FCC TEST REPORT

For

Shenzhen Four Seas Global Link Network Technology Co., Ltd.

2.4G Wireless Adapter

Model No.: CF-WU810N

Additional Model No.: Please refer to page 5.

Prepared for	:	Shenzhen Four Seas Global Link Network Technology Co., Ltd.
Address	:	Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base,Tenglong Road, Longhua District, Shenzhen, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
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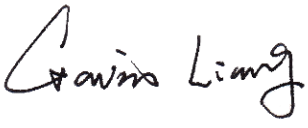
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	November 25, 2015
Number of tested samples	:	1
Date of Test	:	November 25, 2015- December 04, 2015
Date of Report	:	December 04, 2015

FCC TEST REPORT
FCC CFR 47 PART 15 C(15.247): 2015

Report Reference No.	**:**	**LCS1511252146E**
Date of Issue.....	:	December 04, 2015
Testing Laboratory Name	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name	**:**	**Shenzhen Four Seas Global Link Network Technology Co., Ltd.**
Address.....	:	Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base,Tenglong Road, Longhua District, Shenzhen, China
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C(15.247): 2015
Test Report Form No.	**:**	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

Test Item Description.....	**:**	**2.4G Wireless Adapter**
Trade Mark.....	:	COMFAST
Model/ Type reference	:	CF-WU810N
Ratings.....	:	DC 5V 0.5A
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
		
Dick Su / File administrators	Glin Lu / Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1511252146E	December 04, 2015 Date of issue

Type / Model.....	: 2.4G Wireless Adapter
EUT.....	: CF-WU810N
Applicant.....	**: Shenzhen Four Seas Global Link Network Technology Co., Ltd.**
Address.....	: Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base,Tenglong Road, Longhua District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Four Seas Global Link Network Technology Co., Ltd.**
Address.....	: Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base,Tenglong Road, Longhua District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Four Seas Global Link Network Technology Co., Ltd.**
Address.....	: Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base,Tenglong Road, Longhua District, Shenzhen, China
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	2.4G Wireless Adapter
Model Number	:	CF-WU810N
Power Supply	:	DC 5V 0.5A
WIFI		
Frequency Range	:	2412.00-2462.00MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz Bandwidth 7 Channels for 40MHz Bandwidth
Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)
Data Rates	:	IEEE 802.11b: 1-11Mbps IEEE 802.11g: 6-54Mbps IEEE 802.11n: MCS0-MCS7
Antenna Description	:	Internal Antenna, 2.0dBi(Max.)

Additional models No.			
CF-917AC	CF-906AC	CF-920AC	CF-925AC
CF-7500AC	CF-WU755P	CF-WU756P	CF-WU725B
CF-WU883NL	CF-WU882N	CF-WU720N	--
Remark: PCB board, structure and internal of these model(s) are the same, So no additional models were tested.			

1.2. Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	Notebook	B470	WB05067151	DOC

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
USB	--	N/A

1.4. Description of Test Facility

Site Description EMC Lab.	:	CNAS Registration Number. is L4595. FCC Registration Number. is 899208. Industry Canada Registration Number. is 9642A-1. VCCI Registration Number. is C-4260 and R-3804. ESMD Registration Number. is ARCB0108. UL Registration Number. is 100571-492. TUV SUD Registration Number. is SCN1081. TUV RH Registration Number. is UA 50296516-001
Name of Firm	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Site Location	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

1.5. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.7. Description Of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

Worst-case mode and channel used for 150kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, that was determined to be 802.11b mode(Low Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be 802.11b mode(Low Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:
802.11b Mode : 1 Mbps, DSSS.
802.11g Mode : 6 Mbps, OFDM.
802.11n Mode HT20:.MCS0, OFDM.
802.11n Mode HT40:.MCS0, OFDM.

Channel List & Frequency

802.11b/g/n(HT20)

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2412~2462MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	--	--

802.11n(HT40)

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2422~2452MHz	1	--	7	2442
	2	--	8	2447
	3	2422	9	2452
	4	2427	10	--
	5	2432	11	--
	6	2437	--	--

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C and RSS-210.

2.3 General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table 0.8 meter above ground for below 1GHz and 1.5m for above 1GHz. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

3. SYSTEM TEST CONFIGURATION

3.1. Justification

Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	**Description of Test**	**Result**
§15.247(b)	Maximum Conducted Output Power	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(a)	Occupied Bandwidth	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.207(a)	Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant

5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Sensor	R&S	NRV-Z51	100458	2015-06-18	2016-06-17
2	Power Sensor	R&S	NRV-Z32	10057	2015-06-18	2016-06-17
3	Power Meter	R&S	NRVS	100444	2015-06-18	2016-06-17
4	DC Filter	MPE	23872C	N/A	2015-06-18	2016-06-17
5	RF Cable	Harbour Industries	1452	N/A	2015-06-18	2016-06-17
6	SMA Connector	Harbour Industries	9625	N/A	2015-06-18	2016-06-17
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2015-10-27	2016-10-26
8	Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	2015-06-18	2016-06-17
9	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2015-06-18	2016-06-17
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2015-06-18	2016-06-17
11	Amplifier	SCHAFFNER	COA9231A	18667	2015-06-18	2016-06-17
12	Amplifier	Agilent	8449B	3008A02120	2015-06-18	2016-06-17
13	Amplifier	MITEQ	AMF-6F-260400	9121372	2015-06-18	2016-06-17
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2015-06-18	2016-06-17
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2015-06-18	2016-06-17
16	Horn Antenna	EMCO	3115	6741	2015-06-18	2016-06-17
17	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	2015-06-18	2016-06-17
18	RF Cable-R03m	Jye Bao	RG142	CB021	2015-06-18	2016-06-17
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2015-06-18	2016-06-17
20	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	101142	2015-06-18	2016-06-17
21	Artificial Mains	ROHDE & SCHWARZ	ENV216	101288	2015-06-18	2016-06-17
22	EMI Test Software	AUDIX	E3	N/A	2015-06-18	2016-06-17
23	temporary antenna connector	LCS	LCS-RF-20150413	N/A	N/A	N/A

6. TEST RESULT

6.1. Maximum Conducted Output Power Measurement

6.1.1. Standard Applicable

According to §15.247(b): For systems using digital modulation in the 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

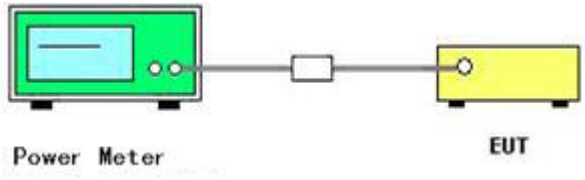
6.1.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

6.1.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

6.1.4. Test Setup Layout



6.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.1.6. Test Result of Maximum Conducted Output Power

Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n

802.11b

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Max. Limit (dBm)	Result
1	2412	8.56	30	Complies
6	2437	8.35	30	Complies
11	2462	8.14	30	Complies

802.11g

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Max. Limit (dBm)	Result
1	2412	7.58	30	Complies
6	2437	7.74	30	Complies
11	2462	7.29	30	Complies

802.11n HT20

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Max. Limit (dBm)	Result
1	2412	6.50	30	Complies
6	2437	6.47	30	Complies
11	2462	6.20	30	Complies

802.11n HT40

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Max. Limit (dBm)	Result
3	2422	5.16	30	Complies
6	2437	5.24	30	Complies
9	2452	5.61	30	Complies

Note: The relevant measured result has the offset with cable loss already.

6.2. Power Spectral Density Measurement

6.2.1. Standard Applicable

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

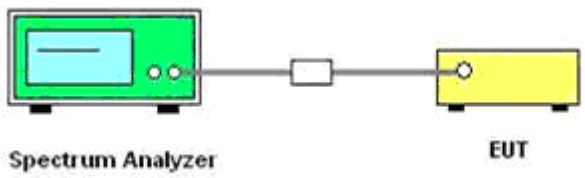
6.2.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

6.2.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 3 kHz.
4. Set the VBW ≥ 3*RBW
5. Set the span to 1.5 times the DTS channel bandwidth.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

6.2.4. Test Setup Layout



6.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.2.6. Test Result of Power Spectral Density

Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n

802.11b

Channel	Frequency (MHz)	Power *Density* (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-18.02	8	Complies
6	2437	-17.52	8	Complies
11	2462	-16.65	8	Complies

802.11g

Channel	Frequency (MHz)	Power *Density* (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-23.06	8	Complies
6	2437	-24.32	8	Complies
11	2462	-25.07	8	Complies

802.11n HT20

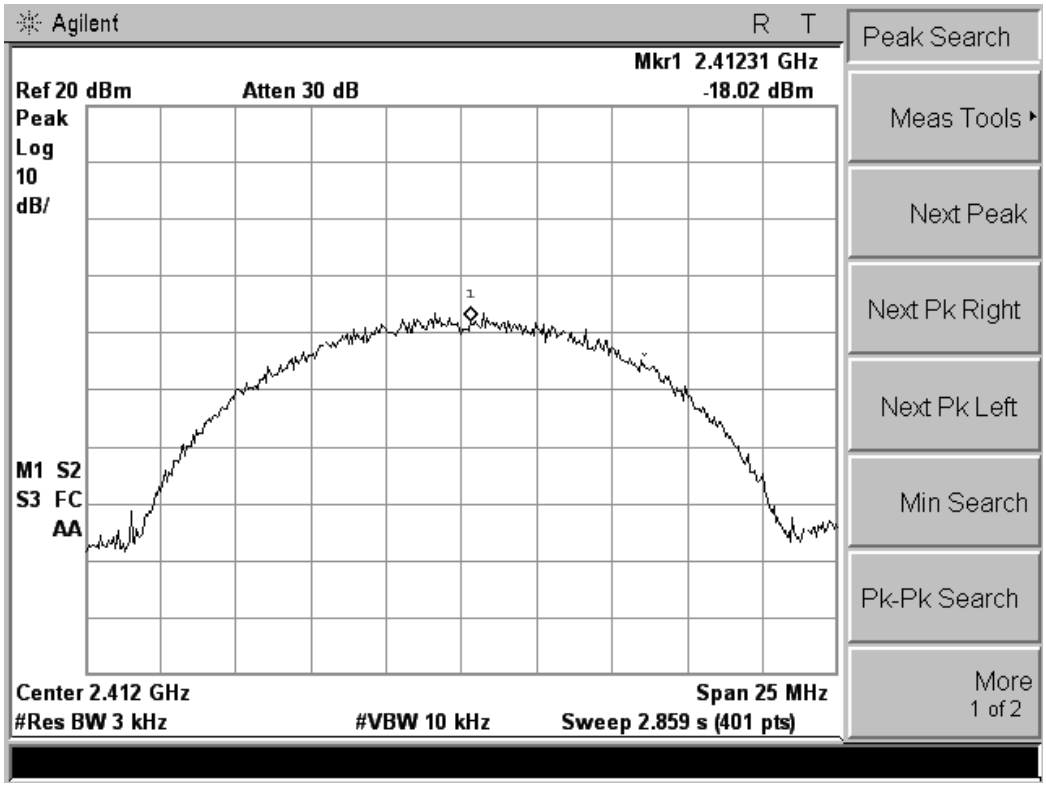
Channel	Frequency (MHz)	Power *Density* (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-26.80	8	Complies
6	2437	-25.16	8	Complies
11	2462	-24.29	8	Complies

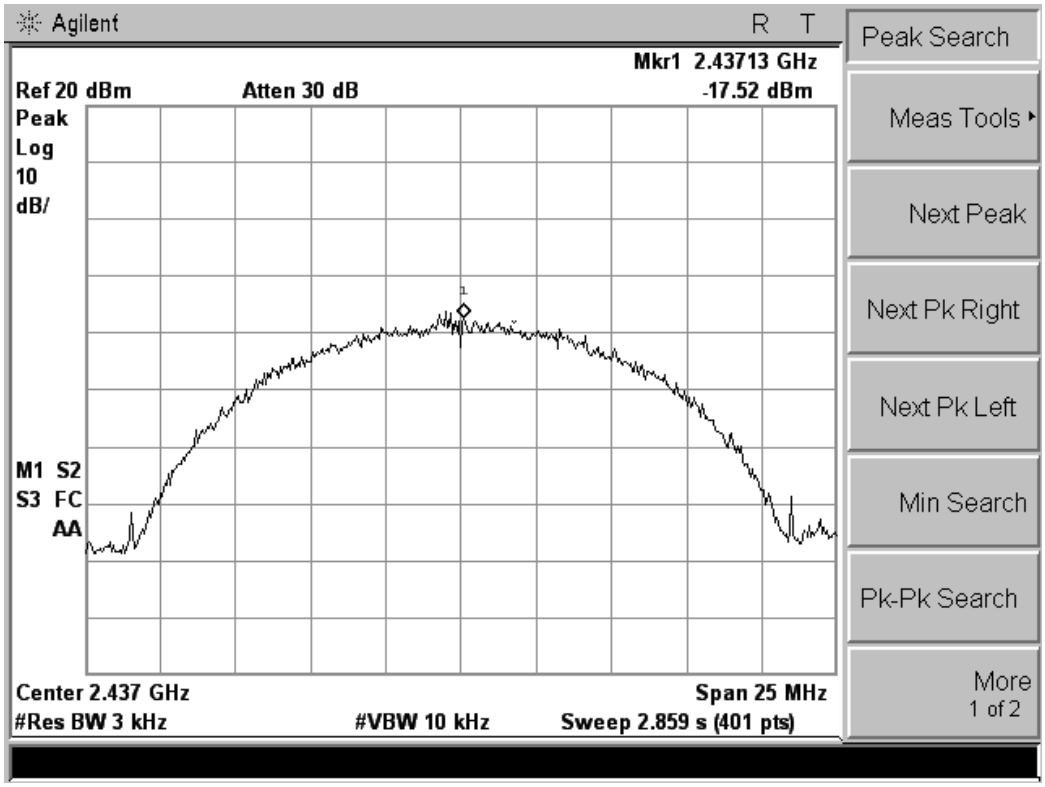
802.11n HT40

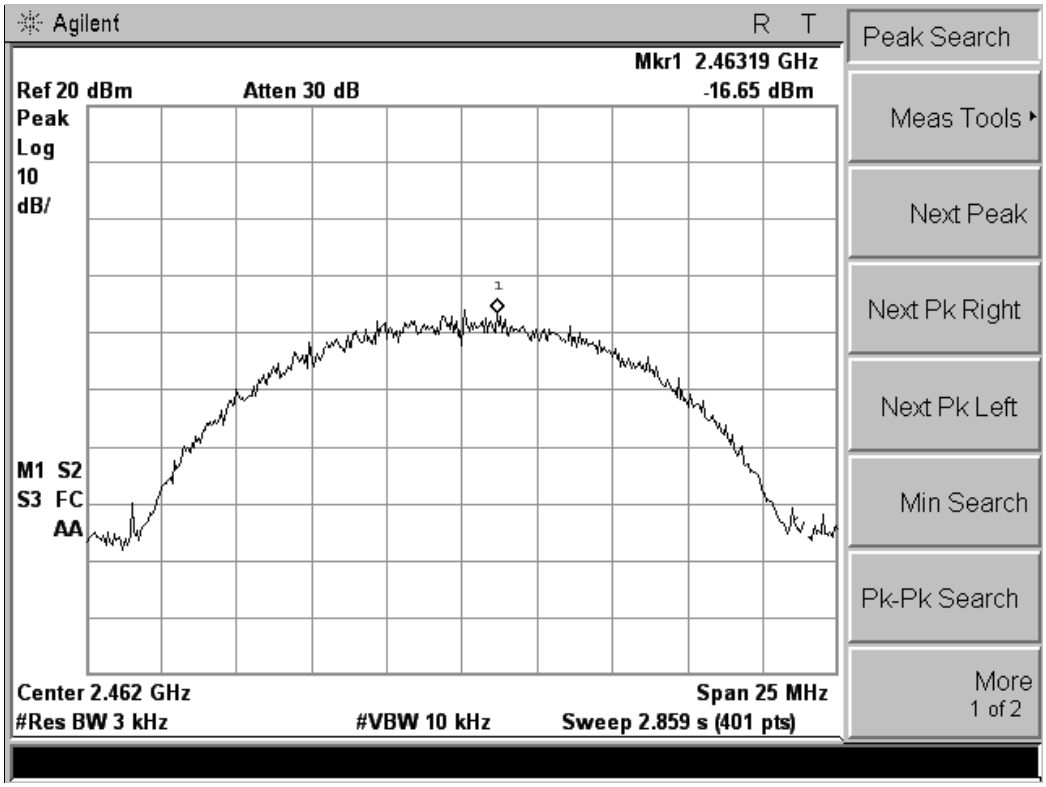
Channel	Frequency (MHz)	Power *Density* (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
3	2422	-29.41	8	Complies
6	2437	-29.03	8	Complies
9	2452	-29.90	8	Complies

Note: The measured power density (dBm) has the offset with cable loss already.

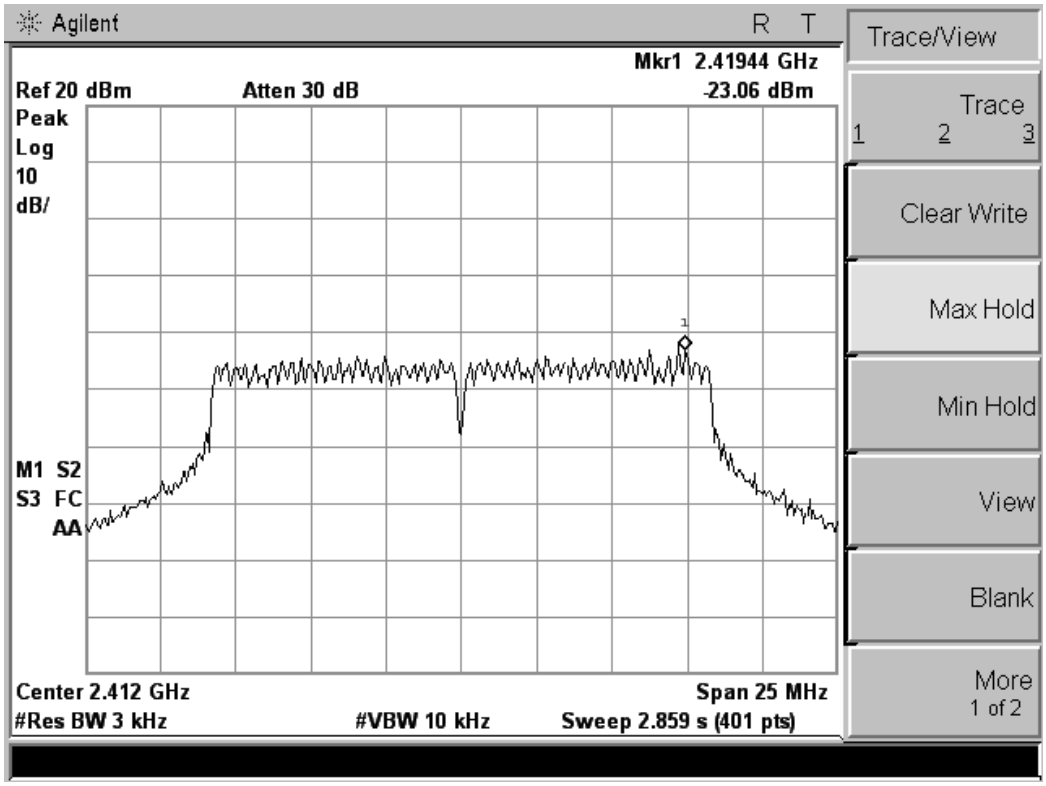
802.11b power density

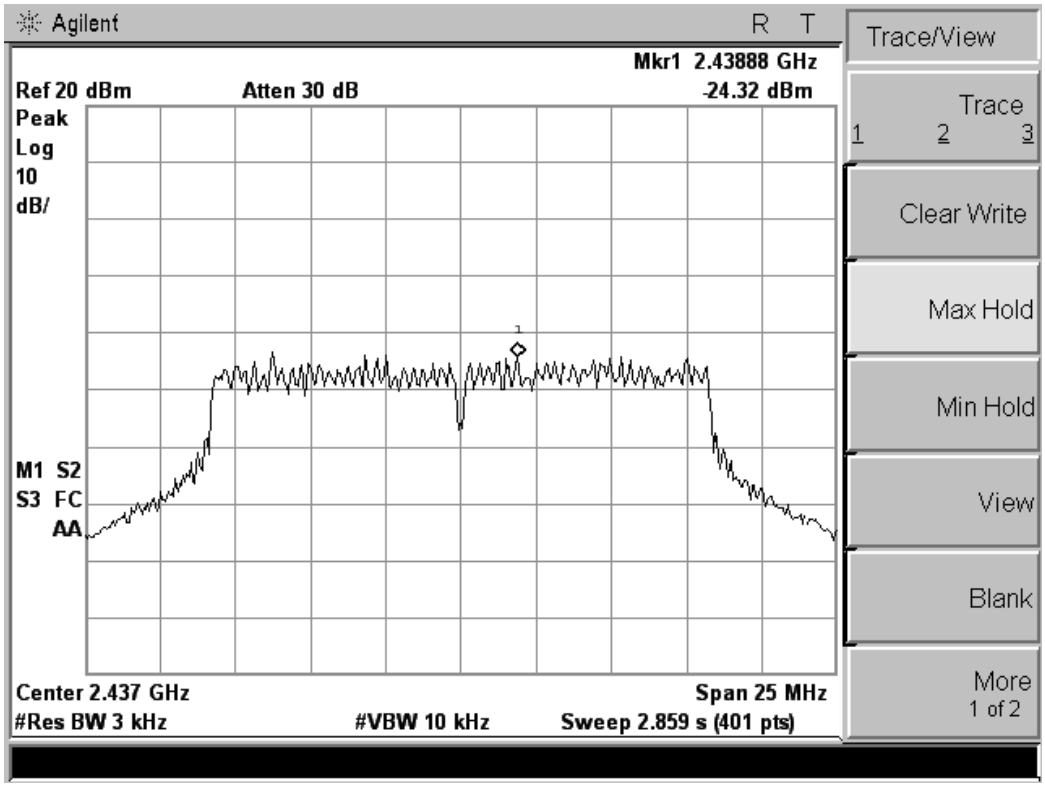






802.11g power density

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R T
Mkr1 2.43888 GHz
Ref 20 dBm
Atten 30 dB
-24.32 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.437 GHz
Span 25 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 2.859 s (401 pts)
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1 2 3
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Max Hold
Min Hold
View
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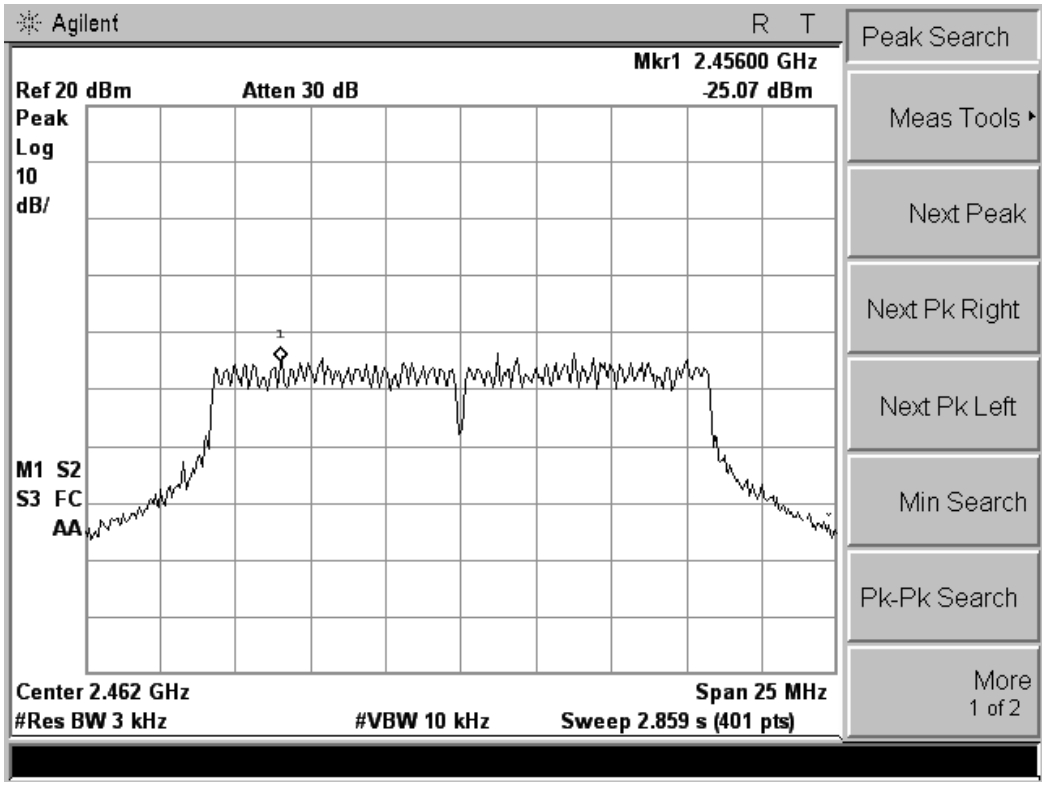
More
1 of 2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R T
Mkr1 2.45600 GHz
Ref 20 dBm
Atten 30 dB
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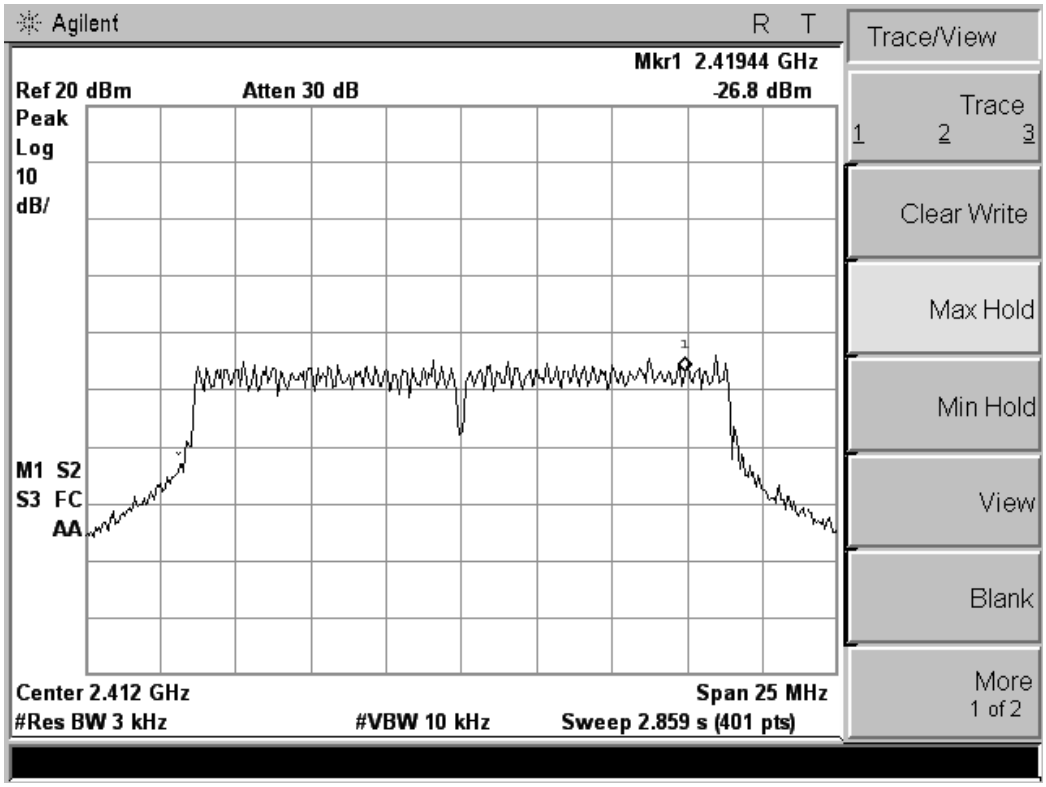
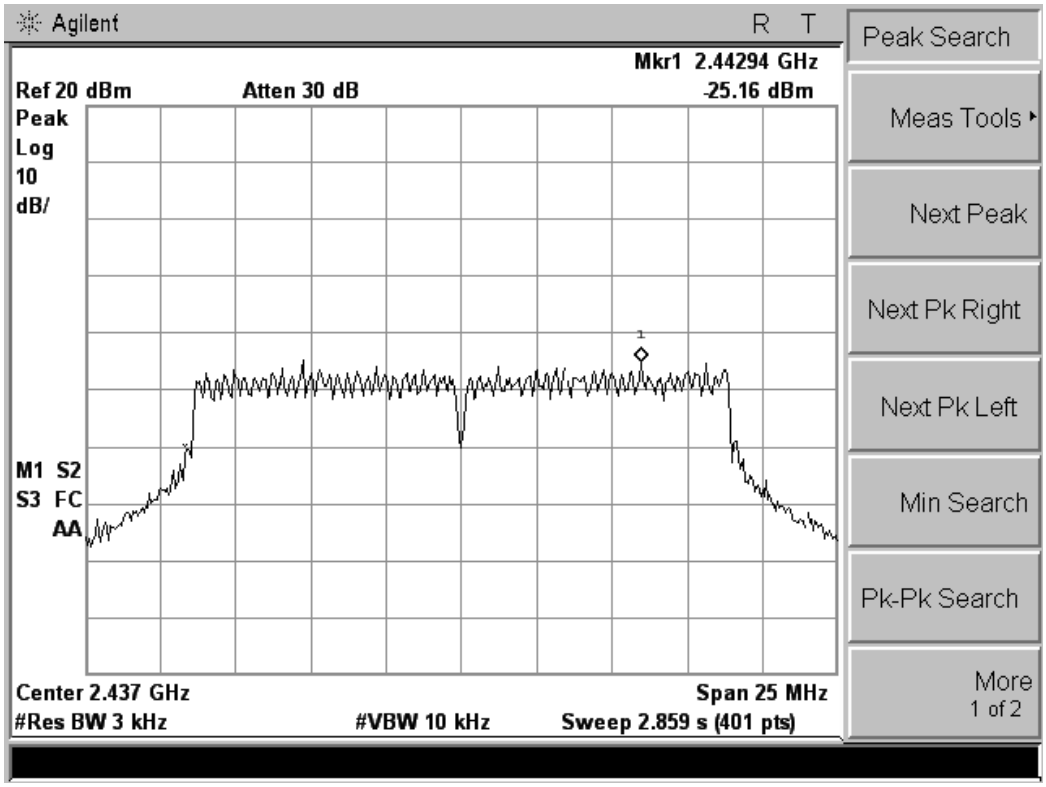
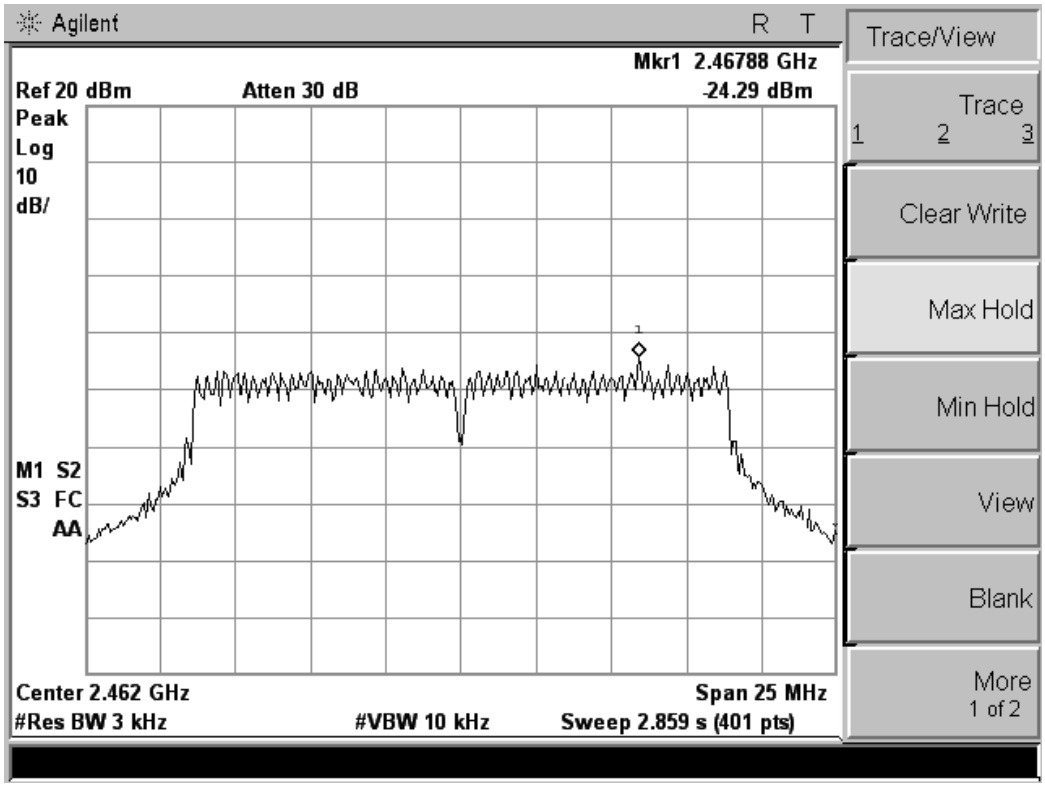
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.462 GHz
Span 25 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 2.859 s (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

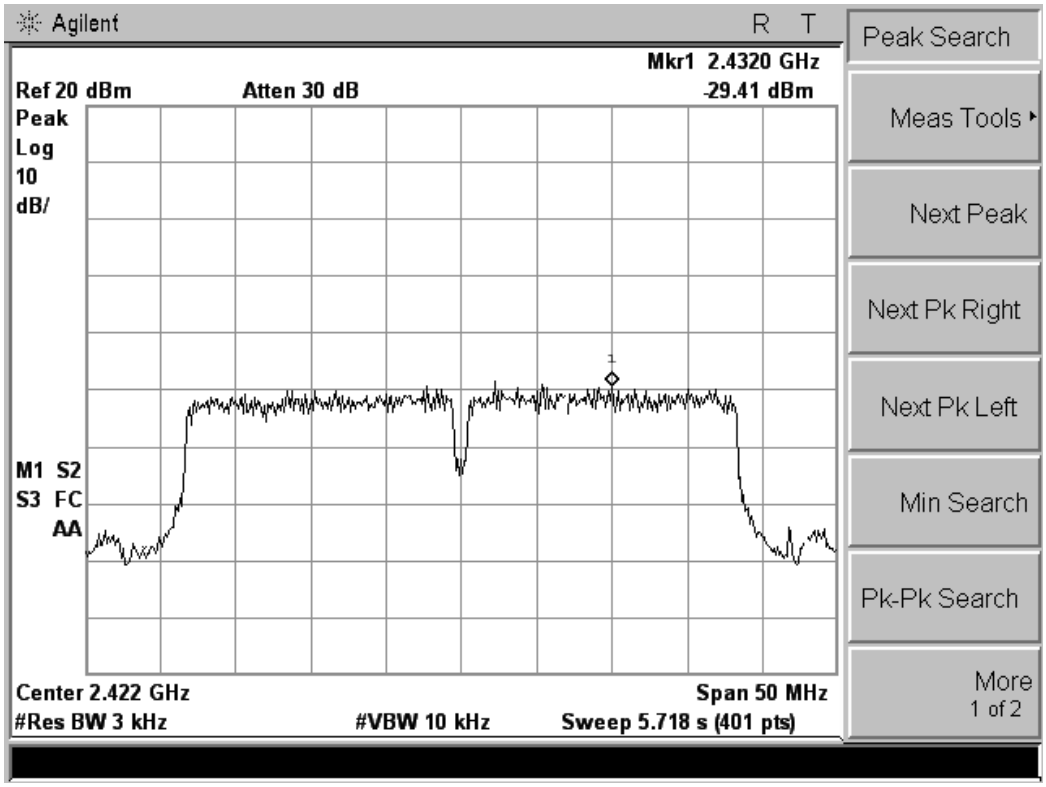
802.11n HT20 power density

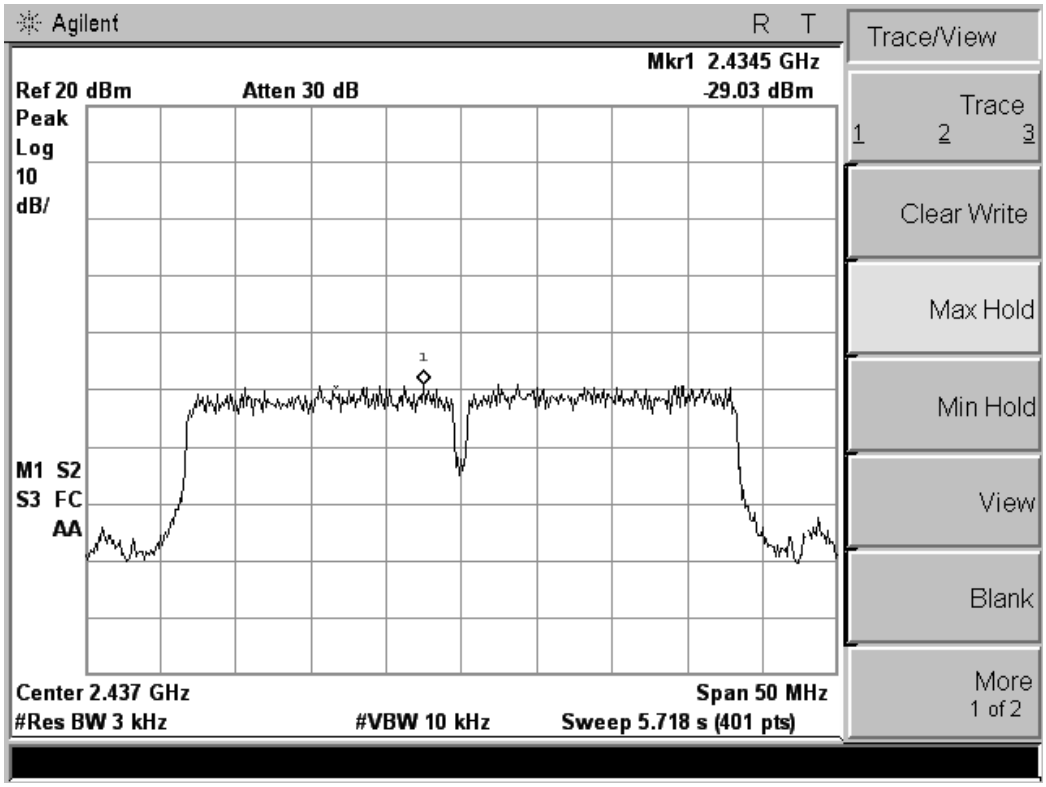


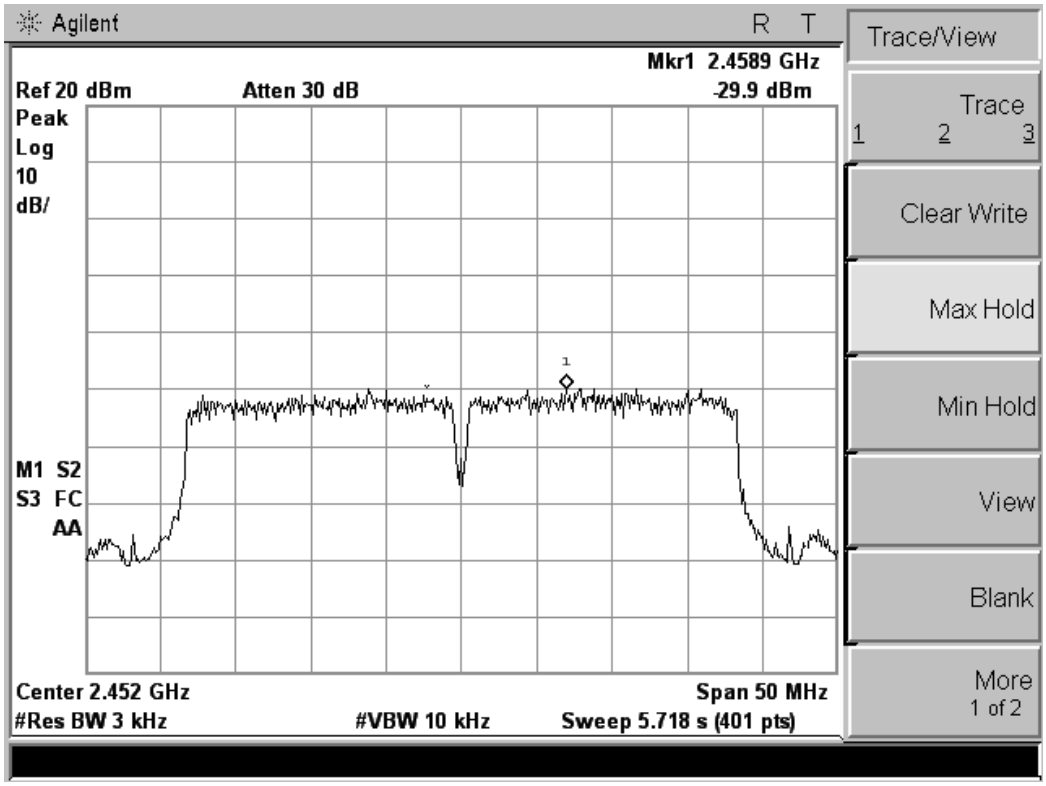




802.11n HT40 power density







6.3. 6 dB Spectrum Bandwidth Measurement

6.3.1. Standard Applicable

According to §15.247(a)(2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.3.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

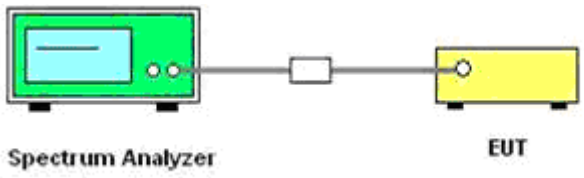
6.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2. The resolution bandwidth and the video bandwidth were set according to KDB558074 D01 v03r03.

3. Measured the spectrum width with power higher than 6dB below carrier.

6.3.4. Test Setup Layout



6.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.3.6. Test Result of 6dB Spectrum Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n

802.11b

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	9.320	500	Complies
6	2437	10.394	500	Complies
11	2462	9.019	500	Complies

802.11g

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	16.407	500	Complies
6	2437	16.429	500	Complies
11	2462	16.406	500	Complies

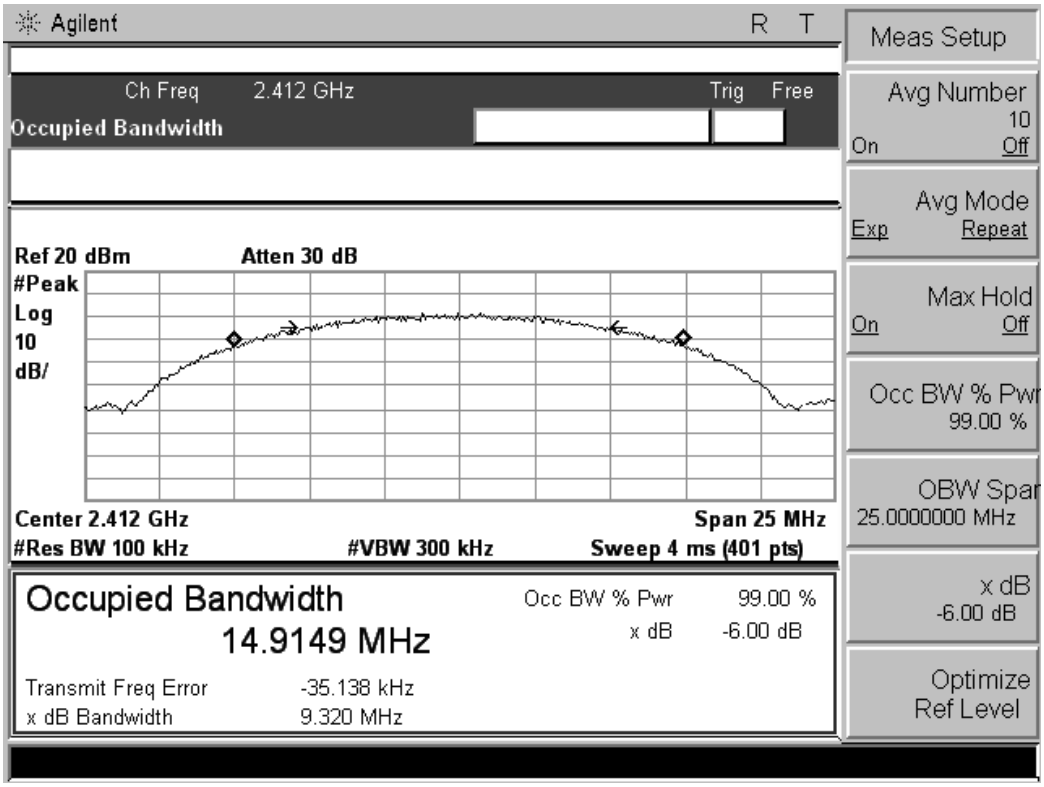
802.11n HT20

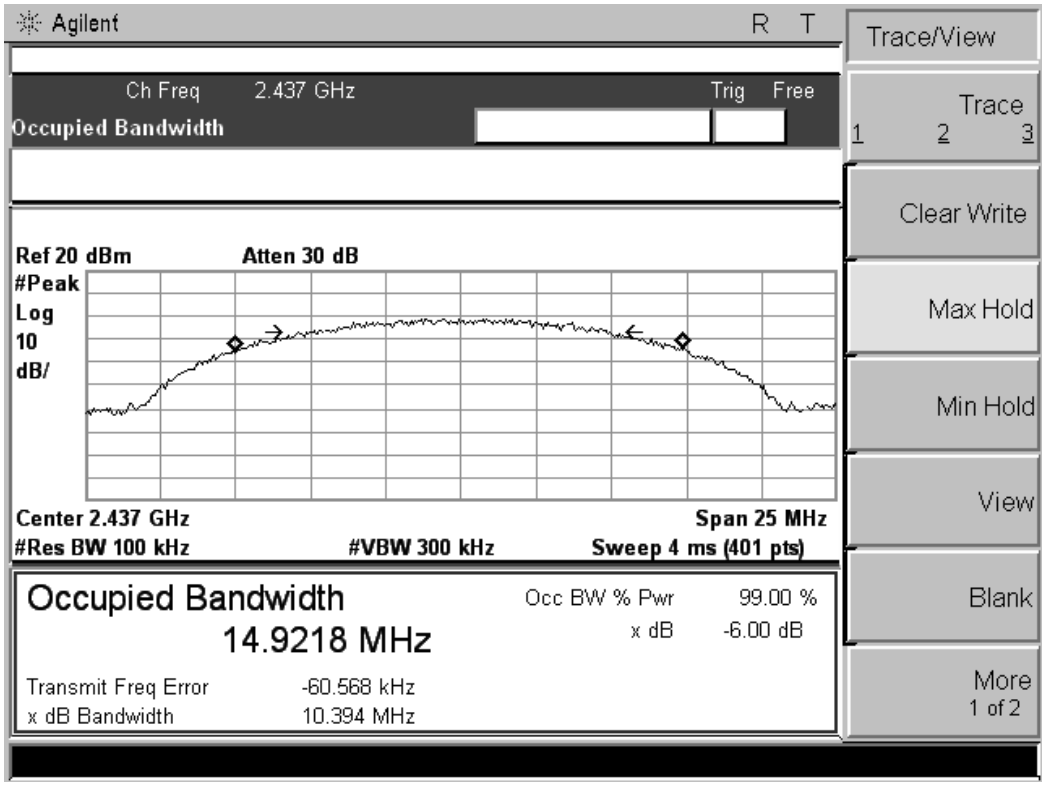
Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	17.696	500	Complies
6	2437	17.656	500	Complies
11	2462	17.637	500	Complies

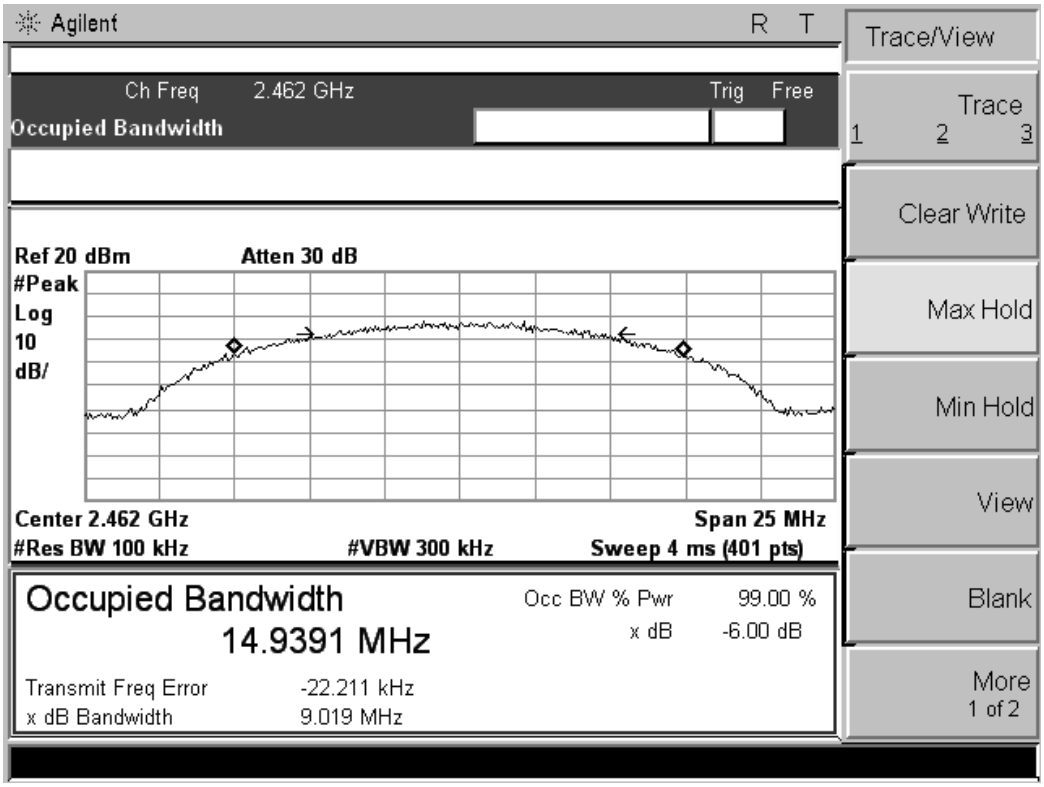
802.11n HT40

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
3	2422	35.820	500	Complies
6	2437	35.866	500	Complies
9	2452	35.479	500	Complies

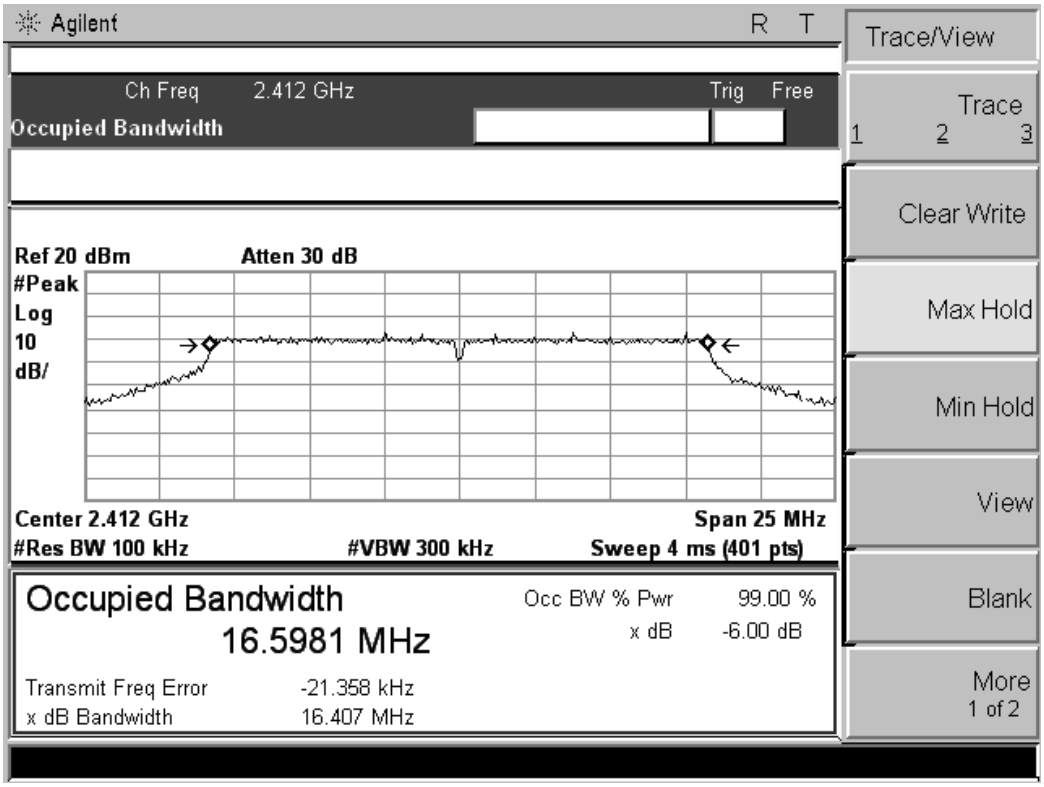
802.11b channel, 6dB bandwidth

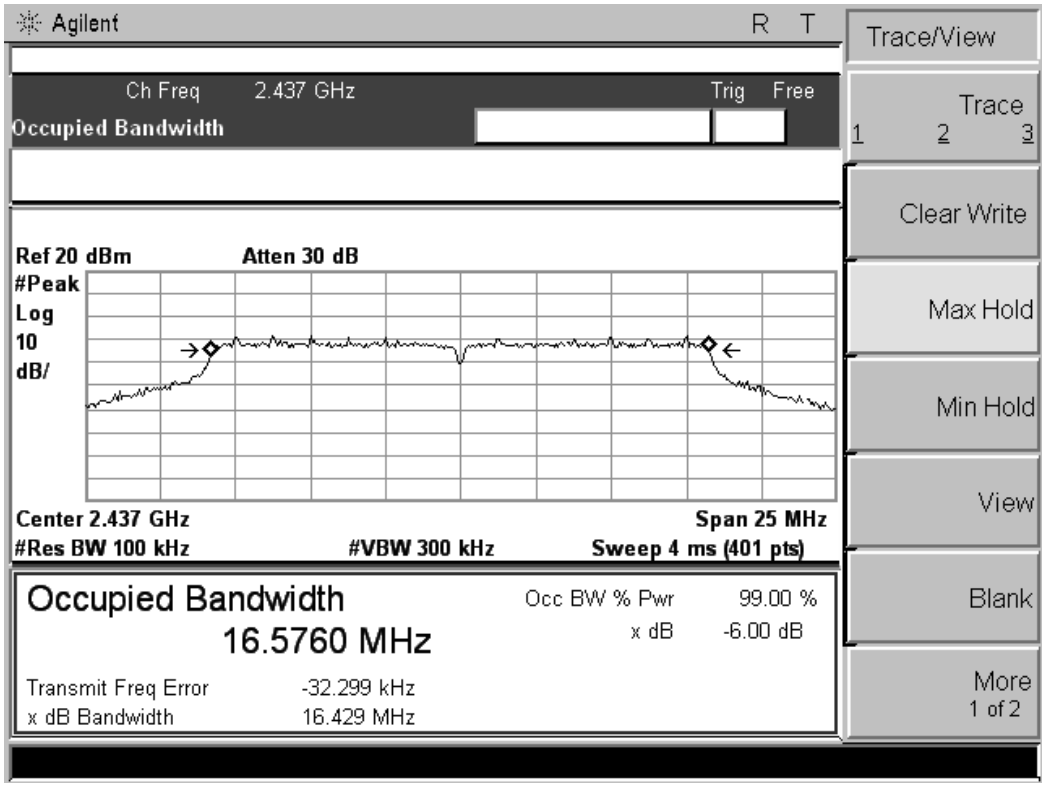


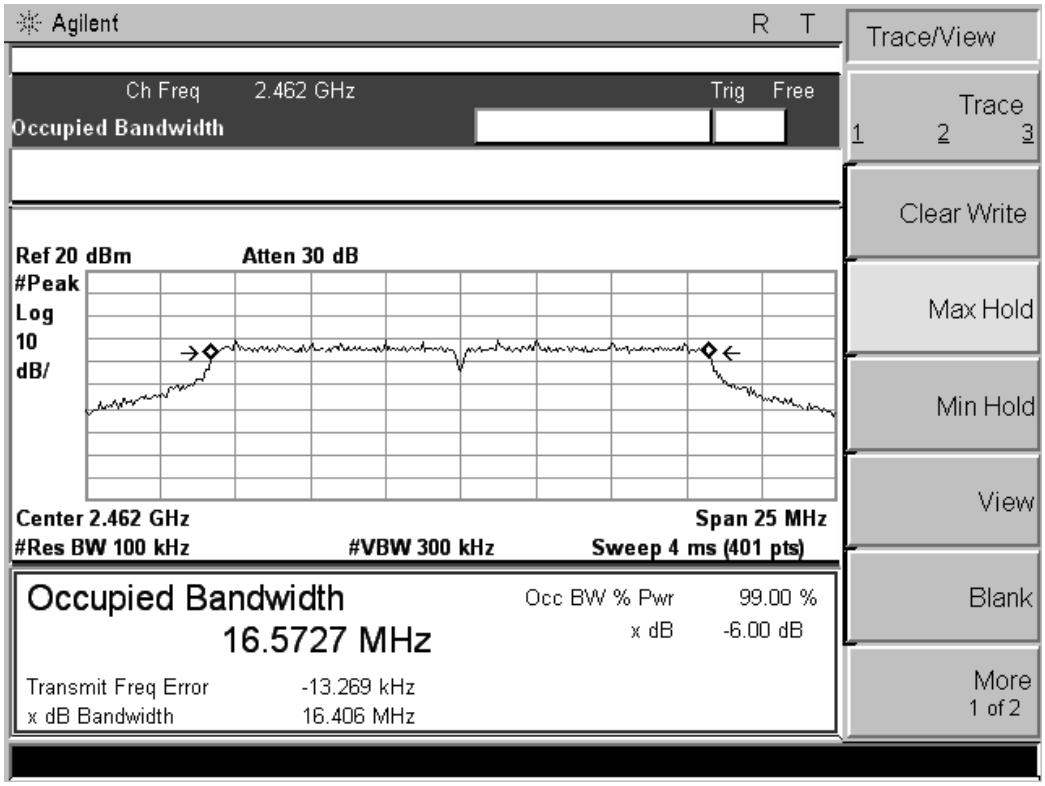




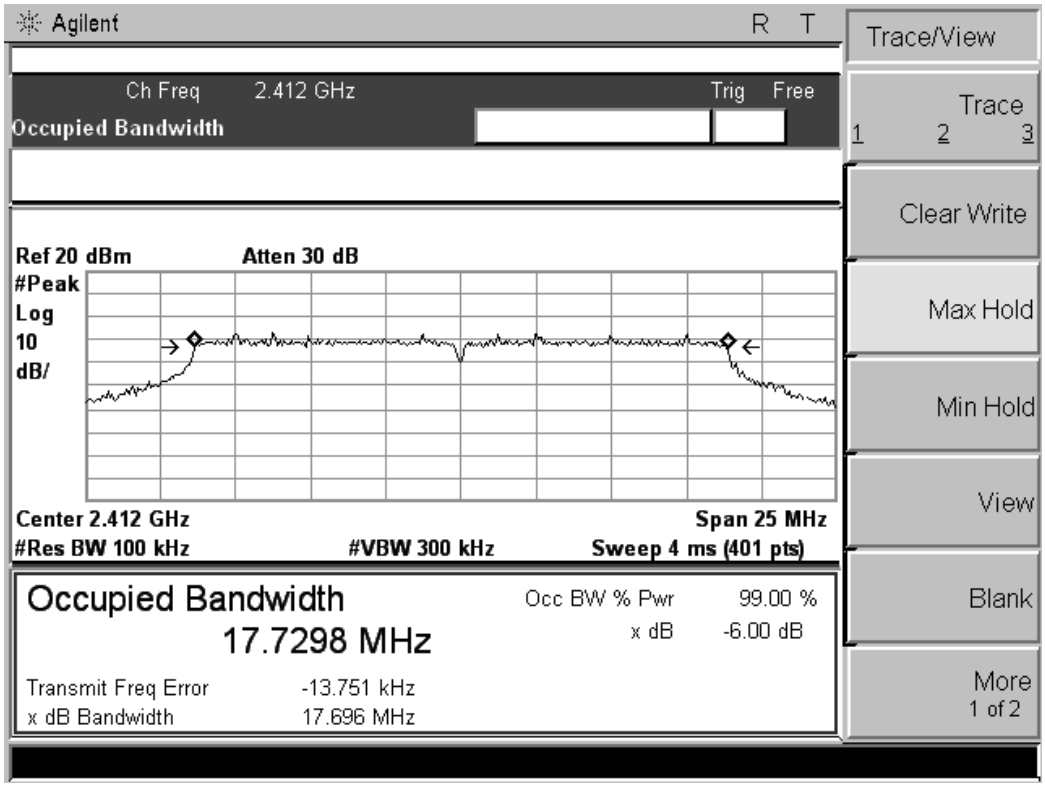
802.11g channel, 6dB bandwidth

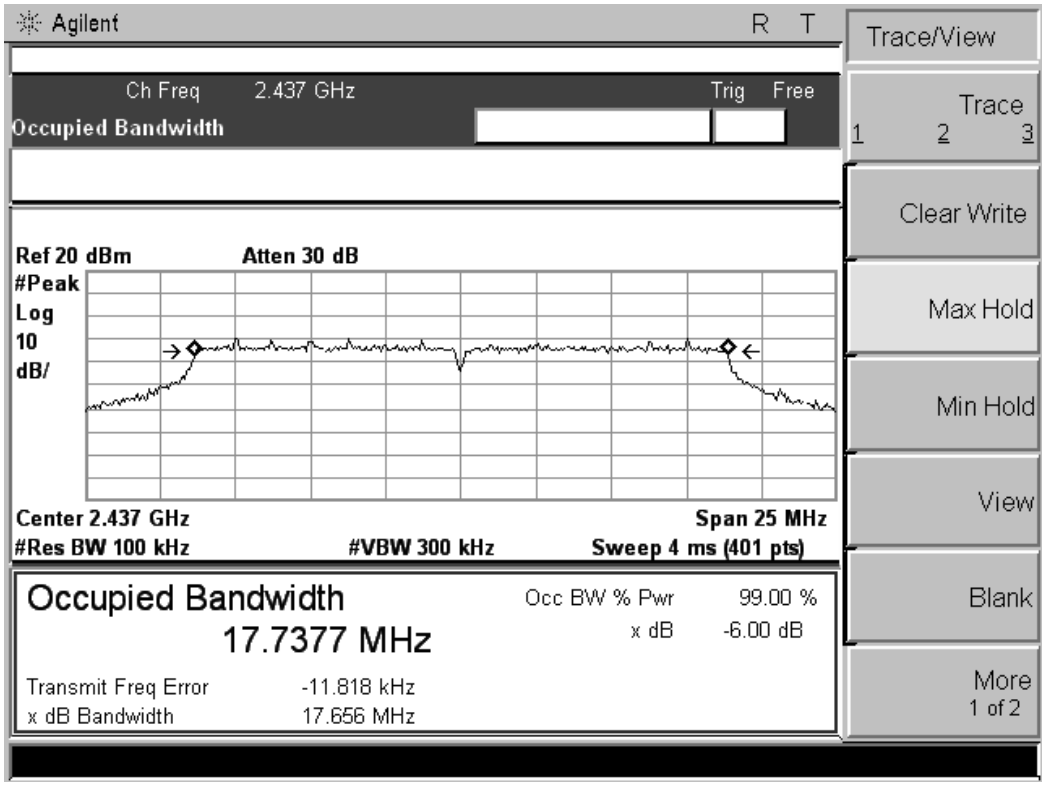


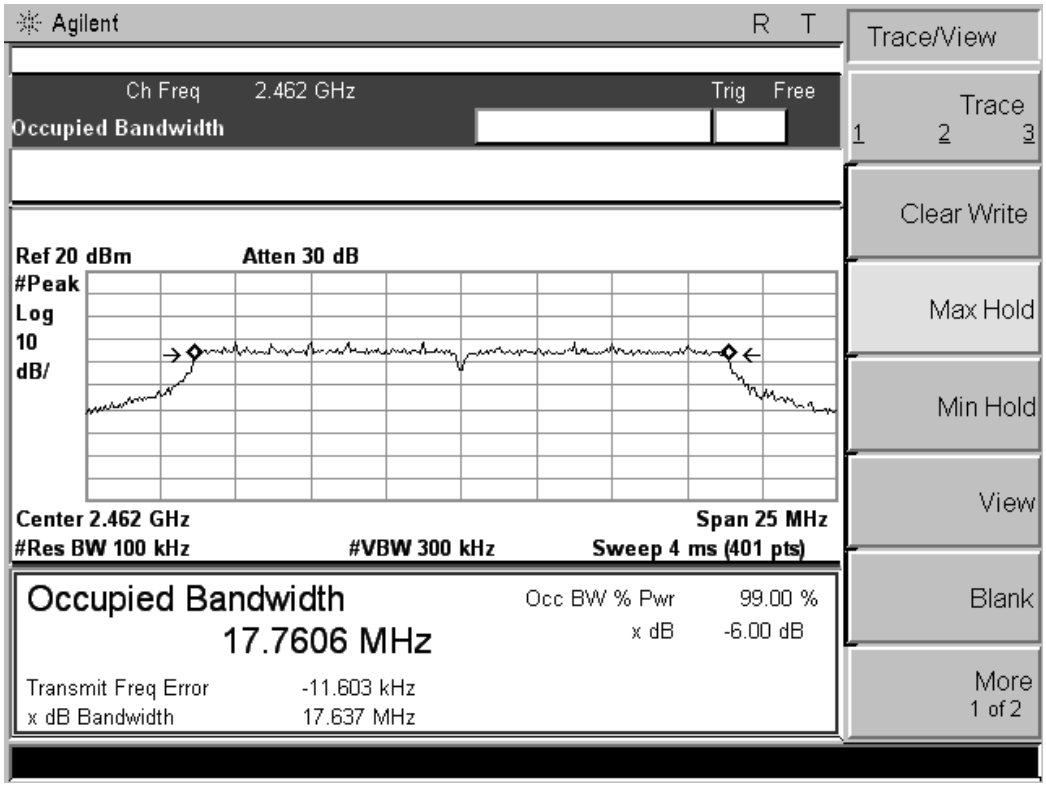




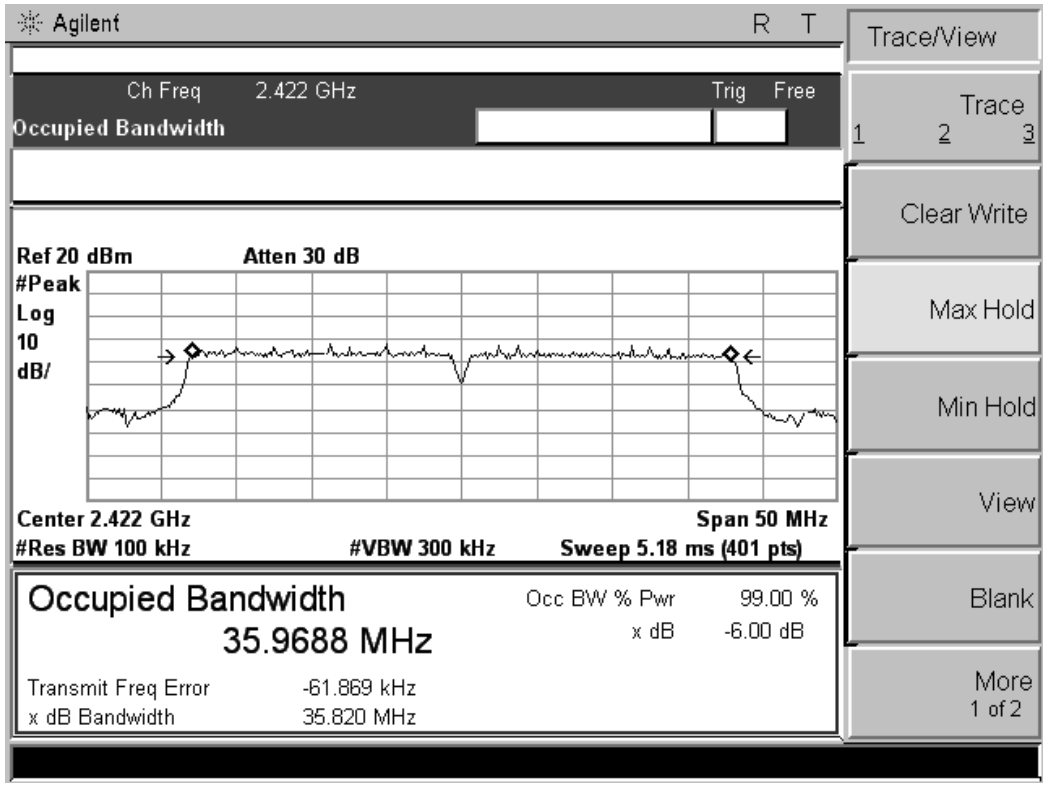
802.11n HT20 channel, 6dB bandwidth

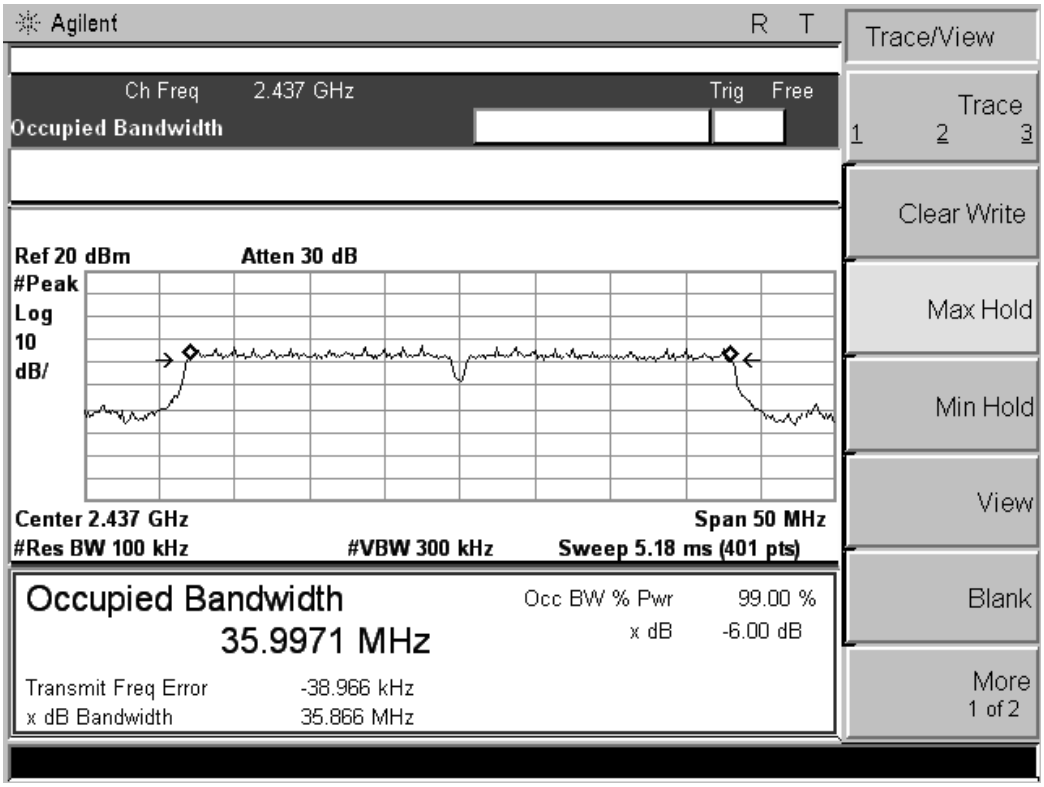


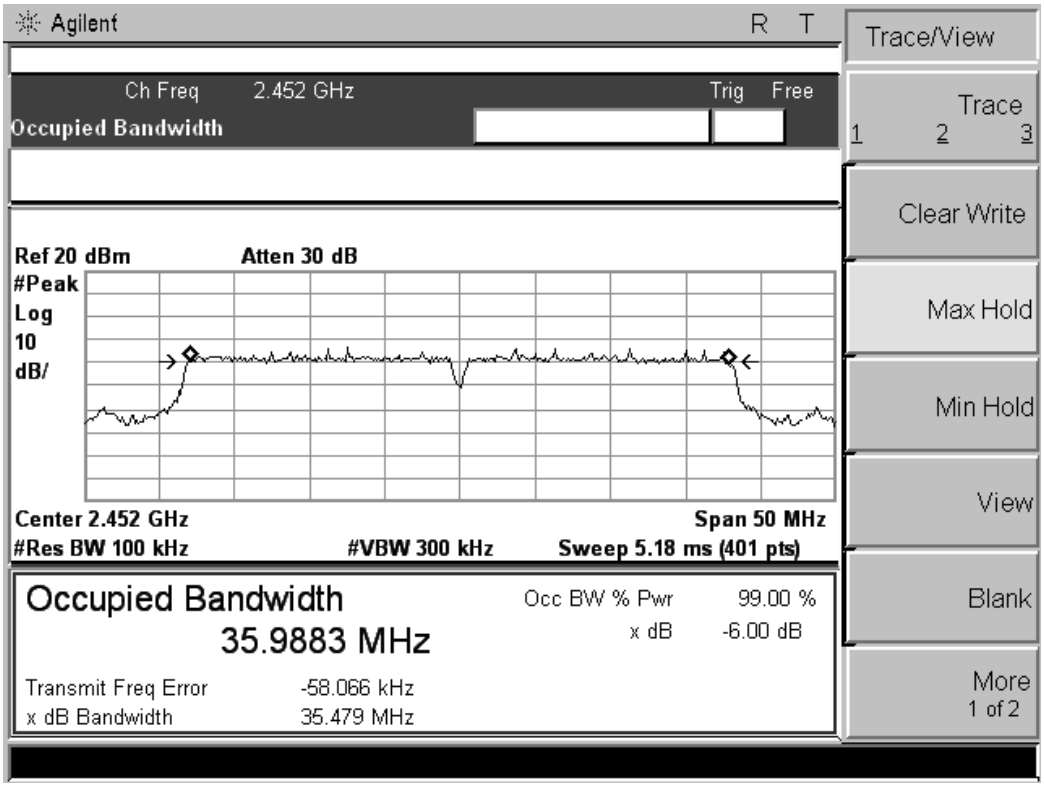




802.11n HT40 channel, 6dB bandwidth







6.4. Occupied Bandwidth

6.4.1. Standard Applicable

According to §15.247(a): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

6.4.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

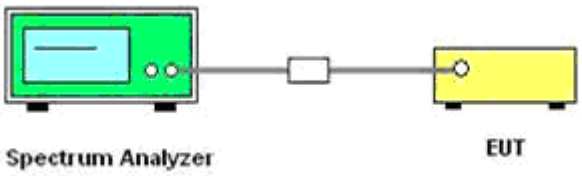
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
RBW	1% to 3% of the band
VBW	3 times the RBW
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

5

6.4.3. Test Procedures

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

6.4.4. Test Setup Layout



6.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.5. Radiated Emissions Measurement

6.5.1. Standard Applicable

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies(MHz)	Field Strength(microvolts/meter)	Measurement Distance(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

6.5.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 °to 360 °) and by rotating the elevation axes (0 °to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

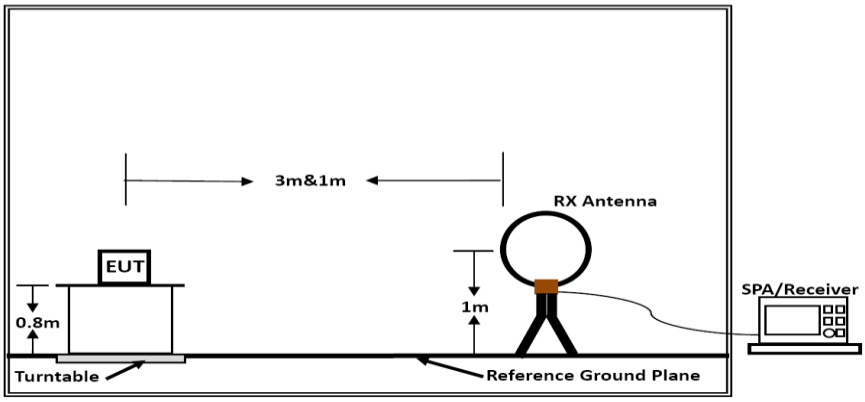
Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

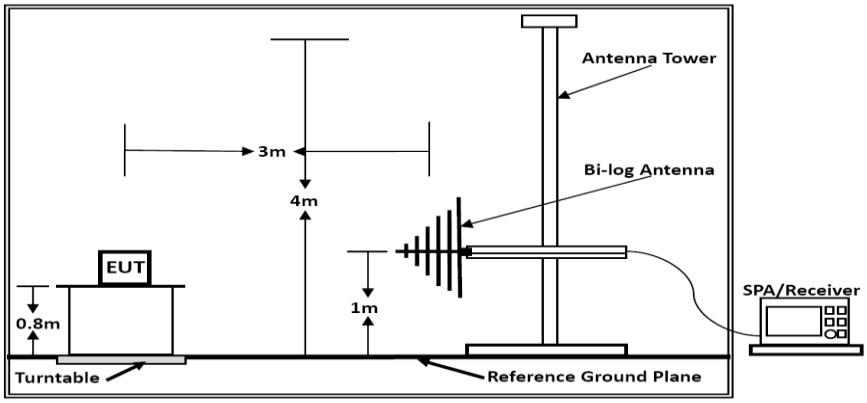
6.5.4. Test Setup Layout

For radiated emissions below 30MHz

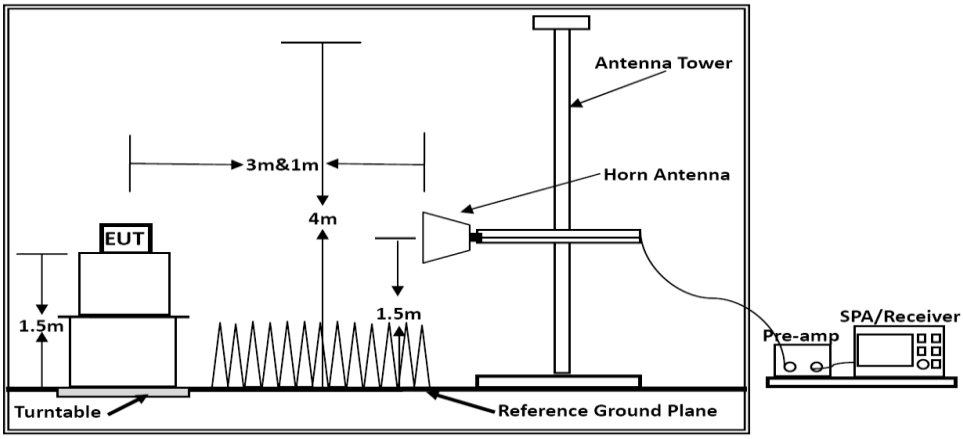


Below 30MHz

For radiated emissions above 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.5.6. Results of Radiated Emissions (9kHz~30MHz)

Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

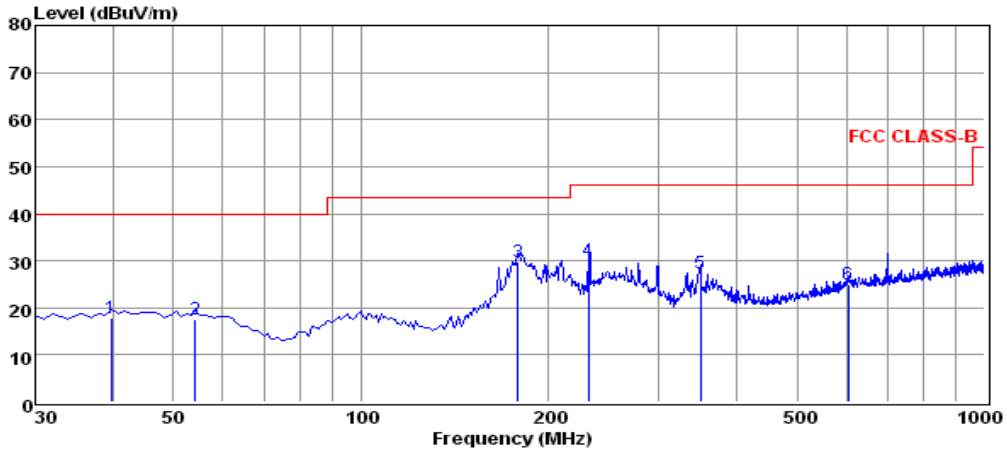
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

6.5.7. Results of Radiated Emissions (30MHz~1GHz)

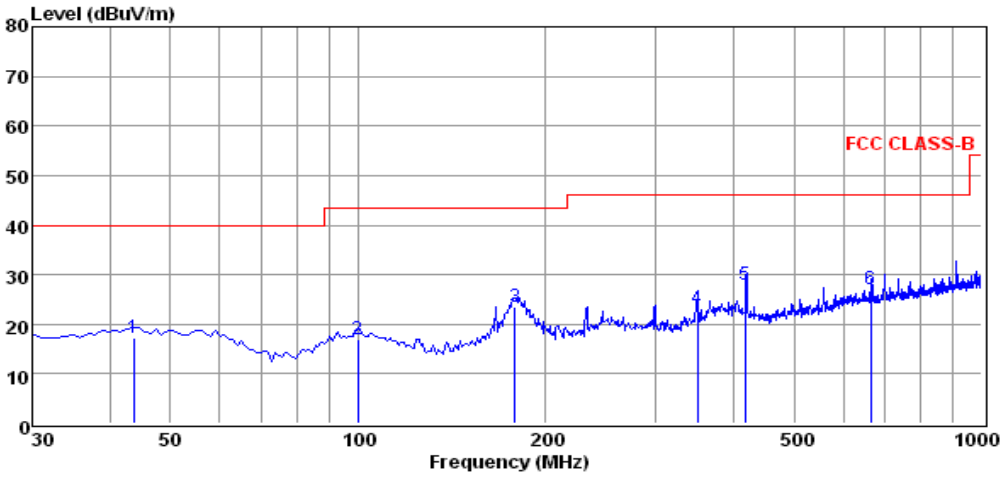
Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	802.11b (Low CH)

Test result for 802.11b (Low Channel)



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	39.70	3.83	0.38	13.50	17.71	40.00	-22.29	QP
2	54.25	4.01	0.46	13.05	17.52	40.00	-22.48	QP
3	178.41	19.21	0.89	9.57	29.67	43.50	-13.83	QP
4	231.76	17.33	0.98	11.72	30.03	46.00	-15.97	QP
5	350.10	11.79	1.15	14.28	27.22	46.00	-18.78	QP
6	604.24	4.86	1.55	18.47	24.88	46.00	-21.12	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	43.58	3.38	0.41	13.56	17.35	40.00	-22.65	QP
2	99.84	3.19	0.60	13.15	16.94	43.50	-26.56	QP
3	178.41	12.93	0.89	9.57	23.39	43.50	-20.11	QP
4	350.10	7.84	1.15	14.28	23.27	46.00	-22.73	QP
5	418.00	11.25	1.32	15.43	28.00	46.00	-18.00	QP
6	664.38	6.94	1.55	18.68	27.17	46.00	-18.83	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Note:

Pre-scan all mode and recorded the worst case results in this report (802.11b (Low Channel)).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

6.5.8. Results for Radiated Emissions (Above 1GHz) 802.11b

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.00	51.82	33.06	35.04	3.94	53.78	74	-20.22	Peak	Horizontal
4824.00	36.94	33.06	35.04	3.94	38.90	54	-15.10	Average	Horizontal
4824.00	46.01	33.06	35.04	3.94	47.97	74	-26.03	Peak	Vertical
4824.00	33.20	33.06	35.04	3.94	35.16	54	-18.84	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.00	47.97	33.16	35.15	3.96	49.94	74	-24.06	Peak	Horizontal
4874.00	39.59	33.16	35.15	3.96	41.56	54	-12.44	Average	Horizontal
4874.00	54.78	33.16	35.15	3.96	56.75	74	-17.25	Peak	Vertical
4874.00	43.24	33.16	35.15	3.96	45.21	54	-8.79	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.00	50.35	33.26	35.14	3.98	52.45	74	-21.55	Peak	Horizontal
4924.00	35.38	33.26	35.14	3.98	37.48	54	-16.52	Average	Horizontal
4924.00	52.02	33.26	35.14	3.98	54.12	74	-19.88	Peak	Vertical
4924.00	35.38	33.26	35.14	3.98	37.48	54	-16.52	Average	Vertical

802.11g

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.00	46.42	33.06	35.04	3.94	48.38	74	-25.62	Peak	Horizontal
4824.00	33.75	33.06	35.04	3.94	35.71	54	-18.29	Average	Horizontal
4824.00	54.02	33.06	35.04	3.94	55.98	74	-18.02	Peak	Vertical
4824.00	36.10	33.06	35.04	3.94	38.06	54	-15.94	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.00	51.53	33.16	35.15	3.96	53.50	74	-20.50	Peak	Horizontal
4874.00	35.93	33.16	35.15	3.96	37.90	54	-16.10	Average	Horizontal
4874.00	48.28	33.16	35.15	3.96	50.25	74	-23.75	Peak	Vertical
4874.00	36.97	33.16	35.15	3.96	38.94	54	-15.06	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.00	52.68	33.26	35.14	3.98	54.78	74	-19.22	Peak	Horizontal
4924.00	36.31	33.26	35.14	3.98	38.41	54	-15.59	Average	Horizontal
4924.00	54.81	33.26	35.14	3.98	56.91	74	-17.09	Peak	Vertical
4924.00	35.59	33.26	35.14	3.98	37.69	54	-16.31	Average	Vertical

802.11n HT20

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.00	45.71	33.06	35.04	3.94	47.67	74	-26.33	Peak	Horizontal
4824.00	35.64	33.06	35.04	3.94	37.60	54	-16.40	Average	Horizontal
4824.00	50.08	33.06	35.04	3.94	52.04	74	-21.96	Peak	Vertical
4824.00	36.04	33.06	35.04	3.94	38.00	54	-16.00	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.00	52.75	33.16	35.15	3.96	54.72	74	-19.28	Peak	Horizontal
4874.00	36.01	33.16	35.15	3.96	37.98	54	-16.02	Average	Horizontal
4874.00	50.63	33.16	35.15	3.96	52.60	74	-21.40	Peak	Vertical
4874.00	34.88	33.16	35.15	3.96	36.85	54	-17.15	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.00	46.45	33.26	35.14	3.98	48.55	74	-25.45	Peak	Horizontal
4924.00	35.90	33.26	35.14	3.98	38.00	54	-16.00	Average	Horizontal
4924.00	48.83	33.26	35.14	3.98	50.93	74	-23.07	Peak	Vertical
4924.00	35.29	33.26	35.14	3.98	37.39	54	-16.61	Average	Vertical

802.11n HT40

Channel 3

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4844.00	43.42	33.06	35.04	3.94	45.38	74	-28.62	Peak	Horizontal
4844.00	34.42	33.06	35.04	3.94	36.38	54	-17.62	Average	Horizontal
4844.00	44.63	33.06	35.04	3.94	46.59	74	-27.41	Peak	Vertical
4844.00	35.40	33.06	35.04	3.94	37.36	54	-16.64	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.00	43.39	33.16	35.15	3.96	45.36	74	-28.64	Peak	Horizontal
4874.00	35.18	33.16	35.15	3.96	37.15	54	-16.85	Average	Horizontal
4874.00	45.68	33.16	35.15	3.96	47.65	74	-26.35	Peak	Vertical
4874.00	35.93	33.16	35.15	3.96	37.90	54	-16.10	Average	Vertical

Channel 9

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4904.00	37.43	33.26	35.14	3.98	39.53	74	-34.47	Peak	Horizontal
4904.00	38.92	33.26	35.14	3.98	41.02	54	-12.98	Average	Horizontal
4904.00	40.44	33.26	35.14	3.98	42.54	74	-31.46	Peak	Vertical
4904.00	33.47	33.26	35.14	3.98	35.57	54	-18.43	Average	Vertical

Notes:

1. *Measuring frequencies from 9k~10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 9k~10th harmonic or 40GHz (which is less) were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

6.5.9. Results of Band Edges Test (Radiated)

802.11b

Tx-2412

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2390.00	55.30	32.89	35.16	3.51	56.54	74	-17.46	Peak	Horizontal
2390.00	35.26	32.89	35.16	3.51	36.51	54	-17.49	Average	Horizontal
2400.00	58.74	32.92	35.16	3.54	60.04	74	-13.96	Peak	Horizontal
2400.00	42.51	32.92	35.16	3.54	43.81	54	-10.19	Average	Horizontal
2390.00	50.24	32.89	35.16	3.51	51.48	74	-22.52	Peak	Vertical
2390.00	34.80	32.89	35.16	3.51	36.05	54	-17.95	Average	Vertical
2400.00	59.10	32.92	35.16	3.54	60.40	74	-13.60	Peak	Vertical
2400.00	36.96	32.92	35.16	3.54	38.26	54	-15.74	Average	Vertical

Tx-2462

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	56.83	33.06	35.18	3.60	58.31	74	-15.69	Peak	Horizontal
2483.50	39.40	33.06	35.18	3.60	40.88	54	-13.12	Average	Horizontal
2483.50	55.42	33.06	35.18	3.60	56.90	74	-17.10	Peak	Vertical
2483.50	38.00	33.06	35.18	3.60	39.48	54	-14.52	Average	Vertical

802.11g

Tx-2412

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2390.00	52.31	32.89	35.16	3.51	53.55	74	-20.45	Peak	Horizontal
2390.00	40.44	32.89	35.16	3.51	41.69	54	-12.31	Average	Horizontal
2400.00	52.76	32.92	35.16	3.54	54.06	74	-19.94	Peak	Horizontal
2400.00	38.23	32.92	35.16	3.54	39.53	54	-14.47	Average	Horizontal
2390.00	54.18	32.89	35.16	3.51	55.42	74	-18.58	Peak	Vertical
2390.00	42.47	32.89	35.16	3.51	43.72	54	-10.28	Average	Vertical
2400.00	56.06	32.92	35.16	3.54	57.36	74	-16.64	Peak	Vertical
2400.00	37.65	32.92	35.16	3.54	38.95	54	-15.05	Average	Vertical

Tx-2462

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	58.05	33.06	35.18	3.60	59.53	74	-14.47	Peak	Horizontal
2483.50	38.80	33.06	35.18	3.60	40.28	54	-13.72	Average	Horizontal
2483.50	55.72	33.06	35.18	3.60	57.20	74	-16.80	Peak	Vertical
2483.50	37.76	33.06	35.18	3.60	39.24	54	-14.76	Average	Vertical

802.11n(HT20)

Tx-2412

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2390.00	53.32	32.89	35.16	3.51	54.56	74	-19.44	Peak	Horizontal
2390.00	39.32	32.89	35.16	3.51	40.57	54	-13.43	Average	Horizontal
2400.00	55.59	32.92	35.16	3.54	56.89	74	-17.11	Peak	Horizontal
2400.00	40.36	32.92	35.16	3.54	41.66	54	-12.34	Average	Horizontal
2390.00	57.38	32.89	35.16	3.51	58.62	74	-15.38	Peak	Vertical
2390.00	38.55	32.89	35.16	3.51	39.80	54	-14.20	Average	Vertical
2400.00	55.23	32.92	35.16	3.54	56.53	74	-17.47	Peak	Vertical
2400.00	36.30	32.92	35.16	3.54	37.60	54	-16.40	Average	Vertical

Tx-2462

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	54.77	33.06	35.18	3.60	56.25	74	-17.75	Peak	Horizontal
2483.50	37.62	33.06	35.18	3.60	39.10	54	-14.90	Average	Horizontal
2483.50	53.37	33.06	35.18	3.60	54.85	74	-19.15	Peak	Vertical
2483.50	39.92	33.06	35.18	3.60	41.40	54	-12.60	Average	Vertical

802.11n(HT40)

Tx-2422

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2390.00	48.26	32.89	35.16	3.51	49.50	74	-24.50	Peak	Horizontal
2390.00	36.03	32.89	35.16	3.51	37.28	54	-16.72	Average	Horizontal
2400.00	54.82	32.92	35.16	3.54	56.12	74	-17.88	Peak	Horizontal
2400.00	42.86	32.92	35.16	3.54	44.16	54	-9.84	Average	Horizontal
2390.00	51.74	32.89	35.16	3.51	52.98	74	-21.02	Peak	Vertical
2390.00	39.08	32.89	35.16	3.51	40.33	54	-13.67	Average	Vertical
2400.00	58.01	32.92	35.16	3.54	59.31	74	-14.69	Peak	Vertical
2400.00	39.33	32.92	35.16	3.54	40.63	54	-13.37	Average	Vertical

Tx-2452

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	58.03	33.06	35.18	3.60	59.51	74	-14.49	Peak	Horizontal
2483.50	37.20	33.06	35.18	3.60	38.68	54	-15.32	Average	Horizontal
2483.50	55.83	33.06	35.18	3.60	57.31	74	-16.69	Peak	Vertical
2483.50	37.85	33.06	35.18	3.60	39.33	54	-14.67	Average	Vertical

6.6. Conducted Spurious Emissions and Band Edges Test

6.6.1. Standard Applicable

According to §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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.6.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

6.6.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9kHz to 40GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

6.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 5.4.4.

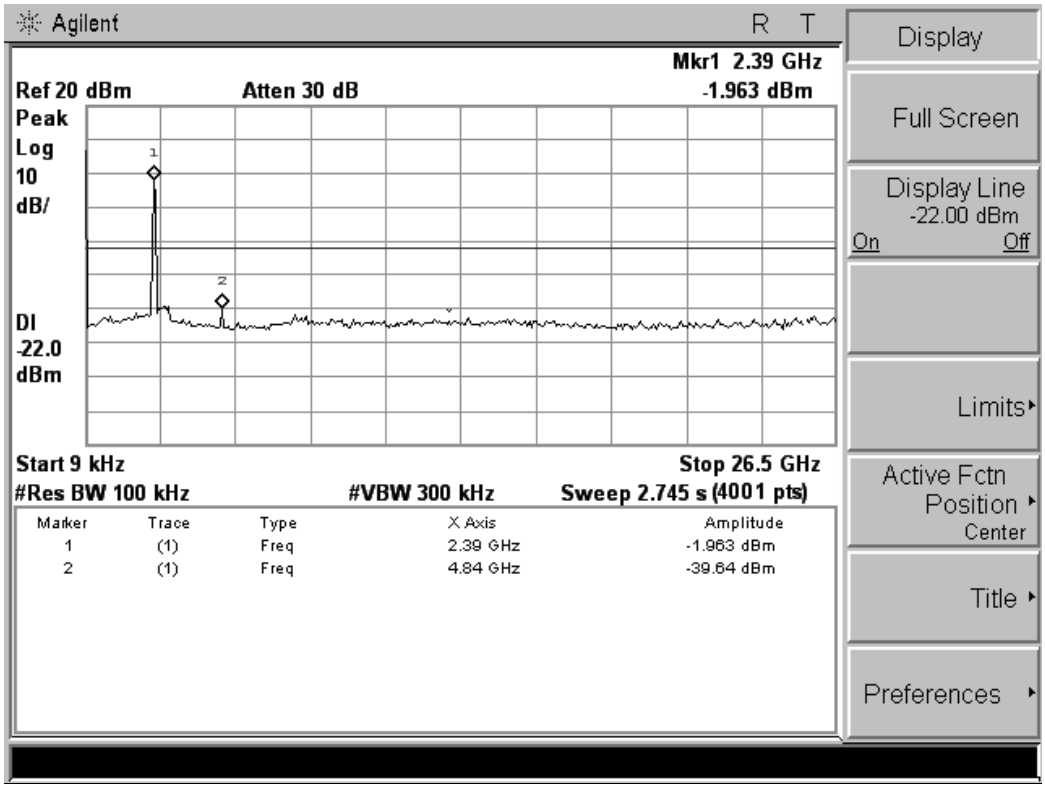
6.6.5. EUT Operation during Test

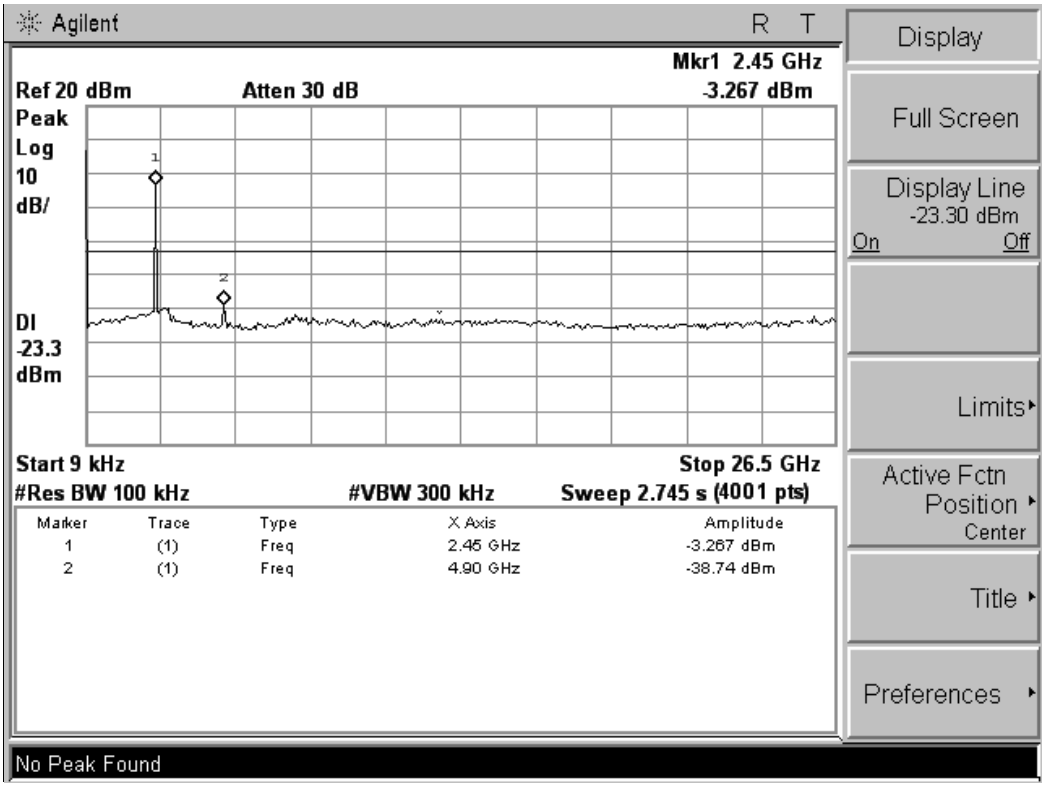
The EUT was programmed to be in continuously transmitting mode.

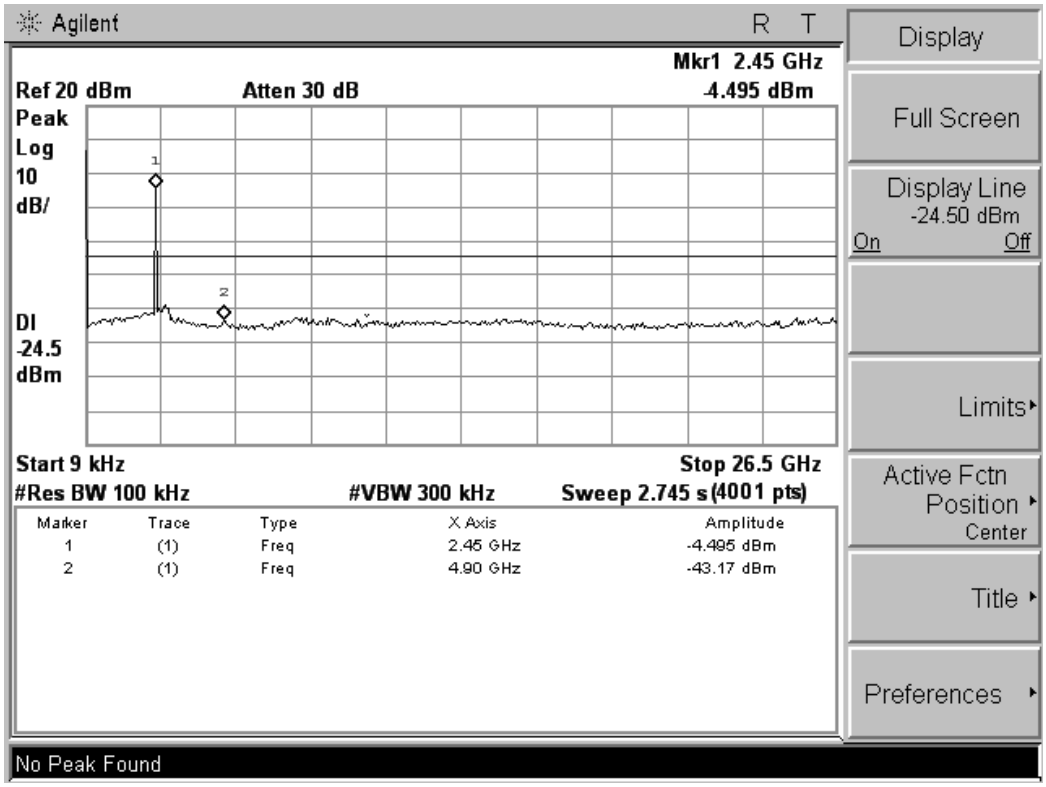
6.6.6. Test Results of Conducted Spurious Emissions

Emissions that fall into restricted frequency bands was blow the emission limits in Section 15.209.

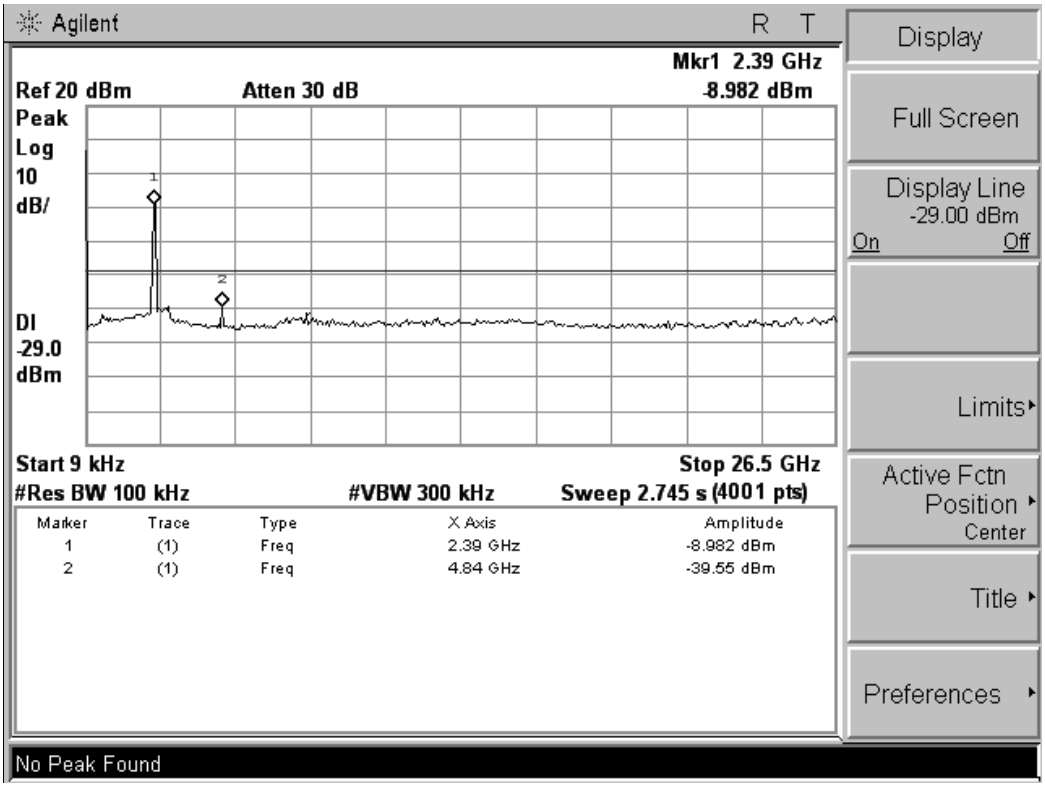
802.11b

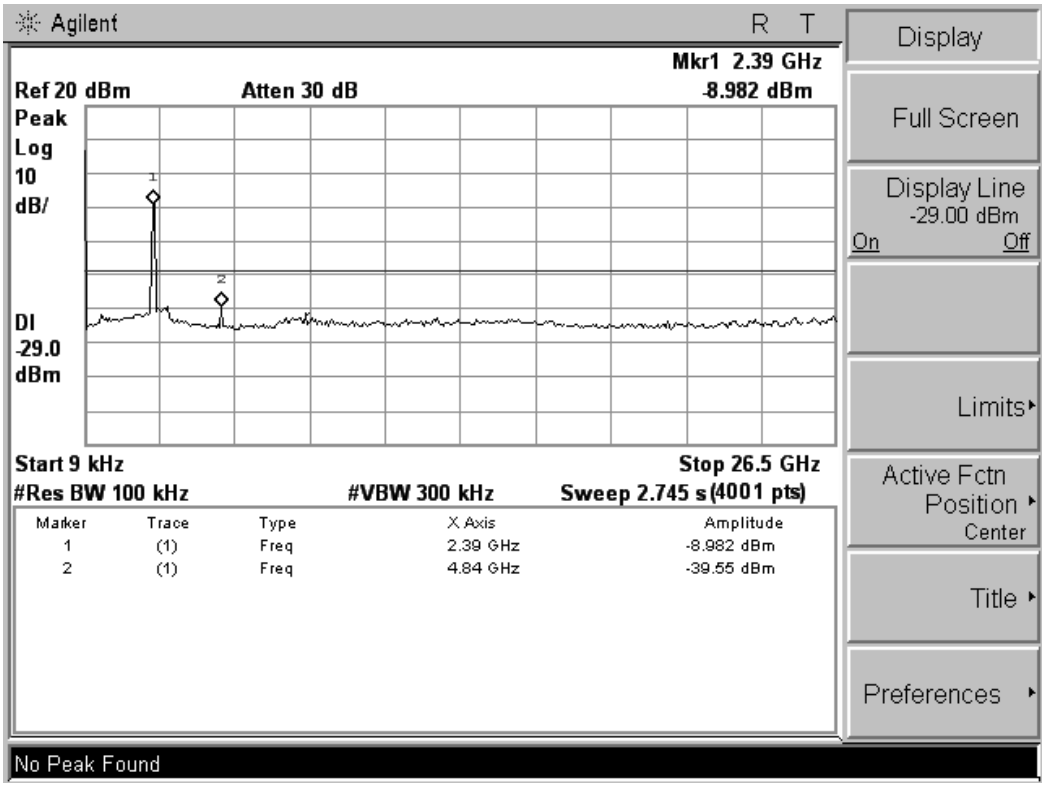


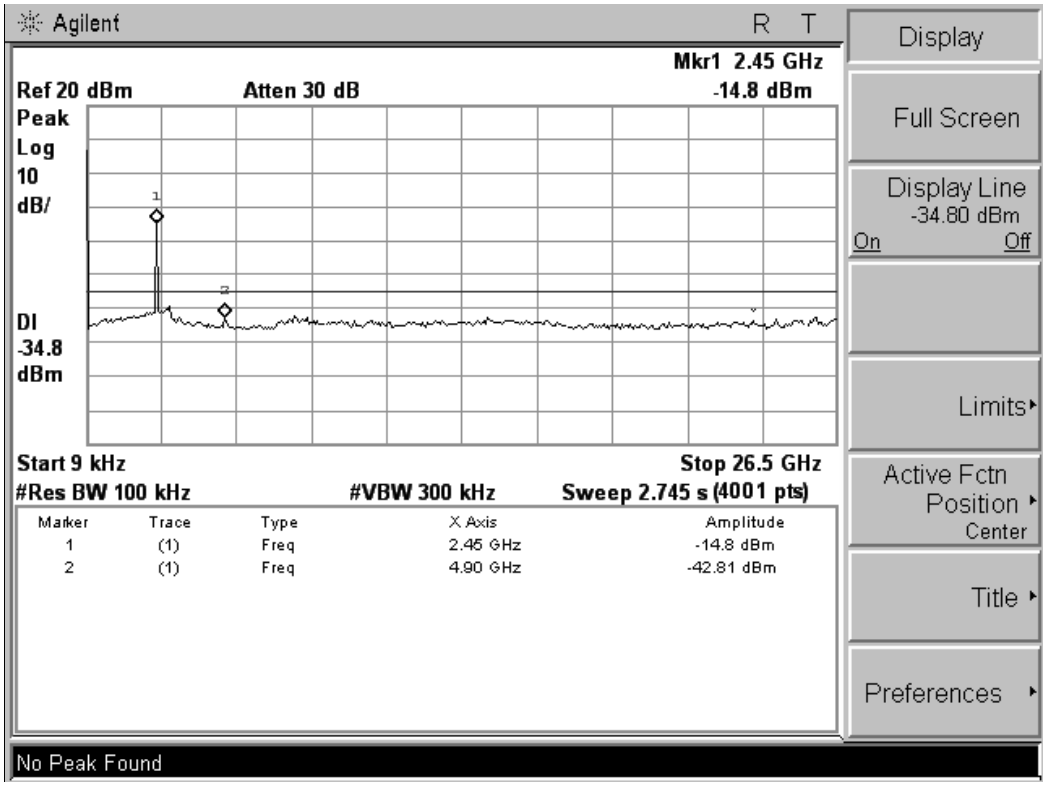



Agilent
R T
Mkr1 2.45 GHz
Ref 20 dBm
Atten 30 dB
-4.495 dBm
Peak
Log
10
dB/
DI
-24.5
dBm
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45 GHz -4.495 dBm
2 (1) Freq 4.90 GHz -43.17 dBm
Display
Full Screen
Display Line
-24.50 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found

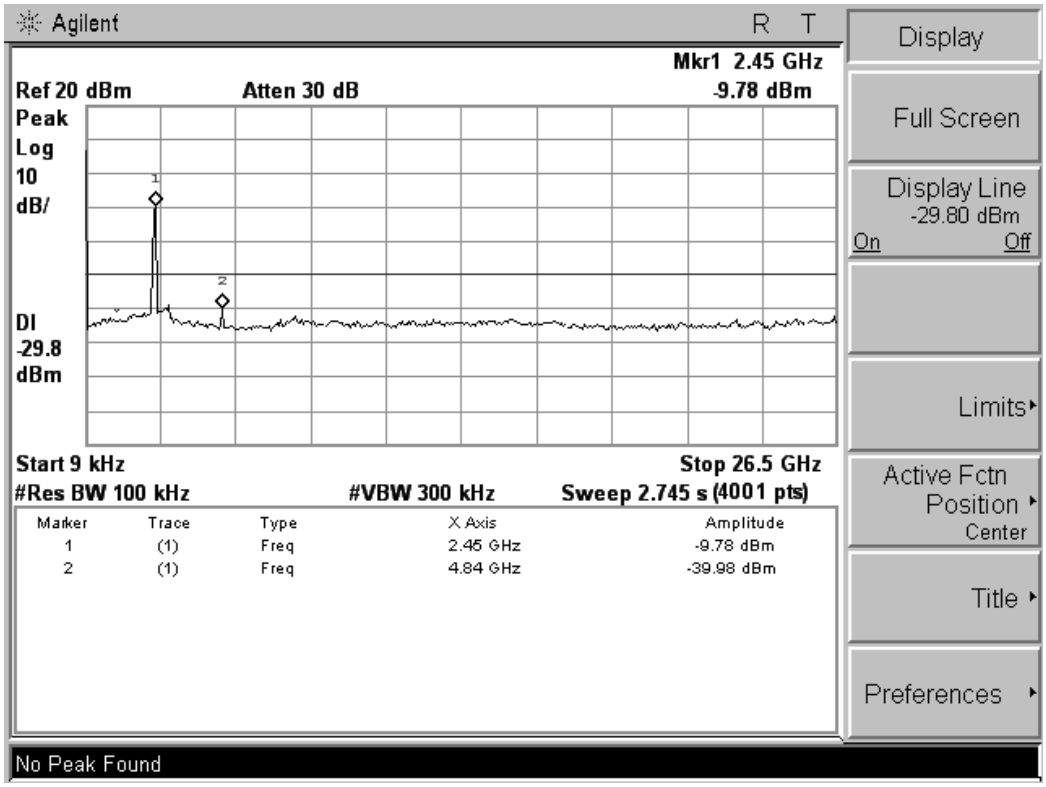
802.11g

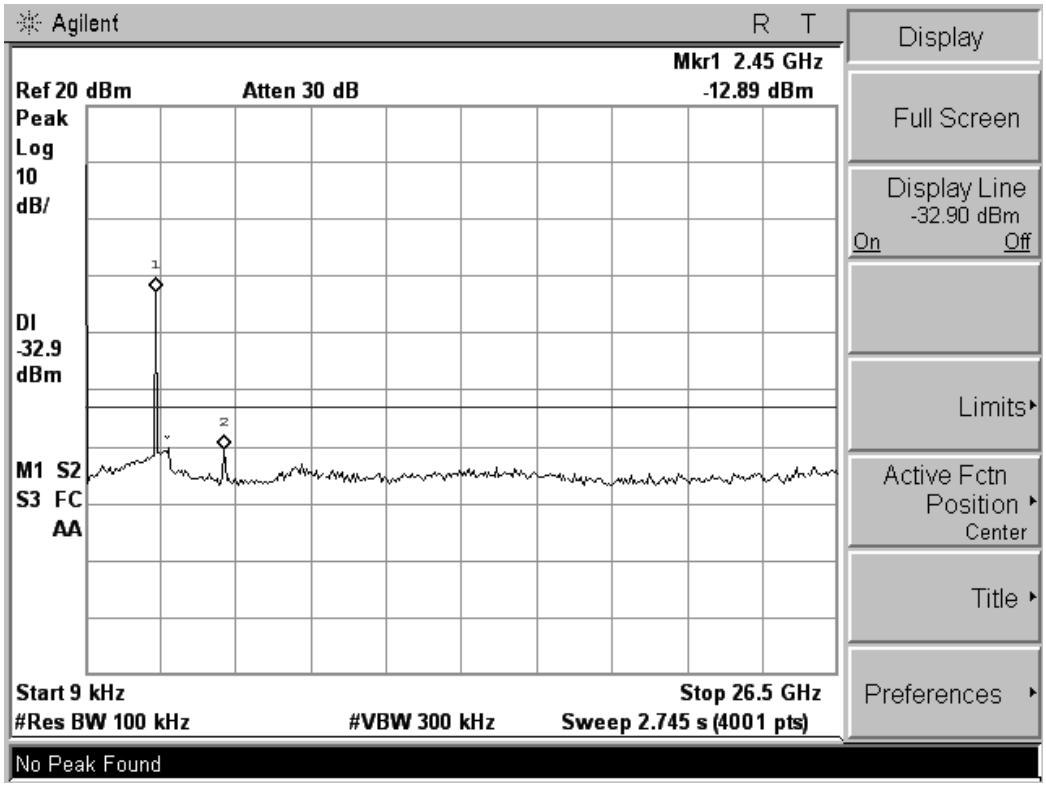

Agilent
R T
Mkr1 2.39 GHz
Ref 20 dBm
Atten 30 dB
-8.982 dBm
Peak
Log
10
dB/
DI
-29.0
dBm
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.39 GHz -8.982 dBm
2 (1) Freq 4.84 GHz -39.55 dBm
Display
Full Screen
Display Line
-29.00 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found

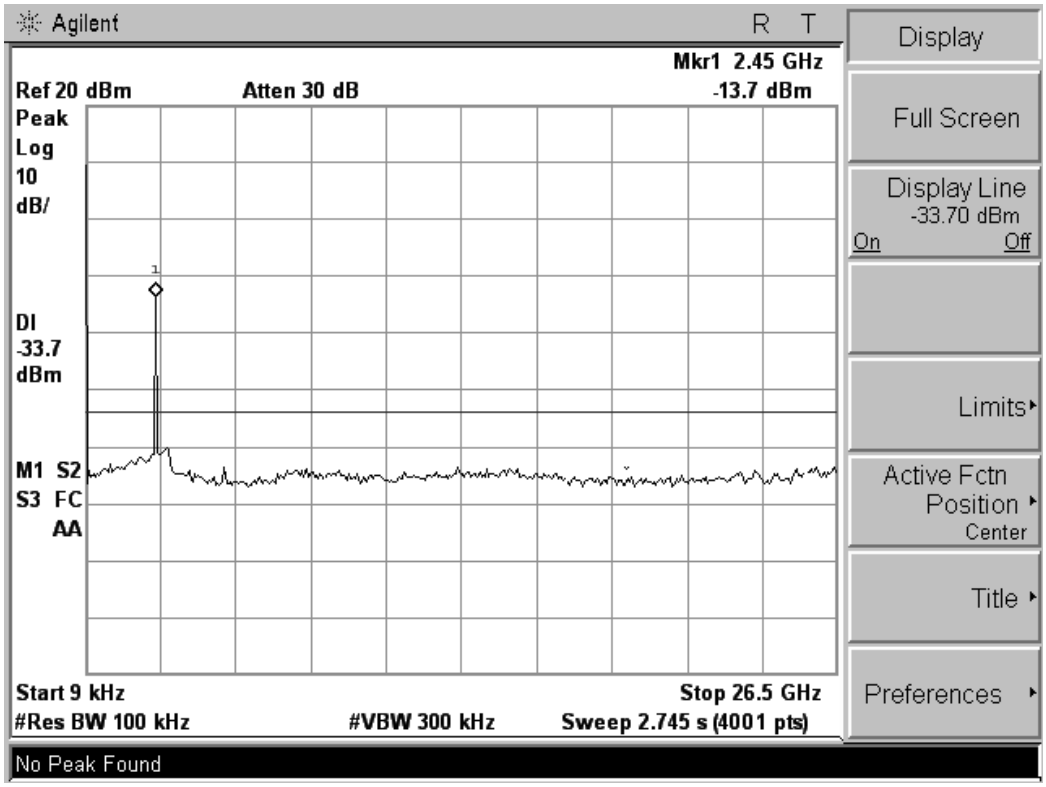




802.11n HT20


Agilent
R T
Mkr1 2.45 GHz
Ref 20 dBm
Atten 30 dB
-9.78 dBm
Peak
Log
10
dB/
DI
-29.8
dBm
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45 GHz -9.78 dBm
2 (1) Freq 4.84 GHz -39.98 dBm
Display
Full Screen
Display Line
-29.80 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found


Agilent
R T
Mkr1 2.45 GHz
Ref 20 dBm
Atten 30 dB
-12.89 dBm
Peak
Log
10
dB/
DI
-32.9
dBm
M1 S2
S3 FC
AA
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
Display
Full Screen
Display Line
-32.90 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found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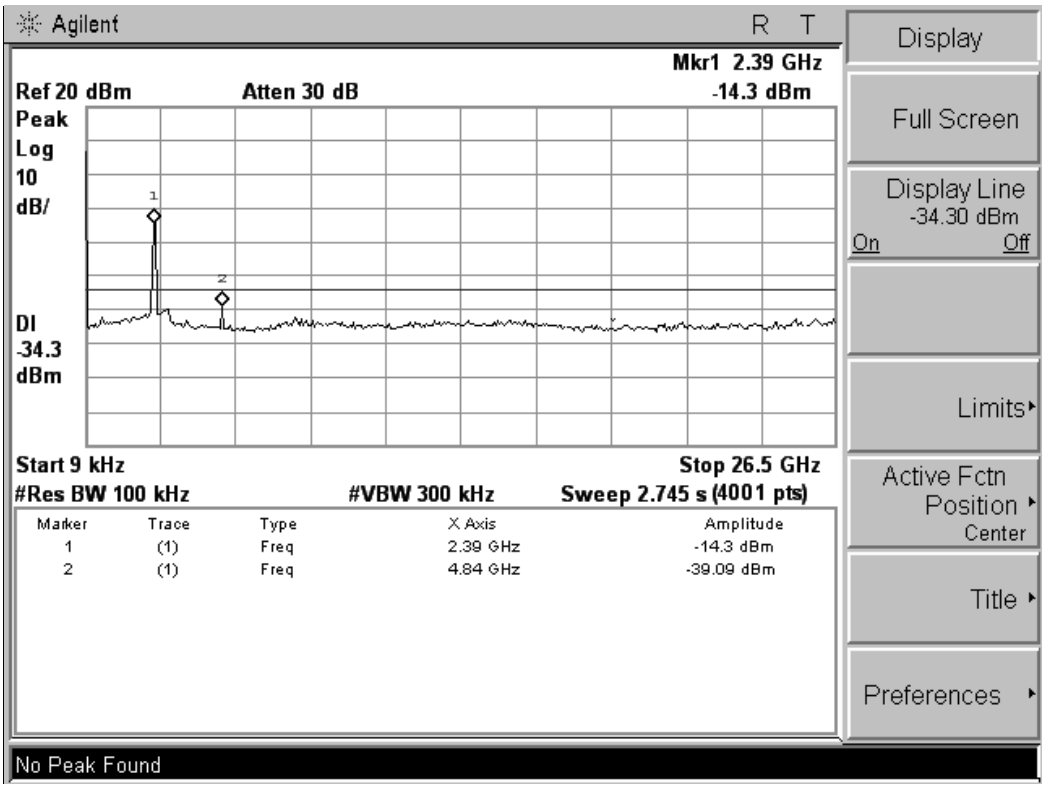
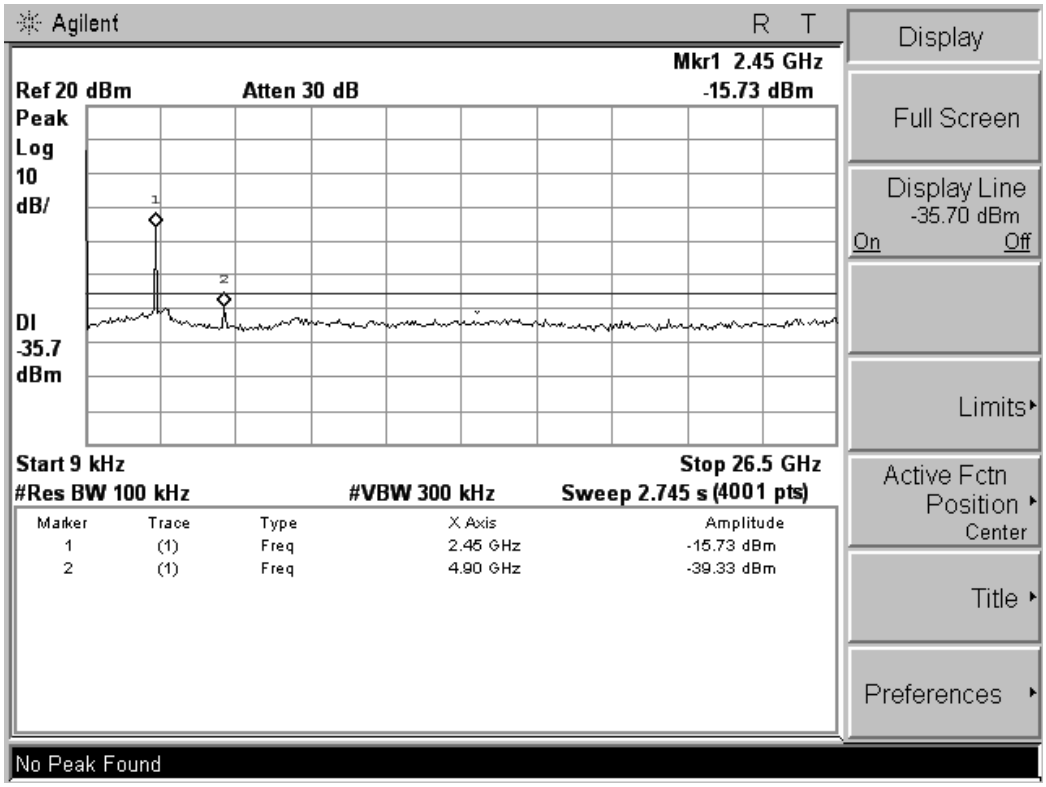
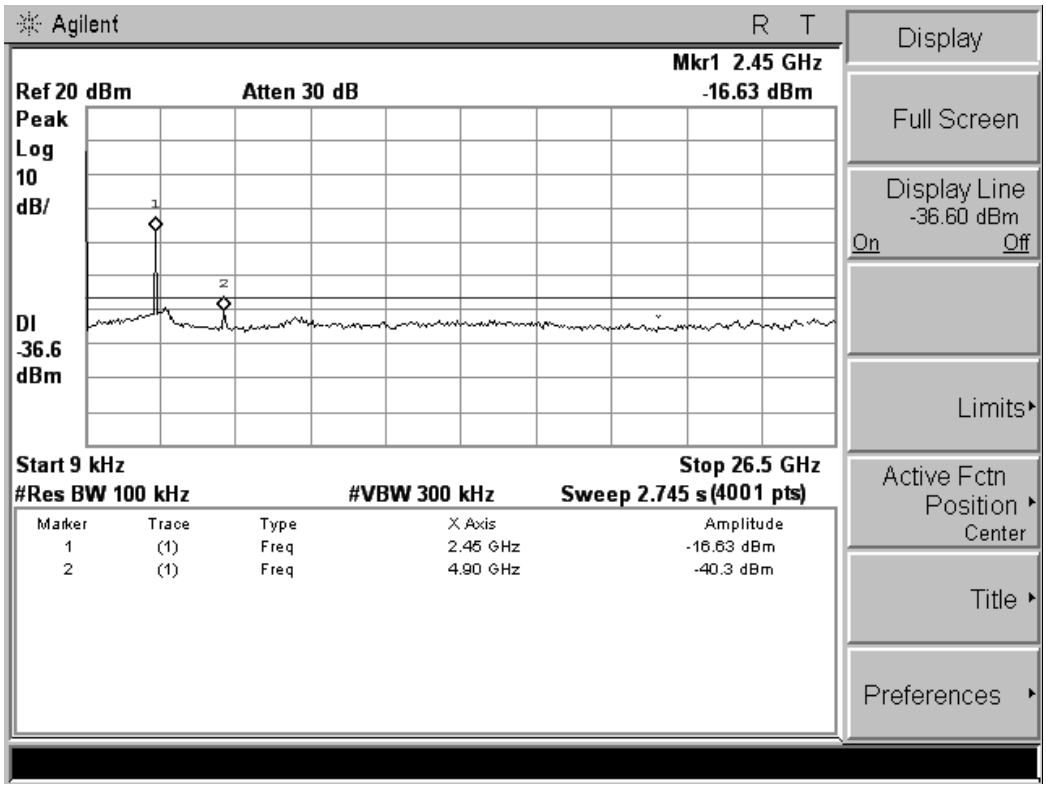
R T
Mkr1 2.45 GHz
Ref 20 dBm
Atten 30 dB
-13.7 dBm
Peak
Log
10
dB/
DI
-33.7
dBm
M1 S2
S3 FC
AA
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
No Peak Found
Display
Full Screen
Display Line
-33.70 dBm
On
Off
Limits
Active Fctn
Position
Center
Title
Preferences

802.11n HT40

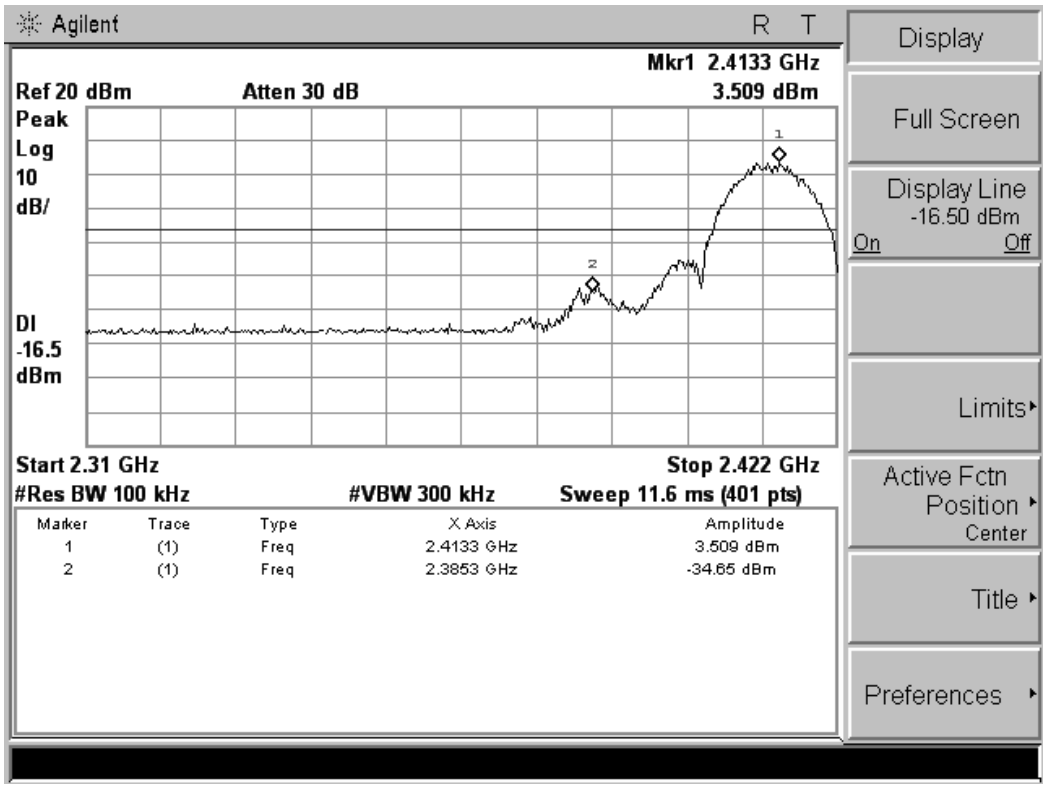

Agilent
R T
Mkr1 2.39 GHz
Ref 20 dBm
Atten 30 dB
-14.3 dBm
Peak
Log
10
dB/
DI
-34.3
dBm
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.745 s (4001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.39 GHz -14.3 dBm
2 (1) Freq 4.84 GHz -39.09 dBm
No Peak Found
Display
Full Screen
Display Line
-34.30 dBm
On
Off
Limits
Active Fctn
Position
Center
Title
Preferences

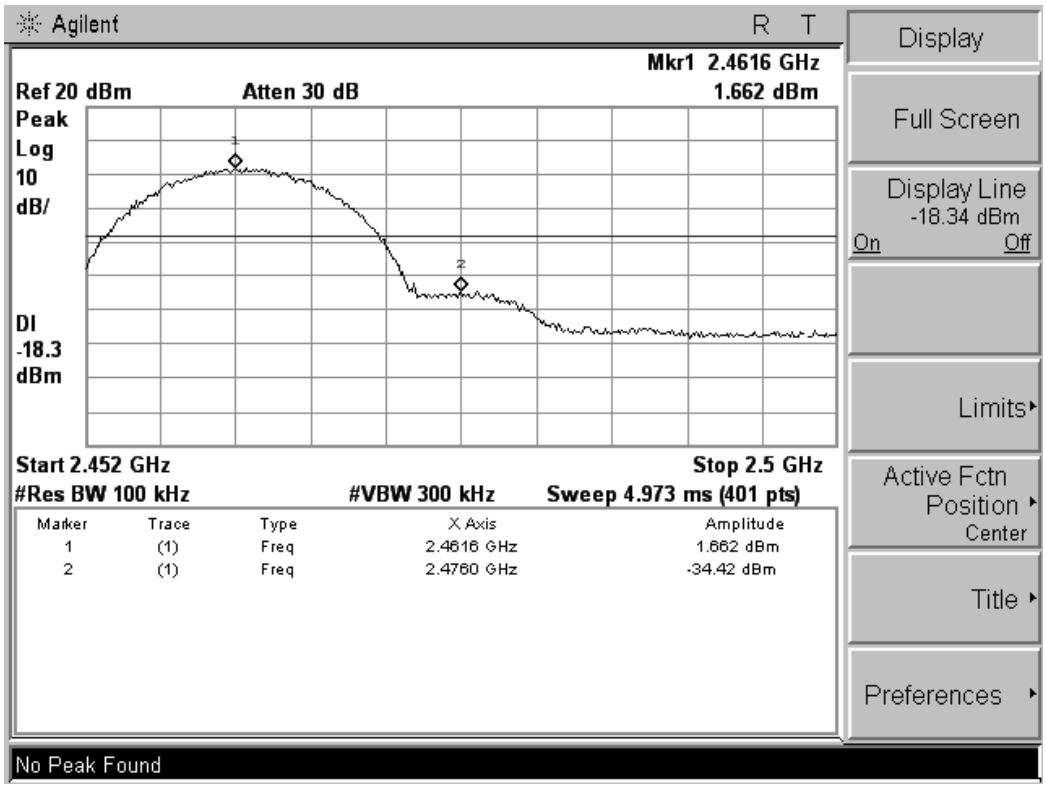




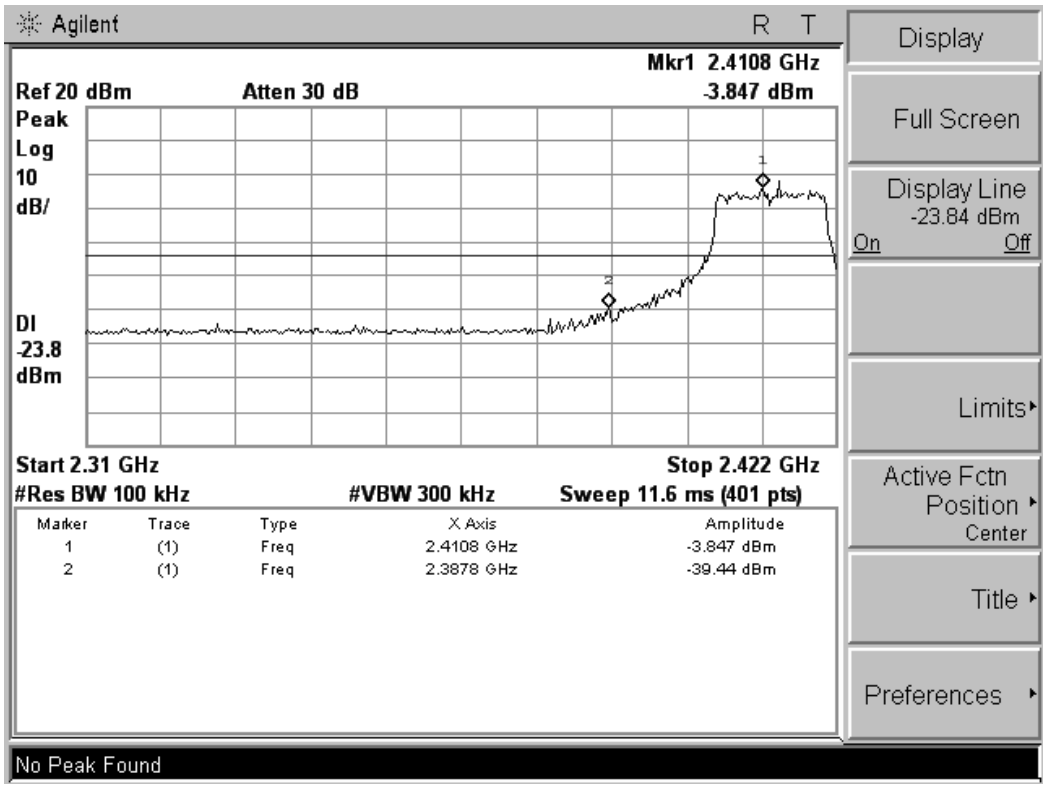
6.6.7. Test Results of Band Edges Test

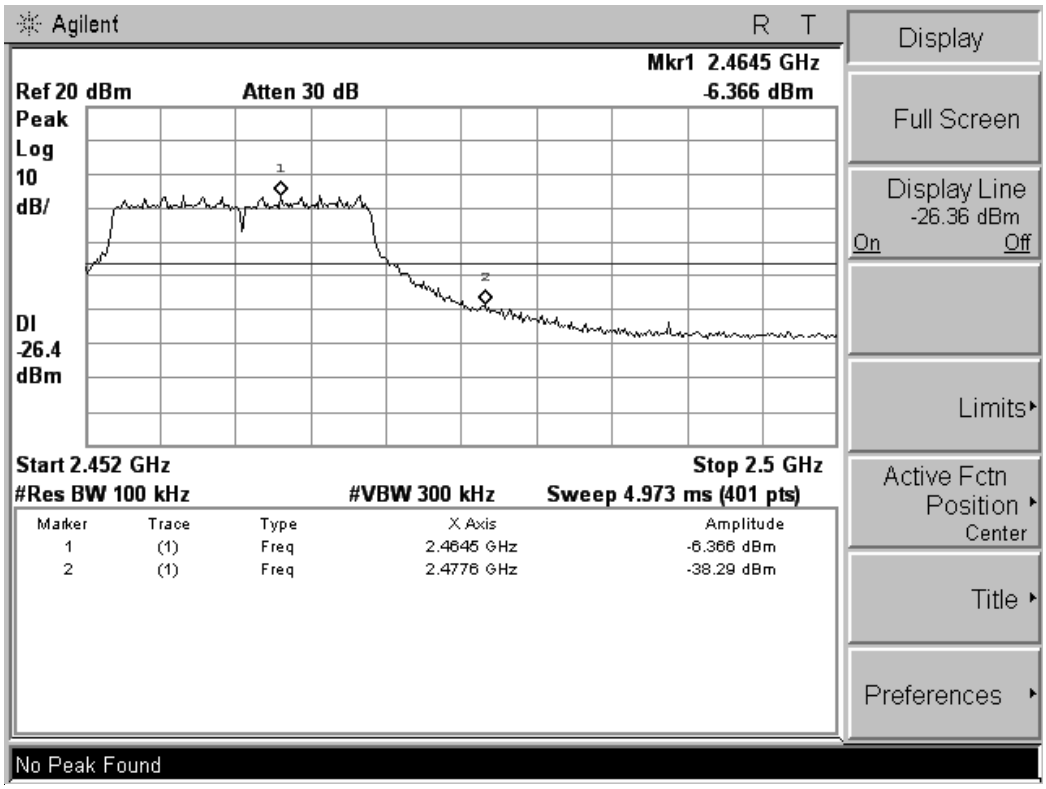
802.11b



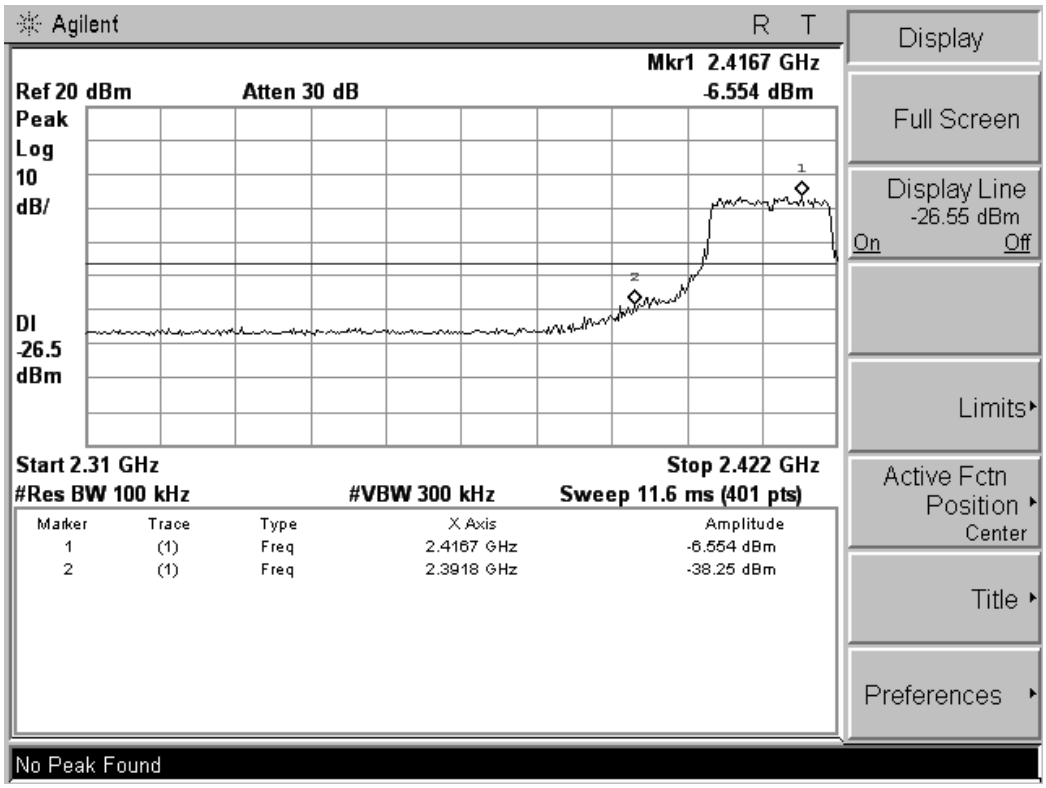


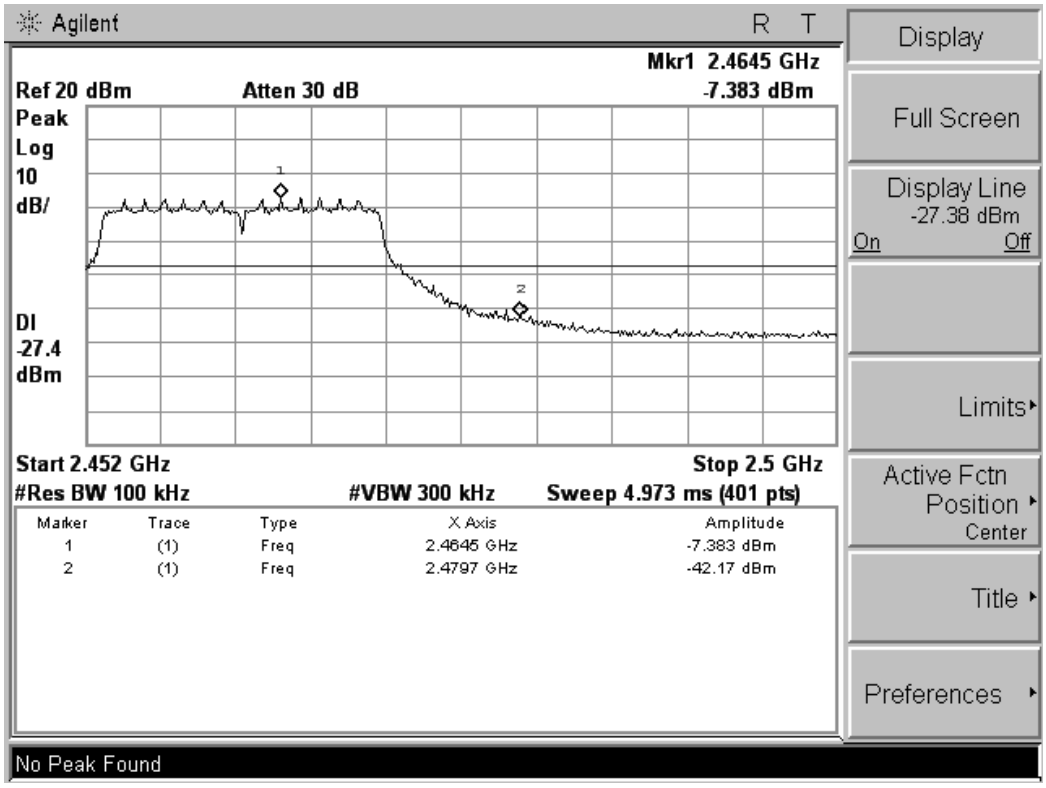
802.11g



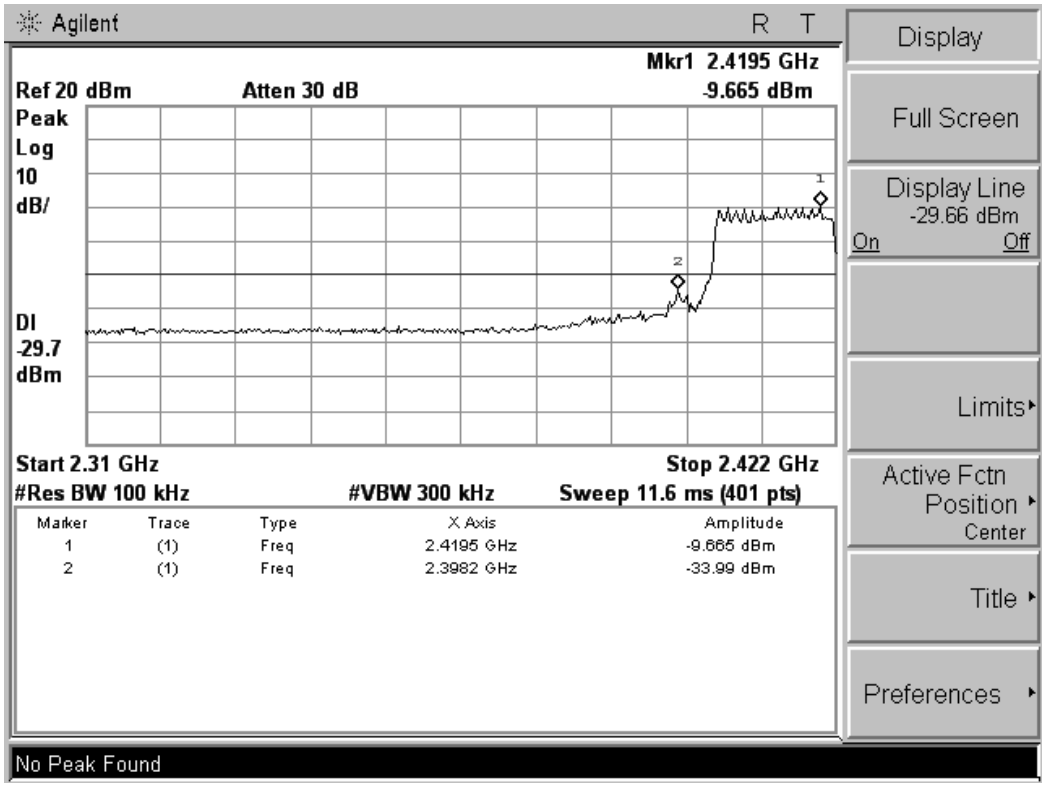


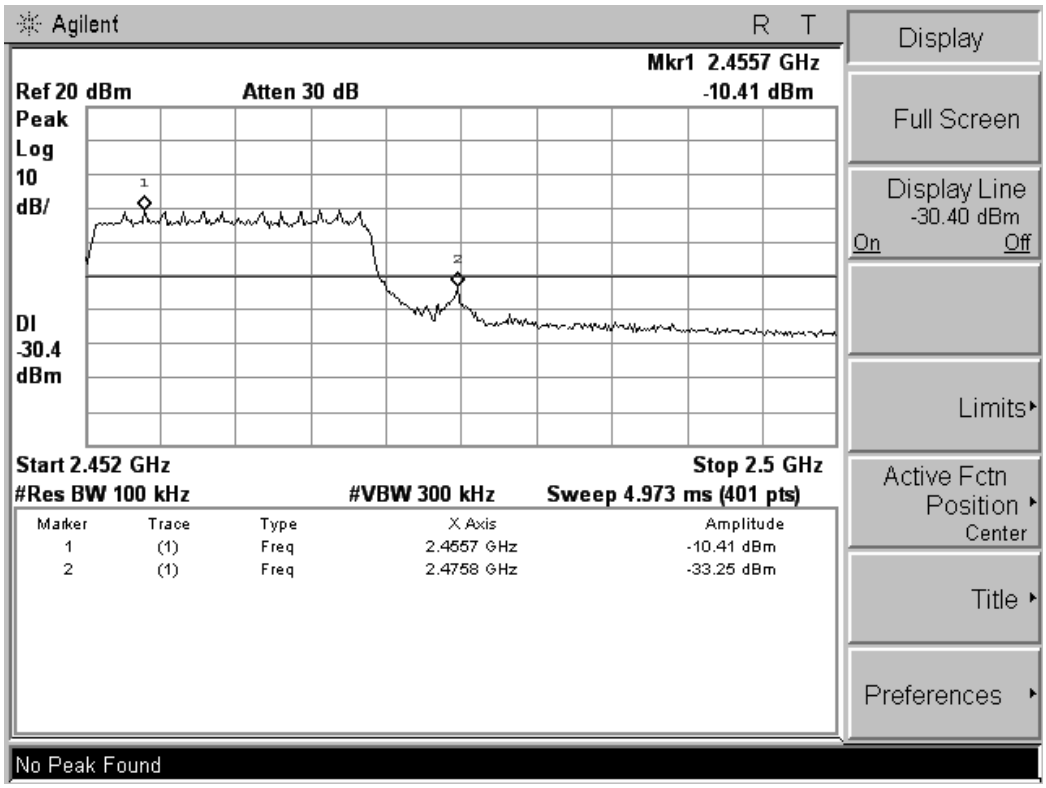
802.11n HT20





802.11n HT40


Agilent
R T
Mkr1 2.4195 GHz
Ref 20 dBm
Atten 30 dB
-9.665 dBm
Peak
Log
10
dB/
Dl
-29.7
dBm
Start 2.31 GHz
Stop 2.422 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 11.6 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4195 GHz -9.665 dBm
2 (1) Freq 2.3982 GHz -33.99 dBm
Display
Full Screen
Display Line
-29.66 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found


Agilent
R T
Mkr1 2.4557 GHz
Ref 20 dBm
Atten 30 dB
-10.41 dBm
Peak
Log
10
dB/
Dl
-30.4
dBm
Start 2.452 GHz
Stop 2.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 4.973 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4557 GHz -10.41 dBm
2 (1) Freq 2.4758 GHz -33.25 dBm
Display
Full Screen
Display Line
-30.40 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
No Peak Found

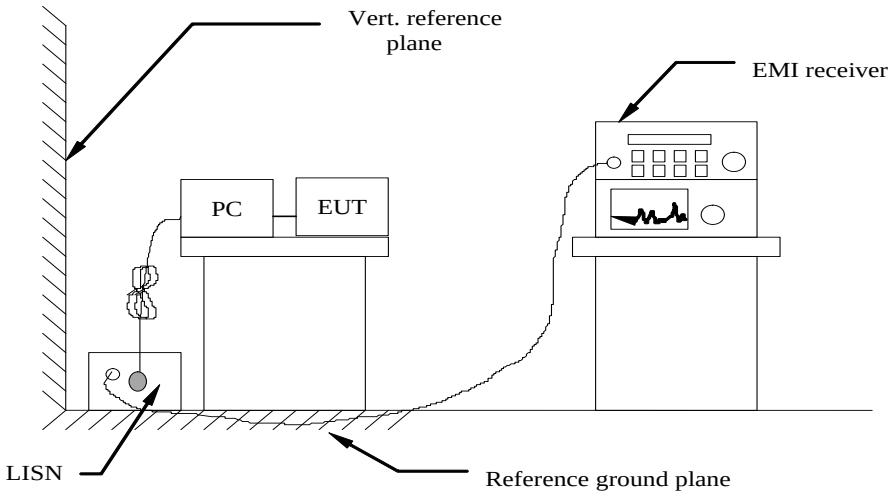
6.7. Power line conducted emissions

6.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

6.7.2 Block Diagram of Test Setup

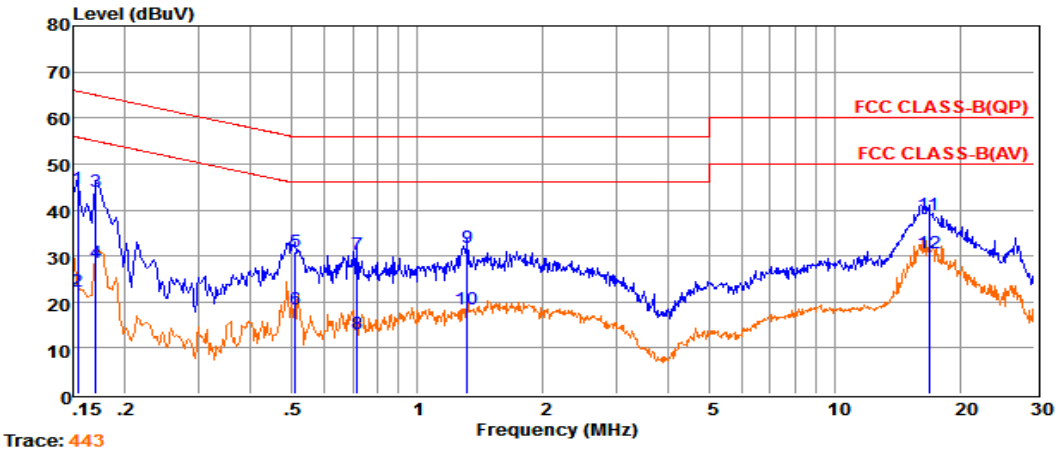


6.7.3 Test Results

PASS.

The test data please refer to following page.

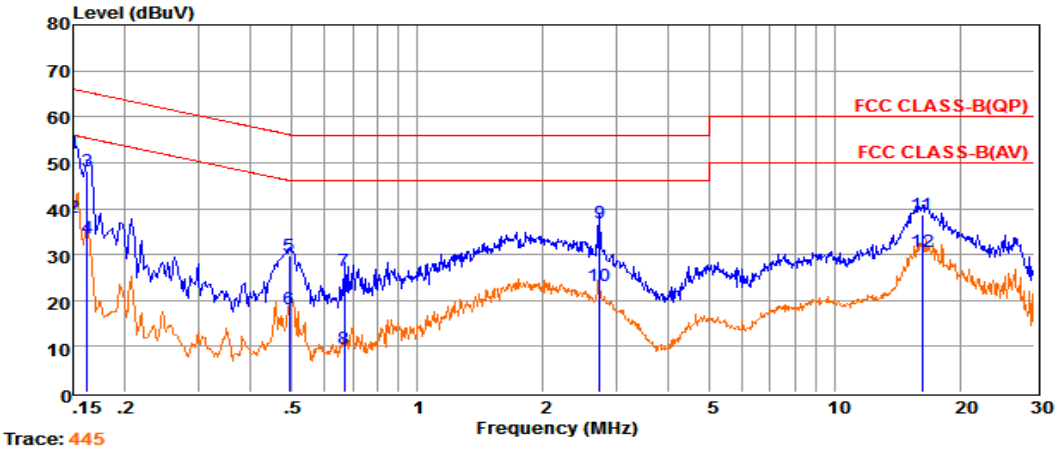
Test Result For Line Power Input AC 120V/60Hz



Trace: 443

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15403	24.98	9.69	0.02	10.00	44.69	65.78	-21.09	QP
2	0.15413	2.56	9.69	0.02	10.00	22.27	55.77	-33.50	Average
3	0.17034	24.49	9.65	0.02	10.00	44.16	64.94	-20.78	QP
4	0.17044	8.85	9.65	0.02	10.00	28.52	54.94	-26.42	Average
5	0.51007	11.28	9.62	0.04	10.00	30.94	56.00	-25.06	QP
6	0.51017	-1.35	9.62	0.04	10.00	18.31	46.00	-27.69	Average
7	0.71977	10.64	9.63	0.04	10.00	30.31	56.00	-25.69	QP
8	0.71987	-6.59	9.63	0.04	10.00	13.08	46.00	-32.92	Average
9	1.31678	12.00	9.63	0.05	10.00	31.68	56.00	-24.32	QP
10	1.31778	-1.12	9.63	0.05	10.00	18.56	46.00	-27.44	Average
1116	.74973	19.17	9.76	0.11	10.00	39.04	60.00	-20.96	QP
1216	.75073	10.81	9.76	0.11	10.00	30.68	50.00	-19.32	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

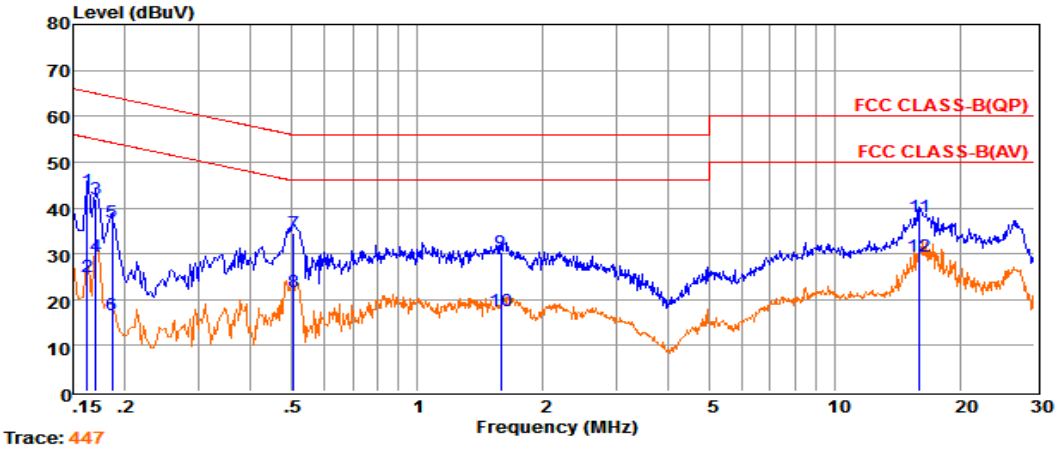


Trace: 445

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15000	32.49	9.57	0.02	10.00	52.08	66.00	-13.92	QP
2	0.15010	18.54	9.57	0.02	10.00	38.13	55.99	-17.86	Average
3	0.16241	28.58	9.59	0.02	10.00	48.19	65.34	-17.15	QP
4	0.16251	13.87	9.59	0.02	10.00	33.48	55.33	-21.85	Average
5	0.49411	9.97	9.62	0.04	10.00	29.63	56.10	-26.47	QP
6	0.49421	-1.59	9.62	0.04	10.00	18.07	46.10	-28.03	Average
7	0.66832	6.66	9.64	0.04	10.00	26.34	56.00	-29.66	QP
8	0.66842	-10.10	9.64	0.04	10.00	9.58	46.00	-36.42	Average
9	2.73562	17.11	9.64	0.05	10.00	36.80	56.00	-19.20	QP
10	2.73662	3.49	9.64	0.05	10.00	23.18	46.00	-22.82	Average
1116	.13990	18.93	9.72	0.11	10.00	38.76	60.00	-21.24	QP
1216	.14090	10.89	9.72	0.11	10.00	30.72	50.00	-19.28	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

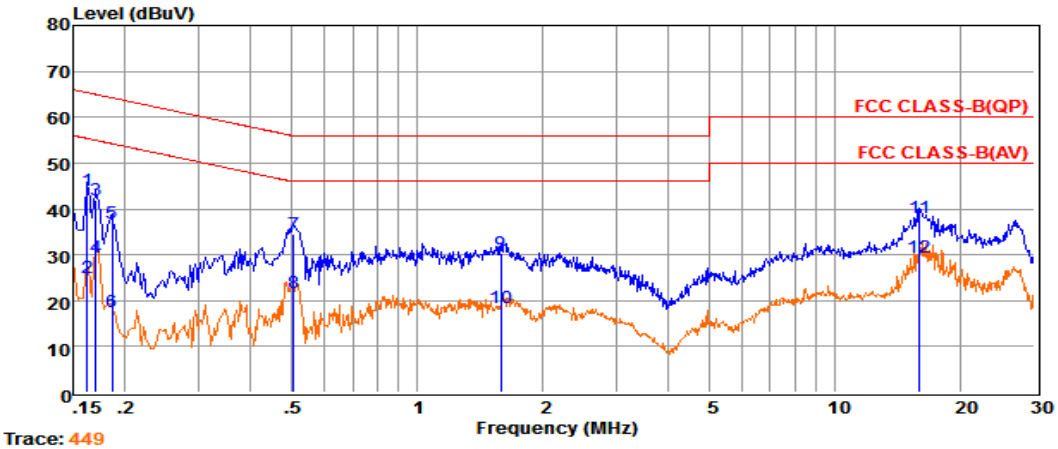
Test Result For Line Power Input AC 240V/60Hz



Trace: 447

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16241	24.24	9.59	0.02	10.00	43.85	65.34	-21.49	QP
2	0.16251	5.43	9.59	0.02	10.00	25.04	55.33	-30.29	Average
3	0.17034	22.26	9.60	0.02	10.00	41.88	64.94	-23.06	QP
4	0.17044	9.71	9.60	0.02	10.00	29.33	54.94	-25.61	Average
5	0.18639	17.25	9.62	0.02	10.00	36.89	64.20	-27.31	QP
6	0.18649	-3.05	9.62	0.02	10.00	16.59	54.19	-37.60	Average
7	0.50469	14.79	9.62	0.04	10.00	34.45	56.00	-21.55	QP
8	0.50479	1.94	9.62	0.04	10.00	21.60	46.00	-24.40	Average
9	1.58507	10.71	9.64	0.05	10.00	30.40	56.00	-25.60	QP
10	1.58607	-2.20	9.64	0.05	10.00	17.49	46.00	-28.51	Average
1115	.96977	18.21	9.72	0.11	10.00	38.04	60.00	-21.96	QP
1215	.97077	9.68	9.72	0.11	10.00	29.51	50.00	-20.49	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.



Trace: 449

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16241	24.25	9.67	0.02	10.00	43.94	65.34	-21.40	QP
2	0.16251	5.43	9.67	0.02	10.00	25.12	55.33	-30.21	Average
3	0.17034	22.26	9.65	0.02	10.00	41.93	64.94	-23.01	QP
4	0.17044	9.71	9.65	0.02	10.00	29.38	54.94	-25.56	Average
5	0.18639	17.25	9.62	0.02	10.00	36.89	64.20	-27.31	QP
6	0.18649	-2.05	9.62	0.02	10.00	17.59	54.19	-36.60	Average
7	0.50469	14.79	9.62	0.04	10.00	34.45	56.00	-21.55	QP
8	0.50479	1.94	9.62	0.04	10.00	21.60	46.00	-24.40	Average
9	1.58507	10.72	9.63	0.05	10.00	30.40	56.00	-25.60	QP
10	1.58607	-1.20	9.63	0.05	10.00	18.48	46.00	-27.52	Average
1115	.96977	18.21	9.75	0.11	10.00	38.07	60.00	-21.93	QP
1215	.97077	9.68	9.75	0.11	10.00	29.54	50.00	-20.46	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all mode and recorded the worst case results in this report (802.11b (Low Channel)).*

7. ANTENNA REQUIREMENT

7.1 Standard Applicable

According to antenna requirement of §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

7.2 Antenna Connected Construction

7.2.1. Standard Applicable

According to §15.203 & RSS-Gen, 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.

7.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.0dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

7.2.3. Results: Compliance.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max hold

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal Bluetooth devices, the DSSS mode is used.

Limits:

FCC	IC
Antenna Gain	
6dBi	

Tnom	Vnom	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS		8.56	8.35	8.14
Radiated power [dBm] Measured with DSSS		10.49	10.31	10.11
Gain [dBi] Calculated		1.93	1.96	1.97
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Result: -/-

----------THE END OF TEST REPORT----------