



FCC PART 15.247 TEST REPORT

For

Skyrocket Toys LLC

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FCC ID: O5301749RX24G

Report Type: Original Report	Product Name: Spiderman Drone
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Report Number: <u>RDG170301004B</u>	
Report Date: <u>2017-03-15</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Skyrocket Toys LLC**'s product, model number: **01749 (FCC ID: O5301749RX24G)** (the "EUT") in this report was a **Spiderman Drone**, which was measured approximately: 18.8 cm (L) x 18.7 cm (W) x 6.5 cm (H), rated input voltage: DC3.7V from battery and the battery can be removed and charged by using USB charger cable.

**All measurement and test data in this report was gathered from final production sample, serial number: 170301004 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-01, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of **Skyrocket Toys LLC** 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.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: O5301749RX24G.

Part of system submissions with FCC ID: O5301748TX24G.

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.

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 2.4GHz band, the device employed 802.11b/g modes.

For 802.11b and 802.11g modes, 11 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

EUT Exercise Software

The software "MT7601 USB QA V1.0.4.0" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

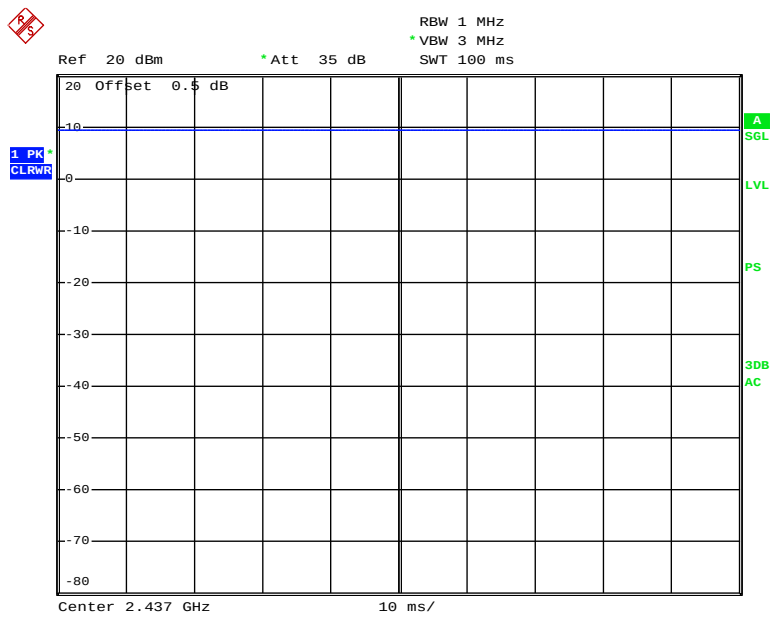
For 802.11b/g mode, the maximum power was as below setting, the power setting was provided by the manufacturer:

Test Mode	Test Software Version	MT7601 USB QA V1.0.4.0		
802.11b	Frequency (MHz)	2412	2437	2462
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	8	7	6
802.11g	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	1	0	0

The software configured maximum duty cycle as below:

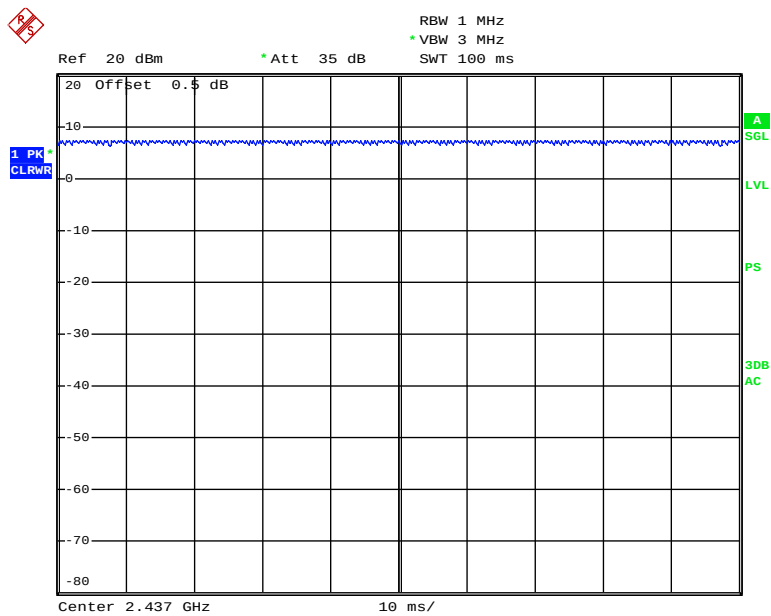
Mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
802.11b	100	100	100
802.11g	100	100	100

802.11b mode



Date: 7.MAR.2017 20:55:20

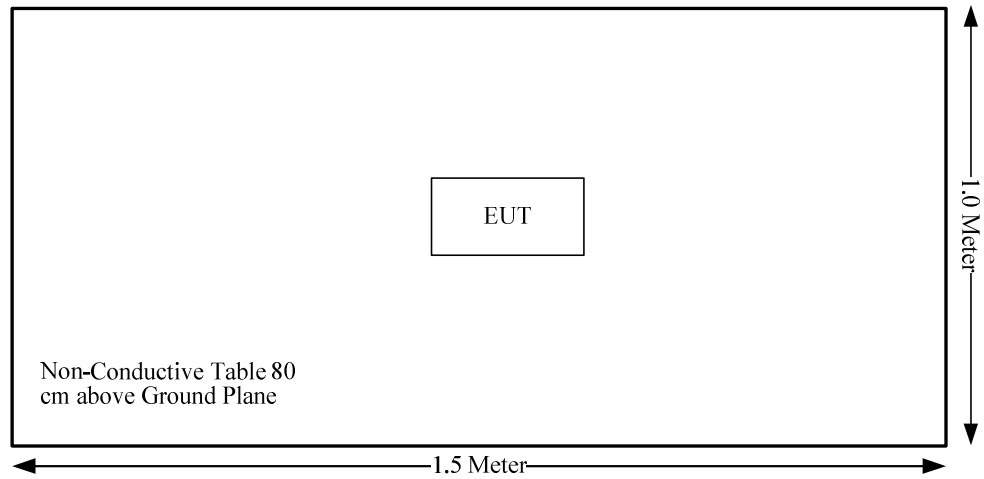
802.11g mode



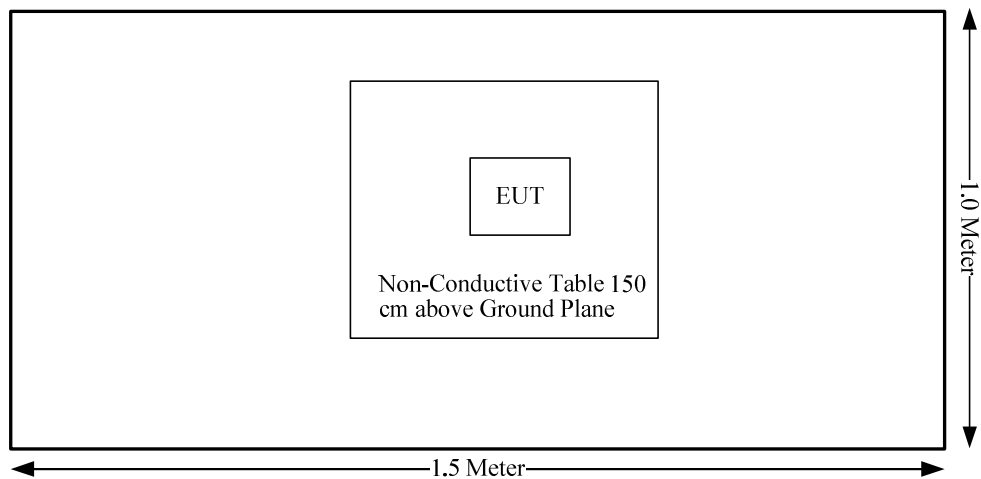
Date: 7.MAR.2017 20:54:35

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
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Note: 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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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:

Mode	Frequency (MHz)	Antenna Gain		Maximum Power including tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
FHSS	2410-2472	0	1.00	-1.0	0.79	20.00	0.0002	1.0
DTS	2412-2462	0	1.00	21	125.89	20.00	0.0251	1.0

Note: The tune-up power including tolerance is declared by manufacturer.

The 2.4GHz FHSS and DTS can transmit simultaneously:

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

$$=S_{FHSS}/S_{limit-FHSS} + S_{DTS}/S_{limit-DTS}$$

$$=0.0002/1+0.0251/1$$

$$=0.0253$$

$$< 1.0$$

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

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.

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 have an internal antenna for Wi-Fi. The Maximum gain is 0dBi, compliance the requirements, 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: ± 5.13 dB;

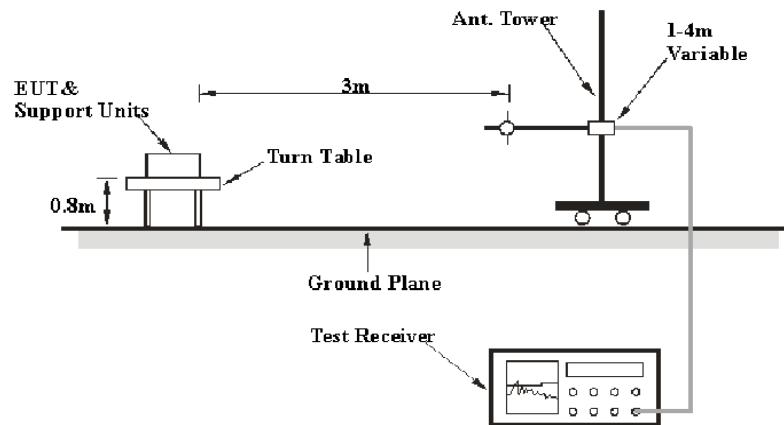
6G~25GHz: ± 5.47 dB;

Table 1 – Values of U_{cispr}

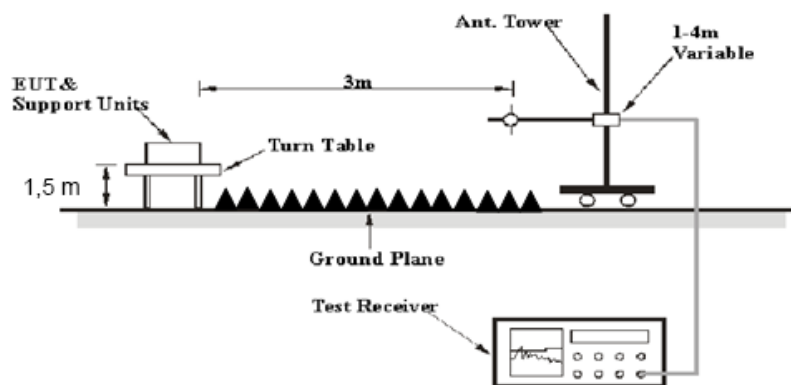
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 25 GHz.

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

30MHz-1000MHz:

Detector	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

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

Note: T is minimum transmission duration

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	A101808	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	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
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
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	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 Data

Environmental Conditions

Temperature:	21.8 °C
Relative Humidity:	37 %
ATM Pressure:	96.5 kPa

* The testing was performed by Kevin Hu on 2017-03-07.

Test Mode: Transmitting

30MHz-25GHz:

802.11b Mode

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: 2412 MHz									
2412	81.14	PK	H	23.50	3.00	0.00	107.64	N/A	N/A
2412	77.21	AV	H	23.50	3.00	0.00	103.71	N/A	N/A
2412	79.6	PK	V	23.50	3.00	0.00	106.10	N/A	N/A
2412	74.99	AV	V	23.50	3.00	0.00	101.49	N/A	N/A
2390	33.43	PK	H	23.57	3.00	0.00	60.00	74.00	14.00
2390	18.82	AV	H	23.57	3.00	0.00	45.39	54.00	8.61
4824	27.39	PK	H	30.84	5.11	26.87	36.47	74.00	37.53
4824	17.1	AV	H	30.84	5.11	26.87	26.18	54.00	27.82
7236	21.93	PK	H	34.77	6.18	26.36	36.52	74.00	37.48
7236	11.64	AV	H	34.77	6.18	26.36	26.23	54.00	27.77
1443	37.9	PK	H	23.95	2.59	26.38	38.06	74.00	35.94
1443	27.55	AV	H	23.95	2.59	26.38	27.71	54.00	26.29
648.86	41.2	QP	H	20.28	1.94	28.85	34.57	46.00	11.43
864.2	39.1	QP	H	22.37	2.33	28.27	35.53	46.00	10.47
Middle Channel: 2437 MHz									
2437	79.61	PK	H	23.41	3.00	0.00	106.02	N/A	N/A
2437	75.45	AV	H	23.41	3.00	0.00	101.86	N/A	N/A
2437	77.19	PK	V	23.41	3.00	0.00	103.60	N/A	N/A
2437	73.44	AV	V	23.41	3.00	0.00	99.85	N/A	N/A
4874	27.51	PK	H	31.00	5.09	26.87	36.73	74.00	37.27
4874	16.78	AV	H	31.00	5.09	26.87	26.00	54.00	28.00
7311	22.04	PK	H	34.92	6.21	26.40	36.77	74.00	37.23
7311	11.83	AV	H	34.92	6.21	26.40	26.56	54.00	27.44
1486	37.69	PK	H	24.06	2.65	26.34	38.06	74.00	35.94
1486	27.13	AV	H	24.06	2.65	26.34	27.50	54.00	26.50
2042	36.86	PK	H	24.76	3.04	26.83	37.83	74.00	36.17
2042	26.35	AV	H	24.76	3.04	26.83	27.32	54.00	26.68
648.86	41.4	QP	H	20.28	1.94	28.85	34.77	46.00	11.23
864.2	39.3	QP	H	22.37	2.33	28.27	35.73	46.00	10.27
High Channel: 2462 MHz									
2462	78.21	PK	H	23.33	2.99	0.00	104.53	N/A	N/A
2462	74.05	AV	H	23.33	2.99	0.00	100.37	N/A	N/A
2462	75.94	PK	V	23.33	2.99	0.00	102.26	N/A	N/A
2462	71.56	AV	V	23.33	2.99	0.00	97.88	N/A	N/A
2483.5	32.74	PK	H	23.26	2.99	0.00	58.99	74.00	15.01
2483.5	18.33	AV	H	23.26	2.99	0.00	44.58	54.00	9.42
4924	26.55	PK	H	31.16	5.07	26.88	35.90	74.00	38.10
4924	16.74	AV	H	31.16	5.07	26.88	26.09	54.00	27.91
7386	21.54	PK	H	35.07	6.25	26.43	36.43	74.00	37.57
7386	11.17	AV	H	35.07	6.25	26.43	26.06	54.00	27.94
1524	36.61	PK	H	24.14	2.69	26.35	37.09	74.00	36.91
1524	26.9	AV	H	24.14	2.69	26.35	27.38	54.00	26.62
648.86	41.8	QP	H	20.28	1.94	28.85	35.17	46.00	10.83
864.2	39.7	QP	H	22.37	2.33	28.27	36.13	46.00	9.87

802.11g Mode

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: 2412 MHz									
2412	79.39	PK	H	23.50	3.00	0.00	105.89	N/A	N/A
2412	69.33	AV	H	23.50	3.00	0.00	95.83	N/A	N/A
2412	76.6	PK	V	23.50	3.00	0.00	103.10	N/A	N/A
2412	66.12	AV	V	23.50	3.00	0.00	92.62	N/A	N/A
2390	34.53	PK	H	23.57	3.00	0.00	61.10	74.00	12.90
2390	19.49	AV	H	23.57	3.00	0.00	46.06	54.00	7.94
4824	27.7	PK	H	30.84	5.11	26.87	36.78	74.00	37.22
4824	16.97	AV	H	30.84	5.11	26.87	26.05	54.00	27.95
7236	22.4	PK	H	34.77	6.18	26.36	36.99	74.00	37.01
7236	11.54	AV	H	34.77	6.18	26.36	26.13	54.00	27.87
1443	37.41	PK	H	23.95	2.59	26.38	37.57	74.00	36.43
1443	27.45	AV	H	23.95	2.59	26.38	27.61	54.00	26.39
648.86	41.5	QP	H	20.28	1.94	28.85	34.87	46.00	11.13
864.2	39.7	QP	H	22.37	2.33	28.27	36.13	46.00	9.87
Middle Channel: 2437 MHz									
2437	78.24	PK	H	23.41	3.00	0.00	104.65	N/A	N/A
2437	68.91	AV	H	23.41	3.00	0.00	95.32	N/A	N/A
2437	75.28	PK	V	23.41	3.00	0.00	101.69	N/A	N/A
2437	65	AV	V	23.41	3.00	0.00	91.41	N/A	N/A
4874	26.88	PK	H	31.00	5.09	26.87	36.10	74.00	37.90
4874	17.3	AV	H	31.00	5.09	26.87	26.52	54.00	27.48
7311	21.86	PK	H	34.92	6.21	26.40	36.59	74.00	37.41
7311	12.12	AV	H	34.92	6.21	26.40	26.85	54.00	27.15
1486	37.74	PK	H	24.06	2.65	26.34	38.11	74.00	35.89
1486	26.5	AV	H	24.06	2.65	26.34	26.87	54.00	27.13
2042	36.83	PK	H	24.76	3.04	26.83	37.80	74.00	36.20
2042	26.51	AV	H	24.76	3.04	26.83	27.48	54.00	26.52
648.86	41.7	QP	H	20.28	1.94	28.85	35.07	46.00	10.93
864.2	39.2	QP	H	22.37	2.33	28.27	35.63	46.00	10.37
High Channel: 2462 MHz									
2462	78.03	PK	H	23.33	2.99	0.00	104.35	N/A	N/A
2462	68.64	AV	H	23.33	2.99	0.00	94.96	N/A	N/A
2462	75.27	PK	V	23.33	2.99	0.00	101.59	N/A	N/A
2462	65.3	AV	V	23.33	2.99	0.00	91.62	N/A	N/A
2483.5	33.87	PK	H	23.26	2.99	0.00	60.12	74.00	13.88
2483.5	19.42	AV	H	23.26	2.99	0.00	45.67	54.00	8.33
4924	26.7	PK	H	31.16	5.07	26.88	36.05	74.00	37.95
4924	16.63	AV	H	31.16	5.07	26.88	25.98	54.00	28.02
7386	22.14	PK	H	35.07	6.25	26.43	37.03	74.00	36.97
7386	11.39	AV	H	35.07	6.25	26.43	26.28	54.00	27.72
1524	36.81	PK	H	24.14	2.69	26.35	37.29	74.00	36.71
1524	26.52	AV	H	24.14	2.69	26.35	27.00	54.00	27.00
648.86	41.5	QP	H	20.28	1.94	28.85	34.87	46.00	11.13
864.2	39.1	QP	H	22.37	2.33	28.27	35.53	46.00	10.47

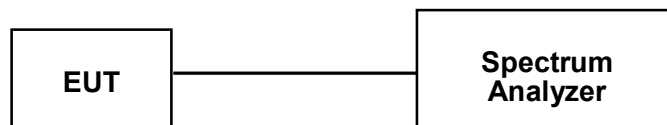
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

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.

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.



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:	21.8 °C
Relative Humidity:	37 %
ATM Pressure:	96.5 kPa

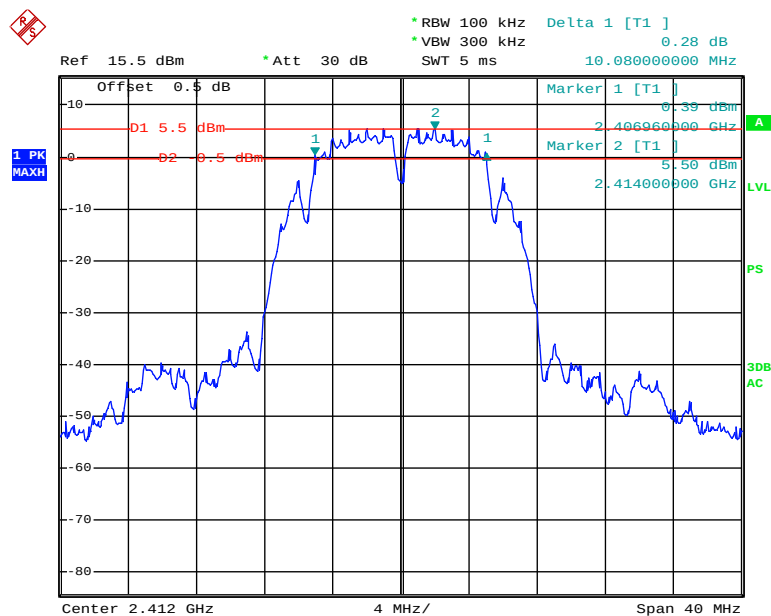
* The testing was performed by Kevin Hu on 2017-03-07.

Test Mode: Transmitting

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

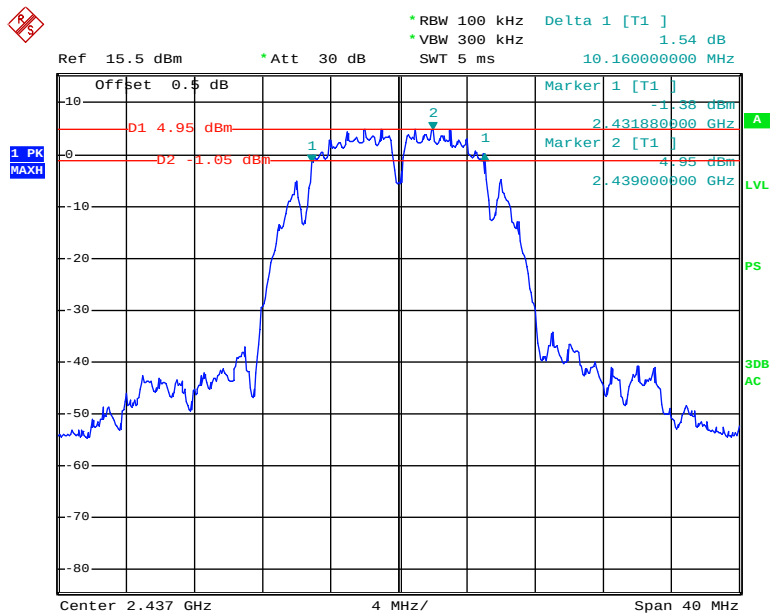
Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.08	≥0.5
	Middle	2437	10.16	≥0.5
	High	2462	10.08	≥0.5
802.11g	Low	2412	16.64	≥0.5
	Middle	2437	16.64	≥0.5
	High	2462	16.64	≥0.5

802.11b Low Channel



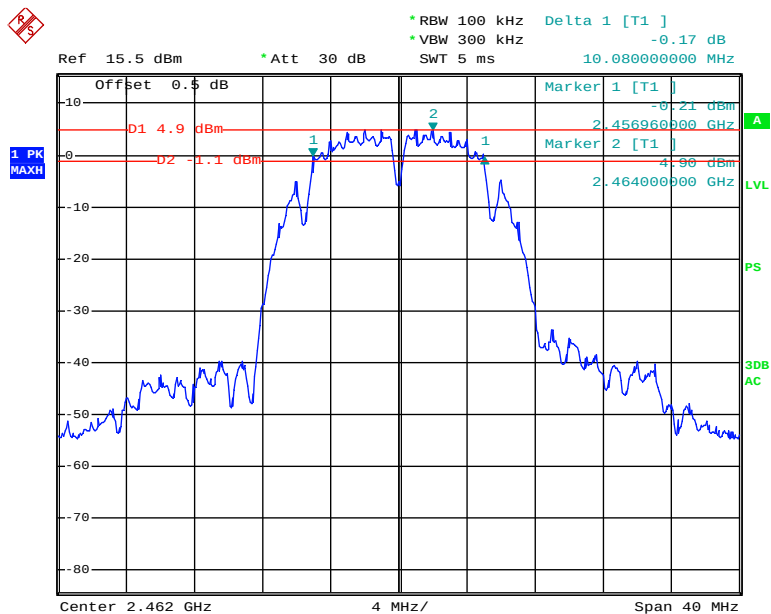
Date: 7.MAR.2017 20:31:21

802.11b Middle Channel



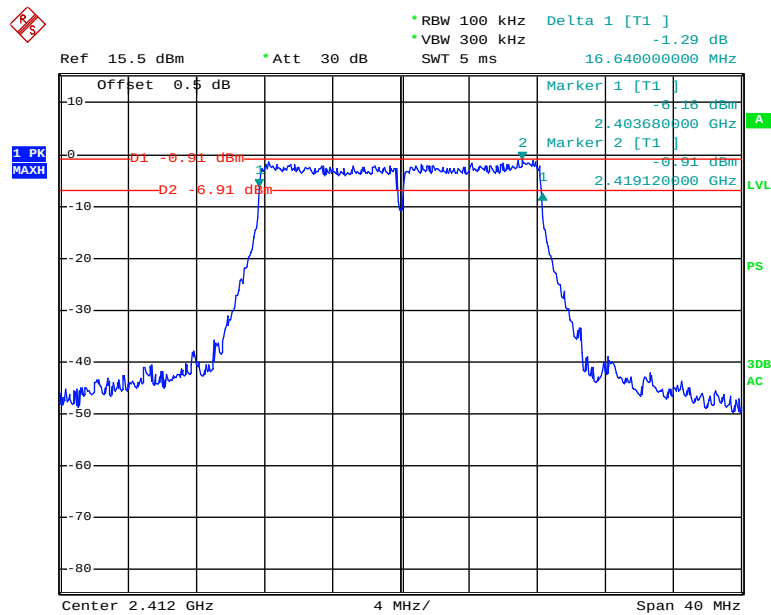
Date: 7.MAR.2017 20:37:56

802.11b High Channel



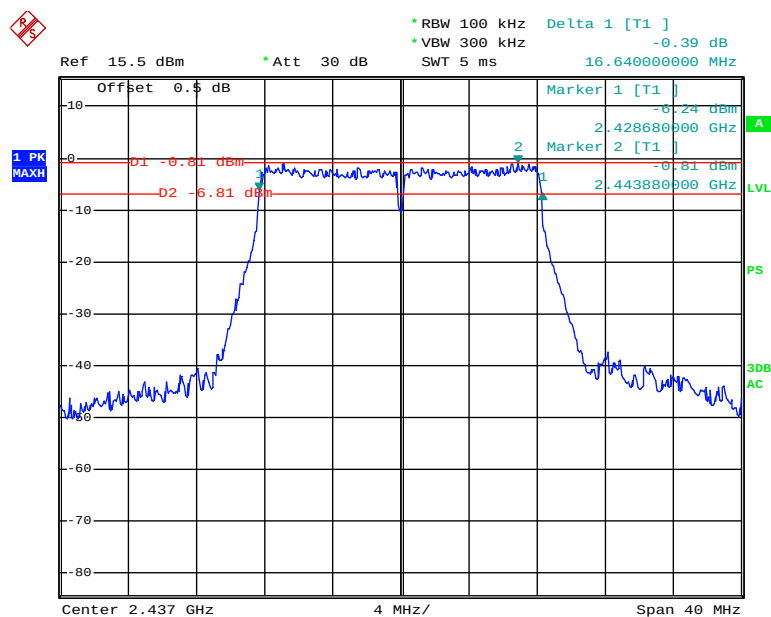
Date: 7.MAR.2017 20:40:13

802.11g Low Channel



Date: 7.MAR.2017 20:50:26

802.11g Middle Channel



Date: 7.MAR.2017 20:47:24

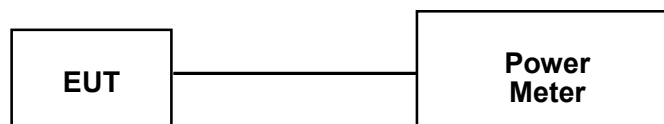
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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.

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	2018-01-03
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-03
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:	21.8 °C
Relative Humidity:	37 %
ATM Pressure:	96.5 kPa

** The testing was performed by Kevin Hu on 2017-03-07.*

Test Mode: Transmitting

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

Test Mode	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limits (dBm)
802.11b	2412	19.46	30
	2437	19.62	30
	2462	19.63	30
802.11g	2412	19.77	30
	2437	19.72	30
	2462	20.3	30

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

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. 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	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

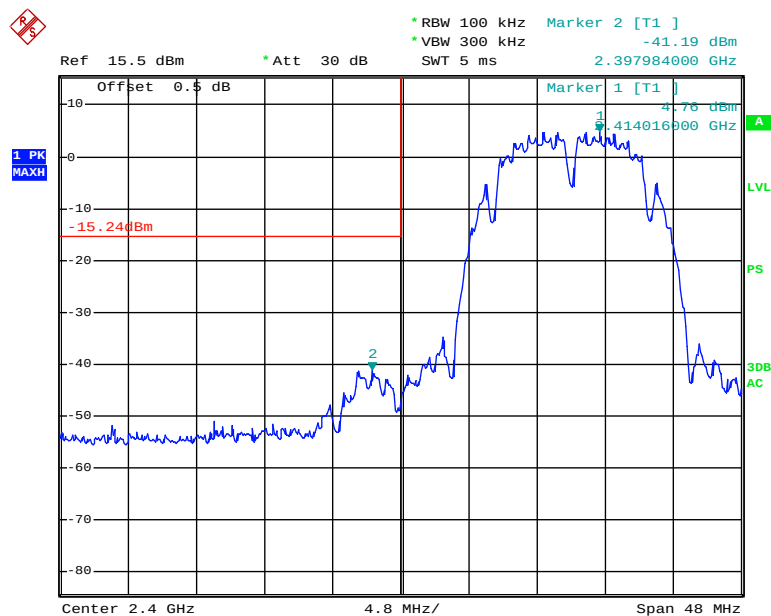
Temperature:	21.8 °C
Relative Humidity:	37 %
ATM Pressure:	96.5 kPa

* The testing was performed by Kevin Hu on 2017-03-07.

Test mode: Transmitting

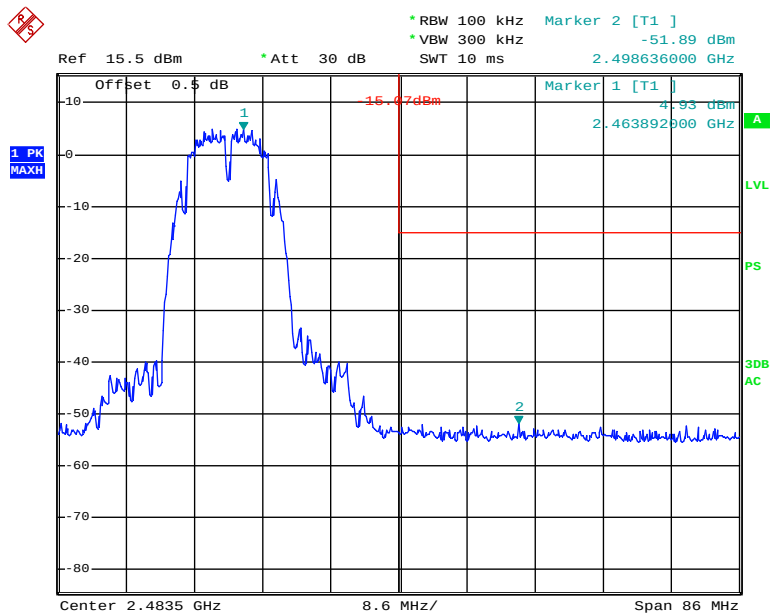
Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side



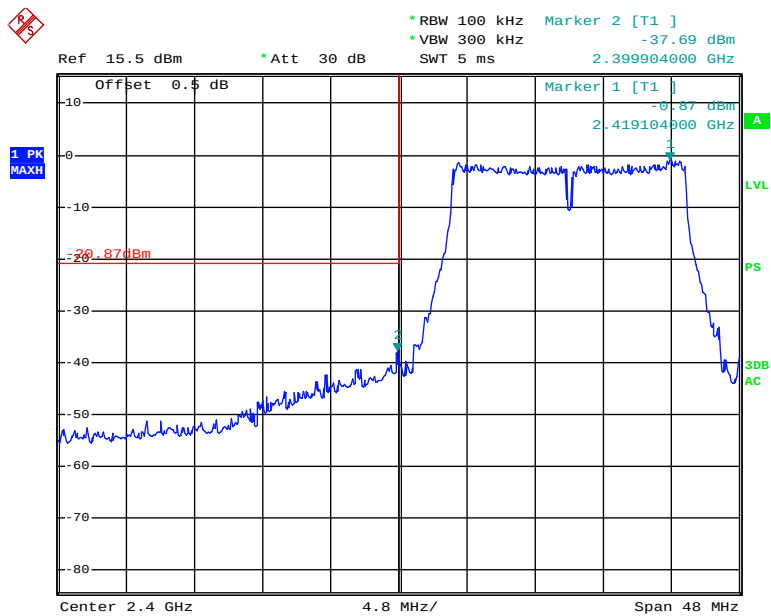
Date: 7.MAR.2017 20:33:00

802.11b: Band Edge, Right Side



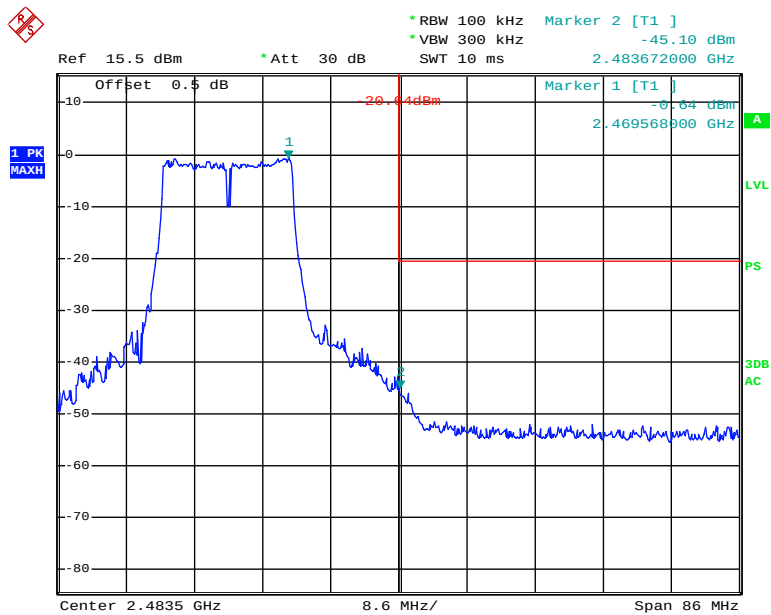
Date: 7.MAR.2017 20:41:48

802.11g: Band Edge, Left Side



Date: 7.MAR.2017 20:52:03

802.11g: Band Edge, Right Side



Date: 7.MAR.2017 20:46:08

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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.

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	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

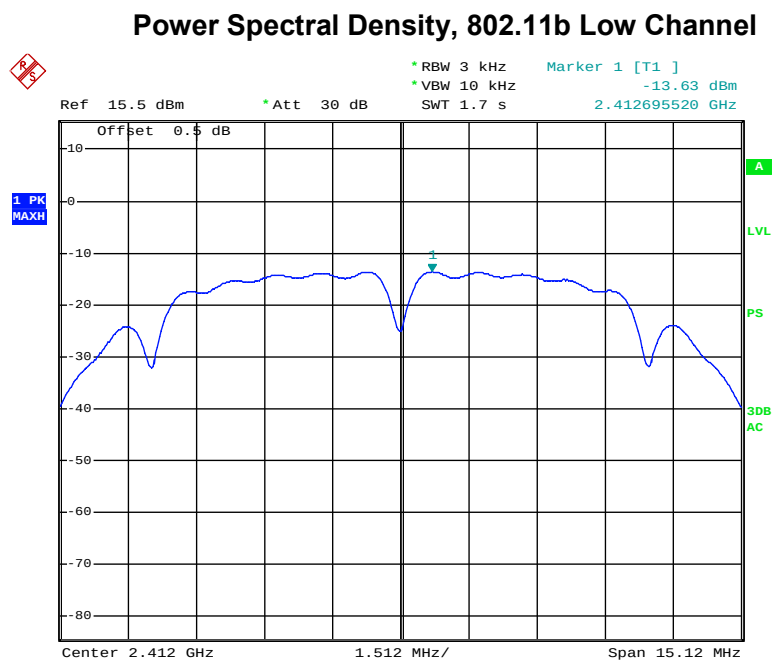
Temperature:	21.8 °C
Relative Humidity:	37 %
ATM Pressure:	96.5 kPa

* The testing was performed by Kevin Hu on 2017-03-07.

Test Mode: Transmitting

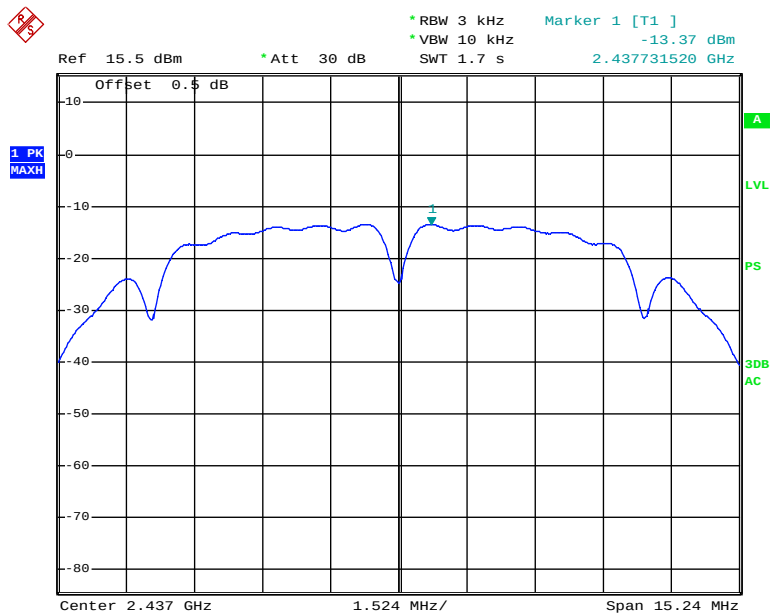
Test Result: Compliant. Please refer to the following table and plots

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-13.63	≤8
	Middle	2437	-13.37	≤8
	High	2462	-13.44	≤8
802.11g	Low	2412	-15.23	≤8
	Middle	2437	-15.11	≤8
	High	2462	-14.93	≤8



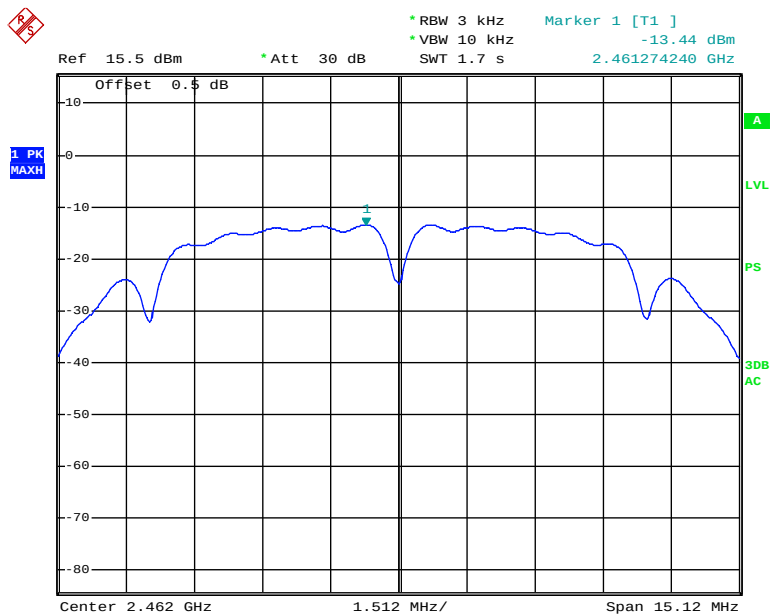
Date: 7.MAR.2017 20:32:36

Power Spectral Density, 802.11b Middle Channel



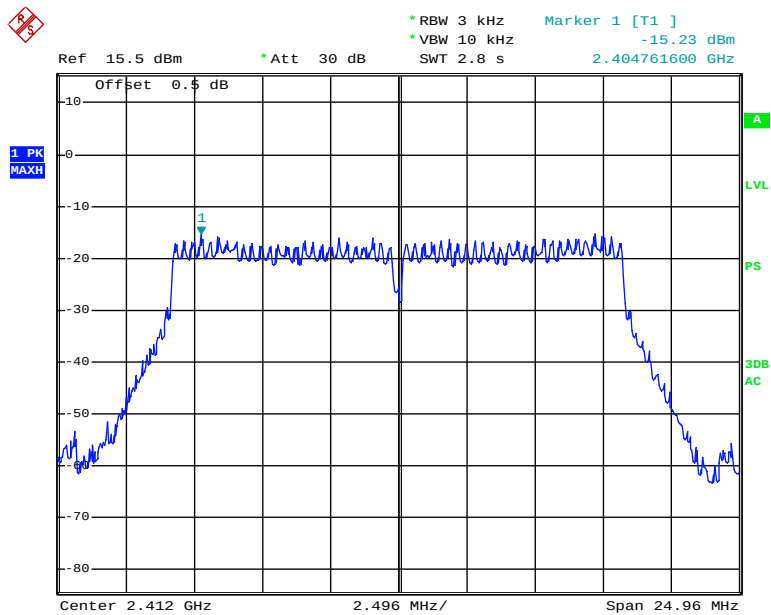
Date: 7.MAR.2017 20:39:18

Power Spectral Density, 802.11b High Channel



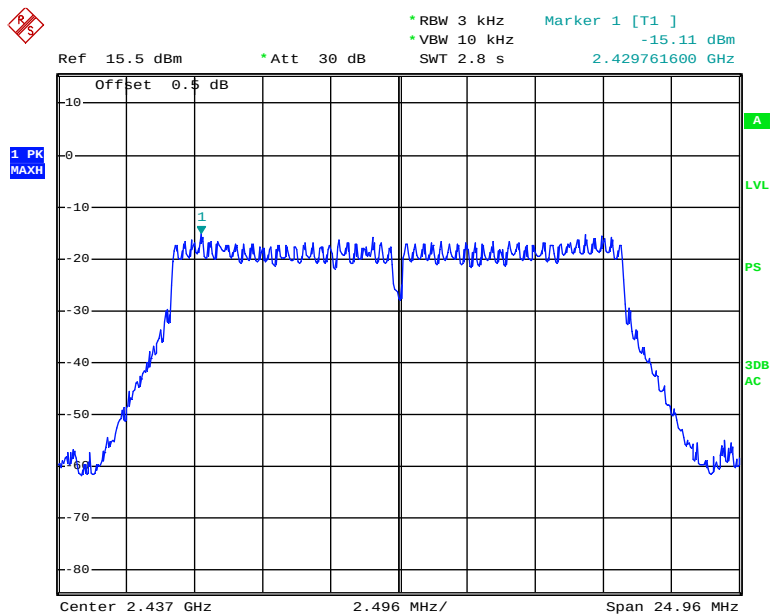
Date: 7.MAR.2017 20:41:31

Power Spectral Density, 802.11g Low Channel

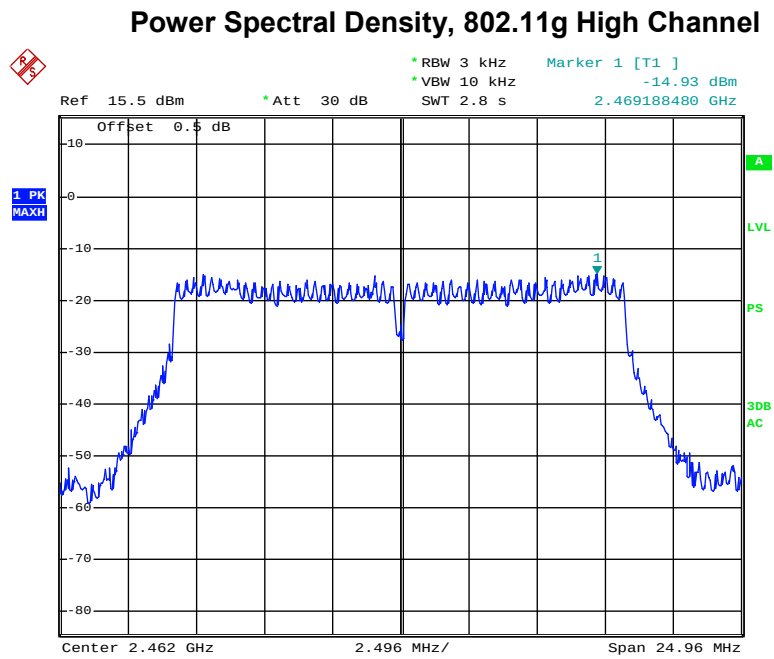


Date: 7.MAR.2017 20:51:45

Power Spectral Density, 802.11g Middle Channel



Date: 7.MAR.2017 20:48:43



Date: 7.MAR.2017 20:45:50

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