



## FCC Test Report (NFC)

**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

**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 15.225

**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.



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## 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:	13.56MHz
		Transfer Rate:	N/A
		Number of Channel:	1 Channel
		Modulation Type:	RFID
		Modulation Technology:	ASK
		Antenna Type:	Integral PCB Antenna
		Antenna Gain:	0dBi
Power Supply	:	3.7V (Internal rechargeable battery) or DC 5V by external power	

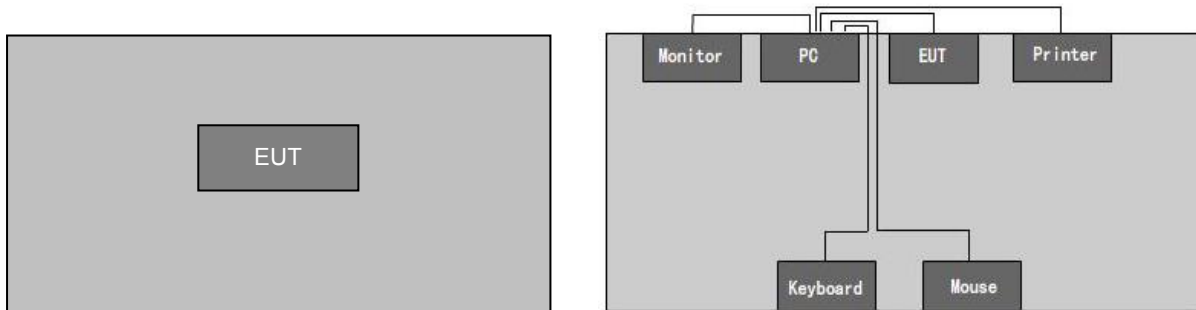
**Note:**

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

Channel	Frequency (MHz)
1	13.56



## 1.3. Block Diagram Showing The Configuration of System Tested



## 1.4. Description of Support Units

Name	Model	Serial Number	Manufacturer
Printer	HP1020	CNCJ410726	HP
LCD Monitor	G205HV	10306738385	ACER
PC	ASPIREM1830	PTSF90C00305005CAC3000	ACER
Keyboard	SK-9625	KBUSB1580500037E0100	ACER
Mouse	MS.11200.014	M-UAY-ACR2	ACER
Adapter	TRAVEL	N/A	N/A

## 1.5. External I/O Cable

Cable Description	Length(m)	From/ Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable serial Cable	1.5	Host PC	Printer
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Unshielding Detachable USB&AV Cable	0.5	EUT	Host PC

## 1.6. Description of Test Mode

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

Test Mode	Description
Charging & BT mode	Keep the EUT in Charging& NFC mode



Transmitting mode	Keep the EUT in Transmitting mode
-------------------	-----------------------------------

**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.

## 1.7. 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



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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

## 1.8. 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.

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



## 2. Test Summary

Standard Section	Test Item	Judgment
15.203/15.225	Antenna Requirement	PASSED
15.207	Conducted Emission	PASSED
15.225	20dB Bandwidth	PASSED
15.225/15.209	Spurious Emission	PASSED
15.225	Frequency stability	PASSED
<b>Remark:</b> "N/A" is an abbreviation for Not Applicable.		





## 3. Antenna Requirement

### 3.1. Standard Requirement

#### 3.1.1 Test standard

FCC Part15 Section 15.203 /225

#### 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 NFC antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 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

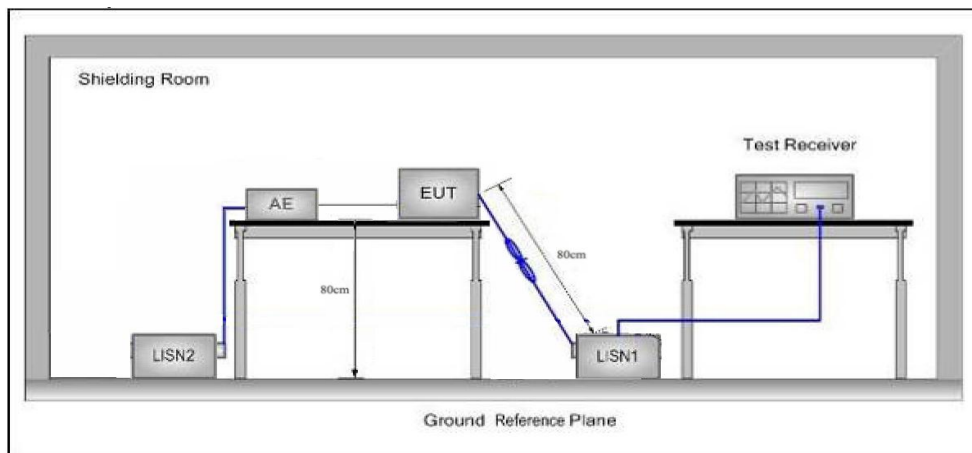
#### 4.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB $\mu$ V)	
	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  $50 \Omega / 50 \mu\text{H} + 5 \Omega$  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.

The Test Receiver setup: RBW=9kHz, VBW=30kHz, Sweep time= auto

#### **4.4. Test Data**

Please to see the following pages



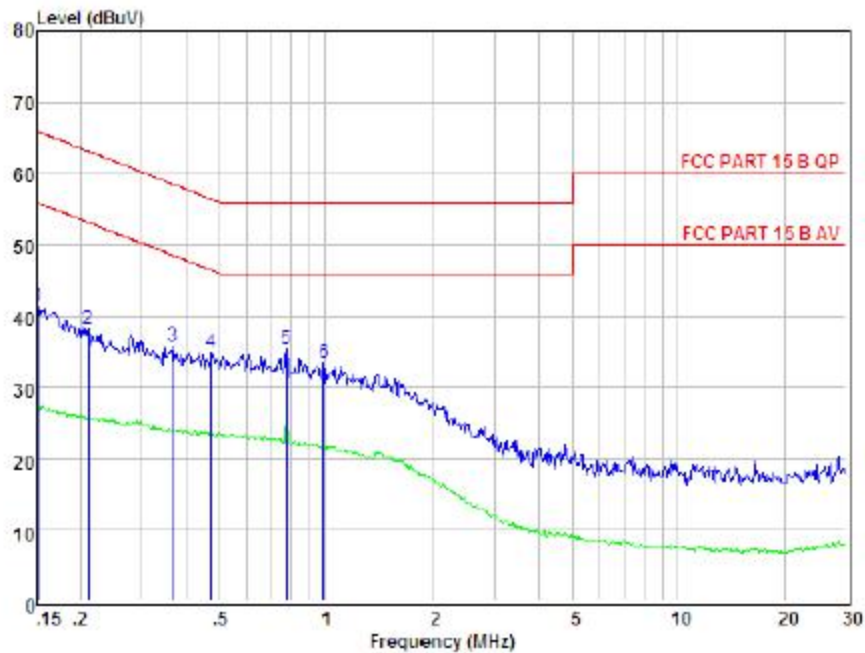
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## Conducted Emission Test Data

EUT: Rugged Smartphone M/N: HG06  
Operating Condition: Charging & NFC mode  
Test Site: Shielded room  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Line  
Note Tem:25°C Hum:50%



Condition : FCC PART 15 B QP					POL: LINE		Temp:		Hum:	
Item	Freq	Read	LISN	Preamp	Cable	Level	Limit	Margin	Remark	
	MHz	dBuV	Factor	Factor	Loss	dBuV	dBuV	dBuV		
1	0.152	31.51	0.03	-9.72	0.10	41.36	65.91	-24.55	QP	
2	0.211	28.29	0.03	-9.72	0.10	38.14	63.18	-25.04	QP	
3	0.367	25.87	0.03	-9.72	0.10	35.72	58.56	-22.84	QP	
4	0.471	25.12	0.03	-9.72	0.10	34.97	56.49	-21.52	QP	
5	0.775	25.53	0.03	-9.71	0.10	35.34	56.00	-20.66	QP	
6	0.989	23.69	0.04	-9.71	0.10	33.54	56.00	-22.46	QP	

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

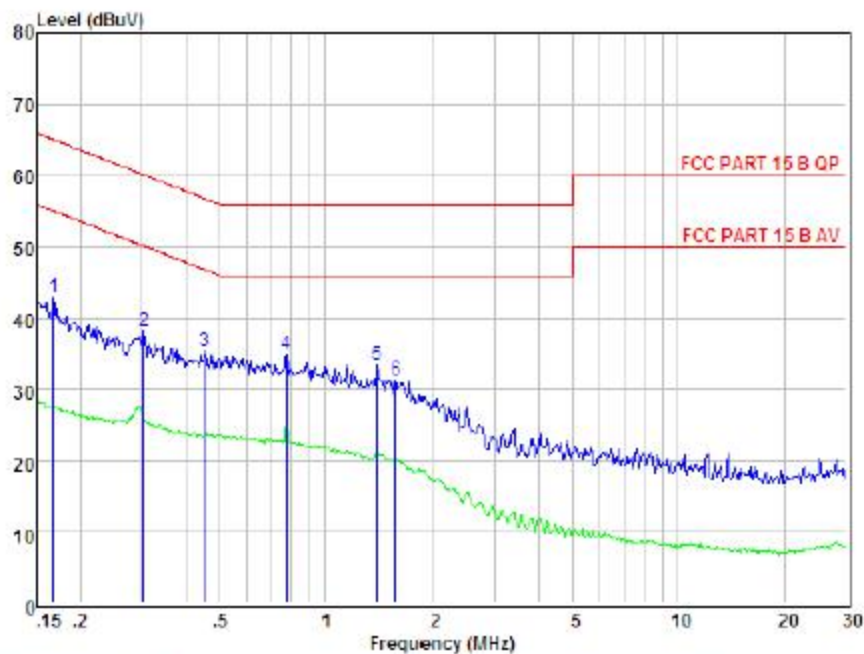


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## Conducted Emission Test Data

EUT: Rugged Smartphone M/N: HG06  
Operating Condition: Charging & NFC mode  
Test Site: Shielded room  
Operator: Jason  
Test Specification: AC 120V/60Hz  
Polarization: Neutral  
Note Tem:25°C Hum:50%



Condition : FCC PART 15 B QP					POL: NEUTRAL		Temp:	Hum:	
Item	Freq	Read	LISN	Preamp	Cable	Level	Limit	Margin	Remark
	MHz	dBuV	Factor	Factor	Loss	dBuV	dBuV	dBuV	
			dB	dB	dB				
1	0.168	33.04	0.03	-9.72	0.10	42.89	65.08	-22.19	QP
2	0.303	28.30	0.03	-9.72	0.10	38.15	60.15	-22.00	QP
3	0.452	25.44	0.03	-9.72	0.10	35.29	56.85	-21.56	QP
4	0.775	25.18	0.00	-9.71	0.10	34.99	56.00	-21.01	QP
5	1.403	23.65	0.05	-9.71	0.10	33.51	56.00	-22.49	QP
6	1.585	21.35	0.05	-9.71	0.10	31.21	56.00	-24.79	QP

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss



## 5. 20dB Bandwidth

### 5.1 Test Standard and Limit

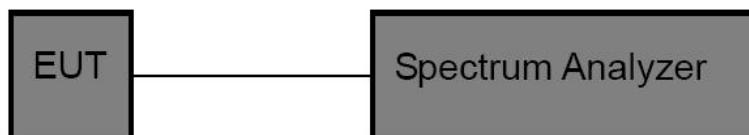
#### 5.1.1 Test Standard

FCC Part15 C Section 15.225

#### 5.1.2 Test Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 5.2 Test Setup

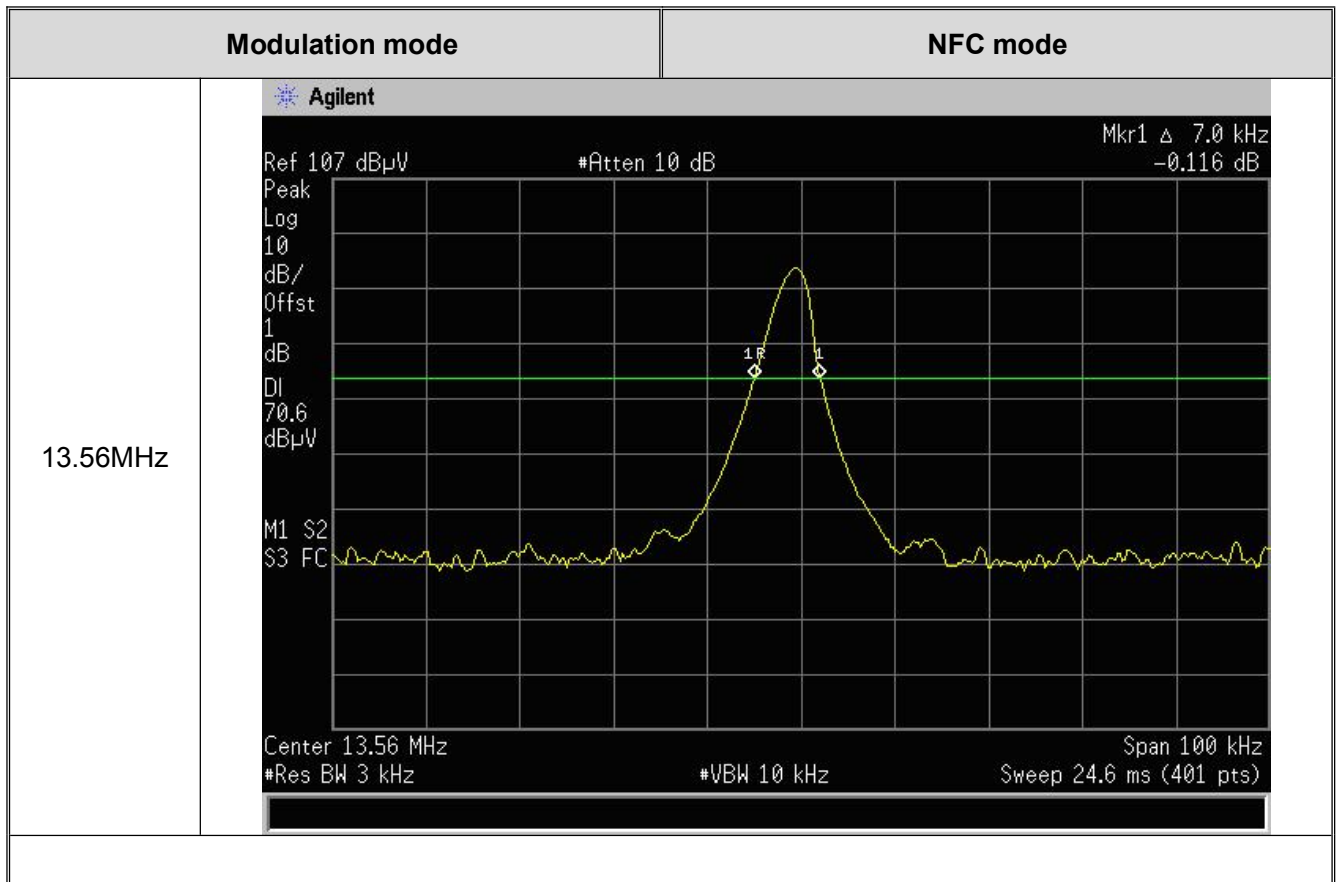


### 5.3 Test Procedure

The transmitter output was coupled to a spectrum analyzer via a antenna. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3KHz RBW and 10kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 5.4 Test Data

Channel Number	Channel Frequency	20dB Bandwidth (KHz)	Limit(kHz)	Judgment
1	13.56(MHz)	7.0	/	PASSED
Remark: Test plot as follows				



## 6. Spurious Emission

### 6.1 Test Standard and Limit

#### 6.1.1 Test Standard

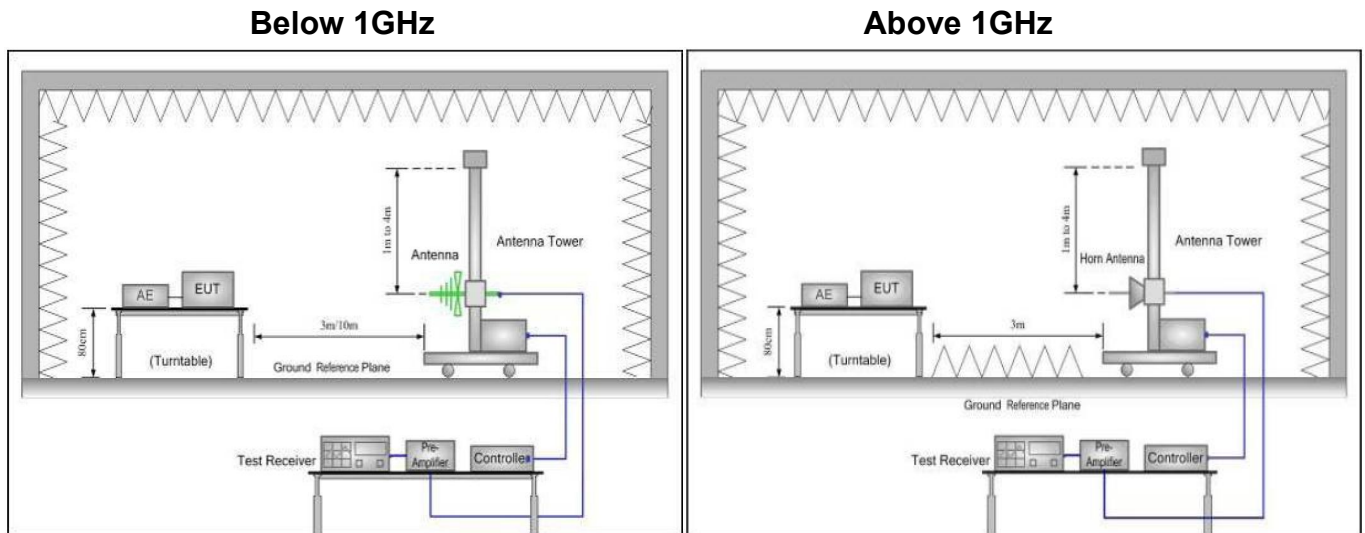
FCC Part15 C Section 15.209 and 15.205

#### 6.1.2 Test Limit

Frequency (MHz)	Limit (dB $\mu$ V/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.

### 6.2 Test Setup



### 6.3 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 chamber. 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.

Peak value: RBW=1MHz, VBW=3MHz;

Average value: RBW=1MHz, VBW=10Hz;

QP Value: RBW=120kHz, VBW=300kHz

- 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.

## 6.4 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 30 MHz is noise floor, so only shows the data of above 30MHz in this report.

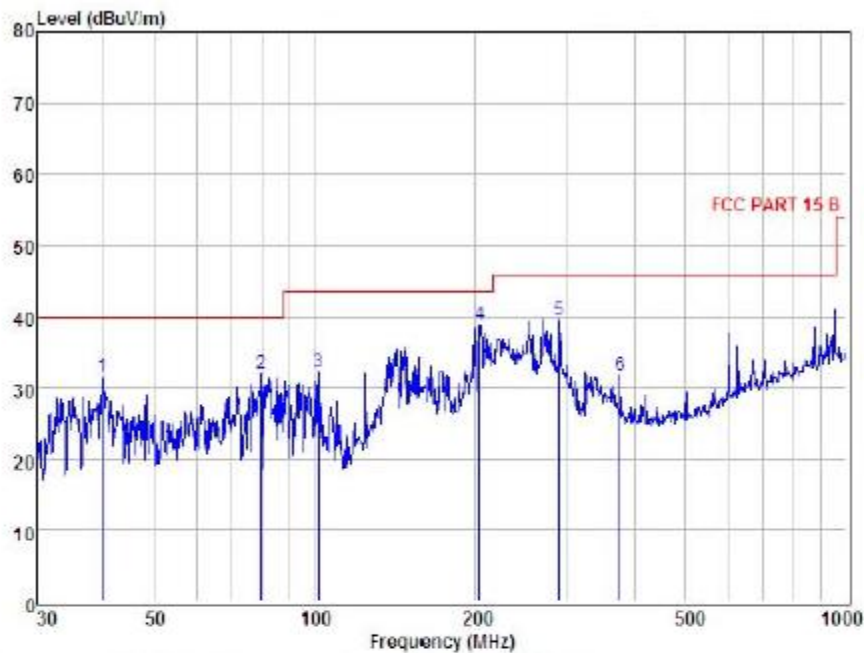


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## Radiated Emission Test Data (Below 1GHz)

EUT: Rugged Smartphone M/N: HG06  
Operating Condition: NFC mode  
Test Site: 3m chamber  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Horizontal  
Note Tem:23℃ Hum:50%



Condition : FCC PART 15 B 3m POL: HORIZONTAL									
Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	40.13	48.21	14.07	30.85	0.17	31.60	40.00	-8.40	Peak
2	79.52	52.46	9.29	29.96	0.23	32.02	40.00	-7.98	Peak
3	102.00	51.68	10.35	30.10	0.34	32.27	43.50	-11.23	Peak
4	204.24	57.26	9.87	28.73	0.38	38.68	43.50	-4.82	Peak
5	287.99	54.27	12.84	28.06	0.66	39.41	46.00	-6.59	Peak
6	375.94	43.76	14.35	27.42	0.96	31.65	46.00	-14.35	Peak

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



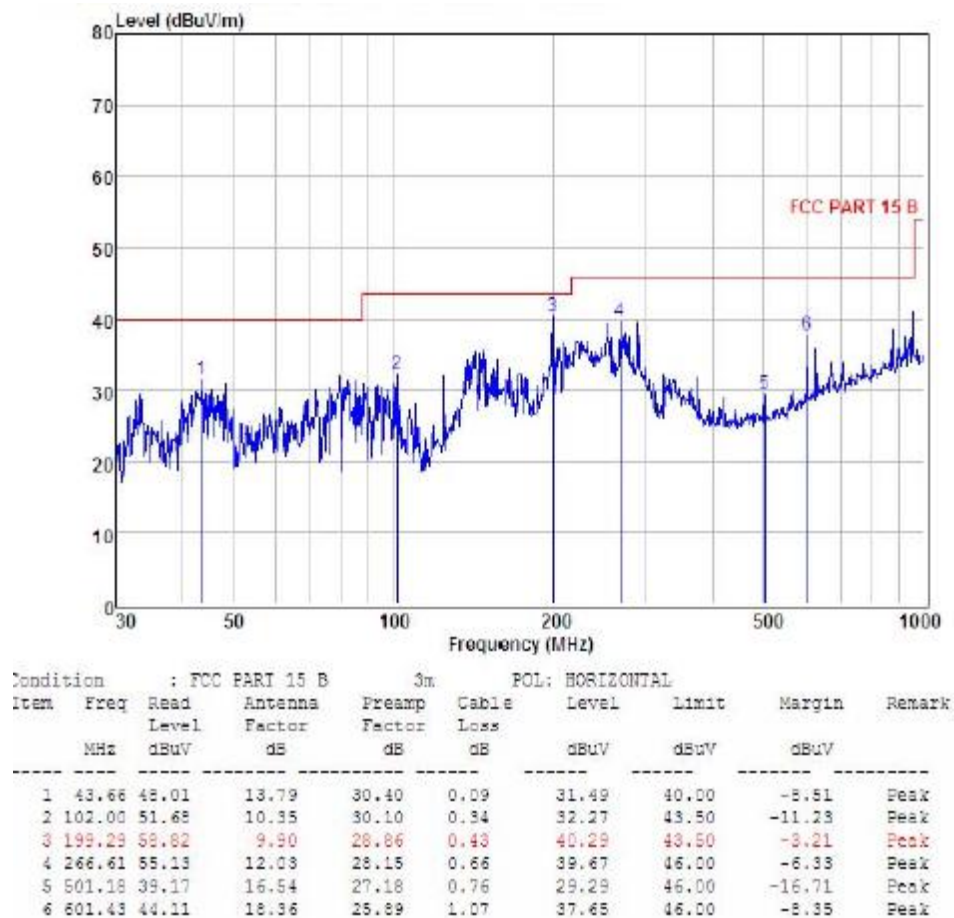
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## Radiated Emission Test Data (Below 1GHz)

EUT: Rugged Smartphone M/N: HG06  
Operating Condition: NFC mode  
Test Site: 3m chamber  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Vertical  
Note Tem:23°C Hum:50%



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



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## Radiated Emissions Result of Inside band (13.56MHZ)

Channel (13.56MHZ)									
Fre. MHz	Position H/V	Reading dBuV	Antenna Factor dB	Cable Loss dB	Amplifier Gain dB	Correct Factor dB	Measure Result dBuV/m	Limit dBuV/m	Margin dB
13.56	H	94.68(PK)	10.6	0.33	24.65	-13.94	80.77	124	-43.23
13.56	H	82.97 (AV)	10.6	0.33	24.65	-13.94	69.06	104	-34.94
--	--	--	--	--	--	--	--	--	--
13.56	V	83.52(PK)	10.6	0.33	24.65	-13.94	69.61	124	-54.39
13.56	V	71.19 (AV)	10.6	0.33	24.65	-13.94	57.28	104	-46.72
--	--	--	--	--	--	--	--	--	--

Remark: --Means other frequency and mode comply with standard requirements and at least have 20dB margin.

Correct Factor=Cable Loss+ Antenna Factor- Amplifier Gain

Measurement Result=Reading + Correct Factor

Margin=Measurement Result-Limit

--Spectrum setting:

a. Peak setting RBW=10KHz, VBW=30KHz.



## 7. Spurious Emission

### 7.1 Limit

Please see the section 15.225(b) and 15.225(c)

15.225(b): Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (50.5dBuV/m) at 30 meters  
15.225©: Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter (40.5dBuV/m) at 30 meters

Note: 30m to 3m correction factor calculation:

$$40 * \text{Log}(30\text{m}/3\text{m}) = 40$$

### 7.2 Test Result

Freq. (MHz)	Position H/V	Detector Mode (PK/Q)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/)	Limits 3m (dBuV/)	Margin (dBuV/m)
13.110	H	Peak	42.72	-13.94	28.78	80.50	-51.72
13.410	H	Peak	43.38	-13.94	29.44	90.50	-61.06
13.553	H	Peak	42.14	-13.94	28.20	90.50	-62.30
13.567	H	Peak	45.93	-13.93	32.00	90.50	-58.50
13.710	H	Peak	43.49	-13.93	29.56	80.50	-50.94
14.010	H	Peak	44.18	-13.93	30.25	80.50	-50.25

Freq. (MHz)	Position H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dBuV/m)
13.110	V	Peak	42.79	-13.94	28.85	69.5	-40.65
13.410	V	Peak	45.24	-13.94	31.30	80.5	-49.20
13.553	V	Peak	43.32	-13.94	29.38	90.5	-61.12
13.567	V	Peak	42.89	-13.94	28.95	90.5	-61.55
13.710	V	Peak	43.71	-13.93	29.78	80.5	-50.72
14.010	V	Peak	44.43	-13.93	30.50	69.5	-39.00



## 8. Frequency Stability

### 8.1 Limit

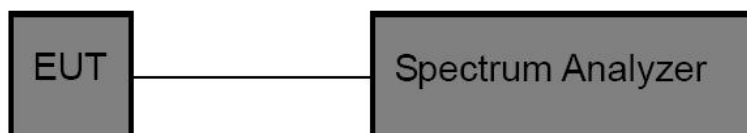
Please refer section 15.225e.

Regulation 15.225(e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  ( $\pm 100$  ppm) of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 8.2 Test Procedure

The following equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 8.3 Test Setup





## 8.4 Test Result

Assigned Frequency(MHz): 13.56MHz				
Voltage: DC 5V from USB				
Voltage	Temperature	Measured	Frequency	Limit
Low AC 102V	+20℃	13.56072	0.00072	±100 ppm ±0.001356MHz
Normal AC 120V	-20℃	13.56069	0.00069	
	-10℃	13.55951	-0.00049	
	0℃	13.56042	0.00042	
	+10℃	13.55937	-0.00063	
	+20℃	13.56045	0.00045	
	+30℃	13.56061	0.00061	
	+40℃	13.55983	-0.00017	
	+50℃	13.55972	-0.00028	
High AC138V	+20℃	13.56058	0.00058	