

FCC PART 15.247

TEST REPORT

For

KYE Systems Corp

No. 492, Chongxin Rd., Sanchong Dist., New Taipei City 24160, Taiwan (R.O.C.)

FCC ID: FSUGK-120009R

Report Type: Original Report	Product Type: 2.4GHz Wireless Dongle
Test Engineer: Ares Liu	
Report Number: R1DG121128003-00	
Report Date: 2012-12-06	
Reviewed By: Ivan Cao RF Leader	
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

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	6
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	6
EXTERNAL CABLE.....	6
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
FCC §15.247 (i) & §1.1307 (b) (1) & §2.1093- RF EXPOSURE.....	9
APPLICABLE STANDARD	9
FCC §15.203 - ANTENNA REQUIREMENT.....	10
APPLICABLE STANDARD	10
ANTENNA CONNECTOR CONSTRUCTION	10
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	11
APPLICABLE STANDARD	11
MEASUREMENT UNCERTAINTY.....	11
EUT SETUP	11
EMI TEST RECEIVER SETUP.....	12
TEST PROCEDURE	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST RESULTS SUMMARY	12
TEST DATA	12
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	15
APPLICABLE STANDARD	15
MEASUREMENT UNCERTAINTY.....	15
EUT SETUP	15
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	16
TEST PROCEDURE	16
TEST EQUIPMENT LIST AND DETAILS.....	16
CORRECTED AMPLITUDE & MARGIN CALCULATION	17
TEST RESULTS SUMMARY	17
TEST DATA	17
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST	22
APPLICABLE STANDARD	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST PROCEDURE	22
TEST DATA	22
FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING	24

APPLICABLE STANDARD	24
TEST PROCEDURE	24
TEST EQUIPMENT LIST AND DETAILS.....	24
TEST DATA	24
FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST EQUIPMENT LIST AND DETAILS.....	27
TEST DATA	27
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	29
APPLICABLE STANDARD	29
TEST PROCEDURE	29
TEST EQUIPMENT LIST AND DETAILS.....	29
TEST DATA	29
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT	31
APPLICABLE STANDARD	31
TEST PROCEDURE	31
TEST EQUIPMENT LIST AND DETAILS.....	31
TEST DATA	31
FCC §15.247(d) - BAND EDGES TESTING	34
APPLICABLE STANDARD	34
TEST PROCEDURE	34
TEST EQUIPMENT LIST AND DETAILS.....	34
TEST DATA	34

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The KYE Systems Corp's product, model number: GK-120009/R (FCC ID: FSUGK-120009R) or ("EUT") in this report is a 2.4GHz Wireless Dongle, named as KB-8000 by applicant, which was measured approximately: 3.2 cm (L) x 1.5 cm (W) x 0.7 cm (H), rated input voltage: DC 5.0V from system.

** All measurement and test data in this report was gathered from production sample serial number: 121128003 (Assigned by BACL, Dongguan). The EUT was received on 2012-11-29.*

Objective

This report is prepared on behalf of KYE Systems Corp 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 Bluetooth of EUT compliance with FCC Part 15, Subpart C, and 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 C63.4-2009, 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 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 30M~200MHz: 5.0 dB; 200M~1GHz: 6.2 dB; 1G~6GHz: 4.45 dB; 6G~18GHz: 5.23 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 C63.4-2009.

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 an engineering mode, which was provided by manufacturer.

39 channels are provided by manufacturer, and 16 hopping channels was configured by system, EUT was tested with low channel : 2403MHz, middle channel : 2441MHz, and high channel: 2479MHz.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2403	20	2443
1	2405	...	...
2	2407	...	...
...	...	...	...
..	...	37	2477
19	2441	38	2479

EUT Exercise Software

Exercise software “FccTest” was used.

Equipment Modifications

No modification was made to the EUT tested.

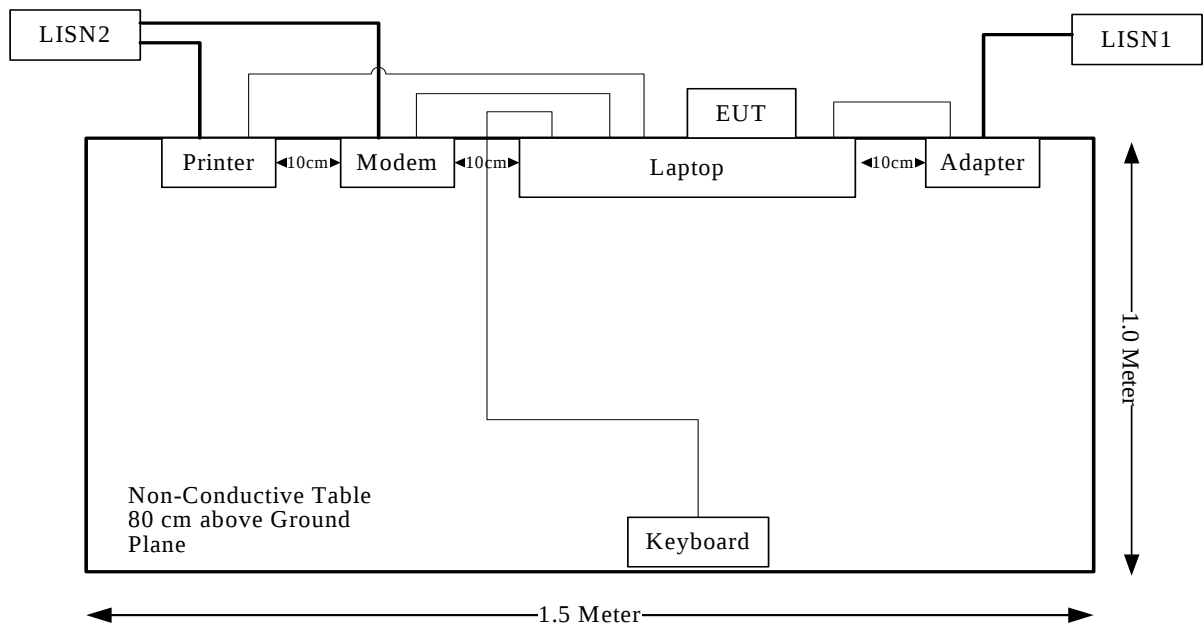
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Keyboard	SK-8115	CN-0DJ313-716716-05A-0DSO
SAST	Modem	AEM-2100	090200213
HP	Printer	C3941A	JPTV013237
DELL	Laptop	PP11L	N/A

External Cable

Cable Description	Length (m)	From Port	To
Shielded Detachable Printer Cable	1.2	Parallel Port of Laptop	Printer
Shielded Detachable Serial Cable	1.2	Serial Port of Laptop	Modem
Shielded Detachable Keyboard Cable	1.5	USB Port of Laptop	Keyboard

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

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 $f=2450\text{MHz}$, the output power is less 10mW at distance of 5mm.

Measurement Result

Conducted output power= -17.43dBm

Ant gain = 0 dBi

SAR exclusion threshold=10mW(10 dBm) > -17.43dBm

So the SAR evaluation is not necessary.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

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

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

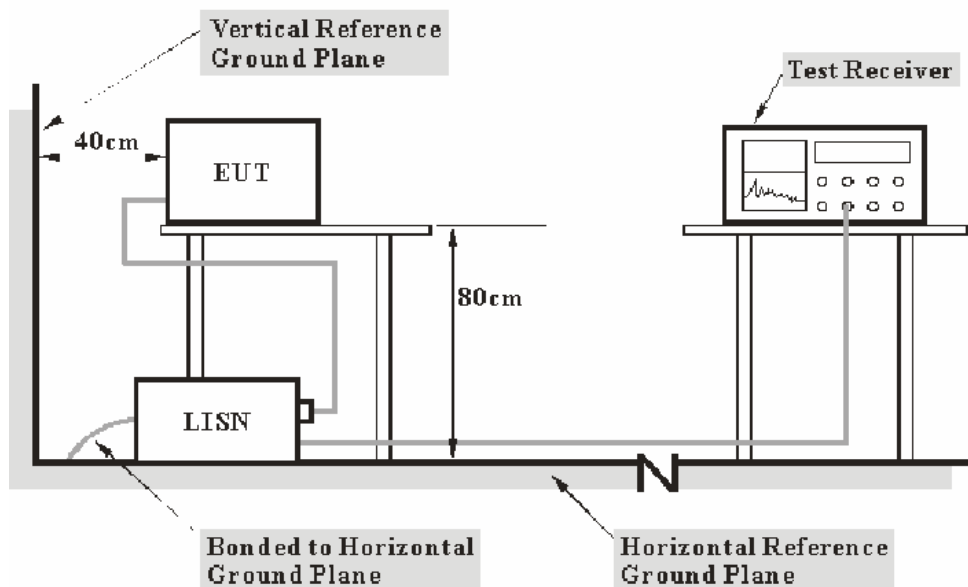
FCC§15.207

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz), and the uncertainty will not be taken into consideration for all the test data recorded in the report.

EUT Setup



- Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

<u>Frequency Range</u>	<u>IF B/W</u>
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2012-11-29	2013-11-28
R&S	LISN1	ESH3-Z5	843331/015	2012-09-17	2013-09-16
R&S	LISN2	ESH3-Z5	100113	2012-11-29	2013-11-28

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

4.63 dB at 0.580 MHz in the Line conducted mode.

Test Data

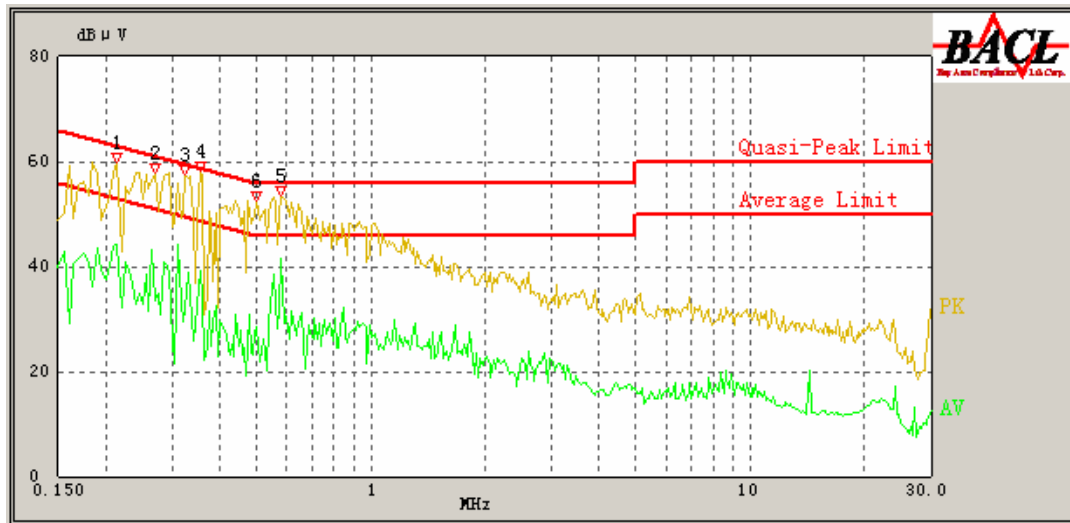
Environmental Conditions

Temperature:	24.8° C
Relative Humidity:	56 %
ATM Pressure:	101.1 kPa

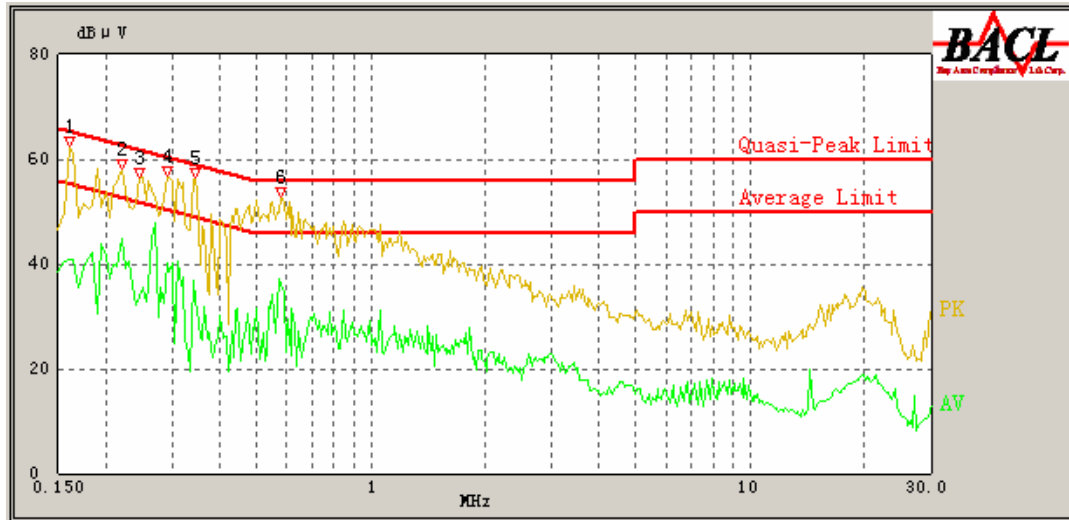
The testing was performed by Ares Liu on 2012-12-03.

Test Mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	Cord. Reading (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
0.580	41.37	0.43	46.00	4.63	AV
0.325	53.07	0.42	61.00	7.93	QP
0.270	53.78	0.42	62.57	8.79	QP
0.580	47.00	0.43	56.00	9.00	QP
0.355	50.45	0.42	60.14	9.69	QP
0.215	44.11	0.42	54.14	10.03	AV
0.355	39.12	0.42	50.14	11.02	AV
0.500	44.57	0.42	56.00	11.43	QP
0.215	52.14	0.42	64.14	12.00	QP
0.500	28.50	0.42	46.00	17.50	AV
0.270	33.60	0.42	52.57	18.97	AV
0.325	31.72	0.42	51.00	19.28	AV

AC 120V/60 Hz, Neutral

Frequency (MHz)	Cord. Reading (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
0.220	44.95	0.42	54.00	9.05	AV
0.345	51.18	0.42	60.43	9.25	QP
0.580	36.14	0.43	46.00	9.86	AV
0.580	45.99	0.43	56.00	10.01	QP
0.290	51.10	0.42	62.00	10.90	QP
0.220	52.46	0.42	64.00	11.54	QP
0.290	40.32	0.42	52.00	11.68	AV
0.245	50.92	0.42	63.29	12.37	QP
0.160	52.53	0.40	65.71	13.18	QP
0.160	40.85	0.40	55.71	14.86	AV
0.345	33.13	0.42	50.43	17.30	AV
0.245	33.83	0.42	53.29	19.46	AV

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 16-4-2-2011, 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

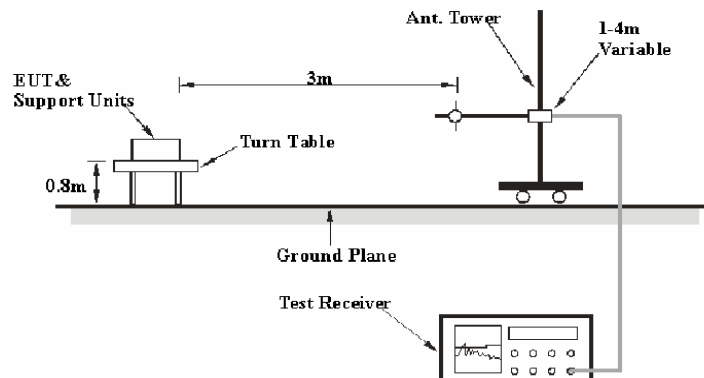
1G~6GHz: 4.45 dB

6G~18GHz: 5.23 dB

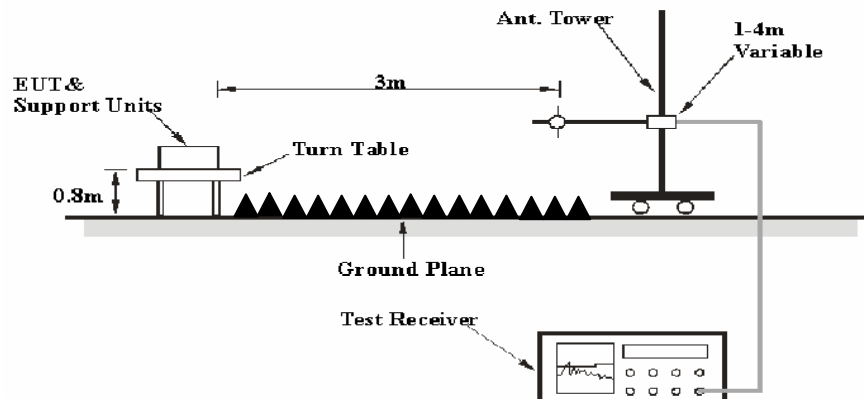
and the uncertainty will not be taken into consideration for all the test data recorded in the report.

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters 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.

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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video BW</i>	<i>Detector</i>
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

For the radiated emissions test, the adapter was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2012-05-14	2013-05-13
Sunol Sciences	Hybrid Antennas	JB3	A060611-1	2011-09-06	2013-09-05
HP	Pre-amplifier	8447E	2434A02181	2012-10-08	2013-10-07
R&S	Spectrum Analyzer	FSEM 30	DE31388	2012-03-15	2013-03-14
ETS-LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2014-09-05
Mini-Circuits	Wideband Amplifier	ZVA-183-S+	96901149	N/A	N/A

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 Results Summary

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

2.94 dB at 7437 MHz in the Vertical polarization

Test Data

Environmental Conditions

Temperature:	24.4°C
Relative Humidity:	54%
ATM Pressure:	101.1kPa

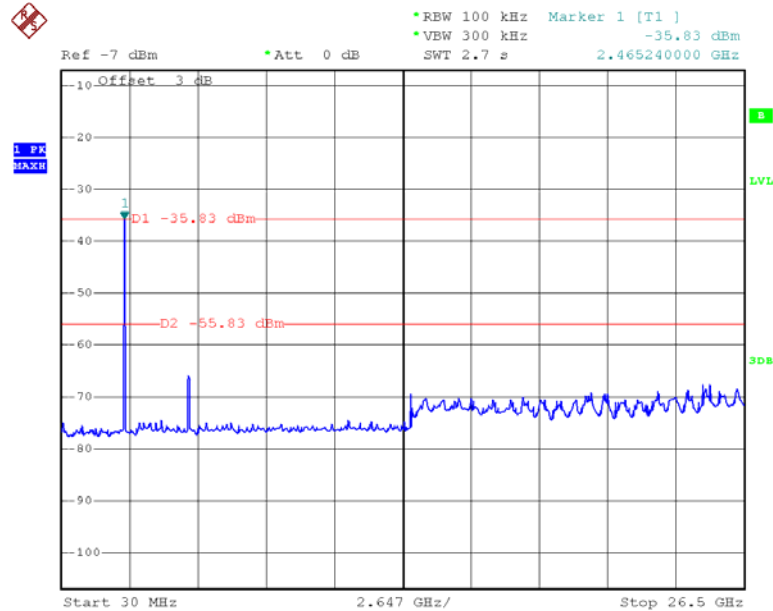
The testing was performed by Ares Liu on 2012-12-03.

Test Mode: Transmitting

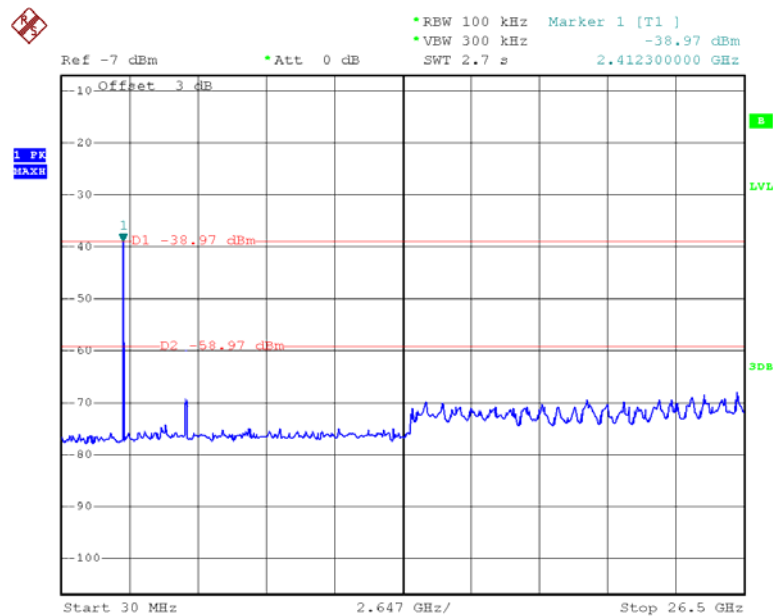
Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)	(dB)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel: 2403(MHz)									
9612	17.19	AV	V	32.97	8.74	8.16	50.74	54.00	3.26*
9783.5	17.09	AV	V	33.38	8.56	8.87	50.16	54.00	3.84*
7209	16.46	AV	V	34.10	6.51	7.08	49.99	54.00	4.01*
9612	31.27	PK	V	32.97	8.74	8.16	64.82	74.00	9.18
9783.5	32.09	PK	V	33.38	8.56	8.87	65.16	74.00	8.84
263.77	43.52	QP	V	13.26	1.95	21.50	37.23	46.00	8.77
4806	16.86	AV	V	30.60	4.68	7.36	44.78	54.00	9.22
7209	30.25	PK	V	34.10	6.51	7.08	63.78	74.00	10.22
4806	29.38	PK	V	30.60	4.68	7.36	57.30	74.00	16.70
2390	15.76	AV	V	25.61	3.84	8.50	36.71	54.00	17.29
2390	29.96	PK	V	25.61	3.84	8.50	50.91	74.00	23.09
2403	55.59	AV	H	25.65	3.91	8.50	76.64	N/A	N/A
2403	56.27	PK	H	25.65	3.91	8.50	77.32	N/A	N/A
2403	58.9	AV	V	25.65	3.91	8.50	79.95	N/A	N/A
2403	59.73	PK	V	25.65	3.91	8.50	80.78	N/A	N/A
Middle Channel: 2441 (MHz)									
9764	17.26	AV	V	33.33	8.58	8.68	50.49	54.00	3.51 *
9784.2	17.09	AV	V	33.38	8.56	9.11	49.92	54.00	4.08 *
7323	16.75	AV	V	34.38	6.72	7.19	50.66	54.00	3.34 *
9764	31.36	PK	V	33.33	8.58	8.68	64.59	74.00	9.41
9784.2	31.34	PK	V	33.38	8.56	9.11	64.17	74.00	9.83
6573.1	17.86	AV	V	32.49	5.49	8.87	46.97	54.00	7.03
4882	16.97	AV	V	30.79	4.75	7.32	45.19	54.00	8.81
263.75	43.21	QP	V	13.25	1.95	21.50	36.91	46.00	9.09
7323	30.47	PK	V	34.38	6.72	7.19	64.38	74.00	9.62
6573.1	32.87	PK	V	32.49	5.49	8.87	61.98	74.00	12.02
4882	29.45	PK	V	30.79	4.75	7.32	57.67	74.00	16.33
2441	54.85	AV	H	25.75	3.99	8.50	76.09	N/A	N/A
2441	55.73	PK	H	25.75	3.99	8.50	76.97	N/A	N/A
2441	57.24	AV	V	25.75	3.99	8.50	78.48	N/A	N/A
2441	58.4	PK	V	25.75	3.99	8.50	79.64	N/A	N/A

High Channel: 2479(MHz)									
9916	16.74	AV	V	33.70	8.42	8.94	49.92	54.00	4.08*
9781.1	17.05	AV	V	33.37	8.56	8.87	50.11	54.00	3.89*
7437	16.77	AV	V	34.65	6.94	7.30	51.06	54.00	2.94*
9916	31.05	PK	V	33.70	8.42	8.94	64.23	74.00	9.77
9781.1	31.32	PK	V	33.37	8.56	8.87	64.38	74.00	9.62
4958	16.71	AV	V	30.99	4.70	7.27	45.13	54.00	8.87
7437	30.58	PK	V	34.65	6.94	7.30	64.87	74.00	9.13
263.54	41.89	QP	V	13.23	1.95	21.50	35.57	46.00	10.43
4958	29.13	PK	V	30.99	4.70	7.27	57.55	74.00	16.45
2483.5	14.91	AV	V	25.86	3.80	8.50	36.07	54.00	17.93
2483.5	29.47	PK	V	25.86	3.80	8.50	50.63	74.00	23.37
2479	54.41	AV	H	25.85	3.82	8.50	75.58	N/A	N/A
2479	55.28	PK	H	25.85	3.82	8.50	76.45	N/A	N/A
2479	56.61	AV	V	25.85	3.82	8.50	77.78	N/A	N/A
2479	57.77	PK	V	25.85	3.82	8.50	78.94	N/A	N/A

*Within measurement uncertainty!

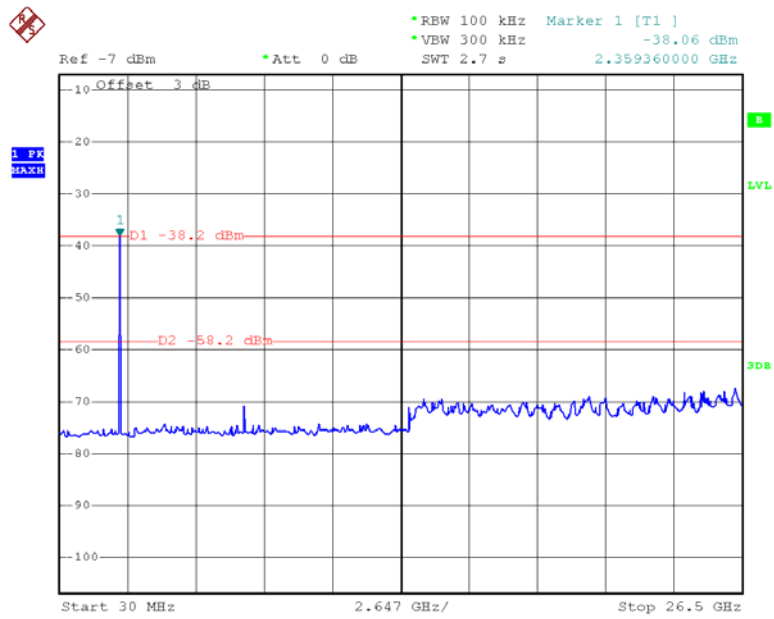
Conducted Spurious Emissions at Antenna Port**Low Channel**

Date: 3.DEC.2012 16:47:21

Middle Channel

Date: 3.DEC.2012 16:46:17

High Channel



Date: 3.DEC.2012 16:45:16

FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

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 Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

* The testing was performed by Ares Liu on 2012-12-06.

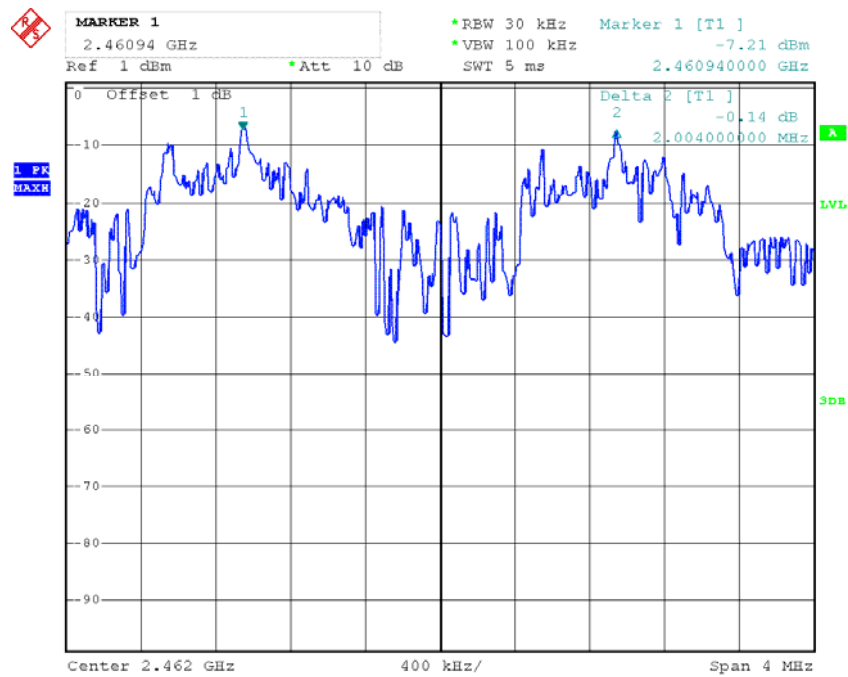
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
29(note)	2461	2.004	0.794	Pass
Adjacent	2463			

Note: the channel 29 was the less spacing with other hopping channel .



Date: 6.DEC.2012 12:49:52

FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING**Applicable Standard**

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

* The testing was performed by Ares Liu on 2012-12-06.

Test Result: Compliance.

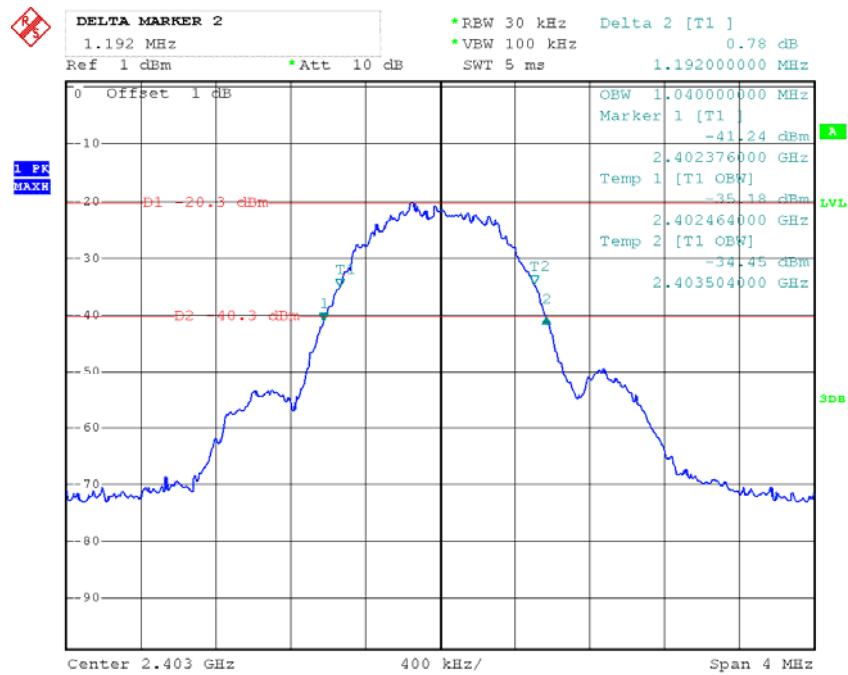
Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2403	1.192
Middle	2441	1.194
High	2479	1.200

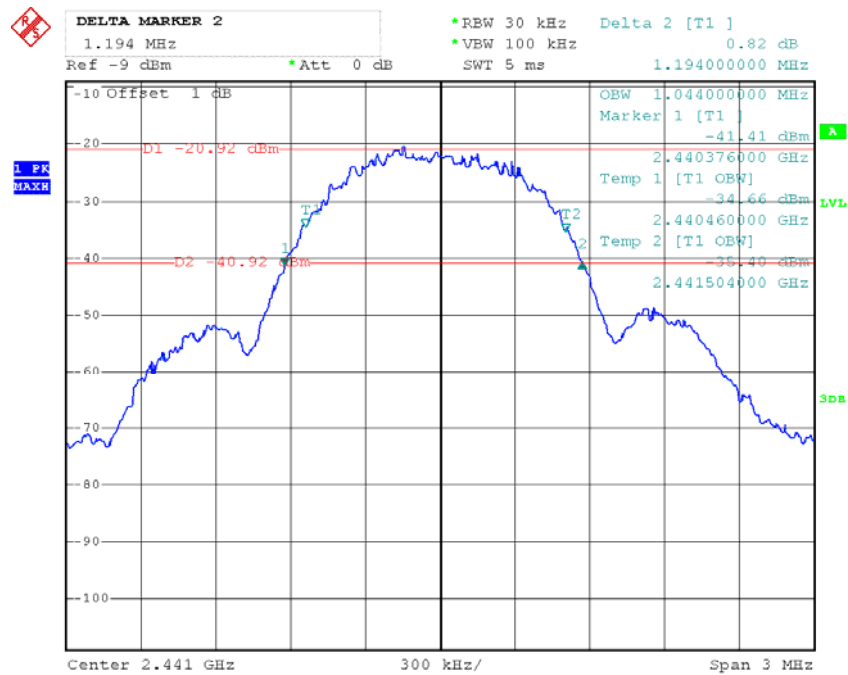
Please refer to the following plots.

Low Channel



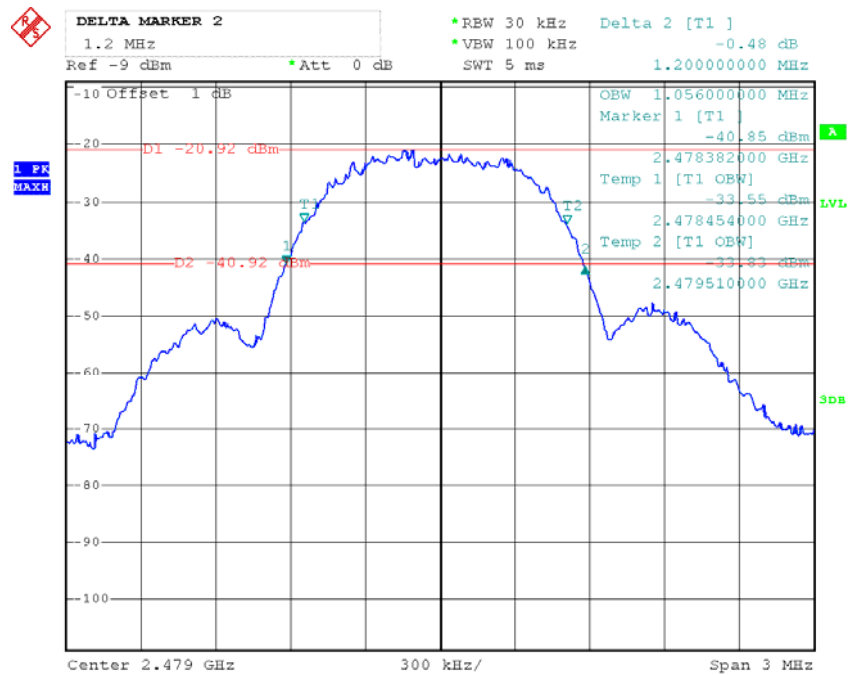
Date: 6.DEC.2012 13:00:58

Middle Channel



Date: 6.DEC.2012 13:11:23

High Channel



Date: 6.DEC.2012 13:14:21

FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST**Applicable Standard**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

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:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

The testing was performed by Ares Liu on 2012-12-06.

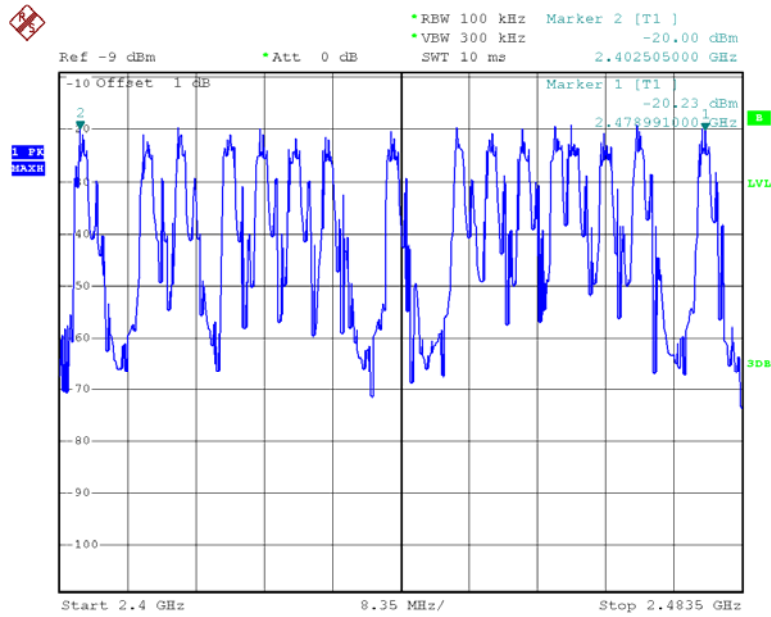
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	16	≥ 15

Number of Hopping Channels



Date: 3.DEC.2012 14:17:50

FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)**Applicable Standard**

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels *hopping NO. * 0.4s

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:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

* The testing was performed by Ares Liu on 2012-12-06.

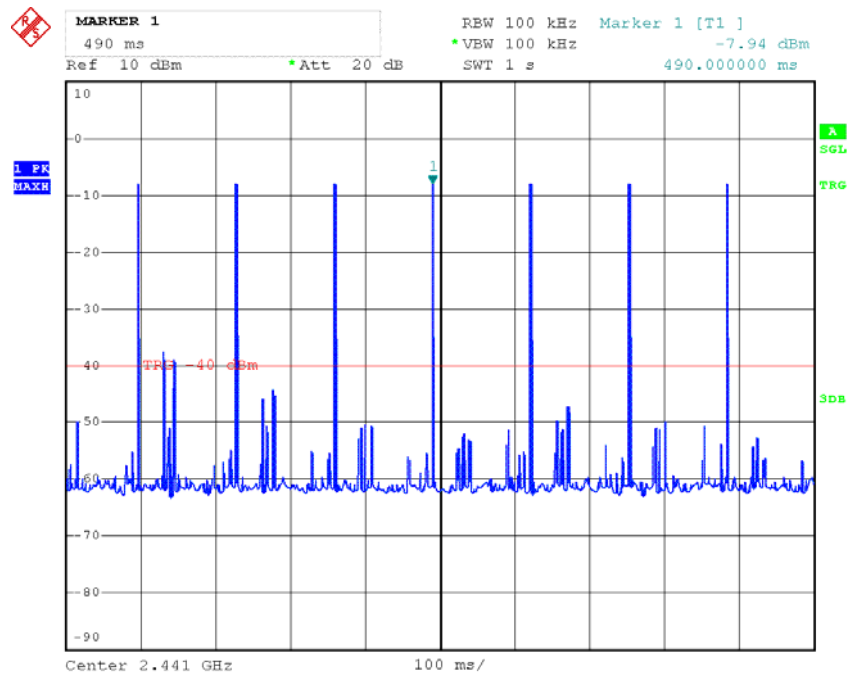
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

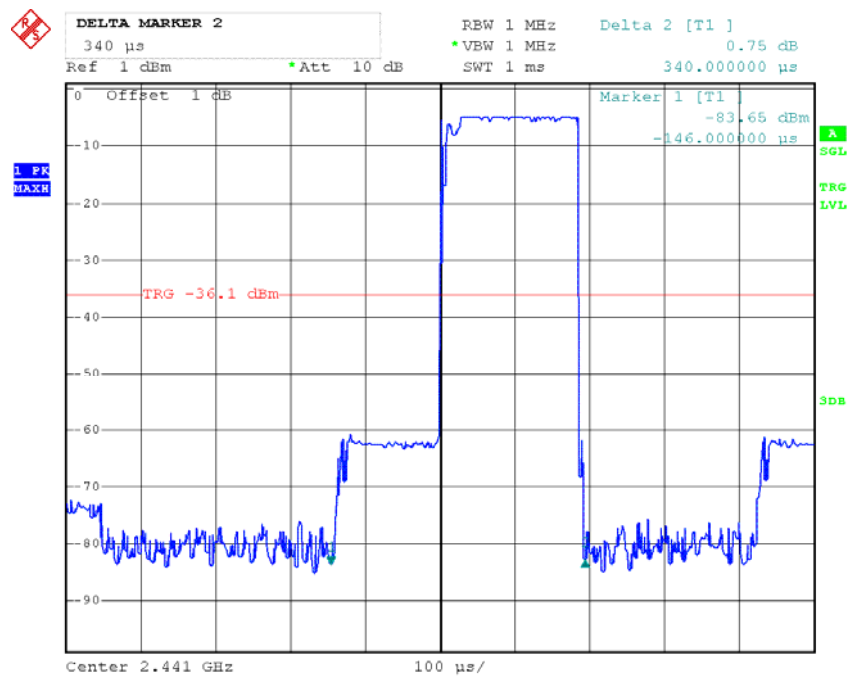
Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2441MHz	0.340	0.015	0.4	Pass
Dwell Time(s)= time slot length(s)* hopping rate /16*16* 0.4				
Hopping rate=7/1*16=112(pulse per second)				

7 pulse in one second



Date: 10.DEC.2012 14:38:32

Time slots length is 340us



Date: 6.DEC.2012 12:53:13

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT**Applicable Standard**

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts

Test Procedure

1. Place the EUT on a bench and set 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:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

* The testing was performed by Ares Liu on 2012-12-06.

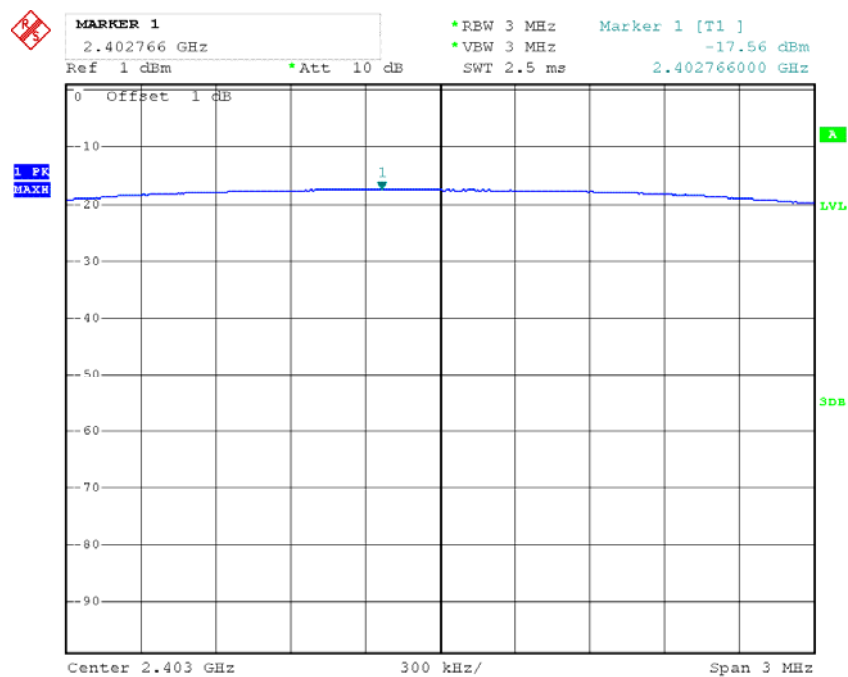
Test Result: Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2403	-17.56	21
Middle	2441	-17.44	21
High	2479	-17.43	21

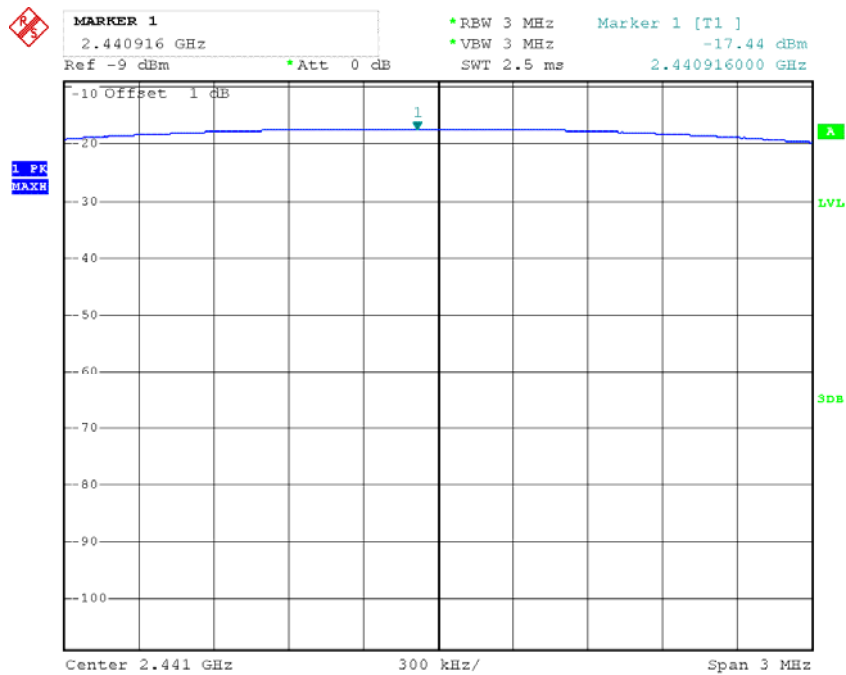
Note: The data above was tested in conducted mode.

Output Power, Low



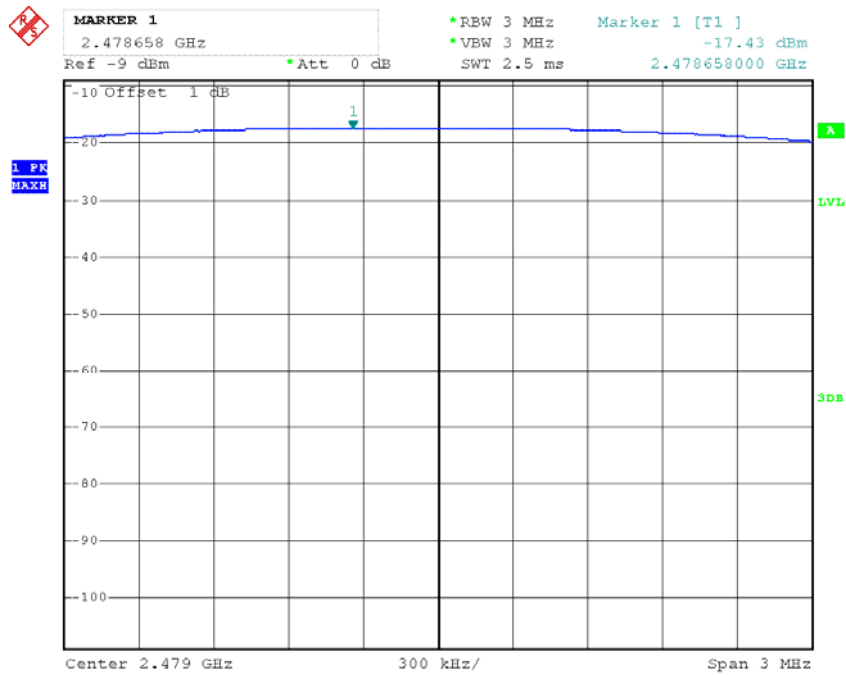
Date: 6.DEC.2012 13:01:59

Output Power, Middle



Date: 6.DEC.2012 13:11:53

Output Power, High



Date: 6.DEC.2012 13:12:52

FCC §15.247(d) - BAND EDGES TESTING

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. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 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

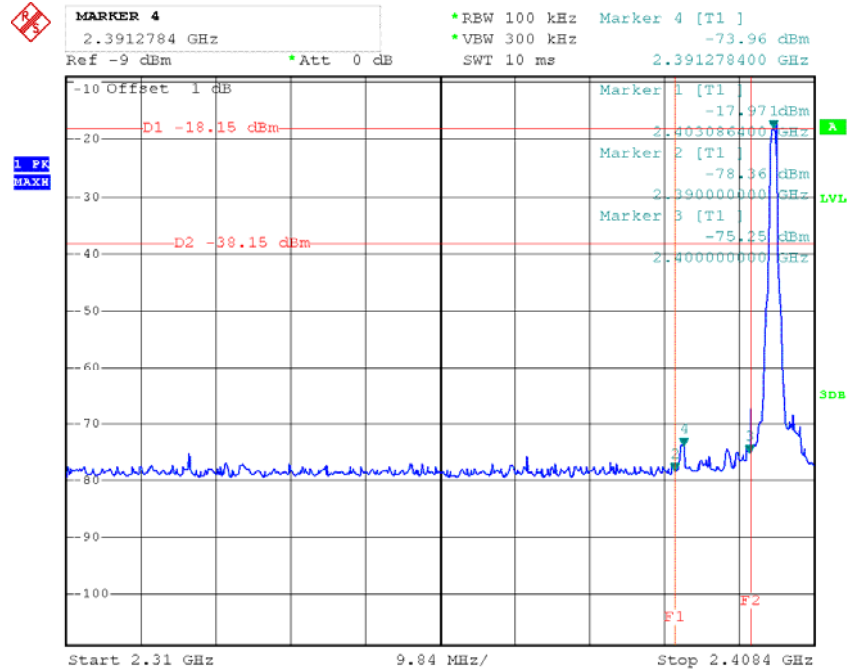
Environmental Conditions

Temperature:	23.6 °C
Relative Humidity:	53 %
ATM Pressure:	102.2kPa

**The testing was performed by Ares Liu on 2012-12-06.*

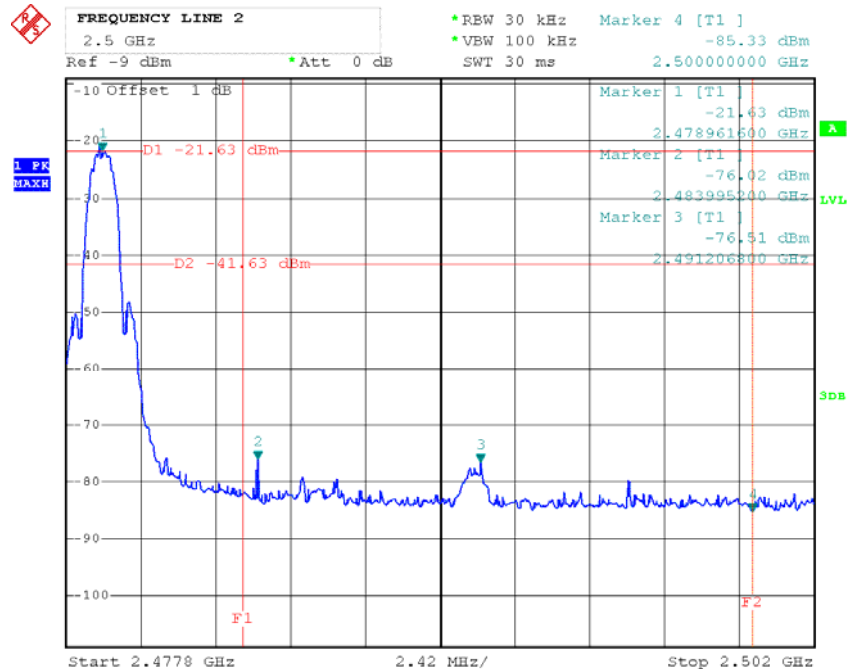
Test Result: Compliance

Band Edge, Left Side



Date: 6.DEC.2012 13:05:26

Band Edge, Right Side



Date: 6.DEC.2012 13:15:46

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