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CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)

ACCREDITED
TESTING LABORATORY
CERTIFICATE # 6356.01

TEST REPORT

Applicant: **Phonex Broadband Corporation dba ReadyNet**

Address: 6952 S High Tech Drive, Suite B, Midvale, Utah, United States 84047

FCC ID: **Y2P-AX1500**

Product Name: **Dual band 11AX Gigabit Wireless Router**

Model Number: **AX1500MS, AX1500M**

Standard(s): **47 CFR Part 15, Subpart C(15.247)**
ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance v05r02

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

Report Number: **CR221050457-00A**

Date Of Issue: **2023/2/27**

Reviewed By: **Sun Zhong**

Sun Zhong

Title: Manager

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Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR221050457-00A	Original Report	2023/2/27

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Dual band 11AX Gigabit Wireless Router
EUT Model:	AX1500MS
Multiple Model:	AX1500M
Operation Frequency:	2412-2462 MHz(802.11b/g/n ht20) 2422-2452 MHz(802.11n ht40)
Maximum Average Output Power (Conducted):	15.79 dBm
Modulation Type:	802.11b:DSSS-DBPSK, DQPSK, CCK 802.11g/n:OFDM-BPSK, QPSK, 16QAM, 64QAM
Rated Input Voltage:	DC 12V from adapter
Serial Number:	1O7R(AX1500MS), 1O8A(AX1500M)
EUT Received Date:	2022/11/2
EUT Received Status:	Good
Note: The Multiple model and test model are with the same electromagnetic emissions and electromagnetic compatibility characteristics. Please refer to the declaration letter for more detail, which was provided by manufacturer.	

Operation Frequency Detail:
For 802.11b/g/n ht20:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

Per section 15.31(m), the below frequencies were performed the test as below:

Test Channel	Frequency (MHz)
Lowest	2412
Middle	2437
Highest	2462

For 802.11n ht40:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437	/	/

Per section 15.31(m), the below frequencies were performed the test as below:

Test Channel	Frequency (MHz)
Lowest	2422
Middle	2437
Highest	2452

Antenna Information Detail▲:

Antenna Chain	Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain
0	Dipole	50	2400-2500MHz	5.59 dBi
1	Dipole	50	2400-2500MHz	5.14 dBi

The Method of §15.203 Compliance:

☒Antenna must be permanently attached to the unit.

☐Antenna must use a unique type of connector to attach to the EUT.

☐Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
Adapter	LISTRD	DZ01G-1201000U	Input:100-240V, 50~60Hz,0.5A Output:12V,1A

1.2 Description of Test Configuration

1.2.1 EUT Operation Condition:

EUT Operation Mode:	The system was configured for testing in Engineering Mode, which was provided by the manufacturer.
Equipment Modifications:	No
EUT Exercise Software:	SecureCRT

The software was provided by manufacturer. The maximum power was configured as below, that was provided by the manufacturer▲:

Mode	Channel	Frequency (MHz)	Data Rate	Power Level Setting	
				Chain 0	Chain 1
802.11b	Lowest	2412	1Mbps	20	35
	Middle	2437	1Mbps	20	35
	Highest	2462	1Mbps	20	35
802.11g	Lowest	2412	6Mbps	34	40
	Middle	2437	6Mbps	34	40
	Highest	2462	6Mbps	34	40
802.11n ht20	Lowest	2412	MCS8	26	32
	Middle	2437	MCS8	26	32
	Highest	2462	MCS8	26	32
802.11n ht40	Lowest	2422	MCS8	24	30
	Middle	2437	MCS8	24	30
	Highest	2452	MCS8	24	30

Note:
1. The above are the worst-case data rates, which are determined for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations.
2. The device supports SISO in all modes, and MIMO 2T2R in 802.11n modes, per pretest, 2T2R mode was the worst mode and reported for 802.11n modes.

1.2.2 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HP	USB Disk	HPFD206W-32	PAA6918477
OneKe	Telephone	TC-108H	DJ21103005
Unknown	RJ45 Load	RJ45X9	F-EM-PHRJ45X8001
DELL	Laptop	E6410	GYXJ3 A00 JSD2

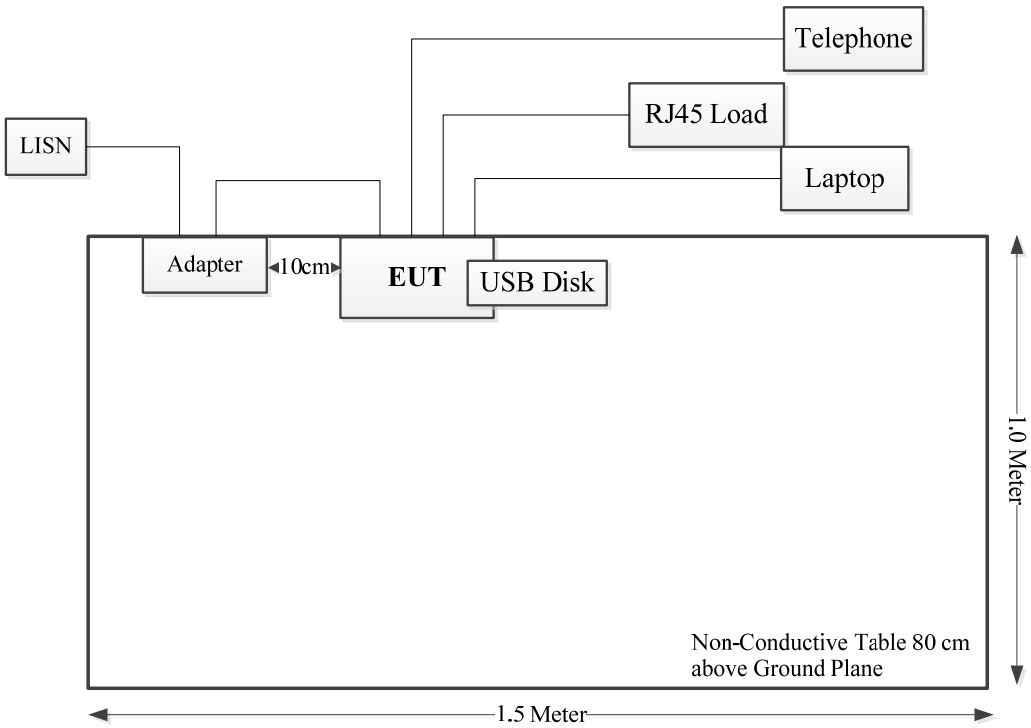
1.2.3 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	Yes	Yes	10	EUT	Laptop
RJ45 Cable*3	Yes	Yes	10	EUT	RJ45 Load
RJ11 Cable	No	No	10	EUT	Telephone
Power Cable	Yes	No	1	EUT	Adapter

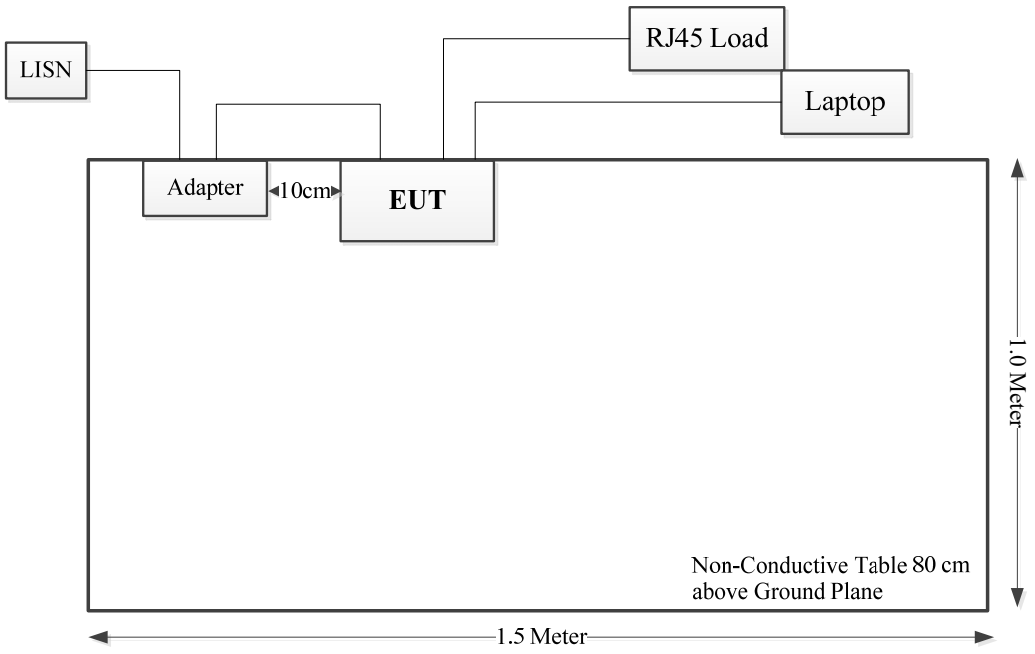
1.2.4 Block Diagram of Test Setup

AC line conducted emissions:

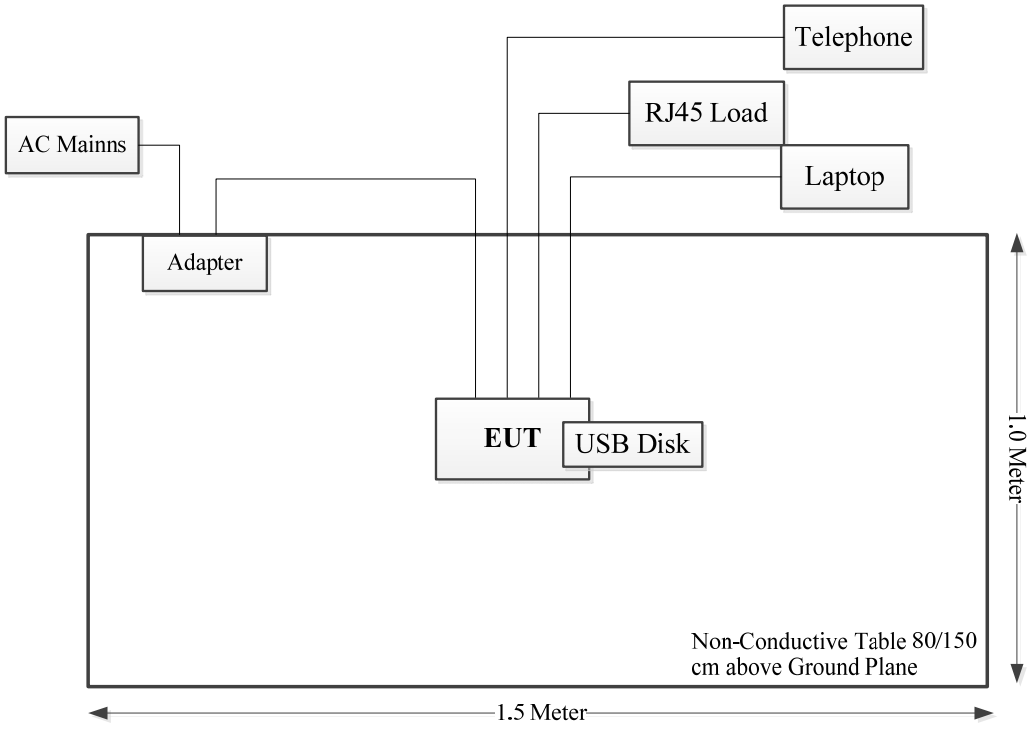
AX1500MS:



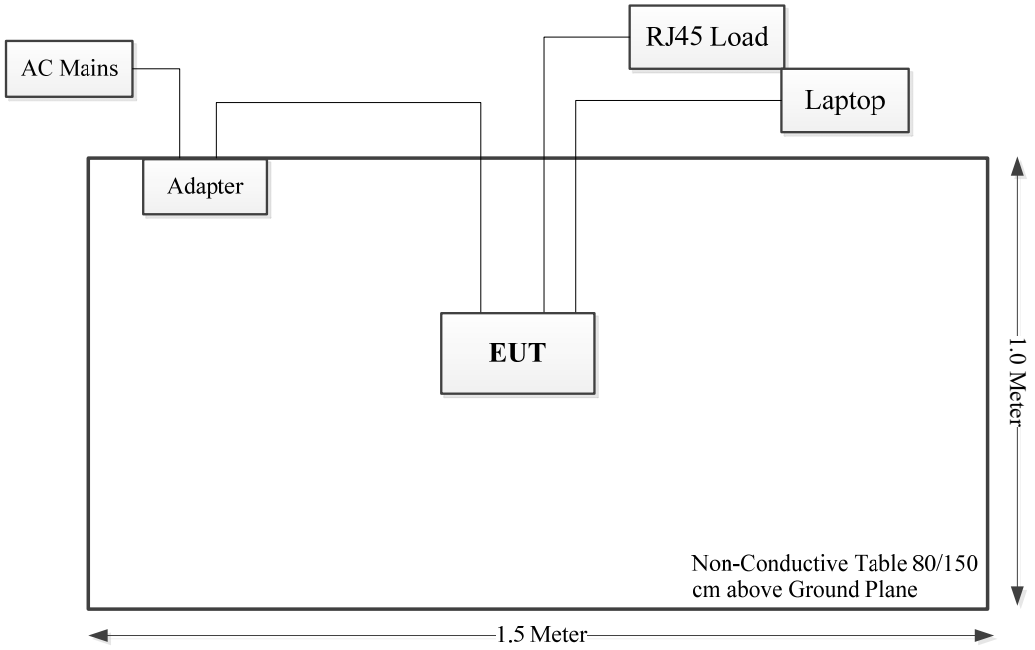
AX1500M:



Spurious Emissions:
AX1500MS:



AX1500M:



1.3 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.15 dB,200M~1GHz: 5.61 dB,1G~6GHz: 5.14 dB, 6G~18GHz: 5.93 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.26 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	2.8 dB (150 kHz to 30 MHz)

2. SUMMARY OF TEST RESULTS

Standard(s) Section	Test Items	Result
§15.207(a)	AC line conducted emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203	Antenna Requirement	Compliant
§15.247 (i) & §1.1307 & §2.1091	RF Exposure Evaluation	Compliant

3. REQUIREMENTS AND TEST PROCEDURES

3.1 AC Line Conducted Emissions

3.1.1 Applicable Standard

FCC§15.207(a).

(a) Except as shown in paragraphs (b) and (c) of this section, 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

	Conducted limit (dBμV)	
Frequency of emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

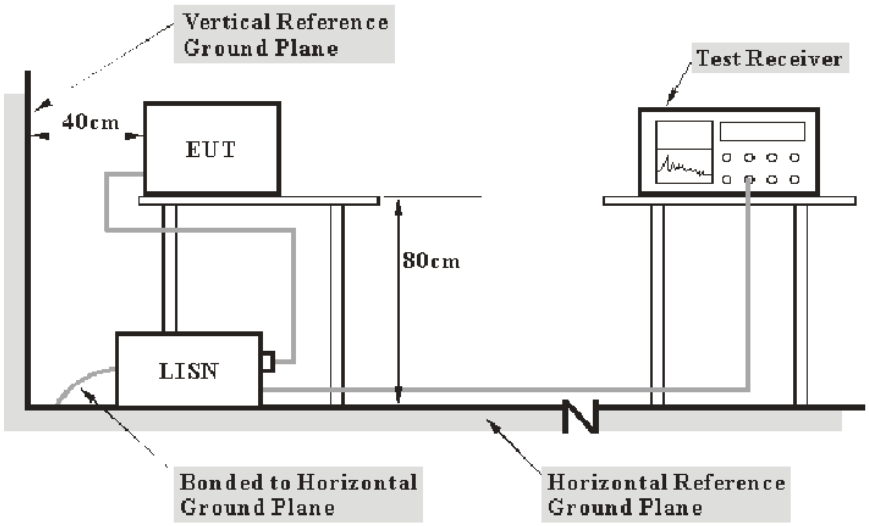
(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535-1705 kHz, as measured using a 50 μH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtainig their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

3.1.2 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter or EUT was connected to the main LISN with a 120 V/60 Hz AC power source.

3.1.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

3.1.4 Test Procedure

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase ("hot") line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

3.1.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor
Factor = attenuation caused by cable loss + voltage division factor of AMN

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

3.2 Radiation Spurious Emissions

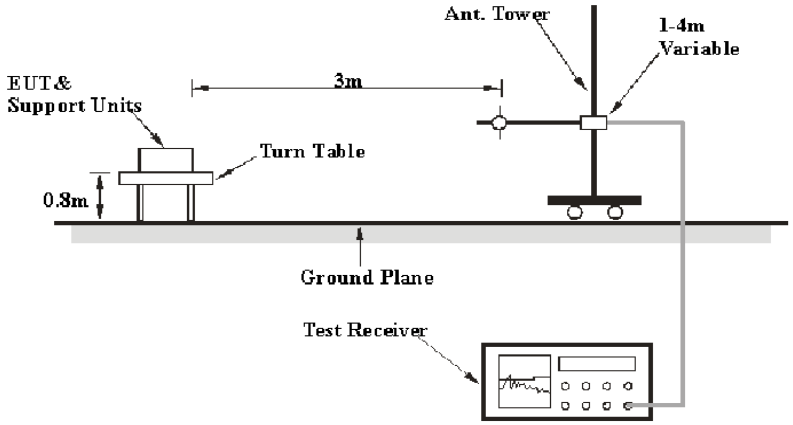
3.2.1 Applicable Standard

FCC §15.247 (d);

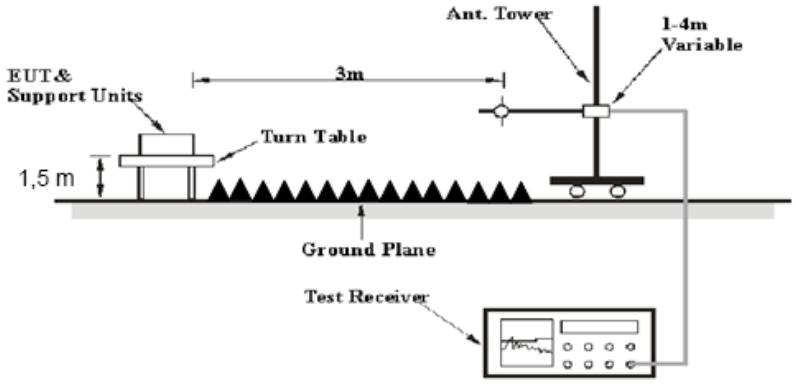
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

3.2.2 EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emissions were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

3.2.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

3.2.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

3.2.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor
Factor = Antenna Factor + Cable Loss- Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

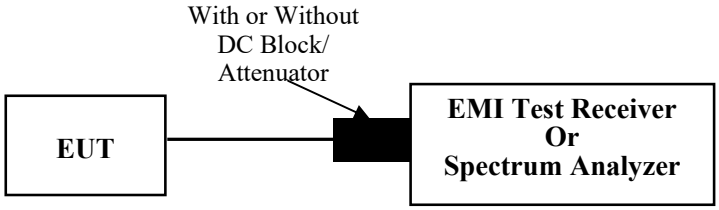
3.3 6 dB Emission Bandwidth:

3.3.1 Applicable Standard

FCC §15.247 (a)(2)

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

3.3.2 EUT Setup



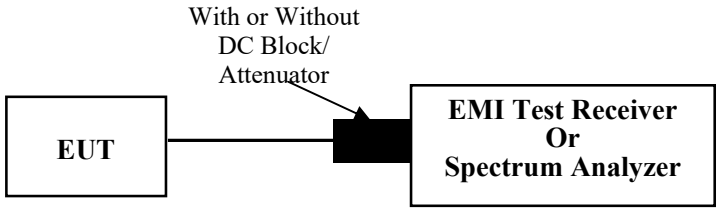
3.3.3Test Procedure

According to ANSI C63.10-2013 Section 11.8

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.

3.4 99% Occupied Bandwidth:

3.4.1 EUT Setup



3.4.2 Test Procedure

According to ANSI C63.10-2013 Section 6.9.3

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.
The following procedure shall be used for measuring 99% power bandwidth:
a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum 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.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

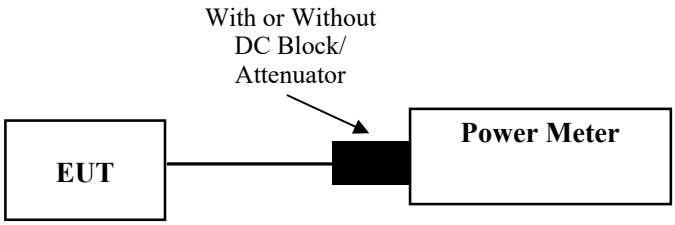
3.5 Maximum Conducted Output Power:

3.5.1 Applicable Standard

FCC §15.247 (b)(3)

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. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

3.5.2 EUT Setup



3.5.3 Test Procedure

According to ANSI C63.10-2013 Section 11.9.2.3.2

Method AVGPM-G is a measurement using a gated RF average power meter.

Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

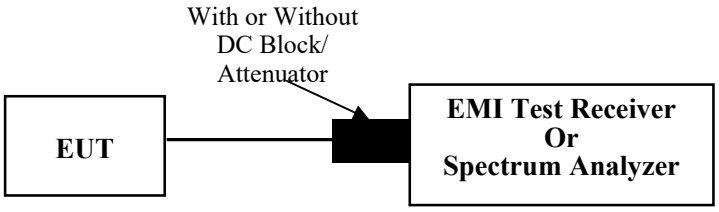
3.6 Maximum Power Spectral Density:

3.6.1 Applicable Standard

FCC §15.247 (e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

3.6.2 EUT Setup



3.6.3 Test Procedure

When Duty cycle ⩾98%

According to ANSI C63.10-2013 Section 11.10.3

Method AVGPSD-1 uses trace averaging with EUT transmitting at full power throughout each sweep.

The following procedure may be used when the maximum (average) conducted output power was used to determine compliance to the fundamental output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has a power averaging (rms) detector, then it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously ($D \geqslant 98\%$), or else sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter OFF time to be considered):

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ⩽ RBW ⩽ 100 kHz.
d) Set VBW ⩾ [3 · RBW].
e) Detector = power averaging (rms) or sample detector (when rms not available).
f) Ensure that the number of measurement points in the sweep ⩾ [2 · span / RBW].
g) Sweep time = auto couple.
h) Employ trace averaging (rms) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

When Duty cycle <98%, and the transmission duty cycle is constant

According to ANSI C63.10-2013 Section 11.10.5

Method AVGPSD-2 uses trace averaging across ON and OFF times of the EUT transmissions, followed by duty cycle correction.
The following procedure is applicable when the EUT cannot be configured to transmit continuously (i.e., $D < 98\%$), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ±2%):

a) Measure the duty cycle (D) of the transmitter output signal as described in 11.6.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥ [3 × RBW].
f) Detector = power averaging (rms) or sample detector (when rms not available).
g) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
h) Sweep time = auto couple.
i) Do not use sweep triggering; allow sweep to “free run.”
j) Employ trace averaging (rms) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add [10 log (1 / D)], where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time.
m) If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

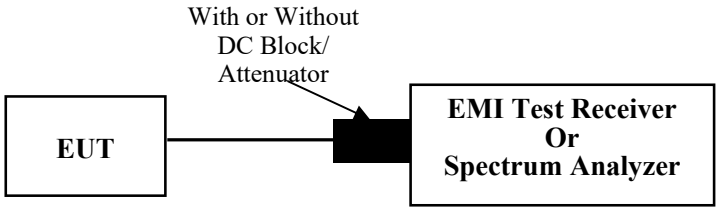
3.7 100 kHz Bandwidth of Frequency Band Edge:

3.7.1 Applicable Standard

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

3.7.2 EUT Setup



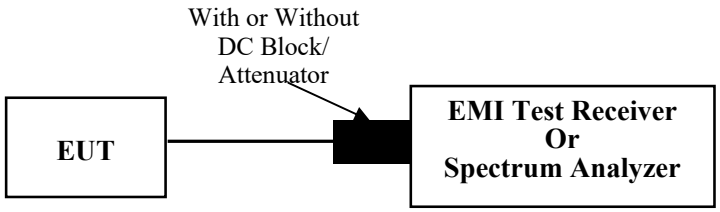
3.7.3 Test Procedure

According to ANSI C63.10-2013 Section 11.11

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) 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) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

3.8 Duty Cycle:

3.8.1 EUT Setup



3.8.2 Test Procedure

According to ANSI C63.10-2013 Section 11.6

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:
1) Set the center frequency of the instrument to the center frequency of the transmission.
2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3) Set VBW ≥ RBW. Set detector = peak or average.
4) 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 the duty cycle shall not be used if T ≤ 16.7 μs.)

3.9 Antenna Requirement

3.9.1 Applicable Standard

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, 15.221, or §15.236. 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.

3.9.2 Judgment

Compliant. Please refer to the Antenna Information detail in Section 1.

4. Test DATA AND RESULTS

4.1 AC Line Conducted Emissions

Serial Number:	1O7R, 1O8A	Test Date:	2022/11/16
Test Site:	CE	Test Mode:	Transmitting(802.11n ht40 high channel was the worst)
Tester:	Vic Du	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	25.4	Relative Humidity: (%)	67	ATM Pressure: (kPa)	100.9

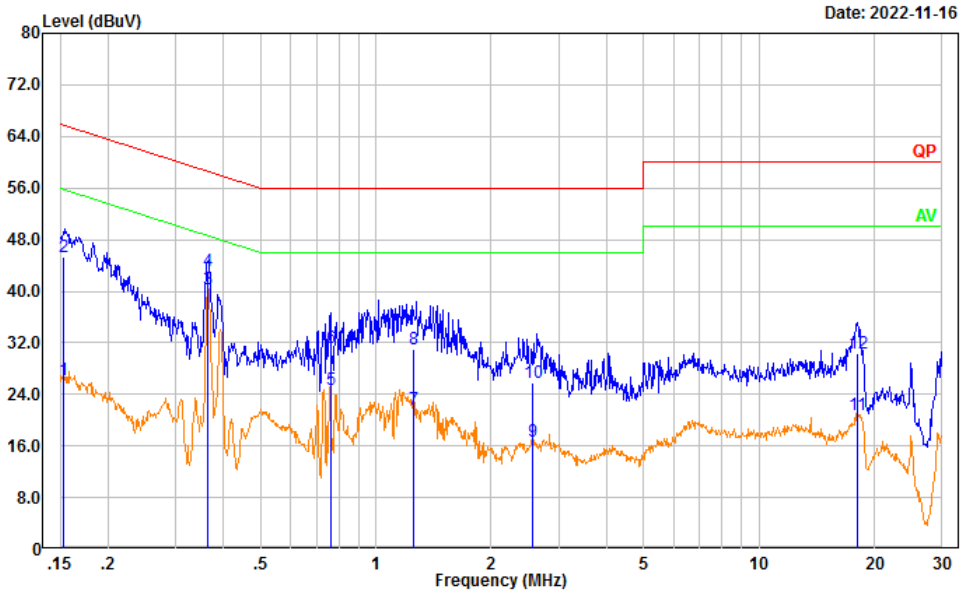
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV216	101134	2022/04/01	2023/03/31
R&S	EMI Test Receiver	ESR3	102726	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UTIFLEX	C-0200-01	2022/08/07	2023/08/06
Audix	Test Software	E3	190306 (V9)	N/A	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

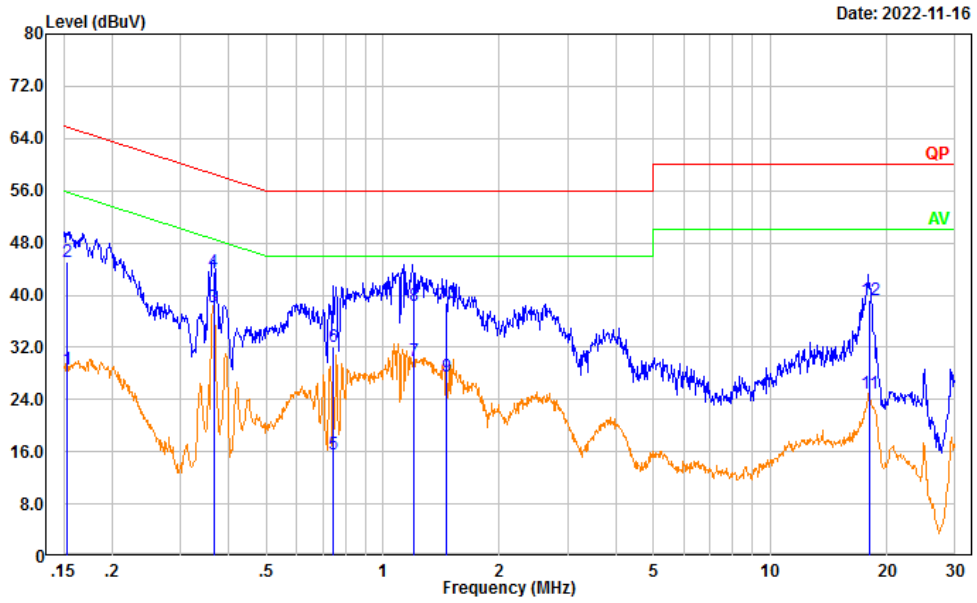
AX1500MS:

Test Mode: Transmitting
Port: Line
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.154	16.71	9.61	26.32	55.81	29.49	Average
2	0.154	35.70	9.61	45.31	65.81	20.50	QP
3	0.366	30.66	9.61	40.27	48.60	8.33	Average
4	0.366	33.58	9.61	43.19	58.60	15.41	QP
5	0.761	15.05	9.62	24.67	46.00	21.33	Average
6	0.761	21.59	9.62	31.21	56.00	24.79	QP
7	1.249	12.09	9.62	21.71	46.00	24.29	Average
8	1.249	21.28	9.62	30.90	56.00	25.10	QP
9	2.569	7.07	9.64	16.71	46.00	29.29	Average
10	2.569	16.14	9.64	25.78	56.00	30.22	QP
11	18.052	11.04	9.75	20.79	50.00	29.21	Average
12	18.052	20.60	9.75	30.35	60.00	29.65	QP

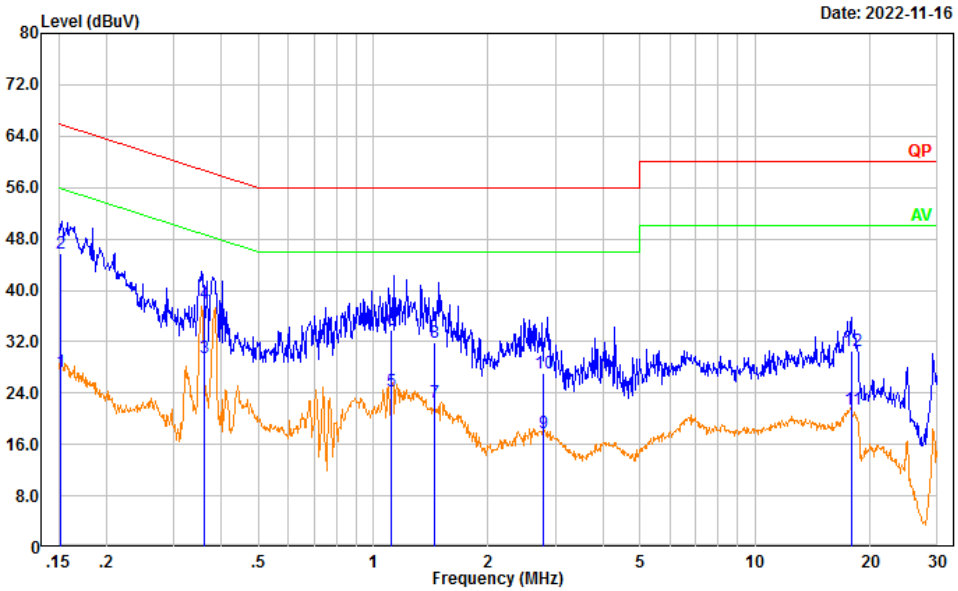
Test Mode: Transmitting
Port: neutral
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.153	18.98	9.61	28.59	55.86	27.27	Average
2	0.153	35.54	9.61	45.15	65.86	20.71	QP
3	0.366	28.58	9.61	38.19	48.60	10.41	Average
4	0.366	34.01	9.61	43.62	58.60	14.98	QP
5	0.747	5.94	9.62	15.56	46.00	30.44	Average
6	0.747	22.49	9.62	32.11	56.00	23.89	QP
7	1.204	20.35	9.62	29.97	46.00	16.03	Average
8	1.204	28.83	9.62	38.45	56.00	17.55	QP
9	1.455	17.93	9.62	27.55	46.00	18.45	Average
10	1.455	29.12	9.62	38.74	56.00	17.26	QP
11	18.005	15.24	9.69	24.93	50.00	25.07	Average
12	18.005	29.51	9.69	39.20	60.00	20.80	QP

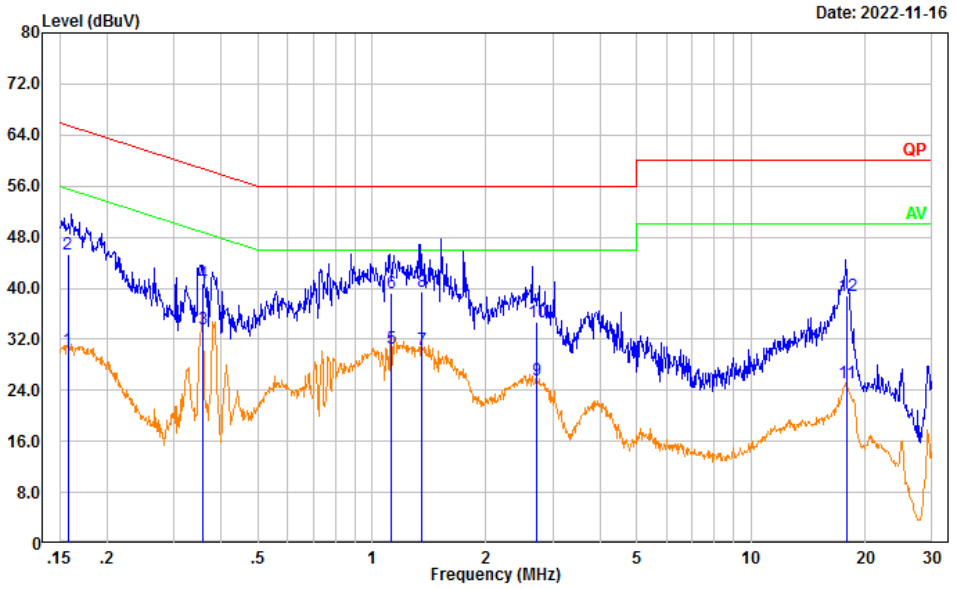
AX1500M:

Test Mode: Transmitting
Port: Line
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.151	17.81	9.61	27.42	55.92	28.50	Average
2	0.151	36.22	9.61	45.83	65.92	20.09	QP
3	0.361	19.83	9.61	29.44	48.70	19.26	Average
4	0.361	28.34	9.61	37.95	58.70	20.75	QP
5	1.117	14.58	9.62	24.20	46.00	21.80	Average
6	1.117	24.31	9.62	33.93	56.00	22.07	QP
7	1.445	12.87	9.62	22.49	46.00	23.51	Average
8	1.445	22.15	9.62	31.77	56.00	24.23	QP
9	2.793	8.21	9.65	17.86	46.00	28.14	Average
10	2.793	17.56	9.65	27.21	56.00	28.79	QP
11	17.922	11.76	9.75	21.51	50.00	28.49	Average
12	17.922	20.78	9.75	30.53	60.00	29.47	QP

Test Mode: Transmitting
Port: neutral
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.158	20.74	9.61	30.35	55.59	25.24	Average
2	0.158	35.78	9.61	45.39	65.59	20.20	QP
3	0.357	24.08	9.61	33.69	48.79	15.10	Average
4	0.357	31.04	9.61	40.65	58.79	18.14	QP
5	1.127	20.93	9.62	30.55	46.00	15.45	Average
6	1.127	29.55	9.62	39.17	56.00	16.83	QP
7	1.351	20.76	9.62	30.38	46.00	15.62	Average
8	1.351	29.73	9.62	39.35	56.00	16.65	QP
9	2.725	15.85	9.64	25.49	46.00	20.51	Average
10	2.725	25.07	9.64	34.71	56.00	21.29	QP
11	17.842	15.50	9.69	25.19	50.00	24.81	Average
12	17.842	29.16	9.69	38.85	60.00	21.15	QP

4.2 Radiation Spurious Emissions

Serial Number:	1O7R, 1O8A	Test Date:	2022/11/23~2022/11/28
Test Site:	966-1,966-2	Test Mode:	Transmitting
Tester:	Carl Xue, Mack Huang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	24.8~26.6	Relative Humidity: (%)	64~71	ATM Pressure: (kPa)	100.2~100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB6	A082520-5	2020/10/19	2023/10/18
R&S	EMI Test Receiver	ESR3	102724	2022/07/15	2023/07/14
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2022/07/17	2023/07/16
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2022/07/17	2023/07/16
Sonoma	Amplifier	310N	186165	2022/07/17	2023/07/16
Audix	Test Software	E3	201021 (V9)	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020/10/13	2023/10/12
R&S	Spectrum Analyzer	FSV40	101591	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2022/08/07	2023/08/06
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2022/08/07	2023/08/06
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2022/11/09	2023/11/08
PASTERNACK	Horn Antenna	PE9852/2F-20	112002	2021/02/05	2024/02/04
AH	Preamplifier	PAM-1840VH	190	2022/11/09	2023/11/08
MICRO-COAX	Coaxial Cable	UFB142A-1-2362-200200	235772-001	2022/08/07	2023/08/06
E-Microwave	Band Rejection Filter	2400-2483.5MHz	OE01902424	2022/08/07	2023/08/06
Mini Circuits	High Pass Filter	VHF-6010+	31119	2022/08/07	2023/08/06

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

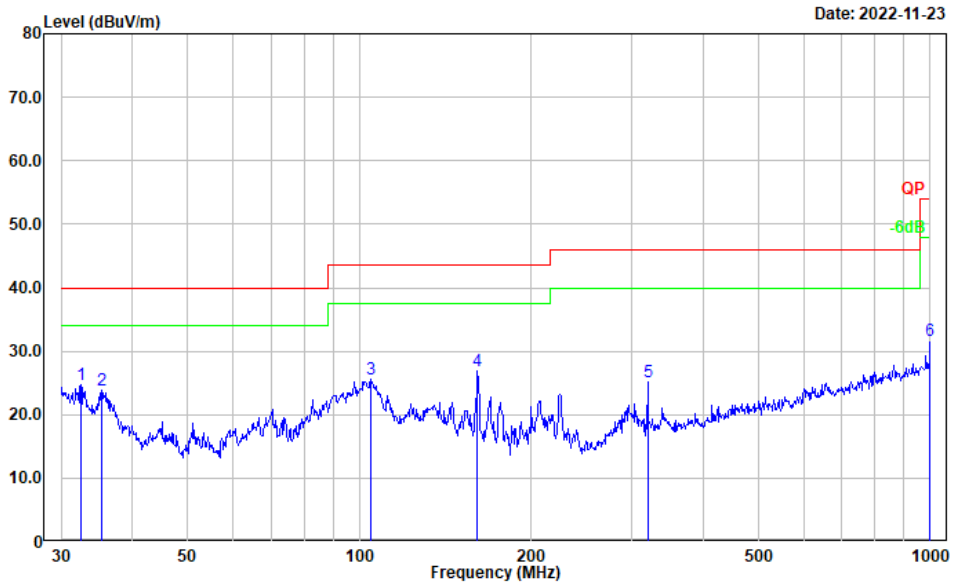
Test Data:

Please refer to the below table and plots.

Note: The device can be mounted in multiple orientations, test was performed with X,Y, Z Axis according to C63.10 figure 8, the worst orientation was photographed and it`s data was recorded.

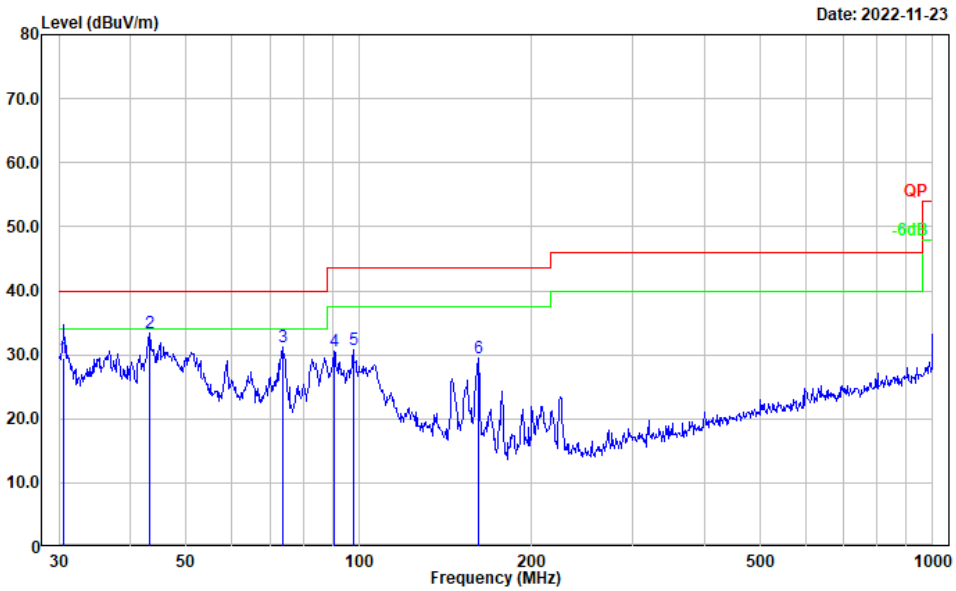
1) 30MHz-1GHz(802.11n ht40 high channel was the worst)
AX1500MS:

Test Mode: Transmitting
Polarization: horizontal
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	32.520	30.17	-5.54	24.63	40.00	15.37	Peak
2	35.251	31.48	-7.67	23.81	40.00	16.19	Peak
3	104.903	38.95	-13.38	25.57	43.50	17.93	Peak
4	160.909	39.04	-12.15	26.89	43.50	16.61	Peak
5	319.937	35.64	-10.55	25.09	46.00	20.91	Peak
6	1000.000	30.67	1.03	31.70	54.00	22.30	Peak

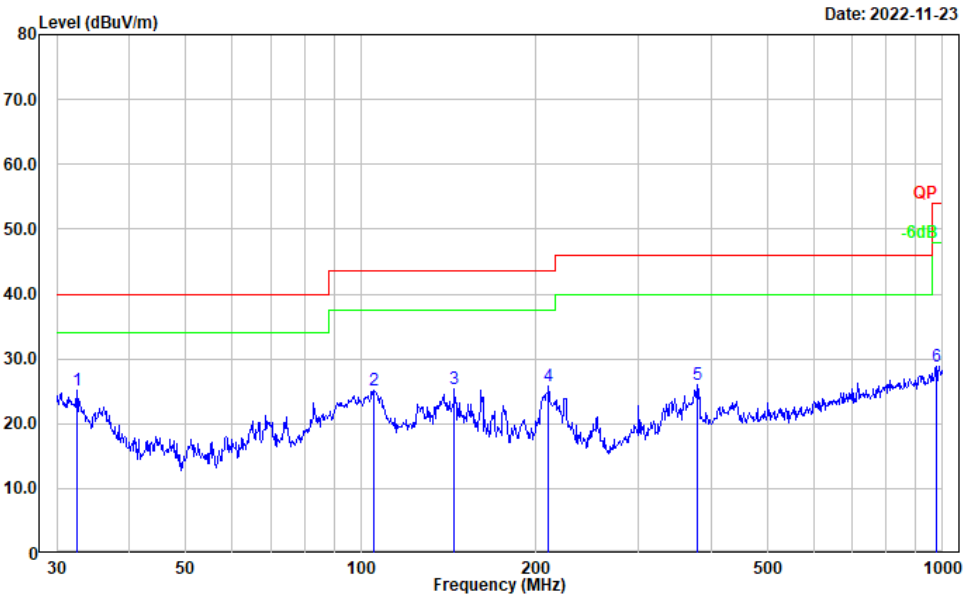
Test Mode: Transmitting
Polarization: vertical
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	30.568	33.48	-4.03	29.45	40.00	10.55	QP
2	43.202	46.60	-13.19	33.41	40.00	6.59	Peak
3	73.617	48.11	-16.83	31.28	40.00	8.72	Peak
4	90.537	47.45	-16.80	30.65	43.50	12.85	Peak
5	97.798	45.59	-14.85	30.74	43.50	12.76	Peak
6	161.474	41.63	-12.21	29.42	43.50	14.08	Peak

AX1500M:

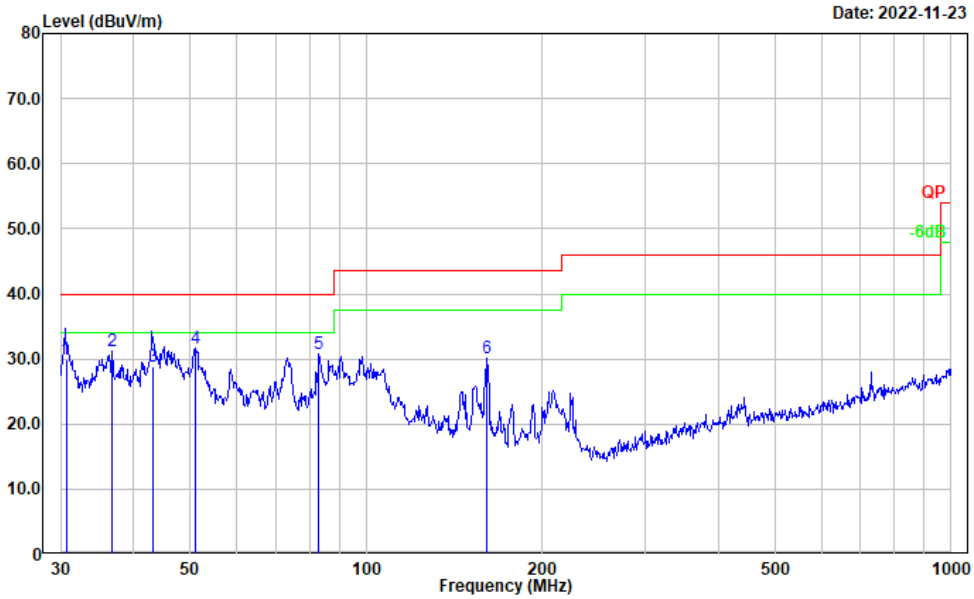
Test Mode: Transmitting
Polarization: horizontal
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	32.520	30.64	-5.54	25.10	40.00	14.90	Peak
2	105.272	38.39	-13.31	25.08	43.50	18.42	Peak
3	144.842	37.34	-11.94	25.40	43.50	18.10	Peak
4	210.048	38.32	-12.47	25.85	43.50	17.65	Peak
5	378.584	35.08	-9.17	25.91	46.00	20.09	Peak
6	975.753	28.43	0.40	28.83	54.00	25.17	Peak

Vertical:

Test Mode: Transmitting
Polarization: vertical
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	30.664	34.08	-4.11	29.97	40.00	10.03	QP
2	36.766	40.16	-8.84	31.32	40.00	8.68	Peak
3	43.188	41.97	-13.18	28.79	40.00	11.21	QP
4	50.942	48.82	-17.21	31.61	40.00	8.39	Peak
5	82.938	47.96	-17.23	30.73	40.00	9.27	Peak
6	160.346	42.30	-12.09	30.21	43.50	13.29	Peak

2) 1-25GHz(AX1500MS):
802.11b Mode, Chain 0:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2412 MHz							
2412.000	59.75	PK	H	31.53	91.28	N/A	N/A
2412.000	53.04	AV	H	31.53	84.57	N/A	N/A
2412.000	67.46	PK	V	31.53	98.99	N/A	N/A
2412.000	61.64	AV	V	31.53	93.17	N/A	N/A
2390.000	37.04	PK	V	31.46	68.50	74.00	5.50
2390.000	17.75	AV	V	31.46	49.21	54.00	4.79
4824.000	38.13	PK	V	10.94	49.07	74.00	24.93
4824.000	35.88	AV	V	10.94	46.82	54.00	7.18
7236.000	37.15	PK	V	14.44	51.59	74.00	22.41
7236.000	25.08	AV	V	14.44	39.52	54.00	14.48
Middle Channel: 2437 MHz							
2437.000	59.73	PK	H	31.60	91.33	N/A	N/A
2437.000	53.76	AV	H	31.60	85.36	N/A	N/A
2437.000	67.65	PK	V	31.60	99.25	N/A	N/A
2437.000	61.60	AV	V	31.60	93.20	N/A	N/A
4874.000	38.32	PK	V	11.05	49.37	74.00	24.63
4874.000	35.18	AV	V	11.05	46.23	54.00	7.77
7311.000	36.20	PK	V	14.80	51.00	74.00	23.00
7311.000	24.10	AV	V	14.80	38.90	54.00	15.10
High Channel: 2462MHz							
2462.000	57.90	PK	H	31.63	89.53	N/A	N/A
2462.000	51.73	AV	H	31.63	83.36	N/A	N/A
2462.000	66.05	PK	V	31.63	97.68	N/A	N/A
2462.000	60.18	AV	V	31.63	91.81	N/A	N/A
2483.500	36.74	PK	V	31.64	68.38	74.00	5.62
2483.500	17.09	AV	V	31.64	48.73	54.00	5.27
4924.000	38.16	PK	V	11.18	49.34	74.00	24.66
4924.000	34.17	AV	V	11.18	45.35	54.00	8.65
7386.000	36.81	PK	V	14.89	51.70	74.00	22.30
7386.000	24.41	AV	V	14.89	39.30	54.00	14.70

802.11b Mode, Chain 1:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2412 MHz							
2412.000	64.65	PK	H	31.53	96.18	N/A	N/A
2412.000	58.37	AV	H	31.53	89.90	N/A	N/A
2412.000	74.61	PK	V	31.53	106.14	N/A	N/A
2412.000	68.59	AV	V	31.53	100.12	N/A	N/A
2390.000	37.76	PK	V	31.46	69.22	74.00	4.78
2390.000	18.25	AV	V	31.46	49.71	54.00	4.29
4824.000	46.89	PK	V	10.94	57.83	74.00	16.17
4824.000	42.18	AV	V	10.94	53.12	54.00	0.88
7236.000	35.33	PK	V	14.44	49.77	74.00	24.23
7236.000	23.17	AV	V	14.44	37.61	54.00	16.39
Middle Channel: 2437 MHz							
2437.000	66.88	PK	H	31.60	98.48	N/A	N/A
2437.000	60.75	AV	H	31.60	92.35	N/A	N/A
2437.000	74.03	PK	V	31.60	105.63	N/A	N/A
2437.000	68.45	AV	V	31.60	100.05	N/A	N/A
4874.000	43.74	PK	V	11.05	54.79	74.00	19.21
4874.000	39.92	AV	V	11.05	50.97	54.00	3.03
7311.000	35.86	PK	V	14.80	50.66	74.00	23.34
7311.000	23.43	AV	V	14.80	38.23	54.00	15.77
High Channel: 2462MHz							
2462.000	64.55	PK	H	31.63	96.18	N/A	N/A
2462.000	56.66	AV	H	31.63	88.29	N/A	N/A
2462.000	72.99	PK	V	31.63	104.62	N/A	N/A
2462.000	64.55	AV	V	31.63	96.18	N/A	N/A
2483.500	36.62	PK	V	31.64	68.26	74.00	5.74
2483.500	16.83	AV	V	31.64	48.47	54.00	5.53
4924.000	41.60	PK	V	11.18	52.78	74.00	21.22
4924.000	37.64	AV	V	11.18	48.82	54.00	5.18
7386.000	36.02	PK	V	14.89	50.91	74.00	23.09
7386.000	24.01	AV	V	14.89	38.90	54.00	15.10

802.11g Mode Chain 0:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2412 MHz							
2412.000	65.89	PK	H	31.53	97.42	N/A	N/A
2412.000	55.36	AV	H	31.53	86.89	N/A	N/A
2412.000	76.61	PK	V	31.53	108.14	N/A	N/A
2412.000	66.90	AV	V	31.53	98.43	N/A	N/A
2390.000	35.62	PK	V	31.46	67.08	74.00	6.92
2390.000	17.61	AV	V	31.46	49.07	54.00	4.93
4824.000	52.15	PK	V	10.94	63.09	74.00	10.91
4824.000	39.21	AV	V	10.94	50.15	54.00	3.85
7236.000	33.80	PK	V	14.44	48.24	74.00	25.76
7236.000	21.40	AV	V	14.44	35.84	54.00	18.16
Middle Channel: 2437 MHz							
2437.000	64.81	PK	H	31.60	96.41	N/A	N/A
2437.000	55.41	AV	H	31.60	87.01	N/A	N/A
2437.000	76.84	PK	V	31.60	108.44	N/A	N/A
2437.000	67.20	AV	V	31.60	98.80	N/A	N/A
4874.000	53.18	PK	V	11.05	64.23	74.00	9.77
4874.000	40.69	AV	V	11.05	51.74	54.00	2.26
7311.000	39.40	PK	V	14.80	54.20	74.00	19.80
7311.000	27.20	AV	V	14.80	42.00	54.00	12.00
High Channel: 2462MHz							
2462.000	66.74	PK	H	31.63	98.37	N/A	N/A
2462.000	57.23	AV	H	31.63	88.86	N/A	N/A
2462.000	77.76	PK	V	31.63	109.39	N/A	N/A
2462.000	68.02	AV	V	31.63	99.65	N/A	N/A
2483.500	36.20	PK	V	31.64	67.84	74.00	6.16
2483.500	17.76	AV	V	31.64	49.40	54.00	4.60
4924.000	52.64	PK	V	11.18	63.82	74.00	10.18
4924.000	39.21	AV	V	11.18	50.39	54.00	3.61
7386.000	37.26	PK	V	14.89	52.15	74.00	21.85
7386.000	25.13	AV	V	14.89	40.02	54.00	13.98

802.11g Mode Chain 1:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2412 MHz							
2412.000	62.90	PK	H	31.53	94.43	N/A	N/A
2412.000	52.45	AV	H	31.53	83.98	N/A	N/A
2412.000	76.45	PK	V	31.53	107.98	N/A	N/A
2412.000	66.65	AV	V	31.53	98.18	N/A	N/A
2390.000	32.81	PK	V	31.46	64.27	74.00	9.73
2390.000	16.39	AV	V	31.46	47.85	54.00	6.15
4824.000	43.51	PK	V	10.94	54.45	74.00	19.55
4824.000	31.26	AV	V	10.94	42.20	54.00	11.80
7236.000	42.56	PK	V	14.44	57.00	74.00	17.00
7236.000	30.28	AV	V	14.44	44.72	54.00	9.28
Middle Channel: 2437 MHz							
2437.000	60.49	PK	H	31.60	92.09	N/A	N/A
2437.000	50.17	AV	H	31.60	81.77	N/A	N/A
2437.000	76.08	PK	V	31.60	107.68	N/A	N/A
2437.000	66.37	AV	V	31.60	97.97	N/A	N/A
4874.000	42.23	PK	V	11.05	53.28	74.00	20.72
4874.000	30.12	AV	V	11.05	41.17	54.00	12.83
7311.000	38.11	PK	V	14.80	52.91	74.00	21.09
7311.000	26.06	AV	V	14.80	40.86	54.00	13.14
High Channel: 2462MHz							
2462.000	60.41	PK	H	31.63	92.04	N/A	N/A
2462.000	50.32	AV	H	31.63	81.95	N/A	N/A
2462.000	77.16	PK	V	31.63	108.79	N/A	N/A
2462.000	67.16	AV	V	31.63	98.79	N/A	N/A
2483.500	31.46	PK	V	31.64	63.10	74.00	10.90
2483.500	16.30	AV	V	31.64	47.94	54.00	6.06
4924.000	41.64	PK	V	11.18	52.82	74.00	21.18
4924.000	29.32	AV	V	11.18	40.50	54.00	13.50
7386.000	34.17	PK	V	14.89	49.06	74.00	24.94
7386.000	22.08	AV	V	14.89	36.97	54.00	17.03

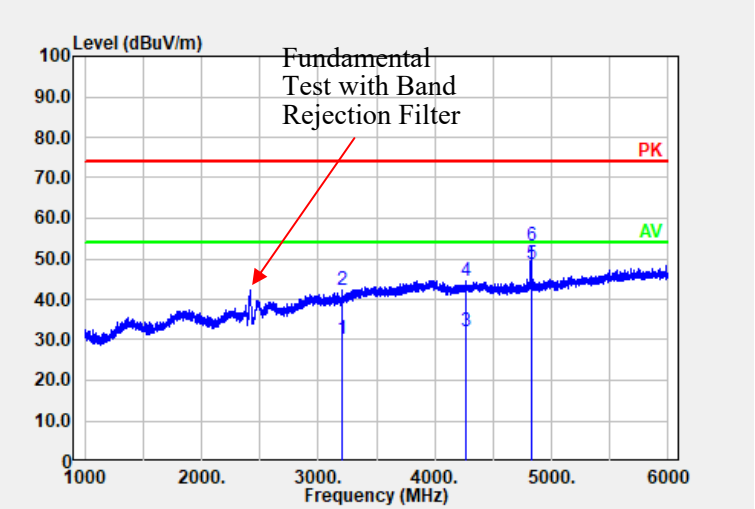
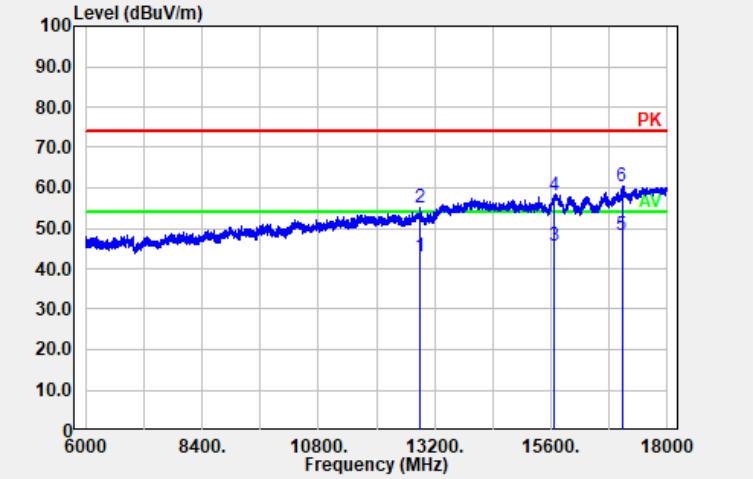
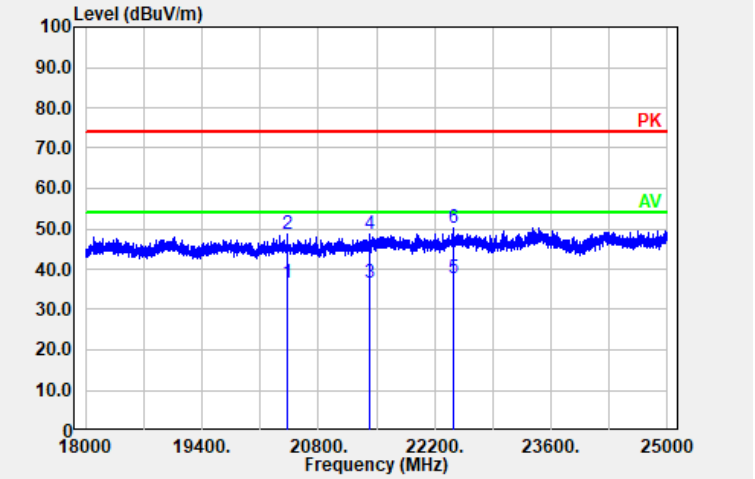
802.11n ht20 Mode(2TX mode was the worst):

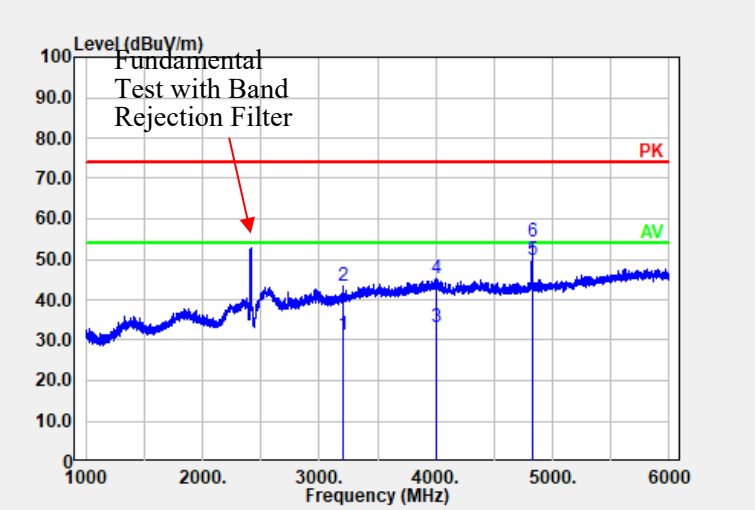
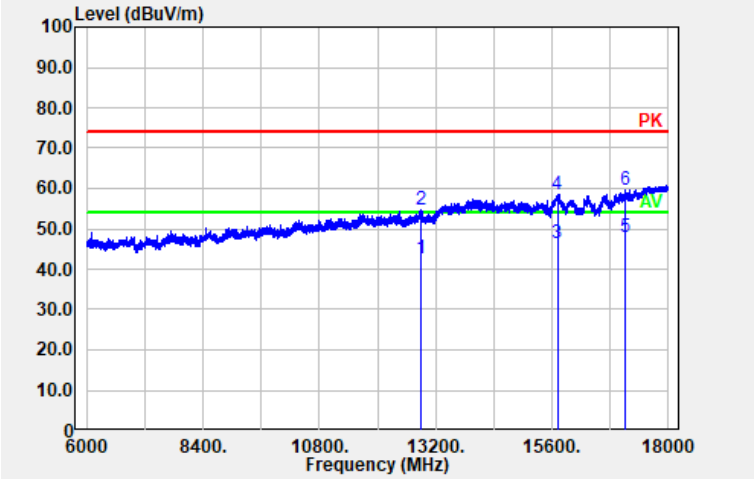
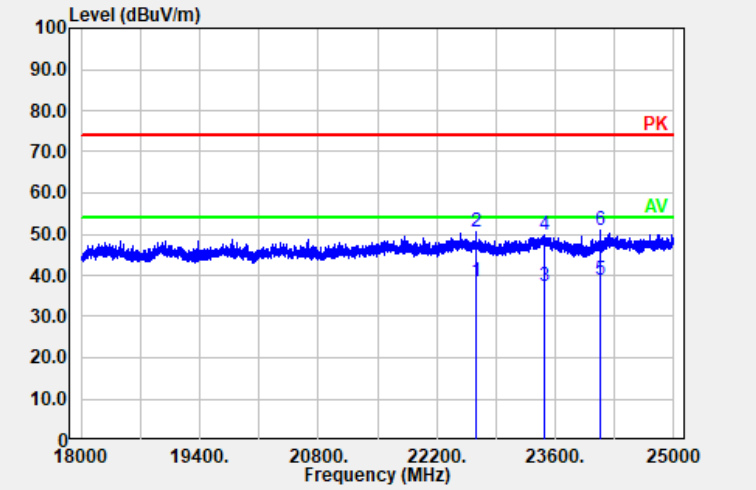
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2412 MHz							
2412.000	60.03	PK	H	31.53	91.56	N/A	N/A
2412.000	48.46	AV	H	31.53	79.99	N/A	N/A
2412.000	76.00	PK	V	31.53	107.53	N/A	N/A
2412.000	64.52	AV	V	31.53	96.05	N/A	N/A
2390.000	28.48	PK	V	31.46	59.94	74.00	14.06
2390.000	15.19	AV	V	31.46	46.65	54.00	7.35
4824.000	47.14	PK	V	10.94	58.08	74.00	15.92
4824.000	34.07	AV	V	10.94	45.01	54.00	8.99
7236.000	34.44	PK	V	14.44	48.88	74.00	25.12
7236.000	22.22	AV	V	14.44	36.66	54.00	17.34
Middle Channel: 2437 MHz							
2437.000	62.61	PK	H	31.60	94.21	N/A	N/A
2437.000	50.33	AV	H	31.60	81.93	N/A	N/A
2437.000	79.22	PK	V	31.60	110.82	N/A	N/A
2437.000	67.45	AV	V	31.60	99.05	N/A	N/A
4874.000	44.84	PK	V	11.05	55.89	74.00	18.11
4874.000	31.42	AV	V	11.05	42.47	54.00	11.53
7311.000	34.60	PK	V	14.80	49.40	74.00	24.60
7311.000	22.30	AV	V	14.80	37.10	54.00	16.90
High Channel: 2462MHz							
2462.000	62.55	PK	H	31.63	94.18	N/A	N/A
2462.000	50.12	AV	H	31.63	81.75	N/A	N/A
2462.000	78.47	PK	V	31.63	110.10	N/A	N/A
2462.000	66.25	AV	V	31.63	97.88	N/A	N/A
2483.500	31.16	PK	V	31.64	62.80	74.00	11.20
2483.500	16.74	AV	V	31.64	48.38	54.00	5.62
4924.000	43.52	PK	V	11.18	54.70	74.00	19.30
4924.000	30.26	AV	V	11.18	41.44	54.00	12.56
7386.000	33.84	PK	V	14.89	48.73	74.00	25.27
7386.000	21.42	AV	V	14.89	36.31	54.00	17.69

802.11n ht40 Mode(2TX mode was the worst):

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 2422 MHz							
2422.000	59.37	PK	H	31.56	90.93	N/A	N/A
2422.000	47.12	AV	H	31.56	78.68	N/A	N/A
2422.000	75.43	PK	V	31.56	106.99	N/A	N/A
2422.000	63.47	AV	V	31.56	95.03	N/A	N/A
2390.000	30.40	PK	V	31.46	61.86	74.00	12.14
2390.000	16.72	AV	V	31.46	48.18	54.00	5.82
4844.000	41.32	PK	V	10.96	52.28	74.00	21.72
4844.000	29.16	AV	V	10.96	40.12	54.00	13.88
7266.000	34.66	PK	V	14.63	49.29	74.00	24.71
7266.000	22.33	AV	V	14.63	36.96	54.00	17.04
Middle Channel: 2437 MHz							
2437.000	59.47	PK	H	31.60	91.07	N/A	N/A
2437.000	47.39	AV	H	31.60	78.99	N/A	N/A
2437.000	76.01	PK	V	31.60	107.61	N/A	N/A
2437.000	64.23	AV	V	31.60	95.83	N/A	N/A
4874.000	41.61	PK	V	11.05	52.66	74.00	21.34
4874.000	29.31	AV	V	11.05	40.36	54.00	13.64
7311.000	34.84	PK	V	14.80	49.64	74.00	24.36
7311.000	22.42	AV	V	14.80	37.22	54.00	16.78
High Channel: 2452MHz							
2452.000	56.79	PK	H	31.63	88.42	N/A	N/A
2452.000	44.32	AV	H	31.63	75.95	N/A	N/A
2452.000	73.79	PK	V	31.63	105.42	N/A	N/A
2452.000	61.02	AV	V	31.63	92.65	N/A	N/A
2483.500	29.74	PK	V	31.64	61.38	74.00	12.62
2483.500	15.86	AV	V	31.64	47.50	54.00	6.50
4904.000	41.24	PK	V	11.14	52.38	74.00	21.62
4904.000	29.12	AV	V	11.14	40.26	54.00	13.74
7356.000	33.60	PK	V	14.80	48.40	74.00	25.60
7356.000	21.30	AV	V	14.80	36.10	54.00	17.90

Worst Test plots(802.11b mode chain 0 low channel):

Horizontal	
1-6GHz	
6-18GHz	
18-25GHz	

Vertical	
1-6GHz	
6-18GHz	
18-25GHz	

4.3 6 dB Emission Bandwidth:

Serial Number:	1O7R	Test Date:	2023/2/24
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	24.8	Relative Humidity: (%)	57	ATM Pressure: (kPa)	101.9

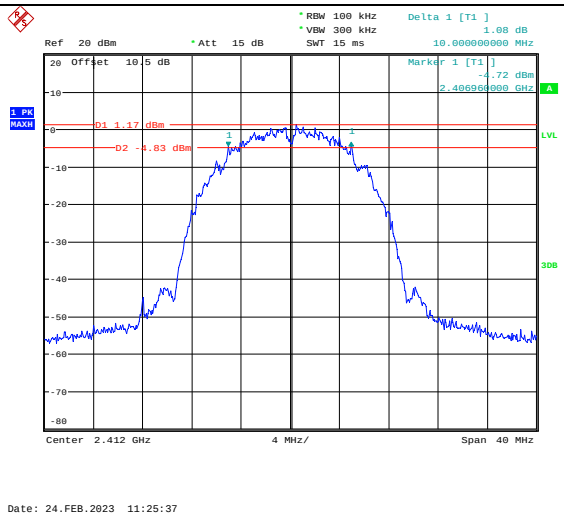
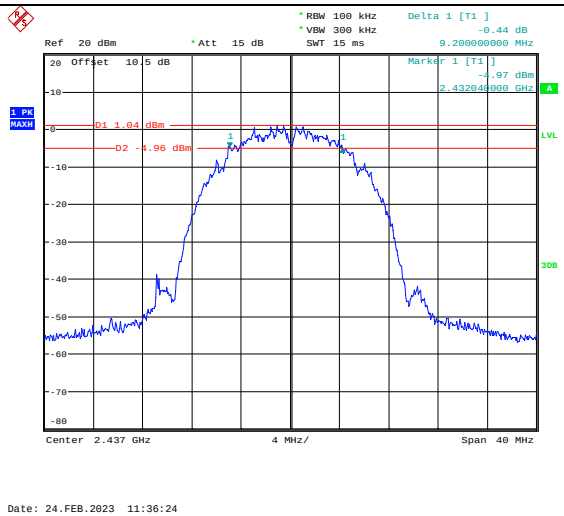
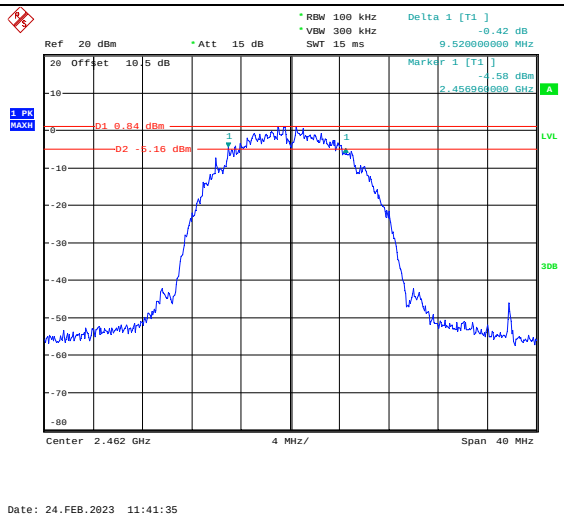
Test Equipment List and Details:

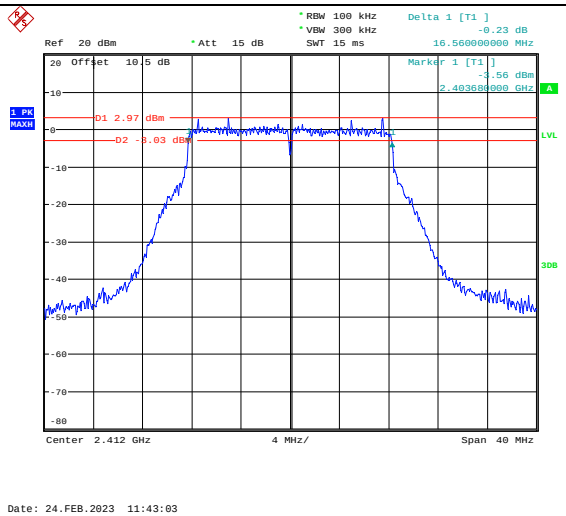
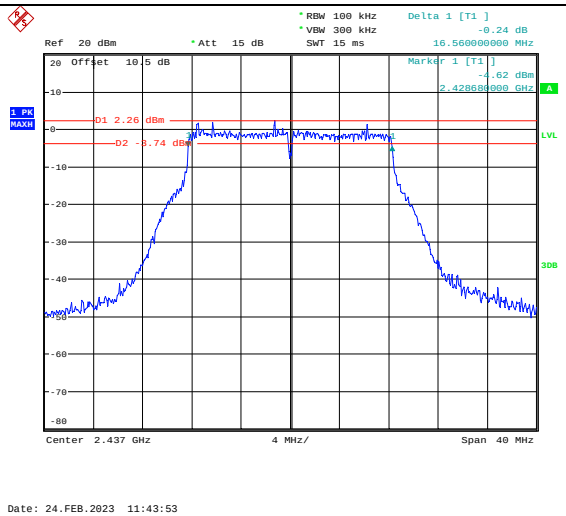
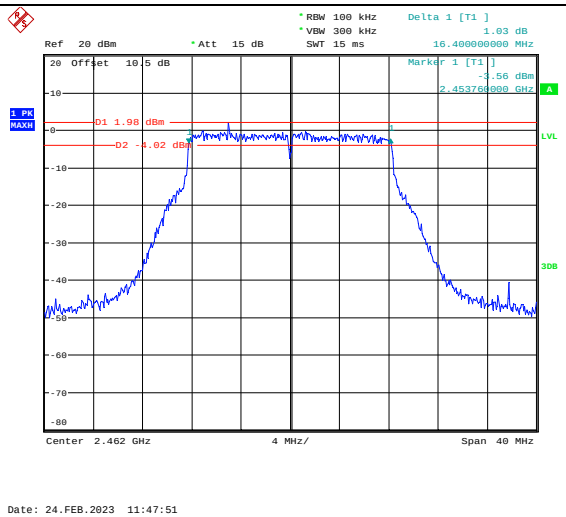
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022/07/15	2023/07/14
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

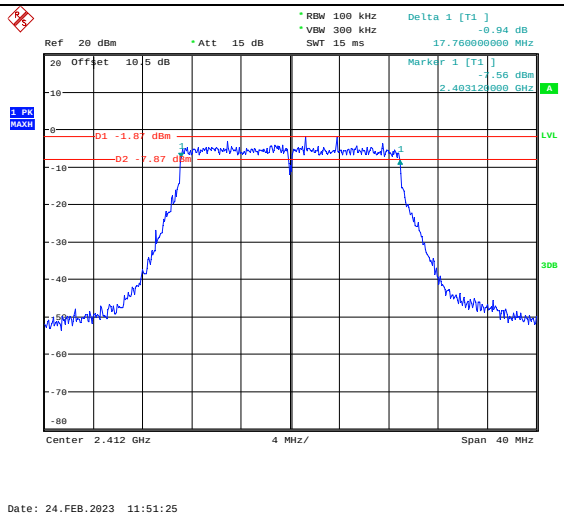
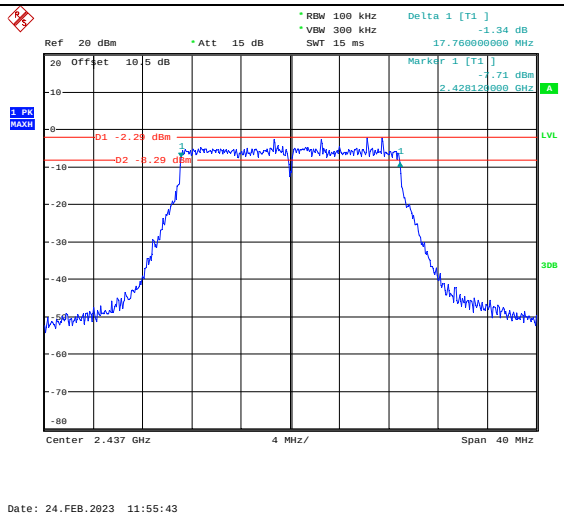
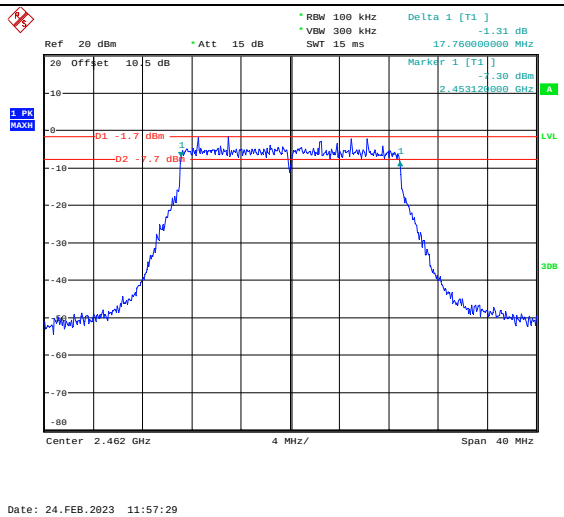
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

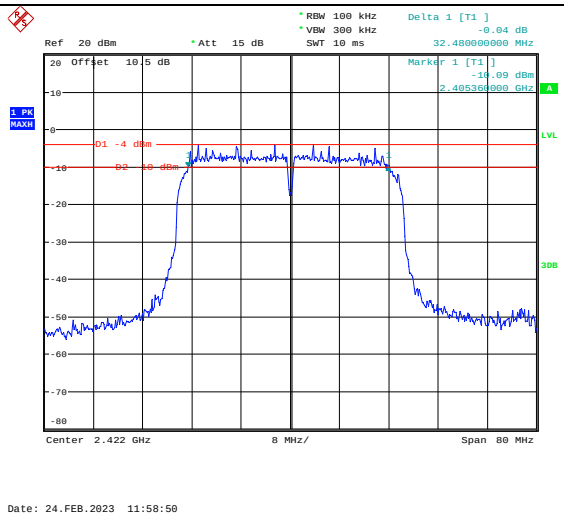
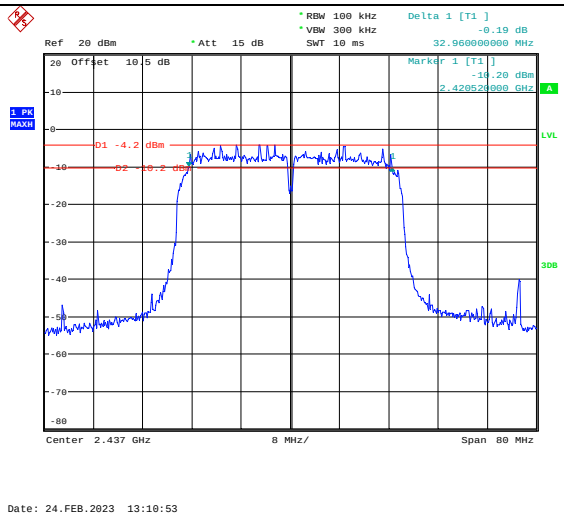
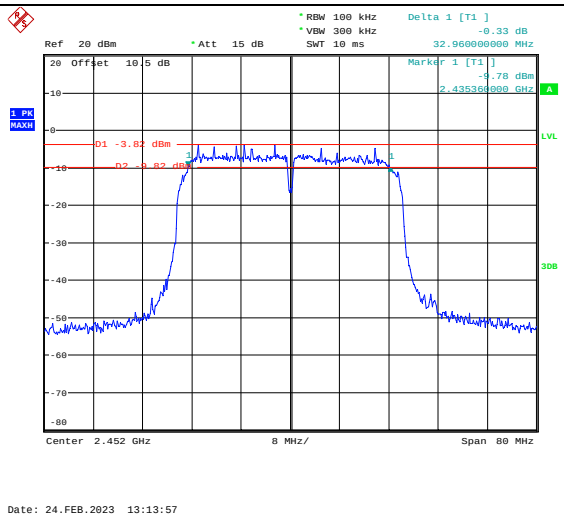
Test Data:

Test Modes	Test Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
802.11b	2412	10.00	0.5
	2437	9.20	0.5
	2462	9.52	0.5
802.11g	2412	16.56	0.5
	2437	16.56	0.5
	2462	16.40	0.5
802.11n ht20	2412	17.76	0.5
	2437	17.76	0.5
	2462	17.76	0.5
802.11n ht40	2422	32.48	0.5
	2437	32.96	0.5
	2452	32.96	0.5
Note: Test only was performed at Chain 0.			

6dB Emission Bandwidth	
802.11b Lowest Channel	
802.11b Middle Channel	
802.11b Highest Channel	

6dB Emission Bandwidth	
802.11g Lowest Channel	
802.11g Middle Channel	
802.11g Highest Channel	

6dB Emission Bandwidth	
802.11n ht20 Lowest Channel	
802.11n ht20 Middle Channel	
802.11n ht20 Highest Channel	

6dB Emission Bandwidth	
802.11n ht40 Lowest Channel	
802.11n ht40 Middle Channel	
802.11n ht40 Highest Channel	

4.4 99% Occupied Bandwidth:

Serial Number:	1O7R	Test Date:	2023/2/24
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	24.8	Relative Humidity: (%)	57	ATM Pressure: (kPa)	101.9

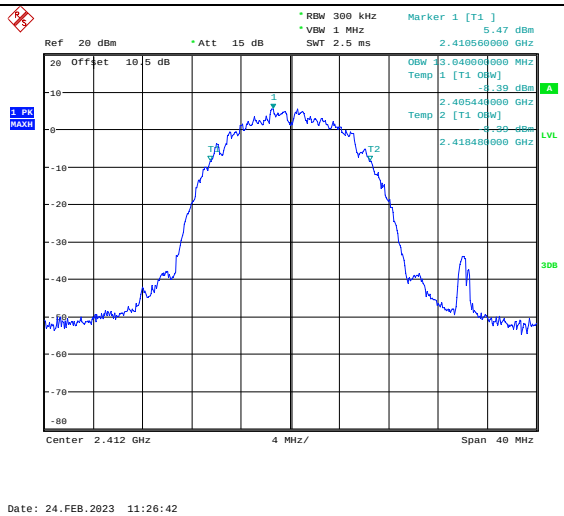
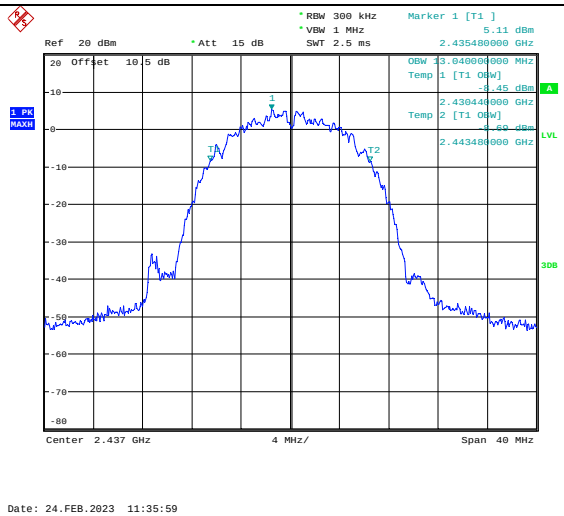
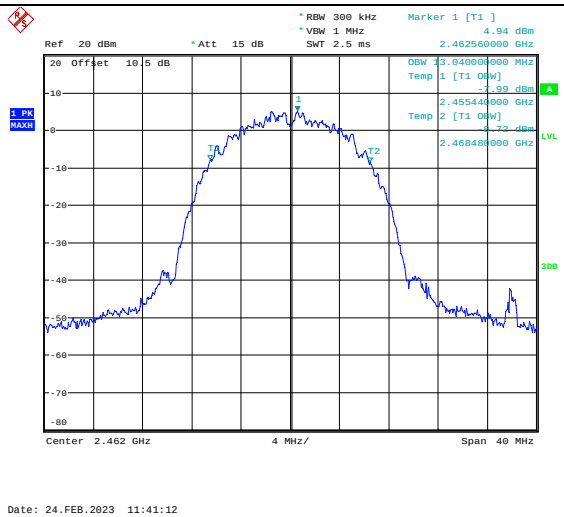
Test Equipment List and Details:

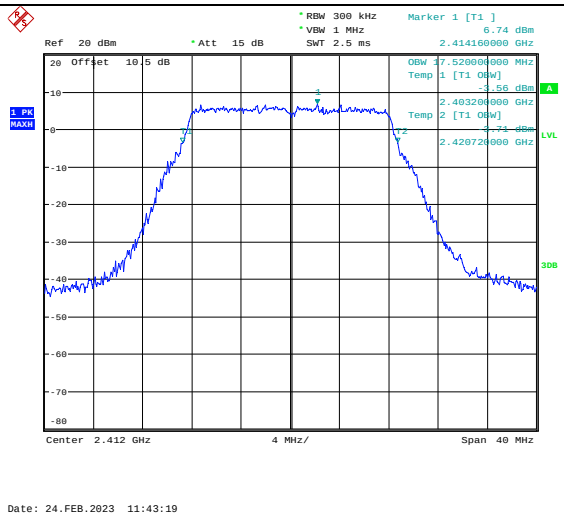
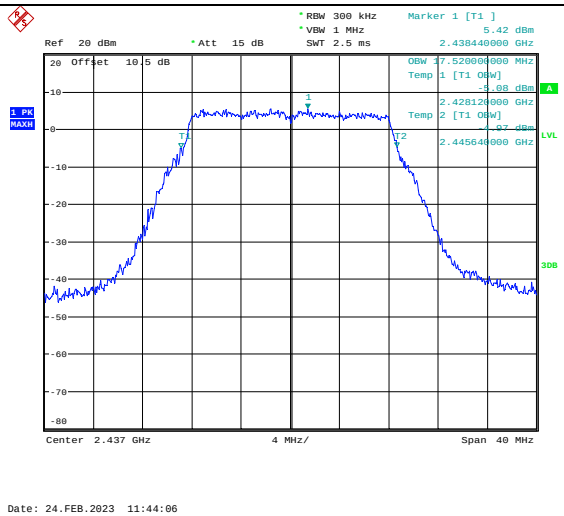
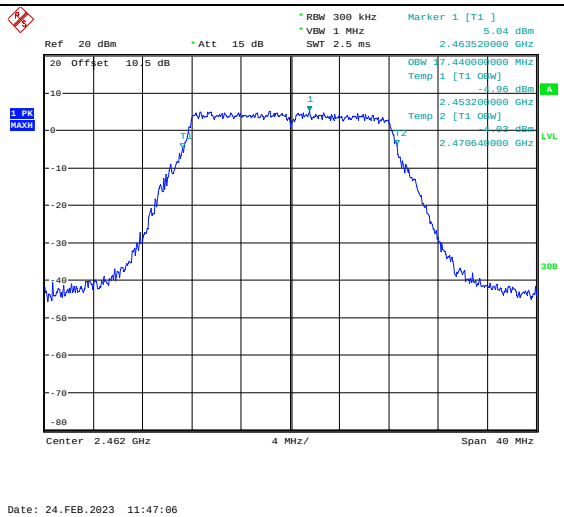
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022/07/15	2023/07/14
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

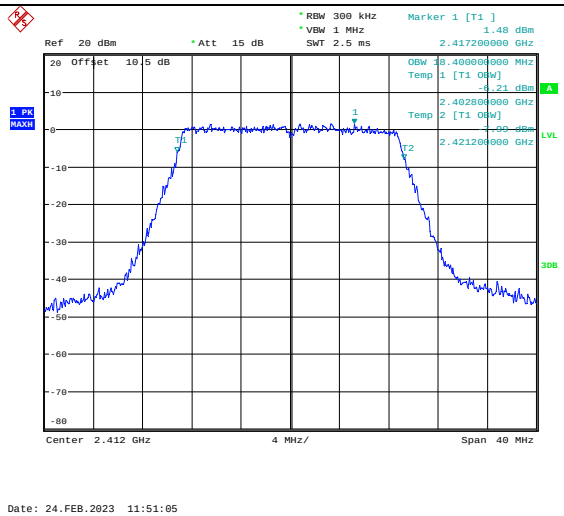
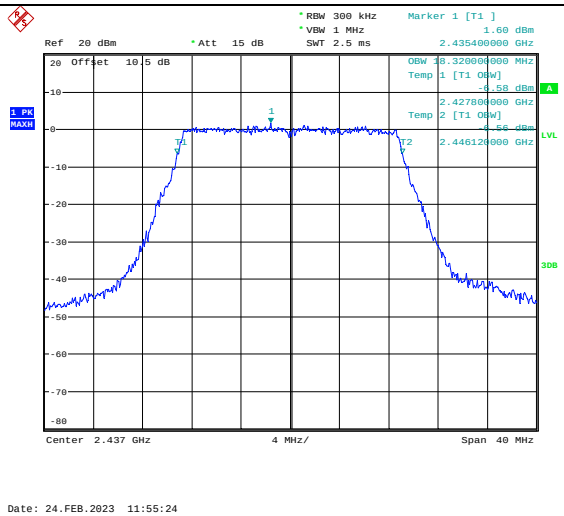
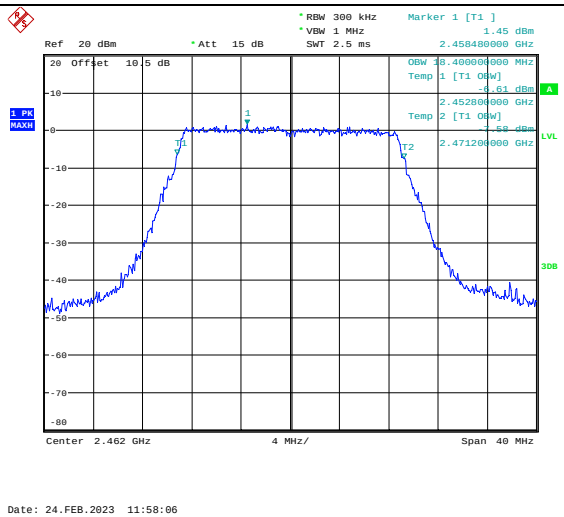
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

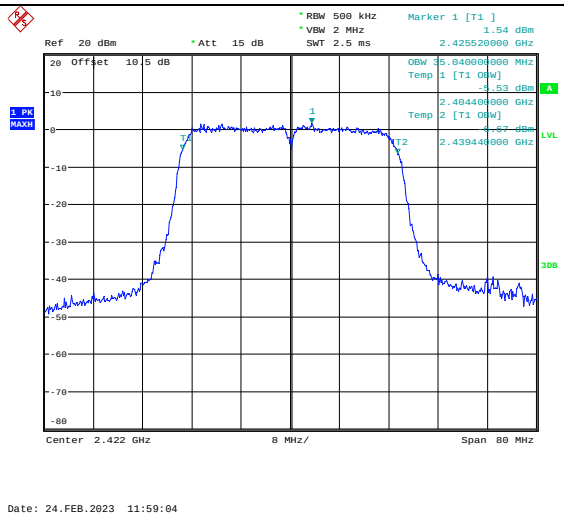
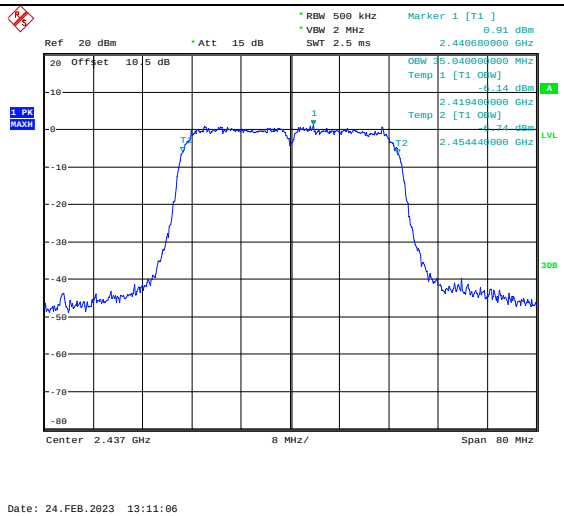
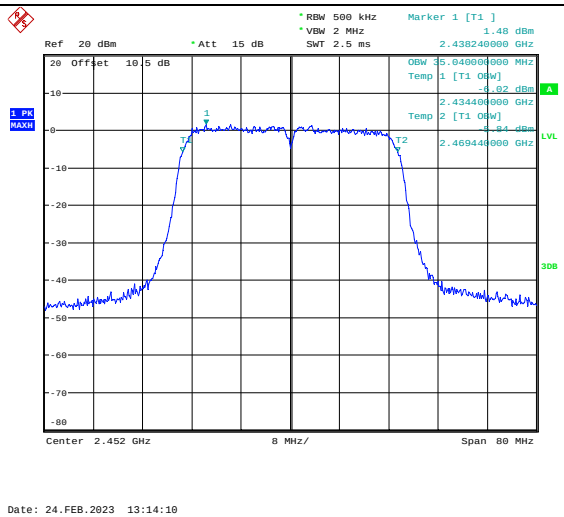
Test Data:

Test Modes	Test Channel	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)
802.11b	Lowest	2412	13.04
	Middle	2437	13.04
	Highest	2462	13.04
802.11g	Lowest	2412	17.52
	Middle	2437	17.52
	Highest	2462	17.44
802.11n ht20	Lowest	2412	18.40
	Middle	2437	18.32
	Highest	2462	18.40
802.11n ht40	Lowest	2422	35.04
	Middle	2437	35.04
	Highest	2452	35.04
Note: Test only was performed at Chain 0.			

99% Occupied Bandwidth	
802.11b Lowest Channel	
802.11b Middle Channel	
802.11b Highest Channel	

99% Occupied Bandwidth	
802.11g Lowest Channel	
802.11g Middle Channel	
802.11g Highest Channel	

99% Occupied Bandwidth	
802.11n ht20 Lowest Channel	
802.11n ht20 Middle Channel	
802.11n ht20 Highest Channel	

99% Occupied Bandwidth	
802.11n ht40 Lowest Channel	
802.11n ht40 Middle Channel	
802.11n ht40 Highest Channel	

4.5 Maximum conducted output power:

Serial Number:	1O7R	Test Date:	2023/2/24
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	24.8	Relative Humidity: (%)	57	ATM Pressure: (kPa)	101.9

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY54080015	2022/07/15	2023/07/14

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Modes	Test Frequency (MHz)	Maximum Conducted Average Output Power (dBm)			Limit (dBm)
		Chain 0	Chain 1	Total	
802.11b	2412	9.97	13.45	/	30
	2437	9.12	13.87	/	30
	2462	9.29	13.99	/	30
802.11g	2412	15.64	15.31	/	30
	2437	15.68	15.27	/	30
	2462	15.79	15.38	/	30
802.11n ht20	2412	10.19	10.59	13.40	30
	2437	10.09	10.25	13.18	30
	2462	10.22	10.34	13.29	30
802.11n ht40	2422	10.06	10.57	13.33	30
	2437	10.21	10.44	13.34	30
	2452	10.26	10.37	13.33	30

Note:
The maximum antenna gain is 5.59 dBi in 2.4GHz band. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

So:
Directional gain =5.59 dBi

4.6 Maximum power spectral density:

Serial Number:	1O7R	Test Date:	2023/2/27
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	59	ATM Pressure: (kPa)	102.3

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022-07-15	2023-07-14
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Modes	Test Frequency (MHz)	Maximum Power Spectral Density (dBm/10kHz)			Limit (dBm/3kHz)
		Chain 0	Chain 1	Total	
802.11b	2412	-18.05	-14.41	/	8
	2437	-18.03	-14.15	/	8
	2462	-18.42	-14.39	/	8
802.11g	2412	-15.04	-15.39	/	8
	2437	-15.02	-15.12	/	8
	2462	-14.99	-15.26	/	8
802.11n ht20	2412	-18.08	-18.01	-15.03	5.41
	2437	-18.46	-18.04	-15.23	5.41
	2462	-18.78	-18.27	-15.51	5.41
802.11n ht40	2422	-18.96	-19.65	-16.28	5.41
	2437	-19.7	-19.38	-16.53	5.41
	2452	-19.73	-19.48	-16.59	5.41

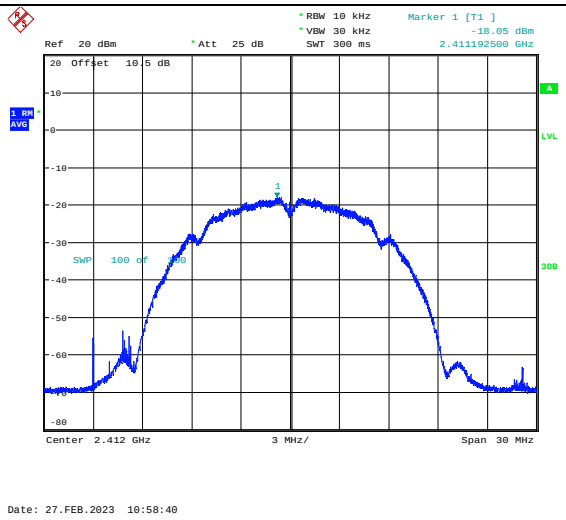
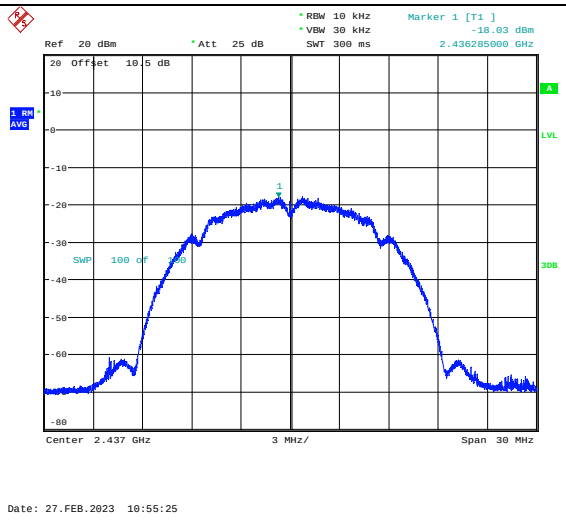
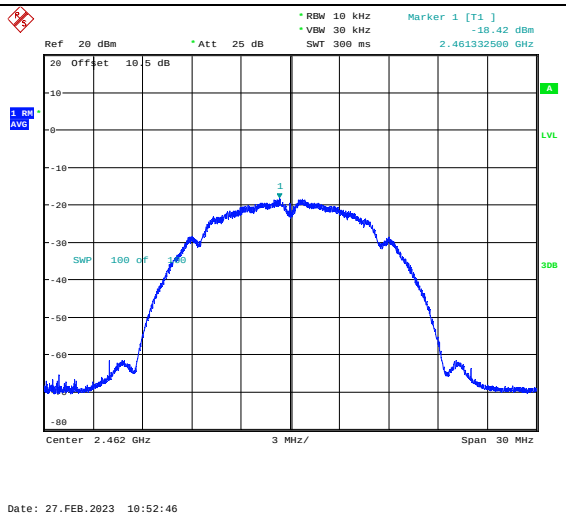
Note 1:The maximum antenna gain is 5.59 dBi. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

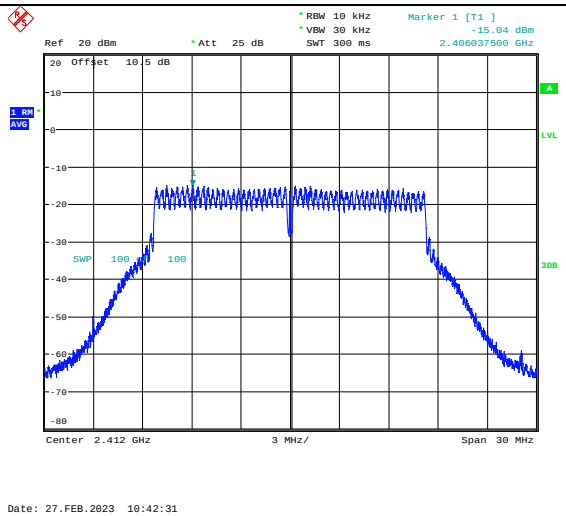
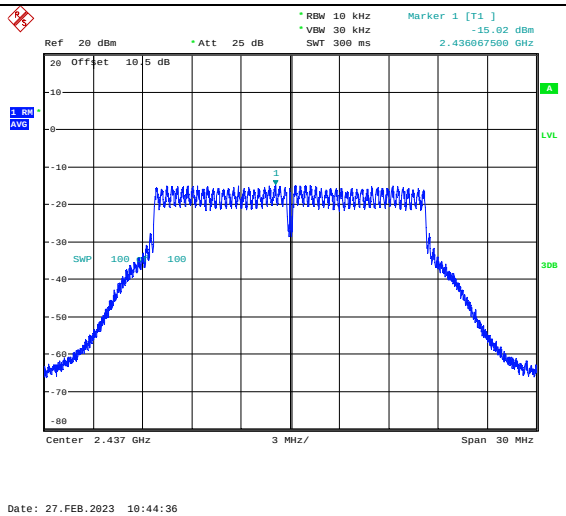
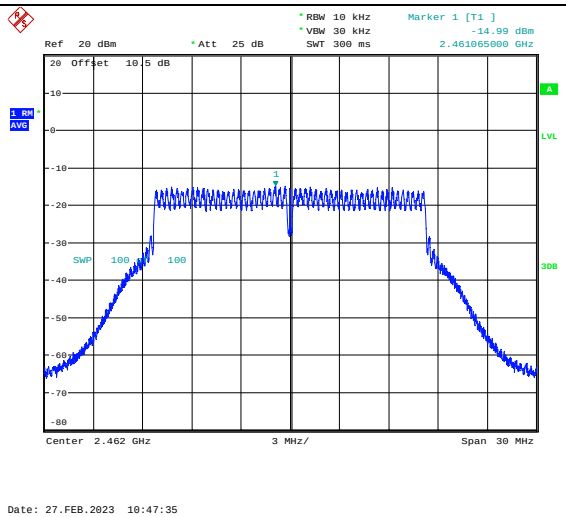
$$\text{Array Gain} = 10 \log(N_{ANT}/N_{SS}) \text{ dB.}$$

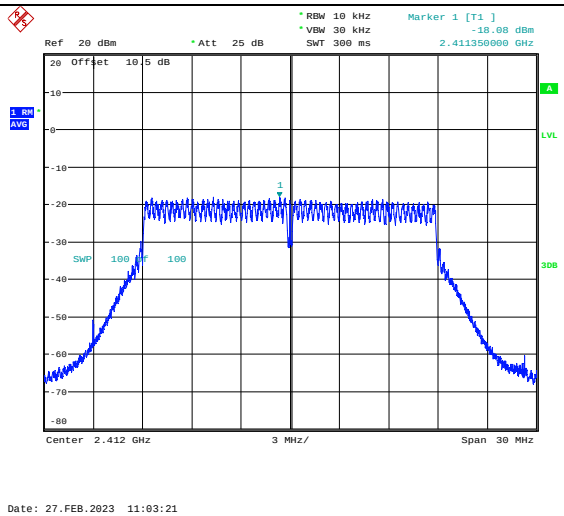
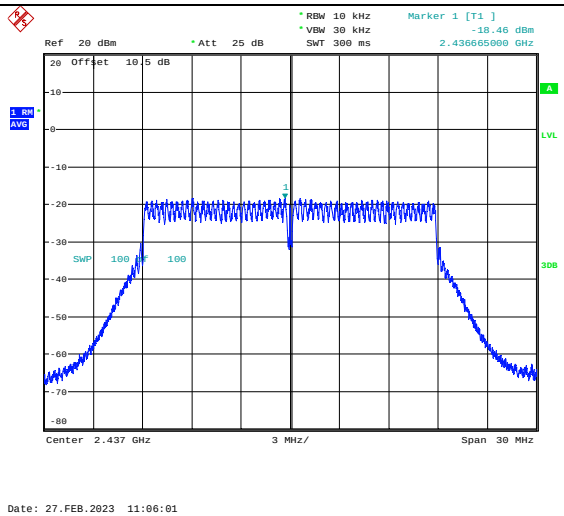
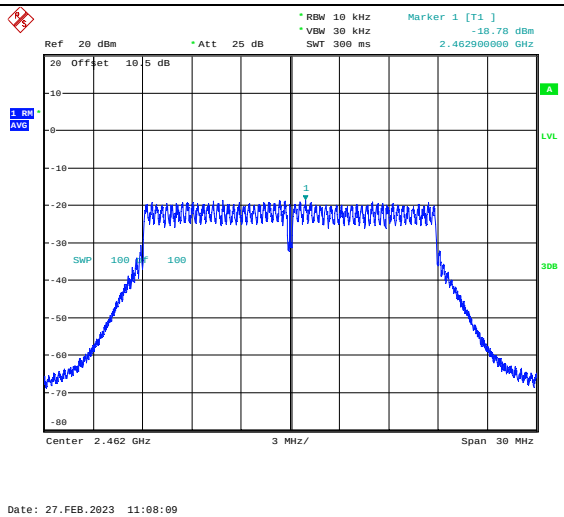
So:

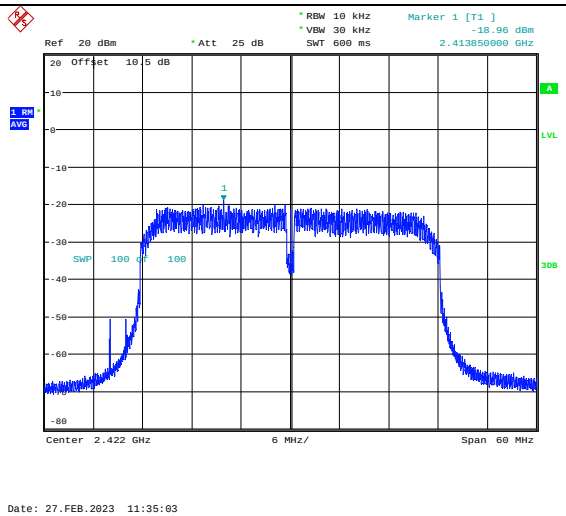
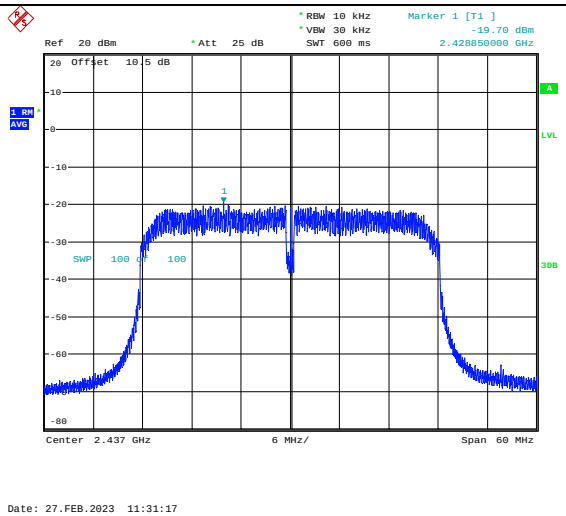
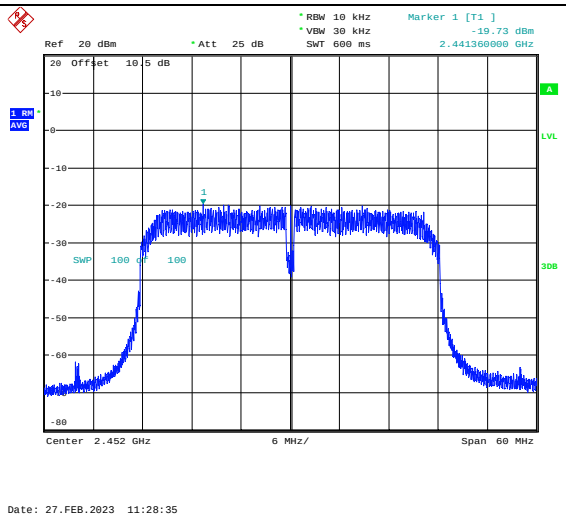
$$\text{Directional gain} = G_{ANT} + \text{Array Gain} = 5.59+10*\log(2/1)=8.59 \text{ dBi}$$

Chain 0:

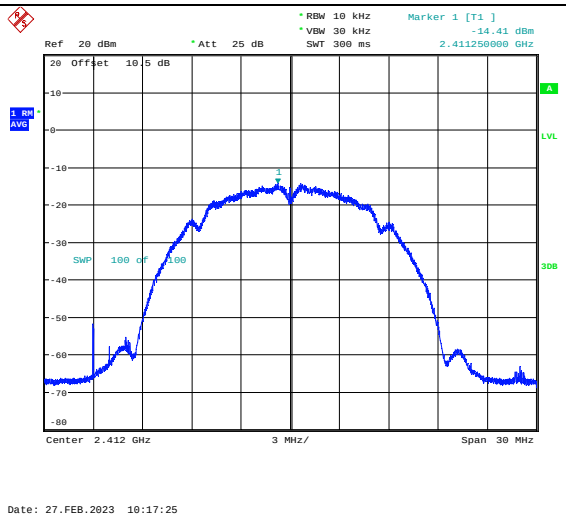
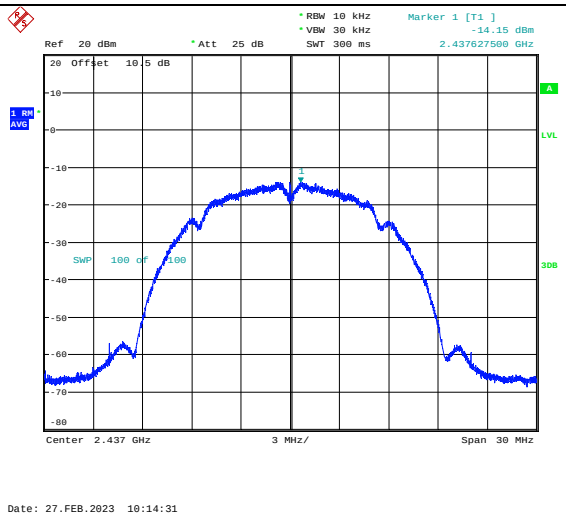
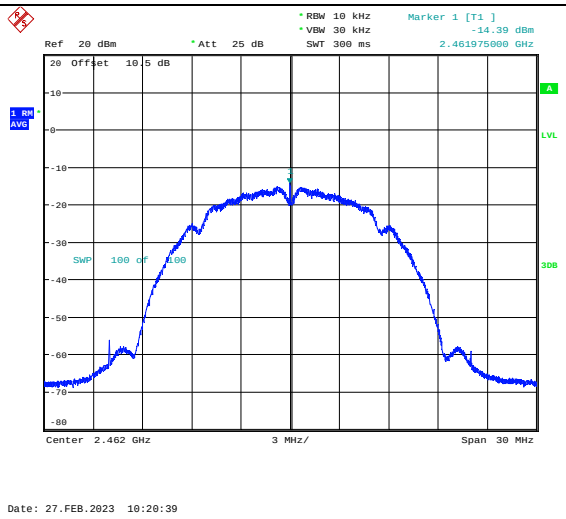
Maximum power spectral density	
802.11b Lowest Channel	
802.11b Middle Channel	
802.11b Highest Channel	

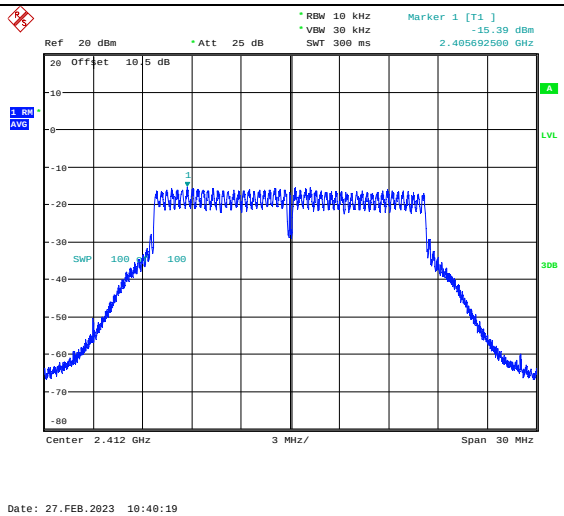
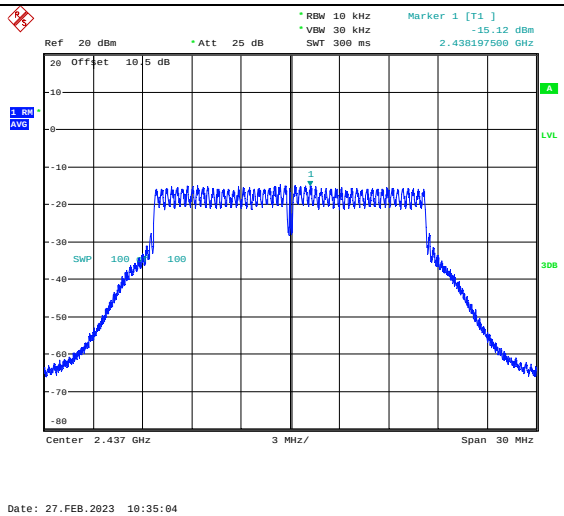
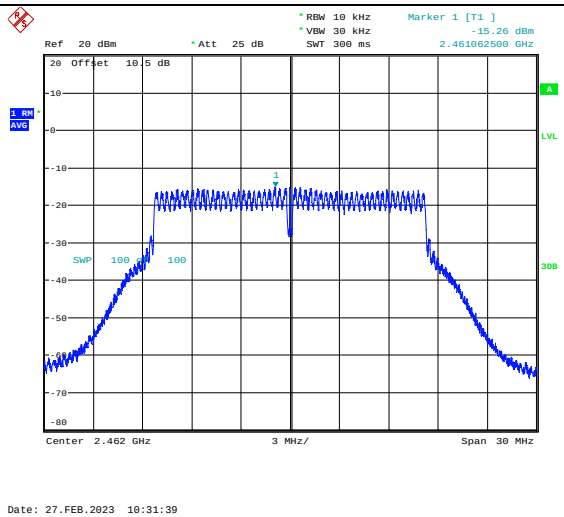
Maximum power spectral density	
802.11g Lowest Channel	
802.11g Middle Channel	
802.11g Highest Channel	

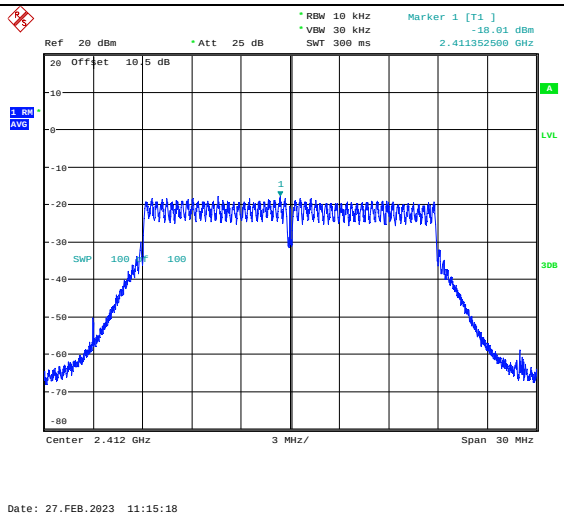
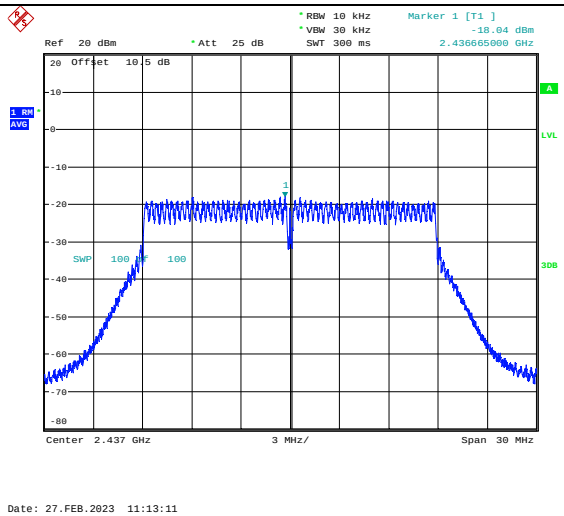
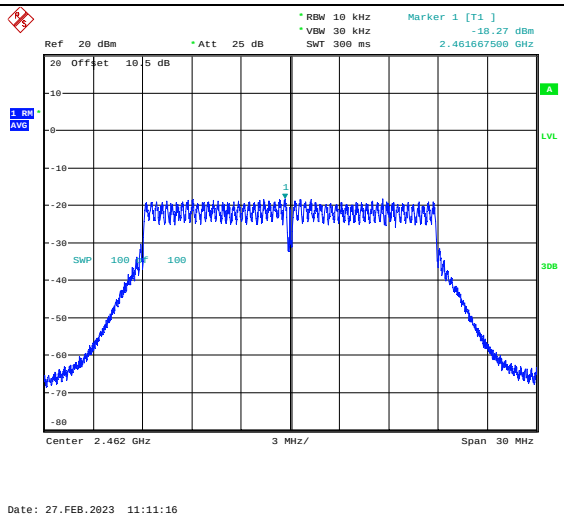
Maximum power spectral density	
802.11n ht20 Lowest Channel	
802.11n ht20 Middle Channel	
802.11n ht20 Highest Channel	

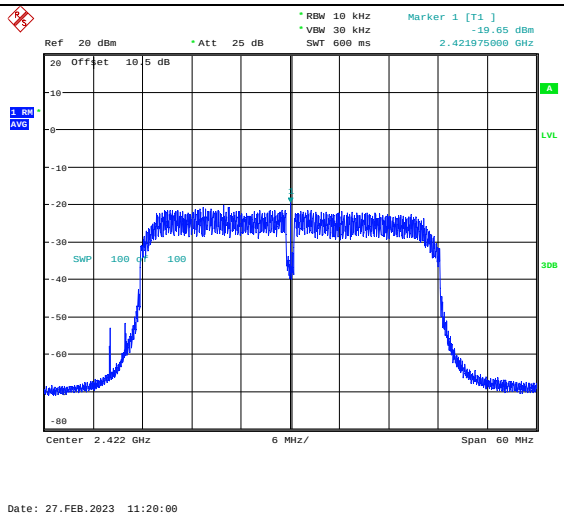
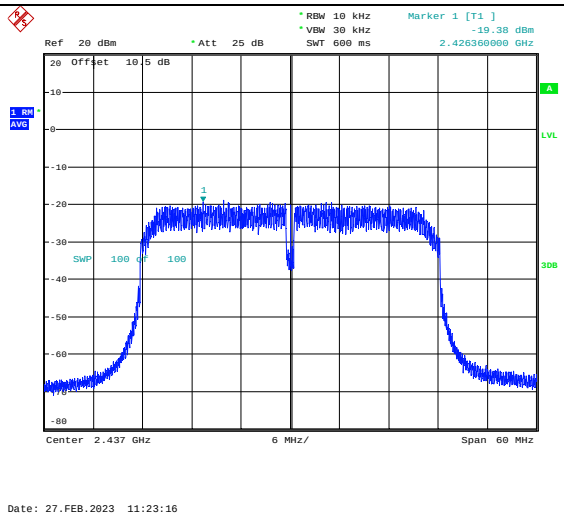
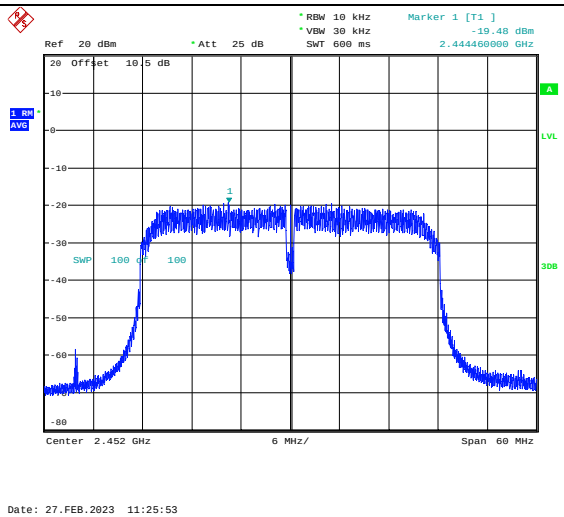
Maximum power spectral density	
802.11n ht40 Lowest Channel	
802.11n ht40 Middle Channel	
802.11n ht40 Highest Channel	

Chain 1:

Maximum power spectral density	
802.11b Lowest Channel	
802.11b Middle Channel	
802.11b Highest Channel	

Maximum power spectral density	
802.11g Lowest Channel	
802.11g Middle Channel	
802.11g Highest Channel	

Maximum power spectral density	
802.11n ht20 Lowest Channel	
802.11n ht20 Middle Channel	
802.11n ht20 Highest Channel	

Maximum power spectral density	
802.11n ht40 Lowest Channel	
802.11n ht40 Middle Channel	
802.11n ht40 Highest Channel	

4.7 100 kHz Bandwidth of Frequency Band Edge:

Serial Number:	1O7R	Test Date:	2023/2/24
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

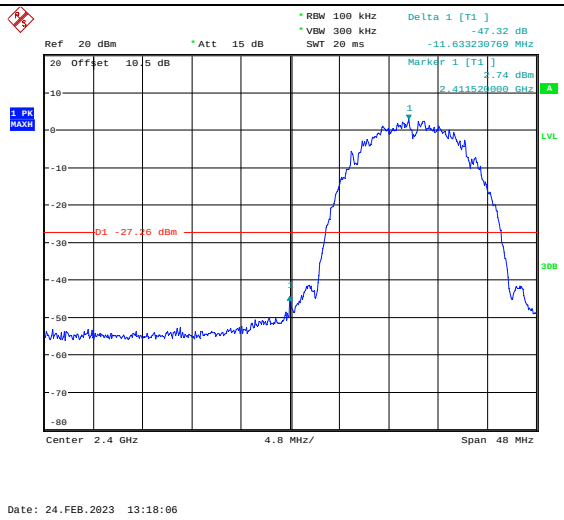
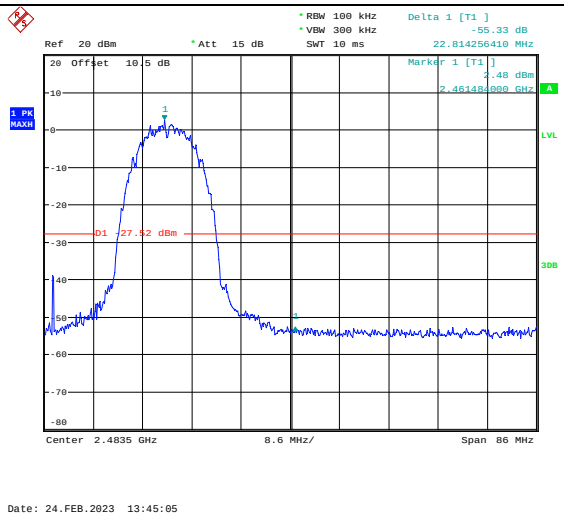
Environmental Conditions:					
Temperature: (℃)	24.8	Relative Humidity: (%)	57	ATM Pressure: (kPa)	101.9

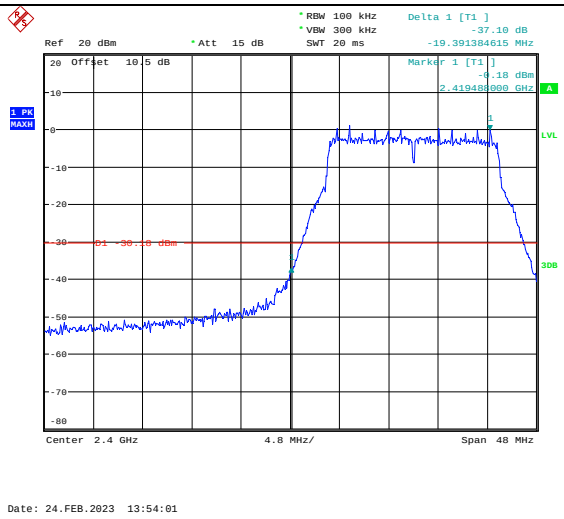
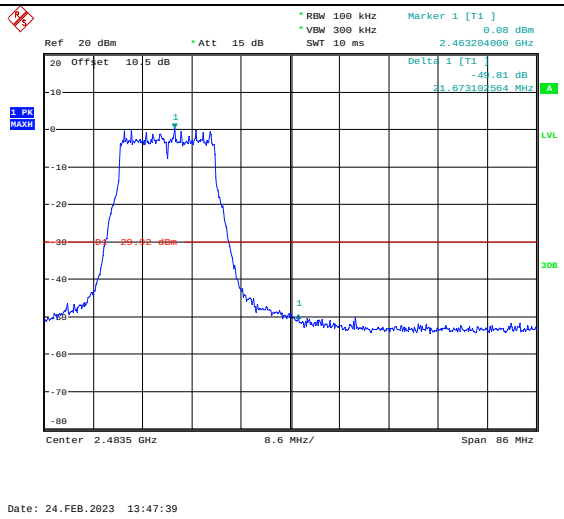
Test Equipment List and Details:

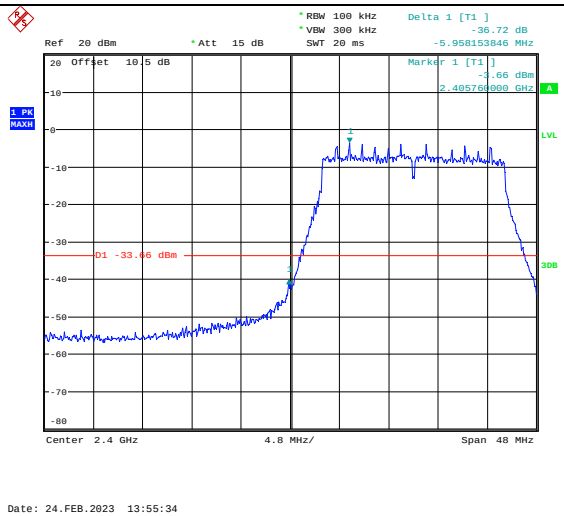
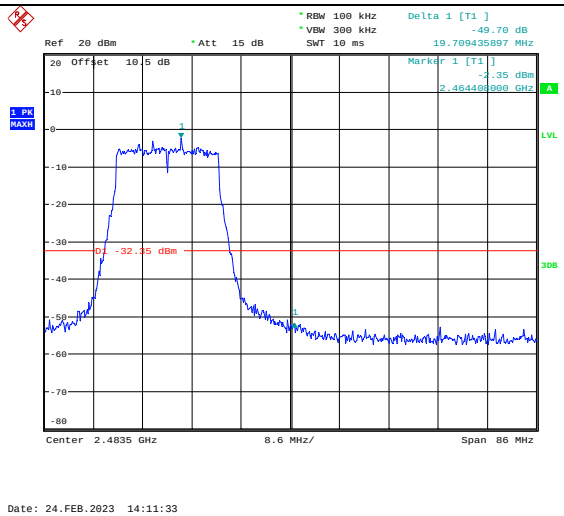
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022-07-15	2023-07-14
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

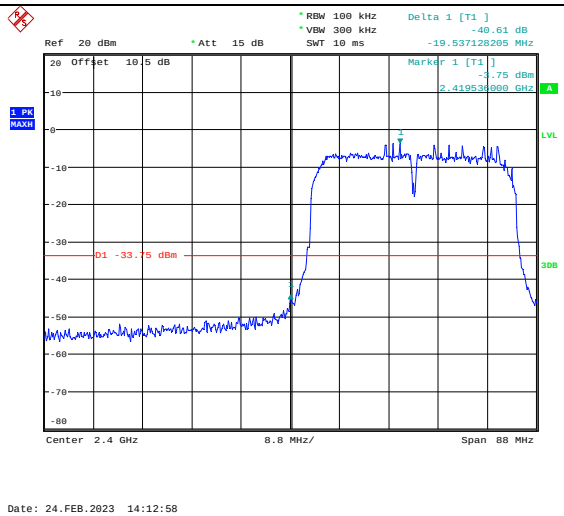
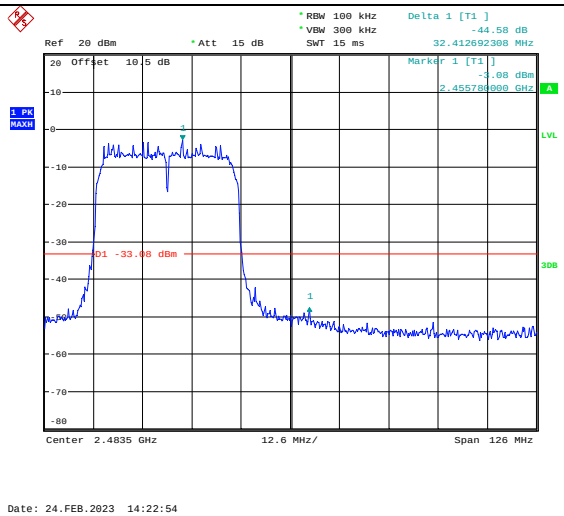
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Chain 0:

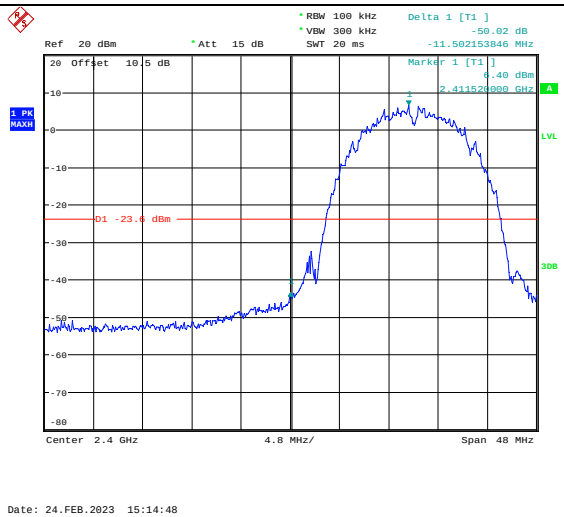
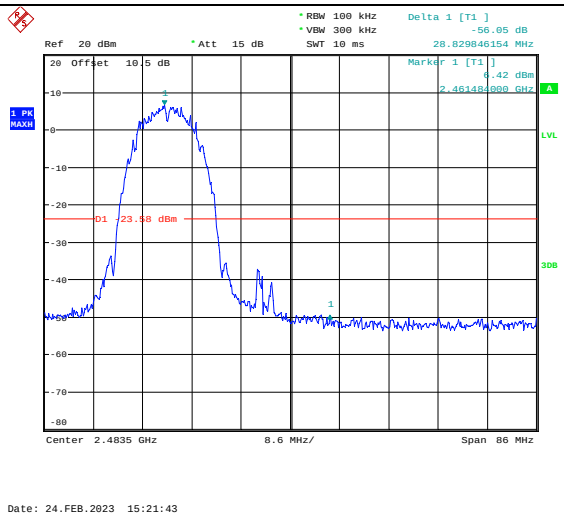
100 kHz Bandwidth of Frequency Band Edge	
802.11b Lowest Band edge	
802.11b Highest Band edge	

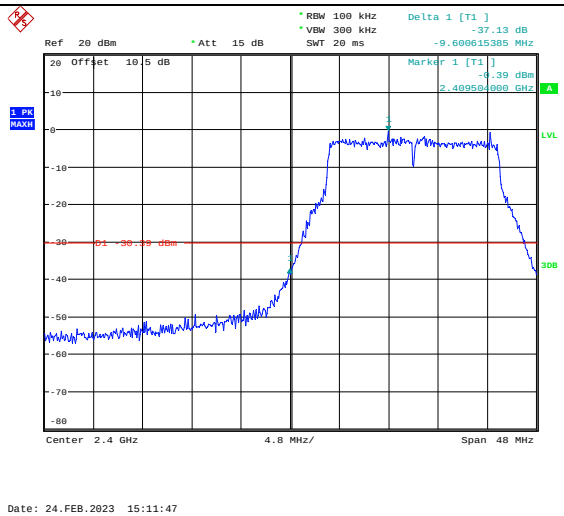
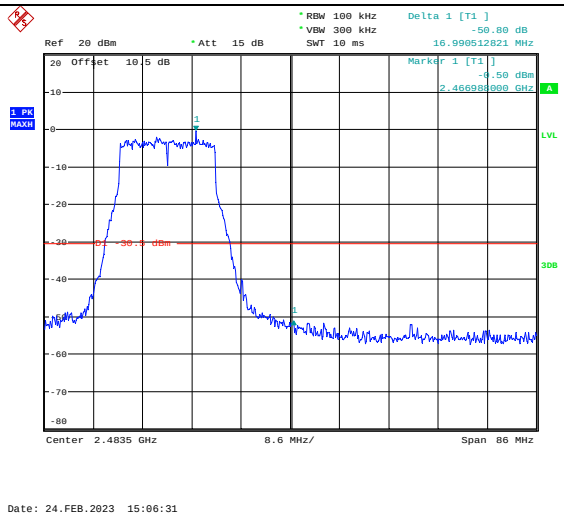
100 kHz Bandwidth of Frequency Band Edge	
802.11g Lowest Band edge	
802.11g Highest Band edge	

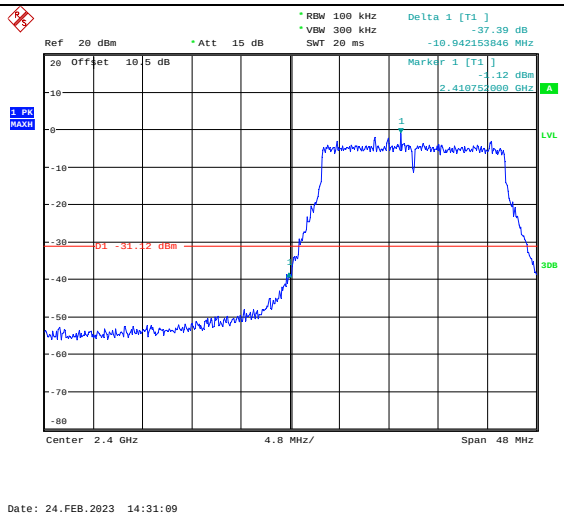
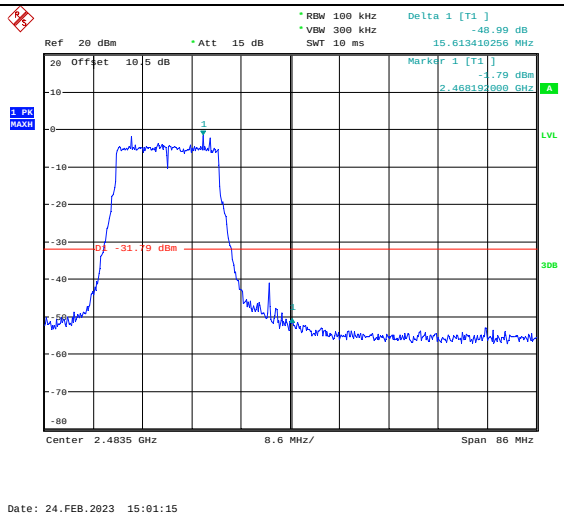
100 kHz Bandwidth of Frequency Band Edge	
802.11n ht20 Lowest Band edge	
802.11n ht20 Highest Band edge	

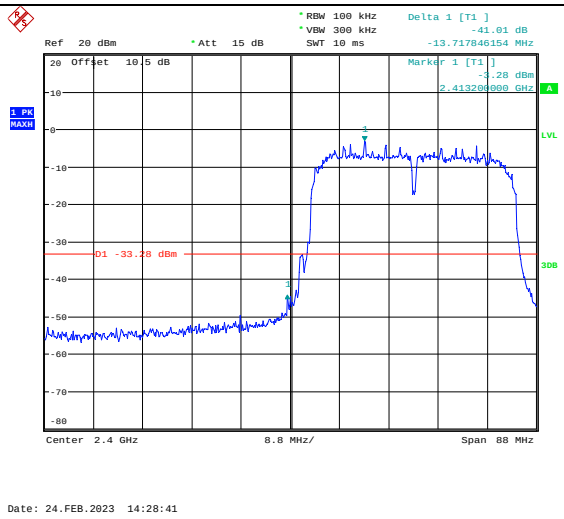
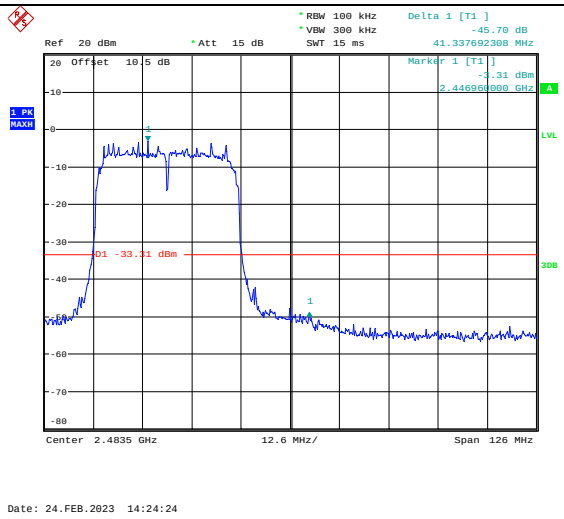
100 kHz Bandwidth of Frequency Band Edge	
802.11n ht40 Lowest Band edge	
802.11n ht40 Highest Band edge	

Chain 1:

100 kHz Bandwidth of Frequency Band Edge	
802.11b Lowest Band edge	
802.11b Highest Band edge	

100 kHz Bandwidth of Frequency Band Edge	
802.11g Lowest Band edge	
802.11g Highest Band edge	

100 kHz Bandwidth of Frequency Band Edge	
802.11n ht20 Lowest Band edge	
802.11n ht20 Highest Band edge	

100 kHz Bandwidth of Frequency Band Edge	
802.11n ht40 Lowest Band edge	
802.11n ht40 Highest Band edge	

4.7 Duty Cycle:

Serial Number:	1O7R	Test Date:	2023/2/24
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	N/A

Environmental Conditions:					
Temperature: (℃)	24.8	Relative Humidity: (%)	57	ATM Pressure: (kPa)	101.9

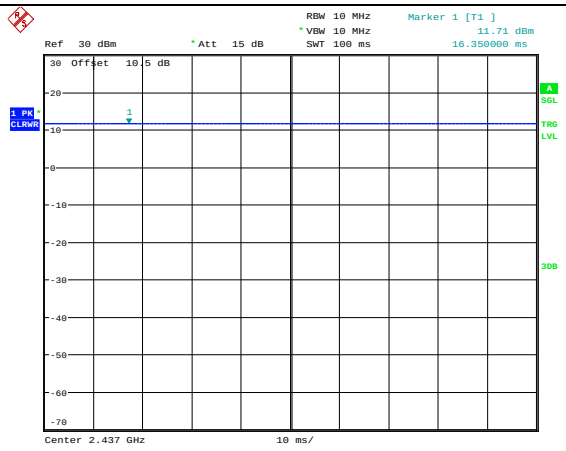
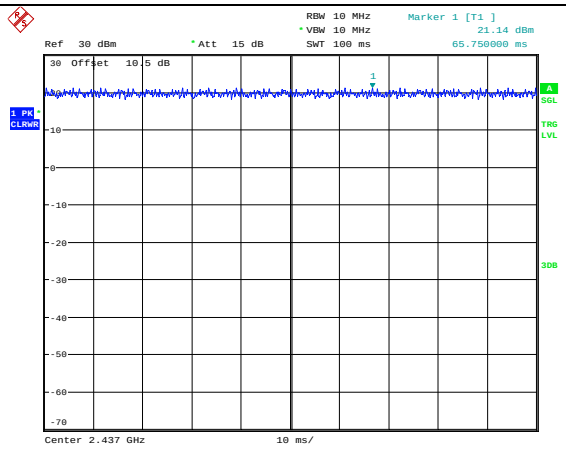
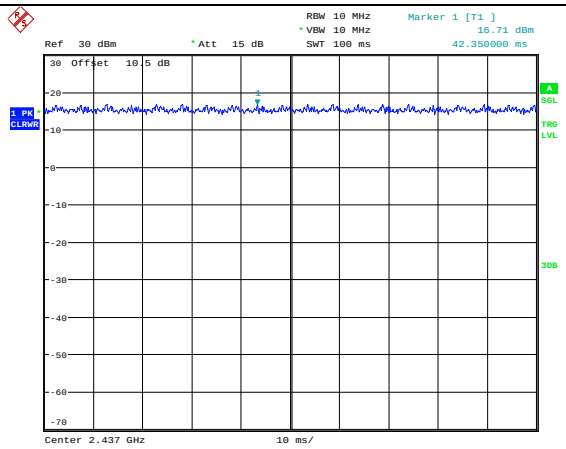
Test Equipment List and Details:

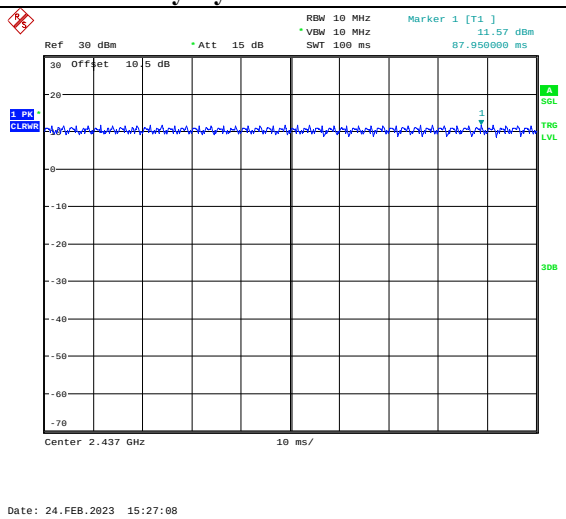
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022-07-15	2023-07-14
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Modes	Ton (ms)	Ton+off (ms)	Duty cycle (%)
802.11b	100	100	100.00
802.11g	100	100	100.00
802.11n ht20	100	100	100.00
802.11n ht40	100	100	100.00

Duty Cycle	
802.11b	
802.11g	
802.11n ht20	

Duty Cycle	
802.11n ht40	

5. RF EXPOSURE EVALUATION

5.1 Applicable Standard

According to §1.1307(b)(3)(i)

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\,cm}(d/20\,\text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\,cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\,cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the separation distance (cm);

According to KDB 447498 D04 Interim General RF Exposure Guidance v01:

2.2.2 Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions

This case is described in detail in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of Formula (1) is satisfied.

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \sum_{j=1}^{b}\frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c}\frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

5.2 Measurement Result

Operation Modes	Frequency (MHz)	Distance (mm)	P_{th}		Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Exemption
			(mW)	(dBm)					
WLAN 2.4G	2412-2462	200	3060	**34.86**	16	5.59	19.44	87.9	Compliant
WLAN 5.2G	5150-5250	200	3060	**34.86**	19	5.55	22.4	173.78	Compliant
WLAN 5.8G	5725-5850	200	3060	**34.86**	23	5.12	25.97	395.37	Compliant

Note: Maximum Conducted Power including Tune-up Tolerance(dBm) was declared by customer.

WLAN 2.4G and 5G can transmit simultaneously:

$$\sum_{i=1}^{a}\left(\frac{P_i}{P_{th\_i}}\right)+\sum_{j=1}^{b}\left(\frac{ERP_j}{ERP_{th\_j}}\right)+\sum_{k=1}^{c}\left(\frac{Evaluated_k}{Exposure\ Limit_k}\right)$$

= $EPR_{-2.4G}/P_{th-2.4G}+EPR_{-5G}/P_{th-5G}$
=87.9/3060+395.37/3060
=0.16
Result: The device compliant the Exemption at 20cm distances.

===== END OF REPORT =====