

FCC PART 15.249

TEST REPORT

For

GODOX Photo Equipment Co.,Ltd.

19th Floor, Room 1902, Building Jinshan, 5033 Shennan East Road, Luohu District, Shenzhen
518001, China

FCC ID: 2ABYNTT600

Report Type: Original Report		Product Type: Thinklite Camera Flash	
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Report Number:	RDG150923001-00		
Report Date:	2015-09-29		
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *GODOX Photo Equipment Co.,Ltd.*'s product, model number: *TT600(FCC ID: 2ABYNTT600)* (the "EUT") in this report was a *Thinklite Camera Flash*, was measured approximately: 19.2cm (L) x 7.1 cm (W) x 6 cm(H), rated input voltage: DC6V from 4 × 1.5V AA battery.

** All measurement and test data in this report was gathered from production sample serial number: 150923001 (Assigned by BACL.Dongguan). The EUT was received on 2015-09-24.*

Objective

This type approval report is prepared on behalf of *GODOX Photo Equipment 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.

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 radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) 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 February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. 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 with maximum power output and switched the channels by key.

32 channels were provided by the manufacturer and channel 1、16、32 were selected to test.

Channel Number	Frequency (GHz)	Channel Number	Frequency (GHz)
1	2.4130	17	2.4395
2	2.4145	18	2.4410
3	2.4160	19	2.4430
4	2.4180	20	2.4445
5	2.4195	21	2.4460
6	2.4210	22	2.4480
7	2.4230	23	2.4495
8	2.4245	24	2.4510
9	2.4260	25	2.4530
10	2.4280	26	2.4545
11	2.4295	27	2.4560
12	2.4310	28	2.4580
13	2.4330	29	2.4595
14	2.4345	30	2.4610
15	2.4360	31	2.4630
16	2.4380	32	2.4645

EUT Exercise Software

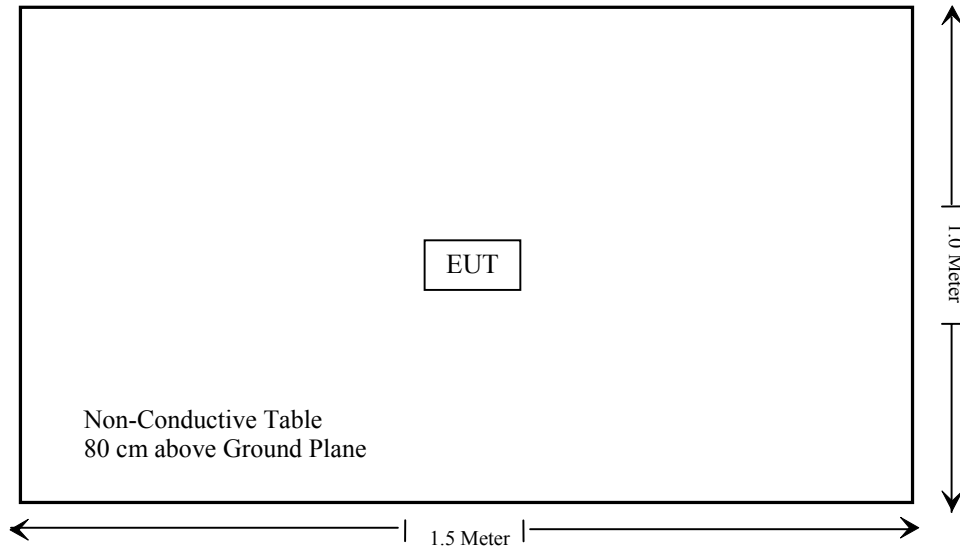
No software was used during the test.

Equipment Modifications

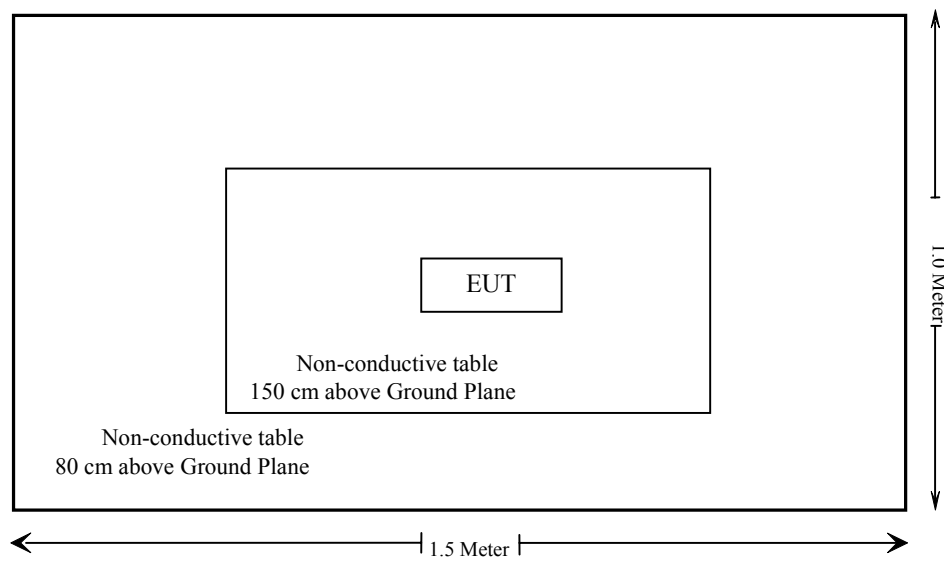
No modification was made to the EUT.

Block Diagram of Test Setup

For below 1GHz:



For above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not Applicable
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance
§15.249(d)	Outside of Band Emission (50dB attenuation)	Compliance

Not Applicable: The EUT is battery operated equipment.

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 one integral antenna arrangement, which was permanently attached and the antenna gain is 0dBi, 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_{cisprr} 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_{cisprr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisprr})$, exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisprr})$, 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. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

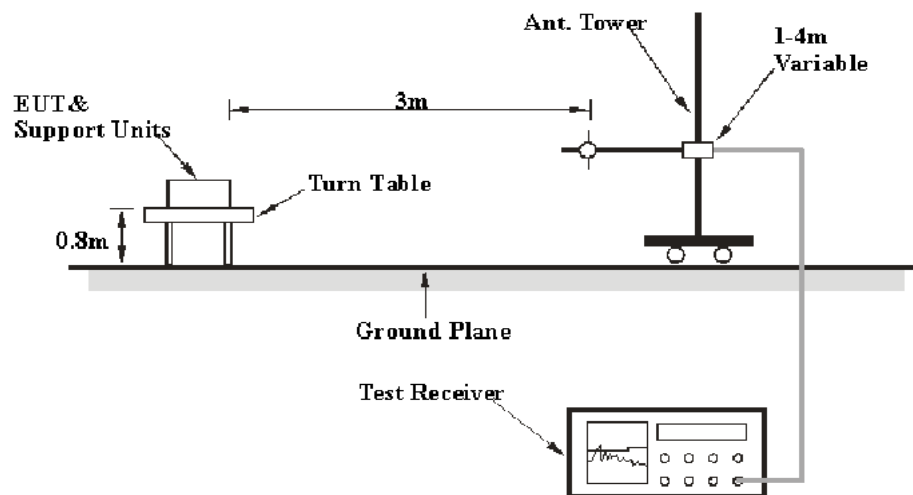
6G~18GHz: 5.23 dB

Table 1 – Values of U_{cispr}

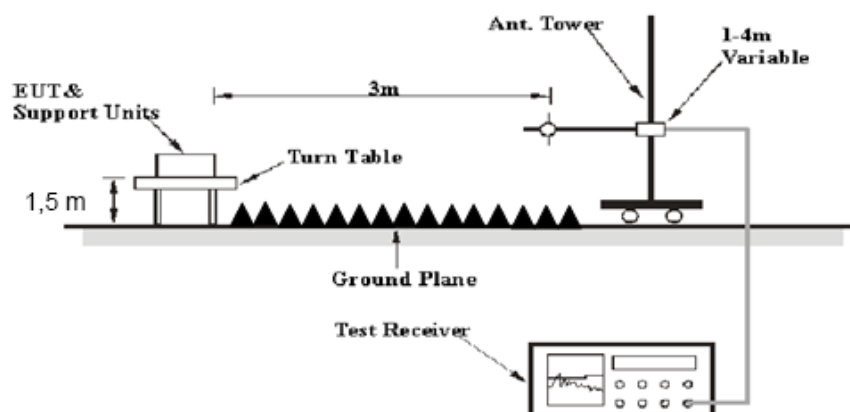
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 25 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
R&S	EMI Test Receiver	ESCI	100224	2015-05-09	2016-05-09
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
R&S	Spectrum Analyzer	E4440A	SG43360054	2014-12-04	2015-12-04
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2015-02-19	2016-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2015-09-06	2016-09-06
N/A	Coaxial Cable	14m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	8m	N/A	2015-05-06	2016-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 & 15.205 & 15.249, with the worst margin reading of:

5.18 dB at 2413 MHz in the Horizontal polarization

Test Data**Environmental Conditions**

Temperature:	26.8 °C
Relative Humidity:	55%
ATM Pressure:	100.3 kPa

The testing was performed by Allen Qiao on 2015-09-28.

Test Mode: Transmitting

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(1/m))					
Low Channel: 2413 MHz									
2413	64.83	PK	H	25.67	3.69	0.00	94.19	114.00	19.81
2413	59.46	AV	H	25.67	3.69	0.00	88.82	94.00	5.18
2413	61.95	PK	V	25.67	3.69	0.00	91.31	114.00	22.69
2413	56.25	AV	V	25.67	3.69	0.00	85.61	94.00	8.39
2390	30.17	PK	H	25.61	3.63	0.00	59.41	74.00	14.59
2390	14.53	AV	H	25.61	3.63	0.00	43.77	54.00	10.23
4826	34.82	PK	H	30.65	5.02	27.41	43.08	74.00	30.92
4826	24.62	AV	H	30.65	5.02	27.41	32.88	54.00	21.12
7239	31.92	PK	H	34.17	6.65	25.90	46.84	74.00	27.16
7239	18.61	AV	H	34.17	6.65	25.90	33.53	54.00	20.47
9652	30.14	PK	H	36.06	8.56	27.45	47.31	74.00	26.69
9652	16.63	AV	H	36.06	8.56	27.45	33.80	54.00	20.20
3131	33.78	PK	H	27.62	6.93	27.43	40.90	74.00	33.10
3131	20.44	AV	H	27.62	6.93	27.43	27.56	54.00	26.44
215.3	32.6	QP	H	11.38	1.77	21.47	24.28	43.50	19.22
Middle Channel: 2438 MHz									
2438	63.89	PK	H	25.74	3.76	0.00	93.39	114.00	20.61
2438	58.44	AV	H	25.74	3.76	0.00	87.94	94.00	6.06
2438	59.71	PK	V	25.74	3.76	0.00	89.21	114.00	24.79
2438	53.87	AV	V	25.74	3.76	0.00	83.37	94.00	10.63
4876	35.3	PK	H	30.78	5.15	27.42	43.81	74.00	30.19
4876	25.48	AV	H	30.78	5.15	27.42	33.99	54.00	20.01
7314	32.26	PK	H	34.35	6.74	25.88	47.47	74.00	26.53
7314	19.06	AV	H	34.35	6.74	25.88	34.27	54.00	19.73
9752	30.4	PK	H	36.30	8.61	27.23	48.08	74.00	25.92
9752	16.72	AV	H	36.30	8.61	27.23	34.40	54.00	19.60
3130	33.51	PK	H	27.62	6.92	27.43	40.62	74.00	33.38
3130	20.39	AV	H	27.62	6.92	27.43	27.50	54.00	26.50
3730	32.87	PK	H	29.31	4.58	27.34	39.42	74.00	34.58
3730	19.66	AV	H	29.31	4.58	27.34	26.21	54.00	27.79
215.3	32.1	QP	H	11.38	1.77	21.47	23.78	43.50	19.72
High Channel: 2464.5 MHz									
2464.5	63.17	PK	H	25.81	3.74	0.00	92.72	114.00	21.28
2464.5	57.23	AV	H	25.81	3.74	0.00	86.78	94.00	7.22
2464.5	59.33	PK	V	25.81	3.74	0.00	88.88	114.00	25.12
2464.5	53.8	AV	V	25.81	3.74	0.00	83.35	94.00	10.65
2483.5	27.48	PK	H	25.86	3.67	0.00	57.01	74.00	16.99
2483.5	13.89	AV	H	25.86	3.67	0.00	43.42	54.00	10.58
4929	35.03	PK	H	30.92	5.34	27.43	43.86	74.00	30.14
4929	25.18	AV	H	30.92	5.34	27.43	34.01	54.00	19.99
7393.5	32.08	PK	H	34.54	6.83	25.86	47.59	74.00	26.41
7393.5	18.86	AV	H	34.54	6.83	25.86	34.37	54.00	19.63
9858	30.64	PK	H	36.56	8.67	26.90	48.97	74.00	25.03
9858	16.9	AV	H	36.56	8.67	26.90	35.23	54.00	18.77
3131	33.87	PK	H	27.62	6.93	27.43	40.99	74.00	33.01
3131	20.54	AV	H	27.62	6.93	27.43	27.66	54.00	26.34
215.3	32.8	QP	H	11.38	1.77	21.47	24.48	43.50	19.02

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. 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
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27.4°C
Relative Humidity:	58 %
ATM Pressure:	100 kPa

* The testing was performed by Allen Qiao on 2015-09-28.

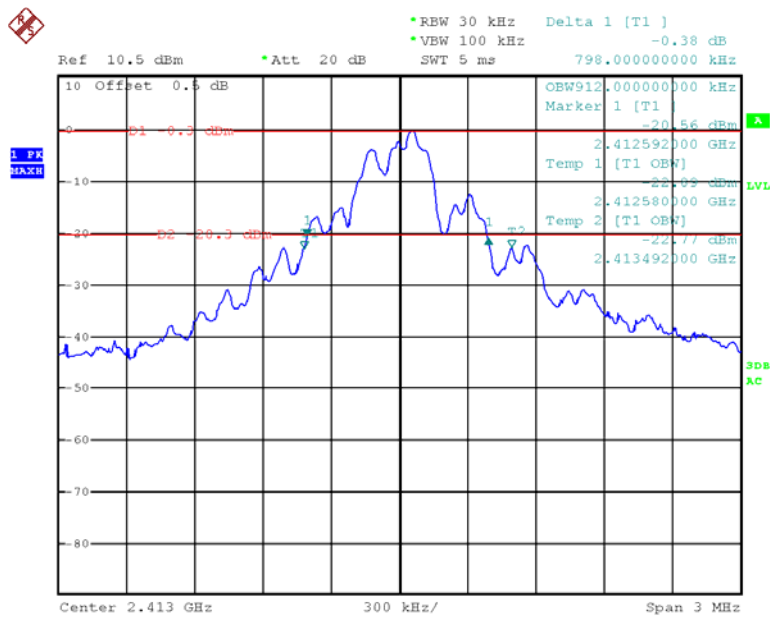
Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

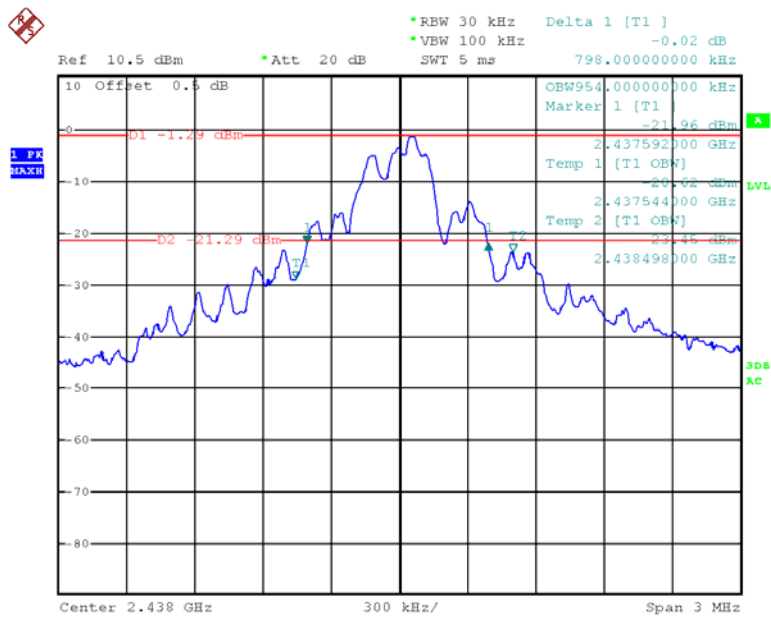
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2413	0.798
Middle	2438	0.798
High	2464.5	0.792

Low Channel



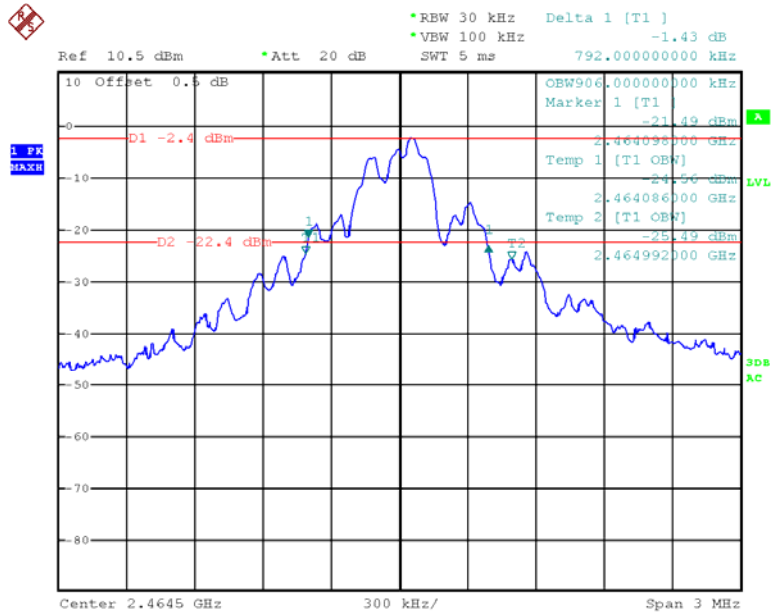
Date: 28.SEP.2015 09:39:18

Middle Channel



Date: 28.SEP.2015 09:48:09

High Channel



Date: 28.SEP.2015 09:44:42

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
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

Temperature:	27.4°C
Relative Humidity:	58 %
ATM Pressure:	100 kPa

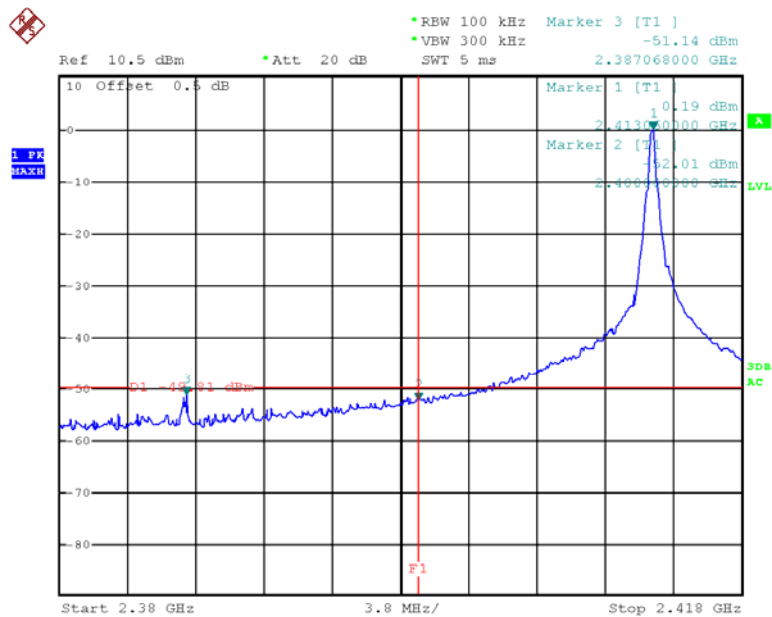
* The testing was performed by Allen Qiao on 2015-09-28.

Test Result: Compliant.

Please refer to the following table and plots:

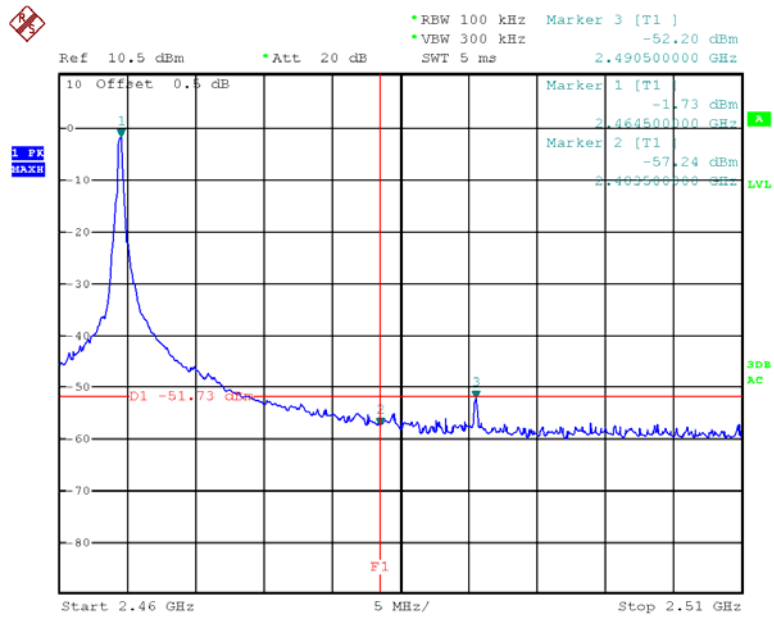
Band Edge	Delta Peak to Band Emission (dBc)	Delta Limit (dBc)
Left	51.33	50
Right	50.47	50

Band Edge, Left Side



Date: 28.SEP.2015 09:54:27

Band Edge, Right Side



Date: 28.SEP.2015 09:51:28

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