TEST REPORT

Applicant:	Seccua LLC
Address:	1601 Concord Pike Wilmington, DE 19803-3600
Equipment Type:	UH15
Model Name:	iUH15
Brand Name:	Mann+ Hummel
FCC ID:	2BA72-IUH15
Test Standard:	47 CFR Part 15 Subpart C (refer section 3.1)
Sample Arrival Date:	Apr. 12, 2023
Test Date:	Apr. 18, 2023 - Apr. 23, 2023
Date of Issue:	Jun. 05, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Julie Zhu **Checked by:** Ye Hongji **Approved by:** Liao Jianming

(Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Jun. 05, 2023	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Seccua LLC
Address	1601 Concord Pike Wilmington, DE 19803-3600

2.2 Manufacturer Information

Manufacturer	MANN+HUMMEL
Address	Schwieberdinger Straße 12671636 Ludwigsburg

2.3 Factory Information

Factory	Shenzhen Valley Ventures Ltd
Address	Room 901, 9F, Block 4, Cloud Park, Bantian Street, Longgang District, Shenzhen, China

2.4 General Description for Equipment under Test (EUT)

EUT Name	UH15
Model Name Under Test	iUH15
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V4.0
Software Version	V0.9.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/HT40)

The requirement for the following technical information of the EUT was tested in this report:

Frequency Range	802.11b/g/n(20 MHz): 2.412 GHz - 2.462 GHz f_c = 2412 MHz + (N-1)*5 MHz, where - f_c = “Operating Frequency” in MHz, - N = “Channel Number” with the range from 1 to 11. 802.11n(40 MHz): 2.422 GHz - 2.452 GHz f_c = 2412 MHz + (N-1)*5 MHz, where - f_c = “Operating Frequency” in MHz, - N = “Channel Number” with the range from 3 to 9.
Modulation Type	DSSS, OFDM
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Antenna System (eg., MIMO, Smart Antenna)	N/A
Categorization as Correlated or Completely Uncorrelated	N/A
Antenna Type	FPC Antenna
Antenna Gain	4.83 dBi
About the Product	Only the WIFI 802.11b, 802.11g and 802.11n (HT20/40) was tested in this report.

Modulation technology	Modulation Type	Transfer Rate (Mbps)(Single RF path)
DSSS (802.11b)	DBPSK	1
	DQPSK	2
	CCK	5.5/11
OFDM (802.11g)	BPSK	6/9
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54
OFDM (802.11n-20 MHz)	BPSK	6.5/7.2
	QPSK	13/19.5/14.4/21.7
	16QAM	26/39/28.9/43.3
	64QAM	52/58.5/65/57.8/65/72.2
OFDM (802.11n-40 MHz)	BPSK	13.5/15
	QPSK	27/40.5/30/45
	16QAM	54/81/60/90
	64QAM	108/121.5/135/120/150

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	
Output Power	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Occupied Bandwidth	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Conducted Spurious Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Conducted Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Radiated Spurious Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Band Edge	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Power spectral density (PSD)	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9

Note: The above EUT information in section 2.4 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional radiators of radio frequency equipment
2	ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
3	KDB Publication 558074 D01v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES

3.2 Test Verdict

No.	Description	FCC PART No.	Test Result	Verdict
1	Antenna Requirement	15.203	N/A	Pass[Note 1]
2	Output Power	15.247 (b)	ANNEX A.1	Pass
3	Occupied Bandwidth	15.247 (a)	ANNEX A.2	Pass
4	Conducted Spurious Emission	15.247 (d)	ANNEX A.3	Pass
5	Band Edge(Authorized-band band-edge)	15.247 (d)	ANNEX A.4	Pass
6	Conducted Emission	15.207	ANNEX A.5	Pass
7	Radiated Spurious Emission	15.209; 15.247 (d)	ANNEX A.6	Pass
8	Band Edge(Restricted-band band-edge)	15.209; 15.247 (d)	ANNEX A.7	Pass
9	Power spectral density (PSD)	15.247 (e)	ANNEX A.8	Pass
10	Receiver Spurious Emissions	N/A	N/A	N/A [Note 2]

Note [1]: Please refer to section 5.1.

Note [2]: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	52% to 67%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.3℃ to +24.7℃
Working Voltage of the EUT	NV (Normal Voltage)	24.0 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY50330200	2022.05.19	2023.05.18
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2022.12.28	2023.12.27
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2022.09.06	2023.09.05
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2022.06.29	2023.06.28
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2021.05.19	2024.05.08
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2021.07.02	2024.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2022.02.19	2024.08.15
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2022.09.09	2023.09.08
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	00883	2022.04.01	2025.03.31
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2021.04.16	2024.04.15
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	130	2021.08.15	2024.08.14
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2022.09.09	2023.09.08
LISN	SCHWARZBECK	NSLK 8127	8127-687	2022.06.01	2023.05.31
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2022.02.19	2025.02.18
Amplifier	COM-MV	LSCX_LNA1-12G-01	180602	2020.09.08	2023.09.07
Amplifier	COM-MV	XKu_LNA7-18G-01	180601	2020.09.08	2023.09.07
Amplifier	COM-MV	KA_LNA18-40G-01	18050001	2020.09.08	2023.09.07
Amplifier	COM-MV	ZT30-1000M	B2017119082	2022.12.07	2023.12.06

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable test Setup
BL410R	BALUN	V2.1.1.488	N/A	The section 4.5.1
BL410E	BALUN	V19.8.28.435	N/A	The section 4.5.2&4.5.3&4.5.4&4.5.5

4.4 Measurement Uncertainty

The following measurement 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.

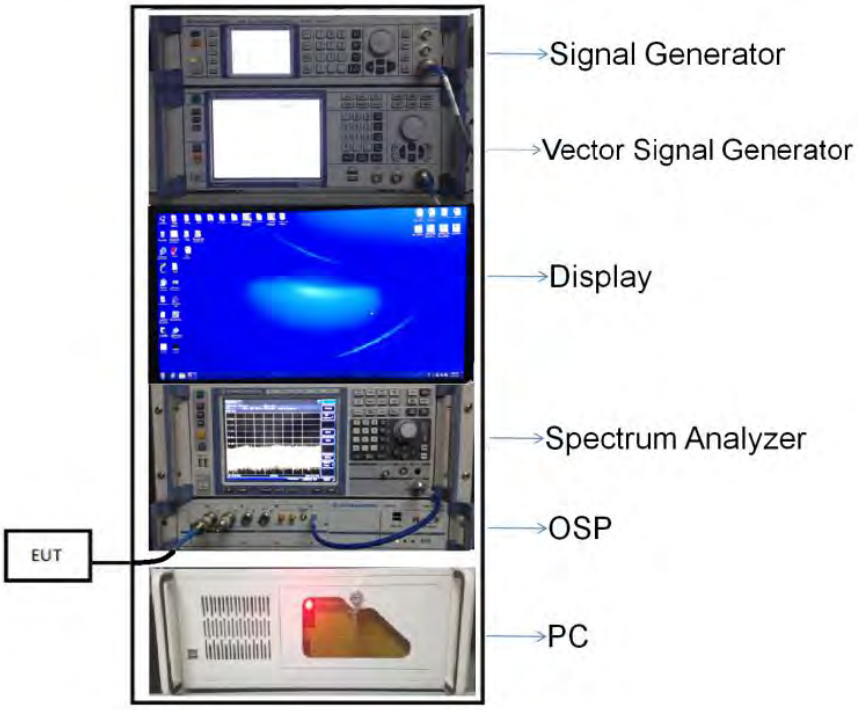
Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.82℃
Humidity	4.1%

4.5 Description of Test Setup

4.5.1 For Antenna Port Test

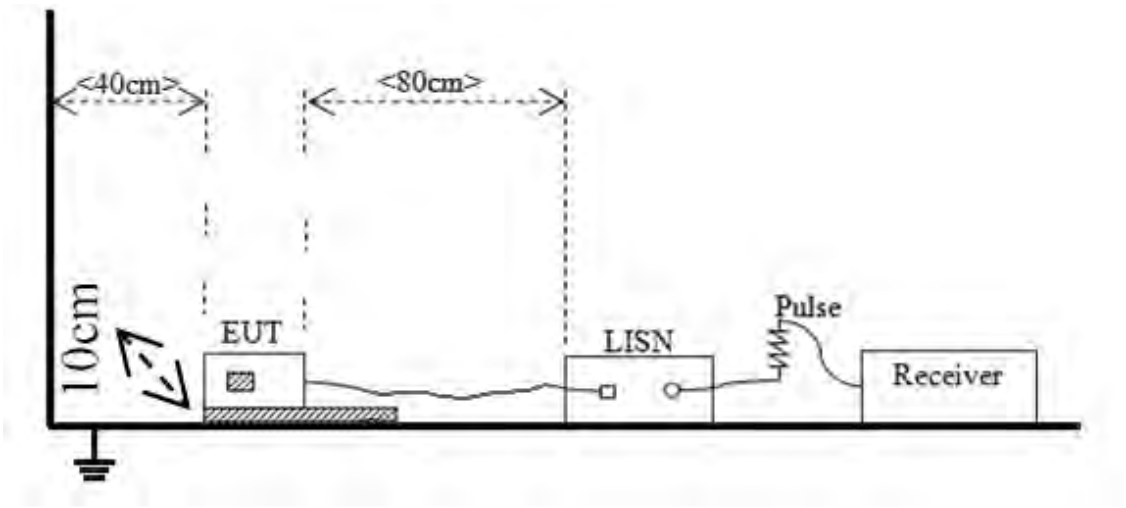
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT: Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



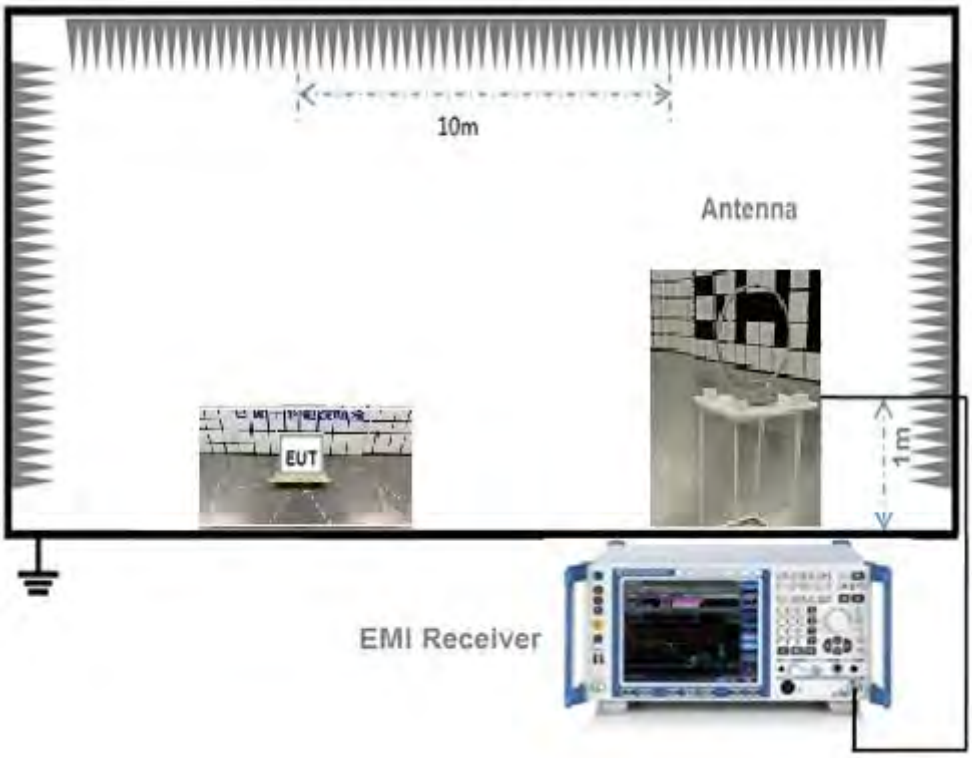
(Diagram 1)

4.5.2 For AC Power Supply Port Test



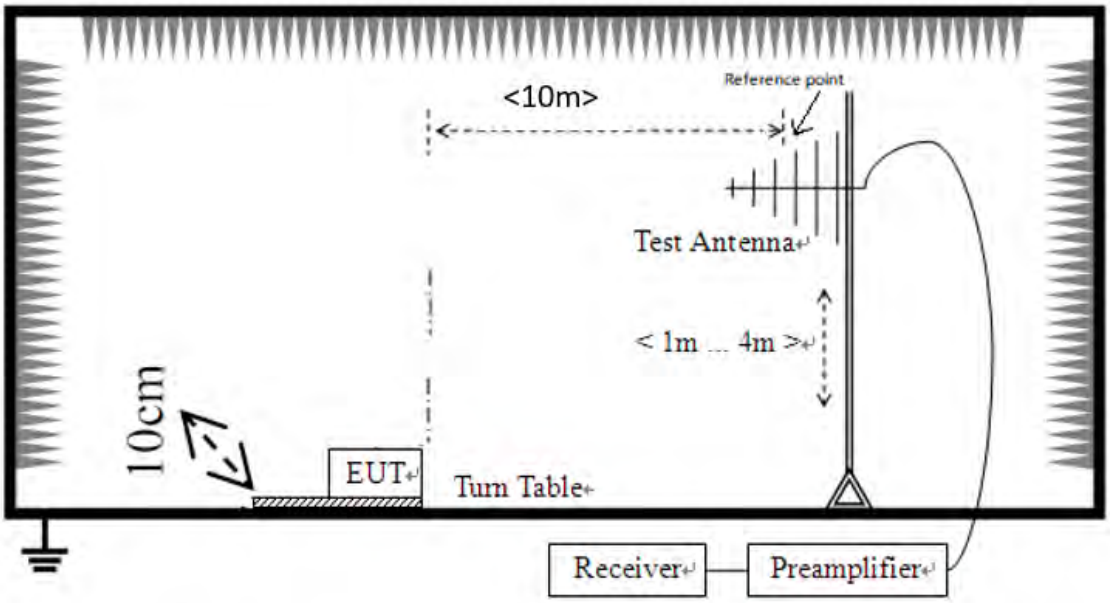
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



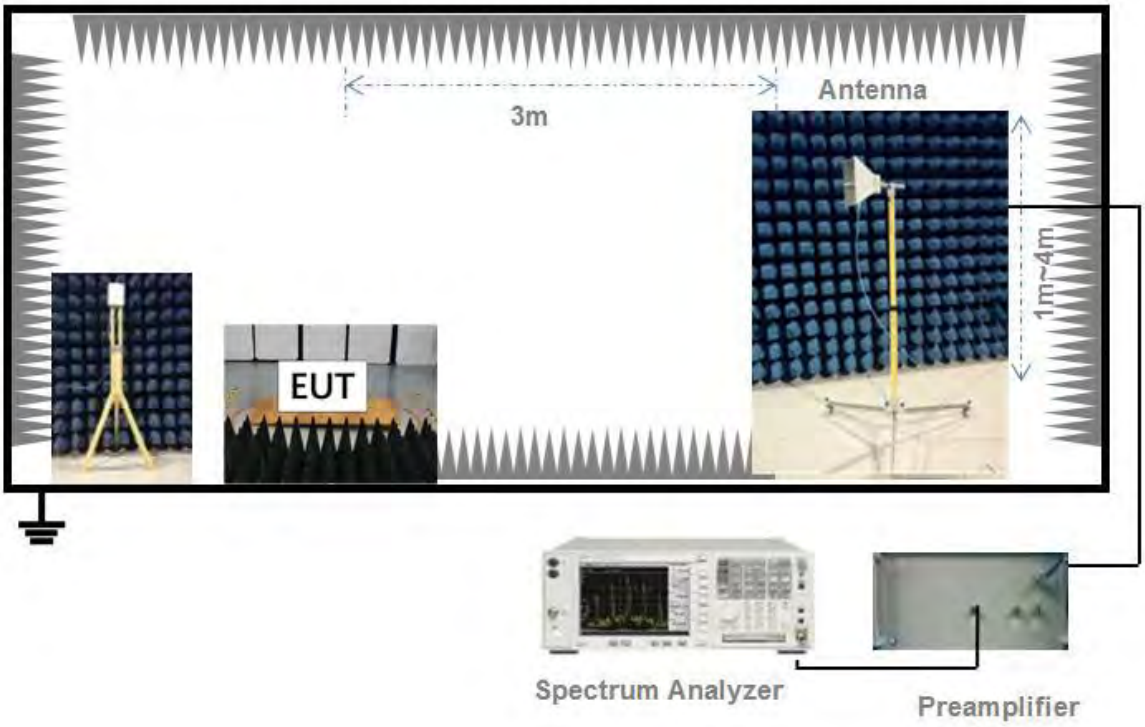
(Diagram 3)

4.5.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.5.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.6 Measurement Results Explanation Example

4.6.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

4.6.2 For radiated band edges and spurious emission test:

$$E = EIRP - 20\log D + 104.8$$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

EIRP= Measure Conducted output power Value (dBm) + Maximum transmit antenna gain (dBi) + the appropriate maximum ground reflection factor (dB)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Output Power

5.2.1 Test Limit

FCC § 15.247(b)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements.

5.2.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Maximum peak conducted output power

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

Maximum conducted (average) output power (Reporting Only)

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be perfor med

using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.

2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a

factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output si gnal as

described in Section 6.0.

c) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

d) Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement r esult.

Measurements of duty cycle

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission.

Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.

Set VBW ≥ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 Occupied Bandwidth

5.3.1 Limit

FCC §15.247(a)

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.

5.3.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Use the following spectrum analyzer settings:

Set RBW = 100 kHz.

Set the video bandwidth (VBW) ⩾ 3 RBW.

Detector = Peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

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 6 dB relative to the maximum level measured in the fundamental emission.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Conducted Spurious Emission

5.4.1 Limit

FCC §15.247(d)

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.

5.4.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

a) If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

b) If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

c) In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required.

The following procedures shall be used to demonstrate compliance to these limits. Note that these procedures can be used in either an antenna-port conducted or radiated test set-up. Radiated tests must conform to the test site requirements and utilize maximization procedures defined herein.

<u>Reference level measurement</u>

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to ⩾ 1.5 times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW ⩾ 3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.

Emission level measurement

Use the following spectrum analyzer settings:

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.

Set the RBW = 100 kHz.

Set the VBW ⩾ 3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Band Edge (Authorized-band band-edge)

5.5.1 Limit

FCC §15.247(d)

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.

5.5.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The following procedures may be used to determine the peak or average field strength or power of an unwanted emission that is within 2 MHz of the authorized band edge. If a peak detector is utilized, use the procedure described in 13.2.1. Use the procedure described in 13.2.2 when using an average detector and the EUT can be configured to transmit continuously (i.e., duty cycle ⩾ 98%). Use the procedure described in 13.2.3 when using an average detector and the EUT cannot be configured to transmit continuously but the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent). Use the procedure described in 13.2.4 when using an average detector for those cases where the EUT cannot be configured to transmit continuously and the duty cycle is not constant (duty cycle variations equal or exceed 2 percent).

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used.

Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).

Set span to 2 MHz

RBW = 100 kHz.

VBW ⩾ 3 x RBW.

Detector = peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweep to continue until the trace stabilizes (required measurement time may increase for low duty cycle applications)

Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (femission) ± 0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission ± 0.5 MHz.

Standard method(The 99% OBW of the fundamental emission is without 2 MHz of the authorized band):

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 that fall outside of the authorized band of operation.

Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

Attenuation: Auto (at least 10 dB preferred).

Sweep time: Coupled.

Resolution bandwidth: 100 kHz.

Video bandwidth: 300 kHz.

Detector: Peak.

Trace: Max hold.

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Conducted Emission

5.6.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.6.2 Test Setup

See section 4.5.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.6.4 Test Result

Please refer to ANNEX A.5.

5.7 Radiated Spurious Emission

5.7.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.7.2 Test Setup

See section 4.5.3 to 4.5.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

General Procedure for conducted measurements in restricted bands

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$E = EIRP – 20\log D + 104.8$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 1.

b) VBW ≥ 3 x RBW.

c) Detector = Peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be

longer for low duty cycle applications).

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

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle ≥ 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW ≥ 3 x RBW.

e) Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is 20 log(1/x), where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.7.4 Test Result

Please refer to ANNEX A.6.

5.8 Band Edge (Restricted-band band-edge)

5.8.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.8.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

For transmitters operating above 1 GHz repeat the measurement with an average detector.

5.8.4 Test Result

Please refer to ANNEX A.7.

5.9 Power Spectral density (PSD)

5.9.1 Limit

FCC §15.247(e)

The same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

5.9.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz ⩽ RBW ⩽ 100 kHz.

Set the VBW ⩾ 3 RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.9.4 Test Result

Please refer to ANNEX A.8.

ANNEX A TEST RESULT

A.1 Output Power

Duty Cycle

Test Mode	On Time (ms)	On+Off time (ms)	Duty Cycle
802.11b	50.00	50.00	100.00%
802.11g	50.00	50.00	100.00%
802.11n-20 MHz	50.00	50.00	100.00%
802.11n-40 MHz	50.00	50.00	100.00%

Peak Power Test Data

802.11b Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	25.10	323.59	30	1000	Pass
Middle	25.85	384.59			Pass
High	25.56	359.75			Pass

802.11g Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	20.95	124.45	30	1000	Pass
Middle	23.31	214.29			Pass
High	21.62	145.21			Pass

802.11n-20 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	21.18	131.22	30	1000	Pass
Middle	23.49	223.36			Pass
High	21.80	151.36			Pass

802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	20.08	101.86	30	1000	Pass
Middle	23.28	212.81			Pass
High	18.87	77.09			Pass

Average Power Test Data

802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	18.38	68.87	30	1000	Pass
Middle	19.13	81.85			Pass
High	18.85	76.74			Pass

802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	15.31	33.96	30	1000	Pass
Middle	17.70	58.88			Pass
High	15.99	39.72			Pass

802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	15.19	33.04	30	1000	Pass
Middle	17.49	56.10			Pass
High	15.81	38.11			Pass

802.11n-40 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	13.81	24.04	30	1000	Pass
Middle	17.02	50.35			Pass
High	12.61	18.24			Pass

A.2 Occupied Bandwidth

Test Data

802.11b Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	9.150000	13.180000	⩾500
Middle	9.150000	13.222000	⩾500
High	9.600000	13.207000	⩾500

802.11g Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	16.450000	16.677000	⩾500
Middle	16.450000	16.697000	⩾500
High	16.450000	16.651000	⩾500

802.11n-20MHz Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	17.400000	17.393000	⩾500
Middle	17.400000	17.409000	⩾500
High	17.400000	17.391000	⩾500

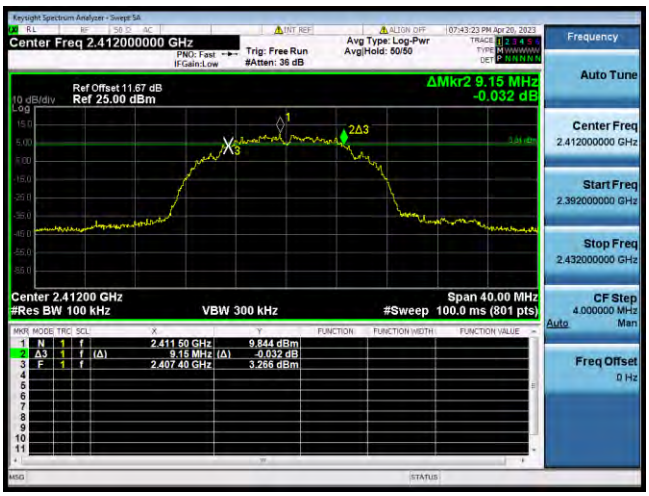
802.11n-40MHz Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	32.900000	34.307000	⩾500
Middle	32.650000	34.336000	⩾500
High	33.000000	34.317000	⩾500

Test Plots

6 dB Bandwidth

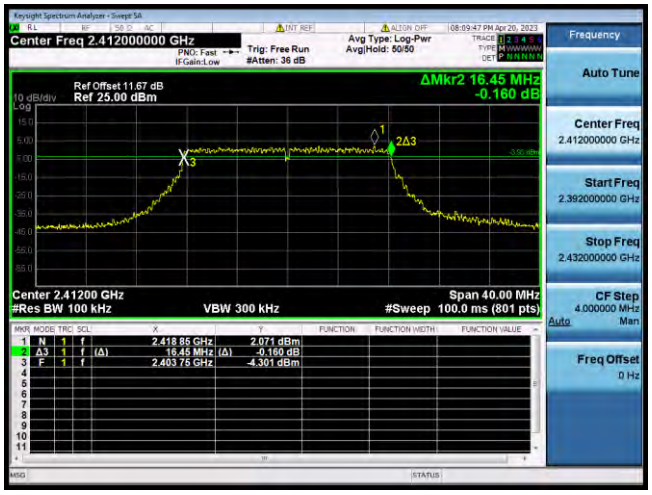
802.11b LOW CHANNEL



802.11b MIDDLE CHANNEL

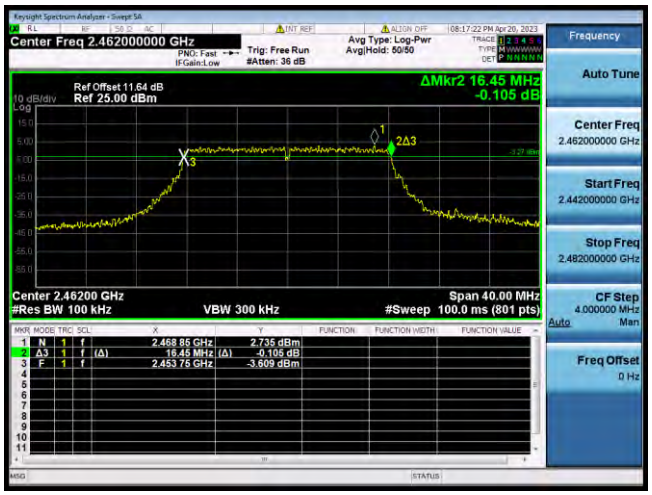
802.11b HIGH CHANNEL

802.11g LOW CHANNEL

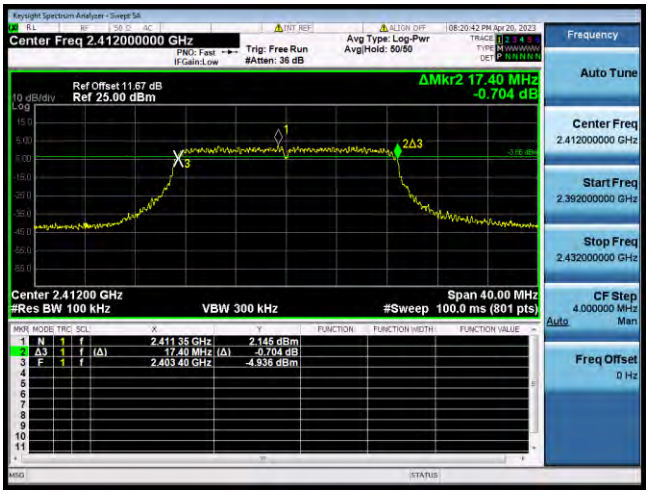


802.11g MIDDLE CHANNEL

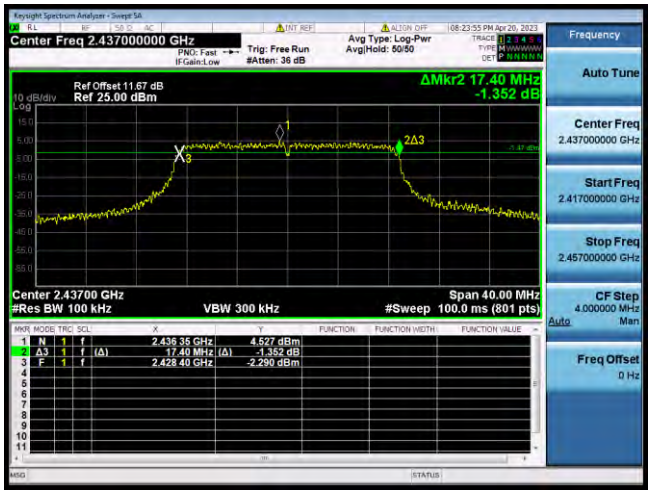
802.11g HIGH CHANNEL



802.11n-20 MHz LOW CHANNEL

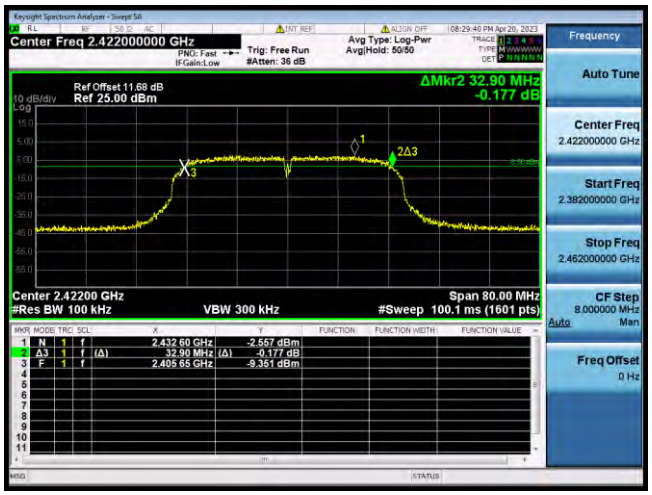


802.11n-20 MHz MIDDLE CHANNEL



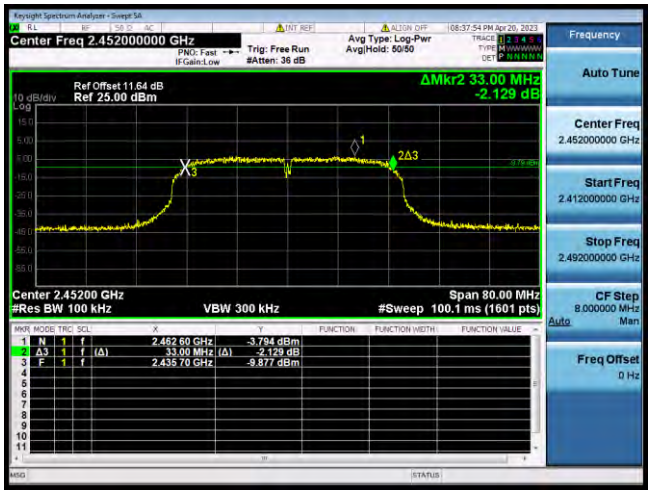
802.11n-20 MHz HIGH CHANNEL

802.11n-40 MHz LOW CHANNEL



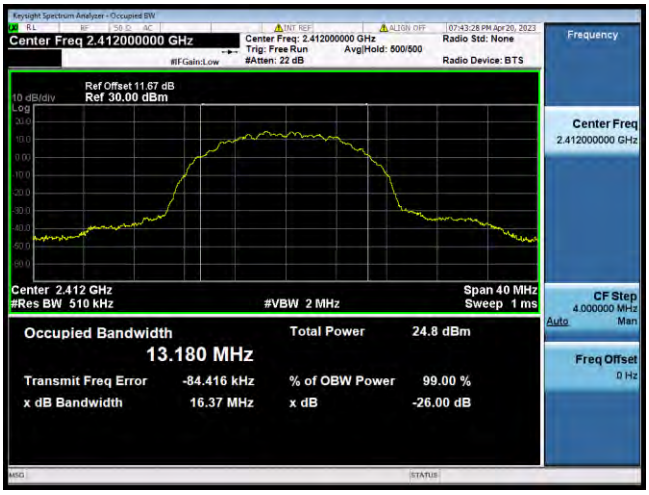
802.11n-40 MHz MIDDLE CHANNEL

802.11n-40 MHz HIGH CHANNEL

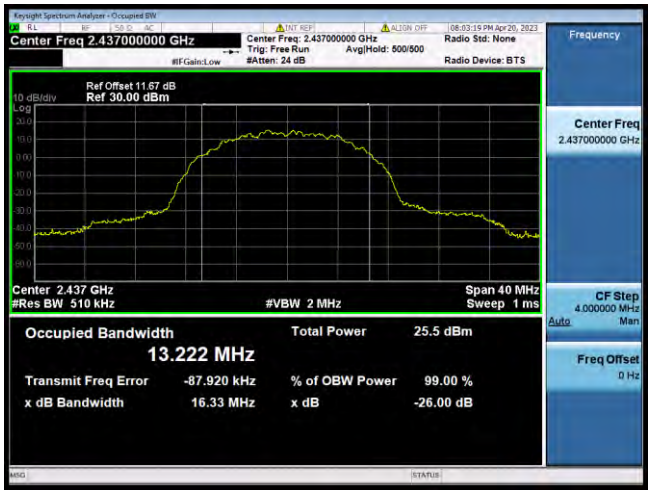


99% Bandwidth

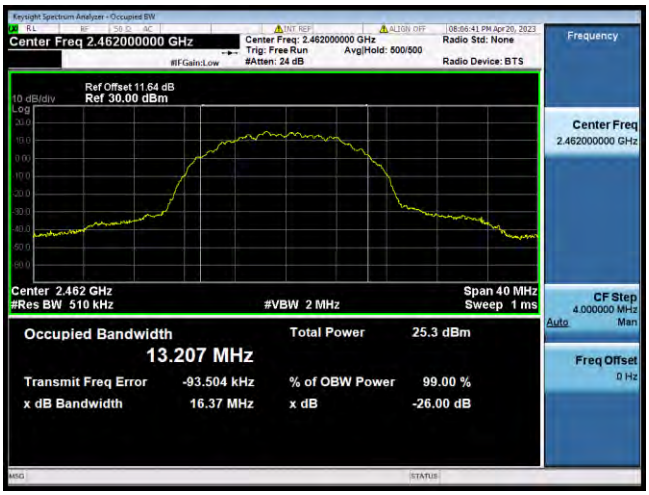
802.11b LOW CHANNEL



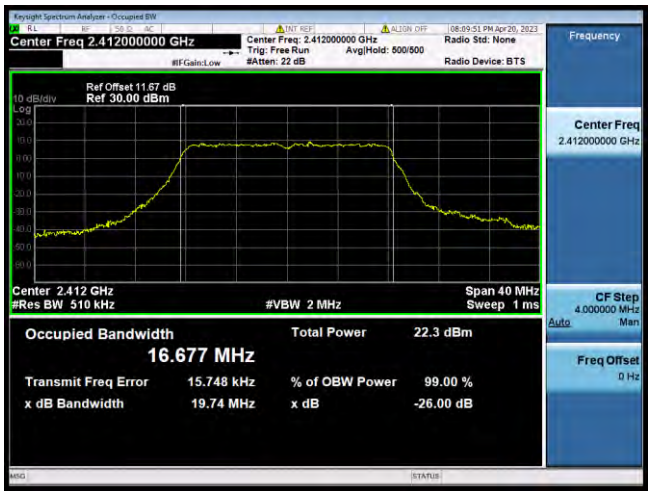
802.11b MIDDLE CHANNEL



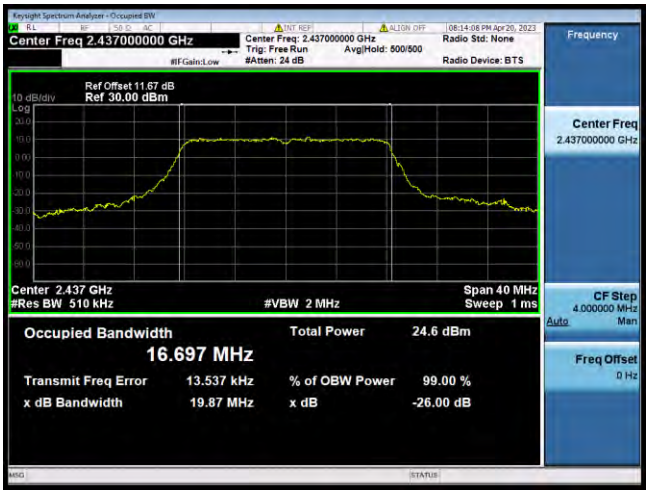
802.11b HIGH CHANNEL



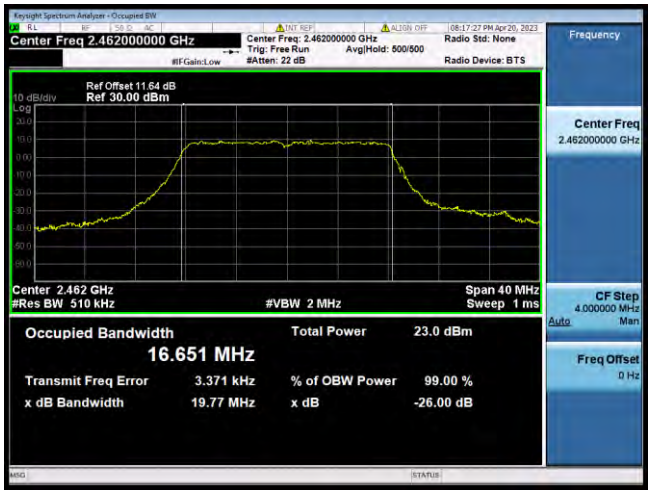
802.11g LOW CHANNEL



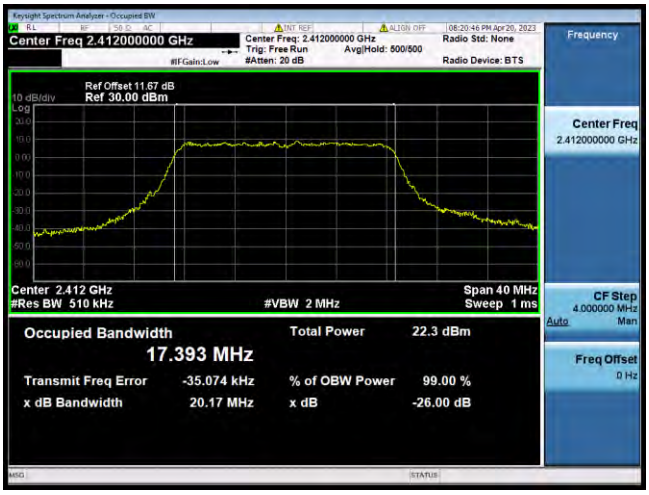
802.11g MIDDLE CHANNEL



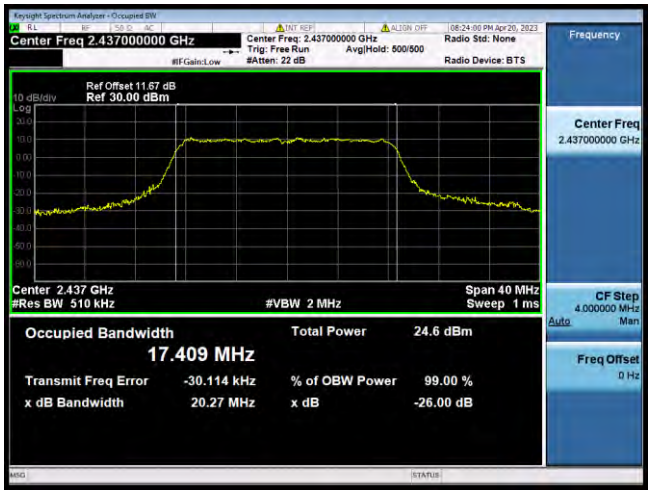
802.11g HIGH CHANNEL



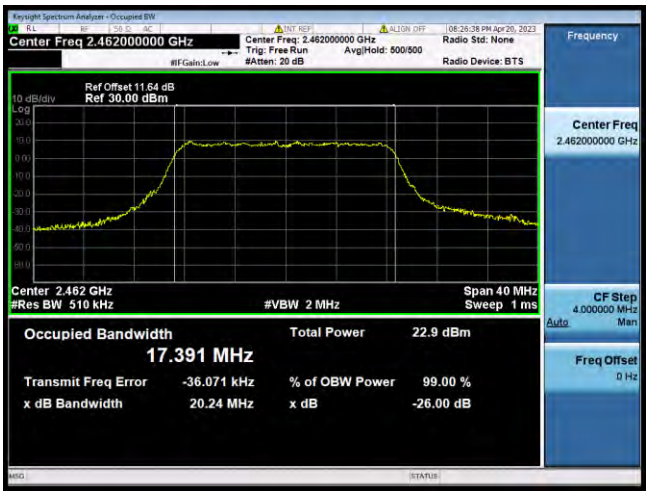
802.11n-20 MHz LOW CHANNEL



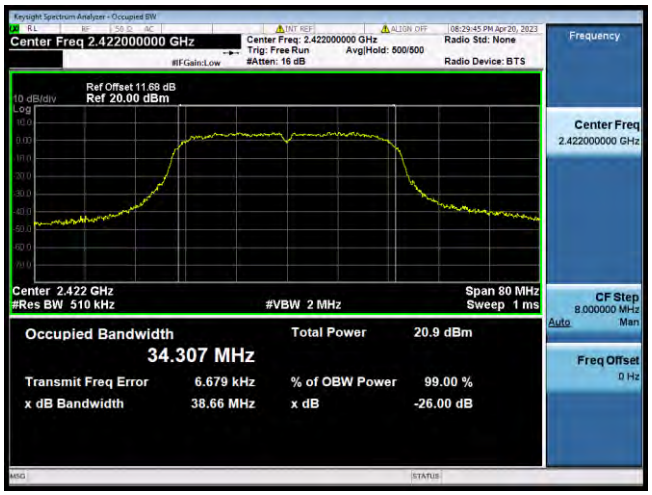
802.11n-20 MHz MIDDLE CHANNEL



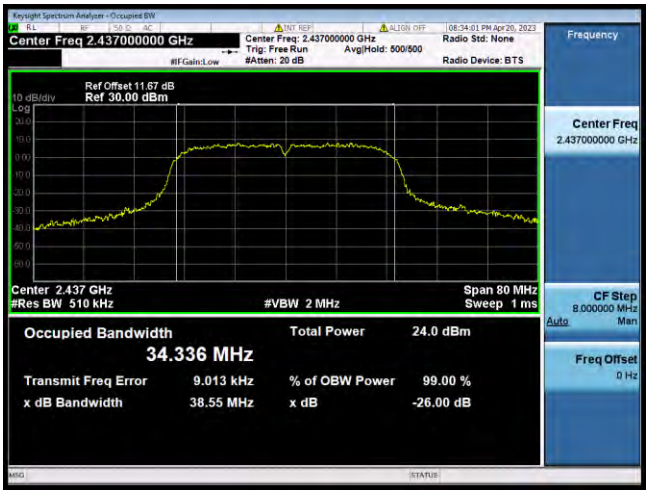
802.11n-20 MHz HIGH CHANNEL



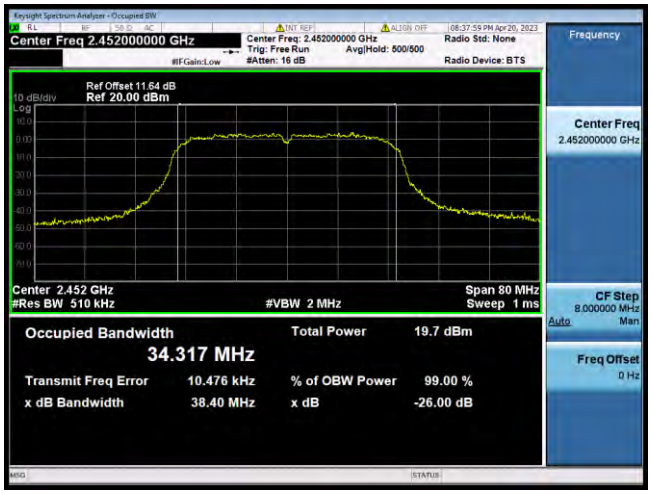
802.11n-40 MHz LOW CHANNEL



802.11n-40 MHz MIDDLE CHANNEL



802.11n-40 MHz HIGH CHANNEL



A.3 Conducted Spurious Emissions

Test Data

802.11b Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-36.84	9.96	-10.04	Pass
Middle	-33.82	10.60	-9.41	Pass
High	-33.64	10.36	-9.64	Pass

802.11g Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-35.74	2.45	-17.55	Pass
Middle	-36.40	4.72	-15.28	Pass
High	-35.69	3.10	-16.90	Pass

802.11n-20MHz Mode:

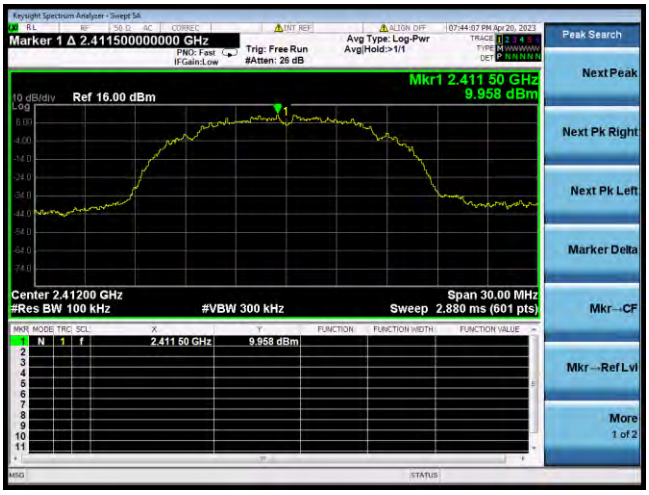
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-35.42	2.56	-17.44	Pass
Middle	-36.07	4.87	-15.13	Pass
High	-36.43	3.18	-16.82	Pass

802.11n-40MHz Mode:

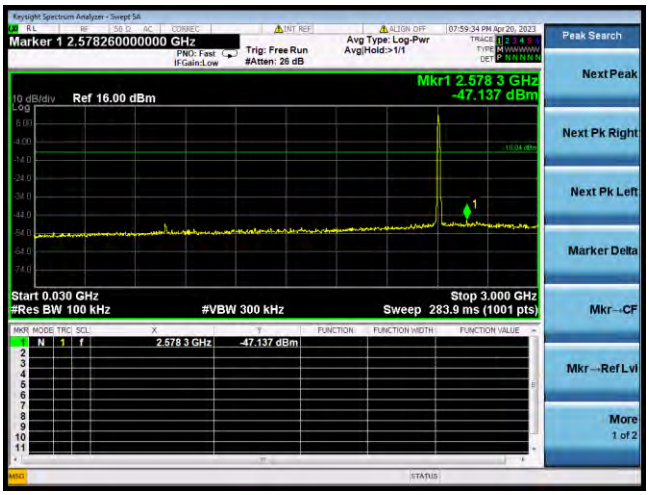
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-36.75	-1.93	-21.93	Pass
Middle	-34.52	1.21	-18.79	Pass
High	-36.67	-3.25	-23.25	Pass

Test Plots

802.11b LOW CHANNEL CARRIER LEVEL

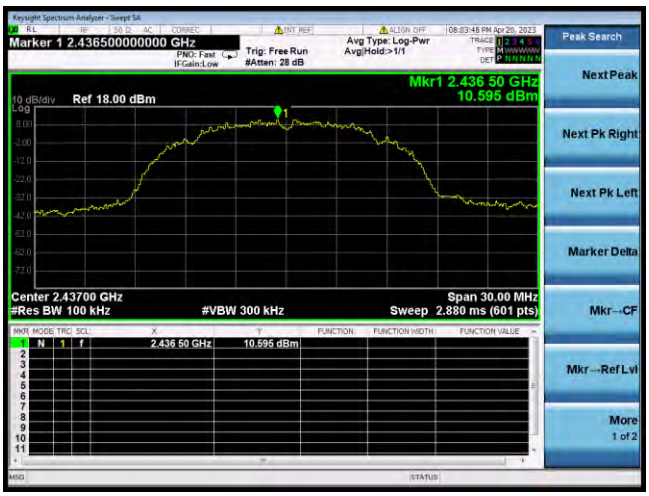


802.11b LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

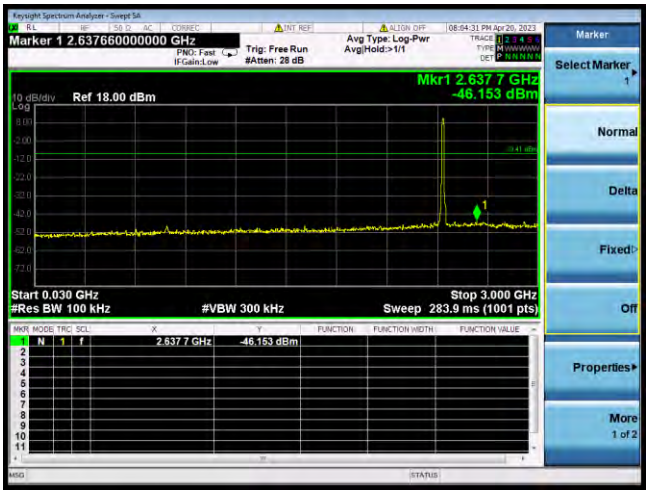


802.11b LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11b MIDDLE CHANNEL CARRIER LEVEL

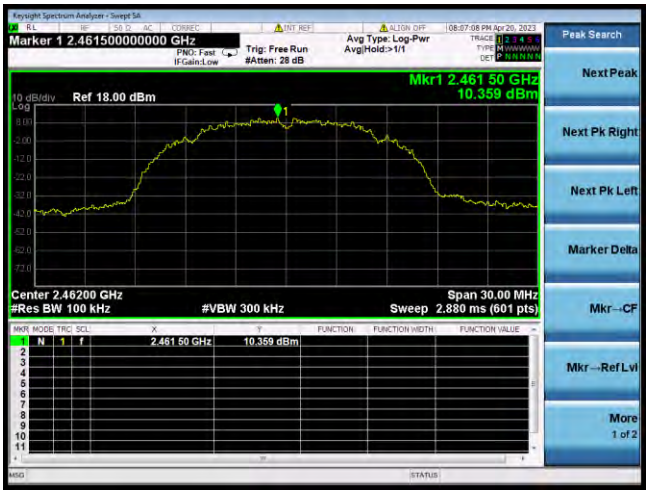


802.11b MIDDLE CHANNEL, SPURIOUS
30 MHz ~ 3 GHz

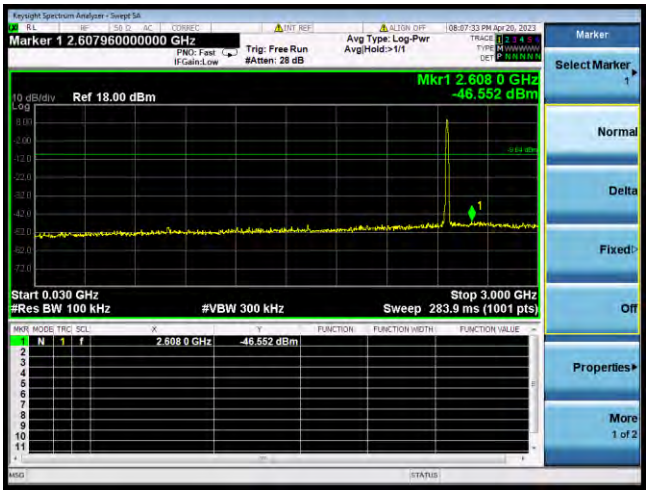


802.11b MIDDLE CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11b HIGH CHANNEL CARRIER LEVEL

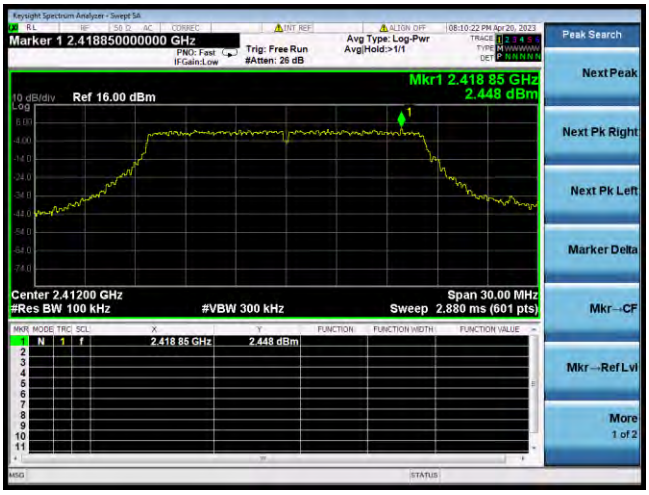


802.11b HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz

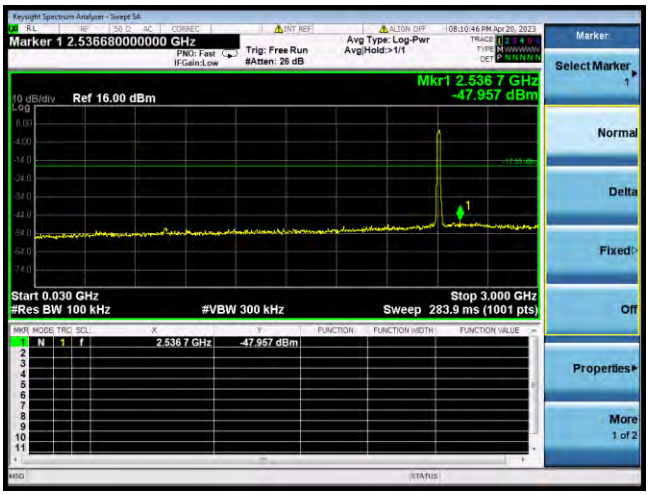


802.11b HIGH CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11g LOW CHANNEL CARRIER LEVEL

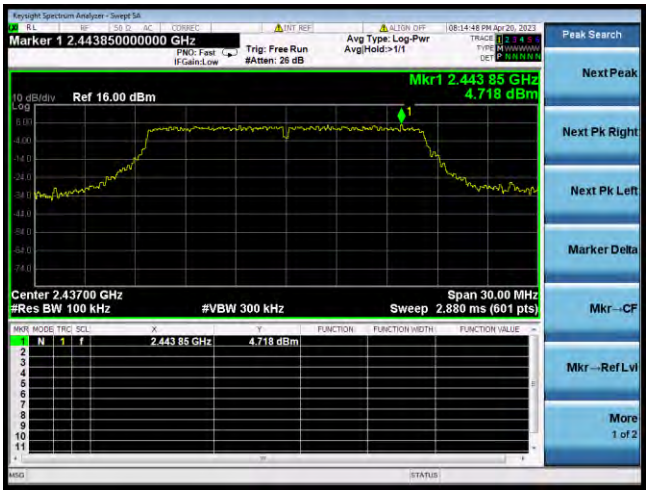


802.11g LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

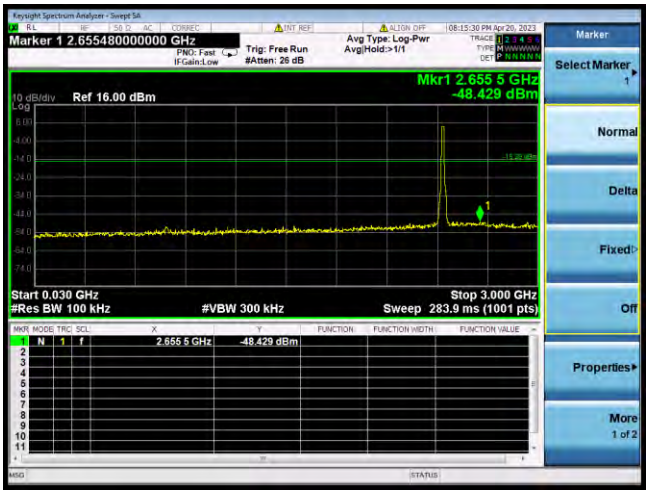


802.11g LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11g MIDDLE CHANNEL CARRIER LEVEL

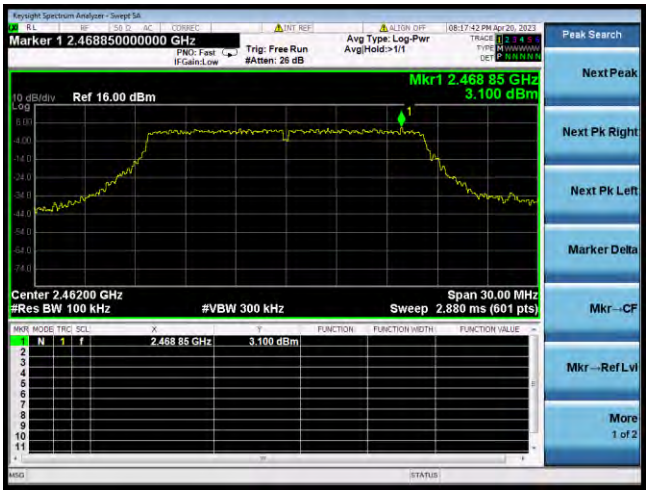


802.11g MIDDLE CHANNEL, SPURIOUS
30 MHz ~ 3 GHz

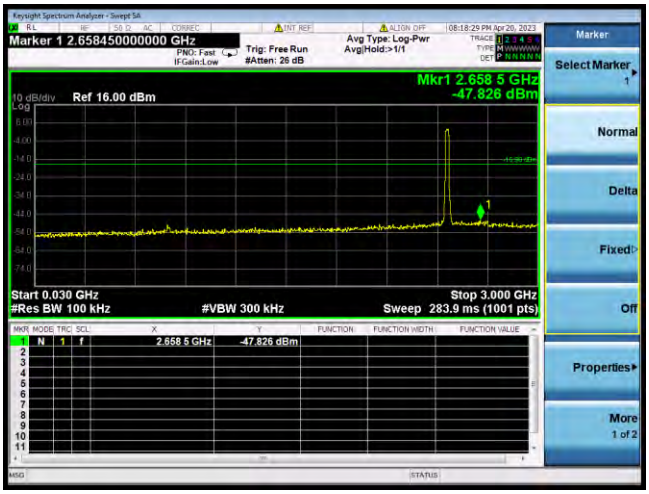


802.11g MIDDLE CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11g HIGH CHANNEL CARRIER LEVEL

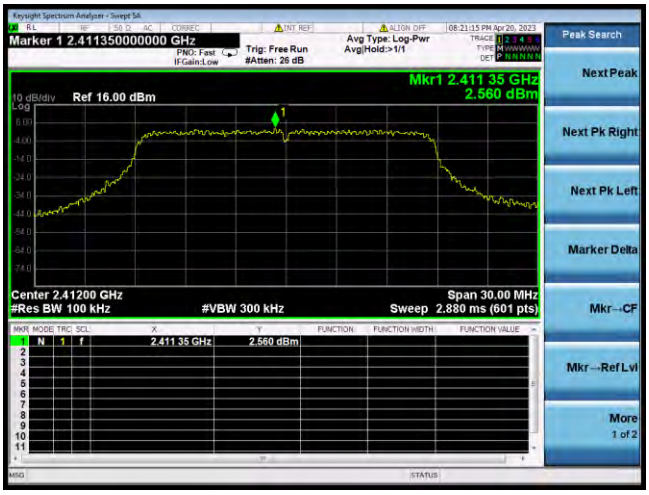


802.11g HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz

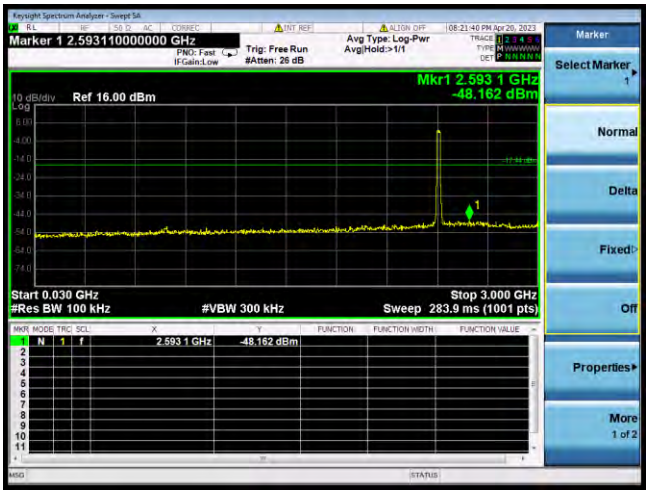


802.11g HIGH CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11n-20 MHz LOW CHANNEL CARRIER LEVEL

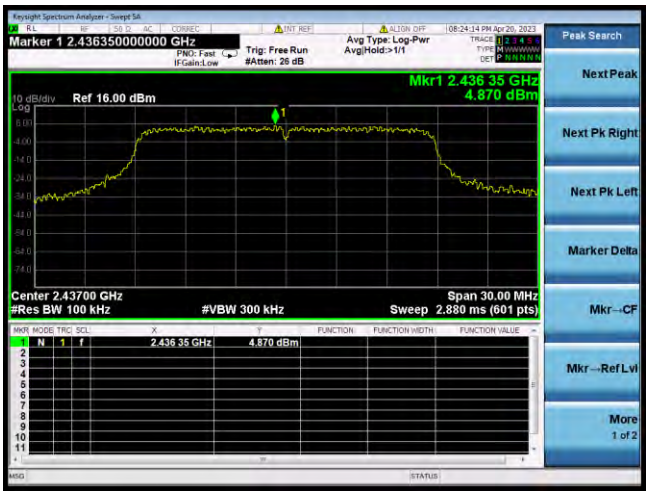


802.11n-20 MHz LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

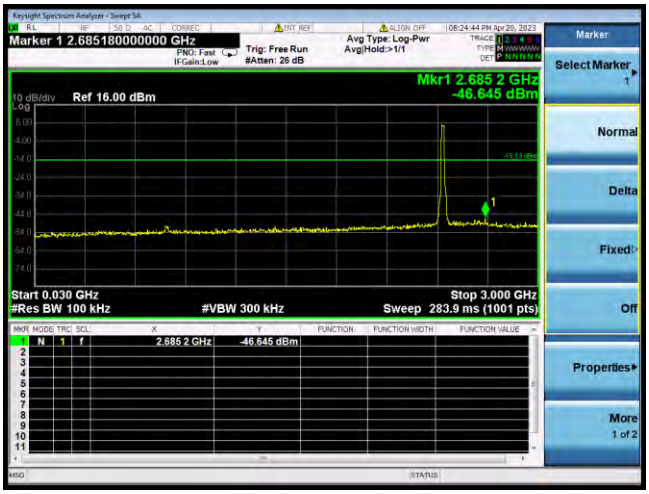


802.11n-20 MHz LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11n-20 MHz MIDDLE CHANNEL CARRIER LEVEL

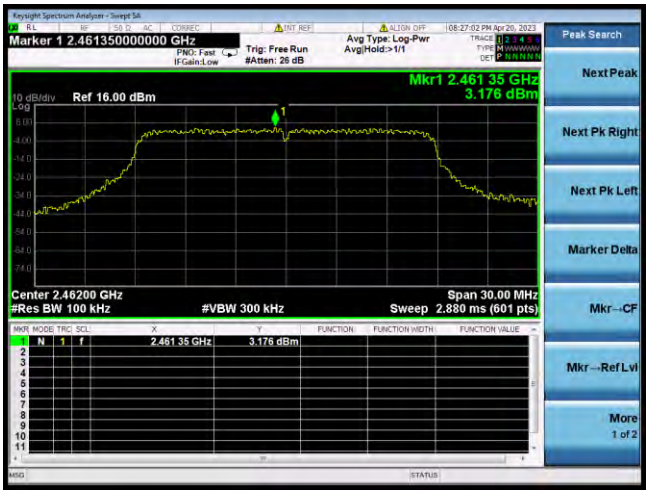


802.11n-20 MHz MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

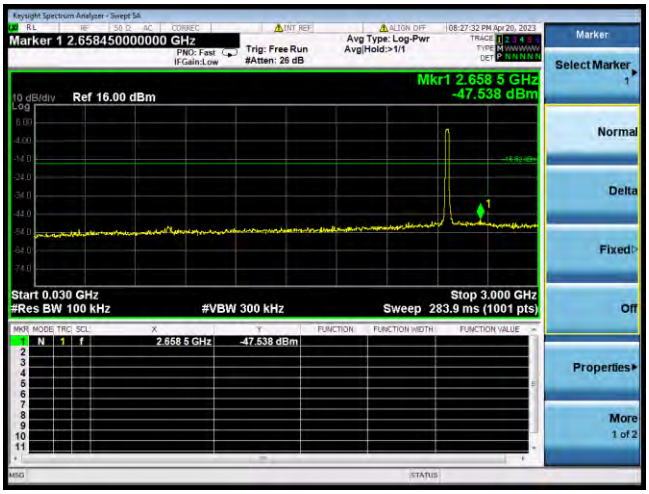


802.11n-20 MHz MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11n-20 MHz HIGH CHANNEL CARRIER LEVEL

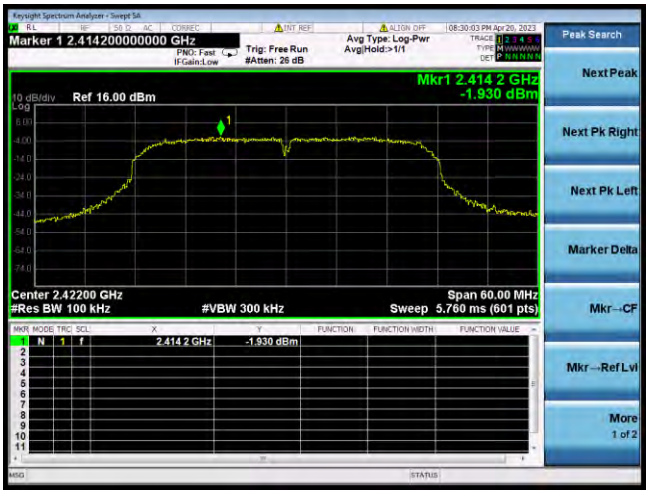


802.11n-20 MHz HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

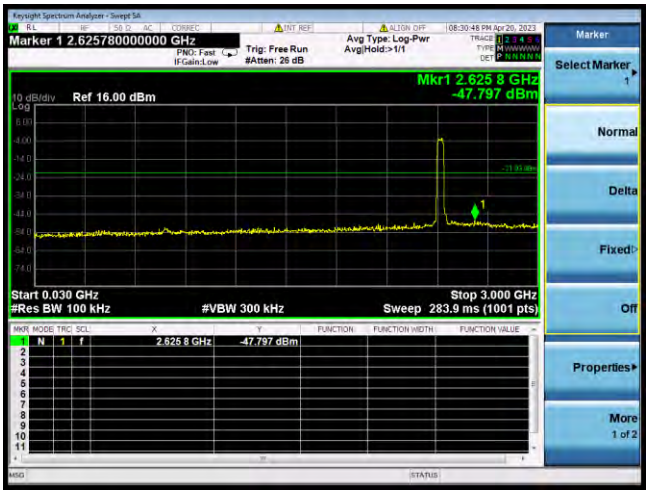


802.11n-20 MHz HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11n-40 MHz LOW CHANNEL CARRIER LEVEL

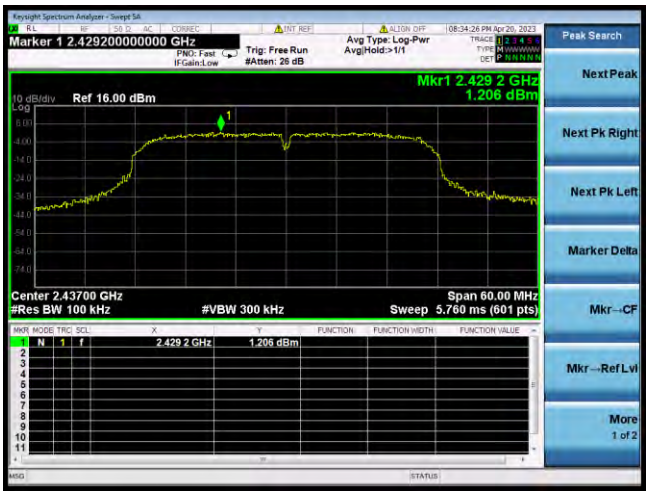


802.11n-40 MHz LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

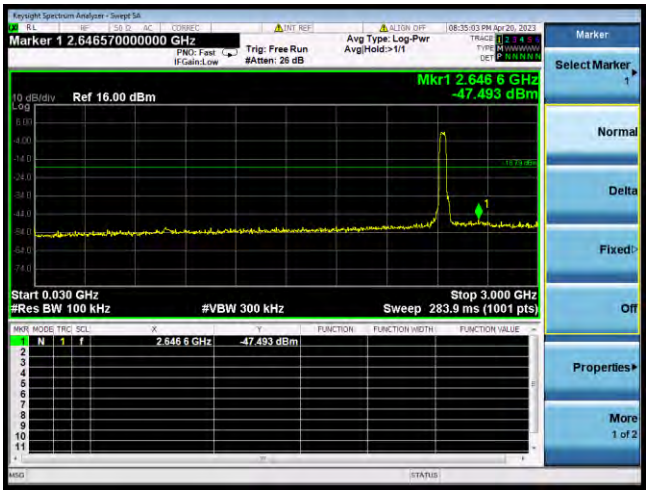


802.11n-40 MHz LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11n-40 MHz MIDDLE CHANNEL CARRIER LEVEL

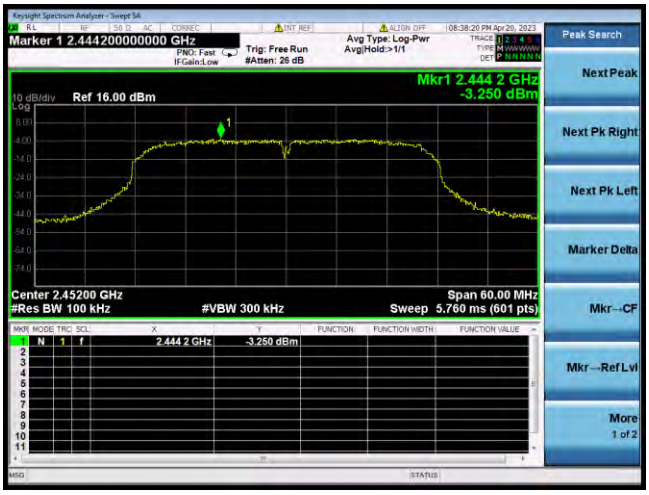


802.11n-40 MHz MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

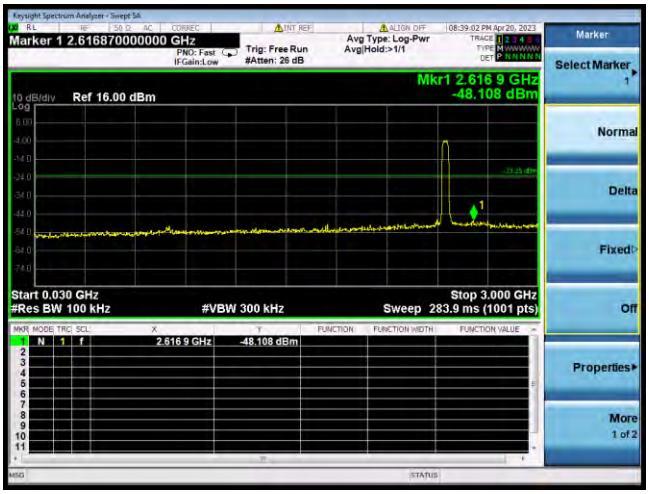


802.11n-40 MHz MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11n-40 MHz HIGH CHANNEL CARRIER LEVEL



802.11n-40 MHz HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11n-40 MHz HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

A.4 Band Edge (Authorized-band band-edge)

Note: The 99% OBW of the fundamental emission is without 2 MHz of the authorized band.

Test Data

802.11b Mode：

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-38.49	9.96	-10.04	Pass
High Channel	-44.59	10.36	-9.64	Pass

802.11g Mode：

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-34.92	2.45	-17.55	Pass
High Channel	-43.14	3.10	-16.90	Pass

802.11n-20 MHz Mode:

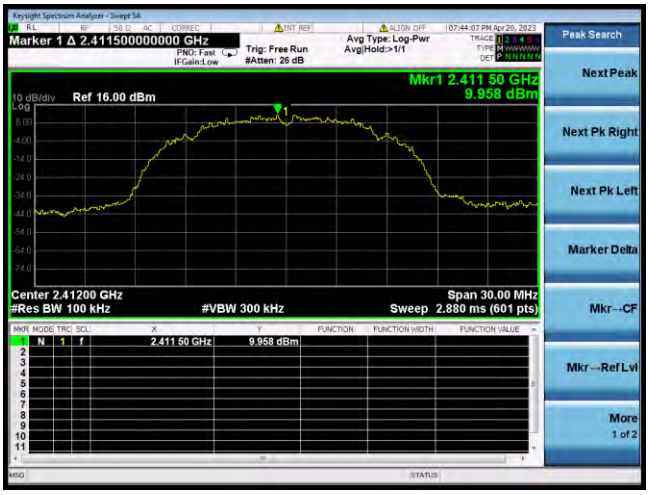
Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-34.72	2.56	-17.44	Pass
High Channel	-42.18	3.18	-16.82	Pass

802.11n-40 MHz Mode:

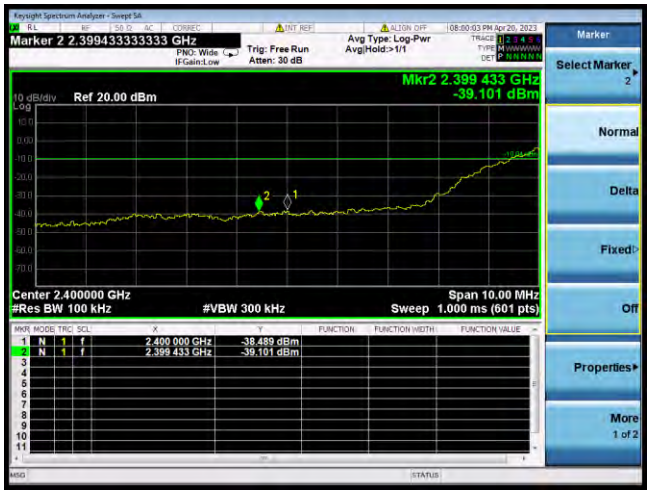
Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-38.73	-1.93	-21.93	Pass
High Channel	-42.82	-3.25	-23.25	Pass

Test Plots

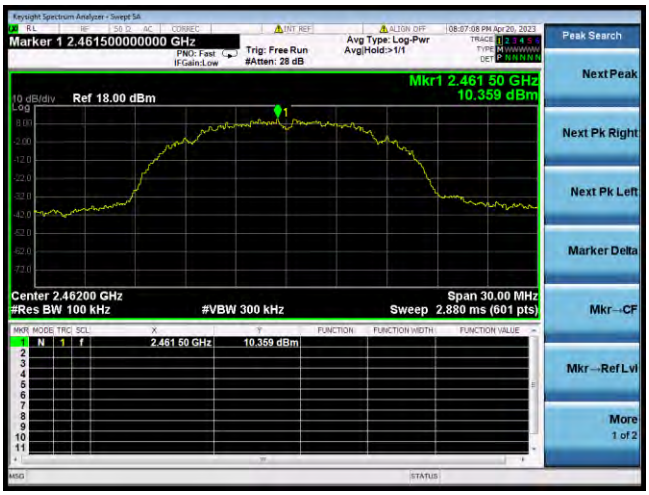
802.11b LOW CHANNEL, CARRIER LEVEL



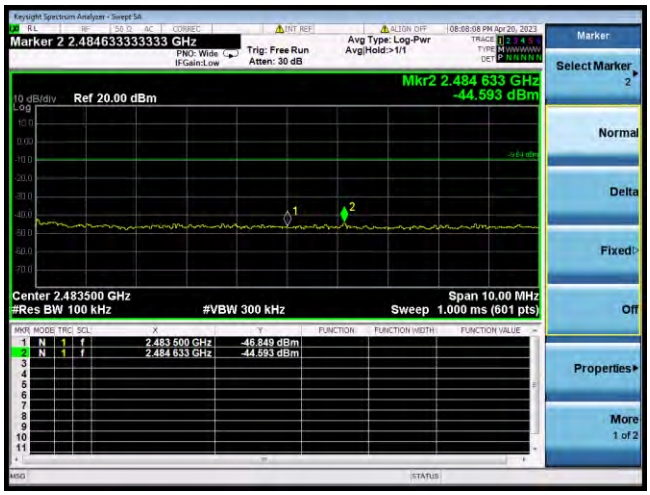
802.11b LOW CHANNEL, BAND EDGE



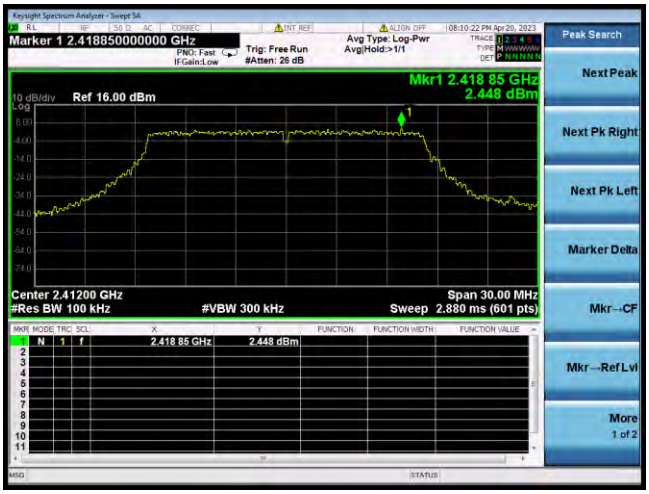
802.11b HIGH CHANNEL, CARRIER LEVEL



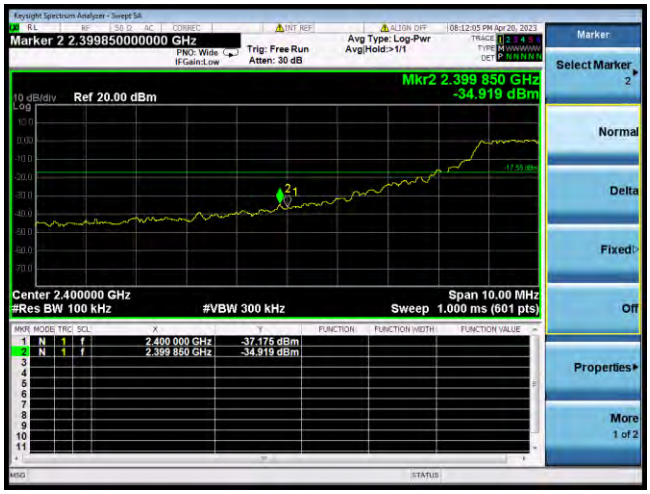
802.11b HIGH CHANNEL, BAND EDGE



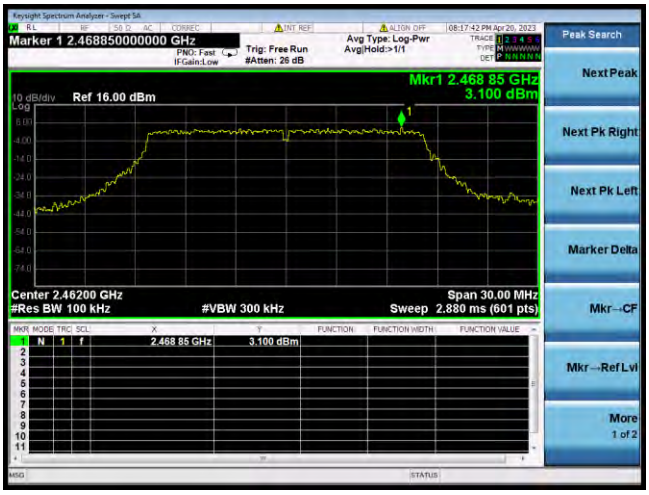
802.11g LOW CHANNEL, CARRIER LEVEL



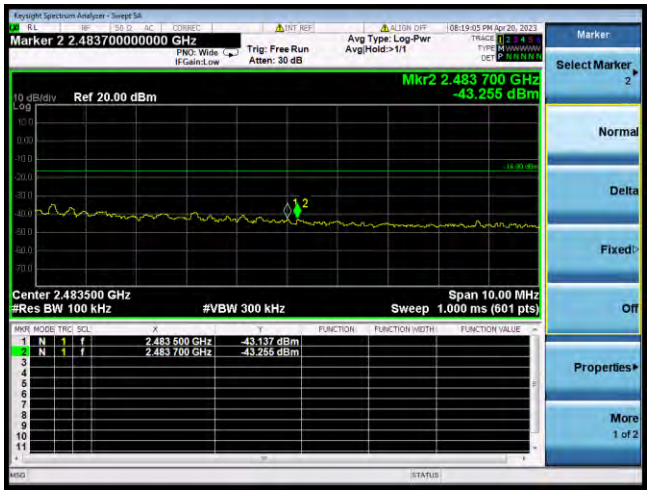
802.11g LOW CHANNEL, BAND EDGE



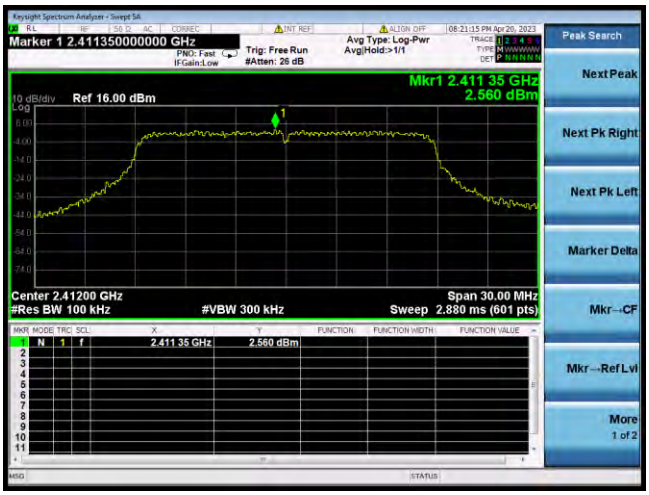
802.11g HIGH CHANNEL, CARRIER LEVEL



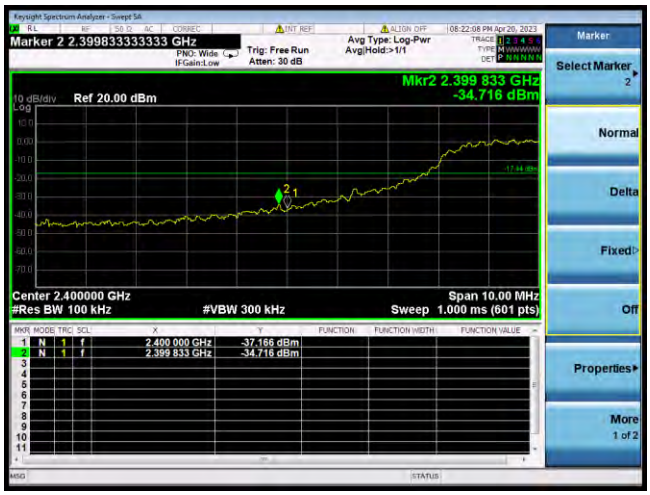
802.11g HIGH CHANNEL, BAND EDGE



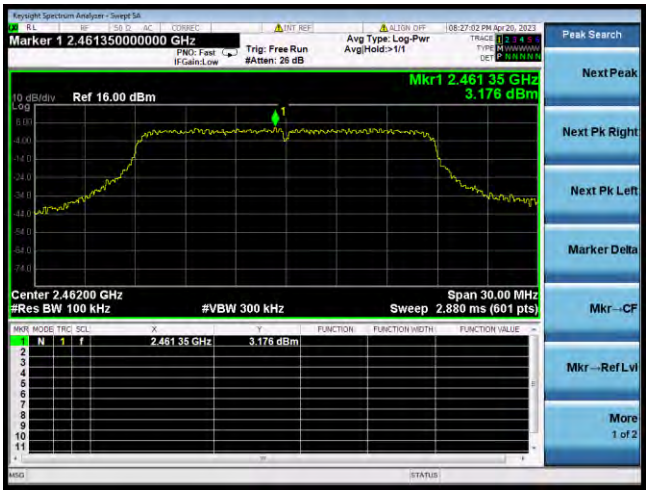
802.11n-20 MHz LOW CHANNEL, CARRIER LEVEL



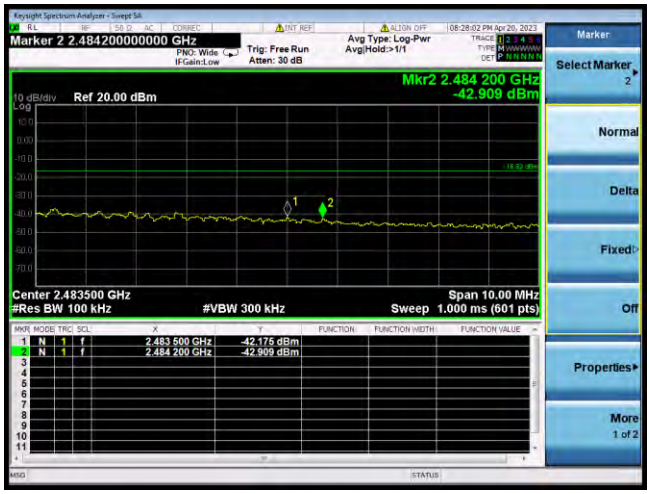
802.11n-20 MHz LOW CHANNEL, BAND EDGE



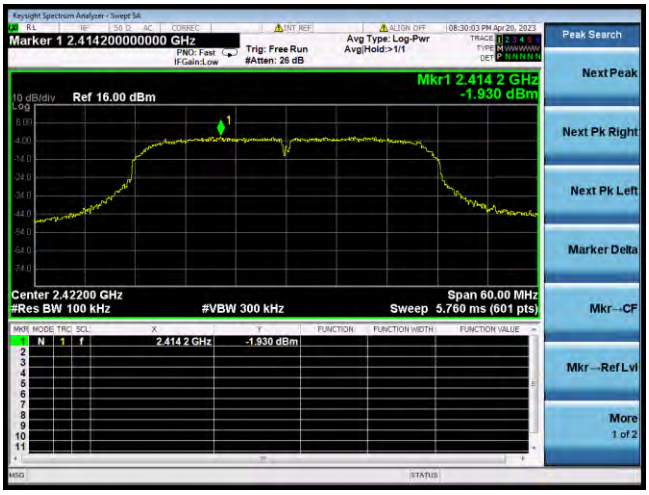
802.11n-20 MHz HIGH CHANNEL, CARRIER LEVEL



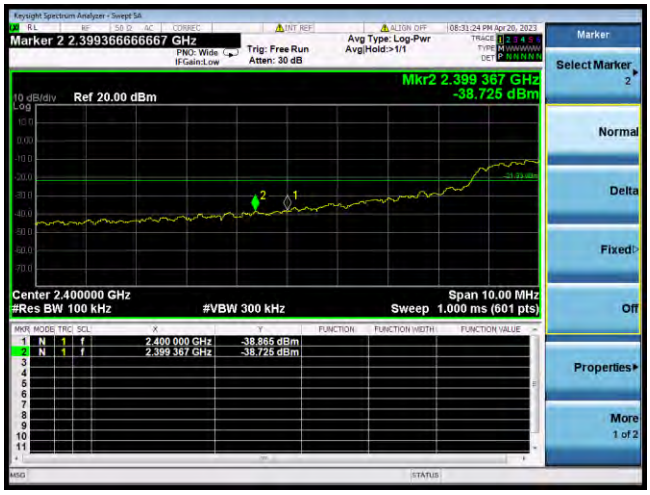
802.11n-20 MHz HIGH CHANNEL, BAND EDGE



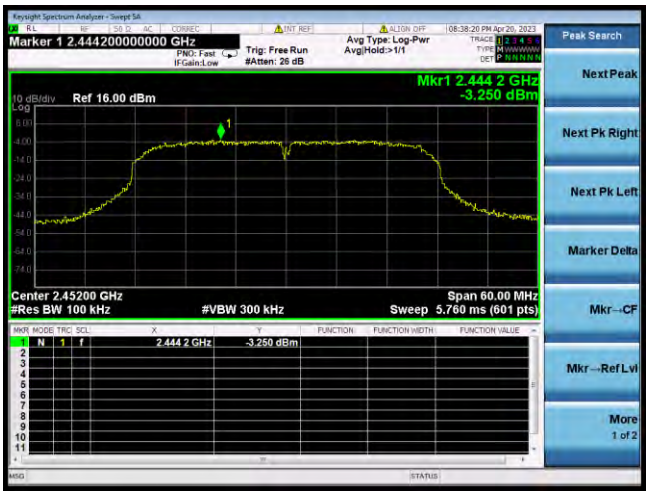
802.11n-40 MHz LOW CHANNEL, CARRIER LEVEL



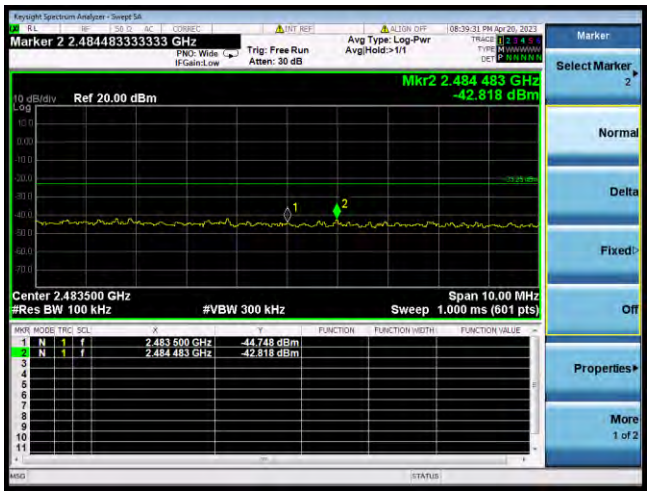
802.11n-40 MHz LOW CHANNEL, BAND EDGE



802.11n-40 MHz HIGH CHANNEL, CARRIER LEVEL



802.11n-40 MHz HIGH CHANNEL, BAND EDGE



A.5 Conducted Emissions

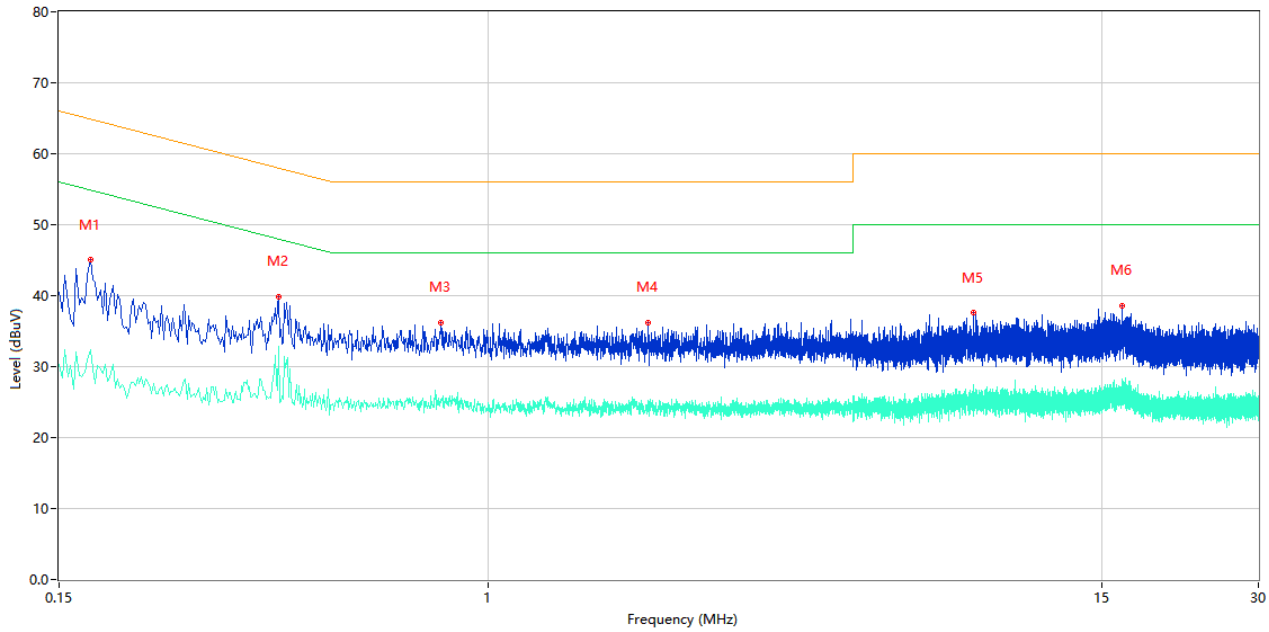
Note [1]: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

Note [2]: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Note [3]: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

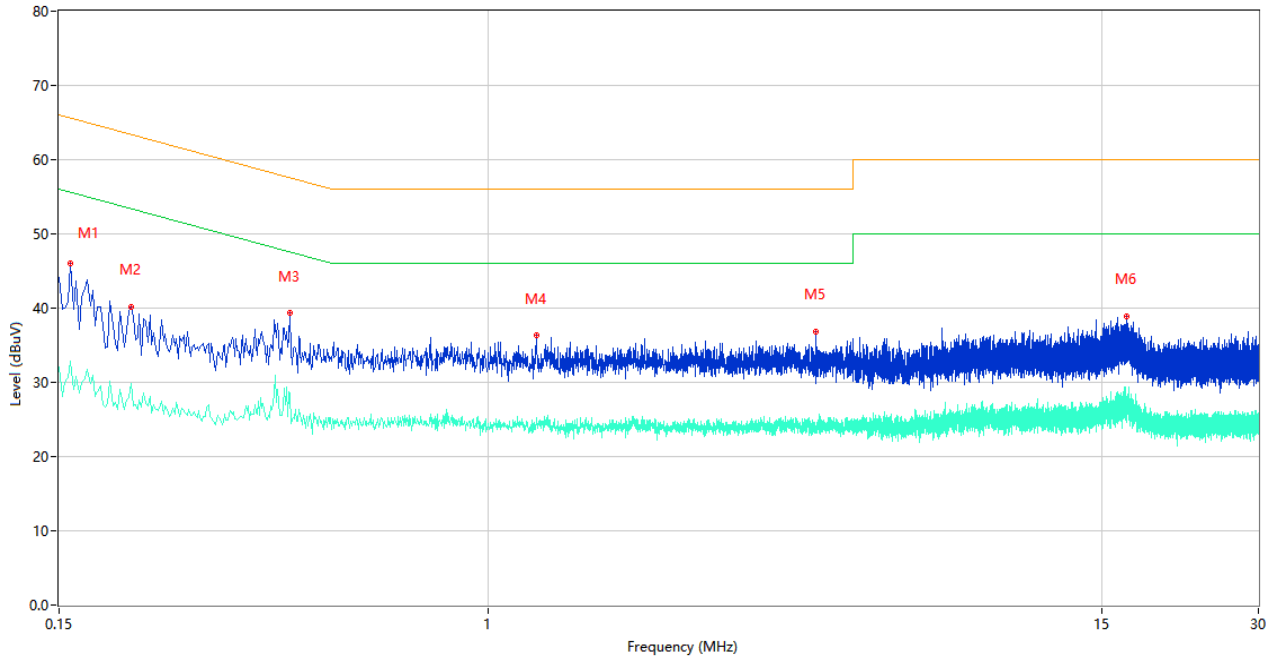
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.172	45.05	10.07	64.86	19.81	Peak	L	Pass
1**	0.172	32.33	10.07	54.86	22.53	AV	L	Pass
2	0.396	39.89	10.78	57.94	18.05	Peak	L	Pass
2**	0.396	32.88	10.78	47.94	15.06	AV	L	Pass
3	0.812	36.23	10.69	56.00	19.77	Peak	L	Pass
3**	0.812	24.93	10.69	46.00	21.07	AV	L	Pass
4	2.028	36.26	10.48	56.00	19.74	Peak	L	Pass
4**	2.028	25.30	10.48	46.00	20.70	AV	L	Pass
5	8.500	37.55	10.31	60.00	22.45	Peak	L	Pass
5**	8.500	27.39	10.31	50.00	22.61	AV	L	Pass
6	16.430	38.59	10.29	60.00	21.41	Peak	L	Pass
6**	16.430	25.85	10.29	50.00	24.15	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.158	46.01	10.08	65.57	19.56	Peak	N	Pass
1**	0.158	32.90	10.08	55.57	22.67	AV	N	Pass
2	0.206	40.23	10.05	63.37	23.14	Peak	N	Pass
2**	0.206	29.82	10.05	53.37	23.55	AV	N	Pass
3	0.416	39.29	10.59	57.53	18.24	Peak	N	Pass
3**	0.416	28.57	10.59	47.53	18.96	AV	N	Pass
4	1.234	36.31	10.39	56.00	19.69	Peak	N	Pass
4**	1.234	24.55	10.39	46.00	21.45	AV	N	Pass
5	4.238	36.89	9.93	56.00	19.11	Peak	N	Pass
5**	4.238	24.20	9.93	46.00	21.80	AV	N	Pass
6	16.792	38.96	10.33	60.00	21.04	Peak	N	Pass
6**	16.792	27.66	10.33	50.00	22.34	AV	N	Pass

A.6 Radiated Emission

Note [1]: The symbol of "--" in the table which means not application.

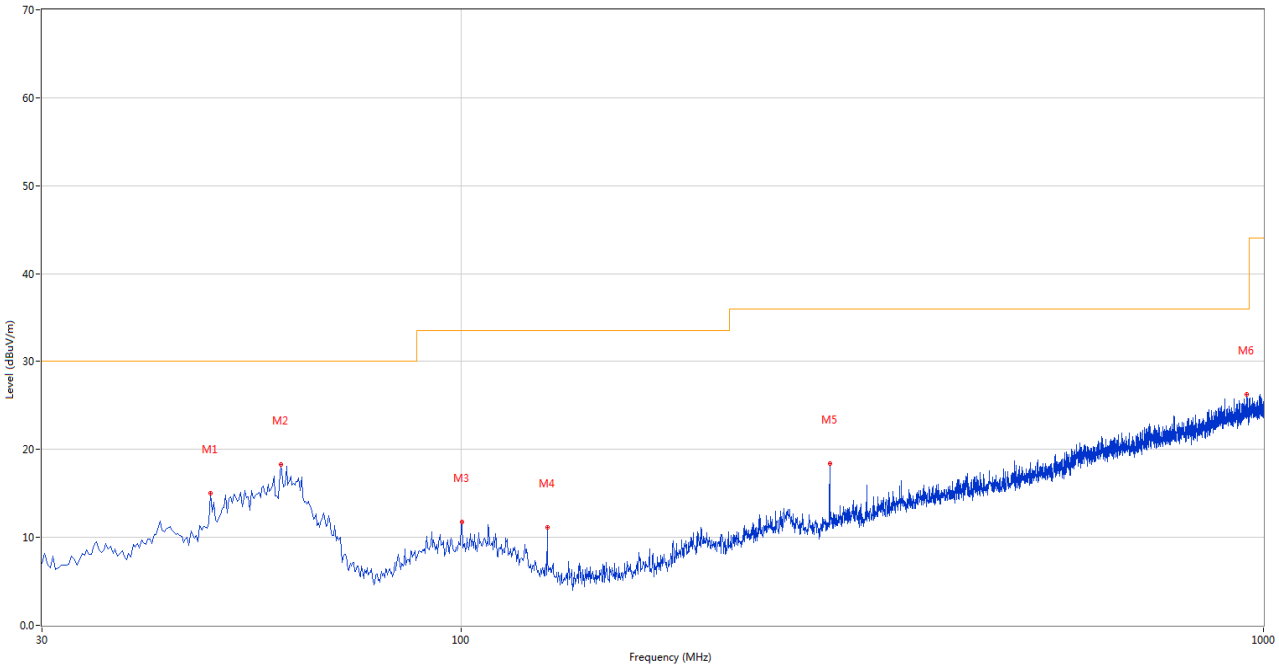
Note [2]: For the test data above 1 GHz，According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note [3]: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note [4]: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and normal link mode is worst.

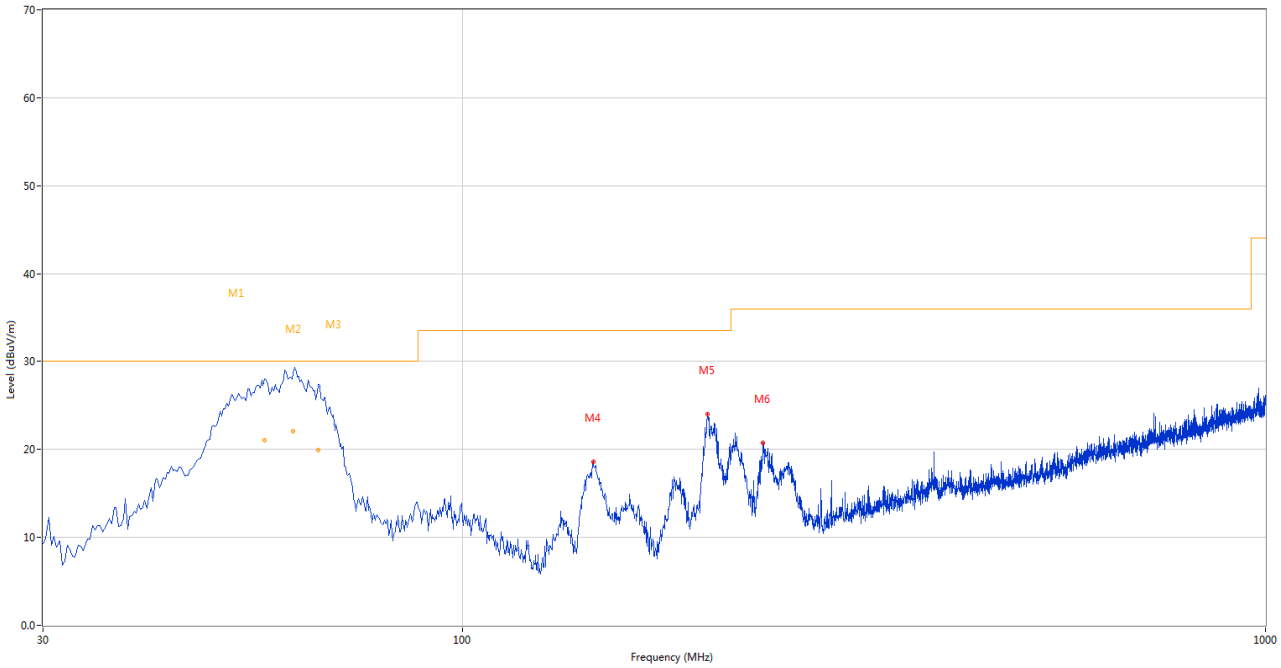
Test Data and Plots

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.668	15.03	-26.34	30.0	14.97	Peak	131.00	200	Horizontal	Pass
2	59.578	18.25	-27.66	30.0	11.75	Peak	211.00	100	Horizontal	Pass
3	100.065	11.71	-27.96	33.5	21.79	Peak	0.00	200	Horizontal	Pass
4	127.946	11.16	-31.06	33.5	22.34	Peak	102.00	100	Horizontal	Pass
5	287.956	18.38	-25.19	36.0	17.62	Peak	264.00	200	Horizontal	Pass
6	953.452	26.27	-11.88	36.0	9.73	Peak	347.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	56.698	25.71	-26.99	30.0	4.29	Peak	158.00	108	Vertical	N/A
1*	56.698	21.04	-26.99	30.0	8.96	QP	158.00	108	Vertical	Pass
2	61.496	26.64	-27.98	30.0	3.36	Peak	0.00	100	Vertical	N/A
2*	61.496	22.10	-27.98	30.0	7.90	QP	0.00	100	Vertical	Pass
3	66.115	24.34	-28.50	30.0	5.66	Peak	305.00	103	Vertical	N/A
3*	66.115	19.91	-28.50	30.0	10.09	QP	305.00	103	Vertical	Pass
4	145.401	18.56	-31.54	33.5	14.94	Peak	196.00	100	Vertical	Pass
5	201.647	24.04	-27.66	33.5	9.46	Peak	112.00	100	Vertical	Pass
6	236.801	20.74	-26.62	36.0	15.26	Peak	105.00	200	Vertical	Pass

Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious above 18G is noise only, do not show on the report.

1 GHz to 18 GHz, ANT H 802.11b Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1431.700	42.95	-17.15	74.0	31.05	Peak	32.00	400	Horizontal	Pass
1**	1431.700	32.93	-17.15	54.0	21.07	AV	32.00	400	Horizontal	Pass
2	2411.900	107.83	-11.63	74.0	-33.83	Peak	91.00	100	Horizontal	N/A
2**	2411.900	100.36	-11.63	54.0	-46.36	AV	91.00	100	Horizontal	N/A
3	3216.250	51.70	-7.76	74.0	22.30	Peak	348.00	150	Horizontal	Pass
3**	3216.250	49.76	-7.76	54.0	4.24	AV	348.00	150	Horizontal	Pass
4	4824.250	50.57	-3.21	74.0	23.43	Peak	340.00	150	Horizontal	Pass
4**	4824.250	45.51	-3.21	54.0	8.49	AV	340.00	150	Horizontal	Pass
5	11149.487	51.99	-0.95	74.0	22.01	Peak	339.00	200	Horizontal	Pass
5**	11149.487	41.85	-0.95	54.0	12.15	AV	339.00	200	Horizontal	Pass
6	16639.725	52.54	0.88	74.0	21.46	Peak	128.00	300	Horizontal	Pass
6**	16639.725	42.21	0.88	54.0	11.79	AV	128.00	300	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11b Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1327.600	43.84	-17.17	74.0	30.16	Peak	328.00	100	Vertical	Pass
1**	1327.600	34.98	-17.17	54.0	19.02	AV	328.00	100	Vertical	Pass
2	2412.200	107.10	-11.63	74.0	-33.10	Peak	237.00	200	Vertical	N/A
2**	2412.200	98.19	-11.63	54.0	-44.19	AV	237.00	200	Vertical	N/A
3	4824.250	49.04	-3.21	74.0	24.96	Peak	87.00	150	Vertical	Pass
3**	4824.250	44.59	-3.21	54.0	9.41	AV	87.00	150	Vertical	Pass
4	7295.250	53.57	-1.06	74.0	20.43	Peak	87.00	100	Vertical	Pass
4**	7295.250	43.50	-1.06	54.0	10.50	AV	87.00	100	Vertical	Pass
5	10963.763	52.22	-2.26	74.0	21.78	Peak	53.00	100	Vertical	Pass
5**	10963.763	42.73	-2.26	54.0	11.27	AV	53.00	100	Vertical	Pass
6	16806.675	53.26	1.11	74.0	20.74	Peak	104.00	400	Vertical	Pass
6**	16806.675	44.71	1.11	54.0	9.29	AV	104.00	400	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11b Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1390.700	42.80	-16.92	74.0	31.20	Peak	241.00	100	Horizontal	Pass
1**	1390.700	32.81	-16.92	54.0	21.19	AV	241.00	100	Horizontal	Pass
2	2437.200	106.85	-10.99	74.0	-32.85	Peak	68.00	200	Horizontal	N/A
2**	2437.200	98.57	-10.99	54.0	-44.57	AV	68.00	200	Horizontal	N/A
3	4874.000	50.81	-3.87	74.0	23.19	Peak	338.00	100	Horizontal	Pass
3**	4874.000	44.25	-3.87	54.0	9.75	AV	338.00	100	Horizontal	Pass
4	7840.750	53.34	2.30	74.0	20.66	Peak	190.00	300	Horizontal	Pass
4**	7840.750	45.07	2.30	54.0	8.93	AV	190.00	300	Horizontal	Pass
5	10966.138	52.69	-2.21	74.0	21.31	Peak	76.00	200	Horizontal	Pass
5**	10966.138	42.15	-2.21	54.0	11.85	AV	76.00	200	Horizontal	Pass
6	16541.025	52.48	0.09	74.0	21.52	Peak	243.00	200	Horizontal	Pass
6**	16541.025	43.42	0.09	54.0	10.58	AV	243.00	200	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11b Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1331.400	42.05	-17.31	74.0	31.95	Peak	345.00	100	Vertical	Pass
1**	1331.400	32.22	-17.31	54.0	21.78	AV	345.00	100	Vertical	Pass
2	2436.900	105.39	-10.89	74.0	-31.39	Peak	155.00	150	Vertical	N/A
2**	2436.900	97.78	-10.89	54.0	-43.78	AV	155.00	150	Vertical	N/A
3	4874.000	51.01	-3.87	74.0	22.99	Peak	182.00	200	Vertical	Pass
3**	4874.000	42.94	-3.87	54.0	11.06	AV	182.00	200	Vertical	Pass
4	7819.750	53.51	2.00	74.0	20.49	Peak	199.00	400	Vertical	Pass
4**	7819.750	44.50	2.00	54.0	9.50	AV	199.00	400	Vertical	Pass
5	9986.450	52.20	-2.65	74.0	21.80	Peak	90.00	400	Vertical	Pass
5**	9986.450	43.06	-2.65	54.0	10.94	AV	90.00	400	Vertical	Pass
6	16609.012	53.56	0.22	74.0	20.44	Peak	258.00	200	Vertical	Pass
6**	16609.012	42.86	0.22	54.0	11.14	AV	258.00	200	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11b High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1407.800	42.25	-17.14	74.0	31.75	Peak	322.00	300	Horizontal	Pass
1**	1407.800	32.27	-17.14	54.0	21.73	AV	322.00	300	Horizontal	Pass
2	2462.100	108.12	-11.55	74.0	-34.12	Peak	154.00	150	Horizontal	N/A
2**	2462.100	100.52	-11.55	54.0	-46.52	AV	154.00	150	Horizontal	N/A
3	4924.500	49.22	-3.78	74.0	24.78	Peak	325.00	150	Horizontal	Pass
3**	4924.500	44.60	-3.78	54.0	9.40	AV	325.00	150	Horizontal	Pass
4	7835.250	53.77	2.48	74.0	20.23	Peak	333.00	100	Horizontal	Pass
4**	7835.250	45.16	2.48	54.0	8.84	AV	333.00	100	Horizontal	Pass
5	10203.525	52.44	-2.02	74.0	21.56	Peak	51.00	200	Horizontal	Pass
5**	10203.525	43.49	-2.02	54.0	10.51	AV	51.00	200	Horizontal	Pass
6	16569.375	52.53	0.03	74.0	21.47	Peak	50.00	200	Horizontal	Pass
6**	16569.375	42.83	0.03	54.0	11.17	AV	50.00	200	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11b High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.100	44.51	-17.27	74.0	29.49	Peak	220.00	200	Vertical	Pass
1**	1332.100	31.87	-17.27	54.0	22.13	AV	220.00	200	Vertical	Pass
2	2462.200	105.02	-11.55	74.0	-31.02	Peak	105.00	150	Vertical	N/A
2**	2462.200	97.48	-11.55	54.0	-43.48	AV	105.00	150	Vertical	N/A
3	4924.250	50.51	-3.76	74.0	23.49	Peak	324.00	150	Vertical	Pass
3**	4924.250	45.18	-3.76	54.0	8.82	AV	324.00	150	Vertical	Pass
4	7831.250	54.48	2.35	74.0	19.52	Peak	141.00	200	Vertical	Pass
4**	7831.250	44.89	2.35	54.0	9.11	AV	141.00	200	Vertical	Pass
5	11052.349	51.76	-1.90	74.0	22.24	Peak	313.00	300	Vertical	Pass
5**	11052.349	42.47	-1.90	54.0	11.53	AV	313.00	300	Vertical	Pass
6	16557.824	52.91	0.03	74.0	21.09	Peak	349.00	100	Vertical	Pass
6**	16557.824	43.34	0.03	54.0	10.66	AV	349.00	100	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11g Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1355.100	41.92	-17.31	74.0	32.08	Peak	184.00	400	Horizontal	Pass
1**	1355.100	32.24	-17.31	54.0	21.76	AV	184.00	400	Horizontal	Pass
2	2406.600	105.01	-11.75	74.0	-31.01	Peak	60.00	100	Horizontal	N/A
2**	2406.600	98.34	-11.75	54.0	-44.34	AV	60.00	100	Horizontal	N/A
3	3216.250	52.72	-7.76	74.0	21.28	Peak	167.00	150	Horizontal	Pass
3**	3216.250	50.43	-7.76	54.0	3.57	AV	167.00	150	Horizontal	Pass
4	7422.500	53.78	1.22	74.0	20.22	Peak	72.00	300	Horizontal	Pass
4**	7422.500	43.17	1.22	54.0	10.83	AV	72.00	300	Horizontal	Pass
5	11127.162	51.96	-0.98	74.0	22.04	Peak	104.00	300	Horizontal	Pass
5**	11127.162	43.24	-0.98	54.0	10.76	AV	104.00	300	Horizontal	Pass
6	16802.738	52.90	1.13	74.0	21.10	Peak	34.00	200	Horizontal	Pass
6**	16802.738	44.07	1.13	54.0	9.93	AV	34.00	200	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11g Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.600	43.24	-17.12	74.0	30.76	Peak	329.00	300	Vertical	Pass
1**	1328.600	35.10	-17.12	54.0	18.90	AV	329.00	300	Vertical	Pass
2	2407.600	103.81	-11.81	74.0	-29.81	Peak	237.00	150	Vertical	N/A
2**	2407.600	96.21	-11.81	54.0	-42.21	AV	237.00	150	Vertical	N/A
3	3216.250	50.80	-7.76	74.0	23.20	Peak	247.00	150	Vertical	Pass
3**	3216.250	48.88	-7.76	54.0	5.12	AV	247.00	150	Vertical	Pass
4	7983.250	53.26	1.22	74.0	20.74	Peak	291.00	300	Vertical	Pass
4**	7983.250	44.03	1.22	54.0	9.97	AV	291.00	300	Vertical	Pass
5	11194.138	51.85	-1.70	74.0	22.15	Peak	165.00	200	Vertical	Pass
5**	11194.138	43.39	-1.70	54.0	10.61	AV	165.00	200	Vertical	Pass
6	16793.026	52.79	0.91	74.0	21.21	Peak	167.00	100	Vertical	Pass
6**	16793.026	43.33	0.91	54.0	10.67	AV	167.00	100	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11g Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1370.700	43.10	-17.28	74.0	30.90	Peak	166.00	300	Horizontal	Pass
1**	1370.700	34.03	-17.28	54.0	19.97	AV	166.00	300	Horizontal	Pass
2	2436.200	103.33	-10.68	74.0	-29.33	Peak	69.00	100	Horizontal	N/A
2**	2436.200	95.65	-10.68	54.0	-41.65	AV	69.00	100	Horizontal	N/A
3	4701.000	49.50	-3.99	74.0	24.50	Peak	189.00	200	Horizontal	Pass
3**	4701.000	41.12	-3.99	54.0	12.88	AV	189.00	200	Horizontal	Pass
4	7857.250	54.09	1.07	74.0	19.91	Peak	304.00	300	Horizontal	Pass
4**	7857.250	44.22	1.07	54.0	9.78	AV	304.00	300	Horizontal	Pass
5	10726.974	51.89	-2.01	74.0	22.11	Peak	25.00	300	Horizontal	Pass
5**	10726.974	42.58	-2.01	54.0	11.42	AV	25.00	300	Horizontal	Pass
6	16560.187	52.88	0.03	74.0	21.12	Peak	124.00	400	Horizontal	Pass
6**	16560.187	43.80	0.03	54.0	10.20	AV	124.00	400	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11g Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.200	43.52	-17.10	74.0	30.48	Peak	334.00	200	Vertical	Pass
1**	1328.200	32.52	-17.10	54.0	21.48	AV	334.00	200	Vertical	Pass
2	2431.800	102.21	-10.65	74.0	-28.21	Peak	237.00	200	Vertical	N/A
2**	2431.800	94.43	-10.65	54.0	-40.43	AV	237.00	200	Vertical	N/A
3	4902.750	49.38	-3.19	74.0	24.62	Peak	313.00	200	Vertical	Pass
3**	4902.750	40.42	-3.19	54.0	13.58	AV	313.00	200	Vertical	Pass
4	7840.750	53.69	2.30	74.0	20.31	Peak	163.00	100	Vertical	Pass
4**	7840.750	45.02	2.30	54.0	8.98	AV	163.00	100	Vertical	Pass
5	11049.263	51.96	-1.93	74.0	22.04	Peak	1.00	100	Vertical	Pass
5**	11049.263	42.66	-1.93	54.0	11.34	AV	1.00	100	Vertical	Pass
6	17327.213	52.64	0.20	74.0	21.36	Peak	99.00	400	Vertical	Pass
6**	17327.213	42.33	0.20	54.0	11.67	AV	99.00	400	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11g High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1330.000	42.74	-17.30	74.0	31.26	Peak	323.00	200	Horizontal	Pass
1**	1330.000	32.41	-17.30	54.0	21.59	AV	323.00	200	Horizontal	Pass
2	2464.300	104.43	-11.77	74.0	-30.43	Peak	157.00	150	Horizontal	N/A
2**	2464.300	97.57	-11.77	54.0	-43.57	AV	157.00	150	Horizontal	N/A
3	4730.500	49.49	-4.37	74.0	24.51	Peak	31.00	200	Horizontal	Pass
3**	4730.500	40.04	-4.37	54.0	13.96	AV	31.00	200	Horizontal	Pass
4	7833.500	54.32	2.32	74.0	19.68	Peak	73.00	300	Horizontal	Pass
4**	7833.500	44.90	2.32	54.0	9.10	AV	73.00	300	Horizontal	Pass
5	10593.500	52.38	-1.52	74.0	21.62	Peak	24.00	400	Horizontal	Pass
5**	10593.500	42.62	-1.52	54.0	11.38	AV	24.00	400	Horizontal	Pass
6	16569.114	52.65	0.03	74.0	21.35	Peak	213.00	200	Horizontal	Pass
6**	16569.114	43.81	0.03	54.0	10.19	AV	213.00	200	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11g High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1315.700	43.47	-17.14	74.0	30.53	Peak	267.00	200	Vertical	Pass
1**	1315.700	32.22	-17.14	54.0	21.78	AV	267.00	200	Vertical	Pass
2	2463.000	101.49	-11.62	74.0	-27.49	Peak	160.00	150	Vertical	N/A
2**	2463.000	93.29	-11.62	54.0	-39.29	AV	160.00	150	Vertical	N/A
3	4802.250	49.24	-4.18	74.0	24.76	Peak	128.00	100	Vertical	Pass
3**	4802.250	39.71	-4.18	54.0	14.29	AV	128.00	100	Vertical	Pass
4	7841.750	53.98	2.22	74.0	20.02	Peak	92.00	400	Vertical	Pass
4**	7841.750	44.81	2.22	54.0	9.19	AV	92.00	400	Vertical	Pass
5	10195.450	52.19	-2.05	74.0	21.81	Peak	35.00	100	Vertical	Pass
5**	10195.450	42.16	-2.05	54.0	11.84	AV	35.00	100	Vertical	Pass
6	16787.775	51.87	0.72	74.0	22.13	Peak	7.00	400	Vertical	Pass
6**	16787.775	43.24	0.72	54.0	10.76	AV	7.00	400	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n20 Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1481.600	41.95	-17.30	74.0	32.05	Peak	210.00	100	Horizontal	Pass
1**	1481.600	32.67	-17.30	54.0	21.33	AV	210.00	100	Horizontal	Pass
2	2406.600	104.98	-11.75	74.0	-30.98	Peak	98.00	150	Horizontal	N/A
2**	2406.600	98.16	-11.75	54.0	-44.16	AV	98.00	150	Horizontal	N/A
3	3216.250	52.02	-7.76	74.0	21.98	Peak	297.00	150	Horizontal	Pass
3**	3216.250	50.10	-7.76	54.0	3.90	AV	297.00	150	Horizontal	Pass
4	7842.250	53.76	2.10	74.0	20.24	Peak	214.00	100	Horizontal	Pass
4**	7842.250	44.41	2.10	54.0	9.59	AV	214.00	100	Horizontal	Pass
5	10200.912	51.60	-1.97	74.0	22.40	Peak	148.00	200	Horizontal	Pass
5**	10200.912	42.77	-1.97	54.0	11.23	AV	148.00	200	Horizontal	Pass
6	16997.775	52.39	0.45	74.0	21.61	Peak	359.00	300	Horizontal	Pass
6**	16997.775	42.74	0.45	54.0	11.26	AV	359.00	300	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n20 Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1329.000	42.92	-17.17	74.0	31.08	Peak	334.00	300	Vertical	Pass
1**	1329.000	34.51	-17.17	54.0	19.49	AV	334.00	300	Vertical	Pass
2	2411.000	103.35	-11.78	74.0	-29.35	Peak	239.00	100	Vertical	N/A
2**	2411.000	95.58	-11.78	54.0	-41.58	AV	239.00	100	Vertical	N/A
3	3216.250	50.43	-7.76	74.0	23.57	Peak	242.00	150	Vertical	Pass
3**	3216.250	48.83	-7.76	54.0	5.17	AV	242.00	150	Vertical	Pass
4	7830.750	53.14	2.39	74.0	20.86	Peak	179.00	100	Vertical	Pass
4**	7830.750	45.98	2.39	54.0	8.02	AV	179.00	100	Vertical	Pass
5	10718.900	52.19	-2.14	74.0	21.81	Peak	81.00	100	Vertical	Pass
5**	10718.900	43.14	-2.14	54.0	10.86	AV	81.00	100	Vertical	Pass
6	16798.801	53.97	1.11	74.0	20.03	Peak	360.00	400	Vertical	Pass
6**	16798.801	44.03	1.11	54.0	9.97	AV	360.00	400	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n20 Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1480.700	42.52	-17.15	74.0	31.48	Peak	360.00	100	Horizontal	Pass
1**	1480.700	32.03	-17.15	54.0	21.97	AV	360.00	100	Horizontal	Pass
2	2436.000	103.80	-10.62	74.0	-29.80	Peak	69.00	100	Horizontal	N/A
2**	2436.000	95.44	-10.62	54.0	-41.44	AV	69.00	100	Horizontal	N/A
3	4965.000	49.44	-4.07	74.0	24.56	Peak	31.00	100	Horizontal	Pass
3**	4965.000	39.74	-4.07	54.0	14.26	AV	31.00	100	Horizontal	Pass
4	7845.250	53.68	1.53	74.0	20.32	Peak	308.00	400	Horizontal	Pass
4**	7845.250	44.21	1.53	54.0	9.79	AV	308.00	400	Horizontal	Pass
5	10207.325	51.65	-2.10	74.0	22.35	Peak	51.00	400	Horizontal	Pass
5**	10207.325	42.72	-2.10	54.0	11.28	AV	51.00	400	Horizontal	Pass
6	16837.650	52.38	0.88	74.0	21.62	Peak	36.00	400	Horizontal	Pass
6**	16837.650	42.19	0.88	54.0	11.81	AV	36.00	400	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n20 Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1330.200	42.64	-17.32	74.0	31.36	Peak	342.00	400	Vertical	Pass
1**	1330.200	32.43	-17.32	54.0	21.57	AV	342.00	400	Vertical	Pass
2	2432.900	102.02	-10.64	74.0	-28.02	Peak	157.00	200	Vertical	N/A
2**	2432.900	93.84	-10.64	54.0	-39.84	AV	157.00	200	Vertical	N/A
3	4825.000	49.84	-3.22	74.0	24.16	Peak	194.00	150	Vertical	Pass
3**	4825.000	39.51	-3.22	54.0	14.49	AV	194.00	150	Vertical	Pass
4	7370.500	53.76	-0.86	74.0	20.24	Peak	286.00	400	Vertical	Pass
4**	7370.500	43.95	-0.86	54.0	10.05	AV	286.00	400	Vertical	Pass
5	11055.674	52.19	-1.83	74.0	21.81	Peak	261.00	100	Vertical	Pass
5**	11055.674	42.24	-1.83	54.0	11.76	AV	261.00	100	Vertical	Pass
6	16460.700	52.22	0.49	74.0	21.78	Peak	36.00	300	Vertical	Pass
6**	16460.700	42.81	0.49	54.0	11.19	AV	36.00	300	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n20 High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1449.800	42.11	-17.05	74.0	31.89	Peak	237.00	200	Horizontal	Pass
1**	1449.800	32.15	-17.05	54.0	21.85	AV	237.00	200	Horizontal	Pass
2	2457.800	104.24	-11.62	74.0	-30.24	Peak	154.00	100	Horizontal	N/A
2**	2457.800	95.55	-11.62	54.0	-41.55	AV	154.00	100	Horizontal	N/A
3	4887.000	49.07	-3.75	74.0	24.93	Peak	126.00	150	Horizontal	Pass
3**	4887.000	40.61	-3.75	54.0	13.39	AV	126.00	150	Horizontal	Pass
4	7765.250	53.51	-0.02	74.0	20.49	Peak	338.00	300	Horizontal	Pass
4**	7765.250	43.31	-0.02	54.0	10.69	AV	338.00	300	Horizontal	Pass
5	10595.162	51.57	-1.49	74.0	22.43	Peak	103.00	200	Horizontal	Pass
5**	10595.162	42.29	-1.49	54.0	11.71	AV	103.00	200	Horizontal	Pass
6	16551.788	53.10	0.03	74.0	20.90	Peak	125.00	100	Horizontal	Pass
6**	16551.788	43.02	0.03	54.0	10.98	AV	125.00	100	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n20 High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1512.000	42.18	-16.89	74.0	31.82	Peak	203.00	400	Vertical	Pass
1**	1512.000	32.93	-16.89	54.0	21.07	AV	203.00	400	Vertical	Pass
2	2458.000	101.49	-11.63	74.0	-27.49	Peak	160.00	150	Vertical	N/A
2**	2458.000	93.59	-11.63	54.0	-39.59	AV	160.00	150	Vertical	N/A
3	4702.750	49.86	-3.92	74.0	24.14	Peak	360.00	100	Vertical	Pass
3**	4702.750	40.17	-3.92	54.0	13.83	AV	360.00	100	Vertical	Pass
4	7833.750	53.34	2.35	74.0	20.66	Peak	260.00	400	Vertical	Pass
4**	7833.750	45.11	2.35	54.0	8.89	AV	260.00	400	Vertical	Pass
5	11184.400	51.78	-1.53	74.0	22.22	Peak	103.00	400	Vertical	Pass
5**	11184.400	42.65	-1.53	54.0	11.35	AV	103.00	400	Vertical	Pass
6	16507.162	53.16	0.30	74.0	20.84	Peak	21.00	100	Vertical	Pass
6**	16507.162	43.02	0.30	54.0	10.98	AV	21.00	100	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n40 Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1487.200	42.32	-17.15	74.0	31.68	Peak	79.00	400	Horizontal	Pass
1**	1487.200	32.09	-17.15	54.0	21.91	AV	79.00	400	Horizontal	Pass
2	2423.700	101.66	-11.19	74.0	-27.66	Peak	149.00	150	Horizontal	N/A
2**	2423.700	93.23	-11.19	54.0	-39.23	AV	149.00	150	Horizontal	N/A
3	3229.500	49.98	-7.41	74.0	24.02	Peak	348.00	150	Horizontal	Pass
3**	3229.500	48.20	-7.41	54.0	5.80	AV	348.00	150	Horizontal	Pass
4	7819.250	53.68	1.89	74.0	20.32	Peak	67.00	300	Horizontal	Pass
4**	7819.250	44.49	1.89	54.0	9.51	AV	67.00	300	Horizontal	Pass
5	11070.401	51.40	-1.56	74.0	22.60	Peak	129.00	300	Horizontal	Pass
5**	11070.401	43.16	-1.56	54.0	10.84	AV	129.00	300	Horizontal	Pass
6	16810.350	52.60	1.08	74.0	21.40	Peak	245.00	200	Horizontal	Pass
6**	16810.350	43.48	1.08	54.0	10.52	AV	245.00	200	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n40 Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1327.300	42.94	-17.21	74.0	31.06	Peak	322.00	200	Vertical	Pass
1**	1327.300	32.36	-17.21	54.0	21.64	AV	322.00	200	Vertical	Pass
2	2423.600	100.45	-11.19	74.0	-26.45	Peak	240.00	100	Vertical	N/A
2**	2423.600	92.32	-11.19	54.0	-38.32	AV	240.00	100	Vertical	N/A
3	3229.750	48.52	-7.45	74.0	25.48	Peak	245.00	150	Vertical	Pass
3**	3229.750	46.19	-7.45	54.0	7.81	AV	245.00	150	Vertical	Pass
4	7828.750	53.62	2.01	74.0	20.38	Peak	311.00	400	Vertical	Pass
4**	7828.750	43.85	2.01	54.0	10.15	AV	311.00	400	Vertical	Pass
5	10978.962	51.71	-1.97	74.0	22.29	Peak	117.00	400	Vertical	Pass
5**	10978.962	42.18	-1.97	54.0	11.82	AV	117.00	400	Vertical	Pass
6	16355.700	52.48	0.72	74.0	21.52	Peak	70.00	300	Vertical	Pass
6**	16355.700	42.95	0.72	54.0	11.05	AV	70.00	300	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n40 Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1430.000	42.70	-17.13	74.0	31.30	Peak	26.00	200	Horizontal	Pass
1**	1430.000	32.35	-17.13	54.0	21.65	AV	26.00	200	Horizontal	Pass
2	2450.000	100.52	-12.00	74.0	-26.52	Peak	157.00	200	Horizontal	N/A
2**	2450.000	91.42	-12.00	54.0	-37.42	AV	157.00	200	Horizontal	N/A
3	4720.250	49.51	-4.13	74.0	24.49	Peak	109.00	100	Horizontal	Pass
3**	4720.250	40.07	-4.13	54.0	13.93	AV	109.00	100	Horizontal	Pass
4	7834.750	53.95	2.47	74.0	20.05	Peak	29.00	400	Horizontal	Pass
4**	7834.750	45.69	2.47	54.0	8.31	AV	29.00	400	Horizontal	Pass
5	11042.375	52.19	-1.88	74.0	21.81	Peak	44.00	400	Horizontal	Pass
5**	11042.375	41.96	-1.88	54.0	12.04	AV	44.00	400	Horizontal	Pass
6	16809.562	52.91	1.08	74.0	21.09	Peak	247.00	400	Horizontal	Pass
6**	16809.562	43.37	1.08	54.0	10.63	AV	247.00	400	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n40 Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1330.500	42.44	-17.36	74.0	31.56	Peak	360.00	100	Vertical	Pass
1**	1330.500	32.90	-17.36	54.0	21.10	AV	360.00	100	Vertical	Pass
2	2442.000	99.04	-11.12	74.0	-25.04	Peak	159.00	100	Vertical	N/A
2**	2442.000	90.08	-11.12	54.0	-36.08	AV	159.00	100	Vertical	N/A
3	4880.500	49.76	-3.57	74.0	24.24	Peak	167.00	200	Vertical	Pass
3**	4880.500	40.58	-3.57	54.0	13.42	AV	167.00	200	Vertical	Pass
4	7836.500	53.33	2.42	74.0	20.67	Peak	313.00	400	Vertical	Pass
4**	7836.500	45.00	2.42	54.0	9.00	AV	313.00	400	Vertical	Pass
5	10823.638	51.55	-2.46	74.0	22.45	Peak	314.00	400	Vertical	Pass
5**	10823.638	42.42	-2.46	54.0	11.58	AV	314.00	400	Vertical	Pass
6	16567.801	53.13	0.03	74.0	20.87	Peak	111.00	100	Vertical	Pass
6**	16567.801	43.42	0.03	54.0	10.58	AV	111.00	100	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11n40 High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1325.900	42.09	-17.33	74.0	31.91	Peak	26.00	200	Horizontal	Pass
1**	1325.900	32.06	-17.33	54.0	21.94	AV	26.00	200	Horizontal	Pass
2	2461.400	102.55	-11.49	74.0	-28.55	Peak	152.00	200	Horizontal	N/A
2**	2461.400	94.05	-11.49	54.0	-40.05	AV	152.00	200	Horizontal	N/A
3	4709.000	49.79	-3.90	74.0	24.21	Peak	257.00	100	Horizontal	Pass
3**	4709.000	40.19	-3.90	54.0	13.81	AV	257.00	100	Horizontal	Pass
4	7840.250	53.79	2.27	74.0	20.21	Peak	133.00	300	Horizontal	Pass
4**	7840.250	44.94	2.27	54.0	9.06	AV	133.00	300	Horizontal	Pass
5	10204.951	52.18	-2.05	74.0	21.82	Peak	57.00	300	Horizontal	Pass
5**	10204.951	43.04	-2.05	54.0	10.96	AV	57.00	300	Horizontal	Pass
6	16549.162	52.65	0.04	74.0	21.35	Peak	276.00	400	Horizontal	Pass
6**	16549.162	43.77	0.04	54.0	10.23	AV	276.00	400	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11n40 High Channel

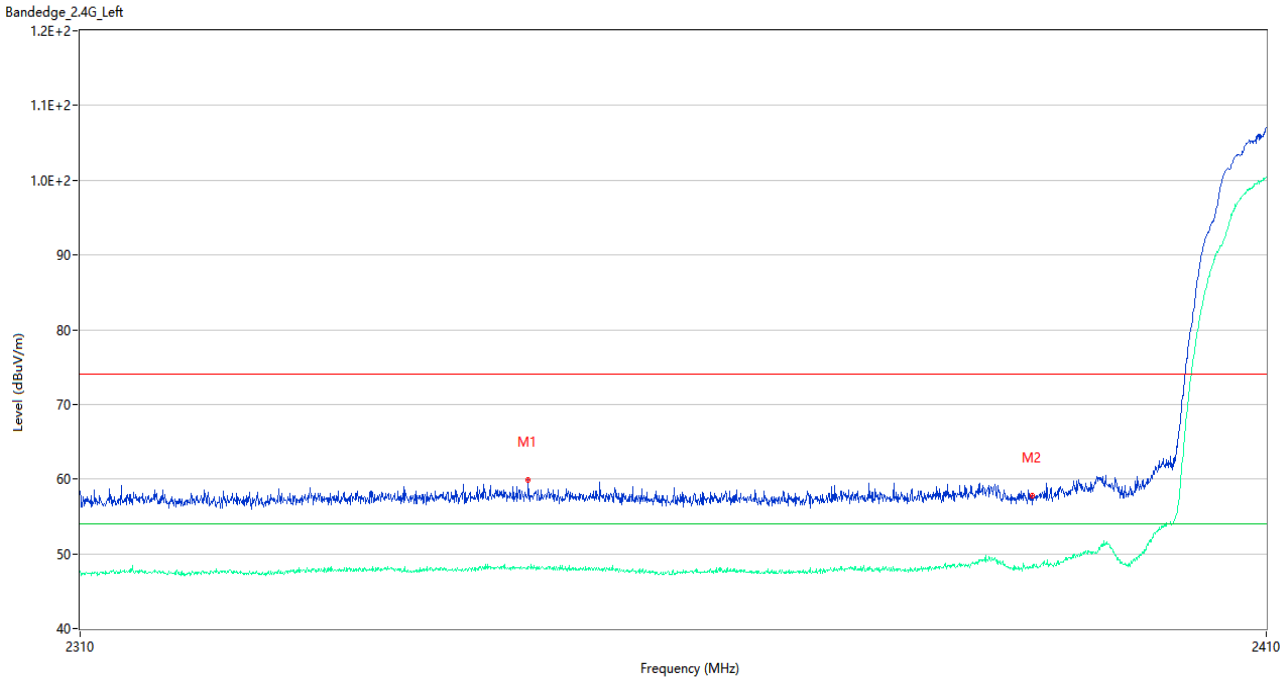
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1408.300	42.14	-17.19	74.0	31.86	Peak	223.00	100	Vertical	Pass
1**	1408.300	32.93	-17.19	54.0	21.07	AV	223.00	100	Vertical	Pass
2	2453.200	98.73	-12.01	74.0	-24.73	Peak	159.00	150	Vertical	N/A
2**	2453.200	89.81	-12.01	54.0	-35.81	AV	159.00	150	Vertical	N/A
3	4696.500	49.80	-4.01	74.0	24.20	Peak	55.00	150	Vertical	Pass
3**	4696.500	40.15	-4.01	54.0	13.85	AV	55.00	150	Vertical	Pass
4	7933.000	53.59	1.13	74.0	20.41	Peak	259.00	300	Vertical	Pass
4**	7933.000	44.67	1.13	54.0	9.33	AV	259.00	300	Vertical	Pass
5	10975.875	51.56	-2.02	74.0	22.44	Peak	327.00	100	Vertical	Pass
5**	10975.875	43.00	-2.02	54.0	11.00	AV	327.00	100	Vertical	Pass
6	16801.688	52.85	1.14	74.0	21.15	Peak	360.00	400	Vertical	Pass
6**	16801.688	44.07	1.14	54.0	9.93	AV	360.00	400	Vertical	Pass

A.7 Band Edge (Restricted-band band-edge)

Note [1]: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.
Note [2]: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.
Note [3]: According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

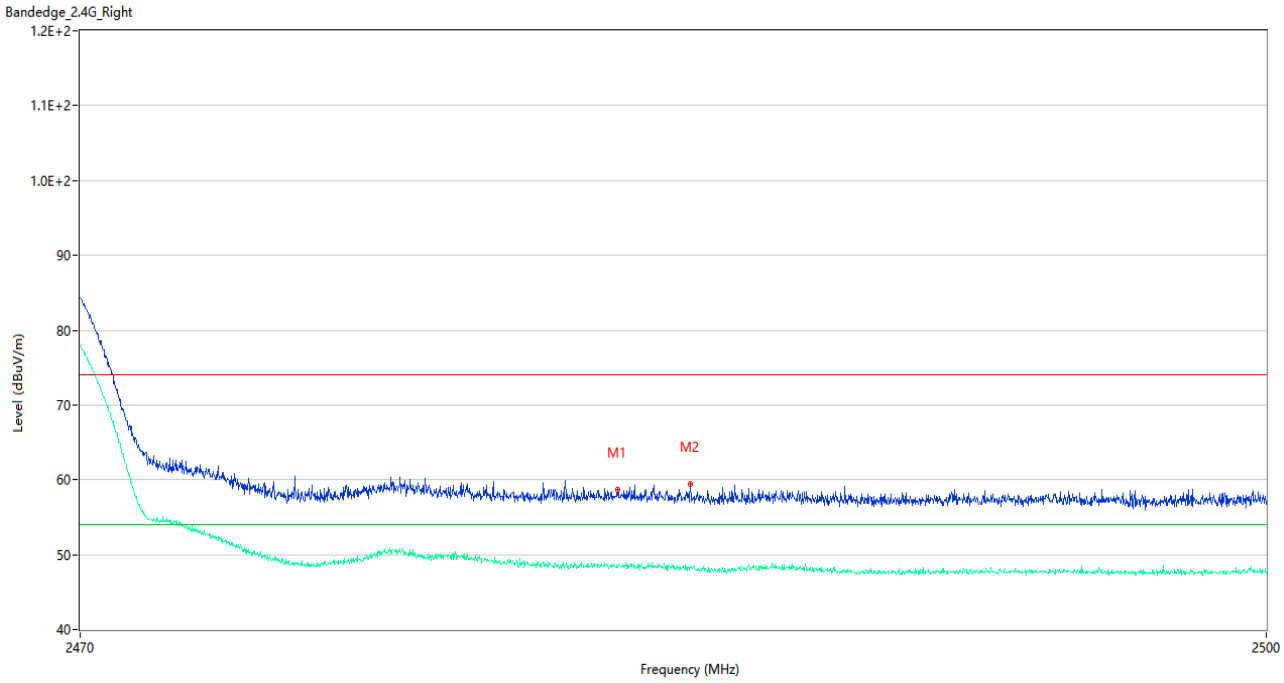
Test Data and Plots

802.11b LOW CHANNEL



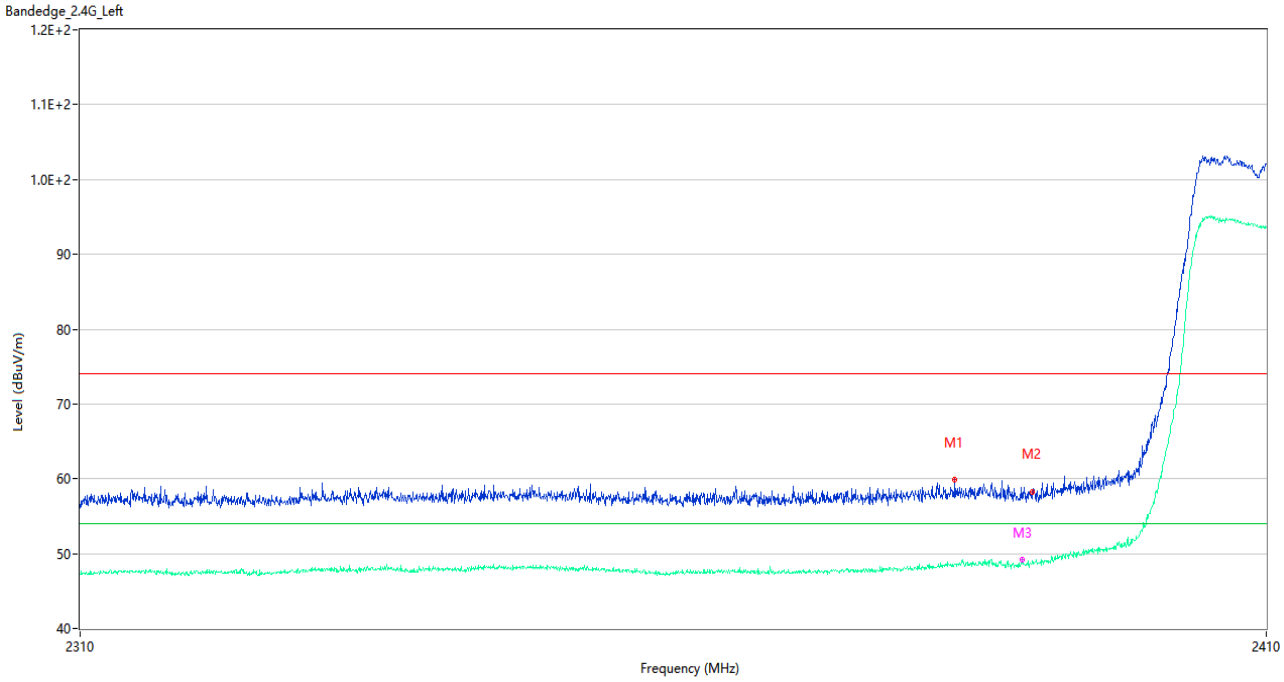
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2347.300	59.95	3.40	74.0	14.05	Peak	294.00	150	Horizontal	Pass
1**	2347.300	48.03	3.40	54.0	5.97	AV	294.00	150	Horizontal	Pass
2	2389.950	57.84	2.29	74.0	16.16	Peak	289.00	200	Horizontal	Pass
2**	2389.950	48.51	2.29	54.0	5.49	AV	289.00	200	Horizontal	Pass

802.11b HIGH CHANNEL



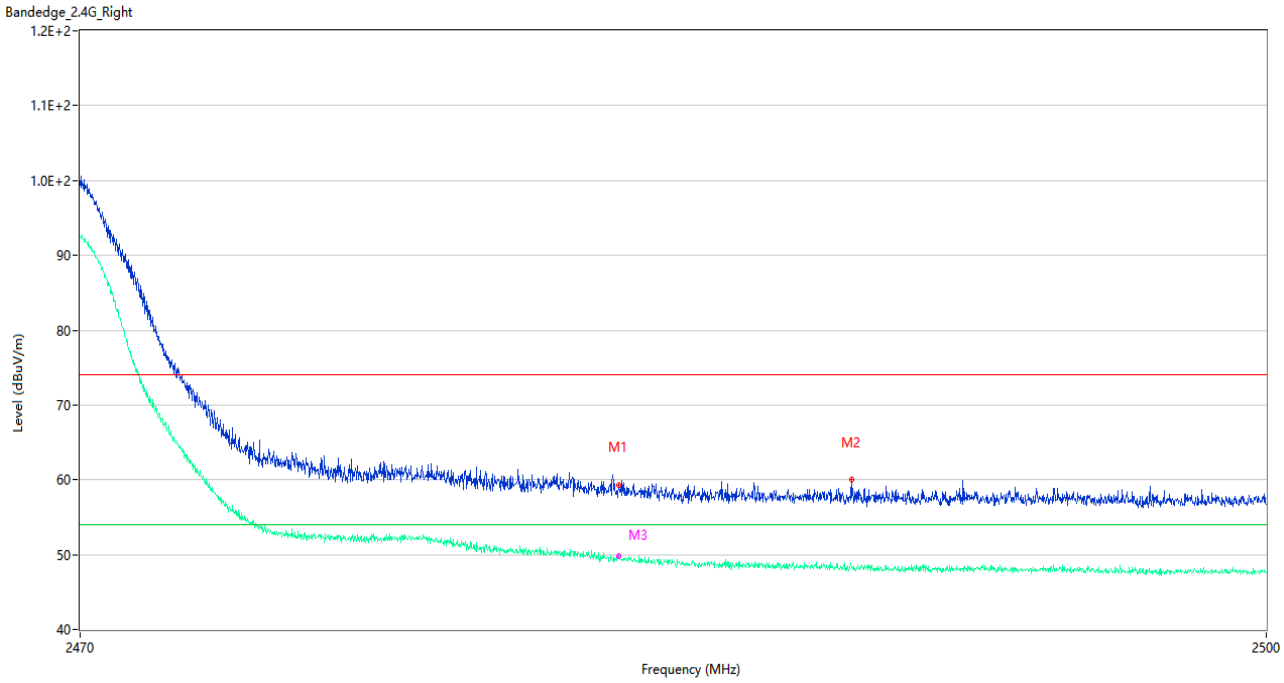
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.545	58.72	2.82	74.0	15.28	Peak	13.00	100	Horizontal	Pass
1**	2483.545	48.35	2.82	54.0	5.65	AV	13.00	100	Horizontal	Pass
2	2485.390	59.46	2.67	74.0	14.54	Peak	351.00	200	Horizontal	Pass
2**	2485.390	48.34	2.67	54.0	5.66	AV	351.00	200	Horizontal	Pass

802.11g LOW CHANNEL



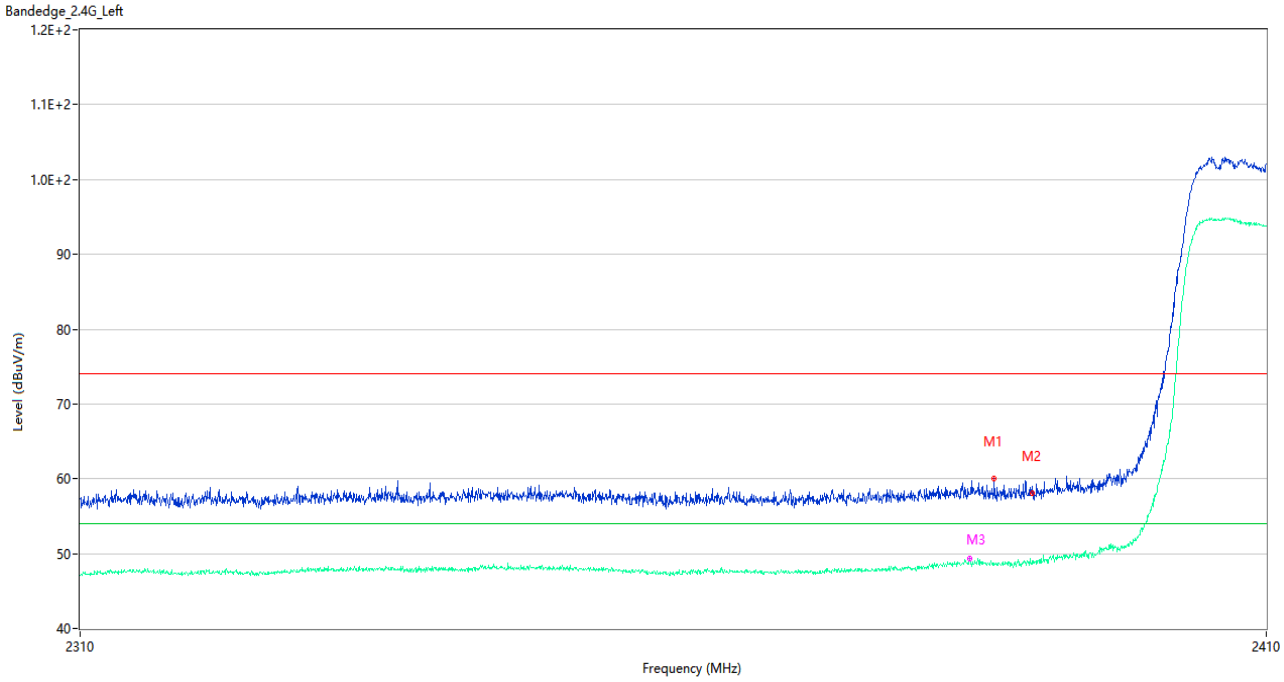
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2383.350	59.91	2.86	74.0	14.09	Peak	151.00	100	Horizontal	Pass
1**	2383.350	48.59	2.86	54.0	5.41	AV	151.00	100	Horizontal	Pass
2	2389.950	58.29	2.29	74.0	15.71	Peak	86.00	150	Horizontal	Pass
2**	2389.950	49.05	2.29	54.0	4.95	AV	86.00	150	Horizontal	Pass
3	2389.100	58.08	2.21	74.0	15.92	Peak	360.00	150	Horizontal	Pass
3**	2389.100	49.50	2.21	54.0	4.50	AV	360.00	150	Horizontal	Pass

802.11g HIGH CHANNEL



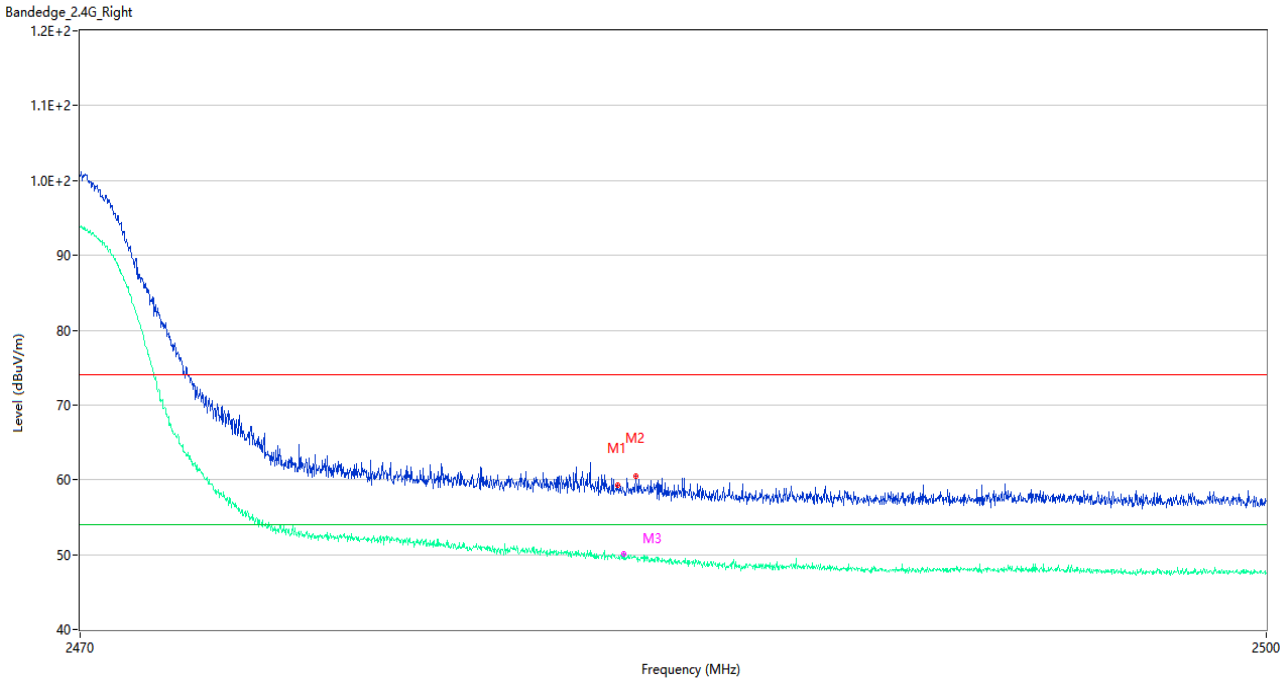
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.590	59.36	2.82	74.0	14.64	Peak	152.00	150	Horizontal	Pass
1**	2483.590	49.59	2.82	54.0	4.41	AV	152.00	150	Horizontal	Pass
2	2489.470	59.99	2.50	74.0	14.01	Peak	154.00	150	Horizontal	Pass
2**	2489.470	48.25	2.50	54.0	5.75	AV	154.00	150	Horizontal	Pass
3	2483.575	59.02	2.82	74.0	14.98	Peak	157.00	150	Horizontal	Pass
3**	2483.575	49.76	2.82	54.0	4.24	AV	157.00	150	Horizontal	Pass

802.11n20 LOW CHANNEL



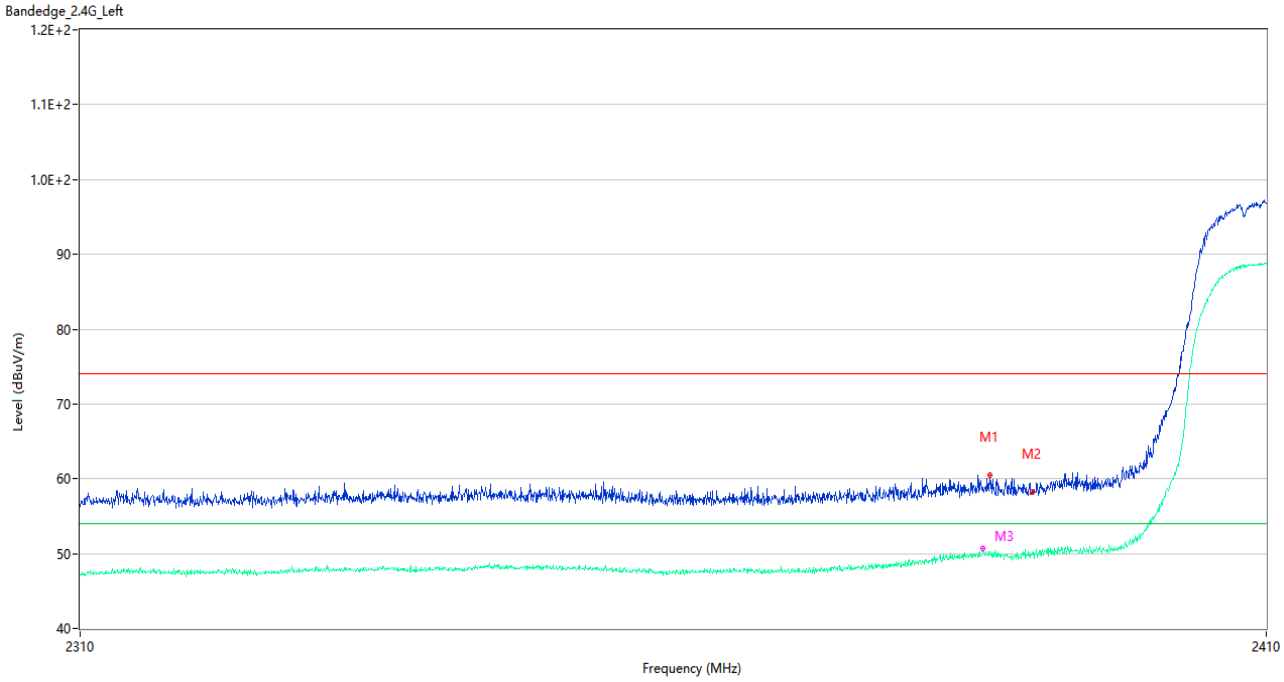
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2386.700	60.01	2.63	74.0	13.99	Peak	155.00	100	Horizontal	Pass
1**	2386.700	48.74	2.63	54.0	5.26	AV	155.00	100	Horizontal	Pass
2	2389.950	58.06	2.29	74.0	15.94	Peak	199.00	200	Horizontal	Pass
2**	2389.950	48.61	2.29	54.0	5.39	AV	199.00	200	Horizontal	Pass
3	2384.600	57.92	2.83	74.0	16.08	Peak	160.00	150	Horizontal	Pass
3**	2384.600	49.50	2.83	54.0	4.50	AV	160.00	150	Horizontal	Pass

802.11n20 HIGH CHANNEL



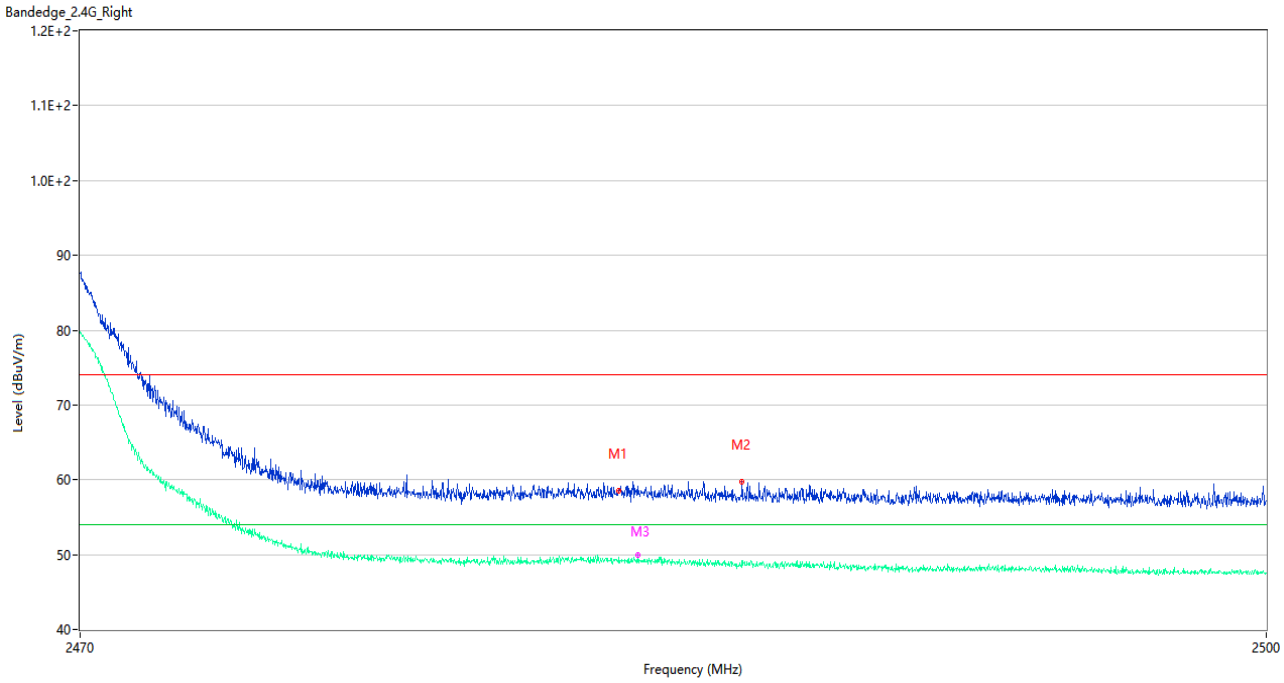
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.545	59.27	2.82	74.0	14.73	Peak	35.00	150	Horizontal	Pass
1**	2483.545	49.49	2.82	54.0	4.51	AV	35.00	150	Horizontal	Pass
2	2484.010	60.54	2.83	74.0	13.46	Peak	159.00	150	Horizontal	Pass
2**	2484.010	49.69	2.83	54.0	4.31	AV	159.00	150	Horizontal	Pass
3	2483.710	58.47	2.82	74.0	15.53	Peak	159.00	150	Horizontal	Pass
3**	2483.710	50.06	2.82	54.0	3.94	AV	159.00	150	Horizontal	Pass

802.11n40 LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2386.350	60.54	2.70	74.0	13.46	Peak	159.00	150	Horizontal	Pass
1**	2386.350	50.29	2.70	54.0	3.71	AV	159.00	150	Horizontal	Pass
2	2389.950	58.29	2.29	74.0	15.71	Peak	47.00	100	Horizontal	Pass
2**	2389.950	50.03	2.29	54.0	3.97	AV	47.00	100	Horizontal	Pass
3	2385.750	58.33	2.74	74.0	15.67	Peak	156.00	150	Horizontal	Pass
3**	2385.750	50.71	2.74	54.0	3.29	AV	156.00	150	Horizontal	Pass

802.11n40 HIGH CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.590	58.47	2.82	74.0	15.53	Peak	161.00	100	Horizontal	Pass
1**	2483.590	49.60	2.82	54.0	4.40	AV	161.00	100	Horizontal	Pass
2	2486.695	59.75	2.55	74.0	14.25	Peak	156.00	150	Horizontal	Pass
2**	2486.695	49.26	2.55	54.0	4.74	AV	156.00	150	Horizontal	Pass
3	2484.070	58.01	2.83	74.0	15.99	Peak	266.00	150	Horizontal	Pass
3**	2484.070	49.96	2.83	54.0	4.04	AV	266.00	150	Horizontal	Pass

A.8 Power Spectral Density (PSD)

Test Data

802.11b Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-13.83	8
Middle	-13.46	8
High	-13.78	8

802.11g Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-19.56	8
Middle	-17.25	8
High	-18.86	8

802.11n-20 MHz Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-19.65	8
Middle	-17.50	8
High	-19.09	8

802.11n-40 MHz Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-24.24	8
Middle	-21.15	8
High	-25.34	8

Test Plots

802.11b LOW CHANNEL

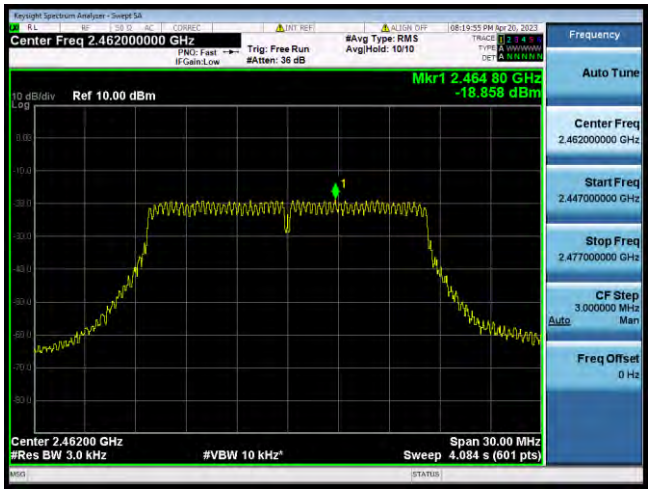
802.11b MIDDLE CHANNEL

802.11b HIGH CHANNEL

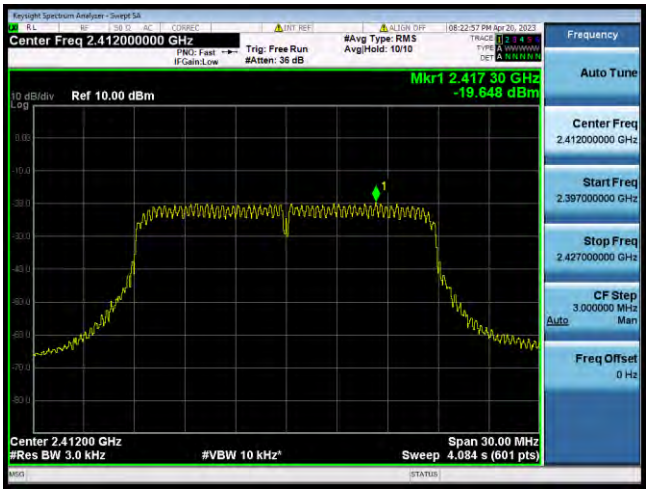
802.11g LOW CHANNEL

802.11g MIDDLE CHANNEL

802.11g HIGH CHANNEL

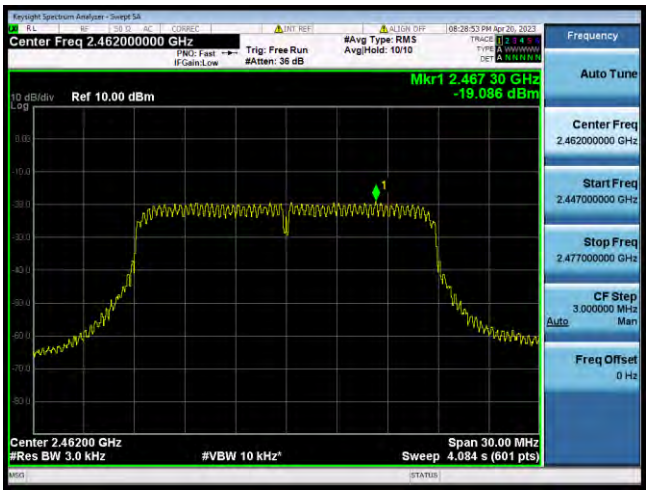


802.11n-20 MHz LOW CHANNEL

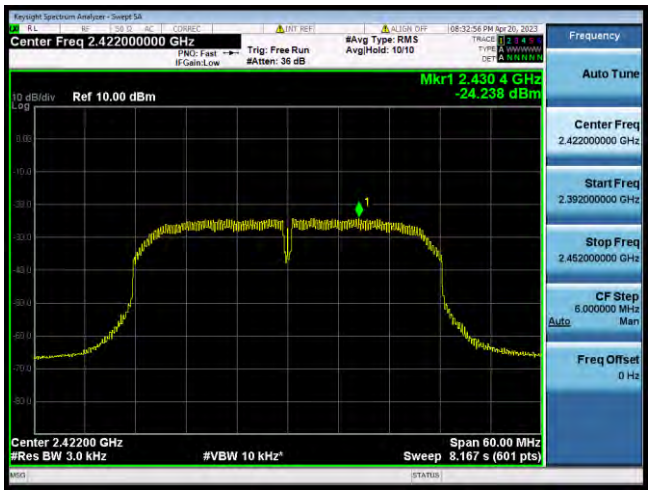


802.11n-20 MHz MIDDLE CHANNEL

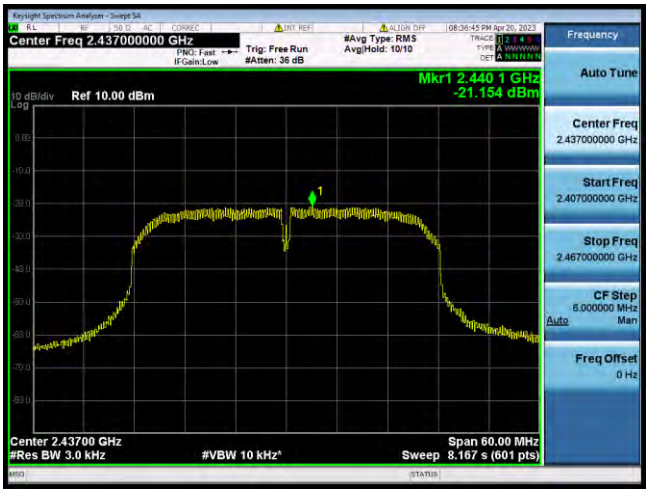
802.11n-20 MHz HIGH CHANNEL



802.11n-40 MHz LOW CHANNEL



802.11n-40 MHz MIDDLE CHANNEL



802.11n-40 MHz HIGH CHANNEL

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2340548-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2340548-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2340548-AI.PDF”.

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--END OF REPORT--