

FCC PART 15.231
EMI MEASUREMENT AND TEST REPORT

For

Lelux Electronics Ltd.

Unit 6, 10/F, TCL TOWER, NO.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong

FCC ID: NS3LELUXT018R

This Report Concerns: ☒ Original Report	Equipment Type: WIRELESS SECURITY ALARM SYSTEM WITH AUTO DIALER
Test Engineer: David Zhang	<i>David Zhang</i>
Report No.: RSZ06110803	
Test Date: 2006-11-29	
Report Date: 2006-12-01	
Reviewed By: EMC Manager: Boni Baniqued	<i>Boni Baniqued</i>
Prepared By:	Bay Area Compliance Laboratory Corp. (ShenZhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone, ShenZhen, Guangdong 518038, P.R.China Tel: +86-755-33320018 Fax: +86-755-33320008

Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratory Corp. (Shenzhen). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
TEST FACILITY	4
EXTERNAL I/O CABLE.....	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION	5
EUT EXERCISE SOFTWARE	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
CONFIGURATION OF TEST SETUP	6
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS.....	7
§15.203 - ANTENNA REQUIREMENT.....	8
STANDARD APPLICABLE	8
ANTENNA CONNECTOR CONSTRUCTION	8
§15.205, §15.209, §15.231 (B)- RADIATED EMISSION.....	9
MEASUREMENT UNCERTAINTY	9
EUT SETUP	9
EMI TEST RECEIVER SETUP.....	9
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST PROCEDURE	10
STANDARD APPLICABLE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	10
TEST RESULTS SUMMARY	11
TEST DATA	11
§15.231(C) 20DB BANDWIDTH TESTING	14
REQUIREMENT	14
TEST EQUIPMENT LIST AND DETAILS.....	14
TEST PROCEDURE	14
TEST DATA	14
§15.231(A)-DEACTIVATE TESTING	16
REQUIREMENT	16
EUT SETUP	16
TEST EQUIPMENT LIST AND DETAILS.....	16
TEST PROCEDURE	16
TEST DATA	17
§15.231- DUTY CYCLE.....	18
LIMIT	18
TEST EQUIPMENT LIST AND DETAILS.....	18
TEST PROCEDURE	18
TEST DATA	18

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Lelux Electronics Ltd.* 's product, model: *T018R* or the "EUT" as referred to in this report is a *WIRELESS SECURITY ALARM SYSTEM WITH AUTO DIALER* which measures approximately 16.4 cm L x 10.5 cm W x 4.0 cm H, rated input voltage: DC 9V adapter.

Adapter:

Model: U090050D; Manufacture: Ten Pao International Ltd.;

Input: 120VAC 60Hz 9W; output: 9VDC 500mA

** The test data gathered are from production sample, serial number: 0611012, provided by the manufacturer, we receive the EUT on 2006-11-08.*

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 Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratory 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 Laboratory 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.

Additionally, Bay Area Compliance Laboratory 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>

External I/O Cable

Cable Description	Length (M)	From/Port	To
Unshielded Detachable Telephone Cable	2.0	EUT	Telephone
Unshielded Detachable Adapter Cable	1.9	EUT	Adapter

SYSTEM TEST CONFIGURATION

Justification

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

EUT Exercise Software

N/A.

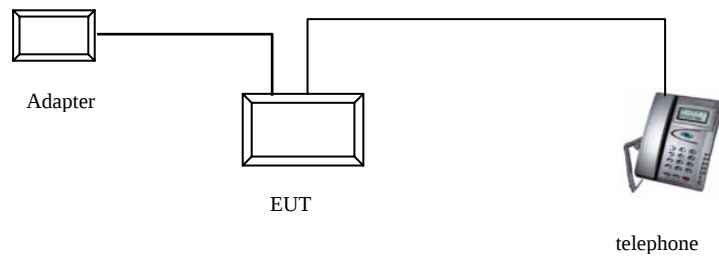
Special Accessories

The special accessories were supplied by manufacturer.

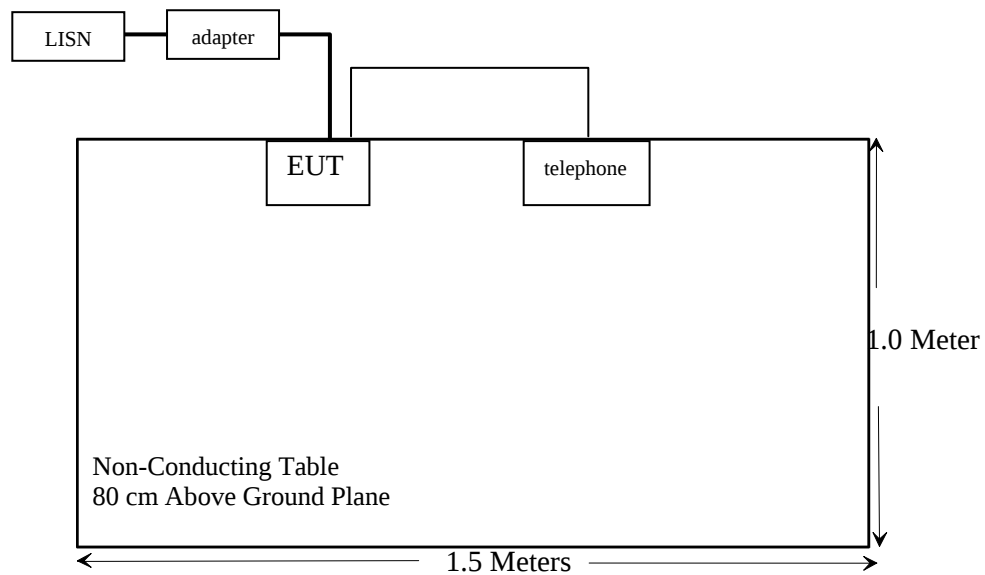
Equipment Modifications

Bay Area Compliance Laboratory 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
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Band	Compliant
§15.209	General Requirement	Compliant
§15.231 (b)	Radiated Emission	Compliant
§15.231 (c)	20dB Band Width Testing	Compliant
§15.231 (a)(1)	Deactivate Testing	Compliant
§15.231	Duty Cycle	Compliant

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

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.

Antenna Connector Construction.

This product has a permanently attached antenna, in which considered sufficient to comply with the provision of the above section.

Result: Compliance.

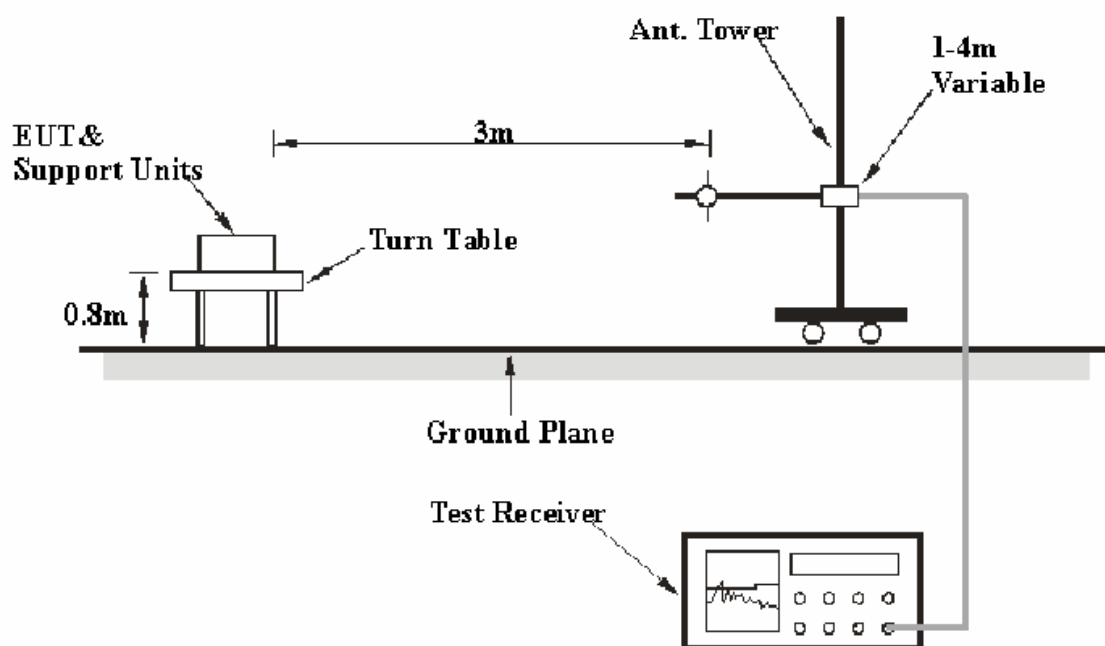
§15.205, §15.209, §15.231 (b)- RADIATED EMISSION

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 Bay Area Compliance Laboratory Corp. (ShenZhen) is ± 4.0 dB.

EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15 § 15.209 and 15.231.

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	300 kHz
1 GHz – 5 GHz	1 MHz	3 MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	8564E	3943A01781	2006-11-22	2007-11-22
HP	Amplifier	8449B	3008A00277	2006-9-29	2007-9-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2006-7-20	2007-7-20
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-9-29	2007-9-29
HP	Amplifier	HP8447E	1937A01046	2006-8-17	2007-8-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2006-8-14	2007-8-14

*** Statement of Traceability:** Bay Area Compliance Laboratory Corp. (ShenZhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to 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 range 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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corr. Amp.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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 limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Cord. Amp} - \text{Limit}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 and 15.231, with the worst margin reading of:

30-1000MHz: 24.99 dB at 867.84 MHz in the Vertical polarization.
Above 1GHz: 35.45 dB at 1301.76 MHz in the Vertical polarization.

Test Data

Environmental Conditions

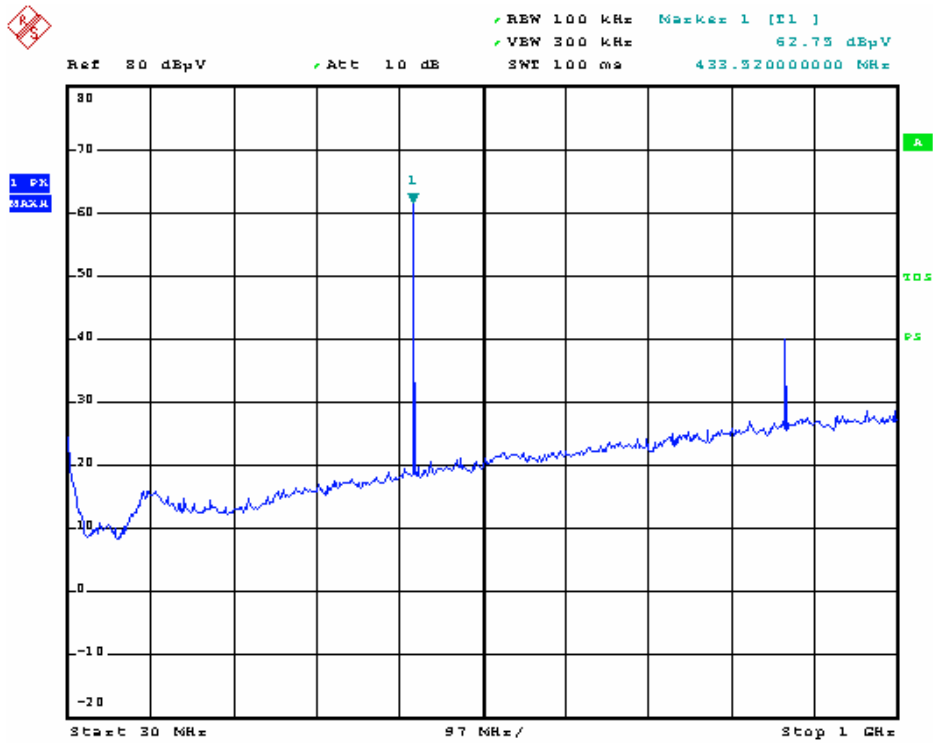
Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	1002mbar

The testing was performed by David Zhang on 2006-11-29.

Test Mode: Running

Frequency MHz	Meter Reading dBuV/m	Detector PK/AV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dB/m	Cable loss dB	Duty Cycle dB	Amp Gain dB	Cord. Amp. dB uV/m	FCC Part 15.231		
											Limit dBuV/m	Margin dB	Remarks
30 -1000MHz													
867.84	39.83	AV	45	1	H	20	7.6	-8.5	26.76	32.17	60.8	28.63	Harmonic
867.84	43.47	AV	45	1.2	V	20	7.6	-8.5	26.76	35.81	60.8	24.99	Harmonic
867.84	39.83	PK	45	1	H	20	7.6	0	26.76	40.67	80.8	40.13	Harmonic
433.92	62.75	AV	180	1	H	14.5	4.65	-8.5	26.94	46.46	80.8	34.34	Fundamental
867.84	43.47	PK	45	1.2	V	20	7.6	0	26.76	44.31	80.8	36.49	Harmonic
433.92	60.55	AV	180	1.2	V	14.5	4.65	-8.5	26.94	44.26	80.8	36.54	Fundamental
433.92	62.75	PK	180	1	H	14.5	4.65	0	26.94	54.96	100.8	45.84	Fundamental
433.92	60.55	PK	180	1.2	V	14.5	4.65	0	26.94	52.76	100.8	48.04	Fundamental
Above 1GHz													
2603.52	29.61	AV	180	1.2	V	29.4	4.84	-8.5	33.80	21.55	60.8	39.25	Harmonic
2169.60	31.08	AV	135	1.2	V	28.8	4.33	-8.5	33.80	21.91	60.8	38.89	Harmonic
1301.76	33.24	AV	45	1.0	H	24.8	3.09	-8.5	34.30	18.33	54.0	35.67	Harmonic
2603.52	31.24	AV	180	1.2	H	29.4	4.84	-8.5	33.80	23.18	60.8	37.62	Harmonic
2169.60	32.29	AV	135	1.2	H	28.8	4.33	-8.5	33.80	23.12	60.8	37.68	Harmonic
1735.68	33.46	AV	90	1.2	H	26.7	3.65	-8.5	34.70	20.61	60.8	40.19	Harmonic
2169.60	31.08	PK	135	1.2	V	28.8	4.33	0.0	33.80	30.41	80.8	50.39	Harmonic
1735.68	32.18	AV	90	1.2	V	26.6	3.65	-8.5	34.70	19.23	60.8	41.57	Harmonic
1301.76	33.56	AV	45	1.0	V	24.7	3.09	-8.5	34.30	18.55	54.0	35.45	Harmonic
2603.52	29.61	PK	180	1.2	V	29.4	4.84	0.0	33.80	30.05	80.8	50.75	Harmonic
1301.76	33.24	PK	45	1.0	H	24.8	3.09	0.0	34.30	26.83	74.0	47.17	Harmonic
2603.52	31.24	PK	180	1.2	H	29.4	4.84	0.0	33.80	31.68	80.8	49.12	Harmonic
2169.60	32.29	PK	135	1.2	H	28.8	4.33	0.0	33.80	31.62	80.8	49.18	Harmonic
1735.68	33.46	PK	90	1.2	H	26.7	3.65	0.0	34.70	29.11	80.8	51.69	Harmonic
1301.76	33.56	PK	45	1.0	V	24.7	3.09	0.0	34.30	27.05	74.0	46.95	Harmonic
1735.68	32.18	PK	90	1.2	V	26.6	3.65	0.0	34.70	27.73	80.8	53.07	Harmonic

Note: The average result is based on the peak measurement with the duty cycle calculation.



Lelux T018R Spurious emission(below 1GHz) Horizontal

Date: 29.NOV.2006 11:14:32



Lelux T018R Spurious emission(below 1GHz) Vertical

Date: 29.NOV.2006 11:29:08

§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
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-8-17	2007-8-17
HP	Amplifier	HP8447E	1937A01046	2006-8-17	2007-8-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2006-4-28	2007-4-28

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

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1009mbar

The testing was performed by David Zhang on 2006-11-22.

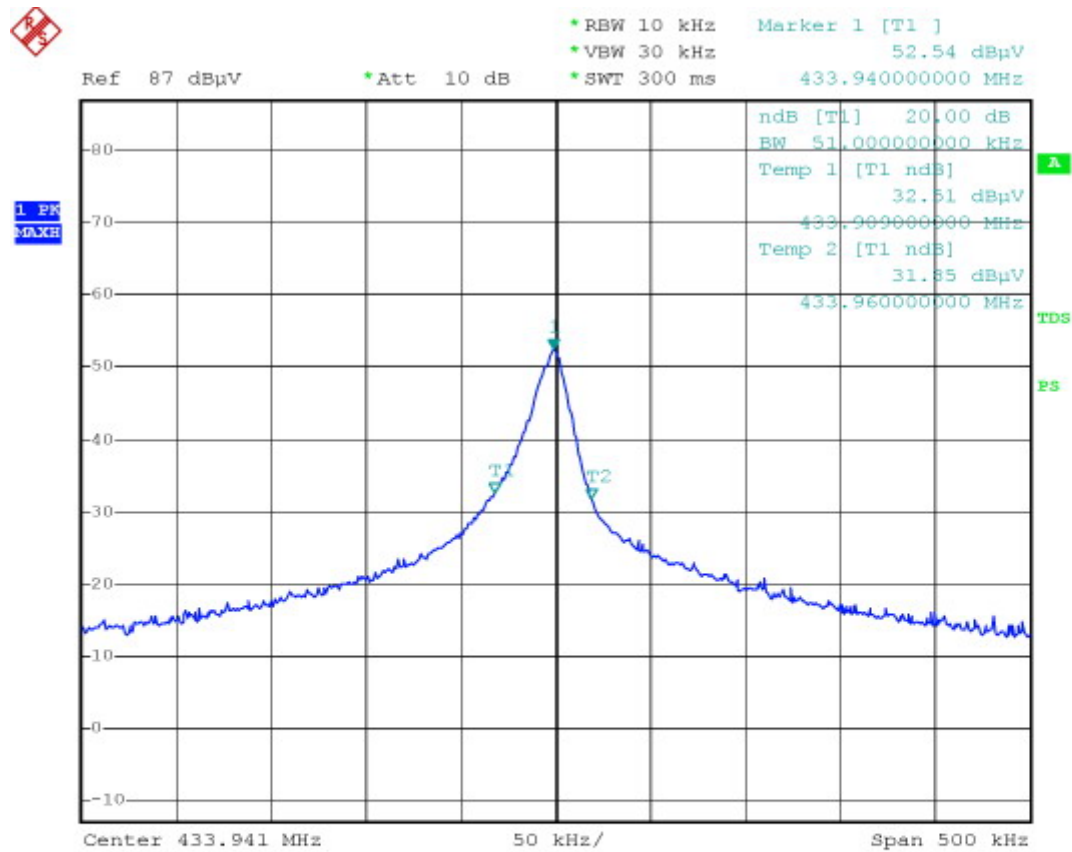
Test Mode: Transmitting

Frequency (MHz)	20dB Bandwidth Emission (kHz)	Limit (kHz)	Result
433.92	51	1084.8	Pass

Limit = Frequency $\times$ 0.25% = 433.92 $\times$ 0.25% = 1084.8 kHz

Test Result: Pass

Refer to the attached plot.



Lelux T018R 20dB bandwidth

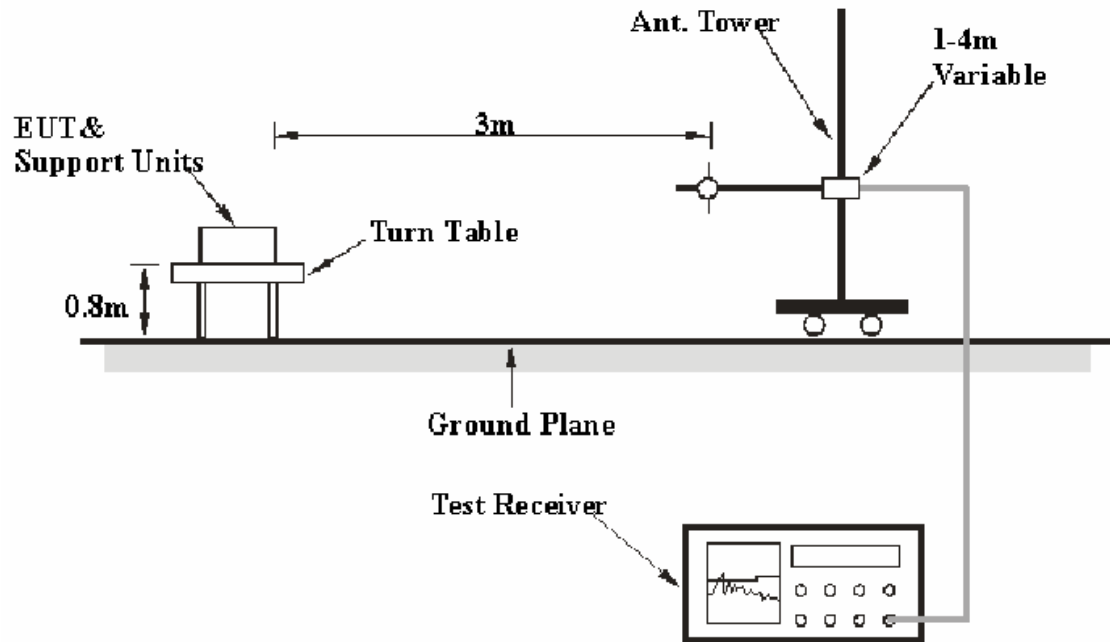
Date: 22.NOV.2006 15:11:47

§15.231(a)-DEACTIVATE 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 meters chamber B test site, 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
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-9-29	2007-9-29
HP	Amplifier	HP8447E	1937A01046	2006-8-17	2007-8-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2006-8-14	2007-8-14

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

Test Procedure

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

Test Data

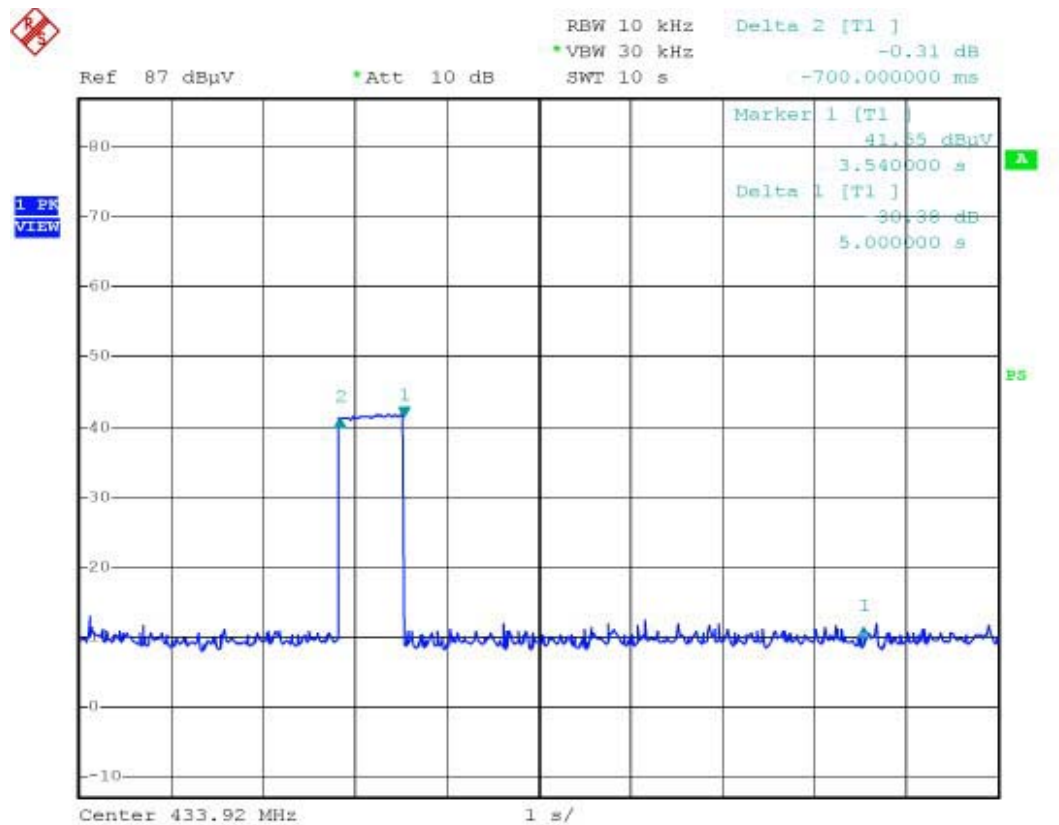
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50%
ATM Pressure:	1015mbar

The testing was performed by David Zhang on 2006-11-28.

Test Mode: Transmitting

Refer to the attached plots.



Lelux T018R Deactivation Time Test

Date: 28.NOV.2006 16:48:22

§15.231- DUTY CYCLE

Limit

Nil (No dedicated limit specified in the Rules).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	Spectrum Analyzer	ESCI	100224	2006-9-29	2007-9-29

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

Test Procedure

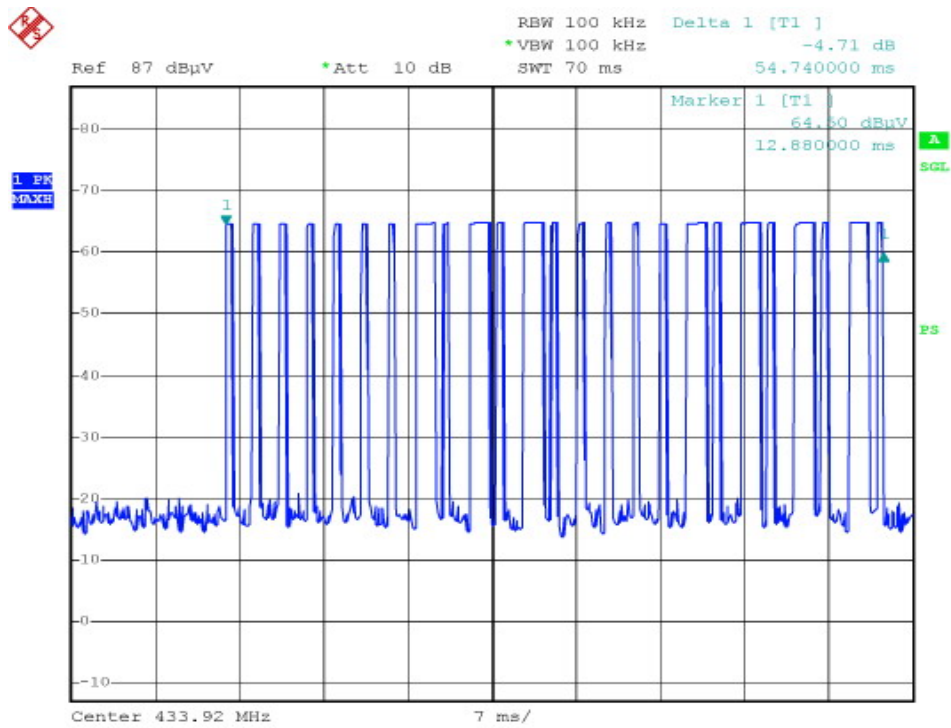
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=0Hz, Adjust Sweep=100ms.
5. Repeat above procedures until all frequency measured were complete.

Test Data

$T_p = 54.74 \text{ ms}$

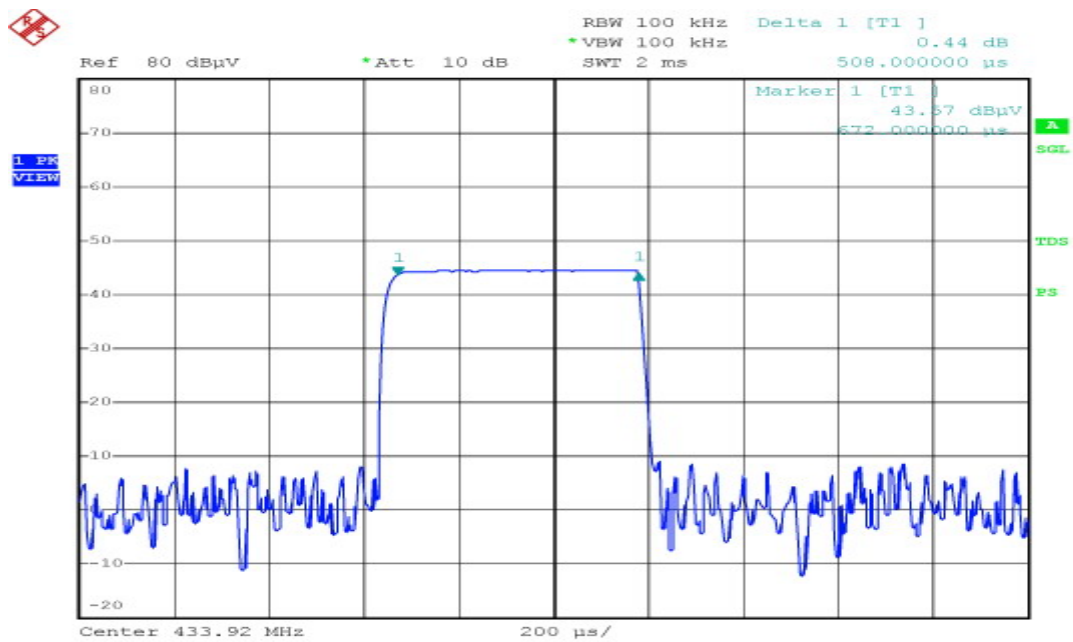
$T_{on} = 0.508 * 18 + 1.632 * 7 = 20.568 \text{ (ms)}$

$\text{Factor} = 20 * \log (T_{on} / T_p) = 20 * \log (20.568/54.74) = - 8.50\text{dB}$



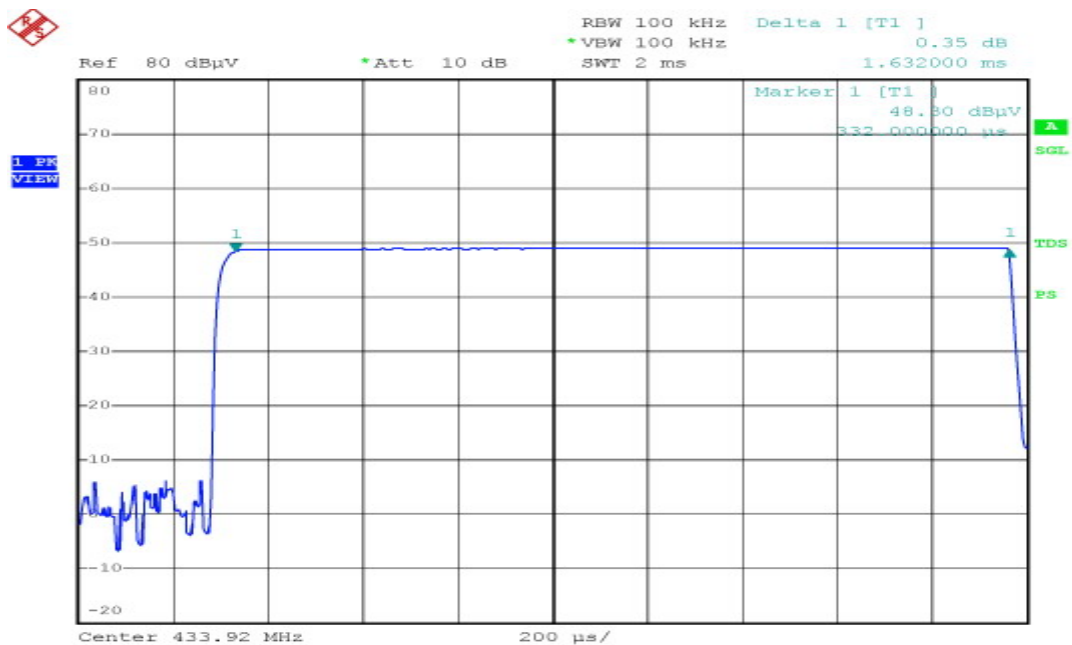
Duty Cycle--Tp

Date: 28.NOV.2006 16:34:02



Duty Cycle -- Ton1

Date: 22.NOV.2006 17:39:40



Duty Cycle -- Ton2

Date: 22.NOV.2006 17:44:37