

FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Tymphany HK Limited

Wireless Subwoofer

Model Number: R-4B Subwoofer

FCC ID: 2AAGJR4BSUB

Prepared for : Tymphany HK Limited
Room 1307-8, Dominon Centre, 43-59 Queen's Road East,
WanChai, Hong Kong

Prepared By : EST Technology Co., Ltd.
Santun(guantai Road), Houjie Town, DongGuan City,
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Report Number: ESTE-R1508025
Date of Test : July 22 ~ August 13,2015
Date of Report : August 15, 2015

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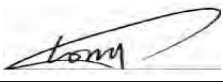
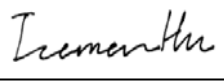
8.4 Test Data 50

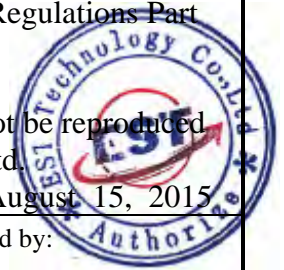
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Test Report Verification

Applicant:	Tymphany HK Limited		
Address:	Room 1307-8, Dominon Centre, 43-59 Queen's Road East, WanChai, Hong Kong		
Manufacturer	Klipsch Group, Inc.		
Address:	3502 Woodview Trace, Indianapolis, IN 46268		
E.U.T:	Wireless Subwoofer		
Model Number:	R-4B Subwoofer		
Power Supply:	DC 24V From Adapter Input AC 100-240V~50/60Hz		
Test Voltage:	AC 120V/AC 240V		
Trade Name:	Klipsch	Serial No.:	-----
Date of Receipt:	July 22 ,2015	Date of Test:	July 22 ~ August 13,2015
Test Specification:	FCC Rules and Regulations Part 15 Subpart C:2014 ANSI C63.10:2013		
Test Result:	<p>The device described above is tested by EST Technology Co., Ltd.. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the ETSI EN FCC Rules and Regulations Part 15 Subpart C requirements.</p> <p>This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.</p> <p style="text-align: right;">Date: August 15, 2015</p>		
Prepared by:	Tested by:	Approved by:	
 <hr/> Ada / Assistant	 <hr/> Tony.Tang/ Engineer	 <hr/> IcemanHu / Manager	
Other Aspects:	None.		
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.			



1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	: Wireless Subwoofer
Model Number	: R-4B Subwoofer
FCC ID	: 2AAGJR4BSUB
Operation frequency	: 2402MHz~2480MHz
Number of channel	: 40
Antenna	: Integral antenna, 2.27 dBi gain
Modulation	: Bluetooth V4.0 BLE: GFSK
Sample Type	: Prototype production

2. SUMMARY OF TEST

2.1. Summary of test result

Description of Test Item	Standard	Results
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10:2013	PASS
Radiated Emission	FCC Part 15: 15.209 ANSI C63.10:2013 KDB 558074	PASS
Band Edge Compliance	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Conducted spurious emissions	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
6dB Bandwidth	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Peak Output Power	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Power Spectral Density	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
Note: 558074 D01 DTS Meas Guidance v03r02		

2.2. Test Facilities

EMC Lab : Certificated by CNAL, CHINA
Registration No.: L5288
Date of registration: November 13, 2014

Certificated by FCC, USA
Registration No.: 989591
Date of registration: November 20, 2013

Certificated by Industry Canada
Registration No.: 46405-9405
Test Side Number: 9405A-1
Date of registration: January 03, 2013

Certificated by VCCI, Japan
Registration No.: R-3663 & C-4103
Date of registration: July 25, 2011

Certificated by TUV Rheinland, Germany
Registration No.: UA 50195514 0001
Date of registration: January 07, 2011

Certificated by TUV/PS, Shenzhen
Registration No.: SCN1017
Date of registration: January 27, 2011

Certificated by Intertek ETL SEMKO
Registration No.: 2011-RTL-L1-18
Date of registration: April 28, 2011

Certificated by Siemic, Inc.
Registration No.: SLCN021
Date of registration: November 8, 2011

Certificated by Nemko, Hong Kong
Registration No.: 175193
Date of registration: May 4, 2011

Name of Firm : EST Technology Co., Ltd.

Site Location : San Tun Management Zone, Houjie Town, Dongguan,
Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.54dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.62
Uncertainty for Radiation Emission test (1GHz to 18GHz)	4.86
Uncertainty for radio frequency	7×10^{-8}
Uncertainty for conducted RF Power	0.20dB
Uncertainty for Power density test	0.26dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.4. Assistant equipment used for test

2.4.1. Adapter

M / N : DYS650-240210W-1
 Manufacturer : DYS
 INPUT : AC 100-240V, 50/60Hz, 1.3A Max.
 OUTPUT : DC 24.0V, 2.1A

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was be set into BT test mode by software before test.



(EUT: Wireless Subwoofer)

2.6. Test mode

A special test software was used to control EUT work in Continuous TX mode(100% duty cycle), and select test channel, wireless mode and data rate.

Mode	Channel	Frequency
BT 4.0-BLE GFSK	Low	2402MHz
	Middle	2440MHz
	High	2480MHz

2.7. Channel List for Bluetooth

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2404
3	2406	4	2408
5	2410	6	2412
7	2414	8	2416
9	2418	10	2420
11	2422	12	2424
13	2426	14	2428
15	2430	16	2432
17	2434	18	2436
19	2438	20	2440
21	2442	22	2444
23	2446	24	2448
25	2450	26	2452
27	2454	28	2456
29	2458	30	2460
31	2462	32	2464
33	2466	34	2468
35	2470	36	2472
37	2474	38	2476
39	2478	40	2480

2.8. Test Equipment

2.8.1. For conducted emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	832354	June,28,15	1 Year
Artificial Mains Networ	Rohde & Schwarz	ENV216	101260	June,28,15	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	June,28,15	1 Year

2.8.2. For radiated emission test(30-1000MHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESVS10	100004	June,28,15	1 Year
Spectrum Analyzer	Agilent	E4411B	MY50140697	June,28,15	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	June,28,15	1 Year
Signal Amplifier	Agilent	310N	187037	June,28,15	1 Year

2.8.3. For radiated emission test(above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA9120D1002	June,28,15	1 Year
Signal Amplifier	SCHWARZBECK	BBV9718	9718-212	June,28,15	1 Year
Spectrum Analyzer	Agilent	E4408B	MY44211139	June,28,15	1 Year
Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	103173	June,28,15	1 Year

3 POWER LINE CONDUCTED EMISSION TEST

3.1. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.3 Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC line 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 C63.10: 2013 on Conducted Emission Test.

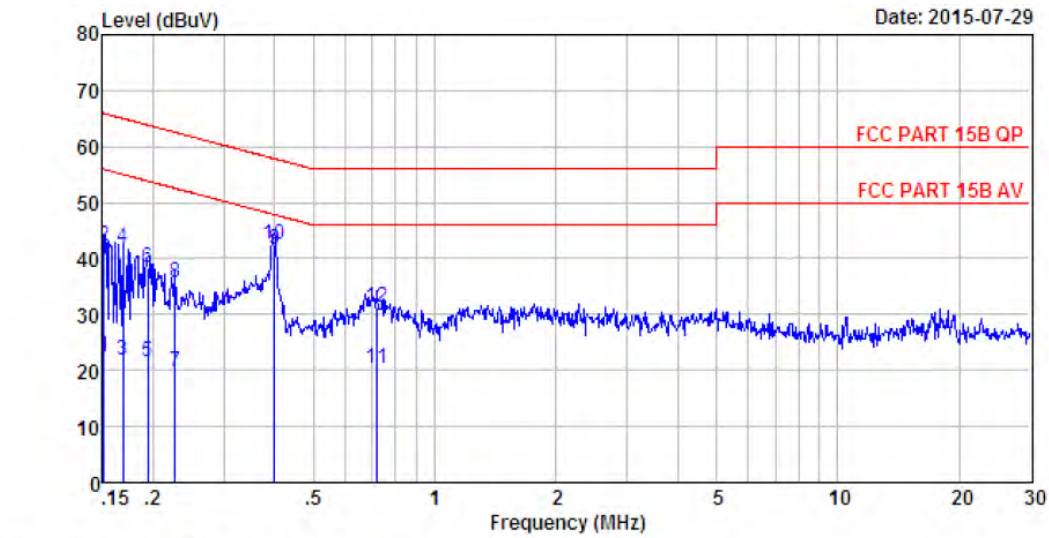
The bandwidth of test receiver (R & S ESHS30) is set at 10kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Result

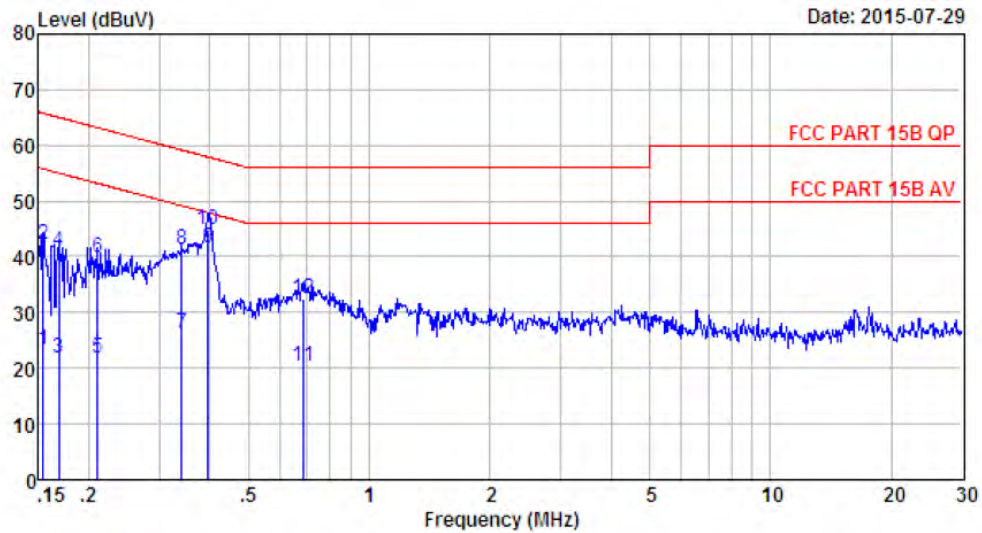
PASS. (All emissions not reported below are too low against the prescribed limits.)

3.5. Test data



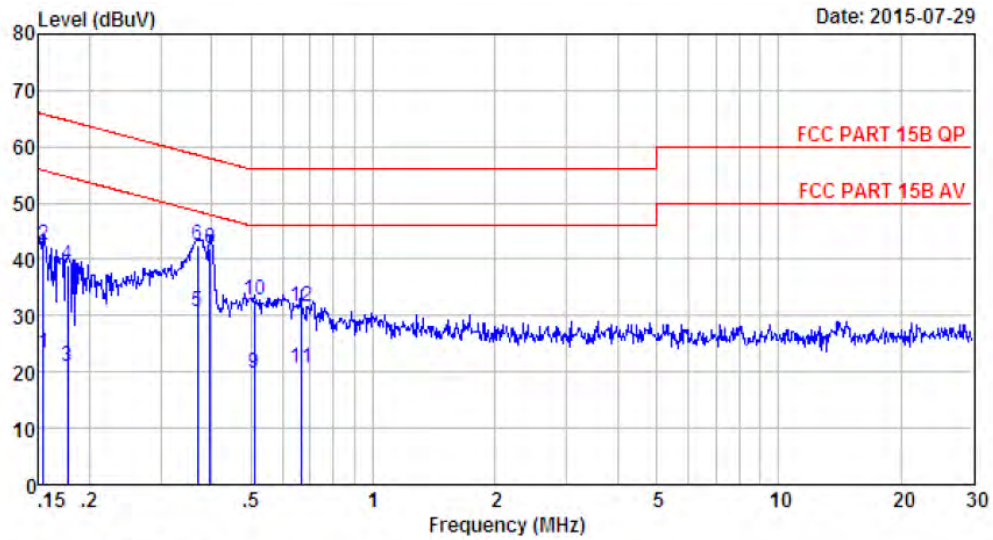
Site no : 844 Shield Room
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa NEUTRAL
 Limit : FCC PART 15B QP
 Engineer : Tony
 EUT : Wireless Subwoofer
 M/N : DC 24V From Adapter Input AC 240V/60Hz
 Power : R-4B Subwoofer
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBUV)	Emission Level (dBUV)	Limits (dBUV)	Margin (dB)	Remark
1	0.15	9.46	9.81	3.07	22.34	55.96	33.62	Average
2	0.15	9.46	9.81	23.07	42.34	65.96	23.62	QP
3	0.17	9.52	9.81	2.58	21.91	55.03	33.12	Average
4	0.17	9.52	9.81	22.58	41.91	65.03	23.12	QP
5	0.19	9.59	9.80	2.03	21.42	53.84	32.42	Average
6	0.19	9.59	9.80	19.03	38.42	63.84	25.42	QP
7	0.23	9.60	9.80	0.28	19.68	52.57	32.89	Average
8	0.23	9.60	9.80	16.28	35.68	62.57	26.89	QP
9	0.40	9.59	9.82	22.17	41.58	47.86	6.28	Average
10	0.40	9.59	9.82	23.17	42.58	57.86	15.28	QP
11	0.72	9.63	9.81	0.79	20.23	46.00	25.77	Average
12	0.72	9.63	9.81	11.79	31.23	56.00	24.77	QP



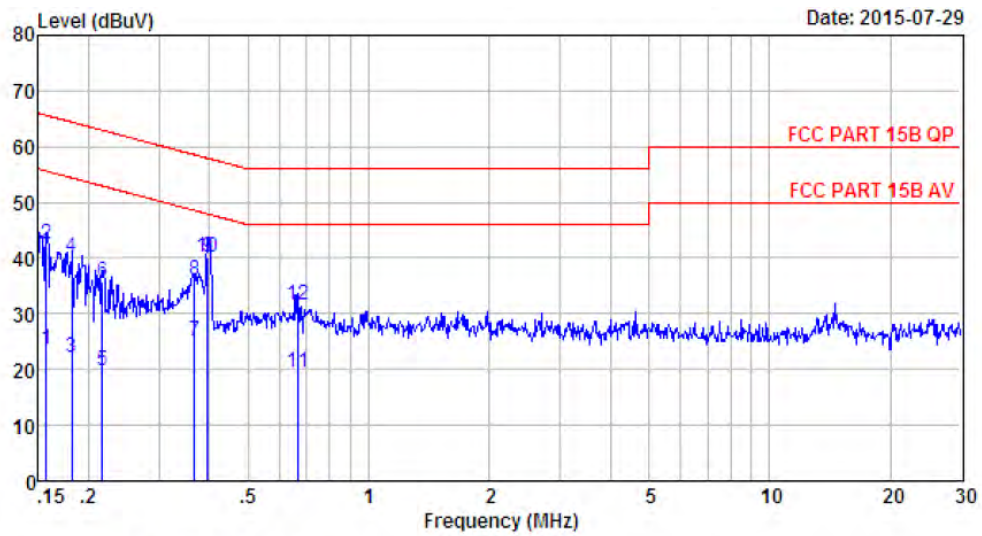
Site no : 844 Shield Room
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa LINE
 Limit : FCC PART 15B QP
 Engineer : Tony
 EUT : Wireless Subwoofer
 M/N : DC 24V From Adapter Input AC 240V/60Hz
 Power : R-4B Subwoofer
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.15	9.61	9.81	3.86	23.28	55.78	32.50	Average
2	0.15	9.61	9.81	22.86	42.28	65.78	23.50	QP
3	0.17	9.61	9.81	2.55	21.97	55.03	33.06	Average
4	0.17	9.61	9.81	21.55	40.97	65.03	24.06	QP
5	0.21	9.61	9.80	2.30	21.71	53.18	31.47	Average
6	0.21	9.61	9.80	20.30	39.71	63.18	23.47	QP
7	0.34	9.61	9.83	6.84	26.28	49.18	22.90	Average
8	0.34	9.61	9.83	21.84	41.28	59.18	17.90	QP
9	0.40	9.61	9.82	22.30	41.73	47.95	6.22	Average
10	0.40	9.61	9.82	25.30	44.73	57.95	13.22	QP
11	0.69	9.59	9.81	1.10	20.50	46.00	25.50	Average
12	0.69	9.59	9.81	13.10	32.50	56.00	23.50	QP



Site no : 844 Shield Room
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa LINE
 Limit : FCC PART 15B QP
 Engineer : Tony
 EUT : Wireless Subwoofer
 M/N : DC 24V From Adapter Input AC 120V/60Hz
 Power : R-4B Subwoofer
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.15	9.61	9.81	3.98	23.40	55.78	32.38	Average
2	0.15	9.61	9.81	22.98	42.40	65.78	23.38	QP
3	0.18	9.61	9.80	1.43	20.84	54.64	33.80	Average
4	0.18	9.61	9.80	19.43	38.84	64.64	25.80	QP
5	0.37	9.61	9.82	11.14	30.57	48.52	17.95	Average
6	0.37	9.61	9.82	23.14	42.57	58.52	15.95	QP
7	0.40	9.61	9.82	21.45	40.88	47.95	7.07	Average
8	0.40	9.61	9.82	22.45	41.88	57.95	16.07	QP
9	0.51	9.61	9.81	0.35	19.77	46.00	26.23	Average
10	0.51	9.61	9.81	13.35	32.77	56.00	23.23	QP
11	0.66	9.59	9.81	1.25	20.65	46.00	25.35	Average
12	0.66	9.59	9.81	12.25	31.65	56.00	24.35	QP



Site no : 844 Shield Room
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa NEUTRAL
 Limit : FCC PART 15B QP
 Engineer : Tony
 EUT : Wireless Subwoofer
 M/N : DC 24V From Adapter Input AC 120V/60Hz
 Power : R-4B Subwoofer
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	9.48	9.81	4.32	23.61	55.65	32.04	Average
2	0.16	9.48	9.81	23.32	42.61	65.65	23.04	QP
3	0.18	9.55	9.80	2.91	22.26	54.42	32.16	Average
4	0.18	9.55	9.80	20.91	40.26	64.42	24.16	QP
5	0.22	9.60	9.80	0.46	19.86	52.96	33.10	Average
6	0.22	9.60	9.80	16.46	35.86	62.96	27.10	QP
7	0.37	9.59	9.82	5.75	25.16	48.56	23.40	Average
8	0.37	9.59	9.82	16.75	36.16	58.56	22.40	QP
9	0.40	9.59	9.82	20.85	40.26	47.95	7.69	Average
10	0.40	9.59	9.82	20.85	40.26	57.95	17.69	QP
11	0.66	9.62	9.81	0.16	19.59	46.00	26.41	Average
12	0.66	9.62	9.81	12.16	31.59	56.00	24.41	QP

4 RADIATED EMISSION TEST

4.1 Limit

4.1.1 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

- Remark : (1) Emission level $\text{dB}\mu\text{V} = 20 \log$ Emission level $\mu\text{V}/\text{m}$
 (2) The smaller limit shall apply at the cross point between two frequency bands.
 (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

4.1.2 15.205 Restricted bands of operation

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)

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.2. Test Procedure

EUT was placed on a turn table, which is 0.8 meter high above ground for 30~1000MHz test, and which is 1.5 meter high above ground for above 1GHz test. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved 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 test.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz

PEAK detector, 1MHz/1MHz for PAEK measurement,

PEAK detector, 1MHz/10Hz for Average measurement

The frequency range from 30MHz to 10th harmonic (25GHz) are checked.

4.3 Test Result

PASS.

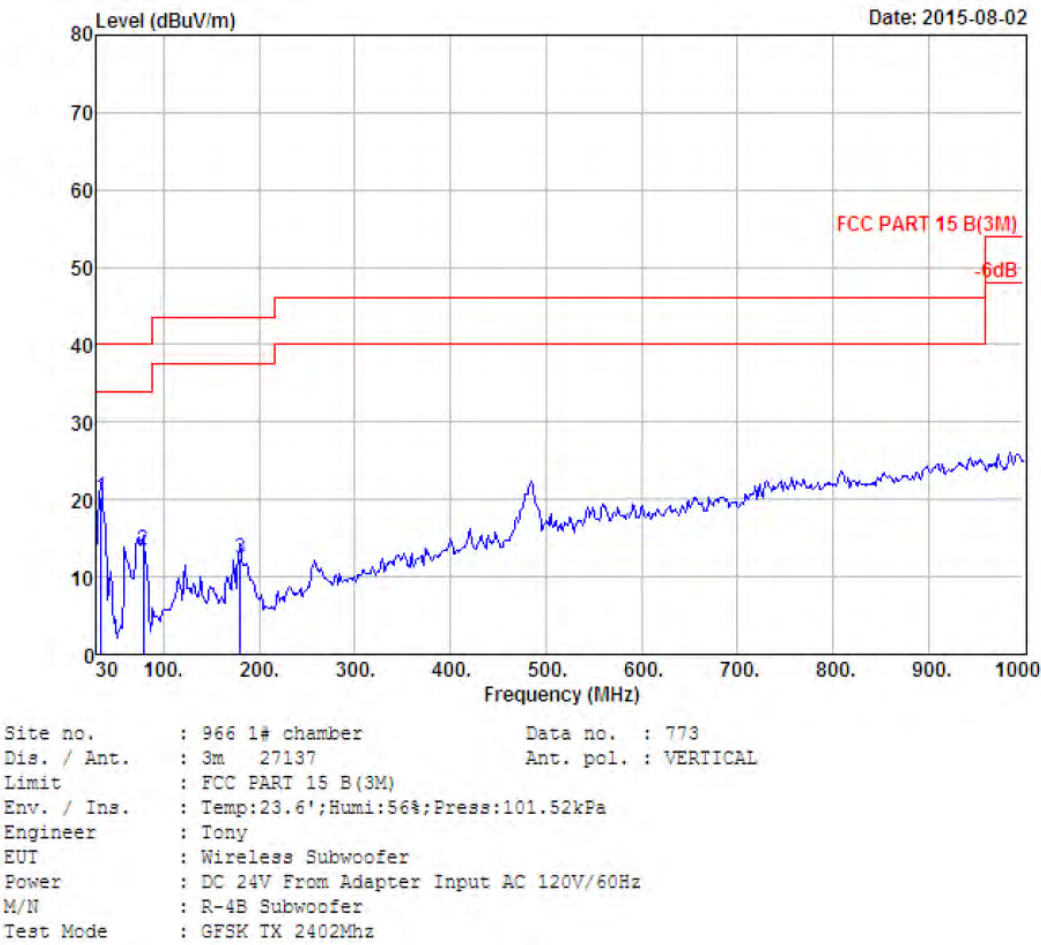
All the emissions from 30MHz to 25 GHz were comply with 15.209 limits.

Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

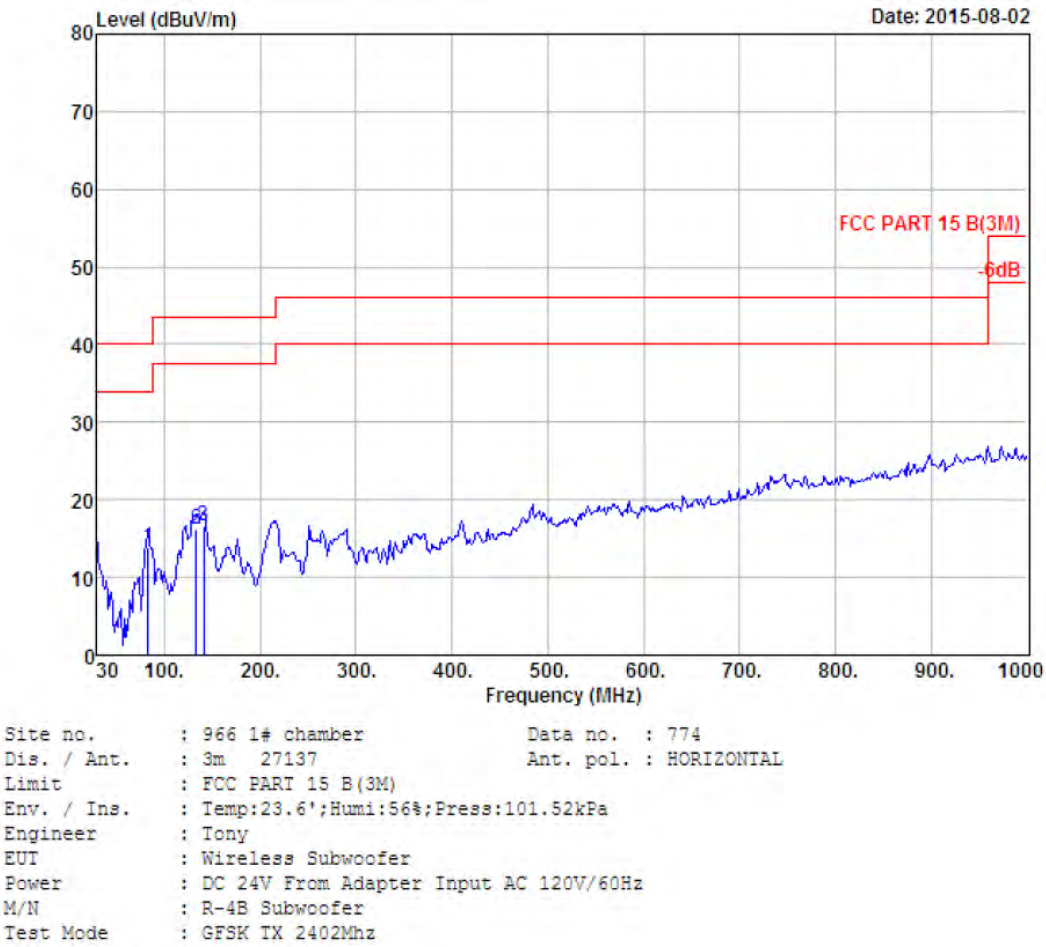
2、 The frequency 2402MHz 、 2440MHz and 2480 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

4.4 Test Data

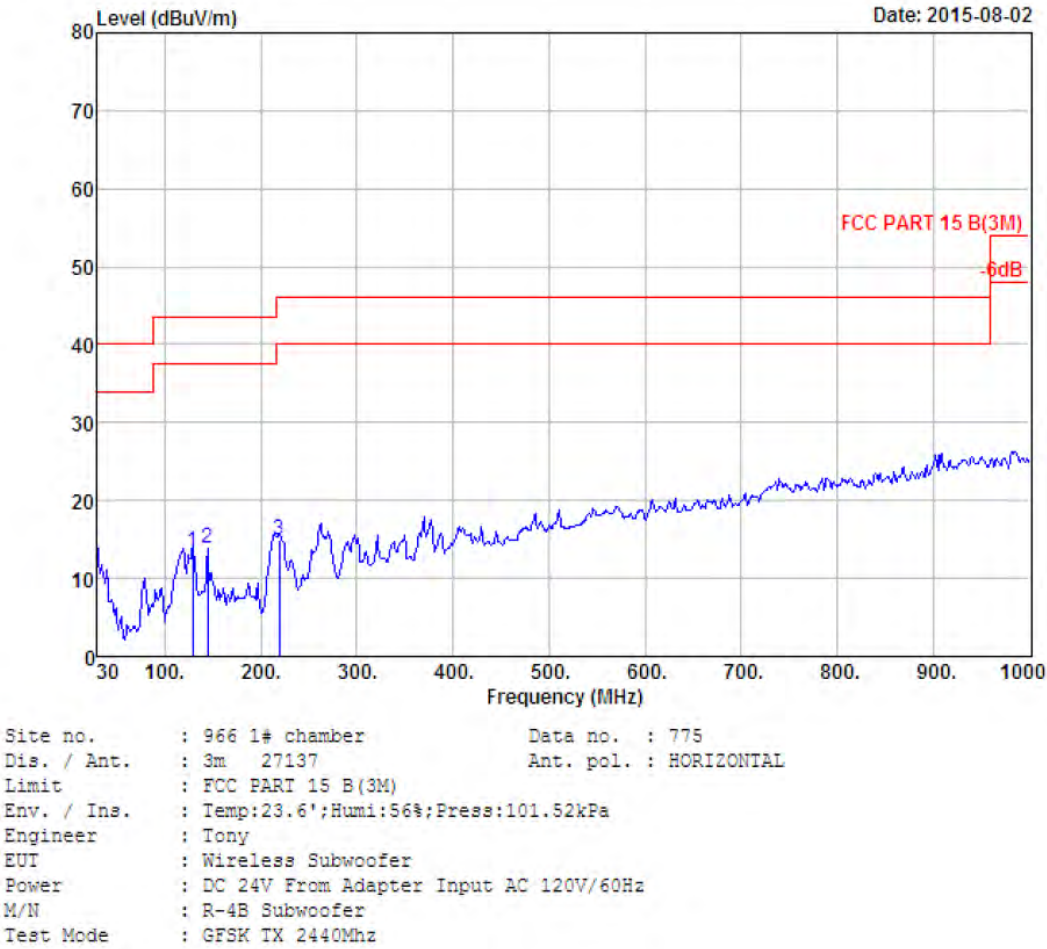
30-1000 MHz



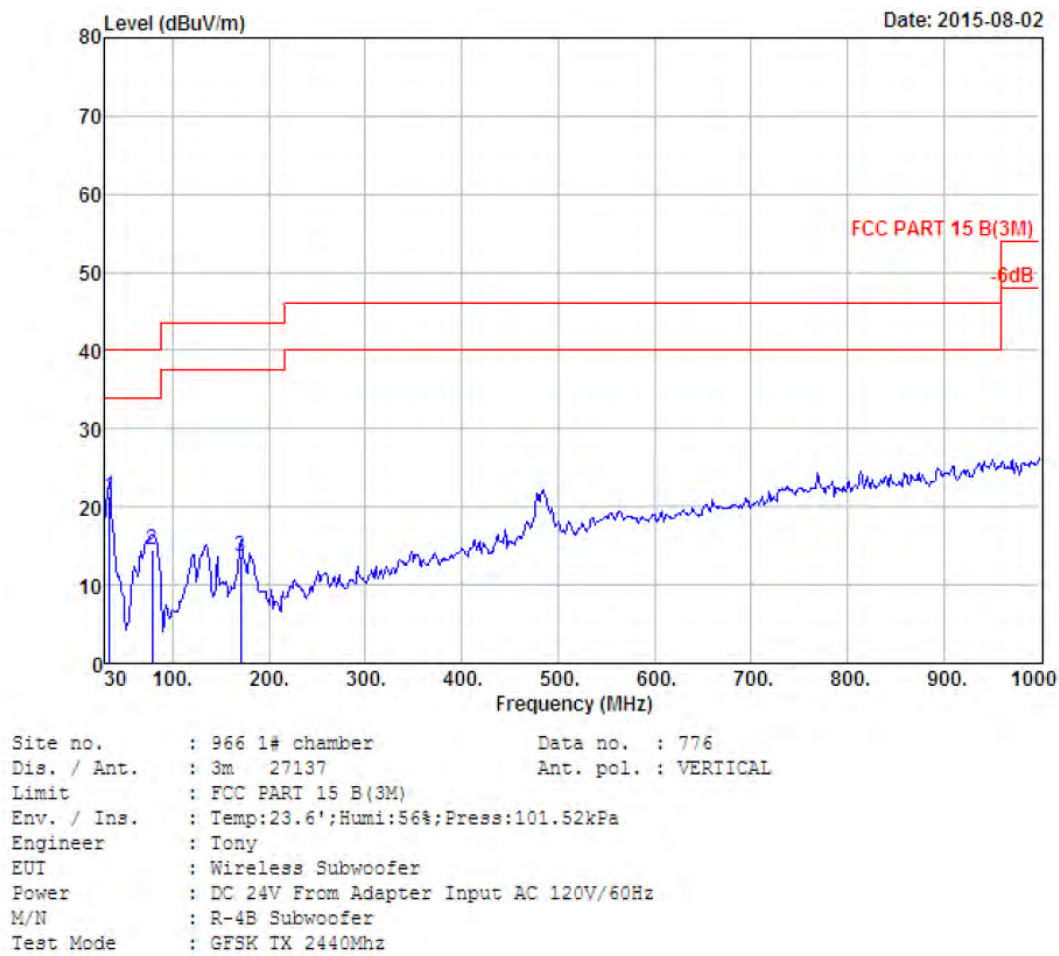
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	34.85	15.55	0.72	4.00	20.27	40.00	19.73	QP
2	78.50	6.89	1.22	5.33	13.44	40.00	26.56	QP
3	180.35	8.95	1.70	1.64	12.29	43.50	31.21	QP



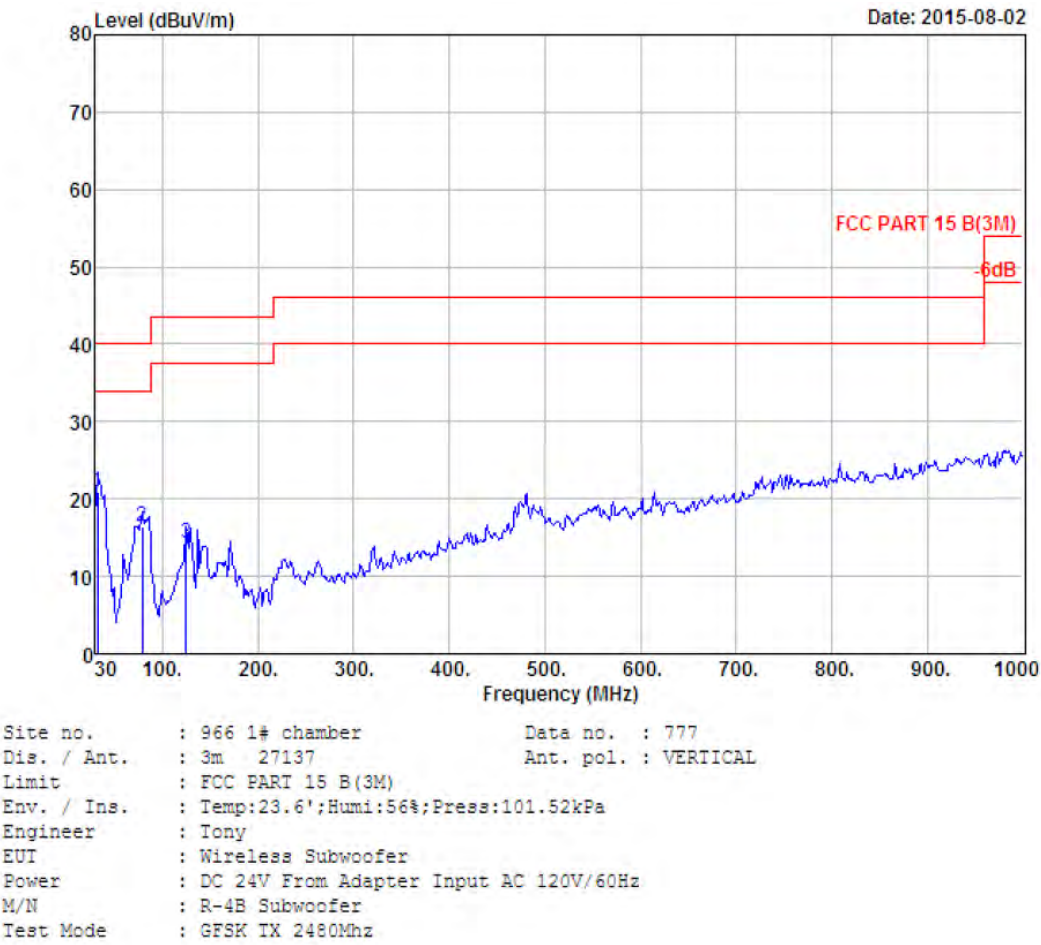
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	83.35	7.47	1.23	5.20	13.90	40.00	26.10	QP
2	133.79	11.36	1.56	3.20	16.12	43.50	27.38	QP
3	141.55	11.36	1.51	3.77	16.64	43.50	26.86	QP



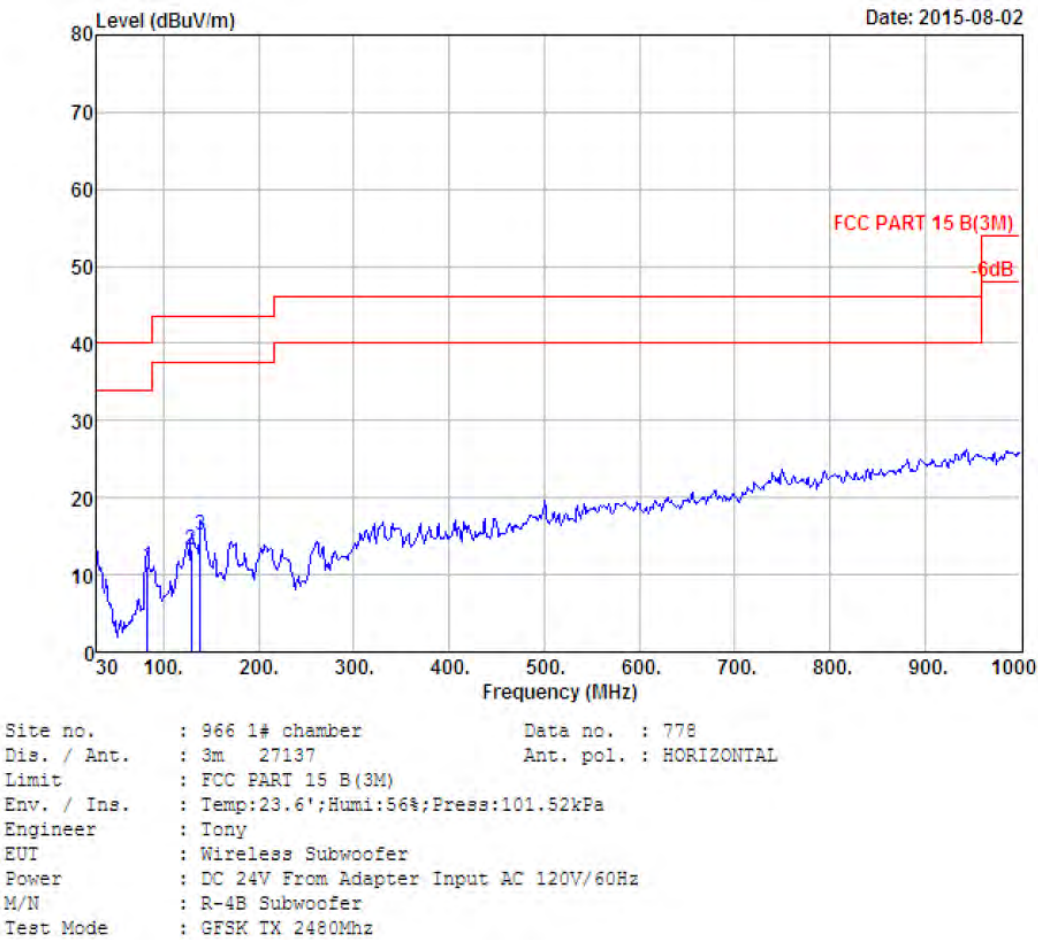
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	128.94	11.33	1.47	0.55	13.35	43.50	30.15	QP
2	144.46	11.26	1.54	1.07	13.87	43.50	29.63	QP
3	219.15	9.10	1.94	3.83	14.87	46.00	31.13	QP



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	34.85	15.55	0.72	4.96	21.23	40.00	18.77	QP
2	78.50	6.89	1.22	6.38	14.49	40.00	25.51	QP
3	170.65	9.16	1.69	2.89	13.74	43.50	29.76	QP

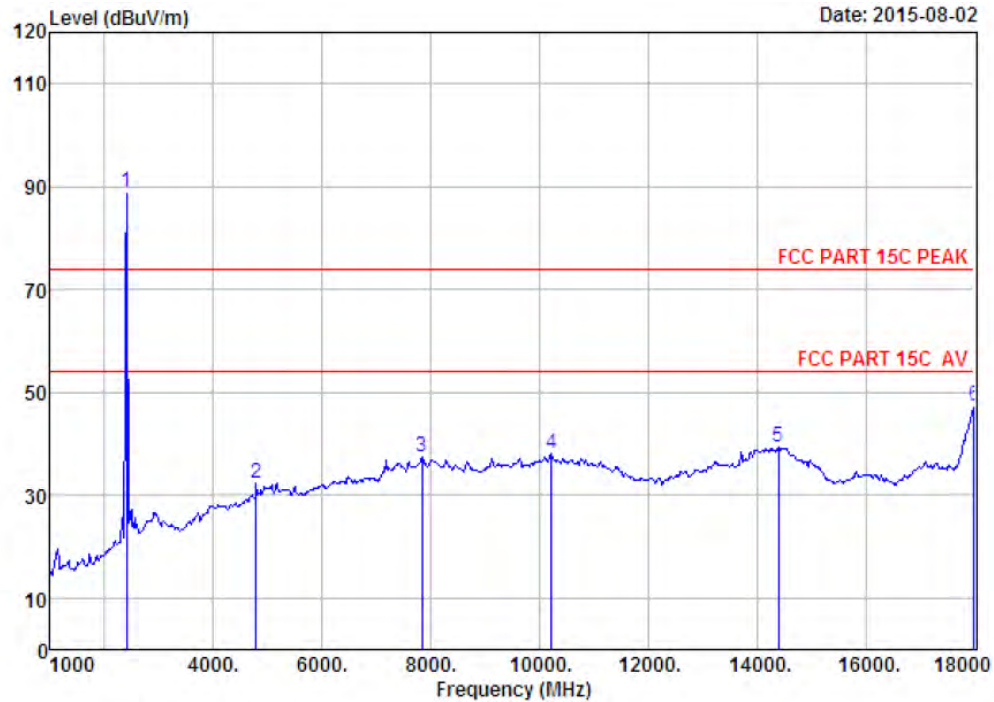


	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	31.94	17.14	0.69	3.10	20.93	40.00	19.07	QP
2	78.50	6.89	1.22	8.22	16.33	40.00	23.67	QP
3	125.06	11.35	1.52	1.46	14.33	43.50	29.17	QP



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	83.35	7.47	1.23	2.39	11.09	40.00	28.91	QP
2	128.94	11.33	1.47	0.47	13.27	43.50	30.23	QP
3	138.64	11.42	1.54	2.10	15.06	43.50	28.44	QP

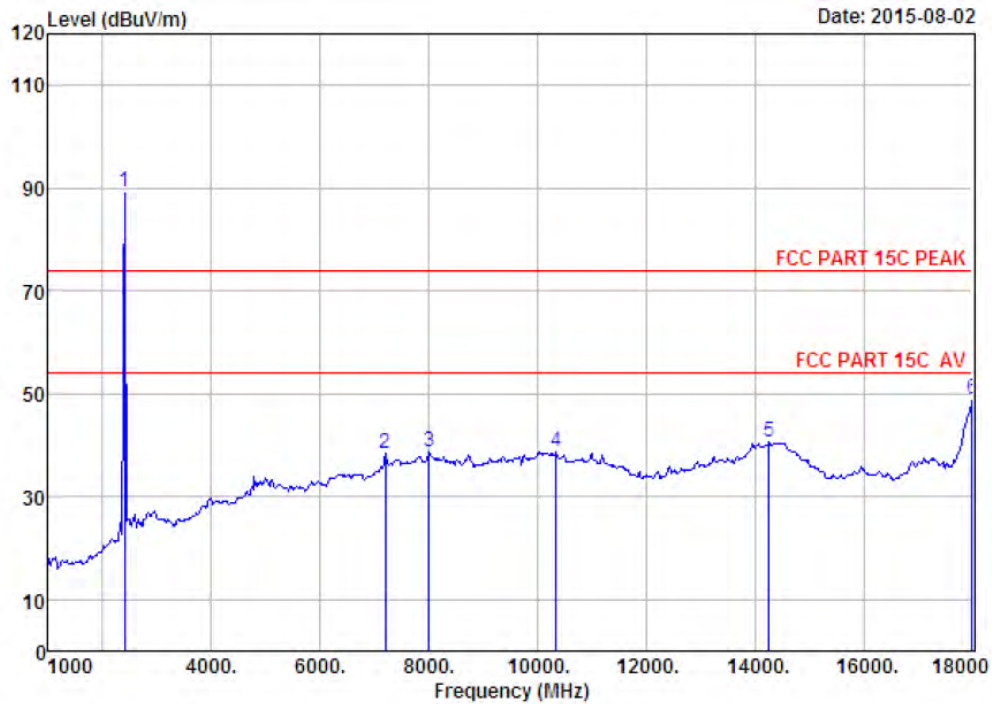
1000-18000 MHz



Site no. : 1# 966 chamber Data no. : 621
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.18	88.96	89.01	74.00	-15.01	Peak
2	4791.00	31.22	11.69	31.80	21.21	32.32	74.00	41.68	Peak
3	7834.00	36.68	11.47	31.40	20.61	37.36	74.00	36.64	Peak
4	10214.00	38.48	11.47	32.17	20.22	38.00	74.00	36.00	Peak
5	14396.00	41.79	10.92	32.83	19.51	39.39	74.00	34.61	Peak
6	18000.00	46.45	11.38	27.85	17.31	47.29	74.00	26.71	Peak

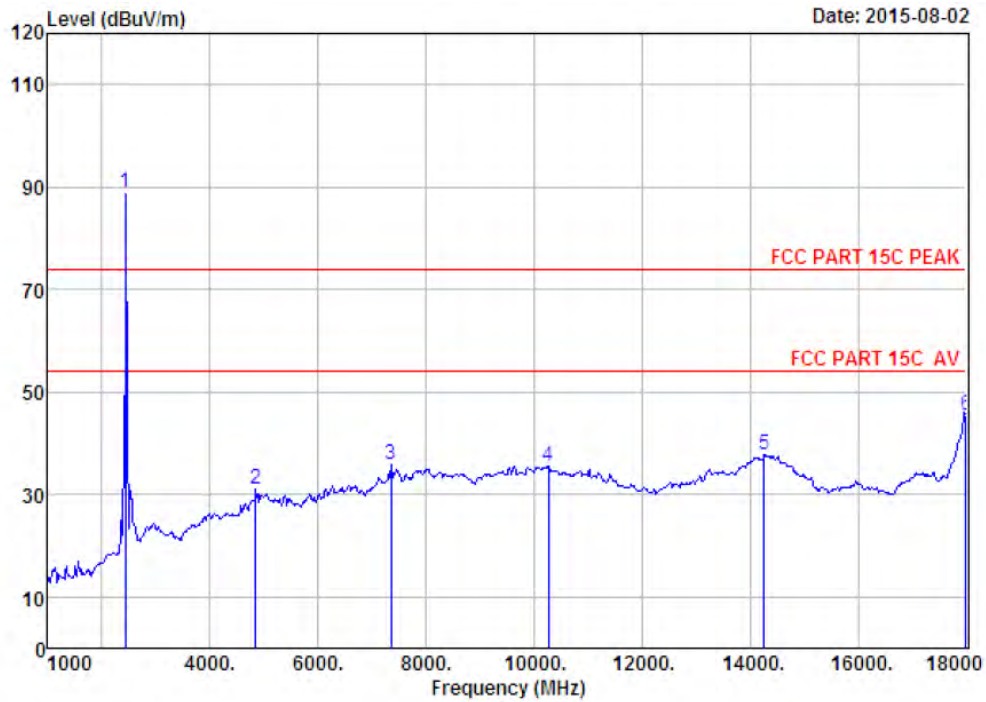
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 622
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.18	89.09	89.14	74.00	-15.14	Peak
2	7205.00	36.52	11.54	32.11	22.58	38.53	74.00	35.47	Peak
3	8004.00	37.01	11.40	31.22	21.42	38.61	74.00	35.39	Peak
4	10350.00	38.71	11.39	32.43	21.05	38.72	74.00	35.28	Peak
5	14260.00	41.68	10.92	33.19	21.16	40.57	74.00	33.43	Peak
6	18000.00	46.45	11.38	27.85	18.93	48.91	74.00	25.09	Peak

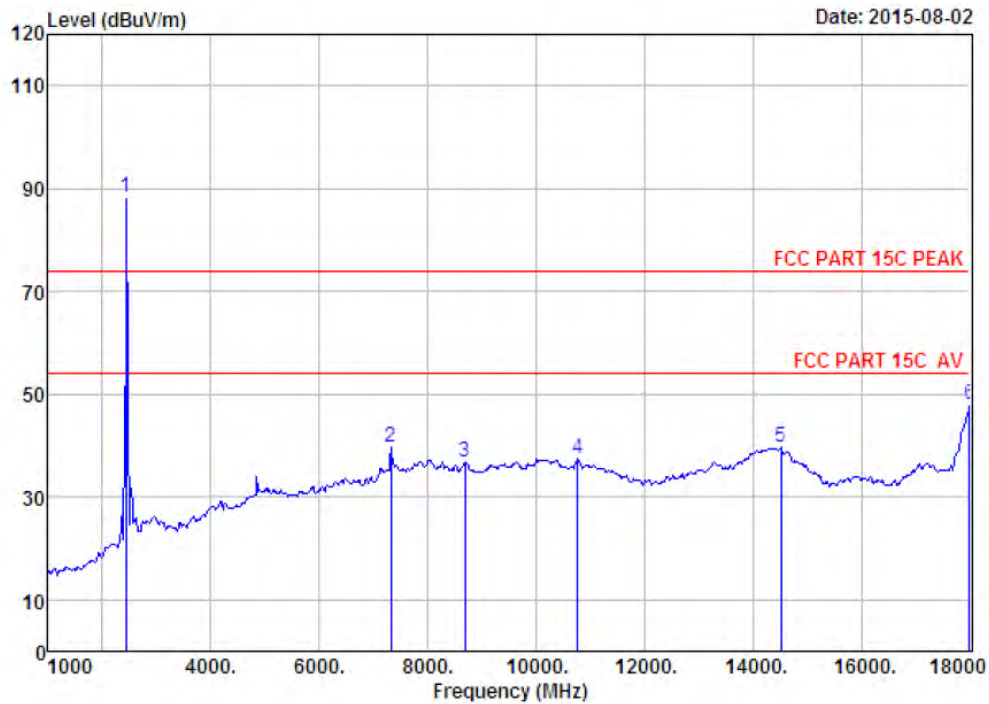
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 625
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUI : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.60	6.67	34.12	88.65	88.80	74.00	-14.80	Peak
2	4842.00	31.31	11.92	31.85	19.81	31.19	74.00	42.81	Peak
3	7358.00	36.56	11.58	31.99	19.63	35.78	74.00	38.22	Peak
4	10265.00	38.56	11.44	32.27	17.90	35.63	74.00	38.37	Peak
5	14260.00	41.68	10.92	33.19	18.41	37.82	74.00	36.18	Peak
6	18000.00	46.45	11.38	27.85	15.50	45.48	74.00	28.52	Peak

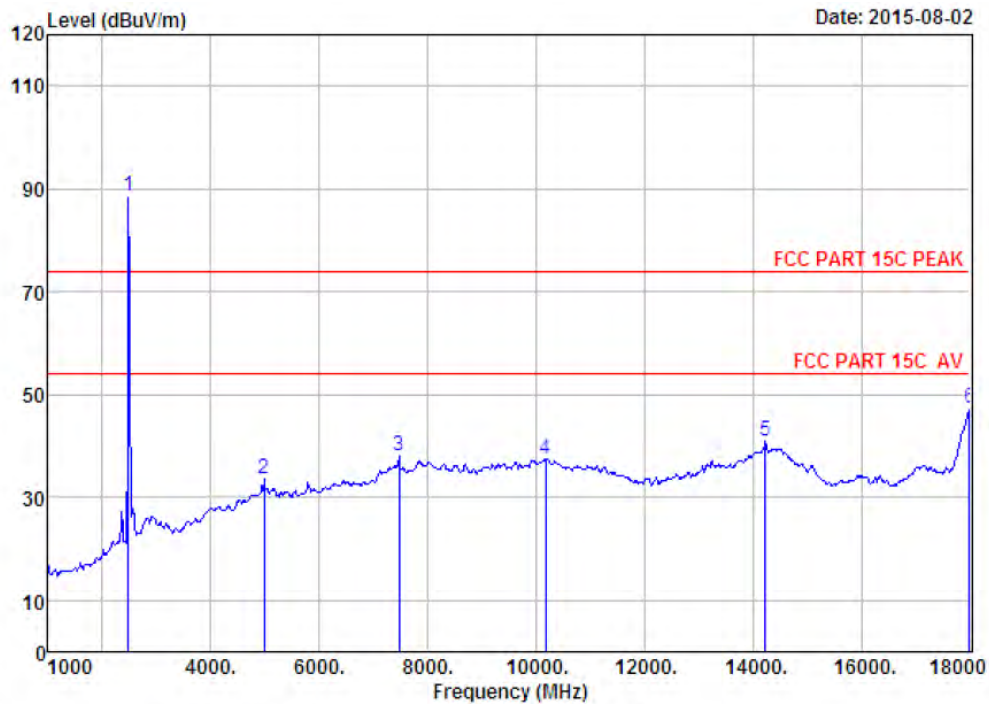
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 626
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.60	6.67	34.12	88.07	88.22	74.00	-14.22	Peak
2	7324.00	36.55	11.57	31.99	23.60	39.73	74.00	34.27	Peak
3	8684.00	37.32	11.45	32.43	20.52	36.86	74.00	37.14	Peak
4	10775.00	39.28	11.30	33.23	20.04	37.39	74.00	36.61	Peak
5	14515.00	41.89	10.93	33.14	20.03	39.71	74.00	34.29	Peak
6	18000.00	46.45	11.38	27.85	17.87	47.85	74.00	26.15	Peak

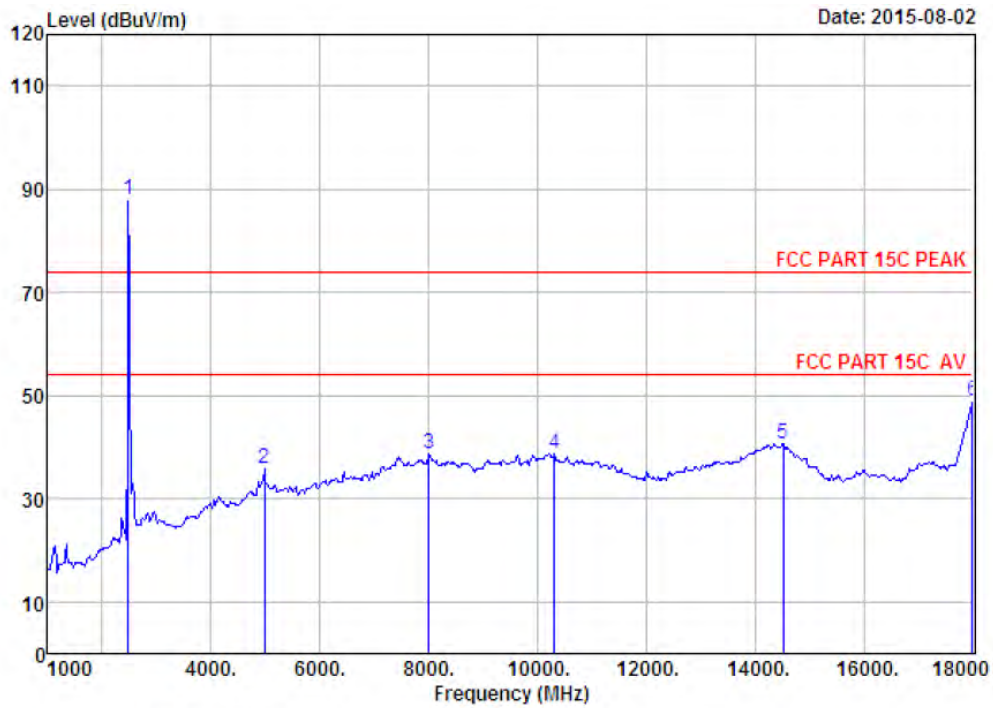
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 627
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	34.03	88.38	88.64	74.00	-14.64	Peak
2	4978.00	31.52	12.52	31.99	21.53	33.58	74.00	40.42	Peak
3	7477.00	36.50	11.62	31.89	21.96	38.19	74.00	35.81	Peak
4	10180.00	38.42	11.49	32.11	19.78	37.58	74.00	36.42	Peak
5	14226.00	41.66	10.91	33.29	21.60	40.88	74.00	33.12	Peak
6	18000.00	46.45	11.38	27.85	17.25	47.23	74.00	26.77	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

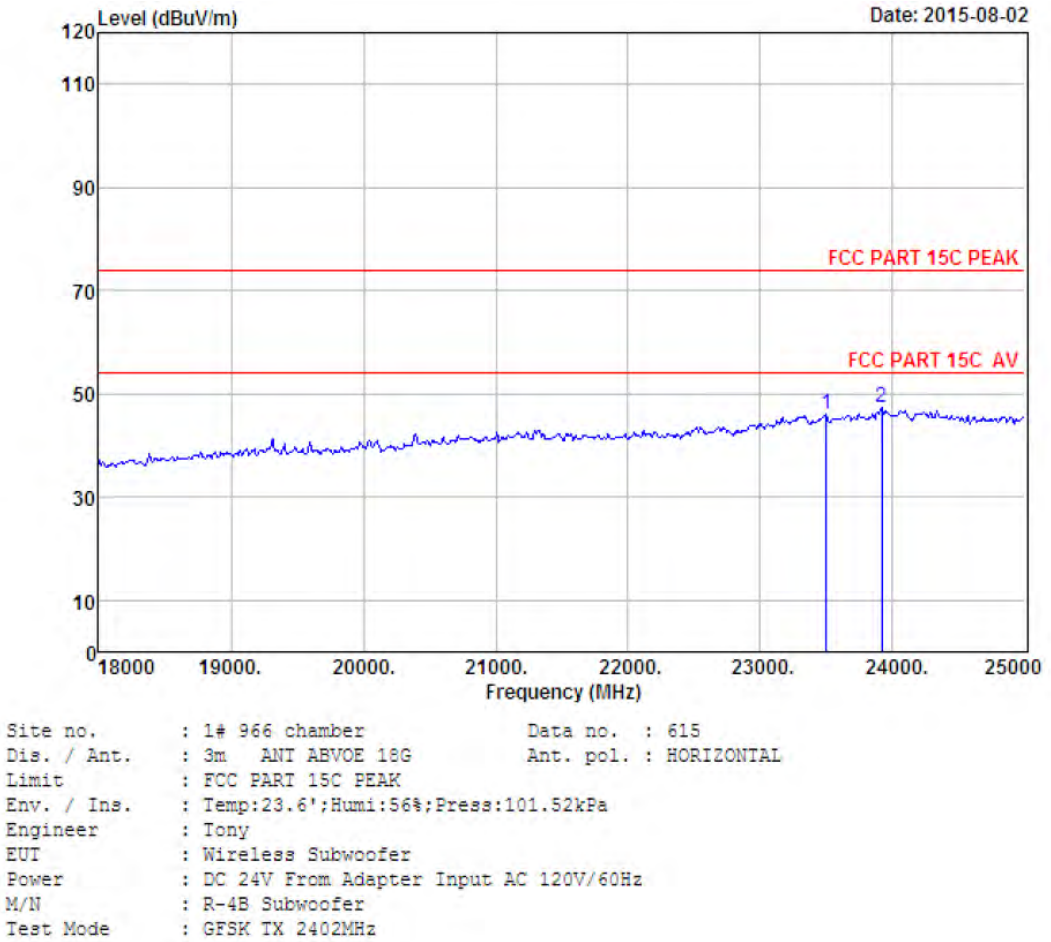


Site no. : 1# 966 chamber Data no. : 628
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	34.03	87.61	87.87	74.00	-13.87	Peak
2	4978.00	31.52	12.52	31.99	23.88	35.93	74.00	38.07	Peak
3	8004.00	37.01	11.40	31.22	21.53	38.72	74.00	35.28	Peak
4	10316.00	38.65	11.41	32.37	20.96	38.65	74.00	35.35	Peak
5	14515.00	41.89	10.93	33.14	21.01	40.69	74.00	33.31	Peak
6	18000.00	46.45	11.38	27.85	19.08	49.06	74.00	24.94	Peak

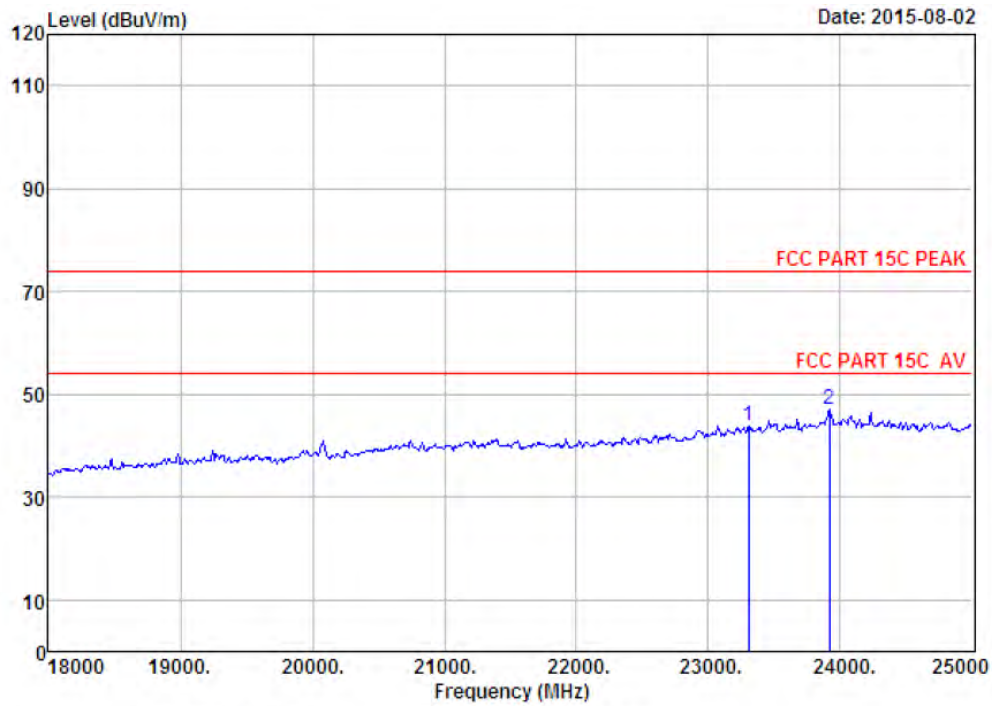
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

18000-25000 MHz



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	23495.00	45.70	21.60	33.33	11.96	45.93	74.00	28.07	Peak
2	23915.00	45.62	21.97	32.88	12.62	47.33	74.00	26.67	Peak

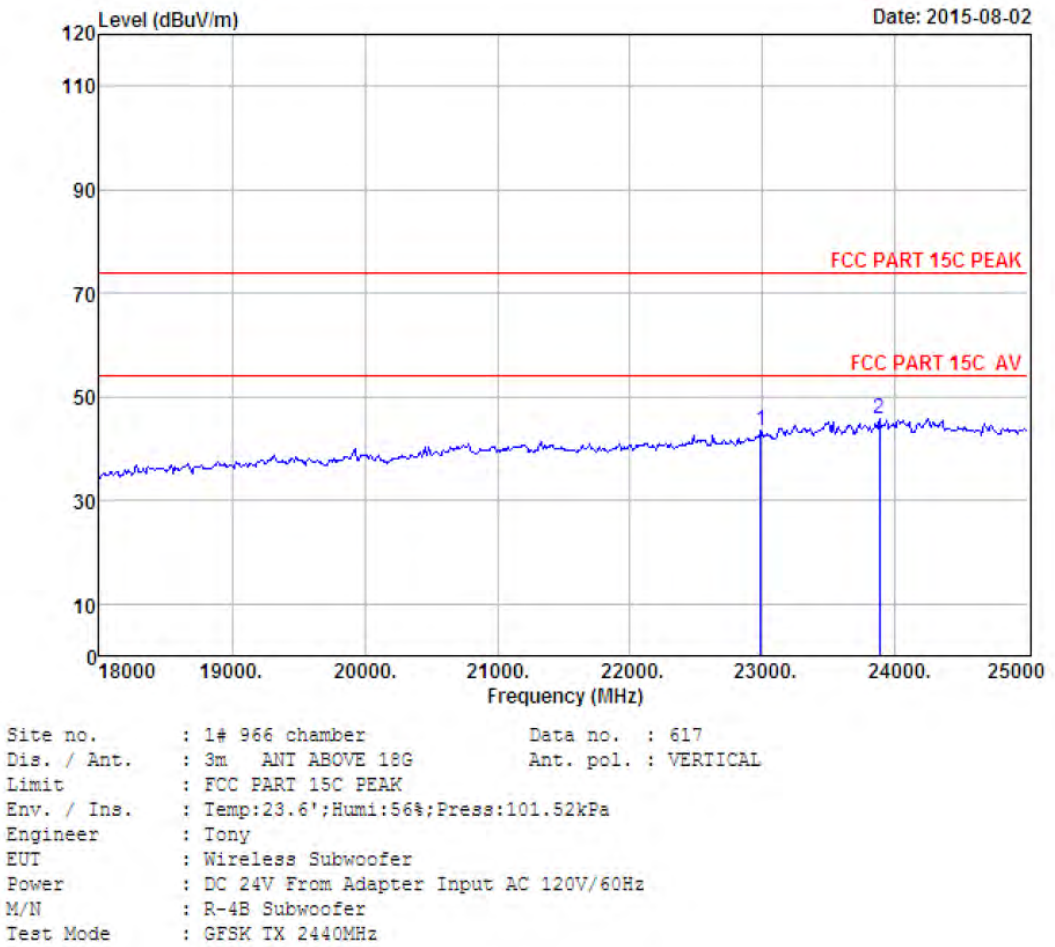
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 616
 Dis. / Ant. : 3m ANT ABOVE 18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2402MHz

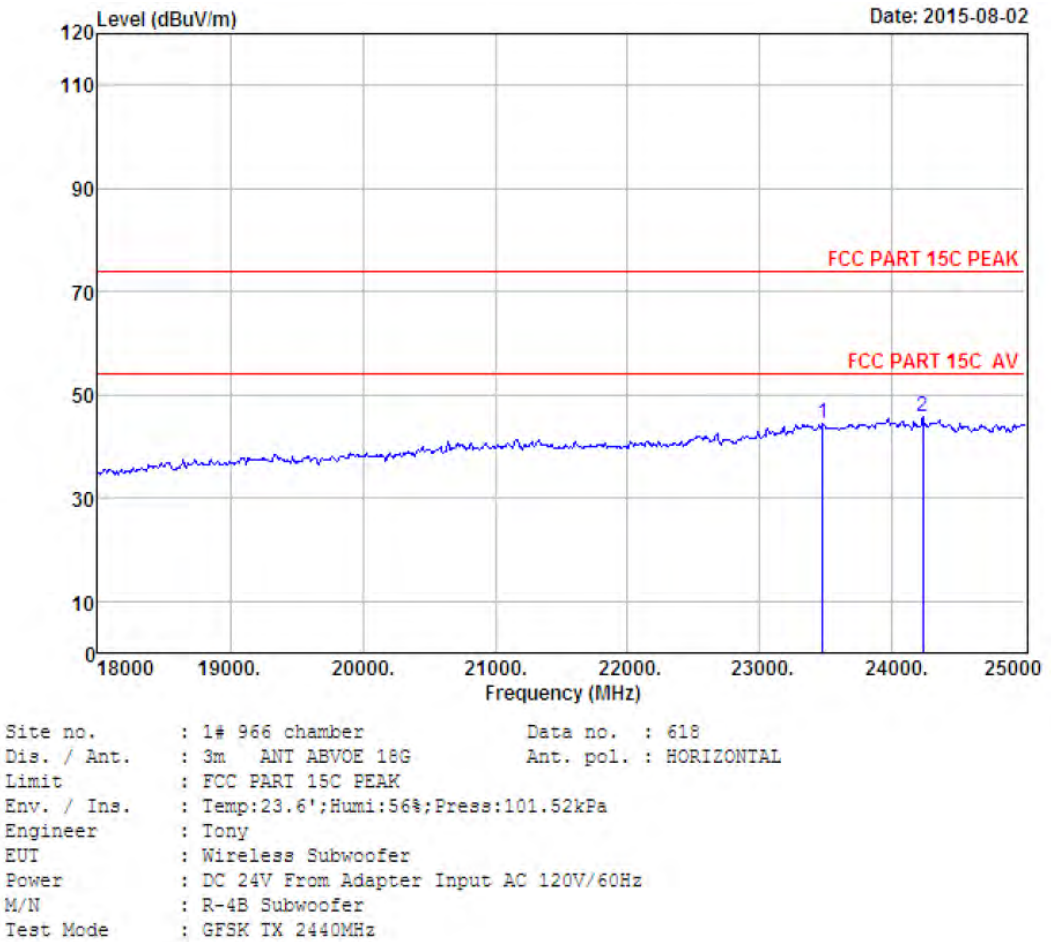
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	23306.00	45.66	21.43	33.53	10.26	43.82	74.00	30.18	Peak
2	23915.00	45.62	21.97	32.88	12.22	46.93	74.00	27.07	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



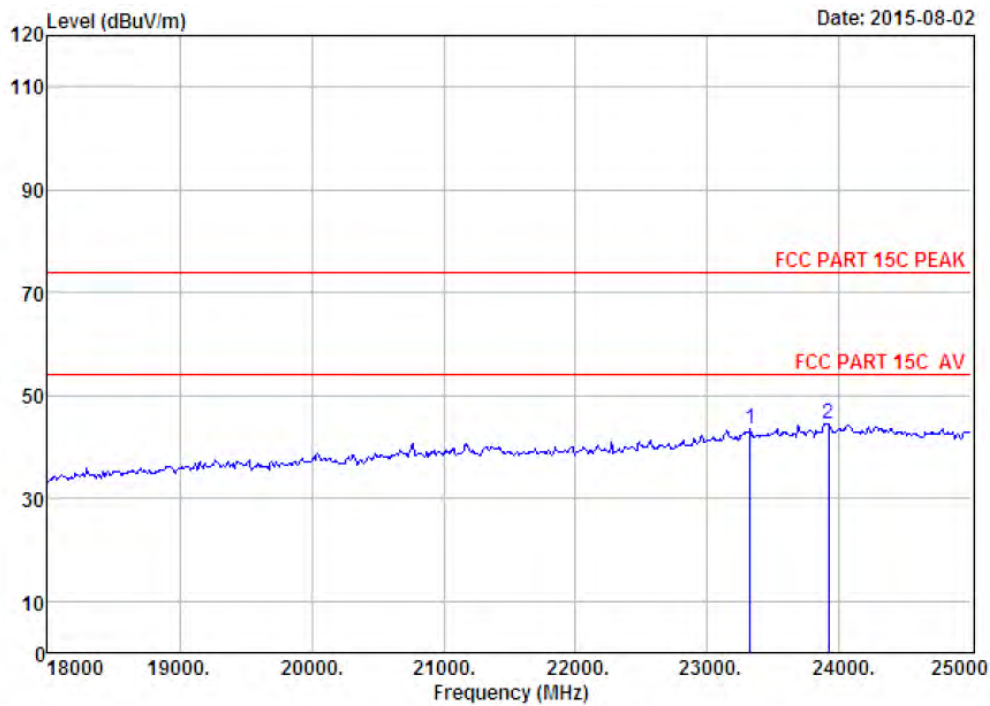
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	22984.00	45.60	21.14	33.88	10.62	43.48	74.00	30.52	Peak
2	23880.00	45.63	21.94	32.93	11.26	45.90	74.00	28.10	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	23474.00	45.70	21.57	33.35	10.49	44.41	74.00	29.59	Peak
2	24230.00	45.65	22.17	33.15	11.17	45.84	74.00	28.16	Peak

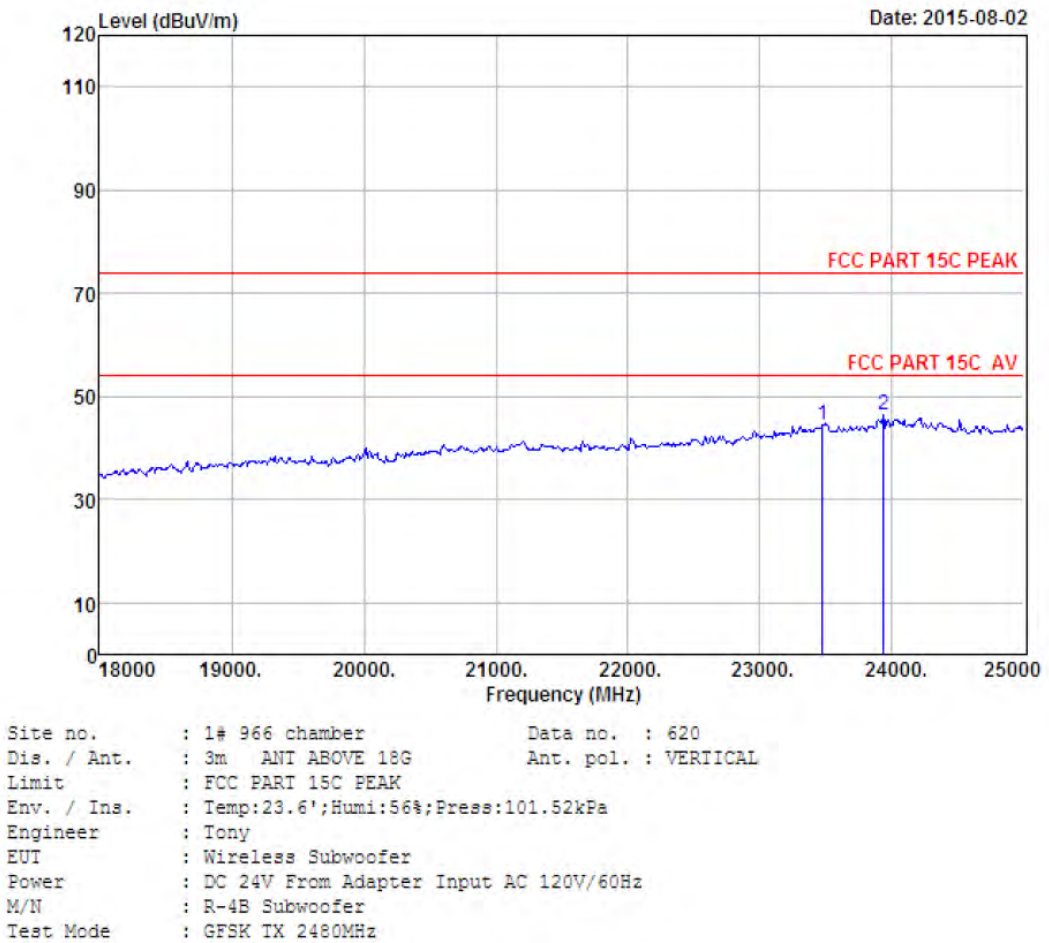
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 619
 Dis. / Ant. : 3m ANT ABVOE 18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK IX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	23320.00	45.67	21.43	33.51	10.03	43.62	74.00	30.38	Peak
2	23915.00	45.62	21.97	32.88	9.72	44.43	74.00	29.57	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	23474.00	45.70	21.57	33.35	10.43	44.35	74.00	29.65	Peak
2	23936.00	45.61	21.99	32.88	11.60	46.32	74.00	27.68	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

5 BAND EDGE COMPLIANCE TEST

5.1 Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits

5.2 Test Procedure

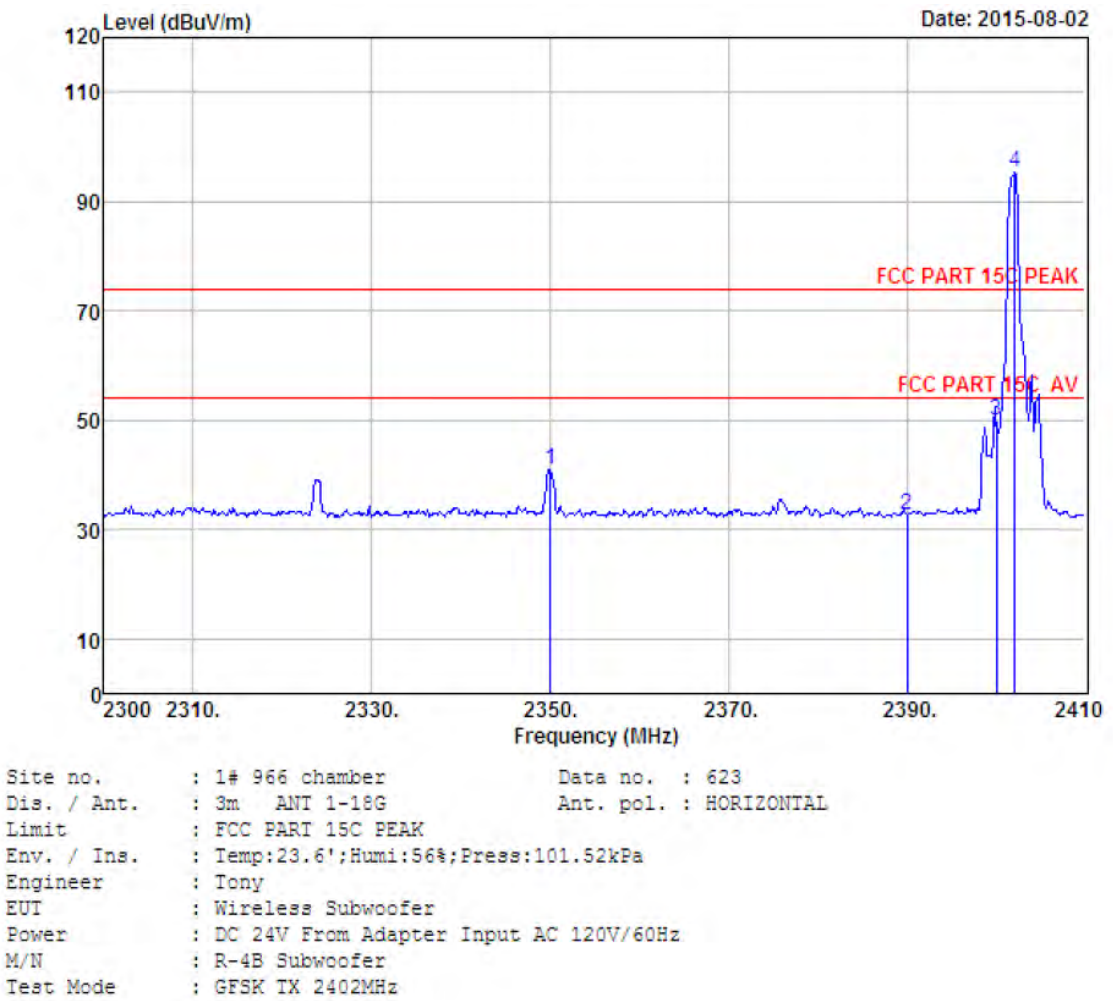
1. The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) Peak : RBW = 1MHz, VBW = 1MHz, Detector=PEAK detector, Sweep time = auto
 - (b) AV : RBW = 1MHz, VBW = 10Hz, Detector=PEAK detector, Sweep time = auto

5.3 Test Result

Pass (The testing data was attached in the next pages.)

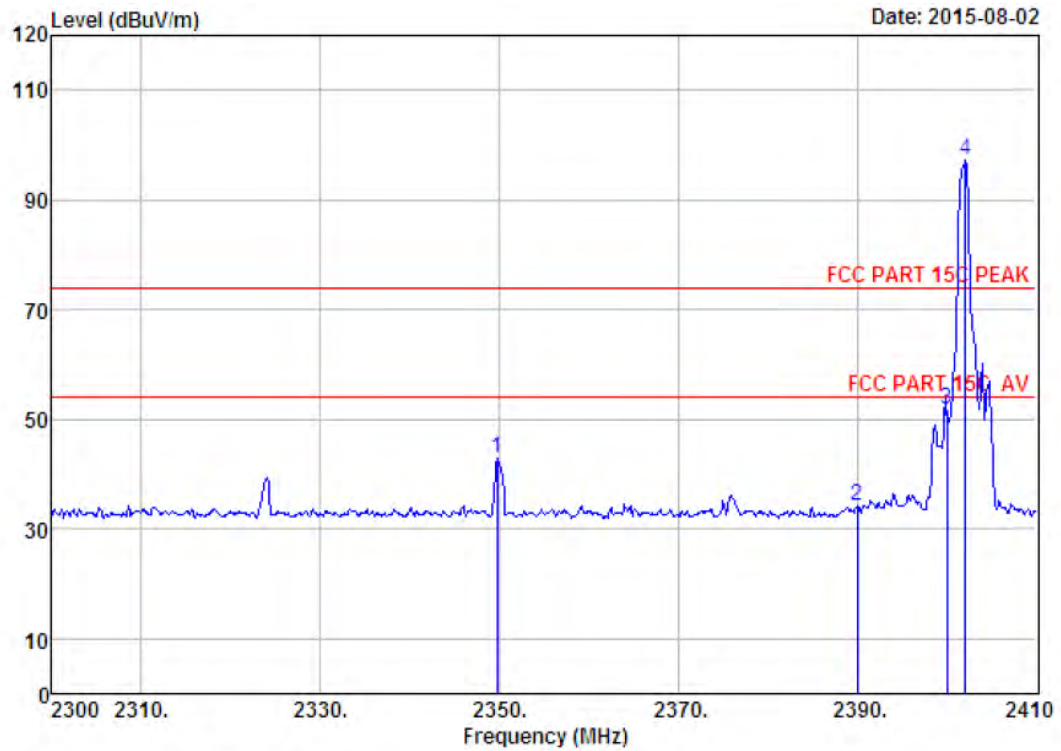
- Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
- 2、 The frequency 2402MHz and 2480 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

5.4 Test Data



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2350.05	27.70	6.56	34.22	40.98	41.02	74.00	32.98	Peak
2	2390.00	27.64	6.62	34.19	32.49	32.56	74.00	41.44	Peak
3	2400.00	27.61	6.62	34.18	49.82	49.87	74.00	24.13	Peak
4	2402.08	27.61	6.62	34.18	95.47	95.52	74.00	-21.52	Peak

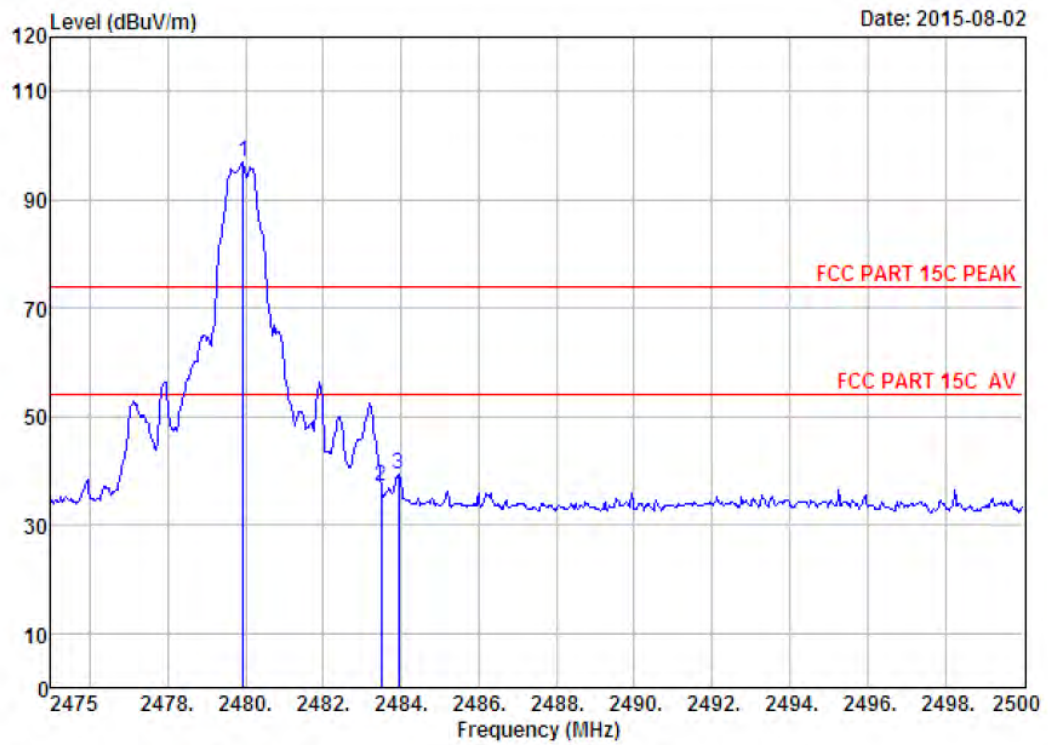
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 624
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2349.72	27.70	6.56	34.22	42.73	42.77	74.00	31.23	Peak
2	2390.00	27.64	6.62	34.19	34.05	34.12	74.00	39.88	Peak
3	2400.00	27.61	6.62	34.18	51.77	51.82	74.00	22.18	Peak
4	2402.08	27.61	6.62	34.18	97.24	97.29	74.00	-23.29	Peak

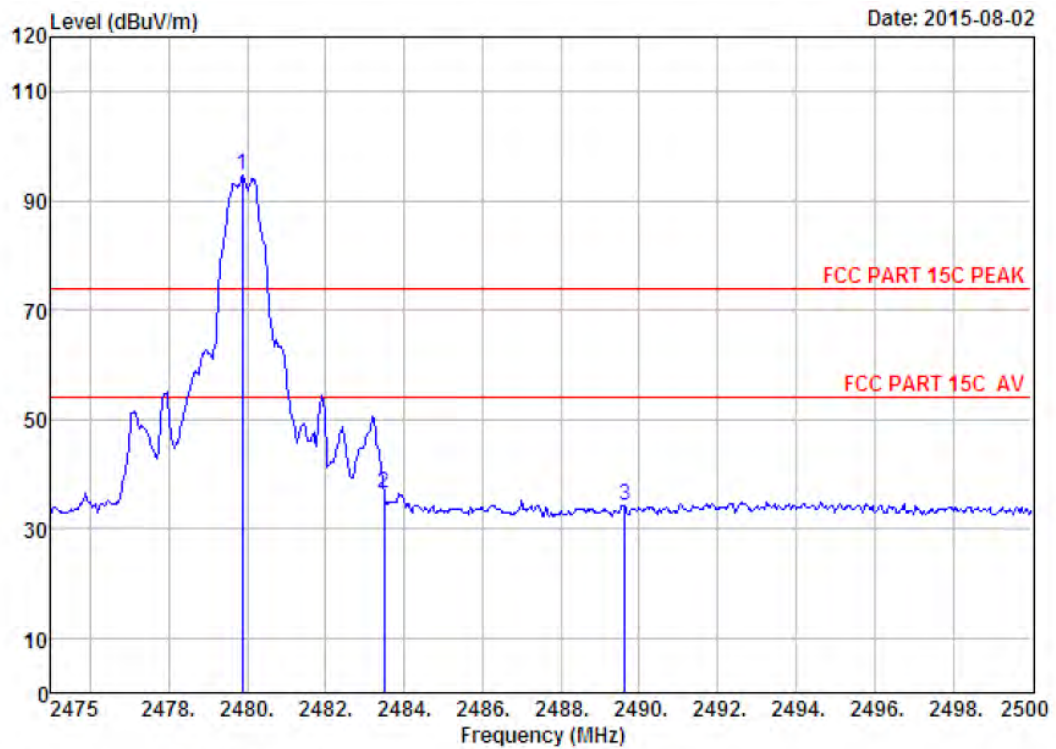
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 629
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.95	27.58	6.71	34.03	96.79	97.05	74.00	-23.05	Peak
2	2483.50	27.58	6.71	34.03	36.93	37.19	74.00	36.81	Peak
3	2483.95	27.58	6.71	34.03	39.11	39.37	74.00	34.63	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 chamber Data no. : 630
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Wireless Subwoofer
 Power : DC 24V From Adapter Input AC 120V/60Hz
 M/N : R-4B Subwoofer
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.88	27.58	6.71	34.03	94.42	94.68	74.00	-20.68	Peak
2	2483.50	27.58	6.71	34.03	36.29	36.55	74.00	37.45	Peak
3	2489.63	27.58	6.73	34.03	34.10	34.38	74.00	39.62	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

6 6dB Bandwidth Test

6.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

6.2 Test Procedure

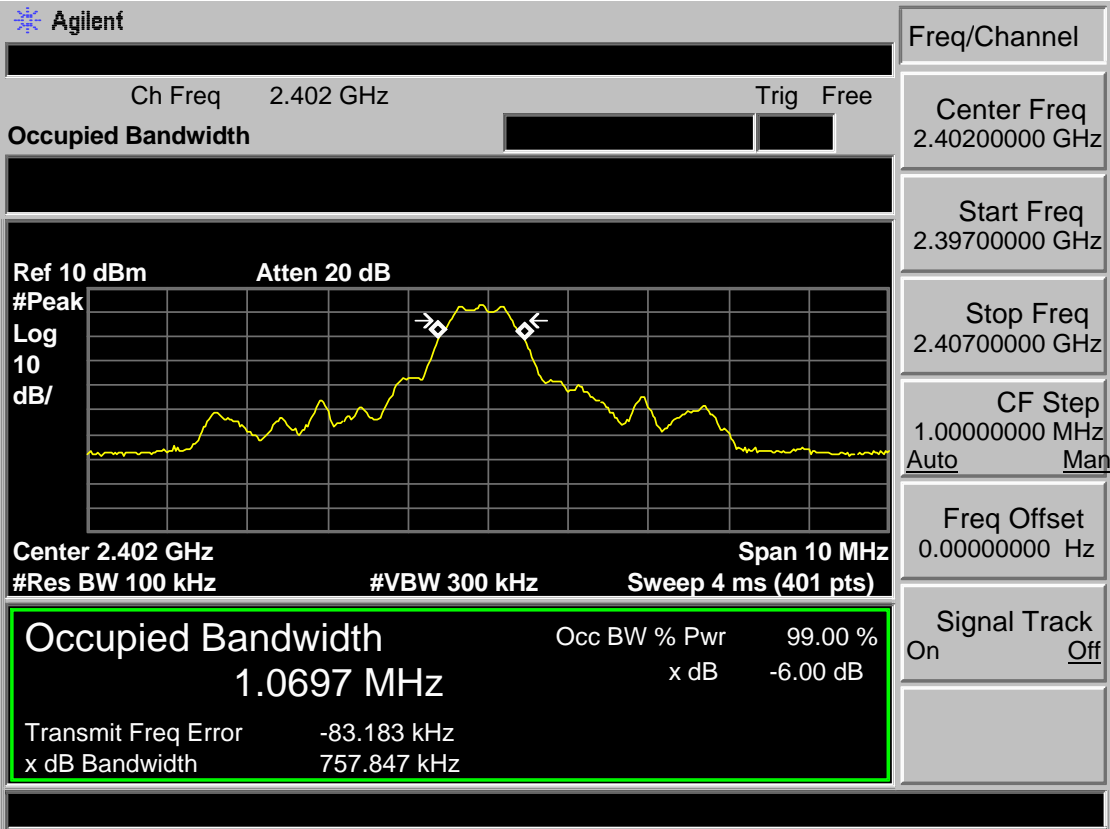
- 1, Connected the EUT's antenna port to spectrum analyzer device.
- 2, Follow the test procedure as described in KDB 558074
 - (1). Set resolution bandwidth (RBW) = 100 kHz.
 - (2). Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
 - (3). Detector = Peak.
 - (4). Trace mode = max hold.
 - (5). Sweep = 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 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Test Result

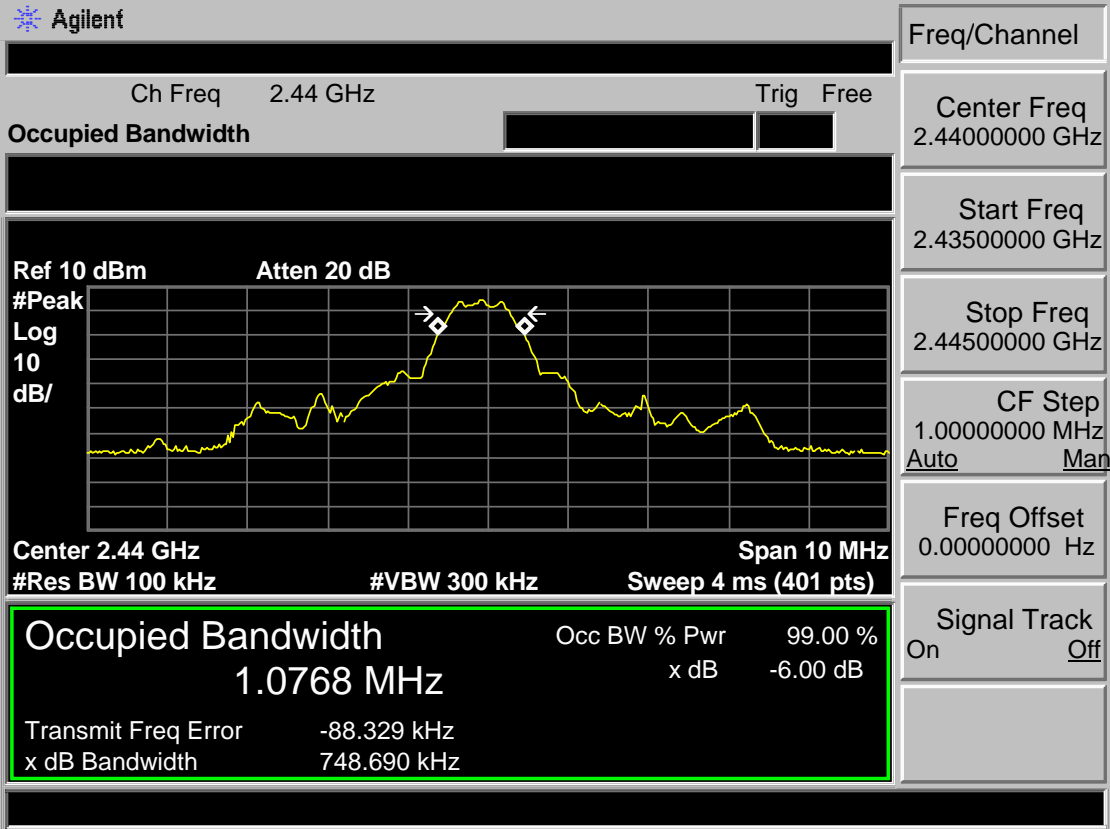
EUT: Wireless Subwoofer			
M/N: R-4B Subwoofer			
Test date: 2015-08-03		Tested by: Tony.Tang	Test site: RF Site
Test Mode	CH	6dB bandwidth (MHz)	Limit (KHz)
BT 4.0-BLE GFSK	CH1	0.758	>500
	CH20	0.749	>500
	CH40	0.739	>500
Conclusion : PASS			

6.4 Test Data

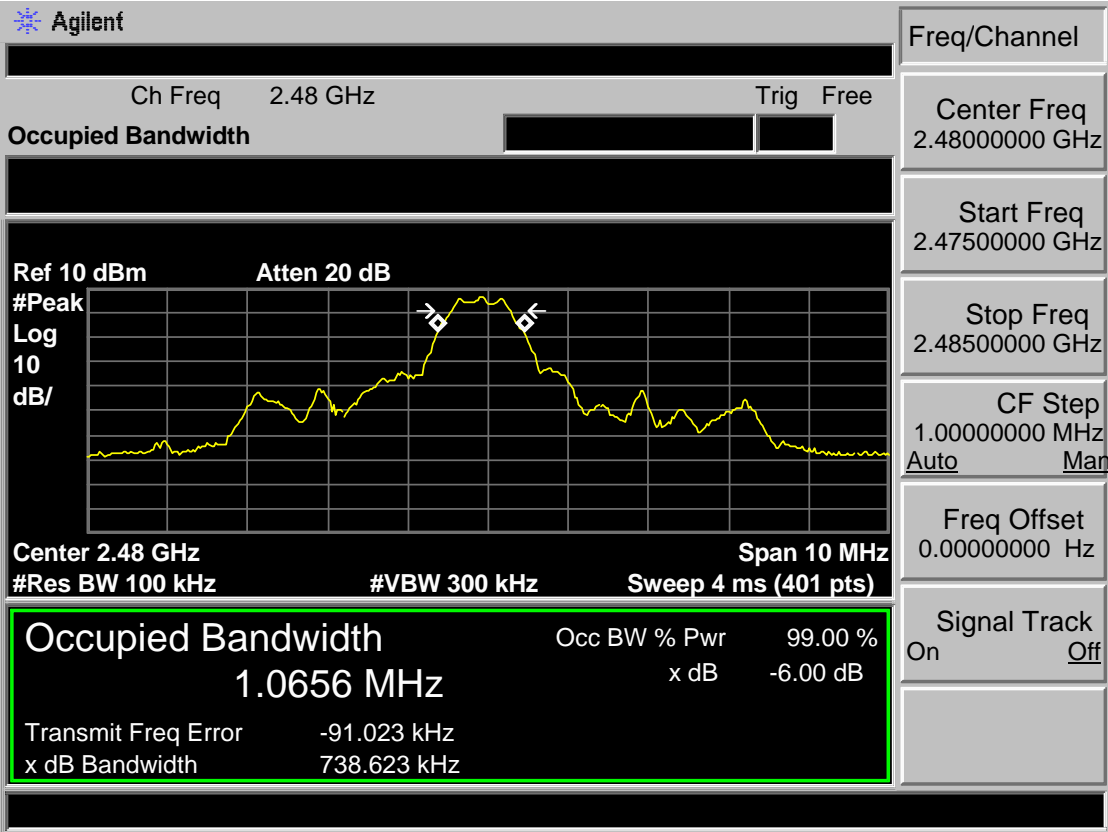
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



7 OUTPUT POWER TEST

7.1 Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm)

7.2 Test Procedure

7.3 Test Procedure

- 1, Connected the EUT's antenna port to spectrum analyzer device.
- 2, Follow the test procedure as described in KDB 558074
 - (1). Set the RBW \geq DTS bandwidth.
 - (2). Set VBW \geq 3 x RBW.
 - (3). Set span \geq 3 x RBW.
 - (4). Sweep time = auto couple.
 - (5). Detector = peak.
 - (6). Trace mode = max hold.
 - (7). Allow trace to fully stabilize.
 - (8). Use peak marker function to determine the peak amplitude level.

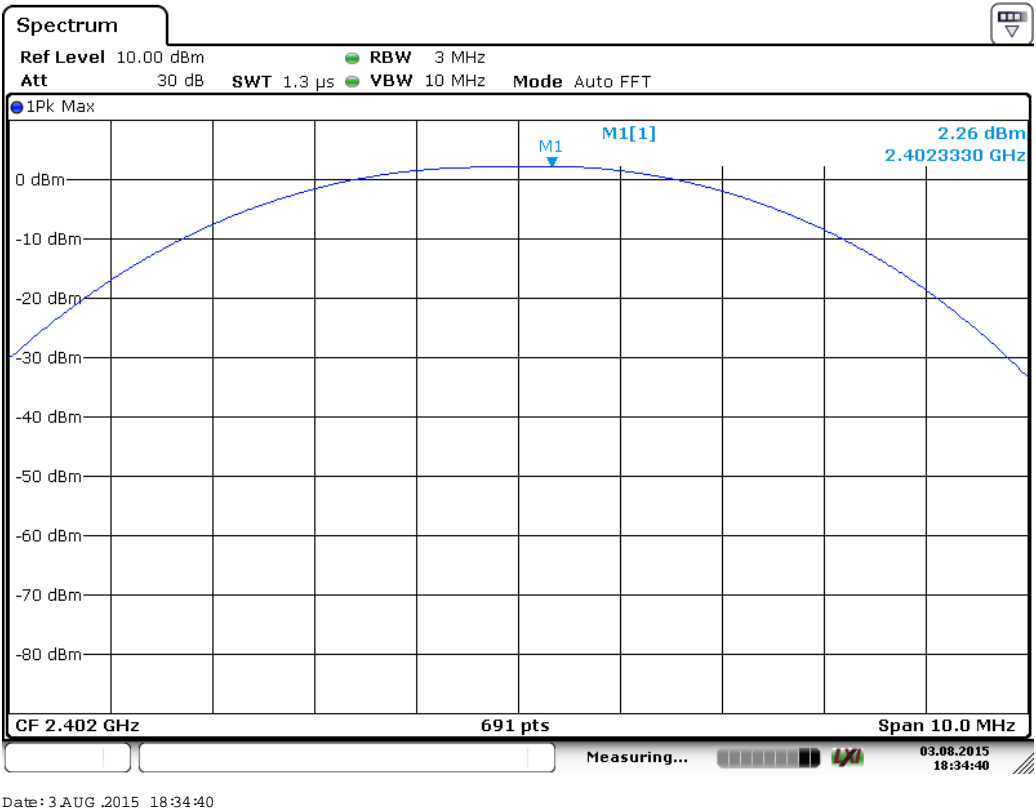
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

7.4 Test Result

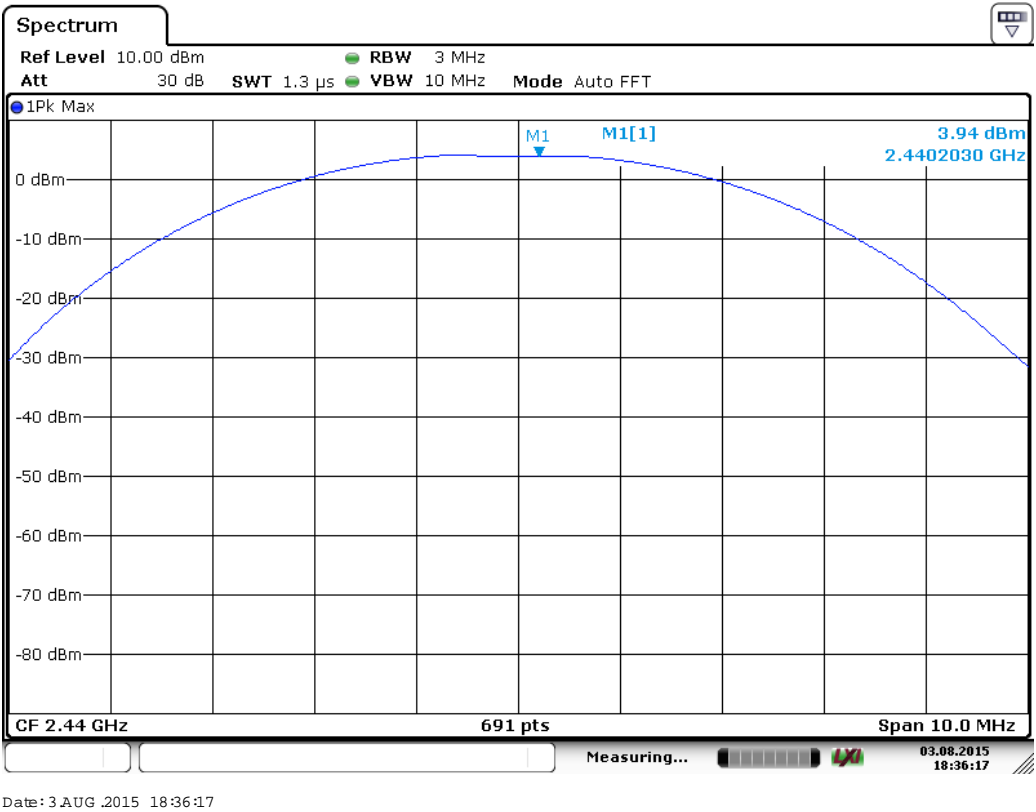
EUT: Wireless Subwoofer			
M/N: R-4B Subwoofer			
Test date: 2015-08-03		Test site: 3m Chamber	Tested by: Tony Tang
Pass			
Test Mode	CH	Peak output Power (dBm)	Limit (dBm)
BT 4.0-BLE GFSK	CH1	2.26	30
	CH20	3.94	30
	CH40	2.72	30
Conclusion : PASS			

7.5 Test Data

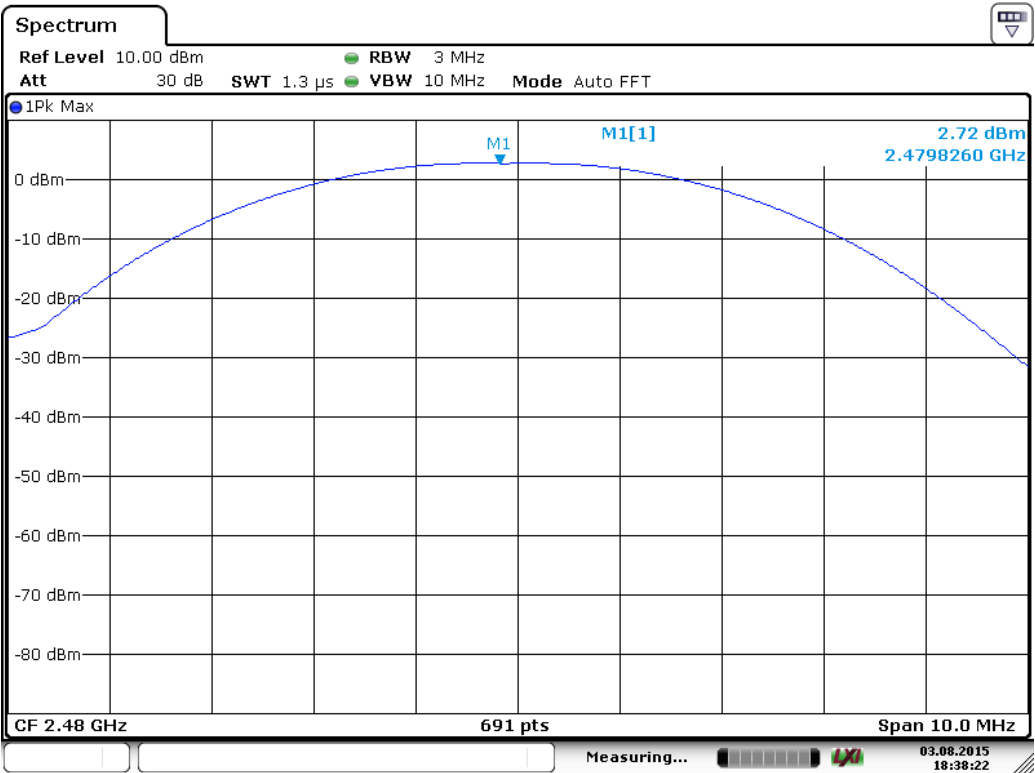
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



Date: 3 AUG .2015 18:38:21

8 POWER SPECTRAL DENSITY TEST

8.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

8.2 Test Procedure

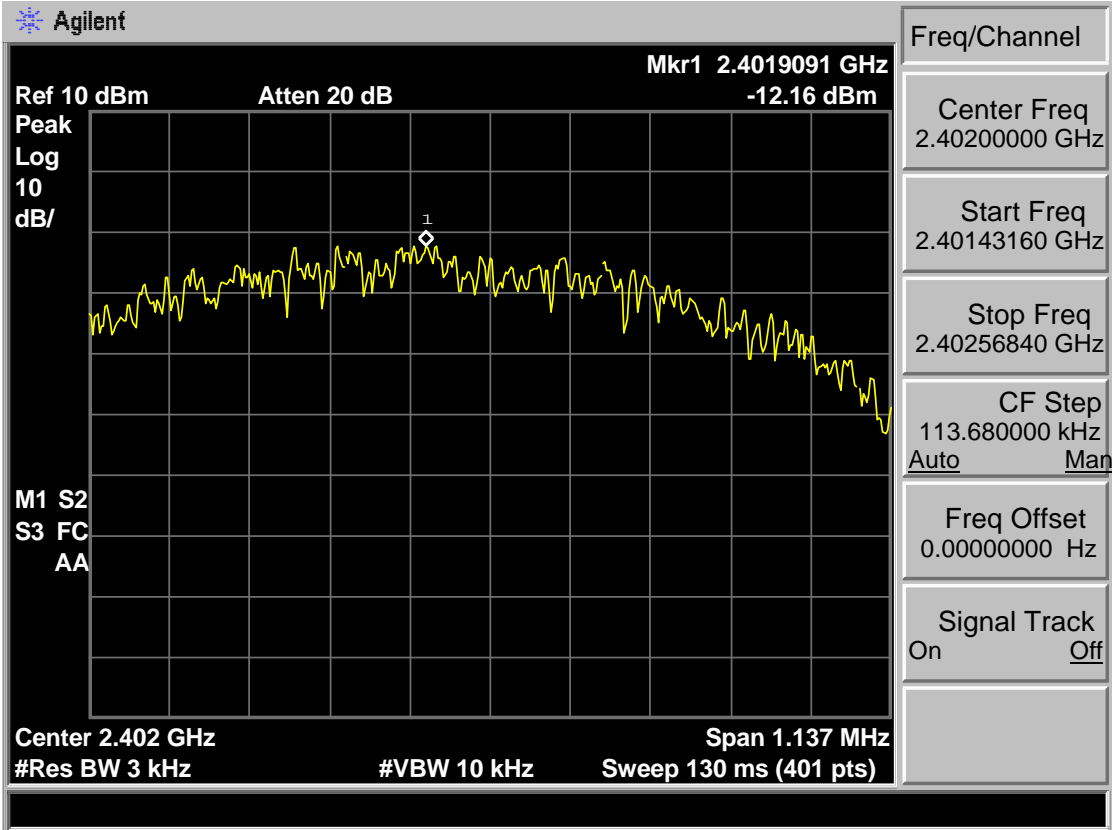
- 1, Connected the EUT's antenna port to spectrum analyzer device.
- 2, Follow the test procedure as described in KDB 558074
 - (1). Set analyzer center frequency to DTS channel center frequency.
 - (2). Set the span to 1.5 times the DTS bandwidth.
 - (3). Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - (4). Set the VBW $\geq 3 \text{ RBW}$.
 - (5). Detector = peak.
 - (6). Sweep time = auto couple.
 - (7). Trace mode = max hold.
 - (8). Allow trace to fully stabilize.
 - (9). Use the peak marker function to determine the maximum amplitude level.
 - (10). If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

8.3 Test Result

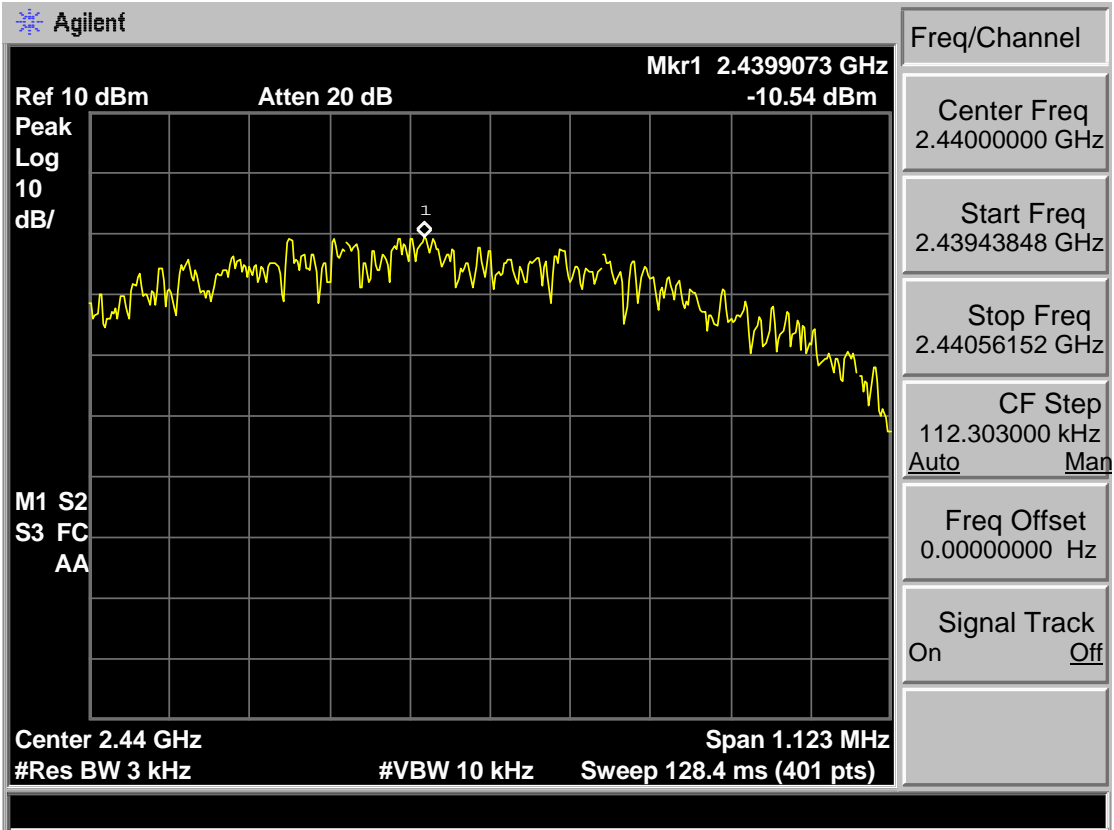
EUT: Wireless Subwoofer			
M/N: R-4B Subwoofer			
Test date: 2015-08-03		Test site: 3m Chamber	Tested by: Tony Tang
Pass			
Test Mode	CH	Power density (dBm/3kHz)	Limit (dBm/3kHz)
BT 4.0-BLE GFSK	CH1	-12.16	8
	CH20	-10.54	8
	CH40	-9.02	8
Conclusion : PASS			

8.4 Test Data

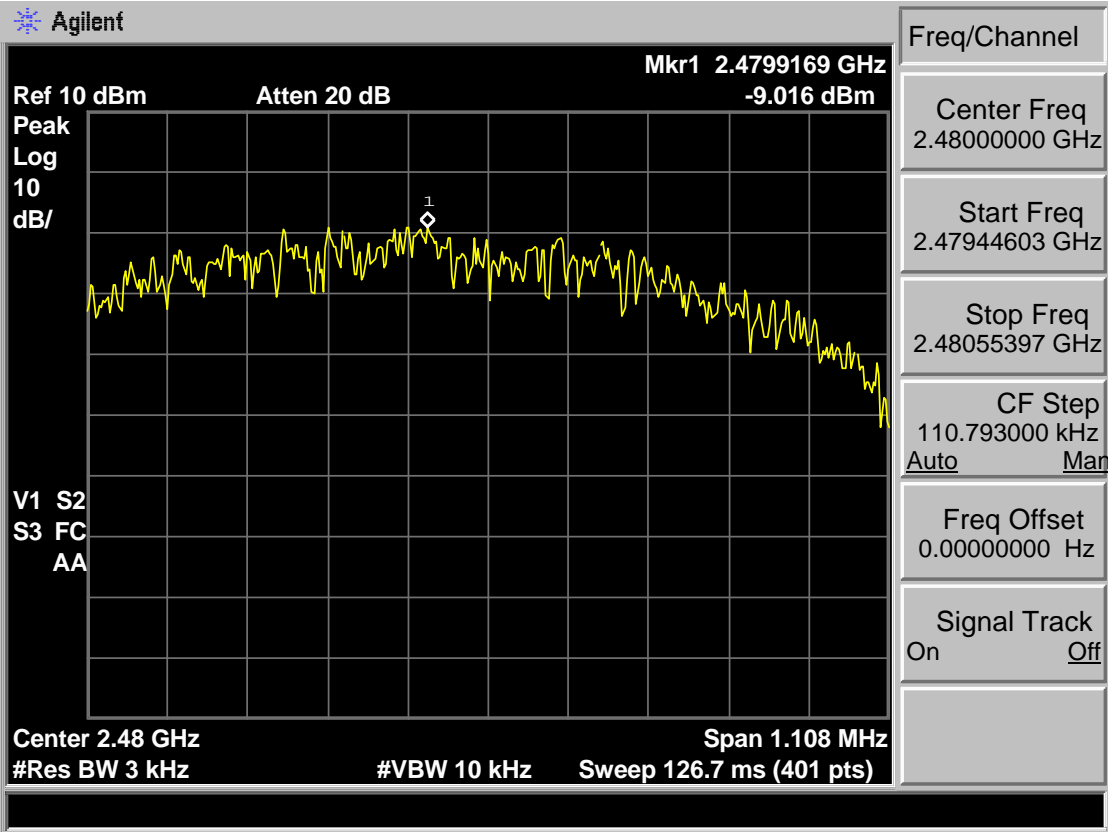
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



9 ANTENNA REQUIREMENTS

9.1 Limit

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 Result

The antennas used for this product are Integrated PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 2.27 dBi.