FCC PART 15.249

TEST REPORT

For

Shenzhen Rapoo Technology Co., Ltd.

22, Jinxiu Road East, Pingshan District, Shenzhen, China

FCC ID: PP23360

Report Type:	**Product Type:**
Original Report	Wireless Optical Mouse
Test Engineer:	Ares Liu
Report Number:	R2DG130314001-00
Report Date:	2013-03-18
Reviewed By:	Ivan Cao EMC Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Rapoo Technology Co., Ltd.*'s product, model number: 3360 (FCC ID: PP23360) (the "EUT") in this report was a *Wireless Optical Mouse*, which was measured approximately: 8.0cm(L) x 5.0 cm(W) x 3.0 cm(H), rated input voltage: DC 1.5V from battery.

All measurement and test data in this report was gathered from production sample serial number: 130314001 (Assigned by BACL, Dongguan). The EUT was received on 2013-03-15.

Objective

This type approval report is prepared on behalf of *Shenzhen Rapoo 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, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

No related submittal(s)

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

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 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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, which was provided by the manufacturer.

16 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	5	2425	9	2446	13	2471
2	2405	6	2428	10	2451	14	2474
3	2409	7	2431	11	2454	15	2477
4	2413	8	2434	12	2457	16	2479

EUT was tested with Channel 1, 9 and 16.

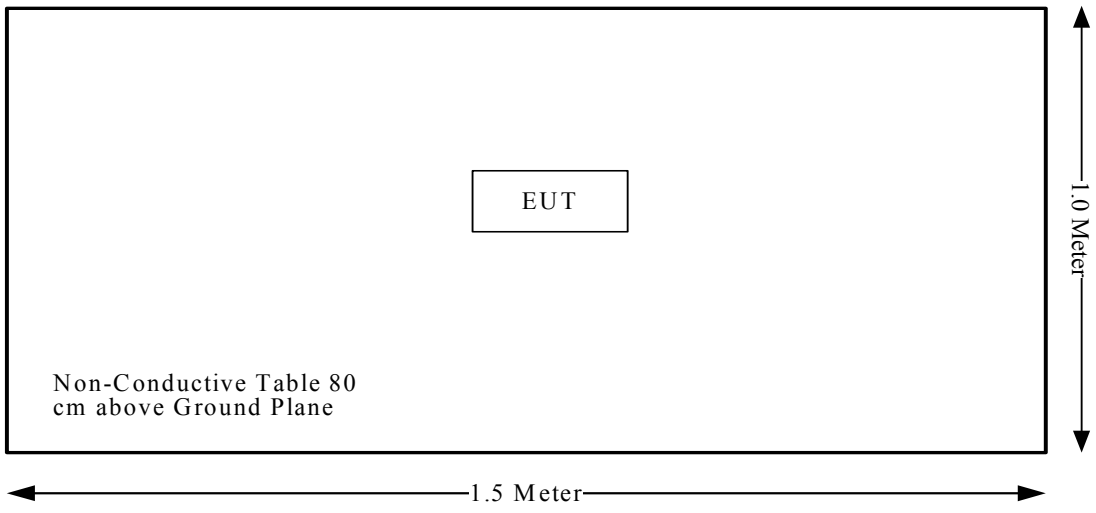
EUT Exercise Software

No exercise software was used.

Equipment Modifications

No modifications were made to the unit tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	N/A*
Ä15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance
§15.249(d)	Outside of Band Emission (50dB attenuation)	Compliance

N/A*:The EUT only powered by DC 1.5V from battery.

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 an internal PCB printed antenna permanently soldering on the printed circuit board, which complied with Ä15.203, the maximum gain was 0 dBi. Please refer to the internal 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. (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

Test Equipment Setup

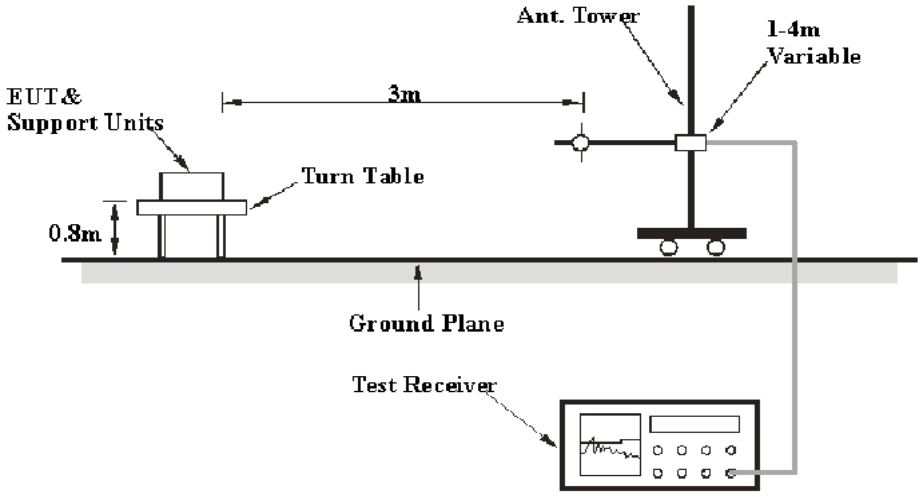
The system was investigated from 30 MHz to 25GHz.

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

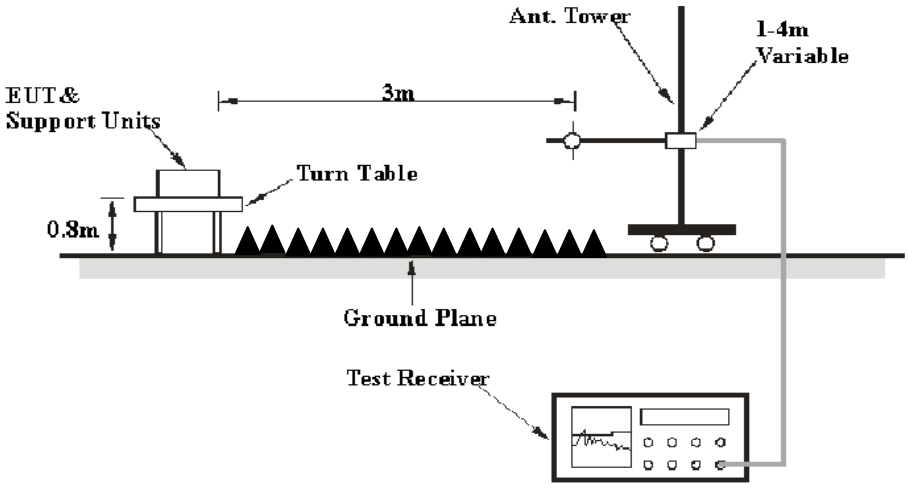
Frequency Range	***RBW***	***Video B/W***	***Detector***
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 40GHz	1 MHz	3 MHz	PK
1000 MHz – 40GHz	1 MHz	10 Hz	Ave

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 C63.4-2003. The specification used was the FCC Ä15.209/15.205 and Ä15.249 limits.

Test Procedure

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101121	2012-10-8	2013-10-7
Sunol Sciences	Hybrid Antennas	JB3	A060611-1	2011-9-6	2013-9-5
HP	Pre-amplifier	8447E	2434A02181	2012-10-8	2013-10-7
R&S	Spectrum Analyzer	FSEM 30	1079 8500	2012-10-9	2013-10-8
ETS-LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2013-09-05
Mini-Circuits	Wideband Amplifier	ZVA-183-S+	96901149	N/A	N/A

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:

7.60 dB at **2483.5 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	27.9℃
Relative Humidity:	52 %
ATM Pressure:	100.6kPa

The testing was performed by Ares Liu on 2013-03-17.

Test Mode: Transmitting

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC Ä15.209/15.249	
(MHz)	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	67.5	AV	H	25.65	3.90	27.13	69.92	94.00	24.08
2402	83.86	PK	H	25.65	3.90	27.13	86.28	114.00	27.72
2402	65.49	AV	V	25.65	3.90	27.13	67.91	94.00	26.09
2402	72.11	PK	V	25.65	3.90	27.13	74.53	114.00	39.47
2390	48.92	PK	H	25.61	3.84	27.13	51.24	74.00	22.76
2390	28.39	AV	H	25.61	3.84	27.13	30.71	54.00	23.29
4804	39.04	PK	H	30.59	4.67	27.26	47.04	74.00	26.96
4804	19.55	AV	H	30.59	4.67	27.26	27.55	54.00	26.45
7206	32.43	PK	H	34.09	6.50	26.30	46.72	74.00	27.28
7206	18.02	AV	H	34.09	6.50	26.30	32.31	54.00	21.69
9608	31.93	PK	V	35.96	8.75	26.22	50.42	74.00	23.58
9608	18.19	AV	V	35.96	8.75	26.22	36.68	54.00	17.32
1447.39	36.26	PK	V	23.46	2.87	27.08	35.51	74.00	38.49
1447.39	21.25	AV	V	23.46	2.87	27.08	20.50	54.00	33.50
419.94	27.5	QP	V	16.71	2.49	21.82	24.88	46.00	21.12
Middle Channel: 2446 MHz									
2446	67.88	AV	H	25.76	4.00	27.18	70.46	94.00	23.54
2446	84.22	PK	H	25.76	4.00	27.18	86.80	114.00	27.20
2446	66.17	AV	V	25.76	4.00	27.18	68.75	94.00	25.25
2446	74.23	PK	V	25.76	4.00	27.18	76.81	114.00	37.19
4892	40.58	PK	H	30.82	4.73	27.26	48.87	74.00	25.13
4892	20.33	AV	H	30.82	4.73	27.26	28.62	54.00	25.38
7338	31.59	PK	H	34.41	6.75	26.56	46.19	74.00	27.81
7338	18.14	AV	H	34.41	6.75	26.56	32.74	54.00	21.26
9784	31.24	PK	V	36.38	8.56	25.54	50.64	74.00	23.36
9784	18.33	AV	V	36.38	8.56	25.54	37.73	54.00	16.27
1446.95	36.58	PK	V	23.46	2.87	27.08	35.83	74.00	38.17
1446.95	21.46	AV	V	23.46	2.87	27.08	20.71	54.00	33.29
2824.73	34.59	PK	V	26.74	4.59	27.37	38.55	74.00	35.45
2824.73	19.38	AV	V	26.74	4.59	27.37	23.34	54.00	30.66
418.93	27.34	QP	V	16.69	2.48	21.82	24.69	46.00	21.31

High Channel: 2479 MHz									
2479	68.5	AV	H	25.85	3.82	27.22	70.95	94.00	23.05
2479	86.66	PK	H	25.85	3.82	27.22	89.11	114.00	24.89
2479	67.09	AV	V	25.85	3.82	27.22	69.54	94.00	24.46
2479	78.35	PK	V	25.85	3.82	27.22	80.80	114.00	33.20
2483.5	63.97	PK	H	25.86	3.80	27.23	66.40	74.00	7.60
2483.5	31.21	AV	H	25.86	3.80	27.23	33.64	54.00	20.36
4958	41.8	PK	H	30.99	4.70	27.27	50.22	74.00	23.78
4958	20.12	AV	H	30.99	4.70	27.27	28.54	54.00	25.46
7437	31.32	PK	H	34.65	6.94	26.57	46.34	74.00	27.66
7437	17.61	AV	H	34.65	6.94	26.57	32.63	54.00	21.37
9916	31.05	PK	V	36.70	8.42	25.50	50.67	74.00	23.33
9916	17.7	AV	V	36.70	8.42	25.50	37.32	54.00	16.68
1447.17	35.37	PK	V	23.46	2.87	27.08	34.62	74.00	39.38
1447.17	21.14	AV	V	23.46	2.87	27.08	20.39	54.00	33.61
419.28	27.84	QP	V	16.70	2.49	21.82	25.21	46.00	20.79

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
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

Test Data

Environmental Conditions

Temperature:	27.9 °C
Relative Humidity:	52 %
ATM Pressure:	100.6kPa

** The testing was performed by Ares Liu on 2013-03-17.*

Test Result: Compliance.

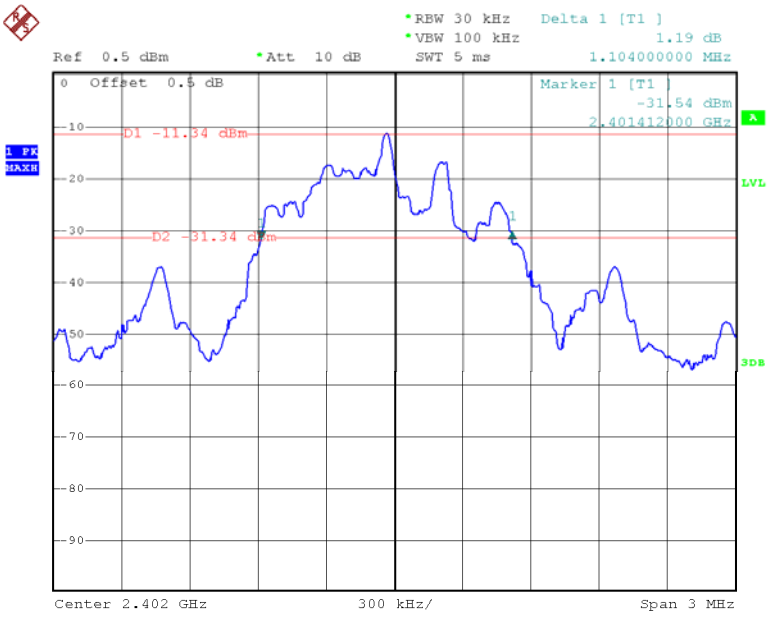
Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.104
Middle	2446	1.104
High	2479	1.128

Please refer to the following plots.

Low Channel



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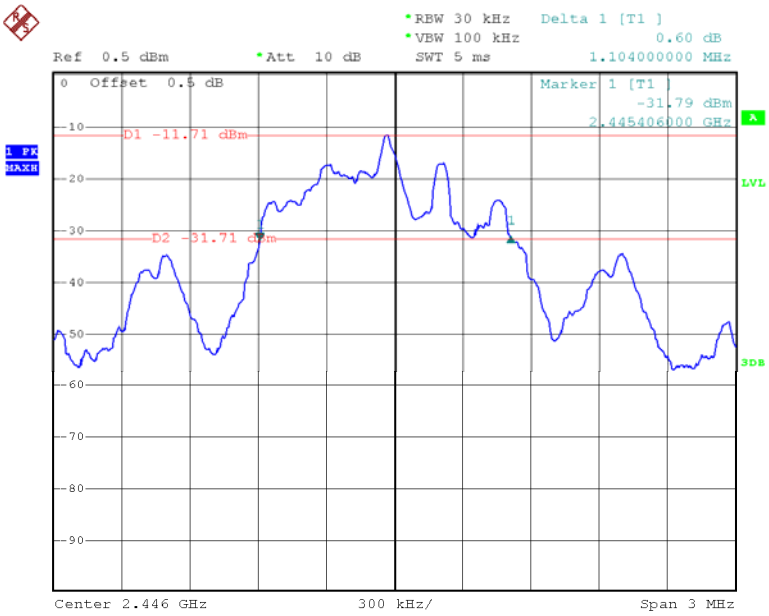
Middle Channel



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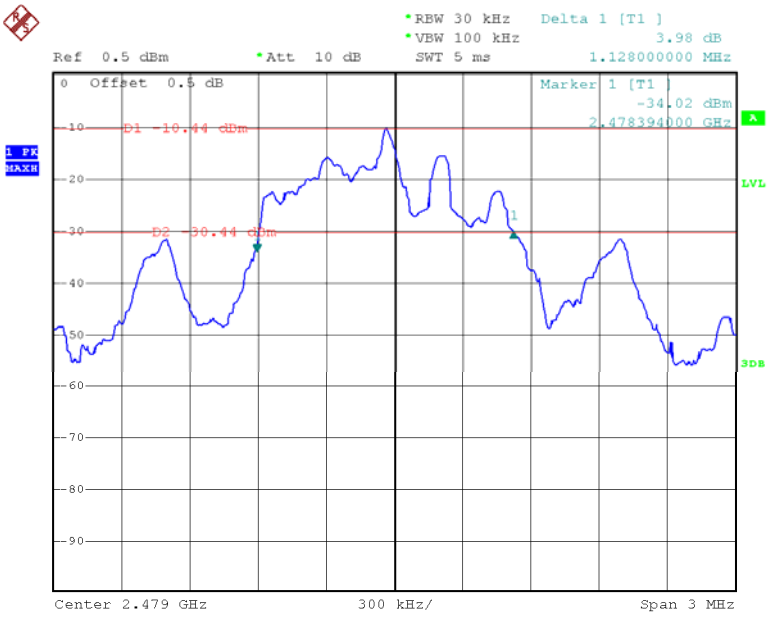
High Channel



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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	FSEM 30	1079 8500	2012-10-9	2013-10-8

Test Data

Environmental Conditions

Temperature:	27.9℃
Relative Humidity:	52 %
ATM Pressure:	100.6kPa

** The testing was performed by Ares Liu on 2013-03-17.*

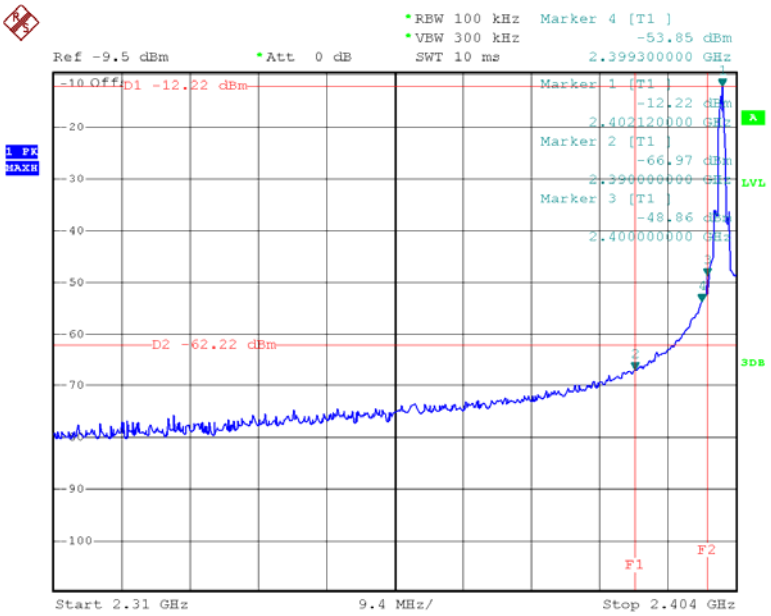
Test Result: Compliance.

Please refer to the following table and plots:

Frequency (MHz)	Delta Peak to Band Emission (dBc)
5725	38.71 (note)
5875	49.94 (note)

note：the delta peak to band emission compliance with 15.209 in the radiation test.

Band Edge, Left Side



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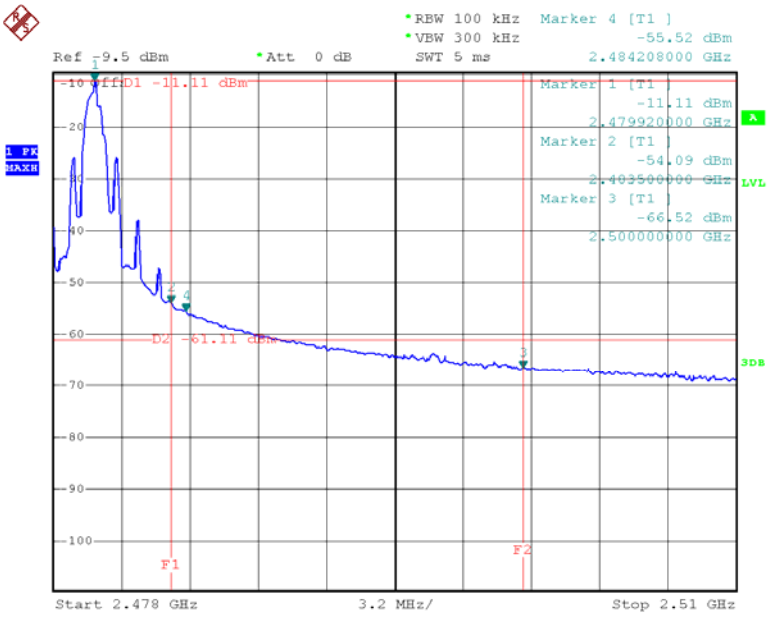
Band Edge, Right Side



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