# FCC REPORT

| | |
|---|---|
| **Applicant:** | Safety Technology International, Inc. |
| **Address of Applicant:** | 2306 Airport Road, Waterford, MI 48327-1209, USA |
| **Equipment Under Test (EUT)** | |
| Product Name: | Wireless Doorbell Chime Sensor |
| Model No.: | STI-3301 |
| Trade Mark: | STI |
| FCC ID: | TXL3301 |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.231:2014 |
| **Date of sample receipt:** | February 25, 2015 |
| **Date of Test:** | February 25-March 26, 2015 |
| **Date of report issued:** | March 26, 2015 |
| **Test Result :** | PASS * |

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

**Robinson Lo**
**Laboratory Manager**

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *March 26, 2015* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Prepared By:*** Edward.Pan **Date:** *March 26, 2015*

***Project Engineer***

***Check By:*** hank.yan **Date:** *March 26, 2015*

***Reviewer***

# 3 Contents

Page

# 4 Test Summary

| Test Item | Section in CFR 47 | Result |
|---|---|---|
| Antenna requirement | 15.203 | Pass |
| Field strength of the fundamental signal | 15.231 (b) | Pass |
| Spurious emissions | 15.231 (b)/15.209 | Pass |
| 20dB Bandwidth | 15.231 (c) | Pass |
| Release time | 15.231 (a) | Pass |

*Pass: The EUT complies with the essential requirements in the standard.*

## 4.1 Measurement Uncertainty

| Test Item | Frequency Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 9kHz ~ 30MHz | ± 4.34dB | (1) |
| Radiated Emission | 30MHz ~ 1000MHz | ± 4.24dB | (1) |
| Radiated Emission | 1GHz ~ 26.5GHz | ± 4.68dB | (1) |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | ± 3.45dB | (1) |
| Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%. | | | |

# 5 General Information

## 5.1 Client Information

| | |
|---|---|
| Applicant: | Safety Technology International, Inc. |
| Address of Applicant: | 2306 Airport Road, Waterford, MI 48327-1209, USA |
| Manufacturer: | Smart Electronic Industrial (Dong Guan) Co., Ltd. |
| Address of Manufacturer | Qing Long Road, Long Jian Tian-Cun, Huang Jiang-Zhen, Dong Guan, Guang Dong, China |
| Factory: | Smart Electronic Industrial (Dong Guan) Co., Ltd. |
| Address of Factory: | Qing Long Road, Long Jian Tian-Cun, Huang Jiang-Zhen, Dong Guan, Guang Dong, China |

## 5.2 General Description of EUT

| | |
|---|---|
| Product Name: | Wireless Doorbell Chime Sensor |
| Model No.: | STI-3301 |
| Operation Frequency: | 433.92MHz |
| Modulation technology: | OOK |
| Antenna Type: | PCB Antenna |
| Antenna gain: | 0dBi (declare by Manufacturer) |
| Power supply: | DC 3V |

## 5.3 Test mode

| | |
|---|---|
| Transmitting mode | Keep the EUT in transmitting mode. |
| *Remark: During the test, the New Battery was used.* | |

**Per-test mode.**

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

| Axis | X | Y | Z |
|---|---|---|---|
| Field Strength(dBuV/m) | 82.13 | 88.65 | 85.37 |

**Final Test Mode:**

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”:

Y axis (see the test setup photo)

## 5.4 Test Facility

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

● **CNAS —Registration No.: CNAS L5775**

CNAS has accredited Global United Technology Services Co., Ltd. to ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

● **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 28, 2013.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.

## 5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Room 301-309, 3th Floor, Block A, Huafeng Jinyuan Business Building, No. 300 Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China
Tel: 0755-27798480
Fax: 0755-27798960

## 5.6 Other Information Requested by the Customer

None.

# 6 Test Instruments list

| Radiated Emission: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | GTS250 | Mar. 28 2014 | Mar. 27 2015 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS251 | N/A | N/A |
| 3 | Spectrum Analyzer | Agilent | E4440A | GTS533 | Dec. 04 2014 | Dec. 03 2015 |
| 4 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | July 01 2014 | June 30 2015 |
| 5 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | GTS214 | Feb. 22 2015 | Feb. 21 2016 |
| 6 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | 9120D-829 | GTS208 | June 27 2014 | June 26 2015 |
| 7 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | Mar. 28 2014 | Mar. 27 2015 |
| 8 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 9 | Coaxial Cable | GTS | N/A | GTS213 | Mar. 29 2014 | Mar. 28 2015 |
| 10 | Coaxial Cable | GTS | N/A | GTS211 | Mar. 29 2014 | Mar. 28 2015 |
| 11 | Coaxial cable | GTS | N/A | GTS210 | Mar. 29 2014 | Mar. 28 2015 |
| 12 | Coaxial Cable | GTS | N/A | GTS212 | Mar. 29 2014 | Mar. 28 2015 |
| 13 | Amplifier(100kHz-3GHz) | HP | 8347A | GTS204 | July 01 2014 | June 30 2015 |
| 14 | Amplifier(2GHz-20GHz) | HP | 8349B | GTS206 | July 01 2014 | June 30 2015 |
| 15 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | June 27 2014 | June 26 2015 |
| 16 | Band filter | Amindeon | 82346 | GTS219 | Mar. 29 2014 | Mar. 28 2015 |
| 17 | D.C. Power Supply | Instek | PS-3030 | GTS232 | Mar. 29 2014 | Mar. 28 2015 |
| 18 | Thermo meter | KTJ | TA328 | GTS256 | Dec. 04 2014 | Dec. 03 2015 |

| General used equipment: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (dd-mm-yy)** | **Cal.Due date (dd-mm-yy)** |
| 1 | Barometer | ChangChun | DYM3 | GTS257 | July 08 2014 | July 07 2015 |

# 7 Test results and Measurement Data

## 7.1 Antenna requirement

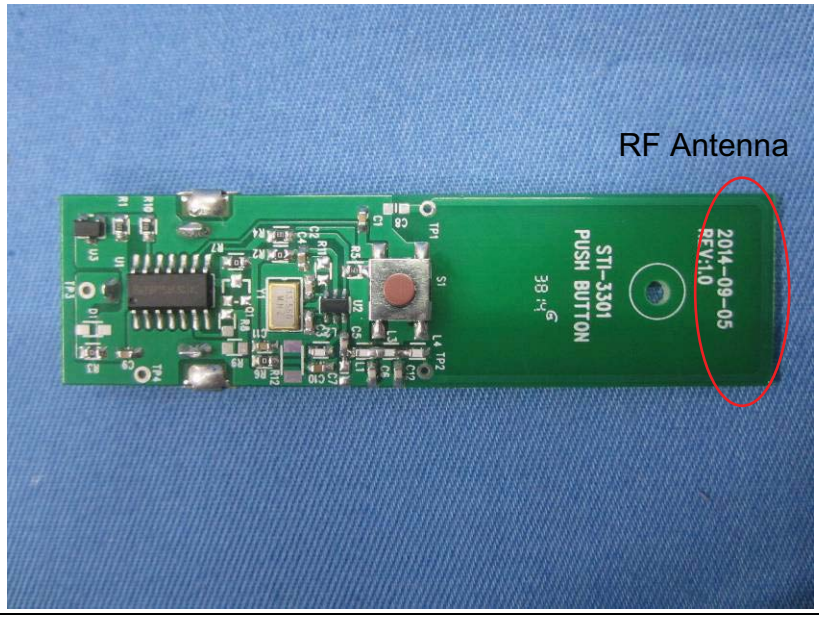
| | |
|---|---|
| **Standard requirement:** | FCC Part15 C Section 15.203 |

**15.203 requirement:**

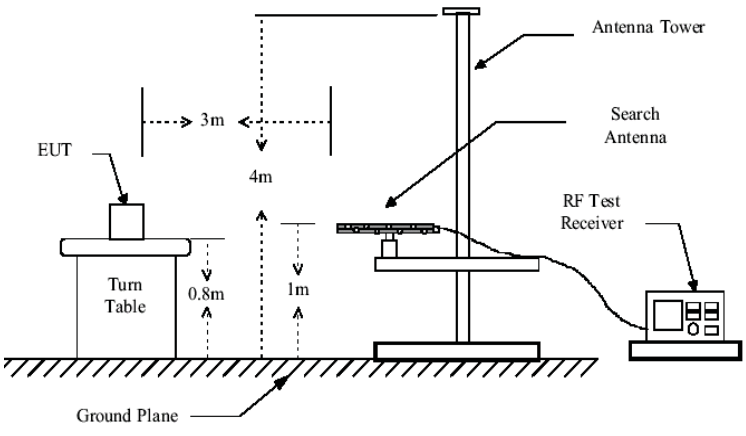
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

**E.U.T Antenna:**

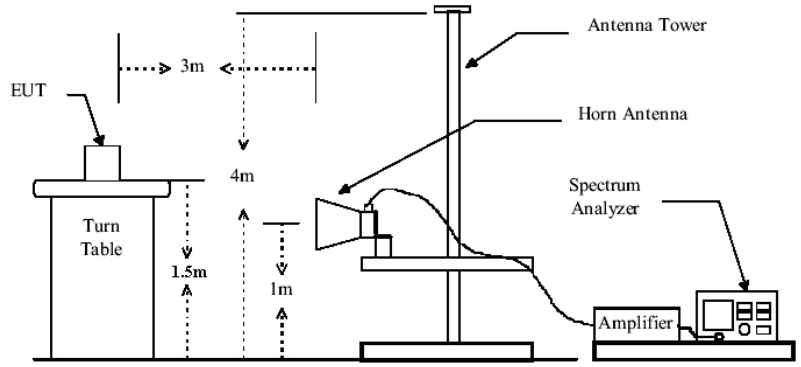
The EUT make use of a PCB Antenna, the typical gain of the antenna is 0dBi.



## 7.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4:2014</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 5000MHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td>Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:<br>(Field strength of the fundamental signal)</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">433.92MHz</td><td>80.80</td><td>Average Value</td></tr>
<tr><td>100.80</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:<br>(Spurious Emissions)</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.00</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.50</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.00</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.00</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr>
<tr><td>74.00</td><td>Peak Value</td></tr>
</table>
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.
</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz<br> 

<br>Above 1GHz</td></tr>
</table>

| | |
|---|---|
| |  |
| Test Procedure: | 1. During the test, the New Battery was used.<br>2. The EUT was placed on the top of a rotating table 0.8m for below 1GHz and 1.5m for above 1GHz above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>3. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>4. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>7. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Pass |

Measurement data:

### 7.2.1 Field Strength of The Fundamental Signal

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 433.92 | 79.12 | 17.53 | 3.02 | 29.43 | 70.24 | 100.80 | -30.56 | Horizontal |
| 433.92 | 97.53 | 17.53 | 3.02 | 29.43 | 88.65 | 100.80 | -12.15 | Vertical |

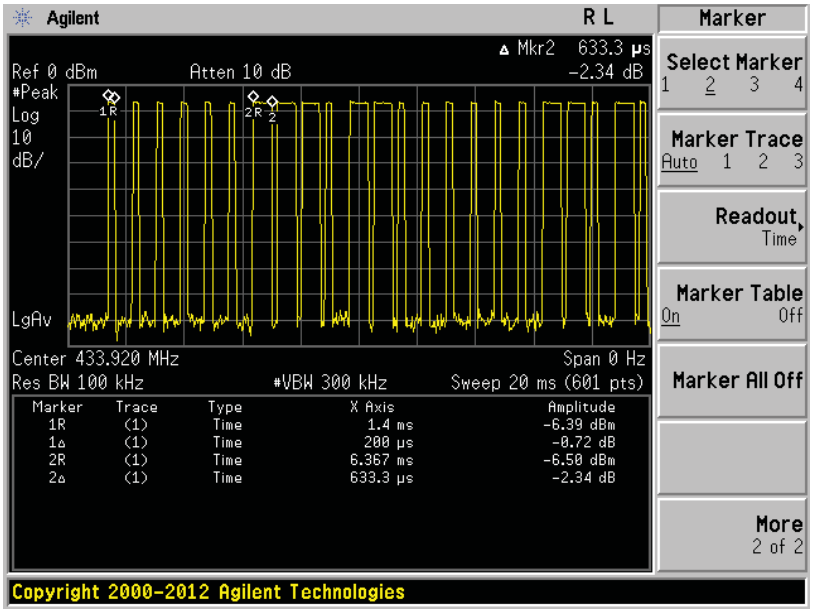
**Average value:**

| Frequency (MHz) | Peak Value (dBuV/m) | Duty cycle factor | Average value (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|
| 433.92 | 70.24 | -8.86 | 61.38 | 80.80 | -19.42 | Horizontal |
| 433.92 | 88.65 | -8.86 | 79.79 | 80.80 | -1.01 | Vertical |

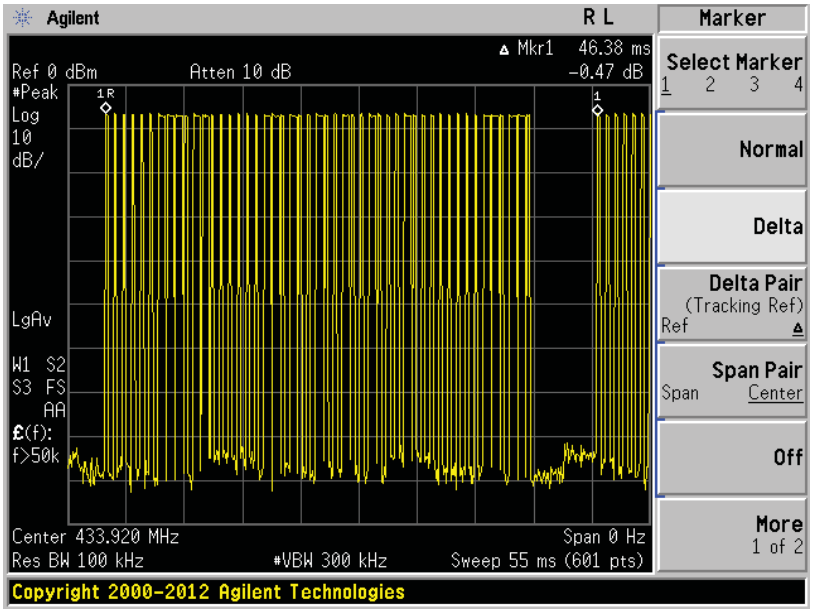
| **Average value:** | |
|---|---|
| Calculate Formula: | Average value=Peak value + Duty Cycle Factor |
| | Duty cycle factor=20 log(Duty cycle) |
| | Duty cycle= T on time / T period |
| Test data: | Ton time =33*0.2+16*0.6333=16.7328ms |
| | T period =46.38ms |
| | Duty cycle= 16.7328/46.38=0.360776 |
| | duty cycle factor=-8.86 |

Test plot as follows:

Ton time:



T period:


Agilent
R L
Marker
Mkr1 46.38 ms
Ref 0 dBm
Atten 10 dB
-0.47 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
f>50k
Center 433.920 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 55 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2012 Agilent Technologies

### 7.2.2 Spurious emissions

Quasi-peak Value

| Quasi-peak Value Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 543.27 | 43.76 | 19.46 | 3.50 | 29.30 | 37.42 | 46.00 | -8.58 | Vertical |
| 570.61 | 45.42 | 19.93 | 3.60 | 29.30 | 39.65 | 46.00 | -6.35 | Vertical |
| 584.79 | 41.16 | 20.19 | 3.66 | 29.30 | 35.71 | 46.00 | -10.29 | Vertical |
| 625.08 | 39.03 | 20.54 | 3.82 | 29.27 | 34.12 | 46.00 | -11.88 | Vertical |
| 51.48 | 29.29 | 15.19 | 0.79 | 29.99 | 15.28 | 40.00 | -24.72 | Horizontal |
| 420.58 | 38.40 | 17.47 | 2.95 | 29.45 | 29.37 | 46.00 | -16.63 | Horizontal |
| 447.98 | 36.84 | 17.57 | 3.08 | 29.40 | 28.09 | 46.00 | -17.91 | Horizontal |
| 543.27 | 30.99 | 19.46 | 3.50 | 29.30 | 24.65 | 46.00 | -21.35 | Horizontal |

**Harmonic emissions**

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 867.84 | 58.43 | 22.78 | 4.74 | 29.13 | 56.82 | 80.80 | -23.98 | Vertical |
| 1301.76 | 45.51 | 25.63 | 4.54 | 33.27 | 42.41 | 74.00 | -31.59 | Vertical |
| 1735.68 | 48.29 | 25.05 | 4.82 | 34.00 | 44.16 | 80.80 | -36.64 | Vertical |
| 2169.60 | 35.91 | 27.67 | 5.15 | 34.27 | 34.46 | 80.80 | -46.34 | Vertical |
| 2603.52 | 39.08 | 27.82 | 5.58 | 33.78 | 38.70 | 80.80 | -42.10 | Vertical |
| 3037.44 | 39.95 | 28.61 | 6.02 | 33.28 | 41.30 | 80.80 | -39.50 | Vertical |
| 3471.36 | 39.50 | 28.90 | 6.91 | 32.79 | 42.52 | 80.80 | -38.28 | Vertical |
| 3905.28 | 38.90 | 29.52 | 7.71 | 32.29 | 43.84 | 74.00 | -30.16 | Vertical |
| 4339.20 | 36.65 | 30.88 | 8.19 | 31.86 | 43.86 | 74.00 | -30.14 | Vertical |
| 867.84 | 51.74 | 22.78 | 4.74 | 29.13 | 50.13 | 80.80 | -30.67 | Horizontal |
| 1301.76 | 39.73 | 25.63 | 4.54 | 33.27 | 36.63 | 74.00 | -37.37 | Horizontal |
| 1735.68 | 43.71 | 25.05 | 4.82 | 34.00 | 39.58 | 80.80 | -41.22 | Horizontal |
| 2169.60 | 36.34 | 27.67 | 5.15 | 34.27 | 34.89 | 80.80 | -45.91 | Horizontal |
| 2603.52 | 39.74 | 27.82 | 5.58 | 33.78 | 39.36 | 80.80 | -41.44 | Horizontal |
| 3037.44 | 40.20 | 28.61 | 6.02 | 33.28 | 41.55 | 80.80 | -39.25 | Horizontal |
| 3471.36 | 39.33 | 28.90 | 6.91 | 32.79 | 42.35 | 80.80 | -38.45 | Horizontal |
| 3905.28 | 36.99 | 29.52 | 7.71 | 32.29 | 41.93 | 74.00 | -32.07 | Horizontal |
| 4339.20 | 36.60 | 30.88 | 8.19 | 31.86 | 43.81 | 74.00 | -30.19 | Horizontal |

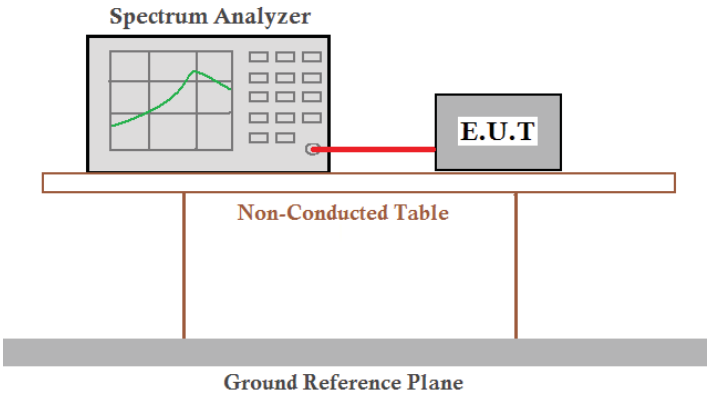
**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Duty cycle factor | Average value (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|
| 867.84 | 56.82 | -8.86 | 47.96 | 60.80 | -12.84 | Vertical |
| 1301.76 | 42.41 | -8.86 | 33.55 | 54.00 | -20.45 | Vertical |
| 1735.68 | 44.16 | -8.86 | 35.30 | 60.80 | -25.50 | Vertical |
| 2169.60 | 34.46 | -8.86 | 25.60 | 60.80 | -35.20 | Vertical |
| 2603.52 | 38.70 | -8.86 | 29.84 | 60.80 | -30.96 | Vertical |
| 3037.44 | 41.30 | -8.86 | 32.44 | 60.80 | -28.36 | Vertical |
| 3471.36 | 42.52 | -8.86 | 33.66 | 60.80 | -27.14 | Vertical |
| 3905.28 | 43.84 | -8.86 | 34.98 | 54.00 | -19.02 | Vertical |
| 4339.20 | 43.86 | -8.86 | 35.00 | 54.00 | -19.00 | Vertical |
| 867.84 | 50.13 | -8.86 | 41.27 | 60.80 | -19.53 | Horizontal |
| 1301.76 | 36.63 | -8.86 | 27.77 | 54.00 | -26.23 | Horizontal |
| 1735.68 | 39.58 | -8.86 | 30.72 | 60.80 | -30.08 | Horizontal |
| 2169.60 | 34.89 | -8.86 | 26.03 | 60.80 | -34.77 | Horizontal |
| 2603.52 | 39.36 | -8.86 | 30.50 | 60.80 | -30.30 | Horizontal |
| 3037.44 | 41.55 | -8.86 | 32.69 | 60.80 | -28.11 | Horizontal |
| 3471.36 | 42.35 | -8.86 | 33.49 | 60.80 | -27.31 | Horizontal |
| 3905.28 | 41.93 | -8.86 | 33.07 | 54.00 | -20.93 | Horizontal |
| 4339.20 | 43.81 | -8.86 | 34.95 | 54.00 | -19.05 | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value=Peak value + Duty cycle factor*

## 7.3 20dB Occupy Bandwidth

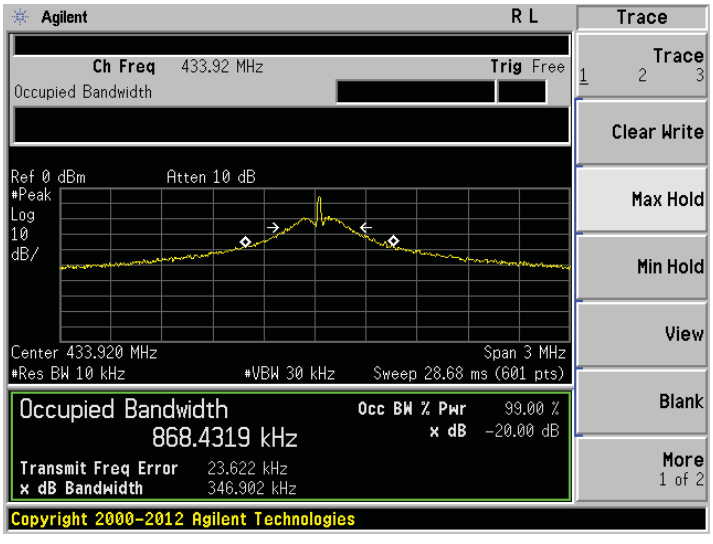
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.231 (c) |
| Test Method: | ANSI C63.4:2014 |
| Limit: | The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier. |
| Test setup: |  |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Pass |

**Measurement Data**

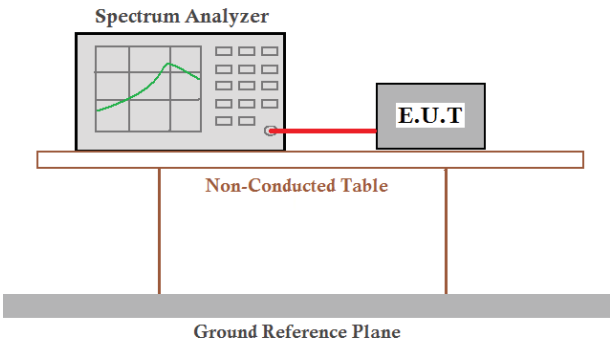
| Test Frequency (MHz) | 20dB bandwidth (MHz) | Limit (MHz) | Result |
|---|---|---|---|
| 433.92 | 0.347 | 1.0848 MHz | Pass |

Note: Limit= Fundamental frequency×0.25%=433.92×0.25%=1.0848MHz

Test plot as follows:



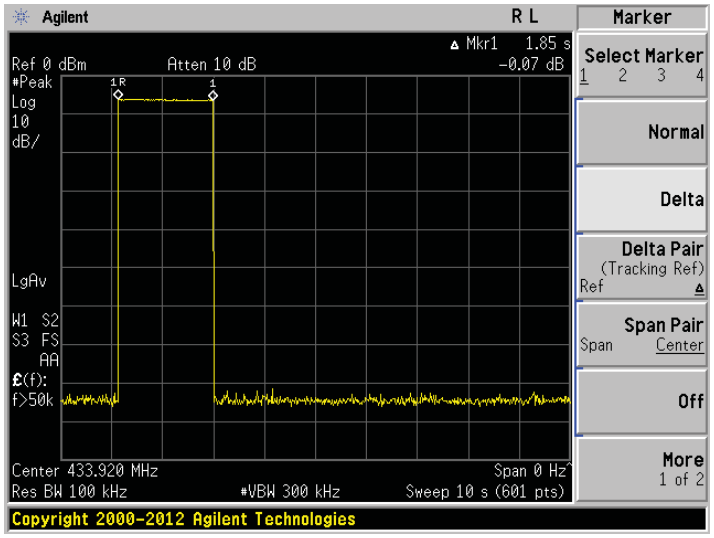
## 7.4 Release time

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.231 (a)(1) |
| Test Method: | ANSI C63.4:2014 |
| Receiver setup: | RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak |
| Limit: | Not more than 5 seconds |
| Test setup: |  |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Pass |
| Product Description: | It is a manually operated transmitter. |

Measurement data:

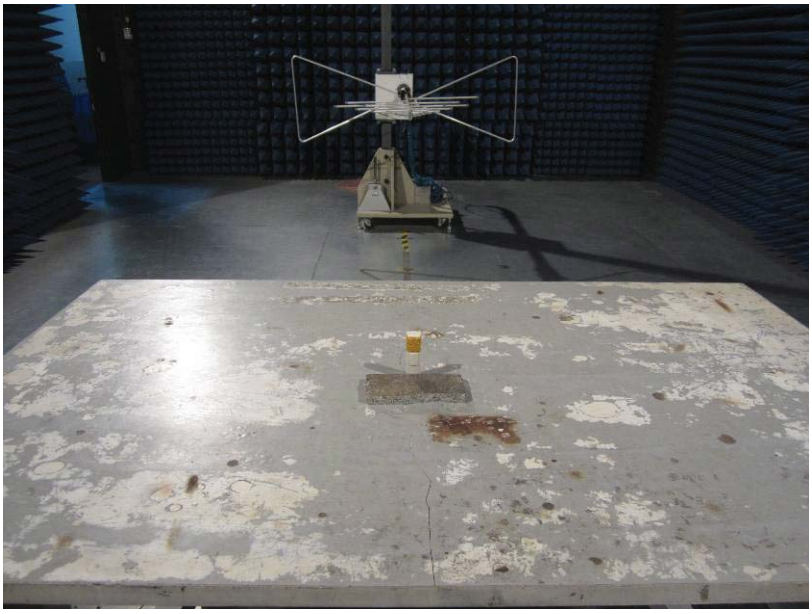
| Release time (second) | Limit (second) | Result |
|---|---|---|
| 1.85 | <5.0 | Pass |

Test plot as follows:

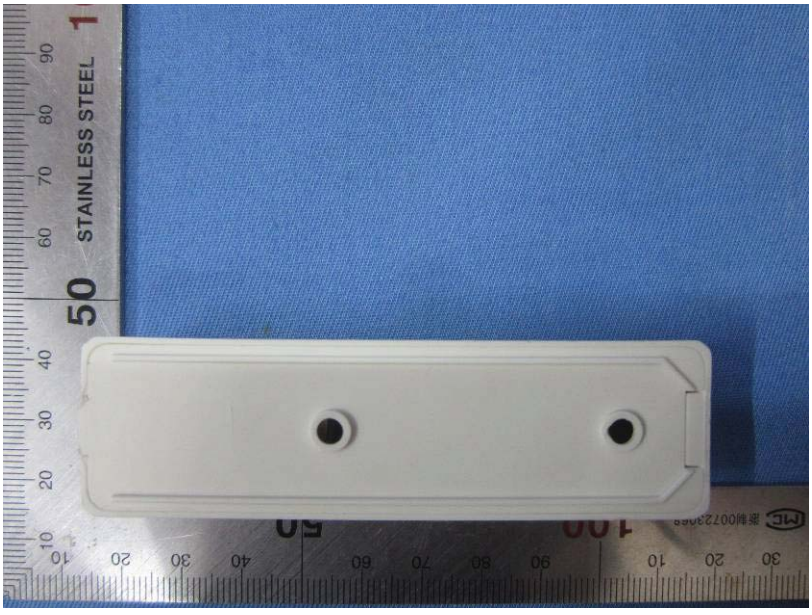


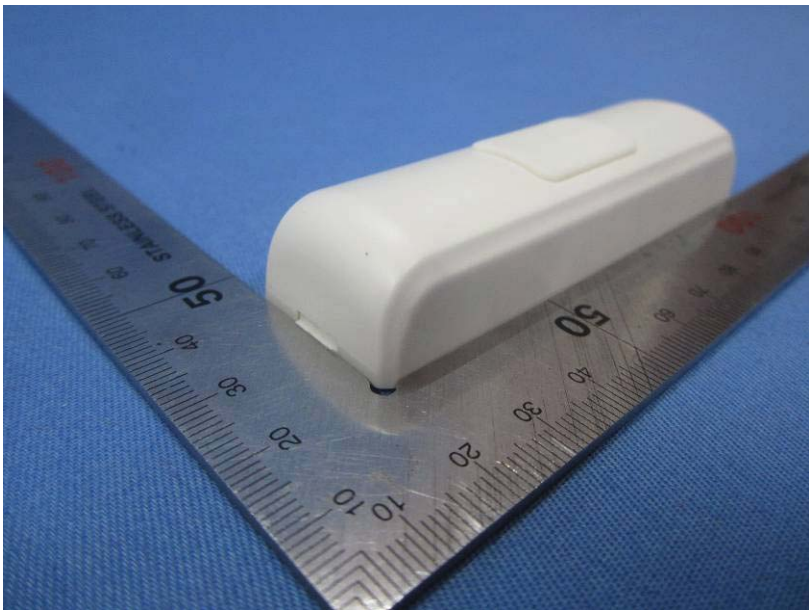
# 8 Test Setup Photo

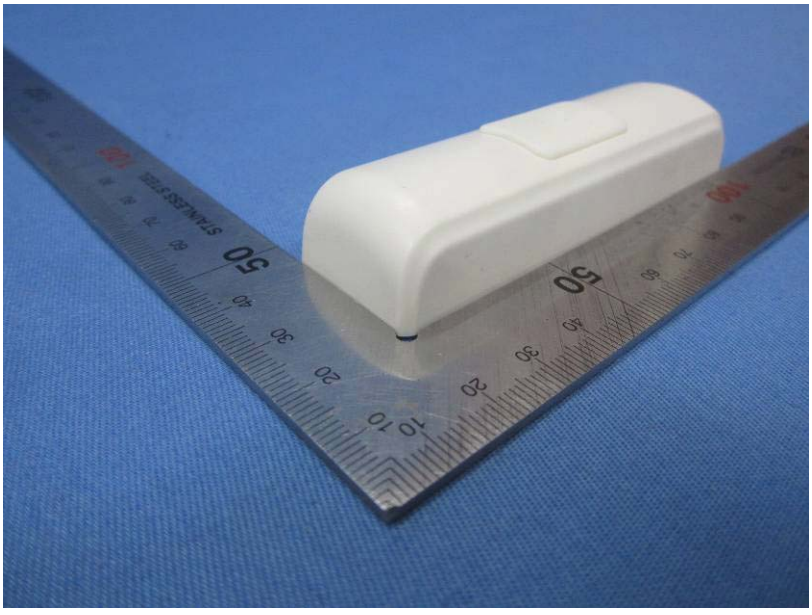
Radiated Emission

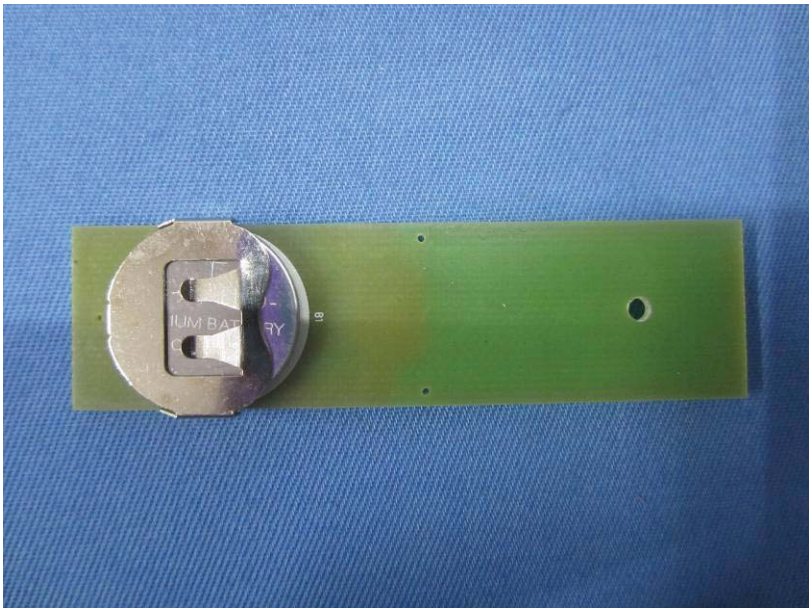


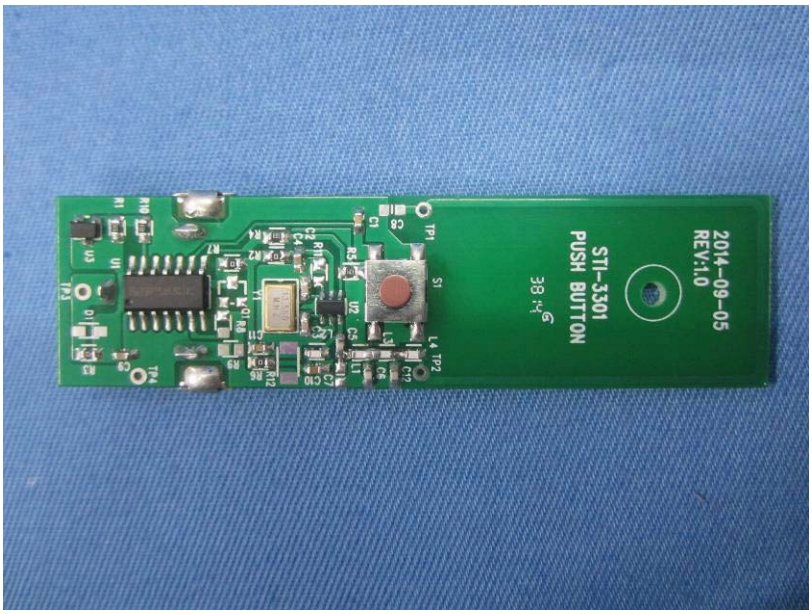
# 9 EUT Constructional Details










------ end ------