# EMC TEST REPORT

For

## Remote Control Transmitter

Model Number: TX31ARSAW
FCC ID: VZYTX31ARSAW

Report Number **:** WT088000212


| | | |
|---|---|---|
| Test Laboratory | : | Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory Guangdong EMC Compliance Test Center |
| Site Location | : | Bldg. of Metrology &Quality Inspection, Longzhu Road, Shenzhen, Guangdong, China |
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## TEST REPORT DECLARATION

| | | |
|---|---|---|
| Applicant | : | Silicon Autoproducts Pte Ltd |
| Address | : | 45, Jalan Pemimpin. #08-00 Foo Wah Industrial Building, Singapore 577197 |
| Manufacturer | : | Silicon Autoproducts Pte Ltd |
| Address | : | 45, Jalan Pemimpin. #08-00 Foo Wah Industrial Building, Singapore 577197 |
| EUT Description | : | Remote Control Transmitter |
| Model Number | | TX31ARSAW |
| **FCC ID Number** | : | VZYTX31ARSAW |

Test Standards:

**FCC Part 15 15.231**

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

| | | | |
|---|---|---|---|
| Tested by: | Winnie Hou (Winnie Hou) | Date: | 2008.01.29 |
| Checked by: | Louis Lin (Louis Lin) | Date: | 2008.01.29 |
| Approved by: | peter (Peter Lin) | Date: | 2008.01.29 |

# 1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

| Test Items | FCC Rules | Test Results |
|---|---|---|
| Conducted Disturbance | 15.207 | N/A |
| Radiated disturbance | 15.231 | Pass |
| 20dB Occupied Bandwidth | 15.231 | Pass |
| Switch off time | 15.231 | Pass |
| Antenna Requirement | 15.203 | Pass |

# 2. GENERAL INFORMATION

## 2.1. Report information

2.1.1.This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

2.1.2.The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

2.1.3.Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

## 2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:
China National Accreditation Committee for Laboratories (**CNAL**) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is L0579.

The Laboratory is listed in the United States of American Federal Communications Commission (**FCC**), and the registration number are **97379**(open area test site) and **274801**(semi anechoic chamber).
The Laboratory is listed in Voluntary Control Council for Interference by Information Technology Equipment (**VCCI**), and the registration number are **R-1974**(open area test site) , **R-1966**(semi anechoic chamber),**C-2117**(mains ports conducted interference measurement) and **T-180**(telecommunication ports conducted interference measurement).

The Laboratory is registered to perform emission tests with Industry Canada (**IC**), and the registration number is **IC4174**.

**TUV Rhineland** accredits the Laboratory for conformance to IEC and EN standards, the registration number is **E2024086Z02**.
Measurement Uncertainty

### 2.3. Measurement Uncertainty

Conducted Disturbance : 9kHz~30MHz 3.5dB

Radiated Disturbance: 30MHz~1000MHz 4.5dB
1GHz~18GHz 4.6dB

## 3. PRODUCT DESCRIPTION

### 3.1. EUT Description

| | | |
|---|---|---|
| Description | : | Remote Control Transmitter |
| Manufacturer | : | Silicon Autoproducts Pte Ltd |
| Model Number | : | TX31ARSAW |
| Input Power | : | DC6.0V 2*3.0V CR2032 battery |
| Operate Frequency | : | 314.95MHz |
| Modulation | | ASK |
| Antenna Designation | : | integrated |

### 3.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: VZYTX31ARSAW filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

### 3.3. Block Diagram of EUT Configuration

EUT

### 3.4. Operating Condition of EUT

Mode 1:314.95MHz TX

### 3.5. Special Accessories

Not available for this EUT intended for grant.

### 3.6. Equipment Modifications

Not available for this EUT intended for grant.

### 3.7. Support Equipment List

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### 3.8. Test Conditions

Date of test：Jan.28-29,2008
Date of EUT Receive：Jan.28,2008
Temperature: 19℃
Relative Humidity: 52%

# 4. TEST EQUIPMENT USED

## 4.1. Test Equipment Used to Measure Conducted Disturbance

Table 2 Conducted Disturbance Test Equipment

| No. | Equipment | Manufacturer | Model No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|
| SB2603 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | Jan.24, 2008 | 1 Year |
| SB3321 | AMN | Rohde & Schwarz | ESH2-Z5 | Jan.24, 2008 | 1 Year |
| SB2604 | AMN | Rohde & Schwarz | ESH3-Z5 | Jan.24, 2008 | 1 Year |

## 4.2. Test Equipment Used to Measure Radiated Disturbance and bandwidth

Table 3 Radiated Disturbance Test Equipment

| No. | Equipment | Manufacturer | Model No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|
| SB3436 | EMI Test Receiver | Rohde & Schwarz | ESI26 | Jan.24, 2008 | 1 Year |
| SB3440 | Bilog Antenna | Chase | CBL6112B | Jan.24, 2008 | 1 Year |
| SB3435 | Horn Antenna | Rohde & Schwarz | HF906 | Jan.24, 2008 | 1 Year |
| SB3435/ 01 | Amplifier(1-18GHz) | Rohde & Schwarz | --- | Jan.24, 2008 | 1 Year |

# 5. CONDUCTED DISTURBANCE TEST

## 5.1. Test Standard and Limit

5.1.1.Test Standard

FCC Part 15 15.207

5.1.2.Test Limit

Table 4 Conducted Disturbance Test Limit (Class B)

| Frequency | Maximum RF Line Voltage (dBμV) | |
|---|---|---|
| | Quasi-peak Level | Average Level |
| 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

③ Decreasing linearly with logarithm of the frequency

③ The lower limit shall apply at the transition frequency.

## 5.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver (R&S Test Receiver ESCS30) is used to test the emissions form both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.The bandwidth of EMI test receiver is set at 9kHz.

## 5.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

## 5.4. Test Data

N/A

# 6. RADIATED DISTURBANCE TEST

## 6.1. Test Standard and Limit

6.1.1.Test Standard

FCC Part 15 15.231

6.1.2.Test Limit

Table 5 Radiated Disturbance Test Limit

| Frequency Range of Fundamental [MHz] | Field Strength of Fundamental Emission [Average] [μV/m] | Field Strength of Spurious Emission [Average] [μV/m] |
|---|---|---|
| 40.66-40.70 | 2250 | 225 |
| 70-130 | 1250 | 125 |
| 130-174 | 1250-3750 | 125-375 |
| 174-260 | 3750 | 375 |
| 260-470 | 3750-12500 | 375-1250 |
| Above 470 | 12500 | 1250 |

Where F is the frequency in MHz, The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174MHz, μ V/m at 3 meters=56.81818(F)-6136.3636; For the band 260-470MHz, μ V/m at 3 meters=41.6667(F)-7083.3333. The maximum permissible unwanted emission level is 20dB below the maximum permitted fundamental level.

Restricted Band Radiation Emission Measurement Limits According to Section 15.205 and Section15.209

## 6.2. Test Procedure

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and13 of ANSI C63.4-2003.

The RBW of the EMI test receiver is :

30~1000MHz 120KHz
1000-18000MHz 1MHz

## 6.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

## 6.4. Test Data

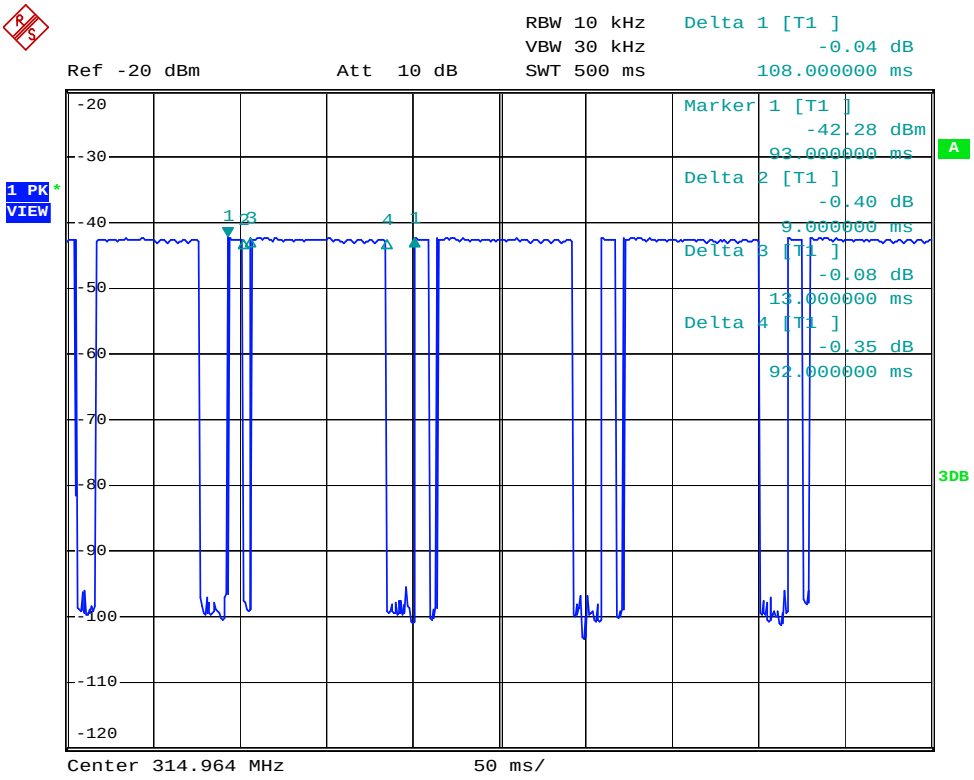
The test was performed with three direct(X Y Z axis) of the EUT. The data shown below were the worst case data.

Table 6 Radiated Disturbance Test Data

Model number: TX31ARSAW
Test Mode:1

| Frequency (MHz) | Polarization | Reading Value (dBμV) Peak | Correction Factor (dB) | Antenna Factor (dB/m) | Emission Level dB(μV/m) | | Limits dB(μV/m) |
|---|---|---|---|---|---|---|---|
| | | | | | Peak | AV | |
| 314.950 | V | 45.1 | 2.9 | 14.0 | 62.0 | 57.4 | 75.6 |
| 1575.120 | V | 62.1 | -32.3 | 27.2 | 57.0 | 52.4 | 55.6 |
| 314.950 | H | 58.6 | 2.9 | 14.0 | 75.5 | 70.9 | 75.6 |
| 630.001 | H | 26.6 | 4.3 | 19.1 | 50.0 | 45.4 | 55.6 |
| 945.010 | H | 31.6 | 5.2 | 21.2 | 58.0 | 53.4 | 55.6 |
| 1259.950 | H | 61.2 | -32.3 | 25.1 | 54.0 | 49.4 | 55.6 |
| 1575.100 | H | 60.1 | -32.3 | 27.2 | 55.0 | 50.4 | 55.6 |
| 2520.100 | H | 53.3 | -31.8 | 29.9 | 51.4 | 46.8 | 55.6 |
| 2835.100 | H | 59.5 | -31.8 | 29.9 | 57.6 | 53.0 | 55.6 |

Note: 1. Emission level(dBuV/m)=Reading Value(dBuV) + Correction Factor(dB/m)+ Antenna Factor (dB/m)
2. Correction Factor(dB/m) = Cable Factor (dB)+Amplifier Factor(dB)
3. The other emission levels were less than the limit 20dB
4.fundamental limit uV/m at 3 meters=41.6667(F)-7083.3333=41.6667*314.95-7083.3333 =6039.594 μV/m=75.6dBuV/m
5. unwanted emission limit=75.6-20=55.6 dBuV/m
6.AV=peak-AV factor
7. AV factor=20log duty cycle=20*log0.5917=-4.6dB
8.duty cycle=(0.54ms*12+0.98ms*52+13*0.49ms)/100=0.5917

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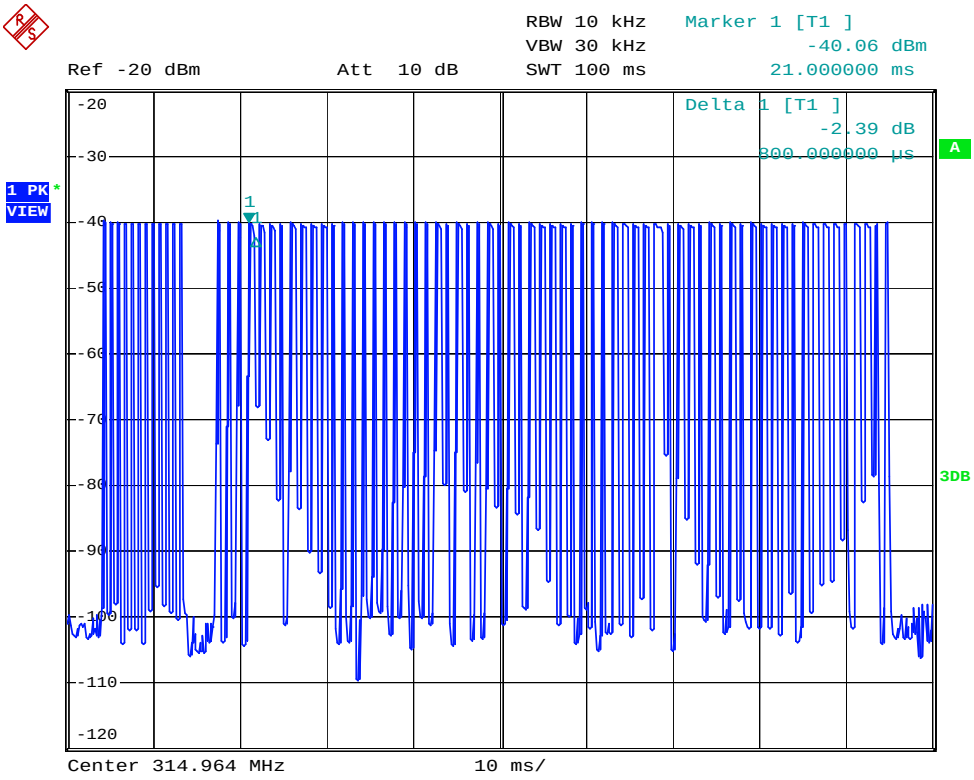


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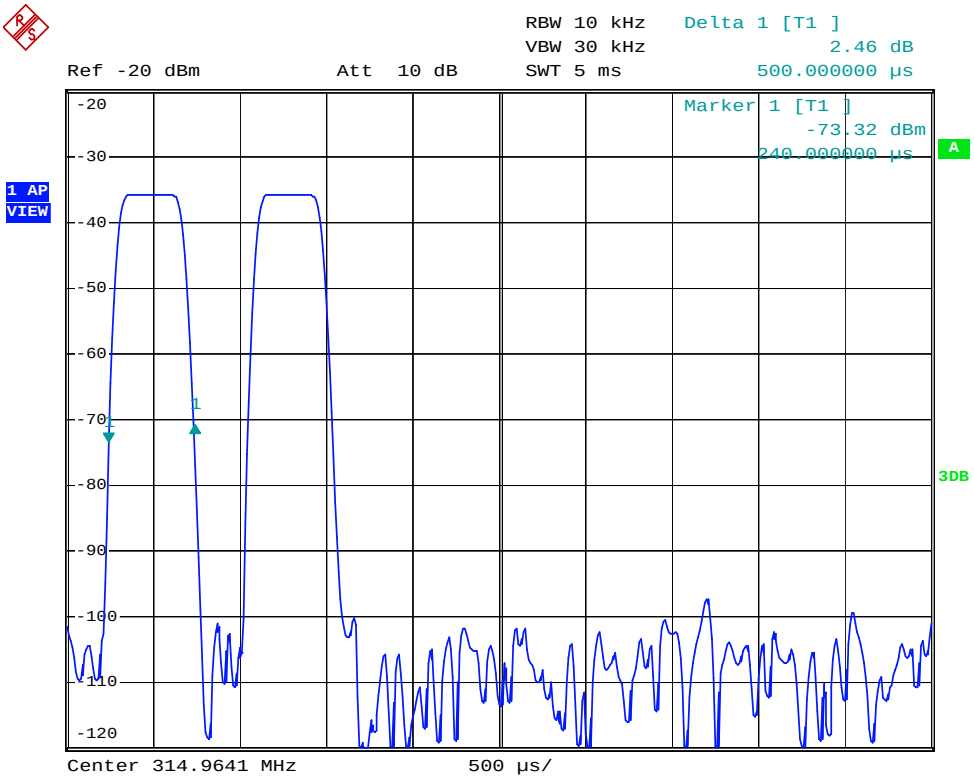


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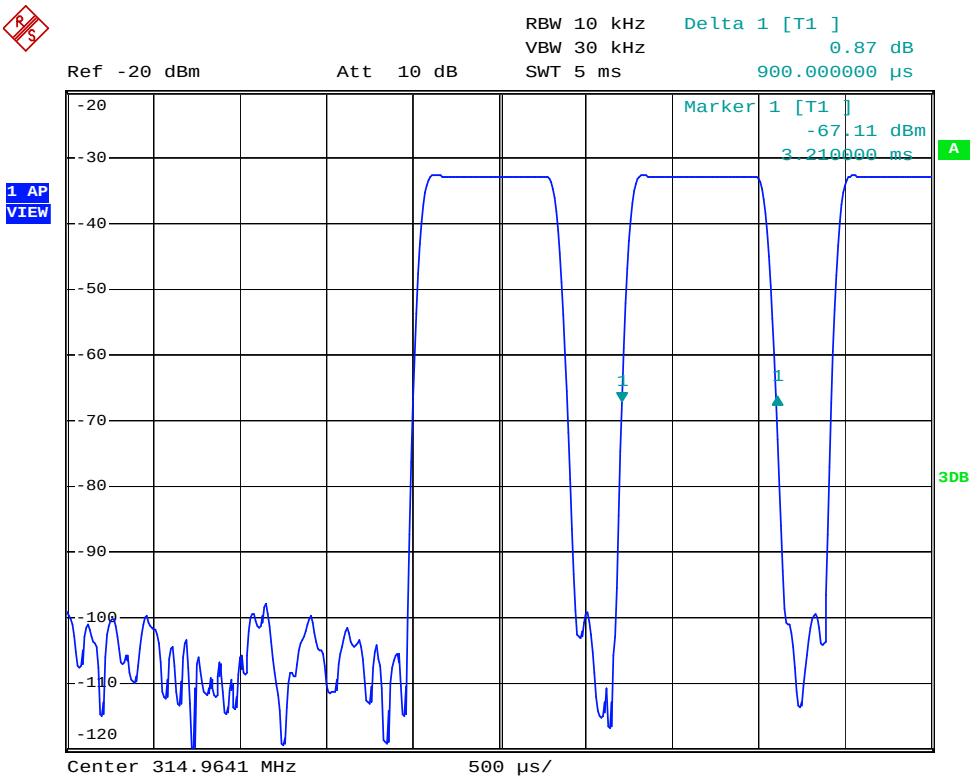


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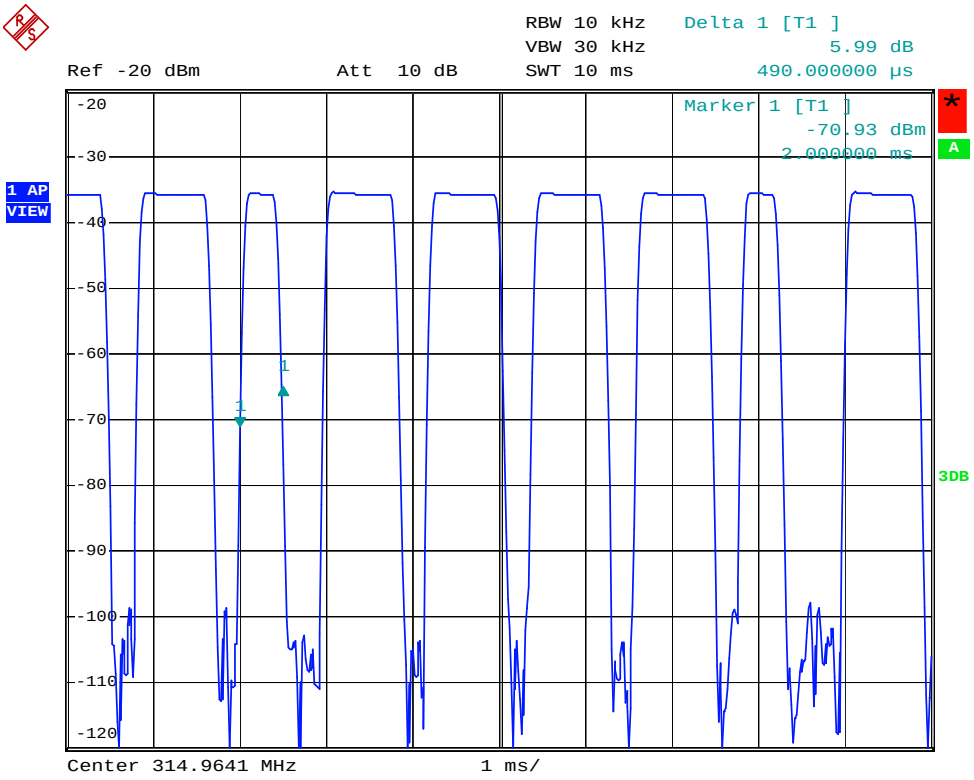


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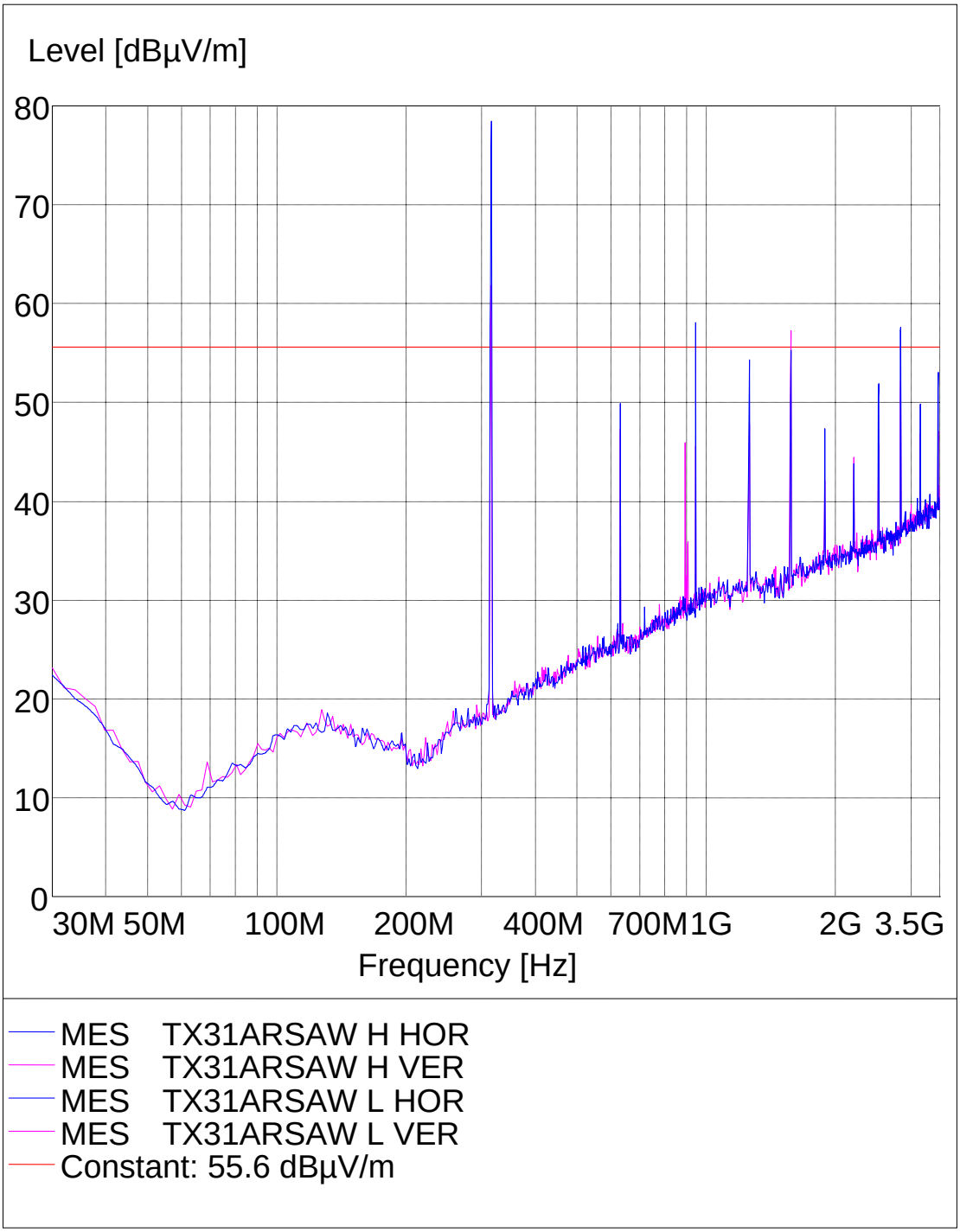
Table 7 **Restricted Band Radiated Emission Data**

| MHz | MHz | MHz |
|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 |
| 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2655 - 2900 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 |
| 12.57675 - 12.57725 | 322 - 335.4 | |
| 13.36 - 13.41 | | |

All the emission of the above band were less than the limit 20dB.

***Radiated Emission***

EUT: TX31ARSAW
Operating Condition: TX
Test Site: SMQ No.1 Sac chamber
Test Specification: Horizontal&Vertical
Comment: DC6.0V



# 7. 20DB OCCUPIED BANDWIDTH

## 7.1. Test Standard and Limit

7.1.1.Test Standard

FCC Part 15 15.231 :2006

7.1.2.limit

The bandwidth of emission shall be no wider than 0.25% of the center frequency.
Therefore, the bandwidth of the emission limit is 314.95MHz×0.25% = 787KHz.
Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

## 7.2. Test Procedure

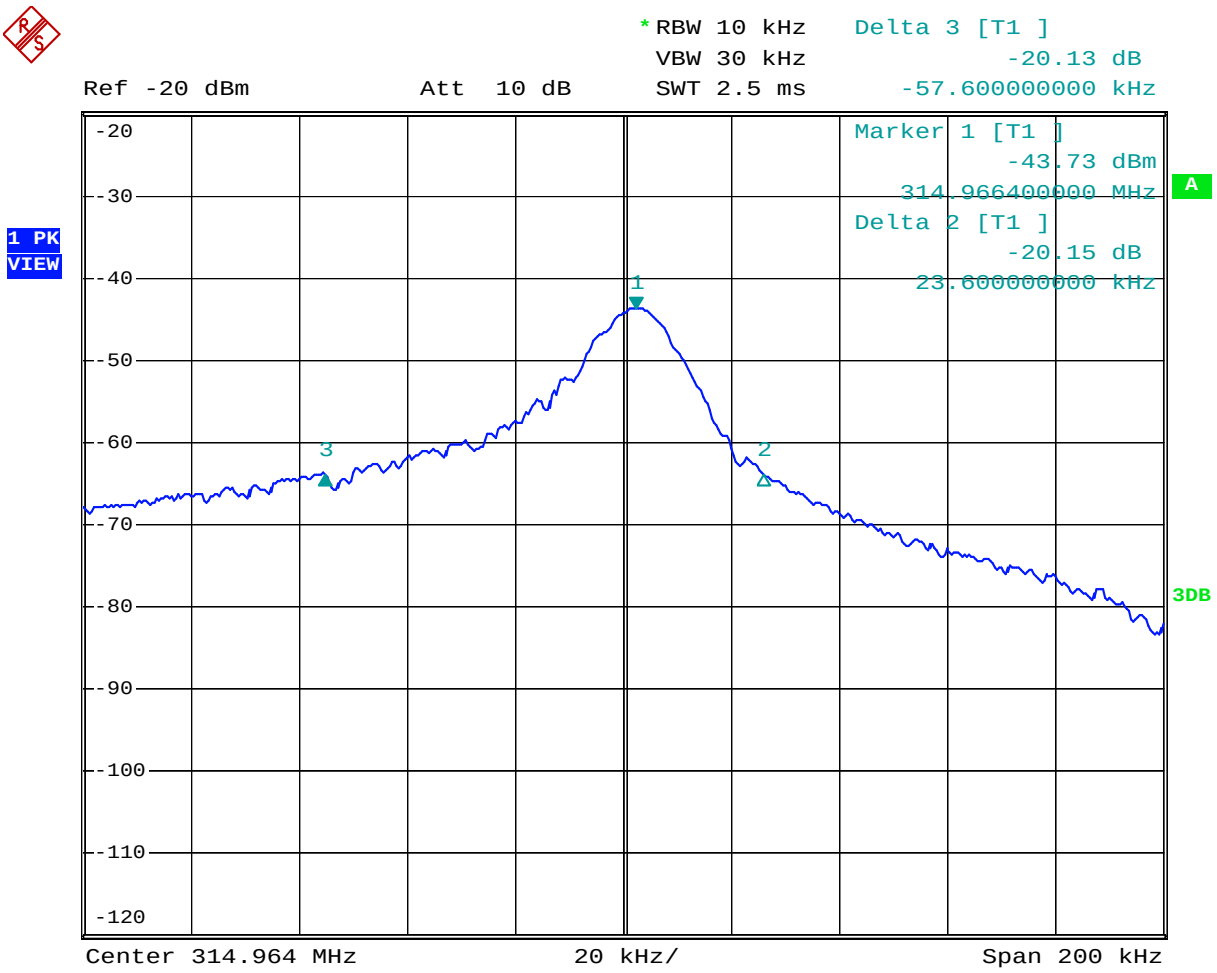
1.The EUT was placed on a turn table which is 0.8m above ground plane.
2.Set EUT as normal operation
3.Set EMI test receiver(ESIB26) Center Frequency = fundamental frequency, RBW=10kHz, VBW= 30kHz, Span=200kHz.
4. Set EMI test receiver(ESIB26) Max hold. Mark peak, -20dB.

## 7.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

## 7.4. Test Data

20dB bandwidth =81.2 kHz

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# 8. SWITCH OFF TIME

## 8.1. Test Standard and Limit

8.1.1.Test Standard

FCC Part 15 Section 15.231(a) (1) A :2006

8.1.2.Limit

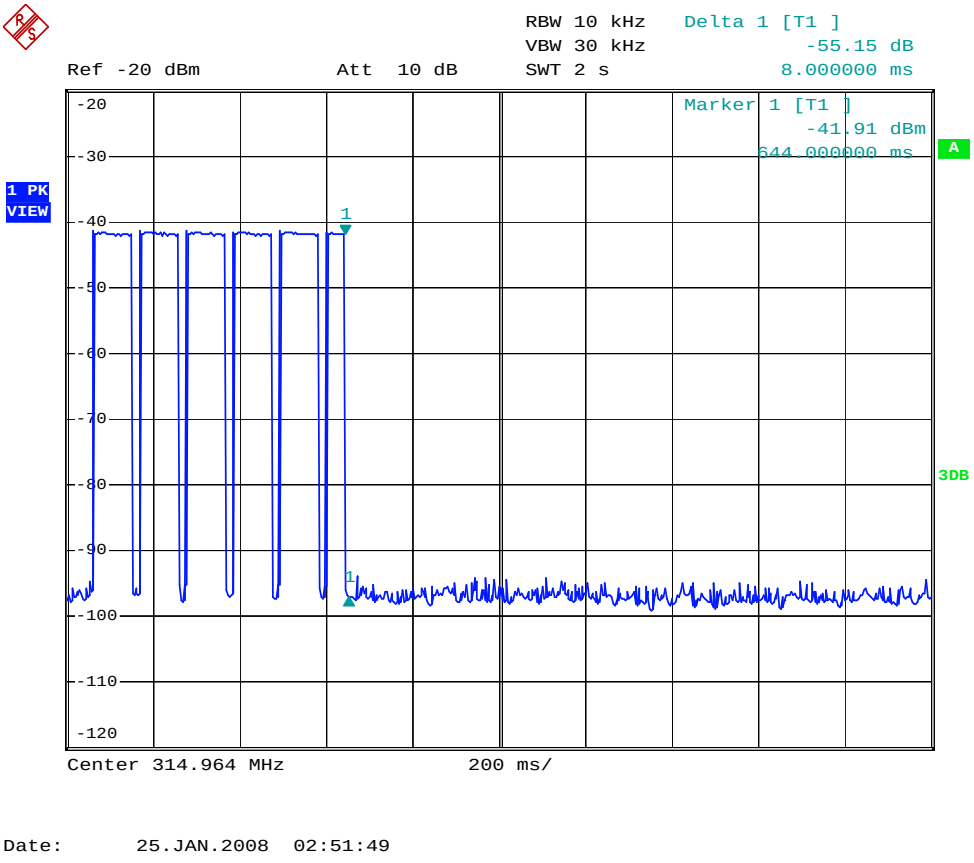
manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

## 8.2. Test Procedure

8.2.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10kHz, VBW = 30kHz, Span = 0Hz. Sweep time = 2s.
8.2.2. Set EUT as normal operation and press Transmitter button.
8.2.3. Set SPA View. Delta Mark time.

## 8.3. Test Data

Switch off time=8ms

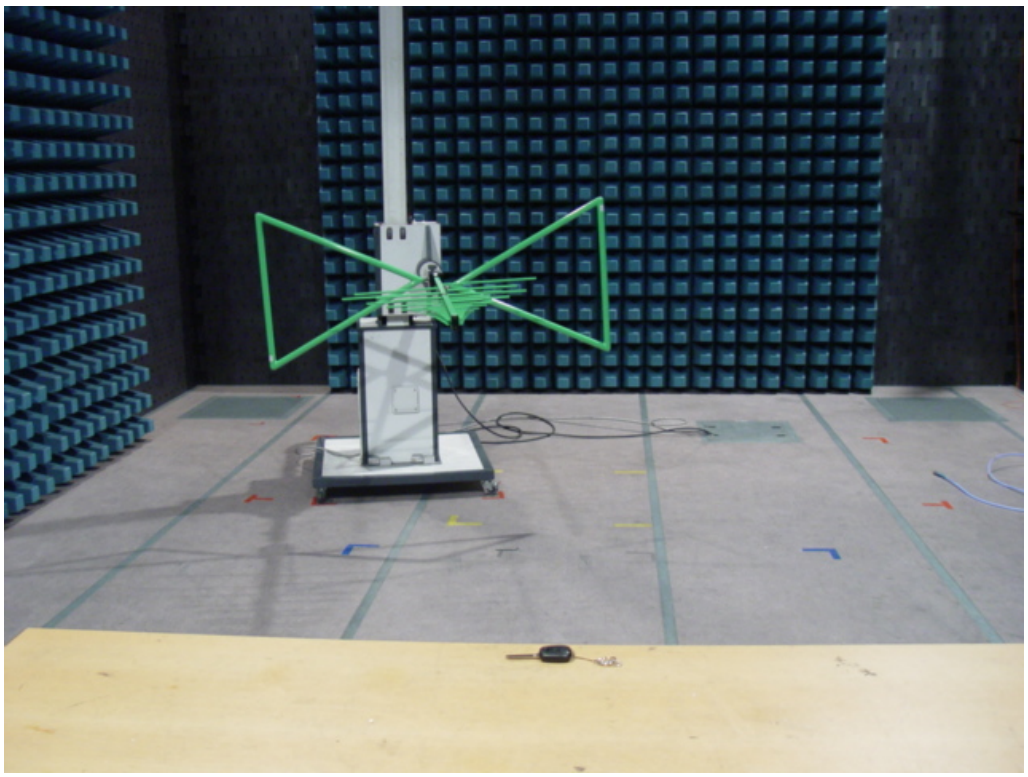


## 9. ANTENNA REQUIREMENT

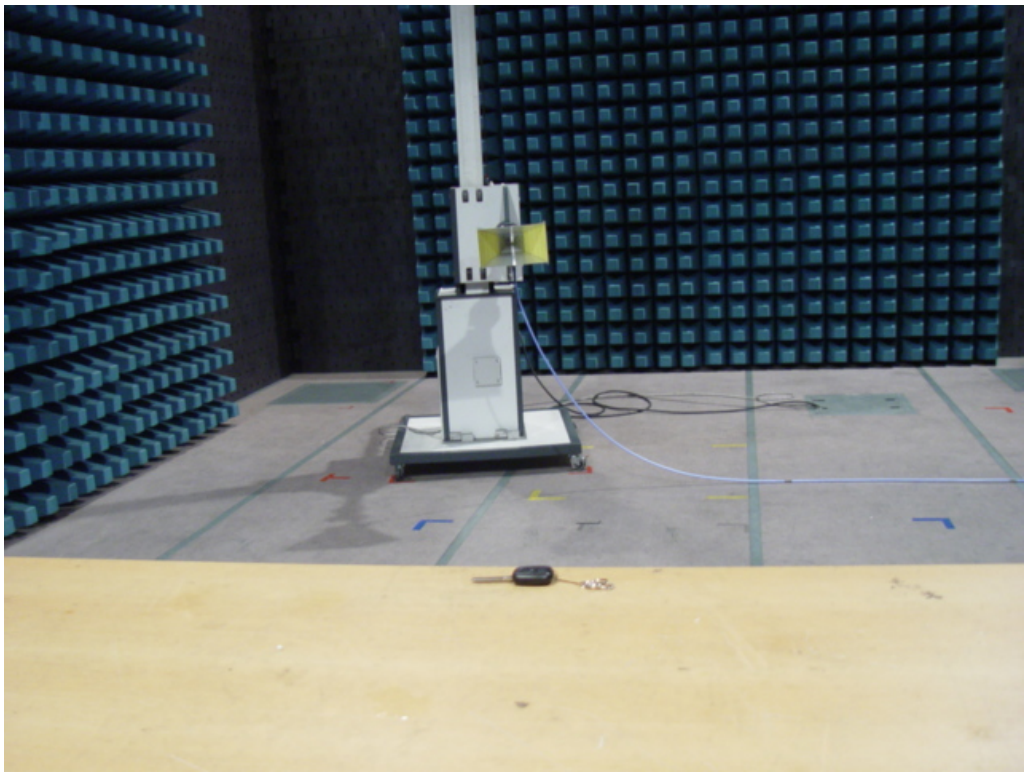
According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
The EUT has a built in antenna which is integrated on the PCB, this is permanently attached antenna and meets the requirements of this section.

# APPENDIX I TEST PHOTO

## Photo 1 Radiated Emission Test



## Photo 2 Radiated Emission Test



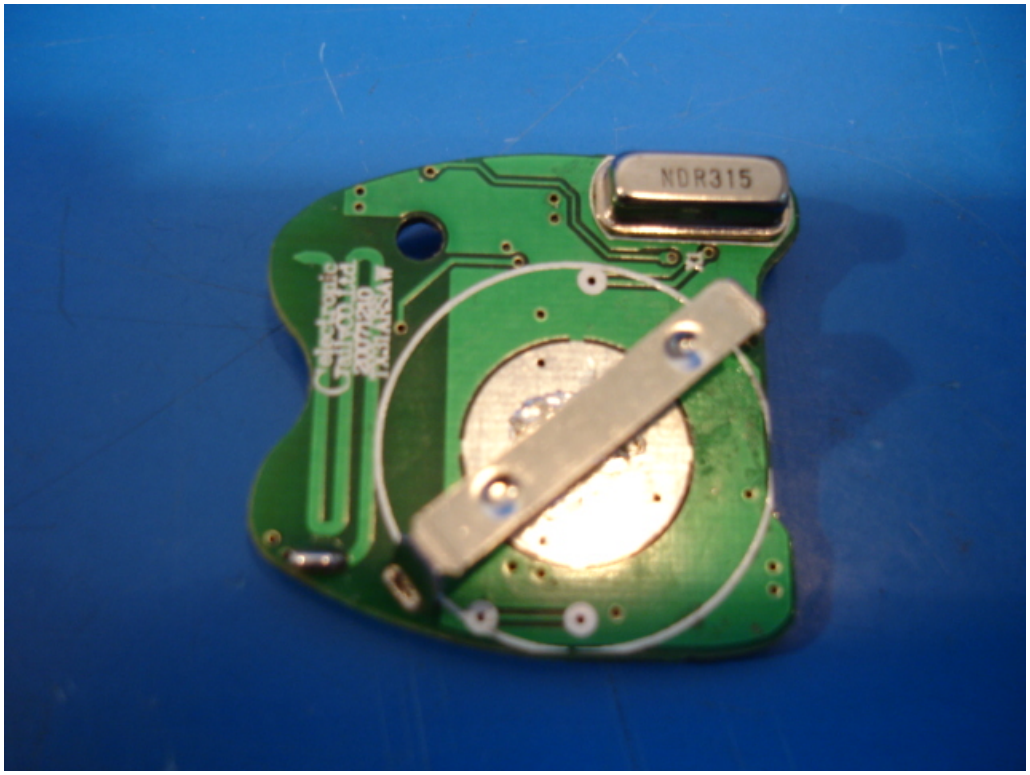
# APPENDIX II EUT PHOTO

**Photo 1 Appearance of EUT**

**Photo 2 Appearance of EUT**

**Photo 3 Inside of EUT**

**Photo 4 Inside of EUT**



## Photo 5 Inside of EUT