



中国认可  
国际互认  
检测  
TESTING  
CNAS L0310



# FCC& RF Test Report

**Product Name: Smart Phone**

**Model Number: FRD-L04**

**Report No: SYBH(Z-RF)002052016-2005**

**FCC ID: QISFRD-L04**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

**(Global Compliance and Testing Center 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 & 2174.02 & 2174.03.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.
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 laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named “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

**Date of Receipt Sample:** 2016-05-05  
**Start Date of Test:** 2016-05-07  
**End Date of Test:** 2016-06-31

**Test Result:** Pass

<b>Approved by Senior Engineer:</b>	2016-06-18	Roger Zhang	<i>Roger Zhang</i>
	Date	Name	Signature

<b>Prepared by:</b>	2016-06-18	Wu Tingsi	<i>Wu Tingsi</i>
	Date	Name	Signature



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## 1 General Information

### 1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J 2014  
47 CFR FCC Part 15, Subpart C 2014  
47 CFR FCC Part 15, Subpart E 2014

Test Method: KDB 789033 D02 General UNII Test Procedures New Rules v01r01  
FCC KDB 558074 D01 DTS Meas Guidance v03r04  
ANSI C63.10-2013, 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

### 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 (5150-5250, 5250-5350, 5470-5725 MHz, 5725-5850)

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
Emission Bandwidth	5150-5250	15.403(i) 15.407(a)(1)	No limit.	Appendix A	Pass
	5250-5350	15.403(i) 15.407(a)(2)			
	5470-5725	15.403(i) 15.407(a)(2)			
	5725-5850	15.403(i) 15.407(e)	≥ 500 kHz.		
Occupied Bandwidth	5150-5250	KDB 789033 § D	No limit.	Appendix B	Pass
	5250-5350				
	5470-5725				
	5725-5850				
Duty Cycle	5150-5850	--	No limit.	Appendix C	
Maximum Conducted Output Power	5150-5250	15.407(a)(1) 15.407(a)(4)	< 250mW (avg during transmission)	Appendix D	Pass
	5250-5350	15.407(a)(2) 15.407(a)(4)	<MIN{250mW, 11dBm + 10*lg(EBW)} (avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	<MIN{250mW, 11dBm + 10*lg(EBW)} (avg during transmission)		
	5725-5850	15.407(a)(3)	< 1W (avg during transmission)		
Peak Power Spectral Density	5150-5250	15.407(a)(1) 15.407(a)(4)	<11dBm/MHz (avg during transmission)	Appendix E	
	5250-5350	15.407(a)(2)	<11dBm/MHz		

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
		15.407(a)(4)	(avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	<11dBm/MHz (avg during transmission)		
	5725-5850	15.407(a)(3) 15.407(a)(4)	<30dBm/500KHz (avg during transmission)		
Unwanted Emissions	5150-5250	15.407(b)(1) 15.407(b)(6) 15.407(b)(7) 15.209	<ul style="list-style-type: none"> <li>F&lt;1GHz: §15.209/§7.2.5 limit (QP).</li> <li>F≥1GHz &amp; out-restricted: &lt;-27dBm/MHz PK e.i.r.p. (exl. 5.15-5.35 GHz).</li> <li>F≥1GHz &amp; in-restricted: §15.209/§7.2.5 limit (AV&amp;PK).</li> </ul>	Appendix F	Pass
	5250-5350	15.407(b)(2) 15.407(b)(6) 15.407(b)(7) 15.209	<ul style="list-style-type: none"> <li>F&lt;1GHz: §15.209/§7.2.5 limit (QP).</li> <li>F≥1GHz &amp; out-restricted: &lt;-27dBm/MHz PK e.i.r.p. (exl. 5.25-5.35 GHz).</li> <li>F≥1GHz &amp; in-restricted: §15.209/§7.2.5 limit (AV&amp;PK).</li> </ul>		
	5470-5750	15.407(b)(3) 15.407(b)(6) 15.407(b)(7) 15.209	<ul style="list-style-type: none"> <li>F&lt;1GHz: §15.209/§7.2.5 limit (QP).</li> <li>F≥1GHz &amp; out-restricted: &lt;-27dBm/MHz PK e.i.r.p. (exl. 5.47-5.725 GHz).</li> <li>F≥1GHz &amp; in-restricted: §15.209/§7.2.5</li> </ul>		

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
			limit (AV&PK).		
	5725-5850	15.407(b)(4) 15.407(b)(6) 15.407(b)(7) 15.209	<ul style="list-style-type: none"> <li>F&lt;1GHz: §15.209/§7.2.5 limit (QP)</li> <li>F≥1GHz &amp; out-restricted: &lt;-17dBm/MHz PK e.i.r.p(from the edge to 10 MHz above or below the band edge); &lt;-27dBm/MHz PK e.i.r.p( for frequencies 10 MHz or greater above or below the band edge) (exl. 5725-5850 GHz).</li> <li>F≥1GHz &amp; in-restricted: §15.209/§7.2.5 limit (AV&amp;PK).</li> </ul>		
Frequence Stability	5150-5250 5250-5350 5470-5725 5725-5850	15.407(g)	FCC Part 15.407(g)	Appendix G	Pass





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

#### 3.1 General Description

FRD-L04 is subscriber equipment in the GSM/WCDMA/LTE system. The GSM frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. The UMTS frequency band is B1 and B2 and B4 and B5 and B8. The LTE frequency band is B1 and B2 and B3 and B4 and B5 and B7 and B8 and B12 and B17 and B20. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/HSPA /UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, AGPS, NFC and WIFI etc. Externally it provides one micro SD card interface (it can also used as SIM card interface), earphone port (to provide voice service) and one SIM card interface. FRD-L04 is single SIM smart phone. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

.NOTE: Only 5G WIFI test data included in this report.











#### 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	HL1FRDL04M	FRD-L04C567B020

### 3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-059200EHQ	Huawei Technologies Co., Ltd.	Input Voltage: ~100-240V 50/60Hz 0.5 A Output Voltage: 5V  2A or 9V  2A
Adapter	HW-059200BHQ	Huawei Technologies Co., Ltd.	Input Voltage: ~100-240V 50/60Hz 0.5 A Output Voltage: 5V  2A or 9V  2A
Adapter	HW-059200AHQ	Huawei Technologies Co., Ltd.	Input Voltage: ~100-240V 50/60Hz 0.5 A Output Voltage: 5V  2A or 9V  2A
Adapter	HW-059200UHQ	Huawei Technologies Co., Ltd.	Input Voltage: ~100-240V 50/60Hz 0.5 A Output Voltage: 5V  2A or 9V  2A
Li-Polymer Battery	HB366481ECW	Huawei Technologies Co., Ltd.	Rated capacity: 2900mAh Nominal Voltage:  +3.82V Charging Voltage:  +4.40V

### 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 checked="" type="checkbox"/> 802.11ac (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ac (40 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ac (80 MHz channel bandwidth),	
TX/RX Operating Range	All	$f_c = 5000 \text{ MHz} + N * 5 \text{ MHz}$ , where: - $f_c$ = "Operating Frequency" in MHz, - $N$ = "Channel Number".
	5150-5250 MHz (U-NII)	$N = 36$ to $48$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 38$ to $46$ with step of $4$ for the $40 \text{ MHz}$ channel bandwidth. $N = 42$ for the $80 \text{ MHz}$ channel bandwidth.
	5250-5350 MHz (U-NII)	$N = 52$ to $64$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 54$ to $62$ with step of $4$ for the $40 \text{ MHz}$ channel bandwidth. $N = 58$ for the $80 \text{ MHz}$ channel bandwidth.
	5470-5600 MHz (U-NII)	$N = 100$ to $116$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 102$ to $110$ with step of $4$ for the $40 \text{ MHz}$ channel bandwidth. $N = 106$ for the $80 \text{ MHz}$ channel bandwidth.
	5650-5725 MHz (U-NII)	$N = 132$ to $140$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 134$ for the $40 \text{ MHz}$ channel bandwidth.
Modulation Type	BPSK/QPSK/16QAM/64QAM (OFDM).	
Emission Designator	U-NII(5150-5250, 5250-5350, 5470-5725)	21M4G7D (for 802.11a mod), 21M9G7D (for 802.11n 20 MHz mode), 41M6G7D (for 802.11n 40 MHz mode), 21M9G7D (for 802.11ac 20 MHz mode) 43M1G7D (for 802.11ac 40 MHz mode) 81M7G7D (for 802.11ac 80 MHz mode)
	U-NII(5725-5850)	16M3G7D (for 802.11a mod), 16M7G7D (for 802.11n 20 MHz mode), 35M5G7D (for 802.11n 40 MHz mode), 16M9G7D (for 802.11ac 20 MHz mode) 35M5G7D (for 802.11ac 40 MHz mode) 75M3G7D (for 802.11ac 80 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 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/ac), <input type="checkbox"/> MIMO (for 802.11n/ac), <input type="checkbox"/> Diversity (for 802.11a) :           Tx &           Rx
	Gain	0.2 dBi (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.



Characteristics	Description		
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.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.
11AC20	IEEE 802.11ac with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11AC40	IEEE 802.11ac with data rate of MCS8 and bandwidth of 40 MHz using SISO mode.
11AC80	IEEE 802.11ac with data rate of MCS8 and bandwidth of 80 MHz using SISO mode.

### 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 performed at all TX antenna ports of the EUT, and</li> <li>All RX tests are performed at all RX antenna ports 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

##### 4.2.2.1 U-NII

Test Mode	Antenna Port	Power Conf.,	Duty cycle [%]
11A	Ant 1	13	90
11N20	Ant 1	12.5	90
11N40	Ant 1	12.5	81
11AC20	Ant 1	12.5	90
11AC40	Ant 1	12.5	90
11AC80	Ant 1	12.5	81

### 4.3 Test Environments

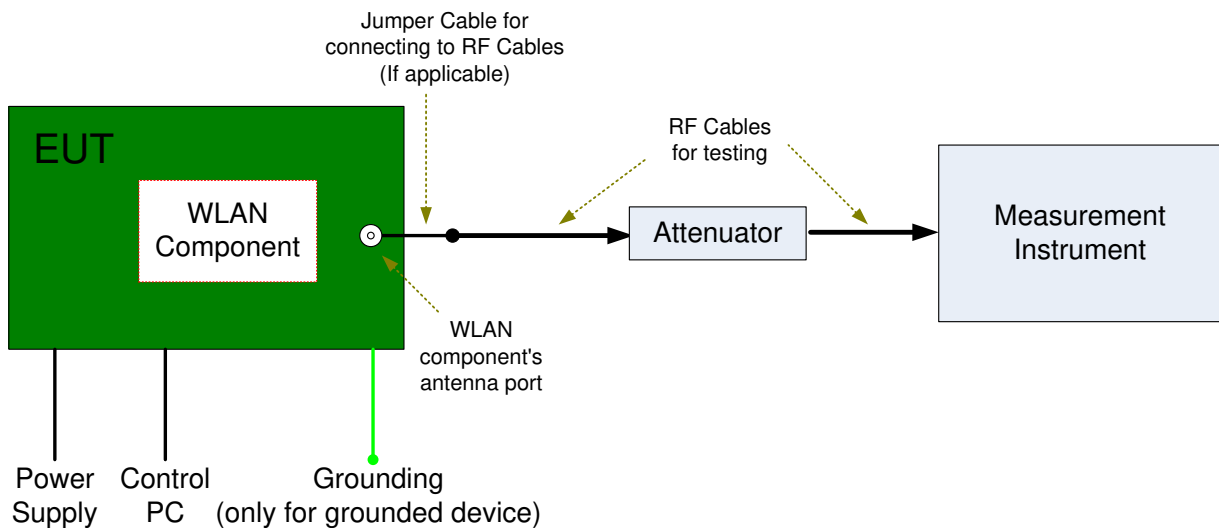
Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VN	3.8V

NOTE: VN= nominal voltage

### 4.4 Test Setups

#### 4.4.1 Test Setup 1

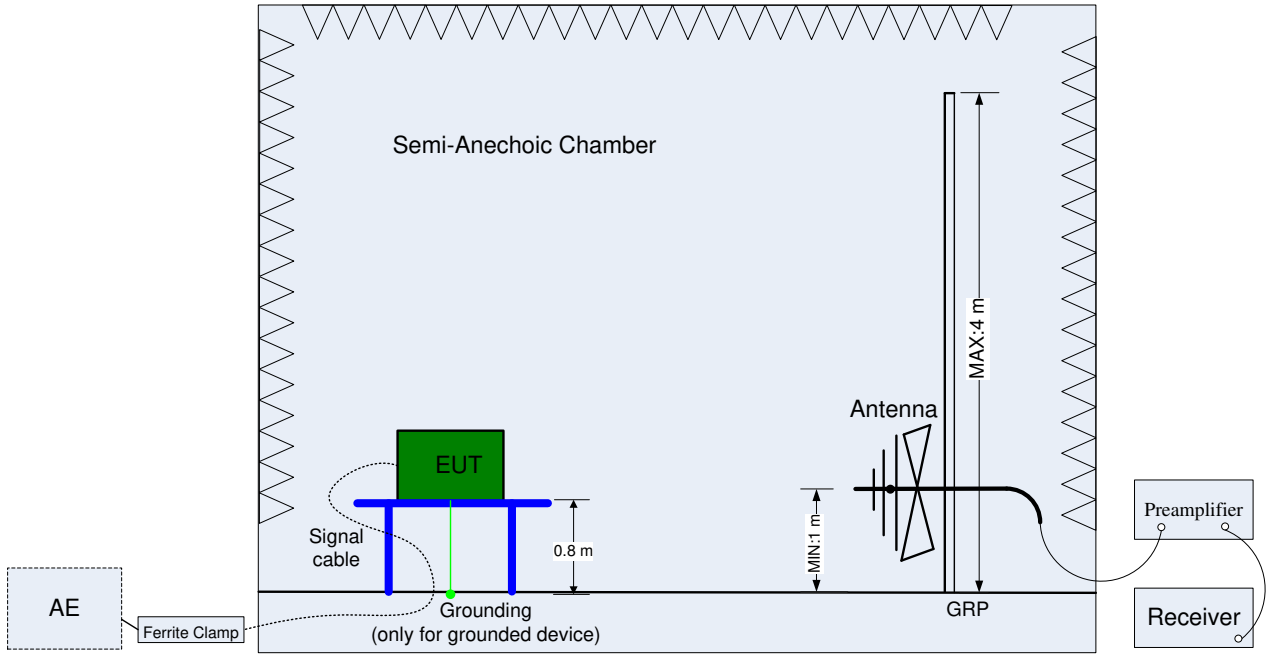
The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



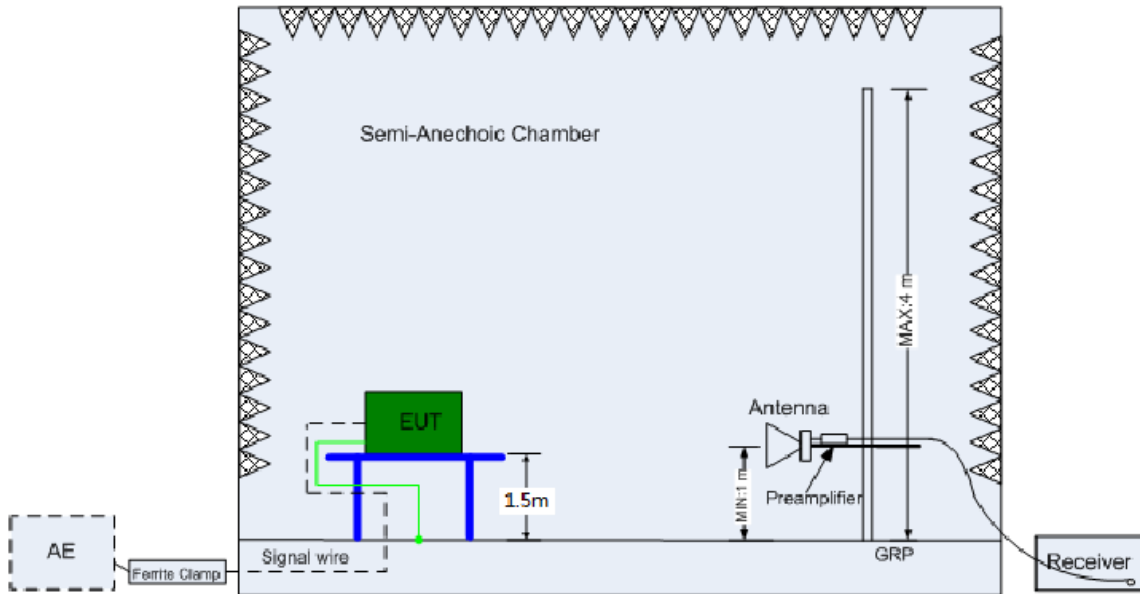
#### 4.4.2 Test Setup 2

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)

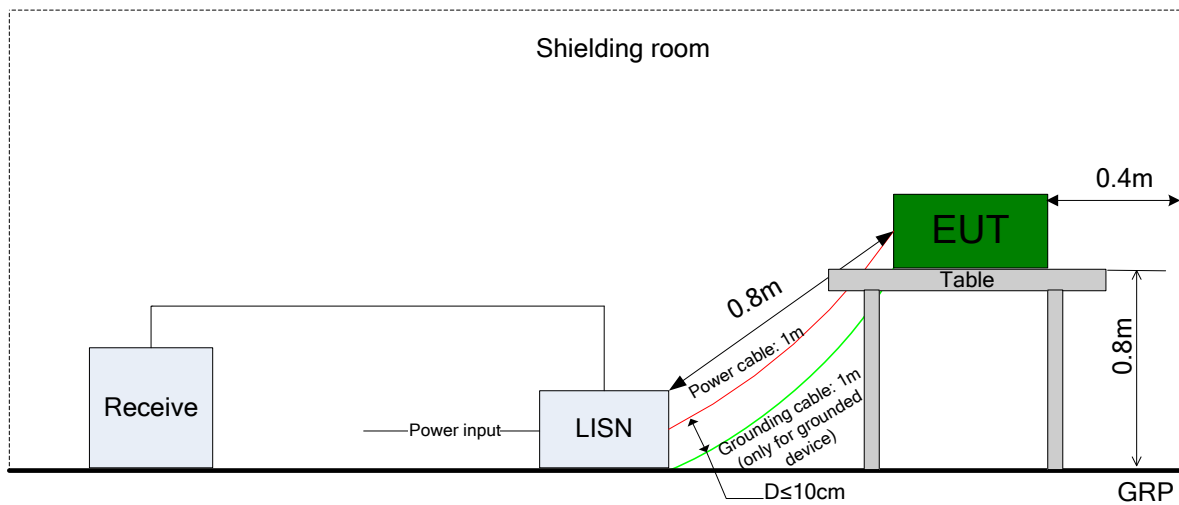


(Above 1 GHz)

### 4.4.3 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 0.8 m 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

### 4.5.1 U-NII

Test Case	Test Conditions		
	Configuration	Description	
Emission Bandwidth (EBW)	Meas. Method	FCC KDB 789033 §C).	
	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 §E)d)	
	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 §F).	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	All EUT conf. with Tx modes.	
Peak Excursion Ratio	Meas. Method	FCC KDB 789033 §F).	
	Test Env.	NTNV	
	Test Setup	Test Setup 1	
	EUT Conf.	All EUT conf. with Tx modes.	
Unwanted Emissions (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 80 MHz bandwidth: Ch.42
		5250-5350	All EUT Test Mode 20 MHz bandwidth: Ch.52, Ch.64 40 MHz bandwidth: Ch.54, Ch.62 80 MHz bandwidth: Ch.58
5470-5725		All EUT Test Mode 20 MHz bandwidth: Ch.100, Ch.140 40 MHz bandwidth: Ch.102, Ch.134	



Test Case	Test Conditions	
	Configuration	Description
		80 MHz bandwidth: Ch.106
		5725-5850 All EUT Test Mode 20 MHz bandwidth: Ch.149, Ch.157, Ch.165 40 MHz bandwidth: Ch.151, Ch.159 80 MHz bandwidth: Ch.155
Frequency Stability	Meas. Method	15.407(g) Frequency Stability
	Test Env.	(1)VL, VN and VH of Rated Voltage at Ambient Climate. (2) -5 °C,5°C,15°C,-25°C,35°C,45°C,50°C
	Test Setup	Test Setup 1
	EUT Conf.	Ch.36,Ch.165



## 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.

Main Test Equipments					
Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal- Due
Power supply	KEITHLEY	2303	1342889	2015-09-16	2017-09-15
Wireless Communication Test set	Agilent	N4010A	MY49081592	2015-10-30	2016-10-29
Universal Radio Communication Tester	R&S	CMU200	123299	2015-10-30	2016-10-29
Spectrum Analyzer	Agilent	N9020A	MY52090652	2015-07-08	2016-07-07
Universal Radio Communication Tester	R & S	CMW500	126854	2016-01-08	2017-01-07
Signal Analyzer	R&S	FSQ31	200021	2015-10-30	2016-10-29
Spectrum Analyzer	Agilent	N9030A	MY49431698	2015-10-30	2016-10-29
Temperature Chamber	WEISS	WKL64	56246002940010	2016-01-21	2017-01-20
Signal generator	Agilent	E8257D	MY49281095	2015-10-30	2016-10-29
Vector Signal Generator	R&S	SMU200A	104162	2015-10-30	2016-10-29
Test receiver	R&S	ESU26	100387	2015-06-24	2016-06-23
Test receiver	R&S	ESCI	101163	2015.11.11	2016.11.10
Spectrum analyzer	R&S	FSU3	200474	2016-05-24	2017-05-23
Spectrum analyzer	R&S	FSU43	100144	2015-06-02	2017-06-02
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100262	2015-04-30	2017-04-29
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100263	2015-04-30	2017-04-29
Trilog Broadband Antenna (30M~3GHz)	SCHWARZ BECK	VULB 9163	9163-490	2015-04-30	2017-04-29
Trilog Broadband Antenna (30M~3GHz)	SCHWARZ BECK	VULB 9163	9163-520	2015-04-30	2017-04-29
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	2015-04-30	2017-04-29
double ridged horn antenna (0.8G-18GHz)	R&S	HF907	100305	2015-04-30	2017-04-29
Pyramidal Horn Antenna(18GHz-26.5GHz)	ETS-Lindgr en	3160-09	5140299	2015-07-15	2017-07-14
Artificial Main Network	R&S	ENV4200	100134	2016-06-02	2017-06-01
Line Impedance Stabilization Network	R&S	ENV216	100382	2016-06-02	2017-06-01



Signal Generator	Agilent	E4438C	MY49071538	2016-03-01	2017-03-01
Power Detecting & Sampling Unit	R&S	OSP-B157	100914	2015-07-27	2016-07-26
Software Information					
Test Item	Software Name		Manufacturer		Version
RE	EMC32		R&S		V9.25.0
CE	EMC32		R&S		V9.25.0
RSE	EMC32		R&S		V8.40.0

## 6 Appendixes

Appendix No.	Description
SYBH(Z-RF)002052016-2005-A	Appendix for 5G

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END