FCC TEST REPORT

Test report
On Behalf of
Shenzhen Teslong Technology Limited
For
WIFI Endoscope Camera
Model No.: WF200, WF200SL

FCC ID: 2AHTO-WF200

Prepared for :	**Shenzhen Teslong Technology Limited** **Room 201, Block D, BaiFuHui Industrial Park, Jianshe Road, Longhua, Shenzhen**
Prepared By :	**WST Certification & Testing (HK) Limited** **12/F., San Toi Building,137-139 Connaught Road Central,HongKong**
Date of Test:	**Mar. 13, 2016 ~ Mar. 23, 2016**
Date of Report:	**Mar. 24, 2016**
Report Number:	**WST160323023-E**

TEST RESULT CERTIFICATION

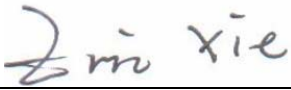
Applicant's name	Shenzhen Teslong Technology Limited
Address	Room 201, Block D, BaiFuHui Industrial Park, Jianshe Road, Longhua, Shenzhen
Manufacture's Name.....	Shenzhen Teslong Technology Limited
Address	Room 201, Block D, BaiFuHui Industrial Park, Jianshe Road, Longhua, Shenzhen
Product description	
Trade Mark:	/
Product name	WIFI Endoscope Camera
Model and/or type reference	WF200, WF200SL
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 ..... **Mar. 13, 2016 ~ Mar. 23, 2016**

Date of Issue..... **Mar. 24, 2016**

Test Result..... **Pass**

Testing Engineer **:** 

(Eric Xie)

Technical Manager **:** 

(Dora Qin)

Authorized Signatory **:** 

(Kait Chen)

Table of Contents **Page**

Table of Contents **Page**

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 Endoscope Camera
Model Name	WF200, WF200SL
Serial No	/
FCC ID	2AHTO-WF200
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different.Test sample model: WF200
Modulation Type	WIFI:DBPSK,DQPSK,CCK,BPSK,
Antenna Type	Internal Antenna
Antenna Gain	0dBi
WLA Operation frequency	802.11b: 2412-2462MHz 802.11g: 2412-2462MHz 802.11n HT20: 2412-2462MHz 802.11n HT40: 2422-2452MHz
Number of Channels	802.11b/g/n (HT20):11 802.11n (HT40): 7
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 150Mbps
Modulation Type	CCK, OFDM
Power Source	DC Voltage
Power Rating	DC 6V with battery
Adapter Model	/

2.2. Carrier frequency of channels

Channel List for 802.11b/g/n(20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

Channel List for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	06	2437	09	2452		
04	2427	07	2442				
05	2432	08	2447				

2.3. 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

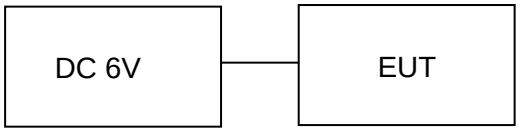
802.11n (HT20) Transmitting mode

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

802.11n (HT40) Transmitting mode

Low Channel: 2422MHz
Middle Channel: 2437MHz
High Channel: 2452MHz

2.4. Description of test setup



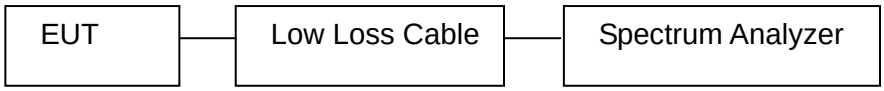
2.5. Measurement instruments list

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~150MHz	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, WF200	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	AWF200080	SEL0073	N/A	N/A
53.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
54.	High Gain Horn Antenna(0.8-5GHz)	Amplifier Reasearch	AT4002A	SEL0075	N/A	N/A

3.. 6DB BANDWIDTH MEASUREMENT

3.1. Block diagram of test setup



3.2. Limit

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. Block diagram of test setup

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	10.108	>0.5MHz
Middle	2437	10.110	>0.5MHz
High	2462	10.109	>0.5MHz

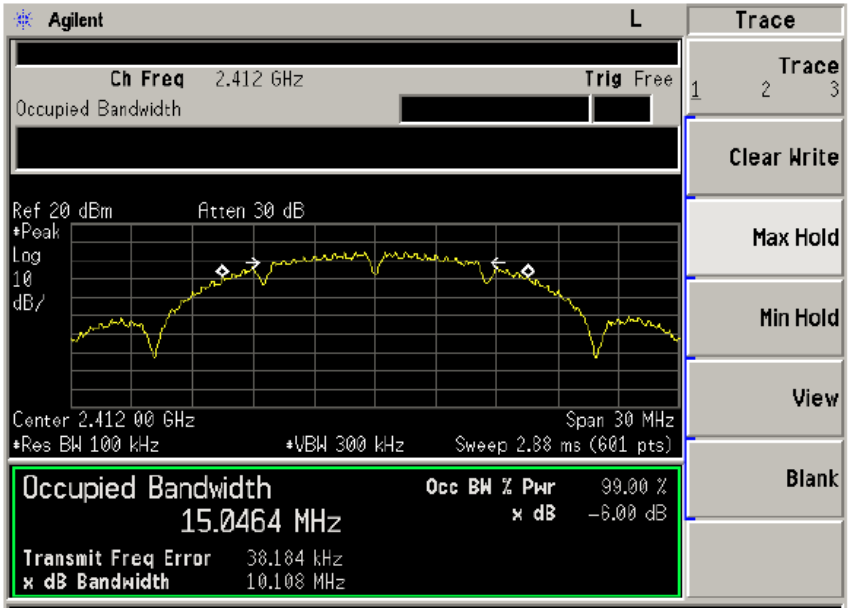
802.11g			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2412	16.619	>0.5MHz
Middle	2437	16.629	>0.5MHz
High	2462	16.627	>0.5MHz

802.11n (HT20)			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2412	17.871	>0.5MHz
Middle	2437	17.842	>0.5MHz
High	2462	17.846	>0.5MHz

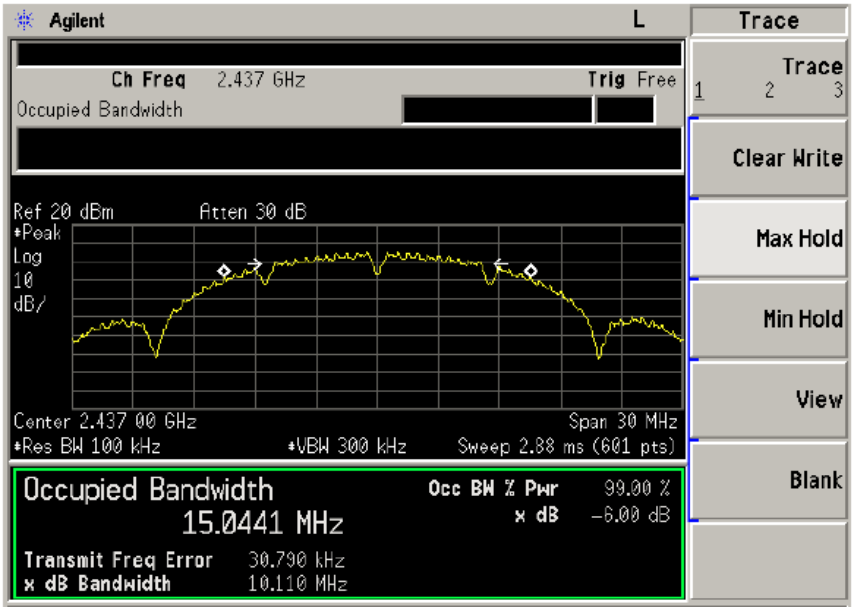
802.11n (HT40)			
Channel	**Frequency (MHz)**	**6DB Bandwidth(MHz)**	**Limit(MHz)**
Low	2422	36.550	>0.5MHz
Middle	2437	36.552	>0.5MHz
High	2452	36.536	>0.5MHz

The spectrum analyzer plots are attached as below.

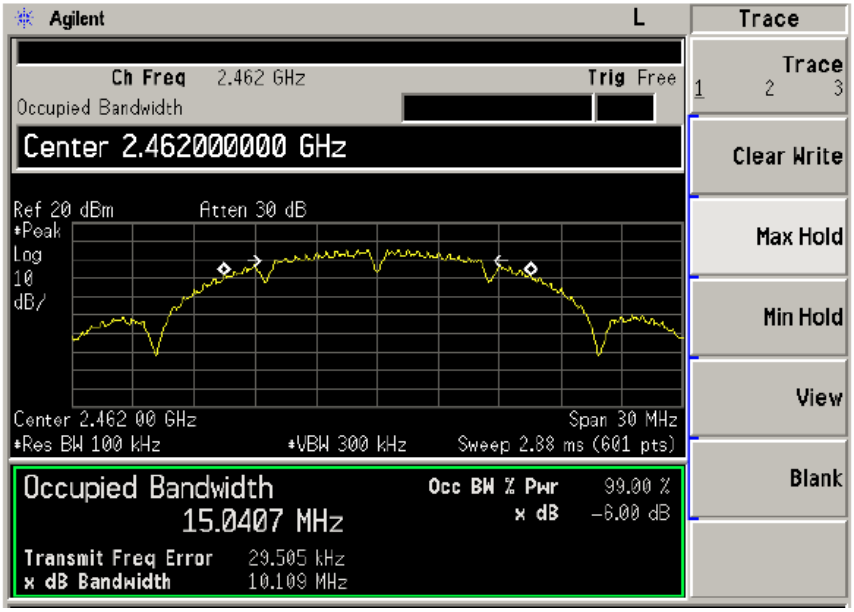
802.11b Channel Low 2412MHz



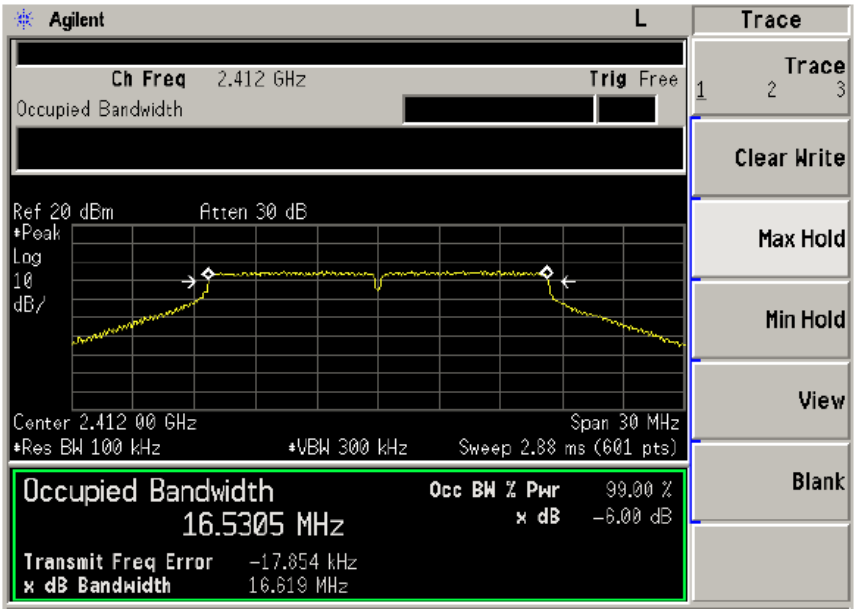
802.11b Channel Middle 2437MHz



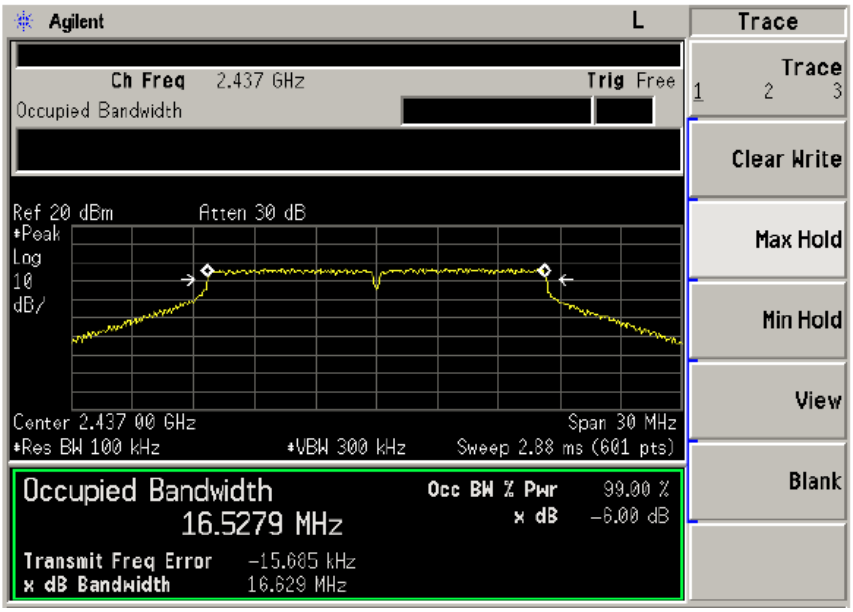
802.11b Channel High 2462MHz



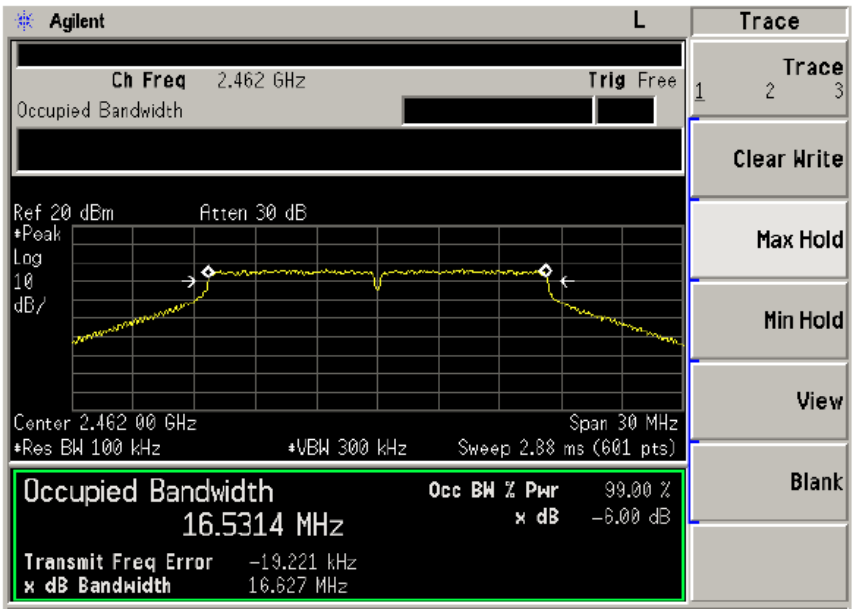
802.11g Channel Low 2412MHz



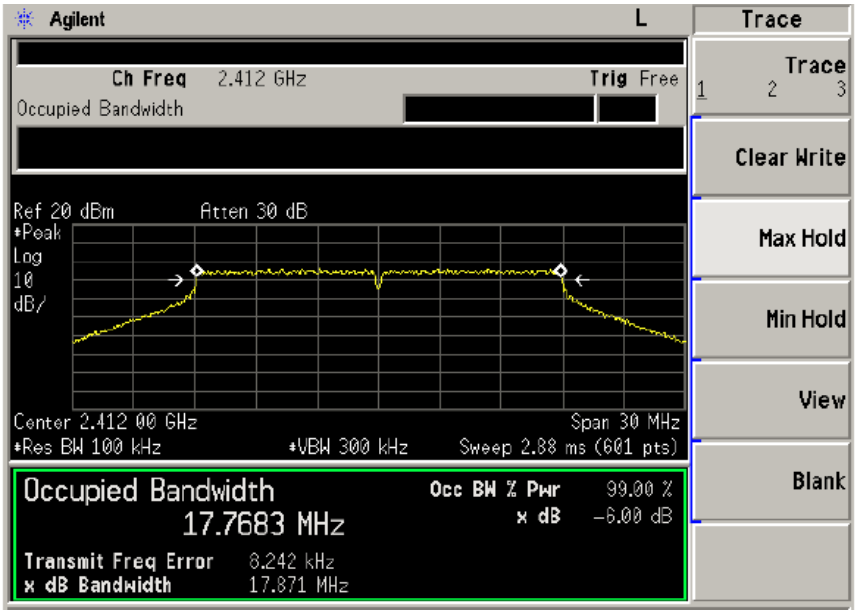
802.11g Channel Middle 2437MHz



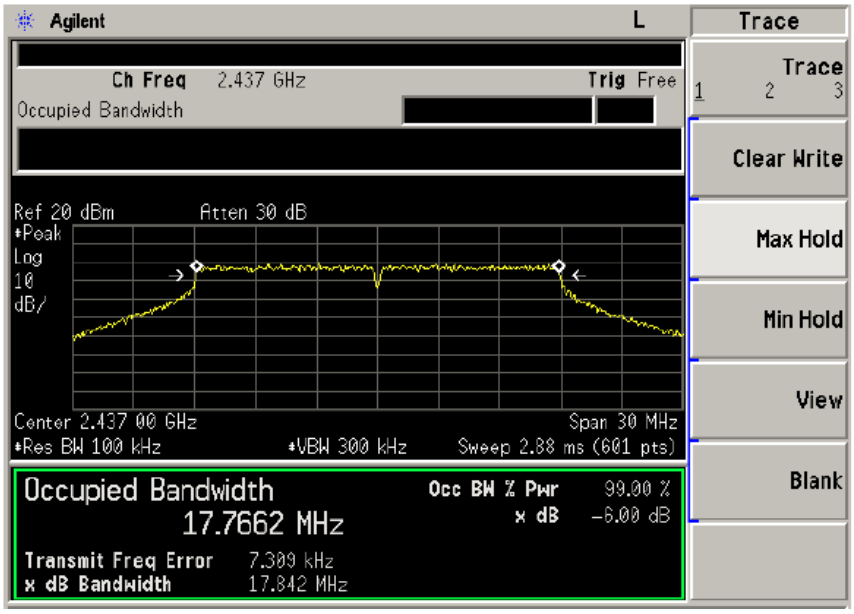
802.11g Channel High 2462MHz



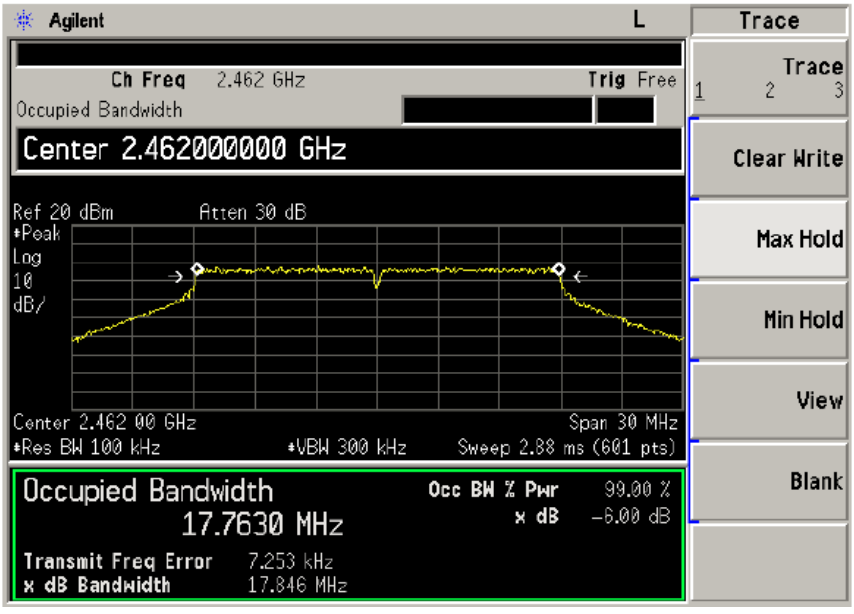
802.11n(HT20) Channel Low 2412MHz



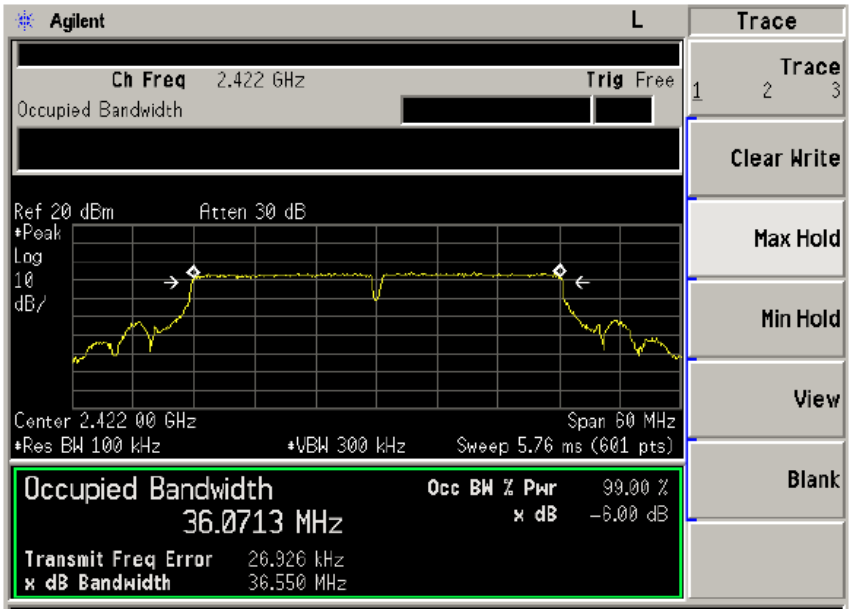
802.11n(HT20) Channel Middle 2437MHz



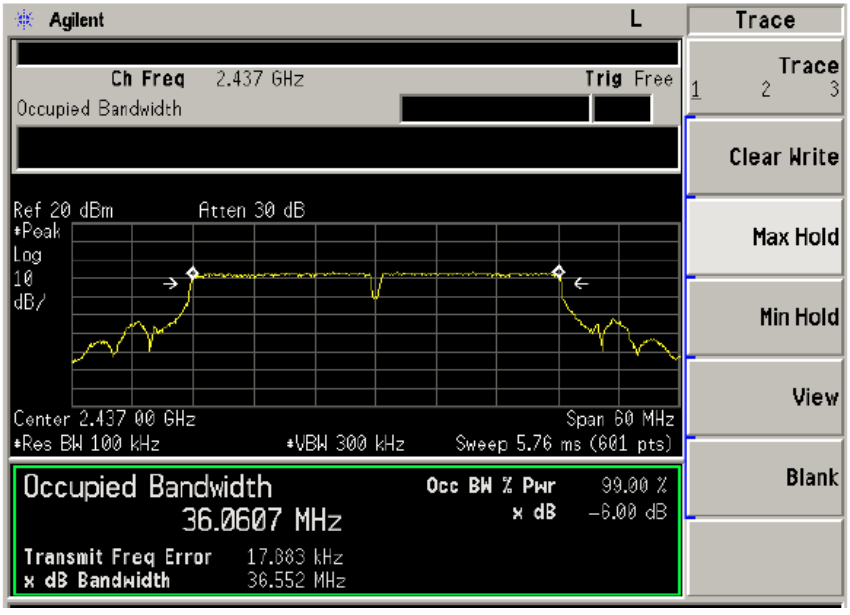
802.11n(HT20) Channel High 2462MHz



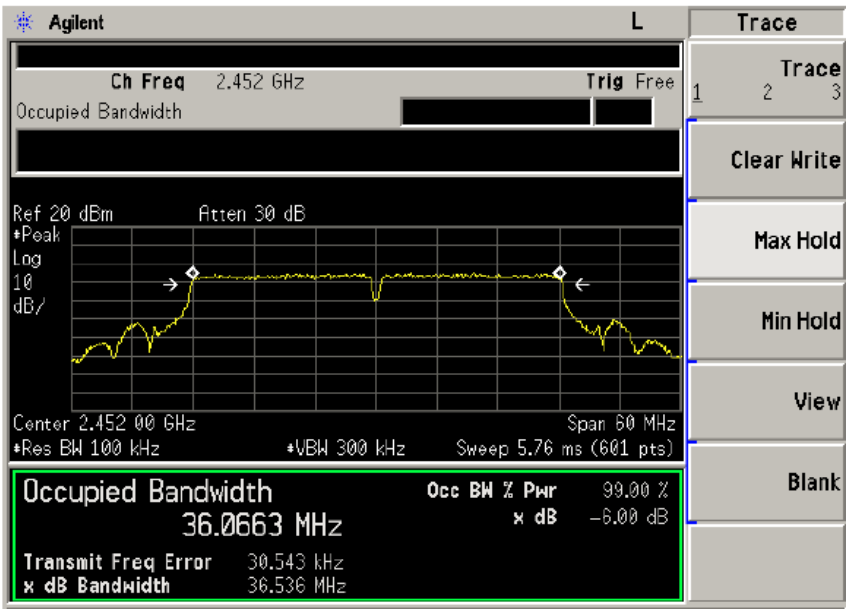
802.11n(HT40) Channel Low 2422MHz



802.11n(HT40) Channel Middle 2437MHz

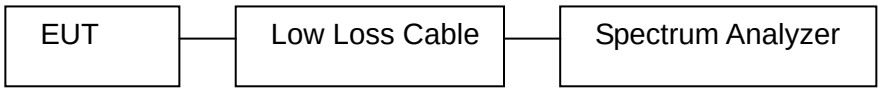


802.11n(HT40) Channel High 2452MHz



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	7.73	30
Middle	2437	7.86	30
High	2462	7.89	30

802.11g

Channel	Frequency (MHz)	Peak output power (dBm)	Limit (dBm)
Low	2412	7.06	30
Middle	2437	7.62	30
High	2462	7.41	30

802.11n (HT20)

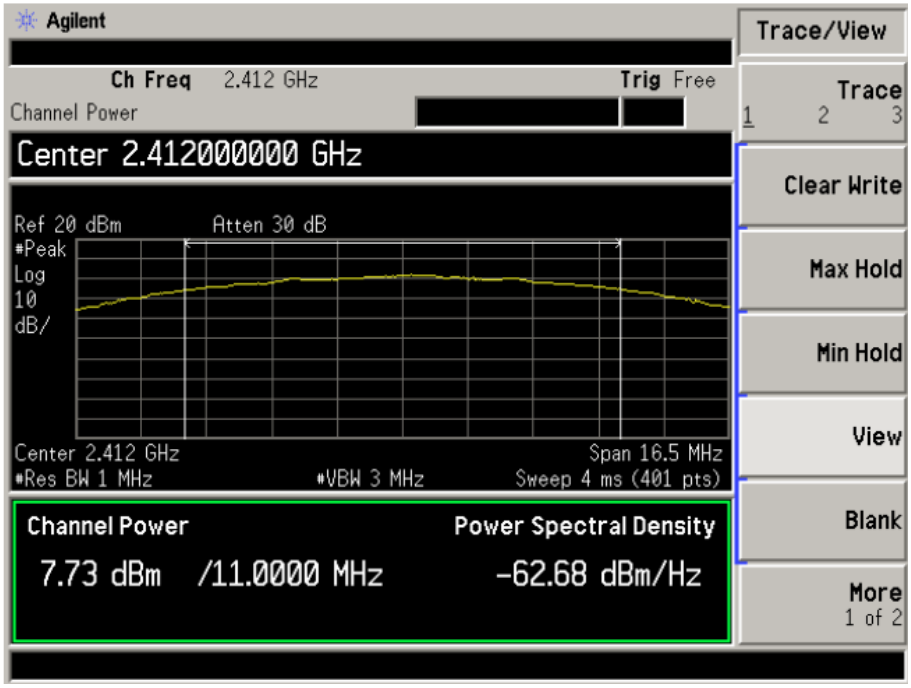
Channel	Frequency (MHz)	Peak output power (dBm)	Limit (dBm)
Low	2412	7.03	30
Middle	2437	7.44	30
High	2462	7.26	30

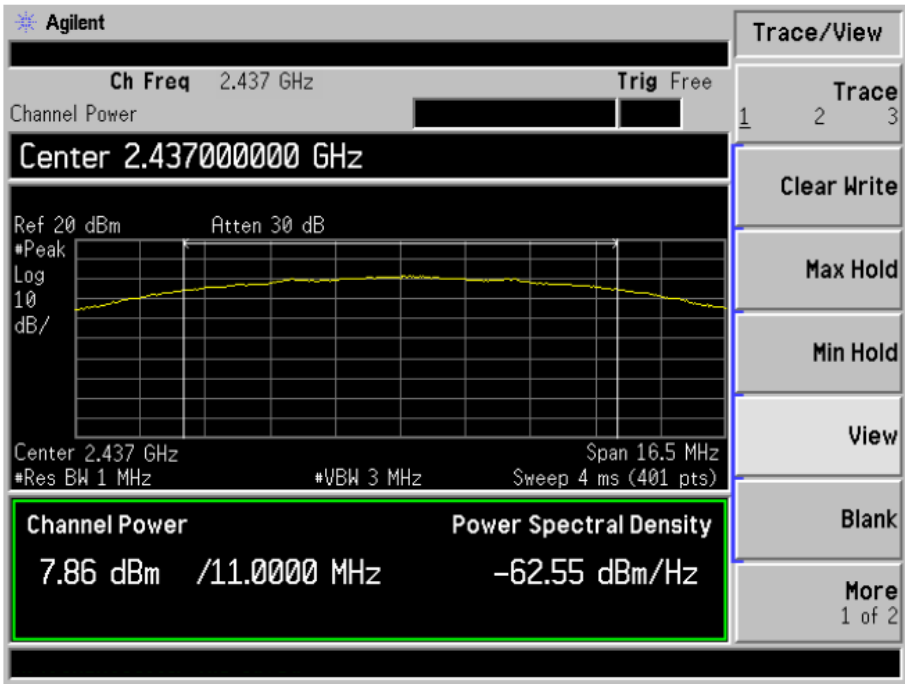
802.11n (HT40)

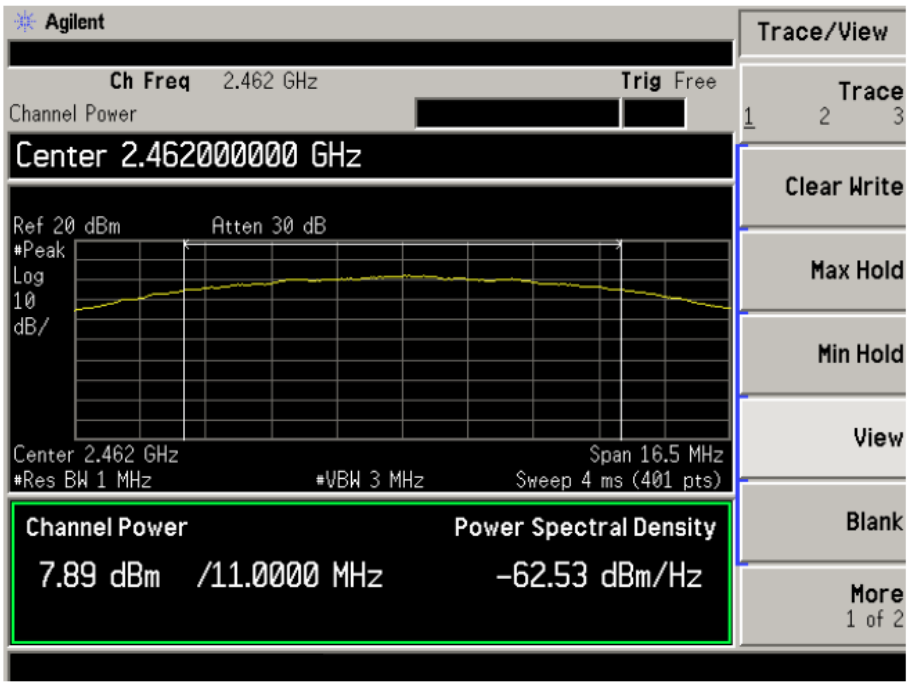
Channel	Frequency (MHz)	Peak output power (dBm)	Limit (dBm)
Low	2422	6.92	30
Middle	2437	7.08	30
High	2452	7.55	30

Pls. refer to following test plots:

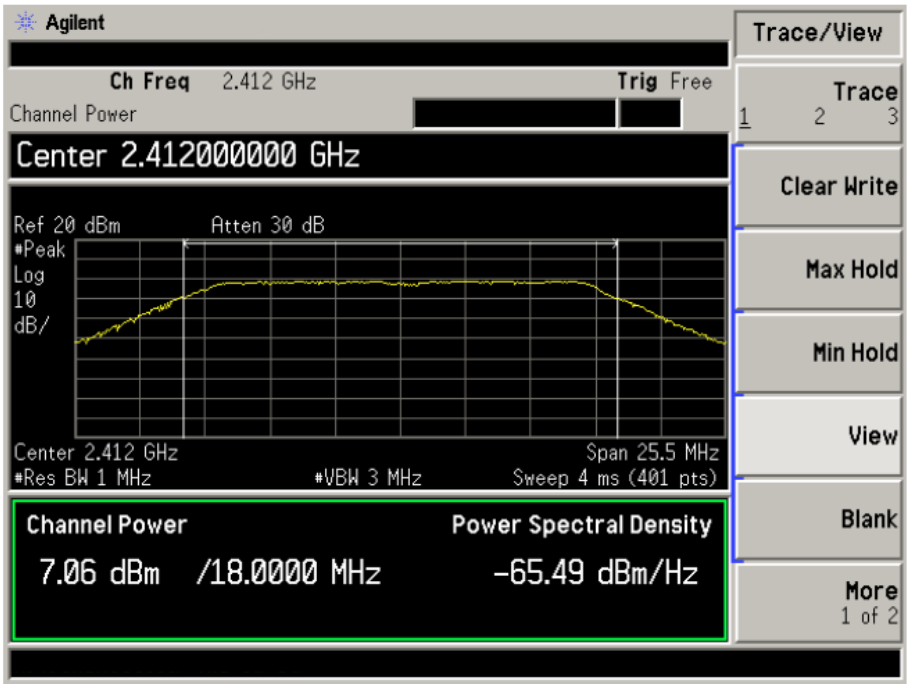
802.11b

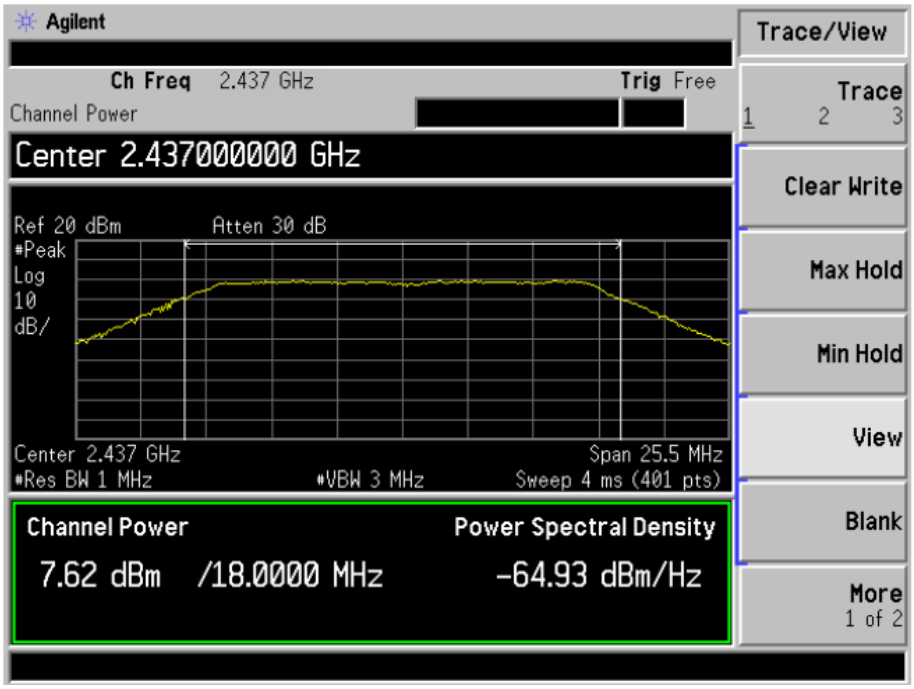


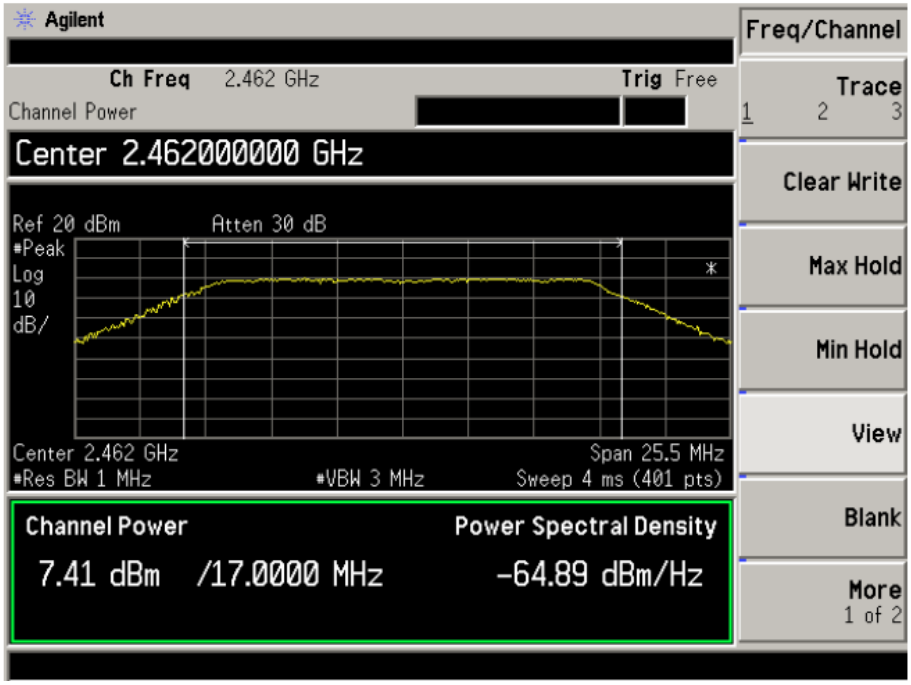

Agilent
Trace/View
Ch Freq 2.437 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.437000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.437 GHz
Span 16.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.86 dBm /11.0000 MHz
-62.55 dBm/Hz
More
1 of 2


Agilent
Trace/View
Ch Freq 2.462 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.462000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.462 GHz
Span 16.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.89 dBm /11.0000 MHz
-62.53 dBm/Hz
More
1 of 2

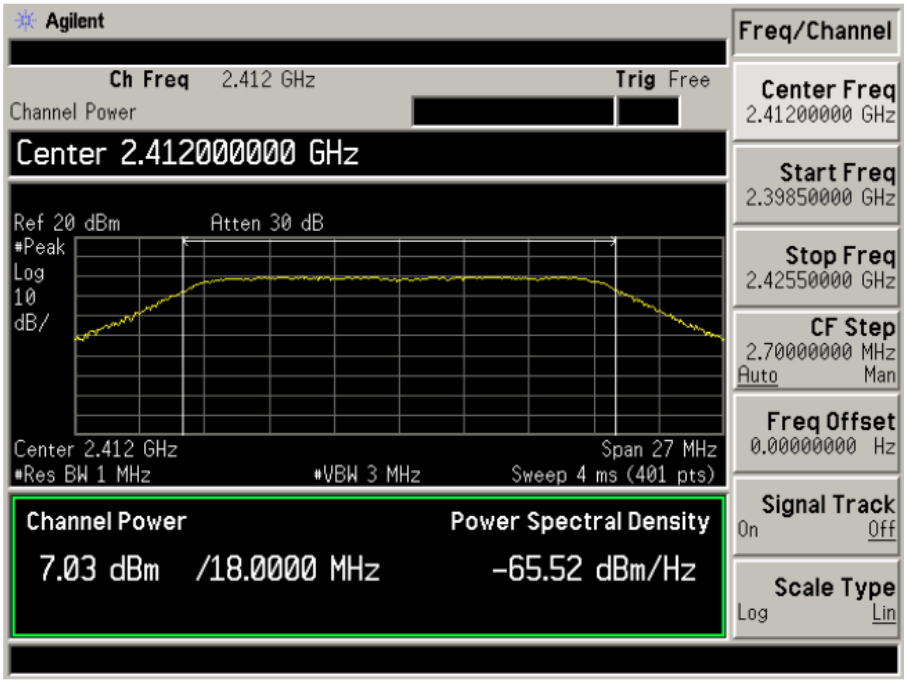
802.11g

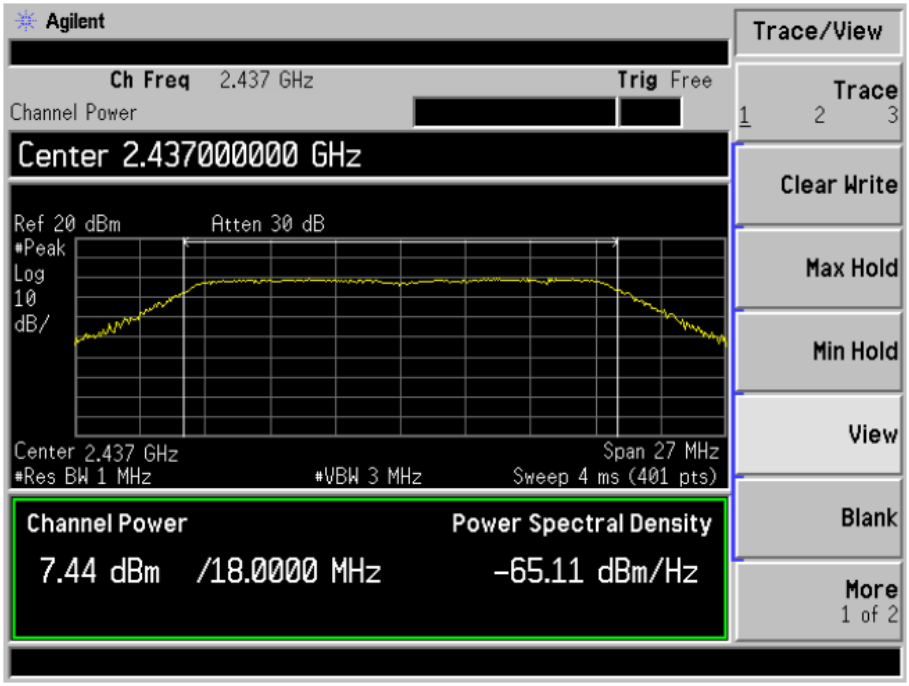

Agilent
Trace/View
Ch Freq 2.412 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.412000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.412 GHz
Span 25.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.06 dBm /18.0000 MHz
-65.49 dBm/Hz
More
1 of 2

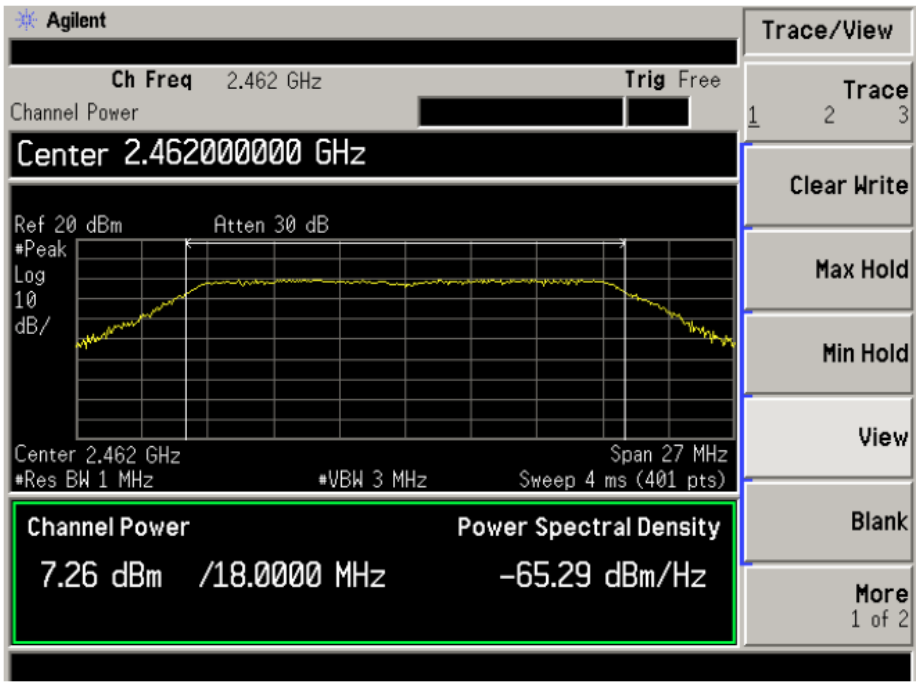

Agilent
Trace/View
Ch Freq 2.437 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.437000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.437 GHz
Span 25.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.62 dBm /18.0000 MHz
-64.93 dBm/Hz
More
1 of 2


Agilent
Ch Freq 2.462 GHz
Trig Free
Channel Power
Center 2.462000000 GHz
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Center 2.462 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 25.5 MHz
Sweep 4 ms (401 pts)
Channel Power
7.41 dBm
/17.0000 MHz
Power Spectral Density
-64.89 dBm/Hz
Freq/Channel
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

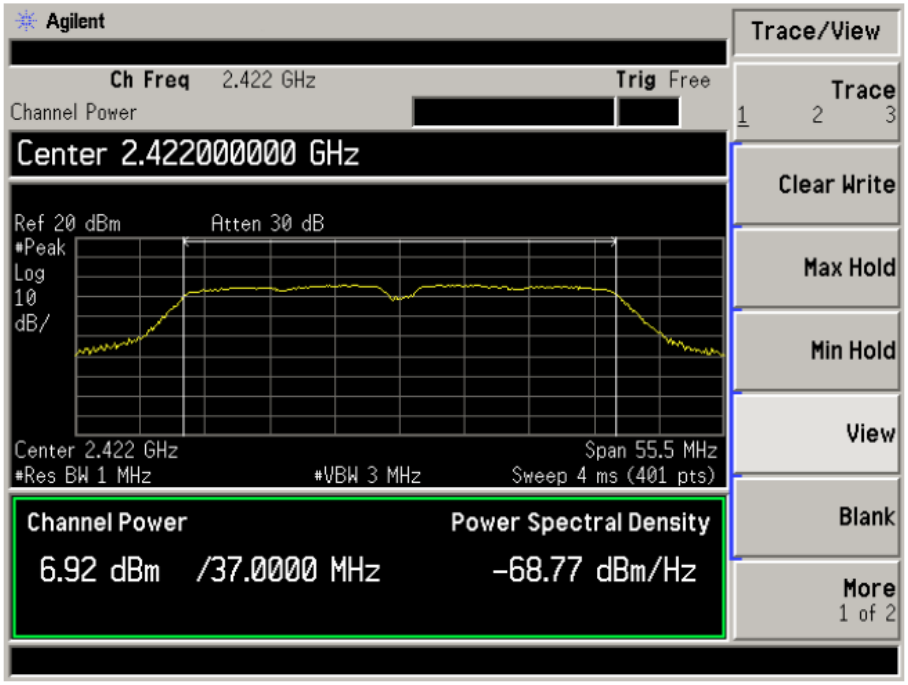
802.11n HT20

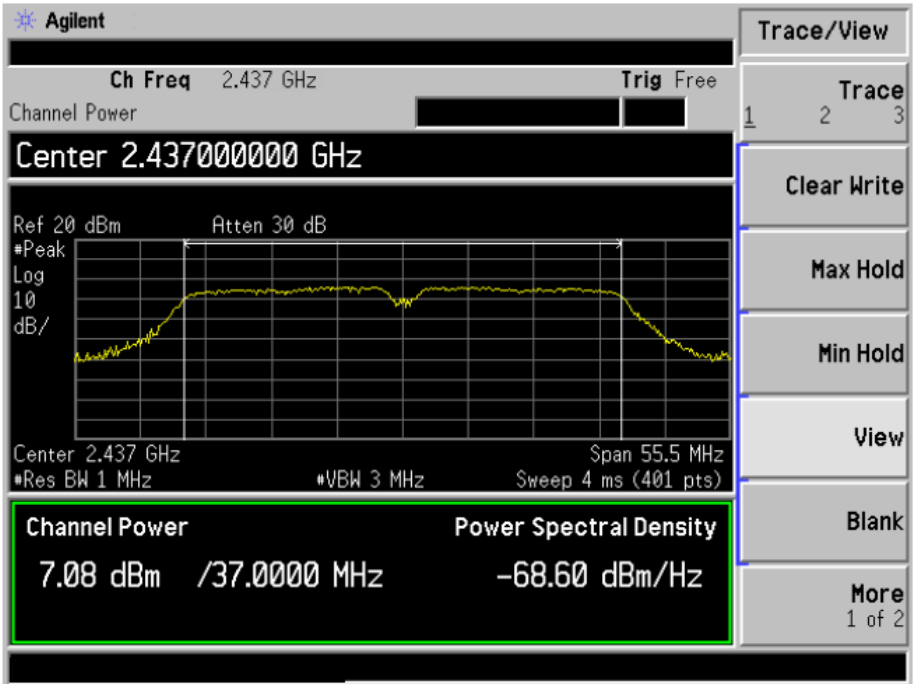

Agilent
Ch Freq 2.412 GHz
Trig Free
Channel Power
Center 2.412000000 GHz
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Center 2.412 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 27 MHz
Sweep 4 ms (401 pts)
Channel Power
7.03 dBm
/18.0000 MHz
Power Spectral Density
-65.52 dBm/Hz
Freq/Channel
Center Freq
2.41200000 GHz
Start Freq
2.39850000 GHz
Stop Freq
2.42550000 GHz
CF Step
2.70000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

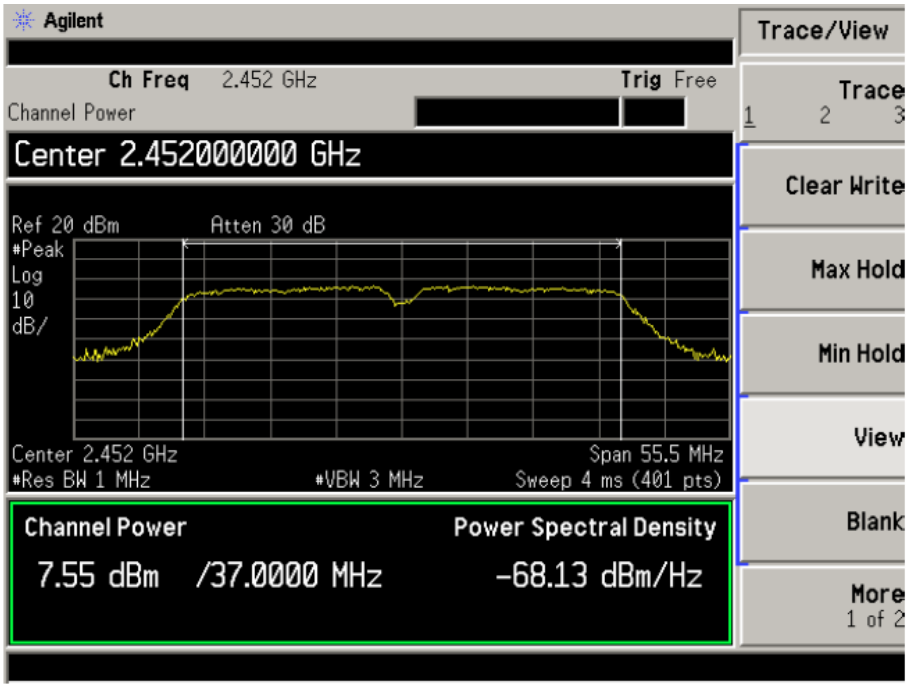

Agilent
Trace/View
Ch Freq 2.437 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.437000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.437 GHz
Span 27 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.44 dBm /18.0000 MHz
-65.11 dBm/Hz
More
1 of 2


Agilent
Trace/View
Ch Freq 2.462 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.462000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.462 GHz
Span 27 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.26 dBm /18.0000 MHz
-65.29 dBm/Hz
More
1 of 2

802.11n HT40

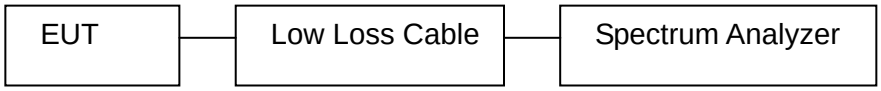

Agilent
Trace/View
Ch Freq 2.422 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.422000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.422 GHz
Span 55.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
6.92 dBm /37.0000 MHz
-68.77 dBm/Hz
More
1 of 2


Agilent
Trace/View
Ch Freq 2.437 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.437000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.437 GHz
Span 55.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.08 dBm /37.0000 MHz
-68.60 dBm/Hz
More
1 of 2


Agilent
Trace/View
Ch Freq 2.452 GHz
Trig Free
Channel Power
Trace
1 2 3
Center 2.452000000 GHz
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.452 GHz
Span 55.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Blank
Channel Power
Power Spectral Density
7.55 dBm /37.0000 MHz
-68.13 dBm/Hz
More
1 of 2

5.. POWER SPECTRAL DENSITY TEST

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. Use the peak marker function to determine the maximum amplitude level.
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	-14.56	8
Middle	2437	-14.86	8
High	2462	-13.54	8

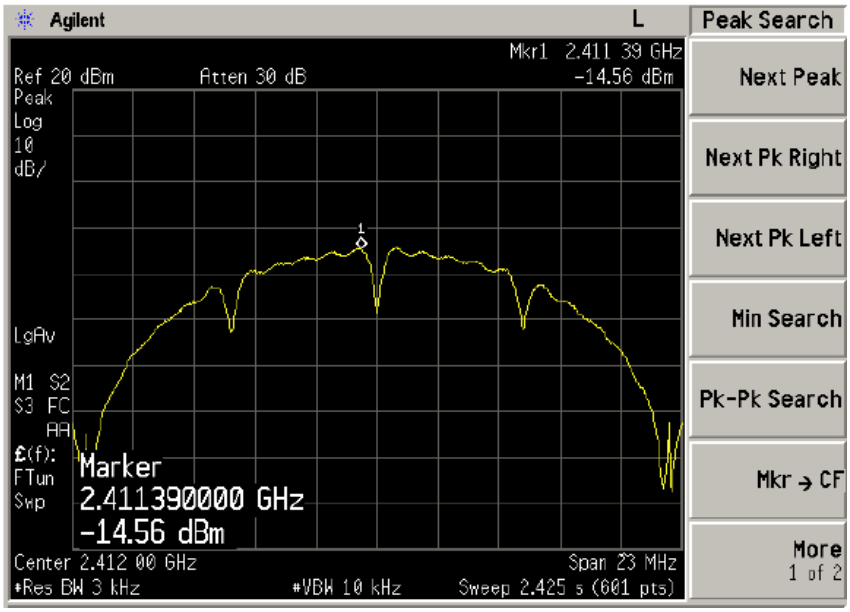
802.11g			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2412	-17.35	8
Middle	2437	-16.95	8
High	2462	-16.72	8

802.11n(HT20)			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2412	-16.31	8
Middle	2437	-16.14	8
High	2462	-16.38	8

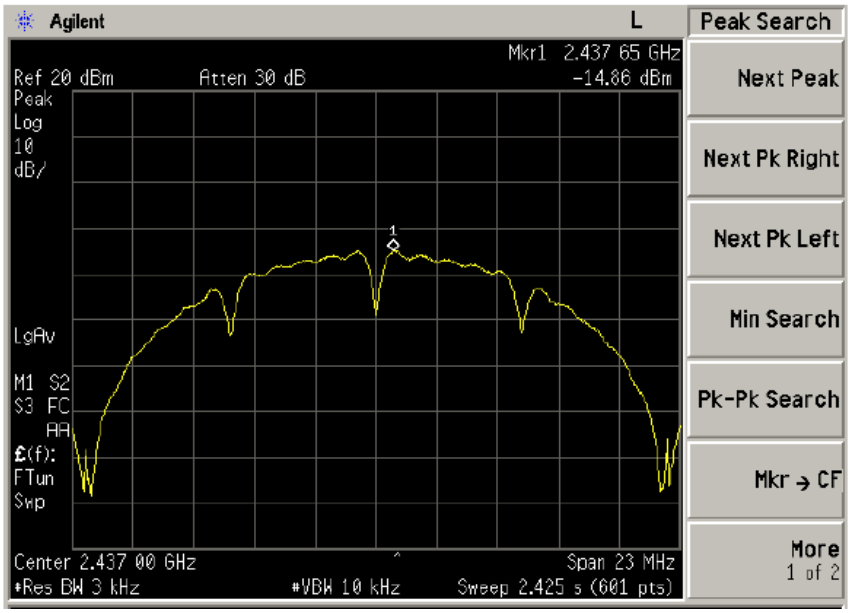
802.11n(40M)			
Channel	**Frequency (MHz)**	**Power Spectral Density (dBm)**	**Limit (dBm)**
Low	2422	-16.76	8
Middle	2437	-18.57	8
High	2452	-18.59	8

The spectrum analyzer plots are attached as below.

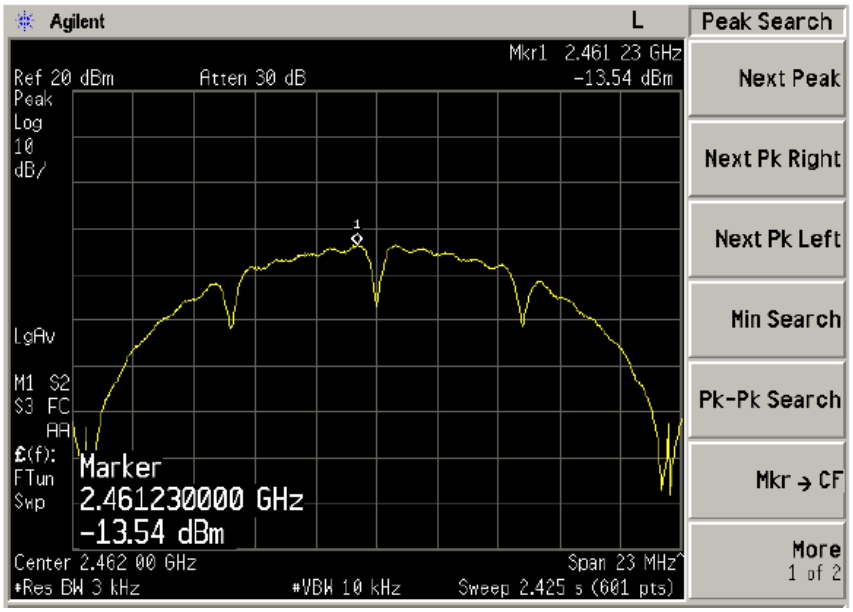
802.11b Channel Low 2412MHz



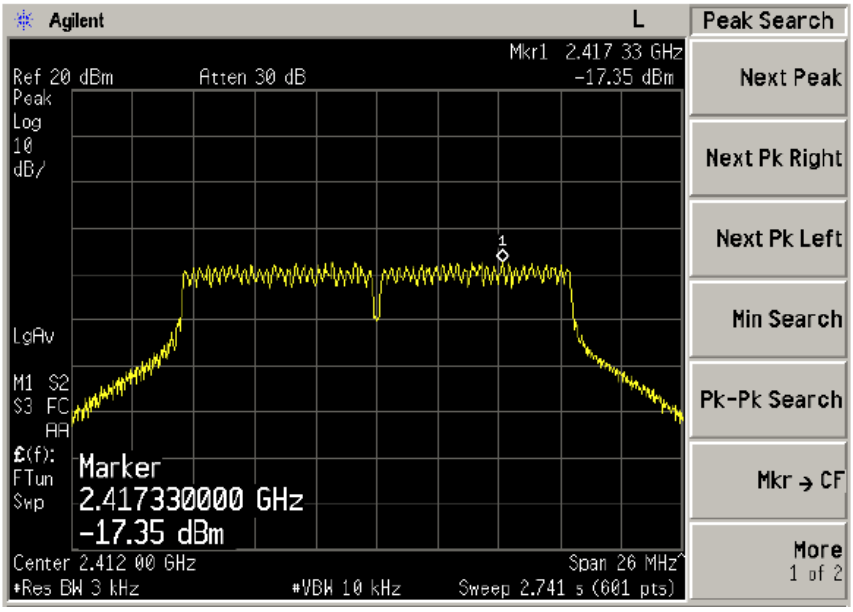
802.11b Channel Middle 2437MHz



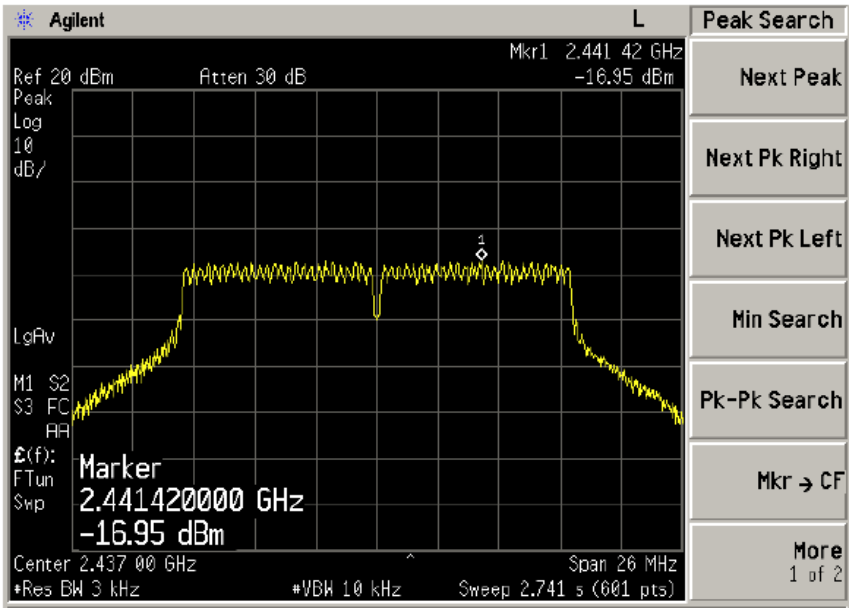
802.11b Channel High 2462MHz



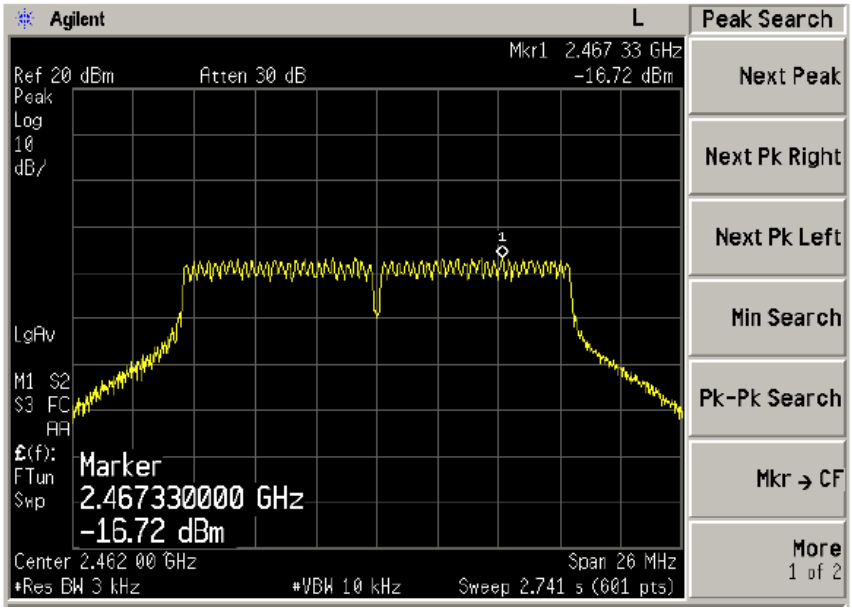
802.11g Channel Low 2412MHz



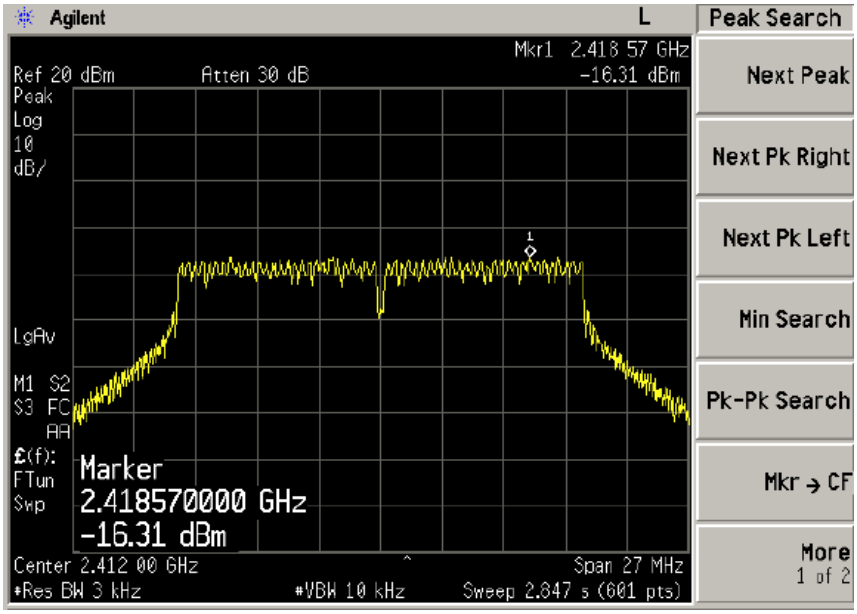
802.11g Channel Middle 2437MHz



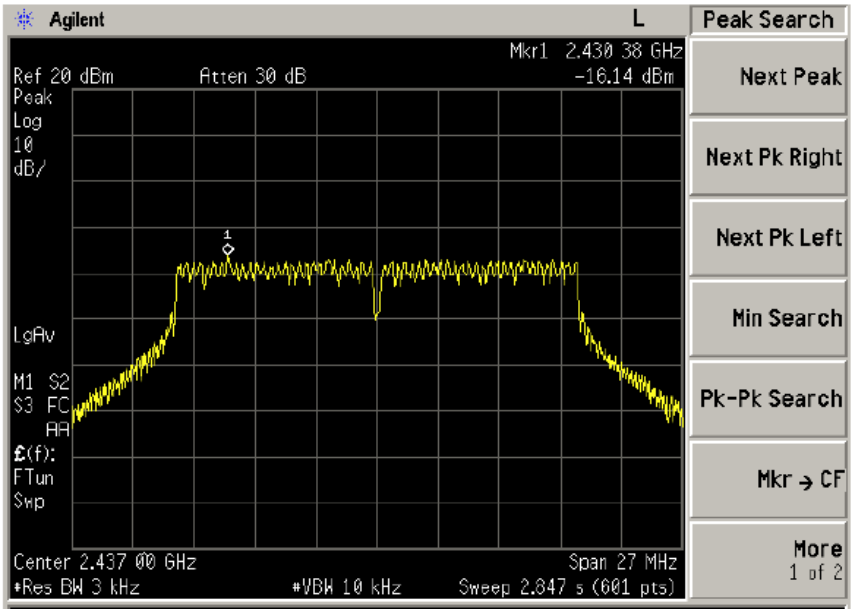
802.11g Channel High 2462MHz



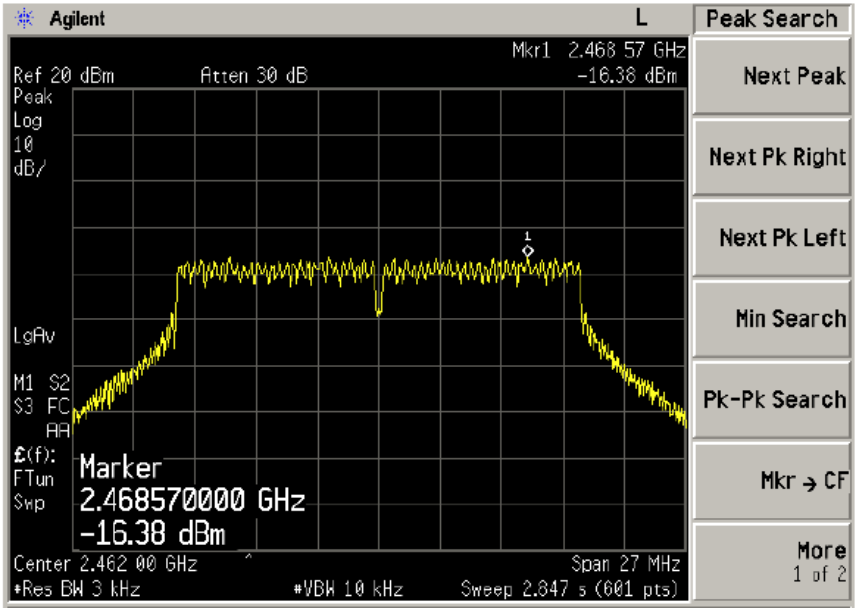
802.11n(HT20M) Channel Low 2412MHz



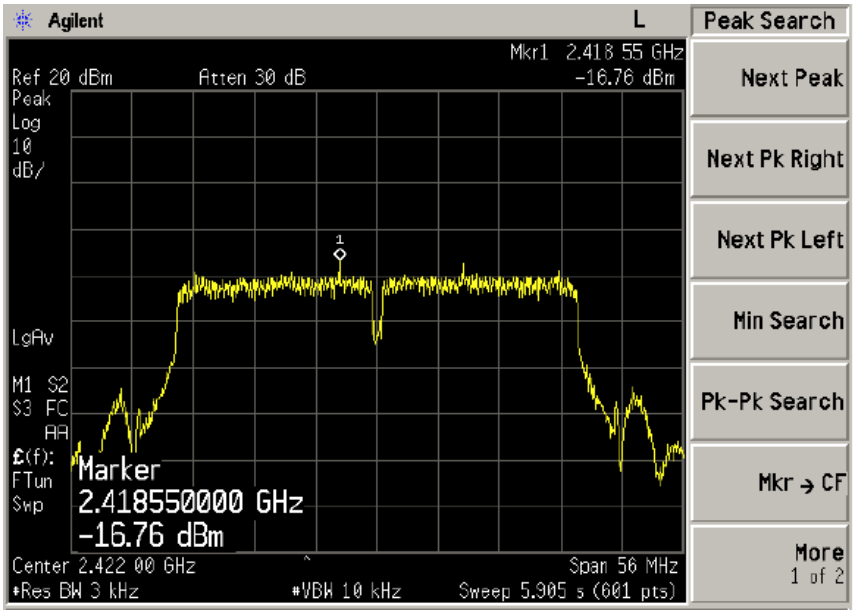
802.11n (HT20) Channel Middle 2437MHz



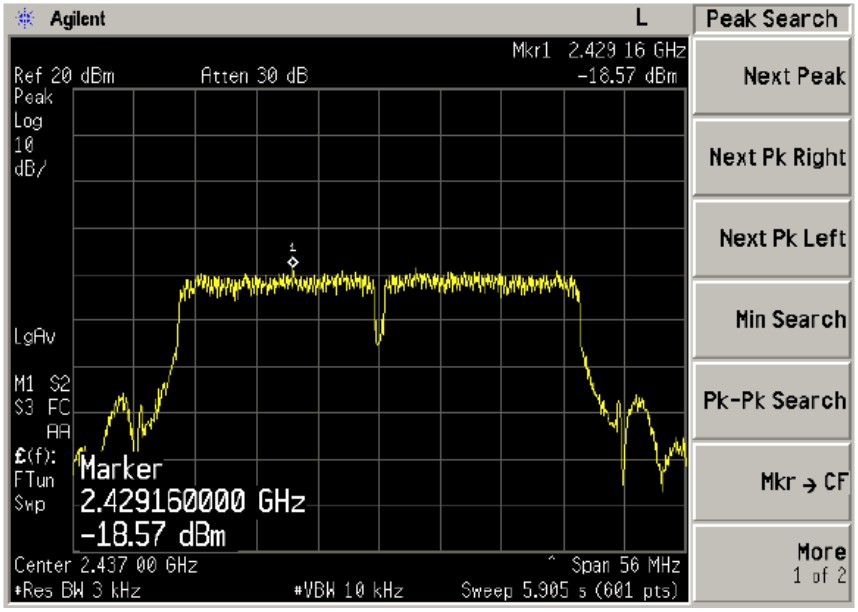
802.11n(HT20) Channel High 2462MHz



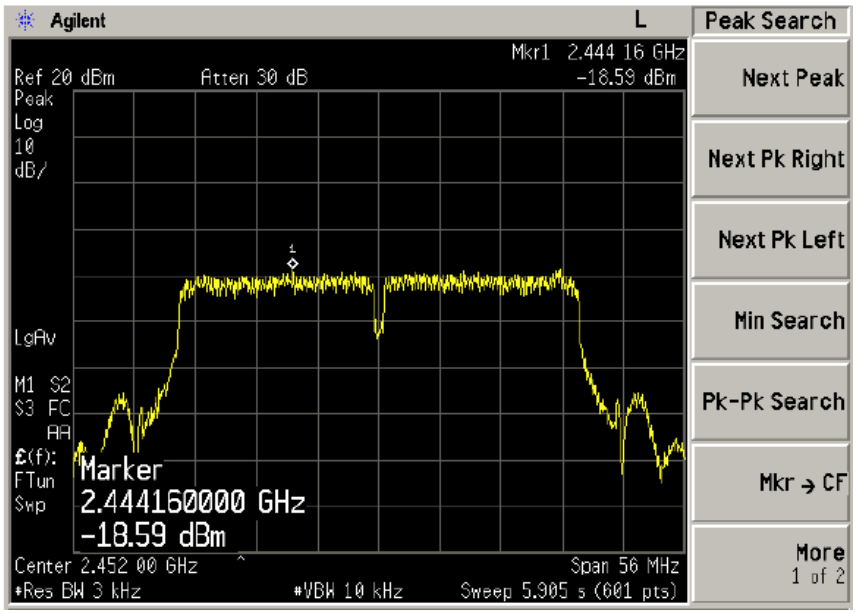
802.11n(HT40) Channel Low 2422MHz



802.11n (HT40) Middle High 2437MHz

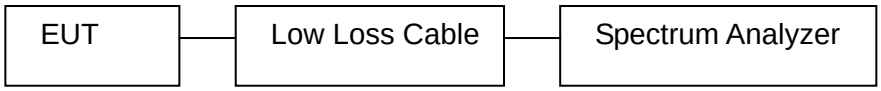


802.11n (HT40M) Channel High 2452MHz



6.. BAND EDGE COMPLIANCE TEST

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.

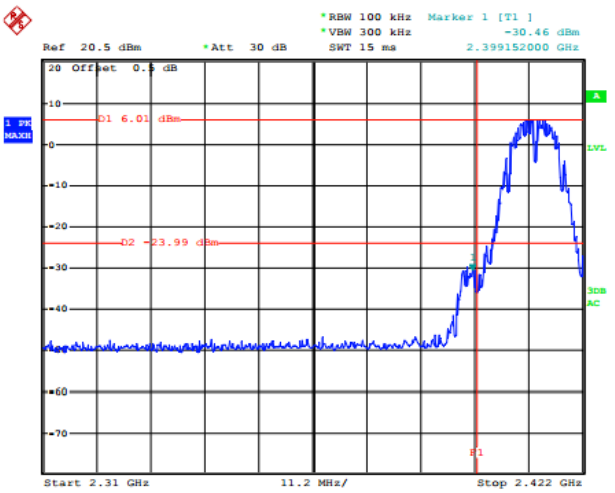
Radiate Band Edge:

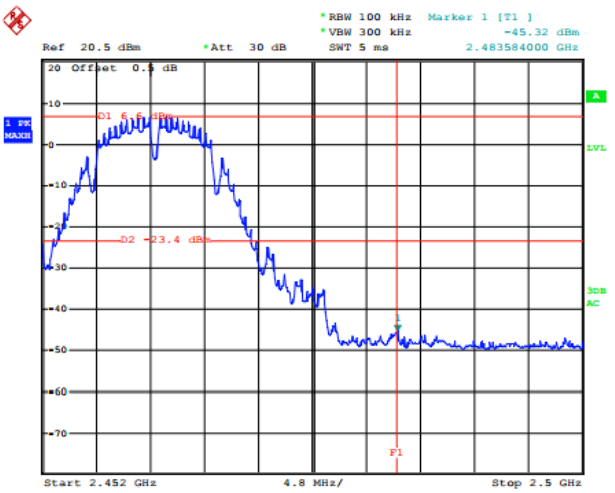
a. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
b. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
c. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out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

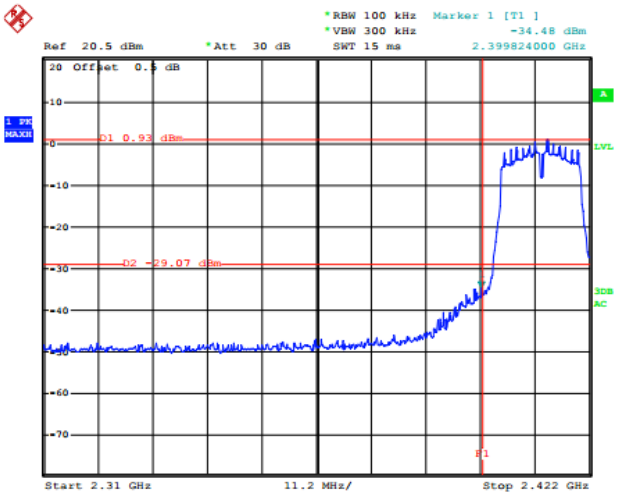
Pass

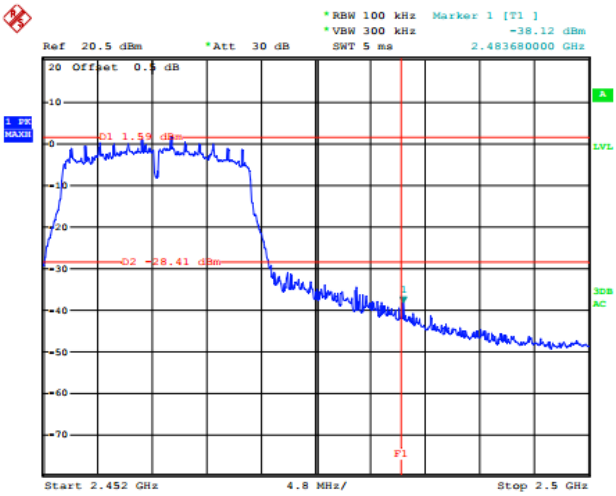
802.11b Channel 2412MHz/2462MHz



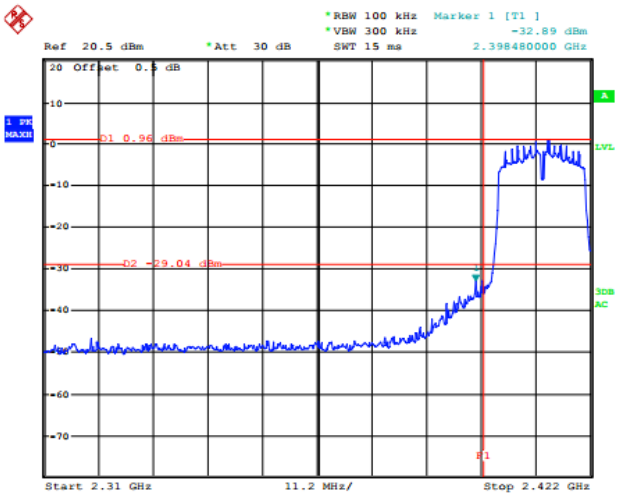


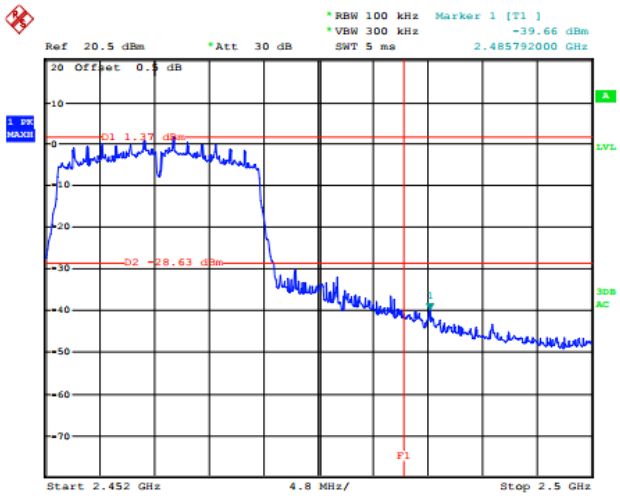
802.11g Channel Low 2412MHz/2462MHz



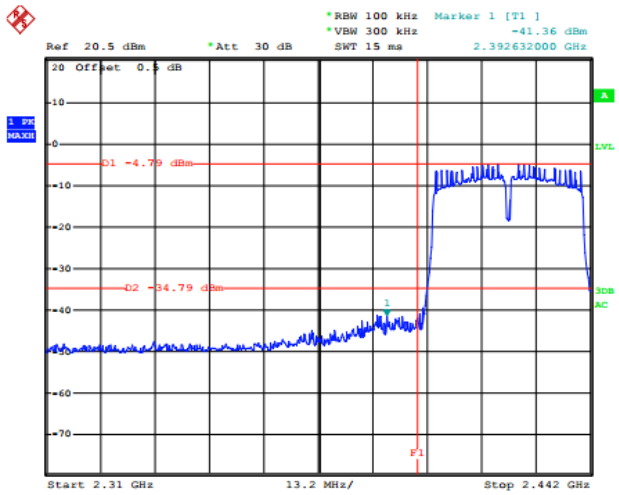


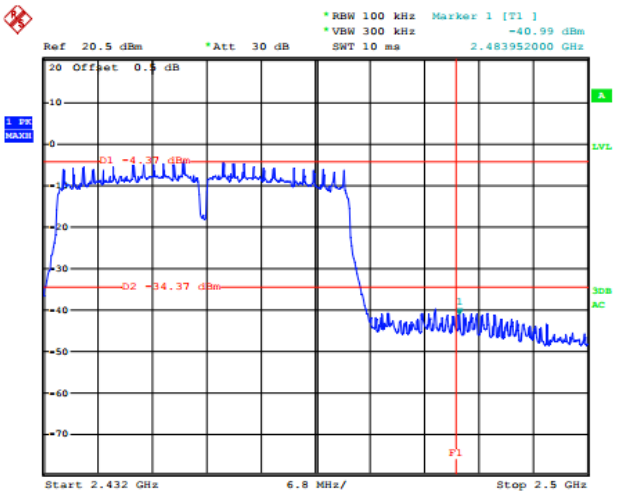
802.11n(HT20) 2412MHz/2462MHz





802.11n(HT40) 2422MHz/2452MHz





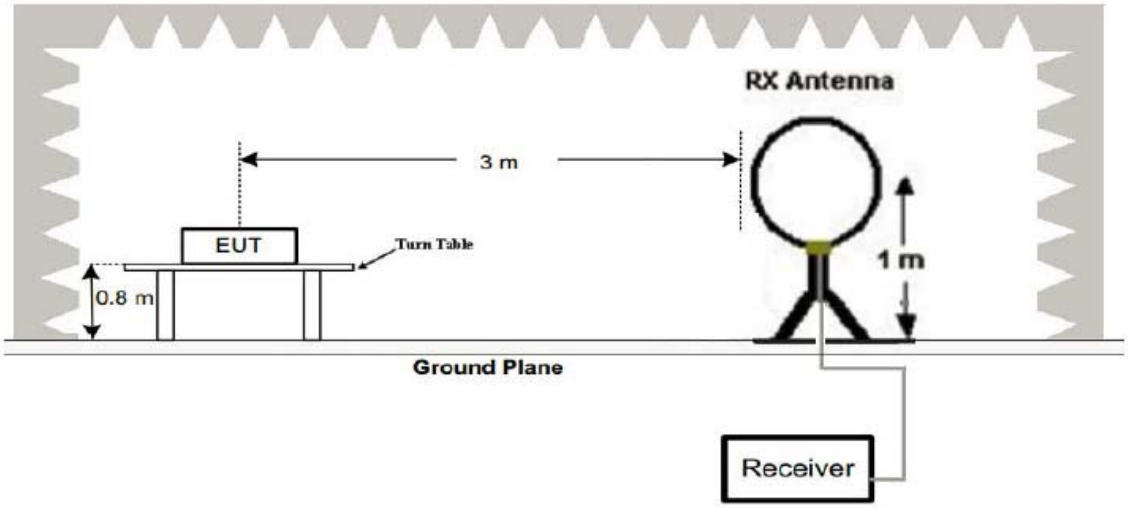
Radiated Band Edge Result

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
802.11b							
2390	59.75	-13.06	46.69	74	-27.31	peak	Vertical
2390	59.48	-13.06	46.42	74	-27.58	peak	Horizontal
2483.5	60.67	-12.78	47.89	74	-26.11	peak	Vertical
2483.5	60.69	-12.78	47.91	74	-26.09	peak	Horizontal
802.11g							
2390	59.33	-13.06	46.27	74	-27.73	peak	Vertical
2390	58.67	-13.06	45.61	74	-28.39	peak	Horizontal
2483.5	60.05	-12.78	47.27	74	-26.73	peak	Vertical
2483.5	60.44	-12.78	47.66	74	-26.34	peak	Horizontal
802.11n HT 20							
2390	62.23	-13.06	49.17	74	-24.83	peak	Vertical
2390	61.78	-13.06	48.72	74	-25.28	peak	Horizontal
2483.5	61.92	-12.78	49.14	74	-24.86	peak	Vertical
2483.5	62.12	-12.78	49.34	74	-24.66	peak	Horizontal
802.11n HT 40							
2390	62.78	-13.06	49.72	74	-24.28	peak	Vertical
2390	63.94	-13.06	50.88	74	-23.12	peak	Horizontal
2483.5	62.44	-12.78	49.66	74	-24.34	peak	Vertical
2483.5	62.38	-12.78	49.6	74	-24.40	peak	Horizontal

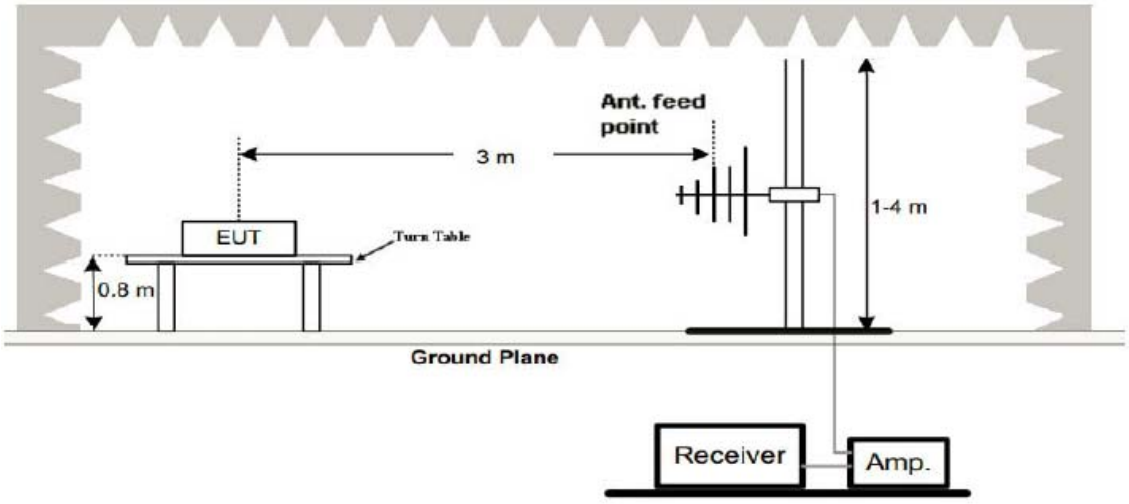
7.. RADIATED SPURIOUS EMISSION TEST

7.1. Block diagram of test setup

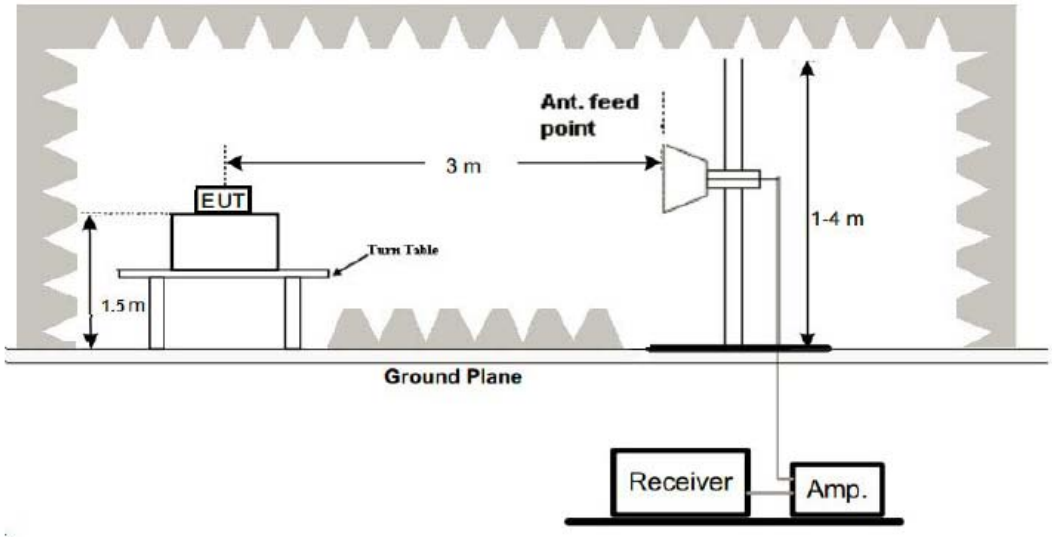
（1） Radiated Emission Test-Up Frequency Below 30MHz



（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

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

1, Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2, Support equipment, if needed, was placed as per ANSI C63.10.
3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5, All support equipments received AC power from a second LISN, if any.
6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

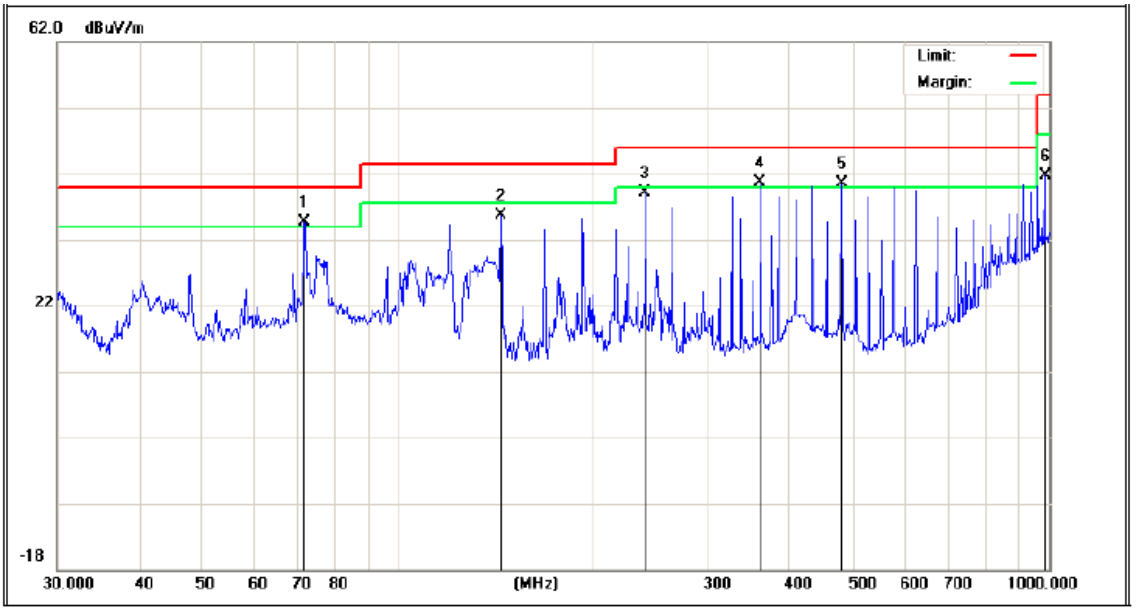
7.5. Test result

Pass

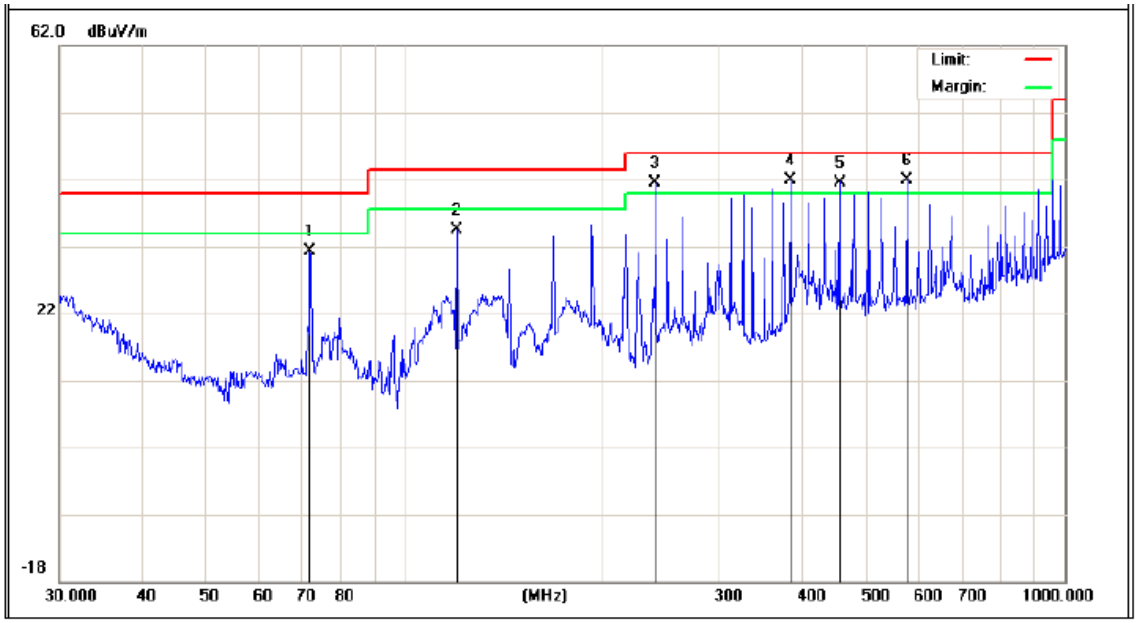
Test mode: 802.11b
For Below 30MHz

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

Test mode: 802.11b
For 30MHz-1000MHz



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	71.8319	29.08	5.62	34.70	40.00	-5.30	QP
V	143.8292	24.62	11.03	35.65	43.50	-7.85	QP
V	239.9874	25.70	13.49	39.19	46.00	-6.81	QP
V	360.4476	24.03	16.67	40.70	46.00	-5.30	QP
V	480.5276	20.63	19.91	40.54	46.00	-5.46	QP
V	986.0715	14.17	27.50	41.67	54.00	-12.33	QP



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	71.8319	25.59	5.62	31.21	40.00	-8.79	QP
H	119.8555	22.35	12.07	34.42	43.50	-9.08	QP
H	239.9874	28.05	13.49	41.54	46.00	-4.46	QP
H	383.9318	24.31	17.64	41.95	46.00	-4.05	QP
H	455.9057	22.18	19.42	41.60	46.00	-4.40	QP
H	576.6443	20.09	21.91	42.00	46.00	-4.00	QP

Test mode: 802.11b
For 1GHz-25GHz

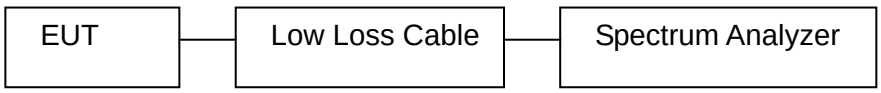
CH low

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (2412 MHz)-Above 1G							
Vertical	4824.214	51.66	10.44	62.10	74.00	-11.90	Pk
Vertical	4824.214	33.22	10.44	43.66	54.00	-10.34	Av
Vertical	7236.301	44.87	12.39	57.26	74.00	-16.74	Pk
Vertical	7236.301	29.15	12.39	41.54	54.00	-12.46	Av
Horizontal	4824.216	53.41	10.44	63.85	74.00	-10.15	Pk
Horizontal	4824.216	32.13	10.44	42.57	54.00	-11.43	Av
Horizontal	7236.147	45.57	12.39	57.96	74.00	-16.04	Pk
Horizontal	7236.147	30.71	12.39	43.10	54.00	-10.90	Av
Mid Channel (2437 MHz)-Above 1G							
Vertical	4874.203	51.07	10.40	61.47	74.00	-12.53	Pk
Vertical	4874.203	31.99	10.40	42.39	54.00	-11.61	Av
Vertical	7311.195	44.73	12.75	57.48	74.00	-16.52	Pk
Vertical	7311.195	27.72	12.75	40.47	54.00	-13.53	Av
Horizontal	4874.216	51.84	10.40	62.24	74.00	-11.76	Pk
Horizontal	4874.216	33.07	10.40	43.47	54.00	-10.53	Av
Horizontal	7311.048	47.95	12.75	60.70	74.00	-13.30	Pk
Horizontal	7311.048	28.64	12.75	41.39	54.00	-12.61	Av
High Channel (2462 MHz)- Above 1G							
Vertical	4924.326	51.01	10.39	61.40	74.00	-12.60	Pk
Vertical	4924.326	32.64	10.39	43.03	54.00	-10.97	Av
Vertical	7386.247	44.41	12.68	57.09	74.00	-16.91	Pk
Vertical	7386.247	28.05	12.68	40.73	54.00	-13.27	Av
Horizontal	4924.089	51.04	10.39	61.43	74.00	-12.57	Pk
Horizontal	4924.089	33.14	10.39	43.53	54.00	-10.47	Av
Horizontal	7386.147	47.43	12.68	60.11	74.00	-13.89	Pk
Horizontal	7386.147	28.73	12.68	41.41	54.00	-12.59	Av

Note: “802.11b” mode is worst mode

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.

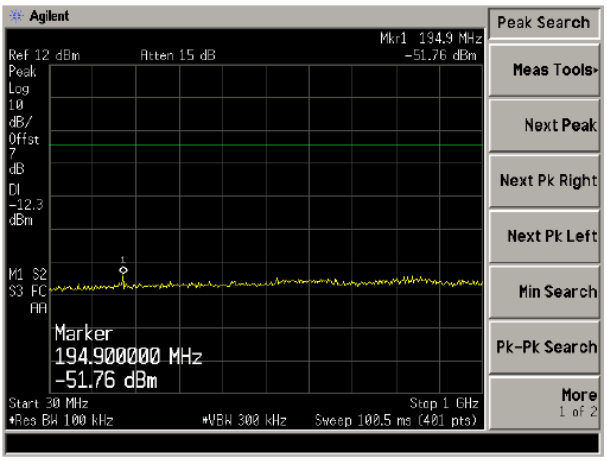
8.4. Test Result

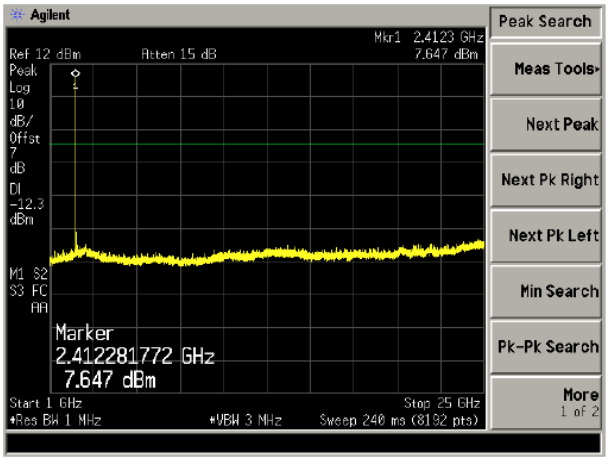
N/A

The spectrum analyzer plots are attached as below.

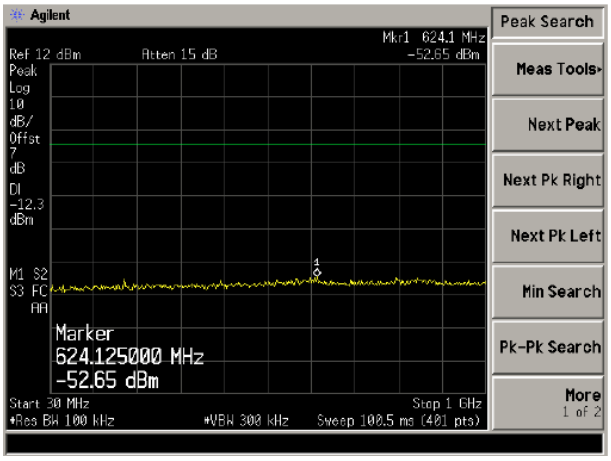
The worst test mode: 802.11b

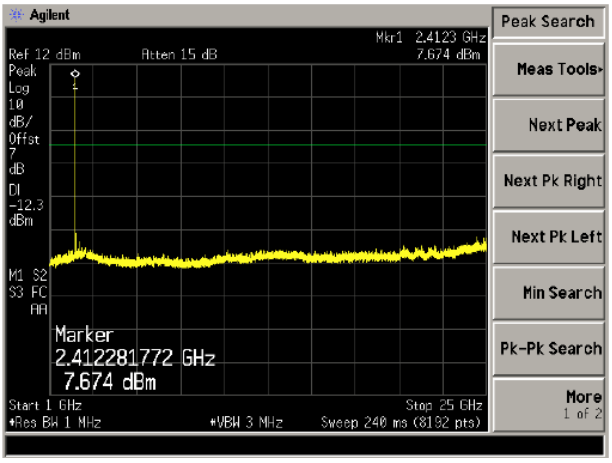
TX 802.11b Channel Low 2412MHz



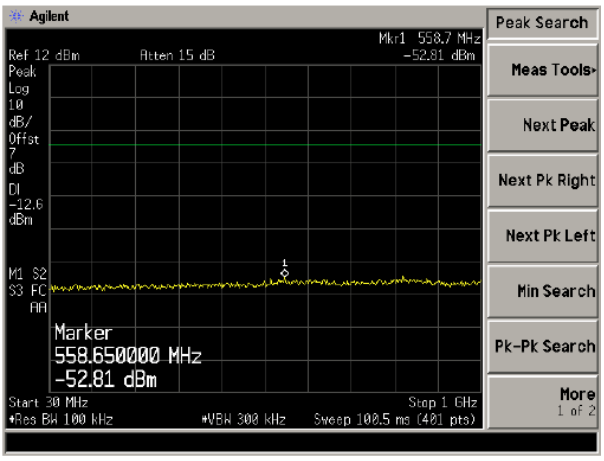


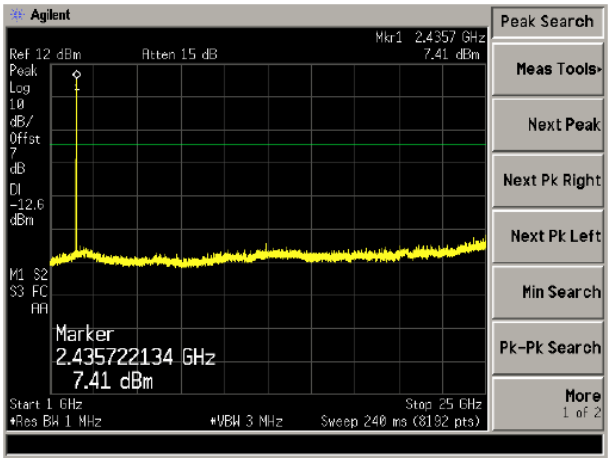
TX 802.11b Channel Middle 2437MHz





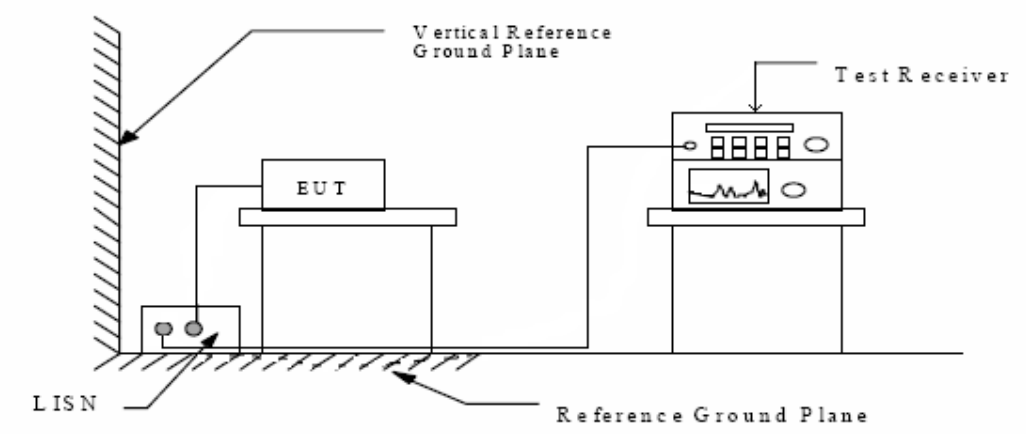
TX 802.11b Channel High 2462MHz





9.. AC POWER LINE CONDUCTED EMISSION

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 C63.10 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

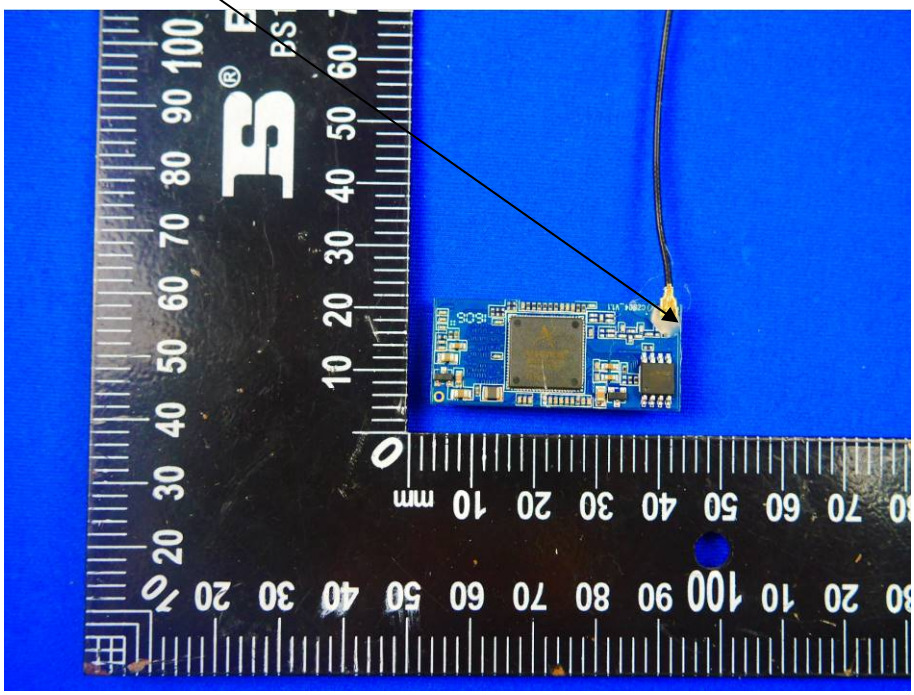
N/A

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.. POTOGRAPH OF TEST

11.1. Radiated Emission