RF MEASUREMENT REPORT

FCC ID:	2BAXN-MR0003
Applicant:	Willand (Beijing) Technology Co., LTD.
Product:	Navimow
Model No.:	i110N, i105N
Brand Name:	Segway
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter (DSS)
FCC Rule Part(s):	Part15 Subpart C (Section 15.247)
Result:	Complies
Received Date:	2023-09-08
Test Date:	2023-10-25 ~ 2023-11-24

Reviewed By: Vincent Yu

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2309RSU022-U3	V01	Initial Report	2023-12-01	Valid

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1. General Information

1.1. Applicant

Willand (Beijing) Technology Co., LTD.

Room 203, A1 Bldg. Zhongguancun Dongsheng Technology Park (Northern Territory), No. 66, Xixiaokou Rd, Haidian Dist., Beijing, China.

1.2. Manufacturer

Navimow B.V.

Dynamostraat 7, 1014 BN Amsterdam, The Netherlands

1.3. Testing Facility

<table>
<tr><td>☒</td><td colspan="5">Test Site – MRT Suzhou Laboratory</td></tr>
<tr><td></td><td colspan="5">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</td></tr>
<tr><td></td><td colspan="5">Laboratory Accreditations</td></tr>
<tr><td></td><td colspan="2">A2LA: 3628.01</td><td colspan="3">CNAS: L10551</td></tr>
<tr><td></td><td colspan="2">FCC: CN1166</td><td colspan="3">ISED: CN0001</td></tr>
<tr><td></td><td rowspan="2">VCCI:</td><td>☐R-20025</td><td>☐G-20034</td><td>☐C-20020</td><td>☐T-20020</td></tr>
<tr><td></td><td>☐R-20141</td><td>☐G-20134</td><td>☐C-20103</td><td>☐T-20104</td></tr>
<tr><td>☐</td><td colspan="5">Test Site – MRT Shenzhen Laboratory</td></tr>
<tr><td></td><td colspan="5">Laboratory Location (Shenzhen)
1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China</td></tr>
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<tr><td></td><td colspan="2">FCC: CN1284</td><td colspan="3">ISED: CN0105</td></tr>
<tr><td>☐</td><td colspan="5">Test Site – MRT Taiwan Laboratory</td></tr>
<tr><td></td><td colspan="5">Laboratory Location (Taiwan)
No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)</td></tr>
<tr><td></td><td colspan="5">Laboratory Accreditations</td></tr>
<tr><td></td><td colspan="5">TAF: 3261</td></tr>
<tr><td></td><td colspan="2">FCC: 291082, TW3261</td><td colspan="3">ISED: TW3261</td></tr>
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1.4. Product Information

Product Name	Navimow
Model No.	i110N, i105N
EUT Identification No.	20231017Sample#05
Wi-Fi Specification	802.11b/g/n
Bluetooth Specification	BLE (1Mbps only)
SRD Specification	915.05 ~ 917.9MHz
GNSS Specification	BDS, Galileo, GLONASS, GPS
Antenna Information	Refer to selection 1.5
Power Type	By Lithium-ion battery
Accessories	
Charging Station	Product Name: Navimow Charging Station Model No.: I1C00G Input: 32V ⎓ 2.5A MAX Output: 25.2V ⎓ 2.5A MAX
Adapter	Model No.: NBW32D002D5N-US Input: 100 ~ 240V, 50/60Hz, 2.0A MAX Output: 32.0V ⎓ 2.5A, 80.0W
Navimow Access+	Model: i1101N Power Type: 5VDC, 2A Contains FCC ID: XMR201909EC25AFX Radio Specification: WCDMA Band 2/4/5; LTE Band 2/4/5/12/13/14/66/71

Remark:

1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.
2. The manufacturer states that the difference between model i110N and i105N is only the battery capacity. The manufacturer selected the model i110N with the largest battery capacity for testing.

1.5. Radio Specification under Test

Frequency Range	915.05 ~ 917.9 MHz
Channel Number	58
Type of modulation	FHSS
Antenna Type	PCB Antenna
Antenna Gain	2.95 dBi

1.6. Working Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	915.05 MHz	02	915.10 MHz	03	915.15 MHz
04	915.20 MHz	05	915.25 MHz	06	915.30 MHz
07	915.35 MHz	08	915.40 MHz	09	915.45 MHz
10	915.50 MHz	11	915.55 MHz	12	915.60 MHz
13	915.65 MHz	14	915.70 MHz	15	915.75 MHz
16	915.80 MHz	17	915.85 MHz	18	915.90 MHz
19	915.95 MHz	20	916.00 MHz	21	916.05 MHz
22	916.10 MHz	23	916.15 MHz	24	916.20 MHz
25	916.25 MHz	26	916.30 MHz	27	916.35 MHz
28	916.40 MHz	29	916.45 MHz	30	916.50 MHz
31	916.55 MHz	32	916.60 MHz	33	916.65 MHz
34	916.70 MHz	35	916.75 MHz	36	916.80 MHz
37	916.85 MHz	38	916.90 MHz	39	916.95 MHz
40	917.00 MHz	41	917.05 MHz	42	917.10 MHz
43	917.15 MHz	44	917.20 MHz	45	917.25 MHz
46	917.30 MHz	47	917.35 MHz	48	917.40 MHz
49	917.45 MHz	50	917.50 MHz	51	917.55 MHz
52	917.60 MHz	53	917.65 MHz	54	917.70 MHz
55	917.75 MHz	56	917.80 MHz	57	917.85 MHz
58	917.90 MHz	--	--	--	--

Note: The CH01/CH30/CH58 were selected as Low/Mid/High test channels in this report.

2. Test Configuration

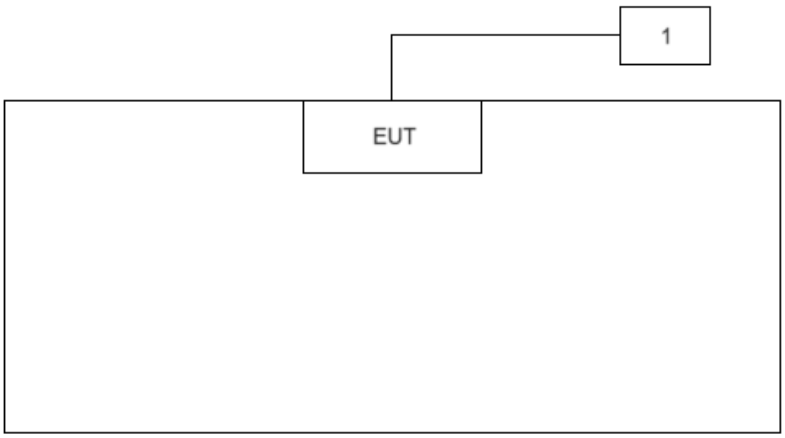
2.1. Test Mode

Mode 1: Transmit at CH01 (915.05MHz)
Mode 2: Transmit at CH30 (916.50MHz)
Mode 3: Transmit at CH58 (917.90MHz)
Mode 4: Transmit at frequency hopping mode

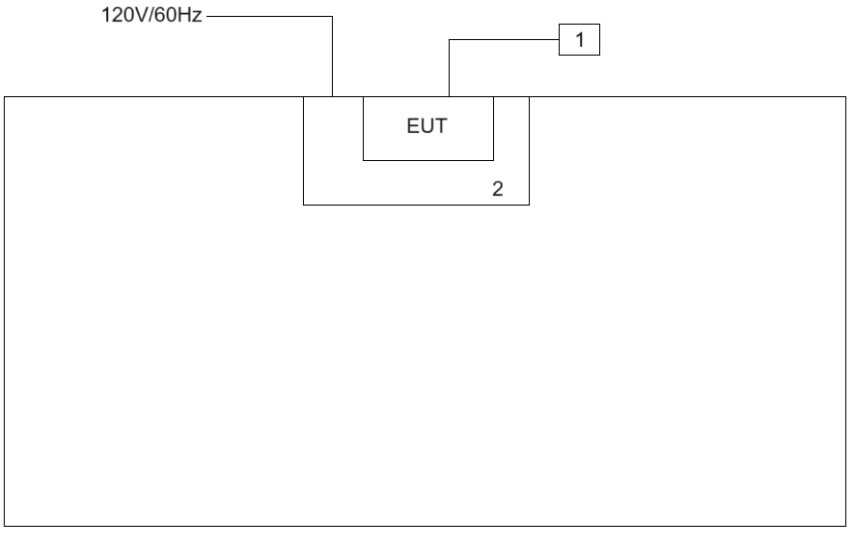
2.2. Test System Connection Diagram

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.

Connection Diagram - Radiated emissions testing



Connection Diagram - AC line conducted testing



Product		Manufacturer	Model No.
1	Notebook	HP	445R G6
2	Navimow Charging Station	Navimow B.V.	i1C00G

2.3. Test Software

The test utility software used during testing was “sscom5.13.1.exe”, and the version was 5.13.1.

2.4. Applied Standards

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

- FCC Part 15.247
- KDB 558074 D01v05r02
- ANSI C63.10-2013

2.5. Test Environment Condition

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

3. Antenna Requirement

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 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	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2024-09-27	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2023-11-01	SIP-AC3
				1 year	2024-10-28	SIP-AC3
Preamplifier	EMCI	EMC001330	MRTSUE06643	1 year	2024-01-12	SIP-AC3
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06646	1 year	2024-08-04	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2023-12-22	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE11255	1 year	2024-08-13	SIP-AC3
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2024-06-29	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2023-11-01	SIP-TR1
				1 year	2024-10-28	SIP-TR1
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2023-12-28	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2024-08-09	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2024-09-17	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2024-06-09	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2024-04-20	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2024-05-31	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2024-10-23	WZ-AC1
Preamplifier	EMCI	EMC051845SE	MRTSUE06987	1 year	2024-09-07	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2023-11-01	WZ-AC1
				1 year	2024-10-25	WZ-AC1
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2024-05-23	SIP-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2024-05-23	SIP-SR2
Four-Line V-Network	R&S	ENV432	MRTSUE06614	1 year	2023-11-27	SIP-SR2
Thermohygrometer	testo	608-H1	MRTSUE06621	1 year	2023-11-27	SIP-SR2
Shielding Room	MIX-BEP	SIP-SR2	MRTSUE06949	5 years	2024-10-23	SIP-SR2

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	2.03C	RE Antenna & Turntable
Controller_MF 7802BS	1.02	RE Antenna & Turntable

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. 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
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.61dB Coplanar: 9kHz~30MHz: 2.62dB Horizontal: 30MHz~200MHz: 3.79dB 200MHz~1GHz: 3.91dB 1GHz~40GHz: 4.99dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.21dB 1GHz~40GHz: 4.90dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.2dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.4dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.7%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(1)	20dB Bandwidth	Conducted	Pass
15.247(b)(2)	Peak Transmitter Output Power		Pass
15.247(a)(1)	Channel Separation		Pass
15.247(a)(1)(i)	Number of Channels		Pass
15.247(a)(1)(i)	Time of Occupancy		Pass
15.247(d)	Band Edge / Out- of-Band Emissions		Pass
15.205, 15.209	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Note: 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.

6.2. 20dB Bandwidth Measurement

6.2.1. Test Limit

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

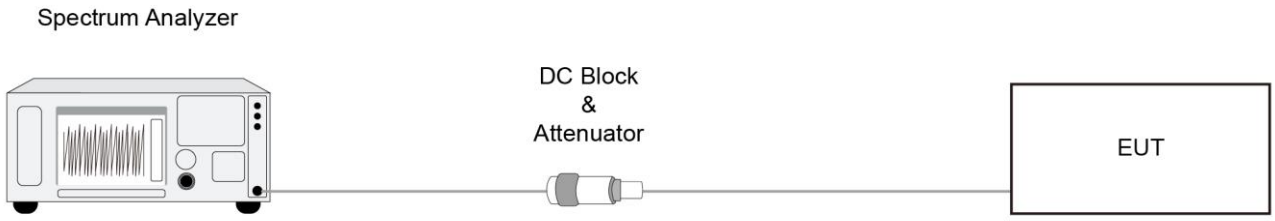
6.2.2. Test Procedure

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

6.2.3. Test Setting

1. Set RBW = 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.

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. Output Power Measurement

6.3.1. Test Limit

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels

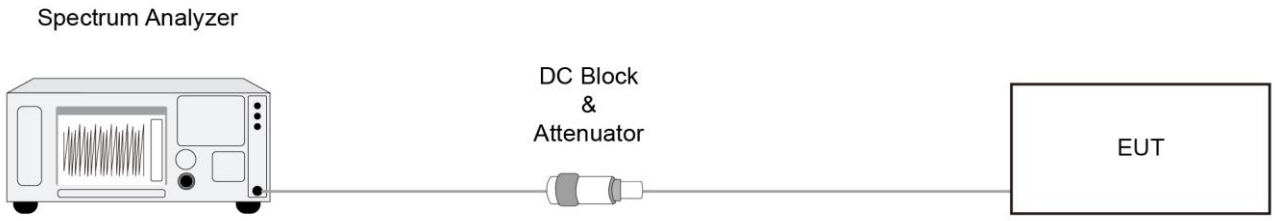
6.3.2. Test Procedure

ANSI C63.10-2013 - Section 7.8.5

6.3.3. Test Setting

1. Set RBW ≥ the 20 dB bandwidth of the emission being measured.
2. VBW ≥ RBW
3. Span = approximately five 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, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss)

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Carrier Frequency Separation Measurement

6.4.1. Test Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

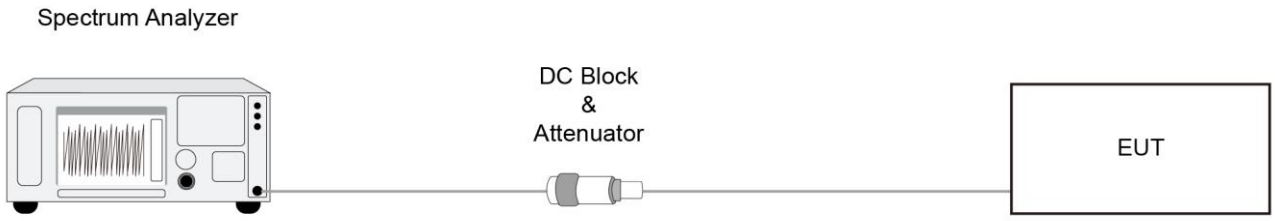
6.4.2. Test Procedure

ANSI C63.10-2013 - Section 7.8.2.

6.4.3.Test Setting

1. Span = wide enough to capture the peaks of two adjacent channels.
2. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. VBW ≥ RBW
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allowed the trace to stabilize
8. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Number of Hopping Channels Measurement

6.5.1. Test Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

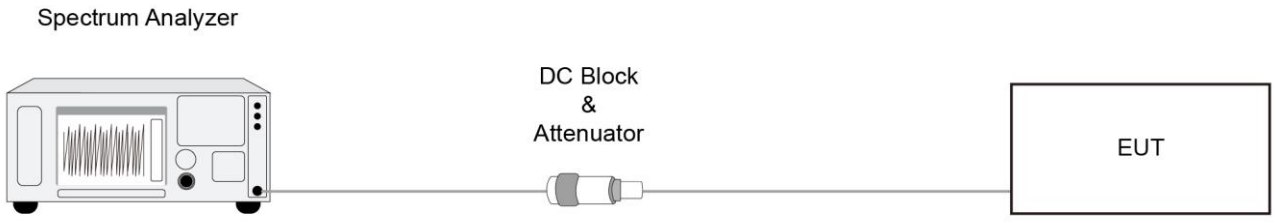
6.5.2. Test Procedure

ANSI C63.10-2013 - Section 7.8.3.

6.5.3. Test Settitng

1. Span = the frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allow the trace to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Time of Occupancy Measurement

6.6.1. Test Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

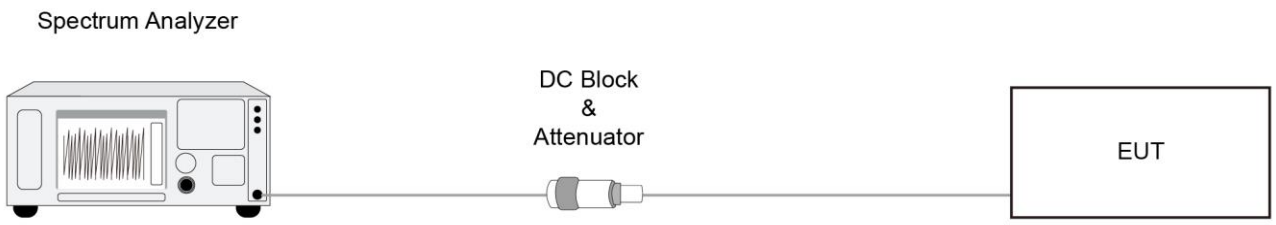
6.6.2. Test Procedure

ANSI C63.10-2013 - Section 7.8.4.

6.6.3. Test Settitng

1. Span = zero span, centered on a hopping channel.
2. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. VBW ≥ RBW
4. Sweep time = as necessary to capture the entire dwell time per hopping channel
5. Detector = Peak
6. Trace mode = max hold
7. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. An oscilloscope may be used instead of a spectrum analyzer. The EUT shall show compliance with the appropriate regulatory limit for the number of hopping channels. A plot of the data shall be included in the test report.

6.6.4. Test Setup



6.6.5. Test Result

Refer to Appendix A.6.

6.7. Band-edge Compliance Measurement

6.7.1. Test Limit

The maximum permissible emission level is 20dBc. Any emissions were lying outside of the emission bandwidth and in authorized band edges to a field strength limit specified in Section 15.209 of the Title 47 CFR.

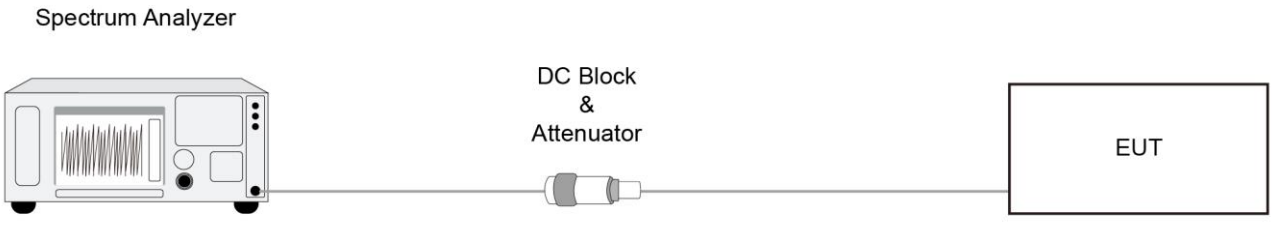
6.7.2. Test Procedure

ANSI C63.10-2013 - Section 6.10.4.

6.7.3. Test Setting

1. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission.

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.7.

6.8. Conducted Spurious Emissions Measurement

6.8.1. Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

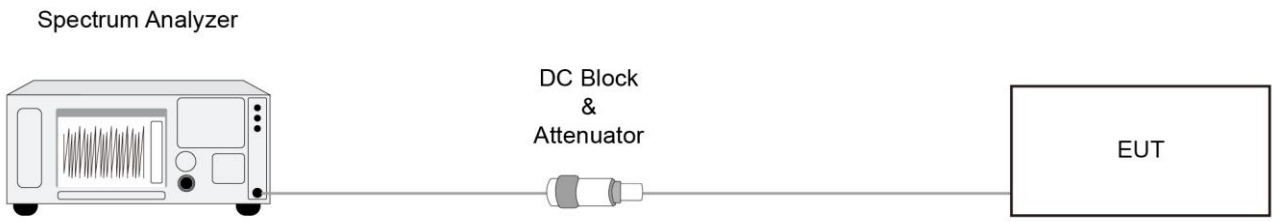
6.8.2. Test Procedure

ANSI C63.10-2013 - Section 7.8.8.

6.8.3. Test Setting

1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

6.8.4. Test Setup



6.8.5. Test Result

Refer to Appendix A.8.

6.9. Radiated Spurious Emission Measurement

6.9.1. 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 [uV/m]	Measured Distance [Meters]
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

6.9.2. Test Procedure

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

6.9.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

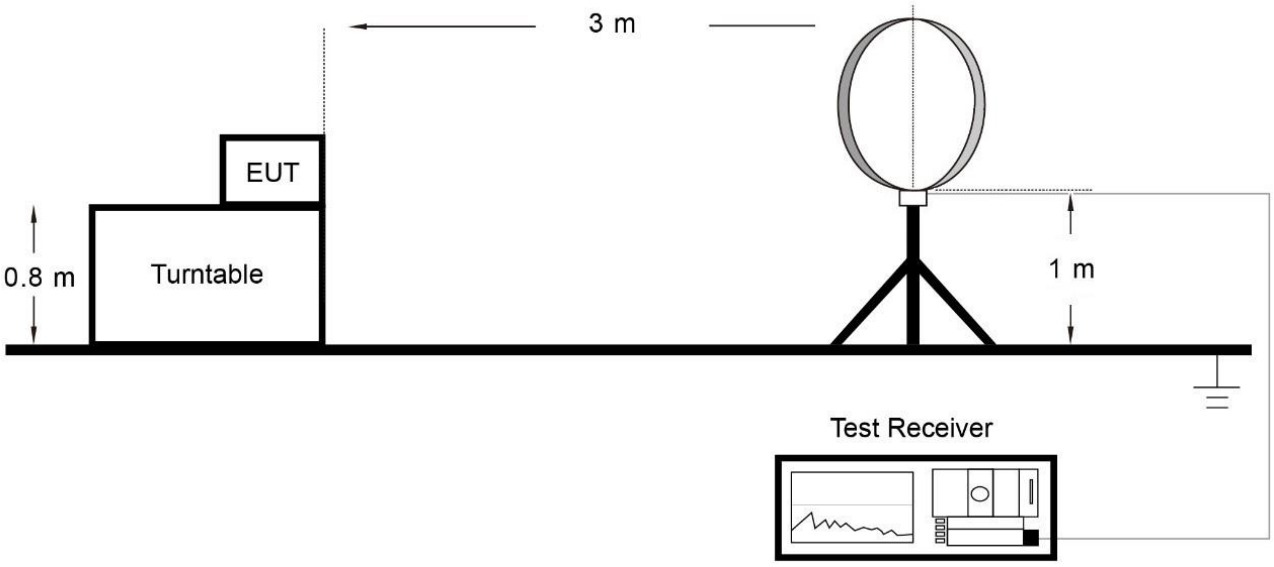
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

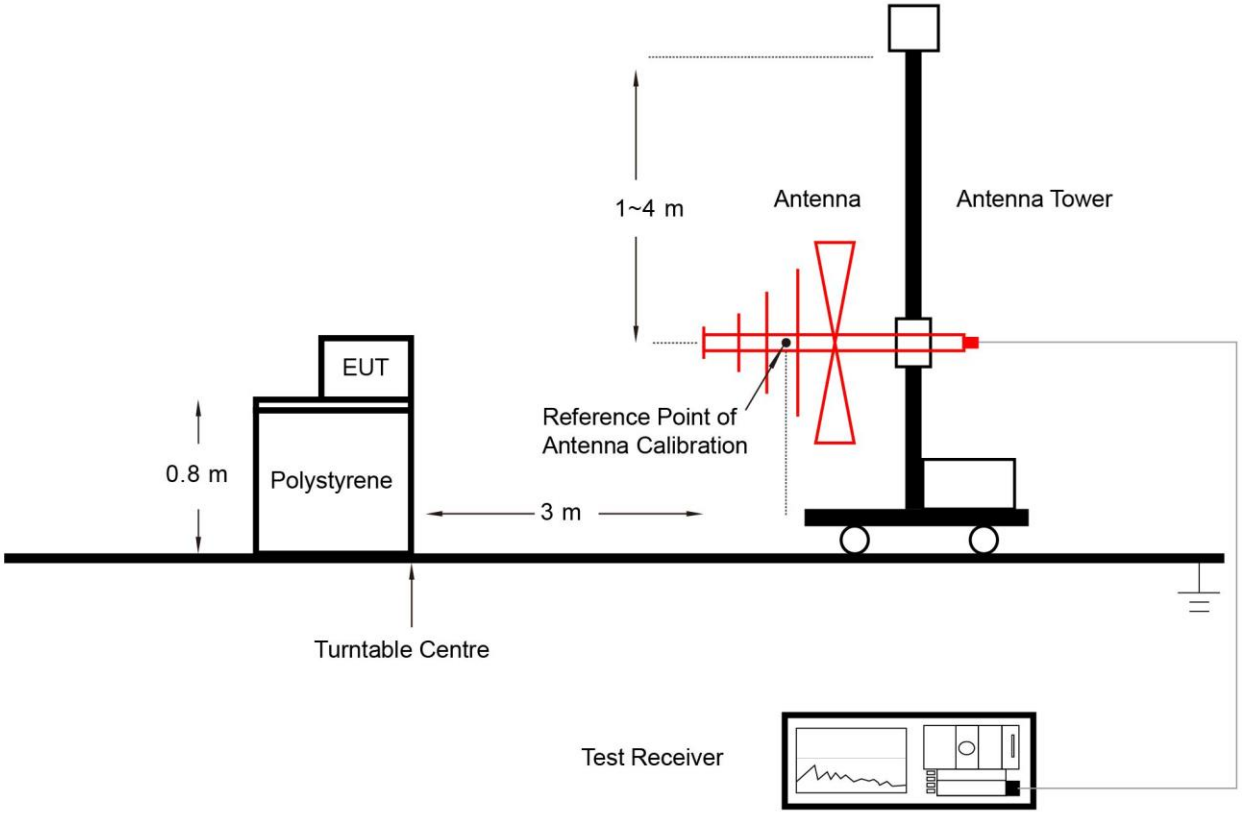
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.9.4. Test Setup

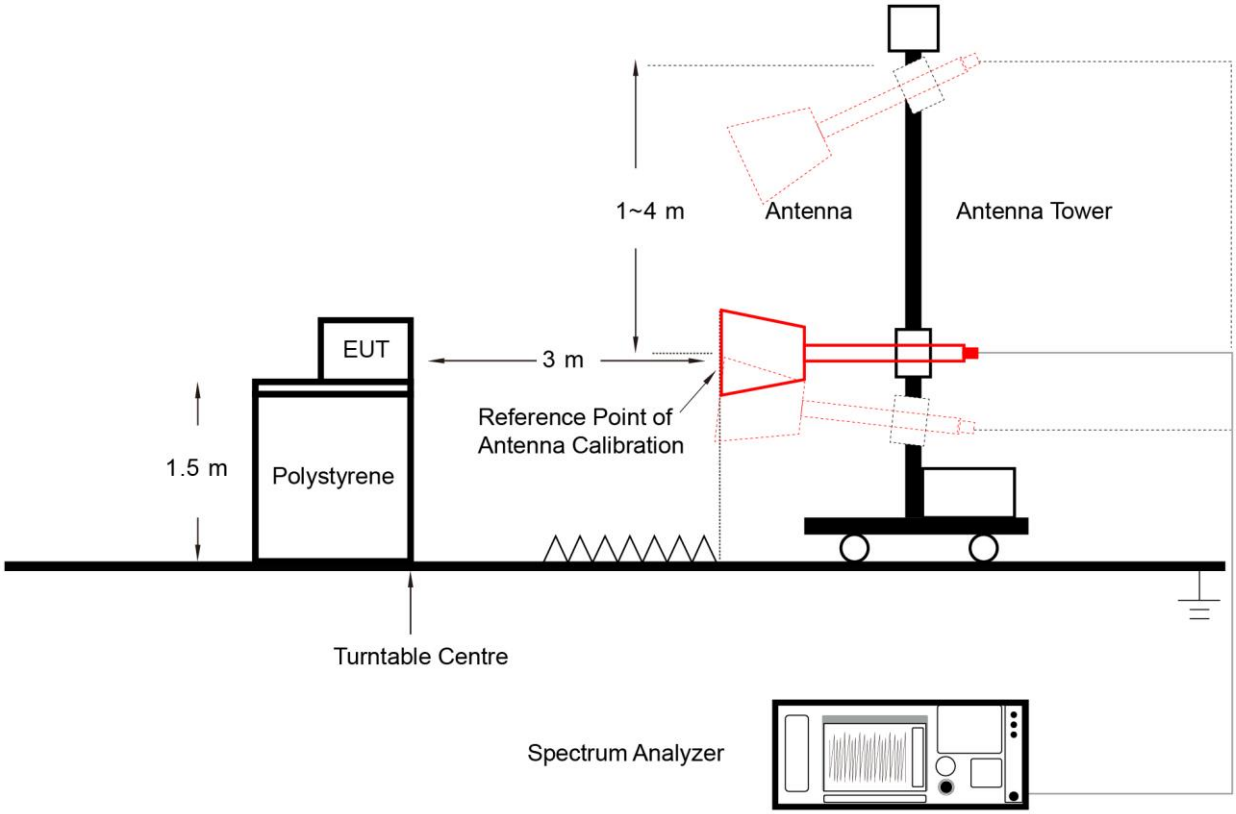
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.9.5. Test Result

Refer to Appendix A.9.

6.10. Radiated Restricted Band Edge Measurement

6.10.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

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

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
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

6.10.2. Test Procedure

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

6.10.3. Test Setting

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated emission of interest

2. Span was set greater than 1MHz

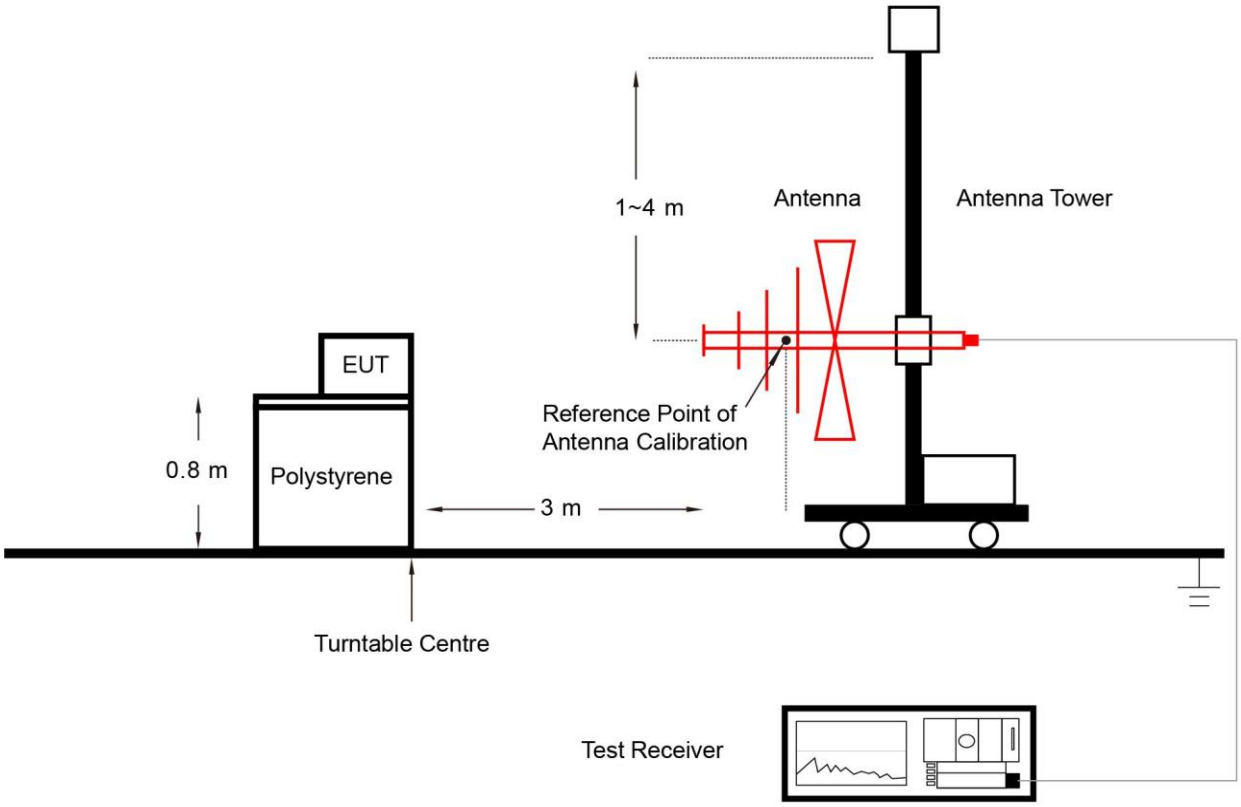
3. RBW = as specified in Table 1

4. Detector = CISPR quasi-peak

5. Sweep time = auto couple

6. Trace was allowed to stabilize

6.10.4. Test Setup



6.10.5. Test Result

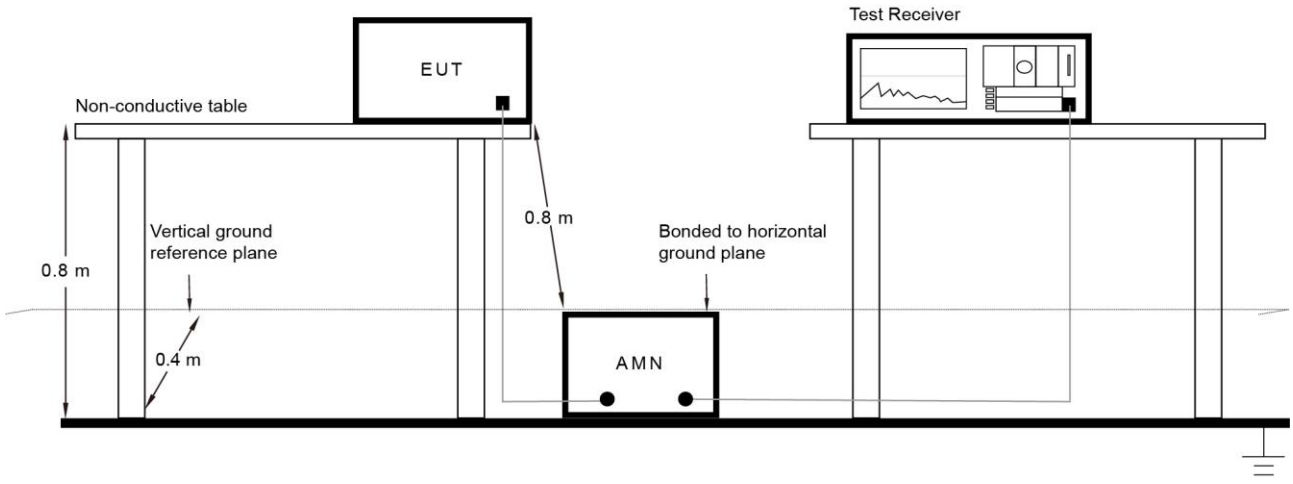
Refer to Appendix A.10.

6.11. AC Conducted Emissions Measurement

6.11.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBμV)	Average (dBμV)
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.		

6.11.2. Test Setup



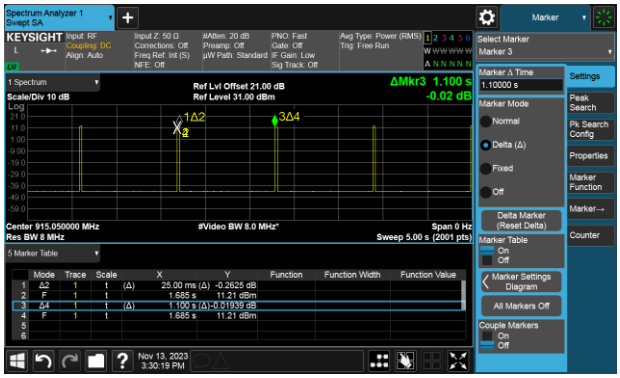
6.11.3. Test Result

Refer to Appendix A.11.

Appendix A - Test Result

A.1 Duty Cycle Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

Test Mode	Duty Cycle
CH01 (915.05MHz)	2.27%
Duty Cycle (T = Transmission Duration)	
CH01 (T = 25.00ms)	
	

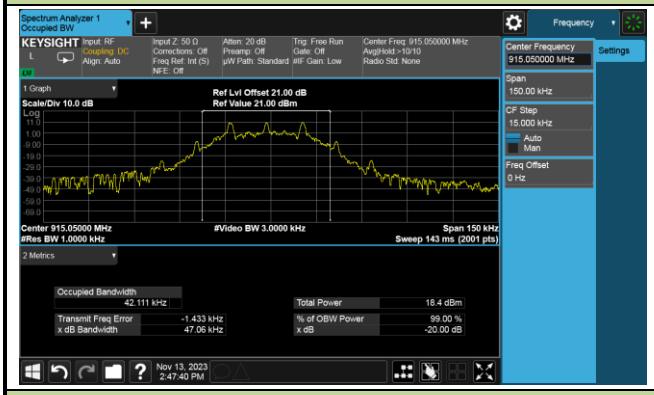
A.2 20dB Bandwidth Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

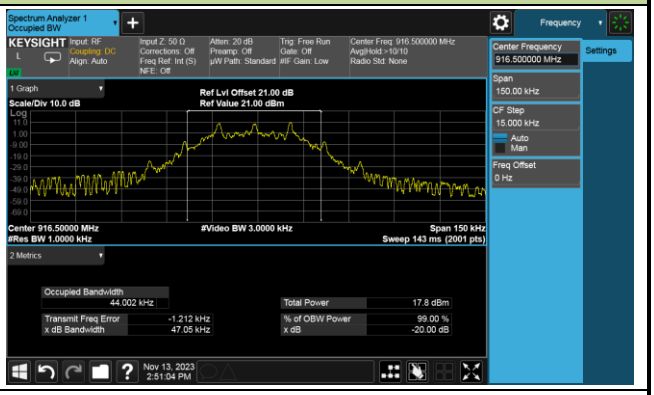
Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)
01	915.05	47.06	≤ 500
30	916.50	47.05	≤ 500
58	917.90	46.87	≤ 500

20dB Bandwidth

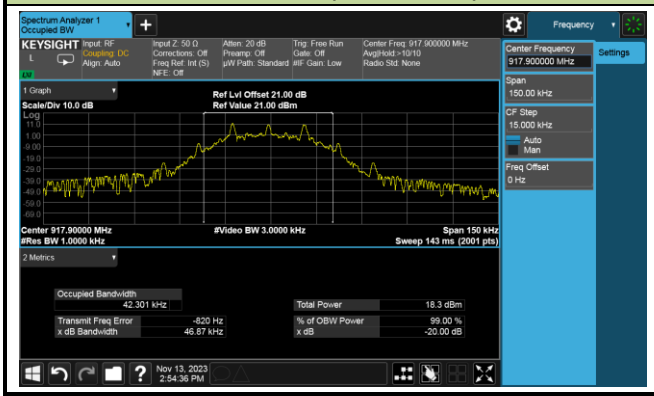
Channel 01 (915.05MHz)



Channel 30 (916.50MHz)



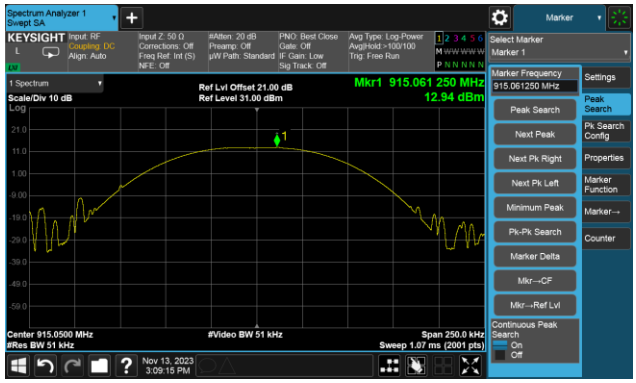
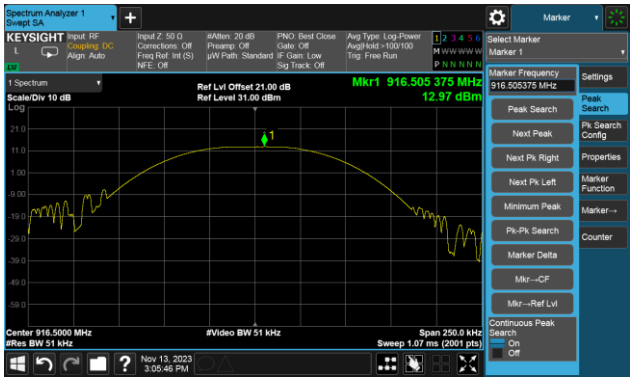
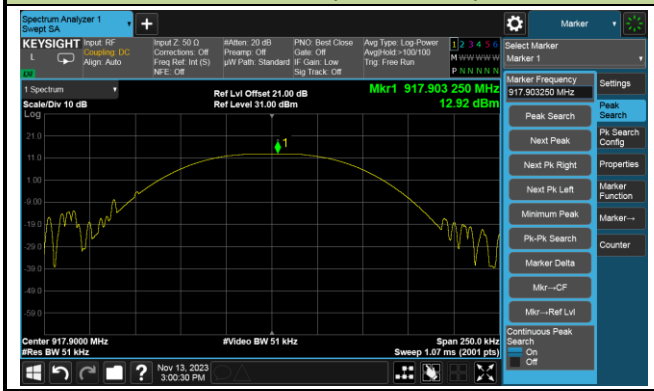
Channel 58 (917.90MHz)



A.3 Output Power Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

Channel No.	Frequency (MHz)	Output Power (dBm)	Power Limit (dBm)
01	915.05	12.94	≤ 30.00
30	916.50	12.97	≤ 30.00
58	917.90	12.92	≤ 30.00

Output Power	
Channel 01 (915.05MHz)	Channel 30 (916.50MHz)
	
Channel 58 (917.90MHz)	
	

A.4 Carrier Frequency Separation Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

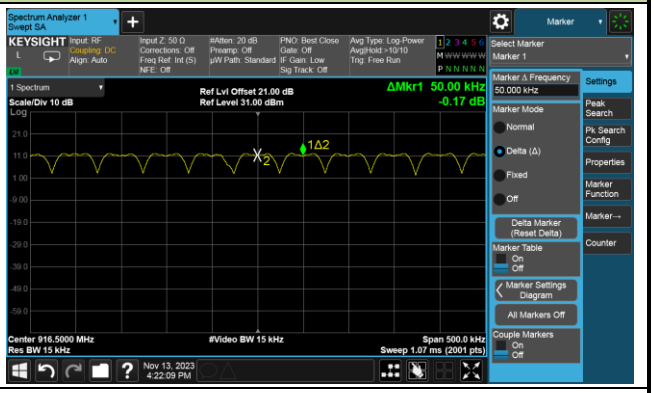
Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
01	915.05	50	≥ 47.06	Pass
30	916.50	50	≥ 47.05	Pass
58	917.90	50	≥ 46.87	Pass

Note: The Limit is the value of the 20dB BW.

Carrier Frequency Separation

Channel 01 (915.05MHz)

Channel 30 (916.50MHz)

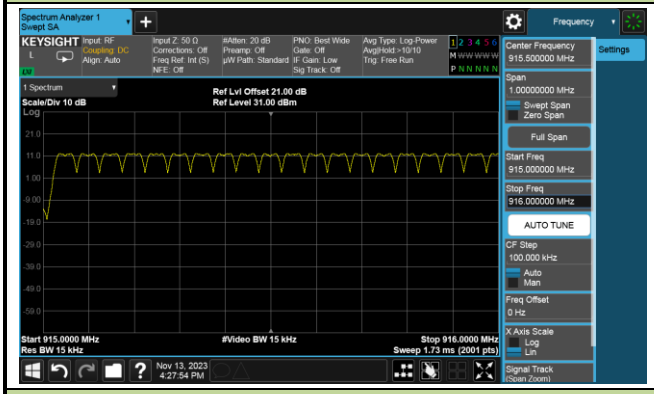
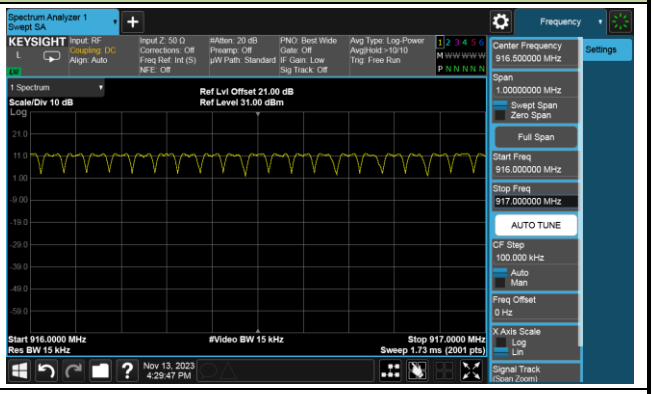
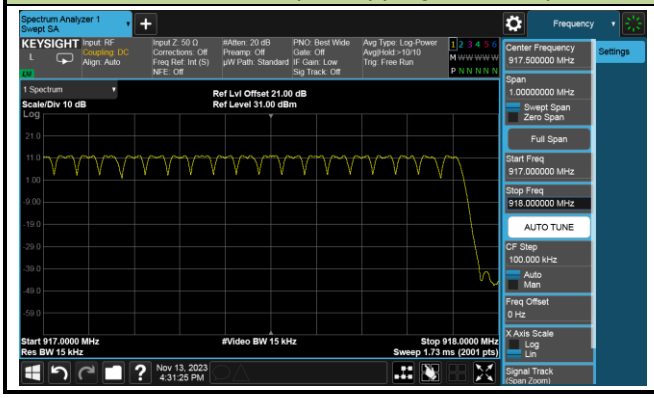


Channel 58 (917.90MHz)

A.5 Number of Hopping Channels Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

Channel Numbers	Frequency (MHz)	Limit (Hopping Channels)	Result
58	915.05~917.90	≥ 50	Pass

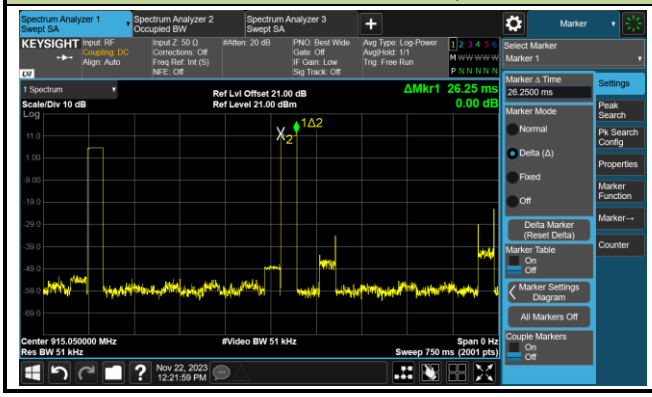
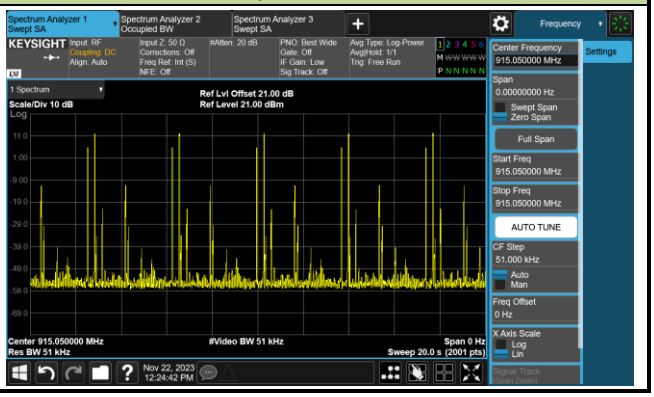
Number of Hopping Channels	
915 ~ 916MHz (20 hopping channels)	916 ~ 917MHz (20hopping channels)
	
917 ~ 918MHz (18 hopping channels)	
	

A.6 Time of Occupancy Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-22		

Channel No.	Frequency (MHz)	Transmit Time Per Hop (ms)	Observation Period (s)	Number of Hops in Observation Period	Time of Occupancy (ms)	Limit (ms)	Result
01 ~ 58	915.05~917.90	26.25	20	5	131.25	≤ 400	Pass

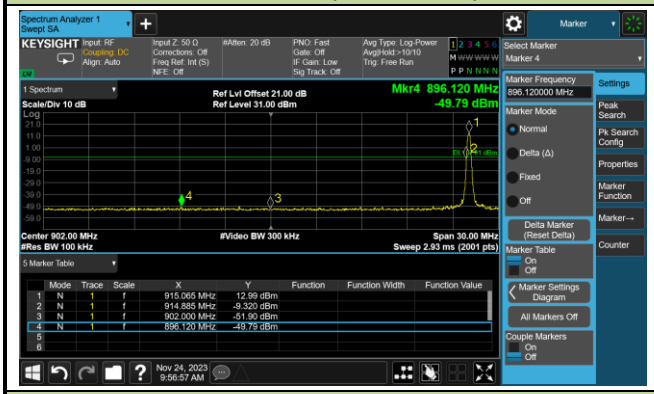
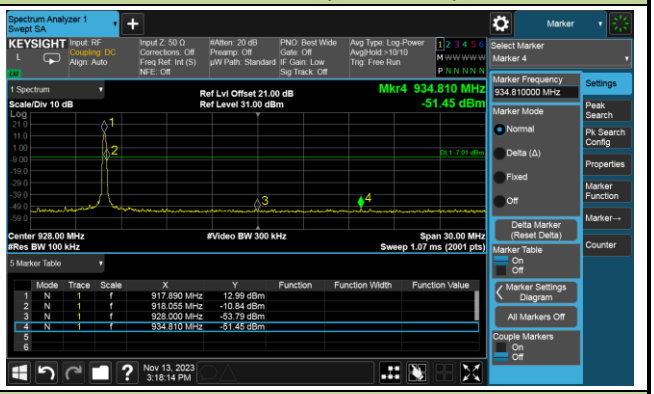
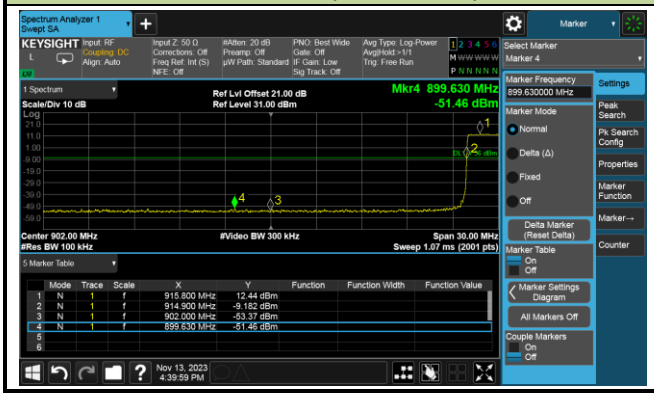
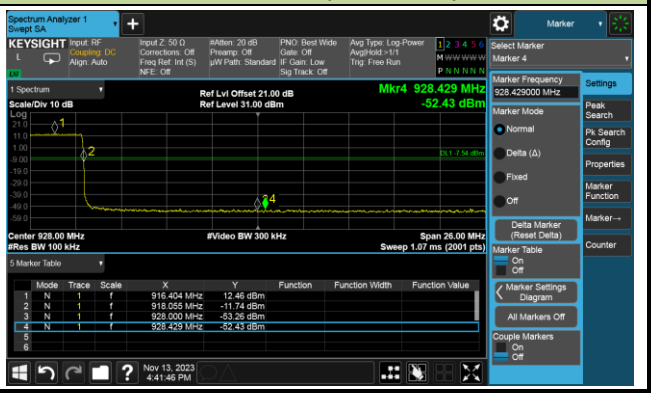
Note: Time of Occupancy (ms) = Transmit Time Per Hop (ms) * Number of Hops in Observation Period

Transmit Time Per Hop	Number of Hops in Observation Period
	

A.7 Band-edge Compliance Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13 ~ 2023-11-24		

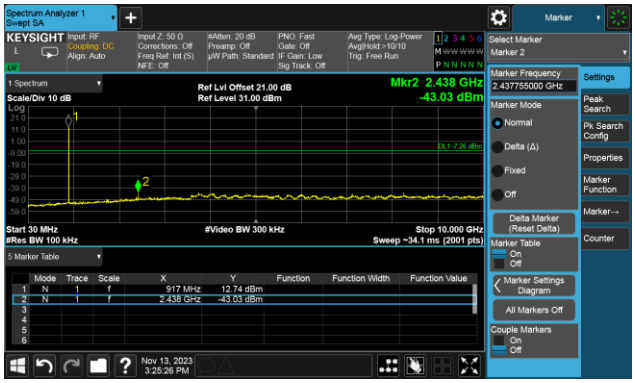
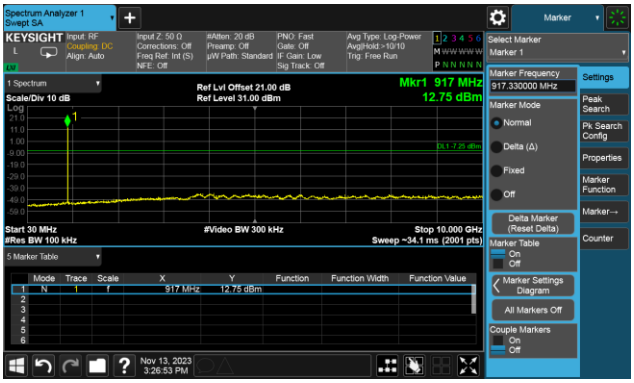
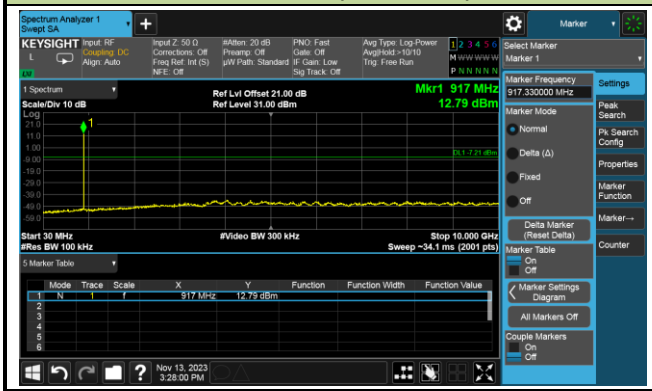
Channel No.	Frequency (MHz)	Limit	Result
01	915.05	20dBc	Pass
58	917.90	20dBc	Pass

Band-edge Compliance	
Channel 01 (915.05MHz)	Channel 58 (917.9MHz)
	
Operation Frequency Range of 20dB Bandwidth within Hopping Mode	
Channel 01 (915.05MHz)	Channel 58 (917.9MHz)
	

A.8 Conducted Spurious Emissions Test Result

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2023-11-13		

Channel No.	Frequency (MHz)	Limit (MHz)	Result
01	915.05	20dBc	Pass
30	916.50	20dBc	Pass
58	917.90	20dBc	Pass

Conducted Spurious Emissions	
Channel 01 (915.05MHz)	Channel 30 (916.5MHz)
	
Channel 58 (917.9MHz)	
	

A.9 Radiated Spurious Emission Test Result

Test Site	WZ-AC1	Test Engineer	Carl Jiang
Test Date	2023-10-26		
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

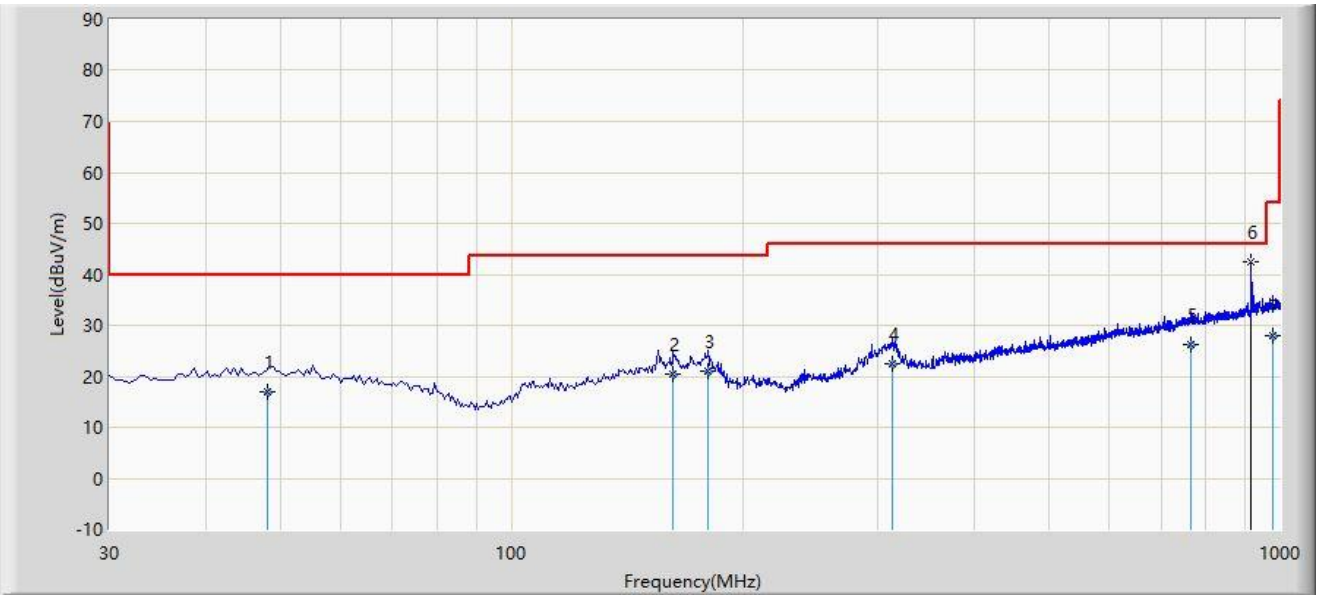
Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
01	3659.5	42.3	-0.1	42.2	74.0	-31.8	Peak	Horizontal
	4699.0	36.9	2.7	39.6	74.0	-34.4	Peak	Horizontal
	7552.0	38.2	8.5	46.7	74.0	-27.3	Peak	Horizontal
	4181.5	37.9	1.2	39.1	74.0	-34.9	Peak	Vertical
	4924.0	36.9	3.2	40.1	74.0	-33.9	Peak	Vertical
	7624.0	39.0	8.3	47.3	74.0	-26.7	Peak	Vertical
30	3664.0	42.6	-0.1	42.5	74.0	-31.5	Peak	Horizontal
	4771.0	34.9	2.7	37.6	74.0	-36.4	Peak	Horizontal
	7606.0	37.4	8.3	45.7	74.0	-28.3	Peak	Horizontal
	5059.0	37.1	3.7	40.8	74.0	-33.2	Peak	Vertical
	7606.0	37.3	8.3	45.6	74.0	-28.4	Peak	Vertical
	8321.5	35.9	8.7	44.6	74.0	-29.4	Peak	Vertical
58	3668.5	42.8	0.0	42.8	74.0	-31.2	Peak	Horizontal
	7637.5	37.0	8.3	45.3	74.0	-28.7	Peak	Horizontal
	8236.0	37.1	8.8	45.9	74.0	-28.1	Peak	Horizontal
	4019.5	36.3	1.0	37.3	74.0	-36.7	Peak	Vertical
	4892.5	36.0	3.2	39.2	74.0	-34.8	Peak	Vertical
	8191.0	36.6	8.8	45.4	74.0	-28.6	Peak	Vertical

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

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Result of Radiated Emission below 1GHz:

Site: WZ-AC1	Test Date: 2023-10-25
Limit: FCC_Part15.209_RSE(3m)	Engineer: Carl Jiang
Probe: VULB 9168_25-2000MHz	Polarity: Horizontal
EUT: Navimow	Power: By Battery
Test Mode: Transmit at CH58, 917.9MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		48.250	17.059	-1.500	-22.941	40.000	18.559	QP
2		162.230	20.310	2.100	-23.190	43.500	18.210	QP
3		180.320	21.083	4.230	-22.417	43.500	16.853	QP
4		313.240	22.557	3.590	-23.443	46.000	18.967	QP
5		766.230	26.265	-1.850	-19.735	46.000	28.115	QP
6	*	918.035	42.538	12.918	N/A	N/A	29.620	PK
7		977.230	28.079	-2.140	-25.921	54.000	30.220	QP

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

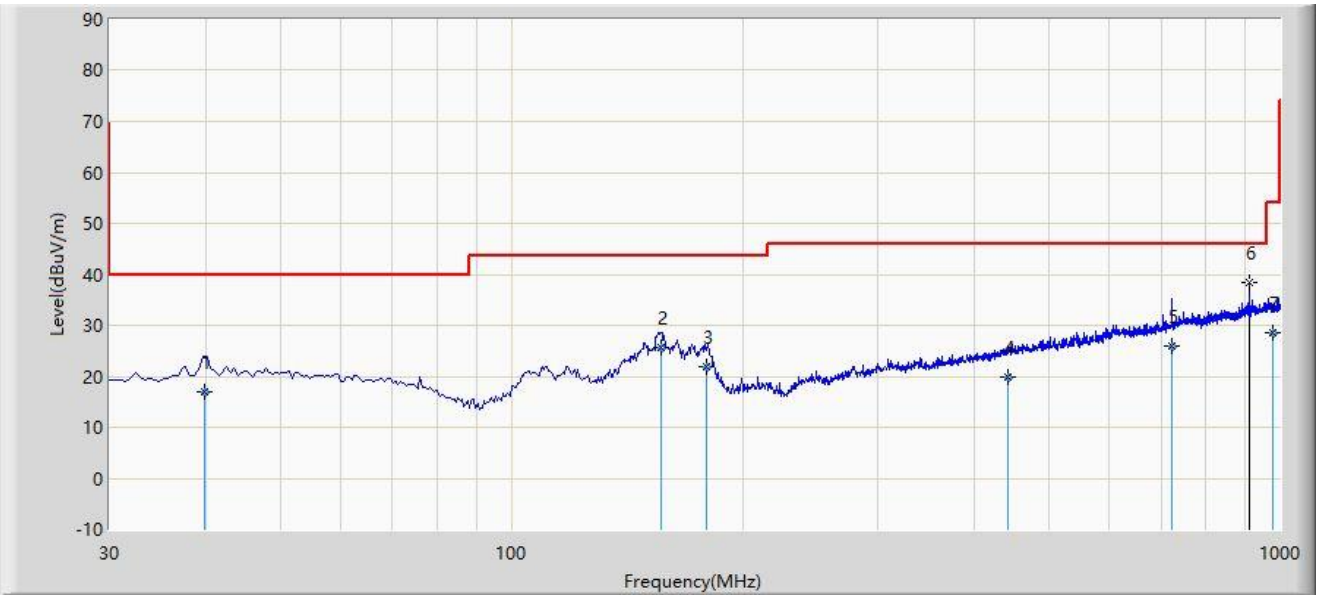
Note 2: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 3: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 4: The No.6 is fundamental frequency.

Note 5: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Site: WZ-AC1	Test Date: 2023-10-25
Limit: FCC_Part15.209_RSE(3m)	Engineer: Carl Jiang
Probe: VULB 9168_25-2000MHz	Polarity: Vertical
EUT: Navimow	Power: By Battery
Test Mode: Transmit at CH58, 917.9MHz	



No	Mark	Frequency (MHz)	Measure Level (dBµV/m)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV/m)	Factor (dB/m)	Type
1		39.850	16.980	-1.030	-23.020	40.000	18.011	QP
2		156.850	25.520	7.230	-17.980	43.500	18.290	QP
3		179.020	21.892	4.890	-21.608	43.500	17.003	QP
4		442.230	19.940	-2.320	-26.060	46.000	22.259	QP
5		723.020	25.970	-1.140	-20.030	46.000	27.110	QP
6	*	911.730	38.340	8.823	N/A	N/A	29.518	PK
7		976.210	28.686	-1.540	-25.314	54.000	30.227	QP

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

Note 2: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

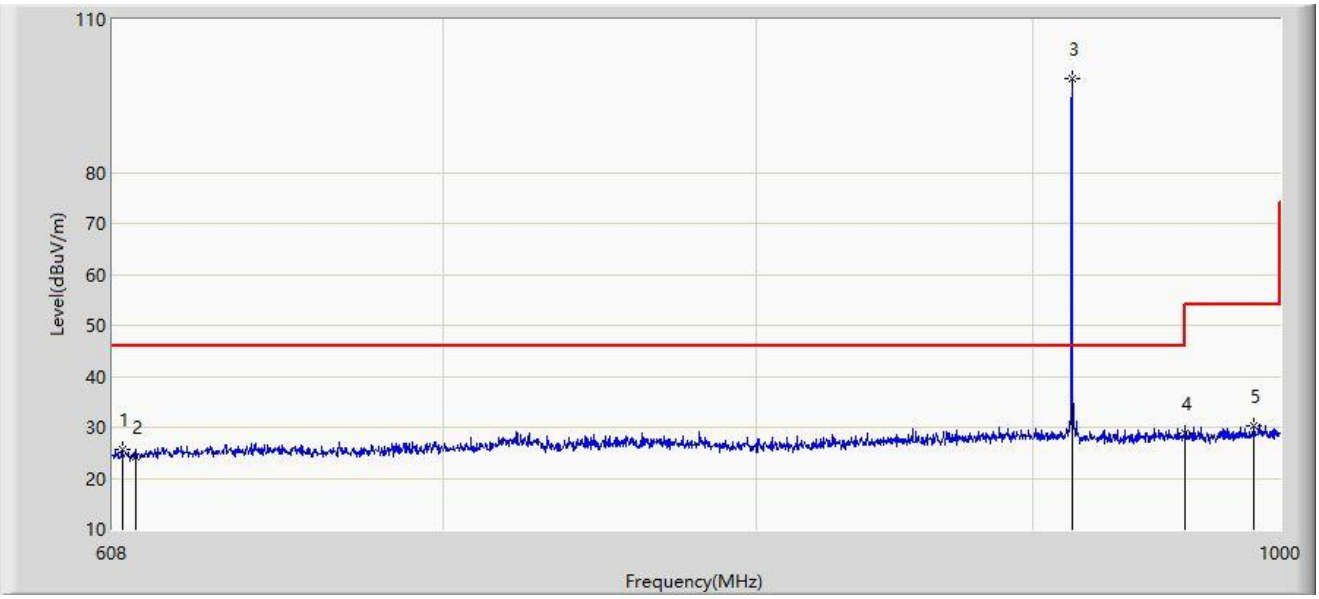
Note 3: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 4: The No.6 is fundamental frequency.

Note 5: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

A.10 Radiated Restricted Band Edge Test Result

Site: SIP-AC3	Test Date: 2023-11-13
Limit: FCC_Part15.209_RSE(3m)	Engineer: Justin Guo
Probe: VULB 9168_00997_25-2000MHz	Polarity: Horizontal
EUT: Navimow	Power: By Battery
Test Mode: Transmit by SRD at CH01, 915.05MHz	



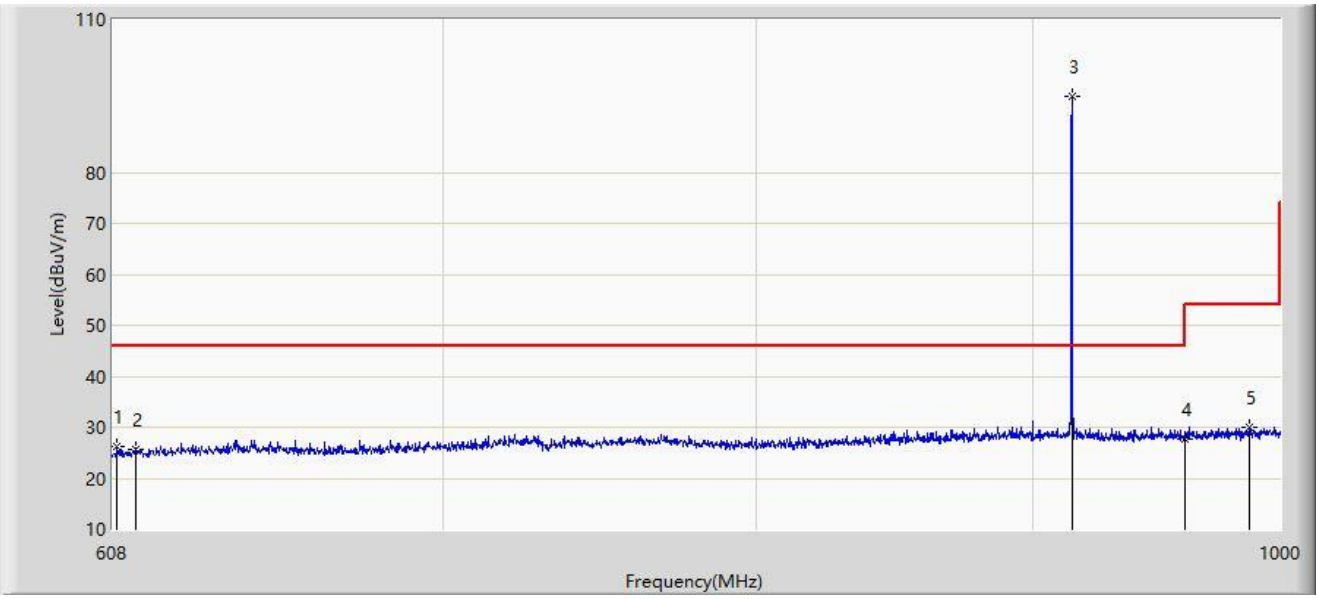
No	Mark	Frequency (MHz)	Measure Level (dBµV/m)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV/m)	Factor (dB/m)	Type
1		610.548	25.624	-0.205	-20.376	46.000	25.828	PK
2		614.000	24.097	-1.828	-21.903	46.000	25.925	PK
3		915.132	98.287	68.705	N/A	N/A	29.582	PK
4	*	960.000	28.802	-0.717	-17.198	46.000	29.519	PK
5		988.632	30.390	30.390	-23.610	54.000	0.000	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: SIP-AC3	Test Date: 2023-11-13
Limit: FCC_Part15.209_RSE(3m)	Engineer: Justin Guo
Probe: VULB 9168_00997_25-2000MHz	Polarity: Vertical
EUT: Navimow	Power: By Battery
Test Mode: Transmit by SRD at CH01, 915.05MHz	



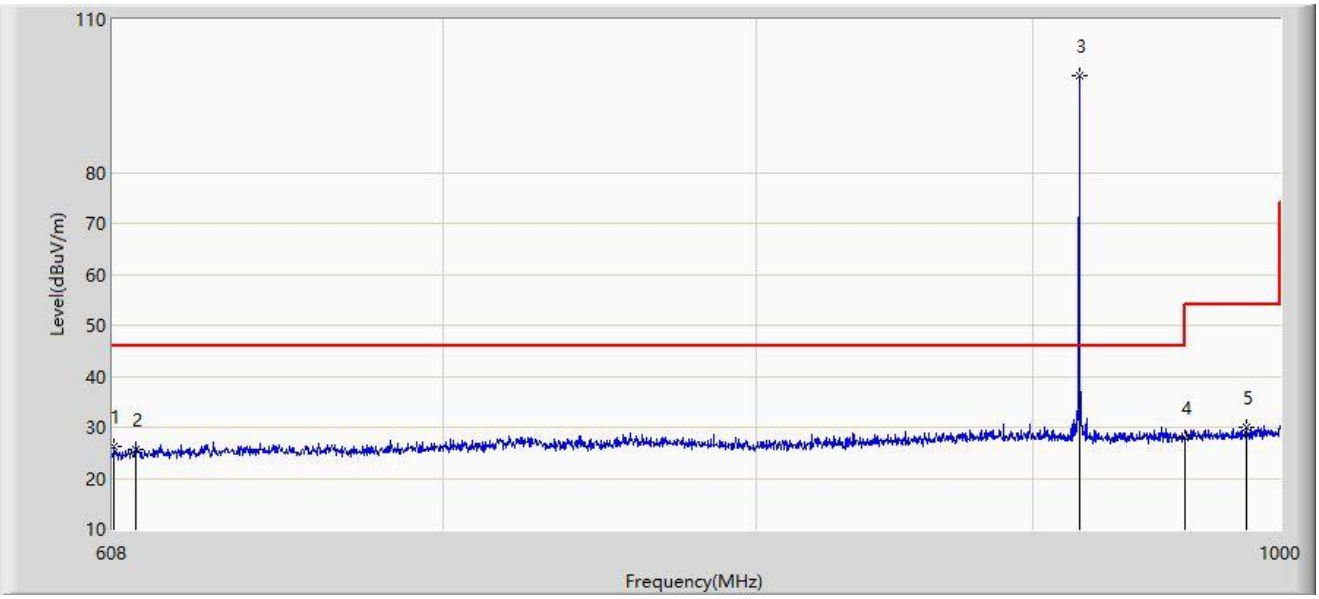
No	Mark	Frequency (MHz)	Measure Level (dBµV/m)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV/m)	Factor (dB/m)	Type
1		609.176	26.191	0.392	-19.809	46.000	25.799	PK
2		614.000	25.516	-0.409	-20.484	46.000	25.925	PK
3		915.132	94.802	65.220	N/A	N/A	29.582	PK
4	*	960.000	27.720	-1.799	-18.280	46.000	29.519	PK
5		987.260	30.036	30.036	-23.964	54.000	0.000	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: SIP-AC3	Test Date: 2023-11-13
Limit: FCC_Part15.209_RSE(3m)	Engineer: Justin Guo
Probe: VULB 9168_00997_25-2000MHz	Polarity: Horizontal
EUT: Navimow	Power: By Battery
Test Mode: Transmit by SRD at CH58, 917.9MHz	



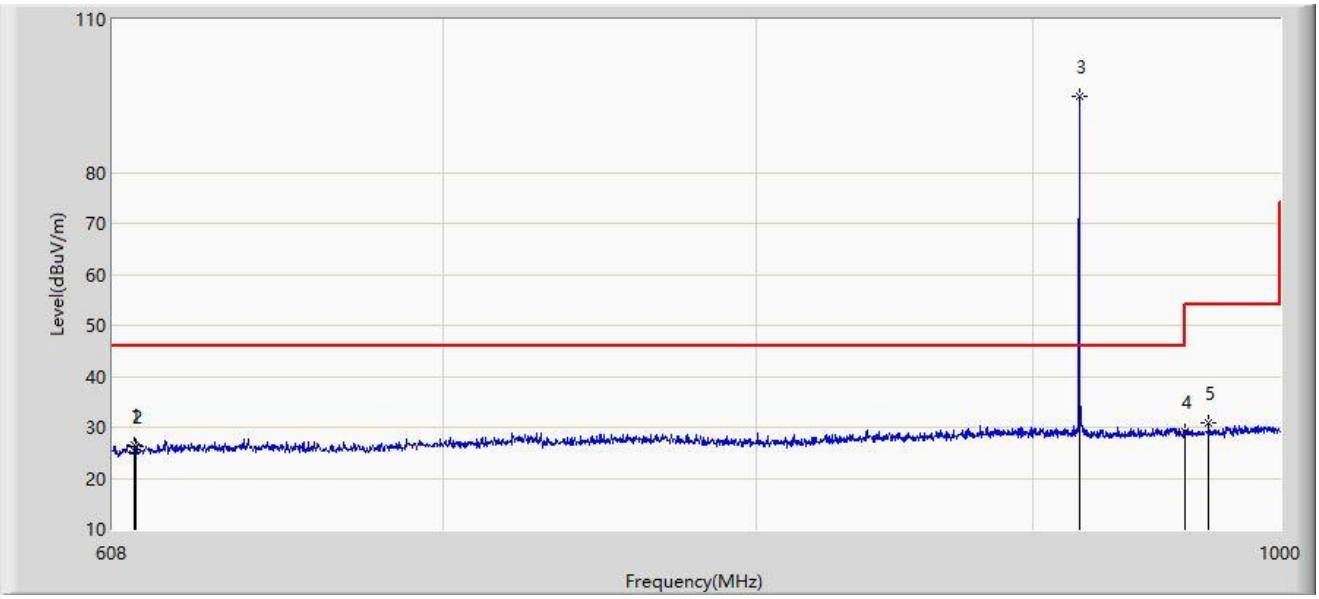
No	Mark	Frequency (MHz)	Measure Level (dBµV/m)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV/m)	Factor (dB/m)	Type
1		608.392	26.271	0.485	-19.729	46.000	25.786	PK
2		614.000	25.655	-0.270	-20.345	46.000	25.925	PK
3		917.876	98.916	69.333	N/A	N/A	29.583	PK
4	*	960.000	27.866	-1.653	-18.134	46.000	29.519	PK
5		985.692	30.117	30.117	-23.883	54.000	0.000	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: SIP-AC3	Test Date: 2023-11-13
Limit: FCC_Part15.209_RSE(3m)	Engineer: Justin Guo
Probe: VULB 9168_00997_25-2000MHz	Polarity: Vertical
EUT: Navimow	Power: By Battery
Test Mode: Transmit by SRD at CH58, 917.9MHz	



No	Mark	Frequency (MHz)	Measure Level (dBµV/m)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV/m)	Factor (dB/m)	Type
1		613.880	26.485	0.563	-19.515	46.000	25.922	PK
2		614.000	26.188	0.263	-19.812	46.000	25.925	PK
3		917.876	94.940	65.357	N/A	N/A	29.583	PK
4	*	960.000	29.238	-0.281	-16.762	46.000	29.519	PK
5		969.816	30.736	30.736	-23.264	54.000	0.000	PK

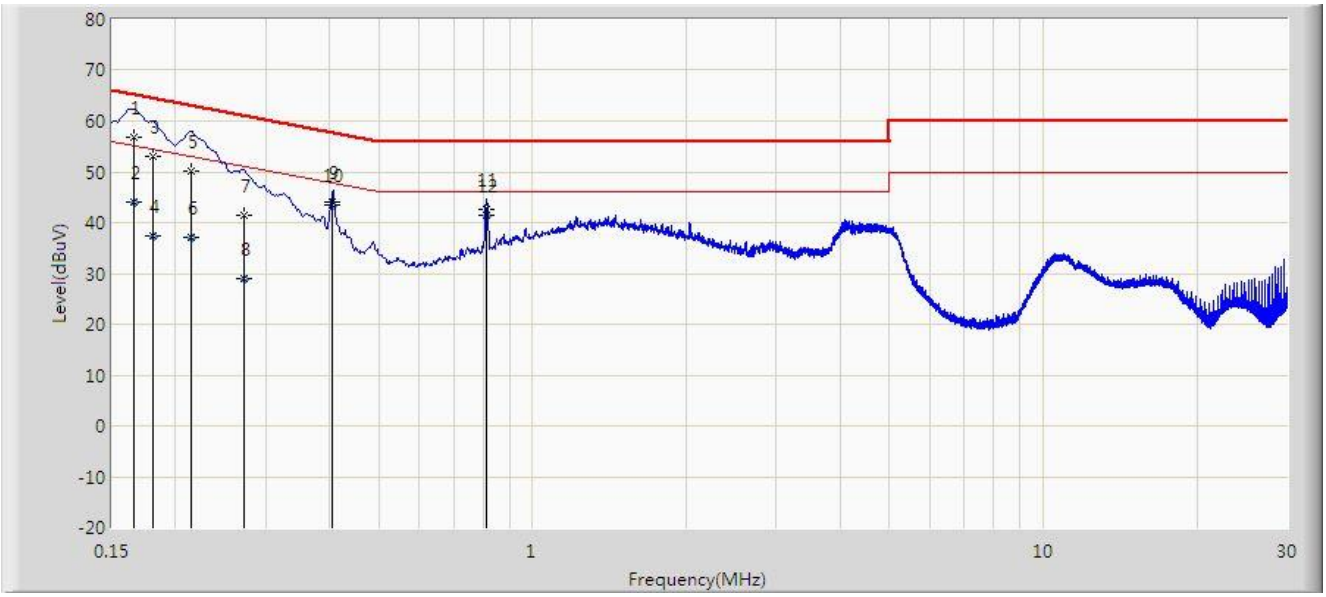
Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

A.11 AC Conducted Emissions Test Result

Site: SIP-SR2	Test Date: 2023/11/01
Temperature: 24.2°C	Humidity: 62.8%
Limit: FCC_Part15.207_CE_AC Power	Engineer: Mark Long
Probe: SIP-SR2-ENV216_101684_C	Polarity: Line
EUT: Navimow	Power: AC 120V/60Hz
Test Mode: Transmit at CH58, 917.90MHz	



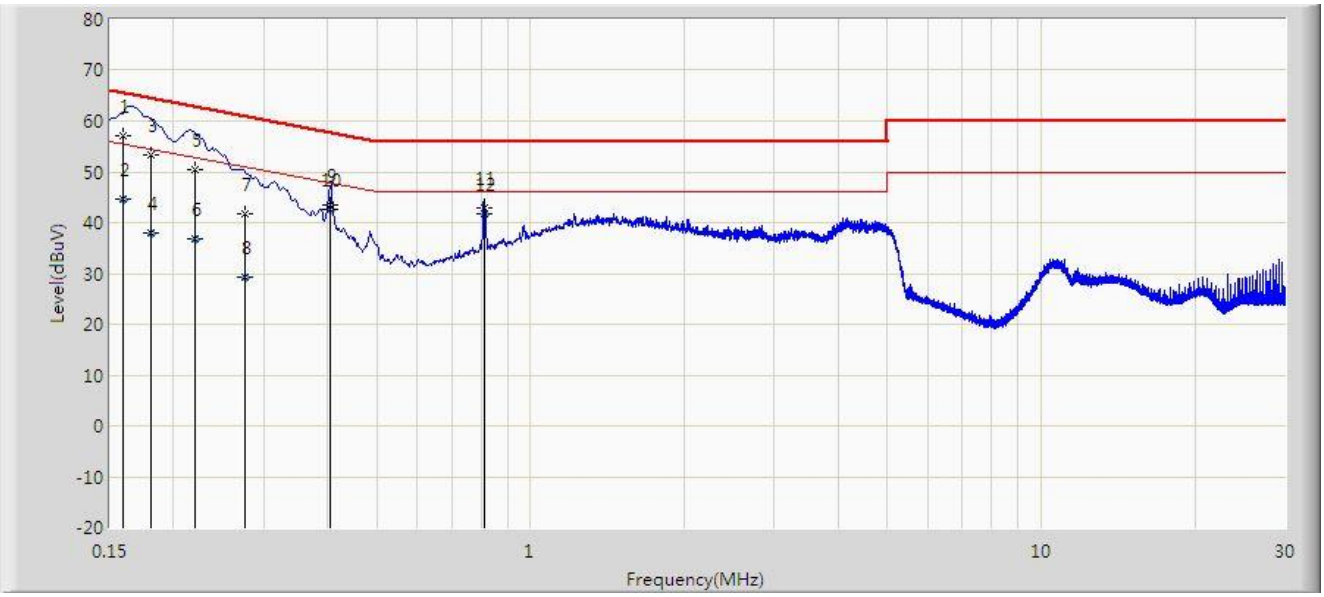
No	Mark	Frequency (MHz)	Measure Level (dBµV)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV)	Factor (dB)	Type
1		0.166	56.754	46.800	-8.404	65.158	9.954	QP
2		0.166	43.954	34.000	-11.204	55.158	9.954	AV
3		0.181	52.956	42.936	-11.460	64.417	10.020	QP
4		0.181	37.502	27.482	-16.914	54.417	10.020	AV
5		0.215	50.223	40.200	-12.787	63.010	10.024	QP
6		0.215	37.123	27.100	-15.887	53.010	10.024	AV
7		0.272	41.458	31.665	-19.614	61.072	9.794	QP
8		0.272	28.959	19.166	-22.113	51.072	9.794	AV
9		0.406	44.152	34.422	-13.567	57.720	9.730	QP
10	*	0.406	43.544	33.814	-4.176	47.720	9.730	AV
11		0.814	42.627	32.879	-13.373	56.000	9.748	QP
12		0.814	41.464	31.717	-4.536	46.000	9.748	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV) = Reading Level (dBµV) + Factor (dB).

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: SIP-SR2	Test Date: 2023/11/01
Temperature: 24.2°C	Humidity: 62.8%
Limit: FCC_Part15.207_CE_AC Power	Engineer: Mark Long
Probe: SIP-SR2-ENV216_101684_C	Polarity: Neutral
EUT: Navimow	Power: AC 120V/60Hz
Test Mode: Transmit at CH58, 917.90MHz	



No	Mark	Frequency (MHz)	Measure Level (dBµV)	Reading Level (dBµV)	Margin (dB)	Limit (dBµV)	Factor (dB)	Type
1		0.159	57.240	47.600	-8.276	65.516	9.640	QP
2		0.159	44.540	34.900	-10.976	55.516	9.640	AV
3		0.181	53.291	43.648	-11.126	64.417	9.642	QP
4		0.181	38.108	28.466	-16.309	54.417	9.642	AV
5		0.220	50.483	40.800	-12.336	62.819	9.683	QP
6		0.220	36.883	27.200	-15.936	52.819	9.683	AV
7		0.276	41.670	31.977	-19.266	60.935	9.692	QP
8		0.276	29.351	19.659	-21.585	50.935	9.692	AV
9		0.404	43.389	33.679	-14.377	57.766	9.710	QP
10		0.404	42.656	32.946	-5.110	47.766	9.710	AV
11		0.811	42.901	33.191	-13.099	56.000	9.710	QP
12	*	0.811	41.686	31.976	-4.314	46.000	9.710	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBµV) = Reading Level (dBµV) + Factor (dB).

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Appendix B - Test Setup Photograph

Refer to “2309RSU022-UT” file.

Appendix C - EUT Photograph

Refer to “ 2309RSU022-UE” file.

The End