TEST REPORT

Applicant:	REOLINK INNOVATION LIMITED
Address:	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL HONG KONG
Equipment Type:	WiFi module
Model Name:	WL1NM1001
Brand Name:	Reolink
FCC ID:	2AYHE-2402A
Test Standard:	47 CFR Part 15 Subpart C (refer to section 3.1)
Sample Arrival Date:	Oct. 14, 2024
Test Date:	Oct. 19, 2024 - Oct. 23, 2024
Date of Issue:	Nov. 04, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Li Ganming	**Checked by:** Ye Hongji	**Approved by:** Sunny Zou (Technical Director)
Li Ganming	Ye Hongji	Sunny Zou

Revision History

Version	Issue Date	Revisions
Rev. 01	Nov. 04, 2024	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	REOLINK INNOVATION LIMITED
Address	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL HONG KONG

2.2 Manufacturer Information

Manufacturer	REOLINK INNOVATION LIMITED
Address	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL HONG KONG

2.3 General Description for Equipment under Test (EUT)

EUT Name	WiFi module
Model Name Under Test	WL1NM1001
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax

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

Frequency Range	802.11b/g/n/ax(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.
Modulation Type	DSSS, OFDM, OFDMA
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Antenna System (eg., MIMO, Smart Antenna)	N/A
Categorization as Correlated or Completely Uncorrelated	N/A
Antenna Type	Dipole Antenna
Antenna Gain	3.12 dBi
About the Product	Only the WIFI 802.11b, 802.11g, 802.11n (HT20) and 802.11ax (HE20) was tested in this report.

802.11ax RU configuration table					
Mode	Full RU (SU)	RU_26	RU_52	RU_106	RU_242
802.11ax20	√	--	--	--	--

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
OFDMA (802.11ax-20 MHz)	BPSK	4
	QPSK	16/24/17/26
	16QAM	33/49/34/52
	64QAM	65/73/81/69/77/86
	256QAM	98/108/103/115
	1024QAM	122/135/129/143

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/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Occupied Bandwidth	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Conducted Spurious Emission	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Conducted Emission	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Radiated Spurious Emission	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Band Edge	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11
Power spectral density (PSD)	11b/11g/11n20/11ax20	1/6/6.5/4 Mbps	1/6/11

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[Note1]
2	Output Power	15.247 (b)	ANNEX A.1	Pass[Note2]
3	Occupied Bandwidth	15.247 (a)	ANNEX A.2	Pass[Note2]
4	Conducted Spurious Emission	15.247 (d)	ANNEX A.3	Pass[Note2]
5	Band Edge(Authorized-band band-edge)	15.247 (d)	ANNEX A.4	Pass[Note2]
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[Note2]

Note [1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note [2]: Compared with the EUT of test report BL-SZ2471080-602, the EUT of this report shows different things as below:

1. Updated the antenna and antenna gain.

Other hardware circuit and software are the same as EUT referred to in test report BL-SZ2471080-602. Therefore, in addition to the above differences, just Conducted Emission & Radiated Spurious Emission & Band Edge(Restricted-band band-edge) were retested in this report, others test data and EUT information are derived from the report BL-SZ2471080-602 published by Shenzhen BALUN Technology Co., Ltd. on Aug. 15, 2024.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	50% to 63%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+24.3℃ to +26.3℃
Working Voltage of the EUT	NV (Normal Voltage)	3.3 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2024.08.01	2025.07.31
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2024.05.22	2025.05.21
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2023.12.27	2024.12.26
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2024.05.16	2027.05.15
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2024.06.15	2027.06.14
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2024.07.28	2027.07.27
Amplifier	COM-MV	LSCX_LNA1-12G-01	7210214	2024.08.01	2025.07.31
Amplifier	COM-MV	XKu_LNA7-18G-01	7210209	2024.08.01	2025.07.31
Amplifier	COM-MV	KA LNA18 40G-01	18050001	2023.12.06	2024.12.05
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2024.08.01	2025.07.31
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-01162	2023.08.04	2026.08.03
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2025.01.22
Amplifier	COM-MV	ZT30-1000M	B2018054558	2023.12.05	2024.12.04
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	130	2024.07.13	2027.07.12
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2024.08.01	2025.07.31
LISN	SCHWARZBECK	NSLK 8127	8127-687	2024.05.09	2025.05.08
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2022.02.19	2025.02.18

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	V22.930	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.

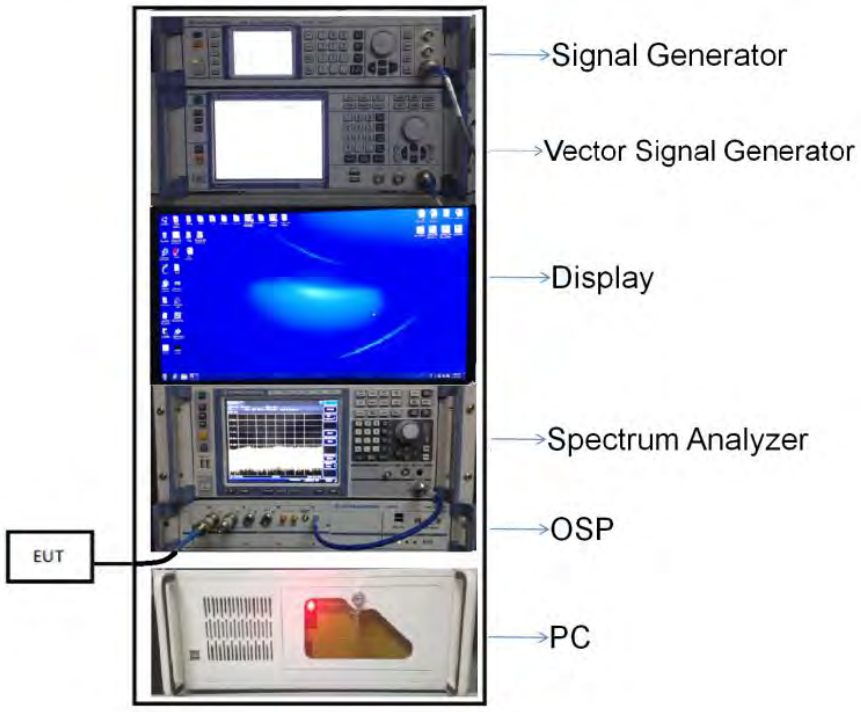
Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8℃
Humidity	4%

4.5 Description of Test Setup

4.5.1 For Antenna Port Test

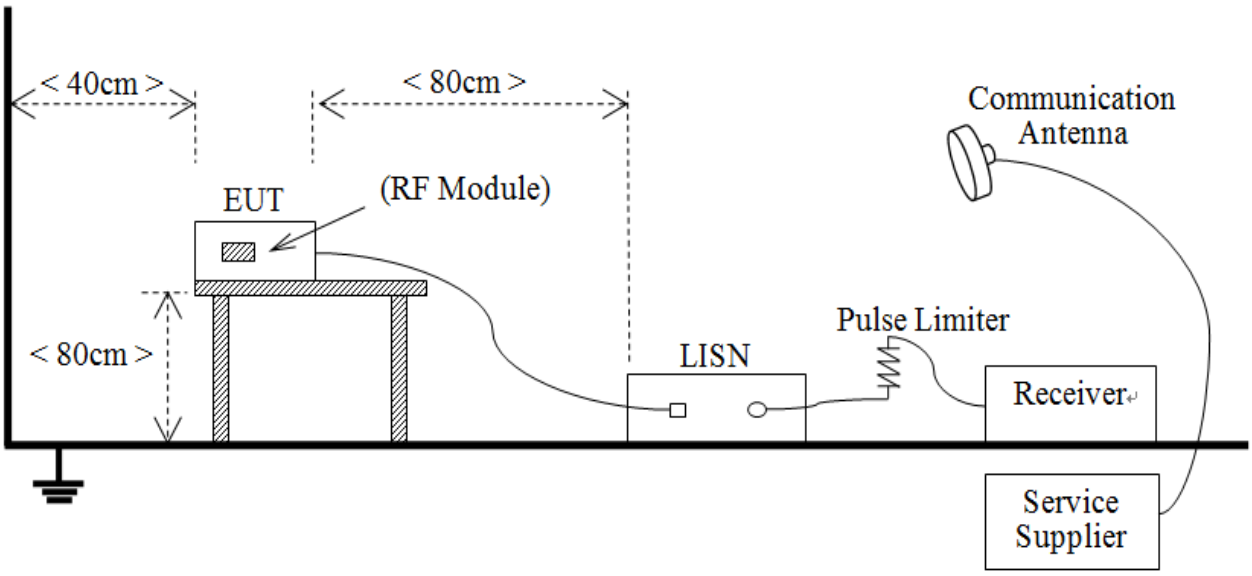
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

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



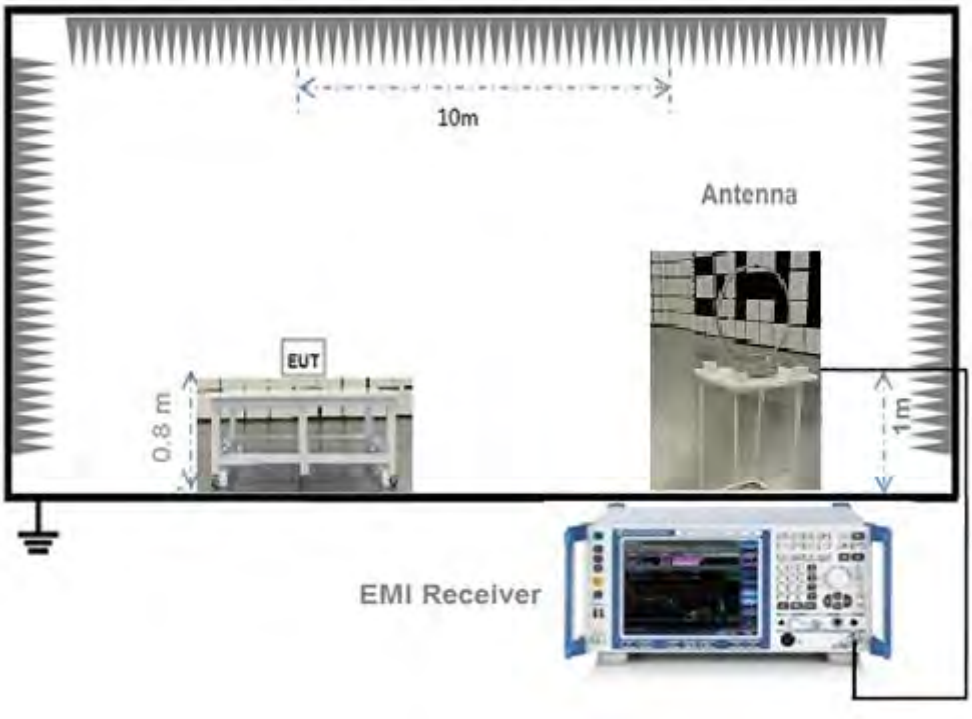
(Diagram 1)

4.5.2 For AC Power Supply Port Test



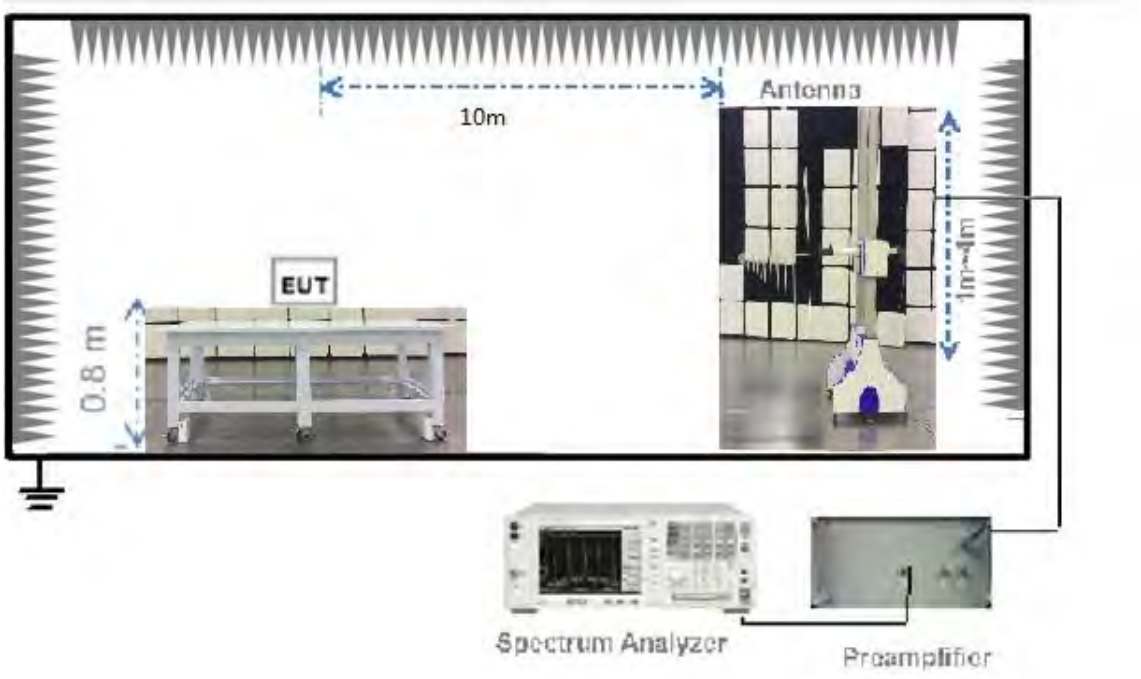
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



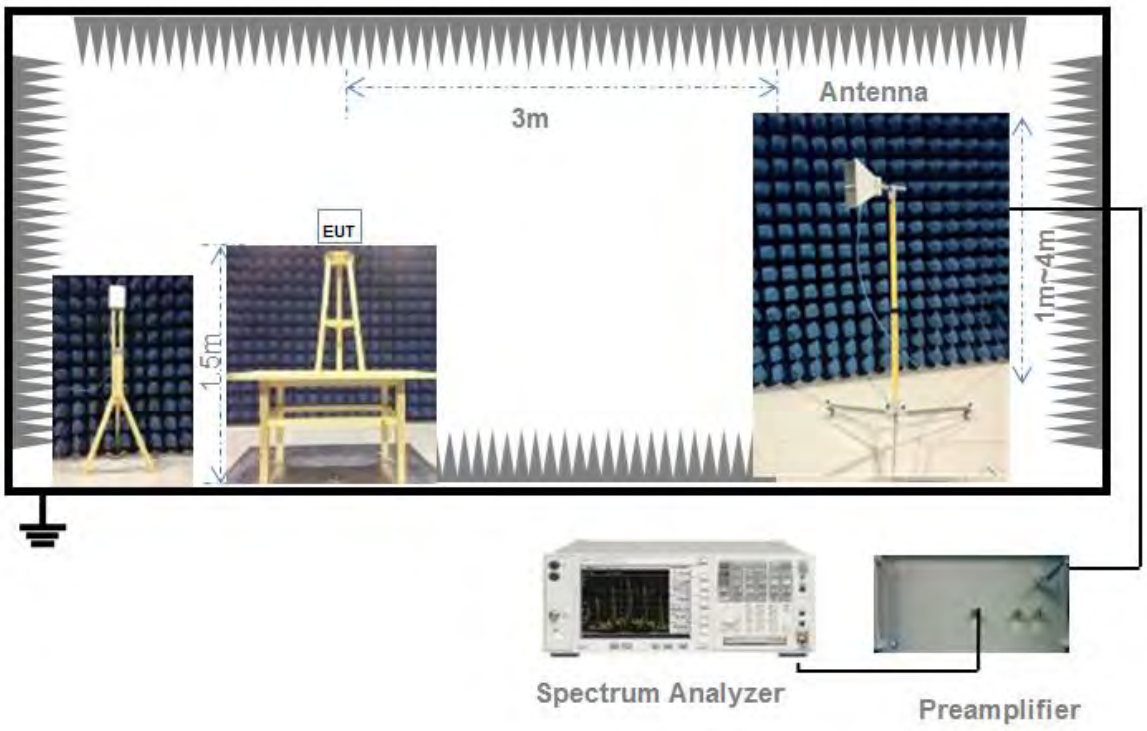
(Diagram 3)

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 – 20log 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.

The EUT shall be transmitted at its maximum power control level.

Maximum conducted (average) output power (Reporting Only)

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed 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 signal.

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.

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.

Reference level measurement

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 $\geqslant$ 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 $\geqslant$ 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 $\leqslant$ RBW $\leqslant$ 100 kHz.

Set the VBW $\geqslant$ 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	Duty Factor
802.11b	8.38	8.71	96.20%	0.17
802.11g	1.39	1.73	80.46%	0.94
802.11n-20 MHz	1.30	1.63	79.31%	1.01
802.11ax-20 MHz	1.01	1.35	75.19%	1.24

Peak Power Test Data

802.11b Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	16.47	44.36	30	1000	Pass
Middle	16.61	45.81			Pass
High	16.78	47.64			Pass

802.11g Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	18.36	68.55	30	1000	Pass
Middle	18.54	71.45			Pass
High	18.65	73.28			Pass

802.11n-20 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	17.99	62.95	30	1000	Pass
Middle	21.27	133.97			Pass
High	16.29	42.56			Pass

802.11ax-20 MHz(SU) Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	21.14	130.02	30	1000	Pass
Middle	21.90	154.88			Pass
High	21.04	127.06			Pass

Average Power Test Data

802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	13.53	22.54	30	1000	Pass
Middle	13.68	23.33			Pass
High	13.83	24.15			Pass

802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	12.69	18.58	30	1000	Pass
Middle	12.85	19.28			Pass
High	12.98	19.86			Pass

802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	12.27	16.87	30	1000	Pass
Middle	15.67	36.90			Pass
High	10.60	11.48			Pass

802.11ax-20 MHz(SU) Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	14.37	27.35	30	1000	Pass
Middle	14.49	28.12			Pass
High	14.11	25.76			Pass

A.2 Occupied Bandwidth

Test Data

802.11b Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	8.700000	12.789000	≥500
Middle	8.200000	12.806000	≥500
High	8.200000	12.820000	≥500

802.11g Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	15.200000	17.038000	≥500
Middle	15.200000	17.004000	≥500
High	15.300000	17.015000	≥500

802.11n-20MHz Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	15.300000	17.835000	≥500
Middle	15.300000	17.849000	≥500
High	15.200000	17.806000	≥500

802.11ax-20 MHz(SU) Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Low	18.100000	18.856000	≥500
Middle	18.100000	18.855000	≥500
High	18.100000	18.844000	≥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

802.11ax-20 MHz(SU) LOW CHANNEL

802.11ax-20 MHz(SU) MIDDLE CHANNEL

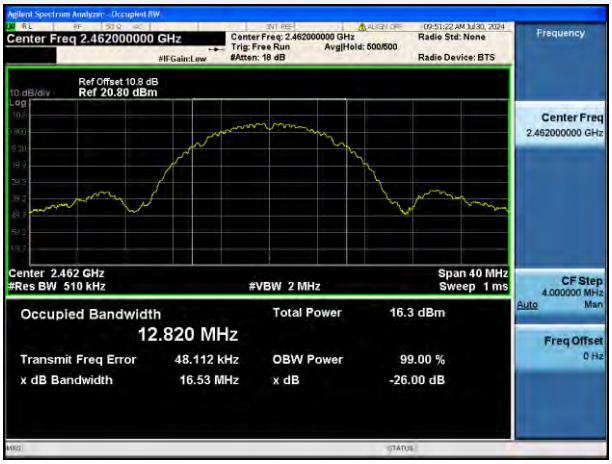
802.11ax-20 MHz(SU) HIGH CHANNEL

99% Bandwidth

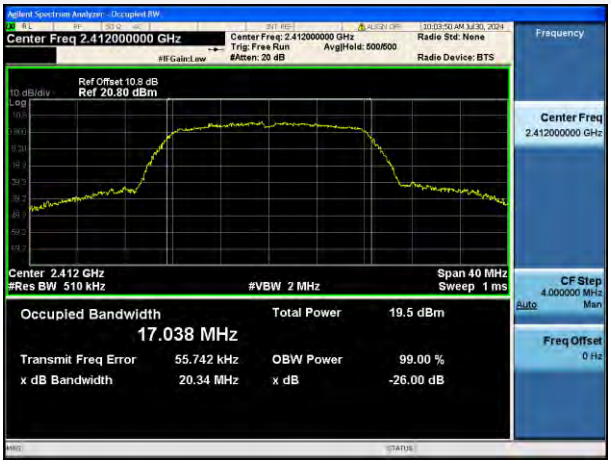
802.11b LOW CHANNEL

802.11b MIDDLE CHANNEL

802.11b HIGH CHANNEL

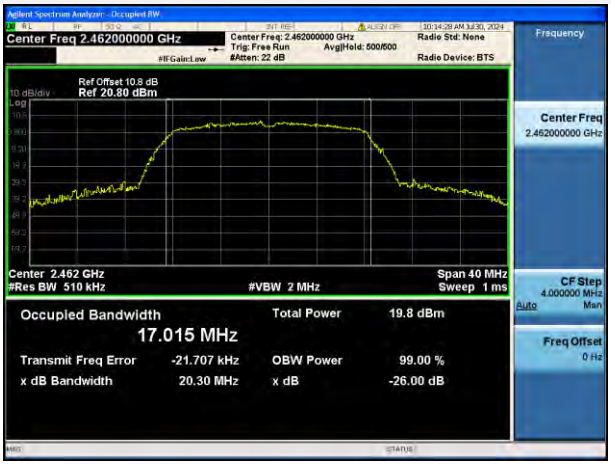


802.11g LOW CHANNEL



802.11g MIDDLE CHANNEL

802.11g HIGH CHANNEL

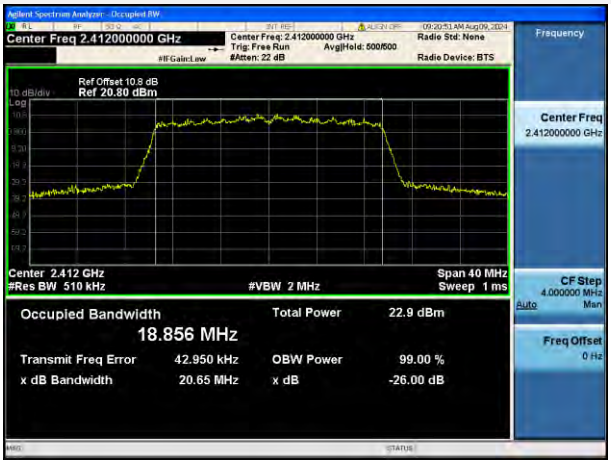


802.11n-20 MHz LOW CHANNEL

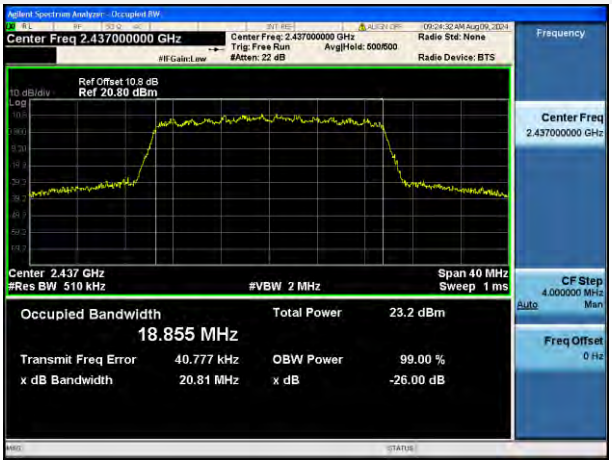
802.11n-20 MHz MIDDLE CHANNEL

802.11n-20 MHz HIGH CHANNEL

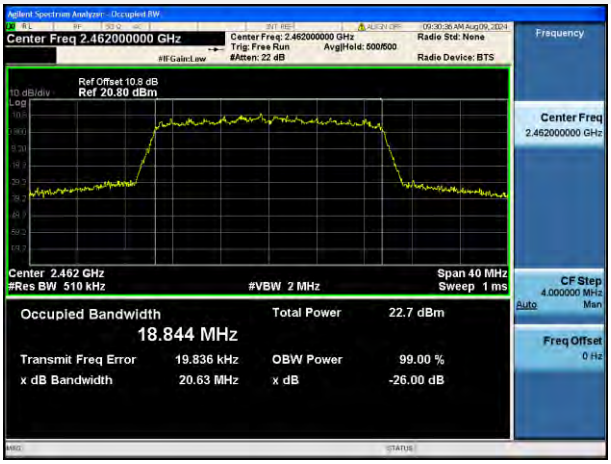
802.11ax-20 MHz(SU) LOW CHANNEL



802.11ax-20 MHz(SU) MIDDLE CHANNEL



802.11ax-20 MHz(SU) 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	-40.90	4.68	-15.32	Pass
Middle	-40.34	4.66	-15.34	Pass
High	-40.87	4.82	-15.18	Pass

802.11g Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-40.71	2.83	-17.17	Pass
Middle	-40.08	3.10	-16.90	Pass
High	-40.34	3.15	-16.85	Pass

802.11n-20MHz Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-37.91	2.66	-17.34	Pass
Middle	-39.36	5.68	-14.33	Pass
High	-38.50	1.02	-18.98	Pass

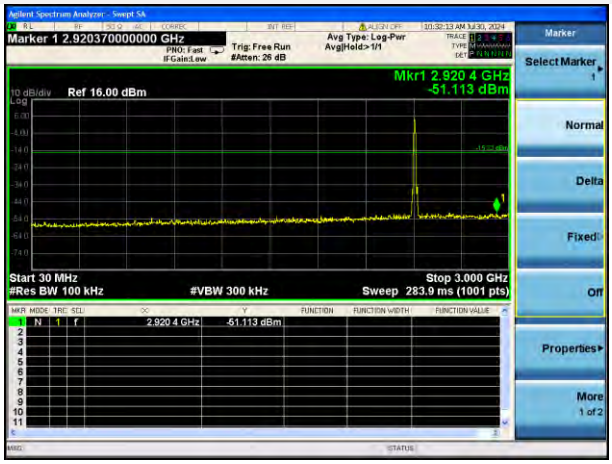
802.11ax-20 MHz(SU) Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-40.52	4.46	-15.54	Pass
Middle	-40.48	4.52	-15.48	Pass
High	-40.31	4.17	-15.83	Pass

Test Plots

802.11b LOW CHANNEL CARRIER LEVEL

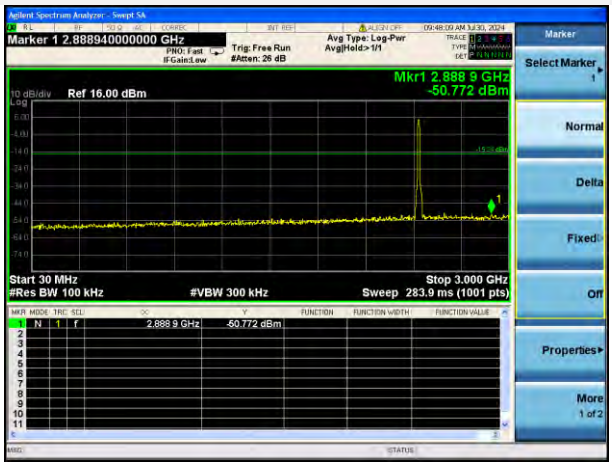
802.11b LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11b LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11b MIDDLE CHANNEL CARRIER LEVEL

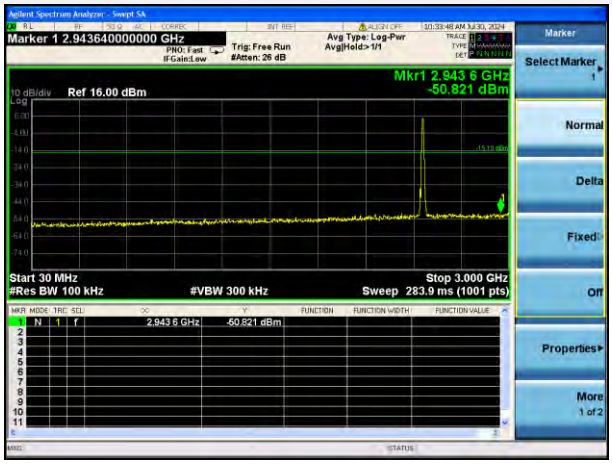
802.11b MIDDLE CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



802.11b MIDDLE CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11b HIGH CHANNEL CARRIER LEVEL

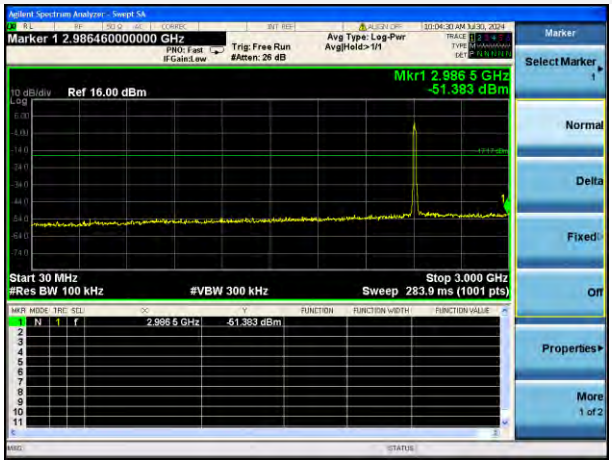
802.11b HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



802.11b HIGH CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11g LOW CHANNEL CARRIER LEVEL

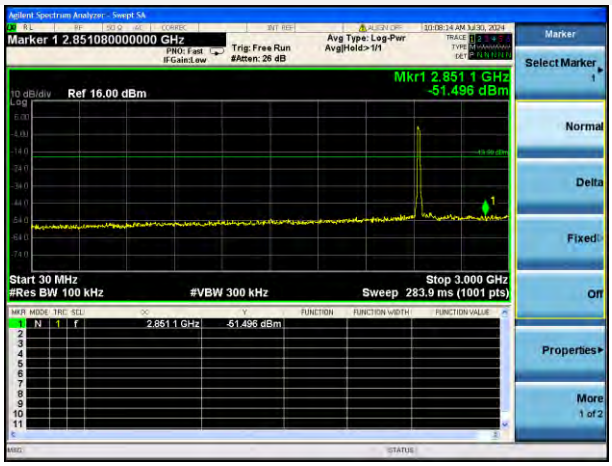
802.11g LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11g LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11g MIDDLE CHANNEL CARRIER LEVEL

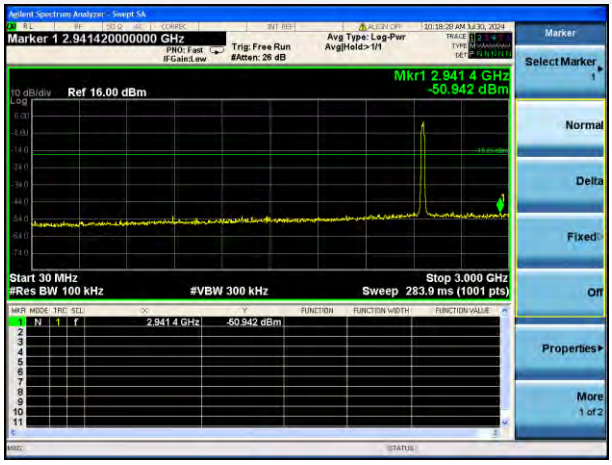
802.11g MIDDLE CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



802.11g MIDDLE CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11g HIGH CHANNEL CARRIER LEVEL

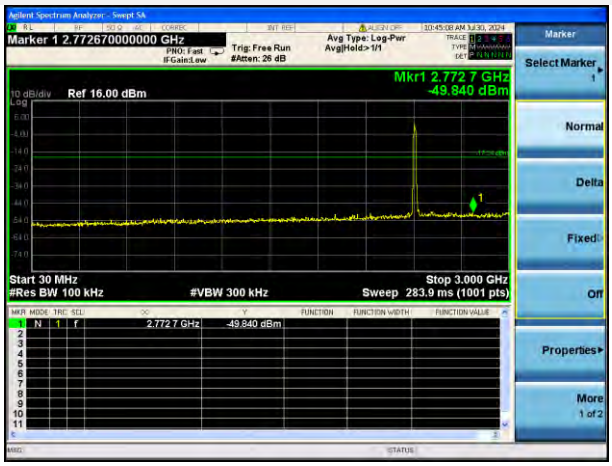
802.11g HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



802.11g HIGH CHANNEL, SPURIOUS
2 GHz ~ 25 GHz

802.11n-20 MHz LOW CHANNEL CARRIER LEVEL

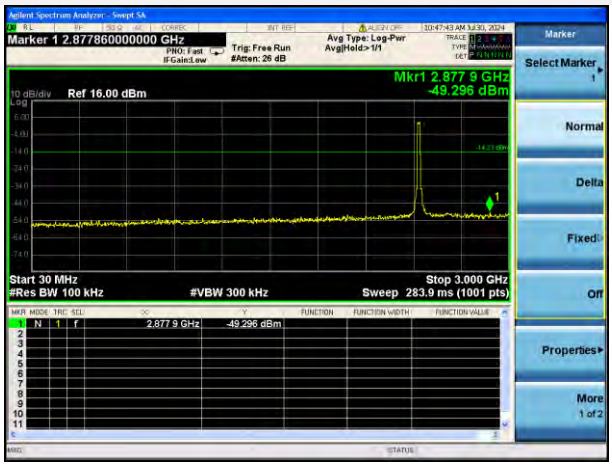
802.11n-20 MHz LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



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

802.11n-20 MHz MIDDLE CHANNEL CARRIER LEVEL

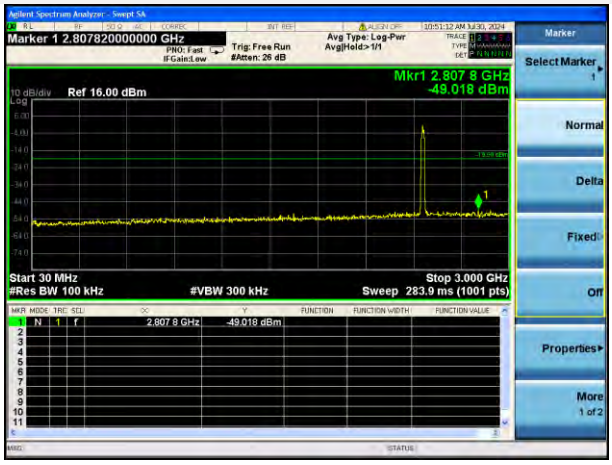
802.11n-20 MHz MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



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

802.11n-20 MHz HIGH CHANNEL CARRIER LEVEL

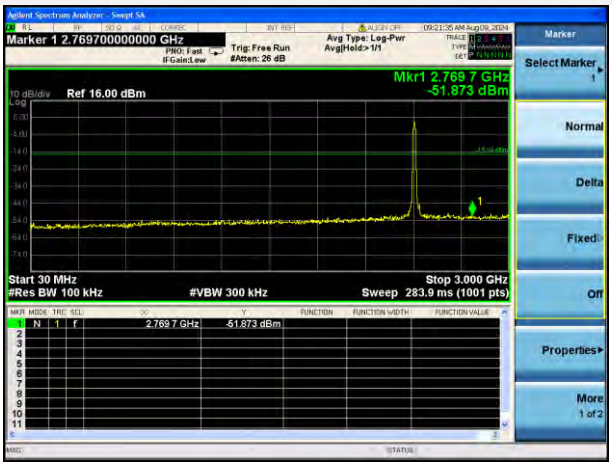
802.11n-20 MHz HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



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

802.11ax-20 MHz(SU) LOW CHANNEL CARRIER LEVEL

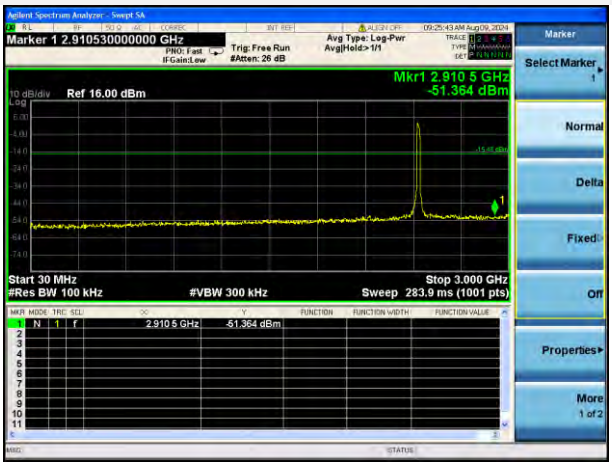
802.11ax-20 MHz(SU) LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11ax-20 MHz(SU) LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11ax-20 MHz(SU) MIDDLE CHANNEL CARRIER LEVEL

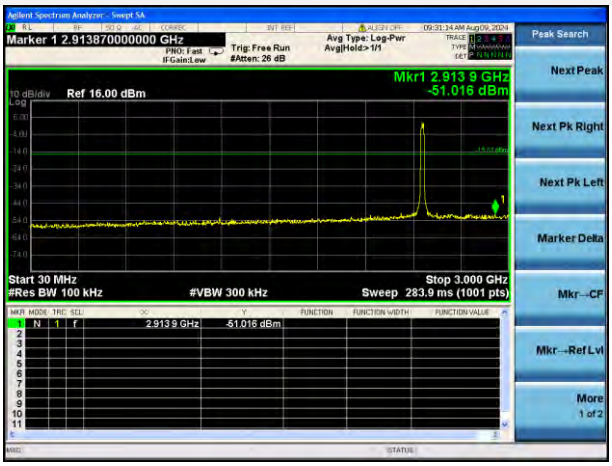
802.11ax-20 MHz(SU) MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11ax-20 MHz(SU) MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

802.11ax-20 MHz(SU) HIGH CHANNEL CARRIER LEVEL

802.11ax-20 MHz(SU) HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



802.11ax-20 MHz(SU) 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	-35.87	4.68	-15.32	Pass
High Channel	-48.30	4.82	-15.18	Pass

802.11g Mode：

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-40.96	2.83	-17.17	Pass
High Channel	-49.55	3.15	-16.85	Pass

802.11n-20 MHz Mode:

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-44.24	4.46	-15.54	Pass
High Channel	-50.09	4.17	-15.83	Pass

802.11ax-20 MHz(SU) Mode:

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low Channel	-37.61	4.46	-15.54	Pass
High Channel	-43.80	4.17	-15.83	Pass

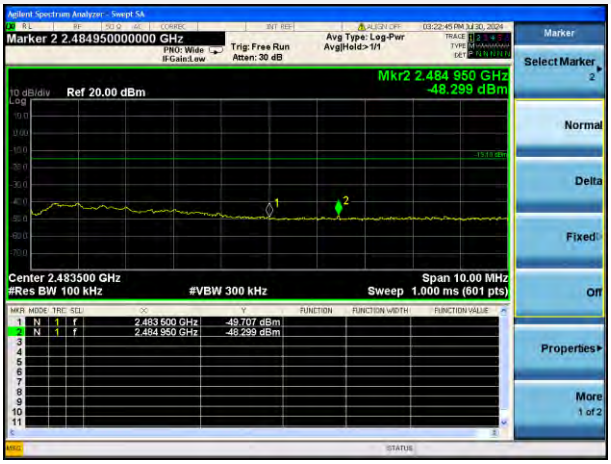
Test Plots

802.11b LOW CHANNEL, CARRIER LEVEL

802.11b LOW CHANNEL, BAND EDGE

802.11b HIGH CHANNEL, CARRIER LEVEL

802.11b HIGH CHANNEL, BAND EDGE

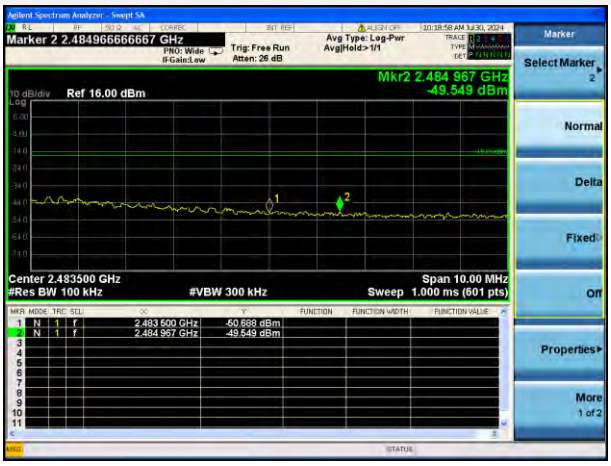


802.11g LOW CHANNEL, CARRIER LEVEL

802.11g LOW CHANNEL, BAND EDGE

802.11g HIGH CHANNEL, CARRIER LEVEL

802.11g HIGH CHANNEL, BAND EDGE

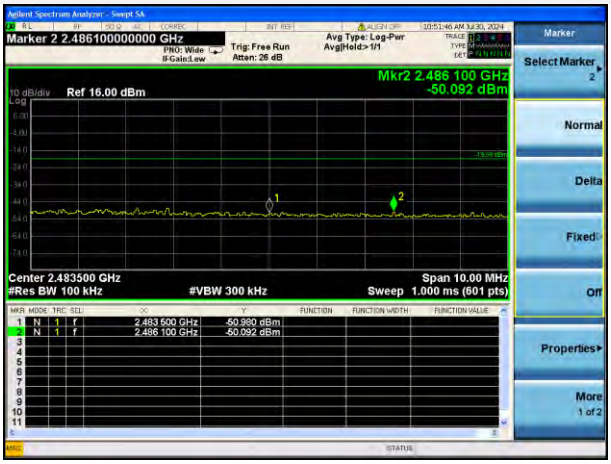


802.11n-20 MHz LOW CHANNEL, CARRIER LEVEL

802.11n-20 MHz LOW CHANNEL, BAND EDGE

802.11n-20 MHz HIGH CHANNEL, CARRIER LEVEL

802.11n-20 MHz HIGH CHANNEL, BAND EDGE

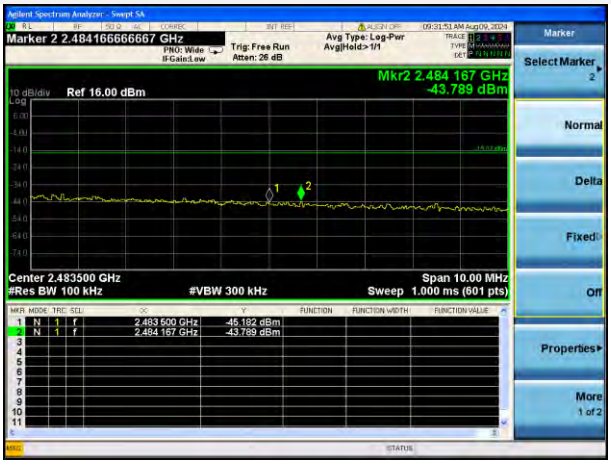


802.11ax-20 MHz(SU) LOW CHANNEL, CARRIER LEVEL

802.11ax-20 MHz(SU) LOW CHANNEL, BAND EDGE

802.11ax-20 MHz(SU) HIGH CHANNEL, CARRIER LEVEL

802.11ax-20 MHz(SU) HIGH CHANNEL, BAND EDGE



A.5 Conducted Emissions

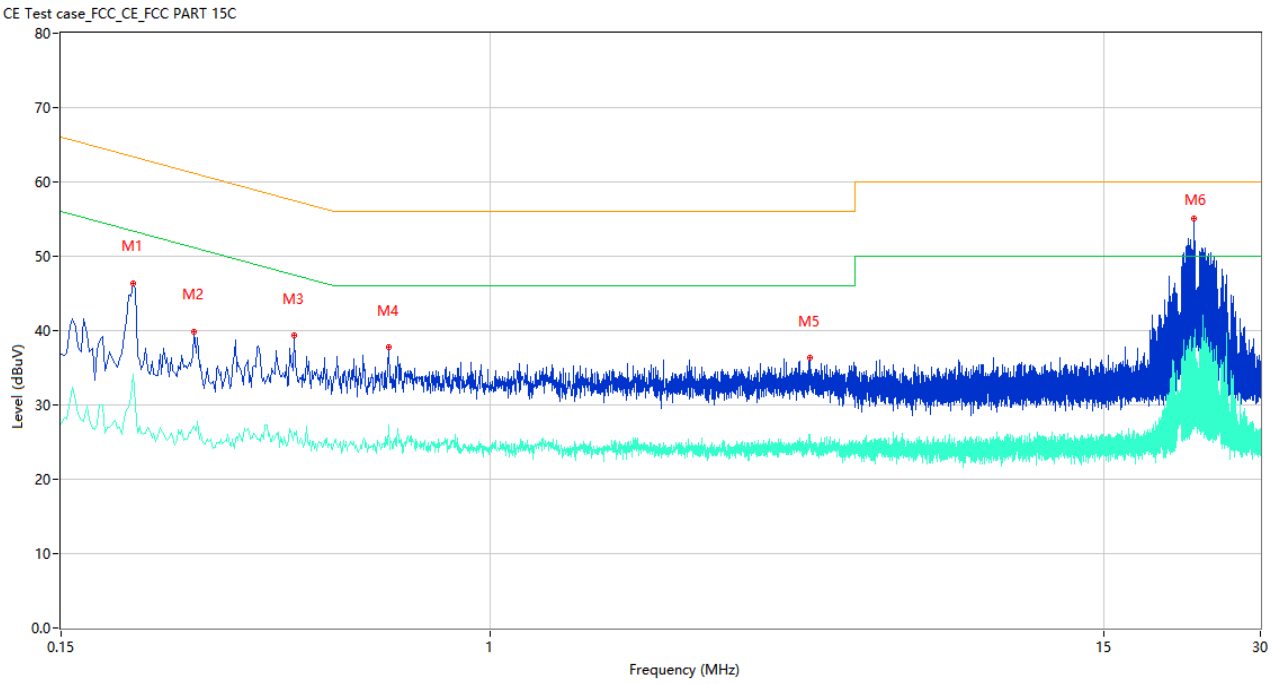
Note [1]: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

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)

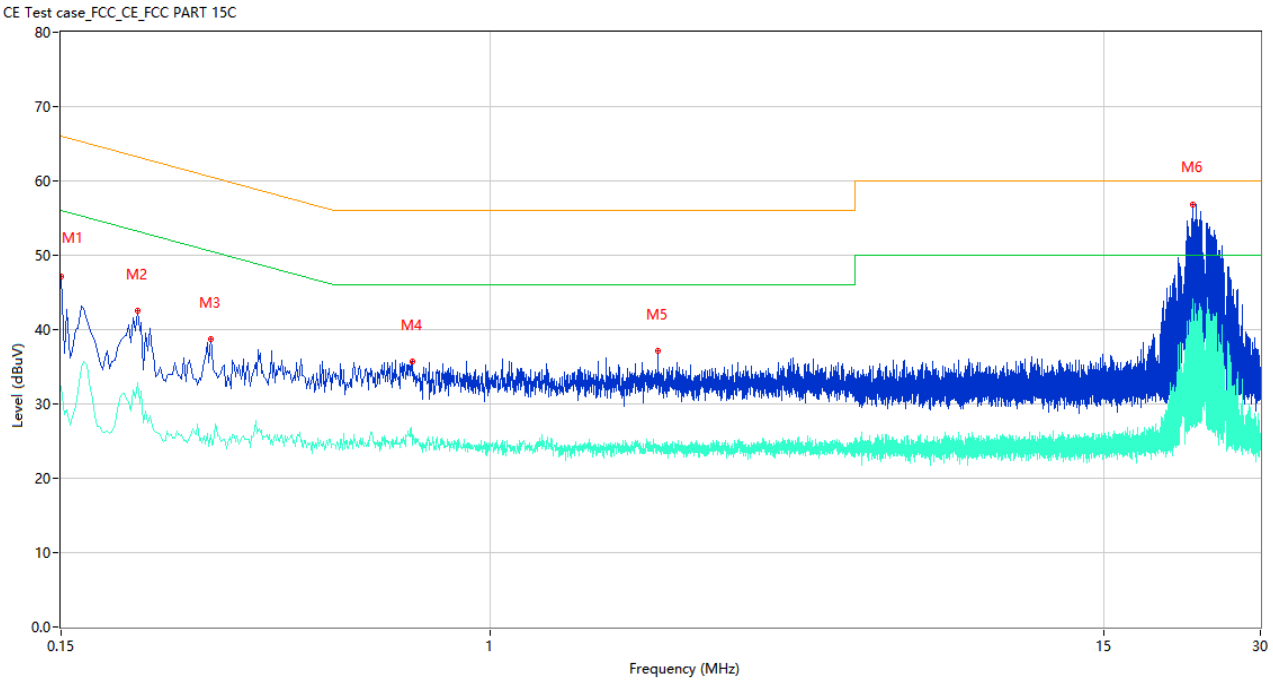
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.206	46.43	9.77	63.37	16.94	Peak	L	Pass
1**	0.206	34.18	9.77	53.37	19.19	AV	L	Pass
2	0.270	39.85	9.76	61.12	21.27	Peak	L	Pass
2**	0.270	27.17	9.76	51.12	23.95	AV	L	Pass
3	0.420	39.35	10.34	57.45	18.10	Peak	L	Pass
3**	0.420	26.32	10.34	47.45	21.13	AV	L	Pass
4	0.638	37.72	10.20	56.00	18.28	Peak	L	Pass
4**	0.638	27.34	10.20	46.00	18.66	AV	L	Pass
5	4.098	36.29	10.41	56.00	19.71	Peak	L	Pass
5**	4.098	25.09	10.41	46.00	20.91	AV	L	Pass
6	22.364	55.10	11.02	60.00	4.90	Peak	L	Pass
6**	22.364	34.66	11.02	50.00	15.34	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	47.12	9.78	66.00	18.88	Peak	N	Pass
1**	0.150	32.37	9.78	56.00	23.63	AV	N	Pass
2	0.210	42.53	9.77	63.21	20.68	Peak	N	Pass
2**	0.210	32.89	9.77	53.21	20.32	AV	N	Pass
3	0.290	38.69	9.76	60.52	21.83	Peak	N	Pass
3**	0.290	25.85	9.76	50.52	24.67	AV	N	Pass
4	0.710	35.68	10.55	56.00	20.32	Peak	N	Pass
4**	0.710	25.91	10.55	46.00	20.09	AV	N	Pass
5	2.100	37.10	9.93	56.00	18.90	Peak	N	Pass
5**	2.100	24.12	9.93	46.00	21.88	AV	N	Pass
6	22.240	56.83	11.03	60.00	3.17	Peak	N	Pass
6**	22.240	44.08	11.03	50.00	5.92	AV	N	Pass

A.6 Radiated Emission

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

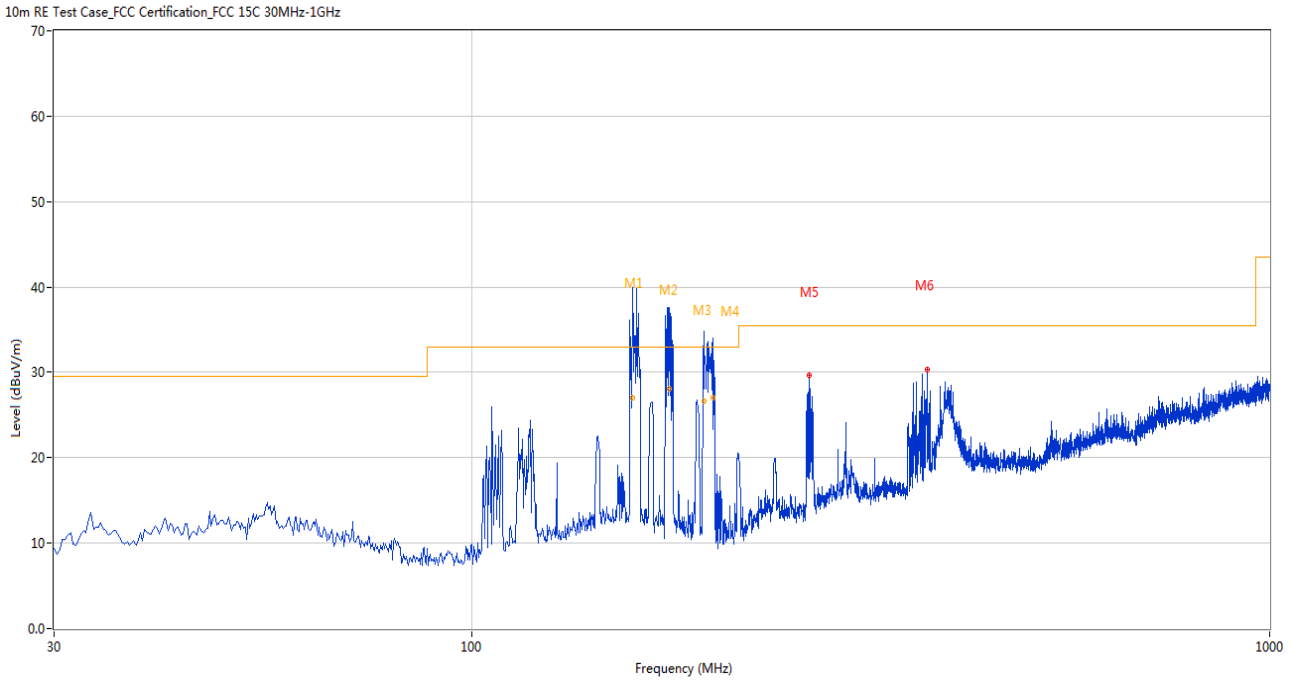
Note [2]: For the test data above 1 GHz, According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

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.

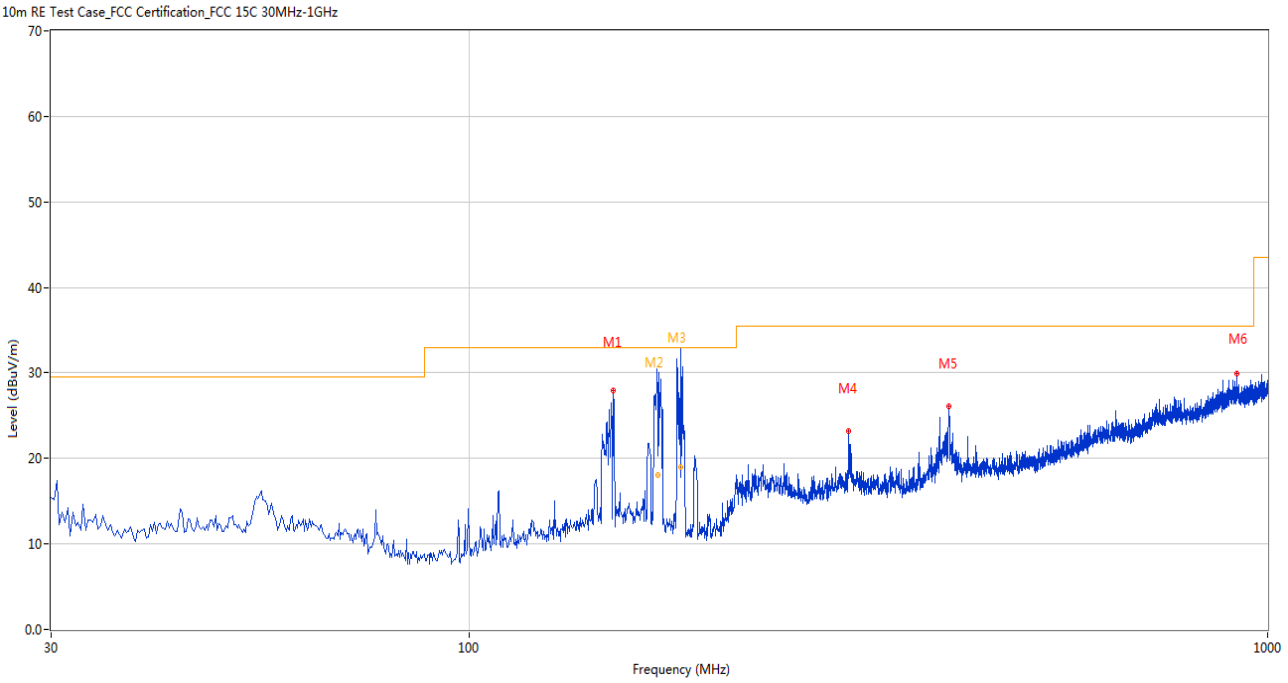
Test Data and Plots

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	158.978	40.00	-25.66	33.0	-7.00	Peak	204.00	200	Horizontal	N/A
1*	158.978	27.00	-25.66	33.0	6.00	QP	204.00	200	Horizontal	Pass
2	176.918	37.63	-26.97	33.0	-4.63	Peak	16.00	100	Horizontal	N/A
2*	176.918	28.13	-26.97	33.0	4.87	QP	16.00	100	Horizontal	Pass
3	195.586	34.76	-28.54	33.0	-1.76	Peak	222.00	100	Horizontal	N/A
3*	195.586	26.66	-28.54	33.0	6.34	QP	222.00	100	Horizontal	Pass
4	200.920	33.95	-28.93	33.0	-0.95	Peak	222.00	100	Horizontal	N/A
4*	200.920	26.97	-28.93	33.0	6.03	QP	222.00	100	Horizontal	Pass
5	264.924	29.63	-26.37	35.5	5.87	Peak	360.00	200	Horizontal	Pass
6	372.567	30.34	-23.03	35.5	5.16	Peak	164.00	200	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	151.705	28.00	-25.56	33.0	5.00	Peak	105.00	200	Vertical	Pass
2	172.413	28.84	-26.32	33.0	4.16	Peak	360.00	151	Vertical	N/A
2*	172.413	18.01	-26.32	33.0	14.99	QP	360.00	151	Vertical	Pass
3	184.305	28.35	-27.67	33.0	4.65	Peak	264.00	198	Vertical	N/A
3*	184.305	19.02	-27.67	33.0	13.98	QP	264.00	198	Vertical	Pass
4	299.108	23.23	-24.82	35.5	12.27	Peak	19.00	100	Vertical	Pass
5	399.478	26.07	-22.38	35.5	9.43	Peak	307.00	100	Vertical	Pass
6	914.419	29.93	-10.41	35.5	5.57	Peak	360.00	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)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.883	43.72	74.0	30.28	Peak	63.00	400	Horizontal	Pass
1**	1328.883	33.84	54.0	20.16	AV	63.00	400	Horizontal	Pass
2	2997.736	51.68	74.0	22.32	Peak	4.00	300	Horizontal	Pass
2**	2997.736	40.30	54.0	13.70	AV	4.00	300	Horizontal	Pass
3	4937.440	53.56	74.0	20.44	Peak	175.00	200	Horizontal	Pass
3**	4937.440	43.60	54.0	10.40	AV	175.00	200	Horizontal	Pass
4	6803.848	57.15	74.0	16.85	Peak	187.00	100	Horizontal	Pass
4**	6803.848	44.61	54.0	9.39	AV	187.00	100	Horizontal	Pass
5	13411.842	54.17	74.0	19.83	Peak	230.00	400	Horizontal	Pass
5**	13411.842	47.05	54.0	6.95	AV	230.00	400	Horizontal	Pass
6	17429.890	54.96	74.0	19.04	Peak	234.00	400	Horizontal	Pass
6**	17429.890	49.63	54.0	4.37	AV	234.00	400	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1335.976	42.72	74.0	31.28	Peak	191.00	200	Vertical	Pass
1**	1335.976	36.79	54.0	17.21	AV	191.00	200	Vertical	Pass
2	2978.559	51.66	74.0	22.34	Peak	9.00	200	Vertical	Pass
2**	2978.559	38.89	54.0	15.11	AV	9.00	200	Vertical	Pass
3	4850.270	47.84	74.0	26.16	Peak	277.00	200	Vertical	Pass
3**	4850.270	38.12	54.0	15.88	AV	277.00	200	Vertical	Pass
4	6607.870	57.07	74.0	16.93	Peak	229.00	400	Vertical	Pass
4**	6607.870	47.78	54.0	6.22	AV	229.00	400	Vertical	Pass
5	13435.322	56.45	74.0	17.55	Peak	246.00	100	Vertical	Pass
5**	13435.322	47.44	54.0	6.56	AV	246.00	100	Vertical	Pass
6	17417.115	58.75	74.0	15.25	Peak	180.00	300	Vertical	Pass
6**	17417.115	46.03	54.0	7.97	AV	180.00	300	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.145	46.67	74.0	27.33	Peak	63.00	300	Horizontal	Pass
1**	1332.145	37.76	54.0	16.24	AV	63.00	300	Horizontal	Pass
2	2995.084	49.16	74.0	24.84	Peak	315.00	200	Horizontal	Pass
2**	2995.084	43.98	54.0	10.02	AV	315.00	200	Horizontal	Pass
3	4935.504	52.54	74.0	21.46	Peak	128.00	200	Horizontal	Pass
3**	4935.504	41.59	54.0	12.41	AV	128.00	200	Horizontal	Pass
4	6809.807	54.16	74.0	19.84	Peak	316.00	300	Horizontal	Pass
4**	6809.807	47.58	54.0	6.42	AV	316.00	300	Horizontal	Pass
5	13412.269	54.04	74.0	19.96	Peak	114.00	200	Horizontal	Pass
5**	13412.269	46.94	54.0	7.06	AV	114.00	200	Horizontal	Pass
6	17425.897	58.07	74.0	15.93	Peak	60.00	300	Horizontal	Pass
6**	17425.897	47.07	54.0	6.93	AV	60.00	300	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1331.318	44.20	74.0	29.80	Peak	31.00	400	Vertical	Pass
1**	1331.318	34.85	54.0	19.15	AV	31.00	400	Vertical	Pass
2	2984.145	52.26	74.0	21.74	Peak	303.00	200	Vertical	Pass
2**	2984.145	42.83	54.0	11.17	AV	303.00	200	Vertical	Pass
3	4852.198	52.11	74.0	21.89	Peak	113.00	200	Vertical	Pass
3**	4852.198	40.88	54.0	13.12	AV	113.00	200	Vertical	Pass
4	6605.781	54.02	74.0	19.98	Peak	356.00	200	Vertical	Pass
4**	6605.781	46.56	54.0	7.44	AV	356.00	200	Vertical	Pass
5	13432.465	57.29	74.0	16.71	Peak	81.00	100	Vertical	Pass
5**	13432.465	45.94	54.0	8.06	AV	81.00	100	Vertical	Pass
6	17419.631	58.53	74.0	15.47	Peak	117.00	100	Vertical	Pass
6**	17419.631	45.36	54.0	8.64	AV	117.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1326.576	41.62	74.0	32.38	Peak	134.00	400	Horizontal	Pass
1**	1326.576	38.46	54.0	15.54	AV	134.00	400	Horizontal	Pass
2	2997.080	52.17	74.0	21.83	Peak	220.00	300	Horizontal	Pass
2**	2997.080	38.64	54.0	15.36	AV	220.00	300	Horizontal	Pass
3	4936.133	49.80	74.0	24.20	Peak	0.00	200	Horizontal	Pass
3**	4936.133	44.59	54.0	9.41	AV	0.00	200	Horizontal	Pass
4	6804.474	53.61	74.0	20.39	Peak	265.00	200	Horizontal	Pass
4**	6804.474	46.13	54.0	7.87	AV	265.00	200	Horizontal	Pass
5	13410.753	54.49	74.0	19.51	Peak	224.00	200	Horizontal	Pass
5**	13410.753	46.64	54.0	7.36	AV	224.00	200	Horizontal	Pass
6	17424.383	57.83	74.0	16.17	Peak	170.00	100	Horizontal	Pass
6**	17424.383	49.63	54.0	4.37	AV	170.00	100	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1336.694	45.66	74.0	28.34	Peak	235.00	200	Vertical	Pass
1**	1336.694	40.11	54.0	13.89	AV	235.00	200	Vertical	Pass
2	2985.297	49.60	74.0	24.40	Peak	150.00	300	Vertical	Pass
2**	2985.297	41.76	54.0	12.24	AV	150.00	300	Vertical	Pass
3	4855.018	46.91	74.0	27.09	Peak	3.00	200	Vertical	Pass
3**	4855.018	39.16	54.0	14.84	AV	3.00	200	Vertical	Pass
4	6607.996	54.58	74.0	19.42	Peak	154.00	200	Vertical	Pass
4**	6607.996	46.81	54.0	7.19	AV	154.00	200	Vertical	Pass
5	13437.233	54.52	74.0	19.48	Peak	201.00	200	Vertical	Pass
5**	13437.233	44.10	54.0	9.90	AV	201.00	200	Vertical	Pass
6	17417.164	59.46	74.0	14.54	Peak	262.00	100	Vertical	Pass
6**	17417.164	49.86	54.0	4.14	AV	262.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.209	47.27	74.0	26.73	Peak	329.00	300	Horizontal	Pass
1**	1328.209	34.67	54.0	19.33	AV	329.00	300	Horizontal	Pass
2	2993.094	47.78	74.0	26.22	Peak	243.00	300	Horizontal	Pass
2**	2993.094	42.62	54.0	11.38	AV	243.00	300	Horizontal	Pass
3	4931.032	54.12	74.0	19.88	Peak	298.00	200	Horizontal	Pass
3**	4931.032	40.93	54.0	13.07	AV	298.00	200	Horizontal	Pass
4	6806.580	53.23	74.0	20.77	Peak	141.00	100	Horizontal	Pass
4**	6806.580	44.87	54.0	9.13	AV	141.00	100	Horizontal	Pass
5	13408.746	54.68	74.0	19.32	Peak	133.00	300	Horizontal	Pass
5**	13408.746	47.22	54.0	6.78	AV	133.00	300	Horizontal	Pass
6	17422.288	58.72	74.0	15.28	Peak	229.00	200	Horizontal	Pass
6**	17422.288	45.26	54.0	8.74	AV	229.00	200	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.019	45.02	74.0	28.98	Peak	312.00	100	Vertical	Pass
1**	1332.019	37.88	54.0	16.12	AV	312.00	100	Vertical	Pass
2	2981.507	49.04	74.0	24.96	Peak	217.00	300	Vertical	Pass
2**	2981.507	43.16	54.0	10.84	AV	217.00	300	Vertical	Pass
3	4852.028	47.52	74.0	26.48	Peak	82.00	200	Vertical	Pass
3**	4852.028	42.49	54.0	11.51	AV	82.00	200	Vertical	Pass
4	6604.135	55.64	74.0	18.36	Peak	187.00	100	Vertical	Pass
4**	6604.135	42.86	54.0	11.14	AV	187.00	100	Vertical	Pass
5	13434.822	54.74	74.0	19.26	Peak	30.00	200	Vertical	Pass
5**	13434.822	47.12	54.0	6.88	AV	30.00	200	Vertical	Pass
6	17419.095	59.53	74.0	14.47	Peak	253.00	100	Vertical	Pass
6**	17419.095	45.91	54.0	8.09	AV	253.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.990	47.06	74.0	26.94	Peak	262.00	200	Horizontal	Pass
1**	1328.990	36.75	54.0	17.25	AV	262.00	200	Horizontal	Pass
2	3000.281	49.49	74.0	24.51	Peak	321.00	300	Horizontal	Pass
2**	3000.281	38.42	54.0	15.58	AV	321.00	300	Horizontal	Pass
3	4932.065	48.95	74.0	25.05	Peak	11.00	200	Horizontal	Pass
3**	4932.065	42.14	54.0	11.86	AV	11.00	200	Horizontal	Pass
4	6804.594	56.08	74.0	17.92	Peak	56.00	200	Horizontal	Pass
4**	6804.594	46.32	54.0	7.68	AV	56.00	200	Horizontal	Pass
5	13415.077	52.82	74.0	21.18	Peak	10.00	200	Horizontal	Pass
5**	13415.077	44.44	54.0	9.56	AV	10.00	200	Horizontal	Pass
6	17426.645	54.58	74.0	19.42	Peak	106.00	300	Horizontal	Pass
6**	17426.645	50.12	54.0	3.88	AV	106.00	300	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1329.610	45.44	74.0	28.56	Peak	40.00	100	Vertical	Pass
1**	1329.610	35.33	54.0	18.67	AV	40.00	100	Vertical	Pass
2	2979.045	48.78	74.0	25.22	Peak	325.00	400	Vertical	Pass
2**	2979.045	41.40	54.0	12.60	AV	325.00	400	Vertical	Pass
3	4852.944	51.87	74.0	22.13	Peak	194.00	200	Vertical	Pass
3**	4852.944	41.66	54.0	12.34	AV	194.00	200	Vertical	Pass
4	6604.282	54.78	74.0	19.22	Peak	185.00	100	Vertical	Pass
4**	6604.282	47.39	54.0	6.61	AV	185.00	100	Vertical	Pass
5	13434.275	54.87	74.0	19.13	Peak	276.00	300	Vertical	Pass
5**	13434.275	47.18	54.0	6.82	AV	276.00	300	Vertical	Pass
6	17417.965	58.05	74.0	15.95	Peak	26.00	100	Vertical	Pass
6**	17417.965	44.63	54.0	9.37	AV	26.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1329.769	41.89	74.0	32.11	Peak	230.00	400	Horizontal	Pass
1**	1329.769	37.99	54.0	16.01	AV	230.00	400	Horizontal	Pass
2	2994.851	47.85	74.0	26.15	Peak	342.00	200	Horizontal	Pass
2**	2994.851	38.84	54.0	15.16	AV	342.00	200	Horizontal	Pass
3	4932.833	48.75	74.0	25.25	Peak	30.00	200	Horizontal	Pass
3**	4932.833	42.57	54.0	11.43	AV	30.00	200	Horizontal	Pass
4	6809.552	53.72	74.0	20.28	Peak	288.00	100	Horizontal	Pass
4**	6809.552	47.21	54.0	6.79	AV	288.00	100	Horizontal	Pass
5	13407.770	53.45	74.0	20.55	Peak	247.00	100	Horizontal	Pass
5**	13407.770	47.09	54.0	6.91	AV	247.00	100	Horizontal	Pass
6	17425.741	55.69	74.0	18.31	Peak	292.00	100	Horizontal	Pass
6**	17425.741	46.85	54.0	7.15	AV	292.00	100	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1333.743	47.97	74.0	26.03	Peak	237.00	200	Vertical	Pass
1**	1333.743	34.88	54.0	19.12	AV	237.00	200	Vertical	Pass
2	2985.386	53.09	74.0	20.91	Peak	236.00	400	Vertical	Pass
2**	2985.386	43.88	54.0	10.12	AV	236.00	400	Vertical	Pass
3	4853.083	52.38	74.0	21.62	Peak	170.00	200	Vertical	Pass
3**	4853.083	37.95	54.0	16.05	AV	170.00	200	Vertical	Pass
4	6611.057	56.89	74.0	17.11	Peak	107.00	100	Vertical	Pass
4**	6611.057	44.66	54.0	9.34	AV	107.00	100	Vertical	Pass
5	13433.002	57.49	74.0	16.51	Peak	170.00	400	Vertical	Pass
5**	13433.002	46.77	54.0	7.23	AV	170.00	400	Vertical	Pass
6	17413.088	56.07	74.0	17.93	Peak	266.00	400	Vertical	Pass
6**	17413.088	50.26	54.0	3.74	AV	266.00	400	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1327.491	42.11	74.0	31.89	Peak	274.00	300	Horizontal	Pass
1**	1327.491	37.00	54.0	17.00	AV	274.00	300	Horizontal	Pass
2	2997.824	53.09	74.0	20.91	Peak	156.00	200	Horizontal	Pass
2**	2997.824	39.63	54.0	14.37	AV	156.00	200	Horizontal	Pass
3	4934.494	51.47	74.0	22.53	Peak	3.00	200	Horizontal	Pass
3**	4934.494	43.03	54.0	10.97	AV	3.00	200	Horizontal	Pass
4	6809.615	57.17	74.0	16.83	Peak	288.00	400	Horizontal	Pass
4**	6809.615	45.84	54.0	8.16	AV	288.00	400	Horizontal	Pass
5	13413.730	52.68	74.0	21.32	Peak	326.00	100	Horizontal	Pass
5**	13413.730	45.94	54.0	8.06	AV	326.00	100	Horizontal	Pass
6	17427.552	56.72	74.0	17.28	Peak	350.00	100	Horizontal	Pass
6**	17427.552	49.98	54.0	4.02	AV	350.00	100	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1336.748	42.43	74.0	31.57	Peak	289.00	100	Vertical	Pass
1**	1336.748	38.47	54.0	15.53	AV	289.00	100	Vertical	Pass
2	2983.543	51.32	74.0	22.68	Peak	66.00	200	Vertical	Pass
2**	2983.543	40.39	54.0	13.61	AV	66.00	200	Vertical	Pass
3	4856.827	47.98	74.0	26.02	Peak	26.00	200	Vertical	Pass
3**	4856.827	40.22	54.0	13.78	AV	26.00	200	Vertical	Pass
4	6609.035	55.30	74.0	18.70	Peak	295.00	400	Vertical	Pass
4**	6609.035	43.64	54.0	10.36	AV	295.00	400	Vertical	Pass
5	13436.765	56.05	74.0	17.95	Peak	176.00	100	Vertical	Pass
5**	13436.765	46.59	54.0	7.41	AV	176.00	100	Vertical	Pass
6	17418.997	54.46	74.0	19.54	Peak	3.00	100	Vertical	Pass
6**	17418.997	48.05	54.0	5.95	AV	3.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1325.948	42.03	74.0	31.97	Peak	127.00	400	Horizontal	Pass
1**	1325.948	35.99	54.0	18.01	AV	127.00	400	Horizontal	Pass
2	2998.882	49.58	74.0	24.42	Peak	85.00	300	Horizontal	Pass
2**	2998.882	40.13	54.0	13.87	AV	85.00	300	Horizontal	Pass
3	4931.699	54.65	74.0	19.35	Peak	12.00	200	Horizontal	Pass
3**	4931.699	39.79	54.0	14.21	AV	12.00	200	Horizontal	Pass
4	6809.020	54.34	74.0	19.66	Peak	150.00	300	Horizontal	Pass
4**	6809.020	43.15	54.0	10.85	AV	150.00	300	Horizontal	Pass
5	13414.989	58.24	74.0	15.76	Peak	106.00	300	Horizontal	Pass
5**	13414.989	47.13	54.0	6.87	AV	106.00	300	Horizontal	Pass
6	17425.037	54.80	74.0	19.20	Peak	321.00	300	Horizontal	Pass
6**	17425.037	46.63	54.0	7.37	AV	321.00	300	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.619	43.08	74.0	30.92	Peak	295.00	300	Vertical	Pass
1**	1332.619	38.33	54.0	15.67	AV	295.00	300	Vertical	Pass
2	2982.282	50.31	74.0	23.69	Peak	325.00	200	Vertical	Pass
2**	2982.282	42.30	54.0	11.70	AV	325.00	200	Vertical	Pass
3	4857.315	51.60	74.0	22.40	Peak	342.00	200	Vertical	Pass
3**	4857.315	43.01	54.0	10.99	AV	342.00	200	Vertical	Pass
4	6610.540	54.33	74.0	19.67	Peak	157.00	100	Vertical	Pass
4**	6610.540	47.58	54.0	6.42	AV	157.00	100	Vertical	Pass
5	13434.423	57.62	74.0	16.38	Peak	317.00	200	Vertical	Pass
5**	13434.423	45.95	54.0	8.05	AV	317.00	200	Vertical	Pass
6	17415.736	57.14	74.0	16.86	Peak	338.00	100	Vertical	Pass
6**	17415.736	46.93	54.0	7.07	AV	338.00	100	Vertical	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1330.526	41.94	74.0	32.06	Peak	127.00	100	Horizontal	Pass
1**	1330.526	35.57	54.0	18.43	AV	127.00	100	Horizontal	Pass
2	2992.973	50.40	74.0	23.60	Peak	158.00	200	Horizontal	Pass
2**	2992.973	44.23	54.0	9.77	AV	158.00	200	Horizontal	Pass
3	4937.800	53.35	74.0	20.65	Peak	332.00	200	Horizontal	Pass
3**	4937.800	42.60	54.0	11.40	AV	332.00	200	Horizontal	Pass
4	6803.590	52.11	74.0	21.89	Peak	270.00	200	Horizontal	Pass
4**	6803.590	43.36	54.0	10.64	AV	270.00	200	Horizontal	Pass
5	13408.982	55.76	74.0	18.24	Peak	299.00	100	Horizontal	Pass
5**	13408.982	43.74	54.0	10.26	AV	299.00	100	Horizontal	Pass
6	17429.446	57.67	74.0	16.33	Peak	52.00	200	Horizontal	Pass
6**	17429.446	45.10	54.0	8.90	AV	52.00	200	Horizontal	Pass

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

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.620	43.40	74.0	30.60	Peak	335.00	400	Vertical	Pass
1**	1332.620	37.43	54.0	16.57	AV	335.00	400	Vertical	Pass
2	2979.415	51.43	74.0	22.57	Peak	304.00	200	Vertical	Pass
2**	2979.415	42.95	54.0	11.05	AV	304.00	200	Vertical	Pass
3	4856.110	49.40	74.0	24.60	Peak	137.00	200	Vertical	Pass
3**	4856.110	41.65	54.0	12.35	AV	137.00	200	Vertical	Pass
4	6609.894	56.35	74.0	17.65	Peak	297.00	200	Vertical	Pass
4**	6609.894	43.08	54.0	10.92	AV	297.00	200	Vertical	Pass
5	13438.586	53.93	74.0	20.07	Peak	309.00	200	Vertical	Pass
5**	13438.586	48.32	54.0	5.68	AV	309.00	200	Vertical	Pass
6	17420.004	54.30	74.0	19.70	Peak	335.00	200	Vertical	Pass
6**	17420.004	45.37	54.0	8.63	AV	335.00	200	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11ax20(SU) Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1329.283	47.40	74.0	26.60	Peak	197.00	100	Horizontal	Pass
1**	1329.283	38.19	54.0	15.81	AV	197.00	100	Horizontal	Pass
2	2996.454	53.13	74.0	20.87	Peak	222.00	200	Horizontal	Pass
2**	2996.454	40.94	54.0	13.06	AV	222.00	200	Horizontal	Pass
3	4934.871	53.97	74.0	20.03	Peak	176.00	200	Horizontal	Pass
3**	4934.871	43.02	54.0	10.98	AV	176.00	200	Horizontal	Pass
4	6809.646	56.37	74.0	17.63	Peak	100.00	100	Horizontal	Pass
4**	6809.646	42.52	54.0	11.48	AV	100.00	100	Horizontal	Pass
5	13409.313	53.67	74.0	20.33	Peak	63.00	100	Horizontal	Pass
5**	13409.313	47.55	54.0	6.45	AV	63.00	100	Horizontal	Pass
6	17426.837	57.33	74.0	16.67	Peak	61.00	100	Horizontal	Pass
6**	17426.837	48.76	54.0	5.24	AV	61.00	100	Horizontal	Pass

1 GHz to 18 GHz, ANT V802.11ax20(SU) Low Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1334.736	44.64	74.0	29.36	Peak	21.00	100	Vertical	Pass
1**	1334.736	35.13	54.0	18.87	AV	21.00	100	Vertical	Pass
2	2979.417	49.83	74.0	24.17	Peak	87.00	400	Vertical	Pass
2**	2979.417	39.27	54.0	14.73	AV	87.00	400	Vertical	Pass
3	4850.907	51.95	74.0	22.05	Peak	23.00	200	Vertical	Pass
3**	4850.907	41.74	54.0	12.26	AV	23.00	200	Vertical	Pass
4	6607.991	56.94	74.0	17.06	Peak	185.00	200	Vertical	Pass
4**	6607.991	43.38	54.0	10.62	AV	185.00	200	Vertical	Pass
5	13432.053	53.89	74.0	20.11	Peak	179.00	300	Vertical	Pass
5**	13432.053	47.54	54.0	6.46	AV	179.00	300	Vertical	Pass
6	17416.740	57.07	74.0	16.93	Peak	320.00	100	Vertical	Pass
6**	17416.740	50.01	54.0	3.99	AV	320.00	100	Vertical	Pass

1 GHz to 18 GHz, ANT H 802.11ax20(SU) Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1326.471	41.96	74.0	32.04	Peak	184.00	300	Horizontal	Pass
1**	1326.471	35.84	54.0	18.16	AV	184.00	300	Horizontal	Pass
2	2993.639	49.55	74.0	24.45	Peak	156.00	400	Horizontal	Pass
2**	2993.639	43.01	54.0	10.99	AV	156.00	400	Horizontal	Pass
3	4934.825	54.16	74.0	19.84	Peak	47.00	200	Horizontal	Pass
3**	4934.825	41.99	54.0	12.01	AV	47.00	200	Horizontal	Pass
4	6803.717	54.65	74.0	19.35	Peak	209.00	300	Horizontal	Pass
4**	6803.717	44.81	54.0	9.19	AV	209.00	300	Horizontal	Pass
5	13411.831	56.69	74.0	17.31	Peak	172.00	300	Horizontal	Pass
5**	13411.831	47.66	54.0	6.34	AV	172.00	300	Horizontal	Pass
6	17425.646	53.05	74.0	20.95	Peak	186.00	400	Horizontal	Pass
6**	17425.646	47.54	54.0	6.46	AV	186.00	400	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11ax20(SU) Middle Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1336.065	48.01	74.0	25.99	Peak	132.00	400	Vertical	Pass
1**	1336.065	39.35	54.0	14.65	AV	132.00	400	Vertical	Pass
2	2980.274	47.82	74.0	26.18	Peak	90.00	400	Vertical	Pass
2**	2980.274	38.93	54.0	15.07	AV	90.00	400	Vertical	Pass
3	4855.473	46.72	74.0	27.28	Peak	32.00	200	Vertical	Pass
3**	4855.473	40.32	54.0	13.68	AV	32.00	200	Vertical	Pass
4	6608.049	54.83	74.0	19.17	Peak	80.00	300	Vertical	Pass
4**	6608.049	47.25	54.0	6.75	AV	80.00	300	Vertical	Pass
5	13436.128	56.10	74.0	17.90	Peak	203.00	100	Vertical	Pass
5**	13436.128	48.72	54.0	5.28	AV	203.00	100	Vertical	Pass
6	17413.968	57.20	74.0	16.80	Peak	199.00	400	Vertical	Pass
6**	17413.968	49.69	54.0	4.31	AV	199.00	400	Vertical	Pass

1 GHz to 18 GHz, ANT H802.11ax20(SU) High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1327.407	45.39	74.0	28.61	Peak	237.00	300	Horizontal	Pass
1**	1327.407	33.80	54.0	20.20	AV	237.00	300	Horizontal	Pass
2	2993.017	52.17	74.0	21.83	Peak	286.00	200	Horizontal	Pass
2**	2993.017	39.54	54.0	14.46	AV	286.00	200	Horizontal	Pass
3	4936.344	50.64	74.0	23.36	Peak	6.00	200	Horizontal	Pass
3**	4936.344	41.02	54.0	12.98	AV	6.00	200	Horizontal	Pass
4	6803.778	56.43	74.0	17.57	Peak	267.00	200	Horizontal	Pass
4**	6803.778	44.45	54.0	9.55	AV	267.00	200	Horizontal	Pass
5	13414.115	56.15	74.0	17.85	Peak	309.00	100	Horizontal	Pass
5**	13414.115	48.91	54.0	5.09	AV	309.00	100	Horizontal	Pass
6	17426.551	58.52	74.0	15.48	Peak	27.00	300	Horizontal	Pass
6**	17426.551	44.96	54.0	9.04	AV	27.00	300	Horizontal	Pass

1 GHz to 18 GHz, ANT V 802.11ax20(SU) High Channel

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.149	43.94	74.0	30.06	Peak	127.00	200	Vertical	Pass
1**	1332.149	38.76	54.0	15.24	AV	127.00	200	Vertical	Pass
2	2983.504	50.04	74.0	23.96	Peak	53.00	200	Vertical	Pass
2**	2983.504	42.17	54.0	11.83	AV	53.00	200	Vertical	Pass
3	4857.156	48.06	74.0	25.94	Peak	19.00	200	Vertical	Pass
3**	4857.156	41.59	54.0	12.41	AV	19.00	200	Vertical	Pass
4	6606.361	52.89	74.0	21.11	Peak	216.00	100	Vertical	Pass
4**	6606.361	44.91	54.0	9.09	AV	216.00	100	Vertical	Pass
5	13432.786	58.15	74.0	15.85	Peak	158.00	300	Vertical	Pass
5**	13432.786	46.04	54.0	7.96	AV	158.00	300	Vertical	Pass
6	17413.080	55.82	74.0	18.18	Peak	101.00	300	Vertical	Pass
6**	17413.080	46.26	54.0	7.74	AV	101.00	300	Vertical	Pass

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

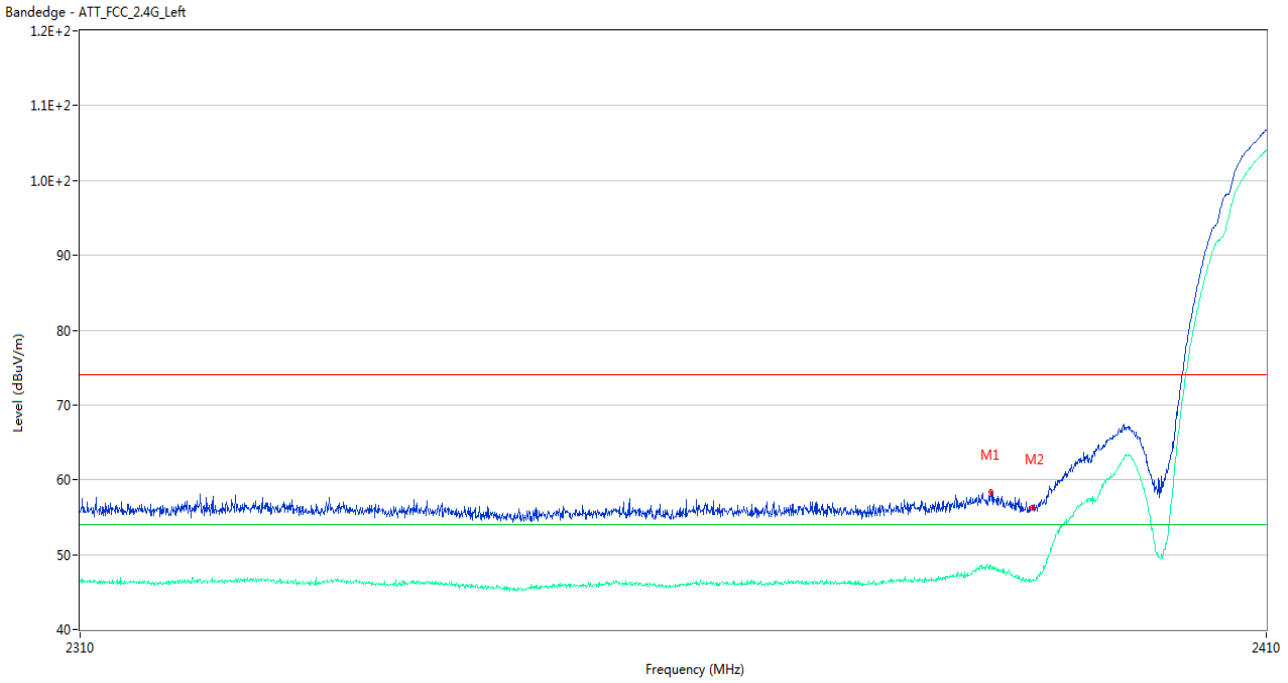
Note [1]: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

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.

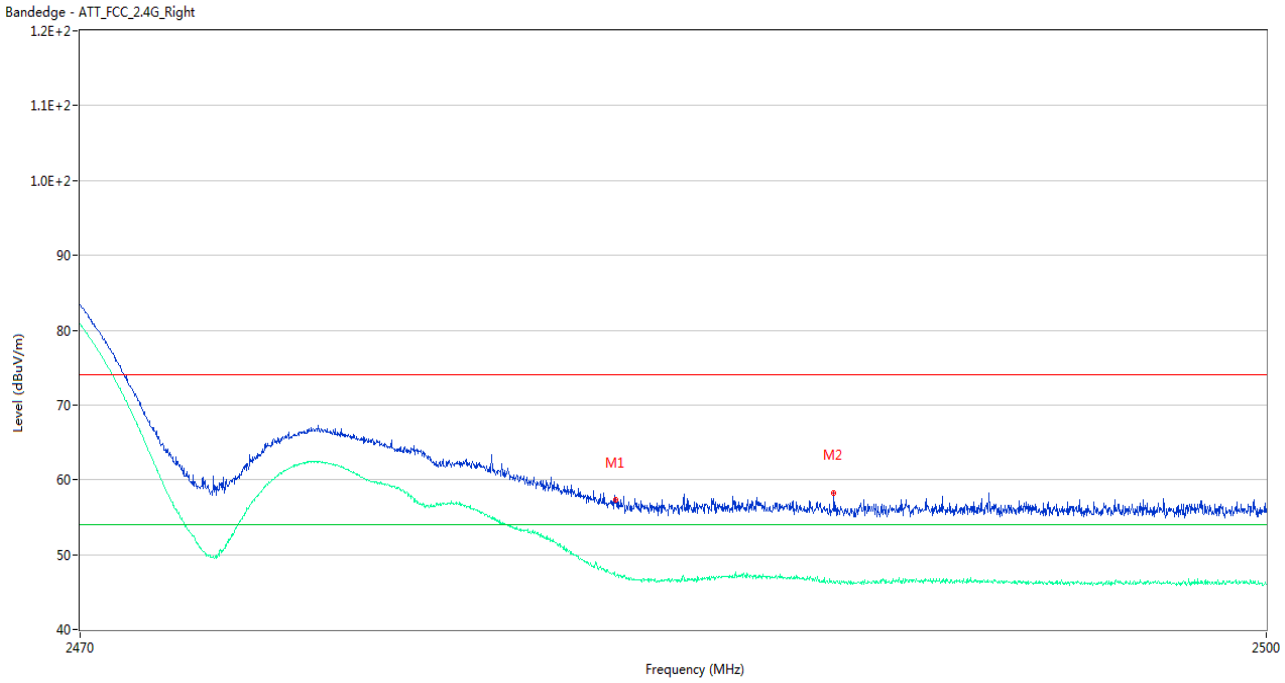
Test Data and Plots

802.11b LOW CHANNEL



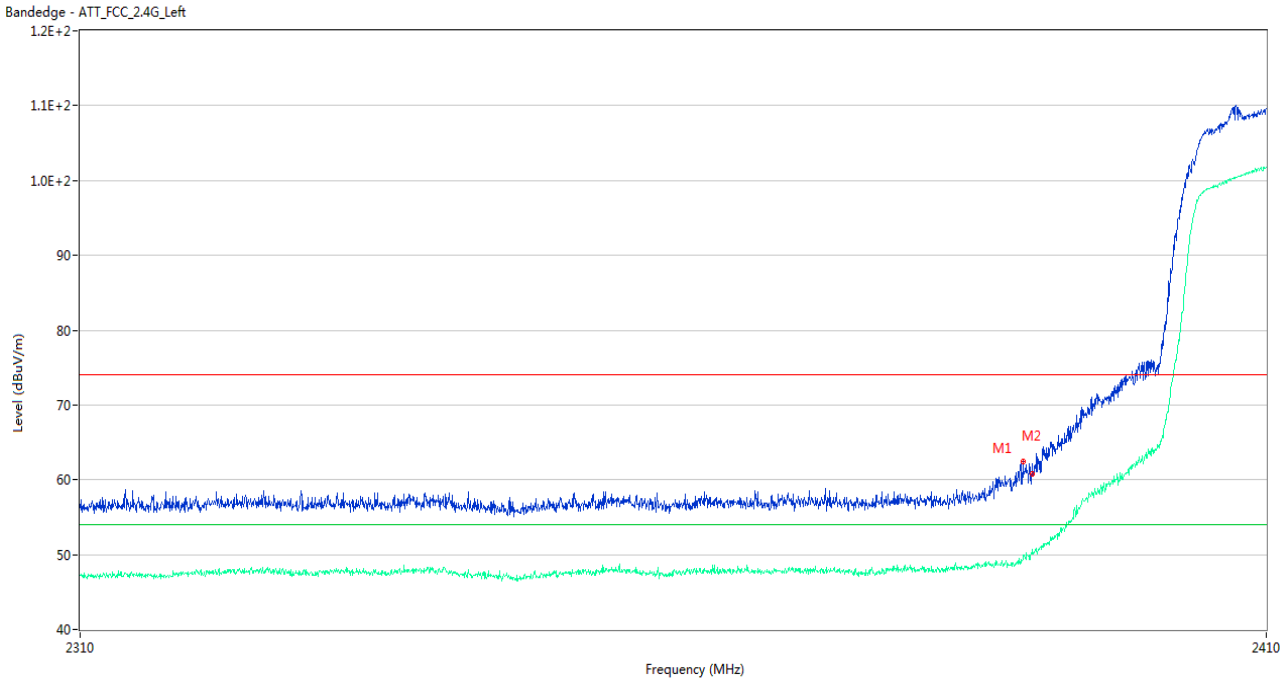
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2386.400	58.40	74.0	15.60	Peak	19.00	200	Horizontal	Pass
1**	2386.400	48.57	54.0	5.43	AV	19.00	200	Horizontal	Pass
2	2389.950	56.27	74.0	17.73	Peak	194.00	200	Horizontal	Pass
2**	2389.950	46.56	54.0	7.44	AV	194.00	200	Horizontal	Pass

802.11b HIGH CHANNEL



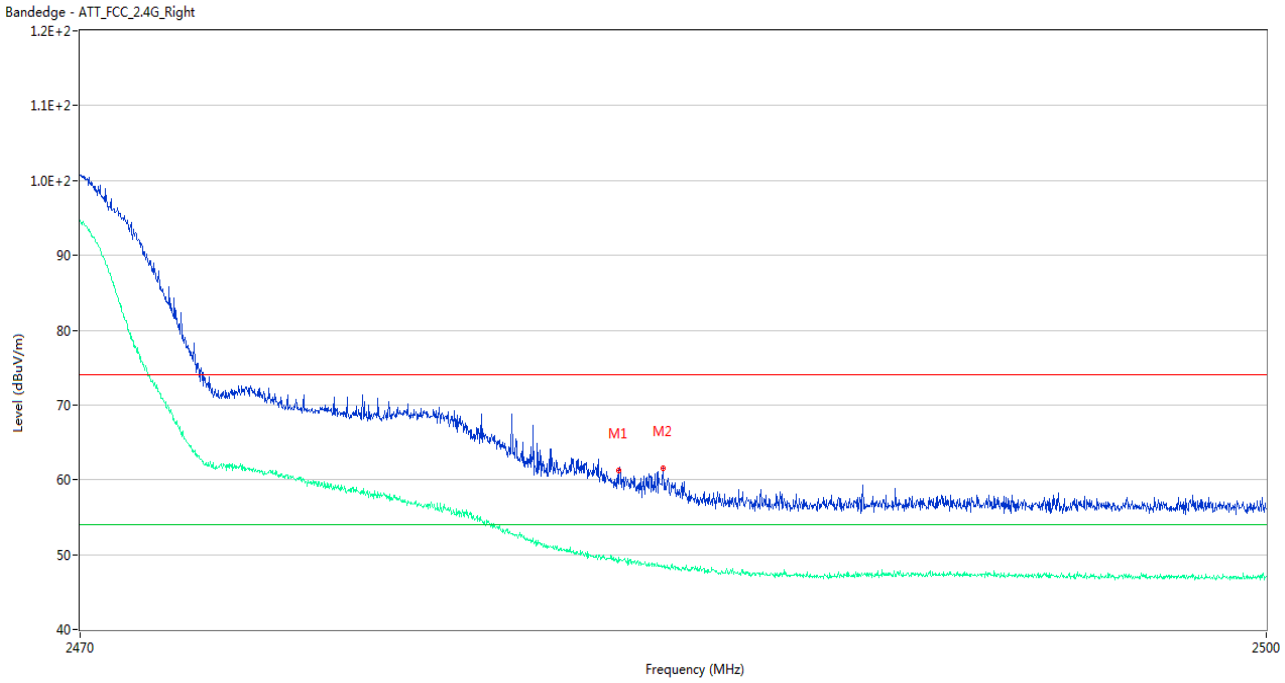
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	57.31	74.0	16.69	Peak	65.00	100	Horizontal	Pass
1**	2483.500	47.13	54.0	6.87	AV	65.00	100	Horizontal	Pass
2	2489.020	58.29	74.0	15.71	Peak	276.00	150	Horizontal	Pass
2**	2489.020	46.54	54.0	7.46	AV	276.00	150	Horizontal	Pass

802.11g LOW CHANNEL



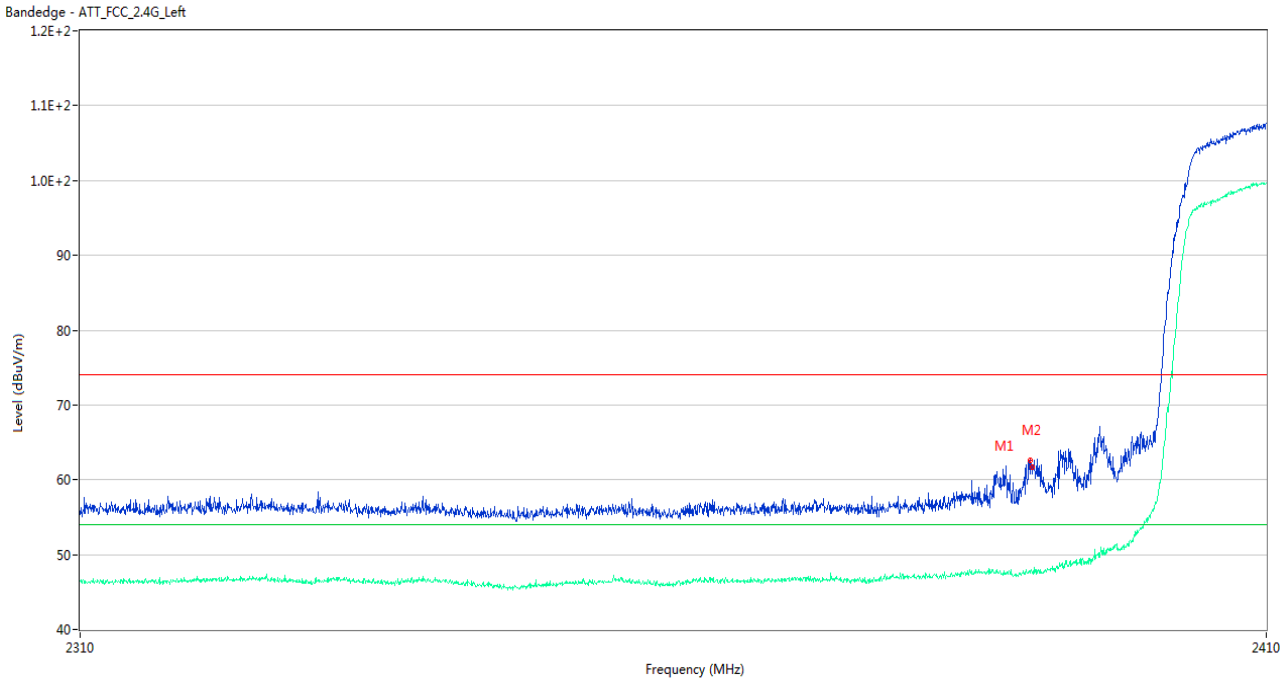
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2389.150	62.49	74.0	11.51	Peak	248.00	150	Horizontal	Pass
1**	2389.150	49.42	54.0	4.58	AV	248.00	150	Horizontal	Pass
2	2389.950	60.86	74.0	13.14	Peak	232.00	150	Horizontal	Pass
2**	2389.950	50.76	54.0	3.24	AV	232.00	150	Horizontal	Pass

802.11g HIGH CHANNEL



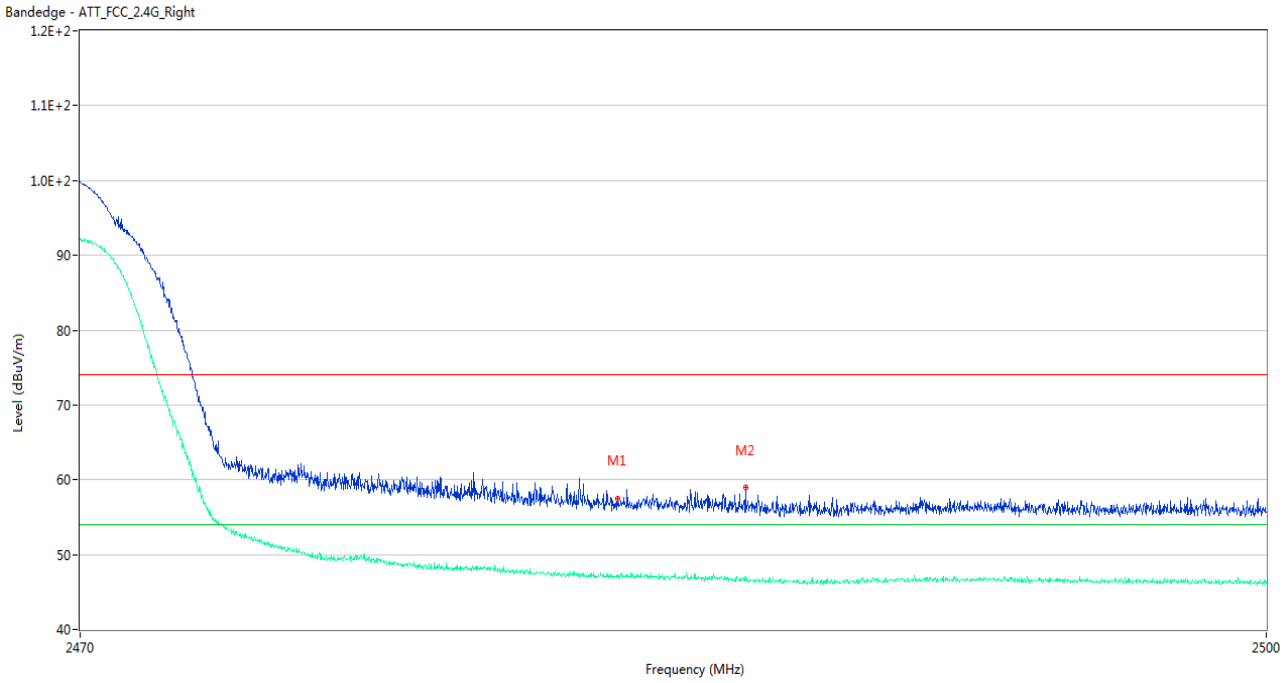
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.590	61.21	74.0	12.79	Peak	253.00	150	Horizontal	Pass
1**	2483.590	49.61	54.0	4.39	AV	253.00	150	Horizontal	Pass
2	2484.700	61.51	74.0	12.49	Peak	248.00	150	Horizontal	Pass
2**	2484.700	48.46	54.0	5.54	AV	248.00	150	Horizontal	Pass

802.11n20 LOW CHANNEL



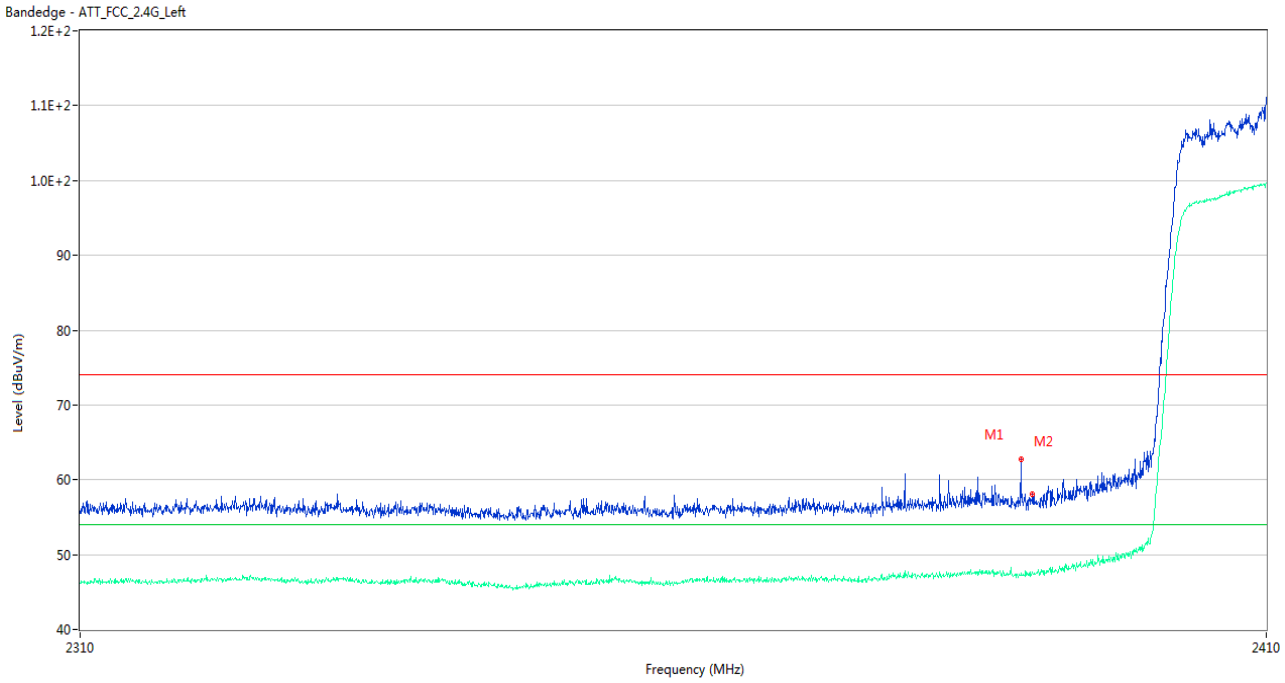
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2389.800	62.58	74.0	11.42	Peak	245.00	150	Horizontal	Pass
1**	2389.800	47.74	54.0	6.26	AV	245.00	150	Horizontal	Pass
2	2389.950	61.69	74.0	12.31	Peak	18.00	100	Horizontal	Pass
2**	2389.950	47.73	54.0	6.27	AV	18.00	100	Horizontal	Pass

802.11n20 HIGH CHANNEL



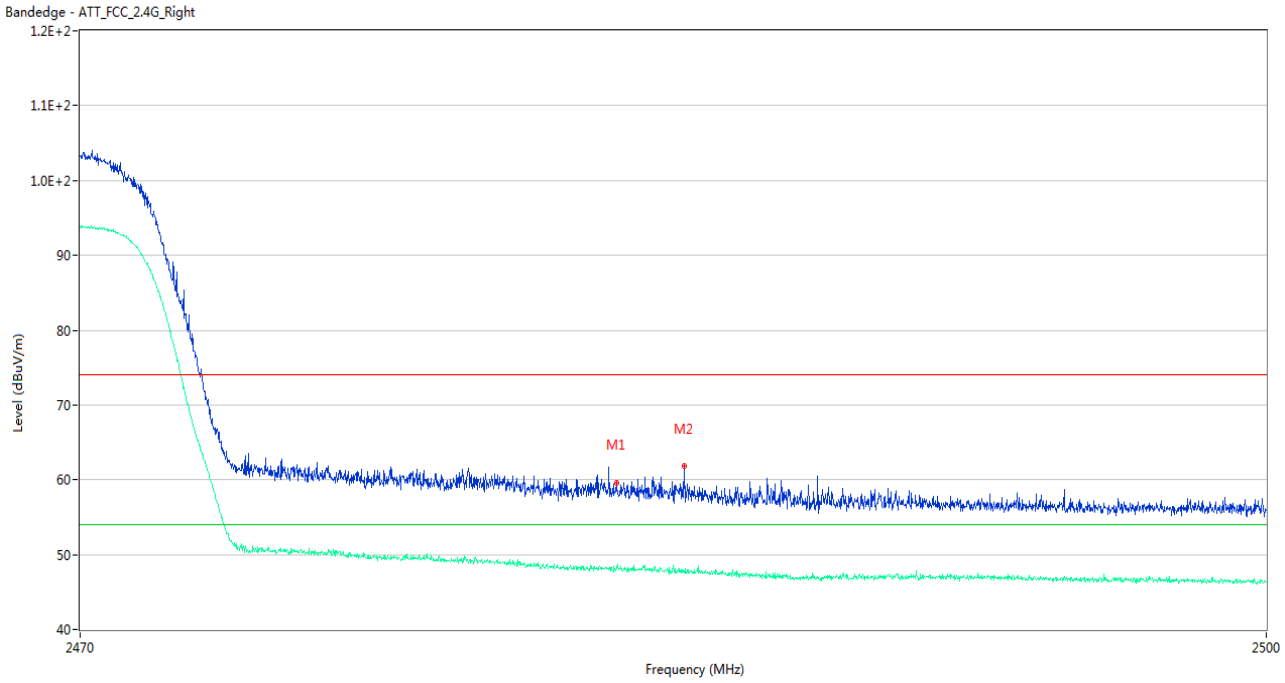
No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.545	57.55	74.0	16.45	Peak	6.00	150	Horizontal	Pass
1**	2483.545	47.27	54.0	6.73	AV	6.00	150	Horizontal	Pass
2	2486.785	58.94	74.0	15.06	Peak	274.00	150	Horizontal	Pass
2**	2486.785	46.66	54.0	7.34	AV	274.00	150	Horizontal	Pass

802.11ax20(SU) LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2388.950	62.78	74.0	11.22	Peak	255.00	150	Horizontal	Pass
1**	2388.950	47.17	54.0	6.83	AV	255.00	150	Horizontal	Pass
2	2389.950	58.13	74.0	15.87	Peak	51.00	100	Horizontal	Pass
2**	2389.950	47.65	54.0	6.35	AV	51.00	100	Horizontal	Pass

802.11 ax20(SU) HIGH CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.515	59.64	74.0	14.36	Peak	255.00	100	Horizontal	Pass
1**	2483.515	48.22	54.0	5.78	AV	255.00	100	Horizontal	Pass
2	2485.225	61.78	74.0	12.22	Peak	20.00	150	Horizontal	Pass
2**	2485.225	47.60	54.0	6.40	AV	20.00	150	Horizontal	Pass

A.8 Power Spectral Density (PSD)

Test Data

802.11b Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-12.22	8
Middle	-11.01	8
High	-10.77	8

802.11g Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-14.16	8
Middle	-13.09	8
High	-13.06	8

802.11n-20 MHz Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-14.41	8
Middle	-11.35	8
High	-15.90	8

802.11ax-20 MHz(SU) Mode:

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)
Low	-13.04	8
Middle	-12.18	8
High	-11.85	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

802.11ax-20 MHz(SU) LOW CHANNEL

802.11ax-20 MHz(SU) MIDDLE CHANNEL

802.11ax-20 MHz(SU) HIGH CHANNEL

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2490411-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2490411-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2490411-AI.PDF”.

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