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TESTING
CNAS L0310



FCC RF Report

Product Name: Remote Radio Unit

Product Model: RRU3276

Report Number: SYBH(R)02755101EB-1

FCC ID: QISRRU3276

Reliability Laboratory of Huawei Technologies Co., Ltd.

(Global Compliance and Testing Center of Huawei Technologies Co., Ltd.)

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District,
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NOTICE

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission (FCC) 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 Innovation, Science and Economic Development Canada (ISED) to perform electromagnetic emission measurements.
 - The recognition number for the test site located in Shenzhen is 6369A-1.
 - The recognition numbers for the test site located in Shanghai is 6369D, which contains 6369D-1 (3m chamber) and 6369D-2 (10m chamber).
 - The recognition number for the test site located in Chengdu is 6369E-1.
5. The laboratory (Reliability Laboratory of Huawei Technologies Co., Ltd.) is also named as "Global Compliance and Testing Center of Huawei Technologies Co., Ltd."; the both names have coexisted since 2009.
6. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
7. The test report is invalid if there is any evidence of erasure and/or falsification.
8. The test report is only valid for the test samples.
9. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.



Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name: Remote Radio Unit
Product Model: RRU3276

Date of Receipt Sample: 2016-11-28
Start Date of Test: 2016-12-08
End Date of Test: 2016-12-15

Test Result: Pass

Approved by Senior Engineer:	2016-12-20	Ren Huasheng	
	Date	Name	Signature

Prepared by:	2016-12-20	Chen Hao	
	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

Rules/Standards: 47 CFR FCC Part 27 (10-1-14 Edition)

Test Methods: FCC KDB 971168 D01 Power Meas License Digital Systems v02r02
(if applicable) FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Note 1: Unless otherwise stated, all standards listed above are accredited by A2LA.

Note 2: For test location(s) other than TL1, excluding sub-contracted (if applicable), the standard is only accredited by CNAS

1.2 Test Location

Test Location 1 (TL1): Global Compliance and Testing Center of Huawei Technologies Co., Ltd.
(Reliability Laboratory of Huawei Technologies Co., Ltd.)

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

1.3 Test Environment Condition

Ambient Temperature: 15 to 30 °C

Ambient Relative Humidity: 20 to 85 %

Atmospheric Pressure: Not applicable

2 Test Summary

NOTE 1: Unless otherwise specified, all test items were tested in test location TL1 which has been accredited by A2LA. The test items tested in other test locations are marked with “(TL##, #####)” where “TL##” denotes test location and “#####” denotes the accreditation organization of the laboratory responsible of this report.

NOTE 2: For ISED, only requirements in RSS but not in SRSP are considered for compliance measurements for certification purposes, since the requirements of SRSP are to be addressed with the device at the time of licensing (except RSS refers to requirements of SRSP).

NOTE 3: In the following table(s), the “NA” denotes “Not applicable”, the “NT” denotes “Not tested”, and “NC” denotes “No conclusion”.

2.1 Test Plan

The TEST PLANS for this report refer to the attached document of “[SYBH\(R\)02755101EB-1-TP](#)”.

2.2 Test Results

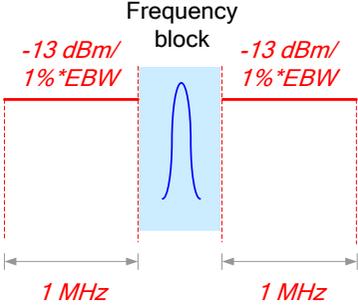
2.2.1 BRS&EBS Band (2496/2500-2690 MHz)

2.2.1.1 Measurement Technical Requirements

The TEST RESULTS for this report (as specified in the column of “Test Result” of the following table) refer to the attached document of “[SYBH\(R\)02755101EB-1-TR](#)”.

Test Item	FCC Rule	ISED Rule	Requirements			Test Result	Verdict
Transmitter Output Power	§2.1046, §27.50(h), §27.50(i)	RSS-Gen,§6.12; RSS-199,§4.4	FCC	Main Station / Booster Station / Base Station / Response Station	<ul style="list-style-type: none"> EIRP Power: <ul style="list-style-type: none"> (1) For SecST: EIRP Power $\leq 33 \text{ dBW} + 10 \lg(X/Y) \text{ dBW} + 10 \lg(360/\text{beamwidth}) \text{ dBW}$. (2) Others: EIRP Power $\leq 33 \text{ dBW} + 10 \lg(X/Y) \text{ dBW}$. For main, booster and response stations utilizing digital 	Annex A	Pass

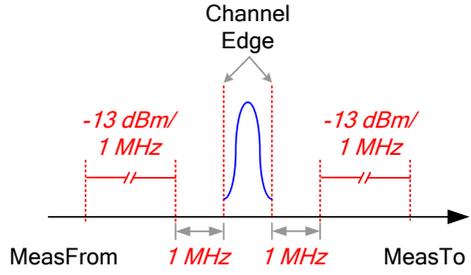
Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict
				<p>emissions with non-uniform power spectral density: $EIRP_{PD} (100 \text{ kHz RBW, within } 6 \text{ MHz OccCh}) \leq EIRP_{Power} / 60 (W/100 \text{ kHz}).$</p> <hr/> <p>Note 1): SecST - main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern.</p> <p>Note 2): $X = ChBW (MHz).$</p> <p>Note 3): $Y =$ either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition. , $Y = 5.5 \text{ MHz}$ (LBS 2496 – 2572 MHz & UBS 2614 – 2690 MHz) or 6 MHz(MBS 2572 – 2614 MHz).</p> <p>Note 4): beamwidth = the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.</p>		
			Mobile Station	<ul style="list-style-type: none"> EIRP Power $\leq 2 \text{ W}.$ Conducted Power $\leq 2 \text{ W}.$ 		
			Other User Station	Conducted Power $\leq 2 \text{ W}.$		
			IC Fixed Station / Base Station	<ul style="list-style-type: none"> EIRP PD: <ol style="list-style-type: none"> HAAT $\leq 300 \text{ m}: \leq 1640 \text{ W/MHz}$ (32.15 dBW/MHz), HAAT $\leq 500 \text{ m}: \leq 32.15 \text{ dBW/MHz} - 2 \text{ dB},$ HAAT $\leq 1000 \text{ m}: \leq 32.15 \text{ dBW/MHz} - 5 \text{ dB},$ HAAT $\leq 1500 \text{ m}: \leq 32.15 \text{ dBW/MHz} - 8 \text{ dB},$ HAAT $\leq 2000 \text{ m}: \leq 32.15 \text{ dBW/MHz} - 10 \text{ dB}.$ RMS detector. 		

Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict	
				<p>Note 1): HAAT - Height Above Average Terrain.</p> <ul style="list-style-type: none"> Mobile Subscriber Station <ul style="list-style-type: none"> EIRP Power ≤ 2 W. Peak detector. Fixed Subscriber Station <ul style="list-style-type: none"> EIRP Power ≤ 40 W. Conducted Power ≤ 2 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 B	Pass	
			IC	OBW: No limit.			
Band Edges Compliance / Emission Mask	§2.1051, §27.53(m)	RSS-Gen,§6.13; RSS-199,§4.6	FCC	Digital Base Station	 <p>Note 1): EBW is -26 dBc EBW.</p>	Annex C	Pass

Test Item	FCC Rule	ISED Rule	Requirements	Test Result	Verdict
			<p>Mobile Digital Station</p> <p>Frequency block</p> <p>$-10 \text{ dBm}/2\% \cdot \text{EBW}$ $-10 \text{ dBm}/1 \text{ MHz}$ $-13 \text{ dBm}/1 \text{ MHz}$</p> <p>$-10 \text{ dBm}/1 \text{ MHz}$ $-13 \text{ dBm}/1 \text{ MHz}$</p> <p>$-X$ -5 -1 0 0 1 5 X / MHz</p> <p>$X = \max \{6 \text{ MHz}, \text{EBW}\}$</p> <p>AND</p> <p>Lowest Channel</p> <p>$-13 \text{ dBm}/1 \text{ MHz}$</p> <p>2490.5 2496 2500 // 2690 / MHz</p> <p>AND, if 2495-2496MHz is immediately outside and adjacent to the frequency block</p> <p>Lowest Channel</p> <p>$-10 \text{ dBm}/1\% \cdot \text{EBW}$</p> <p>2495 2496 // 2690 / MHz</p> <p>Note 1): EBW is -26 dBc EBW.</p>		

Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict
			IC	Base Station / Fixed Subscriber		
Mobile Subscriber						

Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict	
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	RSS-Gen,§6.13; RSS-199,§4.6	FCC	Digital Base Station	<p>Note 1): MeasFrom: max(lowest internal frequency, 9 kHz).</p> <p>Note 2): MeasTo: min(10 * highest fundamental frequency, 40 GHz).</p>	Annex D	Pass
				Mobile Digital Station	<p>AND</p> <p>Note 1): EBW is -26 dBc EBW.</p>		

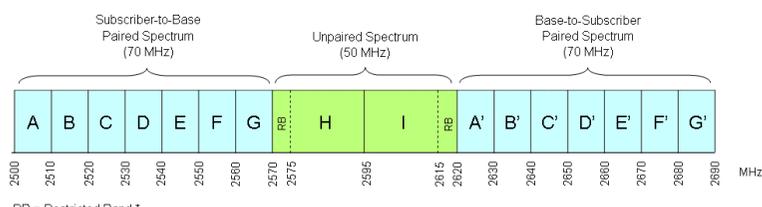
Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict	
					<p>Note 2): MeasFrom: max(lowest internal frequency, 9 kHz).</p> <p>Note 3): MeasTo: min(10 * highest fundamental frequency, 40 GHz).</p>		
			IC	Base Station / Fixed Subscriber	 <p>Note 1): MeasFrom: max(min(lowest internal frequency, 30 MHz), 9 kHz).</p> <p>Note 2): MeasTo: min(10 * highest fundamental frequency, 40 GHz).</p>		

Test Item	FCC Rule	ISED Rule	Requirements		Test Result	Verdict	
				Mobile Subscriber	<p>Channel Edge</p> <p>-25 dBm/1 MHz</p> <p>-25 dBm/1 MHz</p> <p>MeasFrom -X 0 0 X MeasTo</p> <p>$X = \max \{6 \text{ MHz}, \text{OBW}\}$</p> <p>AND</p> <p>Lowest Channel</p> <p>-25 dBm/1 MHz</p> <p>MeasFrom 2490.5 2500 2690 / MHz</p> <p>Note 1): MeasFrom: $\max(\min(\text{lowest internal frequency}, 30 \text{ MHz}), 9 \text{ kHz})$.</p> <p>Note 2): MeasTo: $\min(10 * \text{highest fundamental frequency}, 40 \text{ GHz})$.</p>		
Radiation Emission	§2.1053, §27.53(m)	RSS-Gen,§6.13; RSS-199,§4.6	Refer to requirements of "Spurious Emission at Antenna Terminals".		Annex E	Pass	
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 F	Pass	
			IC	Base Station / Fixed Subscriber <ul style="list-style-type: none"> Step 1: f(offset): no limit. 			

Test Item	FCC Rule	ISED Rule	Requirements	Test Result	Verdict
			<p>Equipment</p> <ul style="list-style-type: none"> Step 2: $f_L - f(\text{offset}) > 2500 \text{ MHz}$, $f_H + f(\text{offset}) < 2690 \text{ MHz}$. <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: NTV. 		
			<p>Mobile Subscriber Equipment</p> <ul style="list-style-type: none"> Step 1: $f(\text{offset})$: no limit. Step 2: $f_L - f(\text{offset}) > 2500 \text{ MHz}$, $f_H + f(\text{offset}) < 2690 \text{ MHz}$. <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: NTV. 		

Test Item	FCC Rule	ISED Rule	Requirements	Test Result	Verdict
Receiver Spurious Emission (Note 1)	---	RSS-Gen,§5; RSS-Gen,§7	---	Annex G	---
<p>Note 1: 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>					

2.2.1.2 Non-measurement Technical Requirements

Description	FCC Rule	ISED Rule	Requirements	Exhibit	Verdict
Frequency Plan	§27.5(i)	RSS-199,§2.2; SRSP-517	<p>FCC 2496-2690 MHz.</p> <p>IC 2500-2690 MHz.</p>  <p>RB = Restricted Band *</p>	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	<p>Multiple Antennas EIRP:</p> <p>(1) Correlated transmission: Aggregate power + Gmax + 10 log10 N;</p> <p>(2) Uncorrelated transmission: Aggregate power + Gmax.</p>	Considered during “Transmitter Output Power” test.	Comply

3 Description of the Equipment under Test (EUT)

3.1 General Description

The DBS3900 LTE TDD, a future-oriented E-UTRAN NodeB (eNodeB) product launched by Huawei, is a distributed eNodeB supporting TDD LTE. The DBS3900 LTE TDD fully exploits Huawei platform resources and uses a variety of technologies.

The RRU3276 is a type of radio remote unit. It implements conversion between baseband signals, IF signals, and RF signals, demodulates the received radio signals, and modulates the signals to be transmitted, and amplifies the transmit power of the 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

Name	Hardware Version	Description
WD5DPHX42900	Ver.A	RF Signal transmission
WD5DPHP42800	Ver.A	DC Power Supply
WD5DPHA42900	Ver.A	PA

3.2.2 Sub-Assembly

Name	Model	Manufacturer	Description
---	---	---	---

3.3 Technical Specification

NOTE: For the detailed technical descriptions, see the applicant/manufacturer's specifications or user manual.

3.3.1 General

Characteristics	Description	
Radio System Type	<input type="checkbox"/> GSM (GO) <input type="checkbox"/> UMTS (UO) <input checked="" type="checkbox"/> LTE (LO) <input type="checkbox"/> CDMA (CO) <input type="checkbox"/> GSM & UMTS (GU) <input type="checkbox"/> GSM & LTE (GL) <input 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 checked="" type="checkbox"/> Indoor <input checked="" type="checkbox"/> Outdoor
Frequency Range (Transmission (TX) and Receiving (RX))	#1	TX: 2496 to 2690 MHz RX: 2496 to 2690 MHz
TX and RX Antenna Ports	TX & RX port: 4, TX-only port: 0, RX-only port: 0	
Multiple Carrier Supported	5	
Maximum RF Bandwidth	150 MHz	
TX Output Power	Max. 40 W (per antenna port) Max. 4*40 W (four antenna ports)	
Supported Channel Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Modulation Type	LTE system:	Base-band: QPSK, 16QAM, 64QAM Carrier: OFDM/OFDMA

Characteristics	Description	
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.)	LTE system: 5M00D9W, 10M0D9W, 15M0D9W, 20M0D9W	
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
Environment (Working/Operating)	Temperature	-40 to +50 °C
	Relative humidity	15 to 95 %

3.3.2 Antenna Assemblies

NOTE 1: (1) For the “No antenna supplied” in the report:

If the antenna is not supplied by the equipment manufacturer, and also will not be equipped on sale, a typical or recommended configuration will be considered during lab testing. However, when the EUT is put into service, the practical maximum antenna gain may exceed the value as described; if this is the case, the combination of the practical output power (may be degraded) and the practical antenna gain should not exceed the required ERP/EIRP limit.

(2) For the “dedicated antenna” in the report:

- It refers to the removable antenna supplied with the EUT, designed as an indispensable part of EUT, using an antenna connector with or without a cable and which has been designed or developed for one or more specific types of equipment.
- It is the combination of dedicated antenna and radio equipment that is expected to be compliant with the regulations.

(3)The “integral antenna” in the report:

- It refers to the antenna designed as a permanent fixed part of the EUT, without the use of an external connector and which cannot be disconnected from the equipment by a user with the intent to connect another antenna.
- For the testing purpose, a temporary RF connector may be provided.

NOTE 2: The antenna gain is the combination of basic gain (directional gain, G) and, if applicable, additional beam-forming gain (Y).

Characteristics	Description
Antenna Type	<input checked="" type="checkbox"/> No antenna supplied <input type="checkbox"/> Dedicated <input type="checkbox"/> Integral

4 General Test Conditions / Configurations

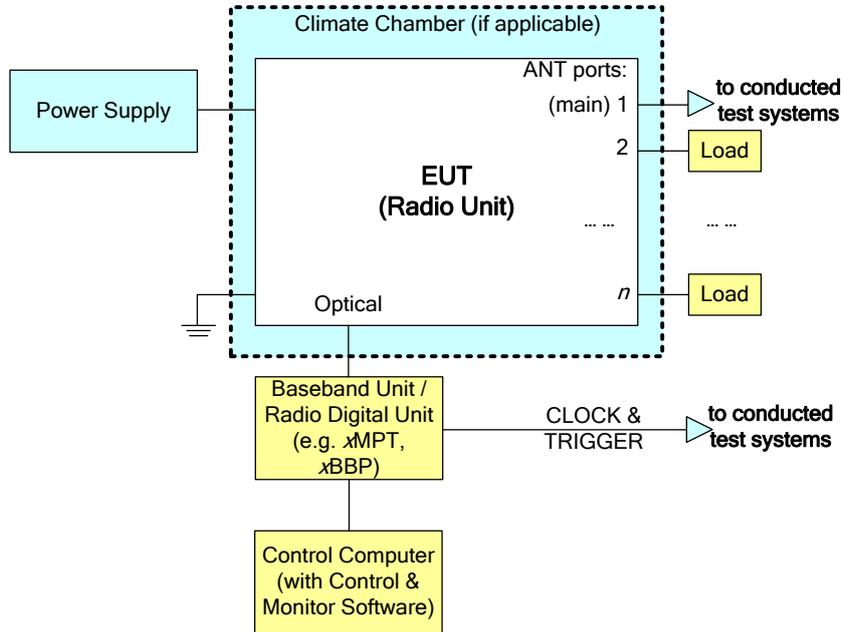
4.1 Auxiliary Facilities Supporting Tests

NOTE: The EUT was tested together with other necessary auxiliary facilities so as to form representative EUT installation configurations and test setup configurations during the tests.

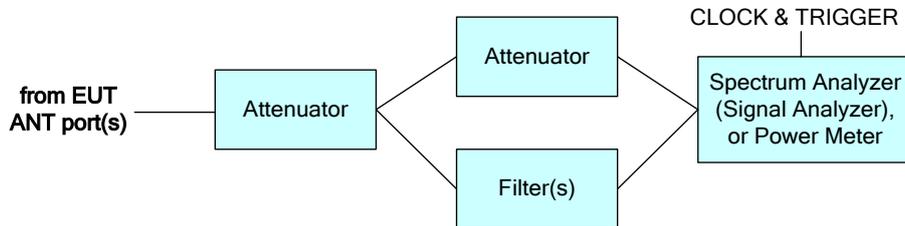
Facility	Manufacturer	Model	Identification	Remark
Control Computer	Lenovo	M8200t	SZ1000167285	Used to control the EUT.
UMPT	HUAWEI	UMPT	020DBBD0D500 2123	Universal Main Processing & Transmission unit
UBBP	HUAWEI	UBBP	022NJR10EB018 710	Baseband Processing and Interface Unit

4.2 Test Setup 1 (for Conducted Test Items)

4.2.1 EUT Arrangement

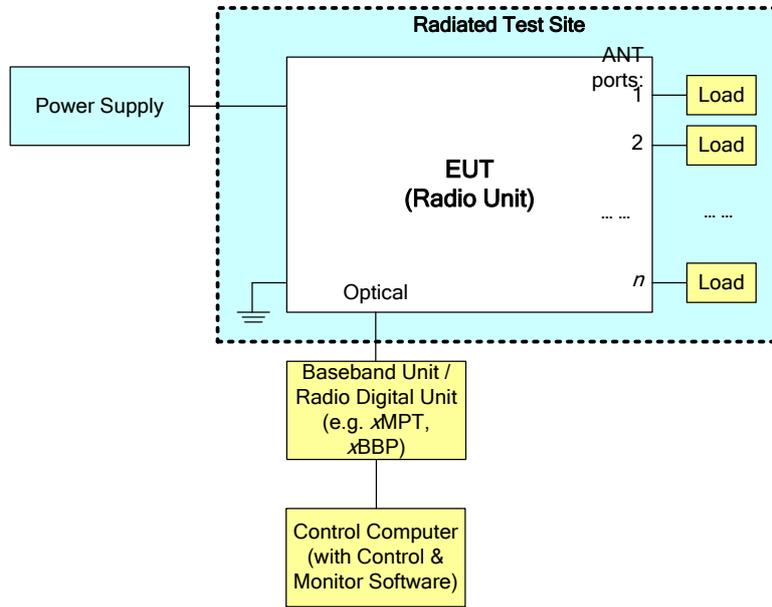


4.2.2 Test Setup



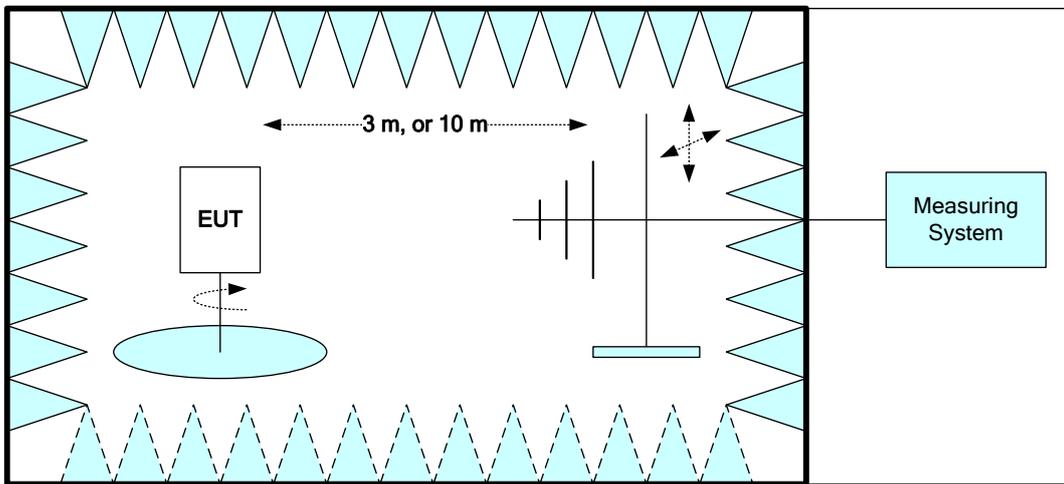
4.3 Test Setup 2 (for Radiated Test Items)

4.3.1 EUT Arrangement

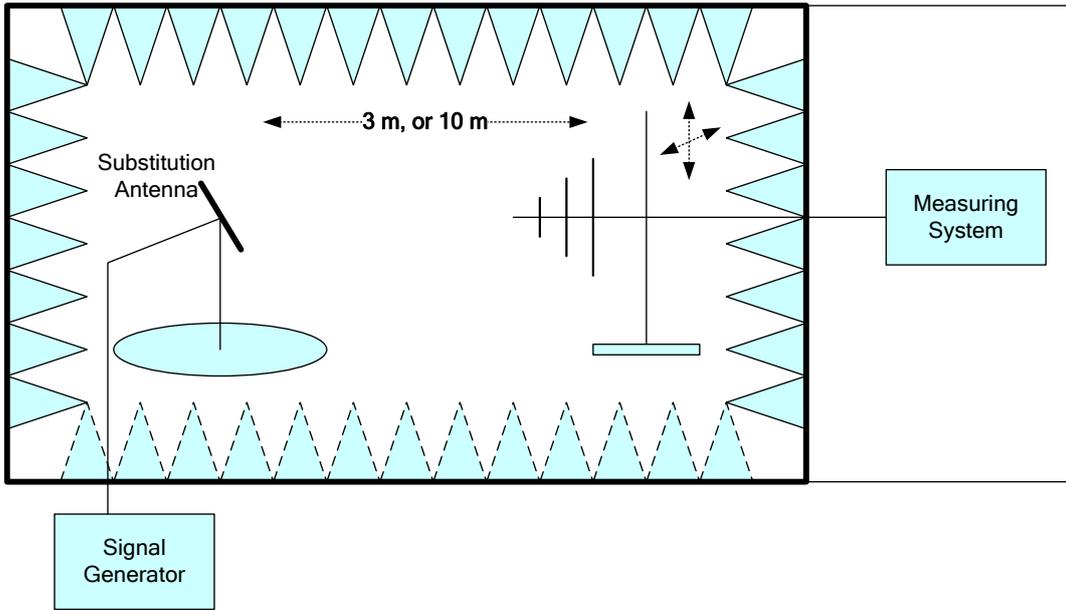


4.3.2 Test Setup

(1) Pre-test:



(2) Substitution method to verify the maximum ERP/EIRP:



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.

5.1 Current Test Project/Report

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1				
Spectrum Analyzer	Keysight	N9020A	MY55400471	2017-09-14
Spectrum Analyzer	Agilent	N9020A	MY51240619	2017-11-23
Spectrum Analyzer	Agilent	N9030A	MY49431033	2017-02-28
Signal Generator	R&S	SMW200A	102101	2017-08-08
Signal Generator	Agilent	E8257D	MY51110541	2017-04-26
Test Setup 2				
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	2018-08-23 (2y)
Horn antenna (1-18GHz)	R&S	HF906	359287/005	2018-02-26 (2y)
Horn antenna (18-26.5GHz)	ETS	3160-09	053215-21876	2017-11-06 (2y)
Horn antenna (26.5-40GHz)	EMCO	3116	00031541	2018-03-25 (2y)
Receiver	R&S	ESU40	100144	2017-06-23

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
Radiation Emission	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



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