中认信通
CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)

ACCREDITED
TESTING LABORATORY
CERTIFICATE # 6356.01

TEST REPORT

Applicant: **Shen Zhen HEQ Intelligent Technology Co.,Ltd**

Address: Room707, Building 1, 1970 Science Park, Minzhi Street, Longhua District, Shenzhen, China

FCC ID: **2AZ3T-VOY**
IC: **27321-VOY**
HVIN: **Swan Voyager**
Product Name: **Swan Voyager**

Standard(s): **47 CFR Part 15, Subpart E(15.407)**
RSS-247 Issue 2, February 2017
RSS-Gen, Issue 5, February 2021 Amendment 2
ANSI C63.10-2013
KDB 789033 D02 General U-NII Test Procedures New Rules v02r01

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

Report Number: **CR221264712-00B**

Date Of Issue: **2023/3/22**

Reviewed By: **Sun Zhong**

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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.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR221264712-00B	Original Report	2023/3/22

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Swan Voyager
EUT Model:	Swan Voyager
Operation Frequency:	5745-5825 MHz (802.11a/n ht20) 5755-5795 MHz(802.11n ht40)
Maximum Average Output Power (Conducted):	20.05dBm
Modulation Type:	802.11a/n:OFDM-BPSK, QPSK, 16QAM, 64QAM
Rated Input Voltage:	15.2 Vdc from battery
Serial Number:	1X70-1
EUT Received Date:	2023/1/11
EUT Received Status:	Good

1.1.2 Operation Frequency Detail:

For 802.11a/n ht20:

Channel	Frequency (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825
Per section 15.31(m)/RSS-Gen, the below frequencies were performed the test as below:	
149	5745
157	5785
165	5825

For 802.11n ht40:

Channel	Frequency (MHz)
151	5755
159	5795
Per section 15.31(m)/RSS-Gen, the below frequencies were performed the test as below:	
151	5755
159	5795

1.1.3 AntennaInformationDetail▲:

Antenna Manufacturer	Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain
Shenzhen HEQ intelligent technology co., LTD	Dipole	50	5150-5850	4.91dBi

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.

1.1.4 Accessory Information:

Accessory Description	Manufacturer	Model
/	/	/

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:	artgui.exe

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

Test Modes	Test Channels	Test Frequency (MHz)	Data rate	Power Level Setting (Chain 0 & 1)
802.11a	Lowest	5745	6Mbps	31.5
	Middle	5785	6Mbps	31.5
	Highest	5825	6Mbps	31.5
802.11n ht20	Lowest	5745	MCS8	31.5
	Middle	5785	MCS8	31.5
	Highest	5825	MCS8	31.5
802.11n ht40	Lowest	5755	MCS8	31.5
	Highest	5795	MCS8	31.5

Note:
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.

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

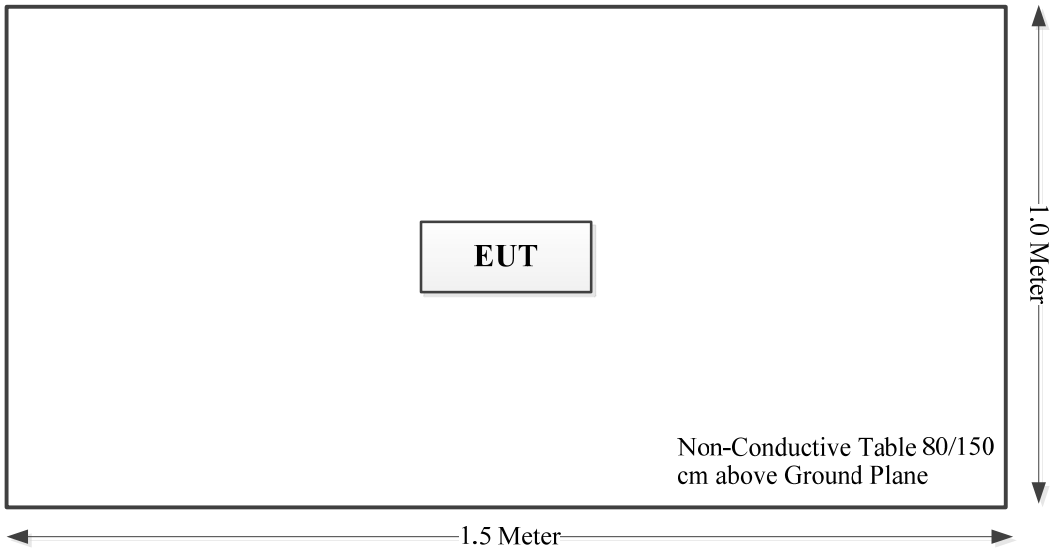
Manufacturer	Description	Model	Serial Number
/	/	/	/

1.2.3 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

1.2.4Block Diagram of Test Setup

Unwanted Emission:



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) RSS-Gen Clause 8.8	AC line conducted emissions	Not Applicable
FCC§15.205& §15.209 &§15.407(b) RSS-247 Clause 6.2	Undesirable Emission& Restricted Bands	Compliant
RSS-247 Clause 6.2.1.2	26dB attenuated below the channel power	Not Applicable
FCC§15.407(a) (e) RSS-247 Clause 6.2 RSS-Gen Clause 6.7	Emission Bandwidth	Compliant
FCC§15.407(a) RSS-247 Clause 6.2	Maximum Conducted Output Power	Compliant
FCC§15.407 (a) RSS-247 Clause 6.2	Power Spectral Density	Compliant
§15.203 RSS-Gen Clause 6.8	Antenna Requirement	Compliant
RSS-247 Clause 6.4	Additional requirements	Compliant
§1.1307 & §2.1091	RF Exposure Evaluation	Compliant
RSS-102 Clause 2.5.2	Exemption Limits For Routine Evaluation-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 thepublic utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency orfrequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohmsline impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement ofthe radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundarybetween 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 onfrequencies 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 bereceived 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 50µH/50 ohmsLISN.

(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 batterypower for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the ACpower lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, ACadapters or battery eliminators or that connect to the AC power lines indirectly, obtainig their power through another device which isconnected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

RSS-Gen Clause 8.8

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.
For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the

boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

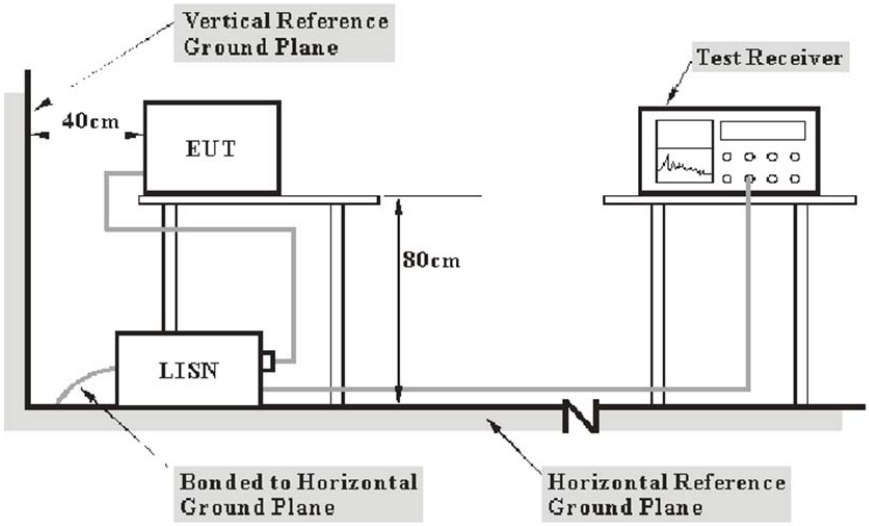
Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

3.1.2EUT 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,RSS-Genlimits.

The spacing between the peripherals was 10cm.

Theadapter or EUT was connected to the main LISN with a 120 V/60 Hz ACpower source.

3.1.3EMI Test Receiver Setup

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

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

FrequencyRange	IF B/W
150 kHz – 30 MHz	9 kHz

3.1.4Test 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 orfrequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are morethan 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carriedout 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 noiselevel of the measuring instrument at representative frequencies should be reported. The specific conductorof the power-line cord for each of the reported emissions should be identified. Measure the six highestemissions with respect to the limit on each current-carrying conductor of each power cord associated withthe EUT (but not the power cords of associated or peripheral equipment that are part of the testconfiguration). Then, report the six highest emissions with respect to the limit from among all themeasurements identifying the frequency and specific current-carrying conductor identified with theemission. The six highest emissions should be reported for each of the current-carrying conductors, or thesix highest emissions may be reported over all the current-carrying conductors.

3.1.5Corrected 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 §15.407 (b);

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz.
(4) For transmitters operating solely in the 5.725-5.850 GHz band:
(i) All emissions shall be limited to a level of –27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
(8) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(9) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.
(10) The provisions of § 15.205 apply to intentional radiators operating under this section.
(11) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.
(c) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

RSS-247 Clause 6.2.1.2 Unwanted emission limits inFrequency band 5150-5250 MHz

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

RSS-247 Clause 6.2.2.2 Unwanted emission limits inFrequency band 5250-5350 MHz

Devices shall comply with the following:

a) All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or

b) All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text "for indoor use only."

RSS-247 Clause 6.2.3.2 Unwanted emission limits inFrequency band 5470-5600 MHz and 5650-5725 MHz

Emissions outside the band 5470-5600 MHz and 5650-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p. at 5850 MHz instead of 5725 MHz.

RSS-247 Clause 6.2.4.2 Unwanted emission limits inFrequency band 5725-5850 MHz

Devices operating in the band 5725-5850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.
Devices operating in the band 5725-5850 MHz with antenna gain of 10 dBi or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.
Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;

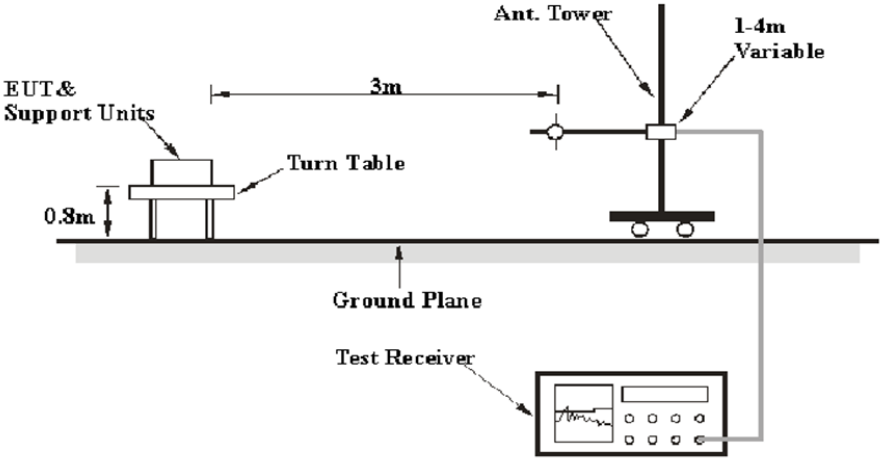
b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;

c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and

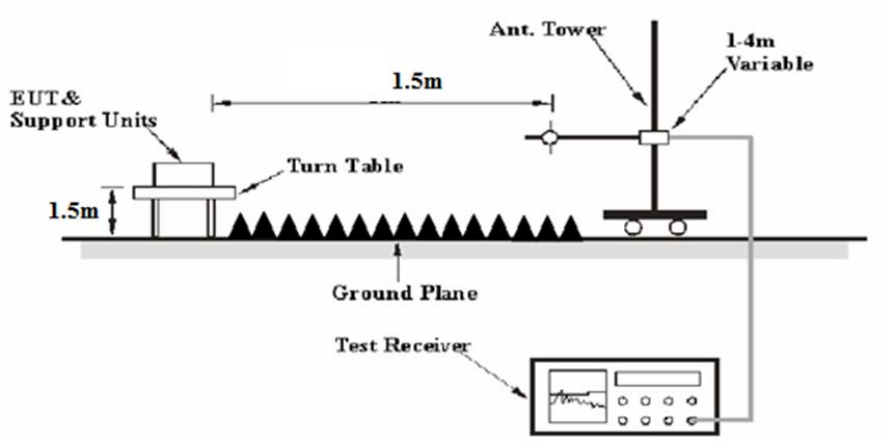
d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

3.2.2EUT Setup

Below 1GHz:



1-40 GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was FCC 15.209, FCC 15.407, RSS-247, RSS-Gen limits.

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

The spacing between the peripherals was 10cm.

3.2.3EMI Test Receiver & Spectrum Analyzer Setup

The system was investigatedfrom 30 MHz to 40 GHz.

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

30-1000MHz:

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

1GHz- 40GHz:

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 peakmeasured value complies with under theQP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

3.2.4Test Procedure

During the radiated emission test, the adapter was connected to the first AC floor outlet.

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

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: E [dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation Factor of 20dB/decade from 3m to 1.5m
Distance extrapolation Factor =20 log (specific distance [3m]/test distance [1.5m]) dB= 6.02 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

3.2.5Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Factor= Antenna Factor + Cable Loss-Amplifier Gain

For 30MHz-1GHz:
Result = Reading + Factor

For 1GHz-40GHz
Result = Reading + Factor-Distance extrapolation Factor

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

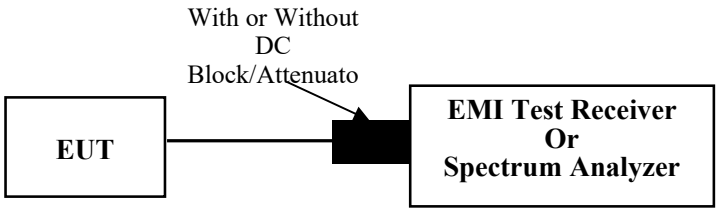
3.3 26dBattenuated below the channel power:

3.3.1 Applicable Standard

RSS-247 Clause 6.2.1.2

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

3.3.2 EUT Setup



3.3.3 Test Procedure

a) Set RBW = 1%~5% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = peak.
d) Trace mode = max hold
e) Measure the emissionattenuated below the channel power

3.4Emission Bandwidth:

3.4.1 Applicable Standard

FCC §15.407 (a),(h)

(h)(2) Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

FCC §15.407 (e)

Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

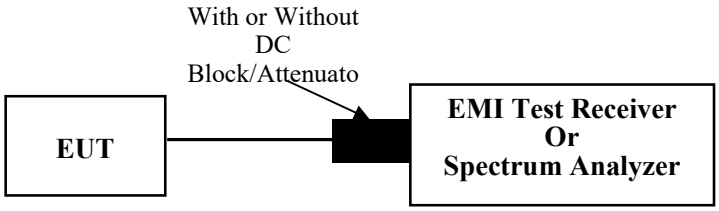
RSS-247 Clause 6.2.1.2

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

RSS-247 Clause 6.2.4.1

For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.4.2 EUT Setup



3.4.3Test Procedure

26dB Emission Bandwidth:

According to ANSI C63.10-2013 Section 12.4.1

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = peak.
d) Trace mode = max hold
e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurementas needed until the RBW/EBW ratio is approximately 1%.

99% Occupied Bandwidth:

According to ANSI C63.10-2013 Section 12.4.2&6.9.3

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upperfrequency 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. Thefrequency 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 theapplicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding themaximum input mixer level for linear operation. In general, the peak of the spectral envelopeshall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is givenin 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 modeshall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall beused.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measuredbandwidth.
g) If the instrument does not have a 99% power bandwidth function, then the trace data points arerecovered 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 thetotal is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth isthe difference between these two frequencies.
h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrumentdisplay; the plot axes and the scale units per division shall be clearly labeled. Tabular data maybe reported in addition to the plot(s).

6 dB emission bandwidth:

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

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.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

3.5Maximum Conducted Output Power:

3.5.1 Applicable Standard

FCC §15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC §15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over thefrequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where Bis the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral densityshall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gaingreater than 6 dBi are used, both the maximum conducted output power and the maximum powerspectral density shall be reduced by the amount in dB that the directional gain of the antennaexceeds 6 dBi.

FCC §15.407(a)(3)(i)

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

RSS-247 Clause 6.2.1.1

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less stringent. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247 Clause 6.2.2.1

Devices, other than devices installed in vehicles, shall comply with the following:

a) The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;

b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RSS-247 Clause 6.2.3.1

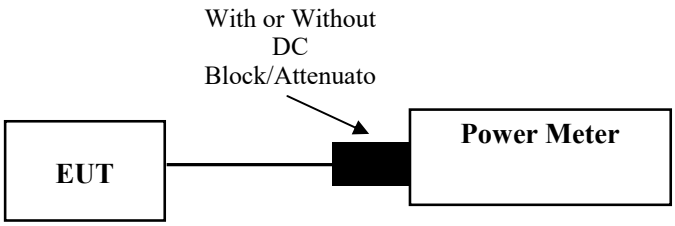
The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RSS-247 Clause 6.2.4.1

The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint3 systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

3.5.2 EUT Setup



3.5.3Test Procedure

According to ANSI C63.10-2013 Section 12.3.3.1

Method PM-G is measurement using a gated RF average power meter.
Measurements may be performed using a wideband gated RF power meter provided that the gateparameters are adjusted such that the power is measured only when the EUT is transmitting at its maximumpower control level. Because the measurement is made only during the ON time of the transmitter, no dutycycle correction factor is required.

3.6Maximum power spectral density:

3.6.1 Applicable Standard

FCC §15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC §15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over thefrequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where Bis the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral densityshall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gaingreater than 6 dBi are used, both the maximum conducted output power and the maximum powerspectral density shall be reduced by the amount in dB that the directional gain of the antennaexceeds 6 dBi.

FCC §15.407(a)(3)(i)

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

RSS-247 Clause 6.2.1.1

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less stringent. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247 Clause 6.2.2.1

Devices, other than devices installed in vehicles, shall comply with the following:

a) The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;

b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RSS-247 Clause 6.2.3.1

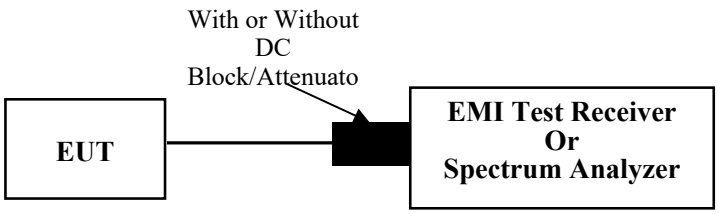
The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RSS-247 Clause 6.2.4.1

The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint3 systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

3.6.2 EUT Setup



3.6.3Test Procedure

According toKDB 789033 D02 General UNII Test Procedures New Rules v02r01

Method SA-3 (power averaging (rms) detection with max hold):
(i) Set span to encompass the entire EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set sweep trigger to “free run.”

(iii) Set RBW = 1 MHz.

(iv) Set VBW ≥ 3 MHz

(v) Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(vi) Sweep time ≤ (number of points in sweep) × *T*, where *T* is defined in II.B.1.a).
Note: If this results in a sweep time less than the auto sweep time of the analyzer, Method SA-3 Alternative shall not be used. (The purpose of this step is to ensure that averaging time in each bin is less than or equal to the minimum time of a transmission.)
(vii) Detector = power averaging (rms).

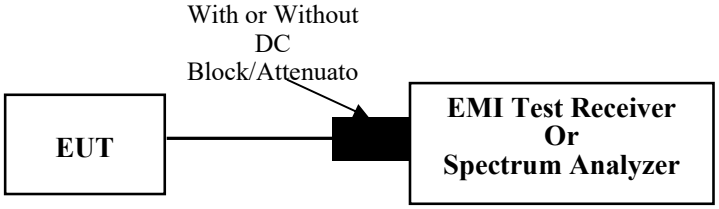
(viii) Trace mode = max hold.

(ix) Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used.

3.7 Duty Cycle:

3.7.1 EUT Setup



3.7.2Test Procedure

According to ANSI C63.10-2013 Section 12.2

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacingbetween bins on the sweep are sufficient to permit accurate measurements of the ON and OFFtimes 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, ifVBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring theduty cycle shall not be used if T ≤ 16.7 μs.)

3.8 Antenna Requirement

3.8.1 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 usedwith the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiatorshall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a brokenantenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirementdoes 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 perimeterprotection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must bemeasured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that thelimits in this part are not exceeded.

RSS-GEN Clause 6.8

The applicant for equipment certification shall provide a list of all antenna types that may be usedwith the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximumpermissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.
The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.
For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:
This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

3.8.2 Judgment

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

3.9 Additional requirement

3.9.1 Applicable Standard

According to RSS-247 Clause 6.4 Additional requirement

The following requirements shall apply:

a) The device shall automatically discontinue transmission in cases of absence of information to transmit, or operational failure. A description on how this is done shall accompany the application for equipment certification. Note that this is not intended to prohibit transmission of control or signalling information or the use of repetitive codes where required by the technology.

b) All LE-LAN devices must contain security features to protect against modification of software by unauthorized parties.

Manufacturers must implement security features in any digitally modulated devices capable of operating in any of the frequency ranges within the 5 GHz band, so that third parties are not able to reprogram the device to operate outside the parameters for which the device was certified. The software must prevent the user from operating the transmitter with operating frequencies, output power, modulation types or other radio frequency parameters outside those that were approved for the device. Manufacturers may use various means, including the use of a private network that allows only authenticated users to download software, electronic signatures in software or coding in hardware that is decoded by software to verify that new software can be legally loaded into a device to meet these requirements and must describe the methods in their application for equipment certification.

Manufacturers must take steps to ensure that DFS functionality cannot be disabled by the operator of the LE-LAN device.

c) The user manual for LE-LAN devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;[4]

ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;

iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and

iv. where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

3.9.2 Judgment

RSS-247 Clause 6.4 a):

The device shall automatically discontinue transmission in cases of absence of information to transmit, or operational failure.Please refer to the declaration

RSS-247 Clause 6.4 b):

The devices must contain security features to protect against modification of software by unauthorized parties. Please refer to the declaration

RSS-247 Clause 6.4 c):

i). The device not operates on 5150-5250MHz.

ii). The device not operates on 5250-5350 MHz and 5470-5725 MHz.

iii). Theantenna is not detachable, and all the EIPR compliance with RSS-247 requirement. Please refer to the conducted output power test result.

iv). Not Applicable.

4.TestDATA AND RESULTS

4.1 AC Line Conducted Emissions

Not Applicable, the device was powered by battery when operating.

4.2 Radiation Spurious Emissions

Serial Number:	1X70-1	Test Date:	2023/3/10~2023/3/21
Test Site:	966-2/966-1	Test Mode:	Transmitting
Tester:	Vic Du,cocoTian	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	22.2~26	Relative Humidity: (%)	51~52	ATM Pressure: (kPa)	100.9~101.8

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	5150-5850MHz	OE01902423	2022/08/07	2023/08/06
Mini Circuits	High Pass Filter	VHF-6010+	31119	2022/08/07	2023/08/06
PASTERNACK	Horn Antenna	PE9850/2F-20	072001	2021/02/05	2024/02/04

** 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).*

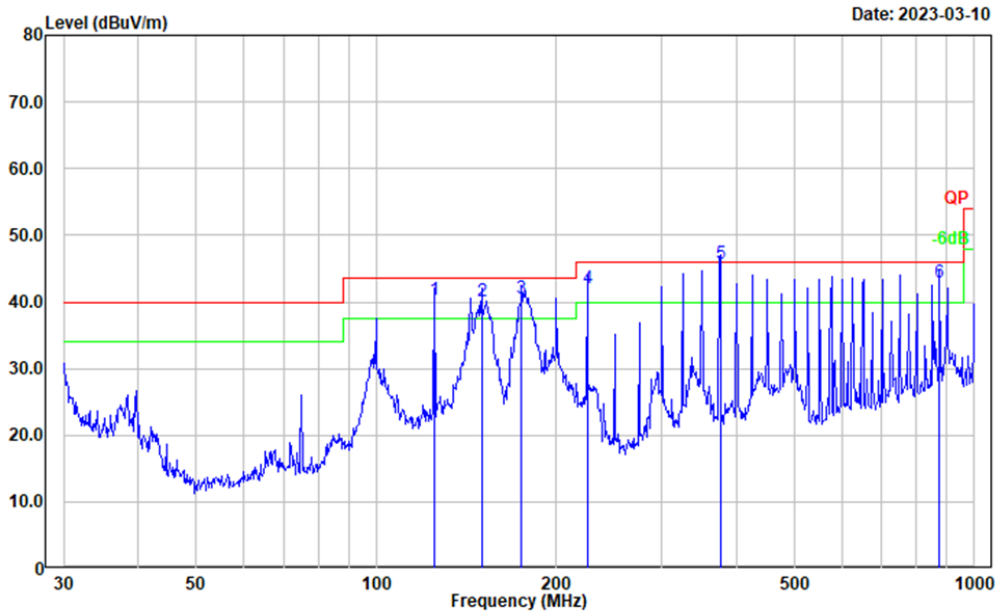
Test Data:

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.

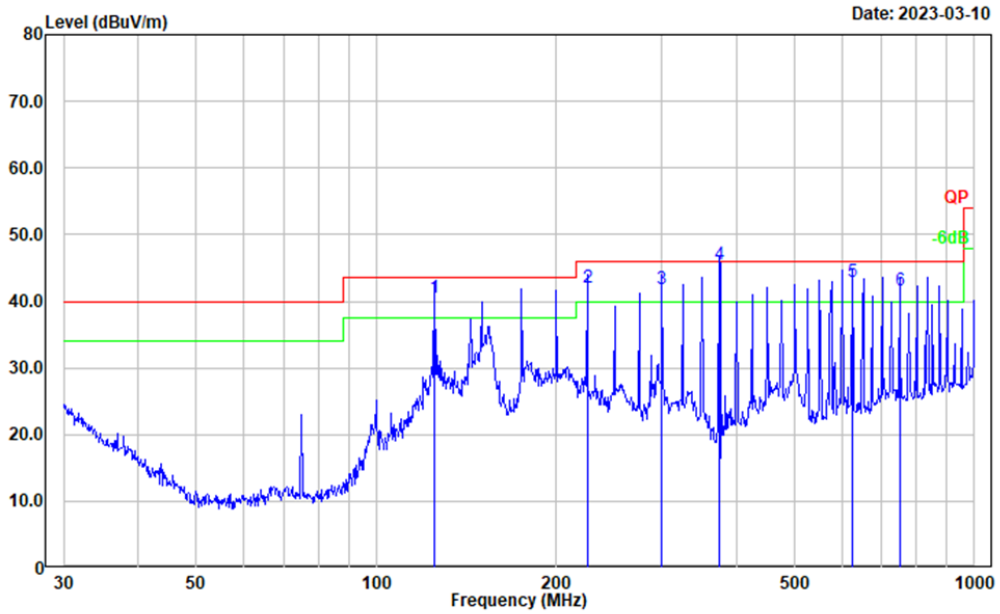
1) 30MHz-1GHz(Chain 0, 802.11a 5785MHz was the worst)

Test Mode: Transmitting
Polarization: vertical
Note:



No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	125.007	51.57	-11.31	40.26	43.50	3.24	QP
2	150.011	52.16	-12.00	40.16	43.50	3.34	QP
3	175.037	53.83	-13.29	40.54	43.50	2.96	QP
4	225.308	54.92	-12.87	42.05	46.00	3.95	QP
5	375.939	54.94	-9.29	45.65	46.00	0.35	QP
6	875.247	44.04	-1.18	42.86	46.00	3.14	QP

Test Mode: Transmitting
Polarization: horizontal
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	125.007	51.92	-11.31	40.61	43.50	2.89	QP
2	225.308	54.93	-12.87	42.06	46.00	3.94	QP
3	300.367	52.53	-10.63	41.90	46.00	4.10	QP
4	374.623	54.92	-9.34	45.58	46.00	0.42	QP
5	625.078	47.57	-4.60	42.97	46.00	3.03	QP
6	750.108	44.65	-3.00	41.65	46.00	4.35	QP

2) 1GHz-40GHz:
5725-5850MHz
802.11a: Chain 0

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 5745 MHz							
5745.000	78.84	PK	H	39.46	112.28	N/A	N/A
5745.000	67.59	AV	H	39.46	101.03	N/A	N/A
5745.000	76.64	PK	V	39.46	110.08	N/A	N/A
5745.000	65.38	AV	V	39.46	98.82	N/A	N/A
5725.000	35.01	PK	H	39.48	68.47	122.20	53.73
5720.000	33.27	PK	H	39.49	66.74	110.80	44.06
5700.000	32.74	PK	H	39.51	66.23	105.20	38.97
5650.000	32.19	PK	H	39.49	65.66	68.20	2.54
11490.000	32.76	PK	H	20.67	47.41	74.00	26.59
11490.000	19.39	AV	H	20.67	34.04	54.00	19.96
17235.000	32.79	PK	H	26.76	53.53	68.20	14.67
Middle Channel: 5785 MHz							
5785.000	78.16	PK	H	39.44	111.58	N/A	N/A
5785.000	67.07	AV	H	39.44	100.49	N/A	N/A
5785.000	76.23	PK	V	39.44	109.65	N/A	N/A
5785.000	65.11	AV	V	39.44	98.53	N/A	N/A
11570.000	32.46	PK	H	20.83	47.27	74.00	26.73
11570.000	19.51	AV	H	20.83	34.32	54.00	19.68
17355.000	32.46	PK	H	27.74	54.18	68.20	14.02
High Channel: 5825 MHz							
5825.000	69.75	PK	H	39.46	103.19	N/A	N/A
5825.000	58.49	AV	H	39.46	91.93	N/A	N/A
5825.000	68.02	PK	V	39.46	101.46	N/A	N/A
5825.000	57.31	AV	V	39.46	90.75	N/A	N/A
5850.000	32.15	PK	H	39.49	65.62	122.20	56.58
5855.000	32.12	PK	H	39.51	65.61	110.80	45.19
5875.000	21.06	PK	H	39.60	54.64	105.20	50.56
5925.000	32.16	PK	H	39.68	65.82	68.20	2.38
11650.000	32.06	PK	H	21.07	47.11	74.00	26.89
11650.000	18.97	AV	H	21.07	34.02	54.00	19.98
17475.000	32.46	PK	H	28.61	55.05	68.20	13.15

802.11a: Chain 1

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector					
Low Channel: 5745 MHz							
5745.000	75.34	PK	H	39.46	108.78	N/A	N/A
5745.000	65.21	AV	H	39.46	98.65	N/A	N/A
5745.000	72.86	PK	V	39.46	106.30	N/A	N/A
5745.000	62.48	AV	V	39.46	95.92	N/A	N/A
5725.000	35.01	PK	H	39.48	68.47	122.20	53.73
5720.000	32.57	PK	H	39.49	66.04	110.80	44.76
5700.000	31.45	PK	H	39.51	64.94	105.20	40.26
5650.000	32.36	PK	H	39.49	65.83	68.20	2.37
11490.000	32.84	PK	H	20.67	47.49	74.00	26.51
11490.000	19.79	AV	H	20.67	34.44	54.00	19.56
17235.000	32.55	PK	H	26.76	53.29	68.20	14.91
Middle Channel: 5785 MHz							
5785.000	75.65	PK	H	39.44	109.07	N/A	N/A
5785.000	65.21	AV	H	39.44	98.63	N/A	N/A
5785.000	73.69	PK	V	39.44	107.11	N/A	N/A
5785.000	63.17	AV	V	39.44	96.59	N/A	N/A
11570.000	33.15	PK	H	20.83	47.96	74.00	26.04
11570.000	20.07	AV	H	20.83	34.88	54.00	19.12
17355.000	32.52	PK	H	27.74	54.24	68.20	13.96
High Channel: 5825 MHz							
5825.000	70.13	PK	H	39.46	103.57	N/A	N/A
5825.000	60.34	AV	H	39.46	93.78	N/A	N/A
5825.000	68.25	PK	V	39.46	101.69	N/A	N/A
5825.000	58.43	AV	V	39.46	91.87	N/A	N/A
5850.000	32.55	PK	H	39.49	66.02	122.20	56.18
5855.000	32.01	PK	H	39.51	65.50	110.80	45.30
5875.000	21.18	PK	H	39.60	54.76	105.20	50.44
5925.000	32.46	PK	H	39.68	66.12	68.20	2.08
11650.000	32.46	PK	H	21.07	47.51	74.00	26.49
11650.000	19.34	AV	H	21.07	34.39	54.00	19.61
17475.000	32.96	PK	H	28.61	55.55	68.20	12.65

802.11n ht20: 2TX is worst

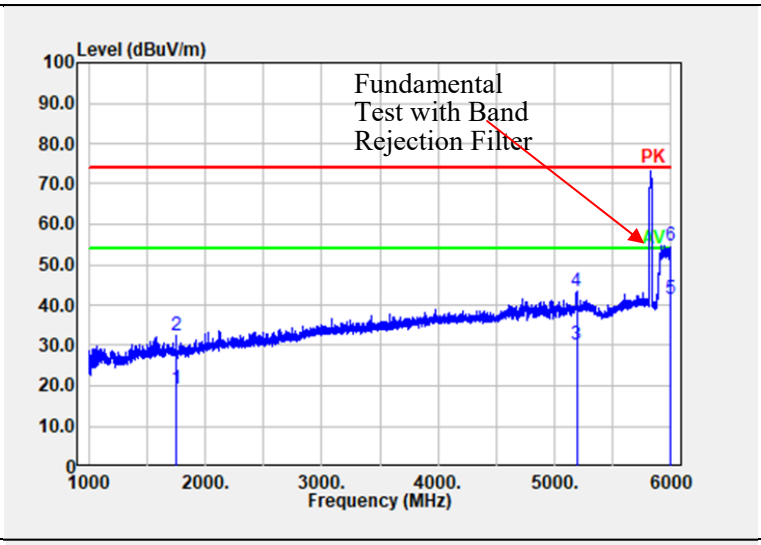
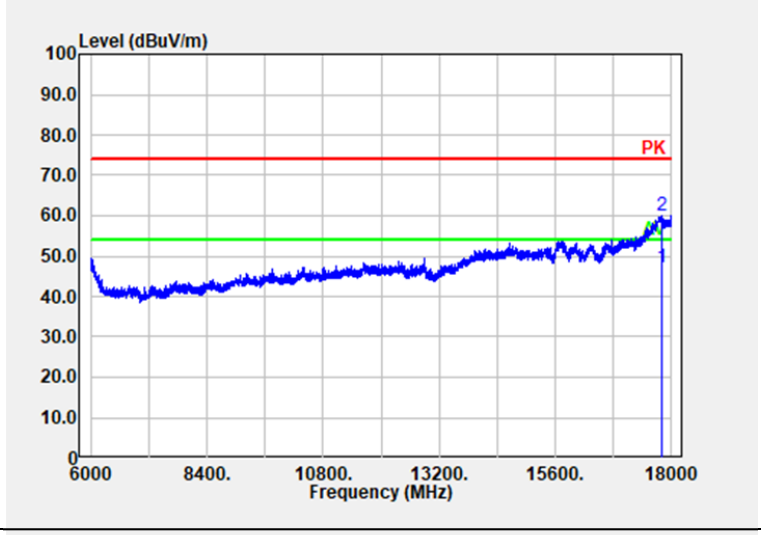
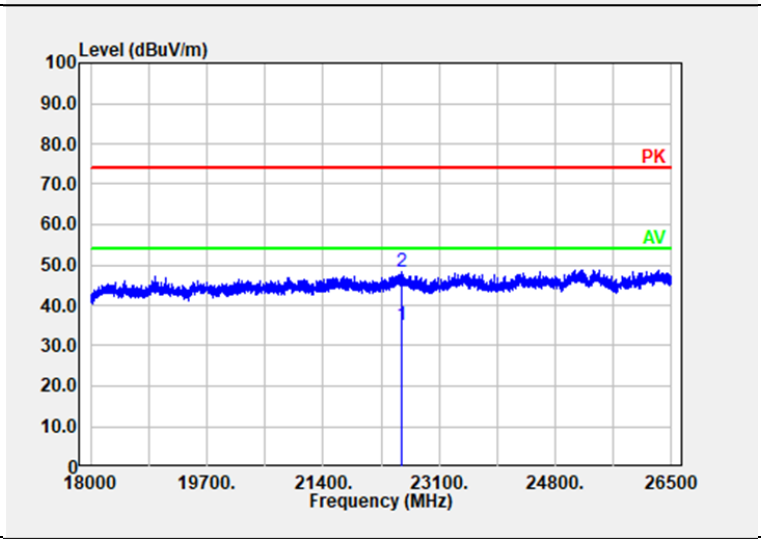
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector					
Low Channel: 5745 MHz							
5745.000	80.26	PK	H	39.46	113.70	N/A	N/A
5745.000	70.00	AV	H	39.46	103.44	N/A	N/A
5745.000	77.82	PK	V	39.46	111.26	N/A	N/A
5745.000	65.78	AV	V	39.46	99.22	N/A	N/A
5725.000	38.24	PK	H	39.48	71.70	122.20	50.50
5720.000	36.06	PK	H	39.49	69.53	110.80	41.27
5700.000	35.65	PK	H	39.51	69.14	105.20	36.06
5650.000	22.16	PK	H	39.49	55.63	68.20	12.57
11490.000	36.47	PK	H	20.67	51.12	74.00	22.88
11490.000	23.52	AV	H	20.67	38.17	54.00	15.83
17235.000	33.14	PK	H	26.76	53.88	68.20	14.32
Middle Channel: 5785 MHz							
5785.000	79.35	PK	H	39.44	112.77	N/A	N/A
5785.000	68.02	AV	H	39.44	101.44	N/A	N/A
5785.000	77.46	PK	V	39.44	110.88	N/A	N/A
5785.000	66.13	AV	V	39.44	99.55	N/A	N/A
11570.000	35.43	PK	H	20.83	50.24	74.00	23.76
11570.000	22.46	AV	H	20.83	37.27	54.00	16.73
17355.000	33.36	PK	H	27.74	55.08	68.20	13.12
High Channel: 5825 MHz							
5825.000	77.54	PK	H	39.46	110.98	N/A	N/A
5825.000	67.12	AV	H	39.46	100.56	N/A	N/A
5825.000	75.89	PK	V	39.46	109.33	N/A	N/A
5825.000	65.07	AV	V	39.46	98.51	N/A	N/A
5850.000	33.35	PK	H	39.49	66.82	122.20	55.38
5855.000	34.43	PK	H	39.51	67.92	110.80	42.88
5875.000	32.67	PK	H	39.60	66.25	105.20	38.95
5925.000	32.68	PK	H	39.68	66.34	68.20	1.86
11650.000	36.07	PK	H	21.07	51.12	74.00	22.88
11650.000	23.19	AV	H	21.07	38.24	54.00	15.76
17475.000	33.37	PK	H	28.61	55.96	68.20	12.24

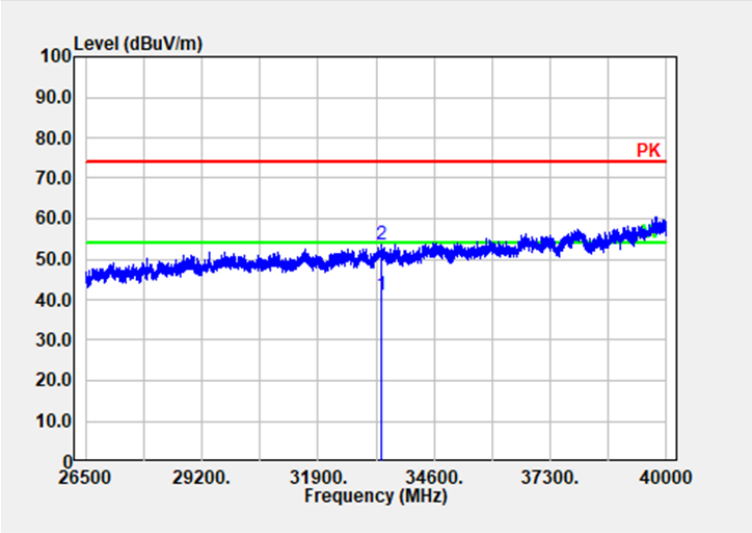
802.11n ht40: 2TX is worst

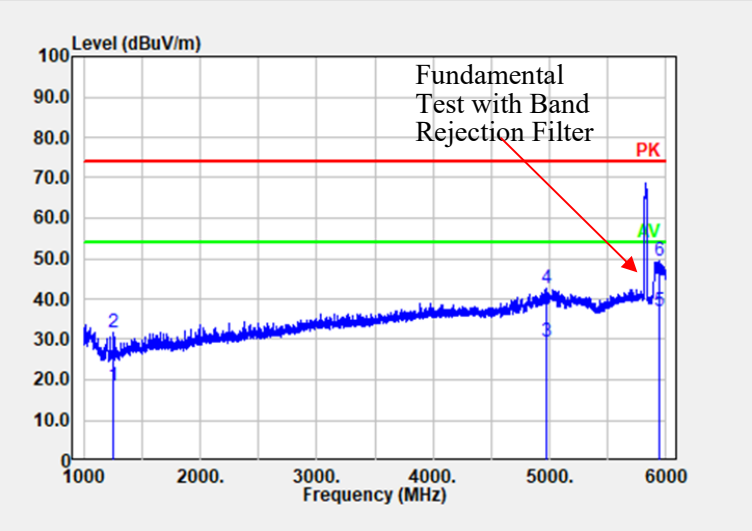
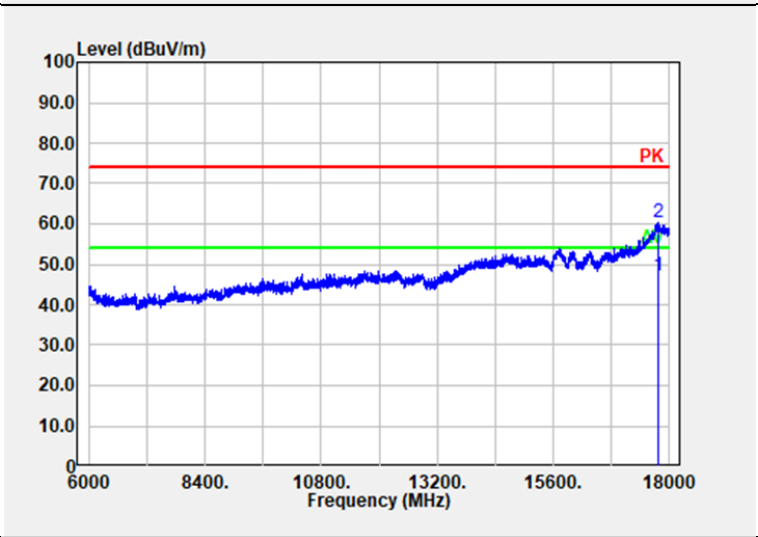
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector					
Low Channel: 5755 MHz							
5755.000	74.18	PK	H	39.45	107.61	N/A	N/A
5755.000	63.20	AV	H	39.45	96.63	N/A	N/A
5755.000	72.64	PK	V	39.45	106.07	N/A	N/A
5755.000	61.78	AV	V	39.45	95.21	N/A	N/A
5725.000	48.23	PK	H	39.48	81.69	122.20	40.51
5720.000	40.81	PK	H	39.49	74.28	110.80	36.52
5700.000	32.97	PK	H	39.51	66.46	105.20	38.74
5650.000	32.39	PK	H	39.49	65.86	68.20	2.34
11510.000	34.56	PK	H	20.67	49.21	74.00	24.79
11510.000	21.52	AV	H	20.67	36.17	54.00	17.83
17265.000	33.64	PK	H	26.94	54.56	68.20	13.64
High Channel: 5795 MHz							
5795.000	75.69	PK	H	39.43	109.10	N/A	N/A
5795.000	64.01	AV	H	39.43	97.42	N/A	N/A
5795.000	73.26	PK	V	39.43	106.67	N/A	N/A
5795.000	62.45	AV	V	39.43	95.86	N/A	N/A
5850.000	33.42	PK	H	39.49	66.89	122.20	55.31
5855.000	33.26	PK	H	39.51	66.75	110.80	44.05
5875.000	33.15	PK	H	39.60	66.73	105.20	38.47
5925.000	32.45	PK	H	39.68	66.11	68.20	2.09
11590.000	34.47	PK	H	20.88	49.33	74.00	24.67
11590.000	21.50	AV	H	20.88	36.36	54.00	17.64
17385.000	33.61	PK	H	28.07	55.66	68.20	12.54

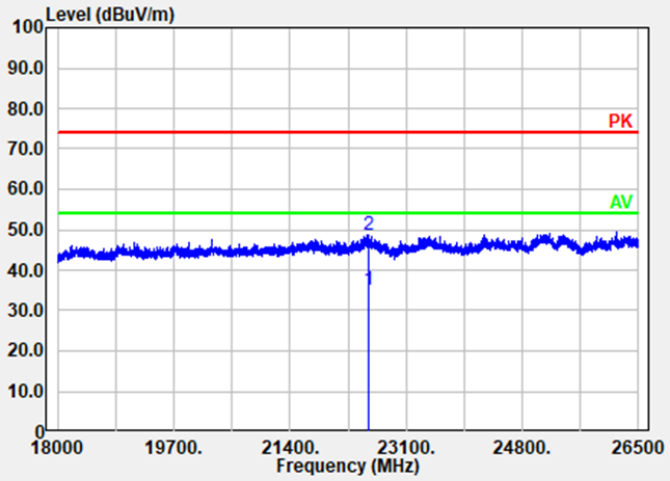
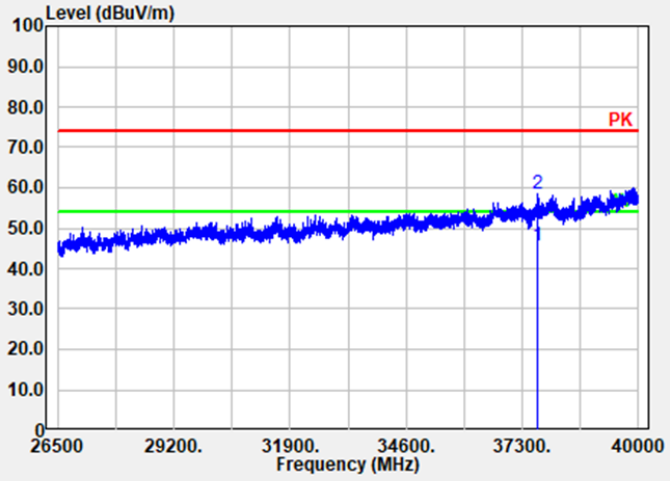
Note:
Result = Reading + Factor- Distance extrapolation Factor
Distance extrapolation Factor =20 log (specific distance [3m]/test distance [1.5m]) dB= 6.02 Db

Worst Test plots(802.11n ht20 5725MHz was the worst)

Horizontal		
1-6GHz		
6-18GHz		
18-26.5GHz		

26.5-40GHz			

Vertical			
1-6GHz			
6-18GHz			

18-26.5GHz			
26.5-40GHz			

4.3 26dBAttenuated Below The Channel Power:

Not Applicable, the device not operates on 5150-5250MHz.

4.4Emission Bandwidth:

Serial Number:	1X70-1	Test Date:	2023/3/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Arthur Su	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	22.5	Relative Humidity: (%)	47	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

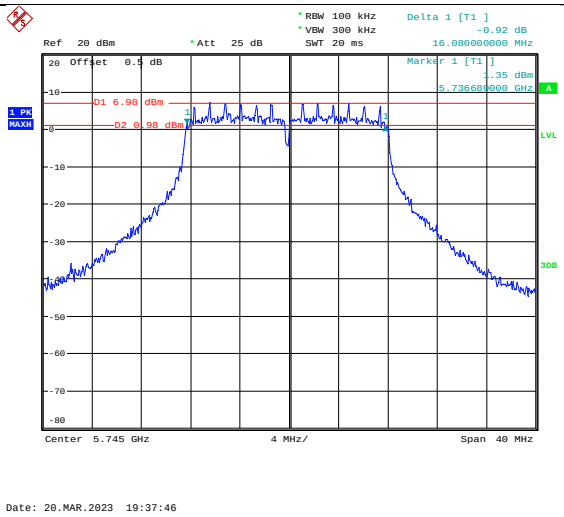
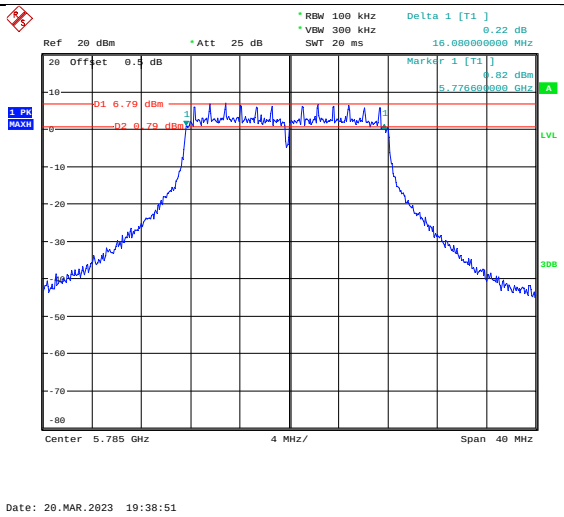
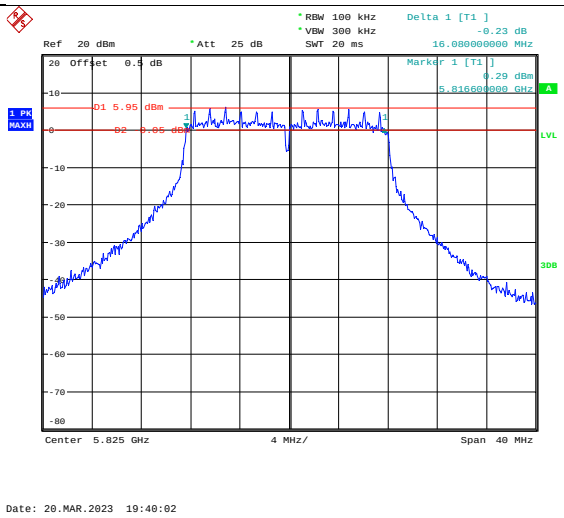
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2022/07/15	2023/07/14
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A

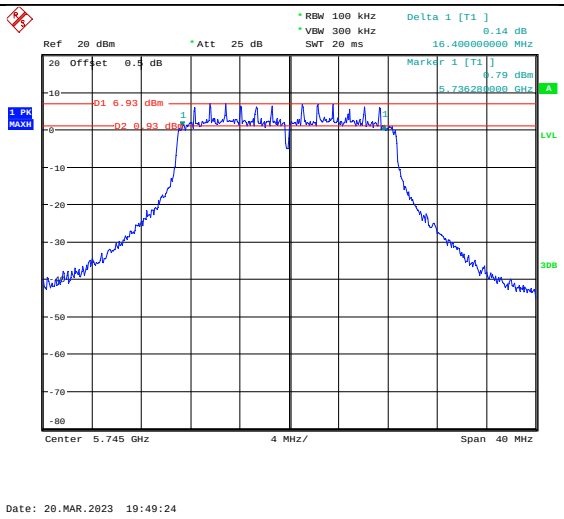
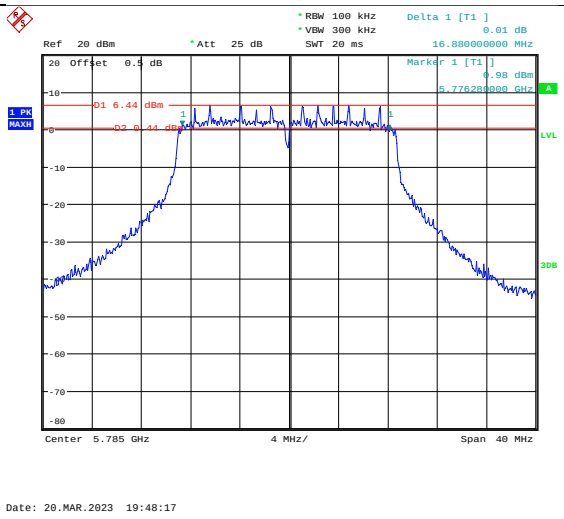
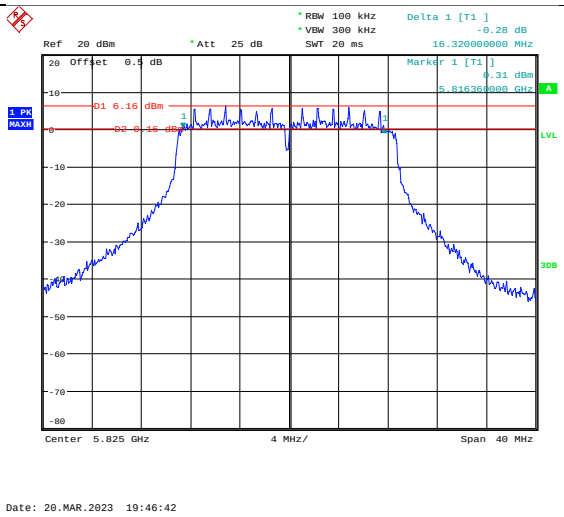
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

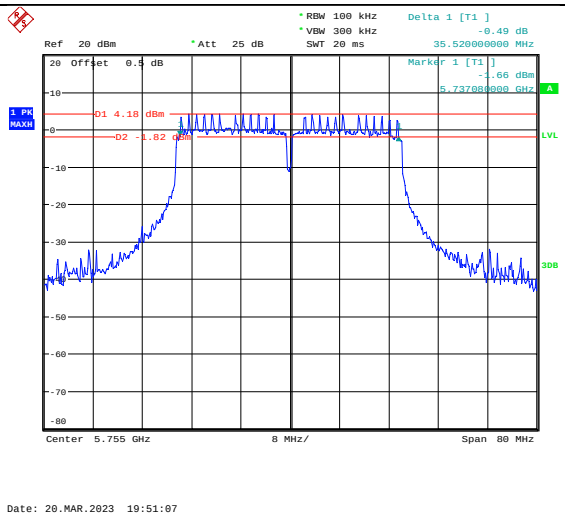
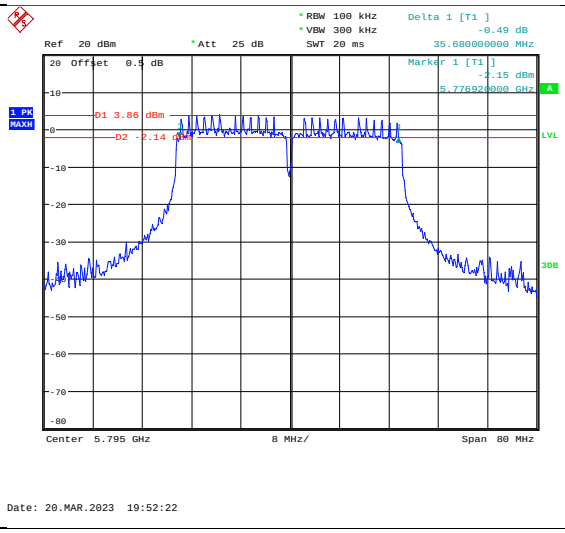
Test Data:

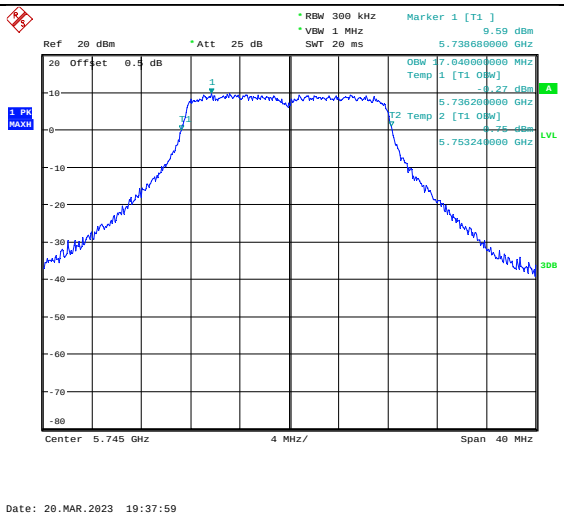
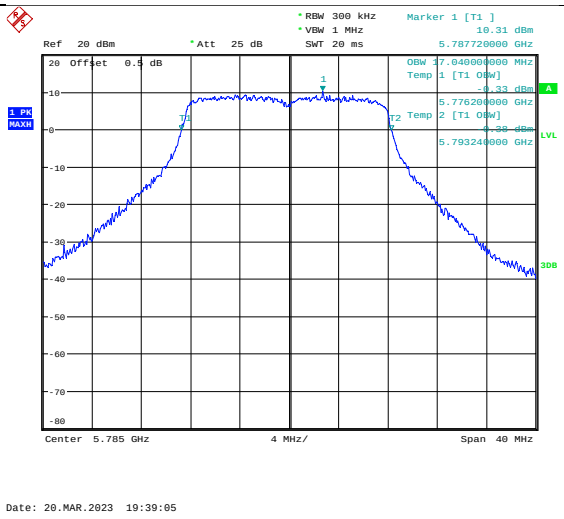
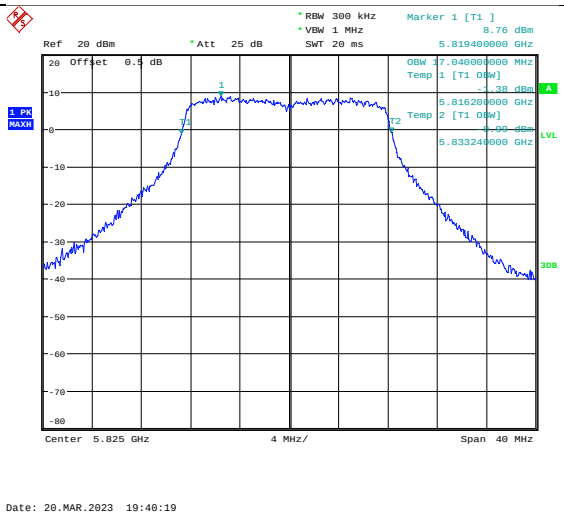
Test Modes	Test Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5745	16.08	17.04
	5785	16.08	17.04
	5825	16.08	17.04
802.11n ht20	5745	16.40	18.08
	5785	16.88	18.08
	5825	16.32	18.08
802.11n ht40	5755	35.52	36.96
	5795	35.68	36.96

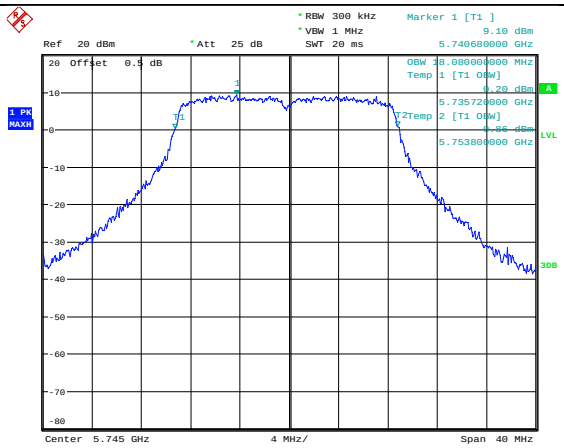
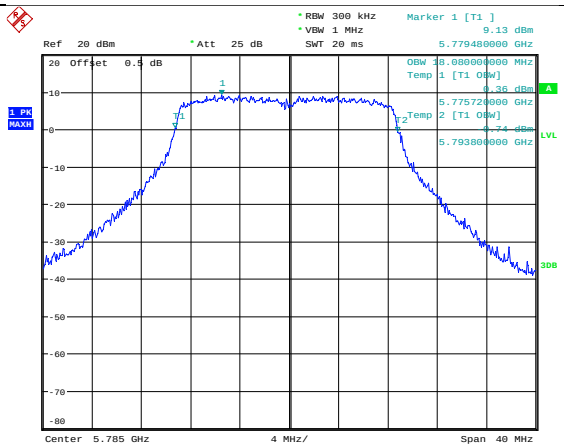
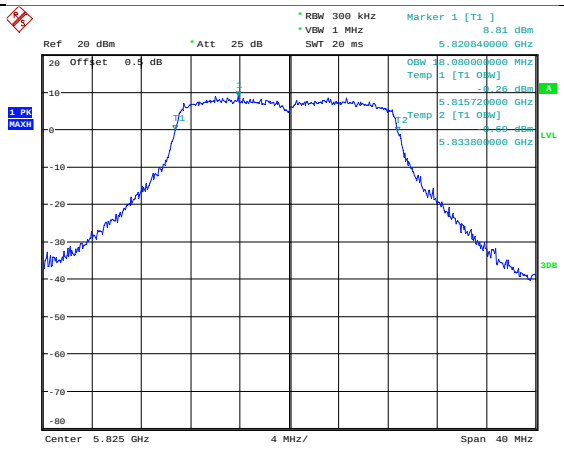
Note 1:
6dB Emission Bandwidth Limit: ⩾0.5 MHz
The 99% Occupied Bandwidth have not fallen into the band 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.
Note 2: Chain 0 was recorded.

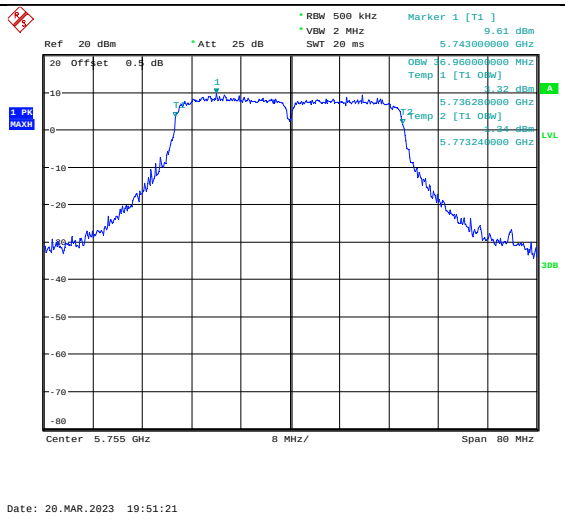
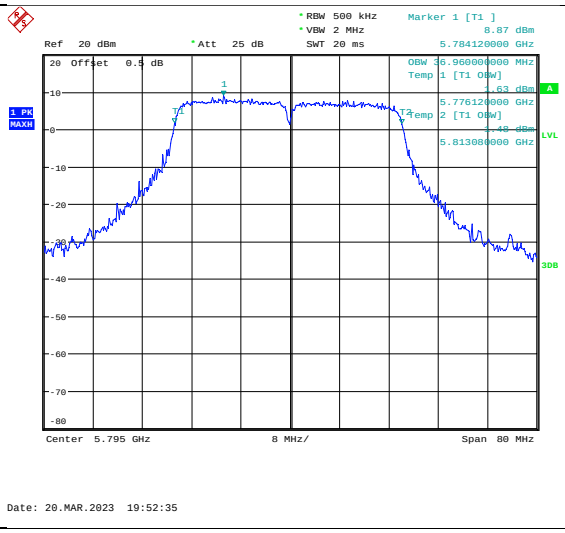
6dB Emission Bandwidth	
802.11a Lowest Channel	
802.11a Middle Channel	
802.11a Highest Channel	

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 Highest Channel	

99% Emission Bandwidth	
802.11a Lowest Channel	
802.11a Middle Channel	
802.11a Highest Channel	

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

99% Emission Bandwidth	
802.11n ht40 Lowest Channel	
802.11n ht40 Highest Channel	

4.5Maximum Conducted Output Power:

Serial Number:	1X70-1	Test Date:	2023/3/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Arthur Su	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	22.5	Relative Humidity: (%)	47	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211001	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)	Max. Conducted Average Output Power(dBm)			
		Chain 0	Chain 1	Total	Limit
802.11a	5745	17.11	16.38	/	30
	5785	16.8	16	/	30
	5825	15.92	15.03	/	30
802.11n ht20	5745	17.03	16.88	19.97	30
	5785	16.81	16.51	19.67	30
	5825	16.1	15.56	18.85	30
802.11n ht40	5755	17.25	16.81	20.05	30
	5795	16.66	16.41	19.55	30
Note: 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 $N_{ANT} \leqslant 4$					
Antenna Gain:	4.91	dBi	Directional gain:	4.91	dBi

4.6Maximum power spectral density:

Serial Number:	1X70-1	Test Date:	2023/3/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Arthur Su	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	22.5	Relative Humidity: (%)	47	ATM Pressure: (kPa)	100.6

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	211001	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:

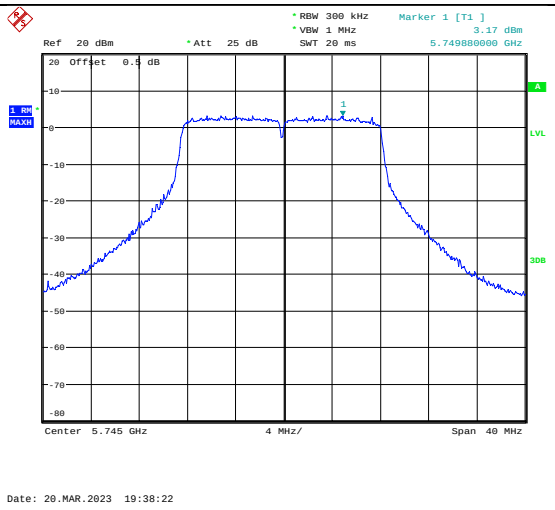
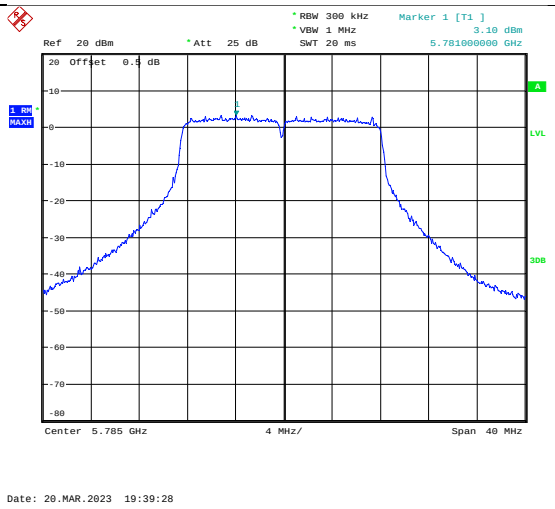
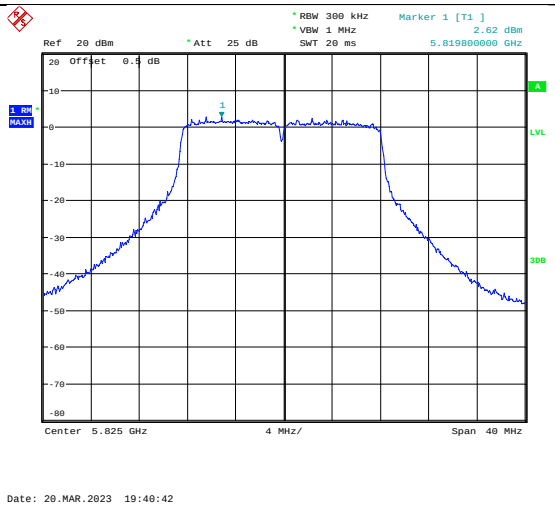
Test Modes	Test Frequency (MHz)	Reading (dBm/300kHz)		Maximum Power Spectral Density (dBm/500kHz)			
		Chain 0	Chain 1	Chain 0	Chain 1	Total	Limit
802.11a	5745	3.17	3.01	5.39	5.23	/	28.09
	5785	3.1	2.02	5.32	4.24	/	28.09
	5825	2.62	1.94	4.84	4.16	/	28.09
802.11n ht20	5745	4.02	3.98	6.24	6.2	9.23	28.09
	5785	3.83	3.58	6.05	5.8	8.94	28.09
	5825	2.91	2.55	5.13	4.77	7.96	28.09
802.11n ht40	5755	1.01	0.53	3.23	2.75	6.01	28.09
	5795	0.79	0.55	3.01	2.77	5.90	28.09

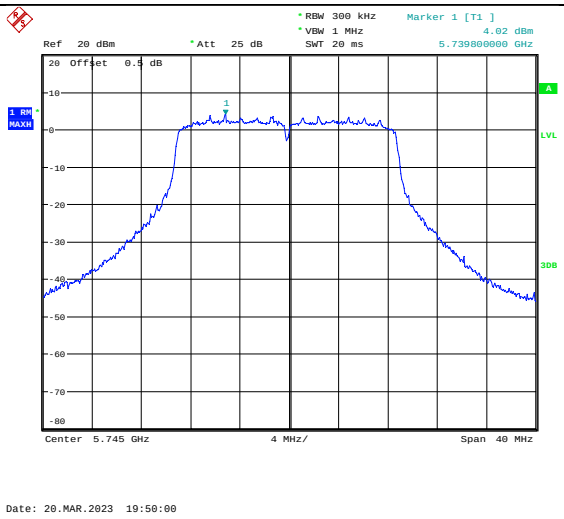
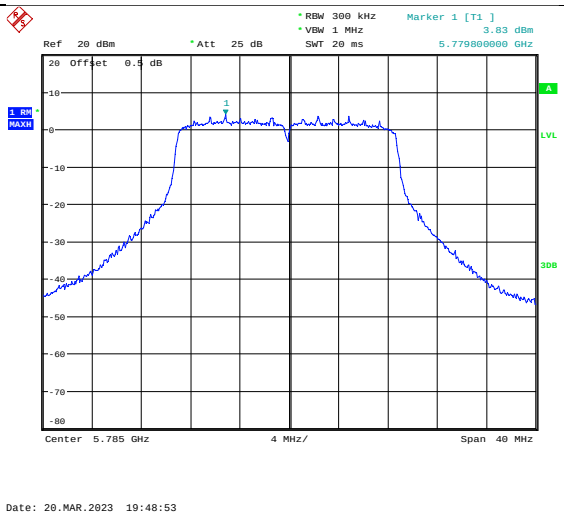
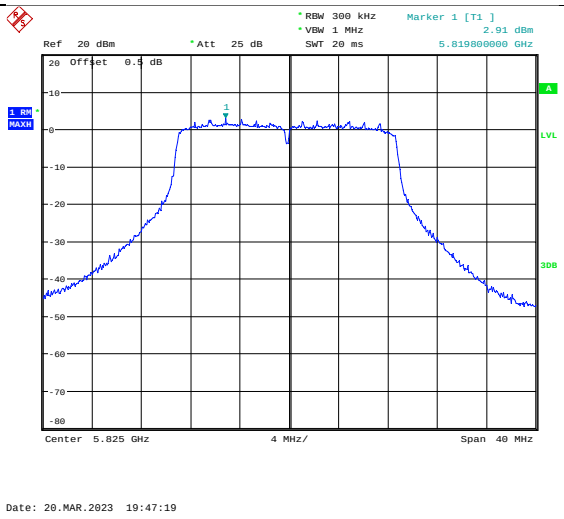
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:
Array Gain = 10 log(N_{ANT}/N_{SS}) dB
If measurement bandwidth of Maximum PSD is specified in 500kHz, add 10log(500kHz/RBW) to the measured result, Whereas RBW (＜500kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

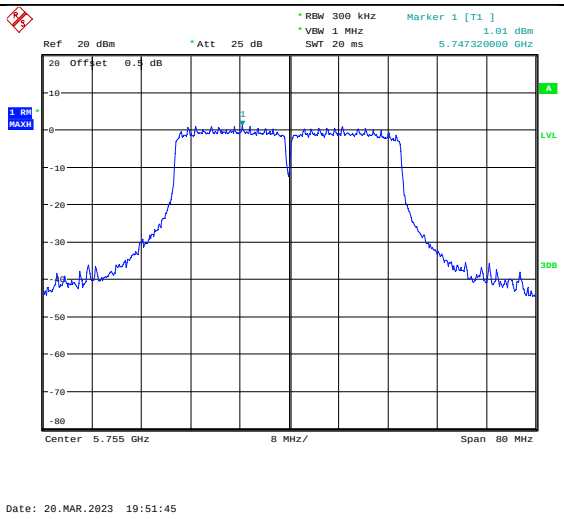
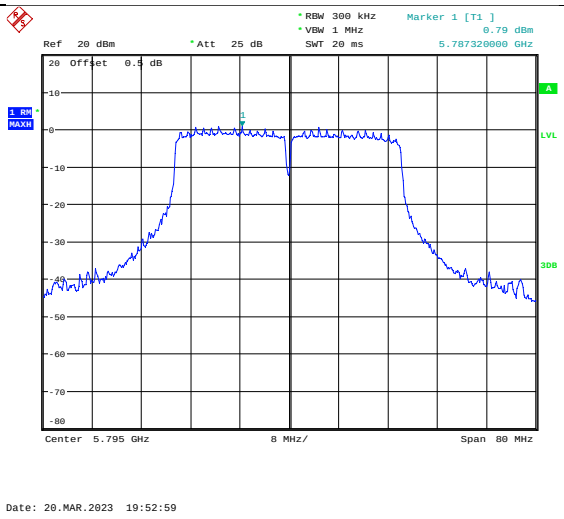
Antenna Gain:	4.91	dBi	Directional gain:	7.91	dBi

Note:
Method SA-3 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01was used for PSD test.

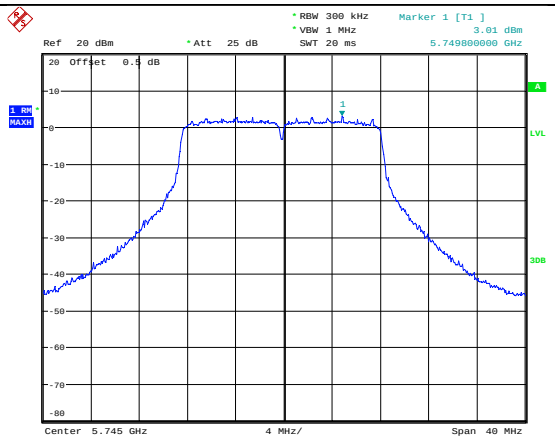
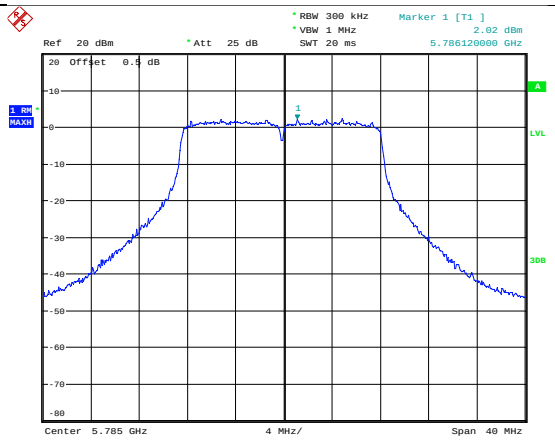
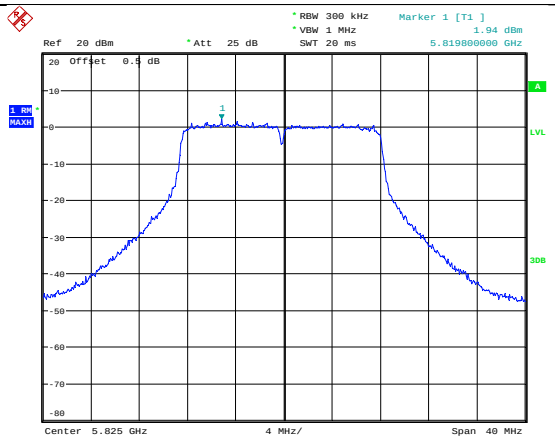
Chain 0:

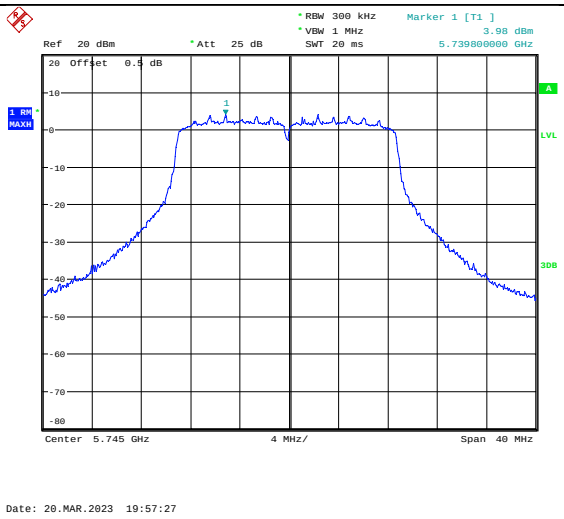
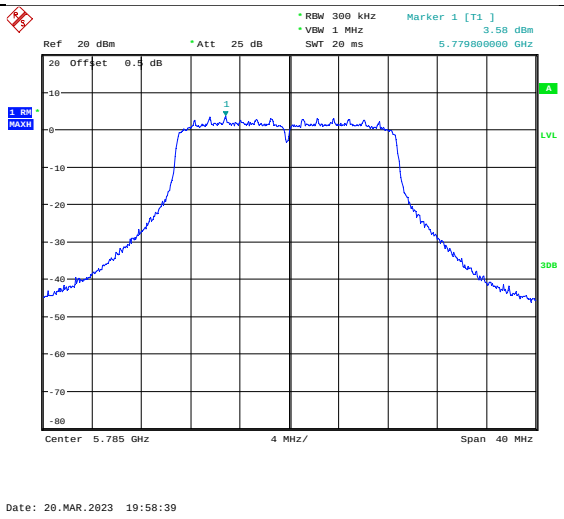
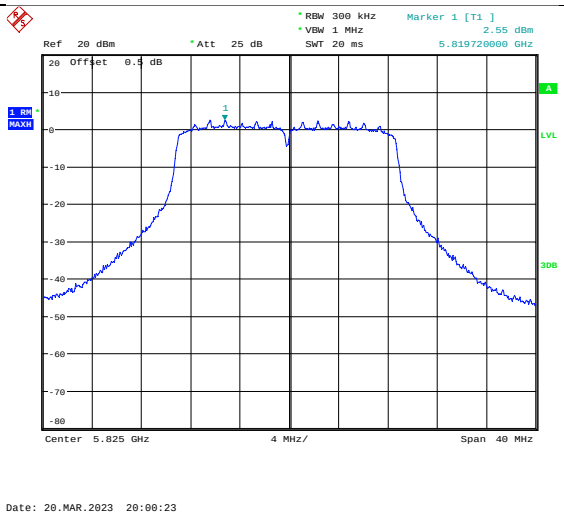
Maximum power spectral density	
802.11a Lowest Channel	
802.11a Middle Channel	
802.11a Highest Channel	

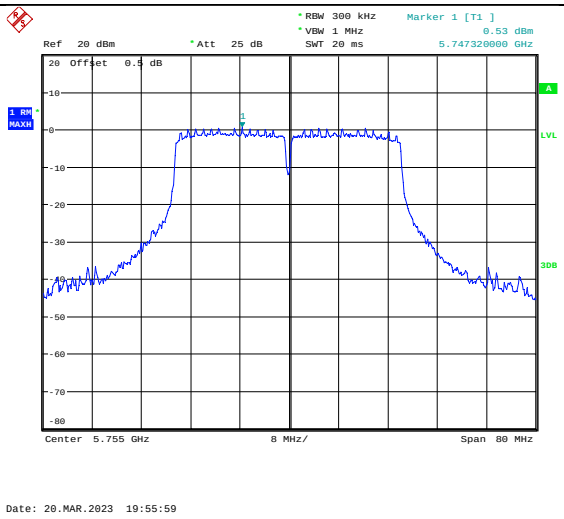
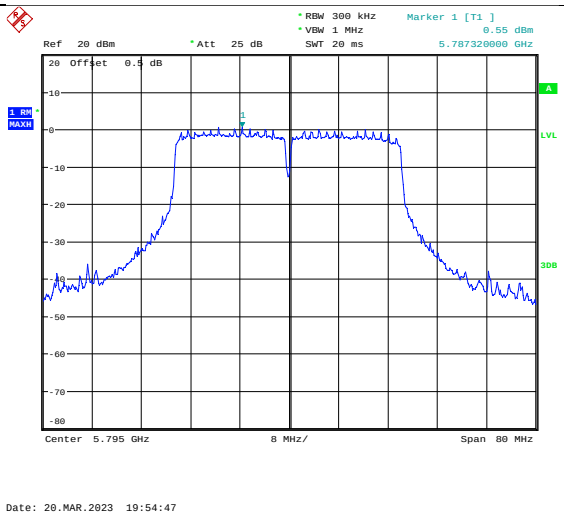
Maximum power spectral density	
802.11n ht20 Lowest Channel	
802.11n ht20 Middle Channel	
802.11n ht20 Highest Channel	

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

Chain 1:

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

4.6Duty Cycle:

Serial Number:	1X70-1	Test Date:	2023/3/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Arthur Su	Test Result:	N/A

Environmental Conditions:					
Temperature: (℃)	22.5	Relative Humidity: (%)	47	ATM Pressure: (kPa)	100.6

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	211001	Each time	N/A

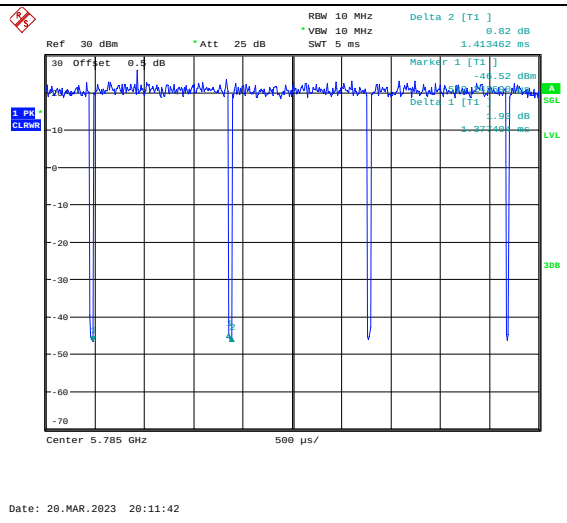
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

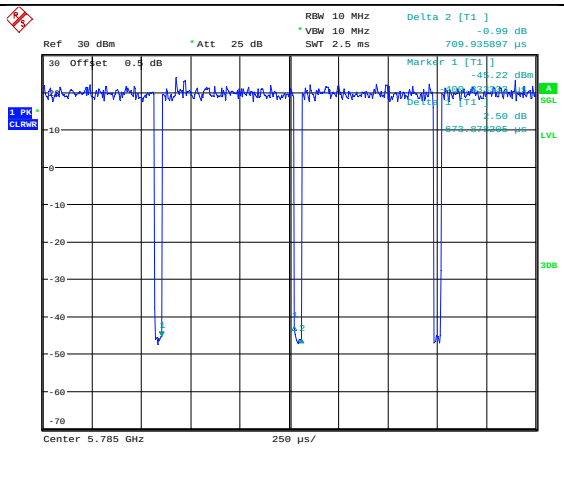
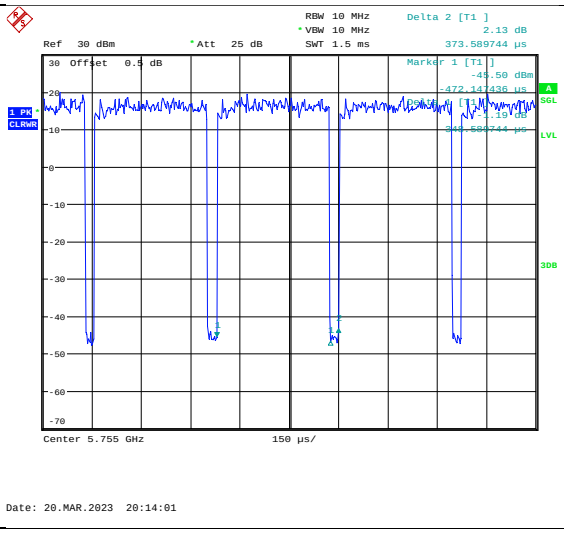
Test Data:

Test Modes	Ton (ms)	Ton+off (ms)	Duty cycle (%)	1/T (Hz)	Duty cycle Factor (dB)
802.11a	1.377	1.413	97.45	726	0.11
802.11n ht20	0.674	0.71	94.93	1484	0.23
802.11n ht40	0.349	0.374	93.32	2865	0.30
Note 1: Chain 0 was recorded.					

Duty Cycle

802.11a



Duty Cycle	
802.11n ht20	
802.11n ht40	

5. RF EXPOSURE EVALUATION

5.1 MPE-Based Exemption

5.1.1 Applicable Standard

According to §1.1307(b)(3)(i)

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

5.1.2 Measurement Result

Operation Modes	Frequency (MHz)	λ/2π (mm)	Distance (mm)	Exemption ERP		Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP (dBm)	MPE-Based Exemption
				(mW)	(dBm)				
WLAN 5.8G	5745-5825	8.31	200	768	28.85	21	4.91	23.76	Compliant

Note:
The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.

Result: The device compliant the MPE-BasedExemption at 20cm distances.

5.2Exemption Limits for Routine Evaluation – RF Exposure Evaluation

5.2.1 Applicable Standard

According to RSS-102 Clause 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHzand the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain	Conducted output power including Tune-upTolerance	EIRP		Exemption limits (mW)
		(dBi)	(dBm)	(dBm)	(mW)	
WLAN 5.8G	5745-5825	4.91	21	25.91	389.94	4857

So the device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

Result: Compliance

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