



FCC PART 15.249

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-WM331A1609

Report Type: Original Report	Product Name: Phantom 4 Pro
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Report Number: <u>RDG160820002B</u>	
Report Date: <u>2016-10-20</u>	
Henry Ding Reviewed By: <u>EMC Leader</u>	
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TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
TEST FACILITY.....	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION.....	5
EUT EXERCISE SOFTWARE.....	5
EQUIPMENT MODIFICATIONS	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS.....	7
FCC§15.203 - ANTENNA REQUIREMENT	8
APPLICABLE STANDARD.....	8
ANTENNA CONNECTOR CONSTRUCTION	8
FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS.....	9
APPLICABLE STANDARD.....	9
MEASUREMENT UNCERTAINTY	9
EUT SETUP.....	10
TEST EQUIPMENT SETUP.....	11
TEST PROCEDURE	11
CORRECTED AMPLITUDE & MARGIN CALCULATION	11
TEST EQUIPMENT LIST AND DETAILS	12
TEST RESULTS SUMMARY	12
TEST DATA	12
FCC §15.215(C) – 20 DB BANDWIDTH TESTING	15
APPLICABLE STANDARD.....	15
TEST PROCEDURE	15
TEST EQUIPMENT LIST AND DETAILS	15
TEST DATA	15
FCC§15.249(D) - OUT OF BAND EMISSION (50 DB ATTENUATION).....	18
APPLICABLE STANDARD.....	18
TEST PROCEDURE	18
TEST EQUIPMENT LIST AND DETAILS	18
TEST DATA	18

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **SZ DJI TECHNOLOGY CO., LTD**'s product, model number: **WM331A (FCC ID: SS3-WM331A1609)** 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: 160820002 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-08-20, and EUT conformed to test requirement.*

Objective

This type approval report is prepared on behalf of **SZ DJI TECHNOLOGY CO., LTD** in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: SS3-WM331A1609.

FCC Part 15E NII submissions with FCC ID: SS3-WM331A1609.

Part of system submissions with FCC ID: SS3-GL300E1609.

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.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ± 3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ± 4.7 dB;

200M~1GHz: ± 6.0 dB;

1G-6GHz: ± 5.13 dB;

6G~25GHz: ± 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 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, 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

Justification

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For Sub 1GHz band, 49 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	/	/

EUT Exercise Software

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

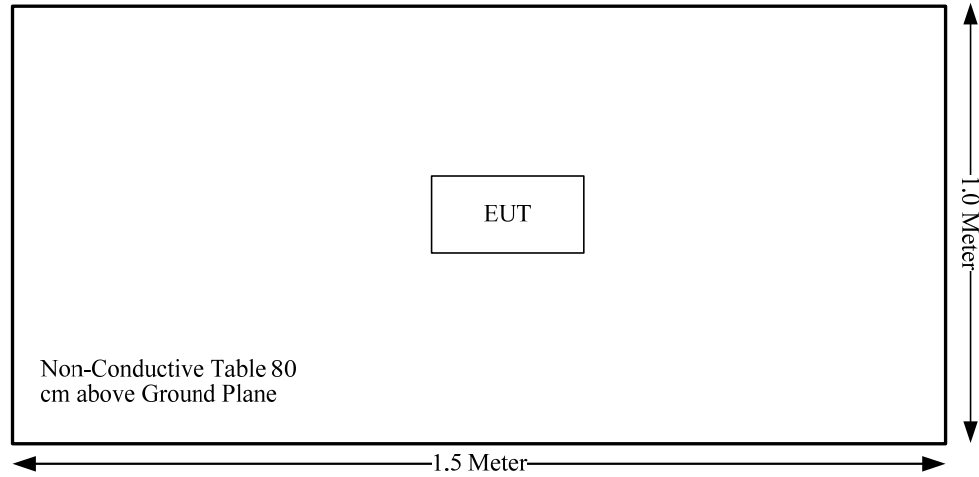
Antenna 0				
Test Mode	Test Software Version	DJI-RF Certification		
SUBG	Test Frequency	915.938MHz	920.738MHz	925.538MHz
	Power Level Setting	25	25	25

Equipment Modifications

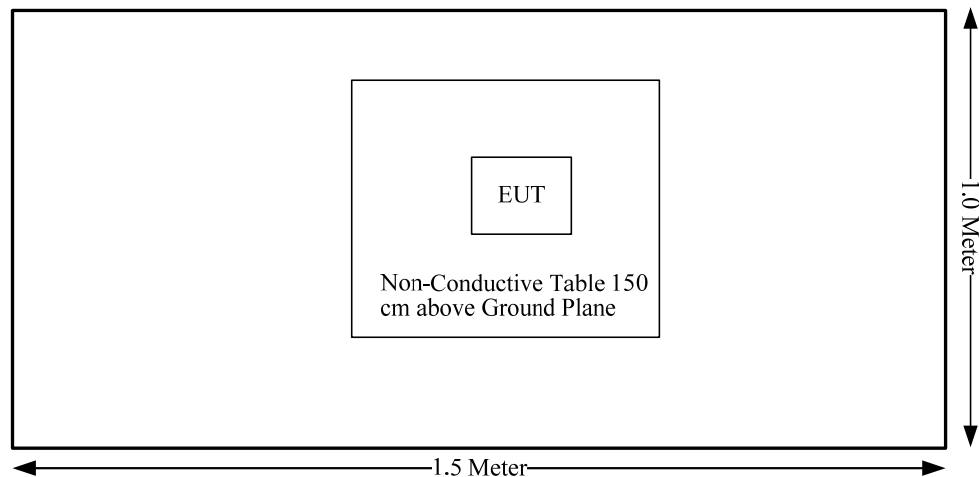
No modifications were made to the EUT.

Block Diagram of Test Setup

Radiation test below 1GHz:



Radiation test above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Not Applicable
15.205, §15.209, §15.249	Radiated Emissions	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant
§15.249 (d)	Out-of-band emissions	Compliant

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, 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.

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: Compliant.

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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;

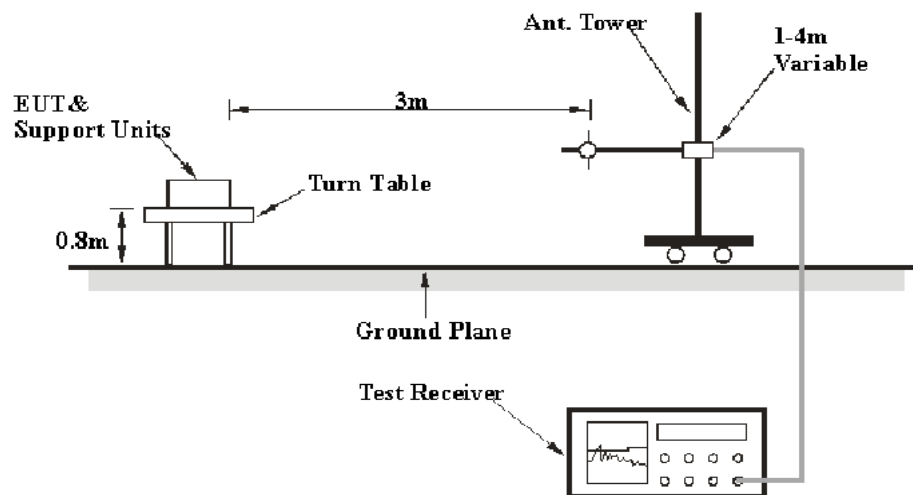
6G~25GHz: ±5.47 dB;

Table 1 – Values of U_{cispr}

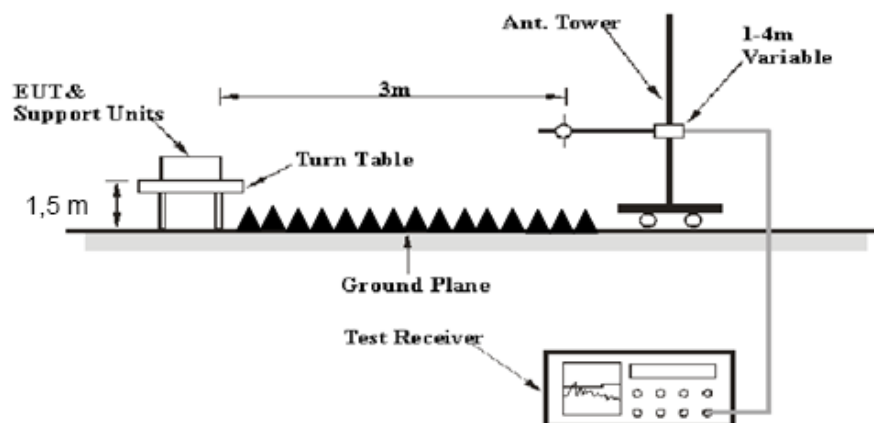
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission and out of band 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 15.209/15.205 and FCC 15.249 limits.

Test Equipment 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	/	Ave.

Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
EM TEST	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113028	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-213-S+	771001215	2016-5-20	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	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2015-11-10	2016-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09

* **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 data in the following table, the EUT complied with the FCC Part 15.209 & 15.205 & 15.249.

Test Data

Environmental Conditions

Temperature:	26.9 °C
Relative Humidity:	39%
ATM Pressure:	100.3 kPa

The testing was performed by Lorin Bian on 2016-10-18.

Test Mode: Transmitting

30MHz-10GHz

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
frequency: 915.938MHz									
915.938	68.12	QP	V	22.99	2.45	0.00	93.56	94.00	0.44
915.938	67.89	QP	H	22.99	2.45	0.00	93.33	94.00	0.67
902	12.58	QP	V	22.82	2.40	0.00	37.80	46.00	8.20
1831.876	49.74	PK	H	24.63	2.92	26.66	50.63	74.00	23.37
1831.876	33.69	AV	H	24.63	2.92	26.66	34.58	54.00	19.42
1831.876	40.64	PK	V	24.63	2.92	26.66	41.53	74.00	32.47
1831.876	23.72	AV	V	24.63	2.92	26.66	24.61	54.00	29.39
2747.814	40.17	PK	H	23.70	3.21	26.65	40.43	74.00	33.57
2747.814	24.59	AV	H	23.70	3.21	26.65	24.85	54.00	29.15
2747.814	36.11	PK	V	23.70	3.21	26.65	36.37	74.00	37.63
2747.814	20.75	AV	V	23.70	3.21	26.65	21.01	54.00	32.99
3663.752	40.15	PK	H	27.66	4.42	26.58	45.65	74.00	28.35
3663.752	22.96	AV	H	27.66	4.42	26.58	28.46	54.00	25.54
3663.752	41.26	PK	V	27.66	4.42	26.58	46.76	74.00	27.24
3663.752	24.99	AV	V	27.66	4.42	26.58	30.49	54.00	23.51
1691.38	45.96	PK	H	24.41	2.82	26.52	46.67	74.00	27.33
1691.38	33.47	AV	H	24.41	2.82	26.52	34.18	54.00	19.82
1711.42	40.36	PK	V	24.44	2.83	26.54	41.09	74.00	32.91
1711.42	27.49	AV	V	24.44	2.83	26.54	28.22	54.00	25.78
248.25	44.66	QP	V	12.30	1.21	27.53	30.64	46.00	15.36
288.02	44.42	QP	V	13.98	1.13	27.52	32.01	46.00	13.99
frequency: 920.738MHz									
920.738	68.2	QP	V	23.05	2.47	0.00	93.72	94.00	0.28
920.738	27.16	QP	H	23.05	2.47	0.00	52.68	94.00	41.32
1841.476	43.26	PK	H	24.65	2.93	26.66	44.18	74.00	29.82
1841.476	25.14	AV	H	24.65	2.93	26.66	26.06	54.00	27.94
1841.476	44.69	PK	V	24.65	2.93	26.66	45.61	74.00	28.39
1841.476	28.98	AV	V	24.65	2.93	26.66	29.90	54.00	24.10
2762.214	36.11	PK	H	23.72	3.22	26.64	36.41	74.00	37.59
2762.214	20.74	AV	H	23.72	3.22	26.64	21.04	54.00	32.96
2762.214	37.59	PK	V	23.72	3.22	26.64	37.89	74.00	36.11
2762.214	21.59	AV	V	23.72	3.22	26.64	21.89	54.00	32.11
3682.952	42.36	PK	H	27.73	4.45	26.58	47.96	74.00	26.04
3682.952	23.54	AV	H	27.73	4.45	26.58	29.14	54.00	24.86
3682.952	43.39	PK	V	27.73	4.45	26.58	48.99	74.00	25.01
3682.952	28.99	AV	V	27.73	4.45	26.58	34.59	54.00	19.41
1701	42.36	PK	H	24.42	2.82	26.53	43.07	74.00	30.93
1701	30.26	AV	H	24.42	2.82	26.53	30.97	54.00	23.03
1310.63	41.00	PK	V	23.61	2.41	26.51	40.51	74.00	33.49
1310.63	29.66	AV	V	23.61	2.41	26.51	29.17	54.00	24.83
248.25	45.69	QP	V	12.30	1.21	27.53	31.67	46.00	14.33
288.02	45.74	QP	V	13.98	1.13	27.52	33.33	46.00	12.67

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
frequency: 925.538MHz									
925.538	67.84	QP	V	23.11	2.49	0.00	93.44	94.00	0.56
925.538	66.12	QP	H	23.11	2.49	0.00	91.72	94.00	2.28
928	13.69	QP	V	23.14	2.50	0.00	39.33	46.00	6.67
1851.076	35.24	PK	H	24.66	2.94	26.67	36.17	74.00	37.83
1851.076	18.45	AV	H	24.66	2.94	26.67	19.38	54.00	34.62
1851.076	42.02	PK	V	24.66	2.94	26.67	42.95	74.00	31.05
1851.076	23.64	AV	V	24.66	2.94	26.67	24.57	54.00	29.43
2776.614	37.51	PK	H	23.75	3.23	26.62	37.87	74.00	36.13
2776.614	20.78	AV	H	23.75	3.23	26.62	21.14	54.00	32.86
2776.614	37.88	PK	V	23.75	3.23	26.62	38.24	74.00	35.76
2776.614	21.36	AV	V	23.75	3.23	26.62	21.72	54.00	32.28
3702.152	40.69	PK	H	27.81	4.48	26.57	46.41	74.00	27.59
3702.152	24.71	AV	H	27.81	4.48	26.57	30.43	54.00	23.57
3702.152	40.36	PK	V	27.81	4.48	26.57	46.08	74.00	27.92
3702.152	25.11	AV	V	27.81	4.48	26.57	30.83	54.00	23.17
1671	42.26	PK	H	24.37	2.80	26.50	42.93	74.00	31.07
1671	28.75	AV	H	24.37	2.80	26.50	29.42	54.00	24.58
1631	34.69	PK	H	24.31	2.77	26.46	35.31	74.00	38.69
1631	21.09	AV	H	24.31	2.77	26.46	21.71	54.00	32.29
248.25	46.75	QP	V	12.30	1.21	27.53	32.73	46.00	13.27
288.02	45.29	QP	V	13.98	1.13	27.52	32.88	46.00	13.12

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

1. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
2. 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	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
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:	27.3 °C
Relative Humidity:	32 %
ATM Pressure:	100.6 kPa

* The testing was performed by Lorin Bian on 2016-10-16.

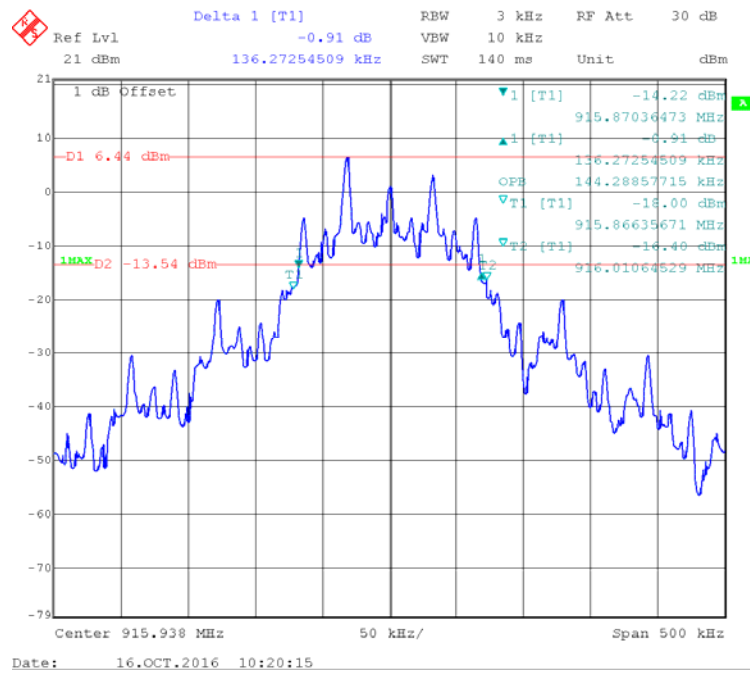
Test Result: Compliant.

Please refer to following tables and plots

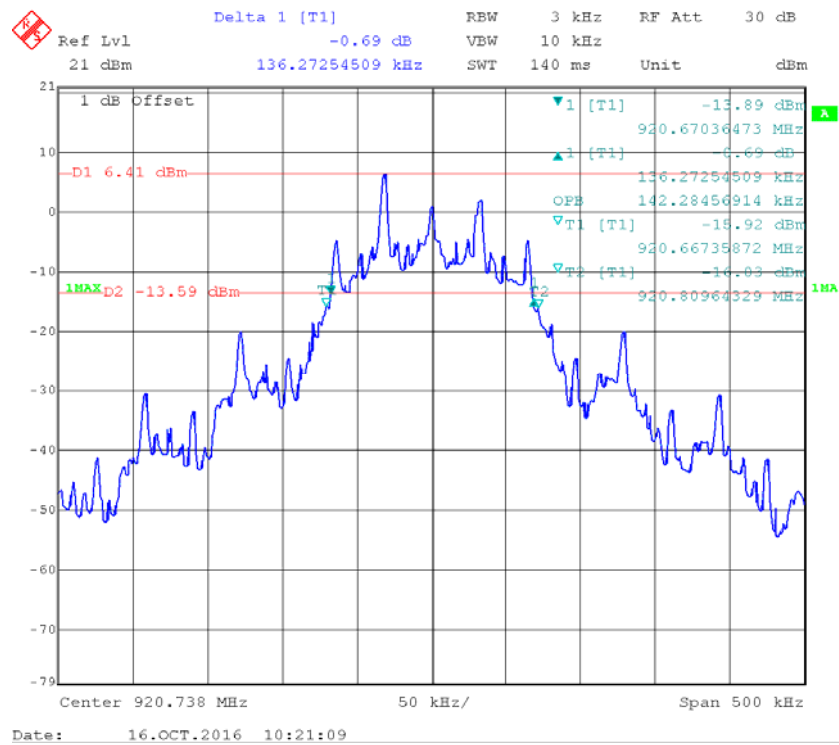
Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	915.938	136
Middle	920.738	136
High	925.538	136

Low Channel



Middle Channel



High Channel



FCC§15.249(d) - OUT OF BAND EMISSION (50 dB ATTENUATION)

Applicable Standard

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation

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
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

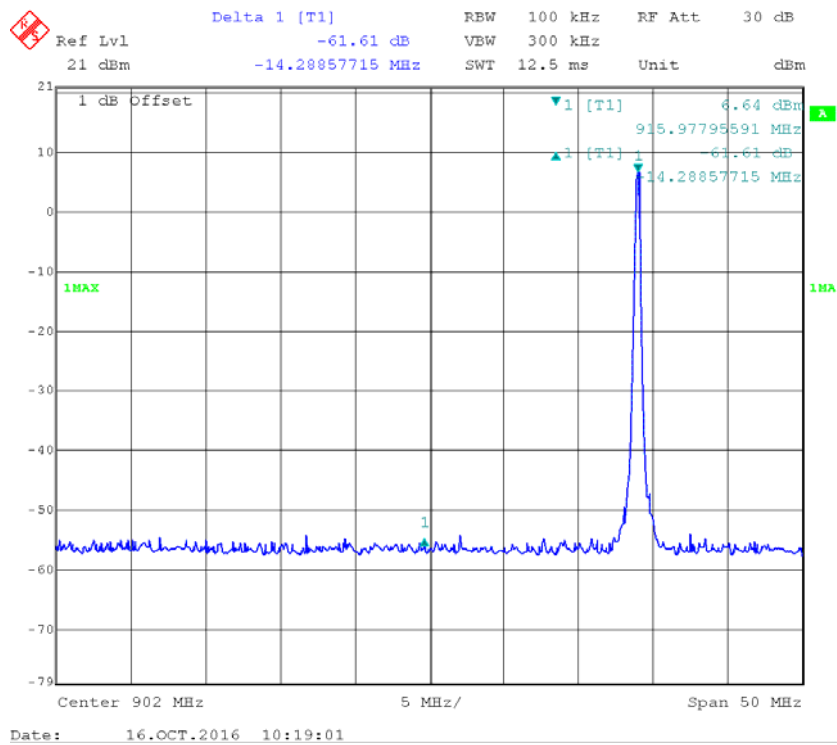
Environmental Conditions

Temperature:	27.3 °C
Relative Humidity:	32 %
ATM Pressure:	100.6 kPa

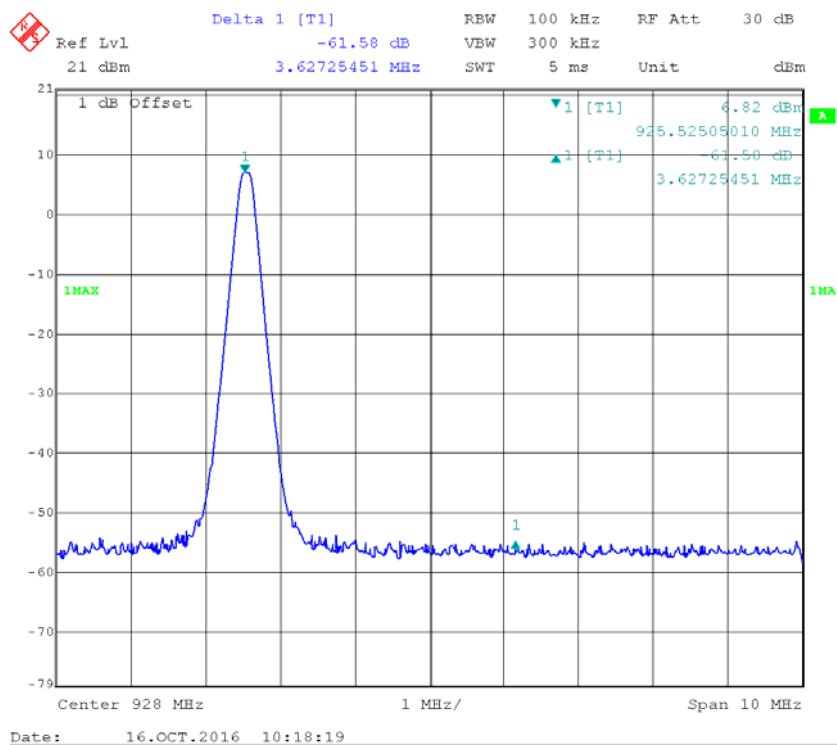
* The testing was performed by Lorin Bian on 2016-10-16.

Test Result: Compliant. Please refer to the below plots.

Band Edge, Left Side



Band Edge, Right Side



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