FCC TEST REPORT

Test report
On Behalf of
WIZnet H.K. Limited
For
WiFi Module
Model No.: WizFi270
FCC ID: 2AHBB-WIZFI270

Prepared for :	**WIZnet H.K. Limited** **Unit 511, 5/F, Enterprise Place, No 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong**
Prepared By :	**WST Certification & Testing (HK) Limited** **12/F., San Toi Building,137-139 Connaught Road Central,Hong Kong**
Date of Test:	**Jan. 13, 2016 ~ Jan. 20, 2016**
Date of Report:	**Jan. 20, 2016**
Report Number:	**WST160113006-E**

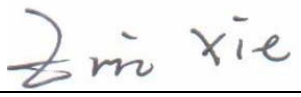
TEST RESULT CERTIFICATION

Applicant's name	:	WIZnet H.K. Limited
Address	:	Unit 511, 5/F, Enterprise Place, No 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong
Manufacture's Name	:	WIZnet H.K. Limited
Address	:	Unit 511, 5/F, Enterprise Place, No 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong

Product description

Trade Mark:		WIZnet
Product name	:	WiFi Module
Model and/or type reference	:	WizFi270
Standards	:	FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

Date of Test	:	
Date (s) of performance of tests	:	**Jan. 13, 2016 ~ Jan. 20, 2016**
Date of Issue	:	**Jan. 20, 2016**
Test Result	:	**Pass**

Testing Engineer : 

(Eric Xie)

Technical Manager : 

(Dora Qin)

Authorized Signatory : 

(Kait Chen)

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1.. TEST SUMMARY

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

1.1. Test Facility

Test Firm : Shenzhen WST Testing Technology Co., Ltd.
Certificated by FCC, Registration No.: 939433
Address : 1F,No.9 Building,TGK Science & Technology Park,Yangtian Rd., NO.72 Bao'an Dist., Shenzhen,Guangdong,China. 518101
Tel : (86)755-33916437
Fax : (86)755-27822175

1.2. Measurement Uncertainty

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2.. GENERAL INFORMATION

2.1. General Description of EUT

Equipment:	WiFi Module
Model Name:	WizFi270
Serial No.:	N/A
FCC ID :	2AHBB-WIZFI270
Model Difference:	N/A
Antenna Type:	Internal Antenna
Antenna Gain:	4dBi
WLAN Operation frequency:	802.11b: 2412-2462MHz 802.11g: 2412-2462MHz 802.11n HT20: 2412-2462MHz
Number of Channels:	11CH
Data Rate:	802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: up to 72Mbps
Modulation Type:	OFDM
Power Source:	DC Voltage
Power Rating:	DC 3.3V
Adapter Model:	N/A

2.2. Carrier Frequency of Channels

Channle information							
CH	Frequency	CH	Frequency	CH	Frequency	CH	Frequency
1	2412	5	2432	9	2452	/	/
2	2417	6	2437	10	2457	/	/
3	2422	7	2442	11	2462	/	/
4	2427	8	2447	/	/	/	/

Operation of EUT during testing

Operating Mode

The mode is used: **802.11b Transmitting mode**

Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

802.11g Transmitting mode

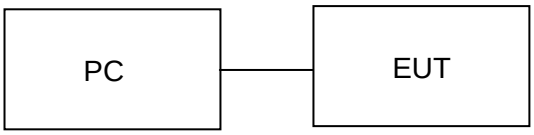
Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

802.11n Transmitting mode

Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

2.3. Description of Test Setup

OPERATION OF EUT DURING TESTING



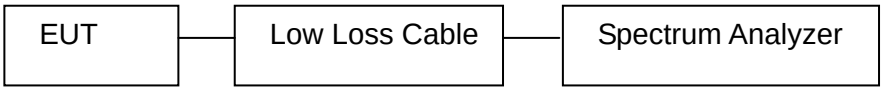
2.4. Measurement Instruments List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 17, 2015	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	May 19, 2015	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Programmable AC Power source	SOPH POWER	PAG-1050	630250	May 26, 2015	1 Year
19.	Harmonic and Flicker Analyzer	LAPLACE	AC2000A	272629	May 26, 2015	1 Year
20.	Harmonic and Flicker Test Software AC 2000A	LAPLACE	N/A	N/A	N/A	N/A
21.	ESD Simulators	KIKUSUI	KES4021	LJ003477	May 25, 2015	1 Year
22.	EFT Generator	EMPEK	EFT-4040B	0430928N	May 19, 2015	1 Year
23.	Shielding Room	ChangZhou ZhongYu	JB88	SEL0166	May 19, 2015	1 Year
24.	Signal Generator 9KHz~2.2GHz	R&S	SML02	SEL0143	May 19, 2015	1 Year
25.	Signal Generator 9KHz~1.1GHz	R&S	SML01	SEL0135	May 19, 2015	1 Year
26.	Power Meter	R&S	NRVS	SEL0144	May 19, 2015	1 Year
27.	RF Level Meter		URV35	SEL0137	May 19, 2015	1 Year
28.	Audio Analyzer	R&S	UPL	SEL0136	May 19, 2015	1 Year
29.	RF-Amplifier 150KHz~150Mz	BONN Elektronik	BSA1515-25	SEL0157	May 19, 2015	1 Year
30.	Stripline Test Cell	Erika Fiedler	VDE0872	SEL0167	N/A	N/A

31.	TV Test Transmitter	R&S	SFM	SEL0159	May 17, 2015	1 Year
32.	TV Generator PAL	R&S	SGPF	SEL0138	May 19, 2015	1 Year
33.	TV Generator Ntsc	R&S	SGMF	SEL0140	May 19, 2015	1 Year
34.	TV Generator Secam	R&S	SGSF	SEL0139	May 19, 2015	1 Year
35.	TV Test Transmitter 0.3MHz~3300MHz	R&S	SFQ	SEL0142	May 19, 2015	1 Year
36.	MPEG2 Measurement Generator	R&S	DVG	SEL0141	May 19, 2015	1 Year
37.	Spectrum Analyzer	R&S	FSP	SEL0177	May 19, 2015	1 Year
38.	Matching	R&S	RAM	SEL0146	N/A	N/A
39.	Matching	R&S	RAM	SEL0148	N/A	N/A
40.	Absorbing Clamp	R&S	MDS21	SEL0158	May 17, 2015	1 Year
41.	Coupling Set	Erika Fiedler	Rco, Rci, MC, AC, LC	SEL0149	N/A	N/A
42.	Filters	Erika Fiedler	Sr, LBS	SEL0150	N/A	N/A
43.	Matching Network	Erika Fiedler	MN, T1	SEL0151	N/A	N/A
44.	Fully Anechoic Room	ChangZhou ZhongYu	854	SEL0169	Jun. 10, 2015	1 Year
45.	Signal Generator	R&S	SML03	SEL0068	May 17, 2015	1 Year
46.	RF-Amplifier 30M~1GHz	Amplifier Reasearch	250W1000A	SEL0066	Oct. 24, 2015	1 Year
47.	RF-Amplifier 0.8~3.0GHz	Amplifier Reasearch	60S1G3	SEL0065	Oct. 24, 2015	1 Year
48.	Power Meter	R&S	NRVD	SEL0069	May 17, 2015	1 Year
49.	Power Sensor	R&S	URV5-Z2	SEL0071	May 17, 2015	1 Year
50.	Power Sensor	R&S	URV5-Z2	SEL0072	May 17, 2015	1 Year
51.	Software EMC32	R&S	EMC32-S	SEL0082	N/A	N/A
52.	Log-periodic Antenna	Amplifier Reasearch	AT1080	SEL0073	N/A	N/A
53.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
54.	High Gain Horn Antenna(0.8-5G Hz)	Amplifier Reasearch	AT4002A	SEL0075	N/A	N/A
55.	Double-Ridged Waveguide Horn Antenna (0.8-18GHz)	ROHDE& SCHWARZ	HF907	100013	May 17, 2015	1 Year
56.	Log-periodic Antenna (850MHz-26.5GHz)	ROHDE& SCHWARZ	HL050S7	100496	May 17, 2015	1 Year

3.. 6DB BANDWIDTH MEASUREMENT

3.1. Block Diagram of Test Setup



3.2. 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

3.3. Test Procedure

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

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

3.3.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

3.4. Test Result

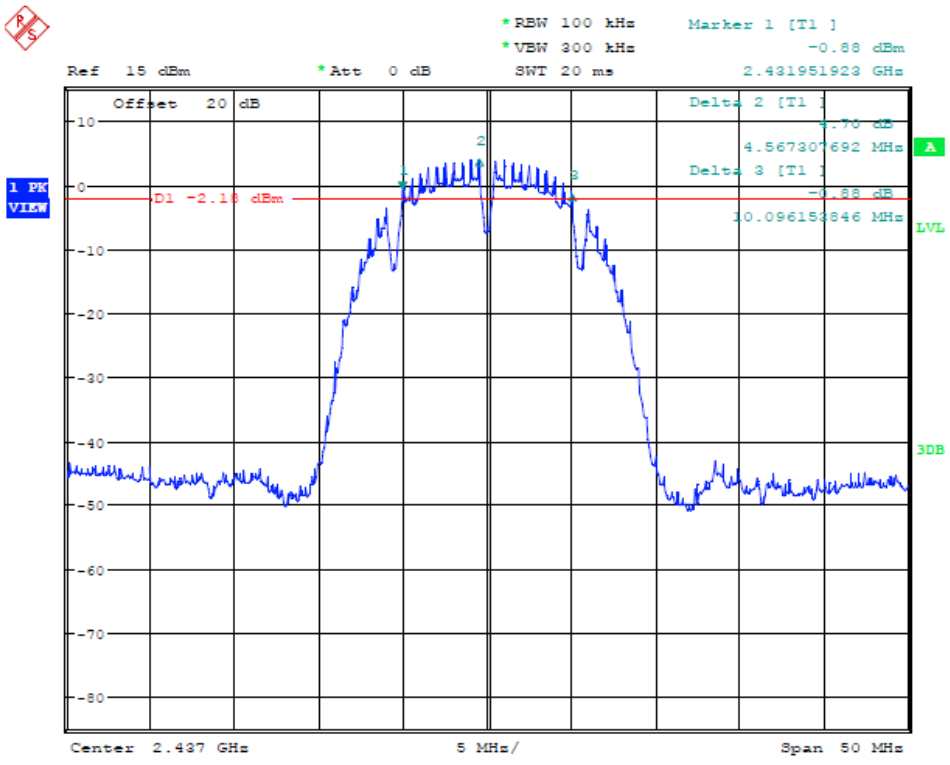
802.11b			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2412	10.96	>0.5MHz
Middle	2437	10.96	>0.5MHz
High	2462	10.96	>0.5MHz

802.11g			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2412	16.587	>0.5MHz
Middle	2437	16.587	>0.5MHz
High	2462	16.587	>0.5MHz

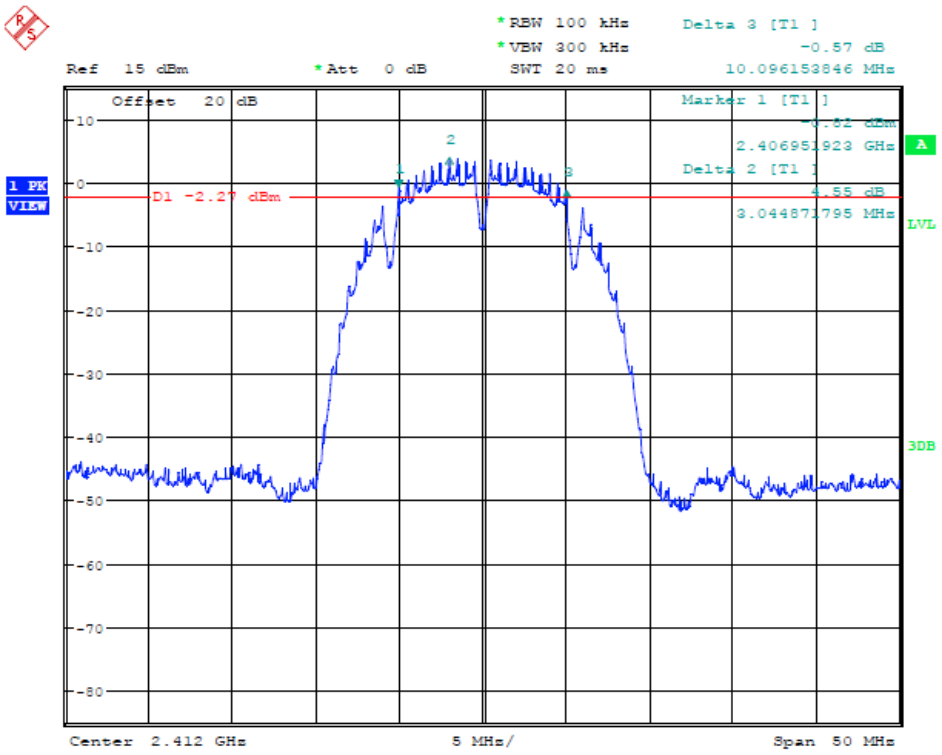
802.11n			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2412	17.869	>0.5MHz
Middle	2437	17.869	>0.5MHz
High	2462	17.869	>0.5MHz

The spectrum analyzer plots are attached as below.

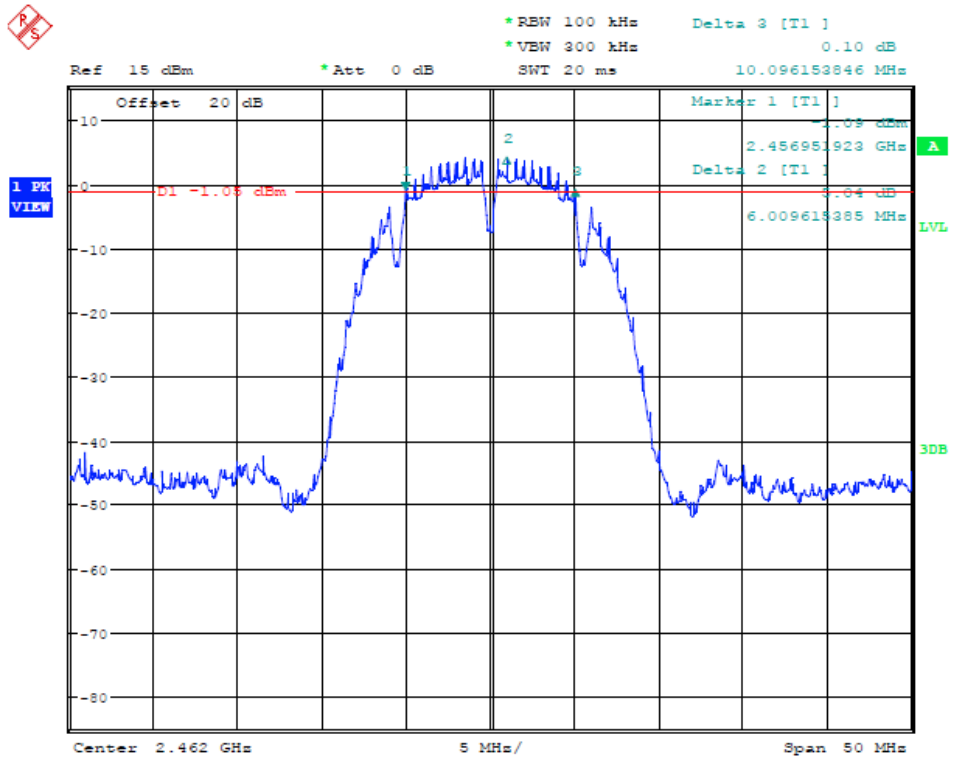
802.11b Channel Low 2412MHz



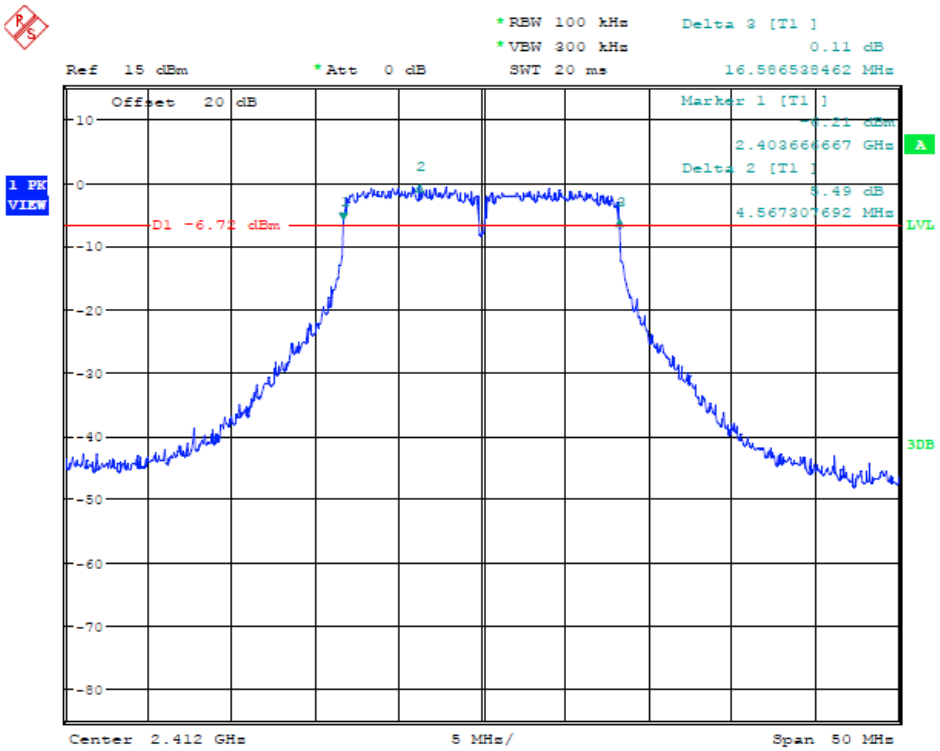
802.11b Channel Middle 2437MHz



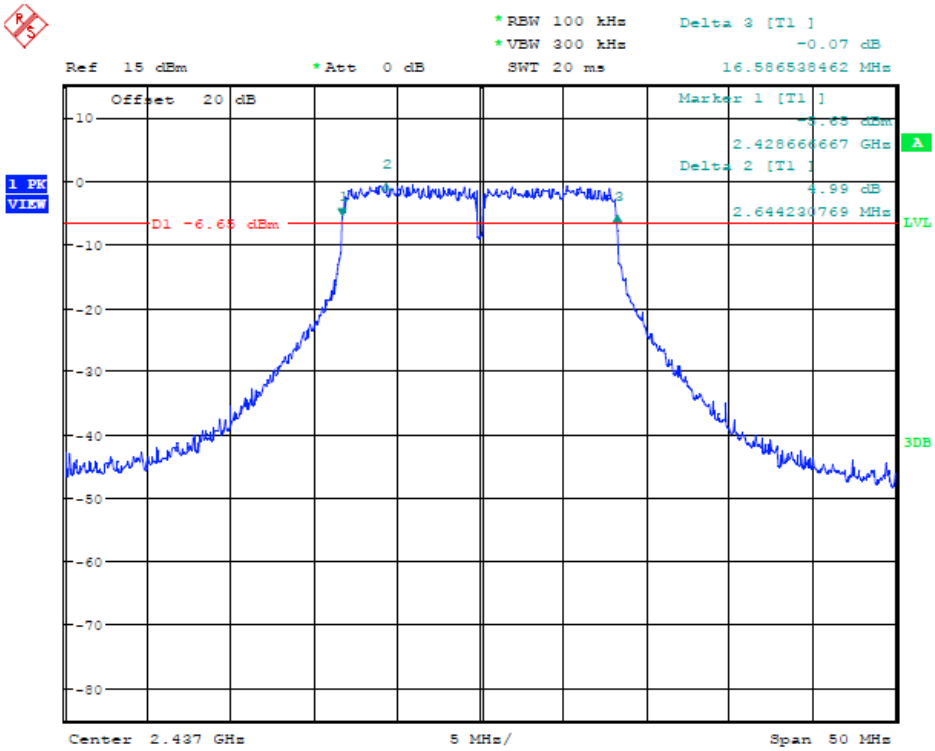
802.11b Channel High 2462MHz



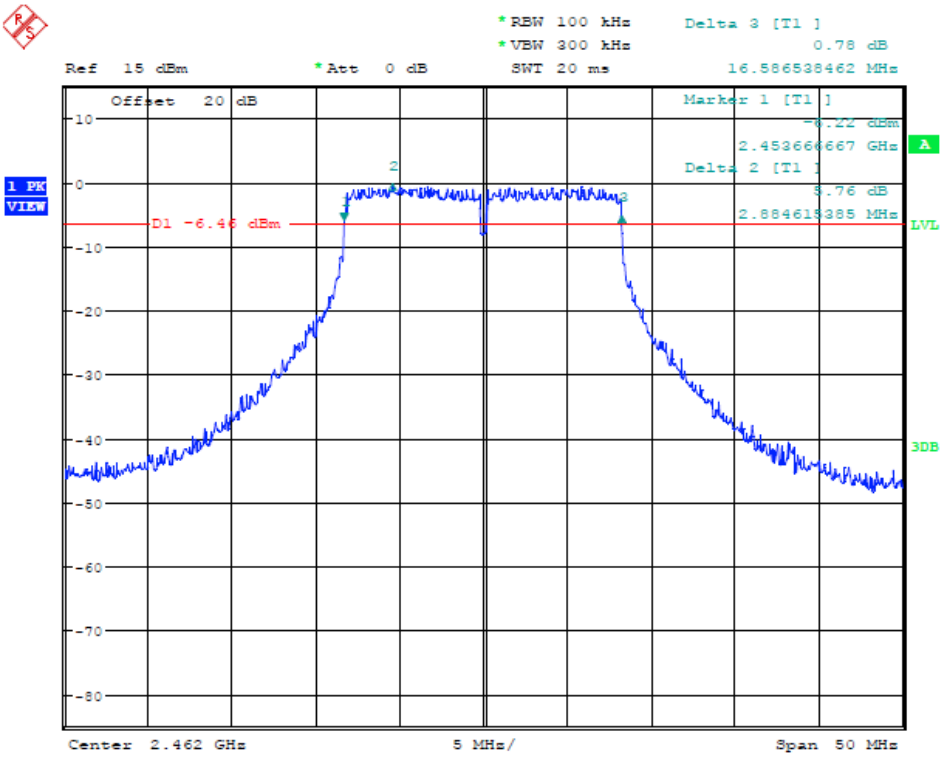
802.11g Channel Low 2412MHz



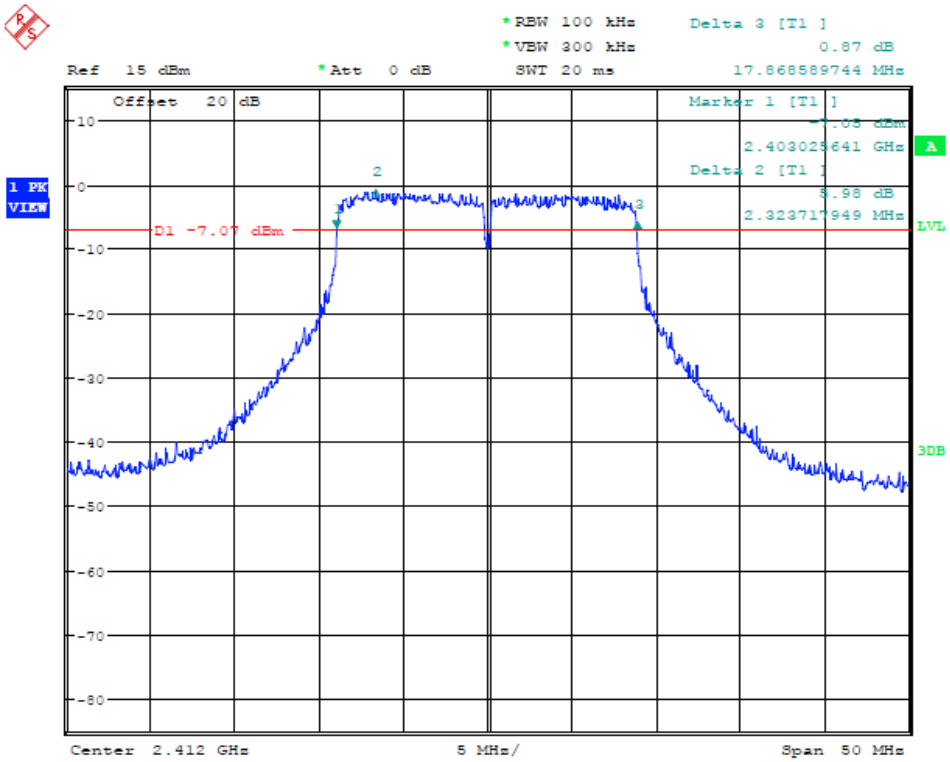
802.11g Channel Middle 2437MHz



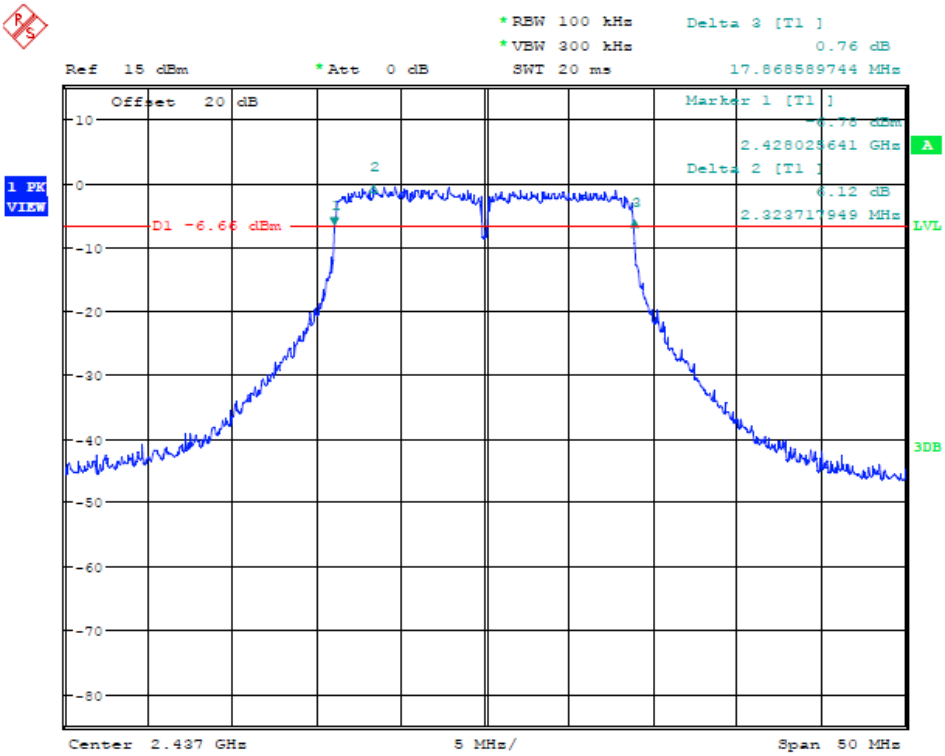
802.11g Channel High 2462MHz



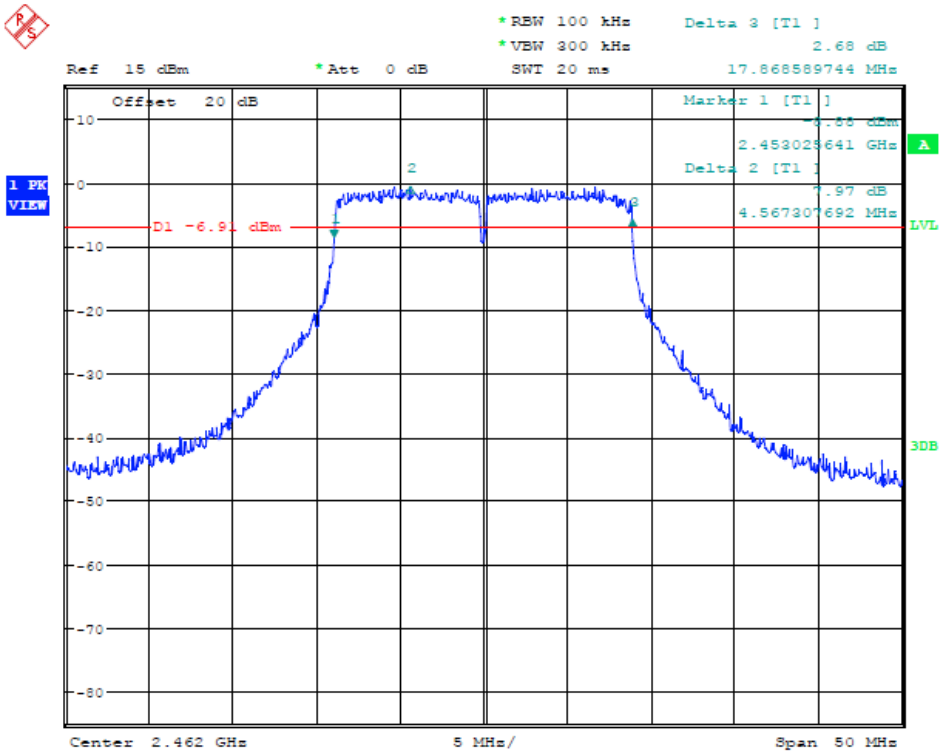
802.11n Channel Low 2412MHz



802.11n Channel Middle 2437MHz(20MHz)

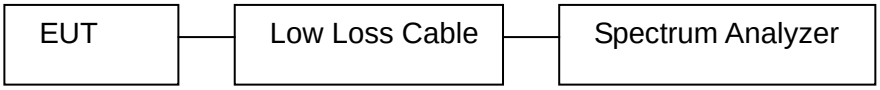


802.11n Channel High 2462MHz



4 MAXIMUM PEAK OUTPUT POWER

4.1 Block Diagram of Test Setup



4.2 Limits

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

4.3 Test Procedure

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

4.4 Test Result

PASS

802.11b			
Channel	**Frequency (MHz)**	**Peak output power (dBm)**	**Limit (dBm)**
Low	2412	9.30	30
Middle	2437	9.20	30
High	2462	9.34	30

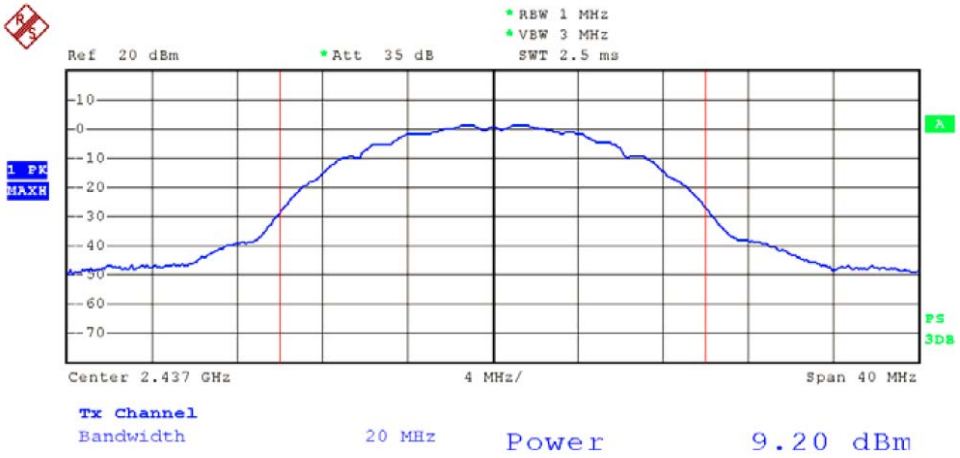
802.11g			
Channel	**Frequency (MHz)**	**Peak output power (dBm)**	**Limit (dBm)**
Low	2412	9.43	30
Middle	2437	9.46	30
High	2462	9.38	30

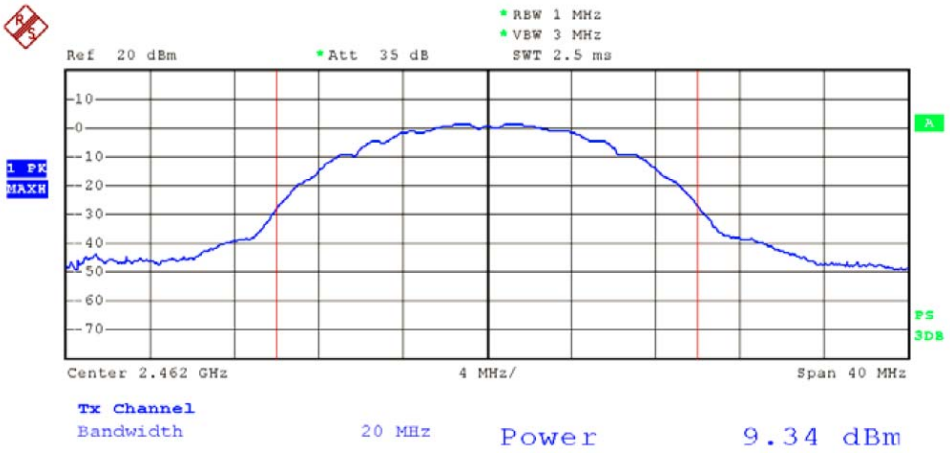
802.11n			
Channel	**Frequency (MHz)**	**Peak output power (dBm)**	**Limit (dBm)**
Low	2412	9.13	30
Middle	2437	9.10	30
High	2462	8.98	30

Pls. refer to the following test plots:

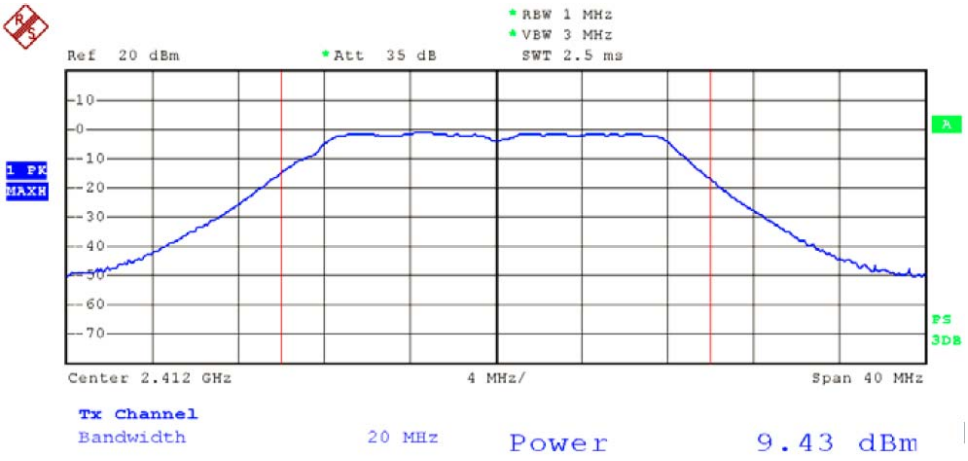
802.11b

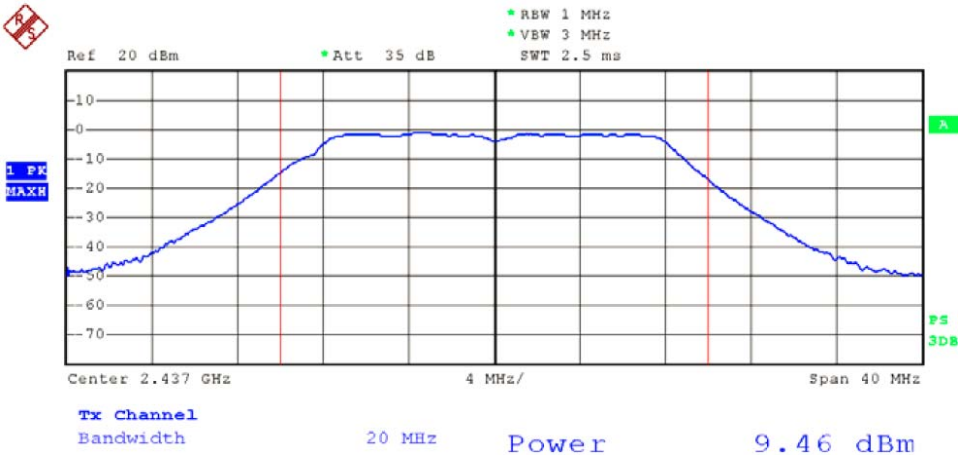

RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.412 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.30 dBm

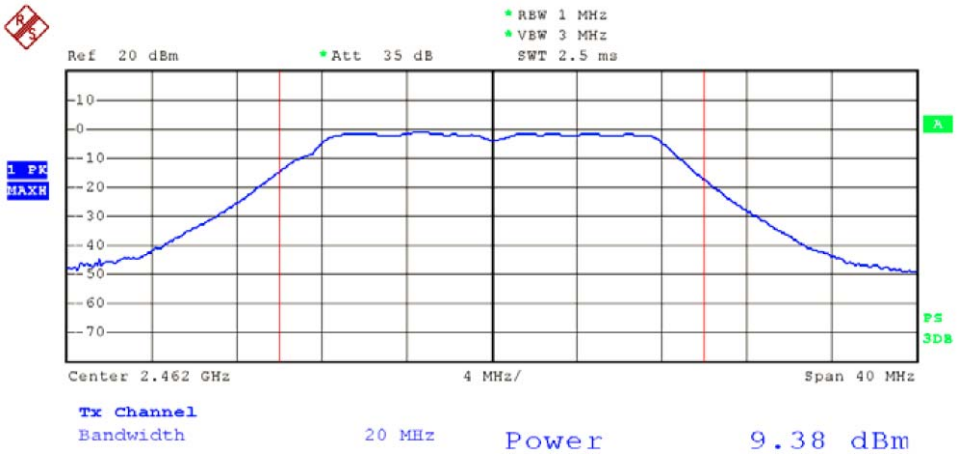

RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.437 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.20 dBm


RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.462 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.34 dBm

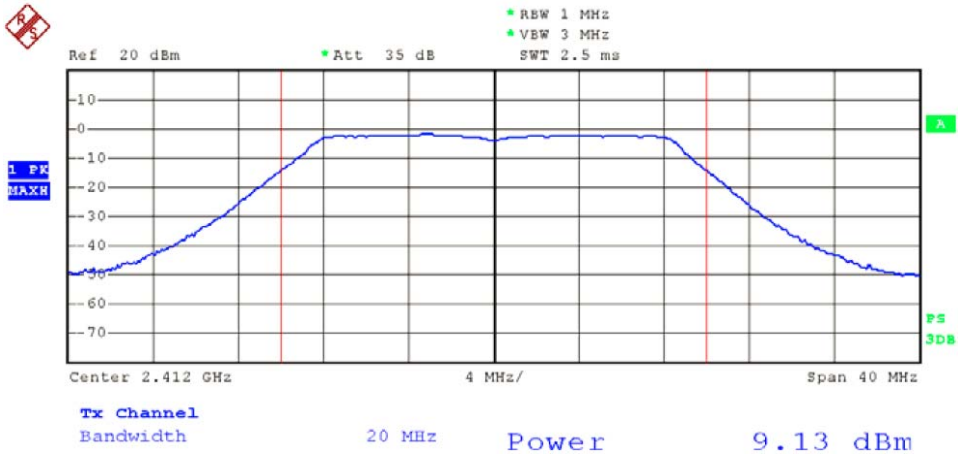
802.11g

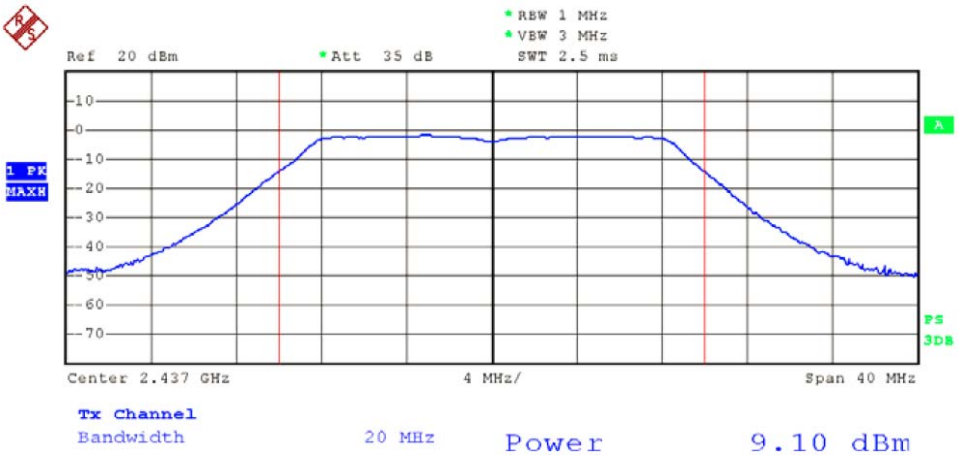

RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
FS
3DB
Center 2.412 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.43 dBm

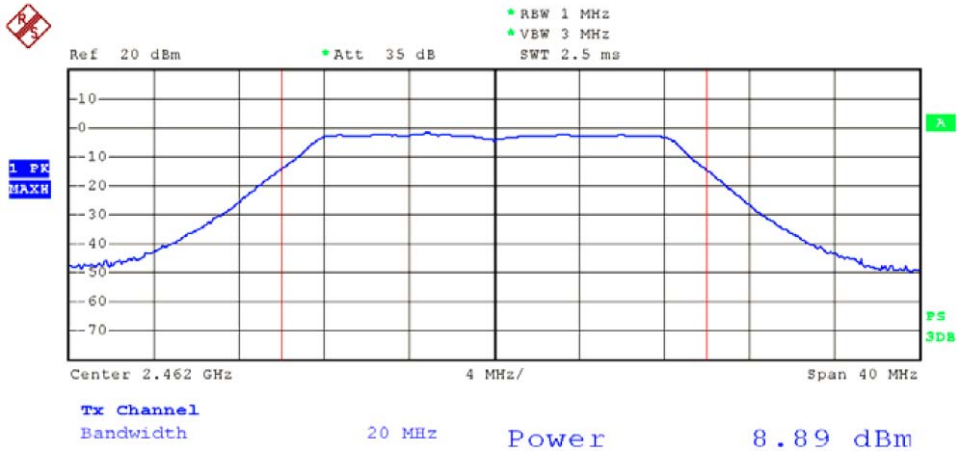

RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
FS
3DB
Center 2.437 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.46 dBm


RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
FS
3DB
Center 2.462 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.38 dBm

802.11n

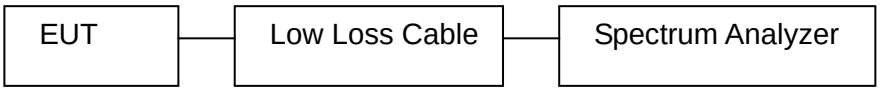

RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.412 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.13 dBm


RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.437 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
9.10 dBm


RBW 1 MHz
VBW 3 MHz
Ref 20 dBm
Att 35 dB
SWT 2.5 ms
1 PK
MAXH
A
PS
3DB
Center 2.462 GHz
4 MHz/
Span 40 MHz
Tx Channel
Bandwidth
20 MHz
Power
8.89 dBm

5 POWER SPECTRAL DENSITY MEASUREMENT

5.1 Block Diagram of Test Setup



5.2 Limits

According to 15.247(a)(1)(iii), 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.

5.3 Test Procedure

According to the KDB 558074 D01 V03r02, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

a. Set instrument center frequency to DTS channel center frequency.
b. Set span to at least 1.5 times the OBW.
c. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set VBW ≥3 x RBW.
e. Detector = power averaging (RMS) or sample detector (when RMS not available)
f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g. Sweep time = auto couple.
h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
i. Use the peak marker function to determine the maximum amplitude level.
j. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require
zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.4 Test Result

PASS

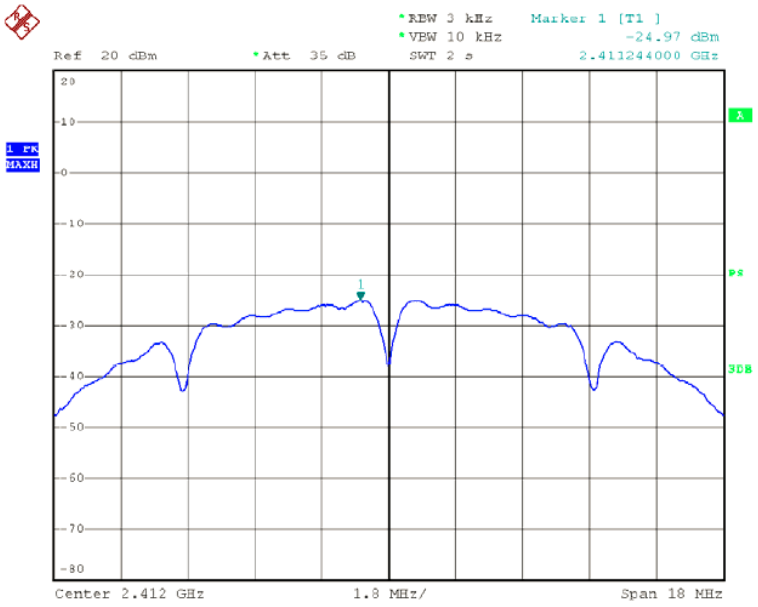
802.11b			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2412	-24.97	8
Middle	2437	-25.10	8
High	2462	-24.93	8

802.11g			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2412	-27.76	8
Middle	2437	-27.77	8
High	2462	-28.03	8

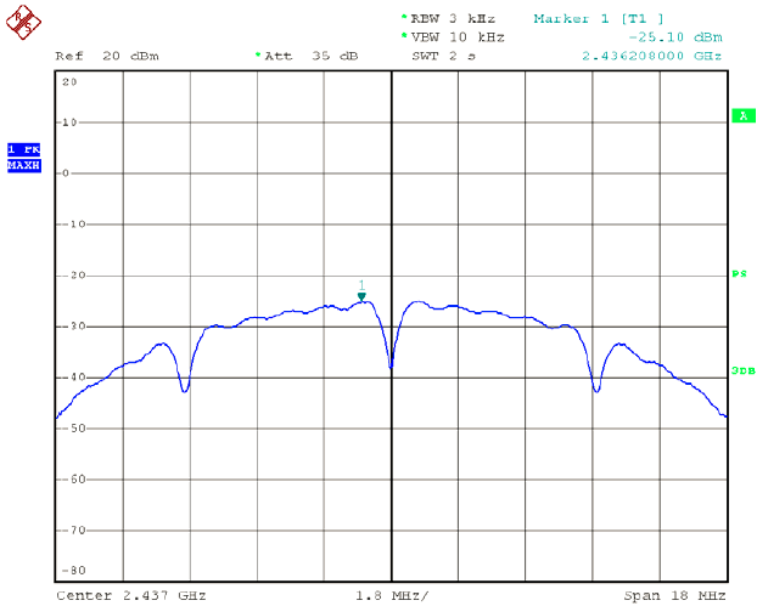
802.11n			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2412	-27.33	8
Middle	2437	-27.58	8
High	2462	-27.65	8

The spectrum analyzer plots are attached as below.

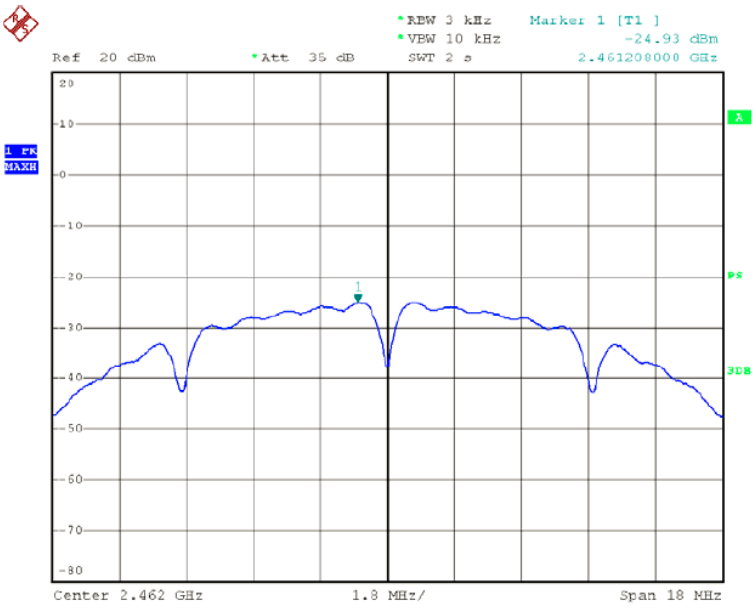
802.11b Channel Low 2412MHz



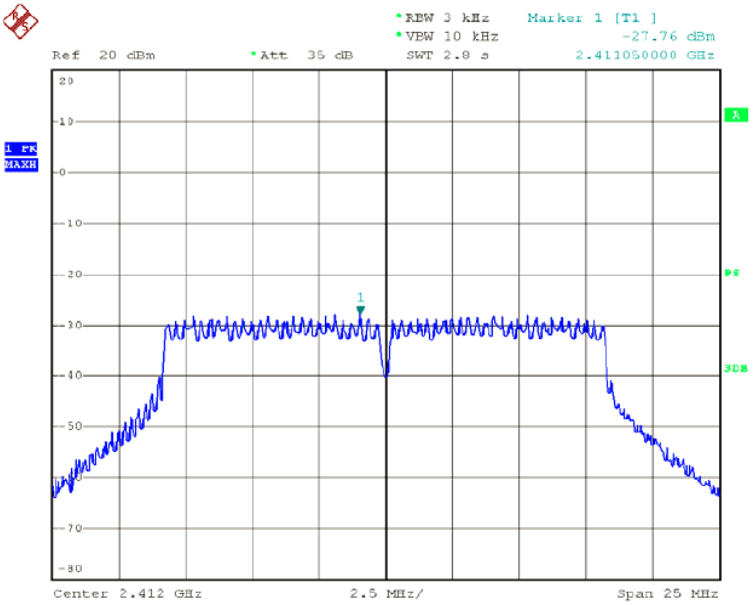
802.11b Channel Middle 2437MHz



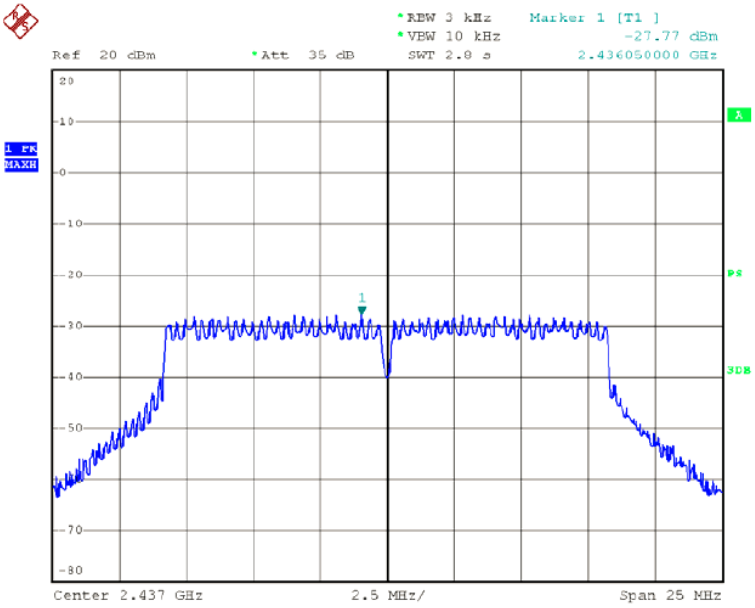
802.11b Channel High 2462MHz



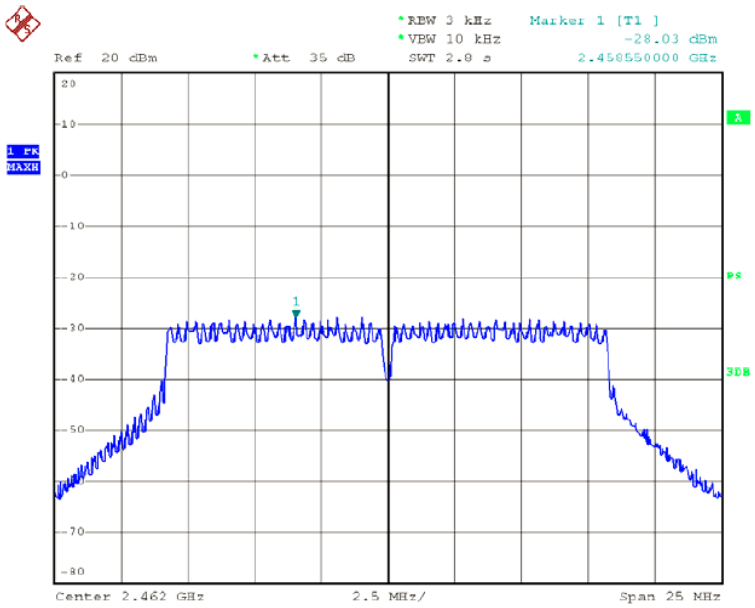
802.11g Channel Low 2412MHz



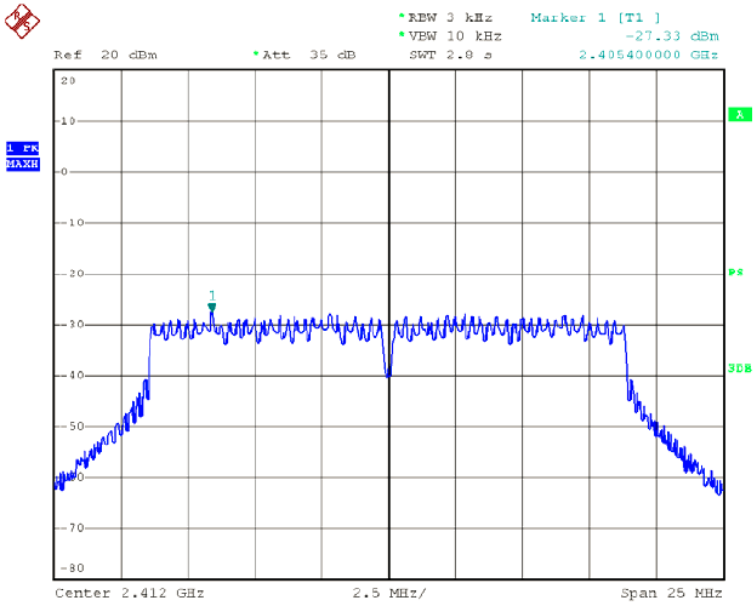
802.11g Channel Middle 2437MHz



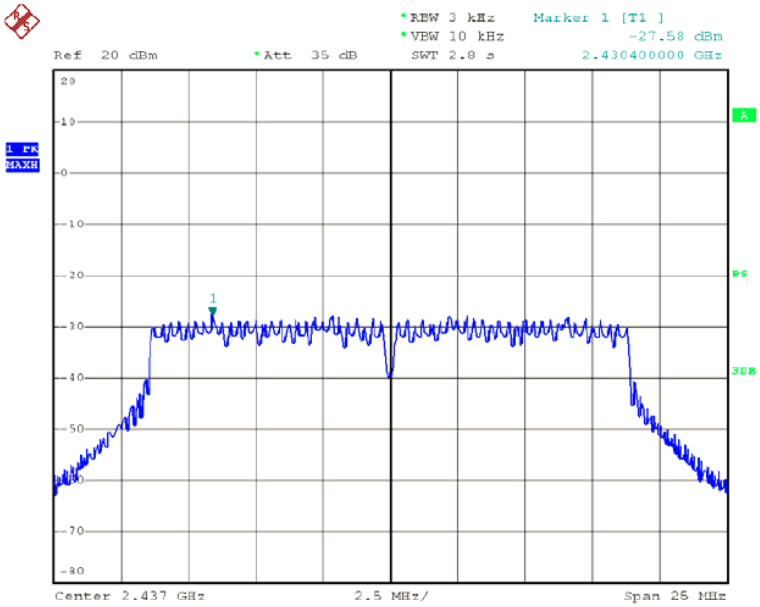
802.11g Channel High 2462MHz



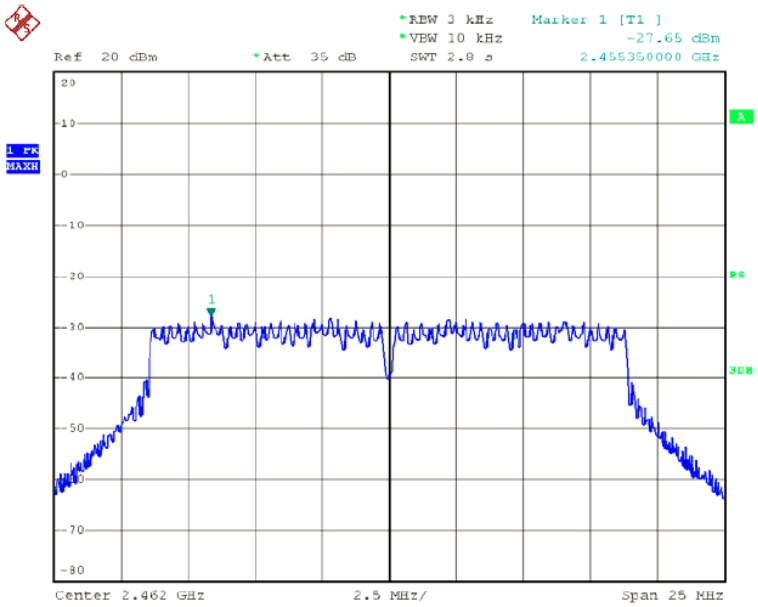
802.11n Channel Low 2412MHz



802.11n Channel High 2437MHz

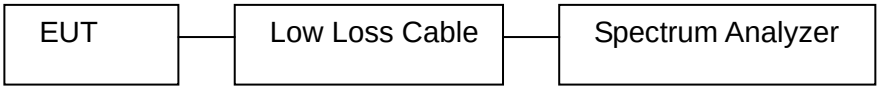


802.11n Channel High 2462MHz



6 BAND EDGE

6.1 Block Diagram of Test Setup



6.2 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).

6.3 Test Procedure

Conducted Band Edge:

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

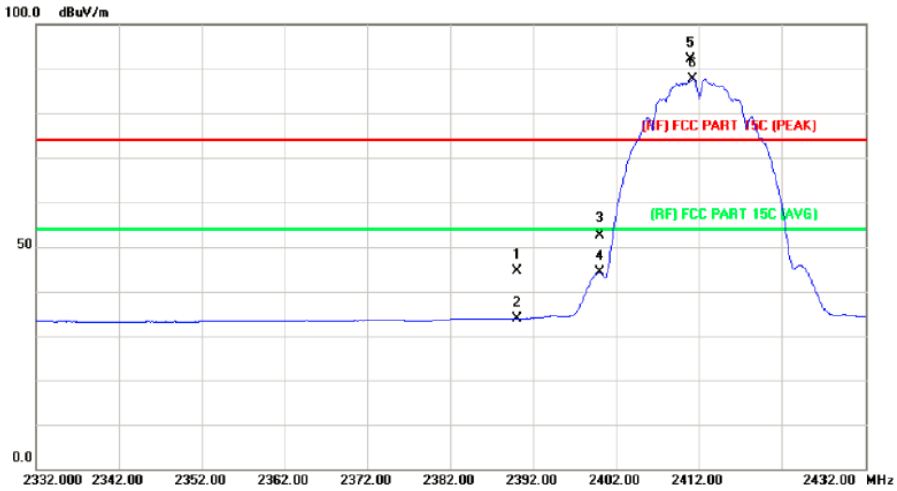
Radiate Band Edge:

a. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
b. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
c. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
d. 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
e. The band edges was measured and recorded.

6.4 Test Result

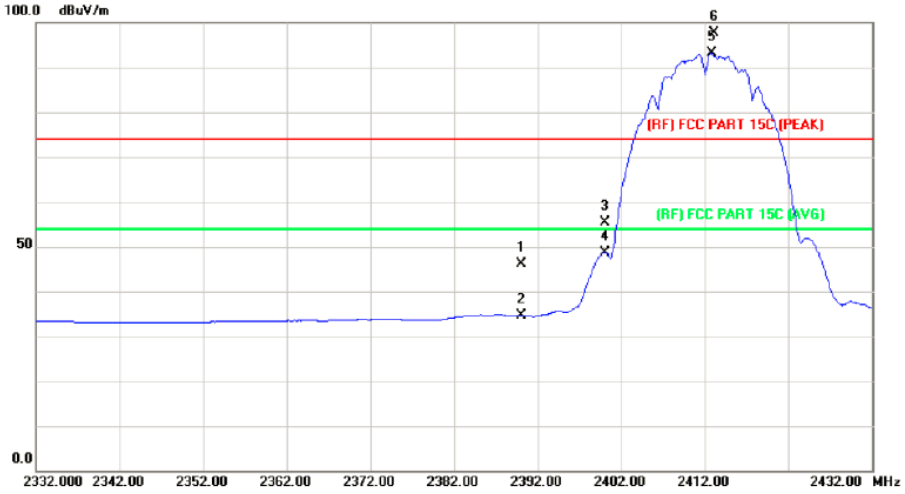
PASS

802.11b Channel Low 2412MHz
Horizontal



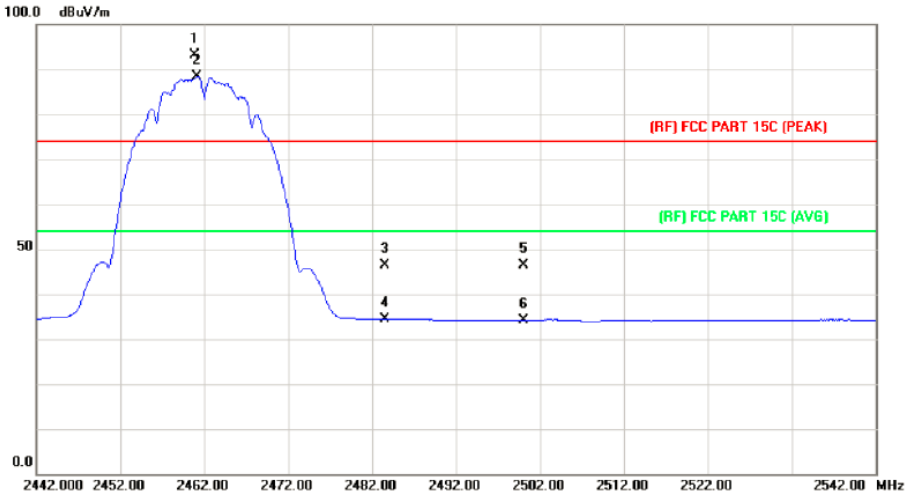
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	43.97	0.77	44.74	74.00	-29.26	peak
2		2390.000	33.18	0.77	33.95	54.00	-20.05	AVG
3		2400.000	51.90	0.81	52.71	74.00	-21.29	peak
4		2400.000	43.47	0.81	44.28	54.00	-9.72	AVG
5	X	2411.000	91.35	0.86	92.21	74.00	18.21	peak
6	*	2411.300	86.81	0.86	87.67	54.00	33.67	AVG

Vertical



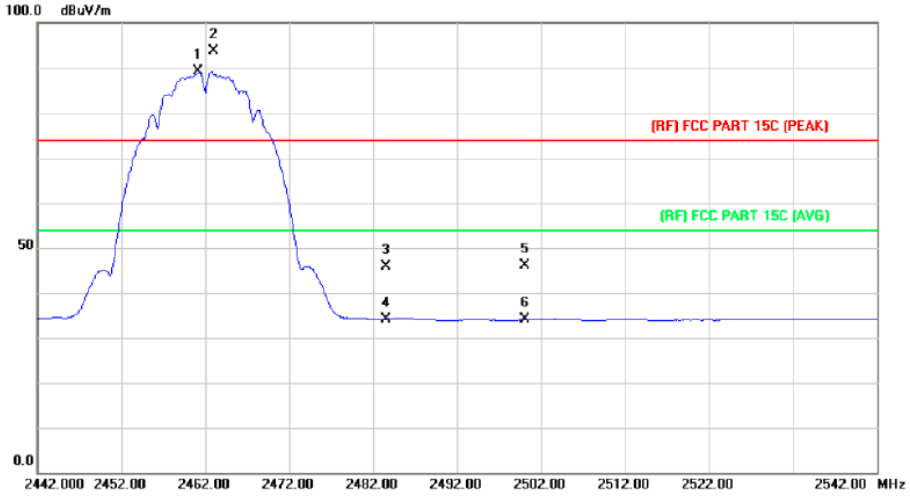
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	45.29	0.77	46.06	74.00	-27.94	peak
2		2390.000	33.78	0.77	34.55	54.00	-19.45	AVG
3		2400.000	54.53	0.81	55.34	74.00	-18.66	peak
4		2400.000	47.76	0.81	48.57	54.00	-5.43	AVG
5	*	2412.800	92.20	0.86	93.06	54.00	39.06	AVG
6	X	2413.200	96.82	0.86	97.68	74.00	23.68	peak

802.11b Channel High 2462MHz
Horizontal



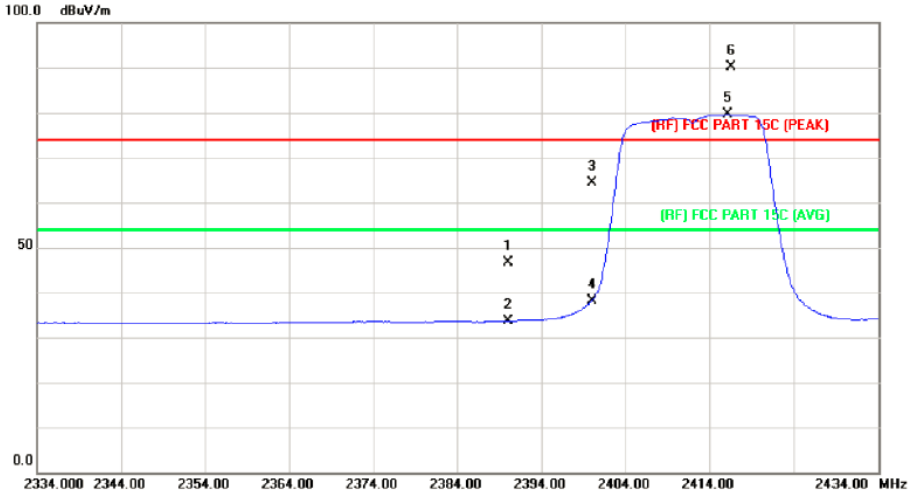
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2460.900	92.05	1.06	93.11	74.00	19.11	peak
2	*	2461.200	87.41	1.07	88.48	54.00	34.48	AVG
3		2483.500	45.21	1.17	46.38	74.00	-27.62	peak
4		2483.500	33.21	1.17	34.38	54.00	-19.62	AVG
5		2500.000	45.20	1.23	46.43	74.00	-27.57	peak
6		2500.000	32.92	1.23	34.15	54.00	-19.85	AVG

Vertical



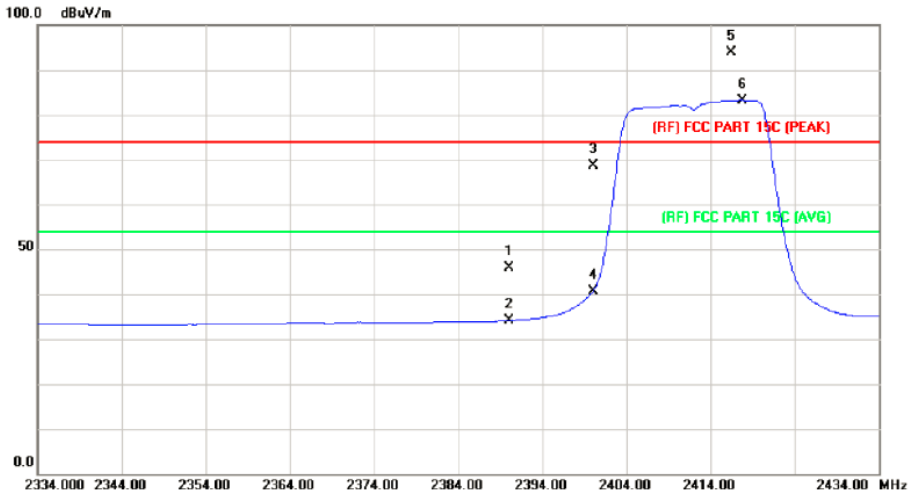
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2461.200	88.00	1.07	89.07	54.00	35.07	AVG
2	X	2463.000	92.62	1.08	93.70	74.00	19.70	peak
3		2483.500	44.68	1.17	45.85	74.00	-28.15	peak
4		2483.500	33.07	1.17	34.24	54.00	-19.76	AVG
5		2500.000	44.79	1.23	46.02	74.00	-27.98	peak
6		2500.000	32.81	1.23	34.04	54.00	-19.96	AVG

802.11g Channel Low 2412MHz
Horizontal



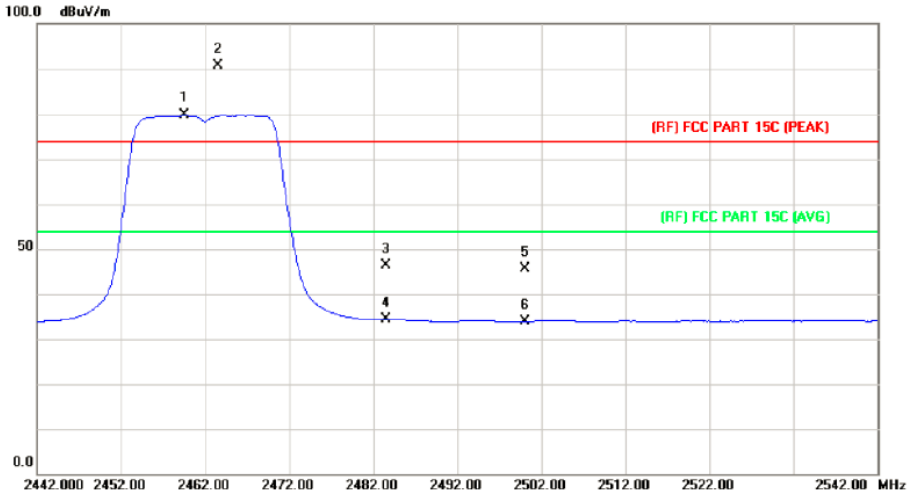
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	45.76	0.77	46.53	74.00	-27.47	peak
2		2390.000	32.92	0.77	33.69	54.00	-20.31	AVG
3		2400.000	63.45	0.81	64.26	74.00	-9.74	peak
4		2400.000	37.33	0.81	38.14	54.00	-15.86	AVG
5	*	2416.200	78.67	0.88	79.55	54.00	25.55	AVG
6	X	2416.600	89.31	0.88	90.19	74.00	16.19	peak

Vertical



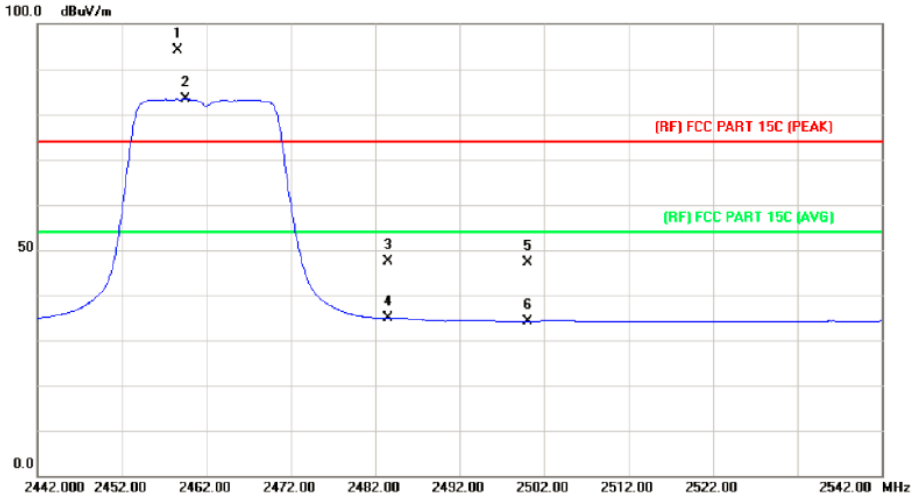
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	45.22	0.77	45.99	74.00	-28.01	peak
2		2390.000	33.41	0.77	34.18	54.00	-19.82	AVG
3		2400.000	67.79	0.81	68.60	74.00	-5.40	peak
4		2400.000	39.83	0.81	40.64	54.00	-13.36	AVG
5	X	2416.500	92.99	0.88	93.87	74.00	19.87	peak
6	*	2417.800	82.36	0.89	83.25	54.00	29.25	AVG

802.11g Channel High 2462MHz
Horizontal



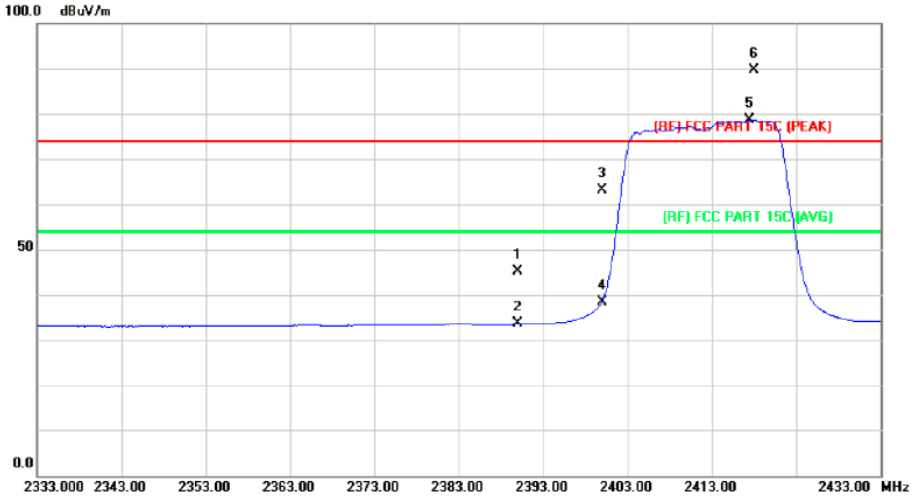
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2459.600	78.82	1.06	79.88	54.00	25.88	AVG
2	X	2463.600	89.52	1.08	90.60	74.00	16.60	peak
3		2483.500	45.31	1.17	46.48	74.00	-27.52	peak
4		2483.500	33.14	1.17	34.31	54.00	-19.69	AVG
5		2500.000	44.51	1.23	45.74	74.00	-28.26	peak
6		2500.000	32.71	1.23	33.94	54.00	-20.06	AVG

Vertical



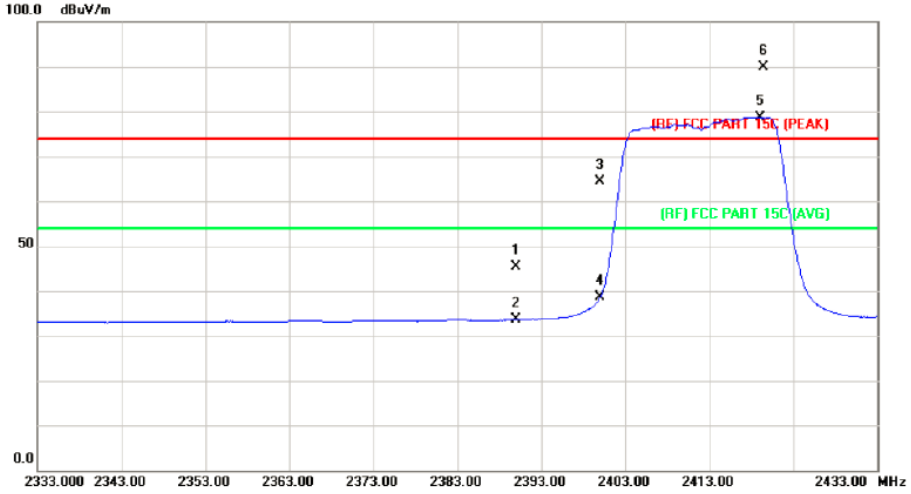
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2458.600	93.13	1.06	94.19	74.00	20.19	peak
2	*	2459.500	82.40	1.06	83.46	54.00	29.46	AVG
3		2483.500	46.09	1.17	47.26	74.00	-26.74	peak
4		2483.500	33.74	1.17	34.91	54.00	-19.09	AVG
5		2500.000	45.90	1.23	47.13	74.00	-26.87	peak
6		2500.000	32.90	1.23	34.13	54.00	-19.87	AVG

802.11n Channel Low 2412MHz
Horizontal



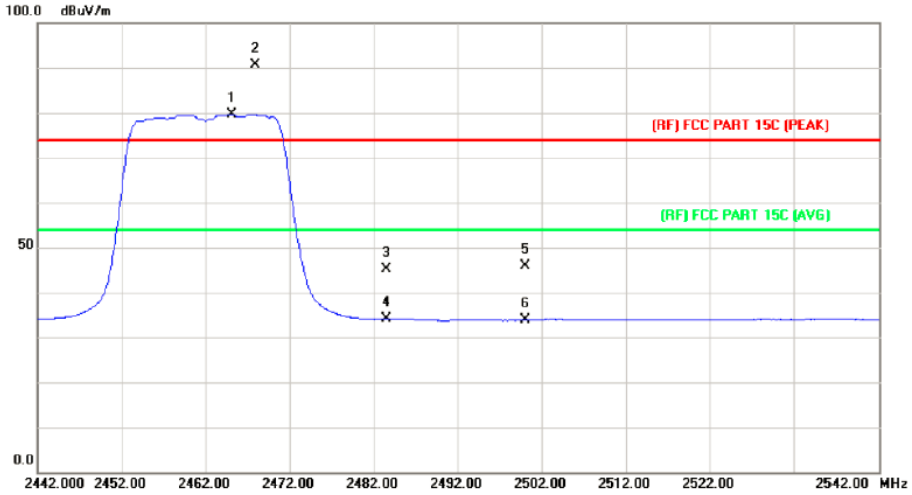
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.43	0.77	45.20	74.00	-28.80	peak
2		2390.000	32.75	0.77	33.52	54.00	-20.48	AVG
3		2400.000	62.41	0.81	63.22	74.00	-10.78	peak
4		2400.000	37.64	0.81	38.45	54.00	-15.55	AVG
5	*	2417.400	77.77	0.89	78.66	54.00	24.66	AVG
6	X	2418.000	88.75	0.89	89.64	74.00	15.64	peak

Vertical



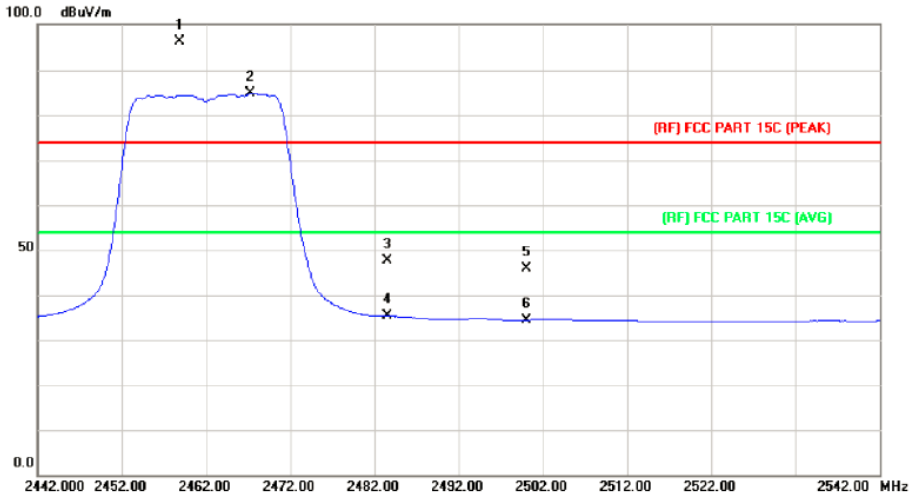
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.52	0.77	45.29	74.00	-28.71	peak
2		2390.000	32.82	0.77	33.59	54.00	-20.41	AVG
3		2400.000	63.56	0.81	64.37	74.00	-9.63	peak
4		2400.000	37.72	0.81	38.53	54.00	-15.47	AVG
5	*	2419.100	77.85	0.89	78.74	54.00	24.74	AVG
6	X	2419.400	88.89	0.89	89.78	74.00	15.78	peak

802.11n Channel High 2462MHz
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2465.100	78.63	1.09	79.72	54.00	25.72	AVG
2	X	2467.900	89.50	1.10	90.60	74.00	16.60	peak
3		2483.500	44.03	1.17	45.20	74.00	-28.80	peak
4		2483.500	32.91	1.17	34.08	54.00	-19.92	AVG
5		2500.000	44.61	1.23	45.84	74.00	-28.16	peak
6		2500.000	32.59	1.23	33.82	54.00	-20.18	AVG

Vertical

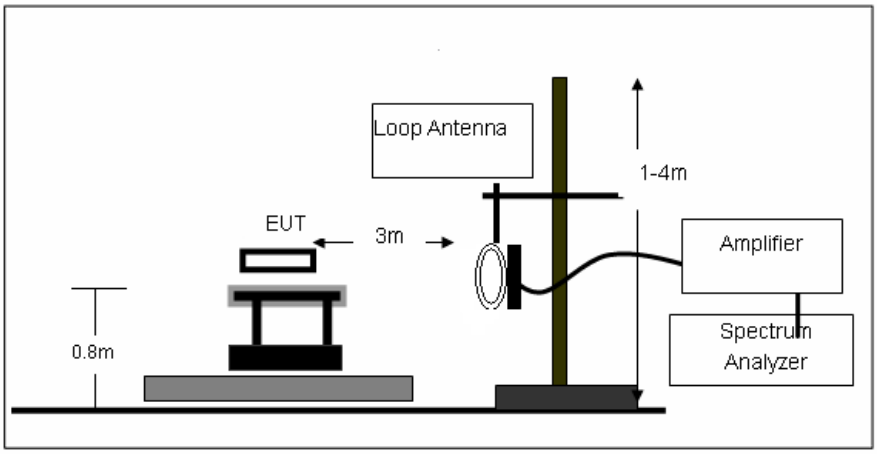


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2458.900	94.95	1.06	96.01	74.00	22.01	peak
2	*	2467.300	83.73	1.10	84.83	54.00	30.83	AVG
3		2483.500	46.48	1.17	47.65	74.00	-26.35	peak
4		2483.500	34.16	1.17	35.33	54.00	-18.67	AVG
5		2500.000	44.70	1.23	45.93	74.00	-28.07	peak
6		2500.000	33.22	1.23	34.45	54.00	-19.55	AVG

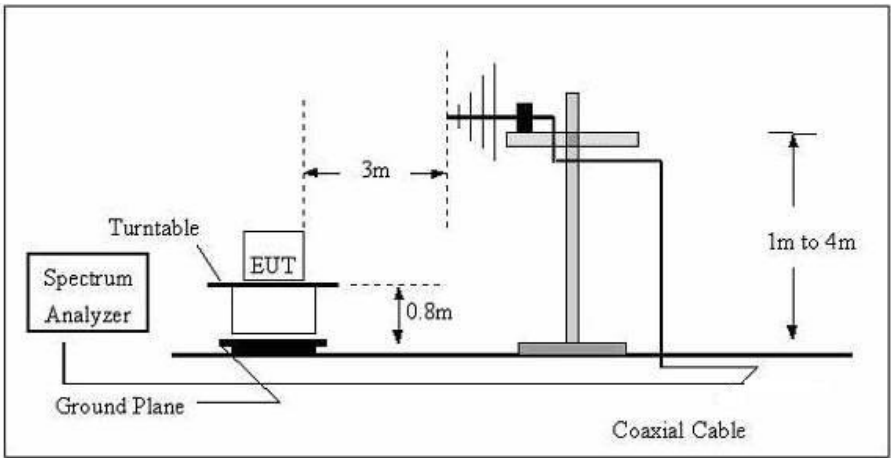
7 RADIATED SPURIOUS EMISSION

7.1 Block Diagram of Test Setup

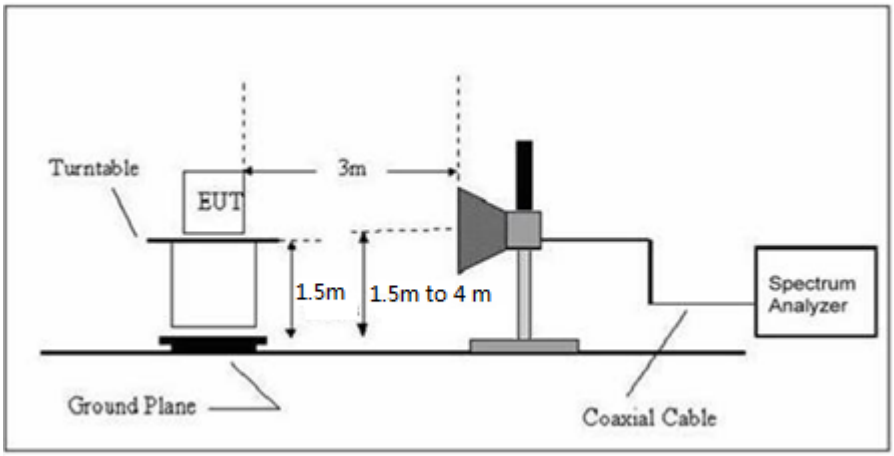
（1）Radiated Emission Test-Up Frequency Below 30MHz



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



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



7.2 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).

7.3 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			

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

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

7.4 Test Procedure

a. 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

7.5 Test Result

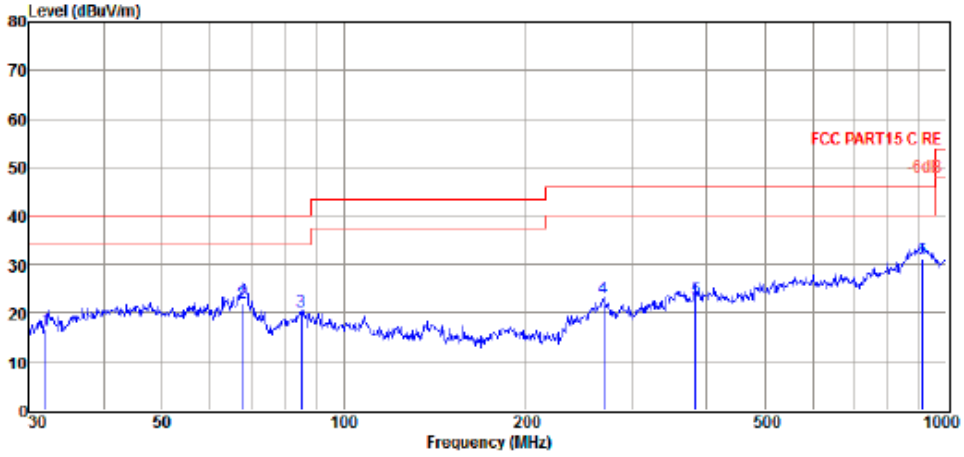
PASS

802.11b

For Below 30MHz

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

For 30MHz-1000MHz

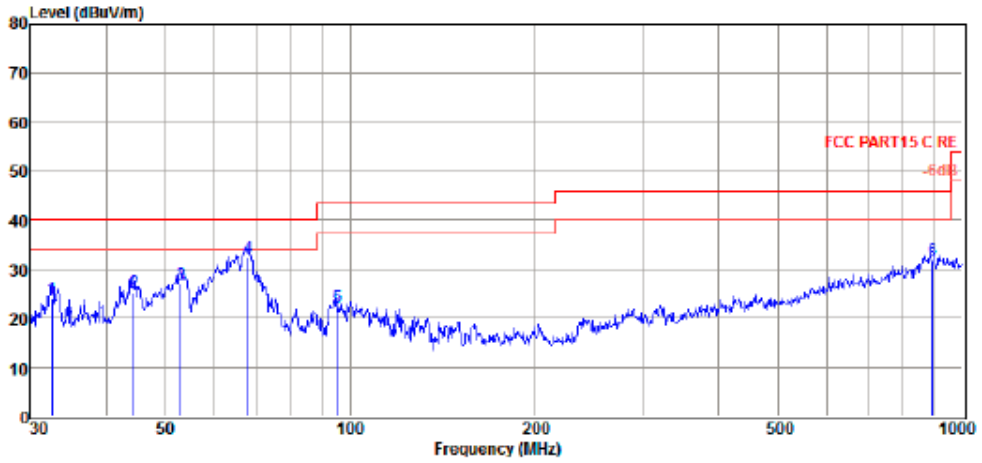


Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	32.07	3.71	11.95	0.92	16.58	40.00	-23.42	QP	HORIZONTAL
2	67.90	10.68	10.15	1.19	22.02	40.00	-17.98	QP	HORIZONTAL
3	85.00	8.78	10.20	1.40	20.38	40.00	-19.62	QP	HORIZONTAL
4	269.43	7.07	13.40	2.59	23.06	46.00	-22.94	QP	HORIZONTAL
5	383.93	4.14	15.58	3.18	22.90	46.00	-23.10	QP	HORIZONTAL
6	912.07	4.05	22.03	4.97	31.05	46.00	-14.95	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	32.63	10.93	11.95	0.93	23.81	40.00	-16.19	QP	VERTICAL
2	44.28	9.42	14.90	1.03	25.35	40.00	-14.65	QP	VERTICAL
3	52.95	11.56	14.20	1.09	26.85	40.00	-13.15	QP	VERTICAL
4	68.15	21.06	10.15	1.19	32.40	40.00	-7.60	QP	VERTICAL
5	95.09	8.68	12.00	1.46	22.14	43.50	-21.36	QP	VERTICAL
6	893.86	4.86	22.03	4.95	31.84	46.00	-14.16	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

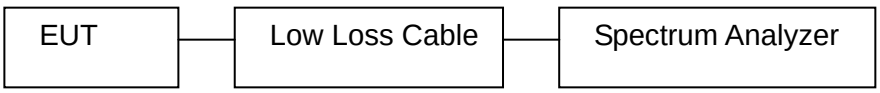
For 1GHz-25GHz

Freq (MHz)	Read level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit (dBμ V/m)	Margin (dB)	Detector type	Polarization
11b CH1									
4824.00	32.22	35.42	29.13	8.09	46.60	74.00	-27.40	Peak	HORIZONTAL
7402.00	34.02	37.35	30.03	10.04	51.38	74.00	-22.62	Peak	HORIZONTAL
13338.00	33.75	40.01	35.36	12.92	51.32	74.00	-22.68	Peak	HORIZONTAL
16502.00	35.52	43.70	36.65	13.77	56.34	74.00	-17.66	Peak	HORIZONTAL
16502.00	20.39	43.70	36.65	13.77	41.21	54.00	-12.79	Average	HORIZONTAL
4824.00	33.38	35.42	29.13	8.09	47.76	74.00	-26.24	Peak	VERTICAL
7318.00	33.79	37.30	29.88	9.99	51.20	74.00	-22.80	Peak	VERTICAL
10412.00	33.52	38.57	33.66	11.26	49.69	74.00	-24.31	Peak	VERTICAL
16292.00	35.07	43.46	36.56	13.73	55.70	74.00	-18.30	Peak	VERTICAL
16292.00	20.70	43.46	36.56	13.73	41.33	54.00	-12.67	Average	VERTICAL
11b CH6									
4874.00	32.62	35.51	29.08	8.14	47.19	74.00	-26.81	Peak	HORIZONTAL
6940.00	35.22	36.98	29.41	9.82	52.61	74.00	-21.39	Peak	HORIZONTAL
11028.00	33.48	38.90	34.08	11.75	50.05	74.00	-23.95	Peak	HORIZONTAL
15732.00	35.51	42.27	36.39	13.65	55.04	74.00	-18.96	Peak	HORIZONTAL
15732.00	21.11	42.27	36.39	13.65	40.64	54.00	-13.36	Average	HORIZONTAL
4874.00	36.47	35.51	29.08	8.14	51.04	74.00	-22.96	Peak	VERTICAL
5218.00	37.03	35.53	29.04	8.30	51.82	74.00	-22.18	Peak	VERTICAL
7178.00	34.11	37.20	29.62	9.92	51.61	74.00	-22.39	Peak	VERTICAL
16572.00	34.19	43.69	36.69	13.78	54.97	74.00	-19.03	Peak	VERTICAL
16572.00	20.49	43.69	36.69	13.78	41.27	54.00	-12.73	Average	VERTICAL
11b CH11									
4924.00	31.94	35.59	29.06	8.16	46.63	74.00	-27.37	Peak	HORIZONTAL
6940.00	33.86	36.98	29.41	9.82	51.25	74.00	-22.75	Peak	HORIZONTAL
11238.00	33.93	38.90	34.24	11.93	50.52	74.00	-23.48	Peak	HORIZONTAL
14668.00	35.55	41.83	35.84	13.34	54.88	74.00	-19.12	Peak	HORIZONTAL
14668.00	21.00	41.83	35.84	13.34	40.33	54.00	-13.67	Average	HORIZONTAL
4924.00	37.76	35.59	29.06	8.16	52.45	74.00	-21.55	Peak	VERTICAL
5162.00	38.06	35.57	29.04	8.28	52.87	74.00	-21.13	Peak	VERTICAL
6912.00	34.75	36.94	29.41	9.80	52.08	74.00	-21.92	Peak	VERTICAL
16418.00	34.85	43.60	36.62	13.75	55.58	74.00	-18.42	Peak	VERTICAL
16418.00	21.71	43.60	36.62	13.75	42.44	54.00	-11.56	Average	VERTICAL

Note: 1.30MHz~18GHz: (Scan with 11b, 11g, 11n HT20, the worst case is 11b Mode)
2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

8 CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

8.1 Block Diagram of Test Setup



8.2 Limits

Se 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

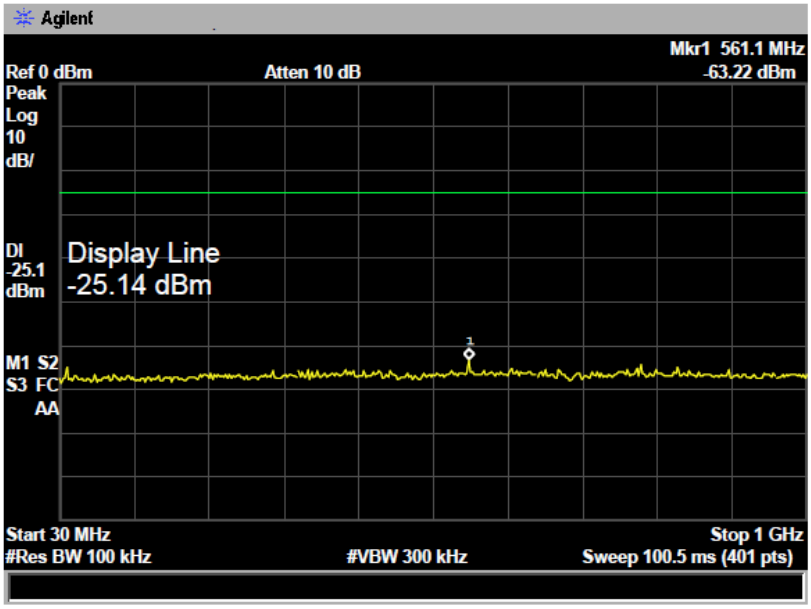
a. The transmitter output was connected to the spectrum analyzer via a low loss cable.
b. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.
c. The Conducted Spurious Emission was measured and recorded.

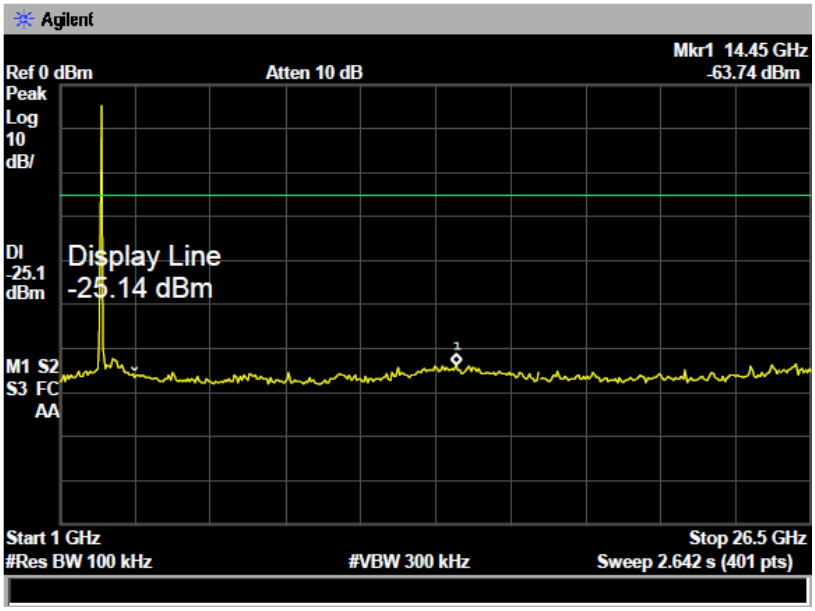
8.4 Test Result

PASS

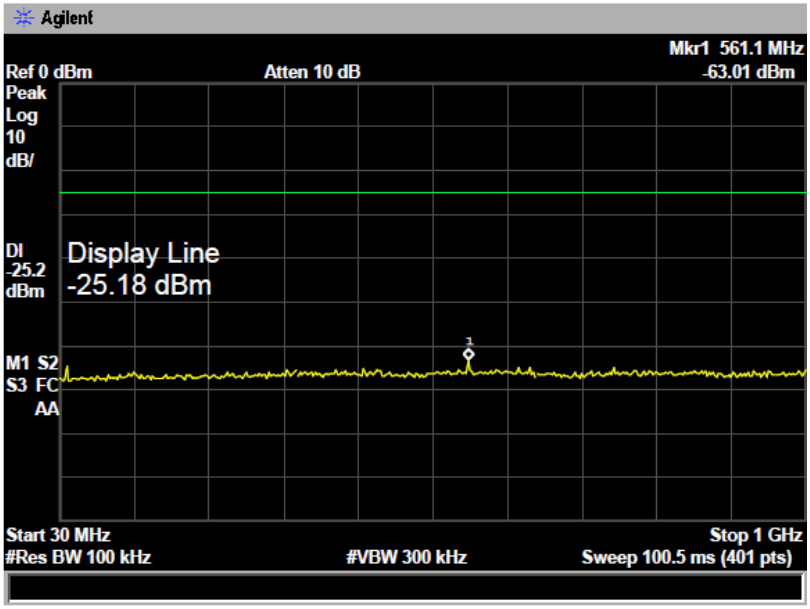
The spectrum analyzer plots are attached as below.

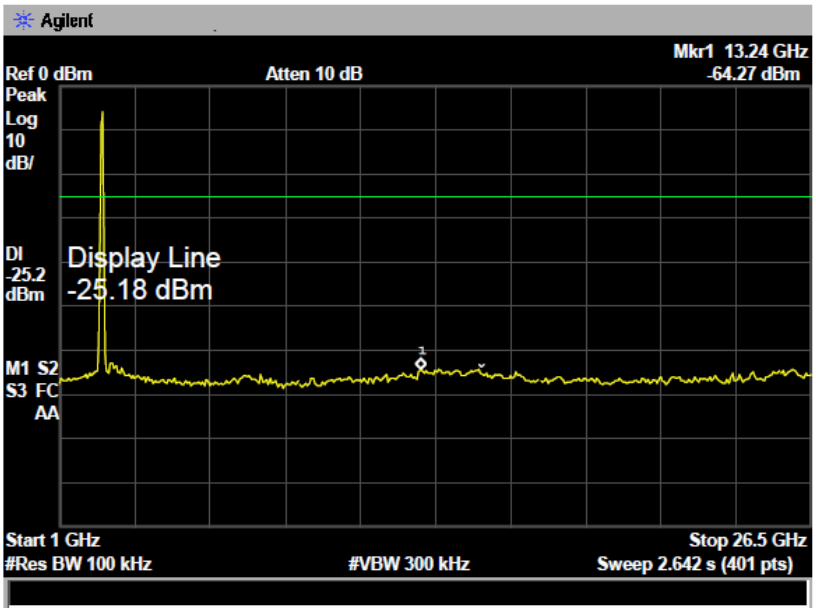
TX 802.11b Channel Low 2412MHz



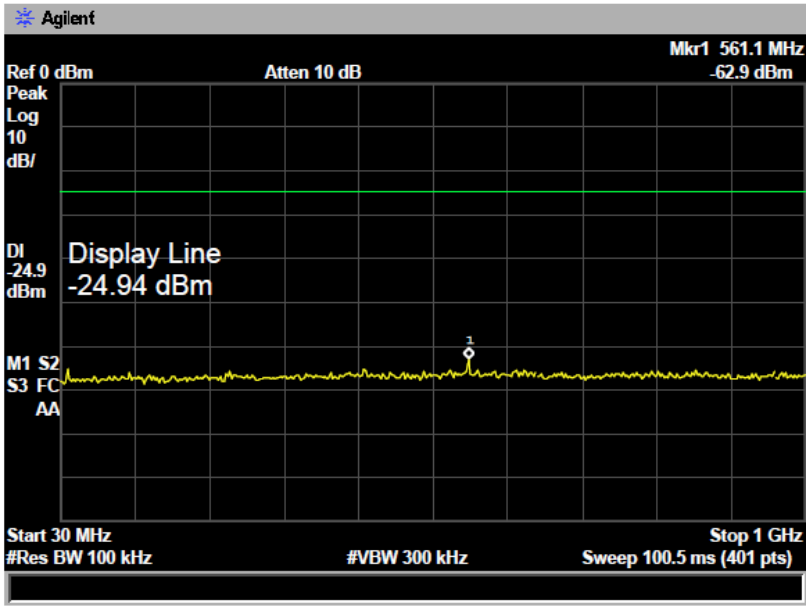


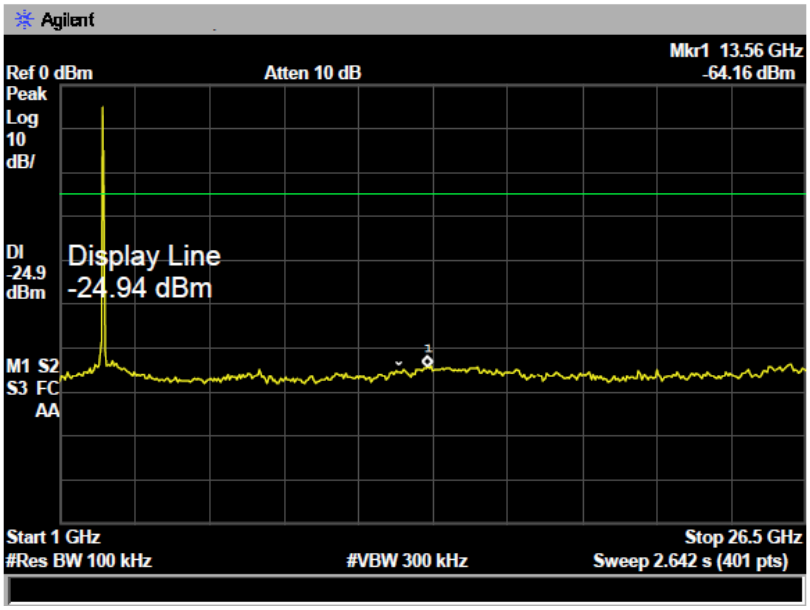
TX 802.11b Channel Middle 2437MHz



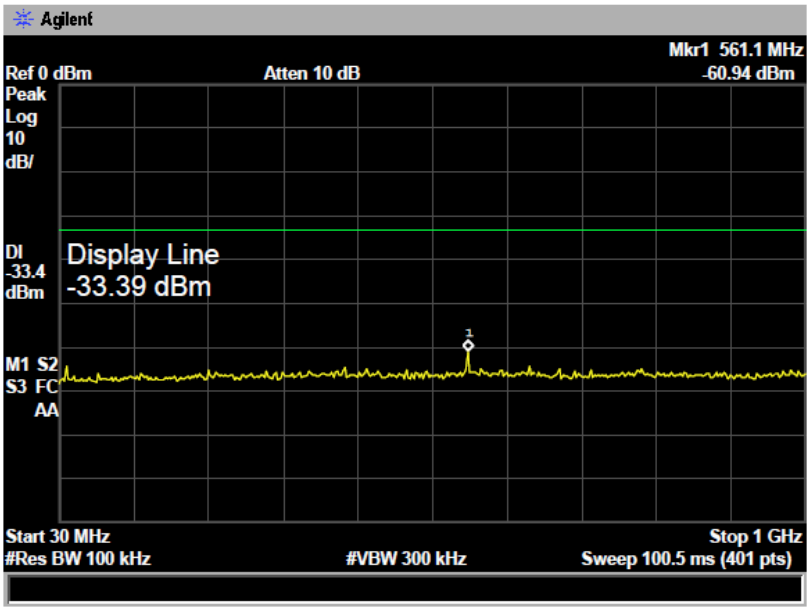


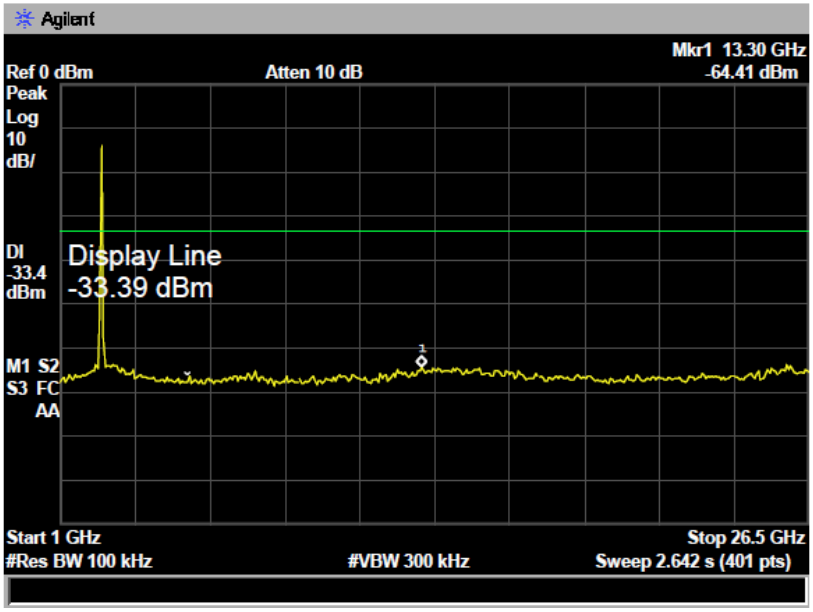
TX 802.11b Channel High 2462MHz



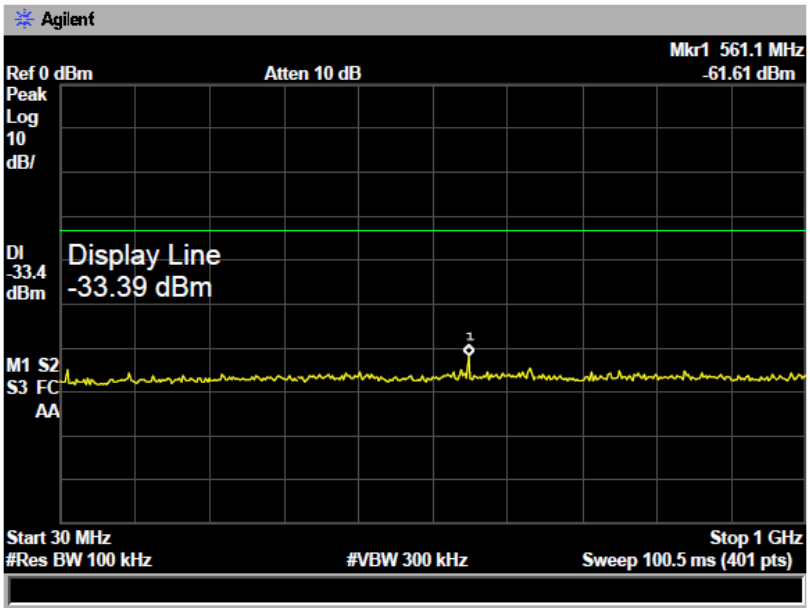


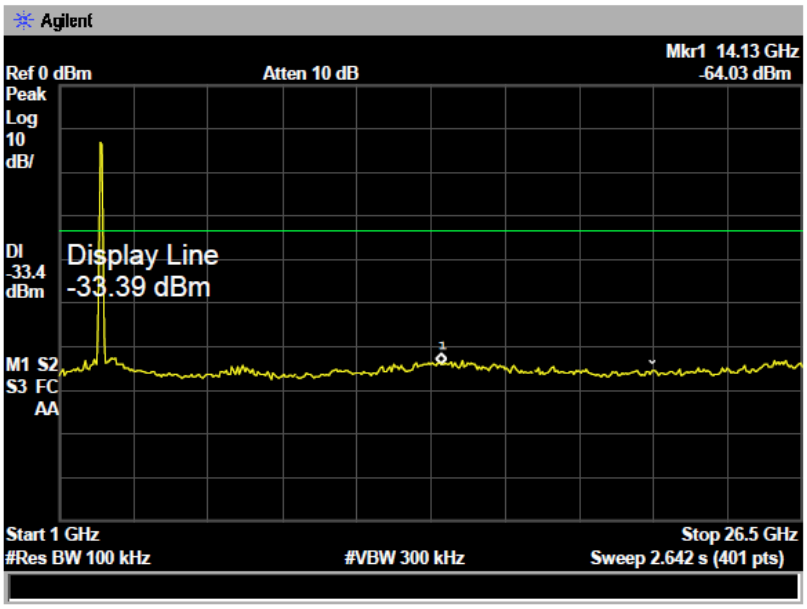
TX 802.11g Channel Low 2412MHz



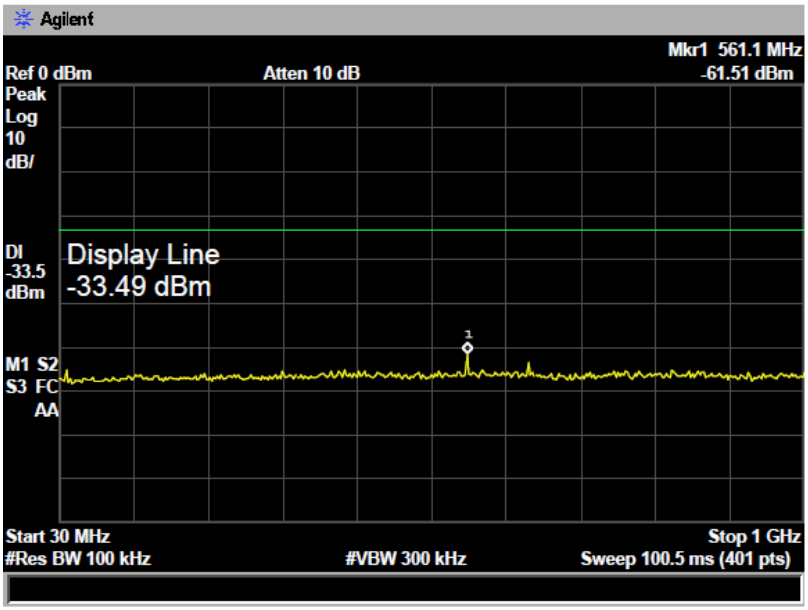


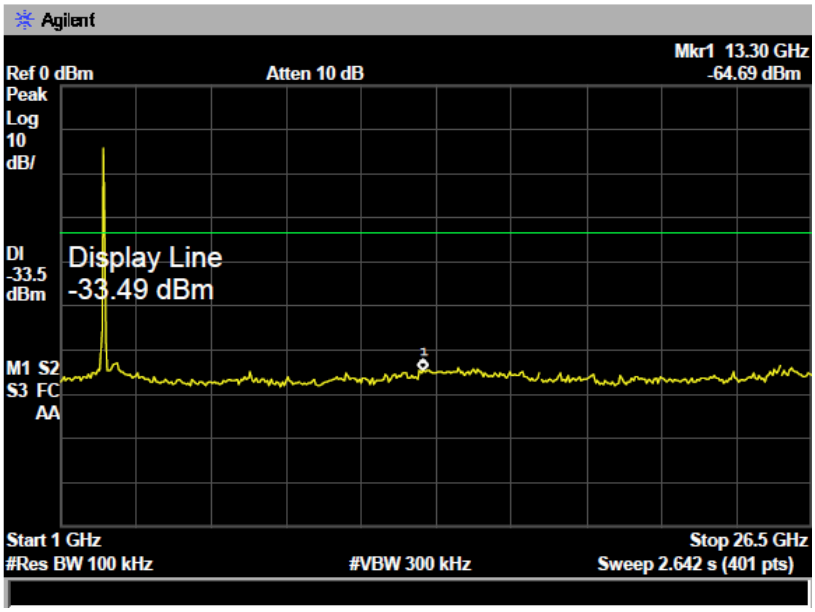
TX 802.11g Channel Middle 2437MHz



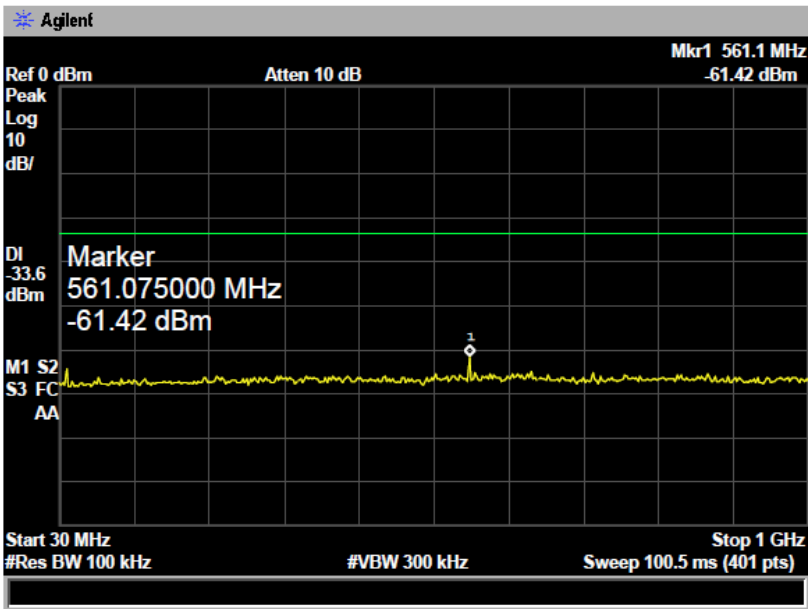


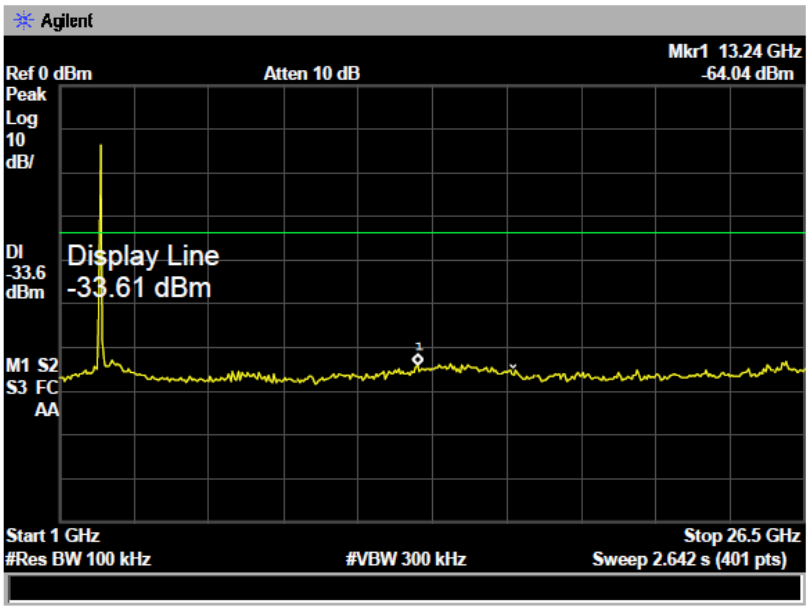
TX 802.11g Channel High 2462MHz



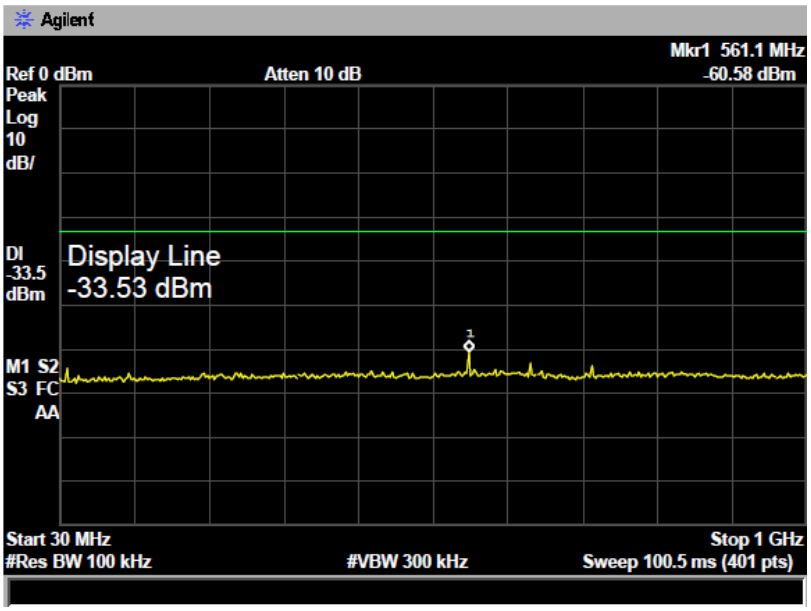


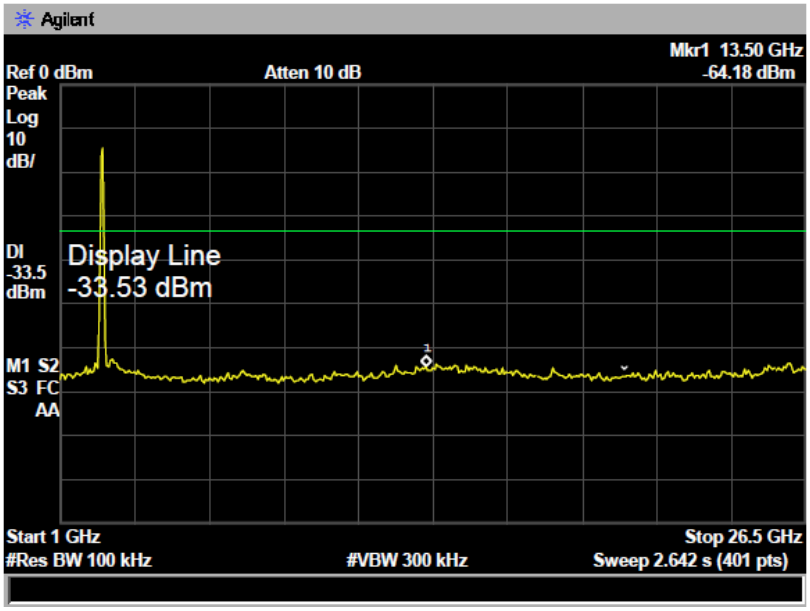
TX 802.11n Channel Low 2412MHz



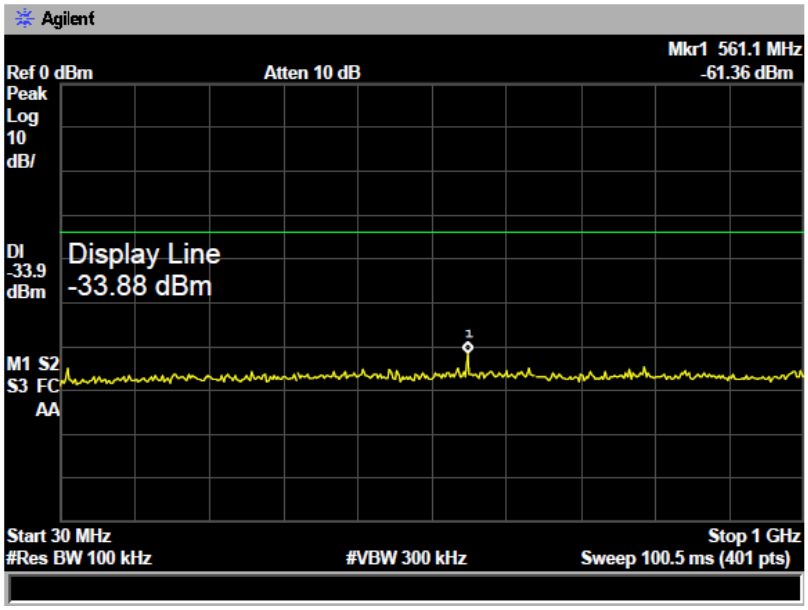


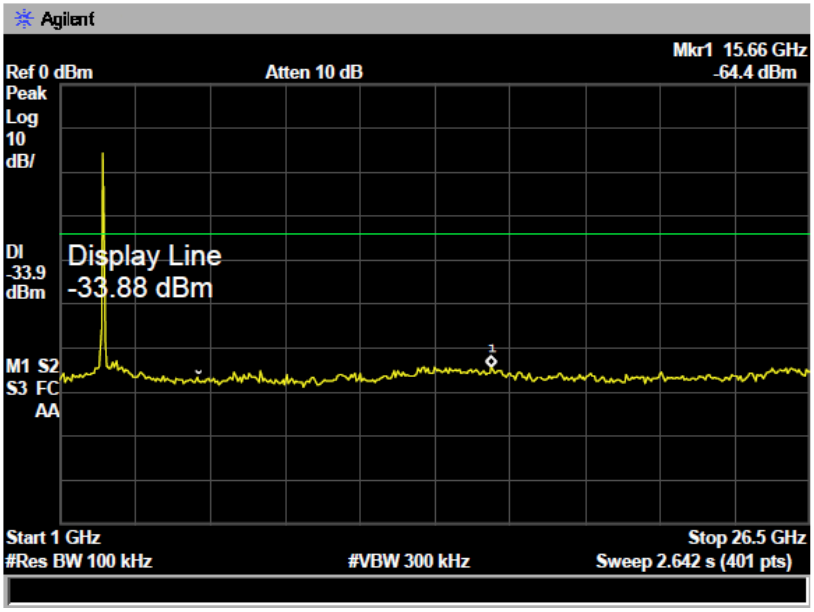
TX 802.11n Channel Middle 2437MHz





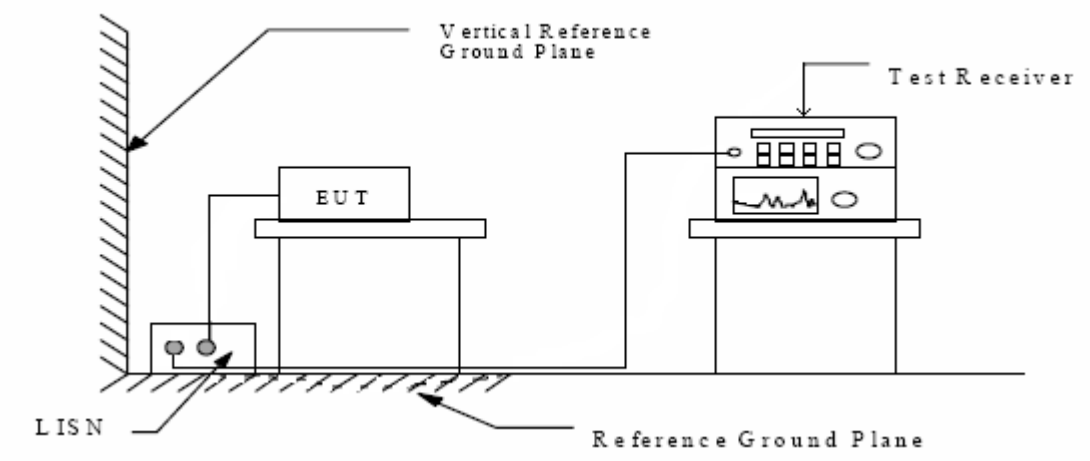
TX 802.11n Channel High 2462MHz (20MHz)





9 AC POWER LINE CONDUCTED EMISSION FOR PART 15 SECTION15.207(A)

9.1 Block Diagram of Test Setup



9.2 Limits

Conducted Emission Measurement Limits According to Section 15.207(a)

Frequency MHz	Limits (dBμV)	
	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.

9.3 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.

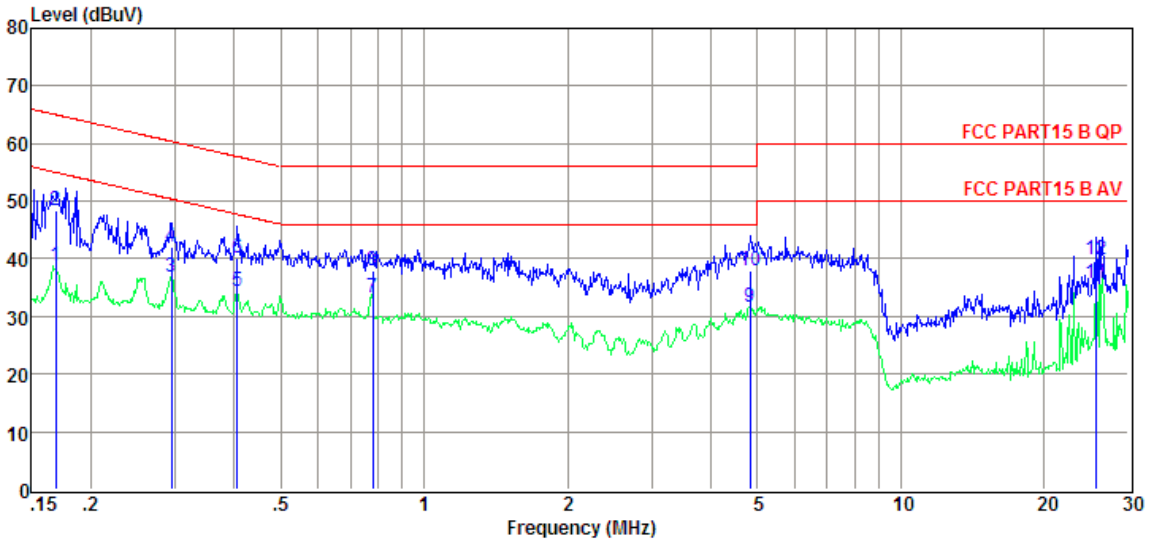
The bandwidth of test receiver (R & S ESPI) is set at 9kHz.

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

9.4 Test Result

Pass

The plots are attached as below.

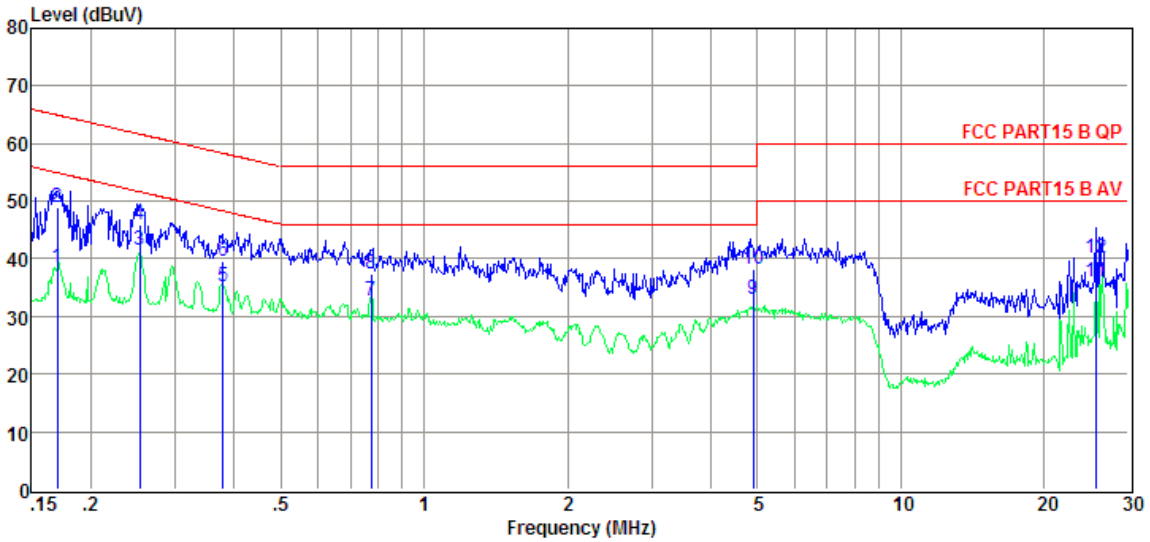


Item	Freq	Read Level	LISN Factor	Cable Loss	Pulse Limiter Factor	Result Level	Limit Line	Over Limit	Detector	Phase
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)		
1	0.17	19.23	9.60	0.01	9.84	38.68	55.03	-16.35	Average	NEUTRAL
2	0.17	29.02	9.60	0.01	9.84	48.47	65.03	-16.56	QP	NEUTRAL
3	0.30	17.27	9.60	0.02	9.85	36.74	50.37	-13.63	Average	NEUTRAL
4	0.30	22.58	9.60	0.02	9.85	42.05	60.37	-18.32	QP	NEUTRAL
5	0.41	14.79	9.61	0.03	9.86	34.29	47.73	-13.44	Average	NEUTRAL
6	0.41	20.57	9.61	0.03	9.86	40.07	57.73	-17.66	QP	NEUTRAL
7	0.78	13.69	9.61	0.08	9.86	33.24	46.00	-12.76	Average	NEUTRAL
8	0.78	18.35	9.61	0.08	9.86	37.90	56.00	-18.10	QP	NEUTRAL
9	4.82	11.92	9.62	0.11	9.88	31.53	46.00	-14.47	Average	NEUTRAL
10	4.82	18.40	9.62	0.11	9.88	38.01	56.00	-17.99	QP	NEUTRAL
11	25.69	15.61	10.02	0.17	9.97	35.77	50.00	-14.23	Average	NEUTRAL
12	25.69	19.70	10.02	0.17	9.97	39.86	60.00	-20.14	QP	NEUTRAL

Note: 1. Result Level = Read Level +LISN Factor + Pulse Limiter Factor + Cable loss.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.



Item (Mark)	Freq (MHz)	Read Level (dBµV)	LISN Factor (dB)	Cable Loss (dB)	Pulse Limiter Factor (dB)	Result Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Detector	Phase
1	0.17	19.03	9.61	0.01	9.84	38.49	54.94	-16.45	Average	LINE
2	0.17	29.36	9.61	0.01	9.84	48.82	64.94	-16.12	QP	LINE
3	0.25	22.13	9.62	0.02	9.85	41.62	51.64	-10.02	Average	LINE
4	0.25	26.46	9.62	0.02	9.85	45.95	61.64	-15.69	QP	LINE
5	0.38	15.67	9.63	0.02	9.86	35.18	48.30	-13.12	Average	LINE
6	0.38	20.05	9.63	0.02	9.86	39.56	58.30	-18.74	QP	LINE
7	0.78	13.22	9.62	0.08	9.86	32.78	46.00	-13.22	Average	LINE
8	0.78	17.85	9.62	0.08	9.86	37.41	56.00	-18.59	QP	LINE
9	4.90	13.33	9.68	0.11	9.88	33.00	46.00	-13.00	Average	LINE
10	4.90	18.50	9.68	0.11	9.88	38.17	56.00	-17.83	QP	LINE
11	25.69	15.91	9.98	0.17	9.97	36.03	50.00	-13.97	Average	LINE
12	25.69	20.09	9.98	0.17	9.97	40.21	60.00	-19.79	QP	LINE

Note: 1. Result Level = Read Level +LISN Factor + Pulse Limiter Factor + Cable loss.

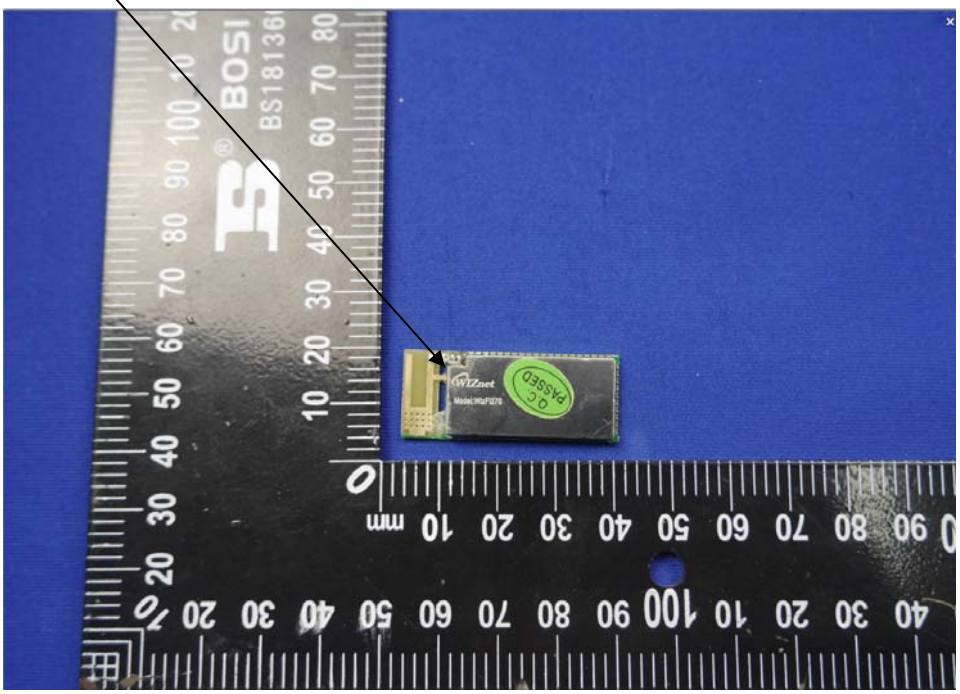
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

10 ANTENNA REQUIREMENT

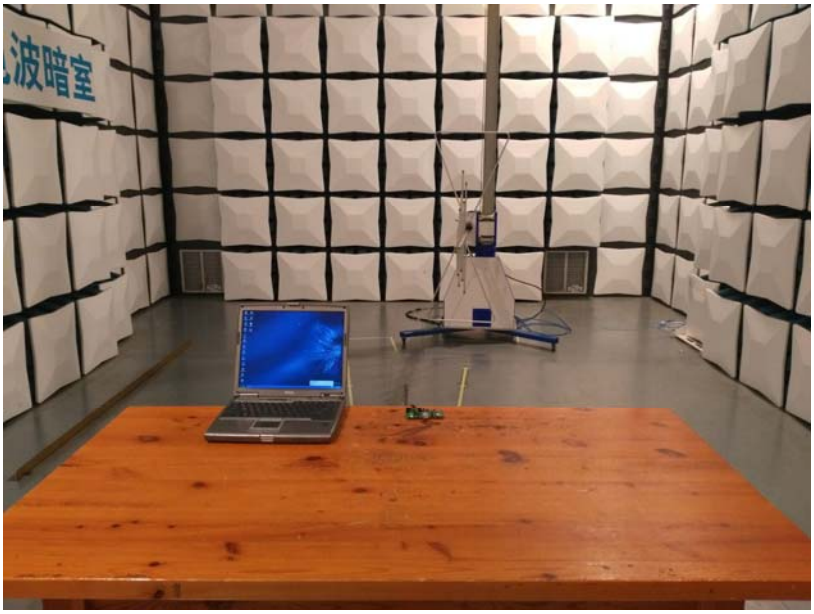
According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna is fixed by enclosure, can not be changed except take apart the product.

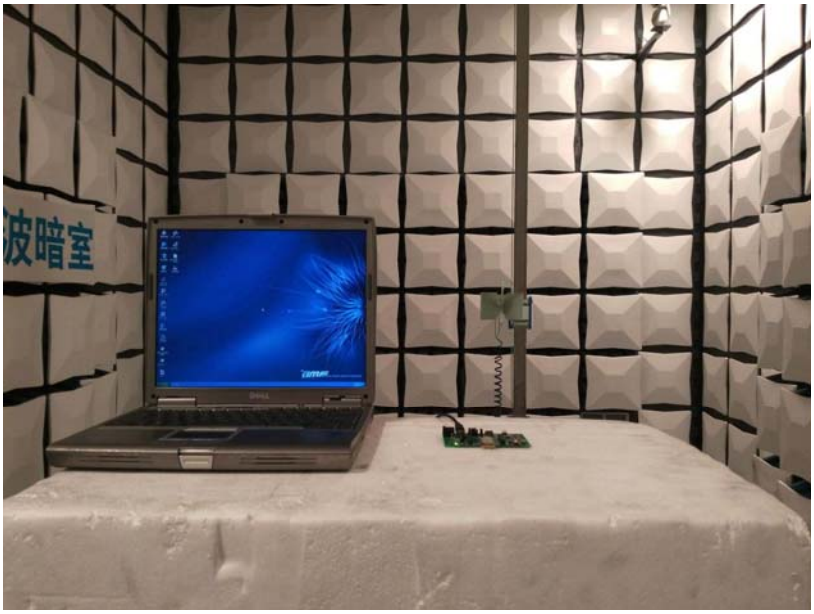
Antenna



11 PHOTOGRAPH OF TEST

11.1 Radiated Emission





11.2 AC Power Line Conducted Emission