# FCC TEST REPORT

for

Lelux Electronics Ltd.

Wireless Power Failure Sensor With Alarm

Model Number: 762T

FCC ID: NS3-762T

| | | |
|---|---|---|
| Prepared for | : | Lelux Electronics Ltd. |
| Address | : | Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong |
| Prepared by | : | Keyway Testing Technology Co., Ltd. |
| Address | : | Baishun Industrial Zone, Zhangmutou Town, Dongguan, Guangdong, China |
| | | Tel: 86-769-8718 2258 |
| | | Fax: 86-769-8718 1058 |

| | | |
|---|---|---|
| Report No. | : | 14KWE011105F |
| Date of Test | : | Dec. 28~30,2013 |
| Date of Report | : | Jan. 2,2014 |

# TABLE OF CONTENTS

# Keyway Testing Technology Co., Ltd.

| | | | |
|---|---|---|---|
| **Applicant:**<br>**Address:** | Lelux Electronics Ltd.<br>Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road,<br>Tsuen Wan, New Territories, Hong Kong | | |
| **Manufacturer:**<br>**Address:** | Lelux Electronics Ltd.<br>Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road,<br>Tsuen Wan, New Territories, Hong Kong | | |
| **E.U.T:** | Wireless Power Failure Sensor With Alarm | | |
| **Model Number:** | 762T | | |
| **Trade Name:** | HomeSafe® | **Serial No.:** | ------ |
| **Date of Receipt:** | Dec. 25, 2013 | **Date of Test:** | Dec. 28~30,2013 |
| **Test Specification:** | FCC Part 15, Subpart C: Oct. 1, 2013<br>ANSI C63.4:2003 | | |
| **Test Result:** | The equipment under test was found to be compliance with the requirements of the standards applied.<br><br>**Issue Date: Jan. 2, 2014** | | |

| Tested by: | Reviewed by: | Approved by: |
|---|---|---|
| Andy Gao / Engineer | Jade Yang/ Supervisor | Chris Du / Manager |

**Other Aspects:**

None.

*Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested*

# 1. GENERAL PRODUCT INFORMATION

## 1.1. Product Function

Refer to Technical Construction Form and User Manual.

## 1.2. Description of Device (EUT)

| | | |
|---|---|---|
| Description | : | Wireless Power Failure Sensor With Alarm |
| M/N | : | 762T |
| Power Supply | : | DC 6V from adapter<br>DC 4.5V(1.5V AAA battery*3) |
| Operation Frequency | : | 433.92MHz |
| Modulation Technology | : | ASK |
| Antenna Type | : | Integral |
| Antenna Gain | : | 2dBi |

## 1.3. Independent Operation Modes

The basic operation modes are:

1.3.1. Keep the EUT in transmitting mode.

## 1.4. Test Supporting System

Adapter
Model:GPE003W-060010-1
Manufacturer: GOLDEN PROFIT ELECTRONICS LTD.
I/P:AC 100~240V 50/60Hz
O/P:DC 6V/0.1A

# 2. TEST SITES

## 2.1. Test Facilities

Lab Qualifications : 944 Shielded Room built by ETS-Lindgren, USA
Date of completion: March 28, 2011

966 Chamber built by ETS-Lindgren, USA
Date of completion: March 28, 2011

Certificated by TUV Rheinland, Germany.
Registration No.: UA 50207153
Date of registration: July 13, 2011

Certificated by UL, USA
Registration No.: 100567-237
Date of registration: September 1, 2011

Certificated by Intertek
Registration No.: 2011-RTL-L1-31
Date of registration: October 11, 2011

Certificated by FCC, USA
Registration No.: 795647
Date of registration: November 7, 2011

Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Name of Firm : Keyway Testing Technology Co., Ltd.

Site Location : Baishun Industrial Zone, Zhangmutou Town,
Dongguan, Guangdong, China

## 2.2. List of Test and Measurement Instruments

### 2.2.1. For conducted emission at the mains terminals test

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101156 | May 9,13 | May 9,14 |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101315 | May 9,13 | May 9,14 |
| Artificial Mains Network (AUX) | Rohde&Schwarz | ENV216 | 101314 | May 9,13 | May 9,14 |
| RF Cable | FUJIKURA | 3D-2W | 944 Cable | May 9,13 | May 9,14 |

### 2.2.2. For above 1GHz radiated emission, band edge, 20dB bandwidth test

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101156 | May 9,13 | May 9,14 |
| Bilog Antenna | ETS-LINDGREN | 3142D | 00135452 | May 20,13 | May 20,14 |
| Horn Antenna | DAZE | ZN30701 | 11003 | May 11,13 | May 11,14 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 9170-068 | May 11,13 | May 11,14 |
| Spectrum Analyzer | Agilent | 8593E | 3911A04271 | May 9,13 | May 9,14 |
| Spectrum Analyzer | Agilent | E4408B | MY44211125 | May 9,13 | May 9,14 |
| Spectrum Analyzer | Rohde&Schwarz | FSP | 100394 | May 9,13 | May 9,14 |
| 3m Semi-anechoic Chamber | ETS-LINDGREN | 966 | KW01 | May 20,13 | May 20,14 |
| Signal Amplifier | SONOMA | 310 | 187303 | May 9,13 | May 9,14 |
| Signal Amplifier | DAZE | ZN3380C | 11001 | May 9,13 | May 9,14 |
| Signal Amplifier | Agilent | 8449B | 3008A00251 | May 9,13 | May 9,14 |
| High Pass filter | Micro | HPM50111 | 324216 | May 9,13 | May 9,14 |
| Power Meter | R&S | NRVS | 101824 | May 9,13 | May 9,14 |
| RF Cable | IMRO | IMRO-400 | 966 Cable 1# | May 9,13 | May 9,14 |
| MULTI-DEVICE Controller | ETS-LINDGREN | 2090 | 126913 | N/A | N/A |
| Antenna Holder | ETS-LINDGREN | 2070B | 00109601 | N/A | N/A |

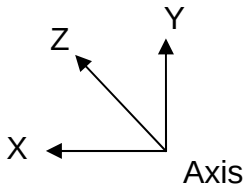
# 3. TEST SET-UP AND OPERATION MODES

## 3.1. Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators




EUT

*(EUT: Wireless Power Failure Sensor With Alarm)*

Note:1: By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Y axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report. Test data as below.

2: For battery test, used new battery.

| Frequency (MHz) | Axis | Field Strength (dBuV/m) | Antenna Polarization |
|---|---|---|---|
| 433.92 | X | 82.67 | Vertical |
| 433.92 | Y | 84.76 | Vertical |
| 433.92 | Z | 83.29 | Vertical |

## 3.3. Test Operation Mode and Test Software

Refer to Test Setup in clause 4.

## 3.4. Special Accessories and Auxiliary Equipment

None.

## 3.5. Countermeasures to Achieve EMC Compliance

None.

# 4. EMISSION TEST RESULTS

## 4.1. Conducted Emission at the Mains Terminals Test

### 4.1.1. Limit 15.207 limits

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

### 4.1.2. Test Setup

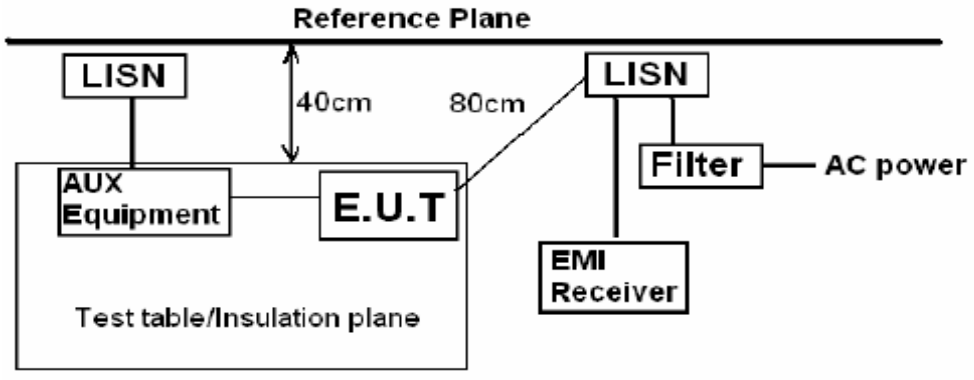
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

The bandwidth of the test receiver was set at 9 kHz.

The test data of the worst case condition(s) was reported on the following page.




*Remark:*
*E.U.T: Equipment Under Test*
*LISN: Line Impedence Stabilization Network*
*Test table height=0.8m*

LINE

| | Freq | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | |
| 1 | 0.180 | 25.10 | 54.50 | -29.40 | Average |
| 2 | 0.180 | 40.16 | 64.50 | -24.34 | QP |
| 3 | 0.310 | 34.63 | 49.97 | -15.34 | Average |
| 4 | 0.310 | 38.59 | 59.97 | -21.38 | QP |
| 5 | 0.614 | 21.65 | 46.00 | -24.35 | Average |
| 6 | 0.614 | 31.26 | 56.00 | -24.74 | QP |
| 7 | 0.933 | 23.70 | 46.00 | -22.30 | Average |
| 8 | 0.933 | 28.39 | 56.00 | -27.61 | QP |
| 9 | 1.662 | 25.05 | 46.00 | -20.95 | Average |
| 10 | 1.662 | 30.16 | 56.00 | -25.84 | QP |
| 11 | 2.750 | 27.75 | 46.00 | -18.25 | Average |
| 12 | 2.750 | 34.61 | 56.00 | -21.39 | QP |

NEUTRAL

| | Freq | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | |
| 1 | 0.160 | 22.59 | 55.47 | -32.88 | Average |
| 2 | 0.160 | 40.35 | 65.47 | -25.12 | QP |
| 3 | 0.305 | 30.15 | 50.10 | -19.95 | Average |
| 4 | 0.305 | 40.39 | 60.10 | -19.71 | QP |
| 5 | 0.914 | 16.81 | 46.00 | -29.19 | Average |
| 6 | 0.914 | 24.35 | 56.00 | -31.65 | QP |
| 7 | 1.781 | 16.62 | 46.00 | -29.38 | Average |
| 8 | 1.781 | 27.34 | 56.00 | -28.66 | QP |
| 9 | 2.884 | 19.82 | 46.00 | -26.18 | Average |
| 10 | 2.884 | 30.12 | 56.00 | -25.88 | QP |
| 11 | 3.623 | 19.93 | 46.00 | -26.07 | Average |
| 12 | 3.623 | 30.19 | 56.00 | -25.81 | QP |

## 4.2. Radiated Emission Test

### 4.2.1. Limit 15.209 limits

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

### 4.2.2. Fundamental and harmonics emission limits

| **Frequency** | **Field Strength of Fundamental** | | **Field Strength of Harmonics** | |
|---|---|---|---|---|
| **(MHz)** | **( μ V/m@3m)** | **(dB μ V/m@3m)** | **( μ V/m@3m)** | **(dB μ V/m@3m)** |
| 433.92 | 10996 | 80.8 | 1099.6 | 60.8 |

### 4.2.3. Restricted bands of operation

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | ([2]) |

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

## 4.2.4. Test setup

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz.

The frequency ranges from 30MHz to 10th harmonic (5GHz) are checked.

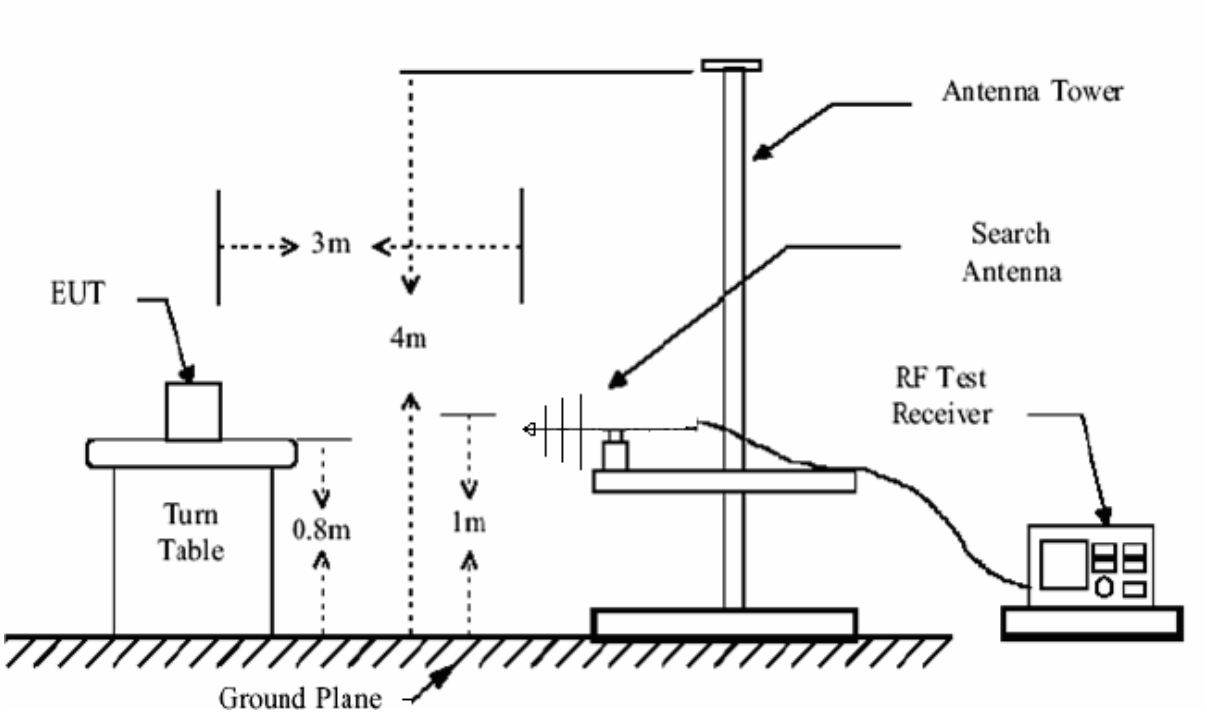
The test data of the worst case condition(s) was reported on the following pages.

Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.

2. Measurement Uncertainty: ±3.2 dB at a level of confidence of 95%.

3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

4. For Both PK and AV value above 1GHz，PK detector is used。



Vertical

| | | Freq | Preamp Factor | Read Level | Cable Loss | Antenna Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dB | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | | 54.25 | 31.37 | 53.24 | 0.75 | 8.16 | 30.78 | 40.00 | -9.22 | QP |
| 2 | ! | 219.15 | 30.99 | 60.10 | 1.53 | 11.92 | 42.56 | 46.00 | -3.44 | QP |
| 3 | ! | 328.76 | 30.79 | 54.82 | 2.02 | 14.65 | 40.70 | 46.00 | -5.30 | QP |
| 4 | | 433.92 | 30.62 | 95.19 | 2.55 | 17.28 | 84.40 | 100.80 | -16.40 | Peak |
| 5 | | 546.04 | 30.85 | 44.74 | 3.03 | 19.45 | 36.37 | 46.00 | -9.63 | QP |
| 6 | | 867.84 | 30.27 | 55.55 | 4.67 | 23.39 | 53.34 | 80.80 | -27.46 | Peak |

Horizontal

| | | Freq | Preamp Factor | Read Level | Cable Loss | Antenna Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dB | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | | 109.54 | 31.31 | 45.46 | 1.03 | 9.31 | 24.49 | 43.50 | -19.01 | QP |
| 2 | ! | 219.15 | 30.99 | 60.00 | 1.53 | 11.92 | 42.46 | 46.00 | -3.54 | QP |
| 3 | ! | 328.76 | 30.79 | 56.40 | 2.02 | 14.65 | 42.28 | 46.00 | -3.72 | QP |
| 4 | | 433.92 | 30.62 | 95.55 | 2.55 | 17.28 | 84.76 | 100.80 | -16.04 | Peak |
| 5 | | 546.04 | 30.85 | 47.08 | 3.03 | 19.45 | 38.71 | 46.00 | -7.29 | QP |
| 6 | | 867.84 | 30.27 | 62.69 | 4.67 | 23.39 | 60.48 | 80.80 | -20.32 | Peak |

For average:

| Frequency MHz | Peak Level dBuV/m | Duty cycle factor(dB) | Emission Level dBuV/m | Limits dBuV/m | Margin dB | Antenna Polarization |
|---|---|---|---|---|---|---|
| 433.92 | 84.40 | -6.27 | 78.13 | 80.80 | -2.67 | Vertical |
| 867.84 | 53.34 | -6.27 | 47.07 | 60.80 | -13.73 | Vertical |
| 433.92 | 84.76 | -6.27 | 78.49 | 80.80 | -2.31 | Horizontal |
| 867.84 | 60.48 | -6.27 | 54.21 | 60.80 | -6.59 | Horizontal |

Notes: 1. Emission Level = Peak Level + Duty cycle factor
2.Duty cycle level please see clause 5.

Above 1GHz

Vertical

| | Freq | Preamp Factor | Read Level | Cable Loss | Antenna Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 1301.76 | 26.06 | 39.21 | 5.15 | 24.84 | 43.14 | 74.00 | -30.86 | Peak |
| 2 | 1735.68 | 26.15 | 38.68 | 5.85 | 26.75 | 45.13 | 74.00 | -28.87 | Peak |
| 3 | 2140.00 | 26.24 | 33.61 | 6.71 | 28.51 | 42.59 | 74.00 | -31.41 | Peak |
| 4 | 2768.00 | 26.43 | 33.76 | 8.84 | 29.44 | 45.61 | 74.00 | -28.39 | Peak |
| 5 | 3148.00 | 26.57 | 33.58 | 9.94 | 30.14 | 47.09 | 74.00 | -26.91 | Peak |
| 6 | 3804.00 | 26.91 | 34.44 | 10.24 | 31.12 | 48.89 | 74.00 | -25.11 | Peak |

Horizontal

| | Freq | Preamp Factor | Read Level | Cable Loss | Antenna Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 1301.76 | 26.06 | 45.07 | 5.15 | 24.84 | 49.00 | 74.00 | -25.00 | Peak |
| 2 | 1735.68 | 26.15 | 40.98 | 5.85 | 26.75 | 47.43 | 74.00 | -26.57 | Peak |
| 3 | 2212.00 | 26.26 | 35.62 | 6.89 | 28.57 | 44.82 | 74.00 | -29.18 | Peak |
| 4 | 2568.00 | 26.37 | 34.57 | 7.84 | 28.96 | 45.00 | 74.00 | -29.00 | Peak |
| 5 | 2764.00 | 26.43 | 34.99 | 8.84 | 29.44 | 46.84 | 74.00 | -27.16 | Peak |
| 6 | 3300.00 | 26.65 | 34.22 | 9.96 | 30.29 | 47.82 | 74.00 | -26.18 | Peak |

# 5. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB =20 log (duty cycle)

The duration of one cycle = 69.6ms

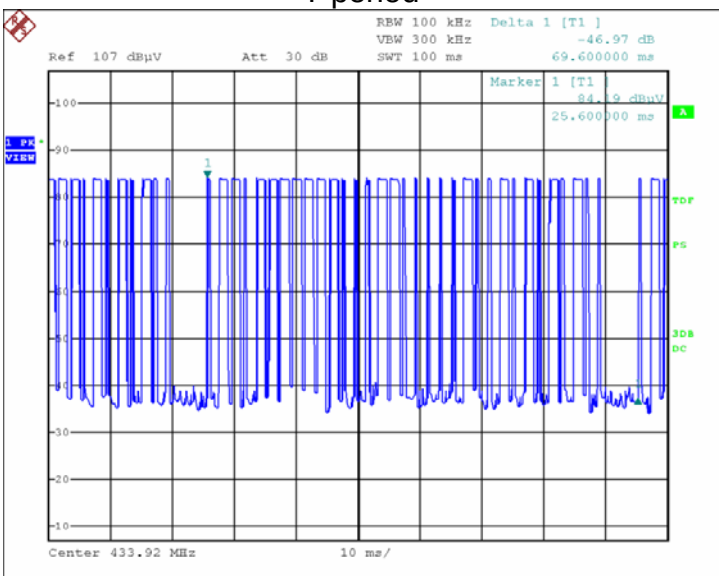
The duty cycle is simply the on-time divided the duration of one cycle

Duty Cycle = (1.54ms*16+0.54ms*17)/69.6=33.82ms / 69.6ms=0.486

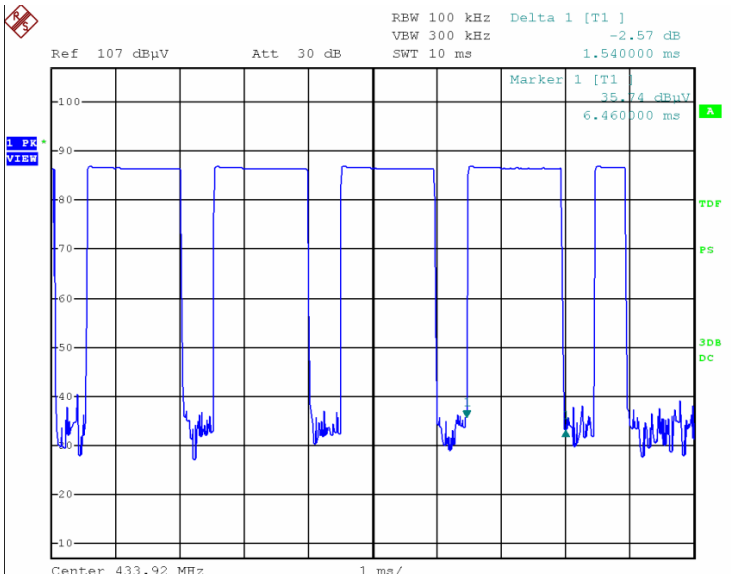
Therefore, the averaging factor is found by 20 log 0.486=**－6.27dB**

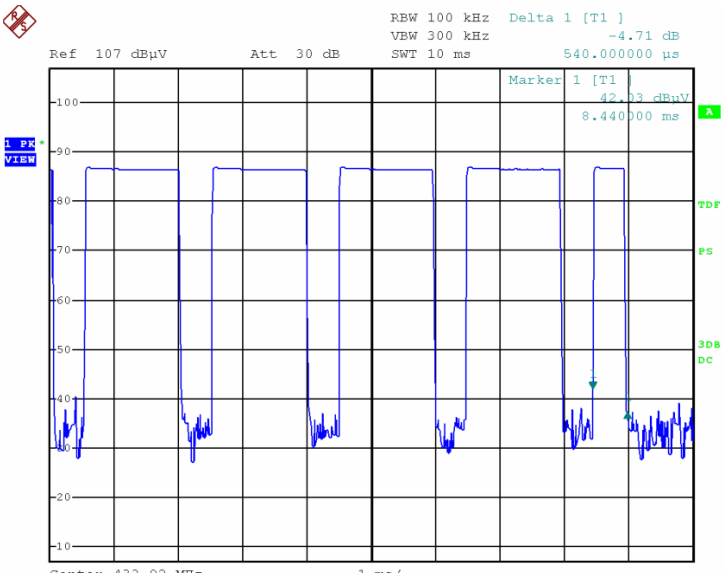
Test plot as follows:

T period




T on time slot



# 6. 20DB OCCUPY BANDWIDTH

## 6.1. Limits

According to FCC 15.231(c) requirement:

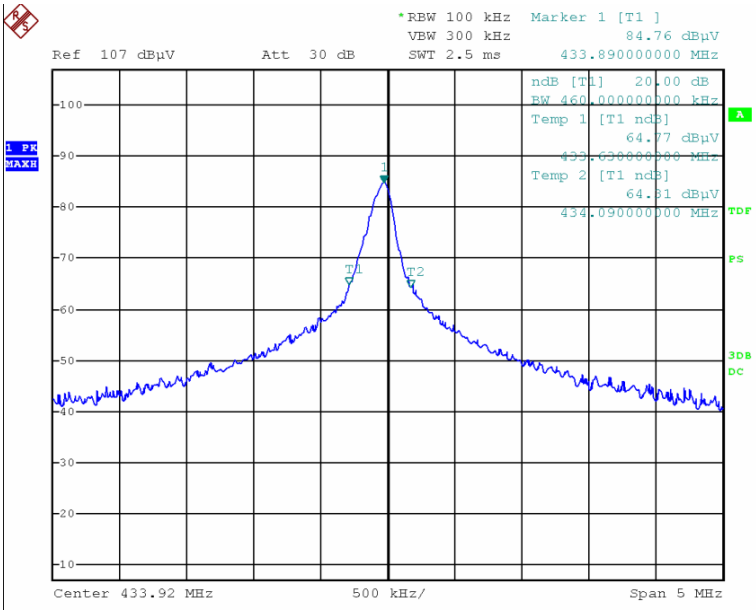
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

B.W (20dBc) Limit = 0.25% * f(MHz) = 0.25% * 433.92MHz = 1.0848MHz

Test data:

| Channel Frequency (MHz) | 20dB Bandwidth (MHz) | Limit (MHz) | Result |
|---|---|---|---|
| 433.92 | 0.46 | 1.0848 | Pass |

Test plot as follows:



# 7. DWELL TIME

## 7.1. Limits

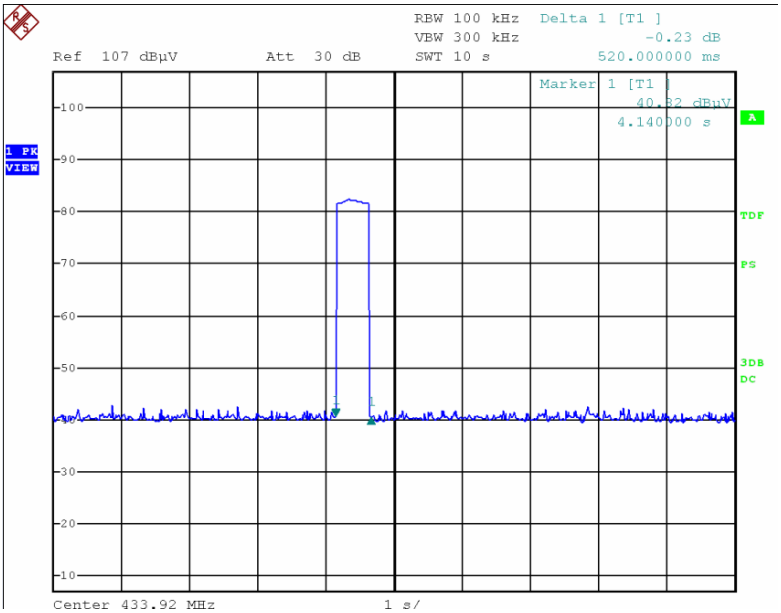
According to FCC 15.231a(2) requirement:

A transmitter activated automatically shall cease transmission within 5 seconds after activation

Test Data:

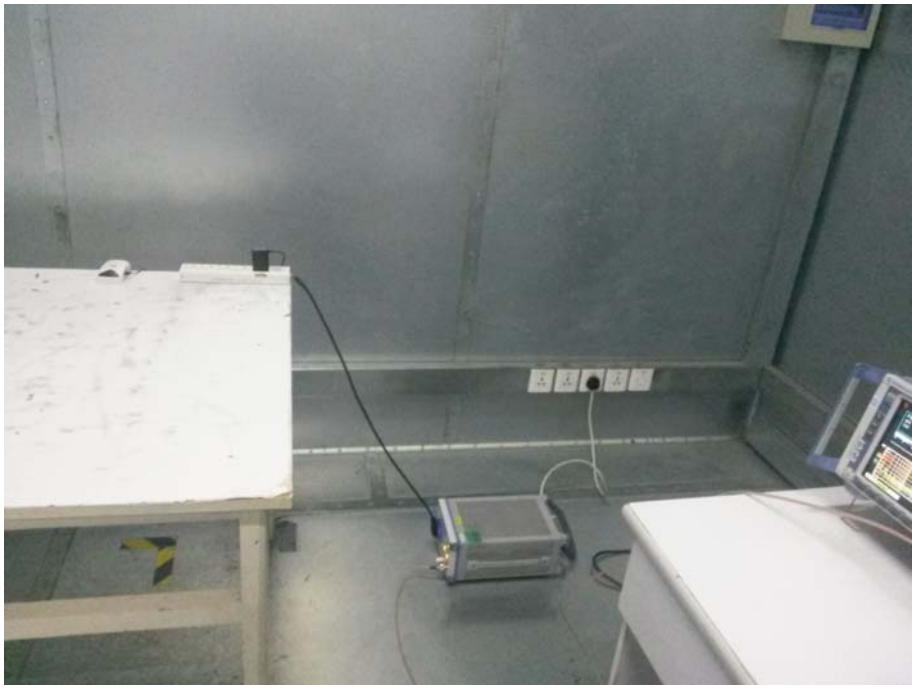
| Dwell time (second) | Limit (second) | Result |
|---|---|---|
| 0.52s | <5s | Pass |

Test plot as follows:

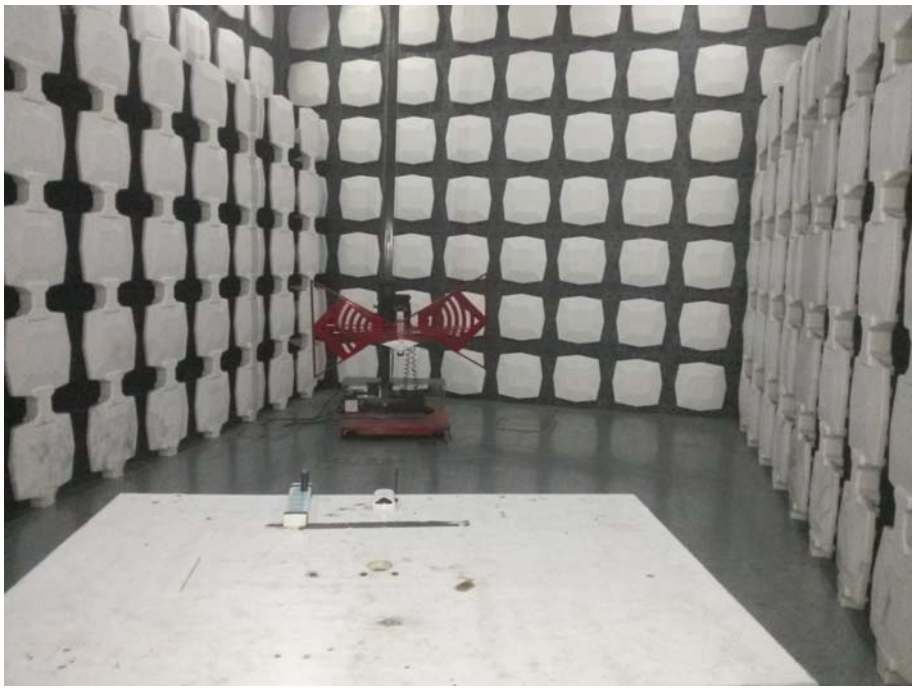


# 8. PHOTOGRAPHS OF TEST SET-UP

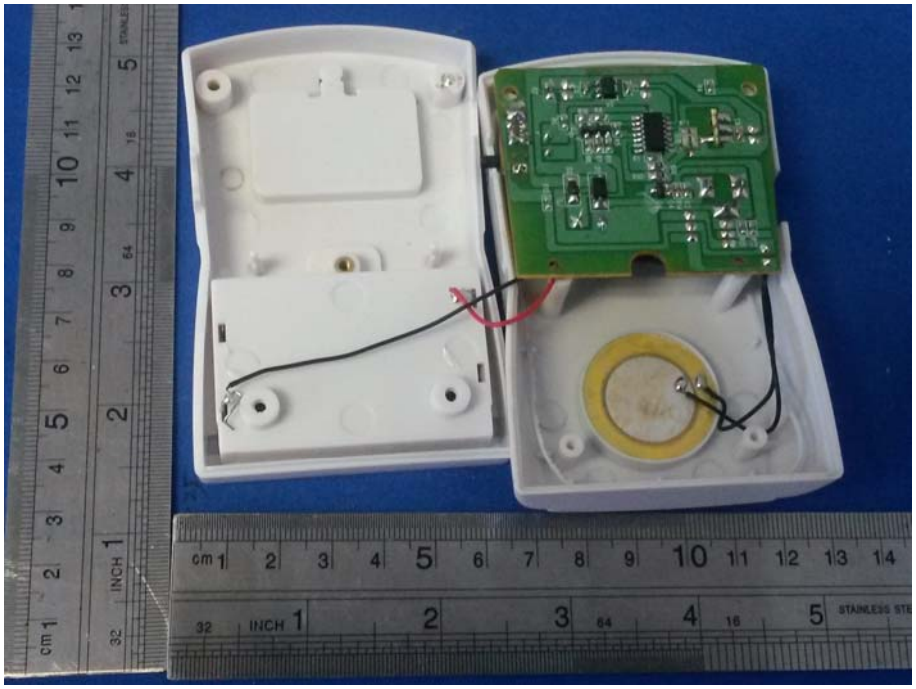
Conducted emission

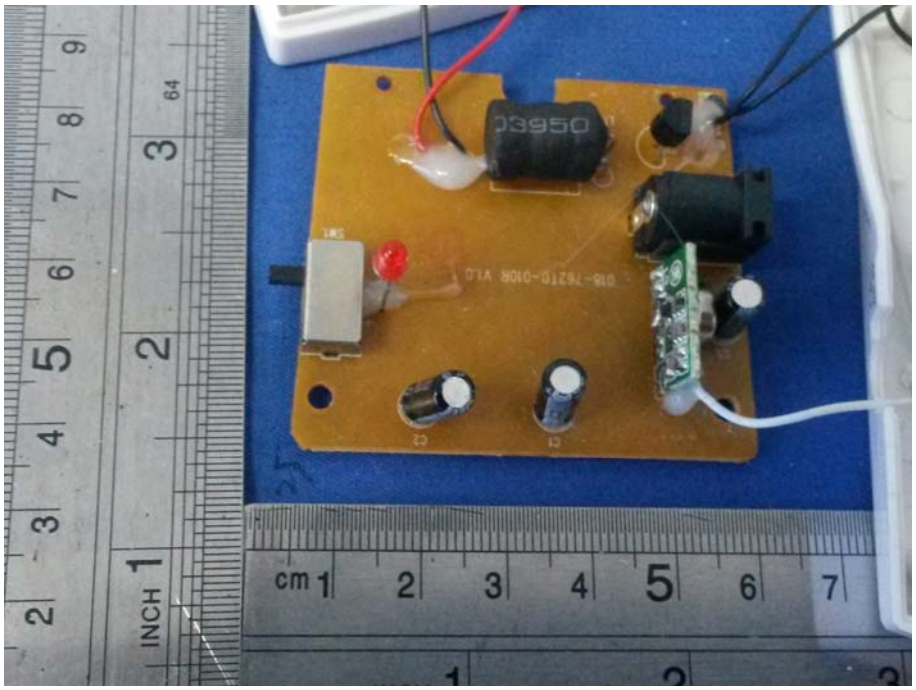


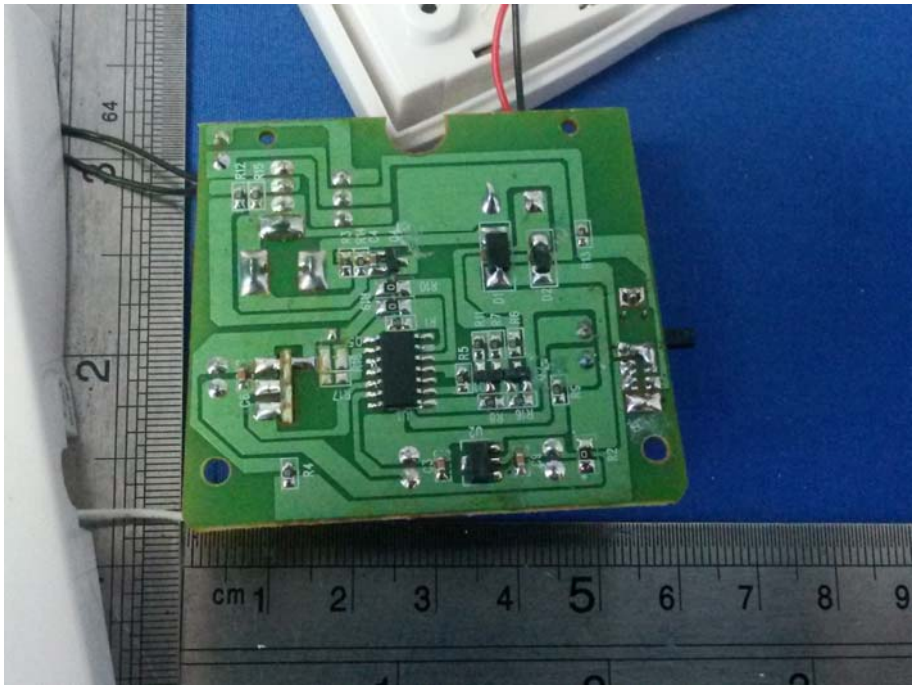
Radiated Emission

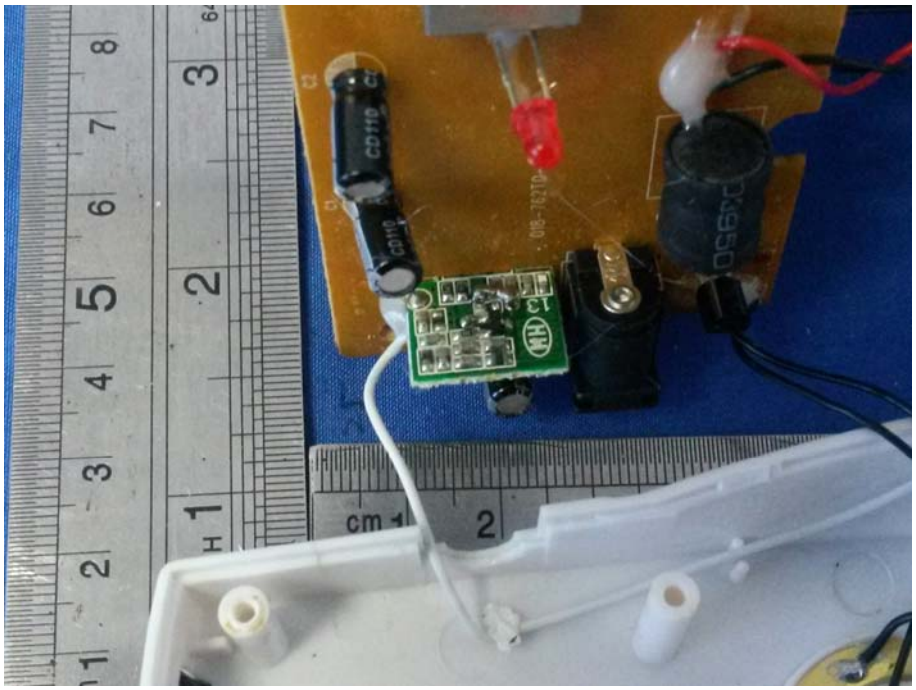


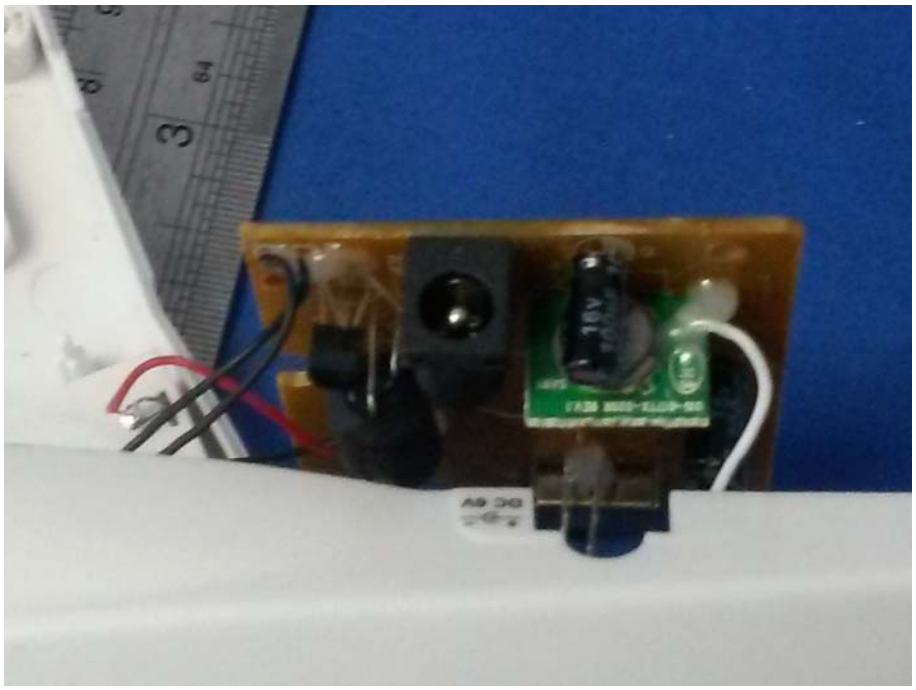
# 9. PHOTOGRAPHS OF THE EUT











END.