_ANTB	M	1*G	881.6	--	0.2	49.0	GSM/GMSK
1G_TM1_M_ANTB_1	M	1*G	881.6	--	0.2	47.8	GSM/GMSK
1G_TM1_T_ANTB	T	1*G	893.6	--	0.2	49.0	GSM/GMSK
1G_TM2_B_ANTB	B	1*G	869.4	--	0.2	49.0	GSM/8PSK
1G_TM2_M_ANTB	M	1*G	881.6	--	0.2	49.0	GSM/8PSK
1G_TM2_T_ANTB	T	1*G	893.6	--	0.2	49.0	GSM/8PSK
4G_TM1_M_ANTB	M	4*G	869.4, 870.0, 893.0, 893.6	--	0.2, 0.2, 0.2, 0.2	43.0, 43.0, 43.0, 43.0	GSM/GMSK



EUT Conf.	RF Ch.	Carrier Conf. Description	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
8G_TM1_M_ANTB	M	8*G	869.4, 870.0, 870.6, 871.2, 891.8, 892.4, 893.0, 893.6	--	0.2, 0.2, 0.2, 0.2, 0.2, 0.2	37.0, 37.0, 37.0, 37.0, 37.0, 37.0	GSM/GMSK
1U_TM1_B_ANTB	B	1*U	871.4	--	5.0	49.0	UMTS/TM1
1U_TM1_M_ANTB	M	1*U	881.6	--	5.0	49.0	UMTS/TM1
1U_TM1_T_ANTB	T	1*U	891.6	--	5.0	49.0	UMTS/TM1
4U_TM1_M_ANTB	M	4*U	871.4, 876.4, 886.6, 891.6	--	5.0, 5.0, 5.0, 5.0	43.0, 43.0, 43.0, 43.0	UMTS/TM1
1L_1.4M_TM1_B_ANTB	B	1*L	869.7	--	1.4	46.0	LTE/TM1.1
1L_1.4M_TM1_M_ANTB	M	1*L	881.5	--	1.4	46.0	LTE/TM1.1
1L_1.4M_TM1_T_ANTB	T	1*L	893.3	--	1.4	46.0	LTE/TM1.1
1L_3M_TM1_B_ANTB	B	1*L	870.5	--	3.0	46.0	LTE/TM1.1
1L_3M_TM1_M_ANTB	M	1*L	881.5	--	3.0	46.0	LTE/TM1.1
1L_3M_TM1_T_ANTB	T	1*L	892.5	--	3.0	46.0	LTE/TM1.1
1L_5M_TM1_B_ANTB	B	1*L	871.5	--	5.0	47.8	LTE/TM1.1
1L_5M_TM1_M_ANTB	M	1*L	881.5	--	5.0	47.8	LTE/TM1.1
1L_5M_TM1_T_ANTB	T	1*L	891.5	--	5.0	47.8	LTE/TM1.1
1L_10M_TM1_B_ANTB	B	1*L	874	--	10	47.8	LTE/TM1.1
1L_10M_TM1_M_ANTB	M	1*L	881.5	--	10	47.8	LTE/TM1.1
1L_10M_TM1_T_ANTB	T	1*L	889.0	--	10	47.8	LTE/TM1.1
1L_15M_TM1_B_ANTB	B	1*L	876.5	--	15	47.8	LTE/TM1.1
1L_15M_TM1_M_ANTB	M	1*L	881.5	--	15	47.8	LTE/TM1.1
1L_15M_TM1_T_ANTB	T	1*L	886.5	--	15	47.8	LTE/TM1.1
1L_20M_TM1_B_ANTB	B	1*L	879.0	--	20	47.8	LTE/TM1.1
1L_20M_TM1_M_ANTB	M	1*L	881.5	--	20	47.8	LTE/TM1.1
1L_20M_TM1_T_ANTB	T	1*L	884.0	--	20	47.8	LTE/TM1.1
2L_5M_TM1_M_ANTB	M	2*L	871.5, 891.5	--	5.0, 5.0	44.8, 44.8	LTE/TM1.1
2G2U_TM1_M_ANTB	M	GUUG	869.4, 879.0, 884.0, 893.6	--	0.2, 5.0, 5.0, 0.2	43.0, 43.0, 43.0, 43.0	GU/TM1
2G2L_TM1_M_ANTB	M	GLLG	869.4, 879.0, 884.0, 893.6	--	0.2, 5.0, 5.0, 0.2	40.0, 43.0, 43.0, 40.0	GL/TM1
4U1L_TM1_M_ANTB	M	UUUUL	871.4, 876.4, 881.4, 886.4, 891.5	--	5.0, 5.0, 5.0, 5.0, 5.0	40.0, 40.0, 40.0, 40.0, 43.0	UL/TM1

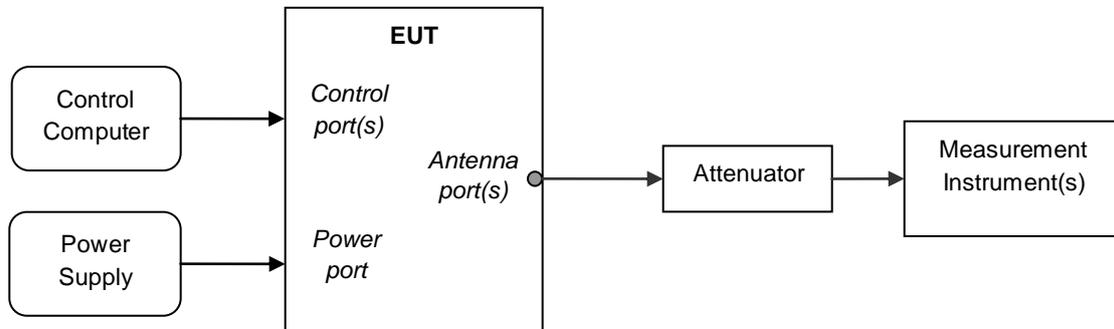


4.2 Test Environments

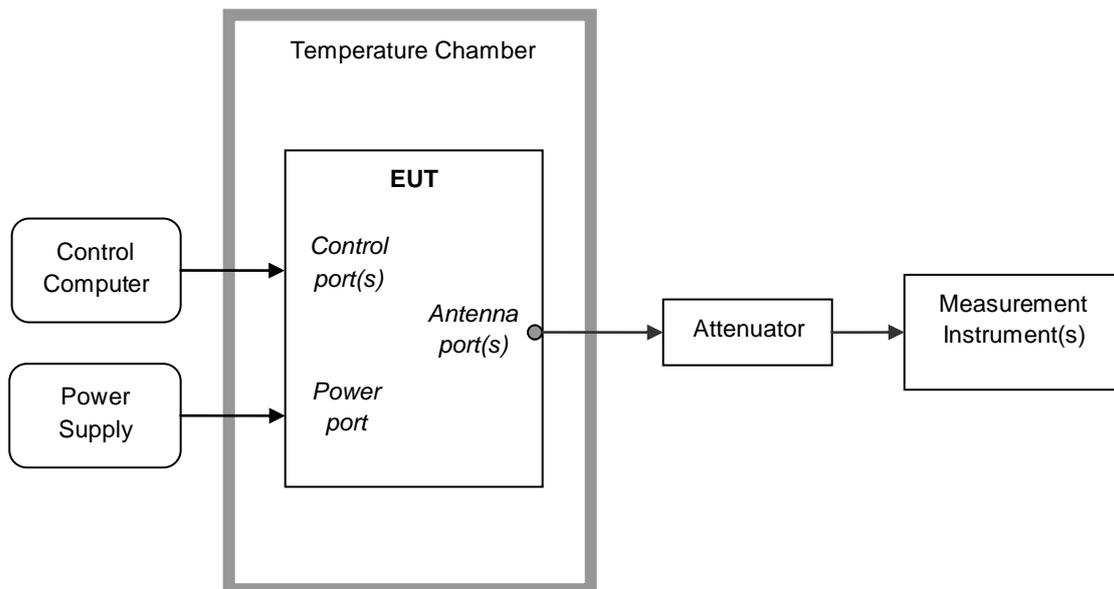
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate (See clause 1.3)	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

4.3 Test Setups

4.3.1 Test Setup 1



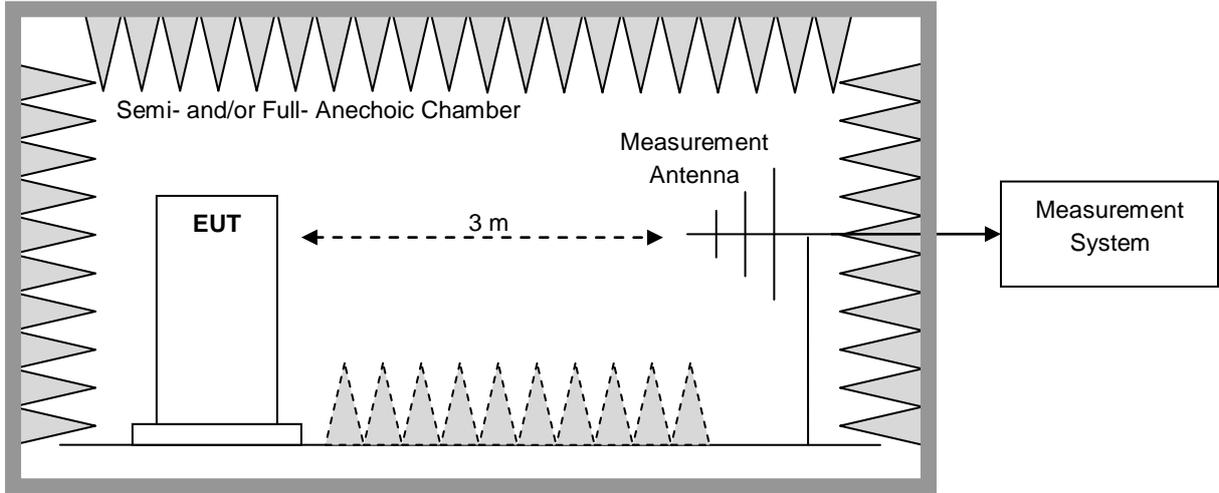
4.3.2 Test Setup 2



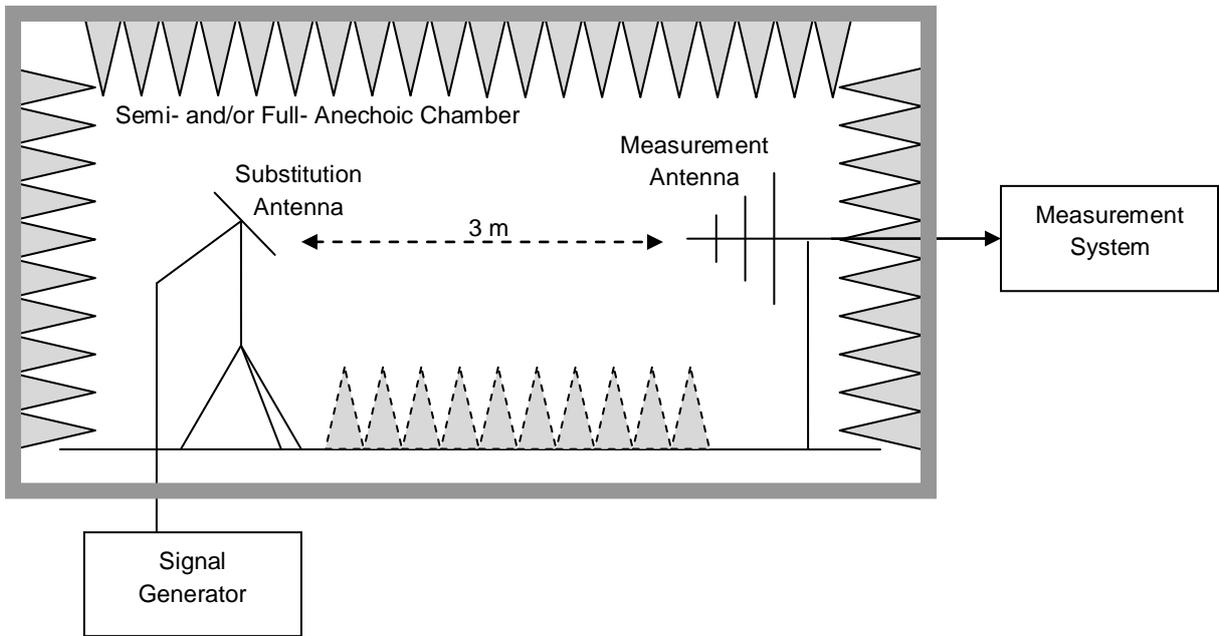
4.3.3 Test Setup 3

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.	1G_TM1_B_ANTA, 1G_TM1_M_ANTA, 1G_TM1_T_ANTA, 1G_TM2_B_ANTA, 1G_TM2_M_ANTA, 1G_TM2_T_ANTA, 4G_TM1_M_ANTA, 1U_TM1_B_ANTA, 1U_TM1_M_ANTA, 1U_TM1_T_ANTA, 4U_TM1_M_ANTA, 1L_1.4M_TM1_B_ANTA, 1L_1.4M_TM1_M_ANTA, 1L_1.4M_TM1_T_ANTA, 1L_3M_TM1_B_ANTA, 1L_3M_TM1_M_ANTA, 1L_3M_TM1_T_ANTA, 1L_5M_TM1_B_ANTA, 1L_5M_TM1_M_ANTA, 1L_5M_TM1_T_ANTA, 1L_10M_TM1_B_ANTA, 1L_10M_TM1_M_ANTA, 1L_10M_TM1_T_ANTA, 1L_15M_TM1_B_ANTA, 1L_15M_TM1_M_ANTA, 1L_15M_TM1_T_ANTA, 1L_20M_TM1_B_ANTA, 1L_20M_TM1_M_ANTA, 1L_20M_TM1_T_ANTA, 2L_5M_TM1_M_ANTA, 2G2U_TM1_M_ANTA, 2G2L_TM1_M_ANTA, 4U1L_TM1_M_ANTA, 1G_TM1_B_ANTB, 1G_TM1_M_ANTB, 1G_TM1_T_ANTB, 1G_TM2_B_ANTB, 1G_TM2_M_ANTB, 1G_TM2_T_ANTB, 4G_TM1_M_ANTB, 8G_TM1_M_ANTB, 1U_TM1_B_ANTB, 1U_TM1_M_ANTB, 1U_TM1_T_ANTB, 4U_TM1_M_ANTB, 1L_1.4M_TM1_B_ANTB, 1L_1.4M_TM1_M_ANTB, 1L_1.4M_TM1_T_ANTB, 1L_3M_TM1_B_ANTB, 1L_3M_TM1_M_ANTB, 1L_3M_TM1_T_ANTB, 1L_5M_TM1_B_ANTB, 1L_5M_TM1_M_ANTB, 1L_5M_TM1_T_ANTB, 1L_10M_TM1_B_ANTB, 1L_10M_TM1_M_ANTB, 1L_10M_TM1_T_ANTB, 1L_15M_TM1_B_ANTB, 1L_15M_TM1_M_ANTB, 1L_15M_TM1_T_ANTB, 1L_20M_TM1_B_ANTB, 1L_20M_TM1_M_ANTB, 1L_20M_TM1_T_ANTB, 2L_5M_TM1_M_ANTB, 2G2U_TM1_M_ANTB, 2G2L_TM1_M_ANTB, 4U1L_TM1_M_ANTB,
	Power Spectral Density	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	---
	Peak-to-Average Ratio	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1



Test Case		Test Conditions	
	(if required)	EUT Conf.	1G_TM1_M_ANTA 1G_TM2_M_ANTA 1U_TM1_M_ANTA 1L_1.4M_TM1_M_ANTA 1L_3M_TM1_M_ANTA 1L_5M_TM1_M_ANTA 1L_10M_TM1_M_ANTA 1L_15M_TM1_M_ANTA 1L_20M_TM1_M_ANTA 1G_TM1_M_ANTB 1G_TM2_M_ANTB 1U_TM1_M_ANTB 1L_1.4M_TM1_M_ANTB 1L_3M_TM1_M_ANTB 1L_5M_TM1_M_ANTB 1L_10M_TM1_M_ANTB 1L_15M_TM1_M_ANTB 1L_20M_TM1_M_ANTB
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
	EUT Conf.	1G_TM1_M_ANTA 1G_TM2_M_ANTA 1U_TM1_M_ANTA 1L_1.4M_TM1_M_ANTA 1L_3M_TM1_M_ANTA 1L_5M_TM1_M_ANTA 1L_10M_TM1_M_ANTA 1L_15M_TM1_M_ANTA 1L_20M_TM1_M_ANTA 1G_TM1_M_ANTB 1G_TM2_M_ANTB 1U_TM1_M_ANTB 1L_1.4M_TM1_M_ANTB 1L_3M_TM1_M_ANTB 1L_5M_TM1_M_ANTB 1L_10M_TM1_M_ANTB 1L_15M_TM1_M_ANTB 1L_20M_TM1_M_ANTB	
Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	EUT Conf.	1G_TM1_M_ANTA	



Test Case		Test Conditions	
			1G_TM2_M_ANTA 1U_TM1_M_ANTA 1L_1.4M_TM1_M_ANTA 1L_3M_TM1_M_ANTA 1L_5M_TM1_M_ANTA 1L_10M_TM1_M_ANTA 1L_15M_TM1_M_ANTA 1L_20M_TM1_M_ANTA 1G_TM1_M_ANTB 1G_TM2_M_ANTB 1U_TM1_M_ANTB 1L_1.4M_TM1_M_ANTB 1L_3M_TM1_M_ANTB 1L_5M_TM1_M_ANTB 1L_10M_TM1_M_ANTB 1L_15M_TM1_M_ANTB 1L_20M_TM1_M_ANTB
Band Edges Compliance / Emission Mask	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	EUT Conf.	1G_TM1_B_ANTA, 1G_TM1_T_ANTA, 1G_TM2_B_ANTA, 1G_TM2_T_ANTA, 4G_TM1_M_ANTA, 1U_TM1_B_ANTA, 1U_TM1_T_ANTA, 4U_TM1_M_ANTA, 1L_1.4M_TM1_B_ANTA, 1L_1.4M_TM1_T_ANTA, 1L_3M_TM1_B_ANTA, 1L_3M_TM1_T_ANTA, 1L_5M_TM1_B_ANTA, 1L_5M_TM1_T_ANTA, 1L_10M_TM1_B_ANTA, 1L_10M_TM1_T_ANTA, 1L_15M_TM1_B_ANTA, 1L_15M_TM1_T_ANTA, 1L_20M_TM1_B_ANTA, 1L_20M_TM1_T_ANTA, 2L_5M_TM1_M_ANTA, 2G2U_TM1_M_ANTA, 2G2L_TM1_M_ANTA, 4U1L_TM1_M_ANTA, 1G_TM1_B_ANTB, 1G_TM1_T_ANTB, 1G_TM2_B_ANTB, 1G_TM2_T_ANTB, 8G_TM1_M_ANTB, 1U_TM1_B_ANTB, 1U_TM1_T_ANTB, 4U_TM1_M_ANTB, 1L_1.4M_TM1_B_ANTB, 1L_1.4M_TM1_T_ANTB, 1L_3M_TM1_B_ANTB, 1L_3M_TM1_T_ANTB,	



Test Case	Test Conditions	
		1L_5M_TM1_B_ANTB, 1L_5M_TM1_T_ANTB, 1L_10M_TM1_B_ANTB, 1L_10M_TM1_T_ANTB, 1L_15M_TM1_B_ANTB, 1L_15M_TM1_T_ANTB, 1L_20M_TM1_B_ANTB, 1L_20M_TM1_T_ANTB, 2L_5M_TM1_M_ANTB, 2G2U_TM1_M_ANTB, 2G2L_TM1_M_ANTB, 4U1L_TM1_M_ANTB,
Spurious Emission at Antenna Terminals	Test Type	<input checked="" type="checkbox"/> Conducted <input type="checkbox"/> 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, 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.	1G_TM1_B_ANTA, 1G_TM1_M_ANTA, 1G_TM1_T_ANTA, 1G_TM2_B_ANTA, 1G_TM2_M_ANTA, 1G_TM2_T_ANTA, 4G_TM1_M_ANTA, 1U_TM1_B_ANTA, 1U_TM1_M_ANTA, 1U_TM1_T_ANTA, 4U_TM1_M_ANTA, 1L_1.4M_TM1_B_ANTA, 1L_1.4M_TM1_M_ANTA, 1L_1.4M_TM1_T_ANTA, 1L_3M_TM1_B_ANTA, 1L_3M_TM1_M_ANTA, 1L_3M_TM1_T_ANTA, 1L_5M_TM1_B_ANTA, 1L_5M_TM1_M_ANTA, 1L_5M_TM1_T_ANTA, 1L_10M_TM1_B_ANTA, 1L_10M_TM1_M_ANTA, 1L_10M_TM1_T_ANTA, 1L_15M_TM1_B_ANTA, 1L_15M_TM1_M_ANTA, 1L_15M_TM1_T_ANTA, 1L_20M_TM1_B_ANTA, 1L_20M_TM1_M_ANTA, 1L_20M_TM1_T_ANTA, 2L_5M_TM1_M_ANTA, 2G2U_TM1_M_ANTA, 2G2L_TM1_M_ANTA, 4U1L_TM1_M_ANTA, 1G_TM1_B_ANTB, 1G_TM1_M_ANTB, 1G_TM1_T_ANTB, 1G_TM2_B_ANTB, 1G_TM2_M_ANTB, 1G_TM2_T_ANTB, 4G_TM1_M_ANTB, 8G_TM1_M_ANTB, 1U_TM1_B_ANTB, 1U_TM1_M_ANTB, 1U_TM1_T_ANTB, 4U_TM1_M_ANTB,



Test Case		Test Conditions	
		1L_1.4M_TM1_B_ANTB, 1L_1.4M_TM1_M_ANTB, 1L_1.4M_TM1_T_ANTB, 1L_3M_TM1_B_ANTB, 1L_3M_TM1_M_ANTB, 1L_3M_TM1_T_ANTB, 1L_5M_TM1_B_ANTB, 1L_5M_TM1_M_ANTB, 1L_5M_TM1_T_ANTB, 1L_10M_TM1_B_ANTB, 1L_10M_TM1_M_ANTB, 1L_10M_TM1_T_ANTB, 1L_15M_TM1_B_ANTB, 1L_15M_TM1_M_ANTB, 1L_15M_TM1_T_ANTB, 1L_20M_TM1_B_ANTB, 1L_20M_TM1_M_ANTB, 1L_20M_TM1_T_ANTB, 2L_5M_TM1_M_ANTB, 2G2U_TM1_M_ANTB, 2G2L_TM1_M_ANTB, 4U1L_TM1_M_ANTB,	
Field Strength of Spurious Radiation / Radiated Spurious Emissions		Test Type	<input type="checkbox"/> Field Strength of Spurious Radiation <input checked="" type="checkbox"/> 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.	1G_TM1_M_ANTA & 1G_TM1_M_ANTB_1 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_M_ANTA



Test Case		Test Conditions	
			NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the standards/rules.
Frequency Range	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 2	
	EUT Conf.	---	
Receiver Spurious Emissions	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	EUT Conf.	1G_TM1_M_ANTA 1U_TM1_M_ANTA 1L_5M_TM1_M_ANTA 1G_TM1_M_ANTB 1U_TM1_M_ANTB 1L_5M_TM1_M_ANTB	



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 & 2				
Spectrum Analyzer	Agilent	N9020A	MY51240619	2015-02-18
Spectrum Analyzer	R&S	FSQ40	100025	2015-10-27
Test Setup 3				
EMI test receiver	Agilent	N9038A	MY52260169	2014-12-01
Spectrum analyser	Agilent	N9010A	MY52220816	2015-03-17
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



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 [dB μ V/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