
FCC TEST REPORT

For

Kopi Incorporation Limited

kStation

Trade Name : KOPI

Model No. : kStation-01, kStation-02, kStation-03, kStation-04, kStation-05, kStation-06.
All the model are the same circuit and RF module,except the appearance colour, this report only test mode name: kStation-01

FCC ID : 2ABRB-KSTATION

Frequency range : 802.11b/g/n(20MHz): 2412-2462MHZ
: 802.11n(40MHz): 2422-2452MHZ

Number of Channel : 802.11b/g/n(20MHz): 11CH
: 802.11n(40MHz): 7CH

Type of antenna : Internal monopole Antenna

Applicant : Kopi Incorporation Limited
Unit 716, Vanta Ind.Ctr.,21-33 Tai Lin Pai Roda,
Kwai Chung, N.T.,Hong Kong

Regulation : FCC Rules and Regulations Part 15 Subpart C Section 15.247

Prepared by : WST Certification & Testing (HK) Limited
Address : 12/F., San Toi Building,137-139 Connaught Road Central,
Hong Kong, China

Report No.: : WST20141224007

Test Date : Dec. 24-28, 2014

Date of Report : Dec. 28, 2014

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TEST REPORT DECLARATION

Applicant : Kopi Incorporation Limited
 Manufacturer : Active Enterprises Limited
 EUT Description : kStation

Model NO. : kStation-01, kStation-02, kStation-03, kStation-04,
 kStation-05, kStation-06.
 All the model are the same circuit and RF module, except
 the appearance colour, this report only test mode name:
 kStation-01

Serial NO. : N/A
 Power Supply : DC 5V

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

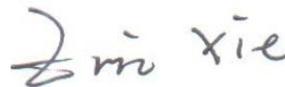
ANSI C63.4:2009

The device described above is tested by WST Certification & Testing (HK) Limited 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 WST Certification & Testing (HK) Limited. 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 WST Certification & Testing (HK) Limited.

Date of Test: Dec. 24-28, 2014

Prepared by:



Project Engineer(Eric Xie)

Reviewed by:



Project Supervisor(Nico Lee)

Approved by:



Technical Director (Kait Chen)

1. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.247(a)2)	6dB Bandwidth Test	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.247(b)(3)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Tes	Compliant
Section 15.247(d) Section 15.209)	Radiated Spurious Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

2. GENERAL INFORMATION

1.1. General Information

EUT	:	kStation
Model Number	:	kStation-01, kStation-02, kStation-03, kStation-04, kStation-05, kStation-06. All the model are the same circuit and RF module,except the appearance colour, this report only test mode name: kStation-01
Frequency Range	:	802.11b/g/n(20MHz): 2412-2462MHZ 802.11n(40MHz): 2422-2452MHZ
Number of Channels	:	802.11b/g/n(20MHz): 11CH 802.11n(40MHz): 7CH
Antenna Gain	:	0dBi
Modulation mode	:	GFSK
Applicant	:	Kopi Incorporation Limited Unit 716, Vanta Ind.Ctr., 21-33 Tai Lin Pai Roda, Kwai Chung, N.T., Hong Kong
Data Rate	:	802.11b: 11, 5.5,2, 1 Mbps 802.11g: 54, 48, 36, 24, 18Mbps 802.11n: 150Mbps
Manufacturer	:	Active Enterprises Limited Bei Men Industrial Zone, Heng Keng,Liao Bu,Dong Guan City,Guang Dong,China
Test Date	:	Dec. 24-28, 2014

1.2. Test Facility

Test Firm : Shenzhen CTL Testing Technology Co., Ltd.
Certificated by FCC, Registration No.: 970318
Address : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road.
Nanshan, Shenzhen, China
Tel : 86-755-89486194
Fax : 86-755-89486194

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	= 3.20dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.10dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.32dB, k=2

3. TEST INSTRUMENT USED

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12	2015/07/11
EMI Test Receiver	R&S	ESCI	103710	2014/07/12	2015/07/11
Spectrum Analyzer	Agilent	E4407B	MY45108355	2014/07/12	2015/07/11
Controller	EM Electronics	Controller EM 1000	N/A	2014/07/12	2015/07/11
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12	2015/07/11
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2014/07/12	2015/07/11
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2014/07/12	2015/07/11
LISN	R&S	ENV216	101316	2014/07/12	2015/07/11
LISN	SCHWARZBECK	NSLK8127	8127687	2014/07/12	2015/07/11
Microwave Preamplifier	HP	8349B	3155A00882	2014/07/12	2015/07/11
Amplifier	HP	8447D	3113A07663	2014/07/12	2015/07/11
Transient Limiter	Com-Power	LIT-153	532226	2014/07/12	2015/07/11
Radio Communication Tester	R&S	CMU200	3655A03522	2014/07/12	2015/07/11
Temperature/Humidity Meter	zhicheng	ZC1-2	22522	2014/07/12	2015/07/11
SIGNAL GENERATOR	HP	8647A	3200A00852	2014/07/12	2015/07/11
Wideband Peak Power Meter	Anritsu	ML2495A	220.23.35	2014/07/12	2015/07/11
Climate Chamber	ESPEC	EL-10KA	A20120523	2014/07/12	2015/07/11
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	/	2014/07/12	2015/07/11
High-Pass Filter	K&L	41H10-1375/U12750-O/O	/	2014/07/12	2015/07/11

4. OPERATION OF EUT DURING TESTING

Operating Mode

The mode is used: **Transmitting mode**

802.11b/g/n(20MHz)

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

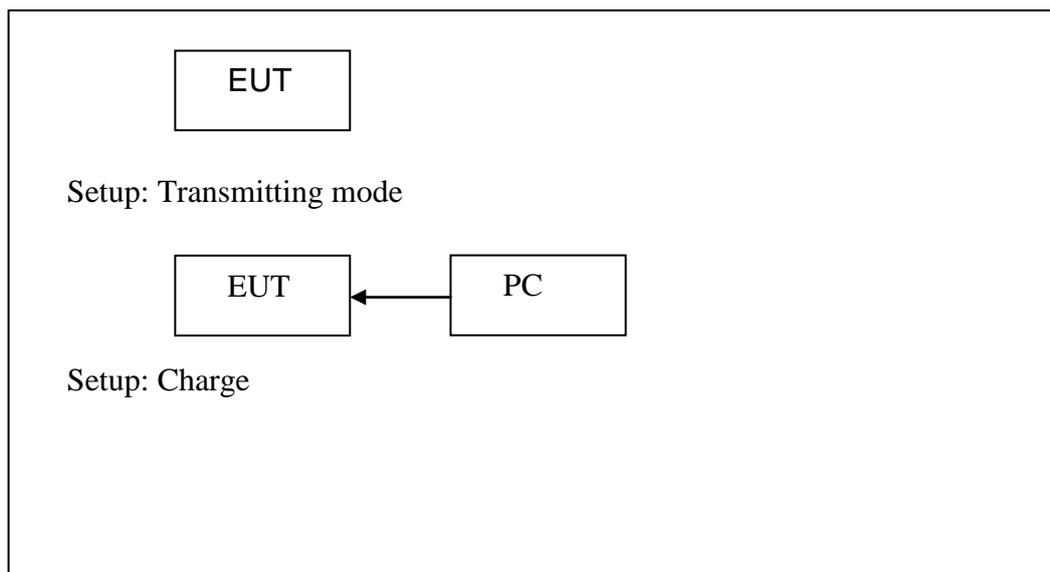
802.11 n(40MHz)

Low Channel: 2422MHz

Middle Channel: 2437MHz

High Channel: 2452MHz

Test Setup



Channel list for wifi

802.11b/g/n(20MHz): 11CH

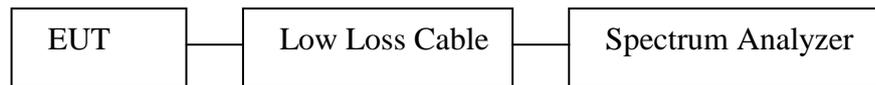
Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	---	---

802.11n(40MHz): 7CH

Channel	Frequency(MHz)	Channel	Frequency(MHz)
---	---	07	2442
---	---	08	2447
03	2422	09	2452
04	2427	---	---
05	2432	---	---
06	2437	---	---

5. 6DB BANDWIDTH MEASUREMENT

5.1. Block Diagram of Test Setup



5.2. Limits

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

5.3. Test Procedure

- 5.3.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 5.3.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz
- 5.3.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.4. Test Result

PASS

802.11b			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	10.32	>0.5MHz
Middle	2437	10.32	>0.5MHz
High	2462	10.32	>0.5MHz

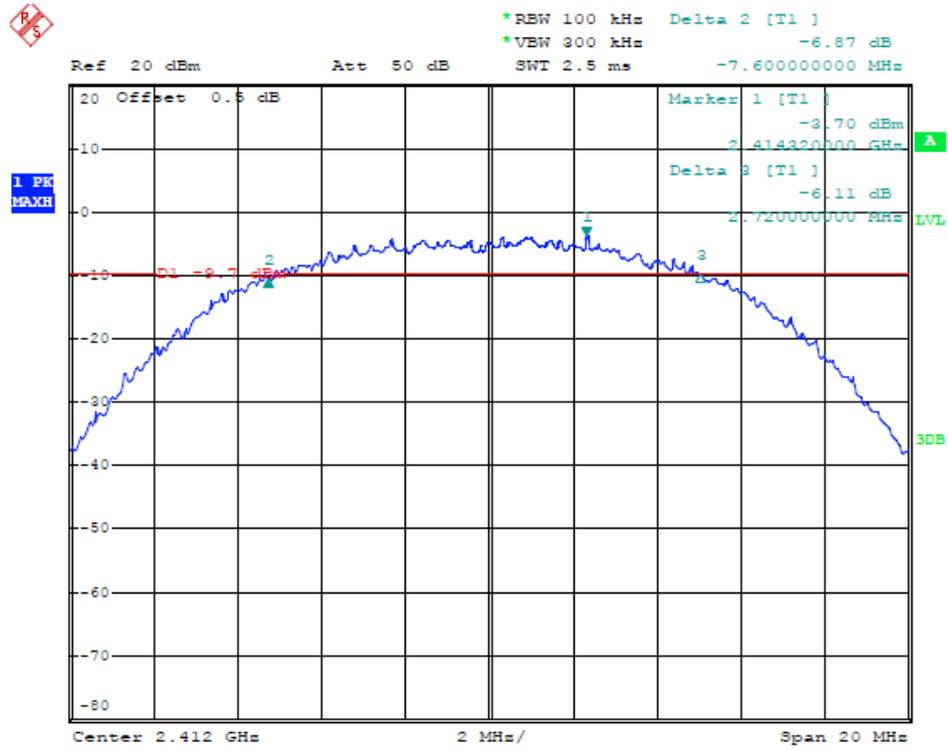
802.11g			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	16.60	>0.5MHz
Middle	2437	16.60	>0.5MHz
High	2462	16.60	>0.5MHz

802.11n(Bandwidth 20MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	17.76	>0.5MHz
Middle	2437	17.76	>0.5MHz
High	2462	17.76	>0.5MHz

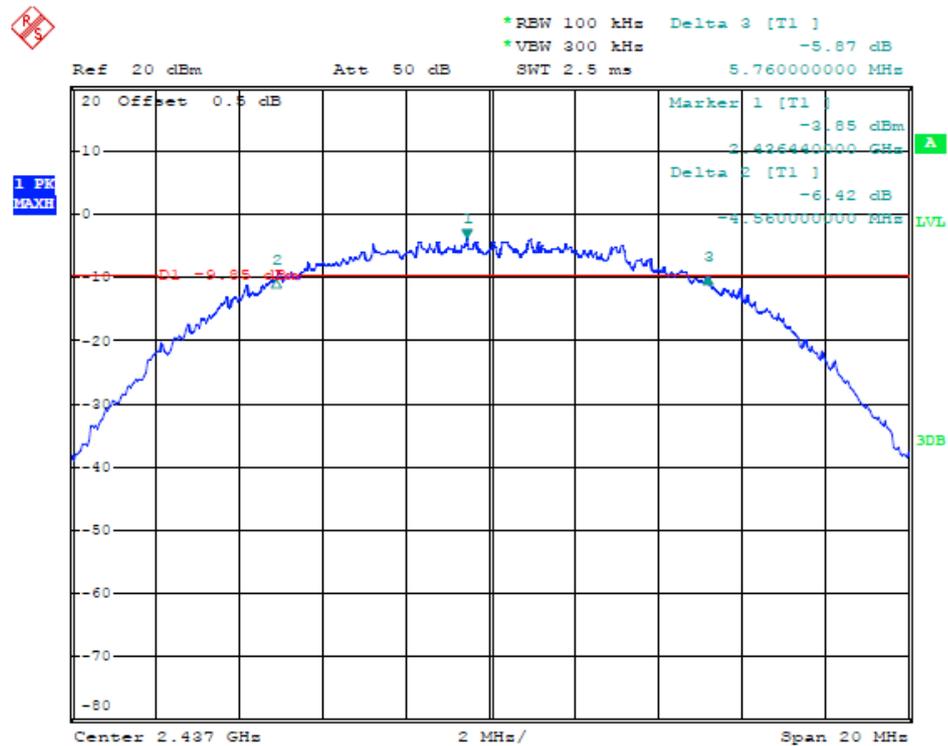
802.11n(Bandwidth 40MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2422	36.56	>0.5MHz
Middle	2437	36.56	>0.5MHz
High	2452	36.56	>0.5MHz

The spectrum analyzer plots are attached as below.

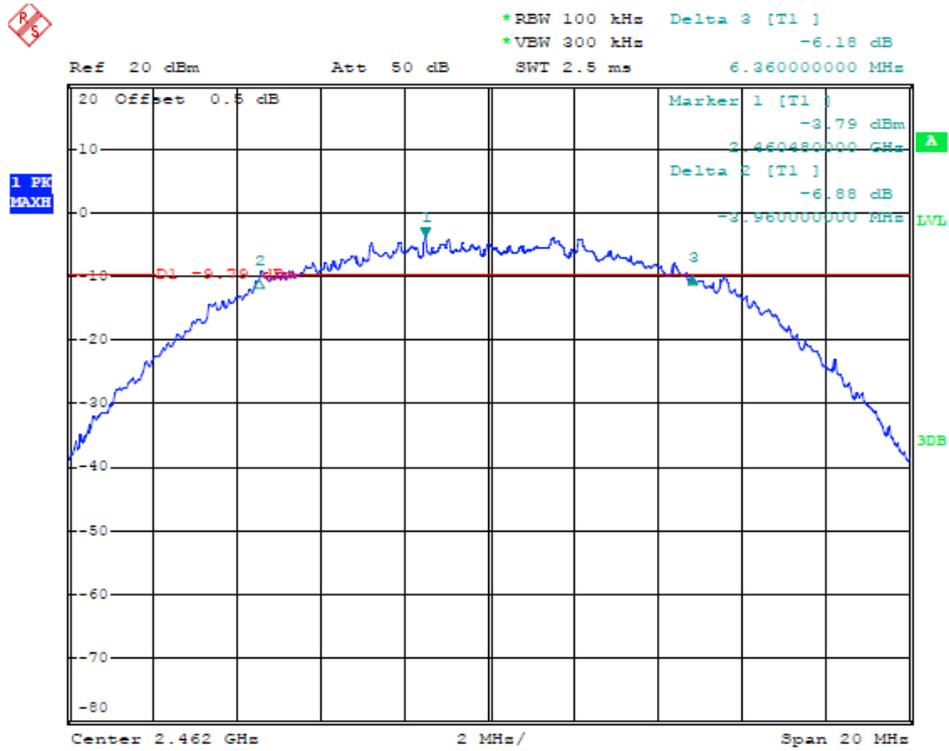
802.11b Channel Low 2412MHz



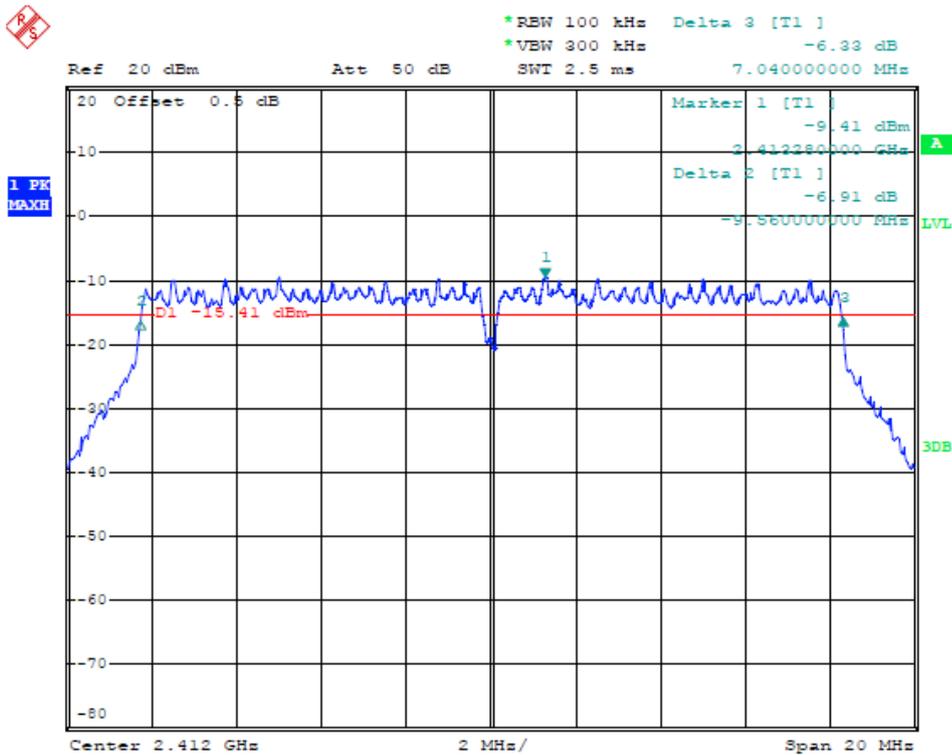
802.11b Channel Middle 2437MHz



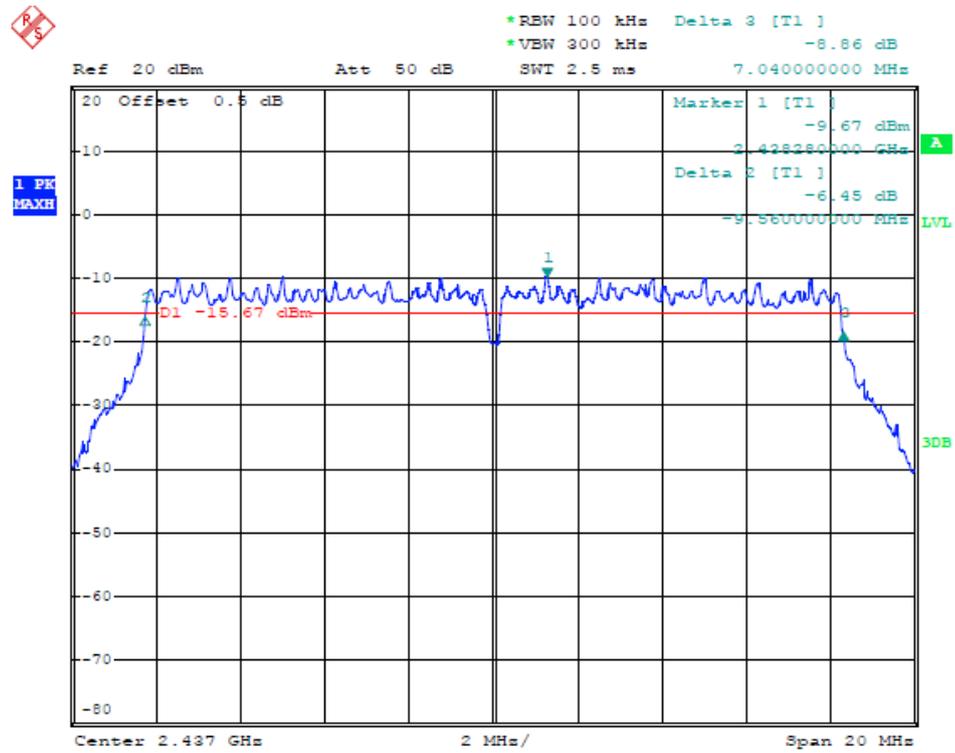
802.11b Channel High 2462MHz



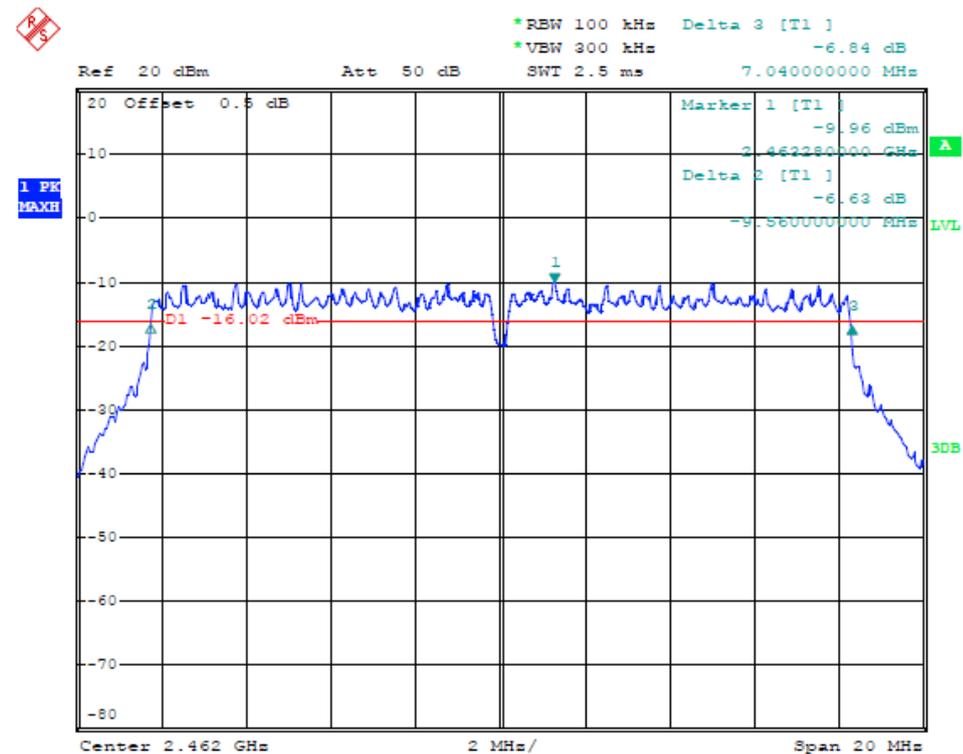
802.11g Channel Low 2412MHz



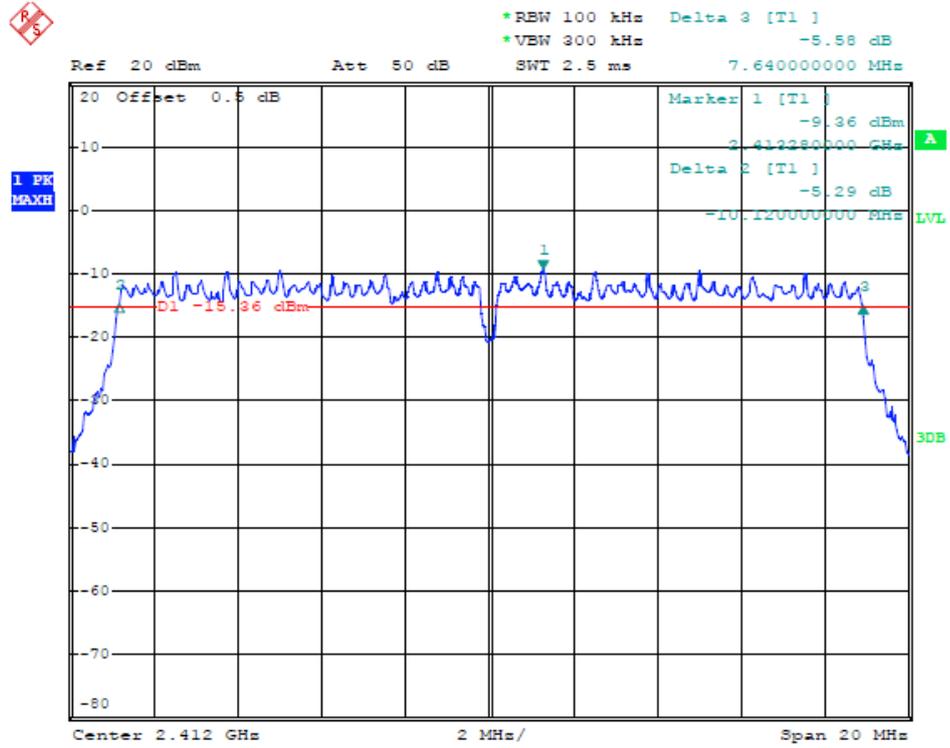
802.11g Channel Middle 2437MHz



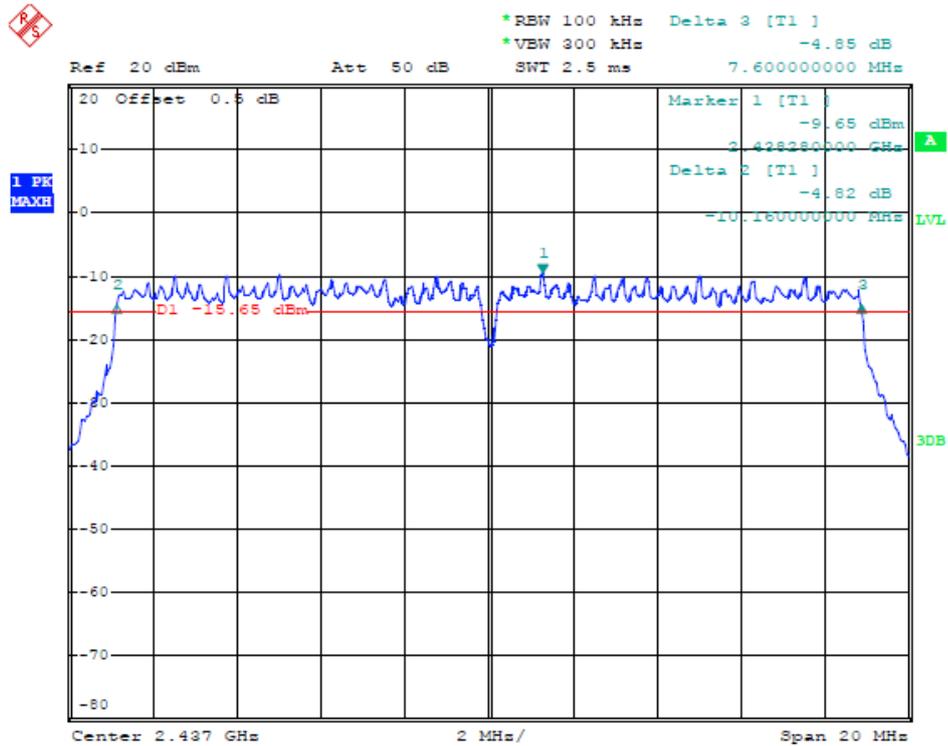
802.11g Channel High 2462MHz



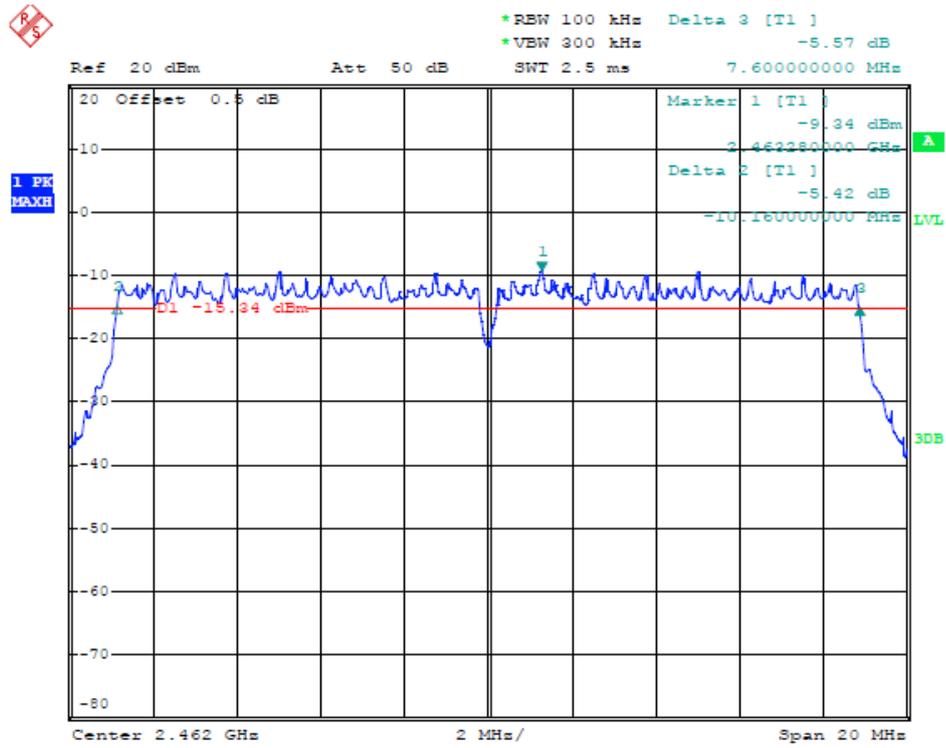
802.11n Channel Low 2412MHz (20MHz)



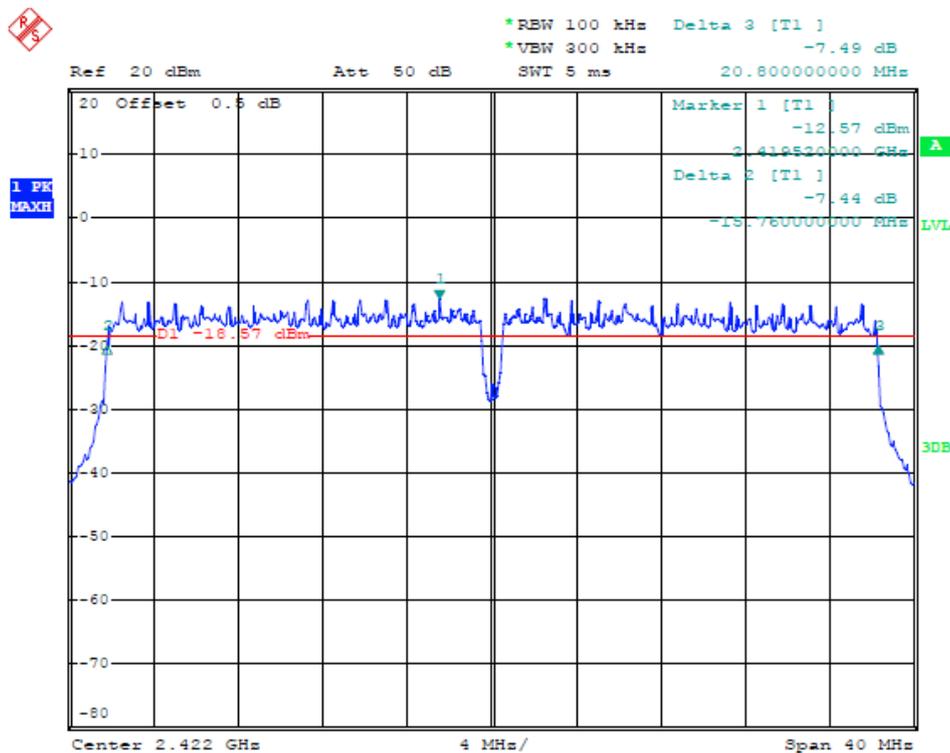
802.11n Channel Middle 2437MHz (20MHz)



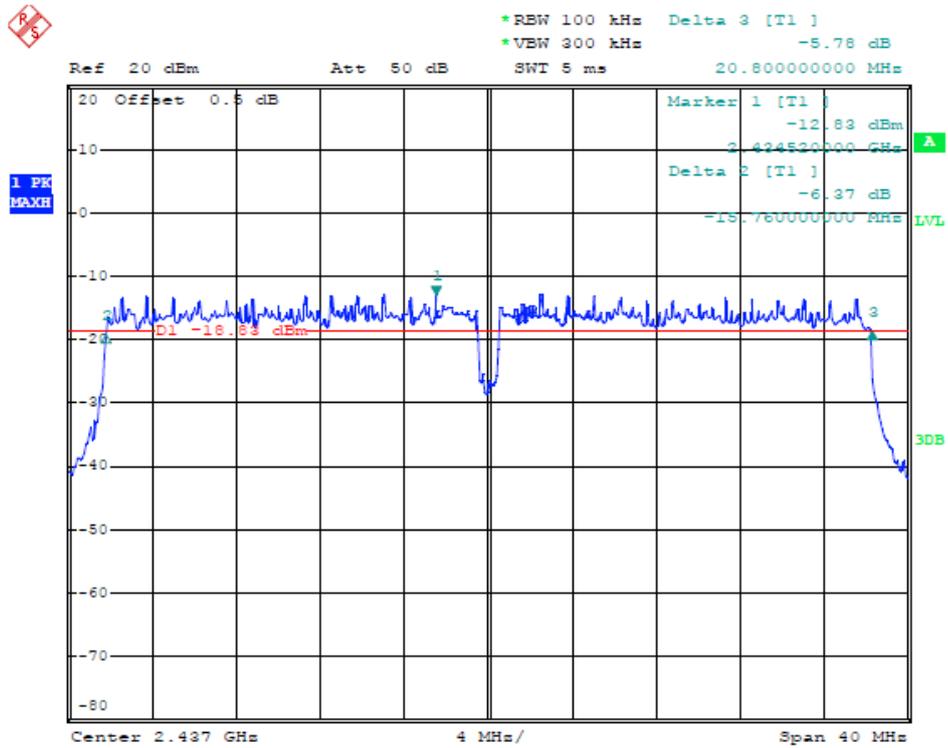
802.11n Channel High 2462MHz (20MHz)



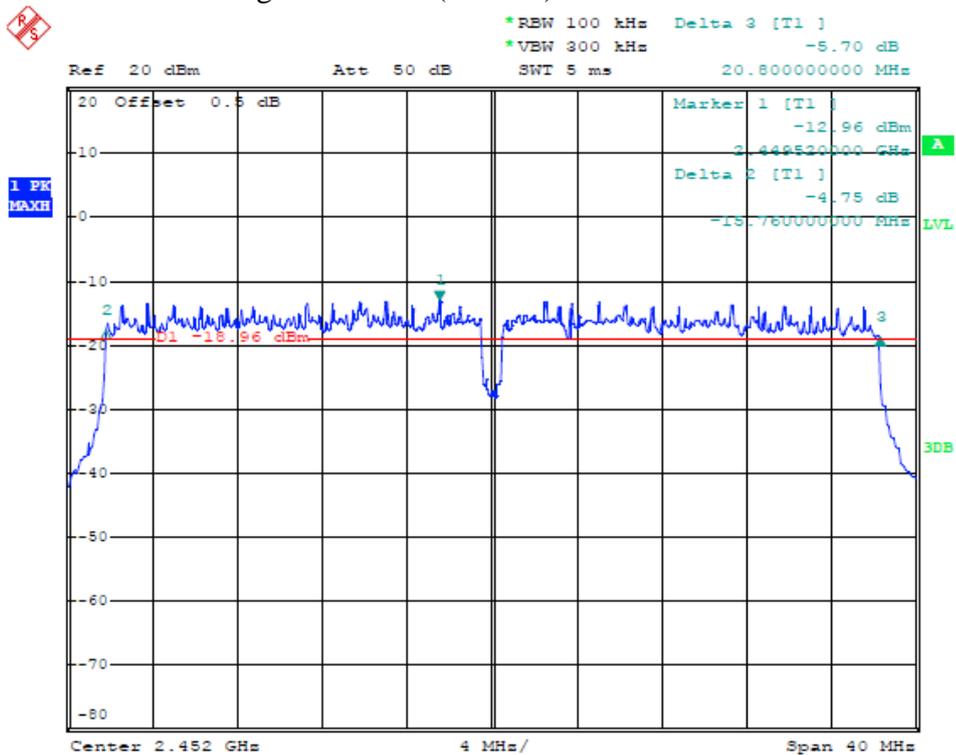
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz (40MHz)

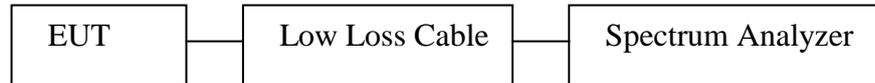


802.11n Channel High 2452MHz (40MHz)



6. MAXIMUM PEAK OUTPUT POWER

6.1. Block Diagram of Test Setup



6.2. Limits

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

6.3. Test Procedure

- 6.3.1. The transmitter output was connected to the spectrum analyzer through a low
- 6.3.2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.
- 6.3.3. Measurement the maximum peak output power.

6.4. Test Result

PASS

802. 11b (Maximum Average Conducted Output Power)			
Channel	Frequency (MHz)	Ave output power (dBm)	Limit (dBm)
Low	2412	9.50	30
Middle	2437	9.27	30
High	2462	9.01	30

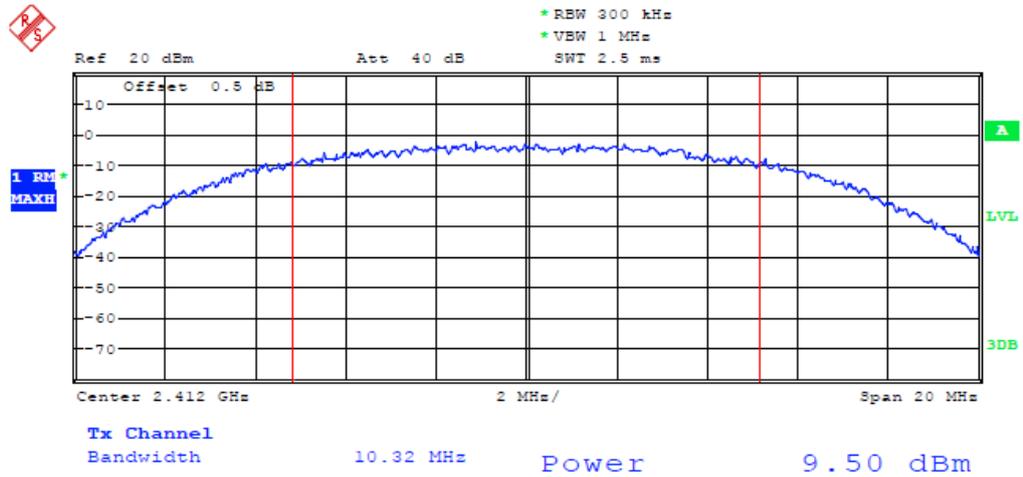
802. 11g (Maximum Average Conducted Output Power)			
Channel	Frequency (MHz)	Ave output power (dBm)	Limit (dBm)
Low	2412	7.82	30
Middle	2437	7.61	30
High	2462	6.76	30

802. 11n(20MHz) (Maximum Average Conducted Output Power)			
Channel	Frequency (MHz)	Ave output power (dBm)	Limit (dBm)
Low	2412	7.12	30
Middle	2437	6.89	30
High	2462	6.65	30

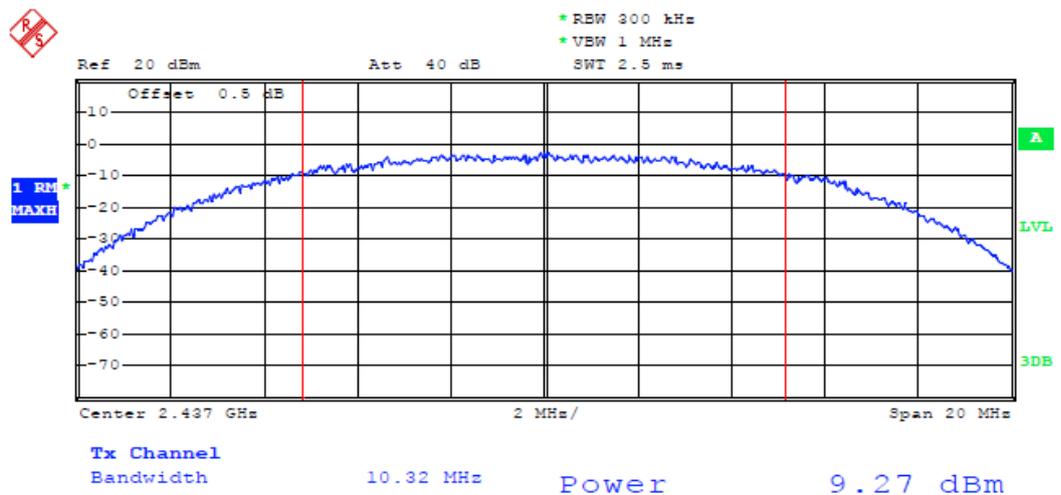
802.11n(40MHz) (Maximum Average Conducted Output Power)			
Channel	Frequency (MHz)	Ave output power (dBm)	Limit (dBm)
Low	2422	4.07	30
Middle	2437	4.95	30
High	2452	5.03	30

The spectrum analyzer plots are attached as below.

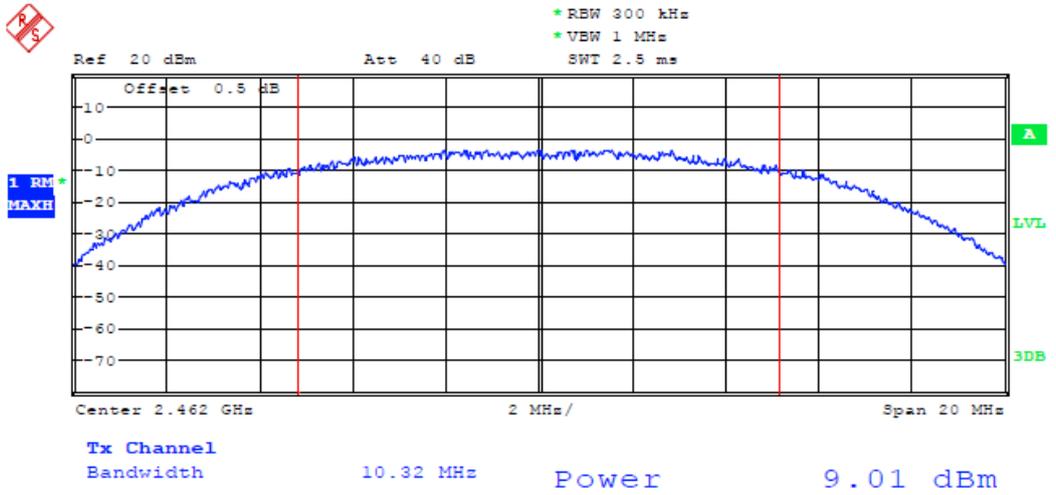
802.11b Channel Low 2412MHz



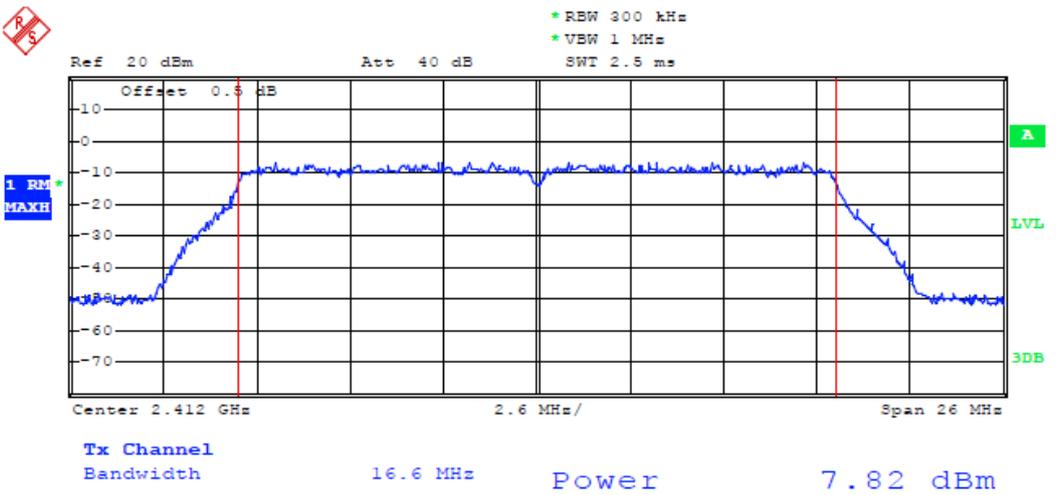
802.11b Channel Middle 2437MHz



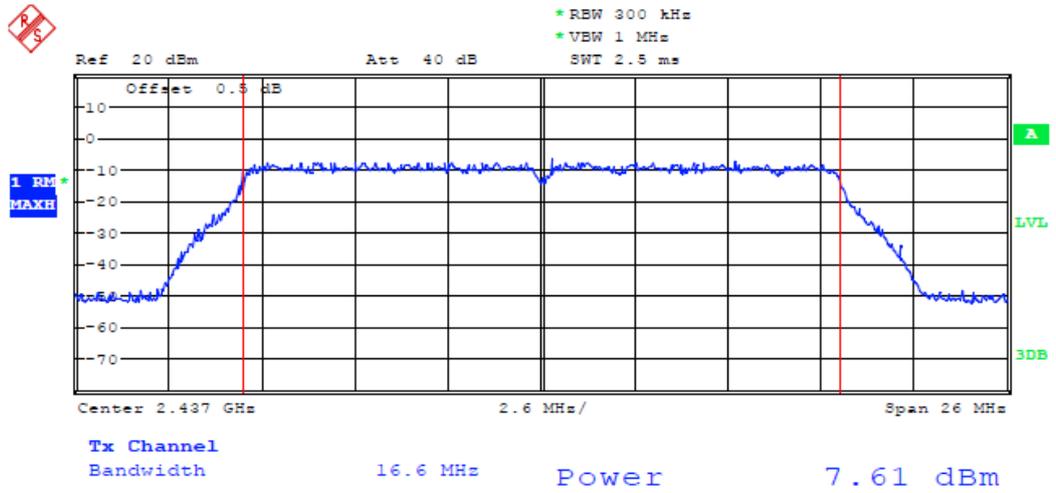
802.11b Channel High 2462MHz



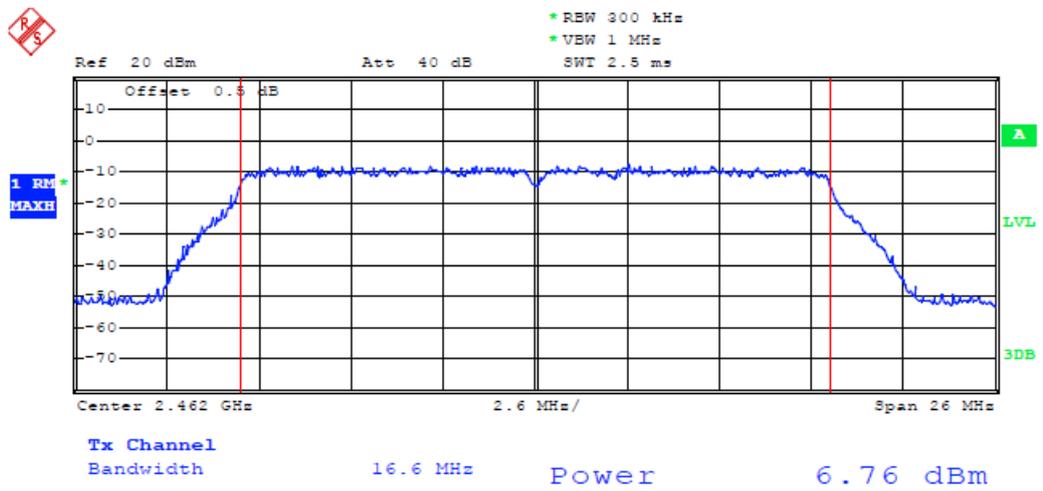
802.11g Channel Low 2412MHz



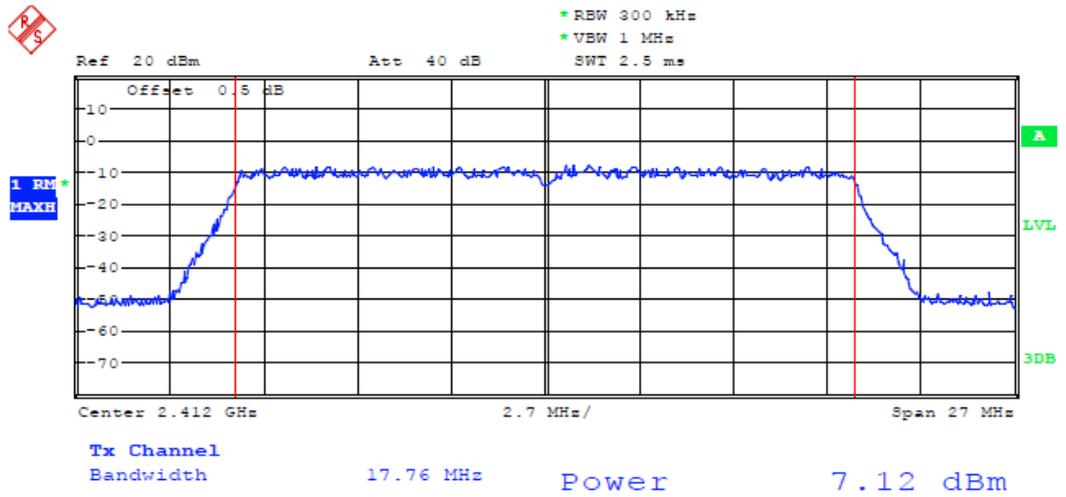
802.11g Channel Middle 2437MHz



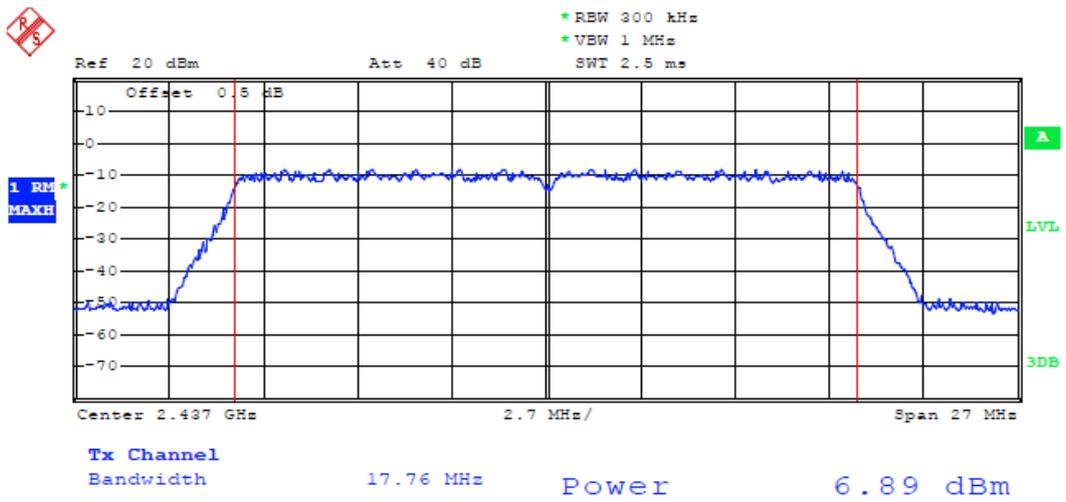
802.11g Channel High 2462MHz



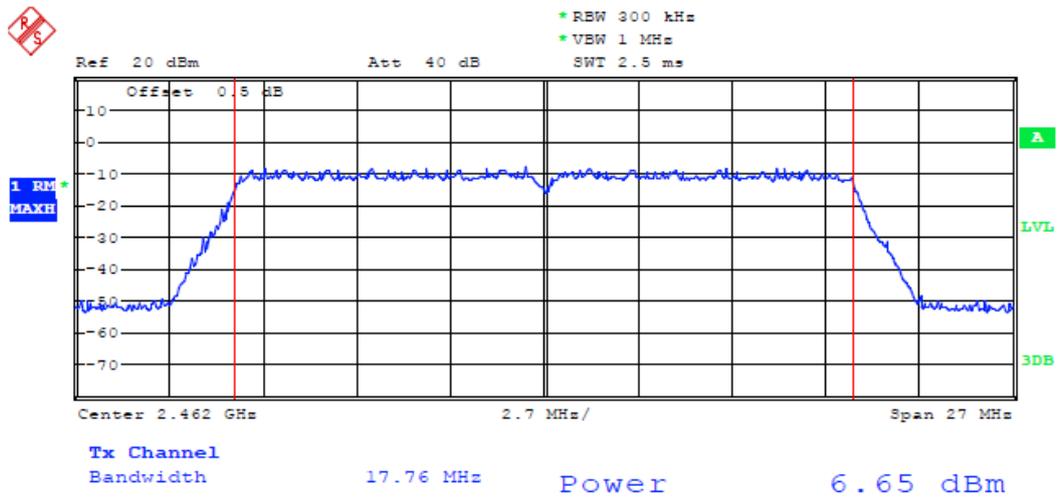
802.11n Channel Low 2412MHz (20MHz)



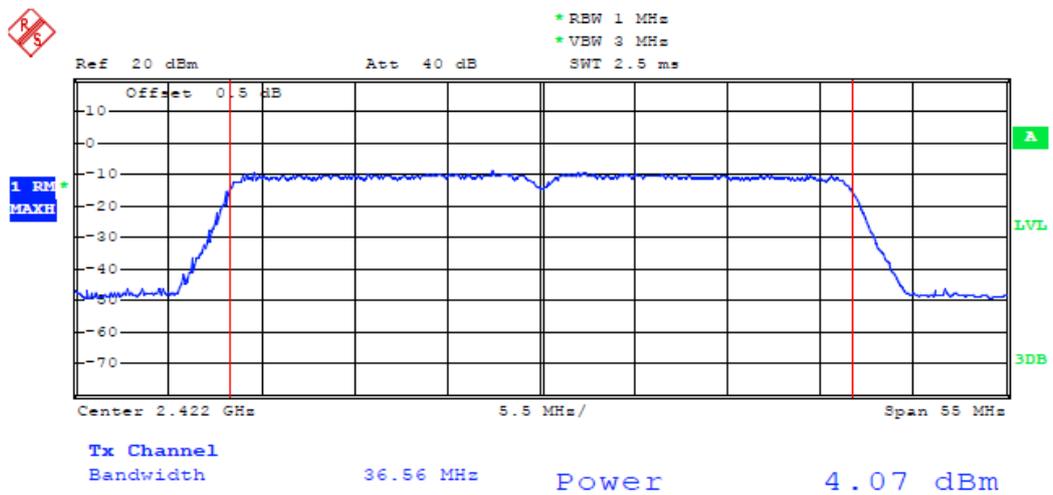
802.11n Channel Middle 2437MHz (20MHz)



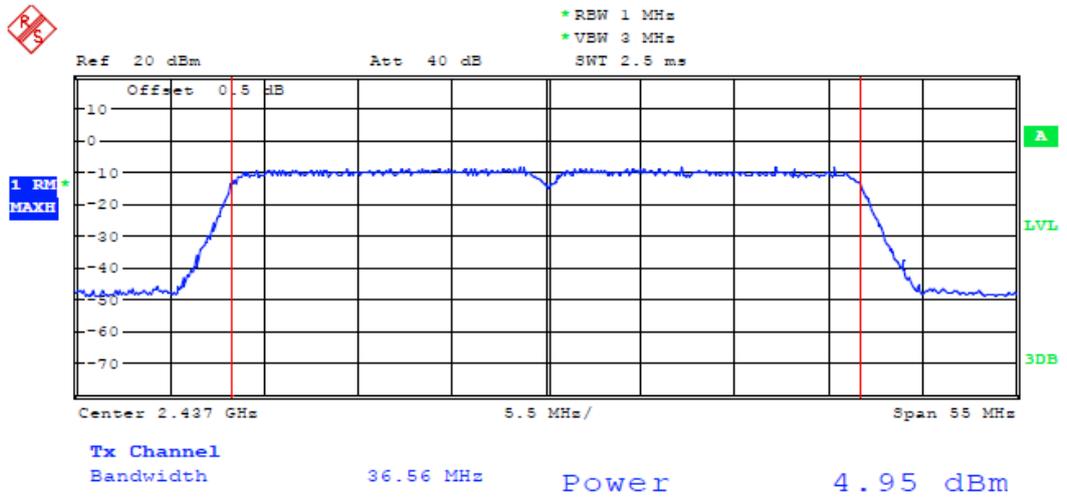
802.11n Channel High 2462MHz (20MHz)



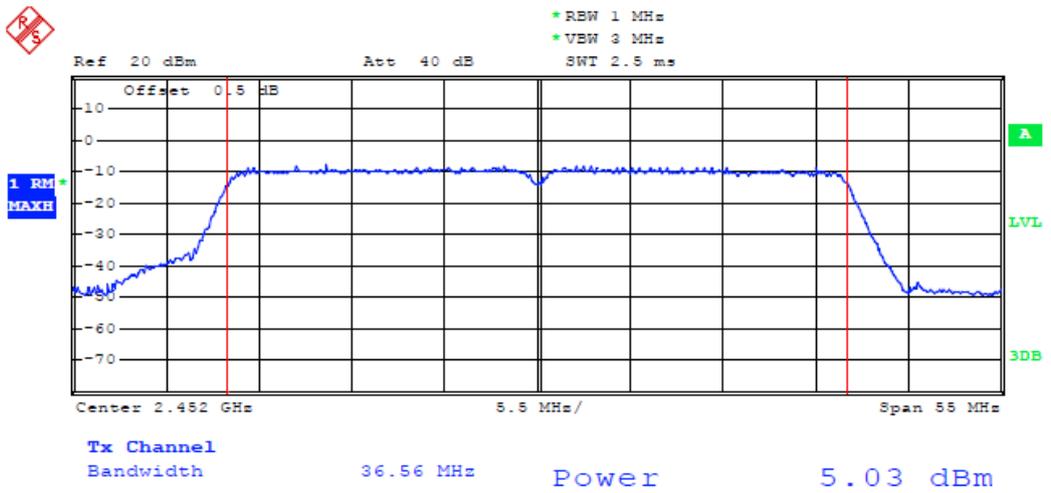
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz (40MHz)

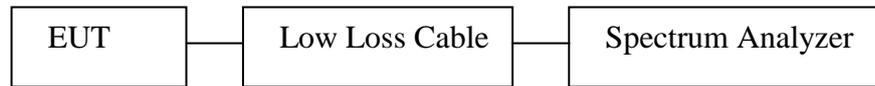


802.11n Channel High 2452MHz (40MHz)



7. POWER SPECTRAL DENSITY MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Limits

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.3. Test Procedure

- 7.3.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 7.3.2. Set RBW of spectrum analyzer to 3kHz and VBW to 10kHz, sweep time = Span/30kHz
- 7.3.2. Measurement the maximum power spectral density.

7.4. Test Result

PASS

802.11b			
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)
Low	2412	-18.77	8
Middle	2437	-19.25	8
High	2462	-18.04	8

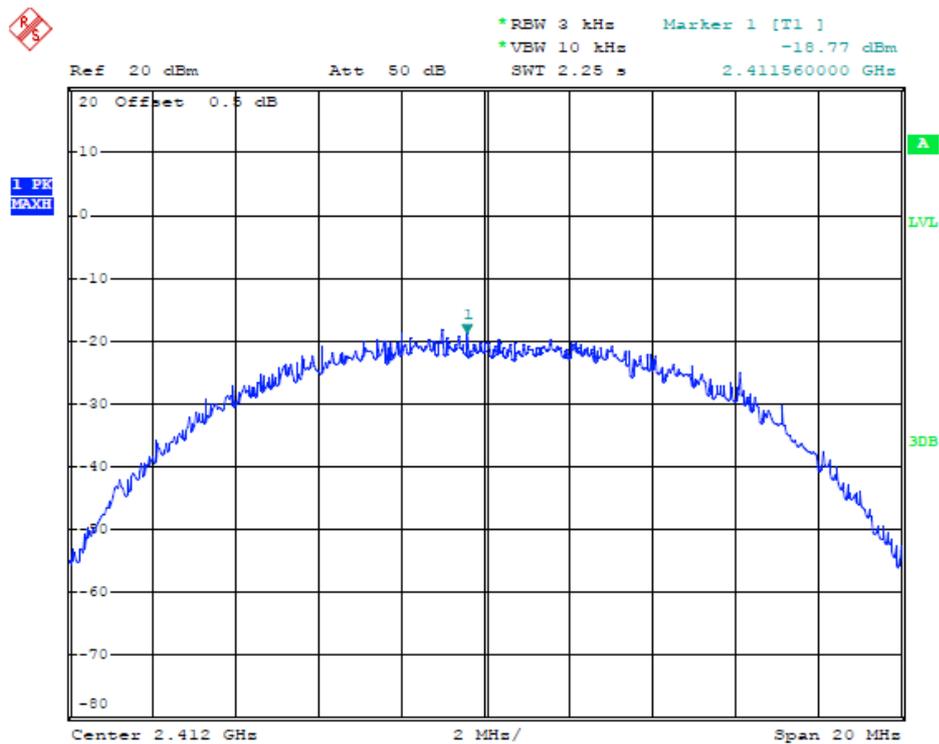
802.11g			
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)
Low	2412	-22.83	8
Middle	2437	-23.37	8
High	2462	-23.86	8

802.11n(20MHz)			
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)
Low	2412	-24.60	8
Middle	2437	-25.36	8
High	2462	-25.25	8

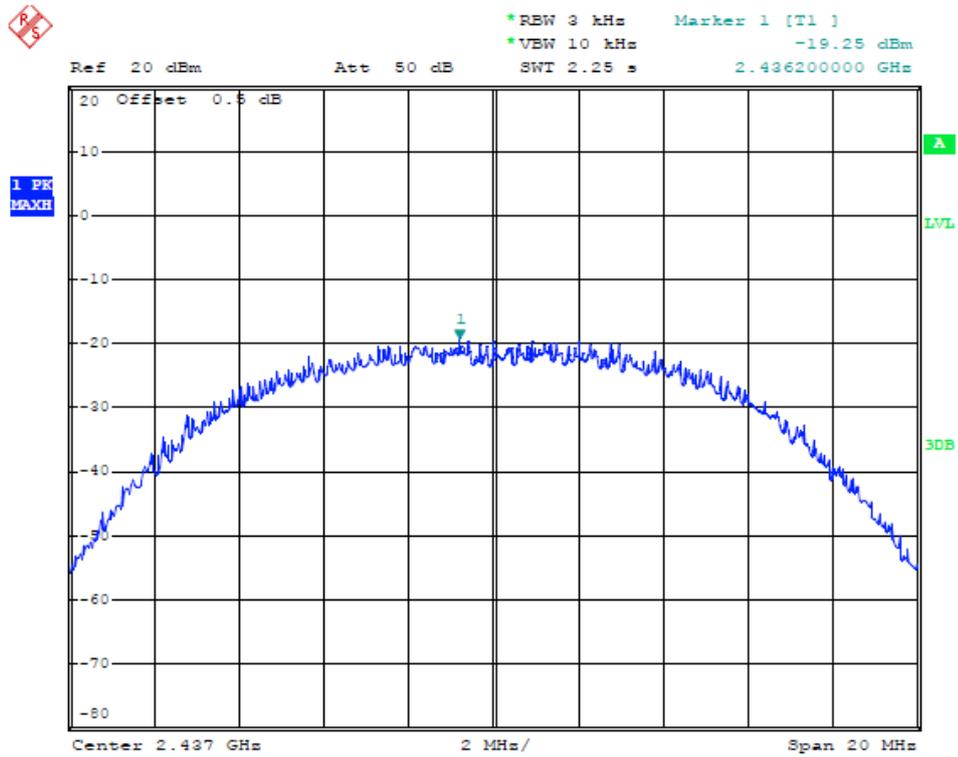
802.11n(40MHz)			
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)
Low	2422	-28.28	8
Middle	2437	-29.62	8
High	2452	-28.90	8

The spectrum analyzer plots are attached as below.

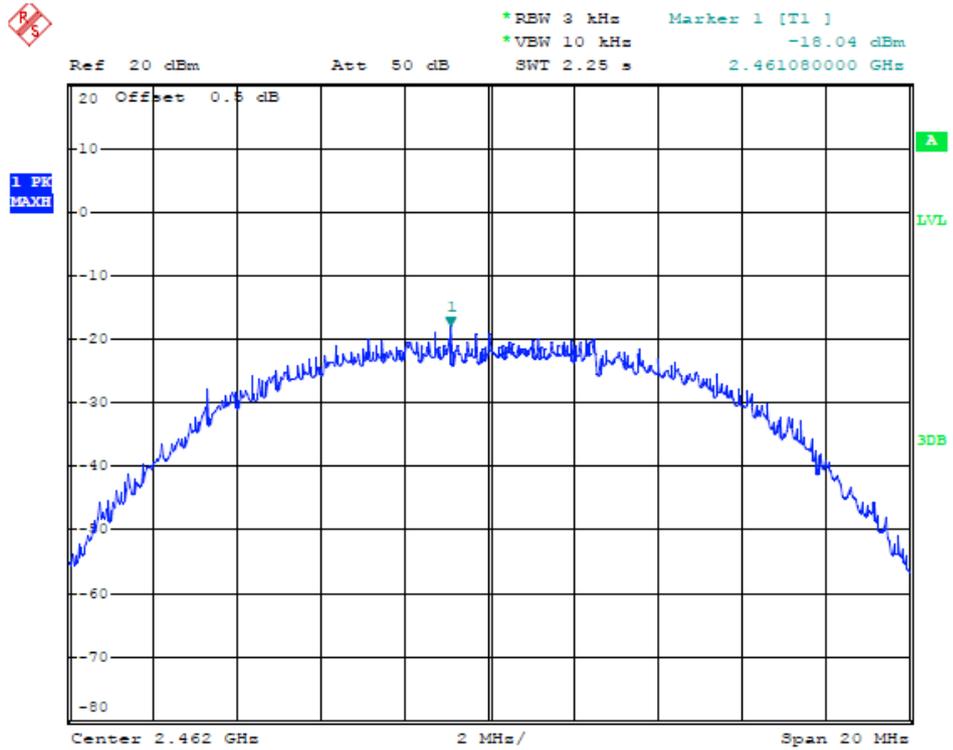
802.11b Channel Low 2412MHz



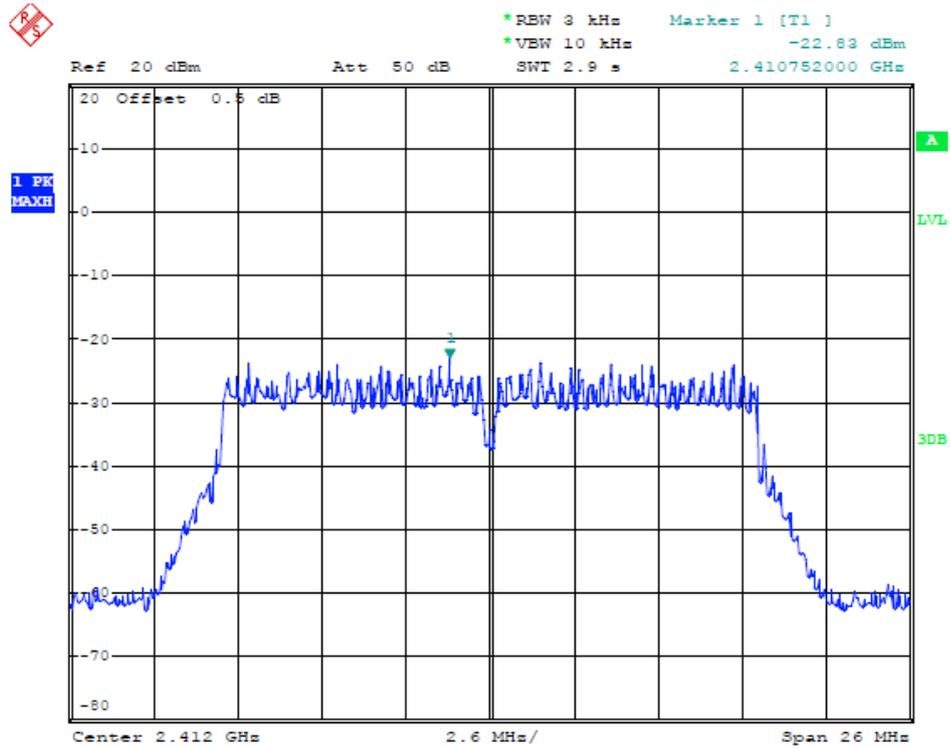
802.11b Channel Middle 2437MHz



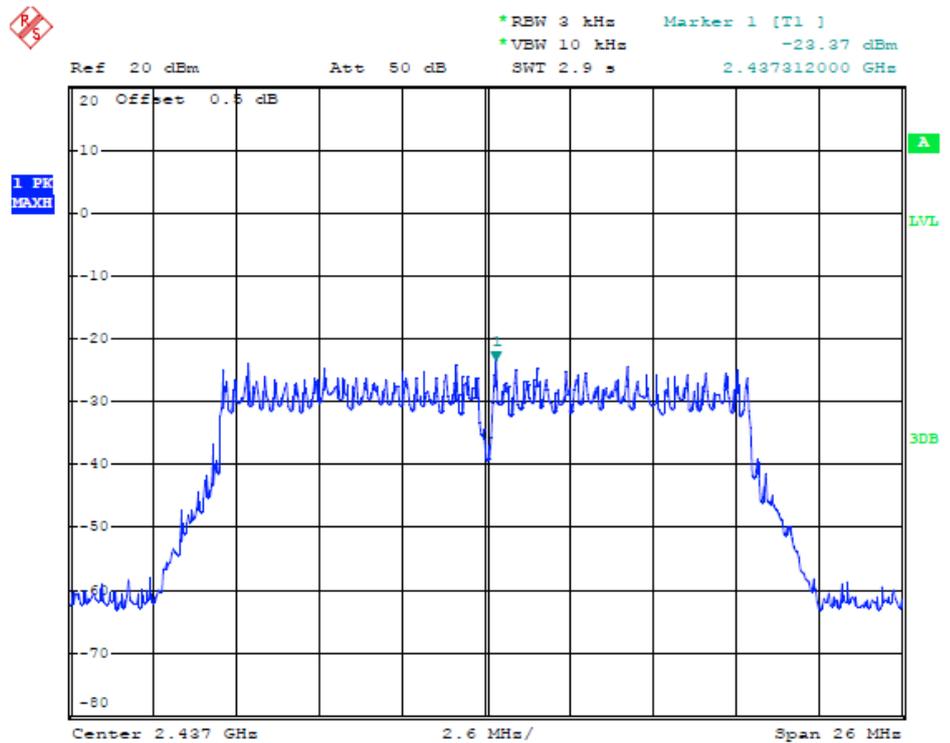
802.11b Channel High 2462MHz



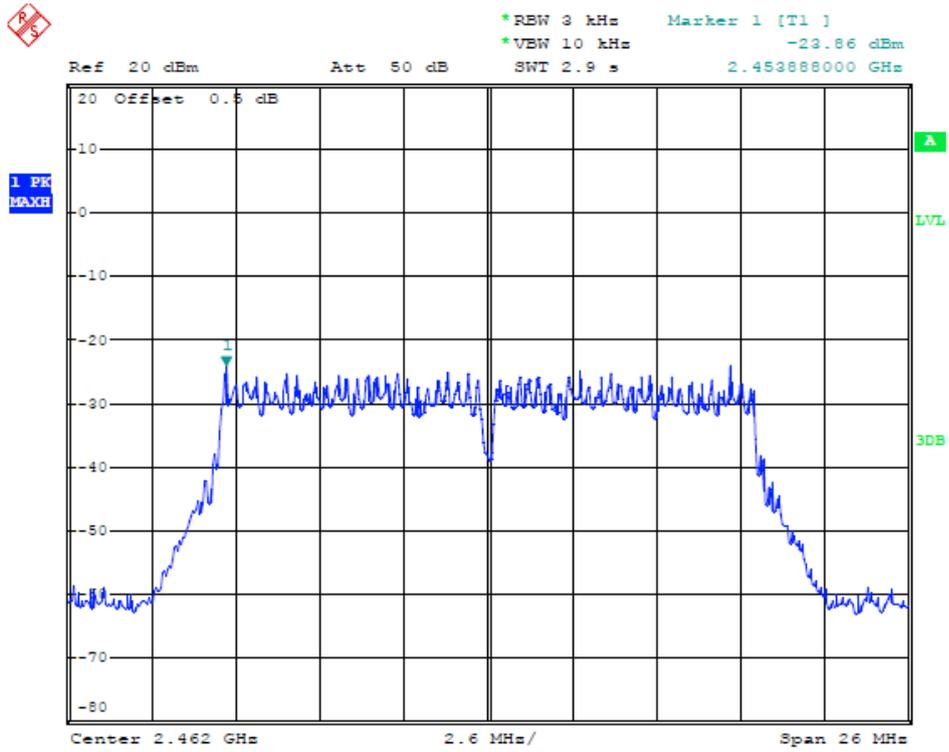
802.11g Channel Low 2412MHz



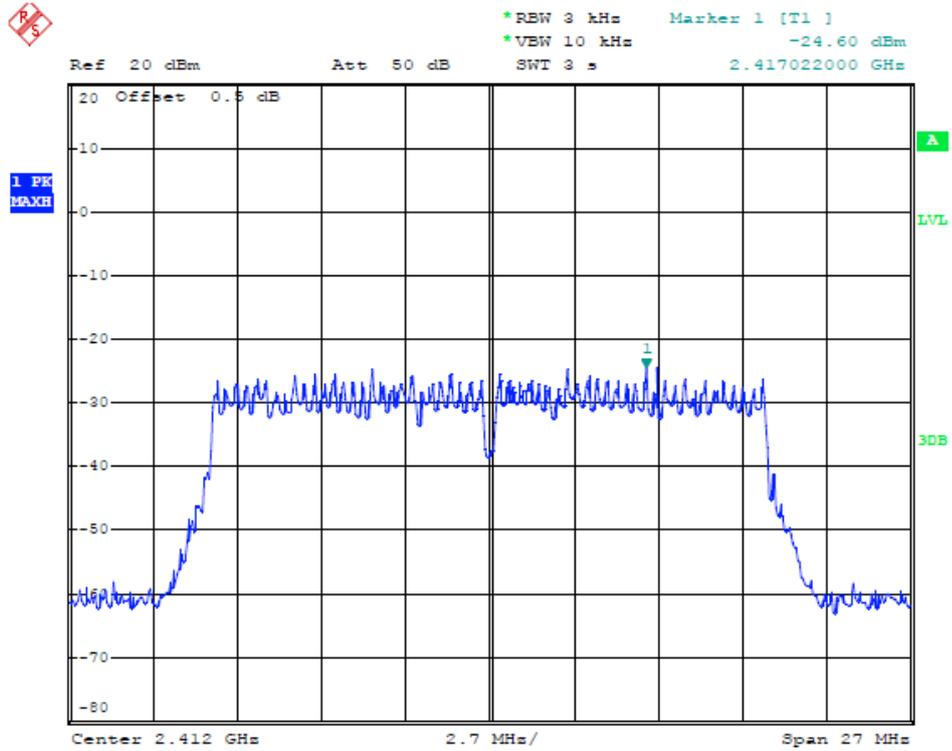
802.11g Channel Middle 2437MHz



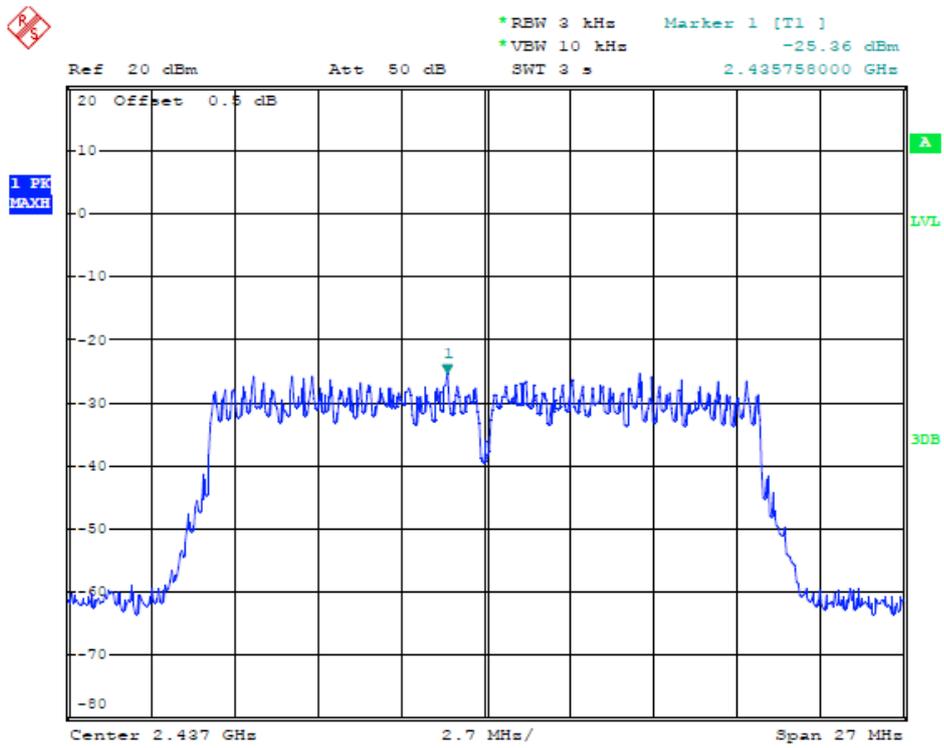
802.11g Channel High 2462MHz



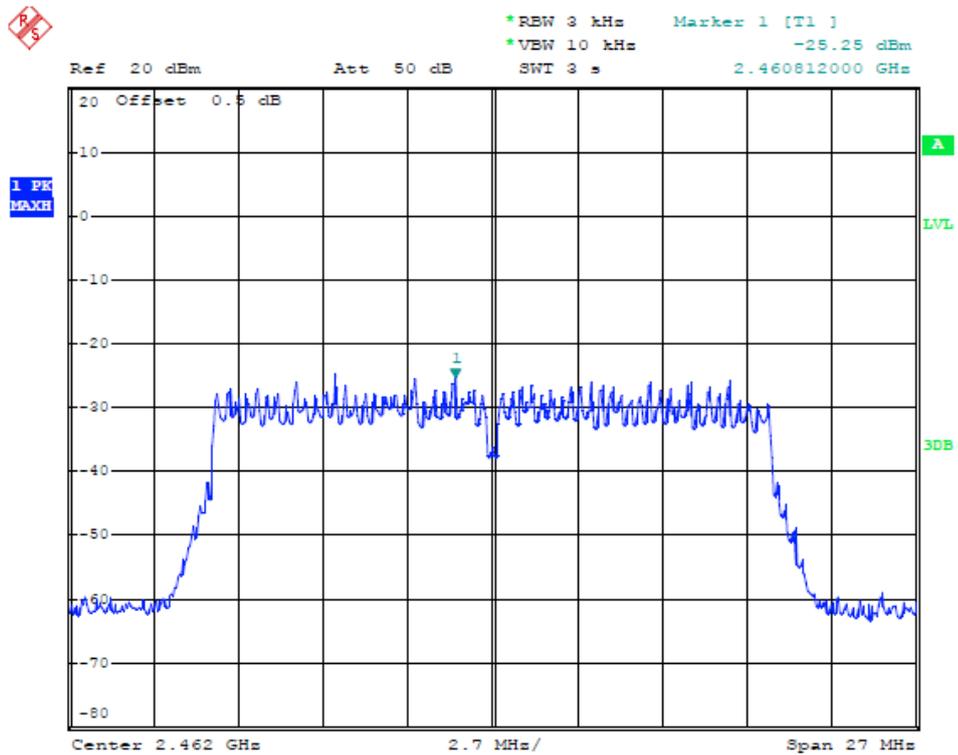
802.11n Channel Low 2412MHz (20MHz)



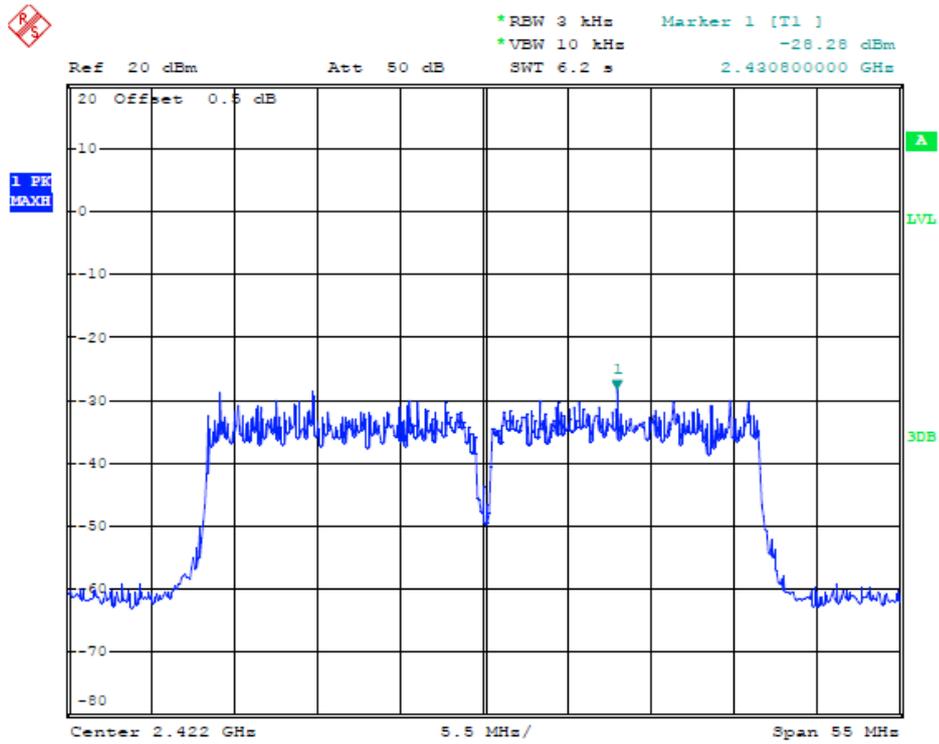
802.11n Channel Middle 2437MHz (20MHz)



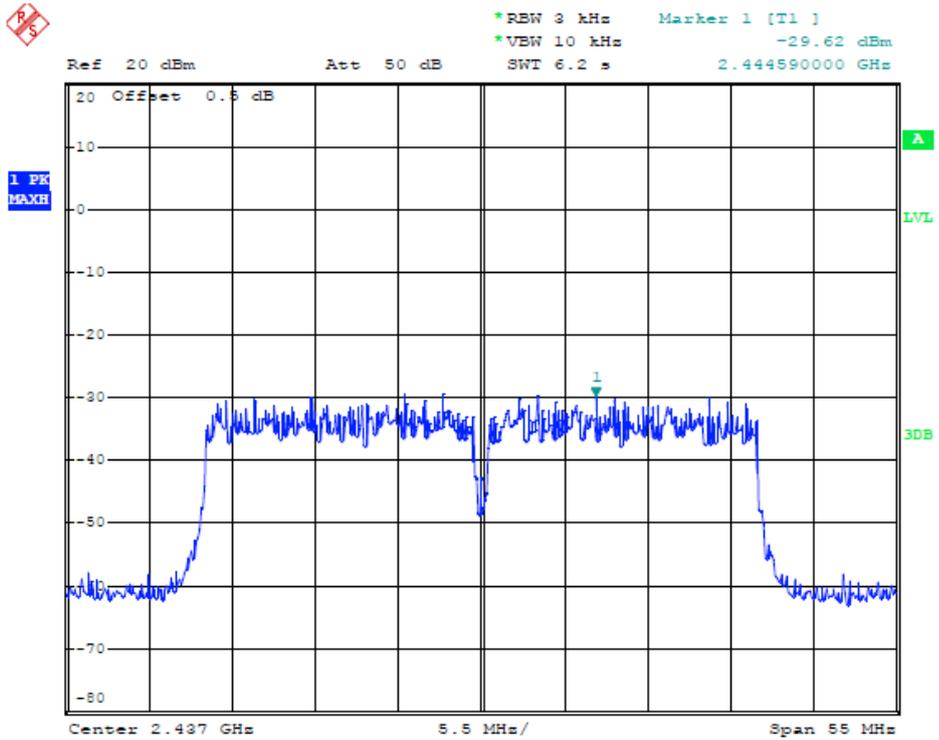
802.11n Channel High 2462MHz (20MHz)



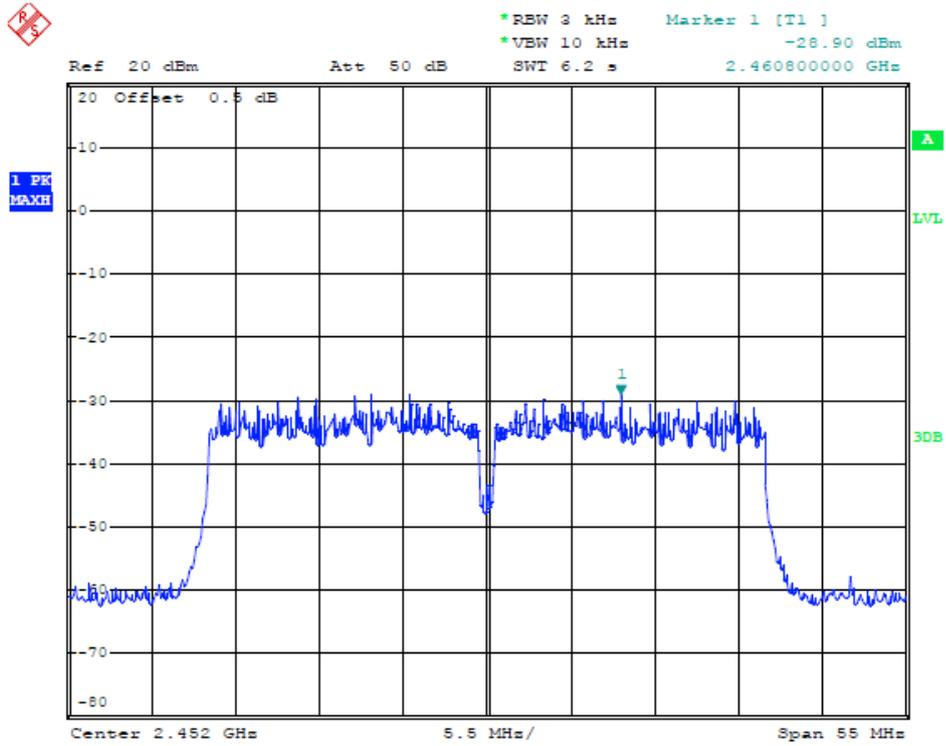
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz (40MHz)

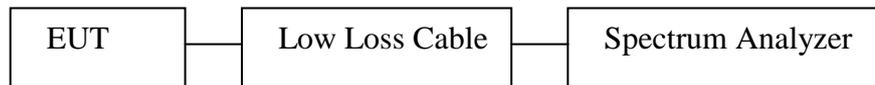


802.11n Channel High 2452MHz (40MHz)



8. BAND EDGE COMPLIANCE TEST

8.1. Block Diagram of Test Setup



8.2. Limits

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).

8.3. Test Procedure

Conducted Band Edge:

- 8.3.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.
- 8.5.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

Radiate Band Edge:

- 8.5.3. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
- 8.3.4. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
- 8.3.5. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 8.3.6. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: RBW=1MHz, VBW=1MHz
- 8.3.7. The band edges was measured and recorded.

8.4. Test Result

PASS

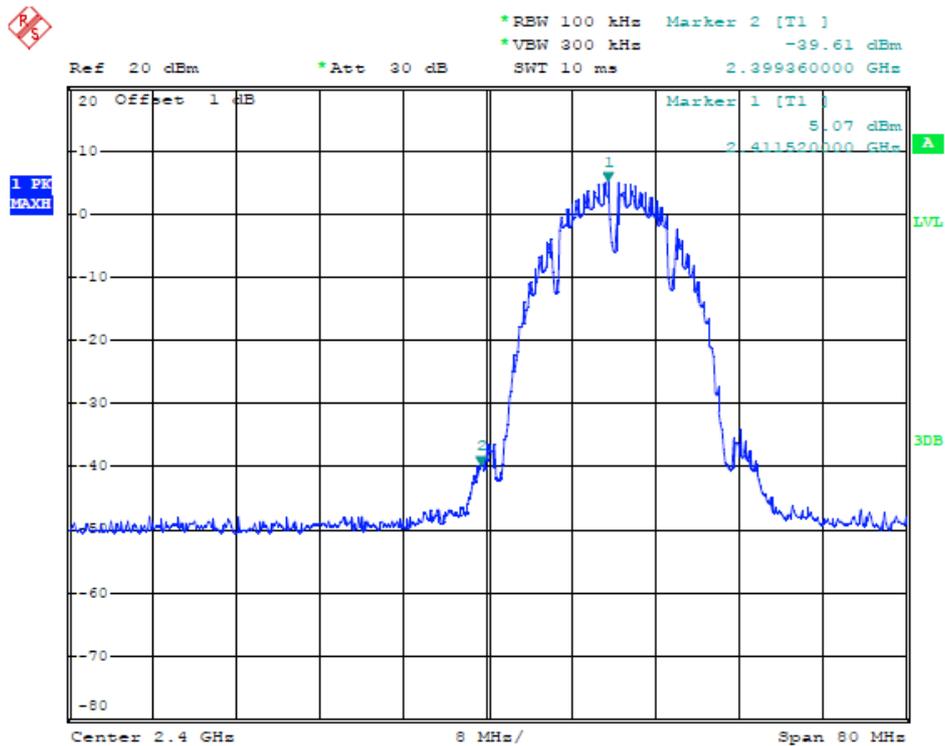
802.11b		
Frequency(MHz)	Result of Band Edge(dBc)	Limit of Band Edge(dBc)
2412	44.61	>20 dBc
2462	52.87	>20 dBc

802.11g		
Frequency(MHz)	Result of Band Edge(dBc)	Limit of Band Edge(dBc)
2412	34.95	>20 dBc
2462	40.66	>20 dBc

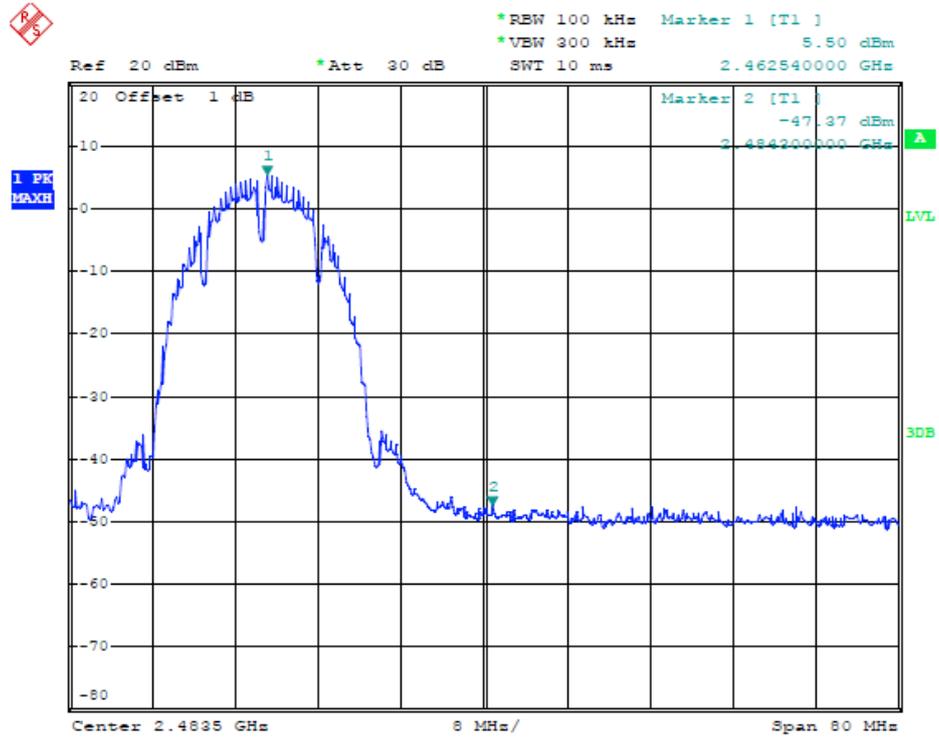
802.11n (20MHz)		
Frequency(MHz)	Result of Band Edge(dBc)	Limit of Band Edge(dBc)
2412	36.25	>20 dBc
2462	41.87	>20 dBc

802.11n (40MHz)		
Frequency(MHz)	Result of Band Edge(dBc)	Limit of Band Edge(dBc)
2422	31.15	>20 dBc
2452	37.70	>20 dBc

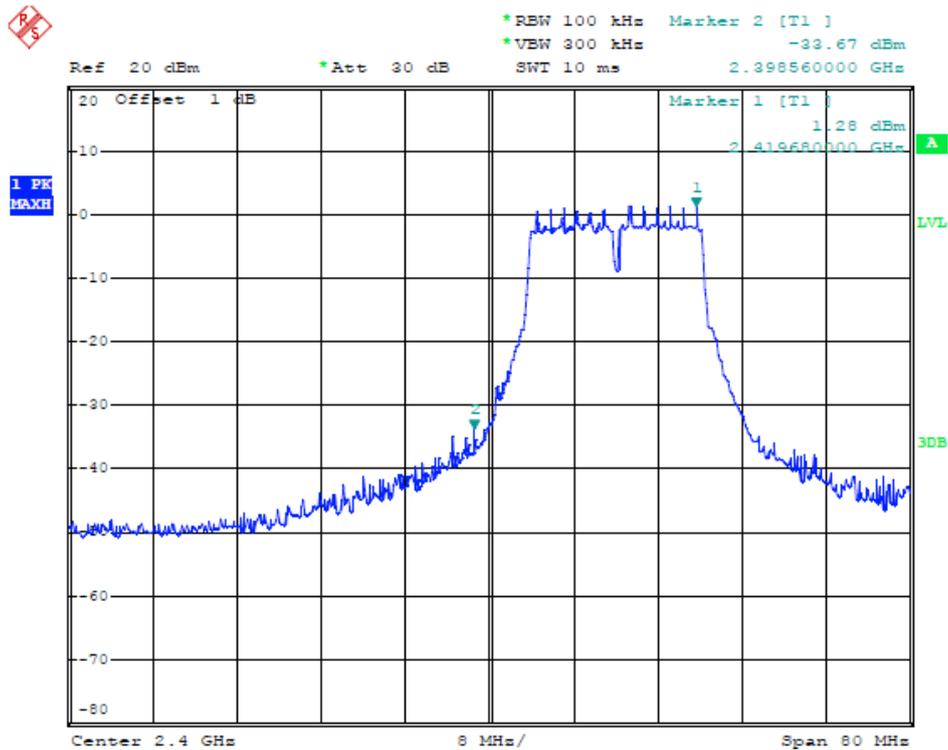
802.11b Channel Low 2412MHz



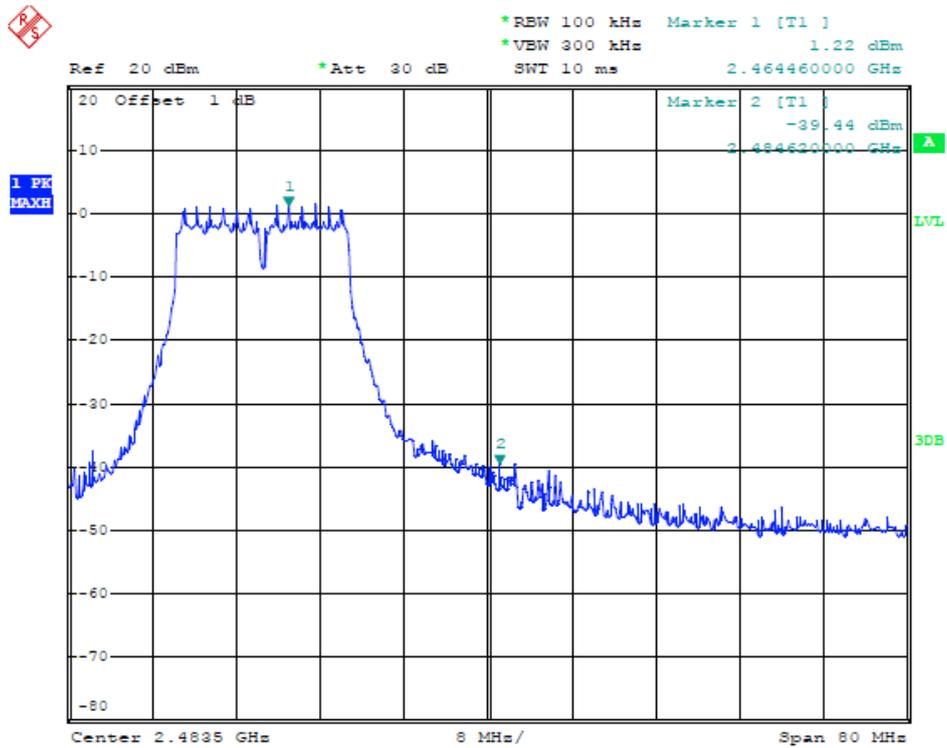
802.11b Channel High 2462MHz



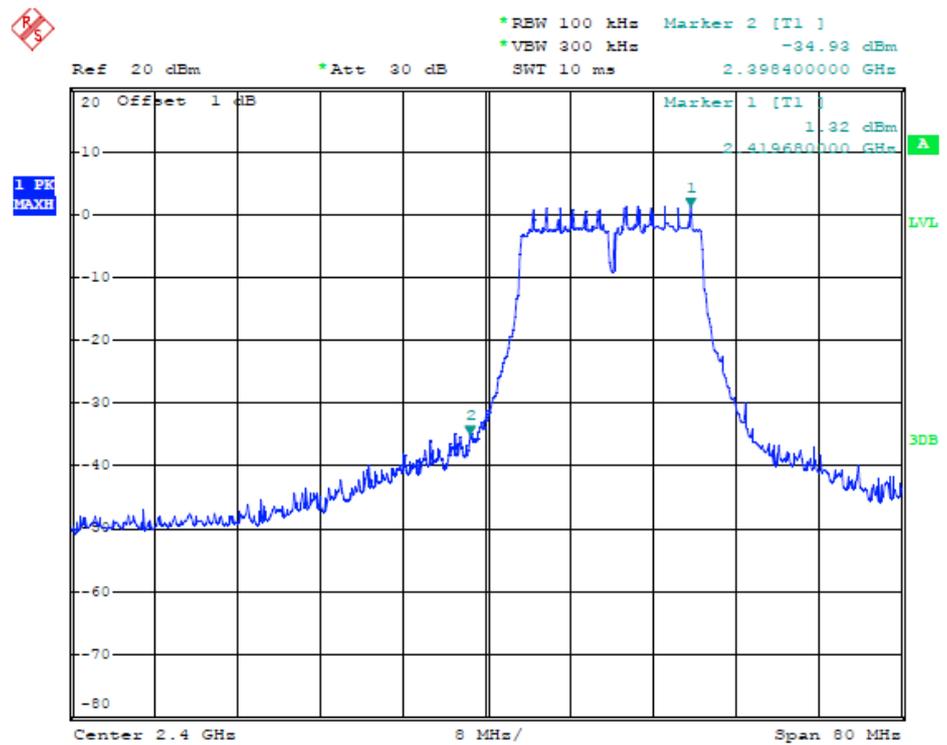
802.11g Channel Low 2412MHz



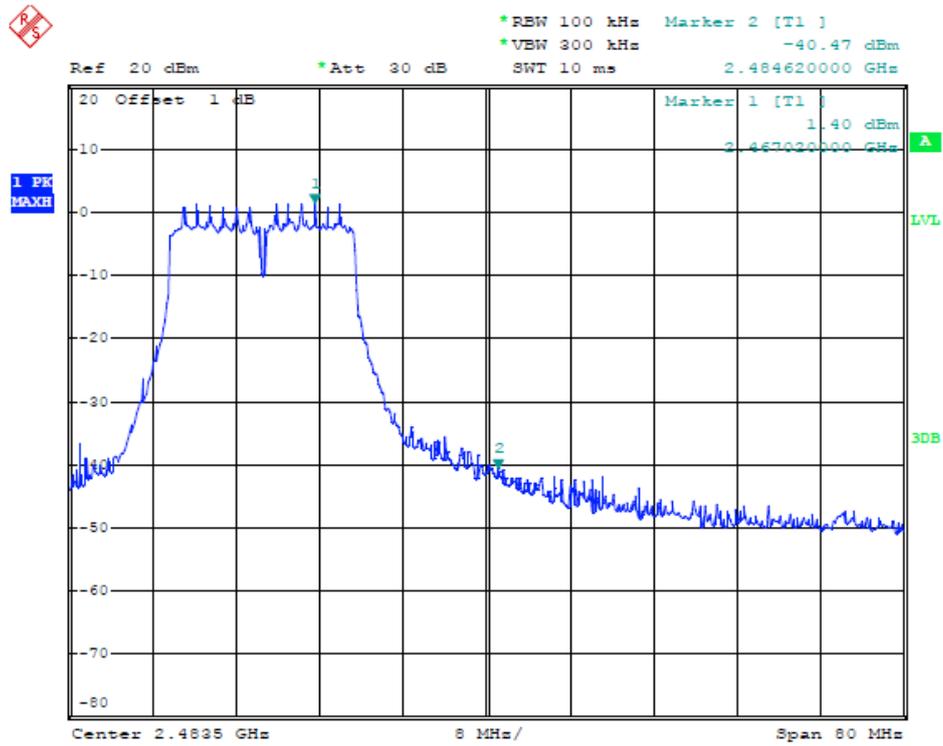
802.11g Channel High 2462MHz



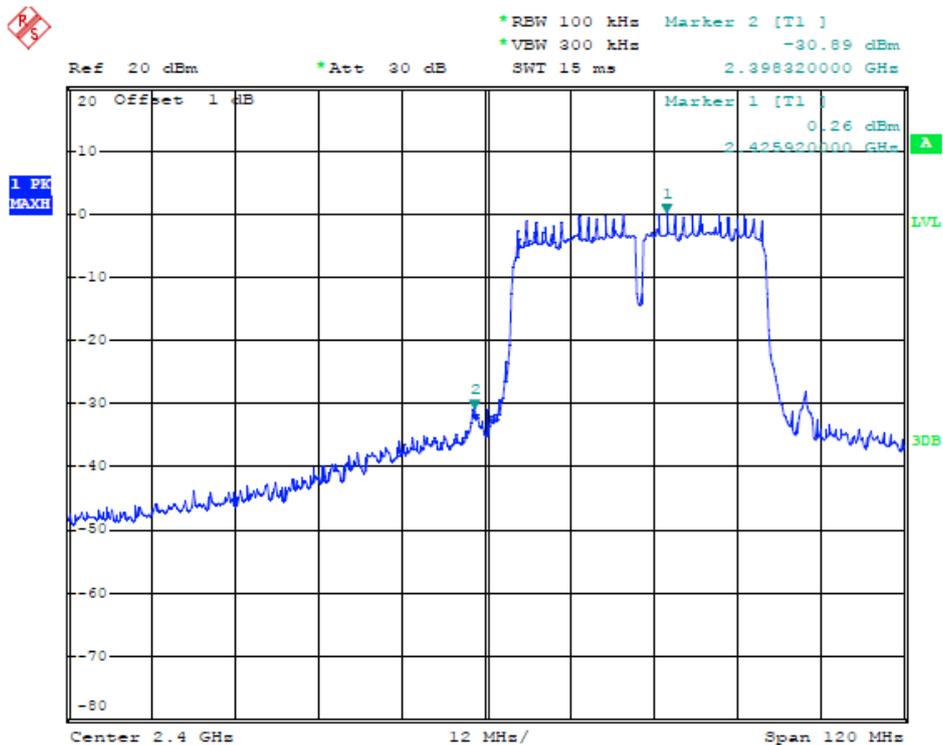
802.11n Channel Low 2412MHz (20MHz)



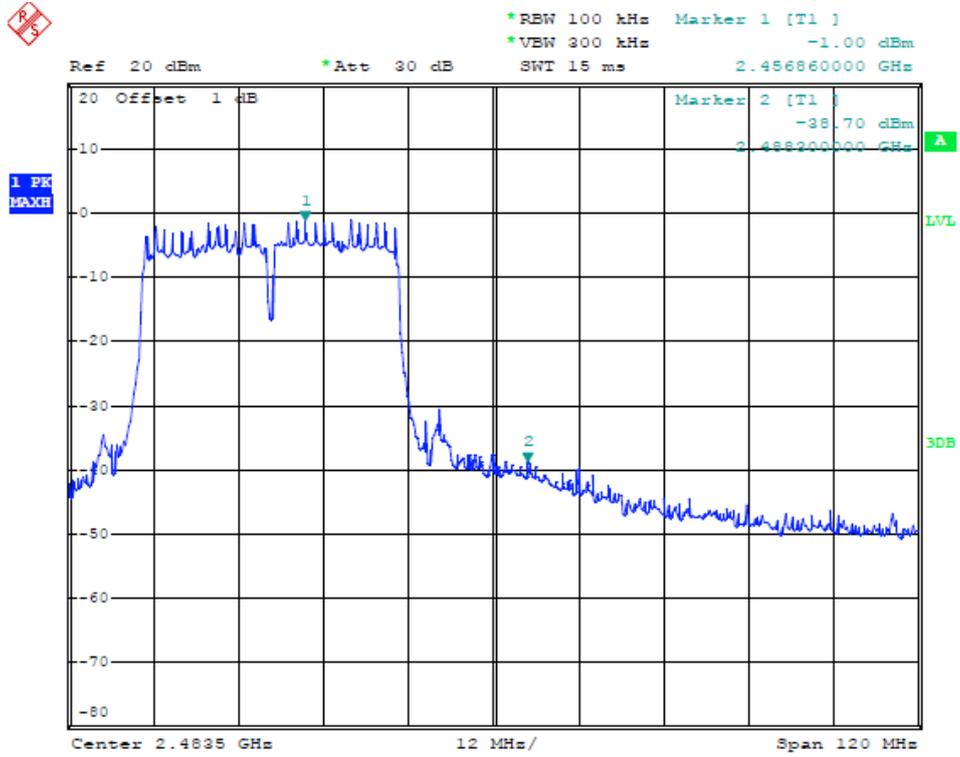
802.11n Channel High 2462MHz (20MHz)



802.11n Channel Low 2422MHz (40MHz)

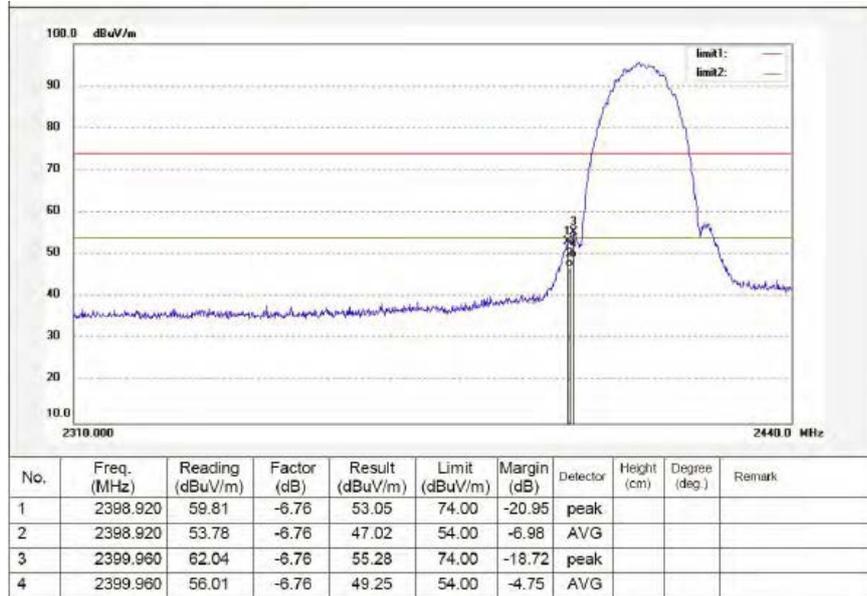


802.11n Channel High 2452MHz (40MHz)

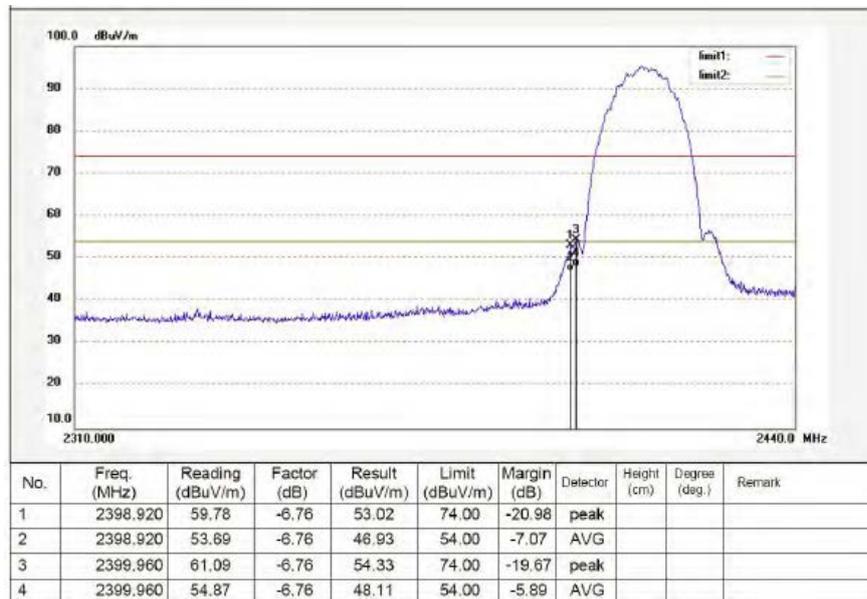


Radiated Band Edge Result

802.11b Channel Low 2412MHz
Horizontal



Vertical

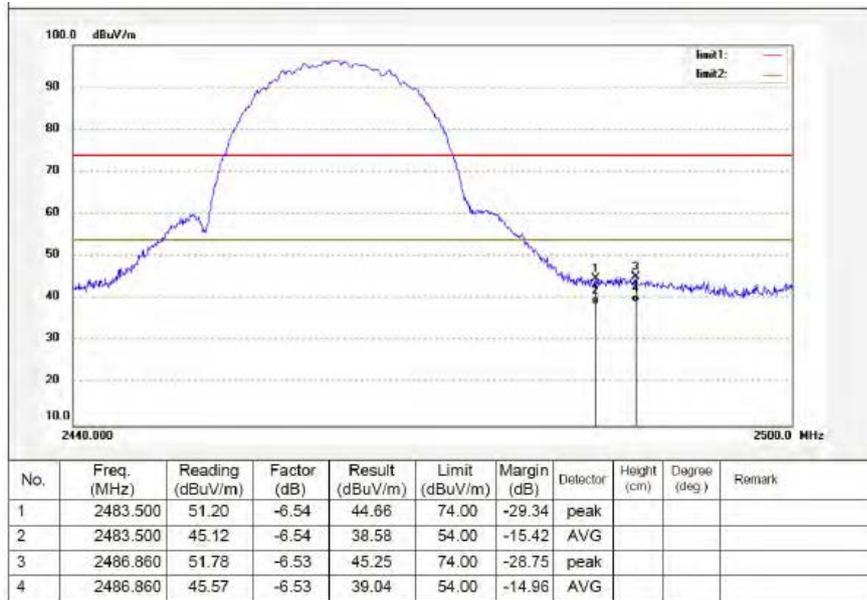


Note:

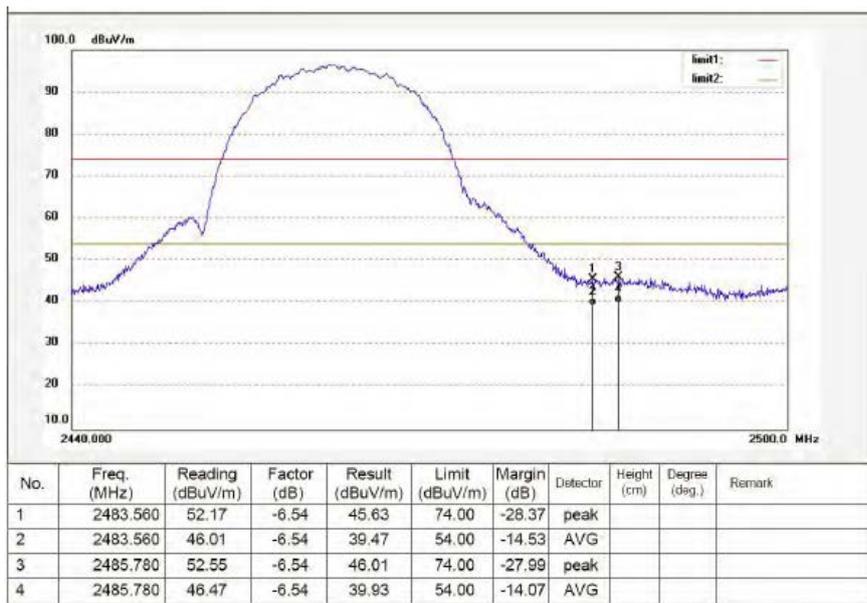
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is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

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

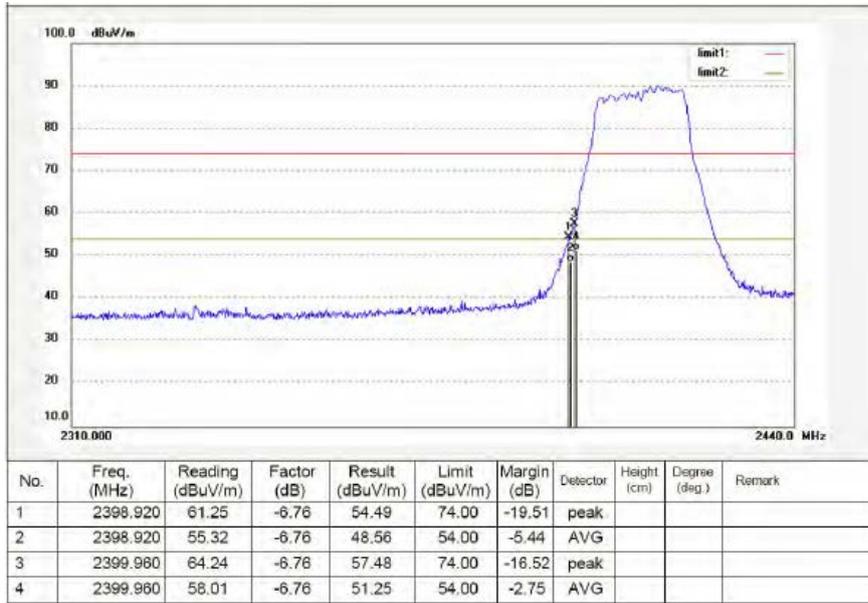
802.11b Channel High 2462MHz
Horizontal



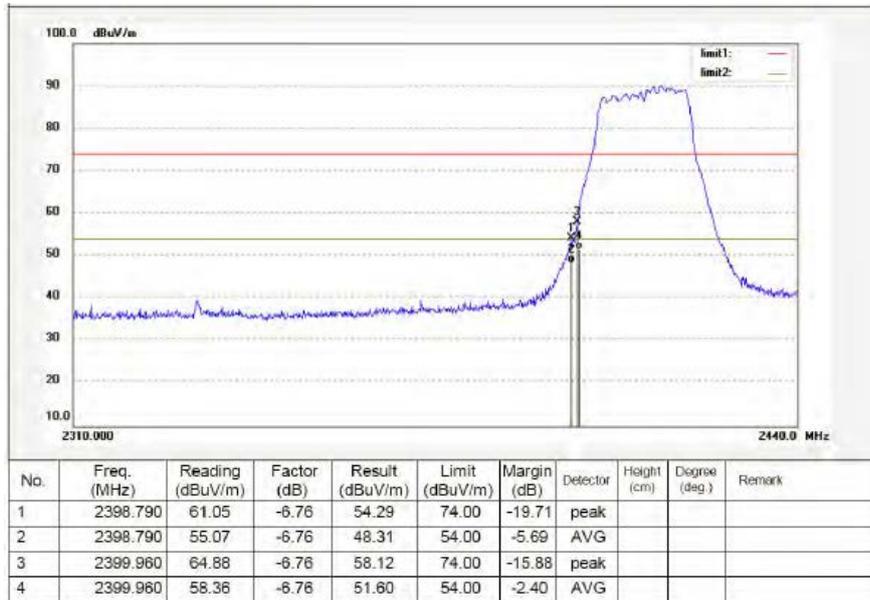
Vertical



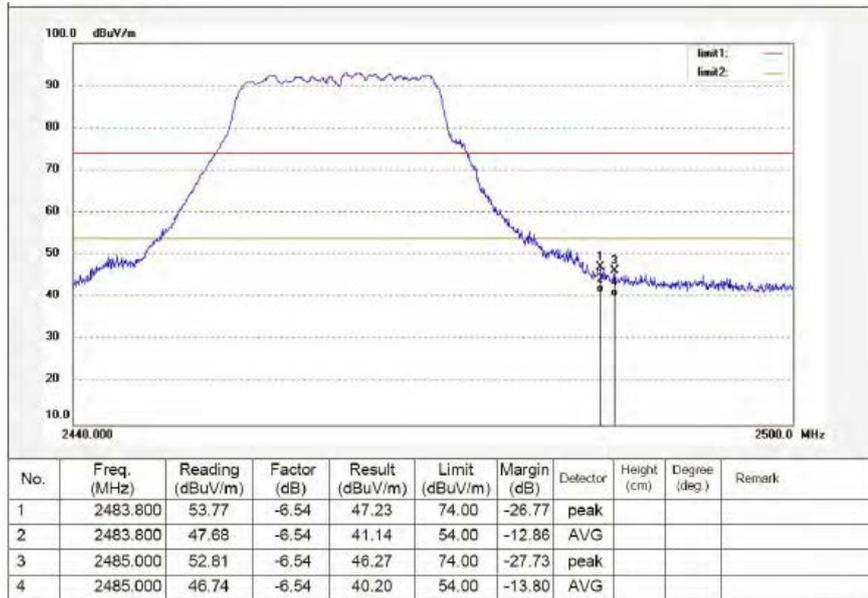
802.11g Channel Low 2412MHz
Horizontal



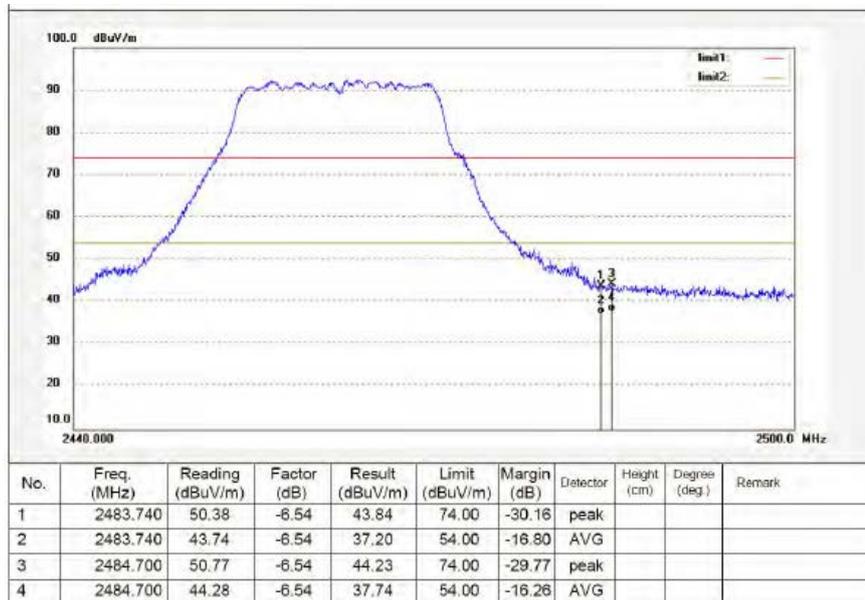
Vertical



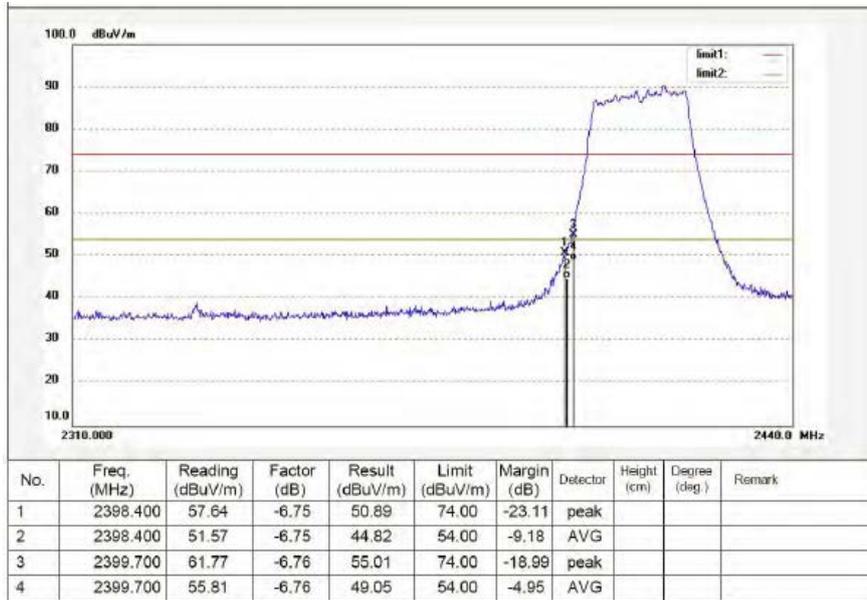
802.11g Channel High 2462MHz
Horizontal



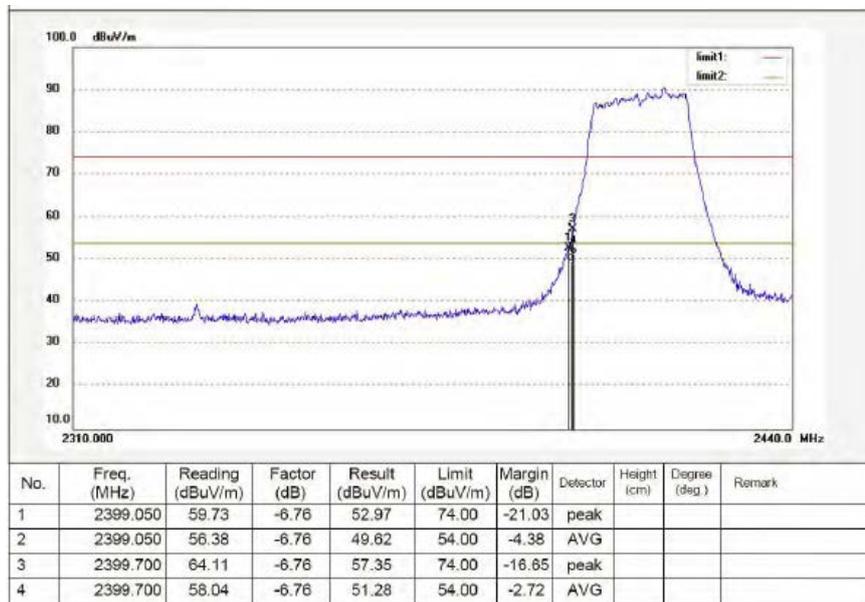
Vertical



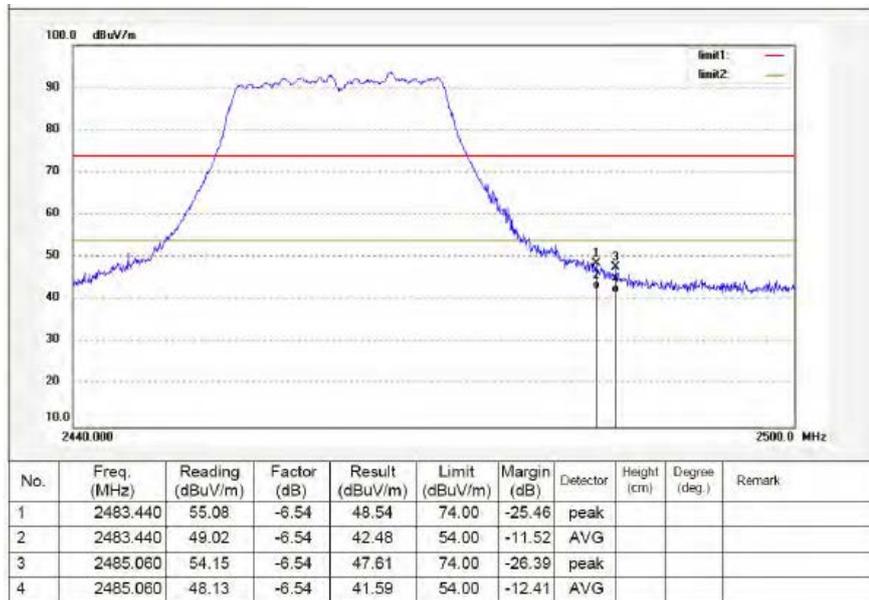
802.11n Channel Low 2412MHz (20MHz)
Horizontal



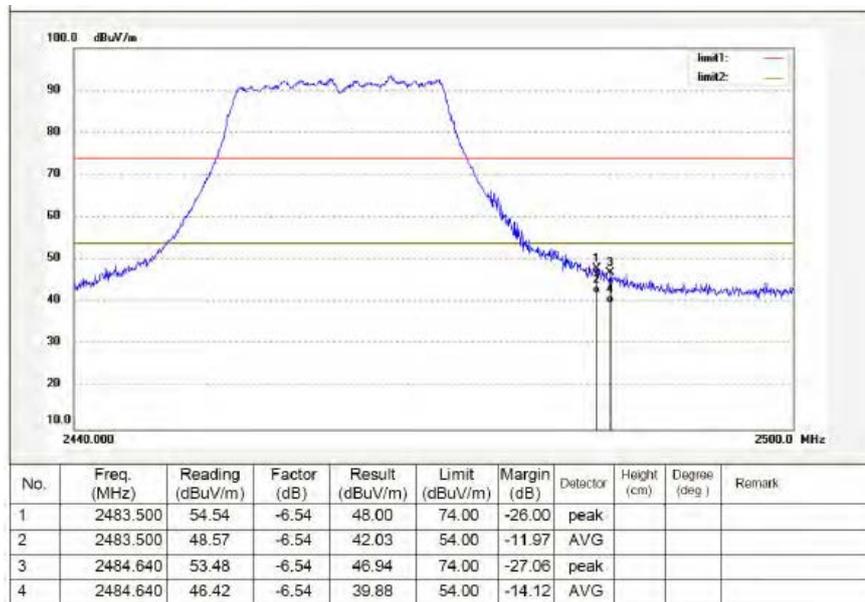
Vertical



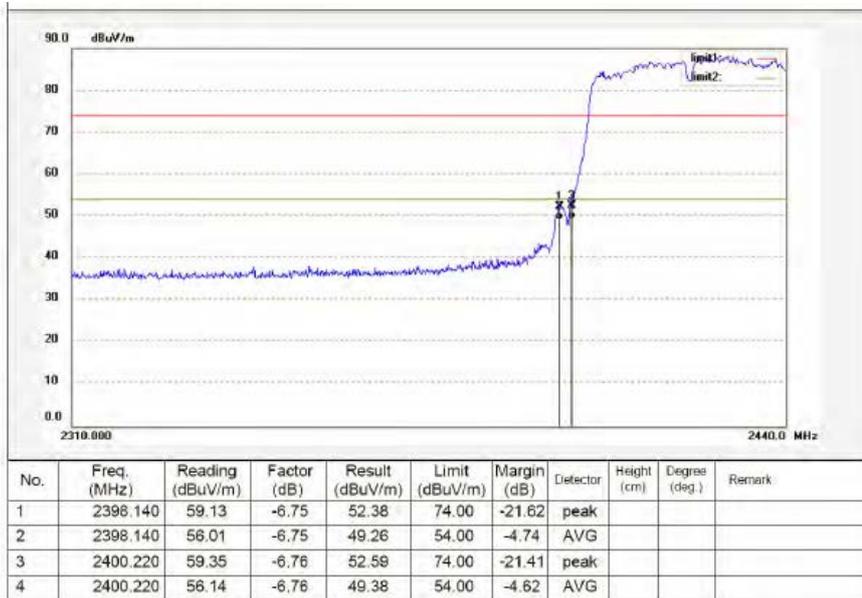
802.11n Channel High 2462MHz (20MHz)
Horizontal



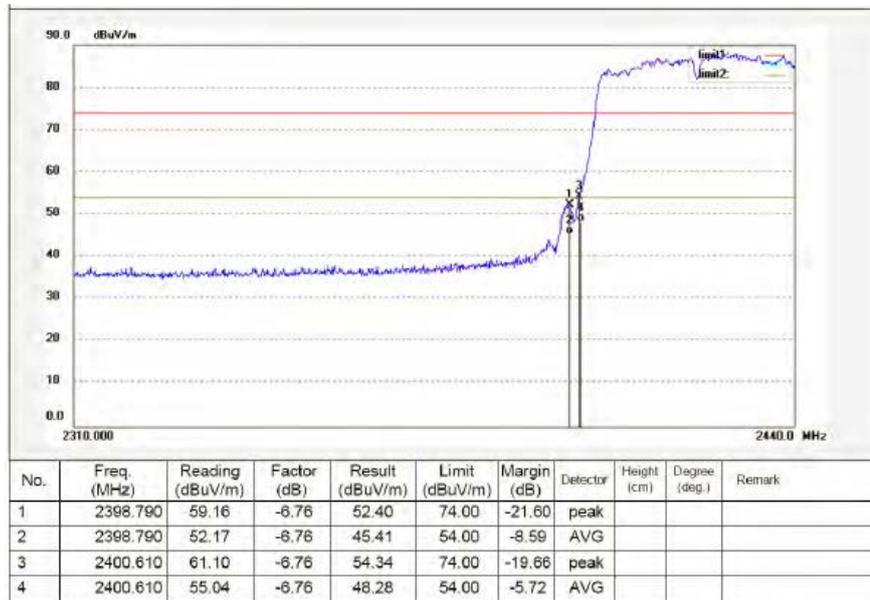
Vertical



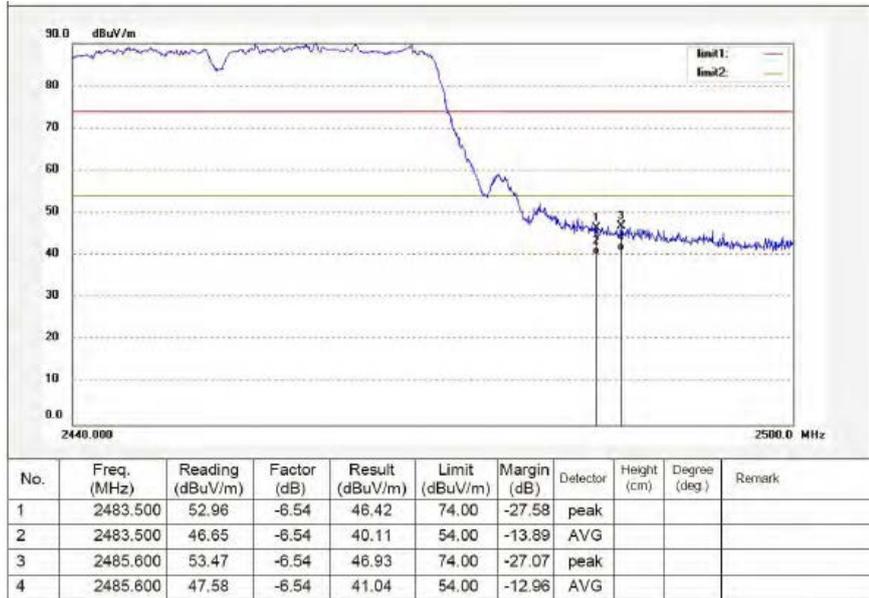
802.11n Channel Low 2422MHz (40MHz)
Horizontal



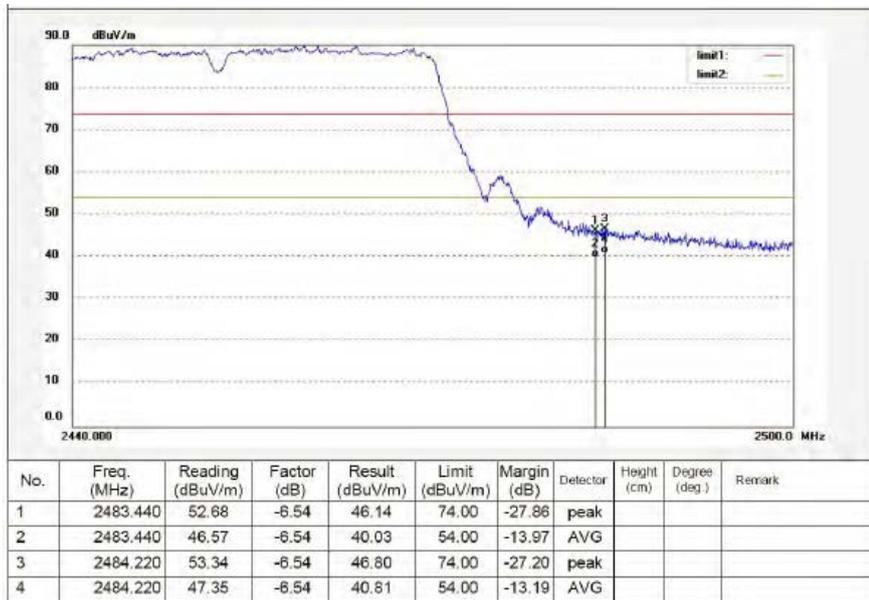
Vertical



802.11n Channel High 2452MHz (40MHz)
Horizontal



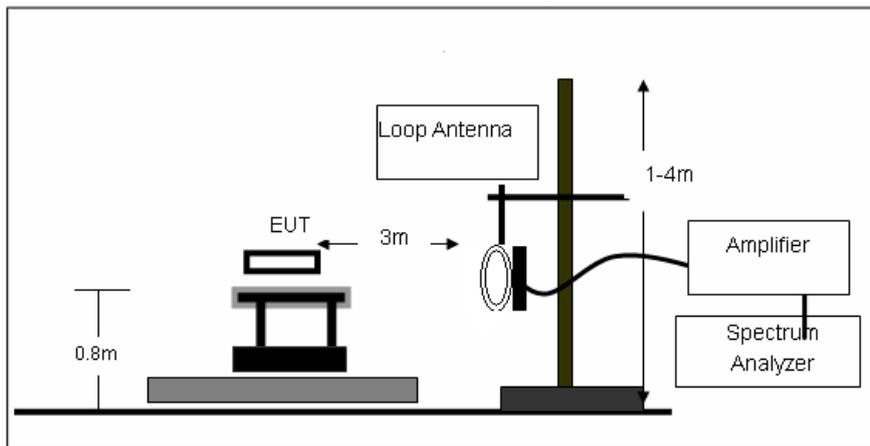
Vertical



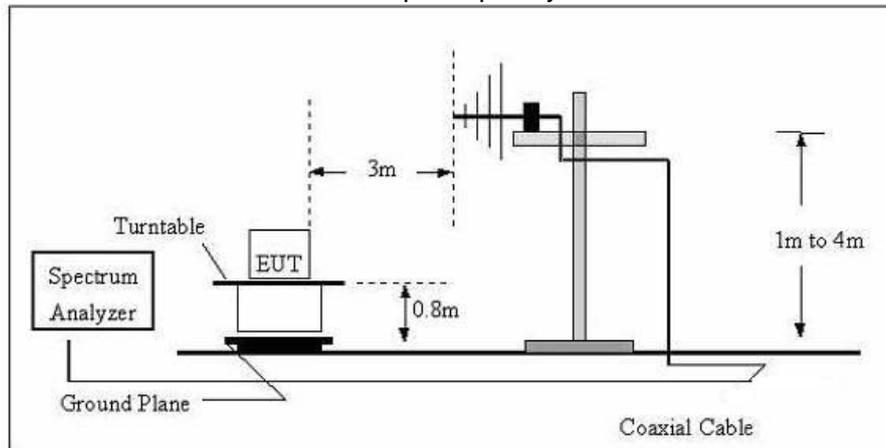
9. RADIATED SPURIOUS EMISSION TEST

9.1. Block Diagram of Test Setup

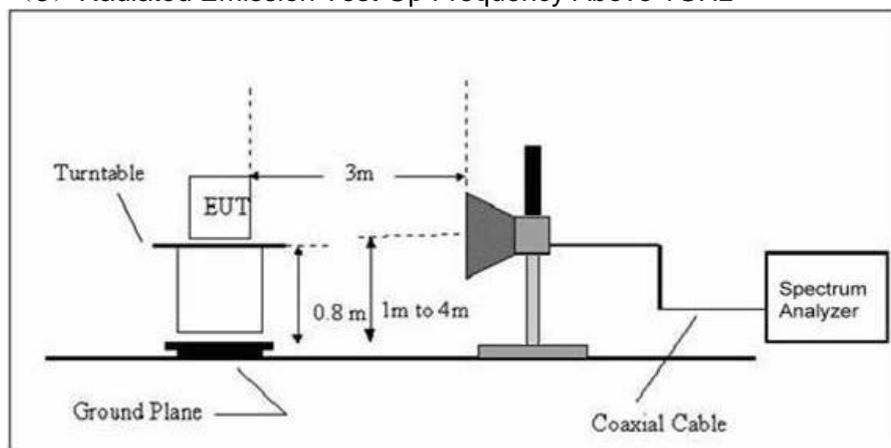
(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



(3) Radiated Emission Test-Up Frequency Above 1GHz



9.2.Limits

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).

9.3.Restricted bands of operation

9.3.1.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			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 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 Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

9.4. 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: 2003 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The worst-case data rate for this channel to be 1Mbps for 802.11b mode and 6Mbps for 802.11g mode and 300Mbps for 802.11n mode, based on previous with 802.11 WLAN product design architectures.

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

9.5. Test Result

PASS

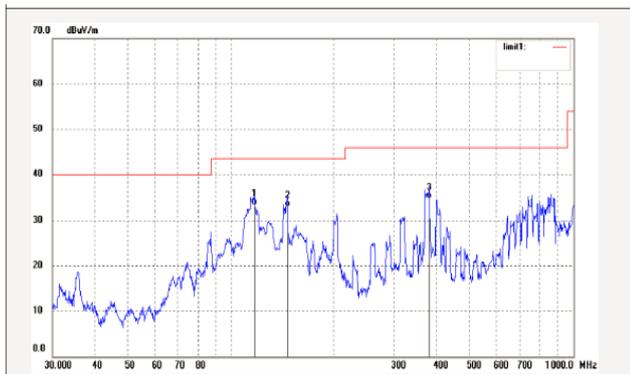
802.11b Channel Low 2412MHz

For Below 30MHz

Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

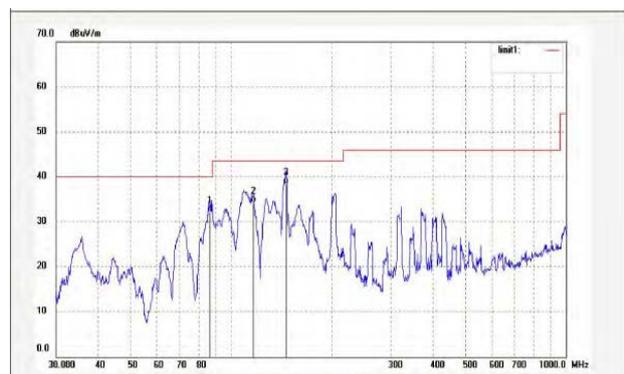
For 30MHz-1000MHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	116.9495	55.54	-22.42	33.12	43.50	-10.38	QP			
2	146.3735	56.54	-23.73	32.81	43.50	-10.69	QP			
3	379.9141	50.32	-15.78	34.54	46.00	-11.46	QP			

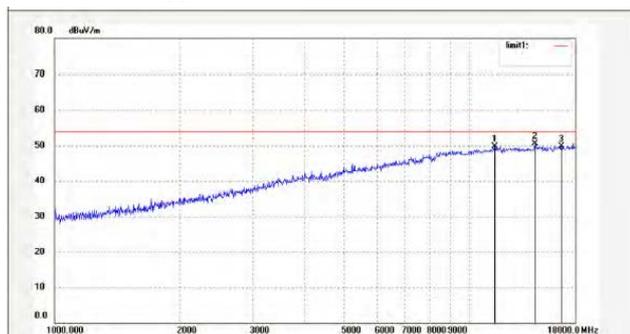
V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	86.5029	63.65	-21.59	32.06	40.00	-7.94	QP			
2	116.5401	56.57	-22.40	34.17	43.50	-9.33	QP			
3	145.8611	62.21	-23.72	38.49	43.50	-5.01	QP			

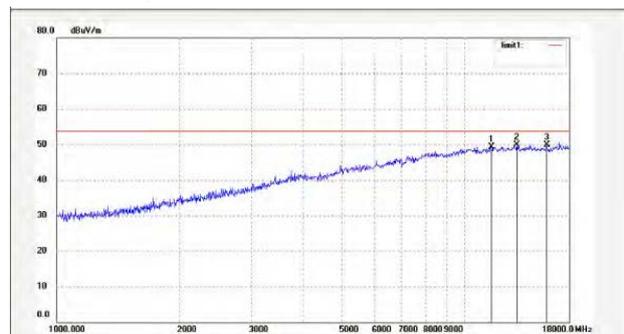
For 1GHz-25GHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	11533.485	43.72	6.07	49.79	54.00	-4.21	peak			
2	14408.425	37.93	12.53	50.46	54.00	-3.54	peak			
3	16696.884	36.97	12.81	49.78	54.00	-4.22	peak			

V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	11800.350	43.21	6.14	49.35	54.00	-4.65	peak			
2	13404.009	41.03	8.82	49.85	54.00	-4.15	peak			
3	15850.410	38.42	11.48	49.90	54.00	-4.10	peak			

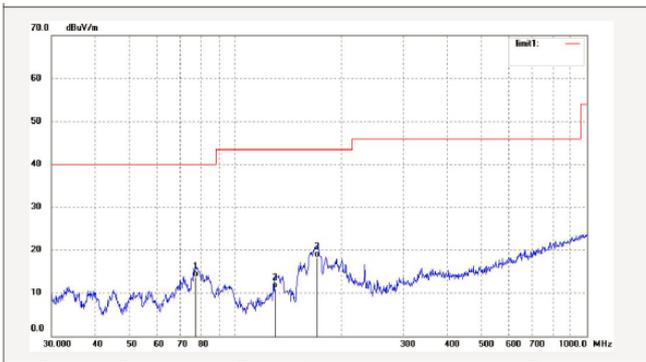
802.11b Channel Middle 2437MHz

For Below 30MHz

Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

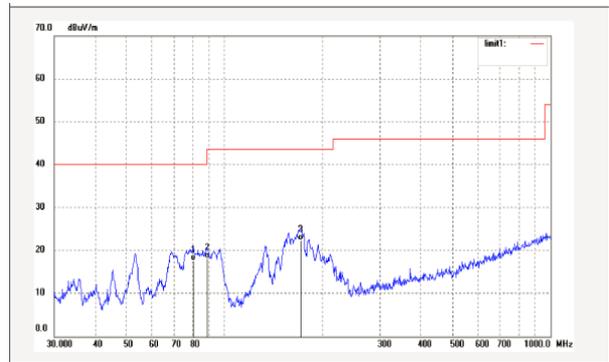
For 30MHz-1000MHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	77.3212	35.18	-21.51	13.67	40.00	-26.33	QP			
2	129.8225	34.21	-23.03	11.18	43.50	-32.32	QP			
3	171.3925	40.18	-21.94	18.24	43.50	-25.26	QP			

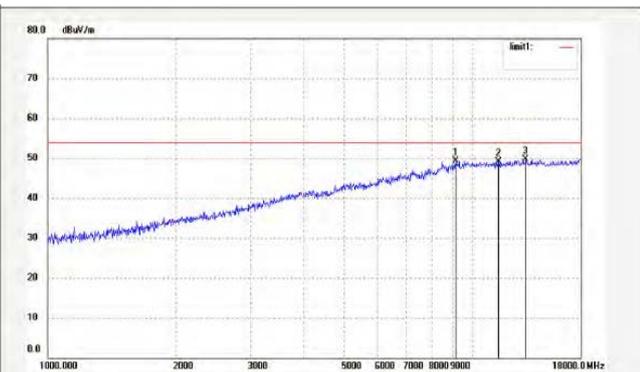
V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	80.3619	39.01	-21.40	17.61	40.00	-22.39	QP			
2	88.3421	39.68	-21.65	18.03	43.50	-25.47	QP			
3	170.7923	44.21	-21.88	22.33	43.50	-21.17	QP			

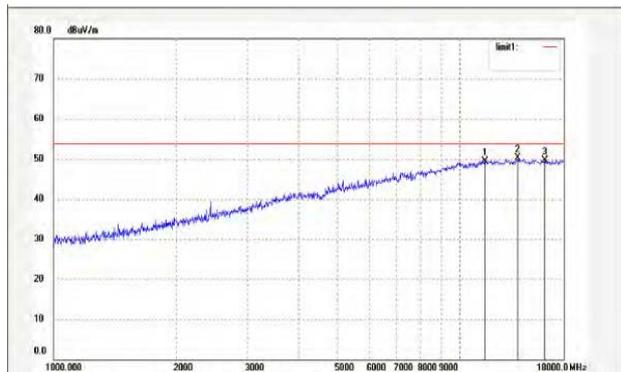
For 1GHz-25GHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	9152.479	45.47	3.68	49.35	54.00	-4.65	peak			
2	11533.485	42.94	6.07	49.01	54.00	-4.99	peak			
3	13365.322	41.06	8.74	49.80	54.00	-4.20	peak			

V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	11533.485	43.52	6.07	49.59	54.00	-4.41	peak			
2	13877.076	40.14	10.08	50.22	54.00	-3.78	peak			
3	16174.372	37.91	11.79	49.70	54.00	-4.30	peak			

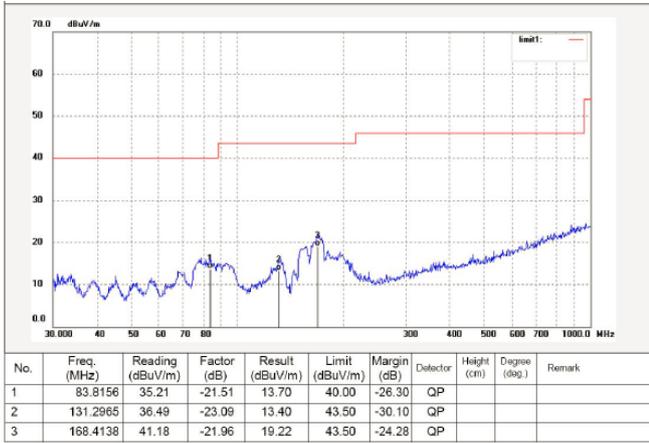
802.11b Channel High 2462MHz

For Below 30MHz

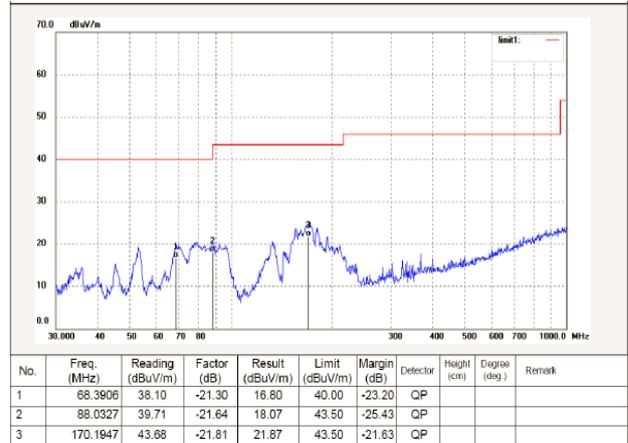
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

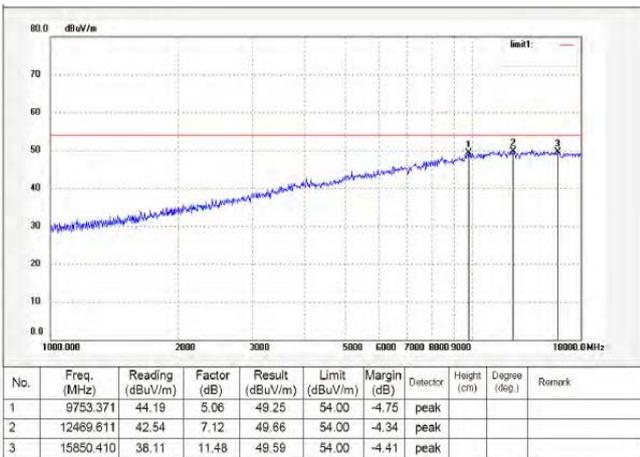


V

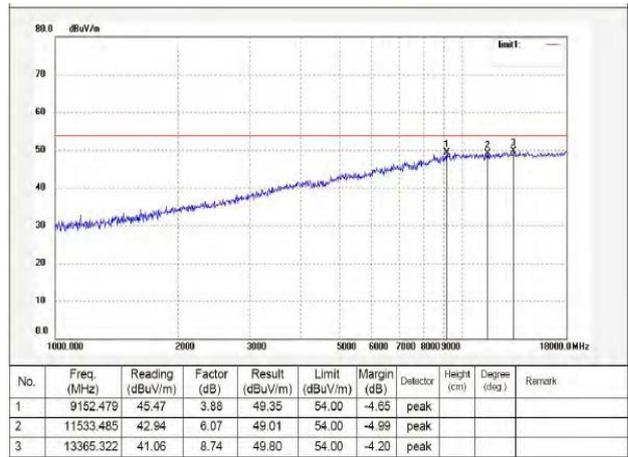


For 1GHz-25GHz

H



V



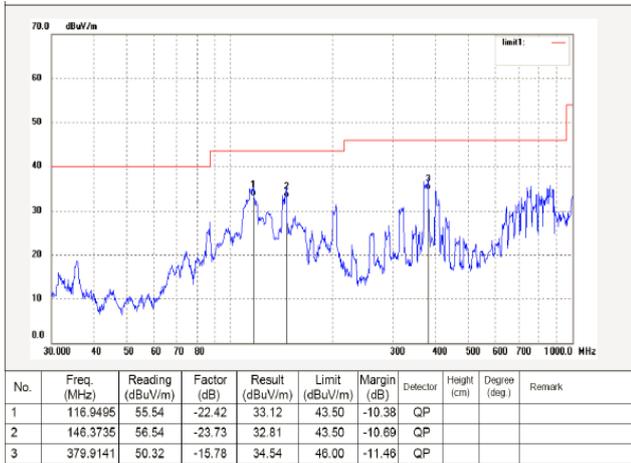
802.11g Channel Low 2412MHz

For Below 30MHz

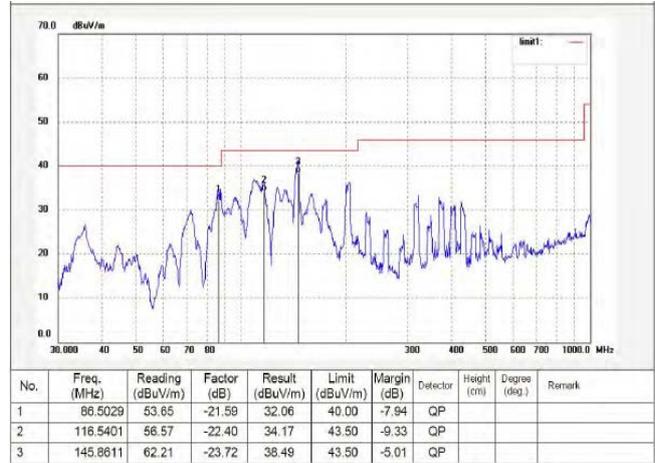
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

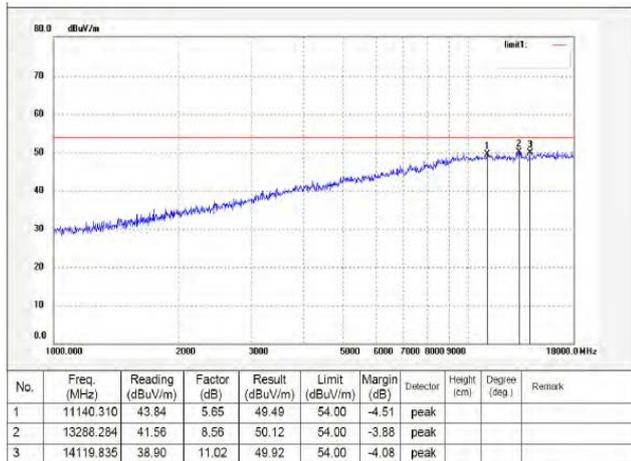


V

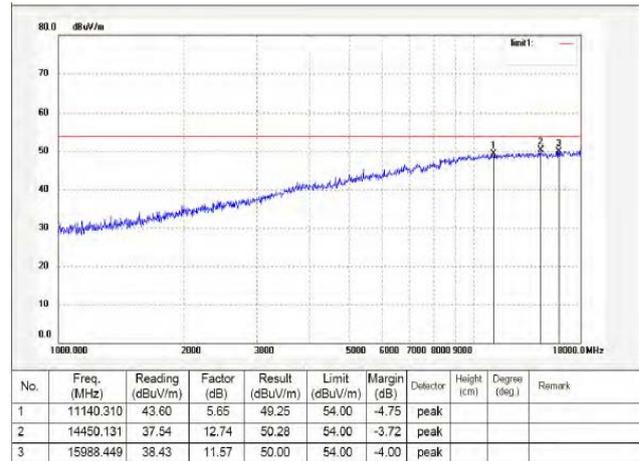


For 1GHz-25GHz

H



V



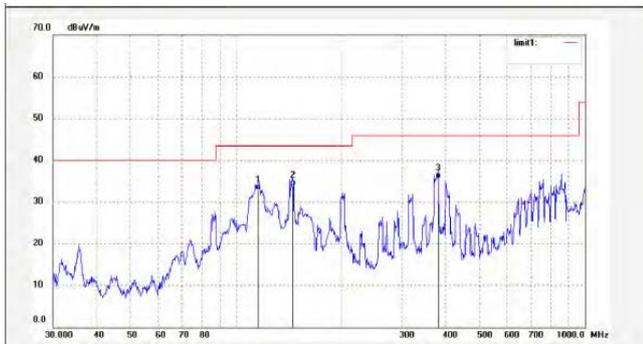
802.11g Channel Middle 2437MHz

For Below 30MHz

Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

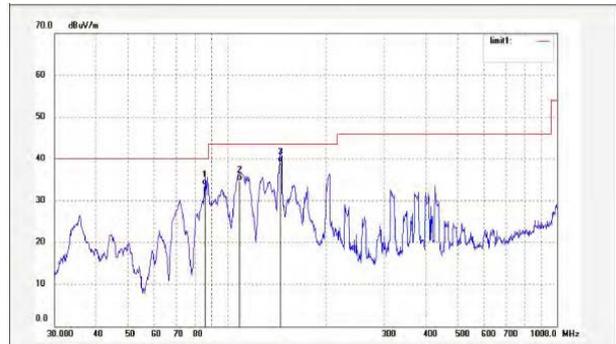
For 30MHz-1000MHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	116.1320	55.23	-22.39	32.84	43.50	-10.66	QP			
2	145.8610	57.50	-23.72	33.78	43.50	-9.72	QP			
3	379.9141	51.38	-15.78	35.60	46.00	-10.40	QP			

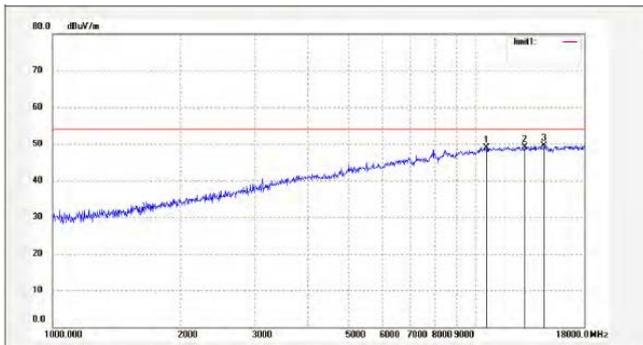
V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	85.5977	55.21	-21.56	33.65	40.00	-6.35	QP			
2	109.0285	57.01	-22.31	34.70	43.50	-8.80	QP			
3	145.3505	62.89	-23.70	39.19	43.50	-4.31	QP			

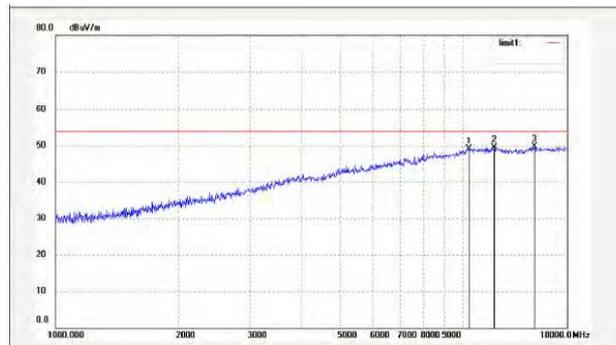
For 1GHz-25GHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	10906.147	43.64	5.26	48.90	54.00	-5.10	peak			
2	13059.822	41.06	8.02	49.08	54.00	-4.92	peak			
3	14450.131	36.83	12.73	49.56	54.00	-4.44	peak			

V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	10333.803	43.88	5.26	49.14	54.00	-4.86	peak			
2	11940.536	43.01	6.43	49.44	54.00	-4.56	peak			
3	14960.120	37.77	11.98	49.75	54.00	-4.25	peak			

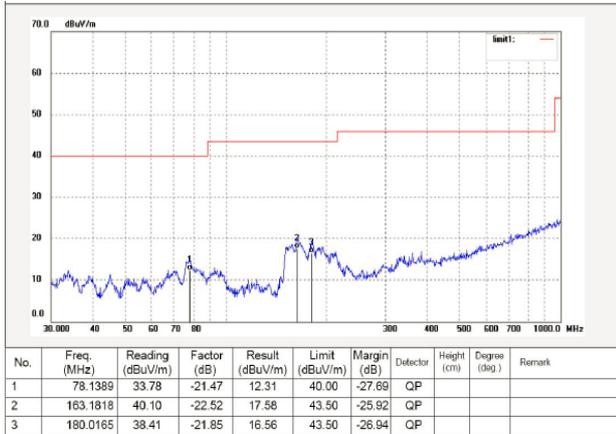
802.11g Channel High 2462MHz

For Below 30MHz

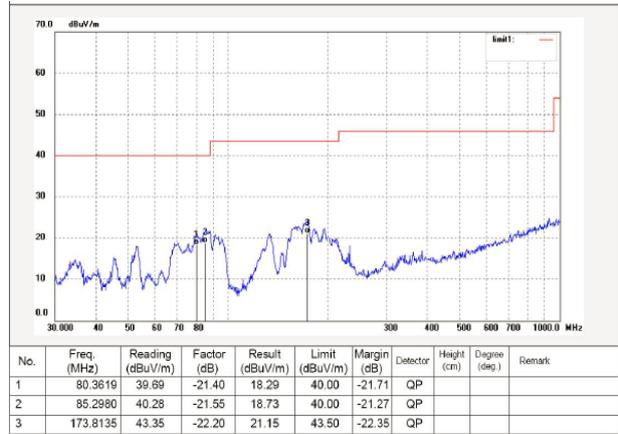
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

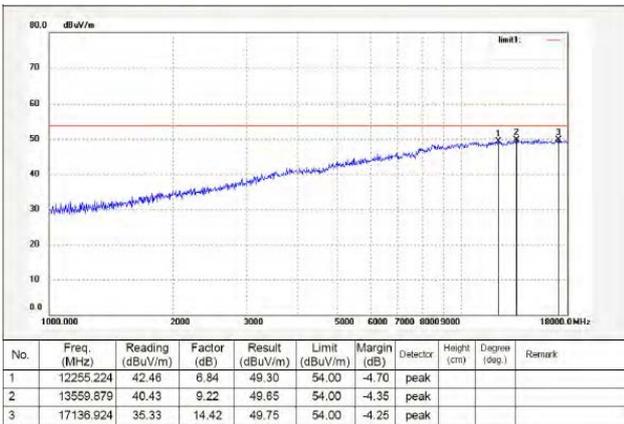


V

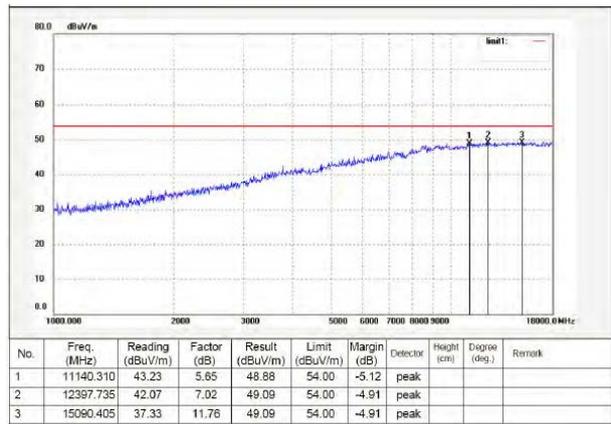


For 1GHz-25GHz

H



V



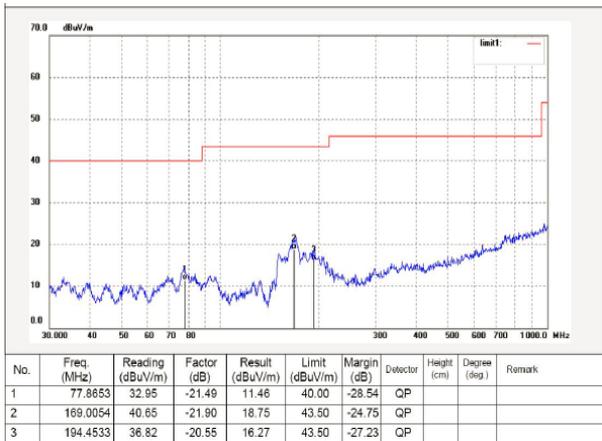
802.11n Channel Low 2412MHz (20MHz)

For Below 30MHz

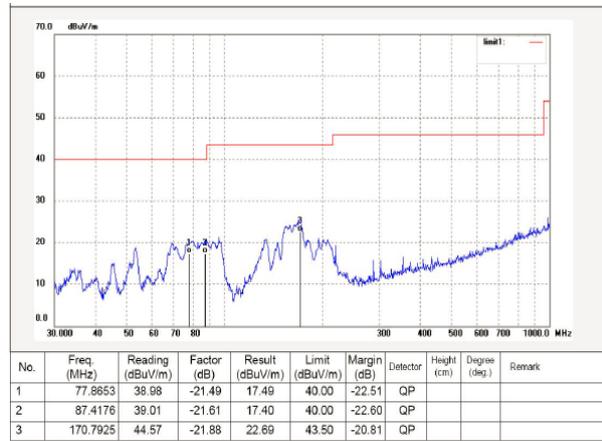
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

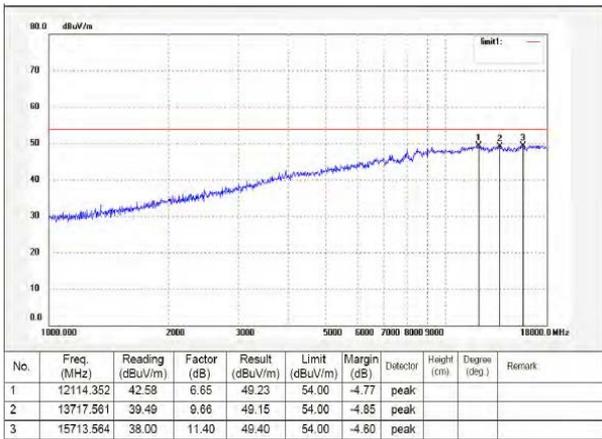


V

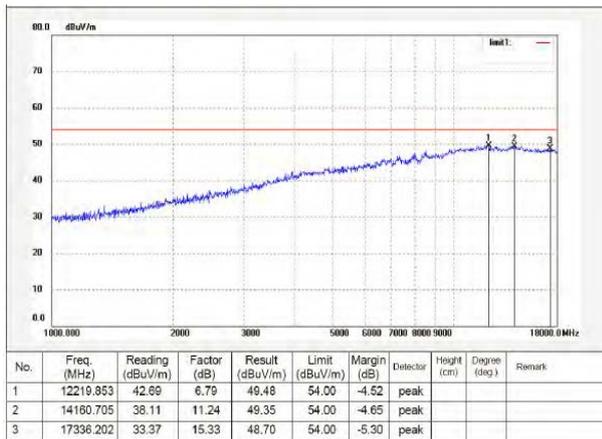


For 1GHz-25GHz

H



V



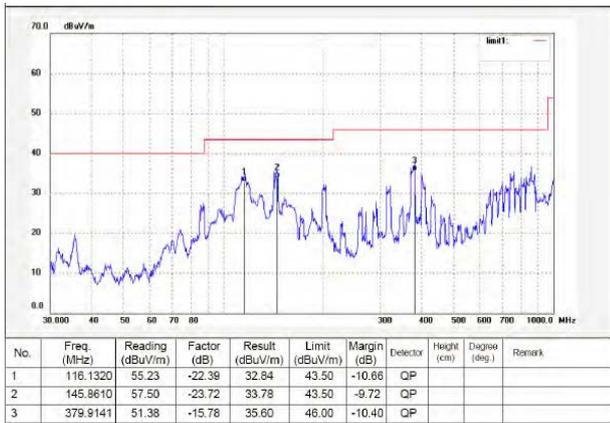
802.11n Channel Middle 2437MHz (20MHz)

For Below 30MHz

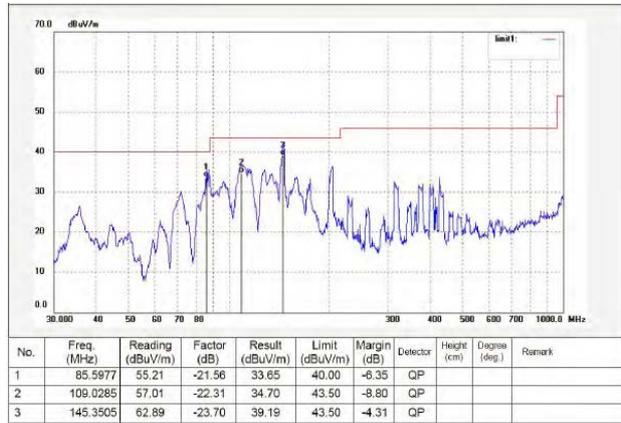
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

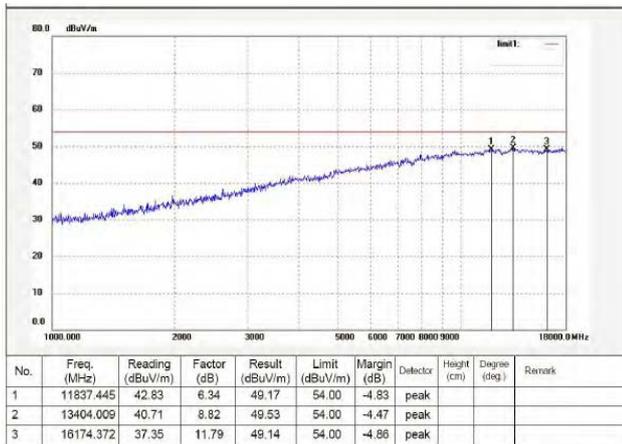


V

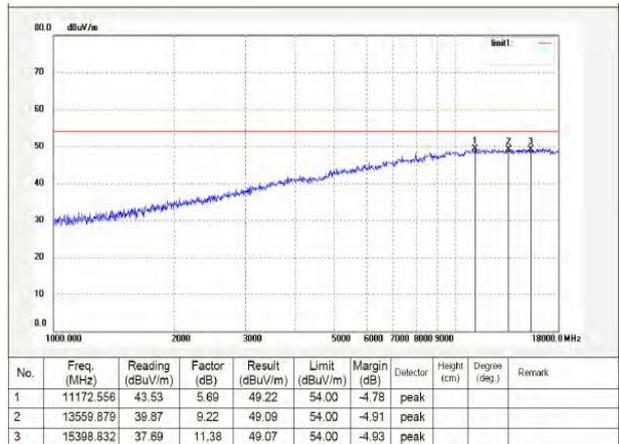


For 1GHz-25GHz

H



V



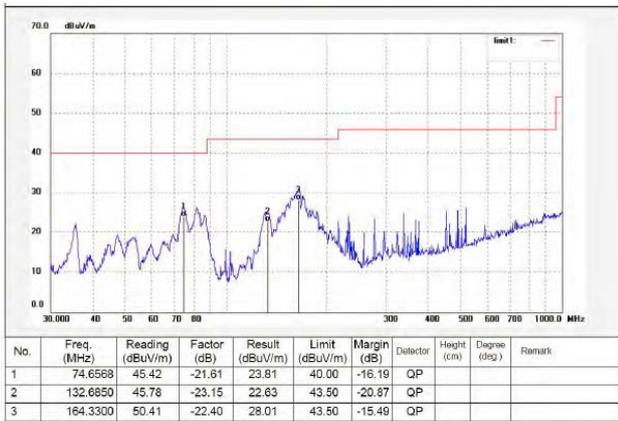
802.11n Channel High 2462MHz (20MHz)

For Below 30MHz

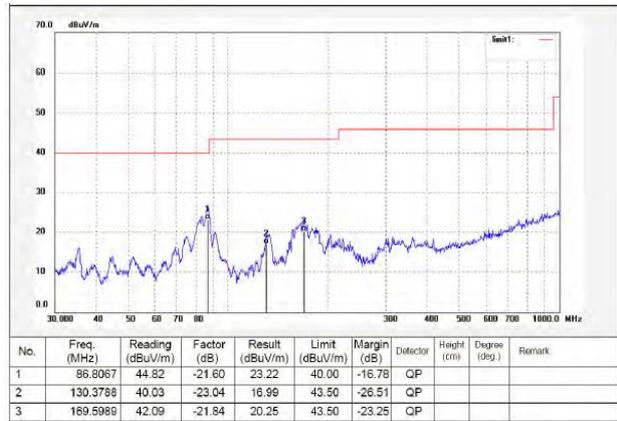
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

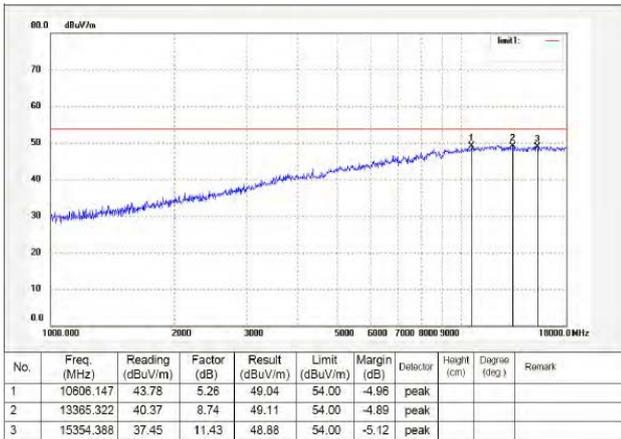


V

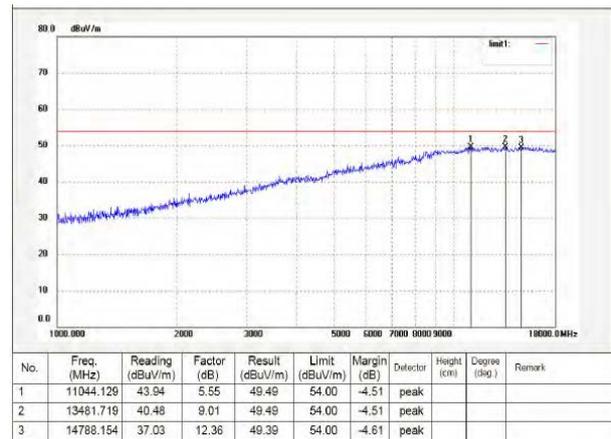


For 1GHz-25GHz

H



V



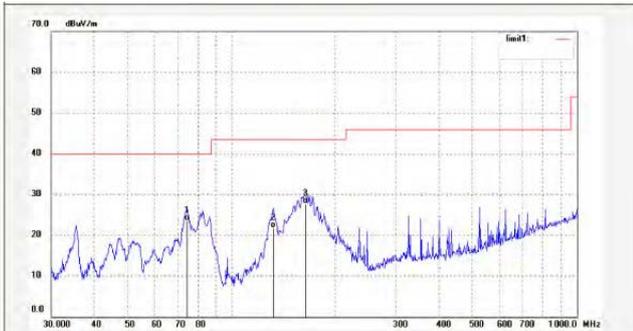
802.11n Channel Low 2422MHz (40MHz)

For Below 30MHz

Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

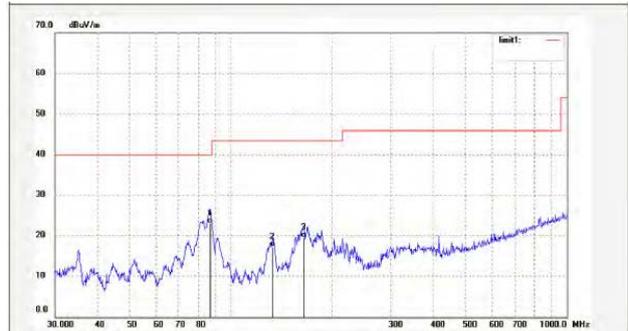
For 30MHz-1000MHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	74.9854	45.12	-21.59	23.53	40.00	-16.47	QP			
2	132.2205	44.84	-23.13	21.71	43.50	-21.79	QP			
3	163.7549	50.23	-22.45	27.78	43.50	-15.72	QP			

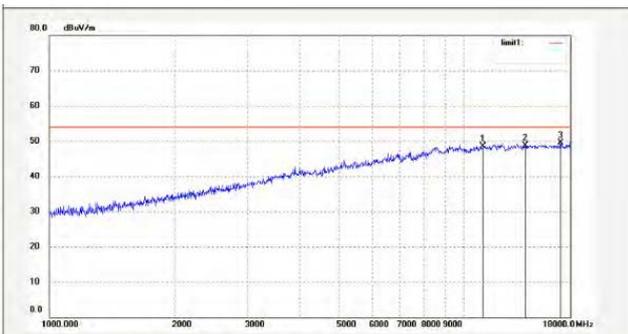
V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	86.8067	44.68	-21.60	23.08	40.00	-16.92	QP			
2	133.1511	40.45	-23.18	17.27	43.50	-26.23	QP			
3	164.9074	41.86	-22.34	19.52	43.50	-23.98	QP			

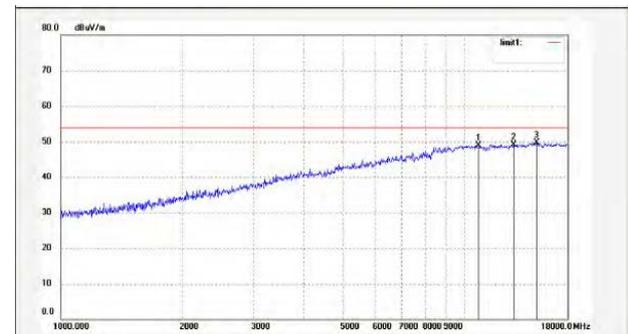
For 1GHz-25GHz

H



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	11108.167	42.96	5.62	48.58	54.00	-5.42	peak			
2	14038.447	38.17	10.61	48.78	54.00	-5.22	peak			
3	17087.464	35.29	14.19	49.48	54.00	-4.52	peak			

V



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	10854.250	43.47	5.41	48.88	54.00	-5.12	peak			
2	13249.931	40.73	8.46	49.19	54.00	-4.81	peak			
3	15090.405	37.93	11.76	49.69	54.00	-4.31	peak			

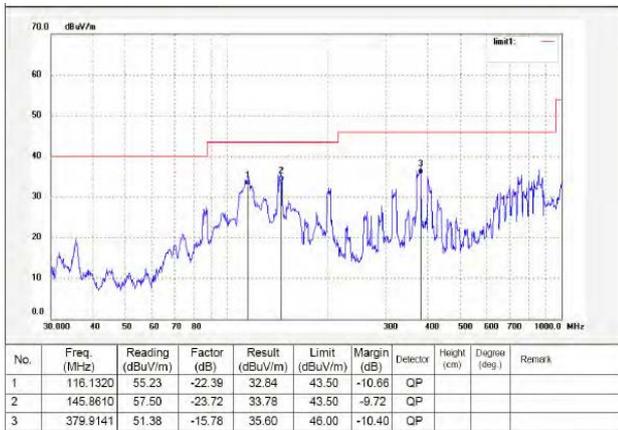
802.11n Channel Middle 2437MHz (40MHz)

For Below 30MHz

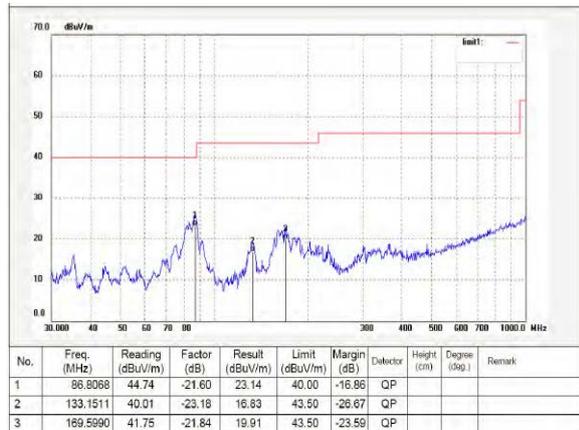
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

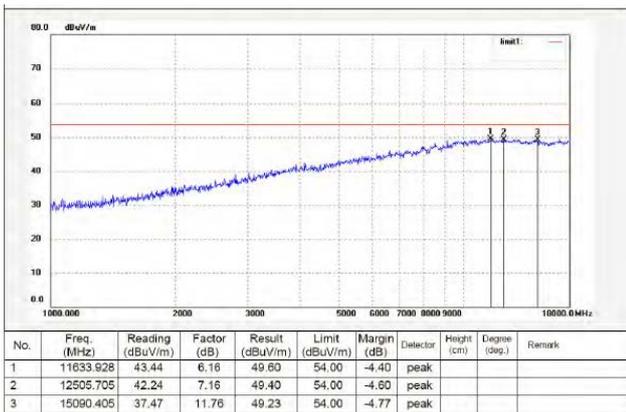


V

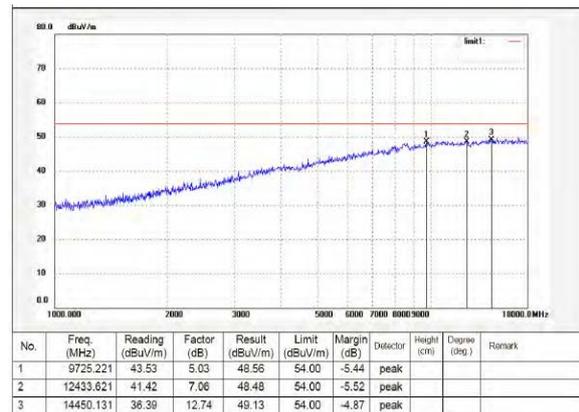


For 1GHz-25GHz

H



V



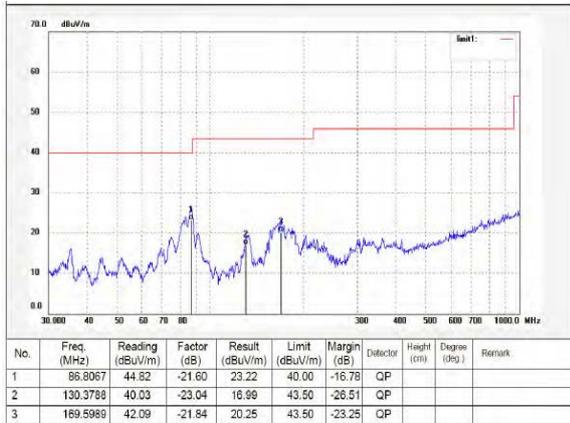
802.11n Channel High 2452MHz (40MHz)

For Below 30MHz

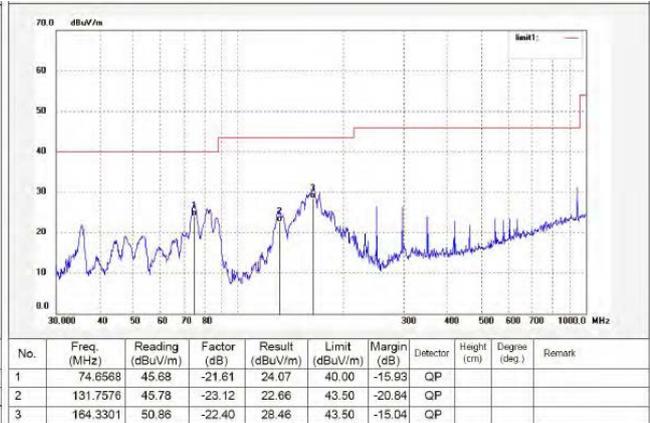
Freq.(MHz)	Reading (dBuV/m) (QP)	Factor(dB) Corr.	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

For 30MHz-1000MHz

H

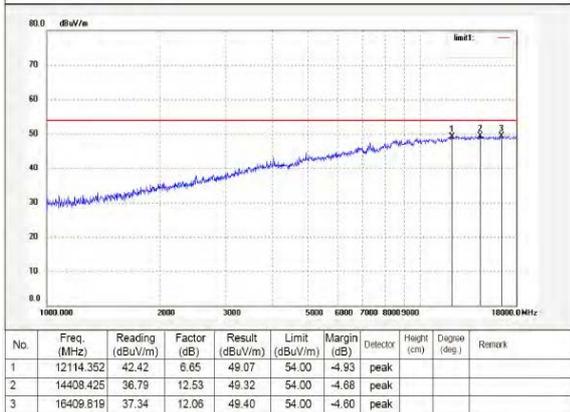


V

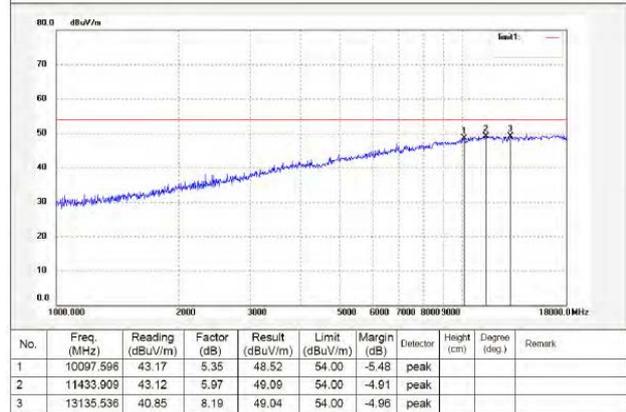


For 1GHz-25GHz

H

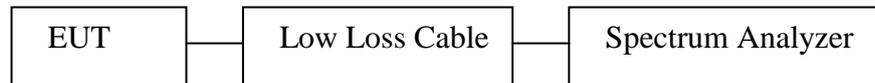


V



10. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

10.1. Block Diagram of Test Setup



10.2. Limits

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).

10.3. Test Procedure

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

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

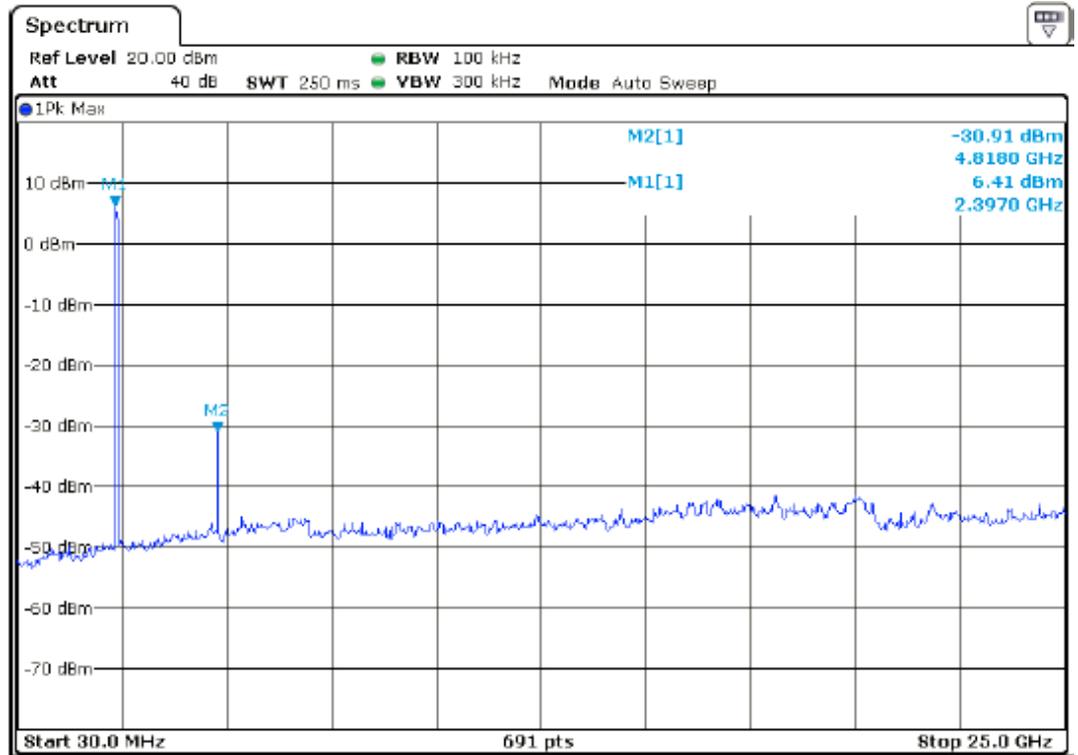
10.3.3. The Conducted Spurious Emission was measured and recorded.

10.4. Test Result

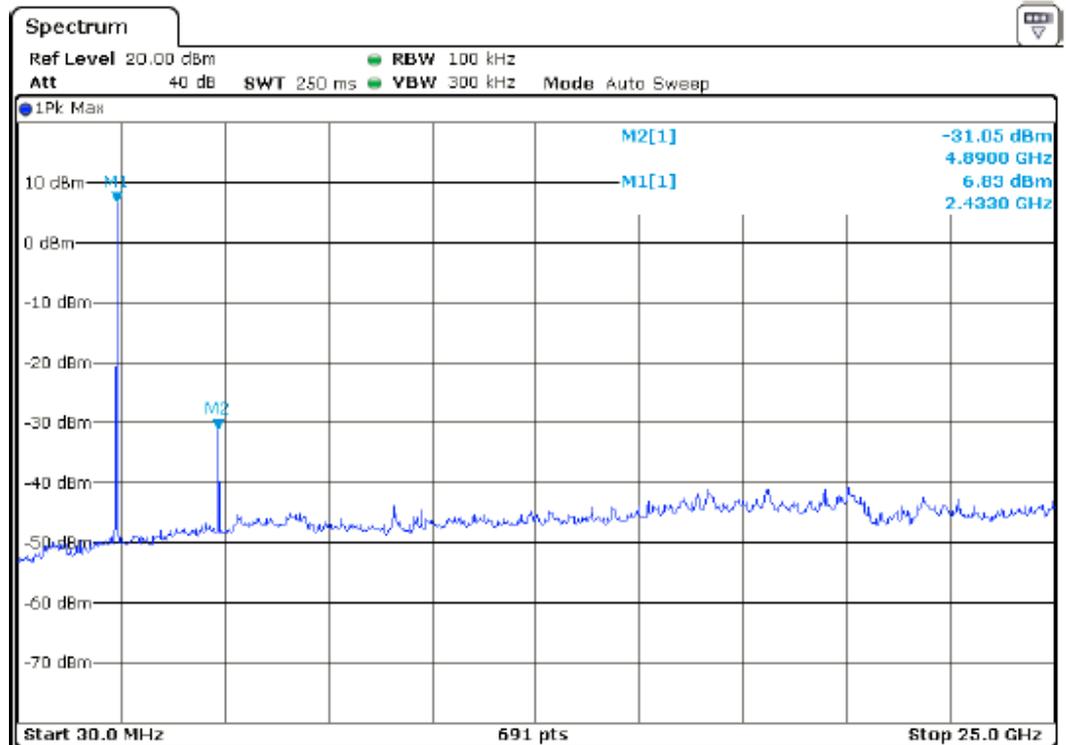
PASS

The spectrum analyzer plots are attached as below.

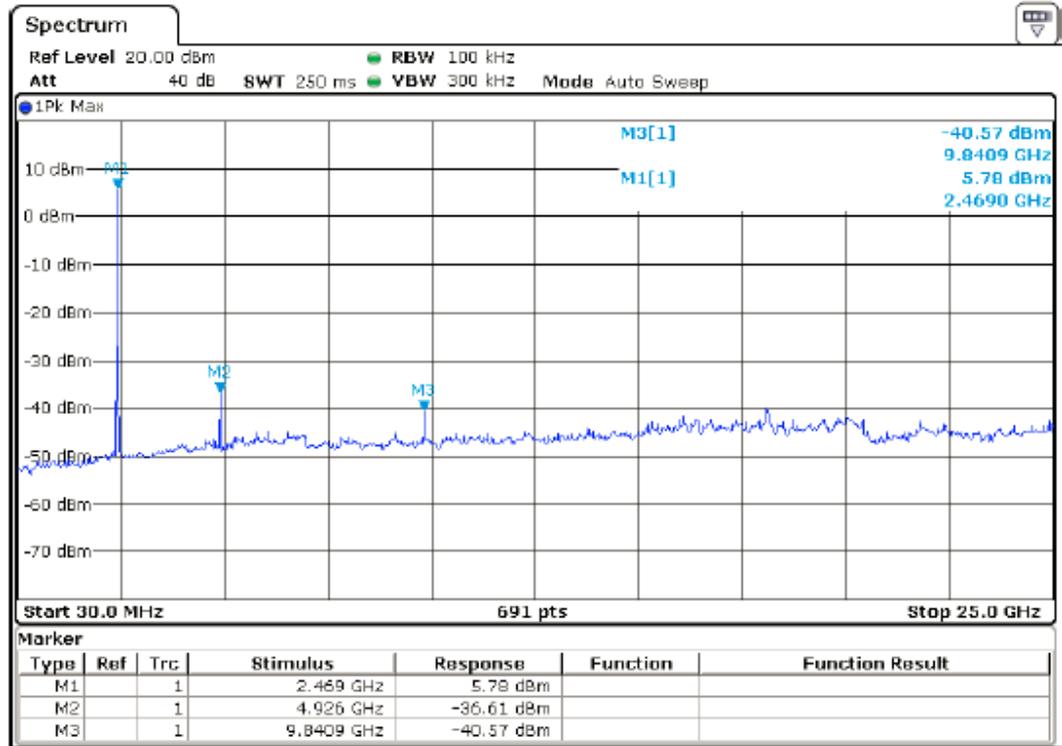
802.11b Channel Low 2412MHz



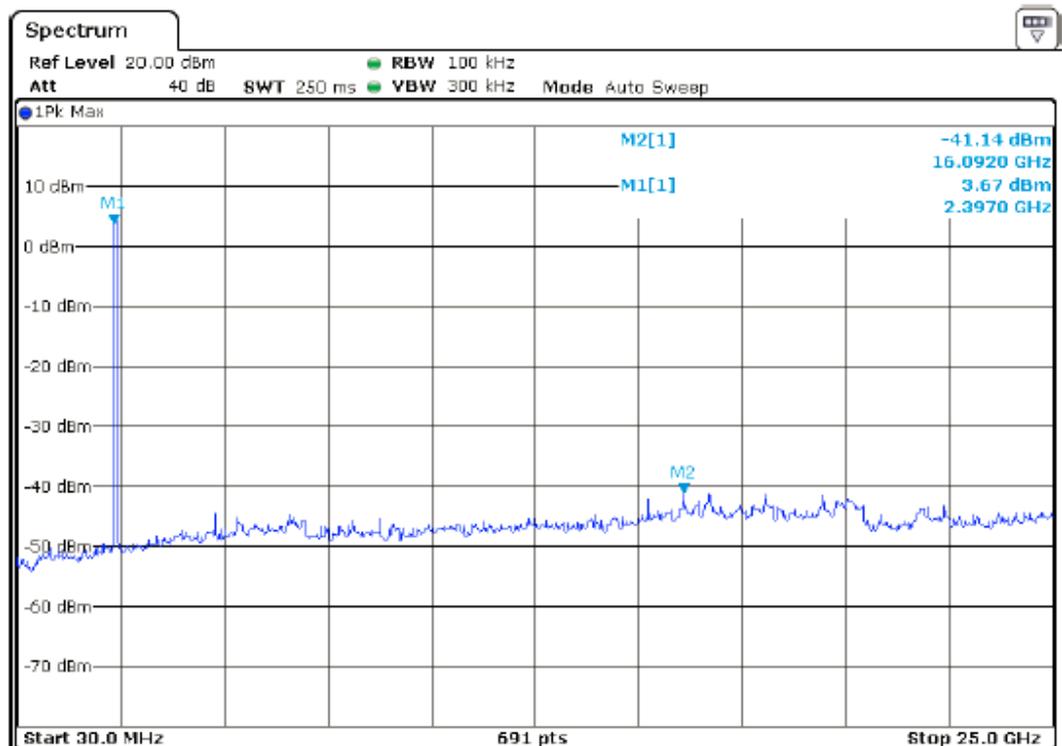
802.11b Channel Middle 2437MHz



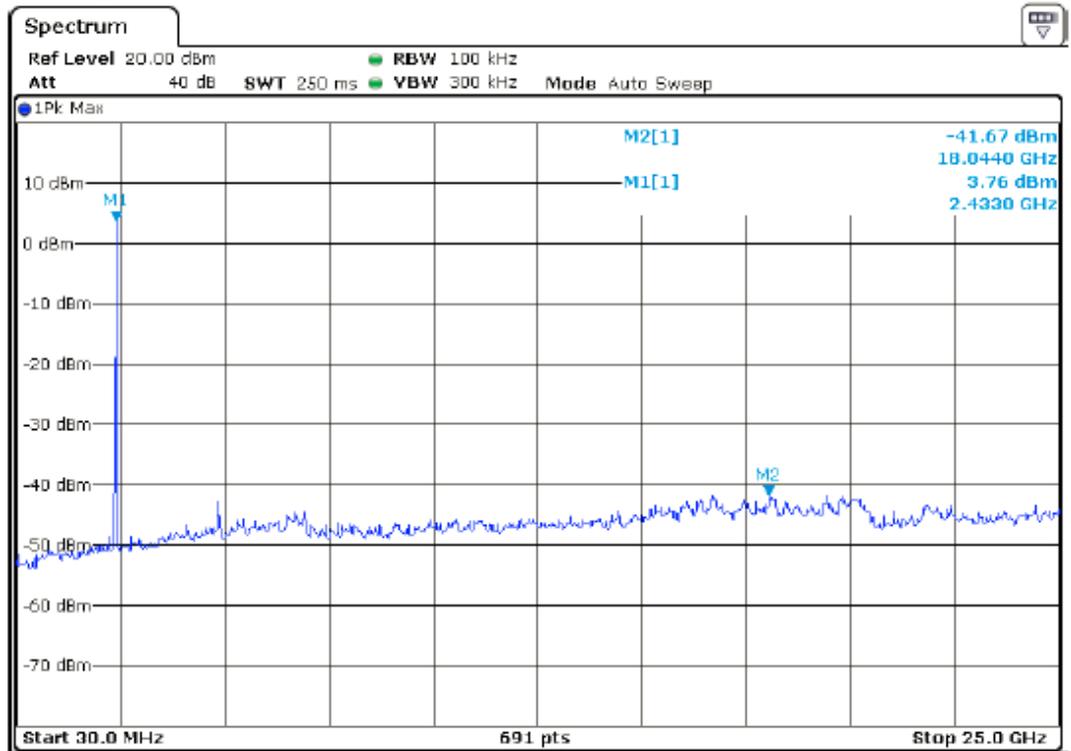
802.11b Channel High 2462MHz



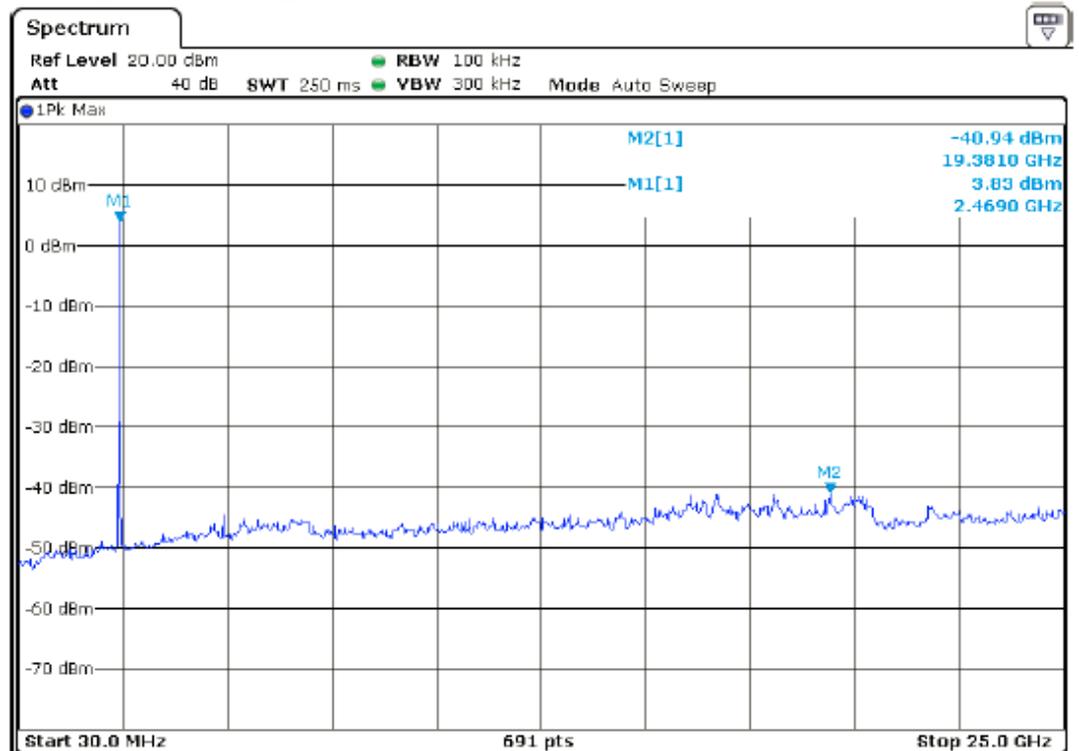
802.11g Channel Low 2412MHz



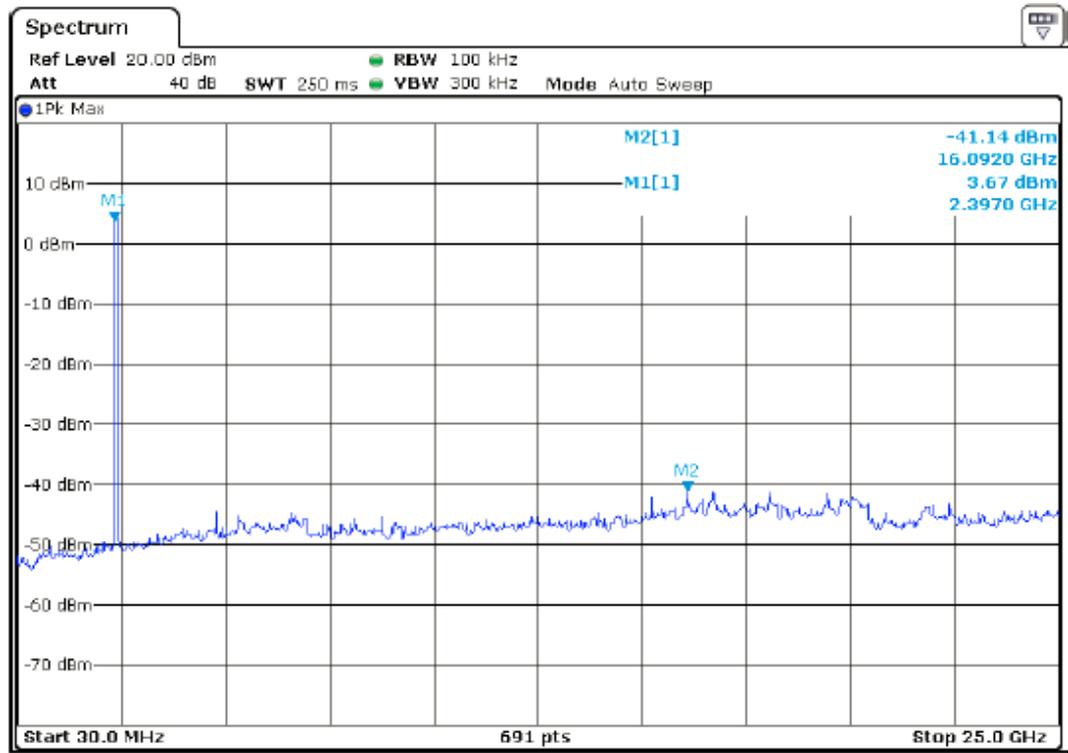
802.11g Channel Middle 2437MHz



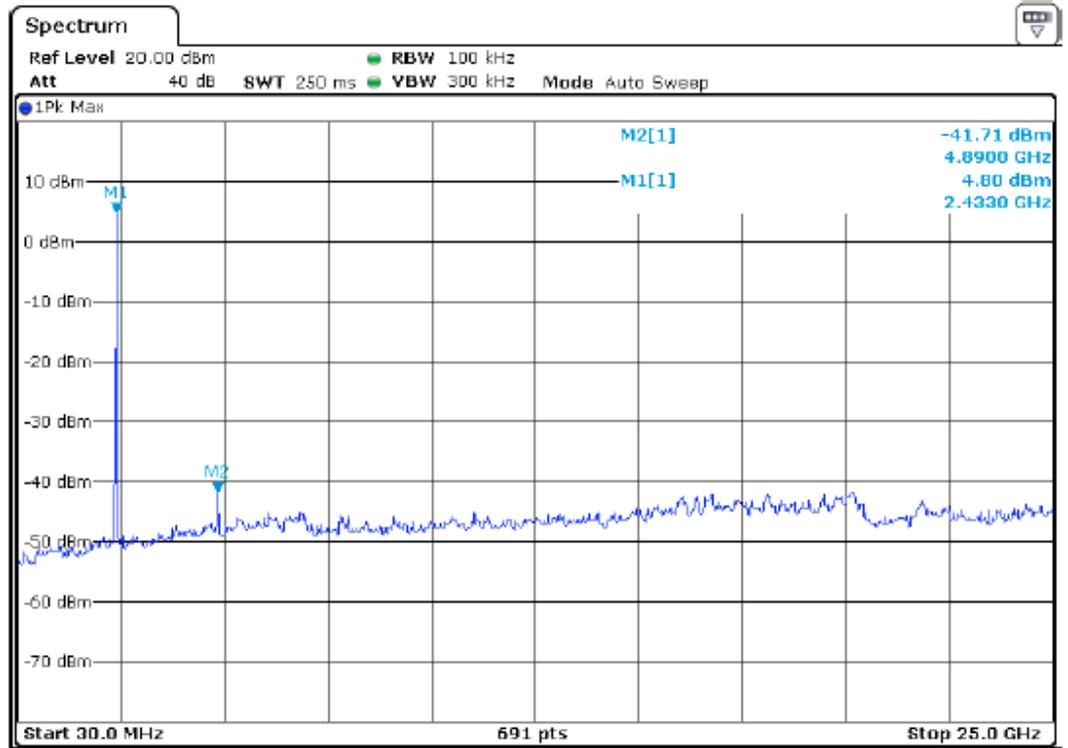
802.11g Channel High 2462MHz



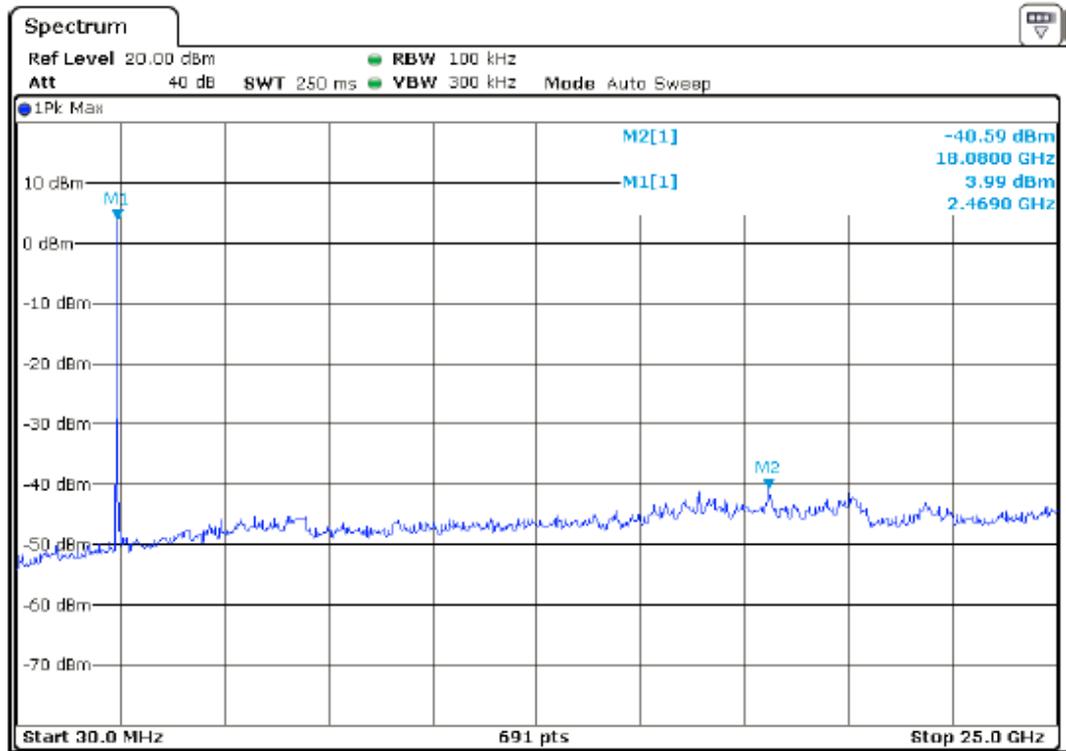
802.11n Channel Low 2412MHz (20MHz)



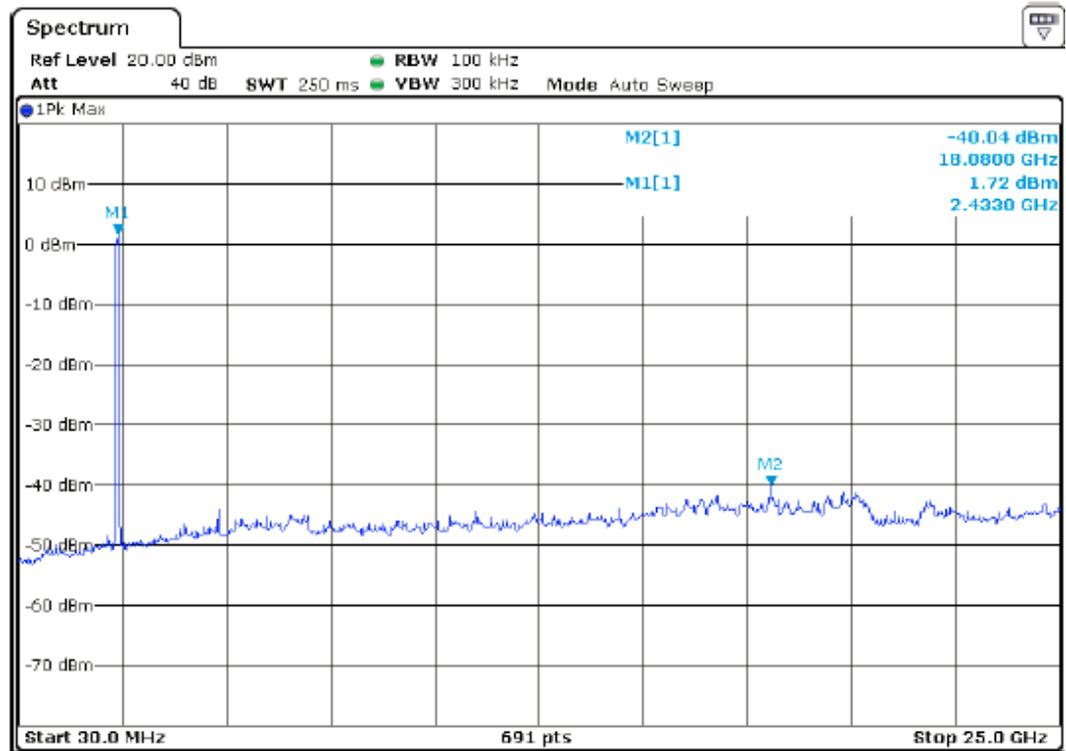
802.11n Channel Middle 2437MHz (20MHz)



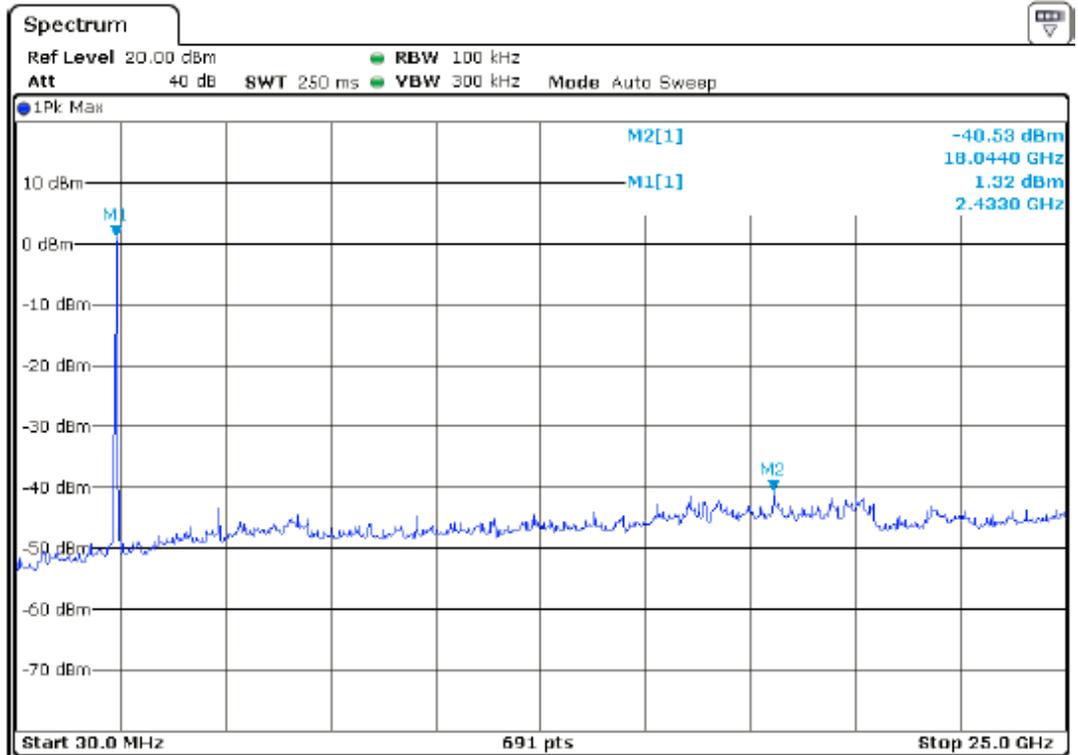
802.11n Channel High 2462MHz (20MHz)



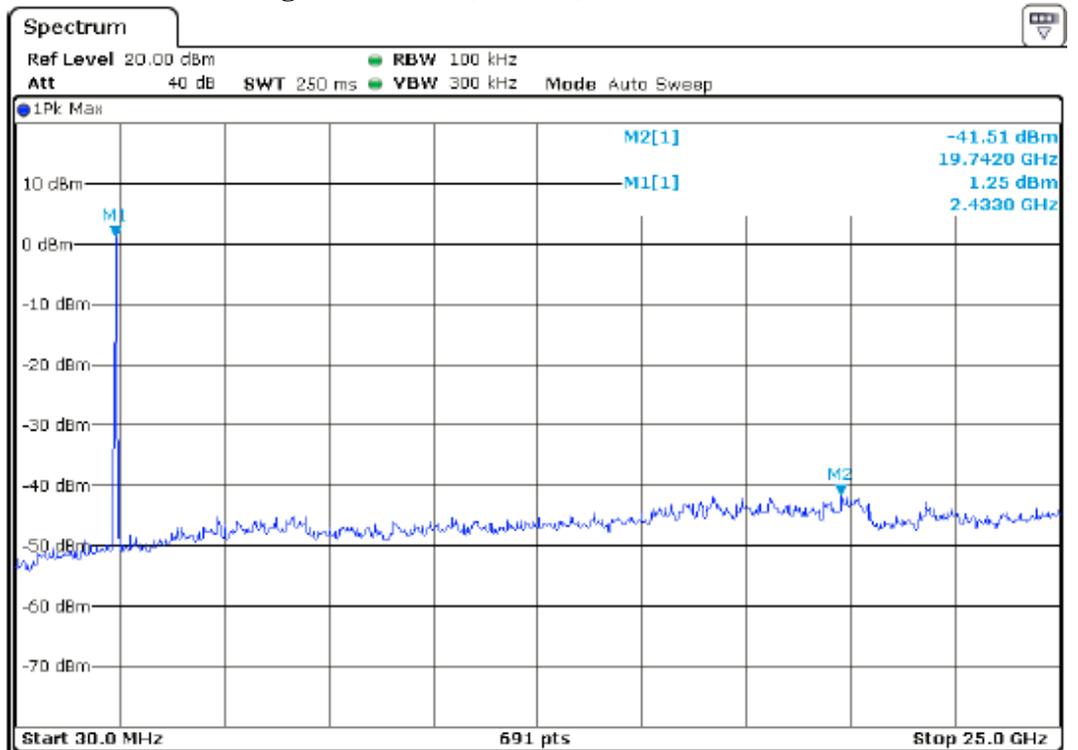
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz (40MHz)



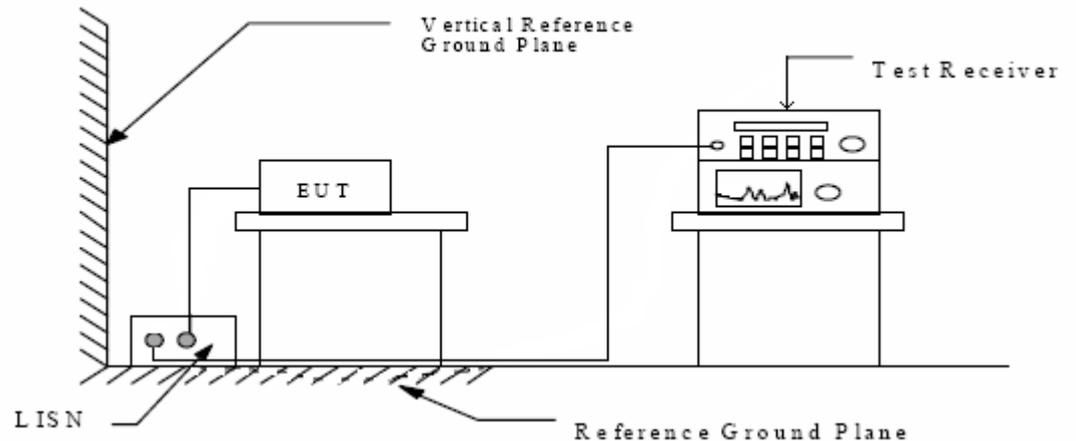
802.11n Channel High 2452MHz (40MHz)



11. AC POWER LINE CONDUCTED EMISSION FOR PART 15 SECTION

15.207(A)

11.1. Block Diagram of Test Setup



11.2. Limits

Conducted Emission Measurement Limits According to Section 15.207(a)

Frequency MHz	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

* Decreases with the logarithm of the frequency.

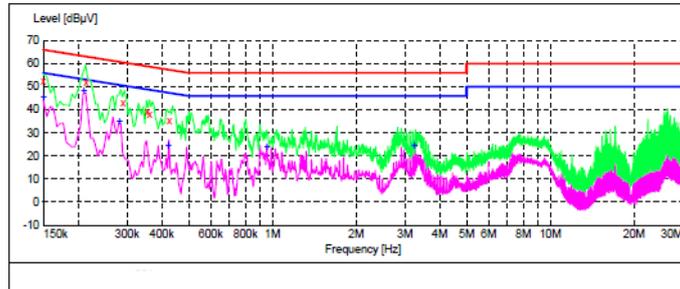
11.3. Test Procedure

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: 2003 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESPI) is set at 9kHz.

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

11.4. Test Result

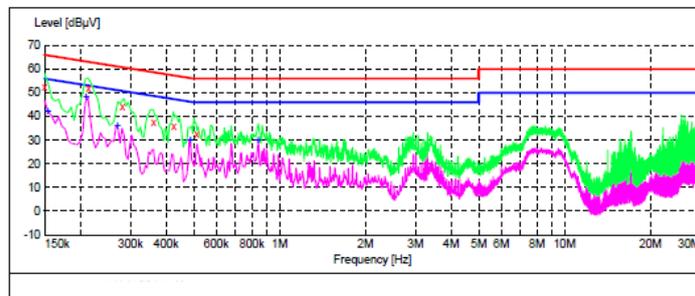


MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	52.50	10.2	66	13.5	QP	N	GND
0.214000	51.70	10.2	63	11.3	QP	N	GND
0.290000	43.00	10.2	61	17.6	QP	N	GND
0.354000	38.90	10.2	59	20.0	QP	N	GND
0.362000	38.00	10.2	59	20.7	QP	N	GND
0.426000	35.40	10.2	57	21.9	QP	N	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	45.90	10.2	56	10.1	AV	N	GND
0.210000	48.60	10.2	53	4.6	AV	N	GND
0.282000	35.10	10.2	51	15.7	AV	N	GND
0.422000	24.90	10.2	47	22.5	AV	N	GND
0.956000	24.30	10.3	46	21.7	AV	N	GND
3.248000	24.60	10.4	46	21.4	AV	N	GND



MEASUREMENT RESULT:

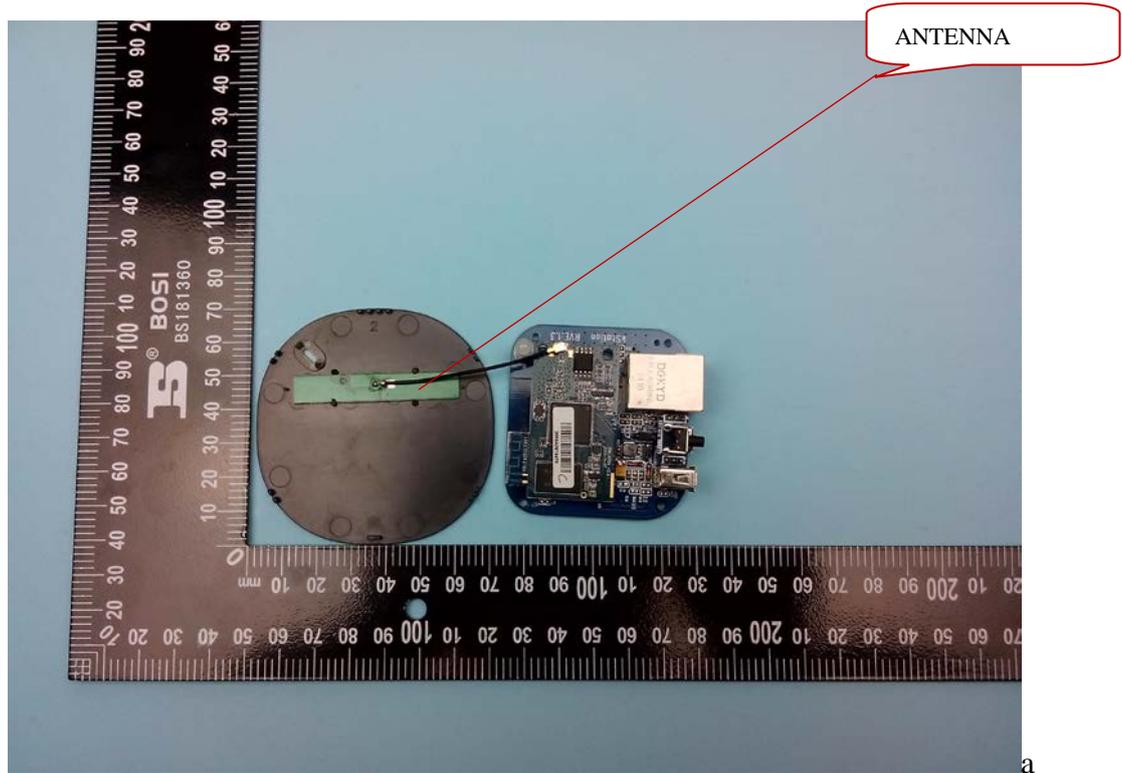
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	52.40	10.2	66	13.6	QP	L1	GND
0.214000	51.60	10.2	63	11.4	QP	L1	GND
0.282000	44.10	10.2	61	16.7	QP	L1	GND
0.362000	37.70	10.2	59	21.0	QP	L1	GND
0.426000	35.60	10.2	57	21.7	QP	L1	GND
0.512000	32.60	10.2	56	23.4	QP	L1	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154000	42.50	10.2	56	13.3	AV	L1	GND
0.210000	48.40	10.2	53	4.8	AV	L1	GND
0.270000	36.30	10.2	51	14.8	AV	L1	GND
0.486000	30.30	10.2	46	15.9	AV	L1	GND
0.842000	30.50	10.2	46	15.5	AV	L1	GND

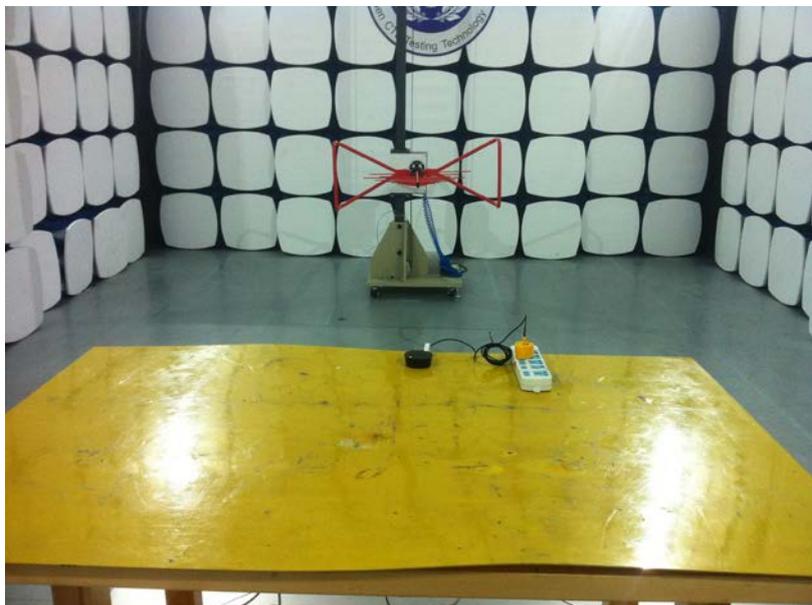
12. ANTENNA REQUIREMENT

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. Antenna is fixed by enclosure, can not be changed except take apart the product.



13. PHOTOGRAPH OF TEST

Radiated Emission





AC power line conducted emission

