STC Test Report

Date : 2008-11-10
No. : MH182636

Applicant (STD003): ShenZhen Zhongherong Electric Technology Co., Ltd.
Floor 1-3 No. 28 Building Northern Yongfa Tech Area Heyi Village Jinxiu Road Shajing District Baoan Shenzhen China

Manufacturer: ShenZhen Zhongherong Electric Technology Co., Ltd.
Floor 1-3 No. 28 Building Northern Yongfa Tech Area Heyi Village Jinxiu Road Shajing District Baoan Shenzhen China

Description of Samples:

Product:	Transmitter
Brand Name:	ESKY
Model Number:	0406F-72M
FCC ID:	WIC-SZESKY004

Date Samples Received: 2008-09-24

Date Tested: 2008-10-08 to 2008-10-23

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 95: 2007 and TIA 603 for FCC Certification.

Conclusions: The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 95.

Fundamental frequencies: 72.010MHz, 72.030MHz, 72.050MHz, 72.070MHz, 72.090MHz, 72.110MHz, 72.130MHz, 72.150MHz, 72.170MHz, 72.190MHz, 72.210MHz, 72.230MHz, 72.250MHz, 72.270MHz, 72.290MHz, 72.310MHz, 72.350MHz, 72.370MHz, 72.490MHz, 72.850MHz, 72.870MHz
(Please refer Section 2.2 of this report which indicates which Fundamental Carrier Frequency was actually tested.)

Remarks: ----

Dr. LEE Kam Chuen,
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

The Hong Kong Standards and Testing Centre Ltd.
10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong
Tel: (852) 2666 1888 Fax: (852) 2664 4353 Homepage: www.hkstc.org E-mail: hkstc@hkstc.org

CONTENT:

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

1.2 Applicant Details

Applicant

ShenZhen Zhongherong Electric Technology Co., Ltd.
Floor 1-3 No. 28 Building Northern Yongfa Tech Area Heyi Village Jinxiu Road Shajing District Baoan Shenzhen China

Manufacturer

ShenZhen Zhongherong Electric Technology Co., Ltd.
Floor 1-3 No. 28 Building Northern Yongfa Tech Area Heyi Village Jinxiu Road Shajing District Baoan Shenzhen China

1.3 Equipment Under Test [EUT]

Description of Sample

Product:	Transmitter
Manufacturer:	ShenZhen Zhongherong Electric Technology Co., Ltd.
Brand Name:	ESKY
Model Number:	0406F-72M
Input Voltage:	12Vd.c ("AA" size battery x 8)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is a ShenZhen Zhongherong Electric Technology Co., Ltd., Transmitter. The transmitter is an 8 switches and 2 joysticks transmitter. The EUT continues to transmit while switches / 2 joysticks is being pressed, Modulation by IC, and type is frequency modulation.

1.4 Date of Order

2008-09-24

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2008-10-18 to 2008-10-23

1.7 Country of Origin

China

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 95: 2007 and TIA 603 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result	
				Pass	Failed
Field Strength of Fundamental Emissions	FCC 47CFR 95.639	TIA 603	N/A	☒	☐
Field Strength of Spurious Emissions	FCC 47CFR 95.635	TIA 603	N/A	☒	☐
Emission Bandwidth	FCC 47CFR 95.633	TIA 603	N/A	☒	☐
Frequency Stability	FCC 47CFR 95.623	TIA 603	N/A	☒	☐

Note: N/A - Not Applicable

Remark:
Since the same PCBs, Circuit design only use different type of crystals,
Only 72.010MHz, 72490MHz & 72.870MHz were completely tested in the whole report.

This transmitter is designed for use only in the Radio Control Service. The operating frequency is factory defined and will not include a plug-in crystal with external access to the user. User may not modify the operating frequency by plug-in/change crystal.

3.0 Test Results

3.1 Field Strength of Fundamental Emissions

Test Requirement:	FCC 47CFR 95.639
Test Method:	TIA 603
Test Date:	2008-10-08
Mode of Operation:	Tx mode

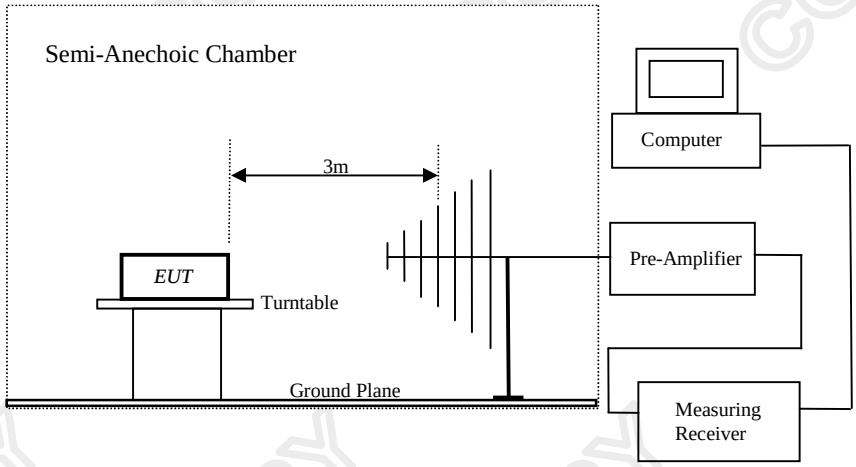
Test Method:

1) The EUT was placed 0.8m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, EUT output power was maximized by: having the EUT continuously working, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations.

2) The EUT is replaced by a substitution antenna (positioned at the EUT's phase or volume center), which is connected to a signal generator. The signal is again 'peaked' and the signal generator output adjusted until the level, noted in step one, is again measured on the receiving device. This signal generator output level is shown in Test Results of the following page.

*: Semi-anechoic chamber located on the G/F of HKSTC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Test Setup:



Test Result:

Ambient Temperature: 23°C Atmospheric Pressure: 102kPa Relative Humidity: 41%

The highest field strength measured at the fundamental frequency at a distance of 3 meters.

Fundamental Frequency	Field Strength of Fundamental Emission at 3m	Transmitter output power noted using antenna substitution method
[MHz]	[dBμV/m]	[mW]
72.010	116.7	44.67

The highest field strength measured at the fundamental frequency at a distance of 3 meters.

Fundamental Frequency	Field Strength of Fundamental Emission at 3m	Transmitter output power noted using antenna substitution method
[MHz]	[dBμV/m]	[mW]
72490	118.9	74.13

The highest field strength measured at the fundamental frequency at a distance of 3 meters.

Fundamental Frequency	Field Strength of Fundamental Emission at 3m	Transmitter output power noted using antenna substitution method
[MHz]	[dBμV/m]	[mW]
72.870	120.2	100

3.2 Field Strength of Spurious Emissions

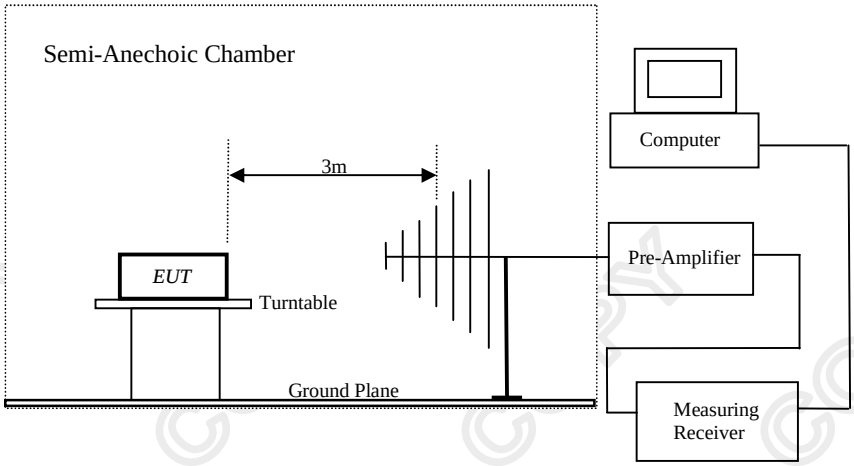
Test Requirement:	FCC 47CFR 95.635
Test Method:	TIA 603
Measurement Distance:	3m (Semi-Anechoic Chamber)
Frequency range:	30MHz – 1GHz for transmitting mode
	Test instrumentation resolution bandwidth 120kHz (30MHz – 100MHz)
Test Date:	2008-10-08
Mode of Operation:	Receive antenna scan height 1-4m, polarization Vertical / Horizontal
Tuned Frequency:	72.010MHz, 72.490MHz & 72.870MHz

Test Requirement:
The power of each unwanted emission should be less than the transmitter power (TP) by at least 56+10Log (TP) on any frequency removed from the center of the authorized bandwidth by more than 250%.

Below 30MHz Test Procedure:
For testing performed with the loop antenna, testing was performed in accordance to TIA 603. The center of the loop was positioned 1m above the ground and positioned with tits plane vertical at the specie distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

Above 30MHz Test Procedure:
The procedure used was TIA603. The receiver was scanned from 30MHz to 1GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the normal rated supply voltage. The worst case emissions were reported.

Test Setup:



Test Result:

Ambient Temperature: 23°C Atmospheric Pressure: 102kPa Relative Humidity: 41%

Field Strength of Spurious Emissions

Nominal Transmit Frequency: **72.010MHz**

Calculation of FCC Limit: FS-[56 + 10Log (TP)] :
where, TP = measured transmitter power (W); FS = Fundamental field strength (dBμV/m)

TP = 44.67mW, FS = 116.7dBμV/m

Limit: 116.7dBμV/m – [56+10log (44.67mW/1000)]=74.2 dBμV/m

Measured Emissions

Frequency (MHz)	Spurious Emission of EUT dB μ V/m
43.2	33.0
57.6	61.8
86.41	69.3
100.81	34.9
129.61	41.9
144.02	70.0
216.03	41.9
288.04	41.1
360.05	44.5
432.06	47.5
504.07	53.6
576.08	46.2
648.09	46.7
864.12	46.8
936.13	55.4

Calculated measurement uncertainty: 30MHz to 1GHz: 5.2dB

Test Result:

Ambient Temperature: 23°C Atmospheric Pressure: 102kPa Relative Humidity: 41%

Field Strength of Spurious Emissions

Nominal Transmit Frequency: **72.490MHz**

Calculation of FCC Limit: FS-[56 + 10Log (TP)] :
where, TP = measured transmitter power (W); FS = Fundamental field strength (dBμV/m)

TP = 74.3mW, FS = 118.9dBμV/m

Limit: 118.9dBμV/m – [56+10log(74.13mW/1000)]=74.2dBμV/m

Measured Emissions

Frequency (MHz)	Spurious Emission of EUT dB μ V/m
43.49	30.3
57.99	54.0
86.98	64.4
130.48	36.2
144.97	69.5
217.46	43.0
289.96	43.5
362.45	47.4
434.94	47.7
507.43	57.2
579.91	46.2
652.40	49.1
724.89	44.6
797.38	51.3
869.87	50.1
942.36	55.7

Calculated measurement uncertainty: 30MHz to 1GHz: 5.2dB

Test Result:

Ambient Temperature: 23°C Atmospheric Pressure: 102kPa Relative Humidity: 41%

Field Strength of Spurious Emissions

Nominal Transmit Frequency: **72.870MHz**

Calculation of FCC Limit: FS-[56 + 10Log (TP)] :
where, TP = measured transmitter power (W); FS = Fundamental field strength (dBμV/m)

TP = 100mW, FS = 120.2dBμV/m

Limit: 120.2dBμV/m – [56+10log(100mW/1000)] = 74.2dBμV/m.

Measured Emissions

Frequency (MHz)	Spurious Emission of EUT dB μ V/m
43.72	28.6
58.29	52.6
87.44	66.2
131.16	39.0
145.74	68.1
218.61	49.4
291.48	45.9
364.48	51.1
437.22	50.1
510.09	59.8
582.96	49.0
655.83	49.8
728.70	47.0
801.57	51.9
874.44	52.9
947.31	55.7

Calculated measurement uncertainty: 30MHz to 1GHz: 5.2dB

3.3 Emission Bandwidth

Test Requirement:	FCC 47CFR 95.633
Test Method:	TIA 603
Test Date:	2008-10-23
Mode of Operation:	Tx Mode

Test Requirement:

An R/C transmitter is allowed to transmit any appropriate non-voice emission, which meets the emission limitations for an R/C transmitter. The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8kHz.

The power of each unwanted emission shall be less than the transmitter power (TP) by:

(1) At least 25dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

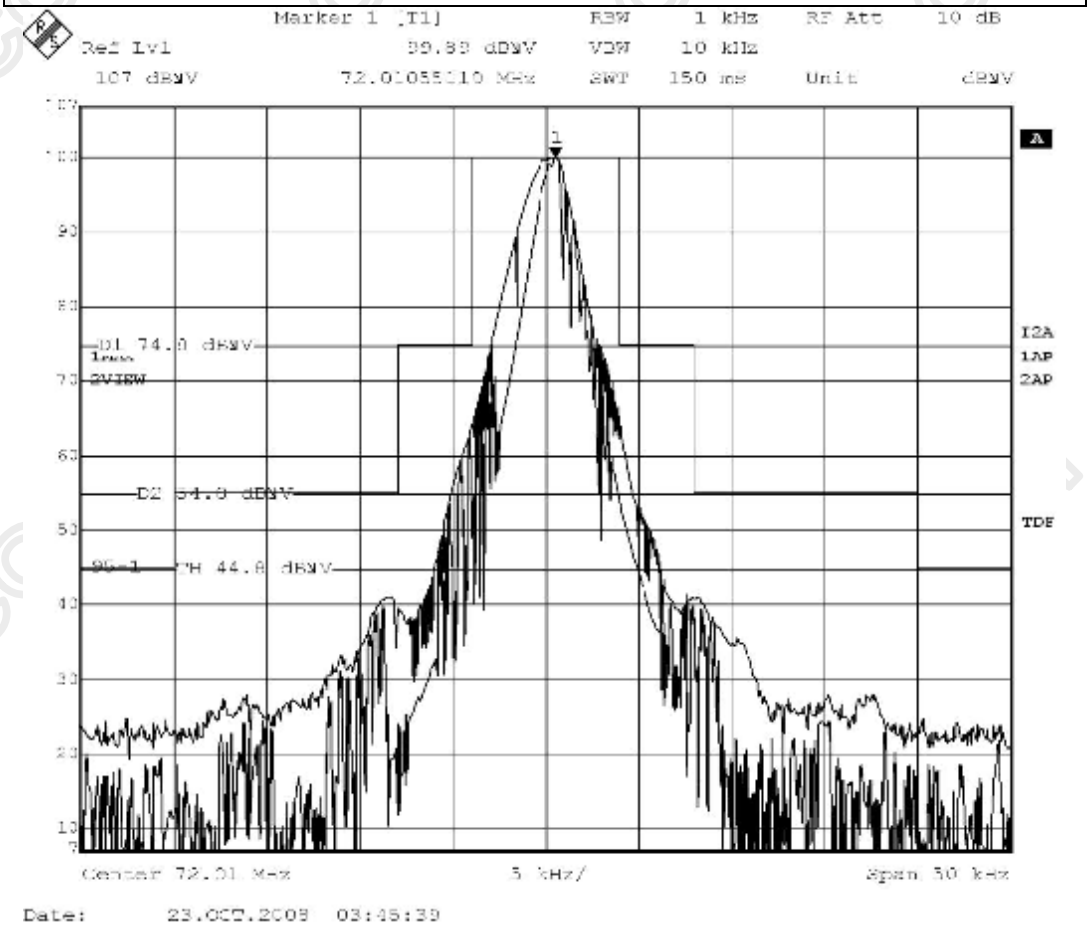
(2) At least 45dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 125% of the authorized bandwidth.

(3) At least 55dB on any frequency removed from the center of the authorized bandwidth by more than 125% up to and including 250% of the authorized bandwidth.

(4) At least 56+10log(T)dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

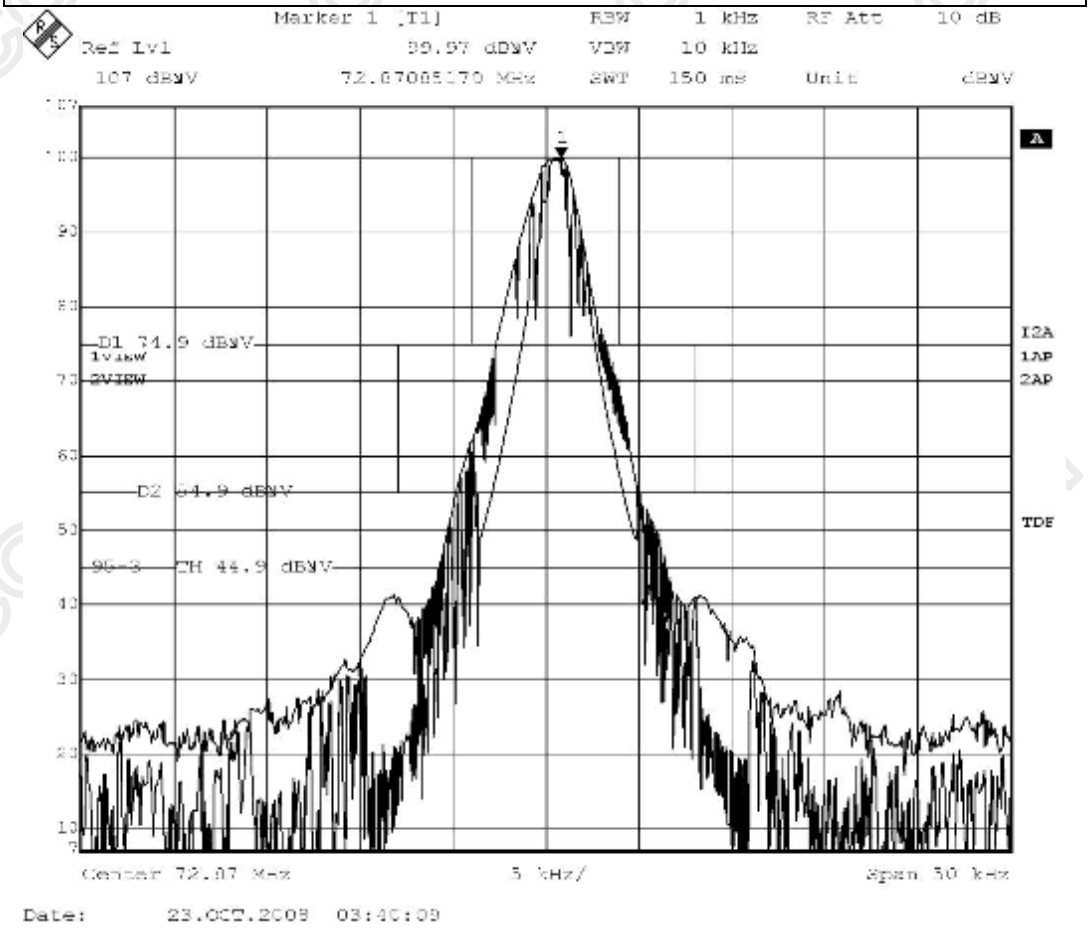
Fundamental Frequency [MHz]	Bandwidth [KHz]
72.010	4.2

Bandwidth of Fundamental Emission



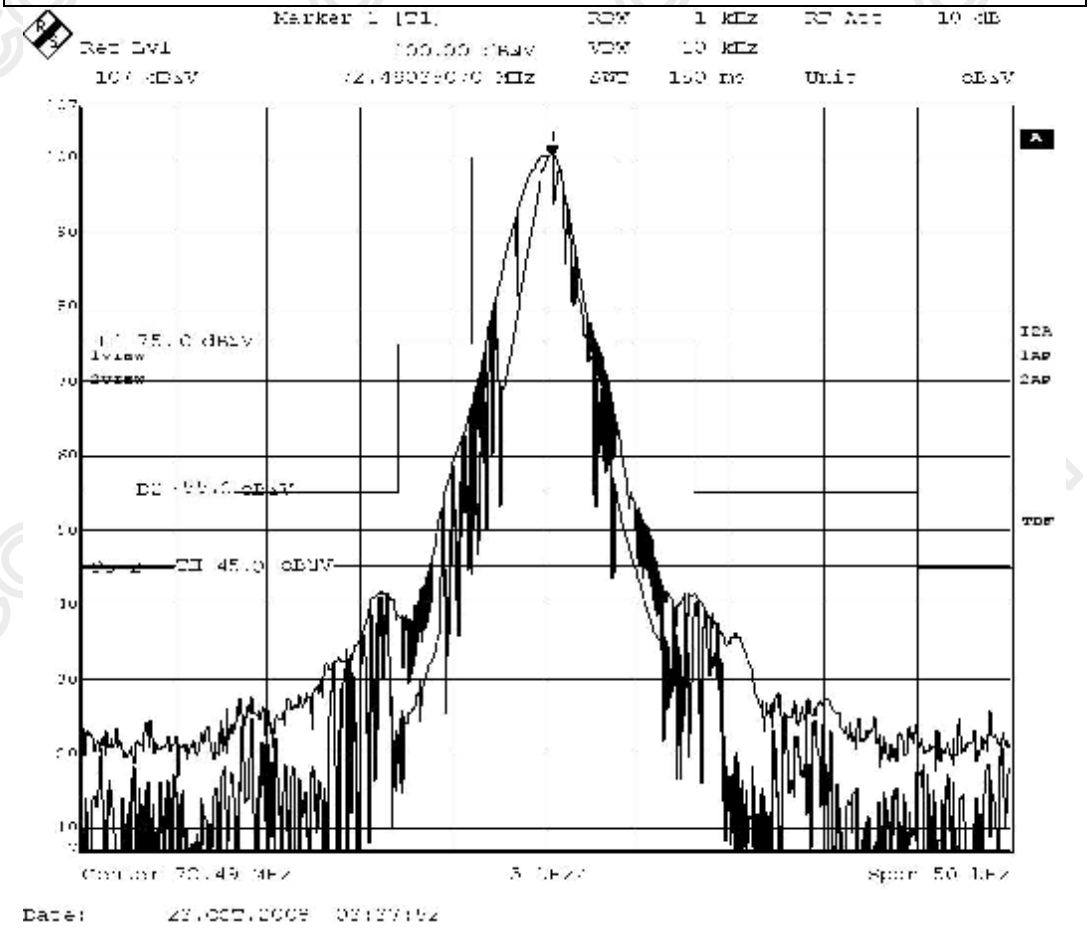
Fundamental Frequency [MHz]	Bandwidth [KHz]
72.490	4.3

Bandwidth of Fundamental Emission



Fundamental Frequency [MHz]	Bandwidth [KHz]
72.870	4.3

Bandwidth of Fundamental Emission



3.4 Frequency Stability

Test Requirement:	FCC 47CFR 95.623
Test Method:	TIA 603
Test Date:	2008
Mode of Operation:	Tx Mode
Test Requirement:	All other R/C transmitters that transmit in the 72-76MHz frequency band must be maintained within a frequency tolerance of 0.002% (20ppm)

Test Method:
Frequency measurements were made as follows:

(a) at 10 degree intervals of temperatures between -20ºC and +55ºC at the manufacturer's rated supply voltage, and

(b) at +20ºC temperature and ±15% supply voltage variations.
Note, for handheld equipment that is only capable of operating from internal batteries, reduce the primary supply voltage to the battery operating end point. The manufacturer should specify the battery operating endpoint voltage of the equipment.

Test Result:

Frequency Stability Under Low Voltage Conditions

Nominal transmit frequency: 72.010MHz

TEST CONDITIONS		Measured frequency (MHz)	Frequency drift (kHz)	Frequency drift (ppm)	Frequency error Limit (kHz)
T_{nom}: 20ºC					
U_{nom}:	12.0V	72.01050	-0.50000	-6.94343	0.443
	11.0V	72.01020	-0.20000	-2.77738	1.443
	10.0V	72.01060	-0.60000	-8.33211	1.443
	9.0V	72.01060	-0.60000	-8.33211	1.443
$U_{cut-off}$: 6.0V		72.00910	0.90000	12.49842	1.443

Nominal transmit frequency: 72.490MHz

TEST CONDITIONS		Measured frequency (MHz)	Frequency drift (kHz)	Frequency drift (ppm)	Frequency error Limit (kHz)
T_{nom}: 20ºC					
U_{nom}:	12.0V	72.49030	-0.30000	-4.13848	1.450
	11.0V	72.49020	-0.20000	-2.75899	1.450
	10.0V	72.49020	-0.20000	-2.75899	1.450
	9.0V	72.49000	0.00000	0.00000	1.450
$U_{cut-off}$: 6.0V		72.48920	0.80000	11.03613	1.450

Nominal transmit frequency: 72.870MHz

TEST CONDITIONS		Measured frequency (MHz)	Frequency drift (kHz)	Frequency drift (ppm)	Frequency error Limit (kHz)
T_{nom}: 20ºC					
U_{nom}:	12.0V	72.87050	-0.50000	-6.86149	1.450
	11.0V	72.87040	-0.40000	-5.48920	1.450
	10.0V	72.87040	-0.40000	-5.48920	1.450
	9.0V	72.87030	-0.30000	-4.11690	1.450
$U_{cut-off}$: 6.0V		72.86990	0.10000	1.37231	1.450

Frequency Stability Under Extreme Temperature

TEST CONDITIONS		Nominal Transmit Frequency: 72.010MHz			
		3dB point Frequency (MHz)	Frequency Drift (kHz)	Frequency Drift (ppm)	Frequency error Limit (kHz)
T_{max}:55ºC	U_{nom}: 12.0V	72.00960	-0.40	-5.55	1.450
T:50ºC	U_{nom}: 12.0V	72.00880	-1.20	-16.66	1.450
T:40ºC	U_{nom}: 12.0V	72.00920	-0.80	-11.11	1.450
T:30ºC	U_{nom}: 12.0V	72.01020	0.20	2.78	1.450
T_{nom}:20ºC	U_{nom}: 12.0V	72.01050	0.50	6.94	1.450
T:10ºC	U_{nom}: 12.0V	72.01080	0.80	11.11	1.450
T:0ºC	U_{nom}: 12.0V	72.01040	0.40	5.55	1.450
T:-10ºC	U_{nom}: 12.0V	72.00890	-1.10	-15.28	1.450
T:-20ºC	U_{nom}: 12.0V	72.01060	0.60	8.33	1.450
T_{min}:-30ºC	U_{nom}: 12.0V	72.00960	-0.40	-5.55	1.450
Maximum Frequency error/drift			1.20	16.66	1.450

Frequency Stability Under Extreme Temperature

TEST CONDITIONS		Nominal Transmit Frequency: 72.490MHz			
		3dB point Frequency (MHz)	Frequency Drift (kHz)	Frequency Drift (ppm)	Frequency error Limit (kHz)
T_{max}:55ºC	U_{nom}: 12.0V	72.48960	-0.40	-5.52	1.450
T:50ºC	U_{nom}: 12.0V	72.49020	0.20	2.76	1.450
T:40ºC	U_{nom}: 12.0V	72.49040	0.40	5.52	1.450
T:30ºC	U_{nom}: 12.0V	72.48970	-0.30	-4.14	1.450
T_{nom}:20ºC	U_{nom}: 12.0V	72.49030	0.30	4.14	1.450
T:10ºC	U_{nom}: 12.0V	72.49040	0.40	5.52	1.450
T:0ºC	U_{nom}: 12.0V	72.48920	-0.80	-11.04	1.450
T:-10ºC	U_{nom}: 12.0V	72.49090	0.90	12.42	1.450
T:-20ºC	U_{nom}: 12.0V	72.49040	0.40	5.52	1.450
T_{min}:-30ºC	U_{nom}: 12.0V	72.48980	-0.20	-2.76	1.450
Maximum Frequency error/drift			0.90	12.42	1.450

Frequency Stability Under Extreme Temperature

TEST CONDITIONS		Nominal Transmit Frequency: 72.870MHz			
		3dB point Frequency (MHz)	Frequency Drift (kHz)	Frequency Drift (ppm)	Frequency error Limit (kHz)
T_{max}:55ºC	U_{nom}: 12.0V	72.86960	-0.40	-5.49	1.450
T:50ºC	U_{nom}: 12.0V	72.86940	-0.60	-8.23	1.450
T:40ºC	U_{nom}: 12.0V	72.87080	0.80	10.98	1.450
T:30ºC	U_{nom}: 12.0V	72.86920	-0.80	-10.98	1.450
T_{nom}:20ºC	U_{nom}: 12.0V	72.87050	0.50	6.86	1.450
T:10ºC	U_{nom}: 12.0V	72.87100	1.00	13.72	1.450
T:0ºC	U_{nom}: 12.0V	72.87040	0.40	5.49	1.450
T:-10ºC	U_{nom}: 12.0V	72.87130	1.30	17.84	1.450
T:-20ºC	U_{nom}: 12.0V	72.87070	0.70	9.61	1.450
T_{min}:-30ºC	U_{nom}: 12.0V	72.87110	1.10	15.10	1.450
Maximum Frequency error/drift			1.30	17.84	1.450

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM020	HORN ANTENNA	EMCO	3115	4032	2006/07/11	2009/07/11
EM215	MULTIDEVICE CONTROLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-Lindgren	FACT-3	--	2006/05/02	2009/05/02
EM174	BICONILOG ANTENNA	EMCO	3142C	00029071	2008/01/24	2010/01/24
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2008/06/16	2009/06/16
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2006/07/26	2009/07/26

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM197	LISN	EMCO	4825/2	1193	2007/10/30	2009/10/30
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2008/06/16	2009/06/16
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2008/01/23	2009/01/23

Remarks:-

CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

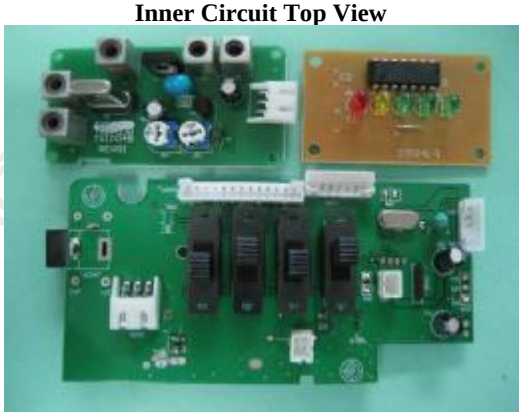
Appendix B

Photographs of EUT

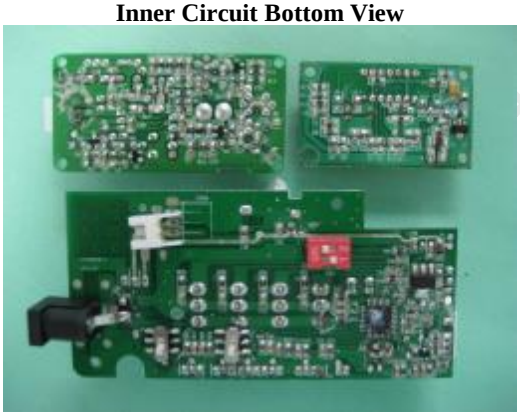
Front View of the product

Rear View of the product

Inner Circuit Top View

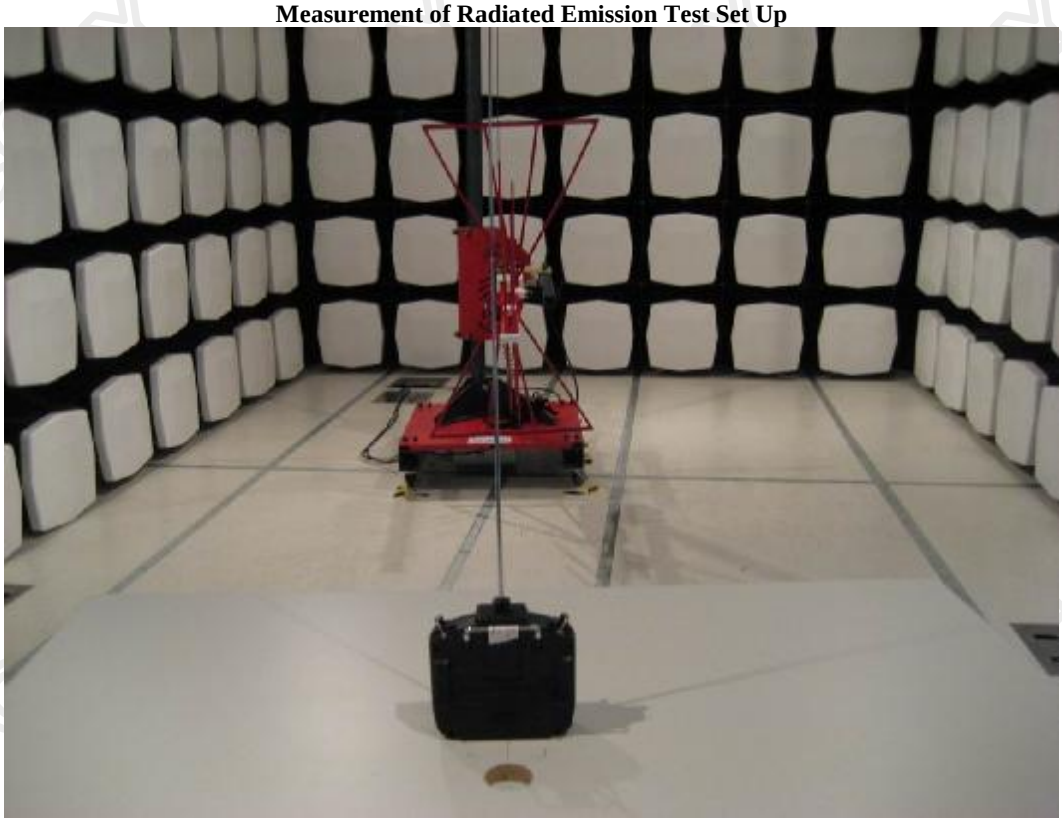


Inner Circuit Bottom View



Photographs of EUT

Measurement of Radiated Emission Test Set Up



******* End of Test Report *******