



RF MEASUREMENT REPORT

FCC ID: 2AU2Y-JH0004

Applicant: Nine Tech Co., Ltd.

Application Type: Certification

Product: Ninebot NFC Dashboard

Model No.: N-C-DISC1.0, EB_DU_03

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

FCC Rule Part(s): Part 15 Subpart C (Section 15.225)

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

Test Date: January 07 ~ 17, 2022

Reviewed By:

Vincent Yu

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
2112RSU049-U1	Rev. 01	Initial Report	04-19-2022	Valid

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1. General Information

1.1. Applicant

Nine Tech Co., Ltd.

1 Xingben Rd. Xinbei Dist. Changzhou, Jiangsu, China

1.2. Manufacturer

Nine Tech Co., Ltd.

1 Xingben Rd. Xinbei Dist. Changzhou, Jiangsu, China

1.3. Testing Facility

[illegible]

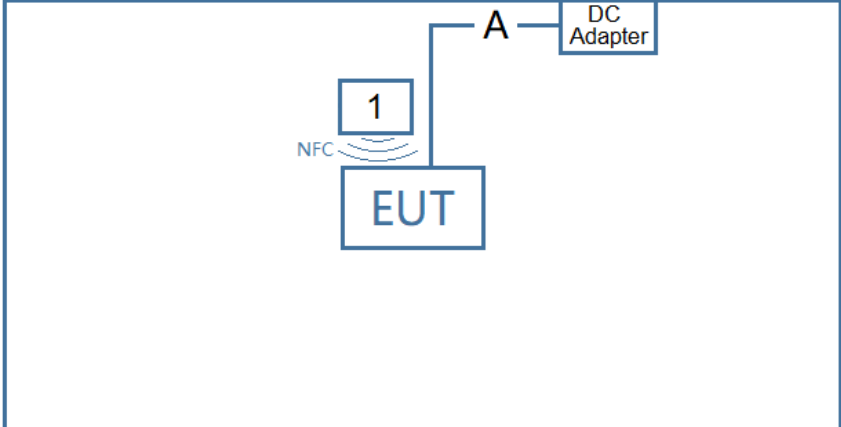
1.4. Product Information

Product Name	Ninebot NFC Dashboard
Model No.	N-C-DISC1.0, EB_DU_03
S/N	7MB4F21HTA0572
NFC Specification	13.56MHz
Type of modulation	ASK
Antenna Type	Loop Antenna
Working Voltage	4Vdc
Remark: - The only difference between the models is the shape of the shell, and the RF characteristics such as the PCB board, RF circuit and antenna are the same. The model EB_DU_03 was selected for all test. - The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Test Mode

Test Mode
Mode 1: Transmit by NFC

1.6. Test Configuration and Software

			
Cable Type		Cable Description	
A	USB Cable	Shielded, 1.2m	
Product		Manufacturer	Model No.
1	Adapter	Shenzhen Honor Electronic Co., Ltd	ADS-12B-06 05010E

1.7. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

1.8. Test Environment Condition

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

2. 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 this device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

3. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022/12/29	SIP-AC3
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2022/6/24	SIP-AC3
Preamplifier	EMCI	EMC001330	MRTSUE06643	1 year	2022/1/14	SIP-AC3
					2023/1/13	
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/3/9	SIP-AC3
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/6/24	SIP-AC3
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2022/10/31	SIP-AC3
Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2022/9/7	SIP-AC3
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/6/9	SIP-AC3
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06598	1 year	2022/11/9	SIP-AC3
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2022/9/12	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2022/11/2	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2022/11/28	SIP-AC3
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2022/1/14	SIP-AC3
					2023/1/13	
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06646	1 year	2022/8/26	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2022/12/23	SIP-AC3
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2022/2/23	SIP-TR1
Communication Tester	R&S	CMW500	MRTSUE06881	1 year	2022/6/2	SIP-TR1
Thermohygrometer	testo	Testo 608-H1	MRTSUE11022	1 year	2022/11/2	SIP-TR1
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2022/8/8	SIP-TR1
Signal Generator	R&S	SMU200A	MRTSUE06489	1 year	2022/2/23	SIP-TR1
USB Power Sensor	Keysight	U2021XA	MRTSUE06595	1 year	2022/9/7	SIP-TR1
USB Power Sensor	Keysight	U2021XA	MRTSUE06596	1 year	2022/9/7	SIP-TR1
Signal Generator	Keysight	N5182B	MRTSUE06605	1 year	2022/10/31	SIP-TR1

Software	Version	Function
EMI Software	V3	EMI Test Software

4. 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 Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 9kHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 9kHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.28%

5. Test Result

5.1. Summary

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

Notes:

- 1) 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.
- 2) "N/A" means not applicable.

5.2. In-band Emission

5.2.1. 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
Note 1: The lower limit shall apply at the transition frequency. Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. Note 3: E field strength (dB $\mu\text{V/m}$) = 20 log E field strength ($\mu\text{V/m}$)		

5.2.2. Test Procedure Used

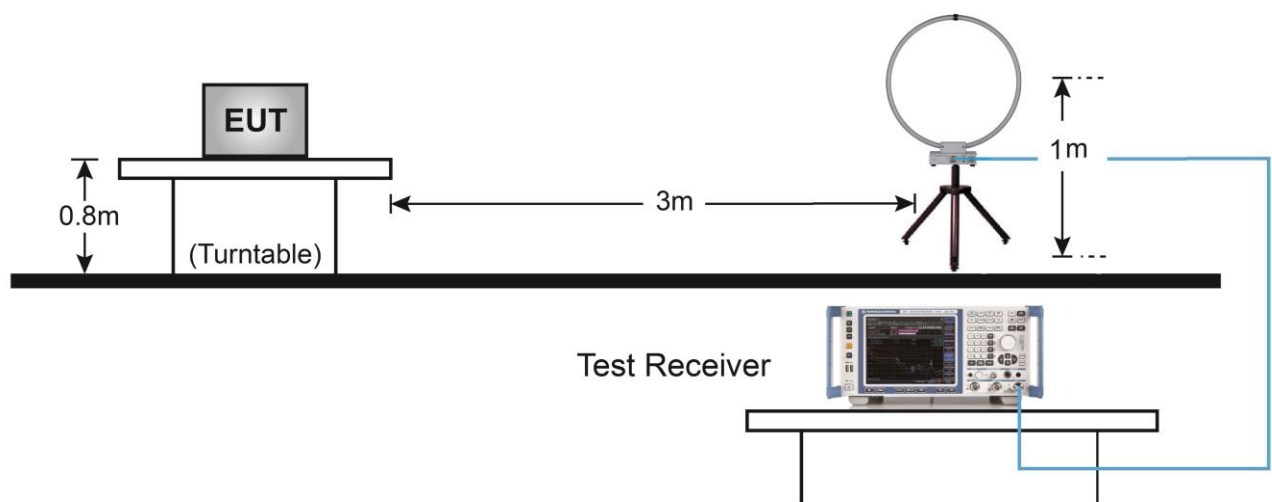
ANSI C63.10-2013 - Section 6.4.7

5.2.3. Test Setting

1. RBW = 9kHz
2. VBW = 3 * RBW
3. Detector = Peak
4. Trace mode = Max hold
5. Sweep = Auto couple
6. Allow the trace to stabilize

5.2.4. Test Setup

9kHz ~ 30MHz Test Setup:



5.2.5. Test Result

Refer to Appendix A.1.

5.3. Out-band Emission

5.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (μV/m)
0.009 - 0.490	300	2400/F (kHz)
0.490 - 1.705	30	24000/F (kHz)
1.705 - 30	30	30
30 - 88	3	100
88 - 216	3	150
216 - 960	3	200
Above 960	3	500

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

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBμV/m) = 20 log E field strength (μV/m)

5.3.2. Test Procedure Used

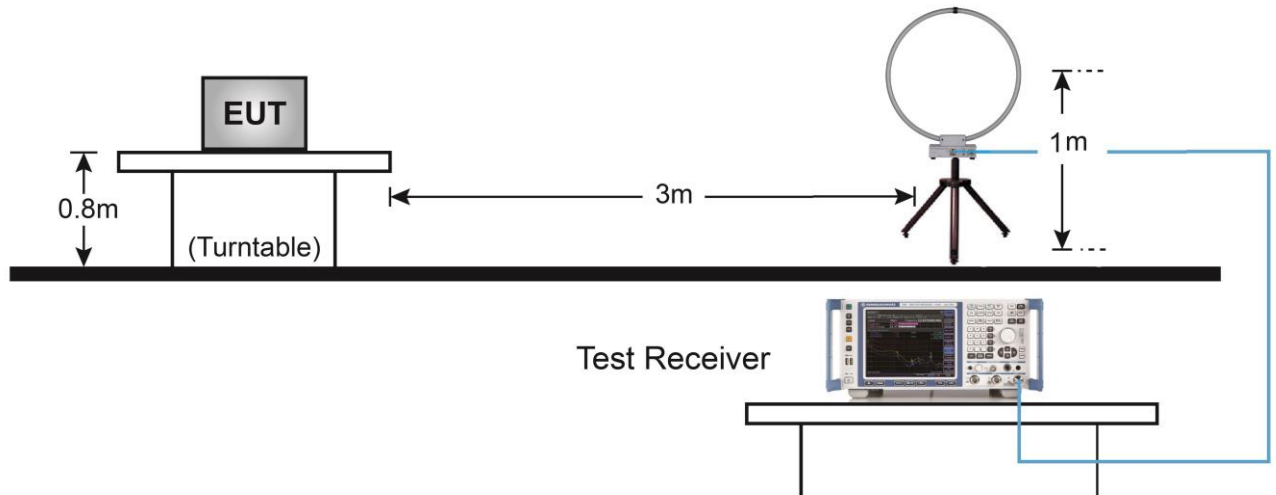
ANSI C63.10-2013 - Section 6.5.4

5.3.3. Test Setting

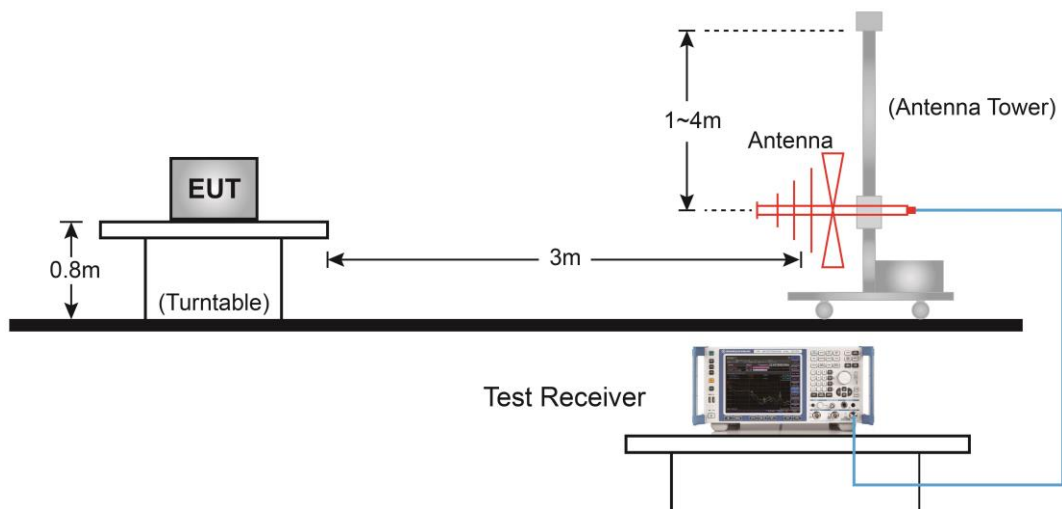
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 9kHz for emission below 30MHz and 100kHz for emission between 30MHz and 1GHz
3. VBW = 3 * RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

5.3.4. Test Setup

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



5.3.5. Test Result

Refer to Appendix A.2.

5.4. 20dB Occupied Bandwidth

5.4.1. Test Limit

N/A

5.4.2. Test Procedure Used

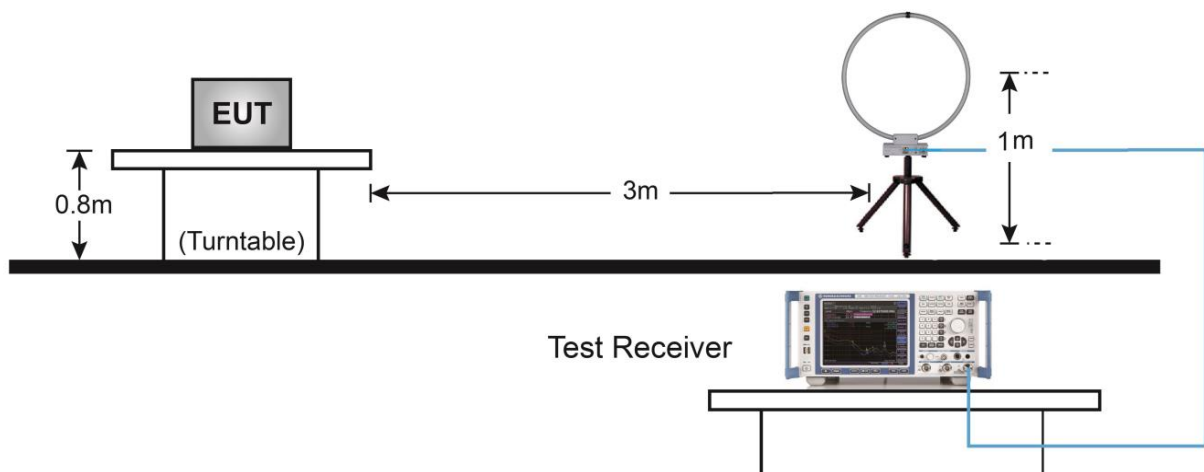
ANSI C63.10-2013 - Section 6.9.2 (20dB Bandwidth)

5.4.3. Test Setting

20dB Bandwidth

1. Set RBW $\geq 1\%$ to 5% of the 20dB bandwidth
2. VBW = approximately three times RBW
3. Span = approximately 2 to 5 times the 20dB bandwidth, centered on a hopping channel
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

5.4.4. Test Setup



5.4.5. Test Result

Refer to Appendix A.3.

5.5. Frequency Tolerance

5.5.1. Test Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency.

5.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 6.8

5.5.3. Test Setting

Frequency Stability Under Temperature Variations:

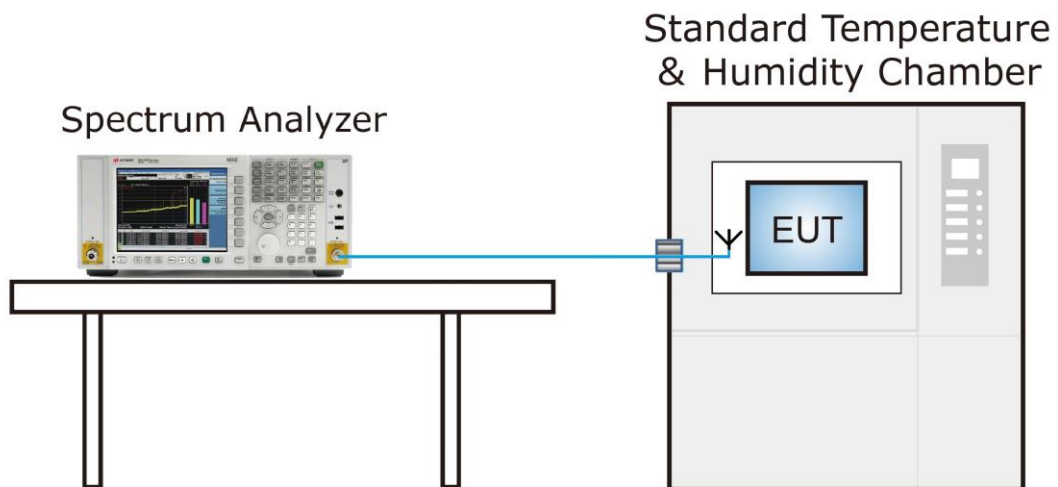
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C 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°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change. For hand-carried battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

5.5.4. Test Setup



5.5.5. Test Result

Refer to Appendix A.4.

5.6. AC Conducted Emissions Measurement

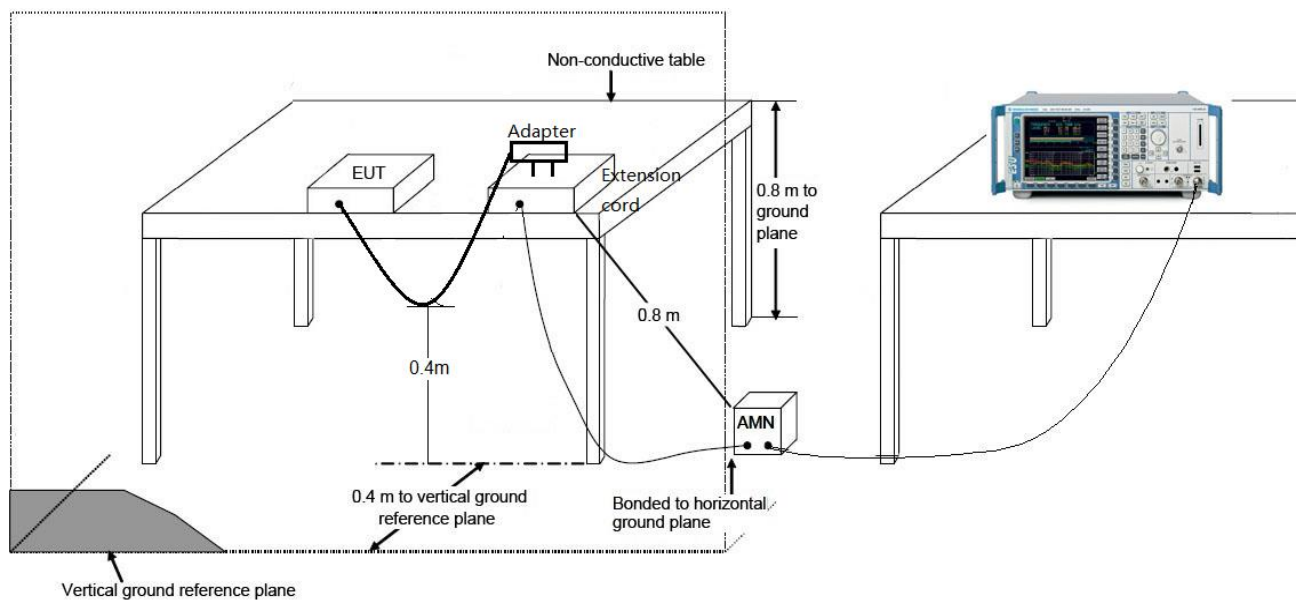
5.6.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207		
Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 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 in the range 0.15MHz to 0.5MHz.

5.6.2. Test Setup



5.6.3. Test Result

Refer to Appendix A.5.

Appendix A - Test Result

A.1 In-band Emission Test Result

Test Site	SIP-AC3	Test Engineer	Stephen Dong
Test Date	2022/01/07	Test Mode	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)	Detector
Face On						
13.236	13.853	19.888	33.741	80.5	-46.759	Peak
13.550	10.206	19.843	30.049	90.5	-60.451	Peak
13.560	26.386	19.847	46.233	124.0	-77.767	Peak
13.570	7.870	19.862	27.731	90.5	-62.769	Peak
13.852	9.862	20.009	29.871	80.5	-50.629	Peak
Face Off						
13.345	13.582	19.975	33.557	80.5	-46.943	Peak
13.486	16.860	19.945	36.805	90.5	-53.695	Peak
13.560	37.909	19.847	57.756	124.0	-66.244	Peak
13.634	18.289	19.896	38.186	90.5	-52.314	Peak
13.771	11.632	20.012	31.644	80.5	-48.856	Peak

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

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

Note 2: All measurements were performed using a loop antenna. The antenna was positioned in two orthogonal (Face On and Face Off) and the position with the highest emission level was recorded.

"Face On" means that loop plane perpendicular to the ground plane and to the measurement axis.

"Face Off" means that loop plane perpendicular to the ground plane and coplanar with the measurement axis.

Note 3: Measurements were tested at 3m and the data was extrapolated to the 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 = $40 \cdot \log(30/3) = 40$ dB.

A.2 Out-Band Emission Test Result

Test Site	SIP-AC3	Test Engineer	Stephen Dong
Test Date	2022/01/07	Test Mode	Mode 1

Out-Band Emission Below 30MHz						
Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)	Detector
Face On						
27.120	9.520	20.089	29.609	69.500	-39.891	Peak
Face Off						
27.120	9.149	20.089	29.238	69.500	-40.262	Peak

Out-Band Emission Above 30MHz							
Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
186.655	18.710	15.931	34.641	43.500	-8.859	Peak	Horizontal
290.930	23.514	18.357	41.871	46.000	-4.129	Peak	Horizontal
344.280	24.047	19.626	43.673	46.000	-2.327	Peak	Horizontal
344.280	23.891	19.626	43.517	46.000	-2.483	QP	Horizontal
458.255	7.123	22.535	29.658	46.000	-16.342	Peak	Horizontal
772.050	3.121	28.383	31.504	46.000	-14.496	Peak	Horizontal
880.690	3.384	29.163	32.547	46.000	-13.453	Peak	Horizontal
44.550	11.349	18.260	29.609	40.000	-10.391	Peak	Vertical
285.595	12.786	18.209	30.995	46.000	-15.005	Peak	Vertical
369.015	13.475	20.287	33.762	46.000	-12.238	Peak	Vertical
458.740	8.048	22.541	30.589	46.000	-15.411	Peak	Vertical
765.260	3.016	28.423	31.439	46.000	-14.561	Peak	Vertical
830.735	4.524	28.455	32.979	46.000	-13.021	Peak	Vertical

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

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

Note 2: Below 30MHz measurement was performed using a loop antenna. The antenna was positioned in two orthogonal (face on and face off) and the position with the highest emission level was recorded.

"Face On" means that loop plane perpendicular to the ground plane and to the measurement axis.

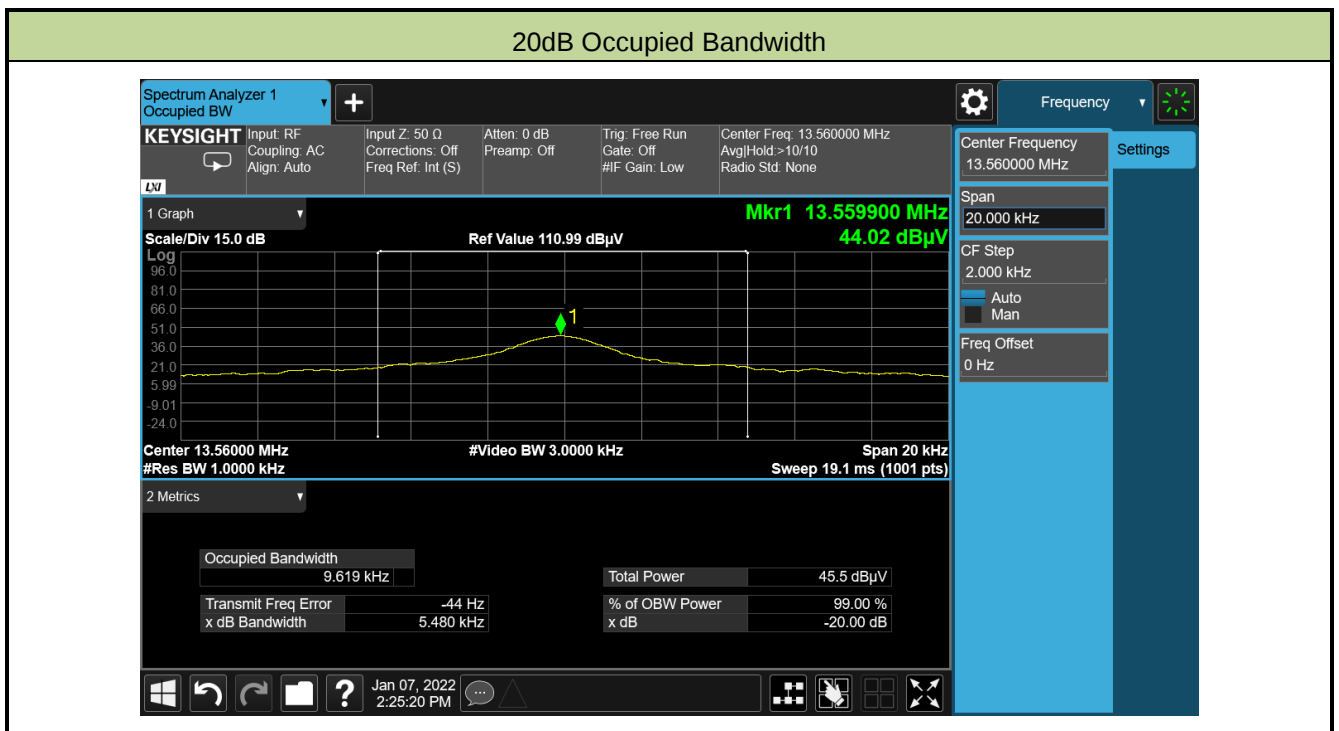
"Face Off" means that loop plane perpendicular to the ground plane and coplanar with the measurement axis.

Note 3: Measurements were tested at 3m and the data was extrapolated to the 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 = $40 \cdot \log(30/3) = 40$ dB.

A.3 20dB Occupied Bandwidth Test Result

Test Site	SIP-AC3	Test Engineer	Stephen Dong
Test Date	2022/01/07	Test Mode	Mode 1

Frequency (MHz)	20dB Occupied Bandwidth (kHz)
13.56	5.480



Note: Because the measured signal is CW adjusting the RBW per ANSI C63.10-2013 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

A.4 Frequency Stability Tolerance Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2022/01/17	Test Mode	Mode 1

Declared Frequency: 13.56 MHz					
Reference Voltage: 4.0Vdc					
Deviation Limit: $\pm 0.01\% = \pm 1356$ Hz					
Voltage (%)	Voltage (Vdc)	Temperature (°C)	Measure Frequency (Hz)	Frequency Deviation (Hz)	Tolerance (%)
100%	4.0	-20	13559974	-26	-0.0002
		-10	13560296	296	0.0022
		0	13559701	-299	-0.0022
		+10	13559252	-748	-0.0055
		+20 (Ref)	13560048	48	0.0004
		+30	13559411	-589	-0.0043
		+40	13560152	152	0.0011
		+50	13560131	131	0.0010
85%	3.4V	+20	13559849	-151	-0.0011
115%	4.6V	+20	13560274	274	0.0020

Note 1: Frequency Deviation (Hz) = Measured Frequency (Hz) - Declared Frequency (Hz)

Note 2: Frequency Tolerance (%) = Frequency Deviation (Hz) / Declared Frequency (Hz) * 100%.

A.5 AC Conducted Emissions Test Result

The EUT is powered by DC source, so this item is not applicable.

Appendix B - Test Setup Photograph

Refer to “2112RSU049-UT” file.

Appendix C - EUT Photograph

Refer to "2112RSU049-UE" file.