

FCC Test Report

Product Name	RF 2.4G RX PCBA Module
Model No.	ARFMR
FCC ID	2AAIL-ARFMR

Applicant	Mae Tay Precision Co.,Ltd.
Address	6F.,No.62, Ln.188, Ruiguang RD., Neihu Dist., Taipei City 114, Taiwan, R.O.C

Date of Receipt	Jun. 26, 2013
Issued Date	Jul. 29, 2013
Report No.	137002R-RFUSP44V01
Report Version	V1.0



The test results relate only to the samples tested.

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Test Report Certification

Issued Date: Jul. 29, 2013

Report No.: 137002R-RFUSP44V01



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Applicant	Mae Tay Precision Co.,Ltd.
Address	6F.,No.62, Ln.188, Ruiguang RD., Neihu Dist., Taipei City 114, Taiwan, R.O.C
Manufacturer	Mae Tay Precision Co.,Ltd.
Model No.	ARFMR
EUT Rated Voltage	DC 5V
EUT Test Voltage	AC 120V/60Hz
Trade Name	Maetay
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2012 ANSI C63.4: 2003, ANSI C63.10: 2009
Test Result	Complied

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	RF 2.4G RX PCBA Module
Trade Name	Maetay
Model No.	ARFMR
FCC ID	2AAIL-ARFMR
Frequency Range	2402~2478MHz
Channel Control	Auto
Channel Separation	1MHz
Antenna Type	Printed on PCB
Channel Number	77
Type of Modulation	GFSK

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Mae Tay	ARFMR	-2.76dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel

Channel 01: 2402 MHz Channel 21: 2422 MHz Channel 41: 2442 MHz Channel 61: 2462 MHz
Channel 02: 2403 MHz Channel 22: 2423 MHz Channel 42: 2443 MHz Channel 62: 2463 MHz
Channel 03: 2404 MHz Channel 23: 2424 MHz Channel 43: 2444 MHz Channel 63: 2464 MHz
Channel 04: 2405 MHz Channel 24: 2425 MHz Channel 44: 2445 MHz Channel 64: 2465 MHz
Channel 05: 2406 MHz Channel 25: 2426 MHz Channel 45: 2446 MHz Channel 65: 2466 MHz
Channel 06: 2407 MHz Channel 26: 2427 MHz Channel 46: 2447 MHz Channel 66: 2467 MHz
Channel 07: 2408 MHz Channel 27: 2428 MHz Channel 47: 2448 MHz Channel 67: 2468 MHz
Channel 08: 2409 MHz Channel 28: 2429 MHz Channel 48: 2449 MHz Channel 68: 2469 MHz
Channel 09: 2410 MHz Channel 29: 2430 MHz Channel 49: 2450 MHz Channel 69: 2470 MHz
Channel 10: 2411 MHz Channel 30: 2431 MHz Channel 50: 2451 MHz Channel 70: 2471 MHz
Channel 11: 2412 MHz Channel 31: 2432 MHz Channel 51: 2452 MHz Channel 71: 2472 MHz
Channel 12: 2413 MHz Channel 32: 2433 MHz Channel 52: 2453 MHz Channel 72: 2473 MHz
Channel 13: 2414 MHz Channel 33: 2434 MHz Channel 53: 2454 MHz Channel 73: 2474 MHz
Channel 14: 2415 MHz Channel 34: 2435 MHz Channel 54: 2455 MHz Channel 74: 2475 MHz
Channel 15: 2416 MHz Channel 35: 2436 MHz Channel 55: 2456 MHz Channel 75: 2476 MHz
Channel 16: 2417 MHz Channel 36: 2437 MHz Channel 56: 2457 MHz Channel 76: 2477 MHz
Channel 17: 2418 MHz Channel 37: 2438 MHz Channel 57: 2458 MHz Channel 77: 2478 MHz
Channel 18: 2419 MHz Channel 38: 2439 MHz Channel 58: 2459 MHz
Channel 19: 2420 MHz Channel 39: 2440 MHz Channel 59: 2460 MHz
Channel 20: 2421 MHz Channel 40: 2441 MHz Channel 60: 2461 MHz

Note:

1. The EUT is a RF 2.4G RX PCBA Module with a built-in 2.4GHz transceiver.
2. This module is “Limited Modular Approval” (LMA).
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
4. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
5. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.

Test Mode	Mode 1: Transmit
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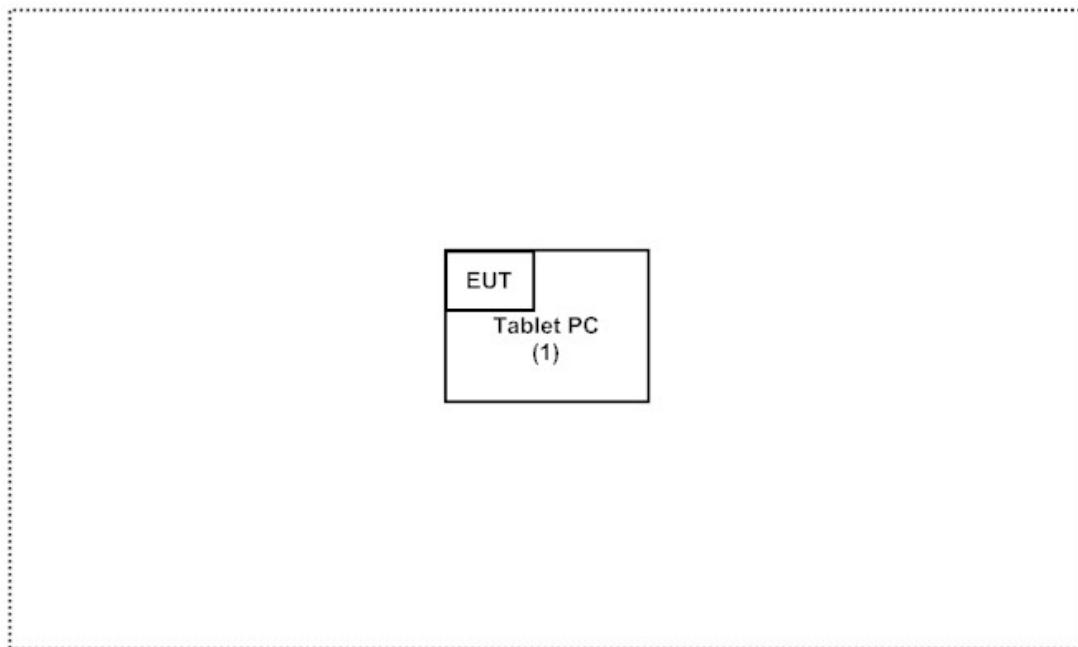
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1. Tablet PC	ASUS	T300LA-PC	N/A	N/A

Signal Cable Type	Signal cable Description
	N/A

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute “LUIP Commander v1.2.0.1” program on the Tablet PC.
- (3) Configure the test mode and the test channel
- (4) start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <http://tw.quietek.com/modules/myalbum/>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on
Federal Communications Commission
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7435 Oakland Mills Road
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FCC Accreditation Number: TW1014

2. Conducted Emission

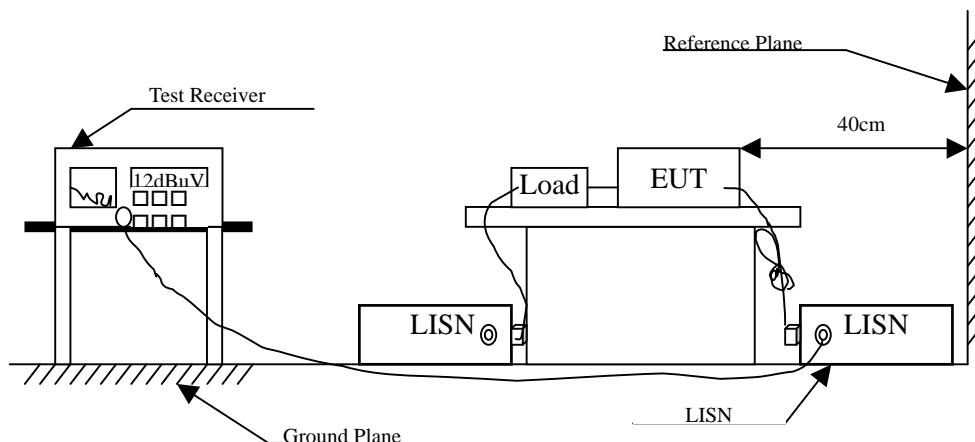
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2012	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2013	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2013	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2013	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2013	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by “X” are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : RF 2.4G RX PCBA Module
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit (2440MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.185	9.719	39.110	48.829	-16.171	65.000
0.240	9.680	36.880	46.560	-16.869	63.429
0.302	9.650	34.470	44.120	-17.537	61.657
0.361	9.650	24.800	34.450	-25.521	59.971
4.072	9.700	19.850	29.550	-26.450	56.000
19.080	9.950	16.390	26.340	-33.660	60.000
Average					
0.185	9.719	22.790	32.509	-22.491	55.000
0.240	9.680	29.010	38.690	-14.739	53.429
0.302	9.650	32.310	41.960	-9.697	51.657
0.361	9.650	17.980	27.630	-22.341	49.971
4.072	9.700	6.310	16.010	-29.990	46.000
19.080	9.950	9.080	19.030	-30.970	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " █ " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : RF 2.4G RX PCBA Module
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit (2440MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.181	9.732	42.250	51.982	-13.132	65.114
0.244	9.689	35.930	45.619	-17.695	63.314
0.302	9.660	33.900	43.560	-18.097	61.657
0.603	9.648	18.120	27.768	-28.232	56.000
4.498	9.700	18.430	28.130	-27.870	56.000
19.447	10.040	13.740	23.780	-36.220	60.000
Average					
0.181	9.732	30.210	39.942	-15.172	55.114
0.244	9.689	14.380	24.069	-29.245	53.314
0.302	9.660	30.220	39.880	-11.777	51.657
0.603	9.648	6.710	16.358	-29.642	46.000
4.498	9.700	2.230	11.930	-34.070	46.000
19.447	10.040	9.060	19.100	-30.900	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "  " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

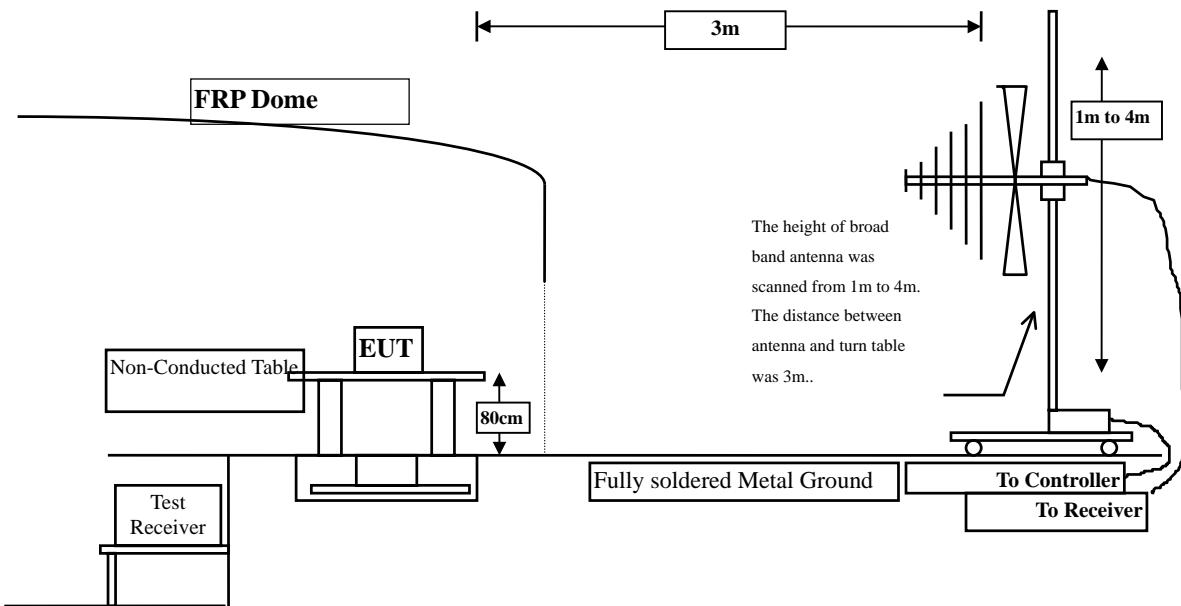
The following test equipment are used during the radiated emission test:

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2013
	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2013
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2013
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012
	X	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/925975	Mar, 2013
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2013
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2012
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2013
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

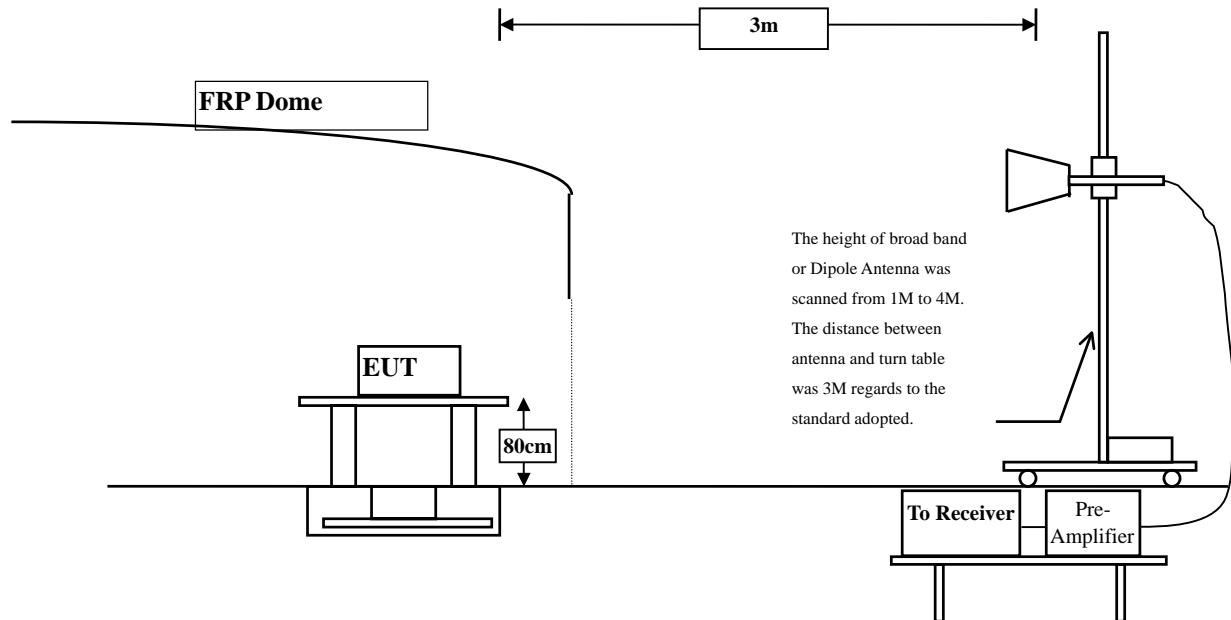
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

3.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.3. Limits

➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

3.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2009 and tested compliance to FCC 47CFR 15.249 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2009 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

X-Axis

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2402.000	31.573	56.500	88.074	-25.926	114.000
2440.000	31.852	57.230	89.082	-24.918	114.000
2478.000	32.140	57.910	90.050	-23.950	114.000
Average					
Detector:					
2402.000	31.573	40.870	72.444	-21.556	94.000
2440.000	31.852	41.630	73.482	-20.518	94.000
2478.000	32.140	42.110	74.250	-19.750	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

X-Axis

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Vertical					
Peak Detector:					
2402.000	30.917	45.560	76.477	-37.523	114.000
2440.000	31.139	49.230	80.369	-33.631	114.000
2478.000	31.397	50.190	81.588	-32.412	114.000
Average					
Detector:					
2402.000	30.917	32.980	63.897	-30.103	94.000
2440.000	31.139	35.220	66.359	-27.641	94.000
2478.000	31.397	36.500	67.898	-26.102	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

Y-Axis

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2402.000	31.573	56.370	87.944	-26.056	114.000
2440.000	31.852	57.690	89.542	-24.458	114.000
2478.000	32.140	58.250	90.390	-23.610	114.000
Average					
Detector:					
2402.000	31.573	40.800	72.374	-21.626	94.000
2440.000	31.852	41.880	73.732	-20.268	94.000
2478.000	32.140	42.080	74.220	-19.780	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

Y-Axis

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Vertical					
Peak Detector:					
2402.000	30.917	51.370	82.287	-31.713	114.000
2440.000	31.139	54.460	85.599	-28.401	114.000
2478.000	31.397	56.290	87.688	-26.312	114.000
Average					
Detector:					
2402.000	30.917	37.270	68.187	-25.813	94.000
2440.000	31.139	39.570	70.709	-23.291	94.000
2478.000	31.397	40.580	71.978	-22.022	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

Z-Axis

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2402.000	31.573	51.750	83.324	-30.676	114.000
2440.000	31.852	51.340	83.192	-30.808	114.000
2478.000	32.140	51.760	83.900	-30.100	114.000
Average					
Detector:					
2402.000	31.573	37.450	69.024	-24.976	94.000
2440.000	31.852	37.360	69.212	-24.788	94.000
2478.000	32.140	37.510	69.650	-24.350	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit

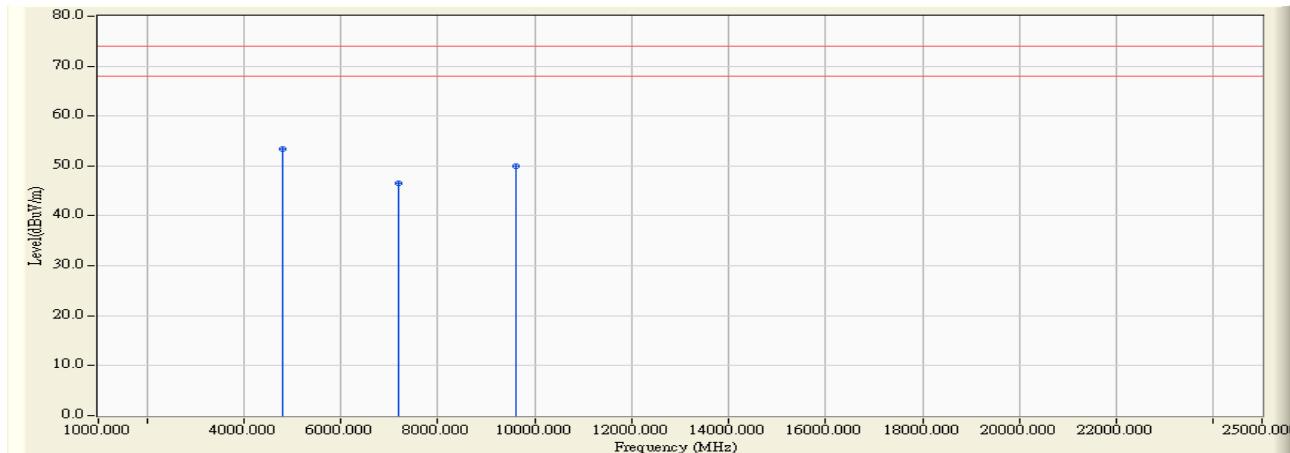
Z-Axis

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Peak Detector:					
2402.000	30.917	56.820	87.737	-26.263	114.000
2440.000	31.139	58.510	89.649	-24.351	114.000
2478.000	31.397	60.120	91.518	-22.482	114.000
Average					
Detector:					
2402.000	30.917	41.110	72.027	-21.973	94.000
2440.000	31.139	42.530	73.669	-20.331	94.000
2478.000	31.397	43.500	74.898	-19.102	94.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2402MHz)



Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBuV/m
		dB	dBuV		

Horizontal

Peak Detector:

4804.000	3.327	50.140	53.467	-20.533	74.000
7206.000	10.136	36.340	46.476	-27.524	74.000
9608.000	13.706	36.210	49.916	-24.084	74.000

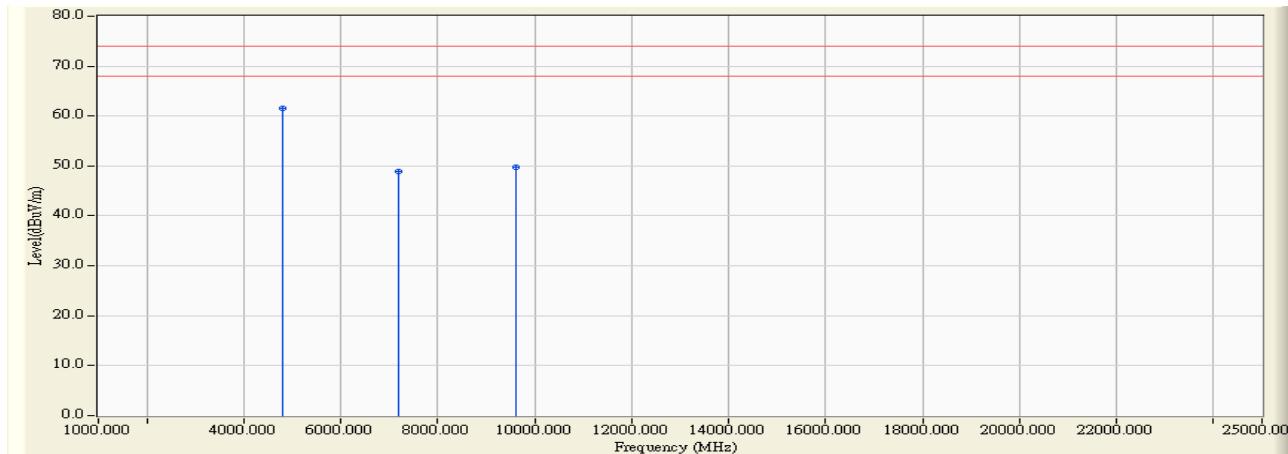
Average Detector:

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Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2402MHz)



Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m

Vertical

Peak Detector:

4804.000	6.638	54.880	61.517	-12.483	74.000
7206.000	11.005	37.860	48.865	-25.135	74.000
9608.000	14.103	35.750	49.853	-24.147	74.000

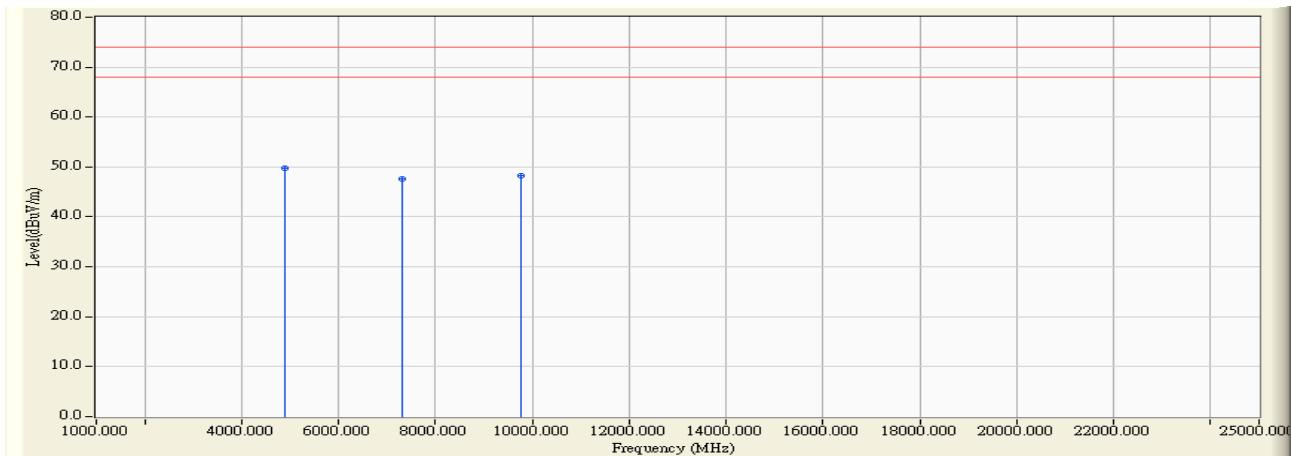
Average Detector:

4804.000	6.638	42.050	48.687	-5.313	54.000
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Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2440 MHz)



Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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Horizontal

Peak Detector:

4880.000	3.010	46.800	49.810	-24.190	74.000
7320.000	11.833	35.820	47.654	-26.346	74.000
9760.000	12.580	35.720	48.301	-25.699	74.000

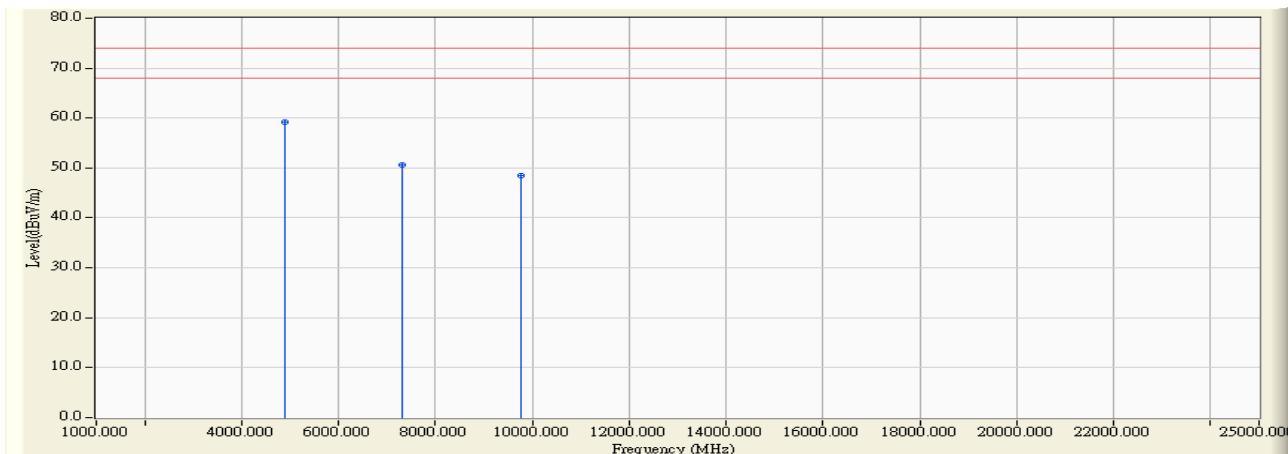
Average Detector:

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Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2440 MHz)

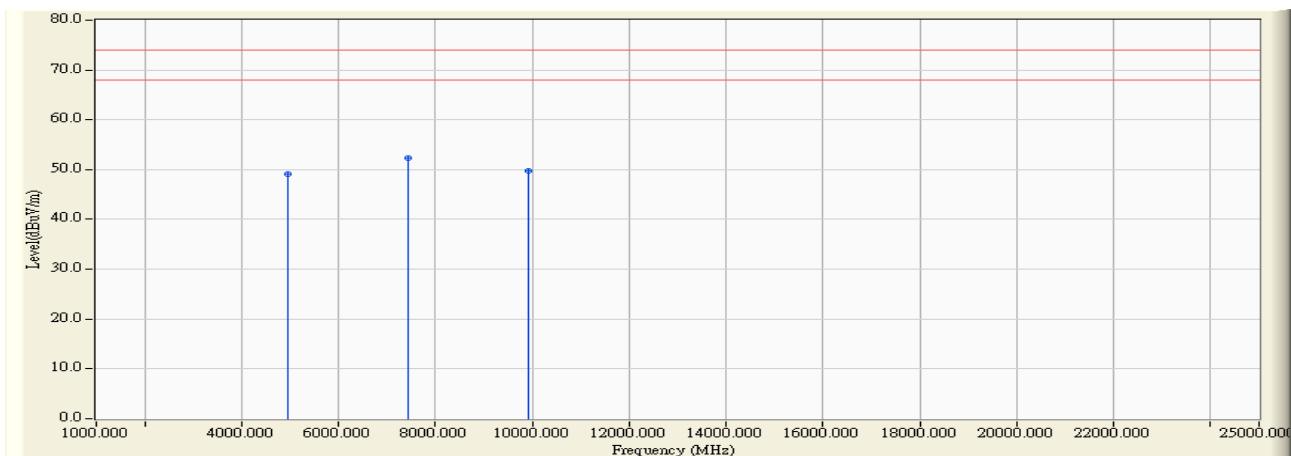


Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Peak Detector:					
4880.000	5.738	53.520	59.258	-14.742	74.000
7320.000	12.703	37.900	50.603	-23.397	74.000
9760.000	13.052	35.480	48.532	-25.468	74.000
Average Detector:					
4880.000	5.738	41.060	46.798	-7.202	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2478 MHz)



Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBuV/m

Horizontal

Peak Detector:

4956.000	2.771	46.350	49.121	-24.879	74.000
7434.000	12.509	39.790	52.300	-21.700	74.000
9912.000	13.411	36.250	49.661	-24.339	74.000

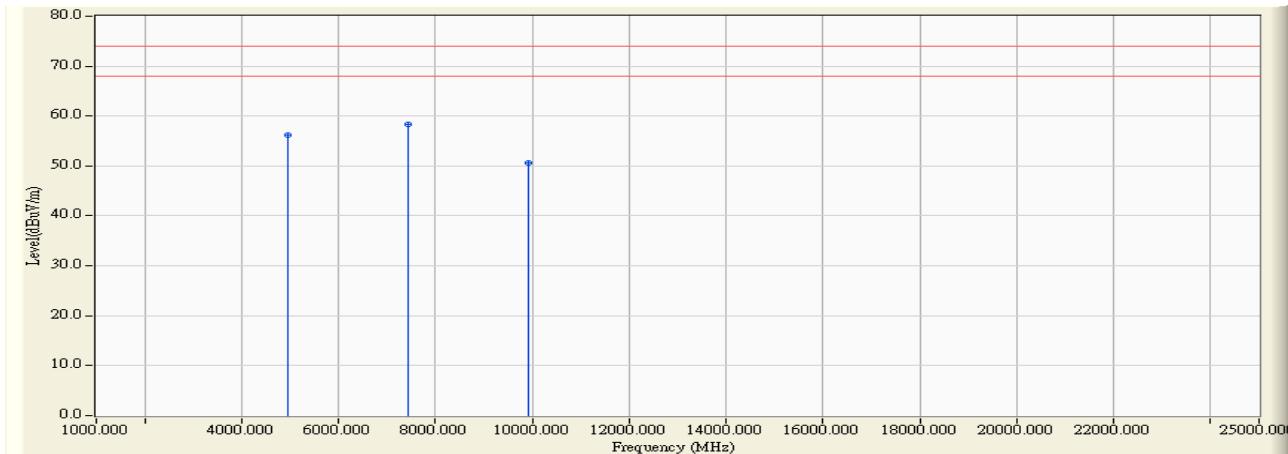
Average Detector:

--

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2478 MHz)



Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Peak Detector:					
4956.000	5.553	50.620	56.174	-17.826	74.000
7434.000	13.416	44.860	58.277	-15.723	74.000
9912.000	13.964	36.670	50.635	-23.365	74.000
Average Detector:					
4956.000	5.553	35.790	41.344	-12.656	54.000
7434.000	13.416	31.640	45.057	-8.943	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RF 2.4G RX PCBA Module
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2440 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
43.580	-4.496	29.319	24.823	-15.177	40.000
286.080	-4.687	27.127	22.440	-23.560	46.000
462.620	1.172	25.310	26.482	-19.518	46.000
594.540	3.927	23.248	27.175	-18.825	46.000
759.440	4.372	23.910	28.282	-17.718	46.000
883.600	6.146	23.214	29.359	-16.641	46.000
Vertical					
146.400	-6.248	33.705	27.457	-16.043	43.500
371.440	-2.737	26.239	23.502	-22.498	46.000
532.460	-0.563	23.746	23.183	-22.817	46.000
685.720	2.319	23.077	25.395	-20.605	46.000
804.060	3.587	23.820	27.407	-18.593	46.000
968.960	8.191	23.137	31.328	-22.672	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

4. Band Edge

4.1. Test Equipment

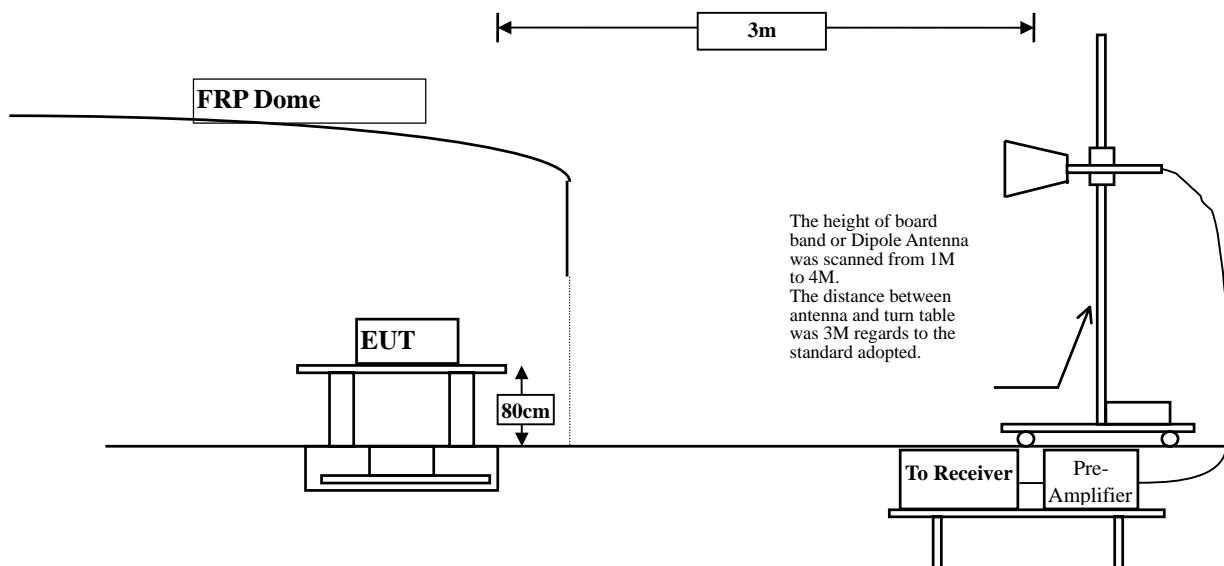
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2013
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2013
	X Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012
	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/925975	Mar, 2013
	X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2013
	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2012
	X Coaxial Cable	QuiTek	QTK-CABLE/ CAB5	Feb., 2013
	X Controller	QuiTek	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note:

1. All equipments are calibrated every one year.
2. The test equipments marked by "X" are used to measure the final test results.

4.2. Test Setup



4.3. Limits

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 50 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. 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) (see Section 15.205(c)).

4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10 2009 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

4.5. Uncertainty

Conducted is \pm 1.27 dB

Radiated is \pm 3.9 dB

4.6. Test Result of Band Edge

Product : RF 2.4G RX PCBA Module
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2390.000	-1.131	48.336	47.205	74.00	54.00	Pass
01 (Peak)	2400.000	-1.084	67.701	66.618	74.00	54.00	Pass
01 (Peak)	2402.200	-1.072	83.731	82.660	--	--	--
01 (Average)	2386.000	-1.147	25.074	23.928	74.00	54.00	Pass
01 (Average)	2390.000	-1.131	23.434	22.303	74.00	54.00	Pass
01 (Average)	2400.000	-1.084	46.459	45.376	74.00	54.00	Pass
01 (Average)	2402.000	-1.073	63.754	62.682	--	--	--

Figure Channel 01:

Horizontal (Peak)

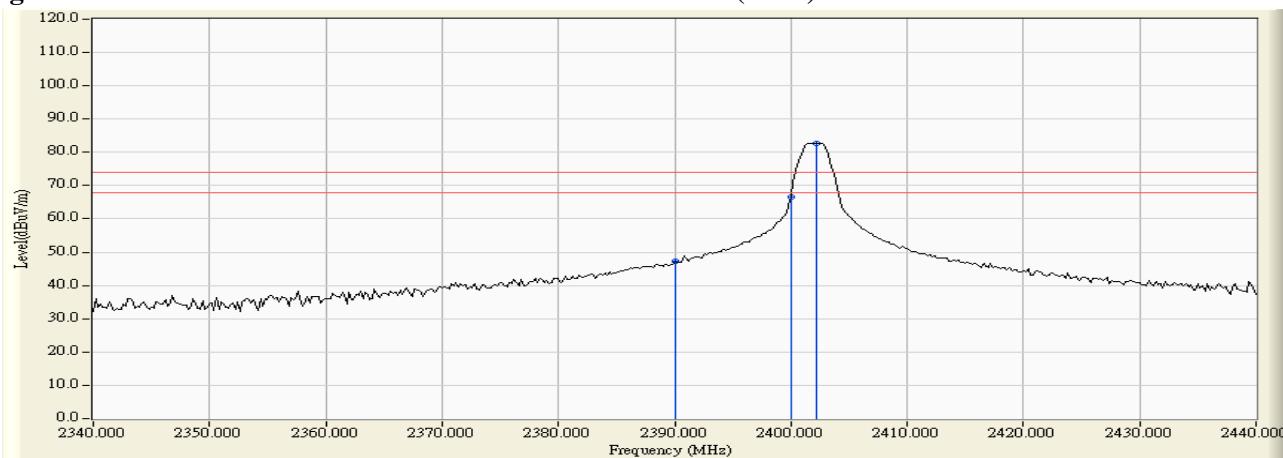
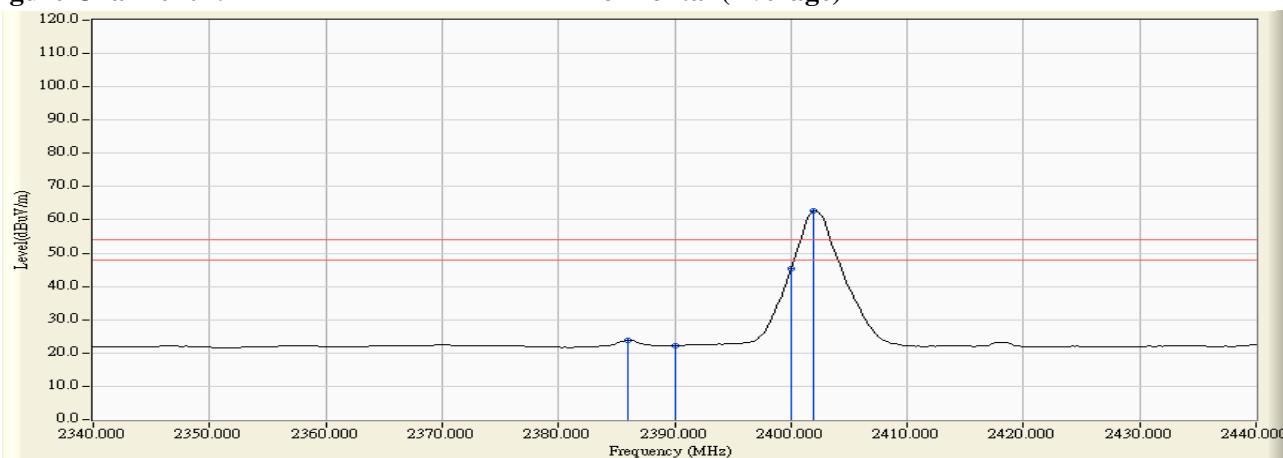


Figure Channel 01:

Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : RF 2.4G RX PCBA Module
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2390.000	-1.725	52.989	51.264	74.00	54.00	Pass
01 (Peak)	2400.000	-1.733	74.924	73.192	74.00	54.00	Pass
01 (Peak)	2402.000	-1.729	89.459	87.730	--	--	--
01 (Average)	2386.200	-1.707	27.068	25.361	74.00	54.00	Pass
01 (Average)	2390.000	-1.725	24.208	22.483	74.00	54.00	Pass
01 (Average)	2400.000	-1.733	50.655	48.923	74.00	54.00	Pass
01 (Average)	2402.000	-1.729	69.094	67.365	--	--	--

Figure Channel 01:

Vertical (Peak)

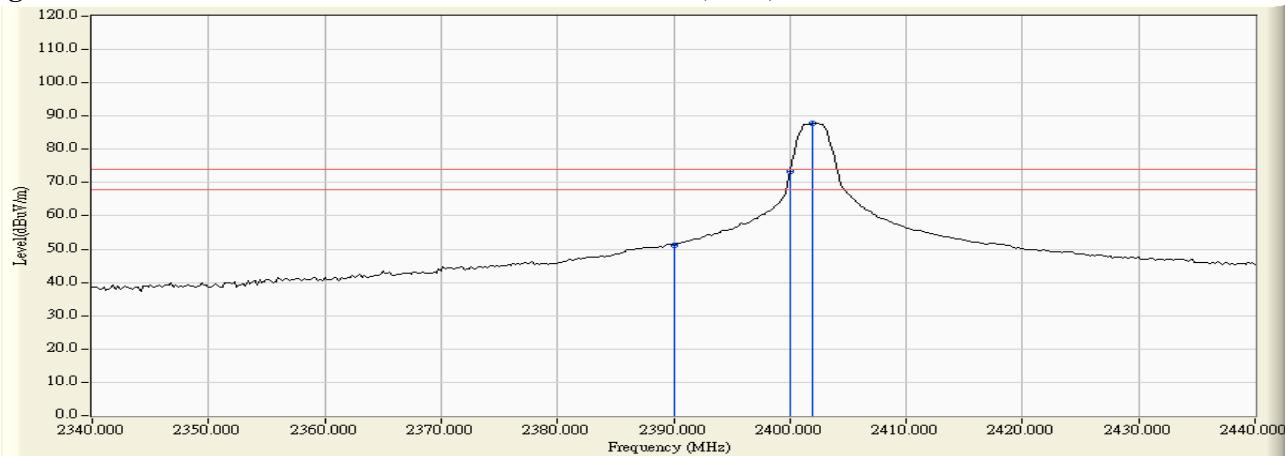
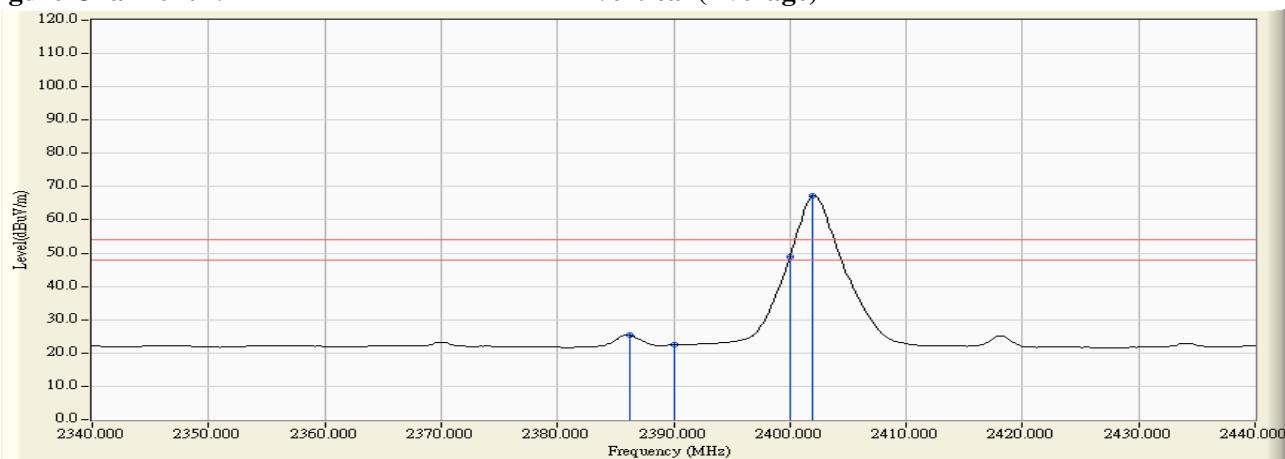


Figure Channel 01:

Vertical (Average)



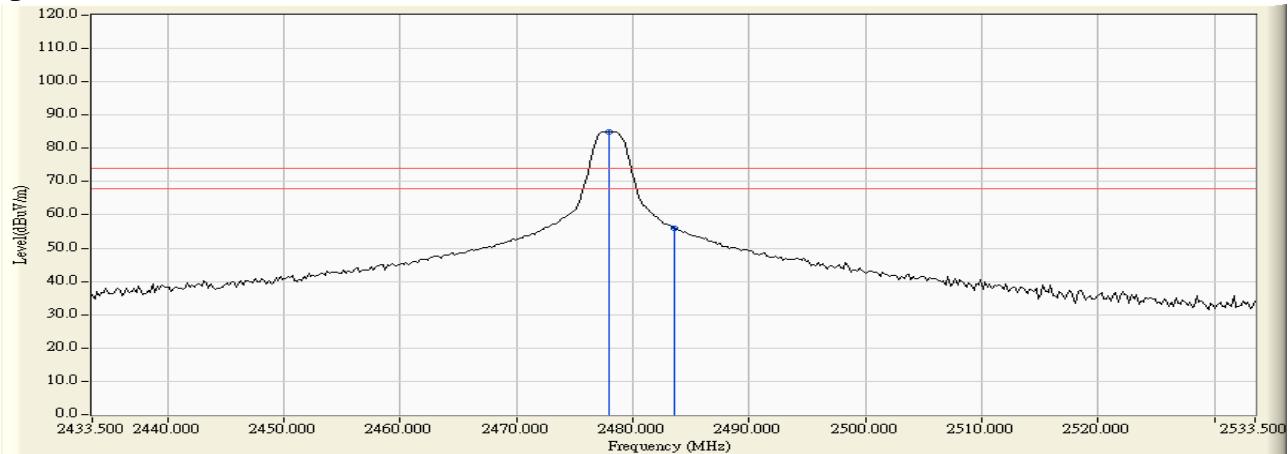
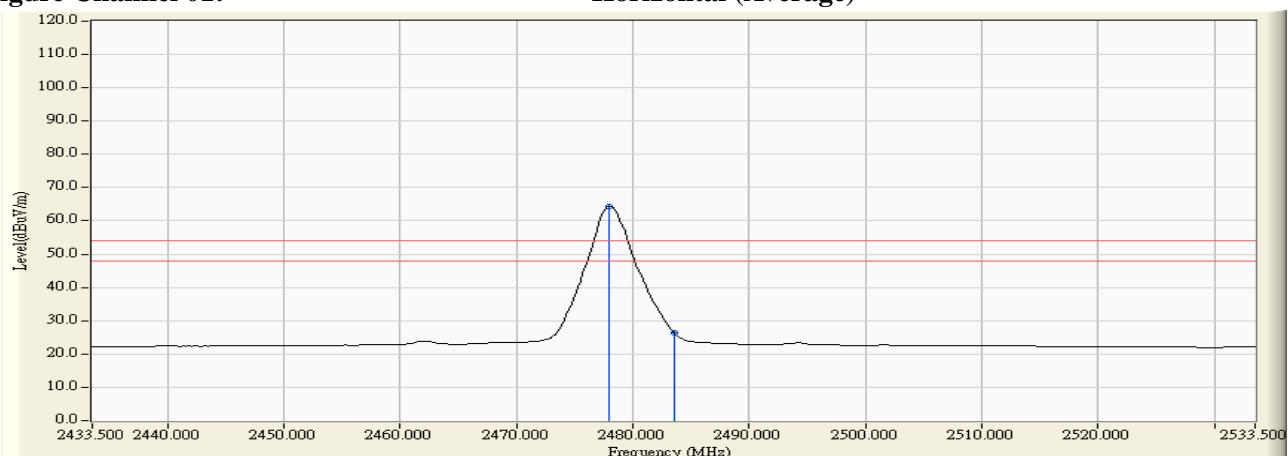
Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : RF 2.4G RX PCBA Module
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
77 (Peak)	2477.900	-0.594	85.539	84.945	--	--	--
77 (Peak)	2483.500	-0.558	56.661	56.103	74.00	54.00	Pass
77 (Average)	2477.900	-0.594	64.951	64.357	--	--	--
77 (Average)	2483.500	-0.558	26.997	26.439	74.00	54.00	Pass

Figure Channel 01:
Horizontal (Peak)

Figure Channel 01:
Horizontal (Average)


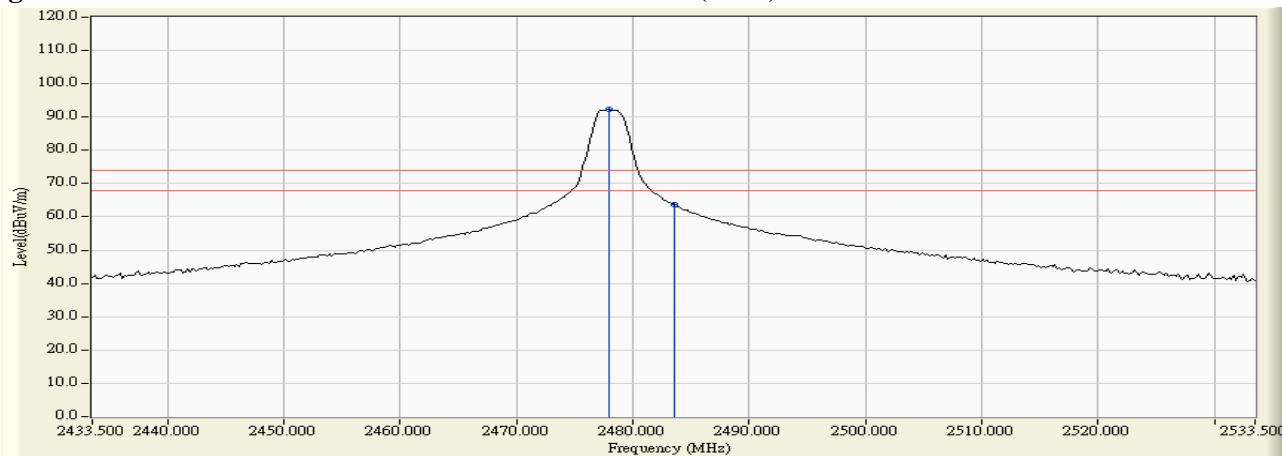
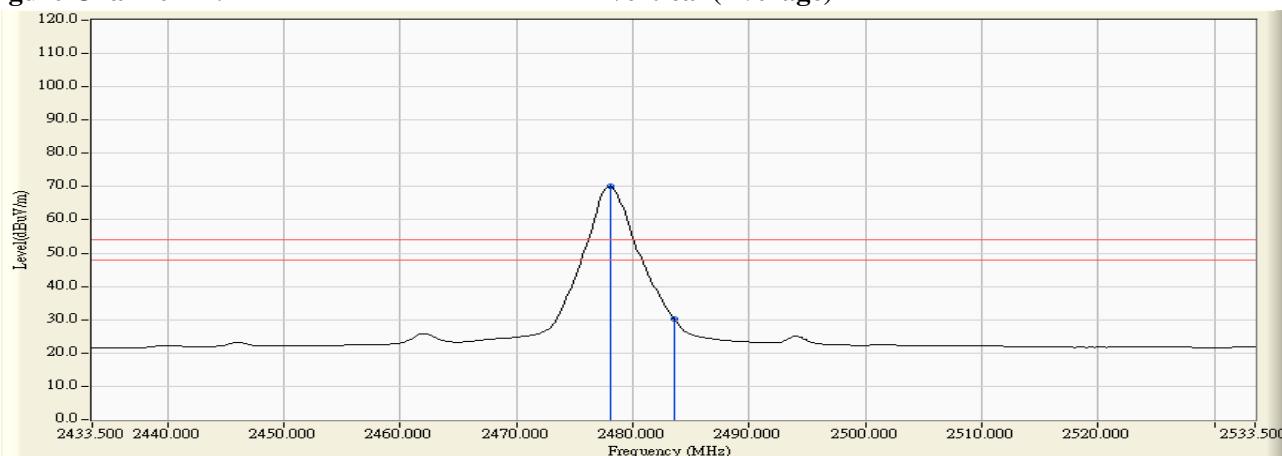
Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : RF 2.4G RX PCBA Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
77 (Peak)	2477.900	-1.336	93.521	92.185	--	--	--
77 (Peak)	2483.500	-1.305	64.950	63.645	74.00	54.00	Pass
77 (Average)	2478.100	-1.334	71.414	70.079	--	--	--
77 (Average)	2483.500	-1.305	31.680	30.375	74.00	54.00	Pass

Figure Channel 77:**Vertical (Peak)****Figure Channel 77:****Vertical (Average)**

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

5. EMI Reduction Method During Compliance Testing

No modification was made during testing.