Lab Code: 200167-0

FCC PART 15.249

MEASUREMENT AND TEST REPORT

For

Electronic Solutions, Inc.

1355 Horizon Ave. Lafayette
CO 80026, USA

FCC ID: P7RTZ330001
Model: TX-3300US

Report Type:	**Product Type:**
Original Report	Wireless Remote Control

Test Engineer:	Jack Liu
Report Number:	R0806023-249
Report Date:	2008-08-19
Reviewed By:	Boni Baniqued Sr. RF Engineer
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DOCUMENT REVISION HISTORY

Revision #	Report Number	Description of Revision	Date of Revision
0	R0806023-249	Original Report	2008-08-19

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This measurement and test report has been compiled on behalf of the company *Electronic Solutions Inc.* and their product model: *TZ-3300US*, FCC ID: *P7RTZ330001* which will be henceforth in this report referred to as the EUT (Equipment under Test).

The EUT is base on ZM3102N US Z-Wave Module's Remote Control also using battery operated. It is for home automation applications. Controlled devices include motorized window coverings, light dimmers, etc.

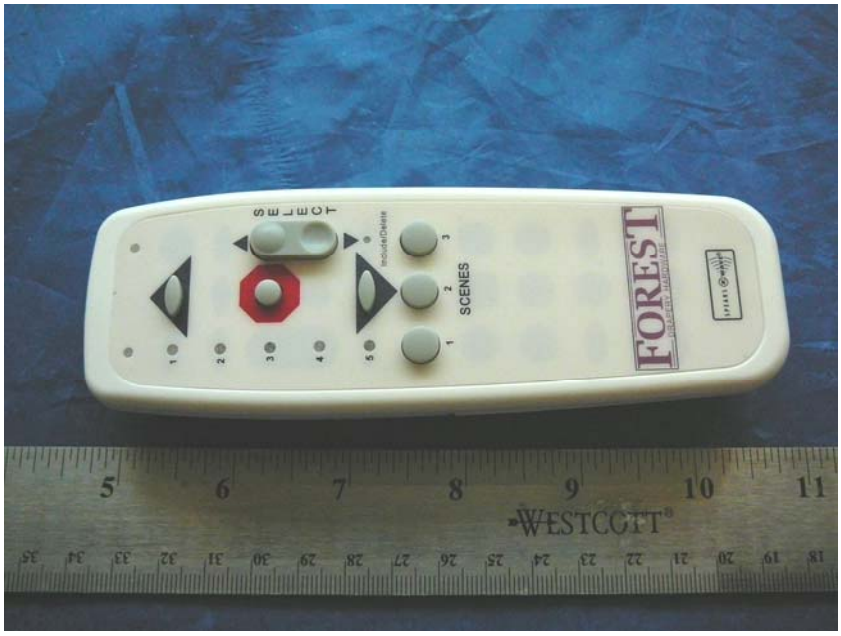
TZ-3300 is a remote control device using the Z-Wave protocol 908 MHz, which is a FSK modulated bidirectional protocol operating at 908.4 MHz. A ZM3102N Z-Wave module (referred to as the "Z-Wave controller") communicates via a 9600 baud serial data link to an Atmel ATtiny2313 microcontroller (referred to as the "board controller"). The entire circuit is powered by a 3V nominal battery composed of two AA cells. The board controller decodes button presses, indicates application state via LEDs, and issues commands to the Z-Wave controller. The Z-Wave controller translates commands issued by the board controller, and implements those commands using the Z-Wave wireless mesh network protocol. The Z-Wave controller uses an external EEPROM for Z-Wave protocol parameters and application parameters. Both the Z-Wave controller and the board controller enter a sleep mode when no button presses occur for 5-10 seconds. In sleep mode the RF section is off, and power consumption for the entire circuit is less than 4 micro amps. The board controller wakes up when a user presses a button, and in turn wakes up the Z-Wave controller by issuing a serial command. When both processors wake up the RF section of the Z-Wave controller is turned on in receive mode, which operates at approximately 5 milliamps. When a button press issues a command that requires Z-Wave protocol communication, the Z-Wave processor switches to transmitting and back to receiving as needed by the Z-Wave protocol libraries. Transmitting draws a maximum of 36 milliamps, and typical communication lengths are less than the time it takes a human to release the button that initiated the command. The antenna is a ¼ wavelength wire whip monopole antenna, detuned in preliminary testing via shortening its length, coupled to the Z-Wave controller through a 47pF capacitor.

** All test data gathered is from a production sample, serial number: B1868, assigned by BACL.*

1.2 Mechanical Description

The EUT is a Z-wave based remote controller of plastic construction that measures approximately 136mm (L) x 41mm (W) x 11mm (H) and weighs approximately2oz without batteries. It is typically powered by 3V (2Cell AAA battery).

1.3 EUT Photo



Please see additional photos in exhibit C

1.4 Objective

This type approval report is prepared on behalf of Electronics Solutions, Inc. in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for section 15.203, 15.205, 15.207, 15.209 and 15.249.

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 Test Methodology

All measurements contained in this report were conducted in accordance with 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.

All radiated and conducted emissions measurement was performed BACL. The radiated testing was performed at an antenna-to-EUT distance of 3 Meters.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from ±2.0 for Conducted Emissions tests and ±4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

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.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have 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, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, 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 can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

None.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

As shown in following test setup block diagram, all interface cables used for compliance testing are unshielded.

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
/	/	/	/	/

2.6 Remote Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
/	/	/	/	/

2.7 Power Supply Information

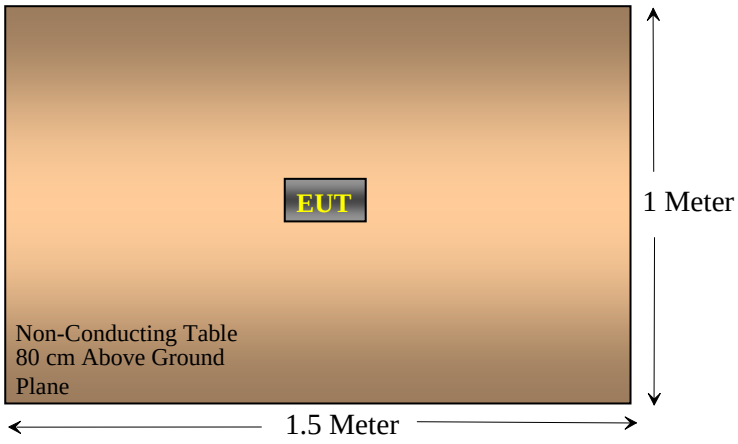
Manufacturer	Description	Model	Serial Number	FCC ID
/	/	/	/	/

2.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
/	/	/	/

2.9 Test Setup Block Diagrams

Radiated Emissions



3 SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	N/A *
§15.205, §15.209(a) §15.249(a), §15.249(d)	Radiated Emissions including Band Edge	Compliant

Note: * Battery operation.

4 §15.203 - ANTENNA REQUIREMENT

4.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to § 15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Antenna Connector Construction

The EUT antenna is wire which is soldered on to the PCB, which in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.

Result: Compliant.

5 §15.205 §15.209(a) §15.249(a) §15.249(d) - RADIATED EMISSIONS

5.1 Applicable Standard

As per 15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per 15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per 15.205(a) except as show 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As Per 15.249(a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation

5.2 Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

5.3 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

5.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
HP	Amplifier, Pre (.1~1300MHz)	8447D	2944A10198	2007-12-09
DRG	Horn Antenna	DRG-118A	1132	2007-06-18
Sunol Sciences	30MHz~2GHz Antenna	JB1	A03105-3	2008-03-25
Agilent	Spectrum analyzer	E4440A	US45303156	2008-05-31
HP	Pre amplifier	8449B	3008A01978	2007-11-02

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

5.5 Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corrected Amplitude - FCC Limit

5.6 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	101.5 kPa

Testing was performed by Jack Liu on 2008-06-19.

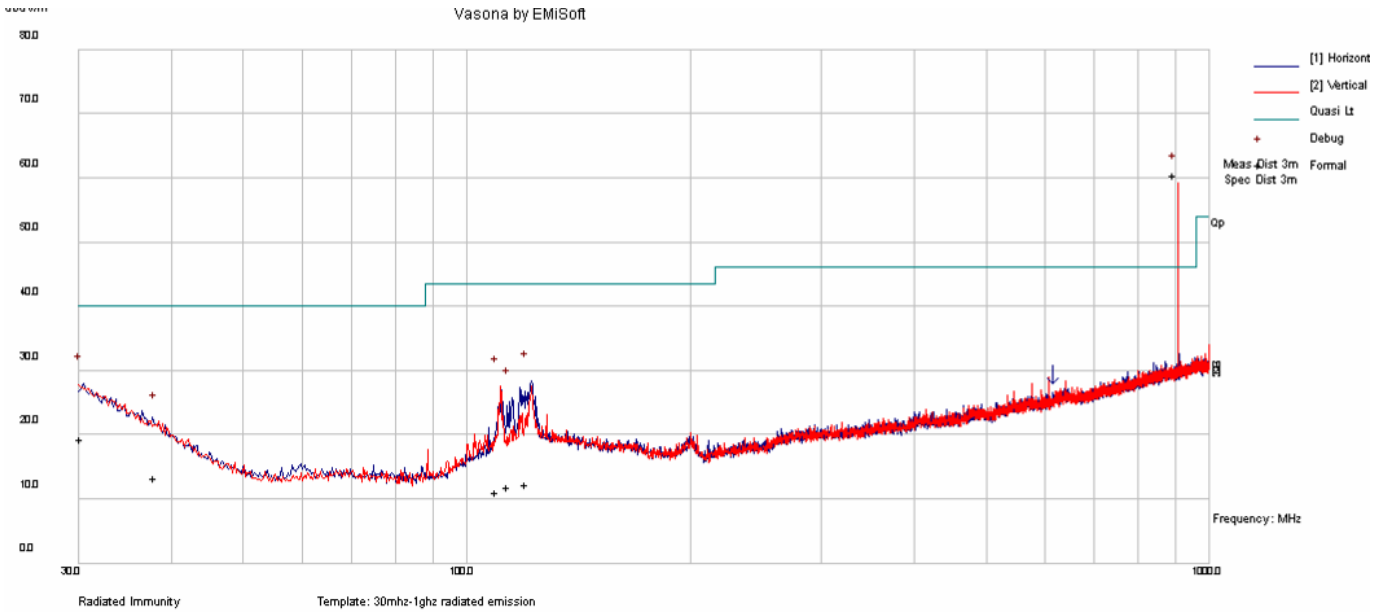
5.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the limits presented in FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.249, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Test Range**
-14.90	1816.80	Vertical	30 MHz – 18 GHz

5.8 Radiated Emissions data:

Radiated Emission at 3 meters, 30 MHz to 1 GHz



Note: * The Highest one is Fundamental with Notch Filter attached.

Frequency (MHz)	Quasi-Peak (dBµV/m)	Ant. Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
30.602	14.8	168	3.53	H	219	40	-25.2
38.511	8.85	393	-2.52	V	180	40	-31.15
121.862	7.91	110	-3.29	H	20	43.5	-35.59
115.297	7.41	170	-3.71	H	54	43.5	-36.09
110.877	6.55	140	-4.41	V	110	43.5	-36.95

Fundamental measured @ 3 meters

Frequency (MHz)	Meter Reading (dBuV)	Detector (QP/AV)	Azimuth (Degree)	Ant. Height (cm)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amplifier Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249	
										Limit (dBuV/m)	Margin (dB)
908.40	93.5	QP	360	1.1	V	23.1	1.9	29.59	88.9	94.00	-5.1
908.40	81.1	QP	0	1.2	H	23.1	1.9	29.59	76.5	94.00	-17.5

Radiated Emission at 3 meters, 1GHz to 18GHz

Frequency (MHz)	Meter Reading (dBuV)	Detector (QP/AV)	Azimuth (Degree)	Ant. Height (cm)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amplifier Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249/15.209	
										Limit (dBuV/m)	Margin (dB)
1816.80	39.2	Peak	360	1.1	V	29.7	2.6	26.62	44.9	74.00	-29.1
1816.80	31.1	Peak	0	1.2	H	29.7	2.6	26.62	45.0	74.00	-29.0
1816.80	33.4	Ave	360	1.1	V	29.7	2.6	26.62	39.1	54.00	-14.9
1816.80	27.8	Ave	280	1.2	H	29.7	2.6	26.62	33.5	54.00	-20.5

Band Edge measured @ 3 meters

Frequency (MHz)	Meter Reading (dBuV)	Detector (QP/AV)	Azimuth (Degree)	Ant. Height (cm)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amplifier Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249/15.209	
										Limit (dBuV/m)	Margin (dB)
902.00	30.3	QP	180	2.0	V	23.1	1.9	29.59	25.7	46.00	-20.3
902.00	28.9	QP	150	1.7	H	23.1	1.9	29.59	24.3	46.00	-21.7
928.00	29.7	QP	330	2.2	V	23.0	1.9	29.59	25.0	46.00	-21.0
928.00	29.5	QP	280	2.0	H	23.0	1.9	29.59	24.8	46.00	-21.2