FCC PART 15.247

TEST REPORT

For

Mad Catz, Inc.

7480 Mission Valley Road, Suite 101, San Diego, CA 92108-4406 United States

FCC ID: P25R243710A4512C

Report Type:	Product Type:
Original Report	Mad Catz R.A.T.M Wireless Mouse

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Report Number:	R1DG121026004-00
Report Date:	2012-11-12
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Mad Catz, Inc.*'s product, model number: *43710 Mouse (FCC ID: P25R243710A4512C) or* ("EUT") in this report is a *Mad Catz R.A.T.M Wireless Mouse,* which was measured approximately: 9.5 cm (L) x 7.0 cm (W) x 4.0 cm (H), rated input voltage: DC 3V from two Series AAA battery.

** All measurement and test data in this report was gathered from production sample serial number: 121026004 (Assigned by BACL, Dongguan). The EUT was received on 2012-10-30.*

Objective

This report is prepared on behalf of *Mad Catz, Inc* .in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions 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, 15.207, 15.209 and 15.247 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 emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan). 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 ±0.96 dB, the uncertainty of any radiation on emissions measurement is ±4.0 dB

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

Description of Test Configuration

The system was configured for testing in a test mode.

40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
..	…	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

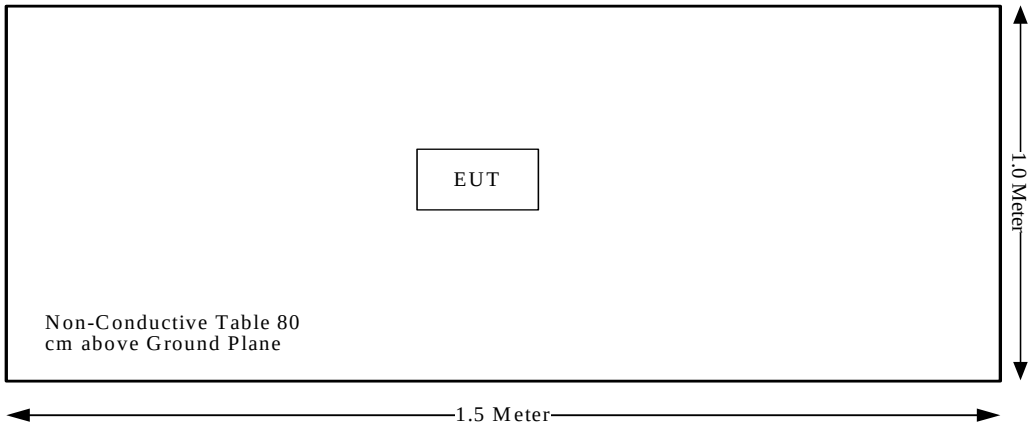
EUT Exercise Software

The test was performed under "*CSR uEnergy Tool 2.0*", which was provided by the manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307(b) (1), §2.1093	RF EXPOSURE	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	N/A*
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

N/A*: The EUT was powered by DC 3.0V from battery.

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1093- RF EXPOSURE

Applicable Standard

According to§15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 Mobile Portable RF Exposure V05 Appendix A, SAR can be exempted if the output power is less than the SAR exclusion threshold:

For f=2450MHz, the output power is less 10mW at distance of 5mm.

Measurement Result

Peak conducted output power= - 0.76 dBm
Antenna gain = 0 dBi
SAR exclusion threshold 10 mW (10dBm) > -0.76 dBm

So the SAR evaluation is not necessary.

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 has an internal PCB printed antenna permanently soldering on the printed circuit board, which complied with 15.203, the maximum gain is 0 dBi, please refer to the internal photos.

Result: Compliance.

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

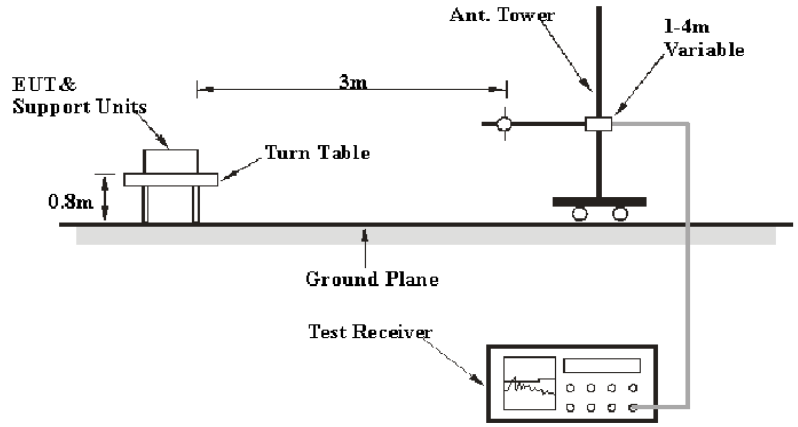
Measurement Uncertainty

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.

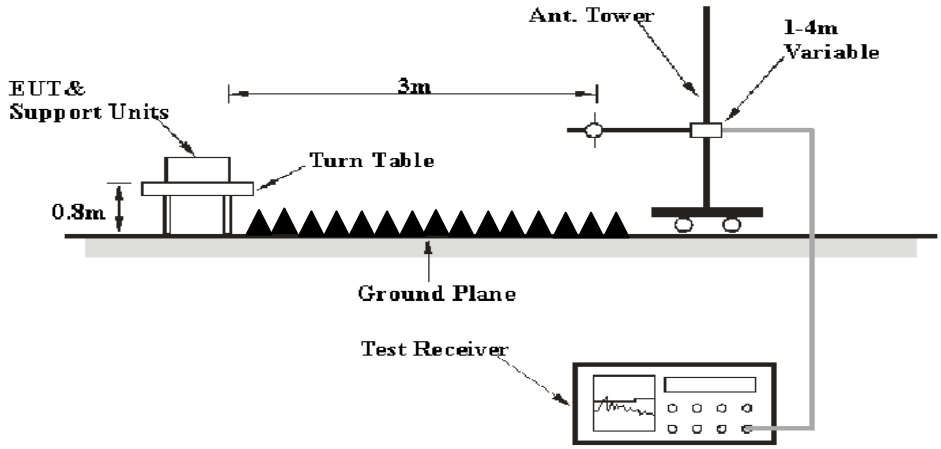
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Dongguan) is 4.0 dB(k=2, 95% level of confidence) , and the uncertainty will not be taken into consideration for all the test data recorded in the report.

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 C63.4-2009. 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:

Frequency Range	***RBW***	***Video B/W***	***Detector***
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

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 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 recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

2.04 dB at **2483.5 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

Temperature:	26.1 ° C
Relative Humidity:	50 %
ATM Pressure:	100.7 kPa

The testing was performed by Leon Chen on 2012-11-07.

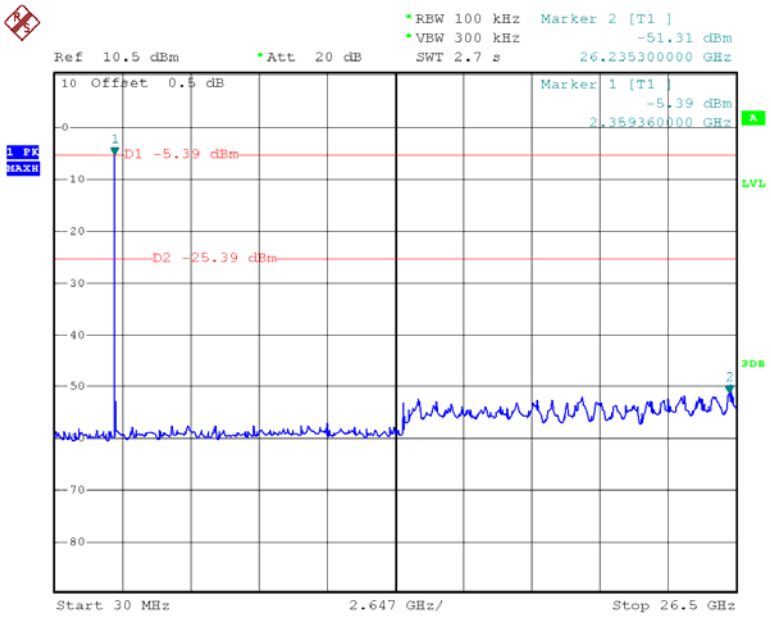
Mode: Transmitting

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB(1/m))				Limit (dBμV/m)	Margin (dB)
Low Channel:2402MHz									
2390	14.32	AV	V	30.98	3.84	0.00	49.15	54.00	4.85
4804	34.02	AV	V	33.17	4.67	27.34	44.52	54.00	9.48
2390	27.52	PK	V	30.98	3.84	0.00	62.35	74.00	11.65
9608	18.22	AV	V	38.52	8.75	26.39	39.09	54.00	14.91
7206	18.24	AV	V	38.67	6.50	26.54	36.87	54.00	17.13
9608	32.54	PK	V	38.52	8.75	26.39	53.41	74.00	20.59
7206	33.49	PK	V	38.67	6.50	26.54	52.12	74.00	21.88
4804	39.77	PK	V	33.17	4.67	27.34	50.27	74.00	23.73
326.8	25.63	QP	V	14.63	2.16	21.59	20.83	46.00	25.17
3418.83	18.34	AV	V	31.57	4.94	27.19	27.66	54.00	26.34
3418.83	33.73	PK	V	31.57	4.94	27.19	43.05	74.00	30.95
2402	49.91	AV	H	31.05	3.90	0.00	84.87	N/A	N/A
2402	50.94	PK	H	31.05	3.90	0.00	85.90	N/A	N/A
2402	50.93	AV	V	31.05	3.90	0.00	85.89	N/A	N/A
2402	51.95	PK	V	31.05	3.90	0.00	86.91	N/A	N/A
Middle Channel:2440Hz									
4880	31.39	AV	V	33.34	4.75	27.04	42.44	54.00	11.56
9760	18.12	AV	V	38.82	8.58	26.54	38.98	54.00	15.02
7320	18.26	AV	V	38.88	6.72	26.66	37.19	54.00	16.81
6947.89	18.36	AV	H	38.05	6.03	26.30	36.14	54.00	17.86
9760	32.87	PK	V	38.82	8.58	26.54	53.73	74.00	20.27
7320	33.25	PK	V	38.88	6.72	26.66	52.18	74.00	21.82
6947.89	33.53	PK	H	38.05	6.03	26.30	51.31	74.00	22.69
4880	37.59	PK	V	33.34	4.75	27.04	48.64	74.00	25.36
329.14	25.41	QP	V	14.66	2.15	21.59	20.63	46.00	25.37
3519.03	18.11	AV	H	31.73	4.87	27.65	27.07	54.00	26.93
3519.03	33.1	PK	H	31.73	4.87	27.65	42.06	74.00	31.94
2440	38.76	AV	H	31.26	3.99	0.00	74.01	N/A	N/A
2440	52.96	PK	H	31.26	3.99	0.00	88.21	N/A	N/A
2440	40.18	AV	V	31.26	3.99	0.00	75.43	N/A	N/A
2440	54.99	PK	V	31.26	3.99	0.00	90.24	N/A	N/A
High Channel:2480MHz									
2483.5	36.66	PK	V	31.51	3.80	0.00	71.96	74.00	2.04 *
2483.5	14.04	AV	V	31.51	3.80	0.00	49.34	54.00	4.66
4960	33.52	AV	V	33.51	4.70	27.26	44.47	54.00	9.53
9920	17.95	AV	V	39.14	8.41	26.70	38.80	54.00	15.20
7440	17.77	AV	V	39.09	6.95	26.79	37.02	54.00	16.98
9920	32.68	PK	V	39.14	8.41	26.70	53.53	74.00	20.47
7440	32.52	PK	V	39.09	6.95	26.79	51.77	74.00	22.23
4960	38.92	PK	V	33.51	4.70	27.26	49.87	74.00	24.13
328.15	25.66	QP	V	14.65	2.15	21.59	20.87	46.00	25.13
3643.28	18.21	AV	H	31.96	4.80	27.73	27.24	54.00	26.76
3643.28	33.27	PK	H	31.96	4.80	27.73	42.30	74.00	31.70
2480	51.64	AV	H	31.49	3.82	0.00	86.95	N/A	N/A
2480	52.35	PK	H	31.49	3.82	0.00	87.66	N/A	N/A
2480	56.19	AV	V	31.49	3.82	0.00	91.50	N/A	N/A
2480	56.75	PK	V	31.49	3.82	0.00	92.06	N/A	N/A

*Within measurement uncertainty!

Conducted Spurious Emissions at Antenna Port

Low Channel



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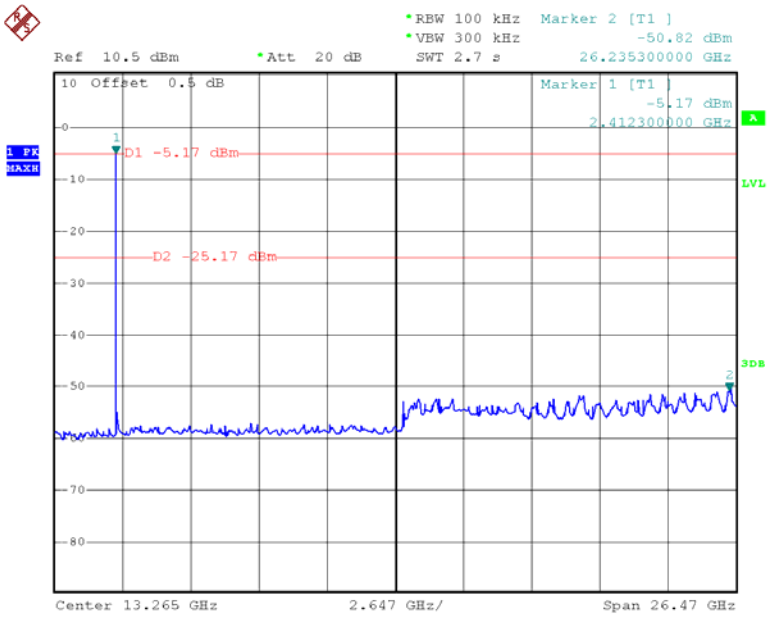
Middle Channel



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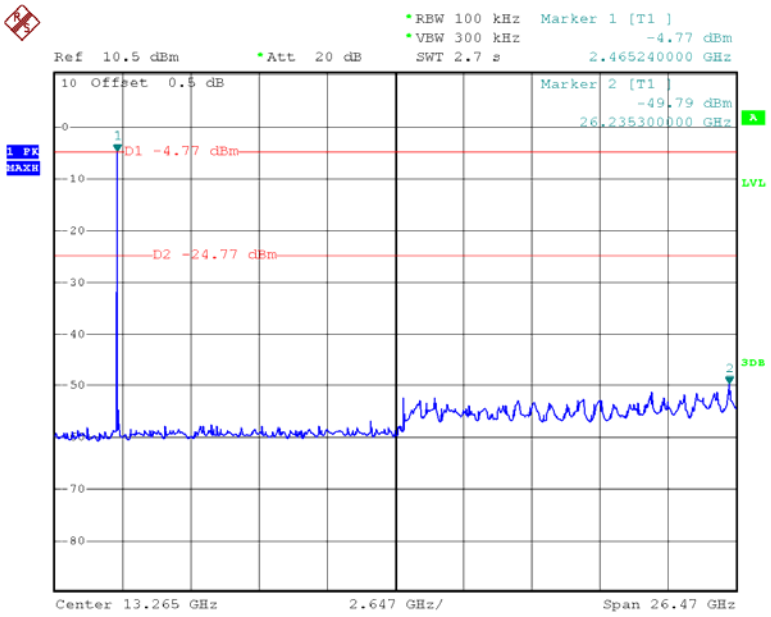
High Channel



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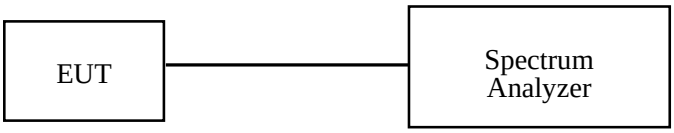
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

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 it to measurement instrument. 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 6 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:	26.1° C
Relative Humidity:	50 %
ATM Pressure:	100.7kPa

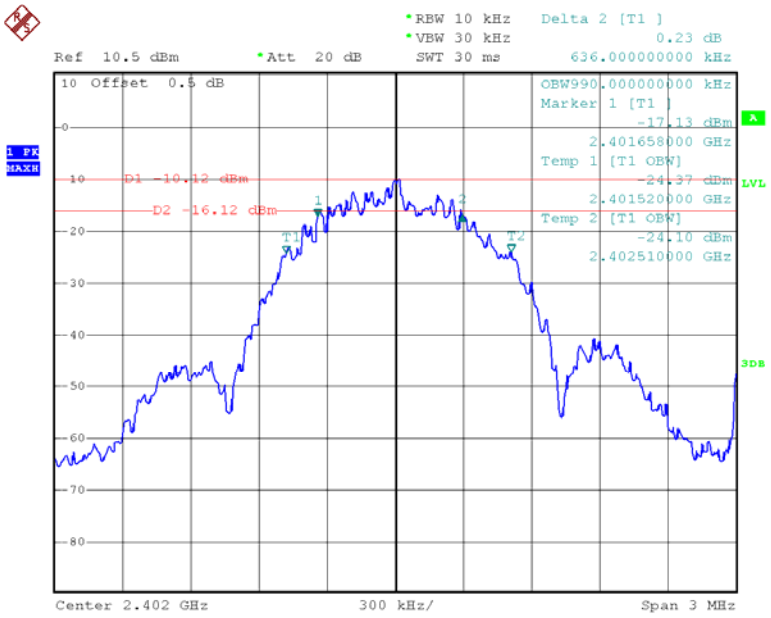
The testing was performed by Leon Chen on 2012-11-07.

Test Result: Pass.

Please refer to the following tables and plots.

Channel	Frequency	6 dB Bandwidth	Limit
	(MHz)	(MHz)	(kHz)
Low	2402	0.636	>500
Middle	2440	0.636	>500
High	2480	0.612	>500

Low Channel



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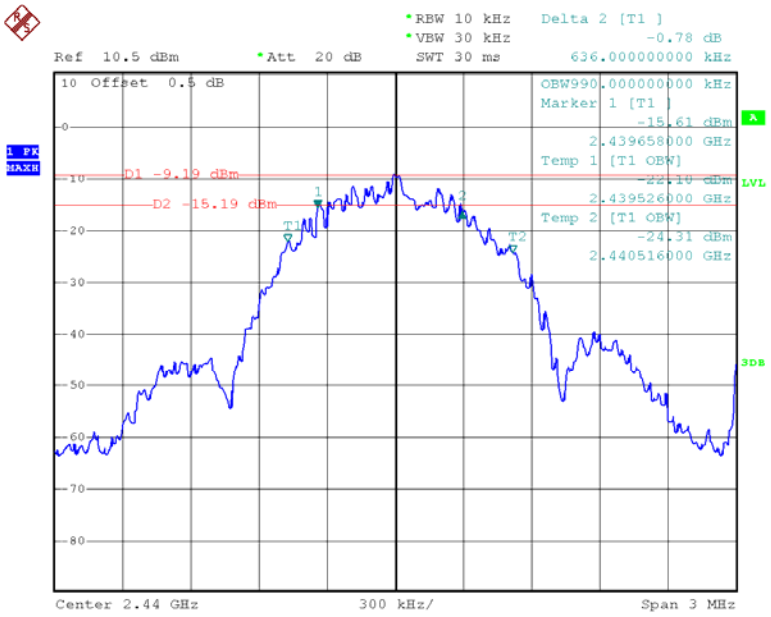
Middle Channel



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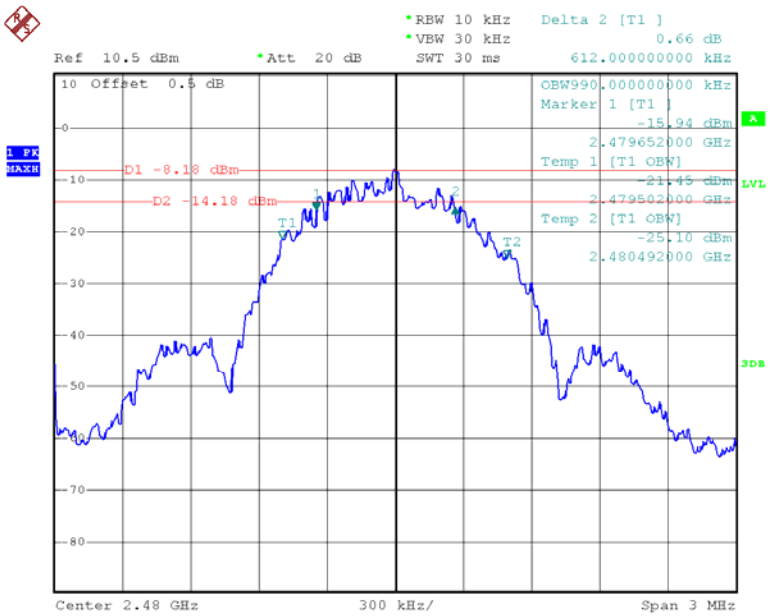
High Channel



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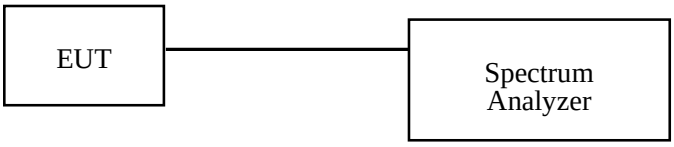
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

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 an EMI Test Receiver.
3. Add a correction factor to the display.



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:	26.1 ° C
Relative Humidity:	50 %
ATM Pressure:	100.7kPa

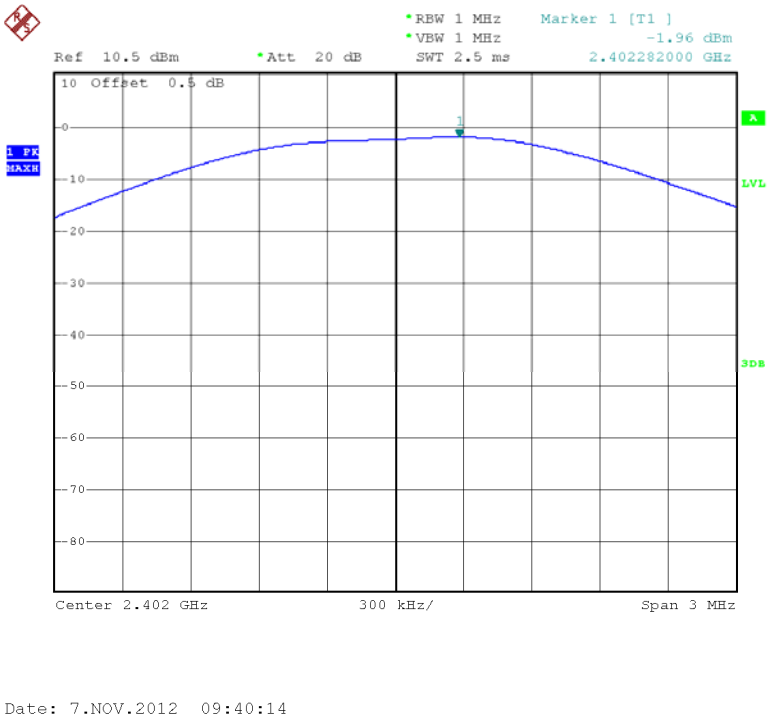
The testing was performed by Leon Chen on 2012-11-07

Test Mode: Transmitting

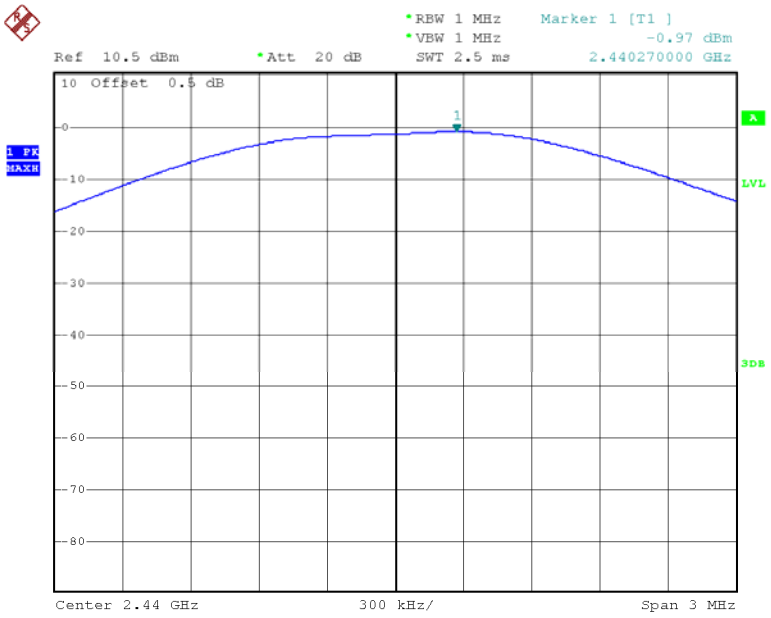
Channel	Frequency	Conducted Output Power	Limit	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	-1.96	30	PASS
Middle	2440	-0.97	30	PASS
High	2480	-0.76	30	PASS

Please refer to the following plots

RF Output Power, Low Channel



RF Output Power, Middle Channel



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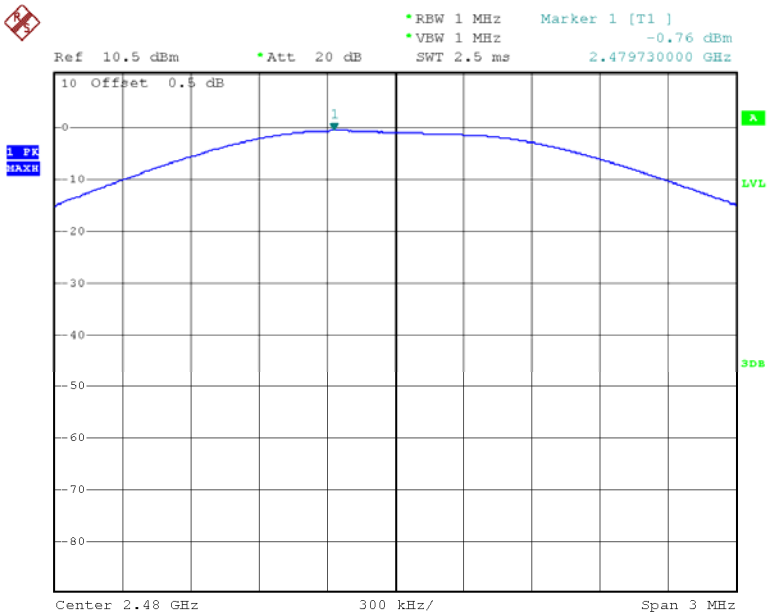
RF Output Power, High Channel



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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	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

Test Data

Environmental Conditions

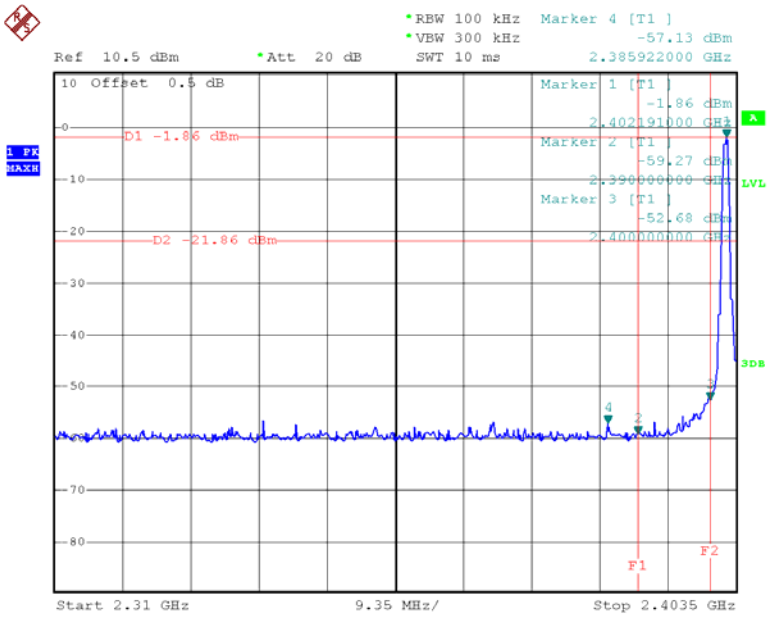
Temperature:	26.1° C
Relative Humidity:	50 %
ATM Pressure:	100.7kPa

The testing was performed by Leon Chen on 2012-11-07.

Test Result: *Compliance*

Please refer to following plots.

Band Edge, Left Side



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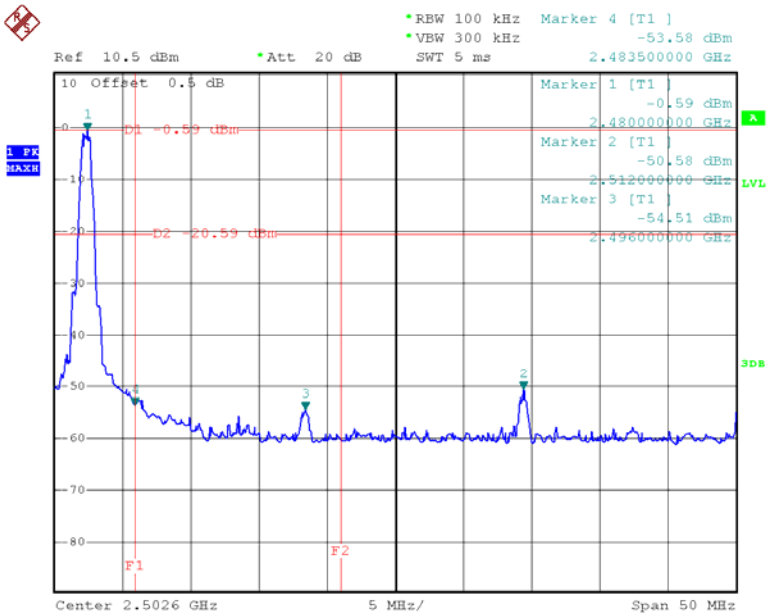
Band Edge, Right Side



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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

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 was set 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. Adjust the center frequency of SA on any frequency be measured and set SA to 300 kHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
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:	26.1° C
Relative Humidity:	50 %
ATM Pressure:	100.7kPa

The testing was performed by Leon Chen on 2012-11-07

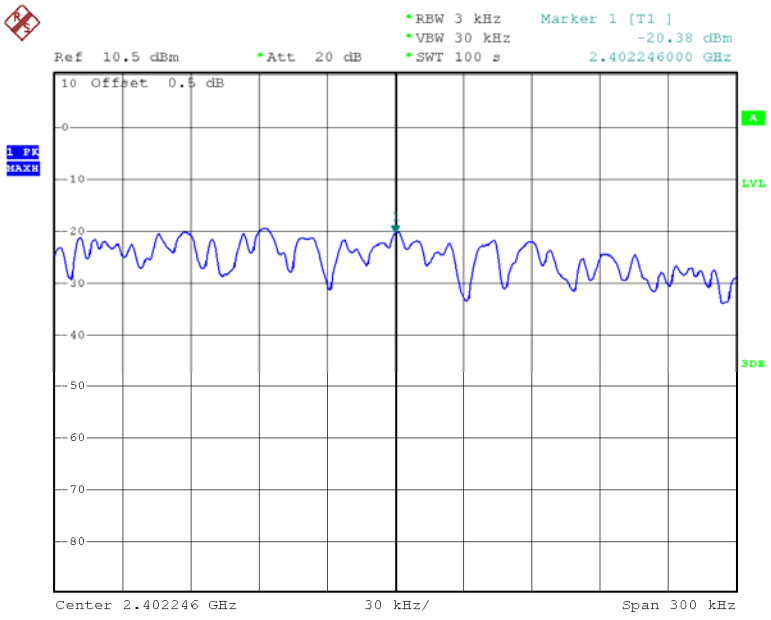
Test Mode: Transmitting

Test Result: Pass

Channel	Frequency	PSD	Limit	Result
	MHz	(dBm/3kHz)	(dBm/3kHz)	
Low	2402	-20.38	8	PASS
Middle	2440	-18.40	8	PASS
High	2480	-15.99	8	PASS

Please refer to the following plots

Power Spectral Density, Low Channel



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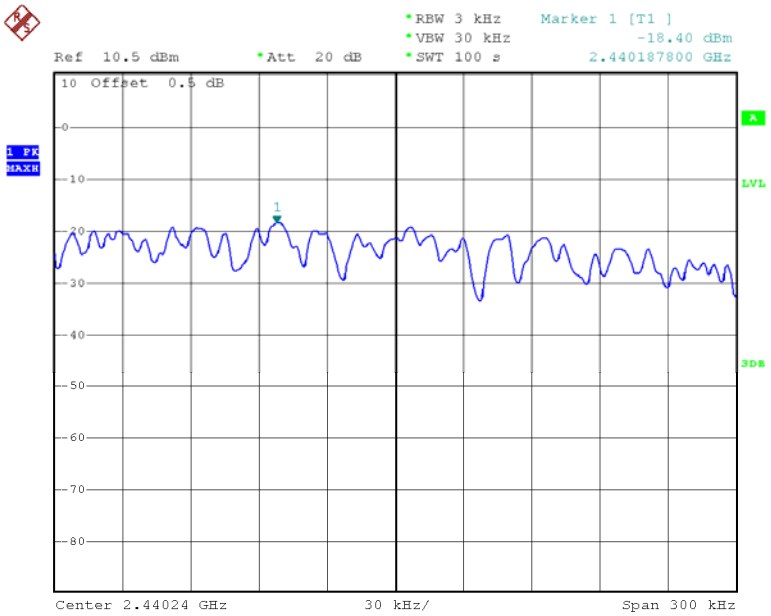
Power Spectral Density, Middle Channel



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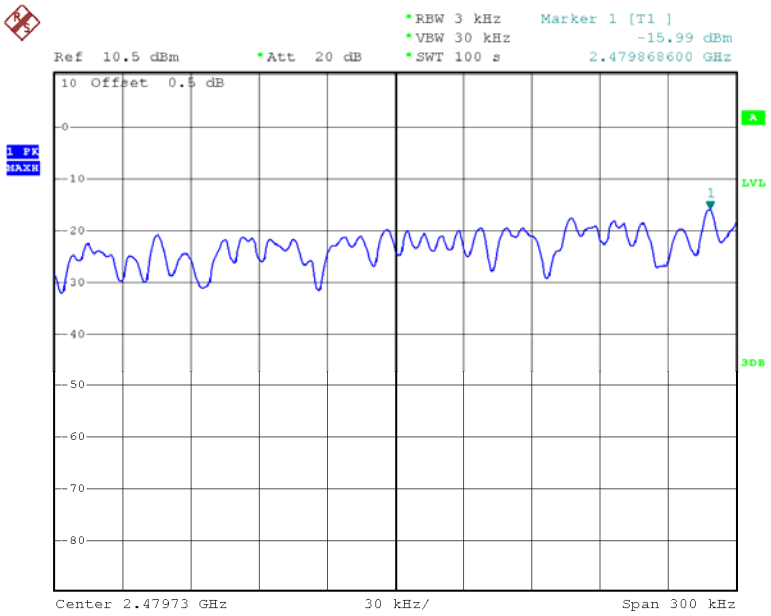
Power Spectral Density, High Channel



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