FCC REPORT

Applicant:	GUANGDONG STEELMATE SECURITY 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:	TPMS sensor
Model No.:	T022
Trade mark:	steelmate
FCC ID:	Q6WT022
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231(e)
Date of sample receipt:	08 May., 2014
Date of Test:	09 May., to 16 May., 2014
Date of report issue:	20 May., 2014
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.

2 Version

Version No.	Date	Description
00	*20 May., 2014*	*Original*

Prepared by: Shirley Li ***Date:*** *20 May., 2014*

Report Clerk

Reviewed by: Gavin Liu ***Date:*** *20 May., 2014*

Project Engineer

3 Contents

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (e)	Pass
Spurious emissions	15.231 (e) /15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (e)	Pass

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

5 General Information

5.1 Client Information

Applicant:	Guangdong Steelmate Security Co., Ltd.
Address of Applicant:	Steelmate Industrial Park, Heping Street, Dongfu Road, Dongfeng Town, Zhongshan City, Guangdong, P.R. China 528425
Manufacturer/ Factory:	Guangdong Steelmate Security 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:	TPMS sensor
Model No.:	T022
Trade mark:	steelmate
Operation Frequency:	433.92MHz
Channel numbers:	1
Modulation type:	FSK
Antenna Type:	PCB antenna
Antenna gain:	1dBi
Power supply:	DC 3V

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation. New battery used

Pre-Test Mode:

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)	83.42	83.51	83.28

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 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.

5.5 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

5.6 Test Instruments list

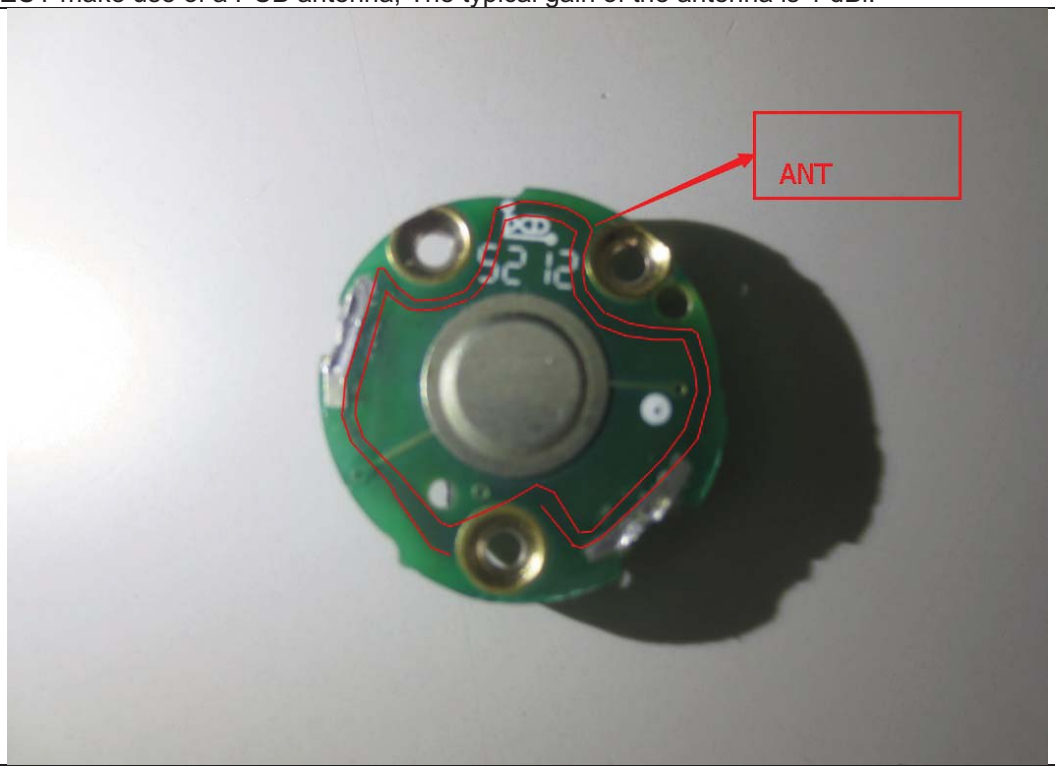
Radiated Emission:

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	May. 25 2013	May. 24 2014
2	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	May 25 2013	May 24 2014
3	Double - ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	May 25 2013	May 24 2014
4	Pre-amplifier	HP	8447D	CCIS0003	Apr. 01 2014	Mar. 31 2015
5	Pre-amplifier	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	June 09 2013	June 08 2014
6	Spectrum analyzer	Rohde & Schwarz	FSP	CCIS0023	May. 25 2013	May. 24 2014

6 Test results and Measurement Data

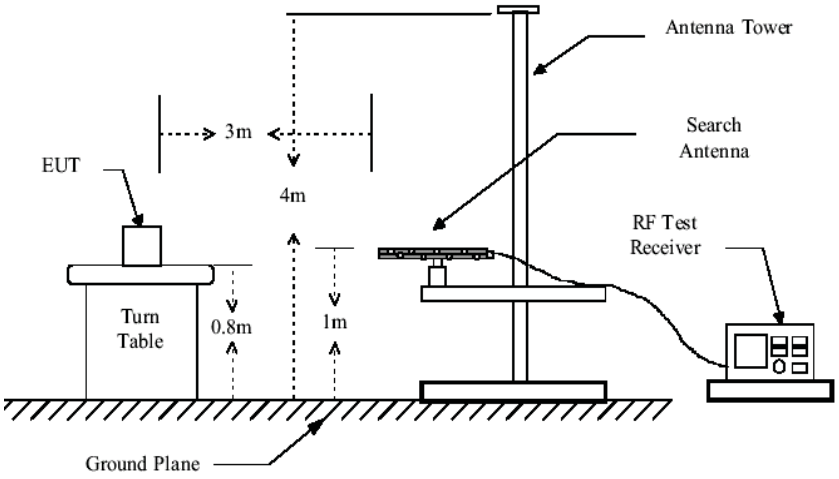
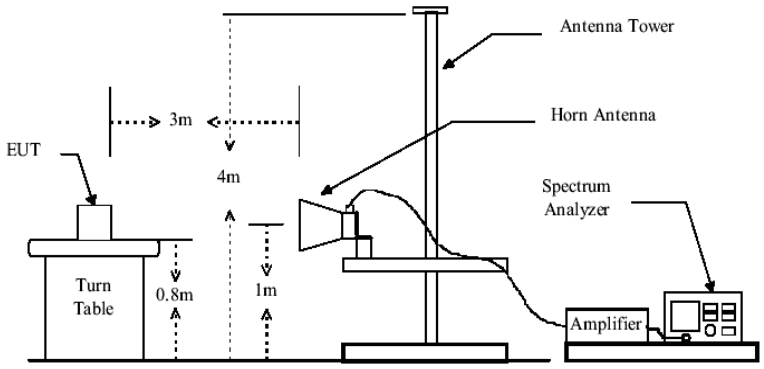
6.1 Antenna requirement

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 1 dBi.	



6.2 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.231(e) and 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4:2003</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 5000MHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td>Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(Field strength of the fundamental signal)</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">433.92 MHz</td><td>72.8</td><td>Average Value</td></tr>
<tr><td>92.8</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(Spurious Emissions)</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
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.
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.
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.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
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.
</td></tr>
</table>

Test setup:	Below 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Uncertainty:	4.88 dB
Test results:	Pass

Measurement Data

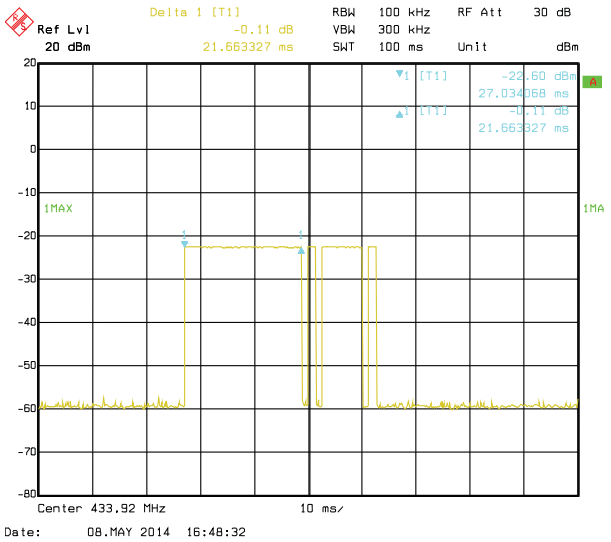
6.2.1 Field Strength Of The Fundamental Signal

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
433.92	45.66	26.40	3.16	0.00	75.22	92.80	-17.58	Horizontal
433.92	53.90	26.40	2.21	0.00	82.51	92.80	-10.29	Vertical

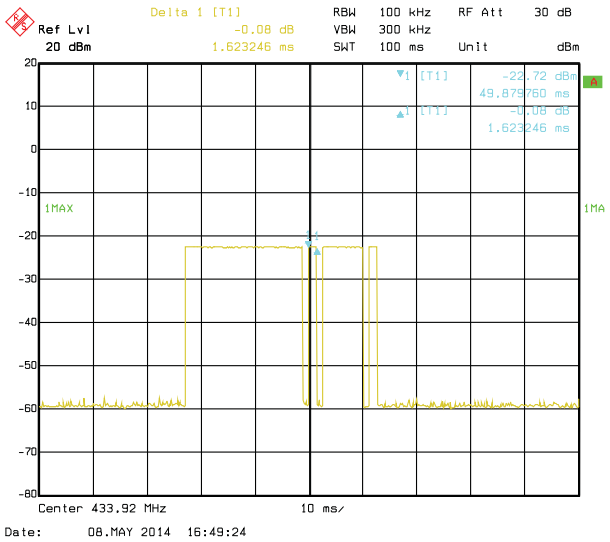
Average value:						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	75.22	-9.75	65.47	72.80	-10.68	Horizontal
433.92	82.51	-9.75	72.76	72.80	-0.04	Vertical

Average value:	
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle=on time/100 milliseconds or period, whichever is less
Test data:	Ton time = 1.62*2(ms)+7.64(ms)+21.66(ms)=32.54(ms)
	T period =100ms
	Duty cycle=32.54%
	Duty Cycle Factor =20 log(Duty cycle)= -9.75

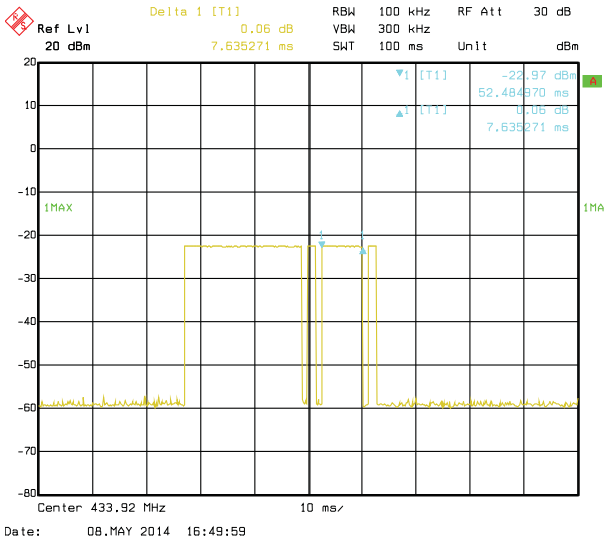
T on time slot-1:



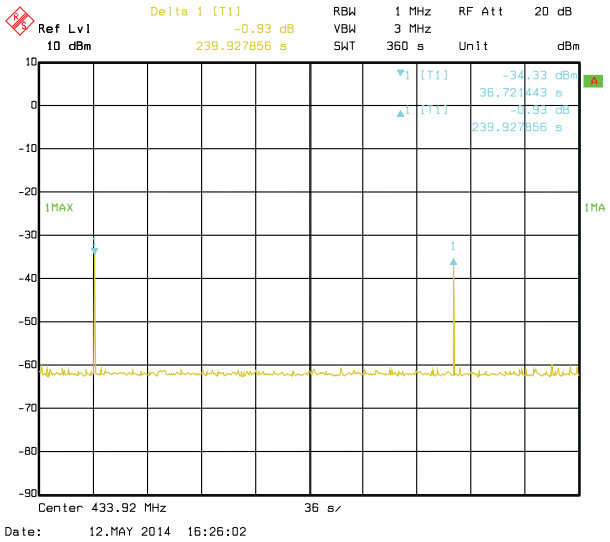
T on time slot-2:



T on time slot-3:



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
48.33	31.54	13.35	1.27	28.14	18.02	40.00	-21.98	QP	Horizontal
104.54	28.18	12.73	1.99	29.99	12.91	43.60	-30.69	QP	Horizontal
869.13	45.28	20.78	4.01	30.22	39.85	46.00	-6.15	QP	Horizontal
36.90	33.85	12.82	1.11	26.98	20.80	40.00	-19.20	QP	Vertical
106.39	33.57	12.59	2.01	29.96	18.21	43.60	-25.39	QP	Vertical
869.13	47.03	20.78	4.01	30.22	30.22	40.60	-4.40	QP	Vertical

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	47.88	25.40	3.72	40.94	36.06	72.80	-36.74	Horizontal
1735.68	50.31	25.52	4.71	40.94	39.60	72.80	-33.20	Horizontal
3905.28	--	--	--	--	--	--	--	Horizontal
1735.68	50.54	25.52	4.71	40.94	39.83	72.80	-32.97	Vertical
2169.60	49.83	26.24	4.87	40.78	40.16	72.80	-32.64	Vertical
3905.28	--	--	--	--	--	--	--	Vertical

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1301.76	36.06	-9.75	26.31	52.80	-26.49	Horizontal
1735.68	39.60	-9.75	29.85	52.80	-22.95	Horizontal
3905.28	--	--	--	--	--	Horizontal
1735.68	39.83	-9.75	30.08	52.80	-22.72	Vertical
2169.60	40.16	-9.75	30.41	52.80	-22.39	Vertical
3905.28	--	--	--	--	--	Vertical

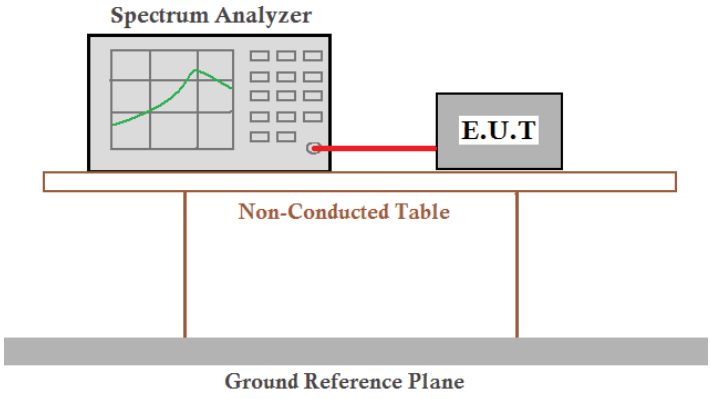
Remark:

Average Limit = Peak Limit-20dB

Average value=Peak value + Duty cycle factor

Duty cycle factor=20 log (Duty cycle)

6.3 20dB Bandwidth

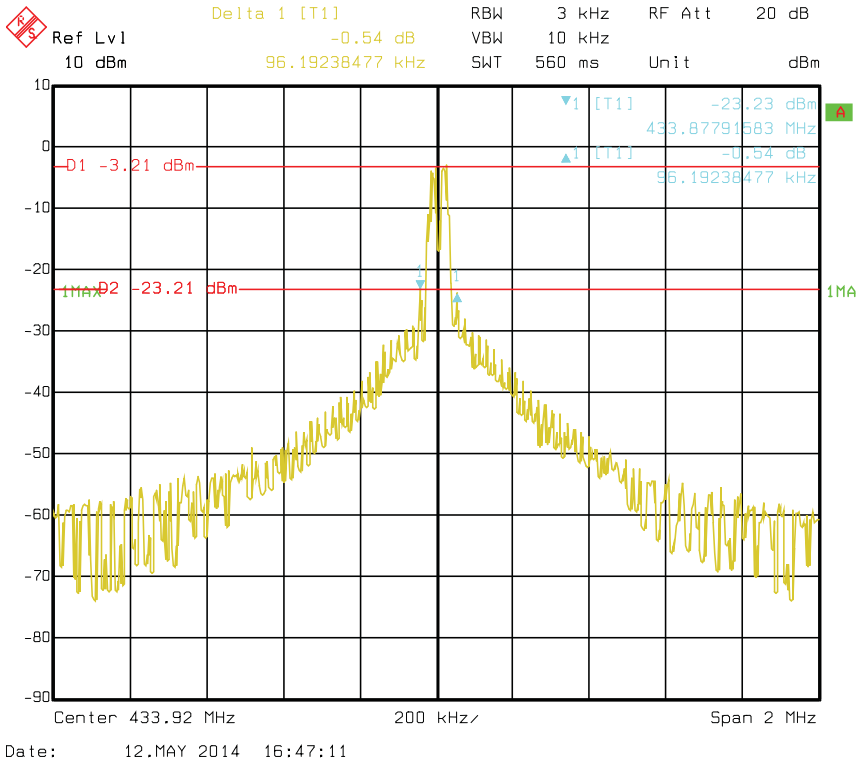
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=3kHz, VBW=10kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 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:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	
Test mode:	Refer to section 5.3 for details
Test Instruments:	Refer to section 5.7 for details
Test results:	Passed

Measurement Data

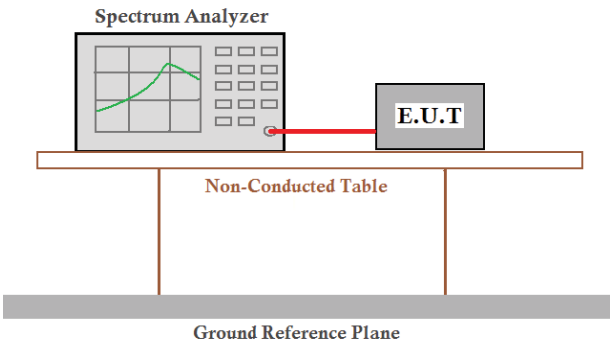
20dB bandwidth (MHz)	Limit (MHz)	Results
0.096	1.0848	Passed

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

Test plot as follows:



6.4 Dwell Time

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, span=0Hz, detector: Peak
Limit:	15.231(e)
Test mode:	Transmitting mode
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. 3. Single scan the transmitter, and read the transmission time.
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test results:	Passed

Measurement Data

Items	Test Data	Limit (second)	Result
Duration time	32.54ms	<1.0	Pass
Silent Time	240s(see plot at page 11)	30* Duration time(No less than 10 s)	Pass
Remark:	The manufacturer declared that the silent time is 4 minutes in normal working condition.		

Test plot as follows: