APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Hobbico Inc

TTX850 8-Channel 2.4GHz Transmitter
Model No.: TACJ2850

FCC ID: IYFTTX850

Prepared for	:	Hobbico Inc
Address	:	2904 Research Road Champaign, IL USA 61821
Prepared by	:	ACCURATE TECHNOLOGY CO., LTD
Address	:	F1, Bldg. A, Chan Yuan New Material Port, Keyuan Rd. Science & Industry Park, Nan Shan, Shenzhen, Guangdong P.R. China Tel: (0755) 26503290 Fax: (0755) 26503396

Report Number	:	ATE20140296
Date of Test	:	Mar 13, 2014- Mar 30, 2014
Date of Report	:	Mar 30, 2014

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Description Page

Test Report Certification

Applicant& address	:	Hobbico Inc 2904 Research Road Champaign, IL USA 61821
Manufacturer& address	:	Shanghai Nine Eagles Electronic Technology Co.,Ltd No.818, FengRao Road, Malu town, Jiading District, Shanghai, China
Product	:	TTX850 8-Channel 2.4GHz Transmitter
Model No.	:	TACJ2850
Trade name	:	TACTIC

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.4: 2009

The device described above is tested by ACCURATE TECHNOLOGY CO. LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and ACCURATE TECHNOLOGY CO. LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of ACCURATE TECHNOLOGY CO. LTD.

Date of Test : Mar 13, 2014- Mar 30, 2014

Prepared by : Tim Zhang
(Tim.zhang, Engineer)

Approved & Authorized Signer : Sean Liu
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

The submitted sample is a TTX850 8-Channel 2.4GHz Transmitter.
The sample is powered by DC 6.0V (Powered by battery).

		TTX850 8-Channel 2.4GHz Transmitter
Frequency Range	:	2.403-2.479GHz
Channel Spacing	:	1MHz
Number of Channels	:	77
Modulation Type	:	GFSK
Type of Antenna	:	Integral Antenna
Max antenna gain	:	2.0dBi
Power Supply	:	DC 6.0V(Powered by battery)

1.2. Special Accessory and Auxiliary Equipment

N/A

1.3. Description of Test Facility

EMC Lab : Accredited by TUV Rheinland Shenzhen

Listed by FCC
The Registration Number is 752051

Listed by Industry Canada
The Registration Number is 5077A-2

Accredited by China National Accreditation Committee for Laboratories
The Certificate Registration Number is L3193

Name of Firm : ACCURATE TECHNOLOGY CO. LTD
Site Location : F1, Bldg. A, Changyuan New Material Port, Keyuan Rd. Science & Industry Park, Nanshan, Shenzhen, Guangdong P.R. China

1.4. 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. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 11, 2014	Jan. 10, 2015
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 11, 2014	Jan. 10, 2015
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 11, 2014	Jan. 10, 2015
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 11, 2014	Jan. 10, 2015
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 15, 2014	Jan. 14, 2015
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 15, 2014	Jan. 14, 2015
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 15, 2014	Jan. 14, 2015
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 15, 2014	Jan. 14, 2015
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 11, 2014	Jan. 10, 2015
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 11, 2014	Jan. 10, 2015
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 11, 2014	Jan. 10, 2015
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 11, 2014	Jan. 10, 2015

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2403MHz
Middle Channel: 2442MHz
High Channel: 2479MHz

3.2.Configuration and peripherals

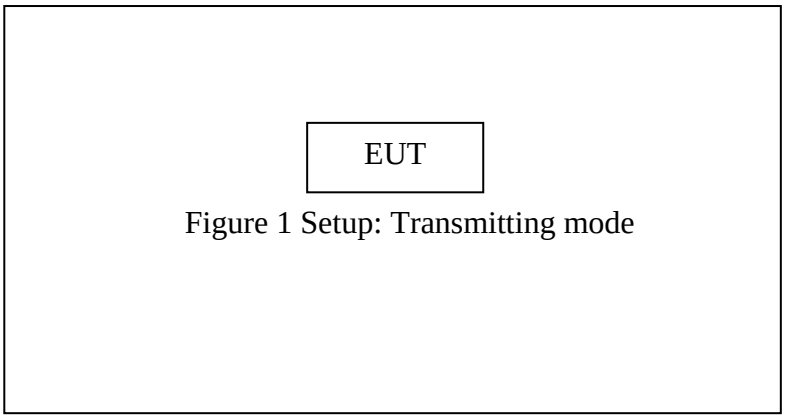


Figure 1 Setup: Transmitting mode

4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Power Line Conducted Emission	N/A
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
Section 15.247(a)(1)	Channel Separation Test	Compliant
Section 15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.205 Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

Remark: “N/A” means “Not applicable”.

5. POWER LINE CONDUCTED MEASUREMENT

5.1.Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies. NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

5.2.Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.3.Test Procedure

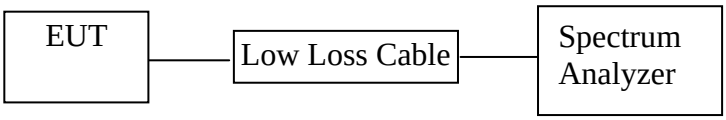
The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both 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: 2009 on Conducted Emission Measurement.
The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

5.4.Power Line Conducted Emission Measurement Results

Not applicable

6. 20DB BANDWIDTH MEASUREMENT

6.1.Block Diagram of Test Setup



6.2.The Requirement For Section 15.247(a)(1)

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 125mW.

6.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz,2479MHz TX frequency to transmit.

6.5.Test Procedure

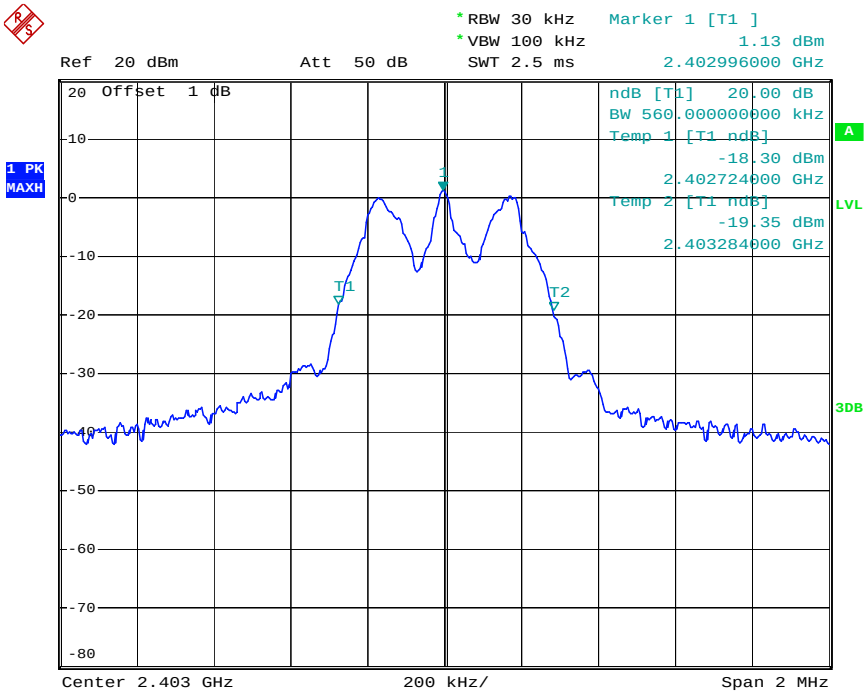
1. Set resolution bandwidth (RBW) = 30 kHz.
2. Set the video bandwidth (VBW) = 100 kHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

6.6.Test Result

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	2403	0.560
40	2442	0.572
77	2479	0.556

The spectrum analyzer plots are attached as below.

Low Channel



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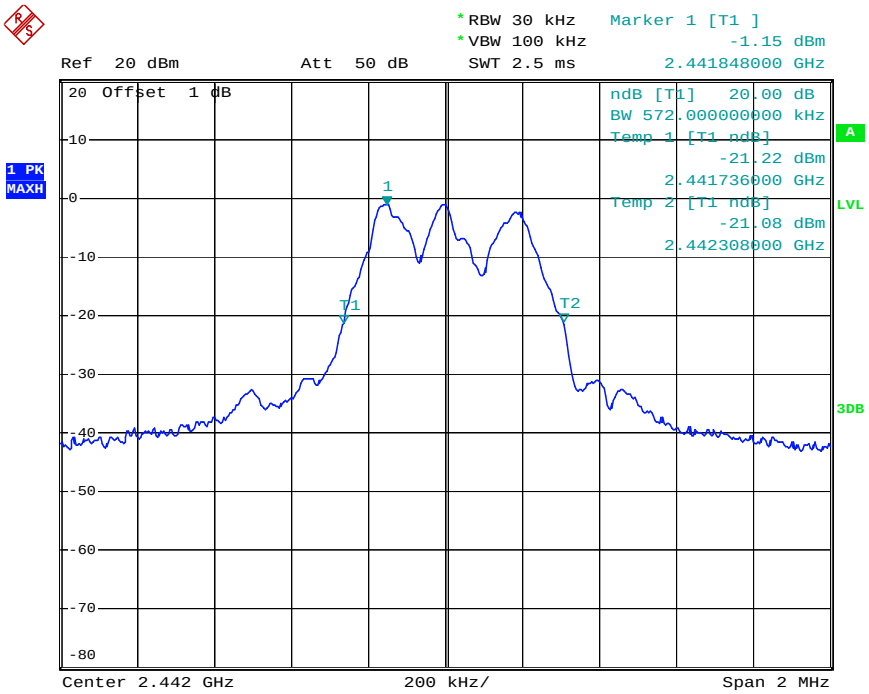
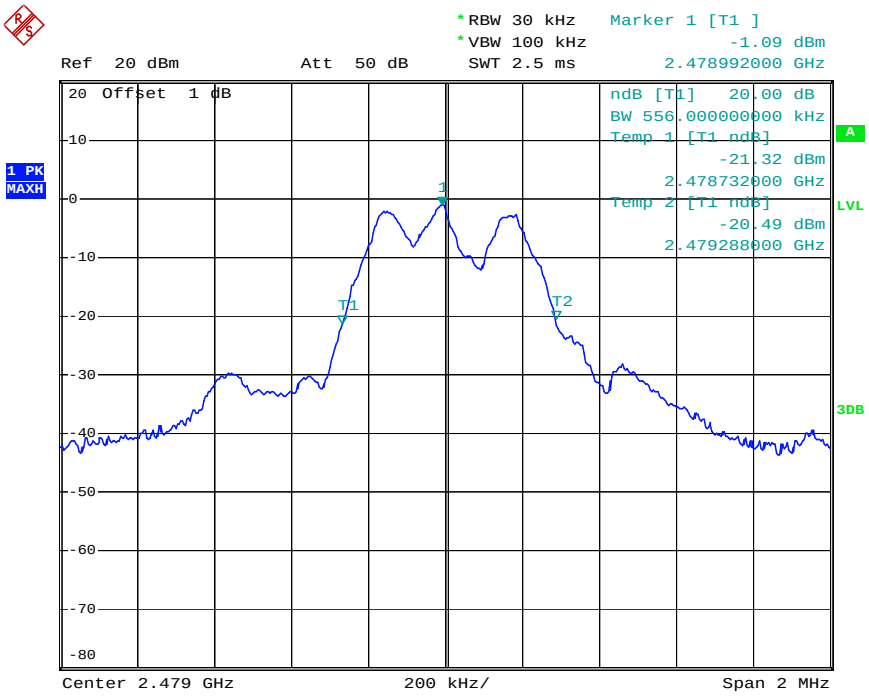
Middle Channel



Date: 25.MAR.2014 09:59:04

High Channel



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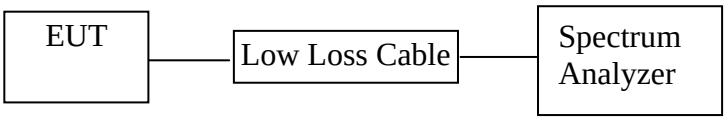
7. MAXIMUM PEAK OUTPUT POWER

7.1.Block Diagram of Test Setup



7.2.The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1):) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. 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

7.3.EUT Configuration on Measurement

The equipment is installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4.Operating Condition of EUT

7.4.1.Setup the EUT and simulator as shown as Section 7.1.

7.4.2.Turn on the power of all equipment.

7.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, 2479MHz TX frequency to transmit.

7.5.Test Procedure

7.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2.Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.

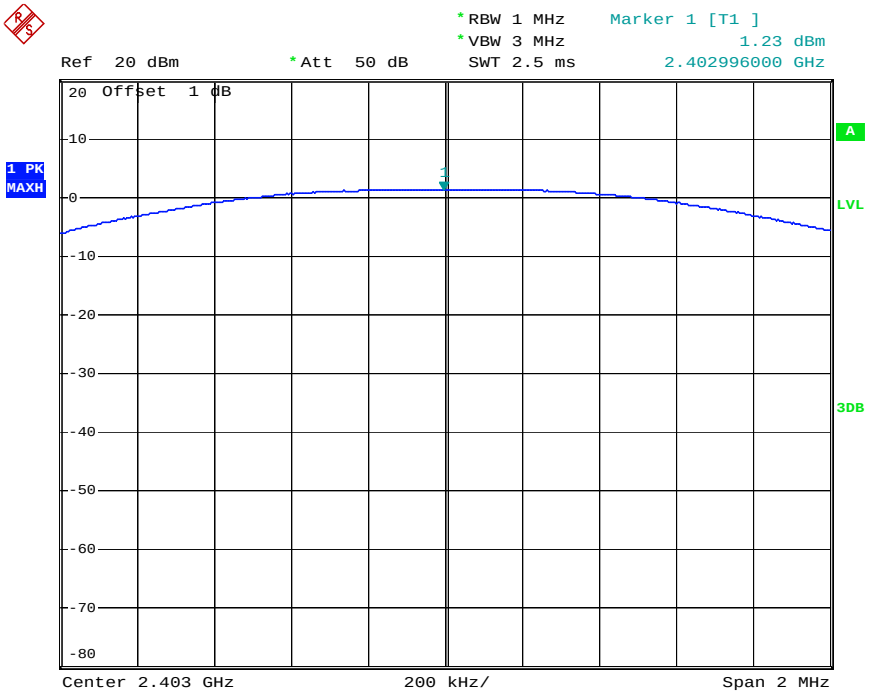
7.5.3.Measurement the maximum peak output power.

7.6.Test Result

Test mode: Transmitting				
Channel	Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (W)	Limits dBm / W
Low	2403	1.23	0.00133	30 dBm / 1 W
Middle	2442	-0.51	0.00089	30 dBm / 1 W
High	2479	-0.21	0.00095	30 dBm / 1 W

The spectrum analyzer plots are attached as below.

Low Channel



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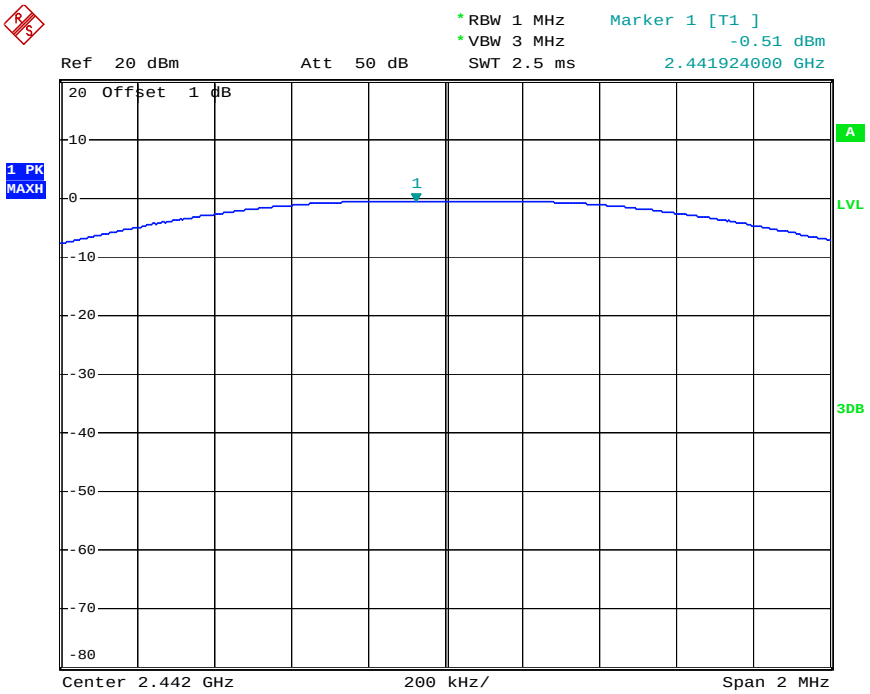
Middle Channel



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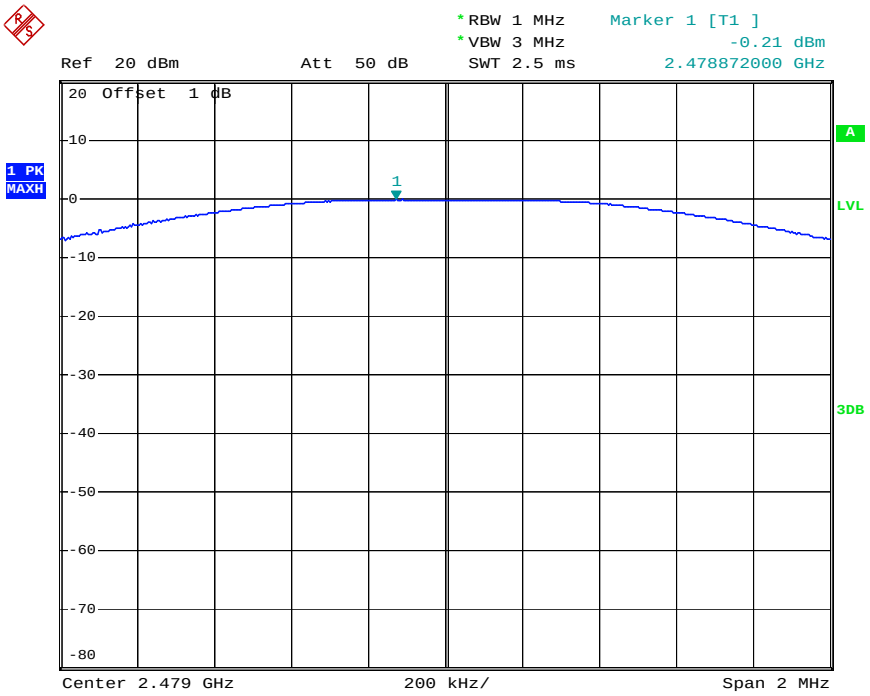
High Channel



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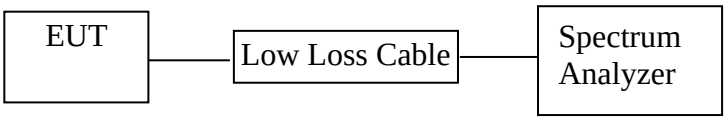
8. TIME OF OCCUPANCY (DWELL TIME)

8.1.Block Diagram of Test Setup



8.2.The Requirement For Section 15.247

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

8.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4.Operating Condition of EUT

8.4.1.Setup the EUT and simulator as shown as Section 8.1.

8.4.2.Turn on the power of all equipment.

8.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, 2479MHz TX frequency to transmit.

8.5.Test Procedure

8.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2.The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep.

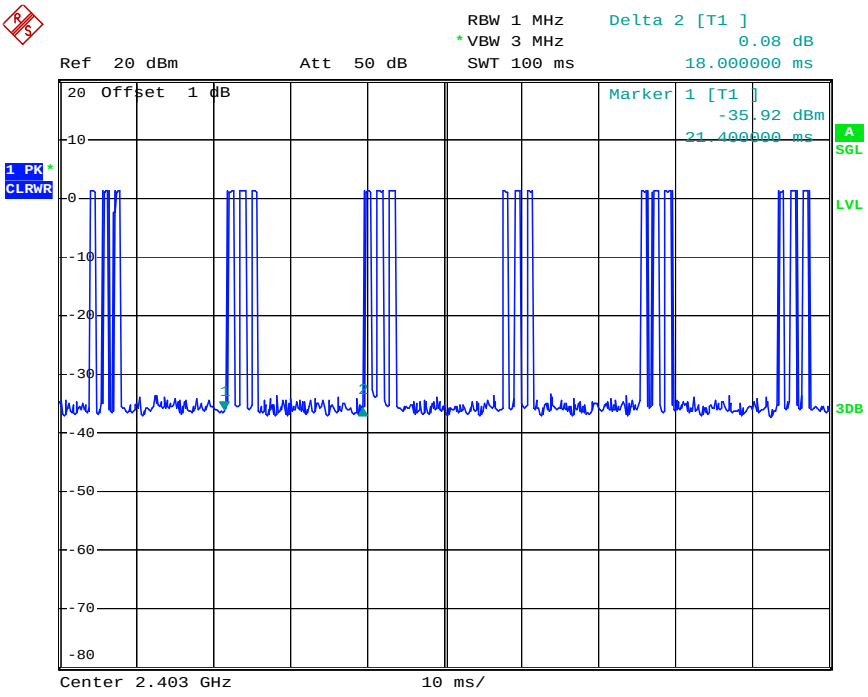
Dwell Time= time slot length * hope rate/ number of hopping channels * 30.8s

8.6.Test Result

Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
TX	Low	2.94	0.0659	0.4	Pass
	Middle	2.94	0.0659	0.4	Pass
	High	2.94	0.0659	0.4	Pass
	400ms*77 hopping channels=30.8sec(Time of Occupancy Limit) EUT transmitter has a channel hopping rate of 56hops/s/slot 56hops/s/77=56/77=0.727hops/sec 0.727*30.8=22.4 0.98 *3=2.94 Dwell Time=22.4*2.94=65.856ms				

The spectrum analyzer plots are attached as below.

Low Channel



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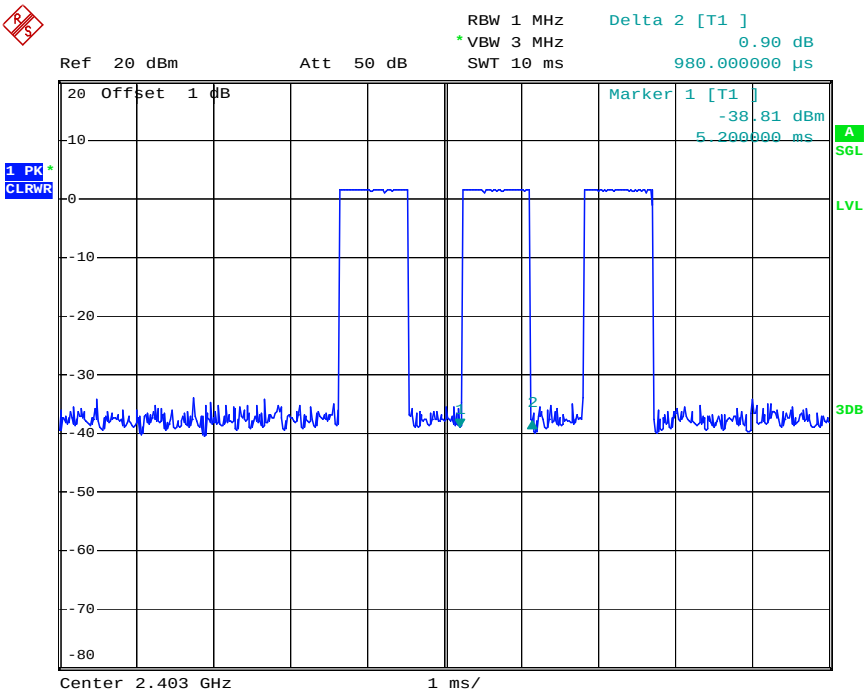

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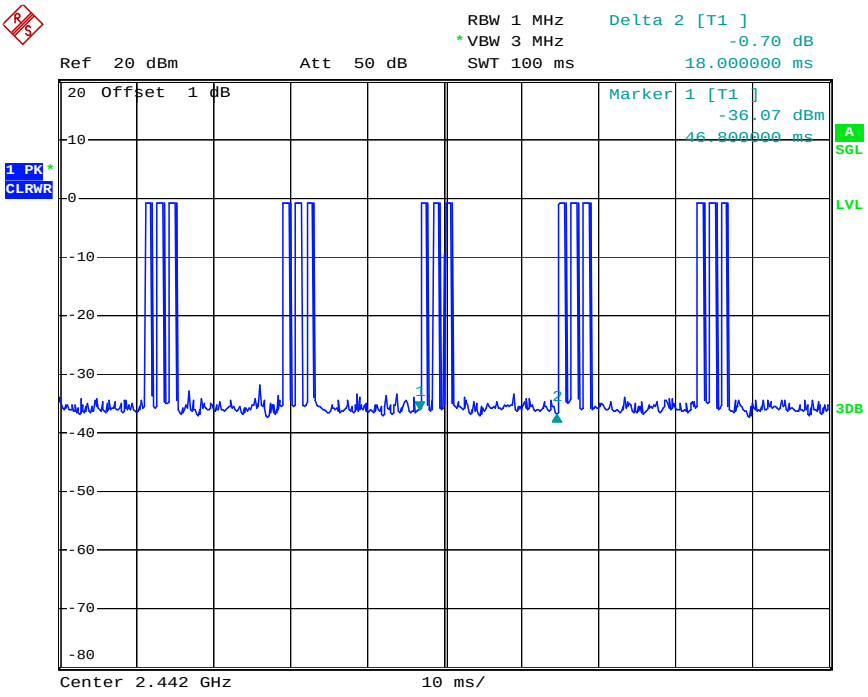
Middle Channel



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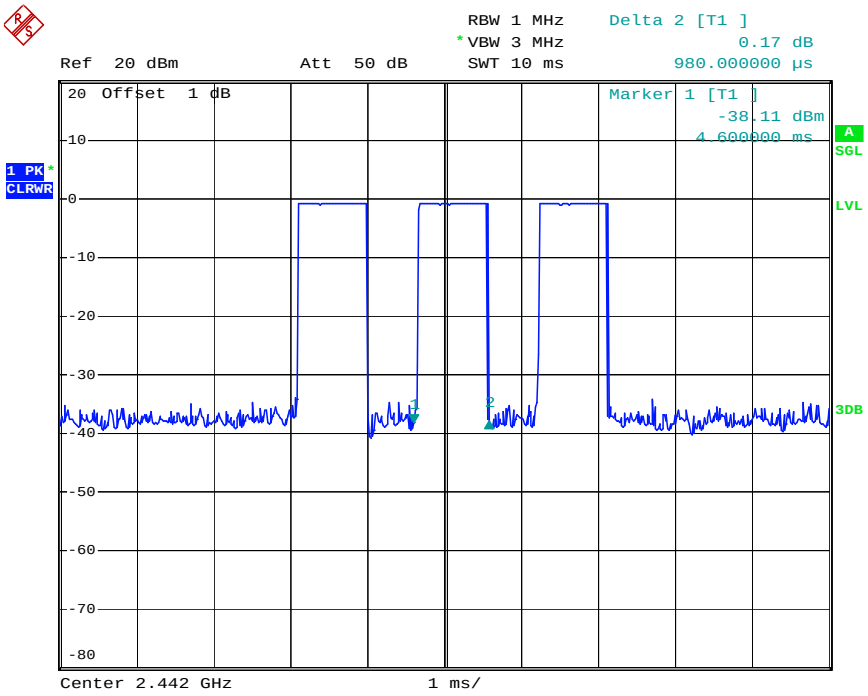
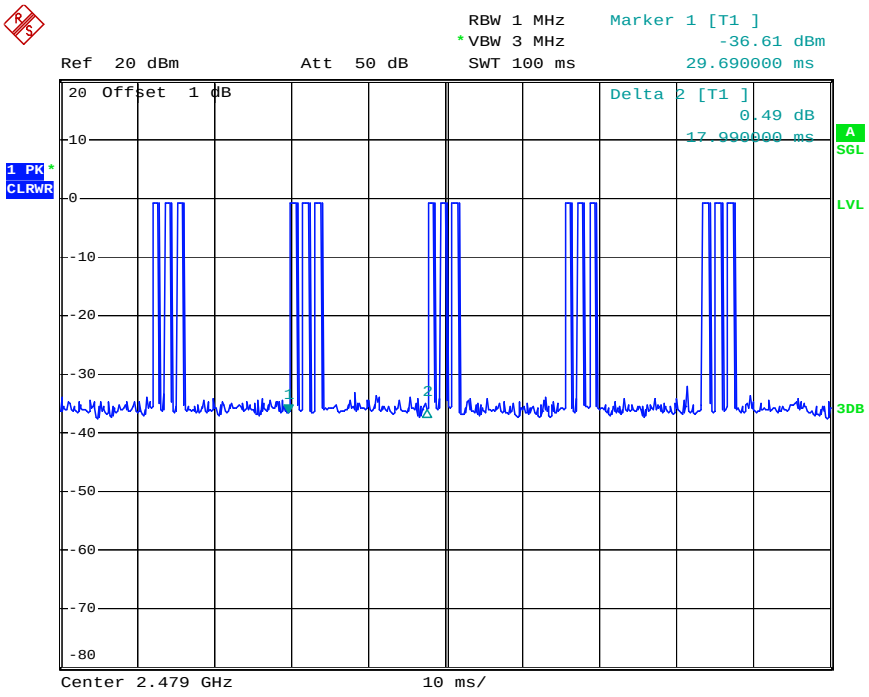


Date: 28.MAR.2014 16:20:17

High Channel



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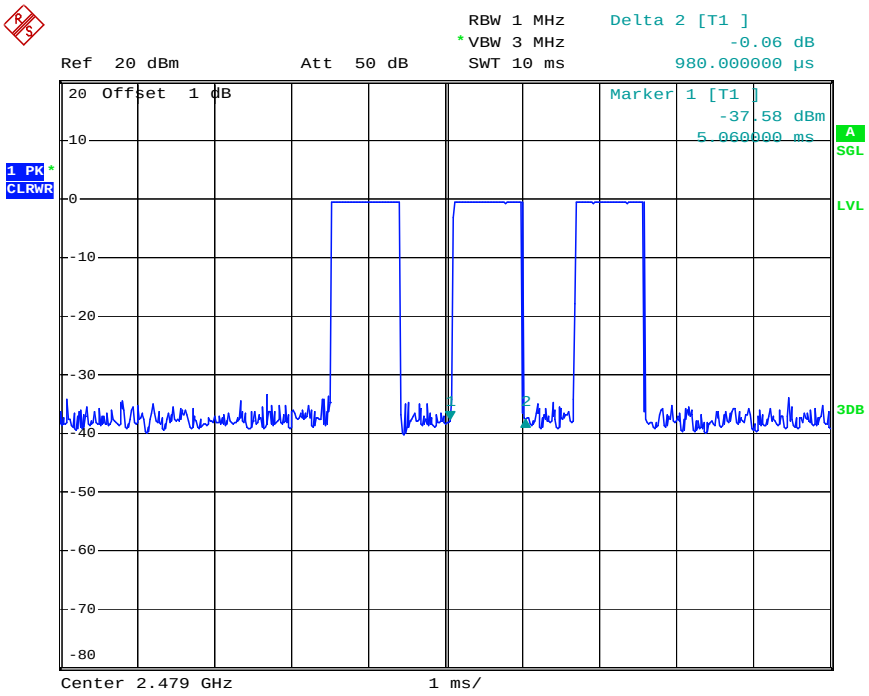
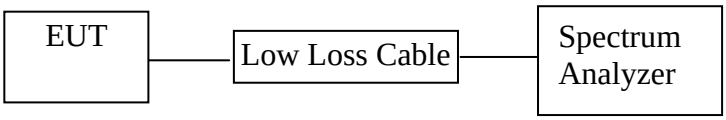


Date: 28.MAR.2014 16:19:17

9. Channel Separation Test

9.1.Block Diagram of Test Setup



9.2.The Requirement For Section 15.247(a)1

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. 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 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

9.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4.Operating Condition of EUT

9.4.1.Setup the EUT and simulator as shown as Section 9.1.

9.4.2.Turn on the power of all equipment.

9.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.

9.5.Test Procedure

9.5.1.Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.

9.5.2.Set the adjacent channel of the EUT maxhold another trace

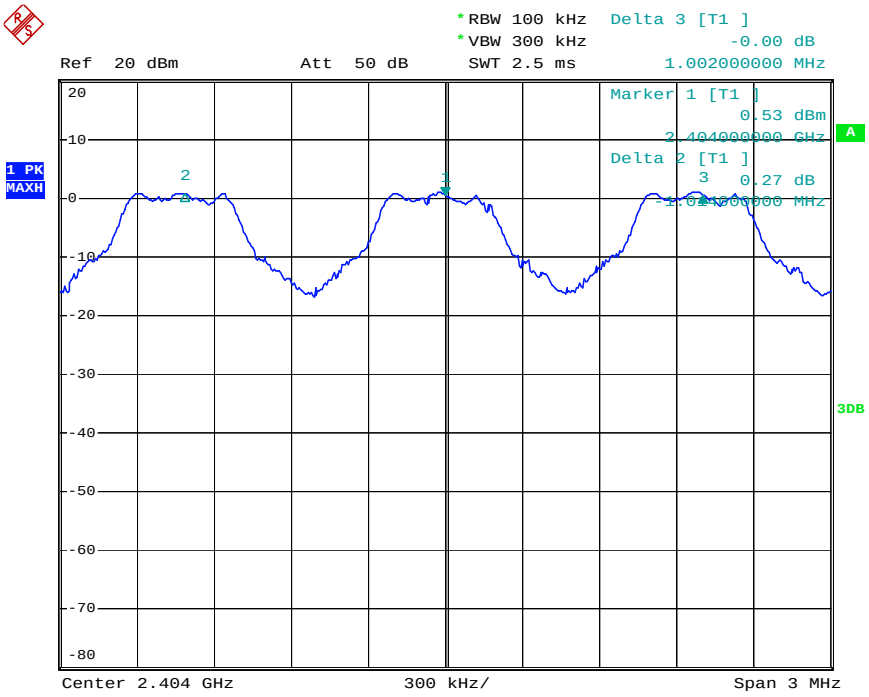
9.5.3.Measure the channel separation.

9.6.Test Result

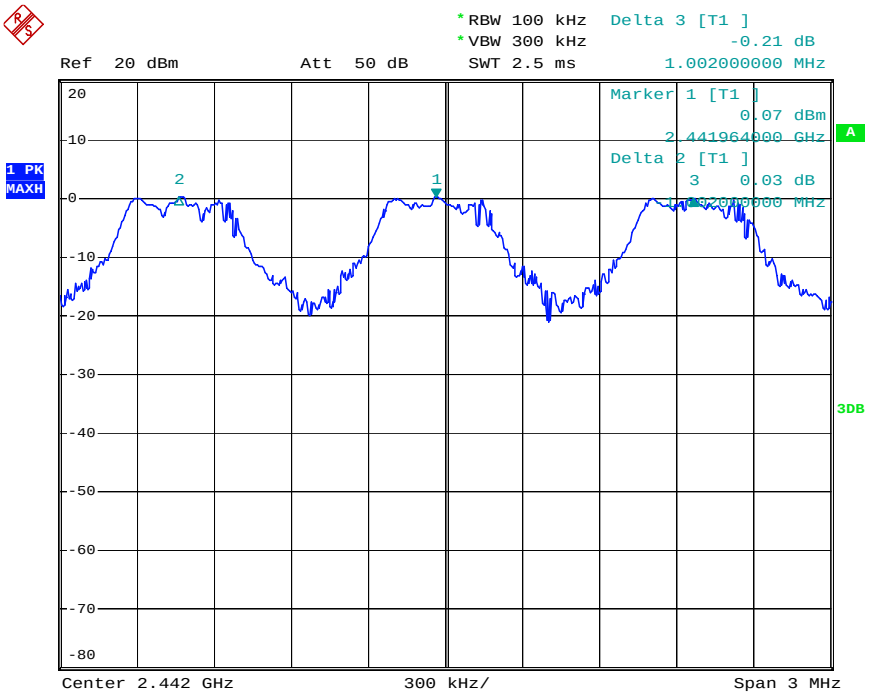
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2403	1.004	0.560	Pass
Adjacent Channel	2404			
Mid Channel	2442	1.002	0.572	Pass
Adjacent Channel	2443			
High Channel	2479	1.002	0.556	Pass
Adjacent Channel	2478			

The spectrum analyzer plots are attached as below.

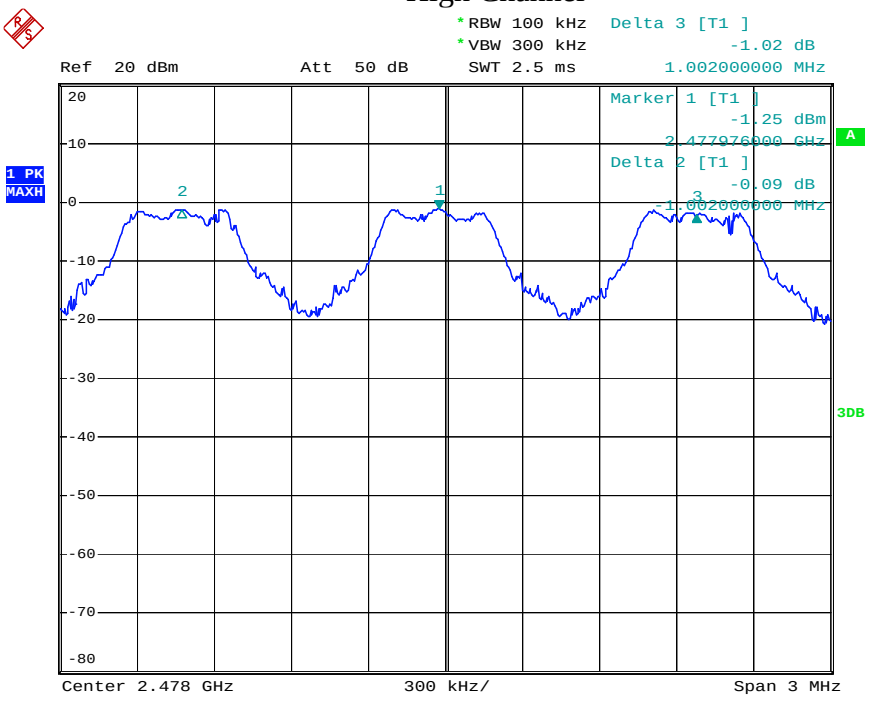
Low Channel



Middle Channel

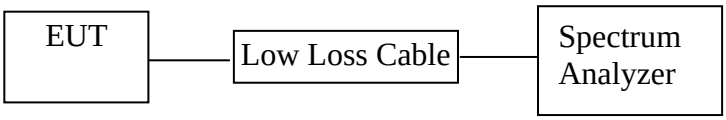


High Channel



10. QUANTITY OF HOPPING CHANNEL TEST

10.1. Block Diagram of Test Setup



10.2. The Requirement For Section 15.247

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

10.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.4. Operating Condition of EUT

10.4.1. Setup the EUT and simulator as shown as Section 10.1.

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in Hopping modes measure it. The transmit frequency are 2403-2479 MHz.

10.5. Test Procedure

10.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

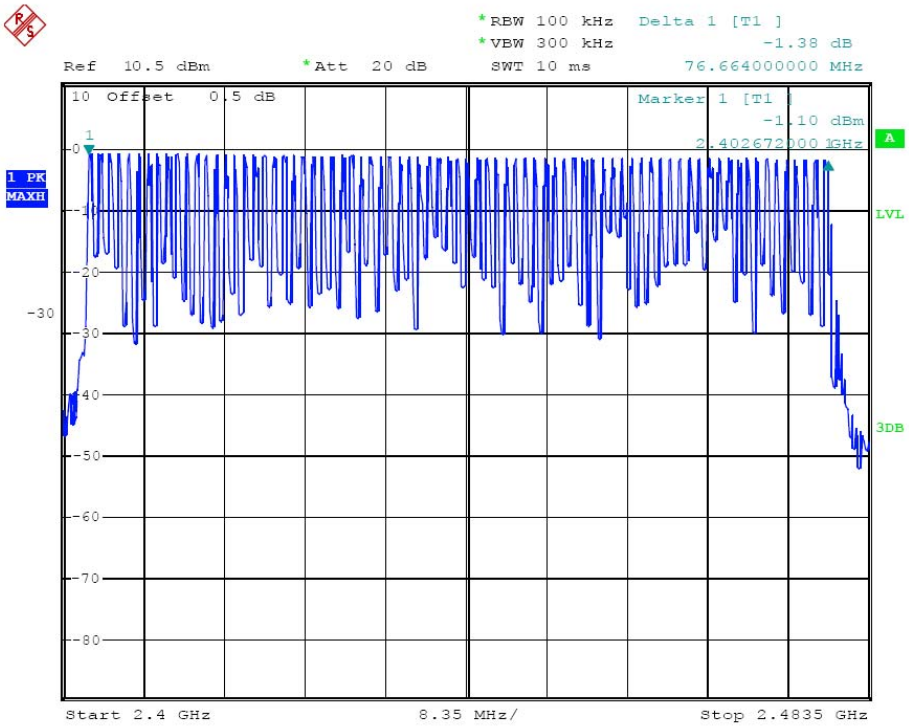
10.5.2. Set the EUT in hopping mode from first channel to last.

10.5.3. By using the Max-Hold function record the Quantity of the channel.

10.6.Test Result

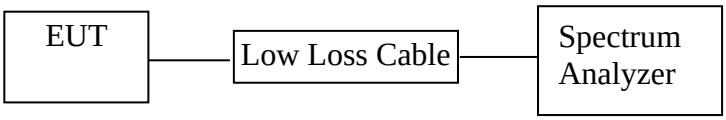
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	77	⩾ 15

The spectrum analyzer plots are attached as below.



11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2.The Requirement For Section 15.247

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2479MHz TX frequency to transmit.

11.5.Test Procedure

Conducted Band Edge:

11.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

Radiate Band Edge:

11.5.3.The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.

11.5.4.The turntable was rotated for 360 degrees to determine the position of maximum emission level.

11.5.5.EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

11.5.6.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

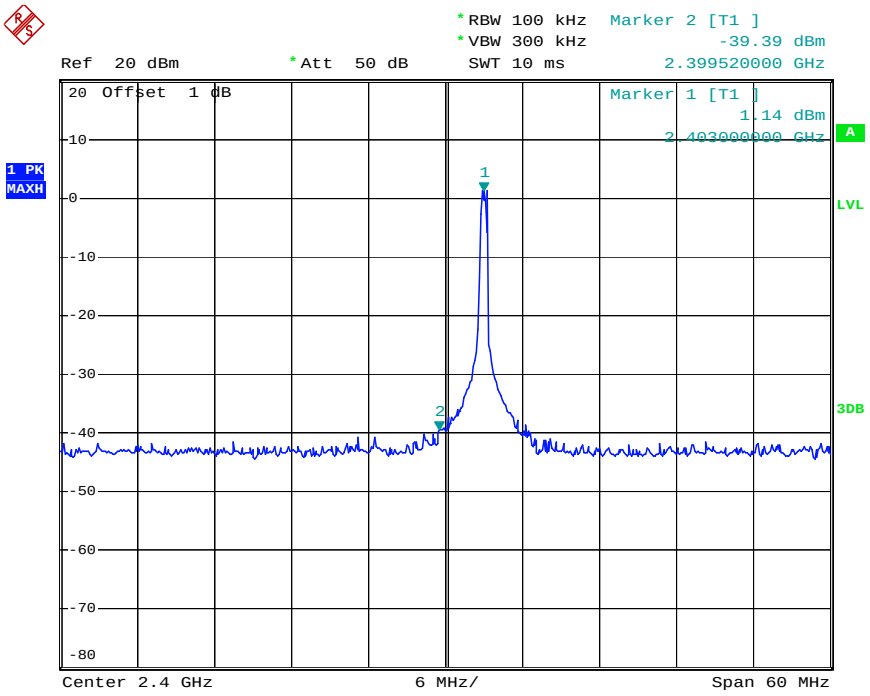
11.5.7.RBW=1MHz, VBW=1MHz

11.5.8.The band edges was measured and recorded.

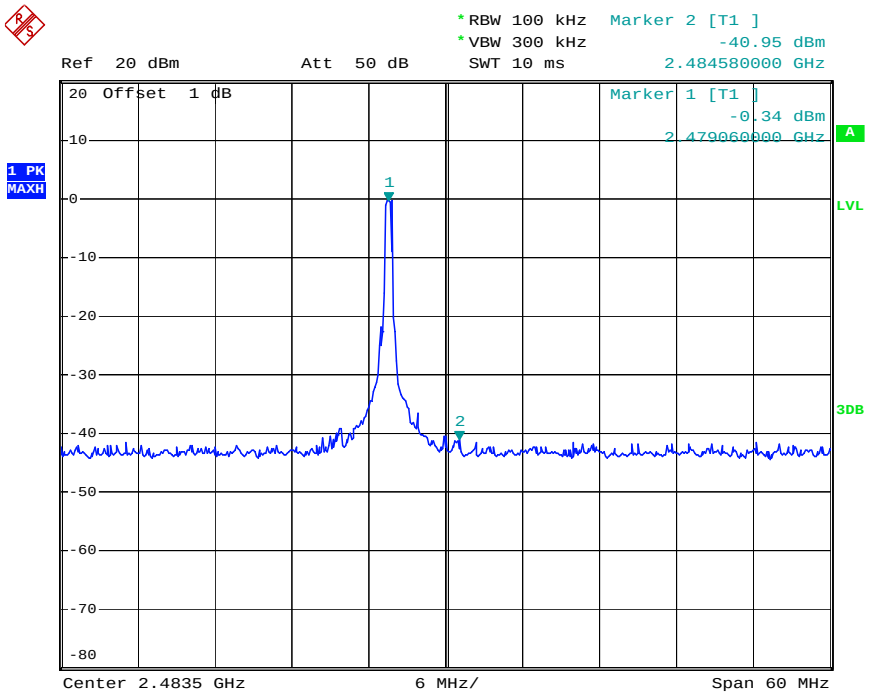
11.6.Test Result

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2403	40.53	> 20dBc
2479	40.61	> 20dBc

Low Channel



High Channel



Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test mode: Non-hopping mode

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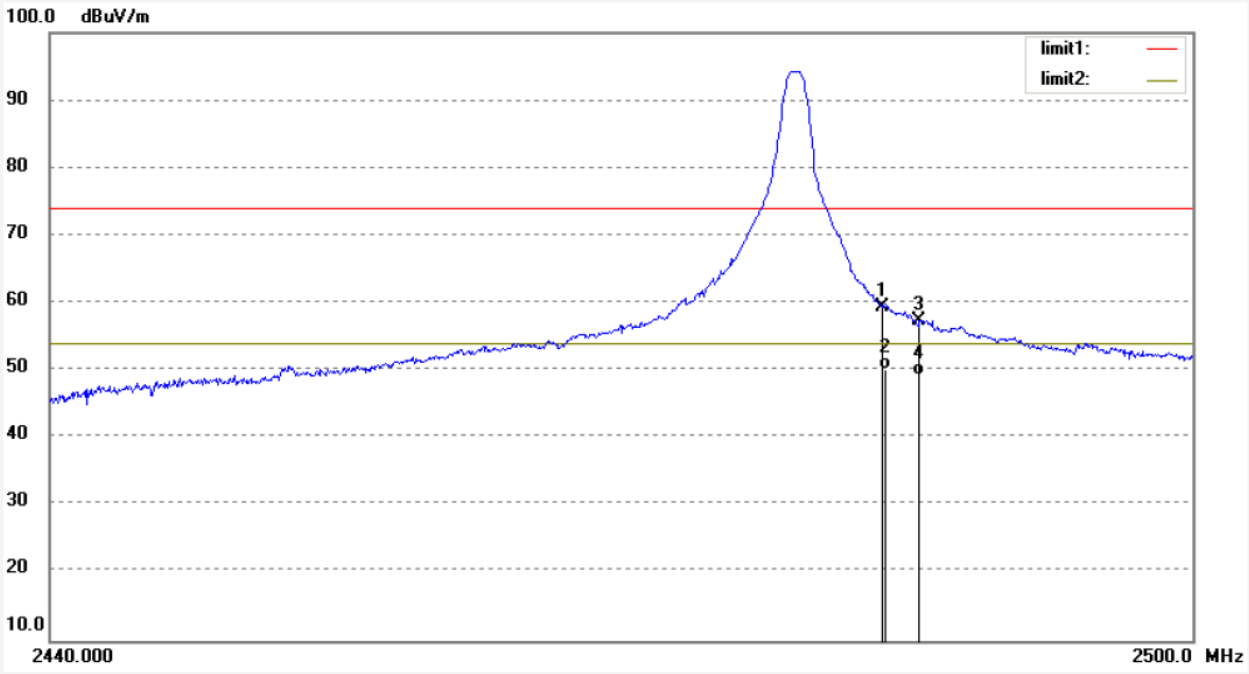
Job No.: alen #3773
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/24
Time: 11:33:42
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.620	65.97	-6.54	59.43	74.00	-14.57	peak			
2	2483.620	56.65	-6.54	50.11	54.00	-3.89	AVG			
3	2485.540	64.00	-6.54	57.46	74.00	-16.54	peak			
4	2485.540	55.78	-6.54	49.24	54.00	-4.76	AVG			

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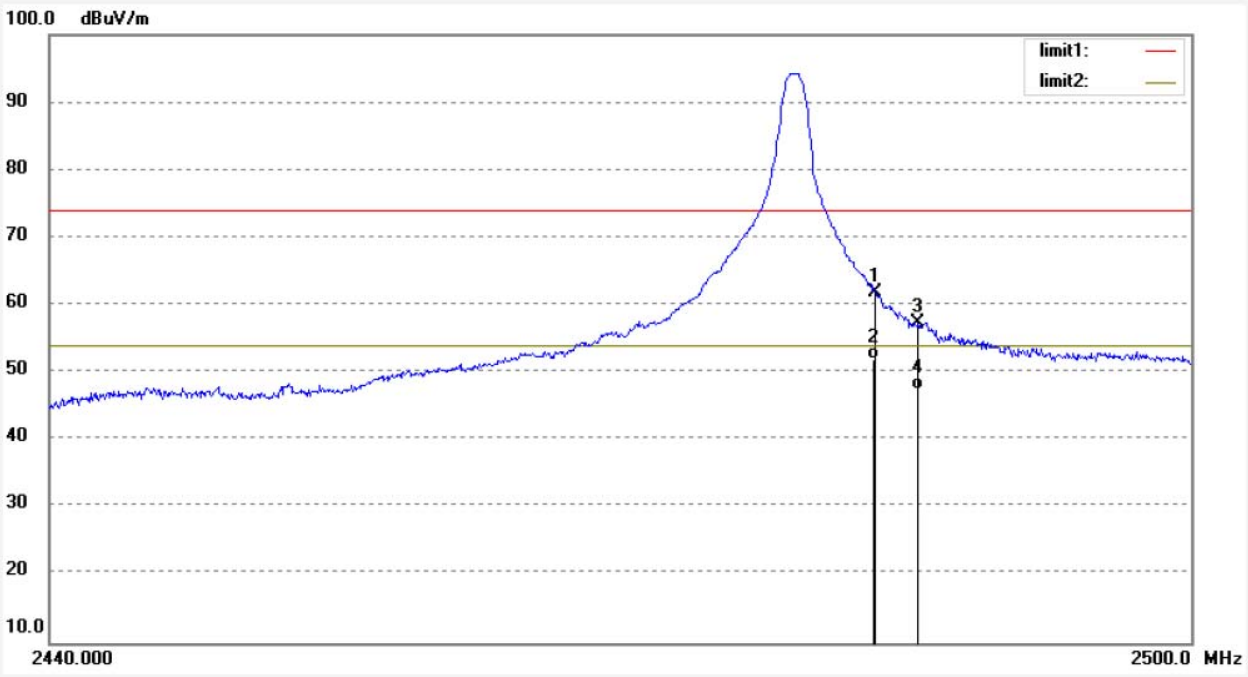
Job No.: alen #3774
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/24
Time: 11:35:18
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.260	68.30	-6.54	61.76	74.00	-12.24	peak			
2	2483.260	58.51	-6.54	51.97	54.00	-2.03	AVG			
3	2485.540	63.96	-6.54	57.42	74.00	-16.58	peak			
4	2485.540	53.99	-6.54	47.45	54.00	-6.55	AVG			

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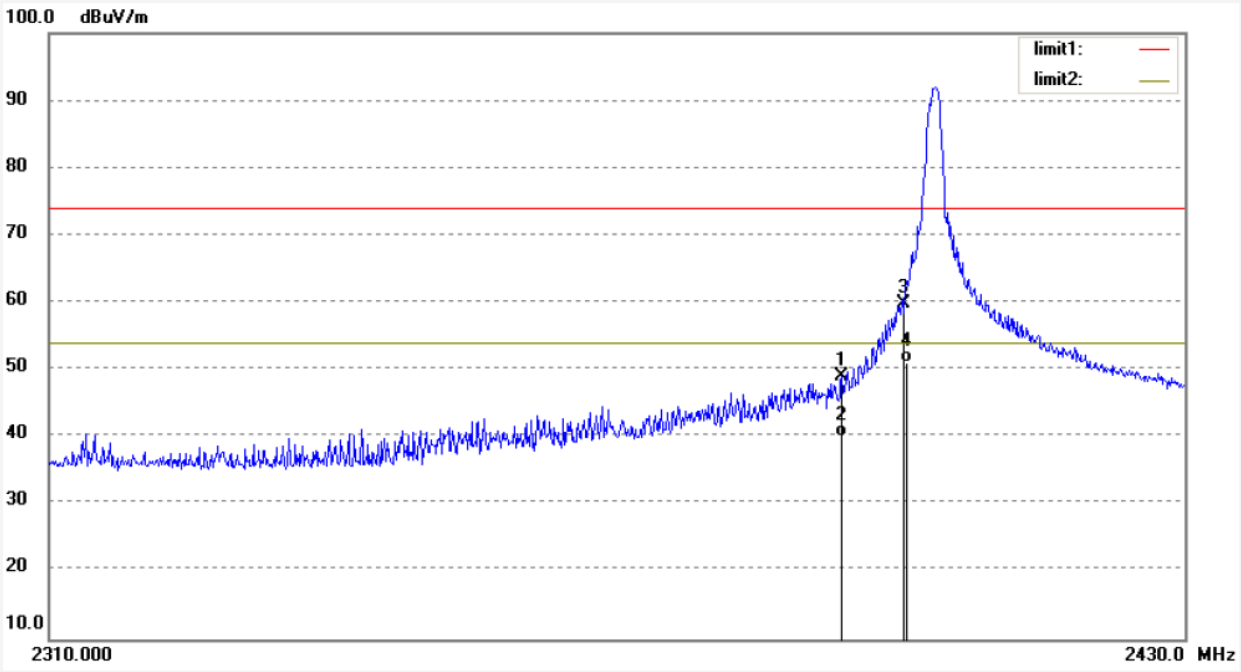
Job No.: alen #3771
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2403MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/24
Time: 11:26:32
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2393.160	55.75	-6.77	48.98	74.00	-25.02	peak			
2	2393.160	46.89	-6.77	40.12	54.00	-13.88	AVG			
3	2399.880	66.69	-6.76	59.93	74.00	-14.07	peak			
4	2399.880	57.78	-6.76	51.02	54.00	-2.98	AVG			

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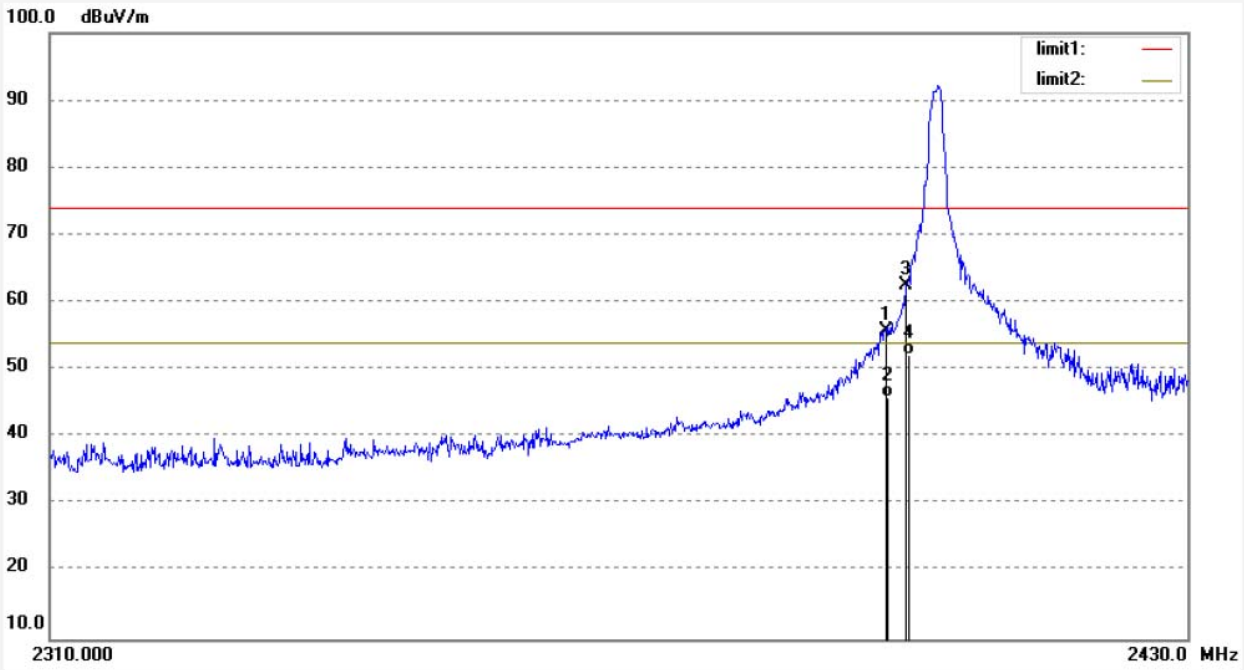
Job No.: alen #3770
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2403MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/24
Time: 11:21:33
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2397.600	62.63	-6.76	55.87	74.00	-18.13	peak			
2	2397.600	52.54	-6.76	45.78	54.00	-8.22	AVG			
3	2399.880	69.23	-6.76	62.47	74.00	-11.53	peak			
4	2399.880	58.99	-6.76	52.23	54.00	-1.77	AVG			

Test mode: hopping mode

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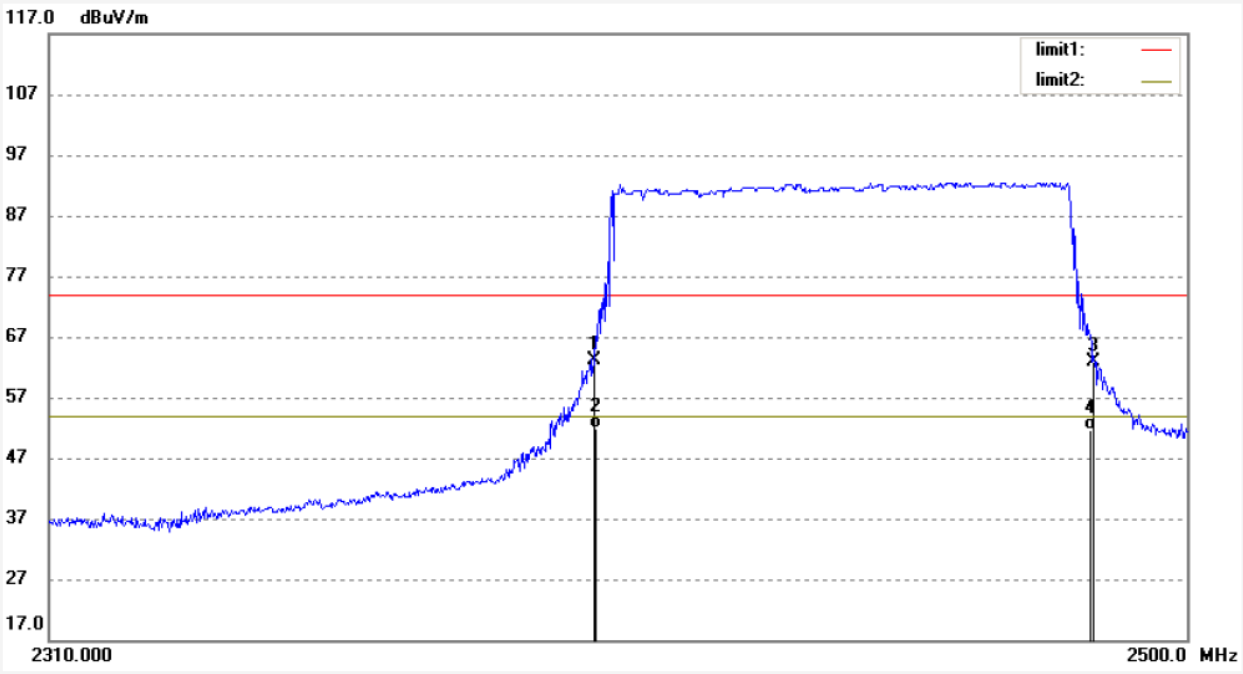
Job No.: alen #3301
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX(Hopping mode)
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6.0V
Date: 14/03/21/
Time: 10/57/00
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2399.300	69.91	-6.76	63.15	74.00	-10.85	peak			
2	2399.300	58.65	-6.76	51.89	54.00	-2.11	AVG			
3	2483.660	69.35	-6.54	62.81	74.00	-11.19	peak			
4	2483.660	58.21	-6.54	51.67	54.00	-2.33	AVG			

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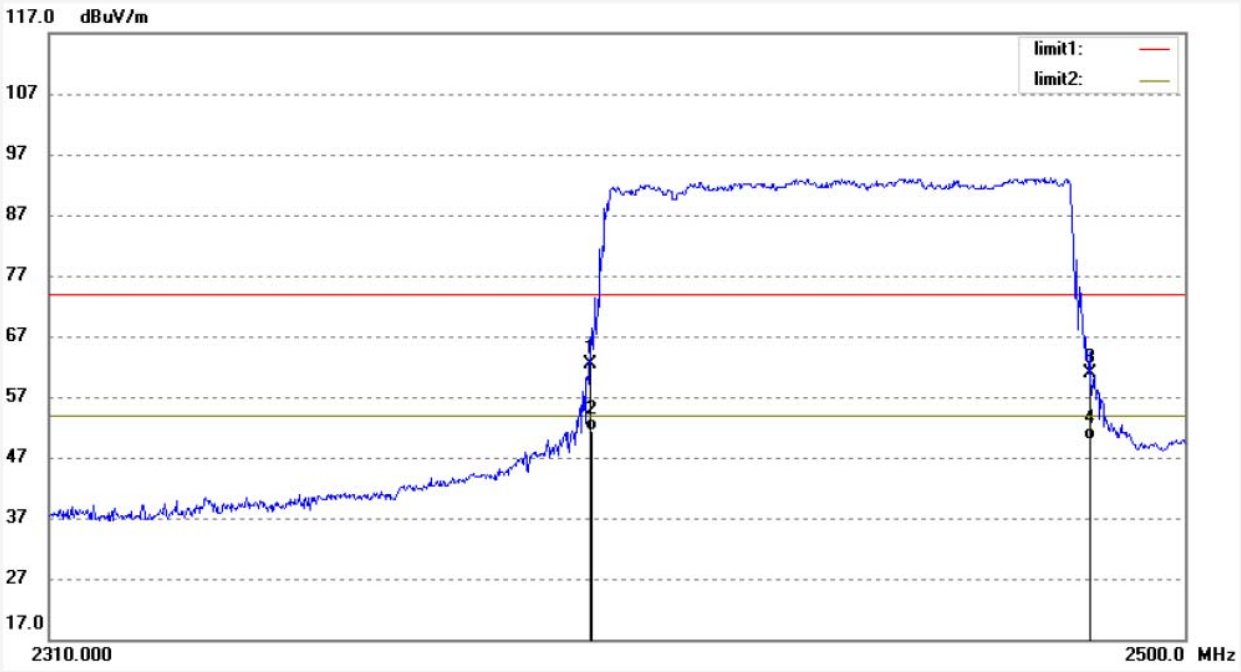
Job No.: alen #3300
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX(Hopping mode)
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6.0V
Date: 14/03/21/
Time: 10/50/35
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2398.920	69.09	-6.76	62.33	74.00	-11.67	peak			
2	2398.920	58.12	-6.76	51.36	54.00	-2.64	AVG			
3	2483.660	67.32	-6.54	60.78	74.00	-13.22	peak			
4	2483.660	56.35	-6.54	49.81	54.00	-4.19	AVG			

12.RADIATED SPURIOUS EMISSION TEST

12.1.Block Diagram of Test Setup

12.1.1.Block diagram of connection between the EUT and peripherals

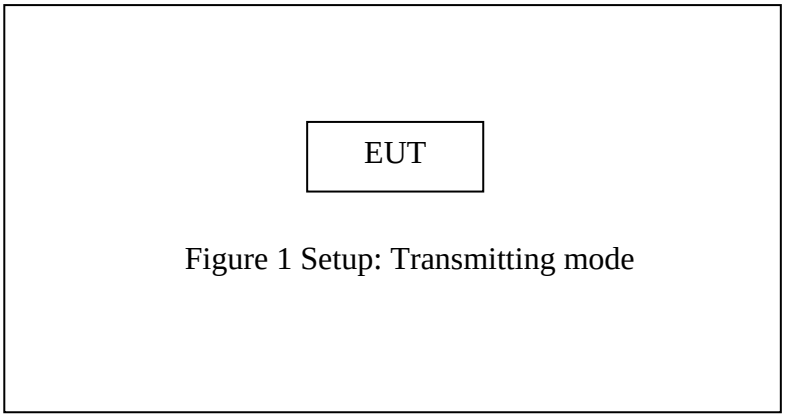
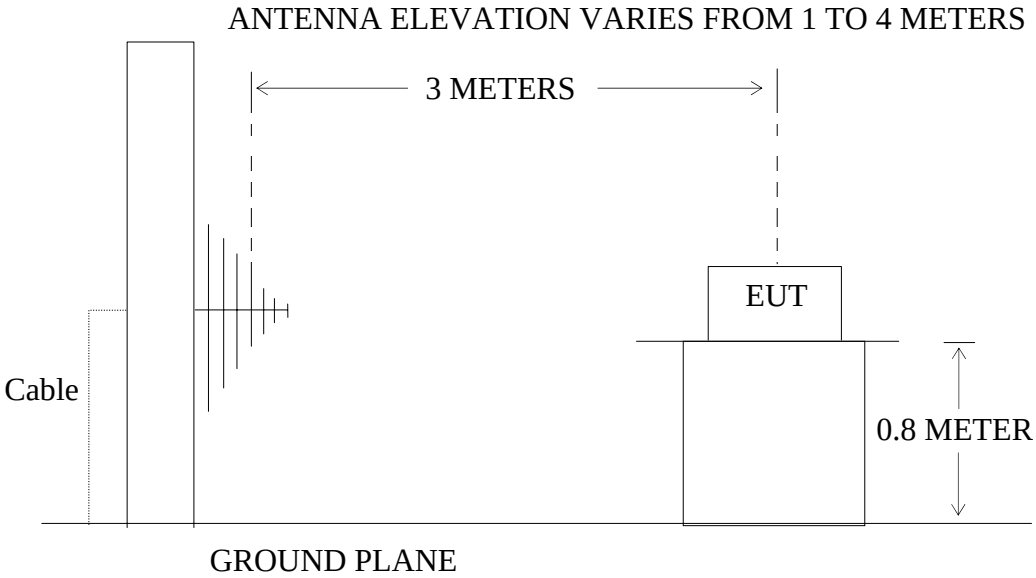


Figure 1 Setup: Transmitting mode

12.1.2.Semi-Anechoic Chamber Test Setup Diagram



12.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the

transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

12.3.Restricted bands of operation

12.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

12.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

12.5.Operating Condition of EUT

12.5.1.Setup the EUT and simulator as shown as Section 12.1.

12.5.2.Turn on the power of all equipment.

12.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.

12.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2009 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9kHz to 25GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows: Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

12.7.The Field Strength of Radiation Emission Measurement Results

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. *: Denotes restricted band of operation.

3. The EUT is tested radiation emission at each test channel in three axes. The worst emissions are reported in all test mode and channels.

4. The radiation emissions from 18-25GHz are not reported, because the test values lower than the limits of 20dB.

Below 1G

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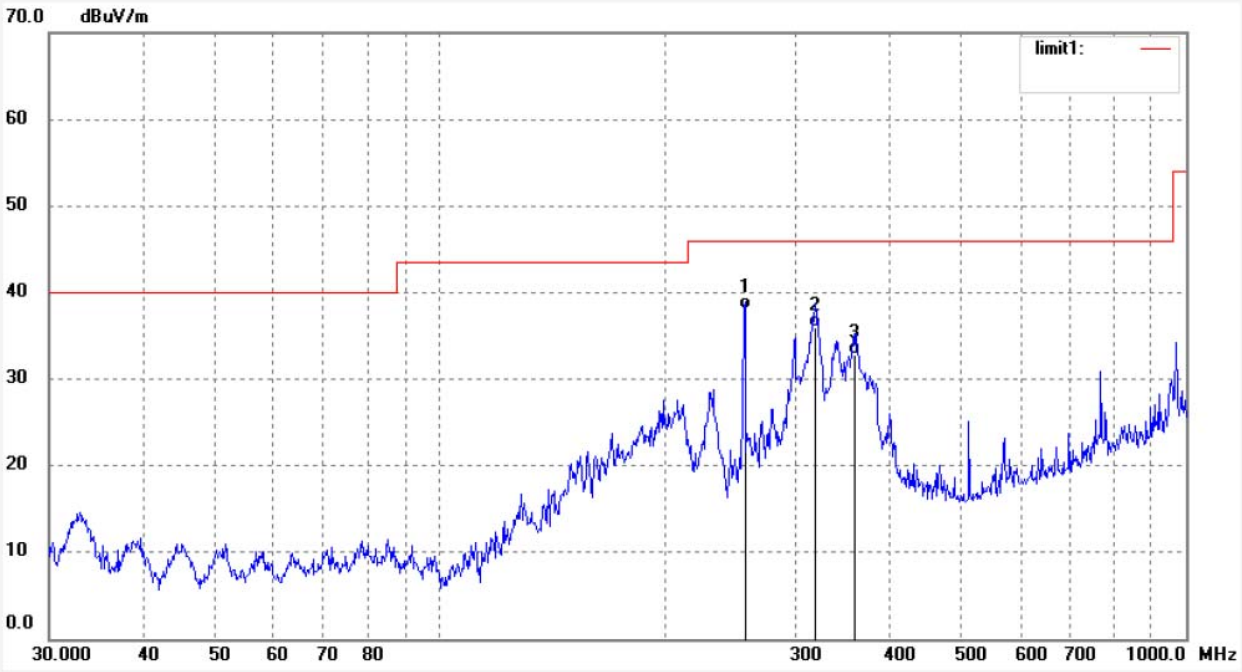
Job No.: alen #3729	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2014/03/14
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 15:53:26
EUT: TTX850 8-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2403MHz	Distance: 3m
Model: TACJ2850	
Manufacturer: Nine Eagles	

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	57.47	-19.36	38.11	46.00	-7.89	QP			
2	318.8170	53.40	-17.43	35.97	46.00	-10.03	QP			
3	359.1859	48.68	-15.94	32.74	46.00	-13.26	QP			

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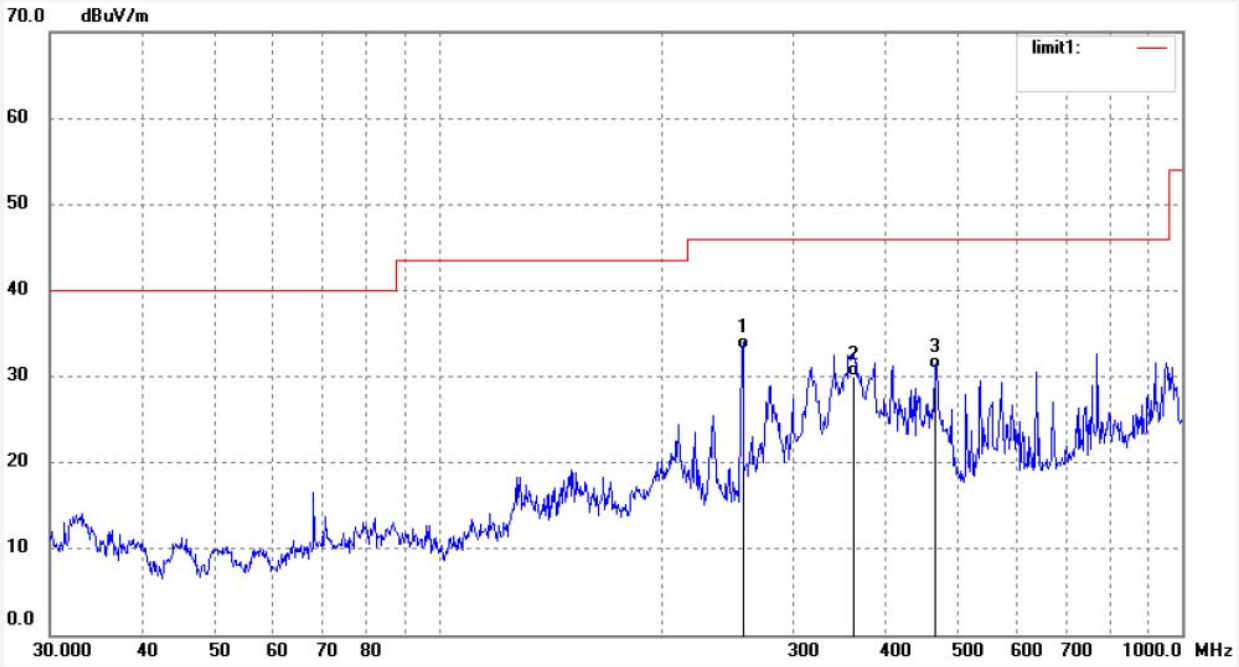
Job No.: alen #3728
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2403MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/14
Time: 15:51:37
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	52.55	-19.36	33.19	46.00	-12.81	QP			
2	361.7139	45.89	-15.91	29.98	46.00	-16.02	QP			
3	465.5994	45.23	-14.32	30.91	46.00	-15.09	QP			

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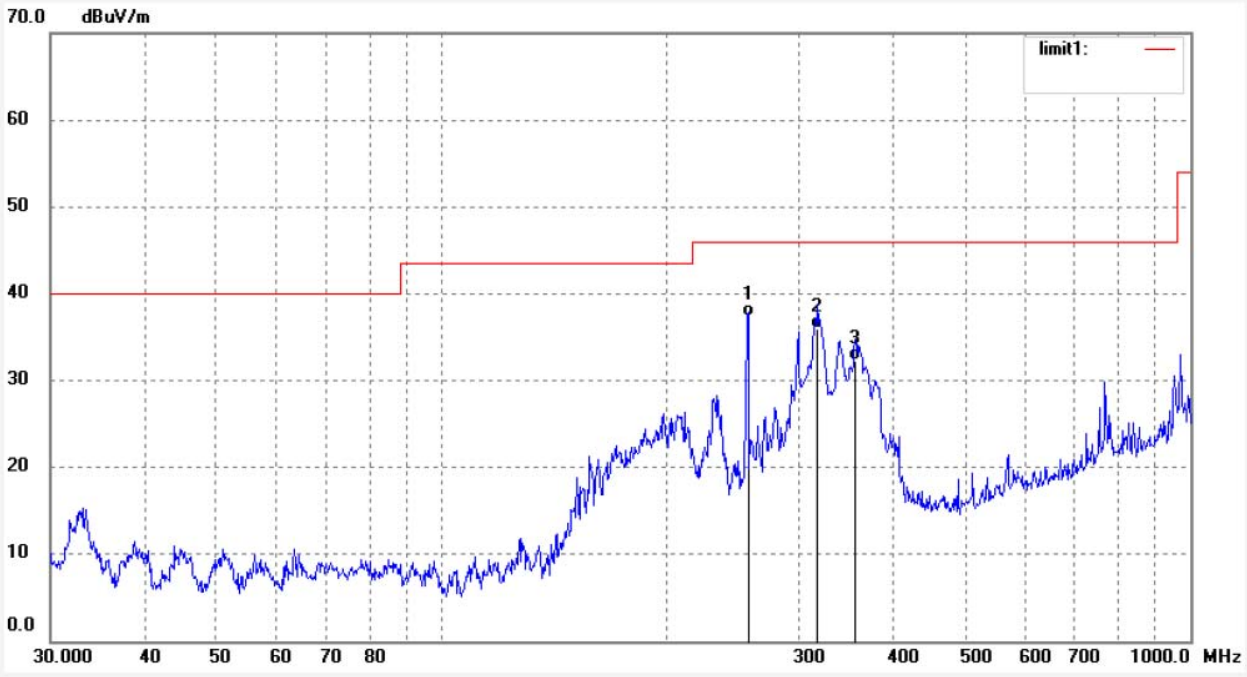
Job No.: alen #3730
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2442MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/14
Time: 15:54:06
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	56.71	-19.36	37.35	46.00	-8.65	QP			
2	317.7010	53.45	-17.45	36.00	46.00	-10.00	QP			
3	356.6757	48.25	-16.03	32.22	46.00	-13.78	QP			

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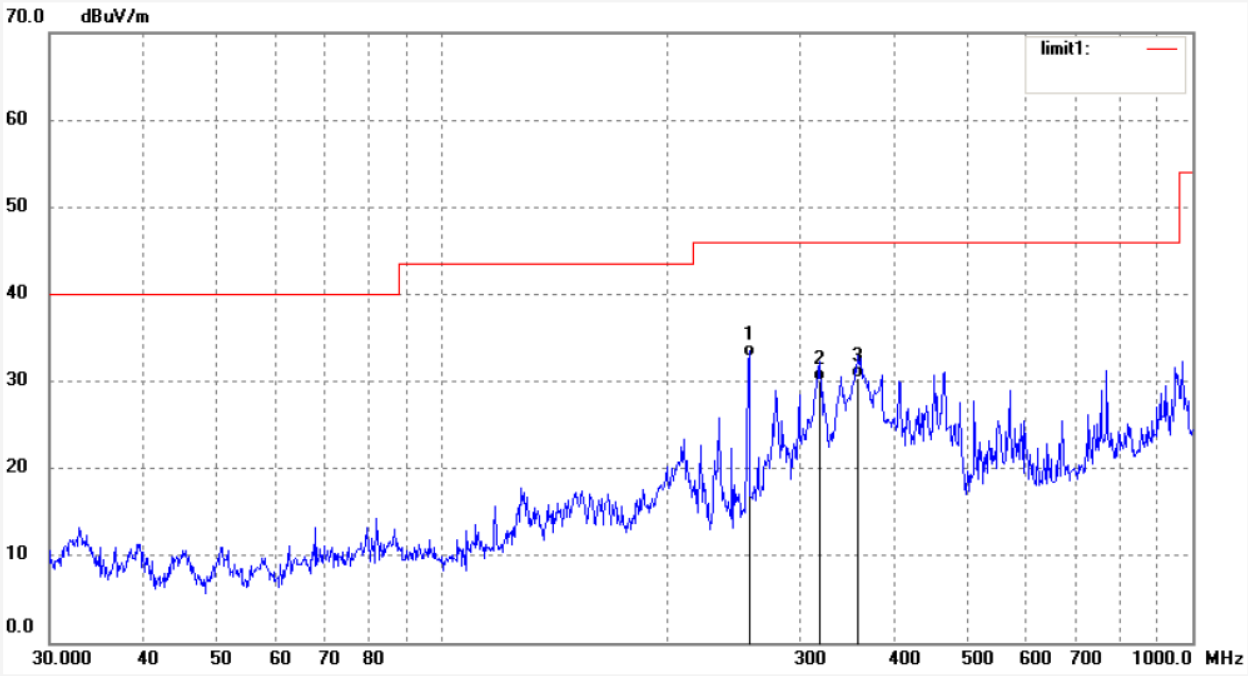
Job No.: alen #3731
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2442MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/14
Time: 15:54:51
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	52.25	-19.36	32.89	46.00	-13.11	QP			
2	318.8170	47.52	-17.43	30.09	46.00	-15.91	QP			
3	357.9286	46.38	-15.98	30.40	46.00	-15.60	QP			

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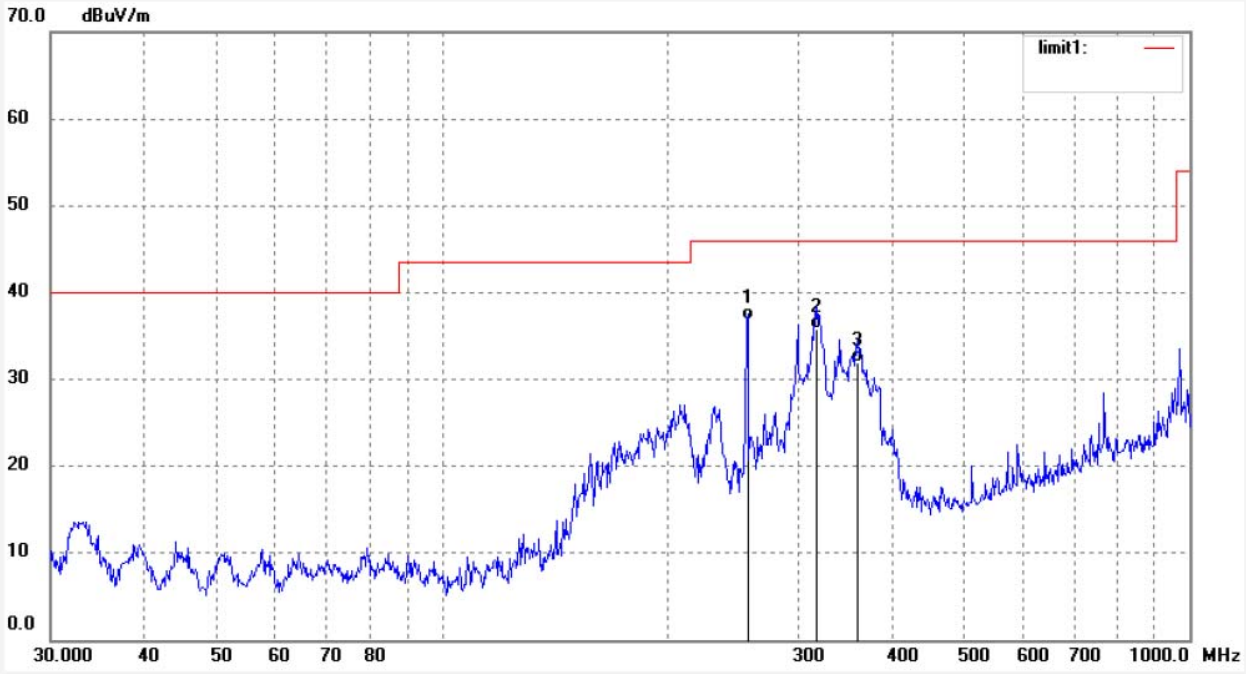
Job No.: alen #3733
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/14
Time: 15:56:21
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	56.25	-19.36	36.89	46.00	-9.11	QP			
2	317.7010	53.20	-17.45	35.75	46.00	-10.25	QP			
3	360.4476	47.87	-15.92	31.95	46.00	-14.05	QP			

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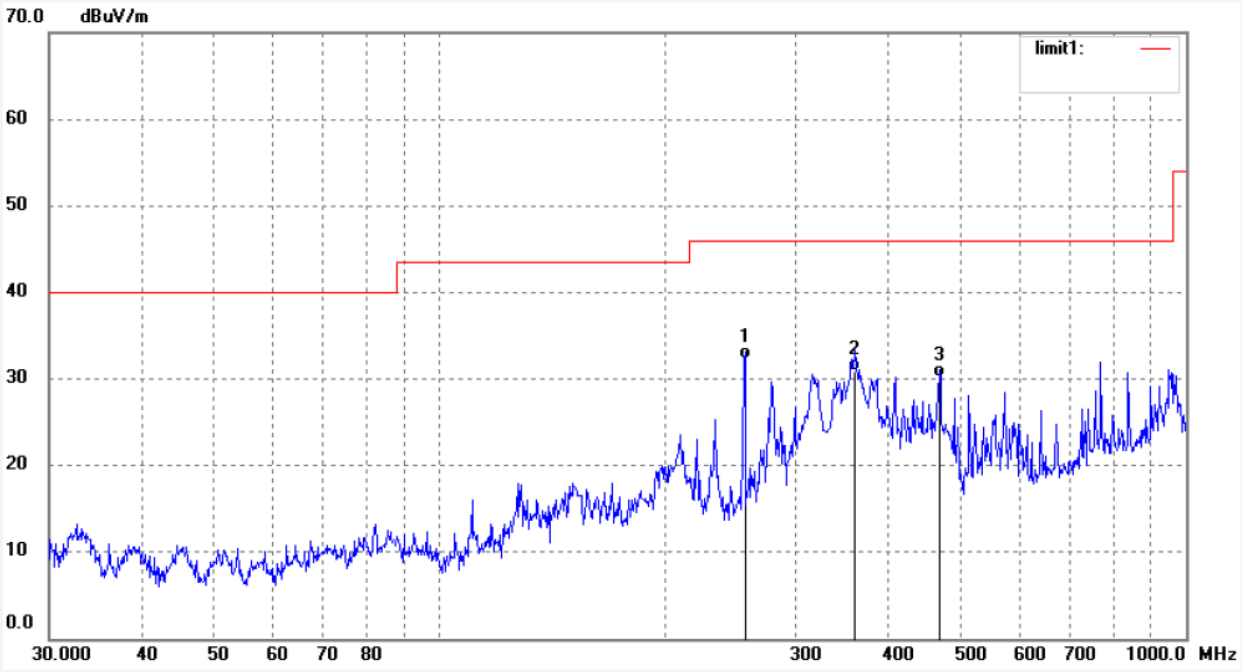
Job No.: alen #3732
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/14
Time: 15:55:30
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	256.5210	51.69	-19.36	32.33	46.00	-13.67	QP			
2	360.4476	46.75	-15.92	30.83	46.00	-15.17	QP			
3	467.2348	44.51	-14.30	30.21	46.00	-15.79	QP			

Above 1G

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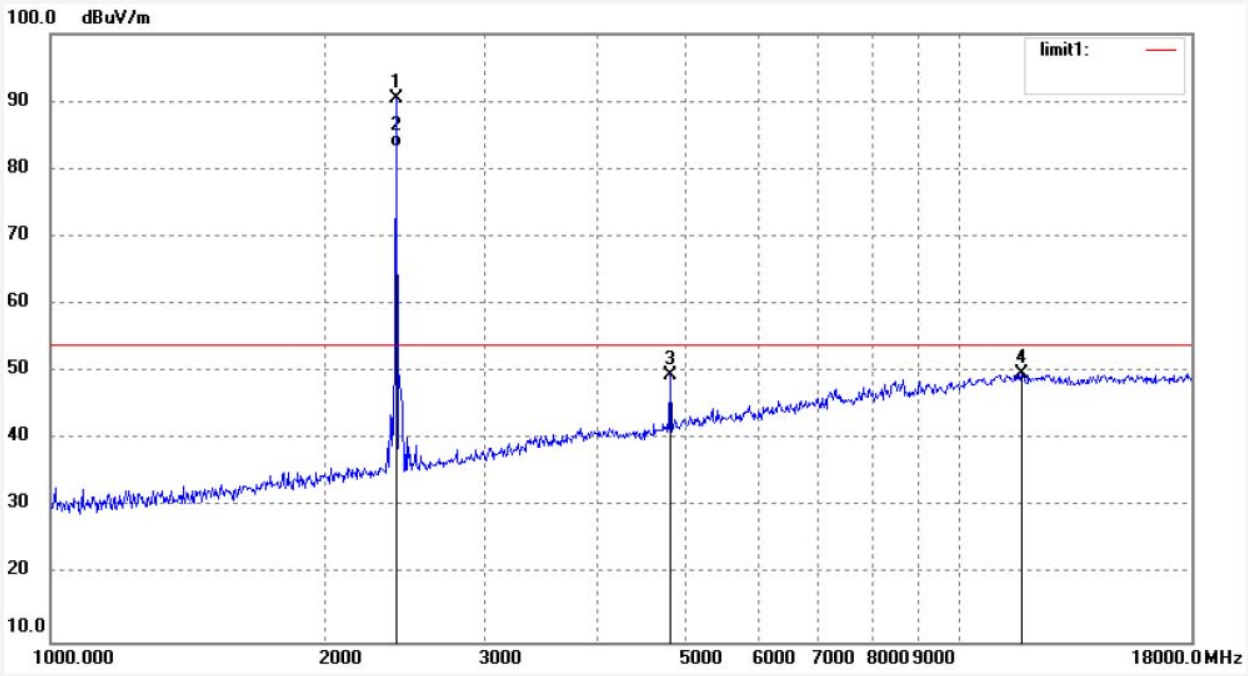
Job No.: alen #3768
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2403MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/24
Time: 11:17:59
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2400.753	97.27	-6.76	90.51			peak			
2	2400.753	90.01	-6.76	83.25			AVG			
3	4804.110	51.14	-1.59	49.55	74.00	-24.45	peak			
4	11701.375	43.49	6.23	49.72	74.00	-24.28	peak			

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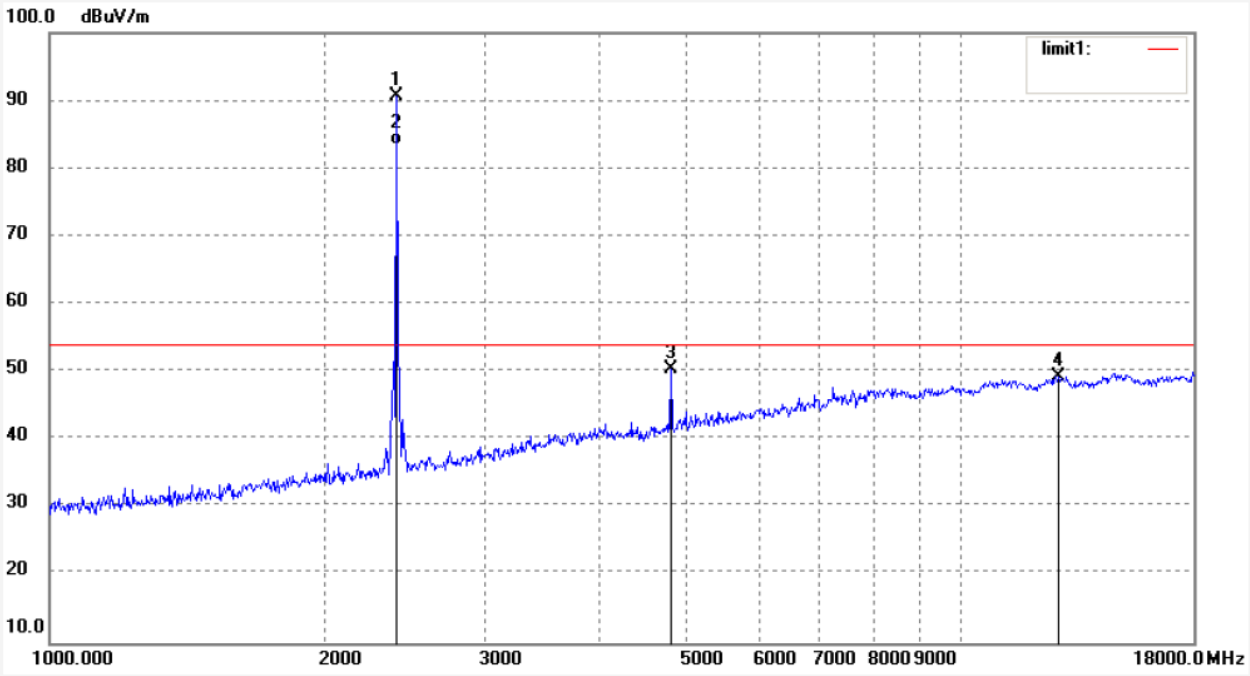
Job No.: alen #3769
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2403MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/24
Time: 11:19:28
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2400.753	97.52	-6.76	90.76			peak			
2	2400.753	90.12	-6.76	83.36			AVG			
3	4804.110	51.90	-1.59	50.31	74.00	-23.69	peak			
4	12798.243	41.71	7.60	49.31	74.00	-24.69	peak			

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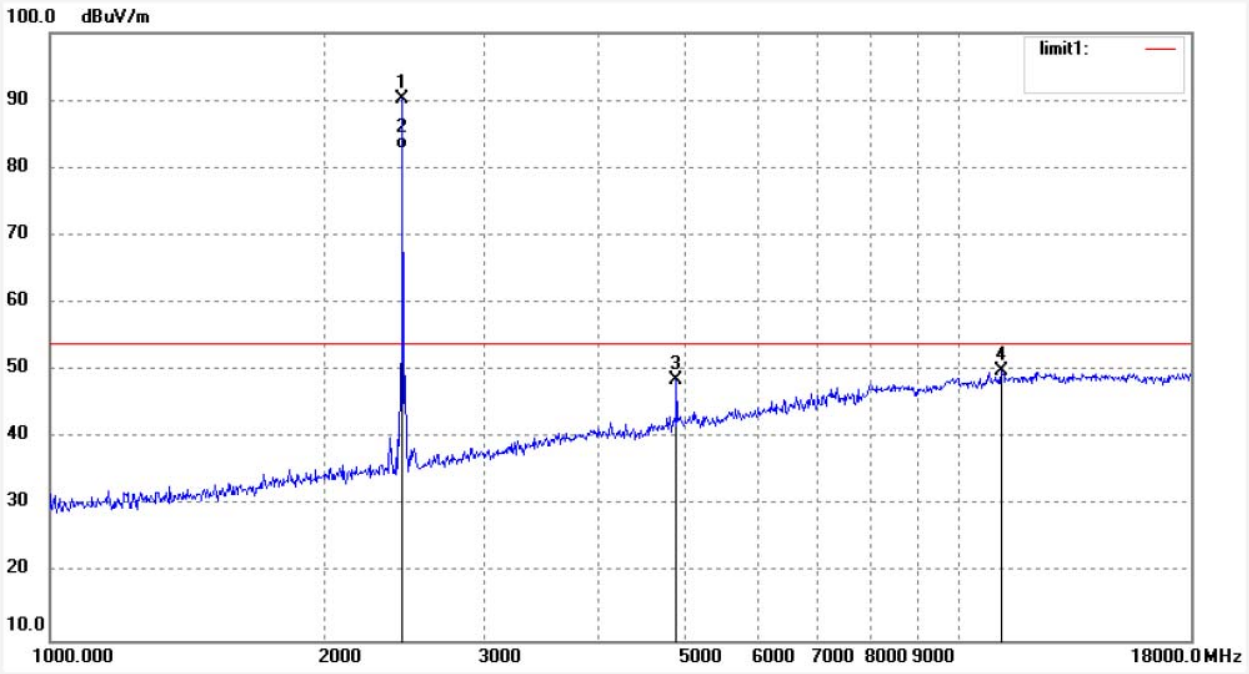
Job No.: alen #3764
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2442MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/24
Time: 11:10:08
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2442.751	96.77	-6.64	90.13			peak			
2	2442.751	89.39	-6.64	82.75			AVG			
3	4888.151	49.82	-1.33	48.49	74.00	-25.51	peak			
4	11140.310	44.27	5.65	49.92	74.00	-24.08	peak			

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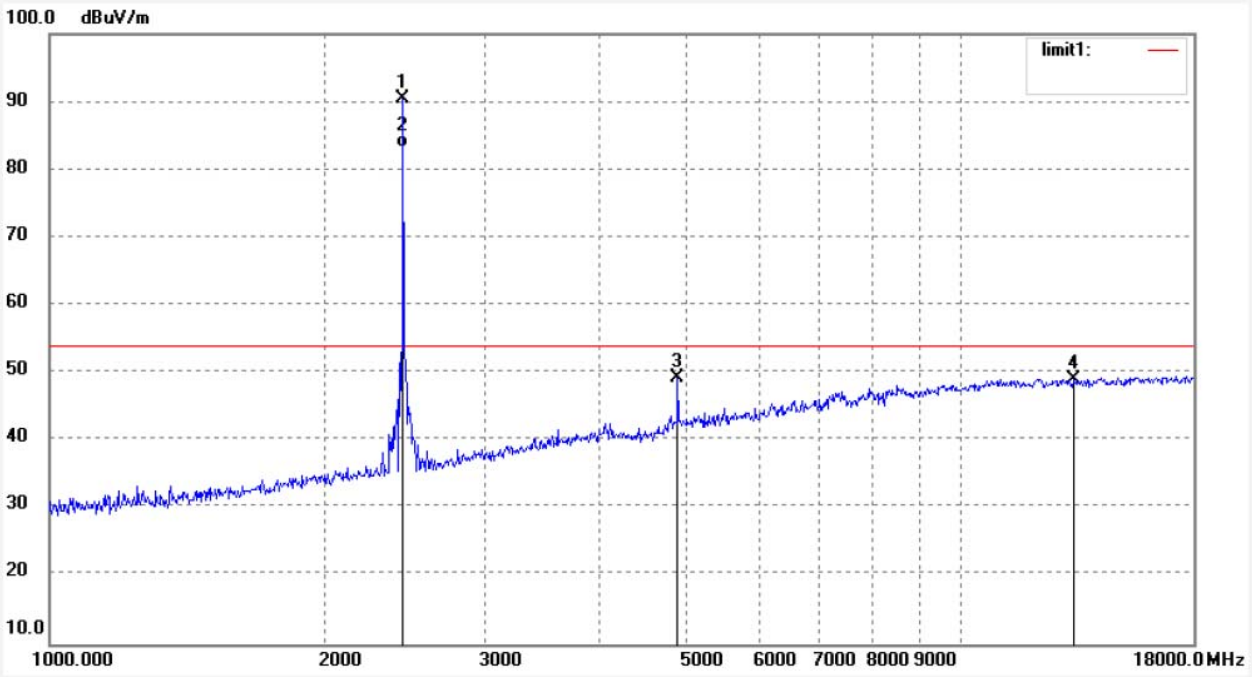
Job No.: alen #3765
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2442MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/24
Time: 11:11:36
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2442.751	97.08	-6.64	90.44			peak			
2	2442.751	89.89	-6.64	83.25			AVG			
3	4888.151	50.67	-1.33	49.34	74.00	-24.66	peak			
4	13288.284	40.51	8.56	49.07	74.00	-24.93	peak			

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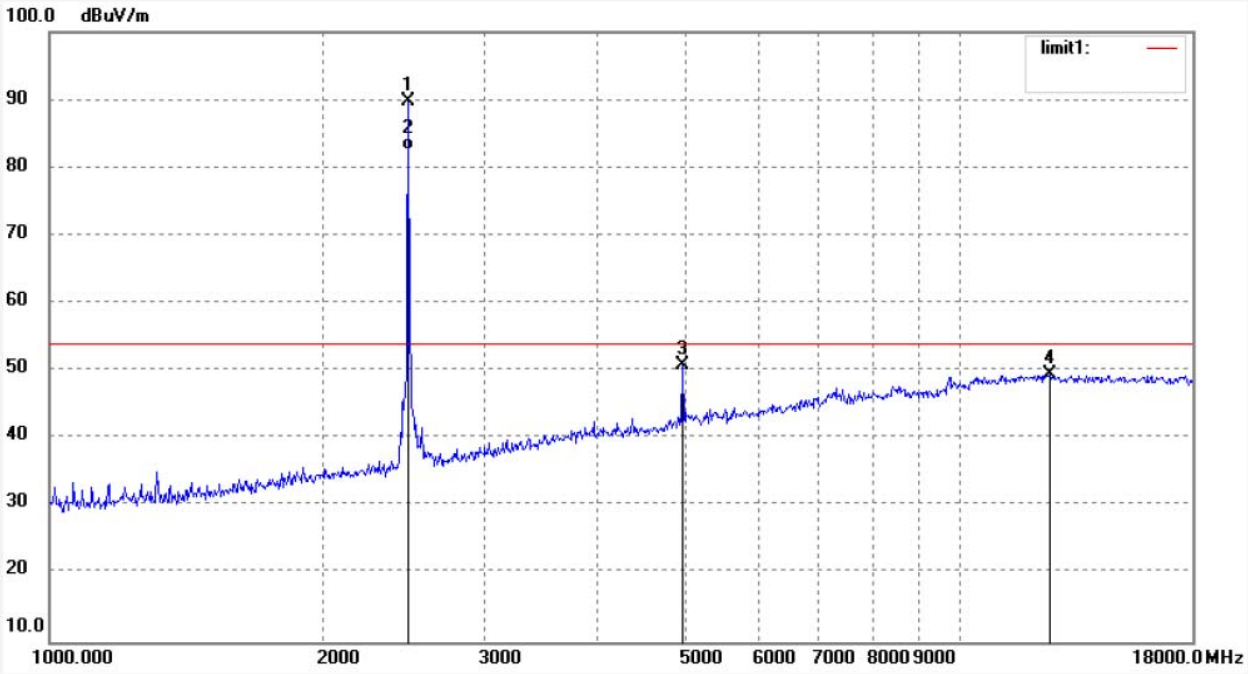
Job No.: alen #3767
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Horizontal
Power Source: DC 6V
Date: 2014/03/24
Time: 11:15:23
Engineer Signature:
Distance: 3m

Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2478.310	96.39	-6.56	89.83			peak			
2	2478.310	89.21	-6.56	82.65			AVG			
3	4959.307	52.05	-1.12	50.93	74.00	-23.07	peak			
4	12541.903	42.16	7.22	49.38	74.00	-24.62	peak			

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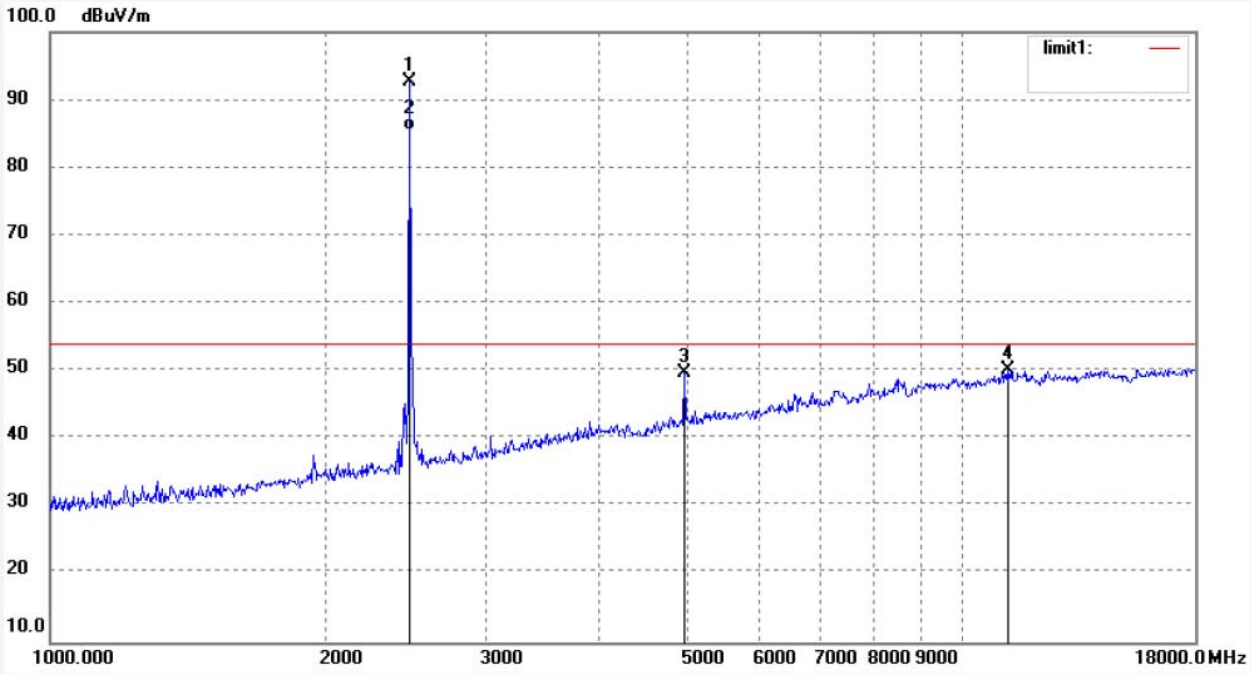
Job No.: alen #3766
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: TTX850 8-Channel 2.4GHz Transmitter
Mode: TX 2479MHz
Model: TACJ2850
Manufacturer: Nine Eagles

Polarization: Vertical
Power Source: DC 6V
Date: 2014/03/24
Time: 11:13:37
Engineer Signature:
Distance: 3m

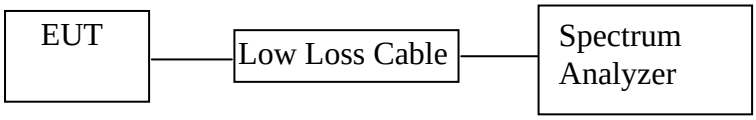
Note: Report No:ATE20140296



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2478.310	99.34	-6.56	92.78			peak			
2	2478.310	92.12	-6.56	85.56			AVG			
3	4959.307	50.93	-1.12	49.81	74.00	-24.19	peak			
4	11204.896	44.51	5.72	50.23	74.00	-23.77	peak			

13. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

13.1. Block Diagram of Test Setup



13.2. The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

13.3. EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

13.4. Operating Condition of EUT

13.4.1. Setup the EUT and simulator as shown as Section 13.1.

13.4.2. Turn on the power of all equipment.

13.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2403-2479 MHz. We select 2403MHz, 2442MHz, and 2479MHz TX frequency to transmit.

13.5.Test Procedure

13.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

13.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz (From 30MHz to 25GHz).

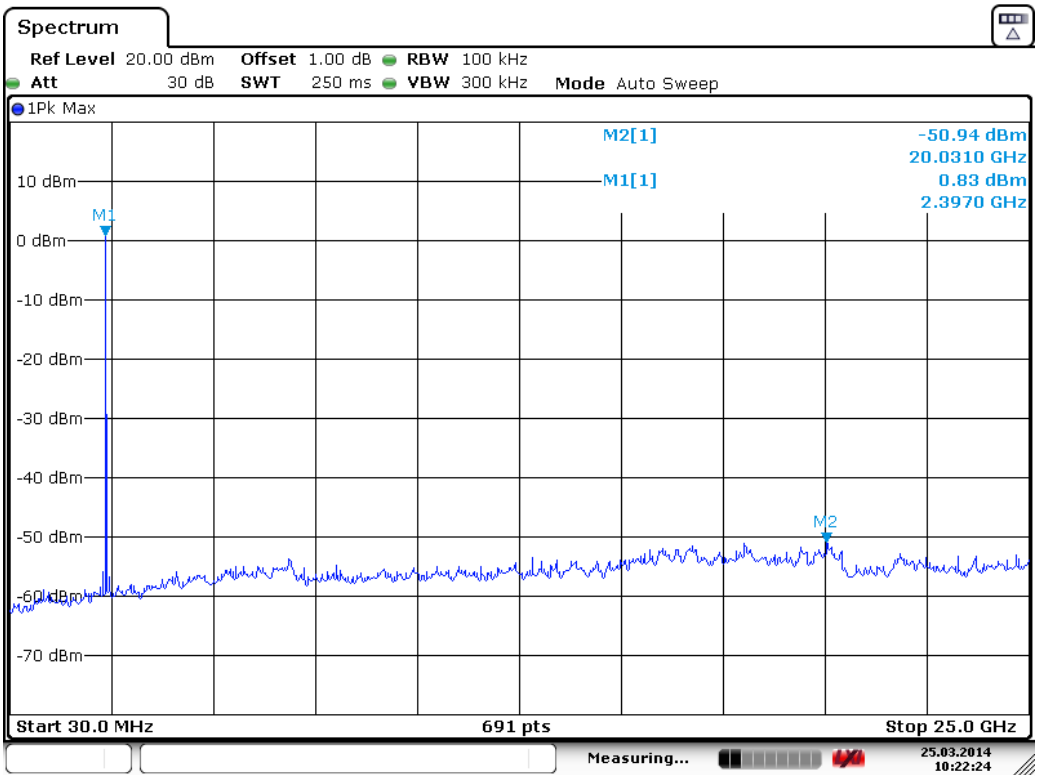
13.5.3.The Conducted Spurious Emission was measured and recorded.

13.6.Test Result

Pass.

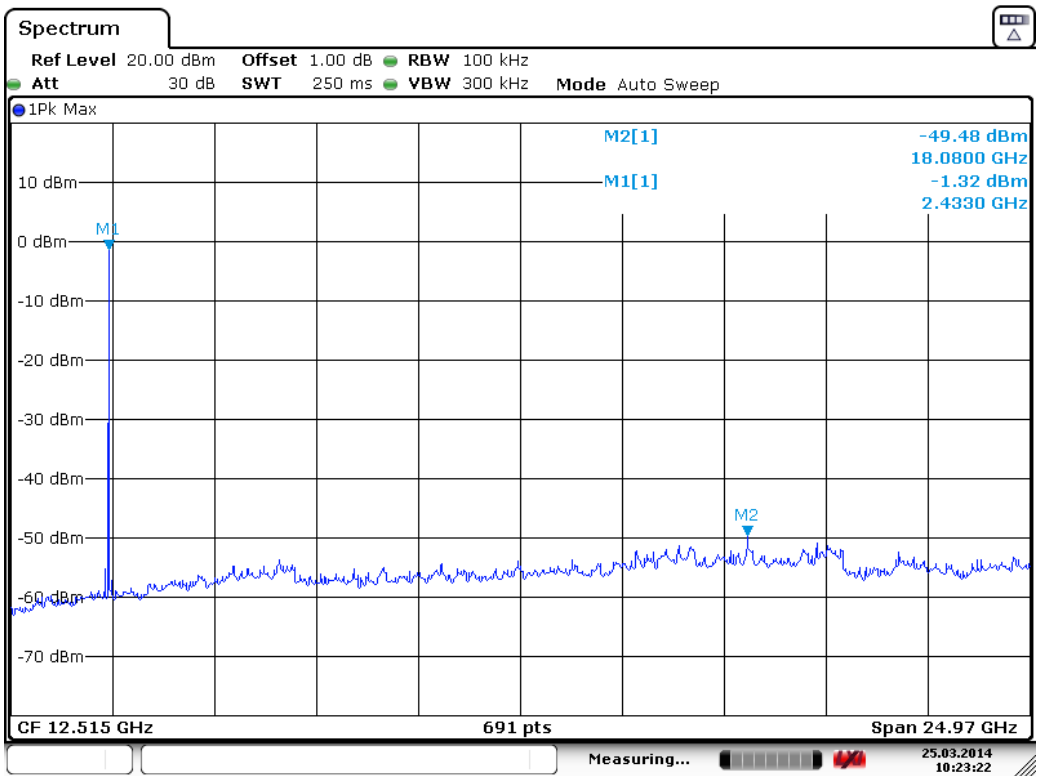
The spectrum analyzer plots are attached as below.

Low Channel



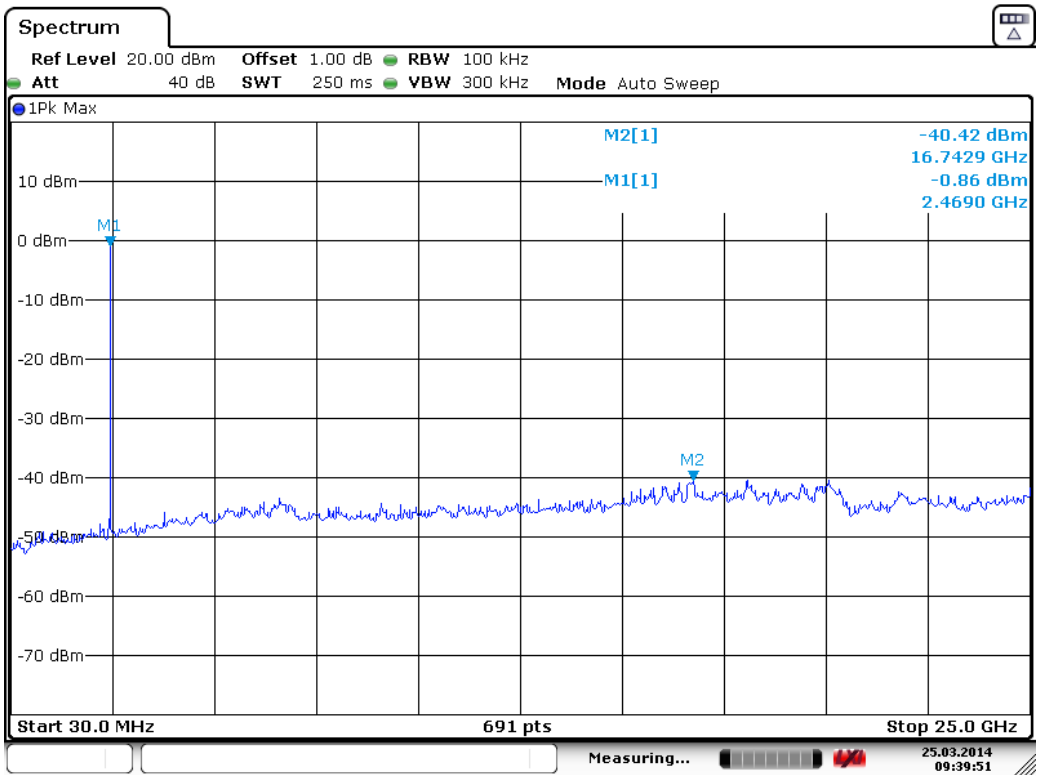
Date: 25.MAR.2014 10:22:24

Middle Channel



Date: 25.MAR.2014 10:23:22

High Channel



Date: 25.MAR.2014 09:39:51

14. ANTENNA REQUIREMENT

14.1. The 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.

14.2. Antenna Construction

Device is equipped with Integral antenna, which isn't displaced by other antenna. Therefore, the equipment complies with the antenna requirement of Section 15.203.