

FCC REPORT

Applicant: Hobbico Inc

Address of Applicant: 2904 Research Road Champaign, Illinois, USA

Equipment Under Test (EUT)

Product Name: 2.4G Transmitter

Model No.: TTX200

Trade mark: TACTIC

FCC ID: IYFTTX200

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 17 May, 2016

Date of Test: 17 May, to 26 Jul, 2016

Date of report issued: 27 Jul, 2016

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.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

Version No.	Date	Description
00	27 Jul, 2016	Original

Prepared by:

Carey Chen

Test Engineer

Date:

27 Jul, 2016

Reviewed by:

Wimer Zhang

Project Engineer

Date:

27 Jul, 2016

3 Contents

Page

1	COVER PAGE	1
2	VERSION	2
3	CONTENTS	3
4	TEST SUMMARY	4
5	GENERAL INFORMATION	5
5.1	CLIENT INFORMATION	5
5.2	GENERAL DESCRIPTION OF E.U.T.	5
5.3	TEST MODE	6
5.4	LABORATORY FACILITY	6
5.5	LABORATORY LOCATION	6
5.6	TEST INSTRUMENTS LIST.....	7
6	TEST RESULTS AND MEASUREMENT DATA	8
6.1	ANTENNA REQUIREMENT	8
6.2	CONDUCTED OUTPUT POWER.....	9
6.3	20dB OCCUPY BANDWIDTH.....	11
6.4	CARRIER FREQUENCIES SEPARATION.....	13
6.5	HOPPING CHANNEL NUMBER	15
6.6	DWELL TIME.....	16
6.7	PSEUDORANDOM FREQUENCY HOPPING SEQUENCE.....	18
6.8	BAND EDGE.....	19
6.8.1	Conducted Emission Method.....	19
6.8.2	Radiated Emission Method	21
6.9	SPURIOUS EMISSION	26
6.9.1	Conducted Emission Method.....	26
6.9.2	Radiated Emission Method	29
7	TEST SETUP PHOTO	34
8	EUT CONSTRUCTIONAL DETAILS	35

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

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

5 General Information

5.1 Client Information

Applicant:	Hobbico, Inc.
Address of Applicant:	2904 Research Road Champaign, Illinois, USA
Manufacturer:	Hobbico, Inc.
Address of Manufacturer:	2904 Research Road Champaign, Illinois, USA

5.2 General Description of E.U.T.

Product Name:	2.4G Transmitter
Model No.:	TTX200
Operation Frequency:	2403MHz~2480MHz
Transfer rate:	1 Mbits/s
Number of channel:	15
Modulation type:	GFSK
Modulation technology:	FHSS
Antenna Type:	PCB Antenna
Antenna gain:	2 dBi
Power supply:	DC 6V(4* 'AA' Battery)

Channel List			
Channel	Frequency	Channel	Frequency
0	2403MHz	8	2447MHz
1	2408MHz	9	2452MHz
2	2414MHz	10	2458MHz
3	2419MHz	11	2463MHz
4	2425MHz	12	2469MHz
5	2430MHz	13	2474MHz
6	2436MHz	14	2480MHz
7	2441MHz		
Remark: Channel 0, 7 &14 selected for test.			

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation
<p>The sample was placed 0.8m above the ground plane of 3m chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working with a fresh battery, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

5.4 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● 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

<p>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</p>

5.6 Test Instruments list

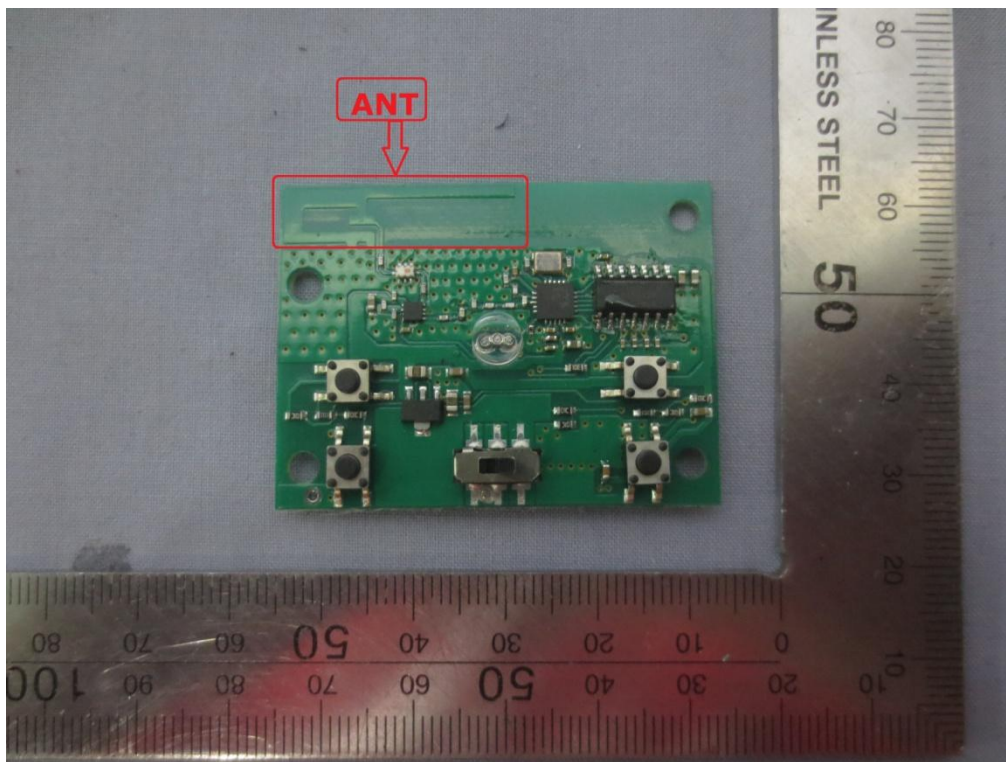
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	3m SAC	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	08-23-2014	08-22-2017
2	BiConiLog Antenna	SCHWARZBECK	VULB9163	CCIS0005	03-25-2016	03-25-2017
3	Horn Antenna	SCHWARZBECK	BBHA9120D	CCIS0006	03-25-2016	03-25-2017
4	Pre-amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	04-01-2016	03-31-2017
5	Pre-amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	04-01-2016	03-31-2017
6	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	04-01-2016	03-31-2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	04-01-2016	03-31-2017
8	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP30	CCIS0023	03-28-2016	03-28-2017
9	EMI Test Receiver	Rohde & Schwarz	ESRP7	CCIS0167	03-28-2016	03-28-2017
10	Loop antenna	Laplace instrument	RF300	EMC0701	04-01-2016	03-31-2017
11	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	Shielding Room	ZhongShuo Electron	11.0(L)x4.0(W)x3.0(H)	CCIS0061	08-23-2014	08-22-2017
2	EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	03-24-2016	03-24-2017
3	LISN	CHASE	MN2050D	CCIS0074	03-26-2016	03-26-2017
4	Coaxial Cable	CCIS	N/A	CCIS0086	04-01-2016	03-31-2017
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

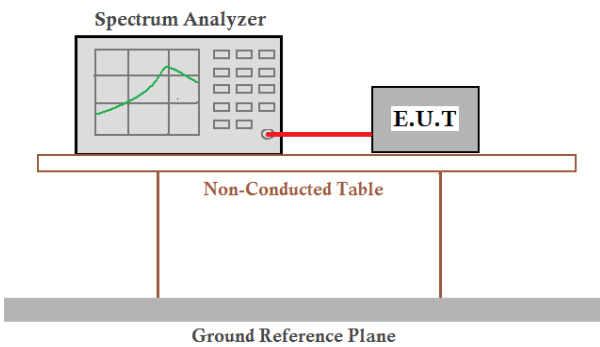
6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p><i>15.203 requirement:</i> <i>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.</i></p> <p><i>15.247(c) (1)(i) requirement:</i> <i>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</i></p>	
E.U.T Antenna:	
<p><i>The EUT antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 2 dBi.</i></p>	



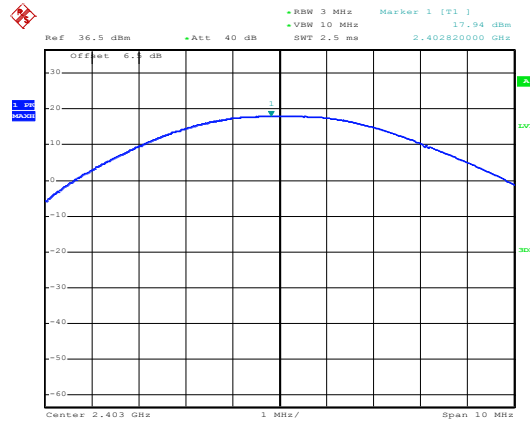
6.2 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=1MHz, VBW=3MHz, Detector=Peak (If 20dB BW ≤ 1 MHz) RBW=3MHz, VBW=10MHz, Detector=Peak (If 20dB BW > 1 MHz and < 3MHz)
Limit:	125 mW(21 dBm)
Test setup:	 <p>The diagram shows a Spectrum Analyzer on the left and an E.U.T. (Equipment Under Test) on the right. They are connected by a red cable. Both are placed on a table labeled 'Non-Conducted Table'. Below the table is a 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data

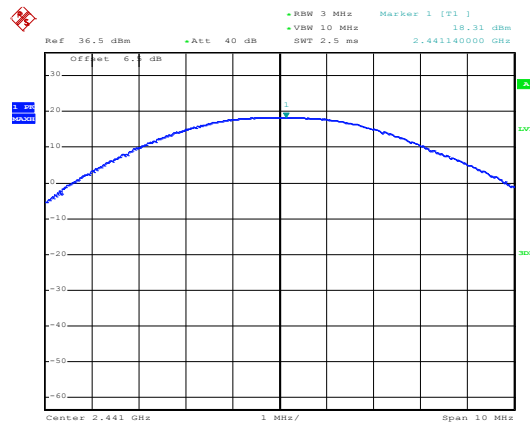
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	17.94	21.00	Pass
Middle	18.31	21.00	Pass
Highest	18.49	21.00	Pass

Test plot as follows:



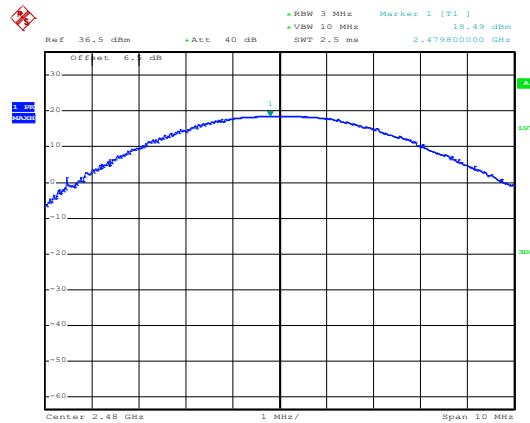
Date: 26.JUL.2016 17:35:02

Lowest channel



Date: 26.JUL.2016 17:36:54

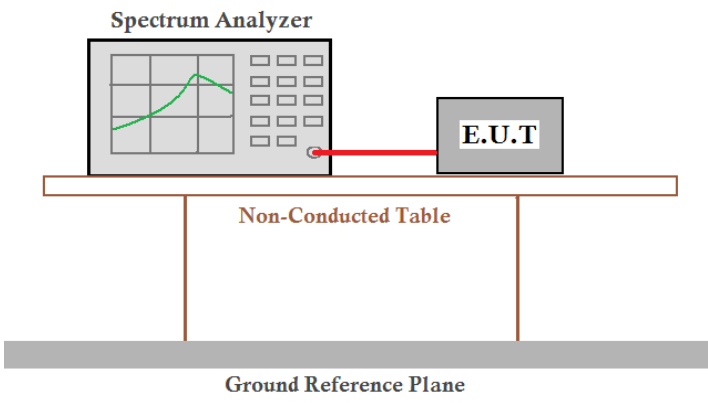
Middle channel



Date: 26.JUL.2016 17:05:25

Highest channel

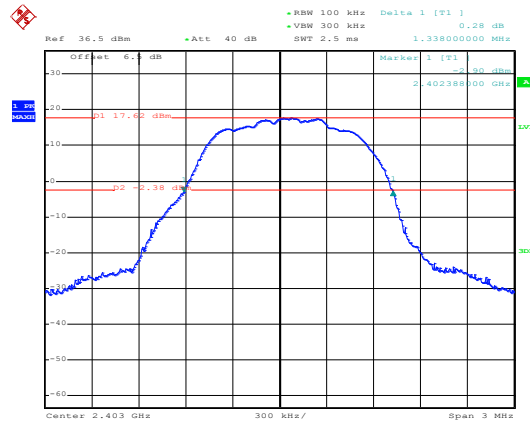
6.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=30 kHz, VBW=100 kHz, detector=Peak
Limit:	NA
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 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data:

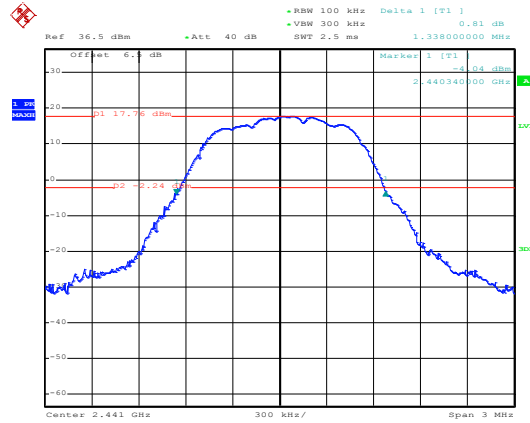
Test channel	20dB Occupy Bandwidth (kHz)
Lowest	1338
Middle	1338
Highest	1332

Test plot as follows:



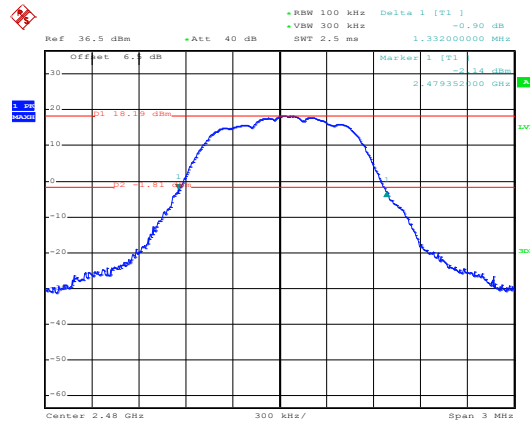
Date: 26.JUL.2016 21:24:28

Lowest channel



Date: 26.JUL.2016 21:25:03

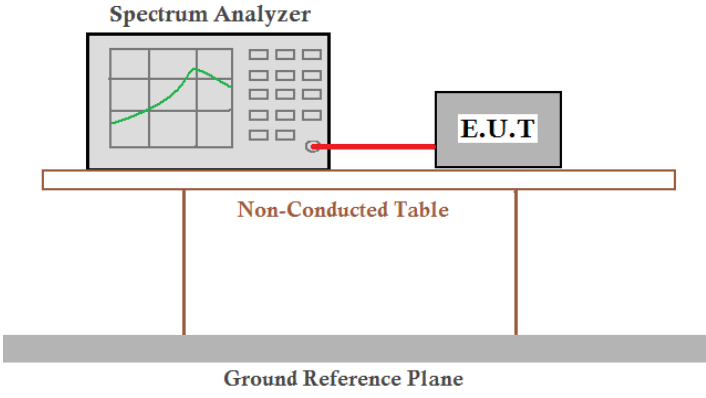
Middle channel



Date: 26.JUL.2016 21:26:07

Highest channel

6.4 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=100 kHz, VBW=300 kHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	 <p>The diagram shows a Spectrum Analyzer on the left and an E.U.T. on the right, connected by a red cable. They are both on a table labeled 'Non-Conducted Table'. Below the table is a 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

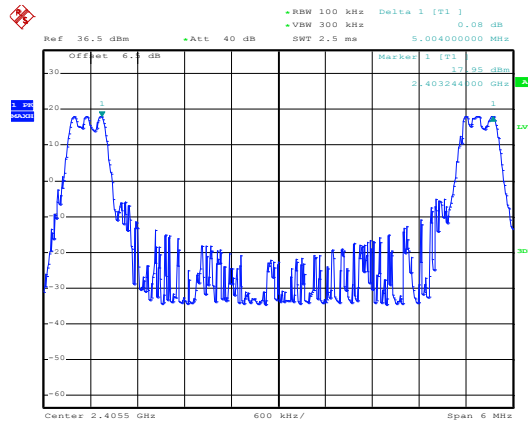
Measurement Data:

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	5004	892.00	Pass
Middle	6020	892.00	Pass
Highest	6020	892.00	Pass

Note: According to section 6.3

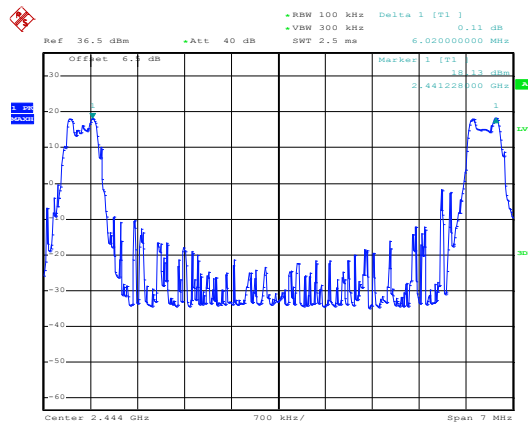
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	1338	892.00

Test plot as follows:



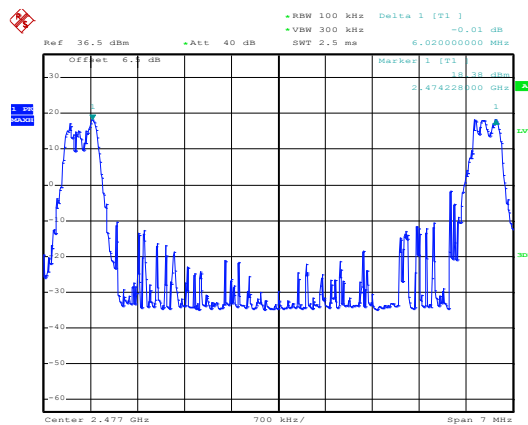
Date: 26.JUL.2016 17:16:53

Lowest channel



Date: 26.JUL.2016 17:34:01

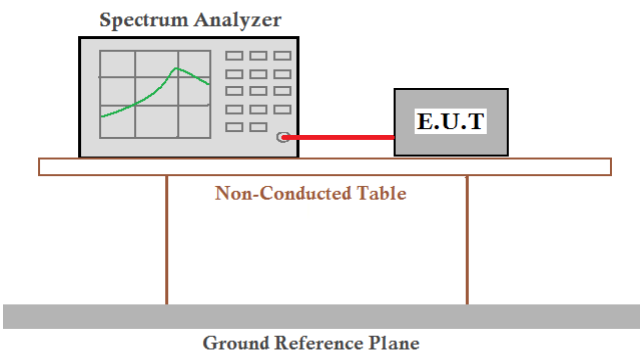
Middle channel



Date: 26.JUL.2016 17:32:51

Highest channel

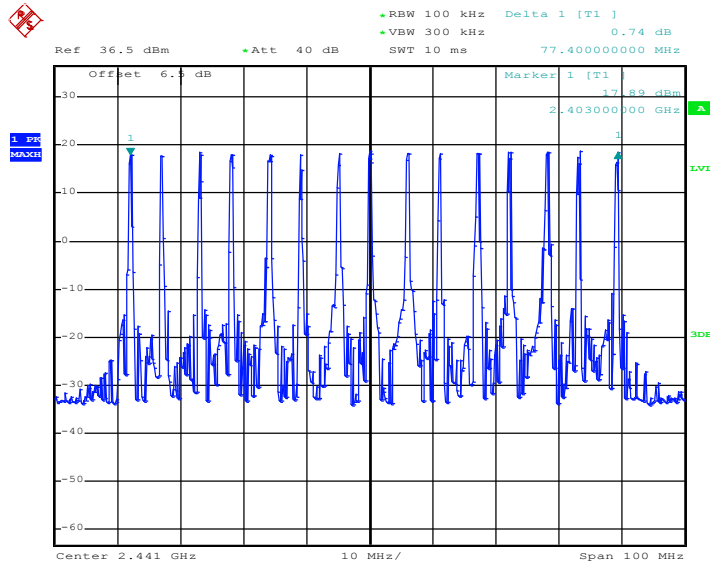
6.5 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data:

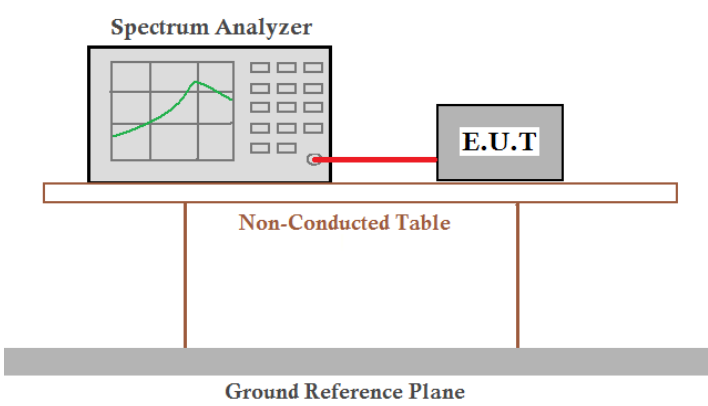
Hopping channel numbers	Limit	Result
15	≥15	Pass

Test plot as follows:



Date: 26.JUL.2016 17:14:32

6.6 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Detector=Peak
Limit:	0.4 Second
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:	Hopping mode
Test results:	Pass

Measurement Data (Worse case)

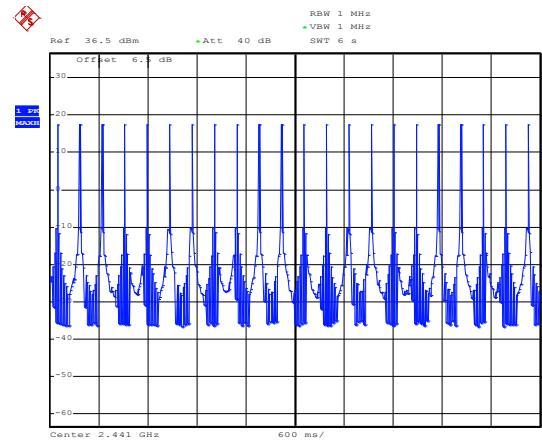
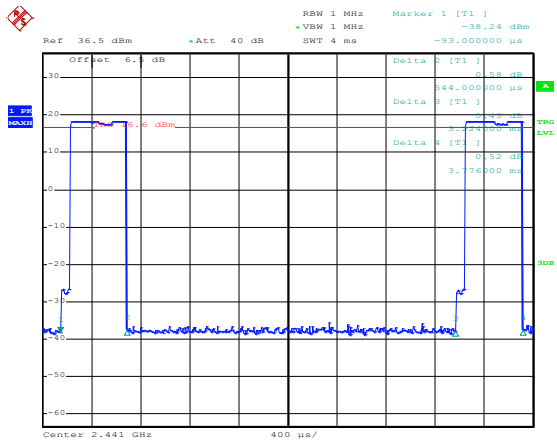
Hopping numbers	Dwell time in one period (Second)	Limit (Second)	Result
22	0.048224	0.4	Pass

Remark:

The test period: $T = 0.4 \text{ Second/Channel} \times 15 \text{ Channel} = 6 \text{ s}$

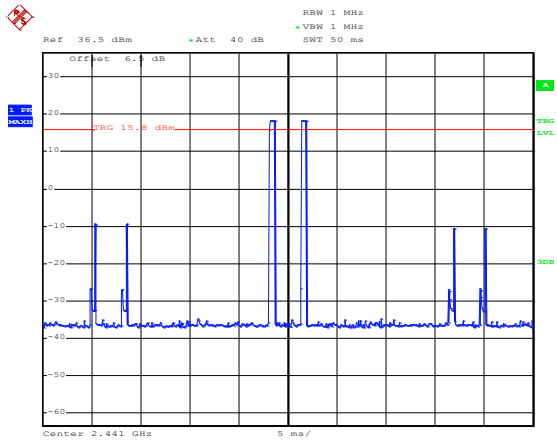
Test plot as follows:

(0.552+0.544) X2X22=48.224ms



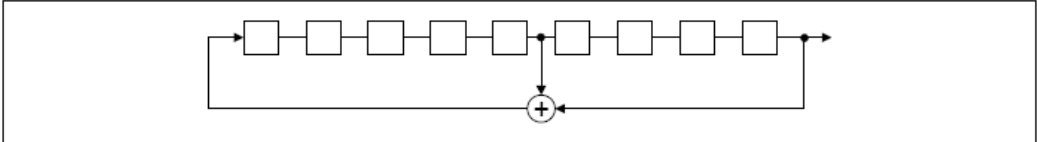
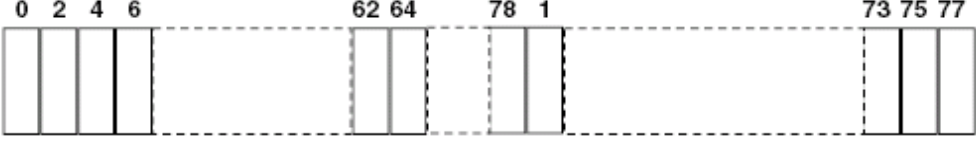
Date: 26.JUL.2016 15:31:59

Date: 26.JUL.2016 17:39:21



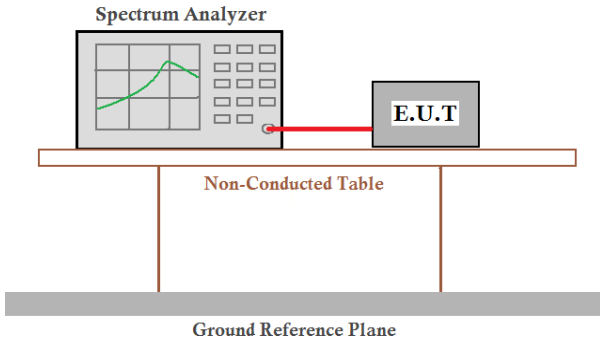
Date: 26.JUL.2016 15:36:30

6.7 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:
<p>Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.</p> <p>Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</p>	
EUT Pseudorandom Frequency Hopping Sequence	
<p>The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.</p> <ul style="list-style-type: none"> • Number of shift register stages: 9 • Length of pseudo-random sequence: $2^9 - 1 = 511$ bits • Longest sequence of zeros: 8 (non-inverted signal) 	
	
<p><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p>	
<p>An example of Pseudorandom Frequency Hopping Sequence as follow:</p>	
	
<p>Each frequency used equally on the average by each transmitter.</p> <p>The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.</p>	

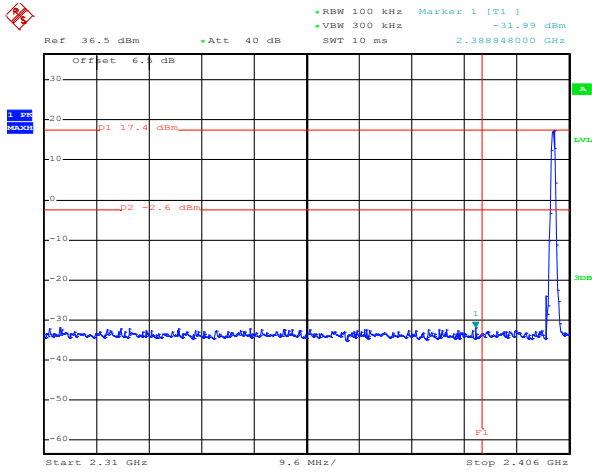
6.8 Band Edge

6.8.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and DA00-705
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
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 the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode and hopping mode
Test results:	Pass

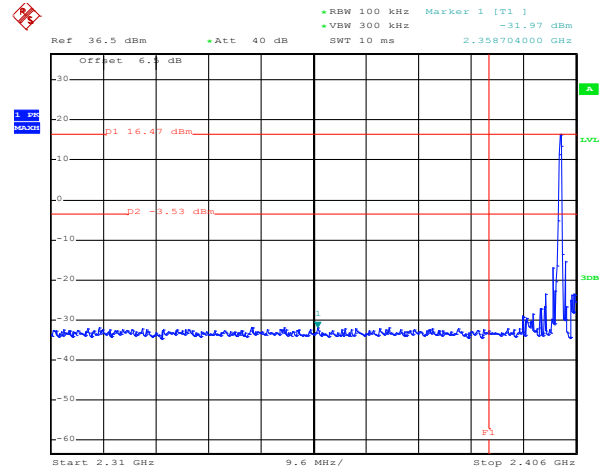
Test plot as follows:

Lowest Channel



Date: 26.JUL.2016 15:43:47

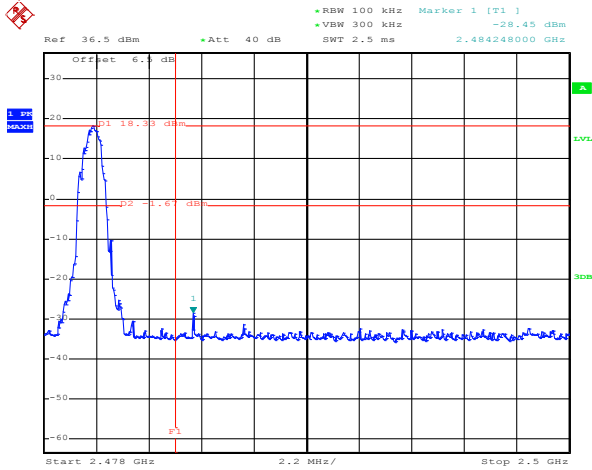
No-hopping mode



Date: 26.JUL.2016 15:47:07

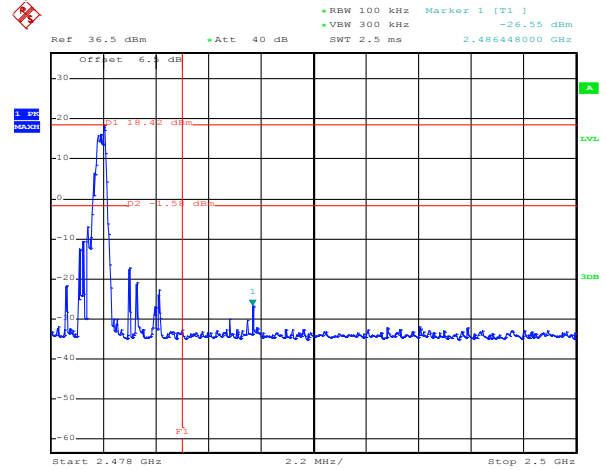
Hopping mode

Highest Channel



Date: 26.JUL.2016 17:12:03

No-hopping mode



Date: 26.JUL.2016 17:11:07

Hopping mode

6.8.2 Radiated Emission Method

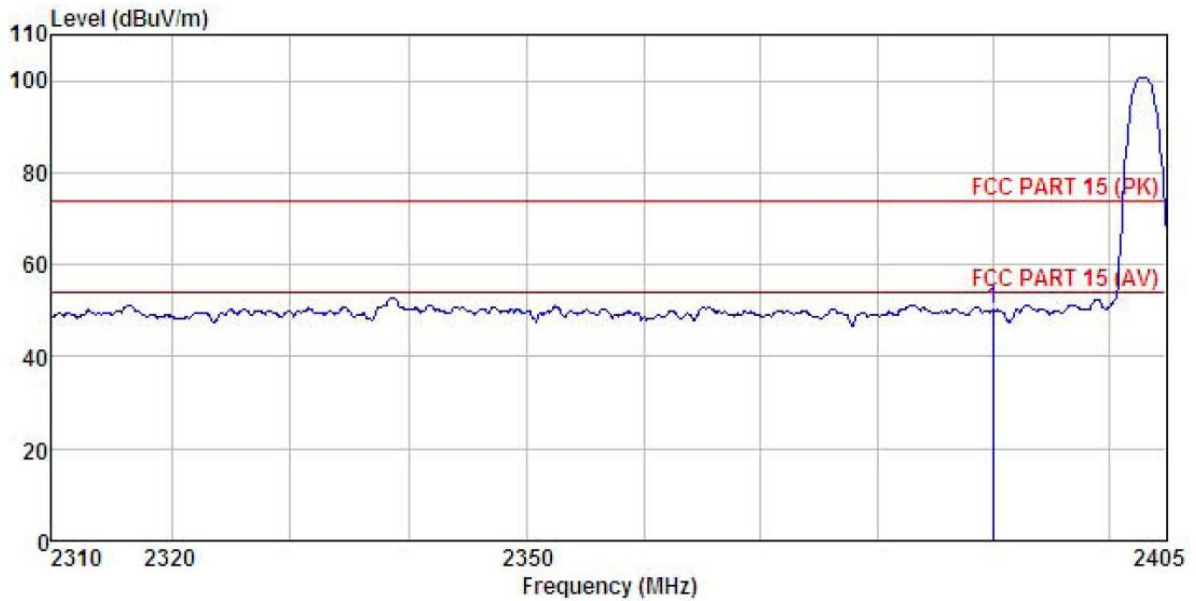
Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.4: 2014				
Test Frequency Range:	2.3GHz to 2.5GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:					
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 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. 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. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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. 				
Test Instruments:	Refer to section 5.7 for details				
Test mode:	Non-hopping mode				
Test results:	Passed				

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.

Test channel: Lowest

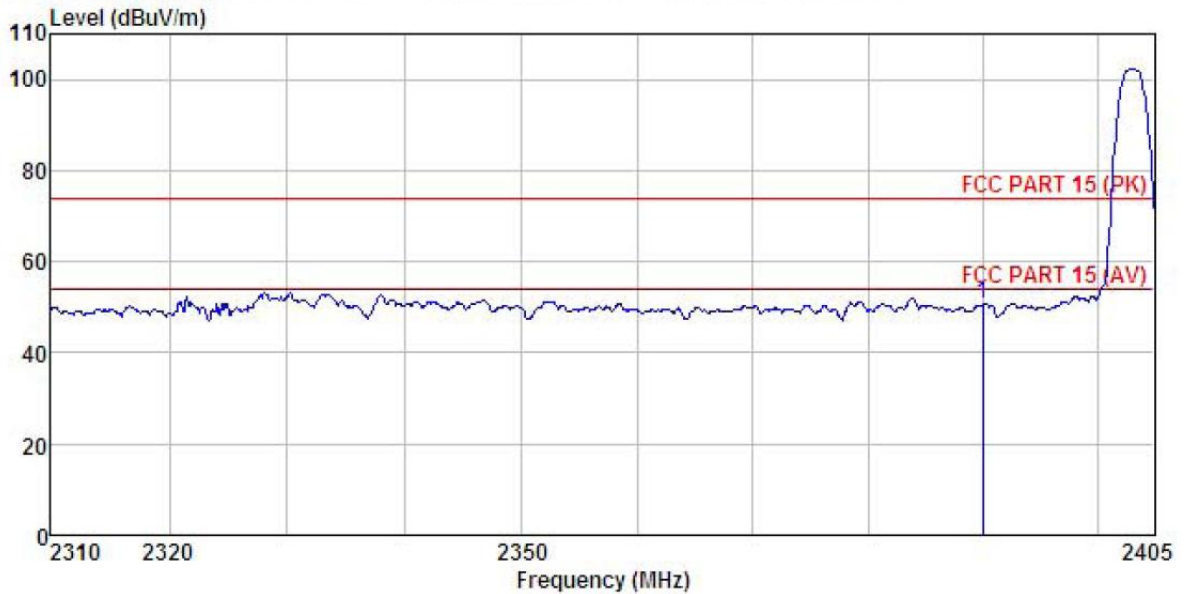
Horizontal:



Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18) HORIZONTAL
 EUT : 2.4G Transmitter
 Model : ITX200
 Test mode : 2403 mode
 Power Rating : DC 6V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 Remark :

Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 2390.000	19.83	23.68	6.63	0.00	50.14	74.00	-23.86	Peak

Vertical:

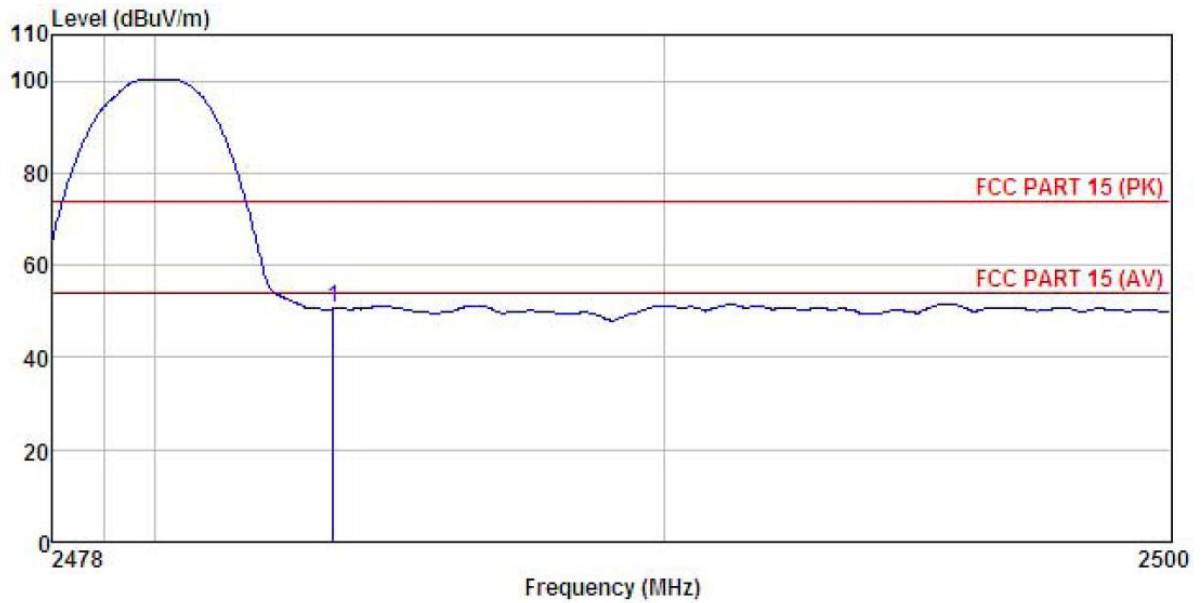


Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18) VERTICAL
 EUT : 2.4G Transmitter
 Model : TTX200
 Test mode : 2403 mode
 Power Rating : DC 6V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 2390.000	20.36	23.68	6.63	0.00	50.67	74.00	-23.33 Peak

Test channel: Highest

Horizontal:

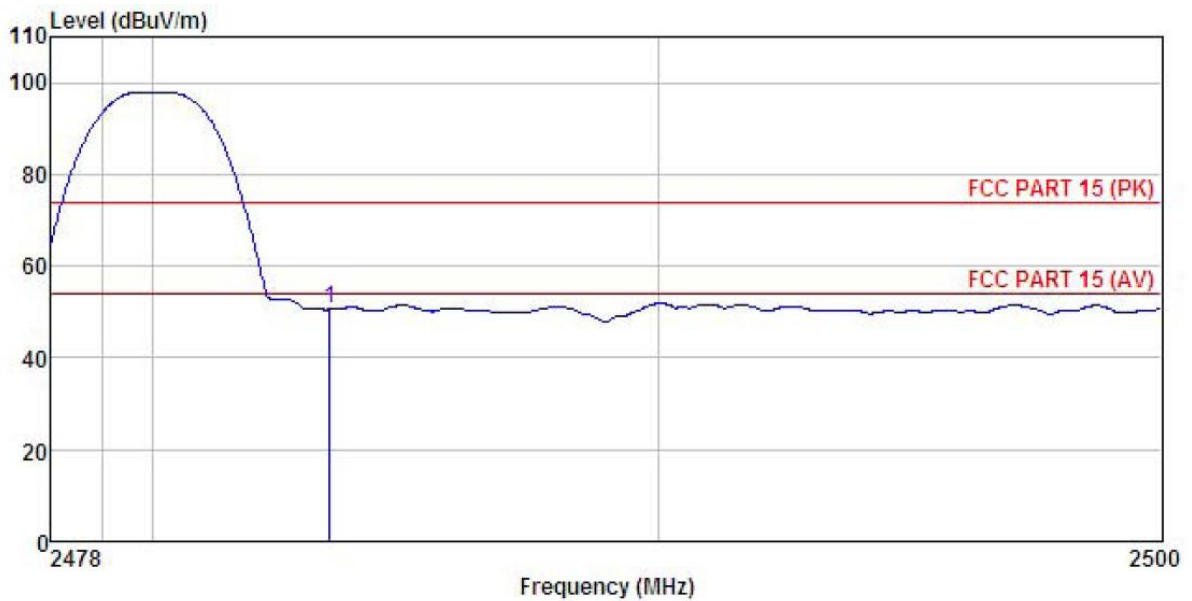


```

Site       : 3m chamber
Condition  : FCC PART 15 (PK) 3m BBHA9120(1G18) HORIZONTAL
EUT       : 2.4G Transmitter
Model     : TTX200
Test mode : 2480 mode
Power Rating : DC 6V
Environment : Temp:25.5°C Humi:55%
Test Engineer: Carey
Remark    :
    
```

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 2483.500	20.06	23.70	6.85	0.00	50.61	74.00	-23.39 Peak

Vertical:

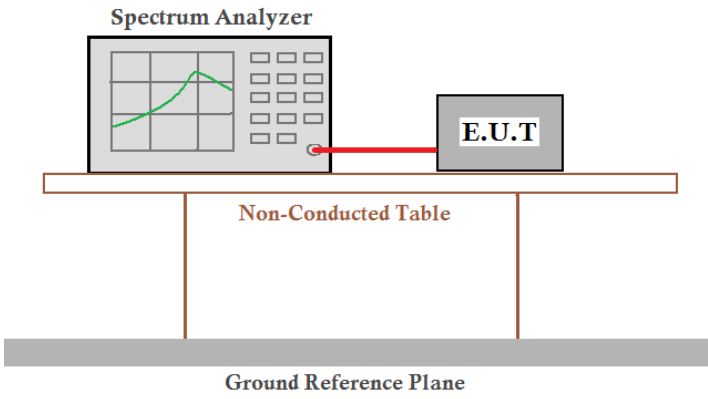


Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18) VERTICAL
 EUT : 2.4G Transmitter
 Model : TTX200
 Test mode : 2480 mode
 Power Rating : DC 6W
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 Remark :

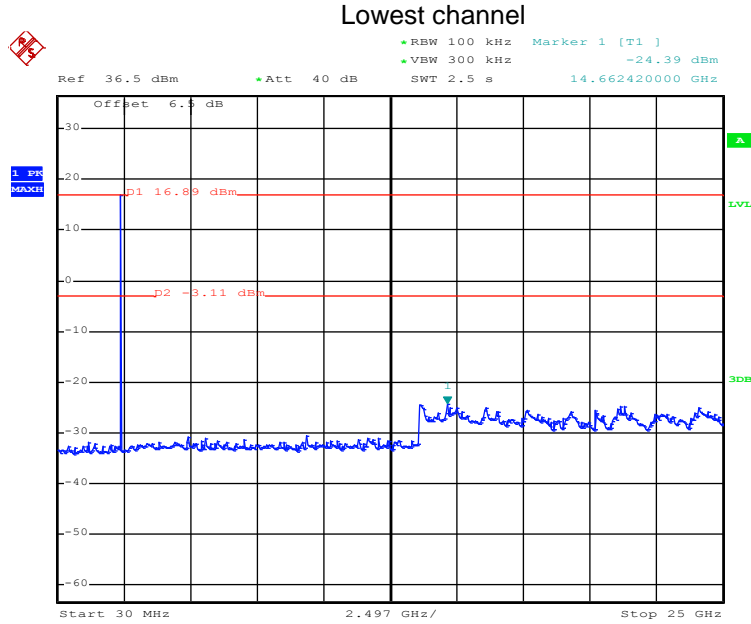
	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2483.500	20.04	23.70	6.85	0.00	50.59	74.00 -23.41 Peak

6.9 Spurious Emission

6.9.1 Conducted Emission Method

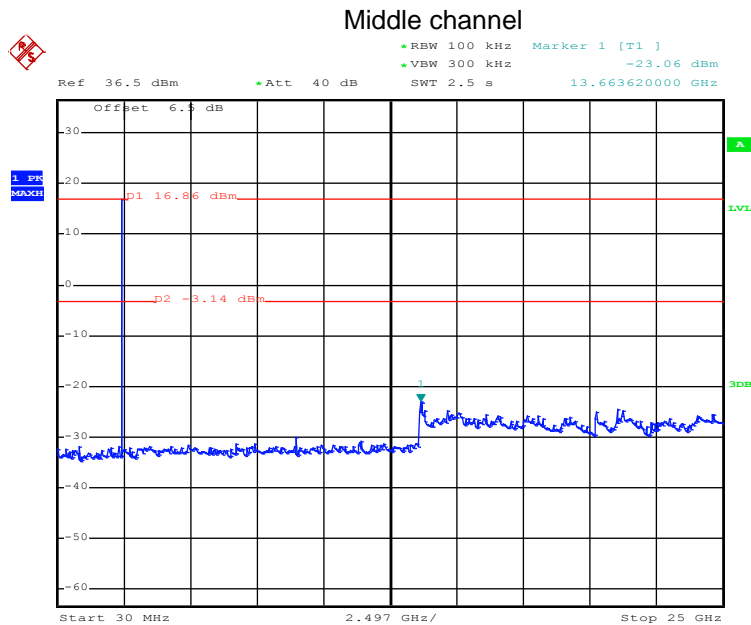
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and DA00-705
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
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 sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Test plot as follows:



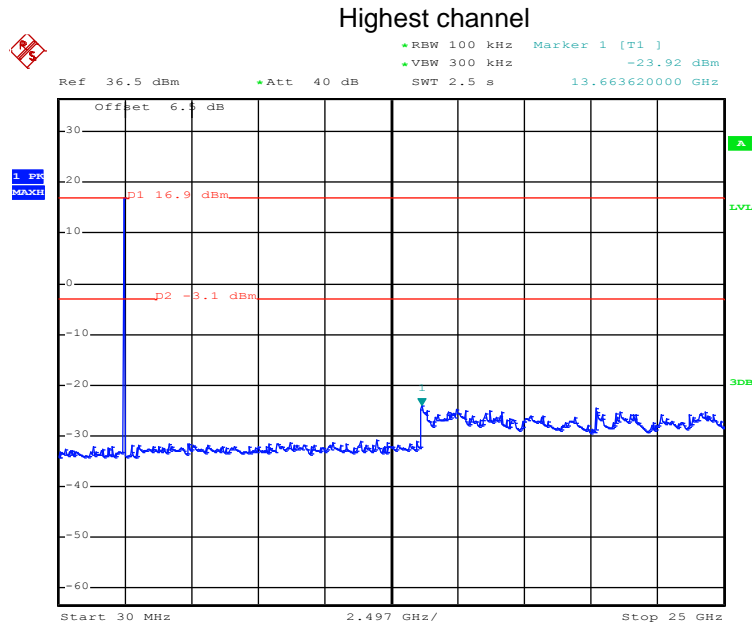
Date: 26.JUL.2016 15:51:36

30MHz~25GHz



Date: 26.JUL.2016 15:52:14

30MHz~25GHz



Date: 26.JUL.2016 15:50:49

30MHz~25GHz

6.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	9 kHz to 25 GHz				
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
Peak		1MHz	10Hz	Average Value	
Limit:	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			
Test setup:	Below 1GHz				
Test setup:	Above 1GHz				

Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation. 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. 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. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

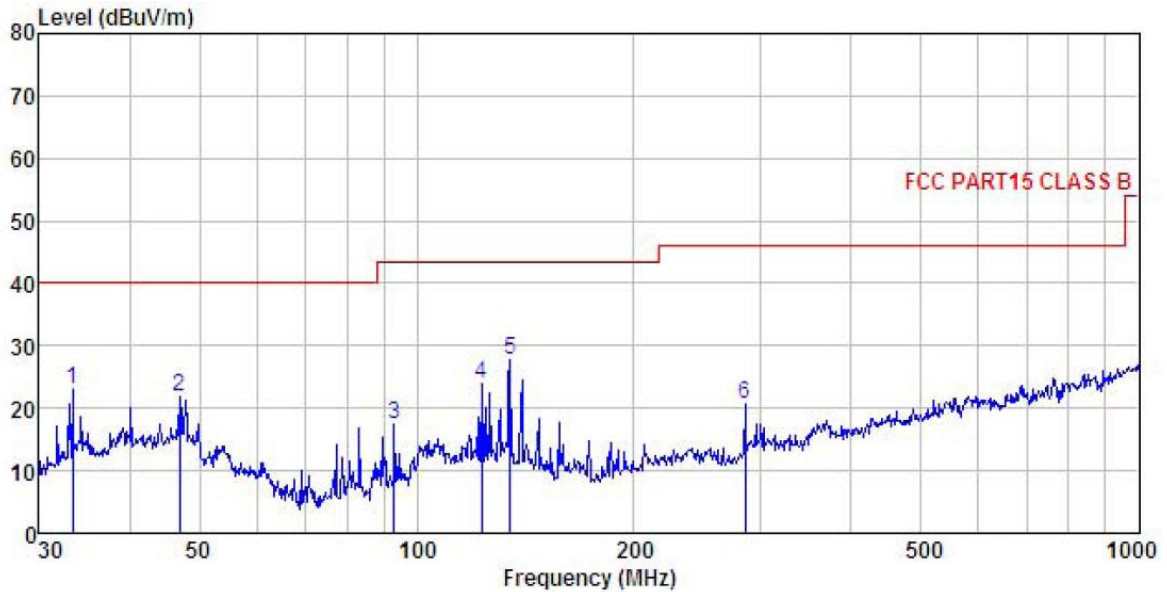
Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.
2. 9 kHz to 30 MHz is noise floor, so only shows the data of above 30MHz in this report.

Measurement data:

Below 1GHz

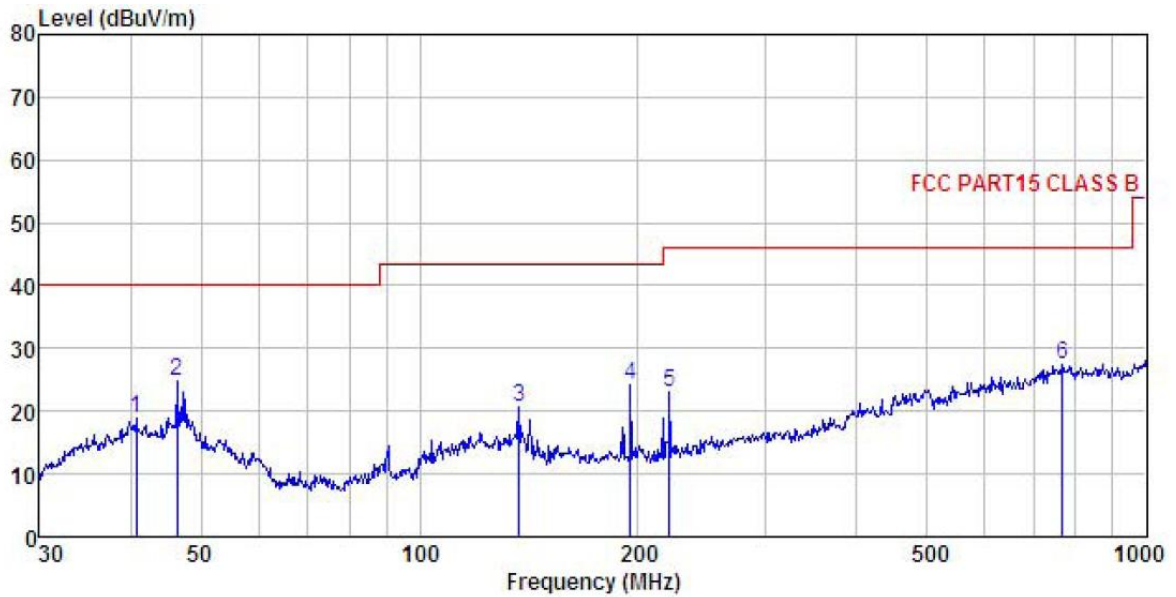
Vertical:



Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) VERTICAL
 EUT : 2.4G Transmitter
 Model : TTX200
 Test mode : ON mode
 Power Rating : DC 6V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	33.328	37.96	13.95	0.98	29.96	22.93	40.00 -17.07 QP
2	46.995	33.77	16.71	1.27	29.84	21.91	40.00 -18.09 QP
3	93.113	36.55	8.45	2.02	29.56	17.46	43.50 -26.04 QP
4	122.834	39.22	11.95	2.20	29.37	24.00	43.50 -19.50 QP
5	134.559	42.72	12.02	2.34	29.30	27.78	43.50 -15.72 QP
6	284.977	33.95	12.25	2.90	28.48	20.62	46.00 -25.38 QP

Horizontal:



Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) HORIZONTAL
 EUT : 2.4G Transmitter
 Model : TTX200
 Test mode : ON mode
 Power Rating : DC 6V
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 Remark :

	ReadAntenna	Cable	Preamp		Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	40.702	30.47	17.01	1.22	29.89	18.81	40.00 -21.19 QP
2	46.340	36.41	17.08	1.28	29.85	24.92	40.00 -15.08 QP
3	136.939	35.72	11.88	2.36	29.29	20.67	43.50 -22.83 QP
4	195.137	40.22	9.97	2.84	28.86	24.17	43.50 -19.33 QP
5	220.617	37.26	11.50	2.85	28.70	22.91	46.00 -23.09 QP
6	766.057	30.97	20.47	4.36	28.39	27.41	46.00 -18.59 QP

Above 1GHz:

Test channel:		Lowest			Level:		Peak	
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
4806.00	45.63	35.99	10.57	40.24	51.95	74.00	-22.05	Vertical
4806.00	46.01	35.99	10.57	40.24	52.33	74.00	-21.67	Horizontal

Test channel:		Middle			Level:		Peak	
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
4882.00	45.66	36.38	10.66	40.15	52.55	74.00	-21.45	Vertical
4882.00	44.31	36.38	10.66	40.15	51.20	74.00	-22.80	Horizontal

Test channel:		Highest			Level:		Peak	
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
4960.00	43.77	36.71	10.73	40.03	51.18	74.00	-22.82	Vertical
4960.00	43.68	36.71	10.73	40.03	51.09	74.00	-22.91	Horizontal