



RF MEASUREMENT REPORT

FCC ID: 2AZX2-MR000001
Applicant: An Energy Technology Co., Ltd
Product: Onboard 15W Wireless Charging
Model No.: W015CN-03
FCC Classification: Part 15 Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s): Part 15 Subpart C (Section 15.225)
Test Date: December 30, 2021 ~ January 06, 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
2112RSU027-U2	Rev. 01	Initial Report	04-02-2022	Valid

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1.1. Applicant

139 Huaye Road, Jintan District, Changzhou City, Jiangsu, China

An Energy Technology Co., Ltd

139 Huaye Road, Jintan District, Changzhou City, Jiangsu, China

<input checked="" type="checkbox"/>	Test Site – MRT Suzhou Laboratory				
	Laboratory Location (Suzhou - Wuzhong)				
	D8 Building, No.2 Tian’edang Rd., Wuzhong Economic Development Zone, Suzhou, China				
	Laboratory Location (Suzhou - SIP)				
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
A2LA: 3628.01		CNAS: L10551			
FCC: CN1166		ISED: CN0001			
VCCI:	<input type="checkbox"/> R-20025	<input type="checkbox"/> G-20034	<input type="checkbox"/> C-20020	<input type="checkbox"/> T-20020	
	<input type="checkbox"/> R-20141	<input type="checkbox"/> G-20134	<input type="checkbox"/> C-20103	<input type="checkbox"/> T-20104	
<input type="checkbox"/>	Test Site – MRT Shenzhen Laboratory				
	Laboratory Location (Shenzhen)				
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
<input type="checkbox"/>	Test Site – MRT Taiwan Laboratory				
	Laboratory Location (Taiwan)				
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725		FCC: 291082, TW3261		
ISED: TW3261					

1.4. Product Information

Product Name	Onboard 15W Wireless Charging
Model No.	W015CN-03
WPT Specification	120 ~ 130kHz
NFC Specification	13.56MHz
Test Sample ID	20211213Sample#14
Operating Temp.	-10 ~ 40°C
Input Voltage	DC 36V
Input Current	2A (MAX)
Output	15W (MAX)
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. Radio Specification

Frequency Range	13.56MHz
Type of modulation	ASK
Antenna Type	Coil Antenna

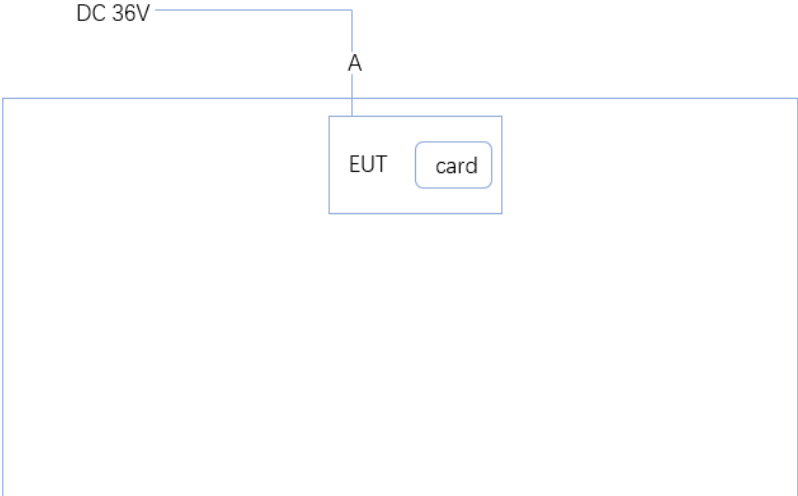
Note: For other features of this EUT, test report will be issued separately.

2. Test Configuration

2.1. Test Mode

Test Mode
Mode 1: Transmit by NFC

2.2. Test Configuration and Software

			
Cable Type	Cable Description		Length
A	Power Cable	Non-Shielded	1.5m

2.3. Applied Standards

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

- FCC Part 15.255
- ANSI C63.10-2013

2.4. Test Environment Condition

Ambient Temperature	15 ~ 35 °C
Relative Humidity	20 ~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 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.

4. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/5/24	WZ-AC2
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2022/10/28	WZ-AC2/WZ-TR3
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2022/6/24	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2022/12/01	WZ-AC2
Thermohygrometer	Yuhuaize	HTC-2	MRTSUE06178	1 year	2022/8/10	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2022/4/29	WZ-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022/1/6	WZ-AC2
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2022/10/10	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2022/6/28	WZ-TR3
Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/4/13	WZ-TR3

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% ($U=2U_c(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 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

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
15.215 (c)	20dB Bandwidth		Pass
15.225(e)	Frequency Stability Tolerance		Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A

Remark:

- For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
- "N/A" means not applicable.

6.2. In-band Emission Measurement

6.2.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.225		
Frequency (MHz)	Distance (m)	Level (μ 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
<p>Note 1: The lower limit shall apply at the transition frequency.</p> <p>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.</p> <p>Note 3: E field strength (dBμV/m) = 20 log E field strength (μV/m)</p>		

6.2.2. Test Procedure

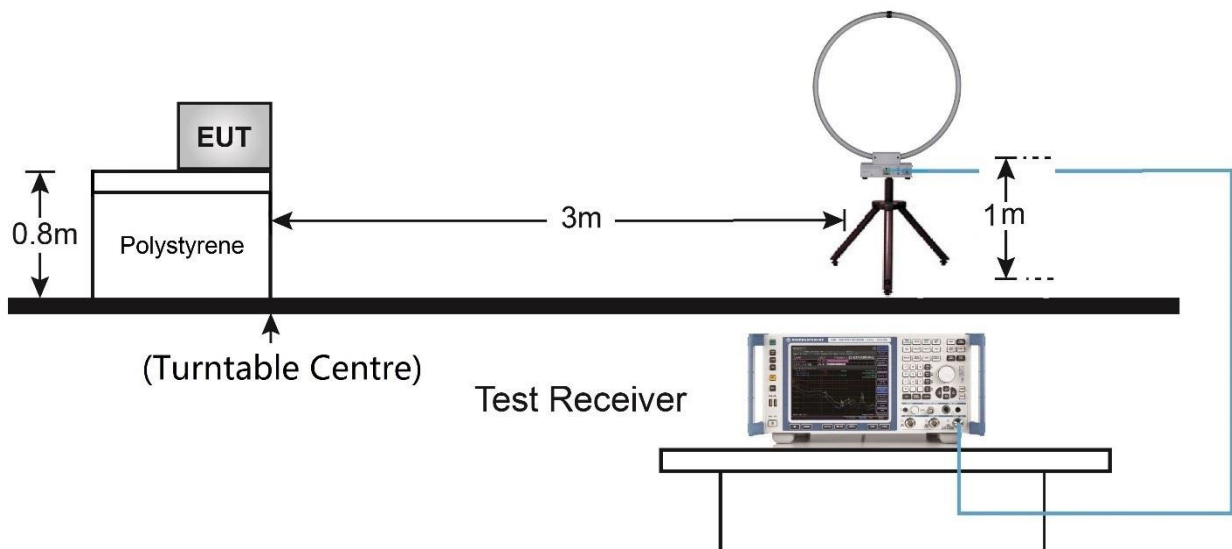
ANSI C63.10-2013 - Section 6.4.7

6.2.3. 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

6.2.4. Test Setup

9kHz ~ 30MHz Test Setup:



6.2.5. Test Result

Refer to Appendix A.1.

6.3. Out-band Emission Measurement

6.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level ($\mu\text{V/m}$)
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: $E \text{ field strength (dB}\mu\text{V/m)} = 20 \log E \text{ field strength (}\mu\text{V/m)}$

6.3.2. Test Procedure

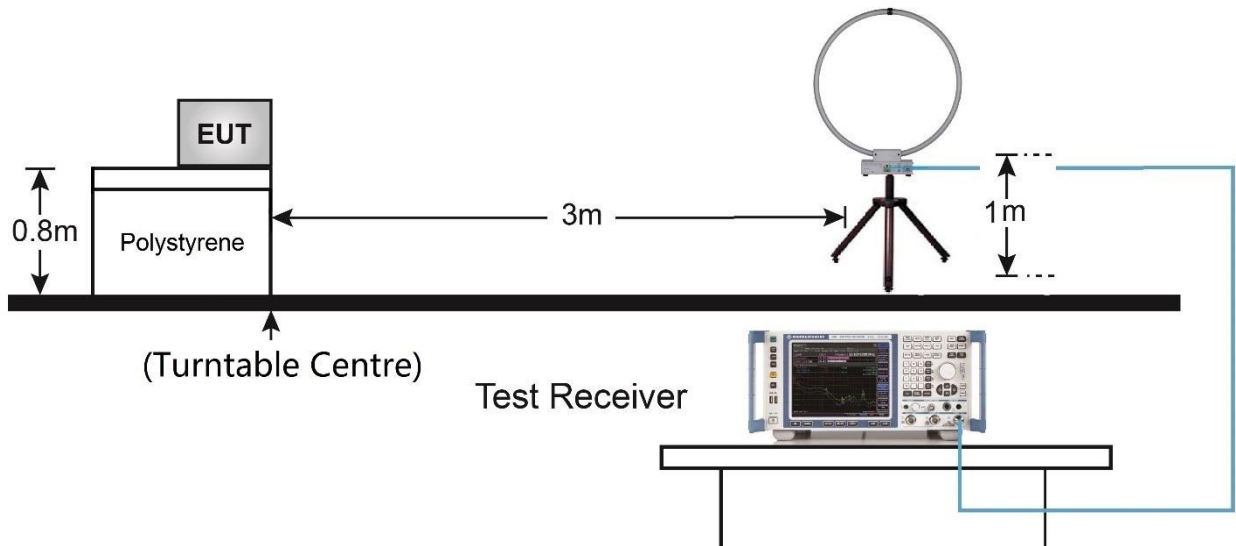
ANSI C63.10-2013 - Section 6.5.4

6.3.3. Test Setting

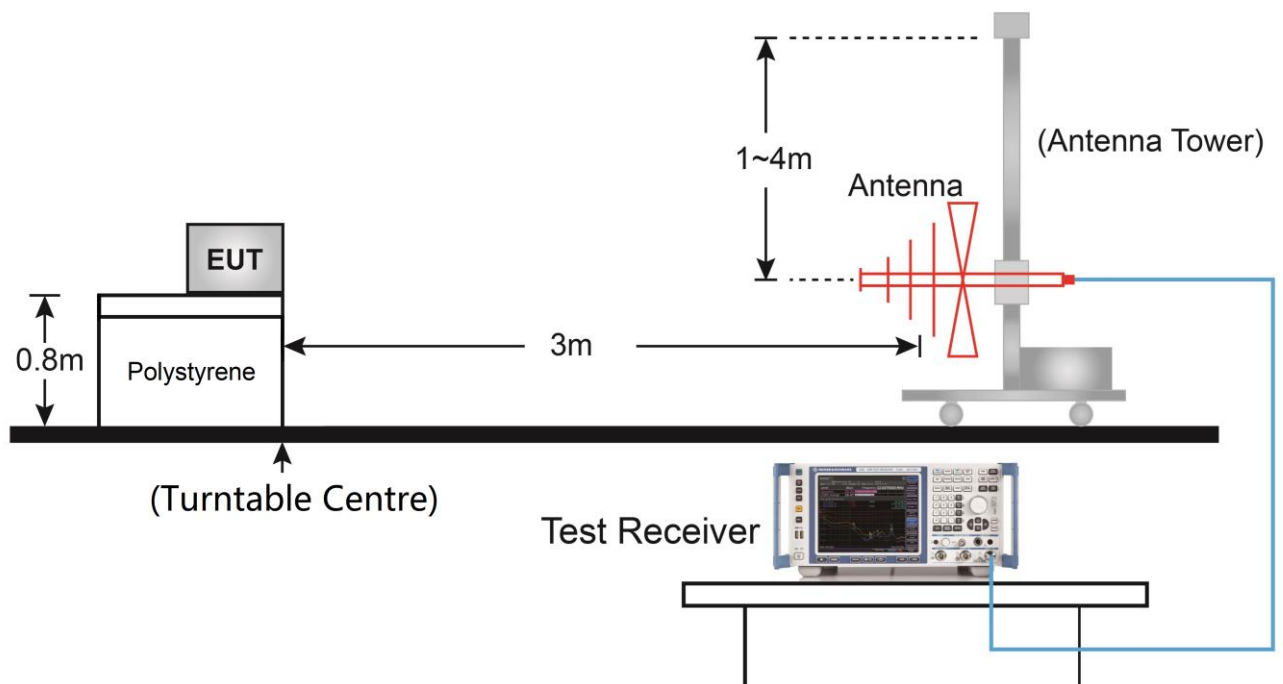
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 9kHz for emission below 30MHz and 100kHz for emission between 30MHz and 1GHz
3. VBW = 3 * RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

6.3.4. Test Setup

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



6.3.5. Test Result

Refer to Appendix A.2.

6.4. Occupied Bandwidth Measurement

6.4.1. Test Limit

The occupied bandwidth is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

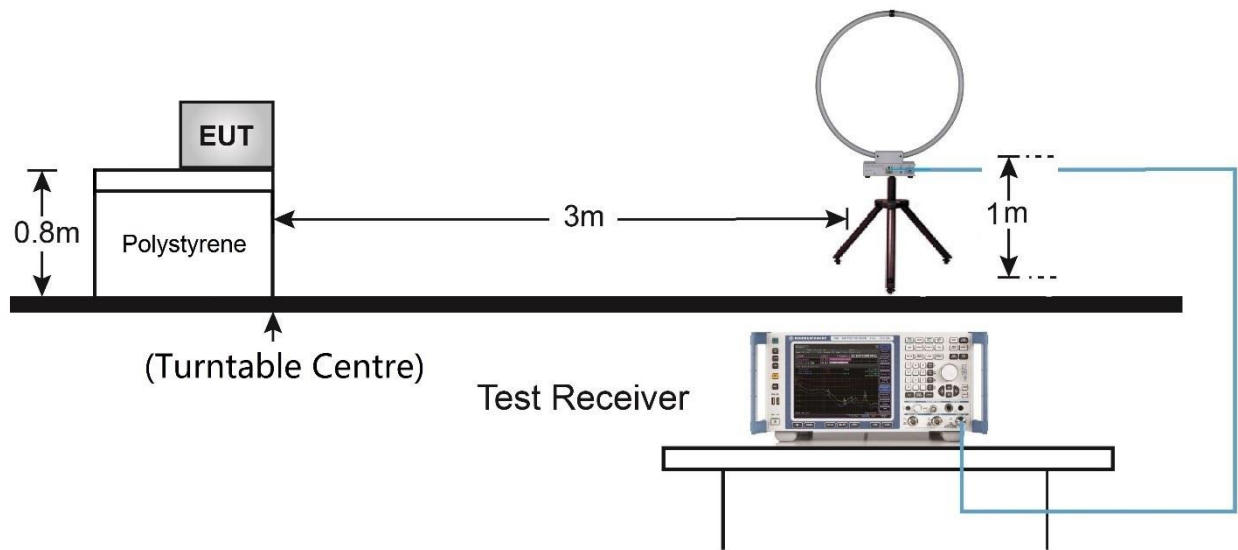
6.4.2. Test Procedure

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

6.4.3. Test Setting

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
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.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.3.

6.5. Frequency Tolerance Measurement

6.5.1. Test Limit

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

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 6.8

6.5.3. Test Setting

Frequency Stability Under Temperature Variations:

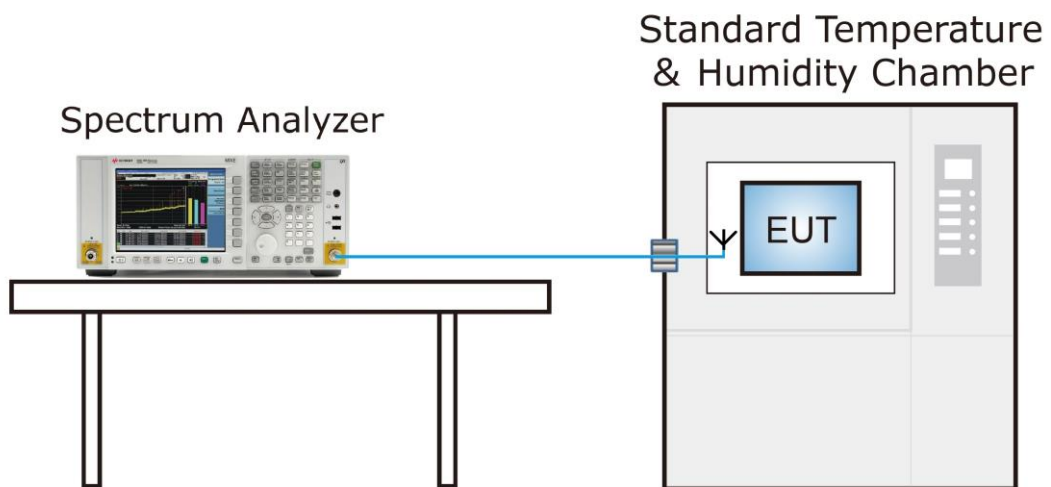
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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.

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.4.

6.6. AC Conducted Emissions Measurement

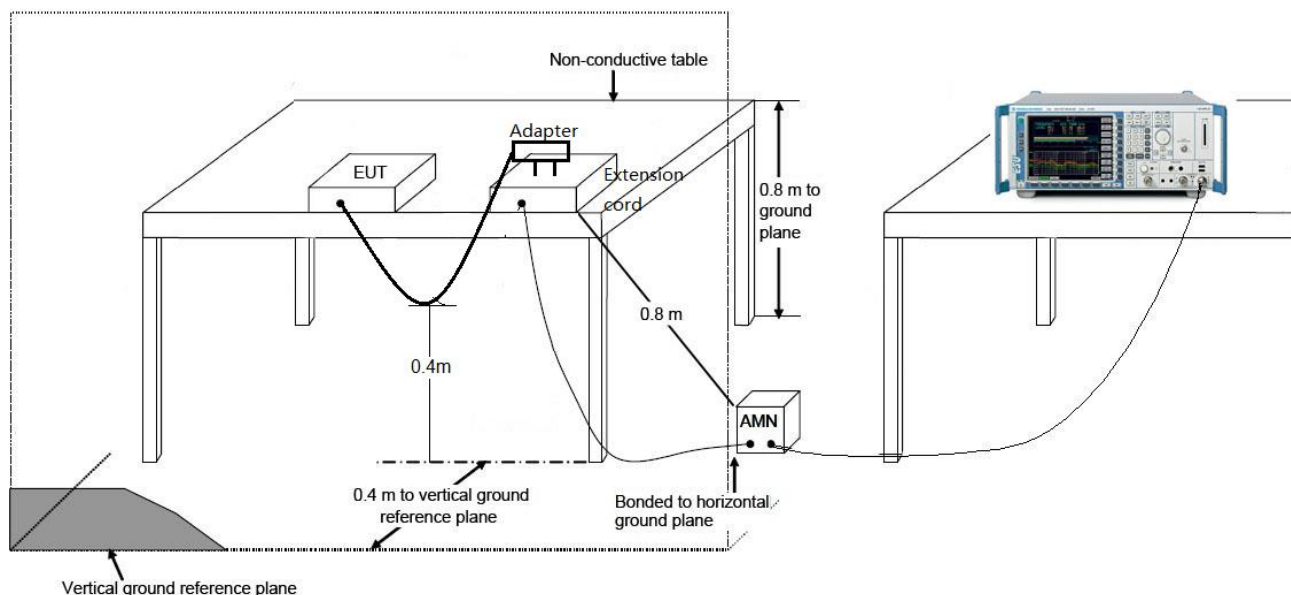
6.6.1. Test Limit

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.

6.6.2. Test Setup



6.6.3. Test Result

Refer to Appendix A.5.

Appendix A - Test Result

A.1 In-band Emission Test Result

Test Engineer	Tommy Tang	Test Date	2022/01/06
Test Mode	Mode 1	Test Site	WZ-AC2

Frequency (MHz)	Reading Level (dBμV/m)	Factor (dB)	Measure Level (dBμV/m)	Limit (@3m) (dBμV/m)	Margin [dB]
Face On					
13.347	17.5	17.0	34.5	80.5	-46.0
13.470	20.6	17.0	37.6	90.5	-52.9
13.563	36.2	17.0	53.2	124.0	-70.8
13.667	22.5	17.0	39.5	90.5	-51.0
13.774	18.4	17.0	35.4	80.5	-45.1
Face Off					
13.347	15.7	17.0	32.7	80.5	-47.8
13.462	17.8	17.0	34.8	90.5	-55.7
13.560	34.8	17.0	51.8	124.0	-72.2
13.649	19.5	17.0	36.5	90.5	-54.0
13.770	15.5	17.0	32.5	80.5	-48.0

Note 1: 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.

Note 2: 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

For example, Limit (@3m) = $20 \cdot \log(106) + 40 = 80.5$ dBμV/m

Note 3: All measurements were recorded using an EMI test receiver employing a peak detector.

Note 4: "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.

A.2 Out-Band Emission Test Result

Test Engineer	Tommy Tang	Test Date	2022/01/06
Test Mode	Mode1	Test Site	WZ-AC2

Out-Band Emission Below 30MHz						
Frequency (MHz)	Reading Level (dBμV/m)	Factor (dB)	Measure Level (dBμV/m)	Limit(@3m) (dBμV/m)	Margin (dB)	Detector
Face On						
0.628	35.3	17.5	52.7	71.7	-19.0	Peak
Face Off						
2.448	33.0	17.6	50.6	69.5	-18.9	Peak

Note: "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.

Out-Band Emission Above 30MHz							
Polarization	Frequency (MHz)	Reading Level (dBμV/m)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
H	44.6	12.7	18.7	31.4	40.0	-8.6	Peak
H	52.3	5.1	18.3	23.4	40.0	-16.6	Peak
H	92.6	9.5	12.1	21.6	43.5	-21.9	Peak
H	122.2	23.4	15.5	38.9	43.5	-4.6	Peak
H	254.1	20.9	16.4	37.3	46.0	-8.7	Peak
H	343.3	17.5	19.3	36.8	46.0	-9.2	Peak
V	44.4	15.1	18.6	33.7	40.0	-6.3	QP
V	52.3	18.5	18.3	36.8	40.0	-3.2	Peak
V	60.6	11.2	17.6	28.8	40.0	-11.2	Peak
V	114.4	22.4	14.8	37.2	43.5	-6.3	Peak
V	123.0	13.0	15.6	28.6	43.5	-14.9	QP
V	133.7	10.1	16.8	26.9	43.5	-16.6	QP

Note 1: 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.

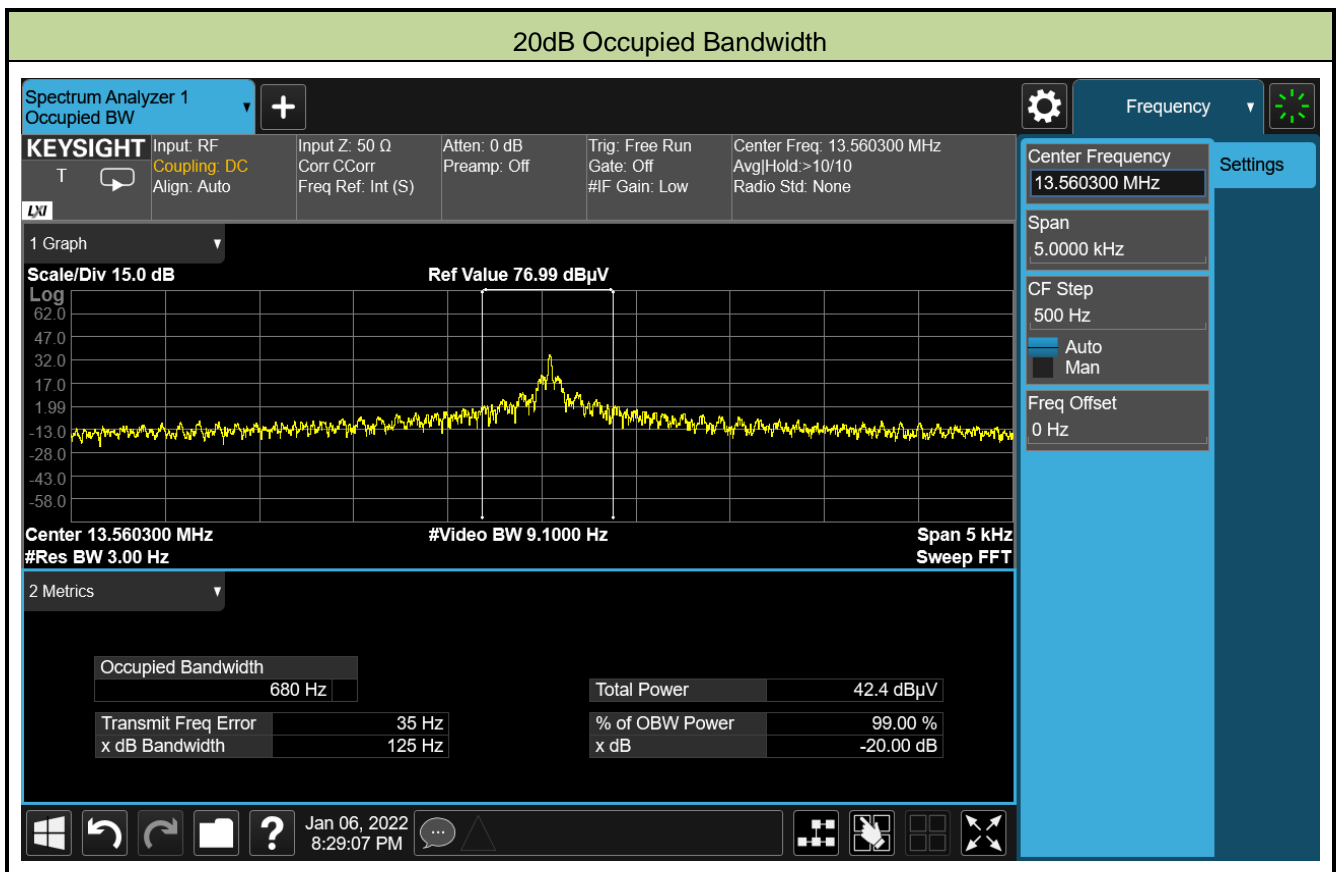
Note 2: Measurements were tested at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2). Extrapolation Factor = $40 \cdot \log(30/3) = 40$ dB

For example, Limit (@3m) = $20 \cdot \log(30) + 40 = 69.5$ dBμV/m

A.3 20dB Bandwidth Test Result

Test Engineer	Tommy Tang	Test Date	2022/01/06
Test Mode	Mode 1	Test Site	WZ-AC2

Frequency (MHz)	20dB Occupied Bandwidth (Hz)
13.56	125



A.4 Frequency Stability Tolerance Test Result

Test Engineer	Stephen Dong	Test Date	2021/12/30
Test Mode	Mode1	Test Site	SIP-AC2

Declared Frequency: 13.56 MHz						
Reference Voltage: 36Vdc						
Voltage (%)	Voltage (Vdc)	Temp (°C)	Measured Freq. (Hz)	Freq. Dev. (Hz)	Limit (Hz)	Result
100	36	-20	13560174	174	-1356 ~ +1356	Pass
		-10	13560189	189	-1356 ~ +1356	Pass
		0	13560355	355	-1356 ~ +1356	Pass
		+10	13559897	-103	-1356 ~ +1356	Pass
		+20	13560339	339	-1356 ~ +1356	Pass
		+30	13560177	177	-1356 ~ +1356	Pass
		+40	13559955	-45	-1356 ~ +1356	Pass
		+50	13560741	741	-1356 ~ +1356	Pass
85	30.6	+ 20	13559771	-229	-1356 ~ +1356	Pass
115	41.4	+ 20	13559920	-80	-1356 ~ +1356	Pass

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

A.5 AC Conducted Emissions Test Result

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

Appendix B - Test Setup Photograph

Refer to "2112RSU027-UT" file.

Appendix C - EUT Photograph

Refer to "2112RSU027-UE" file.