



RF Test Report

Product Name: Radio Transmission System

Product Model: Optix RTN 360

Report Number: SYBH(R)01466066EB-1

FCC ID: QISRTN360

IC: 6369A-RTN360

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).
 - 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 test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
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: Radio Transmission System
Product Model: Optix RTN 360

Date of Receipt Sample: 2014-08-08
Start Date of Test: 2014-08-08
End Date of Test: 2014-10-25

Test Result: Pass

Approved by Senior Engineer:	2014-10-27	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

Prepared by:	2014-10-27	Zhang Weimin	<i>Zhang Weimin</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, Subpart J (10-1-13 Edition)
47 CFR FCC Part 15, Subpart C (10-1-13 Edition)
IC RSS-Gen (Issue 3, December 2010)
IC RSS-210 (Issue 8, December 2010)

Test Method: FCC KDB 200443 D02 RF Detector Method v01
MILLIMETER WAVE TEST PROCEDURES (TCB council members & FCC lab)
60_GHz_Clarification_Letter_30Oct2013 (FCC)
TR 14-1001 MMW Measurements with Harmonic Mixers (FCC)
ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices

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 Band 57-64 GHz (V-Band)

2.1.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location
Bandwidth	§15.255(e)	RSS-210,2.1 RSS-Gen,4.6.1	FCC	-6 dBc EBW (w/ 100 kHz RBW): No limit.	Annex A	Pass	TL1
			IC	OBW: No limit.			
EIRP / In-Band Emissions (NOTE 1)	§15.255(b)	RSS-210,A13.2.2(1); RSS-210,A13.2.4	FCC	(1) Non-fixed field disturbance sensors (Note 1): a) All (outdoor & indoor): <ul style="list-style-type: none"> ● Avg EIRP (Tx on): ≤ 40 dBm, in 57-64GHz. ● Pk EIRP: ≤ 43 dBm, in 57-64GHz. b) Outdoor only: <ul style="list-style-type: none"> ● Avg EIRP (Tx on): ≤ 82 dBm - IF{G > 51dBi, 0, G - 51 dBi * 2} dB, in 57-64GHz. ● Pk EIRP: ≤ 85 dBm - IF{G > 51dBi, 0, G - 51 dBi * 2} dB, in 57-64GHz. (2) Fixed field disturbance sensors (ChBW ≤ 500MHz & in 61-61.5GHz): <ul style="list-style-type: none"> ● Avg EIRP (Tx on) ≤ 40 dBm, in 61-61.5GHz. ● Pk EIRP ≤ 43 dBm, in 61-61.5GHz. ● Avg EIRP (Tx on) ≤ 10 dBm, in 57-61GHz&61.5-64GHz. ● Pk EIRP ≤ 13 dBm, in 57-61GHz&61.5-64GHz. (3) Other fixed field disturbance sensors: <ul style="list-style-type: none"> ● Pk Condt. Pwr ≤ -10 dBm, in 57-64GHz. ● Pk EIRP ≤ 10 dBm, in 57-64GHz. -----	Annex B	Pass	TL1



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<p>Note 1: According to FCC "60_GHz_Clarification_Letter_30Oct2013", the outdoor devices can apply both limit a) and b).</p> <p>Note 2: The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be calculated based on the measured peak levels, over the actual time period during which transmission occurs. Measurement procedures that have been found to be acceptable to the FCC in accordance with §2.947 of this chapter may be used to demonstrate compliance.</p>			
			<p>IC</p> <p>(1) Non-fixed field disturbance sensors:</p> <ul style="list-style-type: none"> ● Avg PD (Tx on) $\leq 9 \mu\text{W}/\text{cm}^2$ @ 3m, in 57-64GHz. ● Pk PD $\leq 18 \mu\text{W}/\text{cm}^2$ @ 3m, in 57-64GHz. <p>(2) Fixed field disturbance sensors (ChBW $\leq 500\text{MHz}$ & in 61-61.5GHz):</p> <ul style="list-style-type: none"> ● Avg PD (Tx on) $\leq 9 \mu\text{W}/\text{cm}^2$ @ 3m, in 61-61.5GHz. ● Pk PD $\leq 18 \mu\text{W}/\text{cm}^2$ @ 3m, in 61-61.5GHz. ● Avg PD (Tx on) $\leq 9 \text{nW}/\text{cm}^2$ @ 3m, in 57-61GHz&61.5-64GHz. ● Pk PD $\leq 18 \text{nW}/\text{cm}^2$ @ 3m, in 57-61GHz&61.5-64GHz. <p>(3) Other fixed field disturbance sensors:</p> <ul style="list-style-type: none"> ● Pk Condt. Pwr $\leq 0.1 \text{mW}$, in 57-64GHz. ● Pk PD $\leq 9 \text{nW}/\text{cm}^2$ @ 3m, in 57-64GHz. <p>-----</p> <p>Note 1: Peak power density and peak transmitter output power shall be measured with a radio frequency (RF) detector that has a detection bandwidth encompassing the band 57-64 GHz and a video bandwidth of at least 10 MHz, or using an equivalent measurement</p>			



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			method. The average emission limits shall be calculated based on the measured peak levels over the time period during which transmission occurs.			
Peak Transmitter Output Power	§15.255(e)	RSS-210,A13.2.3; RSS-210,A13.2.4	<p>(1) EBW < 100MHz (Note 1):</p> <ul style="list-style-type: none"> ● Pk Condt. Pwr: ≤ 500 mW * (EBW / 100 MHz). <p>(2) Others:</p> <ul style="list-style-type: none"> ● Pk Condt. Pwr: ≤ 500 mW. <p>-----</p> <p>Note 1: The EBW is -6dBc EBW for FCC, and (not-defined) for IC.</p> <p>Note 2: Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and that has a video bandwidth of at least 10 MHz. Measurement procedures that have been found to be acceptable to the FCC in accordance with § 2.947 of this chapter may be used to demonstrate compliance.</p> <p>Note 3: For purposes of demonstrating compliance with this paragraph, corrections to the transmitter output power should be made in the event of antenna and circuit loss (e.g. the antenna feed cable loss).</p>	Annex C	Pass	TL1
Spurious Emissions (NOTE 1)	§15.255(c); §15.205(d); §15.209	RSS-210,A13.2.2(2); RSS-210,A13.2.4; RSS-210,2.2; RSS-210,2.5; RSS-Gen,7.2.2; RSS-Gen,7.2.5	<p>FCC</p> <ul style="list-style-type: none"> ● The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions. ● Test range below 40 GHz: Refer to §15.209 general limit (for ALL ranges). ● Test range in 40-200 GHz: ≤ 90 pW/cm² @ 3m. ● The levels of the spurious emissions shall not exceed the level of the fundamental emission. <p>-----</p> <p>Note 1: Measuring range from 9 kHz to MIN{5*fc, 200 GHz}.</p> <p>Note 2: The restricted band is not applicable.</p>	Annex D	Pass	TL1 & TL3

Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
			<p>Note 3: The peak limit (average limit + 20 dB) above 1 GHz is not required.</p> <p>IC</p> <ul style="list-style-type: none"> The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions. Test range below 40 GHz: Refer to RSS-Gen field strength general limit (for ALL ranges). Test range in 40-200 GHz: $\leq 90 \text{ pW/cm}^2 @ 3\text{m}$. The levels of the spurious emissions shall not exceed the level of the fundamental emission. <p>-----</p> <p>Note 1: Measuring range from 30 MHz to $\text{MIN}\{5 \cdot f_c, 200 \text{ GHz}\}$.</p> <p>Note 2: The restricted band is not required.</p>			
Frequency Stability	§2.1055; §15.255(f); §15.215	RSS-Gen,§4.7; RSS-Gen,§7.2.6; RSS-210,A13.2.5	<p>FCC</p> <ul style="list-style-type: none"> Test method: Fundamental emissions must be contained within the frequency bands during all conditions of operation. <p>($f_L > 57 \text{ GHz}$, and $f_H < 64 \text{ GHz}$)</p> <ul style="list-style-type: none"> Test conditions: $-20^\circ\text{C}/\dots/+50^\circ\text{C}$ step=(not-defined), $\pm 15\% \cdot \text{NV}$. <p>IC</p> <ul style="list-style-type: none"> Test method: Fundamental emissions must be contained within the frequency bands during all conditions of operation. Test conditions: (1) NV, $-20^\circ\text{C}/+20^\circ\text{C}/+50^\circ\text{C}$. (2) $+20^\circ\text{C}$, $\pm 15\% \cdot \text{NV}$. 	Annex E	Pass	TL1
AC Power Line	15.207	RSS-Gen,7.2.4	§15.207/RSS-Gen 7.2.4 limit.	Annex F	Pass	TL3



Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
Conducted Emissions						
Receiver Spurious Emissions	---	IC NOTICE 2012-DRS0126 (NOTE 2)	---	Annex G	---	---

NOTE 1: According to FCC "MILLIMETER WAVE TEST PROCEDURES",

(1) the relation between power density (P_d [W/m²]) and field strength (E [V/m]) is: $P_d = E^2 / 377$. So,

- x [μ W/cm²] correspond to $10 \cdot \lg(x) + 125.763$ [dB μ V/m].
- x [nW/cm²] correspond to $10 \cdot \lg(x) + 95.763$ [dB μ V/m].
- x [pW/cm²] correspond to $10 \cdot \lg(x) + 65.763$ [dB μ V/m].

For examples,

- 9 μ W/cm² @ 3m correspond to 135.305 dB μ V/m @ 3m, 18 μ W/cm² @ 3m correspond to 138.316 dB μ V/m @ 3m;
- 9 nW/cm² @ 3m correspond to 105.305 dB μ V/m @ 3m, 18 nW/cm² @ 3m correspond to 108.316 dB μ V/m @ 3m;
- 90 pW/cm² @ 3m correspond to 85.305 dB μ V/m @ 3m.

(2) the relation between EIRP [W] and power density (P_d [W/m²]) @ distance (d [m]) is: $P_d = EIRP / (4 \cdot \pi \cdot d^2)$. So,

- x [μ W/cm²] correspond to $10 \cdot \lg(x) + 20 \cdot \lg(d [m]) + 20.992$ [dBm].
- x [nW/cm²] correspond to $10 \cdot \lg(x) + 20 \cdot \lg(d [m]) - 9.008$ [dBm].
- x [pW/cm²] correspond to $10 \cdot \lg(x) + 20 \cdot \lg(d [m]) - 39.008$ [dBm].

For examples,

- 9 μ W/cm² @ 3m correspond to 40.077 dBm EIRP, 18 μ W/cm² @ 3m correspond to 43.087 dBm EIRP;
- 9 nW/cm² @ 3m correspond to 10.077 dBm EIRP, 18 nW/cm² @ 3m correspond to 13.087 dBm EIRP;
- 90 pW/cm² @ 3m correspond to -9.923 dBm EIRP.

(3) the relation between EIRP and output power (P_{wr}) is $EIRP [dBm] = P_{wr} [dBm] + G [dBi]$.

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.



2.1.2 Non-measurement Technical Requirements

Item	FCC Rule	IC Rule	Requirements	Evidence	Verdict
Product type restriction	§15.255(a)	RSS-210,A13.2.1	Not permitted: - Equipment used on aircraft or satellites. - Field disturbance sensors (non-fixed operation), including vehicle radar systems	See technical specification description.	Comply
57.0-57.05 GHz reserved exclusively	§15.255(d)	RSS-210,A13.2.2(2)	FCC: Only spurious emissions and transmissions related to a publicly-accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57-64 GHz band, are permitted in the 57-57.05 GHz band. IC: Within the band 57.0-57.05 GHz, only spurious emissions related to a publicly-accessible coordination channel are permitted. The band 57-57.05 GHz is reserved exclusively for a publicly-accessible coordination channel.	See technical specification description.	Comply
Group Installations	§15.255(h)	RSS-210,A13.2.6	Any transmitter that has received the necessary FCC/IC certification under this rule may be mounted in a group installation for simultaneous operation with one or more transmitter(s) that have received the necessary departmental authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.	See technical specification description / user's manual.	Comply
Transmitter Self-identification Transmission	--- (removed)	RSS-210,A13.2.7	For all transmissions that emanate from inside a building, within any 1-second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density	See technical specification description /	Comply



Item	FCC Rule	IC Rule	Requirements	Evidence	Verdict
			<p>equal to or greater than 3 nW/cm², as measured 3 metres from the radiating source, must transmit identification at least once. Each application for equipment approval must declare that the equipment that will be used inside a building contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:</p> <p>(a) FCC ID / IC certification number, which shall be programmed at the factory;</p> <p>(b) Manufacturer's serial number, which shall be programmed at the factory; and</p> <p>(c) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The applicant must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.</p>	user's manual.	
Antenna use	§15.203	RSS-Gen,7.1.2	<p>FCC&IC: Permanently attached antenna, with exception (e.g. professional installation).</p> <p>IC only: User manual notices required (see detailed for RSS-Gen, 7.1.2) .</p>	See technical specification description / user's manual.	Comply
Antenna requirement for outdoor non-fixed field disturbance sensors	§15.204; §15.255(b)(1)(ii)	---	The provisions of §15.204(c)(2) and (c)(4) of this part that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated.	See technical specification description / user's manual.	Comply



Item	FCC Rule	IC Rule	Requirements	Evidence	Verdict
			Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in §2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.		
User manual notice for licence-exempt radio apparatus	---	RSS-Gen,7.1.3	User manual notice for licence-exempt radio apparatus is required (see detailed for RSS-Gen, 7.1.3).	See user's manual.	Comply
Radio apparatus containing digital circuits	§15, subpart B	RSS-Gen,7.1.4 ICES-003	FCC: §15 subpart B. IC: ICES-003.	See separate test EMC report.	Comply
Radiation exposure	§15.255(g) §1.1307(b) §2.1091 §2.1093	RSS-Gen,5.6 RSS-102	General population/uncontrolled limit. (for both fundamental emissions and unwanted emissions.)	See separate test MPE/EMF report or declaration.	Comply



3 Description of the Equipment under Test (EUT)

3.1 General Description

RTN 360 is tailored for service backhaul for small cell base stations that are deployed on buildings or at the street level. RTN 360 plays an important role in the Huawei radio backhaul solution for small cell base stations.

As V-band full-outdoor radio equipment, RTN 360 has the following characteristics:

- RTN 360 operates at the frequency band ranging from 59 GHz to 64 GHz. It requires unobstructed line of sight (LOS) and features low inter-site interference and rich idle frequency spectrum resources. A V-band link can span a maximum distance of 300 m, meeting the requirements of service backhaul for small cell base stations. RTN 360 can provide large-capacity microwave links for small cell base stations densely deployed in downtown areas.
- RTN 360 is a highly integrated full-outdoor radio transmission product. Its antenna, RF unit, and baseband unit are integrated into an outdoor unit that supports zero-footprint installation, providing carriers with cost-effective full-outdoor radio solutions.

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	Description
SLV1SHUA2	2*GE Baseband Board
SLV1A64TA	64GHz Microwave Board

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
---	---	---	---

3.3 Technical Description

Characteristics	Description	
Radio System Type	Licence-exempt intentional radiators operation within band 57-64 GHz (V-Band).	
Equipment Type	#1:	<input type="checkbox"/> Fixed-operation field disturbance sensors <input checked="" type="checkbox"/> Other than Fixed-operation field disturbance sensors
	#2:	<input type="checkbox"/> Indoor <input checked="" type="checkbox"/> Outdoor
Frequency Range	TX:	V-Band: 59 to 64 GHz
	RX:	V-Band: 59 to 64 GHz
TX Output Power	3 dBm (max.)	
Channel Bandwidth	200 MHz	
Modulation Type	16QAM	
Emission Designator	180MD7W ----- Note: the necessary bandwidth defined in designation of emissions is the worst value from the measured occupied/emission bandwidths for each type of channel bandwidth configuration.	
Antenna Assemblies (#1)	Model/ID:	(Integrated)
	Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated
	Ports:	<input checked="" type="checkbox"/> Ant 1 (<input checked="" type="checkbox"/> TX&RX, <input type="checkbox"/> TX-only, <input type="checkbox"/> RX-only) <input type="checkbox"/> Ant 2 (<input type="checkbox"/> TX&RX, <input type="checkbox"/> TX-only, <input type="checkbox"/> RX-only)
	Smart Antenna:	<input type="checkbox"/> MIMO, <input type="checkbox"/> Non MIMO
	Antenna Gain:	36 dBi (excluding antenna enclosure, max.) 34.5 dBi (including antenna enclosure, 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.
Power Supply	Type:	<input type="checkbox"/> AC/DC Adapter, <input checked="" type="checkbox"/> PoE, <input type="checkbox"/> External AC mains, <input type="checkbox"/> External DC mains, <input type="checkbox"/> Other:
	Model/ID:	(external supplied)
	Nominal Voltage:	-48 VDC
	Voltage Range:	-38.4 to -57.6 VDC



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 performed at all TX antenna ports of the EUT, and● All RX tests are performed at all RX antenna ports 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 Configurations

# EUT Conf.	Test Mode	TX/RX Freq. [GHz]	Power Conf.	Duty Cycle
B-TM1	200 MHz, 16QAM	59.1	30	Ratio 4 (1:3)
B-TM2	200 MHz, 16QAM	59.1	30	Ratio 5 (3:1)
M-TM1	200 MHz, 16QAM	61.5	30	Ratio 4 (1:3)
M-TM2	200 MHz, 16QAM	61.5	30	Ratio 5 (3:1)
T-TM1	200 MHz, 16QAM	63.9	30	Ratio 4 (1:3)
T-TM2	200 MHz, 16QAM	63.9	30	Ratio 5 (3:1)



4.2 Test Environments

NOTE: The values used in the test report may be stringent than the declared.

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	Ambient	-48 VDC	Ambient
NTNV2	Ambient	120 VAC, 60 Hz (for auxiliary PoE Adapter)	Ambient

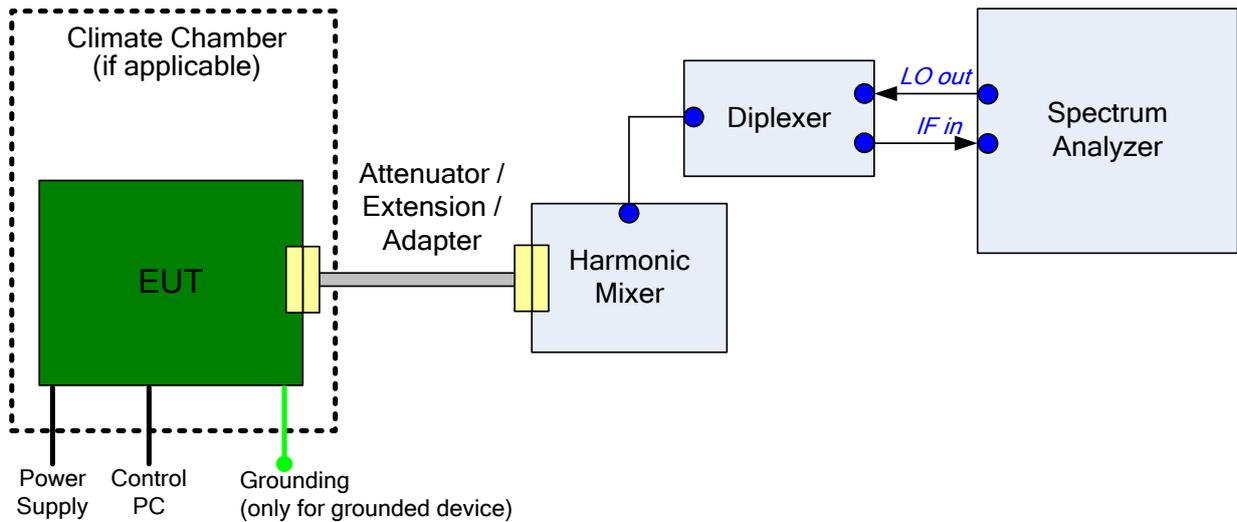
4.3 Auxiliary Peripherals

Periphery	Manufacturer	Model	Identification	Remark
PoE Adapter	HUAWEI	OptiX RTN PI-AC B20	2102310YPJ10 E6000022	Selected used for power supply for AC Power Line Conducted Emissions measurement.
Companion Device	HUAWEI	Optix RTN 360	---	Selected used for communication with the EUT during AC Power Line Conducted Emissions measurement.

4.4 Test Setups

4.4.1 Test Setup 1

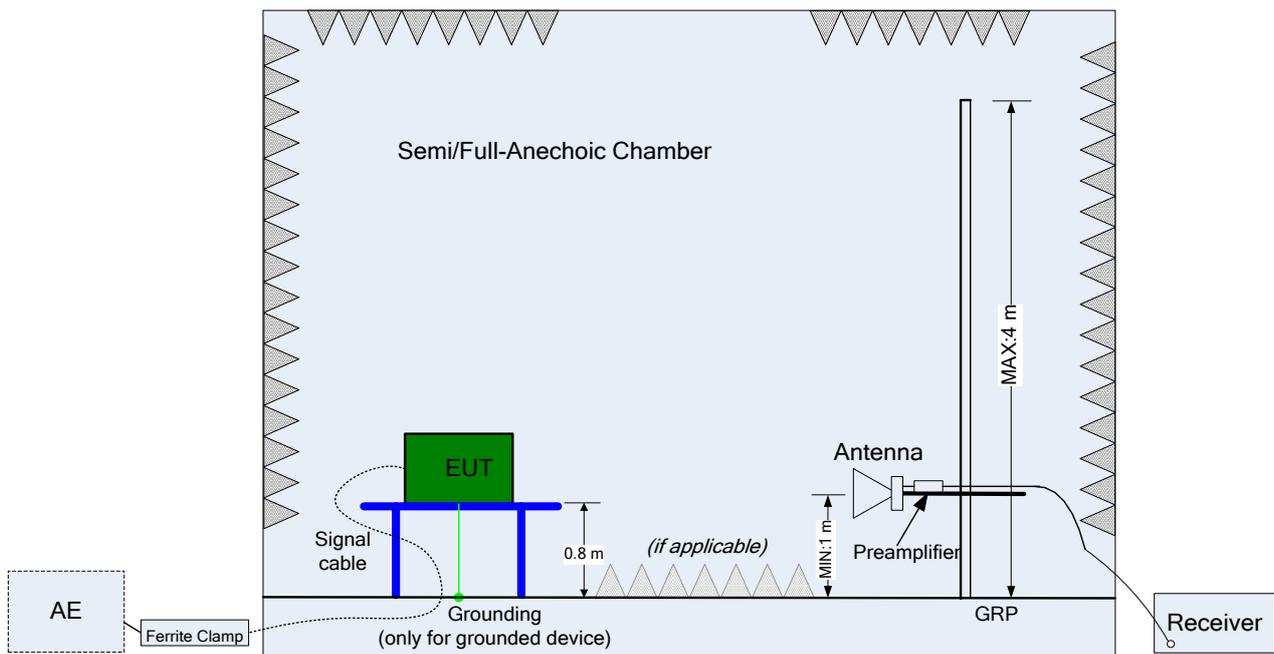
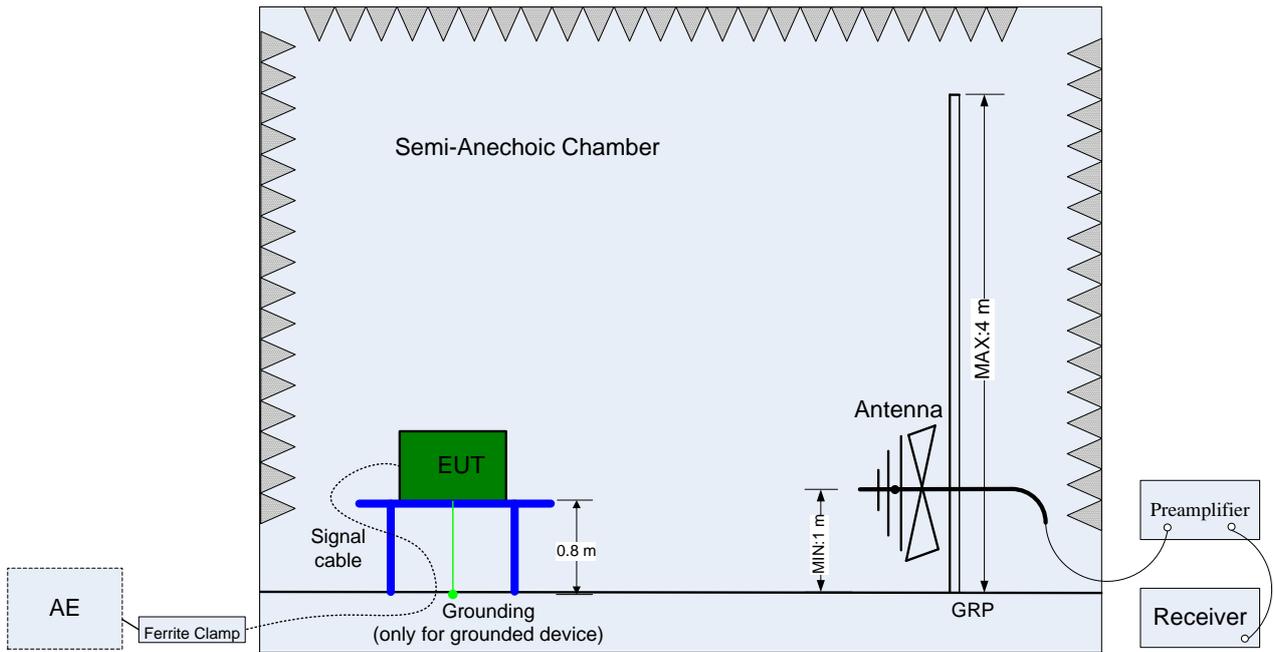
The antenna port (waveguide) of the EUT is connected to the spectrum analyzer per appropriate attenuator/extension/adapter. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



4.4.2 Test Setup 2

The test site semi-anechoic chamber for below 1 GHz met the requirement of NSA tolerance 4 dB according to the standard ANSI C63.4. The test distance is 3 m. The test site semi-/full-anechoic chamber for above 1 GHz test met the requirement of SVSWR tolerance 6 dB in accordance with the standard ANSI C63.4. The test distance was 3 m. The setup is according to ANSI C63.10, ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22.

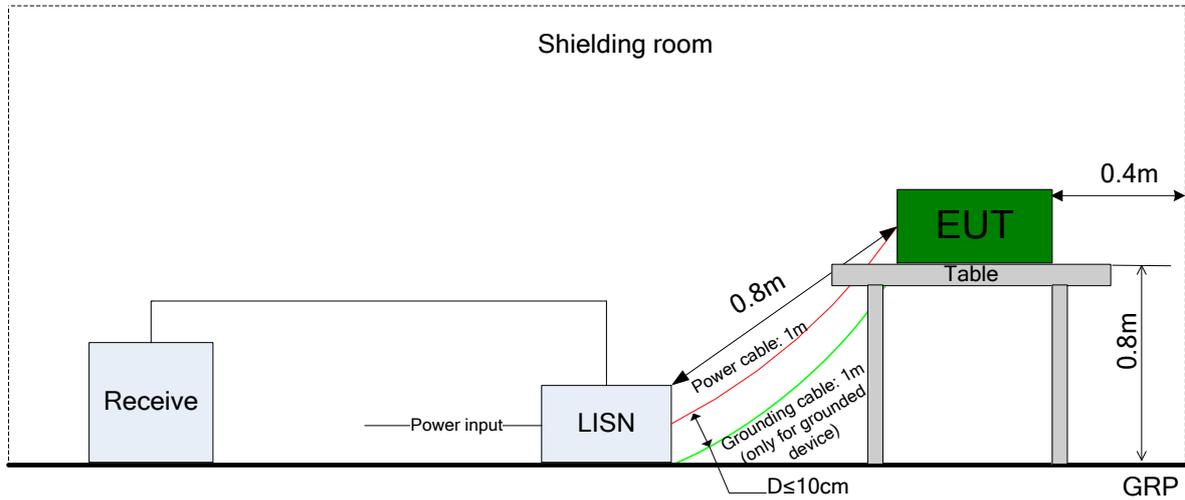
The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).



4.4.3 Test Setup 3

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.



4.5 Test Conditions

Test Case		Test Conditions	
Bandwidth	Occupied Bandwidth (OBW)	Test Method	ANSI C63.10 §6.9; RSS-Gen, §4.6.1. <ul style="list-style-type: none"> SPAN=1.5-5*OBW, RBW=1-5%*OBW, VBW≥3*RBW, Peak Det., Trace Max Hold, Coupled Sweep Time. (If trace max hold is restricted, use appropriate sweep time)
		Test Env.	NTNV
		Test Setup	Test Seup 1
		EUT Conf.	B-TM1, B-TM2, M-TM1, M-TM2, T-TM1, T-TM2
	Emission Bandwidth (-6 dBc EBW)	Test Method	FCC §15.255(e); KDB200443 §3; MILLIMETER WAVE TEST PROCEDURES. <ul style="list-style-type: none"> SPAN=2-3*EBW(-6dBc), RBW=100kHz, VBW≥3*RBW, Peak Det., Trace Max Hold, Coupled Sweep Time. (If trace max hold is restricted, use appropriate sweep time)
		Test Env.	NTNV
		Test Setup	Test Seup 1
		EUT Conf.	B-TM1, B-TM2, M-TM1, M-TM2, T-TM1, T-TM2
EIRP / In-Band Emissions	Test Method	MILLIMETER WAVE TEST PROCEDURES. <ul style="list-style-type: none"> If modulation can be disabled (CW mode, preferred): RBW=1MHz, VBW≥3*RBW, RMS/Peak Det, Coupled Sweep Time. If modulation can not be disabled: ChPwr Meas, RBW=1MHz, VBW≥3*RBW, IBW>EBW, RMS/Peak Det. Note: The compliance of power density or EIRP is based on conducted output power measurement (see NOTE 1 of the table in clause 2.1.1).	
	Test Env.	NTNV	
	Test Setup	Test Seup 1	
	EUT Conf.	B-TM1, B-TM2, M-TM1, M-TM2, T-TM1, T-TM2	
Peak Transmitter Output Power	Test Method	MILLIMETER WAVE TEST PROCEDURES. <ul style="list-style-type: none"> If modulation can be disabled (CW mode, preferred): RBW=1MHz, VBW≥3*RBW, Peak Det, Coupled Sweep Time. If modulation can not be disabled: ChPwr Meas, RBW=1MHz, VBW≥3*RBW, IBW>EBW, Peak Det. 	
	Test Env.	NTNV	
	Test Setup	Test Seup 1	
	EUT Conf.	B-TM1, B-TM2, M-TM1, M-TM2, T-TM1, T-TM2	
Spurious Emissions	Test Method	ANSI C63.10.	
		9k-150kHz	<ul style="list-style-type: none"> Pre.: RBW=300Hz; VBW=1kHz; Det=Peak. Final: ---
		150k-30MHz	<ul style="list-style-type: none"> Pre.: RBW=10kHz; VBW=30kHz; Det=Peak. Final: ---

Test Case	Test Conditions		
	30M-1GHz	<ul style="list-style-type: none"> ● Pre.: RBW=100kHz; VBW=300kHz; Det=Peak. ● Final: RBW=120kHz; Det=CISPR Quasi-Peak. 	
	1G-40GHz	<ul style="list-style-type: none"> ● Avg.: RBW=1MHz; VBW=3MHz; Det.=RMS; SPAN/Sweep-point≤RBW/2; Sweep-time=Auto; Trace≥RMS*100; Add-Transd.=10*Ig(1/X). ● Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold. <p>Note: The peak measurement is not required, just for reference.</p>	
	≥40GHz	<ul style="list-style-type: none"> ● Avg.: RBW=1MHz; VBW=3MHz; Det.=RMS; SPAN/Sweep-point≤RBW/2; Sweep-time=Auto; Trace≥RMS*100; Add-Transd.=10*Ig(1/X). ● Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold. <p>Note 1: The peak measurement is not required, just for reference.</p> <p>Note 2: According to FCC "MILLIMETER WAVE TEST PROCEDURES", the reduced RBW can be used to increase system sensitivity.</p>	
	Test Env.	NTNV	
	Test Setup	Test Seup 2	
	EUT Conf.	The whole testing range is from "9 kHz to 220 GHz" is divided into following several parts according to the test site settings for radiated measurement.	
		9k-150kHz	Worst Case (B-TM1)
		150k-30MHz	Worst Case (B-TM1)
		30M-1GHz	Worst Case (B-TM1)
		1G-40GHz	Worst Case (B-TM1)
	40 G-50 GHz	Worst Case (B-TM1)	
	50 G-75 GHz	Worst Case (B-TM1)	
	75G-110 GHz	Worst Case (B-TM1)	
	110G-140 GHz	Worst Case (B-TM1)	
	140G-220 GHz	Worst Case (B-TM1)	
Frequency Stability	Test Method	KDB200443 §6; MILLIMETER WAVE TEST PROCEDURES. <ul style="list-style-type: none"> ● SPAN=2-3*EBW(-20dBc), RBW=1%*EBW(-20dBc), VBW≥3*RBW, Peak Det., Trace Max Hold, Coupled Sweep Time. (If trace max hold is restricted, use appropriate sweep time) 	
	Test Env.	(1) -20 °C to +50 °C with step 10 °C at 100% of Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at +20 °C.	
	Test Setup	Test Setup 1	
	EUT Conf.	B-TM1, B-TM2, T-TM1, T-TM2	
AC Power Line Conducted Emissions	Test Method	AC mains conducted. <ul style="list-style-type: none"> ● Pre.: RBW=10 kHz; Det.=Peak. 	



Test Case	Test Conditions	
		● Final: RBW=9 kHz; Det.=CISPR Quasi-Peak & Average.
	Test Env.	NTNV2
	Test Setup	Test Setup 3
	EUT Conf.	Worst Case (B-TM1)



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	Calibration Date
Test Setup 1				
Spectrum Analyzer	Agilent	E4440A	MY49420179	2013-08-30
Spectrum Analyzer	R&S	FSU67	101148	2013-12-05
Power Meter	Agilent	E4418B	MY45108722	2013-12-05
Power Sensor	Agilent	V8486A	MY53080008	2014-04-20
Power Supply (AC)	Chroma	6530	653000008611	2012-10-16 (2y)
Power Supply (DC)	Chroma	62012P-80-60	62012PD01403	2012-10-16 (2y)
Climate Chamber	ESPEC	EW0470S	12113066	2013-12-26
Test Setup 2				
EMI test receiver	Agilent	N9038A	MY52260169	2013-12-02
Spectrum analyser	Agilent	N9010A	MY52220816	2014-03-18
Bilog antenna	TESEQ	CBL 6112B	35238	2013-12-02 (2y)
Bilog antenna	TESEQ	CBL 6112B	35239	2013-12-02 (2y)
Horn antenna (1-18GHz)	SWARZBECK	BBHA 9120D	1077	2013-12-02 (2y)
Horn antenna (1-18GHz)	SWARZBECK	BBHA 9120D	1078	2013-12-02 (2y)
Horn antenna (18-26.5GHz)	ETS	3160-09	00114886	2014-05-08 (2y)
Horn antenna (18-26.5GHz)	ETS	3160-09	00117544	2013-12-27 (2y)
Horn antenna (26.5-40GHz)	ETS	3160-10	00144745	2013-12-27 (2y)
Horn antenna (40-60GHz)	OML	M19RH	A130913826	VOU
Horn antenna (50-75GHz)	OML	M15RH	A130913825	VOU
Horn antenna (75-110GHz)	OML	M10RH	A130913824	VOU
Horn antenna (110-170GHz)	OML	M06RH	A130913823	VOU
Horn antenna (140-220GHz)	OML	M05RH	A130913822	VOU
Harmonic mixer (40-60GHz)	Farran	WHMB-19-0002	FTL 9039	VOU
Harmonic mixer (50-75GHz)	Farran	WHMB-15-0002	FTL 9040	VOU
Harmonic mixer (75-110GHz)	Farran	WHMB-10-0002	FTL 9042	VOU
Harmonic mixer (110-170GHz)	Farran	WHMB-06-0002	FTL 9043	VOU
Harmonic mixer (140-220GHz)	Farran	WHMB-05-0002	FTL 9044	VOU
Test Setup 3				
EMI Test receiver	R&S	ESCS30	830245/018	2014-03-18
Artificial Mains Network	R&S	ENV4200	100063	2014-03-18

END