

FCC Part 15C Measurement and Test Report

For

Shenzhen Samoon technology Co.,Ltd

Floor 6, Zhongyuntai Industrial Park, Yingrenshi Road Crossing, Shiyan

Town, Baoan District, Shenzhen, Guangdong China

FCC ID: 2AASO-CHB47LOW

FCC Rule(s):	<u>FCC Part 15C</u>
Product Description:	<u>CHB47LOW CAR DV</u>
Tested Model:	<u>CHB47LOW-T</u>
Report No.:	<u>STR17108173I</u>
Sample Receipt Date:	<u>2017-10-29</u>
Tested Date:	<u>2017-10-30 to 2017-11-07</u>
Issued Date:	<u>2017-11-07</u>
Tested By:	<u>Long Tang / Engineer</u> <i>Long Tang</i>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Samoon technology Co.,Ltd
 Address of applicant: Floor 6, Zhongyuntai Industrial Park, Yingrenshi Road Crossing, Shiyan Town, Baoan District, Shenzhen, Guangdong China

Manufacturer: Shenzhen Samoon technology Co.,Ltd
 Address of manufacturer: Floor 6, Zhongyuntai Industrial Park, Yingrenshi Road Crossing, Shiyan Town, Baoan District, Shenzhen, Guangdong China

General Description of EUT	
Product Name:	CHB47LOW CAR DV
Trade Name:	SAMOON
Model No.:	CHB47LOW-T
Adding Model(s):	CHB47LOW, CHB47LOW-B, CHB47LOW-C, CHB47LOW-D, CHB47LOW-F, CHB47LOW-G, CHB47LOW-H, CHB47LOW-J, CHB47LOW-K, CHB47LOW-P, CHB47LOW-Q, CHB47LOW-W, CHB47LOW-X, CHB47LOW-Y, V2, CHB47LO, CHB47LO-B, CHB47LO-C, CHB47LO-D, CHB47LO-F, CHB47LO-G, CHB47LO-H, CHB47LO-J, CHB47LO-K, CHB47LO-P, CHB47LO-Q, CHB47LO-T, CHB47LO-W, CHB47LO-X, CHB47LO-Y, X1Pro
Rated Voltage:	Battery DC 3.7V
Battery Capacity:	130mAh
Power Adapter Model:	Car adapter 5V 1.5A
Software Version:	/
Hardware Version:	V1.0
<p><i>Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model CHB47LOW-T, but the circuit and the electronic construction do not change, declared by the manufacturer.</i></p>	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 11b/g/n(HT20) 2422-2452MHz for 11n(HT40)
RF Output Power:	10.13dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11/7
Channel Separation:	5MHz
Type of Antenna:	PCB
Antenna Gain:	2.0dBi
Lowest Internal Frequency	32.768kHz

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Samoon technology Co.,Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz
TM2	802.11g	2412MHz, 2437MHz, 2462MHz
TM3	802.11n-HT20	2412MHz, 2437MHz, 2462MHz
TM4	802.11n-HT40	2422MHz, 2437MHz, 2452MHz

Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.

Accessories Equipment List and Details			
Description	Manufacturer	Model No.	Serial Number
Notebook	Lenovo	E10	LR-63C8R
Car adapter	/	/	/
Battery	CHILWEE	6-DZM-10	/
Display	SUNSANG	LS22PUHKF/XF	YDG7HVJZ800050N

Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
Car adapter Line	3.6	Unshielded	Without Core
HDMI Cable	2.4	Shielded	Without Core

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2017-03-09	2018-03-08

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 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.

4.2 Evaluation Information

This product has an integral antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

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.

5.2 Test Procedure

According to the KDB 558074 D01 v04, 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set VBW $\geq 3 \times \text{RBW}$.
- e) Detector = power averaging (RMS) or sample detector (when RMS not available).
- f) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- g) Sweep time = auto couple.
- h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i) Use the peak marker function to determine the maximum amplitude level.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Environmental Conditions

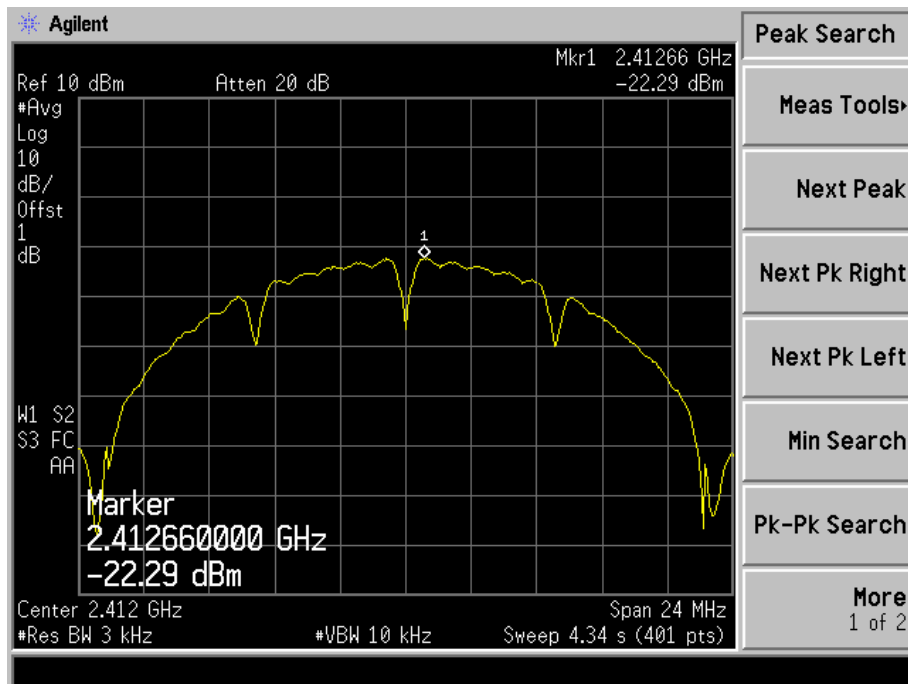
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

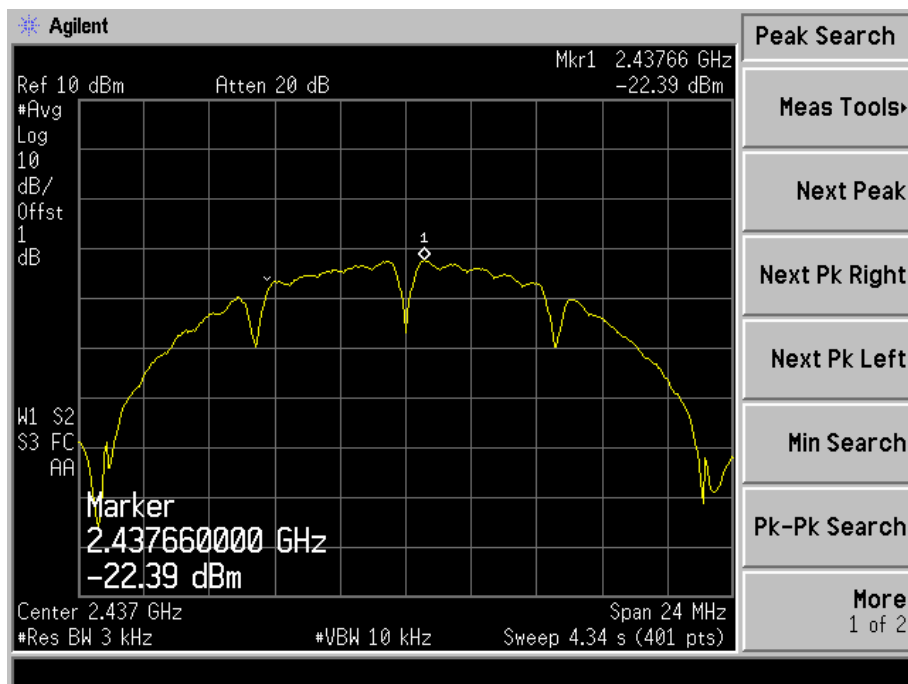
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-22.29	8
	2437	-22.39	8
	2462	-22.69	8
802.11g	2412	-26.23	8
	2437	-26.09	8
	2462	-26.55	8
802.11n HT20	2412	-27.50	8
	2437	-27.50	8
	2462	-27.48	8
802.11n HT40	2422	-30.63	8
	2437	-30.79	8
	2452	-31.01	8

Please refer to the following test plots:

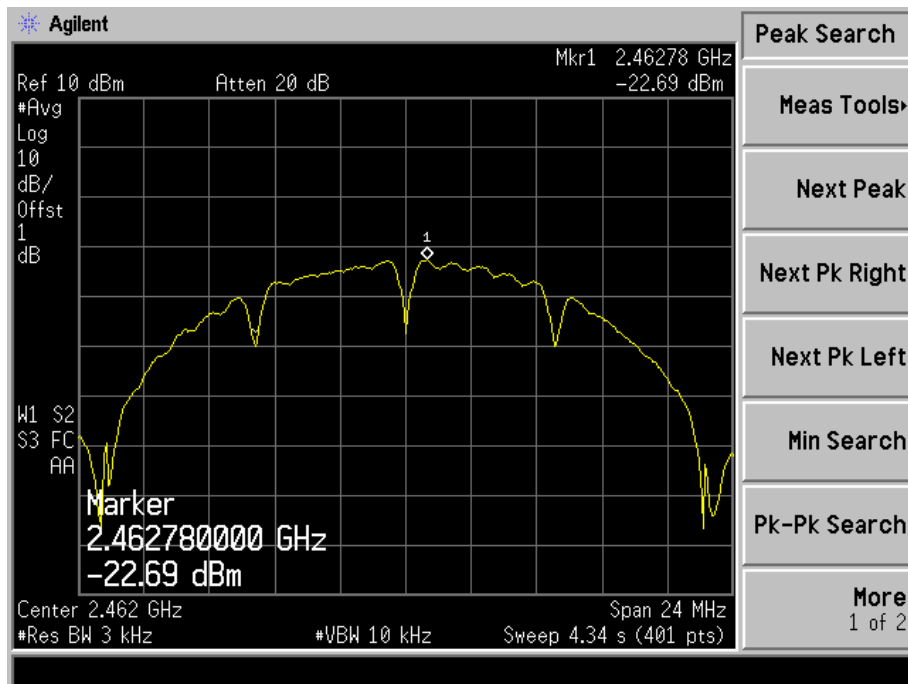
802.11b-Low Channel



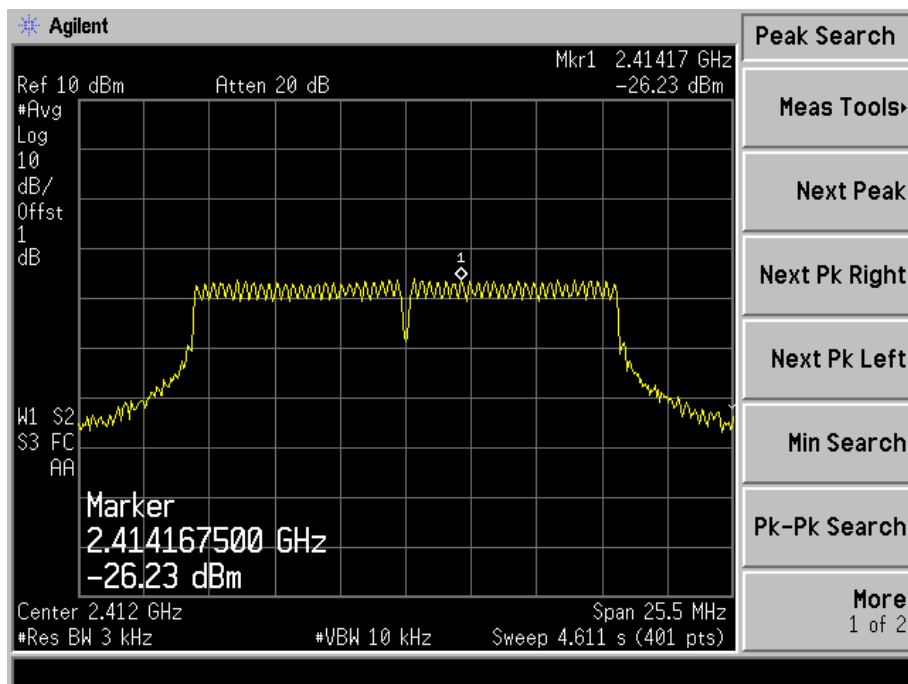
802.11b-Middle Channel



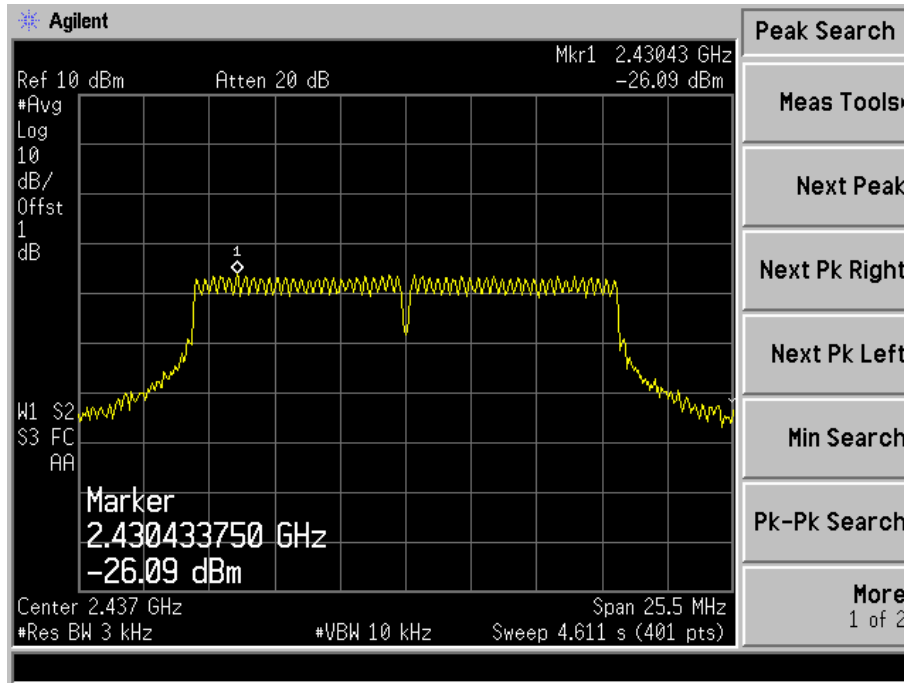
802.11b-High Channel



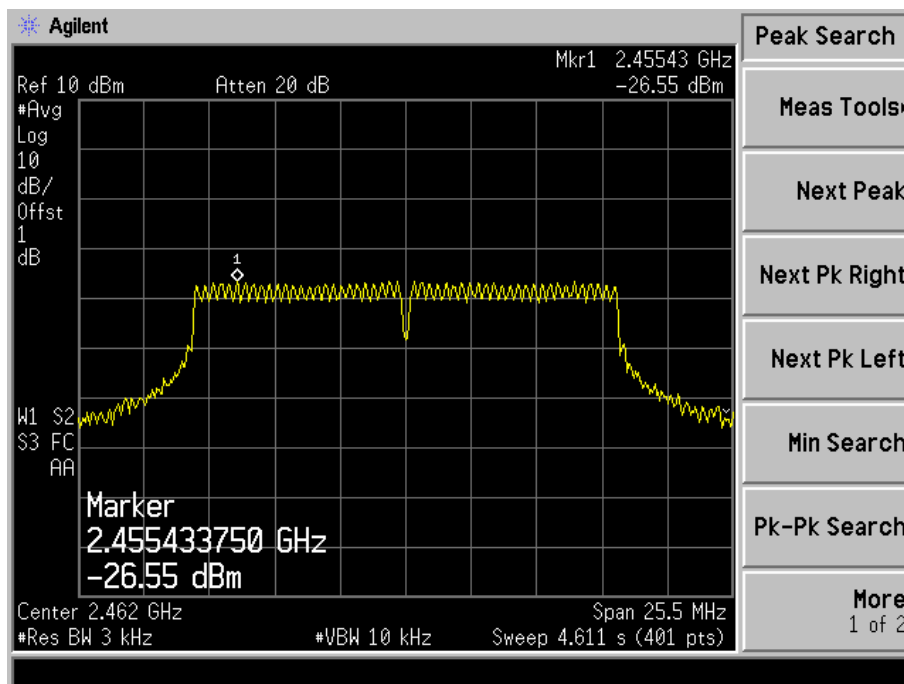
802.11g-Low Channel



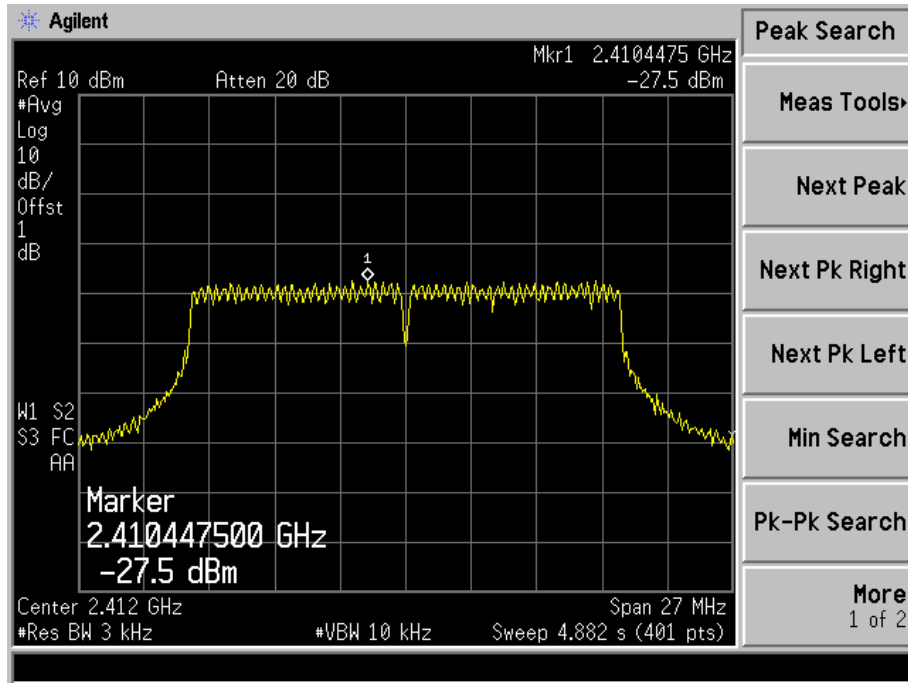
802.11g-Middle Channel



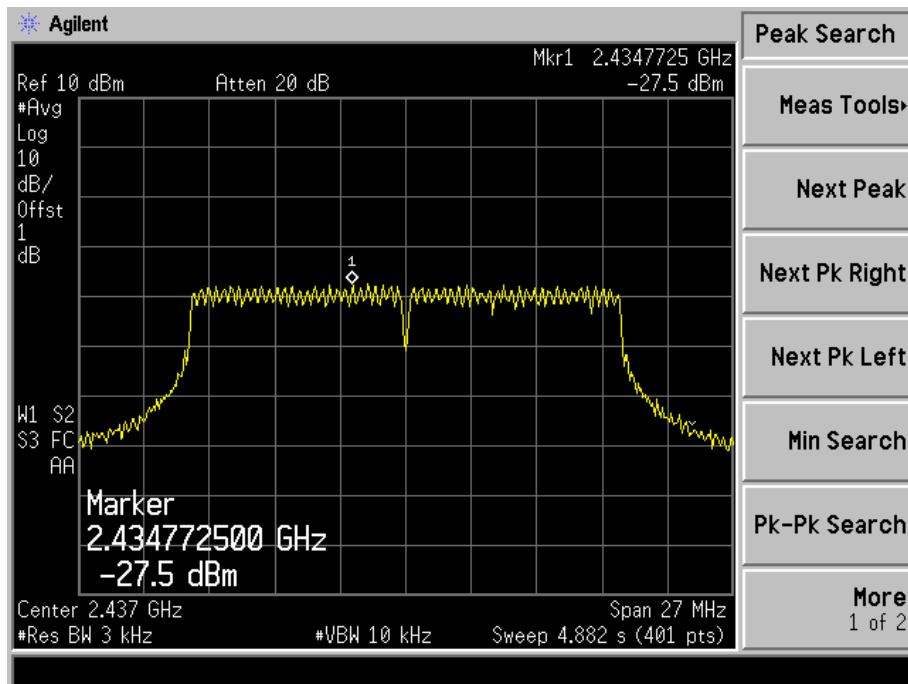
802.11g-High Channel



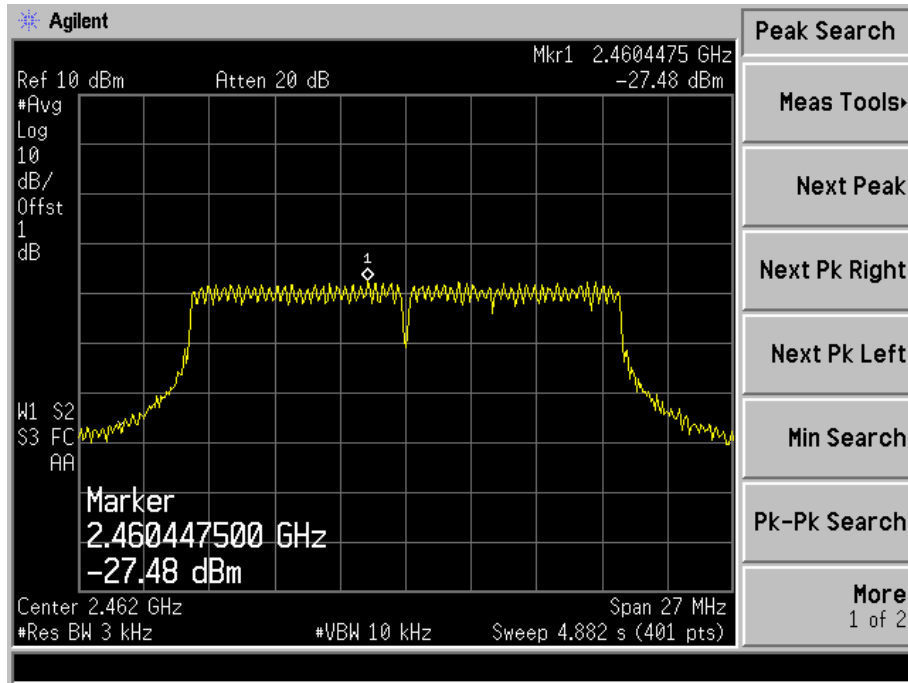
802.11n-HT20-Low Channel



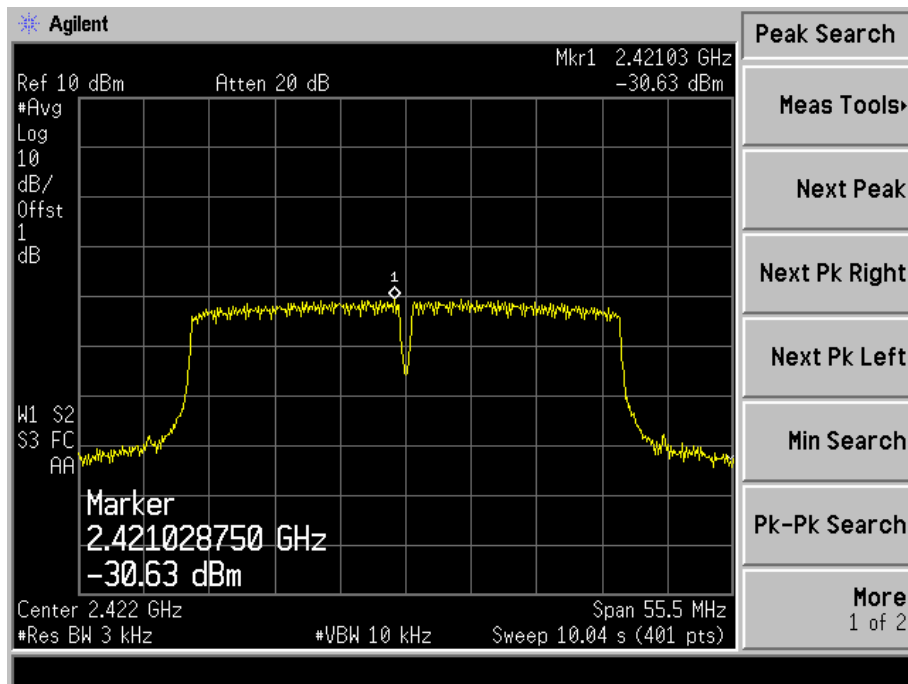
802.11n-HT20-Middle Channel



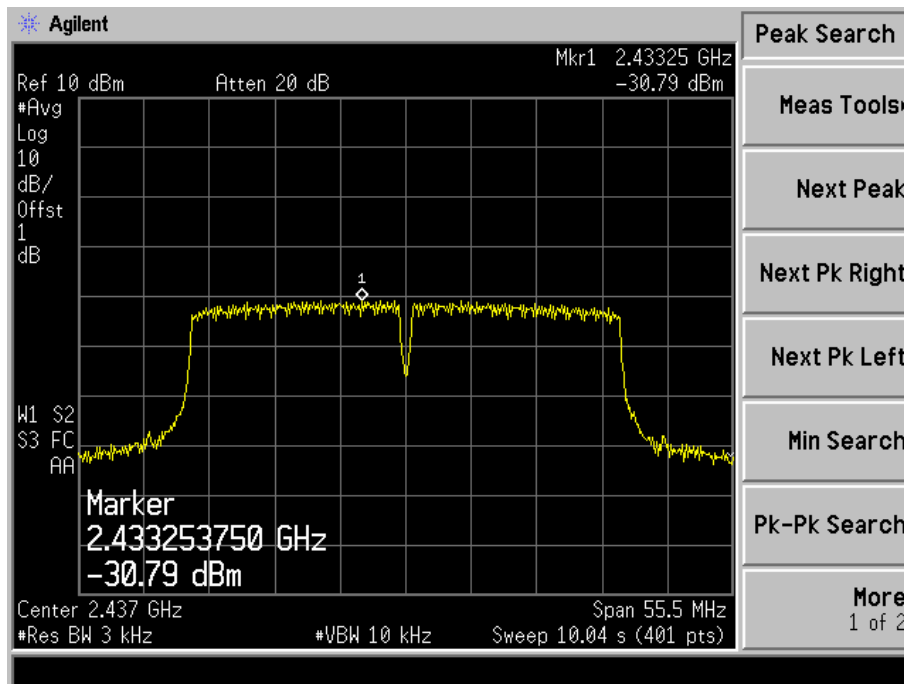
802.11n-HT20-High Channel



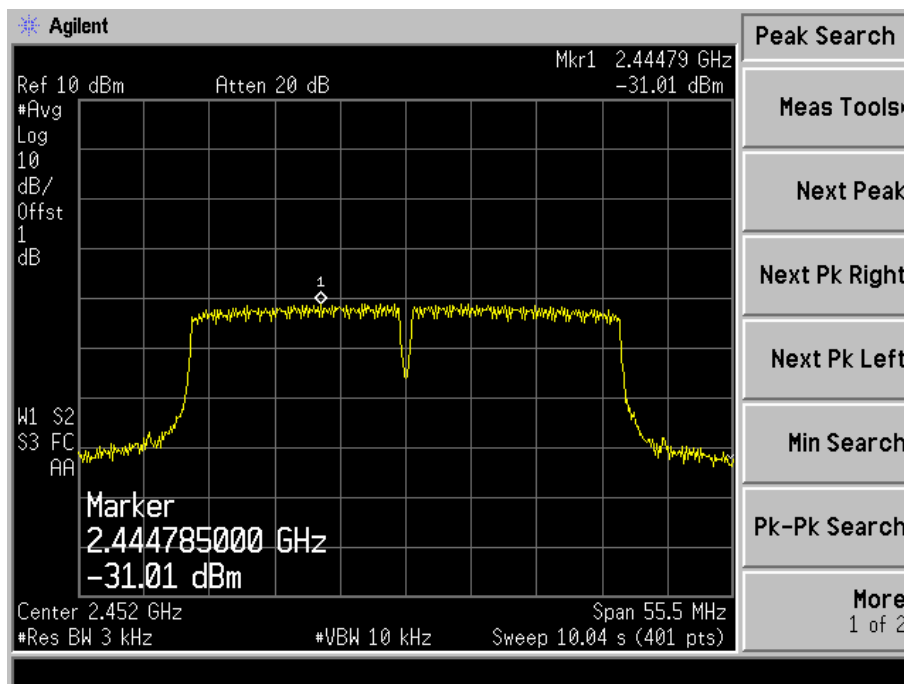
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

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

6.2 Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Environmental Conditions

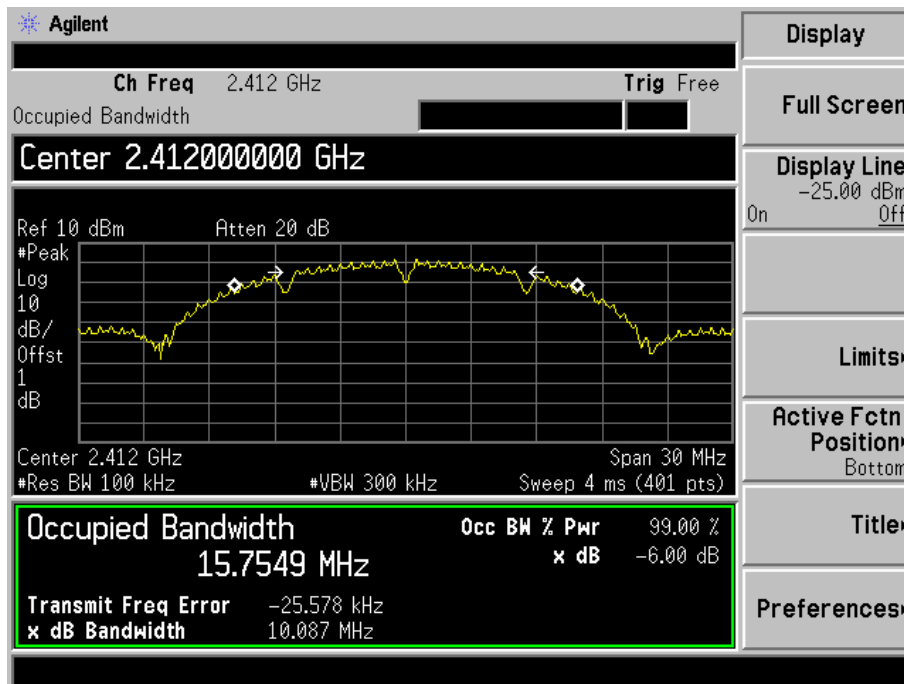
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b	2412	10.087	15.7849	≥ 500
	2437	10.115	15.7646	≥ 500
	2462	10.080	15.7628	≥ 500
802.11g	2412	16.438	16.4826	≥ 500
	2437	16.435	16.4822	≥ 500
	2462	16.455	16.4943	≥ 500
802.11n-HT20	2412	17.650	17.7136	≥ 500
	2437	17.628	17.7198	≥ 500
	2462	17.601	17.7296	≥ 500
802.11n-HT40	2422	35.883	35.9239	≥ 500
	2437	36.071	36.0548	≥ 500
	2452	35.761	36.0595	≥ 500

Please refer to the following test plots:

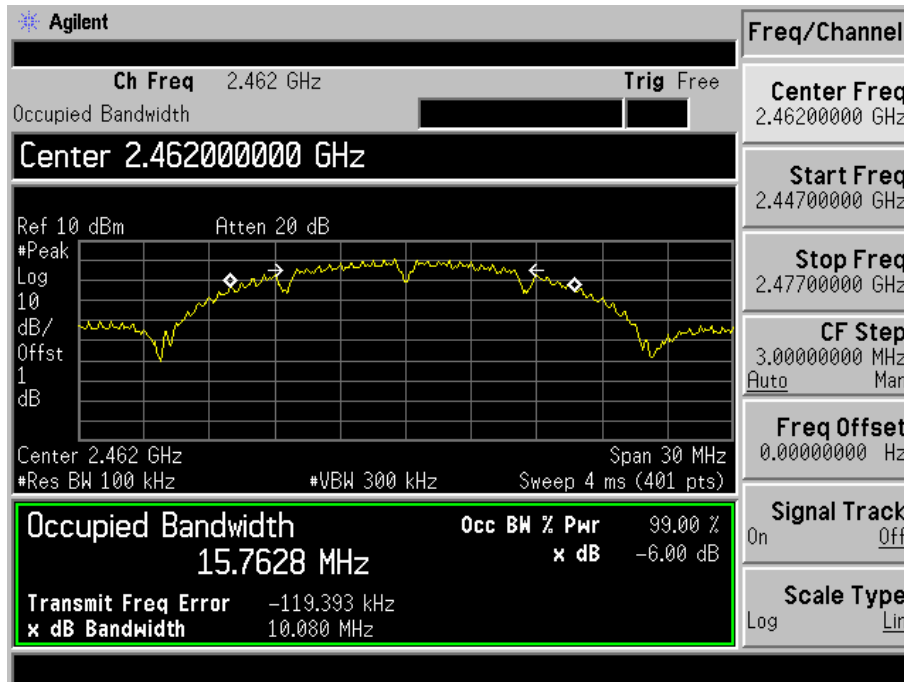
802.11b-Low Channel



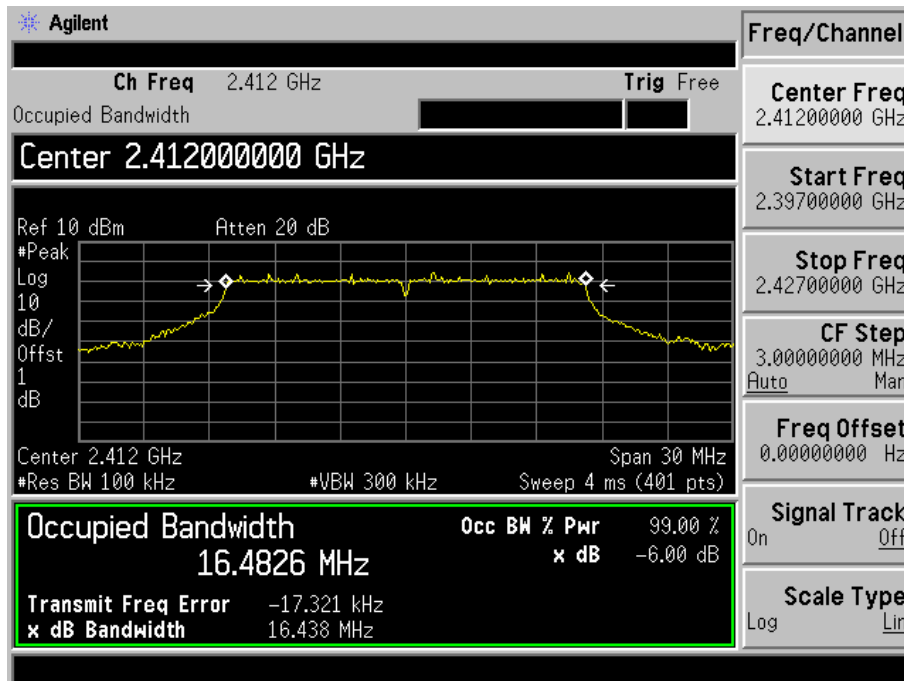
802.11b-Middle Channel



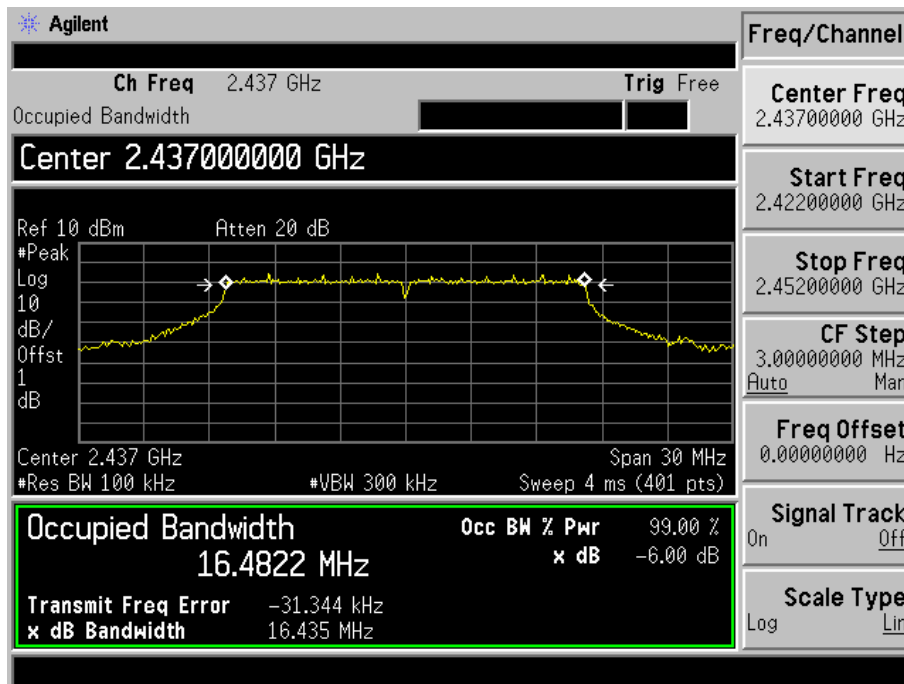
802.11b-High Channel



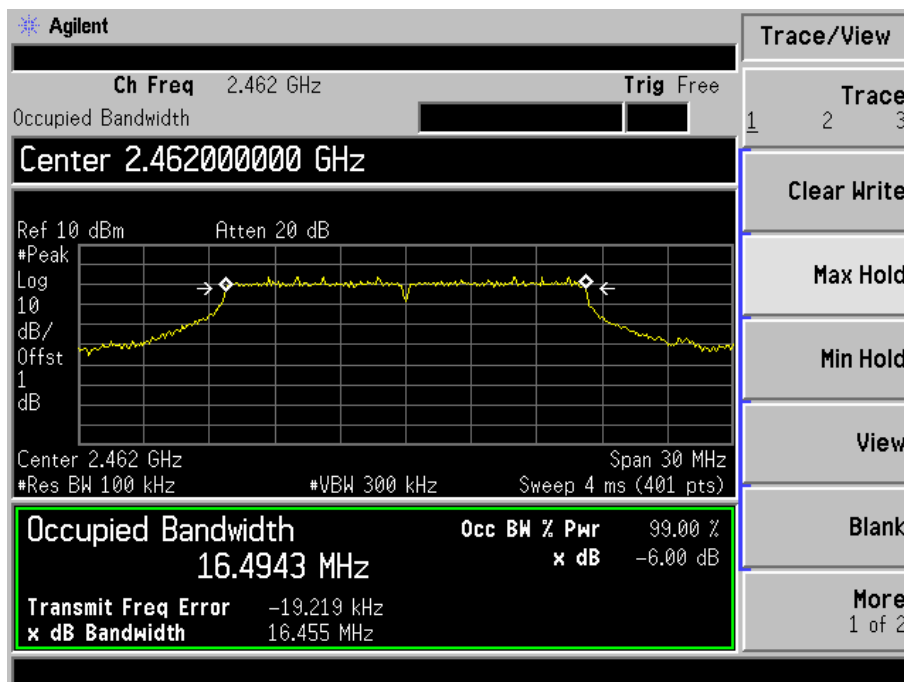
802.11g-Low Channel



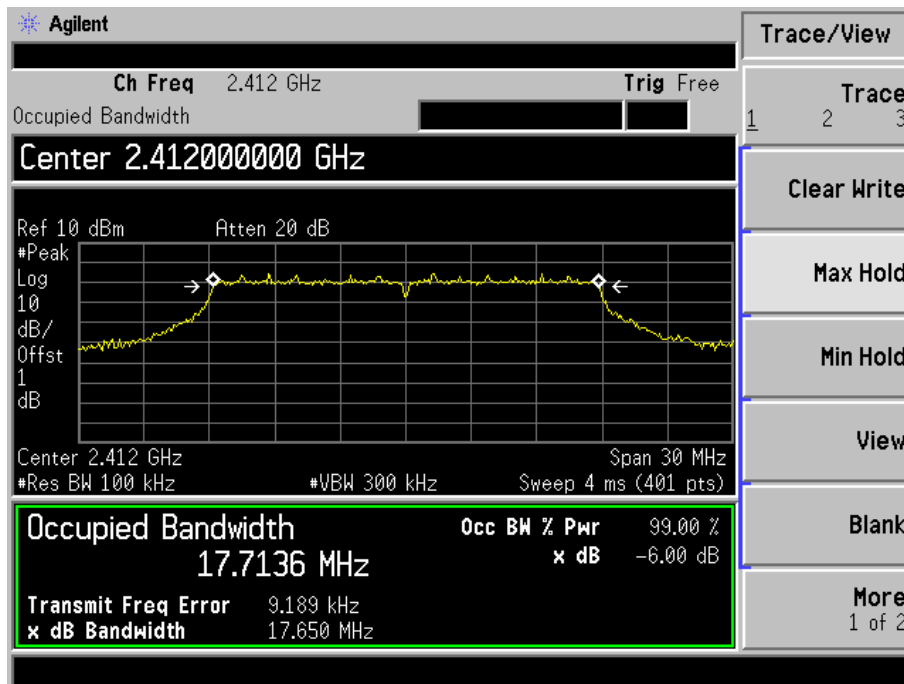
802.11g-Middle Channel



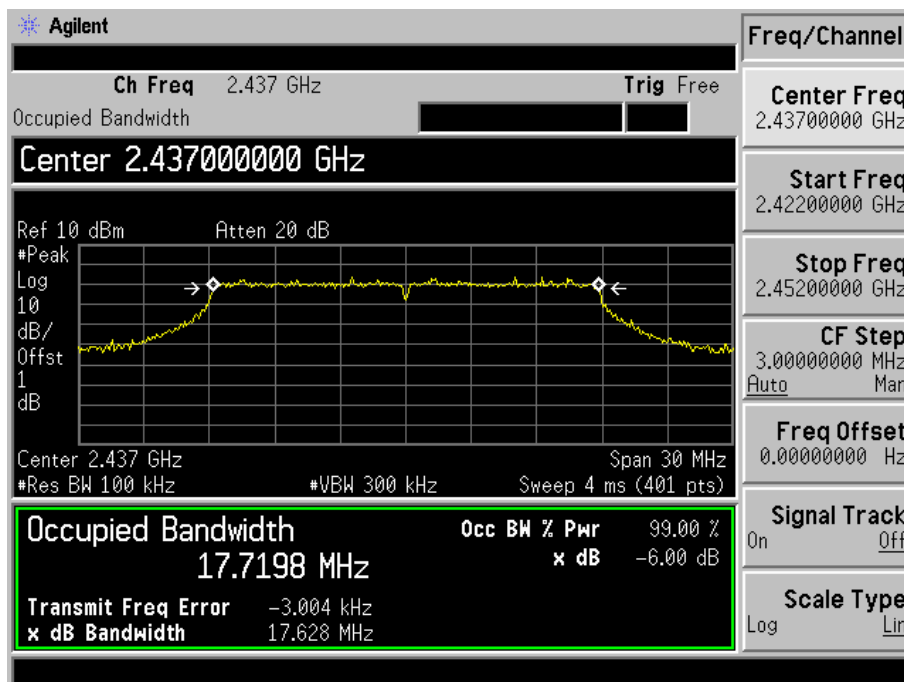
802.11g-High Channel



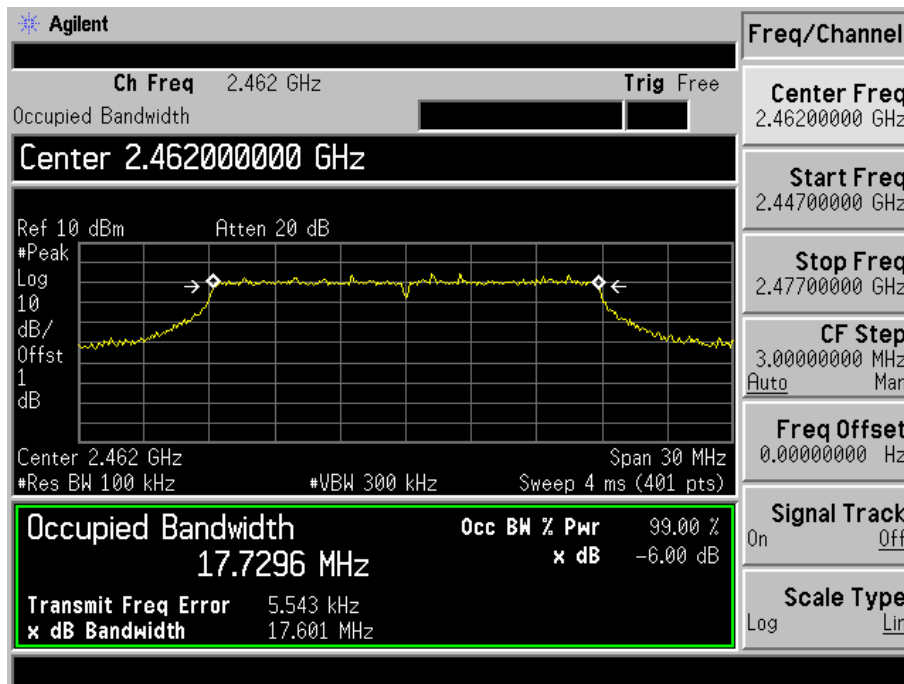
802.11n-HT20-Low Channel



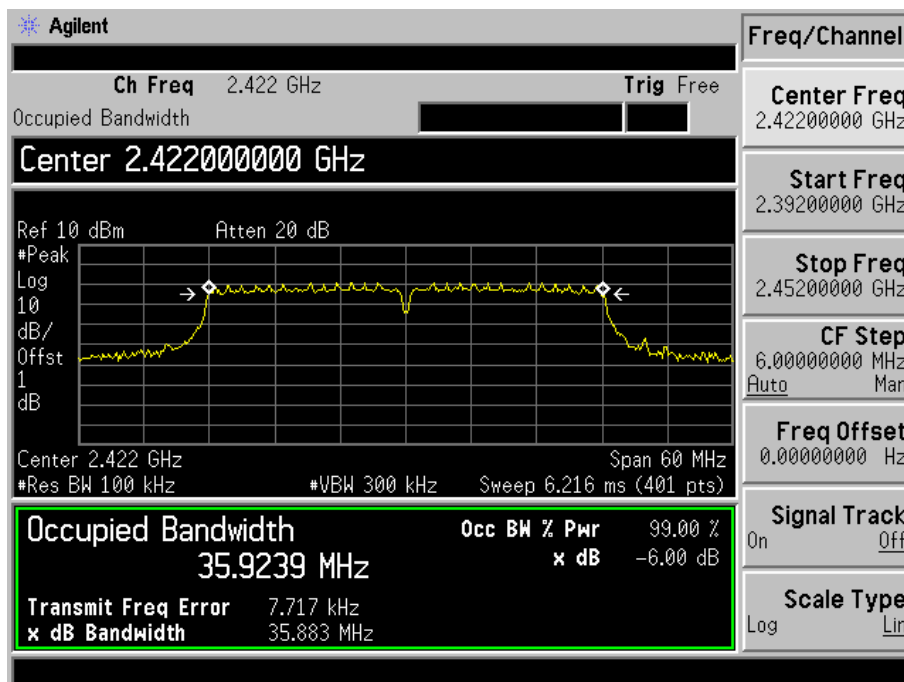
802.11n-HT20-Middle Channel



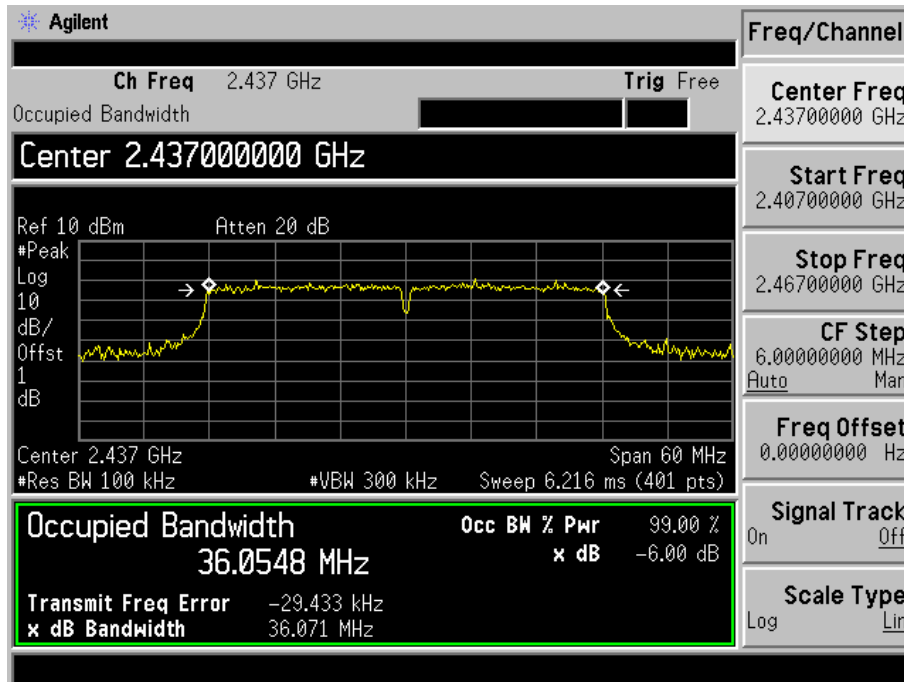
802.11n-HT20-High Channel



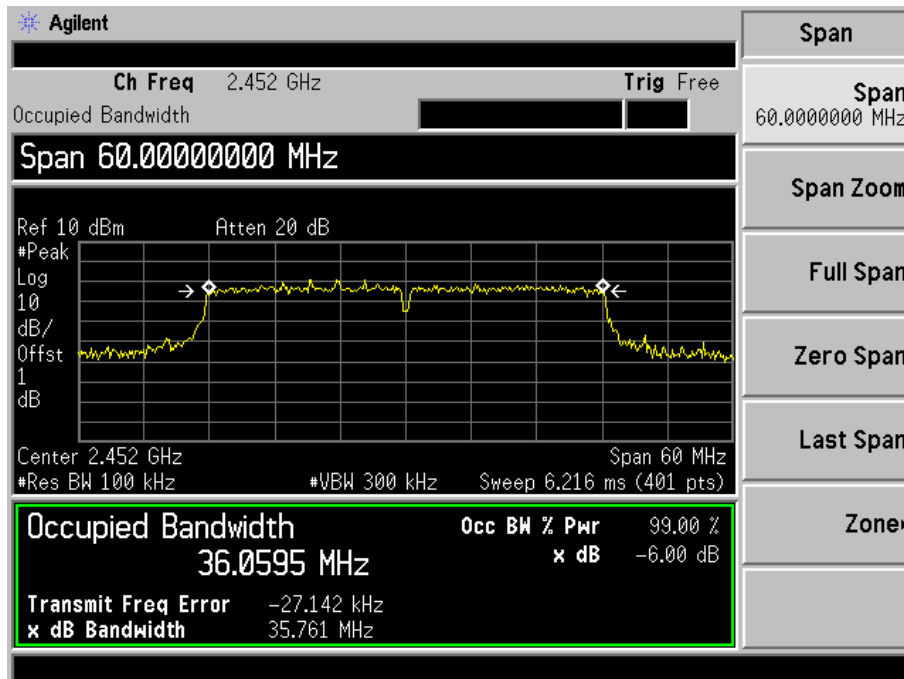
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel



7. RF Output Power

7.1 Standard Applicable

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

7.2 Test Procedure

According to the KDB-558074 D01 v04, 9.2.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW $\geq 3 \times$ RBW.
- d) 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.)
- e) Sweep time = auto.
- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- g) If transmit duty cycle $< 98 \%$, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq 98 \%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run” .
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- i) 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.

7.3 Environmental Conditions

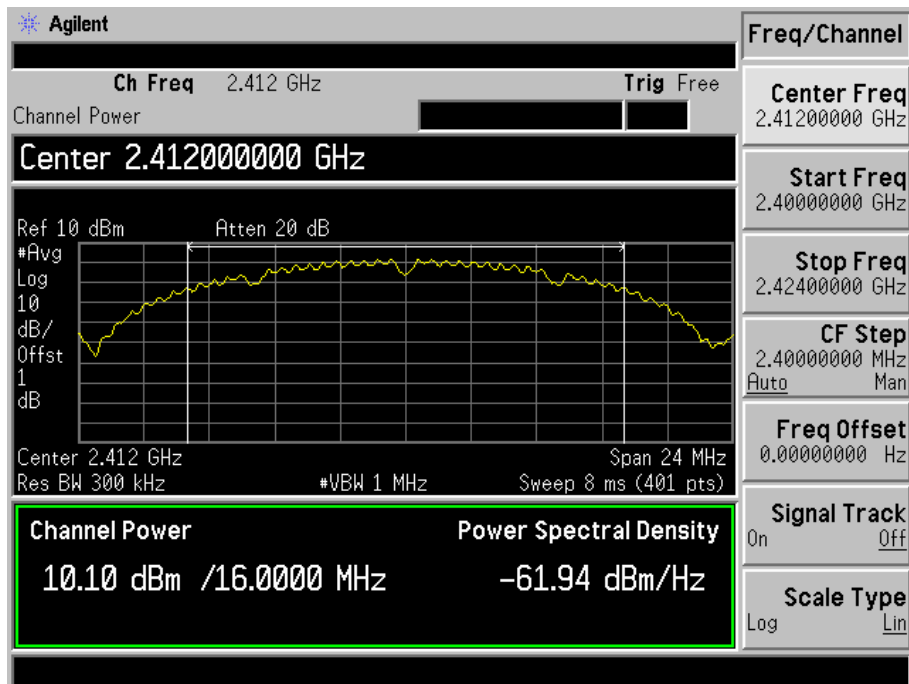
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

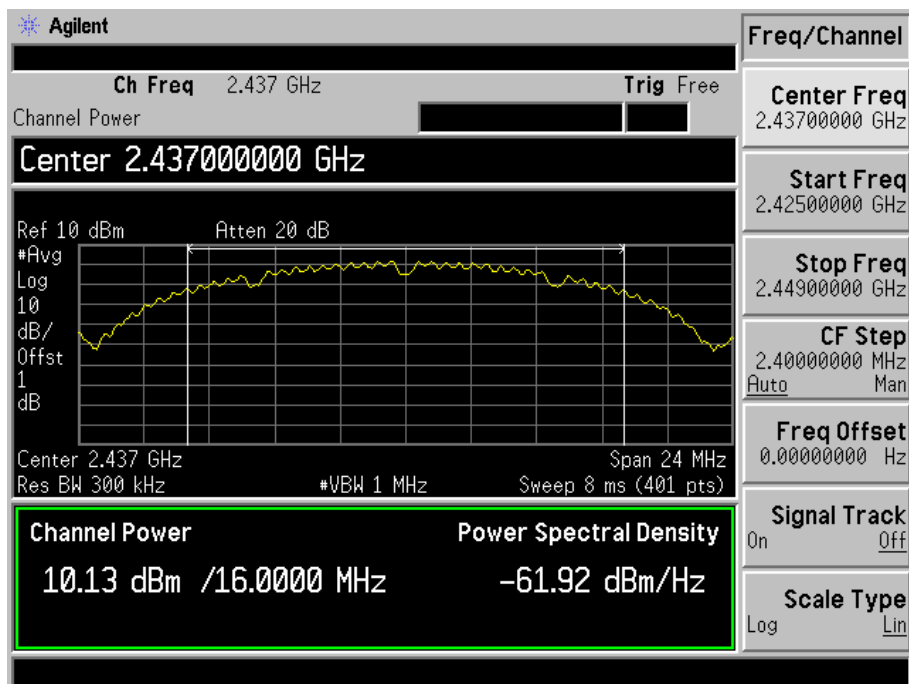
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_11Mbps	2412	10.10	10.23	1000
	2437	10.13	10.30	1000
	2462	9.71	9.35	1000
802.11g_54Mbps	2412	8.47	7.03	1000
	2437	8.40	6.92	1000
	2462	7.94	6.22	1000
802.11n HT20_MCS7	2412	7.25	5.31	1000
	2437	6.69	4.67	1000
	2462	6.67	4.65	1000
802.11n HT40_MCS7	2422	5.42	3.48	1000
	2437	5.30	3.39	1000
	2452	5.03	3.18	1000

Please refer to the following test plots:

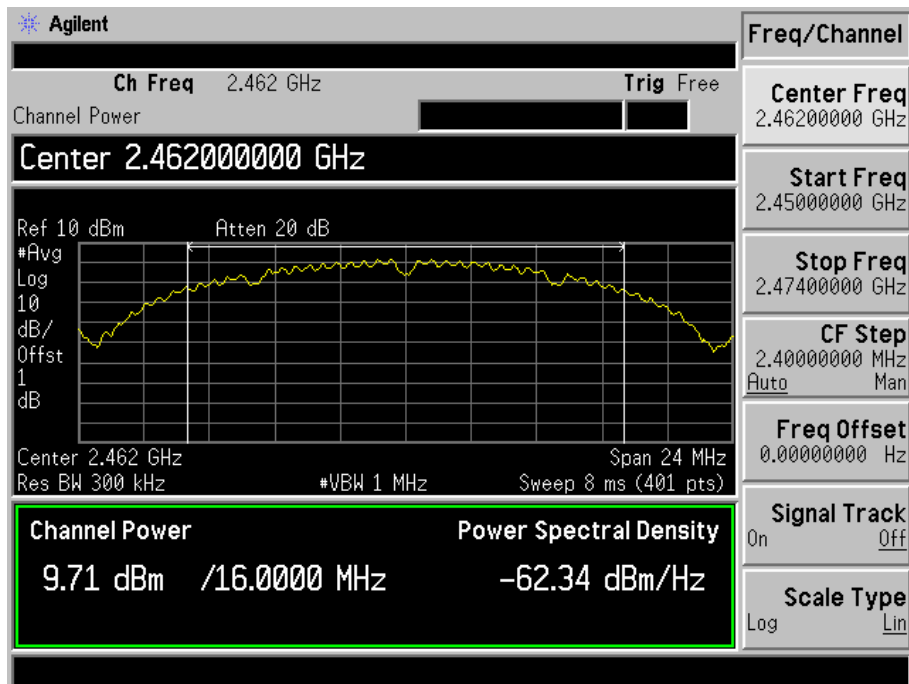
802.11b-11Mbps-Low Channel



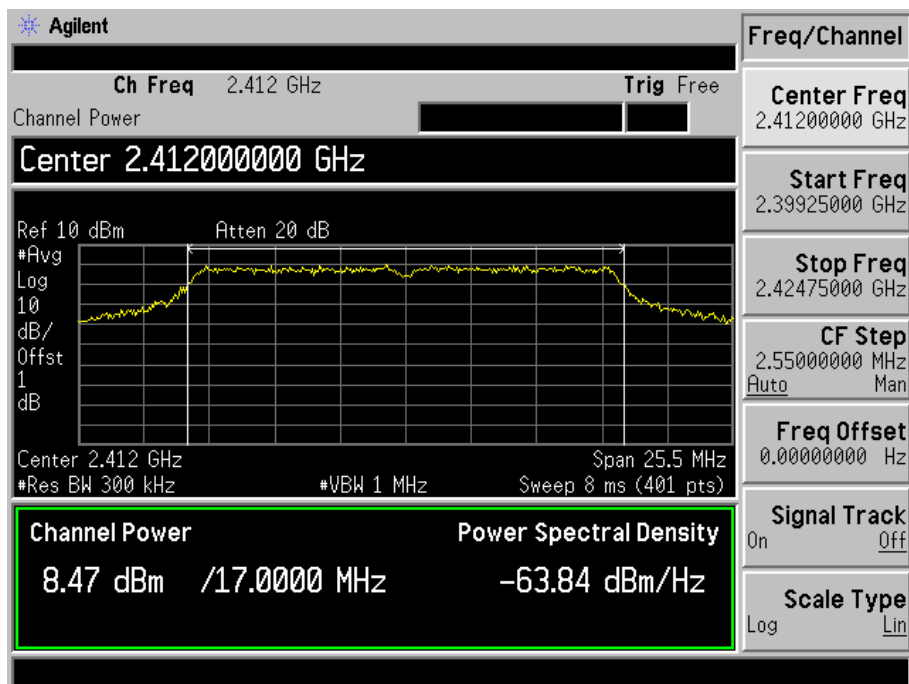
802.11b -11Mbps-Middle Channel



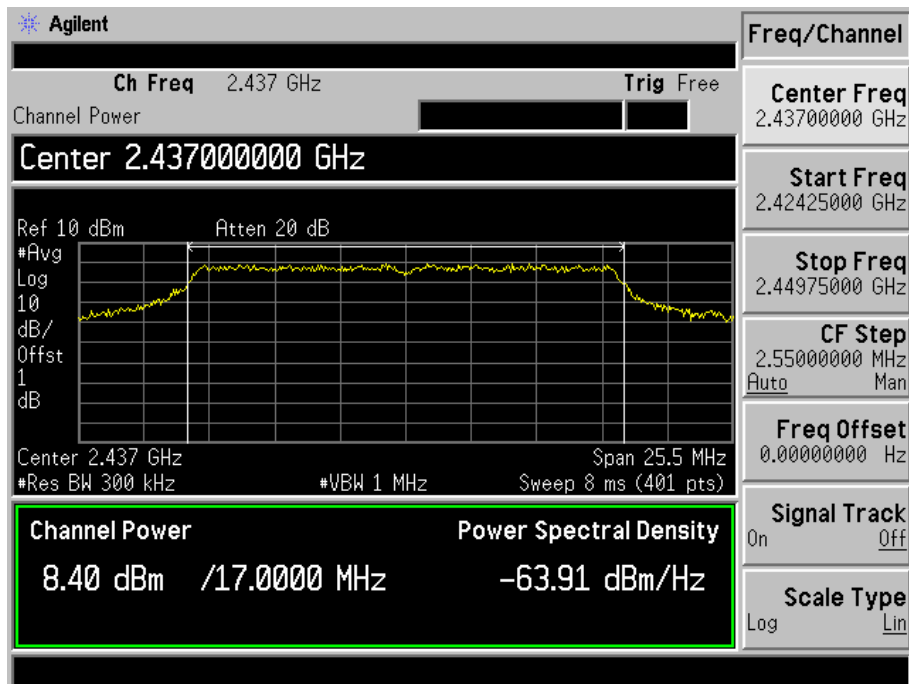
802.11b -11Mbps-High Channel



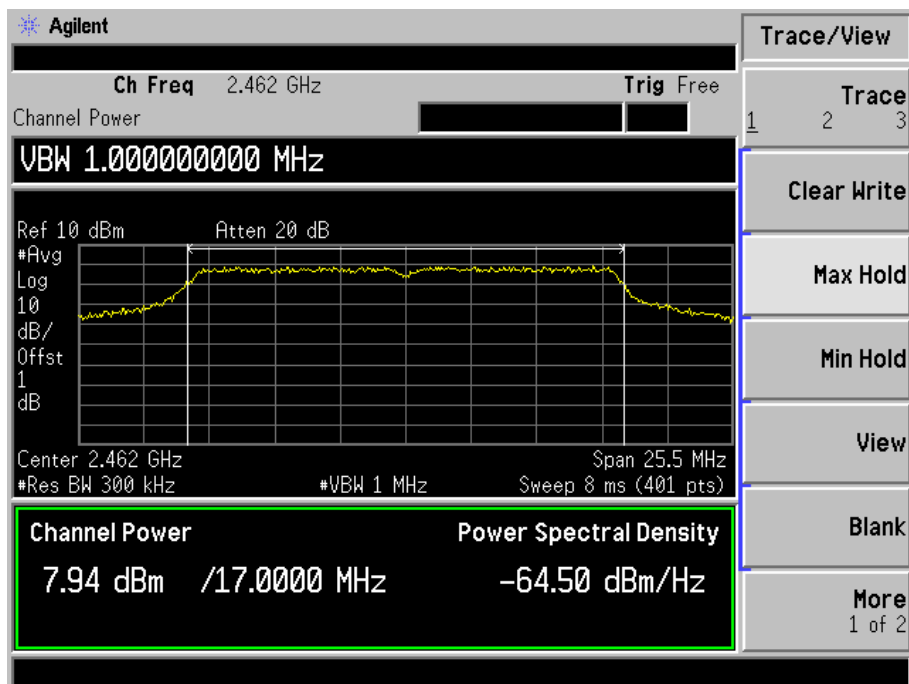
802.11g-54Mbps-Low Channel



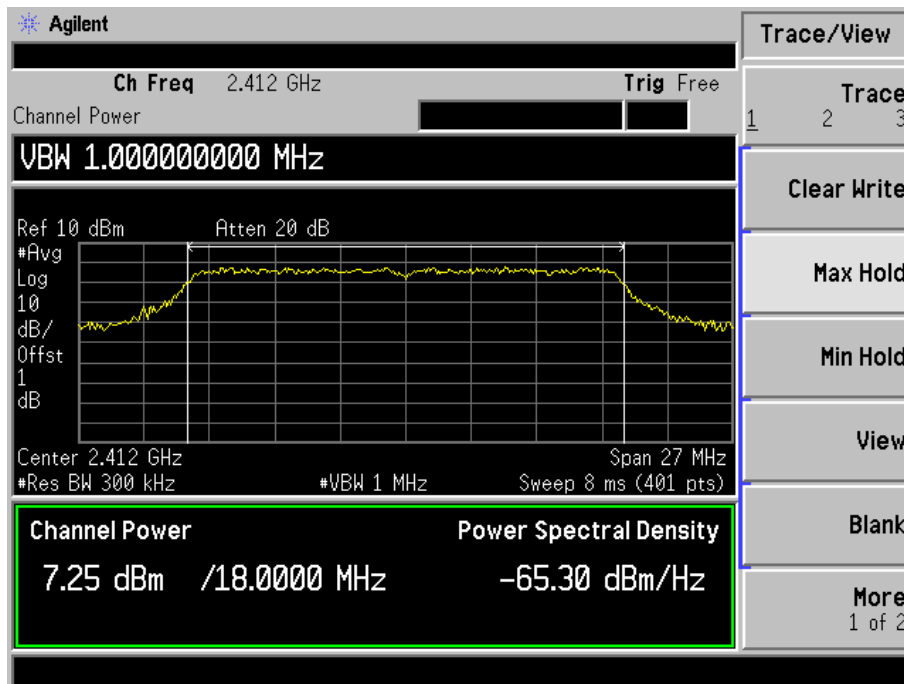
802.11g-54Mbps-Middle Channel



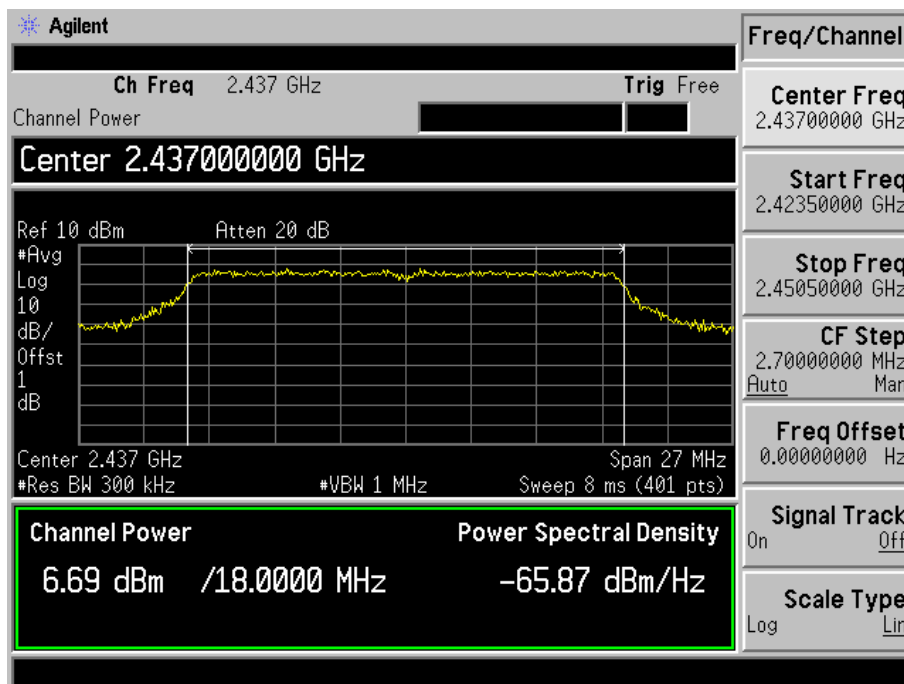
802.11g-54Mbps-High Channel



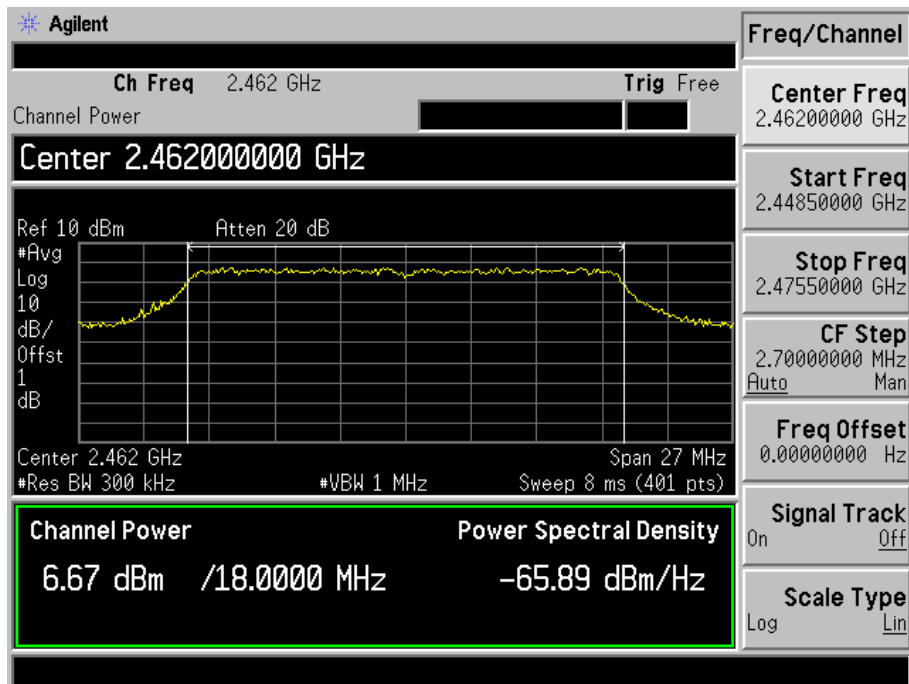
802.11n-HT20-MCS7-Low Channel



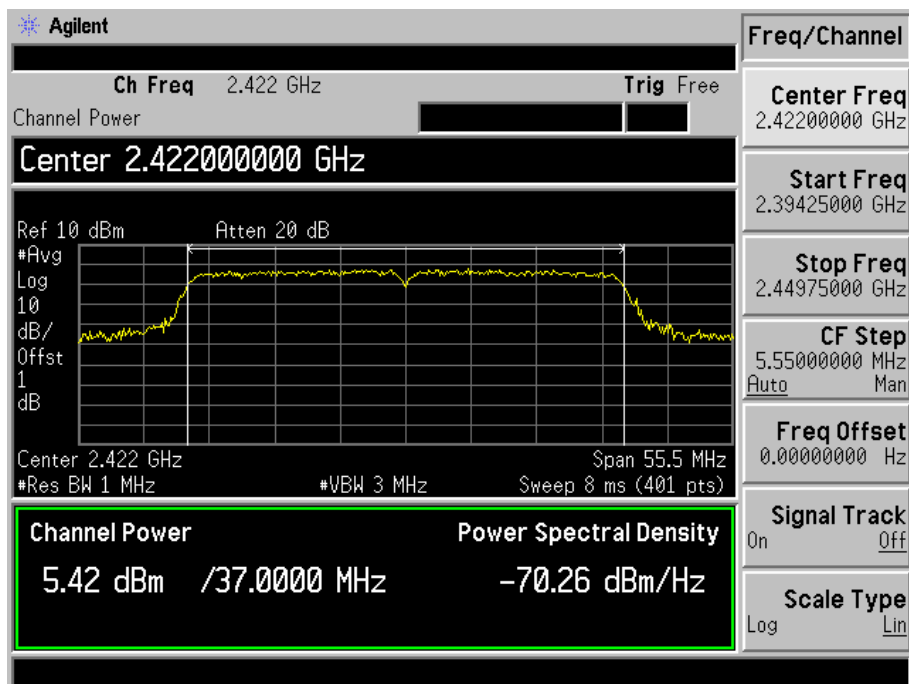
802.11n-HT20-MCS7-Middle Channel



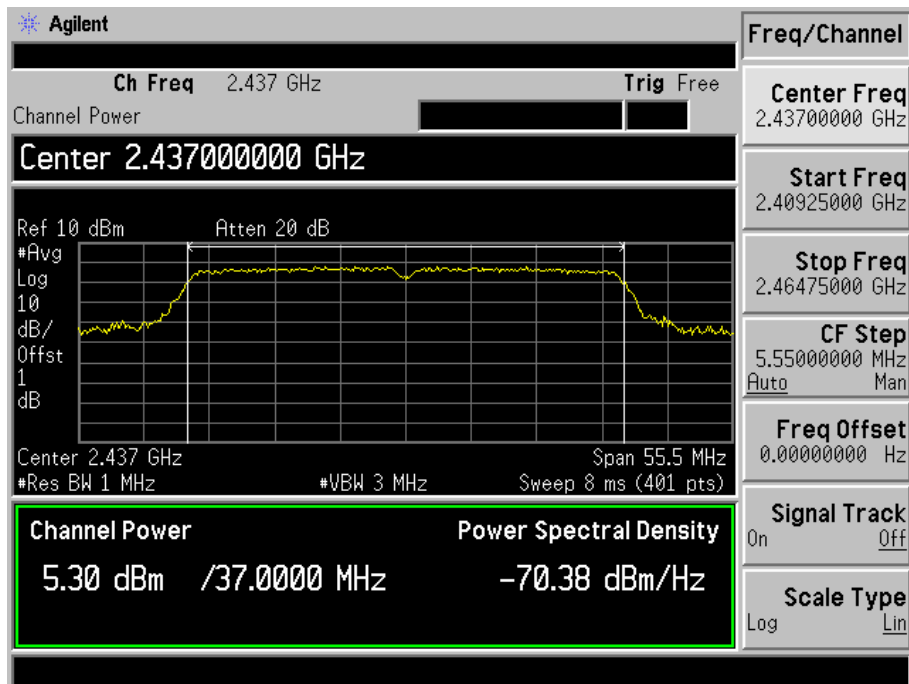
802.11n-HT20-MCS7-High Channel



802.11n-HT40-MCS7-Low Channel



802.11n-HT40-MCS7-Middle Channel



802.11n-HT40-MCS7-High Channel



8. Field Strength of Spurious Emissions

8.1 Standard Applicable

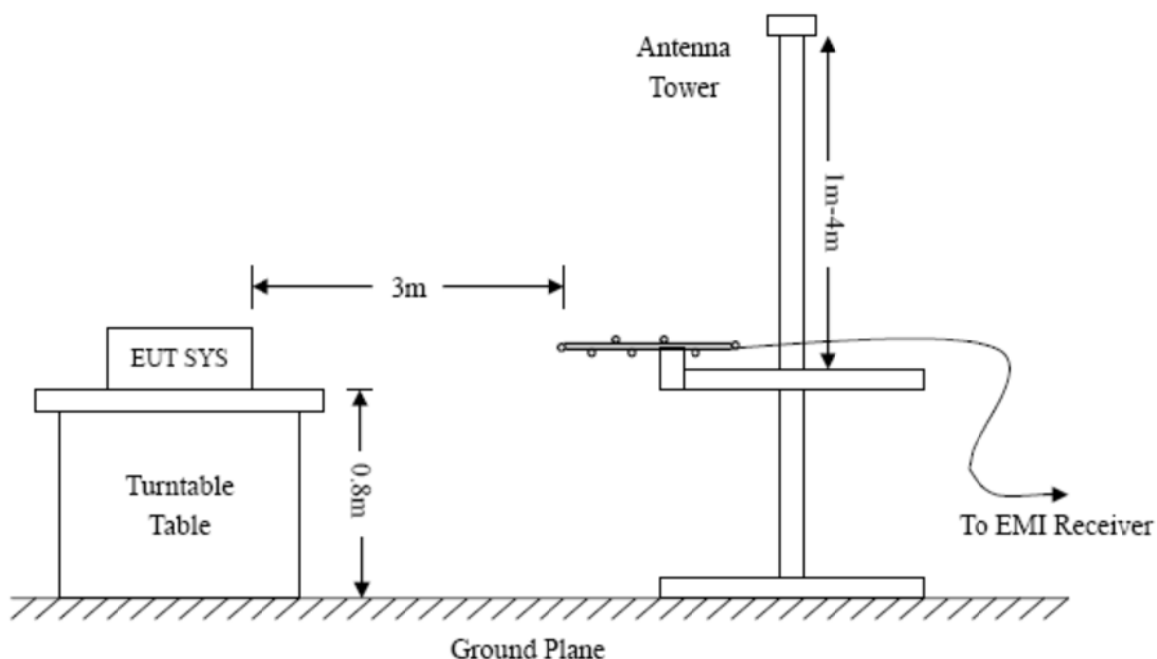
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

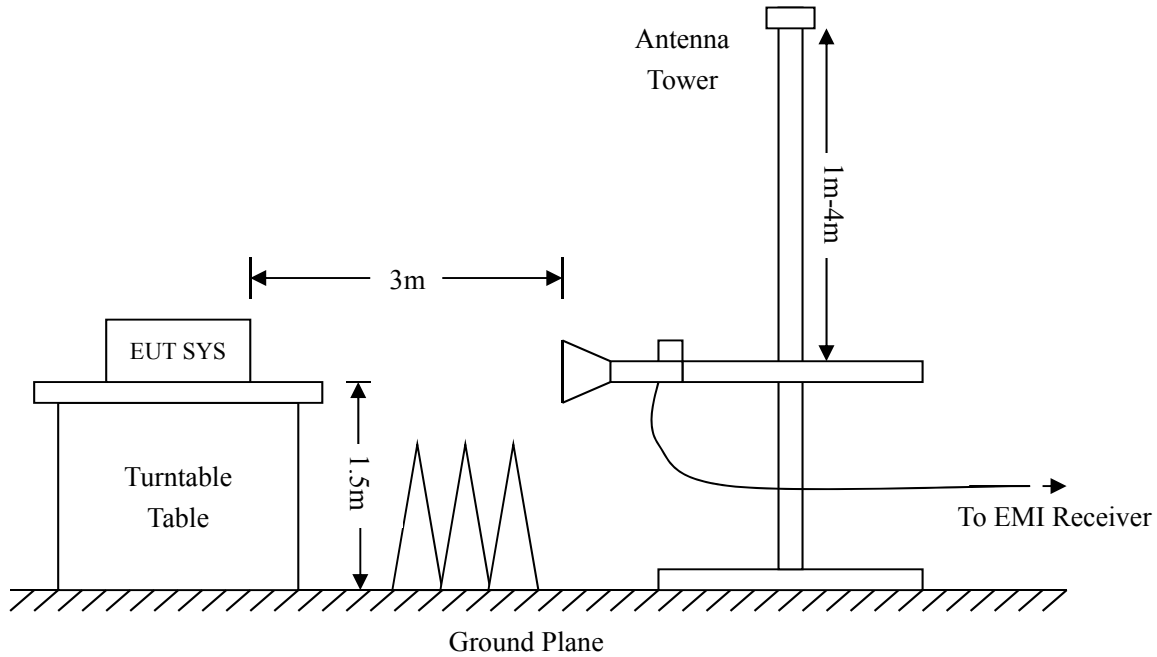
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=360KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

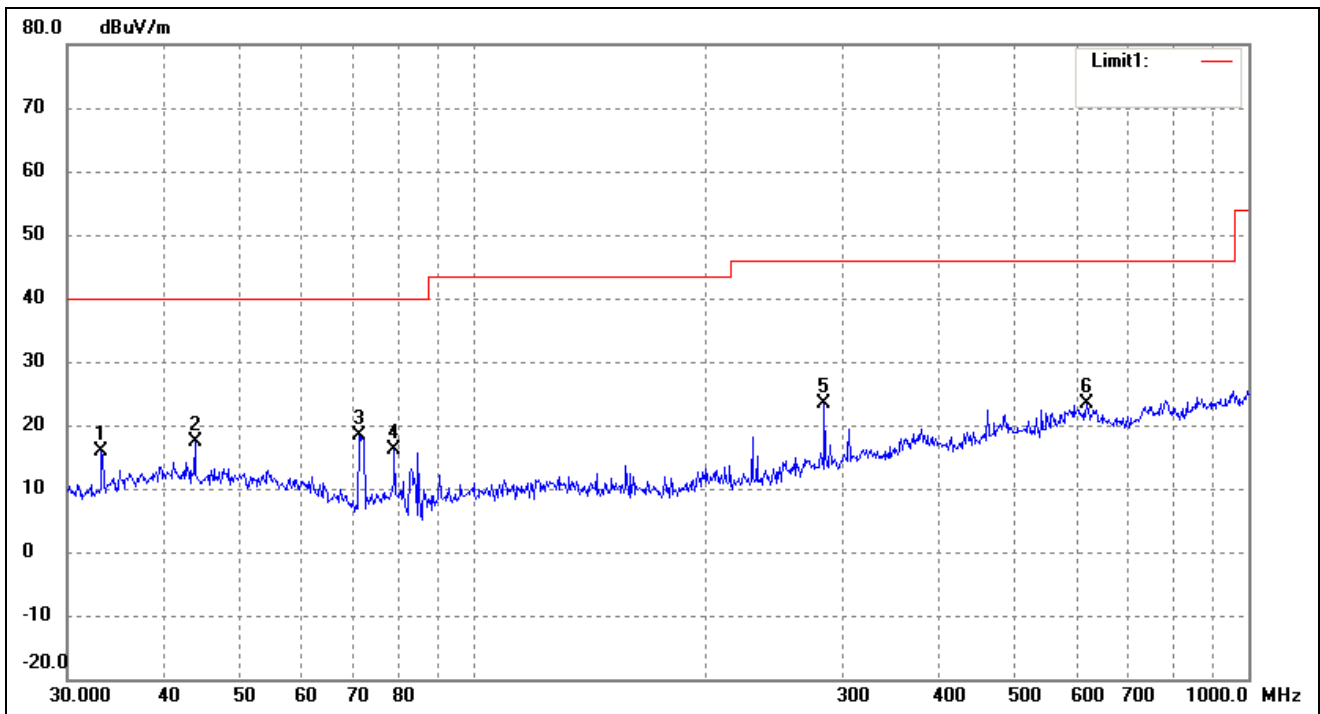
EUT: CHB47LOW CAR DV

Tested Model: CHB47LOW-T

Operating Condition: 802.11b Transmitting

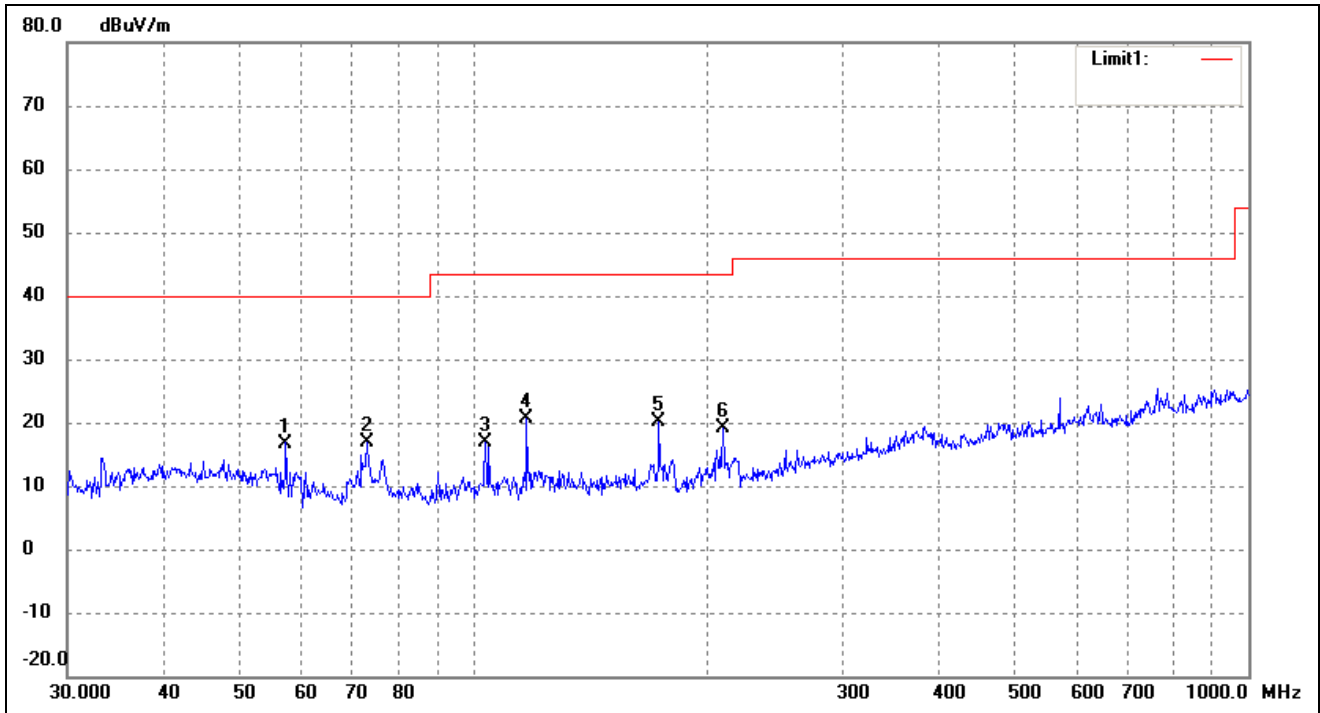
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.2112	25.38	-9.50	15.88	40.00	-24.12	341	100	peak
2	43.8119	25.25	-7.92	17.33	40.00	-22.67	96	100	peak
3	71.3300	31.00	-12.72	18.28	40.00	-21.72	194	100	peak
4	79.2426	28.16	-12.05	16.11	40.00	-23.89	102	100	peak
5	283.9791	29.39	-6.01	23.38	46.00	-22.62	94	100	peak
6	618.5369	22.29	1.14	23.43	46.00	-22.57	318	100	peak

Test Specification: Vertical

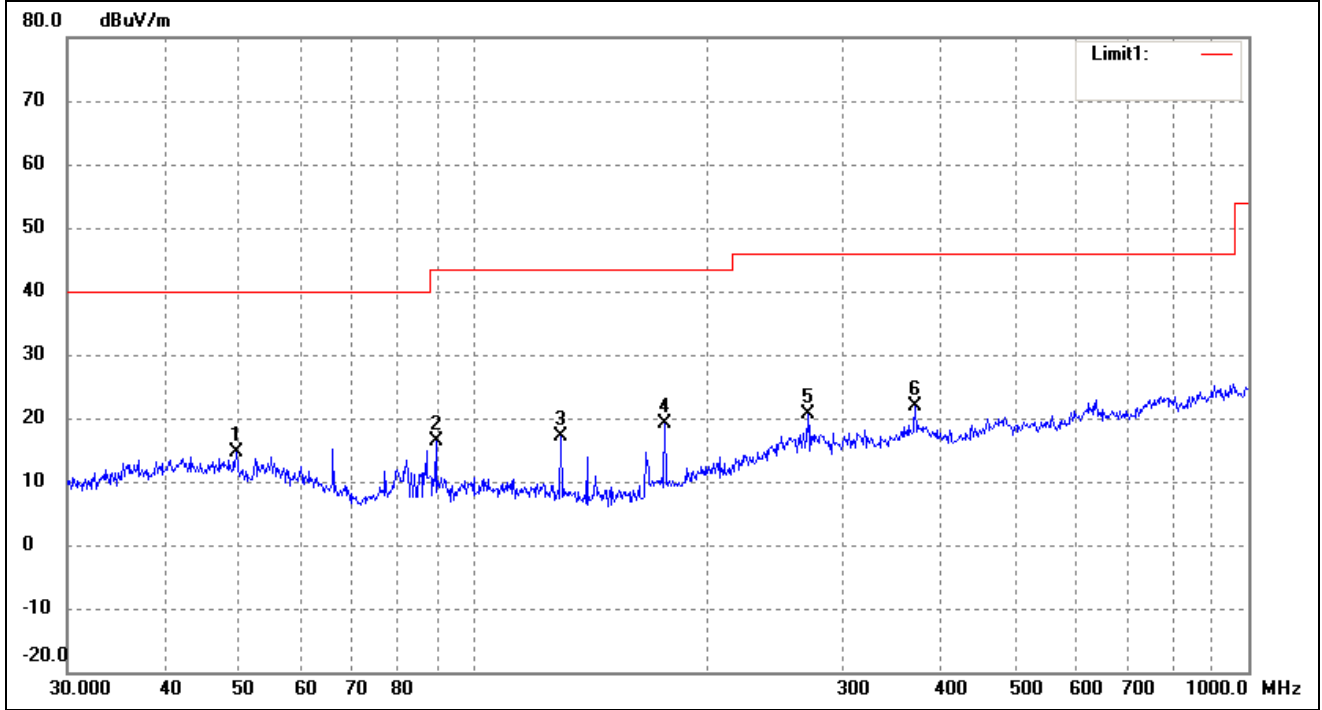


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	57.3923	26.00	-9.25	16.75	40.00	-23.25	202	100	peak
2	73.1025	29.43	-12.57	16.86	40.00	-23.14	92	100	peak
3	103.8055	27.78	-11.00	16.78	43.50	-26.72	250	100	peak
4	117.3603	31.98	-11.37	20.61	43.50	-22.89	118	100	peak
5	173.8135	31.68	-11.63	20.05	43.50	-23.45	59	100	peak
6	210.0482	27.89	-8.74	19.15	43.50	-24.35	125	100	peak

Operating Condition: 802.11g Transmitting

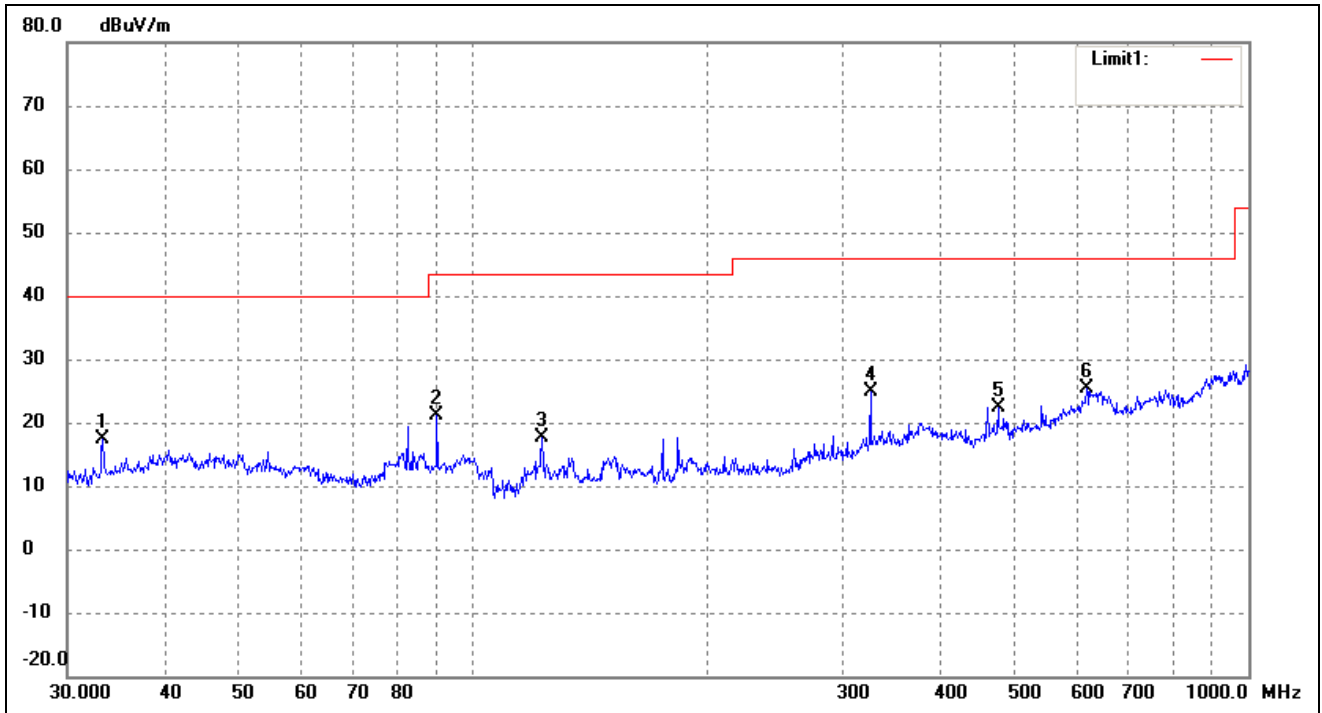
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	49.5328	23.02	-8.29	14.73	40.00	-25.27	312	100	peak
2	89.5900	29.26	-12.90	16.36	43.50	-27.14	235	100	peak
3	129.9226	29.06	-11.99	17.07	43.50	-26.43	55	100	peak
4	176.8878	30.73	-11.50	19.23	43.50	-24.27	335	100	peak
5	270.3748	27.03	-6.51	20.52	46.00	-25.48	95	100	peak
6	372.0045	24.55	-2.56	21.99	46.00	-24.01	278	100	peak

Test Specification: Vertical

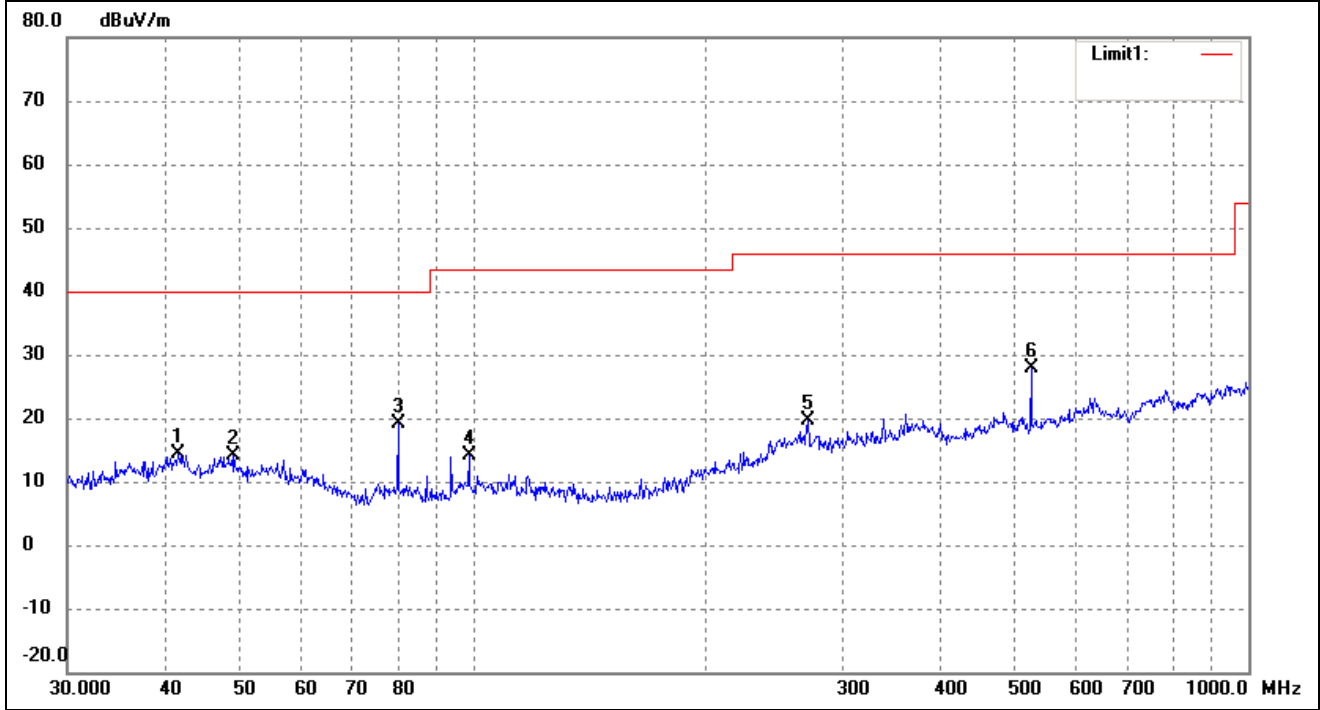


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.3279	26.77	-9.46	17.31	40.00	-22.69	103	100	peak
2	89.9047	34.18	-12.93	21.25	43.50	-22.25	120	100	peak
3	122.8340	29.20	-11.59	17.61	43.50	-25.89	58	100	peak
4	325.5958	29.56	-4.72	24.84	46.00	-21.16	159	100	peak
5	475.4991	23.77	-1.42	22.35	46.00	-23.65	180	100	peak
6	618.5369	24.17	1.14	25.31	46.00	-20.69	240	100	peak

Operating Condition: 802.11n-HT20 Transmitting

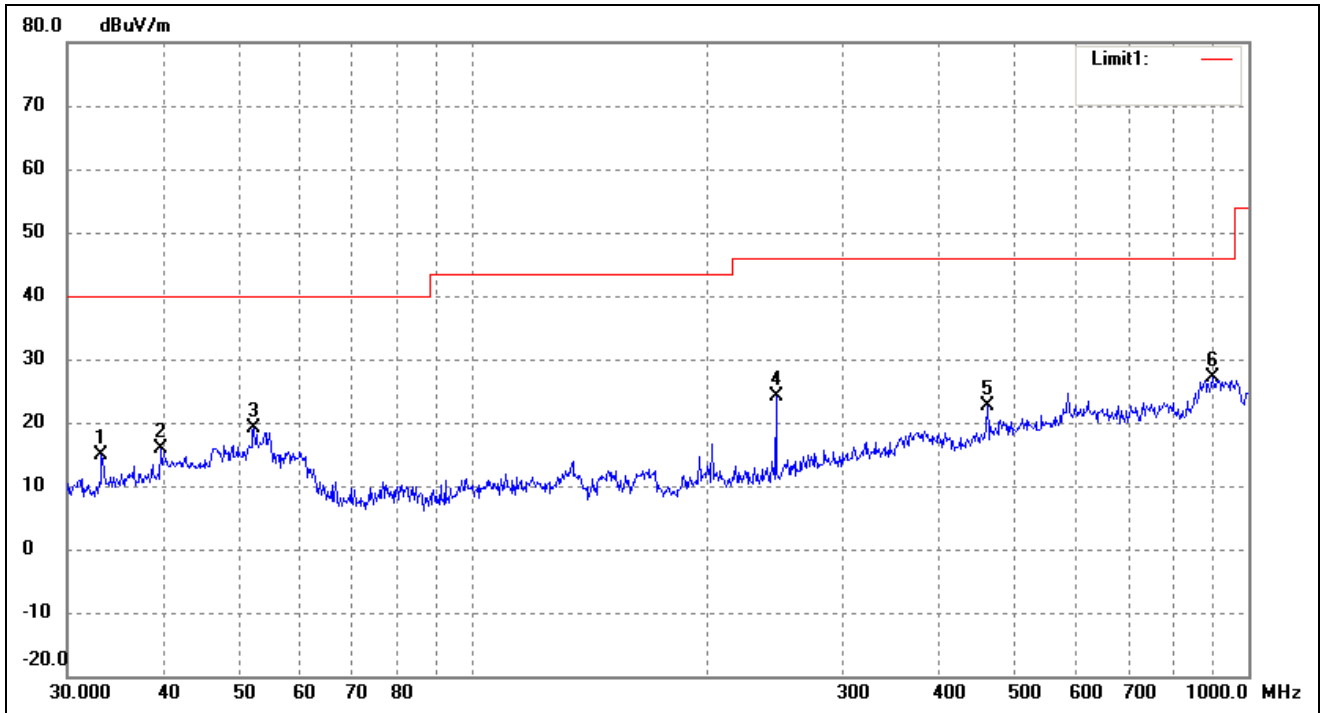
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	41.7130	22.17	-7.78	14.39	40.00	-25.61	110	100	peak
2	49.1866	22.34	-8.27	14.07	40.00	-25.93	117	100	peak
3	80.0806	31.02	-12.00	19.02	40.00	-20.98	77	100	peak
4	98.8326	25.15	-11.14	14.01	43.50	-29.49	97	100	peak
5	270.3748	26.02	-6.51	19.51	46.00	-26.49	288	100	peak
6	524.5541	29.71	-1.87	27.84	46.00	-18.16	163	100	peak

Test Specification: Vertical

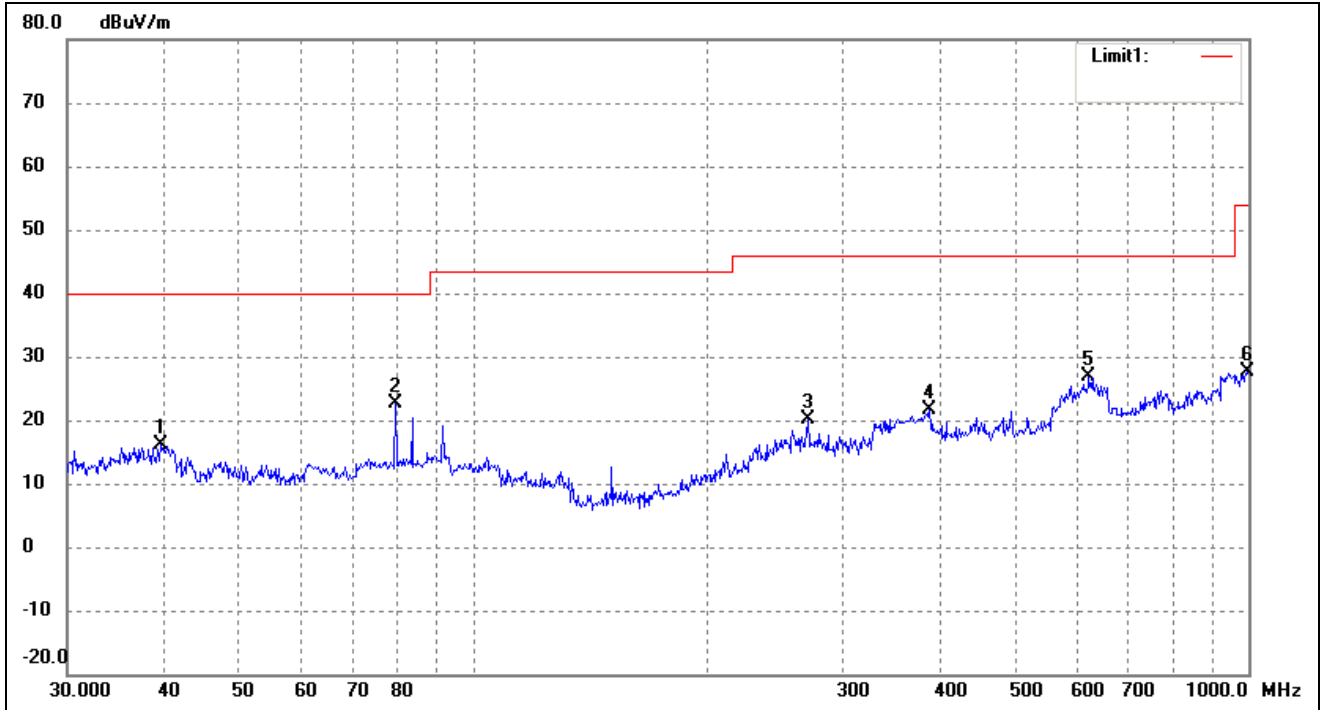


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.2112	24.34	-9.50	14.84	40.00	-25.16	71	100	peak
2	39.5757	23.61	-7.78	15.83	40.00	-24.17	100	100	peak
3	52.2079	27.70	-8.59	19.11	40.00	-20.89	83	100	peak
4	245.9509	31.99	-7.91	24.08	46.00	-21.92	131	100	peak
5	460.7271	25.38	-2.63	22.75	46.00	-23.25	213	100	peak
6	900.1474	23.86	3.15	27.01	46.00	-18.99	345	100	peak

Operating Condition: 802.11n-HT40 Transmitting

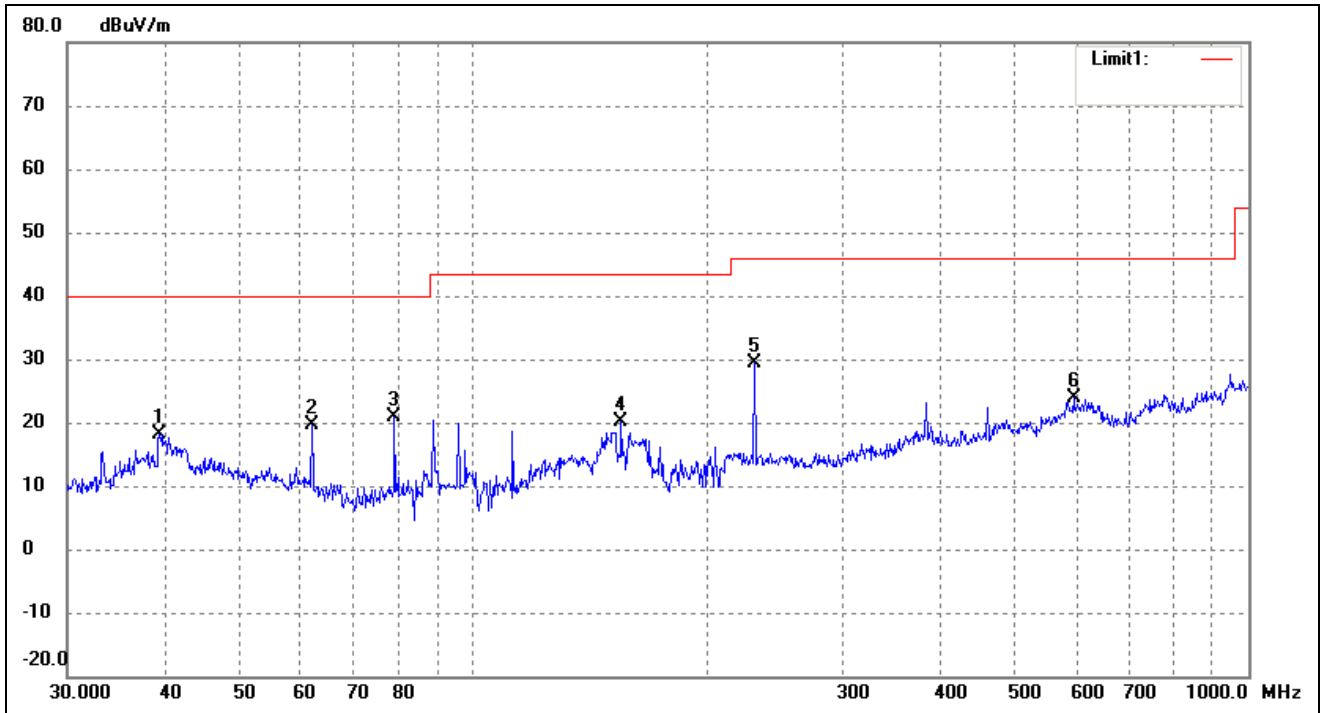
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	39.5757	24.01	-7.78	16.23	40.00	-23.77	266	100	peak
2	79.5209	34.77	-12.03	22.74	40.00	-17.26	99	100	peak
3	270.3748	26.62	-6.51	20.11	46.00	-25.89	216	100	peak
4	387.9920	24.24	-2.51	21.73	46.00	-24.27	96	100	peak
5	622.8900	25.76	1.16	26.92	46.00	-19.08	184	100	peak
6	996.4996	23.02	4.64	27.66	54.00	-26.34	96	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	39.4372	26.02	-7.82	18.20	40.00	-21.80	353	100	peak
2	61.9951	29.74	-10.23	19.51	40.00	-20.49	94	100	peak
3	79.2426	32.90	-12.05	20.85	40.00	-19.15	271	100	peak
4	155.3644	32.51	-12.34	20.17	43.50	-23.33	103	100	peak
5	230.9068	38.00	-8.57	29.43	46.00	-16.57	272	100	peak
6	595.1329	24.14	-0.33	23.81	46.00	-22.19	184	100	peak

Spurious Emissions Above 1GHz
Test Mode: 802.11b

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	60.00	-3.86	56.14	74	-17.86	H	PK
4824.000	47.27	-3.86	43.41	54	-10.59	H	AV
7236.000	56.36	1.1	57.46	74	-16.54	H	PK
7236.000	40.00	1.1	41.10	54	-12.90	H	AV
4824.000	60.00	-3.86	56.14	74	-17.86	V	PK
4824.000	40.91	-3.86	37.05	54	-16.95	V	AV
7236.000	56.36	1.1	57.46	74	-16.54	V	PK
7236.000	41.82	1.1	42.92	54	-11.08	V	AV
Middle Channel-2437MHz							
4874.000	56.36	-3.74	52.62	74	-21.38	H	PK
4874.000	49.09	-3.74	45.35	54	-8.65	H	AV
7311.000	57.27	1.47	58.74	74	-15.26	H	PK
7311.000	50.00	1.47	51.47	54	-2.53	H	AV
4874.000	56.36	-3.74	52.62	74	-21.38	V	PK
4874.000	50.00	-3.74	46.26	54	-7.74	V	AV
7311.000	54.55	1.47	56.02	74	-17.98	V	PK
7311.000	41.82	1.47	43.29	54	-10.71	V	AV
High Channel-2462MHz							
4924.000	60.00	-3.63	56.37	74	-17.63	H	PK
4924.000	45.45	-3.63	41.82	54	-12.18	H	AV
7386.000	59.09	1.62	60.71	74	-13.29	H	PK
7386.000	40.00	1.62	41.62	54	-12.38	H	AV
4924.000	58.18	-3.63	54.55	74	-19.45	V	PK
4924.000	41.82	-3.63	38.19	54	-15.81	V	AV
7386.000	59.09	1.62	60.71	74	-13.29	V	PK
7386.000	41.82	1.62	43.44	54	-10.56	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	52.73	-3.86	48.87	74	-25.13	H	PK
4824.000	40.91	-3.86	37.05	54	-16.95	H	AV
7236.000	56.36	1.1	57.46	74	-16.54	H	PK
7236.000	41.82	1.1	42.92	54	-11.08	H	AV
4824.000	60.00	-3.86	56.14	74	-17.86	V	PK
4824.000	49.09	-3.86	45.23	54	-8.77	V	AV
7236.000	53.64	1.1	54.74	74	-19.26	V	PK
7236.000	47.27	1.1	48.37	54	-5.63	V	AV
Middle Channel-2437MHz							
4874.000	54.55	-3.74	50.81	74	-23.19	H	PK
4874.000	42.73	-3.74	38.99	54	-15.01	H	AV
7311.000	60.00	1.47	61.47	74	-12.53	H	PK
7311.000	41.82	1.47	43.29	54	-10.71	H	AV
4874.000	54.55	-3.74	50.81	74	-23.19	V	PK
4874.000	47.27	-3.74	43.53	54	-10.47	V	AV
7311.000	59.09	1.47	60.56	74	-13.44	V	PK
7311.000	48.18	1.47	49.65	54	-4.35	V	AV
High Channel-2462MHz							
4924.000	52.73	-3.63	49.10	74	-24.90	H	PK
4924.000	40.00	-3.63	36.37	54	-17.63	H	AV
7386.000	52.73	1.62	54.35	74	-19.65	H	PK
7386.000	42.73	1.62	44.35	54	-9.65	H	AV
4924.000	55.45	-3.63	51.82	74	-22.18	V	PK
4924.000	40.00	-3.63	36.37	54	-17.63	V	AV
7386.000	60.00	1.62	61.62	74	-12.38	V	PK
7386.000	40.00	1.62	41.62	54	-12.38	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	56.36	-3.86	52.50	74	-21.50	H	PK
4824.000	49.09	-3.86	45.23	54	-8.77	H	AV
7236.000	58.18	1.1	59.28	74	-14.72	H	PK
7236.000	42.73	1.1	43.83	54	-10.17	H	AV
4824.000	60.00	-3.86	56.14	74	-17.86	V	PK
4824.000	44.55	-3.86	40.69	54	-13.31	V	AV
7236.000	57.27	1.1	58.37	74	-15.63	V	PK
7236.000	48.18	1.1	49.28	54	-4.72	V	AV
Middle Channel-2437MHz							
4874.000	53.64	-3.74	49.90	74	-24.10	H	PK
4874.000	45.45	-3.74	41.71	54	-12.29	H	AV
7311.000	56.36	1.47	57.83	74	-16.17	H	PK
7311.000	42.73	1.47	44.20	54	-9.80	H	AV
4874.000	59.09	-3.74	55.35	74	-18.65	V	PK
4874.000	46.36	-3.74	42.62	54	-11.38	V	AV
7311.000	56.36	1.47	57.83	74	-16.17	V	PK
7311.000	46.36	1.47	47.83	54	-6.17	V	AV
High Channel-2462MHz							
4924.000	53.64	-3.63	50.01	74	-23.99	H	PK
4924.000	41.82	-3.63	38.19	54	-15.81	H	AV
7386.000	53.64	1.62	55.26	74	-18.74	H	PK
7386.000	40.00	1.62	41.62	54	-12.38	H	AV
4924.000	60.00	-3.63	56.37	74	-17.63	V	PK
4924.000	48.18	-3.63	44.55	54	-9.45	V	AV
7386.000	56.36	1.62	57.98	74	-16.02	V	PK
7386.000	40.00	1.62	41.62	54	-12.38	V	AV

Test Mode: 802.11n-HT40

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2422MHz							
4844.000	58.98	-3.9	55.08	74	-18.92	H	PK
4824.000	42.07	-3.9	38.17	54	-15.83	H	AV
7266.000	51.27	1.06	52.33	74	-21.67	H	PK
7266.000	40.08	1.06	41.14	54	-12.86	H	AV
4844.000	57.56	-3.9	53.66	74	-20.34	V	PK
4824.000	42.55	-3.9	38.65	54	-15.35	V	AV
7266.000	51.3	1.06	52.36	74	-21.64	V	PK
7266.000	40.27	1.06	41.33	54	-12.67	V	AV
Middle Channel-2437MHz							
4874.000	57.89	-3.74	54.15	74	-19.85	H	PK
4874.000	41.14	-3.74	37.4	54	-16.6	H	AV
7311.000	51.74	1.47	53.21	74	-20.79	H	PK
7311.000	38.07	1.47	39.54	54	-14.46	H	AV
4874.000	59.55	-3.74	55.81	74	-18.19	V	PK
4874.000	41.46	-3.74	37.72	54	-16.28	V	AV
7311.000	53.59	1.47	55.06	74	-18.94	V	PK
7311.000	40.95	1.47	42.42	54	-11.58	V	AV
High Channel-2452MHz							
4904.000	59.06	-3.63	55.43	74	-18.57	H	PK
4904.000	42.37	-3.63	38.74	54	-15.26	H	AV
7356.000	52.46	1.62	54.08	74	-19.92	H	PK
7356.000	39.8	1.62	41.42	54	-12.58	H	AV
4904.000	60.93	-3.63	57.3	74	-16.7	V	PK
4904.000	41.19	-3.63	37.56	54	-16.44	V	AV
7356.000	51.02	1.62	52.64	74	-21.36	V	PK
7356.000	38.22	1.62	39.84	54	-14.16	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Out of Band Emissions

9.1 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, 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Test Procedure

According to the KDB 558074D01 v04, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW \geq 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

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 specified in section 8.1. Report the three highest emissions relative to the limit.

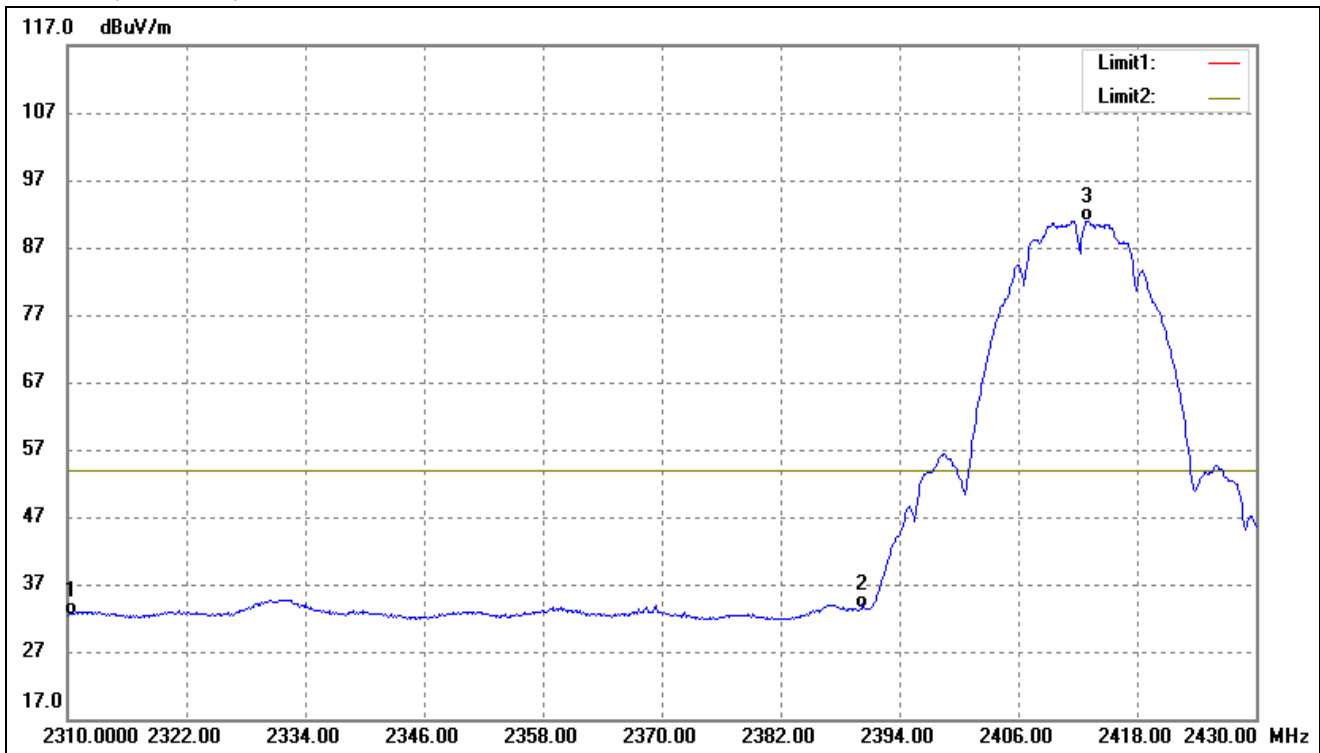
9.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

802.11b-Lowest Bandedge

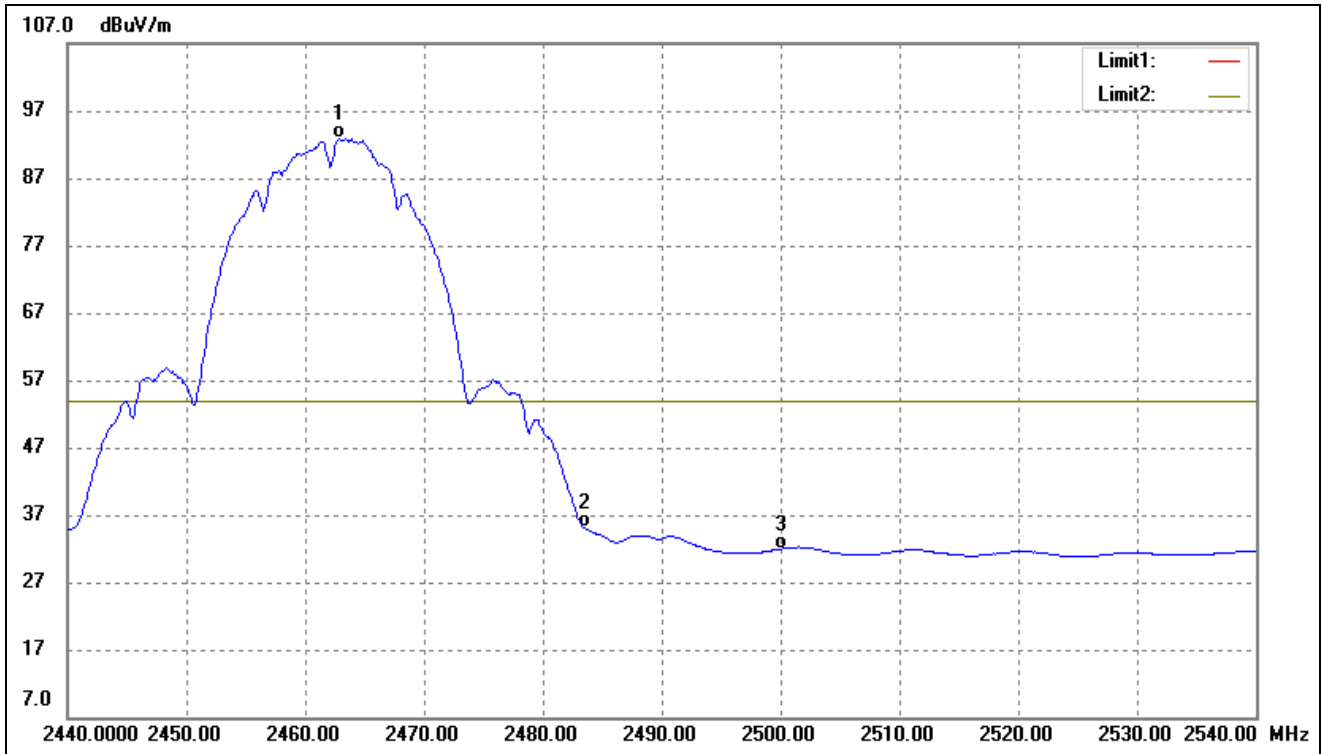
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	-6.44	38.87	32.43	54.00	-21.57	AVG
	2310.000	4.80	38.87	43.67	74.00	-30.33	peak
2	2390.000	-4.19	37.51	33.32	54.00	-20.68	AVG
	2390.000	7.67	37.51	45.18	74.00	-28.82	peak
3	2412.960	53.39	37.50	90.89	/	/	AVG
	2412.960	57.98	37.51	95.49	/	/	peak

802.11b-Highest Bandedge

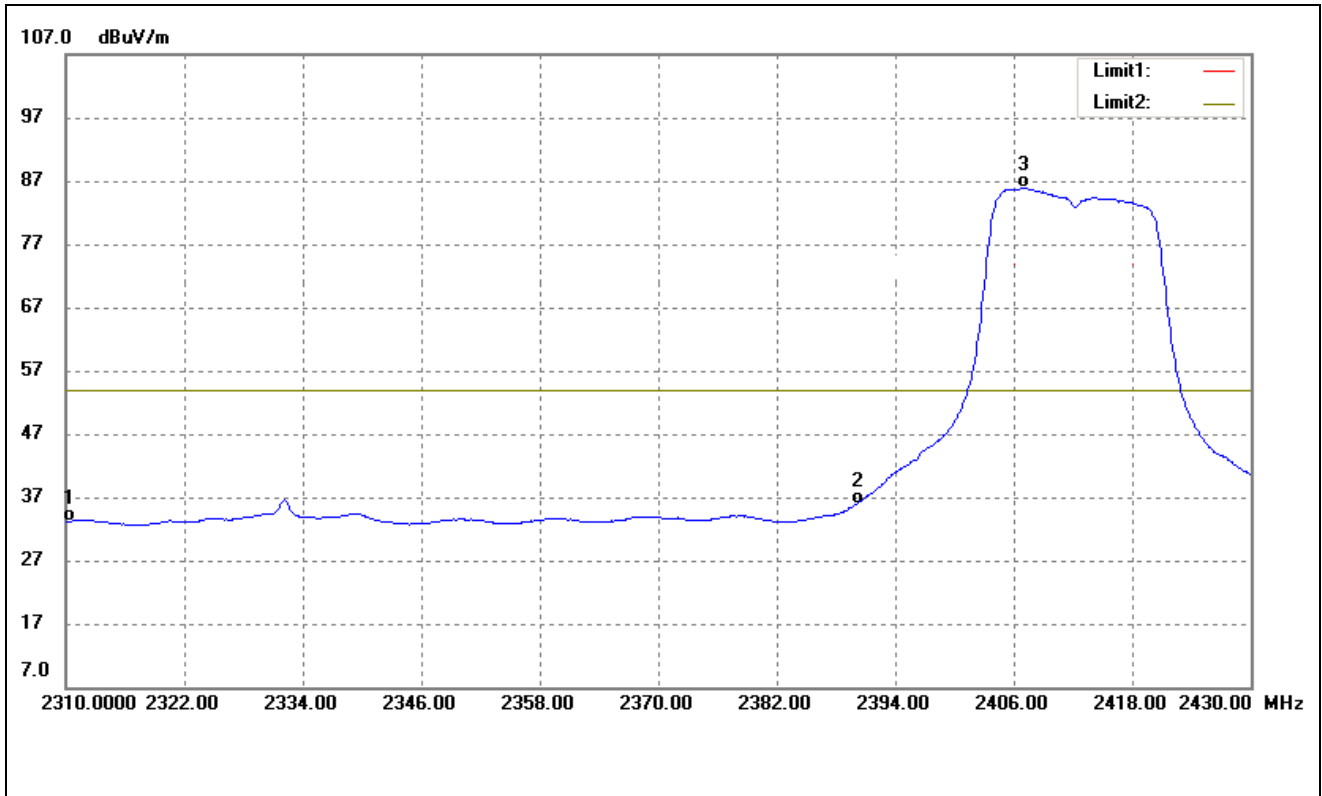
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2462.800	100.21	-7.31	92.90	/	/	AVG
	2462.800	105.56	-7.31	98.25	/	/	peak
2	2483.500	42.34	-7.28	35.06	54.00	-18.94	AVG
	2483.500	53.86	-7.28	46.58	74.00	-27.42	peak
3	2500.000	39.19	-7.25	31.94	54.00	-22.06	AVG
	2500.000	44.59	-7.25	37.34	74.00	-36.66	peak

802.11g-Lowest Bandedge

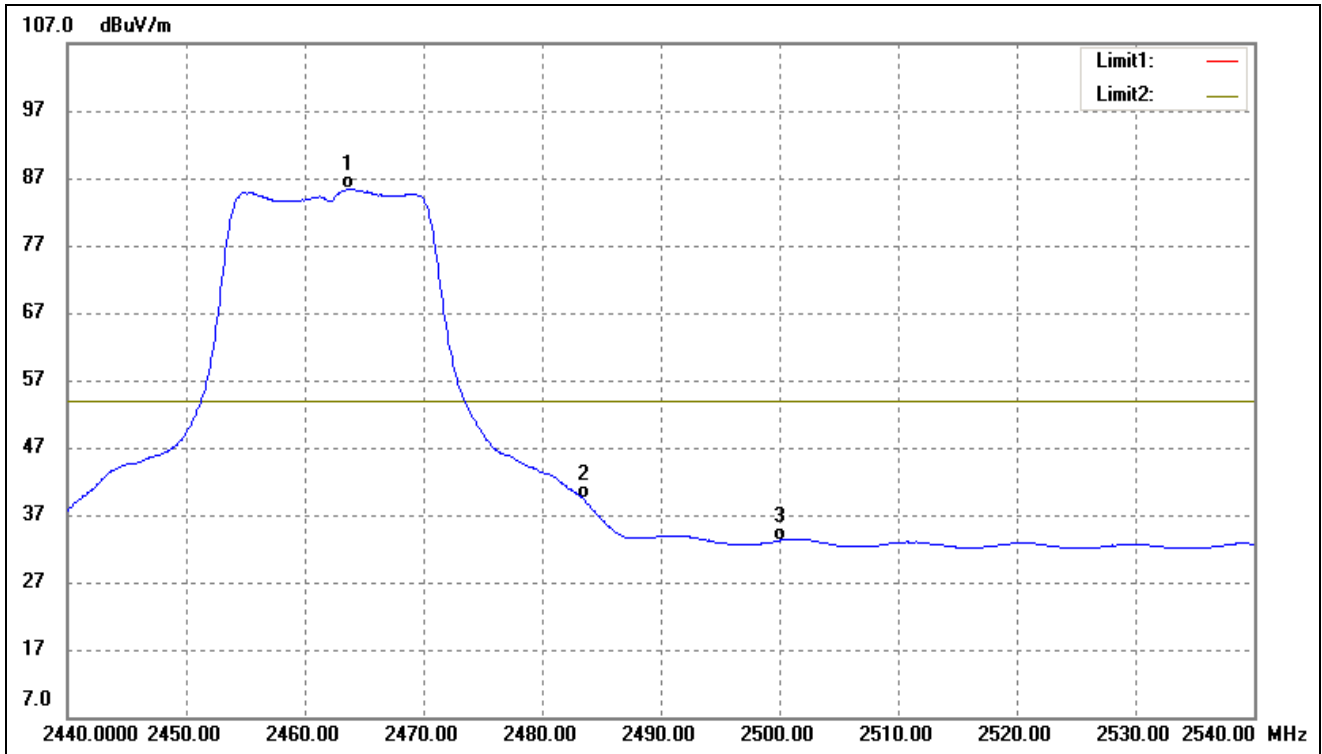
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	39.61	-6.38	33.23	54.00	-20.77	AVG
	2310.000	51.38	-6.38	45.00	74.00	-29.00	peak
2	2390.000	43.19	-7.26	35.93	54.00	-18.07	AVG
	2390.000	56.76	-7.26	49.50	74.00	-24.50	peak
3	2406.960	93.25	-7.42	85.83	/	/	AVG
	2406.960	102.75	-7.42	95.33	/	/	peak

802.11g-Highest Bandedge

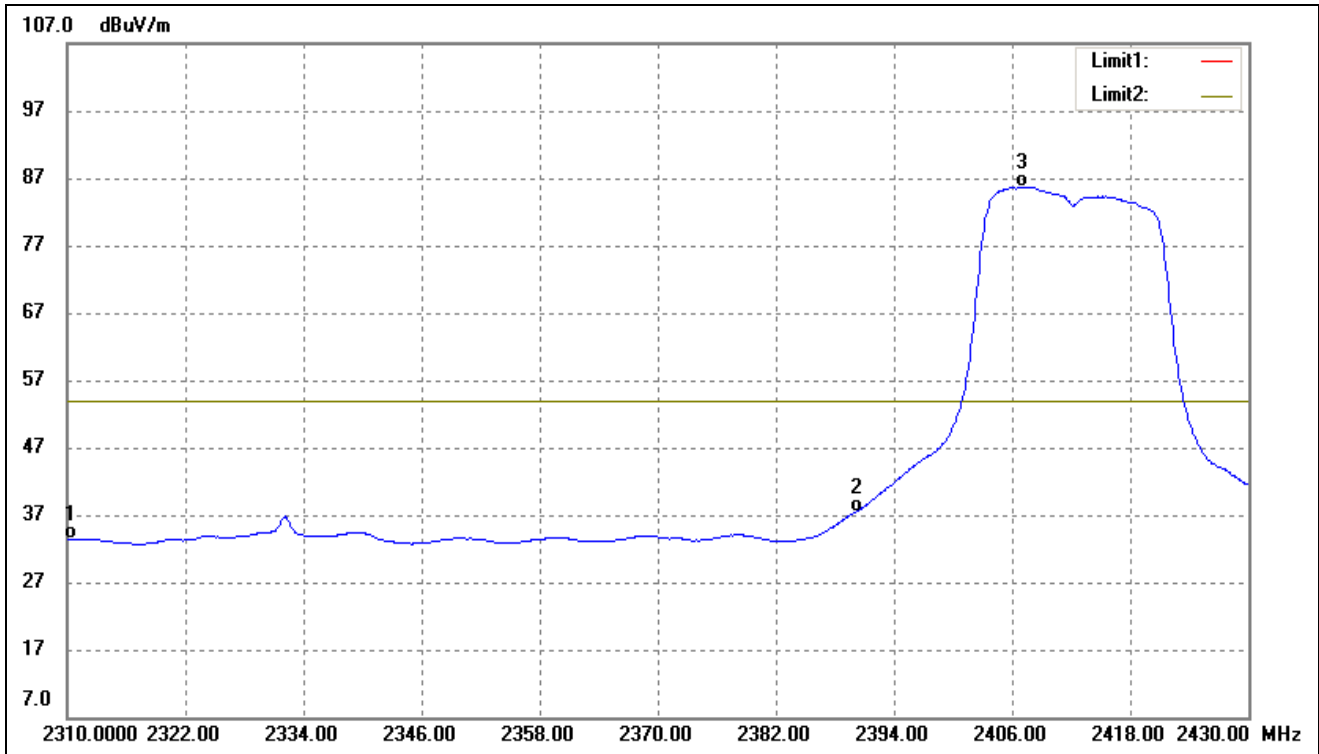
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2463.700	92.69	-7.31	85.38	/	/	AVG
	2463.700	102.34	-7.31	95.03	/	/	peak
2	2483.500	46.59	-7.28	39.31	54.00	-14.69	AVG
	2483.500	62.90	-7.28	55.62	74.00	-18.38	peak
3	2500.000	40.48	-7.25	33.23	54.00	-20.77	AVG
	2500.000	49.87	-7.25	42.62	74.00	-31.38	peak

802.11n-HT20-Lowest Bandedge

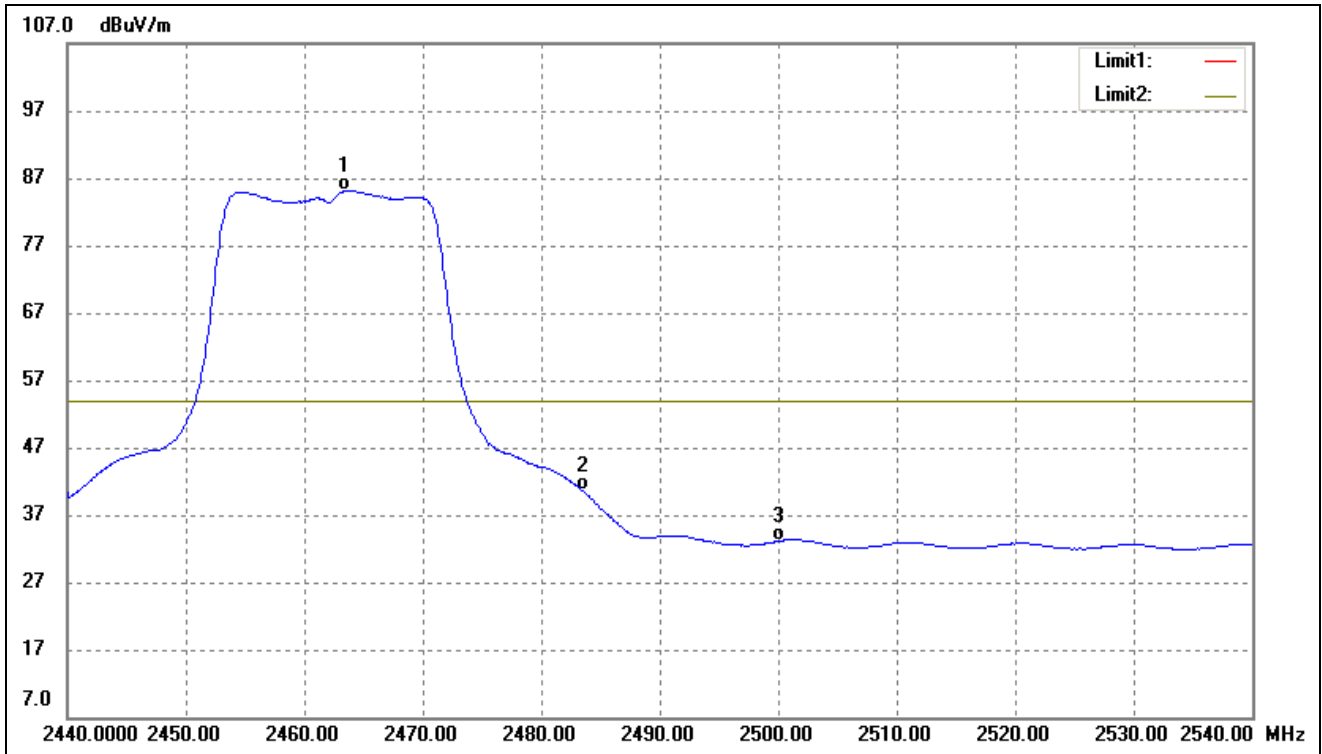
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	39.69	-6.38	33.31	54.00	-20.69	AVG
	2310.000	50.35	-6.38	43.97	74.00	-30.03	peak
2	2390.000	44.64	-7.26	37.38	54.00	-16.62	AVG
	2390.000	61.38	-7.26	54.12	74.00	-19.88	peak
3	2406.960	93.17	-7.42	85.75	/	/	AVG
	2406.960	102.81	-7.42	95.39	/	/	peak

802.11n-HT20-Highest Bandedge

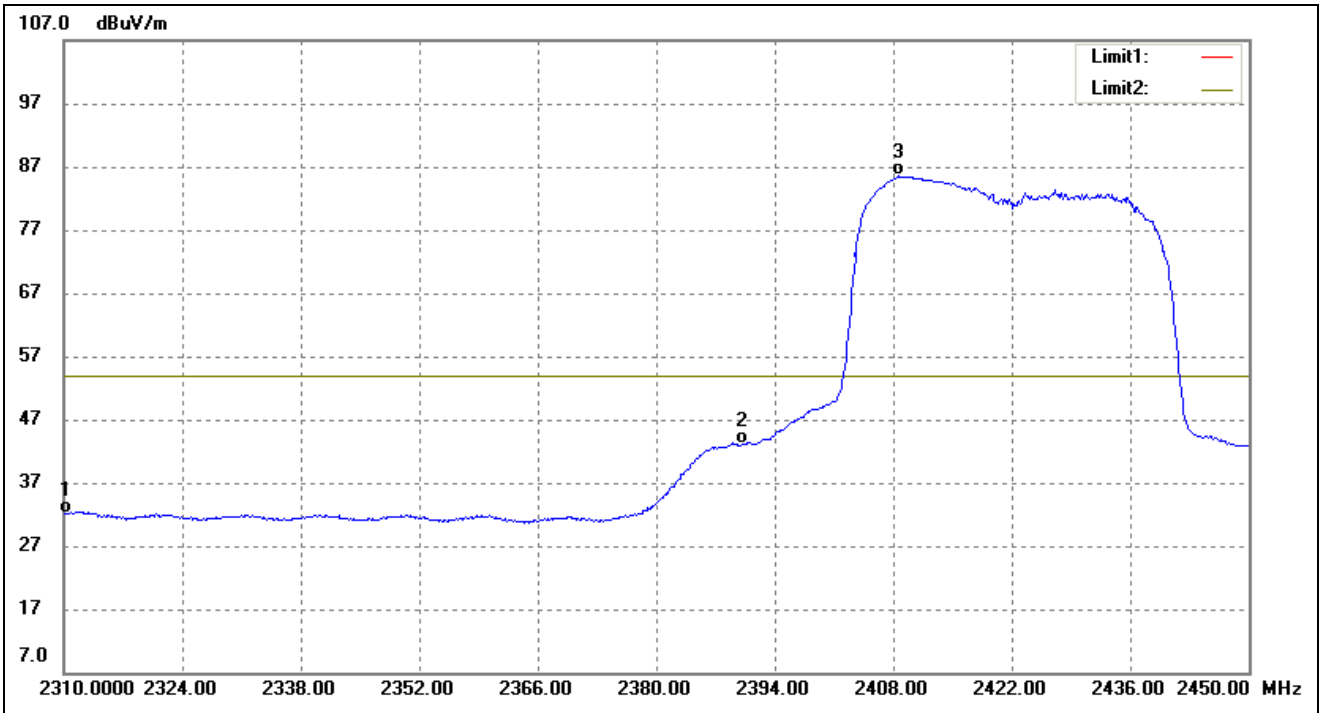
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2463.400	92.43	-7.31	85.12	/	/	AVG
	2463.800	102.23	-7.31	94.92	/	/	peak
2	2483.500	47.83	-7.28	40.55	54.00	-13.45	AVG
	2483.500	68.43	-7.28	61.15	74.00	-12.85	peak
3	2500.000	40.34	-7.25	33.09	54.00	-20.91	AVG
	2500.000	49.62	-7.25	42.37	74.00	-31.63	peak

802.11n-HT40-Lowest Bandedge

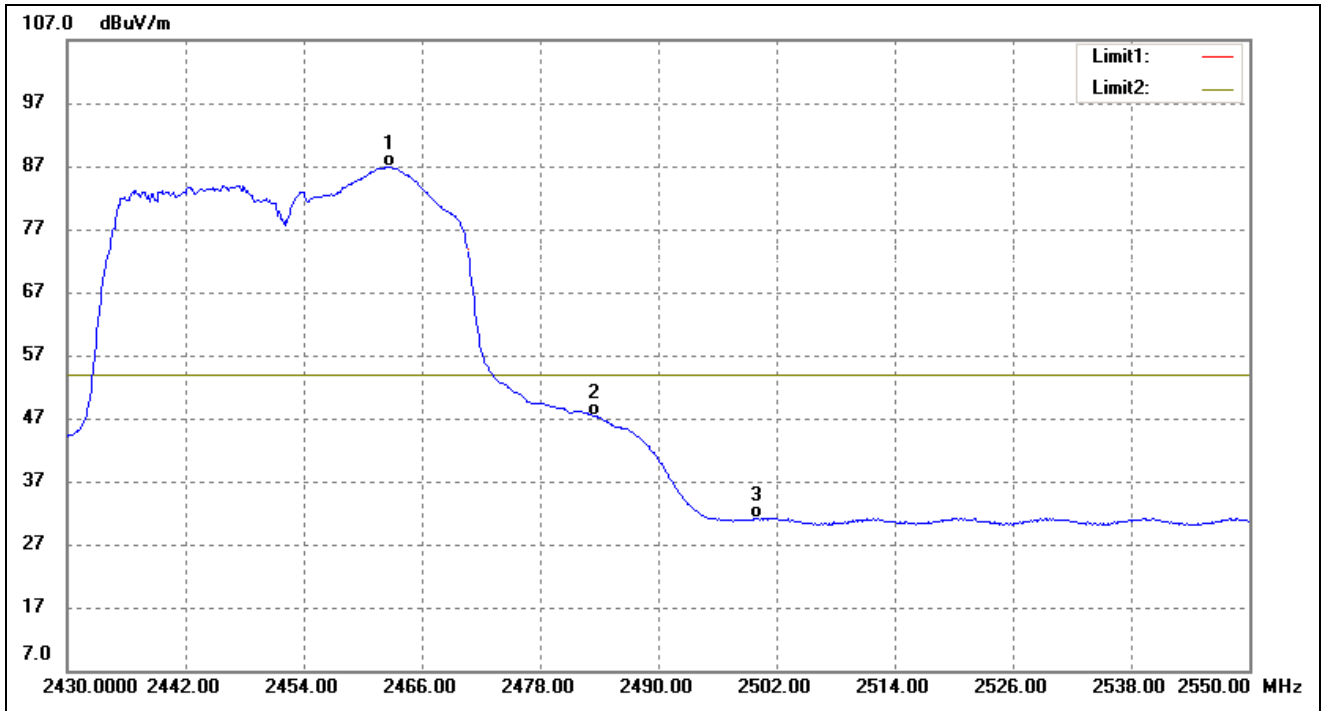
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.42	-6.38	32.04	54.00	-21.96	AVG
	2310.000	51.38	-6.38	45.00	74.00	-29.00	peak
2	2390.000	50.29	-7.26	43.03	54.00	-10.97	AVG
	2390.000	62.89	-7.26	55.63	74.00	-18.37	peak
3	2408.700	92.94	-7.42	85.52	/	/	AVG
	2408.700	102.86	-7.42	95.44	/	/	peak

802.11n-HT40-Highest Bandedge

Vertical (Worst case)

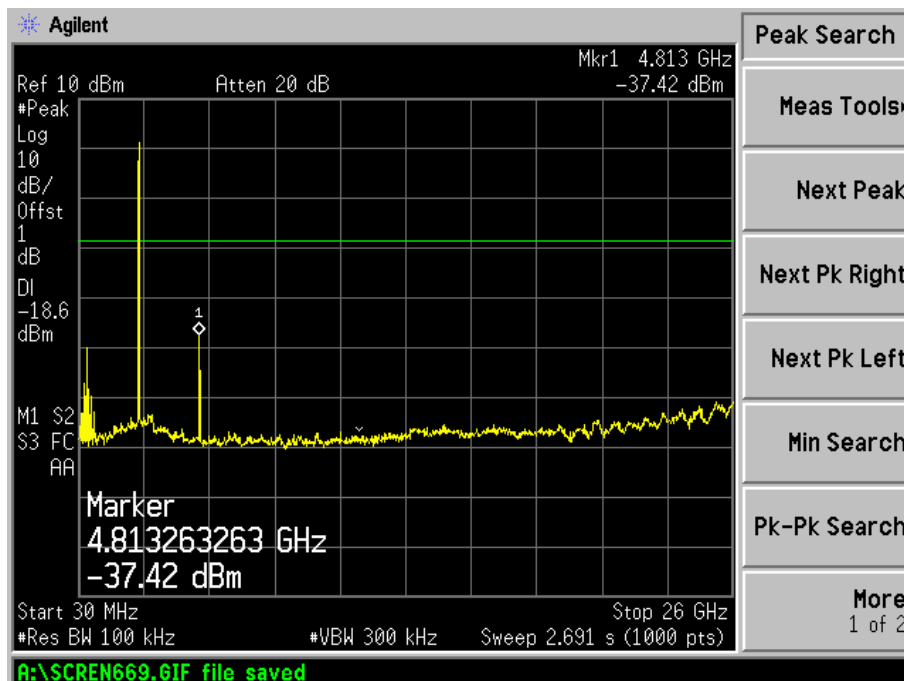
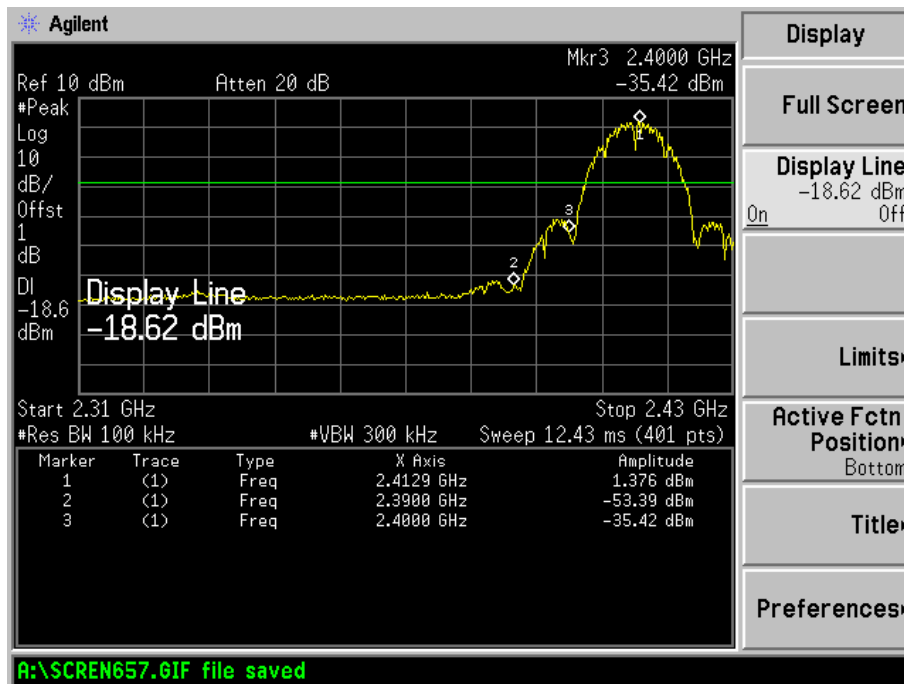


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2462.640	94.14	-7.31	86.83	/	/	AVG
	2462.520	104.76	-7.31	97.45	/	/	peak
2	2483.500	54.71	-7.28	47.43	54.00	-6.57	AVG
	2483.500	69.71	-7.28	62.43	74.00	-11.57	peak
3	2500.000	38.27	-7.25	31.02	54.00	-22.98	AVG
	2500.000	48.00	-7.25	40.75	74.00	-33.25	peak

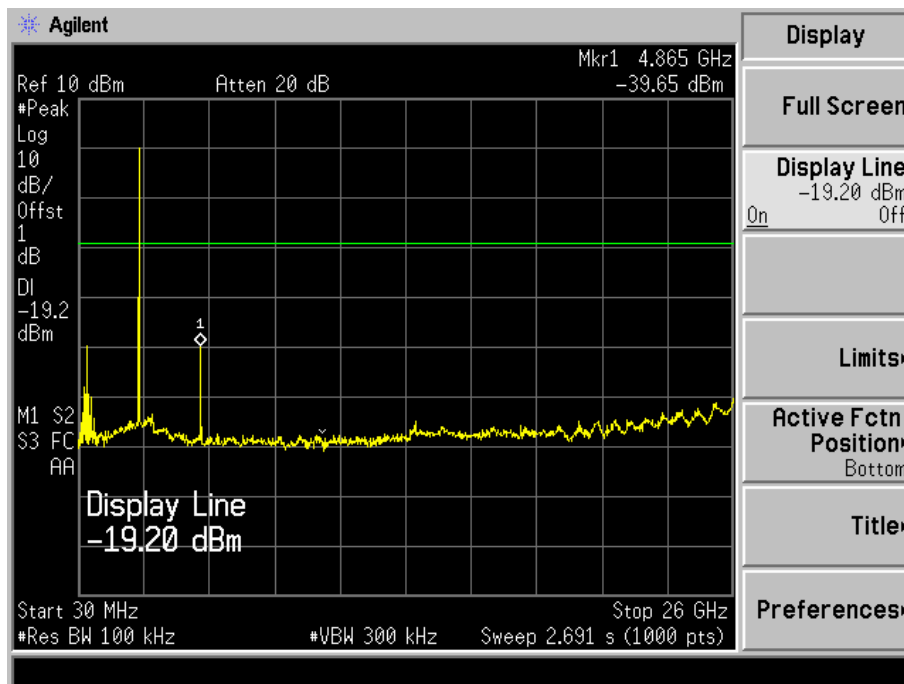
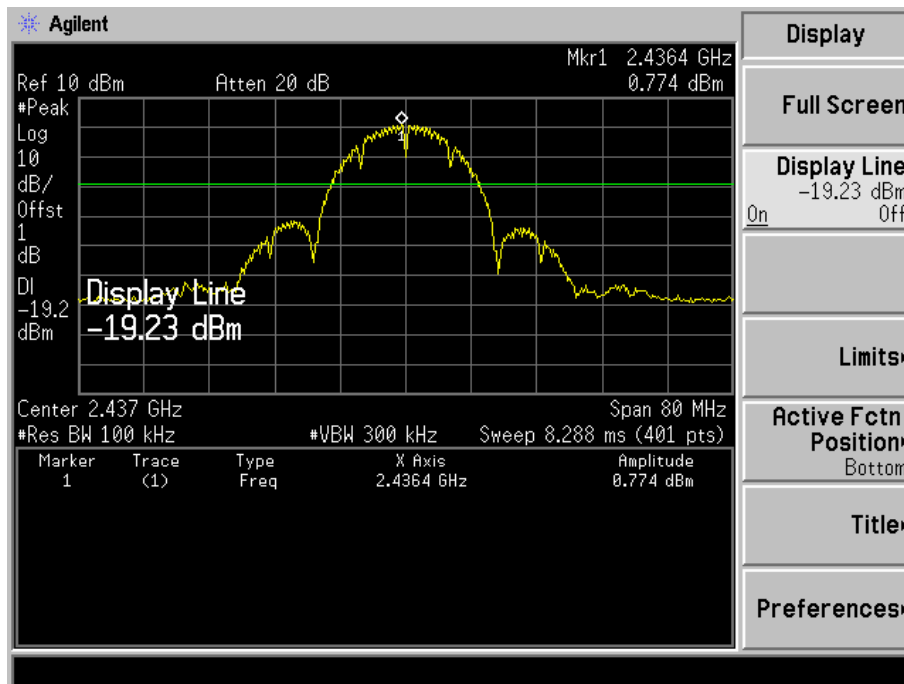
Spurious (Conducted)

802.11b-Lowest

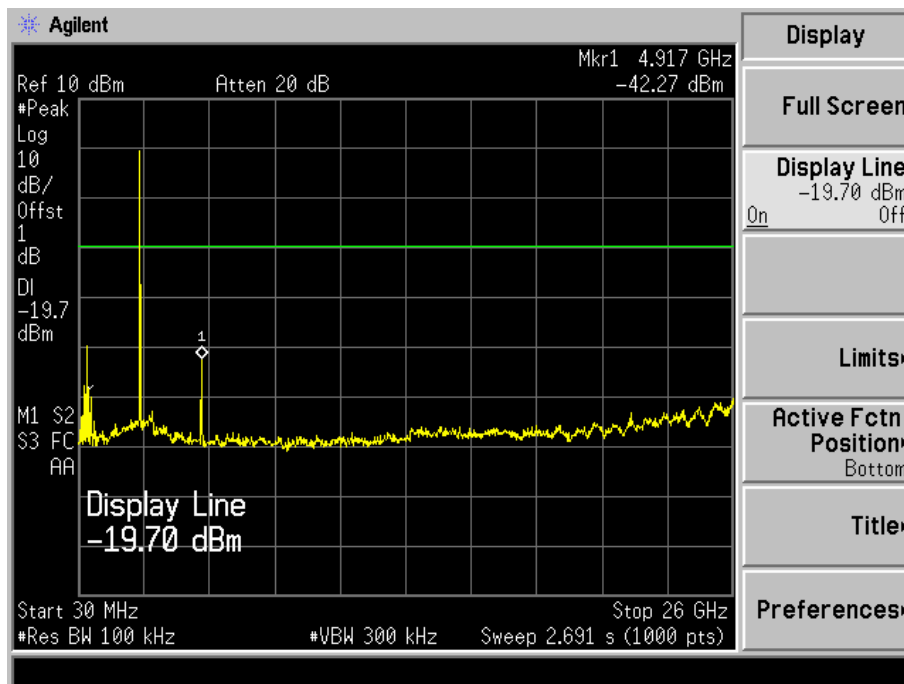
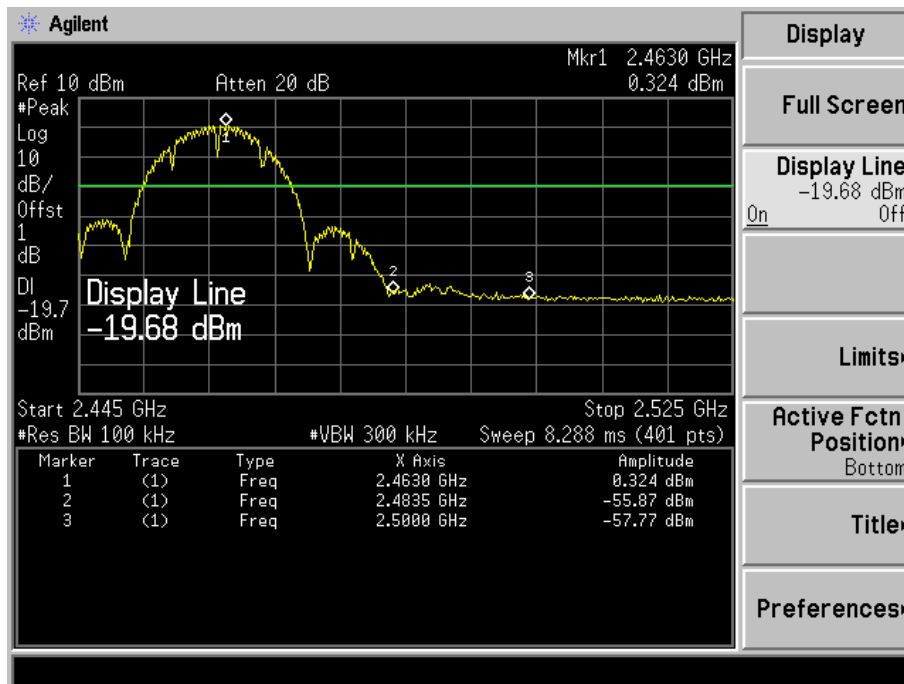
Lowest



Middle



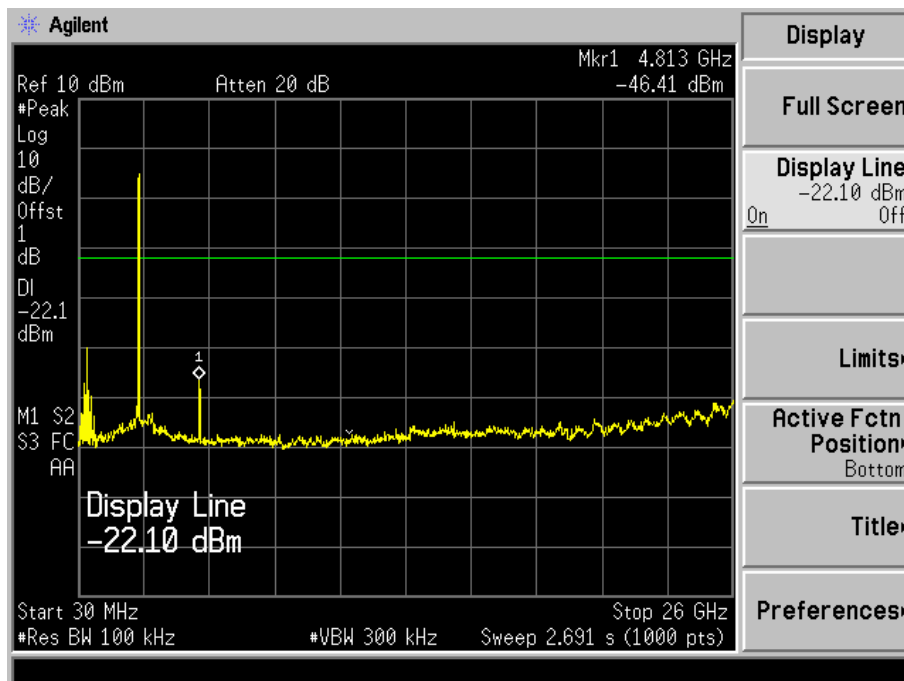
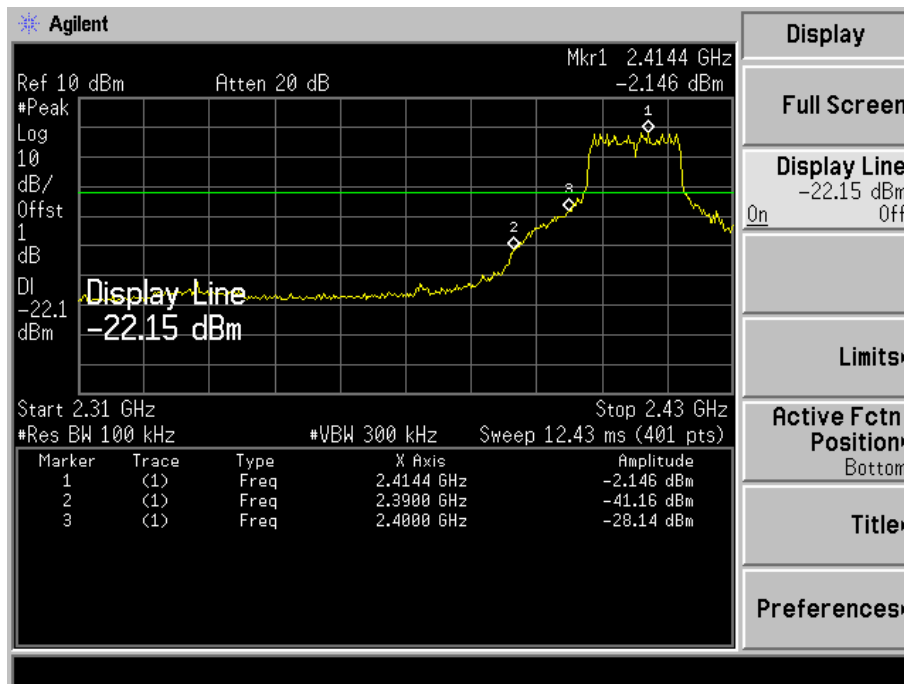
Highest



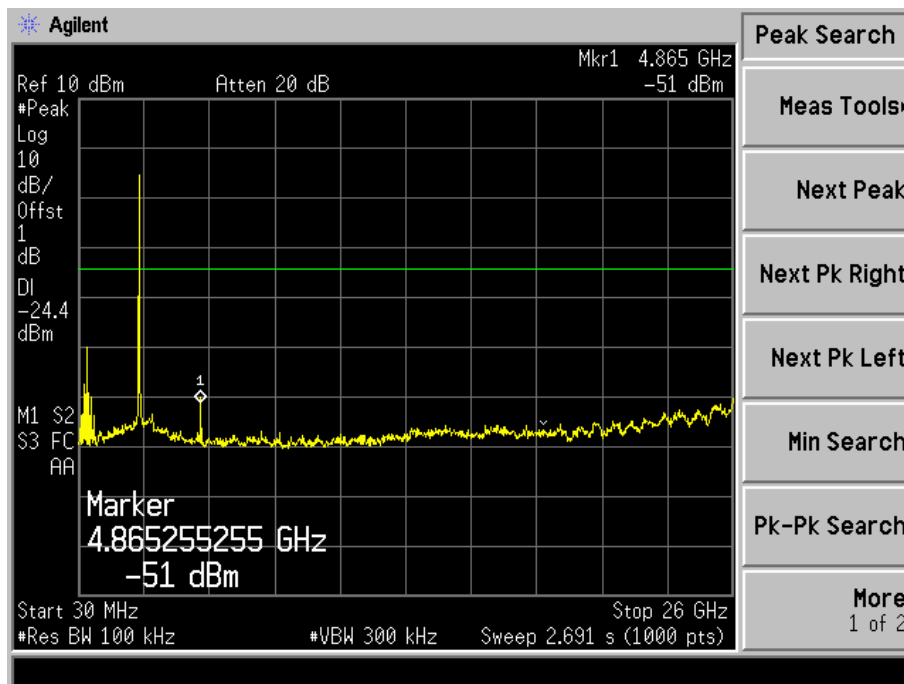
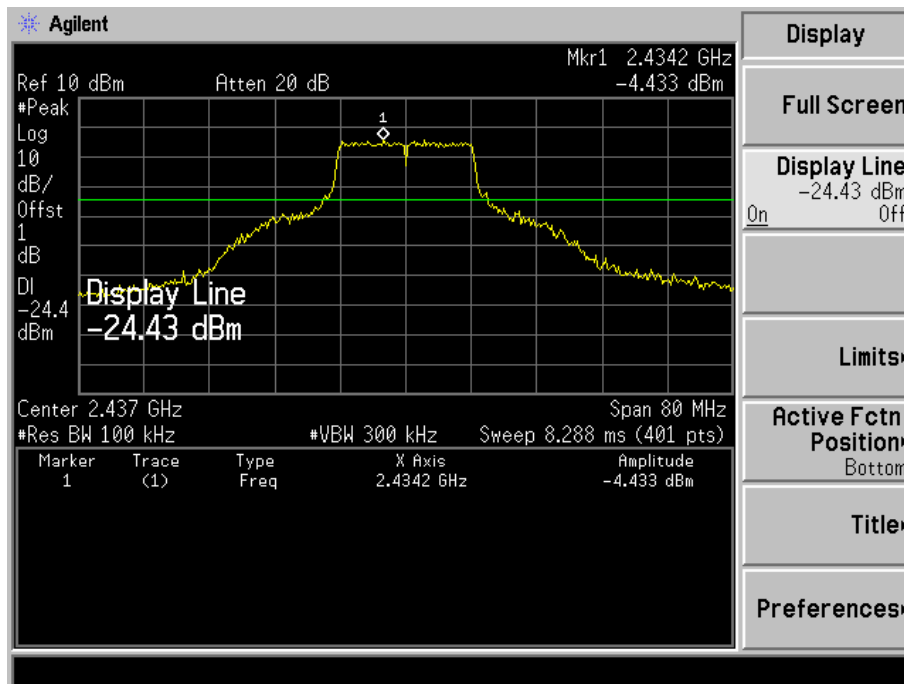
Spurious (Conducted)

802.11g-Lowest

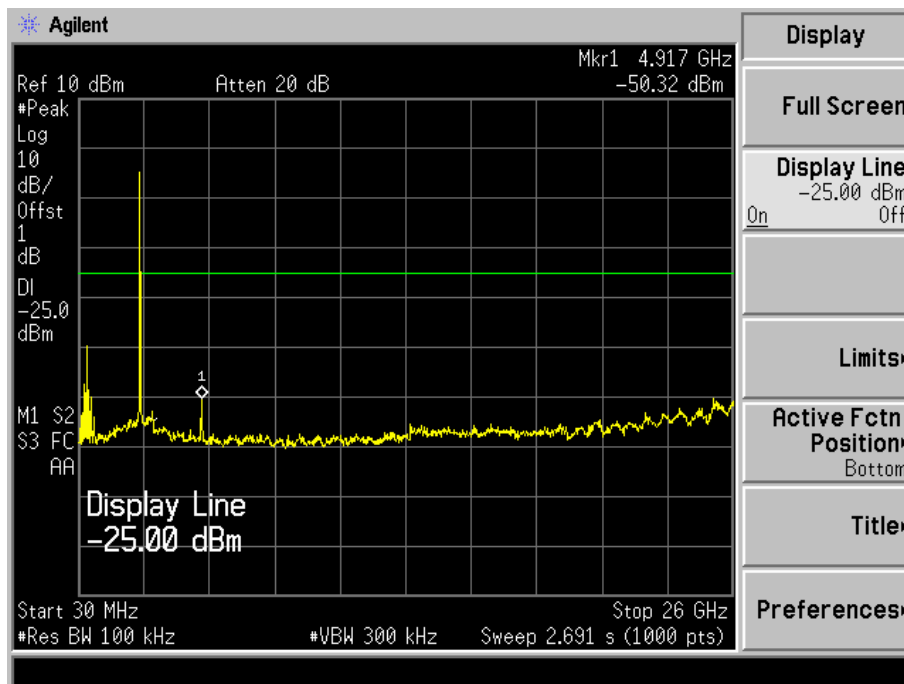
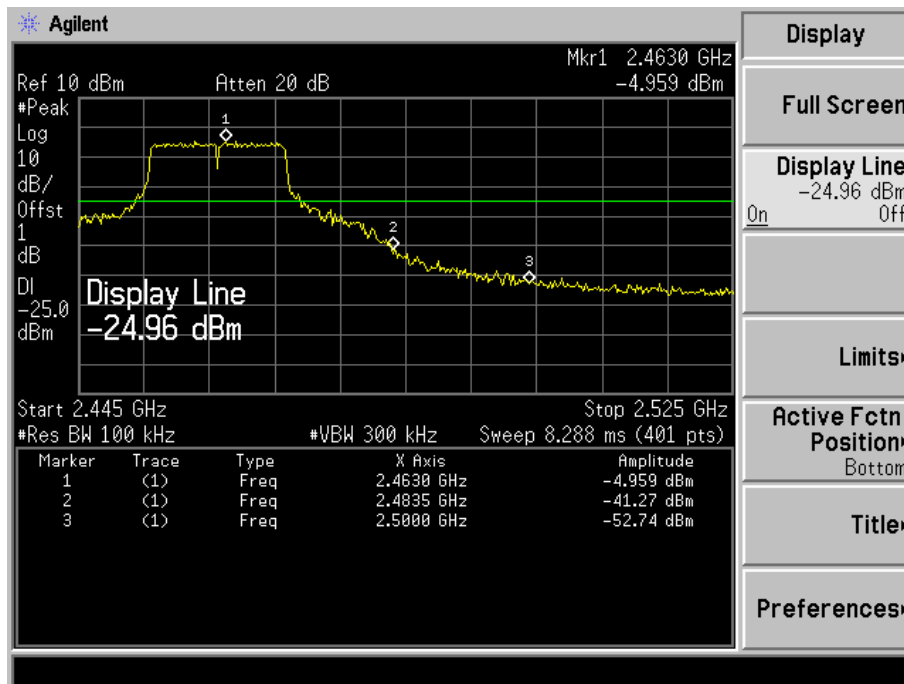
Lowest



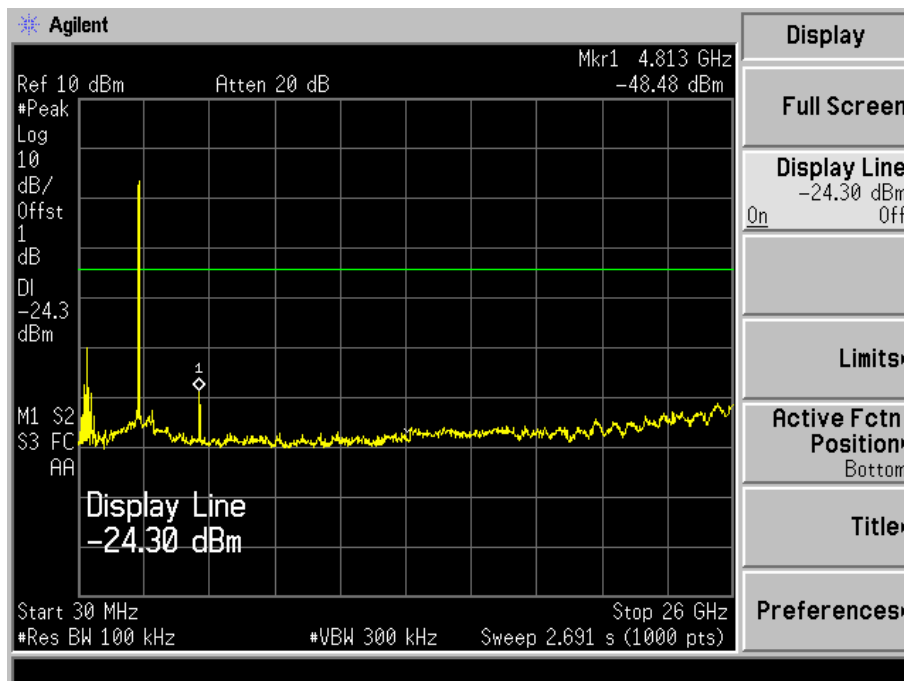
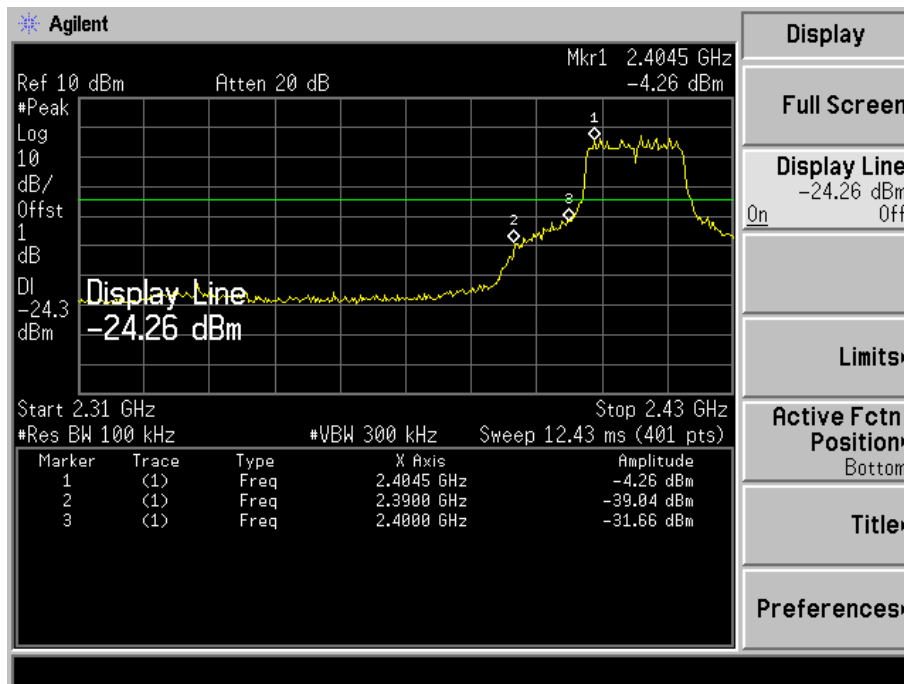
Middle



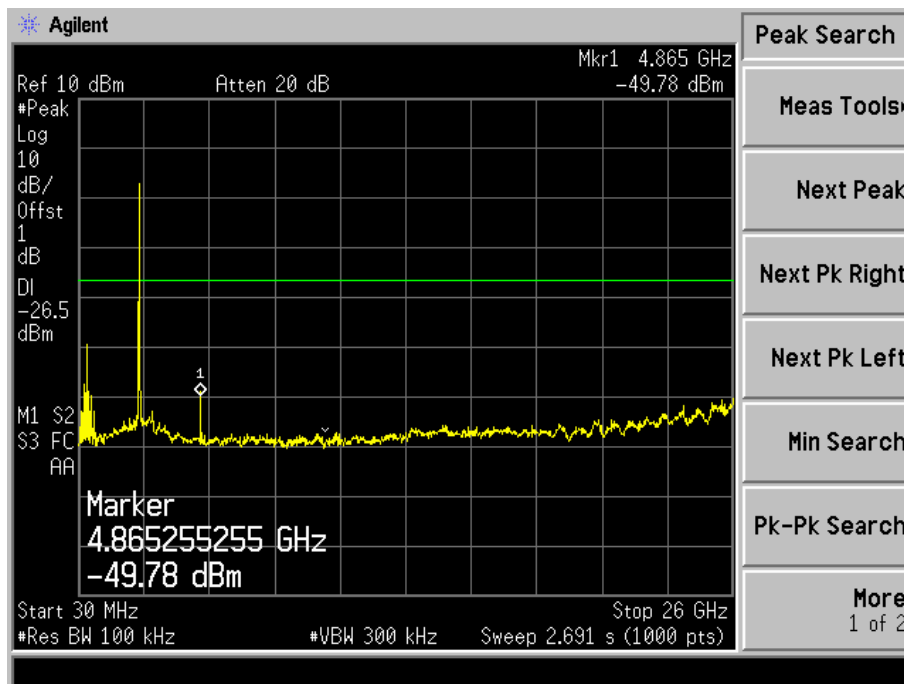
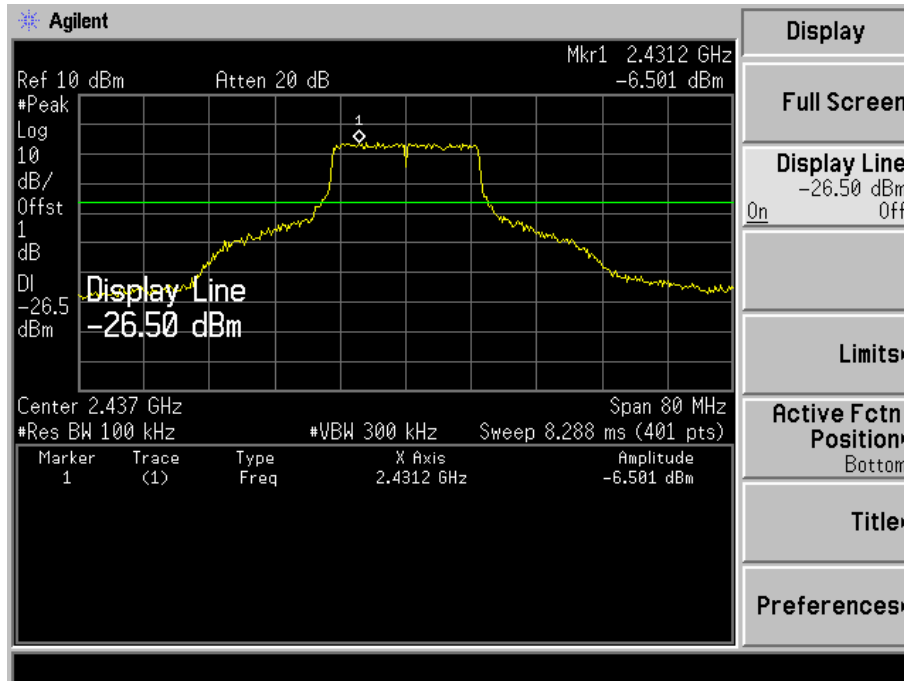
Highest



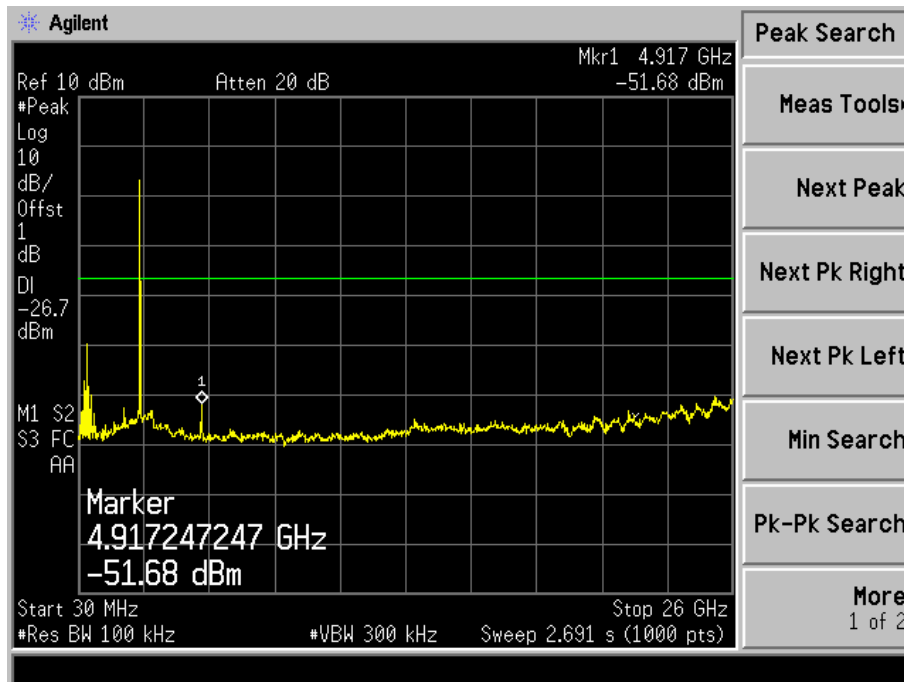
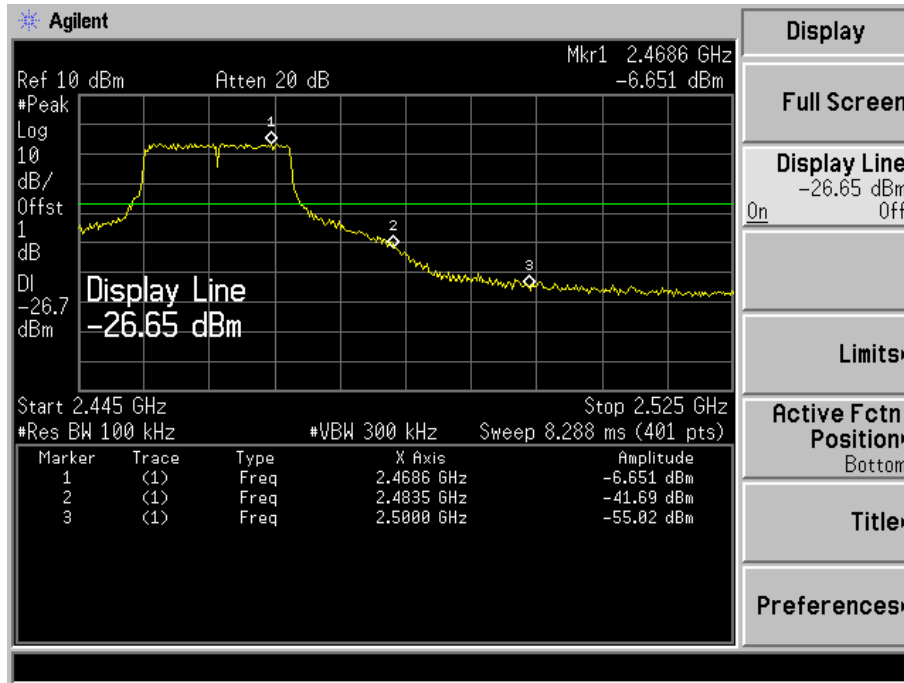
Spurious (Conducted)
 802.11n-HT20-Lowest
 Lowest



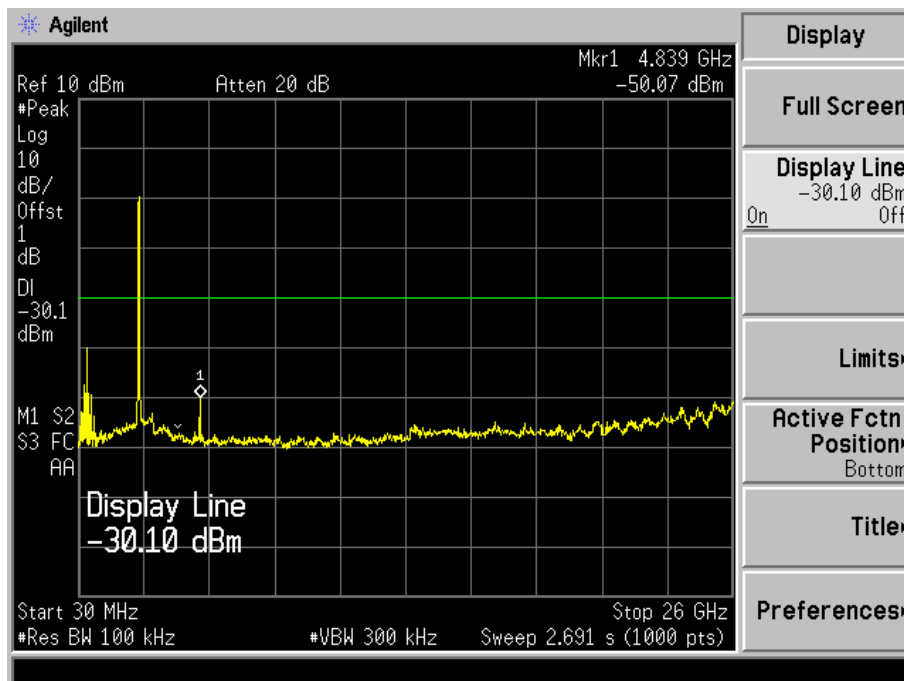
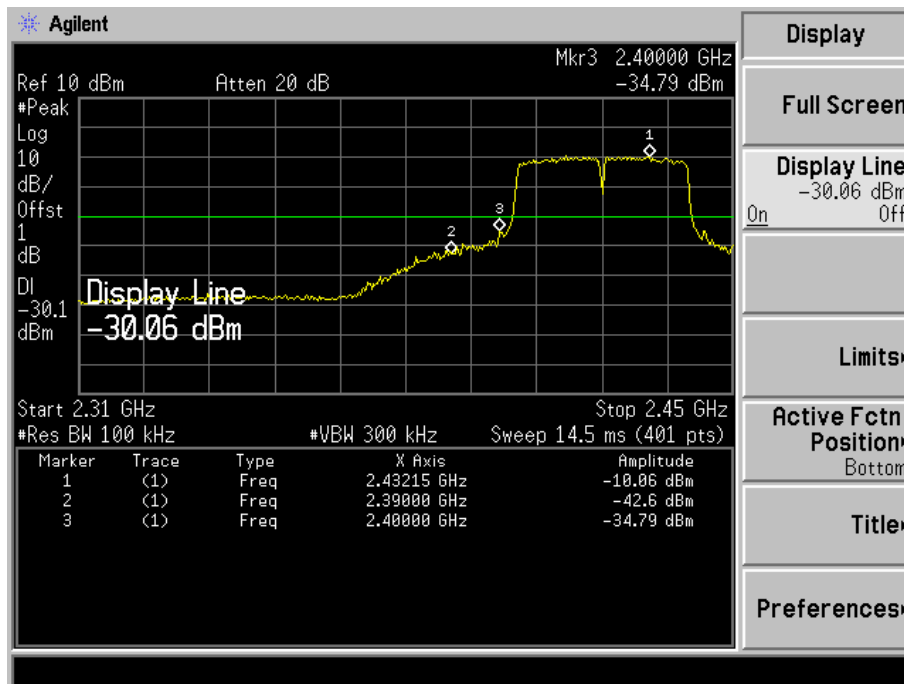
Middle



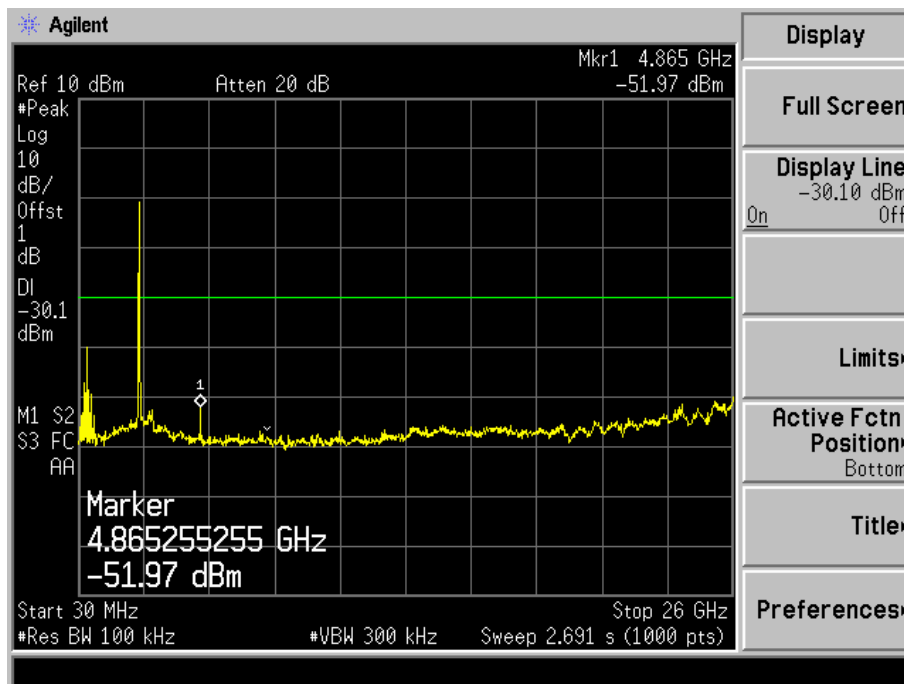
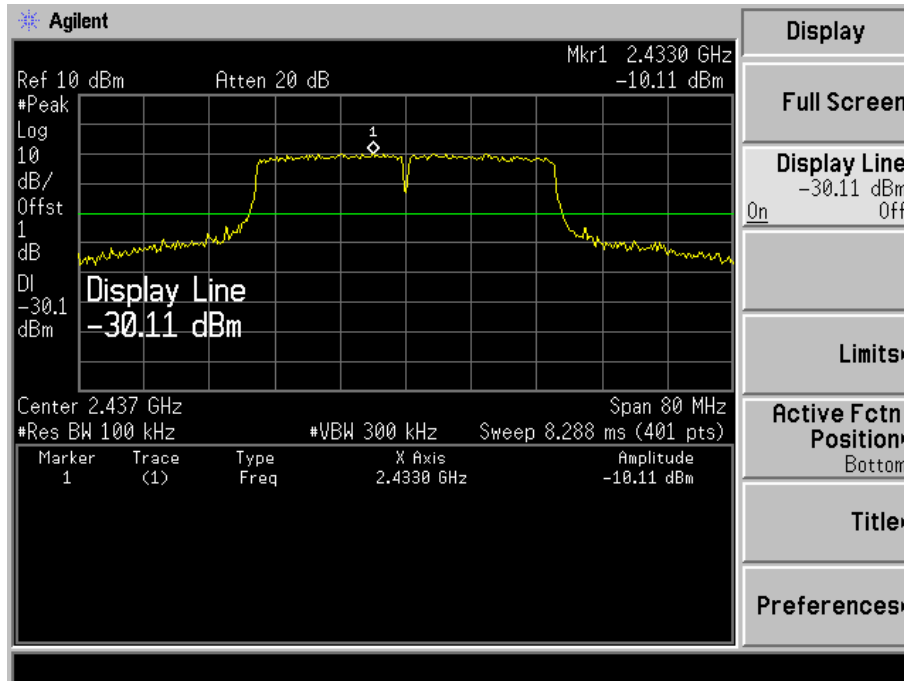
Highest



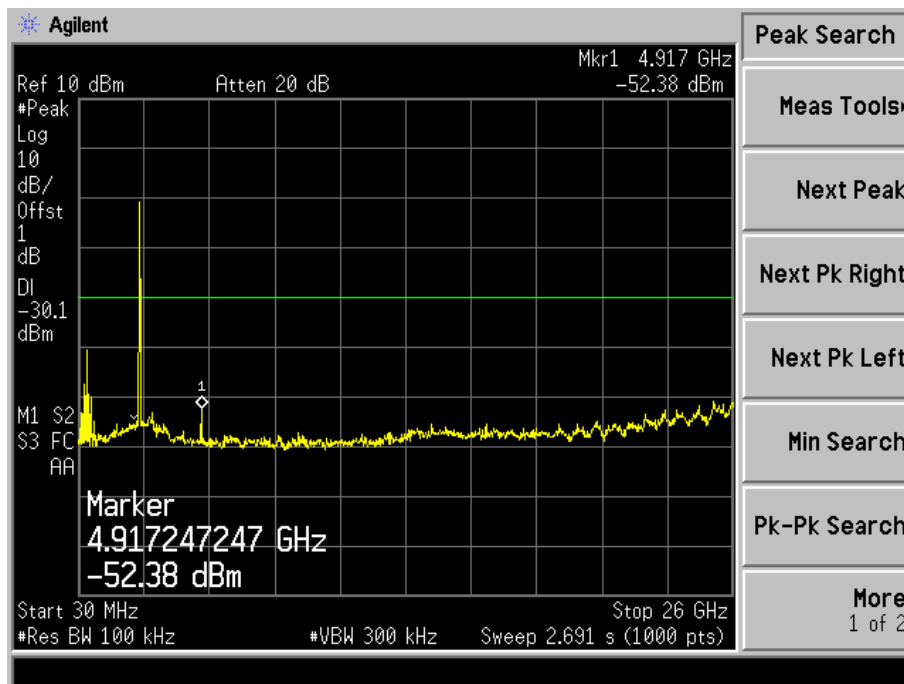
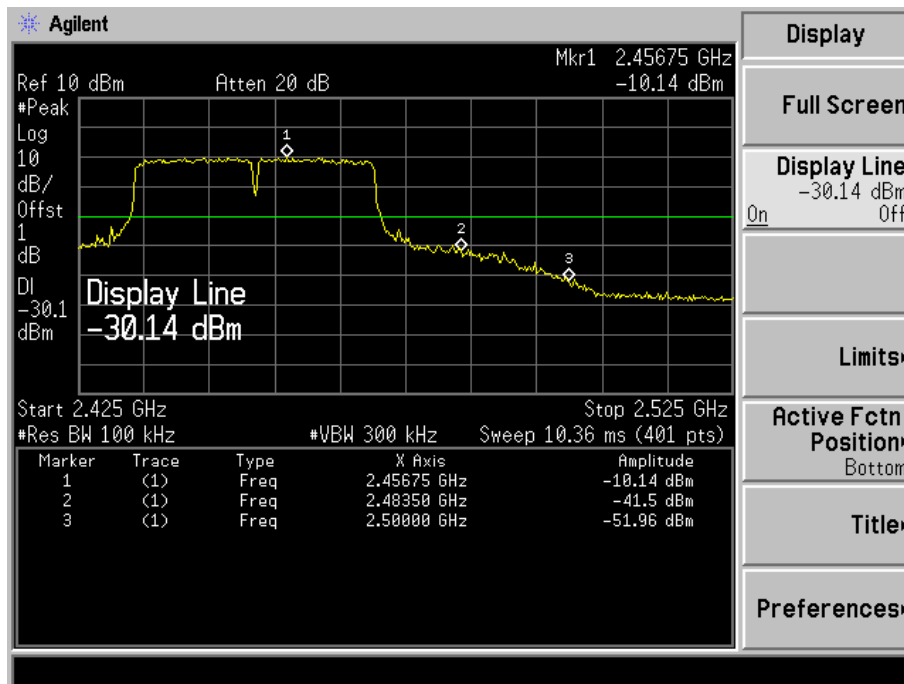
Spurious (Conducted)
 802.11n-HT40-Lowest
 Lowest



Middle



Highest



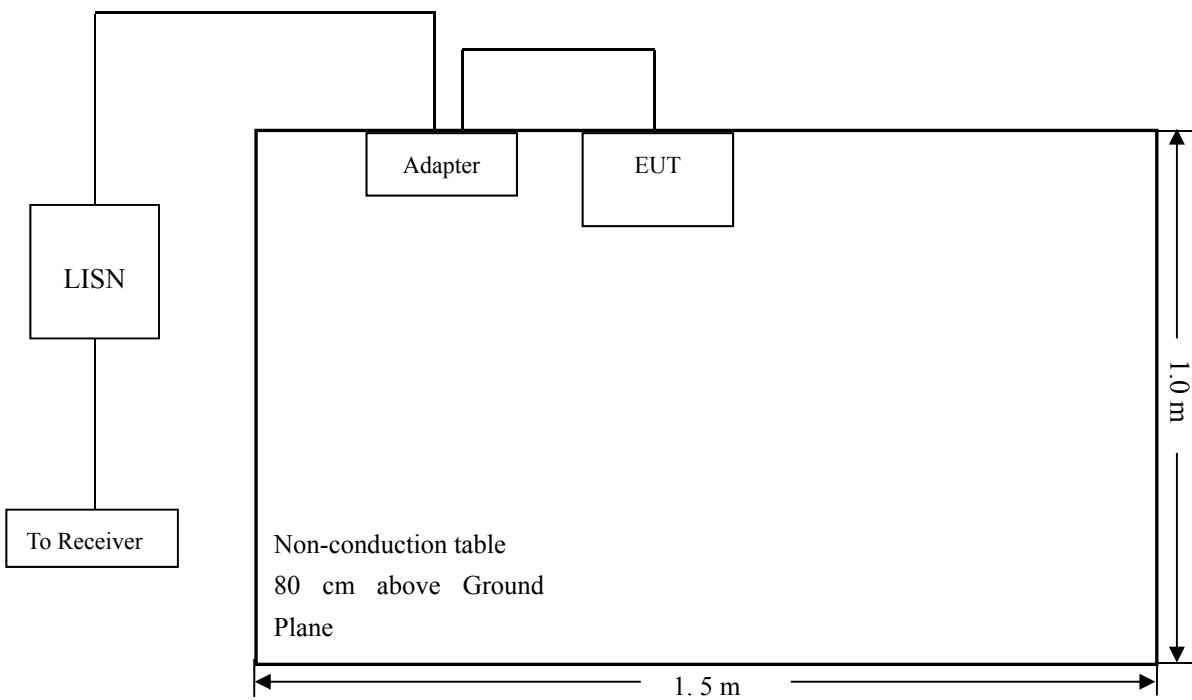
10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

10.2 Basic Test Setup Block Diagram



10.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

10.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

10.5 Summary of Test Results/Plots

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

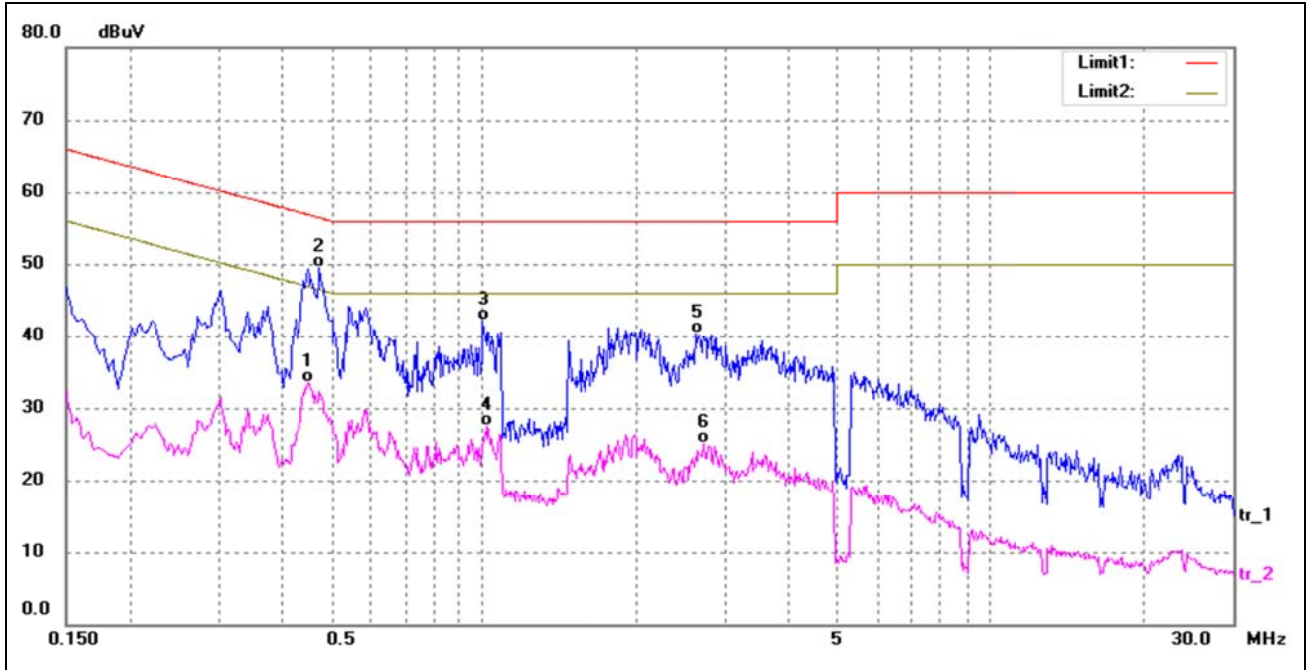
-6.72 dB at 0.154 MHz in the Line mode, Peak detector, 0.15-30MHz

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

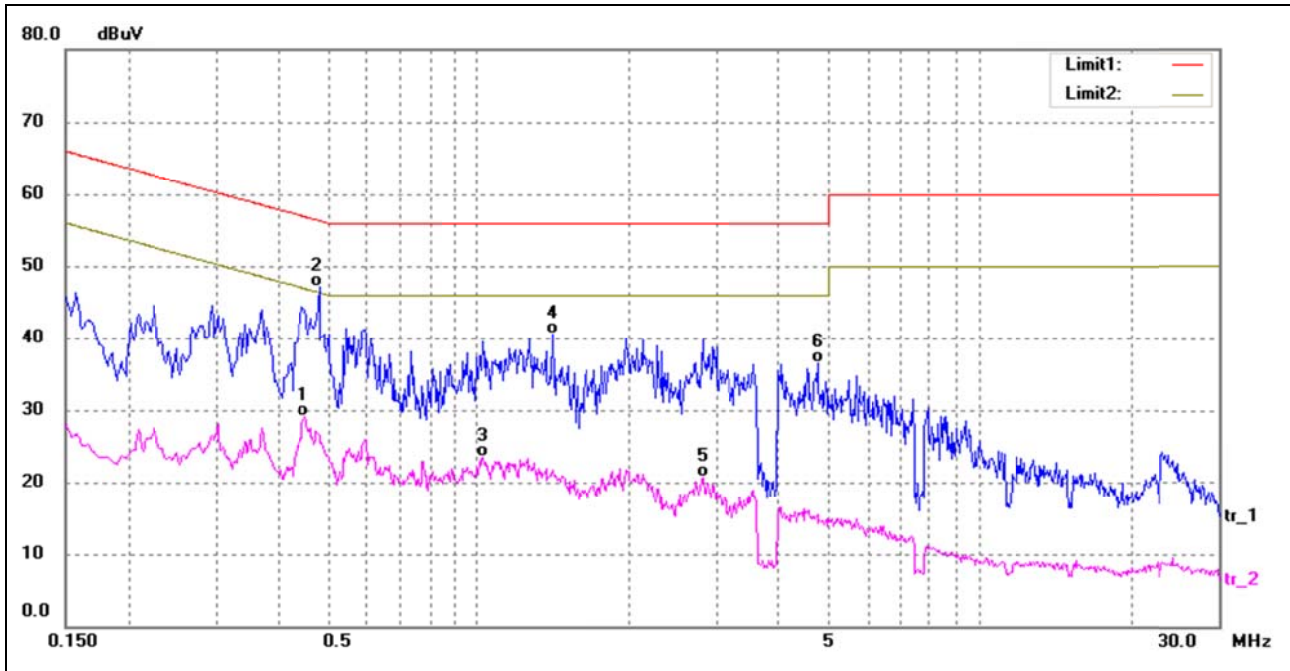
EUT: CHB47LOW CAR DV
 Tested Model: CHB47LOW-T
 Operating Condition: Transmitting(Wi-Fi)
 Comment: AC 120V/60Hz to PC

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.4500	23.75	9.80	33.55	46.88	-13.33	QP
2	0.4740	39.72	9.80	49.52	56.44	-6.92	AVG
3	0.9980	32.38	9.76	42.14	56.00	-13.86	QP
4	1.0180	17.77	9.76	27.53	46.00	-18.47	AVG
5	2.6180	30.65	9.72	40.37	56.00	-15.63	AVG
6	2.7100	15.35	9.72	25.07	46.00	-20.93	QP

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.4500	19.29	9.80	29.09	46.88	-17.79	QP
2	0.4820	37.27	9.80	47.07	56.30	-9.23	AVG
3	1.0220	13.75	9.76	23.51	46.00	-22.49	QP
4	1.4060	30.80	9.75	40.55	56.00	-15.45	AVG
5	2.8180	10.90	9.71	20.61	46.00	-25.39	QP
6	4.7580	26.86	9.67	36.53	56.00	-19.47	AVG

***** END OF REPORT *****