



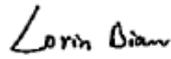
FCC PART 15.247 TEST REPORT

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-WM331A1704

Report Type: Original Report	Product Name: Phantom 4 Pro
Test Engineer: <u>Lorin Bian</u>	
Report Number: <u>RDG170329005A-A1</u>	
Report Date: <u>2017-04-11</u>	
Reviewed By: <u>Henry Ding</u> EMC Leader	
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

Note: This test report was 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. (Chengdu). Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

TABLE OF CONTENTS

GENERAL INFORMATION	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S)	4
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	6
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
FCC §15.247 (i) & §1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	9
APPLICABLE STANDARD	9
FCC §15.203 - ANTENNA REQUIREMENT	11
APPLICABLE STANDARD	11
ANTENNA CONNECTOR CONSTRUCTION	11
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS	12
APPLICABLE STANDARD	12
MEASUREMENT UNCERTAINTY	12
EUT SETUP	13
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	14
TEST PROCEDURE	14
CORRECTED AMPLITUDE & MARGIN CALCULATION	14
TEST EQUIPMENT LIST AND DETAILS	15
TEST RESULTS SUMMARY	15
TEST DATA	15
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST	17
APPLICABLE STANDARD	17
TEST EQUIPMENT LIST AND DETAILS	17
TEST PROCEDURE	17
TEST DATA	17
FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING	20
APPLICABLE STANDARD	20
TEST PROCEDURE	20
TEST EQUIPMENT LIST AND DETAILS	20
TEST DATA	20
FCC §15.247(a) (1) (i) - QUANTITY OF HOPPING CHANNEL TEST	23
APPLICABLE STANDARD	23
TEST PROCEDURE	23
TEST EQUIPMENT LIST AND DETAILS	23
TEST DATA	23
FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME)	25
APPLICABLE STANDARD	25

TEST PROCEDURE	25
TEST EQUIPMENT LIST AND DETAILS	25
TEST DATA	25
FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST EQUIPMENT LIST AND DETAILS	30
TEST DATA	30
FCC §15.247(d) - BAND EDGES TESTING	33
APPLICABLE STANDARD	33
TEST PROCEDURE	33
TEST EQUIPMENT LIST AND DETAILS	33
TEST DATA	34

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **SZ DJI TECHNOLOGY CO., LTD's** product, model number: **WM331A** (**FCC ID: SS3-WM331A1704**) (or the "EUT") in this report was a **Phantom 4 Pro**, which was measured approximately: 500 mm (L) x 500 mm (W) x 185 mm(H), rated input voltage: DC 15.2V from lithium battery.

**All measurement and test data in this report was gathered from final production sample, serial number: 170329005 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-20, 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, B and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

This is the second application for model number: **WM331A**, the first application was certified with FCC ID: **SS3-WM331A1609**, granted on 2016-10-28, the difference between the original device and the current one is as follows:

1. Increased one channel in Sub 1G Mode:
Previous: 49 channels from 915.938MHz-925.538MHz, 200kHz channel separation.
Current: 50 channels from 915.938MHz-925.738MHz, 200kHz channel separation.
2. Increased the output power for Sub 1G mode.
3. employed FHSS for the Sub 1G mode.

The change made to the device affected all the test results for Sub 1G mode and the applicable standard change to FCC Part 15-Subpart C section 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15E NII submissions with FCC ID: SS3-WM331A1704.
FCC Part 15C DTS submissions with FCC ID: SS3-WM331A1704.
Part of system granted with FCC ID: SS3-GL300E1609.

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.62dB
Power Spectral Density, conducted	±0.62 dB
Unwanted Emissions, radiated	30M~200MHz: 4.7 dB for Horizontal, 4.7 dB for Vertical 200M~1GHz:6.0 dB for Horizontal, 6.0 for Vertical 1G~6GHz: 5.13 dB, 6G~18GHz: 5.47 dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.17 dB (150 kHz to 30 MHz)

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 Engineering Mode, which was provided by the manufacturer.

For Sub 1GHz band, 50 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	915.938	26	920.938
2	916.138	27	921.138
...
...	...	48	925.338
24	920.538	49	925.538
25	920.738	50	925.738

Channel 915.938MHz, 920.738MHz and 925.738MHz were tested.

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 default setting level as below:

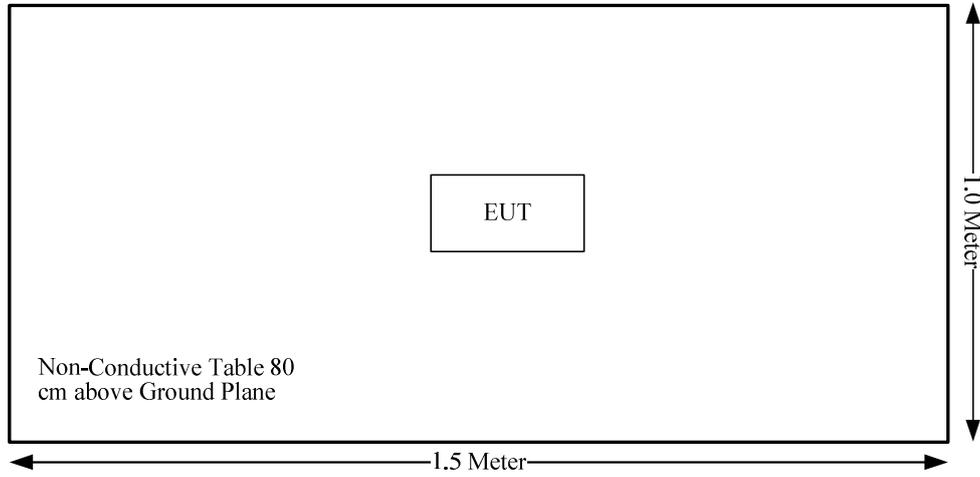
Antenna 0				
Test Mode	Test Software Version	DJI-RF Certification		
SUBG	Frequency (MHz)	915.938	920.738	925.738
	Power Level Setting	70	70	70

Equipment Modifications

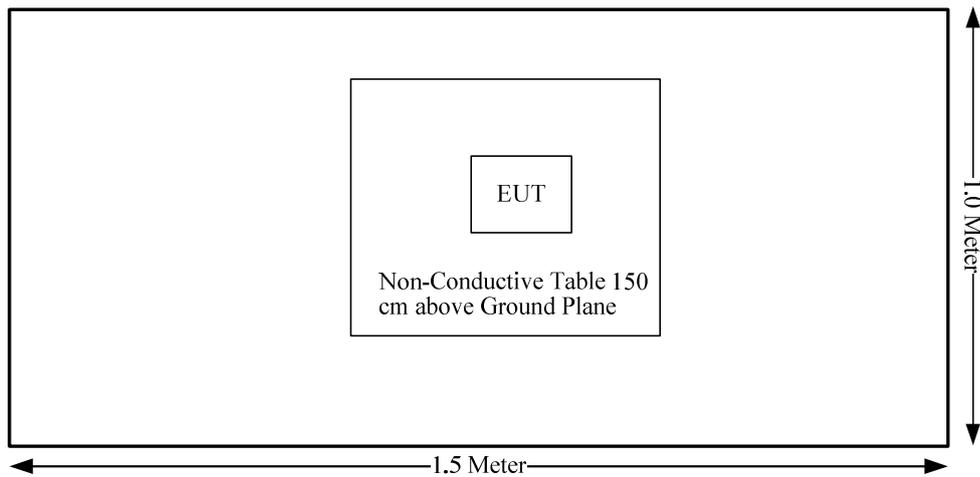
No modification was made to the EUT.

Block Diagram of Test Setup

Radiation test below 1GHz:



Radiation test above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(i)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(i)	Quantity of hopping channel Test	Compliance
§15.247(b)(2)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

FCC §15.247 (i) & §1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1307, 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;

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/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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Frequency Range (MHz)	Antenna Gain		Maximum Power Including Tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
915.938-927.738	-0.46	0.90	12	15.85	20.00	0.0028	0.6173
2406.5-2476.5	1.60	1.45	29	794.33	20.00	0.2285	1.0
5730-5845	0.79	1.20	26	398.11	20.00	0.0950	1.0

Note: The Maximum Power Including Tolerance was declared by manufacturer. 2.4GHz and 5.8GHz can't transmission simultaneously.

The maximum simultaneously transmit is Sub 1G+2.4G mode:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$=S_{sub}/S_{limit-sub} + S_{2.4G}/S_{limit-2.4G}$$

$$=0.0028/0.6173+0.2285/1$$

$$=0.23$$

$$< 1.0$$

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - 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.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has two internal antenna arrangement for Sub 1GHz, one for TX and one for RX, and all the antenna gain is -0.46 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

–compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;

–non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

30M~200MHz: ±4.7 dB;

200M~1GHz: ±6.0 dB;

1G-6GHz: ±5.13dB;

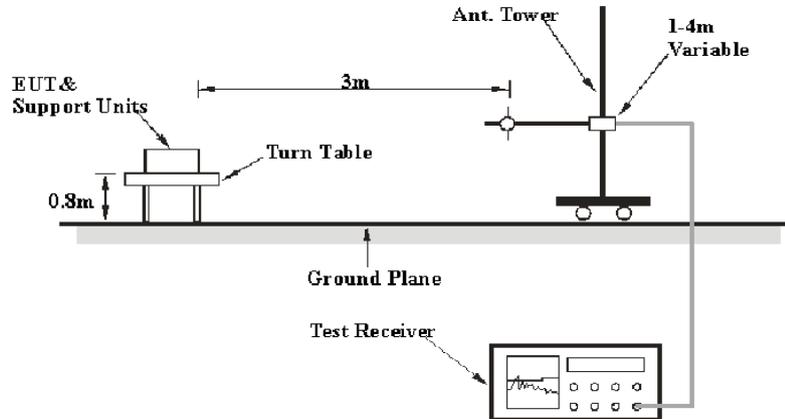
6G~25GHz: ±5.47 dB;

Table 1 – Values of U_{cispr}

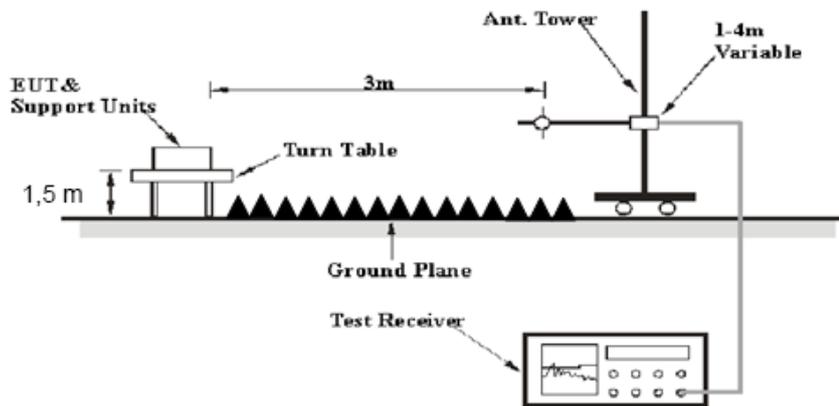
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 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 10 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

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:

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

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
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247.

Test Data

Environmental Conditions

Temperature:	19 °C
Relative Humidity:	58 %
ATM Pressure:	96.2 kPa

The testing was performed by Lorin Bian on 2017-03-23.

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

30MHz-10GHz:

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: 915.938 MHz									
915.938	77.44	QP	V	22.99	2.45	0.00	102.88	N/A	N/A
915.938	66.54	QP	H	22.99	2.45	0.00	91.98	N/A	N/A
902	16.83	QP	V	22.82	2.40	0.00	42.05	82.88	40.83
1831.876	35.82	PK	V	24.63	2.92	26.66	36.71	74	37.29
1831.876	24.13	AV	V	24.63	2.92	26.66	25.02	54	28.98
2747.814	42.65	PK	V	23.70	3.21	26.65	42.91	74	31.09
2747.814	30.24	AV	V	23.70	3.21	26.65	30.5	54	23.5
3663.752	43.44	PK	V	27.66	4.42	26.58	48.94	74	25.06
3663.752	30.89	AV	V	27.66	4.42	26.58	36.39	54	17.61
3321	41.38	PK	V	26.00	3.91	26.53	44.76	74	29.24
3321	29.23	AV	V	26.00	3.91	26.53	32.61	54	21.39
347.19	37.02	QP	H	15.12	1.27	27.79	25.62	46.00	20.38
600.36	35.13	QP	H	19.51	1.85	28.85	27.64	46.00	18.36
Middle Channel: 920.738 MHz									
920.738	80.85	QP	V	23.05	2.47	0.00	106.37	N/A	N/A
920.738	77.05	QP	H	23.05	2.47	0.00	102.57	N/A	N/A
1841.476	33.48	PK	V	24.65	2.93	26.66	34.4	74	39.6
1841.476	21.02	AV	V	24.65	2.93	26.66	21.94	54	32.06
2762.214	43.00	PK	V	23.72	3.22	26.64	43.3	74	30.7
2762.214	31.50	AV	V	23.72	3.22	26.64	31.8	54	22.2
3682.952	42.35	PK	V	27.73	4.45	26.58	47.95	74	26.05
3682.952	30.01	AV	V	27.73	4.45	26.58	35.61	54	18.39
3105	40.98	PK	V	24.79	3.59	26.45	42.91	74	31.09
3105	29.37	AV	V	24.79	3.59	26.45	31.3	54	22.7
3298	41.22	PK	V	25.87	3.88	26.52	44.45	74	29.55
3298	28.70	AV	V	25.87	3.88	26.52	31.93	54	22.07
347.19	37.29	QP	H	15.12	1.27	27.79	25.89	46.00	20.11
600.36	35.27	QP	H	19.51	1.85	28.85	27.78	46.00	18.22
High Channel: 925.738 MHz									
925.738	79.73	QP	V	23.11	2.49	0.00	105.33	N/A	N/A
925.738	77.43	QP	H	23.11	2.49	0.00	103.03	N/A	N/A
928	16.26	QP	V	23.14	2.50	0.00	41.9	85.33	43.43
1851.476	41.31	PK	V	24.66	2.94	26.67	42.24	74	31.76
1851.476	29.02	AV	V	24.66	2.94	26.67	29.95	54	24.05
2777.214	42.81	PK	V	23.75	3.23	26.62	43.17	74	30.83
2777.214	31.22	AV	V	23.75	3.23	26.62	31.58	54	22.42
3702.952	40.79	PK	V	27.81	4.48	26.57	46.51	74	27.49
3702.952	29.11	AV	V	27.81	4.48	26.57	34.83	54	19.17
3505	41.63	PK	V	27.02	4.19	26.59	46.25	74	27.75
3505	29.24	AV	V	27.02	4.19	26.59	33.86	54	20.14
347.19	38.13	QP	H	15.12	1.27	27.79	26.73	46.00	19.27
600.36	35.69	QP	H	19.51	1.85	28.85	28.20	46.00	17.80

FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

* The testing was performed by Lorin Bian on 2017-03-28.

Test Result: Compliance.

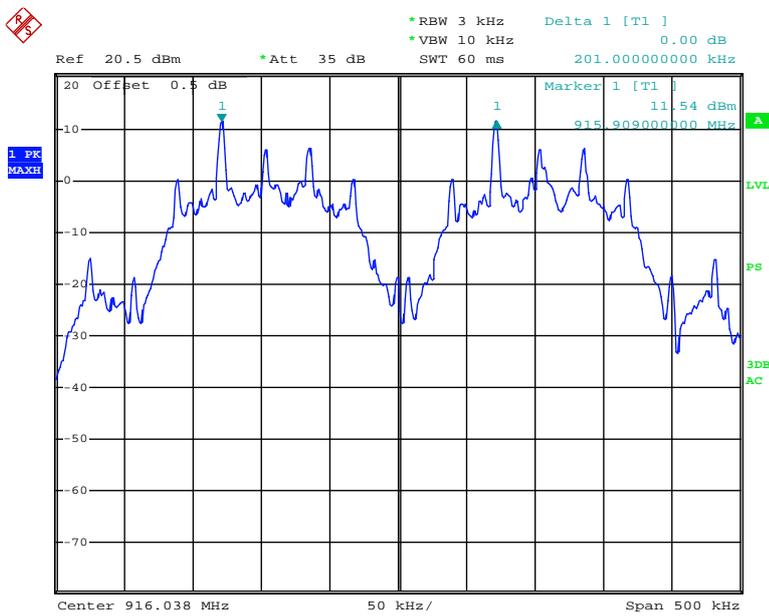
Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	915.938	0.201	0.137
Middle	920.738	0.201	0.136
High	925.738	0.201	0.136

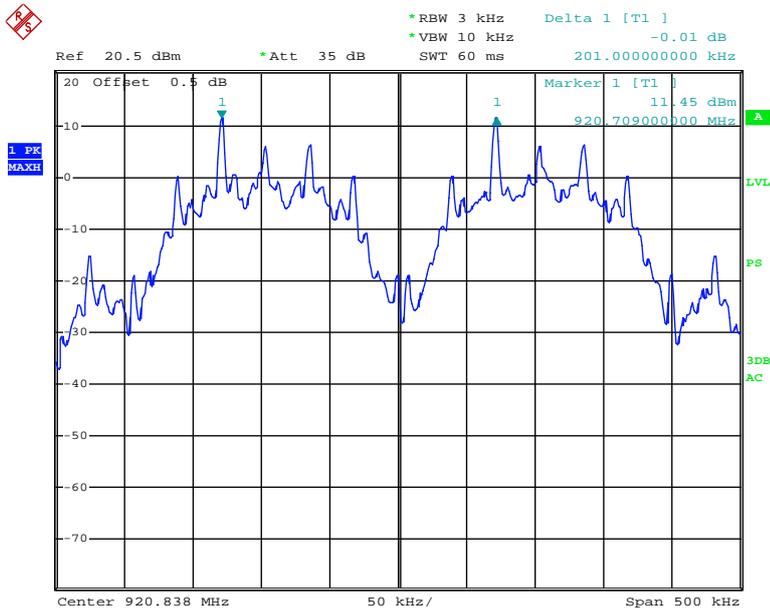
Note: the Channel Separation limit is minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Low Channel



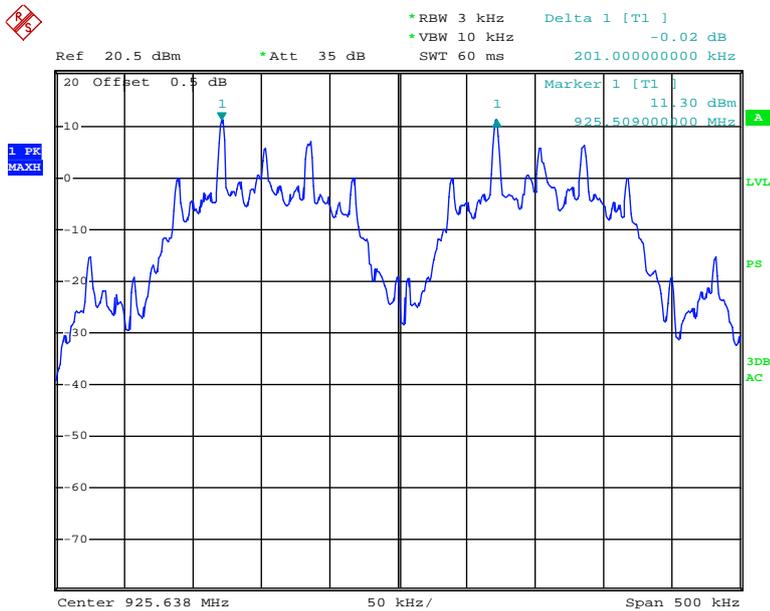
Date: 28.MAR.2017 21:20:23

Middle Channel



Date: 28.MAR.2017 21:24:19

High Channel



Date: 28.MAR.2017 21:33:40

FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

Applicable Standard

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

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 on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

* The testing was performed by Lorin Bian on 2017-03-28.

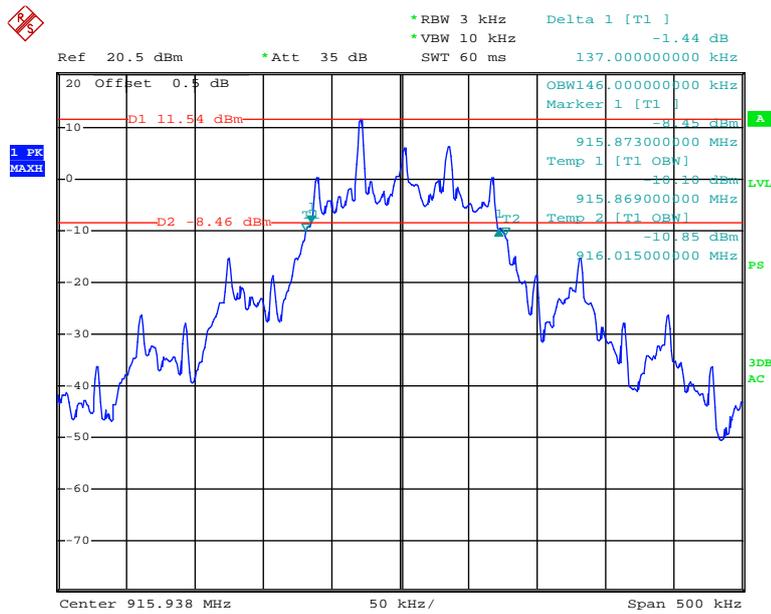
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

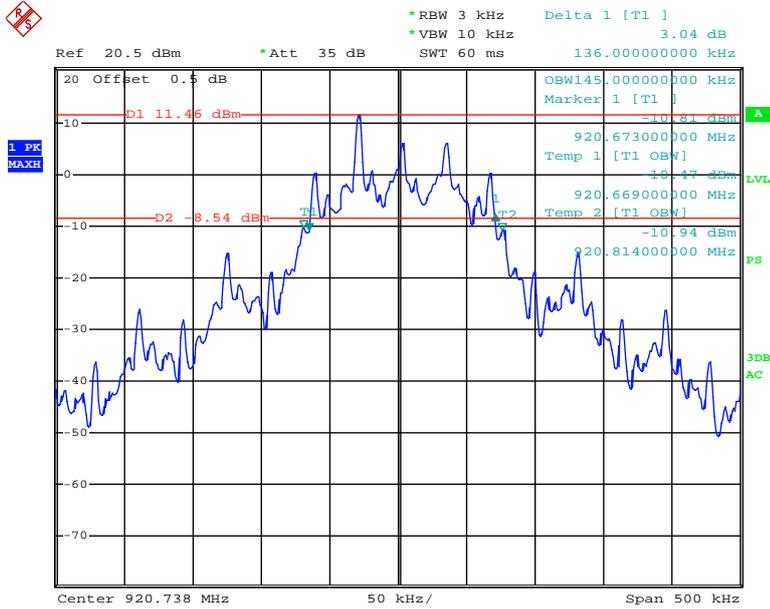
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	915.938	0.137
Middle	920.738	0.136
High	925.738	0.136

Low Channel



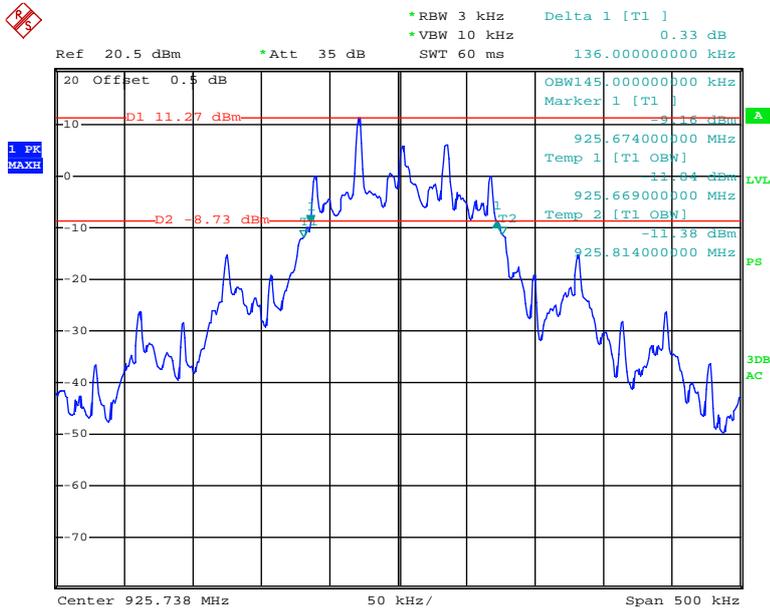
Date: 28.MAR.2017 21:17:39

Middle Channel



Date: 28.MAR.2017 21:15:47

High Channel



Date: 28.MAR.2017 21:35:20

FCC §15.247(a) (1) (i) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

* *The testing was performed by Lorin Bian on 2017-03-28.*

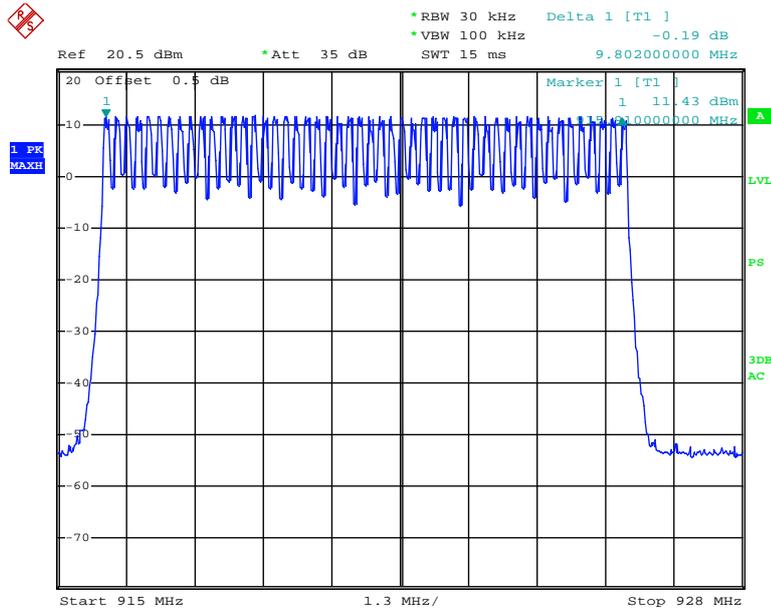
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
915-928	50	≥50

Number of Hopping Channels



Date: 28.MAR.2017 22:19:57

FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 20s. In addition, the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

* The testing was performed by Lorin Bian on 2017-03-28 and 2017-04-12.

Test Result: Compliance.

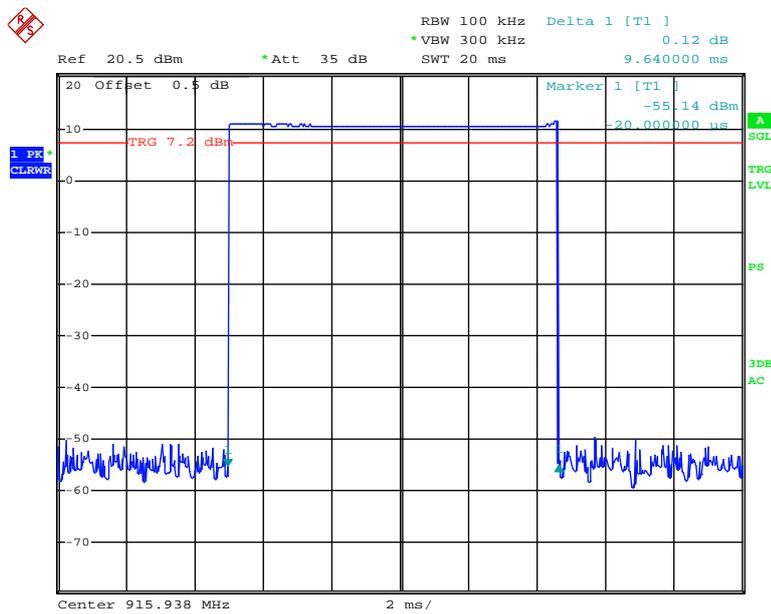
Please refer to following tables and plots

Test Mode: Transmitting

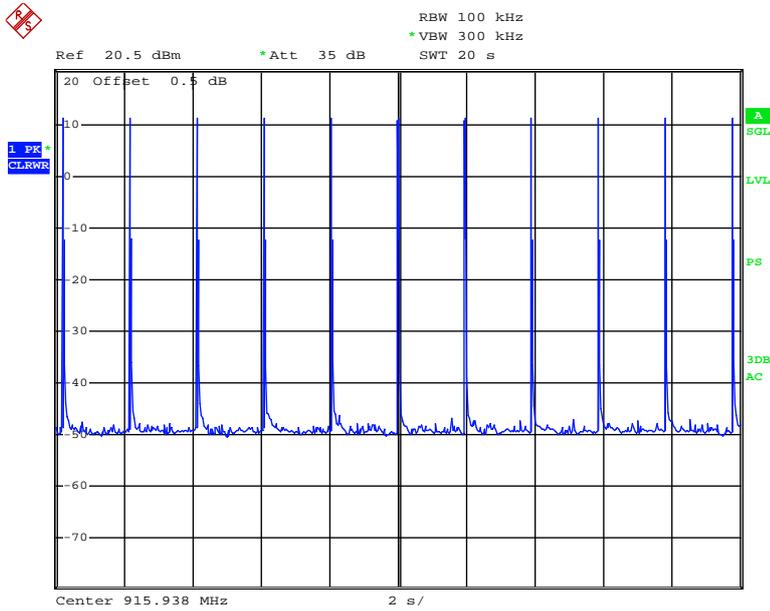
Channel	Occupancy Time For Single Hop (ms)	Real Observed Period (s)	Hops in Observed Period	Dwell time(s)	Limit (s)	Result
Low	9.64	20	11	0.106	0.4	Compliance
Middle	9.64	20	11	0.106	0.4	Compliance
High	9.64	20	11	0.106	0.4	Compliance

Note: Dwell time= Pulse time (ms) × hopping number per channel in 20s

Low Channel

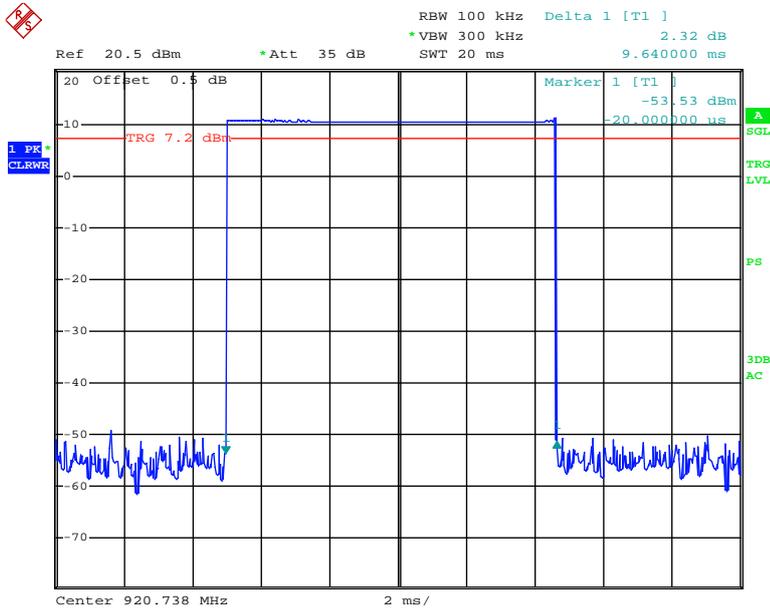


Date: 28.MAR.2017 21:53:53

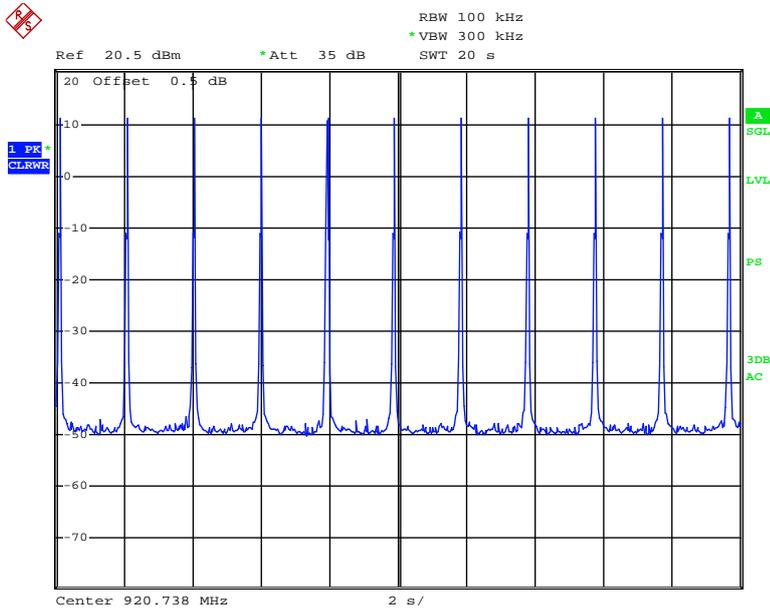


Date: 12.APR.2017 14:39:09

Middle Channel

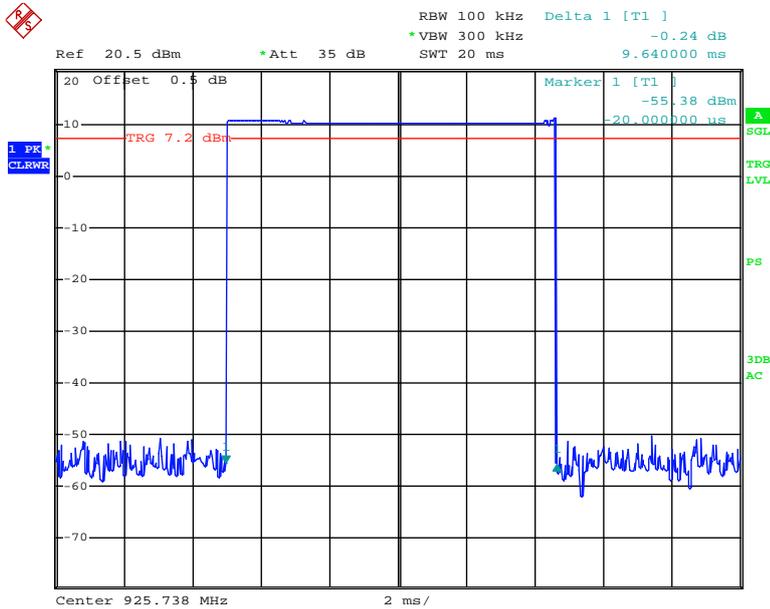


Date: 28.MAR.2017 21:54:21

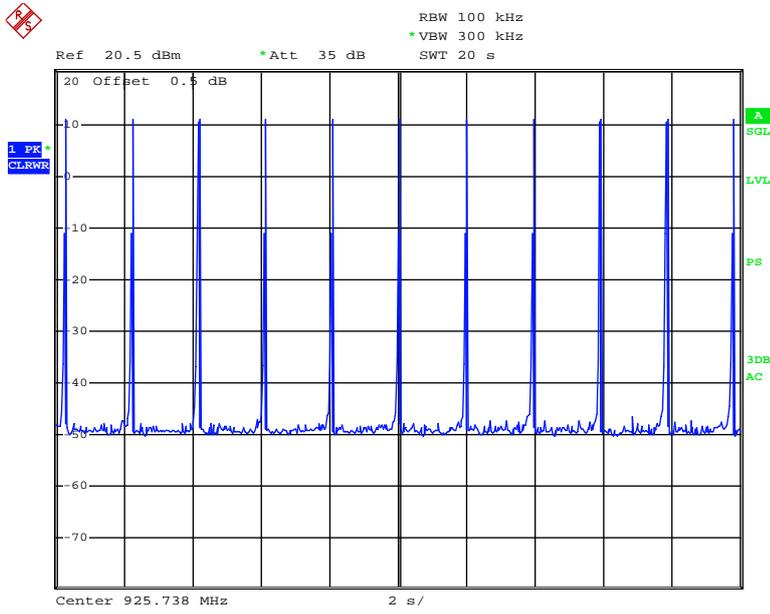


Date: 12.APR.2017 14:39:56

High Channel



Date: 28.MAR.2017 21:54:44



Date: 12.APR.2017 14:44:50

FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b)(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one 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
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

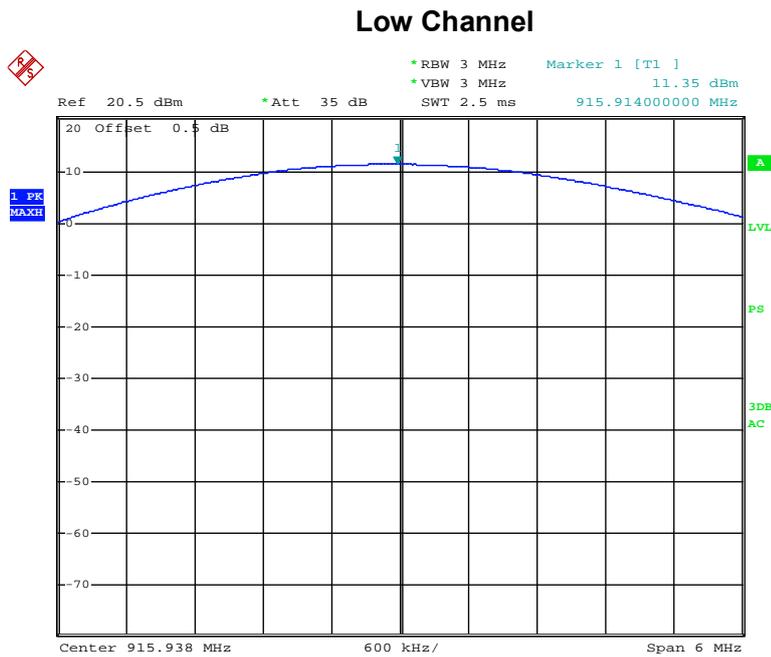
* *The testing was performed by Lorin Bian on 2017-03-28.*

Test Result: Compliance.

Test Mode: Transmitting

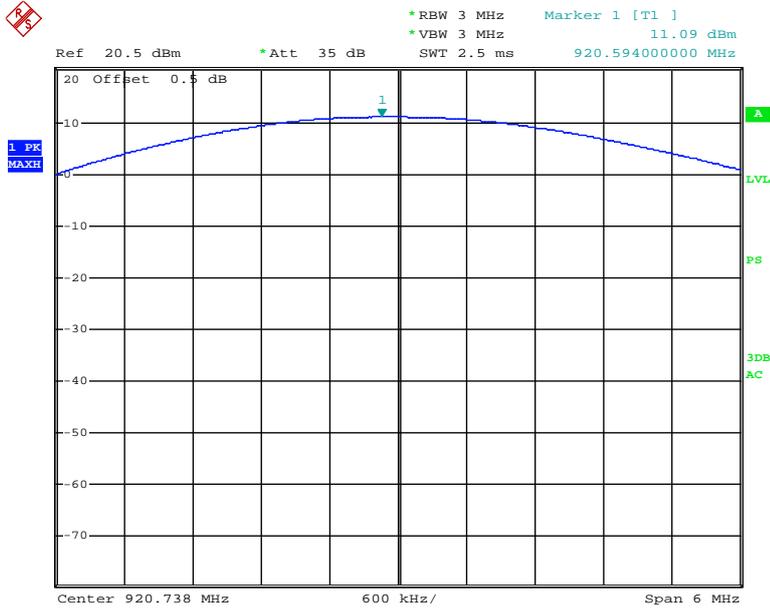
Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)
915.938	11.35	30
920.738	11.09	30
925.738	11.07	30

Note: The data above was tested in conducted mode.



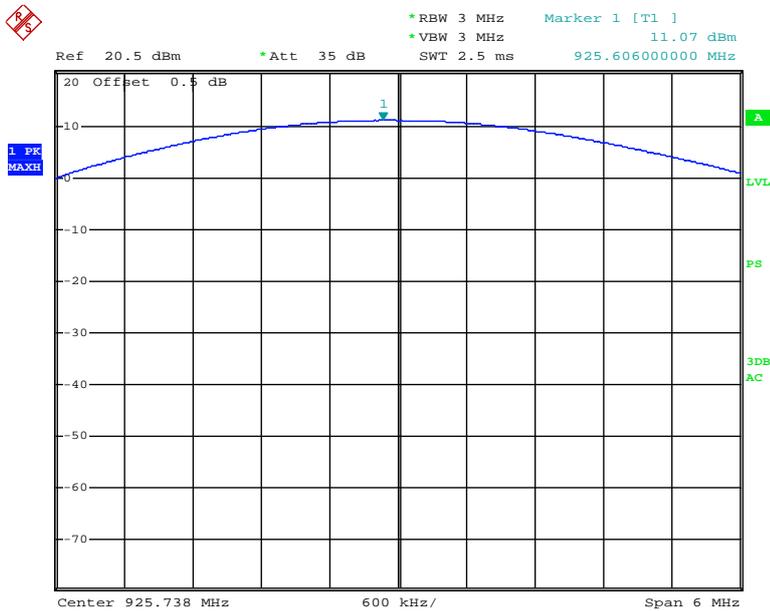
Date: 28.MAR.2017 21:09:12

Middle Channel



Date: 28.MAR.2017 22:27:15

High Channel



Date: 28.MAR.2017 21:35:51

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW/ VBW of spectrum analyzer to 100/300 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	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/

* **Statement of Traceability:** BAAC (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

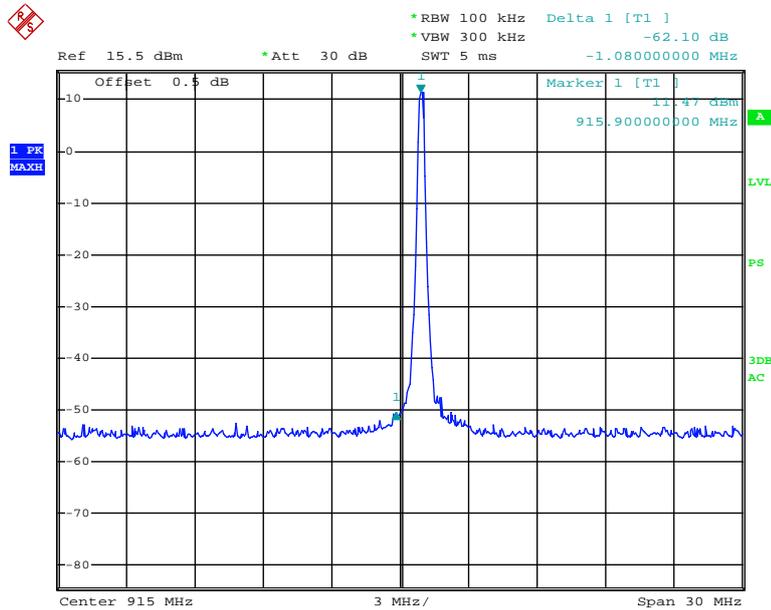
Environmental Conditions

Temperature:	20 °C
Relative Humidity:	58 %
ATM Pressure:	95.4 kPa

* The testing was performed by Lorin Bian on 2017-03-28.

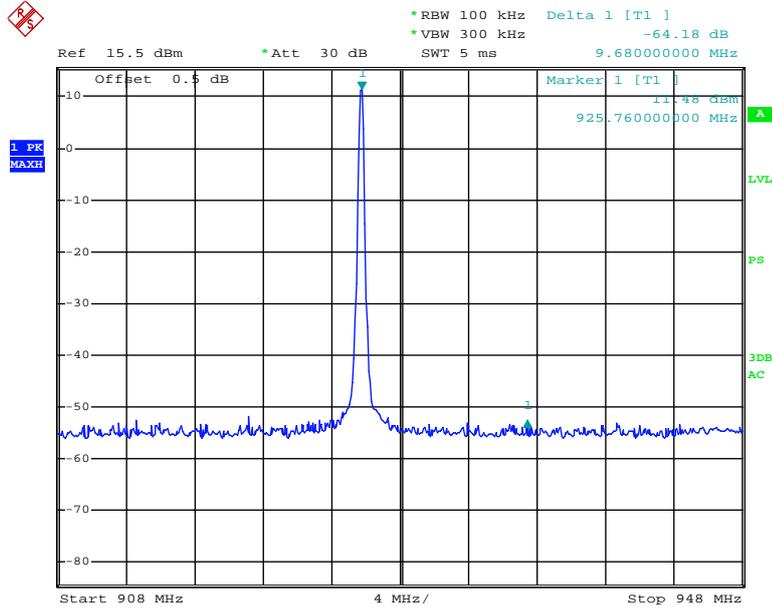
Test Result: Compliance

Band Edge, Left Side



Date: 28.MAR.2017 21:38:40

Band Edge, Right Side



Date: 28.MAR.2017 21:37:34

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