RF MEASUREMENT REPORT

FCC ID:	2BAXN-MR0001
Applicant:	Willand (Beijing) Technology Co., LTD.
Product:	Navimow
Model No.:	H800N-VF, H1500N-VF, H3000N-VF
Brand Name:	Segway
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Result:	Complies
Received Date:	2023-04-20
Test Date:	2023-04-23 ~ 2023-06-02

Reviewed By: Vincent Yu

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2304RSU043-U3	V01	Initial Report	2023-06-14	Valid

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1. General Information

1.1. Applicant

Willand (Beijing) Technology Co., LTD.

Room 203, A1 Bldg. Zhongguancun Dongsheng Technology Park, Haidian Dist., Beijing, China.

1.2. Manufacturer

Willand (Beijing) Technology Co., LTD.

Room 203, A1 Bldg. Zhongguancun Dongsheng Technology Park, Haidian Dist., Beijing, China.

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>
<tr><td></td><td colspan="5">Laboratory Accreditations</td></tr>
<tr><td></td><td colspan="2">A2LA: 3628.02</td><td colspan="3">CNAS: L10551</td></tr>
<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: L3261-190725</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.	H800N-VF, H1500N-VF, H3000N-VF
EUT Identification No.	2.4G WIFI#1: 20230423Sample#06 for Conducted measurement 20230423Sample#08 for Radiated measurement 2.4G WIFI#2: 20230423Sample#14 for Conducted measurement 20230423Sample#14 for Radiated measurement
Wi-Fi Specification	802.11b/g/n
Bluetooth Specification	V4.1
SRD Specification	915.05 ~ 917.9 MHz
Antenna Information	Refer to 1.5.
Power Supply	By Battery Pack

Note:

1. Only the rated capacity of the internal battery is different, others are all identical. H3000N-VF was selected for all of test in this report.
2. This device contains a certified WWAN module (FCC ID: XMR201909EC25AFX).
3. 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 under Test

2.4G WIFI#1	
Frequency Range	802.11b/g/n-HT20: 2412 ~ 2462MHz
Channel Number	802.11b/g/n-HT20: 11
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Data Rate	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 72.2Mbps
Antenna Type	PCB Antenna
Number of Antenna	1
Antenna Gain	5.00dBi
2.4G WIFI#2	
Frequency Range	802.11b/g/n-HT20: 2412 ~ 2462MHz 802.11n-HT40: 2422 ~ 2452MHz
Channel Number	802.11b/g/n-HT20: 11 802.11n-HT40: 7
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Data Rate	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 150Mbps
Antenna Type	PIFA Antenna
Number of Antenna	1
Antenna Gain	3.47dBi

1.6. Working Frequencies

802.11b/g/n-HT20 (2.4G WIFI#1, 2.4G WIFI#2)

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

802.11n-HT40 (2.4G WIFI#2)

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	--	--	--	--

2. Test Configuration

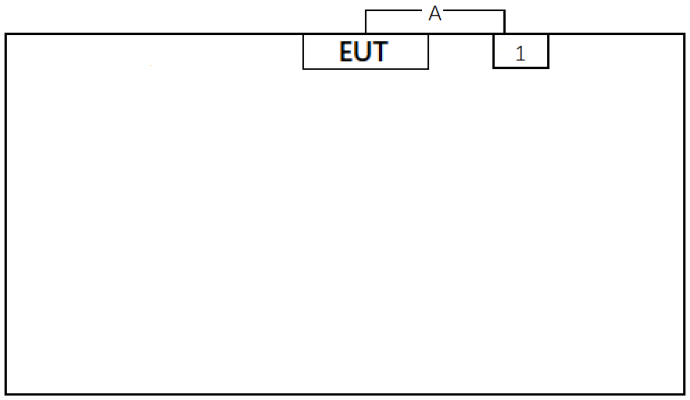
2.1. Test Mode

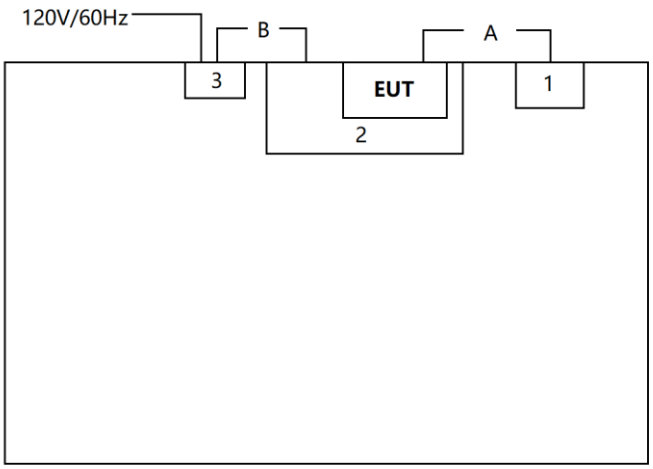
For 2.4G WIFI#1
Mode 1: Transmit by 802.11b (1Mbps) _SISO Mode
Mode 2: Transmit by 802.11g (6Mbps) _SISO Mode
Mode 3: Transmit by 802.11n-HT20 (MCS0) _SISO Mode
For 2.4G WIFI#2
Mode 4: Transmit by 802.11b (1Mbps) _SISO Mode
Mode 5: Transmit by 802.11g (6Mbps) _SISO Mode
Mode 6: Transmit by 802.11n-HT20 (MCS0) _SISO Mode
Mode 7: Transmit by 802.11n-HT40 (MCS0) _SISO Mode

Note: All modes of operation and data rates were investigated, so all RF test requirements was executed at the worst data rate.

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 Emission testing


Connection Diagram – AC Line Conducted Emission testing			
			
Cable Type		Cable Spec.	Length
A	USB Cable	Non-shielding	< 0.5m
B	Power Cable	Shielding	< 0.5m
Product		Manufacturer	Model No.
1	Notebook	DELL	DELL Inspiron 5359
2	Navimow Charging Station	Segway	H25D2E
3	AC/DC Adapter	Segway	NBW32D002D5N-US

2.3. Test Software

For 2.4G WIFI#1, the test utility software used during testing was “EspRFTestTool”, and the version was v2.8.

For 2.4G WIFI#2, the test utility software used during testing was “Windows Powershell”.

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 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 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
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2023-12-28	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2023-08-22	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2023-05-08	WZ-AC1
				1 year	2024-05-07	
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2023-06-21	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2024-04-20	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2023-06-06	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2023-12-28	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2023-11-01	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC1/WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-AC1/WZ-AC2
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2023-05-20	WZ-AC2
				1 year	2024-05-15	
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2023-06-04	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2023-11-27	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2023-05-08	WZ-AC2
				1 year	2024-05-15	
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2024-04-20	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2023-06-04	WZ-SR2
Symmetrical Attenuator	Schwarzbeck	SYMAT 40	MRTSUE06117	1 year	2024-04-09	WZ-SR2
Shielding Room	MIX-BEP	WZ-SR2	MRTSUE06215	5 years	2026-12-20	WZ-SR2
Thermohygrometer	testo	608-H1	MRTSUE06404	1 year	2023-06-06	WZ-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2023-10-27	WZ-SR2
USB Power Sensor	Keysight	U2021XA	MRTSUE06446	1 year	2023-06-04	WZ-SR5
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2023-06-06	WZ-SR5
Shielding Room	HUAMING	WZ-SR5	MRTSUE06442	N/A	N/A	WZ-SR5
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2023-06-04	WZ-SR5
Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2024-02-29	WZ-SR5
Attenuator	MVE	MVE2213	MRTSUE11071	1 year	2023-06-09	WZ-SR5
Attenuator	MVE	MVE2213	MRTSUE11074	1 year	2023-06-09	WZ-SR5

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Agilent Power Analyzer/Agilent Power Panel	V R03.09.00	Power
Controller_MF 7802	1.02	RE Antenna & Turntable
Controller_MF 7802	2.03C	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
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Coaxial: 9kHz~30MHz: 2.59dB Coplanar: 9kHz~30MHz: 2.60dB Horizontal: 30MHz~200MHz: 3.85dB 200MHz~1GHz: 4.36dB 1GHz~10GHz: 4.98dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.28dB 1GHz~10GHz: 4.91dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.30dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.30dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.30dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.20%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(2)	6dB Bandwidth	Conducted	Pass
15.247(b)(3)	Output Power		Pass
15.247(e)	Power Spectral Density		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

Notes:

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. The test results shown in the following sections represent the worst-case emissions.

6.2. 6dB Bandwidth Measurement

6.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

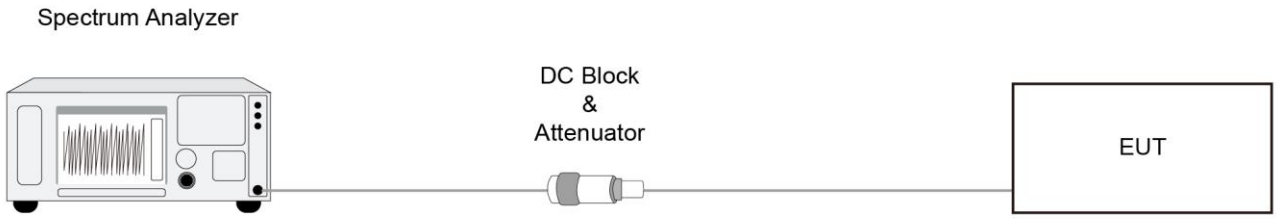
6.2.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.8

6.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

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

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.3.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.9.1.3

ANSI C63.10 - 2013 - Section 11.9.2.3.2

6.3.3. Test Setting

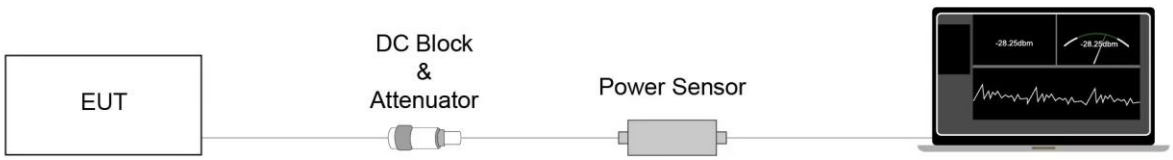
Method PKPM1 (Peak Power Measurement of Signals with DTS BW ≤ 50MHz)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Power Spectral Density Measurement

6.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

6.4.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.10.2

ANSI C63.10 - 2013 - Section 11.10.5

6.4.3. Test Setting

Peak Power Spectral Density measurment

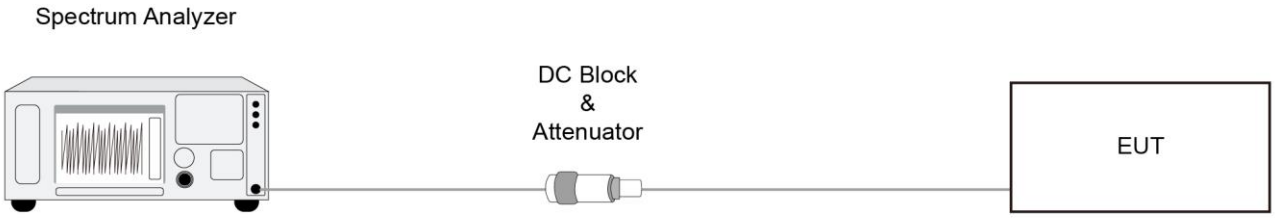
1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Average Power Spectral Density measurment

1. Measure the duty cycle (x) of the transmitter output signal.
2. Set instrument center frequency to DTS channel center frequency.
3. Set span to at least 1.5 times the OBW.
4. RBW = 10 kHz.
5. VBW = 30 kHz.
6. Detector = RMS.
7. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
8. Sweep time = auto couple.
9. Don’t use sweep triggering. Allow sweep to “free run”.
10. Employ trace averaging (RMS) mode over a minimum of 100 traces.
11. Use the peak marker function to determine the maximum amplitude level.
12. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the

average PSD during the actual transmission time. If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Conducted Band Edge and Out-of-Band Emissions Measurement

6.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB or 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 11.11

6.5.3. Test Settitng

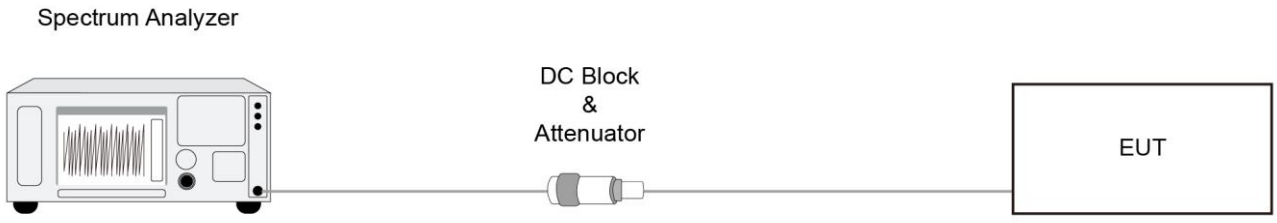
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW ≥ 3 x RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Radiated Spurious Emission Measurement

6.6.1. 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

6.6.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.11 & 11.12

ANSI C63.10 - 2013 - Section 6.3 (General Requirements)

ANSI C63.10 - 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - 2013 - Section 6.6 (Standard test method above 1GHz)

6.6.3. 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
> 1000MHz	1MHz

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

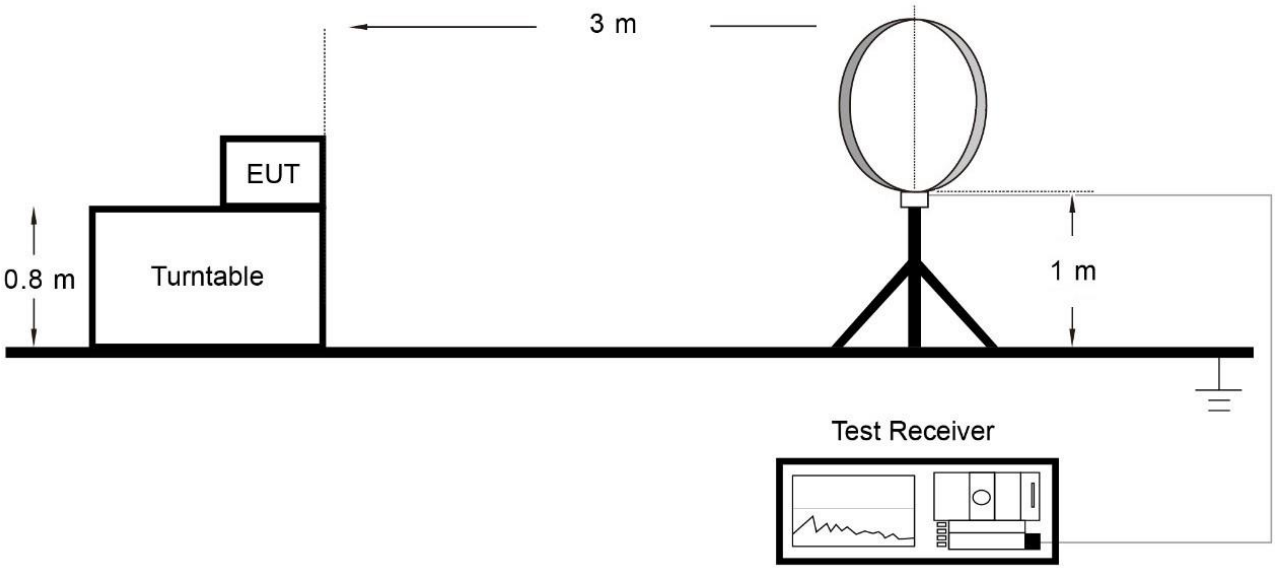
5. Sweep time = auto

6. Trace mode = max hold

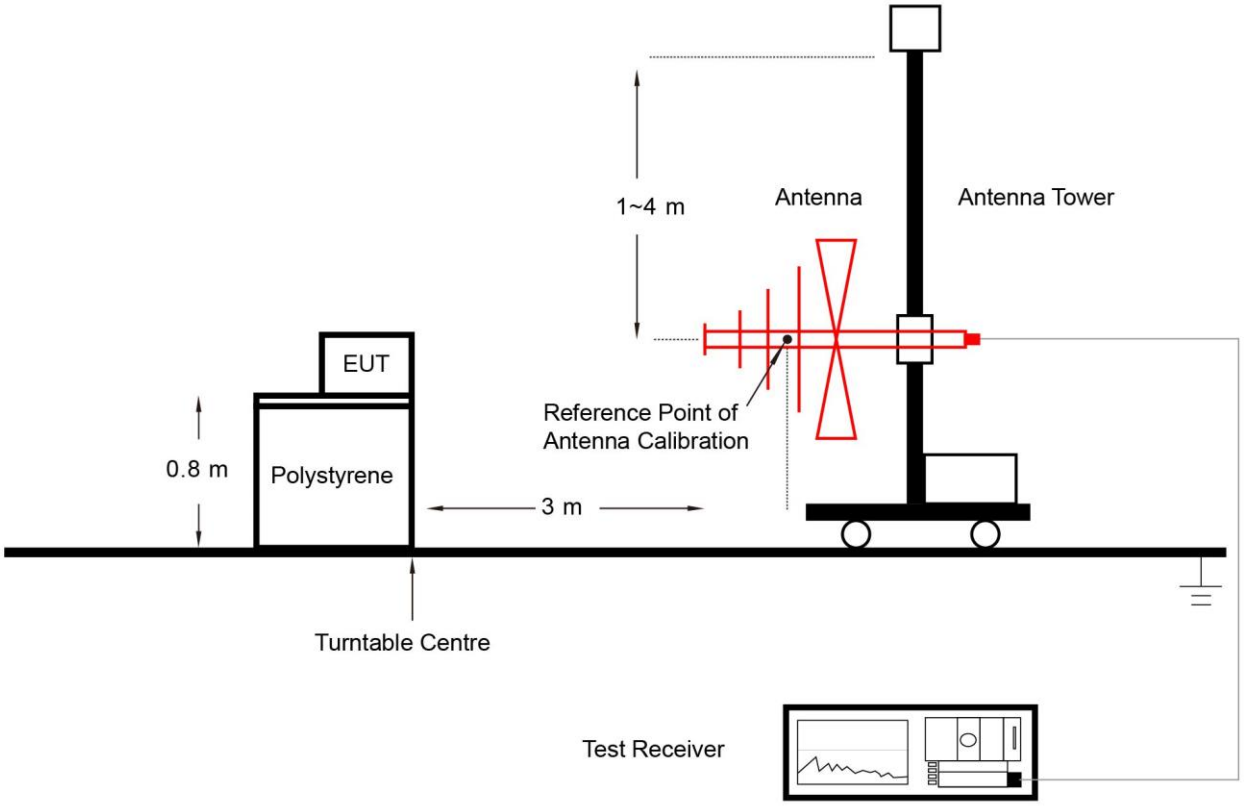
7. Trace was allowed to stabilize

6.6.4. Test Setup

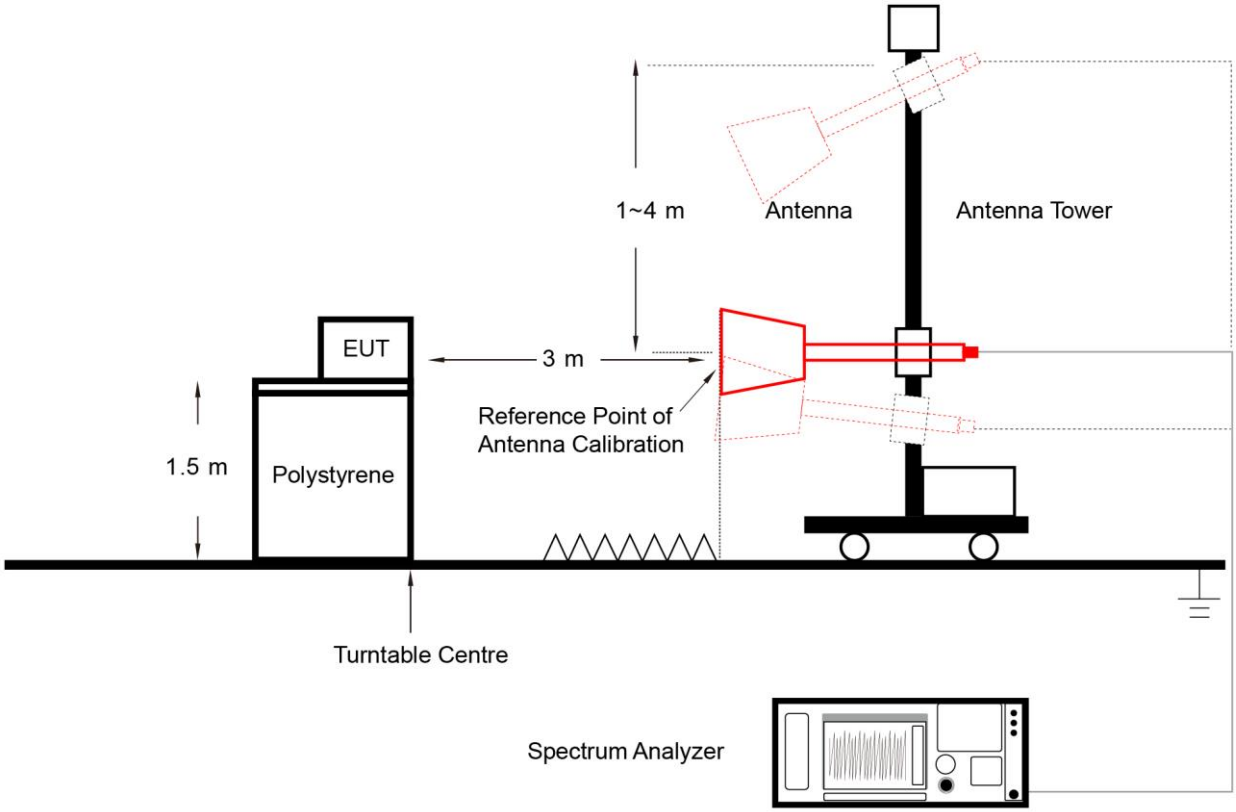
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Refer to Appendix A.6.

6.7. Radiated Restricted Band Edge Measurement

6.7.1. 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

6.7.2. Test Procedure

ANSI C63.10-2013 Section 6.3 & 6.6 & 11.13

6.7.3. Test Setting

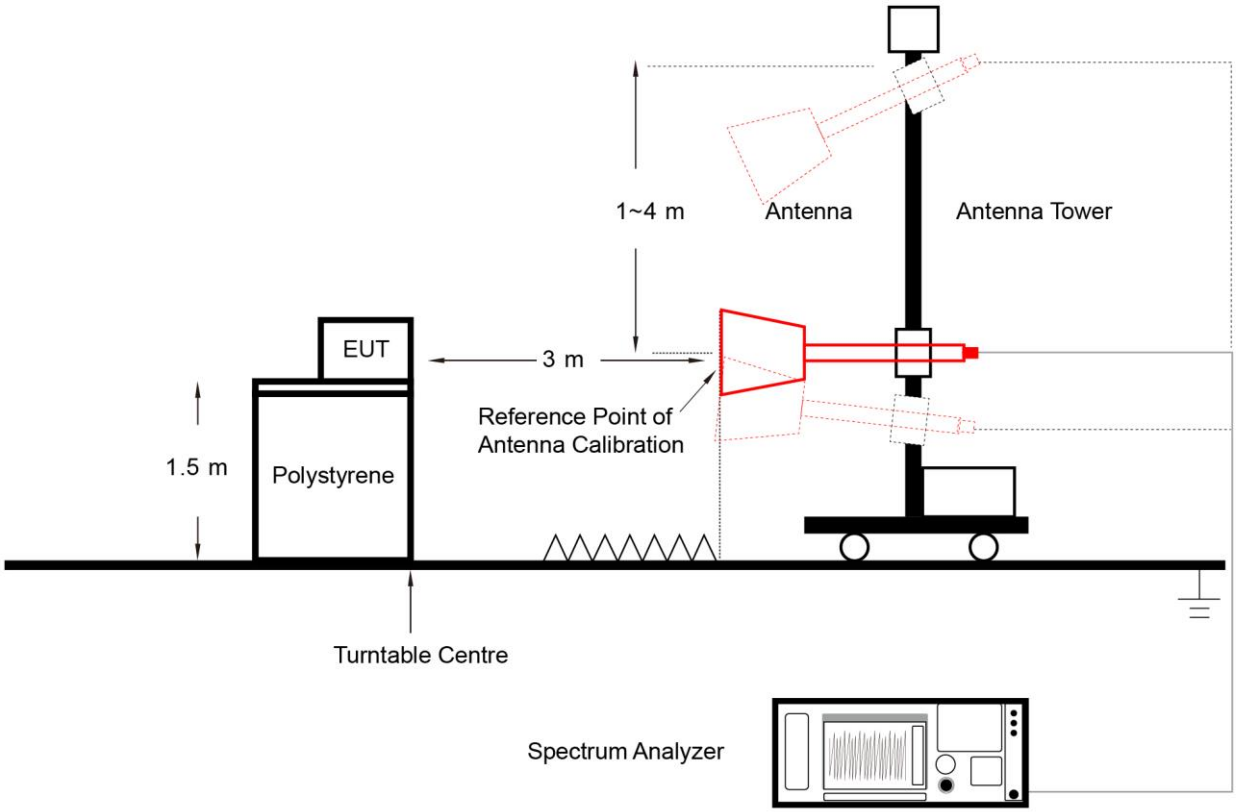
Peak Field Strength Measurements

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 Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. Average Type = Voltage
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.7.4. Test Setup



6.7.5. Test Result

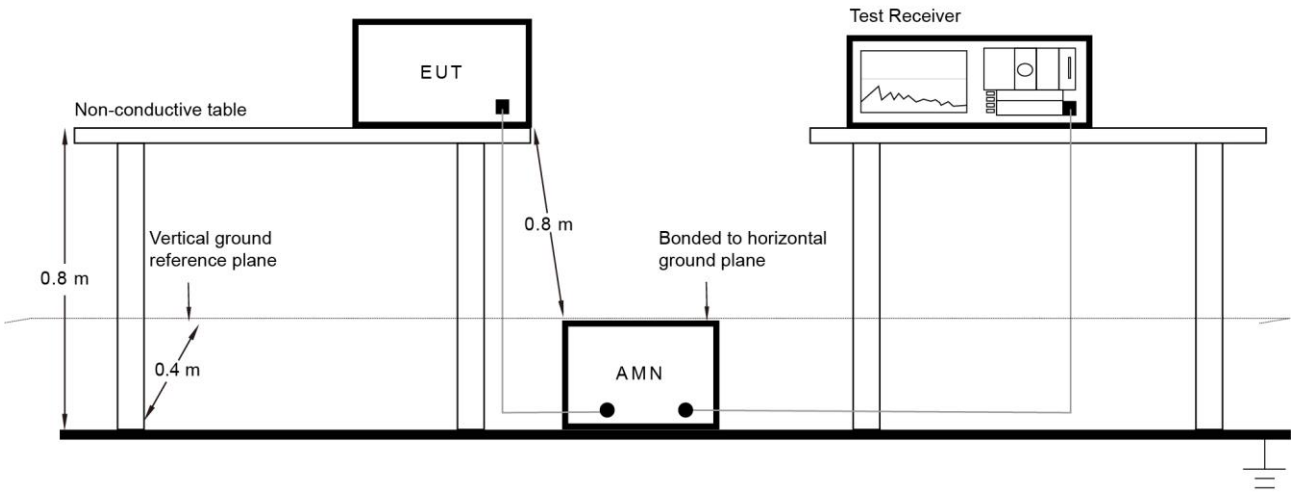
Refer to Appendix A.7.

6.8. AC Conducted Emissions Measurement

6.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
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.		

6.8.2. Test Setup



6.8.3. Test Result

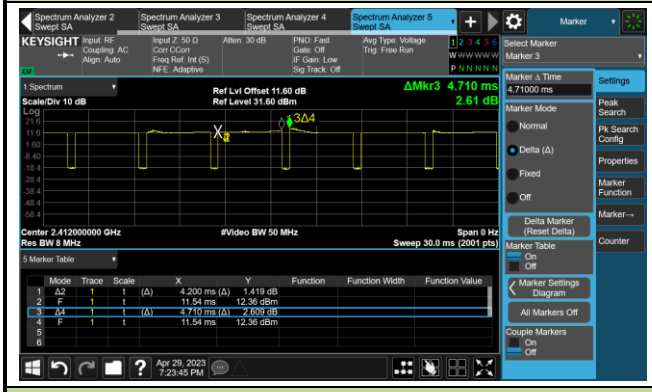
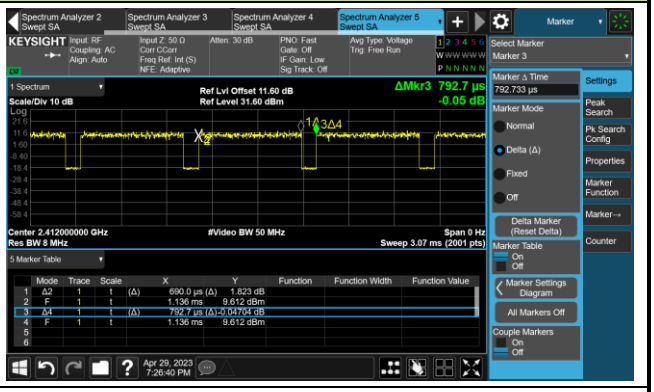
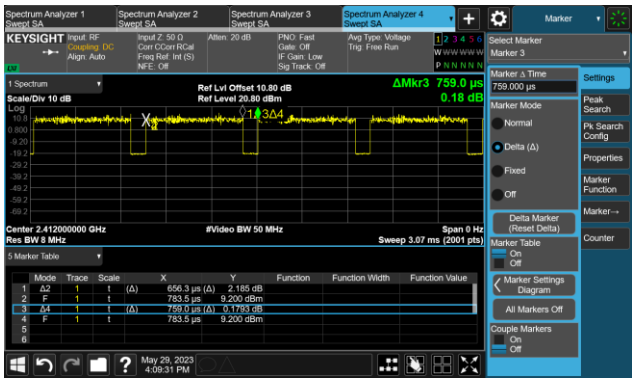
Refer to Appendix A.8.

Appendix A – Test Result

A.1 Duty Cycle Test Result

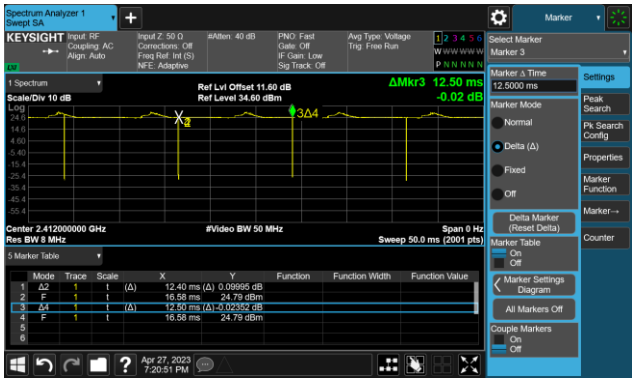
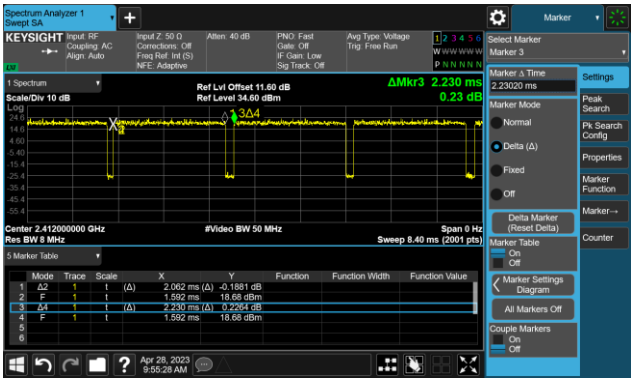
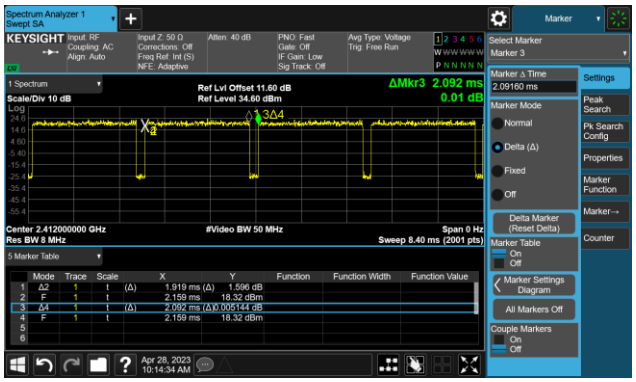
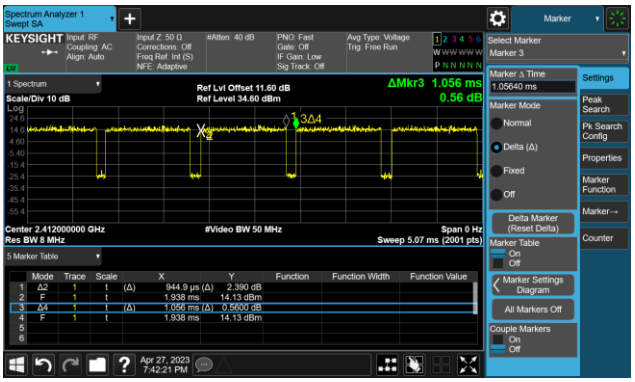
Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-29~2023-05-29	Remark	2.4G WIFI#1

Test Mode	Duty Cycle
802.11b	89.17%
802.11g	87.04%
802.11n-HT20	86.47%

Duty Cycle (T = Transmission Duration)	
802.11b (T = 4.200ms)	802.11g (T = 690.0us)
	
802.11n-HT20 (T = 656.3us)	
	

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-27~2023-04-28	Remark	2.4G WIFI#2

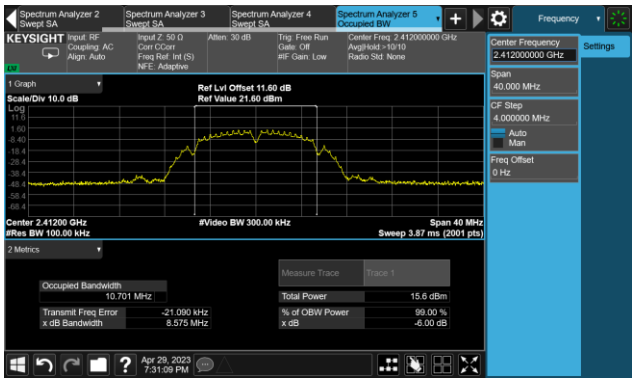
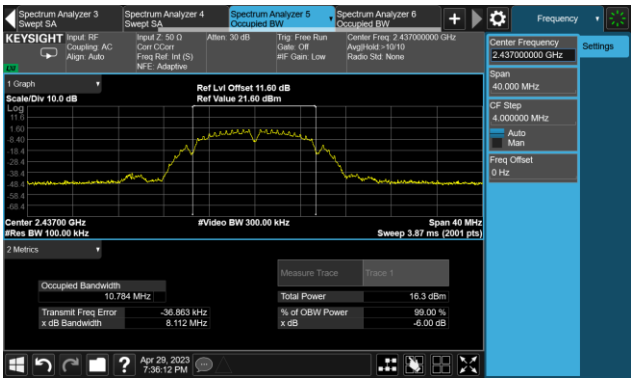
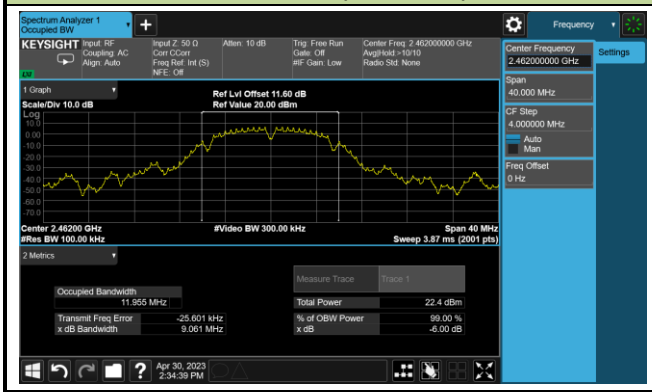
Test Mode	Duty Cycle
802.11b	99.20%
802.11g	92.47%
802.11n-HT20	91.73%
802.11n-HT40	89.48%

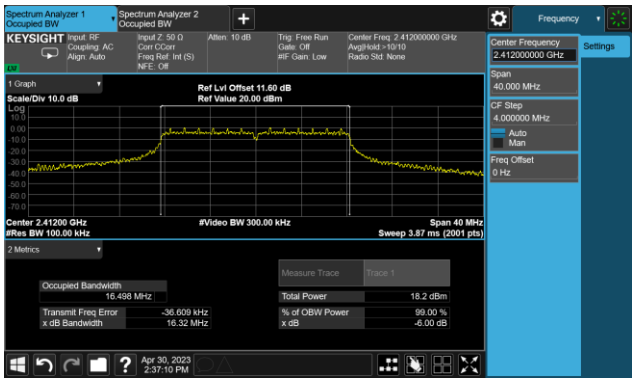
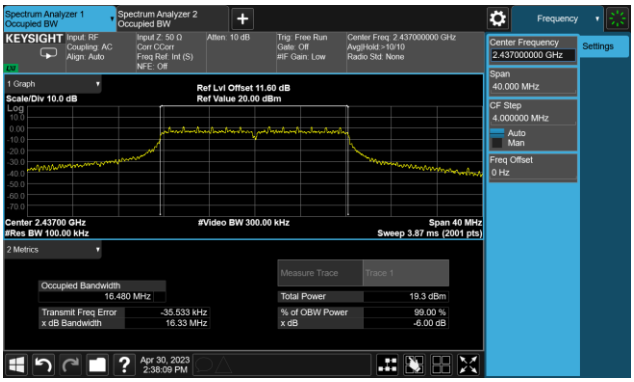
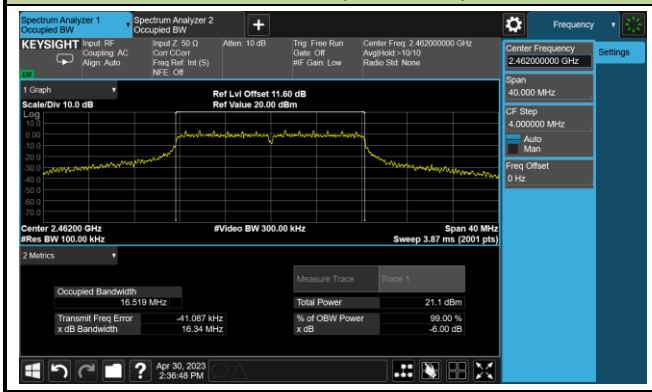
Duty Cycle (T = Transmission Duration)	
802.11b (T = 12.40ms)	802.11g (T = 2.062ms)
	
802.11n-HT20 (T = 1.919ms)	802.11n-HT40 (T = 944.9us)
	

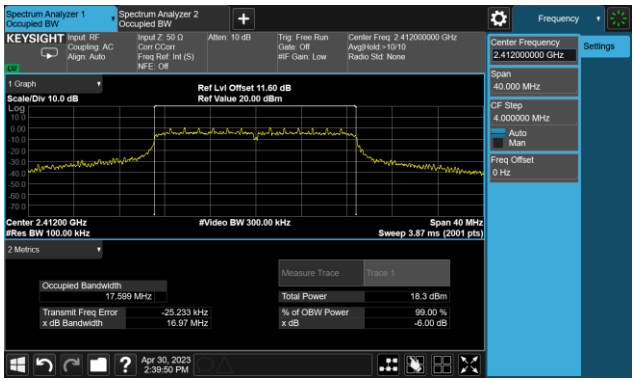
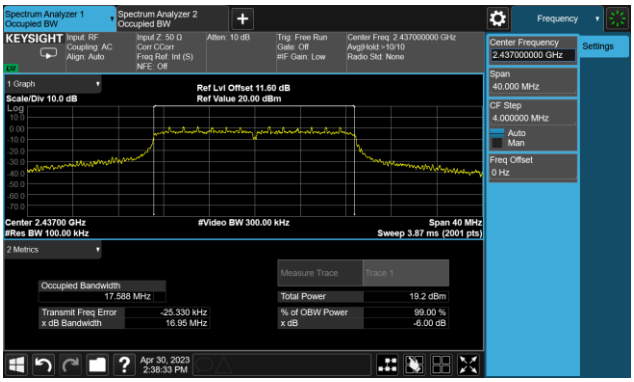
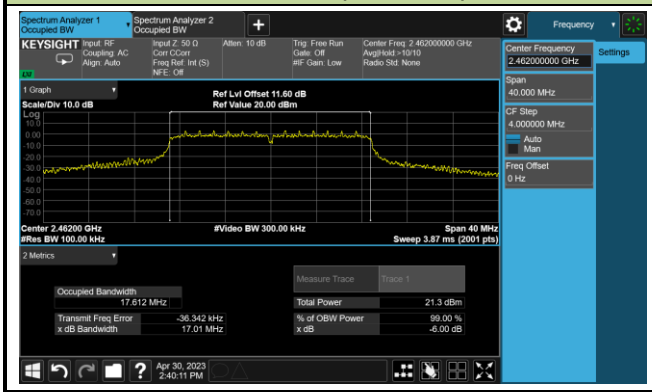
A.2 6dB Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-29~2023-04-30	Remark	2.4G WIFI#1

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
11b	1Mbps	01	2412	8.575	≥ 0.5
11b	1Mbps	06	2437	8.112	≥ 0.5
11b	1Mbps	11	2462	9.061	≥ 0.5
11g	6Mbps	01	2412	16.32	≥ 0.5
11g	6Mbps	06	2437	16.33	≥ 0.5
11g	6Mbps	11	2462	16.34	≥ 0.5
11n-HT20	MCS0	01	2412	16.97	≥ 0.5
11n-HT20	MCS0	06	2437	16.95	≥ 0.5
11n-HT20	MCS0	11	2462	17.01	≥ 0.5

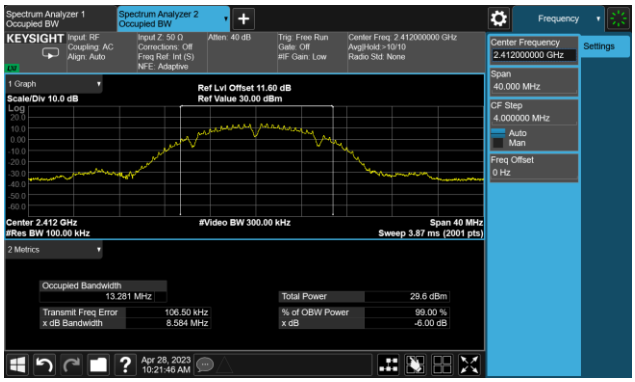
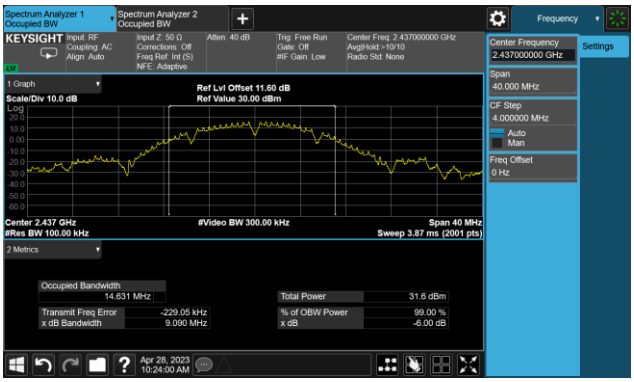
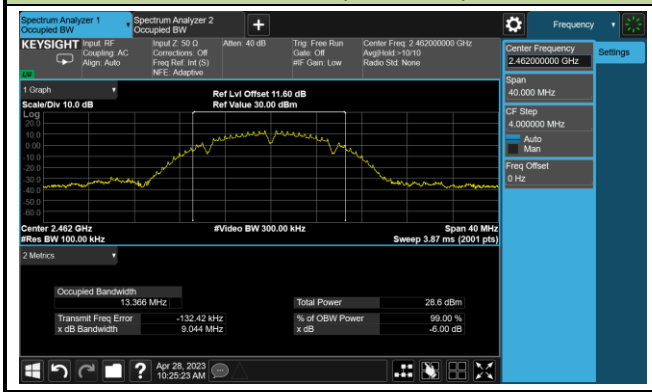
802.11b 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

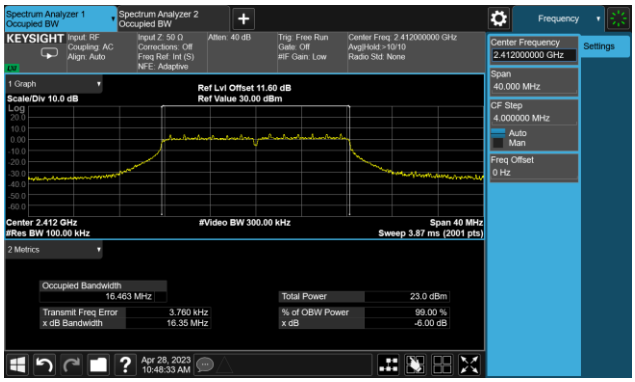
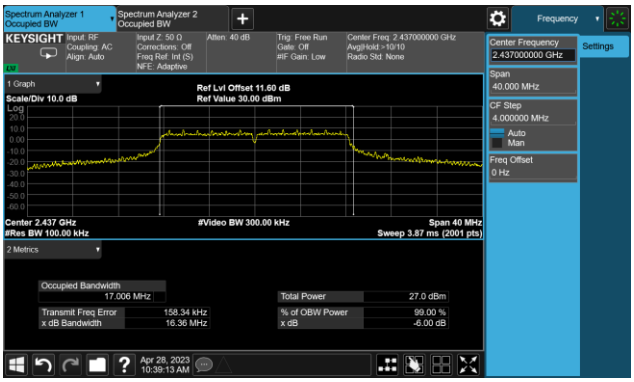
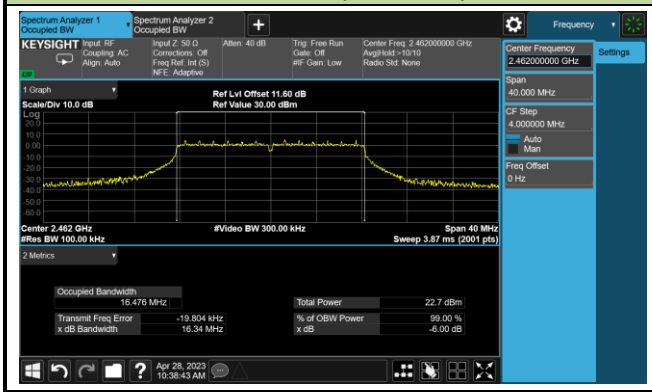
802.11g 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

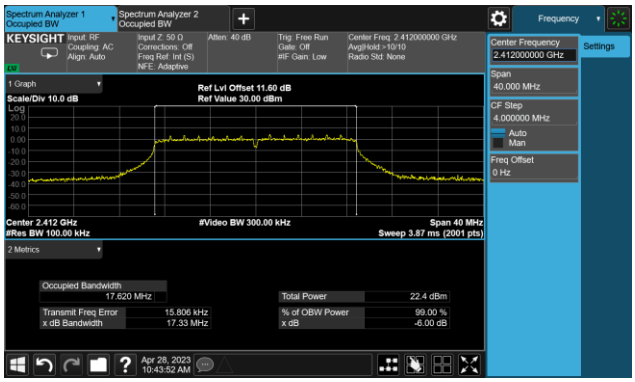
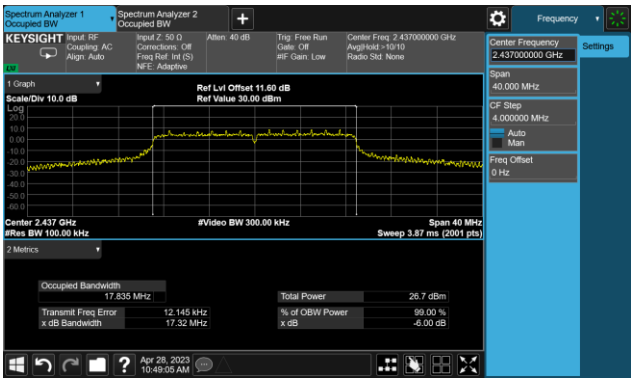
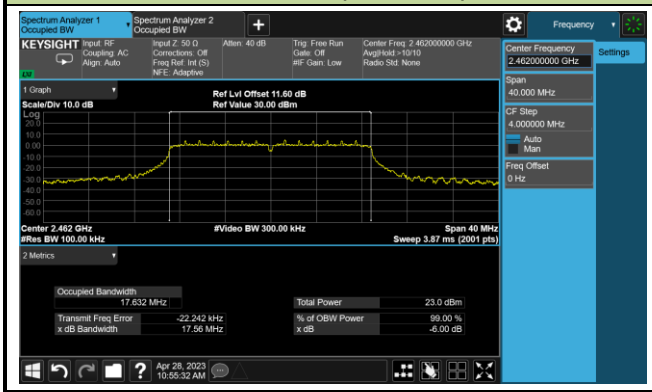
802.11n-HT20 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

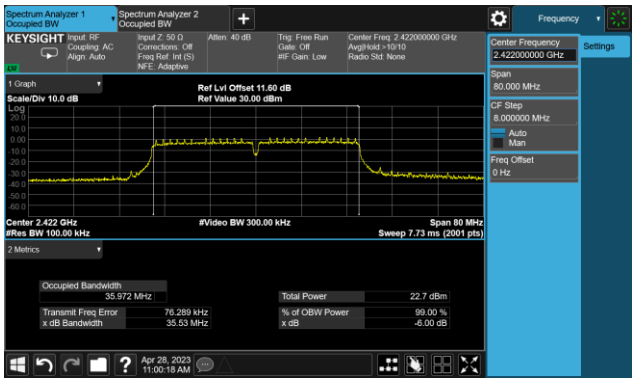
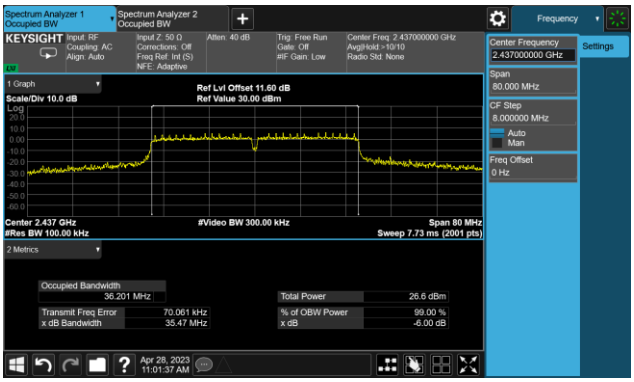
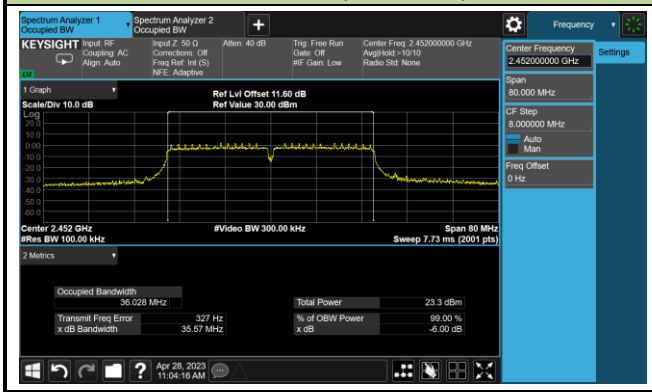
Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-28	Remark	2.4G WIFI#2

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
11b	1Mbps	01	2412	8.584	≥ 0.5
11b	1Mbps	06	2437	9.090	≥ 0.5
11b	1Mbps	11	2462	9.044	≥ 0.5
11g	6Mbps	01	2412	16.35	≥ 0.5
11g	6Mbps	06	2437	16.36	≥ 0.5
11g	6Mbps	11	2462	16.34	≥ 0.5
11n-HT20	MCS0	01	2412	17.33	≥ 0.5
11n-HT20	MCS0	06	2437	17.32	≥ 0.5
11n-HT20	MCS0	11	2462	17.56	≥ 0.5
11n-HT40	MCS0	03	2422	35.53	≥ 0.5
11n-HT40	MCS0	06	2437	35.47	≥ 0.5
11n-HT40	MCS0	09	2452	35.57	≥ 0.5

802.11b 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11g 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT20 6dB Bandwidth	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT40 6dB Bandwidth	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

A.3 Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-05-30	Remark	2.4G WIFI#1

Test Result of Peak Output Power

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)
11b	1Mbps	01	2412	12.68	≤ 30.00
11b	1Mbps	06	2437	13.37	≤ 30.00
11b	1Mbps	11	2462	14.65	≤ 30.00
11g	6Mbps	01	2412	15.65	≤ 30.00
11g	6Mbps	06	2437	16.23	≤ 30.00
11g	6Mbps	11	2462	16.09	≤ 30.00
11n-HT20	MCS0	01	2412	15.62	≤ 30.00
11n-HT20	MCS0	06	2437	16.18	≤ 30.00
11n-HT20	MCS0	11	2462	16.10	≤ 30.00

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)
11b	1Mbps	01	2412	9.18	≤ 30.00
11b	1Mbps	06	2437	9.83	≤ 30.00
11b	1Mbps	11	2462	11.45	≤ 30.00
11g	6Mbps	01	2412	9.91	≤ 30.00
11g	6Mbps	06	2437	10.61	≤ 30.00
11g	6Mbps	11	2462	10.48	≤ 30.00
11n-HT20	MCS0	01	2412	9.96	≤ 30.00
11n-HT20	MCS0	06	2437	10.41	≤ 30.00
11n-HT20	MCS0	11	2462	10.33	≤ 30.00

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-29~2023-04-30	Remark	2.4G WIFI#2

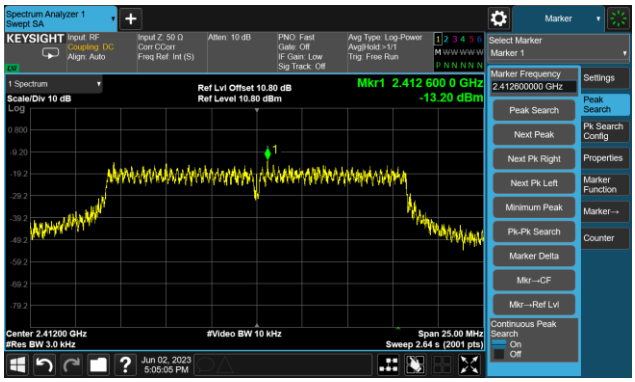
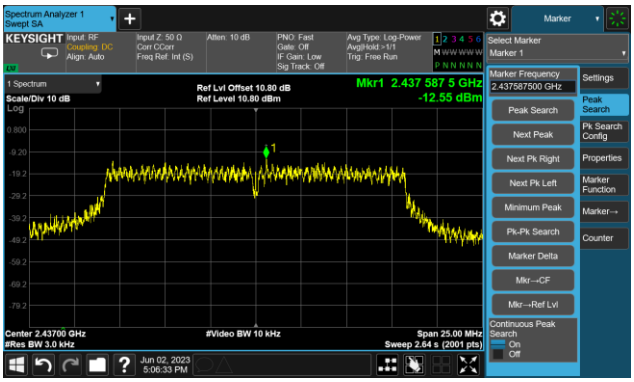
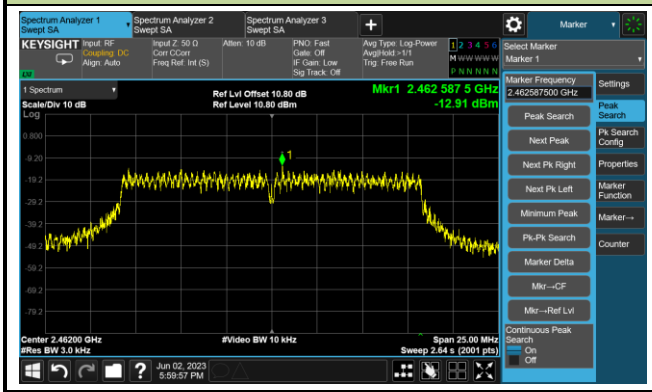
Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)
11b	1Mbps	01	2412	21.51	≤ 30.00
11b	1Mbps	06	2437	23.85	≤ 30.00
11b	1Mbps	11	2462	21.20	≤ 30.00
11g	6Mbps	01	2412	15.80	≤ 30.00
11g	6Mbps	06	2437	19.92	≤ 30.00
11g	6Mbps	11	2462	15.83	≤ 30.00
11n-HT20	MCS0	01	2412	15.26	≤ 30.00
11n-HT20	MCS0	06	2437	19.50	≤ 30.00
11n-HT20	MCS0	11	2462	15.52	≤ 30.00
11n-HT40	MCS0	03	2422	15.31	≤ 30.00
11n-HT40	MCS0	06	2437	19.52	≤ 30.00
11n-HT40	MCS0	09	2452	15.68	≤ 30.00

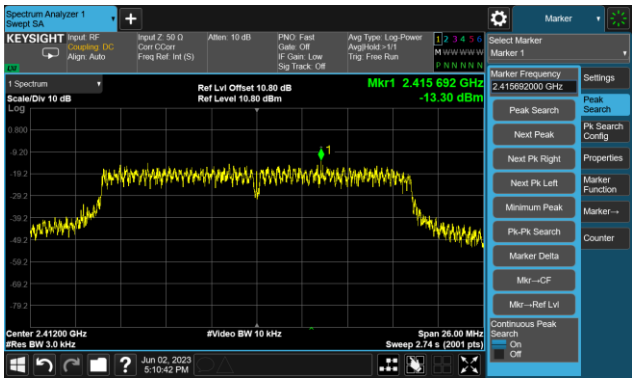
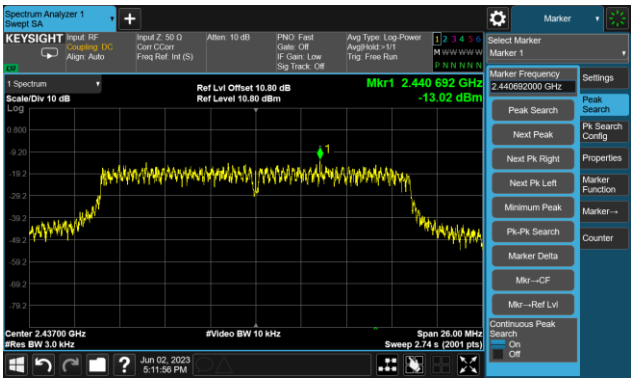
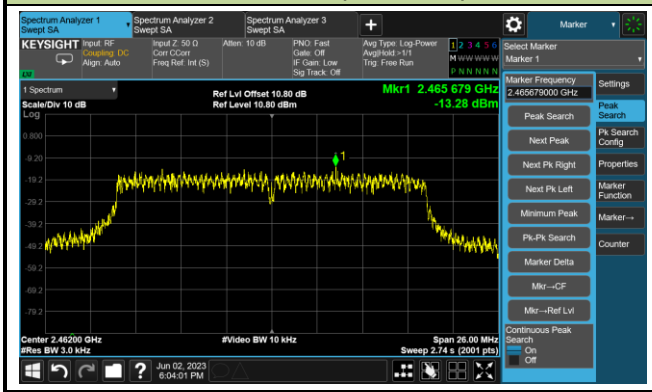
A.4 Power Spectral Density Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-06-02	Remark	2.4G WIFI#1

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	PKPSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
11b	1Mbps	01	2412	-11.89	≤ 8.00	Pass
11b	1Mbps	06	2437	-11.49	≤ 8.00	Pass
11b	1Mbps	11	2462	-10.26	≤ 8.00	Pass
11g	6Mbps	01	2412	-13.20	≤ 8.00	Pass
11g	6Mbps	06	2437	-12.55	≤ 8.00	Pass
11g	6Mbps	11	2462	-12.91	≤ 8.00	Pass
11n-HT20	MCS0	01	2412	-13.30	≤ 8.00	Pass
11n-HT20	MCS0	06	2437	-13.02	≤ 8.00	Pass
11n-HT20	MCS0	11	2462	-13.28	≤ 8.00	Pass

802.11b - PKPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11g - PKPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT20 - PKPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-04-28~2023-04-29	Remark	2.4G WIFI#2

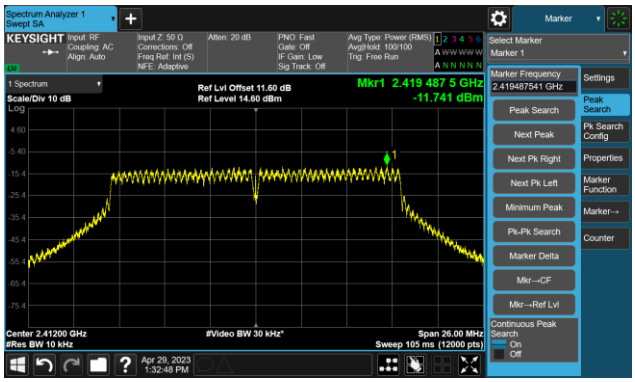
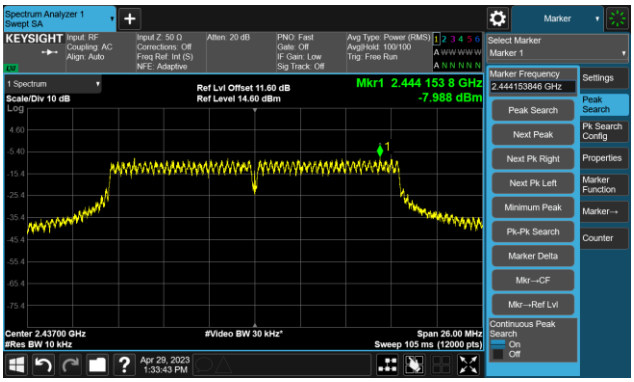
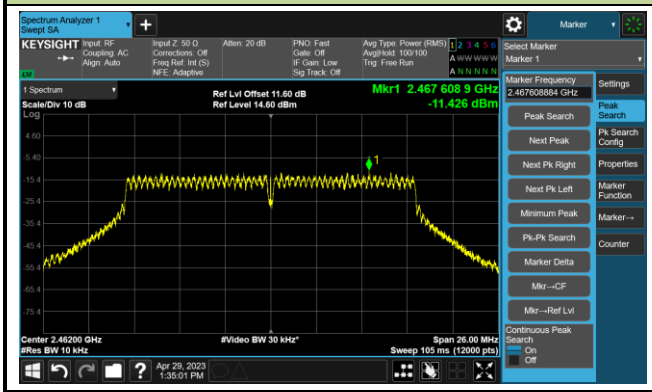
Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	AV PSD (dBm/3KHz)	Total AV PSD (dBm/3KHz)	Limit (dBm / 3kHz)	Result
11b	1Mbps	01	2412	-4.148	-4.148	≤ 8.00	Pass
11b	1Mbps	06	2437	-2.019	-2.019	≤ 8.00	Pass
11b	1Mbps	11	2462	-3.993	-3.993	≤ 8.00	Pass
11g	6Mbps	01	2412	-11.741	-11.401	≤ 8.00	Pass
11g	6Mbps	06	2437	-7.988	-7.648	≤ 8.00	Pass
11g	6Mbps	11	2462	-11.426	-11.086	≤ 8.00	Pass
11n-HT20	MCS0	01	2412	-12.701	-12.326	≤ 8.00	Pass
11n-HT20	MCS0	06	2437	-8.948	-8.573	≤ 8.00	Pass
11n-HT20	MCS0	11	2462	-12.759	-12.384	≤ 8.00	Pass
11n-HT40	MCS0	03	2422	-14.149	-13.666	≤ 8.00	Pass
11n-HT40	MCS0	06	2437	-9.729	-9.246	≤ 8.00	Pass
11n-HT40	MCS0	09	2452	-13.927	-13.444	≤ 8.00	Pass

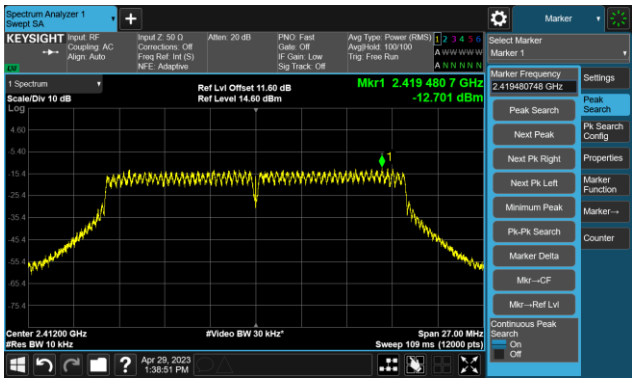
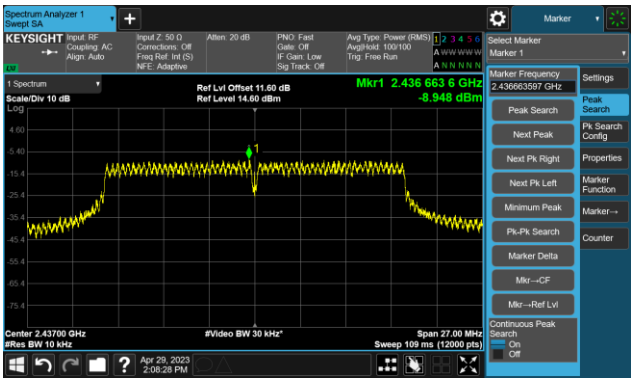
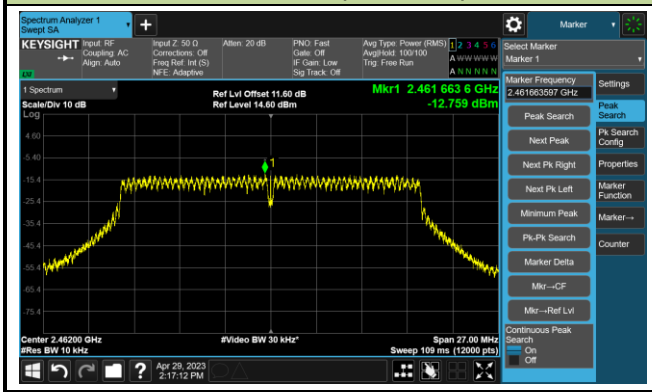
Note:

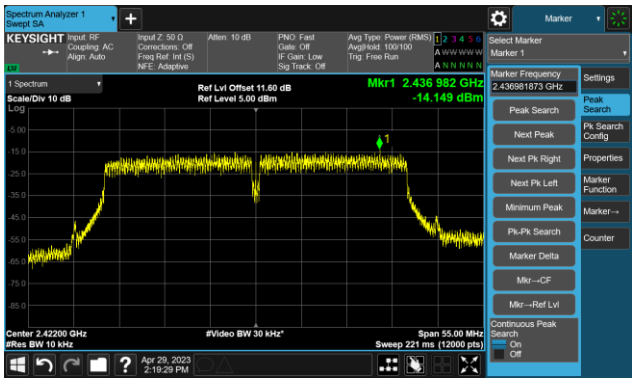
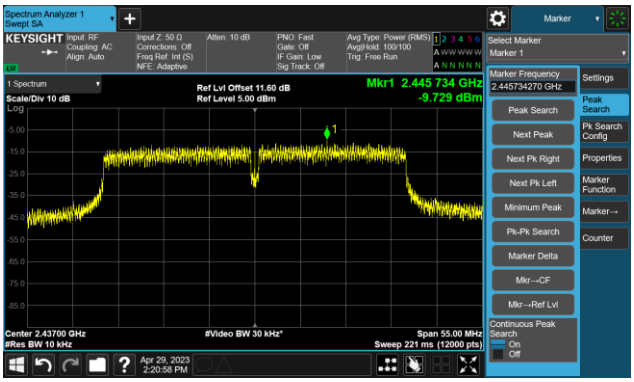
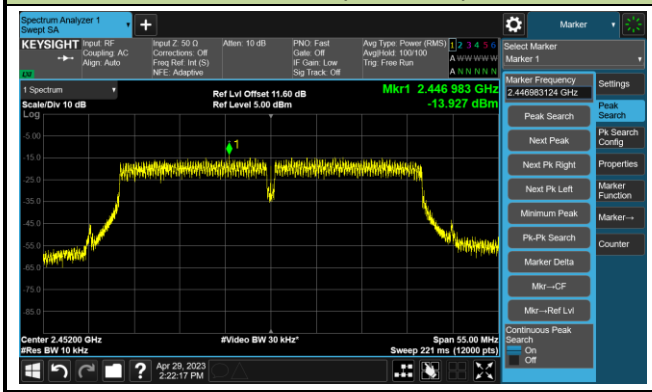
When EUT duty cycle ≥ 98%, the total AV PSD (dBm/10kHz) = AV PSD (dBm/10kHz)

When EUT duty cycle < 98%, the total AV PSD (dBm/10kHz) = AV PSD (dBm/10kHz) + 10*log (1/Duty cycle).

802.11b - AVPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11g - AVPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

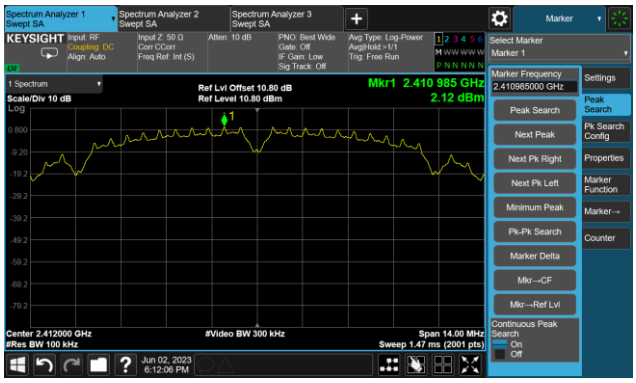
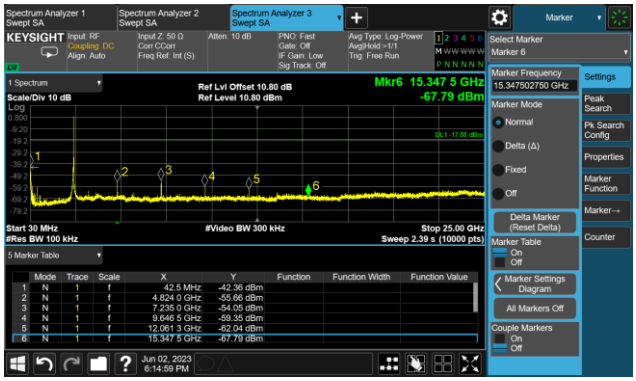
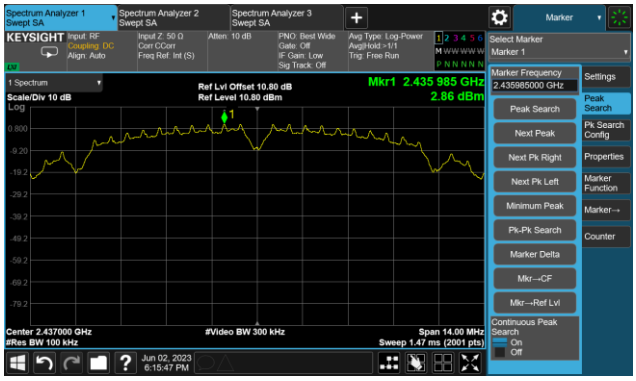
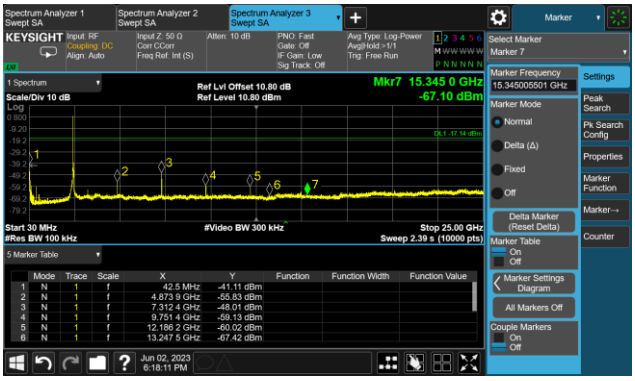
802.11n-HT20 - AVPSD	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

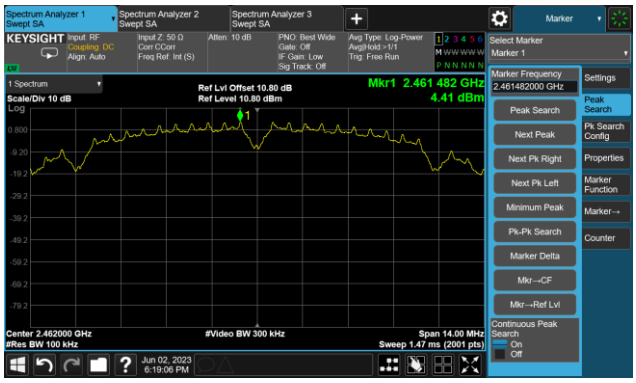
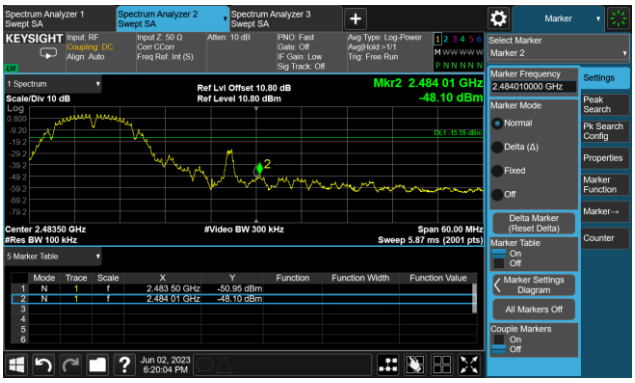
802.11n-HT40 - AVPSD	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

A.5 Conducted Band Edge and Out-of-Band Emissions Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2023-06-02	Remark	2.4G WIFI#1

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit
11b	1Mbps	01	2412	20dBc
11b	1Mbps	06	2437	20dBc
11b	1Mbps	11	2462	20dBc
11g	6Mbps	01	2412	20dBc
11g	6Mbps	06	2437	20dBc
11g	6Mbps	11	2462	20dBc
11n-HT20	MCS0	01	2412	20dBc
11n-HT20	MCS0	06	2437	20dBc
11n-HT20	MCS0	11	2462	20dBc

802.11b Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD Reference Level	Low Band Edge
	
Spurious Emission	
	
Channel 06 (2437MHz)	
100kHz PSD Reference Level	Spurious Emission
	

802.11b Out-of-Band Emissions	
Channel 11 (2462MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission