

FCC PART 15.249
MEASUREMENT AND TEST REPORT
FOR
SHENZHEN COLCO MODEL CO., LTD

West building 3, HuangJiangYuan Ind Park QiaoLi North Gate ChangPing
 Town Dongguan China

FCC ID: TZMLAMA5-J

Report Concerns: Original Report	Equipment Type: 2.4G 4CH RC Helicopter
Model:	<u>2.4G Lama5-J</u>
Report No.:	<u>STR10128165I</u>
Test Date:	<u>2010-12-24 to 2011-02-19</u>
Issue Date:	<u>2011-03-21</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: SHENZHEN COLCO MODEL CO., LTD
 Address of applicant: West building 3, HuangJiangYuan Ind Park QiaoLi North Gate ChangPing Town Dongguan China

Manufacturer: SHENZHEN COLCO MODEL CO., LTD
 Address of manufacturer: West building 3, HuangJiangYuan Ind Park QiaoLi North Gate ChangPing Town Dongguan China

General Description of E.U.T

Items	Description
EUT Description:	2.4G 4CH RC Helicopter
Trade Name:	COLCO
Model No.:	2.4G Lama5-J
Adding Models:	Ranger206-J, 2.4G Lama6-J
Rated Voltage:	12V DC
Rated Current:	/
RF Output Power:	<10 m W
Frequency Range:	2402~2480MHz
Antenna Type:	Integral Antenna
Size:	18.5X29.5X9.5 cm
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. Test is carried out with 2.4G Lama5-J since the other models listed in this report are different appearance without circuit and electronic construction changed, declared by the manufacture.

1.2 Test Standards

The following report is prepared on behalf of the SHENZHEN COLCO MODEL 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.

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	Compliant
§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. §15.207 (a)- CONDUCTED EMISSION

4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-12-20	2011-12-19
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-12-20	2011-12-19
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-12-20	2011-12-19

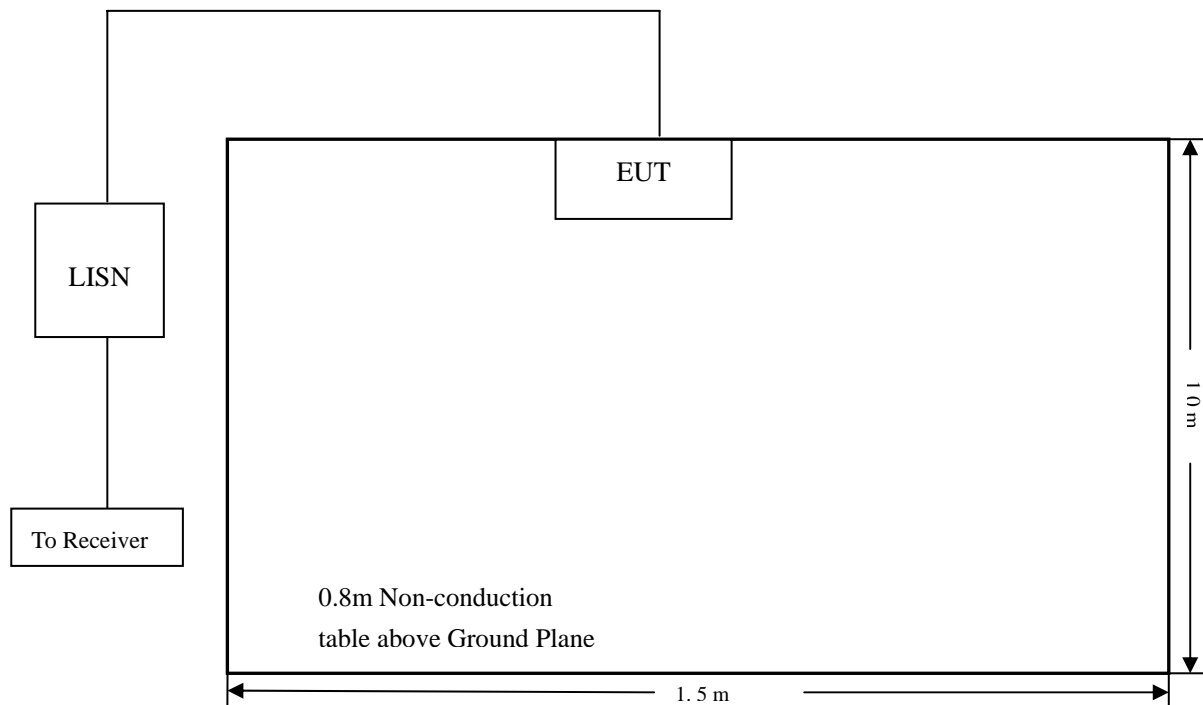
4.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 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.

4.4 Basic Test Setup Block Diagram



4.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

4.6 Test Receiver Setup

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

- Start Frequency 150 kHz
- Stop Frequency..... 30 MHz
- Sweep Speed Auto
- IF Bandwidth..... 10 kHz
- Quasi-Peak Adapter Bandwidth 9 kHz
- Quasi-Peak Adapter Mode Normal

4.7 Summary of Test Results/Plots

According to the data in section 3.8, the EUT complied with the FCC Part 15B Conducted margin for a Class B device, with the *worst* margin reading of:

-7.4 dBµV at 0.166 MHz in the Line mode, Pk detector, 0.15-30MHz

4.8 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

Conducted Disturbance

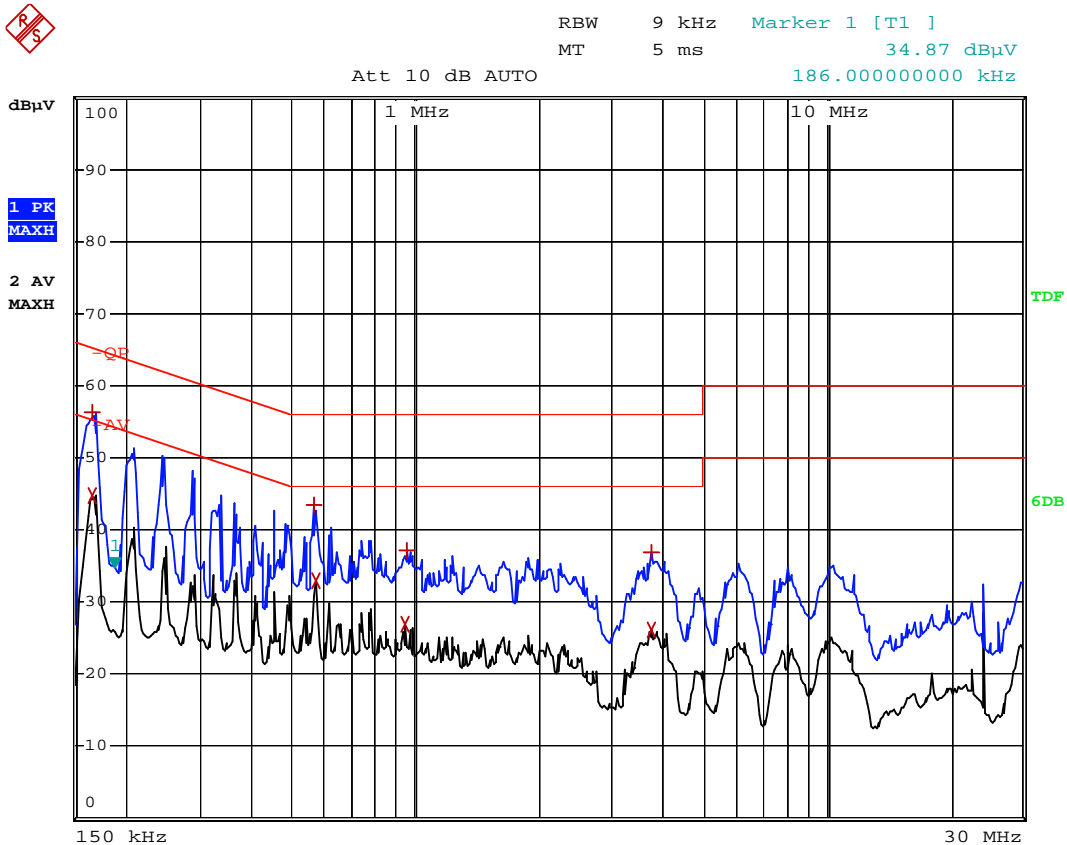
EUT: 2.4G 4CH RC Helicopter

M/N: 2.4G Lama5-J

Operating Condition: Charging

Test Specification: N

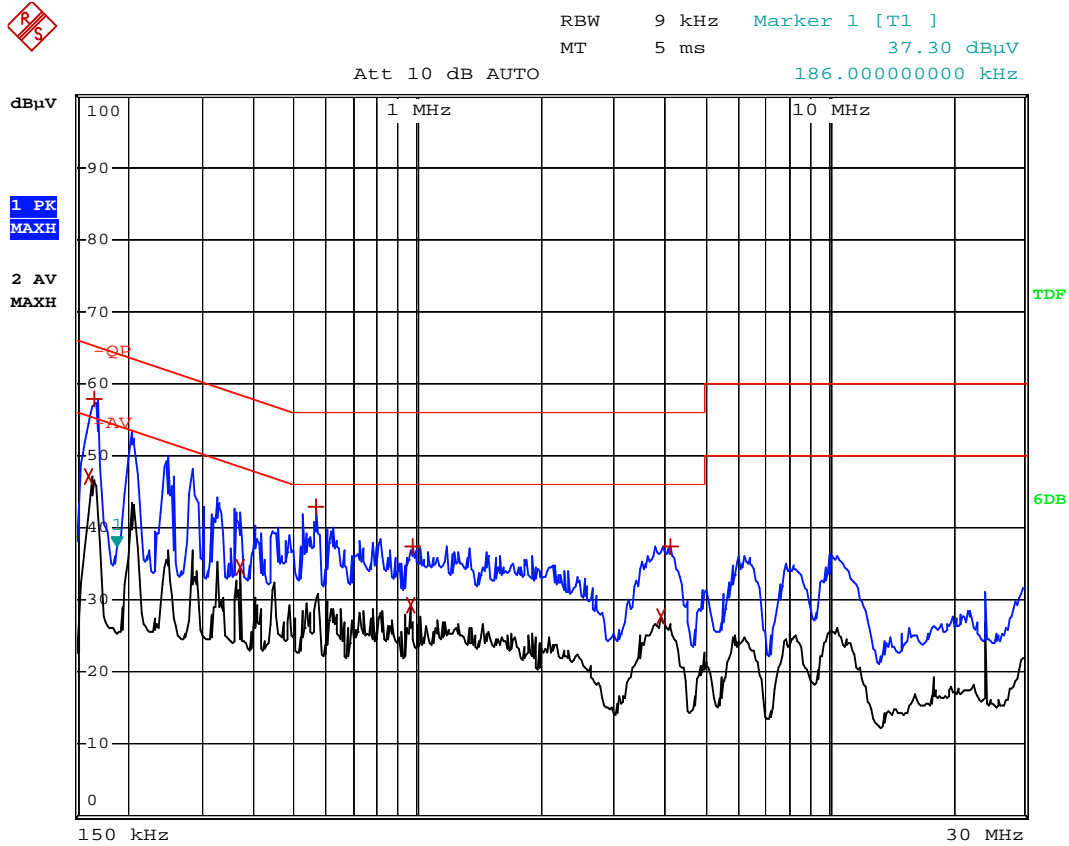
Comment: AC 120V/60Hz



EDIT PEAK LIST (Prescan Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
1 Max Peak	166 kHz	56.20	-8.95
2 Average	166 kHz	44.62	-10.52
1 Max Peak	566 kHz	43.40	-12.59
2 Average	570 kHz	32.93	-13.06
2 Average	946 kHz	26.92	-19.07
1 Max Peak	958 kHz	37.05	-18.94
1 Max Peak	3.75 MHz	36.91	-19.08
2 Average	3.75 MHz	26.07	-19.93

Plot of Conducted Emissions Test Data

Conducted Disturbance
 EUT: 2.4G 4CH RC Helicopter
 M/N: 2.4G Lama5-J
 Operating Condition: Charging
 Test Specification: L
 Comment: AC 120V/60Hz



EDIT PEAK LIST (Prescan Results)				
TRACE	FREQUENCY	LEVEL dBµV	DELTA	LIMIT dB
Trace1:	-QP			
Trace2:	-AV			
Trace3:	---			
2 Average	162 kHz	47.07		-8.28
1 Max Peak	166 kHz	57.75		-7.40
2 Average	370 kHz	34.56		-13.93
1 Max Peak	566 kHz	42.95		-13.04
2 Average	962 kHz	29.23		-16.76
1 Max Peak	974 kHz	37.48		-18.51
2 Average	3.926 MHz	27.63		-18.36
1 Max Peak	4.13 MHz	37.52		-18.47

5. §15.205, §15.209, §15.249 (a)- RADIATED EMISSION

5.1 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.

5.2 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

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.

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 20 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209,WHICHEVER IS THE LESSER ATTENUATION.

Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

5.3 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

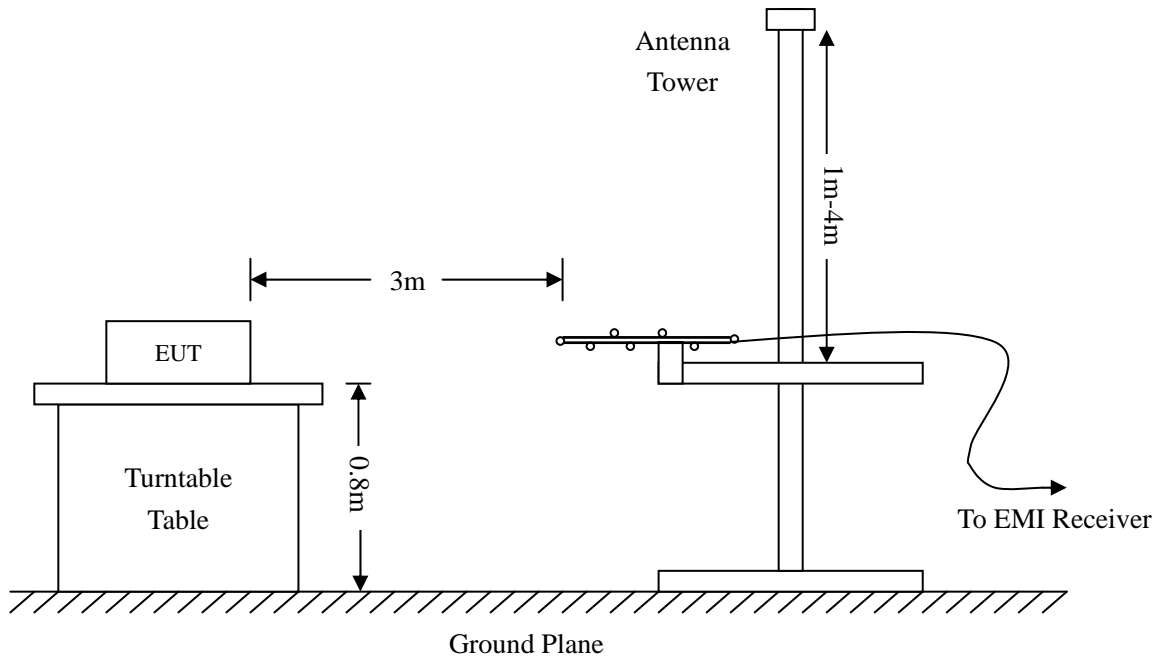
Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.4 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 15.247(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.



5.5 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:

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

5.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	41 %
ATM Pressure:	1012 mbar

5.7 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:

-0.40 dB μ V at 4884.0 MHz in the Horizontal polarization, 30 MHz 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

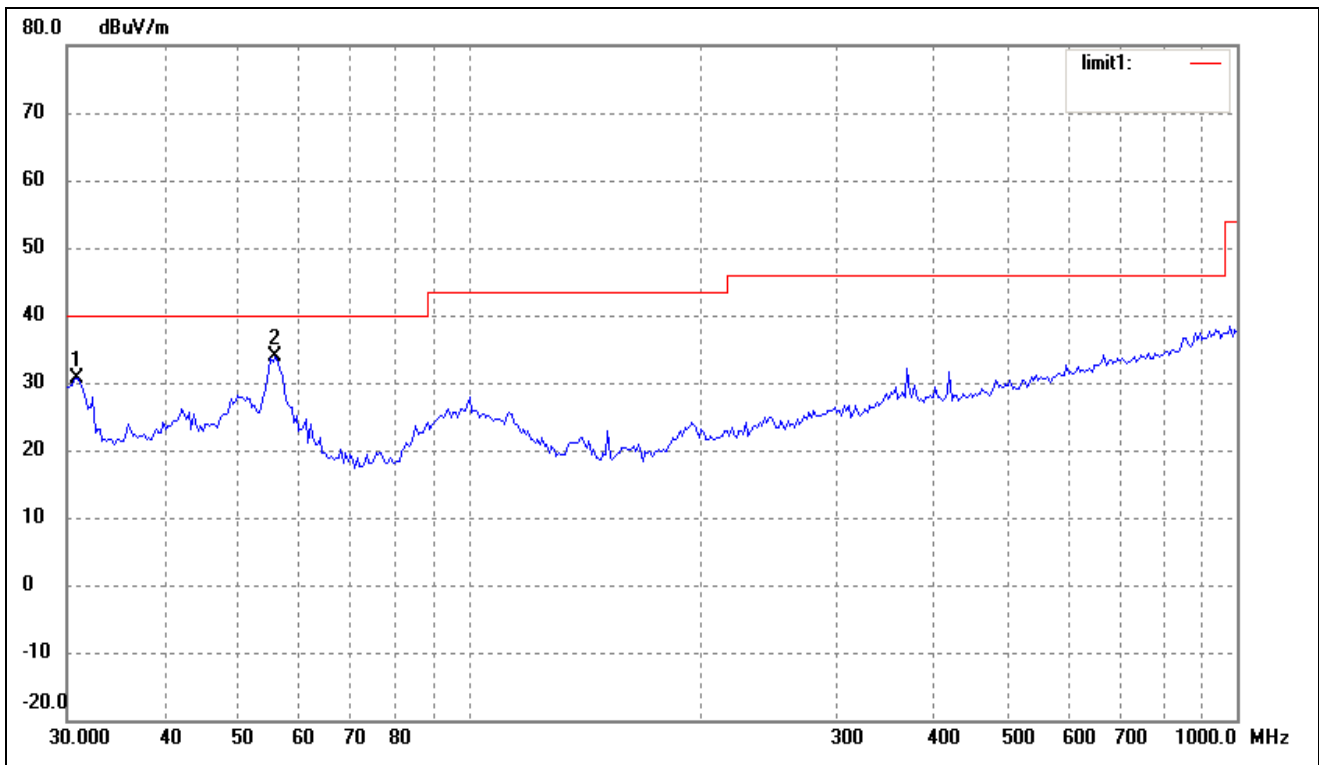
EUT: 2.4G 4CH RC Helicopter

M/N: 2.4G Lama5-J

Operating Condition: Charging

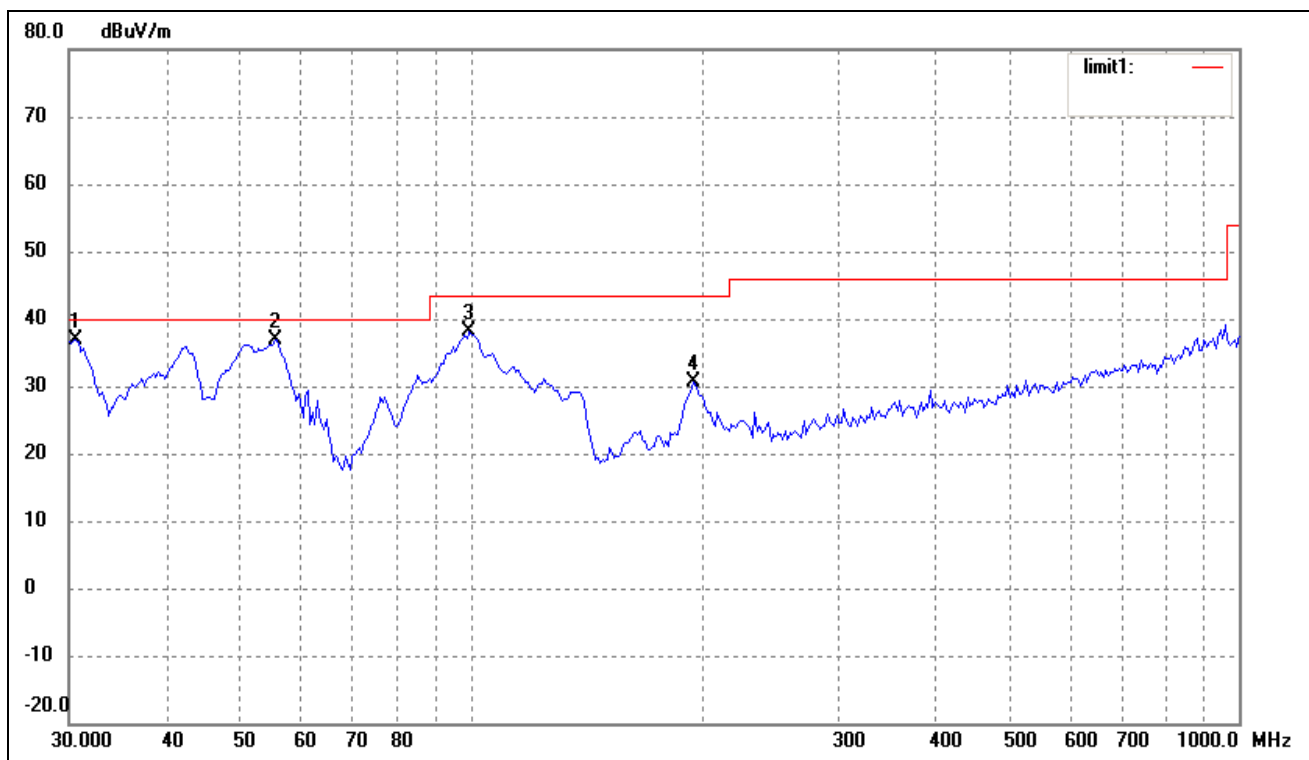
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.8535	23.71	6.93	30.64	40.00	-9.36	360	100	peak
2	56.0007	26.21	7.73	33.94	40.00	-6.06	360	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.6379	29.98	6.93	36.91	40.00	-3.09	360	100	peak
2	55.6094	29.10	7.74	36.84	40.00	-3.16	360	100	peak
3	99.5281	29.69	8.40	38.09	43.50	-5.41	360	100	peak
4	195.1365	23.87	6.86	30.73	43.50	-12.77	360	100	peak

Radiated Disturbance

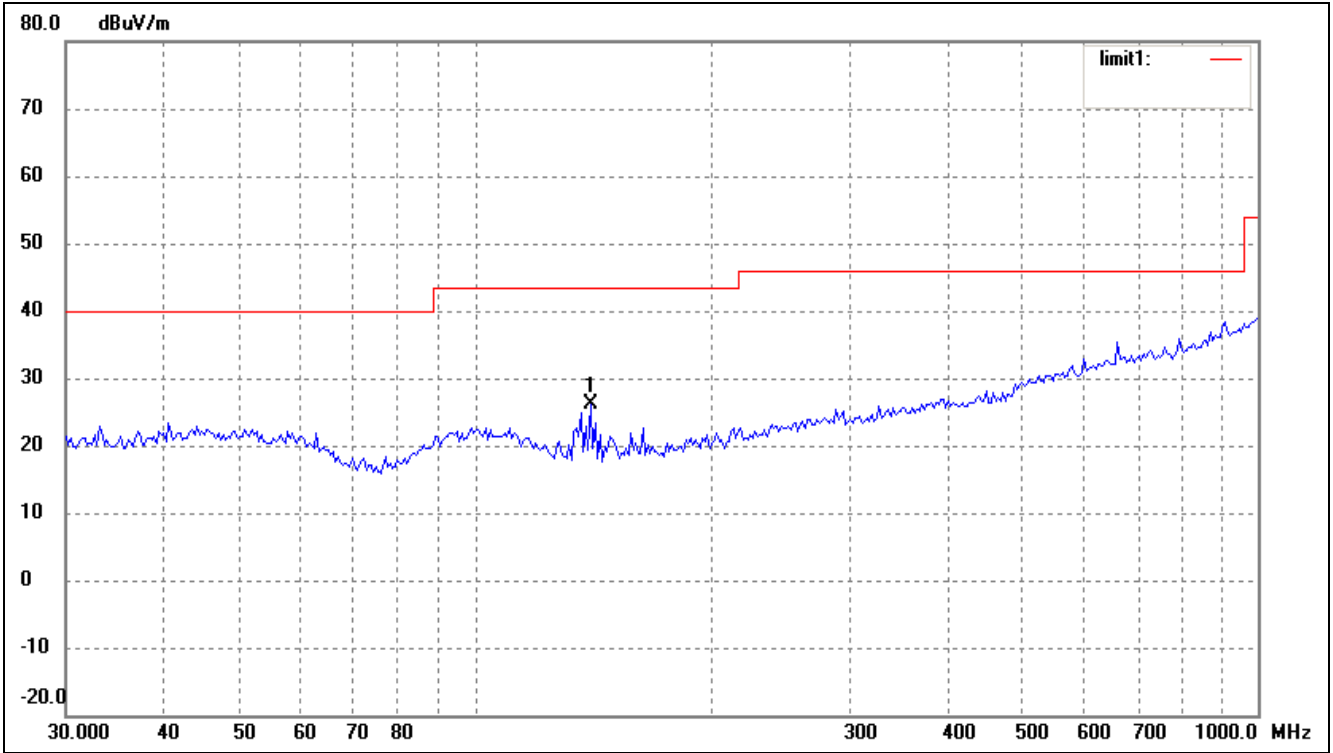
EUT: 2.4G 4CH RC Helicopter

M/N: 2.4G Lama5-J

Operating Condition: Transmitting below 1GHz (Low CH)

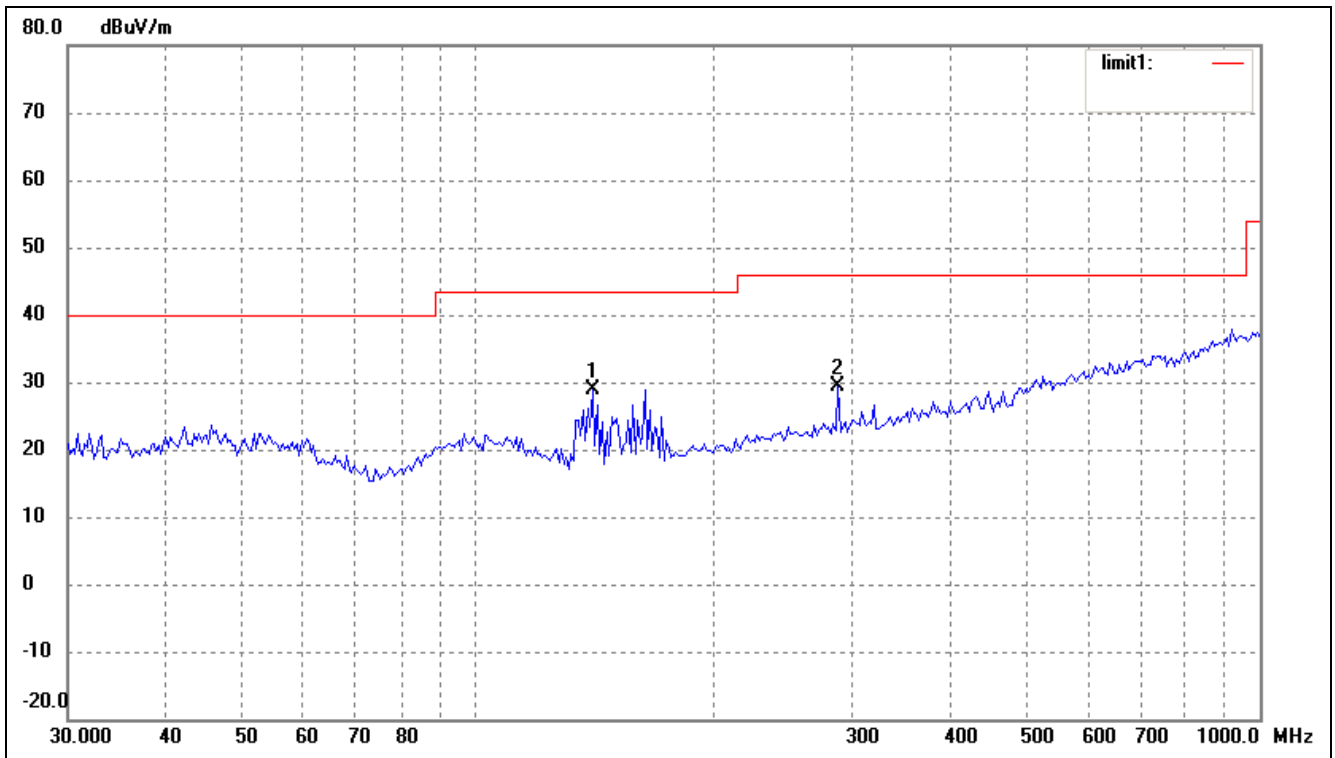
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	140.3421	22.23	3.96	26.19	43.50	-17.31	123	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	140.3421	24.96	3.96	28.92	43.50	-14.58	225	100	peak
2	289.0021	19.71	9.63	29.34	46.00	-16.66	36	100	peak

Radiated Disturbance

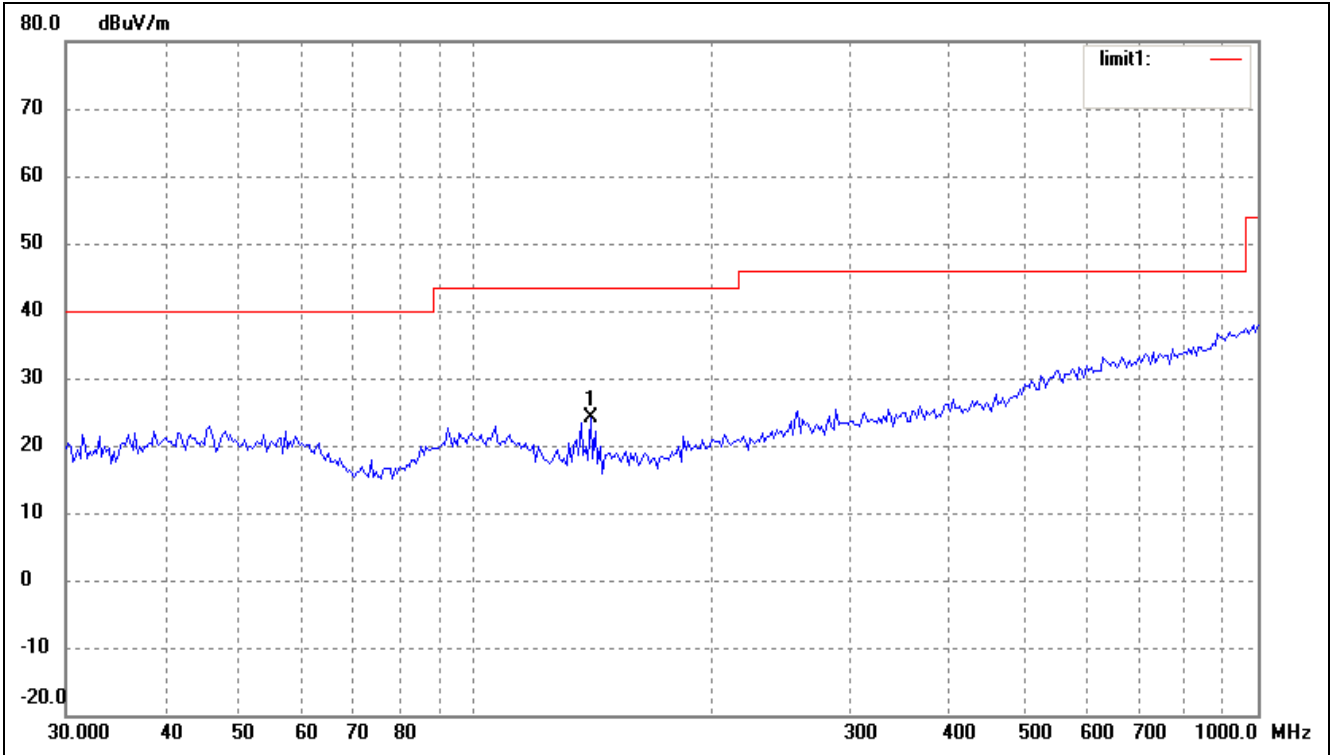
EUT: 2.4G 4CH RC Helicopter

M/N: 2.4G Lama5-J

Operating Condition: Transmitting below 1GHz (Middle CH)

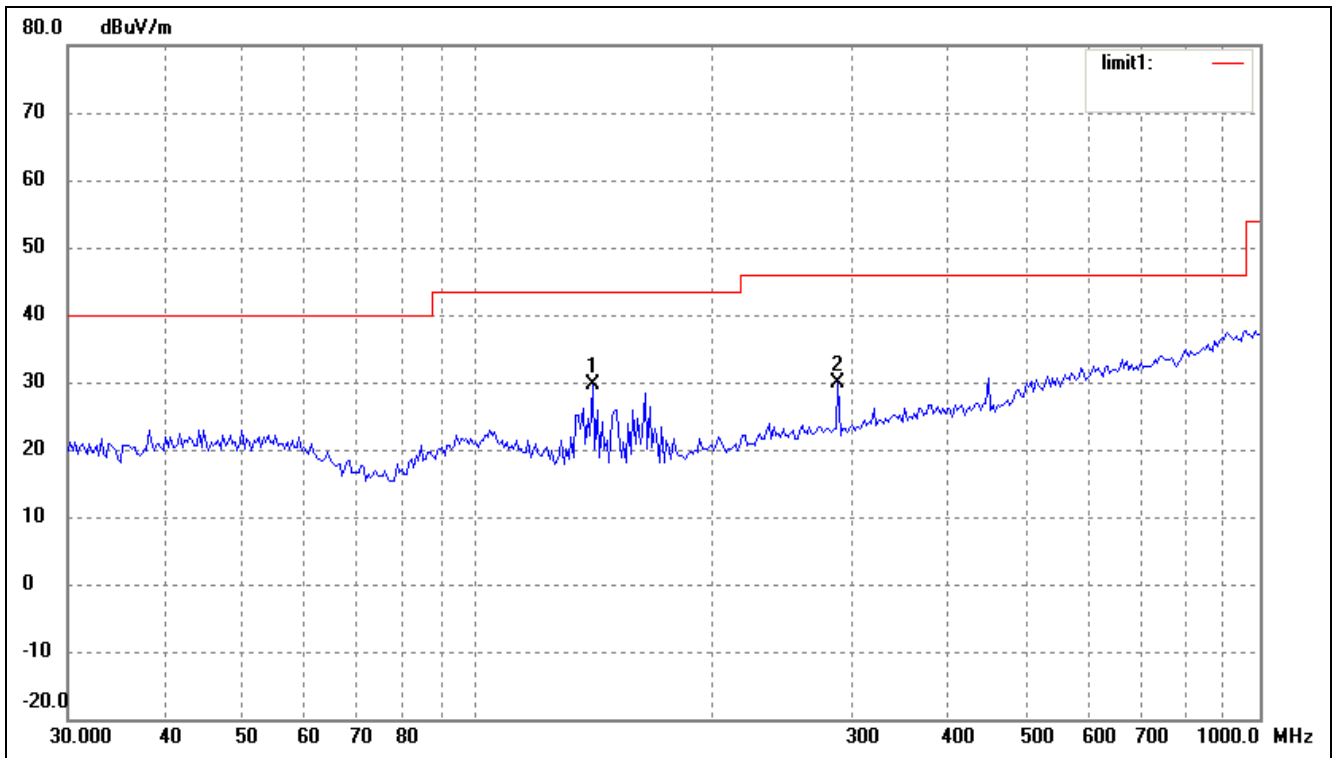
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	140.3421	20.20	3.96	24.16	43.50	-19.34	154	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	140.3421	25.79	3.96	29.75	43.50	-13.75	32	100	peak
2	289.0021	20.28	9.63	29.91	46.00	-16.09	242	100	peak

Radiated Disturbance

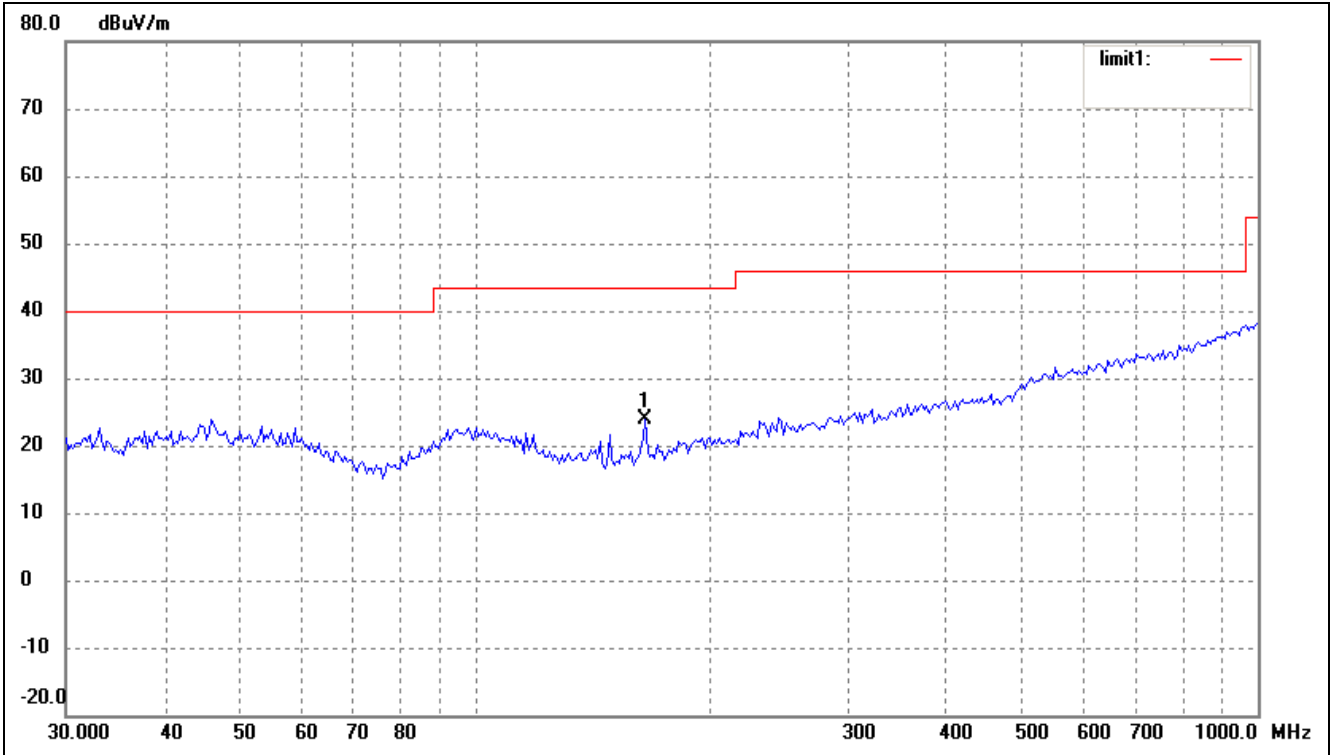
EUT: 2.4G 4CH RC Helicopter

M/N: 2.4G Lama5-J

Operating Condition: Transmitting below 1GHz (High CH)

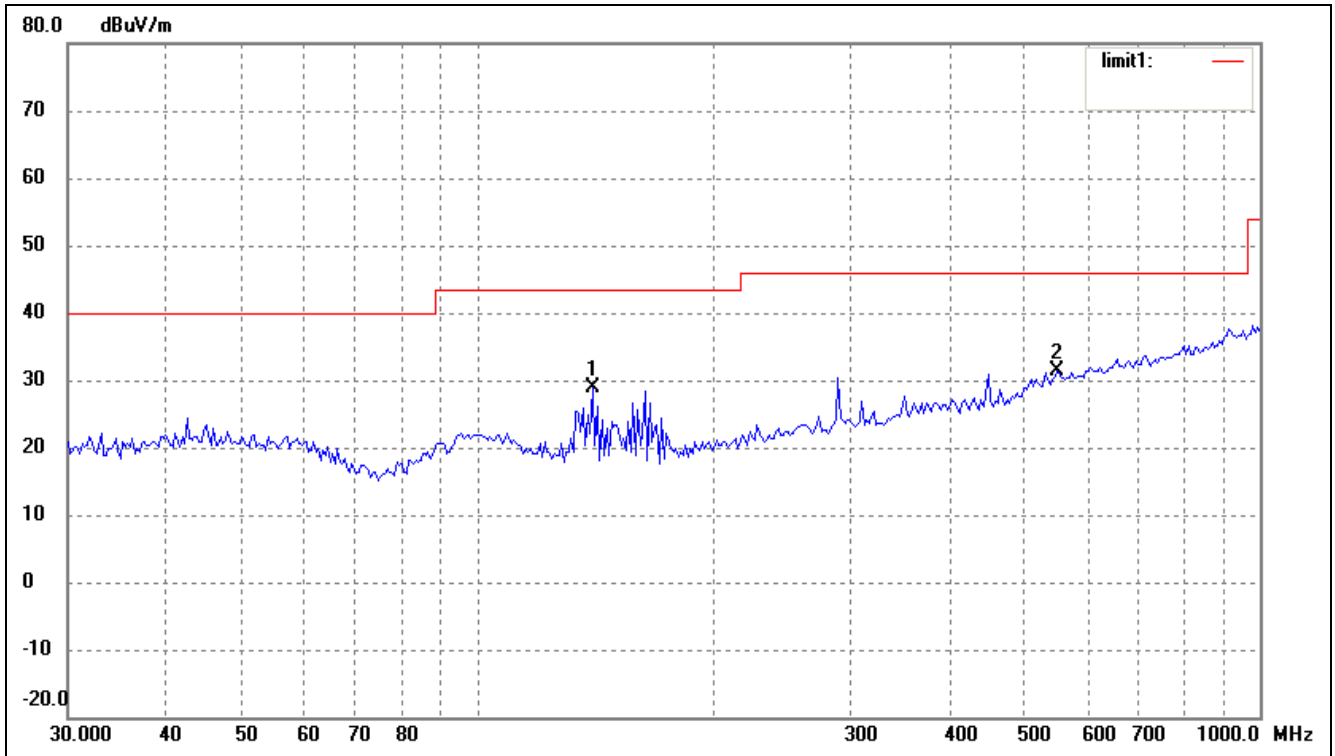
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	164.9075	19.27	4.71	23.98	43.50	-19.52	49	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	140.3421	24.97	3.96	28.93	43.50	-14.57	216	100	peak
2	550.9480	15.72	15.57	31.29	46.00	-14.71	14	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
4804.0	AV	40.6	24	V	34.1	5.2	33	46.88	54	-7.1
4804.0	AV	46.6	24	H	34.1	5.2	33	52.91	54	-1.1
4804.0	PK	40.7	177	V	34.1	5.2	33	46.96	74	-27.0
4804.0	PK	46.7	177	H	34.1	5.2	33	53.03	74	-21.0
9608.0	AV	39.6	91	V	37.4	6.1	33.5	49.61	54	-4.4
9608.0	AV	39.3	91	H	37.4	6.1	33.5	49.25	54	-4.8
9608.0	PK	39.8	77	V	37.4	6.1	33.5	49.83	74	-24.2
9608.0	PK	39.4	77	H	37.4	6.1	33.5	49.38	74	-24.6
2402.0	AV	85.2	33	V	29.1	3.7	34	84.04	94	-10.0
2402.0	AV	73.1	33	H	29.1	3.7	34	71.88	94	-22.1
2402.0	PK	85.4	164	V	29.1	3.7	34	84.16	114	-29.8
2402.0	PK	73.2	164	H	29.1	3.7	34	72.01	114	-42.0
4884.0	AV	40.7	115	V	34.1	5.2	33	46.96	54	-7.0
4884.0	AV	47.3	115	H	34.1	5.2	33	53.64	54	-0.4
4884.0	PK	39.8	0	V	34.1	5.2	33	46.14	74	-27.9
4884.0	PK	47.5	0	H	34.1	5.2	33	53.79	74	-20.2
9768.0	AV	37.9	158	V	37.4	6.1	33.5	47.94	54	-6.1
9768.0	AV	41.6	158	H	37.4	6.1	33.5	51.60	54	-2.4
9768.0	PK	38.1	34	V	37.4	6.1	33.5	48.05	74	-26.0
9768.0	PK	41.8	34	H	37.4	6.1	33.5	51.84	74	-22.2
2442.0	AV	85.3	24	V	29.1	3.7	34	84.14	94	-9.9
2442.0	AV	73.9	24	H	29.1	3.7	34	72.74	94	-21.3
2442.0	PK	85.4	90	V	29.1	3.7	34	84.18	114	-29.8
2442.0	PK	74.1	90	H	29.1	3.7	34	72.86	114	-41.1
4960.0	AV	41.1	63	V	34.1	5.2	33	47.39	54	-6.6
4960.0	AV	46.9	63	H	34.1	5.2	33	53.24	54	-0.8
4960.0	PK	41.2	157	V	34.1	5.2	33	47.51	74	-26.5
4960.0	PK	47.1	157	H	34.1	5.2	33	53.35	74	-20.7
9920.0	AV	36.0	24	V	37.4	6.1	33.5	46.04	54	-8.0
9920.0	AV	38.7	24	H	37.4	6.1	33.5	48.73	54	-5.3
9920.0	PK	36.2	44	V	37.4	6.1	33.5	46.16	74	-27.8
9920.0	PK	38.8	44	H	37.4	6.1	33.5	48.78	74	-25.2

2480.0	AV	85.5	51	V	29.1	3.7	34	84.33	94	-9.7
2480.0	AV	73.8	51	H	29.1	3.7	34	72.57	94	-21.4
2480.0	PK	85.7	33	V	29.1	3.7	34	84.50	114	-29.5
2480.0	PK	73.8	33	H	29.1	3.7	34	72.59	114	-41.4

Note: Testing is carried out with frequency rang 30MHz 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. Emissions 20dB lower than the limit are not reported.

6. §15.249(b) OUT OF BAND EMISSIONS

6.1 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.

6.2 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.

6.3 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.

6.4 Environmental Conditions

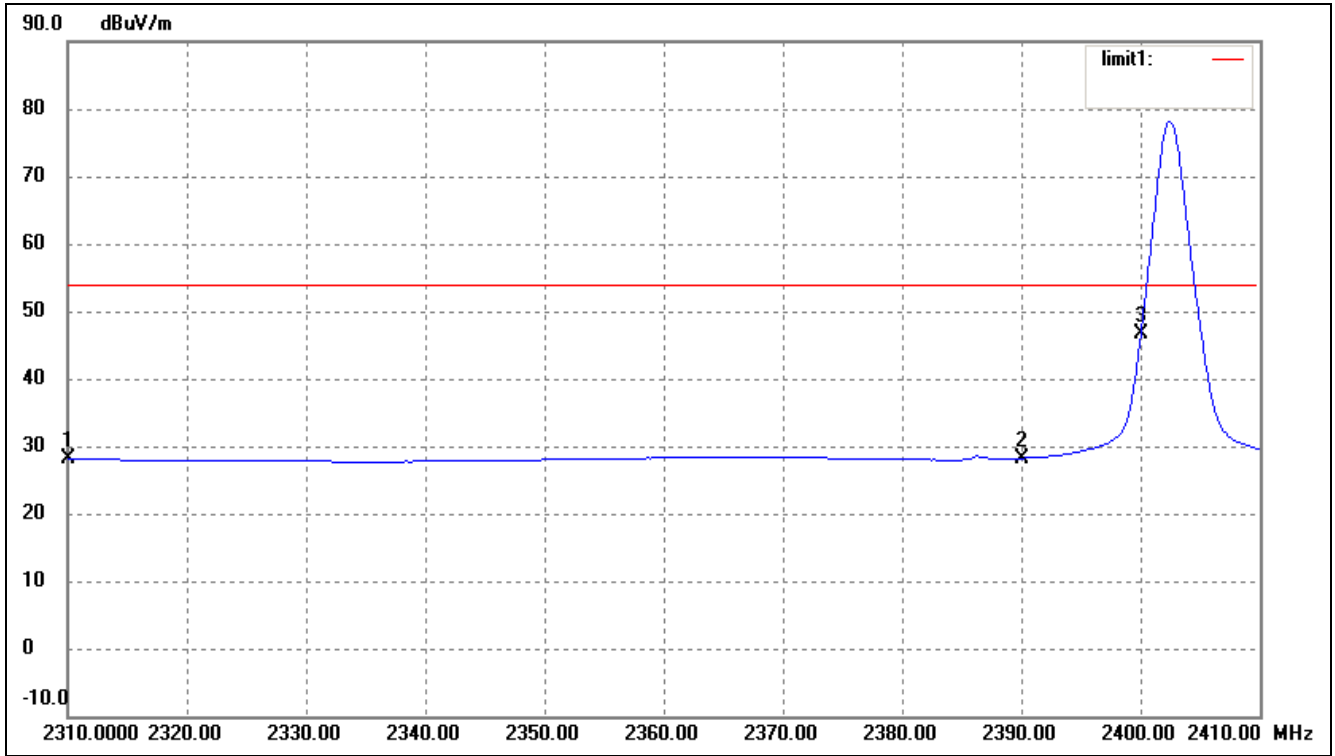
Temperature:	23 °C
Relative Humidity:	40 %
ATM Pressure:	1012 mbar

6.5 Summary of Test Results/Plots

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

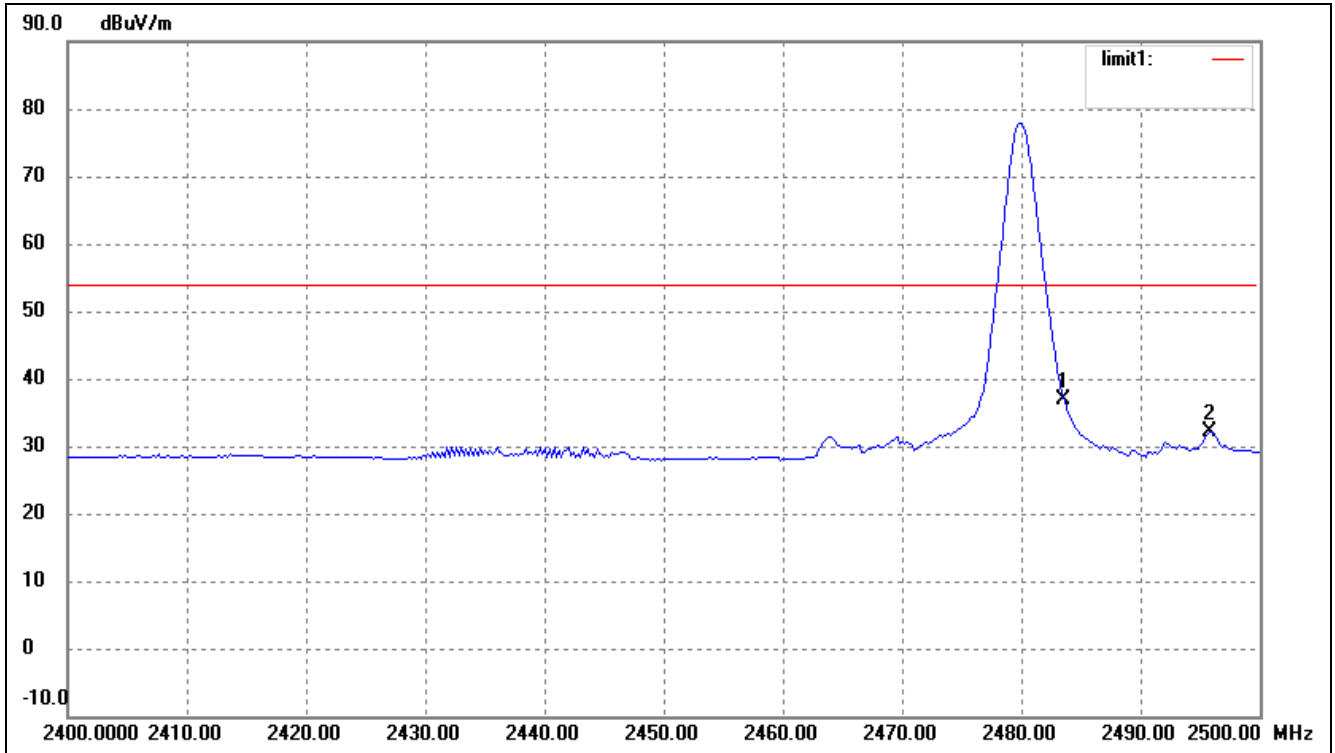
The edge emissions are below the FCC 15.209 Limits. Please refer to the test plots below.

Lowest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	32.67	-4.65	28.02	54.00	-25.98	Ave Detector
	2310.000	42.79	-4.65	38.14	74.00	-35.86	Peak Detector
2	2390.000	32.66	-4.46	28.20	54.00	-25.80	Ave Detector
	2390.000	42.81	-4.46	38.35	74.00	-35.65	Peak Detector
3	2400.000	51.18	-4.43	46.75	54.00	-7.25	Ave Detector
	2400.000	62.18	-4.43	57.85	74.00	-17.15	Peak Detector

Highest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	41.18	-4.23	36.95	54.00	-17.05	Ave Detector
	2483.500	51.22	-4.23	46.99	74.00	-27.01	Peak Detector
2	2495.800	36.24	-4.20	32.04	54.00	-21.96	Ave Detector
	2495.800	46.28	-4.20	42.08	74.00	-31.92	Peak Detector

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