



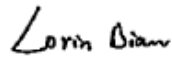
FCC PART 15.247
RSS-GEN, ISSUE 4, NOVEMBER 2014
RSS-247, ISSUE 2, FEBRUARY 2017
TEST REPORT

For

SZ DJI TECHNOLOGY CO., LTD

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Nanshan, Shenzhen, Guangdong, China

FCC ID: SS3-PM4101703
IC: 11805A-PM4101703

Report Type: Original Report	Product Name: MATRICE SERIES
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Report Number:	<u>RDG170423002A</u>
Report Date:	<u>2017-06-09</u>
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **SZ DJI TECHNOLOGY CO., LTD**'s product, model number: **MATRICE 200** (**FCC ID: SS3-PM4101703, IC: 11805A-PM4101703**) (the "EUT") in this report was a **MATRICE SERIES**, which was measured approximately: 53 cm (L) x 48 cm (W) x 29.5 cm (H), rated input voltage: DC22.8V form battery, the battery can be removed to charge.

Note: The series product, model MATRICE 200, M210, M210RTK are electrically identical, we selected MATRICE 200 for fully testing, and all model for radiation emissions test, the details of the difference between them was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from final production sample, serial number: 170423002-1(M210), 170423002-2(MATRICE 200), 170423002-3(M210RTK) (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-05-03, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of **SZ DJI TECHNOLOGY CO., LTD** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 15.209, 15.247 rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15E NII submissions with FCC ID: SS3-PM4101703.
RSS-247 LE-LAN submissions with IC: 11805A-PM4101703.
Part of system granted with FCC ID: SS3-GL6D10A1609, IC: 11805A-GL6D10A1609

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”, and RSS-247, ISSUE 2, February 2017, RSS-GeN ISSUE 4, November 2014 of the Innovation, Science and Economic Development Canada.

All of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu’s measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ± 3.17 dB.

-For of all of the Direct Antenna Conducted Emissions Tests reported herein: ± 0.56 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:

30 MHz to 200 MHz: ± 4.7 dB;

200 MHz to 1 GHz: ± 6.0 dB;

1 GHz to 6 GHz: ± 5.13 dB; and,

6 GHz to 40 GHz: ± 5.47 dB.

And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.

The device support 2.4GHz and 5.8 GHz double band. For both bands, The EUT have 4 antennas, but only supports 2T2R MIMO mode, the system configures two of them transmitting depending on better performance by the system automatically recognizes.

For 2.4GHz band, total 8 channels were employed by the system:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2406.5	5	2446.5
2	2416.5	6	2456.5
3	2426.5	7	2466.5
4	2436.5	8	2476.5

EUT Exercise Software

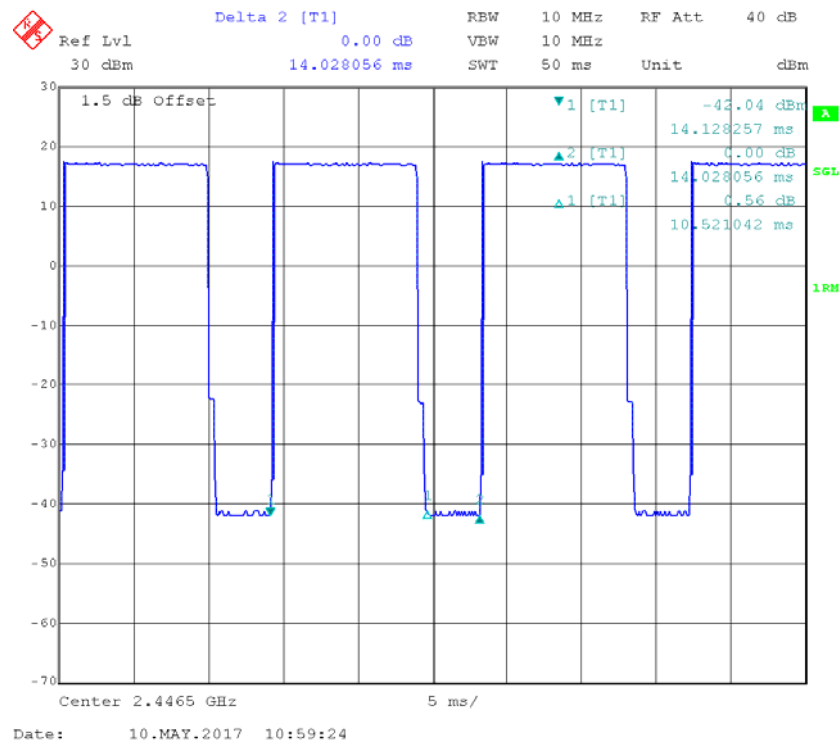
The software “DJI-RF Certification” was used for testing, which was provided by manufacturer. The maximum power and duty cycle was configured by system default setting. The Target power level as below:

Test Software Version	DJI-RF Certification		
Frequency (MHz)	2406.5	2416.5~2466.5	2476.5
Power Level Setting	16	22	14

For difference power level configured by system default setting, all test items performed at Low, Middle and High Channel, output power, radiation bandedge test with additional channels according to the power setting and power test results.

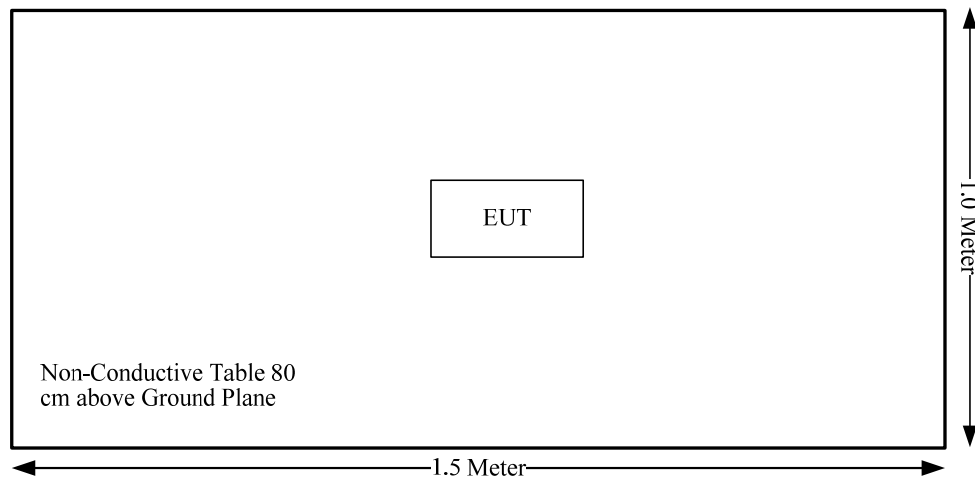
The duty cycle as below:

T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)	Minimum Transmission Duration (T) (ms)
10.52	14.03	75	10.52

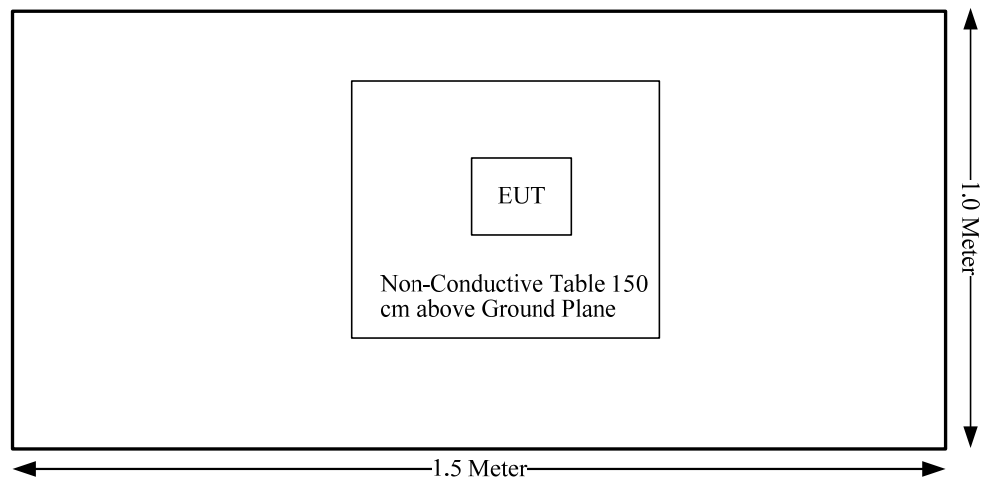


Block Diagram of Test Setup

Radiation test below 1GHz:



Radiation test above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
RSS-102 § 2.5.2	Exemption Limits For Routine Evaluation- RF Exposure Evaluation	Compliance
FCC§15.203 RSS-GEN§8.3	Antenna Requirement	Compliance
§15.207 (a) RSS-Gen §8.8	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d) RSS-247 §5.5 RSS-Gen §8.10	Spurious Emissions	Compliance
§15.247 (a)(2) RSS-247 §5.2 a)	6 dB Emission Bandwidth And 99% Occupied Bandwidth	Compliance
§15.247(b)(3) RSS-247 §5.4 d)	Maximum conducted output power	Compliance
§15.247(d) RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) RSS-247 §5.2 b)	Power Spectral Density	Compliance

Not Applicable: the device was powered by battery.

FCC §15.247 (i) , §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/f ²)	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;

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/cm²);

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	Antenna Gain		Maximum Conducted Power Including Tune Up Tolerance		Evaluation Distance	Power Density	Limit
	dBi	numeric	dBm	mW			
2406.5-2476.5	2.24	1.67	22	158.49	20.00	0.0528	1.0
5730-5845	1.77	1.50	25	316.23	20.00	0.0946	1.0

Note: The 2.4GHz and 5GHz band can't transmit simultaneously.

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 MHz⁶ 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:

For 2.4GHz band:

The maximum power including tune-up tolerance is 22dBm@ 2.4GHz band, the antenna gain is 2.24dBi, so the maximum e.i.p. is 24.24dBm (0.265W)

Exemption from Routine Evaluation Limit is:

$$1.31 \times 10^{-2} f^{0.6834} \text{ W} = 1.31 \times 10^{-2} \times 2406.5^{0.6834} \text{ W} = 2.68 \text{ W} > 0.237 \text{ W}$$

For 5.8GHz Band:

The maximum tune-up power including tolerance is 25dBm, and the antenna gain is 1.77 dBi, so the maximum Power(E.I.R.P or conducted) is less 26.77 dBm(0.475W).

Exemption limits for RF exposure is:

$$1.31 \times 10^{-2} f^{0.6834} = 4.85 \text{ W at } 5730 \text{ MHz} > 0.4 \text{ W}$$

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

Result: Compliance

FCC §15.203 ,RSS-GEN§8.3- ANTENNA REQUIREMENT

Applicable Standard

According to § 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.

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 §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.⁹ When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Information And Connector Construction

Ant.	Antenna Type	Connector	Frequency Range/Antenna Gain
Chain 0	PCB	MCX	2.4GHz Band/2.24dBi 5GHz Band/1.77dBi
Chain 1	PCB	MCX	2.4GHz Band/2.24dBi 5GHz Band/1.77dBi
Chain 2	PCB	MCX	2.4GHz Band/2.24dBi 5GHz Band/1.77dBi
Chain 3	PCB	MCX	2.4GHz Band/2.24dBi 5GHz Band/1.77dBi

Result: Compliance. Please refer to the EUT photos

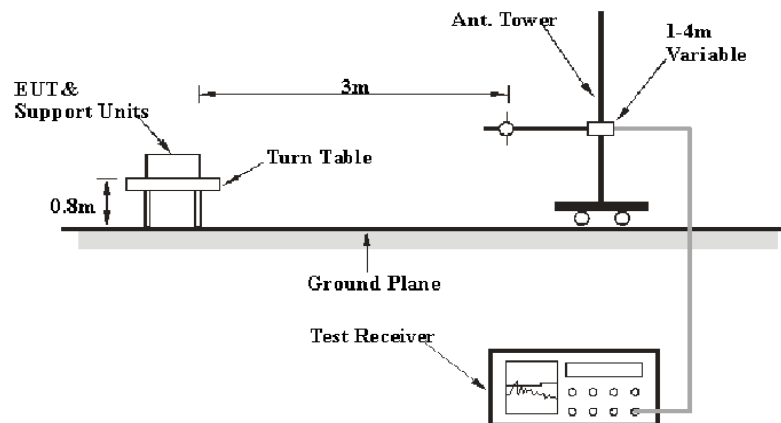
FCC §15.209, §15.205 , §15.247(d) & RSS-247 §5.5&RSS-GEN§8.10- SPURIOUS EMISSIONS

Applicable Standard

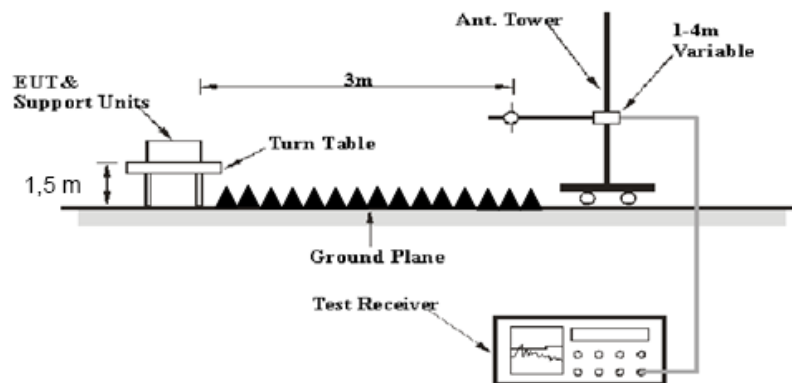
FCC §15.247 (d); §15.209; §15.205; and RSS-247 §5.5, RSS-GEN §8.10

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 and RSS-247 §5.5,RSS-GEN §8.10 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

30-1000MHz:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

1GHz- 25GHz:

Detector	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Test Procedure

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

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

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss 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:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	30.1 °C
Relative Humidity:	43.2 %
ATM Pressure:	100.1 kPa

* The testing was performed by Lorin Bian on 2017-06-09.

Test Mode: Transmitting (M210 was the worst and recored in the report)

30MHz-25GHz(Chain 0+1 was the worst):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2406.5 MHz									
2406.5	73.33	PK	H	23.52	3.00	0.00	99.85	N/A	N/A
2406.5	58.42	AV	H	23.52	3.00	0.00	84.94	N/A	N/A
2406.5	85.01	PK	V	23.52	3.00	0.00	111.53	N/A	N/A
2406.5	70.26	AV	V	23.52	3.00	0.00	96.78	N/A	N/A
2390	28.89	PK	V	23.57	3.00	0.00	55.46	74	18.54
2390	13.50	AV	V	23.57	3.00	0.00	40.07	54	13.93
4813	35.04	PK	V	30.80	5.12	26.87	44.09	74	29.91
4813	22.87	AV	V	30.80	5.12	26.87	31.92	54	22.08
7219.5	35.29	PK	V	34.74	6.17	26.36	49.84	74	24.16
7219.5	22.62	AV	V	34.74	6.17	26.36	37.17	54	16.83
3131	40.31	PK	V	24.93	3.63	26.46	42.41	74	31.59
3131	27.42	AV	V	24.93	3.63	26.46	29.52	54	24.48
400.54	44.89	QP	H	16.12	1.64	28.23	34.42	46.00	11.58
442.25	42.36	QP	H	16.96	1.58	28.46	32.44	46.00	13.56
High Channel: 2446.5 MHz									
2446.5	78.31	PK	H	23.38	3.00	0.00	104.69	N/A	N/A
2446.5	64.92	AV	H	23.38	3.00	0.00	91.3	N/A	N/A
2446.5	91.90	PK	V	23.38	3.00	0.00	118.28	N/A	N/A
2446.5	78.07	AV	V	23.38	3.00	0.00	104.45	N/A	N/A
4893	34.95	PK	V	31.06	5.08	26.87	44.22	74	29.78
4893	22.94	AV	V	31.06	5.08	26.87	32.21	54	21.79
7339.5	34.66	PK	V	34.98	6.23	26.41	49.46	74	24.54
7339.5	22.45	AV	V	34.98	6.23	26.41	37.25	54	16.75
3131	40.03	PK	V	24.93	3.63	26.46	42.13	74	31.87
3131	27.07	AV	V	24.93	3.63	26.46	29.17	54	24.83
3190	40.59	PK	V	25.26	3.72	26.48	43.09	74	30.91
3190	28.36	AV	V	25.26	3.72	26.48	30.86	54	23.14
400.54	45.16	QP	H	16.12	1.64	28.23	34.69	46.00	11.31
442.25	42.5	QP	H	16.96	1.58	28.46	32.58	46.00	13.42
Middle Channel: 2476.5 MHz									
2476.5	71.50	PK	H	23.28	2.99	0.00	97.77	N/A	N/A
2476.5	56.96	AV	H	23.28	2.99	0.00	83.23	N/A	N/A
2476.5	84.11	PK	V	23.28	2.99	0.00	110.38	N/A	N/A
2476.5	69.99	AV	V	23.28	2.99	0.00	96.26	N/A	N/A
2483.5	38.18	PK	V	23.26	2.99	0.00	64.43	74	9.57
2483.5	24.39	AV	V	23.26	2.99	0.00	50.64	54	3.36
4953	35.39	PK	V	31.25	5.05	26.88	44.81	74	29.19
4953	23.69	AV	V	31.25	5.05	26.88	33.11	54	20.89
7429.5	35.64	PK	V	35.16	6.27	26.45	50.62	74	23.38
7429.5	22.89	AV	V	35.16	6.27	26.45	37.87	54	16.13
3131	40.33	PK	V	24.93	3.63	26.46	42.43	74	31.57
3131	27.36	AV	V	24.93	3.63	26.46	29.46	54	24.54
400.54	46	QP	H	16.12	1.64	28.23	35.53	46.00	10.47
442.25	42.92	QP	H	16.96	1.58	28.46	33.00	46.00	13.00

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Additional Channel: 2416.5 MHz									
2416.5	79.79	PK	H	23.48	3.00	0.00	106.27	N/A	N/A
2416.5	66.22	AV	H	23.48	3.00	0.00	92.7	N/A	N/A
2416.5	90.13	PK	V	23.48	3.00	0.00	116.61	N/A	N/A
2416.5	76.89	AV	V	23.48	3.00	0.00	103.37	N/A	N/A
2390	36.01	PK	V	23.57	3.00	0.00	62.58	74	11.42
2390	13.83	AV	V	23.57	3.00	0.00	40.4	54	13.6
Additional Channel: 2466.5 MHz									
2466.5	78.77	PK	H	23.31	2.99	0.00	105.07	N/A	N/A
2466.5	65.35	AV	H	23.31	2.99	0.00	91.65	N/A	N/A
2466.5	91.24	PK	V	23.31	2.99	0.00	117.54	N/A	N/A
2466.5	77.42	AV	V	23.31	2.99	0.00	103.72	N/A	N/A
2483.5	42.98	PK	V	23.26	2.99	0.00	69.23	74	4.77
2483.5	22.35	AV	V	23.26	2.99	0.00	48.6	54	5.4

FCC §15.247(a) (2)& RSS-247 §5.2 a) &RSS-GEN§6.6 –6 dB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)

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

According to RSS-247 §5.2 a)

The minimum 6 dB bandwidth shall be 500 kHz.

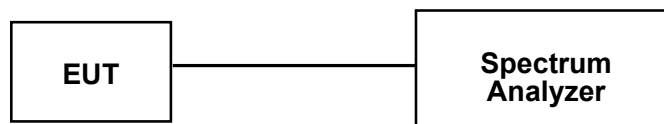
According to RSS-Gen §6.6

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
- h) Measure the 99% bandwidth use OBW test function.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	25.9 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

* The testing was performed by Lorin Bian on 2017-05-10.

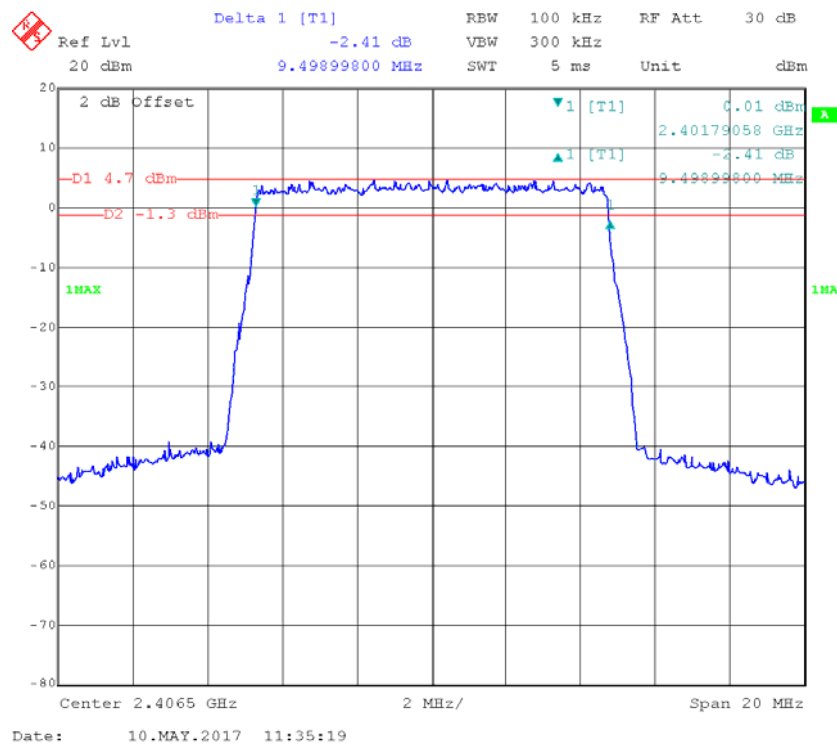
Test Mode: Transmitting (Test performed at Chain 0)

Test Result: Compliant. Please refer to the following table and plots.

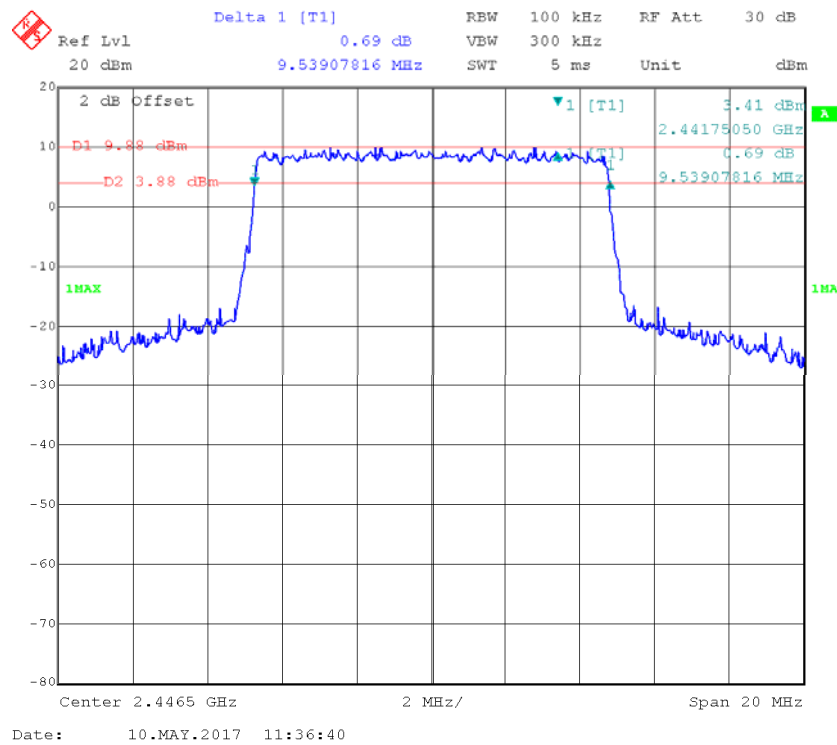
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied bandwidth (MHz)	Limit (MHz)
Low	2406.5	9.50	9.42	≥0.5
Middle	2446.5	9.54	9.38	≥0.5
High	2476.5	9.50	9.38	≥0.5

6dB Bandwidth:

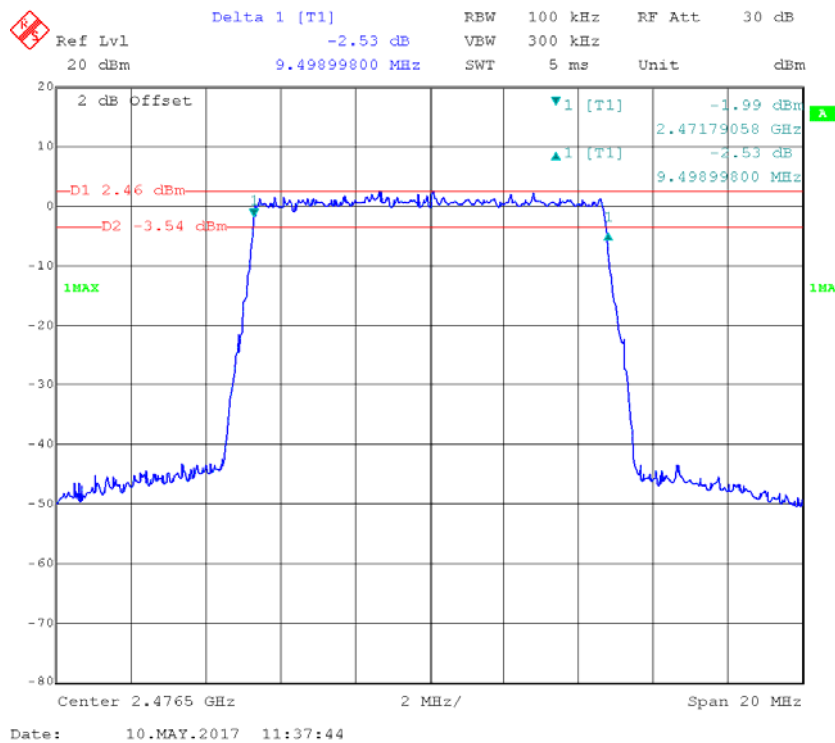
Low Channel



Middle Channel

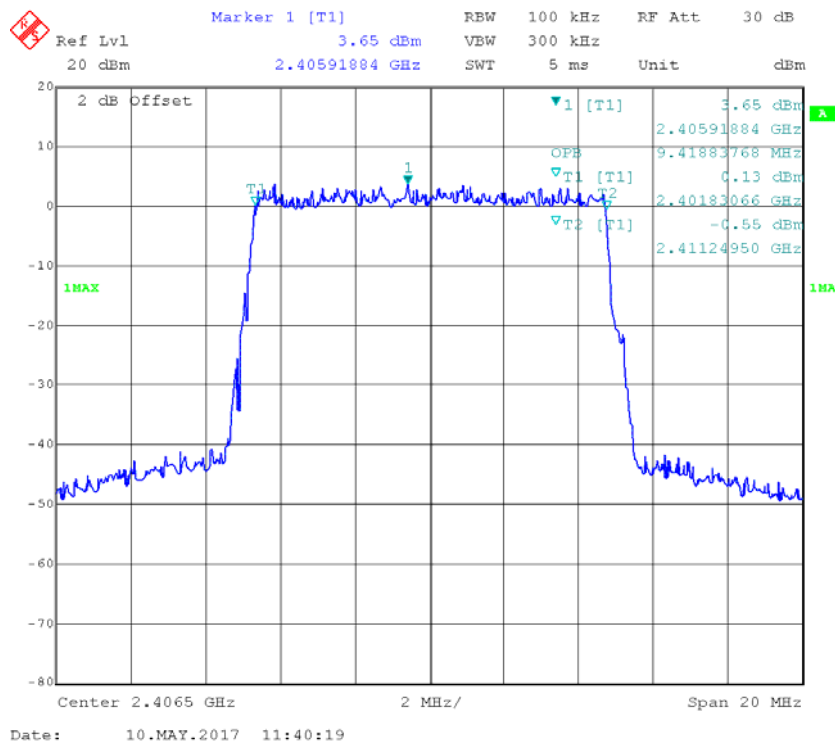


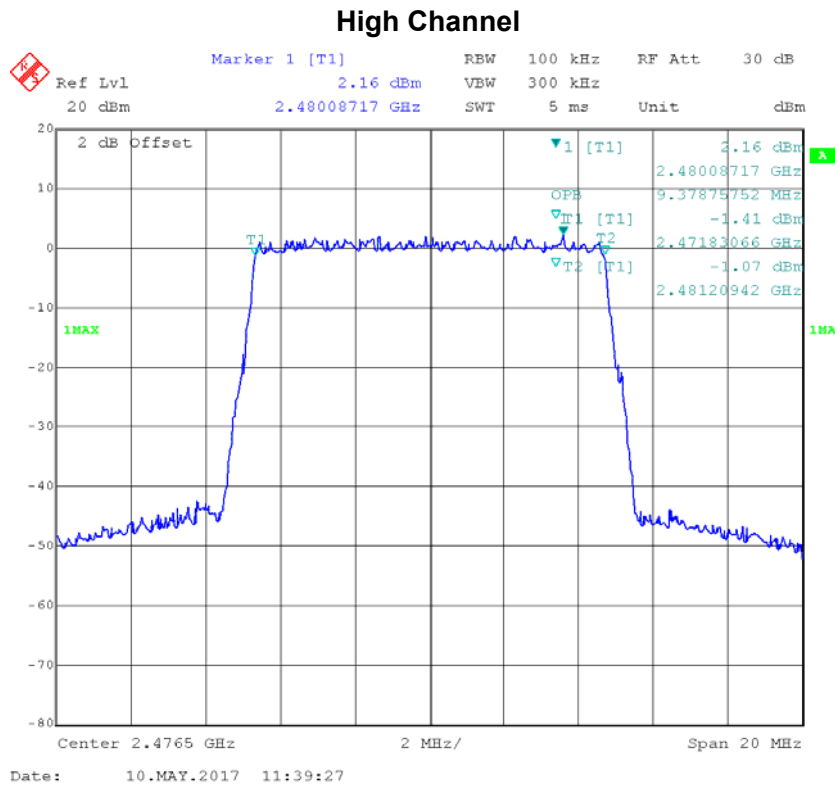
High Channel



99% Occupied Bandwidth:

Low Channel





FCC §15.247(b) (3)& RSS-247 §5.4 d) - MAXIMUM CONDUCTED OUTPUT POWER

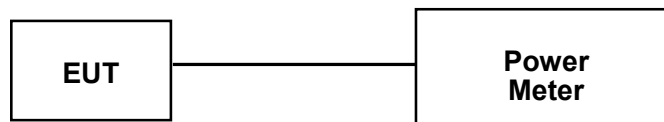
Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247§5.4 d) For DTSS employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(e), the e.i.r.p. shall not exceed 4 W. As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170074	2017-01-03	2018-01-02
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	25.9 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

* The testing was performed by Lorin Bian on 2017-05-10.

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)				Total (dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 2	Chain 3		
Low	2406.5	12.22	12.32	12.05	11.88	15.28	30
Additional	2416.5	18.43	18.27	18.14	17.96	21.36	30
Middle	2446.5	18.53	18.44	18.02	18.24	21.50	30
Additional	2466.5	18.42	18.27	18.03	17.92	21.36	30
High	2476.5	10.33	10.06	9.77	9.89	13.21	30

Note:

The device supports 2T2R mode, the Total power was calculated by adding two maximum output power of them.

The antenna gains are 2.24 dBi in 2.4GHz band, the device employed Cyclic Delay Diversity (CDD) for 2TX 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 NANT ≤ 4;

So:

Directional gain = GANT + Array Gain = 2.24 dBi < 6dBi

FCC §15.247(d)& RSS-247 §5.5 – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§15.247(d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to RSS-247 §5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

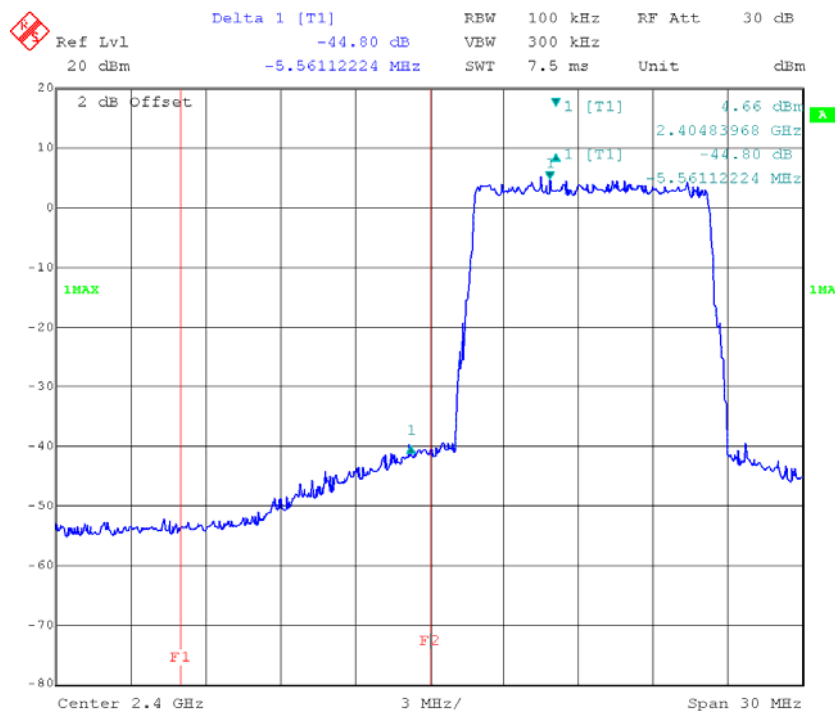
Temperature:	29.5 °C
Relative Humidity:	42.3 %
ATM Pressure:	100.1 kPa

* *The testing was performed by Lorin Bian on 2017-06-08.*

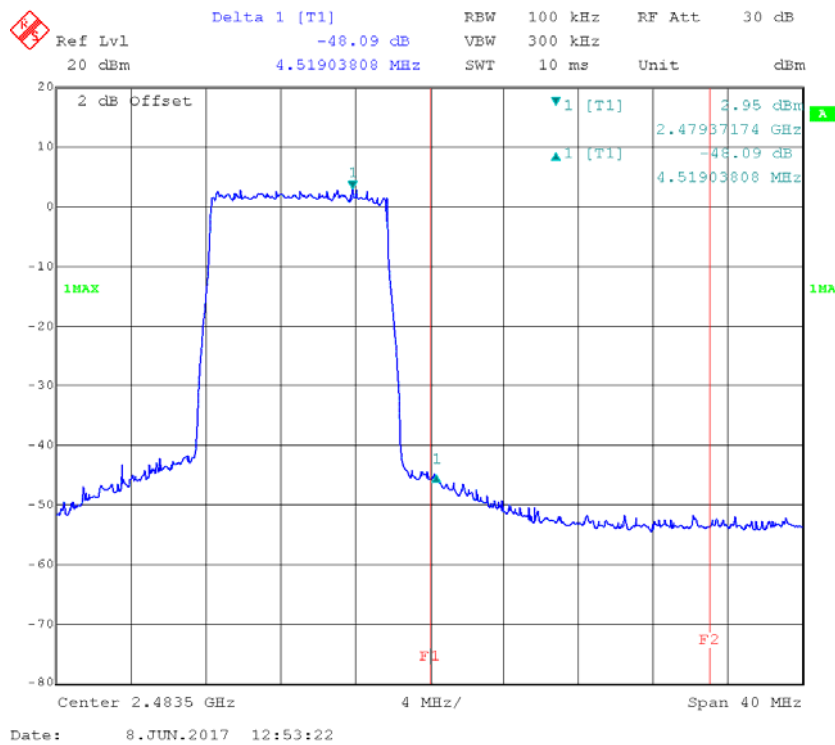
Test mode: Transmitting(the PSD test performed at chain 0 and 1, Since per output power test, Chain 0 and 1 was the maximum output)

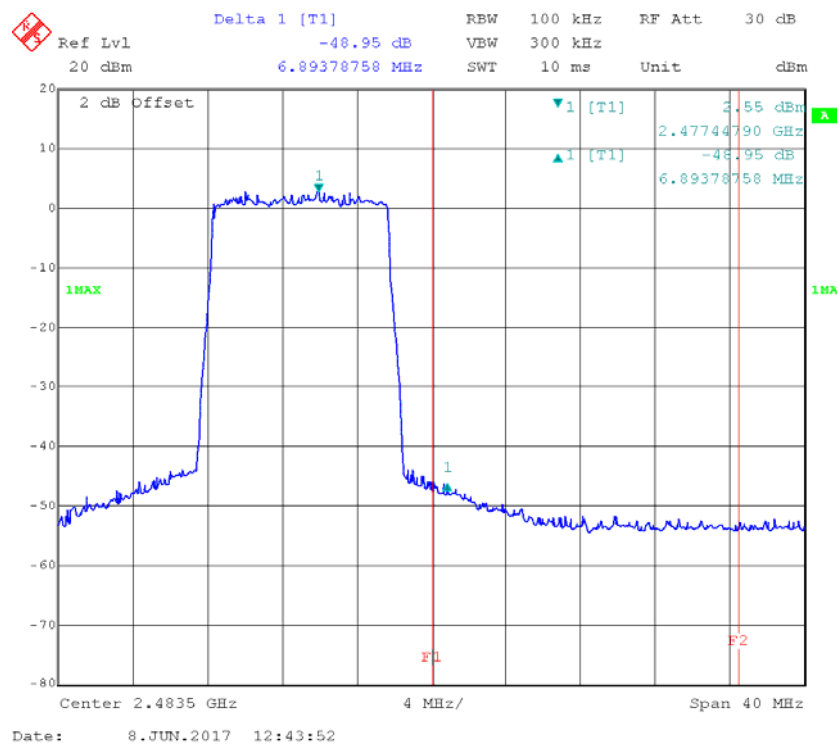
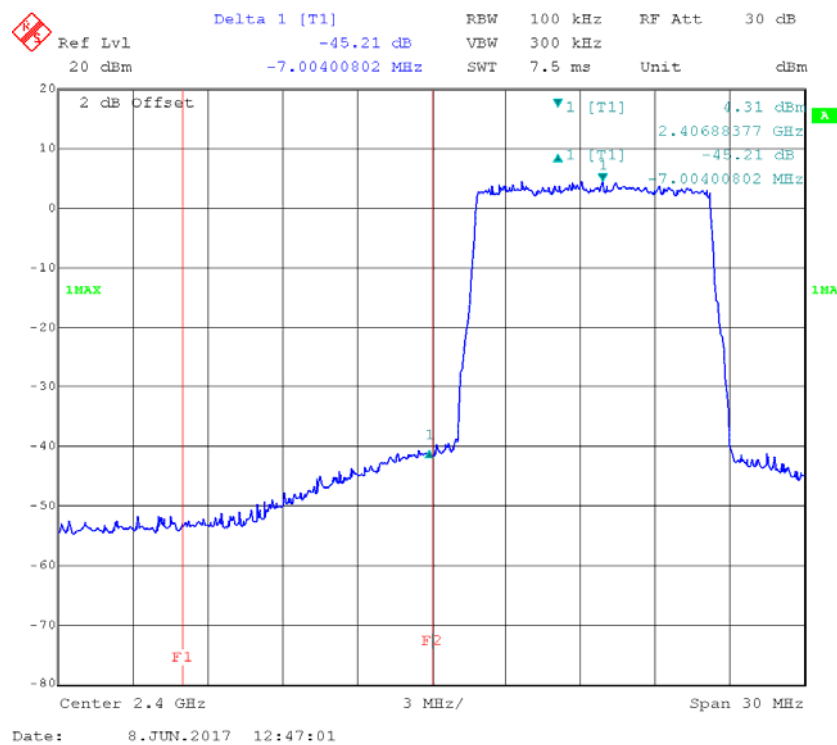
Test Result: Compliant. Please refer to following plots.

Chain 0, Band Edge, Left Side



Chain 0, Band Edge, Right Side





FCC §15.247(e) & RSS-247 §5.2 b)- POWER SPECTRAL DENSITY

Applicable Standard

According to FCC§15.247(e):For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-247 §5.2 b):

- b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Test Procedure

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

* The testing was performed by Lorin Bian on 2017-05-10.

Test Mode: Transmitting(the PSD test performed at chain 0 and 1, Since per output power test, Chain 0 and 1 was the maximum output)

Test Result: Compliant. Please refer to the following table and plots

Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
		Chain 0	Chain 1		
Low	2406.5	-20.63	-21.57	-18.06	≤8
Middle	2446.5	-15.16	-14.54	-11.83	≤8
High	2476.5	-22.54	-23.18	-19.84	≤8

Note: the antenna maximum gain are 2.24dBi in 2.4GHz band, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

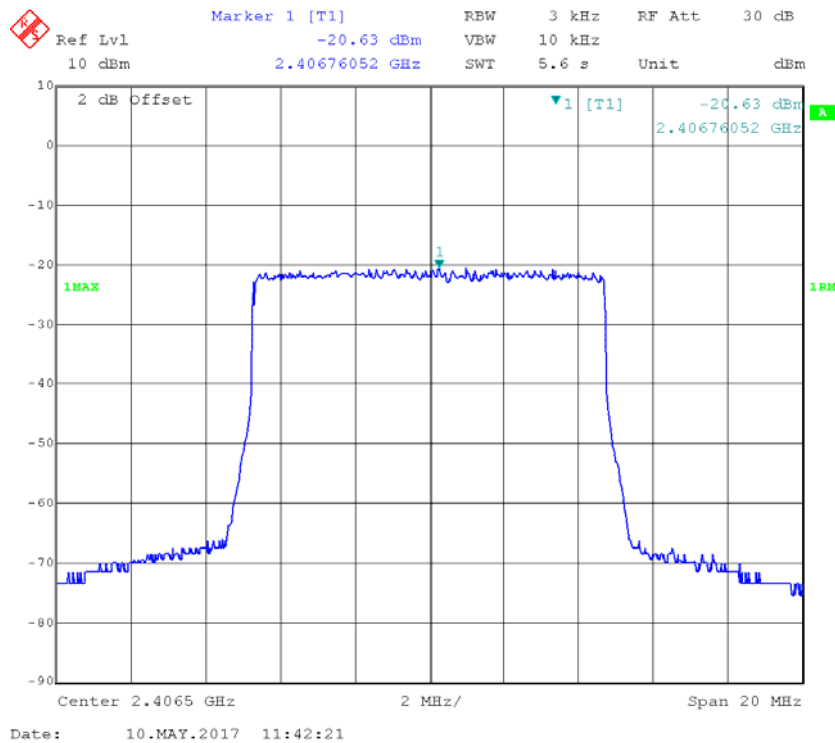
Array Gain = $10 \log(\text{NANT}/\text{NSS})$ dB.

So:

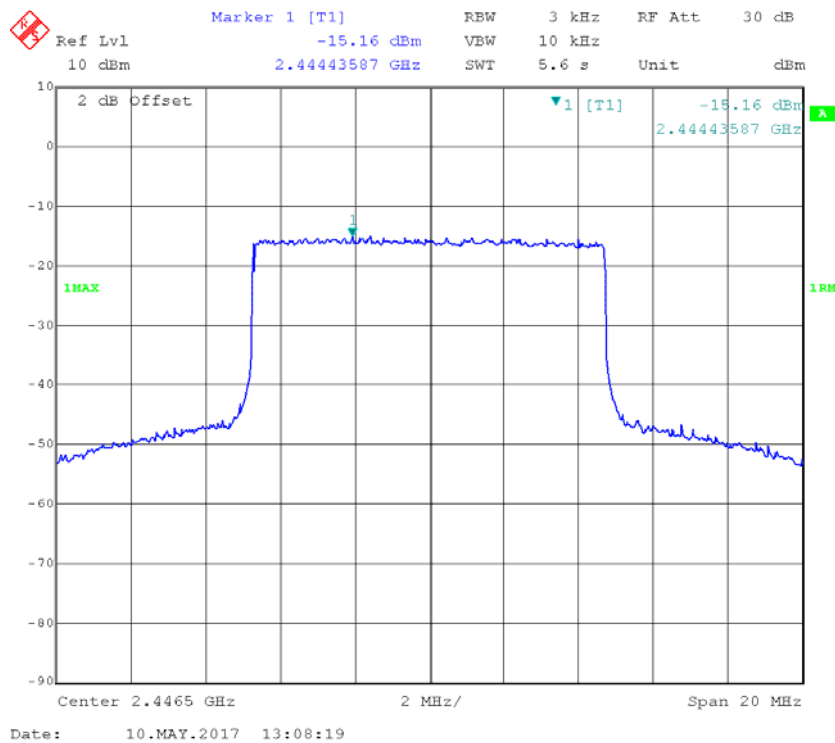
Directional gain = GANT + Array Gain = $2.24 + 10 \cdot \log(2) = 5.24$ dBi < 6dBi

Chain 0:

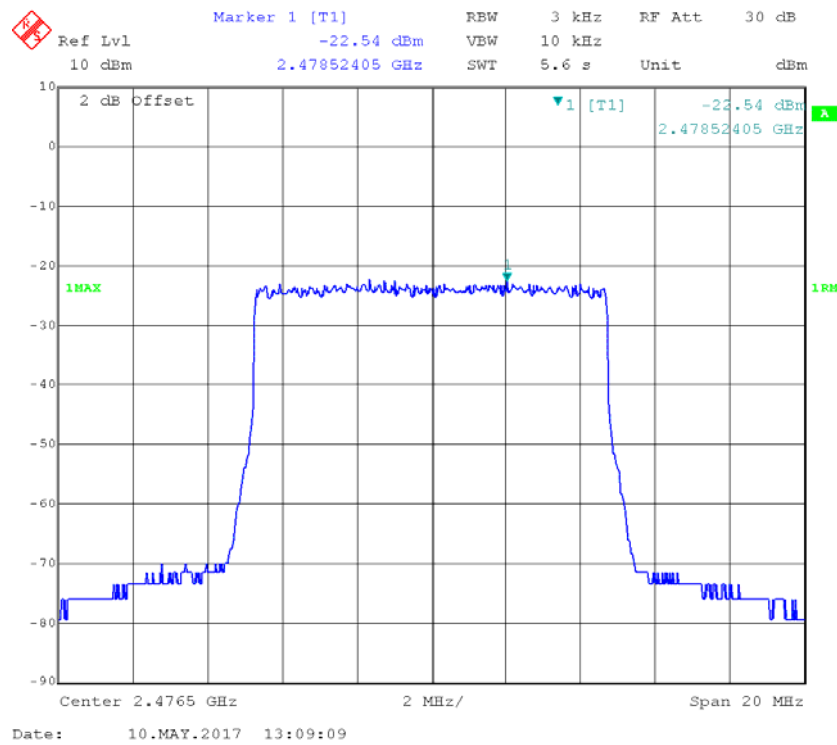
Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel

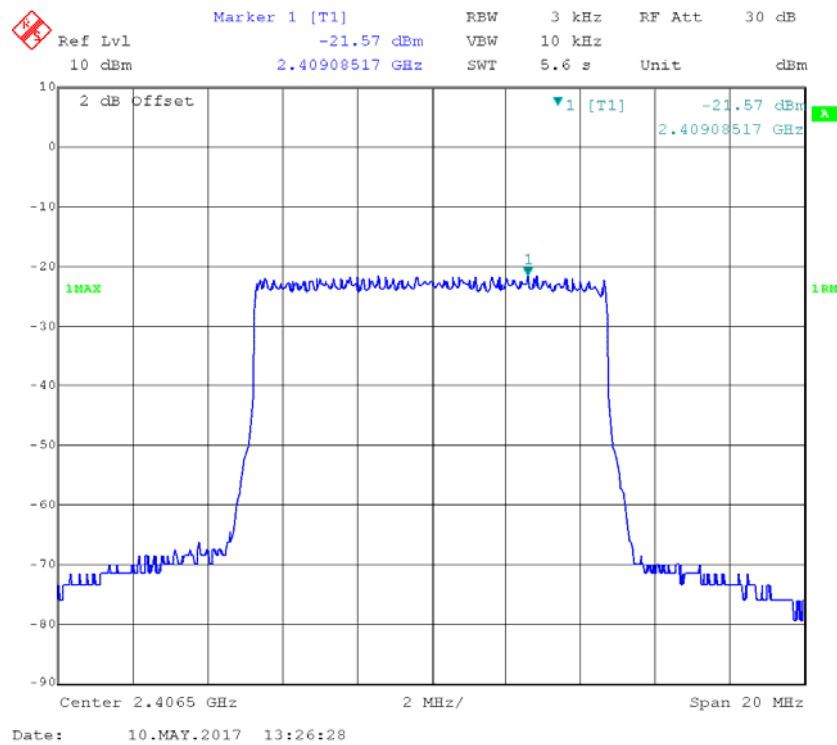


Power Spectral Density, High Channel

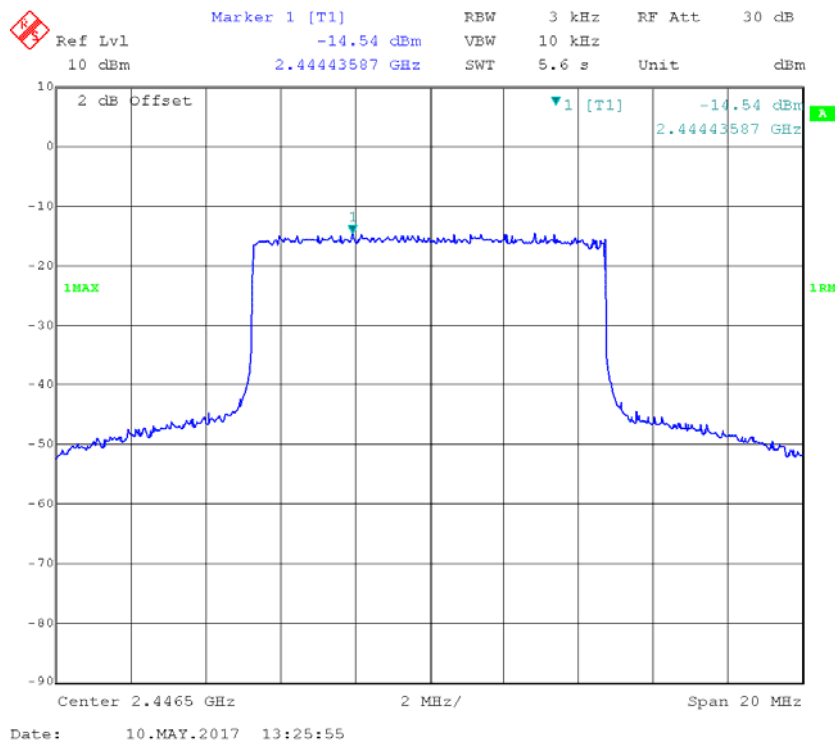


Chain 1

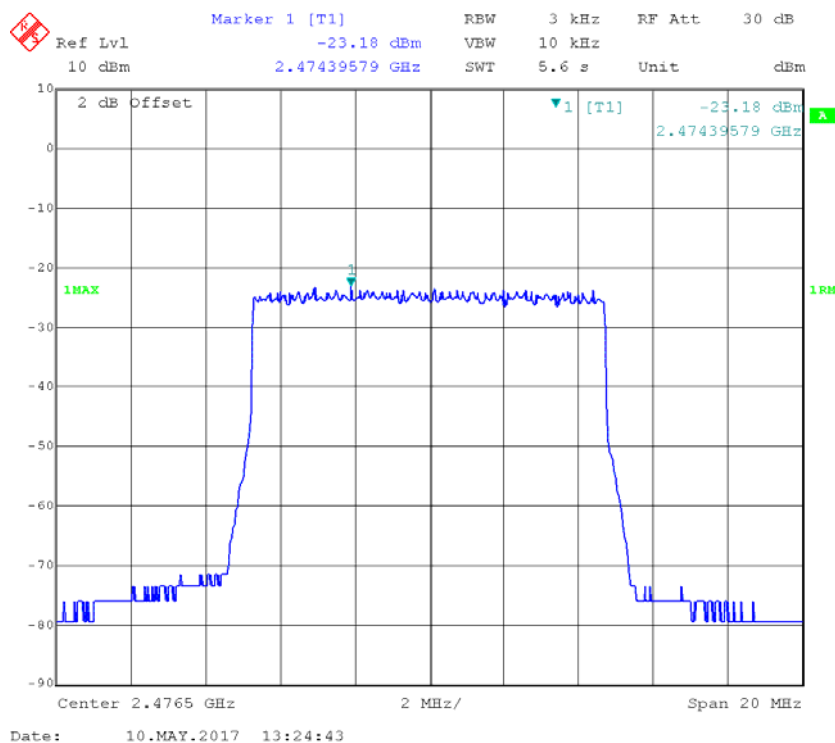
Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel



Power Spectral Density, High Channel



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