



# FCC REPORT

**Applicant:** INTERNATIONAL DEVELOPMENT COMPANY

**Address of Applicant:** 899 Henrietta Creek Road, Roanoke, Texas 76262, United States

**Manufacturer/Factory:** Zhongshan Quanxin Lighting Electrical Co., Ltd.

**Address of Manufacturer/Factory:** Hong Ji Street, Shalang, Long Ping Cun, West District, ZHONGSHAN Guangdong 528411 China

**Equipment Under Test (EUT)**

Product Name: LED String Light

Model No.: ST136A116220, ST1##A##6### (Where “#” is used to denote numbers or blank for commercial purpose.)

**FCC ID:** 2AP35ST1XXA6

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

**Date of sample receipt:** December 25, 2018

**Date of Test:** December 26, 2018-March 12, 2019

**Date of report issued:** March 13, 2019

**Test Result :** PASS \*

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

Authorized Signature: 

**Robinson Lo**

**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

Version No.	Date	Description
01	March 13, 2019	Original

Prepared By:

*Bill. yuan*

Date:

March 13, 2019

Project Engineer

Check By:

*Robinsons*

Date:

March 13, 2019

Reviewer

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
Conduction Emission	15.207	N/A
Field strength of the Fundamental Signal	15.231 (b)	Pass
Spurious Emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell Time	15.231 (a)(1)	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	± 4.54dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 5.34dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 5.34dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.44dB	(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 General Description of EUT

Product Name:	LED String Light
Model No.:	ST136A116220, ST1##A##6### (Where “#” is used to denote numbers or blank for commercial purpose.)
Test Model No:	ST136A116220
<i>Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is model name for commercial purpose.</i>	
Serial No.:	QXST1XXA6
Software version	V1.0
Hardware version	V1.1
Test sample(s) ID:	GTS201812000197-1
Sample(s) Status:	Engineer sample
Operation Frequency:	434MHz
Modulation technology:	ASK
Antenna Type:	PCB Antenna
Antenna gain:	0.5dBi(declare by applicant)
Power supply:	TX: DC 3V (2*1.5V Size“AAA” battery ) RX: AC120V 60Hz

## 5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.(New battery is used during all test)
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### 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 only the worst case was shown in this test report and defined as follows:

434MHz	Axis	X	Y	Z
	Field Strength(dBuV/m)	84.72	86.93	85.25

## 5.3 Description of Support Units

None.
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## 5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>● <b>FCC —Registration No.: 381383</b> 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 381383.</li> <li>● <b>Industry Canada (IC) —Registration No.: 9079A-2</b> 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.</li> <li>● <b>NVLAP (LAB CODE:600179-0)</b> Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0</li> </ul>
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## 5.5 Test Location

All tests were performed at:
<p>Global United Technology Services Co., Ltd. No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China Tel: 0755-27798480 Fax: 0755-27798960</p>

## 5.6 Other Information Requested by the Customer

None.
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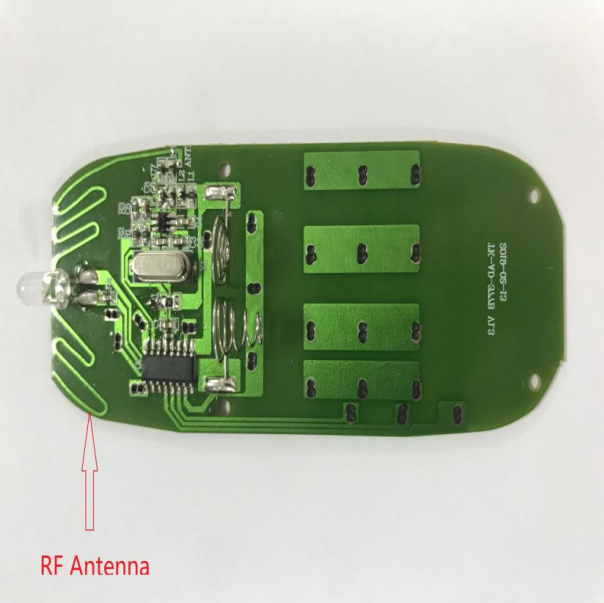
## 6 Test Instruments list

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	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 27 2018	June. 26 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 27 2018	June. 26 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 27 2018	June. 26 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 27 2018	June. 26 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 27 2018	June. 26 2019
9	Coaxial Cable	GTS	N/A	GTS211	June. 27 2018	June. 26 2019
10	Coaxial cable	GTS	N/A	GTS210	June. 27 2018	June. 26 2019
11	Coaxial Cable	GTS	N/A	GTS212	June. 27 2018	June. 26 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 27 2018	June. 26 2019
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 27 2018	June. 26 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 27 2018	June. 26 2019
15	Band filter	Amindeon	82346	GTS219	June. 27 2018	June. 26 2019
16	Power Meter	Anritsu	ML2495A	GTS540	June. 27 2018	June. 26 2019
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 27 2018	June. 26 2019
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 27 2018	June. 26 2019
19	Splitter	Agilent	11636B	GTS237	June. 27 2018	June. 26 2019
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 27 2018	June. 26 2019
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 20 2018	Oct. 19 2019
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 20 2018	Oct. 19 2019
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 20 2018	Oct. 19 2019
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 27 2018	June. 26 2019

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 27 2018	June. 26 2019
2	Barometer	ChangChun	DYM3	GTS255	June. 27 2018	June. 26 2019

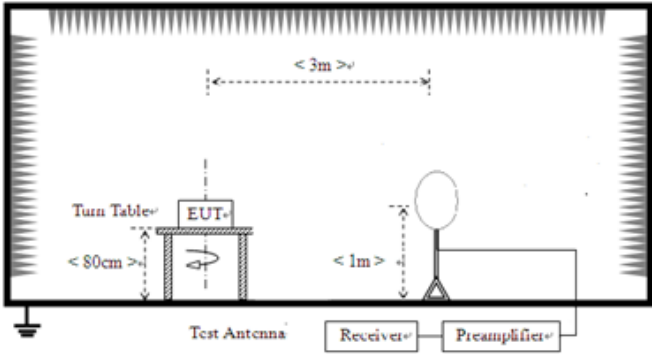
## 7 Test results and Measurement Data

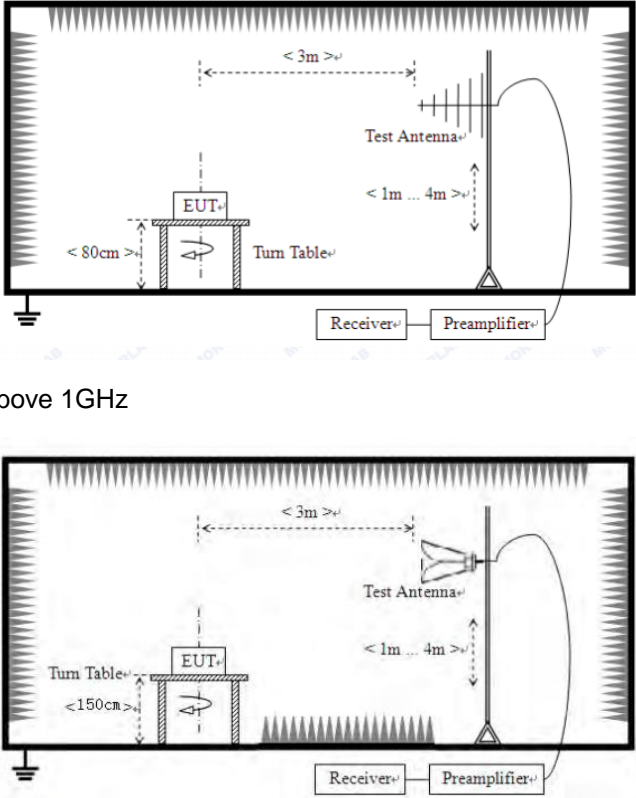
### 7.1 Antenna Requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p><b>15.203 requirement:</b></p> <p>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.</p>	
<b>EUT Antenna:</b>	
<p><i>The antenna is PCB antenna, the best case gain of the antenna is 0.5dBi</i></p> <div style="text-align: center;">  <p style="color: red; margin-left: 100px;">RF Antenna</p> </div>	



## 7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.231 (b)& Section 15.209					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	9kHz to 5000MHz					
Test site:	Measurement Distance: 3m					
Receiver setup:	Frequency	Detector	RBW	VBW	Value	
	9KHz-150KHz	PK,AV,QP	200Hz	600Hz	PK,AV,QP	
	150KHz-30MHz	PK,AV,QP	9KHz	30KHz	PK,AV,QP	
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak	
	Above 1GHz	Peak	1MHz	3MHz	Peak	
Peak		1MHz	10Hz	Average		
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark		
	434MHz	100.83		Peak Value		
		80.83		Average Value		
Limit: (Spurious Emissions)	Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)		Field Strength of Unwanted Emissions (microvolts/meter)		
	40.66-40.70	1,000		100		
	70-130	500		50		
	130-174	500 to 1,500**		50 to 1,50**		
	174-260	1,500		1,50		
	260-470	1,500 to 5,000**		1,50 to 5,00**		
	Above 470	5,000		5,00		
	Frequency (MHz)	Class B(dBuV/m @3m)				
		Above 1000	Peak	Average		
			74	54		
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:	<p>Below 30MHz</p>  <p>Below 1GHz</p>					

	 <p>Above 1GHz</p>
<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters 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.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. 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.</li> <li>4. 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.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. 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.</li> </ol>
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.2 for details</p>
<p>Test results:</p>	<p>Pass</p>

**Measurement data:****7.2.1 Field Strength of The Fundamental Signal****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
434.00	105.37	16.06	3.02	37.52	86.93	100.83	-13.90	Horizontal
434.00	93.41	16.06	3.02	37.52	74.97	100.83	-25.86	Vertical

**Average value:**

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
434.00	86.93	-12.96	73.97	80.83	-6.86	Horizontal
434.00	74.97	-12.96	62.01	80.83	-18.82	Vertical

*Remarks:*

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

## 7.2.2 Spurious Emissions

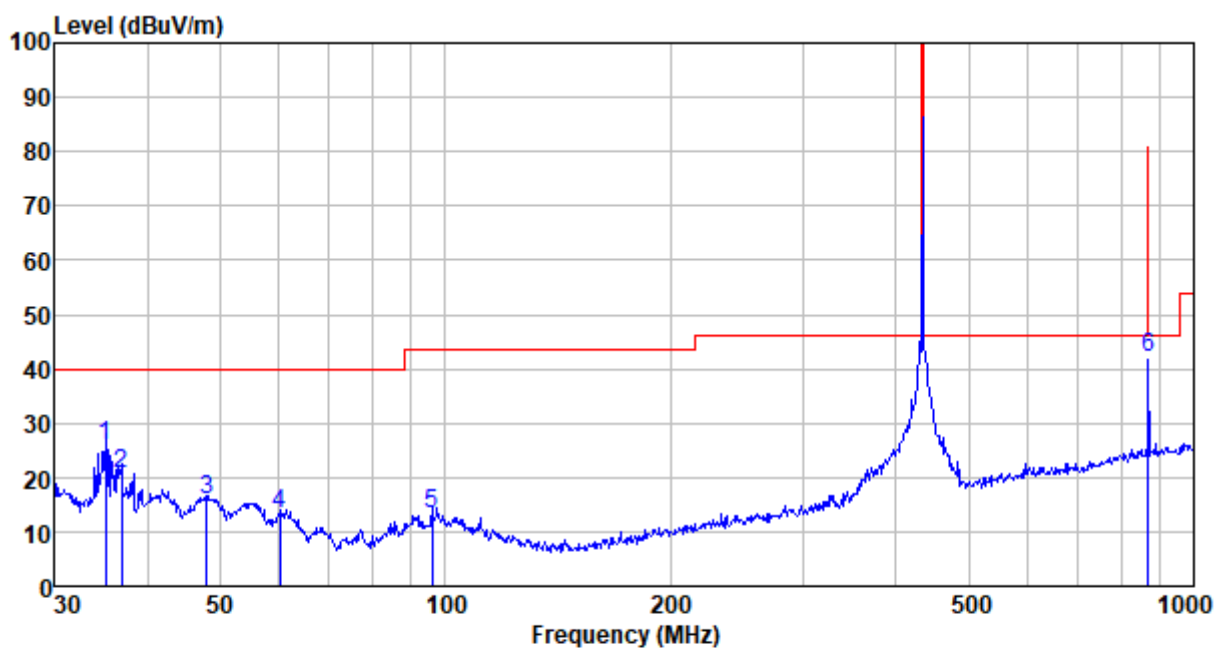
### Measurement data:

#### 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

#### Below 1GHz:

Mode:	Transmitting mode	Test by:	Bill
Temp./Hum.(%RH):	26°C/56%RH	Polarization:	Horizontal

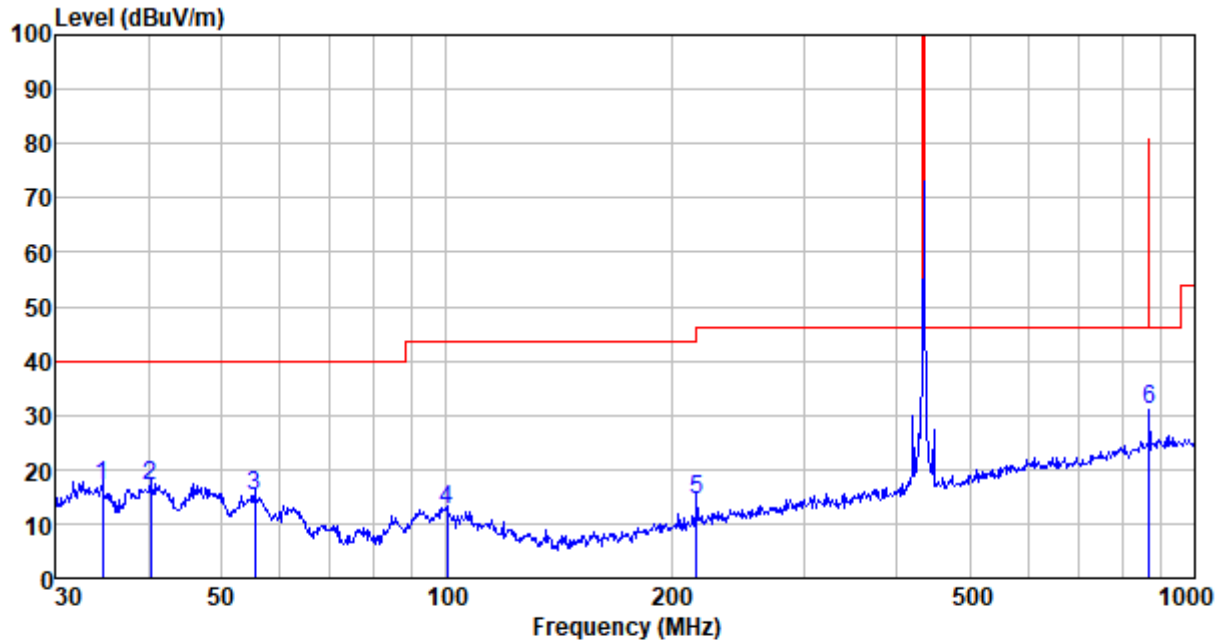


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
35.128	49.32	11.42	0.61	35.36	25.99	40.00	-14.01	QP
36.895	43.58	11.76	0.63	35.48	20.49	40.00	-19.51	QP
47.994	38.58	12.46	0.75	36.09	15.70	40.00	-24.30	QP
60.069	37.40	11.17	0.86	36.32	13.11	40.00	-26.89	QP
96.099	36.98	11.80	1.16	36.69	13.25	43.50	-30.25	QP
868.050	52.91	22.12	4.73	37.61	42.15	80.83	-38.68	Peak

#### Average value:

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.050	42.15	-12.96	29.19	60.83	-31.64	Horizontal

Mode:	Transmitting mode	Test by:	Bill
Temp./Hum.(%H):	26°C/56%RH	Polarization:	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
34.760	40.25	11.40	0.61	35.34	16.92	40.00	-23.08	QP
40.276	39.68	12.31	0.66	35.68	16.97	40.00	-23.03	QP
55.415	38.93	11.77	0.82	36.26	15.26	40.00	-24.74	QP
100.229	35.53	12.37	1.19	36.72	12.37	43.50	-31.13	QP
216.024	38.93	10.99	1.93	37.35	14.50	46.00	-31.50	QP
868.050	41.68	22.12	4.73	37.61	30.92	80.83	-49.91	Peak

Average value:

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.050	30.92	-12.96	17.96	60.83	-42.87	Vertical

**Above 1G:**

**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
1736.00	66.43	25.05	4.82	34.00	62.30	80.83	-18.53	Vertical
2170.00	51.34	27.74	5.15	34.27	49.96	80.83	-30.87	Vertical
2604.00	50.71	27.82	5.58	33.78	50.33	80.83	-30.50	Vertical
1736.00	68.15	25.05	4.82	34.00	64.02	80.83	-16.81	Horizontal
2170.00	51.78	27.74	5.15	34.27	50.40	80.83	-30.43	Horizontal
2604.00	50.12	27.82	5.58	33.78	49.74	80.83	-31.09	Horizontal

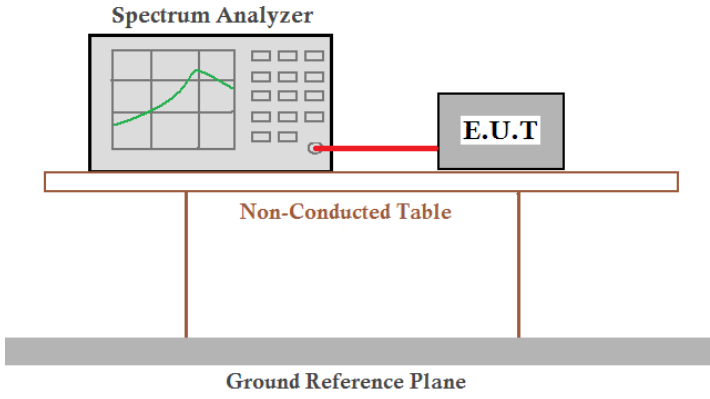
**Average value:**

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1736.00	62.30	-12.96	49.34	60.83	-11.49	Vertical
2170.00	49.96	-12.96	37.00	60.83	-23.83	Vertical
2604.00	50.33	-12.96	37.37	60.83	-23.46	Vertical
1736.00	64.02	-12.96	51.06	60.83	-9.77	Horizontal
2170.00	50.40	-12.96	37.44	60.83	-23.39	Horizontal
2604.00	49.74	-12.96	36.78	60.83	-24.05	Horizontal

*Remarks:*

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 C63.10:2013
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 5.2 for details
Test results:	Pass

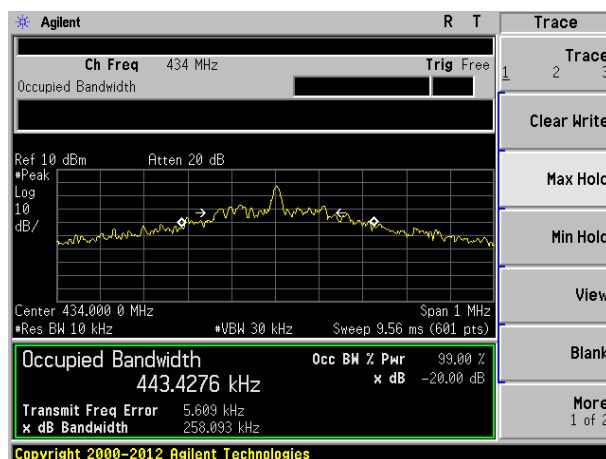
#### Measurement Data

Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
434.00	0.258	1.085	Pass

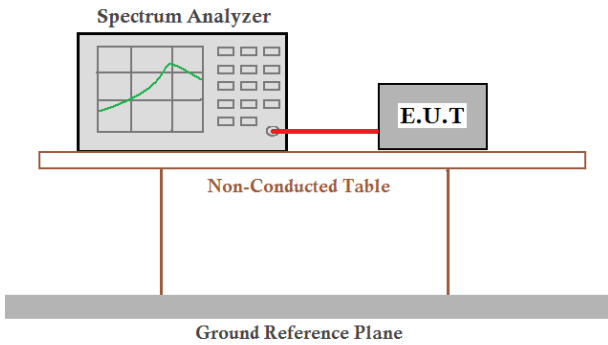
Note: Limit= Fundamental frequency×0.25%

434×0.25%=1.085MHz

Test plot as follows:



## 7.4 Dwell Time

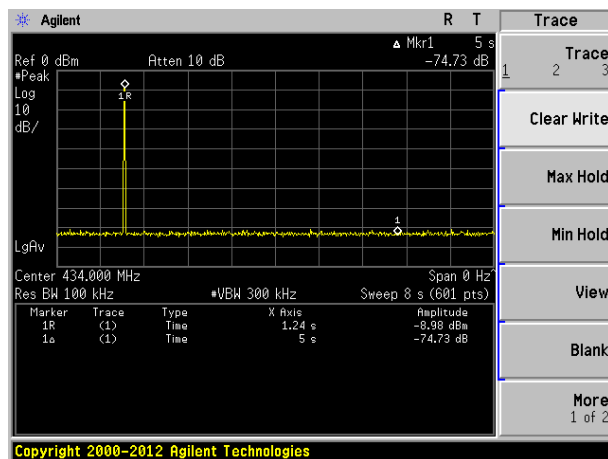
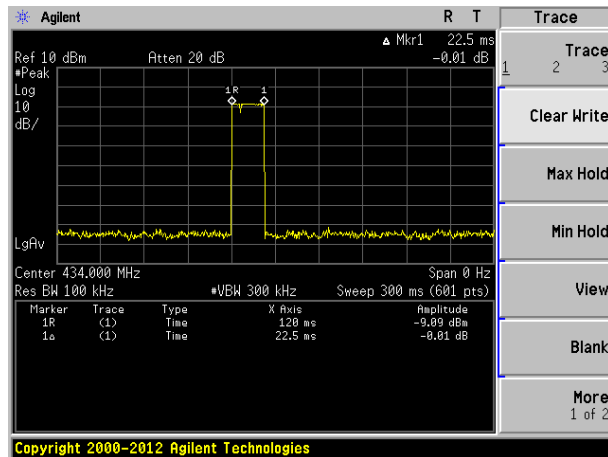
Test Requirement:	FCC Part15 C Section 15.231 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=100KHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

### Measurement data:

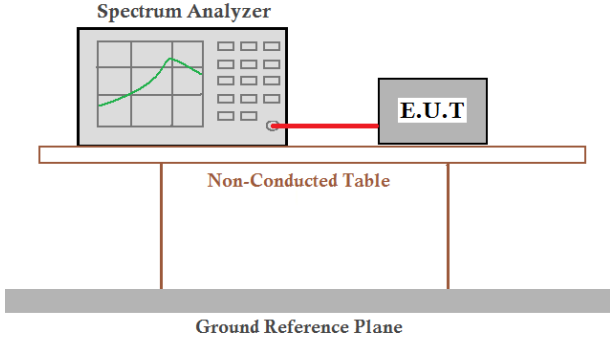
Frequency (MHz)	Duration of each TX (second)	Limit (second)	Result
434.00	0.0225	<5.0	Pass



Test plot as follows:



## 7.5 Duty Cycle

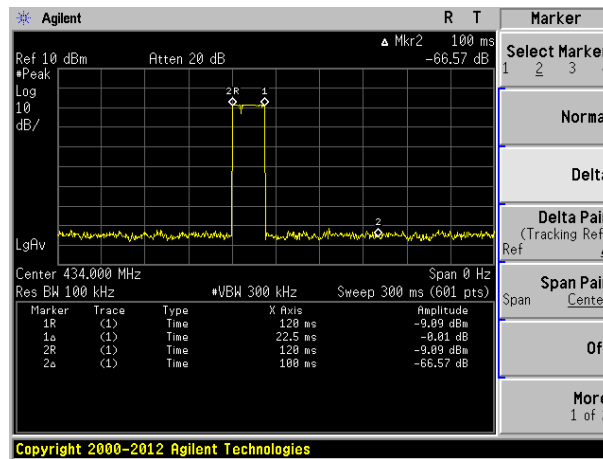
Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=100KHz, span=0Hz, detector: Peak
Limit:	No dedicated limit specified in the Rules.
Test Procedure:	<ol style="list-style-type: none"> <li>1. Place the EUT on the table and set it in transmitting mode.</li> <li>2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.</li> <li>3. Set centre frequency of spectrum analyzer=operating frequency.</li> <li>4. Set the spectrum analyzer as RBW=100kHz, VBW=100KHz, Span=0Hz, Adjust Sweep=100ms to obtain the “worst-case” pulse on time</li> <li>5. Repeat above procedures until all frequency measured was complete.</li> </ol>
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 5.2 for details
Test results:	Pass

**Measurement data:**

Calculate Formula:  $\text{Duty cycle factor} = 20 \log(\text{Duty cycle})$   
 Duty cycle = on time / 0.1 seconds or period, whichever is less

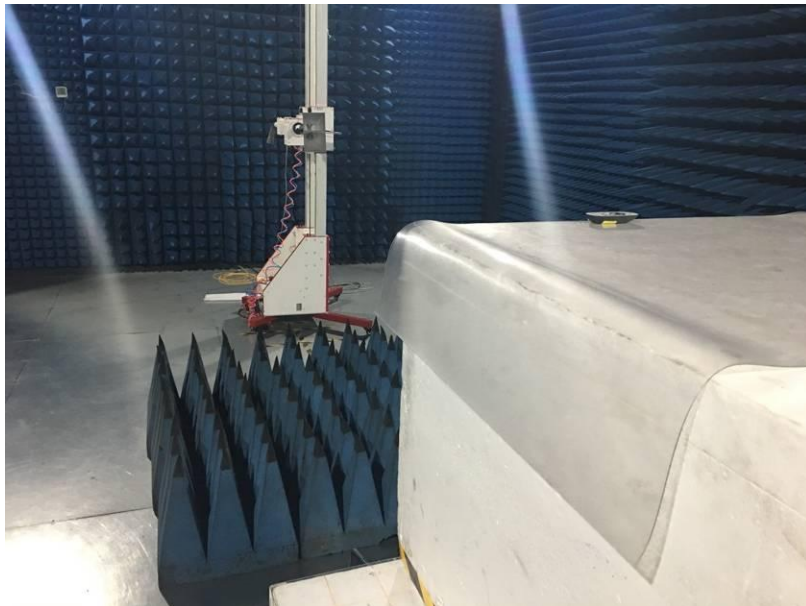
Test data:  
 T on time = 22.5(ms)  
 T period = 100(ms)  
 Duty cycle =  $22.5 / 100 = 22.5\%$   
 Duty cycle factor =  $20 \log(0.225) = -12.96$

Test plot as follows:



## 8 Test Setup Photo

Radiated Emission

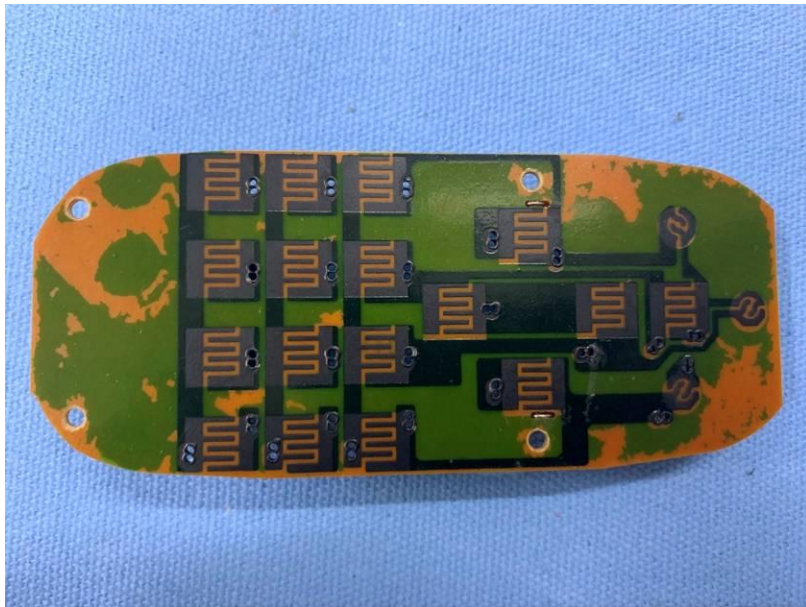


## 9 EUT Constructional Details

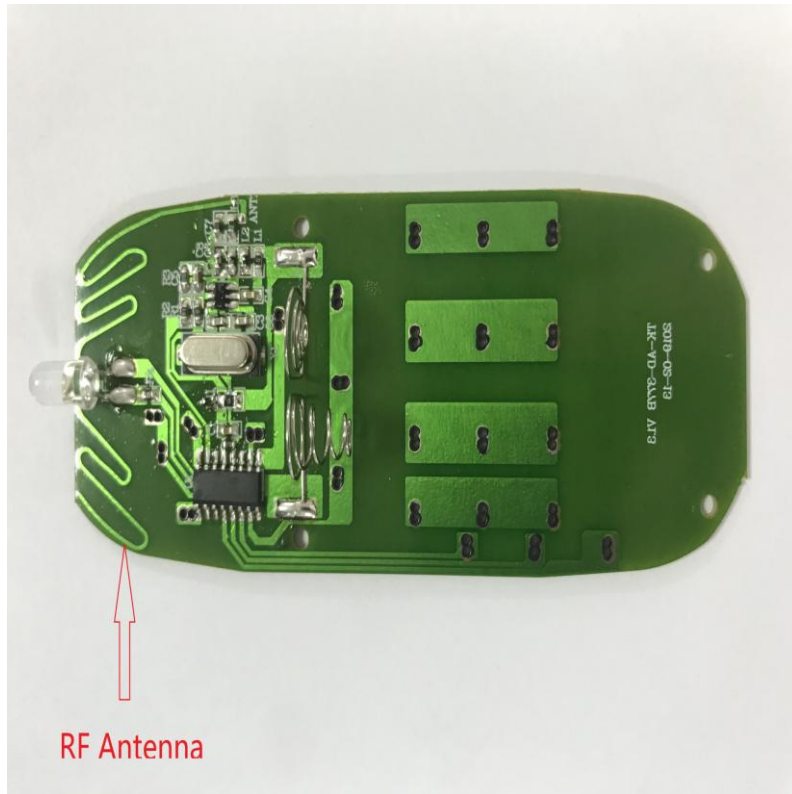


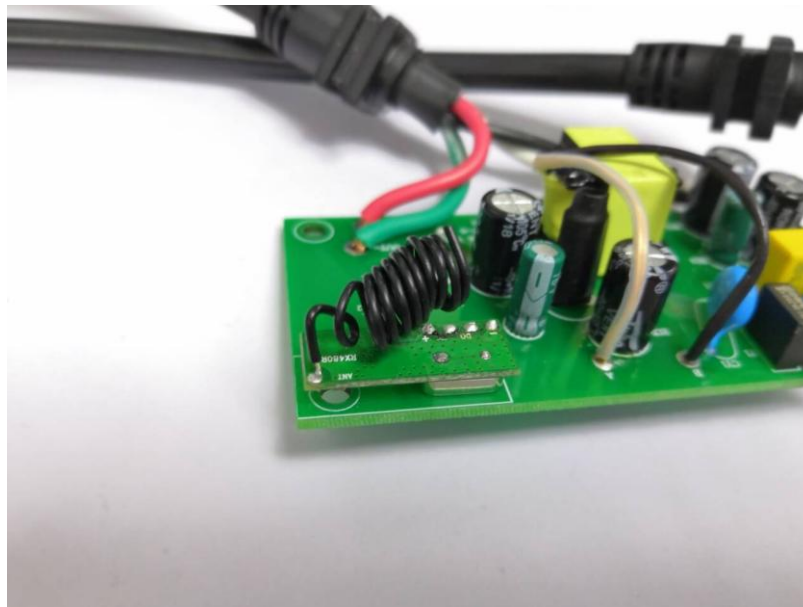
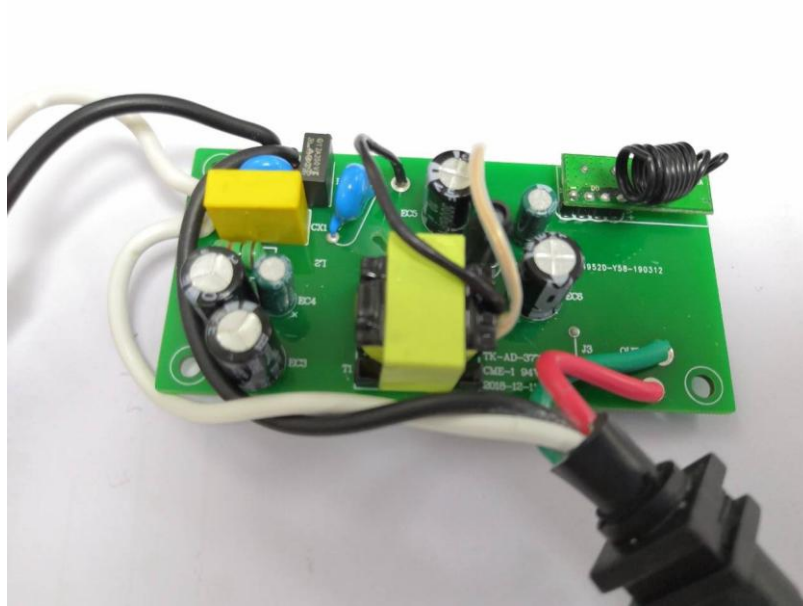


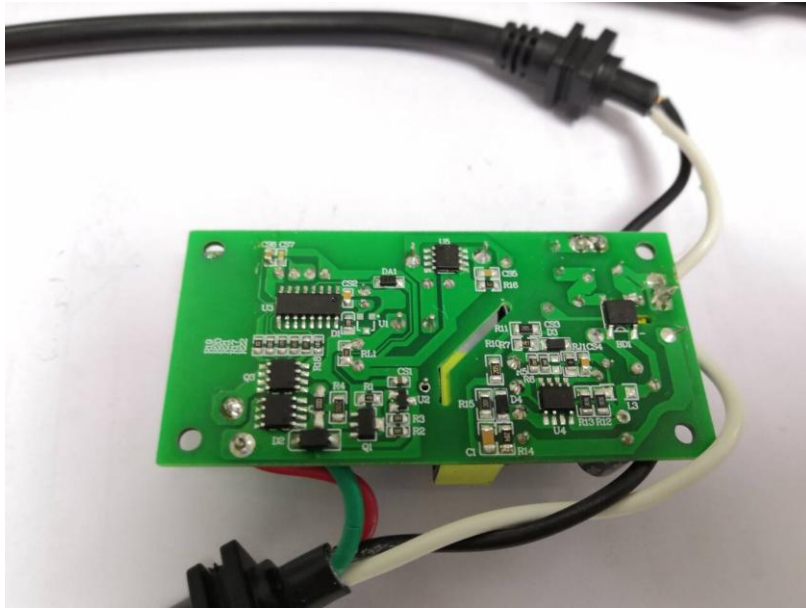












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