

# FCC PART 95

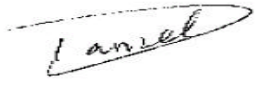
## EMI MEASUREMENT AND TEST REPORT

For

### GuangZhou Walkera Technology Co., Ltd

Taishi Industrial Park, Yuwotou, Panyu,  
Guangzhou, China, 511475

**FCC ID: S29NO22**

|                                                                                     |                                                                                                                                          |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report | <b>Equipment Type:</b><br>R/C Helicopter - Transmitter                                                                                   |
|    |                                                                                                                                          |
| <b>Test Engineer:</b>                                                               | Ming Jing /                                                                                                                              |
| <b>Report Number:</b>                                                               | R0502097 TX                                                                                                                              |
| <b>Report Date:</b>                                                                 | 2005-03-03                                                                                                                               |
| <b>Reviewed By:</b>                                                                 | Daniel Deng /                                        |
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## GENERAL INFORMATION

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### Product Description for Equipment Under Test (EUT)

The *GuangZhou Walkera Technology Co., Ltd*'s product, FCC ID: S29NO22, Model: NO.22 or the "EUT" as referred to in this report is a Transmitter, R/C Airplane, which measures approximately 185mmL x 180mmW x 75mmH with weight 480g.

*\* The test data gathered are from production sample, serial number: 00B35C, provided by the manufacturer.*

### Objective

This report is prepared on behalf of *GuangZhou Walkera Technology Co., Ltd* in accordance with Part 2, Part 95 Subpart C and Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for effective radiated power, occupied bandwidth, radiated spurious emissions, and frequency stability.

### Related Grant/Submission

No Related Submittals.

### Test Methodology

Measurements contained in this report were also conducted with TIA/EIA Standard 603, Telecommunications Industry Association Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. 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 and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations is attached hereinafter and can also be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

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## SYSTEM TEST CONFIGURATION

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### Justification

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

### Special Accessories

As shown in following test block diagram setup, interface cable used for compliance testing is shielded as normally supplied by customer and its respective support equipment manufacturers.

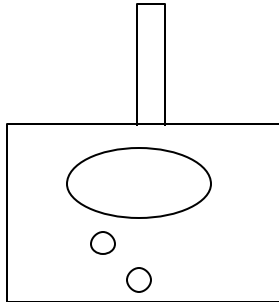
### Schematics / Block Diagram

Please refer to Appendix D.

### Equipment Modifications

No modifications were made to the EUT.

### Configuration of Test System



## REQUIREMENTS OF PROVISIONS

Results reported relate only to the product tested, serial number: 00B35C.

| FCC Rules                                                                                            | Rules Description                                     | Requirement        | Result   |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------|----------|
| 2.1046<br>95.639 (b)(3)                                                                              | RF Output Power                                       | 0.75W              | Complied |
| 2.1049<br>95.633 (b)                                                                                 | Emission bandwidth                                    | 8 kHz              | Complied |
| 2.1053<br>95.635                                                                                     | Spurious Radiation                                    | < -26 dBm          | Complied |
| 95.635 (b)(1)<br>95.635 (b)(3)<br>95.635(b)(7)<br>95.635 (b)(10)<br>95.635 (b)(11)<br>95.635 (b)(12) | Unwanted Radition                                     | Complied           | Complied |
| 2.1055<br>95.623(c)                                                                                  | Frequency Stability<br>Vs. Temperature<br>Vs. Voltage | Deviation < 0.002% | Complied |

## §2.1046, and §95.639(b)(3) – RF OUTPUT POWER

### 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.

### Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuator.

### Test Equipment

| Manufacturer    | Description       | Model   | Serial Number | Cal. Date  |
|-----------------|-------------------|---------|---------------|------------|
| Hewlett Packard | Spectrum Analyzer | 8565EC  | 3946A00131    | 2004-08-06 |
| Hewlett Packard | Plotter           | HP7470A | N/A           | N/A        |

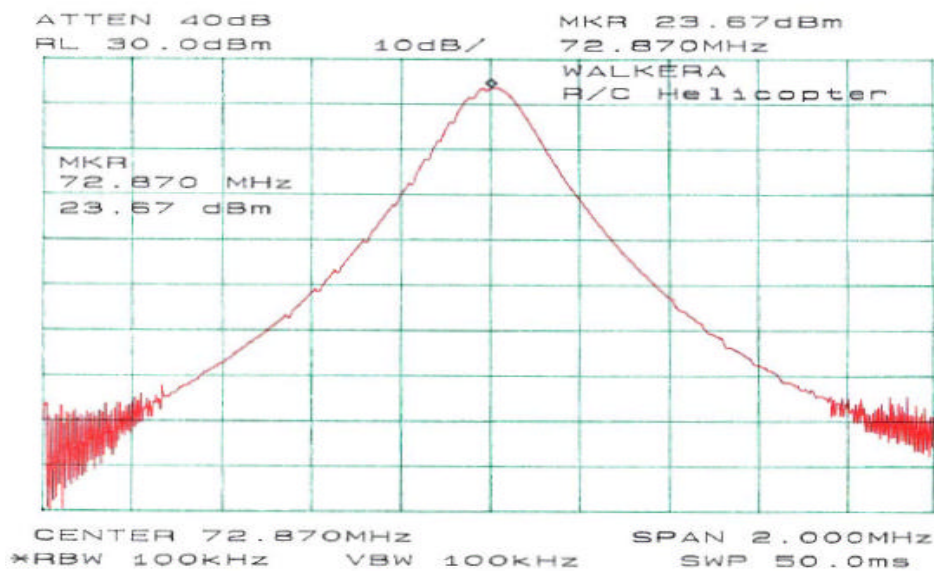
\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 21 °C     |
| Relative Humidity: | 37%       |
| ATM Pressure:      | 1032 mbar |

The testing was performed by Ming Jin on 2005-02-17.

### Test Results



## §2.1049, and §95.633(b) - OCCUPIED BANDWIDTH OF EMISSION

### 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.

### 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.

### Test Equipment

| Manufacturer | Description       | Model  | Serial Number | Cal. Date  |
|--------------|-------------------|--------|---------------|------------|
| HP           | Spectrum Analyzer | 8565EC | 3946A00131    | 2004-08-06 |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

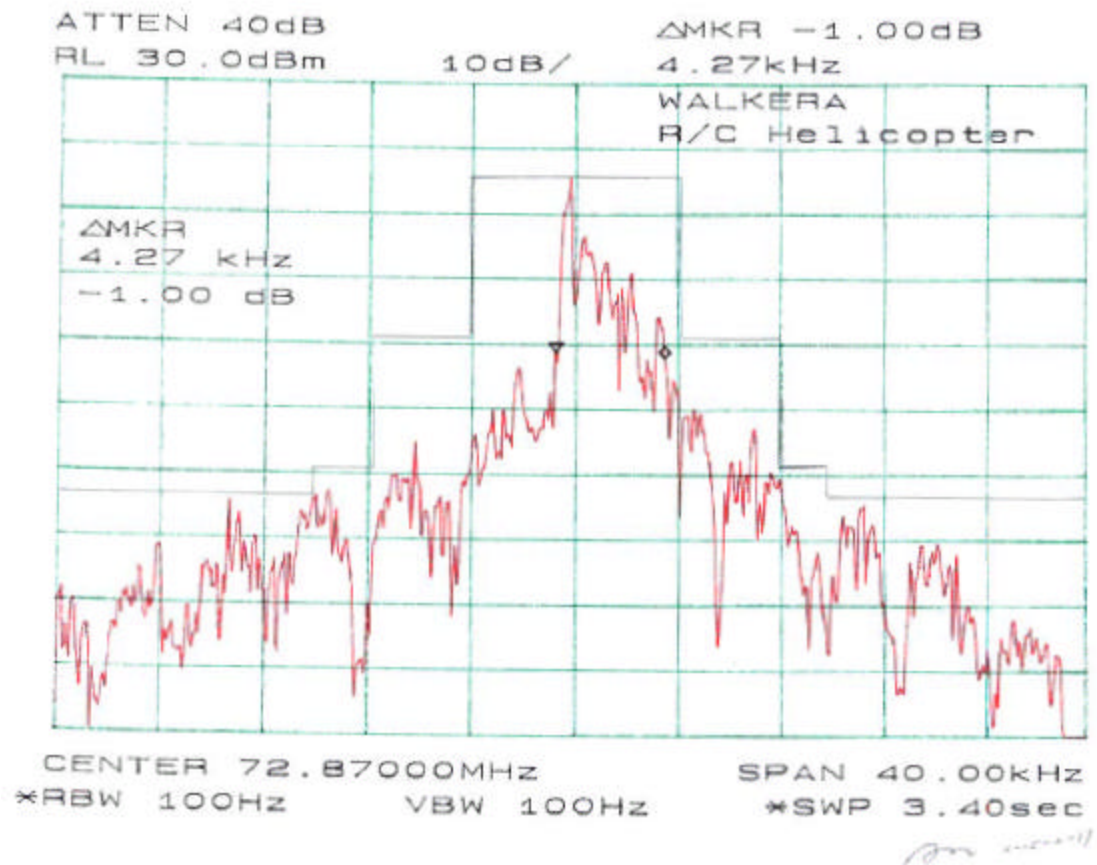
|                    |           |
|--------------------|-----------|
| Temperature:       | 21 ° C    |
| Relative Humidity: | 37%       |
| ATM Pressure:      | 1032 mbar |

\* The testing was performed by Ming Jin on 2005-02-17.

### Test Results

Test Result: Pass

Please refer to the following curve and plots.



## §2.1053 and §95.635 - SPURIOUS RADIATED

### Standard Applicable

According to FCC §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

### 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 tenth 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 emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg(\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $56 + 10 \lg(\text{power out in Watts})$

### Test Equipment

| Manufacturer     | Description          | Model       | Serial Number | Cal. Date  |
|------------------|----------------------|-------------|---------------|------------|
| HP               | Spectrum Analyzer    | 8565EC      | 3946A00131    | 2004-08-08 |
| HP               | Amplifier            | 8447E       | 2944A10187    | 2004-09-23 |
| EMCO             | Biconical Antenna    | 3110B       | 9309-1165     | 2004-10-11 |
| EMCO             | Log Periodic Antenna | 3146        | 2101          | 2004-10-01 |
| Rohole & Schwarz | Signal Generator     | SMIQ03      | DE23746       | 2004-07-03 |
| Cow-Power        | Standard Dipole      | AD-100      | 2219          | 2004-09-08 |
| AH-System        | Horn Antenna         | SAS-200/511 | 261           | 2004-08-02 |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

**Environmental Conditions**

|                    |           |
|--------------------|-----------|
| Temperature:       | 21 ° C    |
| Relative Humidity: | 37%       |
| ATM Pressure:      | 1032 mbar |

The testing was performed by Ming Jing on 2005-02-17.

**Test Result**

-16.7 dB at 145.74 MHz

Primary scan 30MHz – 800MHz

| EUT              |                 |                 |                 |              | Generator        |              |                   |            |              | Standard     |              |
|------------------|-----------------|-----------------|-----------------|--------------|------------------|--------------|-------------------|------------|--------------|--------------|--------------|
| Indicated        |                 | Table           | Test Antenna    |              | Substitution     |              | Antenna           | Cable      | Absolute     | FCC          | FCC          |
| Frequency<br>MHz | Ampl.<br>dBuV/m | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Frequency<br>MHz | Level<br>dBm | Gain<br>Corrected | Loss<br>DB | Level<br>dBm | Limit<br>dBm | Margin<br>dB |
| 72.87            | 93.9            | 310             | 2.2             | v            | 72.87            | 22.35        | 0                 | 0.1        | 22.25        |              |              |
| 72.87            | 80.2            | 90              | 1.8             | h            | 72.87            | 17.23        | 0                 | 0.1        | 17.13        |              |              |
| 145.74           | 36.4            | 0               | 2.1             | v            | 145.74           | -42.5        | 0                 | 0.2        | -42.7        | -26          | -16.7        |
| 218.61           | 27.3            | 30              | 1.5             | v            | 218.61           | -47.3        | 0                 | 0.2        | -47.5        | -26          | -21.5        |
| 218.61           | 27.1            | 30              | 1.2             | h            | 218.61           | -47.5        | 0                 | 0.2        | -47.7        | -26          | -21.7        |
| 291.16           | 26.5            | 110             | 1.5             | v            | 291.16           | -47.8        | 0                 | 0.3        | -48.1        | -26          | -22.1        |
| 145.74           | 29.7            | 270             | 1.8             | h            | 145.74           | -48.1        | 0                 | 0.2        | -48.3        | -26          | -22.3        |
| 291.16           | 26.2            | 330             | 1.2             | h            | 291.16           | -48.3        | 0                 | 0.3        | -48.6        | -26          | -22.6        |

Note: No Preamplifier Used. The EUT was tested in three orthogonal planes.

**§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 RADITION****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  $43 \pm 10 \log_{10} (T)$  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%.

**Measurement 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 Equipment**

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date |
|--------------|-------------------|-----------|------------|------------------|
| HP           | Spectrum Analyzer | 8564E     | 3943A01781 | 2004-10-04       |

**\* Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

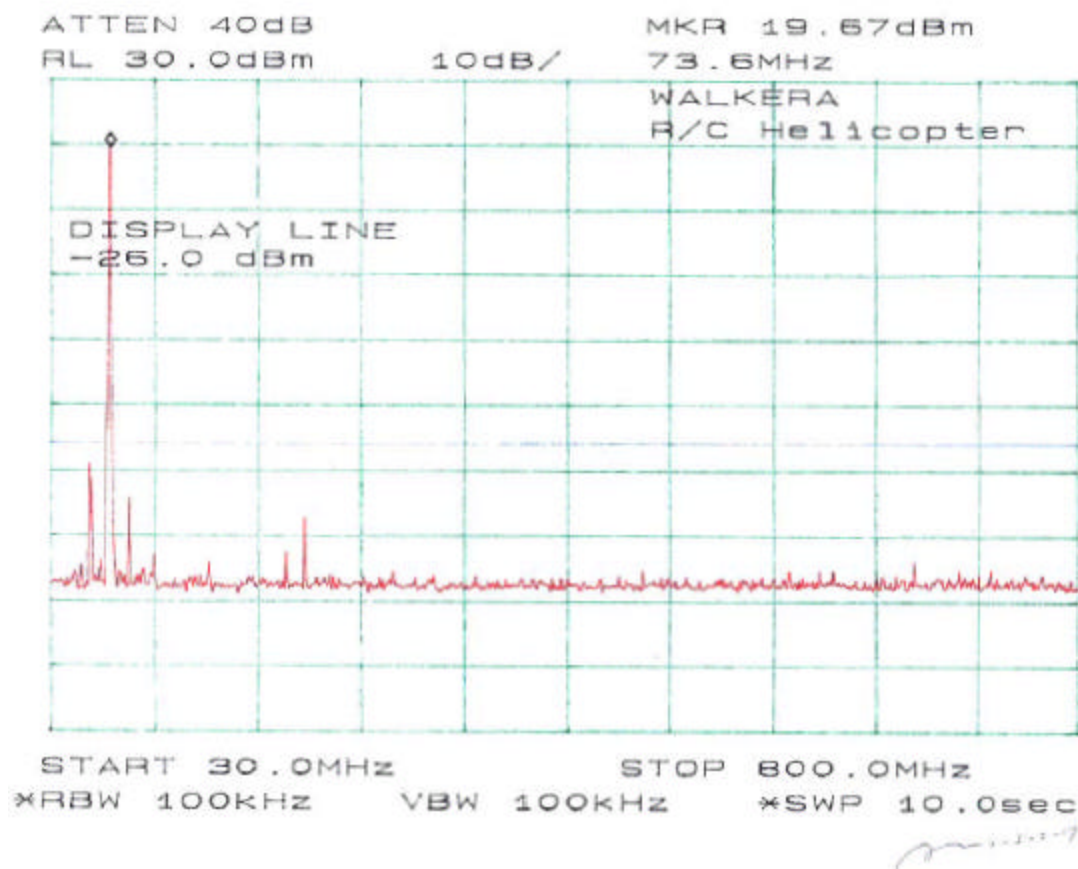
**Environmental Conditions**

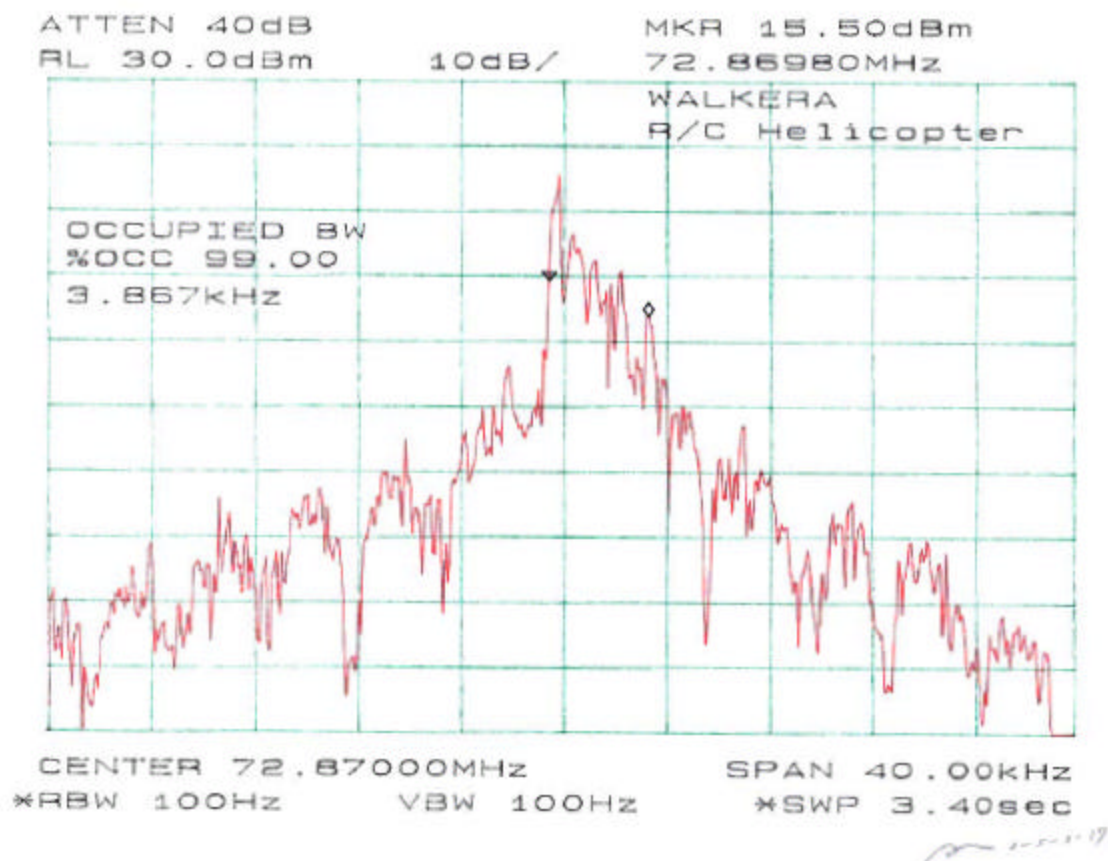
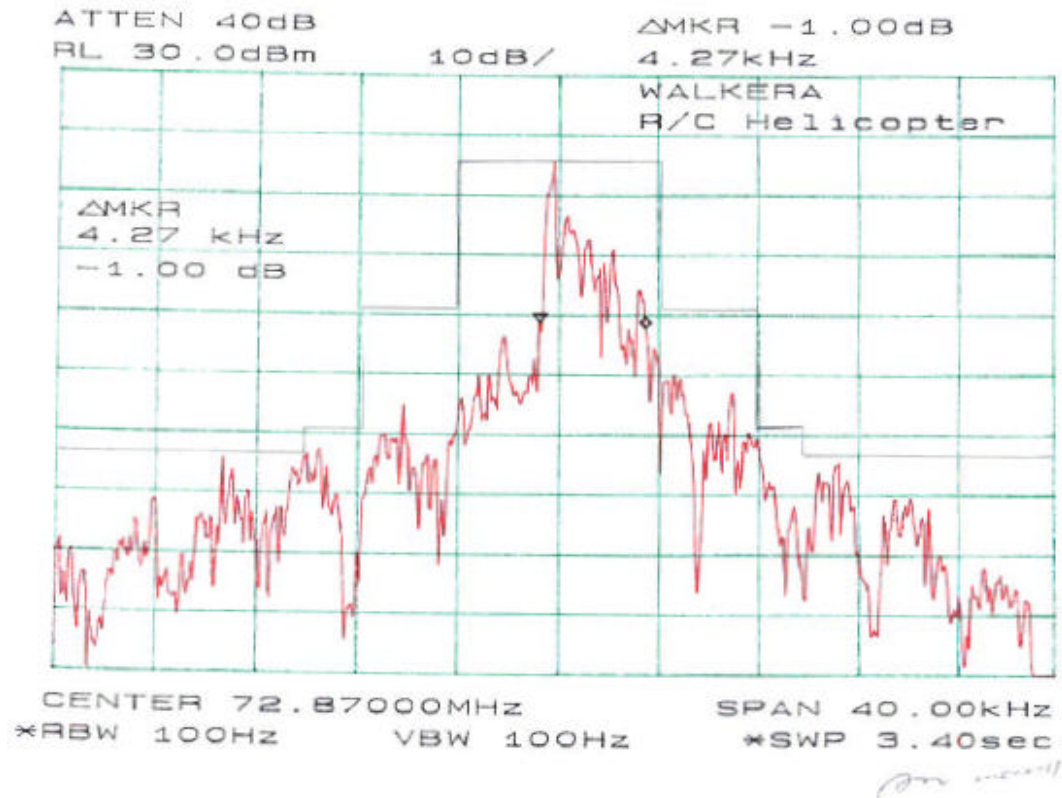
|                    |           |
|--------------------|-----------|
| Temperature:       | 21 °C     |
| Relative Humidity: | 37%       |
| ATM Pressure:      | 1032 mbar |

The testing was performed by Ming Jing on 2005-02-17.

**Test Result**

Please refer to the following plot(s).





## §2.1055, and §95.623 - FREQUENCY STABILITY MEASUREMENT

### Standard Applicable

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from  $-30^{\circ}\text{C}$  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%.

### 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 feedthrough attenuators. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

#### Frequency Stability versus Input Voltage

At room temperature ( $25\pm 5^{\circ}\text{C}$ ), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

### Test Equipment

| Manufacturer | Description         | Model No. | Serial No. | Calibration Date |
|--------------|---------------------|-----------|------------|------------------|
| HP           | Spectrum Analyzer   | 8564E     | 3943A01781 | 2004-10-04       |
| Tenny        | Temperature Chamber | Versa     | 4581       | 2004-04-23       |

\* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Environmental Conditions

|                    |                      |
|--------------------|----------------------|
| Temperature:       | $21^{\circ}\text{C}$ |
| Relative Humidity: | 37%                  |
| ATM Pressure:      | 1032 mbar            |

\* The testing was performed by Ming Jing on 2005-02-17.

**Test Results**

| Reference Frequency: 72.87 MHz, Limit: +/-0.002% |                         |                                     |         |
|--------------------------------------------------|-------------------------|-------------------------------------|---------|
| Environment Temperature<br>(°C)                  | Power Supplied<br>(Vdc) | Frequency Measure with Time Elapsed |         |
|                                                  |                         | MCF (MHz)                           | Error % |
| 50                                               | 12                      | 72.86901                            | -0.0014 |
| 40                                               | 12                      | 72.86917                            | -0.0011 |
| 30                                               | 12                      | 72.86995                            | -0.0001 |
| 20                                               | 12                      | 72.86995                            | -0.0001 |
| 10                                               | 12                      | 72.87013                            | 0.0002  |
| 0                                                | 12                      | 72.87021                            | 0.0003  |
| -10                                              | 12                      | 72.87035                            | 0.0005  |
| -20                                              | 12                      | 72.87052                            | 0.0007  |
| -30                                              | 12                      | 72.87063                            | 0.0009  |

*Frequency Stability Versus Input Voltage*

| Reference Frequency: 72.87 MHz, Limit: +/-0.002% |                                      |         |
|--------------------------------------------------|--------------------------------------|---------|
| Power Supplied (Vdc)                             | Frequency Measured with Time Elapsed |         |
|                                                  | Frequency (MHz)                      | Error % |
| 10.2                                             | 72.86995                             | -0.0001 |

Note: The end point is 10.2 Vdc.