



FCC

RF Test Report

Product Name: Vodafone Mobile Wi-Fi

Model Number: R216

Report No: SYBH(Z-RF)024122014-2003

FCC ID: QISR216

Reliability Laboratory 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 to perform electromagnetic emission measurements. The site recognition number is 684868.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-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.
1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.

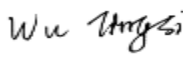


Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R.C

Date of Receipt Sample: 2014-12-08
Start Date of Test: 2014-12-08
End Date of Test: 2014-12-22

Test Result: Pass

Approved by Senior Engineer:	2014-12-22	Liu Chunlin	
	Date	Name	Signature

Prepared by:	2014-12-22	Wu Tingsi	
	Date	Name	Signature

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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J
 47 CFR FCC Part 15, Subpart C
 47 CFR FCC Part 15, Subpart E

Test Method: KDB 789033 D02 General UNII Test Procedures New Rules v01
 FCC KDB 662911 D01 Multiple Transmitter Output v02
 ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices

1.2 Test Location

Test Location 1: 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: Intertek Testing Services Shenzhen Ltd.
Address: Kejiyuan Branch 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen,
 P.R. China
 Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

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 Measurement Technical Requirements

2.1.1 U-NII (5150-5250MHz)

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
Emission Bandwidth	5150-5250	15.403	No limit.	Appendix A	Pass
Maximum Conducted Output Power	5150-5250	15.407(a)	<Fixed:1Watt Mobile and portable:250mW	Appendix B	Pass
Peak Power Spectral Density	5150-5250	15.407(a)	Mobile and portable:11dBm/MHz Other then Mobileand portable:17dBm/MHz	Appendix C	
Unwanted Emissions into Non-Restricted Frequency Bands	5150-5250	15.407(b)	<-27(beyond 10 MHz of the band edge)	Appendix D	Pass (Note 1)
AC Power Line Conducted Emissions	5150-5250	15.207	FCC Part 15.207 conducted limit;	Appendix E	Pass
Unwanted Emissions in restricted frequency band	5150-5250	15.407(b)	FCC Part 15.209 limit;	Appendix F	Pass
Frequency Stability	5150-5250	15.407(g)	FCC Part 15.407(g)	Appendix G	Pass
NOTE 1: Unwanted Emissions is tested by Intertek.					

2.1.2 UNII-3 (5725-5850 MHz)

Test Item	FCC Rule	Requirements	Test Result	Verdict
6 dB Bandwidth	15.403 15.407(e)	≥ 500 kHz.	Appendix A	Pass
Maximum Peak Conducted Output Power	15.407(a)	<30dBm	Appendix B	Pass
Maximum Power Spectral Density Level	15.407(a)	<30dBm/500KHz	Appendix C	Pass
Unwanted Emissions into Non-Restricted Frequency Bands	15.407(b)	<-27(beyond 10 MHz of the band edge)	Appendix D	Pass
		<-17(beyond 10 MHz of the band edge)		
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	Appendix E	Pass
Unwanted Emissions in restricted frequency band	15.407(e)	FCC Part 15.209 limit;	Appendix F	Pass
Frequency Stability	15.407(g)	FCC Part 15.407(g)	Appendix G	Pass
NOTE 1: Unwanted Emissions is tested by Intertek.				

3 Description of the Equipment under Test (EUT)

3.1 General Description

R216 is a LTE/UMTS/GSM triple mode and WiFi Wireless mobile WiFi. It can be used as a WiFi hotspot based on standard of IEEE802.11a/b/g/n. It supports 3G WCDMA and 4G LTE wireless internet accessing function. About 3G WCDMA wireless mode, it supports WCDMA and HSDPA/HSUPA/HSPA+/DC-HSPA+, operating in Band1 (2100MHz)、Band5(850M) 、Band8(900MHz), the 4G LTE operating inBand3(1800MHz)、Band5(850MHz)、Band7(2600MHz)、Band20(800MHz), and the GSM mode supports EDGE/GPRS/GSM 1900MHz/1800MHz/850MHz/900MHz. The WiFi supports 1X1 and 2X2, the frequency are 2.4GHz and 5GHz.





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		
Description	Hardware Version	Software Version
Main Board	CL1E5573SM06	TBD

3.2.2 Sub-Assembly

Name	Manufacture	Description
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100E1W Input voltage: ~100-240V 50/60Hz 0.2A Output voltage: 5V  1A Rated Power: 3.5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100B1W Input voltage: ~100-240V 50/60Hz 0.2A Output voltage: 5V  1A Rated Power: 3.5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100A1W Input voltage: ~100-240V 50/60Hz 0.2A Output voltage: 5V  1A Rated Power: 3.5W
Li-ion Battery	Huawei Technologies Co., Ltd.	Battery Model: HB434666RBC Rated capacity: 1500mAh Nominal Voltage:  +3.7V

		Charging Voltage:  +4.2V
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3.3 Technical Description

Characteristics	Description			
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11a (20 MHz channel bandwidth) , <input checked="" type="checkbox"/> 802.11n (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11n (40 MHz channel bandwidth), <input type="checkbox"/> 802.11ac (20 MHz channel bandwidth), <input type="checkbox"/> 802.11ac (40 MHz channel bandwidth), <input type="checkbox"/> 802.11ac (80 MHz channel bandwidth),			
TX/RX Operating Range	All	fc = 5000 MHz + N * 5 MHz, where: - fc = “Operating Frequency” in MHz, - N = “Channel Number”.		
	5150-5250 MHz (U-NII)	N = 36 to 48 with step of 4 for the 20 MHz channel bandwidth. N = 38 to 46 with step of 4 for the 40 MHz channel bandwidth. N = 42 for the 80 MHz channel bandwidth.		
	5725-5850 MHz U-NII-3	N = 149 to 165 with step of 4 for the 20 MHz channel bandwidth. N = 151 to 159 with step of 4 for the 40 MHz channel bandwidth. N = 155 for the 80 MHz channel bandwidth.		
Modulation Type	BPSK/QPSK/16QAM/64QAM (OFDM).			
Emission Designator	U-NII(5150-5250)	19M2G7D (for 802.11a mod), 19M8G7D (for 802.11n 20 MHz mode), 46M0G7D (for 802.11n 40 MHz mode),		
	U-NII-3 (5725-5850 MHz)	15M9G7D (for 802.11a mod), 17M0G7D (for 802.11n 20 MHz mode), 36M5G7D (for 802.11n 40 MHz mode),		
TPC	<input checked="" type="checkbox"/> Supported, <input type="checkbox"/> Not Supported			
Antenna	Type	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated		
	Ports	<input checked="" type="checkbox"/> Ant 1, <input checked="" type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3, <input type="checkbox"/> Ant 4		
	Smart System	<input checked="" type="checkbox"/> SISO (for 802.11a/n), <input checked="" type="checkbox"/> MIMO (for 802.11n): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11a) : Tx & Rx		
	Gain	Ant 1: 2.8 dBi, Ant 2: 2.8dBi (per antenna port, max.)		
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.		
Power Supply	Type	<input checked="" type="checkbox"/> AC/DC Adapter	<input type="checkbox"/> PoE:	<input type="checkbox"/> Other:

4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: Worst cases for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
11A	IEEE 802.11a with data rate of 6 Mbps using SISO mode.
11N20	IEEE 802.11n with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11N20m	IEEE 802.11n with data rate of MCS8 and bandwidth of 20 MHz using MIMO mode.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.
11N40m	IEEE 802.11n with data rate of MCS8 and bandwidth of 40 MHz using MIMO mode.

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 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.

4.2.2 Customized Configurations

4.2.2.1 U-NII

Test Mode	Antenna Port	TX Freq. [MHz]	RX Freq. [MHz]	Power Conf., per Port	Duty Cycle
11A	Ant 1	5180 (Ch.36)	---	10	95%
11A	Ant 2	5180 (Ch.36)	---	10	95%
11A	Ant 1	5200 (Ch.40)	---	10	95%
11A	Ant 2	5200 (Ch.40)	---	10	95%
11A	Ant 1	5240 (Ch.48)	---	10	95%
11A	Ant 2	5240 (Ch.48)	---	10	95%
11N20	Ant 1	5180 (Ch.36)	---	10	95%
11N20	Ant 2	5180 (Ch.36)	---	10	95%
11N20m	Ant 1	5180 (Ch.36)	---	10	65%
11N20m	Ant 2	5180 (Ch.36)	---	10	65%

Test Mode	Antenna Port	TX Freq. [MHz]	RX Freq. [MHz]	Power Conf., per Port	Duty Cycle
11N20	Ant 1	5200 (Ch.40)	---	10	95%
11N20	Ant 2	5200 (Ch.40)	---	10	95%
11N20m	Ant 1	5200 (Ch.40)	---	10	65%
11N20m	Ant 2	5200 (Ch.40)	---	10	65%
11N20	Ant 1	5240 (Ch.48)	---	10	95%
11N20	Ant 2	5240 (Ch.48)	---	10	95%
11N20m	Ant 1	5240 (Ch.48)	---	10	65%
11N20m	Ant 2	5240 (Ch.48)	---	10	65%
11N40	Ant 1	5190 (Ch.38)	---	10	90%
11N40	Ant 2	5190 (Ch.38)	---	10	90%
11N40m	Ant 1	5190 (Ch.38)	---	10	51%
11N40m	Ant 2	5190 (Ch.38)	---	10	51%
11N40	Ant 1	5230 (Ch.46)	---	10	90%
11N40	Ant 2	5230 (Ch.46)	---	10	90%
11N40m	Ant 1	5230 (Ch.46)	---	10	51%
11N40m	Ant 2	5230 (Ch.46)	---	10	51%

4.2.2.2 U-NII-3

Test Mode	Antenna Port	TX Freq. [MHz]	RX Freq. [MHz]	Power Conf., per Port	Duty Cycle
11A	Ant 1	5745 (Ch.149)	---	10	95%
11A	Ant 2	5745 (Ch.149)	---	10	95%
11A	Ant 1	5785 (Ch.157)	---	10	95%
11A	Ant 2	5785 (Ch.157)	---	10	95%
11A	Ant 1	5825 (Ch.165)	---	10	95%
11A	Ant 2	5825 (Ch.165)	---	10	95%
11N20	Ant 1	5745 (Ch.149)	---	10	95%
11N20	Ant 2	5745 (Ch.149)	---	10	95%
11N20m	Ant 1	5745 (Ch.149)	---	10	65%
11N20m	Ant 2	5745 (Ch.149)	---	10	65%
11N20	Ant 1	5785 (Ch.157)	---	10	95%
11N20	Ant 2	5785 (Ch.157)	---	10	95%
11N20m	Ant 1	5785 (Ch.157)	---	10	65%
11N20m	Ant 2	5785 (Ch.157)	---	10	65%

Test Mode	Antenna Port	TX Freq. [MHz]	RX Freq. [MHz]	Power Conf., per Port	Duty Cycle
11N20	Ant 1	5825 (Ch.165)	---	10	95%
11N20	Ant 2	5825 (Ch.165)	---	10	95%
11N20m	Ant 1	5825 (Ch.165)	---	10	65%
11N20m	Ant 2	5825 (Ch.165)	---	10	65%
11N40	Ant 1	5755(Ch.151)	---	10	90%
11N40	Ant 2	5755(Ch.151)	---	10	90%
11N40m	Ant 1	5755(Ch.151)	---	10	51%
11N40m	Ant 2	5755(Ch.151)	---	10	51%
11N40	Ant 1	5795(Ch.159)	---	10	90%
11N40	Ant 2	5795(Ch.159)	---	10	90%
11N40m	Ant 1	5795(Ch.159)	---	10	51%
11N40m	Ant 2	5795(Ch.159)	---	10	51%

4.3 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	3.7 VDC	Ambient

4.4 Antenna requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

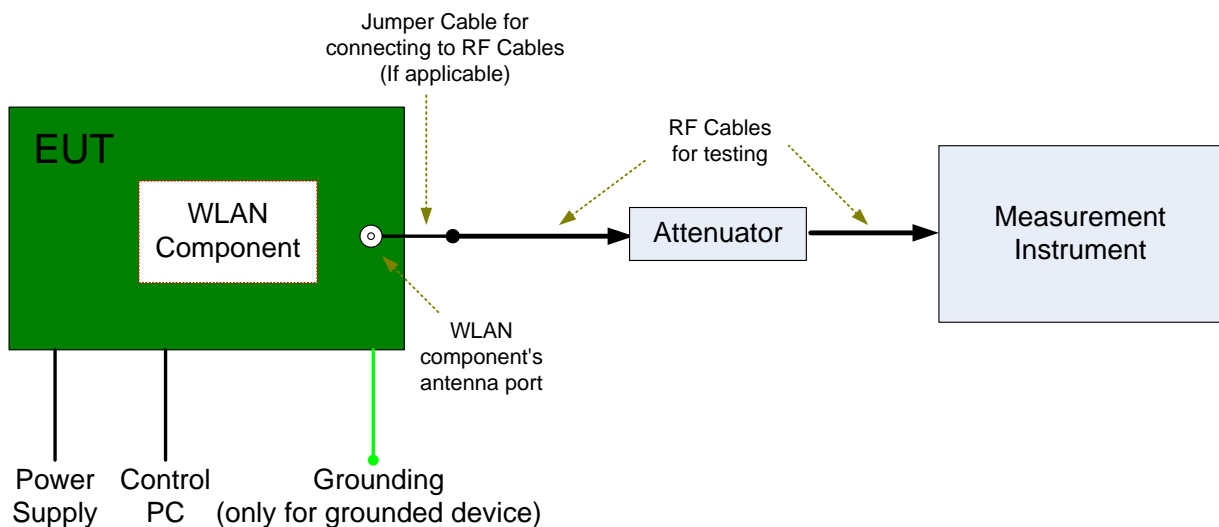
The antennas of the **R216** are **permanently attached**.

There are no provisions for connection to an external antenna.

4.5 Test Setups

4.5.1 Test Setup 1

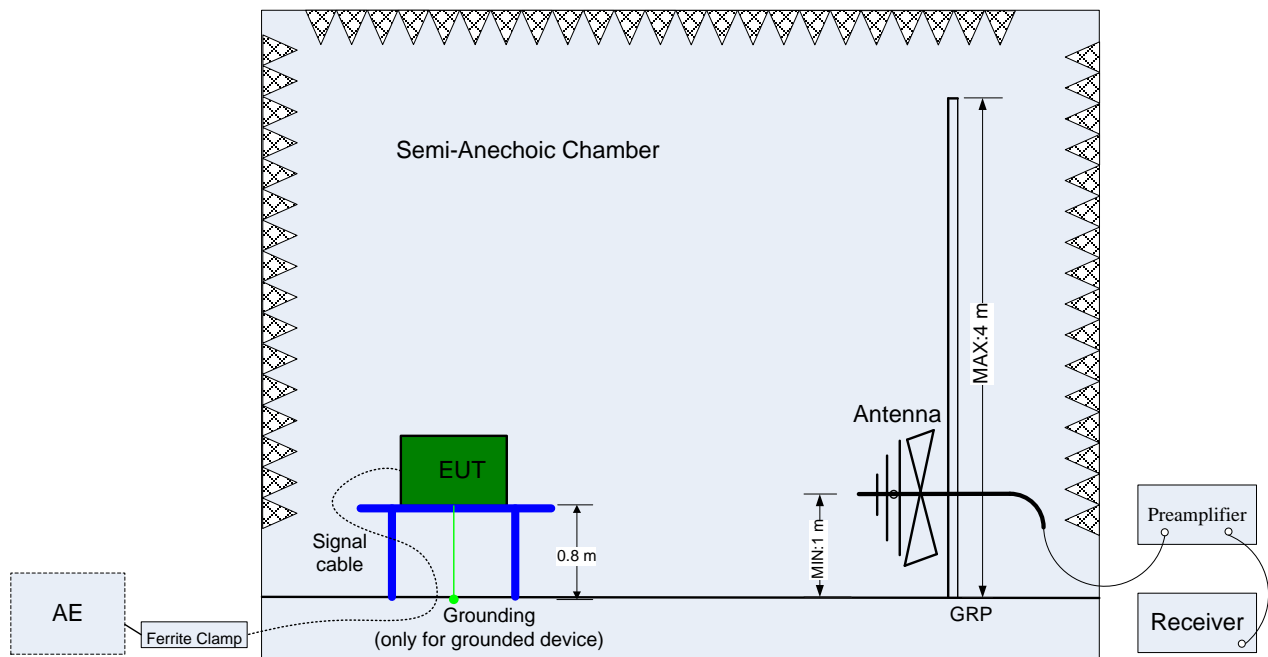
The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



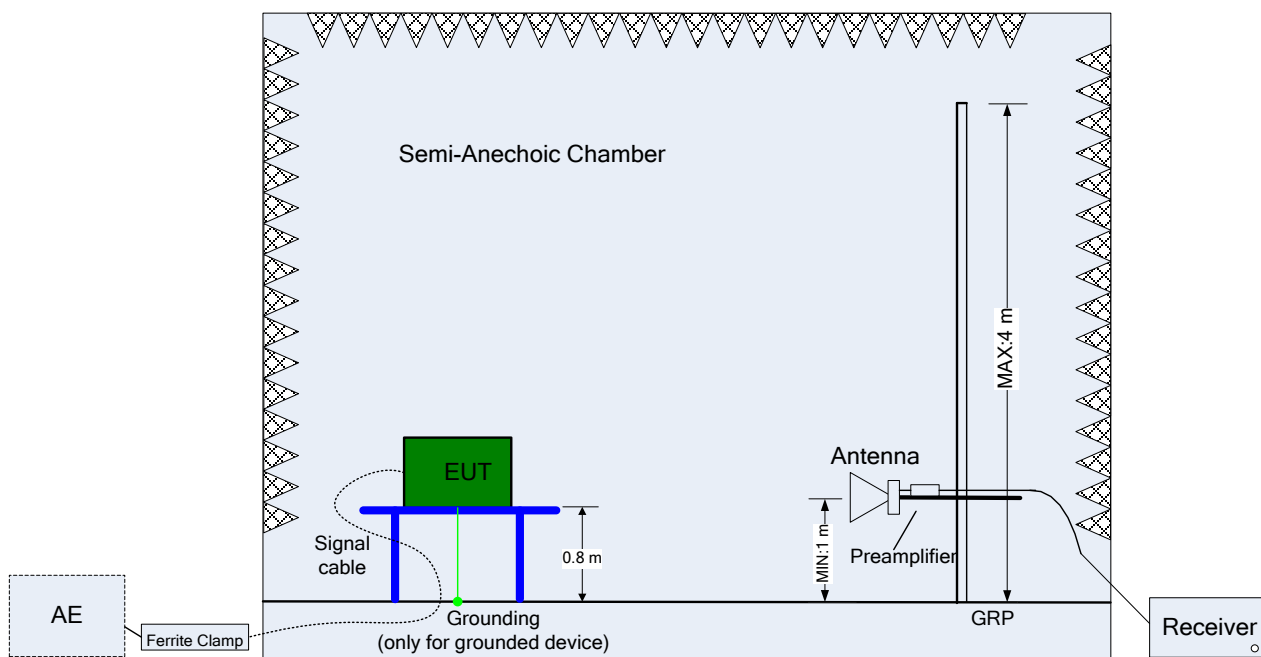
4.5.2 Test Setup 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4. The test distance is 3 m (for 30 MHz to 26.5 GHz) or 1 m (for 26.5 GHz to 40 GHz). 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).



(Below 1 GHz)

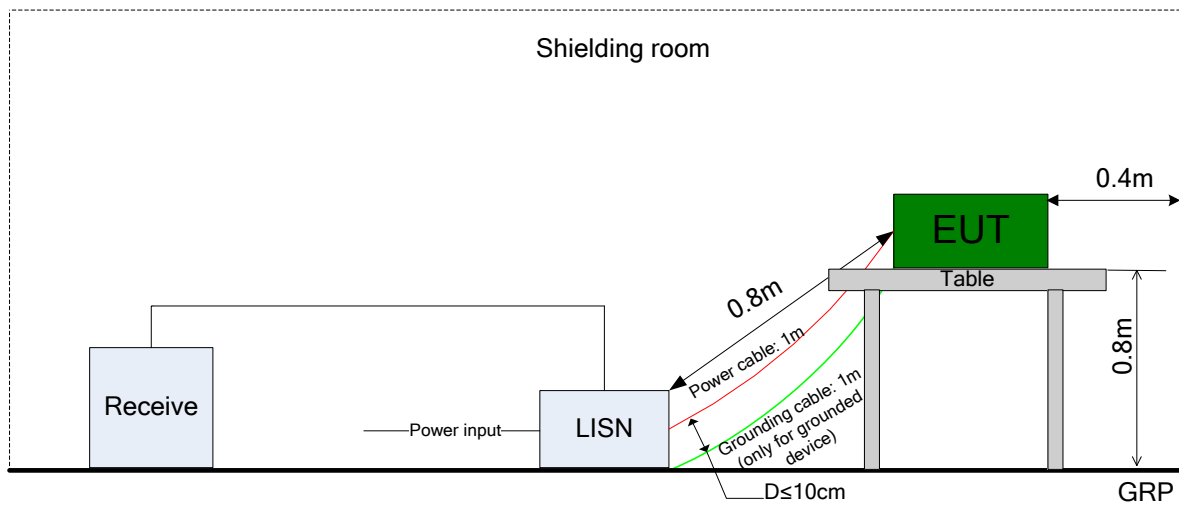


(Above 1 GHz)

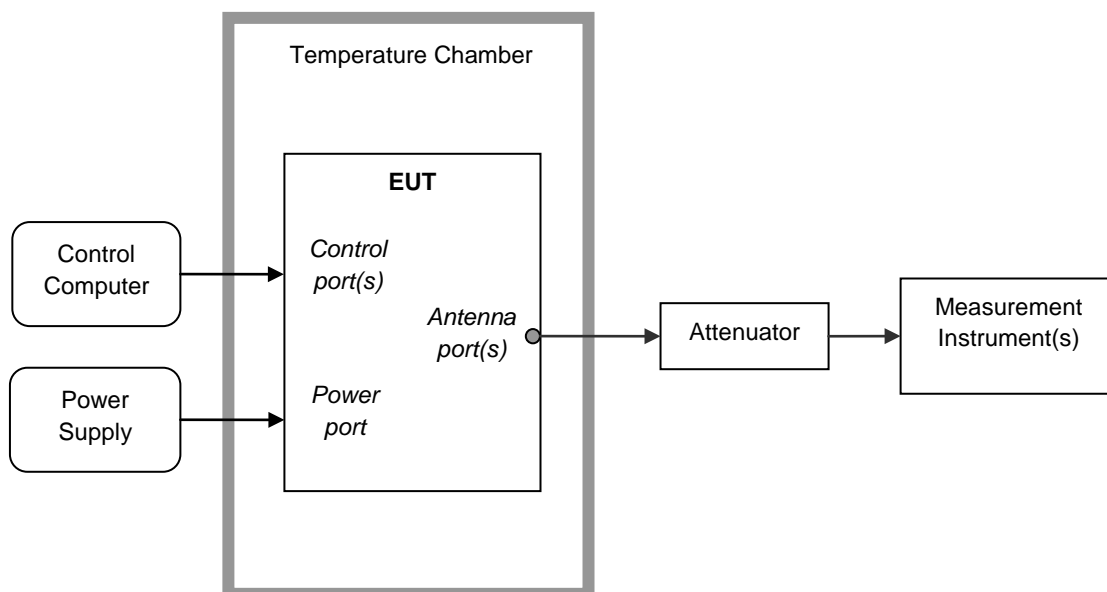
4.5.3 Test Setup 3

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.



4.5.4 Test Setup 4



4.6 Test Conditions

4.6.1 U-NII

Test Case	Test Conditions		
	Configuration	Description	
26 dB Emission Bandwidth (EBW)	Meas. Method	FCC KDB 789033 §C1).	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	All EUT conf. with Tx modes.	
Maximum Conducted Output Power	Meas. Method	FCC KDB 789033 §C)3)b) Method SA-1 and d) Method SA-2.	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	All EUT conf. with Tx modes.	
Peak Power Spectral Density	Meas. Method	FCC KDB 789033 §E).	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	All EUT conf. with Tx modes.	
Unwanted Emissions into Non-Restricted Frequency Bands (Cond.)	Meas. Method	FCC KDB 789033 §G), Conducted (antenna-port). NOTE: Antenna-port conducted measurements (Cond.) are acceptable as an alternative to radiated measurements (Rad.) for demonstrating compliance to the limits in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test (Rad-a) for cabinet/case emissions will also be required.	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	5150-5250	All EUT Test Mode 20 MHz bandwidth: Ch.36, Ch.48 40 MHz bandwidth: Ch.38, Ch.46
Unwanted Emissions in restricted frequency band	Meas. Method	FCC KDB 789033 §G)	
	Test Env.	NTNV	
	Test Setup	Test Setup 2	
	EUT Conf.	5150-5250	All EUT Test Mode
AC Power Line Conducted Emissions	Meas. Method	AC mains conducted. Pre: RBW = 10 kHz; Det. = Peak. Final: RBW = 9 kHz; Det. = CISPR Quasi-Peak & Average.	
	Test Env.	NTNV	
	Test Setup	Test Setup 3	
	EUT Conf.	Ch.36 (Worst Conf.)	
Frequency Stability	Test Env.	(1) -5 °C to +50 °C with step 5 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.	

Test Case	Test Conditions	
	Configuration	Description
	Test Setup	Test Setup 4
	EUT Conf.	Ch.36 (Worst Conf.)

4.6.1.1 U-NII-3

Test Case	Test Conditions	
	Configuration	Description
6 dB Emission Bandwidth (EBW)	Meas. Method	FCC KDB 789033 §C2).
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Maximum Conducted Output Power	Meas. Method	FCC KDB 789033 §C3)b) Method SA-1 and d) Method SA-2.
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Peak Power Spectral Density	Meas. Method	FCC KDB 789033 §E).
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Unwanted Emissions into Non-Restricted Frequency Bands (Cond.)	Meas. Method	FCC KDB 789033 §G), Conducted (antenna-port). NOTE: Antenna-port conducted measurements (Cond.) are acceptable as an alternative to radiated measurements (Rad.) for demonstrating compliance to the limits in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test (Rad-a) for cabinet/case emissions will also be required.
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	5725-5825 All EUT Test Mode
Unwanted Emissions in restricted frequency band	Meas. Method	FCC KDB 789033 §G)
	Test Env.	NTNV
	Test Setup	Test Setup 2
	EUT Conf.	5725-5825 All EUT Test Mode
AC Power Line Conducted Emissions	Meas. Method	AC mains conducted. Pre: RBW = 10 kHz; Det. = Peak. Final: RBW = 9 kHz; Det. = CISPR Quasi-Peak & Average.
	Test Env.	NTNV
	Test Setup	Test Setup 3
	EUT Conf.	Ch.36 (Worst Conf.)

Test Case	Test Conditions	
	Configuration	Description
Frequency Stability	Test Env.	(1) -5 °C to +50 °C with step 5 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.
	Test Setup	Test Setup 4
	EUT Conf.	Ch.165 (Worst Conf.)

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 Date	Cal- Due
Power supply	KEITHLEY	2303	A120714713	2014-05-26	2015-05-25
Wireless Communication Test set	Agilent	N4010A	MY49081592	2014-11-04	2015-11-03
Universal Radio Communication Tester	R&S	CMU200	117341	2014-02-25	2015-02-24
Spectrum Analyzer	Agilent	N9020A	MY52090652	2014-07-11	2015-07-10
Universal Radio Communication Tester	R & S	CMW500	126855	2013-08-08	2015-08-09
Spectrum Analyzer	Agilent	E4440A	MY48250119	2014-07-11	2015-07-10
Signal Analyzer	R&S	FSQ31	200021	2014-11-04	2015-11-03
Spectrum Analyzer	Agilent	N9030A	MY49431698	2014-11-04	2015-11-03
Temperature Chamber	WEISS	WKL64	56246002940010	2014-02-25	2015-02-24
Temperature Chamber	ESPEC	MW3030	06114003	2014-05-09	2015-05-08
Signal generator	Agilent	E8257D	MY51500314	2014-05-09	2015-05-08
Vector Signal Generator	R&S	SMU200A	104162	2014-11-04	2015-11-03
Test receiver	R&S	ESU26	100150	2014-05-09	2015-05-08
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	2013-02-02	2015-02-01
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBECK	VULB 9163	9163-490	2013-02-02	2015-02-01
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100262	2013-03-23	2015-03-22
Pyramidal Horn Antenna(18GHz-26-5GHz)	ETS-LINDGREN	3160-09	5140299	2013-03-05	2015-03-04

END