

# RF Test Report

**Product Name: pico Remote Radio Unit**

**Product Model: pRRU3901 850+PCS**

**Report Number: SYBH(R)02089455EB-1**

**FCC ID: QISPRRU3901B2B5**

**IC: 6369A-PRU3901B2B5**

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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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7. The test report is only valid for the test samples.
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**Applicant:** Huawei Technologies Co., Ltd.  
**Address:** Administration Building, Headquarters of Huawei Technologies Co., Ltd.,  
 Bantian, Longgang District, Shenzhen, 518129, P.R.C  
**Product Name:** pRRU Multi-Mode Radio Unit  
**Product Model:** pRRU3901 850+PCS

	For SYBH(R)01601078	For SYBH(R)02089455
<b>Date of Receipt Sample:</b>	2014-05-19	2015-11-11
<b>Start Date of Test:</b>	2014-05-19	2015-11-11
<b>End Date of Test:</b>	2014-12-19	2015-11-25

**Test Result:** Pass

<b>Approved by Senior Engineer:</b>	2015-12-11	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

<b>Prepared by:</b>	2015-12-11	Hu Wei	<i>Hu Wei</i>
	Date	Name	Signature



### Modification Record

No.	Last Report No.	Modification Description
1	---	First report. The hardware of the PCS Band for pRRU3901 850+PCS is the same with pRU01-B02(FCC ID: QISPRU01B02; IC ID: 6369A-PRU01B02), so the test data is just quoted from the report SYBH(R)01601078EB-3 of pRU01-B02, and only the config of 2U is changed which is retested. The Cellular Band is new tested, and the test number is SYBH(R)02089455.



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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 22 (10-1-14 Edition) 47 CFR FCC Part 24 (10-1-14 Edition) IC RSS-Gen (Issue 4, November 2014) IC RSS-132 (Issue 3, January 2013) IC RSS-133 (Issue 6, January 2013)
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:	21 to 28 °C (Ambient)
Relative Humidity:	53 to 72 % (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 A1	Pass	TL1
				Mobile Station	ERP Power ≤ 7 W.			
			IC	Base Station	<ul style="list-style-type: none"> <li>● Average EIRP Power ≤ 820 W.</li> <li>● PAPR ≤ 13 dB@0.1%.</li> </ul>			
				Mobile Station	<ul style="list-style-type: none"> <li>● Average EIRP Power ≤ 11.5 W.</li> <li>● PAPR ≤ 13 dB@0.1%.</li> </ul>			
Bandwidth	§2.1049, §22.917	RSS-Gen,§6.6	FCC	<ul style="list-style-type: none"> <li>● OBW: No limit.</li> <li>● EBW (-26 dBc): No limit.</li> </ul>	Annex B1	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 C1	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 <sup>th</sup> harmonics but outside authorized operating frequency ranges/sub-bands.		Annex D1	Pass	TL1	
Field Strength of Spurious Radiation / Radiated Spurious Emissions	§2.1053, §22.917	RSS-Gen,§6.13; RSS-132,§5.5	≤ -13 dBm/100 kHz.		Annex E1	Pass	TL3	



Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Frequency Stability	§2.1055, §22.355	RSS-Gen,§6.11; RSS-132,§5.3	FCC	Base Station	<ul style="list-style-type: none"> <li>Test method: <math>(F_{c\_meas} - F_{c\_rated}) / F_{c\_rated} \leq \pm 1.5 \text{ ppm}</math>.</li> <li>Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, <math>\pm 15\% * NV</math>.</li> </ul>	Annex F1	Pass	TL1
				Mobile Station	<ul style="list-style-type: none"> <li>Test method: <math>(F_{c\_meas} - F_{c\_rated}) / F_{c\_rated} \leq \pm 2.5 \text{ ppm}</math>.</li> <li>Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, <math>\pm 15\% * NV</math>.</li> </ul>			
			IC	Base Station	<ul style="list-style-type: none"> <li>Test method option #1: <math>(F_{c\_meas} - F_{c\_meas@20^\circ\text{C}\&amp;NV}) / F_{c\_meas@20^\circ\text{C}\&amp;NV} \leq \pm 1.5 \text{ ppm}</math>.</li> <li>Test method option#2: OBW (OBW_lower to OBW_higher) within each sub-band.</li> <li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, <math>\pm 15\% * NV</math>.</li> </ul>			
				Mobile Station	<ul style="list-style-type: none"> <li>Test method option #1: <math>(F_{c\_meas} - F_{c\_meas@20^\circ\text{C}\&amp;NV}) / F_{c\_meas@20^\circ\text{C}\&amp;NV} \leq \pm 2.5 \text{ ppm}</math>.</li> <li>Test method option #2: OBW (OBW_lower to OBW_higher) within each sub-band.</li> <li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, <math>\pm 15\% * NV</math>.</li> </ul>			
Receiver Spurious Emissions	---	RSS-Gen,§5; RSS-Gen,§7;	<ul style="list-style-type: none"> <li>Radiated limit: RSS-Gen, §6.1 field strength limit.</li> <li>Conducted limit: <math>\leq -57 \text{ dBm}/120 \text{ kHz}</math> (CISPR-QP), from 30 MHz to 1000 MHz,</li> </ul>			Annex G1	---	---



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
(Note 1, 2)		RSS-132,§5.6	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



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

### 2.2.1 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"> <li>Average EIRP Power <math>\leq 1640</math> W (for EBW <math>\leq 1</math> MHz).</li> <li>Average EIRP PD <math>\leq 1640</math> W/MHz (for EBW <math>&gt; 1</math> MHz).</li> <li>PAPR <math>\leq 13</math> dB@0.1%.</li> </ul>	Appendix A2	Pass	TL1
				Mobile Station / Portable Station	<ul style="list-style-type: none"> <li>Average EIRP <math>\leq 2</math> W.</li> <li>PAPR <math>\leq 13</math> dB@0.1%.</li> </ul>			
			IC	Base Station	<ul style="list-style-type: none"> <li>Average EIRP Power <math>\leq 1640</math> W (for ChBW <math>\leq 1</math> MHz).</li> <li>Average EIRP PD <math>\leq 1640</math> W/MHz (for ChBW <math>&gt; 1</math> MHz).</li> <li>Average Conducted Power <math>\leq 100</math> W.</li> <li>PAPR <math>\leq 13</math> dB@0.1%.</li> </ul>			
				Mobile Station / Hand-held Portable Station	<ul style="list-style-type: none"> <li>Average EIRP Power <math>\leq 2</math> W.</li> <li>PAPR <math>\leq 13</math> dB@0.1%.</li> </ul>			
Bandwidth	§2.1049, §24.238	RSS-Gen,§6.6; RSS-133,§2.3	FCC	<ul style="list-style-type: none"> <li>OBW: No limit.</li> <li>EBW (-26 dBc): No limit.</li> </ul>	Appendix B2	Pass	TL1	
			IC	<ul style="list-style-type: none"> <li>OBW: No limit, may in lieu of EBW (-20 dBc).</li> <li>EBW (-20 dBc): No limit.</li> </ul>				
Band Edges	§2.1051,	RSS-Gen,§6.13;	FCC	$\leq -13$ dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the		Appendix	Pass	TL1



Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location	
Compliance	§24.238	RSS-133,§6.5		frequency block. (EBW is -26 dBc EBW)	C2			
			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 <sup>th</sup> harmonics but outside authorized operating frequency blocks.		Appendix D2	Pass	TL1	
Field Strength of Spurious Radiation	§2.1053, §24.238	RSS-Gen,§6.13; RSS-133,§6.5	≤ -13 dBm/1 MHz.		Appendix E2	Pass	TL3	
Frequency Stability	§2.1055, §24.235	RSS-Gen,§6.11; RSS-133,§6.3	FCC	<ul style="list-style-type: none"> <li>Test method: Fundamental emissions (Fc_meas) within the authorized frequency block.</li> <li>Test conditions: (1) NV, -30°C/.../+50°C step=+10°C. (2) NT, ±15%*NV.</li> </ul>	Appendix F2	Pass	TL1	
			IC	Base Station				<ul style="list-style-type: none"> <li>Test method option #1: (Fc_meas - Fc_meas@20°C&amp;NV) / Fc_meas@20°C&amp;NV ≤ ±1.0 ppm.</li> <li>Test method option#2: EBW (EBW_lower to EBW_higher) within frequency block.</li> <li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV.</li> </ul> (EBW is -20 dBc EBW, or OBW)
				Mobile Station				<ul style="list-style-type: none"> <li>Test method option #1: (Fc_meas - Fc_meas@20°C&amp;NV) / Fc_meas@20°C&amp;NV ≤ ±2.5 ppm.</li> <li>Test method option #2: EBW (EBW_lower to EBW_higher) within</li> </ul>



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<p>frequency block.</p> <ul style="list-style-type: none"> <li>Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV.</li> </ul> <p>(EBW is -20 dBc EBW, or OBW)</p>			
Receiver Spurious Emissions	---	IC NOTICE 2012-DRS0126	---	Appendix G2	---	---
Photos of Test Setups	---	---	---	---	---	---

### 2.2.2 Non-measurement Technical Requirements

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

### 3 Description of the Equipment under Test (EUT)

#### 3.1 General Description

The pRRU3901 850+PCS is the indoor remote radio unit which is the elements of the lampsite indoor coverage network solutions. Working with BBU and RHUB3908, It supports buildings scenes indoor coverage. The pRRU3901 850+PCS 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
WD6DLPX2T0	Ver.A	Manufactured Board,pRU01,WD6DLPX2T0,CL Multi-Mode Radio Telecom 850 M Board,2T2R,2*50 mW
WD6DIPX220	Ver.C	Manufactured Board,pRU01,WD6DIPX220,Multi-Mode 1.9G Radio Board,2T2R, 200mW
WD6EXRUIBD	Ver.A	Manufactured Board,pRRU 3901,WD6EXRUIBD,pRRU Interface Board

##### 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	WD22UBBPd6	Huawei	Manufactured Board,BBU3900,WD22UBBPd6,Baseband Processing and Interface Unit ,1*1
RHUB3908	WD6M1RBH2	Huawei	RHUB3908,WD6M1RBH2,pRRU pool and PoE support(2* CPRI SFP,8*CPRI OVER PHY with PSE,PSU,Global)



### 3.3 Technical Specification

#### 3.3.1 Cellular 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 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): 869 to 894 MHz Receiving (RX): 824 to 849 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	10 MHz
TX Output Power	Max. 100 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 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: 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: 4M15F9W LTE system: 4M50D9W, 8M94D9W 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: 0 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 PCS Band

Characteristics	Description
Radio System Type	Single Radio <input type="checkbox"/> GSM Access Technology (Single-RAT): <input checked="" type="checkbox"/> UMTS <input checked="" type="checkbox"/> LTE <input type="checkbox"/> CDMA <input type="checkbox"/> WiMAX Multi-Standard Radio (MSR): <input type="checkbox"/> GSM & UMTS <input type="checkbox"/> GSM & LTE <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)



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): 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 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, PoE power supply: -48 VDC Input to EUT: Voltage Range, PoE power supply: -36VDC to -60VDC Input to EUT:
Antenna Assemblies	Antenna Type: <input type="checkbox"/> External <input checked="" type="checkbox"/> Integrated



Characteristics	Description
	<p>Smart Antenna: <input checked="" type="checkbox"/> MIMO(for LTE) <input checked="" type="checkbox"/> Non MIMO(for UMTS)</p> <p>Antenna Gain: 4 dBi (per antenna port, max.)</p> <p>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.</p>



## 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"> <li>All TX tests are ONLY performed at the main TX antenna port (e.g. TRXA, TXA or similar) of the EUT, and</li> <li>All RX tests are ONLY performed at the main RX antenna port (e.g. TRXA, RXB or similar) of the EUT.</li> </ul>
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 Cellular Band

EUT Conf.	RF Ch	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
5M_B	B	871.5	---	5	17@Ant1,2	LTE/TM1.1
5M_M	M	881.5	---	5	17@Ant1,2	LTE/TM1.1
5M_T	T	891.5	---	5	17@Ant1,2	LTE/TM1.1
10M_B	B	874	---	10	17@Ant1,2	LTE/TM1.1
10M_M	M	881.5	---	10	17@Ant1,2	LTE/TM1.1
10M_T	T	889	---	10	17@Ant1,2	LTE/TM1.1
1U_B	B	871.4	---	5	17@Ant1	UMTS/TM1
1U_M	M	881.4	---	5	17@Ant1	UMTS/TM1
1U_T	T	891.6	---	5	17@Ant1	UMTS/TM1
2U_B	B	871.4, 876.4	---	5,5	14,14@Ant1	UMTS/TM1
2U_M	M	881.4, 886.4	---	5,5	14,14@Ant1	UMTS/TM1
2U_T	T	886.6, 891.6	---	5,5	14,14@Ant1	UMTS/TM1

#### 4.2.2.2 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



EUT Conf.	RF Ch	RX Freq. [MHz]	TX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
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
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

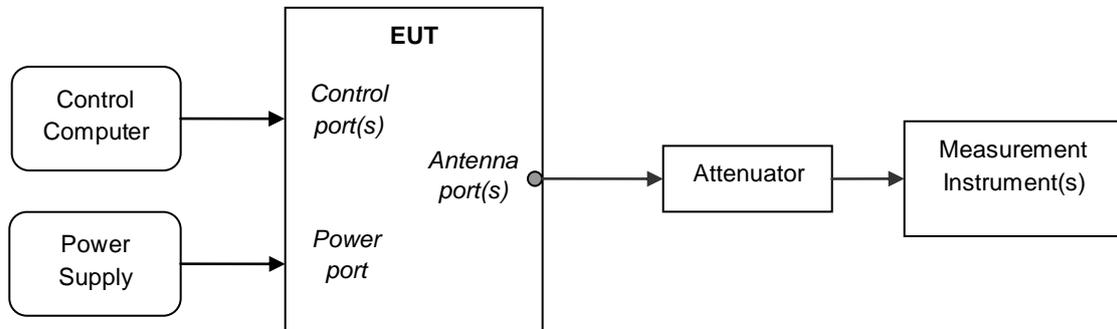


### 4.3 Test Environments

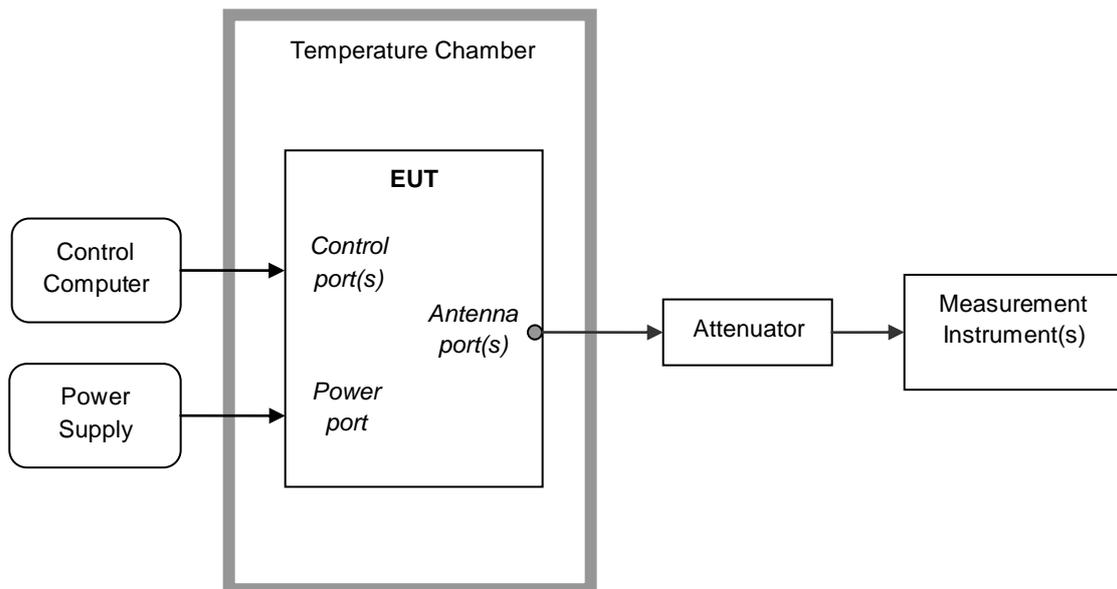
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

## 4.4 Test Setups

### 4.4.1 Test Setup 1



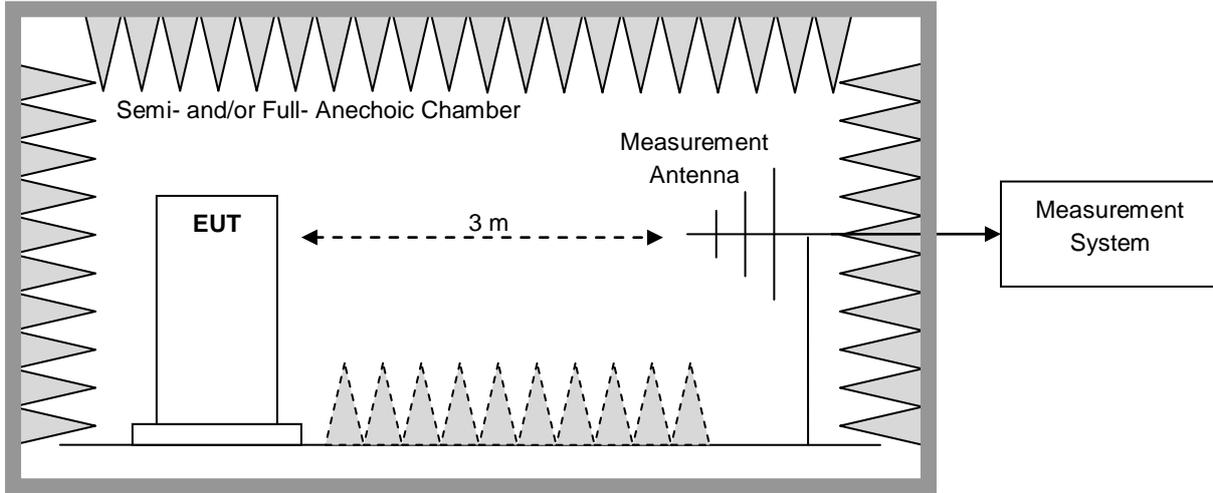
### 4.4.2 Test Setup 2



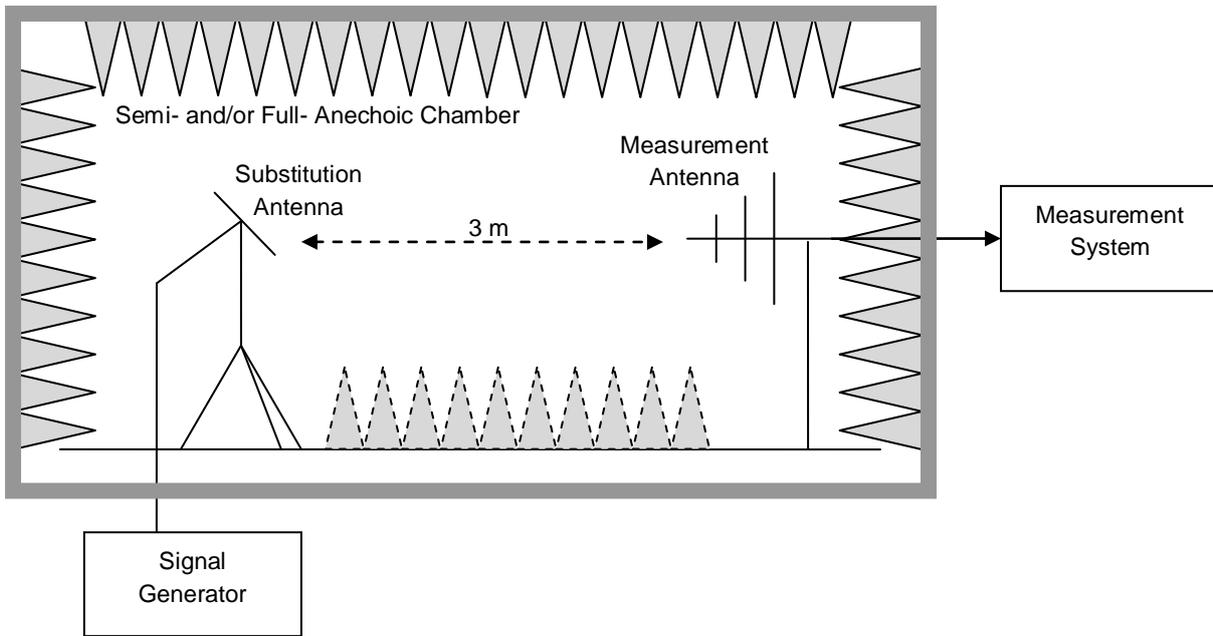
### 4.4.3 Test Setup 3

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 Cellular 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 1U_B, 1U_M, 1U_T 2U_B, 2U_M, 2U_T
	Power Spectral Density	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		EUT Conf.	Not applicable
	Peak-to-Average Ratio	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 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 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 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 10M_B, 10M_T 1U_B, 1U_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 10M_B,10M_M,10M_T 1U_B, 1U_M, 1U_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	



Test Case		Test Conditions	
			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 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



Test Case		Test Conditions	
	Emission Bandwidth		15M_B,15M_M,15M_T 20M_B,20M_M,20M_T 1U_B,1U_M,1U_T
		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
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



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Test Case	Test Conditions	
	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.

### 5.1 For test number SYBH(R) 01601078

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1 & 2				
Spectrum Analyzer	R&S	FSQ40	100025	2015-10-27
Spectrum Analyzer	R&S	FSQ26	201082	2015-03-17
Spectrum Analyzer	R&S	FSQ26	200941	2015-06-23
Spectrum Analyzer	Agilent	E4440A	MY49420179	2015-08-29
Spectrum Analyzer	Agilent	N9020A	MY51240619	2015-02-18
Vector Signal Generator	Agilent	E8257D	MY49281095	2015-11-03
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	2015-03-17
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

### 5.2 For test number SYBH(R) 02089455

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1 & 2				
Spectrum Analyzer	R&S	FSQ26	200988	2016-01-26
Network analyzer	Anritsu	MS4622B	051604	2016-07-27
Power Supply	KIKUSUI	PCR1000LE	TJ002353	2016-06-26
Temperature Chamber	Chongqingyinhe	ESS-KWGDS61III	201000447	2016-03-09
Test Setup 3				
EMI Test receiver	Agilent	N9038A	MY52260169	2016-10-26
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	2017-11-06(2 y)



## 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