FCC Test Report (WIFI)

FCC ID	:	**2AIV5CWELL001**
Applicant	:	**CWELL INTERNATIONAL CO.,LTD.** Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .
Sample Description		
Product Name	:	**Rugged Smartphone**
Model No.	:	HG06
Serial No.	:	N/A
Trademark	:	AngelLira
Receipt Date	:	2016-06-26
Test Date	:	2016-06-27 to 2016-07-05
Issue Date	:	2016-07-06
Test Standard(s)	:	**FCC CFR Title 47 Part 15 Subpart C Section 15.407**
Conclusions	:	**PASSED***

*In the configuration tested, the EUT complied with the standards specified above.

Test/Witness Engineer : Jason Deng

Approved & Authorized : Frank Zhang

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

Contents

1. General Information

1.1 Client Information

Applicant	:	CWELL INTERNATIONAL CO.,LTD.
Address	:	Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .
Manufacturer	:	CWELL INTERNATIONAL CO.,LTD.
Address	:	Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .

1.2 General Description of EUT (Equipment Under Test)

Product Name	:	Rugged Smartphone	
Models No.	:	HG06	
Difference	:	N/A	
Trademark	:	AngelLira	
Product Description	:	Operation Frequency:	5180MHz~5240MHz (802.11a/802.11n(H20)/ 802.11n(H40)
		Transfer Rate:	802.11a: 6Mbps 802.11n(20): 6.5Mbps 802.11n(40): 13.5Mbp
		Number of Channel:	4 for 802.11a/802.11n(H20), 2 for 802.11n(H40)
		Channel separation	5MHz
		Modulation Technology:	OFDM
		Antenna Type:	Integral Antenna
		Antenna Gain:	2.0 dBi
Power Supply	:	USB DC 5V from PC, DC 3.7V from Li-ion battery	

Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(2) Channel List:

Channel list for 802.11a/ n(20M)

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	40	5200
44	5220	48	5240

Channel list for 802.11n(40M)

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1.3 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

Test Mode	Description
Transmitting mode	Keep the EUT in continuous transmitting with modulation

Remark: The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.
We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6Mbps
802.11n(H20)	6.5Mbps
802.11n(H40)	13.5 Mbps
Final Test Mode:	
According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup” 6Mbps for 802.11a, 6.5Mbps for 802.11n(H20) and 13.5 Mbps for 802.11n(H40). Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

1.4 Test Instruments List

	Test Equipment	Manufacturer	Model No.	Cal. Date	Cal. Due date
1	Bilog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	May 22, 2016	May 21, 2017
2	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	May 27, 2016	May 26, 2017
3	Coaxial Cable	N/A	N/A	Mar. 28, 2016	Mar. 27, 2017
4	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
5	Coaxial cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
6	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
7	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
8	Amplifier (10kHz-1.3GHz)	HP	8447D	Mar. 29, 2016	Mar. 29, 2017
9	Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	Jun. 06, 2016	Mar. 29, 2017
10	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	Mar. 29, 2016	Mar. 29, 2017
11	Horn Antenna	ETS-LINDGREN	3160	Mar. 27, 2016	Mar. 27, 2017
12	Positioning Controller	UC	UC3000	N/A	N/A
13	Spectrum analyzer 9kHz-30GHz	Rohde & Schwarz	FSP	May 26, 2016	May 27, 2017
14	EMI Test Receiver	Rohde & Schwarz	ESPI	Mar. 29, 2016	Mar. 30, 2017
15	Loop antenna	Laplace instrument	RF300	May 22,, 2016	May 23, 2017
16	Universal radio communication tester	Rhode & Schwarz	CMU200	May 26, 2016	May 27, 2017
17	Signal Analyzer	Rohde & Schwarz	FSIQ3	May 26, 2016	May 27, 2017
18	L.I.S.N.#1	Rohde & Schwarz	NSLK8126	May 26, 2016	May 27, 2017
19	L.I.S.N.#2	Rohde & Schwarz	ENV216	May 26, 2016	May 27, 2017
20	Power Meter	Anritsu	ML2495A	May 26, 2016	May 27, 2017
21	Power sensor	Anritsu	ML2491A	May 26, 2016	May 27, 2017

1.5 Laboratory Location

Shenzhen TOBY technology Co., Ltd

Address: 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467,

Xixiang, Bao'an, Shenzhen, Guangdong, 518057, China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562 7.

Tel:0086-755-26509301 Fax: 0086-755-26509195

2. Test Summary

Standard Section	Test Item	Judgment
15.203/15.407	Antenna Requirement	PASSED
15.207	Conducted Emission	PASSED
15.407(a)	Conducted Peak Output Power	PASSED
15.407(a)	Emission Bandwidth	PASSED
15.407(a)	Power Spectral Density	PASSED
15.407(b)&15.209	Spurious Emission	PASSED
15.407(b)	Undesirable emission	PASSED
15.407	Frequency stability	PASSED

3. Antenna Requirement

3.1. Standard Requirement

3.1.1 Test standard

FCC Part15 Section 15.203 /407

3.1.2 Requirement

1) 15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

3.2. Antenna Connected Construction

The antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 2.0dBi. It complies with the standard requirement.

4. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1 Test Standard

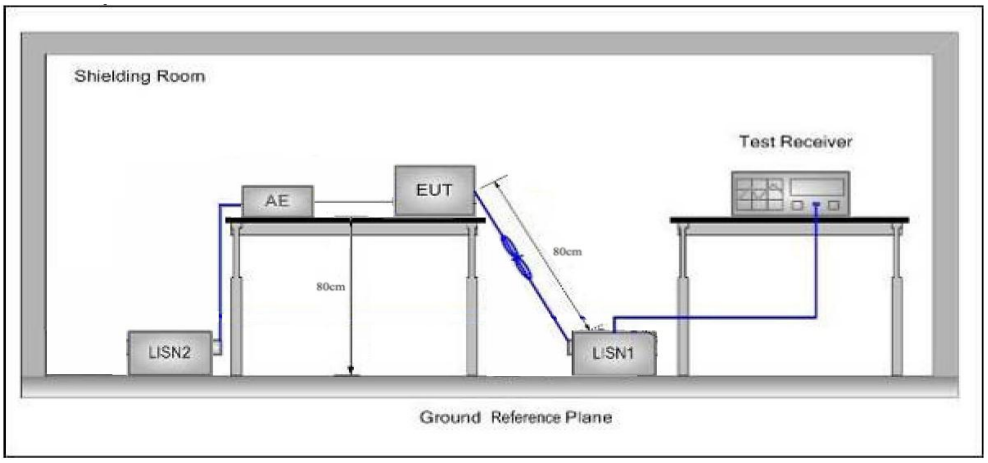
FCC Part15 Section 15.207

4.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequencies.		

4.2 Test Setup



4.3 Test Procedure

1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal

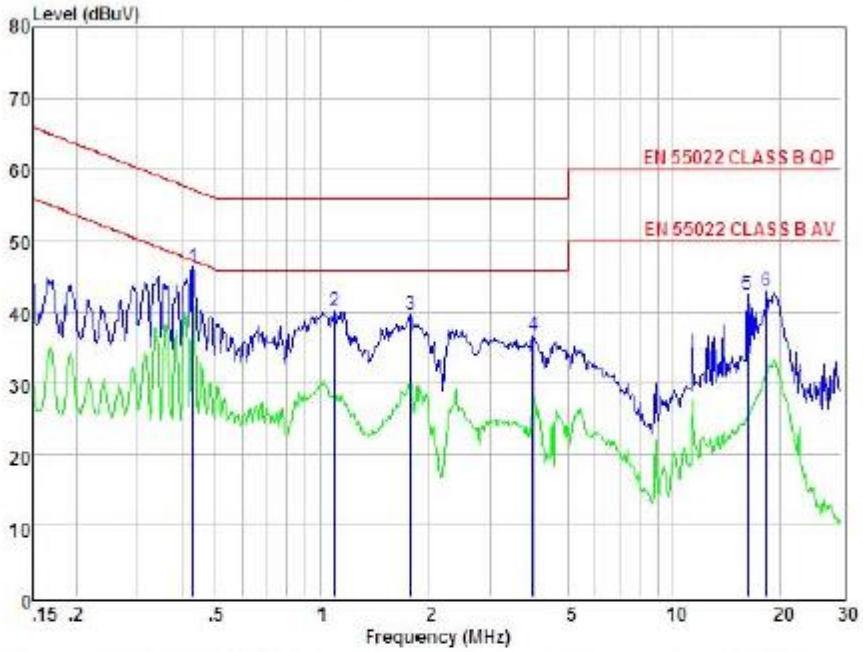
ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

4.4 Test Data

Please refer to the following pages

Conducted Emission Test Data

EUT:	Rugged Smartphone	M/N: HG06
Operating Condition:	WIFI mode	
Test Site:	Shielded room	
Operator:	Jason	
Test Specification:	AC 120V/60Hz	
Polarization:	Line	
Note	Tem:25℃ Hum:50%	



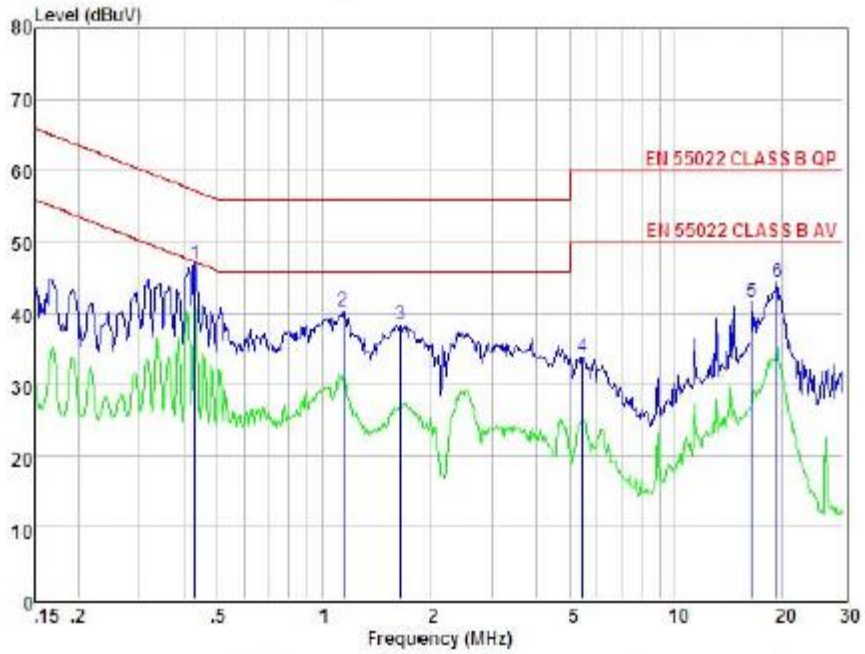
Condition : EN 55022 CLASS B QP POL: LINE Temp: 25.7 ℃ Hum: 51 %

Item	Freq	Read Level	LISN Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.431	36.64	0.03	-9.57	0.10	46.34	57.24	-10.90	Peak
2	1.094	30.37	0.04	-9.64	0.10	40.15	56.00	-15.85	Peak
3	1.800	29.76	0.05	-9.70	0.10	39.61	56.00	-16.39	Peak
4	3.985	26.52	0.08	-9.88	0.12	36.60	56.00	-19.40	Peak
5	16.226	32.21	0.25	-9.83	0.27	42.56	60.00	-17.44	Peak
6	18.426	32.39	0.29	-9.82	0.32	42.82	60.00	-17.18	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

Conducted Emission Test Data

EUT:	Rugged Smartphone	M/N: HG06 EM12, EM12
Operating Condition:	WIFI mode	
Test Site:	Shielded room	
Operator:	Jason	
Test Specification:	AC 120V/60Hz	
Polarization:	Neutral	
Note	Tem:25℃ Hum:50%	



Condition : EN 55022 CLASS B QP POL: NEUTRAL Temp: 25.7 ℃ Hum: 51 %

Item	Freq	Read Level	LISN Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.431	37.30	0.08	-9.87	0.10	47.00	57.24	-10.24	Peak
2	1.141	30.52	0.04	-9.64	0.10	40.30	56.00	-15.70	Peak
3	1.662	28.47	0.05	-9.70	0.10	38.32	56.00	-17.68	Peak
4	5.419	23.68	0.10	-9.95	0.13	33.86	60.00	-26.14	Peak
5	16.486	31.16	0.26	-9.83	0.28	41.53	60.00	-18.47	Peak
6	19.532	33.91	0.31	-9.80	0.34	44.36	60.00	-15.64	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

5. Peak Output Power Test

5.1. Test Standard and Limit

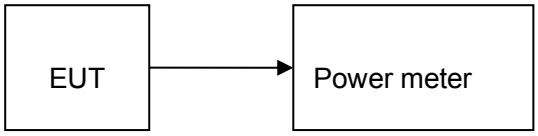
5.1.1 Test Standard

FCC Part15 C Section 15.407

5.1.2 Test Limit

For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

5.2. Test Setup



5.3. Test Procedure

(1) The EUT was directly connected to peak power meter and antenna output port as show in the block diagram above.
(2) Measure out each mode and each bands peak output power of EUT.
(3) The EUT was set to continuously transmitting in the max power during the test.

5.4. Test Data

Test CH	Maximum Conducted Output Power (dBm)			Limit(dBm)	Result
	802.11a	802.11n(H20)	802.11n(H40)		
Lowest	16.89	15.96	16.33	30.00dBm	PASSED
Middle	16.73	15.99	/		PASSED
Highest	16.12	16.41	16.29		PASSED

6. Occupy Bandwidth Test

6.1. Test Standard and Limit

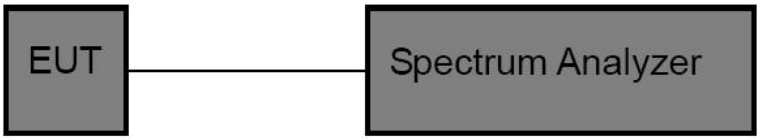
6.1.1 Test Standard

FCC Part15 C Section 15.407

6.1.2 Test Limit

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier

6.2. Test Setup



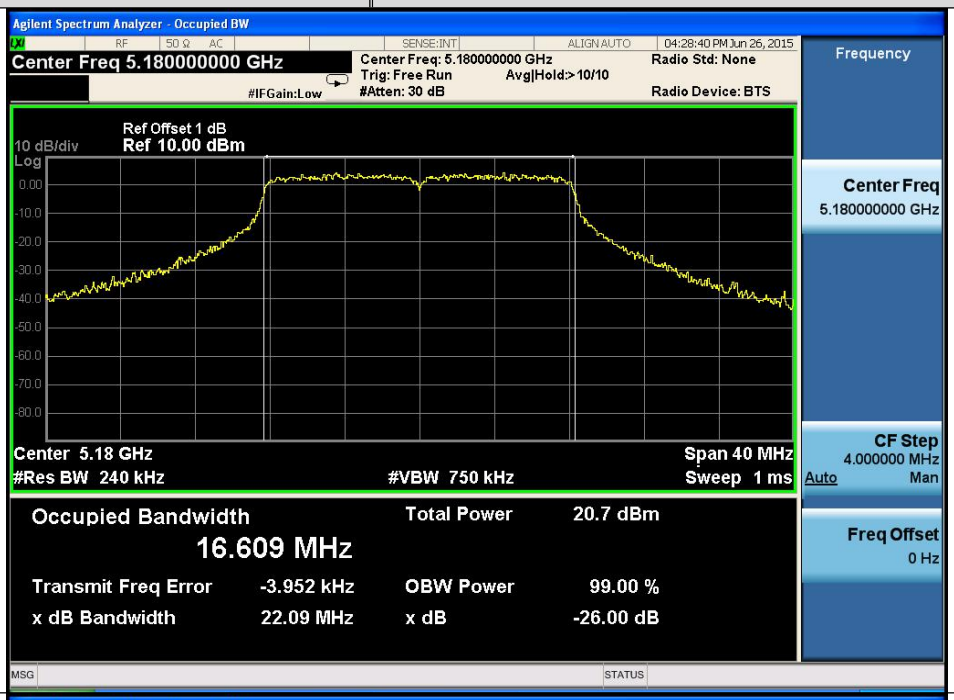
6.3. Test Procedure

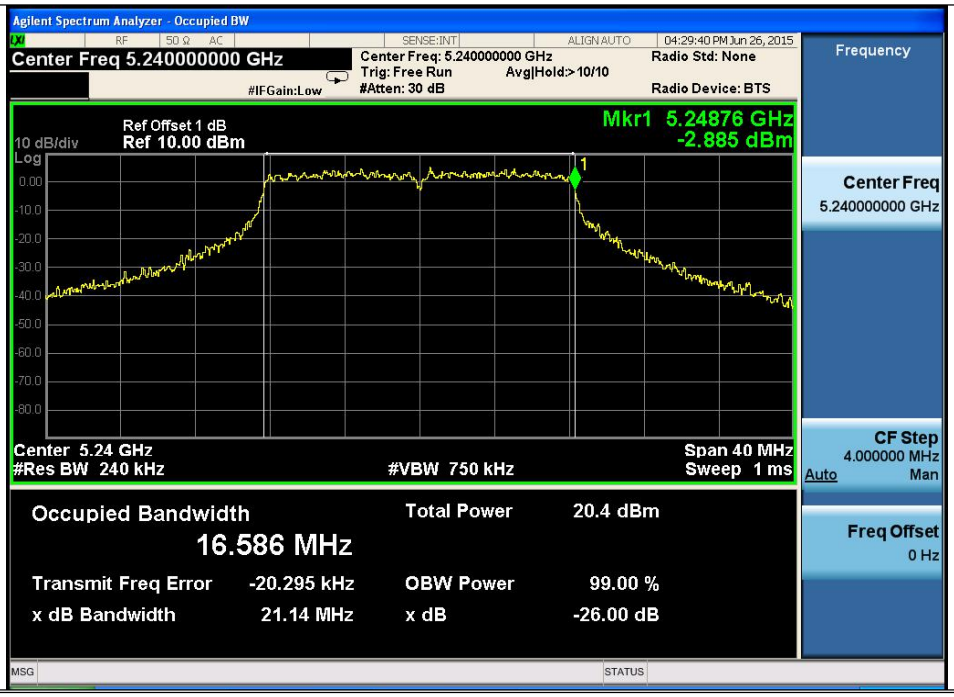
a) The bandwidth is measured at an amplitude level reduced 26dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

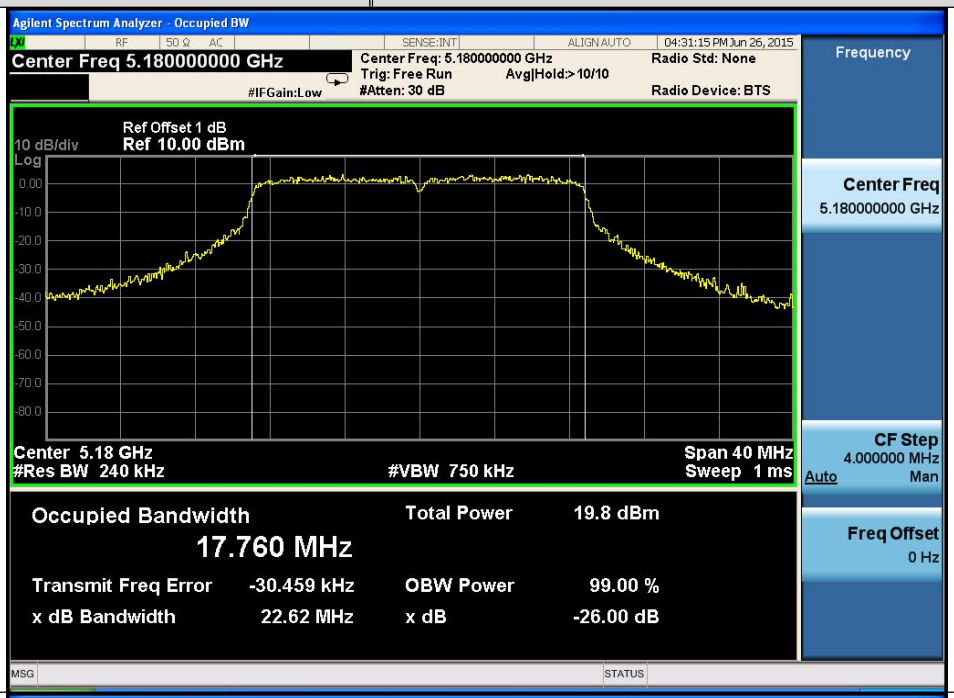
b) The test receiver set RBW = 1-5 % EBW, VBW≥3RBW, Sweep time set auto, detail see the test plot.

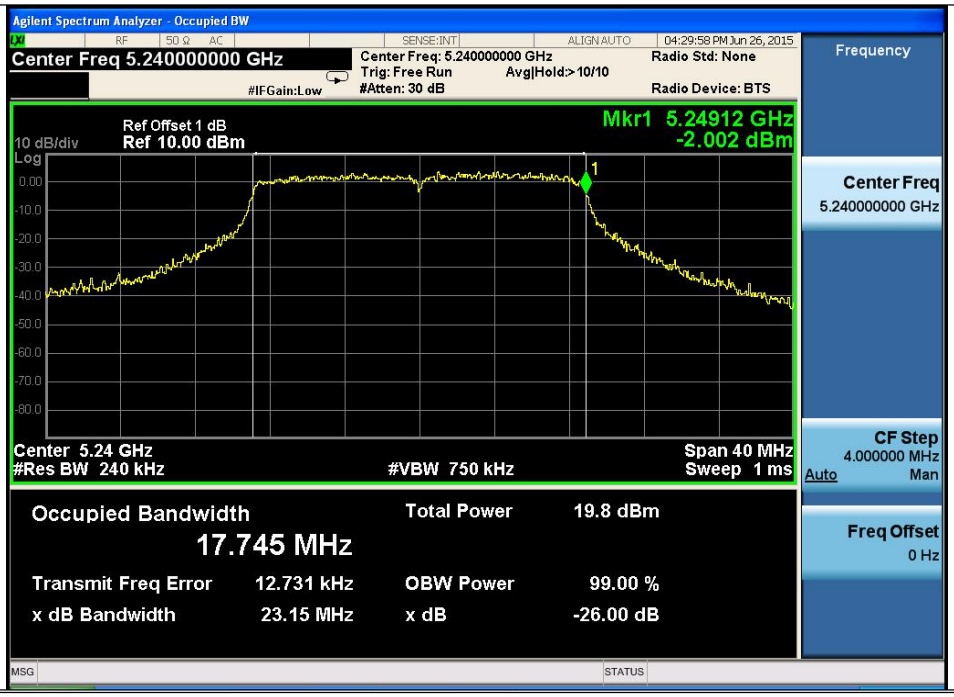
Test Data

Test CH	26dB Occupy Bandwidth (MHz)			Limit (kHz)	Result
	802.11a	802.11n(H20)	802.11n(H40)		
Lowest	22.09	22.62	46.23	>=500 kHz	PASSED
Middle	21.46	23.19	/		PASSED
Highest	21.14	23.15	44.93		PASSED
Remark: Test plot as follows					

Test mode		26dB BW 802.11a
Lowest Channel		
Middle Channel		

Highest Channel		

Test mode		26dB BW 802.11n(H20)
Lowest Channel		
Middle Channel		

Highest Channel	

Test mode	26dB BW 802.11n(H40)
Lowest Channel	

Highest Channel		

7. Power Spectral Density Test

7.1. Test Standard and Limit

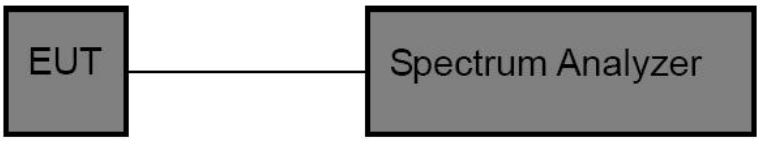
7.1.1 Test Standard

FCC Part15 C Section 15.407

7.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	17dBm(in any 1 megahertz)	5150-5250

7.2. Test Setup



7.3. Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Measure the spectral power density the spectrum analyzer was set to Resolution Bandwidth=100 0kHz, and Video Bandwidth≥3000kHz, Detector: Peak, Span to 5%~30% greater than EBW, Sweep time auto.

7.4. Test Data

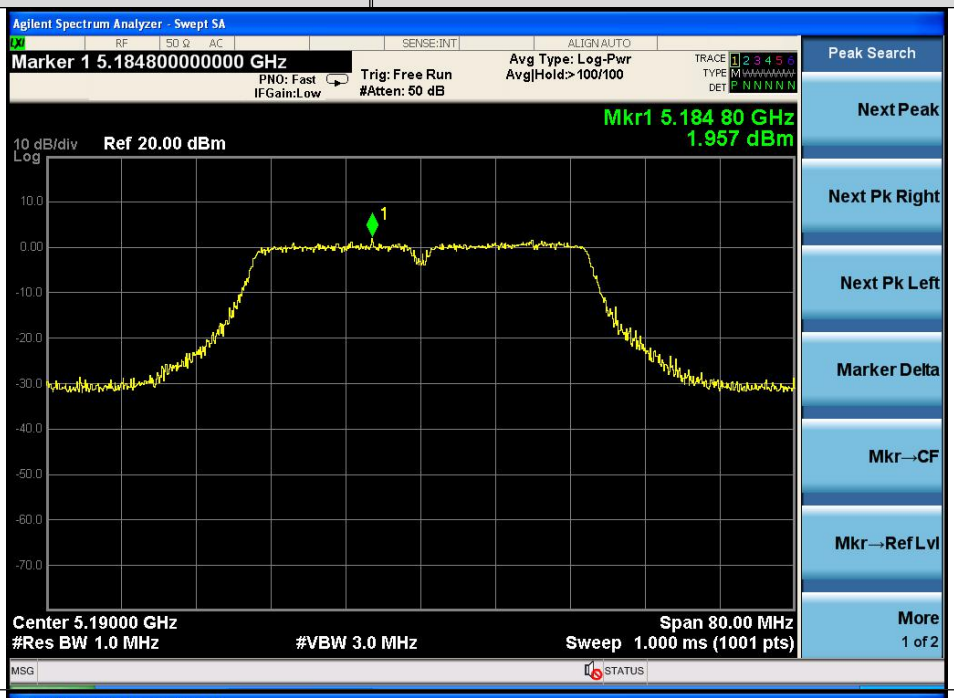
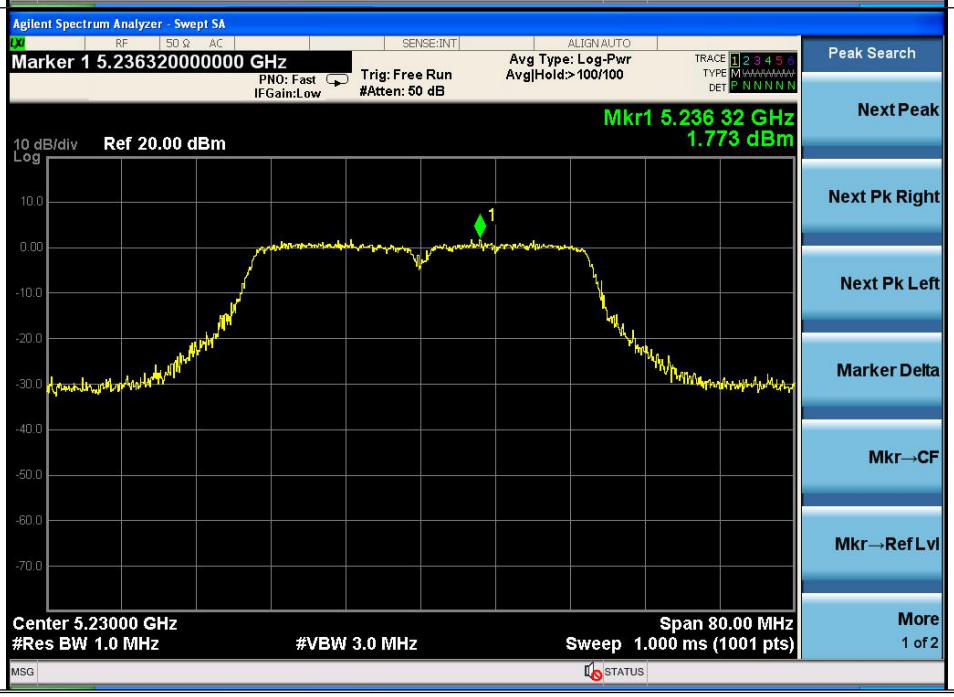
Test CH	Power Spectral Density (dBm)			Limit (dBm)	Result
	802.11a	802.11n(H20)	802.11n(H40)		
Lowest	5.432	4.144	1.957	17.00	PASSED
Middle	5.725	5.270	/		PASSED
Highest	5.515	4.424	1.773		PASSED
Remark: Test plot as follows					

Test mode		802.11a
Lowest Channel		
Middle Channel		

Highest Channel		

Test mode		802.11n(H20)
Lowest Channel		
Middle Channel		

Highest Channel	

Test mode		802.11n(H40)
Lowest Channel		
Highest Channel		

8. Band Edge Requirement (Radiated Emission Method)

8.1 Test Standard and Limit

8.1.1 Test Standard

FCC Part15 C Section 15.407

8.1.2 Test Limit

Except as shown in paragraph (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

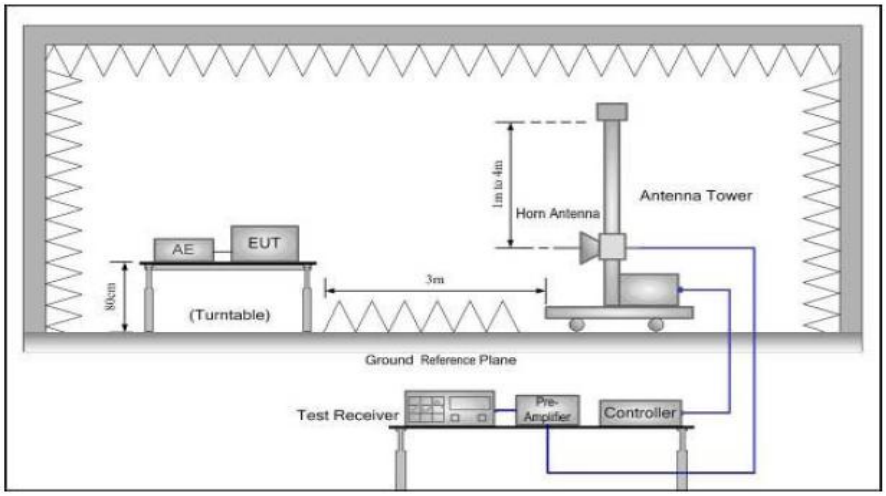
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits

8.2 Test Setup



8.3 Test Procedure

8.3.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.3.2 Check the spurious emissions out of band.

8.3.3 RBW 1MHz ,VBW 3MHz ,peak detector for peak value , RBW 1MHz ,VBW 3MHz , RMS detector for AV value.

8.4 Test Data

IEEE 802.11a CH LOW

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX Low								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5150	45.44	31.65	5.92	33.9	49.11	68.2	19.09	PK
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5150	43.19	31.65	5.92	33.9	46.86	68.2	21.34	PK
--	--	--	--	--	--	--	--	--

Note:
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK
2, Result = Read level + Antenna factor + cable loss-Amp factor
3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

IEEE 802.11a CH High

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX High								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5350	46.25	31.73	6.05	33.73	50.3	68.2	17.9	PK
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5350	44.52	31.73	6.05	33.73	48.57	68.2	19.63	PK
--	--	--	--	--	--	--	--	--

Note:
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK
2, Result = Read level + Antenna factor + cable loss-Amp factor
3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

IEEE 802.11n HT20 CH Low

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX Low								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5150	45.38	31.65	5.92	33.9	49.05	68.2	19.15	PK
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5150	43.93	31.65	5.92	33.9	47.6	68.2	20.6	PK
--	--	--	--	--	--	--	--	--

Note:
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK
2, Result = Read level + Antenna factor + cable loss-Amp factor
3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

IEEE 802.11n HT20 CH High

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX High								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5350	45.98	31.73	6.05	33.73	50.03	68.2	18.17	PK
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5350	43.72	31.73	6.05	33.73	47.77	68.2	20.43	PK
--	--	--	--	--	--	--	--	--

Note:
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK
2, Result = Read level + Antenna factor + cable loss-Amp factor
3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

IEEE 802.11n HT40 CH Low

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX Low								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5150	45.28	31.65	5.92	33.9	48.95	68.2	19.25	PK
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5150	43.28	31.65	5.92	33.9	46.95	68.2	21.25	PK
--	--	--	--	--	--	--	--	--
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Result = Read level + Antenna factor + cable loss-Amp factor 3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

IEEE 802.11n HT40 CH High

Band Edge Test result								
EUT: Rugged Smartphone M/N: HG06								
Power: DC 3.7V From battery								
Test mode: TX High								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5350	44.99	31.73	6.05	33.73	49.04	68.2	19.16	**PK**
--	--	--	--	--	--	--	--	--
Antenna Polarity: Horizontal								
5350	42.27	31.73	6.05	33.73	46.32	68.2	21.88	**PK**
--	--	--	--	--	--	--	--	--
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Result = Read level + Antenna factor + cable loss-Amp factor 3, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

Note: According to KDB 789033, EIRP【dBm】=E【dBuV/m】-95.2, thus, limit for 5150MHz band is -27+95.2=68.2 dBuV/m.

9. Spurious Emission (Radiated Emission Method)

9.1 Test Standard and Limit

9.1.1 Test Standard

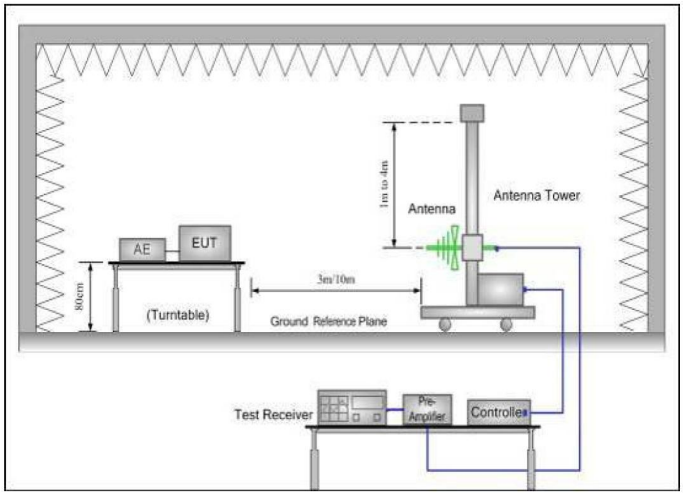
FCC Part15 C Section 15.209 and 15.205

9.1.2 Test Limit

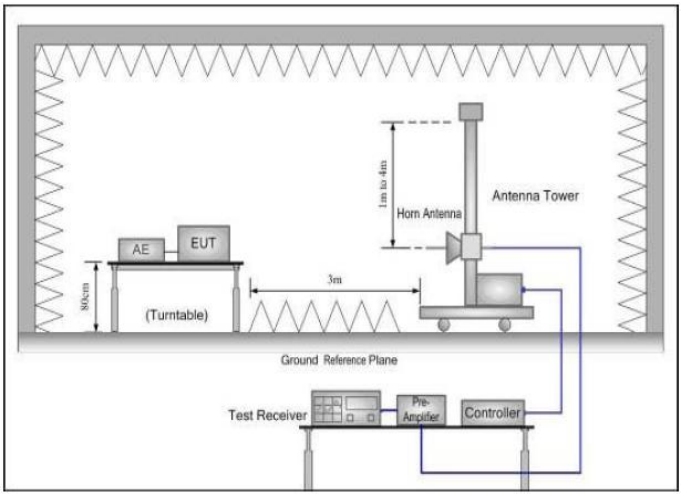
Frequency (MHz)	Limit (dBμV/m) At 3m Distance	
30MHz~88MHz	40	Quasi-peak
88MHz~216MHz	43.5	Quasi-peak
216MHz~960MHz	46	Quasi-peak
960MHz~1000MHz	54	Quasi-peak
Above 1000MHz	54	Average
	74	Peak
Remark: 1. The lower limit shall apply at the transition frequency.		

9.2 Test Setup

Below 1GHz



Above 1GHz



9.3 Test Procedure

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

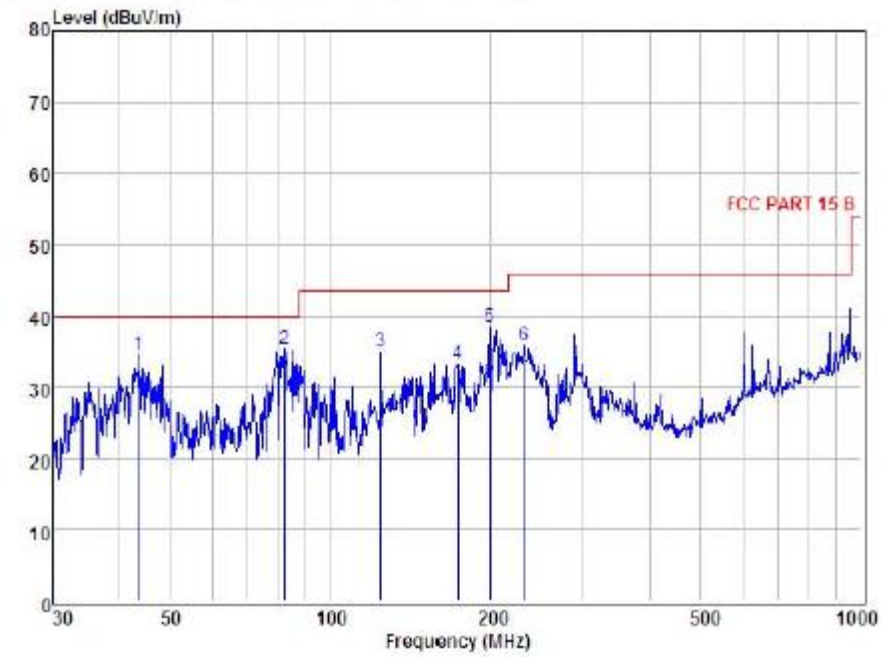
9.4 Test Data

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.
2. 9 kHz to 30MHz is noise floor, so only shows the data of above 30MHz in this report.

Radiated Emission Test Data (Below 1GHz)

EUT:	Rugged Smartphone	M/N: HG06
Operating Condition:	WIFI mode	
Test Site:	3m chamber	
Operator:	Jason	
Test Specification:	AC 120V/60Hz	
Polarization:	Horizontal	
Note	Tem:25℃ Hum:50%	



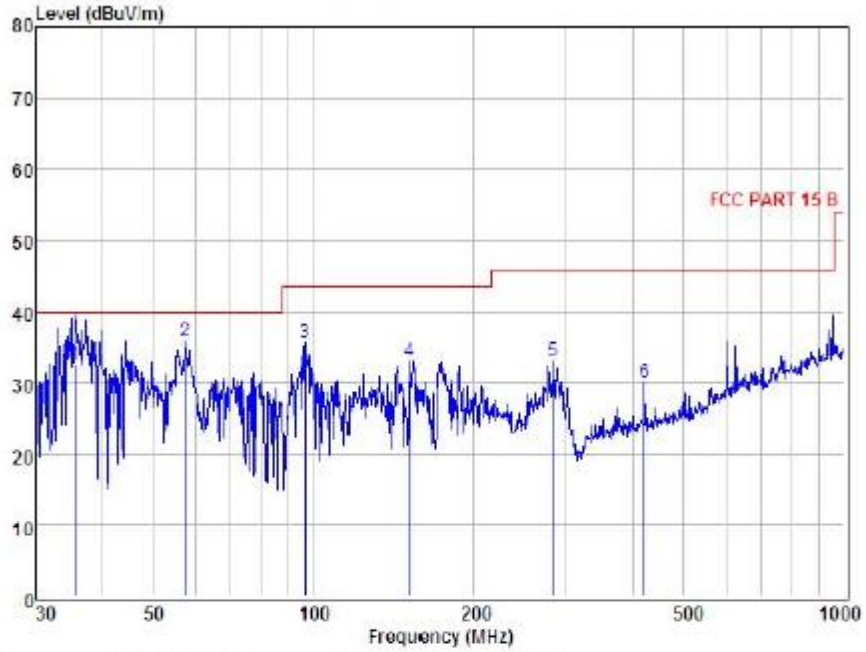
Condition : FCC PART 15 B 3m POL: HORIZONTAL

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	43.66	51.01	13.79	30.40	0.09	34.49	40.00	-5.51	Peak
2	82.36	55.86	9.32	30.02	0.20	35.36	40.00	-4.64	Peak
3	125.01	51.76	12.46	29.56	0.28	34.94	43.50	-8.56	Peak
4	173.21	48.87	12.85	29.08	0.52	33.19	43.50	-10.31	Peak
5	199.29	56.82	9.90	28.86	0.43	38.29	43.50	-5.21	Peak
6	282.53	52.18	11.26	28.10	0.56	35.90	46.00	-10.10	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Radiated Emission Test Data (Below 1GHz)

EUT:	Rugged Smartphone	M/N: HG06
Operating Condition:	WIFI mode	
Test Site:	3m chamber	
Operator:	Jason	
Test Specification:	AC 120V/60Hz	
Polarization:	Vertical	
Note	Tem:25℃ Hum:50%	



Condition : FCC PART 15 B 3m POL: VERTICAL

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	35.75	49.81	13.39	30.82	0.11	32.49	40.00	-7.51	QP
2	57.80	53.50	12.91	30.89	0.23	35.75	40.00	-4.25	Peak
3	96.77	55.33	10.01	30.19	0.35	35.50	43.50	-8.00	Peak
4	153.20	47.92	14.16	29.36	0.41	33.13	43.50	-10.37	Peak
5	281.99	48.16	12.41	28.08	0.47	32.96	46.00	-13.04	Peak
6	420.58	41.16	15.23	27.12	0.81	30.08	46.00	-15.92	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Radiated Emission Test Data (Above 1GHz)

802.11a Low

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/m)	AV Reading (dBuV/m)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10360	V	52.91	---	2.36	55.27	---	74	/	18.73	Peak
15540	V	32.92	---	4.52	37.44	---	54	/	16.56	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/m)	AV Reading (dBuV/m)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10360	H	53.05	---	2.36	55.41	---	74	/	18.59	Peak
15540	H	32.84	---	4.52	37.36	---	54	/	16.64	Peak
N/A										

Remark:

1. “*”, means this data is the too weak instrument of signal is unable to test.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11a Middle

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10400	V	52.77	---	2.36	55.13	---	74	/	18.87	Peak
15600	V	33.16	---	4.52	37.68	---	54	/	16.32	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10400	H	53.29	--	2.36	55.65	--	74	/	18.35	Peak
15600	H	32.59	--	4.52	37.11	--	54	/	16.89	Peak
N/A										

Remark:

1 "*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11a High

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10480	V	52.82	---	2.36	55.18	---	74	/	18.82	Peak
15720	V	32.72	---	4.52	37.24	---	54	/	16.76	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10480	H	53.32	---	2.36	55.68	---	74	/	18.32	Peak
15720	H	32.70	---	4.52	37.22	---	54	/	16.78	Peak
N/A										

Remark:

1 “*”, means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11n(20) Low

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10360	V	53.22	---	2.36	55.58	---	74	/	18.42	Peak
15540	V	32.71	---	4.52	37.23	---	54	/	16.77	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10360	H	53.48	---	2.36	55.84	---	74	/	18.16	Peak
15540	H	33.02	---	4.52	37.54	---	54	/	16.46	Peak
N/A										

Remark:

1 "*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11n(20) Middle

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10400	V	53.19	---	2.36	55.55	---	74	/	18.45	Peak
15600	V	33.13	---	4.52	37.65	---	54	/	16.35	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10400	H	53.31	-- -	2.36	55.67	-- -	74	/	18.33	Peak
15600	H	33.62	--	4.52	38.14	--	54	/	15.86	Peak
N/A										

Remark:

1"*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11n(20) High

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10480	V	53.22	---	2.36	55.58	---	74	/	18.42	Peak
15720	V	33.61	---	4.52	38.13	---	54	/	15.87	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10480	H	52.87	---	2.36	55.23	---	74	/	18.77	Peak
15720	H	33.15	---	4.52	37.67	---	54	/	16.33	Peak
N/A										

Remark:

1"*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11n(40) Low

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10380	V	53.17	---	2.36	55.53	---	74	/	18.47	Peak
15570	V	33.06	---	4.52	37.58	---	54	/	16.42	Peak
N/A										

Freq. (MHz)	Ant.Pol H/V	Peak Reading (dBuV/m)	AV Reading (dBuV/	Ant./CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10380	H	52.52	---	2.36	54.88	---	74	/	19.12	Peak
15570	H	32.02	---	4.52	36.54	---	54	/	17.46	Peak
N/A										

Remark:

1"*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

802.11n(40) High

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10460	V	52.50	---	2.36	54.86	---	74	/	19.14	Peak
15690	V	27.43	---	4.52	31.95	---	54	/	22.05	Peak
N/A										

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV/	AV Reading (dBuV/	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
10460	H	53.4	---	2.36	55.76	---	74	/	18.24	Peak
15690	H	32.93	---	4.52	37.45	---	54	/	16.55	Peak
N/A										

Remark:

1"*", means this data is the too weak instrument of signal is unable to test.

2 The emission levels of other frequencies are very lower than the limit and not show in test report.

10. Test Frequency stability

10. 1Test Standard and Limit

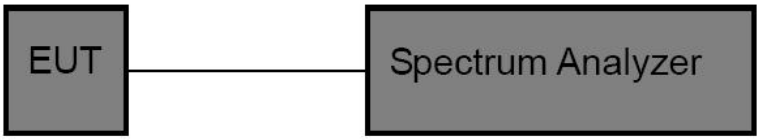
10.1.1 Test Standard

FCC Part15 C Section 15.407

10.1.2 Test Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

10.2 Test Setup



10.3 Test Data

Frequency VS Voltage

Mode	Voltage (V)	FH_L (5180MHz)	Deviation (KHz)	FH_H (5240MHz)	Deviation (KHz)
5.2G Band	132 V	5179.975	25	5239.974	26
	120 V	5179.975	25	5239.974	26
	108 V	5179.975	25	5239.974	26

Frequency VS Temperature

Mode	Temperature (℃)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
5.2G Band	-30	5179.932	68	5239.942	58
	-20	5179.957	43	5239.951	49
	-10	5179.941	59	5239.947	53
	0	5179.949	51	5239.962	38
	10	5179.968	32	5239.921	79
	20	5179.932	68	5239.947	53
	30	5179.954	46	5239.951	49
	40	5179.959	41	5239.959	41
	50	5179.957	43	5239.968	32