

# FCC REPORT

**Applicant:** STEELMATE CO.,LTD.

**Address of Applicant:** Steelmate Industrial Park, Heping Street, Dongfu Road,  
Dongfeng Town, Zhongshan City, Guangdong, P.R.China  
528425

**Equipment Under Test (EUT)**

Product Name: Transmitter

Model No.: 4312A

Trade mark: steelmate

**FCC ID:** Q6WBT4312A

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

**Date of sample receipt:** 13 Jul., 2015

**Date of Test:** 13 Jul., to 27 Jul., 2015

**Date of report issue:** 27 Jul., 2015

**Test Result:** PASS\*

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

Authorized Signature:



Bruce Zhang  
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 CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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## 2 Version

Version No.	Date	Description
00	27 Jul., 2015	Original

**Tested By:**

*Luna Gao*

**Date:**

27 Jul., 2015

**Report Clerk**

**Check By:**

*Wimer Zhang*

**Date:**

27 Jul., 2015

**Project Engineer**

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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 (a)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (a) (1)	Pass
Conducted Emission	15.107	Pass

*Remarks:*

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

## 5 General Information

### 5.1 Client Information

Applicant:	STEELMATE CO., LTD.
Address of Applicant:	Steelmate Industrial Park, Heping Street, Dongfu Road, Dongfeng Town, Zhongshan City, Guangdong, P.R. China 528425
Manufacturer/ Factory:	Steelmate Co., Ltd.
Address of Manufacturer/ Factory:	Steelmate Industrial Park, Heping Street, Dongfu Road, Dongfeng Town, Zhongshan City, Guangdong, P.R. China 528425

### 5.2 General Description of E.U.T.

Product Name:	Transmitter
Model No.:	4312A
Operation Frequency:	433.92MHz
Channel numbers:	1
Modulation type:	FSK
Antenna Type:	Integrated antenna
Antenna gain:	5dBi
Power supply:	DC 6V Lithium Battery

### 5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation (new battery used)		
<b>Pre-Test Mode:</b>			
CCIS has 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)	93.66	94.92	91.95
<b>Final Test Mode:</b>			
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 Description of Support Units

N/A
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## 5.5 Laboratory Facility

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

● **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. 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 out files. Registration 817957, February 27, 2012.

● **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

## 5.6 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.  
 Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,  
 Bao'an District, Shenzhen, Guangdong, China  
 Tel: +86-755-23118282  
 Fax: +86-755-23116366

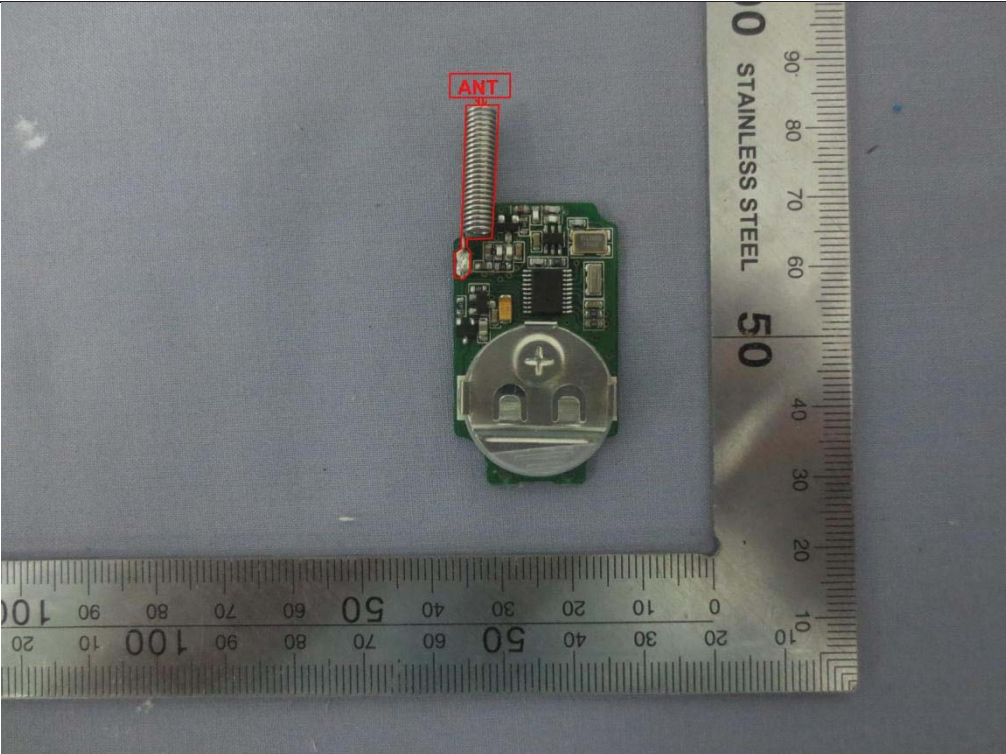
## 5.7 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	03-28-2015	03-28-2016
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	03-28-2015	03-28-2016
Double-ridged waveguide horn antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	03-28-2015	03-28-2016
Amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	04-01-2015	03-31-2016
Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	04-01-2015	03-31-2016
Spectrum analyzer	Rohde & Schwarz	FSP	CCIS0023	03-28-2015	03-28-2016

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	03-28-2015	03-28-2016
LISN	CHASE	MN2050D	CCIS0074	03-28-2015	03-28-2016

## 6 Test results and Measurement Data

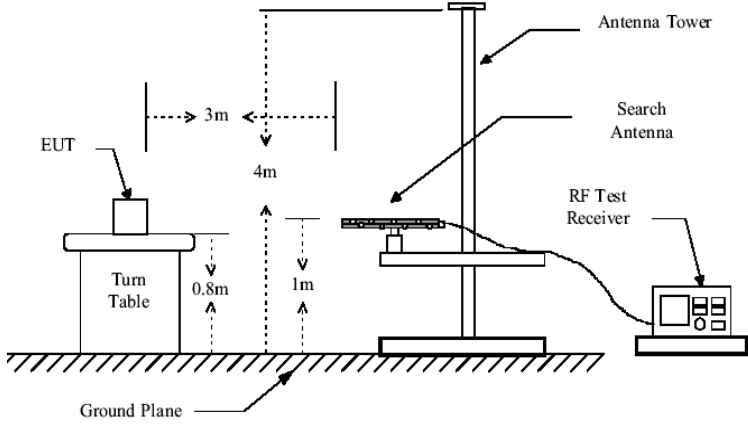
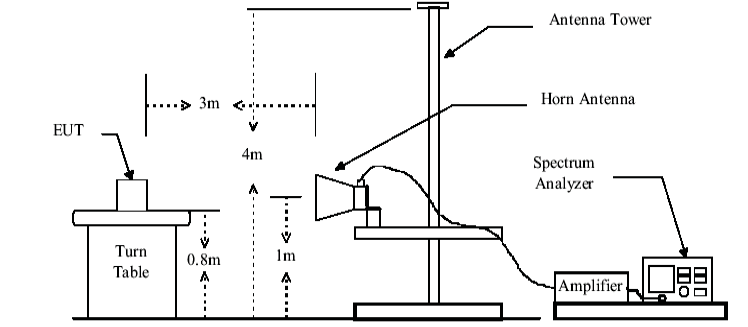
### 6.1 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p>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.</p>	
<b>E.U.T Antenna:</b>	
<p>The EUT make use of an integrated antenna, The typical gain of the antenna is 5dBi.</p>	
	

## 6.2 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.231(a) and 15.209				
Test Method:	ANSI C63.4:2009				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
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	
	433.92 MHz	80.8		Average Value	
		100.8		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	960MHz-1GHz	54.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
		74.0		Peak Value	
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.					
Test Procedure:	<p>a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</p> <p>c. 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.</p> <p>d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. 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.</p>				

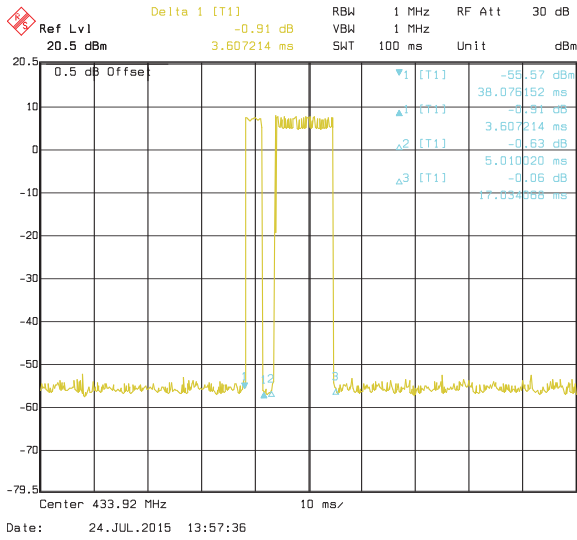


<p>Test setup:</p>	<p>Below 1GHz</p>  <p>Above 1GHz</p> 
<p>Test Instruments:</p>	<p>Refer to section 5.7 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Measurement Record:</p>	<p style="text-align: right;">Uncertainty:±4.88 dB</p>
<p>Test results:</p>	<p>Pass</p>

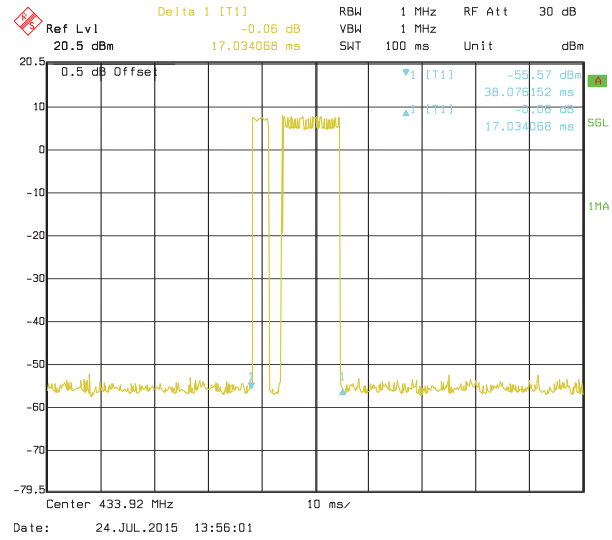
## 6.2.1 Field Strength Of The Fundamental Signal

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
433.92	77.18	15.53	2.21	0.00	94.92	100.80	-5.88	Vertical
433.92	66.47	15.53	2.21	0.00	84.21	100.80	-16.59	Horizontal
Average value:								
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)		Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
433.92	94.92	-16.12	78.80		80.80	-2.00	Vertical	
433.92	84.21	-16.12	68.09		80.80	-12.71	Horizontal	
Average value:								
Calculate Formula:		Average value = Peak value + Duty Cycle Factor						
		Duty cycle factor = $20\log(\text{Duty cycle})$						
		Duty cycle = on time/100 milliseconds or period, whichever is less						
Test data:		T on time = $3.61(\text{ms}) + 12.02(\text{ms}) = 15.63(\text{ms})$						
		T period = $118.64(\text{ms})$						
		Duty cycle = $15.63\%$						
		Duty cycle factor = $20\log(\text{Duty cycle}) = -16.12$						

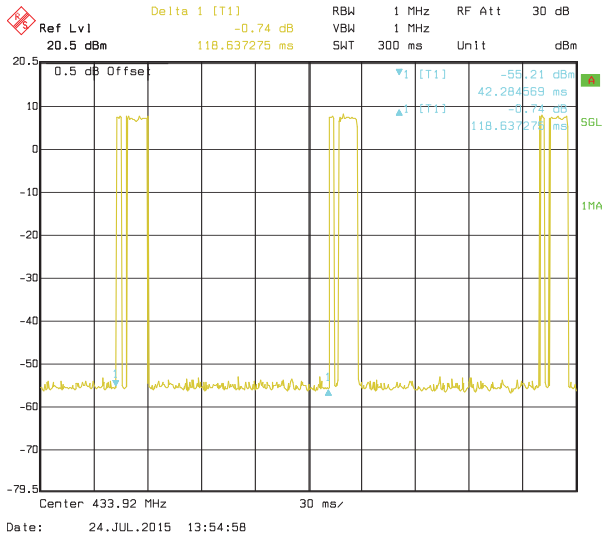
### T on time slot-1:



### 100ms:



### T period:



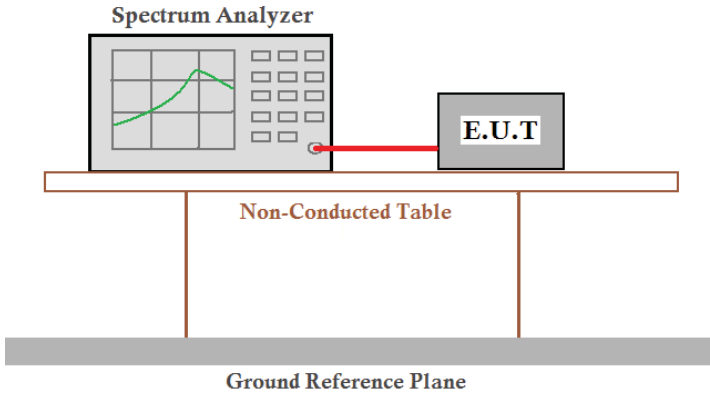
## 6.2.2 Spurious Emissions

Below 1GHz (30MHz-1000MHz)									
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	polarization
82.65	13.14	13.05	1.36	0.00	27.55	40.00	-12.45	QP	Vertical
543.27	13.97	12.92	1.96	0.00	28.85	46.00	-17.15	QP	Vertical
869.13	27.17	20.78	4.02	0.00	51.97	80.80	-28.83	PK	Vertical
584.79	10.48	13.46	1.28	0.00	25.22	46.00	-20.78	QP	Horizontal
724.26	10.23	13.06	1.97	0.00	25.26	46.00	-20.74	QP	Horizontal
869.13	30.58	20.78	4.02	0.00	55.38	80.80	-25.42	PK	Horizontal
Average value									
Frequency (MHz)	Level (dBuV/m)	Duty Cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization			
869.13	51.97	-16.12	35.85	60.80	-24.95	Vertical			
869.13	55.38	-16.12	39.26	60.80	-21.54	Horizontal			

Above 1GHz								
Peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1301.76	69.80	25.52	4.49	40.92	58.89	74.00	-15.11	Vertical
1735.68	64.37	25.04	5.31	40.98	53.74	80.80	-27.06	Vertical
2169.60	72.12	27.66	6.14	40.28	65.64	80.80	-15.16	Vertical
2603.52	60.81	27.80	7.09	40.18	55.52	80.80	-25.28	Vertical
3037.44	62.93	28.65	7.91	40.55	58.94	80.80	-21.86	Vertical
3471.36	62.66	28.76	8.74	39.46	60.70	80.80	-20.10	Vertical
3905.28	50.30	29.77	9.48	40.89	48.66	74.00	-25.34	Vertical
4339.20	62.70	30.47	10.04	40.83	62.38	74.00	-11.62	Vertical
1301.76	62.72	25.52	4.49	40.92	51.81	74.00	-22.19	Horizontal
1735.68	59.71	25.04	5.32	40.98	49.09	80.80	-31.71	Horizontal
2169.60	58.51	27.66	6.14	40.28	52.03	80.80	-28.77	Horizontal
2603.52	63.11	27.80	7.09	40.18	57.82	80.80	-22.98	Horizontal
3037.44	60.73	28.59	7.89	40.55	56.66	80.80	-24.14	Horizontal
3471.36	65.44	28.76	8.74	39.46	63.48	80.80	-17.32	Horizontal
3905.28	52.53	29.77	9.48	40.89	50.89	74.00	-23.11	Horizontal
4339.20	68.24	30.47	10.04	40.83	67.92	74.00	-6.08	Horizontal

Average value						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1301.76	58.89	-16.12	42.77	54.00	-11.23	Vertical
1735.68	53.74	-16.12	37.62	60.80	-23.18	Vertical
2169.60	65.64	-16.12	49.52	60.80	-11.28	Vertical
2603.52	55.52	-16.12	39.40	60.80	-21.40	Vertical
3037.44	58.94	-16.12	42.82	60.80	-17.98	Vertical
3471.36	60.70	-16.12	44.58	60.80	-16.22	Vertical
3905.28	48.66	-16.12	32.54	54.00	-21.46	Vertical
4339.20	62.38	-16.12	46.26	54.00	-7.74	Vertical
1301.76	51.81	-16.12	35.69	54.00	-18.31	Horizontal
1735.68	49.09	-16.12	32.97	60.80	-27.83	Horizontal
2169.60	52.03	-16.12	35.91	60.80	-24.89	Horizontal
2603.52	57.82	-16.12	41.70	60.80	-19.10	Horizontal
3037.44	56.66	-16.12	40.54	60.80	-20.26	Horizontal
3471.36	63.48	-16.12	47.36	60.80	-13.44	Horizontal
3905.28	50.89	-16.12	34.77	54.00	-19.23	Horizontal
4339.20	67.92	-16.12	51.80	54.00	-2.20	Horizontal

## 6.3 20dB Bandwidth

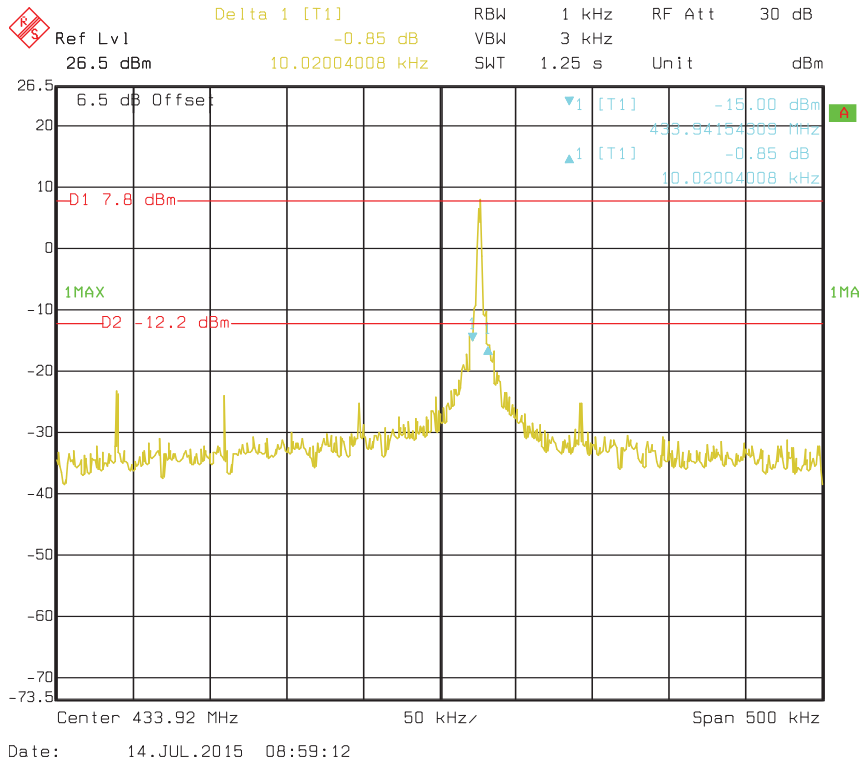
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2009
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 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 Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.</li> <li>4. Read 20dB bandwidth.</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 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

### Measurement Data

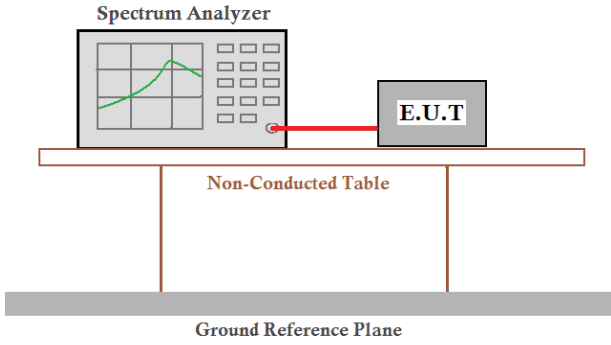
20dB bandwidth (MHz)	Limit (MHz)	Results
0.010	1.0848	Passed

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

Test plot as follows:



## 6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a) (1)
Test Method:	ANSI C63.4:2009
Receiver setup:	RBW=100kHz, VBW=300kHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Single scan the transmission, and read the transmission time.</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 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

### Measurement Data

Duration time (second)	Limit (second)	Result
4.21	<5.0	Pass



Test plot as follows:

