TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

RSS-GEN, ISSUE 5, AMENDMENT 1, MARCH 2019

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Chasing-Innovation Technology Co.,Ltd.

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FCC ID:2AMOD-CHASINGF1
IC:22933-CHASINGF1

Report Type:	**Product Name:**
Original Report	Fishfinder Drone

Report Number:	RDG200811002-00B
Report Date:	2020-09-16
Reviewed By:	Ivan Cao Assistant Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Fishfinder Drone
EUT Model:	CHASING F1
Operation Frequency:	5745-5825MHz(802.11a/n ht20) 5755-5795 MHz(802.11n ht40)
Maximum Output Power (Conducted):	12.70 dBm
Modulation Type:	OFDM
Rated Input Voltage:	DC10.8V from battery
Serial Number:	RDG200811002-RF-S2
EUT Received Date:	2020.08.14
EUT Received Status:	Good

Objective

This type approval report is prepared on behalf of ***Chasing-Innovation Technology Co.,Ltd.*** in accordance with Part 2-Subpart J, Part 15-Subparts A, and E of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, Amendment 1, March 2019 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart E, section 15.203, 15.205, 15.209 and 15.407 rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, Amendment 1, March 2019 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AMOD-CHASINGF1
RSS-247 DTSs submissions with IC: 22933-CHASINGF1

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB 789033 D02 General U-NII Test Procedures New Rules v02r01, and RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, Amendment 1, March 2019 of the Innovation, Science and Economic Development Canada.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

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: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions,conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: 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.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, 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. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL 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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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

The system only supports 802.11a/n ht20/n ht40 in 5.8 GHz band.

For 5725~5850MHz band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	159	5795
151	5755	161	5805
153	5765	165	5825
157	5785	/	/

For 802.11a, 802.11n ht20 Channel 149, 157 and 165 was tested, for 802.11n ht40 Channel 151, 159 were tested.

The worst-case data rates are determined to be as follows 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 in 802.11n modes, per pretest, 2TX mode was the worst mode and reported for 802.11n modes.

EUT Exercise Software

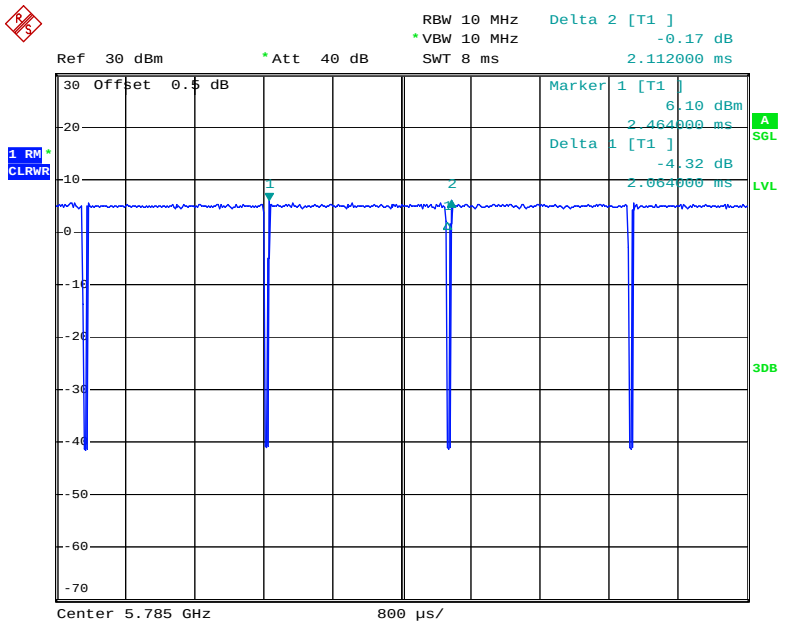
Software " ubuntu10.04 " was used during test, which was provided by manufacturer, the maximum power was configured as below:

Mode	Channel	Frequency (MHz)	Data rate	Power level Setting	
				Chain 0	Chain 1
802.11a	Low	5745	6Mbps	16	13
	Middle	5785	6Mbps	16	13
	High	5825	6Mbps	16	13
802.11n ht20	Low	5745	MCS8	15	15
	Middle	5785	MCS8	15	15
	High	5825	MCS8	15	15
802.11n ht40	Low	5755	MCS8	10	10
	High	5795	MCS8	10	10

The duty cycle as below:

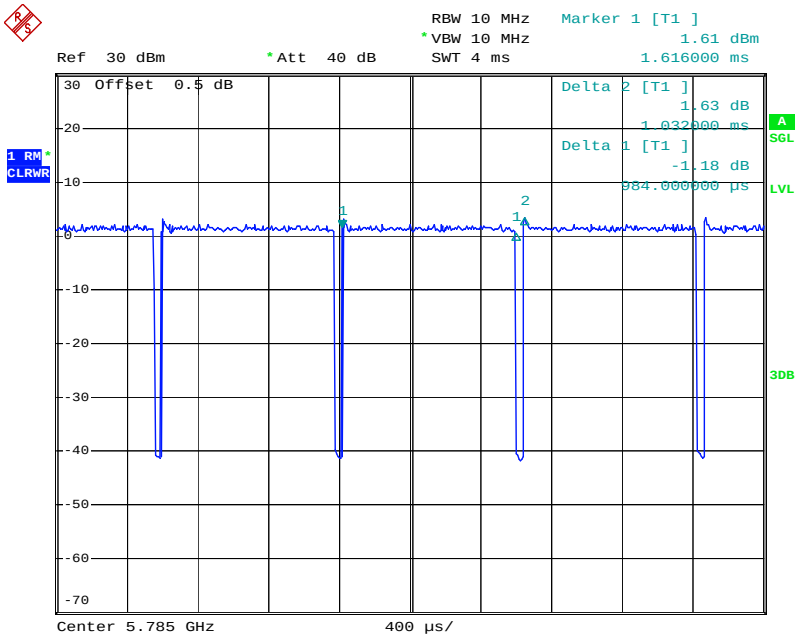
Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle(x) (%)
802.11 a	2.064	2.112	97.59
802.11n ht20	0.954	1.032	98.01
802.11n ht40	0.496	0.536	96.15

802.11a



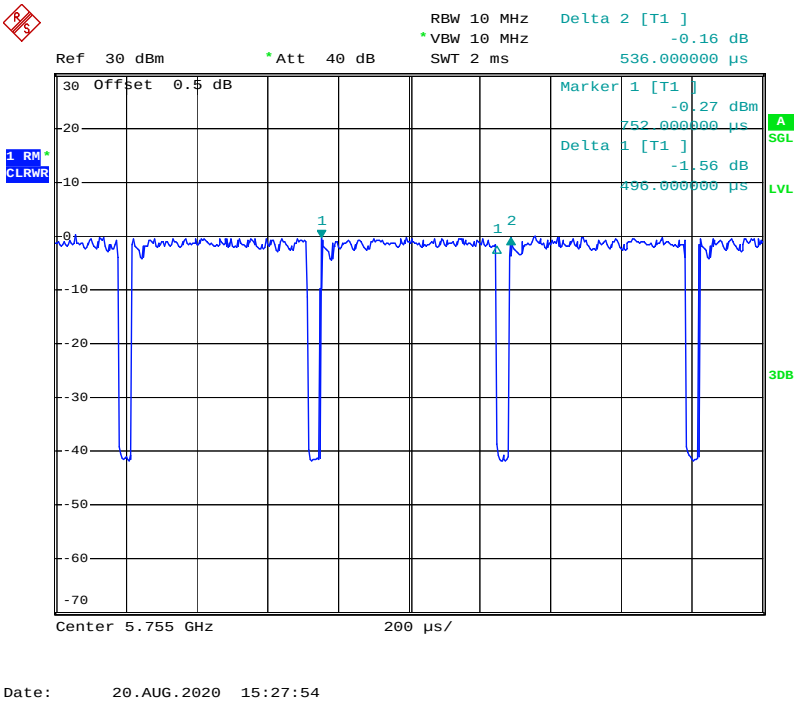
Date: 20.AUG.2020 15:25:30

802.11n ht20



Date: 20.AUG.2020 15:26:40

802.11n ht40



Equipment Modifications

No modification was made to the EUT.

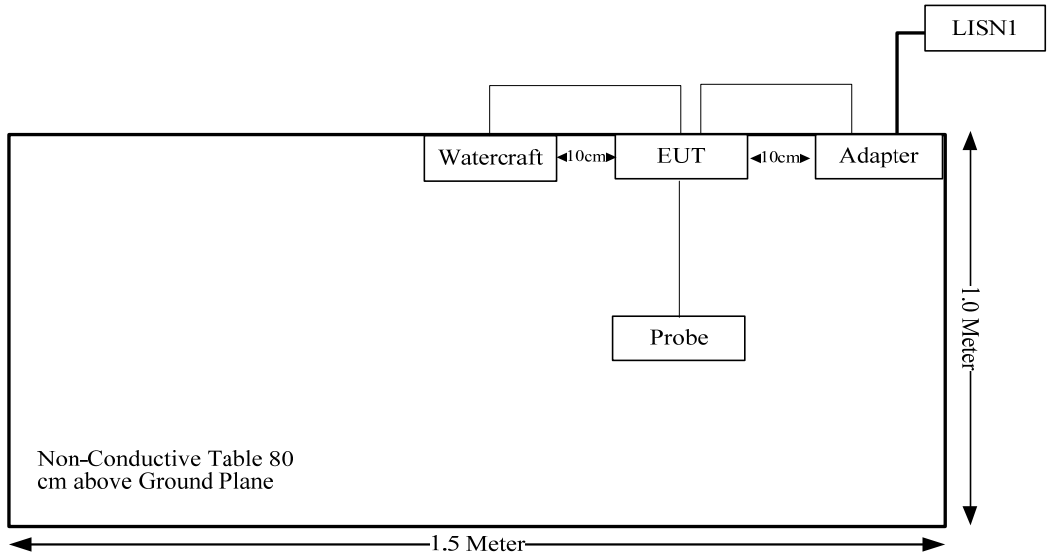
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	D8289217

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB To TTL Cable	Yes	No	0.8	Laptop	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.407 (f) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
RSS-102 Clause 2.5.2	Exemption Limits For Routine Evaluation-RF Exposure Evaluation	Compliance
FCC§15.407(b)(6)& §15.207(a), RSS-Gen Clause 8.8	AC Line Conducted Emissions	Compliance
FCC§15.205& §15.209 &§15.407(b), RSS-247 Clause 6.2	Undesirable Emission& Restricted Bands	Compliance
FCC§15.407(a) (e), RSS-247 Clause 6.2 RSS-Gen Clause 6.7	Emission Bandwidth	Compliance
FCC§15.407(a) RSS-247 Clause 6.2	Conducted Transmitter Output Power	Compliance
FCC§15.407 (a), RSS-247 Clause 6.2	Power Spectral Density	Compliance
RSS-247 Clause 6.4	Additional requirements	Compliance

FCC §15.407 (f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Conducted output power including Tune-up Tolerance**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2412-2462	1.8	1.51	19	79.43	20.00	0.02	1.0
5745-5825	5.9	3.89	13	19.95	20.00	0.02	1.0

Note: The 2.4G and 5.8G can`t transmit simultaneously.

Result: The device meet FCC MPE at 20 cm distance

RSS-102 § 2.5.2 - EXEMPTION LIMITS FOR ROUTINE EVALUATION – RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 § (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 MHz and 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:

Frequency (MHz)	Antenna Gain	Conducted output power including Tune-up Tolerance	EIRP		Exemption limits (mW)
	(dBi)	(dBm)	(dBm)	(mW)	
2412-2462	1.8	19	20.8	120.23	2684
5745-5825	5.9	13	18.9	77.62	4857

Note: The 2.4G and 5.8G can`t transmit simultaneously.

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

Result: Compliance

FCC §15.203& RSS-GEN CLAUSE 6.8 - ANTENNA REQUIREMENT

Applicable Standard

According to 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

According to RSS-Gen Clause 6.8, The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible 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.

Antenna Connector Construction

The EUT has two External antenna use a unique type of connector to attach to the EUT, fulfill the requirement of this section. Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
Dipole	50	1.8 dBi/2.4~2.5GHz 5.9 dBi/5.725-5.825GHz

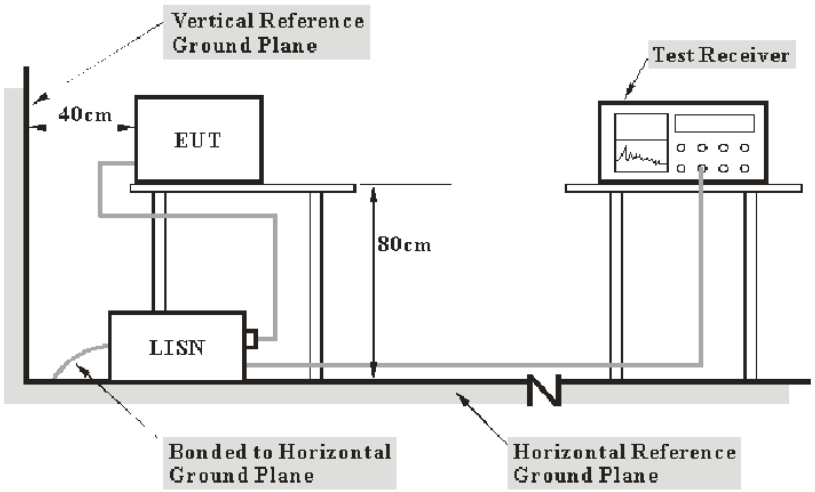
Result: Compliance.

FCC §15.207(a) RSS-GEN CLAUSE 8.8– CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a), §15.407(b) (6), RSS-GEN CLAUSE 8.8.

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 and RSS-Gen clause 8.8 limits.

The spacing between the peripherals was 10 cm.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-05-09	2021-05-09
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

During the conducted emission test, the EUT was connected to the first LISN.

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.

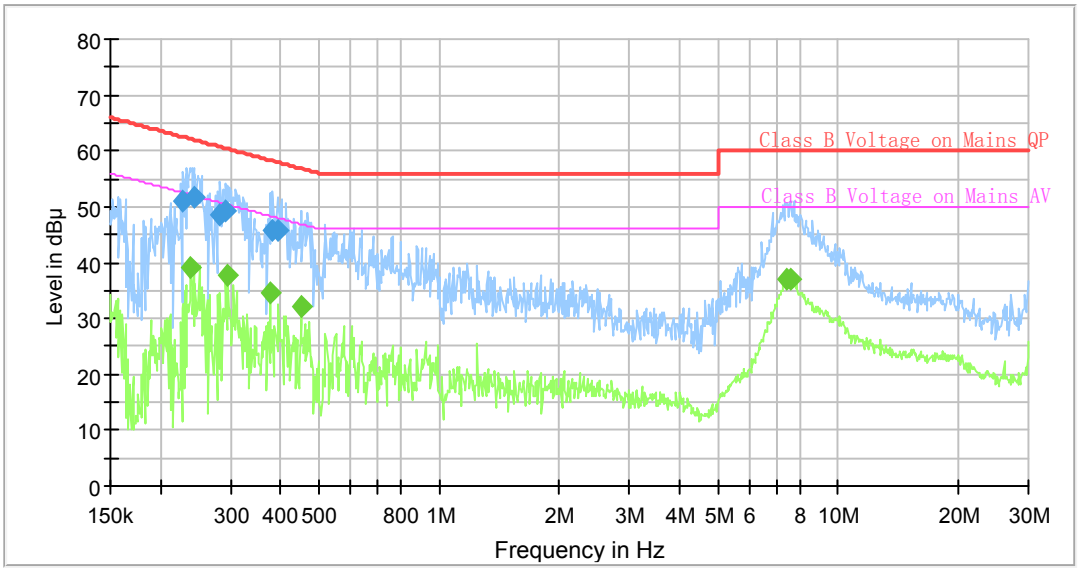
Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	73 %
ATM Pressure:	101 kPa
Tester:	Barry Yang
Test Date:	2020-08-20

Test Mode: Transmitting (802.11a middle channel was the worst)

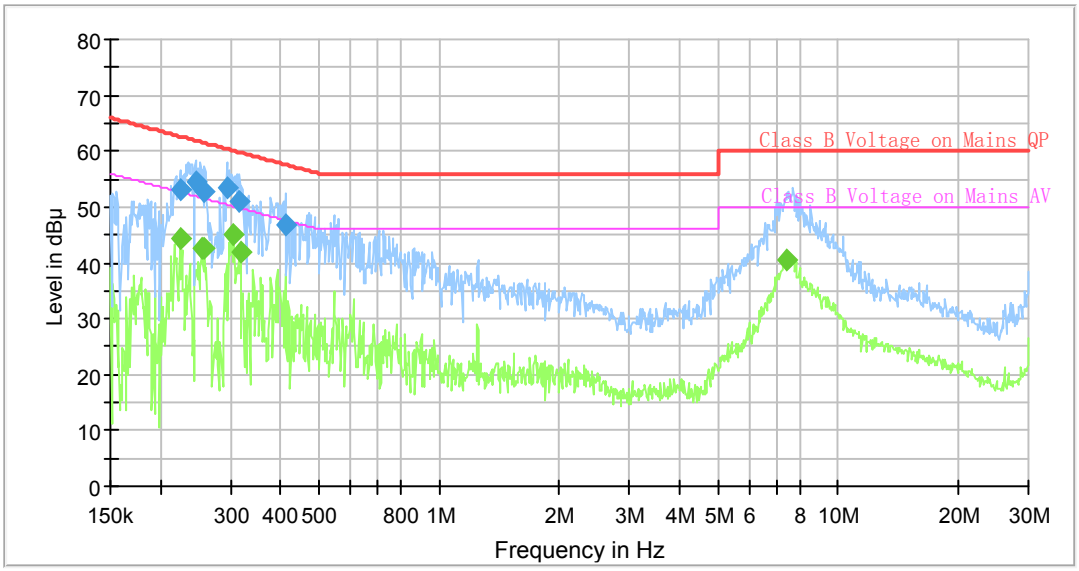
AC120 V, 60 Hz, Line:



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.228055	51.14	---	62.52	11.38	9.000	L1	9.6
0.238526	---	39.28	52.15	12.87	9.000	L1	9.6
0.242121	51.87	---	62.02	10.15	9.000	L1	9.6
0.282606	48.54	---	60.74	12.20	9.000	L1	9.6
0.292647	49.14	---	60.45	11.31	9.000	L1	9.6
0.295580	---	37.74	50.37	17.63	9.000	L1	9.6
0.377409	---	34.60	48.34	13.74	9.000	L1	9.6
0.383099	45.93	---	58.21	12.28	9.000	L1	9.6
0.392773	45.88	---	58.00	12.12	9.000	L1	9.6
0.451638	---	32.16	46.84	13.68	9.000	L1	9.6
7.449337	---	37.15	50.00	12.85	9.000	L1	9.8
7.599445	---	37.13	50.00	12.87	9.000	L1	9.8

AC120 V, 60 Hz, Neutral:



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.224669	---	44.36	52.64	13.28	9.000	N	9.6
0.224669	52.97	---	62.64	9.67	9.000	N	9.6
0.245771	54.50	---	61.90	7.40	9.000	N	9.6
0.254504	---	42.77	51.61	8.84	9.000	N	9.6
0.258340	---	42.78	51.48	8.70	9.000	N	9.6
0.258340	52.92	---	61.48	8.56	9.000	N	9.6
0.294110	53.30	---	60.41	7.11	9.000	N	9.6
0.303044	---	45.18	50.16	4.98	9.000	N	9.6
0.315380	50.94	---	59.83	8.89	9.000	N	9.6
0.316957	---	41.92	49.79	7.87	9.000	N	9.6
0.412859	46.93	---	57.59	10.66	9.000	N	9.6
7.449337	---	40.63	50.00	9.37	9.000	N	9.6

FCC §15.209, §15.205 , §15.407(b) &RSS-247 CLAUSE 6.2, RSS-GEN CLAUSE 8.10 –UNWANTED EMISSION

Applicable Standard

FCC §15.407; §15.209; §15.205;

(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 in the 5.725-5.85 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.

(5) 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.

(6) 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.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

According to RSS-247 Clause 6.2

Frequency band 5150-5250 MHz

6.2.1.2 Unwanted emission limits

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.

Frequency band 5250-5350 MHz

6.2.2.2 Unwanted emission limits

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.”

Frequency bands 5470-5600 MHz and 5650-5725 MHz:

6.2.3.2 Unwanted emission limits

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.

Frequency band 5725-5850 MHz

6.2.4.2 Unwanted emission limits

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;

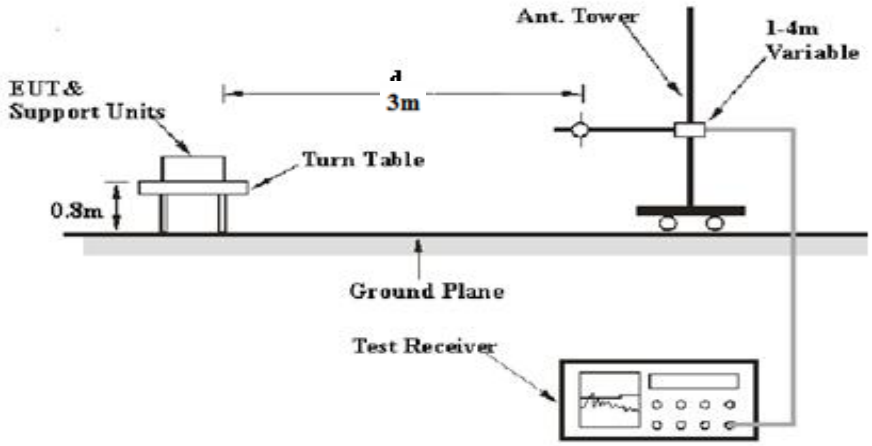
b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;

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

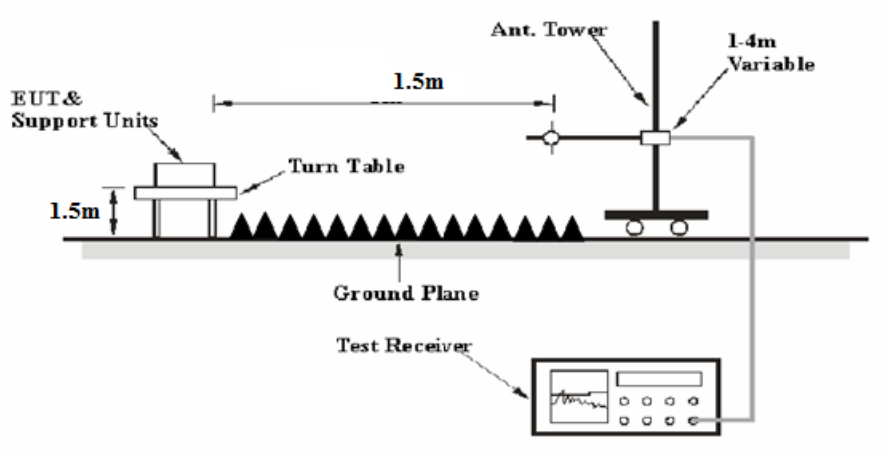
d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

EUT Setup

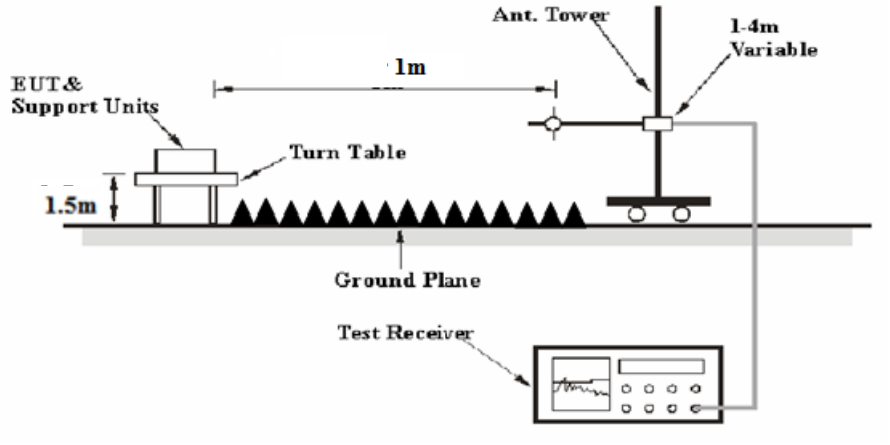
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.407 limits and RSS-247, RSS-Gen 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.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 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:

Measurement	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
Ave.	>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.

Test 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 or 1m
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1.5m]) dB= 6.02 dB
or
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1m]) dB= 9.54 dB

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

Corrected Amplitude & Margin Calculation

For the range 30MHz-1GHz, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

For the range 1GHz-40GHz, Test performed at 1.5m or 1m, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading and the Distance extrapolation factor. The basic equation is as follows:

Corrected Amplitude
= Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain-Distance extrapolation factor

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit- Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated emissions below 1GHz					
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESR3	102453	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2020-05-06	2021-05-06
HP	Amplifier	8447D	2727A05902	2020-09-05	2021-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiated emissions Above 1GHz					
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-12-06	2020-12-05
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-02 1302	2017-12-06	2020-12-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2019-09-05	2020-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2019-09-05	2020-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2020-05-06	2021-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2019-06-16	2020-06-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

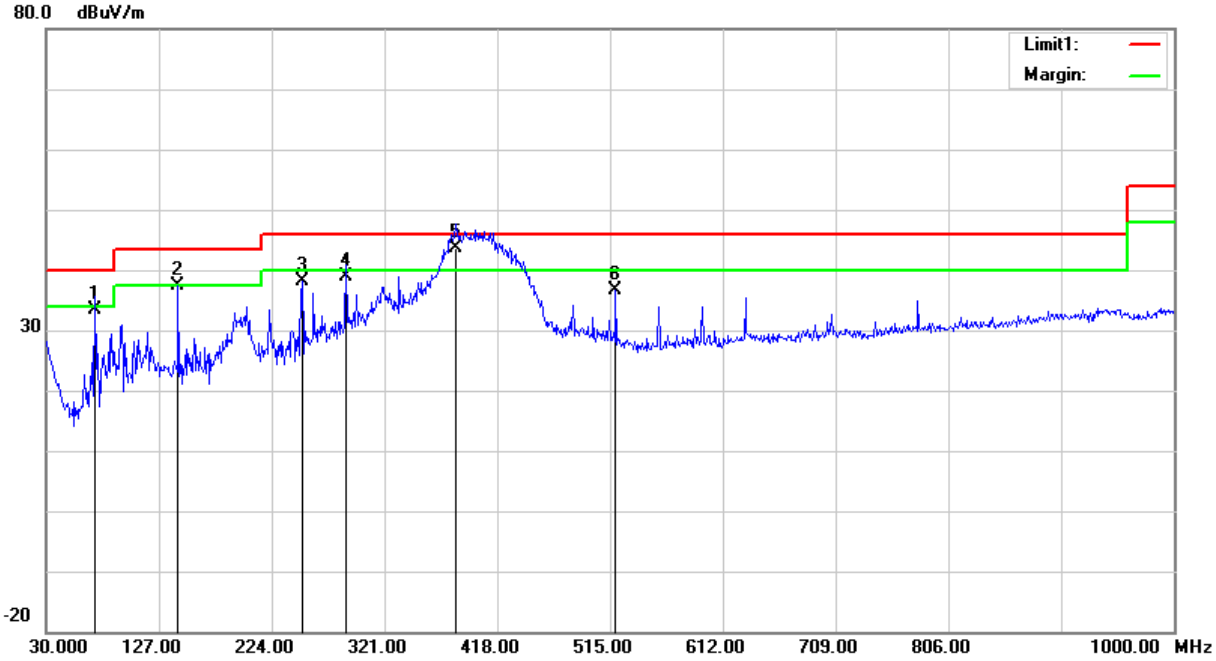
Environmental Conditions

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	26.7°C	30 °C
Relative Humidity:	32%	46%
ATM Pressure:	100.9 kPa	100.8kPa
Tester:	Calvin Chen	Bond Qin
Test Date:	2020-09-16	2020-09-04

Test Mode: Transmitting

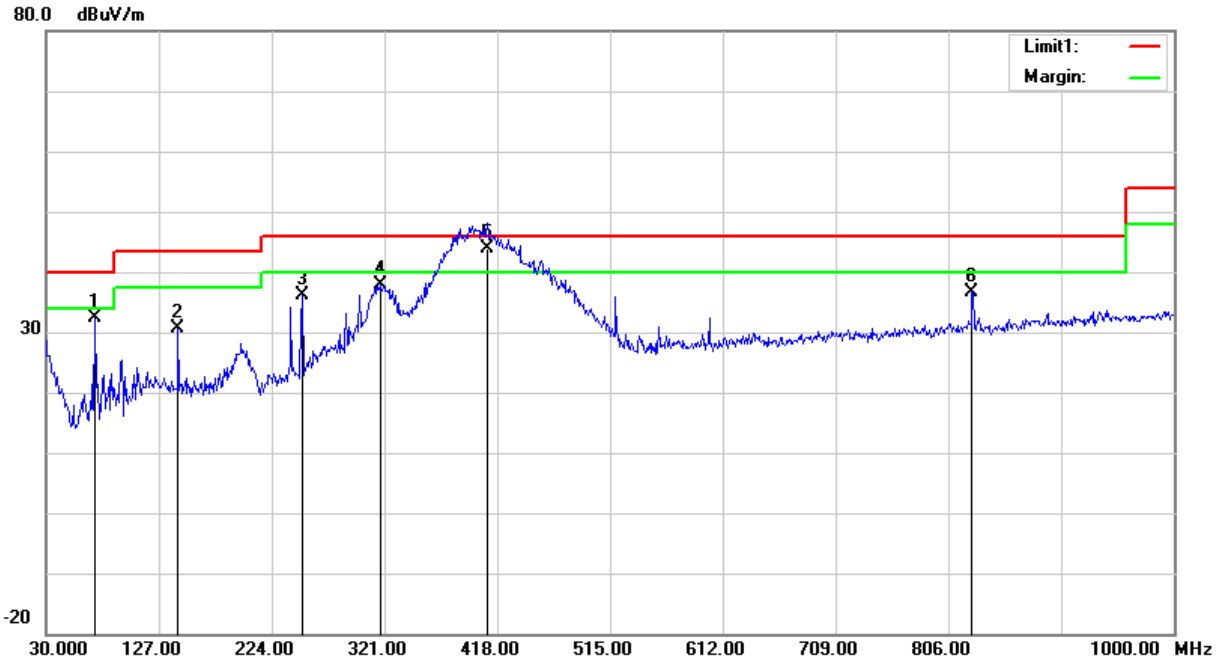
Below 1GHz (802.11a chain 1, 5745 MHz was the worst):

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
71.7100	44.60	QP	-11.27	33.33	40.00	6.67
143.4900	43.39	peak	-6.11	37.28	43.50	6.22
250.1900	44.20	peak	-5.99	38.21	46.00	7.79
288.0200	42.90	QP	-3.90	39.00	46.00	7.00
382.1100	46.20	QP	-2.46	43.74	46.00	2.26
519.8500	36.72	peak	-0.14	36.58	46.00	9.42

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
71.7100	43.75	peak	-11.27	32.48	40.00	7.52
143.4900	36.78	peak	-6.11	30.67	43.50	12.83
250.1900	42.20	peak	-5.99	36.21	46.00	9.79
318.0900	41.33	peak	-3.42	37.91	46.00	8.09
409.2700	45.70	QP	-1.90	43.80	46.00	2.20
826.3700	32.21	peak	4.37	36.58	46.00	9.42

1GHz-40GHz:
802.11a,Chain 0:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	63.14	PK	H	34.20	3.69	0.00	101.03	95.01	N/A	N/A
5745.00	54.35	AV	H	34.20	3.69	0.00	92.24	86.22	N/A	N/A
5745.00	75.46	PK	V	34.20	3.69	0.00	113.35	107.33	N/A	N/A
5745.00	66.02	AV	V	34.20	3.69	0.00	103.91	97.89	N/A	N/A
5725.00	52.55	PK	V	34.19	3.69	0.00	90.43	84.41	122.20	37.79
5720.00	46.94	PK	V	34.19	3.69	0.00	84.82	78.8	110.80	32.00
5700.00	37.81	PK	V	34.18	3.68	0.00	75.67	69.65	105.20	35.55
5650.00	27.73	PK	V	34.16	3.63	0.00	65.52	59.5	68.20	8.70
11490.00	49.27	PK	V	38.99	6.59	25.51	69.34	63.32	74.00	10.68
11490.00	37.46	AV	V	38.99	6.59	25.51	57.53	51.51	54.00	2.49
17235.00	35.87	PK	V	41.56	8.78	23.72	62.49	56.47	68.20	11.73
Middle Channel: 5785 MHz										
5785.00	61.58	PK	H	34.21	3.71	0.00	99.50	93.48	N/A	N/A
5785.00	52.71	AV	H	34.21	3.71	0.00	90.63	84.61	N/A	N/A
5785.00	73.33	PK	V	34.21	3.71	0.00	111.25	105.23	N/A	N/A
5785.00	64.64	AV	V	34.21	3.71	0.00	102.56	96.54	N/A	N/A
11570.00	47.90	PK	V	39.00	6.61	25.46	68.05	62.03	74.00	11.97
11570.00	36.73	AV	V	39.00	6.61	25.46	56.88	50.86	54.00	3.14
17355.00	35.63	PK	V	42.26	8.81	23.60	63.10	57.08	68.20	11.12
High Channel: 5825 MHz										
5825.00	60.68	PK	H	34.23	3.73	0.00	98.64	92.62	N/A	N/A
5825.00	51.55	AV	H	34.23	3.73	0.00	89.51	83.49	N/A	N/A
5825.00	72.43	PK	V	34.23	3.73	0.00	110.39	104.37	N/A	N/A
5825.00	63.21	AV	V	34.23	3.73	0.00	101.17	95.15	N/A	N/A
5850.00	39.77	PK	V	34.24	3.75	0.00	77.76	71.74	122.20	50.46
5855.00	36.07	PK	V	34.24	3.75	0.00	74.06	68.04	110.80	42.76
5875.00	27.70	PK	V	34.25	3.77	0.00	65.72	59.7	105.20	45.50
5925.00	27.71	PK	V	34.27	3.80	0.00	65.78	59.76	68.20	8.44
11650.00	47.11	PK	V	39.00	6.64	25.41	67.34	61.32	74.00	12.68
11650.00	35.19	AV	V	39.00	6.64	25.41	55.42	49.4	54.00	4.60
17475.00	35.13	PK	V	42.96	8.84	23.48	63.45	57.43	68.20	10.77

802.11a,Chain 1:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	64.36	PK	H	34.20	3.69	0.00	102.25	96.23	N/A	N/A
5745.00	54.63	AV	H	34.20	3.69	0.00	92.52	86.5	N/A	N/A
5745.00	77.12	PK	V	34.20	3.69	0.00	115.01	108.99	N/A	N/A
5745.00	67.45	AV	V	34.20	3.69	0.00	105.34	99.32	N/A	N/A
5725.00	49.33	PK	V	34.19	3.69	0.00	87.21	81.19	122.20	41.01
5720.00	39.58	PK	V	34.19	3.69	0.00	77.46	71.44	110.80	39.36
5700.00	28.15	PK	V	34.18	3.68	0.00	66.01	59.99	105.20	45.21
5650.00	27.68	PK	V	34.16	3.63	0.00	65.47	59.45	68.20	8.75
11490.00	48.23	PK	V	38.99	6.59	25.51	68.30	62.28	74.00	11.72
11490.00	35.40	AV	V	38.99	6.59	25.51	55.47	49.45	54.00	4.55
17235.00	35.53	PK	V	41.56	8.78	23.72	62.15	56.13	68.20	12.07
Middle Channel: 5785 MHz										
5785.00	63.89	PK	H	34.21	3.71	0.00	101.81	95.79	N/A	N/A
5785.00	54.52	AV	H	34.21	3.71	0.00	92.44	86.42	N/A	N/A
5785.00	75.83	PK	V	34.21	3.71	0.00	113.75	107.73	N/A	N/A
5785.00	65.98	AV	V	34.21	3.71	0.00	103.90	97.88	N/A	N/A
11570.00	48.67	PK	V	39.00	6.61	25.46	68.82	62.8	74.00	11.20
11570.00	35.89	AV	V	39.00	6.61	25.46	56.04	50.02	54.00	3.98
17355.00	35.62	PK	V	42.26	8.81	23.60	63.09	57.07	68.20	11.13
High Channel: 5825 MHz										
5825.00	62.86	PK	H	34.23	3.73	0.00	100.82	94.8	N/A	N/A
5825.00	53.54	AV	H	34.23	3.73	0.00	91.50	85.48	N/A	N/A
5825.00	74.69	PK	V	34.23	3.73	0.00	112.65	106.63	N/A	N/A
5825.00	65.52	AV	V	34.23	3.73	0.00	103.48	97.46	N/A	N/A
5850.00	37.86	PK	V	34.24	3.75	0.00	75.85	69.83	122.20	52.37
5855.00	32.72	PK	V	34.24	3.75	0.00	70.71	64.69	110.80	46.11
5875.00	27.77	PK	V	34.25	3.77	0.00	65.79	59.77	105.20	45.43
5925.00	27.98	PK	V	34.27	3.80	0.00	66.05	60.03	68.20	8.17
11650.00	48.12	PK	V	39.00	6.64	25.41	68.35	62.33	74.00	11.67
11650.00	35.77	AV	V	39.00	6.64	25.41	56.00	49.98	54.00	4.02
17475.00	35.69	PK	V	42.96	8.84	23.48	64.01	57.99	68.20	10.21

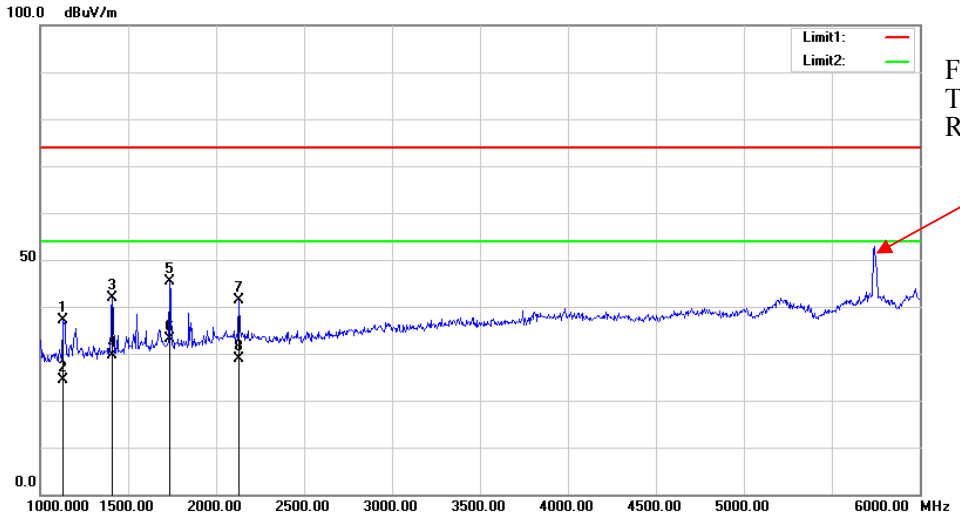
802.11n ht20(2Tx was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	65.58	PK	H	34.20	3.69	0.00	103.47	97.45	N/A	N/A
5745.00	53.65	AV	H	34.20	3.69	0.00	91.54	85.52	N/A	N/A
5745.00	77.78	PK	V	34.20	3.69	0.00	115.67	109.65	N/A	N/A
5745.00	65.81	AV	V	34.20	3.69	0.00	103.70	97.68	N/A	N/A
5725.00	50.28	PK	V	34.19	3.69	0.00	88.16	82.14	122.20	40.06
5720.00	38.80	PK	V	34.19	3.69	0.00	76.68	70.66	110.80	40.14
5700.00	29.70	PK	V	34.18	3.68	0.00	67.56	61.54	105.20	43.66
5650.00	28.11	PK	V	34.16	3.63	0.00	65.90	59.88	68.20	8.32
11490.00	48.52	PK	V	38.99	6.59	25.51	68.59	62.57	74.00	11.43
11490.00	35.87	AV	V	38.99	6.59	25.51	55.94	49.92	54.00	4.08
17235.00	35.63	PK	V	41.56	8.78	23.72	62.25	56.23	68.20	11.97
Middle Channel: 5785 MHz										
5785.00	64.35	PK	H	34.21	3.71	0.00	102.27	96.25	N/A	N/A
5785.00	52.54	AV	H	34.21	3.71	0.00	90.46	84.44	N/A	N/A
5785.00	76.41	PK	V	34.21	3.71	0.00	114.33	108.31	N/A	N/A
5785.00	64.52	AV	V	34.21	3.71	0.00	102.44	96.42	N/A	N/A
11570.00	48.20	PK	V	39.00	6.61	25.46	68.35	62.33	74.00	11.67
11570.00	35.75	AV	V	39.00	6.61	25.46	55.90	49.88	54.00	4.12
17355.00	35.52	PK	V	42.26	8.81	23.60	62.99	56.97	68.20	11.23
High Channel: 5825 MHz										
5825.00	63.78	PK	H	34.23	3.73	0.00	101.74	95.72	N/A	N/A
5825.00	51.89	AV	H	34.23	3.73	0.00	89.85	83.83	N/A	N/A
5825.00	75.21	PK	V	34.23	3.73	0.00	113.17	107.15	N/A	N/A
5825.00	63.36	AV	V	34.23	3.73	0.00	101.32	95.3	N/A	N/A
5850.00	41.13	PK	V	34.24	3.75	0.00	79.12	73.1	122.20	49.10
5855.00	32.33	PK	V	34.24	3.75	0.00	70.32	64.3	110.80	46.50
5875.00	27.30	PK	V	34.25	3.77	0.00	65.32	59.3	105.20	45.90
5925.00	27.12	PK	V	34.27	3.80	0.00	65.19	59.17	68.20	9.03
11650.00	47.52	PK	V	39.00	6.64	25.41	67.75	61.73	74.00	12.27
11650.00	35.25	AV	V	39.00	6.64	25.41	55.48	49.46	54.00	4.54
17475.00	35.62	PK	V	42.96	8.84	23.48	63.94	57.92	68.20	10.28

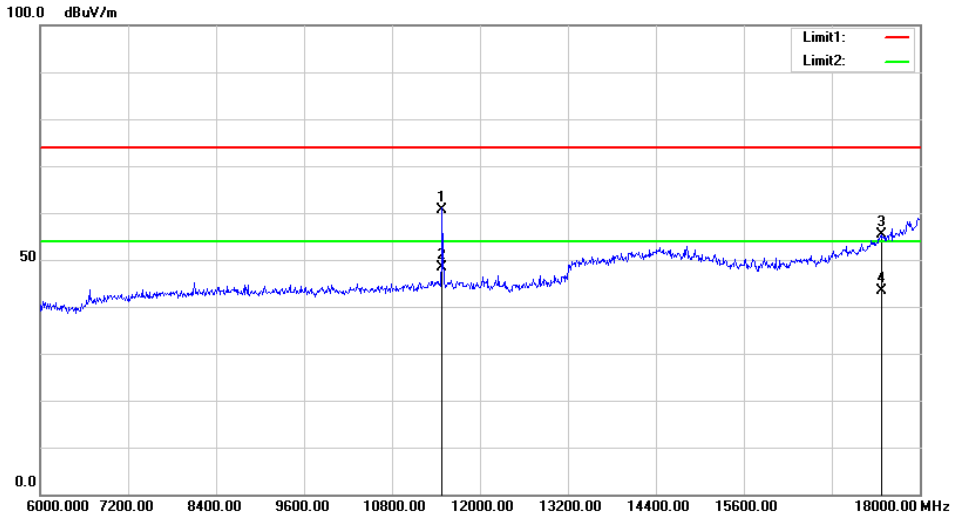
802.11n ht40(2Tx was the worst)

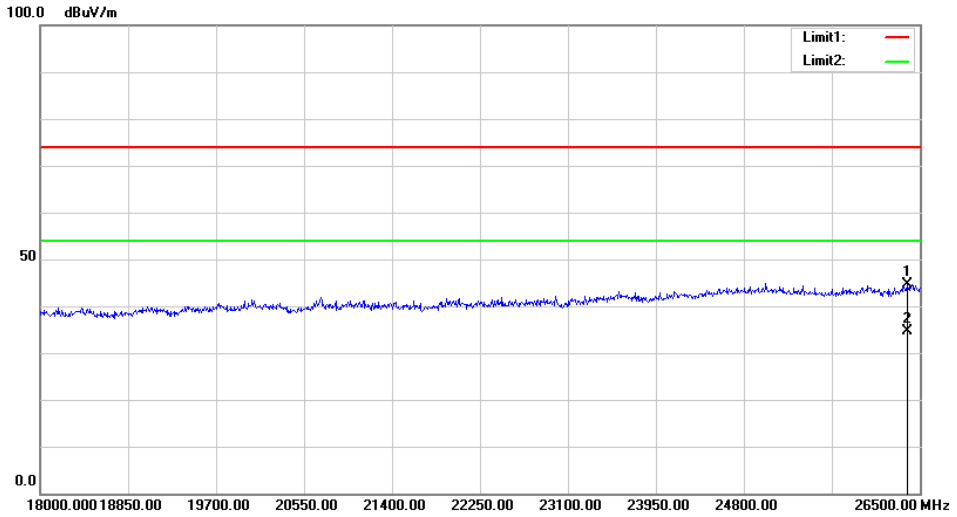
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755 MHz										
5755.00	62.63	PK	H	34.20	3.70	0.00	100.53	94.51	N/A	N/A
5755.00	52.05	AV	H	34.20	3.70	0.00	89.95	83.93	N/A	N/A
5755.00	72.79	PK	V	34.20	3.70	0.00	110.69	104.67	N/A	N/A
5755.00	62.19	AV	V	34.20	3.70	0.00	100.09	94.07	N/A	N/A
5725.00	50.52	PK	V	34.19	3.69	0.00	88.40	82.38	122.20	39.82
5720.00	48.52	PK	V	34.19	3.69	0.00	86.40	80.38	110.80	30.42
5700.00	36.45	PK	V	34.18	3.68	0.00	74.31	68.29	105.20	36.91
5650.00	27.15	PK	V	34.16	3.63	0.00	64.94	58.92	68.20	9.28
11510.00	47.02	PK	V	39.00	6.59	25.50	67.11	61.09	74.00	12.91
11510.00	34.94	AV	V	39.00	6.59	25.50	55.03	49.01	54.00	4.99
17265.00	35.62	PK	V	41.74	8.79	23.69	62.46	56.44	68.20	11.76
High Channel: 5795 MHz										
5795.00	62.45	PK	H	34.22	3.71	0.00	100.38	94.36	N/A	N/A
5795.00	52.13	AV	H	34.22	3.71	0.00	90.06	84.04	N/A	N/A
5795.00	72.03	PK	V	34.22	3.71	0.00	109.96	103.94	N/A	N/A
5795.00	61.89	AV	V	34.22	3.71	0.00	99.82	93.8	N/A	N/A
5850.00	32.79	PK	V	34.24	3.75	0.00	70.78	64.76	122.20	57.44
5855.00	30.10	PK	V	34.24	3.75	0.00	68.09	62.07	110.80	48.73
5875.00	27.30	PK	V	34.25	3.77	0.00	65.32	59.3	105.20	45.90
5925.00	27.27	PK	V	34.27	3.80	0.00	65.34	59.32	68.20	8.88
11590.00	46.96	PK	V	39.00	6.62	25.45	67.13	61.11	74.00	12.89
11590.00	34.87	AV	V	39.00	6.62	25.45	55.04	49.02	54.00	4.98
17385.00	35.91	PK	V	42.43	8.82	23.57	63.59	57.57	68.20	10.63

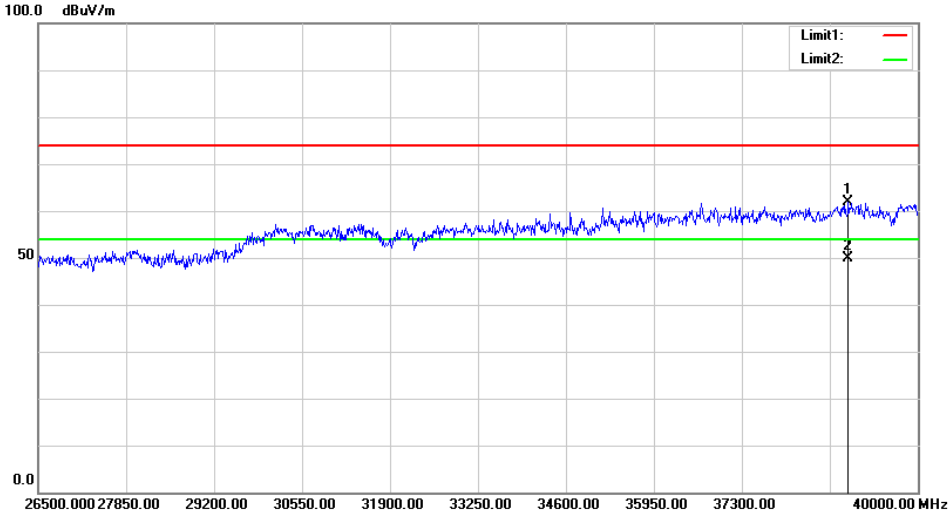
Test Plots(For worst mode 802.11a chain 0 5745MHz)
Horizontal



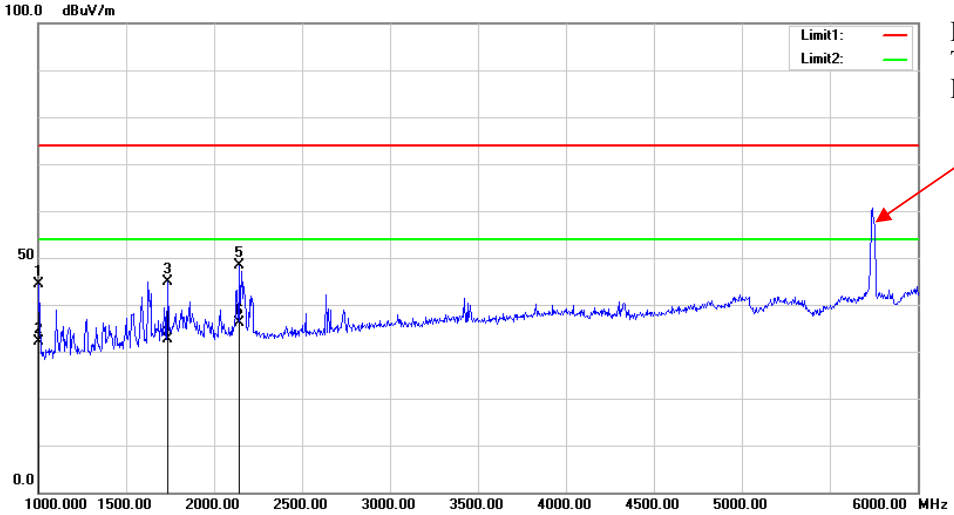
Fundamental Test with Band Rejection Filter



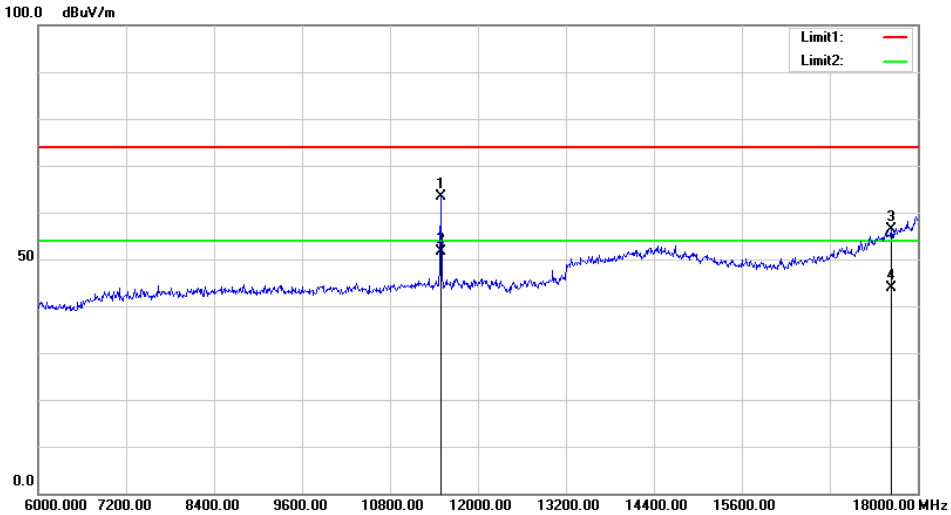


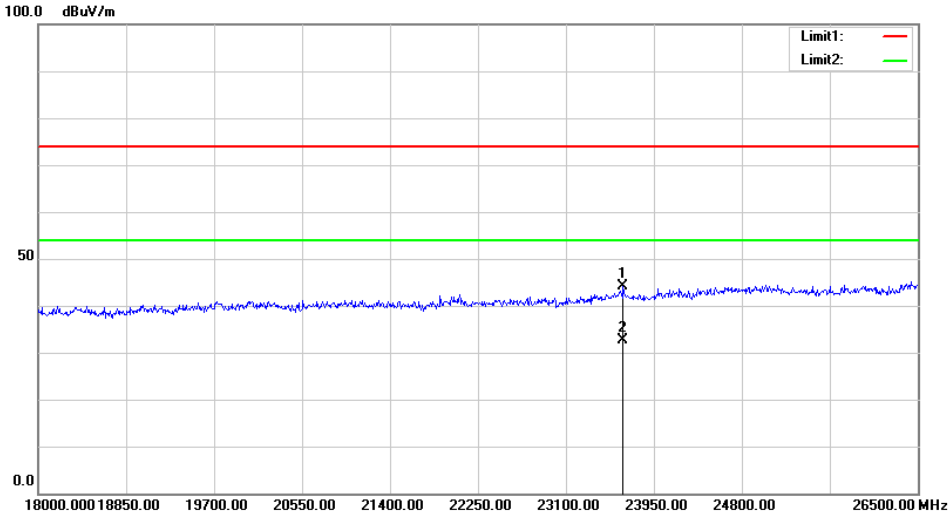


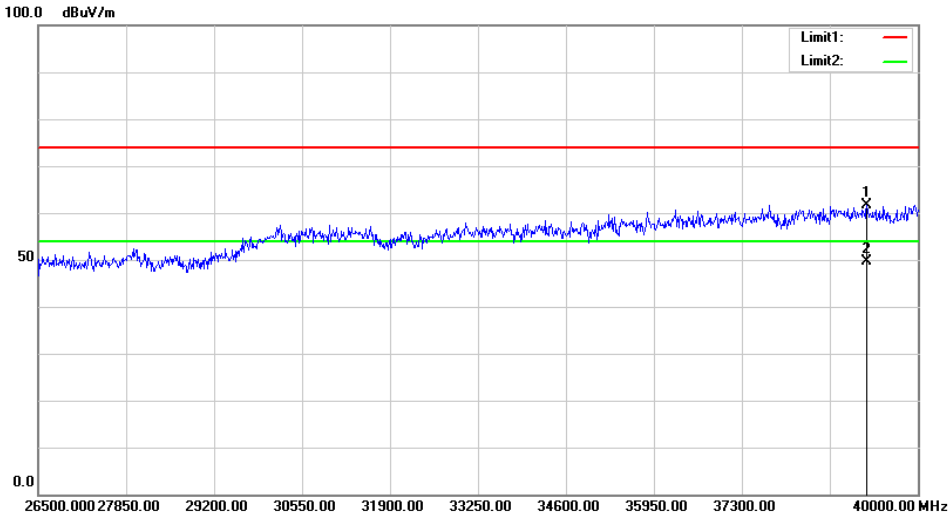
Vertical:



Fundamental Test with Band Rejection Filter




100.0 dBuV/m
Limit1:
Limit2:
50
0.0
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

FCC §15.407(a)(e) & RSS-247 CLAUSE 6.2,RSS-Gen CLAUSE 6.7– EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH

Applicable Standard

15.407(a) (e), RSS-247 Clause 6.2 and RSS-Gen Clause 6.7

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2020-05-09	2021-05-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26.5~28.9°C
Relative Humidity:	64~68 %
ATM Pressure:	100~101 kPa
Tester:	Rennes Guo
Test Date:	*2020-08-29~2020-09-06*

Test mode: Transmitting (test was only performed at chain 0)

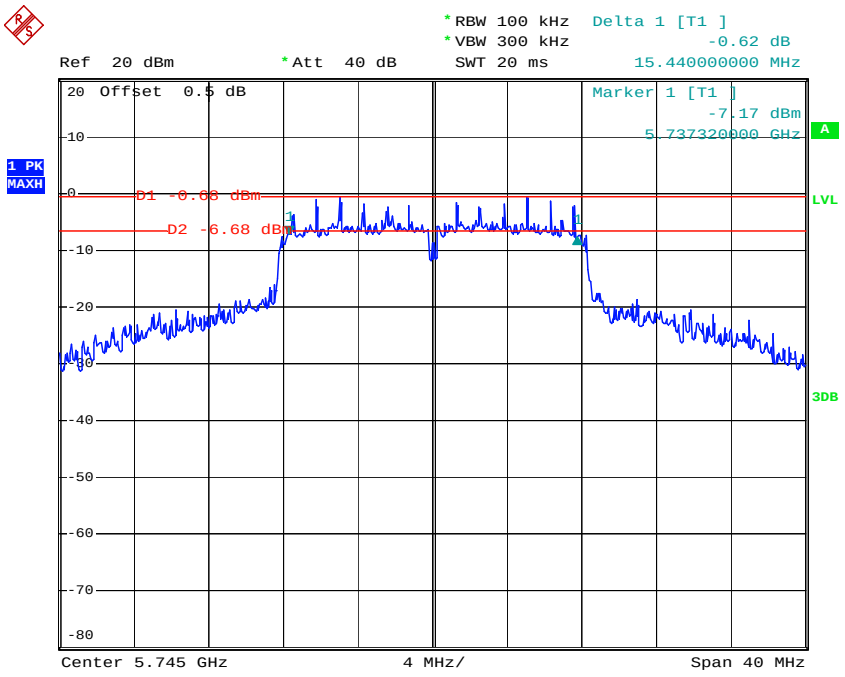
Test Result: Compliance. Please refer to the following tables and plots.

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	6 dB Emission Bandwidth Limit (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	5745	15.440	≥0.5	17.200
	5785	15.200	≥0.5	17.200
	5825	15.440	≥0.5	17.200
802.11n ht20	5745	15.440	≥0.5	18.160
	5785	15.280	≥0.5	18.080
	5825	15.360	≥0.5	18.000
802.11n ht40	5755	35.680	≥0.5	37.440
	5795	35.840	≥0.5	37.440

Note: the 99% Occupied Bandwidth have not fall into the band 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.

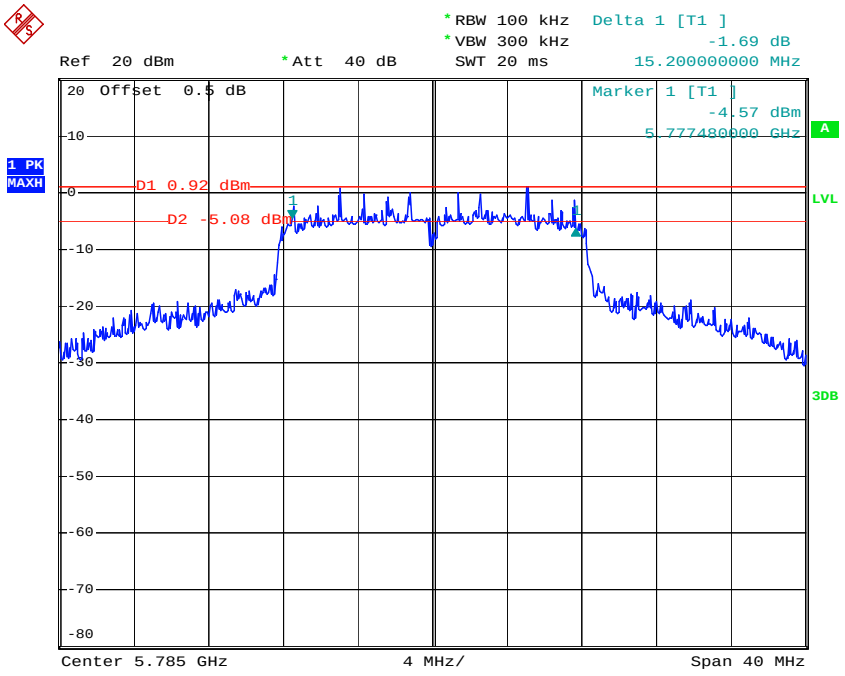
6dB Emission Bandwidth:

802.11a Low Channel



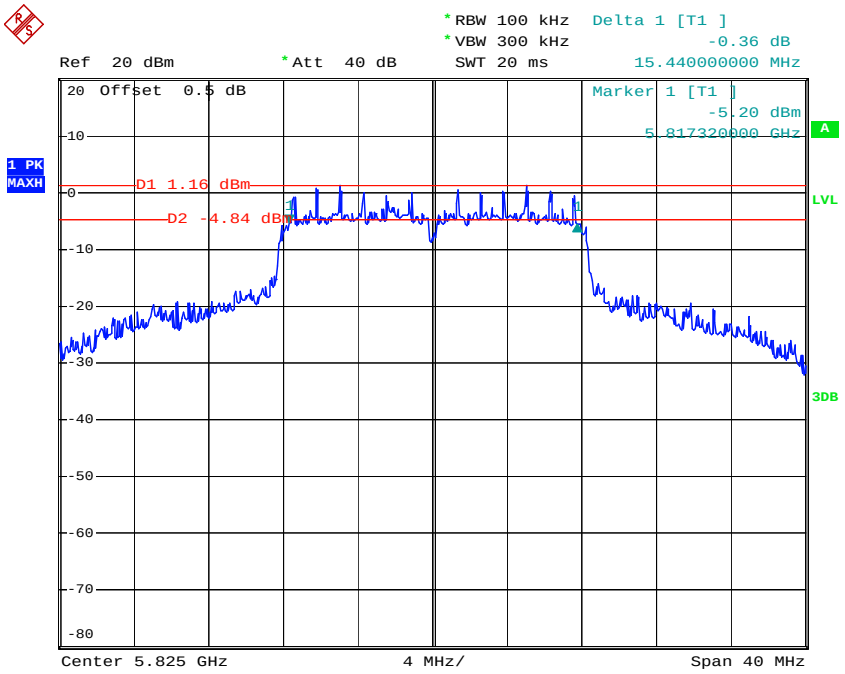
Date: 29.AUG.2020 07:33:03

802.11a Middle Channel



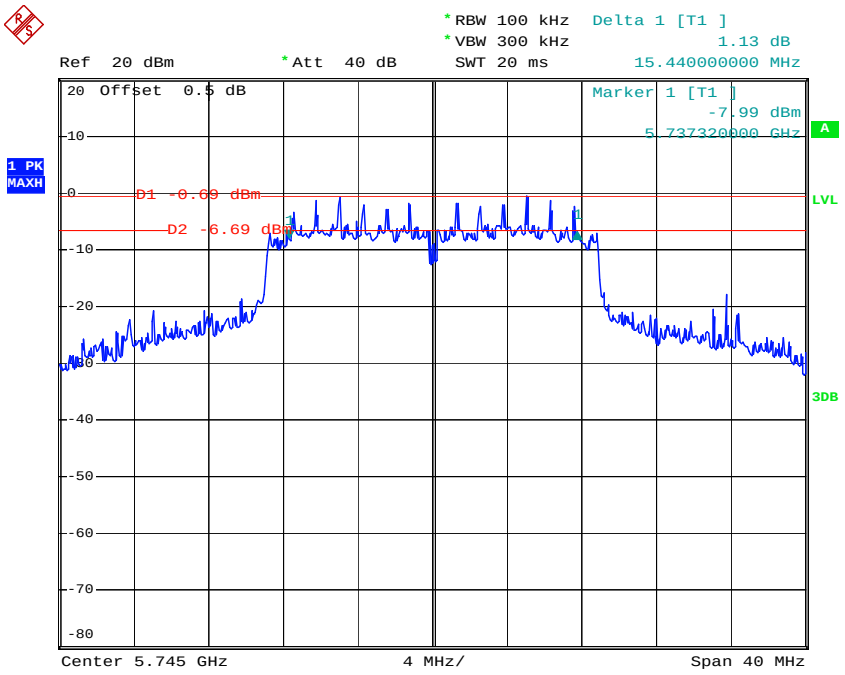
Date: 29.AUG.2020 07:33:56

802.11a High Channel



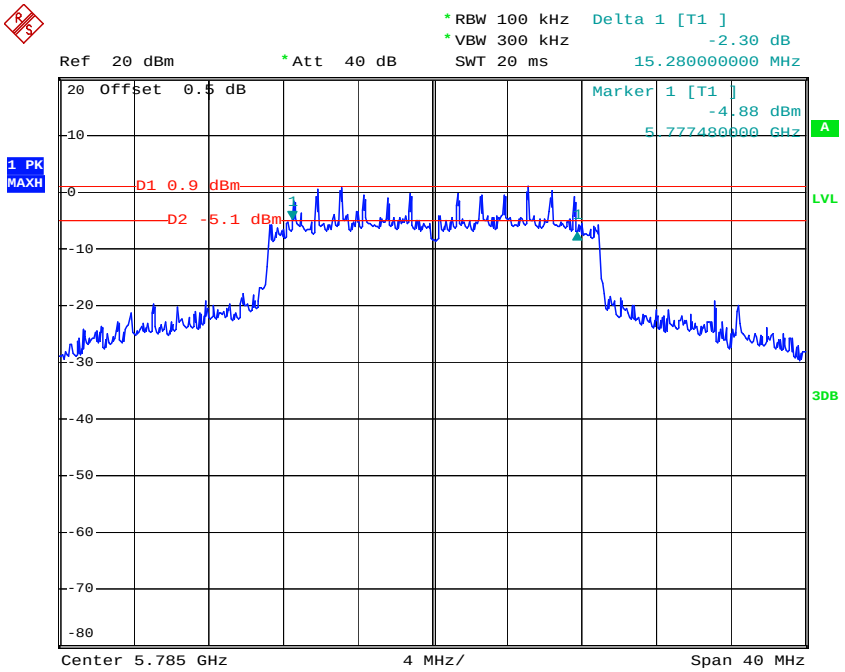
Date: 29.AUG.2020 07:35:34

802.11n ht20 Low Channel



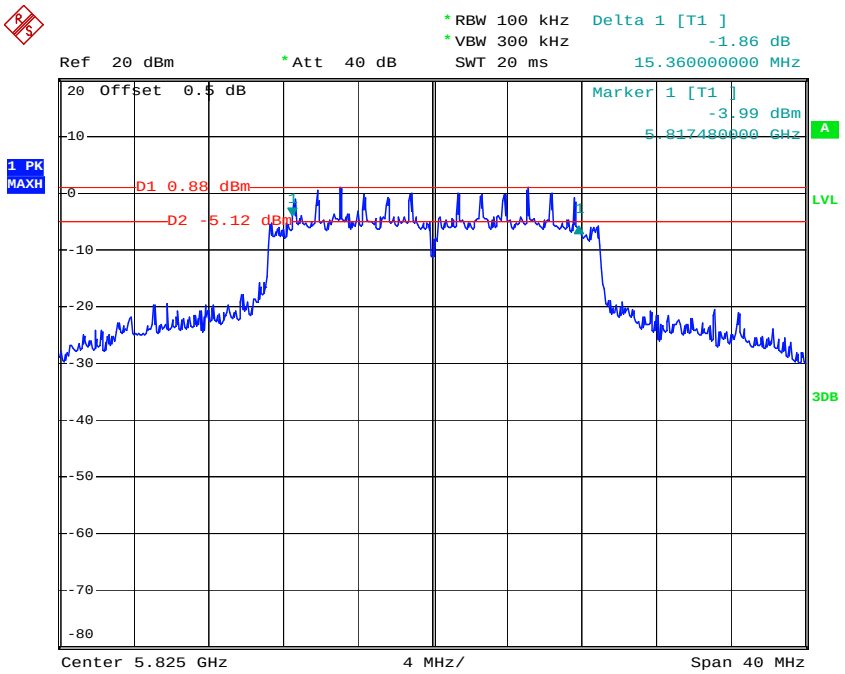
Date: 29.AUG.2020 07:58:01

802.11n ht20 Middle Channel



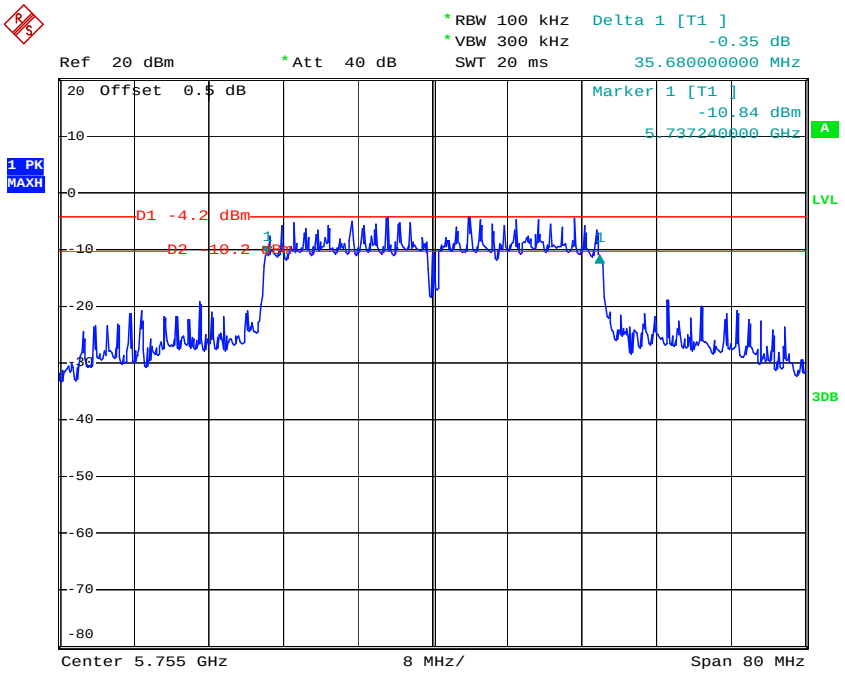
Date: 29.AUG.2020 07:59:08

802.11n ht20 High Channel



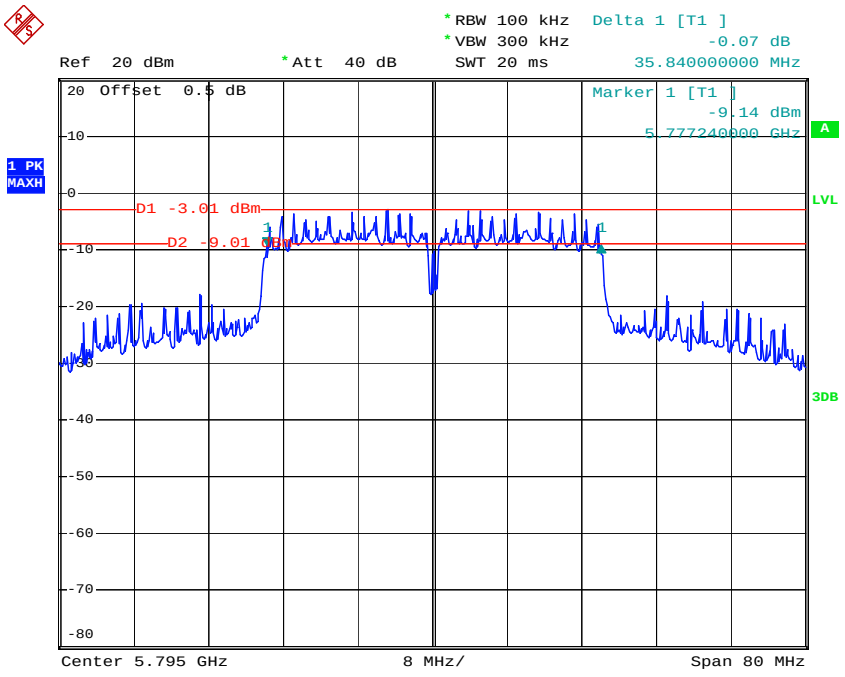
Date: 29.AUG.2020 08:00:16

802.11n ht40 Low Channel



Date: 29.AUG.2020 08:01:16

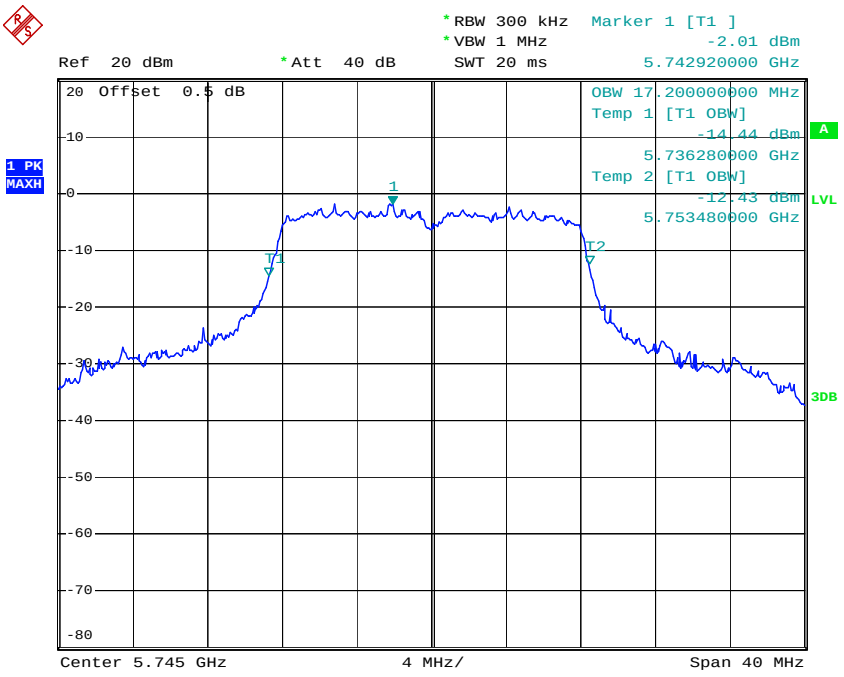
802.11n ht40 High Channel



Date: 29.AUG.2020 08:02:10

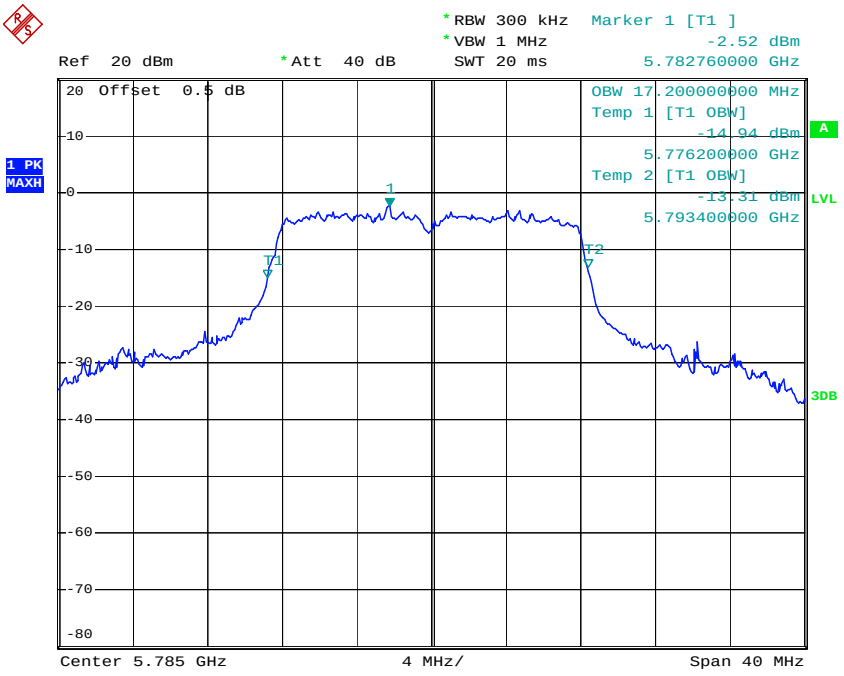
99% Occupied Bandwidth:

802.11a Low Channel



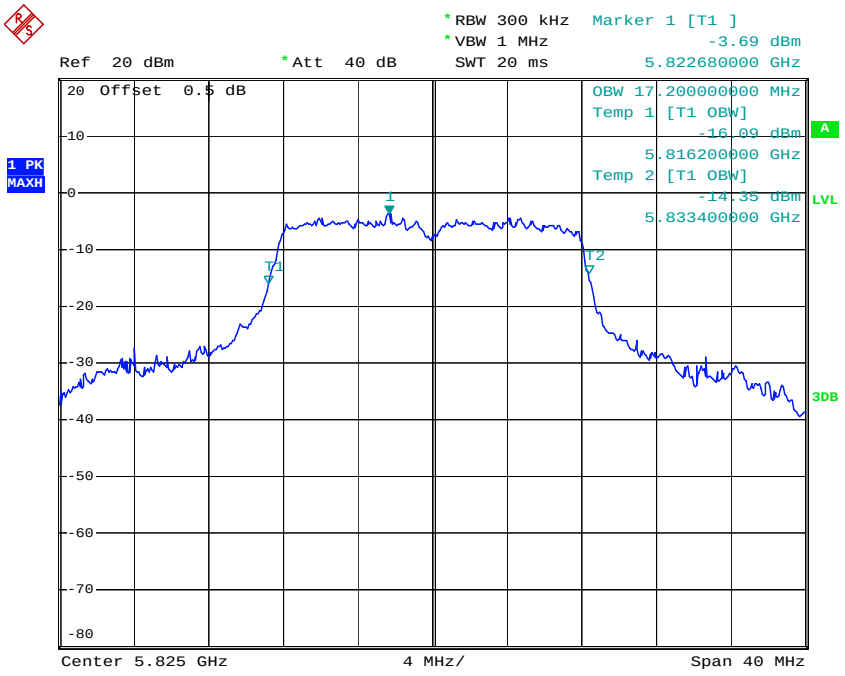
Date: 6.SEP.2020 07:11:39

802.11a Middle Channel



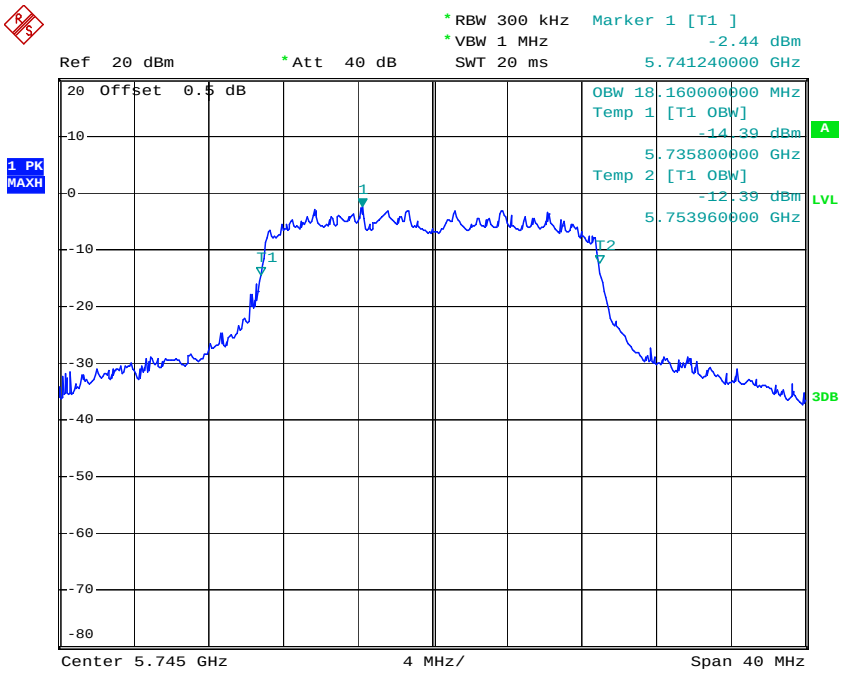
Date: 6.SEP.2020 07:13:12

802.11a High Channel



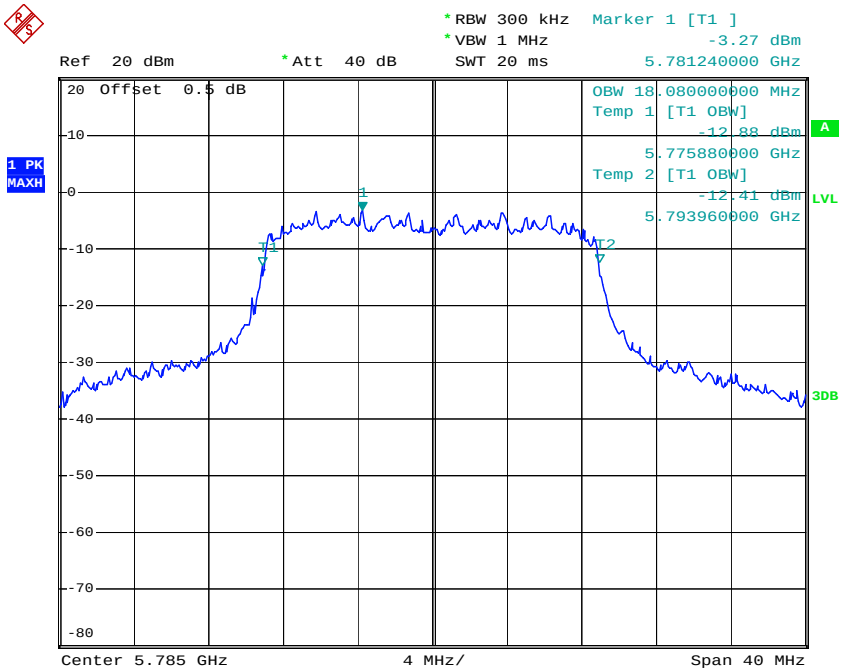
Date: 6.SEP.2020 07:13:57

802.11n ht20 Low Channel



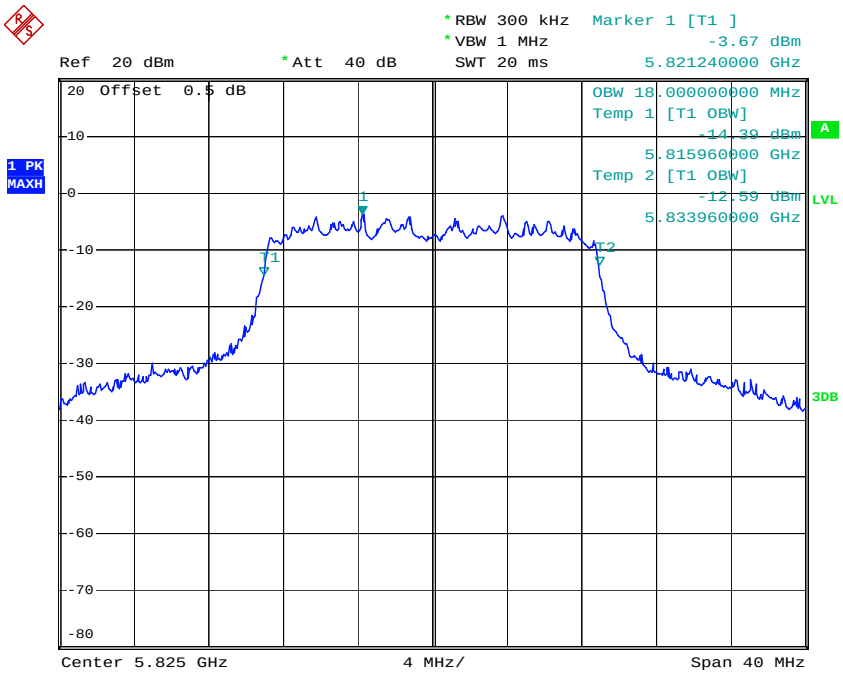
Date: 6.SEP.2020 07:15:13

802.11n ht20 Middle Channel



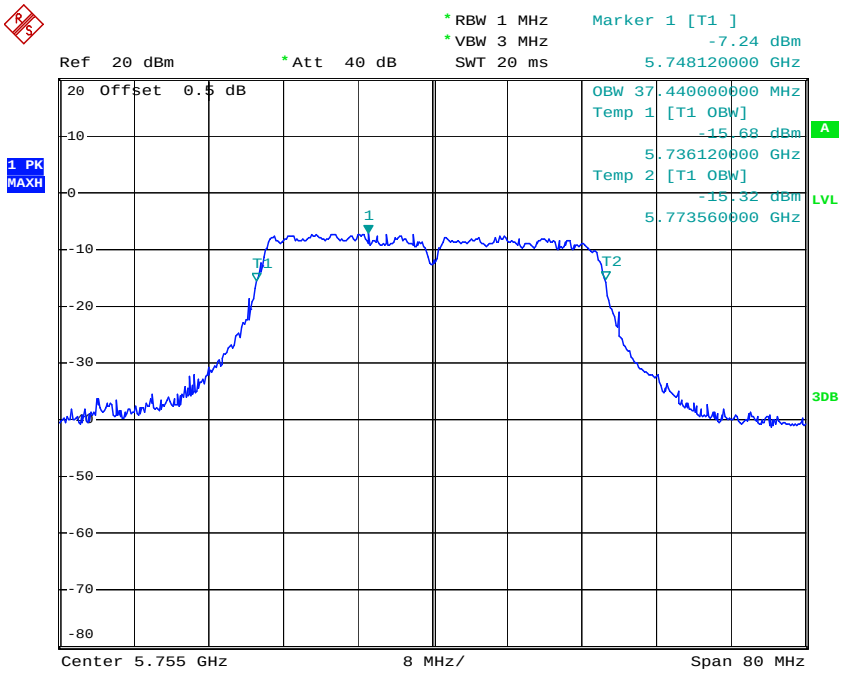
Date: 6.SEP.2020 07:15:51

802.11n ht20 High Channel



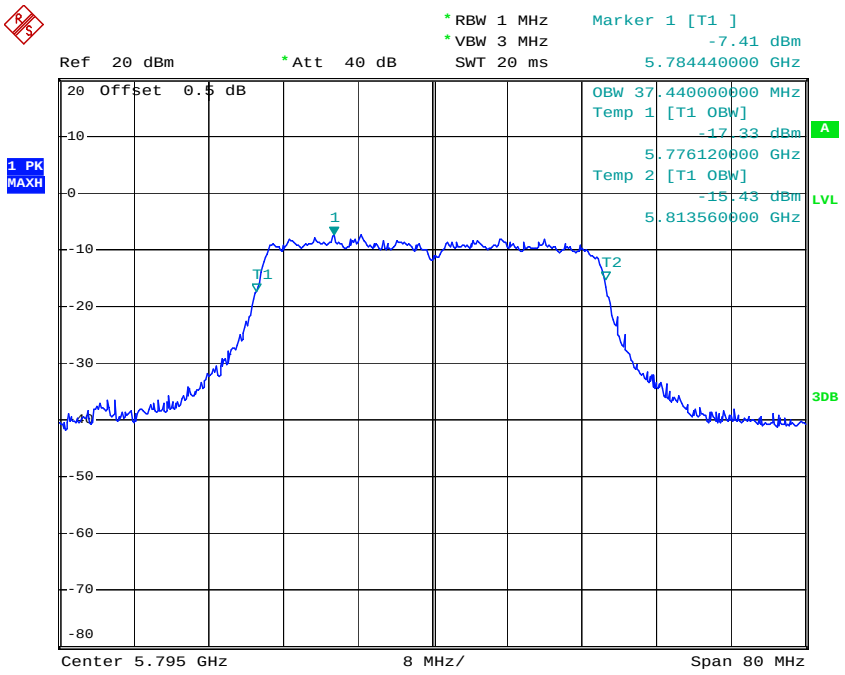
Date: 6.SEP.2020 07:17:07

802.11n ht40 Low Channel



Date: 6.SEP.2020 07:19:02

802.11n ht40 High Channel



Date: 6.SEP.2020 07:19:46

FCC §15.407(a) & RSS-247 CLAUSE 6.2 –MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

(3) For the band 5.725-5.85 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.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

According to RSS-247 Clause 6.2:

Frequency band 5150-5250 MHz

6.2.1.1 Power limits

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.

Frequency band 5250-5350 MHz

6.2.2.1 Power limits

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. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

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.

Frequency bands 5470-5600 MHz and 5650-5725 MHz

6.2.3.1 Power limits

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.

Frequency band 5725-5850 MHz

6.2.4.1 Power limits

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

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-multipoint[3] systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A
Unknown	Attenuator	UNAT-3+	15529	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY5425009	2020-05-09	2021-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26.9°C
Relative Humidity:	68%
ATM Pressure:	101kPa
Test by:	Rennes Guo
Test Date:	2020-08-29

Test Mode: Transmitting

Test Result: Compliance.

Mode	Frequency (MHz)	Conducted Average Output Power (dBm)			Limit (dBm)
		Chain 0	Chain 1	Total	
802.11 a	5745	9.86	11.65	/	30
	5785	10.06	11.55	/	30
	5825	9.49	10.27	/	30
802.11n ht20	5745	8.69	10.47	12.68	30
	5785	8.76	10.22	12.56	30
	5825	8.44	9.11	11.8	30
802.11n ht40	5755	8.43	10.66	12.7	30
	5795	8.23	10.53	12.54	30

Note:
The duty cycle factor has been calculated into the test data.
The maximum antenna gain is 5.9dBi in 5GHz band, meets the RSS-247 EIRP limits. 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 = G_{ANT} + Array Gain = 5.9dBi

FCC §15.407(a)& RSS-247 CLAUSE 6.2- POWER SPECTRAL DENSITY

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

(3) For the band 5.725-5.85 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.

According to RSS-247 Clause 6.2:

Frequency band 5150-5250 MHz

6.2.1.1 Power limits

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.

Frequency band 5250-5350 MHz

6.2.2.1 Power limits

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. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

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.

Frequency bands 5470-5600 MHz and 5650-5725 MHz

6.2.3.1 Power limits

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.

Frequency band 5725-5850 MHz

6.2.4.1 Power limits

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

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-multipoint[3] systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2020-05-09	2021-05-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.9°C
Relative Humidity:	68%
ATM Pressure:	101kPa
Test by:	Rennes Guo
Test Date:	2020-08-29

Test Mode: Transmitting

Test Result:Compliance.Please refer to the following table and plot.

Mode	Frequency (MHz)	Reading (dBm/300kHz)		Result (dBm/500kHz)			Limit (dBm/500kHz)
		Chain 0	Chain 1	Chain 0	Chain 1	Total	
802.11a	5745	-4.05	-2.61	-1.83	-0.39	/	30
	5785	-2.94	-2.93	-0.72	-0.71	/	30
	5825	-2.92	-2.69	-0.7	-0.47	/	30
802.11n ht20	5745	-3.92	-2.25	-1.7	-0.03	2.23	27.1
	5785	-3.23	-1.70	-1.01	0.52	2.83	27.1
	5825	-2.02	-2.50	0.2	-0.28	2.98	27.1
802.11n ht40	5755	-7.93	-5.61	-5.71	-3.39	-1.39	27.1
	5795	-6.45	-6.02	-4.23	-3.8	-1.00	27.1

Note:
The maximum antenna gain is 5.9 dBi in 5GHz band. 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:

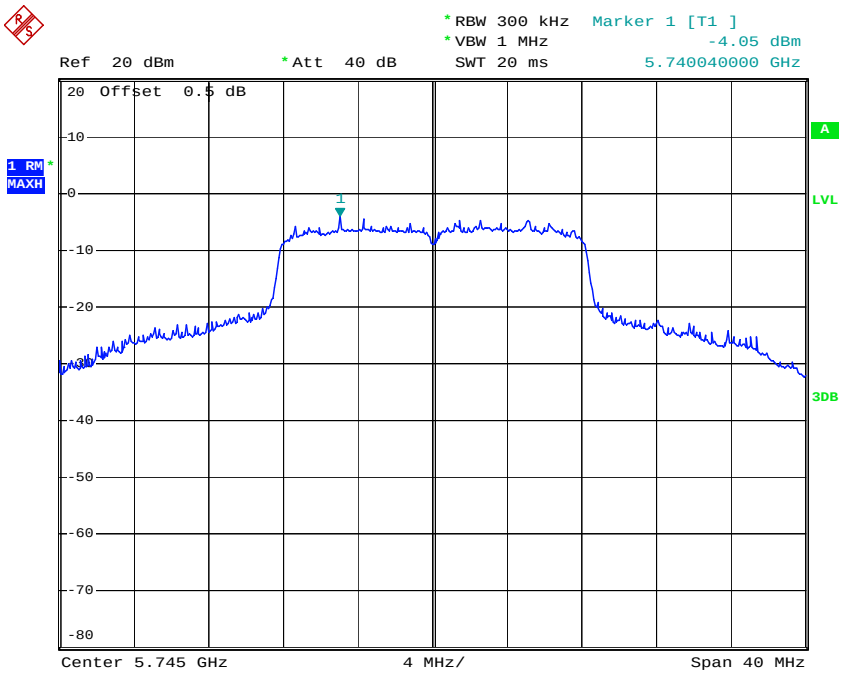
$$\text{Directional gain} = G_{ANT} + \text{Array Gain} = 5.9\text{dBi}+10*\log(2/1)=8.9\text{dBi}$$

For 5.8GHz band, If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

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

Chain 0:

802.11a Low Channel



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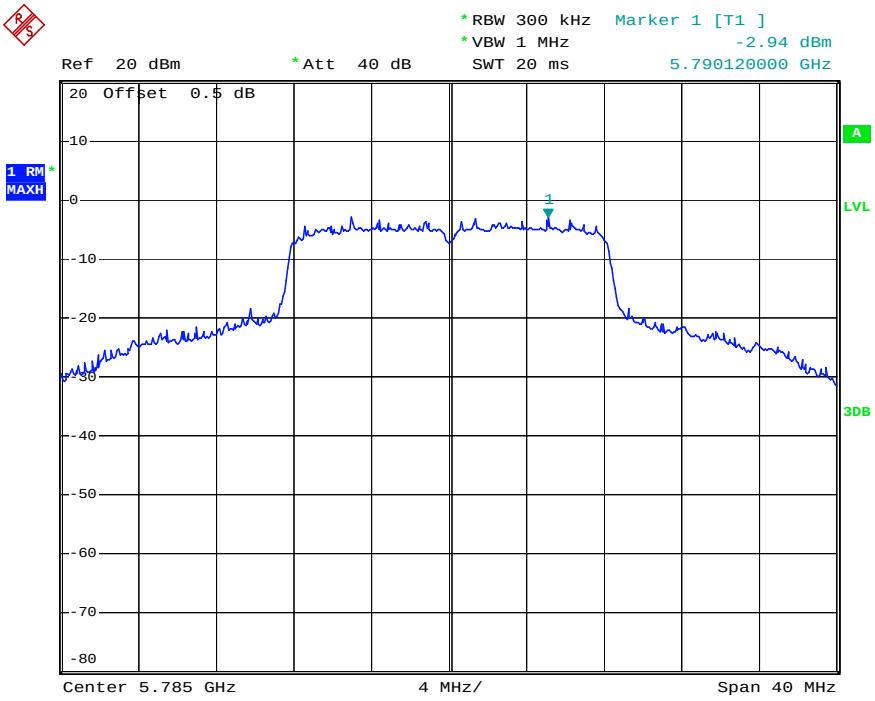
802.11a Middle Channel



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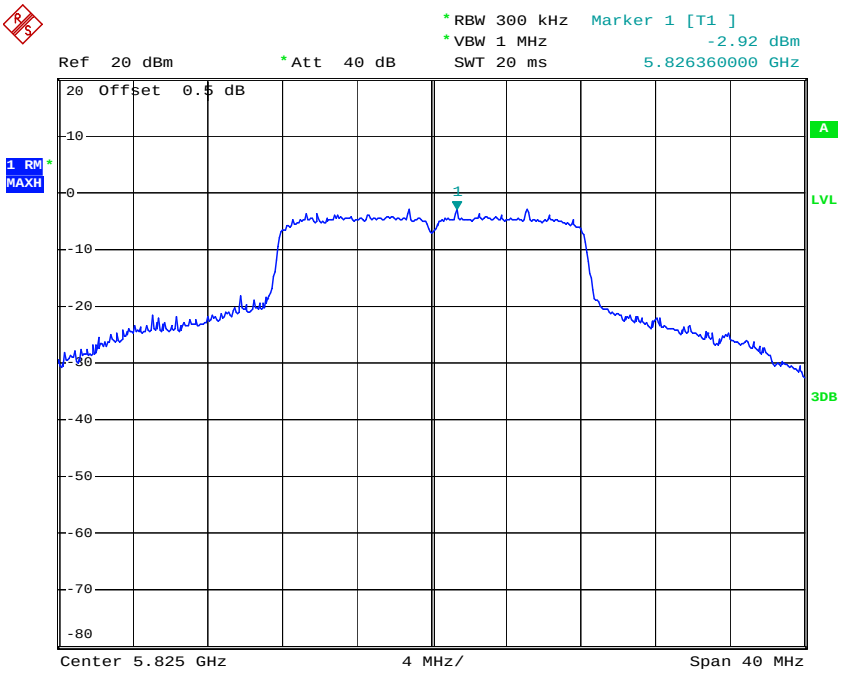
802.11a High Channel



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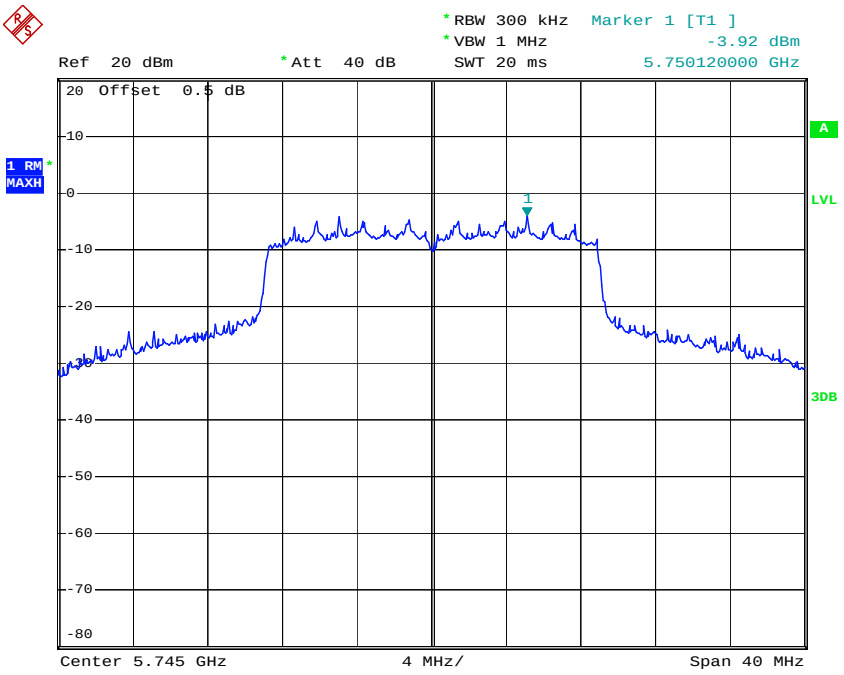
802.11n ht20 Low Channel



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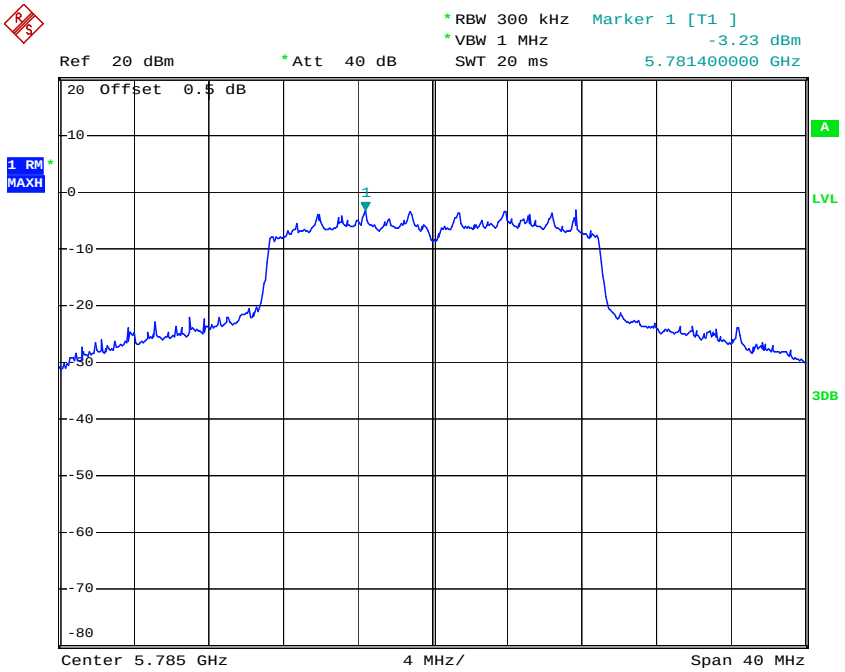

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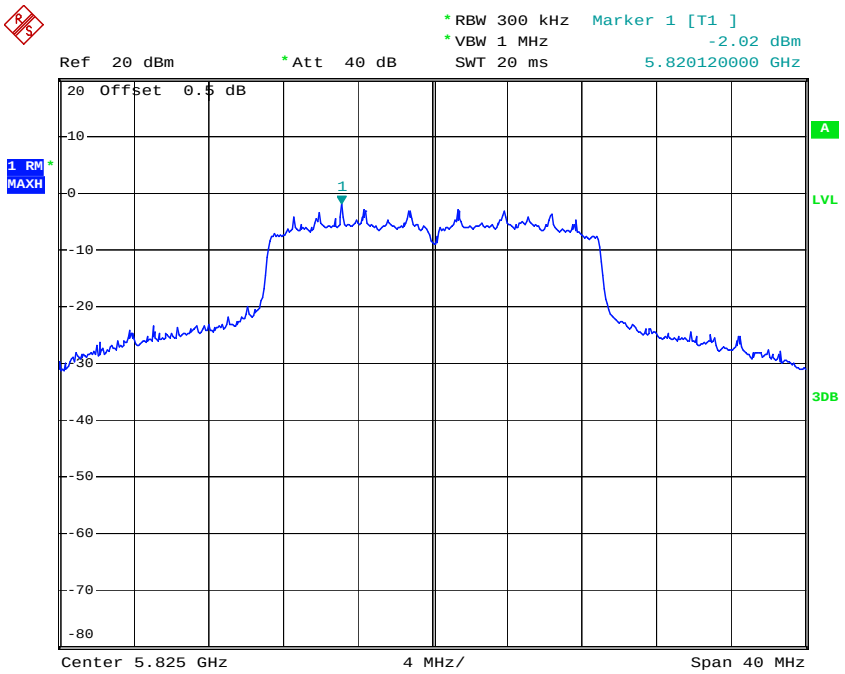

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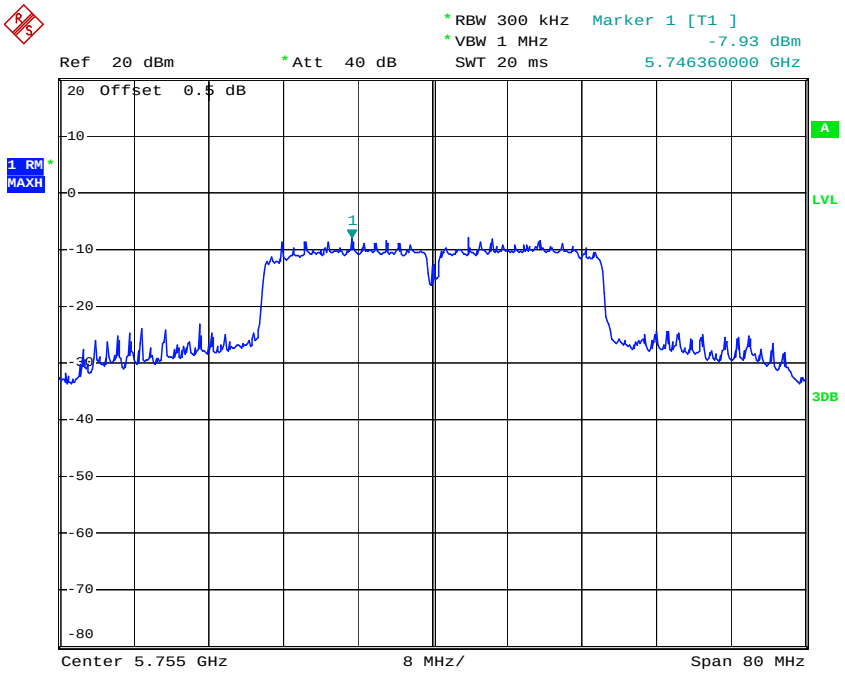

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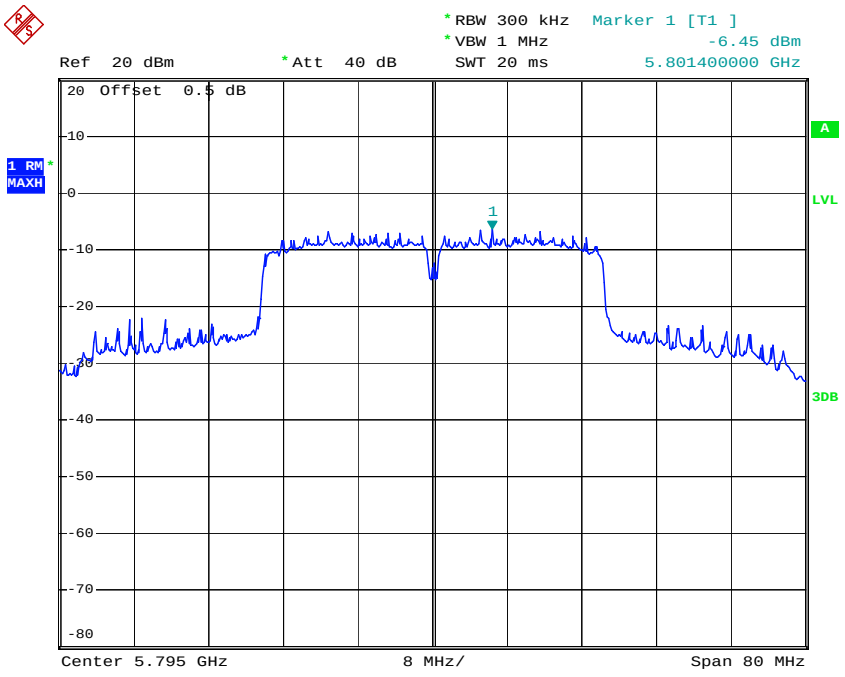
802.11n ht40 High Channel



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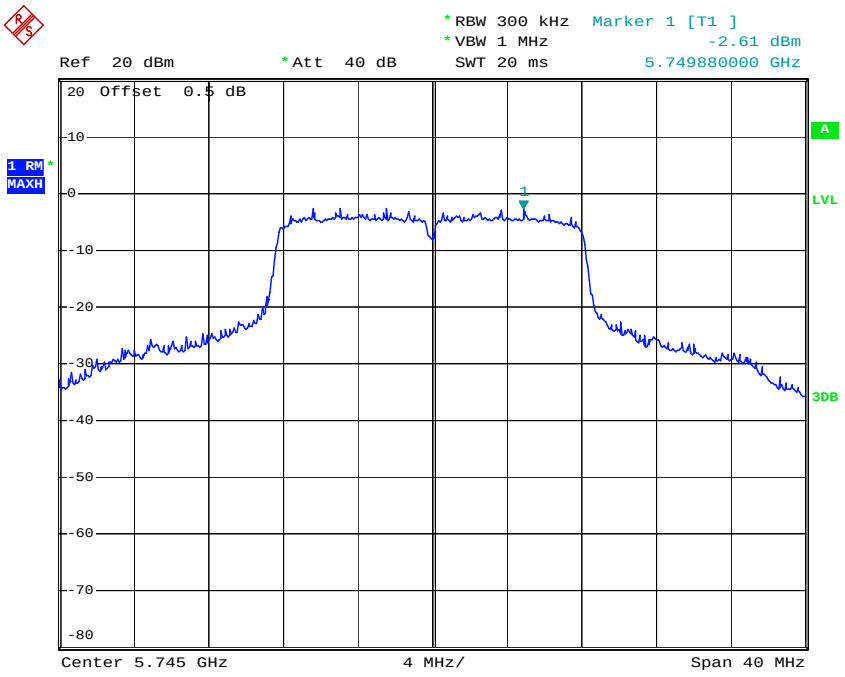
Chain 1:

802.11a Low Channel



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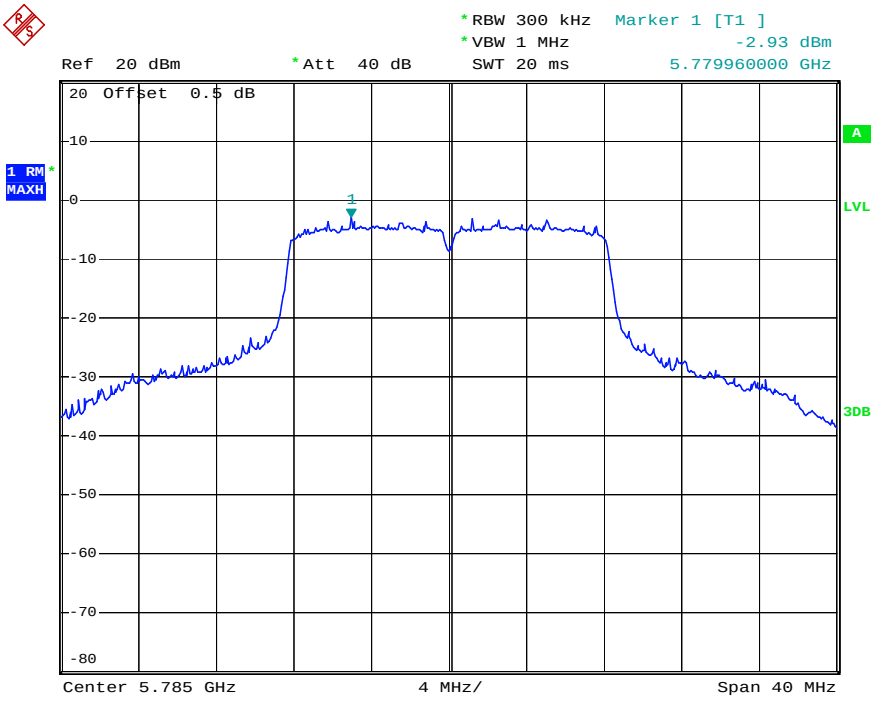
802.11a Middle Channel



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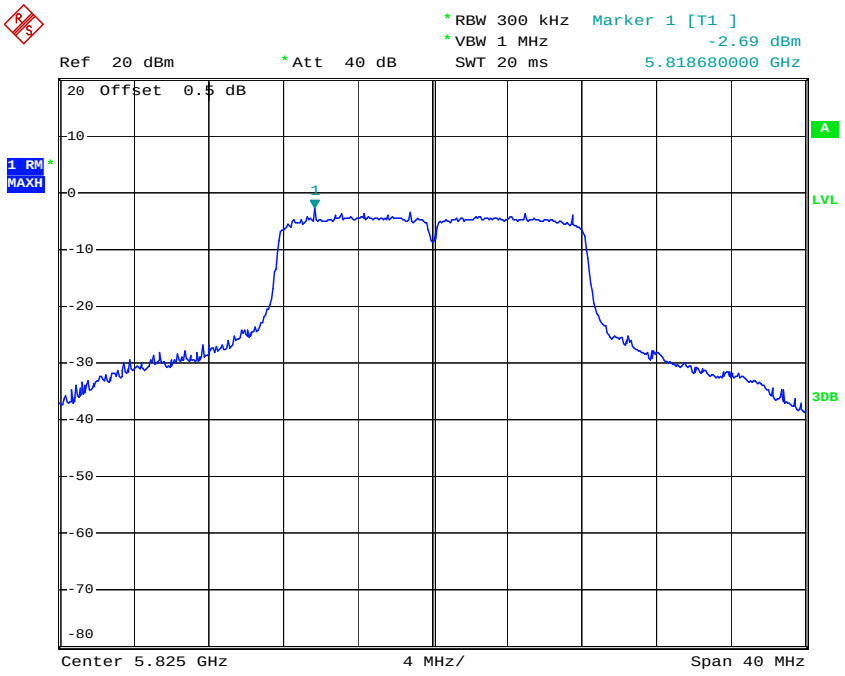
802.11a High Channel



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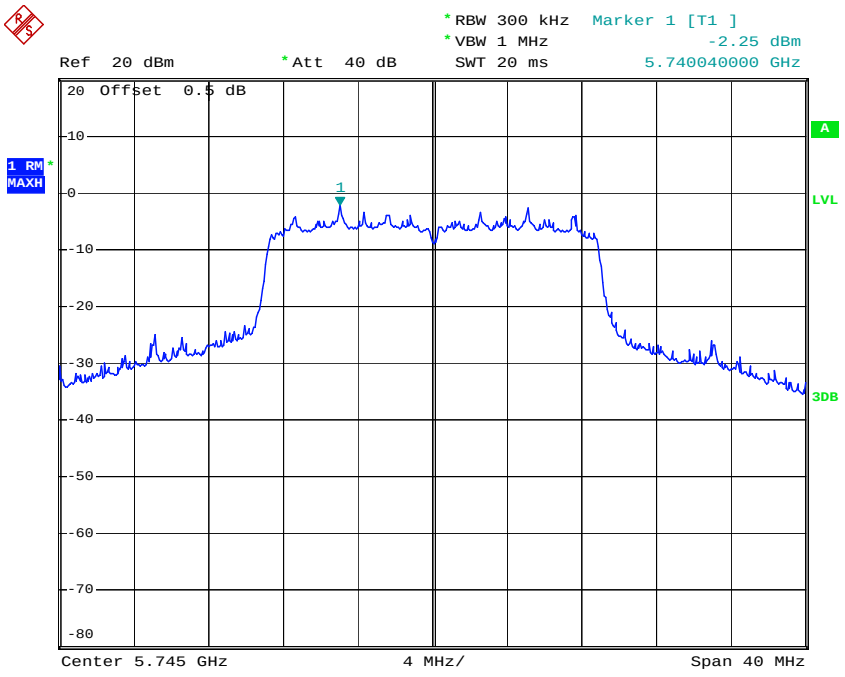

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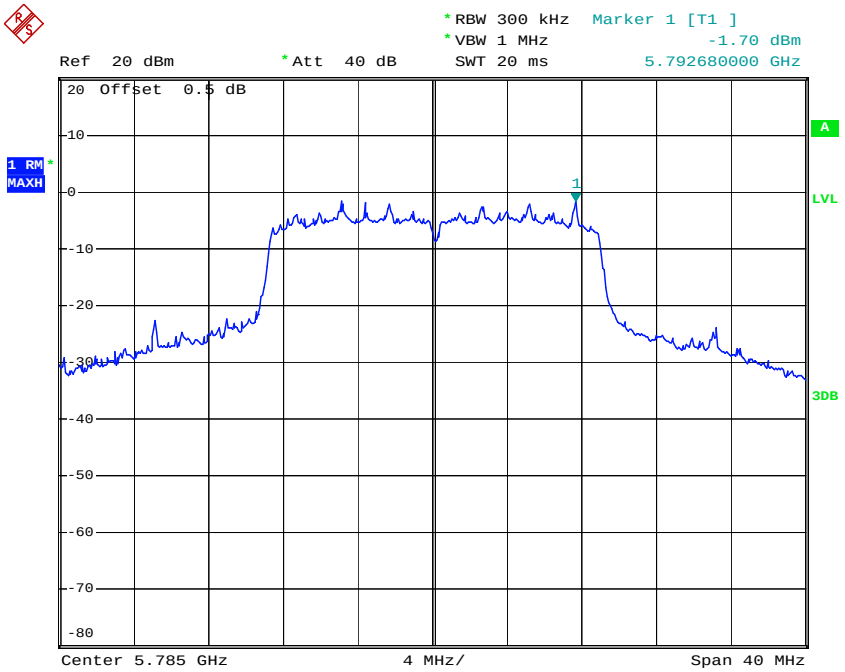

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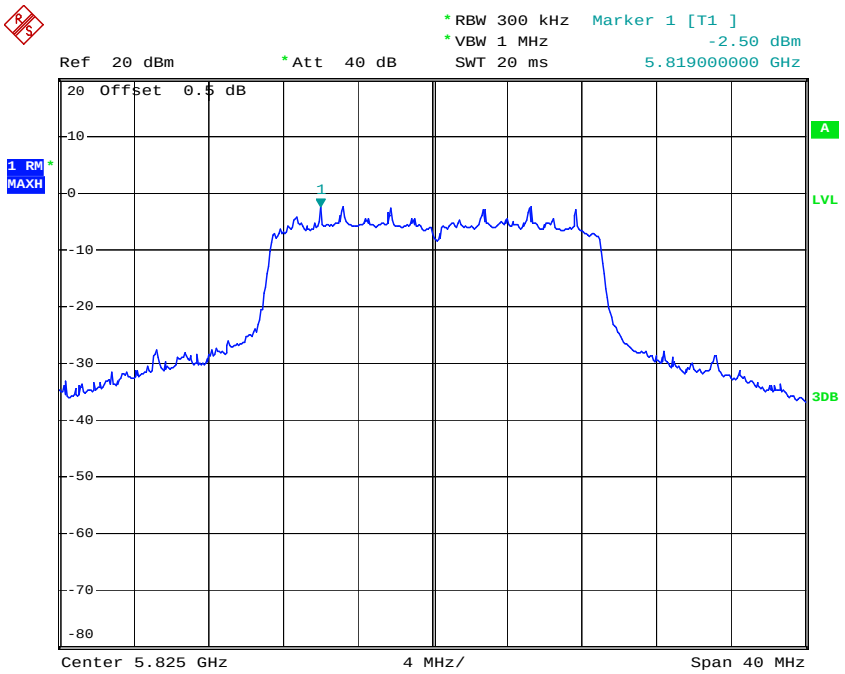

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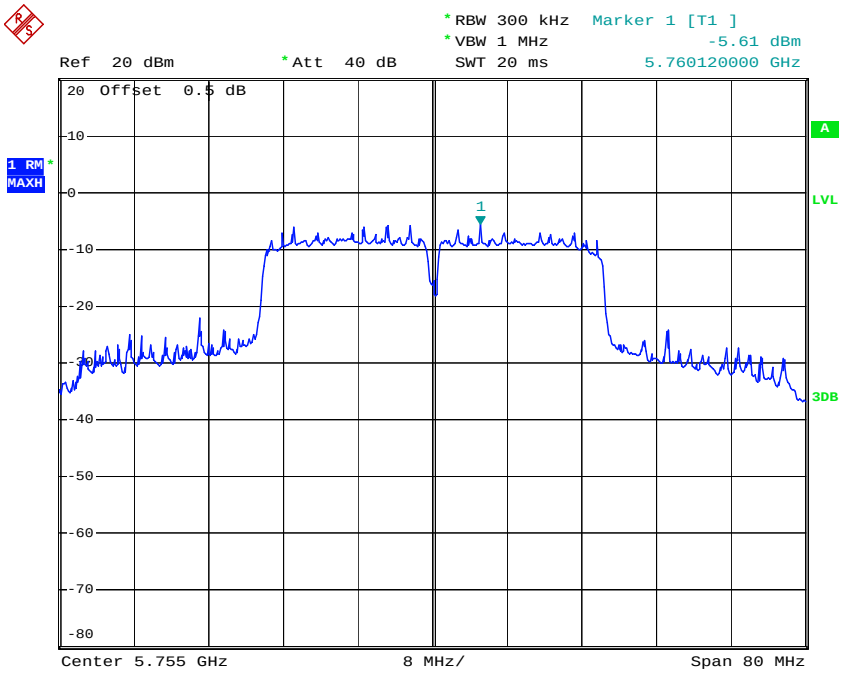
802.11n ht40 Low Channel



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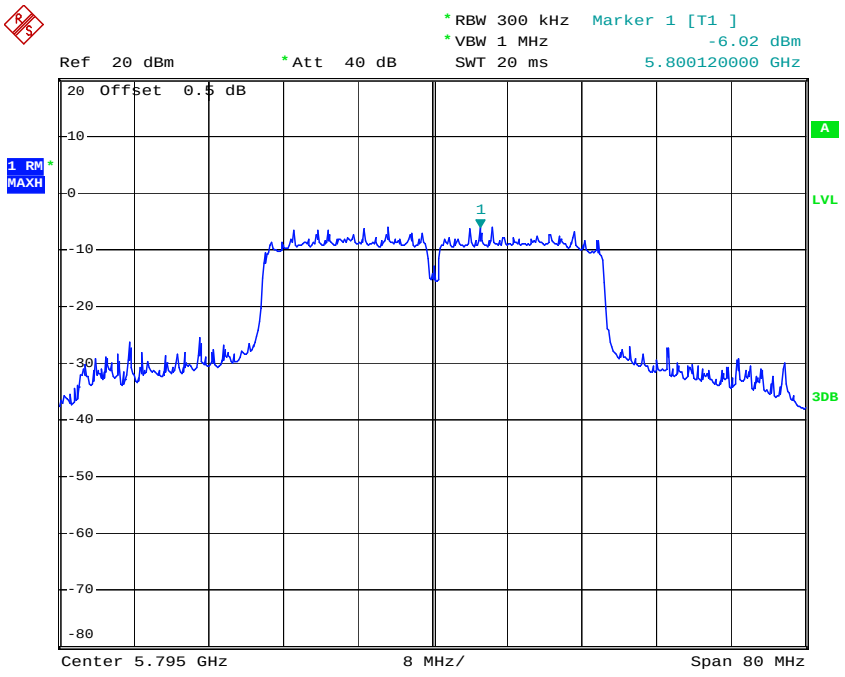
802.11n ht40 High Channel



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RSS-247 CLAUSE 6.4- ADDITIONAL REQREMENT

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.

Result

Compliance.

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):

The device operates on 5725-5850MHz, the antennas are un-detachable, and meets the EIPR limit.

******* END OF REPORT *******