

FCC PART 95

MEASURMENT AND TEST REPORT

For

GreatMountain Electric Technology CO., LTD
Liheng Industrial Zone, Qinxi Town, Dongguan City, Guangdong Province,
China

FCC ID: T5K602

Report Concerns: Original Report	Equipment Type: Transmitter
Model: <u>T602</u>	
Report No.: <u>STR07058004I</u>	
Test/Witness Engineer: <u>Lahm Peng</u>	
Test Date: <u>2007-05-15</u>	
Prepared By: Shenzhen SEM.Test Compliance Service Co., Ltd. Room 609-610, Baotong Building, Baomin 1 st Road, Baoan District, Shenzhen, Guangdong, P.R.C. (518133)  Approved & Authorized By: <u>Jandy So / PSQ Manager</u>	

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: GreatMountain Electric Technology Co., LTD
Address of applicant: Liheng Industrial Zone, Qinxi Town, Dongguan City, Guangdong Province, China

Manufacturer: GreatMountain Electric Technology Co., Ltd
Address of applicant: Liheng Industrial Zone, Qinxi Town, Dongguan City, Guangdong Province, China

General Description of E.U.T

Items	Description
EUT Description:	Transmitter
Trade Name:	GM
Model No.:	T602
Rated Voltage:	DC 12V Battery
Output Power:	<10mW
Frequency Range:	72.01 – 72.99MHz
Size:	8.0X19.0X20.0 cm
No. of Channel:	6 CH with different encode for identification
Antenna Type:	Dedicated Antenna
Antenna Length:	103cm
For more information refer to the circuit diagram form and the user's manual.	

The test data is gathered from a production sample, Model T602, provided by the manufacturer.

1.2 Test Standards

The following report of is prepared on behalf of GreatMountain Electric Technology Co., Ltd. in accordance with FCC Rules and Regulations Part 2 & FCC Rules and Regulations Part 95 Subpart C of the Federal Communication Commissions rules.

The objective is to determine compliance with the FCC Rules and Regulations Part 2 & FCC Rules and Regulations Part 95 Subpart C of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 Test Methodology

Measurements contained in this report were also conducted with Part 2 & FCC Rules and Regulations Part 95 Subpart C of the Federal Communication Commissions rules and ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level according to TIA/EIA 603A to represent the worst-case results during the final qualification test. The test modes were adapted with transmitting mode. For more detail refer to the Operating Instructions.

1.5 Test Facility

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

United States of American Federal Communications Commission (**FCC**), and the registration number is **274801**.

Industry Canada (**IC**), and the registration number is **IC4174**.

All measurement required was performed at laboratory of Shenzhen Academy of Metrology and Quality Inspection, Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

1.8 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Cord/Without Cord
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	LIMIT
2.1046 95.639 (b)(3)	RF Output Power	<0.75W
2.1049 95.633 (b)	Occupied Bandwidth Emission	8 kHz
95.635(b)(1) 95.635(b)(3) 95.635(b)(7) 95.635(b)(10) 95.635(b)(11) 95.635(b)(12)	Radiated Spurious Emissions	Reference to section 5.6 in this report
2.1055 95.623	Frequency Stability Vs. Temperature Vs. Voltage	Deviation < 0.002%

3. §2.1046 and §95.639(b) (3) - RF OUTPUT POWER

3.1 Standard Applicable

According to 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.

3.2 Test Equipment List and Detail

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2007-1-16	2008-1-15
ETS	Multi_Device Controller	2090	57230	2007-1-16	2008-1-15
Schwarzbeck	Antenna	VUBA9117	115	2007-1-14	2008-1-13
3m chamber	Albatross Projects	9X6X6	----	2007-1-14	2008-1-13
Rohde & Schwarz	Horn Antenna	HF906	100014	2007-1-16	2008-1-15
Rohde & Schwarz	Signal Generator	SMR20	100047	2007-1-14	2008-1-13
Schwarzbeck	Dipole Antenna	H00009170	9136	2007-1-14	2008-1-13

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

3.3 Test Procedure

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 (72.230MHz) 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 (72.230MHz) 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.

4.4 Environmental Conditions

Temperature:	26° C
Relative Humidity:	51%
ATM Pressure:	1012 mbar

3.4 Test Result/Plots

Frequency	Substitution SG Reading	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	Corrected Ampl.	FCC Part 95 Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	mW	mW
72.230	-19.83	1.6	180	H	0.8	0	-20.63	0.0086	750
72.230	-5.45	1.7	196	V	0.8	0	-6.25	0.2371	750

4. §2.1049 and § 95.633(b) - OCCUPIED BANDWIDTH OF EMISSION

4.1 Standard Applicable

According to FCC §2.1049 and FCC §95.633 (b), The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 kHz.

4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2006-06-30	2007-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2006-06-30	2007-06-29

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.3 Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. Turn on the transmitter, and set it to transmit the pulse train continuously.
3. The bandwidth of the carrier was measured and recorded.

4.4 Environmental Conditions

Temperature:	22° C
Relative Humidity:	50%
ATM Pressure:	1012 mbar

4.5 Test Results/Masks

The occupied Bandwidth Emission of all fall in the Mask, full fit the requirements of the standards.



5. §95.635(b)(1), §95.635(b)(3), §95.635(b)(7), §95.635(b)(10), §95.635(b)(11),

§95.635(b)(12)- RADIATED SPURIOUS EMISSION

5.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 0.5 dB.

5.2 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%.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2007-1-16	2008-1-15
ETS	Multi_Device Controller	2090	57230	2007-1-16	2008-1-15
Schwarzbeck	Antenna	VUBA9117	115	2007-1-14	2008-1-13
Albatross Projects	3m chamber	9X6X6	----	2007-1-14	2008-1-13
Rohde & Schwarz	Horn Antenna	HF906	100014	2007-1-16	2008-1-15
Rohde & Schwarz	Signal Generator	SMR20	100047	2007-1-14	2008-1-13
Schwarzbeck	Dipole Antenna	H00009170	9136	2007-1-14	2008-1-13

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.4 Test Procedure

1. The setup of EUT is according with per TIA/EIA Standard 603 and ANSI C63.4-2003 measurement procedure.
2. 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.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. 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 attenuation limit in dB = $56 + 10 \log_{10}$ (power out in Watts)

5.5 Environmental Conditions

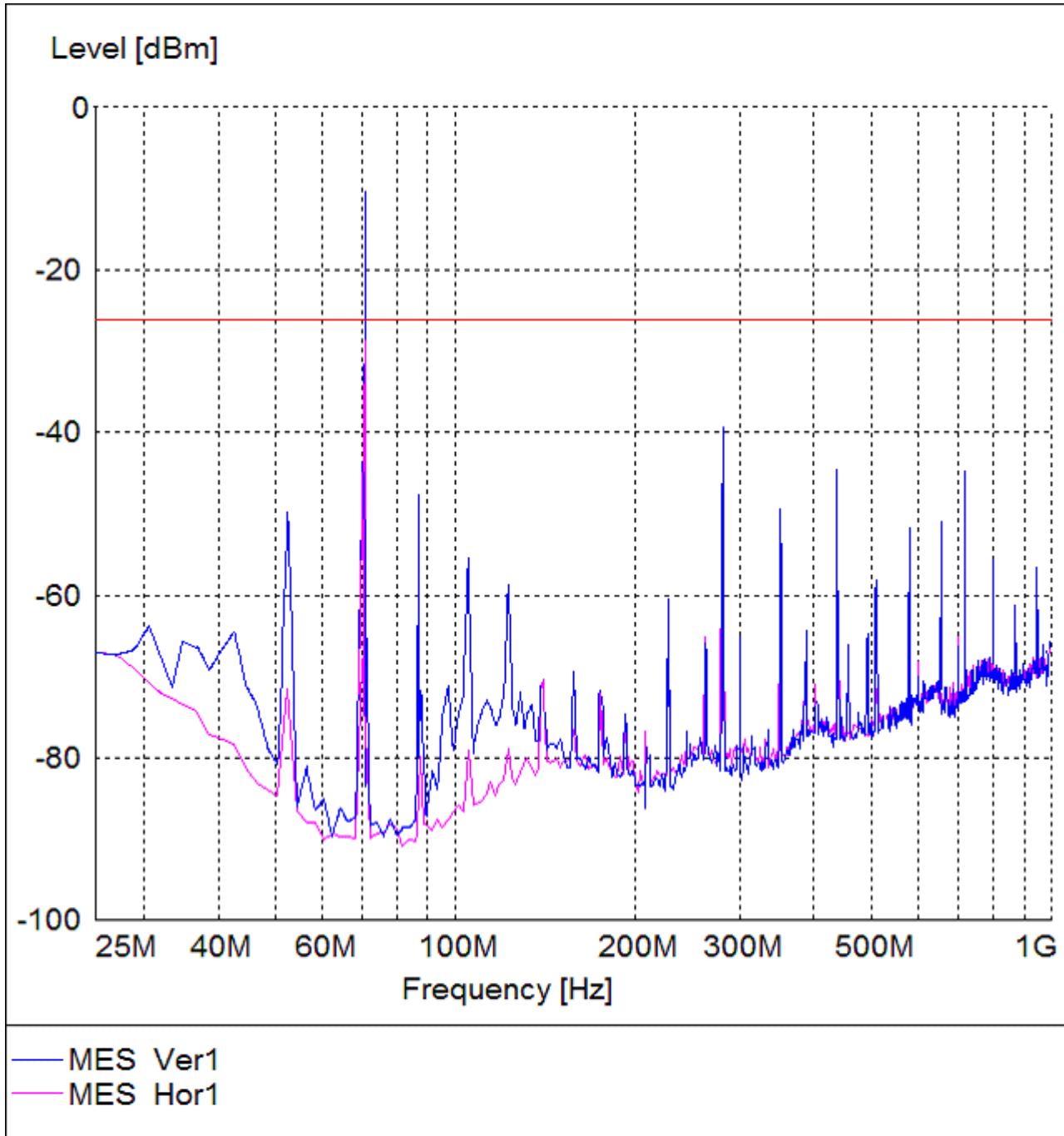
Temperature:	21°C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

5.6 Summary of Test Results/Plots

According to the data below, the FCC Part 95 standards, and had the worst margin of:

-13.6 dB at 280.1 MHz in the Vertical polarization, 30 MHz to 1 GHz, 3 Meters

Frequency	SG Reading	Table	Height	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 95 Limit	FCC Part 95 Margin
MHz	dBm	Degree	Meter	H / V	dB	dB	dBm	dBm	dB
280.1	-38.1	45	1.4	V	1.5	0	-39.6	-26	-13.6
430.5	-42.7	180	1.7	V	2.2	0	-44.9	-26	-18.9
712.3	-42.1	45	1.8	V	3.1	0	-45.2	-26	-19.2
87.3	-47.7	45	1.5	V	0.9	0	-48.6	-26	-22.6
349.8	-47.5	60	1.4	V	1.8	0	-49.3	-26	-23.3
52.6	-49.4	270	1.6	V	0.7	0	-50.1	-26	-24.1
280.1	-63.3	45	1.8	H	1.5	0	-64.8	-26	-38.8
256.7	-64.3	90	1.7	H	1.3	0	-65.6	-26	-39.6
700.0	-63.5	180	1.6	H	3.0	0	-66.5	-26	-40.5
143.2	-70.5	0	1.7	H	1.1	0	-71.6	-26	-45.6
52.6	-71.8	60	1.6	H	0.7	0	-72.5	-26	-46.5
87.3	-78.8	45	1.5	H	0.9	0	-79.7	-26	-53.7



Note: Testing is carried out with 3-orthogonal axis and frequency rang 30MHz to the tenth harmonics. Emissions undetected below the base noise are not reported.

6. §2.1055, §95.621 and §95.627(b)- FREQUENCY STABILITY

6.1 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%.

6.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2006-06-30	2007-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2006-06-30	2007-06-29
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2006-06-30	2007-06-29

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

1. Setup the configuration of the ambient temperature from -30°C to $+50^{\circ}\text{C}$ with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Active the Analyzer frequency counter option, center frequency to the right frequency needs to be measured.

6.4 Test Results/Plots

Reference Frequency: 72.810 MHz, Limit: +/-0.002%			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (MHz)	Error %
50	12	72.22990	-0.000138
40	12	72.22983	-0.000235
30	12	72.22982	-0.000249
20	12	72.22980	-0.000277
10	12	72.22980	-0.000277
0	12	72.22975	-0.000346
-10	12	72.22976	-0.000332
-20	12	72.22968	-0.000443
-30	12	72.22965	-0.000485

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 %
9.6	72.22970	-0.000415