

FCC Part 15C Measurement and Test Report

For

JUNENG ELECTRONICS TECHNOLOGY CO., LTD.

Building B, Wang Wu Zhou Industry, Fang Zheng East Rd, Xincheng

District, Shilong Town, Dongguan City, Guangdong Province, China.

FCC ID: UM61833

FCC Rules:	<u>FCC Part 15.249</u>
Product Description:	<u>2.4G Wireless Mouse</u>
Tested Model:	<u>JM-183R</u>
Report No.:	<u>STR12118243I</u>
Tested Date:	<u>2012-11-21 to 2012-11-30</u>
Issued Date:	<u>2012-12-06</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY	4
1.5 EUT SETUP AND TEST MODE.....	5
2. SUMMARY OF TEST RESULTS	6
3. ANTENNA REQUIREMENTS.....	7
3.1 STANDARD APPLICABLE.....	7
3.2 TEST RESULT.....	7
4. RADIATED EMISSIONS.....	8
4.1 MEASUREMENT UNCERTAINTY	8
4.2 STANDARD APPLICABLE.....	8
4.3 TEST EQUIPMENT LIST AND DETAILS	8
4.4 TEST PROCEDURE.....	9
4.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	9
4.6 ENVIRONMENTAL CONDITIONS	9
4.7 SUMMARY OF TEST RESULTS/PLOTS	10
5. OUT OF BAND EMISSIONS.....	18
5.1 STANDARD APPLICABLE.....	18
5.2 TEST EQUIPMENT LIST AND DETAILS	18
5.3 TEST PROCEDURE.....	18
5.4 ENVIRONMENTAL CONDITIONS	18
5.5 SUMMARY OF TEST RESULTS/PLOTS	18
6. EMISSION BANDWIDTH.....	21
6.1 STANDARD APPLICABLE.....	21
6.2 TEST EQUIPMENT LIST AND DETAILS	21
6.3 TEST PROCEDURE.....	21
6.4 ENVIRONMENTAL CONDITIONS	21
6.5 SUMMARY OF TEST RESULTS/PLOTS	21

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: JUNENG ELECTRONICS TECHNOLOGY CO., LTD.
Address of applicant: Buiding B,Wang Wu Zhou Industry,Fang Zheng East Rd, Xincheng District, Shilong Town, Dongguan City Guangdong Province, China
Manufacturer: JUNENG ELECTRONICS TECHNOLOGY CO., LTD.
Address of manufacturer: Buiding B,Wang Wu Zhou Industry,Fang Zheng East Rd, Xincheng District, Shilong Town, Dongguan City Guangdong Province, China

General Description of EUT	
Product Name:	2.4G Wireless Mouse
Trade Name:	/
Model No.:	JM-183R
Adding Model(s):	/
Rated Voltage:	DC 3 V
Power Adapter Model:	/
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	2403-2479MHz
Max. Field Strength:	71.25 dBuV/m (at 3m distance)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	16
Channel Separation:	/
Antenna Type:	PCB Antenna
Antenna Gain:	0 dBi
Lowest Internal Frequency of EUT:	12MHz
Device Category:	Portable Device

1.2 Test Standards

The following report is prepared on behalf of the JUNENG ELECTRONICS TECHNOLOGY CO.,LTD. in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 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.

1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	2403MHz
TM2	Middle Channel	2441MHz
TM3	High Channel	2479MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	N/A
§ 15.209(a)(f)	Radiated Supirous Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 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.

3.2 Test Result

This product has an PCB antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of fundamental (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(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.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.3 Test Equipment List and Details

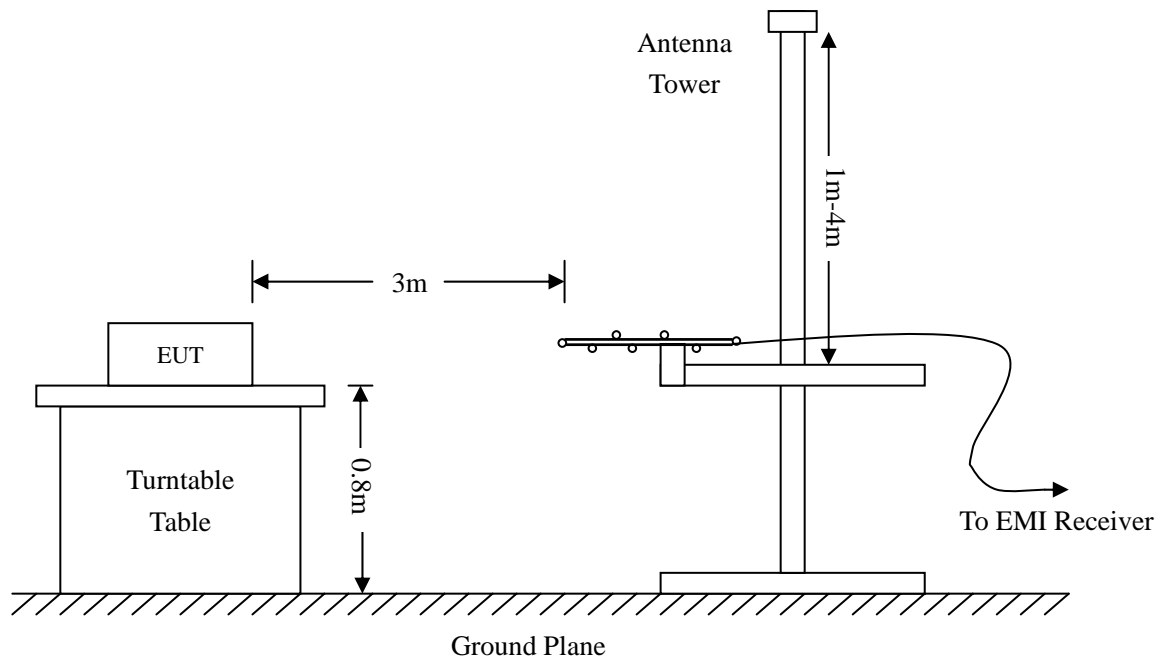
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2012-02-25	2013-02-24

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

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.



4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-11.24 dB at 734.4913 MHz in the Horizontal polarization, Low Channel, 9 kHz to 25 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

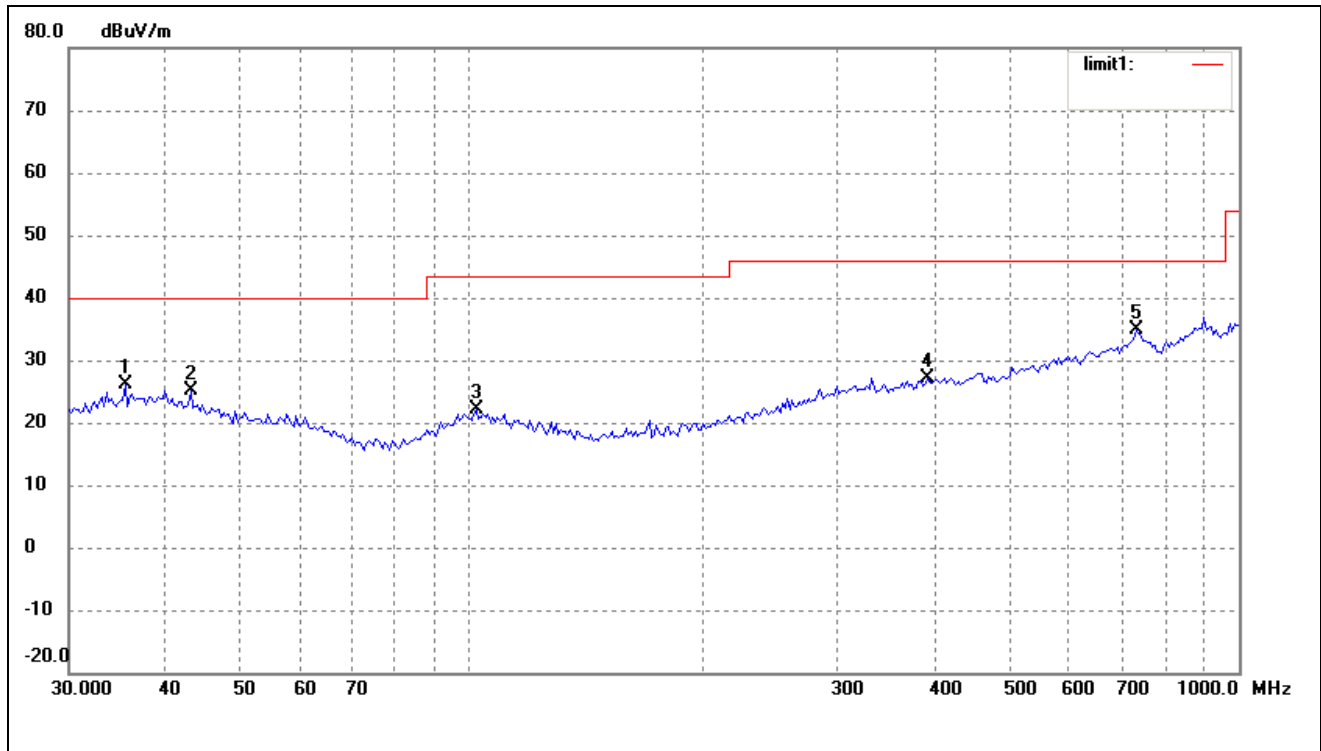
EUT: 2.4G Wireless Mouse

Tested Model: JM-183R

Operating Condition: Transmitting Low Channel (2403MHz)

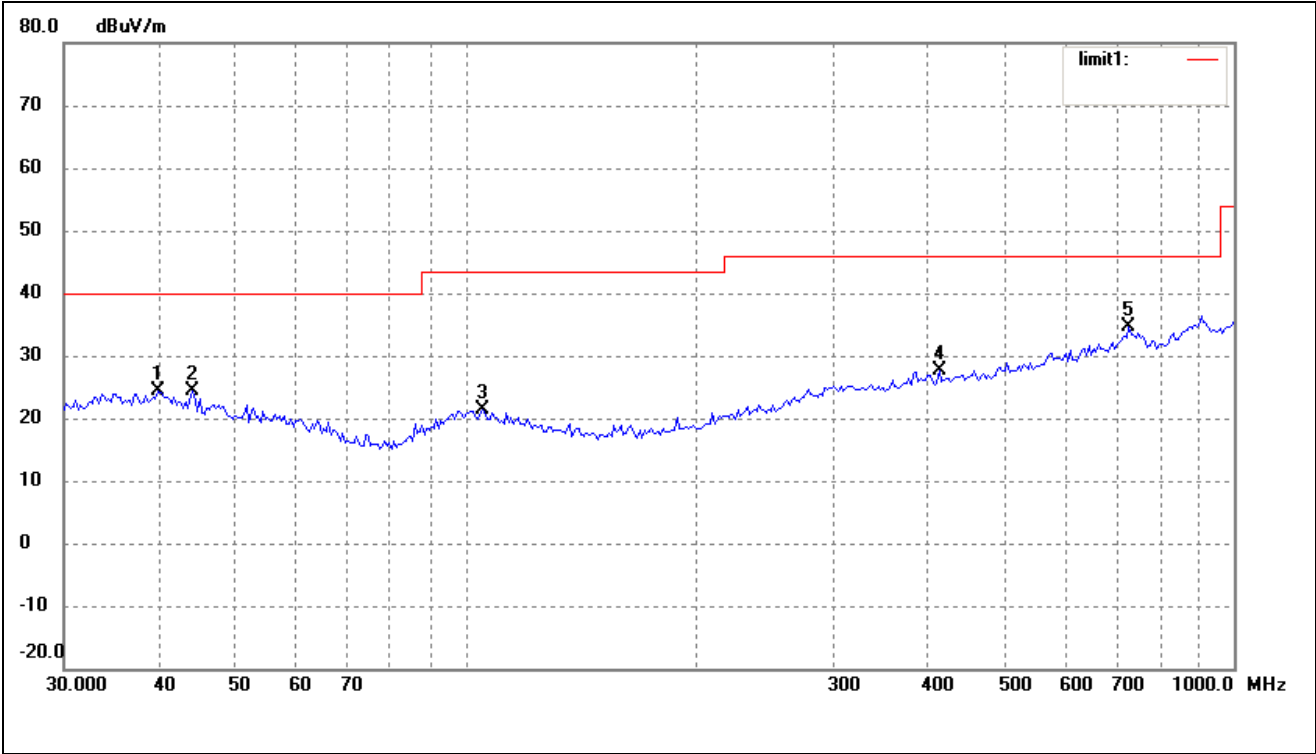
Comment:

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	35.4993	17.18	8.95	26.13	40.00	-13.87	360	100	peak
2	43.2017	16.36	8.70	25.06	40.00	-14.94	327	100	peak
3	101.6443	15.46	6.67	22.13	43.50	-21.37	265	120	peak
4	393.4723	15.91	11.24	27.15	46.00	-18.85	169	100	peak
5	734.4913	17.08	17.68	34.76	46.00	-11.24	242	100	peak

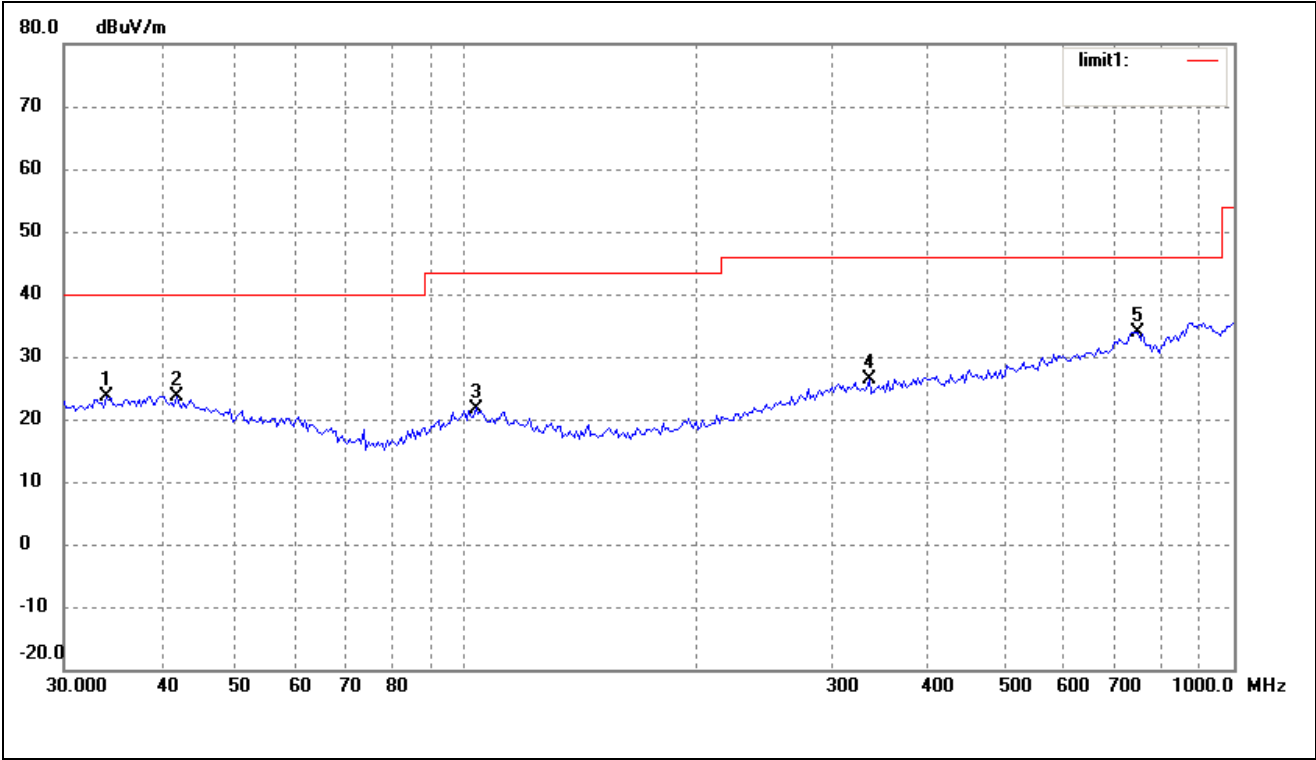
Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	39.7146	14.74	9.64	24.38	40.00	-15.62	323	100	peak
2	44.1202	15.93	8.43	24.36	40.00	-15.64	354	100	peak
3	105.2718	14.98	6.32	21.30	43.50	-22.20	243	100	peak
4	413.2706	16.54	10.98	27.52	46.00	-18.48	210	100	peak
5	729.3583	17.25	17.31	34.56	46.00	-11.44	164	100	peak

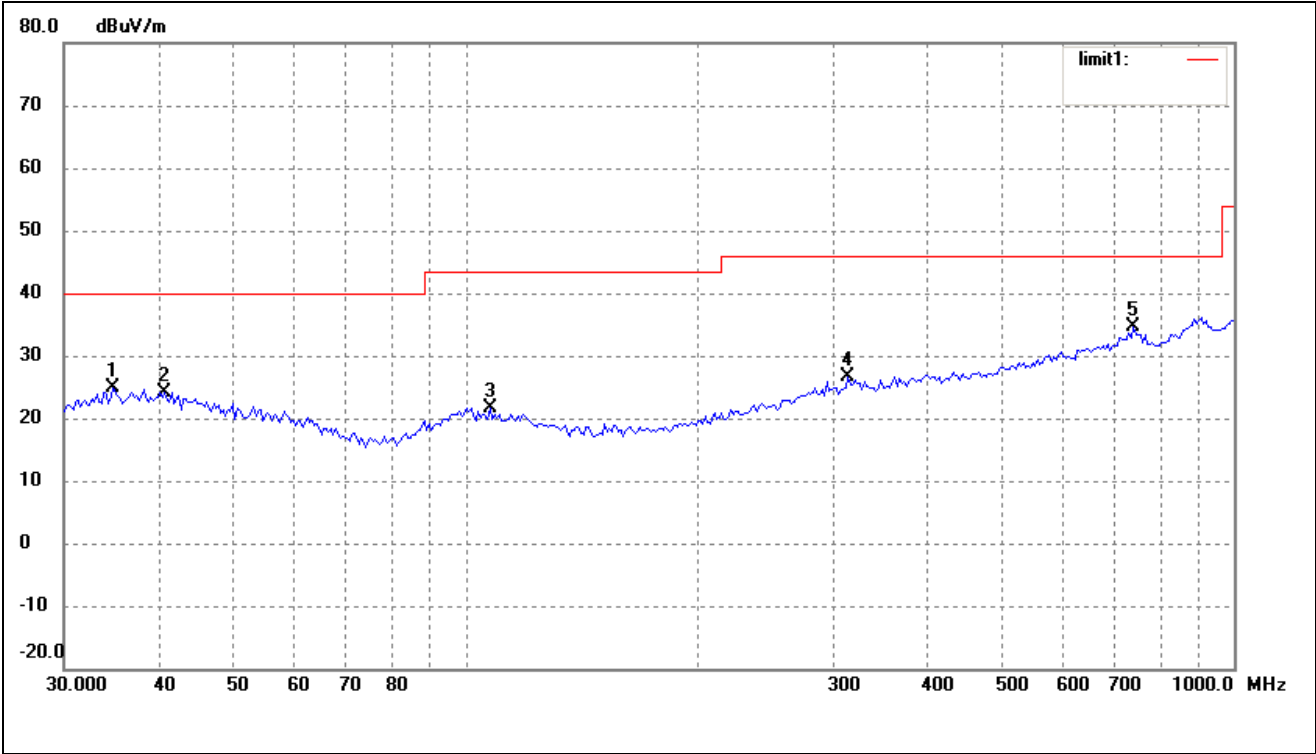
Operating Condition: Transmitting Middle Channel (2441MHz)
Comment:

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	34.0365	15.03	8.72	23.75	40.00	-16.25	350	100	peak
2	42.0066	14.68	9.07	23.75	40.00	-16.25	324	100	peak
3	103.0800	15.21	6.54	21.75	43.50	-21.75	237	100	peak
4	334.8589	16.24	10.19	26.43	46.00	-19.57	195	100	peak
5	750.1083	16.13	17.78	33.91	46.00	-12.09	112	100	peak

Test Specification: Vertical

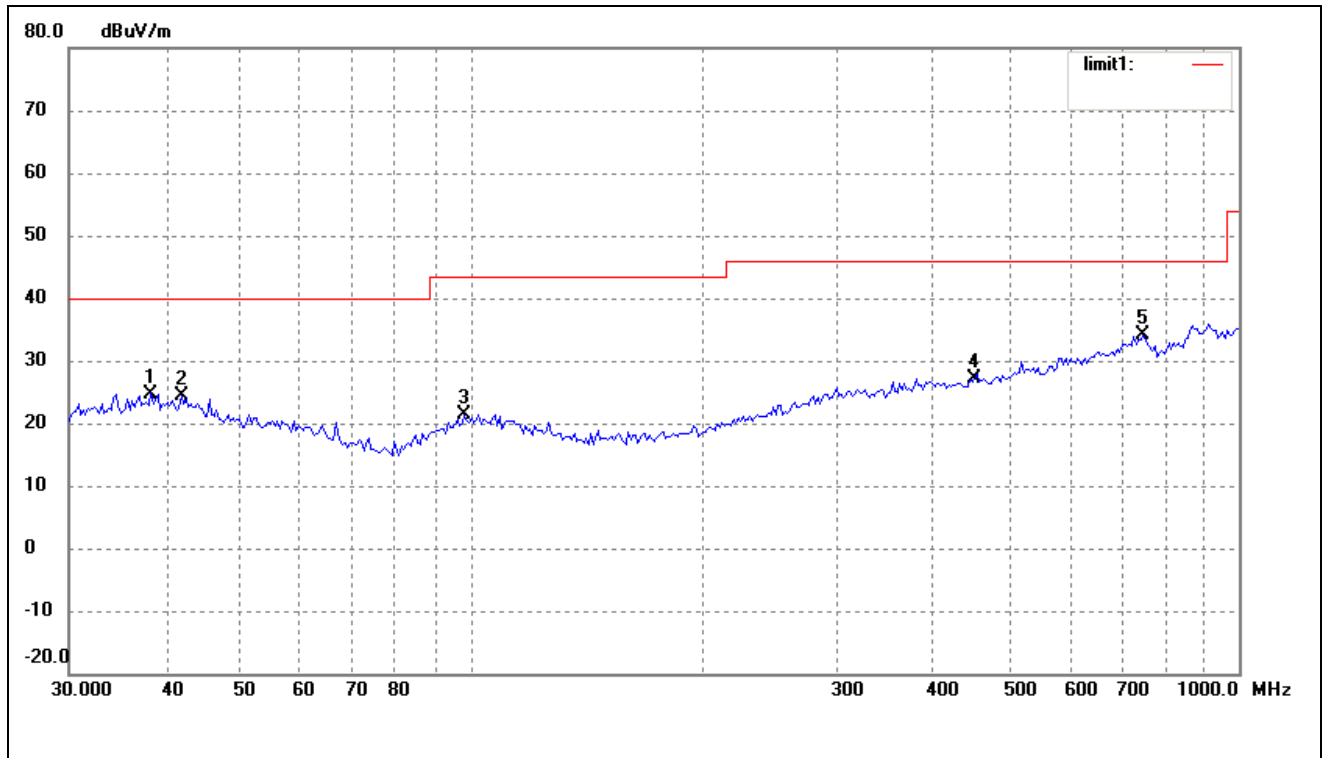


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	34.7602	15.95	8.84	24.79	40.00	-15.21	327	100	peak
2	40.5591	14.71	9.51	24.22	40.00	-15.78	193	100	peak
3	107.5101	15.54	6.10	21.64	43.50	-21.86	164	100	peak
4	314.3765	16.29	10.40	26.69	46.00	-19.31	132	100	peak
5	739.6605	16.60	18.07	34.67	46.00	-11.33	97	100	peak

Operating Condition: Transmitting High Channel (2479MHz)

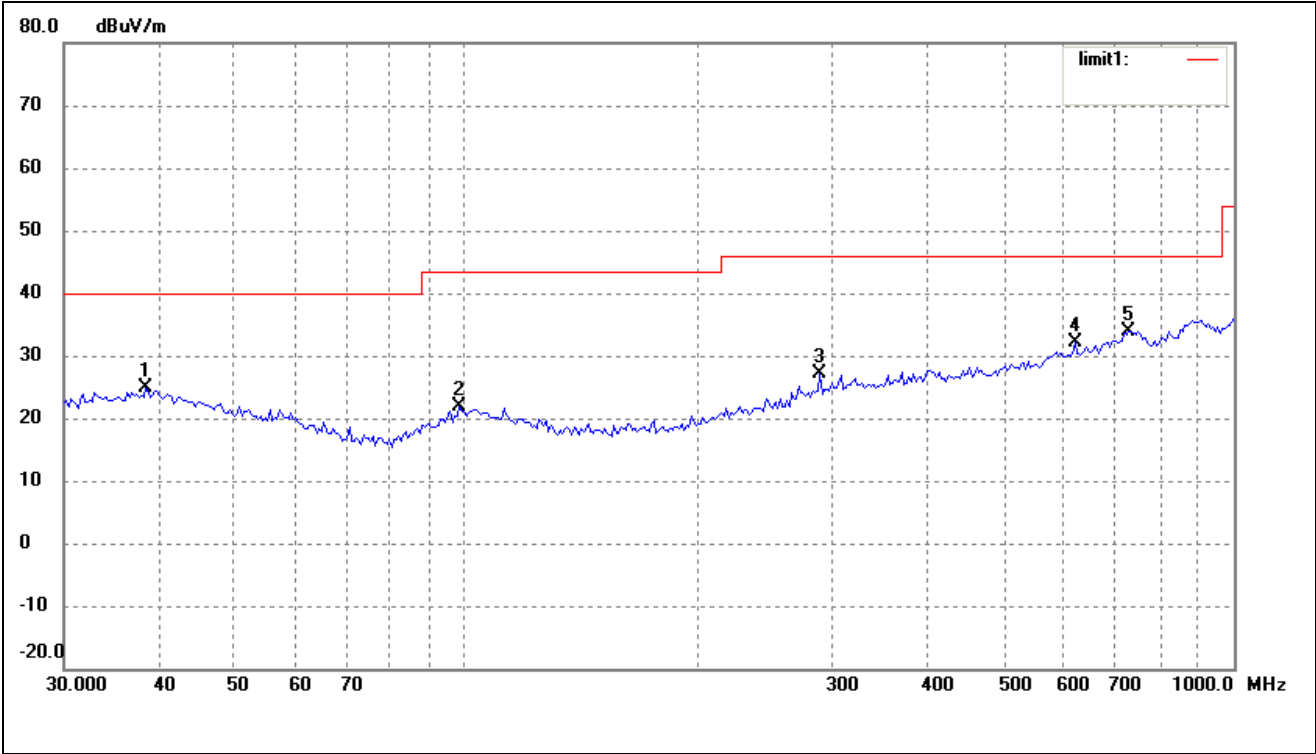
Comment:

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	38.3462	15.33	9.42	24.75	40.00	-15.25	360	100	peak
2	42.0066	15.20	9.07	24.27	40.00	-15.73	342	100	peak
3	98.1419	14.93	6.39	21.32	43.50	-22.18	258	100	peak
4	452.7197	15.58	11.58	27.16	46.00	-18.84	198	100	peak
5	750.1083	16.41	17.78	34.19	46.00	-11.81	123	100	peak

Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	38.3462	15.52	9.42	24.94	40.00	-15.06	358	100	peak
2	98.1419	15.43	6.39	21.82	43.50	-21.68	347	100	peak
3	289.0021	17.39	9.67	27.06	46.00	-18.94	249	100	peak
4	620.7096	18.29	13.95	32.24	46.00	-13.76	214	100	peak
5	729.3583	16.66	17.31	33.97	46.00	-12.03	183	100	peak

Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2403MHz							
2403	59.50	-11.75	71.25	114	-42.75	H	PK
2403	53.49	-11.75	65.24	94	-28.76	H	AV
4806	50.53	-3.92	46.61	74	-27.39	H	PK
4806	32.88	-3.88	29.00	54	-25.00	H	AV
7209	46.87	1.03	47.90	74	-26.10	H	PK
7209	34.10	1.50	35.60	54	-18.40	H	AV
2403	56.47	-11.75	68.22	114	-45.78	V	PK
2403	49.31	-11.75	61.06	94	-32.94	V	AV
4806	27.97	-3.96	24.01	74	-29.99	V	PK
4806	47.64	-3.92	43.72	54	-30.28	V	AV
7209	45.61	1.03	46.64	74	-27.36	V	PK
7209	33.88	1.03	34.91	54	-19.09	V	AV
Middle Channel-2441MHz							
2441	58.23	-11.76	69.99	114	-44.01	H	PK
2441	51.28	-11.76	63.04	94	-30.96	H	AV
4882	54.25	-3.67	50.58	74	-23.42	H	PK
4882	35.80	-3.67	32.13	54	-21.87	H	AV
7323	47.88	3.68	51.56	74	-22.44	H	PK
7323	35.02	3.68	38.70	54	-15.30	H	AV
2441	57.02	-11.76	68.78	114	-45.22	V	PK
2441	49.47	-11.76	61.23	94	-32.77	V	AV
4882	50.95	-3.67	47.28	74	-26.72	V	PK
4882	34.72	-3.67	31.05	54	-22.95	V	AV
7323	35.02	3.68	38.70	74	-15.30	V	PK
7323	47.05	3.86	50.91	54	-23.09	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
High Channel-2479MHz							
2479	58.42	-11.77	70.19	114	-43.81	H	PK
2479	50.55	-11.77	62.32	94	-31.68	H	AV
4958	50.56	-3.45	47.11	74	-26.89	H	PK
4958	34.29	-2.91	31.38	54	-22.62	H	AV
7437	35.10	3.68	38.78	74	-15.22	H	PK
7437	46.68	3.77	50.45	54	-23.55	H	AV
2479	57.68	-11.77	69.45	114	-44.55	V	PK
2479	50.10	-11.77	61.87	94	-32.13	V	AV
4958	48.75	-3.45	45.30	74	-28.70	V	PK
4958	33.72	-3.45	30.27	54	-23.73	V	AV
7437	47.15	3.68	50.83	74	-23.17	V	PK
7437	34.96	3.68	38.64	54	-15.36	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz..

5. Out of Band Emissions

5.1 Standard Applicable

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.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

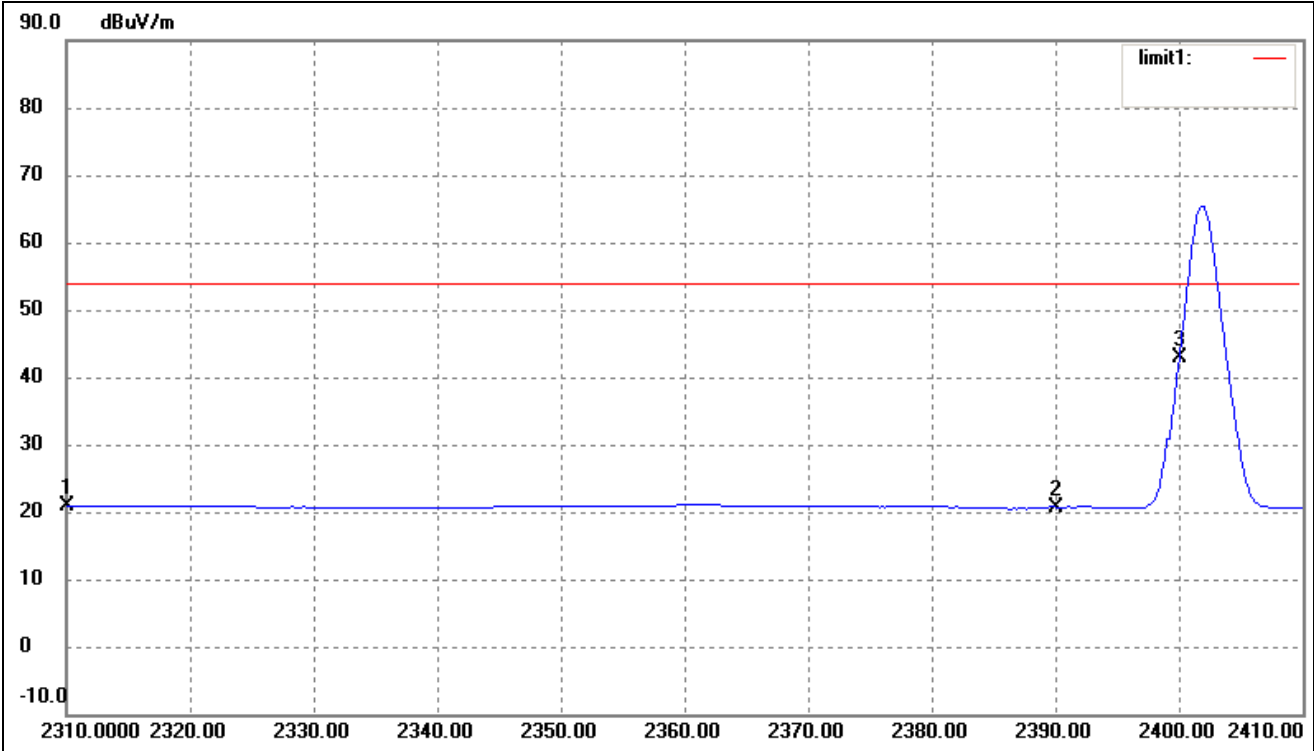
5.5 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	2310.00	<54 dBuV	Pass
	2390.00	<54 dBuV	Pass
	2400.00	<54 dBuV	Pass
Highest	2483.50	<54 dBuV	Pass
	2500.00	<54 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.247(d) requirements.

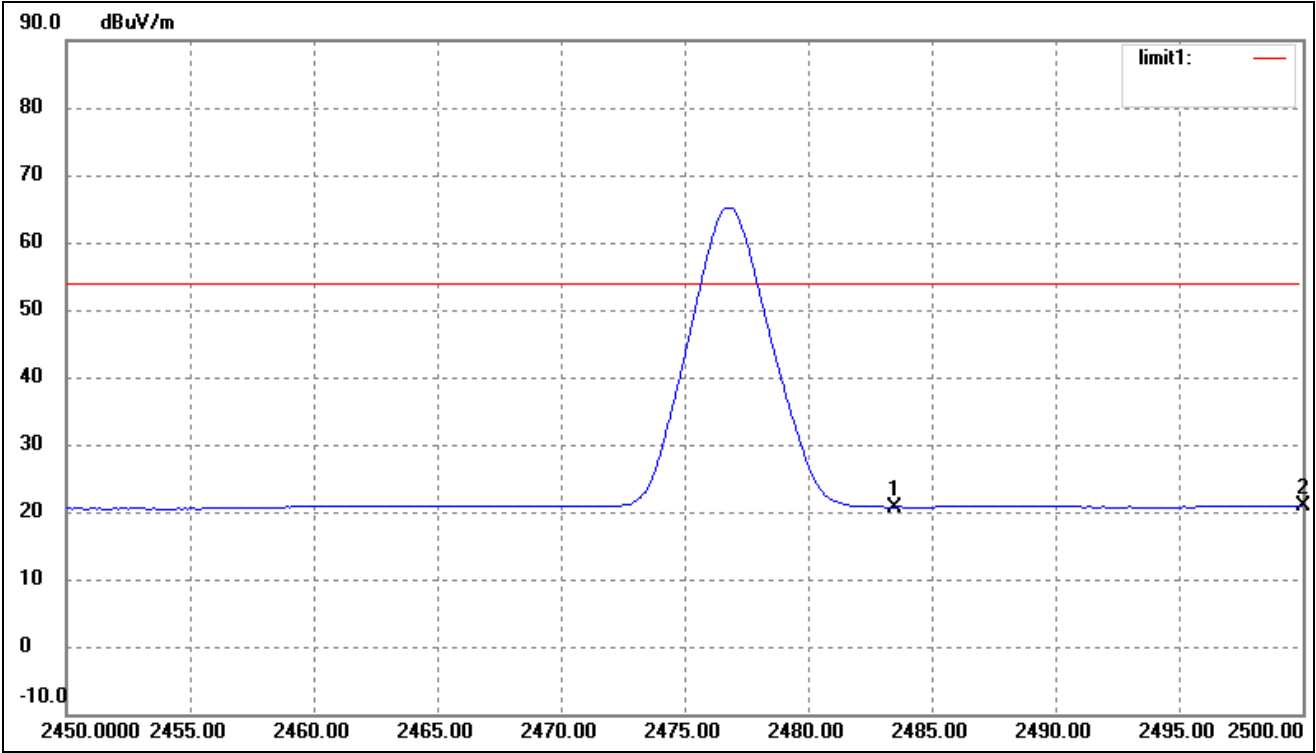
Please refer to the test plots as below.

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	32.51	-11.72	20.79	54.00	-33.21	Ave Detector
	2310.000	49.97	-7.51	42.46	74.00	-31.54	Peak Detector
2	2390.000	32.50	-11.75	20.75	54.00	-33.25	Ave Detector
	2390.000	49.63	-7.34	42.29	74.00	-31.71	Peak Detector
3	2400.000	54.69	-11.75	42.94	54.00	-11.06	Ave Detector
	2400.000	51.33	-7.31	54.02	74.00	-19.98	Peak Detector

Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	32.51	-11.78	20.73	54.00	-33.27	Ave Detector
	2483.500	49.66	-7.13	42.53	74.00	-31.47	Peak Detector
2	2500.000	32.62	-11.78	20.84	54.00	-33.16	Ave Detector
	2500.000	49.83	-7.08	52.75	74.00	-21.25	Peak Detector

6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), 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. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

6.3 Test Procedure

According to the ANSI 63.4-2003, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW \geq 1% 20dB Bandwidth, VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

6.4 Environmental Conditions

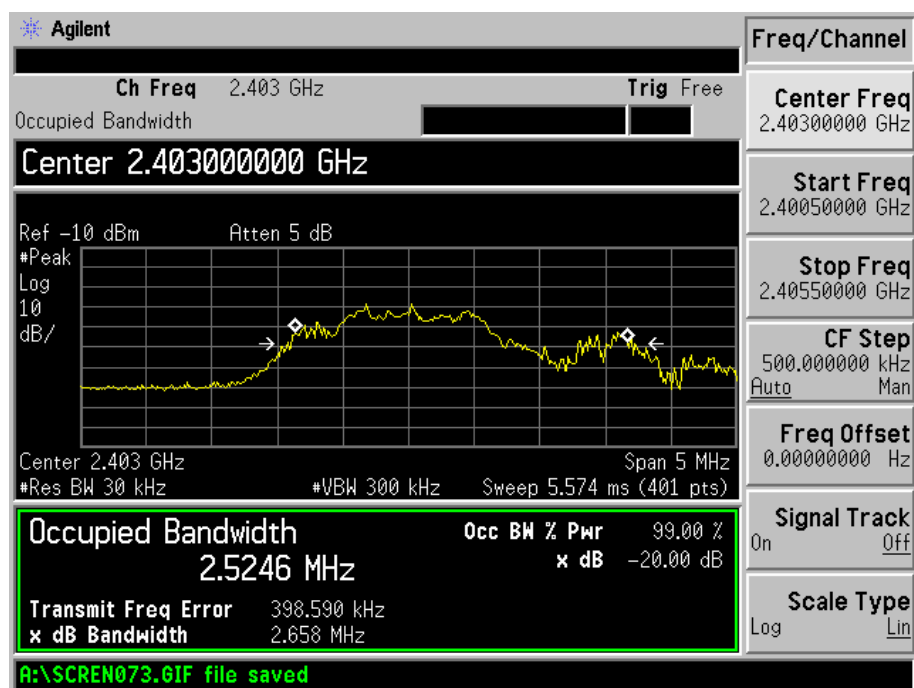
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

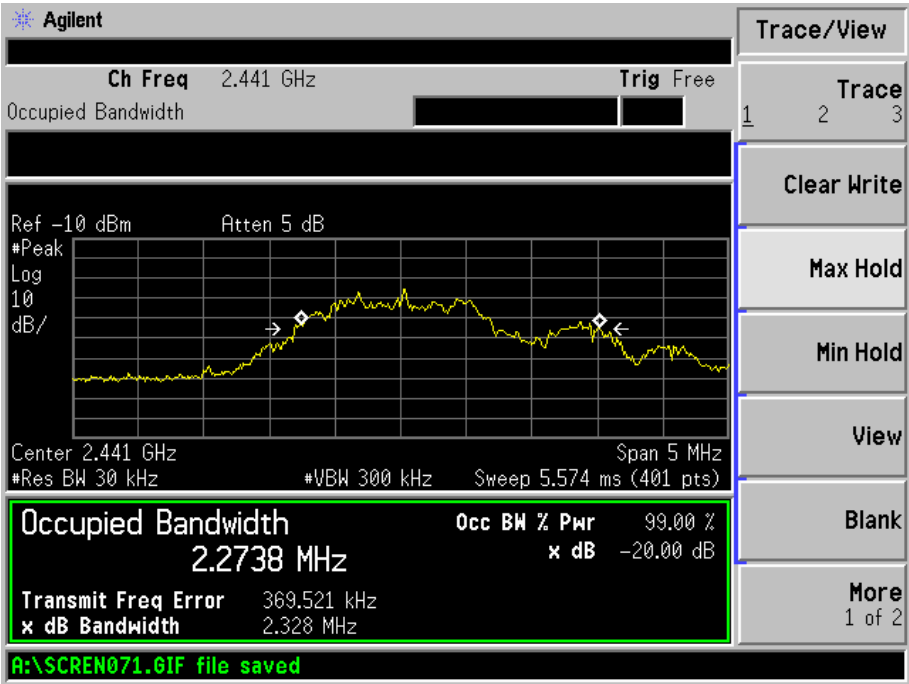
Channel	Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
Low Channel	2403	2658	2524.6
Middle Channel	2441	2328	2273.8
High Channel	2479	2093	2010.8

Please refer to the following test plots

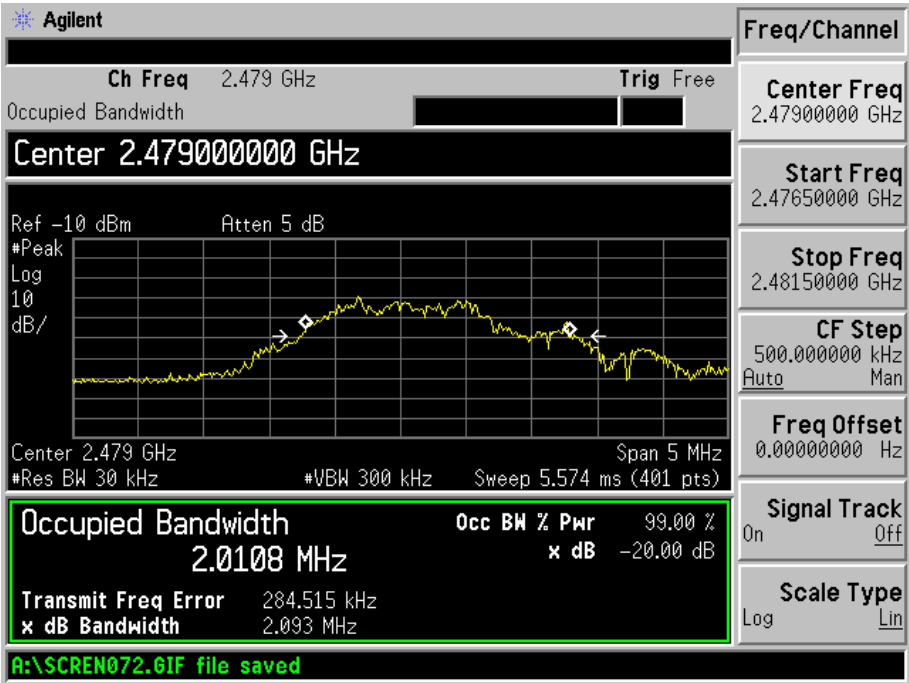
Low Channel:



Middle Channel:



High Channel:



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