



FCC 47 CFR PART 95 SUBPART C

TEST REPORT

For

**4CH / 6CH Remote Control Transmitter,
4CH / 6 CH Remote Control Receiver**

Model: ATF1 / ATS1

Trade Name: ARC

Issued to

**SHENZHEN AWING ROC INDUSTRY CO., LTD.
ROOM C2001-2004, TIMES EXHIBITION CENTER,
NO.3008 YITIAN ROAD,
SHENZHEN 518026,
CHINA**

Issued by

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1. TEST RESULT CERTIFICATION

Applicant: SHENZHEN AWING ROC INDUSTRY CO., LTD.
ROOM C2001-2004, TIMES EXHIBITION CENTER, NO.3008
YITIAN ROAD, SHENZHEN 518026, CHINA

Equipment Under Test: 4CH / 6CH Remote Control Transmitter,
4CH / 6 CH Remote Control Receiver

Trade Name: ARC

Model: ATF1 / ATS1

Date of Test: October 17-November 07, 2005

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:

Terry. Yang / Engineer

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

Reviewed By:

Eric. Wong / Assistant manager
COMPLIANCE CERTIFICATION
SERVICES (SHENZHEN) INC.



2. EUT DESCRIPTION

Product	4CH / 6CH Remote Control Transmitter, 4CH / 6 CH Remote Control Receiver
Trade Name	ARC
Model Number	ATF1 / ATS1
Model Discrepancy	ATF1 is 4 channels, ATS1 is 6 channels
Power Supply	Powered by 8 pcs of AA batteries
Frequency Range	72.49MHz
Number of Channels	1 Channel
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.

3.1 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.

3.2 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.

3.3 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.

3.4 MODIFICATION

N/A

3.5 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.6 DESCRIPTION OF TEST MODES

The EUT was preliminary tested under all operating condition.(72.49 MHz)

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

After verification, all tests were carried out with the worst case test modes (72.49MHz) as shown below, where worst case was in normal link mode only.

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

5.1 FACILITIES

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

No. 6, 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.

5.2 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."

5.3 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

6.1 SETUP CONFIGURATION OF EUT

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

6.2 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

7.1 FREQUENCY TOLERANCE MEASUREMENT

LIMIT

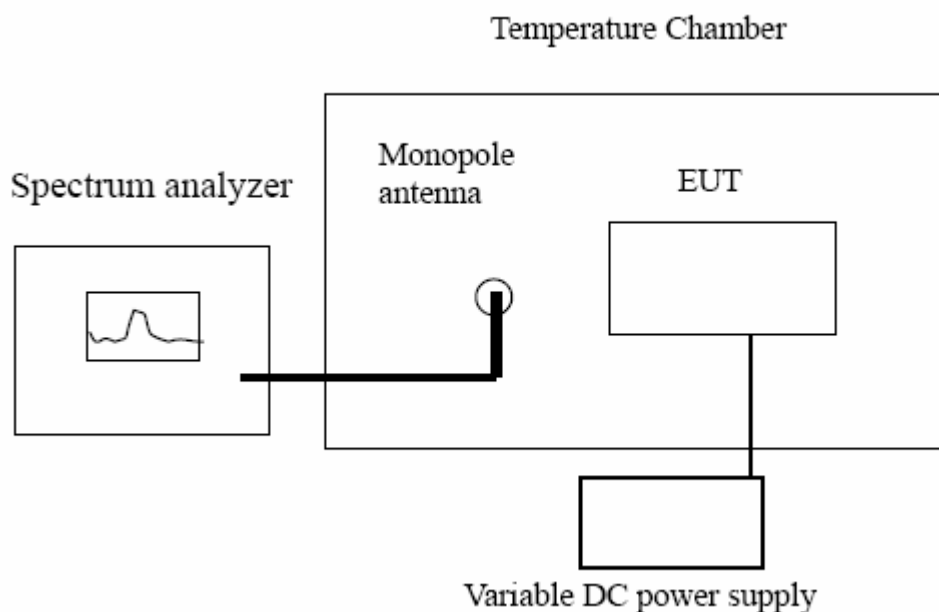
1. According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30 to $+50$ centigrade.
2. According to FCC Part 2 Section 2.1055(d)(2), for hand carried battery powered equipment, the frequency stability shall be measured with reducing 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
Spectrum Analyzer	Advantest	R3132	120901472	06/07/2006
Temperature Chamber	Shihin	BM50-CB	908	06/29/2006
DC Power Supply	WYK	WYK-605	N/A	05/29/2006
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 to 1KHz 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 (%)
72.49000	72.49030	0.0003	0.002

(Notes: End point 7.12V)

Frequency stability versus environmental temperature

Reference frequency: 72.49MHz			
Limit: $\pm 0.002\%$			
Environment temp ()	Power supply	Frequency deviation measured with time elapse (10 minute)	
		(MHz)	(%)
50	12	72.48891	-0.00150
40	12	72.48975	-0.00034
30	12	72.48998	-0.00002
20	12	72.49000	0.00000
10	12	72.49030	0.00041
0	12	72.49032	0.00044
-10	12	72.49035	0.00048
-20	12	72.49038	0.00052
-30	12	72.49041	0.00056

7.2 EMISSION BANDWIDTH MEASUREMENT

LIMIT

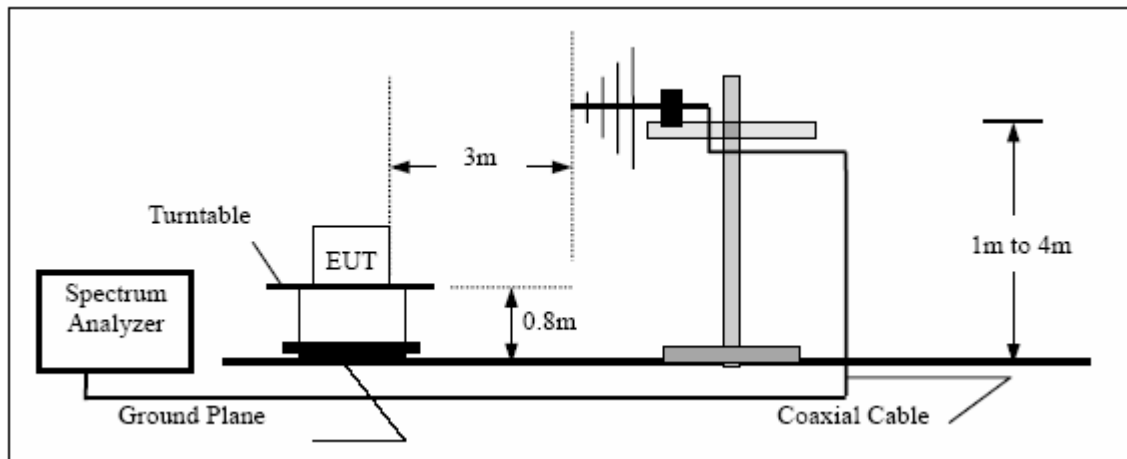
According to FCC Part 95 Section 95.633 (b): The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 KHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Advantest	R3132	120901472	06/07/2006
EMI Test Receiver	HP	8546A	3448A00232	06/07/2006
Pre-amplifier	HP	8447D	2944A07999	06/07/2006
Bi-log antenna	EMCO	3142	910-1436	05/07/2006

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

Test Configuration



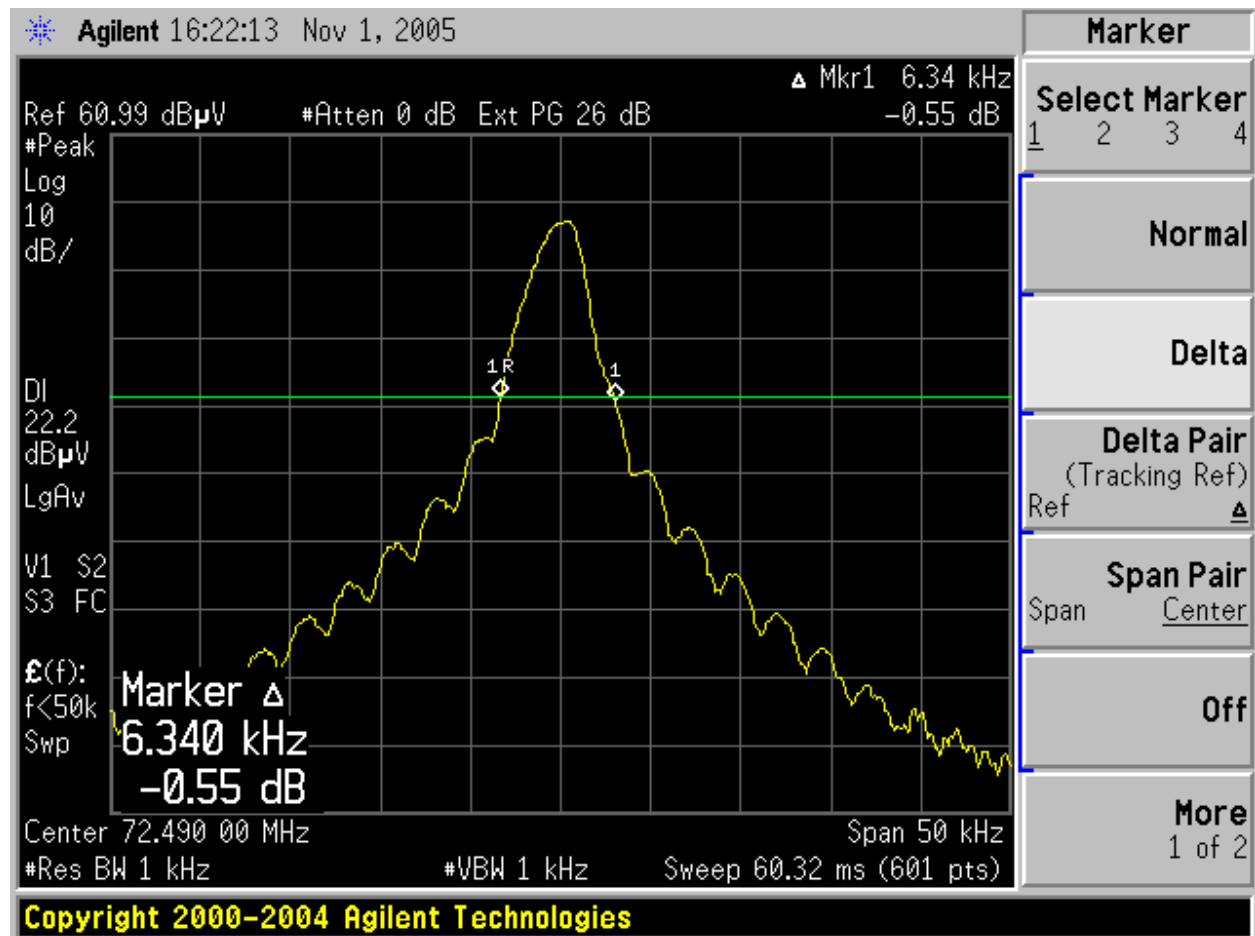
TEST PROCEDURE

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.





7.3 UNWANTED RADIATION

LIMIT

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

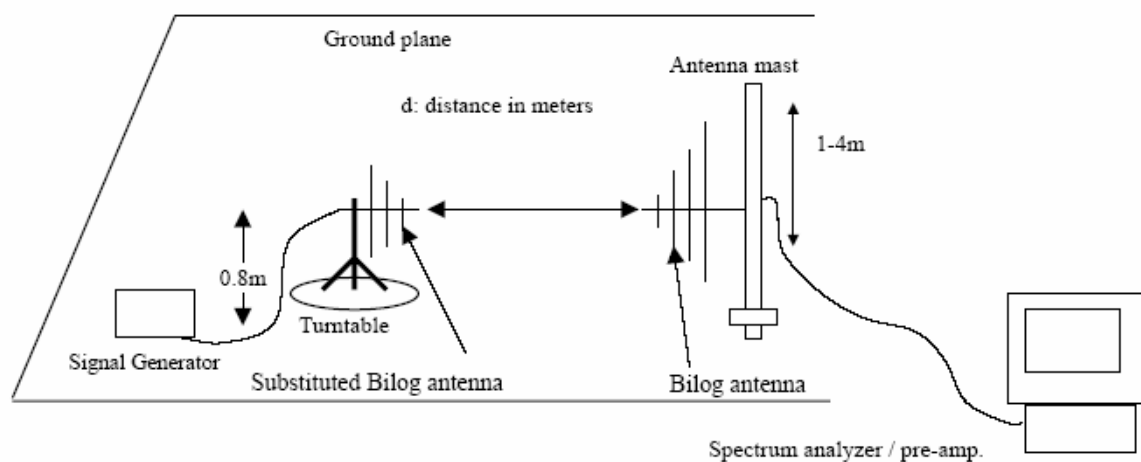
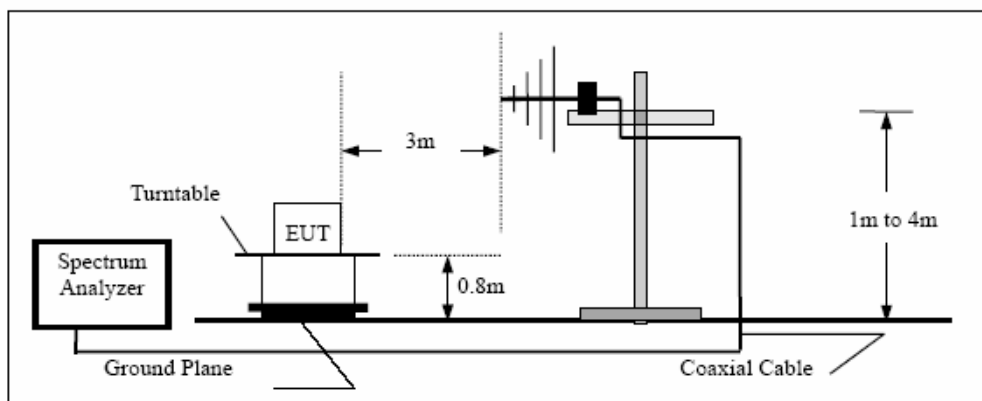
- 1 At least 25 db on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.
- 2 At least 45 db on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 125% of the authorized 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
Spectrum Analyzer	Advantest	R3132	120901472	06/07/2006
EMI Test Receiver	HP	8546A	3448A00232	06/07/2006
Pre-amplifier	HP	8447D	2944A07999	06/07/2006
Bi-log Antenna	EMCO	3142	9910-1436	06/07/2006
Bi-log Antenna	Schaffner	CBL6143	5082	06/07/2006

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 then 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.

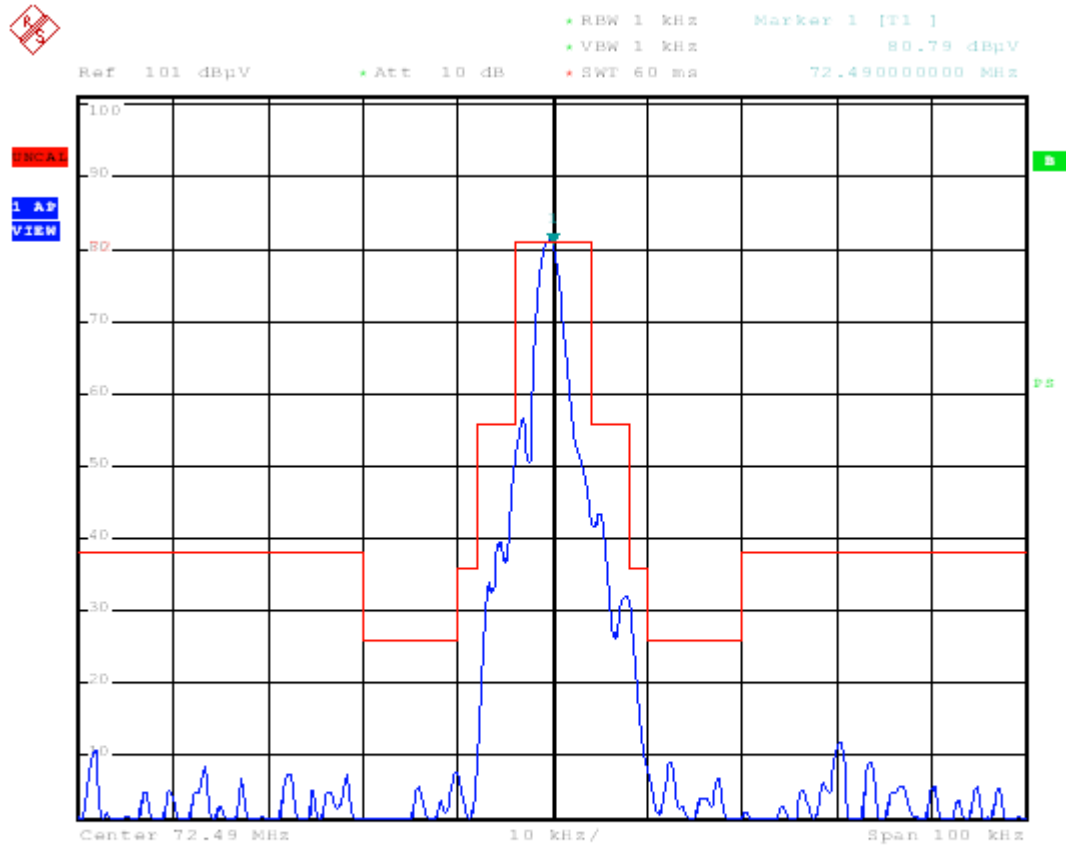
**TEST RESULTS***No non-compliance noted***Test Data**

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
72.490	-07.16	V	-2.70	0.69	10.28	6.89	28.75	-21.86
145.200	-46.44	V	-40.36	0.89	10.59	-37.66	-36.00	-1.66
217.650	-64.19	V	-57.27	1.04	10.80	-47.50	-36.00	-11.5
290.100	-70.47	V	-62.18	1.18	11.02	-52.34	-36.00	-16.34
72.490	-29.35	H	-22.73	0.69	10.28	-13.14	28.75	-41.89
145.200	-34.06	H	-28.97	0.89	10.59	-49.27	-36.00	-13.27
217.650	-72.32	H	-35.38	1.04	10.80	-55.61	-36.00	-19.61
290.100	-77.92	H	-40.62	1.18	11.02	-60.78	-36.00	-24.78

*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 (0.0048) = -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



Date: 31.OCT.2005 10:39:04

7.4 MAXIMUM TRANSMITTER POWER

LIMIT

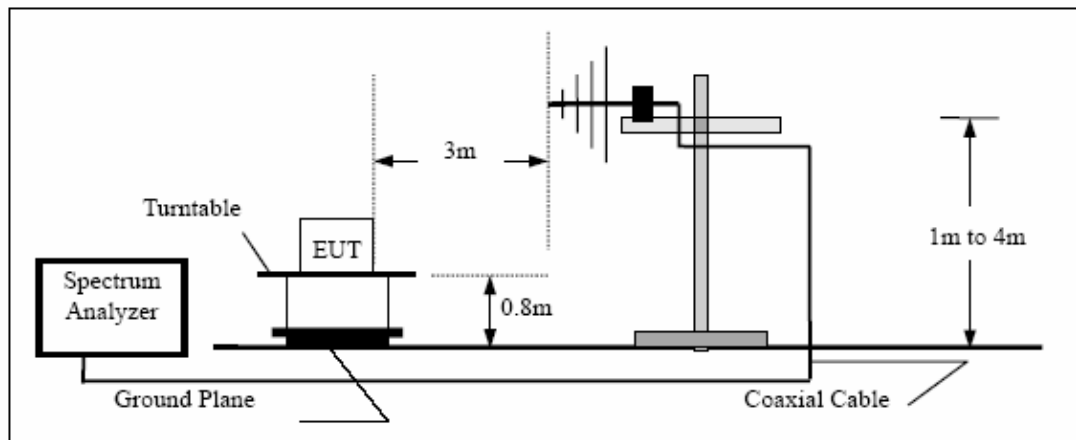
According to FCC Part 95 Section 95.639(b), under any condition of modulation, the R/C transmitter operates in the 72-76MHz frequency band shall not exceed a carrier power of 0.75W.

MEASUREMENT EQUIPMENT USED

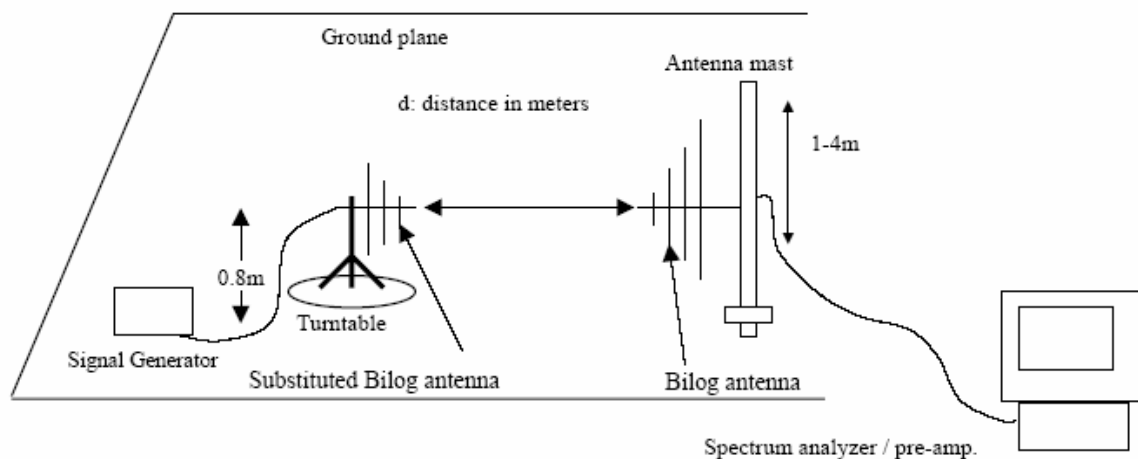
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Advantest	R3132	120901472	06/07/2006
EMI Test Receiver	HP	8546A	3448A00232	06/07/2006
Pre-amplifier	HP	8447D	2944A07999	06/07/2006
Bi-log Antenna	EMCO	3142	9910-1436	06/07/2006
Bi-log Antenna	Schaffner	CBL6143	5082	06/07/2006

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 then 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:

HP 8546A			
RW=120KHz	VBW=300KHz	C.F.=fundamental frequency	SPAN 5MHz

ADVANTEST R3132			
RW=100KHz	VBW=100KHz	C.F.=Max peak frequency	SPAN 0MHz

**TEST RESULTS***No non-compliance noted***Test Data**

Freq. (MHz)	Ant. Polarity	Reading (dBm)	S.G. (dBm)	Ant. Gain (dB)	Dipole Gain (dBi)	Cable Loss (dB)	Corrected Power		Limit (W)
							(dBm)	(mW)	
72.490	H	-29.35	-22.73	10.28	0	0.69	-13.14	0.048	0.75
72.490	V	-07.16	-2.70	10.28	0	0.69	6.89	4.886	0.75



7.5 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,

OBSERVATION & EVALUATION

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

7.6 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.

OBSERVATION 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.

7.7 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.

OBSERVATION AND EVALUATION

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



7.8 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

OBSERVATION AND EVALUATION

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

7.9 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.

OBSERVATION AND EVALUATION

The crystal is not accessible to user.

APPENDIX 1

PHOTOGRAPHS OF TEST SETUP

Radiated Emission Set up Photos

