

FCC- TEST REPORTReport Number : **68.930.14.005.01** Date of Issue: December 11, 2014

Model : AV13021-W , AV13021-B

Product Type : Tablet based monitor

Applicant : Excel Medical Electronics LLC

Address : 801 Maplewood Dr Ste 26 Jupiter, FL 33458 United States

Production Facility : Excel Medical Electronics LLC

Address : 801 Maplewood Dr Ste 26 Jupiter, FL 33458 United States

Test Result : ☒ **Positive** ☐ **Negative**Total pages including
Appendices : 35

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

1 Table of Contents

1	Table of Contents	2
2	Details about the Test Laboratory.....	3
3	Description of the Equipment under Test	4
4	Summary of Test Standards.....	5
5	Summary of Test Results.....	6
6	General Remarks	7
7	Test Setups	8
8	Systems test configuration.....	9
9	Technical Requirement	10
9.1	Conducted Emission	10
9.2	Conducted peak output power.....	13
9.3	6dB bandwidth	15
9.4	Power spectral density.....	22
9.5	Spurious RF conducted emissions	23
9.6	Band edge	28
9.7	Spurious radiated emissions for transmitter	32
10	Test Equipment List.....	34
11	System Measurement Uncertainty	35

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

Telephone: 86 755 8828 6998
Fax: 86 755 828 5299

Test Site 2

Company name: Audix Technology (shenzhen) Co.,Ltd
Block Shenzhen, Science & Industry Park,
Nantou, Shenzhen,
Guangdong,
China

Telephone: 86 755 2663 9496
Fax: 86 755 2663 2877

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Tablet based monitor
Model no.:	AV13021-B, AV13021-W
FCC ID:	2ADHJ-AV13021
Options and accessories:	AC/DC SWITCHING ADAPTOR MODEL NO: GSM40A05 INPUT: 100-240VAC,50/60Hz, 1.0-0.5A
Rating:	5.0A, 25W MAX
RF Transmission Frequency:	2412MHz-2462MHz
No. of Operated Channel:	11
Modulation:	DSSS, DBPSK, DQPSK, CCK and OFDM
Antenna Type:	FPC
Antenna Gain:	2dBi
Description of the EUT:	The EUT is a mobile computer.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-14 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
§15.207 Conducted emission AC power port	10	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (b) (1) Conducted peak output power	13	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1) 20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1) Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii) Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii) Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2) 6dB bandwidth	15	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e) Power spectral density	22	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) Spurious RF conducted emissions	23	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) Band edge	28	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209 Spurious radiated emissions for transmitter	32	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203 Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a permanently FPC Antenna, which gain is 2 dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ADHJ-AV13021 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

AV13021-B is identical to AV13021-W except for the exterior color.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: March 12, 2014

Testing Start Date: March 13, 2014

Testing End Date: November 15, 2014

Reviewed by:

Prepared by:

Tested by:



Phoebe Hu
EMC Project Manager



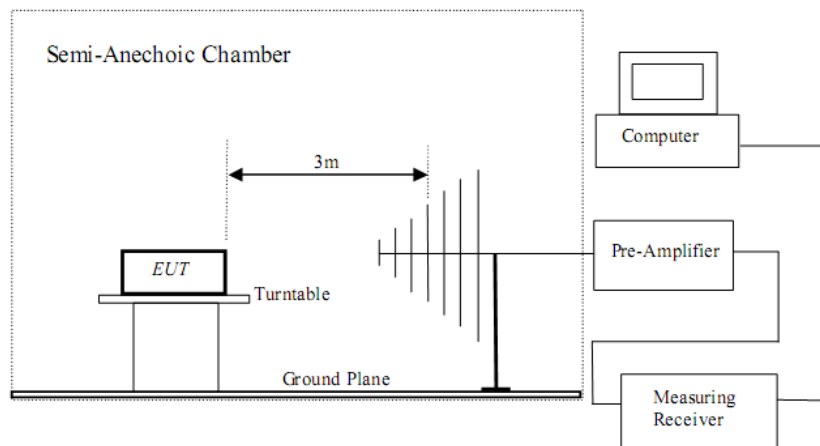
Felix Li
EMC Project Engineer



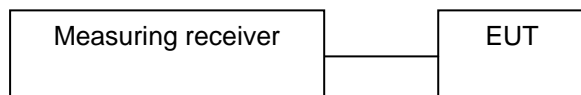
Leo Li
EMC Test Engineer

7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
NoteBook	lenovo	X220	---

Test software: adb tool.

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

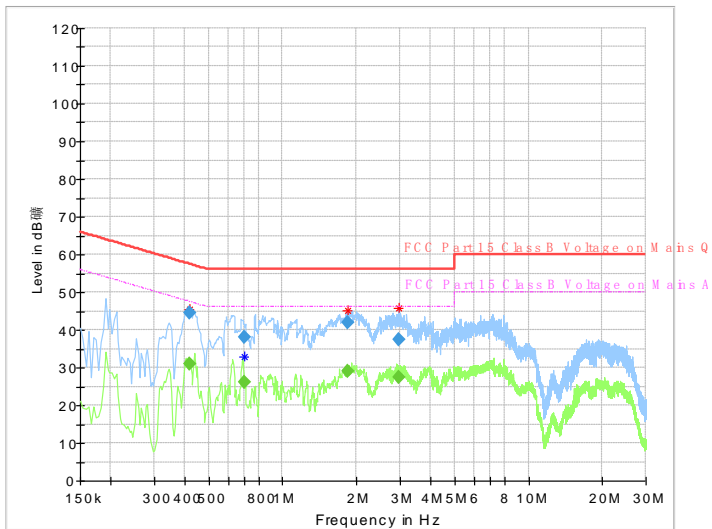
Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

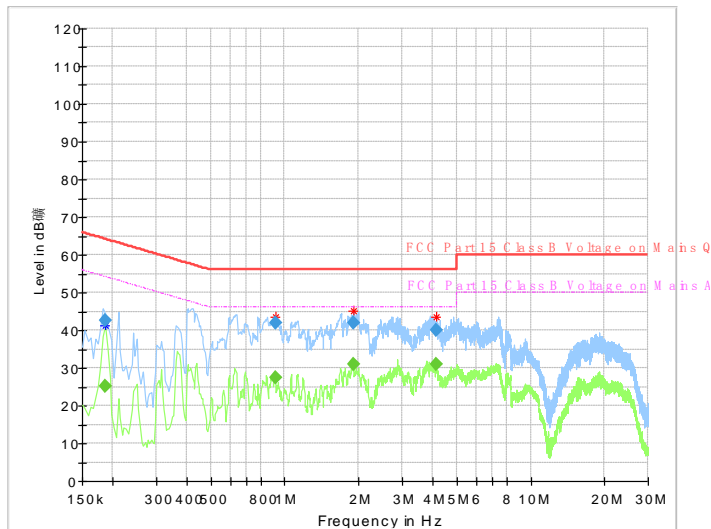
Decreasing linearly with logarithm of the frequency

Product Type : Tablet based monitor
 M/N : AV13021-W
 Operating Condition : 802.11b transmitting
 Test Specification : AC 120V/60Hz, Live



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.418500	45.44	---	57.57	12.13	L1	10.1
0.694500	---	32.82	46.00	13.18	L1	10.0
1.849500	45.01	---	56.00	10.99	L1	9.8
2.981500	45.84	---	56.00	10.16	L1	9.8

Product Type : Tablet based monitor
 M/N : AV13021-W
 Operating Condition : 802.11b transmitting
 Test Specification : AC 120V/60Hz, Neutral



Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.185500	---	41.35	54.21	12.86	N	9.7
0.913500	43.39	---	56.00	12.61	N	9.8
1.901500	45.06	---	56.00	10.94	N	9.8
4.121500	43.56	---	56.00	12.44	N	9.8

9.2 Conducted peak output power

Test Method

- Set span to at least 1.5 times the OBW.
- Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- Set VBW $\geq 3 \times$ RBW.
- Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.)
- Sweep time = auto.
- Detector = RMS
- Set the EUT transmits continuously, the trigger shall be set to "free run".
- Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

Test result as below table:

IEEE 802.11b modulation (1Mbps) data rate Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
CH1 2412MHz	14.0	Pass
CH2 2437MHz	14.5	Pass
CH3 2462MHz	15.6	Pass

IEEE 802.11g modulation (6Mbps) data rate Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
CH1 2412MHz	10.8	Pass
CH2 2437MHz	11.3	Pass
CH3 2462MHz	12.4	Pass

IEEE 802.11n HT20 modulation (MCS0) Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
CH1 2412MHz	10.4	Pass
CH1 2437MHz	11.0	Pass
CH11 2462MHz	12.0	Pass

IEEE 802.11n HT40 modulation (MCS0) Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
CH3 2422MHz	9.9	Pass
CH6 2437MHz	10.6	Pass
CH9 2452MHz	11.0	Pass

9.3 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥500

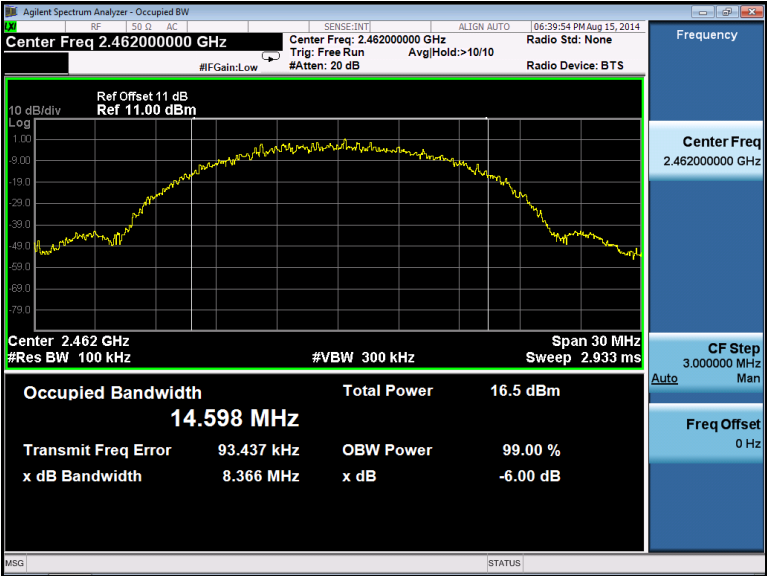
IEEE 802.11b modulation (1Mbps) Test Result

Frequency MHz	Bandwidth MHz	Limit kHz	Result
2412	14.62	≥ 500	Pass
2437	14.72	≥ 500	Pass
2462	14.60	≥ 500	Pass



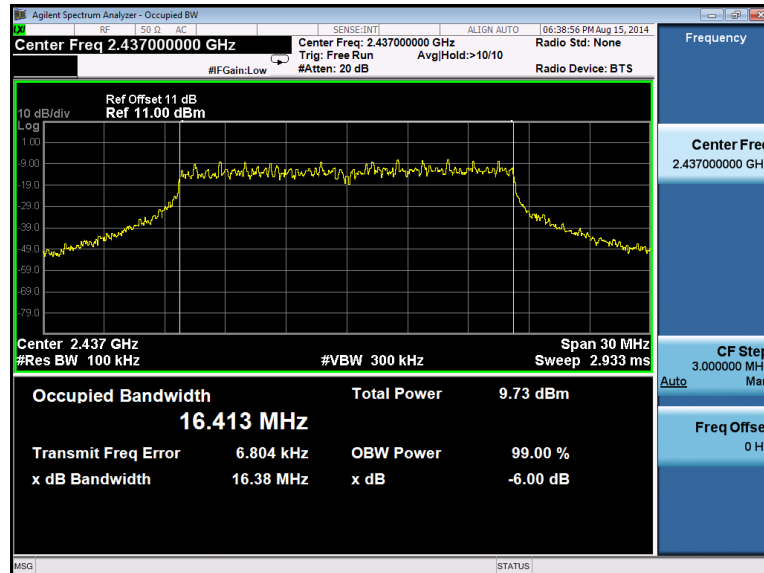
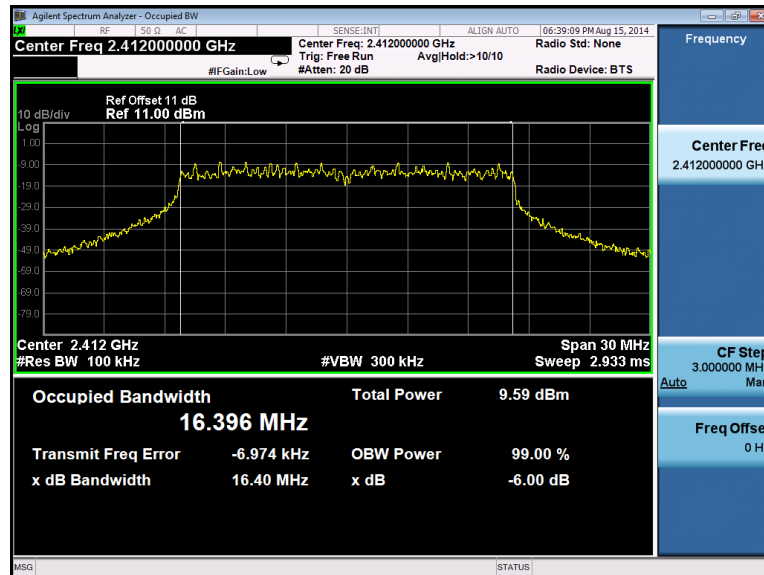


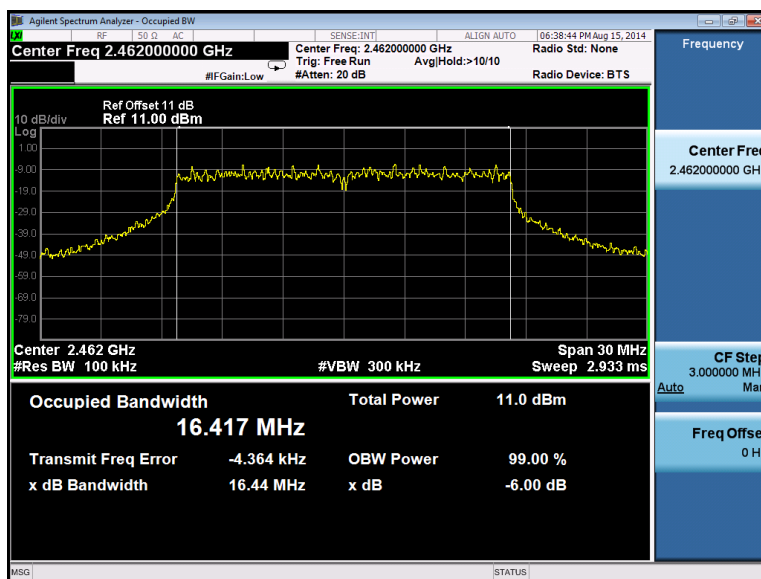
China



IEEE 802.11g modulation (6Mbps) Test Result

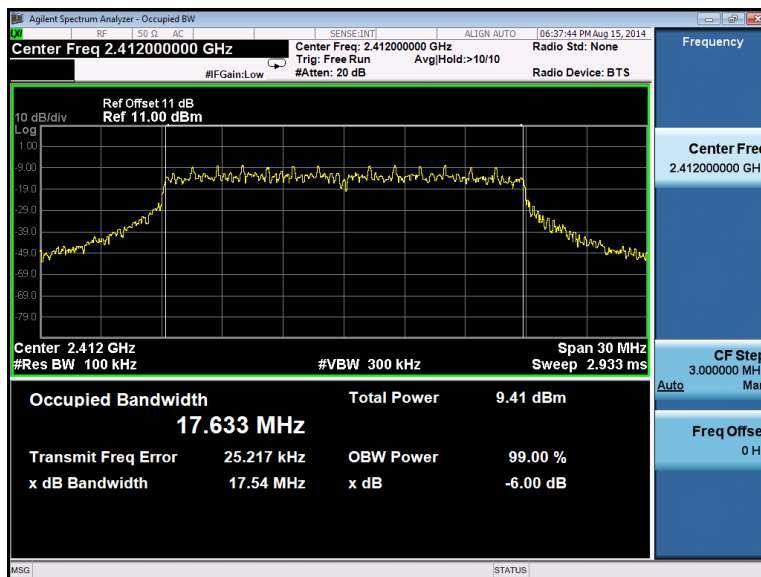
Frequency MHz	Bandwidth MHz	Limit kHz	Result
2412	16.40	≥ 500	Pass
2437	16.41	≥ 500	Pass
2462	16.42	≥ 500	Pass

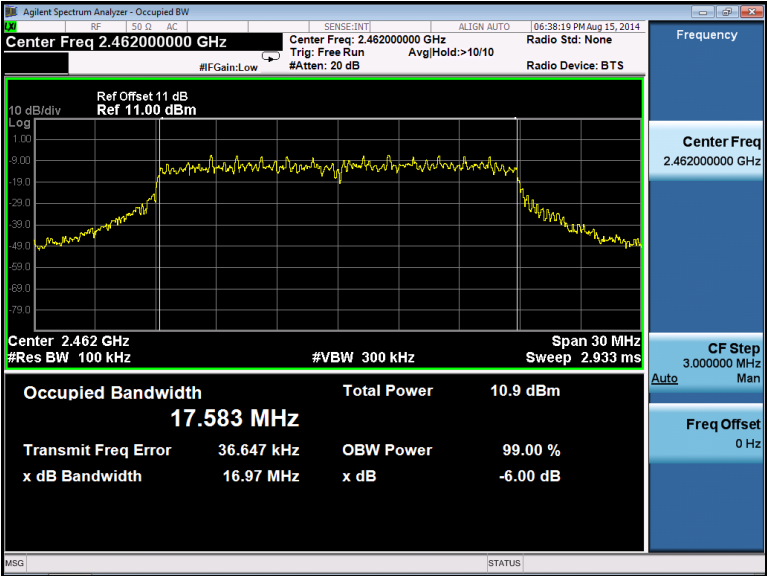
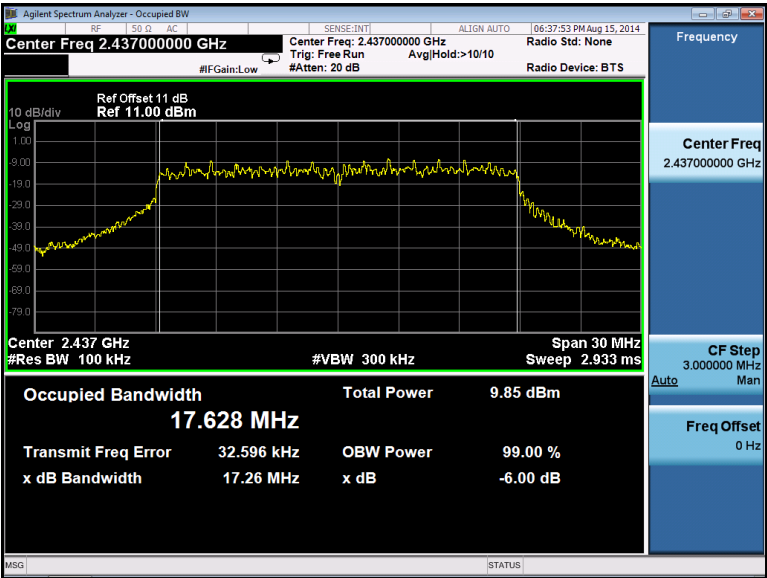




IEEE 802.11n HT20 modulation (MCS0) Test Result

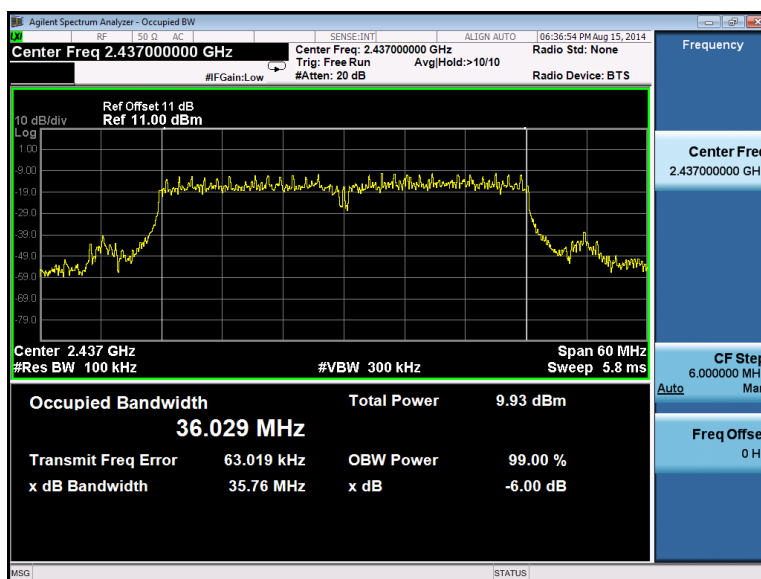
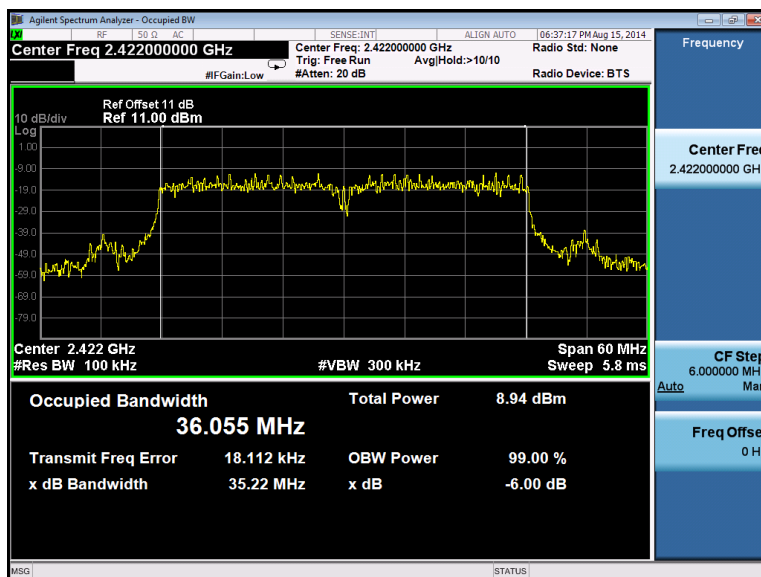
Frequency MHz	Bandwidth kHz	Limit kHz	Result
2412	17.63	≥ 500	Pass
2437	17.63	≥ 500	Pass
2462	17.58	≥ 500	Pass

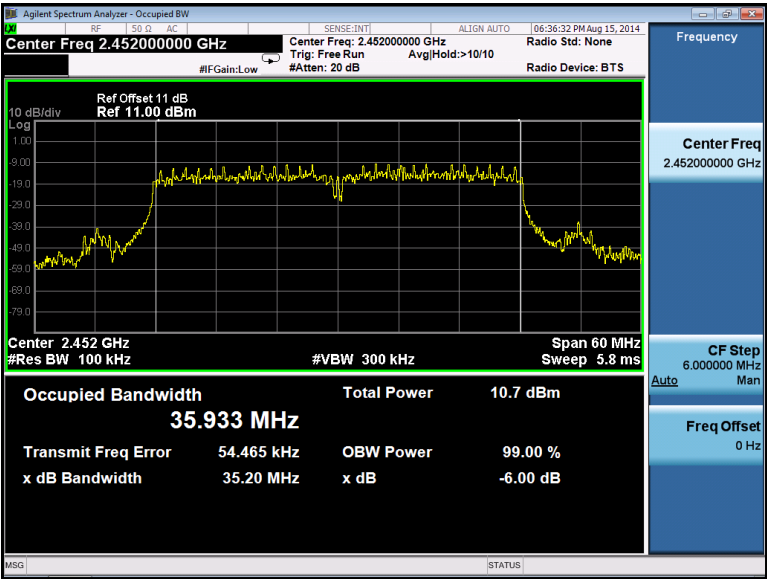




IEEE 802.11n HT40 modulation (MCS0) Test Result

Frequency MHz	Bandwidth kHz	Limit kHz	Result
2412	36.06	≥ 500	Pass
2437	36.03	≥ 500	Pass
2452	35.93	≥ 500	Pass





9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤8

IEEE 802.11b modulation (1Mbps) Test Result

Frequency MHz	Power spectral density dBm	Result
2412	-2.09	Pass
2437	-7.69	Pass
2462	-1.32	Pass

IEEE 802.11g modulation (6Mbps) Test Result

Frequency MHz	Power spectral density dBm	Result
2412	-18.65	Pass
2437	-18.24	Pass
2462	-17.00	Pass

IEEE 802.11n HT20 modulation (MCS0) Test Result

Frequency MHz	Power spectral density dBm	Result
2412	-18.57	Pass
2437	-18.36	Pass
2462	-17.30	Pass

IEEE 802.11n HT40 modulation (MCS0) Test Result

Frequency MHz	Power spectral density dBm	Result
2412	-19.88	Pass
2437	-19.16	Pass
2452	-18.27	Pass

9.5 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

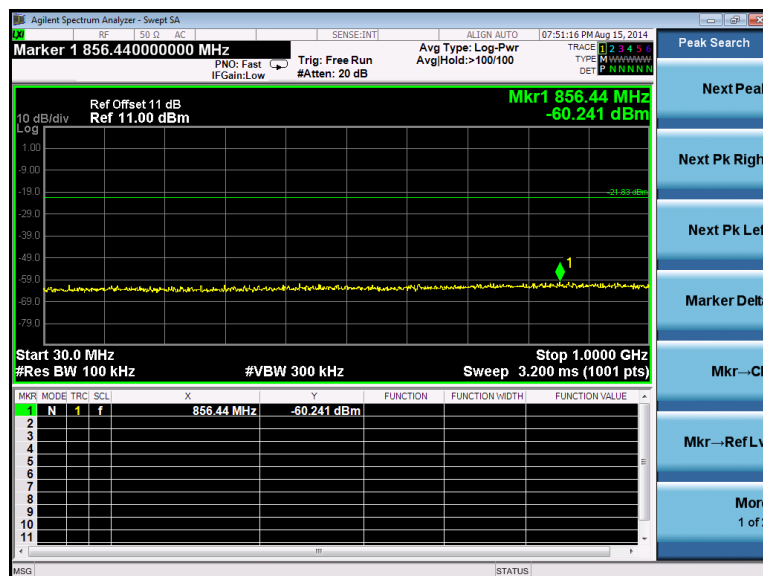
Frequency Range MHz	Limit (dBc)
30-25000	-20

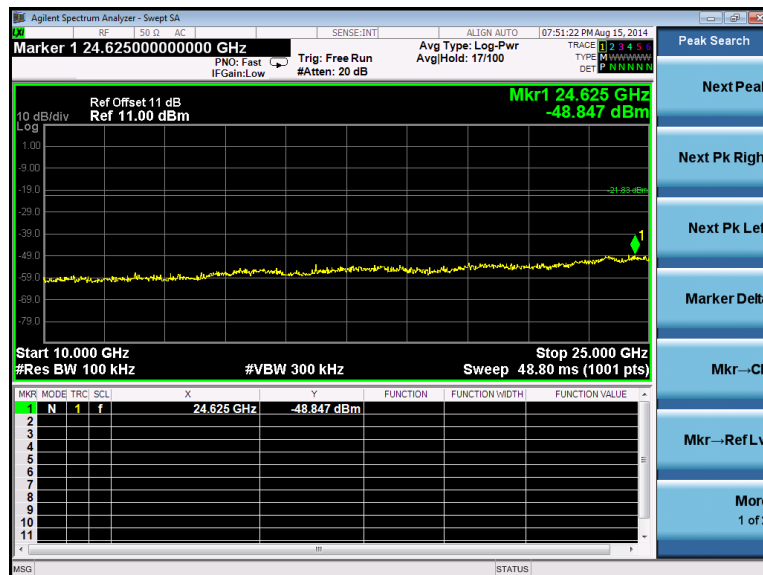
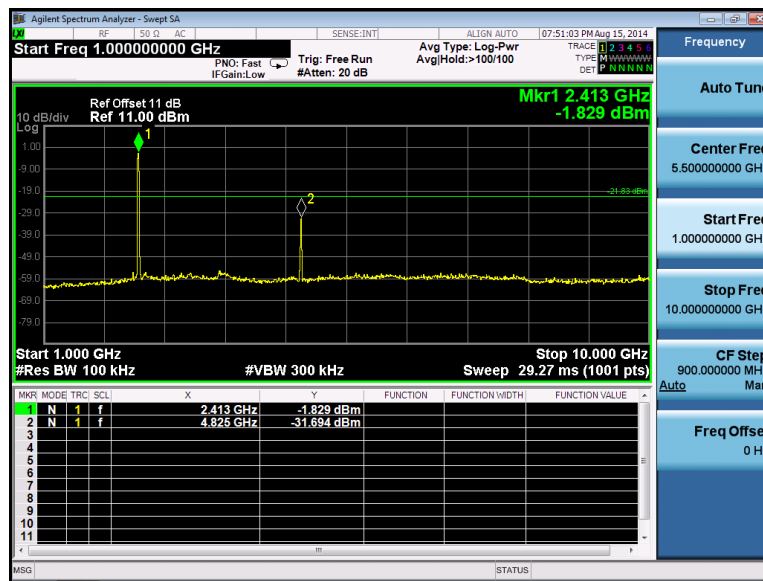
The test result is for the worst case for all test modes and Channels.

Spurious RF conducted emissions

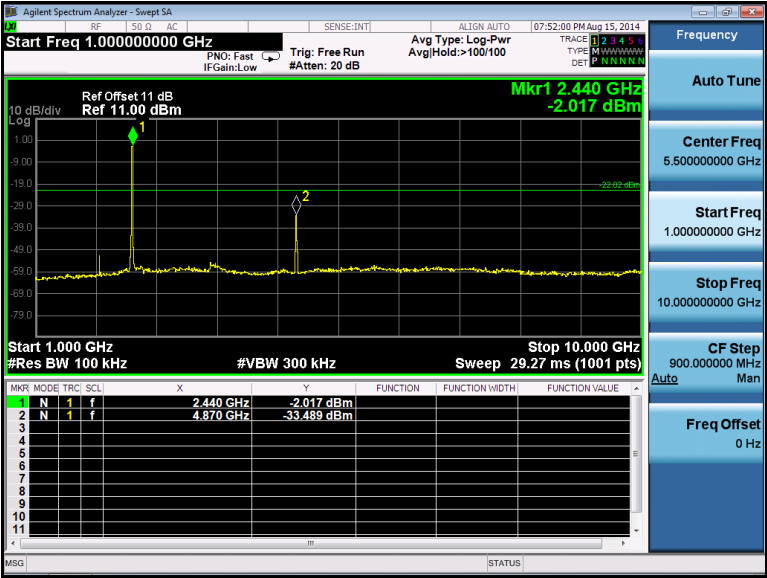
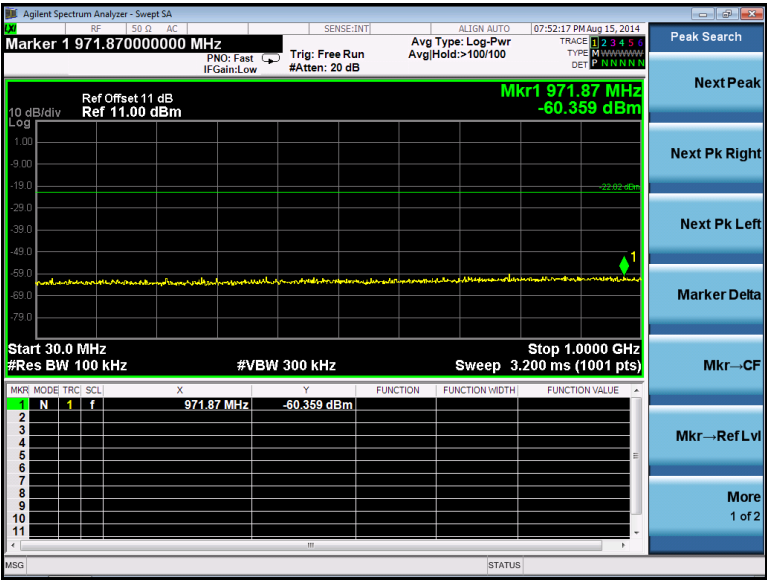
IEEE 802.11b modulation (1Mbps) Test Result

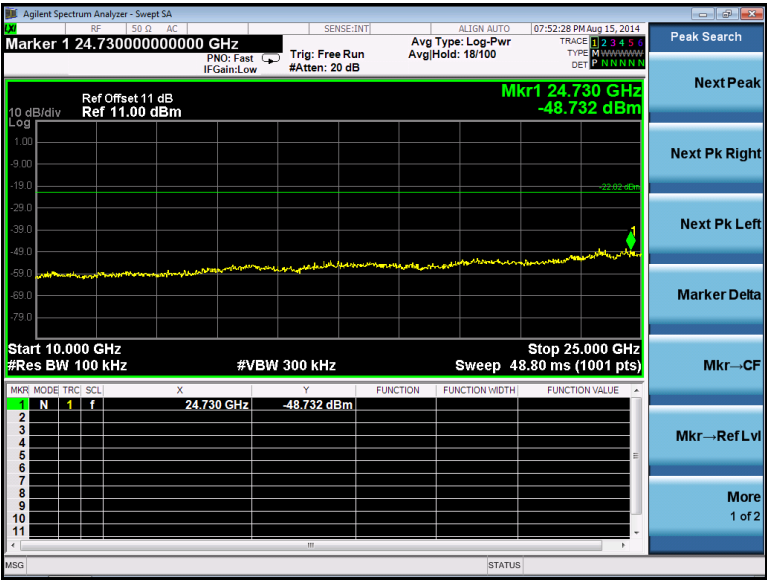
2412MHz



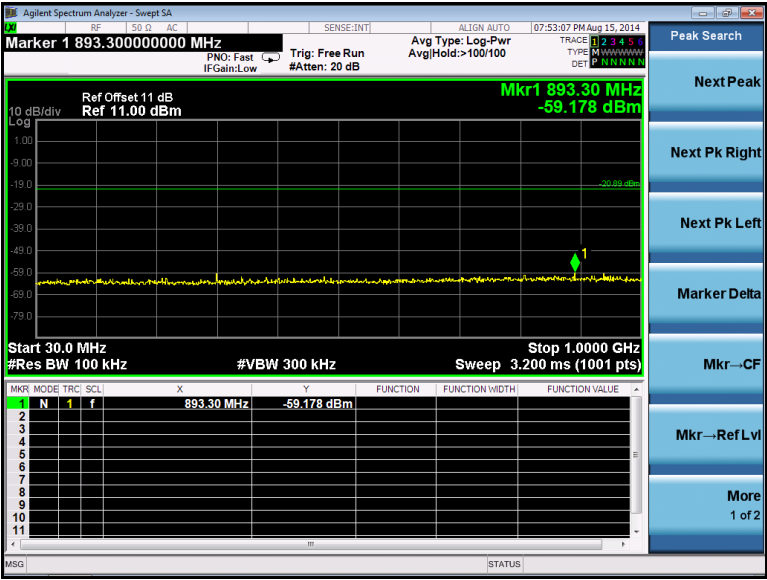


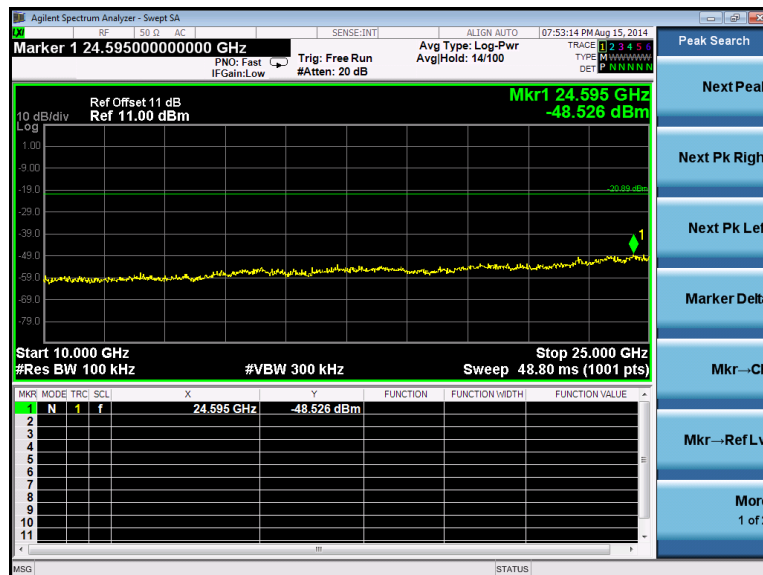
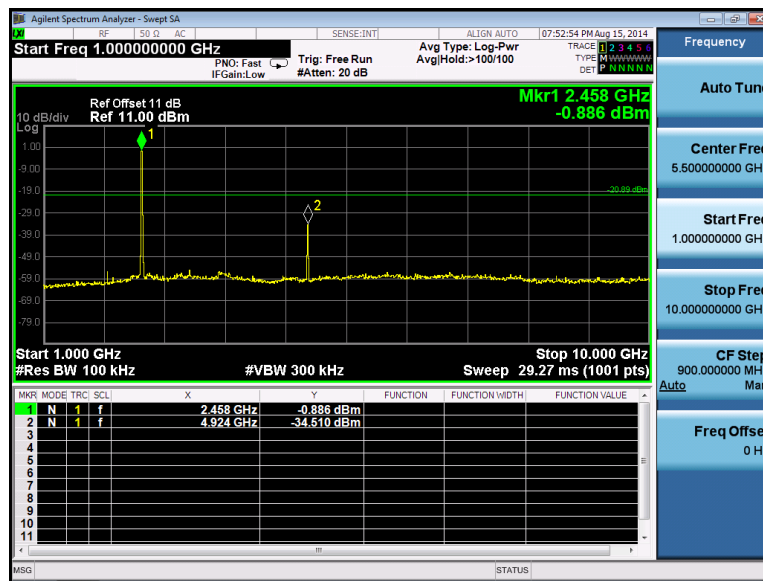
2437MHz





2462MHz





9.6 Band edge

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limit

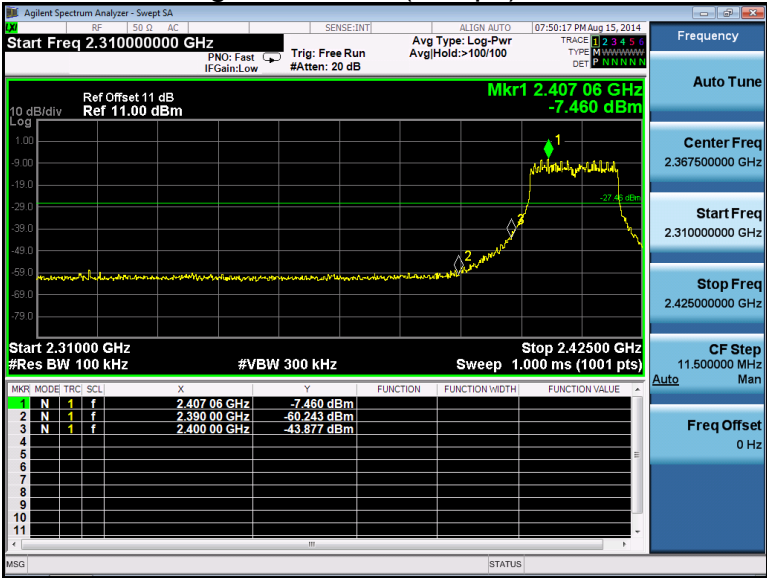
Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

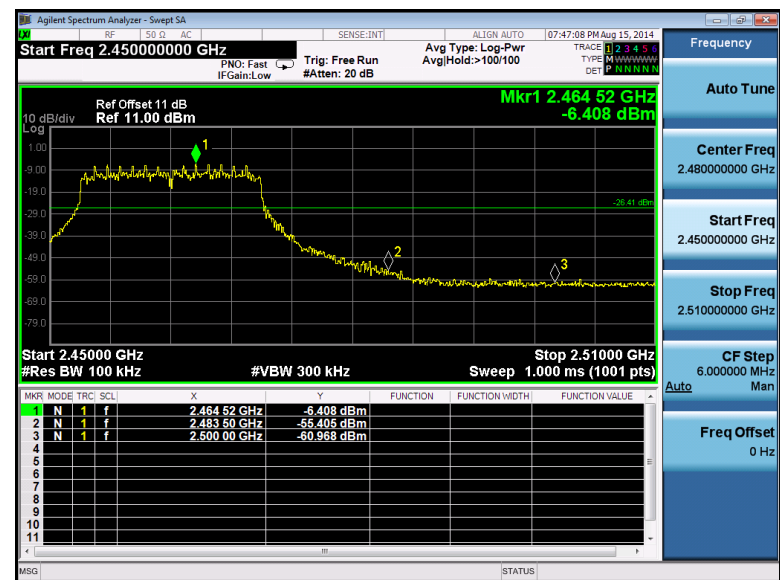
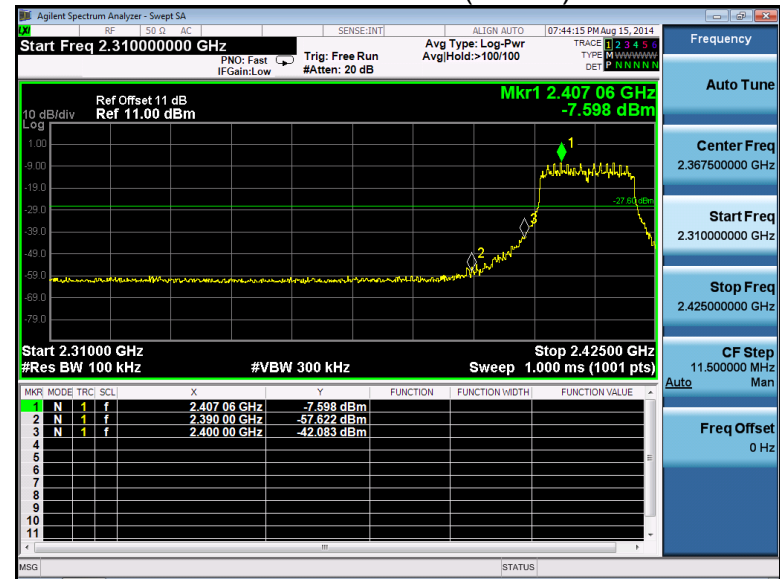
IEEE 802.11b modulation (1Mbps) Test Result



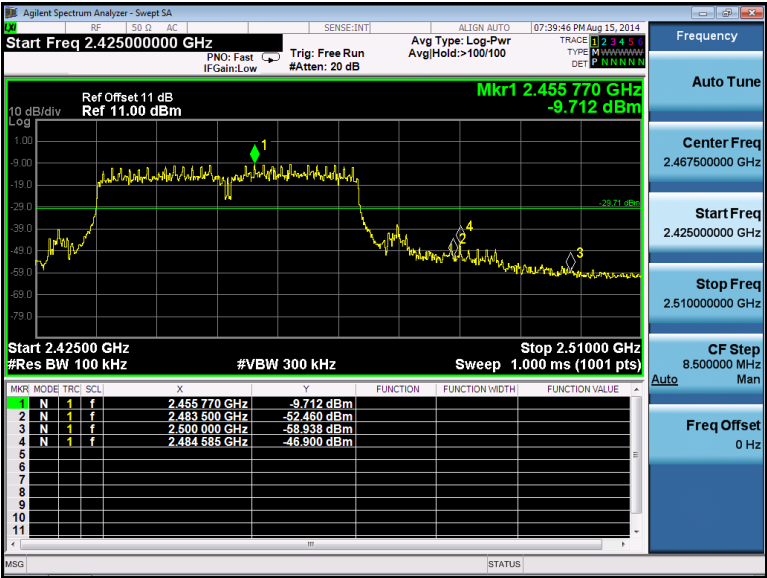
IEEE 802.11g modulation (6Mbps) Test Result



IEEE 802.11n HT20 modulation (MCS0) Test Result



IEEE 802.11n HT40 modulation (MCS0) Test Result



9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{GHz}$, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{duty cycle}/100\text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBuV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement. The test result is for the worst case for all test modes and Channels.

Transmitting spurious emission test result as below:

2412MHz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Amp. Factor dB	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
--	--	--	--	--	--	Horizontal	--	QP	Pass
--	--	--	--	--	--	Vertical	--	QP	Pass
*4824	32.88	8.58	35.7	62.10	67.86	Vertical	74	PK	Pass
*4824	32.88	8.58	35.7	47.06	52.82	Vertical	54	AV	Pass
*4824	32.88	8.58	35.7	58.72	64.48	Horizontal	74	PK	Pass
*4824	32.88	8.58	35.7	43.55	43.55	Horizontal	54	AV	Pass

2437MHz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Amp. Factor dB	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
*4874	32.64	8.74	35.69	59.74	65.43	Vertical	74	PK	Pass
*4874	32.64	8.74	35.69	41.78	47.47	Vertical	54	AV	Pass
*4874	32.64	8.74	35.69	60.58	66.27	Horizontal	74	PK	Pass
*4874	32.64	8.74	35.69	40.06	45.75	Horizontal	54	AV	Pass

2462MHz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Amp. Factor dB	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
--	--	--	--	--	--	Horizontal	--	QP	--
--	--	--	--	--	--	Vertical	--	QP	--
*4924	33.06	8.69	35.7	58.24	64.29	Horizontal	74	PK	Pass
*4924	33.06	8.69	35.7	40.78	46.83	Horizontal	54	AV	Pass
*4924	33.06	8.69	35.7	60.88	66.93	Vertical	74	PK	Pass
*4924	33.06	8.69	35.7	41.19	47.24	Vertical	54	AV	Pass

Remark:

- (1) QP Emission Level= Antenna Factor +Cable Loss + Reading
PK Emission Level= Antenna Factor +Cable Loss - Amp. Factor + Reading
AV Emission Level= PK Emission Level+20log (duty cycle)
- (2) Data of measurement within 30-1000MHz 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.
- (3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
CE	Test Receiver	Rohde & Schwarz	ESHS10	838693/001	Nov.04, 15	<input checked="" type="checkbox"/>
	L.I.S.N.#1	Rohde & Schwarz	ESH2-Z5	834066/011	Nov.04, 15	<input checked="" type="checkbox"/>
	L.I.S.N.#3	Kyoritsu	KNW-242C	8-1920-1	May.07, 15	<input type="checkbox"/>
	RF Cable	3D-2W	Fujikura	LISN Cable 1#	May.07, 15	<input checked="" type="checkbox"/>
	Coaxial Switch	MP59B	Anritsu	M55367	May.07, 15	<input checked="" type="checkbox"/>
	Passive Probe	ESH2-Z3	Rohde & Schwarz	299.7810.52	May.07, 15	<input type="checkbox"/>
	Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100341	May.07, 15	<input type="checkbox"/>
C	Spectrum	Agilent	E4446A	US44300459	May.08, 15	<input checked="" type="checkbox"/>
RE < 1 GHz	Test Receiver <1GHz	Rohde & Schwarz	ESVS10	834468/011	May.07, 15	<input checked="" type="checkbox"/>
	Amplifier < 1 GHz	HP	8447D	2648A04738	May.07, 15	<input checked="" type="checkbox"/>
	HF Cable	Hubersuhne	Sucoflex104	Room 2	May.08, 15	<input checked="" type="checkbox"/>
	Bilog Antenna	Schaffner	CBL6111C	2598	Oct.25, 15	<input checked="" type="checkbox"/>
RE > 1 GHz	Spectrum > 1GHz	Agilent	E4446A	US44300459	May.08, 15	<input checked="" type="checkbox"/>
	Horn Antenna	EMCO	3115	9607-4877	Jun. 24, 15	<input checked="" type="checkbox"/>
	Amp > 1 Ghz	HP	8449B	3008A08495	May.08, 15	<input checked="" type="checkbox"/>
	HF Cable	Hubersuhne	Sucoflex104	Room1	May.08, 15	<input checked="" type="checkbox"/>

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items	Extended Uncertainty
Radiation emission	U=4.32dB (30MHz-25GHz)
Output power test	0.94 dB
Power density test	2.10 dB
Bandwidth	1x10 ⁻⁹