
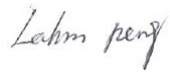



FCC PART 15.249
MEASUREMENT AND TEST REPORT
FOR

A-RC Model Limited

**3rd Floor, Building B3, You Ma Gang Industrial Park No.19, Gong Ming Town,
Shenzhen City, 518106 China**

FCC ID: Z4SMINI4

Report Concerns: Original Report	Equipment Type: R/C Radio System
Model:	<u>MINI4</u>
Report No.:	<u>STR11098238I</u>
Test Date:	<u>2011-09-28 to 2011-10-17</u>
Issue Date:	<u>2011-10-20</u>
Tested By:	<u>Jason Jiang / Engineer</u> 
Reviewed By:	<u>Lahm Peng / EMC Manager</u> 
Approved & Authorized By:	<u>Jandy so / PSQ Manager</u> 
Prepared By:	SEM.Test Compliance Service Co., Ltd 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C. (518101) Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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: A-RC Model Limited
Address of applicant: 3 rd Floor, Building B3, You Ma Gang Industrial Park No.19,
Gong Ming Town, Shenzhen City, 518106 China

Manufacturer: A-RC Model Limited
Address of manufacturer: 3 rd Floor, Building B3, You Ma Gang Industrial Park No.19,
Gong Ming Town, Shenzhen City, 518106 China

General Description of E.U.T

Items	Description
EUT Description:	R/C Radio System
Trade Name:	A-RC
Model No.:	MINI4
Rated Voltage:	DC 5.5V—6.5V Battery
Frequency Range:	2403.5~2479.5 MHz
Antenna Type:	Integral Antenna
Comment:	Manual Operation Device
For more information refer to the circuit diagram form and the user's manual.	

The test data is gathered from a production sample, provided by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the A-RC Model 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.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions and let the EUT keep transmitting.

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 Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software is started while the whole system is on.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emission	N/A
§15.205	Restricted Band of Operation	Compliant
§15.209	Radiated Emission	Compliant
§15.249(a)	Field Strength	Compliant
§15.249(d)	Out of Band Emission	Compliant

3. §15.203 - ANTENNA REQUIREMENT

3.1 Standard Applicable

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.

3.2 Test Result

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

4. §15.205, §15.209, §15.249 (a)- 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 harmonics (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	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2011-01-09	2012-01-08

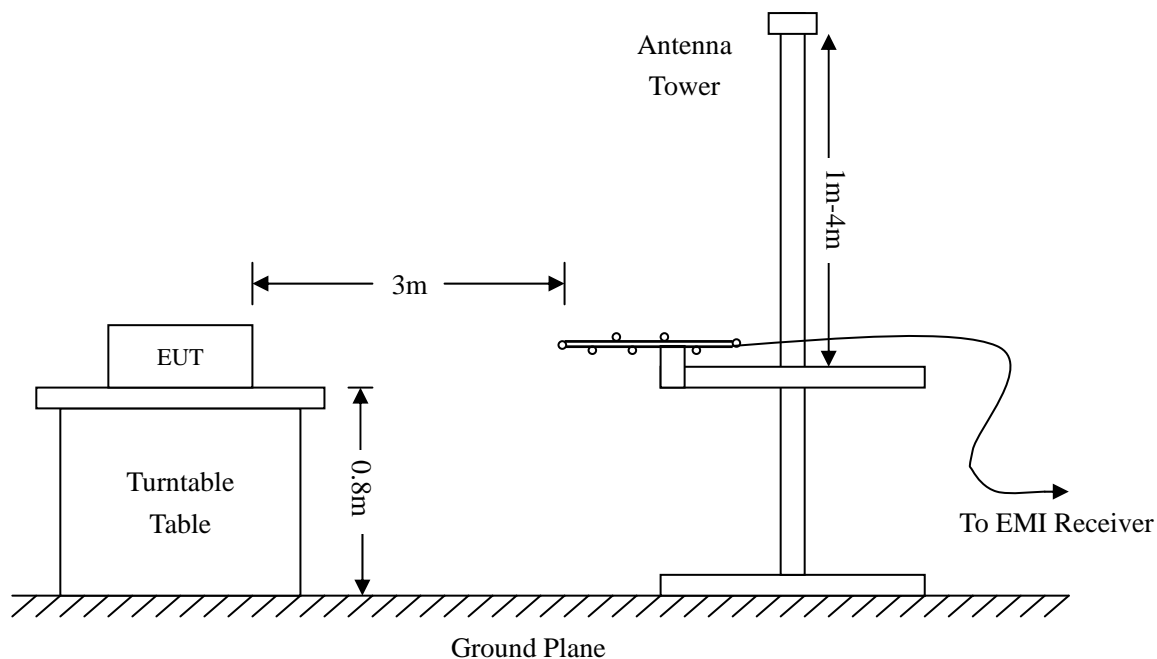
Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

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:

-9.89 dB μ V at 53.3179MHz in the Vertical polarization,Middle Channel, 9kHz to 25 GHz, 3Meters

Plot of Radiation Emissions Test Data

Radiated Disturbance

EUT: R/C Radio System

M/N:MINI4

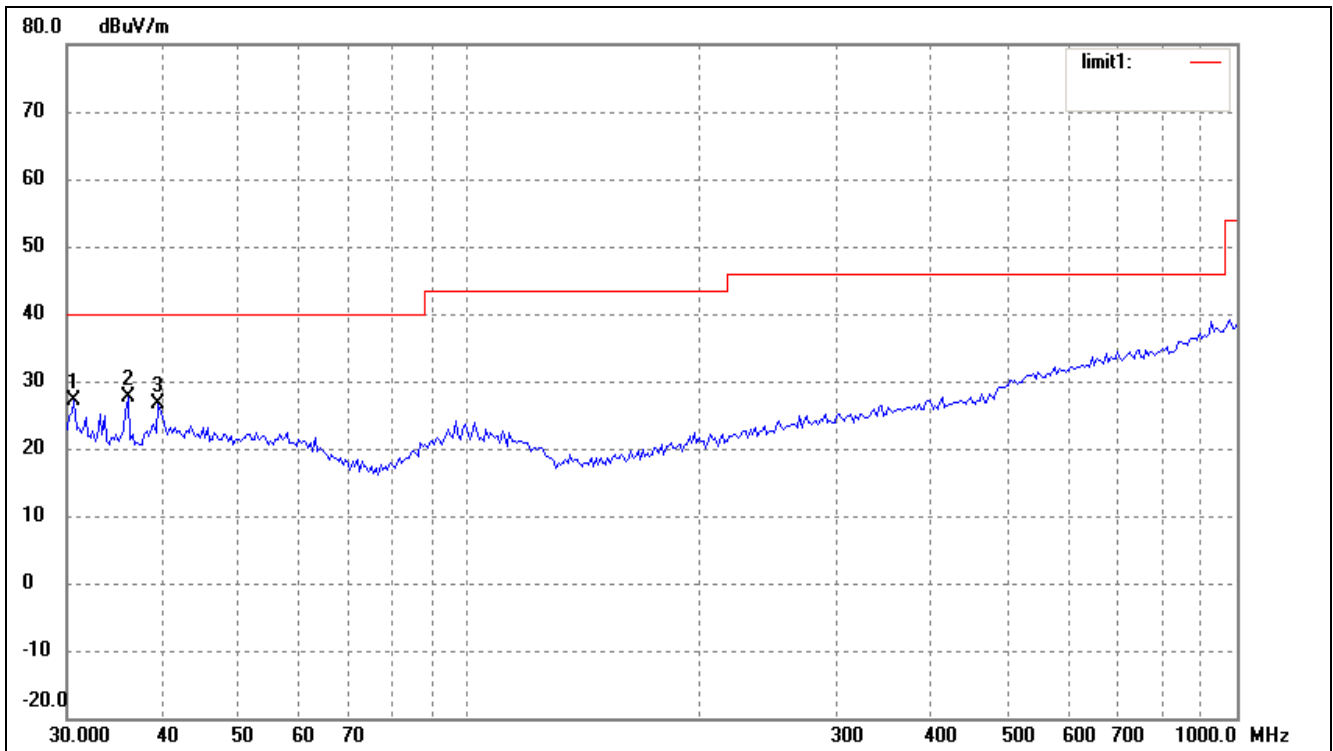
Operating Condition: Transmitting

Test Specification: Horizontal & Vertical

Comment: DC 6V

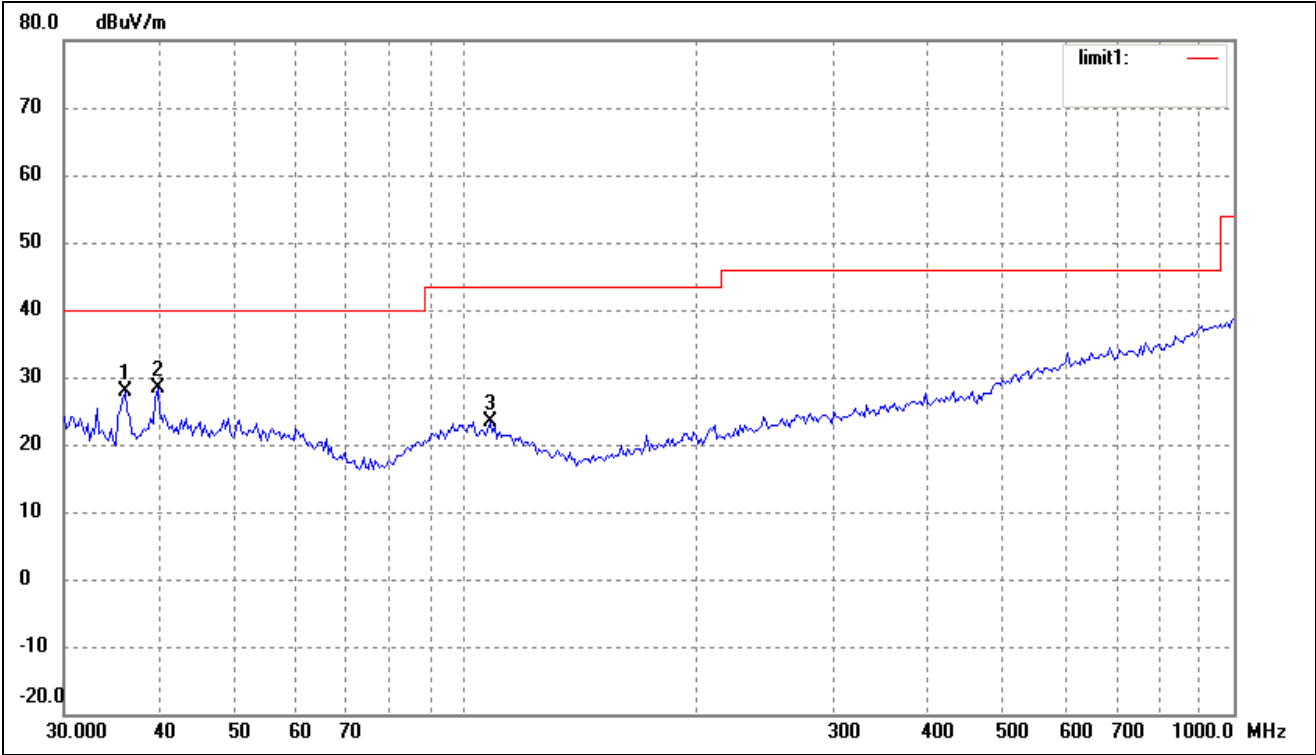
Low Channel(2403.5MHz)

Horizontal



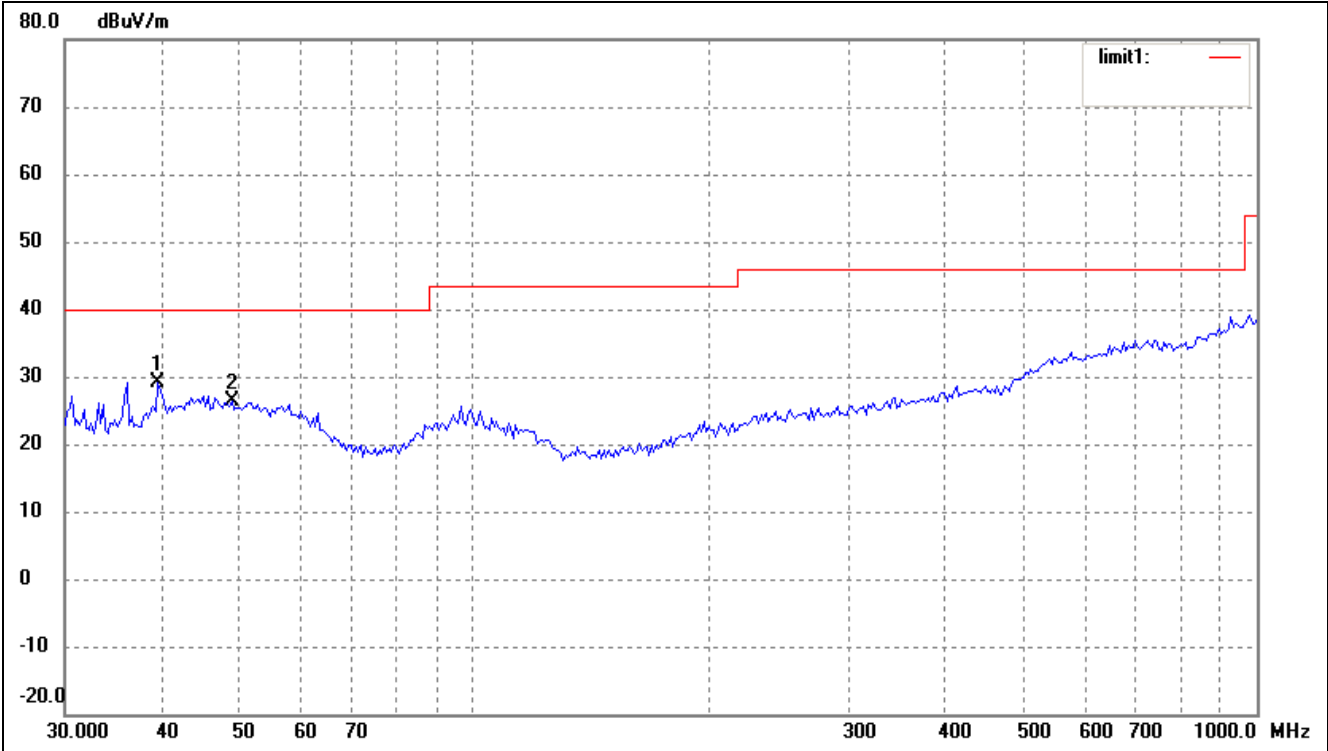
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.6379	20.39	6.77	27.16	40.00	-12.84	223	203	peak
2	36.0007	20.48	7.05	27.53	40.00	-12.47	360	200	peak
3	39.4371	18.72	7.99	26.71	40.00	-13.29	205	104	peak

Vertical



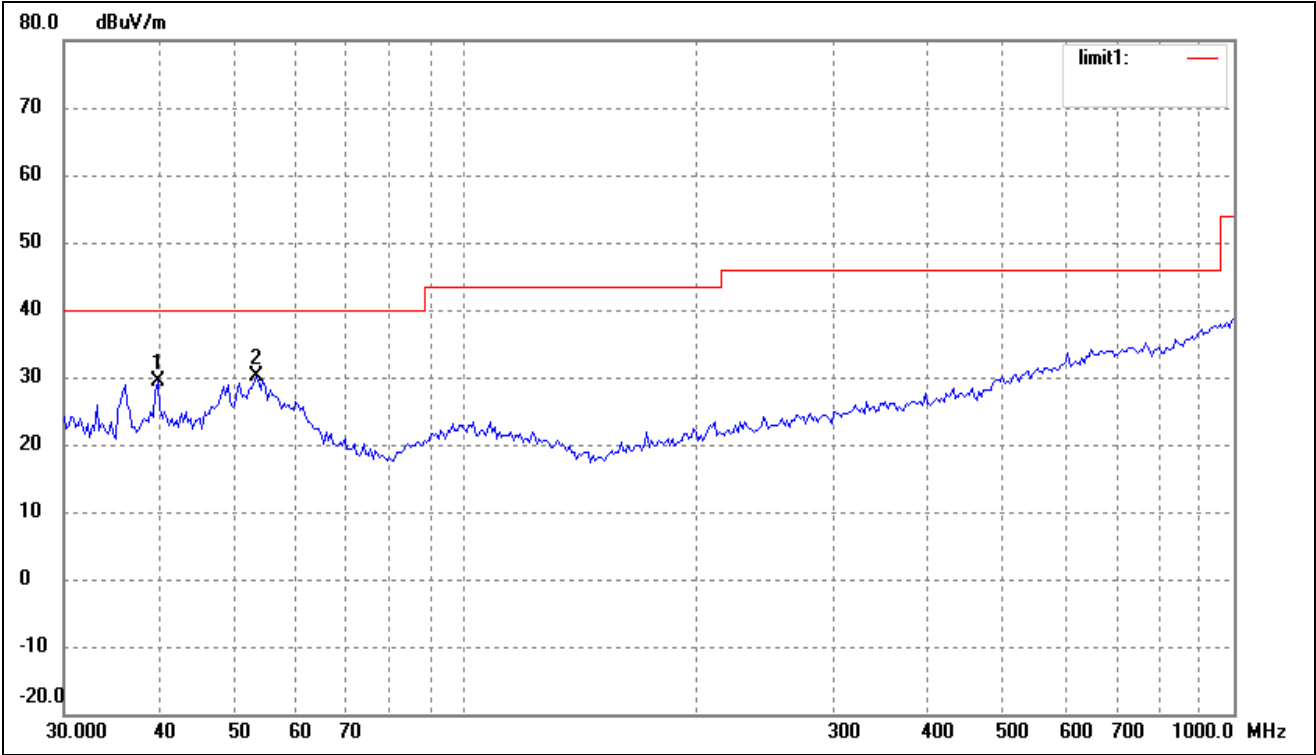
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.0007	20.85	7.05	27.90	40.00	-12.10	220	100	peak
2	39.7146	20.37	8.07	28.44	40.00	-11.56	360	400	peak
3	107.5101	15.60	7.80	23.40	43.50	-20.10	350	120	peak

Middle Channel(2439.5MHz)
Horizontal



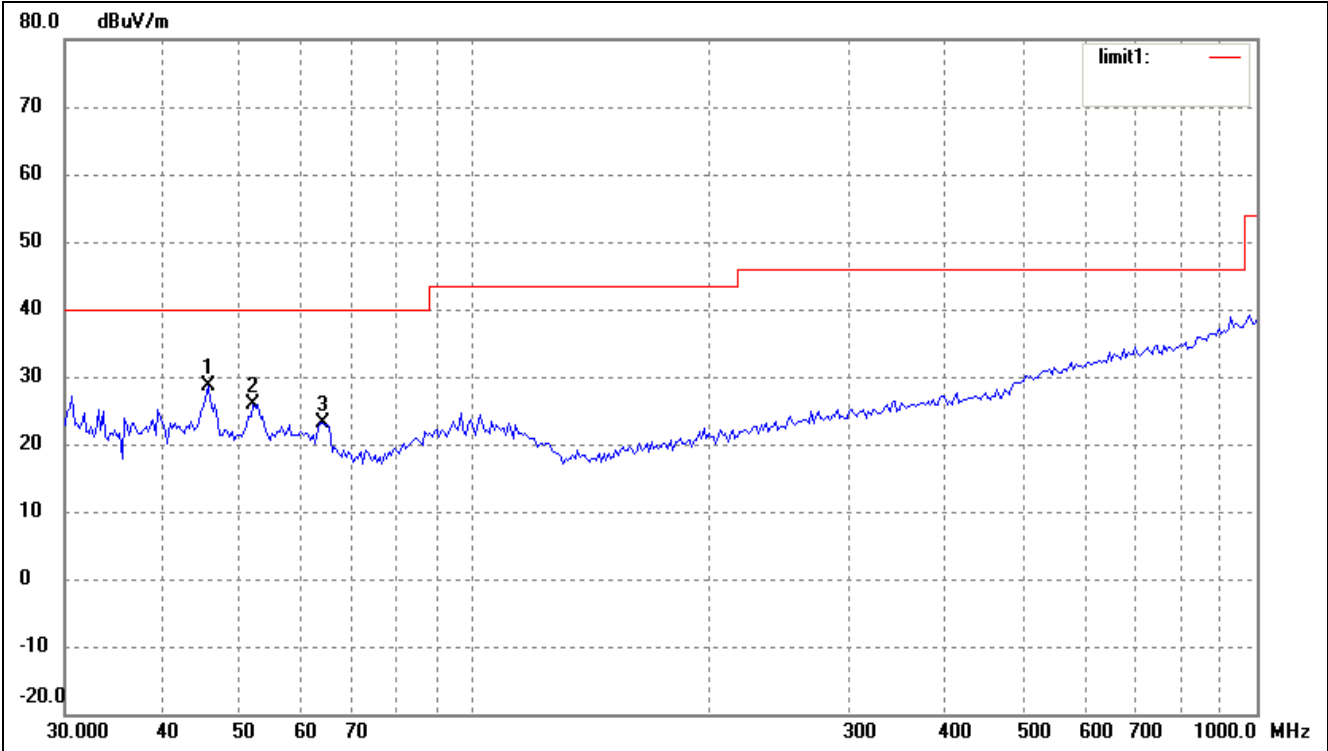
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	39.4371	21.22	7.99	29.21	40.00	-10.79	223	203	peak
2	49.0144	18.26	8.02	26.28	40.00	-13.72	360	200	peak

Vertical



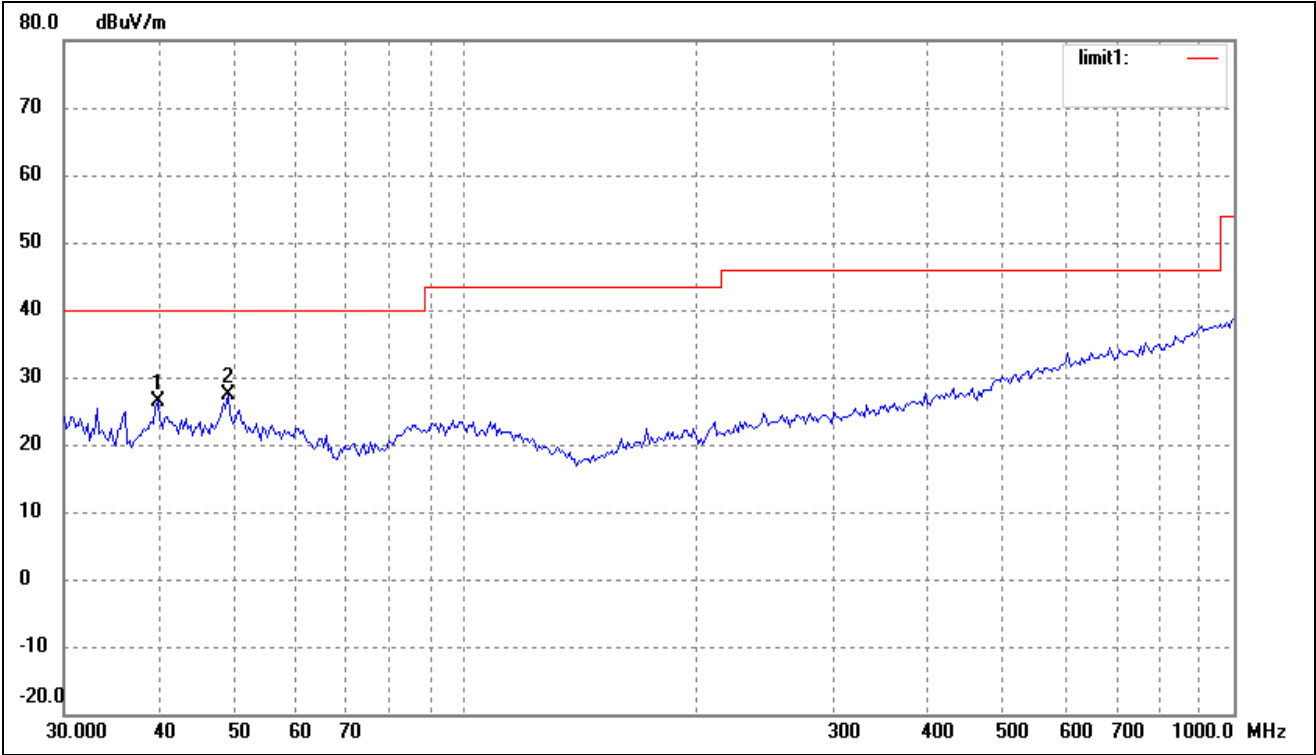
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	39.7146	21.37	8.07	29.44	40.00	-10.56	220	100	peak
2	53.3179	22.27	7.84	30.11	40.00	-9.89	360	400	peak

High Channel(2479.5MHz)
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	45.6948	20.43	8.20	28.63	40.00	-11.37	223	203	peak
2	52.2079	17.94	7.88	25.82	40.00	-14.18	360	200	peak
3	63.9827	17.16	5.97	23.13	40.00	-16.87	205	104	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	39.7146	18.37	8.07	26.44	40.00	-13.56	220	100	peak
2	49.0144	19.32	8.02	27.34	40.00	-12.66	360	400	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 Channel (2403.5MHz)										
2403.5	AV	63.26	45	H	29.1	3.7	34.0	62.06	94	-31.94
2403.5	PK	67.47	78	H	29.1	3.7	34.0	66.27	114	-47.73
4807.0	AV	17.03	57	H	34.1	5.2	33.0	23.33	54	-30.67
4807.0	PK	33.82	65	H	34.1	5.2	33.0	40.12	74	-33.88
7210.5	AV	10.04	60	H	37.4	6.1	33.5	20.04	54	-33.96
7210.5	PK	23.00	256	H	37.4	6.1	33.5	33.00	74	-41.00
2403.5	AV	67.29	359	V	29.1	3.7	34.0	66.09	94	-27.91
2403.5	PK	68.29	44	V	29.1	3.7	34.0	67.09	114	-46.91
4807.0	AV	17.49	35	V	34.1	5.2	33.0	23.79	54	-30.21
4807.0	PK	34.22	98	V	34.1	5.2	33.0	40.52	74	-33.48
7210.5	AV	10.3	79	V	37.4	6.1	33.5	20.30	54	-33.7
7210.5	PK	23.22	185	V	37.4	6.1	33.5	33.22	74	-40.78
Middle Channel (2439.5MHz)										
2439.5	AV	60.12	34	H	29.1	3.7	34	58.92	94	-35.08
2439.5	PK	65.27	159	H	29.1	3.7	34	64.07	114	-49.93
4879	AV	16.91	341	H	34.1	5.2	33	23.21	54	-30.79
4879	PK	31.76	28	H	34.1	5.2	33	38.06	74	-35.94
7318.5	AV	10.1	91	H	37.4	6.1	33.5	20.10	54	-33.9
7318.5	PK	21.86	267	H	37.4	6.1	33.5	31.86	74	-42.14
2439.5	AV	64.37	33	V	29.1	3.7	34	63.17	94	-30.83
2439.5	PK	68.83	164	V	29.1	3.7	34	67.63	114	-46.37
4879	AV	18.42	24	V	34.1	5.2	33	24.72	54	-29.28
4879	PK	36.14	177	V	34.1	5.2	33	42.44	74	-31.56
7318.5	AV	9.97	325	V	37.4	6.1	33.5	19.97	54	-34.03
7318.5	PK	22.42	77	V	37.4	6.1	33.5	32.42	74	-41.58

High Channel (2479.5MHz)										
2479.5	AV	60.59	63	H	29.1	3.7	34.0	59.39	94	-34.61
2479.5	PK	67.97	85	H	29.1	3.7	34.0	66.77	114	-47.23
4959	AV	18.91	17	H	34.1	5.2	33.0	25.21	54	-28.79
4959	PK	36.66	50	H	34.1	5.2	33.0	42.96	74	-31.04
7438.5	AV	10.54	355	H	37.4	6.1	33.5	20.54	54	-33.46
7438.5	PK	22.53	269	H	37.4	6.1	33.5	32.53	74	-41.47
2479.5	AV	59.99	85	V	29.1	3.7	34.0	58.79	94	-35.21
2479.5	PK	68.81	55	V	29.1	3.7	34.0	67.61	114	-46.39
4959	AV	19.63	13	V	34.1	5.2	33.0	25.93	54	-28.07
4959	PK	37.33	59	V	34.1	5.2	33.0	43.63	74	-30.37
7438.5	AV	10.45	66	V	37.4	6.1	33.5	20.45	54	-33.55
7438.5	PK	21.65	64	V	37.4	6.1	33.5	31.65	74	-42.35

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

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

5. §15.249(b) 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	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2438.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4 Environmental Conditions

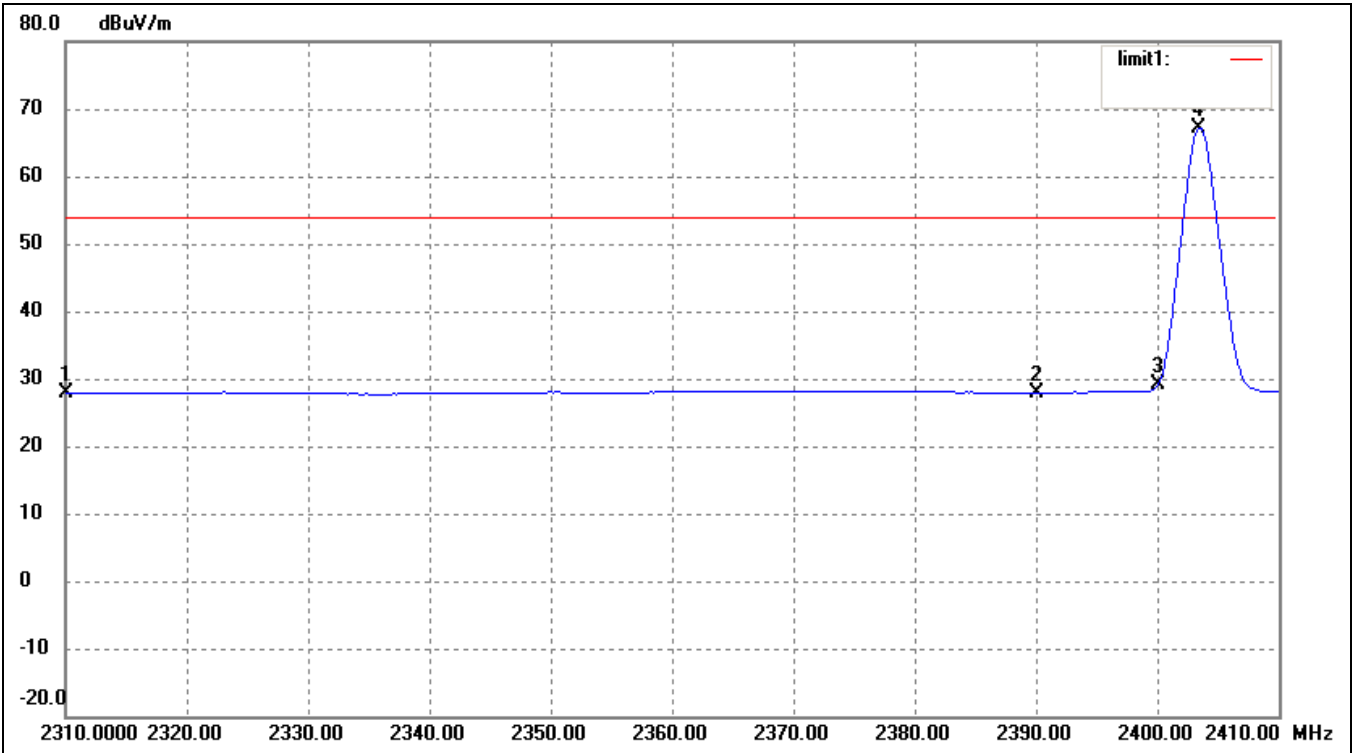
Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

5.5 Summary of Test Results/Plots

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

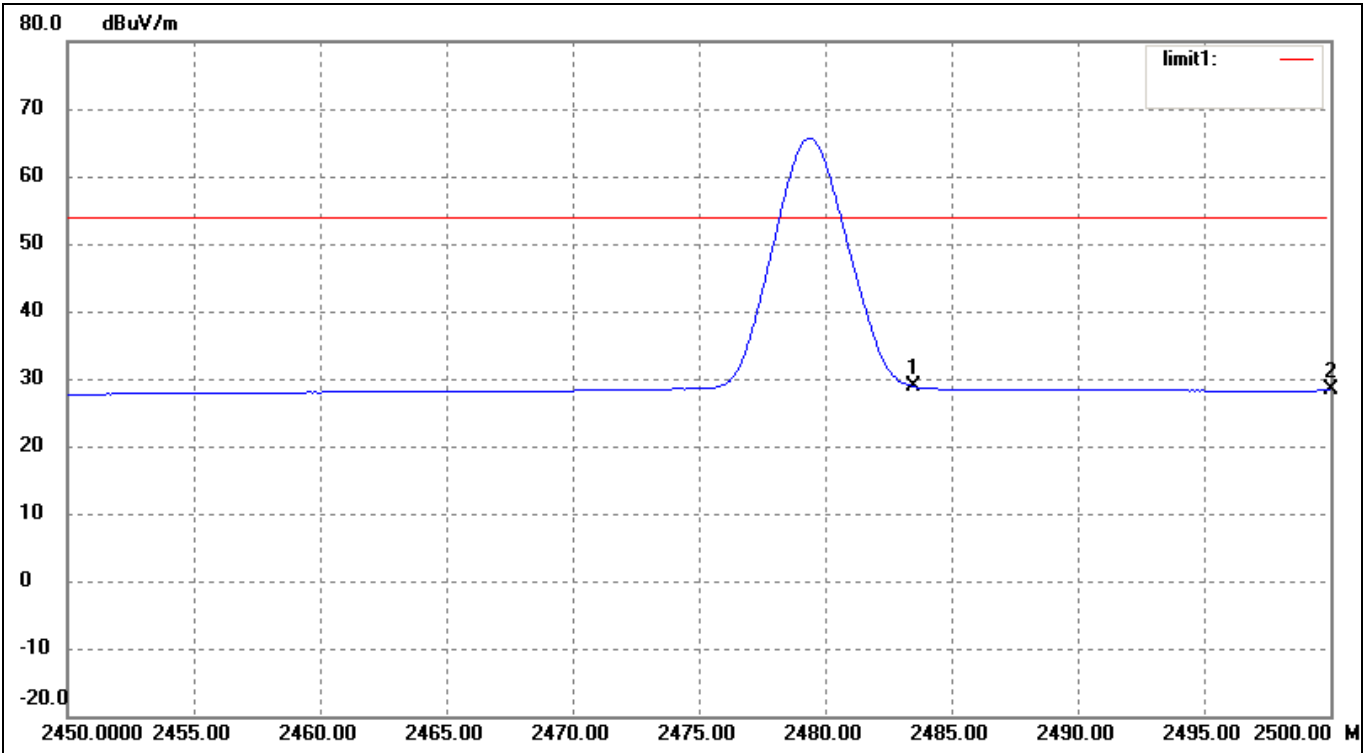
The edge emissions are below the FCC 15.209 Limits. Please refer to the test plots below.

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	35.32	-7.51	27.81	54.00	-26.19	Ave Detector
	2310.000	47.18	-7.51	39.67	74.00	-34.33	Peak Detector
2	2390.000	35.28	-7.34	27.94	54.00	-26.06	Ave Detector
	2390.000	46.90	-7.34	39.56	74.00	-34.44	Peak Detector
3	2400.000	36.39	-7.31	29.08	54.00	-24.92	Ave Detector
	2400.000	55.66	-7.31	48.35	74.00	-25.65	Peak Detector
4	2403.400	74.46	-7.30	67.16	54.00	13.16	

Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	36.00	-7.13	28.87	54.00	-25.13	Ave Detector
	2483.500	54.54	-7.13	47.41	74.00	-26.59	Peak Detector
2	2500.000	35.36	-7.08	28.28	54.00	-25.72	Ave Detector
	2500.000	48.97	-7.08	41.89	74.00	-32.11	Peak Detector

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