

RF Test Report

Product Name: pico Remote Radio Unit

Product Model: pRRU3901 PCS+2.6G

Report Number: SYBH(R)01870933EB-1

FCC ID: QISPRU01P2G6

IC: 6369A-PRU01P2G6

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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).
 - 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.
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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: pico Remote Radio Unit
Product Model: pRRU3901 PCS+2.6G

Date of Receipt Sample: 2014-05-19
Start Date of Test: 2014-05-19
End Date of Test: 2015-06-30

Test Result: Pass

Approved by Senior Engineer:	2015-06-30	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

Prepared by:	2015-06-30	Hu Wei	<i>Hu Wei</i>
	Date	Name	Signature



Modification Record

No.	Last Report No.	Modification Description
1	---	First report. For the PCS band, the hardware is the same as pRU01-B02, in addition to the updated 2U configuration, the other data is completely quoted from the previous report No SYBH(R)01601078EB-3.



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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2 (10-1-14 Edition)
47 CFR FCC Part 24 (10-1-14 Edition)
47 CFR FCC Part 27 (10-1-14 Edition)
IC RSS-Gen (Issue 4, November 2014)
IC RSS-133 (Issue 6, January 2013)
IC RSS-199 (Issue 2, October 2014)

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: 21 to 24 °C (Ambient)
Relative Humidity: 60 to 72 % (Ambient)
Atmospheric Pressure: Not applicable



2 Test Summary

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

2.1.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Transmitter Output Power	§2.1046, §24.232	RSS-Gen,§6.12; RSS-133,§6.4; RSS-133,§4.1	FCC	Base Station	<ul style="list-style-type: none"> Average EIRP Power \leq 1640 W (for EBW \leq 1 MHz). Average EIRP PD \leq 1640 W/MHz (for EBW $>$ 1 MHz). PAPR \leq 13 dB@0.1%. 	Appendix A1	Pass	TL1
				Mobile Station / Portable Station	<ul style="list-style-type: none"> Average EIRP \leq 2 W. PAPR \leq 13 dB@0.1%. 			
			IC	Base Station	<ul style="list-style-type: none"> Average EIRP Power \leq 1640 W (for ChBW \leq 1 MHz). Average EIRP PD \leq 1640 W/MHz (for ChBW $>$ 1 MHz). Average Conducted Power \leq 100 W. PAPR \leq 13 dB@0.1%. 			
				Mobile Station / Hand-held Portable Station	<ul style="list-style-type: none"> Average EIRP Power \leq 2 W. PAPR \leq 13 dB@0.1%. 			
Bandwidth	§2.1049, §24.238	RSS-Gen,§6.6; RSS-133,§2.3	FCC	<ul style="list-style-type: none"> OBW: No limit. EBW (-26 dBc): No limit. 	Appendix B1	Pass	TL1	
			IC	<ul style="list-style-type: none"> OBW: No limit, may in lieu of EBW (-20 dBc). 				



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location		
			<ul style="list-style-type: none"> EBW (-20 dBc): No limit. 					
Band Edges Compliance	§2.1051, §24.238	RSS-Gen,§6.13; RSS-133,§6.5	FCC	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block. (EBW is -26 dBc EBW)	Appendix C1	Pass	TL1	
			IC	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block. (EBW is -20 dBc EBW, or OBW)				
Spurious Emission at Antenna Terminals	§2.1051, §24.238	RSS-Gen,§6.13; RSS-133,§6.5	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency blocks.	Appendix D1	Pass	TL1		
Field Strength of Spurious Radiation	§2.1053, §24.238	RSS-Gen,§6.13; RSS-133,§6.5	≤ -13 dBm/1 MHz.	Appendix E1	Pass	TL3		
Frequency Stability	§2.1055, §24.235	RSS-Gen,§6.11; RSS-133,§6.3	FCC	<ul style="list-style-type: none"> Test method: Fundamental emissions (Fc_meas) within the authorized frequency block. Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, $\pm 15\% \cdot NV$. 	Appendix F1	Pass	TL1	
			IC	Base Station				<ul style="list-style-type: none"> Test method option #1: (Fc_meas - Fc_meas@20°C&NV) / Fc_meas@20°C&NV $\leq \pm 1.0$ ppm. Test method option#2: EBW (EBW_lower to EBW_higher) within frequency block. Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, $\pm 15\% \cdot NV$. (EBW is -20 dBc EBW, or OBW)
				Mobile Station				<ul style="list-style-type: none"> Test method option #1: (Fc_meas - Fc_meas@20°C&NV) / Fc_meas@20°C&NV $\leq \pm 2.5$ ppm.



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<ul style="list-style-type: none"> Test method option #2: EBW (EBW_lower to EBW_higher) within frequency block. Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV. (EBW is -20 dBc EBW, or OBW) 			
Receiver Spurious Emissions	---	IC NOTICE 2012-DRS0126	---	Appendix G1	---	---
Photos of Test Setups	---	---	---	---	---	---

2.1.2 Non-measurement Technical Requirements

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



2.2 BRS&EBS Band (2496/2500-2690 MHz)

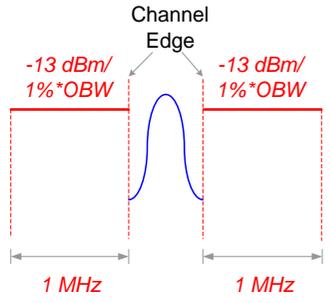
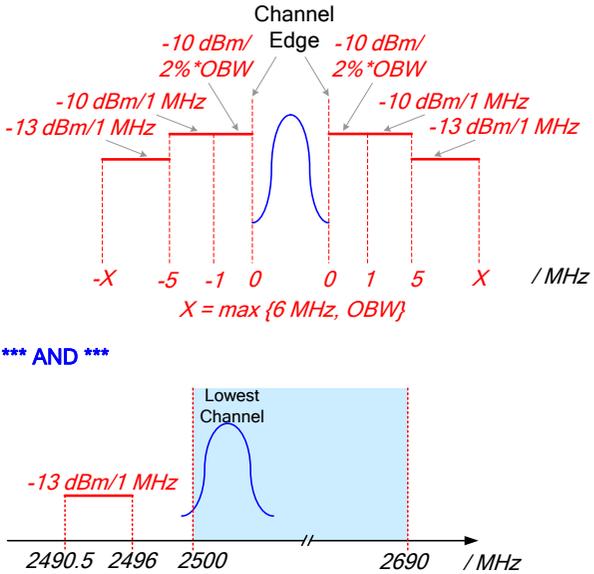
2.2.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Transmitter Output Power	§2.1046, §27.50(h)	RSS-Gen,§6.12; RSS-199,§4.4	FCC	Base Station	EIRP Power $\leq 33 \text{ dBW} + 10 \lg(X/Y) \text{ dBW} + 10 \lg(360/\text{beamwidth}) \text{ dBW}$, where $X=\text{ChBW}(\text{MHz})$, $Y=5.5$ or 6 MHz .	Annex A2	Pass	TL1
				Mobile Subscriber Station	EIRP Power $\leq 2 \text{ W}$.			
				Subscriber Station	Conducted Power $\leq 2 \text{ W}$.			
			IC	Base Station	<ul style="list-style-type: none"> ● HAAT $\leq 300 \text{ m}$: EIRP PD $\leq 1640 \text{ W}/1 \text{ MHz}$. ● HAAT $\leq 2000 \text{ m}$: EIRP PD $\leq 164 \text{ W}/1 \text{ MHz}$. ● Peak detector. 			
				Mobile Subscriber	<ul style="list-style-type: none"> ● EIRP Power $\leq 2 \text{ W}$. ● Peak detector. 			
				Fixed Subscriber	<ul style="list-style-type: none"> ● EIRP Power $\leq 40 \text{ W}$. ● Condt. Power $\leq 2 \text{ W}$. ● Peak detector. 			
Bandwidth	§2.1049, §27.53(m)	RSS-Gen,§6.6	FCC	<ul style="list-style-type: none"> ● OBW: No limit. ● EBW (-26 dBc): No limit. 	Annex B2	Pass	TL1	
			IC	OBW: No limit.				



Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location	
Band Edges Compliance / Emission Mask	§2.1051, §27.53(m)	RSS-Gen, §6.13; RSS-199, §4.6	FCC	Base Station / Fixed Subscriber Station	<p>Channel Edge</p> <p>-13 dBm/ 1%*EBW</p> <p>-13 dBm/ 1%*EBW</p> <p>1 MHz</p> <p>1 MHz</p> <p>(EBW is -26 dBc EBW)</p>	Annex C2	Pass	TL1
				Mobile Station	<p>Channel Edge</p> <p>-13 dBm</p> <p>-13 dBm</p> <p>4.5 MHz 1 MHz 1 MHz 4.5 MHz</p> <p>RBW = 1 MHz RBW ≥ 1%*EBW RBW ≥ 1%*EBW RBW = 1 MHz</p> <p>(EBW is -26 dBc EBW)</p>			



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			IC Base Station and Fixed Subscriber 			
			Mobile Subscriber  <p>Channel Edge -10 dBm/2%*OBW -10 dBm/2%*OBW</p> <p>-10 dBm/1 MHz -10 dBm/1 MHz</p> <p>-13 dBm/1 MHz -13 dBm/1 MHz</p> <p>-X -5 -1 0 0 1 5 X / MHz</p> <p>X = max {6 MHz, OBW}</p> <p>*** AND ***</p> <p>Lowest Channel</p> <p>-13 dBm/1 MHz</p> <p>2490.5 2496 2500 // 2690 / MHz</p>			



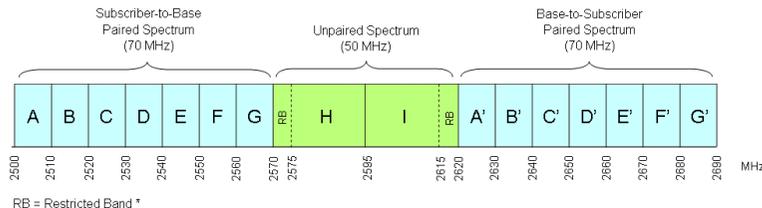
Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location	
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	RSS-Gen, §6.13; RSS-199, §4.6	FCC	Base Station / Fixed Subscriber Station	<p>Channel Edge $-13 \text{ dBm}/1 \text{ MHz}$ $-13 \text{ dBm}/1 \text{ MHz}$ 9 kHz 1 MHz 1 MHz 10th harmonics</p>	Annex D2	Pass	TL1
				Mobile Station	<p>Channel Edge $-25 \text{ dBm}/1 \text{ MHz}$ $-25 \text{ dBm}/1 \text{ MHz}$ 9 kHz 5.5 MHz 5.5 MHz 10th harmonics</p>			
			IC	Base Station and Fixed Subscriber	<p>Channel Edge $-13 \text{ dBm}/1 \text{ MHz}$ $-13 \text{ dBm}/1 \text{ MHz}$ 9 kHz 1 MHz 1 MHz 10th harmonics (Peak detector)</p>			



Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location
			Mobile Subscriber	<p>Channel Edge</p> <p>-25 dBm/1 MHz</p> <p>9 kHz -X 0 0 X 10th harmonics</p> <p>$X = \max \{6 \text{ MHz}, \text{OBW}\}$</p> <p>*** AND ***</p> <p>Lowest Channel</p> <p>-25 dBm/1 MHz</p> <p>9 kHz 2490.5 2500 2690 / MHz</p> <p>(Peak detector)</p>			
Field Strength of Spurious Radiation / Radiated Spurious Emissions	§2.1053, §27.53(m)	RSS-Gen,§6.13; RSS-199,§4.6	Refer to requiremnts of "Spurious Emission at Antenna Terminals". (ERP level)		Annex E2	Pass	TL3
Frequency Stability	§2.1055, §27.54	RSS-Gen,§6.11; RSS-199,§4.3	FCC	<ul style="list-style-type: none"> 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 F2	Pass	TL1
			IC	<p>Base Station and Fixed Subscriber Equipment</p> <ul style="list-style-type: none"> Step 1: f(offset): no limit. Step 2: fL – f(offset) > 2500 MHz, fH + f(offset) < 2690 MHz. 			

Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"></div> <div style="width: 45%;"> <p>2500 MHz 2690 MHz</p> <p>Lowest Channel Highest Channel</p> <p>-13 dBm/ 1%*OBW</p> <p>f_L f_H</p> <ul style="list-style-type: none"> ● Test conditions for Step 1: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV. ● Test conditions for Step 2: NTN. </div> </div>			
			<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Mobile Subscriber Equipment</p> <ul style="list-style-type: none"> ● Step 1: f(offset): no limit. ● Step 2: $f_L - f(\text{offset}) > 2500 \text{ MHz}$, $f_H + f(\text{offset}) < 2690 \text{ MHz}$. </div> <div style="width: 45%;"> <p>2500 MHz 2690 MHz</p> <p>Lowest Channel Highest Channel</p> <p>-10 dBm/ 2%*OBW</p> <p>f_L f_H</p> <ul style="list-style-type: none"> ● Test conditions for Step 1: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV. ● Test conditions for Step 2: NTN. </div> </div>			
Receiver Spurious Emissions	---	RSS-Gen,§5; RSS-Gen,§7;	---	Annex G2	---	---

2.2.2 Non-measurement Technical Requirements

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
Frequency Plan	§27.5(i)	RSS-199,§2.2; SRSP-517	FCC 2496-2690 MHz. IC 2500-2690 MHz. 	See technical specification description.	Comply
Modulation Characteristics	§2.1047	RSS-199,§4.1	Digital modulation.	See technical specification description.	Comply
Channel Bandwidth	---	RSS-199,§4.2	ChBW ≥ 1 MHz.	See technical specification description.	Comply
Equipment with Multiple Antennas	---	RSS-199,§4.5	Multiple Antennas EIRP: (1) Correlated transmission: Aggregate power + Gmax + 10 log10 N; (2) 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 pRRU3901 PCS+2.6G is the indoor remote radio unit. which is the elements of LampSite indoor coverage network solutions, need to be used with the BBU and RHUB3908, using for support buildings scenes indoor coverage, a product at the Operators layer launched by Huawei Technologies Co., Ltd., It is the RF module of the distributed eNodeB and is installed close to the antenna. The pRRU3901 PCS+2.6G performs modulation, demodulation, data processing, and combination and division of baseband signals and RF signals.

3.2 EUT Identity

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

3.2.1 Board

Board		
Board Name	Hardware Version	Description
WD6MLPRA270	Ver.B	Manufactured Board,pRU01, WD6MLPRA270,LTE FDD 2.6G Radio Board,2T2R,2*100mW
WD6MIPRA220	Ver.B	Manufactured Board,pRU01, WD6MIPRA220,Multi-Mode 1.9G Radio Board,2T2R,200mW
WD6MXRUIBC	Ver.B	Manufactured Board, pRRU 3901, WD6MXRUIBC,pRRU Interface Board

3.2.2 Sub-Assembly

Sub-Assembly		
Sub-Assembly Name	Manufacturer	Description
RHUB	HUAWEI	RRU combiner&powered by POE
LBBP	HUAWEI	BaseBand Processing Unit
UMPT	HUAWEI	Processing &Transmission Unit



3.3 Technical Specification

3.3.1 PCS Band

Characteristics	Description
Radio System Type	Single Radio <input type="checkbox"/> GSM Access Technology <input checked="" 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 checked="" type="checkbox"/> UMTS & LTE <input type="checkbox"/> WiMAX & LTE <input type="checkbox"/> CDMA & LTE
Equipment Type	#1 <input checked="" type="checkbox"/> Base Station <input type="checkbox"/> CPE (Customer Premises Equipment) Station <input type="checkbox"/> Subscriber Station (User Equipment) #2 <input checked="" type="checkbox"/> Fixed Station <input type="checkbox"/> Mobile Station <input type="checkbox"/> Portable Station #3 <input checked="" type="checkbox"/> Indoor Station <input type="checkbox"/> Outdoor Station
Supported Frequency Range	Transmission (TX): 1930 to 1990 MHz Receiving (RX): 1850 to 1910 MHz
TX and RX Antenna Ports	TX & RX port: 1(for UMTS), 2(for LTE) TX-only port: 0 RX-only port: 1(for UMTS), 0(for LTE)
Multiple Carrier Supported	2
Maximum RF Bandwidth	20 MHz
TX Output Power	Max. 200 mW
Supported Channel Bandwidth	GSM system: <input type="checkbox"/> 200 kHz UMTS system: <input checked="" type="checkbox"/> 5 MHz LTE system: <input type="checkbox"/> 1.4 MHz, <input type="checkbox"/> 3 MHz, <input checked="" type="checkbox"/> 5 MHz, <input checked="" type="checkbox"/> 10 MHz, <input checked="" type="checkbox"/> 15 MHz, <input checked="" type="checkbox"/> 20 MHz 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: Not applicable UMTS system: Base-band: QPSK, 16QAM, 64QAM Carrier: CDMA LTE system: Base-band: QPSK, 16QAM, 64QAM Carrier: OFDM/OFDMA CDMA system: Not applicable



Characteristics	Description
	WiMAX system: Not applicable
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: Not applicable UMTS system: 4M18F9W LTE system: 4M50D9W, 8M98D9W, 13M5D9W, 17M9D9W CDMA system: Not applicable WiMAX system: Not applicable
Power Supply	Power Supply Type: <input type="checkbox"/> External AC mains, <input type="checkbox"/> External DC mains, <input type="checkbox"/> AC/DC Adapter, <input checked="" type="checkbox"/> Powered over Ethernet (PoE) Nominal Voltage, Input to EUT: PoE power supply: -48 VDC Voltage Range, Input to EUT: PoE power supply: -36VDC to -60VDC
Antenna Assembles	Antenna Type: <input type="checkbox"/> External <input checked="" type="checkbox"/> Integrated Smart Antenna: <input checked="" type="checkbox"/> MIMO(for LTE) <input checked="" type="checkbox"/> Non MIMO(for UMTS) Antenna Gain: 4 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 BRS&EBS Band

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 Radio <input type="checkbox"/> GSM & UMTS (MSR): <input type="checkbox"/> GSM & LTE <input type="checkbox"/> GSM & UMTS & LTE <input type="checkbox"/> UMTS & LTE <input type="checkbox"/> WiMAX & LTE <input type="checkbox"/> CDMA & LTE
Equipment Type	#1 <input checked="" type="checkbox"/> Base Station <input type="checkbox"/> CPE (Customer Premises Equipment) Station <input type="checkbox"/> Subscriber Station (User Equipment)



Characteristics	Description
	#2 <input checked="" type="checkbox"/> Fixed Station <input type="checkbox"/> Mobile Station <input type="checkbox"/> Portable Station #3 <input checked="" type="checkbox"/> Indoor Station <input type="checkbox"/> Outdoor Station
Supported Frequency Range	Transmission (TX): 2620 to 2690 MHz Receiving (RX): 2500 to 2570 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	20 MHz
TX Output Power	Max. 200 mW
Supported Channel Bandwidth	GSM system: <input type="checkbox"/> 200 kHz UMTS system: <input type="checkbox"/> 5 MHz LTE system: <input type="checkbox"/> 1.4 MHz, <input type="checkbox"/> 3 MHz, <input checked="" type="checkbox"/> 5 MHz, <input checked="" type="checkbox"/> 10 MHz, <input checked="" type="checkbox"/> 15 MHz, <input checked="" type="checkbox"/> 20 MHz 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: Not applicable UMTS system: Not applicable LTE system: Base-band: QPSK, 16QAM, 64QAM Carrier: OFDM/OFDMA CDMA system: Not applicable WiMAX system: Not applicable
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: Not applicable UMTS system: Not applicable LTE system: 4M51D9W, 9M05D9W, 13M5D9W, 17M9D9W CDMA system: Not applicable WiMAX system: Not applicable
Power Supply	Power Supply Type: <input type="checkbox"/> External AC mains, <input type="checkbox"/> External DC mains, <input type="checkbox"/> AC/DC Adapter, <input checked="" type="checkbox"/> Powered over Ethernet (PoE) Nominal Voltage, Input to EUT: PoE power supply: -48 VDC Voltage Range, Input to EUT: PoE power supply: -36VDC to -60VDC
Antenna Assembles	Antenna Type: <input type="checkbox"/> External <input checked="" type="checkbox"/> Integrated Smart Antenna: <input checked="" type="checkbox"/> MIMO



Characteristics	Description
	<input type="checkbox"/> Non MIMO Antenna Gain: 4 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, and these test mode(s) reflect the worst case scenario.

Test Mode	Test Modes Description
UMTS/TM1	UMTS system, 3GPP TS 25.141 clause 6.1.1, Test Model 1, QPSK modulation
LTE/TM1.1	LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.1
UL/TM1	MSR system, 3GPP TS 37.141 clause 4.9.2 (UMTS/TM1; LTE/TM1.1)



4.2 EUT Configurations

4.2.1 General Configurations

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

4.2.2.1 PCS Band

EUT Conf.	RF Ch	RX Freq. [MHz]	TX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
5M_B	B	1852.5	1932.5	5	20@Ant 1,2	LTE/TM1.1
5M_M	M	1880	1960	5	20@Ant 1,2	LTE/TM1.1
5M_T	T	1907.5	1987.5	5	20@Ant 1,2	LTE/TM1.1
10M_B	B	1855	1935	10	20@Ant 1,2	LTE/TM1.1
10M_M	M	1880	1960	10	20@Ant 1,2	LTE/TM1.1
10M_T	T	1905	1985	10	20@Ant 1,2	LTE/TM1.1
15M_B	B	1857.5	1937.5	15	20@Ant 1,2	LTE/TM1.1
15M_M	M	1880	1960	15	20@Ant 1,2	LTE/TM1.1
15M_T	T	1902.5	1982.5	15	20@Ant 1,2	LTE/TM1.1
20M_B	B	1860	1940	20	20@Ant 1,2	LTE/TM1.1
20M_M	M	1880	1960	20	20@Ant 1,2	LTE/TM1.1
20M_T	T	1900	1980	20	20@Ant 1,2	LTE/TM1.1
1U_B	B	1852.4	1932.4	5	23@Ant 1	UMTS/TM1
1U_M	M	1880	1960	5	23@Ant 1	UMTS/TM1
1U_T	T	1907.6	1987.6	5	23@Ant 1	UMTS/TM1
2U_B	B	1852.4,1857.4	1932.4,1937.4	5,5	19,19@Ant 1	UMTS/TM1
2U_M	M	1880,1885	1960,1965	5,5	19,19@Ant 1	UMTS/TM1
2U_T	T	1902.6,1907.6	1982.6,1987.6	5,5	19,19@Ant 1	UMTS/TM1
1U1L5M_B	B	1852.4, 1857.4	1932.4,1937.4	5,5	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L5M_M	M	1880, 1885	1960,1965	5,5	17,17@Ant 1; 17@Ant 2	UL/TM1



EUT Conf.	RF Ch	RX Freq. [MHz]	TX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1U1L5M_T	T	1902.6, 1907.6	1982.6,1987.6	5,5	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L10M_B	B	1852.4, 1859.9	1932.4, 1939.9	5,10	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L10M_M	M	1880, 1887.5	1960,1967.5	5,10	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L10M_T	T	1900.1, 1907.6	1980.1,1987.6	10,5	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L15M_B	B	1852.4, 1862.4	1932.4,1942.4	5,15	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L15M_M	M	1880, 1890	1960,1970	5,15	17,17@Ant 1; 17@Ant 2	UL/TM1
1U1L15M_T	T	1897.6, 1907.6	1977.6,1987.6	15,5	17,17@Ant 1; 17@Ant 2	UL/TM1

4.2.2.2 BRS&EBS Band

EUT Conf.	RF Ch	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
5M_B	B	2622.5	2502.5	5	20@Ant 1,2	LTE/TM1.1
5M_M	M	2655	2535	5	20@Ant 1,2	LTE/TM1.1
5M_T	T	2687.5	2567.5	5	20@Ant 1,2	LTE/TM1.1
10M_B	B	2625	2505	10	20@Ant 1,2	LTE/TM1.1
10M_M	M	2655	2535	10	20@Ant 1,2	LTE/TM1.1
10M_T	T	2685	2565	10	20@Ant 1,2	LTE/TM1.1
15M_B	B	2627.5	2507.5	15	20@Ant 1,2	LTE/TM1.1
15M_M	M	2655	2535	15	20@Ant 1,2	LTE/TM1.1
15M_T	T	2682.5	2562.5	15	20@Ant 1,2	LTE/TM1.1
20M_B	B	2630	2510	20	20@Ant 1,2	LTE/TM1.1
20M_M	M	2655	2535	20	20@Ant 1,2	LTE/TM1.1
20M_T	T	2680	2560	20	20@Ant 1,2	LTE/TM1.1

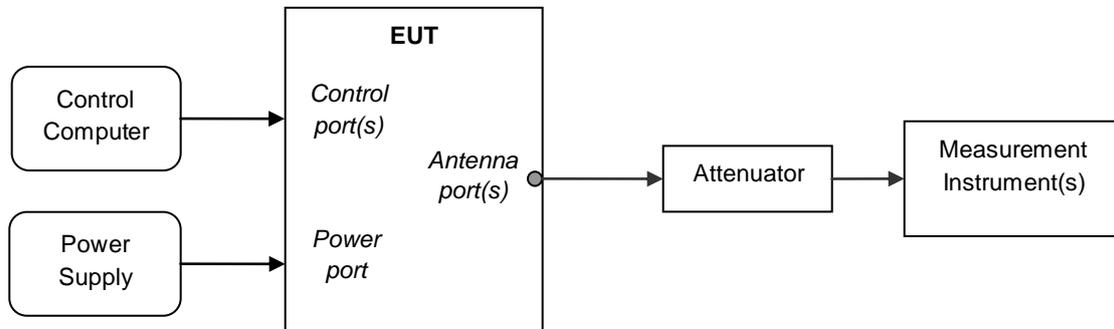


4.3 Test Environments

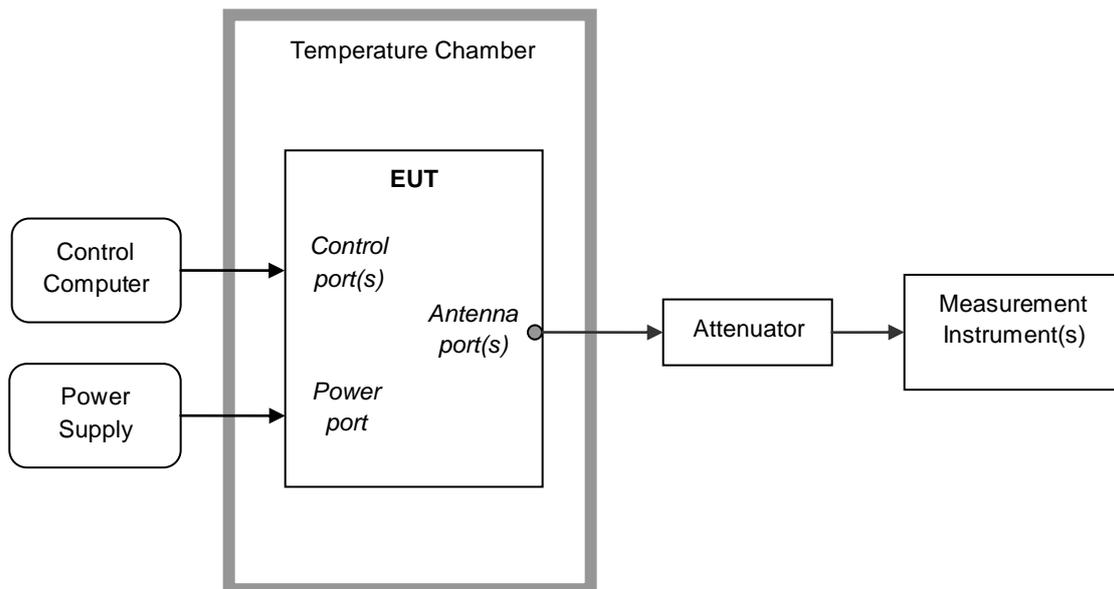
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

4.4 Test Setups

4.4.1 Test Setup 1



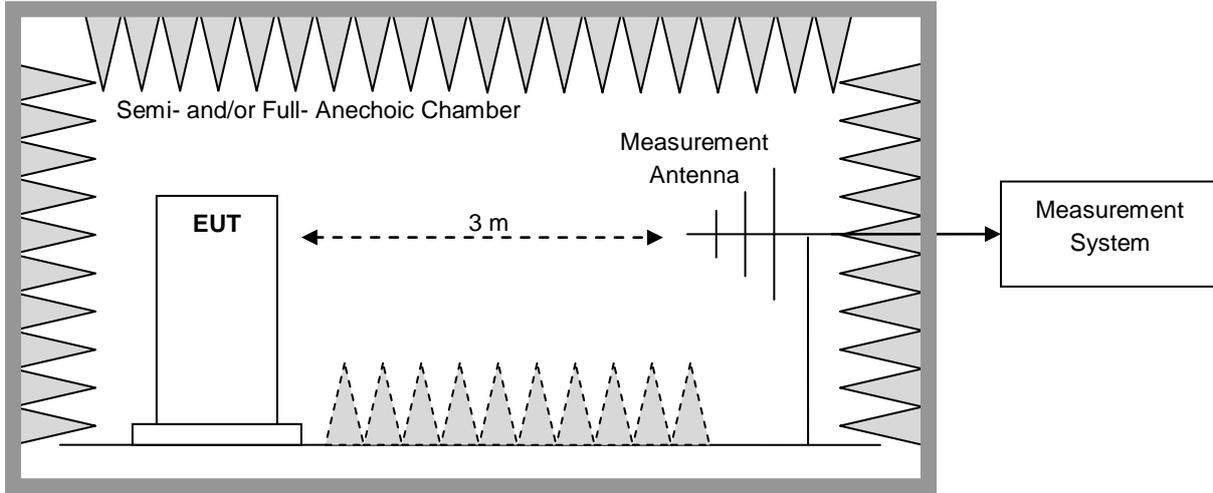
4.4.2 Test Setup 2



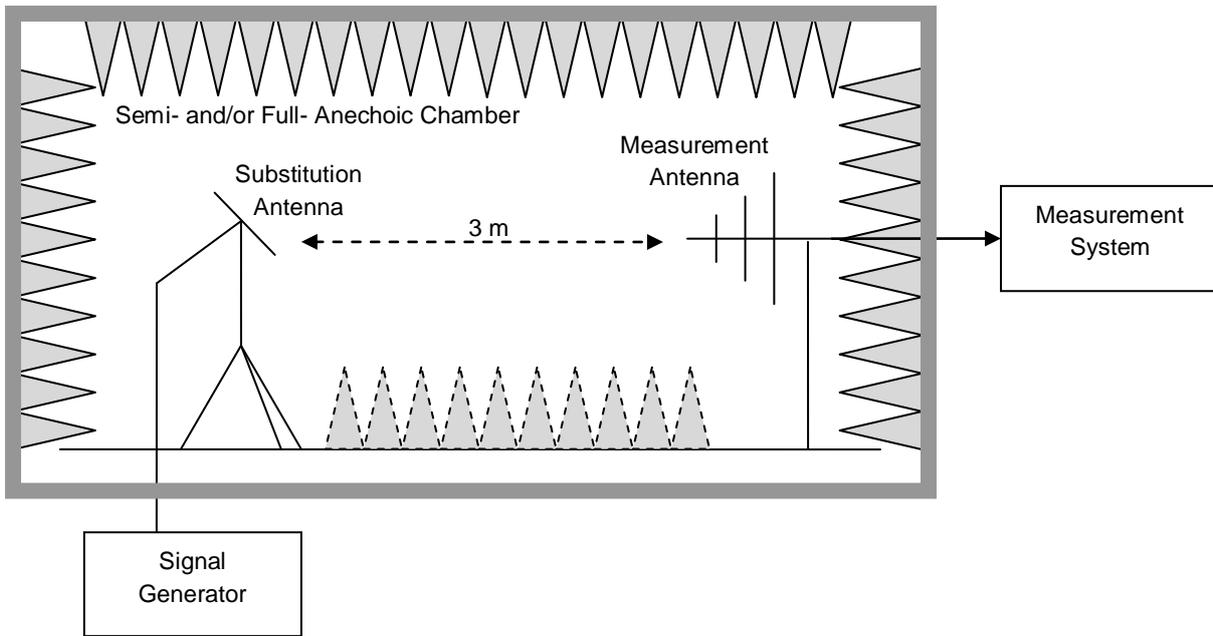
4.4.3 Test Setup 3

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

4.5.1 PCS Band

Test Case		Test Conditions	
Transmitter Output Power	Channel Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T 1U_B,1U_M,1U_T 2U_B,2U_M,2U_T 1U1L5M_B, 1U1L5M_M, 1U1L5M_T 1U1L10M_B, 1U1L10M_M, 1U1L10M_T 1U1L15M_B, 1U1L15M_M, 1U1L15M_T
	Power Spectral Density	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 1U_B,1U_M,1U_T
	Peak-to-Average Ratio	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 1U_B,1U_M,1U_T
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T 1U_B,1U_M,1U_T
	Emission Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T 1U_B,1U_M,1U_T
Band Edges Compliance	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Setup 1	
	EUT Conf.	5M_B,5M_T 20M_B,20M_T 1U_B,1U_T 2U_B,2U_T	



Test Case		Test Conditions		
Spurious Emission at Antenna Terminals	Test Env.	Ambient Climate & Rated Voltage		
	Test Setup	Test Setup 1		
	EUT Conf.	5M_B,5M_M,5M_T 1U_B,1U_M,1U_T 2U_B,2U_M,2U_T 1U1L5M_B, 1U1L5M_M, 1U1L5M_T		
Field Strength of Spurious Radiation	Test Env.	Ambient Climate & Rated Voltage		
	Test Setup	Test Setup 3		
	EUT Conf.	1U_M (Worst case) 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 Setup 2	
		EUT Conf.	5M_M NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the standards/rules.	
	Frequency Range (if required)	Test Env.	Ambient Climate & Rated Voltage	
		Test Setup	Test Setup 2	
		EUT Conf.	Not applicable	
Receiver Spurious Emissions	Test Env.	Ambient Climate & Rated Voltage		
	Test Setup	Test Setup 1		
	EUT Conf.	Not applicable		

4.5.2 BRS&EBS Band

Test Case		Test Conditions		
Transmitter Output Power	Channel Power, Total	Test Env.	Ambient Climate & Rated Voltage	
		Test Setup	Test Setup 1	
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T	
	Power Spectral Density	Test Env.	Ambient Climate & Rated Voltage	
		Test Setup	Test Setup 1	
		EUT Conf.	5M_B,5M_M,5M_T	
	Peak-to-Average Ratio	Test Env.	Ambient Climate & Rated Voltage	
		Test Setup	Test Setup 1	
		EUT Conf.	Not applicable	



Test Case		Test Conditions	
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T
	Emission Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 10M_B,10M_M,10M_T 15M_B,15M_M,15M_T 20M_B,20M_M,20M_T
Band Edges Compliance		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_T 20M_B,20M_T
Spurious Emission at Antenna Terminals		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	5M_B,5M_M,5M_T 20M_B,20M_M,20M_T
Field Strength of Spurious Radiation		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 3
		EUT Conf.	5M_M (Worst case) 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 Setup 2
		EUT Conf.	5M_M NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the standards/rules.
	Frequency Range (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 2
		EUT Conf.	5M_B, 5M_T
Receiver Spurious Emissions		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	Not applicable



5 Main Test Instruments

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

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1 & 2				
Spectrum Analyzer	R&S	FSQ40	100025	2016-03-17
Spectrum Analyzer	R&S	FSQ26	200941	2016-04-20
Spectrum Analyzer	Agilent	E4440A	MY49420179	2016-03-24
Spectrum Analyzer	Agilent	N9020A	MY51240619	2016-03-25
Vector Signal Generator	Agilent	E8257D	MY49281095	2015-11-03
Power supply	Chroma	6530	653000008611	2016-10-20
Temperature Chamber	ESPEC	EW0470S	12113066	2015-10-20
Test Setup 3				
EMI Test receiver	Agilent	N9038A	MY52260169	2015-11-23
Spectrum analyser	Agilent	N9010A	MY52220816	2016-03-15
Bilog Antenna	TESQ	CBL 6112D	35238	2015-12-01
Horn Antenna	SWARZBECK	BBHA 9120D	1077	2015-12-01
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	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