FCC 47 CFR PART 95 SUBPART C

TEST REPORT

For

TRANSMITTER

Model: JFT401, JFT402

Trade Name: GM

Issued to

GREAT MOUNTAIN ELECTRIC TECHNOLOGY COMPANY LIMITED
LIHENG INDUSTRIAL ZONE, QINXI TOWN, DONGGUAN CITY, GUANGDONG PROVINCE, CHINA

Issued by

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.
NO. 5, JINAO INDUSTRIAL PARK, NO. 35 JUKENG ROAD, DASHUIKENG VILLAGE, GUANLAN TOWN, BAOAN DISTRICT, SHENZHEN, CHINA
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LAB CODE:200577-0

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1. TEST RESULT CERTIFICATION

Applicant: GREAT MOUNTAIN ELECTRIC TECHNOLOGY COMPANY LIMITED
LIHENG INDUSTRIAL ZONE, QINXI TOWN, DONGGUAN CITY, GUANGDONG PROVINCE, CHINA

Equipment Under Test: TRANSMITTER

Trade Name: GM

Model: JFT401, JFT402

Date of Test: August 17, 2006-January 08, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 95 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 95C.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by: ***Tested By:*** **Henry Ding**

Clinton Kao/ Manager
COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

***Reviewed By*:**
Eric Wong / Assistant manager
COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

2. EUT DESCRIPTION

Product	TRANSMITTER
Trade Name	GM
Model Number	JFT401, JFT402
Model Discrepancy	The models are identical except for the appearance.
Power Supply	TX: DC12V supplied by the battery
Frequency Range	72.010 MHz, 72.210 MHz & 72.850 MHz
Temperature Range	0°C ~ +55°C

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 Rules Part 95 Subpart C.

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements under the FCC Rules Part 95 Subpart C.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

MODIFICATION

N/A

DESCRIPTION OF TEST MODES

The EUT was preliminary tested under all operating condition

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis).

The worst emission was found in lie-down position (Y axis) and recorded.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 5, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200577-0 to perform Electromagnetic Interference tests according to FCC PART 95 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

6. SETUP OF EQUIPMENT UNDER TEST

SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	N/A						

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7. FCC PART 95 REQUIREMENTS

FREQUENCY TOLERANCE MEASUREMENT

LIMIT

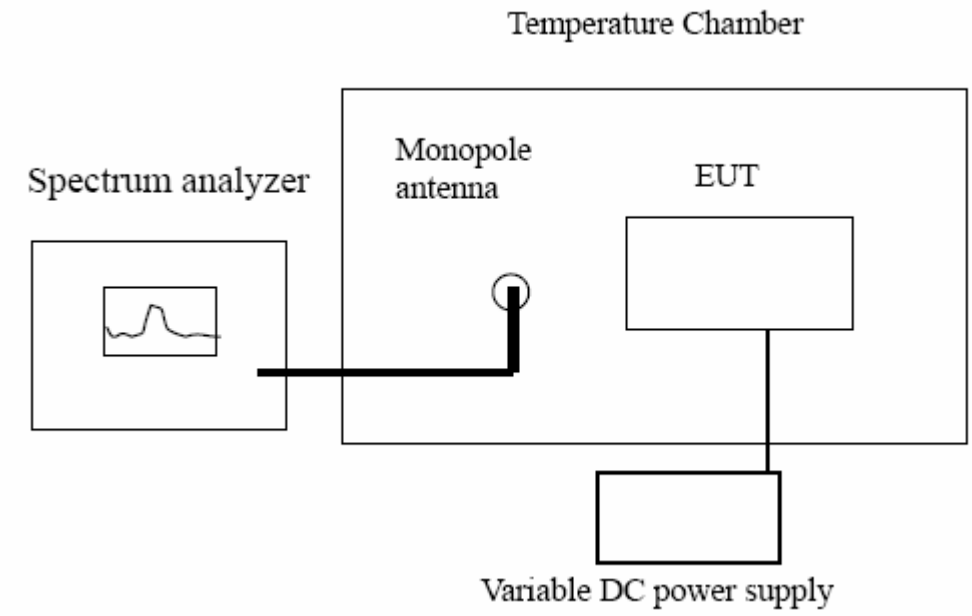
1. According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from –30℃ to +50℃centigrade.
2. According to FCC Part 2 Section 2.1055(d)(2), for hand carried battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. According to FCC Part 95 Section 95.623(c), the frequency tolerance must be maintained within 0.002%.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007
Temperature Chamber	Shihin	BM50-CB	908	06/29/2007
DC Power Supply	WYK	WYK-605	N/A	05/29/2007
Low Loss Cable	N/A	N/A	N/A	N/A
Monopole Antenna	N/A	N/A	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration



TEST PROCEDURE

Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
2. Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz and Frequency Span to 50KHz.Record this frequency as reference frequency.
3. Set the temperature of chamber to 50℃. Allow sufficient time(approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10℃ decreased per stage until the lowest temperature -30℃ is measured, record all measured frequencies on each temperature step

Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15 ℃ to 25℃. Otherwise, an environment chamber set for a temperature of 20℃ shall be used. Install new battery in the EUT.
2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to1KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
3. For battery operated only device, supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency

TEST RESULTS

No non-compliance noted

Test Data

Frequency stability versus input voltage

Reference Frequency (MHZ)	Frequency measured at end point voltage	Frequency deviation (%)	Limit (%)
72.010	72.0107	0.00097	0.002
72.210	72.2106	0.00083	0.002
72.850	72.8505	0.00068	0.002

(Notes: End point 5.40V)

Frequency stability versus environmental temperature

Reference frequency: 72.010MHz			
Limit: ±0.002%			
Environment temperature (℃)	**Power supply**	**Frequency deviation measured with time elapse (10 minute)**	
		(MHz)	**(%)**
50	12V	72.0108	0.000011110
40	12V	72.0105	0.000006944
30	12V	72.0006	-0.000130537
20	12V	72.0001	-0.000137481
10	12V	72.01	0
0	12V	72.0001	-0.000137481
-10	12V	72.0002	-0.000136092
-20	12V	72.0098	-0.000002777
-30	12V	72.0095	-0.000006944

Reference frequency: 72.210MHz			
Limit: ±0.002%			
Environment temperature (℃)	**Power supply**	**Frequency deviation measured with time elapse (10 minute)**	
		(MHz)	**(%)**
50	12V	72.21003	0.00004%
40	12V	72.21003	0.00004%
30	12V	72.21033	0.00046%
20	12V	72.21057	0.00079%
10	12V	72.21093	0.00129%
0	12V	72.21117	0.00162%
-10	12V	72.21141	0.00195%
-20	12V	72.21132	0.00183%
-30	12V	72.21122	0.00169%

Reference frequency: 72.850MHz			
Limit: ±0.002%			
Environment temperature (℃)	**Power supply**	**Frequency deviation measured with time elapse (10 minute)**	
		(MHz)	**(%)**
50	12V	72.8507	0.0000096088
40	12V	72.8506	0.0000082361
30	12V	72.8504	0.0000054907
20	12V	72.8502	0.0000027454
10	12V	72.8500	0
0	12V	72.8501	0.00000137268
-10	12V	72.8497	-0.00000411805
-20	12V	72.8495	-0.00000686342
-30	12V	72.8493	-0.00000960879

EMISSION BANDWIDTH MEASUREMENT

LIMIT

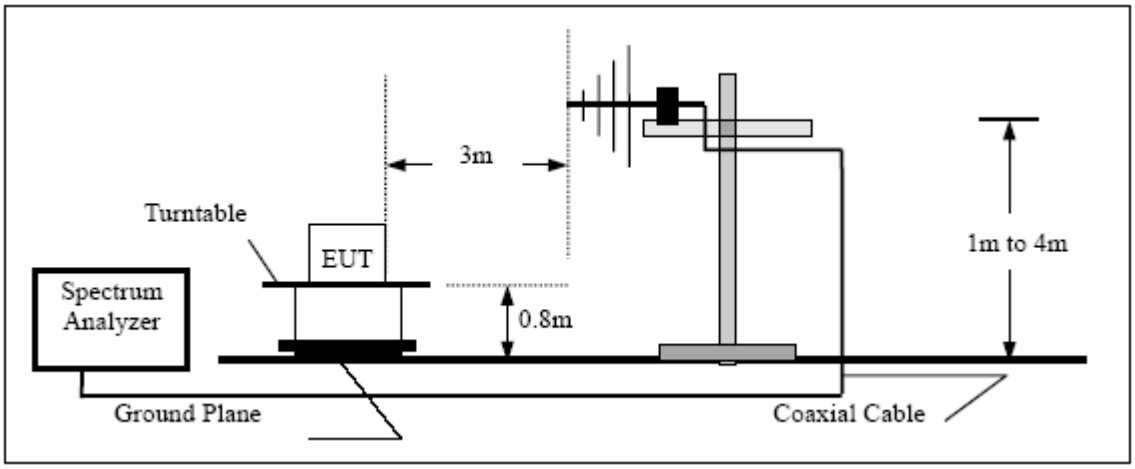
According to FCC Part 95 Section 95.633 (b): The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 KHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007
EMI Test Receiver	R&S	ESCI	1166.5950 03	01/13/2007
Pre-Amplifier	MITEQ	N/A	AFS42-00102650-42-10P-42	02/14/2007
Bi-log Antenna	EMCO	3142	9910-1436	06/07/2007

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration



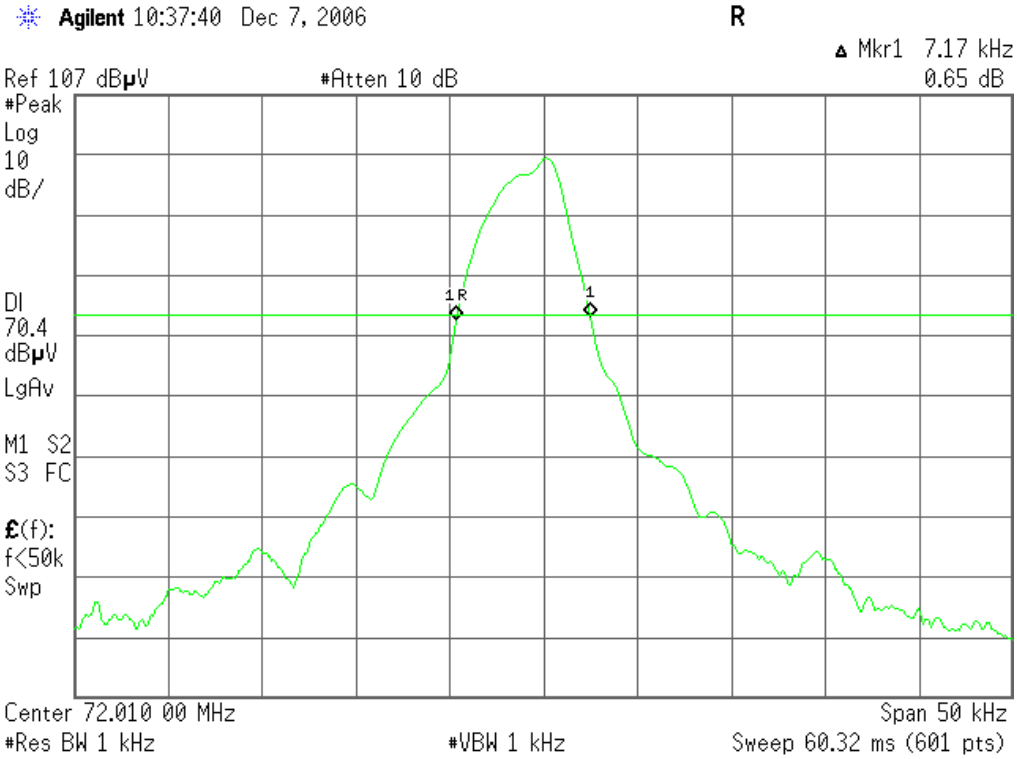
TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW,VBW= 1KHz, Span =50KHz.
4. Set SPA Max hold. Mark peak, -26dB.

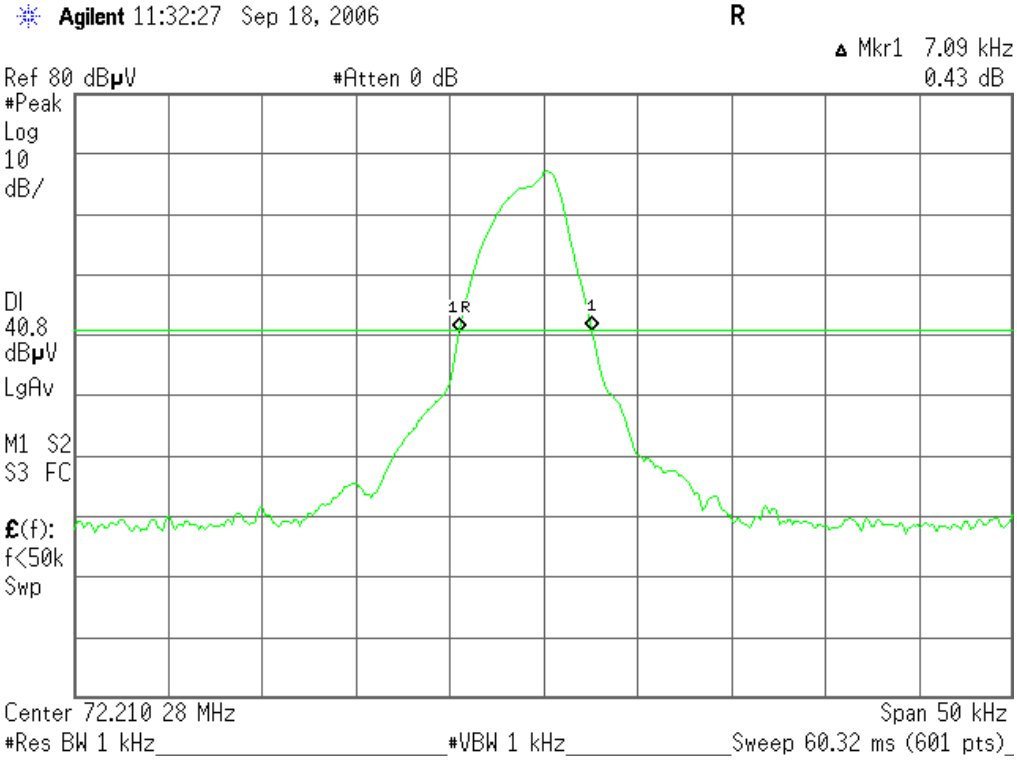
TEST RESULTS

Refer to attach spectrum analyzer data chart.

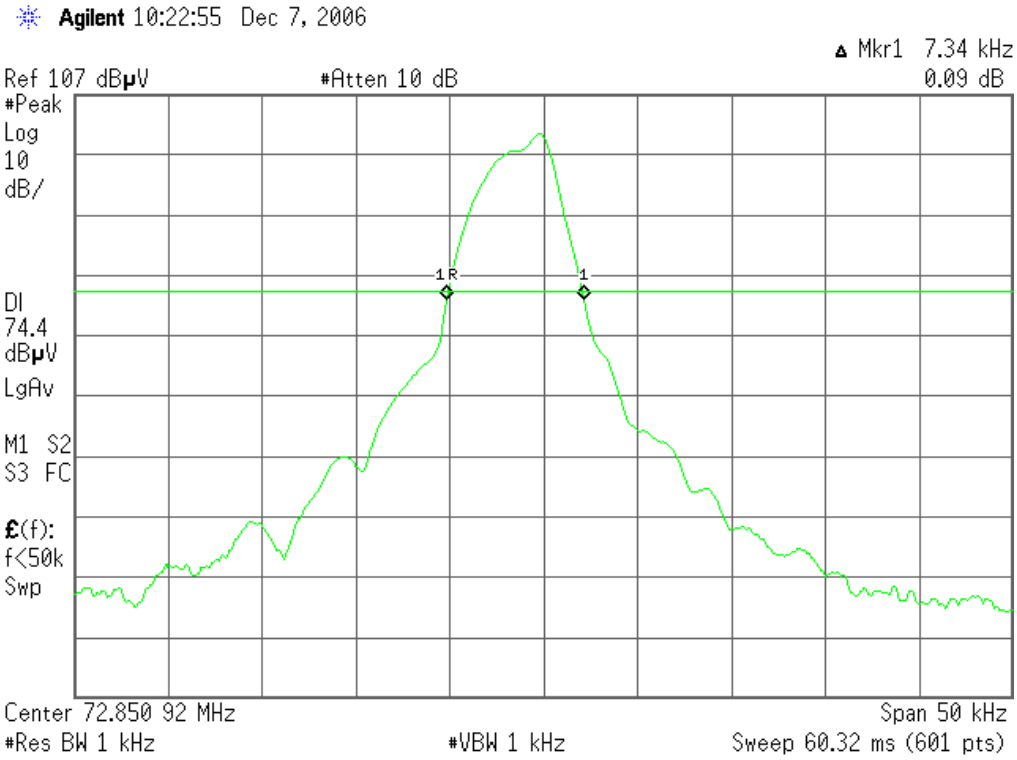
72.010 MHz



72.210 MHz



72.850MHz


Agilent 10:22:55 Dec 7, 2006
Mkr1 7.34 kHz
0.09 dB
Ref 107 dBµV
#Atten 10 dB
#Peak
Log
10
dB/
1R
1
Dl
74.4
dBµV
LgAv
M1 S2
S3 FC
£(f):
f<50k
Swp
Center 72.850 92 MHz
Span 50 kHz
#Res BW 1 kHz
#VBW 1 kHz
Sweep 60.32 ms (601 pts)

UNWANTED RADIATION

LIMIT

According to Section 95.635(b), the power of each unwanted emission shall be less than Transmitted Power as specified below:

1 At least 25 db 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 45 db 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 55 db on any frequency removed from the center of the authorized bandwidth by more than 125% up to and including 250% of the authorized bandwidth.

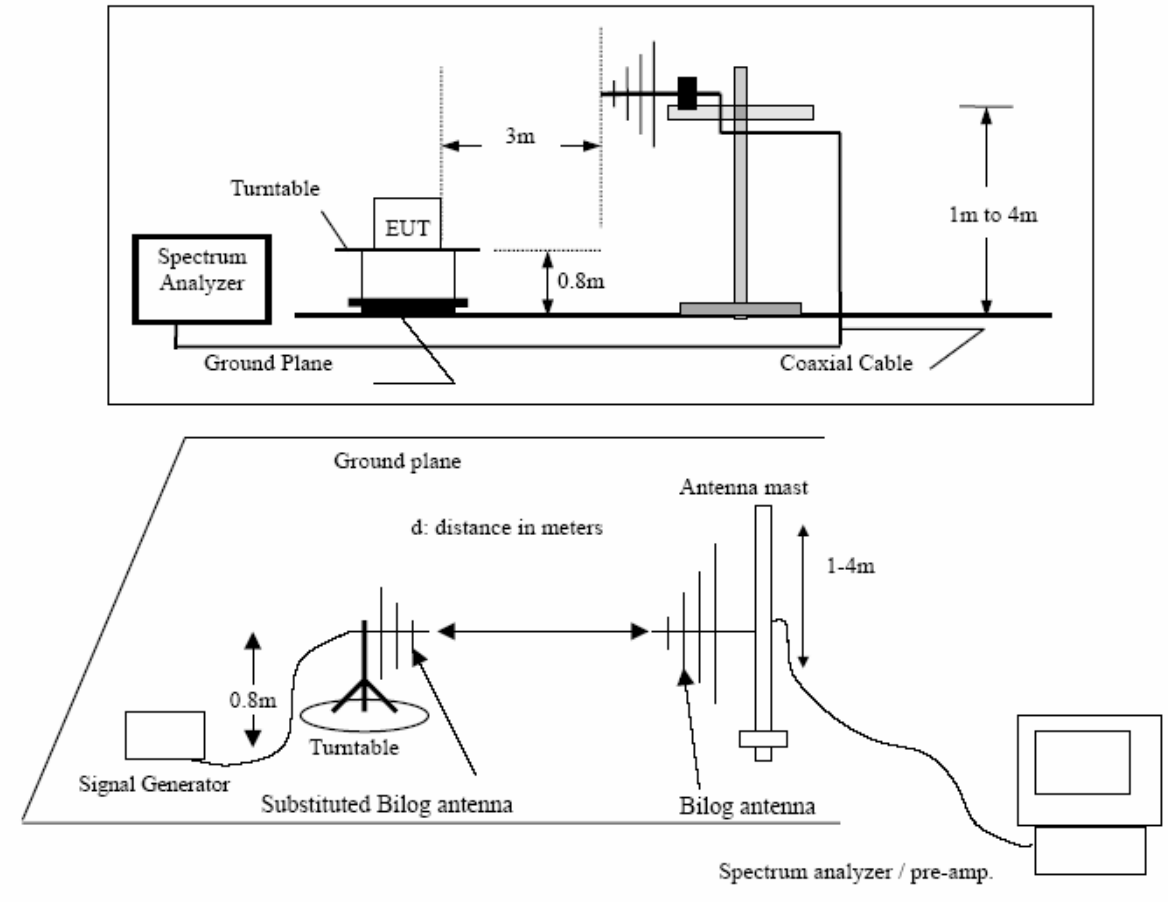
4. At least $56 + 10 \log_{10}(TP)$ db on any frequency removed from the center of the authorized bandwidth by more than 250%.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007
EMI Test Receiver	R&S	ESCI	1166.5950 03	01/13/2007
Pre-Amplifier	MITEQ	N/A	AFS42-00102650-42-10P-42	02/14/2007
Bi-log Antenna	EMCO	3142	9910-1436	06/07/2007
Bilog Antenna	SCHWAZBECK	CBL6143	5082	06/09/2007

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration



TEST PROCEDURE

1. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

2. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

3. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

4. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

5. The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

6. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.

7. The maximum signal level detected by the measuring receiver shall be noted.

8. The measurement shall be repeated with the test antenna set to horizontal polarization.

9. Replace the antenna with a proper Antenna (substitution antenna).

10. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

11. The substitution antenna shall be connected to a calibrated signal generator.

12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

13. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

14. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

16. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

TEST RESULTS

No non-compliance noted

Test Data

72.010MHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
115.050	-58.97	V	-72.61	0.77	1.10	-72.28	-54.00	-18.28
225.300	-57.40	V	-74.31	1.09	5.76	-69.64	-54.00	-15.64
N/A								
182.550	-64.35	H	-80.87	0.99	0.67	-81.19	-54.00	-27.19
225.300	-64.78	H	-83.32	1.09	5.76	-78.65	-54.00	-24.65
N/A								

72.210MHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
43.500	-60.34	V	-71.58	0.49	-6.51	-78.58	-32.45	-46.13
86.700	-54.62	V	-70.51	0.66	0.04	-71.13	-32.45	-38.68
N/A								
86.700	-69.45	H	-86.99	0.66	0.04	-87.61	-32.45	-55.16
158.700	-64.74	H	-81.66	0.91	0.80	-81.77	-32.45	-49.32
N/A								

72.850MHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
87.600	-54.68	V	-70.54	0.66	0.11	-71.09	-54.00	-17.09
225.300	-57.50	V	-74.41	1.09	5.76	-69.74	-54.00	-15.74
N/A								
92.100	-67.76	H	-85.55	0.68	0.43	-85.80	-54.00	-31.80
225.300	-65.07	H	-83.61	1.09	5.76	-78.94	-54.00	-24.94
N/A								

Notes:(Calculation)

Limit (dBm)= EL-56-10log10 (TP)

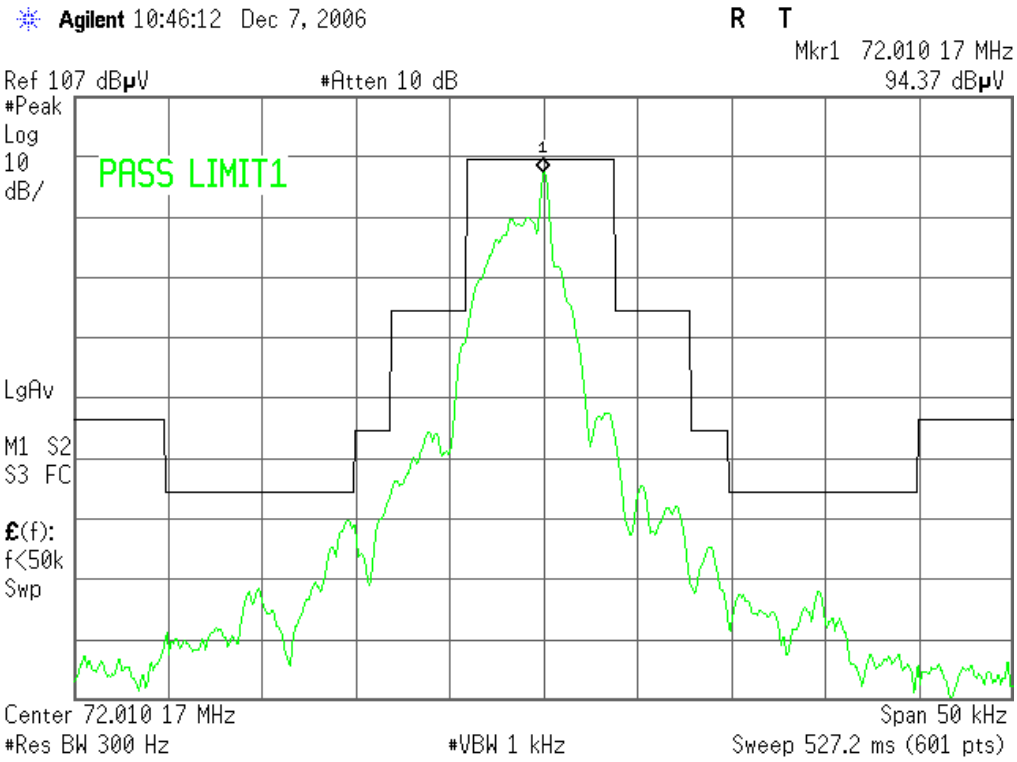
Notes: EL is the emission level of the Output Power expressed in dBm, in this application, the TG is 6.89 dBm. TP is the Output Power express in Watts, in the application the TP is 0.0048 W

Limit (dBm)=EL -56-10log10 (0.00017) = -36

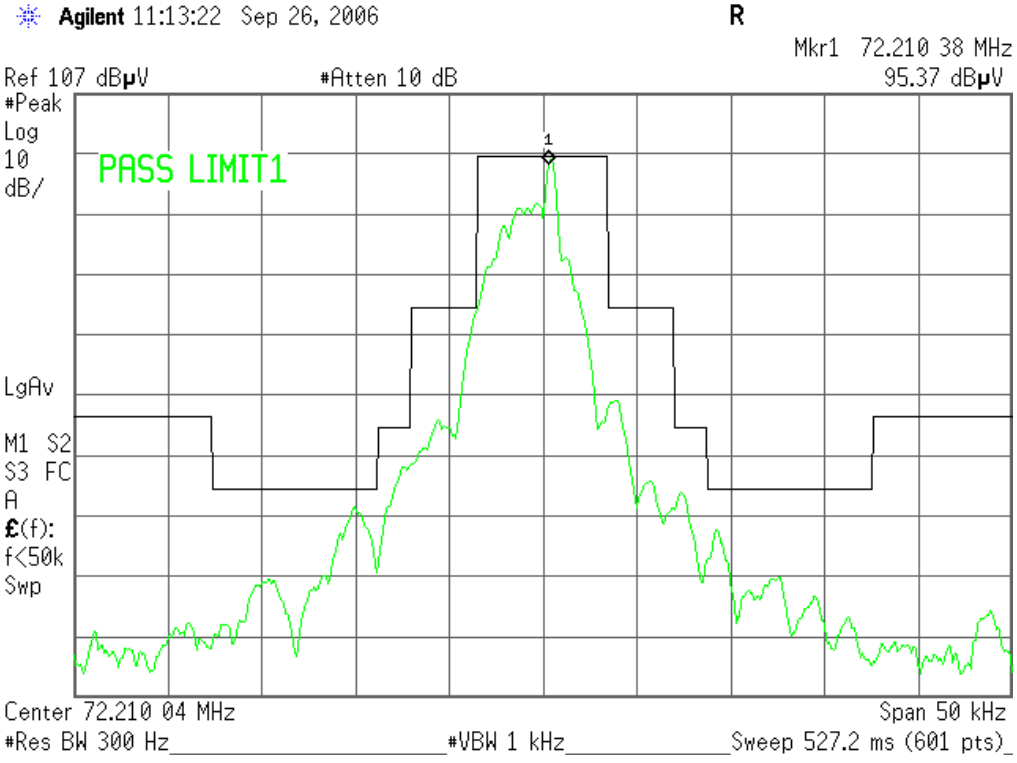
Notes: Two 10db attenuators are used between S.G. and substitution antenna while measuring the Spurious Emission, so the 20db attenuation should be added to the cable loss.

Test Plot

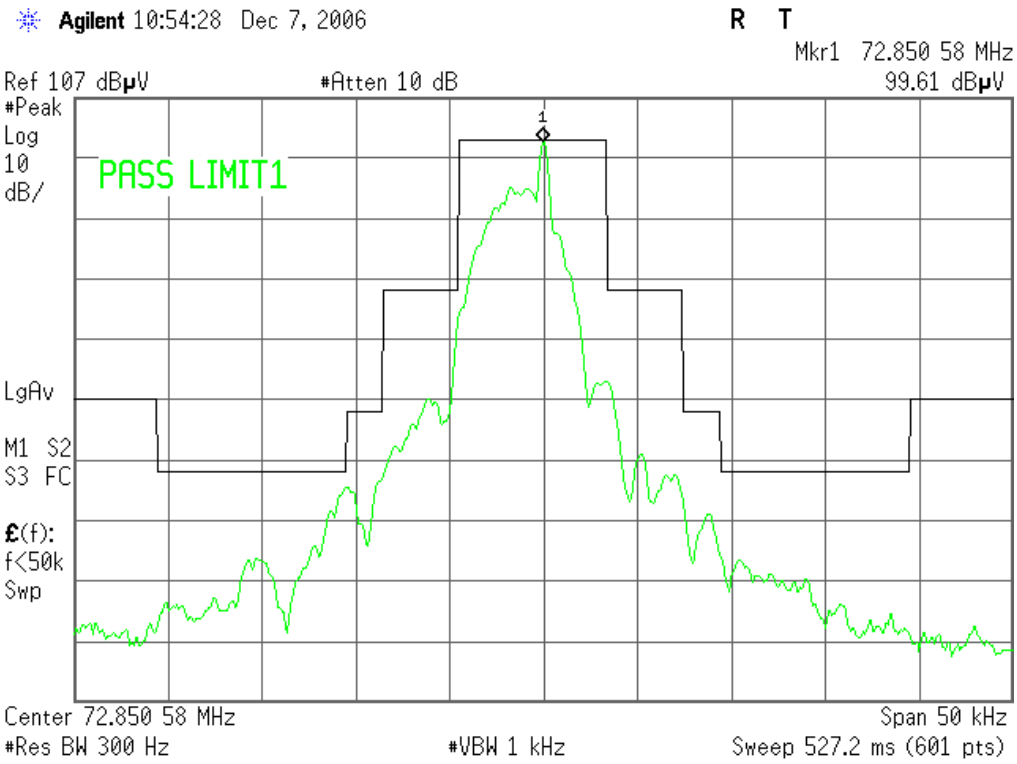
72.010MHz



72.210MHz



72.850MHz


Agilent 10:54:28 Dec 7, 2006
R T
Mkr1 72.850 58 MHz
99.61 dBµV
Ref 107 dBµV
#Atten 10 dB
#Peak
Log
10
dB/
PASS LIMIT1
LgAv
M1 S2
S3 FC
£(f):
f<50k
Swp
Center 72.850 58 MHz
Span 50 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 527.2 ms (601 pts)

MAXIMUM TRANSMITTER POWER

LIMIT

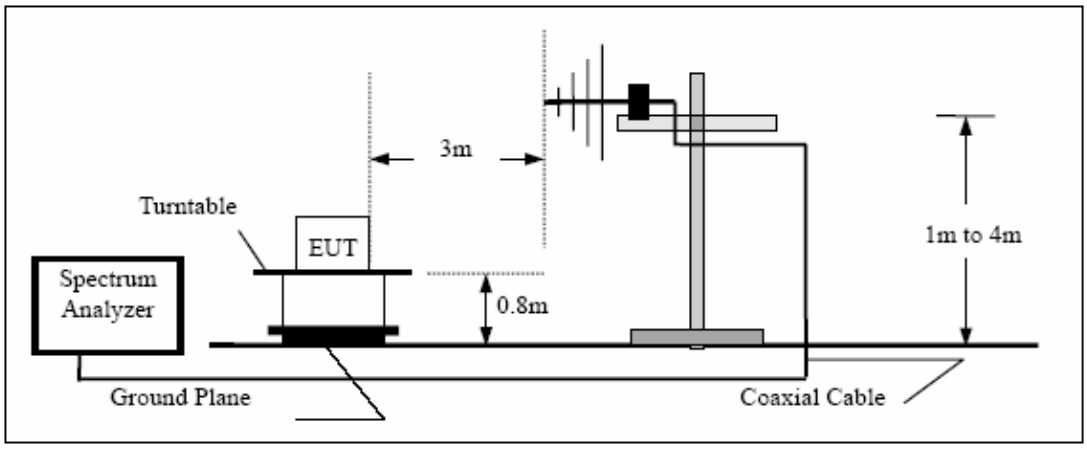
According to FCC Part 95 Section 95.639(b), under any condition of modulation, the R/C transmitter operates in the 72-76MHz frequency band shall not exceed a carrier power of 0.75W.

MEASUREMENT EQUIPMENT USED

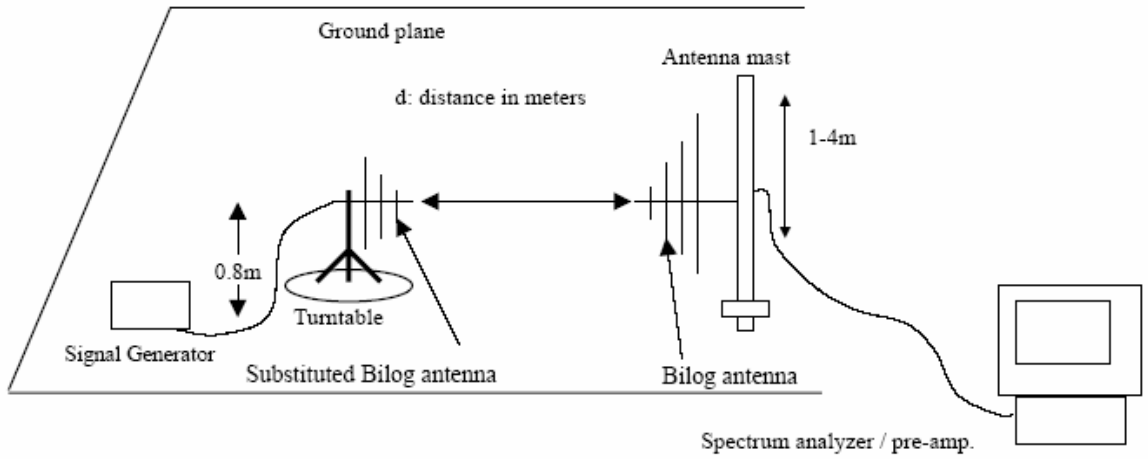
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
PSA Spectrum Analyzer	Agilent	E4446A	US44300399	02/08/2007
EMI Test Receiver	R&S	ESCI	1166.5950 03	01/13/2007
Pre-Amplifier	MITEQ	N/A	AFS42-00102650-42-10P-42	02/14/2007
Bi-log Antenna	EMCO	3142	9910-1436	06/07/2007
Bilog Antenna	SCHWAZBECK	CBL6143	5082	06/09/2007

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration



SUBSTITUTION METHOD:



TEST PROCEDURE

1. On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.

2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

6. The transmitter shall than be rotated through 360˚in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.

8. The maximum signal level detected by the measuring receiver shall be noted.

9. Replace the antenna with a proper Antenna (substitution antenna).

10. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

11. The substitution antenna shall be connected to a calibrated signal generator.
The instrument setting used during the measurement procedure is as follow:

EMI Test Receiver			
RW=120KHz	VBW=300KHz	C.F.=fundamental frequency	SPAN 5MHz

PSA Spectrum Analyzer			
RW=100KHz	VBW=100KHz	C.F.=Max peak frequency	SPAN 0MHz

TEST RESULTS

No non-compliance noted

Test Data

72.010MHz

Freq. (MHz)	Ant. Polarity	Reading (dBm)	S.G. (dBm)	Ant. Gain (dB)	Dipole Gain (dBi)	Cable Loss (dB)	Corrected Power		Limit (W)
							(dBm)	(mW)	
72.010	V	-10.52	-26.91	0.60	0	-1.23	-28.74	0.0013	0.75
72.010	H	-38.87	-54.76	0.60	0	-1.23	-56.59	$2.19E^{-6}$	0.75

72.210MHz

Freq. (MHz)	Ant. Polarity	Reading (dBm)	S.G. (dBm)	Ant. Gain (dB)	Dipole Gain (dBi)	Cable Loss (dB)	Corrected Power		Limit (W)
							(dBm)	(uW)	
72.210	V	-9.44	-26.34	-1.4	0	1.5	-29.24	1.2	0.75
72.210	H	-31.44	-48.74	-1.0	0	1.5	-51.24	0.008	0.75

72.850MHz

Freq. (MHz)	Ant. Polarity	Reading (dBm)	S.G. (dBm)	Ant. Gain (dB)	Dipole Gain (dBi)	Cable Loss (dB)	Corrected Power		Limit (W)
							(dBm)	(mW)	
72.850	V	-6.16	-22.51	0.60	0	-1.15	-24.27	0.0037	0.75
72.850	H	-34.38	-50.39	0.60	0	-1.15	-52.15	$6.10E^{-6}$	0.75

AUTHORIZED OPERATION CHANNELS

REQUIREMENT

According to FCC Part 95 Section 95.207, the authorized operation channels for model aircrafts are located on the frequencies from 72.01 to 72.99 with the interval of 20KHz,

OBSERVARION & EVALUATION

The EUT designed as a model aircraft controller with the operation frequency on 72.49 MHz accordance with the requirement above

EMISSION TYPE

REQUIREMENT

According to FCC Part 95 Section 95.631(b) : An R/C transmitter may transmit any appropriate non-voice emission which meets the emission limitations of §95.633.

OBSERVARION AND EVALUATION

The EUT is solely used to control model aircraft without transmitting any voice emission and it has been tested to comply with the emission limitation of §95.633.

ANTENNA OF THE TRANSMITTER

REQUIREMENT

According to FCC Part 95 Section 95.647, the antenna of each R/C station transmitting in 72-76MHz band, must be an integral part of the transmitter. The antenna must have no gain and must be vertically polarized.

OBSERVARION AND EVALUATION

The antenna is designed as a fixed, non-user replaceable with no gain and vertically polarized unit integrated to EUT.

POWER CAPABILITY

REQUIREMENT

According to FCC Part 95 Section 95.649,no R/C unit shall incorporate provisions for increasing its transmitter power to any level in excess of the limits specified in §95.639

OBSERVARION AND EVALUATION

All the components employed by EUT have the power capability less than 0.75W either being assembled or individual.

CRYSTAL CONTROL

REQUIREMENT

According to FCC Part 95 Section 95.651,all transmitters used in Personal Radio Services must be crystal controlled, except an R/C station that transmits in 26-27 MHz frequency band.

OBSERVARION AND EVALUATION

The crystal is not accessible to user.

APPENDIX 1
PHOTOGRAPHS OF TEST SETUP

Radiated Emission Set up Photos