

FCC PART 15.231
EMI MEASUREMENT AND TEST REPORT

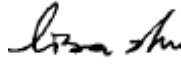
For

Zhuhai Roule Electric Co. Ltd.

No.12, Pingdong Rd.3, Nanping Industry Community, Zhuhai City, China

FCC ID: SUKRL-3980

March 15, 2005

This Report Concerns: ☒ Original Report	Equipment Type: Wireless Digital Door Chime
Test Engineer: Sam Lin 	
Report No.: RSZ04122802	
Test Date: January 7, 2005	
Reviewed By: Lisa Zhu 	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The Zhuhai Roule Electric Co. Ltd. 's product, model RL-9880 or the "EUT" as referred to in this report is a Wireless Digital Door Chime which measures approximately 3.8cm L x 8.0cm W x 2.0cm H, rated input voltage: DC 12 V battery.

** The test data gathered are from an engineering sample, serial number: 0020041205, provided by the manufacturer.*

Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203,15.205,15.209 and 15.231 rules.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted 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 at 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 radiated and conducted emission measurement 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. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The final qualification test was performed with the EUT operating at transmitting mode

Equipment Modifications

BACL has not done any modification on the EUT.

Configuration of Test Setup



Stand view



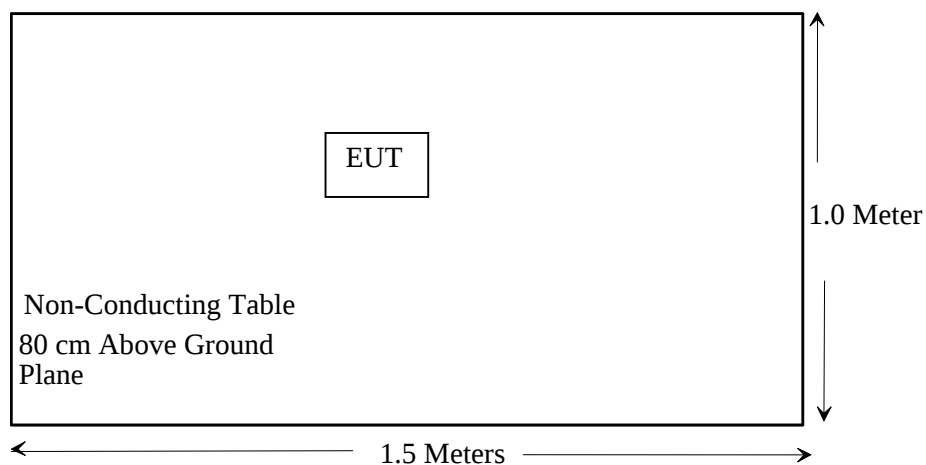
Side view



Lie View

Note: We tested Lie orientation, side orientation and stand orientation, the stand orientation is the worst mode, so we select the stand orientation to test.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.231 (b)	Radiated Emission	Passed
§15.231 (c)	20dB Band Width Testing	Passed
§15.231 (a)(1)	Deactivation Testing	Passed
§15.205	Restricted Band	Passed
§15.209	General requirement	Passed
§15.203	Antenna requirement	Passed

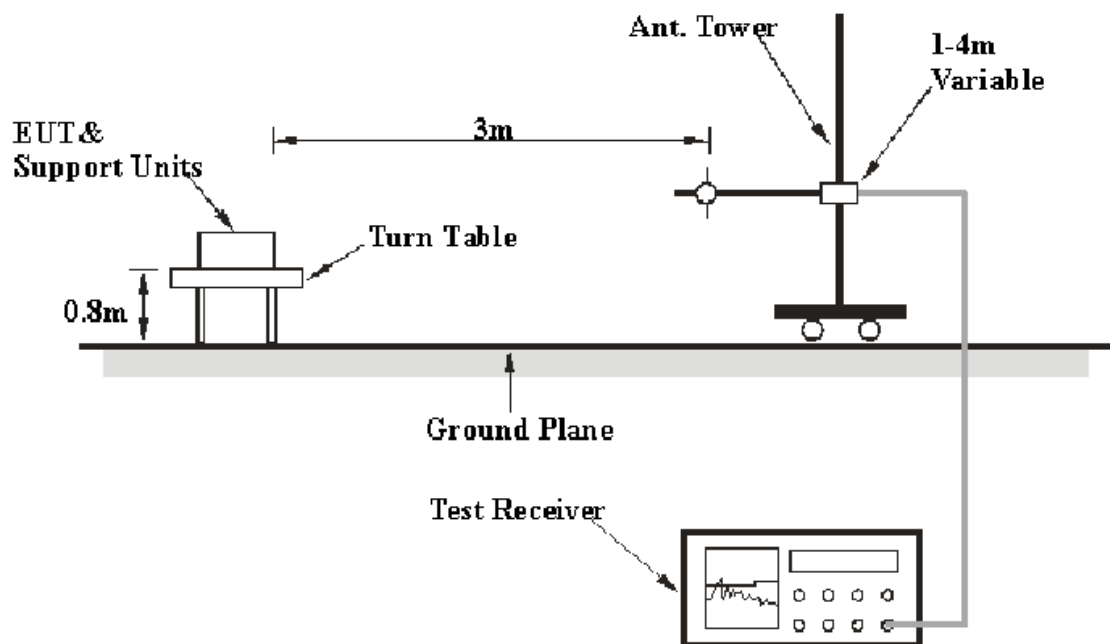
§15.231 (b)- RADIATED EMISSION

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 best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

EUT Setup



The radiated emission tests were performed in the 3-meter Chamber A, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15 § 15.231(b)"

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>VBW</i>
30 – 1000 MHz	100 kHz	100 kHz
1000 MHz – 5 GHz	1 MHz	1 MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEM30	849720/019	2004-11-10	2005-11-10
Amplifier	HP	8449B	3008A00277	2004-09-01	2004-08-31
Horn Antenna	Sunol Sciences	DRH-118	A052604	2004-06-02	2005-06-02
HP	Amplifier	8447E	1937A01046	2004-09-01	2005-08-31
Rohde & Schwarz	Test Receiver	ESCI	100035	2004-09-15	2005-09-14
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2004-04-19	2005-04-18

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

Test Procedure

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

All data was recorded in the Peak and Average detection mode.

Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2,250.....	225
70-130.....	1,250.....	125
130-174.....	1,250 to 3,370.....	125 to 375
174-260.....	3,750	375
260-470.....	3,750 to 12,500.....	375 to 1,250
Above 470	12,500.....	1,250

Linear interpolations for frequency ranges 130 - 174 MHz and 260 - 470 MHz

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -5.8dB means the emission is 5.8dB below the maximum limit for. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.231, with the worst margin reading of:

-16.70 dB at 1301.76 MHz in the **Horizontal polarization.**

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1032mbar

The testing was performed by Sam Lin on 2005-02-7.

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H / V	Antenna Loss dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	FCC Part 15.231		
									Limit	Margin	Remark
1301.76	37.38	154	3.1	H	23.8	3.7	27.6	37.3	54.0	-16.70	PK
1302.40	37.21	45	1.2	V	23.8	3.7	27.6	37.1	54.0	-16.90	PK
433.92	65.52	60	1.2	V	16.8	2.2	28.3	56.2	80.8	-24.60	AV
1735.68	34.94	270	1.0	V	28.1	3.7	26.7	40.0	60.8	-20.80	PK
1732.20	34.67	360	2.0	H	28.1	3.7	26.7	39.8	60.8	-21.00	PK
869.88	31.94	61	3.1	H	22.2	3.4	28.1	29.4	60.8	-31.40	PK
867.84	30.99	270	1.0	V	22.2	3.4	28.1	28.5	60.8	-32.30	PK
433.92	50.94	60	3.0	H	16.8	2.2	28.3	41.6	80.8	-39.20	AV
433.92	69.13	60	3.0	V	16.8	2.2	28.3	59.8	100.8	-41.00	PK
433.92	54.36	61	3.1	H	16.8	2.2	28.3	45.1	100.8	-55.70	PK

* Note: The EUT was tested in all three orthogonal planes.

§15.231(c) 20dB BANDWIDTH TESTING

Requirement

Per 15.231 (c) ,The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2004-09-01	2005-08-31
Rohde & Schwarz	Test Receiver	ESCI	100035	2004-09-15	2005-09-14
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2004-04-19	2005-04-18

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

Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

The 0.25% of 433.81 MHz = 1.0845 MHz

20dB Bandwidth was 40 kHz < 1.0845 MHz

Test Data

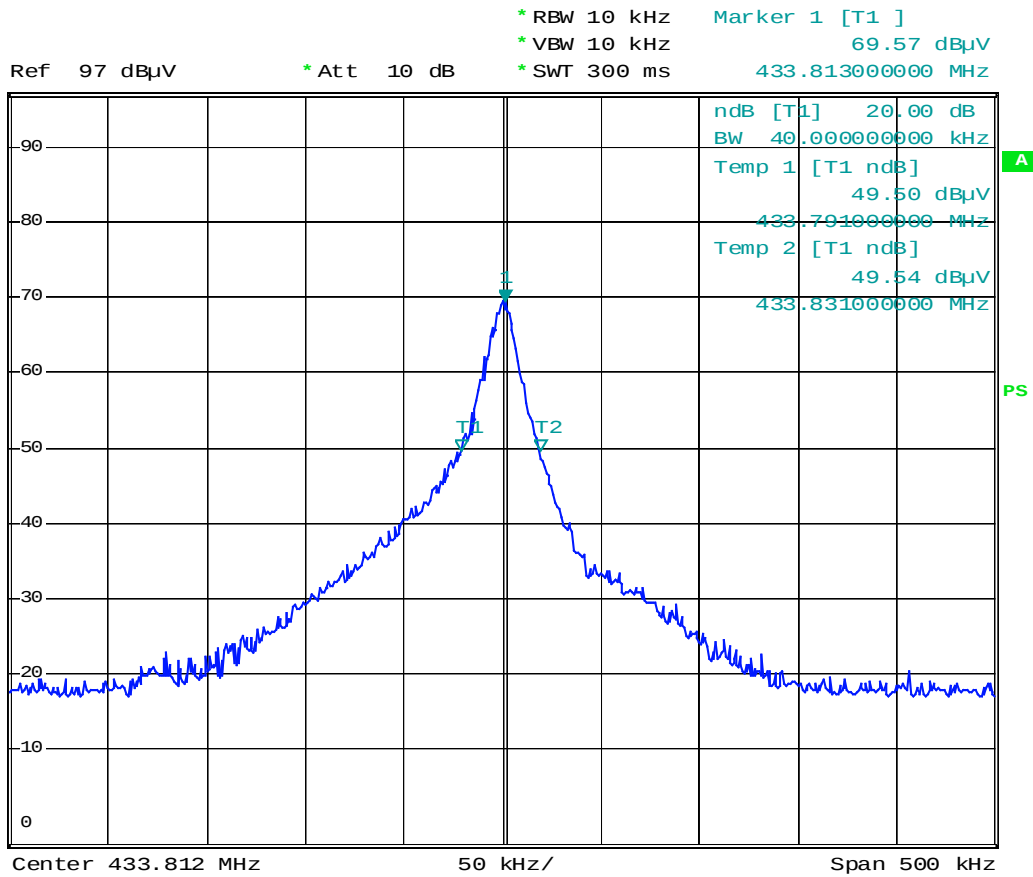
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1032mbar

The testing was performed by Sam Lin on 2005-02-7.

Test Result: Pass

Refer to the attached plots.

1 PK
VIEW

XB2317T Time Frequency Stability

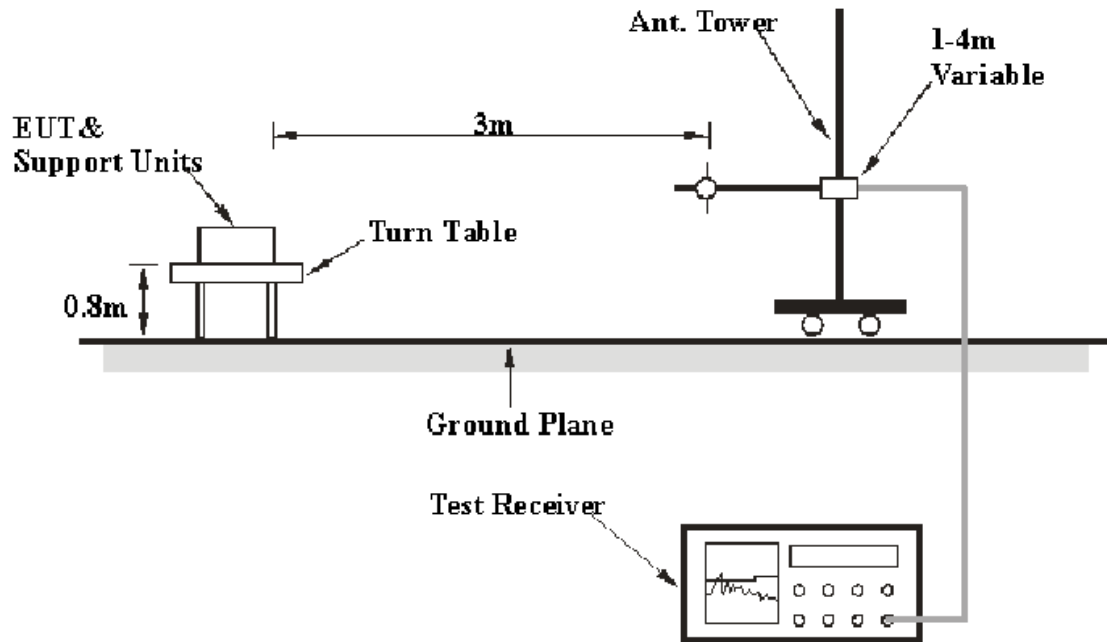
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§15.231(a)-DEACTIVATION TESTING

Requirement

Per 15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

EUT Setup



The deactivation test was performed in the 3-meter Chamber, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15.231(a) limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2004-09-01	2005-08-31
Rohde & Schwarz	Test Receiver	ESCI	100035	2004-09-15	2005-09-14
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2004-04-19	2005-04-18

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

Test Procedure

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

Test Data

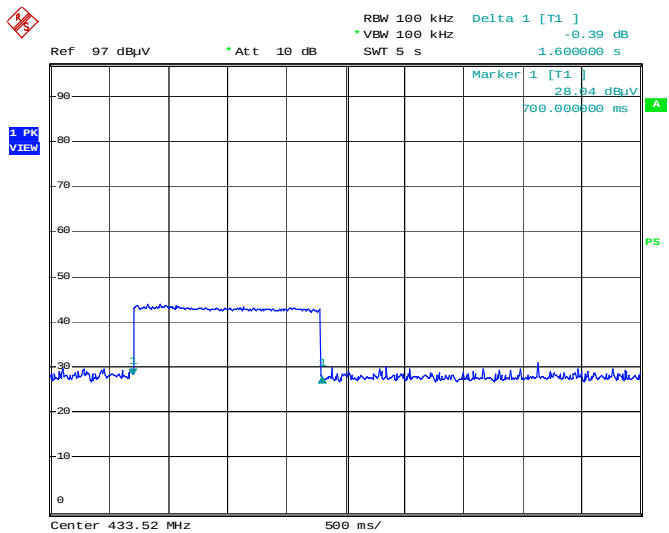
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1032mbar

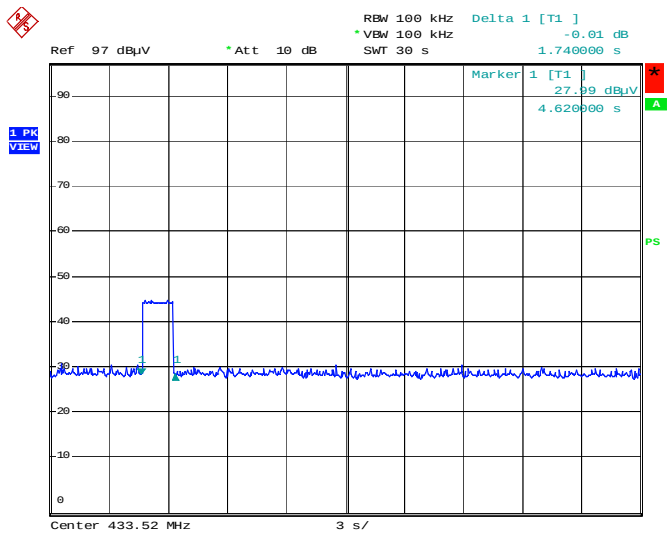
The testing was performed by Sam Lin on 2005-02-7.

Test Result: Pass

Refer to the attached plots.



XB2317T Time Frequency Stability
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XB2317T Time Frequency Stability
Date: 14.MAR.2005 14:22:30