

# FCC PART 15.249

## TEST REPORT

For

**Cadent Ltd.**

17 Ha'Taasiya st., Or Yehuda, Israel

**FCC ID: UZ2EM10577**

<b>Report Type:</b> Original Report	<b>Product Type:</b> 2.4G wireless mouse
<b>Test Engineer:</b>	<u>Jimmy Xiao</u> <i>Jimmy Xiao</i>
<b>Report Number:</b>	<u>RSZ120116006-00</u>
<b>Report Date:</b>	<u>2012-02-17</u>
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\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Cadent Ltd.*'s product, model number: *EM 10577 (FCC ID: UZ2EM10577)* (the "EUT") in this report was a *2.4G wireless mouse*, which was measured approximately: 94 mm (L) x 65 mm (W) x 36 mm (H), rated input voltage: AA 1.5V\*1 battery

*\* All measurement and test data in this report was gathered from production sample serial number: 1201048 (Assigned by BACL, Shenzhen). The EUT was received on 2012-01-16.*

### Objective

This report is prepared on behalf of *Cadent 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 the compliance of EUT with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

No related submittal.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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. (Shenzhen). 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  $\pm 0.96$  dB, the uncertainty of any radiation on emissions measurement is  $\pm 4.0$  dB

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured in a testing mode which was selected by manufacturer.

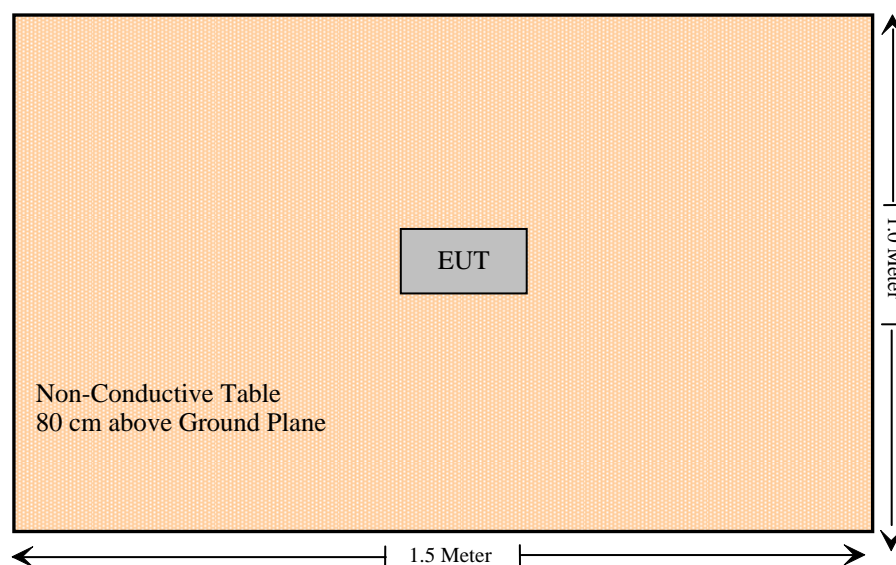
### EUT Exercise Software

N/A

### Equipment Modifications

No modification was made to the EUT tested.

### Block Diagram of Test Setup



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**SUMMARY OF TEST RESULTS**

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

Not Applicable – The EUT was powered by battery.

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **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 used one PCB antenna, the gain is 3.85 dBi, which is in accordance to section 15.203, 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:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
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**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB.

**Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Below 1000MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

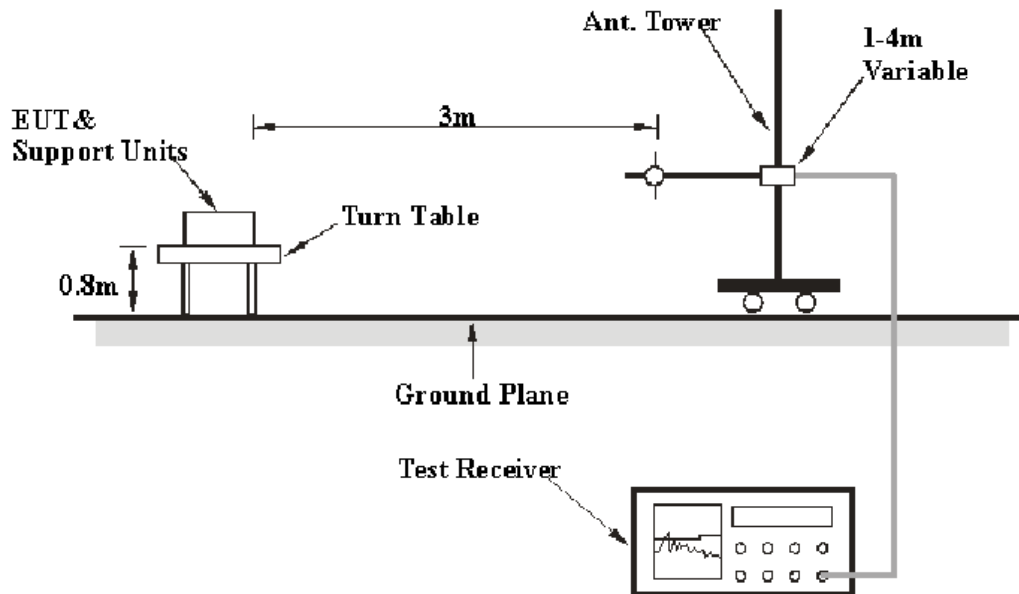
Above 1000MHz:

$$\text{Peak: RBW} = 1 \text{ MHz} / \text{VBW} = 1 \text{ MHz} / \text{Sweep} = \text{Auto}$$

$$\text{Average: RBW} = 1 \text{ MHz} / \text{VBW} = 10 \text{ Hz} / \text{Sweep} = \text{Auto}$$



## EUT Setup



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 C63.4-2009. The specification used was the FCC 15.209, 15.205 and FCC 15.249 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 meter, 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:

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

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
HP	Amplifier	HP8447D	2944A09795	2011-08-02	2012-08-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-04
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-04	2012-05-03
Electro-Mechanics	Horn Antenna	3116	9510-2270	2011-10-11	2012-10-10
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Results Summary

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

**1.89 dB at 4806 MHz in the Horizontal polarization**

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

*The testing was performed by Jimmy Xiao on 2012-02-03.*

*Test Mode: Transmitting*

*Test Result: Compliance.*

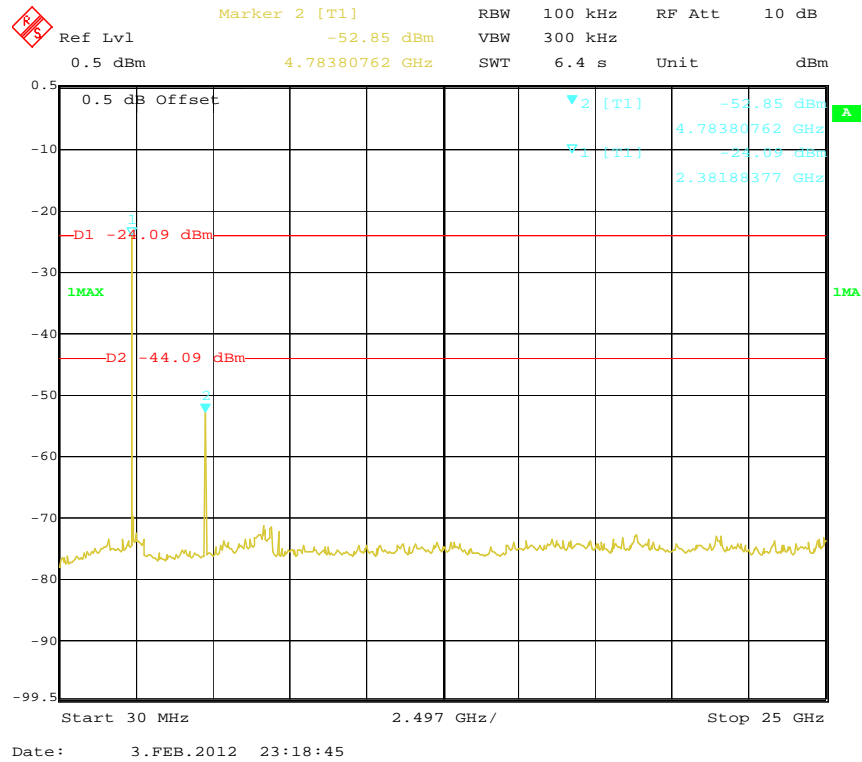
## 30 MHz ~ 25 GHz

Indicated		Detector (PK/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.249/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2403 MHz)												
4806	38.68	Ave.	130	1.8	H	36.0	4.30	26.87	52.11	54	1.89*	harmonic
4806	38.76	Ave.	240	1.1	V	34.5	4.30	26.87	50.69	54	3.31*	harmonic
2403	78.95	Ave.	160	1.6	H	30.5	3.03	26.83	85.65	94	8.35	fund
7209	23.25	Ave.	170	1.4	H	39.2	5.16	26.64	40.97	54	13.03	harmonic
6933.9	24.33	Ave.	360	1.2	V	37.9	5.17	26.68	40.72	54	13.28	spurious
4806	45.95	PK	130	1.8	H	36.0	4.30	26.87	59.38	74	14.62	harmonic
2403	72.66	Ave.	210	1.2	V	30.5	3.03	26.83	79.36	94	14.64	fund
7209	22.14	Ave.	150	1.0	V	37.9	5.16	26.64	38.56	54	15.44	harmonic
4806	43.84	PK	240	1.1	V	34.5	4.30	26.87	55.77	74	18.23	harmonic
6933.9	37.96	PK	360	1.2	V	37.9	5.17	26.68	54.35	74	19.65	spurious
7209	34.66	PK	170	1.4	H	39.2	5.16	26.64	52.38	74	21.62	harmonic
3903.6	23.14	Ave.	60	1.9	V	32.3	3.73	26.88	32.29	54	21.71	spurious
7209	32.78	PK	150	1.0	V	37.8	5.16	26.64	49.1	74	24.9	harmonic
2384.5	21.12	Ave.	290	2.1	H	30.4	2.98	26.83	27.67	54	26.33	spurious
2403	80.86	PK	160	1.6	H	30.5	3.03	26.83	87.56	114	26.44	fund
2389.7	20.98	Ave.	140	1.4	H	30.4	2.98	26.83	27.53	54	26.47	spurious
3903.6	35.09	PK	60	1.9	V	32.3	3.73	26.88	44.24	74	29.76	spurious
2384.5	35.28	PK	290	2.1	H	30.4	2.98	26.83	41.83	74	32.17	spurious
2389.7	35.01	PK	140	1.4	H	30.4	2.98	26.83	41.56	74	32.44	spurious
2403	73.69	PK	210	1.2	V	30.5	3.03	26.83	80.39	114	33.61	fund
Middle Channel (2441 MHz)												
4882	37.92	Ave.	210	1.6	H	36.2	4.36	26.87	51.61	54	2.39*	harmonic
4882	38.01	Ave.	160	1.1	V	34.7	4.36	26.87	50.20	54	3.80*	harmonic
2441	79.61	Ave.	150	1.5	H	30.6	3.11	26.83	86.49	94	7.51	fund
7323	22.56	Ave.	340	1.7	H	39.1	5.09	26.64	40.11	54	13.89	harmonic
2441	72.49	Ave.	230	1.7	V	30.6	3.11	26.83	79.37	94	14.63	fund
4882	45.66	PK	210	1.6	H	36.2	4.36	26.87	59.35	74	14.65	harmonic
7323	22.43	Ave.	150	1.5	V	37.8	5.09	26.64	38.68	54	15.32	harmonic
6938.6	20.15	Ave.	170	2.1	V	37.9	5.17	26.68	36.54	54	17.46	spurious
4882	43.75	PK	160	1.1	V	34.7	4.36	26.87	55.94	74	18.06	harmonic
7323	34.71	PK	340	1.7	H	39.1	5.09	26.64	52.26	74	21.74	harmonic
6938.6	35.49	PK	170	2.1	V	37.9	5.17	26.68	51.88	74	22.12	spurious
3907.9	20.06	Ave.	190	1.4	V	32.3	3.73	26.88	29.21	54	24.79	spurious
7323	32.87	PK	150	1.5	V	37.8	5.09	26.64	49.12	74	24.88	harmonic
2441	80.72	PK	150	1.5	H	30.6	3.11	26.83	87.60	114	26.40	fund
3907.9	34.82	PK	190	1.4	V	32.3	3.73	26.88	43.97	74	30.03	spurious
2441	73.54	PK	230	1.7	V	30.6	3.11	26.83	80.42	114	33.58	fund

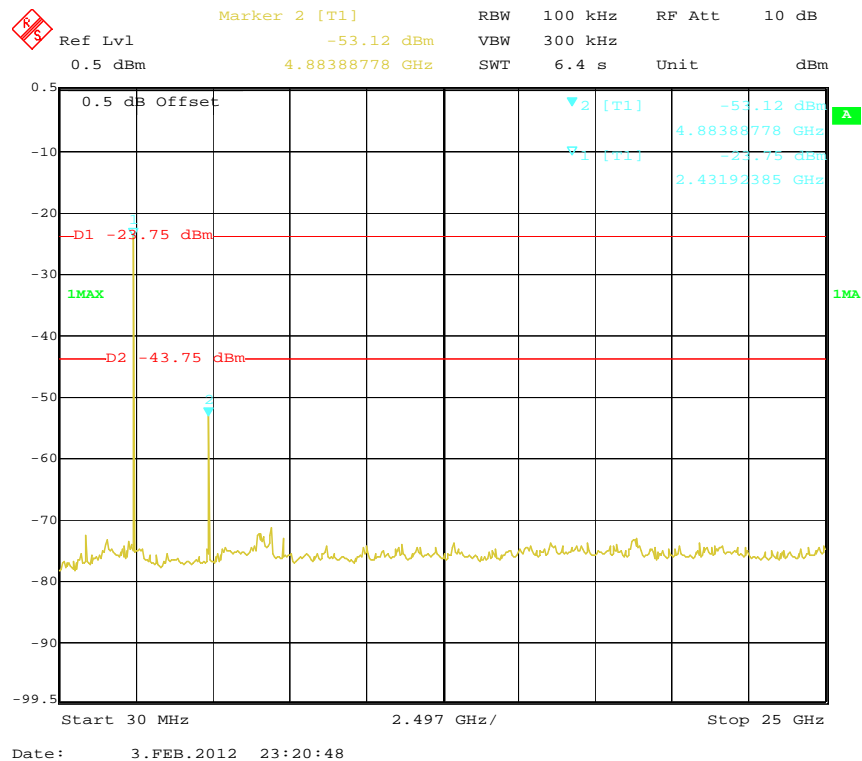
Indicated		Detector (PK/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.249/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2479 MHz)												
4958	36.71	Ave.	280	1.9	H	36.4	4.40	26.87	50.64	54	3.36*	harmonic
4958	34.78	Ave.	150	2.1	V	35.0	4.40	26.87	47.31	54	6.69	harmonic
2479	79.38	Ave.	150	1.3	H	30.7	3.29	26.83	86.54	94	7.46	fund
7437	23.11	Ave.	310	1.5	H	39.0	5.20	26.64	40.67	54	13.33	harmonic
4958	45.26	PK	280	1.9	H	36.4	4.40	26.87	59.19	74	14.81	harmonic
2479	71.77	Ave.	250	1.8	V	30.6	3.29	26.83	78.83	94	15.17	fund
7437	22.07	Ave.	20	2.0	V	37.7	5.20	26.64	38.33	54	15.67	harmonic
6937.1	20.16	Ave.	240	2.1	V	37.9	5.17	26.68	36.55	54	17.45	spurious
4958	42.14	PK	150	2.1	V	35.0	4.40	26.87	54.67	74	19.33	harmonic
7437	35.16	PK	310	1.5	H	39.0	5.20	26.64	52.72	74	21.28	harmonic
6937.1	35.06	PK	240	2.1	V	37.9	5.17	26.68	51.45	74	22.55	spurious
7437	33.89	PK	20	2	V	37.7	5.20	26.64	50.15	74	23.85	harmonic
3904.6	20.53	Ave.	130	1.5	V	32.3	3.73	26.88	29.68	54	24.32	spurious
2479	80.16	PK	150	1.3	H	30.7	3.29	26.83	87.32	114	26.68	fund
2489.5	20.37	Ave.	160	1.4	V	30.6	3.11	26.83	27.25	54	26.75	spurious
2487.6	20.18	Ave.	180	1.3	V	30.6	3.11	26.83	27.06	54	26.94	spurious
3904.6	35.81	PK	130	1.5	V	32.3	3.73	26.88	44.96	74	29.04	spurious
2489.5	34.15	PK	160	1.4	V	30.6	3.11	26.83	41.03	74	32.97	spurious
2487.6	33.75	PK	180	1.3	V	30.6	3.11	26.83	40.63	74	33.37	spurious
2479	72.92	PK	250	1.8	V	30.6	3.29	26.83	79.98	114	34.02	fund

Spurious emissions at antenna port were shown as the below plots

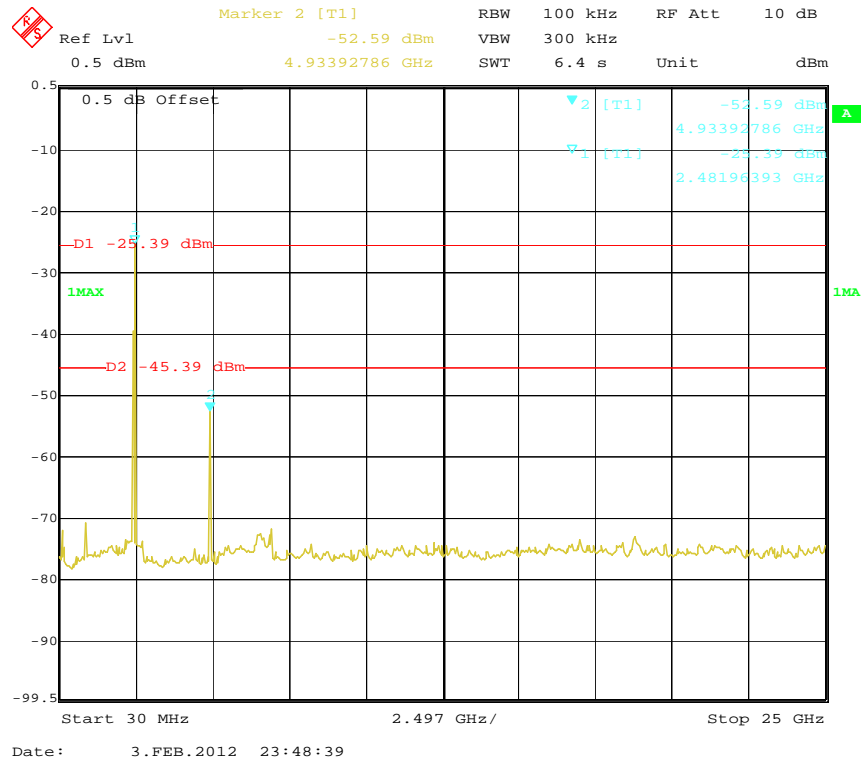
### Low Channel



### Middle Channel



# High Channel



## FCC§15.249(d) - OUT OF BAND EMISSION (50dB 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	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Data

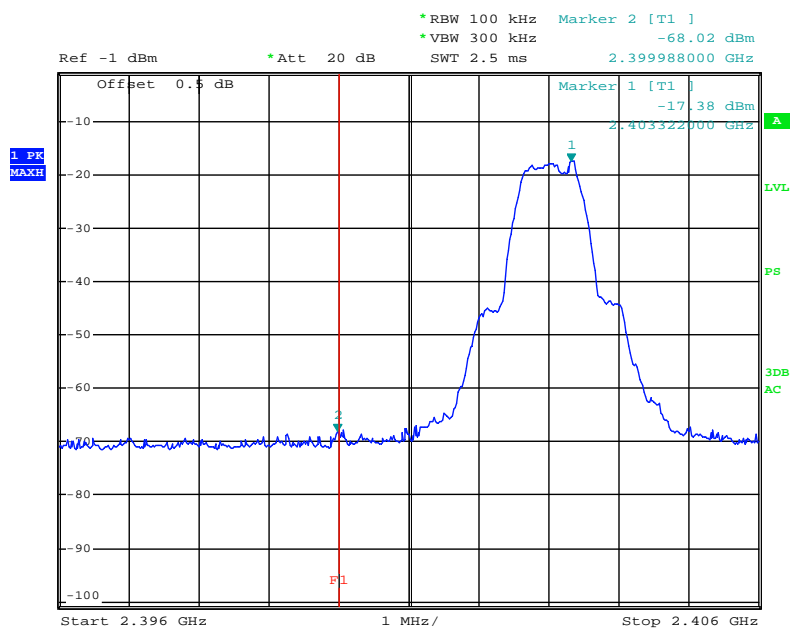
#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

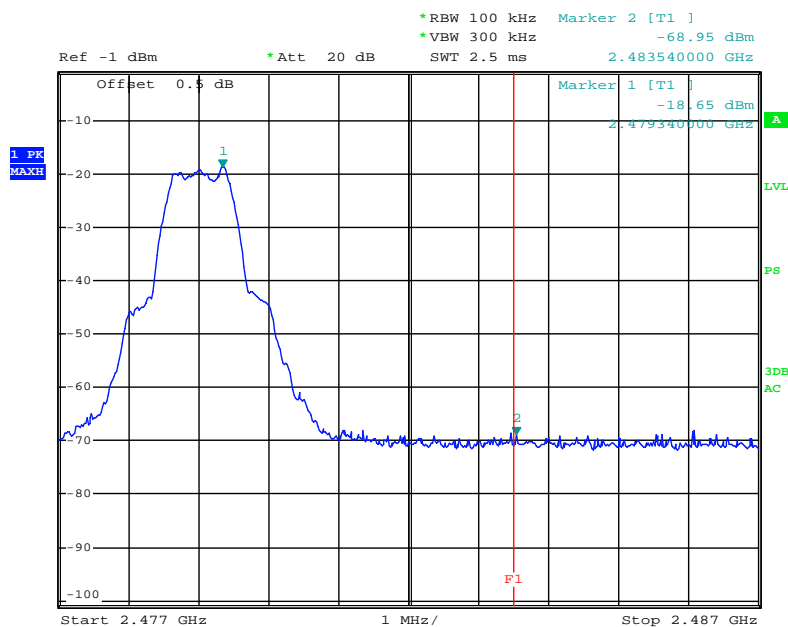
\* The testing was performed by Jimmy Xiao on 2012-02-02.

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

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Delta Limit (dBc)
2399.988	50.64	50
2483.540	50.30	50

**Band Edge: Left Side**

Date: 2.FEB.2012 19:43:47

**Band Edge: Right Side**

Date: 2.FEB.2012 19:44:59

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