TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

RSS-GEN, ISSUE 5, APRIL 2018

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

SZ DJI TECHNOLOGY CO., LTD

14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan, Shenzhen, Guangdong, China

FCC ID: SS3-P1AS1901
IC: 11805A-P1AS1901

Report Type:	**Product Type:**
Original Report	DJI FPV Air Unit

Report Number: RDG190321002-00B

Report Date: 2019-04-20

Reviewed By: Jerry Zhang
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TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EQUIPMENT MODIFICATIONS 6
EUT EXERCISE SOFTWARE 7
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS 10
SUPPORT CABLE LIST AND DETAILS 10
BLOCK DIAGRAM OF TEST SETUP 10
SUMMARY OF TEST RESULTS **11**
FCC §15.407 (f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE) **12**
APPLICABLE STANDARD 12
RSS-102 § 2.5.2 - EXEMPTION LIMITS FOR ROUTINE EVALUATION – RF EXPOSURE EVALUATION **13**
APPLICABLE STANDARD 13
FCC §15.203& RSS-GEN CLAUSE 6.8 - ANTENNA REQUIREMENT **14**
APPLICABLE STANDARD 14
ANTENNA INFORMATION AND CONNECTOR CONSTRUCTION 15
FCC §15.209, §15.205 , §15.407(b) &RSS-247 CLAUSE 6.2, RSS-GEN CLAUSE 8.10 –UNWANTED EMISSION **16**
APPLICABLE STANDARD 16
EUT SETUP 17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 18
TEST PROCEDURE 19
CORRECTED AMPLITUDE & MARGIN CALCULATION 19
TEST EQUIPMENT LIST AND DETAILS 20
TEST DATA 21
FCC §15.407(a)(e) & RSS-247 CLAUSE 6.2,RSS-Gen CLAUSE 6.7–EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH **28**
APPLICABLE STANDARD 28
TEST EQUIPMENT LIST AND DETAILS 28
TEST PROCEDURE 28
TEST DATA 28
FCC §15.407(a) & RSS-247 CLAUSE 6.2 –MAXIMUM CONDUCTED OUTPUT POWER **35**
APPLICABLE STANDARD 35
TEST EQUIPMENT LIST AND DETAILS 36
TEST PROCEDURE 36
TEST DATA 36
FCC §15.407(a)& RSS-247 CLAUSE 6.2- POWER SPECTRAL DENSITY **37**

APPLICABLE STANDARD 37
TEST PROCEDURE 37
TEST EQUIPMENT LIST AND DETAILS.....38
TEST DATA 38

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

	EUT Type:	DJI FPV Air Unit
	EUT Name:	DJI FPV Air Unit
	EUT Model:	P1AS
	FCC ID:	SS3-P1AS1901
	IC:	11805A-P1AS1901
Camera Information	**Product Name:**	DJI FPV Camera
	Model Name:	P1C
	Rated Input Voltage:	7.4Vdc~17.6Vdc from battery
	External Dimension:	Air Unit: 44mm(L)*37.8mm(W)*14.4mm(H) Camera: 27.4mm(L)×21.1mm(W)×20.1mm(H)
	Serial Number:	190321002
	EUT Received Date:	2019.3.21

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)

Part of system submissions with FCC ID: SS3-P1RC1901, IC: 11805A-P1RC1901.

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℃
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, 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.

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 10MHz and 20MHz modes. And the EUT has 2 antennas, the system only supports MIMO mode.

For 10MHz mode, 115 channels are are employed:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5730.5	59	5788.5
2	5731.5	…	…
…	…	…	…
…	…	114	5843.5
…	…	115	5844.5
58	5787.5	/	/

Test was performed with Channel: 1, 58 and 115.

For 20MHz mode, 105 channels are employed:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5735.5	54	5788.5
2	5736.5	…	…
…	…	…	…
…	…	104	5838.5
…	…	105	5839.5
53	5787.5	/	/

Test was performed with Channel: 1, 53 and 105.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

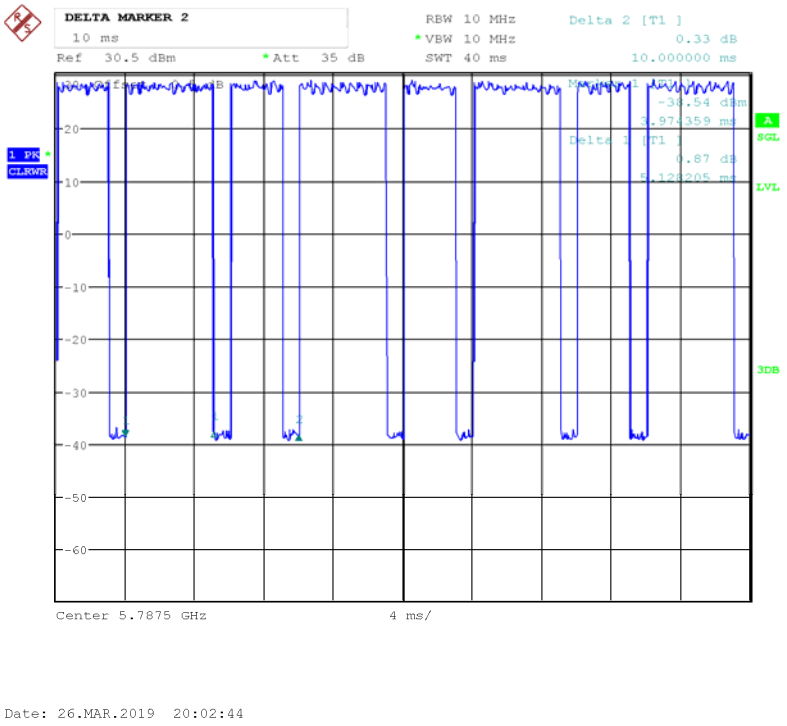
Test software: ' DjiSdrConsole_V1.3.5.59.exe ' was used in test for SDR mode. For 10MHz and 20MHz mode, the maximum power with maximum duty cycle was configured as following setting.

Mode	Channel	Frequency (MHz)	Power level	
			Chain 0	Chain 1
10MHz	Low	5730.5	2	2
	Middle	5787.5	2	2
	High	5844.5	2	2
20MHz	Low	5735.5	3	3
	Middle	5787.5	2	2
	High	5839.5	2	2

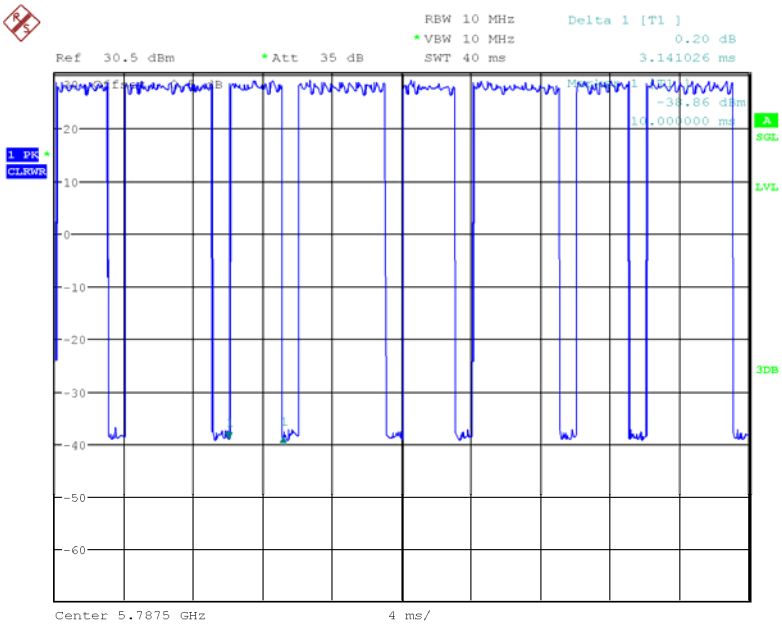
The duty cycle as below:

Mode	**T_{on} (ms)**	**T_{on+off} (ms)**	**Duty Cycle(x) (%)**
10M	8.27	10	82.7
20M	8.33	10	83.3

10M mode 1



10M mode 2



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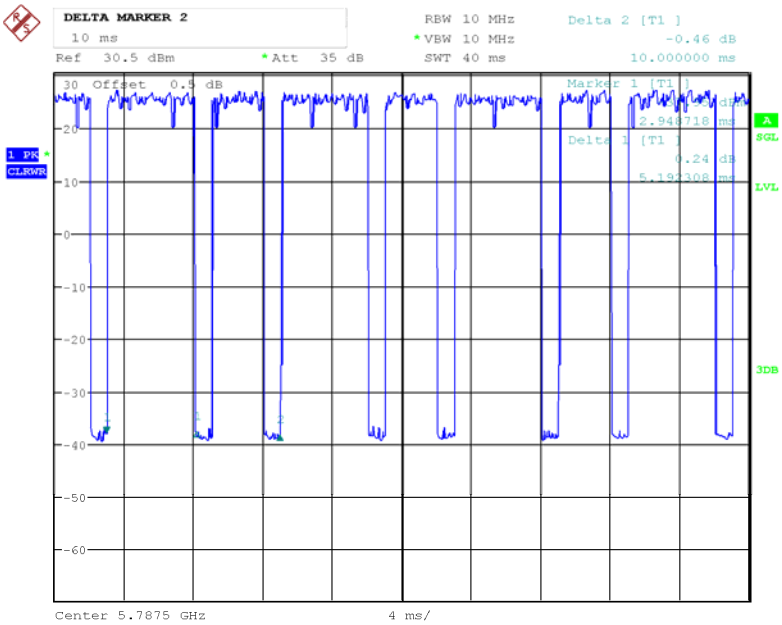
20M mode 1



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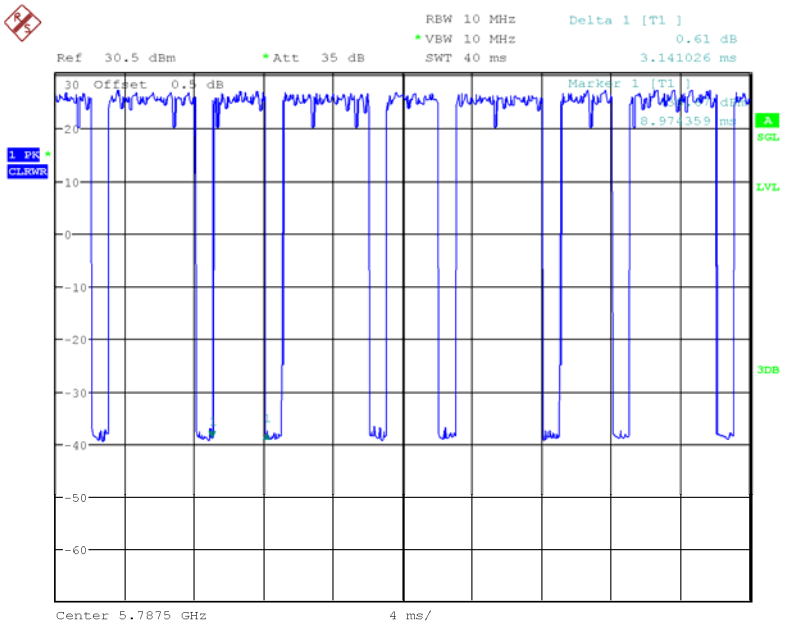
20M mode 2



Date: 26.MAR.2019 20:04:04

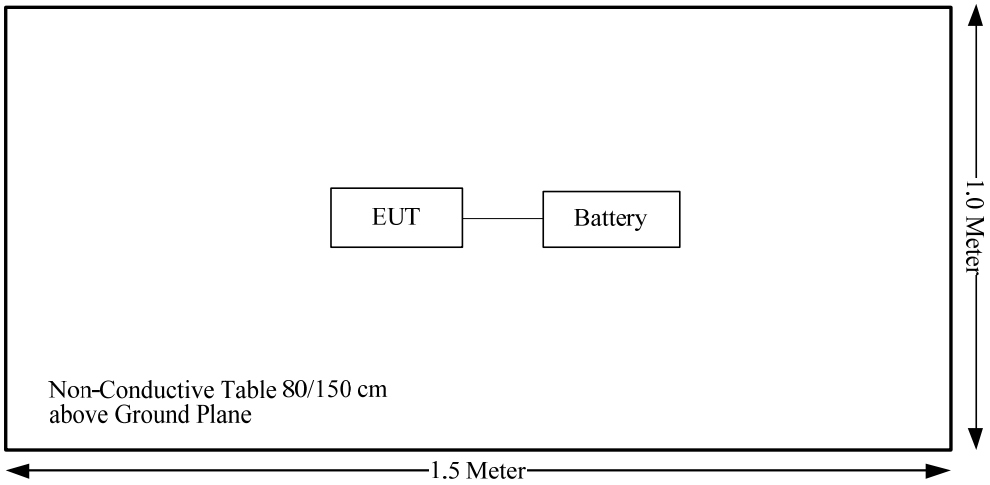
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Redzone	LiPo Battery	REDZONELIPO08F02058	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
3-in-1 Connection Cable	Yes	No	0.2	S.Bus Port of EUT	Battery

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
§15.407 (f) & §1.1310 & §2.1091	Maximum Permissable Exposure (MPE)	Compliance
RSS-102 § 2.5.2	Exemption Limits For Routine Evaluation-RF Exposure Evaluation	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	Not applicable
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

Note:
Not applicable: The device was powered by battery for normally use.

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

Applicable Standard

According to subpart 15.407(f)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 Band	**Antenna Gain**		**Max. Target Power including Tolerance**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
5.8GHz Band	4.32	2.7	25	316.23	20.00	0.17	1.0

Note: the Max. Target Power including Tolerance was declared by manufacturer.

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥20 cm.

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:

The maximum power including tune-up tolerance is 25dBm@ 5.8 GHz band, the maximum antenna gain is 4.32 dBi @ 5.8GHz band, so the maximum e.r.i.p. is 29.32 dBm (0.86W),

Exemption from Routine Evaluation Limit is:
$1.31 \times 10^{-2} f^{0.6834} = 1.31 \times 10^{-2} \times 5730.5^{0.6834} = 4.85 > 0.86$ W

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 Information And Connector Construction

The EUT has 2 external antennas attached to the unit, the device supports 2T2R, 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
0	DJI	WM150 Air Antenna	LHCP	MMCX or female SMA	50	4.32dBi
1	DJI	WM150 Air Antenna	LHCP	MMCX or female SMA	50	4.32dBi

Note: The MMCX connector has two types: straight and elbow.

Result: 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:

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;

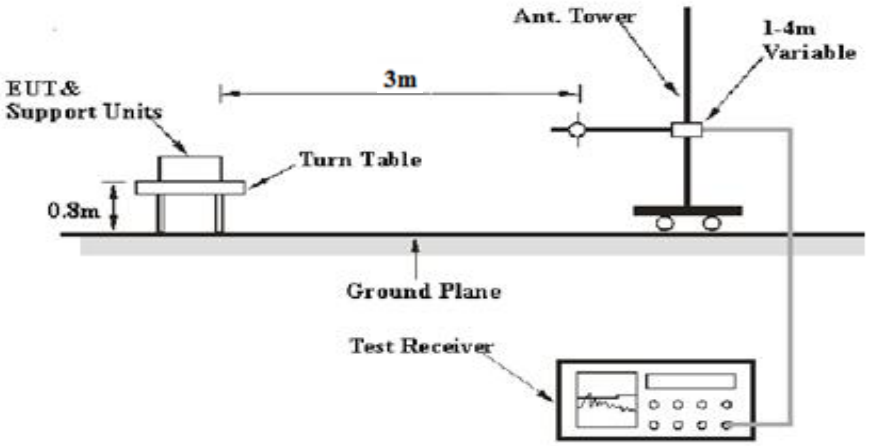
b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;

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

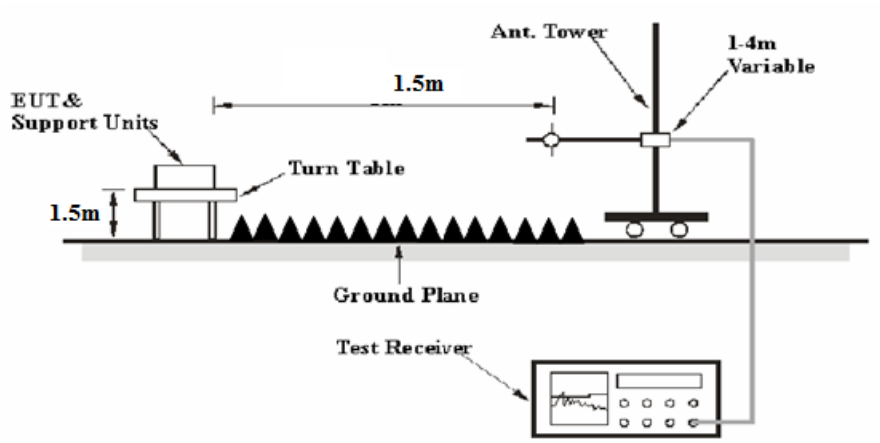
d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

EUT Setup

Below 1 GHz:



1-40 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 [dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

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

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

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, 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
= 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-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	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technolagies	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:	23.3~23.9 °C
Relative Humidity:	44~64%
ATM Pressure:	101.4~101.5kPa

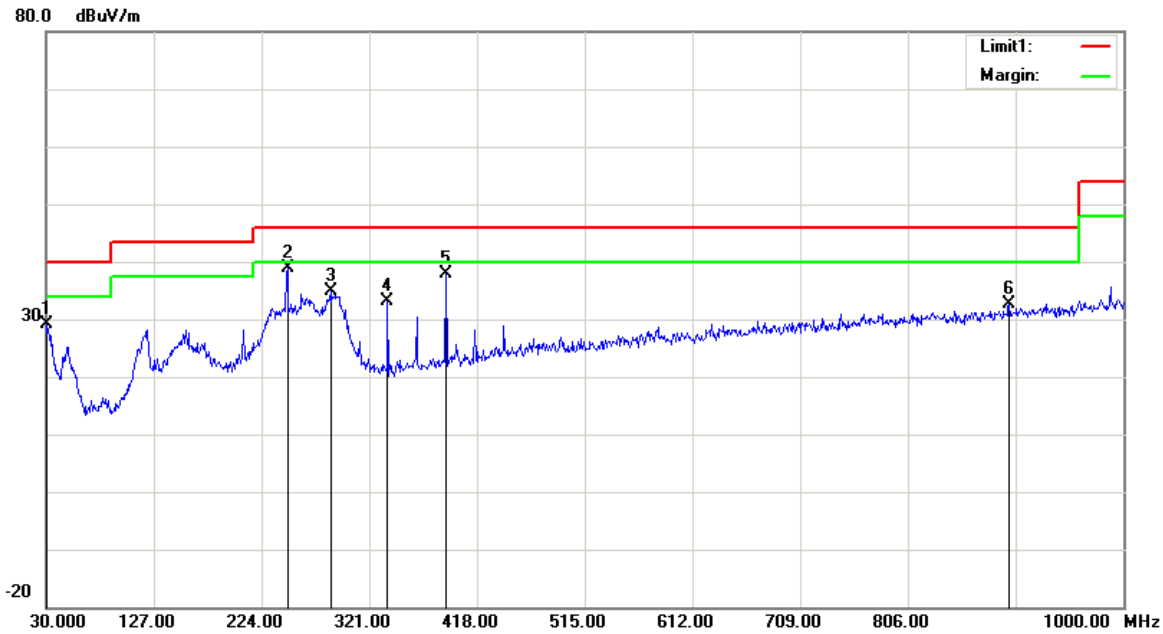
** The testing was performed by Neil Liao, Tyler Pan from 2019-03-27 to 2019-03-29.*

Test Mode: Transmitting

Pre-scan all antenna connector types and MMCX elbow was the worst case.

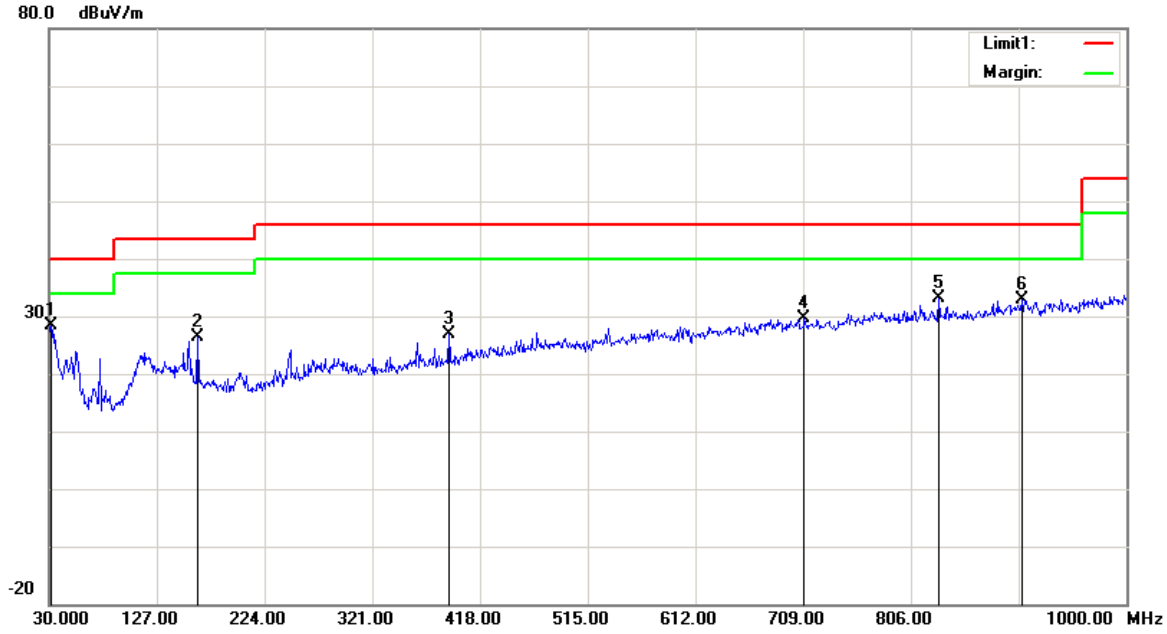
1) 30MHz-1GHz *(10M middle channel was the worst)*

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	28.10	peak	0.91	29.01	40.00	10.99
247.2800	44.90	peak	-5.92	38.98	46.00	7.02
286.0800	38.97	peak	-4.03	34.94	46.00	11.06
337.4900	36.43	peak	-3.39	33.04	46.00	12.96
389.8700	40.17	peak	-2.34	37.83	46.00	8.17
897.1800	36.43	peak	-3.90	32.53	46.00	13.47

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
31.9400	28.22	peak	0.19	28.41	40.00	11.59
163.8600	32.56	peak	-6.16	26.40	43.50	17.10
389.8700	29.28	peak	-2.34	26.94	46.00	19.06
709.9700	26.59	peak	3.14	29.73	46.00	16.27
831.2200	28.00	peak	5.05	33.05	46.00	12.95
905.9100	36.72	peak	-3.76	32.96	46.00	13.04

2) 1GHz-40GHz:

10MHz Mode :

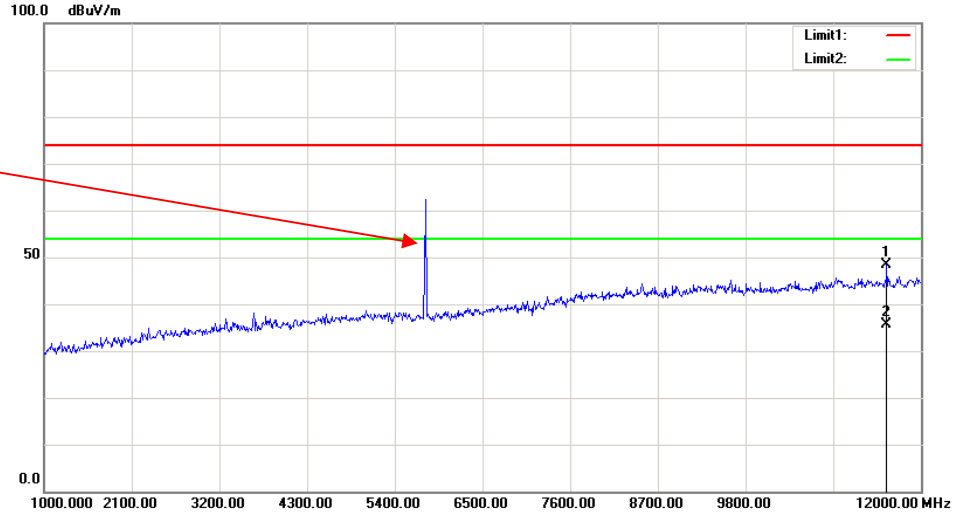
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5730.5 MHz										
5730.50	86.05	PK	H	34.19	3.69	0.00	123.93	117.91	N/A	N/A
5730.50	75.89	AV	H	34.19	3.69	0.00	113.77	107.75	N/A	N/A
5730.50	87.42	PK	V	34.19	3.69	0.00	125.30	119.28	N/A	N/A
5730.50	77.36	AV	V	34.19	3.69	0.00	115.24	109.22	N/A	N/A
5725.00	71.82	PK	V	34.19	3.69	0.00	109.70	103.68	122.20	18.52
5720.00	57.69	PK	V	34.19	3.69	0.00	95.57	89.55	110.80	21.25
5700.00	30.30	PK	V	34.18	3.68	0.00	68.16	62.14	105.20	43.06
5650.00	28.75	PK	V	34.16	3.63	0.00	66.54	60.52	68.20	7.68
11461.00	46.37	PK	V	38.96	6.59	37.34	54.58	48.56	74.00	25.44
11461.00	33.77	AV	V	38.96	6.59	37.34	41.98	35.96	54.00	18.04
17191.50	48.32	PK	V	41.31	8.77	38.64	59.76	53.74	68.20	14.46
Middle Channel: 5787.5 MHz										
5787.50	86.22	PK	H	34.22	3.71	0.00	124.15	118.13	N/A	N/A
5787.50	76.13	AV	H	34.22	3.71	0.00	114.06	108.04	N/A	N/A
5787.50	87.91	PK	V	34.22	3.71	0.00	125.84	119.82	N/A	N/A
5787.50	78.10	AV	V	34.22	3.71	0.00	116.03	110.01	N/A	N/A
11575.00	46.55	PK	V	39.00	6.61	37.45	54.71	48.69	74.00	25.31
11575.00	34.10	AV	V	39.00	6.61	37.45	42.26	36.24	54.00	17.76
17362.50	48.26	PK	V	42.30	8.81	38.52	60.85	54.83	68.20	13.37
High Channel: 5844.5 MHz										
5844.50	84.50	PK	H	34.24	3.75	0.00	122.49	116.47	N/A	N/A
5844.50	74.61	AV	H	34.24	3.75	0.00	112.60	106.58	N/A	N/A
5844.50	86.36	PK	V	34.24	3.75	0.00	124.35	118.33	N/A	N/A
5844.50	76.44	AV	V	34.24	3.75	0.00	114.43	108.41	N/A	N/A
5850.00	70.81	PK	V	34.24	3.75	0.00	108.80	102.78	122.20	19.42
5855.00	55.58	PK	V	34.24	3.75	0.00	93.57	87.55	110.80	23.25
5875.00	28.77	PK	V	34.25	3.77	0.00	66.79	60.77	105.20	44.43
5925.00	27.57	PK	V	34.27	3.80	0.00	65.64	59.62	68.20	8.58
11689.00	46.37	PK	V	39.00	6.65	37.58	54.44	48.42	74.00	25.58
11689.00	33.74	AV	V	39.00	6.65	37.58	41.81	35.79	54.00	18.21
17533.50	48.25	PK	V	43.31	8.85	38.39	62.02	56	68.20	12.20

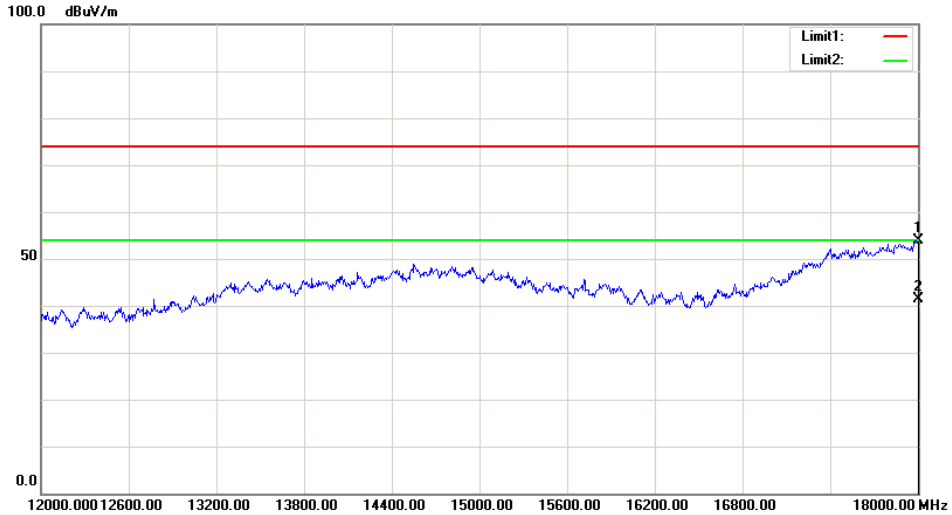
20MHz Mode :

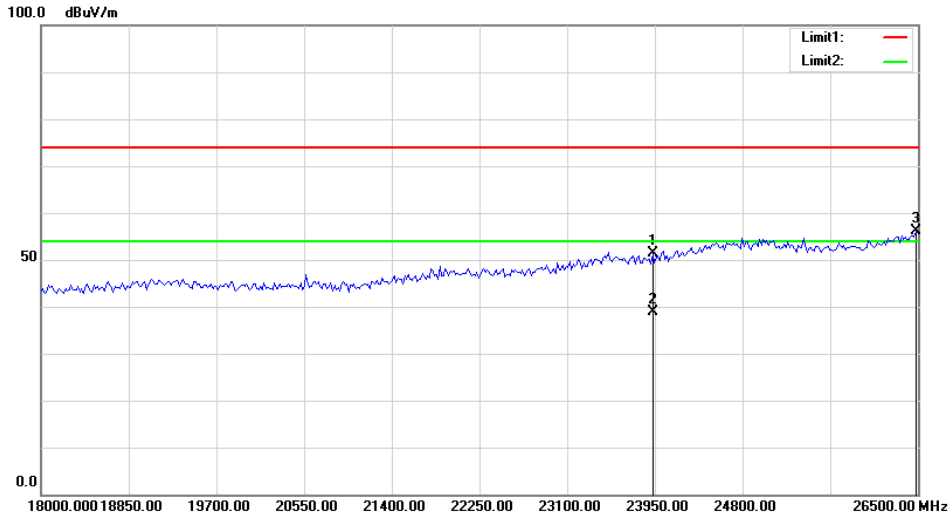
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5735.5 MHz										
5735.50	85.25	PK	H	34.19	3.69	0.00	123.13	117.11	N/A	N/A
5735.50	75.01	AV	H	34.19	3.69	0.00	112.89	106.87	N/A	N/A
5735.50	86.43	PK	V	34.19	3.69	0.00	124.31	118.29	N/A	N/A
5735.50	76.34	AV	V	34.19	3.69	0.00	114.22	108.2	N/A	N/A
5725.00	63.48	PK	V	34.19	3.69	0.00	101.36	95.34	122.20	26.86
5720.00	59.78	PK	V	34.19	3.69	0.00	97.66	91.64	110.80	19.16
5700.00	35.21	PK	V	34.18	3.68	0.00	73.07	67.05	105.20	38.15
5650.00	28.49	PK	V	34.16	3.63	0.00	66.28	60.26	68.20	7.94
11471.00	46.25	PK	V	38.97	6.59	37.34	54.47	48.45	74.00	25.55
11471.00	34.10	AV	V	38.97	6.59	37.34	42.32	36.3	54.00	17.70
17206.50	48.21	PK	V	41.40	8.77	38.63	59.75	53.73	68.20	14.47
Middle Channel: 5787.5 MHz										
5787.50	84.99	PK	H	34.22	3.71	0.00	122.92	116.9	N/A	N/A
5787.50	74.86	AV	H	34.22	3.71	0.00	112.79	106.77	N/A	N/A
5787.50	86.21	PK	V	34.22	3.71	0.00	124.14	118.12	N/A	N/A
5787.50	76.16	AV	V	34.22	3.71	0.00	114.09	108.07	N/A	N/A
11575.00	46.10	PK	V	39.00	6.61	37.45	54.26	48.24	74.00	25.76
11575.00	33.67	AV	V	39.00	6.61	37.45	41.83	35.81	54.00	18.19
17362.50	48.06	PK	V	42.30	8.81	38.52	60.65	54.63	68.20	13.57
High Channel: 5839.5 MHz										
5839.50	85.08	PK	H	34.24	3.74	0.00	123.06	117.04	N/A	N/A
5839.50	75.68	AV	H	34.24	3.74	0.00	113.66	107.64	N/A	N/A
5839.50	85.72	PK	V	34.24	3.74	0.00	123.70	117.68	N/A	N/A
5839.50	75.33	AV	V	34.24	3.74	0.00	113.31	107.29	N/A	N/A
5850.00	60.41	PK	V	34.24	3.75	0.00	98.40	92.38	122.20	29.82
5855.00	56.24	PK	V	34.24	3.75	0.00	94.23	88.21	110.80	22.59
5875.00	34.62	PK	V	34.25	3.77	0.00	72.64	66.62	105.20	38.58
5925.00	27.75	PK	V	34.27	3.80	0.00	65.82	59.8	68.20	8.40
11679.00	45.96	PK	V	39.00	6.65	37.56	54.05	48.03	74.00	25.97
11679.00	33.46	AV	V	39.00	6.65	37.56	41.55	35.53	54.00	18.47
17518.50	48.36	PK	V	43.21	8.85	38.40	62.02	56	68.20	12.20

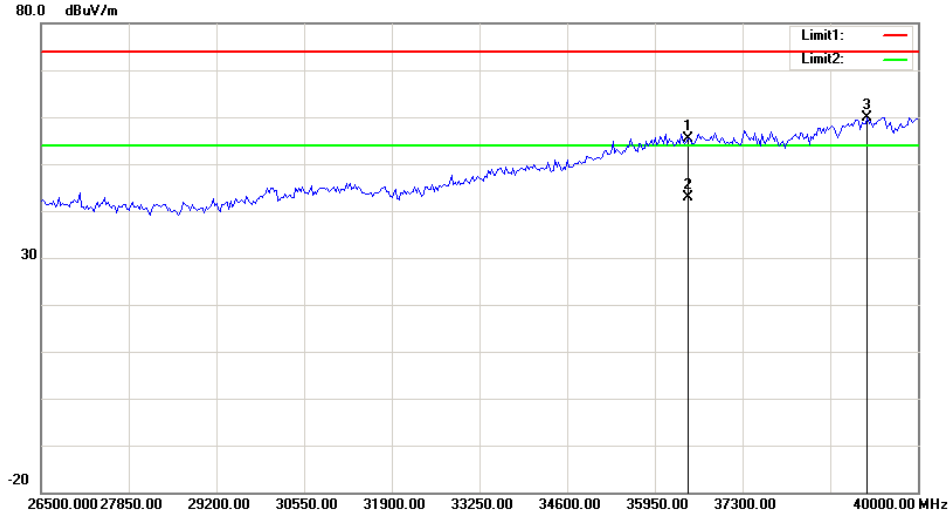
Test Plots *(10M high channel was the worst)*
Horizontal

Fundamental Test with Band Rejection Filter

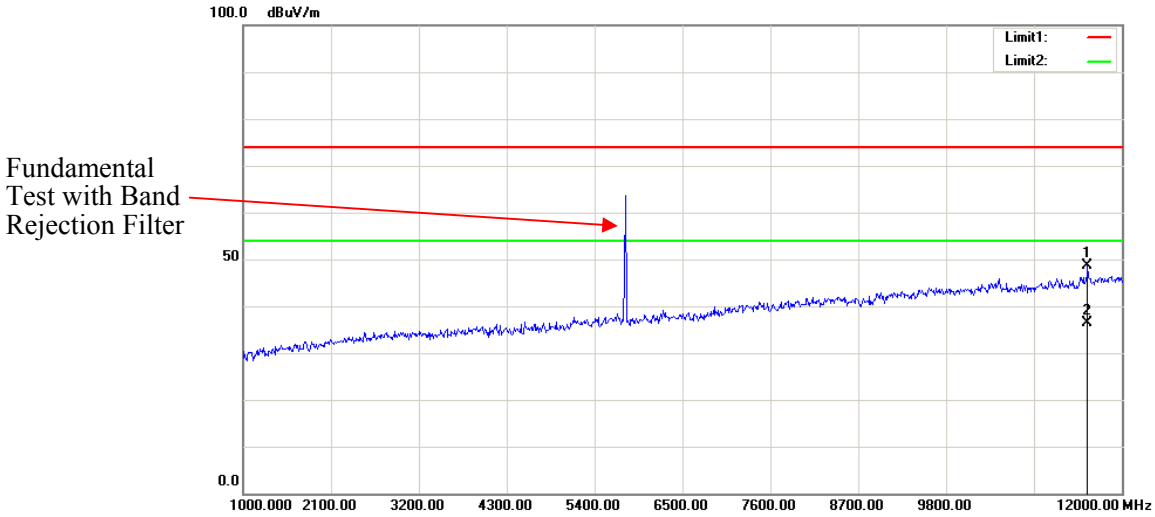


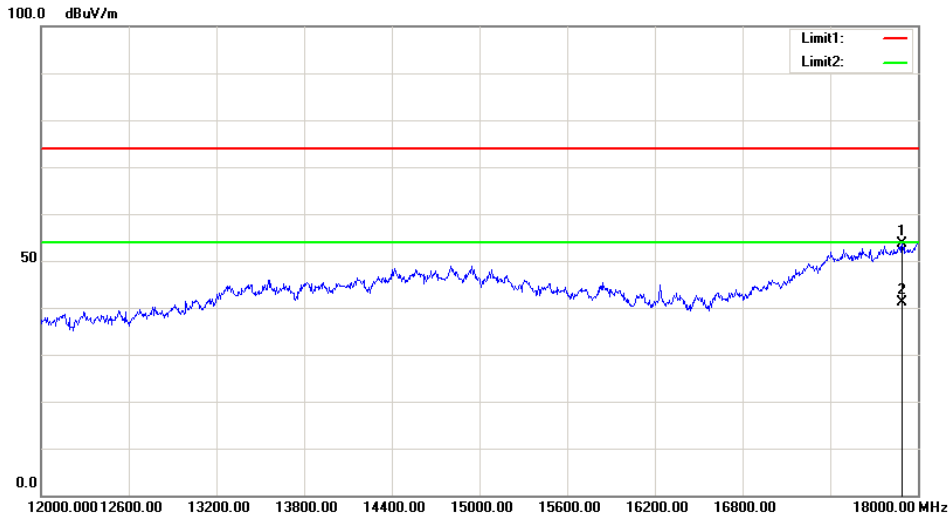


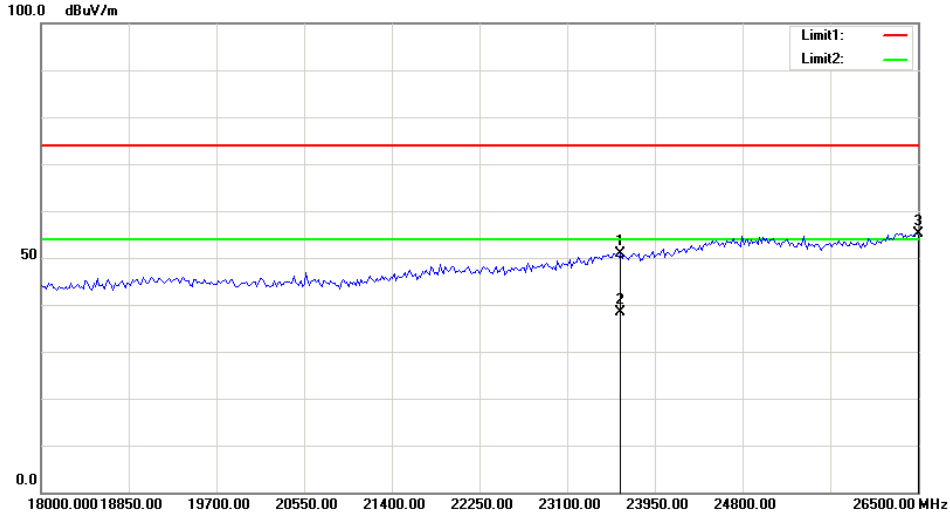


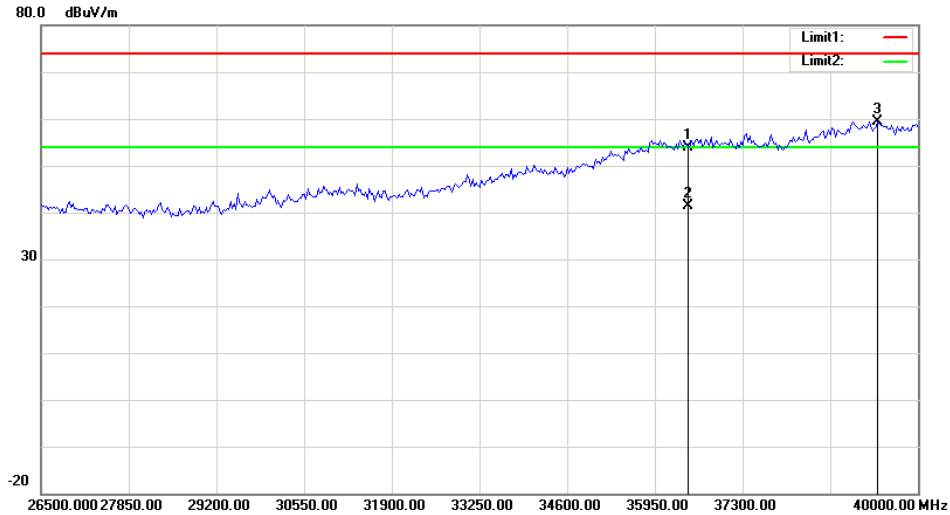

80.0 dBuV/m
Limit1:
Limit2:
30
-20
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

Vertical


100.0 dBuV/m
Limit1:
Limit2:
Fundamental Test with Band Rejection Filter
50
0.0
1000.000 2100.00 3200.00 4300.00 5400.00 6500.00 7600.00 8700.00 9800.00 12000.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
12000.000 12600.00 13200.00 13800.00 14400.00 15000.00 15600.00 16200.00 16800.00 18000.00 MHz


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


80.0 dBuV/m
Limit1:
Limit2:
30
-20
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	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:	26.8 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

** The testing was performed by Andy Huang from 2019-03-26.*

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

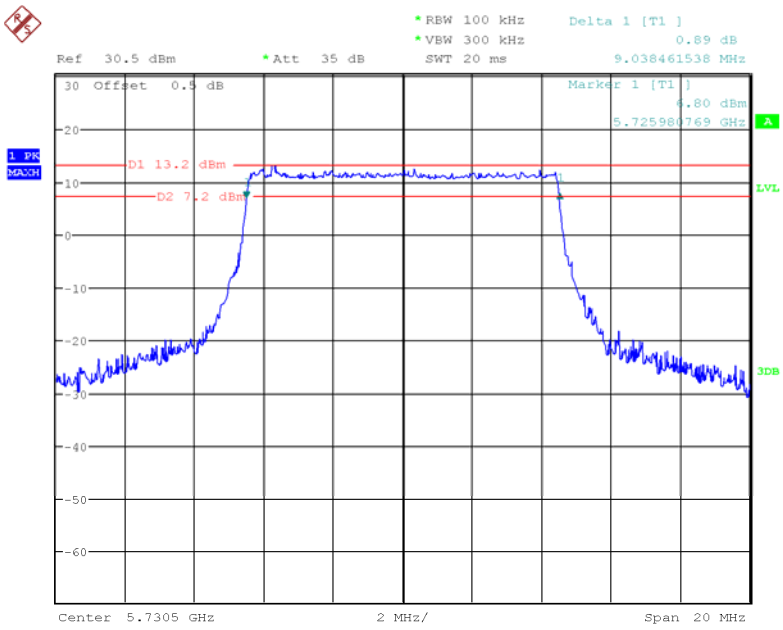
Test mode: Transmitting (Test performe at Chain 0)

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limis (MHz)
10M	5730.5	9.038	9.071	≥0.5
	5787.5	9.038	9.038	≥0.5
	5844.5	9.071	9.038	≥0.5
20M	5735.5	18.077	17.756	≥0.5
	5787.5	18.077	17.692	≥0.5
	5839.5	18.077	17.692	≥0.5

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

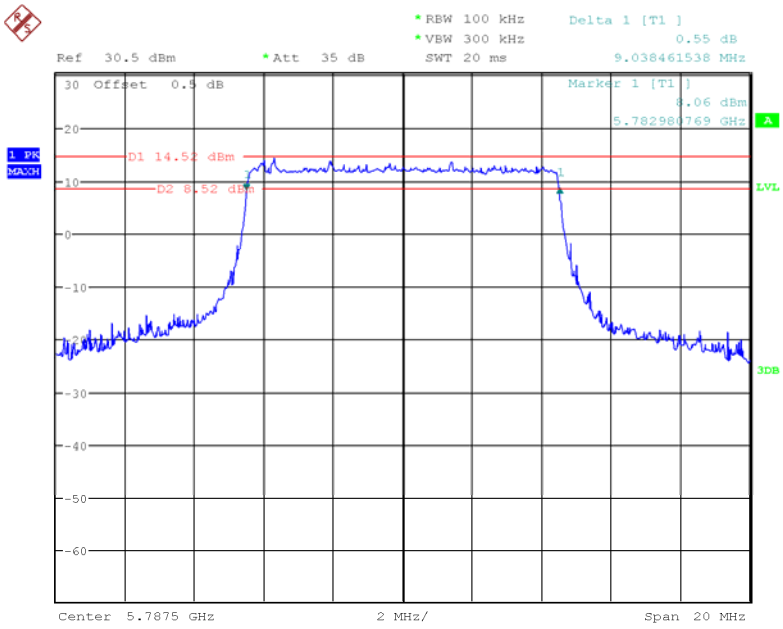
6dB Minimum Emission Bandwidth:

10M Low Channel



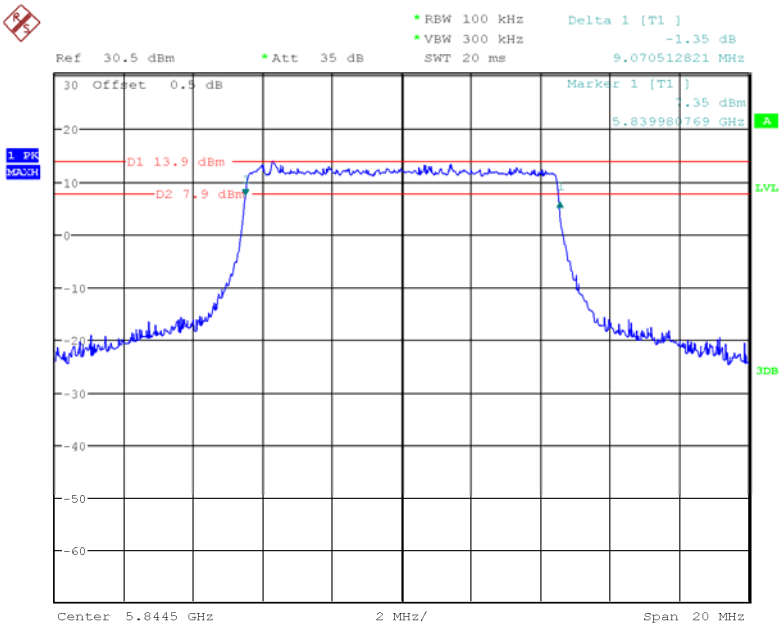
Date: 26.MAR.2019 19:32:41

10M Middle Channel



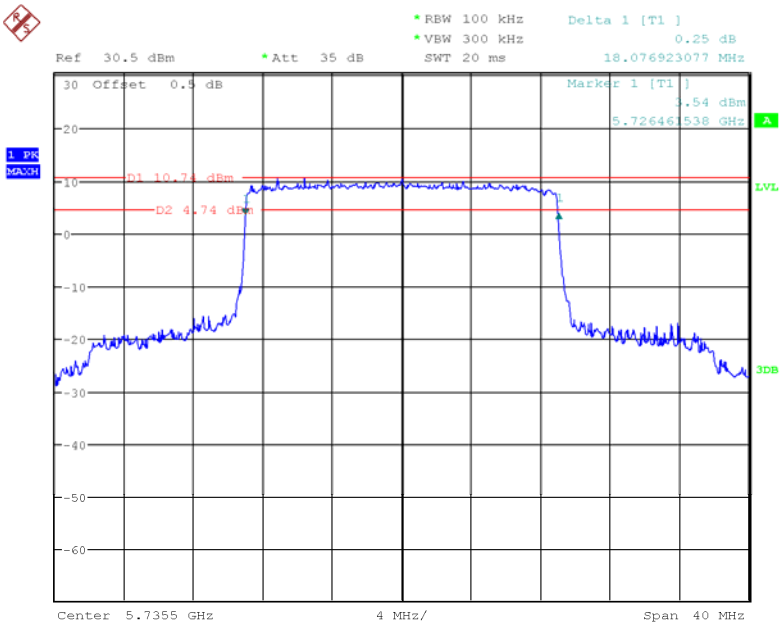
Date: 26.MAR.2019 19:35:28

10M High Channel



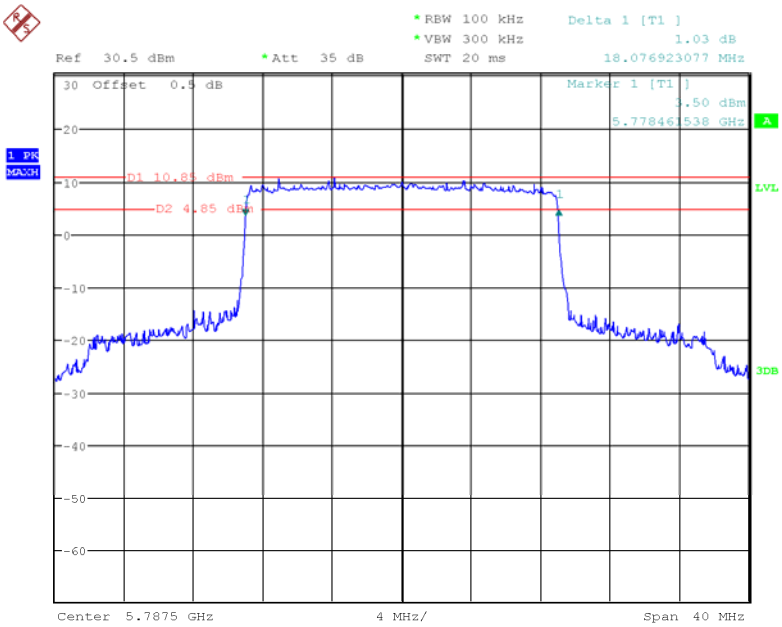
Date: 26.MAR.2019 19:40:16

20M Low Channel



Date: 26.MAR.2019 18:43:10

20M Middle Channel



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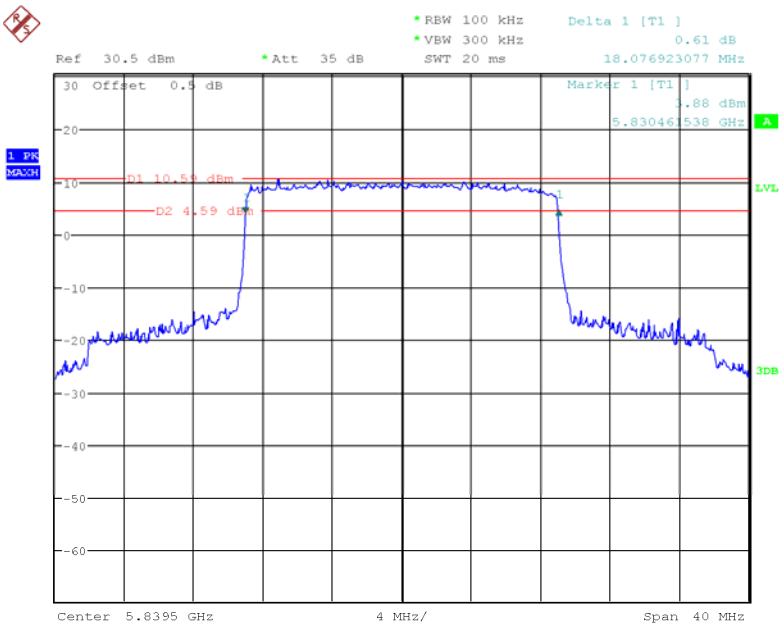
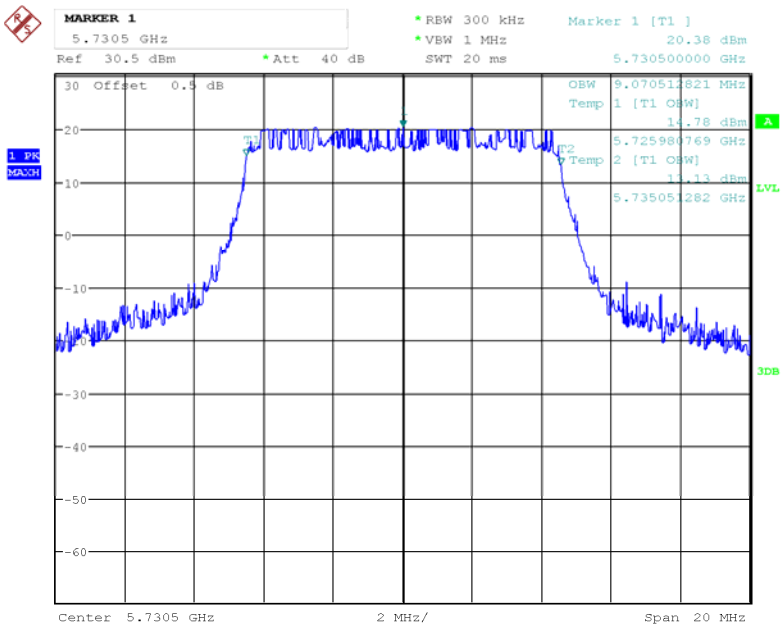
20M High Channel



Date: 26.MAR.2019 18:29:21

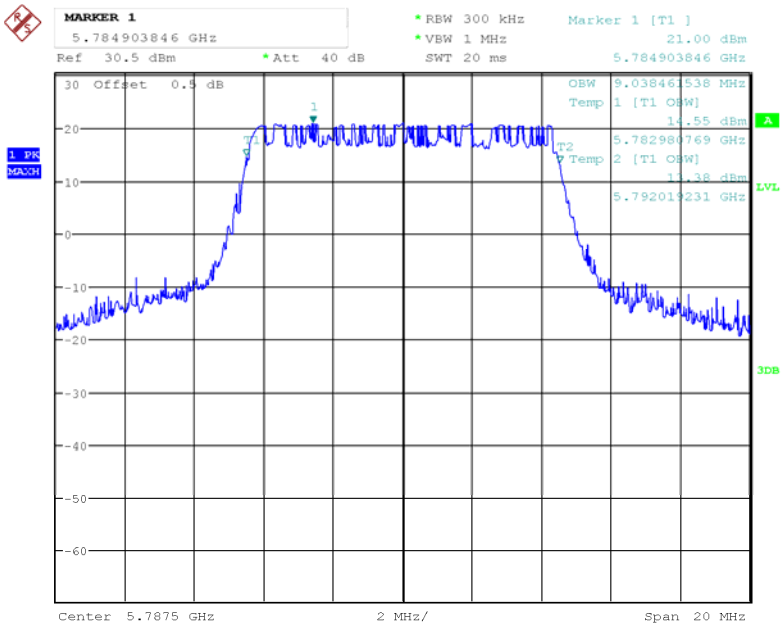
99% Occupied bandwidth:

10M Low Channel



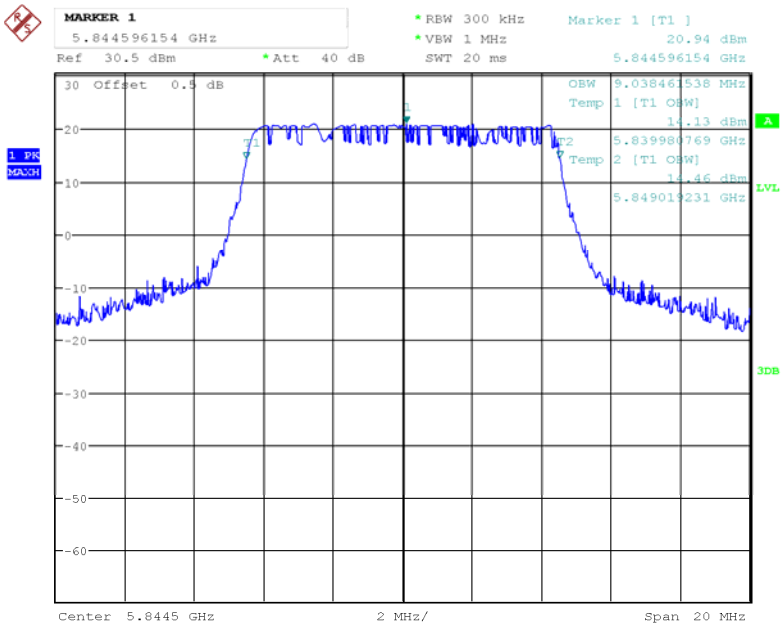
Date: 26.MAR.2019 18:20:00

10M Middle Channel



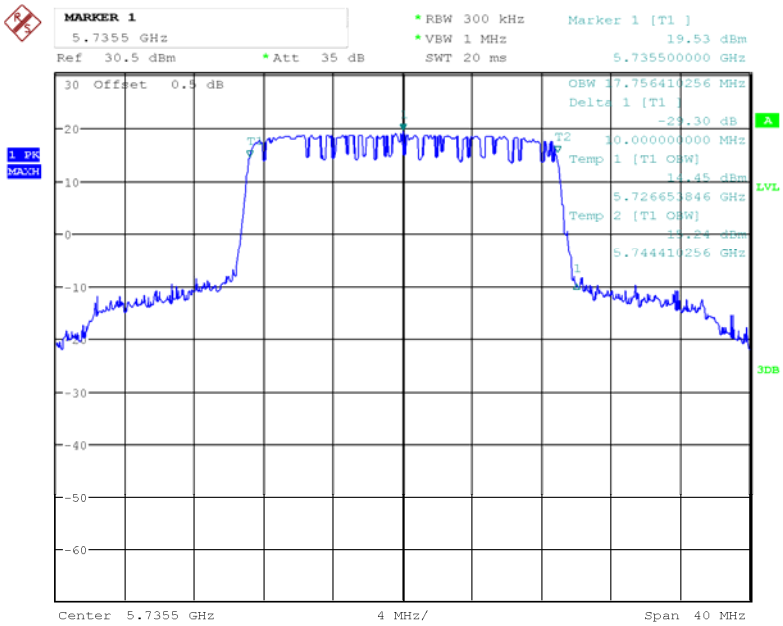
Date: 26.MAR.2019 18:19:43

10M High Channel



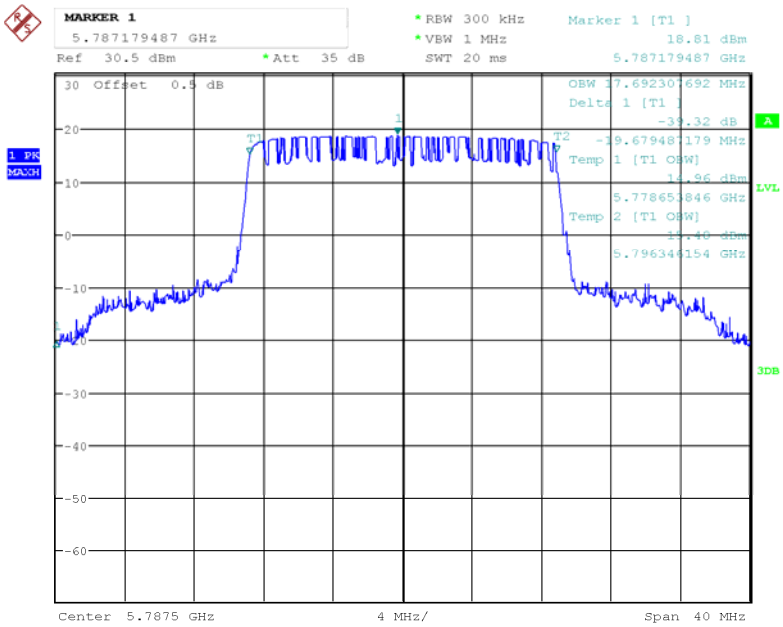
Date: 26.MAR.2019 18:19:27

20M Low Channel



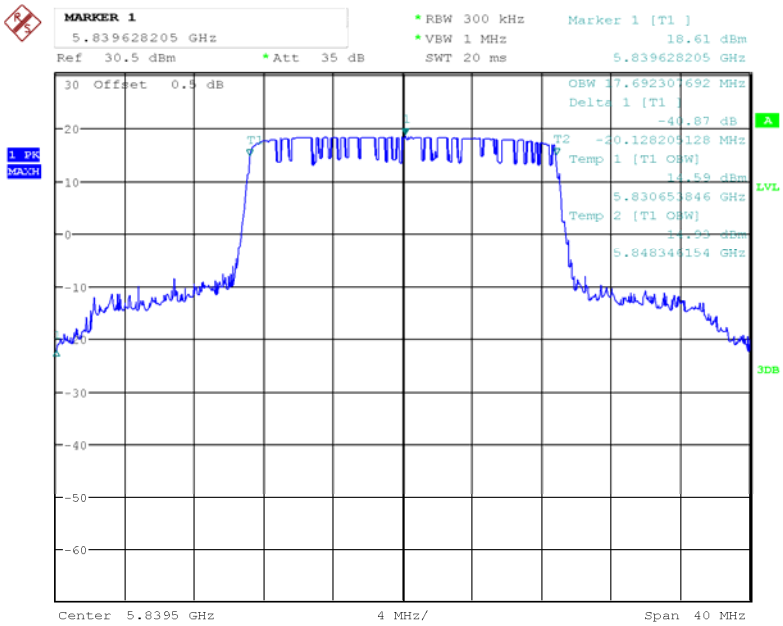
Date: 26.MAR.2019 19:43:25

20M Middle Channel



Date: 26.MAR.2019 19:43:52

20M High Channel



Date: 26.MAR.2019 19:44:24

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-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
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:	26.8 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

** The testing was performed by Andy Huang from 2019-03-26.*

Test Mode: Transmitting

Mode	Frequency (MHz)	Conducted Average Output Power (dBm)			Limit (dBm)	Result
		Chain 0	Chain 1	Total		
10MHz	5730.5	21.07	20.29	23.71	30	PASS
	5787.5	21.69	21.30	24.51	30	PASS
	5844.5	21.42	21.22	24.33	30	PASS
20MHz	5735.5	21.44	20.67	24.08	30	PASS
	5787.5	21.56	20.95	24.28	30	PASS
	5839.5	21.24	21.24	24.25	30	PASS

Note:
The duty cycle was calculated into the reading already.
The maximum antenna gain is 4.32dBi 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} + Array Gain = 4.32 dBi < 6dBi

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-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	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:	26.8 °C
Relative Humidity:	54%
ATM Pressure:	101.5kPa

** The testing was performed by Andy Huang from 2019-03-26.*

Test Result:Compliance.

Test Mode: Transmitting

Band	Mode	Channel	Frequency (MHz)	Result (dBm/500kHz)			Limit (dBm/500kHz)
				Chain 0	Chain 1	Total	
5.8G	10M	Low	5730.5	13.06	11.48	15.35	28.68
		Middle	5787.5	13.05	12.94	16.01	
		High	5844.5	12.77	13.08	15.94	
	20M	Low	5735.5	10.98	9.17	13.18	
		Middle	5787.5	10.53	10.48	13.52	
		High	5839.5	10.11	10.63	13.39	

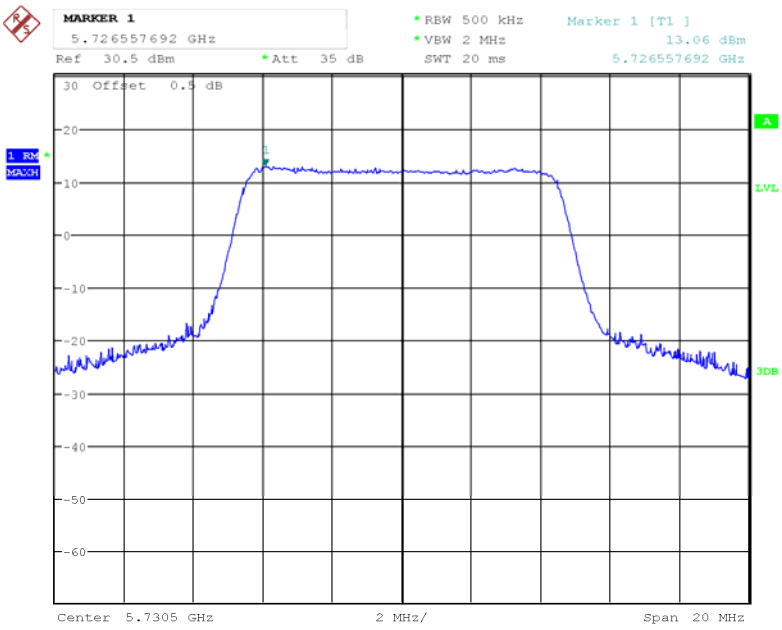
Note 1: The maximum antenna gain is 4.32dBi in 5GHz band. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

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

So:
Directional gain = G_{ANT} + Array Gain = 4.32dBi+10*log (2/1) =7.32dBi

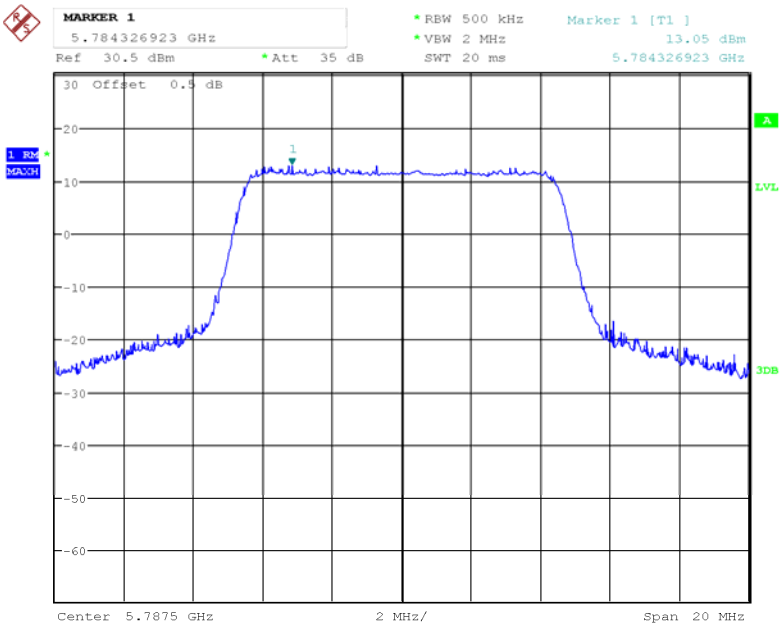
Chain 0:

10M Low Channel



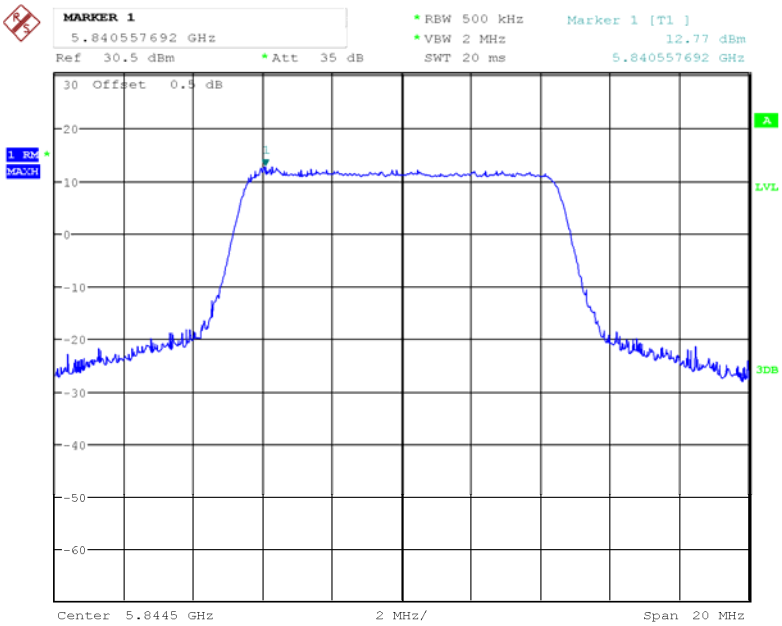
Date: 26.MAR.2019 19:49:13

10M Middle Channel



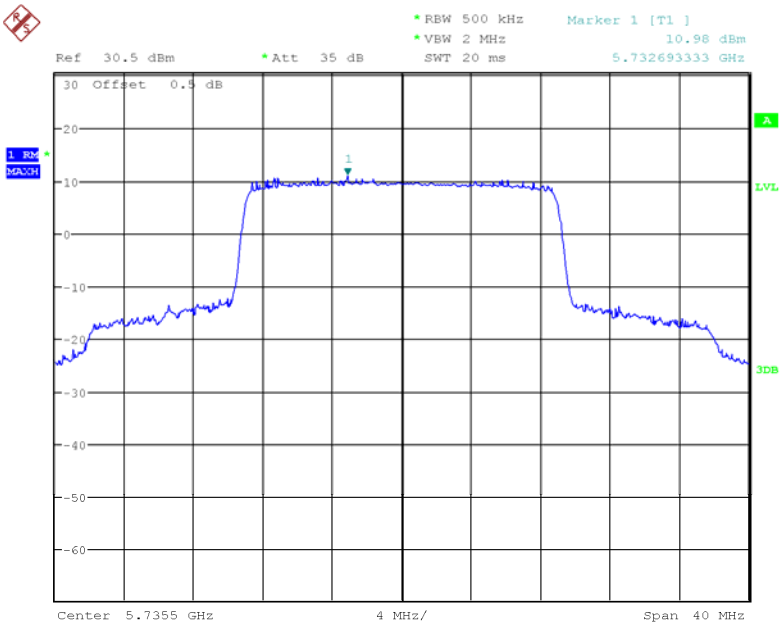
Date: 26.MAR.2019 19:49:50

10M High Channel



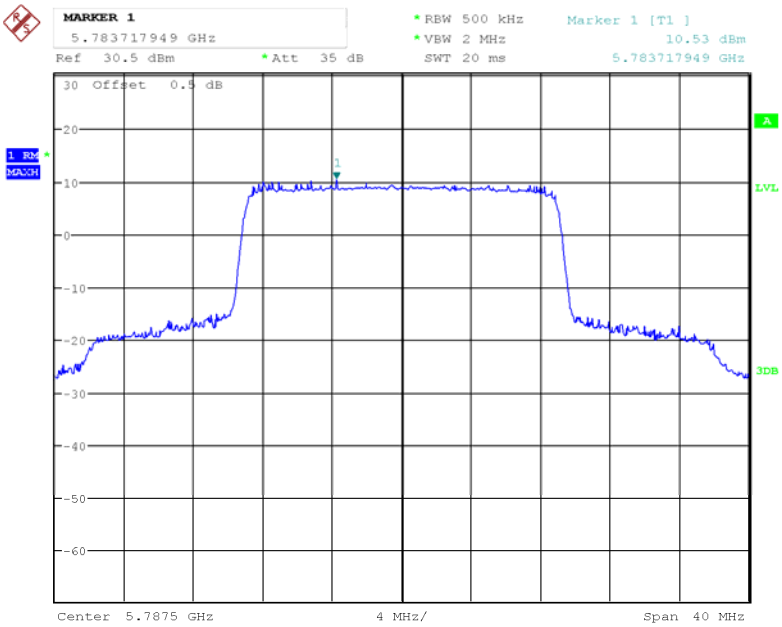
Date: 26.MAR.2019 19:50:38

20M Low Channel



Date: 17.APR.2019 00:33:12

20M Middle Channel



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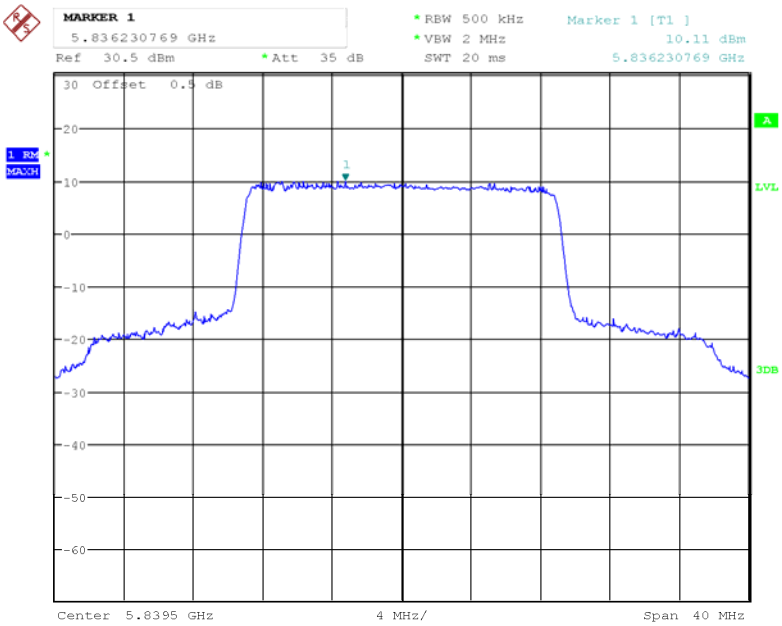
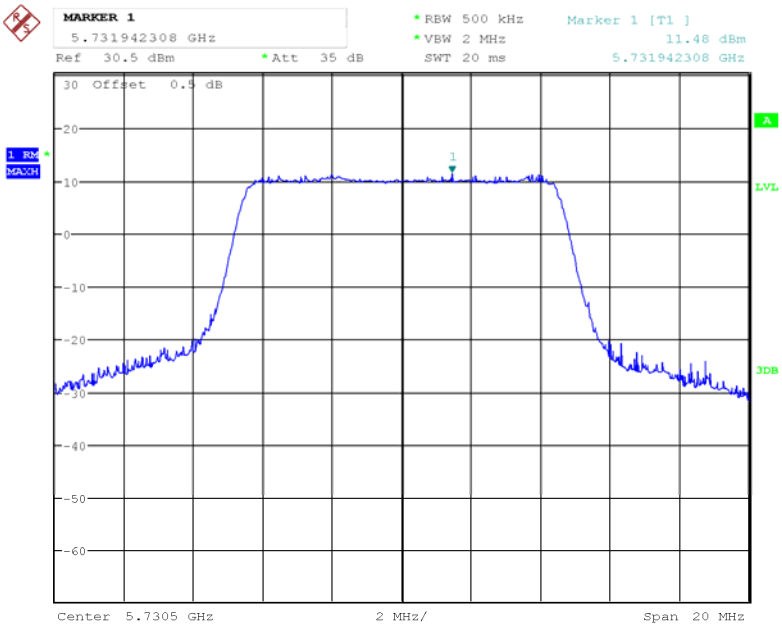
20M High Channel



Date: 26.MAR.2019 19:53:25

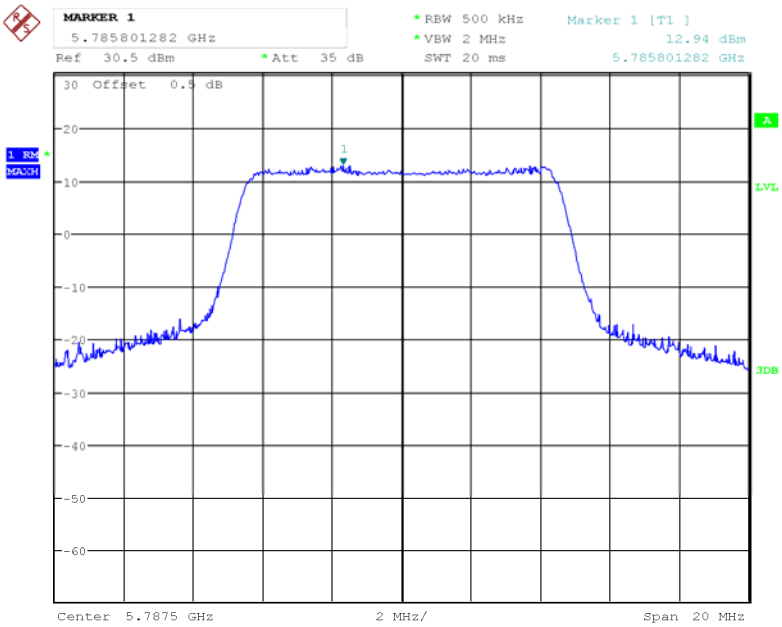
Chain 1:

10M Low Channel



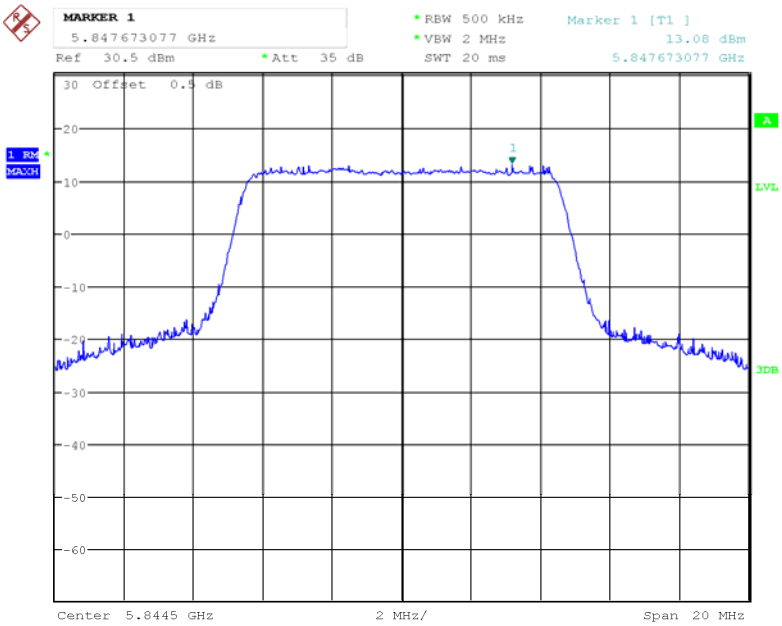
Date: 26.MAR.2019 19:57:43

10M Middle Channel



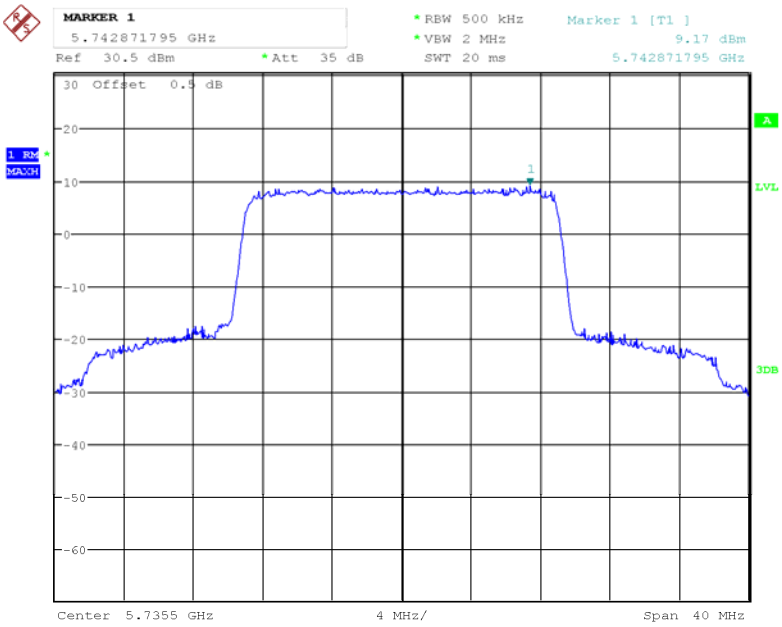
Date: 26.MAR.2019 19:59:15

10M High Channel



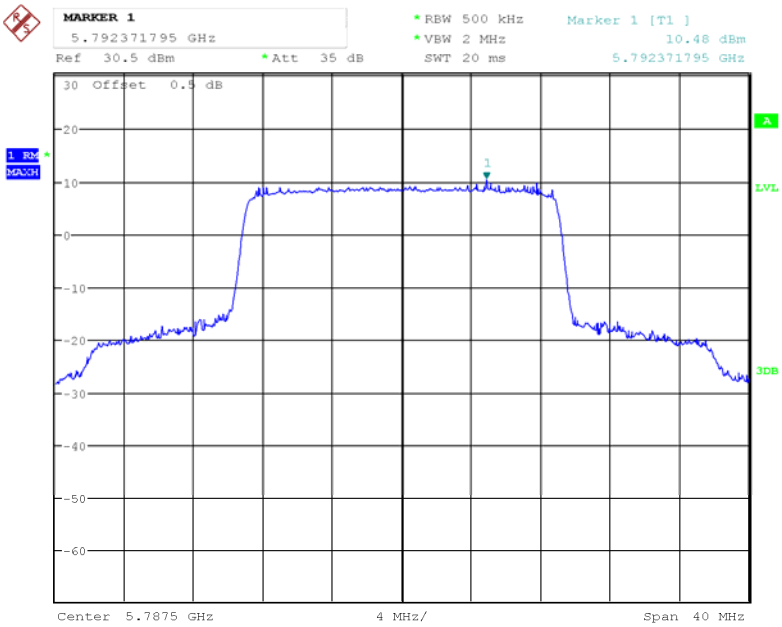
Date: 26.MAR.2019 19:59:37

20M Low Channel



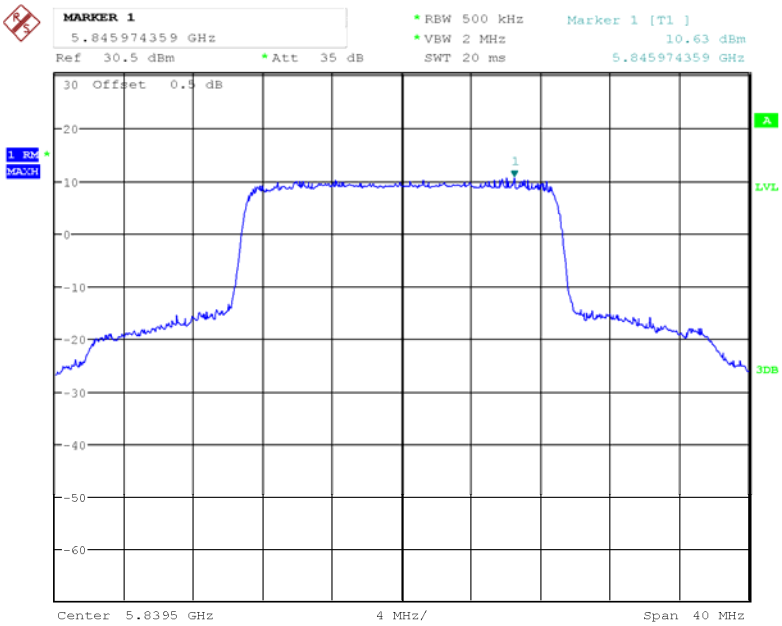
Date: 26.MAR.2019 19:56:55

20M Middle Channel



Date: 26.MAR.2019 19:55:27

20M High Channel



Date: 26.MAR.2019 19:55:10

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