

FCC Part 95
MEASUREMENT AND TEST REPORT
For
Shantou Tiansheng Model Co., Ltd
2/F, No.118 Shongshan Road, Shantou, Guangdong, China

FCC ID: XD5FM4T-72

May 15, 2009

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: RC Model Aircrafts
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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 written consent of S&E Technologies Laboratory Ltd.

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: **Shantou Tiansheng Model Co., Ltd**
Address of applicant: 2/F, No.118 Shongshan Road, Shantou, Guangdong, China
Manufacturer: **Shantou Tiansheng Model Co., Ltd**
Address of manufacturer: 2/F, No.118 Shongshan Road, Shantou, Guangdong, China

General Description of E.U.T

The **Shantou Tiansheng Model Co., Ltd**'s product, model number: **FM4T-72** or the "EUT" as referred to in this report is a **Transmitter for Model Plane**.

The technical data has been listed following:

Items	Description
EUT Description:	RC Model Aircrafts
Trade Name:	N/A
Model No.:	FM4T-72
Rated Voltage:	DC 12V (8 X 1.5V "AA" size batteries)
Max. Output Power	0.040W
Frequency range:	72.810MHz
Number of channels:	1 channel
Size	175mmL x 95mmW x 220mmH
Channel Separation:	None
Type of Antenna:	Dedicated Antenna

* The test data gathered are from the production sample provided by the manufacturer.

1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with

FCC Rules and Regulations Part 2

FCC Rules and Regulations Part 95 Subpart C

The objective of the manufacturer is to demonstrate compliance with the described above standards.

1.3 Test Summary

For the EUT described above, test items carried out under FCC Rules and Regulations Part 2 & FCC Rules and Regulations Part 95 Subpart C are listed as follow:

FCC Rules	Test Item	Requirement	Result
2.1053 15.107 (a)	Conducted Emission	Reference to Conducted Limit Table in 15.107 (a)	N/A
2.1046 95.639 (b)(3)	RF Output Power	0.75W	Complied
2.1049 95.633 (b)	Emission Bandwidth	8 kHz	Complied
95.635(b)(1) 95.635(b)(3) 95.635(b)(7) 95.635(b)(10) 95.635(b)(11) 95.635(b)(12)	Unwanted Emission	Reference to section 6.3 in this report	Complied
2.1055 95.623	Frequency Stability Vs. Temperature Vs. Voltage	Deviation < 0.002%	Complied

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003.

The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

The maximum emission levels emanating from the device are compared to the FCC Rules and Regulations Part 95 Subpart C limits for radiation emissions and the measurement results contained in this test report show that EUT is to be technically compliant with FCC requirements.

All measurement required was performed at laboratory of ATC Lab Co., Ltd (Guangdong, China), 205#, Yingfeng Building, Ronggu Rd, Ronggui Shunde, Foshan 528305, P.R. China.

1.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 415467

ATC Lab Co., Ltd (Guangdong, China) 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. Registration 415467. Listing date October 10, 2008.

IC-Registration No.: 7949A

The 3m Alternate Test Site of ATC Lab Co., Ltd (Guangdong, China) has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7949A on Oct. 29th, 2008. .

1.6 Test Equipment List and Details

No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Calibration Period
1	Semi- Anechoic Chamber	ETS	N/A	N/A	2009/05	1 year
2	Receiver	R & S	SMR4503	11725	2009/07	1 year
3	Spectrum Analyzer	R & S	FSP30	100755	2008/11	1 year
4	Spectrum Analyzer	Agilent	E7405A	US41160314	2008/11	1 year
5	Spectrum Analyzer	Agilent	E74052	US40240262	2008/11	1 year
6	Microwave system amplifier	Agilent	83017A	MY39500438	2008/11	1 year
7	Biconilog Antenna	ETS	3142C	00042672	2008/09	1 year
8	Signal Generator	HP	8657A	2849U00982	2008/11	1 year
9	RF Test Panel	R & S	TS / RSP	N/A	N/A	N/A

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was tested according to TIA/EIA 603 to represent the worst-case results during the final qualification test.

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software offered by manufacturer, can let the EUT being normal operation.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product supplied by **Shantou Tiansheng Model Co., Ltd** and its respective support equipment manufacturers.

2.4 Equipment Modifications

The EUT tested was not modified by S&E Technologies.

2.5 Basic Test Setup Block Diagram

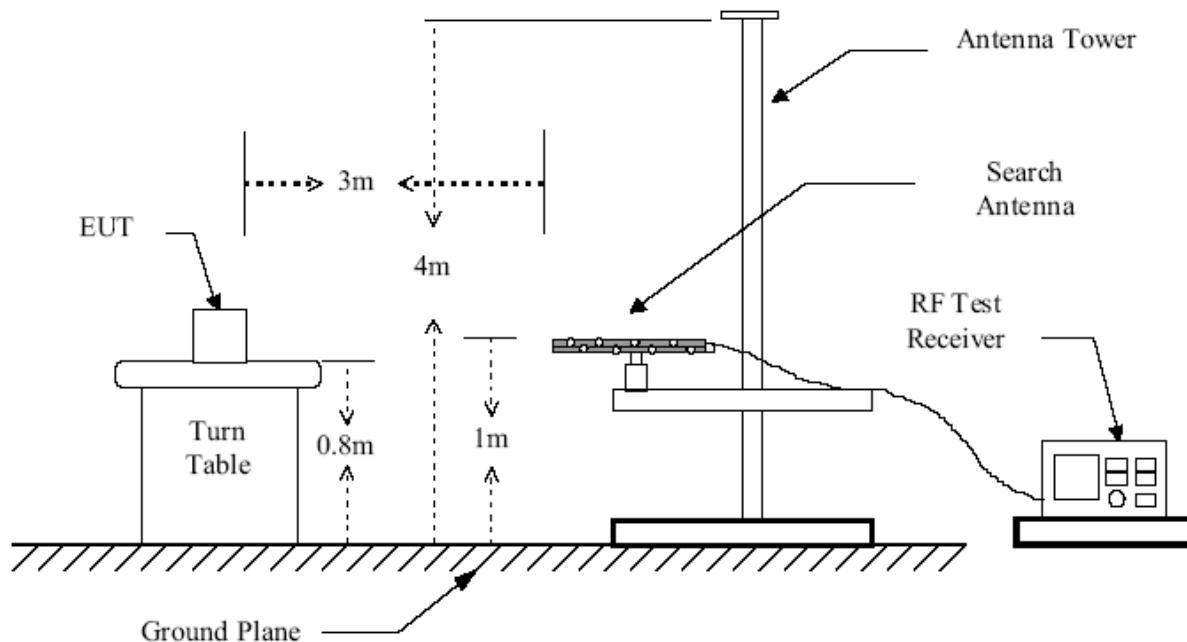


Figure 1 : Frequencies measured below 1 GHz configuration

3 – Conducted Disturbances

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ±2.4 dB.

3.2 Limit of Conducted Disturbances (Class B)

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150~0.500	66~56	56~46
0.500~5.000	56	46
5.000~30.00	60	50

Note: (1) The tighter limit shall apply at the edge between two frequency bands.

3.3 Test Description

The EUT is excused from investigation of Disturbance Voltage at The Mains Terminals, for it can be powered alternatively by rechargeable or un rechargeable battery and the charger was not supplied by the applicant. According to the Section 15.207(d), measurement to demonstrate compliance with the limits of Disturbance Voltage at The Mains Terminals are not required to the devices which only employed battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

4- RF OUTPUT POWER

4.1 Standard Applicable

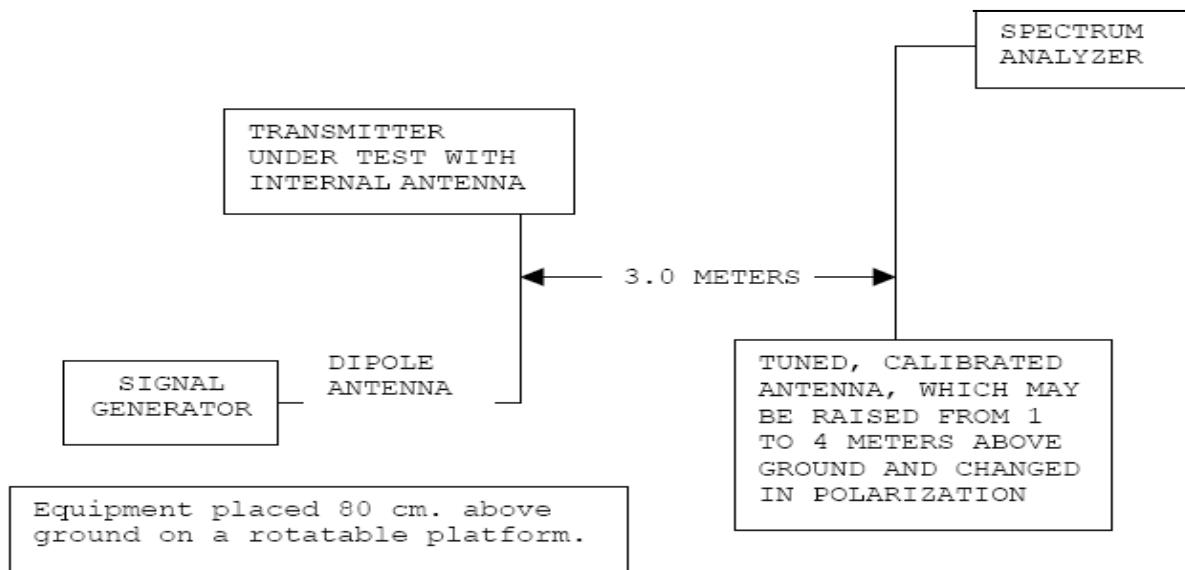
Per FCC §2.1046, and §95.639(b)(3), no R/C transmitter, under any condition of modulation, shall exceed a carrier power or peak envelope TP (single-sideband only) of: 0.75 W in the 72-76 MHz frequency band.

4.2 Test Procedure

The technique used to find the output power of the transmitter was the antenna substitution method. The test procedure was followed:

1. The EUT was powered ON and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length of 91cm.
2. The fundamental frequency (72.810MHz) of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna and by rotating the turntable. After the fundamental emission was maximized, a field strength measurement was made.
3. Steps 1 and 2 were preformed with the EUT and the receive antenna in both vertical and horizontal polarization and performed a pre-test three orthogonal planes.
4. The transmitter was then removed and replaced with a substitution antenna.
5. A signal at the fundamental frequency (72.810MHz) was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally and vertically polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2 is obtained for this set of conditions.
6. The output power into the substitution antenna was then measured.

The test setup plot was followed:



4.3 RF Output Power Test Result

Temperature (°C)	22~23
Humidity (%RH)	50~54
Barometric Pressure (mbar)	950~1000
EUT	RC Model Aircrafts
M/N	FM4T-72
Operating Mode	Continuous Transmitting

Test result:

The transmitter output power found using the antenna substitution method was 0.040W.

Indicated		Table	Test Antenna		Substituted		Antenna Gain Corr.	Cable Loss	Absolute Level	Limit	Margin
Freq.	Meter Reading	Angle	Height	Polar	Freq.	SG Level					
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm					
72.810	108.8	100	1.50	V	72.810	13.7	2.4	0.1	16.0	28.7	12.7

5- OCCUPIED BANDWIDTH

5.1 Standard Applicable

Per FCC §2.1049 and FCC §95.633 (b), the authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 KHz.

5.2 Test Procedure

The antenna was detached from the transmitter and the short cable was connected to the transmitter RF output. The RF output was connected to the input of the spectrum analyzer through sufficient attenuation.

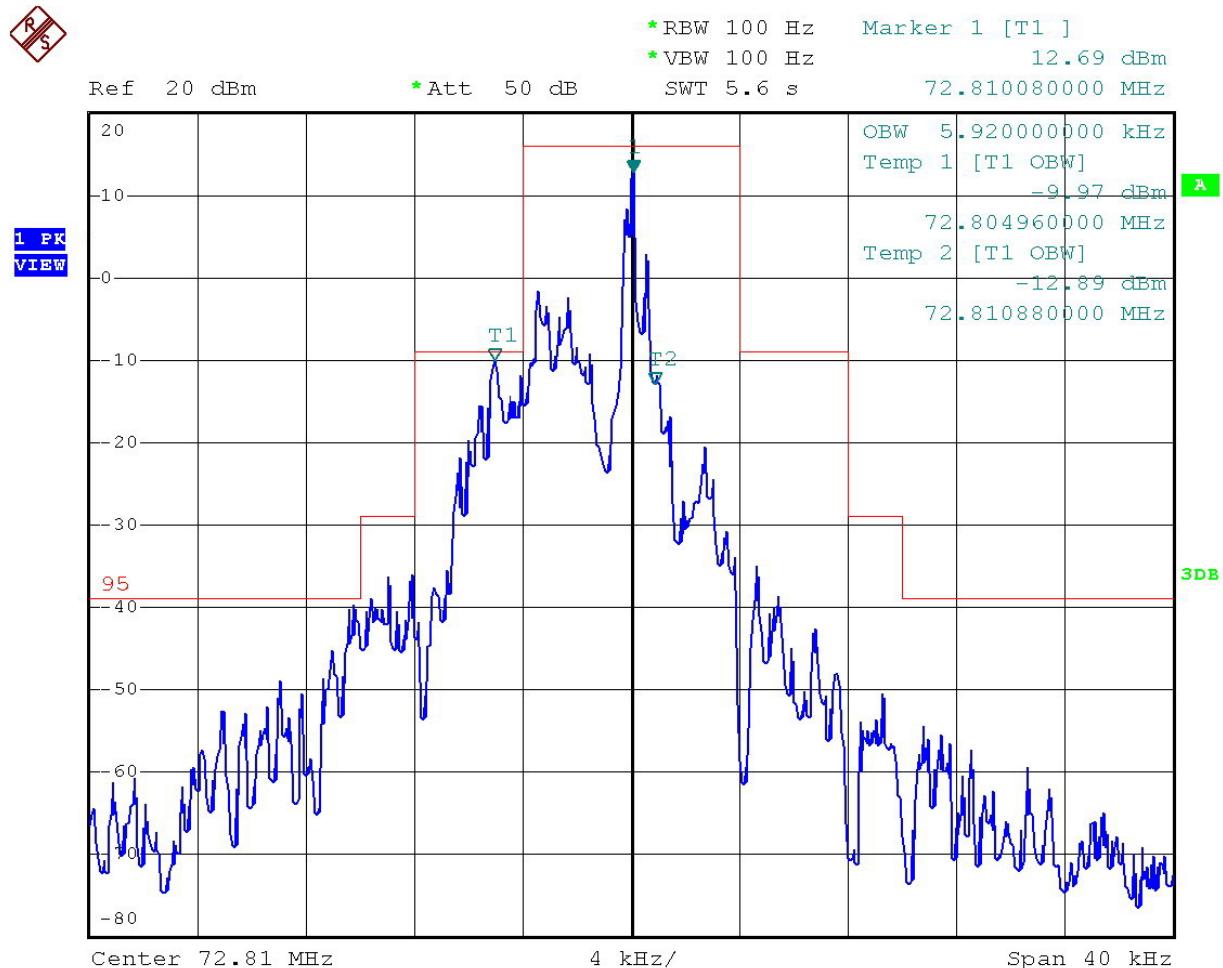
Turn on the transmitter, and set it to transmit the pulse train continuously.

The bandwidth of the carrier was measured and recorded.

5.3 Occupied Bandwidth Test Result

Temperature (°C)	22~23
Humidity (%RH)	48~52
Barometric Pressure (mbar)	950~1000
EUT	RC Model Aircrafts
M/N	FM4T-72
Operating Mode	Continuous Transmitting

The tested bandwidth of EUT is 5.92kHz. It is less than the authorized bandwidth 8 kHz.
Test plot shown on the next page.



**6- §95.635(b)(1), §95.635(b)(3), §95.635(b)(7), §95.635(b)(10),
§95.635(b)(11), §95.635(b)(12) - UNWANTED EMISSION****6.1 Standard Applicable**

Per FCC §95.635 (b)(1), at least 25 dB (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.

Per FCC §95.635 (b)(3), at least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

Per FCC §95.635 (b)(7), at least $43 + 10 \log_{10} (T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

Per FCC §95.635 (b)(10), 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.

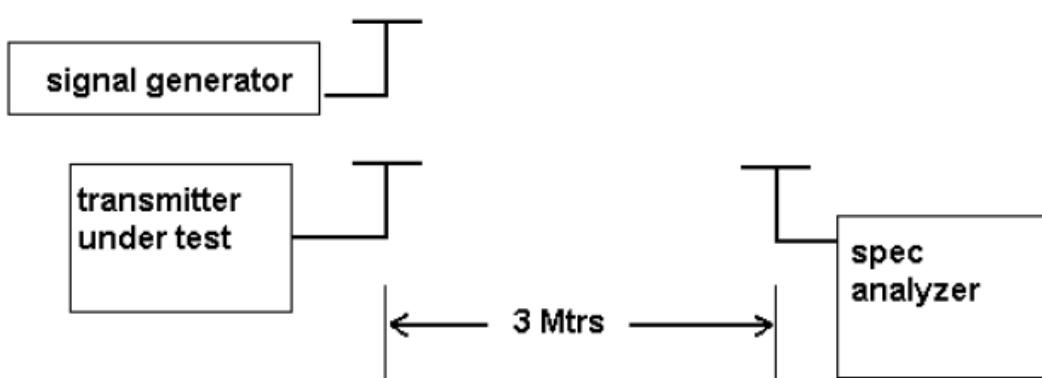
Per FCC §95.635 (b)(11), At least 55 dB on any frequency removed from the center of the authorized bandwidth by more than 125% up to and including 250% of the authorized bandwidth.

Per FCC §95.635 (b)(12), At least $56 + 10 \log_{10} (T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

6.2 Test Procedure

The device was tested according to the substitution method as prescribed in ANSI/TIA-603-C-2004 of August 17, 2004 section 2.2.12. The unit was operating into its permanently attached antenna at a height of 103 cm. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental using a spectrum analyzer and an appropriate antenna. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

The test setup plot was followed:



6.3 Unwanted Emission Test Result

Temperature (°C)	22~23
Humidity (%RH)	48~52
Barometric Pressure (mbar)	950~1000
EUT	RC Model Aircrafts
M/N	FM4T-72
Operating Mode	Continuous Transmitting

Note:

Calculation of FCC Limit was: $16.0 - (56 + 10 \log_{10} 0.040) = -24\text{dB}$

Test Result:

Indicated		Table	Test Antenna		Substituted		Antenna Gain Correction	Cable Loss	Absolute Level	Limit	Margin
Frequency MHz	Meter Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm					
58.240	60.5	100	1.2	V	58.240	-36.8	2.2	0.1	-34.7	-24.0	10.7
145.620	60.9	120	1.3	V	145.620	-36.1	3.3	0.2	-33.0	-24.0	9.0
218.430	59.0	130	1.2	V	218.430	-38.3	3.1	0.2	-35.4	-24.0	11.4
291.240	46.5	165	1.2	V	291.240	-49.6	3.2	0.1	-46.5	-24.0	22.5
364.050	52.6	220	1.1	V	364.050	-43.6	4.0	0.1	-39.7	-24.0	15.7
436.860	60.4	225	1.1	V	436.860	-37.8	3.9	0.1	-34.0	-24.0	10.0
509.670	54.4	0	1.2	V	509.670	-44.8	4.1	0.2	-40.9	-24.0	16.9
582.480	56.3	60	1.3	V	582.480	-43.5	4.1	0.2	-39.6	-24.0	15.6
655.290	58.0	90	1.1	V	655.290	-39.5	4.2	0.2	-35.5	-24.0	11.5
728.080	60.4	130	1.4	V	728.080	-38.1	4.2	0.2	-34.1	-24.0	10.1
800.880	55.6	160	1.5	V	800.880	-43.5	4.2	0.2	-39.5	-24.0	15.5
58.240	43.6	120	1.2	H	58.240	-52.1	2.2	0.1	-50.0	-24.0	26.0
145.620	47.8	60	1.1	H	145.620	-50.1	3.3	0.2	-47.0	-24.0	23.0
218.430	35.1	50	1.5	H	218.430	-60.6	3.1	0.2	-57.7	-24.0	33.7
291.240	47.4	230	1.3	H	291.240	-49.6	3.2	0.1	-46.5	-24.0	22.5
364.050	54.2	120	1.2	H	364.050	-42.5	4.0	0.1	-38.6	-24.0	14.6
436.860	57.0	155	1.2	H	436.860	-40.2	3.9	0.1	-36.4	-24.0	12.4
509.670	51.0	210	1.0	H	509.670	-45.3	4.1	0.2	-41.4	-24.0	17.4
582.480	53.7	170	1.2	H	582.480	-43.0	4.1	0.2	-39.1	-24.0	15.1
655.290	56.1	0	1.1	H	655.290	-40.5	4.2	0.2	-36.5	-24.0	12.5
728.080	68.1	45	1.2	H	728.080	-34.7	4.2	0.2	-30.7	-24.0	6.7
800.880	67.4	20	1.2	H	800.880	-35.2	4.2	0.2	-31.2	-24.0	7.2

7- FREQUENCY STABILITY MEASUREMENT

7.1 Standard Applicable

According to FCC §2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$, and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.623(c), All R/C transmitters capable of operation in the 72-76 MHz band that are manufactured in or imported into the United States, on or after March 1, 1992, or are marketed on or after March 1, 1993, must be maintained within a frequency tolerance of 0.002%.

7.2 Test Procedure

Frequency stability versus environmental temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15-second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30°C after which the transmitter was again allowed to stabilize for one Hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. The worst-case Number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to $+50^{\circ}\text{C}$.

Frequency Stability versus Input Voltage

At room temperature ($25\pm5^{\circ}\text{C}$), an external variable DC power supply was connected to the EUT. Readings were also taken at the end point of the battery voltage of 12.0VDC.

7.3 Frequency Stability Test Result

Temperature ($^{\circ}\text{C}$)	22~23
Humidity (%RH)	48~52
Barometric Pressure (mbar)	950~1000
EUT	RC Model Aircrafts
M/N	FM4T-72
Operating Mode	Continuous Transmitting

Reference Frequency: 72.810 MHz, Limit: +/-0.002%			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (MHz)	Error %
50	12	72.81100	-0.0014
40	12	72.81102	-0.0014
30	12	72.81108	-0.0015
20	12	72.81050	-0.0007
10	12	72.81098	-0.0013
0	12	72.81097	-0.0013
-10	12	72.81106	-0.0015
-20	12	72.81110	-0.0015
-30	12	72.81125	-0.0017

So, Frequency Stability Versus Input Voltage is:

Reference Frequency: 72.810 MHz, Limit: +/-0.002%		
Power Supplied (VDC)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	Error %
12	72.81086	-0.0012
10	72.81095	-0.0013
8	72.81098	-0.0013
6	72.81110	-0.0015
4	72.81119	-0.0016
3.6	72.81120	-0.0016

Note: The EUT ceases to function below the manufacturer declared operating end voltage:3.5V.