

FCC PART 15.407
RSS-GEN, ISSUE 5, APRIL 2018
RSS-247, ISSUE 2, FEBRUARY 2017
TEST REPORT

For

SZ DJI TECHNOLOGY CO., LTD

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Nanshan, Shenzhen, Guangdong, China

FCC ID: SS3-P1RC1901
IC: 11805A-P1RC1901

Report Type: Original Report	Product Type: DJI FPV Remote Controller
Report Number: RDG190321008-00B	
Report Date: 2019-04-20	
Reviewed By: Allen Qiao RF Supervisor	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Type:	DJI FPV Remote Controller
EUT Name:	DJI FPV Remote Controller
EUT Model:	P1RC
FCC ID:	SS3-P1RC1901
IC:	11805A-P1RC1901
Rated Input Voltage:	7.6Vdc from battery
External Dimension:	180(L)*170mm(W)*190mm(H) (including antenna)
Serial Number:	190321008
EUT Received Date:	2019.3.22

Objective

This type approval report is prepared on behalf of **SZ DJI 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, April 2018 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, 15.207, 15.209 and 15.407 rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, April 2018 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15B JBP submissions with FCC ID: SS3-P1RC1901.

Part of system submissions with FCC ID: SS3-P1AS1901, IC: 11805A-P1AS1901.

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, April 2018 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: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~40GHz: 5.23 dB
Unwanted Emissions,conducted	±1.5 dB
Temperature	±1 °C
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)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxihu 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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device employs 1.4MHz mode. And the EUT has 2 antennas and it only supports MIMO.

For 1.4MHz mode, 124 channels are employed:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5731.50	32	5754.12	63	5784.50	94	5816.12
2	5732.50	33	5754.50	64	5786.12	95	5816.50
3	5733.12	34	5756.12	65	5786.50	96	5818.12
4	5733.50	35	5756.50	66	5788.12	97	5818.50
5	5734.12	36	5758.12	67	5788.50	98	5820.12
6	5734.50	37	5758.50	68	5790.12	99	5820.50
7	5735.12	38	5760.12	69	5790.50	100	5822.12
8	5735.50	39	5760.50	70	5792.12	101	5822.50
9	5736.12	40	5762.12	71	5792.50	102	5824.12
10	5736.50	41	5762.50	72	5794.12	103	5824.50
11	5737.12	42	5764.12	73	5794.50	104	5826.12
12	5737.50	43	5764.50	74	5796.12	105	5826.50
13	5738.12	44	5766.12	75	5796.50	106	5828.12
14	5738.50	45	5766.50	76	5798.12	107	5828.50
15	5739.12	46	5768.12	77	5798.50	108	5830.12
16	5739.50	47	5768.50	78	5800.12	109	5830.50
17	5740.12	48	5770.12	79	5800.50	110	5832.12
18	5740.50	49	5770.50	80	5802.12	111	5832.50
19	5741.12	50	5772.12	81	5802.50	112	5834.12
20	5742.12	51	5772.50	82	5804.12	113	5834.50
21	5742.50	52	5774.12	83	5804.50	114	5836.12
22	5744.12	53	5774.50	84	5806.12	115	5836.50
23	5744.50	54	5776.12	85	5806.50	116	5838.12
24	5746.12	55	5776.50	86	5808.12	117	5838.50
25	5746.50	56	5778.12	87	5808.50	118	5840.12
26	5748.12	57	5778.50	88	5810.12	119	5840.50
27	5748.50	58	5780.12	89	5810.50	120	5842.12
28	5750.12	59	5780.50	90	5812.12	121	5842.50
29	5750.50	60	5782.12	91	5812.50	122	5844.12
30	5752.12	61	5782.50	92	5814.12	123	5844.50
31	5752.50	62	5784.12	93	5814.50	124	5846.12

Test was performed with Channel: 1, 62 and 124.

Equipment Modifications

No modification was made to the EUT tested.

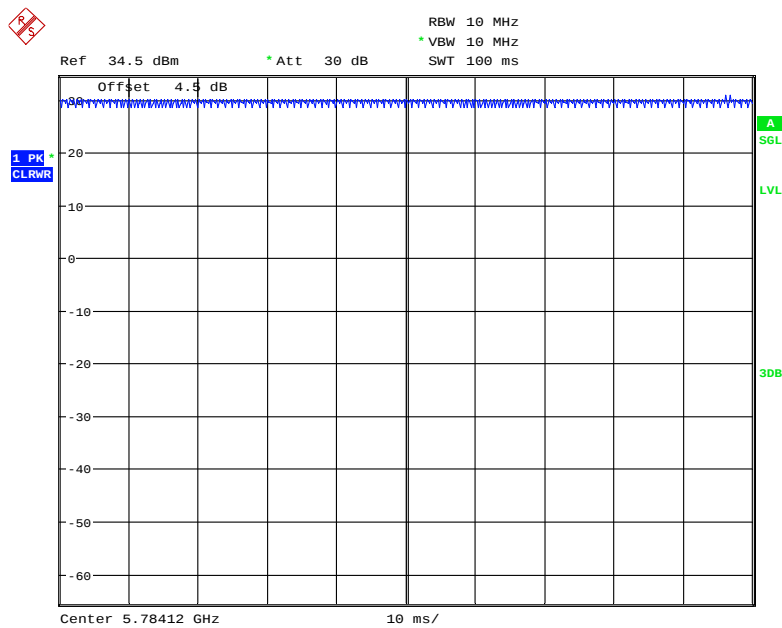
EUT Exercise Software

Test software: 'DjiSdrConsole_V1.3.5.59.exe' was used in test for SDR mode. For 1.4MHz mode, the maximum power with maximum duty cycle was configured as following setting.

Channel	Frequency	Power level	
	MHz	Chain 0	Chain 1
Low	5731.5	0	0
Middle	5784.12	-1	-1
High	5846.12	-1	-1

The duty cycle as below:

Mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle(x) (%)
1.4M	100	100	100



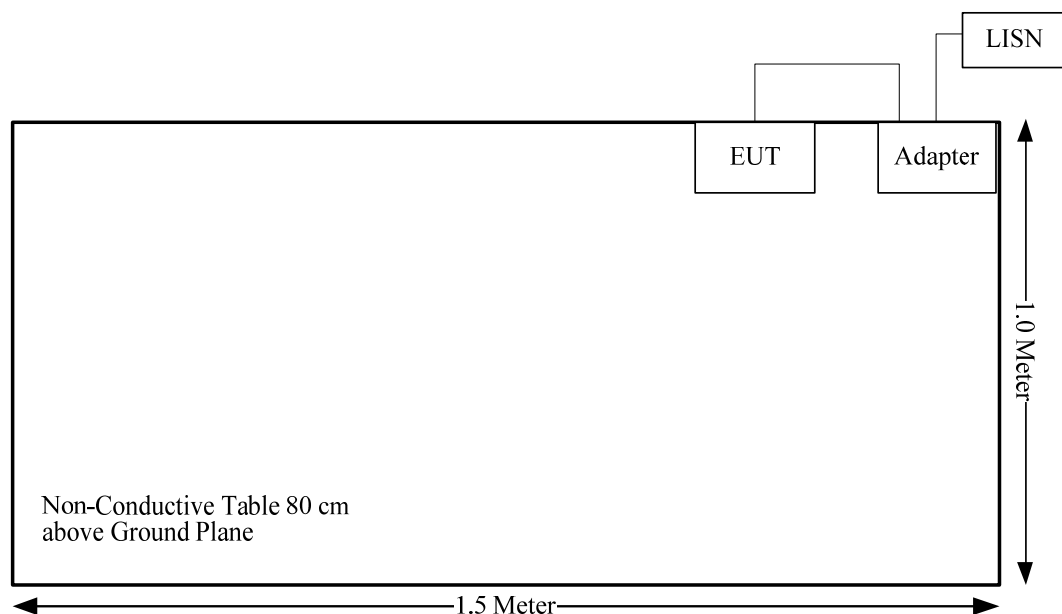
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Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Huawei	Adapter	HW050200C01	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB-C Cable	Yes	No	1.2	USB-C Port of EUT	Adapter

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093 RSS-102 Clause 4	RF Exposure	Compliance
FCC§15.203, RSS-Gen Clause 6.8	Antenna Requirement	Compliance
FCC§15.407(b)(6)& §15.207(a), RSS-Gen Clause 8.8	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

FCC §15.247 (I) & §1.1310 & §2.1093, RSS-102 CLAUSE 4- RF EXPOSURE**Applicable Standard**

According to §15.247(i), §1.1310 and §2.1093.

According to RSS-102 Clause 4 Table 3, SAR limits for device used by the general public

Body Region	Average SAR (W/Kg)	Averaging Time (minutes)	Mass Average (g)
Whole Body	0.08	6	Whole Body
Localized Head, Neck and Trunk	1.6	6	1
Localized Limbs	4	6	10

Test Result

Compliant, please refer to the SAR report: RDG190321008-20.

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 Information And Connector Construction

The EUT has 2 integral antennas attached to the unit, fulfill the requirement of the item. Please refer to the internal photos.

Chain	Manufacturer	Model Number	Antenna Type	Connector Type	input impedance (Ohm)	Antenna Gain /Frequency
0	DJI	WM150 RC Ant	Dipole	IPEX	50	4.56dBi
1	DJI	WM150 RC Ant	Dipole	IPEX	50	4.56dBi

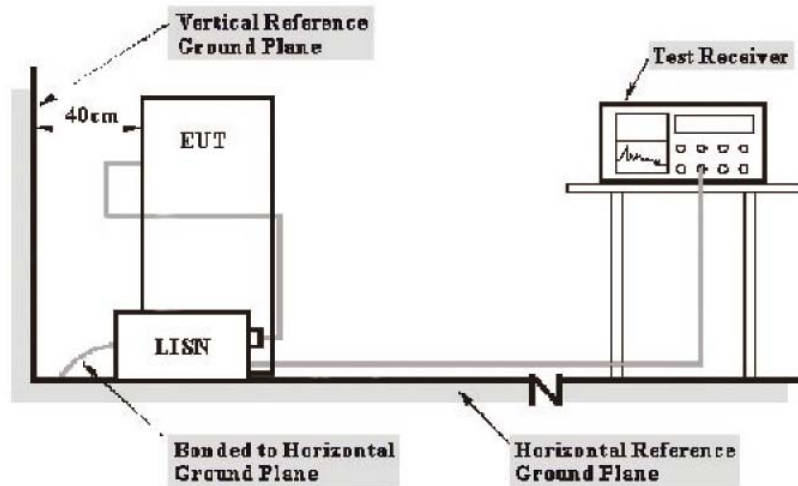
Result: Compliance.

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 30 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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2018-12-11	2019-12-11
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2018-09-05	2019-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2018-12-08	2019-12-08

* **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 adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

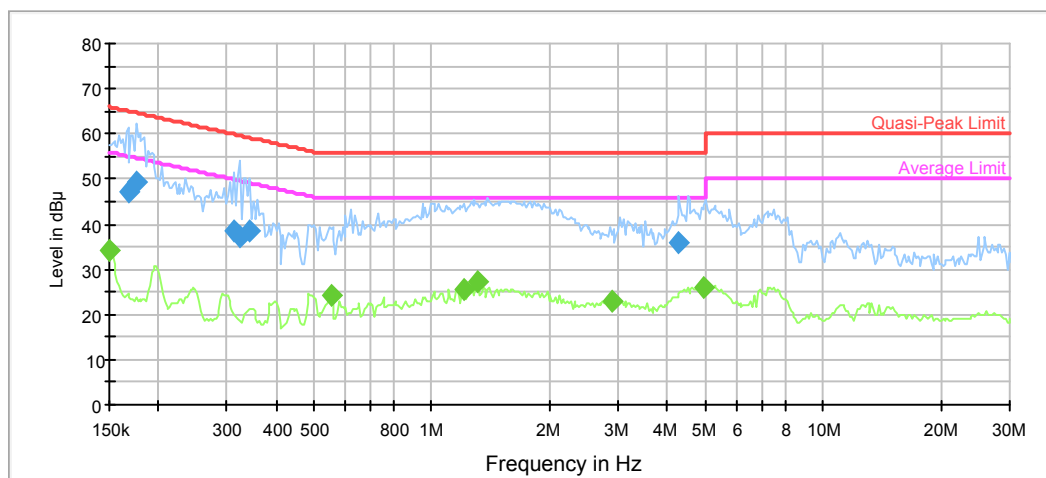
Test Data**Environmental Conditions**

Temperature:	26.5°C
Relative Humidity:	60 %
ATM Pressure:	100.3 kPa

The testing was performed by Lily Xie on 2019-03-22.

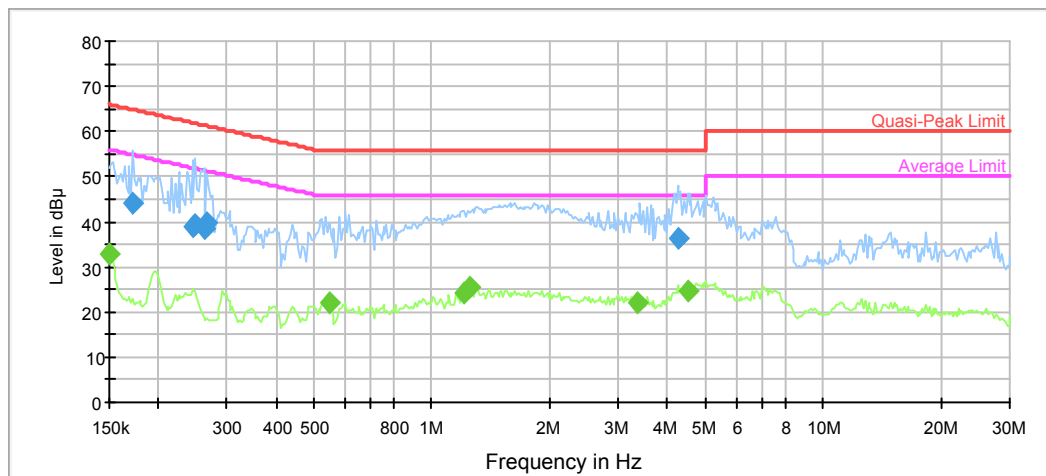
Test Mode: Transmitting

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167350	47.1	9.000	L1	10.9	18.0	65.1	Compliance
0.175887	49.3	9.000	L1	10.8	15.4	64.7	Compliance
0.313237	38.6	9.000	L1	10.1	21.3	59.9	Compliance
0.322729	37.1	9.000	L1	10.1	21.5	59.6	Compliance
0.342583	38.5	9.000	L1	10.0	20.6	59.1	Compliance
4.289380	35.9	9.000	L1	9.8	20.1	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	34.3	9.000	L1	11.2	21.7	56.0	Compliance
0.552321	24.1	9.000	L1	9.8	21.9	46.0	Compliance
1.212216	25.5	9.000	L1	9.8	20.5	46.0	Compliance
1.312656	27.2	9.000	L1	9.8	18.8	46.0	Compliance
2.880975	22.9	9.000	L1	9.8	23.1	46.0	Compliance
4.930532	26.0	9.000	L1	9.8	20.0	46.0	Compliance

AC120 V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.172421	44.0	9.000	N	10.9	20.8	64.8	Compliance
0.244252	39.1	9.000	N	10.3	22.9	62.0	Compliance
0.249162	39.3	9.000	N	10.3	22.5	61.8	Compliance
0.261872	38.7	9.000	N	10.3	22.7	61.4	Compliance
0.267135	39.6	9.000	N	10.3	21.6	61.2	Compliance
4.246911	36.2	9.000	N	9.8	19.8	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	32.8	9.000	N	11.2	23.2	56.0	Compliance
0.546852	22.0	9.000	N	9.8	24.0	46.0	Compliance
1.212216	24.2	9.000	N	9.8	21.8	46.0	Compliance
1.248947	25.4	9.000	N	9.8	20.6	46.0	Compliance
3.344723	22.1	9.000	N	9.8	23.9	46.0	Compliance
4.508181	24.7	9.000	N	9.8	21.3	46.0	Compliance

**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:

(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.

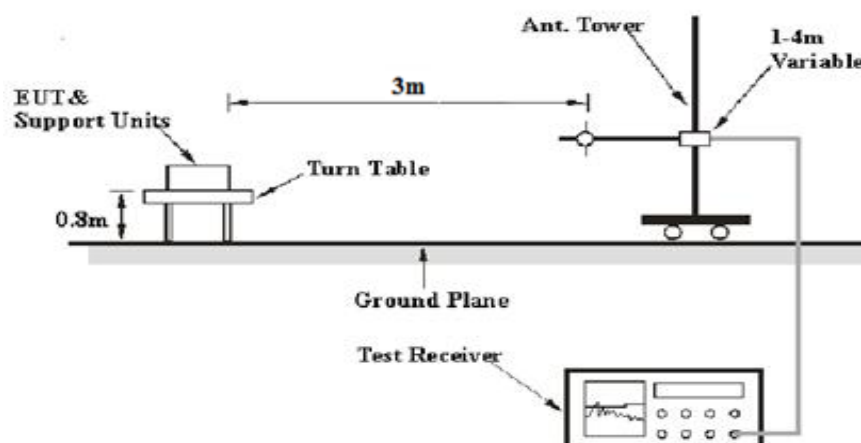
According to RSS-247 Clause 6.2**Frequency band 5725-5850 MHz****6.2.4.2 Unwanted emission limits**

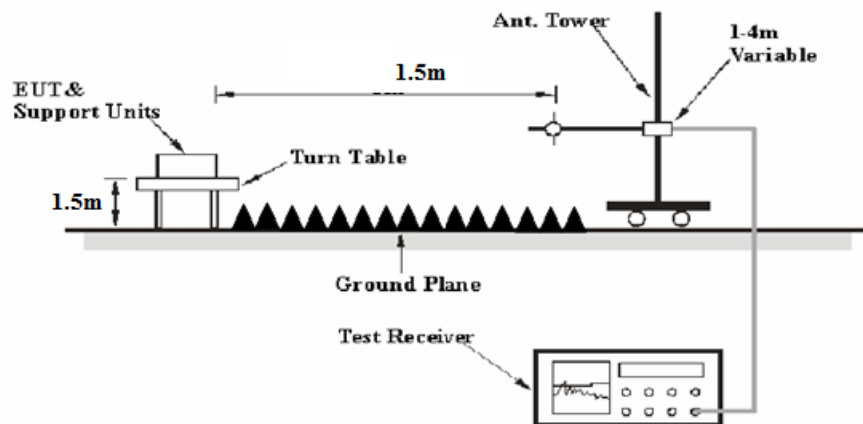
Devices operating in the band 5725-5850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with 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:

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

EUT Setup**Below 1 GHz:**

1-40 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 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: $E [dB\mu V/m] = EIRP[dBm] + 95.2$, 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 $= 20 \log(\text{specific distance } [3m] / \text{test distance } [1.5m])$ dB = 6.02 dB

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

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

For the range 1GHz-40GHz, Test performed at 1.5m, 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:

Extrapolation result

$$= \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain} - \text{Distance extrapolation factor}$$

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:

$$\text{Margin} = \text{Limit} - \text{Extrapolation result}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
R&S	EMI Test Receiver	ESCI	100224	2018-12-10	2019-12-10
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2018-05-06	2019-05-06
HP	Amplifier	8447D	2727A05902	2018-09-05	2019-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-01-04	2020-01-04
R&S	Spectrum Analyzer	FSP 38	100478	2018-12-08	2019-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2018-06-27	2019-06-27
MITEQ	Amplifier	AFS42-00101800- 25-S-42	2001271	2018-09-05	2019-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN- 0899-003	0899003	2018-05-06	2019-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2018-06-16	2019-06-16

* **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

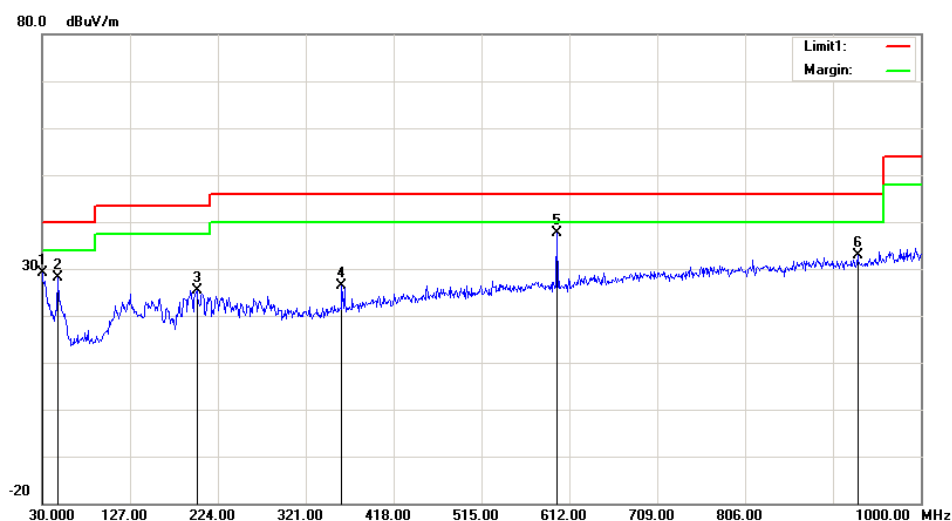
Temperature:	23.5~24.6 °C
Relative Humidity:	49~64%
ATM Pressure:	100.6~101.5kPa

* The testing was performed by Elena Lei, Neil Liao, Tyler Pan from 2019-03-25 to 2019-04-05.

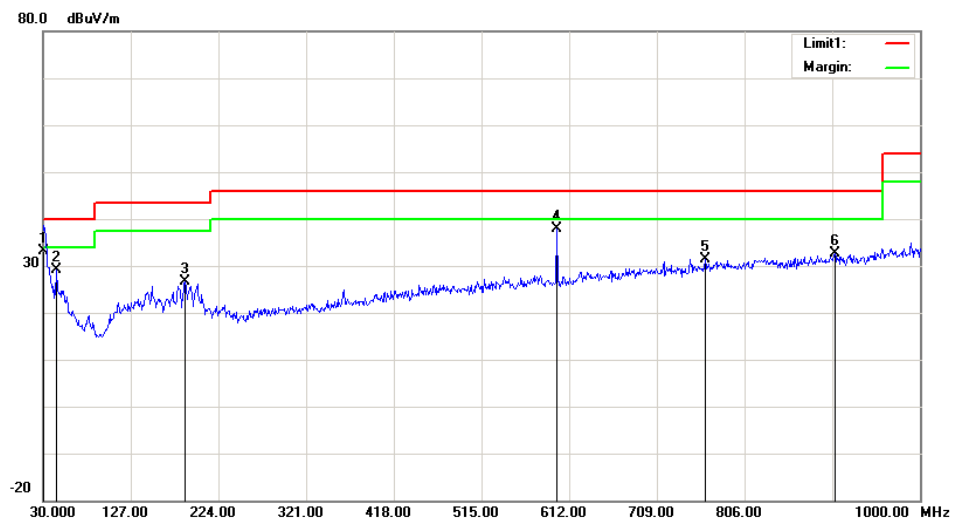
Test Mode: Transmitting

1) 30MHz-1GHz (low channel was the worst)

Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	27.52	peak	1.72	29.24	40.00	10.76
47.4600	38.42	peak	-10.36	28.06	40.00	11.94
200.7200	31.36	peak	-5.88	25.48	43.50	18.02
360.7700	29.22	peak	-2.80	26.42	46.00	19.58
598.4200	36.55	peak	0.97	37.52	46.00	8.48
930.1600	36.42	peak	-3.51	32.91	46.00	13.09

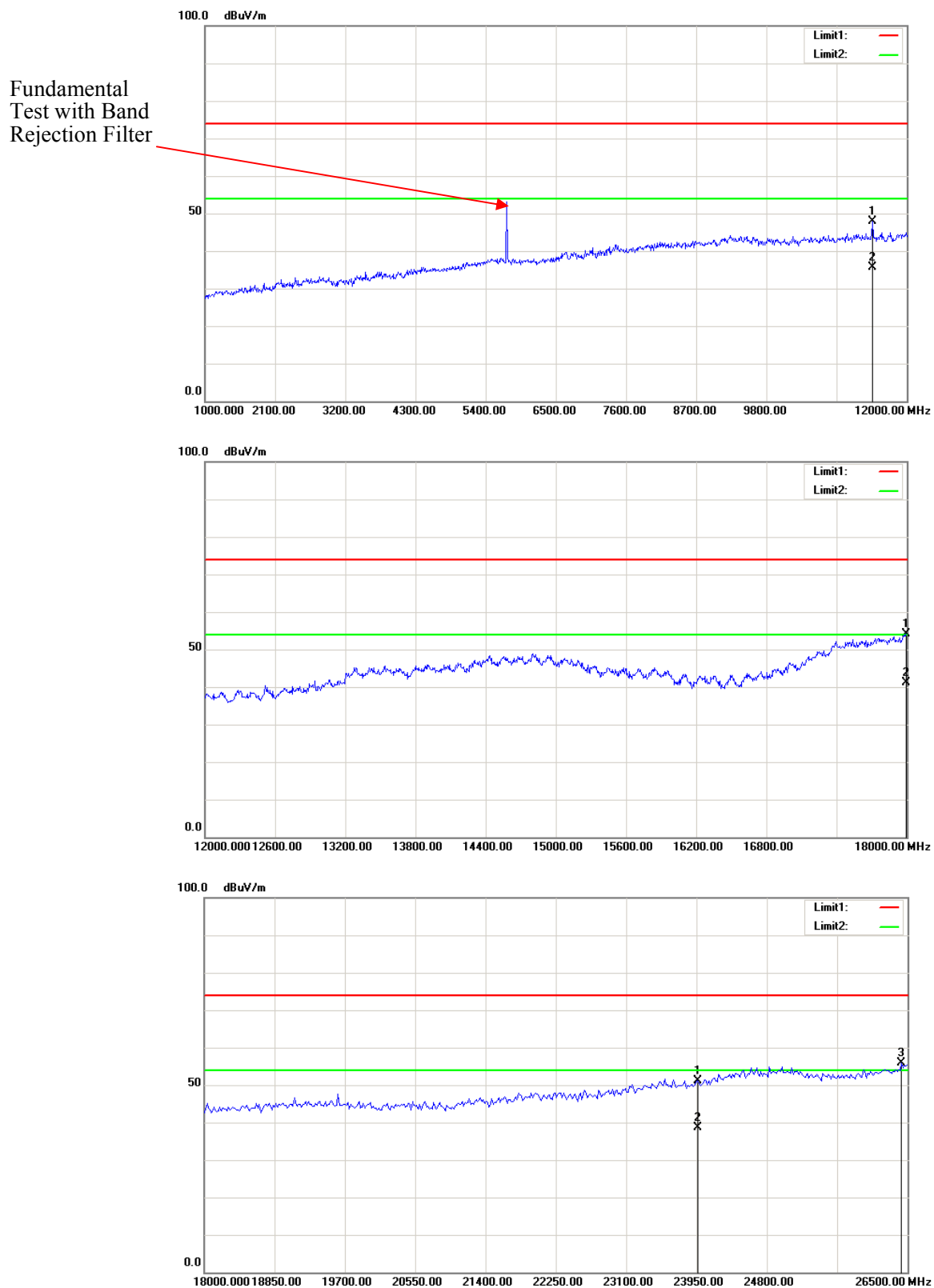
Vertical

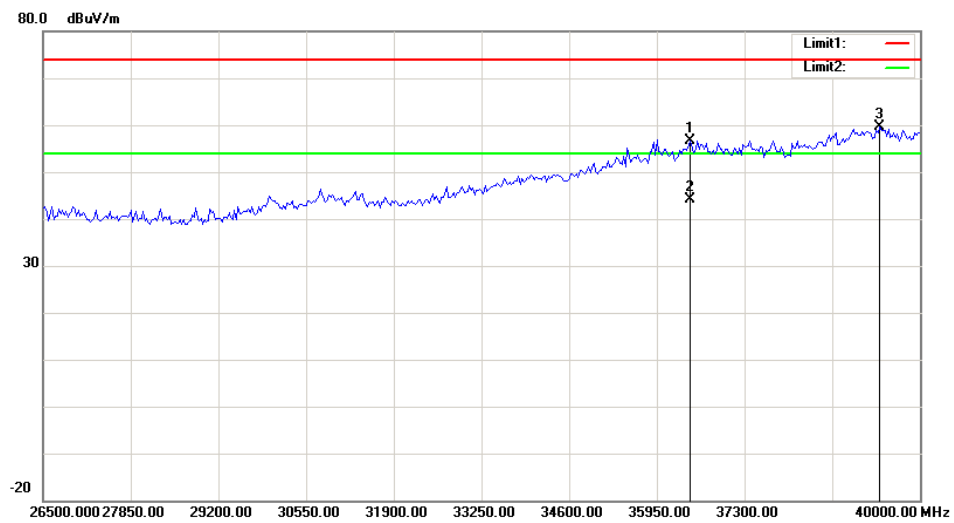
Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	32.19	QP	0.91	33.10	40.00	6.90
44.5500	38.11	peak	-8.96	29.15	40.00	10.85
187.1400	33.91	peak	-7.29	26.62	43.50	16.88
598.4200	36.96	peak	0.97	37.93	46.00	8.07
762.3500	27.41	peak	4.06	31.47	46.00	14.53
905.9100	36.28	peak	-3.76	32.52	46.00	13.48

2) 1GHz-40GHz:**1.4MHz Mode :**

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: 5731.5 MHz										
5731.50	82.84	PK	H	34.19	3.69	0.00	120.72	114.7	N/A	N/A
5731.50	73.64	AV	H	34.19	3.69	0.00	111.52	105.5	N/A	N/A
5731.50	95.96	PK	V	34.19	3.69	0.00	133.84	127.82	N/A	N/A
5731.50	86.90	AV	V	34.19	3.69	0.00	124.78	118.76	N/A	N/A
5725.00	38.45	PK	V	34.19	3.69	0.00	76.33	70.31	122.20	51.89
5720.00	35.21	PK	V	34.19	3.69	0.00	73.09	67.07	110.80	43.73
5700.00	28.68	PK	V	34.18	3.68	0.00	66.54	60.52	105.20	44.68
5650.00	28.63	PK	V	34.16	3.63	0.00	66.42	60.4	68.20	7.80
11463.00	46.75	PK	V	38.96	6.59	37.34	54.96	48.94	74.00	25.06
11463.00	34.36	AV	V	38.96	6.59	37.34	42.57	36.55	54.00	17.45
17194.50	48.53	PK	V	41.33	8.77	38.63	60.00	53.98	68.20	14.22
Middle Channel: 5784.12 MHz										
5784.12	80.46	PK	H	34.21	3.71	0.00	118.38	112.36	N/A	N/A
5784.12	71.33	AV	H	34.21	3.71	0.00	109.25	103.23	N/A	N/A
5784.12	93.35	PK	V	34.21	3.71	0.00	131.27	125.25	N/A	N/A
5784.12	84.01	AV	V	34.21	3.71	0.00	121.93	115.91	N/A	N/A
11568.24	46.40	PK	V	39.00	6.61	37.44	54.57	48.55	74.00	25.45
11568.24	33.86	AV	V	39.00	6.61	37.44	42.03	36.01	54.00	17.99
17352.36	48.36	PK	V	42.24	8.81	38.52	60.89	54.87	68.20	13.33
High Channel: 5846.12 MHz										
5846.12	80.36	PK	H	34.24	3.75	0.00	118.35	112.33	N/A	N/A
5846.12	71.22	AV	H	34.24	3.75	0.00	109.21	103.19	N/A	N/A
5846.12	93.18	PK	V	34.24	3.75	0.00	131.17	125.15	N/A	N/A
5846.12	84.10	AV	V	34.24	3.75	0.00	122.09	116.07	N/A	N/A
5850.00	42.60	PK	V	34.24	3.75	0.00	80.59	74.57	122.20	47.63
5855.00	35.68	PK	V	34.24	3.75	0.00	73.67	67.65	110.80	43.15
5875.00	28.12	PK	V	34.25	3.77	0.00	66.14	60.12	105.20	45.08
5925.00	18.06	PK	V	34.27	3.80	0.00	56.13	50.11	68.20	18.09
11692.24	46.41	PK	V	39.00	6.65	37.58	54.48	48.46	74.00	25.54
11692.24	33.87	AV	V	39.00	6.65	37.58	41.94	35.92	54.00	18.08
17538.36	48.25	PK	V	43.34	8.85	38.38	62.06	56.04	68.20	12.16

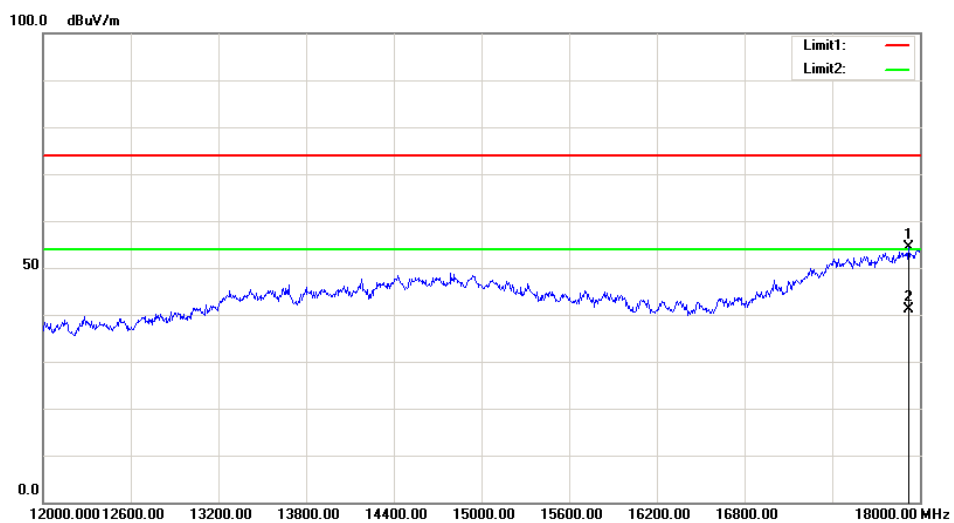
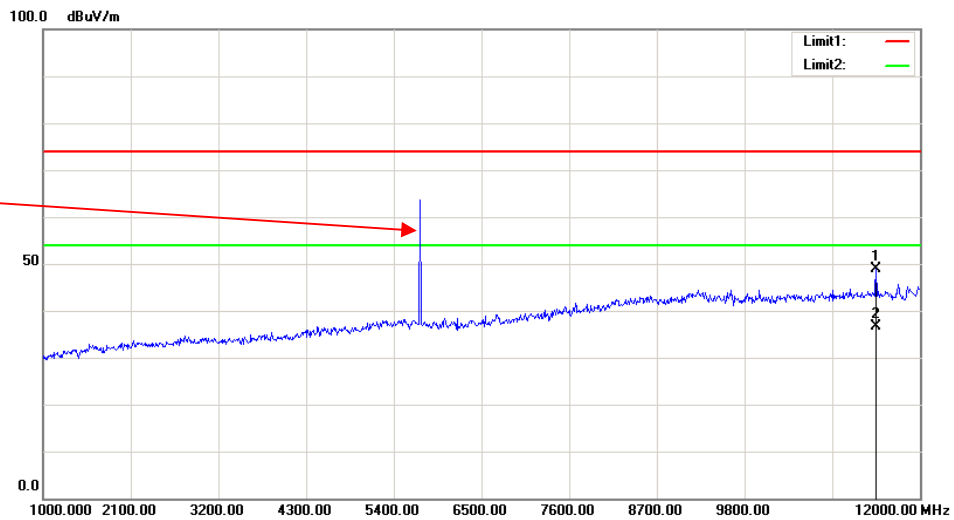
Test Plots (*low channel was the worst*)
Horizontal

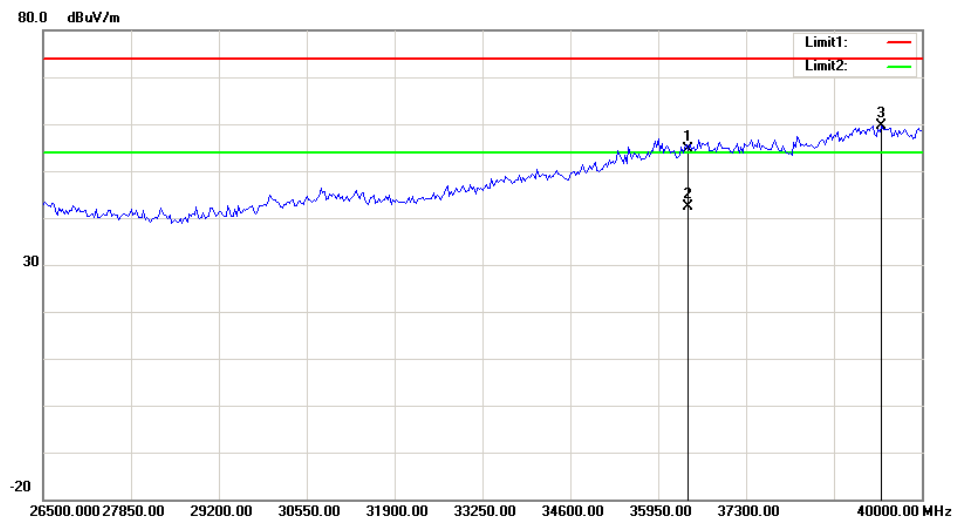
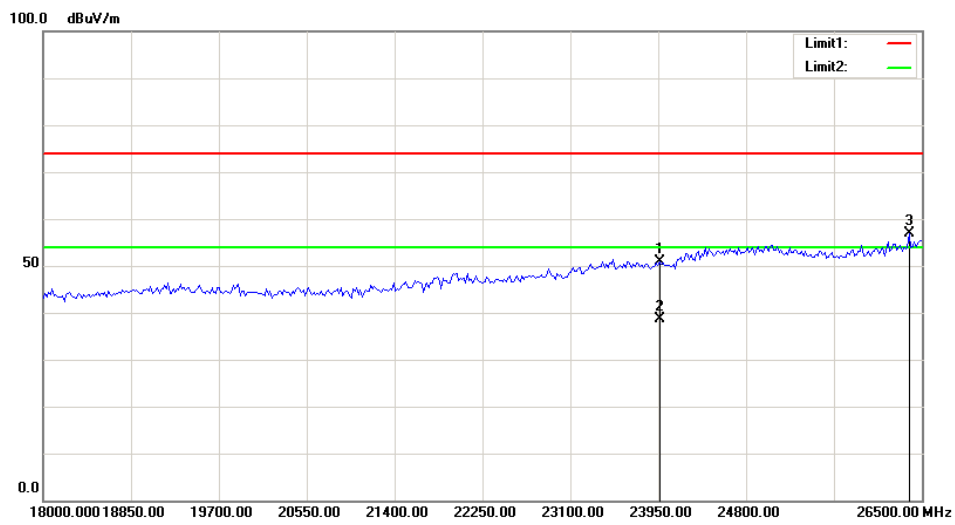




Vertical

Fundamental
Test with Band
Rejection Filter





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	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	24.6 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

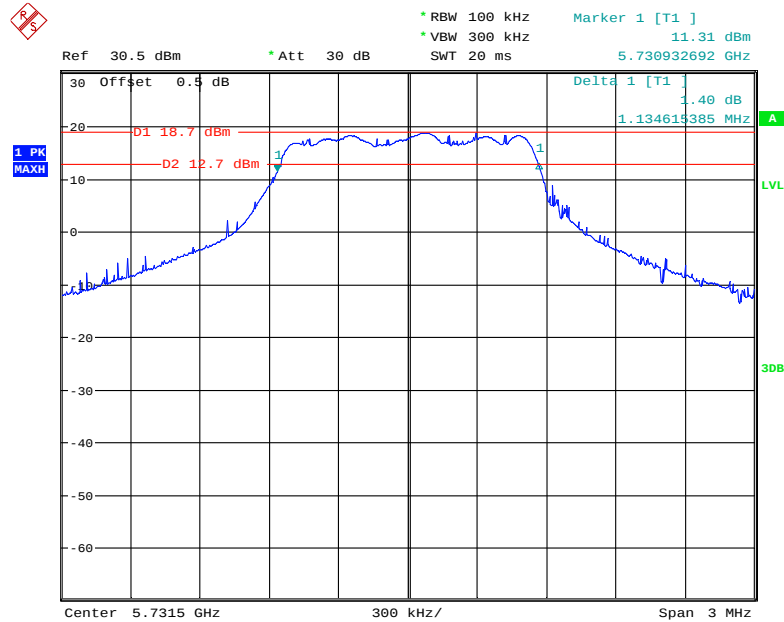
* The testing was performed by Elena Lei from 2019-03-25.

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

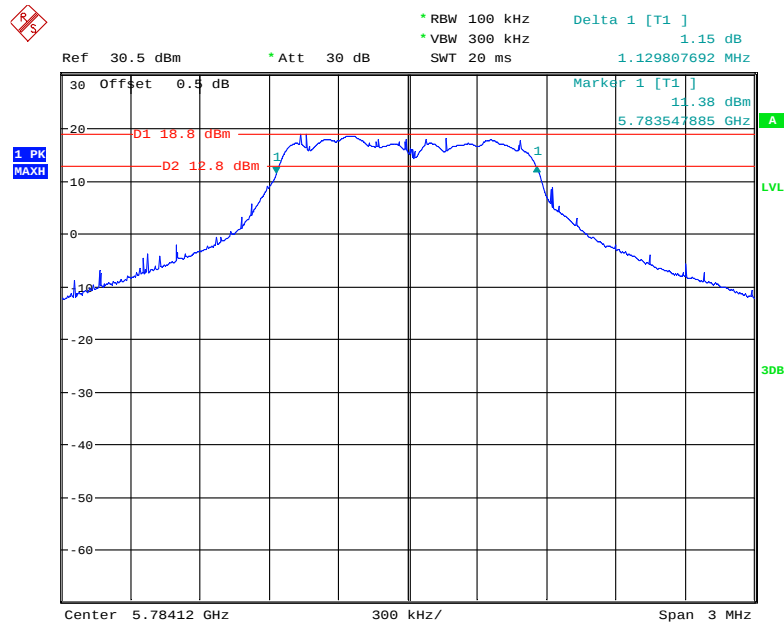
Test mode: Transmitting (Test performed at Chain 0)

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	6 dB Emission Bandwidth Limis (MHz)
1.4M	5731.50	1.135	1.197	≥0.5
	5784.12	1.130	1.197	≥0.5
	5846.12	1.135	1.197	≥0.5

Note: the 99% Occupied Bandwidth has not fallen into the band 5470-5725MHz.

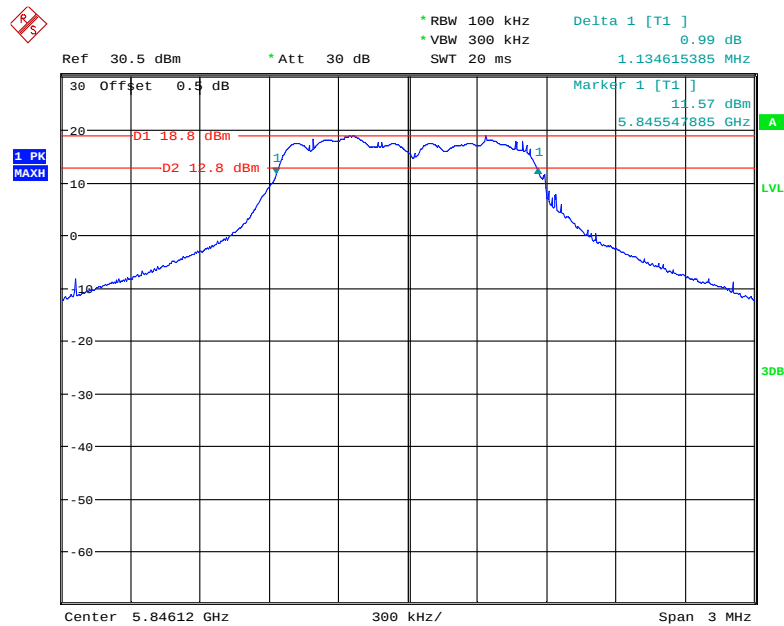
6dB Emission Bandwidth:**1.4M Low Channel**

Date: 25.MAR.2019 14:33:09

1.4M Middle Channel

Date: 25.MAR.2019 14:34:57

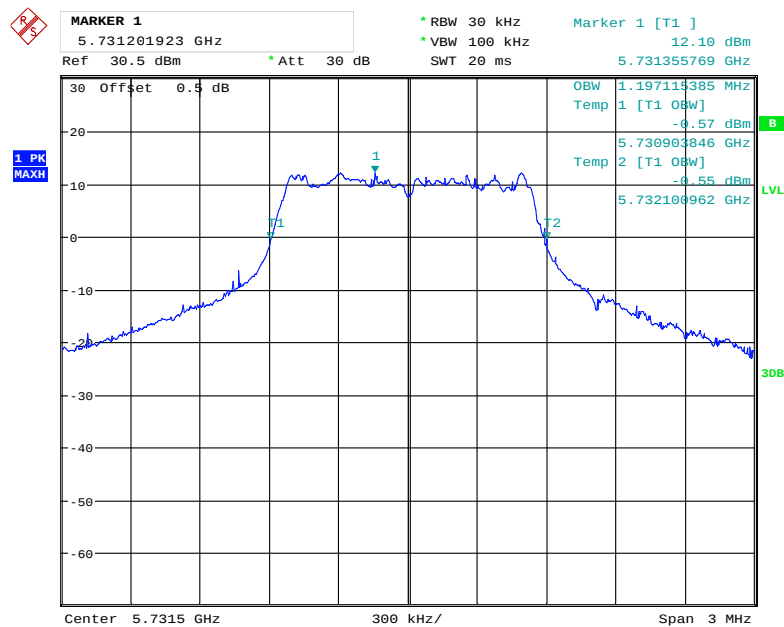
1.4M High Channel



Date: 25.MAR.2019 14:47:56

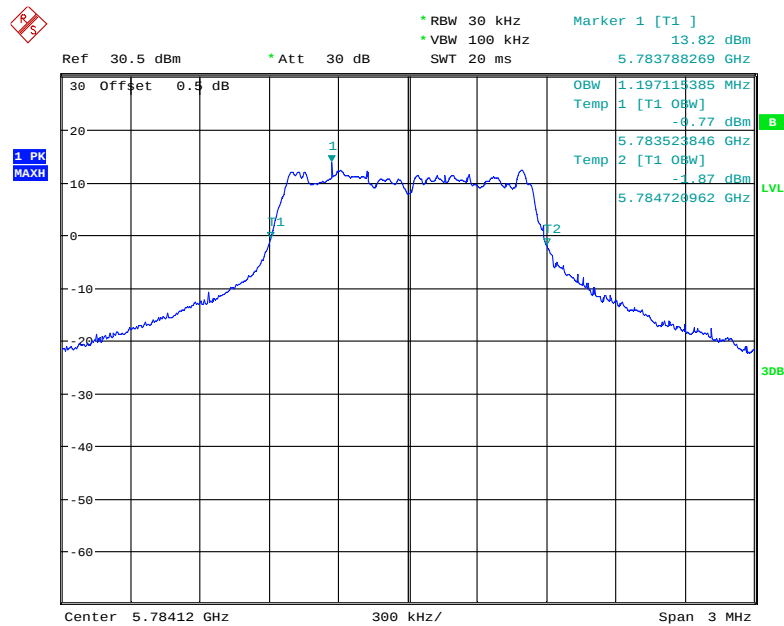
99% Occupied Bandwidth:

1.4M High Channel



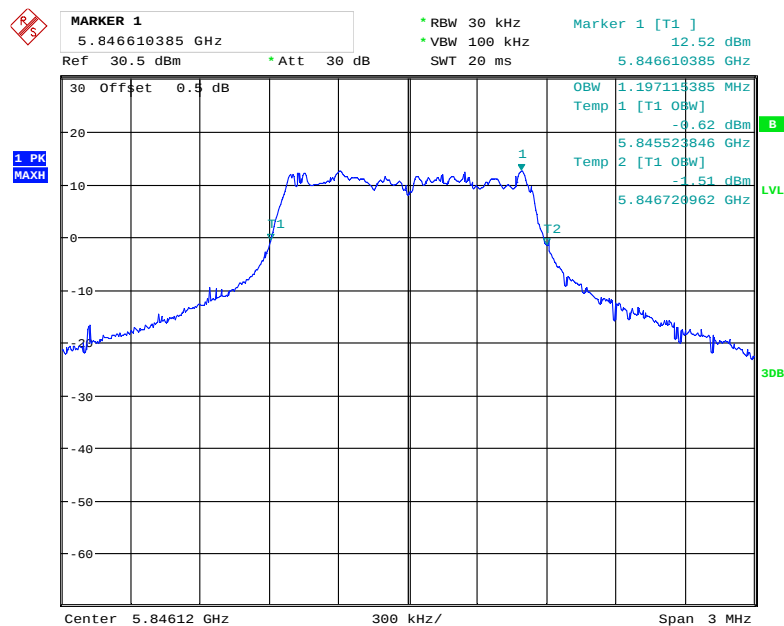
Date: 25.MAR.2019 14:49:34

1.4M Middle Channel



Date: 25.MAR.2019 14:36:15

1.4M High Channel



Date: 25.MAR.2019 14:48:20

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

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(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 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-multipoint³ 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
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2018-12-10	2019-12-10
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	24.6 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

* The testing was performed by Elena Lei from 2019-03-25.

Test Mode: Transmitting

Mode	Frequency (MHz)	Conducted Average Output Power (dBm)			Limit (dBm)	Result
		Chain 0	Chain 1	Total		
1.4MHz	5731.5	20.21	21.10	23.69	30	PASS
	5784.12	20.20	21.20	23.74	30	PASS
	5846.12	20.24	21.24	23.78	30	PASS

Note:

The duty cycle was calculated into the reading already.

The maximum antenna gain is 4.56dBi 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 measurements on IEEE 802.11 devices:

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

So:

Directional gain = $G_{ANT} + \text{Array Gain} = 4.56 \text{ dBi} < 6 \text{ dBi}$

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

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(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 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-multipoint³ 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	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	24.6 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

* The testing was performed by Elena Lei from 2019-03-25.

Test Result: Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Result (dBm/300kHz)			Total PSD (dBm/500kHz)	Limit (dBm/500kHz)
		Chain 0	Chain 1	Total		
Low	5731.50	17.17	17.67	20.44	22.66	28.44
Middle	5784.12	17.29	17.36	20.34	22.56	
High	5846.12	17.67	17.73	20.71	22.93	

Note 1: The maximum antenna gain is 4.56dBi 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:

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

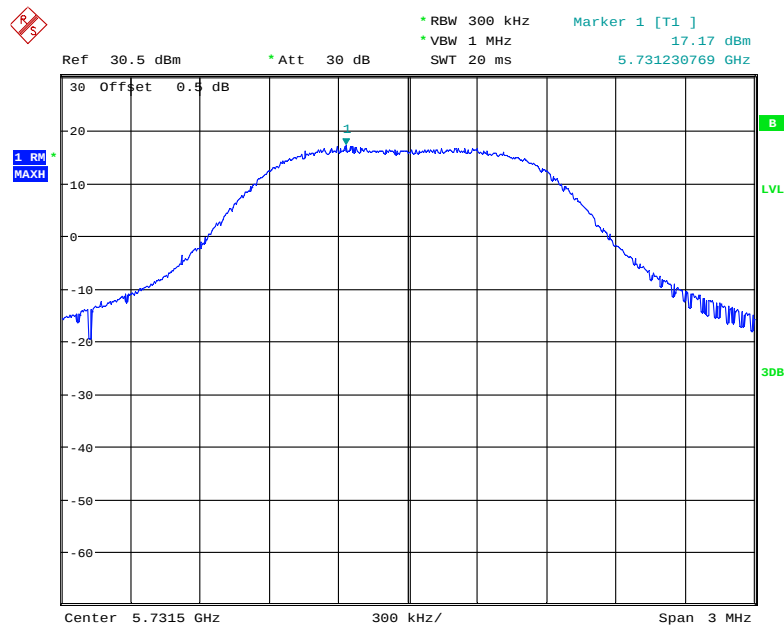
So:

$$\text{Directional gain} = G_{\text{ANT}} + \text{Array Gain} = 4.56\text{dBi} + 10 \cdot \log(2/1) = 7.56\text{dBi}$$

Note 2: The measurement bandwidth of PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz}/\text{RBW})$ to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

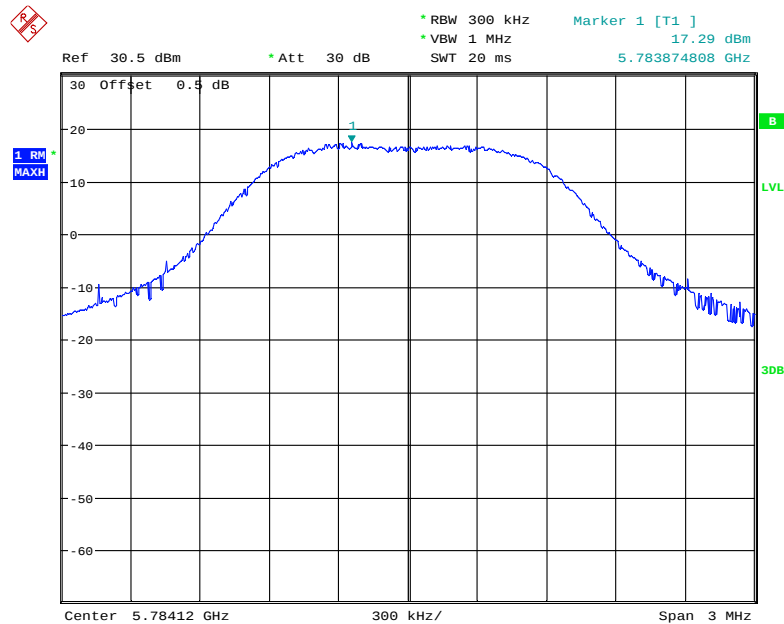
Chain0:

1.4M Low Channel



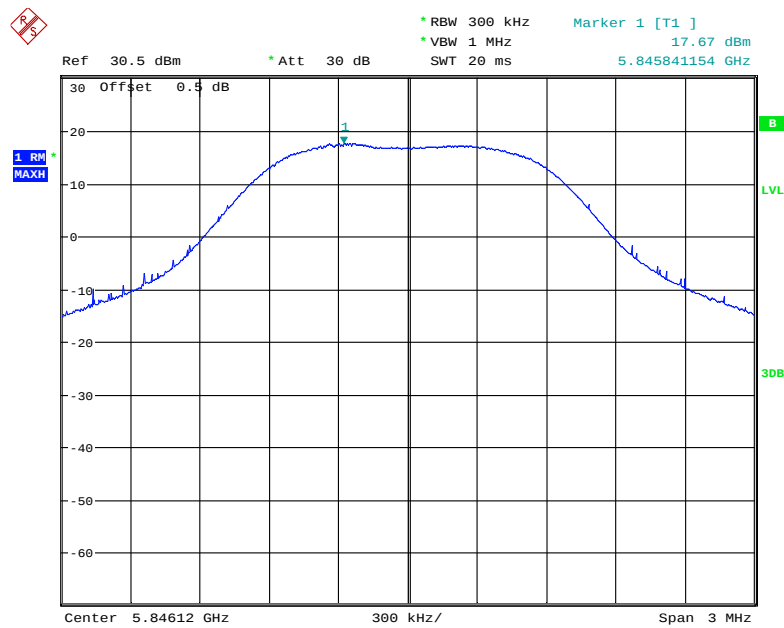
Date: 25.MAR.2019 15:12:05

1.4M Middle Channel



Date: 25.MAR.2019 15:14:30

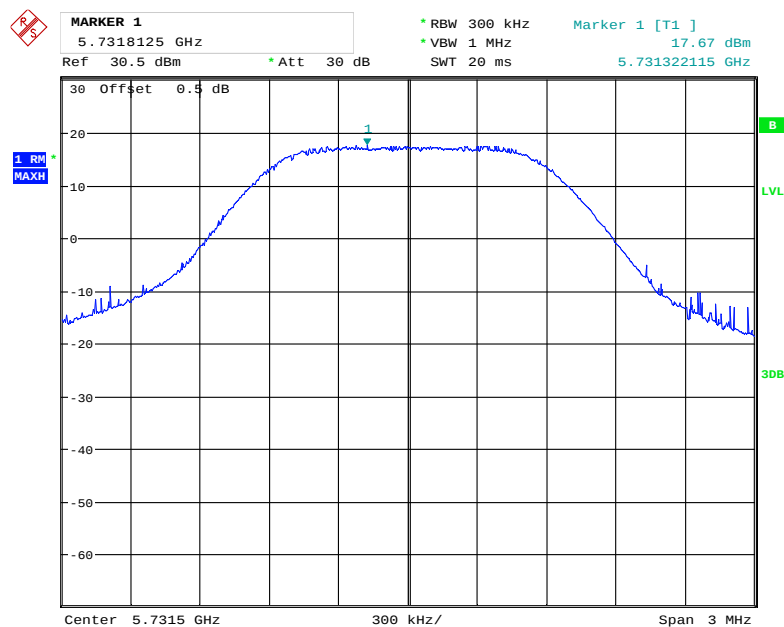
1.4M High Channel



Date: 25.MAR.2019 15:15:47

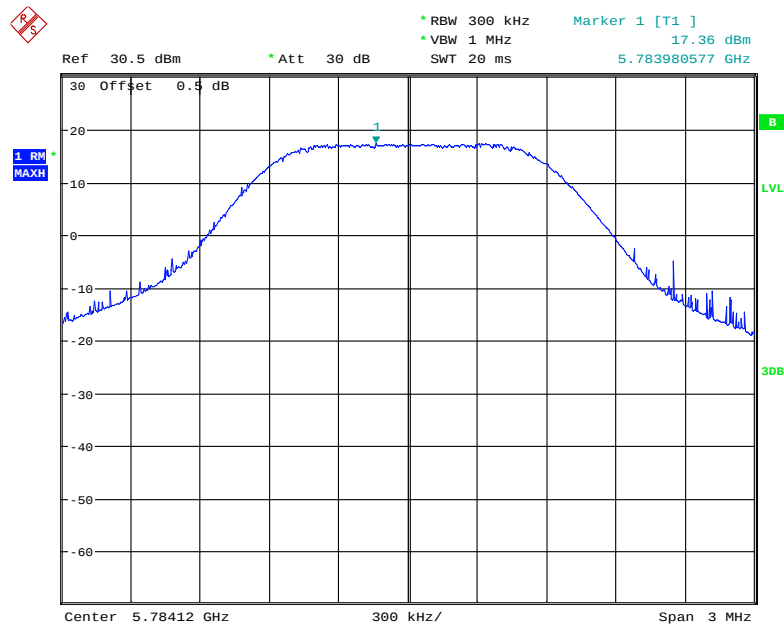
Chain1:

1.4M Low Channel



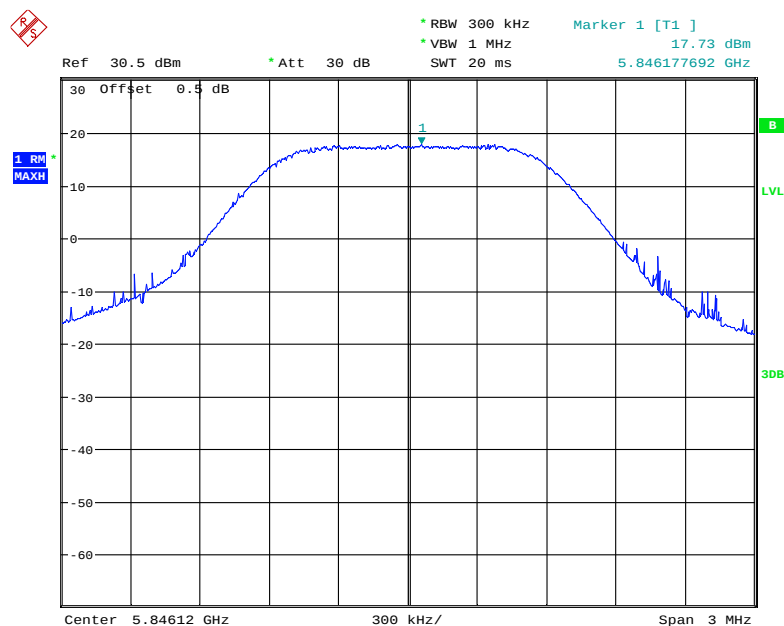
Date: 25.MAR.2019 15:01:03

1.4M Middle Channel



Date: 25.MAR.2019 15:25:13

1.4M High Channel



Date: 25.MAR.2019 15:23:43

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