

MEASUREMENT REPORT

FCC PART 15.225 / NFC 13.56MHz

FCC ID: HD5-EDA511

Applicant: Honeywell International Inc
Honeywell Safety and Productivity Solutions

Application Type: Class II Permissive Change

Product: Mobile Computer

Model No.: EDA51-1

Brand Name: Honeywell

FCC Classification: Part 15 Low Power Communication Device Transmitter (DXX)

FCC Rule Part(s): Part 15.225

Test Procedure(s): ANSI C63.10-2013

Test Date: November 16 ~ 22, 2021

Reviewed By:

Jame Yuan

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2111RSU038-U1	Rev. 01	Initial Report	11-26-2021	Valid

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1.4. Product Information

Product Name	Mobile Computer
Model No. (HVIN)	EDA51-1
Serial No.	21300B8E0C, 21300B9971
Hardware Version	EDA51 3.0
Software Version	215.02.00.0025
Wi-Fi Specification	802.11 a/b/g/n/ac
Bluetooth Version	v4.2 dual mode
NFC	13.56MHz
GNSS Specification	GPS/Galileo/BDS/GLONASS
3GPP Specification	GSM 850/1900
	WCDMA Band 2/5/8 LTE Band 2/4/5/7/26/41
Power Supply	Battery or AC/DC Adapter
Accessories	
Battery	Model No.: BAT-EDA50US
	Rated Capacity: 15.2Wh, 4000mAh
	Rated Voltage: 3.8V
DC Adapter	Model No.: ADS-12B-06 05010E
	Input Power: 100 - 240V ~ 50/60Hz, Max. 0.3A
	Output Power: 5V DC 2.0A, 10.0W
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Product Specification under test

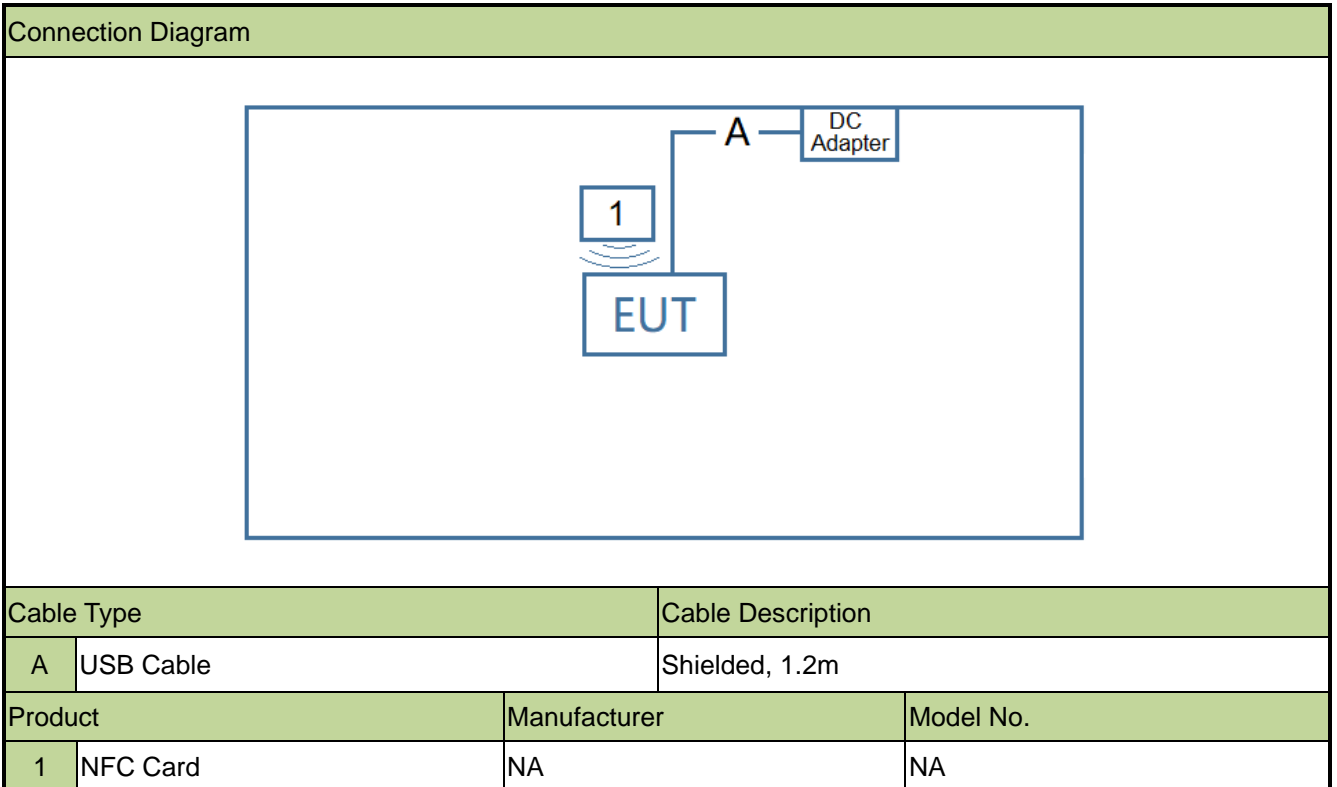
Frequency Range	13.56MHz
Type of Modulation	ASK
Antenna Type	Loop Antenna

2. Test Configuration Test Mode

Mode 1: Transmit by NFC

2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.



2.3. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.225
- ANSI C63.10-2013

2.4. Test Environment Condition

Ambient Temperature	15°C~35°C
Relative Humidity	20%RH ~75%RH

3. 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 antenna of the Mobile Computer is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Test Equipment Calibration Date

No.	Instrument	Manufacturer	Model No.	Asset No.	Last Cali. Date	Cali. Due Date	Test Site
1	EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022/1/4	WZ-AC1
2	Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2022/6/8	WZ-SR2
3	TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/5/24	WZ-AC2
4	Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2022/10/28	WZ-AC1/WZ-AC2
5	Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2022/10/10	WZ-TR3
6	EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2022/6/24	WZ-AC2
7	Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2021/12/8	WZ-AC2
8	TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/8/5	WZ-AC1
9	Thermohygrometer	Yuhuaze	HTC-2	MRTSUE06178	1 year	2022/8/10	WZ-AC2
10	Thermohygrometer	Yuhuaze	HTC-2	MRTSUE06184	1 year	2022/8/10	WZ-AC1
11	Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2022/4/29	WZ-AC1
12	Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2022/4/29	WZ-AC2
13	Shielding Room	MIX-BEP	WZ-SR2	MRTSUE06215	/	/	WZ-SR2
14	Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2022/6/28	WZ-TR3
15	Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2022/6/28	WZ-AC1
16	Thermohygrometer	testo	608-H1	MRTSUE06404	1 year	2022/6/28	WZ-SR2
17	Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022/1/6	WZ-AC1
18	EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2021/11/22	WZ-SR2

Software	Version	Function
EMI Software	V3	EMI Test Software

5. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB

6. Test Result

6.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
15.225 (a), (b), (c)	In-Band Emission	Radiated	Pass
15.225 (d)	Out-Band Emission		Pass
2.1049	20dB Bandwidth		N/A
15.225 (e)	Frequency Stability Tolerance		Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Remark:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
3. "N/A" means that this item is not applicable, and the detail information refer to relevant section.

6.2. In-band Emission

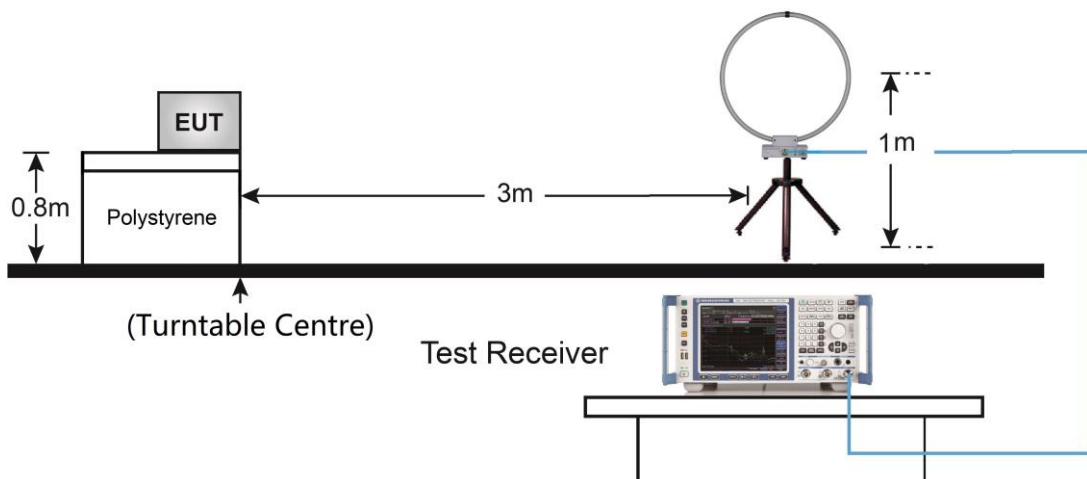
6.2.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.225		
Frequency (MHz)	Measured Distance (m)	Field Strength ($\mu\text{V/m}$)
13.553 ~ 13.567	30	15848
13.410 ~ 13.553 13.567 ~ 13.710	30	334
13.110 ~ 13.410 13.710 ~ 14.010	30	106

6.2.2. Test Procedure Used

EUT was tested from 9kHz up to the 1GHz excluding the band 13.110-14.010MHz. All measurements were recorded with a spectrum analyzer employing CISPR quasi-peak detector for emissions below 30MHz. All in-band emissions must not exceed the limits shown as stated per FCC Part 15 Subpart C Paragraph 15.225. Measurements below 30MHz were performed using a loop antenna. The antenna was positioned in two orthogonal (face on and face off).

6.2.3. Test Setup



6.2.4. Test Result

Test Site	WZ-AC1	Test Engineer	Tommy Tang
Test Date	2021/11/16	Test Mode	Mode 1

Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit @3m (dB μ V/m)	Margin (dB)	Detector
Face On						
13.350	13.506	20.042	33.548	80.506	-46.958	Peak
13.553	25.983	20.036	46.019	90.475	-44.456	Peak
13.560	34.137	17.044	51.181	123.999	-72.818	Peak
13.567	28.379	20.036	48.415	90.475	-42.060	Peak
13.773	16.096	20.029	36.125	80.506	-44.381	Peak
Face Off						
13.349	10.385	20.042	30.427	80.506	-50.079	Peak
13.553	21.466	20.036	41.502	90.475	-48.973	Peak
13.561	27.632	20.036	47.668	123.999	-76.331	Peak
13.567	23.446	20.036	43.482	90.475	-46.993	Peak
13.776	12.465	20.029	32.494	80.506	-48.012	Peak

Note 1: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 2: Measurements were tested at 3m, and the limit was extrapolated to the measurement distance of 3m from specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2). Extrapolation Factor = $40 \cdot \log(30/3) = 40\text{dB}$.

Note 3: Quasi-peak measurement was not performed if peak level lower than quasi-peak limit.

6.3. Out-band Emission

6.3.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measured Distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

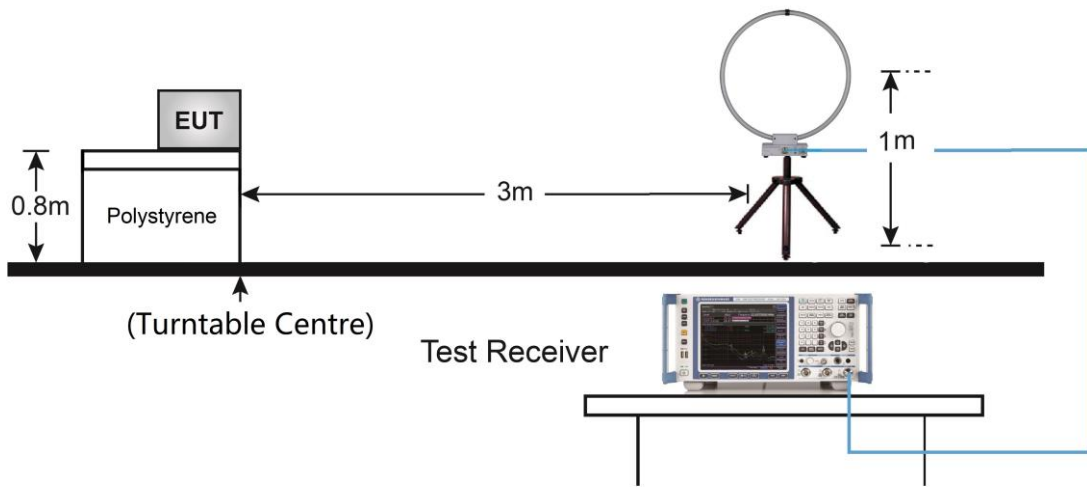
6.3.2. Test Procedure Used

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110-14.010MHz. All measurements were recorded with a spectrum analyzer employing CISPR quasi-peak detector for emissions below 1GHz. All out-of-band emissions must not exceed the limits shown as stated per FCC Part 15 Subpart C Paragraph 15.209.

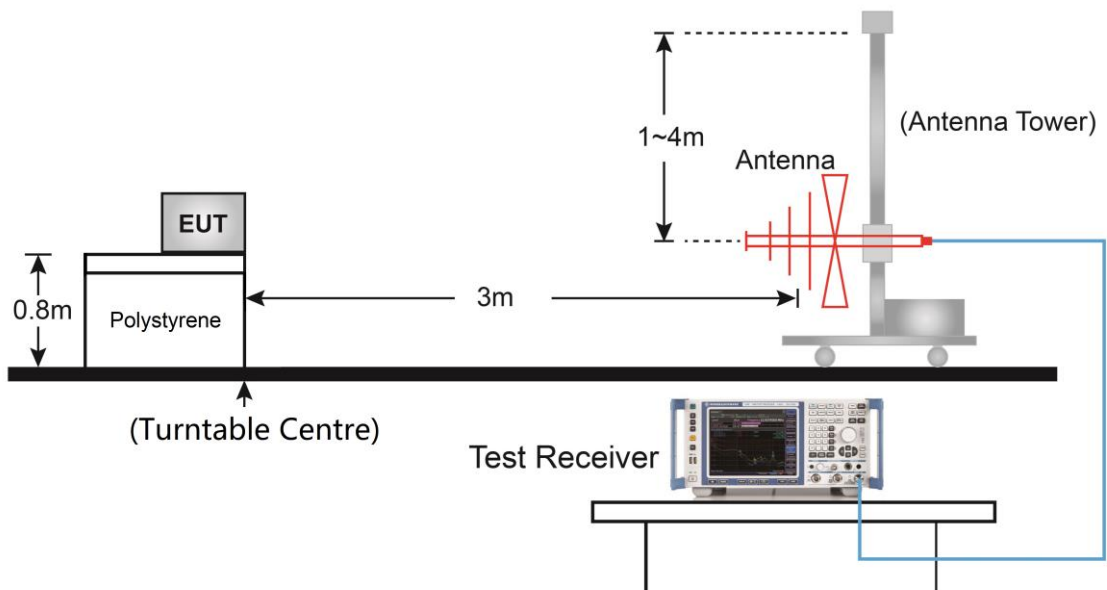
Measurements below 30MHz were performed using a loop antenna. The antenna was positioned in two orthogonal (face on and face off). Measurements above 30MHz were performed using a log-periodic antenna, and the highest emission level was recorded.

6.3.3. Test Setup

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



6.3.4. Test Result

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Tommy Tang & Kin Xia
Test Date	2021/11/16 ~ 2021/11/17	Test Mode	Mode 1

Out-Band Emission Below 30MHz						
Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit @3m (dB μ V/m)	Margin (dB)	Detector
Face On						
27.120	8.917	19.818	28.735	69.542	-40.807	Peak
Face Off						
27.120	8.893	19.818	28.711	69.542	-40.831	Peak

Note 1: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 2: Measurements were tested at 3m, and the limit was extrapolated to the measurement distance of 3m from specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2). Extrapolation Factor = $40 \cdot \log(30/3) = 40\text{dB}$.

Note 3: Measure Level (dB μ A/m) = Measure Level (dB μ V/m) - 51.5dB.

Out-Band Emission Above 30MHz							
Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
51.8	2.8	20.7	23.5	40.0	-16.5	Peak	Horizontal
102.3	1.0	18.7	19.7	43.5	-23.8	Peak	Horizontal
268.1	2.2	20.3	22.5	46.0	-23.5	Peak	Horizontal
449.0	4.2	24.1	28.3	46.0	-17.7	Peak	Horizontal
653.7	4.9	28.0	32.9	46.0	-13.1	Peak	Horizontal
903.5	3.6	31.6	35.2	46.0	-10.8	Peak	Horizontal
43.1	2.3	20.3	22.6	40.0	-17.4	Peak	Vertical
102.3	0.8	18.7	19.5	43.5	-24.0	Peak	Vertical
346.7	2.7	22.8	25.5	46.0	-20.5	Peak	Vertical
597.9	3.9	27.6	31.5	46.0	-14.5	Peak	Vertical
692.5	4.2	28.9	33.1	46.0	-12.9	Peak	Vertical
887.5	4.3	31.4	35.7	46.0	-10.3	Peak	Vertical

Note 1: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 2: Quasi-peak measurement was not performed if peak level lower than quasi-peak limit.

6.4. 20dB Bandwidth & 99% Bandwidth

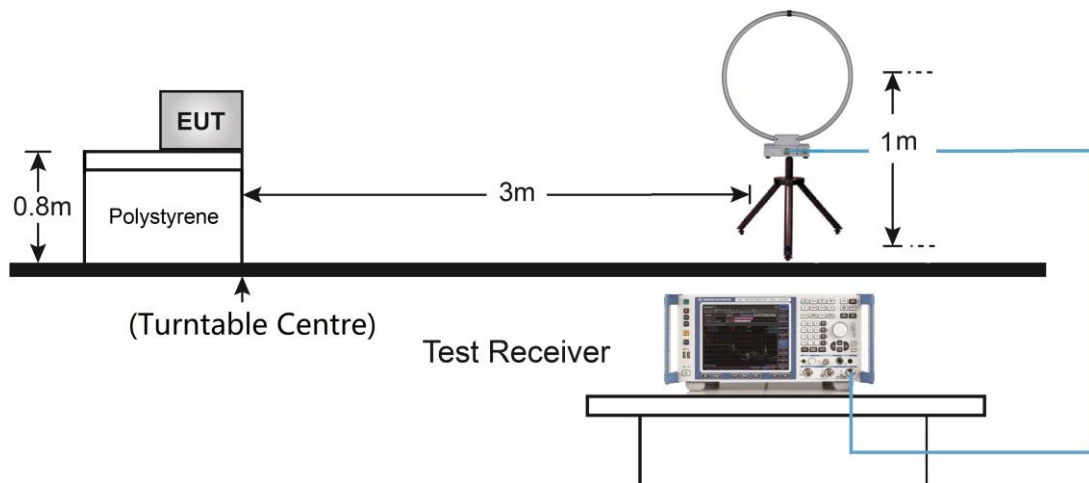
6.4.1. Test Limit

N/A

6.4.2. Test Procedure Used

Measurements below 30MHz were performed using a loop antenna. The antenna was positioned in face on orthogonal.

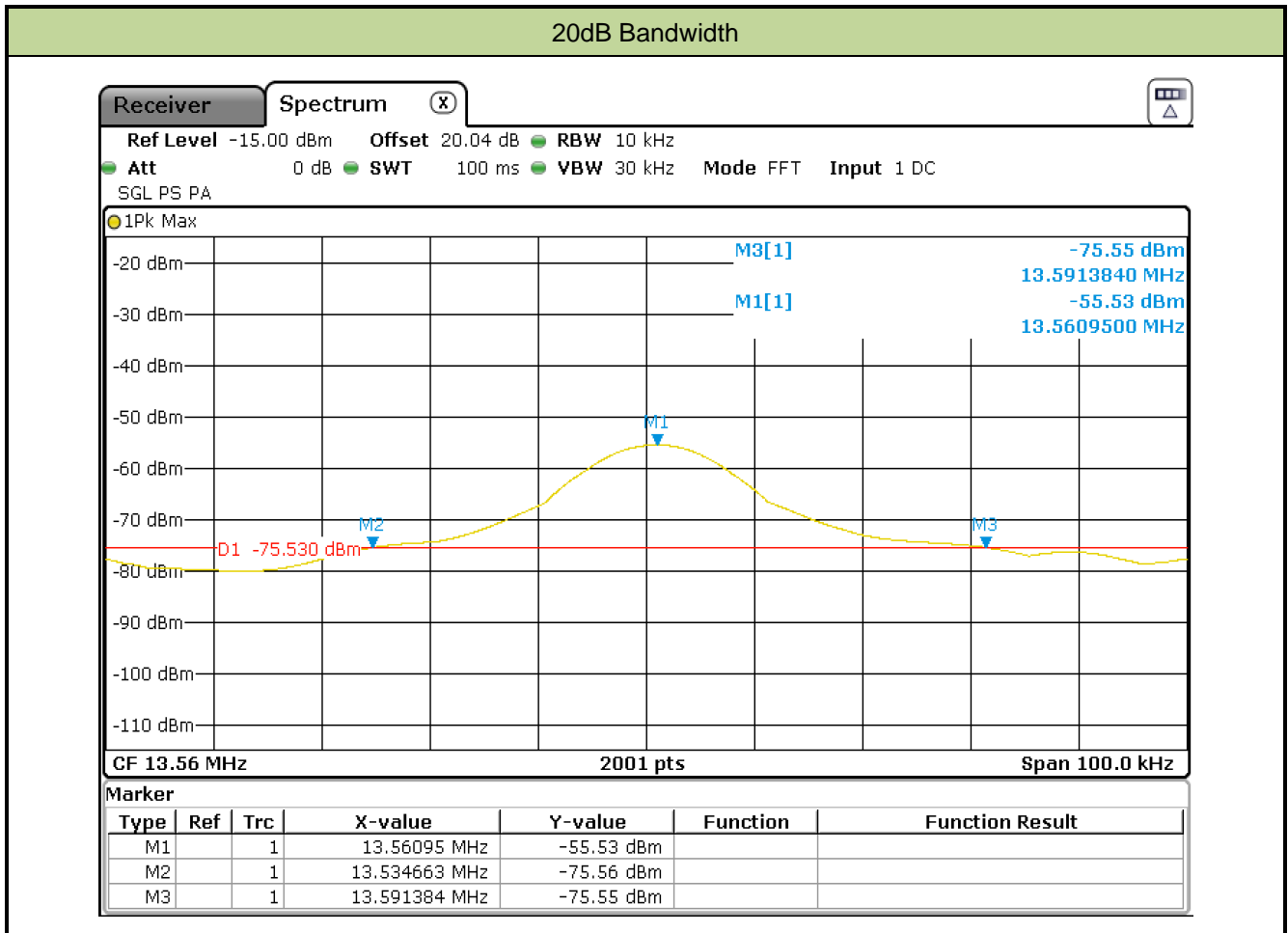
6.4.3. Test Setup



6.4.4. Test Result

Test Site	WZ-AC1	Test Engineer	Tommy Tang
Test Date	2021/11/16	Test Mode	Mode 1

Frequency (MHz)	20dB Bandwidth (kHz)
13.56	56.721



Note: Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

6.5. Frequency Tolerance

6.5.1. Test Limit

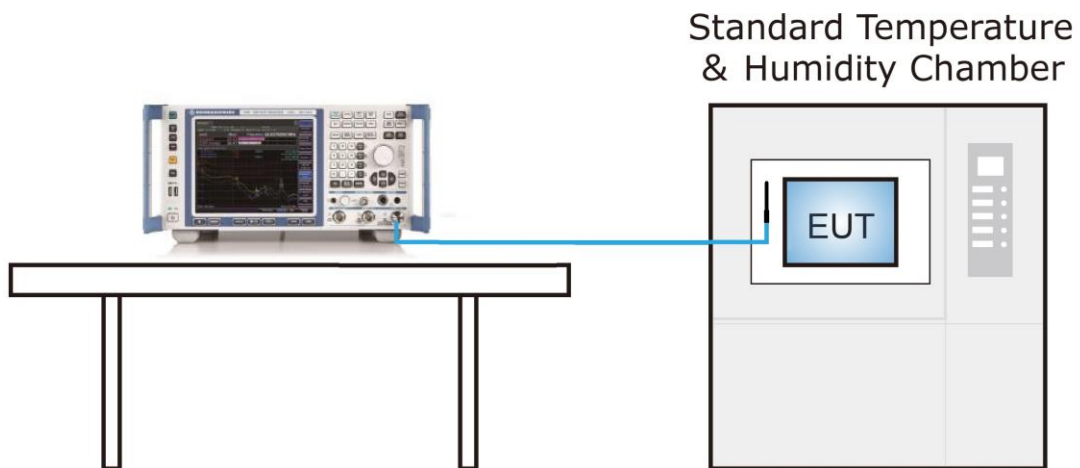
The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

6.5.2. Test Procedure Used

The frequency shall be measured 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.

The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20 degrees operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10 degrees decreased per stage until the lowest temperature reached.

6.5.3. Test Setup



6.5.4. Test Result

Test Site	WZ-TR3	Test Engineer	Bruce Wang
Test Date	2021/11/22	Test Mode	Mode 1

Operating Frequency: 13.56 MHz					
Reference Voltage: 3.8V dc					
Deviation Limit: $\pm 0.01\% = \pm 1356$ Hz					
Voltage (%)	Battery Power	Temperature (°C)	Measure Frequency (Hz)	Frequency Deviation (Hz)	Deviation (%)
100%	3.80	-20	13560352	215	0.001586
		-10	13560387	250	0.001844
		0	13560472	335	0.002470
		+10	13560620	483	0.003562
		+20 (Ref)	13560137	0	0.000000
		+30	13560681	544	0.004012
		+40	13560593	456	0.003363
		+50	13560434	297	0.002190
85%	3.23	+20	13560592	455	0.003355
115%	4.37	+20	13560686	549	0.004049

6.6. AC Conducted Emissions Measurement

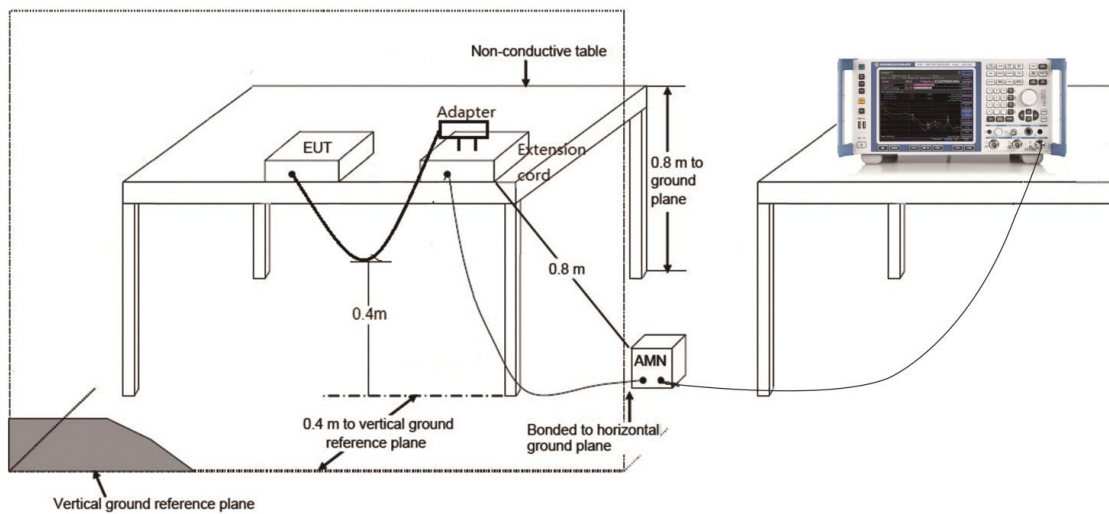
6.6.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207		
Frequency (MHz)	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

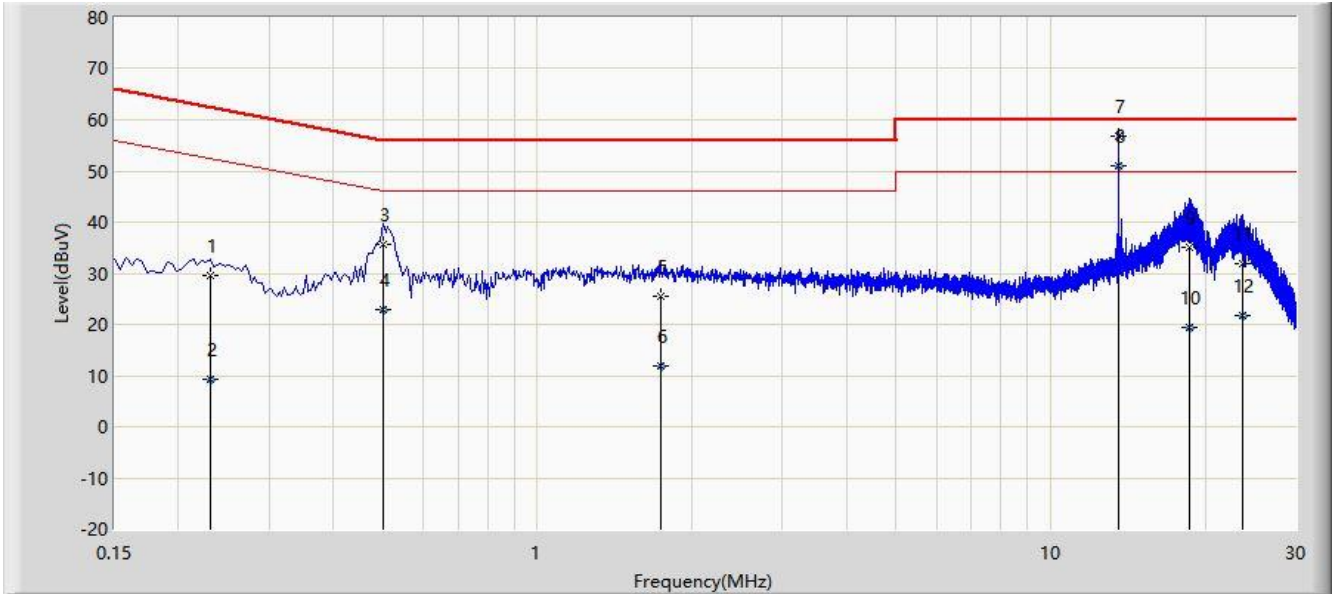
Note 2: The limit decreases linearly with the logarithm of the frequency.

6.6.2. Test Setup



6.6.3. Test Result

Site: WZ-SR2	Time: 2021/11/17 - 16:31
Limit: FCC_Part15.207_CE_AC Power	Engineer: Helen Han
Probe: ENV216_101683_Filter Off_E	Polarity: Line
EUT: Mobile Computer	Power: AC 120V/60Hz
Test Mode 1	



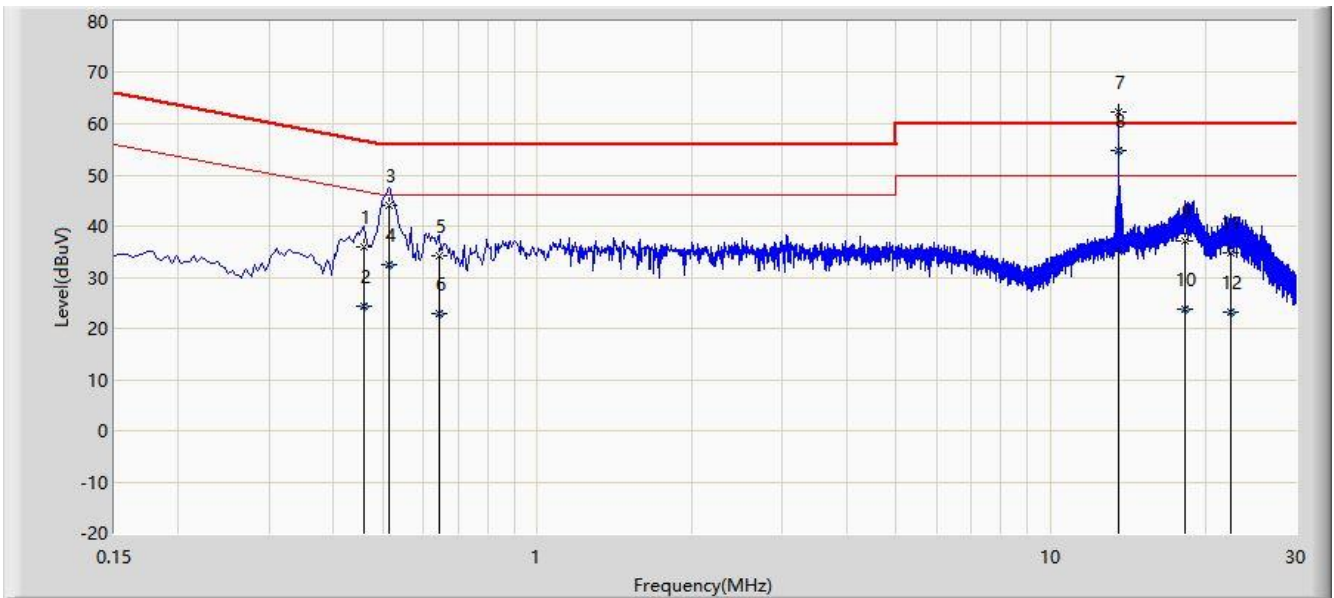
No	Flag	Mark	Frequency (MHz)	Measure Level (dBμV)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV)	Factor (dB)	Type
1			0.230	29.521	19.533	-32.928	62.450	9.989	QP
2			0.230	9.417	-0.571	-43.032	52.450	9.989	AV
3		*	0.502	35.556	25.541	-20.444	56.000	10.015	QP
4			0.502	22.962	12.946	-23.038	46.000	10.015	AV
5			1.734	25.612	15.466	-30.388	56.000	10.146	QP
6			1.734	12.022	1.876	-33.978	46.000	10.146	AV
7			13.562	56.796	43.316	N/A	N/A	13.480	QP
8			13.562	50.945	37.465	N/A	N/A	13.480	AV
9			18.654	35.153	19.729	-24.847	60.000	15.424	QP
10			18.654	19.520	4.096	-30.480	50.000	15.424	AV
11			23.650	32.006	15.277	-27.994	60.000	16.730	QP
12			23.650	21.684	4.955	-28.316	50.000	16.730	AV

Note 1: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Note 2: Frequency (Point No. 7 & 8) is NFC operating frequency.

Site: WZ-SR2	Time: 2021/11/17 - 16:35
Limit: FCC_Part15.207_CE_AC Power	Engineer: Helen Han
Probe: ENV216_101683_Filter Off_E	Polarity: Neutral
EUT: Mobile Computer	Power: AC 120V/60Hz
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V)	Reading Level (dB μ V)	Margin (dB)	Limit (dB μ V)	Factor (dB)	Type
1			0.458	35.904	25.857	-20.825	56.729	10.047	QP
2			0.458	24.284	14.237	-22.445	46.729	10.047	AV
3		*	0.514	44.138	34.086	-11.862	56.000	10.052	QP
4			0.514	32.327	22.276	-13.673	46.000	10.052	AV
5			0.646	34.096	24.032	-21.904	56.000	10.063	QP
6			0.646	22.893	12.829	-23.107	46.000	10.063	AV
7			13.562	62.404	48.799	N/A	N/A	13.605	QP
8			13.562	54.711	41.105	N/A	N/A	13.605	AV
9			18.302	36.993	21.819	-23.007	60.000	15.174	QP
10			18.302	23.751	8.576	-26.249	50.000	15.174	AV
11			22.370	34.648	18.362	-25.352	60.000	16.287	QP
12			22.370	23.240	6.954	-26.760	50.000	16.287	AV

Note 1: Measure Level (dB μ V) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Note 2: Frequency (Point No. 7 & 8) is NFC operating frequency.

7. Conclusion

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC Rules and ISED Rules.

————— The End —————

Appendix A - Test Setup Photograph

Refer to "2111RSU038-UT" file.

Appendix B - EUT Photograph

Refer to "2111RSU038-UE" file.