# FCC Part 15

## 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: NS3LELUX616PR**

November 07, 2006

| **This Report Concerns:** ☒ Original Report | **Equipment Type:** Wireless outdoor adjustable angle motion detector sensor |
|---|---|

| | |
|---|---|
| **Test Engineer:** | Rocky Ge |
| **Report Number:** | **SE06K-400R** |
| **Test Date:** | November 01-06, 2006 |
| **Reviewed By:** | |
| **Prepared By:** | **S&E Technologies Laboratory Ltd**<br>Room 407, Block A Shennan Garden, Hi-Tech Industrial Park,<br>Shenzhen 518057, P.R. China.<br>Tel: 86-755-26636573, 26630631<br>Fax: 86-755-26630557 |

## Table of contents

## 1. Test Summary

| FCC Rules | Description of Test | Result |
|---|---|---|
| § 15.207 | Conducted Emission | N/A |
| § 15.231 | Radiated Emission | Compliant |
| § 15.231 | Occupied Bandwidth | Compliant |

# 2. General Information

## 2.1 Client Information

| | |
|---|---|
| Applicant: | **Lelux Electronics Ltd** |
| Address of Applicant: | Unit 6, 10/F, TCL TOWER, No.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong |

## 2.2 General Description of E.U.T.

| | |
|---|---|
| Product description: | Wireless outdoor adjustable angle motion detector sensor |
| Model No.: | 616PR |
| Operation Frequency: | 433.92MHz |
| Modulation: | FSK |
| Antenna Designation: | Non-user replaceable (fixed) |

## 2.3 Details of E.U.T.

Power Supply: 4.5VDC Battery

## 2.4 Description of Support Units

The EUT has been tested as an independent device unit.

## 2.5 Standards Applicable for Testing

The customer requested FCC tests for a remote control. The standards used were FCC 15 Paragraph 15.205, Paragraph 15.209, Paragraph 15.231,Paragraph 15.31,Paragraph 15.33, Paragraph 15.35.

## 2.6 Test Facility

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

- **FCC – Registration No.: 662850**

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 662850, November 17, 2003.

## 2.7 Test Location

All Emissions tests were performed at:-Shenzhen Huatongwei International Inspection Co., Ltd. at Keji S,12th,Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China.

# 3. Equipment Used during Test

**Conducted Emission Test**

| Iten | Test Equipment | Manufacturer | Model No | Serial No. | Cal. Date | Due dat |
|---|---|---|---|---|---|---|
| 1 | Artificial Mains | Rohde & Schwarz | ESH2-Z5 | 100028 | 2006/10 | 2007/10 |
| 2 | Pulse Limiter | Rohde & Schwarz | ESH2-Z2 | 100044 | 2006/10 | 2007/10 |
| 3 | EMI Test Software | Rohde & Schwarz | ES-K1 V1.71 | N/A | 2006/10 | 2007/10 |
| 4 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | 100038 | 2006/10 | 2007/10 |

**Radiated Emission Test**

| Iten | Test Equipment | Manufacturer | Model No | Serial No. | Cal. Date | Due dat |
|---|---|---|---|---|---|---|
| 1 | 3m Semi- Anechoic Chamber | ETS | N/A | N/A | 2006/10 | 2007/10 |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESI 26 | 100009 | 2006/10 | 2007/10 |
| 3 | RF Test Panel | Rohde & Schwarz | TS/RSP | 335015/0017 | N/A | N/A |
| 4 | Turntable | ETS | 2088 | 2149 | N/A | N/A |
| 5 | Antenna Mast | ETS | 2075 | 2346 | N/A | N/A |
| 6 | EMI Test Software | Rohde & Schwarz | ES-K1 | N/A | N/A | N/A |
| 7 | Double-Ridged-Waveguide Horn Antenna | Rohde & Schwarz | HF906 | 100039 | 2006/10 | 2007/10 |
| 8 | Ultra-Broadband Antenna | Rohde & Schwarz | HL562 | 100015 | 2006/10 | 2007/10 |

**Dwell Time Test**

| Iten | Test Equipment | Manufacturer | Model No. | Series No. | Cal. Date | Due date |
|---|---|---|---|---|---|---|
| 1 | Shielded Room | ETS LINDGREN | RFD-100 | 2391 | N/A | N/A |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESI 26 | 100009 | 2006/10 | 2007/10 |

**Common Used Equipment**

| Iten | Test Equipment | Manufacturer | Model No. | Series No. | Cal. Date | Due date |
|---|---|---|---|---|---|---|
| 1 | Temperature, Humidity&Barometer | Oregon Scientific | BA-888 | EMC0001 to EMC0004 | 2006/10 | 2007/10 |
| 2 | DMM | Fluke | 73 | 70681569 or 70671122 | 2006/07 | 2007/07 |

# 4. Conducted Emission Test

| | |
|---|---|
| Product: | Remote control |
| Test Requirement: | FCC Part15 Paragraph 15.207 |
| Test Method: | Based on FCC Part15 Paragraph 15.207 |
| Test Date: | - |
| Frequency Range: | 150kHz to 30MHz |
| Class: | Class B |
| Detector: | Peak for pre-scan (9kHz Resolution Bandwidth)<br>Quasi-Peak & Average if maximized peak within 6dB of Average Limit |

## 4.1 Test Equipment

Please refer to Section 3 this report.

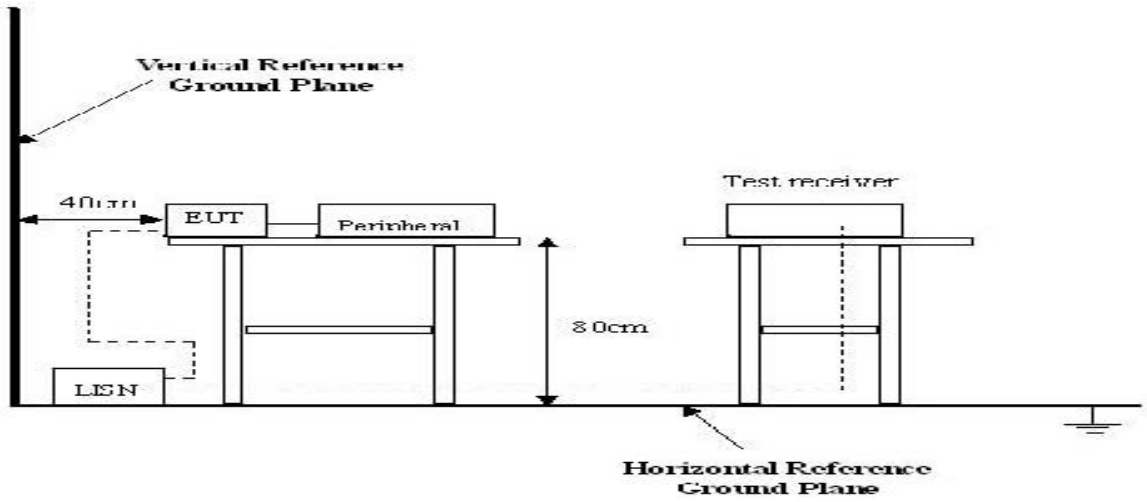
## 4.2 Test Procedure

1. The EUT was tested according to ANSI C63.4. The frequency spectrum from 150kHz to 30MHz was investigated.

2. The maximized peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

## 4.3 Conducted Test Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



## 4.4 EUT Operating Condition

Operating condition is according to ANSI C63.4.
A. Setup the EUT and simulators as shown on follow.
B. Enable RF signal and confirm EUT active.
C. Modulate output capacity of EUT up to specification.


## 4.5 Conducted Emission Limits

66-56 dBμV/m between 0.15MHz & 0.5MHz
56 dBμV/m between 0.5MHz & 5MHz
60 dBμV/m between 5MHz & 30MHz

**Note**: In the above limits, the tighter limit applies at the band edges.

## 4.6 Conducted Emission Test Result

Owing to the DC operation of EUT, this test is not performed.

# 5. Radiation Emission Test

| | |
|---|---|
| Product: | Remote control |
| Test Requirement: | FCC Part15 Paragraph 15.209, Paragraph 15.231 |
| Test Method: | Based on FCC Part15 Paragraph 15.33 |
| Test Date: | November 05, 2006 |
| Frequency Range: | 30MHz to 5GHz |
| Measurement Distance: | 3m |
| Detector: | Peak for pre-scan (120kHz resolution bandwidth)<br>Quasi-Peak if maximized peak within 6dB of limit |

## 5.1 Test Equipment

Please refer to Section 3 this report.

## 5.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 ANSI C63.4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SZHTW is +4.0 dB.

## 5.3 Test Procedure

1. For the radiated emissions test, since the EUT does not have a power source, there was no connection to AC outlets.

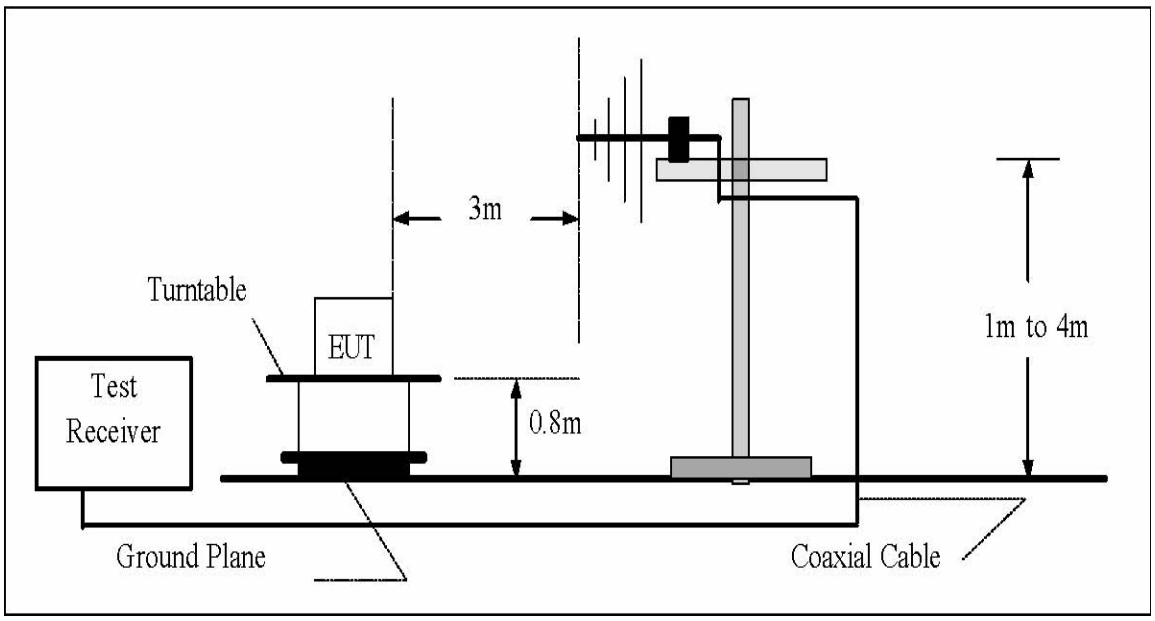
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.

3. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBµV of specification limits), and are distinguished with a "Qp" in the data table.

4. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

## 5.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4, The specification used in this report was the FCC Part15 Paragraph 15.209, Paragraph 15.231 limits.




## 5.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.209, Paragraph 15.231 Rules, the system was tested to 5000 MHz.

| | |
|---|---|
| Start Frequency: | 30 MHz |
| Stop Frequency: | 5000 MHz |
| Sweep Speed Auto | |
| IF Bandwidth: | 100 kHz |
| Video Bandwidth: | 1 MHz |
| Quasi-Peak Adapter Bandwidth: | 120 kHz |
| Quasi-Peak Adapter Mode: | Normal |
| Resolution Bandwidth: | 1MHz |

## 5.6 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:

Corr. Ampl. = 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 -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

## 5.7 Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.209 and Paragraph 15.231 standards.

## 5.8 EUT Operating Condition

Same as section 4.4 of this report.

## 5.9 Radiated Emissions Limit

### A. FCC Part 15 subpart C Paragraph 15.231 Limit

| Fundamental Frequency (MHz) | Field Strength of Fundamental | |
|---|---|---|
| | uV/m | dBuV/m |
| 433.92 | 10996.7 | 80.83 |
| Harmonics | 1100.0 | 60.83 |

**Note**: (1) RF Voltage (dBuV)=20 log RF Voltage (uV)
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(3)The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

### B. Frequencies in restricted band are complied to limit on Paragraph 15.209

| Frequency (MHz) | Distance (m) | Field strength (dBuV/m) |
|---|---|---|
| 30-88 | 3 | 40.0 |
| 88-216 | 3 | 43.5 |
| 216-960 | 3 | 46.0 |
| Above 960 | 3 | 54.0 |

**Note**: (1) RF Voltage (dBuV)=20 log RF Voltage (uV)
(2) In the above table,the tighter limit applies at the band edges.
(3) Distance refers to the distance in meters between the measuring instrument antenna.

## 5.10 Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding The meter reading of the spectrum analyzer (which is set to read in units of dBuV) To the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stared in terms of dB. The gain of the pressletor was accounted for in the spectrum analyzer meter reading.

Example:
Freq (MHz) Meter Reading +ACF=FS
33 20dBuV+10.36dB=30.36dBuV/m @3m

**A. Fundamental Radiated Emission Data for 433MHz**

| | |
|---|---|
| Test Item: | Fundamental Radiated Emission Data |
| Test Voltage: | 4.5VDC Battery |
| Test Mode: | Transmitting |
| Temperature: | 23 °C |
| Humidity: | 53%RH |
| Test Result: | PASS |

| Frequency (MHz) | Antenna Polarization | Emission Level (dBuV/m) | FCC 15 Subpart C Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|---|---|---|---|---|---|---|
| 433.924 | Vertical | 62.70 | 80.83 | -18.13 | 1.6 | 70 |
| 867.843 | Vertical | 32.50 | 60.83 | -28.33 | 1.7 | 180 |
| 1301.763 | Vertical | 28.90 | 60.83 | -31.93 | 1.8 | 325 |
| 433.924 | Horizontal | 50.70 | 80.83 | -30.13 | 1.4 | 80 |
| 867.843 | Horizontal | 39.30 | 60.83 | -21.53 | 1.7 | 220 |
| 1301.763 | Horizontal | 35.10 | 60.83 | -25.73 | 2.0 | 295 |
| Others | | - | | | | |

Note: 1. Datum of measurement within this frequency range shown “-”in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

**B. General Radiated Emission Data**

| | |
|---|---|
| Test Item: | General Radiated Emission Data |
| Test Voltage: | 4.5VDC Battery |
| Test Mode: | Transmitting |
| Temperature: | 23 °C |
| Humidity: | 53%RH |
| Test Result: | PASS |

| Frequency (MHz) | Antenna Polarization | Emission Level (dBuV/m) | FCC 15 Subpart C Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|---|---|---|---|---|---|---|
| 133. 234545 | Vertical | 23.40 | 43.5 | -20.1 | 1.3 | 60 |
| 288.456109 | Vertical | 24.90 | 46.0 | -21.1 | 1.5 | 140 |
| 548.120098 | Vertical | 31.70 | 46.0 | -14.3 | 2.0 | 70 |
| 169.453870 | Horizontal | 25.50 | 43.5 | -18.0 | 1.6 | 45 |
| 257.121209 | Horizontal | 29.20 | 46.0 | -16.8 | 1.8 | 69 |
| 567.096721 | Horizontal | 32.40 | 46.0 | -13.6 | 2.0 | 162 |

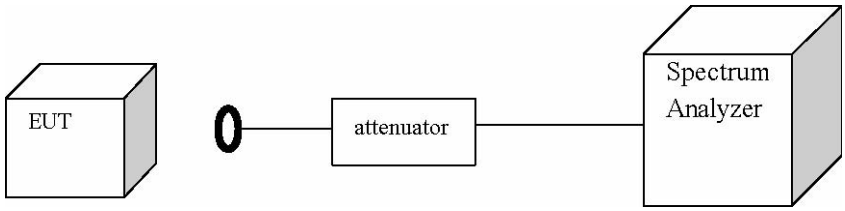
# 6. Dwell Time

## 6.1 Test Standards

FCC Rules and Regulations Part 15 Subpart C –Intentional Radiators

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

## 6.2 Diagram of Test Setup




Remark: the attenuator is the built-in part of spectrum analyzer.

## 6.3 Test Equipments Used

Please refer to Section 3 this report

## 6.4 Test Description

6.4.1 Test Receiver Setting:

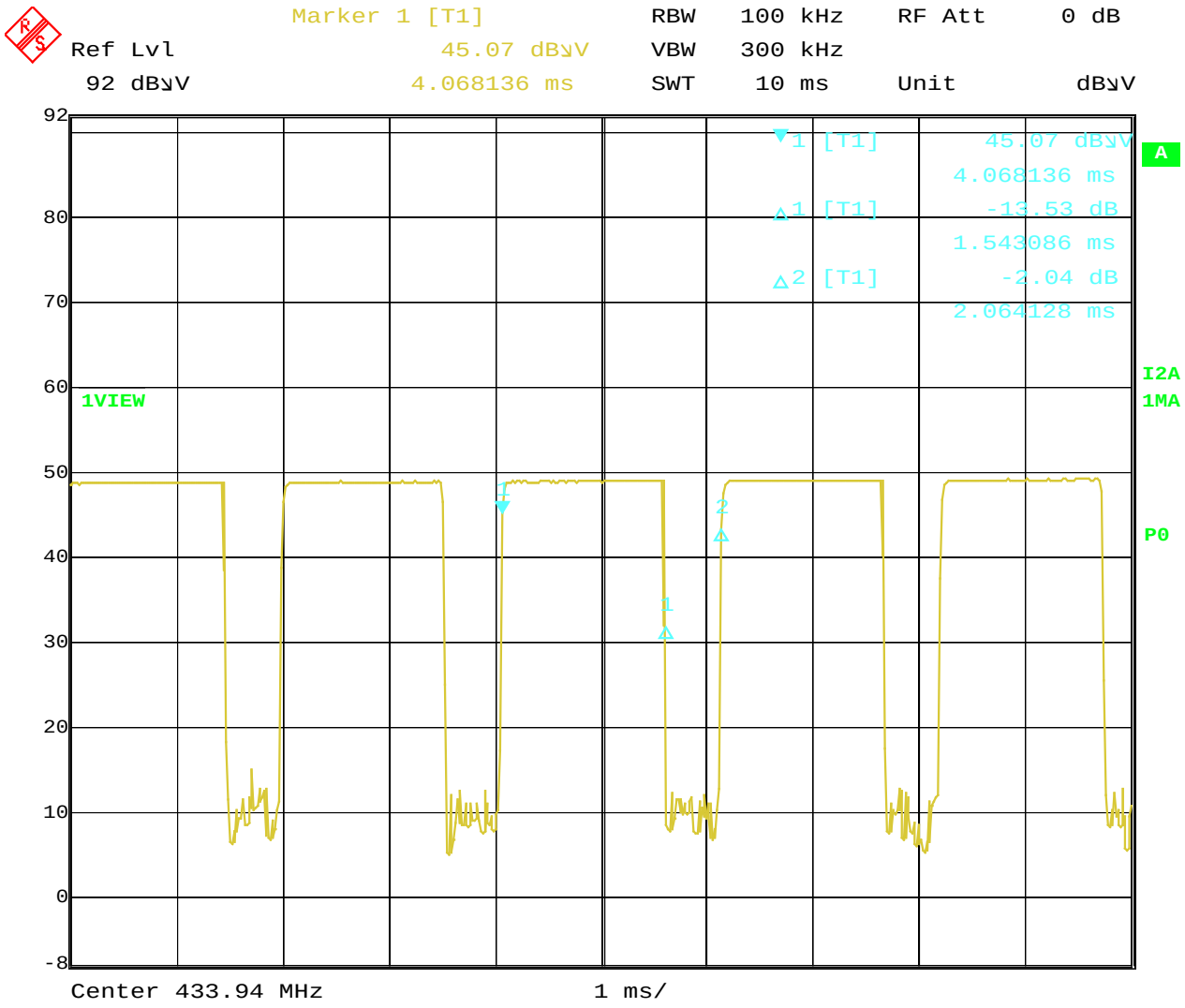
| RBW (KHz) | VBW (KHz) | Detector | Comment |
|---|---|---|---|
| 30 | 100 | Peak | |

6.4.2 Test Procedure The EUT was set up per the test configuration figured in Sec 6.2 of this test report to simulate the typical usage per the user's manual. The transmitter output of EUT was connected to the spectrum analyzer through an attenuator.

Set the spectrum analyzer into zero span and perform the dwell time bandwidth measurement.
Record the dwell time and compare with the required limit.

## 6.5 Test Results Test Results : PASS

**Test data see following graph:**



# 7. Band Edge

| | |
|---|---|
| Test Requirement: | FCC Part15 C |
| Test Method: | Based on FCC Part15 Paragraph 15.231 |
| Test Date: | November 05, 2006 |
| Test mode: | Transmitting |
| Temperature: | 23 °C |
| Humidity: | 53%RH |

## 7.1 Test Procedure

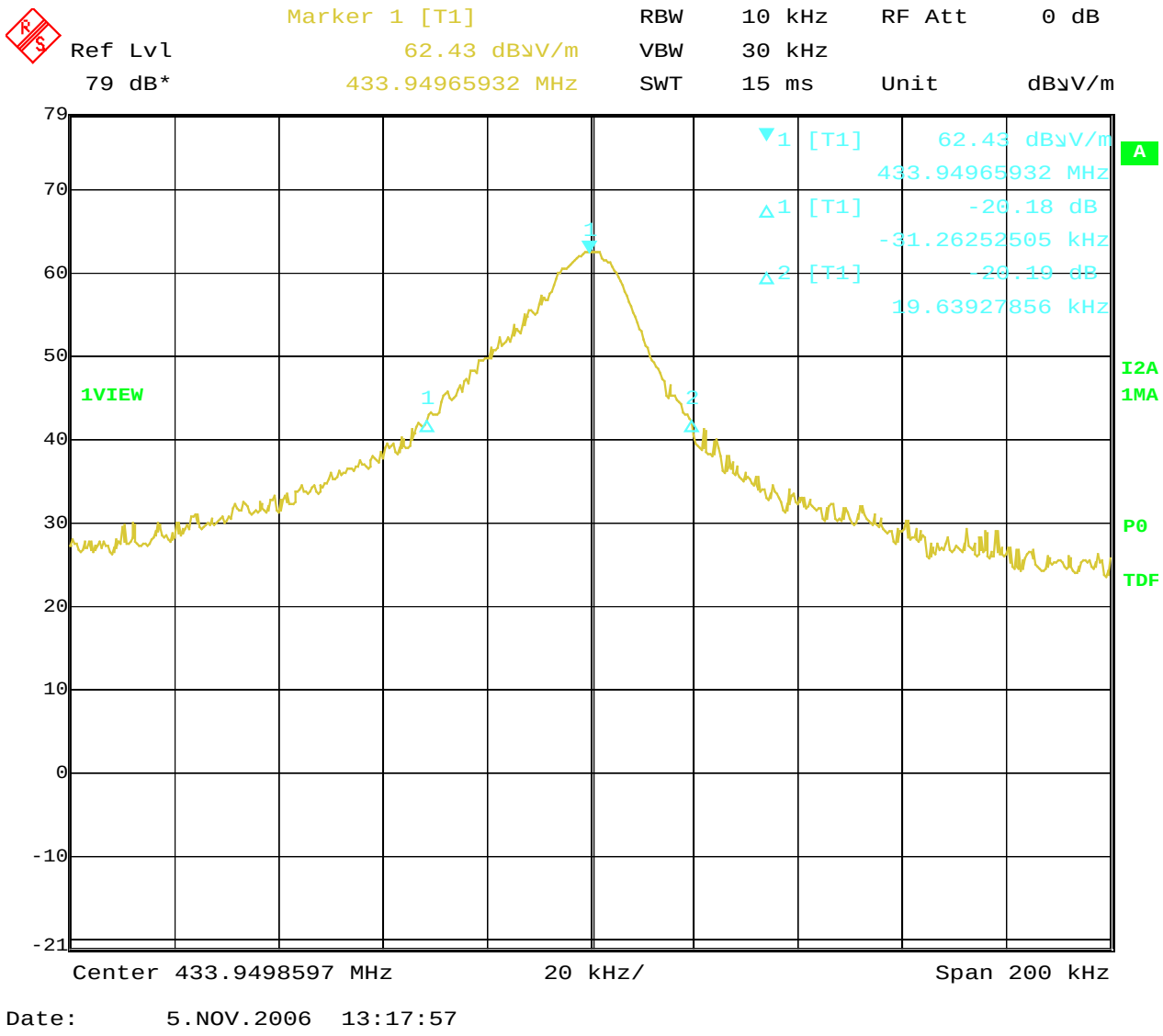
1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4.
2. With the EUT's antenna attached, The EUT's radiated emission power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band. Measurements were made at 3 meters.
3. The antenna high were varied from 1m to 4m high to find the maximum emission for each frequency.
4. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 20KHz RBW and 200KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

## 7.2 Band Edge

Requirements: Paragraph 15.231,The emission power at the START and STOP frequencies shall be at least 50dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209.

## 7.3 Band Edge Test Result: Pass

The graph as below, represents the emissions take for this device.



# 8. Photographs of Testing

**Radiated Emission Setup Photo**

# 9. Photographs – Constructional Details

## 9.1 EUT – Outside View

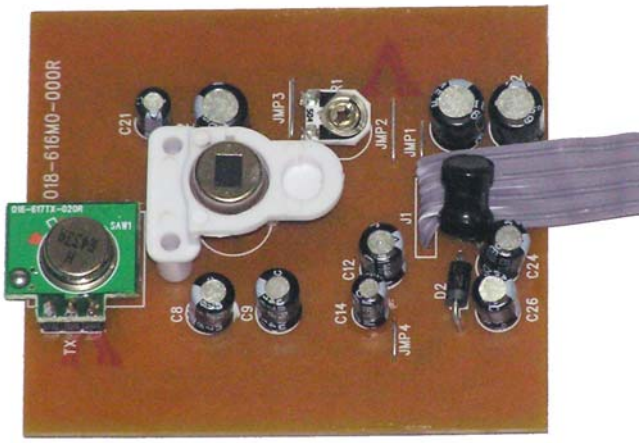

## 9.2 EUT – Front View

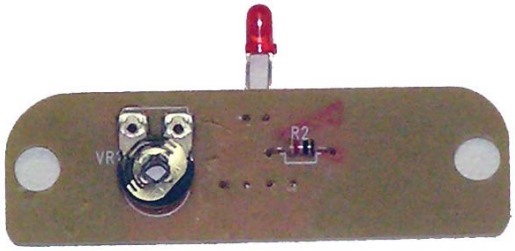
### 9.3 EUT – Rear View

### 9.4 EUT – Side View

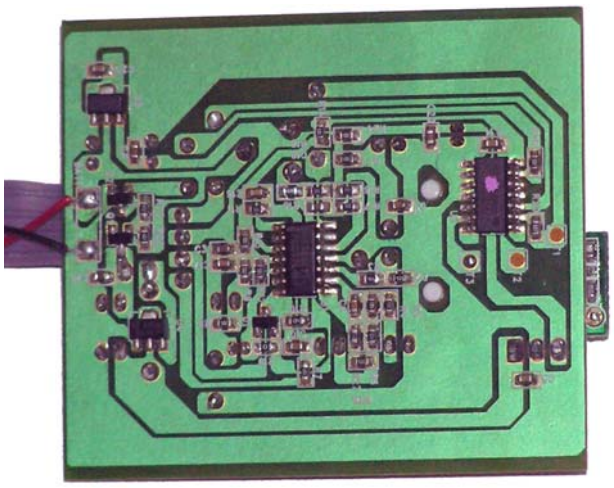
## 9.5 EUT – Inside View

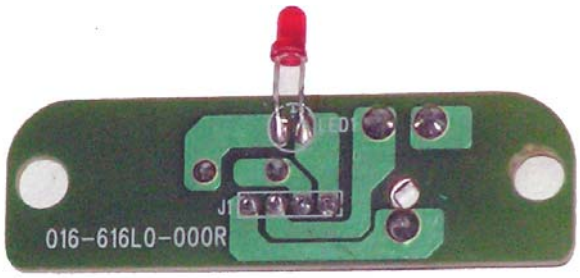
## 9.6 PCB – Component Side View



## 9.7 PCB – Solder Side View





## 10. FCC ID Label

**FCC ID: NS3LELUX616PR**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

**Proposed Label Location on EUT**
**EUT Bottom View/proposed FCC Mark Location**