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 Extender

Model No.: STI-3331

Trade Mark: STI

FCC ID: TXL3331

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231:2014

Date of sample receipt: May 25, 2015

Date of Test: May 25-26, 2015

Date of report issued: May 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	*May 27, 2015*	*Original*

Prepared By: Edward.Pan ***Date:*** *May 27, 2015*

Project Engineer

Check By: hank. yan ***Date:*** *May 27, 2015*

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	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.

Remark: Test according to ANSI C63.10:2013 and ANSI C63.4:2014

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 Extender
Model No.:	STI-3331
Operation Frequency:	433.92MHz
Modulation technology:	OOK
Antenna Type:	PCB Antenna
Antenna gain:	0dBi (declare by Manufacturer)
Power supply:	16VAC, 10VA

5.3 Test mode

Transmitting mode	Keep the EUT in transmitting mode.

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

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)	85.36	87.64	86.51

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.

5.7 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC Approval
GATES THAT OPEN, LLC	Transformer	RB502	N/A	Verification

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. 27 2015	Mar. 26 2016
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. 27 2015	Mar. 26 2016
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 28 2015	Mar. 27 2016
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 28 2015	Mar. 27 2016
11	Coaxial cable	GTS	N/A	GTS210	Mar. 28 2015	Mar. 27 2016
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 28 2015	Mar. 27 2016
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. 28 2015	Mar. 27 2016
17	D.C. Power Supply	Instek	PS-3030	GTS232	Mar. 28 2015	Mar. 27 2016

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 07 2013	Sep. 06 2015
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	July 01 2014	June 30 2015
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	July 01 2014	June 30 2015
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	July 01 2014	June 30 2015
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	July 01 2014	June 30 2015
6	Coaxial Cable	GTS	N/A	GTS227	July 01 2014	June 30 2015
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

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

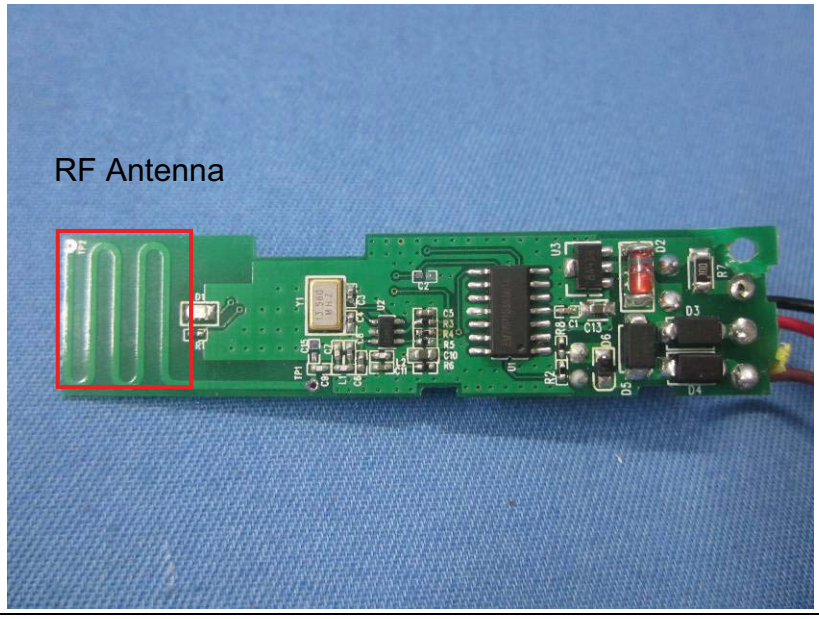
Standard requirement:	FCC Part15 C Section 15.203

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.



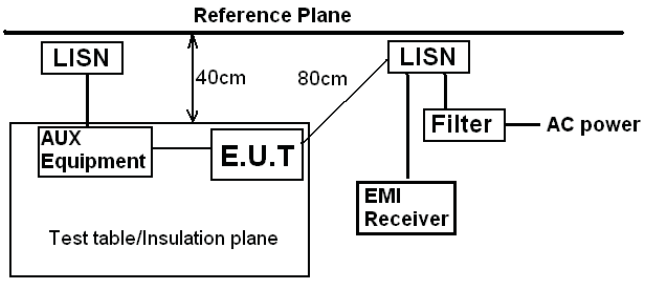
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.4:2014
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test setup:



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

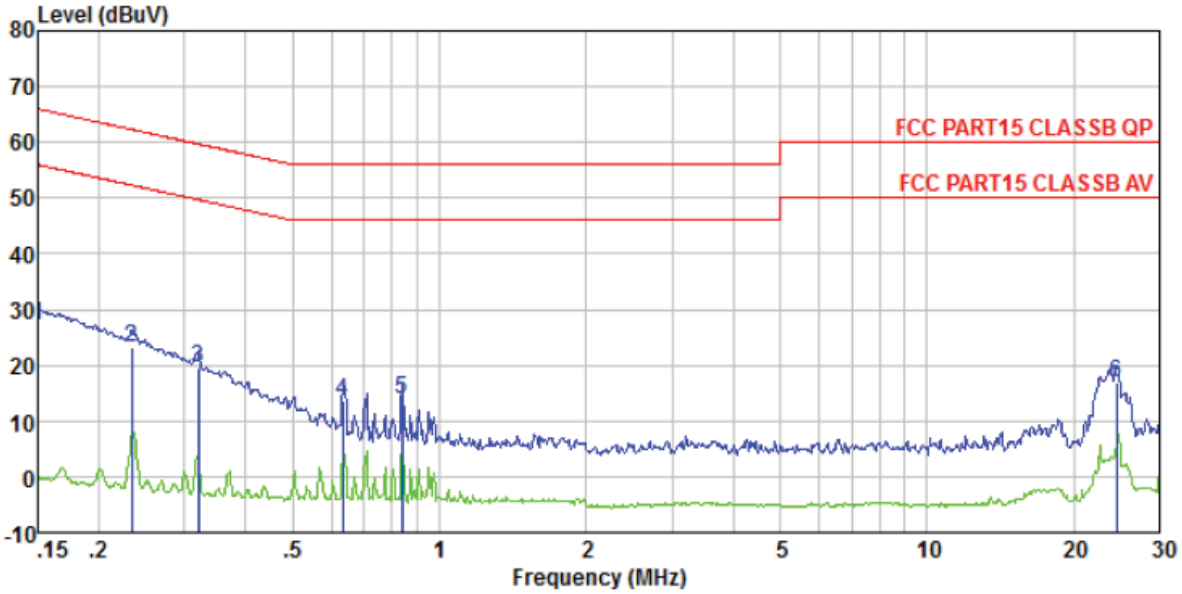
Test procedure:

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4:2014 on conducted measurement.

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

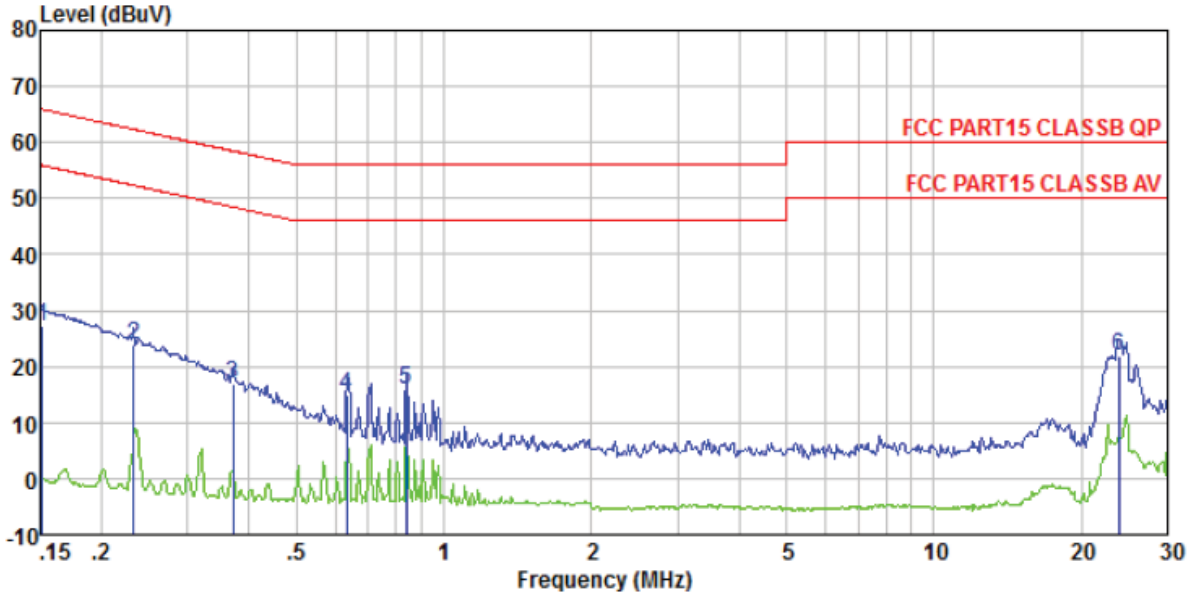
Line:



Site : Shielded room
Condition : FCC PART15 CLASSB QP LISN-2013 LINE
Job No. : 0632RF
Test mode : Transmitting mode
Test Engineer: Qing

	Freq	Read Level	Level	Limit Line	LISN Factor	Cable Loss	Over Limit	Remark
	MHz	dBuV	dBuV	dBuV	dB	dB	dB	
1	0.150	26.77	27.04	66.00	0.15	0.12	-38.96	QP
2	0.234	23.03	23.27	62.30	0.12	0.12	-39.03	QP
3	0.320	19.26	19.47	59.71	0.11	0.10	-40.24	QP
4	0.634	13.41	13.67	56.00	0.13	0.13	-42.33	QP
5	0.839	13.64	13.91	56.00	0.14	0.13	-42.09	QP
6	24.529	15.64	16.98	60.00	1.11	0.23	-43.02	QP

Neutral:



Site : Shielded room
Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
Job No. : 0632RF
Test mode : Transmitting mode
Test Engineer: Qing

	Freq	Read Level	Level	Limit Line	LISN Factor	Cable Loss	Over Limit	Remark
	MHz	dBuV	dBuV	dBuV	dB	dB	dB	
1	0.152	26.85	27.04	65.91	0.07	0.12	-38.87	QP
2	0.233	23.56	23.74	62.35	0.06	0.12	-38.61	QP
3	0.371	16.71	16.87	58.47	0.06	0.10	-41.60	QP
4	0.634	14.69	14.89	56.00	0.07	0.13	-41.11	QP
5	0.839	15.61	15.81	56.00	0.07	0.13	-40.19	QP
6	23.888	20.66	21.85	60.00	0.96	0.23	-38.15	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.4:2014
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

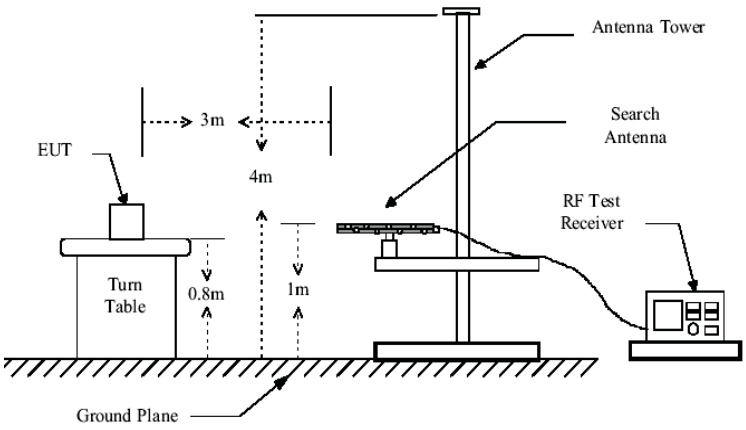
Limit:
(Spurious Emissions)

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

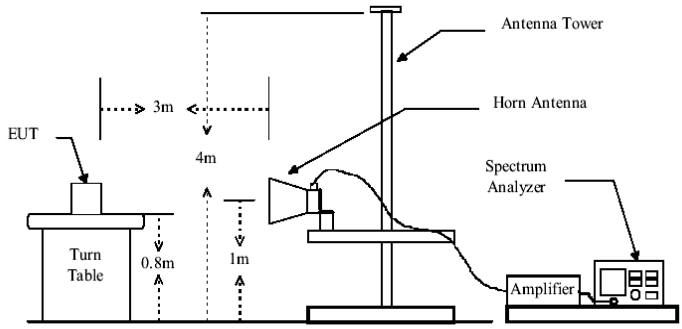
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

Below 1GHz



Above 1GHz

	
Test Procedure:	1. During the test, the New Battery was used. 2. The EUT was placed on the top of a rotating table0.8 meters 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:

7.3.1 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	93.31	17.53	3.02	29.43	84.43	100.80	-16.37	Horizontal
433.92	96.52	17.53	3.02	29.43	87.64	100.80	-13.16	Vertical

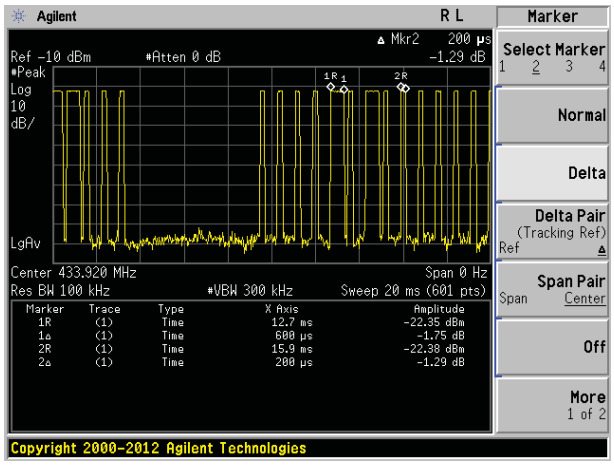
Average value:

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	84.43	-8.85	75.58	80.80	-5.22	Horizontal
433.92	87.64	-8.85	78.79	80.80	-2.01	Vertical

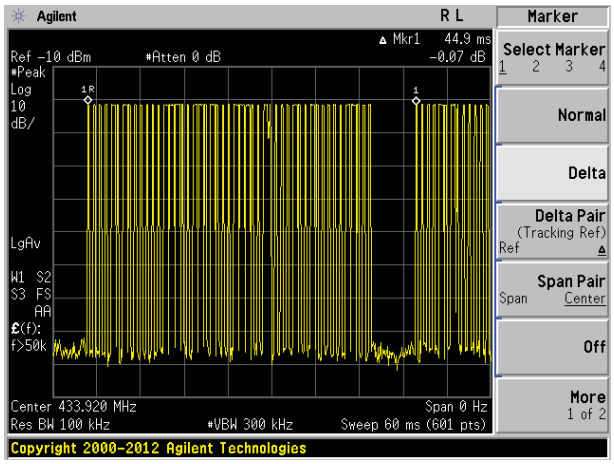
Average value:	
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =33*0.2+16*0.6=16.20ms
	T period =44.9ms
	Duty cycle= 16.2/44.9=0.3608
	duty cycle factor=-8.85

Test plot as follows:

Ton time:



T period:


Agilent
R L
Marker
Mkr1 44.9 ms
Ref -10 dBm
#Atten 0 dB
-0.07 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
f>50k
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 433.920 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 60 ms (601 pts)
Copyright 2000-2012 Agilent Technologies

7.3.2 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
31.96	35.27	14.32	0.57	30.09	20.07	40.00	-19.93	Vertical
45.38	30.34	15.54	0.72	30.02	16.58	40.00	-23.42	Vertical
312.18	34.28	15.22	2.42	29.93	21.99	46.00	-24.01	Vertical
407.52	39.02	17.22	2.89	29.48	29.65	46.00	-16.35	Vertical
121.98	38.28	12.19	1.38	29.56	22.29	43.50	-21.21	Horizontal
230.91	39.05	13.67	2.02	29.48	25.26	46.00	-20.74	Horizontal
420.58	50.18	17.47	2.95	29.45	41.15	46.00	-4.85	Horizontal
447.98	47.14	17.57	3.08	29.40	38.39	46.00	-7.61	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	58.99	22.78	4.74	29.13	57.38	80.80	-23.42	Vertical
1301.76	42.57	25.63	4.54	33.27	39.47	74.00	-34.53	Vertical
1735.68	45.67	25.05	4.82	34.00	41.54	80.80	-39.26	Vertical
2169.60	34.15	27.67	5.15	34.27	32.70	80.80	-48.10	Vertical
2603.52	31.53	27.82	5.58	33.78	31.15	80.80	-49.65	Vertical
3037.44	29.76	28.61	6.02	33.28	31.11	80.80	-49.69	Vertical
3471.36	30.60	28.90	6.91	32.79	33.62	80.80	-47.18	Vertical
3905.28	28.24	29.52	7.71	32.29	33.18	74.00	-40.82	Vertical
4339.20	28.55	30.88	8.19	31.86	35.76	74.00	-38.24	Vertical
867.84	66.11	22.78	4.74	29.13	64.50	80.80	-16.30	Horizontal
1301.76	36.77	25.63	4.54	33.27	33.67	74.00	-40.33	Horizontal
1735.68	42.75	25.05	4.82	34.00	38.62	80.80	-42.18	Horizontal
2169.60	30.95	27.67	5.15	34.27	29.50	80.80	-51.30	Horizontal
2603.52	31.56	27.82	5.58	33.78	31.18	80.80	-49.62	Horizontal
3037.44	30.61	28.61	6.02	33.28	31.96	80.80	-48.84	Horizontal
3471.36	31.41	28.90	6.91	32.79	34.43	80.80	-46.37	Horizontal
3905.28	27.81	29.52	7.71	32.29	32.75	74.00	-41.25	Horizontal
4339.20	27.96	30.88	8.19	31.86	35.17	74.00	-38.83	Horizontal

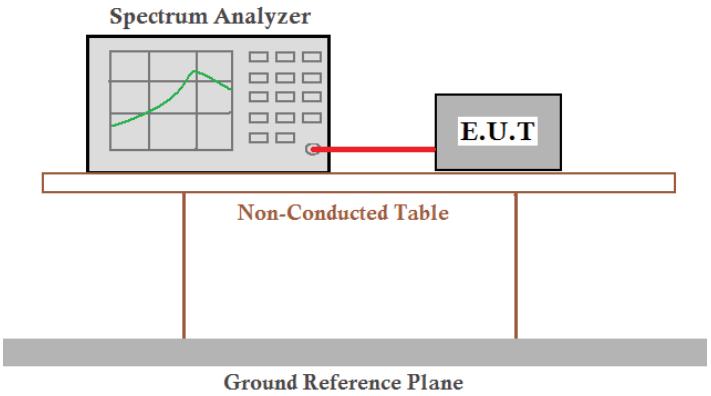
Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	57.38	-8.85	48.53	60.80	-12.27	Vertical
1301.76	39.47	-8.85	30.62	54.00	-23.38	Vertical
1735.68	41.54	-8.85	32.69	60.80	-28.11	Vertical
2169.60	32.70	-8.85	23.85	60.80	-36.95	Vertical
2603.52	31.15	-8.85	22.30	60.80	-38.50	Vertical
3037.44	31.11	-8.85	22.26	60.80	-38.54	Vertical
3471.36	33.62	-8.85	24.77	60.80	-36.03	Vertical
3905.28	33.18	-8.85	24.33	54.00	-29.67	Vertical
4339.20	35.76	-8.85	26.91	54.00	-27.09	Vertical
867.84	64.50	-8.85	55.65	60.80	-5.15	Horizontal
1301.76	33.67	-8.85	24.82	54.00	-29.18	Horizontal
1735.68	38.62	-8.85	29.77	60.80	-31.03	Horizontal
2169.60	29.50	-8.85	20.65	60.80	-40.15	Horizontal
2603.52	31.18	-8.85	22.33	60.80	-38.47	Horizontal
3037.44	31.96	-8.85	23.11	60.80	-37.69	Horizontal
3471.36	34.43	-8.85	25.58	60.80	-35.22	Horizontal
3905.28	32.75	-8.85	23.90	54.00	-30.10	Horizontal
4339.20	35.17	-8.85	26.32	54.00	-27.68	Horizontal

Remark:

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

7.4 20dB Occupy Bandwidth

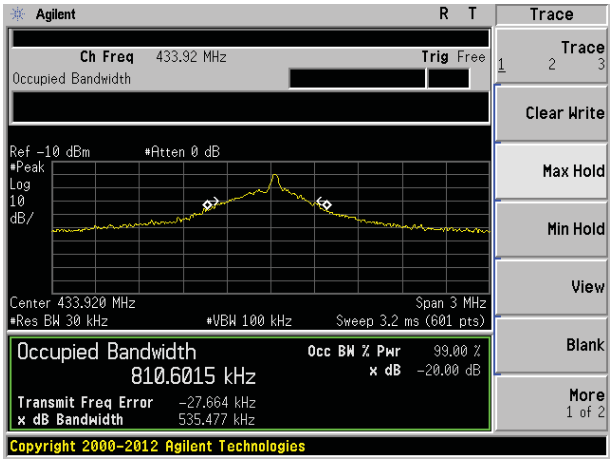
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2014
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of 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

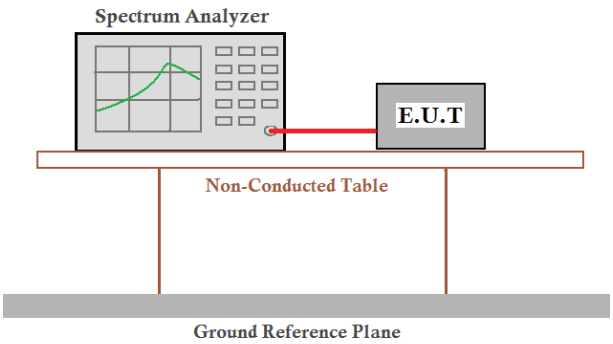
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.535	1.0848 MHz	Pass

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

Test plot as follows:



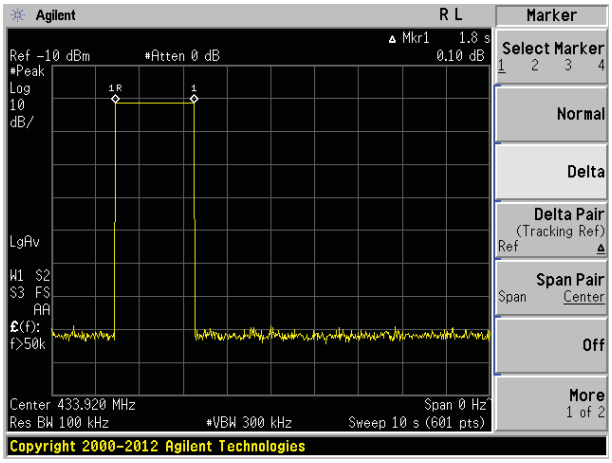
7.5 Release time

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:

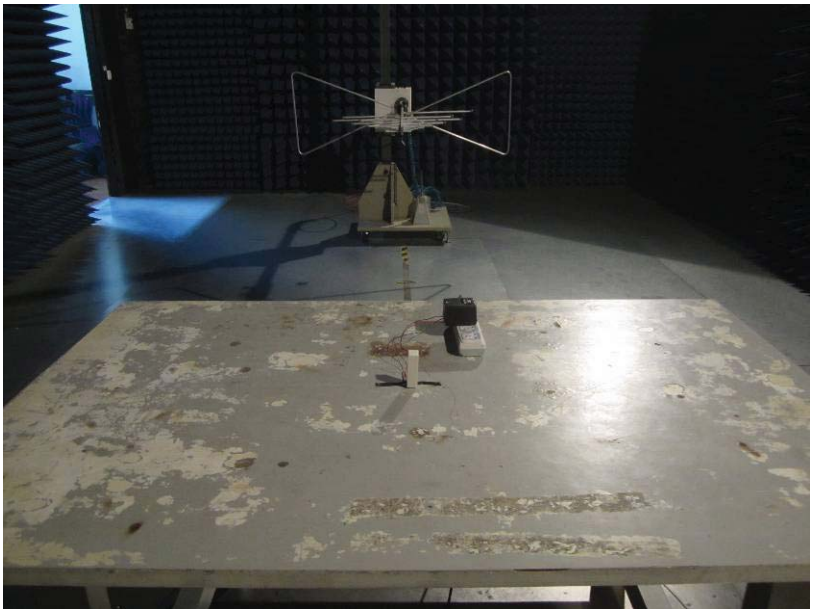
Release time (second)	Limit (second)	Result
1.80	<5.0	Pass

Test plot as follows:



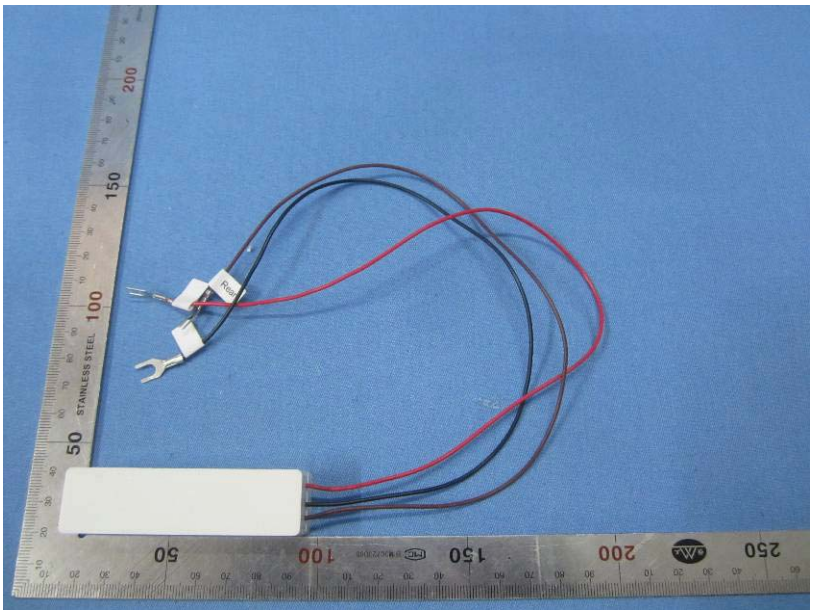
8 Test Setup Photo

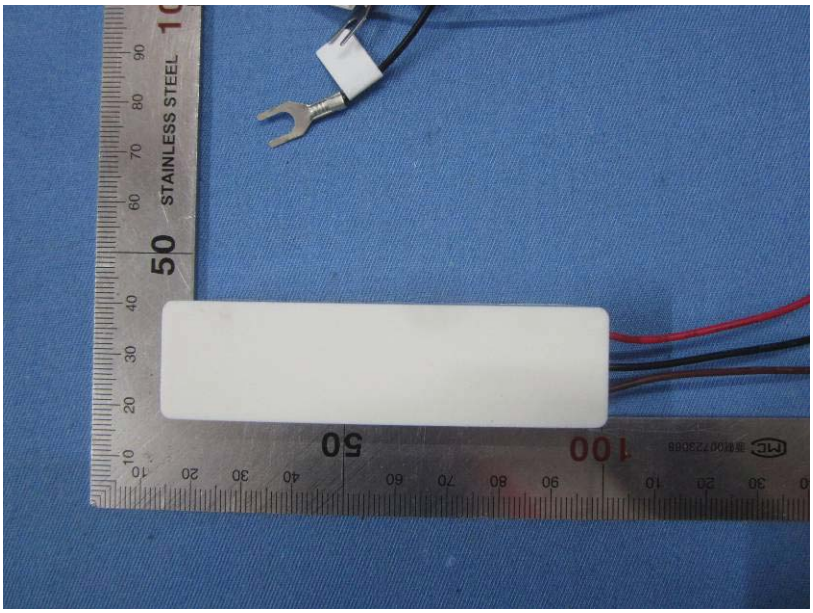
Radiated Emission

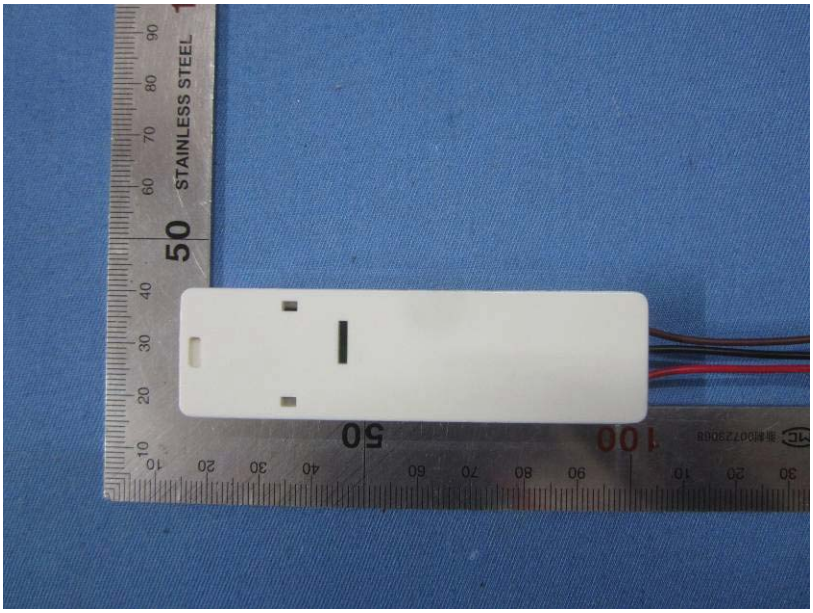


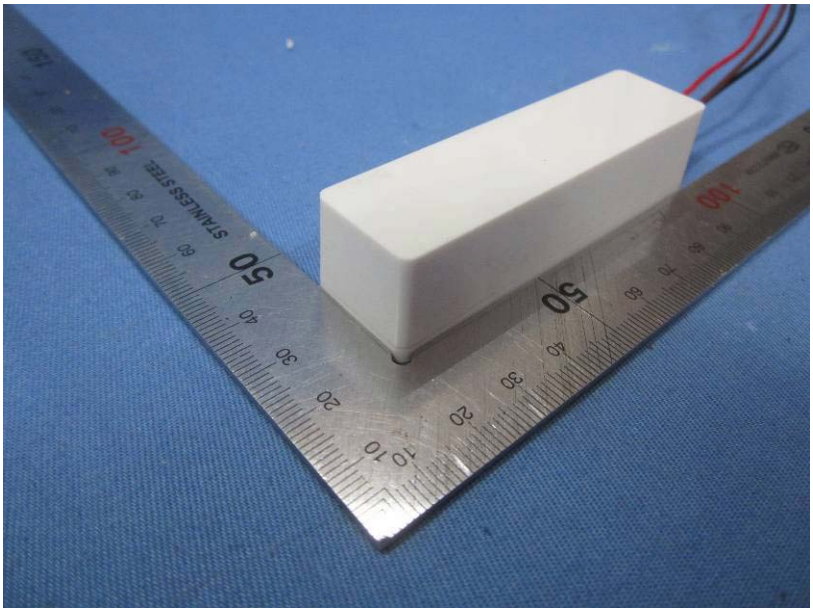
Conducted Emission

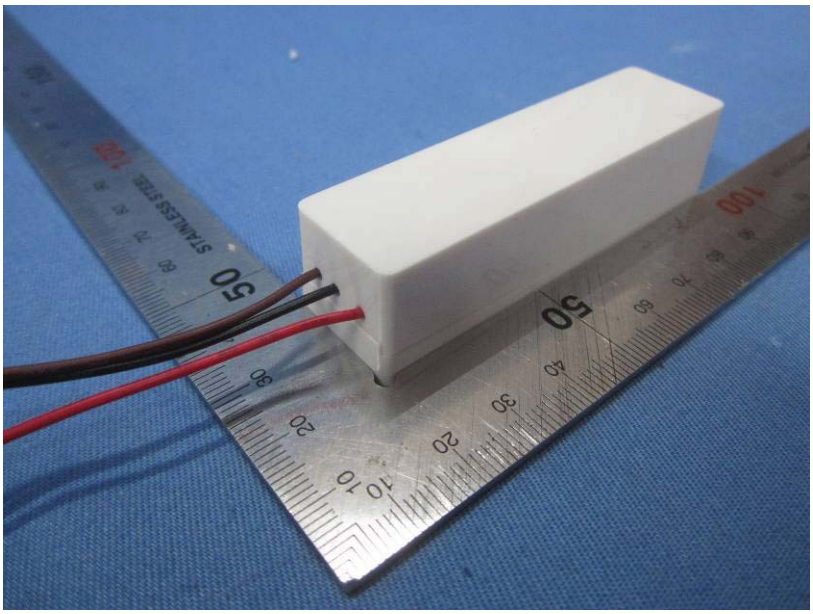
9 EUT Constructional Details

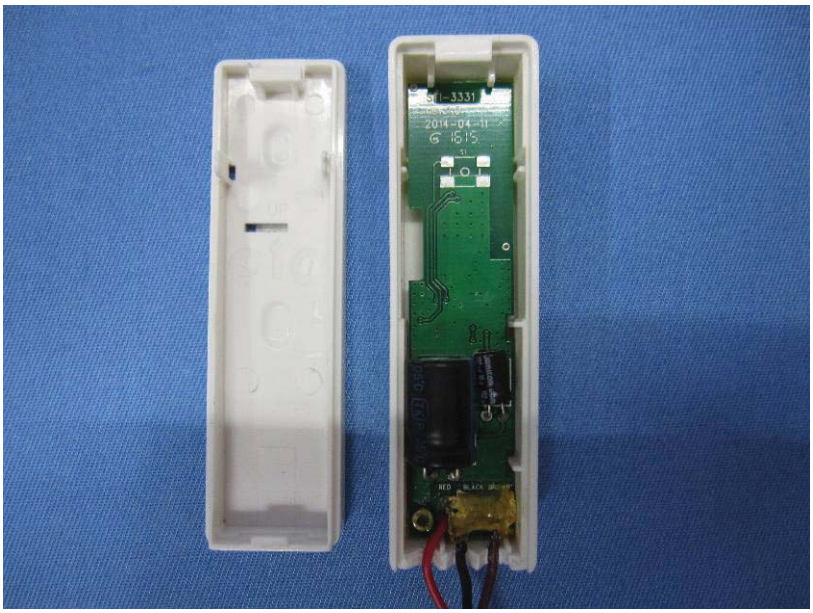


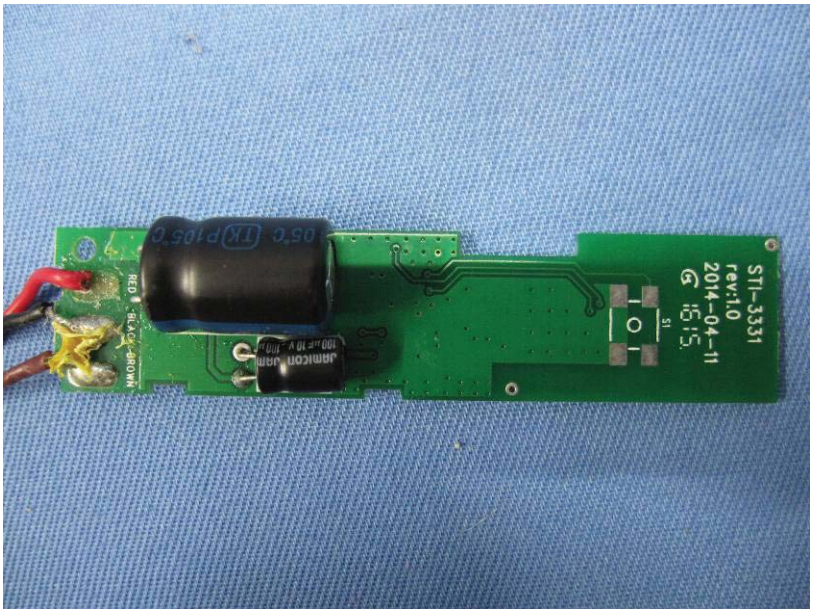


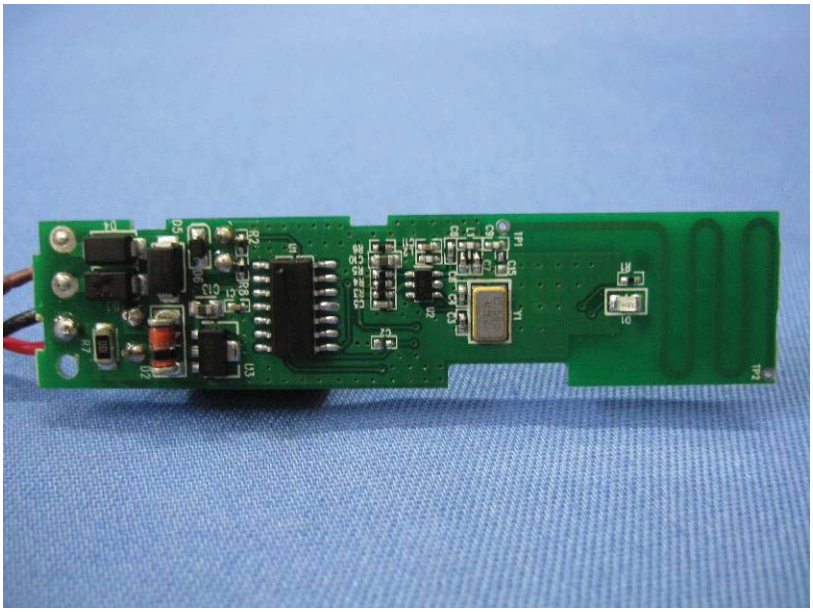

STAINLESS STEEL


STAINLESS STEEL









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