

FCC PART 15.249
MEASUREMENT AND TEST REPORT
FOR

Fashion Star Technology Limited

A-2305, Cyber Times, Tian'an Cyber Park Futian District, Shenzhen, China

FCC ID: COAF-456AB

Report Concerns: Original Report	Equipment Type: 2.4G Mini Radio Control System
Model:	<u>F-4</u>
Report No.:	<u>STR12038059I</u>
Test Date:	<u>2012-03-07 to 2012-03-14</u>
Issue Date:	<u>2012-05-29</u>
Tested By:	<u>Susan Su / Engineer</u> 
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Approved & Authorized By:	<u>Jandy so / PSQ Manager</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.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Fashion Star Technology Limited
Address of applicant: A-2305, Cyber Times, Tian'an Cyber Park Futian District, Shenzhen, China
Manufacturer: Zhongshan WATA Electronics Co., Ltd
Address of manufacturer: No.142, South Tanshan Road, Tanzhou, Zhongshan City, Guangdong, China

General Description of EUT	
Product Name:	2.4G Mini Radio Control System
Trade Name:	Fashion Star
Model No.:	F-4
Adding Model(s):	F-5, F-6A, F-6B
Rated Voltage:	DC 4.0-6.0V
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The other model listed in the report has different appearance only of F-4 without circuit and electronic construction changed, declared by the manufacturer</i>	

Technical Characteristics of EUT	
Frequency Range:	2405-2465MHz
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	3 dBi
Lowest Internal Frequency of EUT:	16MHz
Device Category:	Portable Device

1.2 Test Standards

The following report is prepared on behalf of the Fashion Star Technology Limited 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	2405MHz
TM2	Middle Channel	2439MHz
TM3	High Channel	2465MHz

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

3. ANTENNA REQUIREMENT

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 integral antenna, fulfill the requirement of this section.

4. RADIATED EMISSION

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

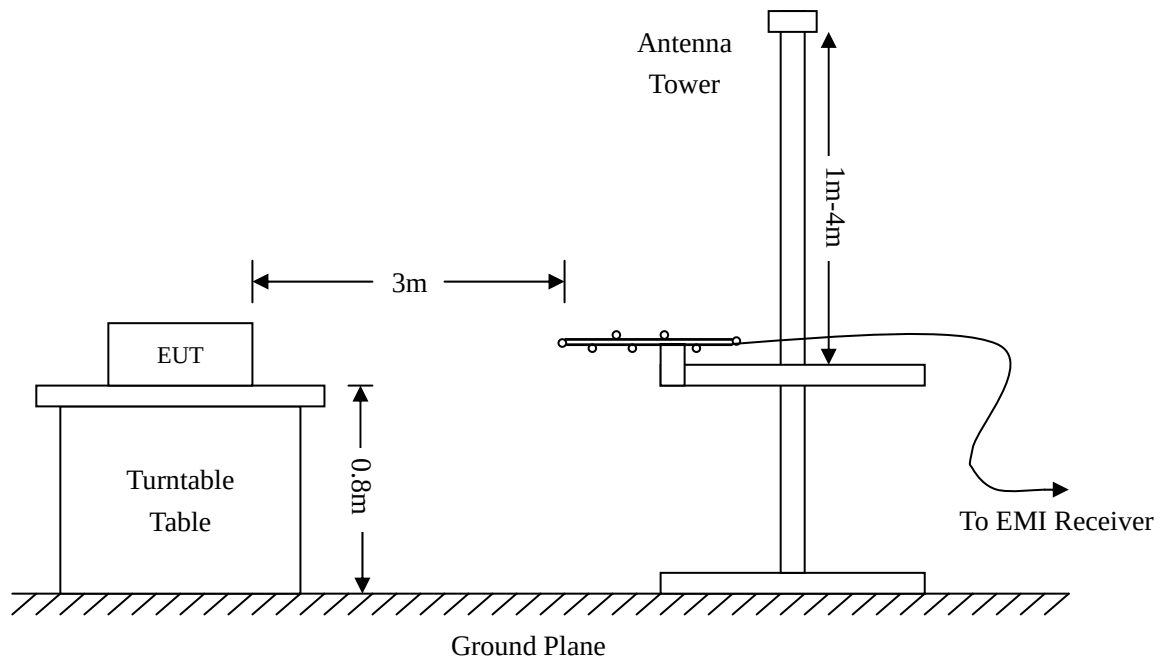
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	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 for Class B. The equation for margin calculation is as follows:

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

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:

-0.3 dB μ V at 2405 MHz in the Vertical polarization, 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 Radiation Emissions Test

Radiated Disturbance

EUT: 2.4G Mini Radio Control System

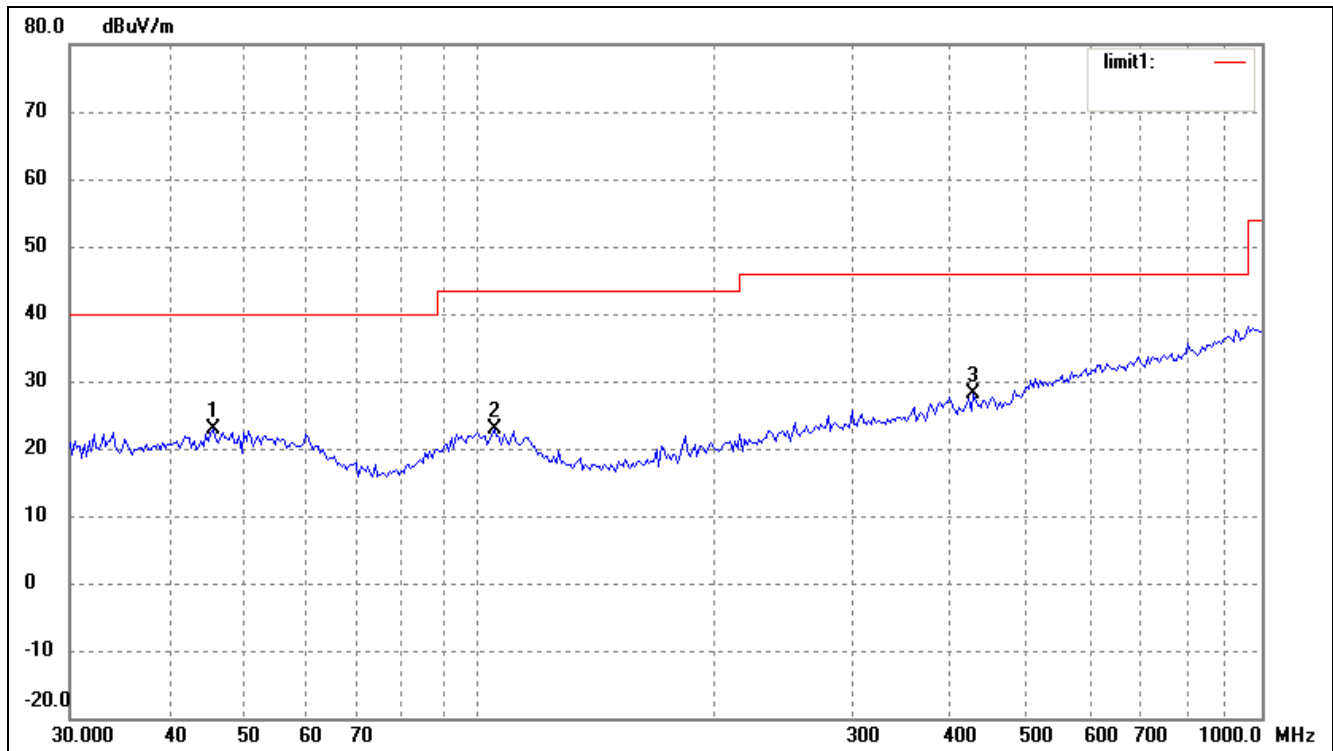
M/N: F-4

Operating Condition: Transmitting below 1GHz

Test Specification: Horizontal & Vertical

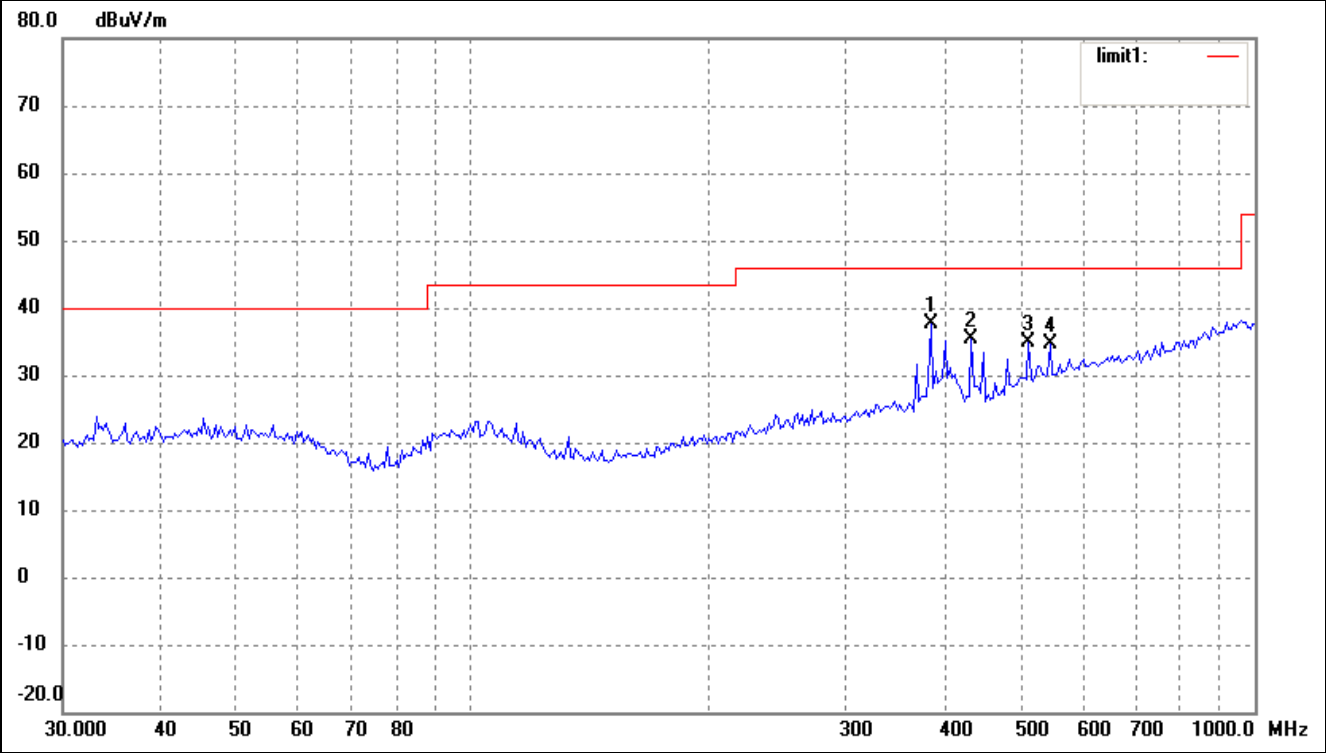
Low CH (2405MHz)

Horizontal:



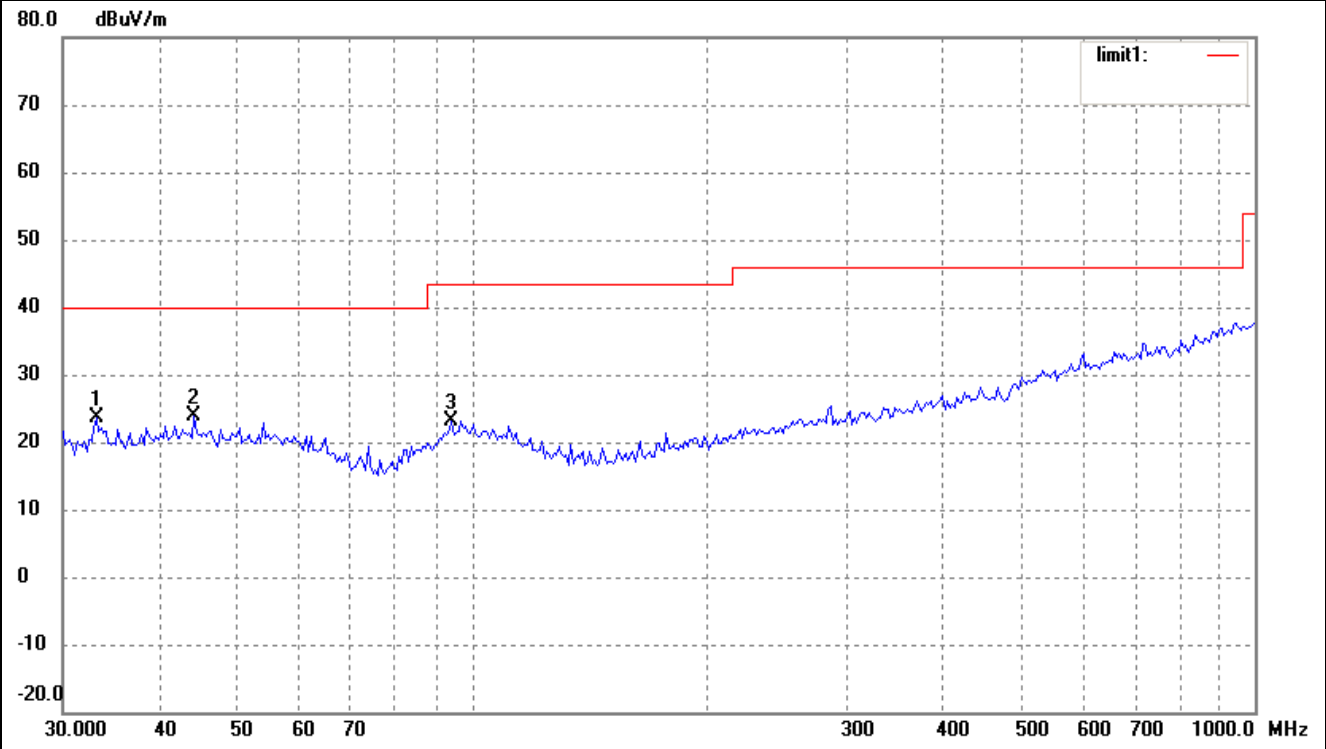
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	45.6948	14.61	8.20	22.81	40.00	-17.19	30	100	peak
2	104.5361	14.73	8.04	22.77	43.50	-20.73	65	100	peak
3	428.0193	16.37	11.69	28.06	46.00	-17.94	74	100	peak

Vertical:



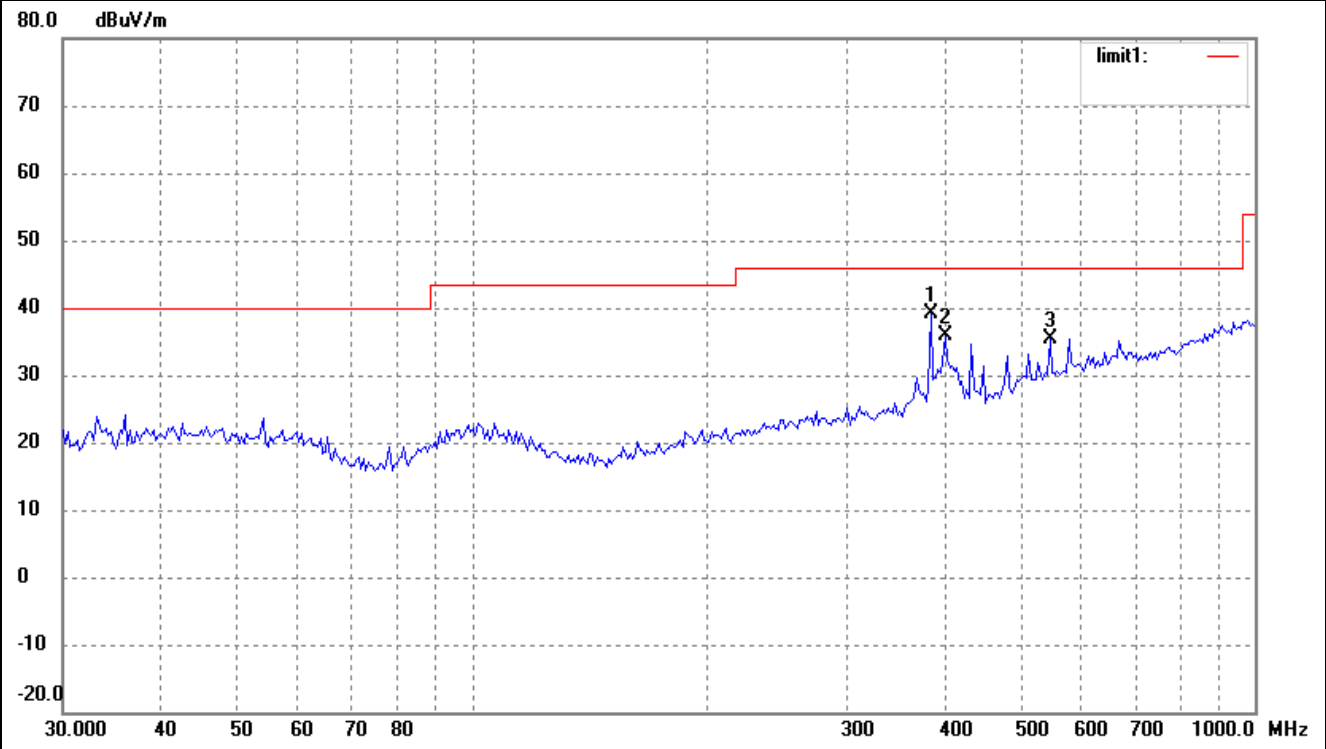
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	385.2805	26.49	11.25	37.74	46.00	-8.26	0	100	peak
2	434.0651	23.38	11.93	35.31	46.00	-10.69	24	100	peak
3	513.6331	20.16	14.72	34.88	46.00	-11.12	177	100	peak
4	547.0977	19.16	15.48	34.64	46.00	-11.36	22	100	peak

Middle CH
Horizontal



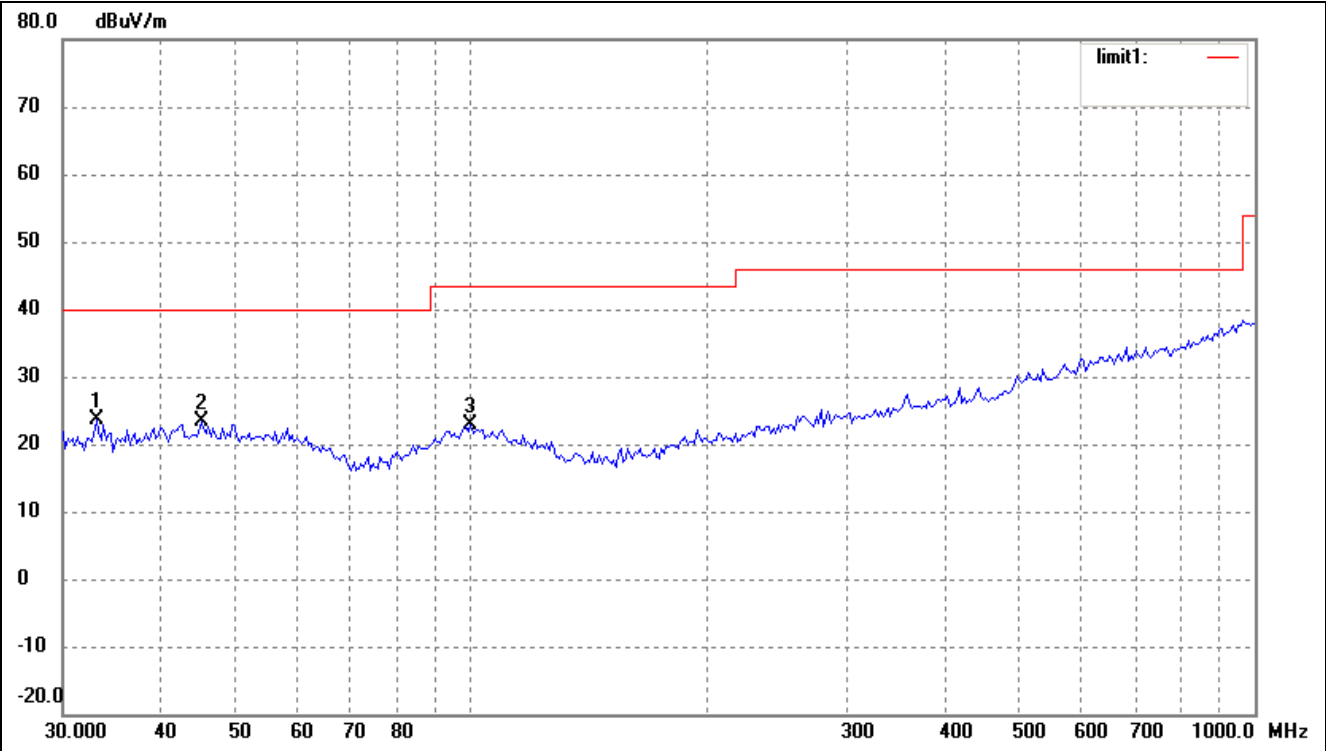
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.0950	16.92	6.77	23.69	40.00	-16.31	0	100	peak
2	44.1202	15.78	8.21	23.99	40.00	-16.01	0	100	peak
3	94.0979	15.35	7.88	23.23	43.50	-20.27	360	100	peak

Vertical



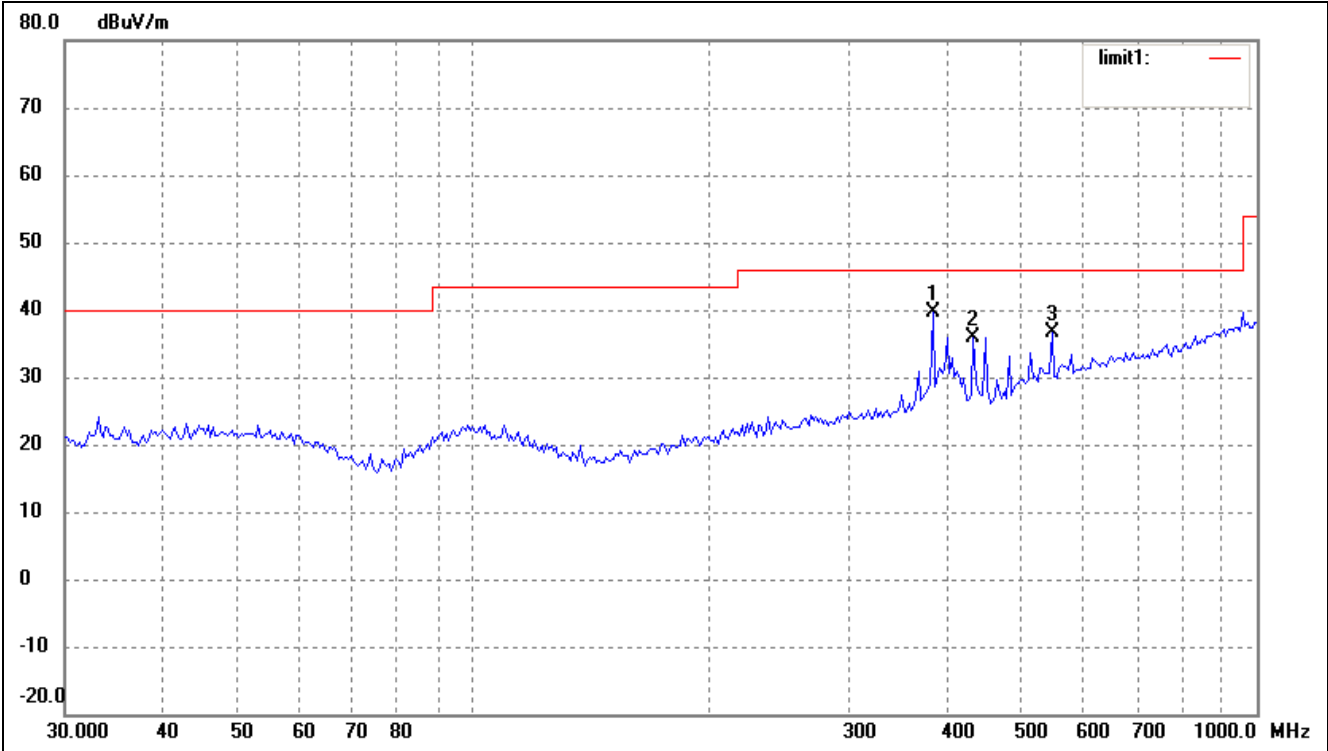
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	385.2805	27.89	11.25	39.14	46.00	-6.86	250	100	peak
2	401.8385	24.40	11.40	35.80	46.00	-10.20	34	100	peak
3	547.0977	19.81	15.48	35.29	46.00	-10.71	360	100	peak

High CH
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.0950	16.97	6.77	23.74	40.00	-16.26	234	100	peak
2	45.0583	15.09	8.23	23.32	40.00	-16.68	44	100	peak
3	99.5281	14.50	8.40	22.90	43.50	-20.60	360	100	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	385.2805	28.32	11.25	39.57	46.00	-6.43	125	100	peak
2	434.0651	24.04	11.93	35.97	46.00	-10.03	36	100	peak
3	547.0977	21.23	15.48	36.71	46.00	-9.29	74	100	peak

Spurious Emission Above 1GHz

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low CH (2405MHz)										
4810	AV	29.0	24	V	34.1	5.2	33	35.3	54	-18.7
4810	AV	30.2	341	H	34.1	5.2	33	36.5	54	-17.5
4810	PK	47.1	24	V	34.1	5.2	33	53.4	74	-20.6
4810	PK	48.7	341	H	34.1	5.2	33	55.0	74	-19.0
7215	AV	24.8	325	V	37.4	6.1	33.5	34.8	54	-19.2
7215	AV	25.2	91	H	37.4	6.1	33.5	35.2	54	-18.8
7215	PK	37.8	77	V	37.4	6.1	33.5	47.8	74	-26.2
7215	PK	37.3	91	H	37.4	6.1	33.5	47.3	74	-26.7
2405	AV	53.8	77	V	29.1	3.7	34	52.6	94	-41.4
2405	AV	51.3	34	H	29.1	3.7	34	50.1	94	-43.9
2405	PK	114.9	77	V	29.1	3.7	34	113.7	114	-0.3
2405	PK	106.5	34	H	29.1	3.7	34	105.3	114	-8.7
Middle CH (2439MHz)										
4878	AV	29.3	28	V	34.1	5.2	33	35.6	54	-18.4
4878	AV	28.8	325	H	34.1	5.2	33	35.1	54	-18.9
4878	PK	46.5	28	V	34.1	5.2	33	52.8	74	-21.2
4878	PK	45.5	325	H	34.1	5.2	33	51.8	74	-22.2
7317	AV	25.6	33	V	37.4	6.1	33.5	35.6	54	-18.4
7317	AV	26.7	34	H	37.4	6.1	33.5	36.7	54	-17.3
7317	PK	42.3	33	V	37.4	6.1	33.5	52.3	74	-21.7
7317	PK	43.1	34	H	37.4	6.1	33.5	53.1	74	-20.9
2439	AV	54.2	360	V	29.1	3.7	34	53.0	94	-41.0
2439	AV	52.3	360	H	29.1	3.7	34	51.1	94	-42.9
2439	PK	114.8	360	V	29.1	3.7	34	113.6	114	-0.4
2439	PK	106.9	360	H	29.1	3.7	34	105.7	114	-8.3
High CH (2465MHz)										
4930	AV	25.9	164	V	34.1	5.2	33	32.2	54	-21.8
4930	AV	27.5	159	H	34.1	5.2	33	33.8	54	-20.2
4930	PK	38.2	164	V	34.1	5.2	33	44.5	74	-29.5
4930	PK	40.5	159	H	34.1	5.2	33	46.8	74	-27.2
7395	AV	25.8	177	V	37.4	6.1	33.5	35.8	54	-18.2
7395	AV	25.8	28	H	37.4	6.1	33.5	35.8	54	-18.2
7395	PK	38.3	177	V	37.4	6.1	33.5	48.3	74	-25.7
7395	PK	38.6	28	H	37.4	6.1	33.5	48.6	74	-25.4

2465	AV	52.8	52	V	29.1	3.7	34	51.6	94	-42.4
2465	AV	46.5	31	H	29.1	3.7	34	45.3	94	-48.7
2465	PK	111.1	52	V	29.1	3.7	34	109.9	114	-4.1
2465	PK	97.5	31	H	29.1	3.7	34	96.3	114	-17.7

*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

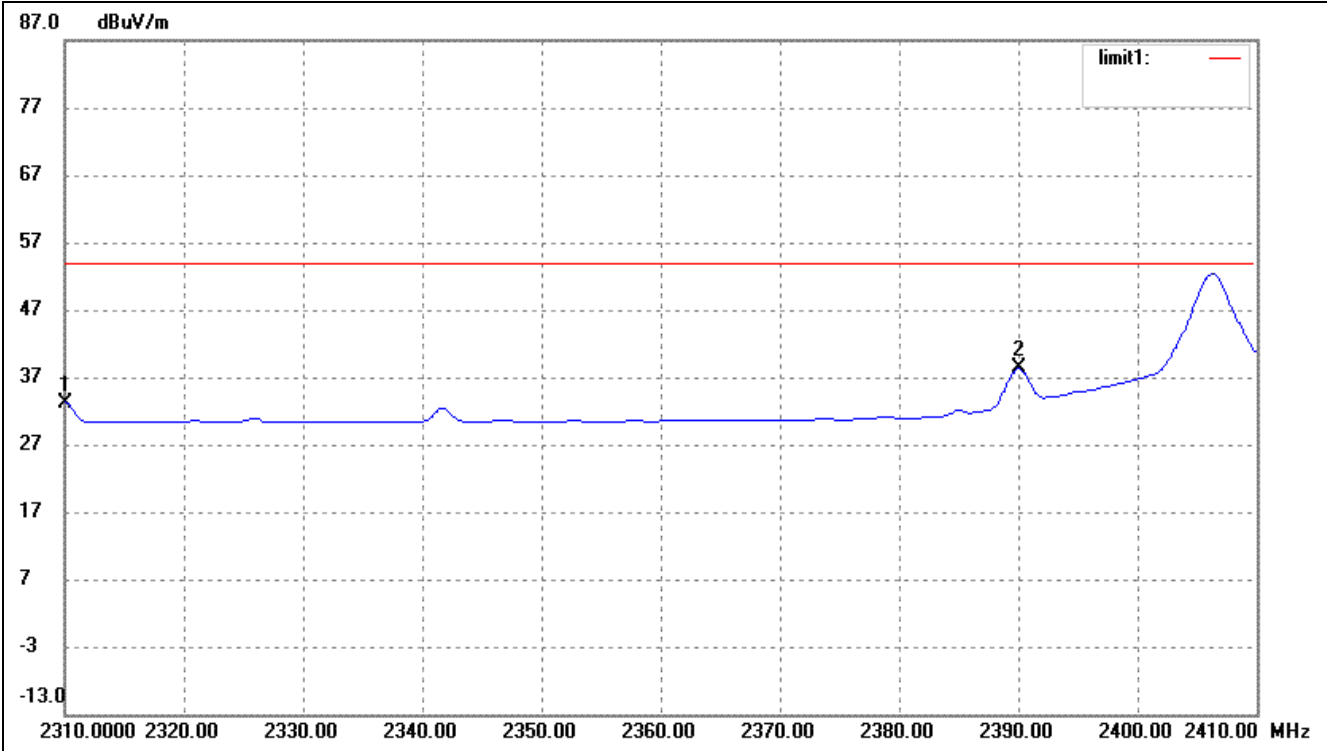
Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

5.5 Summary of Test Results/Plots

Frequency MHz	Limit dBuV	Result
Low Edge	<54	Pass
High Edge	<54	Pass

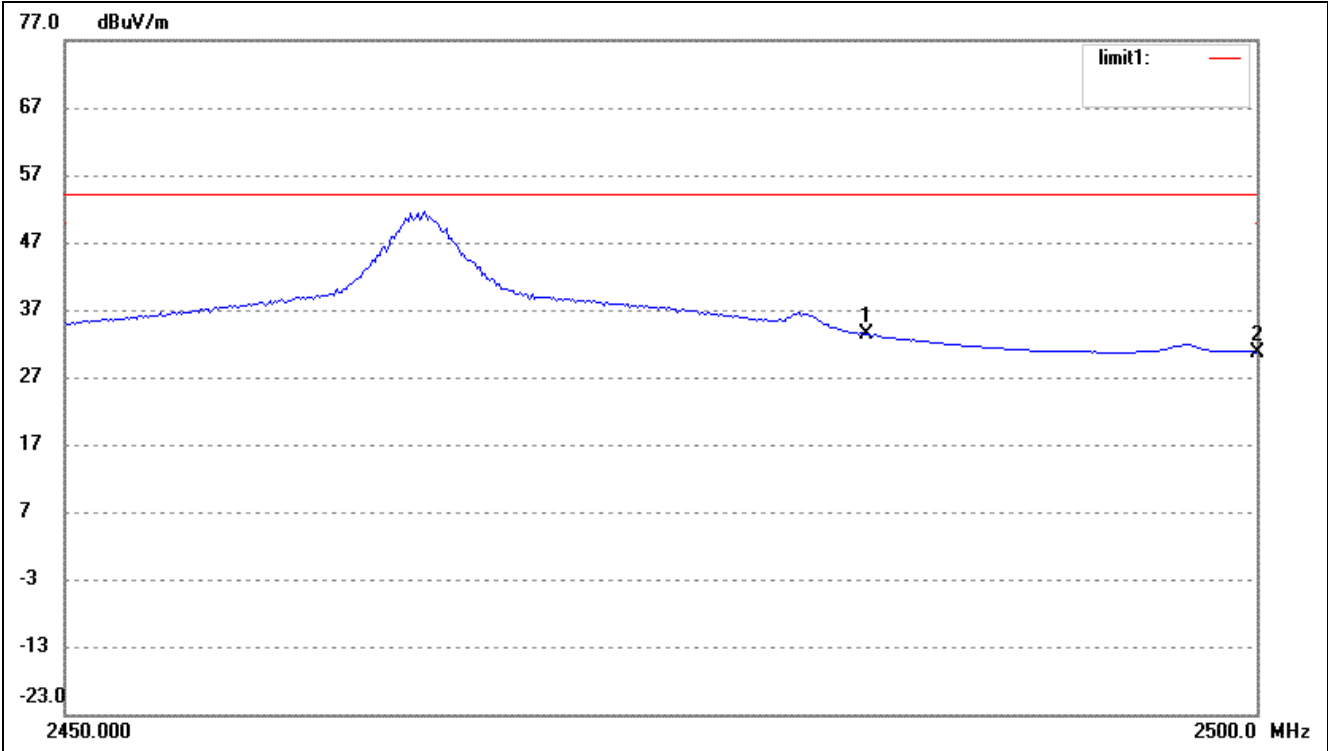
The edge emissions are below the FCC 15.209 Limits. Please refer to the test plots below.

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	40.71	-7.51	33.20	54.00	-20.80	Ave Detector
	2310.000	63.84	-7.51	56.33	74.00	-17.67	Peak Detector
2	2390.000	45.61	-7.34	38.27	54.00	-15.73	Ave Detector
	2390.000	80.05	-7.34	72.71	74.00	-1.29	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	40.46	-7.13	33.33	54.00	-20.67	Ave Detector
	2483.500	79.86	-7.13	72.73	74.00	-1.27	Peak Detector
2	2500.000	37.83	-7.08	30.75	54.00	-23.25	Ave Detector
	2500.000	76.29	-7.08	69.21	74.00	-4.79	Peak Detector

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