



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 Entry Alert[®] Sensor

Model No.: STI-3551

Trade Mark: STI

FCC ID: TXL3551

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 27, 2015

Test Result : PASS *

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

Authorized Signature:



Robinson Lo
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	March 27, 2015	Original

Prepared By:

Edward. Pan

Date:

March 27, 2015

Project Engineer

Check By:

Hank. Yan

Date:

March 27, 2015

Reviewer

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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	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(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 Entry Alert® Sensor
Model No.:	STI-3551
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.
<i>Remark: During the test, the New Battery was used.</i>	

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)	82.56	83.34	81.46

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 fully 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.

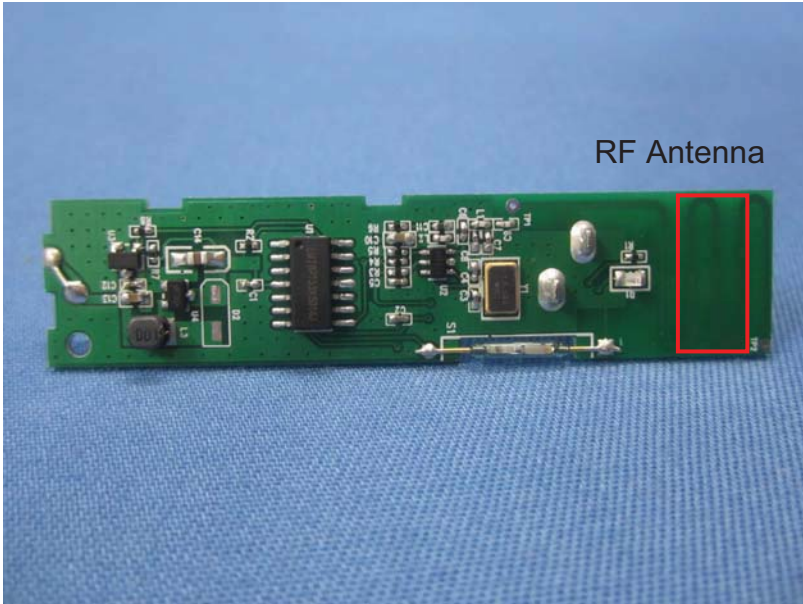
6 Test Instruments list

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

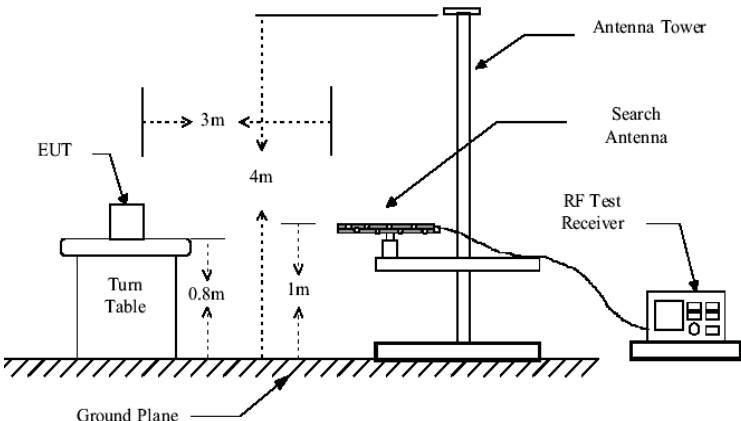
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	Barometer	ChangChun	DYM3	GTS257	July 08 2014	July 07 2015

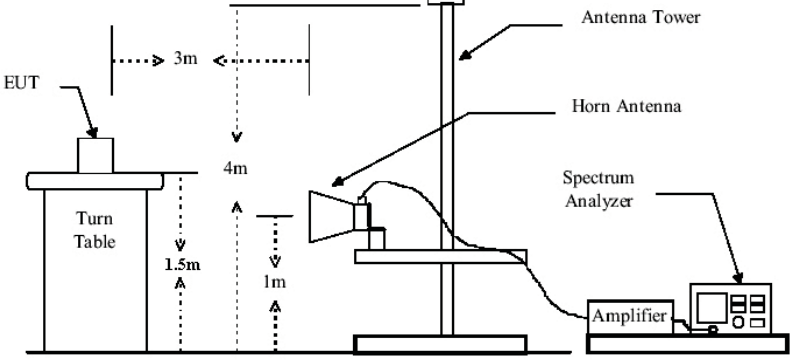
7 Test results and Measurement Data

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

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.4:2014 and ANSI C63.10:2013				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	433.92MHz		80.80		Average Value
			100.80		Peak Value
Limit: (Spurious Emissions)	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.00		Quasi-peak Value
	88MHz-216MHz		43.50		Quasi-peak Value
	216MHz-960MHz		46.00		Quasi-peak Value
	960MHz-1GHz		54.00		Quasi-peak Value
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.					
Test setup:	Below 1GHz				
	 <p>Above 1GHz</p>				

	 <p>The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a Turn Table. The Turn Table has two height settings: 1.5m and 1m. The EUT is positioned 3m away from the Antenna Tower. The Antenna Tower has a Horn Antenna at a height of 4m. The Antenna Tower is connected to a Spectrum Analyzer via an Amplifier.</p>
Test Procedure:	<ol style="list-style-type: none"> 1. During the test, the New Battery was used. 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. 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. 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. 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. 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.92	73.66	17.53	3.02	29.43	64.78	100.80	-36.02	Horizontal
433.92	92.22	17.53	3.02	29.43	83.34	100.80	-17.46	Vertical

Average value:

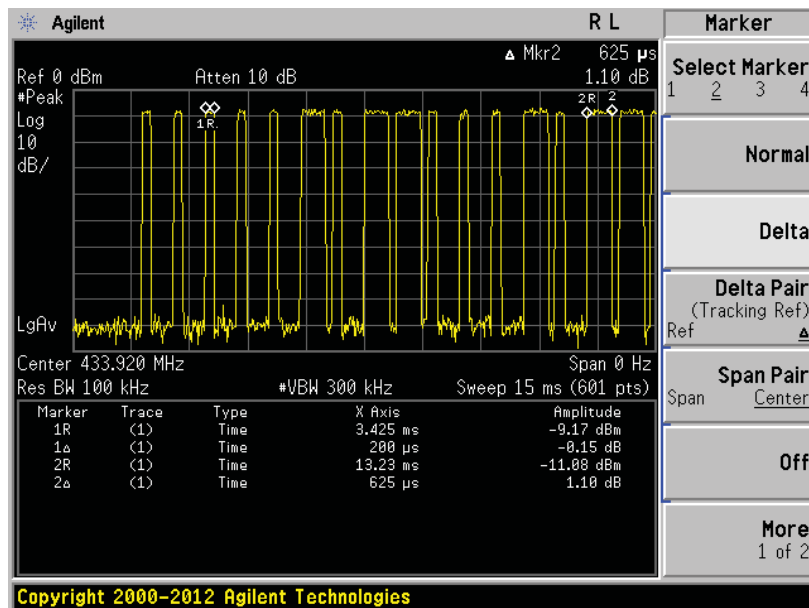
Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	64.78	-8.82	55.96	80.80	-24.84	Horizontal
433.92	83.34	-8.82	74.52	80.80	-6.28	Vertical

Average value:

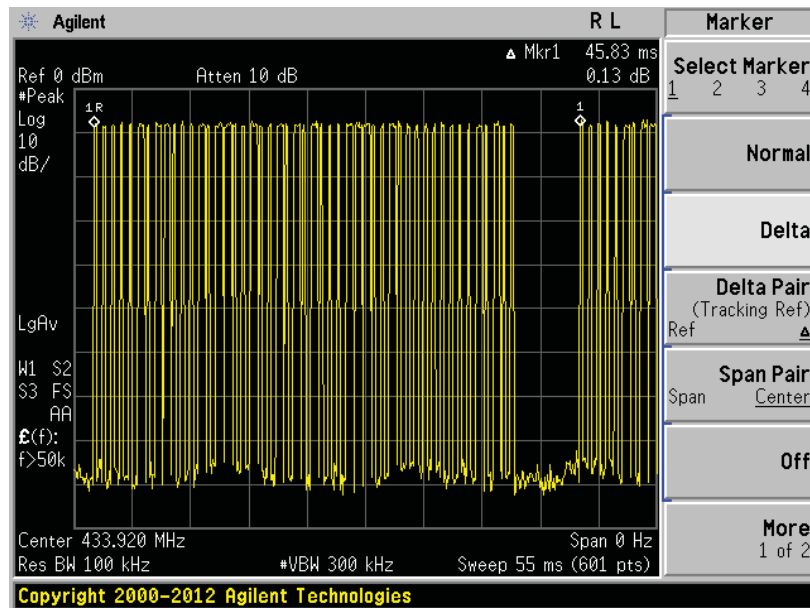
Calculate Formula:	Average value=Peak value + Duty Cycle Factor					
	Duty cycle factor=20 log(Duty cycle)					
	Duty cycle= T on time / T period					
Test data:	Ton time = 33*0.2+16*0.625=16.6ms					
	T period =45.83ms					
	Duty cycle= 16.6/45.83=0.362208					
	duty cycle factor=-8.82					

Test plot as follows:

Ton time:



T period:



7.2.2 Spurious emissions

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
40.56	27.69	15.58	0.67	30.04	13.90	40.00	-26.10	Vertical
420.58	45.85	17.47	2.95	29.45	36.82	46.00	-9.18	Vertical
447.98	45.49	17.57	3.08	29.40	36.74	46.00	-9.26	Vertical
857.03	30.59	22.64	4.68	29.14	28.77	46.00	-17.23	Vertical
103.44	26.71	14.82	1.22	29.68	13.07	43.50	-30.43	Horizontal
420.58	30.47	17.47	2.95	29.45	21.44	46.00	-24.56	Horizontal
893.86	32.93	23.05	4.83	29.10	31.71	46.00	-14.29	Horizontal
906.48	33.31	23.15	4.88	29.10	32.24	46.00	-13.76	Horizontal

Harmonic emissions

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	64.48	22.78	4.74	29.13	62.87	80.80	-17.93	Vertical
1301.76	59.65	25.63	4.54	33.27	56.55	74.00	-17.45	Vertical
1735.68	51.96	25.05	4.82	34.00	47.83	80.80	-32.97	Vertical
2169.60	38.34	27.67	5.15	34.27	36.89	80.80	-43.91	Vertical
2603.52	37.95	27.84	5.59	33.76	37.62	80.80	-43.18	Vertical
3037.44	37.29	28.46	5.92	33.33	38.34	80.80	-42.46	Vertical
3471.36	39.30	28.60	6.76	32.87	41.79	80.80	-39.01	Vertical
3905.28	36.59	29.58	7.75	32.25	41.67	74.00	-32.33	Vertical
4339.20	36.29	31.16	8.26	31.90	43.81	74.00	-30.19	Vertical
867.84	49.93	22.78	4.74	29.13	48.32	80.80	-32.48	Horizontal
1301.76	42.78	25.63	4.54	33.27	39.68	74.00	-34.32	Horizontal
1735.68	43.89	25.05	4.82	34.00	39.76	80.80	-41.04	Horizontal
2169.60	37.51	28.01	5.25	34.17	36.60	80.80	-44.20	Horizontal
2603.52	37.28	27.84	5.59	33.76	36.95	80.80	-43.85	Horizontal
3037.44	37.81	28.46	5.92	33.33	38.86	80.80	-41.94	Horizontal
3471.36	38.98	28.80	6.86	32.81	41.83	80.80	-38.97	Horizontal
3905.28	36.54	29.32	7.44	32.46	40.84	74.00	-33.16	Horizontal
4339.20	37.25	29.95	7.99	32.05	43.14	74.00	-30.86	Horizontal

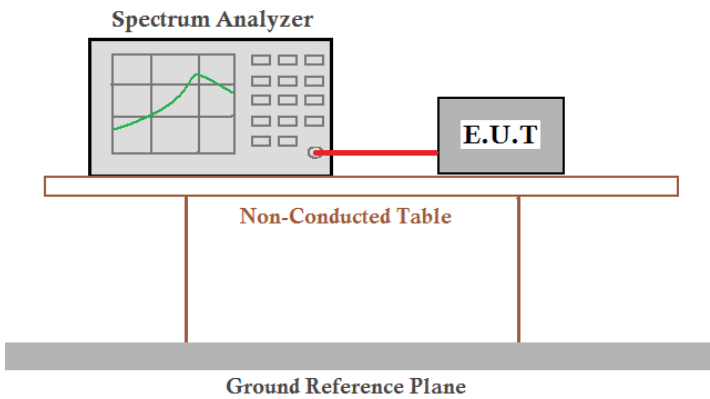
Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	62.87	-8.82	54.05	60.80	-6.75	Vertical
1301.76	56.55	-8.82	47.73	54.00	-6.27	Vertical
1735.68	47.83	-8.82	39.01	60.80	-21.79	Vertical
2169.60	36.89	-8.82	28.07	60.80	-32.73	Vertical
2603.52	37.62	-8.82	28.80	60.80	-32.00	Vertical
3037.44	38.34	-8.82	29.52	60.80	-31.28	Vertical
3471.36	41.79	-8.82	32.97	60.80	-27.83	Vertical
3905.28	41.67	-8.82	32.85	54.00	-21.15	Vertical
4339.20	43.81	-8.82	34.99	54.00	-19.01	Vertical
867.84	48.32	-8.82	39.50	60.80	-21.30	Horizontal
1301.76	39.68	-8.82	30.86	54.00	-23.14	Horizontal
1735.68	39.76	-8.82	30.94	60.80	-29.86	Horizontal
2169.60	36.60	-8.82	27.78	60.80	-33.02	Horizontal
2603.52	36.95	-8.82	28.13	60.80	-32.67	Horizontal
3037.44	38.86	-8.82	30.04	60.80	-30.76	Horizontal
3471.36	41.83	-8.82	33.01	60.80	-27.79	Horizontal
3905.28	40.84	-8.82	32.02	54.00	-21.98	Horizontal
4339.20	43.14	-8.82	34.32	54.00	-19.68	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

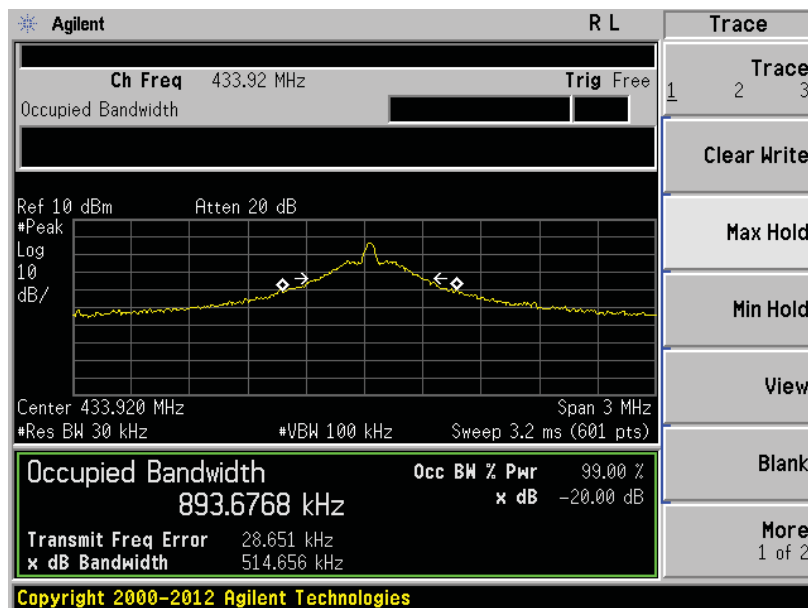
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2014
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

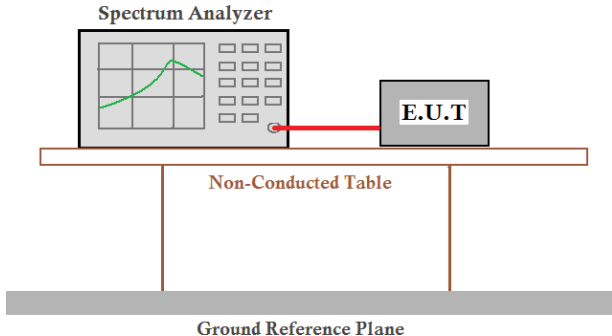
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.515	1.0848 MHz	Pass

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

Test plot as follows:



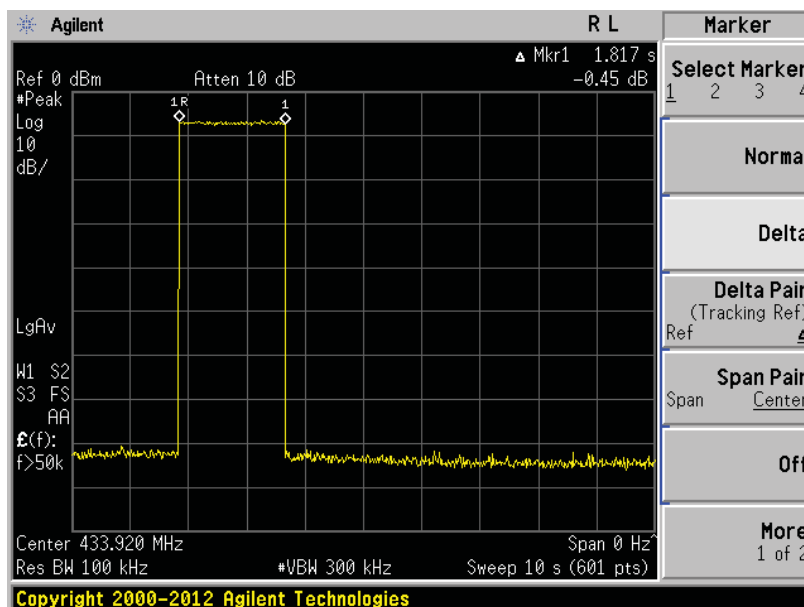
7.4 Release time

Test Requirement:	FCC Part15 C Section 15.231 (a)(2)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer and an Equipment Under Test (E.U.T.) are connected by a red cable. They are placed on a white rectangular table labeled "Non-Conducted Table". Below this table is a thick grey horizontal bar labeled "Ground Reference Plane".</p>
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:

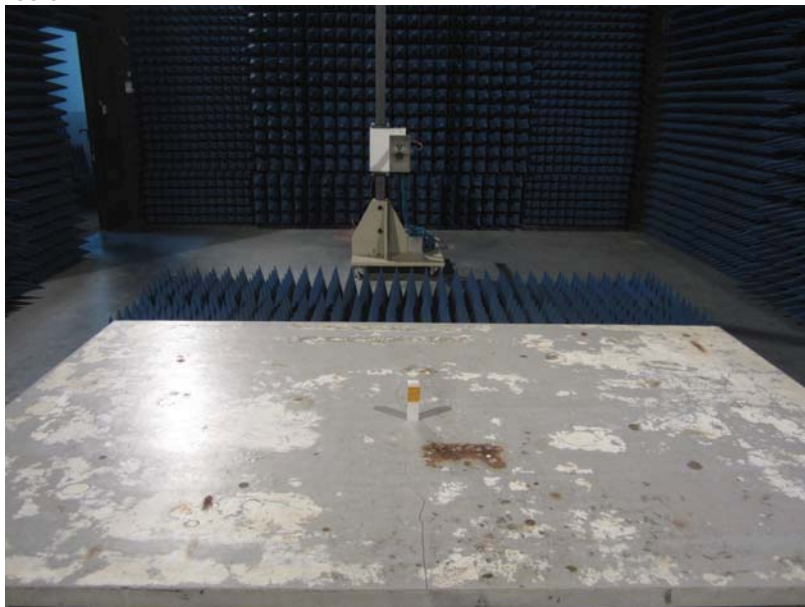
Release time (second)	Limit (second)	Result
1.817	<5.0	Pass

Test plot as follows:

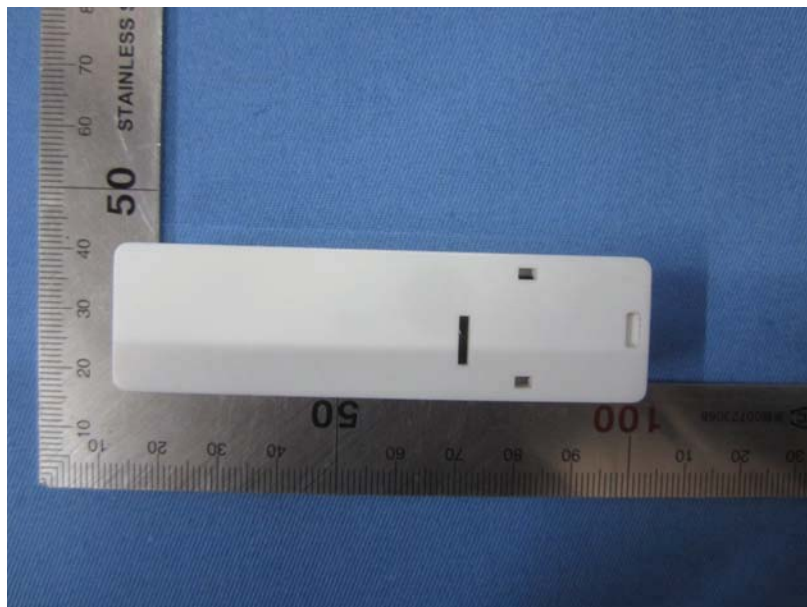
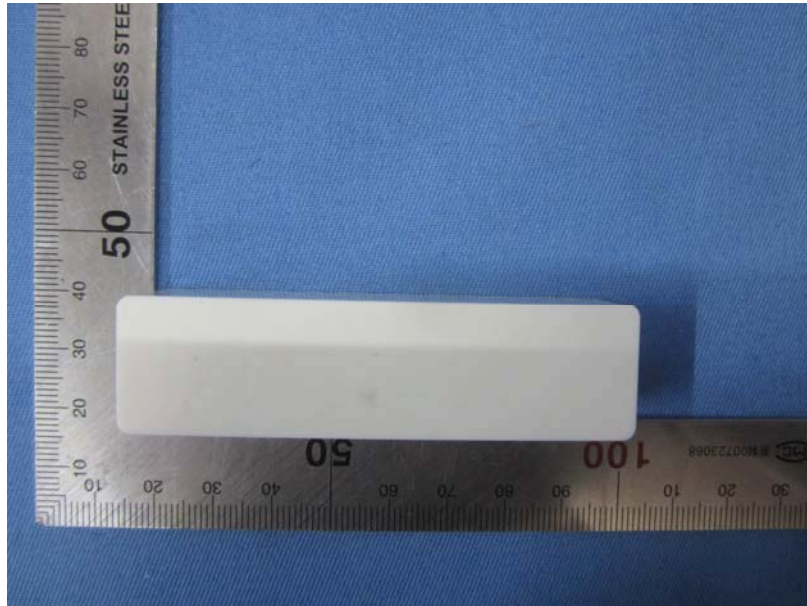


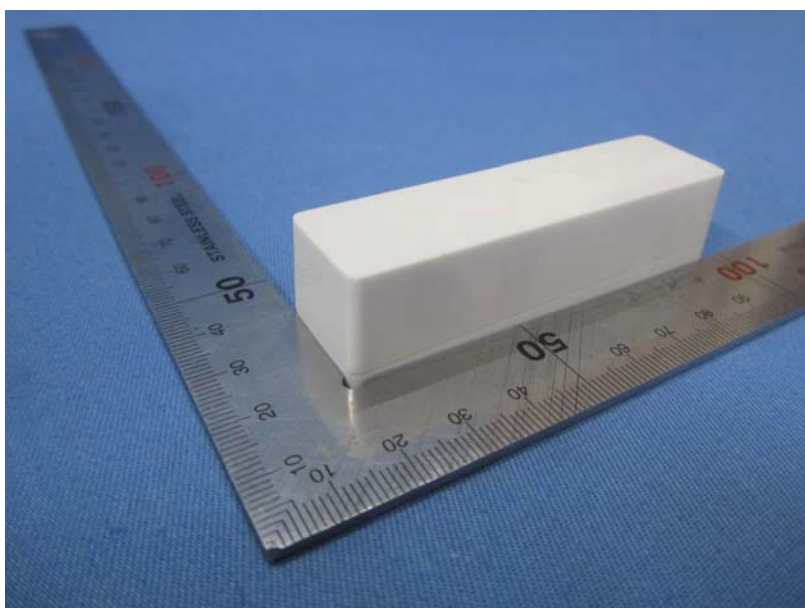
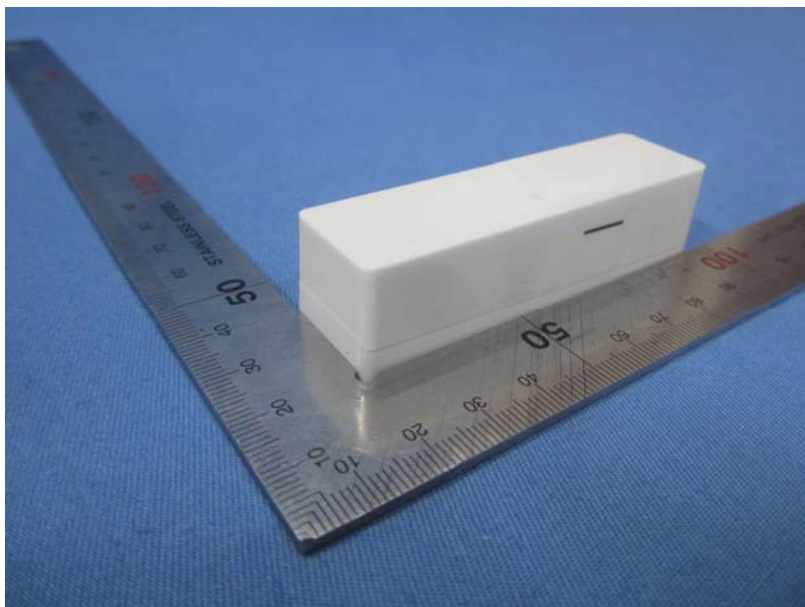
8 Test Setup Photo

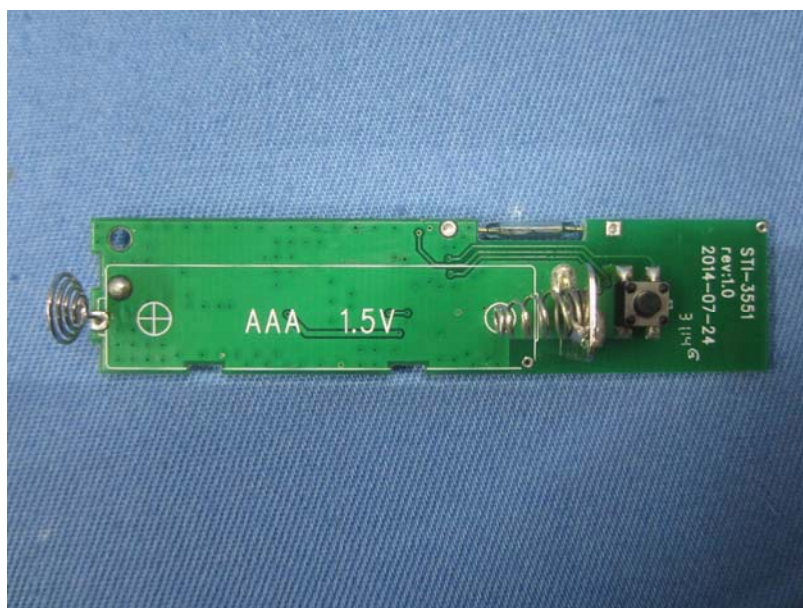
Radiated Emission

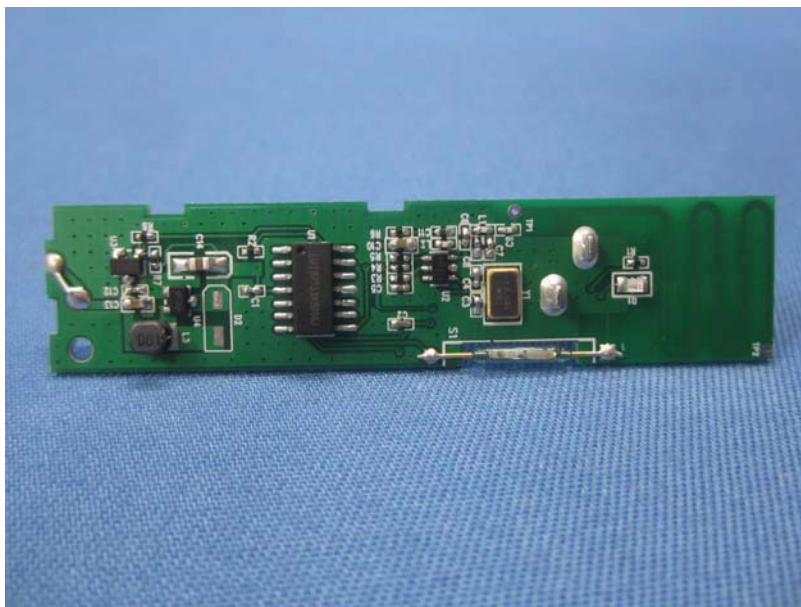


9 EUT Constructional Details









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