

FCC PART 95
EMI MEASUREMENT AND TEST REPORT
For
Shenzhen Colco Model Co., Ltd.

3/F Block 1, Fuguo Industrial District, Meilin Kaifeng North Road, Futian Shenzhen China P.R

FCC ID: TZMCOLCO-TX

June 16, 2005

This Report Concerns: ☒ Original Report	Equipment Type: R/C Helicopter
Test Engineer: Charmi Peng <i>Charmi Peng</i>	
Report No.: RSZ05122004	
Test Date: June 7-15, 2006	
Reviewed By: Boni Baniqued <i>Boni Baniqued</i>	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Shenzhen Colco Model Co., Ltd.*'s product, model number: T6 or the "EUT" as referred to in this report is a R/C Helicopter. The EUT is measured approximately 18.0 cm L x 6.5 cmW x 18.0 cmH, rated input voltage: DC 12 V Battery.

** The test data gathered are from production sample, serial number: 0512029, provided by the manufacturer, we received the EUT on 2005-12-20.*

Objective

This Type approval report is prepared on behalf of *Shenzhen Colco Model Co., Ltd.* in accordance with Part 2, Subpart J, and Part 95 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All tests and measurements indicated in this document were performed in accordance with Part 95 Subpart B and Subpart E of the Federal Communication Commissions rules.

All emissions measurement was performed and Bay Area Compliance Lab Corp. (ShenZhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Lab Corp. (ShenZhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone, ShenZhen, Guangdong 518038, P.R.China.

Test site at Bay Area Compliance Lab Corp. (ShenZhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 04, 2004. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179 and Industrial Canada registration test site No.: 5500A. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Lab Corp. (ShenZhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

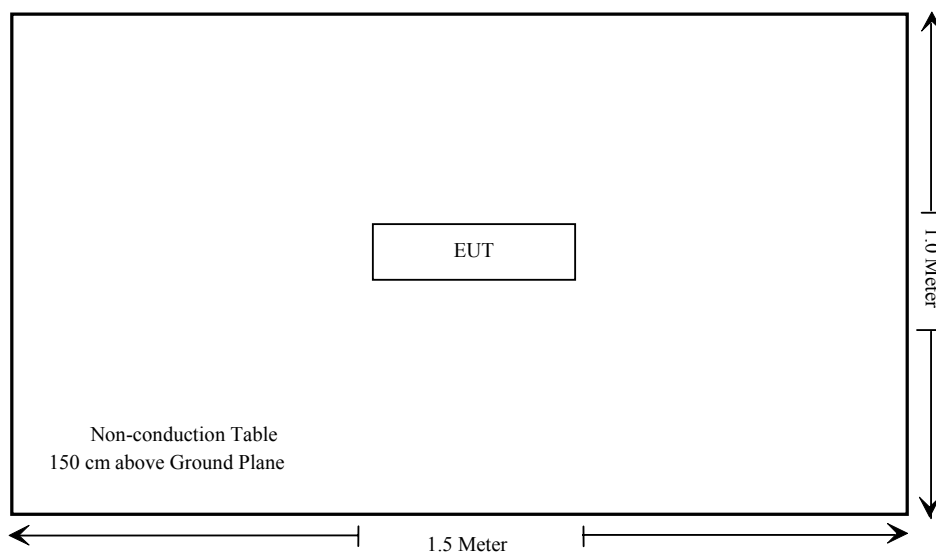
Equipment Modifications

Bay Area Compliance Lab Corp. (ShenZhen) has not done any modification on the EUT.

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§95.207	Authorized Operation Channels	Compliant
§95.623	Frequency Stability	Compliant
§95.631	Emission Type	Compliant
§95.633	Emission Bandwidth	Compliant
§95.635	Unwanted Radiation	Compliant
§95.639	Maximum Transmitter Power	Compliant
§95.647	Transmitter Antennas	Compliant
§95.649	Power Capability	Compliant
§95.651	Crystal Control Required	Compliant

§95.207- AUTHORIZED OPERATION CHANNELS

The product operation at 72.81 MHz.

§95.623, §2.1055- FREQUENCY STABILITY

Standard Applicable

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from –30°C to +50°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%. R/C transmitters operating in the 72–76 MHz band and marketed before March 1, 1993, may continue to be operated with a frequency tolerance of 0.005% until March 1, 1998.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2006-3-1	2007-3-1
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2005-12-28	2006-12-28

* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a f Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Frequency Counter.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

Test Data**Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

The testing was performed by Kamn Hu on 2006-6-7.

Test Result: Pass

Test Mode: Transmitting

Reference Frequency: 72.810 MHz, Limit: 20 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	12	72.810699	9.600
40	12	72.810732	10.054
30	12	72.810786	10.795
20	12	72.810804	11.042
10	12	72.810812	11.152
0	12	72.810831	11.413
-10	12	72.810866	11.894
-20	12	72.810900	12.361
-30	12	72.810955	13.116

Frequency Stability Versus Input Voltage

Reference Frequency: 72.810 MHz, Limit: 20 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
9.6	72.810755	10.369

§95.631- EMISSION TYPE

4K20F1D

§95.633 – EMISSION BANDWIDTH

Standard Applicable

Per FCC §95.633, the authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 kHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2005-8-17	2006-8-17

* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

The antenna was disconnected 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. Set SPA Center Frequency to fundamental frequency, RBW, VBW=1 kHz, SPAN=50 kHz, Set SPA Max hold, Mark peak, -26 dB

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

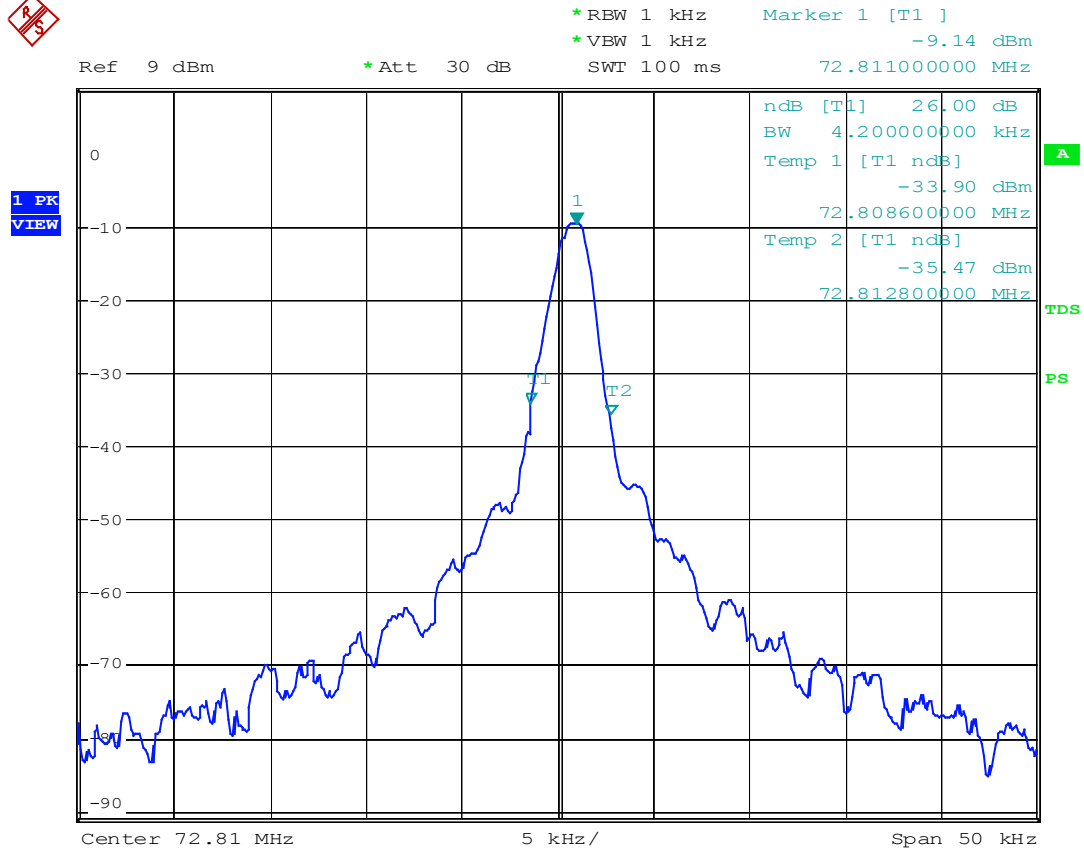
The testing was performed by Charmi Peng on 2006-6-15.

Test Result: Pass.

Test Mode: Transmitting

26 dB Bandwidth=4.2 kHz

Please refer to the hereinafter plots.



Colco Emission bandwidth

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§95.635- UNWANTED RADIATION

Standard Applicable

According to §95.635

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2005-11-10	2006-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
COM POWER	Dipole Antenna	AD-100	041000	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

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. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

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 emission were measured by the substitution.

Spurious emissions in dB=10 lg(TXpwr in Watts/0.001) the absolute level

Spurious attenuation limit in dB=10 log10 (power out in Watts

Test Results Summary

-29.15 dB at 744.866 MHz

Test Data**Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

The testing was performed by Charmi on 2006-6-13.

Test Result: Pass

Test Mode: Transmitting

Indicated Frequency MHz	Meter Reading dBuV/m	Table Angle Degree	Test Antenna		Substituted			Antenna Loss		Absolute Level dBm	FCC PART 95	
			Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain dBi	Cable Loss dB		Limit dBm	Margin dB
744.866	43.57	270	1.0	H	744.866	-48.4	H	0	6.75	-55.15	-26	-29.15
142.320	41.34	180	1.2	V	142.320	-52.8	V	0	2.36	-55.16	-26	-29.16
670.489	42.09	60	1.2	H	670.489	-49.2	H	0	6.33	-55.53	-26	-29.53
87.110	26.20	180	1.2	H	87.110	-53.6	H	0	2.11	-55.71	-26	-29.71
145.606	37.17	180	1.2	V	145.606	-55.6	V	0	2.36	-57.96	-26	-31.96
133.620	36.72	45	1.0	V	133.620	-57.3	V	0	2.36	-59.66	-26	-33.66
87.110	31.2	45	1.0	V	87.110	-60.8	V	0	2.11	-62.91	-26	-36.91
145.606	31.07	270	1.0	H	145.606	-64.15	H	0	2.36	-66.51	-26	-40.51
133.620	31.92	270	1.0	H	133.620	-65.0	H	0	2.36	-67.36	-26	-41.36
455.190	33.92	270	1.0	V	455.190	-68	V	0	5.07	-73.07	-26	-47.07

§95.635– UNWANTED RADIATION

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)(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%.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2005-8-17	2006-8-17

* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.
6. Spurious attenuation limits in dB = $56 + 10\log_{10}(\text{power out in Watts})$

Test Data**Environmental Conditions**

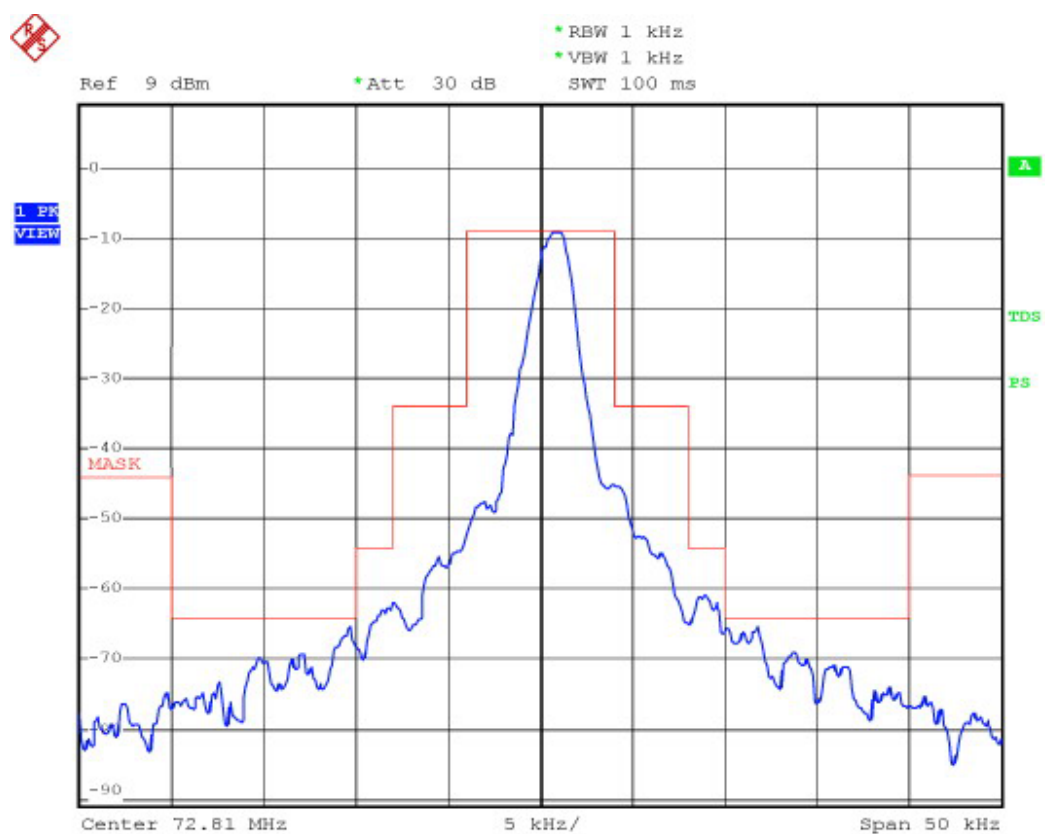
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

The testing was performed by Charmi Peng on 2006-6-15.

Test Result: Pass

Test Mode: Transmitting

Please refer to the hereinafter plots.



Colco Emission mask

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§95.639- MAXIMUM TRANSMITTER POWER

Standard Applicable

Per §95.639, 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2005-11-10	2006-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
COM POWER	Dipole Antenna	AD-100	041000	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

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. The test was performed by placing the EUT on 3-orthogonal axis.

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

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 transmitter power were measured by the substitution.

Test Data**Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

The testing was performed by Charmi on 2006-6-13.

Test Result: Pass

Test Mode: Transmitting

Indicated		Table Test Antenna			Substituted			Antenna Loss	Cable Loss	Absolute		Limit	Test Result
Frequency	Meter Reading	Angle	Height	Polar	Frequency	Level	Polar	Gain	Loss	Level			
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	H/V	dBi	dB	dBm	mW	mW	
72.81	74.43.	45	1.0	V	72.81	8.1	V	0	1.86	6.24	4.6	750	Pass
72.81	54.02	45	1.0	H	72.81	-15	H	0	1.86	-16.86	0.021	750	Pass

§95.647- TRANSMITTER ANTENNAS

The antenna of EUT is an integral part of the transmitter with a length fo 82 cm in accordance to section 95.674, is considered sufficient to comply with the provision of this section.

§95.649- POWER CAPABILITY

The EUT is not capable to incorporate provisions for increasing its transmitter power to any level in excess of the limits specified in §95.639.

§95.651- CRYSTAL CONTROL REQUIRED

The EUT is controlled by 72.81 MHz crystal.