FCC TEST REPORT

Test report
On Behalf of
Solatube International Inc.
For
Touch screw remote control
Model No.: SLT-SYT100-1M, SLT-SYT100-2M, SLT-SYT100-3M, Solatube PN 579490

FCC ID: 2AIMD-SLT

Prepared for :	**Solatube International Inc.**
	2210 Oak Ridge Way, Vista, CA 92081-8341
Prepared By :	**WST Certification & Testing (HK) Limited**
	12/F., San Toi Building,137-139 Connaught Road Central,Hong Kong
Date of Test:	**May. 15, 2016 ~ May. 23, 2016**
Date of Report:	**May. 23, 2016**
Report Number:	**WST160515118-E**

TEST RESULT CERTIFICATION

Applicant's name	Solatube International Inc.
Address	2210 Oak Ridge Way, Vista, CA 92081-8341
Manufacture's Name.....	Shenzhen SZSAW Electronic Co., Ltd.
Address	F/4, Bolck 7, Baimenqian Industrial Area, Busha Road, Nanwan, Longgang District, Shenzhen
Product description	
Trade Mark:	Solatube
Product name	Touch screw remote control
Model and/or type reference	SLT-SYT100-1M, SLT-SYT100-2M, SLT-SYT100-3M, Solatube PN 579490
Standards	FCC Rules and Regulations Part 15 Subpart C Section 15.231 ANSI C63.10: 2013

Date of Test.....

Date (s) of performance of tests ..... **May. 15, 2016 ~ May. 23, 2016**

Date of Issue..... **May. 23, 2016**

Test Result..... **Pass**

Testing Engineer : Eric Xie

(Eric Xie)

Technical Manager : Dora Qin

(Dora Qin)

Authorized Signatory : Kait Chen

(Kait Chen)

Table of Contents **Page**

1. TEST SUMMARY

FCC Rules	Description of Test	Result
Section 15.231(a)	Electric Field Strength of Fundamental Emission	Compliant
Section 15.231(a)	Electric Field Strength of Spurious Emission	Compliant
Section 15.231(c)	20dB bandwidth & 99% bandwidth	Compliant
FCC §15.231(a)	Deactivation Time	Compliant
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

1.1 TEST FACILITY

Test Firm : Shenzhen WST Testing Technology Co., Ltd.
Certificated by FCC, Registration No.: 939433
Address : 1F,No.9 Building,TGK Science & Technology Park,Yangtian Rd.,
NO.72 Bao'an Dist., Shenzhen,Guangdong,China. 518101

1.2 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2. GENERAL INFORMATION

2.1 General description of EUT

Equipment	Touch screw remote control
Model Name	SLT-SYT100-1M
Serial Name	SLT-SYT100-2M, SLT-SYT100-3M, Solatube PN 579490
FCC ID	2AIMD-SLT
Model Difference	All the model are the same circuit and RF module, except The appearance color, this report only test model name: SLT-SYT100-1M.
Modulation Type	ASK
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Operation frequency	433.92MHz
Number of Channels	1
Power Source	DC 6V
Power Rating	/
Adapter Model	/

2.2 Carrier frequency of channels

CH1: 433.92MHz

2.3 Operation of EUT during testing

Operating Mode

The mode is used: **Transmitting mode**

Channel 1: 433.92MHz

2.4 Description of test setup

2.5 Measurement instruments list

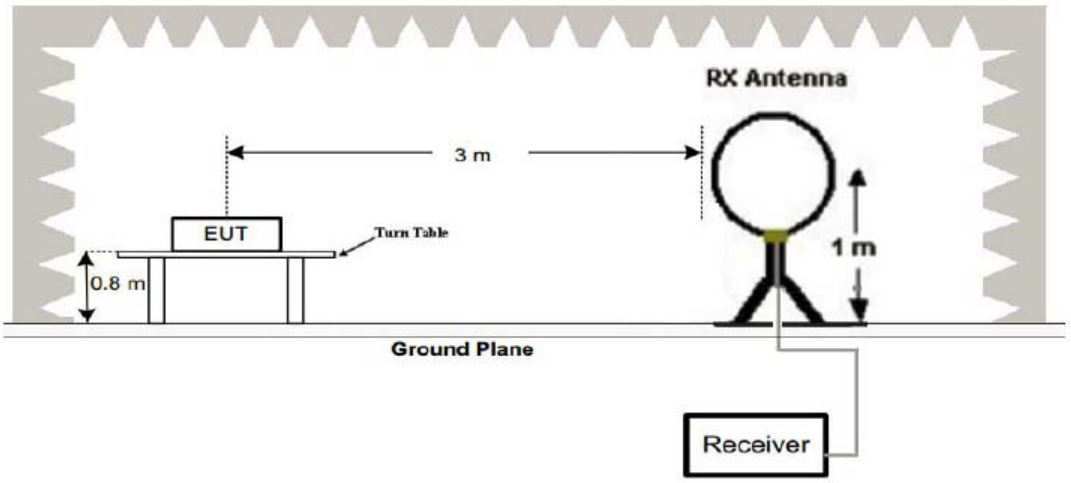
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 10, 2016	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	May 10, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 10, 2016	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 10, 2016	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 12, 2016	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	May 10, 2016	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 10, 2016	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	May 10, 2016	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 10, 2016	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 10, 2016	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 10, 2016	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	May 10, 2016	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 10, 2016	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Programmable AC Power source	SOPH POWER	PAG-1050	630250	May 10, 2016	1 Year
19.	Harmonic and Flicker Analyzer	LAPLACE	AC2000A	272629	May 10, 2016	1 Year
20.	Harmonic and Flicker Test Software AC 2000A	LAPLACE	N/A	N/A	N/A	N/A
21.	ESD Simulators	KIKUSUI	KES4021	LJ003477	May 10, 2016	1 Year
22.	EFT Generator	EMPEK	EFT-4040B	0430928N	May 10, 2016	1 Year
23.	Shielding Room	ChangZhou ZhongYu	JB88	SEL0166	May 10, 2016	1 Year
24.	Signal Generator 9KHz~2.2GHz	R&S	SML02	SEL0143	May 10, 2016	1 Year
25.	Signal Generator 9KHz~1.1GHz	R&S	SML01	SEL0135	May 10, 2016	1 Year
26.	Power Meter	R&S	NRVS	SEL0144	May 10, 2016	1 Year
27.	RF Level Meter		URV35	SEL0137	May 10, 2016	1 Year
28.	Audio Analyzer	R&S	UPL	SEL0136	May 10, 2016	1 Year

29.	RF-Amplifier 150KHz~150MHz	BONN Elektronik	BSA1515-25	SEL0157	May 10, 2016	1 Year
30.	Stripline Test Cell	Erika Fiedler	VDE0872	SEL0167	May 10, 2016	N/A
31.	TV Test Transmitter	R&S	SFM	SEL0159	May 10, 2016	1 Year
32.	TV Generator PAL	R&S	SGPF	SEL0138	May 10, 2016	1 Year
33.	TV Generator Ntsc	R&S	SGMF	SEL0140	May 10, 2016	1 Year
34.	TV Generator Secam	R&S	SGSF	SEL0139	May 10, 2016	1 Year
35.	TV Test Transmitter 0.3MHz~3300MHz	R&S	SFQ	SEL0142	May 10, 2016	1 Year
36.	MPEG2 Measurement Generator	R&S	DVG	SEL0141	May 10, 2016	1 Year
37.	Spectrum Analyzer	R&S	FSP	SEL0177	May 10, 2016	1 Year
38.	Matching	R&S	RAM	SEL0146	N/A	N/A
39.	Matching	R&S	RAM	SEL0148	N/A	N/A
40.	Absorbing Clamp	R&S	MDS21	SEL0158	May 10, 2016	1 Year
41.	Coupling Set	Erika Fiedler	Rco, Rci, MC, AC, LC	SEL0149	N/A	N/A
42.	Filters	Erika Fiedler	Sr, LBS	SEL0150	N/A	N/A
43.	Matching Network	Erika Fiedler	MN, SLT-SYT100-1M	SEL0151	N/A	N/A
44.	Fully Anechoic Room	ChangZhou ZhongYu	854	SEL0169	May 10, 2016	1 Year
45.	Signal Generator	R&S	SML03	SEL0068	May 10, 2016	1 Year
46.	RF-Amplifier 30M~1GHz	Amplifier Reasearch	250W1000A	SEL0066	Oct. 24, 2015	1 Year
47.	RF-Amplifier 0.8~3.0GHz	Amplifier Reasearch	60S1G3	SEL0065	Oct. 24, 2015	1 Year
48.	Power Meter	R&S	NRVD	SEL0069	May 10, 2016	1 Year
49.	Power Sensor	R&S	URV5-Z2	SEL0071	May 10, 2016	1 Year
50.	Power Sensor	R&S	URV5-Z2	SEL0072	May 10, 2016	1 Year
51.	Software EMC32	R&S	EMC32-S	SEL0082	May 10, 2016	N/A
52.	Log-periodic Antenna	Amplifier Reasearch	ASLT-SYT100-1M080	SEL0073	May 10, 2016	N/A
53.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	May 10, 2016	N/A
54.	High Gain Horn Antenna(0.8-5GHz)	Amplifier Reasearch	AT4002A	SEL0075	May 10, 2016	N/A

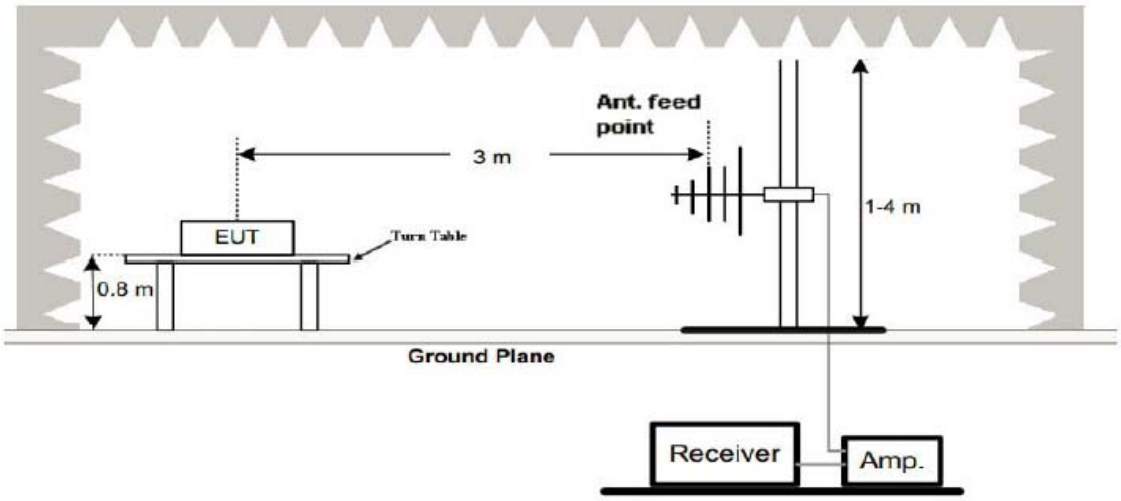
3. RADIATED EMISSION TEST

3.1 Block diagram of test setup

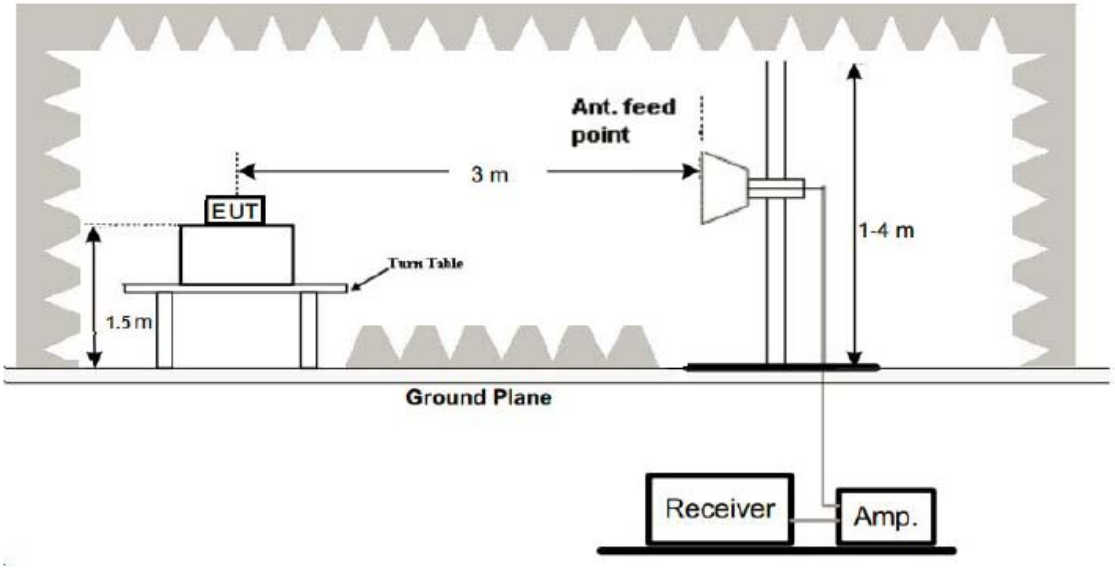
（1） Radiated Emission Test-Up Frequency Below 30MHz



（2） Radiated Emission Test-Up Frequency 30MHz~1GHz



（3） Radiated Emission Test-Up Frequency Above 1GHz



3.2 Limits

For intentional device, according to 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

In addition to the provisions of 15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66–40.70.	2,250	225
70–130	1,250	125
130–174	[1] 1,250 to 3,750	[1] 125 to 375
174–260	3,750	375
260–470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

[1] Linear interpolations.

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μV/m at 3 meters =41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

3.3 Test procedure

1, Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2, Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3, And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4, Repeat above procedures until all frequency measurements have been completed.
.

Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

3.4 Test result

Pass

The emissions from 30MHz to 5GHz are measured peak and average level, below 1 GHz measured QP level, detailed test data please see below. Besides, we tested 3 directions and recorded the worst data.

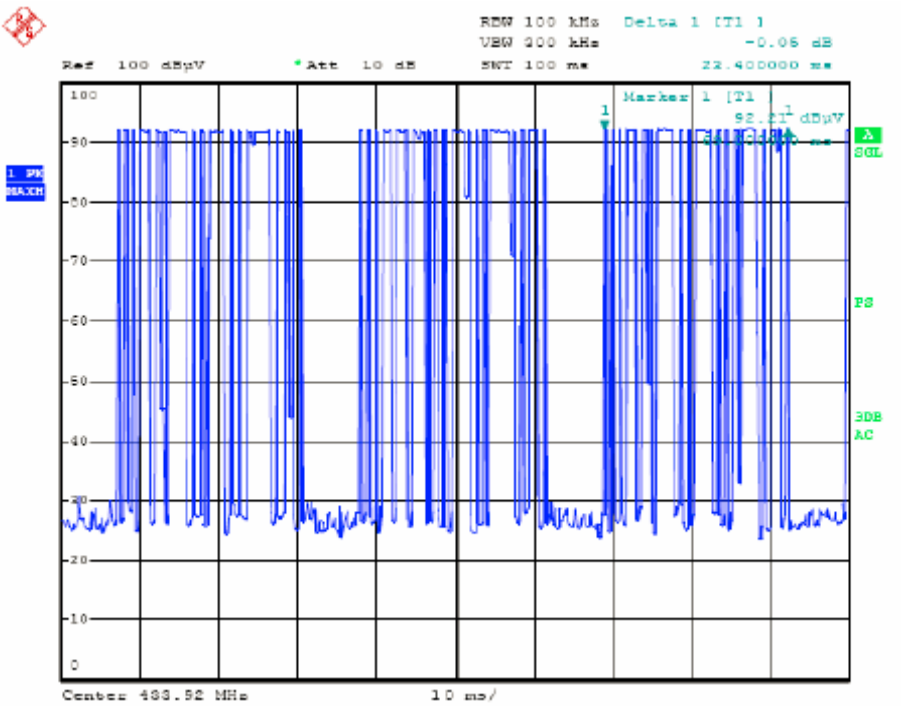
Emission Styles	Frequency (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Direction (H/V)
Fundamental	433.92	86.01	100.80	14.79	PK	H
Spurious	436.71	59.93	80.80	20.87	PK	H
Harmonics	867.84	64.42	80.80	16.38	PK	H
Harmonics	1735.68	57.04	80.80	23.76	PK	H
--	--	--	--	--	--	--
Fundamental	433.92	87.13	100.80	13.67	PK	V
Spurious	436.71	60.08	80.80	20.72	PK	V
Harmonics	867.84	65.95	80.80	14.85	PK	V
Harmonics	1735.68	58.48	80.80	22.32	PK	V
--	--	--	--	--	--	--

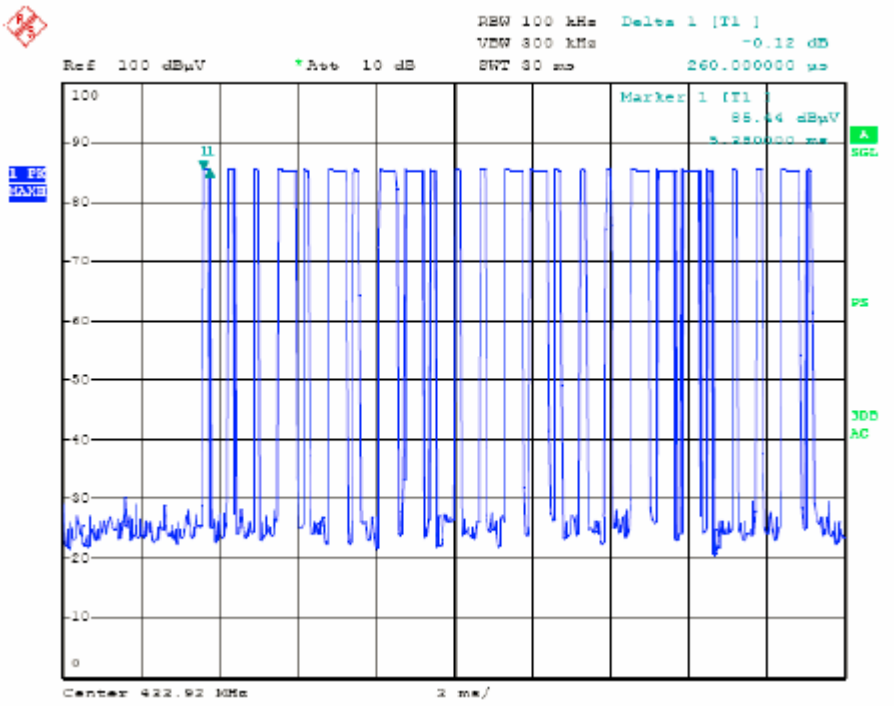
Emission Styles	Frequency (MHz)	PK Level (dBuV/m)	AV Factor (dB/m)	AV Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Direction (H/V)
Fundamental	433.92	86.01	-9.24	76.77	80.80	4.03	H
Spurious	436.71	59.93	-9.24	50.69	60.80	10.11	H
Harmonics	867.84	64.42	-9.24	55.18	60.80	5.62	H
Harmonics	1735.68	57.04	-9.24	47.80	60.80	13.00	H
--	--	--	--	--	--	--	--
Fundamental	433.92	87.13	-9.24	77.89	80.80	2.91	V
Spurious	436.71	60.08	-9.24	50.84	60.80	9.96	V
Harmonics	867.84	65.95	-9.24	56.71	60.80	4.09	V
Harmonics	1735.68	58.48	-9.24	49.24	60.80	11.56	V
--	--	--	--	--	--	--	--

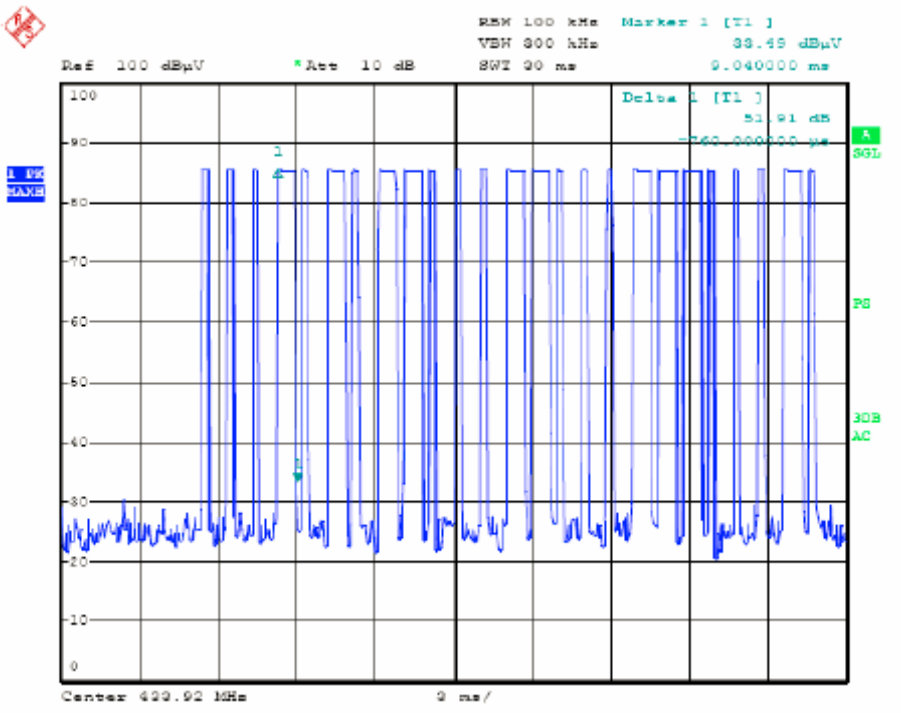
Note:

1. AV Level (dBuV/m)= PK Level (dBuV/m) + AV Factor(dB)
2. In a 100ms observation period found 0.26ms burst 1pcs*15*3=45 pcs, 0.76ms burst 1pcs*10*3=30 pcs,
   The Duty Cycle=(0.26ms*45+0.76ms*30)/100ms=0.345
   AV Factor= 20*log(Duty Cycle)= 20log(0.345)=-9.24

Data of Duty Cycle See the follow page:

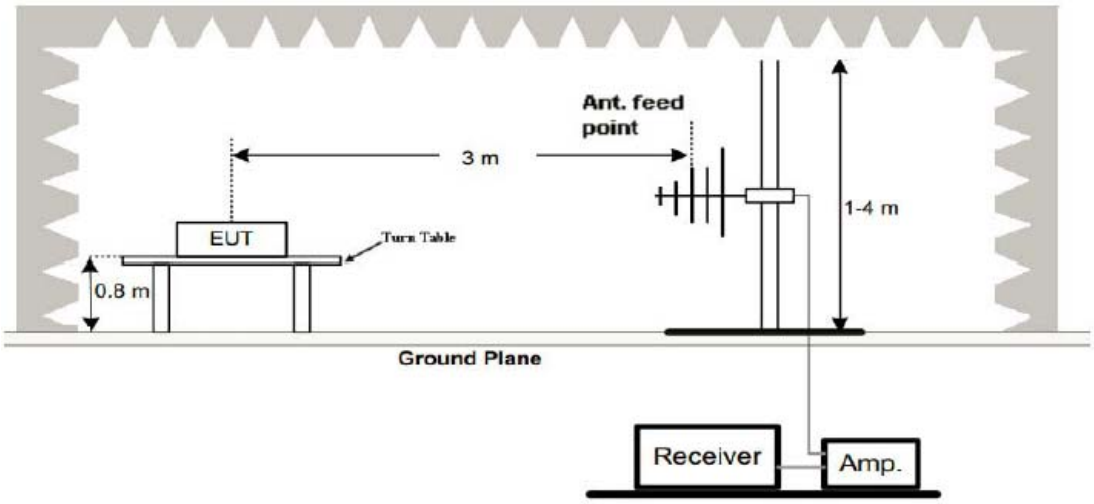

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Delta 1 [T1]
-0.06 dB
22.400000 ms
Ref 100 dBµV
*Att 10 dB
Marker 1 [T1]
92.21 dBµV
1
100
90
80
70
60
50
40
30
20
10
0
PS
3DB
AC
SGL
Center 433.92 MHz
10 ms/


RBW 100 kHz
VBW 300 kHz
SWT 30 ms
Delta 1 [T1]
-0.12 dB
260.000000 µs
Ref 100 dBµV
*Att 10 dB
Marker 1 [T1]
85.44 dBµV
5.280000 ms
1
100
90
80
70
60
50
40
30
20
10
0
PS
3DB
AC
SGL
Center 422.92 MHz
2 ms/


RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
33.49 dBµV
9.040000 ms
Ref 100 dBµV
*Att 10 dB
Delta 1 [T1]
51.91 dB
100
90
80
70
60
50
40
30
20
10
0
Center 499.92 MHz
2 ms/

4. OCCUPIED BANDWIDTH MEASUREMENT

4.1 Block diagram of test setup



4.2 Limits

According to 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

4.3 Test procedure

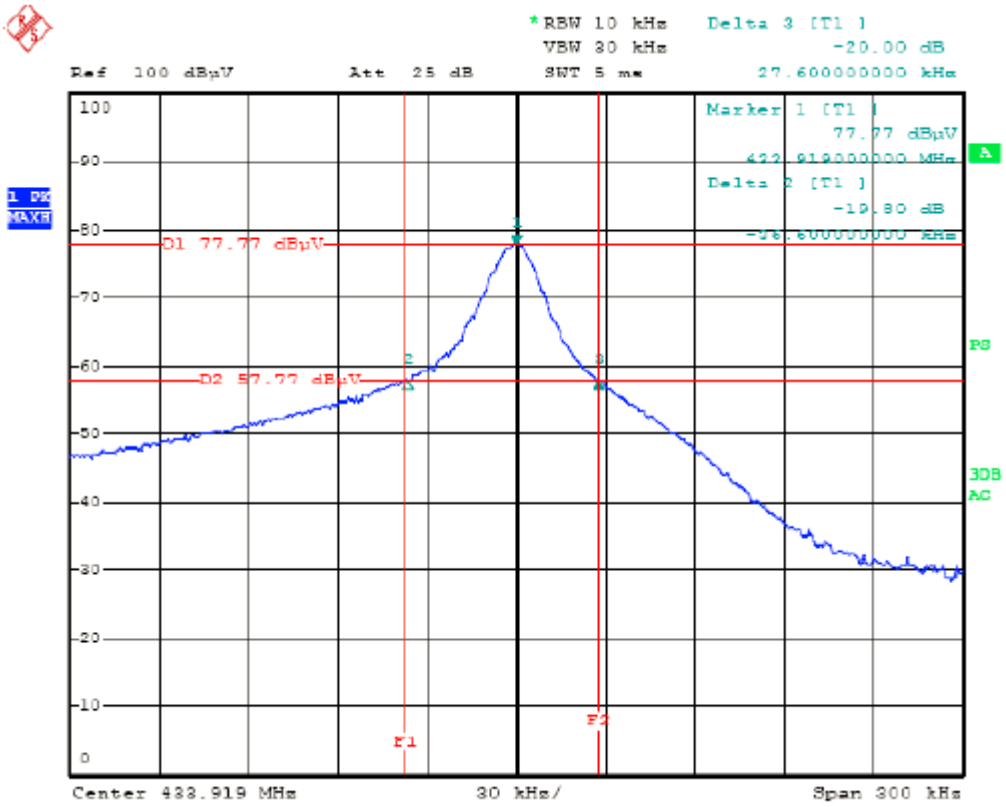
a. The 20dB bandwidth and 99% bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode

b. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.4 Test Result

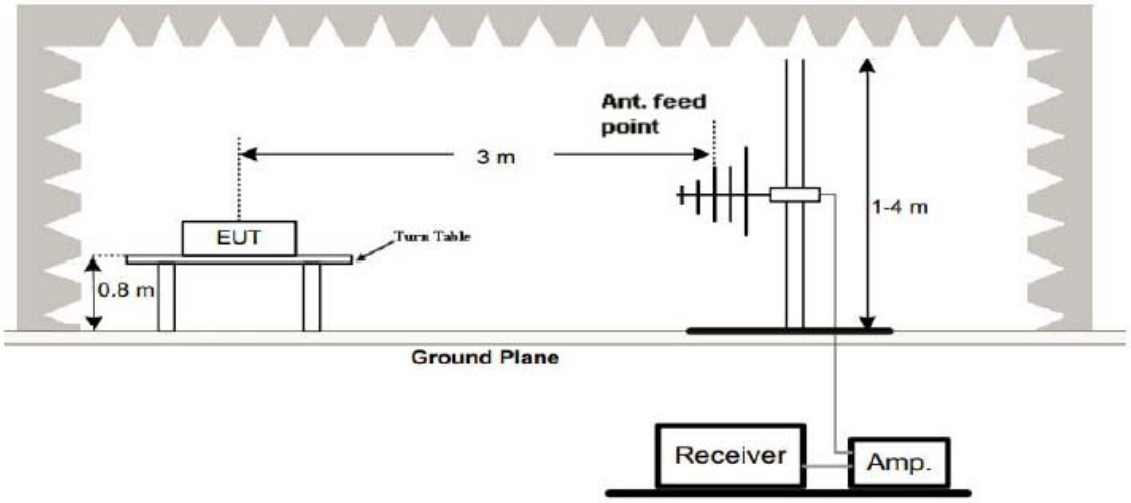
Channel Frequency(MHz)	Modulation	20dB bandwidth (KHz)	Limit (KHz)	Result
433.92MHz	ASK	64.2	433.92*0.25%=1084.8	Pass

The spectrum analyzer plots are attached as below.


*RBW 10 kHz
VBW 30 kHz
SWT 5 ms
Delta 3 [T1]
-20.00 dB
27.600000000 kHz
Ref 100 dBµV
Att 25 dB
Marker 1 [T1]
77.77 dBµV
422.919000000 MHz
Delta 2 [T1]
-19.80 dB
-96.600000000 kHz
1 PK
MAXH
D1 77.77 dBµV
D2 57.77 dBµV
100
90
80
70
60
50
40
30
20
10
0
A
PB
3DB
AC
Center 433.919 MHz
30 kHz/
Span 300 kHz

5. DEACTIVATION TIME

5.1 Block diagram of test setup



5.2 Limits

According to FCC §15.231(a)(1),A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released

5.3 Test procedure

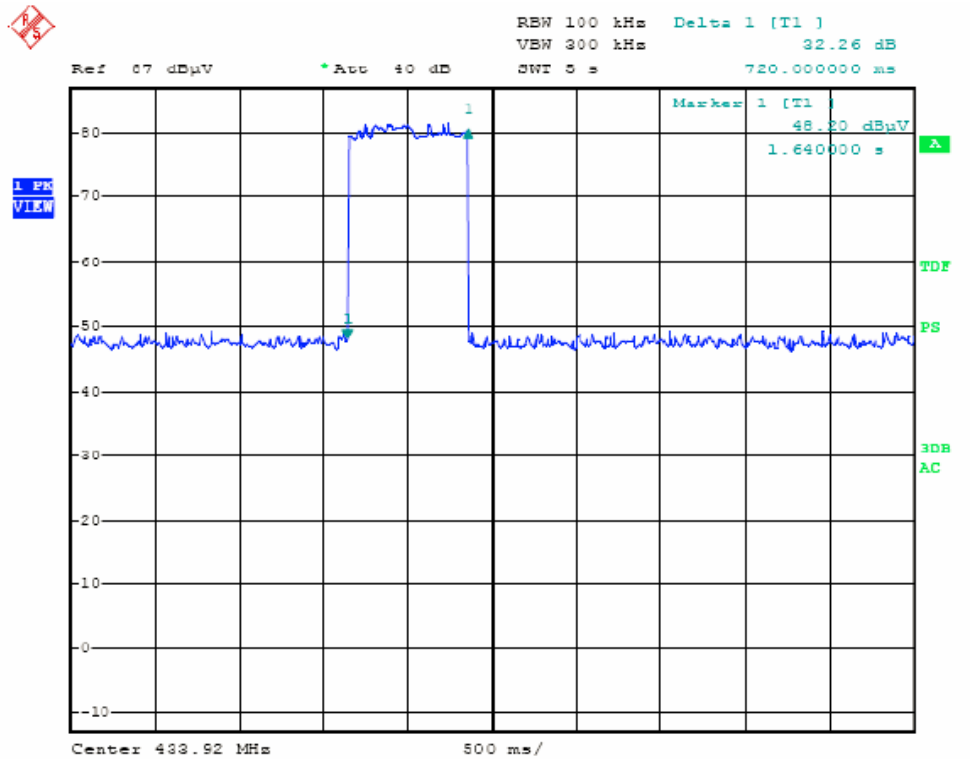
a. The EUT was placed on a wooded table which is 0.8m height and close to receiver antenna of spectrum analyzer

b. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was set to 1 MHz to encompass all significant spectral components during the test. The spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

5.4 Test Result

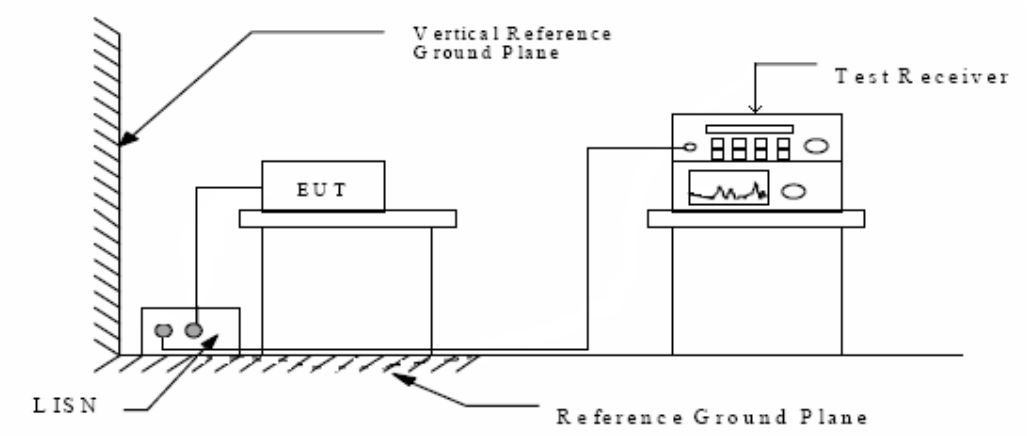
Channel Frequency(MHz)	One transmission time (S)	Limit (S)	Result
433.92MHz	0.72	5	Pass

Note: The transmitter was automatically activated, and the carrier frequency 433.92MHz: The spectrum analyzer plots are attached as below.


RBW 100 kHz
VBW 300 kHz
SWT 5 s
Delta 1 [T1]
32.26 dB
720.000000 ms
Ref 67 dBµV
*Att 40 dB
Marker 1 [T1]
48.20 dBµV
1.640000 s
1 PK VIEW
A
TDF
PS
3DB AC
80
70
60
50
40
30
20
10
0
-10
Center 433.92 MHz
500 ms/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block diagram of test setup



6.2 Limits

Conducted Emission Measurement Limits According to Section 15.207(a)

Frequency MHz	Limits (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

* Decreases with the logarithm of the frequency.

6.3 Test procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2003 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESPI) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

6.4 Test Result

N/A

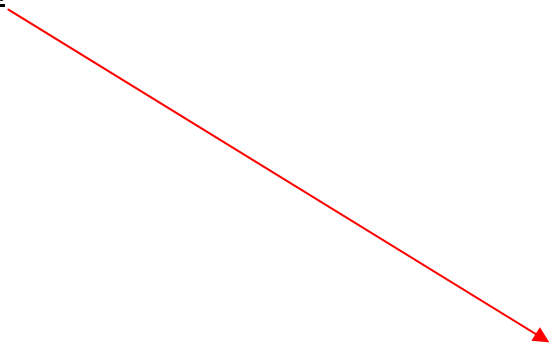
No measurement is required as the EUT is a battery operated product.

7. 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.

Antenna is fixed by enclosure, can not be changed except take apart the product.

Antenna



8. POTOGRAPH OF TEST

8.1 Radiated Emission