

FCC Part 15C Measurement and Test Report

For

Hangzhou Taogu Information Technology Co., Ltd.

Room 903-5 ,NO.111 Hushu South Road, Gongshu District,

Hangzhou, Zhejiang, China

FCC ID: 2AP7X-DRM3

FCC Rule(s):	<u>FCC Part 15C</u>
Product Description:	<u>WIFI module</u>
Tested Model:	<u>DRM3</u>
Report No.:	<u>STR18068092I</u>
Sample Receipt Date:	<u>2018-06-06</u>
Tested Date:	<u>2018-06-07 to 2018-06-12</u>
Issued Date:	<u>2018-06-12</u>
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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: Hangzhou Taogu Information Technology Co., Ltd
Address of applicant: Room 903-5 ,NO.111 Hushu South Road, Gongshu District, Hangzhou,Zhejiang, China

Manufacturer: ShenZhen HaiLingKe Electronic co., Ltd
Address of manufacturer: Room 903-5 ,NO.111 Hushu South Road, Gongshu District, Hangzhou,Zhejiang, China

General Description of EUT	
Product Name:	WIFI module
Trade Name:	daren daren wisdom
Model No.:	DRM3
Adding Model(s):	/
Rated Voltage:	DC3.3V
Battery:	/
Power Adapter Model:	/
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n-HT20; 802.11n-HT40
Frequency Range:	2412-2462MHz for802.11n-HT20 2422-2452MHz for802.11n-HT40
RF Output Power:	12.34dBm (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:	External
Antenna Gain:	6dBi
Lowest Internal Frequency:	40MHz

1.2 Test Standards

The following report is prepared on behalf of the Hangzhou Taogu Information 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, with a duty cycle equal to 100%, 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
Switching Adapter	WEEQU	WEEQU-0510	/
Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/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	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

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 authorized external 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

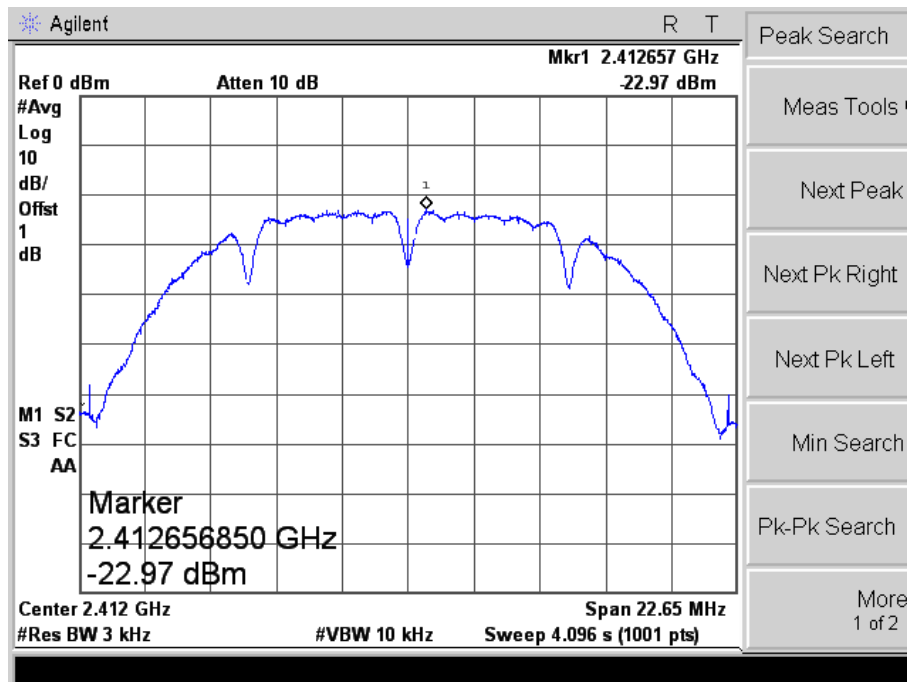
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

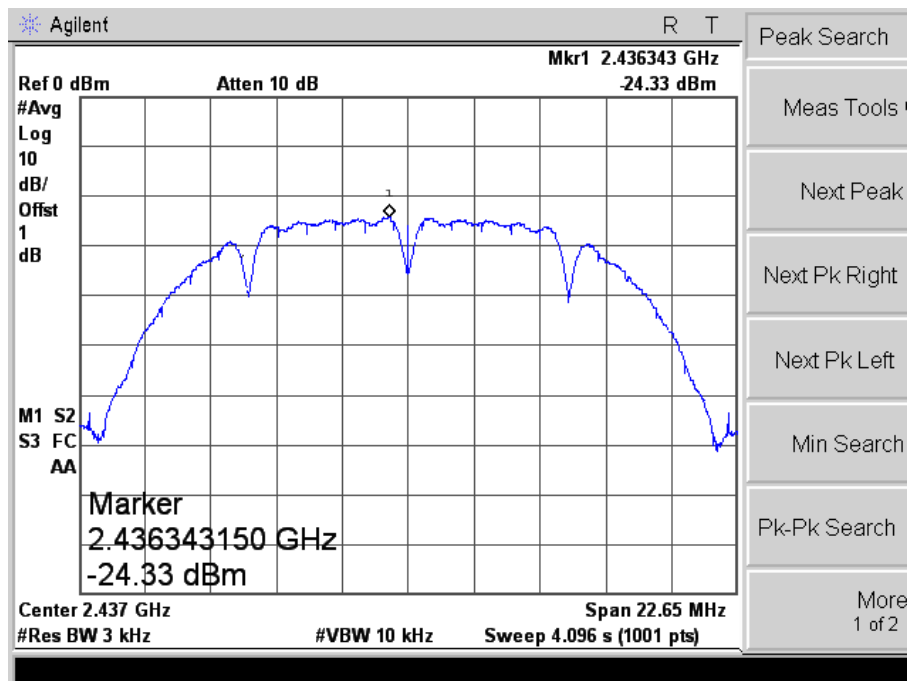
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b_11Mbps	2412	-22.97	8
	2437	-24.33	8
	2462	-24.33	8
802.11g_54Mbps	2412	-23.95	8
	2437	-24.49	8
	2462	-22.99	8
802.11n HT20_MCS7	2412	-26.07	8
	2437	-26.76	8
	2462	-26.73	8
802.11n HT40_MCS7	2422	-29.77	8
	2437	-30.09	8
	2452	-28.31	8

Please refer to the following test plots:

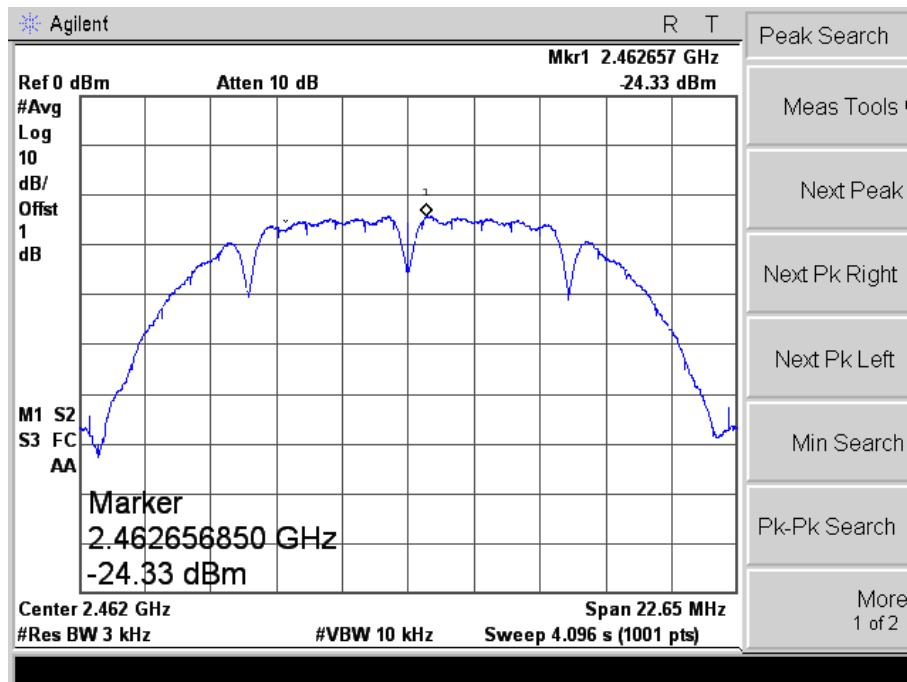
802.11b-Low Channel



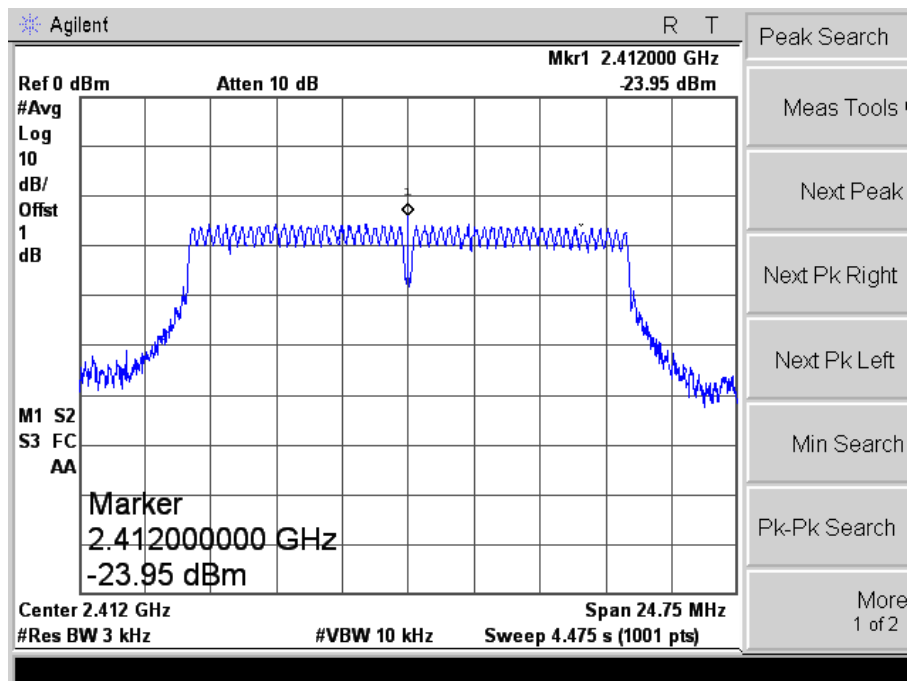
802.11b-Middle Channel



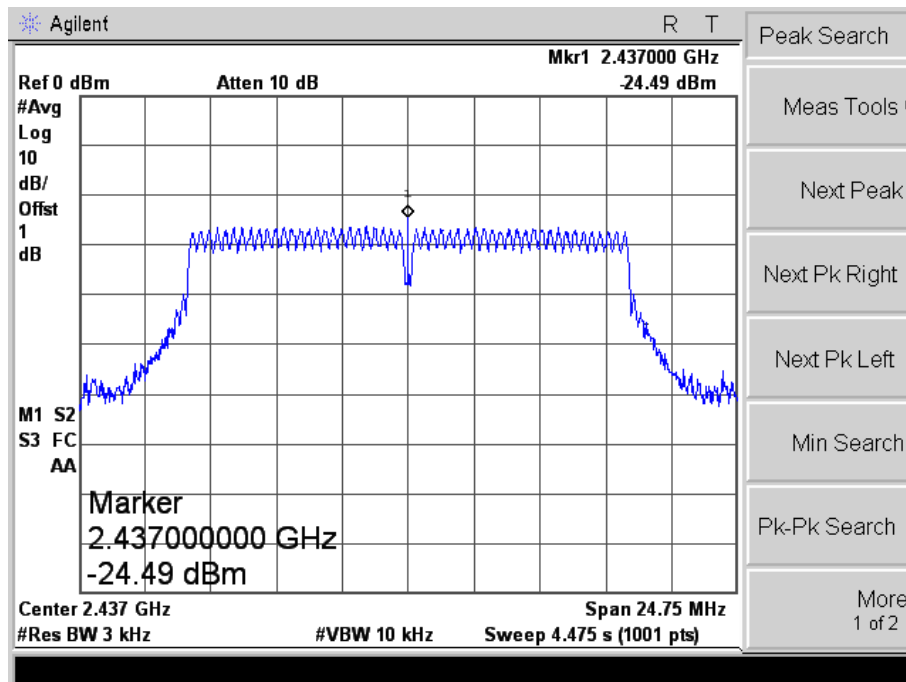
802.11b-High Channel



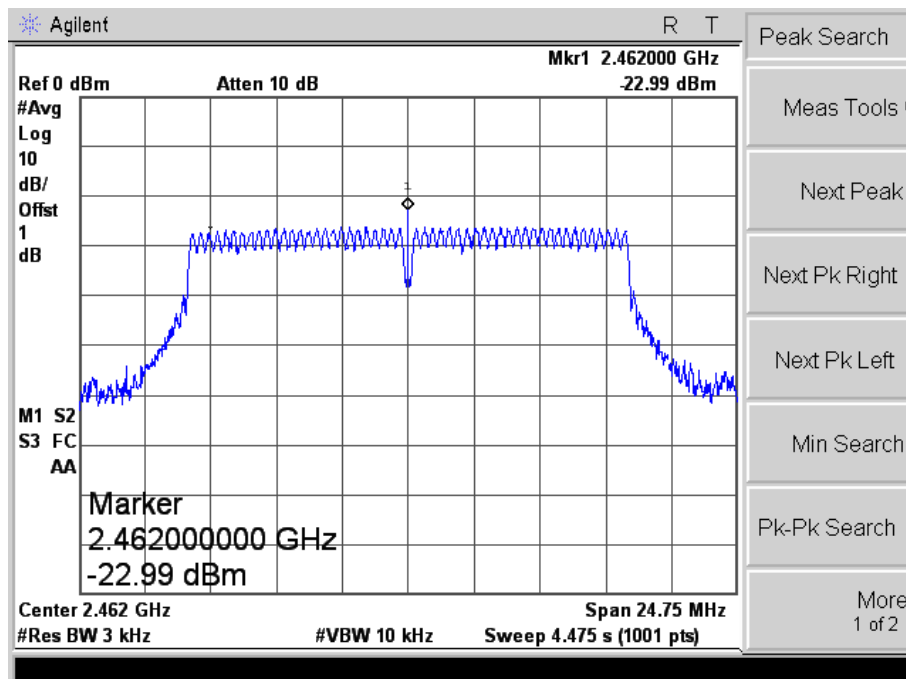
802.11g-Low Channel



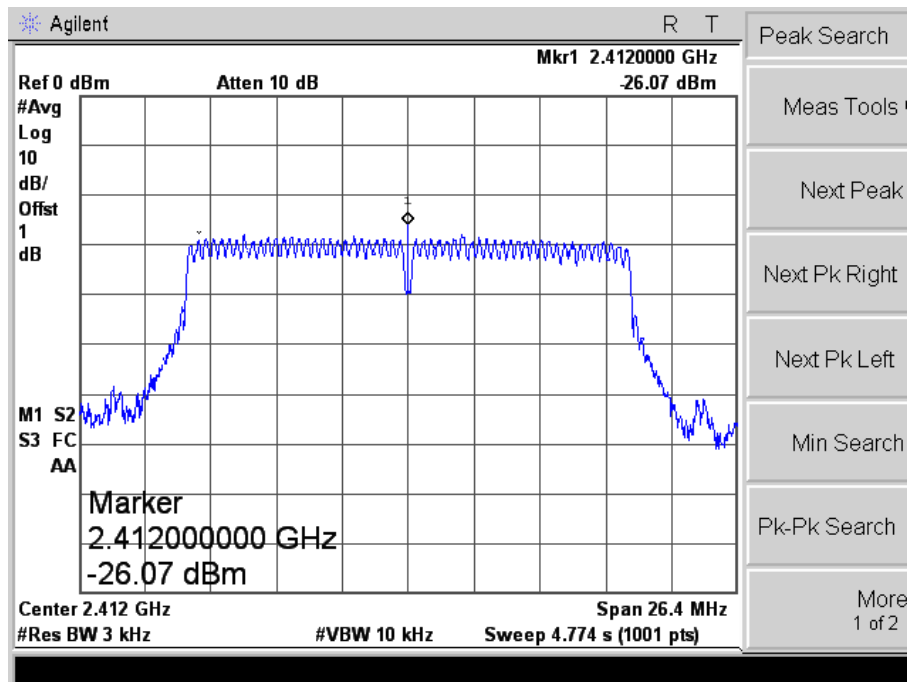
802.11g-Middle Channel



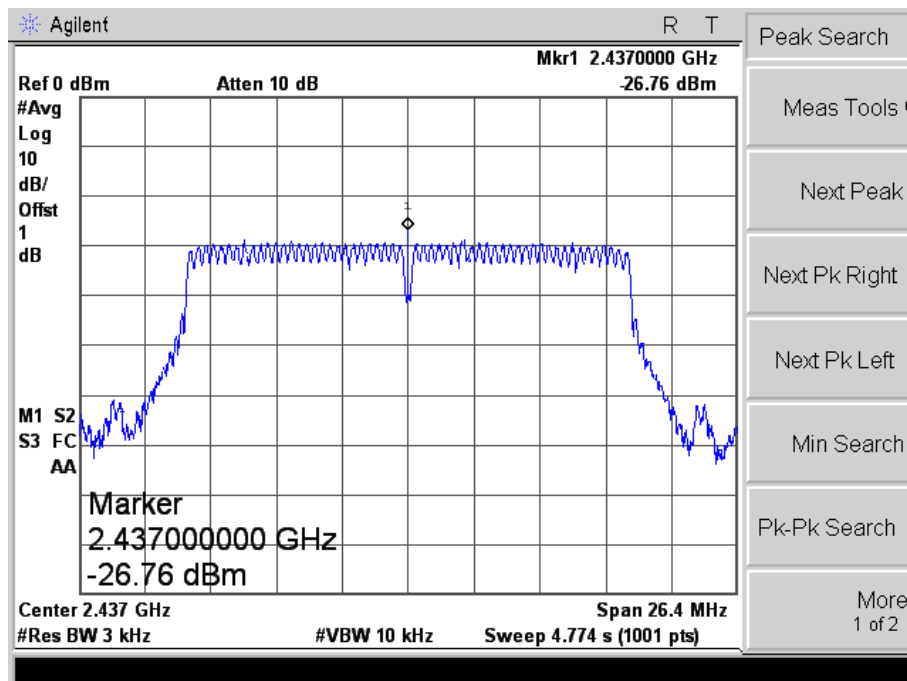
802.11g-High Channel



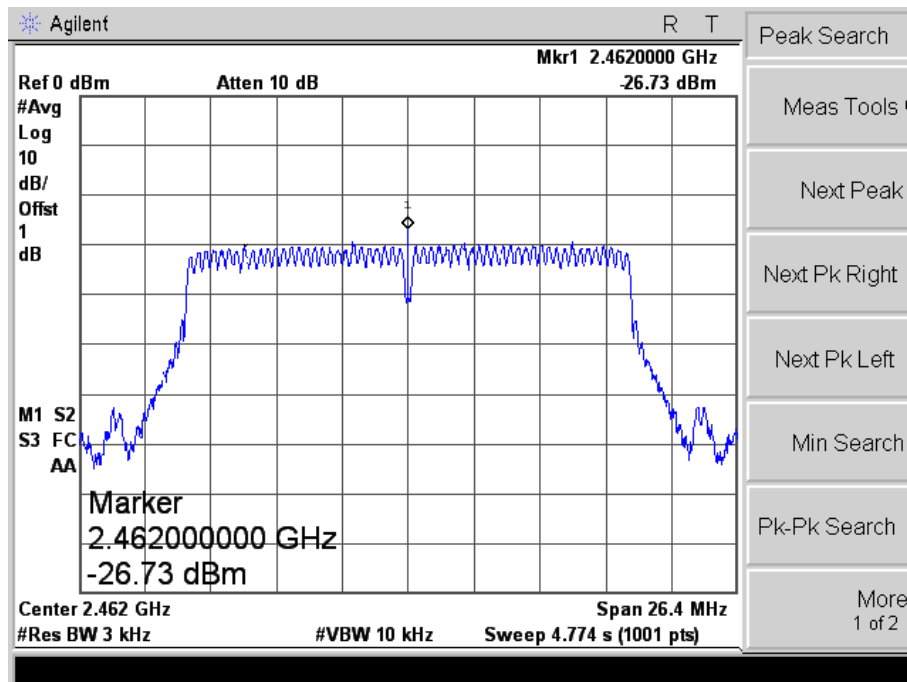
802.11n-HT20-Low Channel



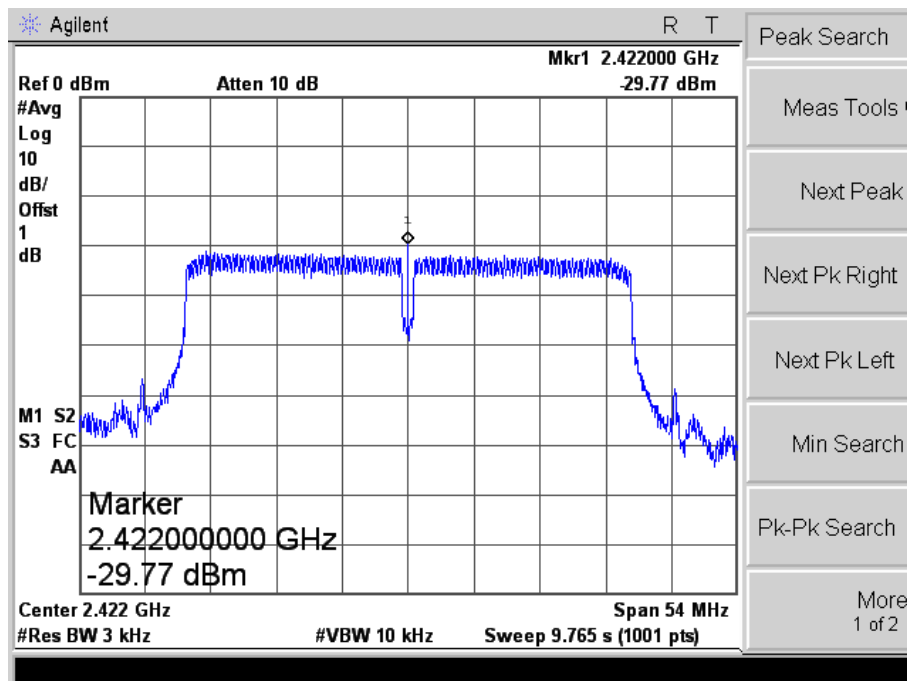
802.11n-HT20-Middle Channel



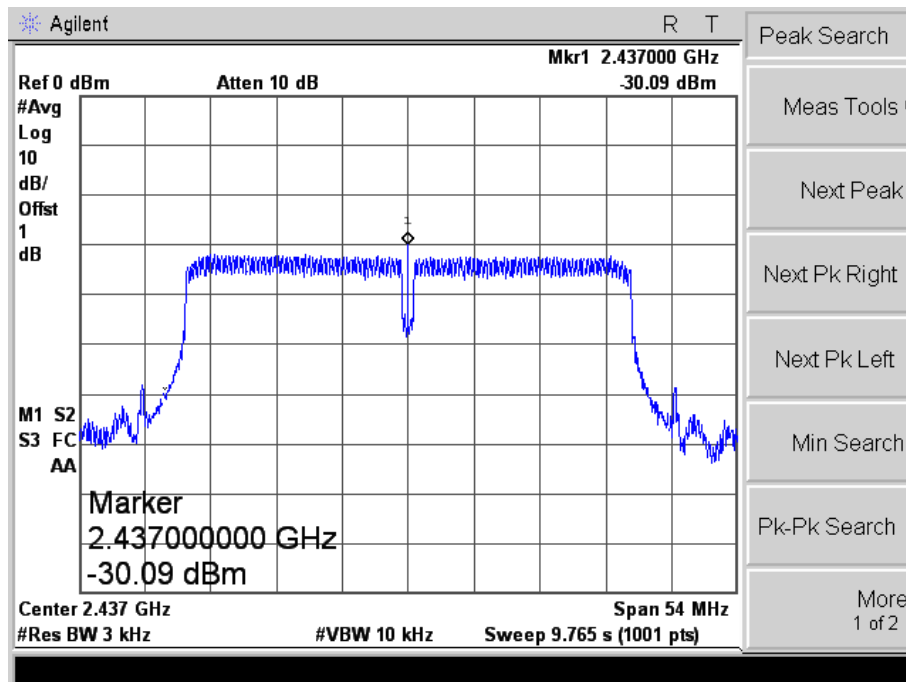
802.11n-HT20-High Channel



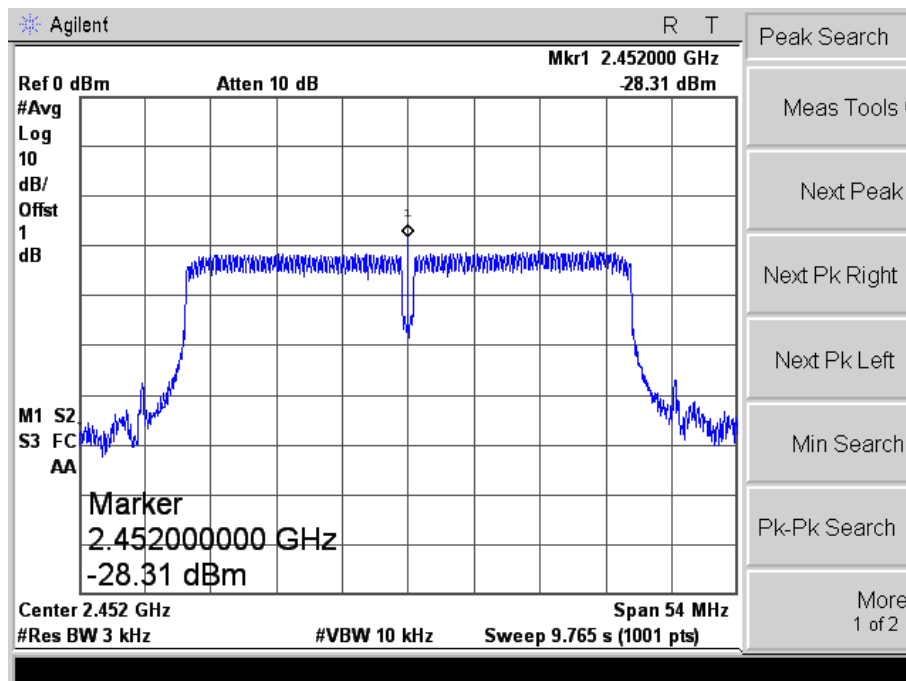
802.11n-HT40-Low Channel



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

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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

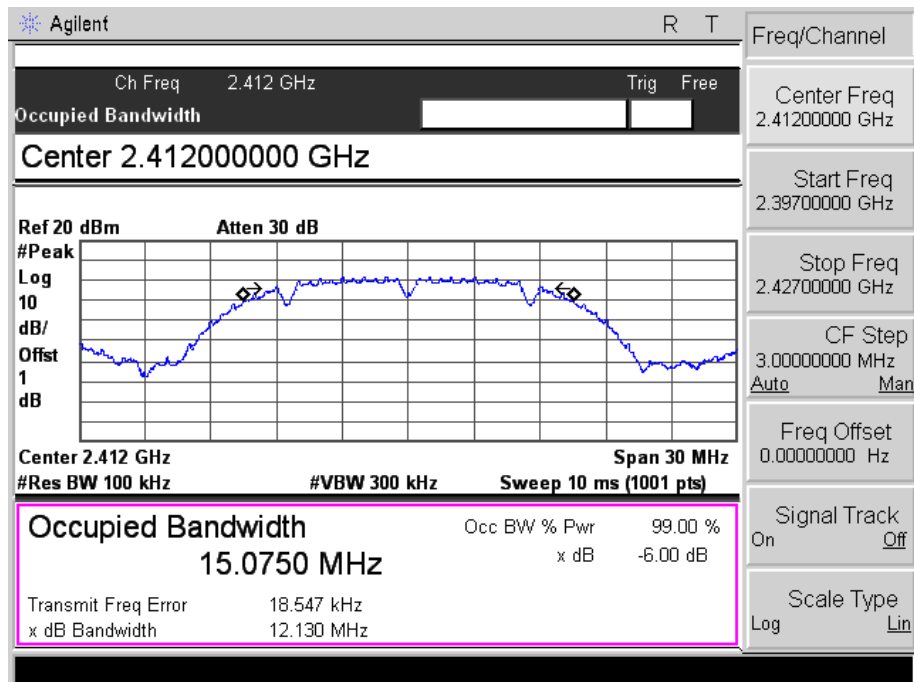
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

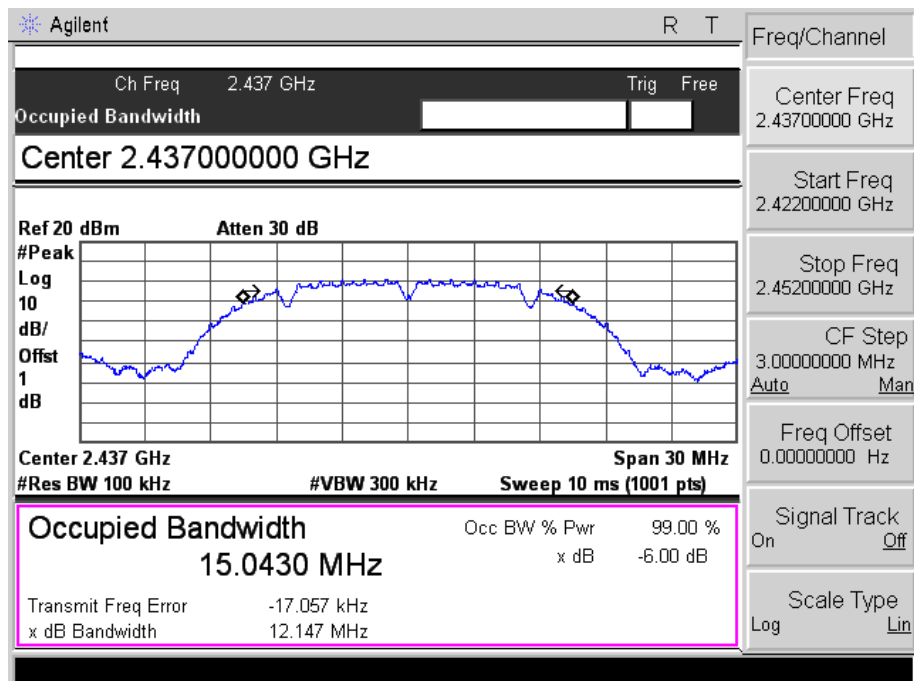
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b_11Mbps	2412	12.130	15.0750	≥ 500
	2437	12.147	15.0430	≥ 500
	2462	12.146	15.0237	≥ 500
802.11g_54Mbps	2412	16.517	16.4439	≥ 500
	2437	16.528	16.4850	≥ 500
	2462	16.350	16.4455	≥ 500
802.11n-HT20_MC S7	2412	17.738	17.5736	≥ 500
	2437	17.644	17.5683	≥ 500
	2462	17.683	17.5715	≥ 500
802.11n-HT40_MC S7	2422	36.399	35.9598	≥ 500
	2437	36.445	35.9742	≥ 500
	2452	36.439	35.9956	≥ 500

Please refer to the following test plots:

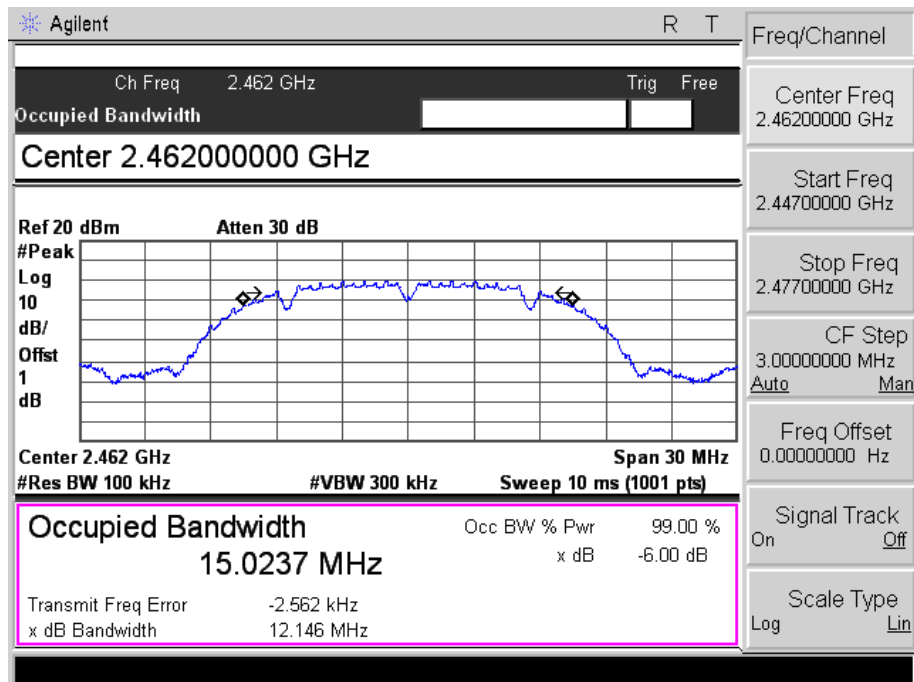
802.11b-Low Channel



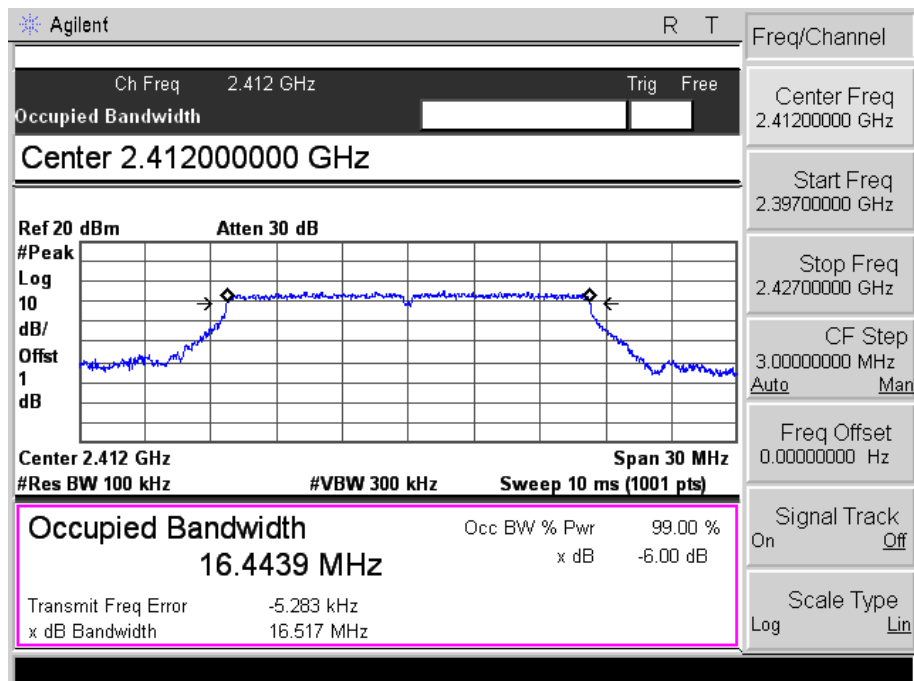
802.11b-Middle Channel



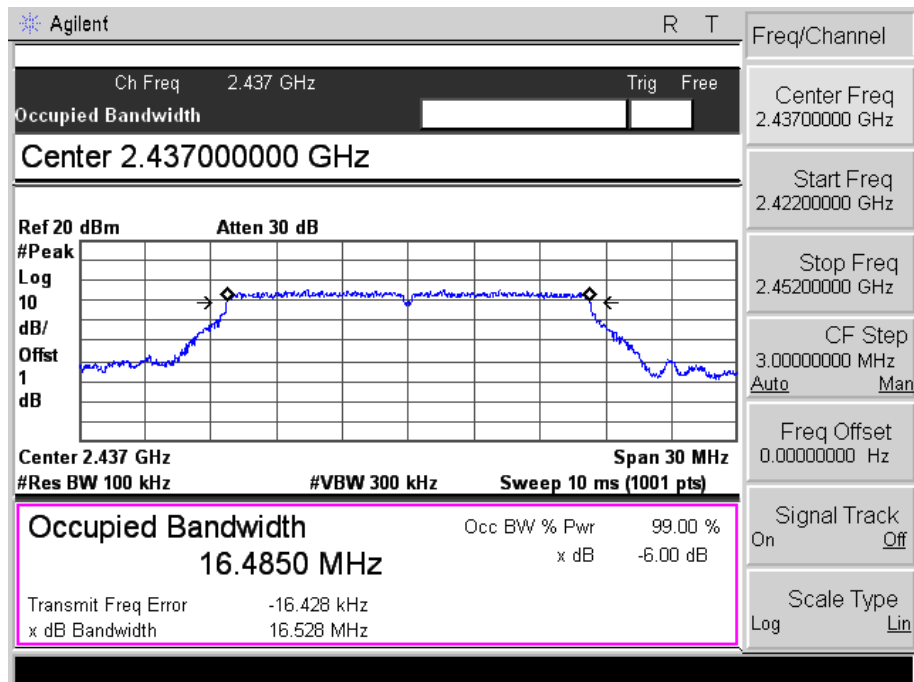
802.11b-High Channel



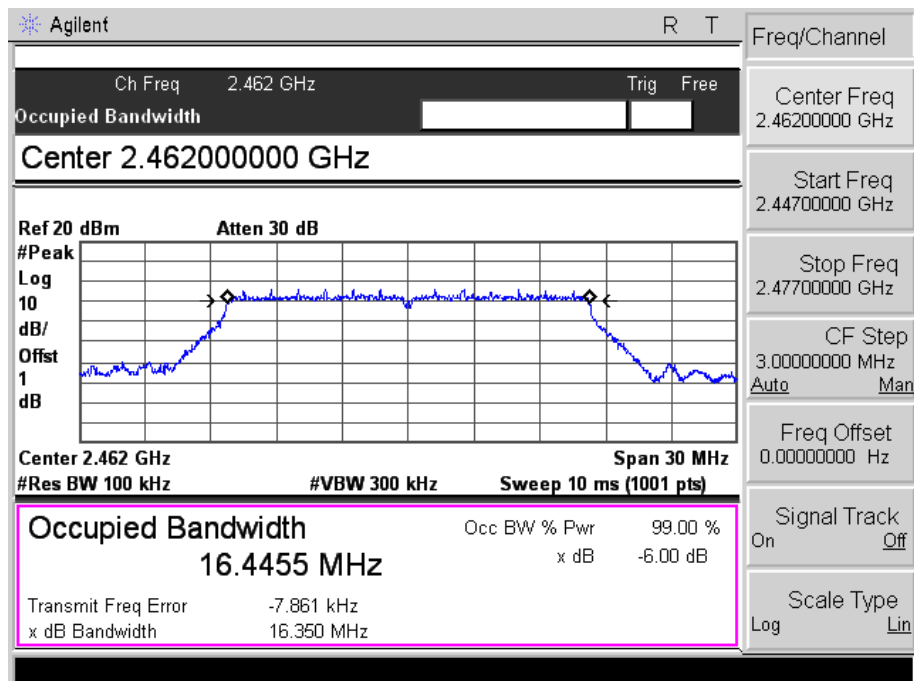
802.11g-Low Channel



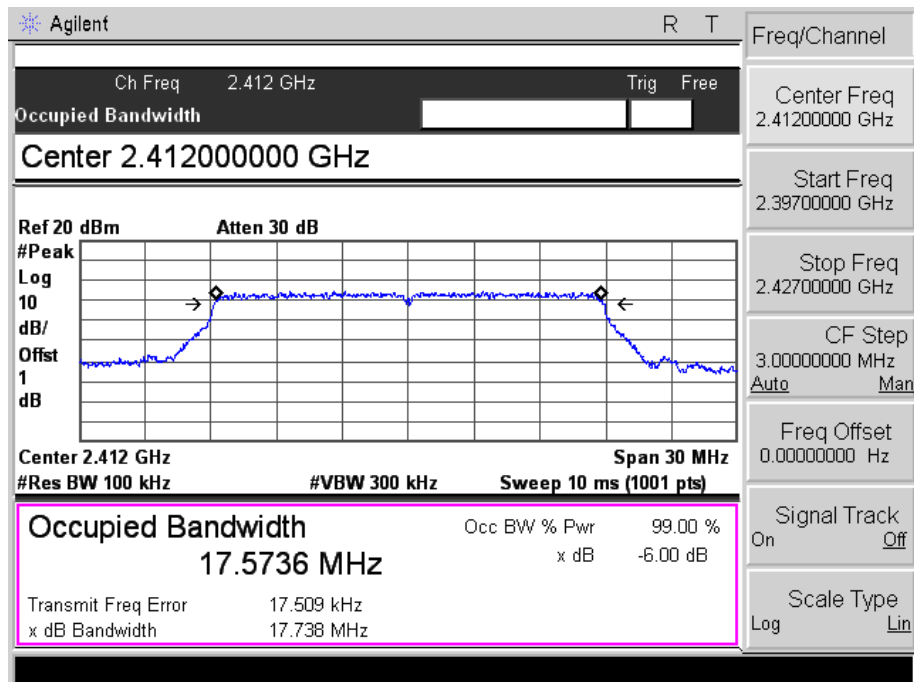
802.11g-Middle Channel



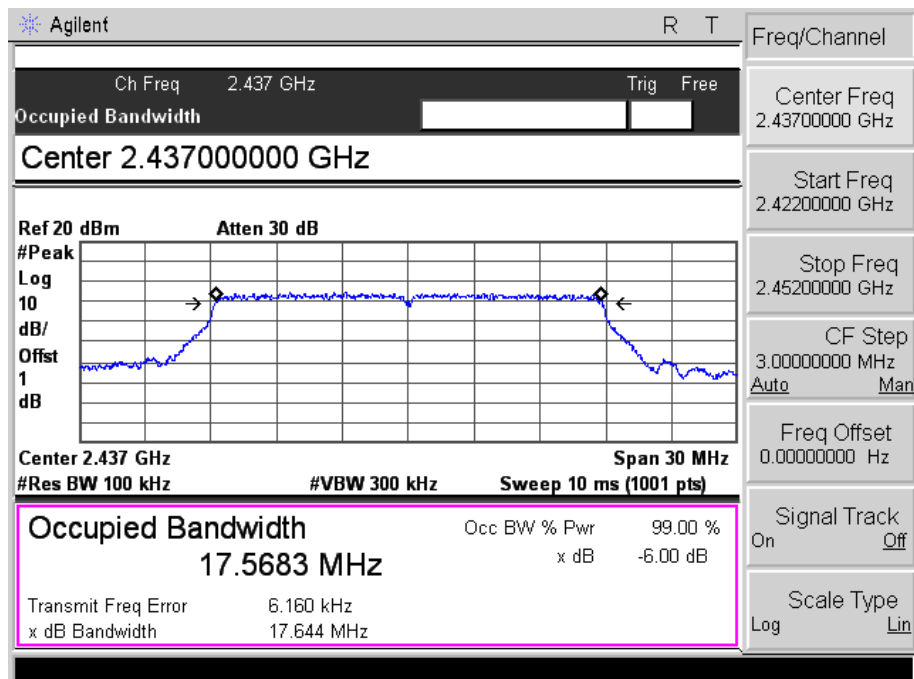
802.11g-High Channel



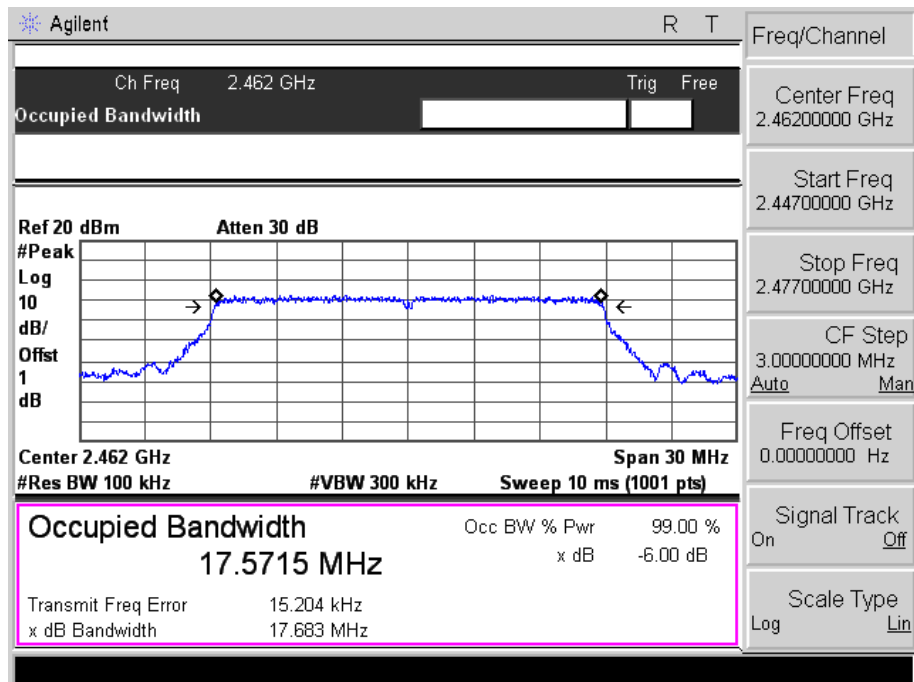
802.11n-HT20-Low Channel



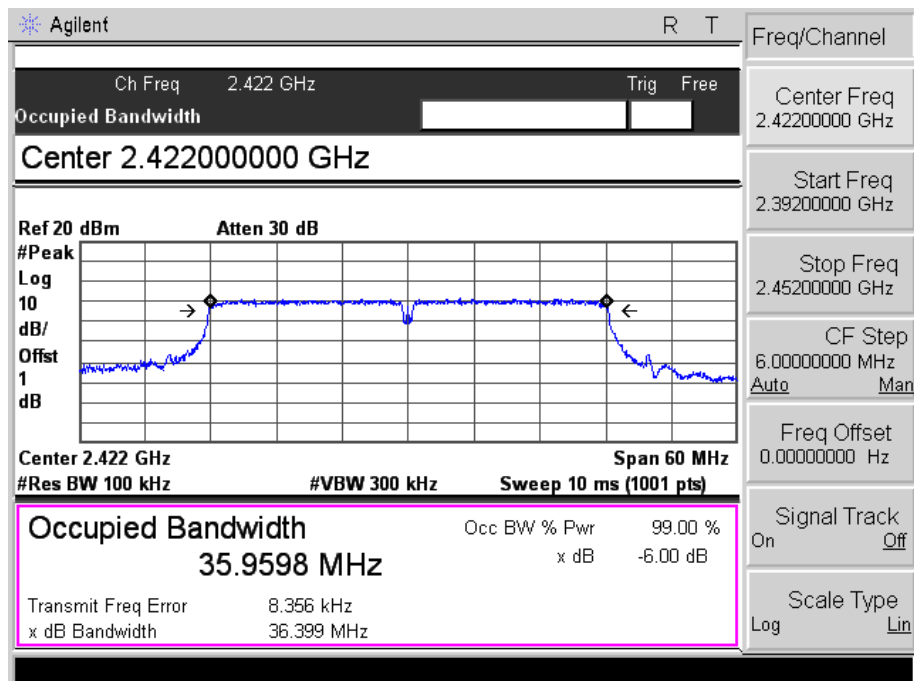
802.11n-HT20-Middle Channel

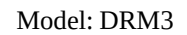


802.11n-HT20-High Channel



802.11n-HT40-Low Channel





Agilent R T

Ch Freq 2.437 GHz Trig Free

Occupied Bandwidth

Center 2.437000000 GHz

Ref 20 dBm Atten 30 dB

#Peak Log 10 dB/Offst 1 dB

Center 2.437 GHz Span 60 MHz

#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)

Occupied Bandwidth

35.9742 MHz

Transmit Freq Error -9.505 kHz

x dB Bandwidth 36.445 MHz

Occ BW % Pwr 99.00 %

x dB -6.00 dB

Freq/Channel

Center Freq 2.43700000 GHz

Start Freq 2.40700000 GHz

Stop Freq 2.46700000 GHz

CF Step 6.00000000 MHz

Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

Scale Type Log Lin

Agilent R T

Ch Freq 2.452 GHz Trig Free

Occupied Bandwidth

Center 2.45200000 GHz

Ref 20 dBm Atten 30 dB

#Peak Log 10 dB/Offset 1 dB

Center 2.452 GHz Span 60 MHz

#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)

Occupied Bandwidth 35.9956 MHz

Transmit Freq Error 787.330 Hz

x dB Bandwidth 36.439 MHz

Occ BW % Pwr 99.00 %

x dB -6.00 dB

Freq/Channel

Center Freq 2.45200000 GHz

Start Freq 2.42200000 GHz

Stop Freq 2.48200000 GHz

CF Step 6.00000000 MHz

Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

Scale Type Log Lin

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 $\geq 2 \times \text{span} / \text{RBW}$. (This gives bin-to-bin spacing $\leq \text{RBW}/2$, 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

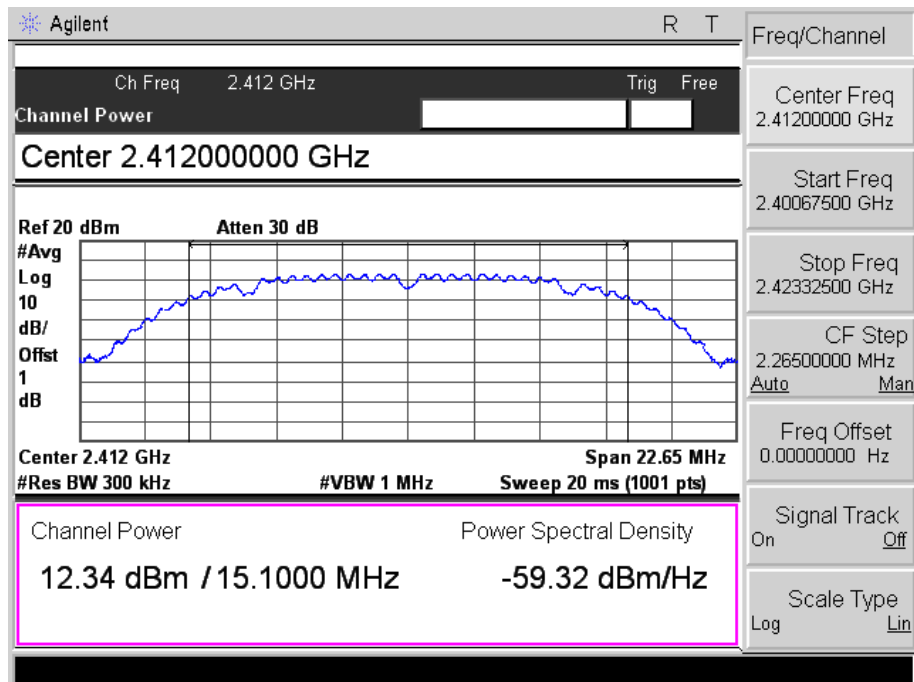
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

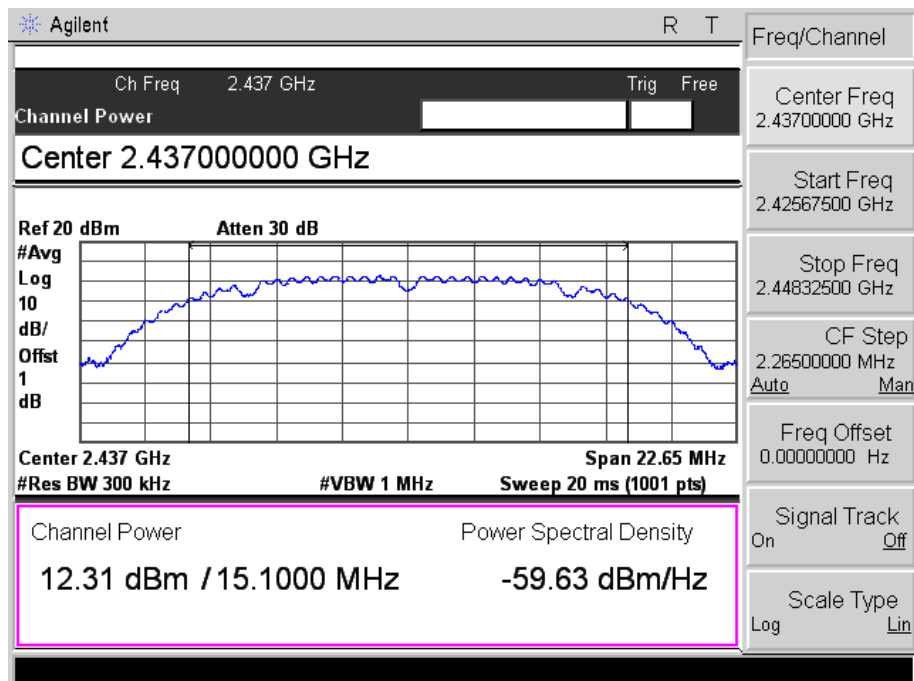
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _ 11Mbps	2412	12.34	17.14	1000
	2437	12.31	17.02	1000
	2462	11.58	14.39	1000
802.11g_54Mbps	2412	10.35	10.84	1000
	2437	10.45	11.09	1000
	2462	10.50	11.22	1000
802.11n HT20_MCS7	2412	8.26	6.70	1000
	2437	8.11	6.47	1000
	2462	8.47	7.03	1000
802.11n HT40_MCS7	2422	8.32	6.79	1000
	2437	8.46	7.01	1000
	2452	8.31	6.78	1000

Please refer to the following test plots:

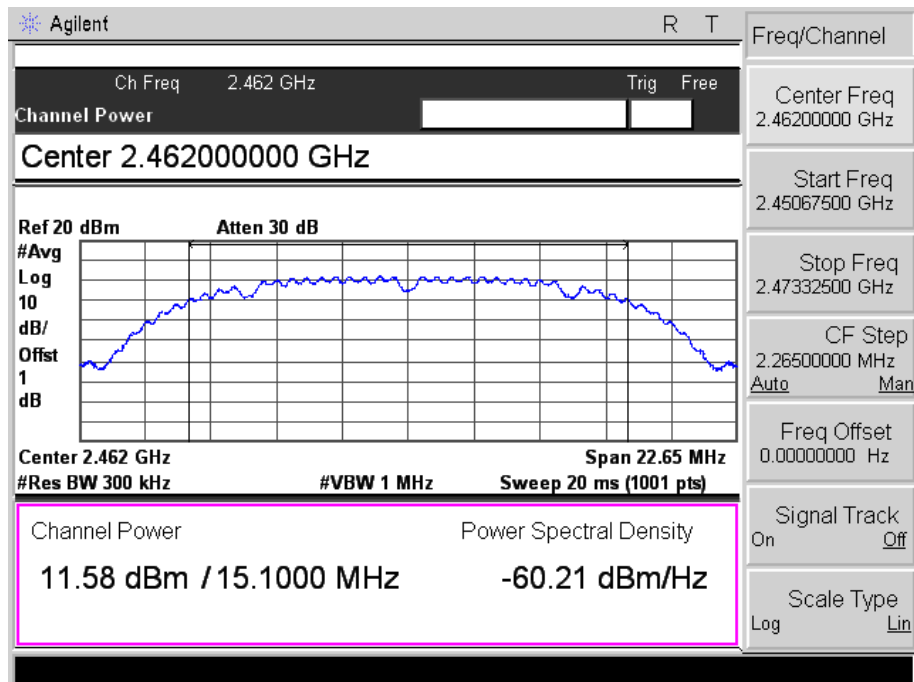
802.11b-11Mbps-Low Channel



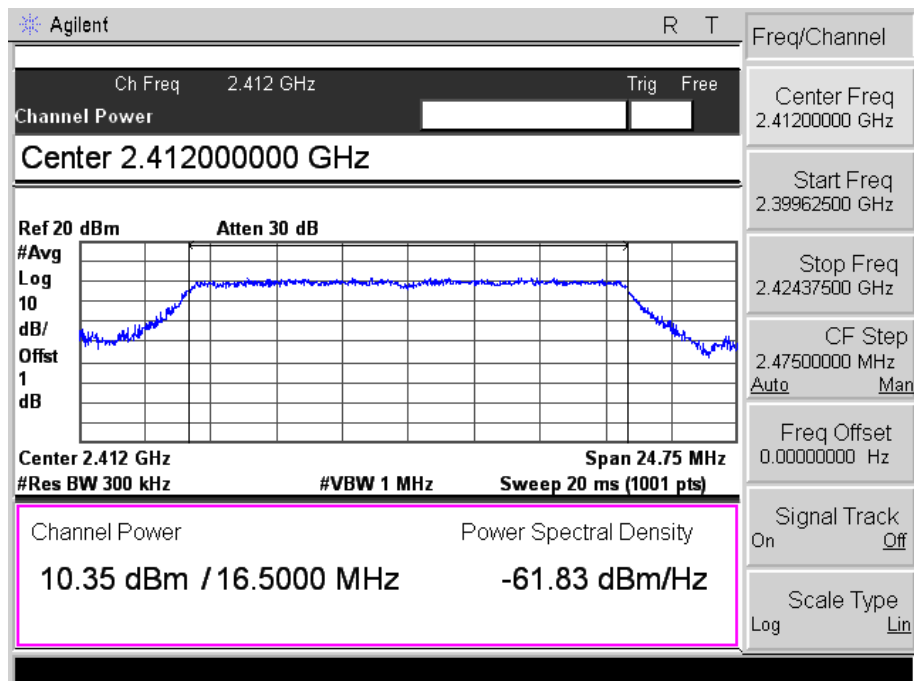
802.11b -11Mbps-Middle Channel



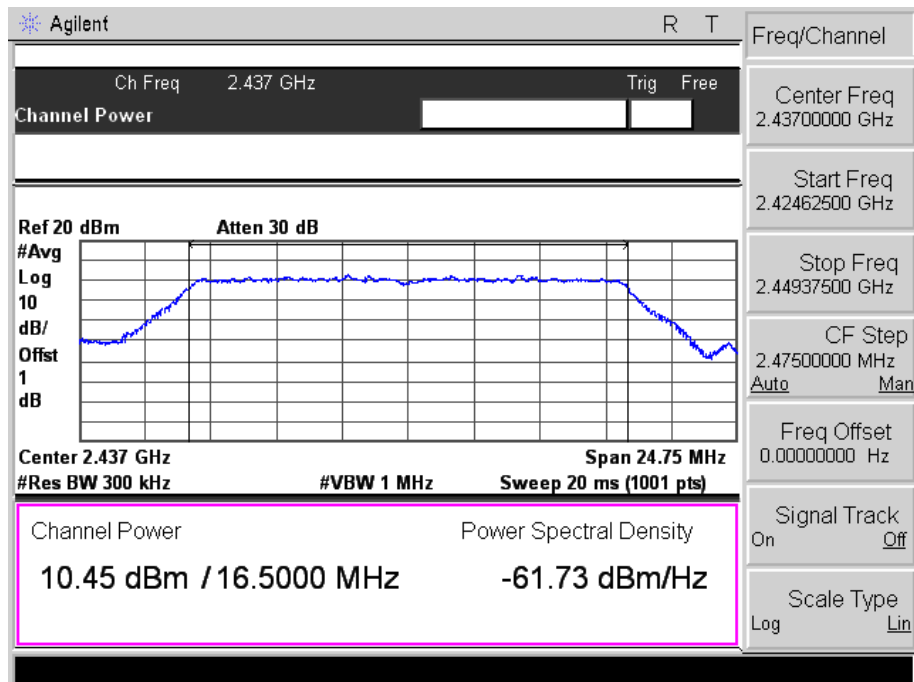
802.11b -11Mbps-High Channel



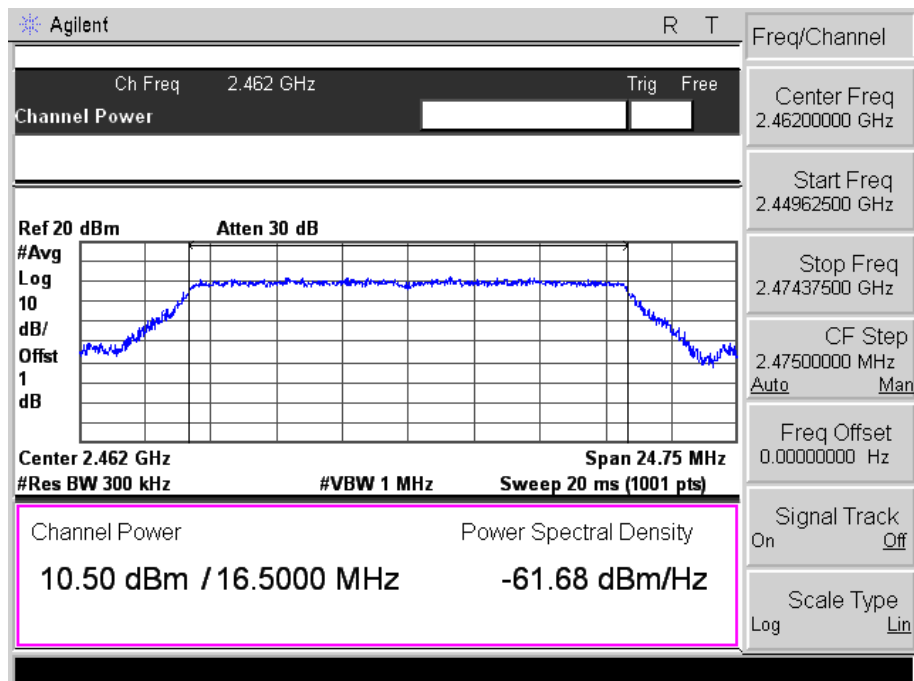
802.11g-54Mbps-Low Channel



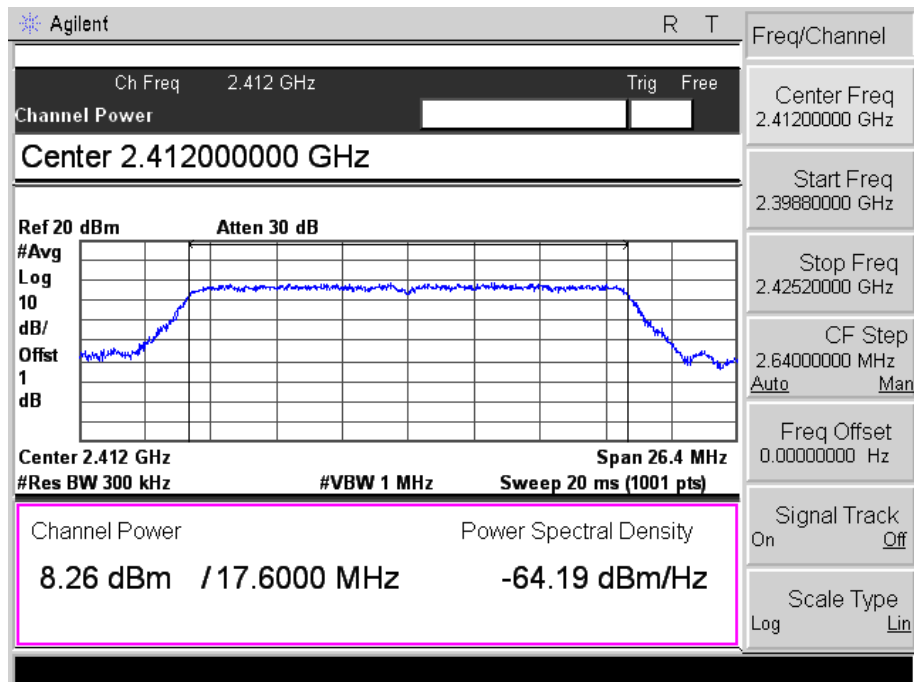
802.11g-54Mbps-Middle Channel



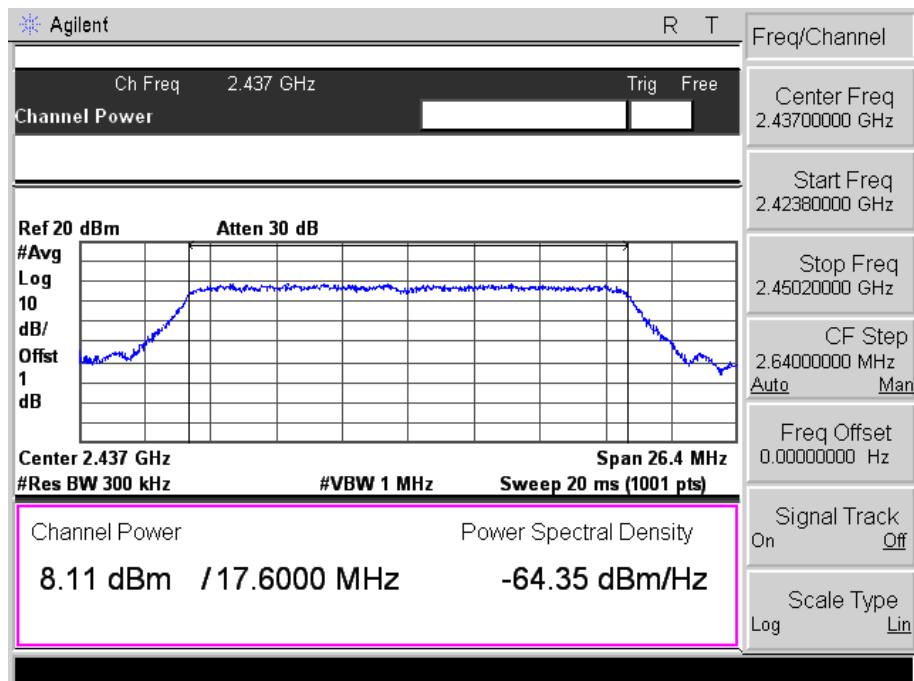
802.11g-54Mbps-High Channel



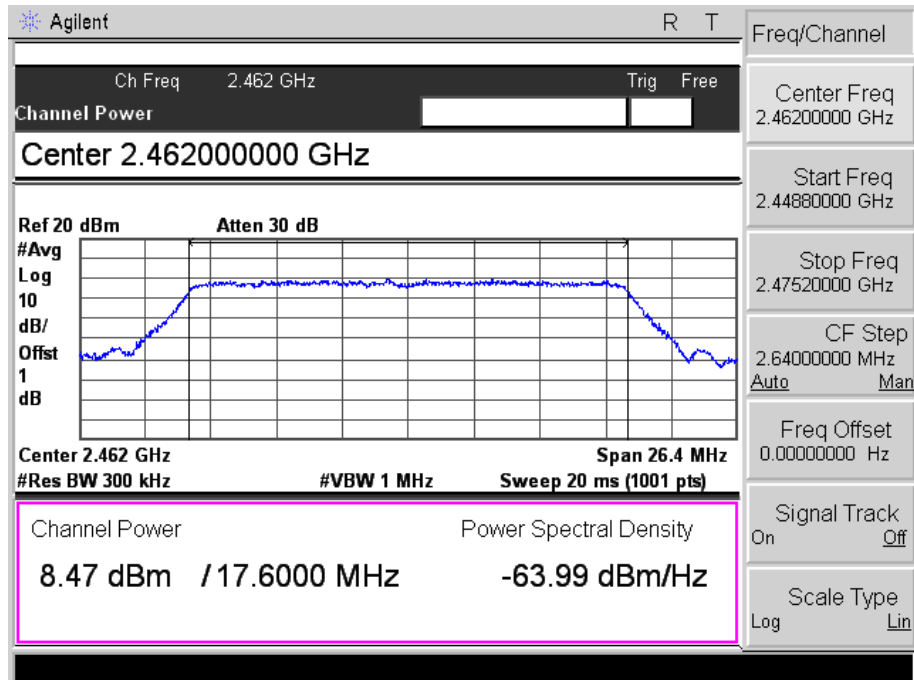
802.11n-HT20-MCS7-Low Channel



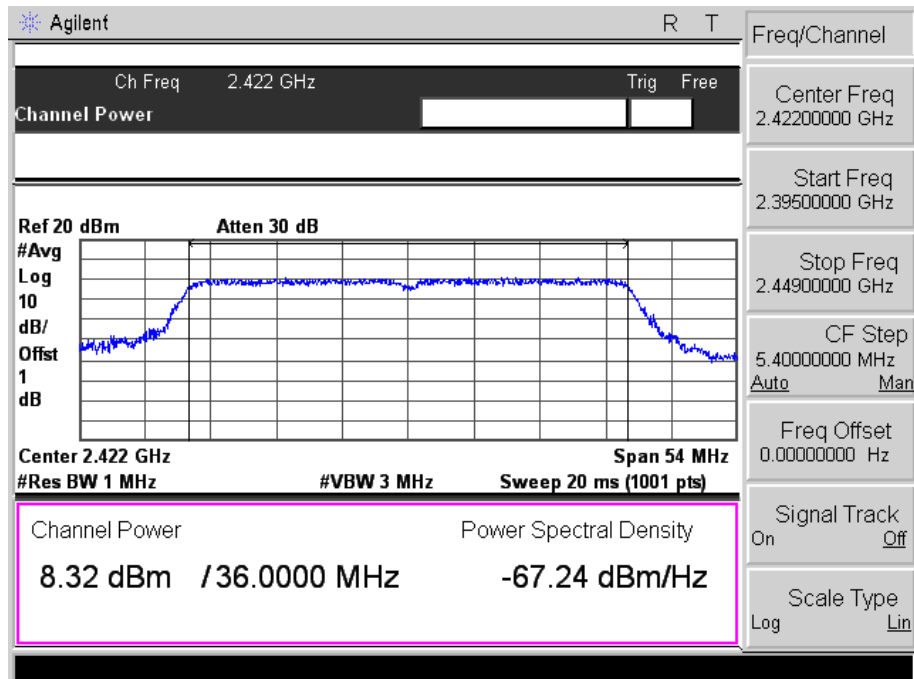
802.11n-HT20-MCS7-Middle Channel



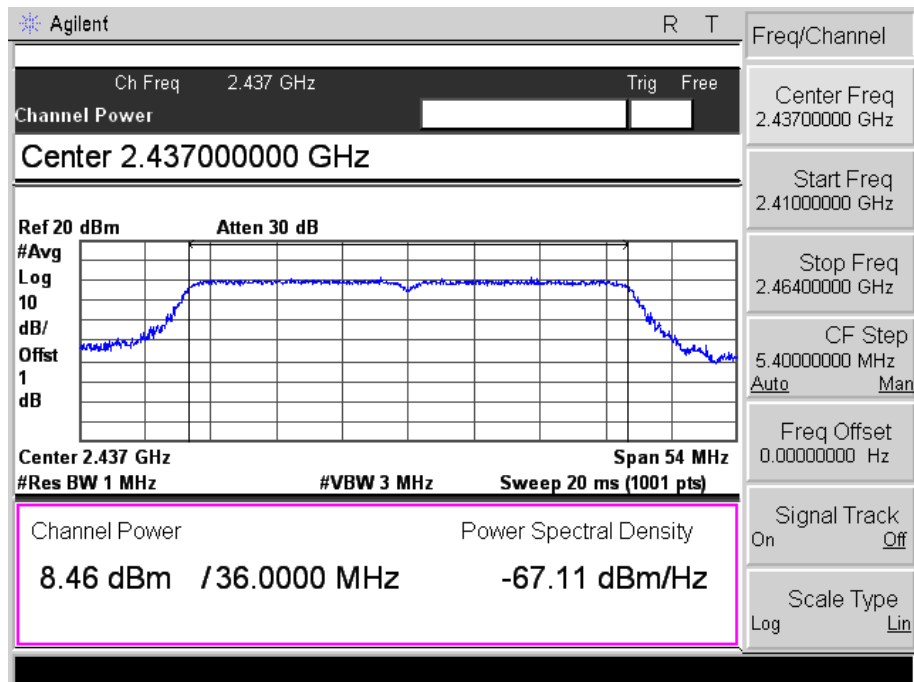
802.11n-HT20-MCS7-High Channel



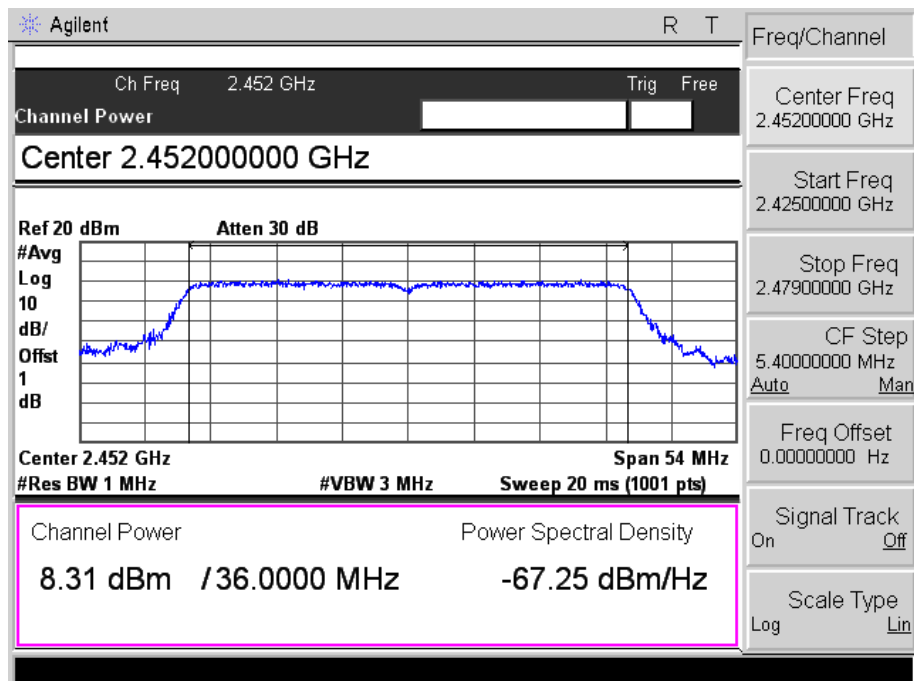
802.11n-HT40-MCS7-Low Channel



802.11n-HT40-MCS7-Middle Channel



802.11n-HT40-MCS7-High Channel



8. Field Strength of Spurious Emissions

8.1 Standard Applicable

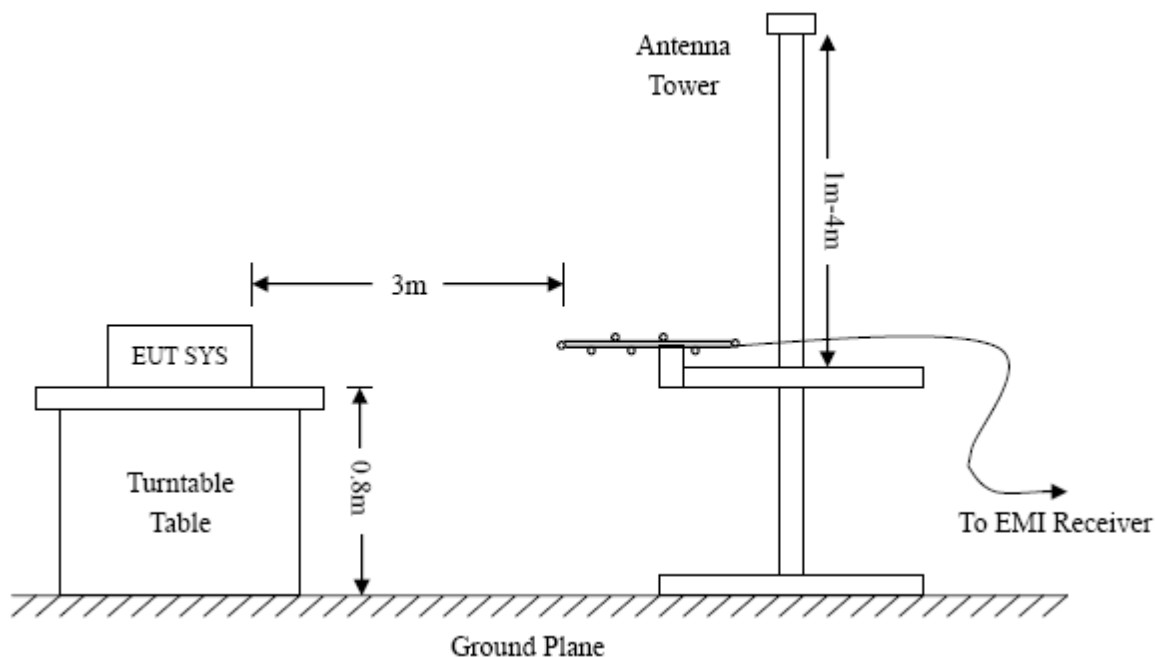
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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).

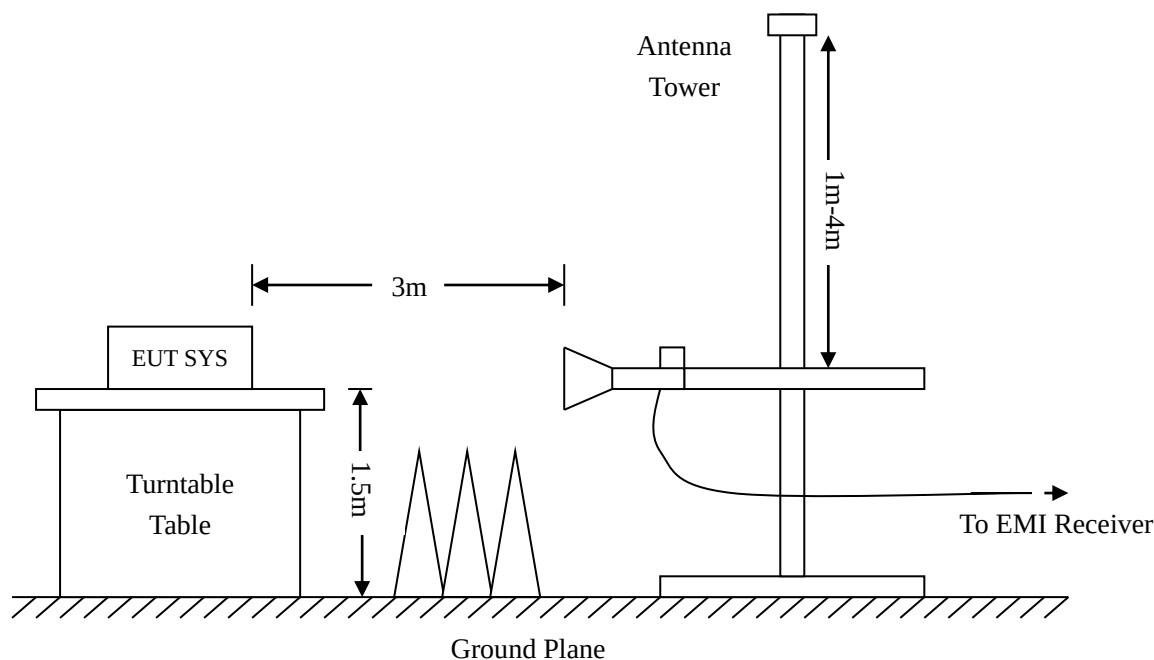
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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)

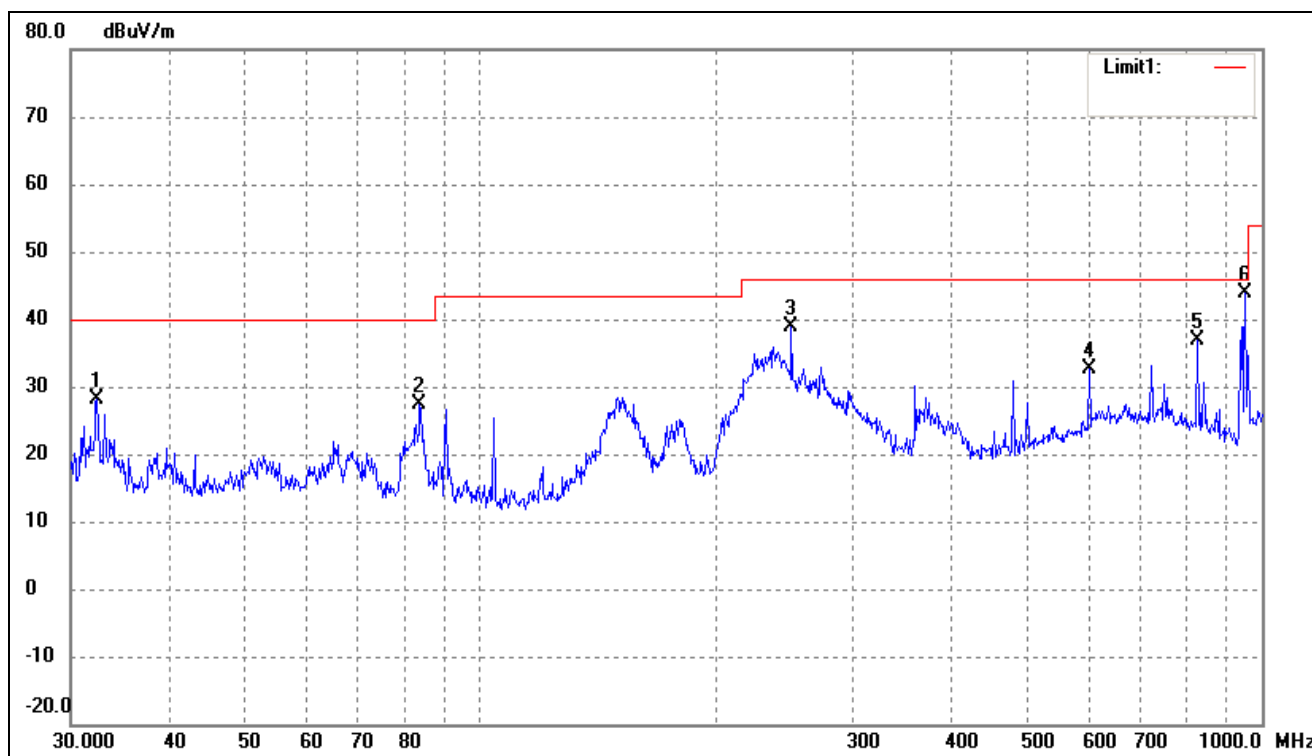
EUT: WIFI module

Tested Model: HLK-RM04

Operating Condition: 802.11b_11Mbps Transmitting Low Channel-2412MHz(worst case)

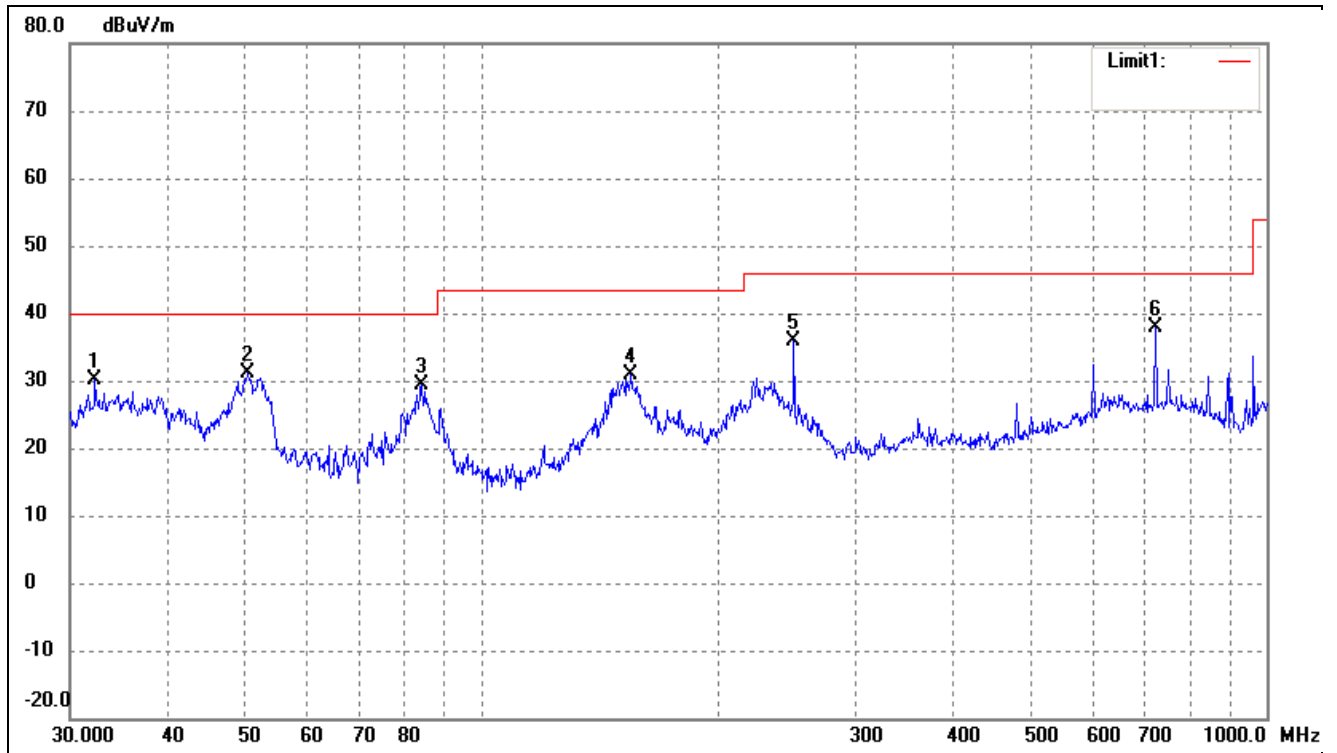
Comment: AC120V 60Hz

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	32.4059	46.01	-17.77	28.24	40.00	-11.76	296	100	peak
2	83.8156	46.63	-19.16	27.47	40.00	-12.53	95	100	peak
3	250.3012	51.13	-12.13	39.00	46.00	-7.00	317	100	peak
4	601.4265	33.04	-0.36	32.68	46.00	-13.32	96	100	peak
5	827.4934	39.51	-2.67	36.84	46.00	-9.16	113	100	peak
6	952.0937	47.54	-3.71	43.83	46.00	-2.17	336	100	peak

Test Specification: Vertical

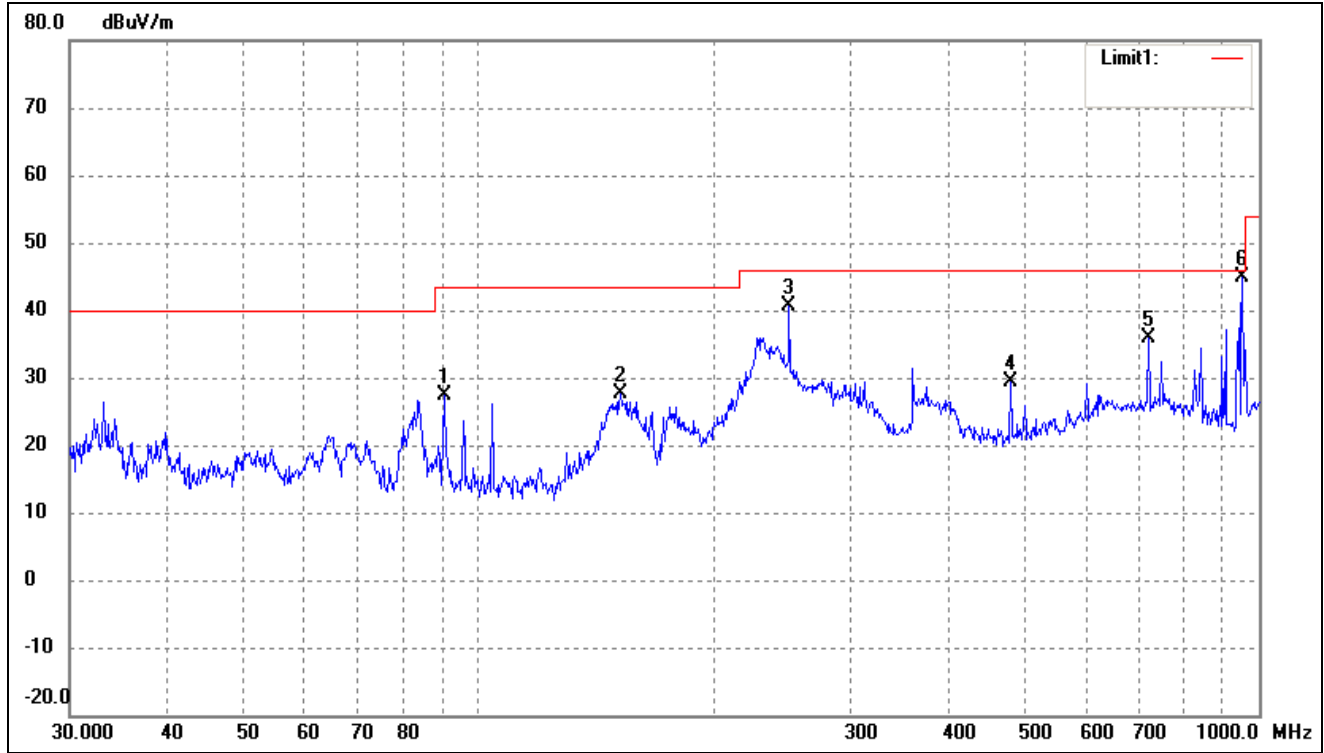


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	32.2925	47.87	-17.79	30.08	40.00	-9.92	322	100	peak
2	50.5860	47.74	-16.53	31.21	40.00	-8.79	99	100	peak
3	84.1100	48.50	-19.11	29.39	40.00	-10.61	68	100	peak
4	155.3644	49.76	-18.94	30.82	43.50	-12.68	93	100	peak
5	250.3012	47.96	-12.13	35.83	46.00	-10.17	224	100	peak
6	721.7259	38.82	-1.02	37.80	46.00	-8.20	203	100	peak

Operating Condition: 802.11b_11Mbps Transmitting Middle Channel-2437MHz(worst case)

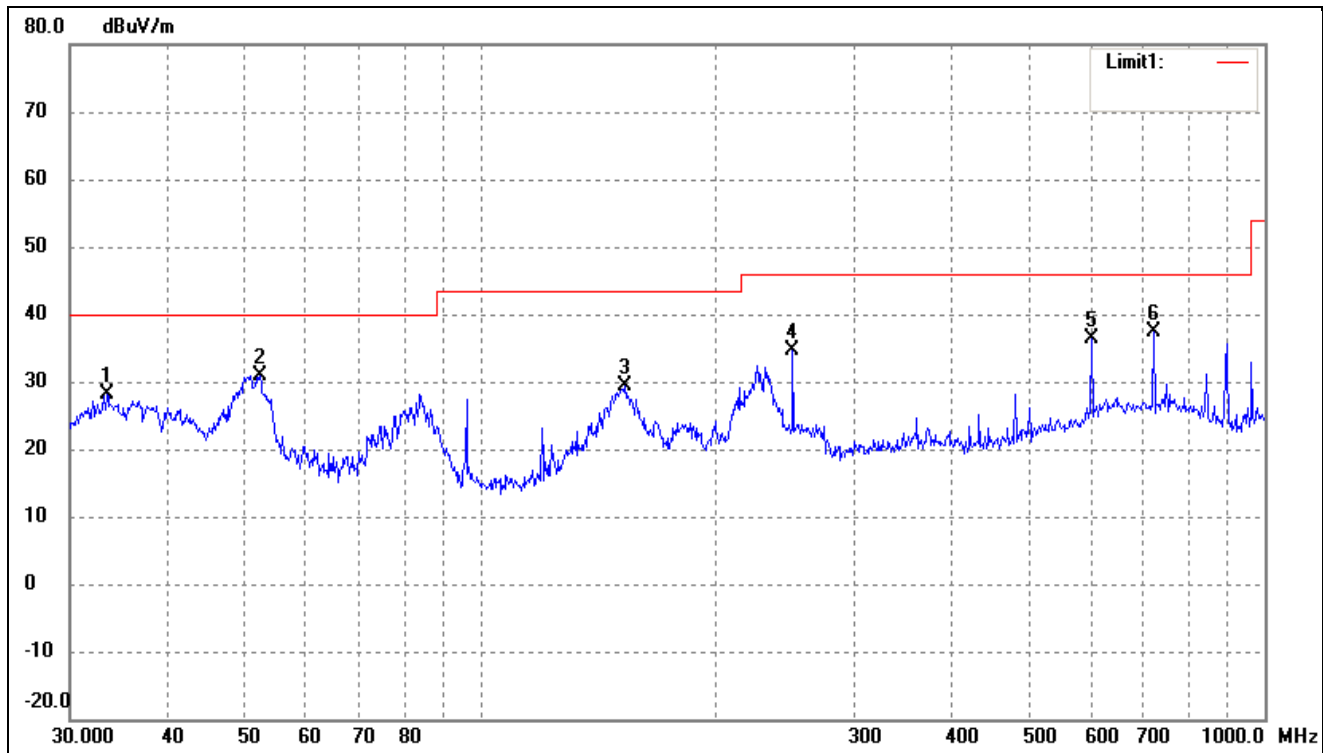
Comment: AC120V 60Hz

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	90.5374	45.40	-18.00	27.40	43.50	-16.10	143	100	peak
2	152.1297	46.42	-18.82	27.60	43.50	-15.90	263	100	peak
3	250.3012	52.65	-12.13	40.52	46.00	-5.48	98	100	peak
4	480.5276	36.12	-6.84	29.28	46.00	-16.72	262	100	peak
5	721.7259	36.82	-1.02	35.80	46.00	-10.20	173	100	peak
6	952.0937	48.62	-3.71	44.91	46.00	-1.09	320	100	peak

Test Specification: Vertical

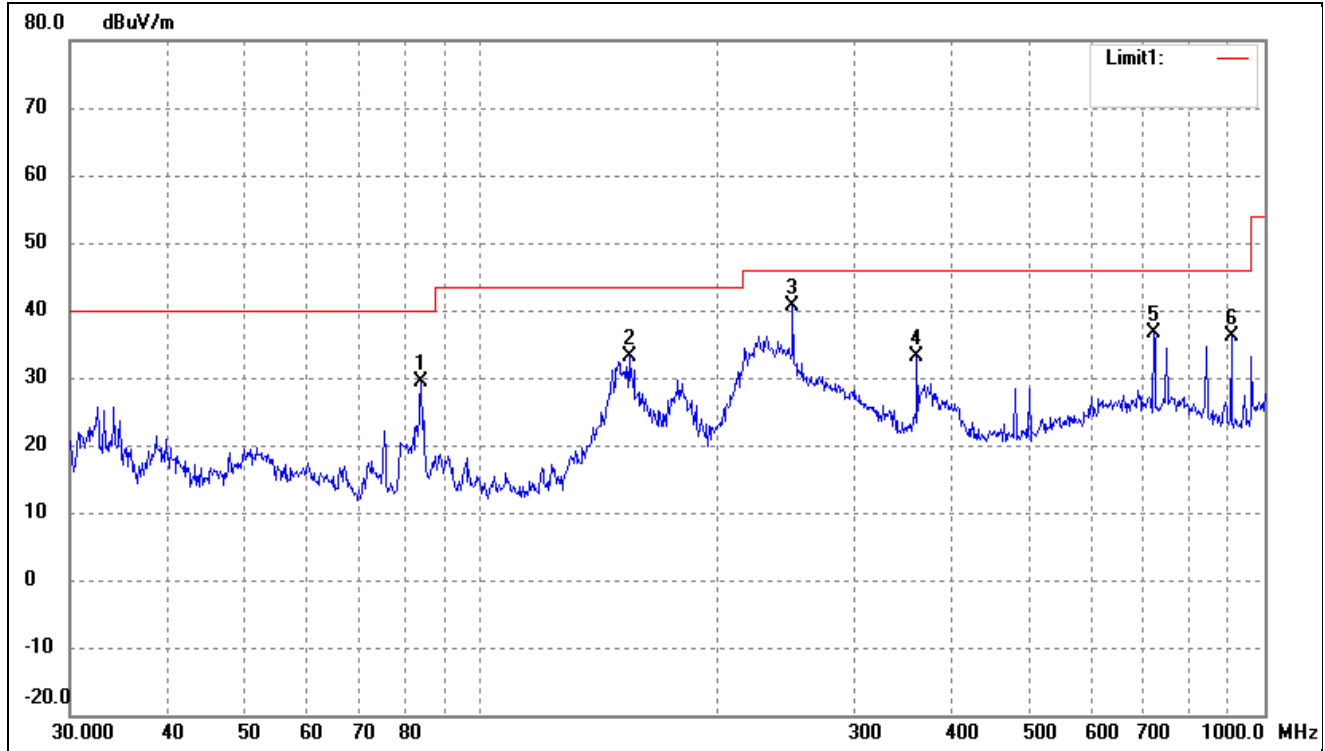


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.4449	45.68	-17.58	28.10	40.00	-11.90	239	100	peak
2	52.3912	47.37	-16.50	30.87	40.00	-9.13	165	100	peak
3	153.2004	48.35	-18.85	29.50	43.50	-14.00	90	100	peak
4	250.3012	46.64	-12.13	34.51	46.00	-11.49	127	100	peak
5	601.4265	36.62	-0.36	36.26	46.00	-9.74	124	100	peak
6	721.7259	38.40	-1.02	37.38	46.00	-8.62	160	100	peak

Operating Condition: 802.11b_11Mbps Transmitting High Channel-2462MHz(worst case)

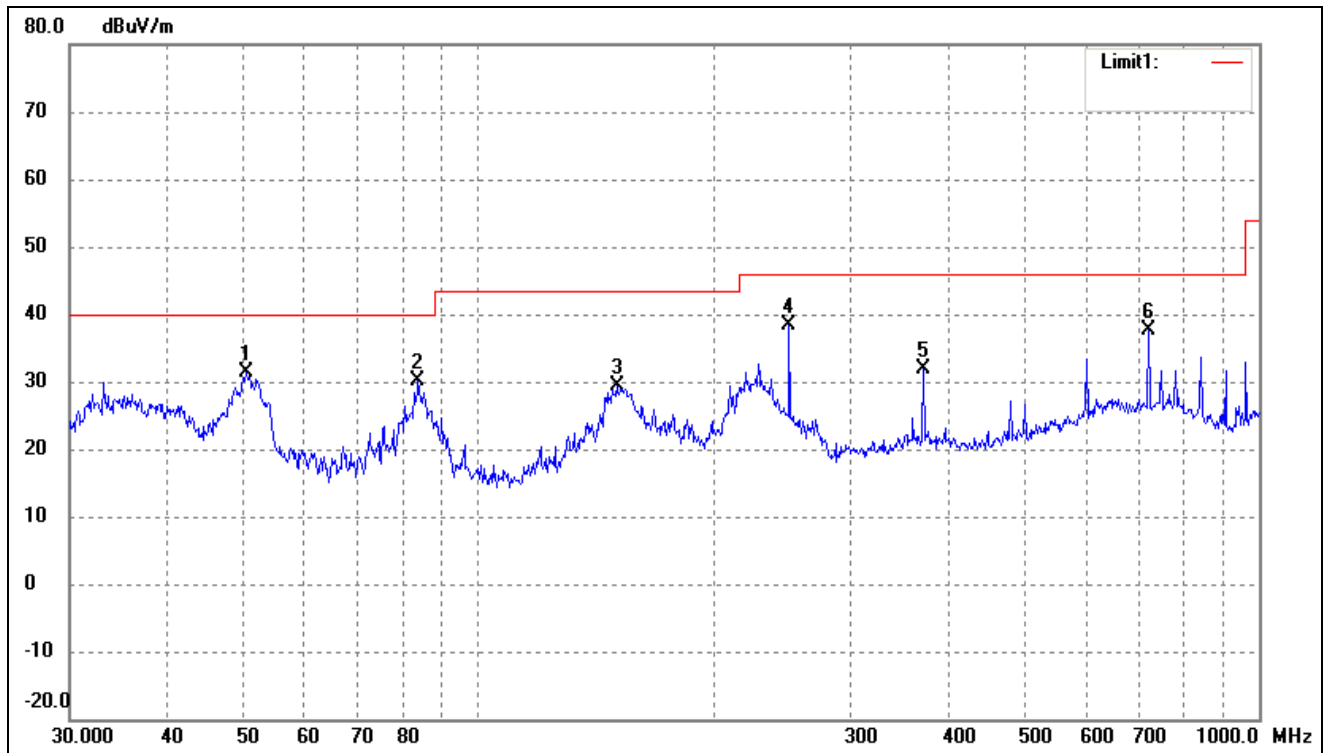
Comment: AC120V 60Hz

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	84.1100	48.43	-19.11	29.32	40.00	-10.68	129	100	peak
2	154.8204	52.17	-18.92	33.25	43.50	-10.25	105	100	peak
3	250.3012	52.79	-12.13	40.66	46.00	-5.34	137	100	peak
4	360.4476	41.97	-8.92	33.05	46.00	-12.95	137	100	peak
5	721.7259	37.74	-1.02	36.72	46.00	-9.28	344	100	peak
6	906.4824	39.46	-3.45	36.01	46.00	-9.99	156	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	50.5860	47.84	-16.53	31.31	40.00	-8.69	53	100	peak
2	83.8156	49.26	-19.16	30.10	40.00	-9.90	149	100	peak
3	150.5378	48.16	-18.74	29.42	43.50	-14.08	146	100	peak
4	250.3012	50.51	-12.13	38.38	46.00	-7.62	123	100	peak
5	372.0045	40.76	-8.88	31.88	46.00	-14.12	299	100	peak
6	721.7259	38.69	-1.02	37.67	46.00	-8.33	331	100	peak

Spurious Emissions Above 1GHz

Test Mode: 802.11b_11Mbps (worst case)

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	59.79	-3.87	55.92	74	-18.08	H	PK
4824.000	43.26	-3.87	39.39	54	-14.61	H	AV
7236.000	52.04	1.14	53.18	74	-20.82	H	PK
7236.000	40.44	1.19	41.63	54	-12.37	H	AV
4824.000	60.76	-3.86	56.9	74	-17.1	V	PK
4824.000	42.31	-3.86	38.45	54	-15.55	V	AV
7236.000	53.39	1.1	54.49	74	-19.51	V	PK
7236.000	40	1.1	41.1	54	-12.9	V	AV
Middle Channel-2437MHz							
4874.000	60.97	-3.74	57.23	74	-16.77	H	PK
4874.000	43.73	-3.74	39.99	54	-14.01	H	AV
7311.000	55.15	1.47	56.62	74	-17.38	H	PK
7311.000	39.97	1.47	41.44	54	-12.56	H	AV
4874.000	60.38	-3.74	56.64	74	-17.36	V	PK
4874.000	43.74	-3.74	40	54	-14	V	AV
7311.000	53.06	1.47	54.53	74	-19.47	V	PK
7311.000	40.37	1.47	41.84	54	-12.16	V	AV
High Channel-2462MHz							
4924.000	59.03	-3.59	55.44	74	-18.56	H	PK
4924.000	42.71	-3.59	39.12	54	-14.88	H	AV
7386.000	53.52	1.79	55.31	74	-18.69	H	PK
7386.000	39.49	1.79	41.28	54	-12.72	H	AV
4924.000	58.15	-3.59	54.56	74	-19.44	V	PK
4924.000	42.69	-3.59	39.1	54	-14.9	V	AV
7386.000	53.56	1.79	55.35	74	-18.65	V	PK
7386.000	39.25	1.79	41.04	54	-12.96	V	AV

Note: Testing is carried out with frequency rang 30MHz 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.

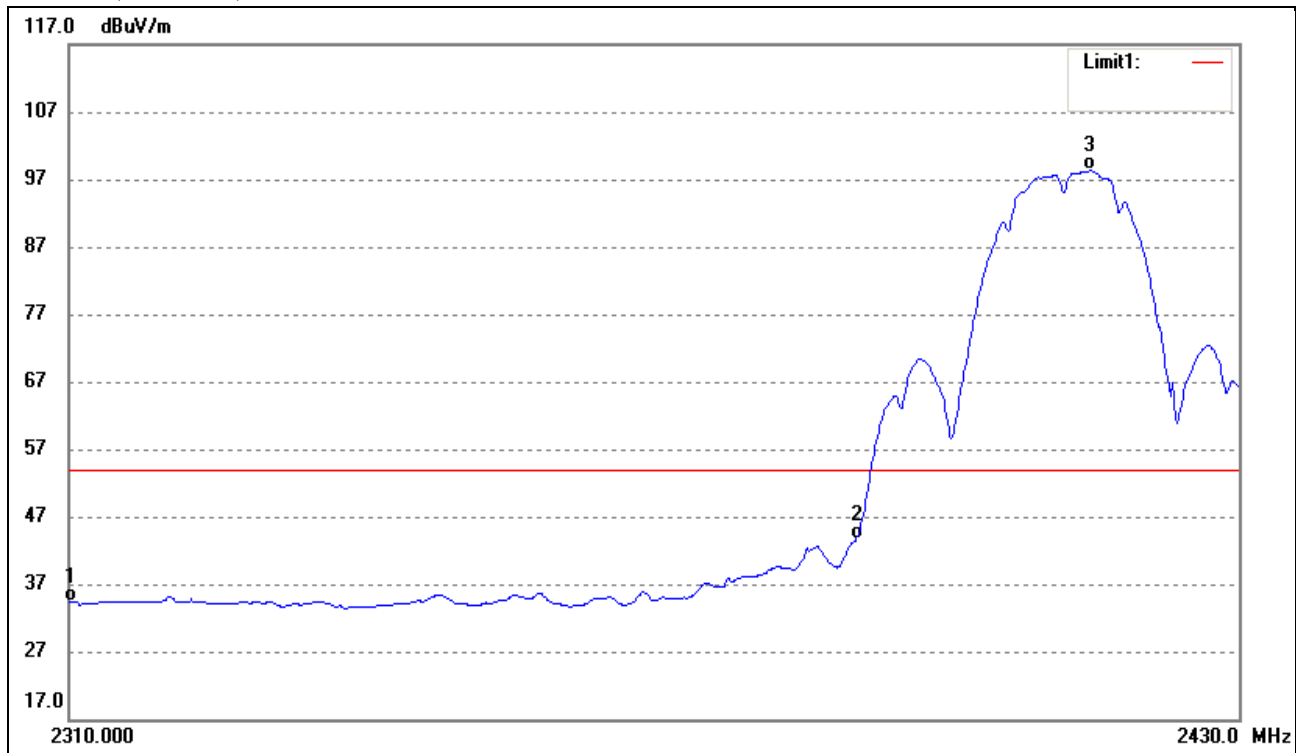
9.3 Environmental Conditions

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

9.4 Summary of Test Results/Plots

802.11b_11Mbps-Lowest Bandedge

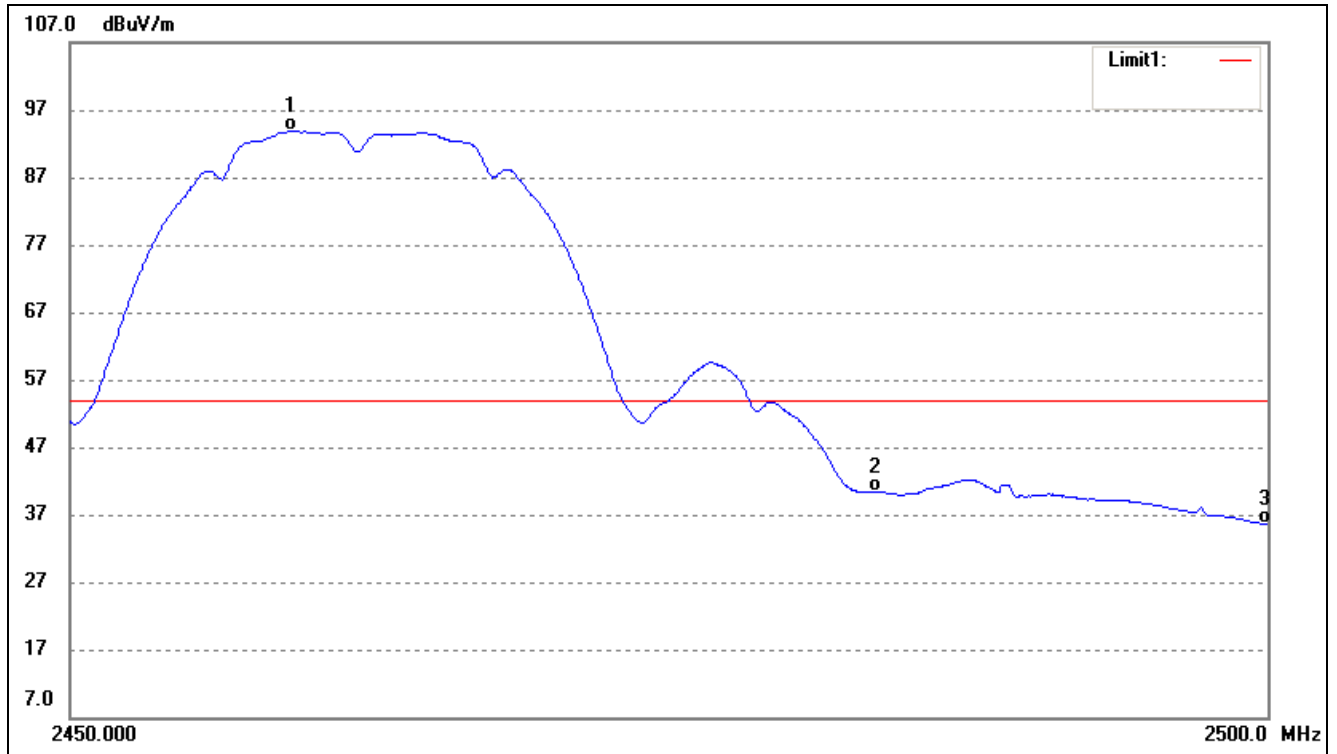
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	40.72	-6.38	34.34	54.00	-19.66	Average Detector
	2310.000	55.77	-6.38	49.39	74.00	-24.61	Peak Detector
2	2390.000	50.96	-7.26	43.70	54.00	-10.30	Average Detector
	2390.000	66.60	-7.26	59.34	74.00	-14.66	Peak Detector
3	2414.421	105.76	-7.40	98.36	/	/	Average Detector
	2413.076	110.74	-7.40	103.34	/	/	Peak Detector

802.11b_11Mbps-Highest Bandedge

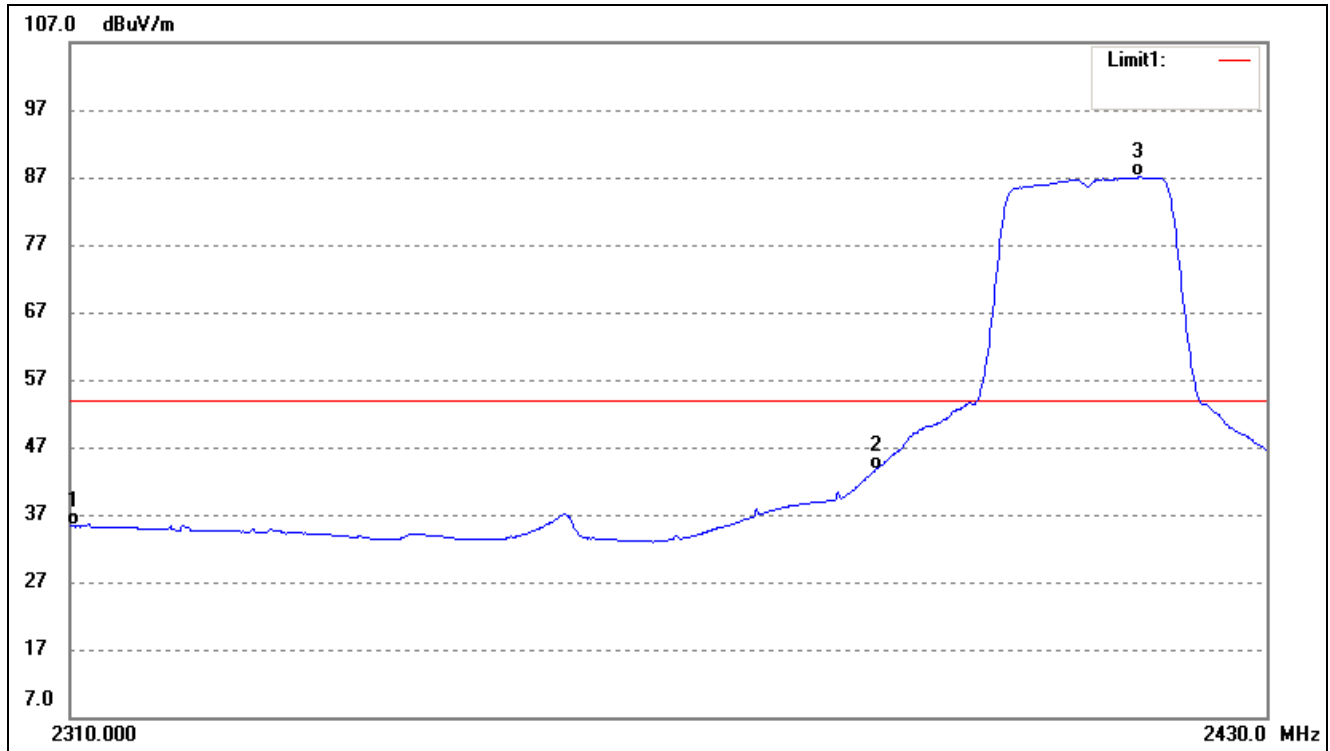
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2459.174	101.23	-7.33	93.90	/	/	Average Detector
	2460.466	106.51	-7.32	99.19	/	/	Peak Detector
2	2483.500	47.67	-7.28	40.39	54.00	-13.61	Average Detector
	2483.500	63.48	-7.28	56.20	74.00	-17.80	Peak Detector
3	2500.000	42.77	-7.25	35.52	54.00	-18.48	Average Detector
	2500.000	57.08	-7.25	49.83	74.00	-24.17	Peak Detector

802.11g_54Mbps-Lowest Bandedge

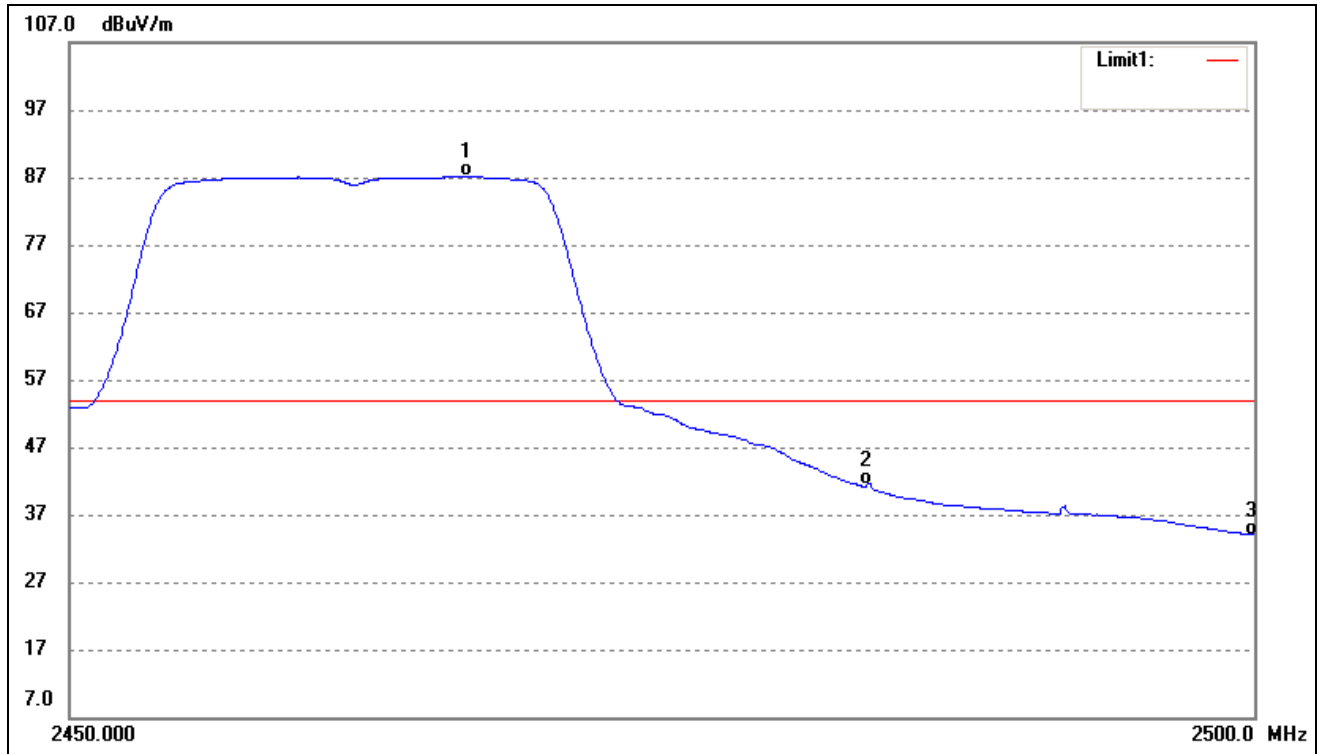
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	41.72	-6.38	35.34	54.00	-18.66	Average Detector
	2310.000	55.63	-6.38	49.25	74.00	-24.75	Peak Detector
2	2390.000	50.87	-7.26	43.61	54.00	-10.39	Average Detector
	2390.000	66.10	-7.26	58.84	74.00	-15.16	Peak Detector
3	2416.868	94.41	-7.39	87.02	/	/	Average Detector
	2417.725	105.45	-7.39	98.06	/	/	Peak Detector

802.11g_54Mbps-Highest Bandedge

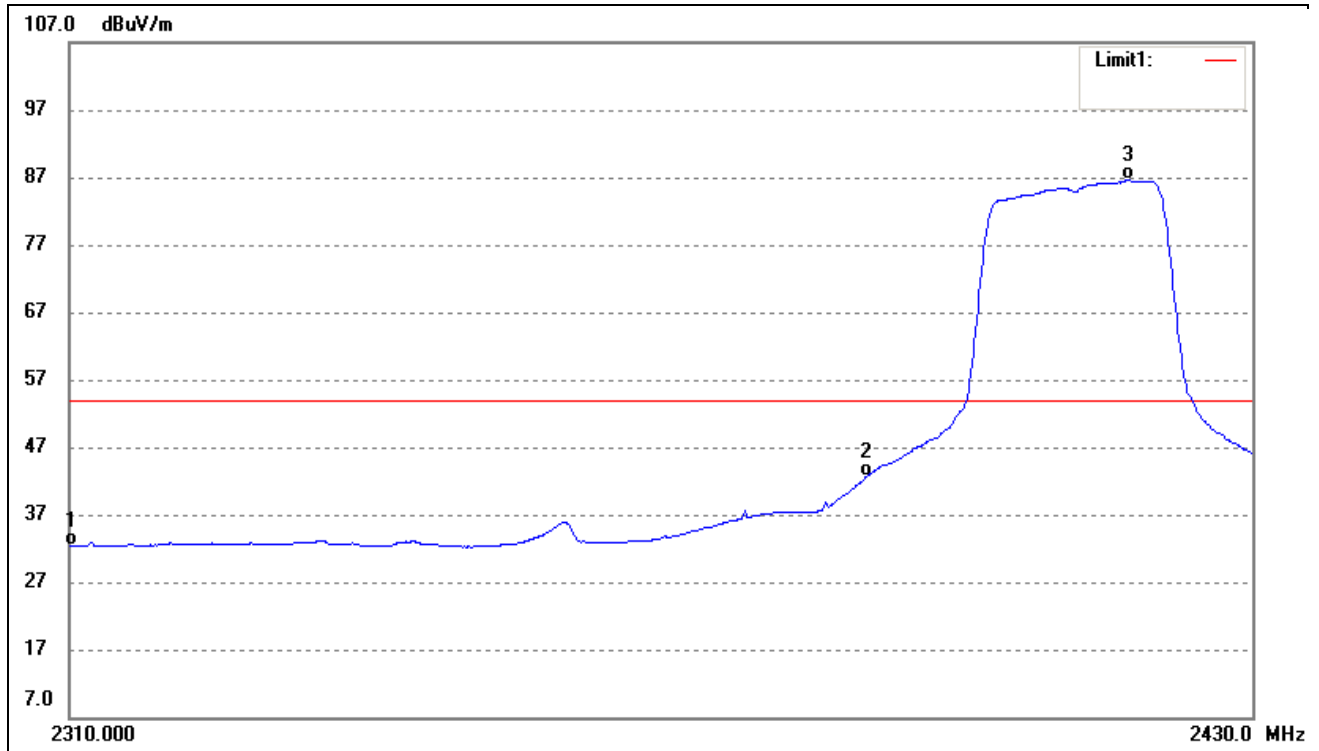
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2466.638	94.41	-7.30	87.11	/	/	Average Detector
	2457.188	107.55	-7.33	100.22	/	/	Peak Detector
2	2483.500	48.70	-7.28	41.42	54.00	-12.58	Average Detector
	2483.500	65.99	-7.28	58.71	74.00	-15.29	Peak Detector
3	2500.000	41.24	-7.25	33.99	54.00	-20.01	Average Detector
	2500.000	58.74	-7.25	51.49	74.00	-22.51	Peak Detector

802.11n-HT20_MCS7-Lowest Bandedge

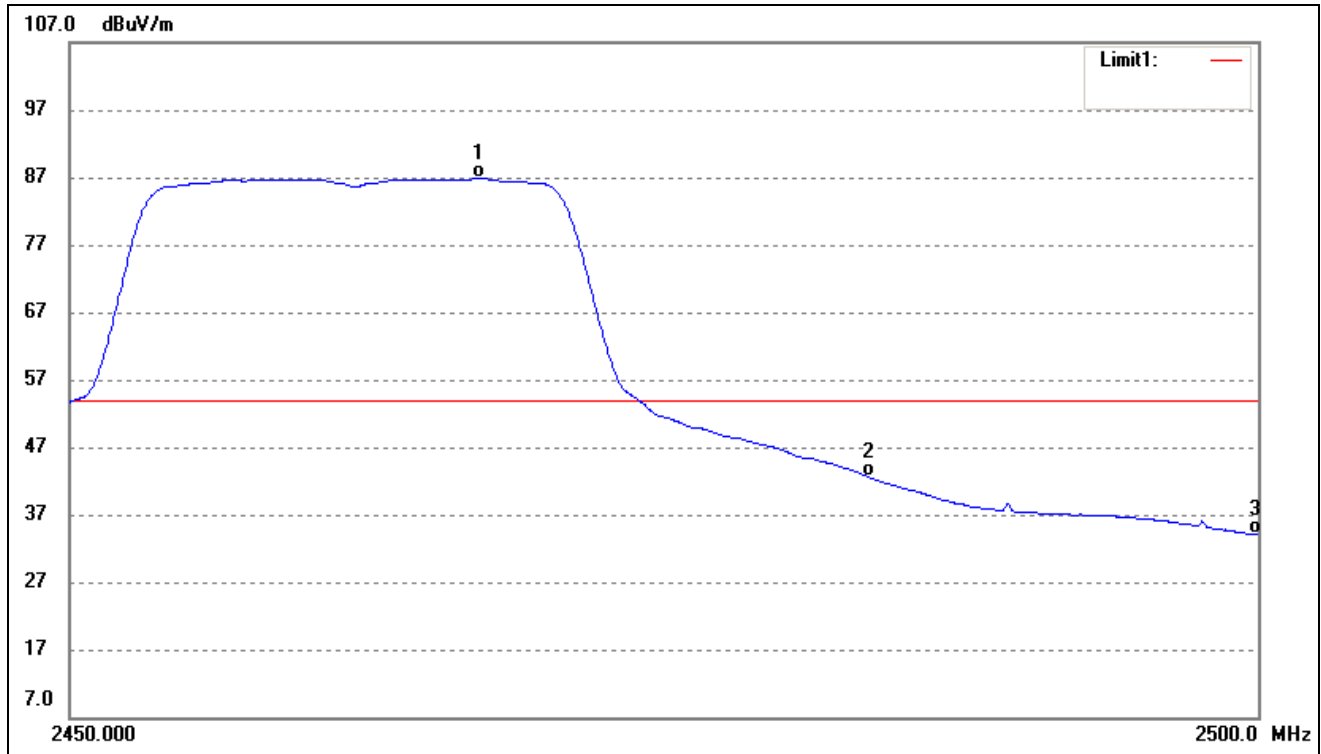
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	38.86	-6.38	32.48	54.00	-21.52	Average Detector
	2310.000	50.21	-6.38	43.83	74.00	-30.17	Peak Detector
2	2390.000	49.77	-7.26	42.51	54.00	-11.49	Average Detector
	2390.000	67.92	-7.26	60.66	74.00	-13.34	Peak Detector
3	2417.113	93.95	-7.39	86.56	/	/	Average Detector
	2416.868	104.91	-7.39	97.52	/	/	Peak Detector

802.11n-HT20_MCS7-Highest Bandedge

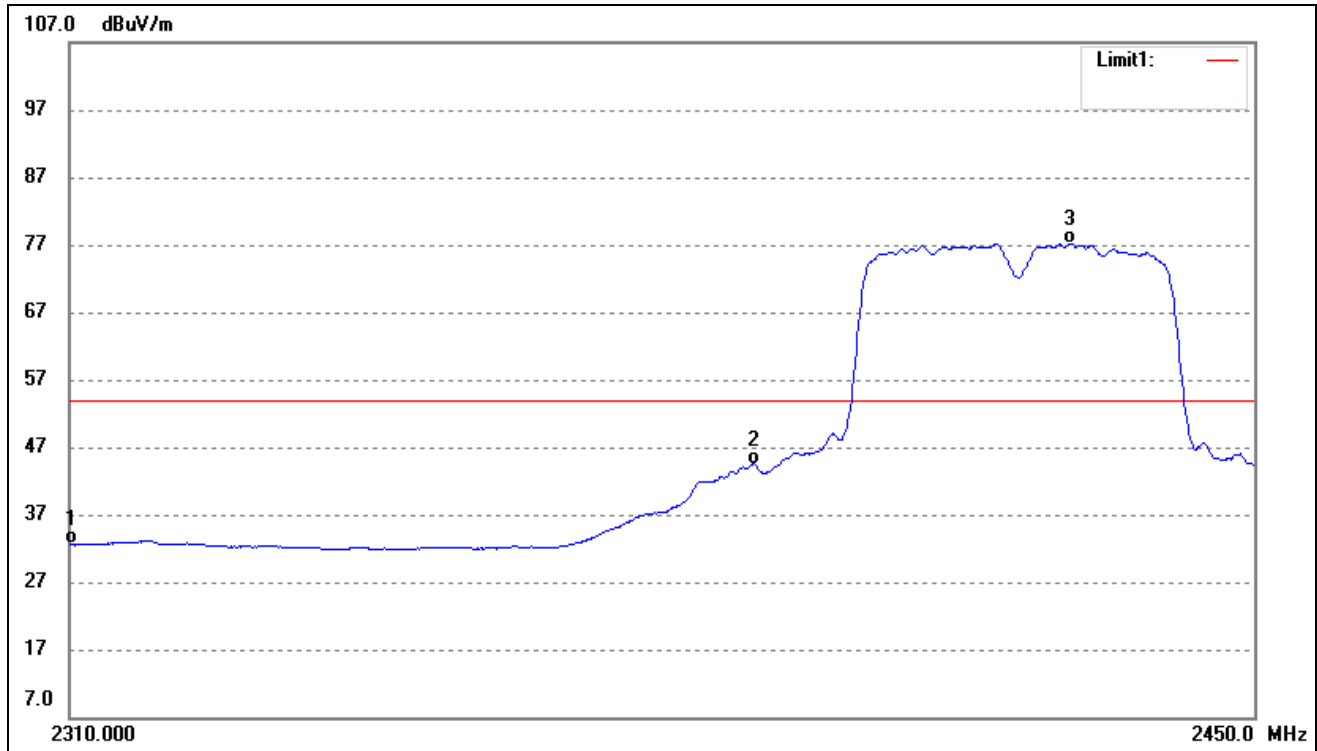
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2467.086	94.14	-7.30	86.84	/	/	Average Detector
	2465.392	105.16	-7.31	97.85	/	/	Peak Detector
2	2483.500	49.82	-7.28	42.54	54.00	-11.46	Average Detector
	2483.500	66.14	-7.28	58.86	74.00	-15.14	Peak Detector
3	2500.000	41.30	-7.25	34.05	54.00	-19.95	Average Detector
	2500.000	56.08	-7.25	48.83	74.00	-25.17	Peak Detector

802.11n-HT40_MCS7-Lowest Bandedge

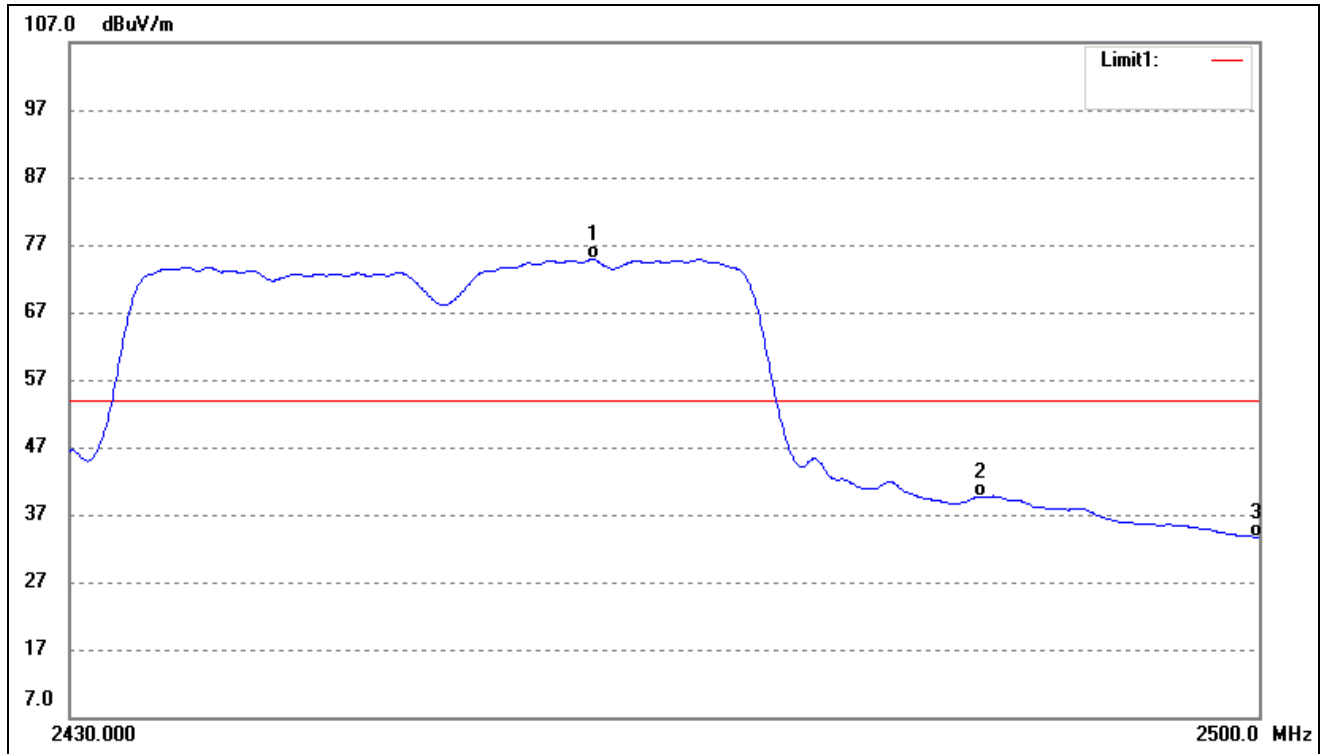
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.92	-6.38	32.54	54.00	-21.46	Average Detector
	2310.000	54.71	-6.38	48.33	74.00	-25.67	Peak Detector
2	2390.000	51.69	-7.26	44.43	54.00	-9.57	Average Detector
	2390.000	74.29	-7.26	67.03	74.00	-6.97	Peak Detector
3	2427.757	84.57	-7.38	77.19	/	/	Average Detector
	2431.045	104.31	-7.37	96.94	/	/	Peak Detector

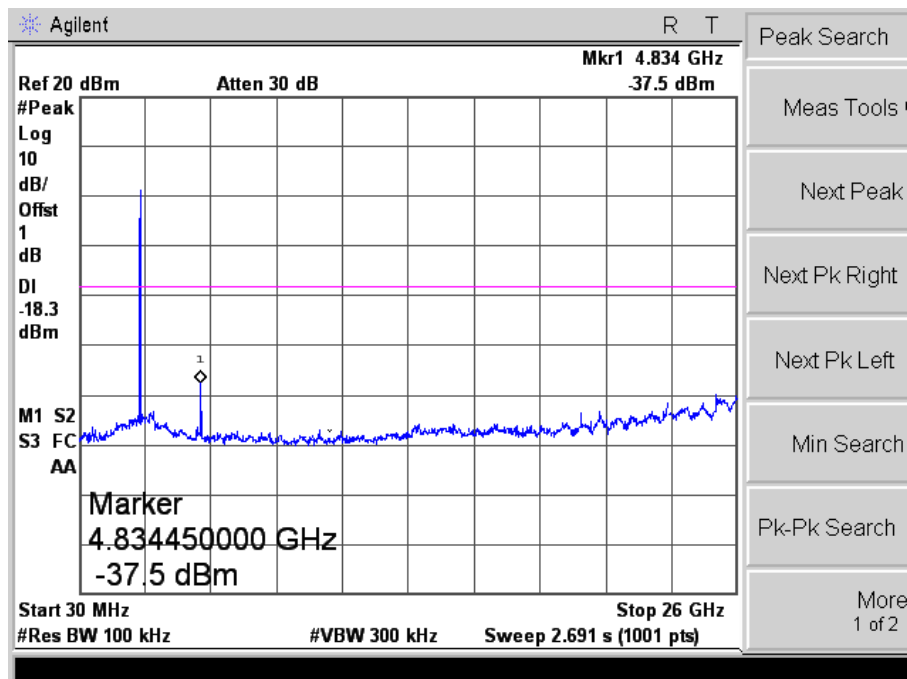
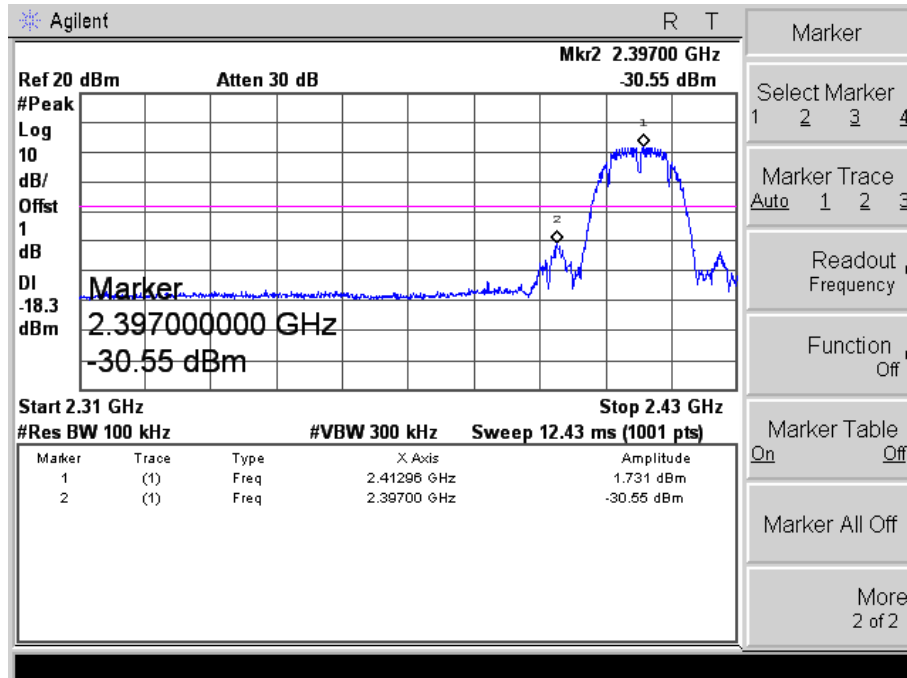
802.11n-HT40_MCS7-Highest Bandedge

Vertical (Worst case)

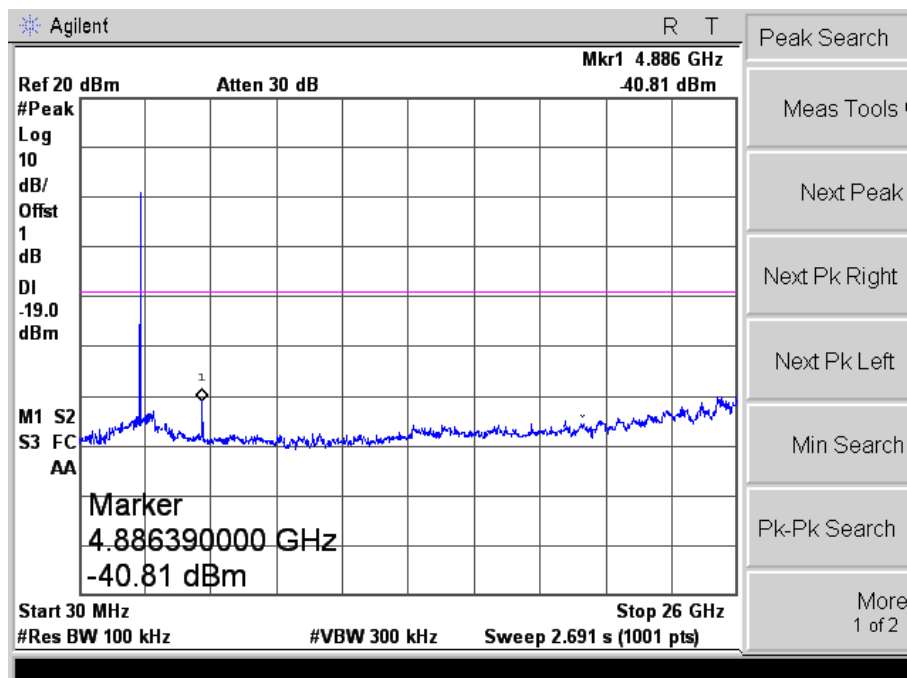
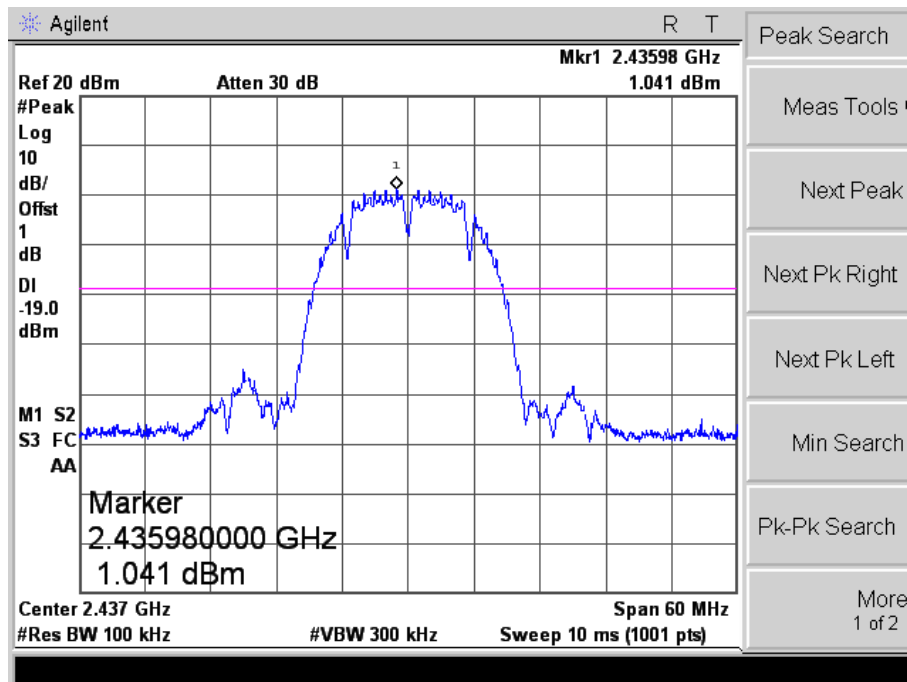


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.555	82.19	-7.32	74.87	/	/	Average Detector
	2462.582	102.46	-7.31	95.15	/	/	Peak Detector
2	2483.500	46.93	-7.28	39.65	54.00	-14.35	Average Detector
	2483.500	65.56	-7.28	58.28	74.00	-15.72	Peak Detector
3	2500.000	40.86	-7.25	33.61	54.00	-20.39	Average Detector
	2500.000	61.12	-7.25	53.87	74.00	-20.13	Peak Detector

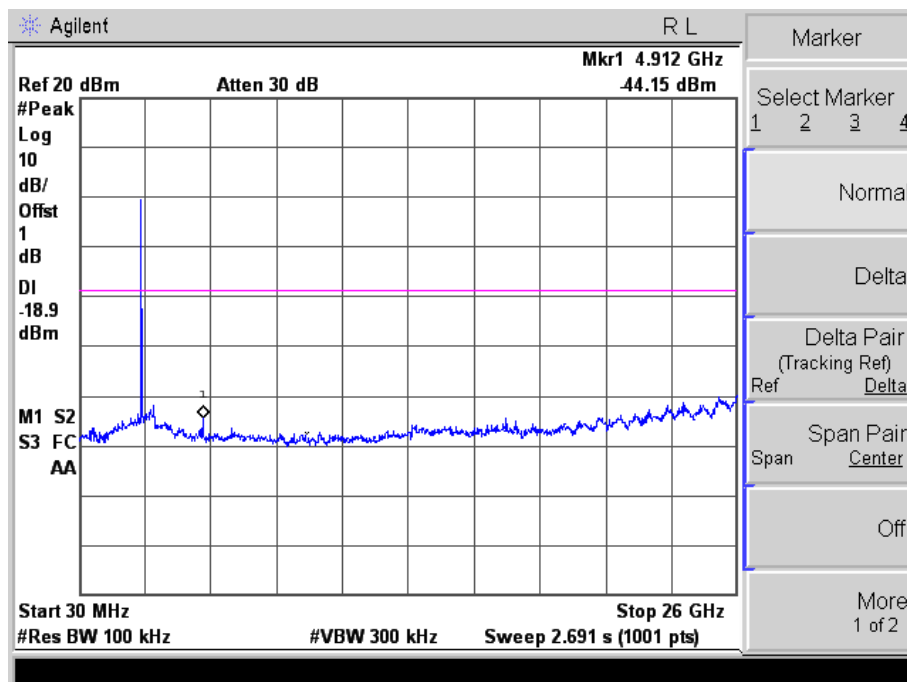
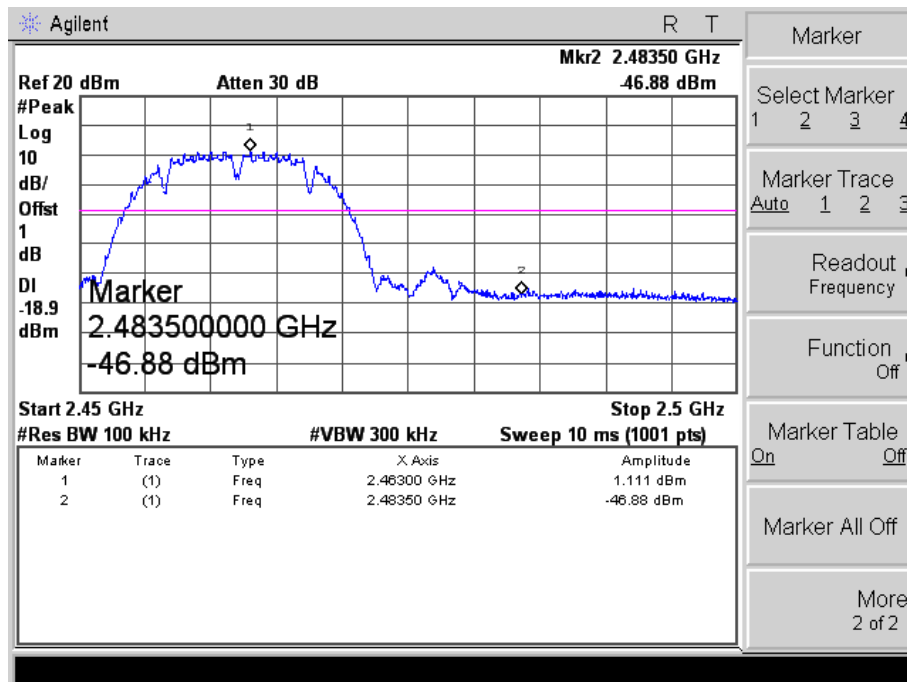
Spurious (Conducted)
802.11b_11Mbps-Lowest
Lowest



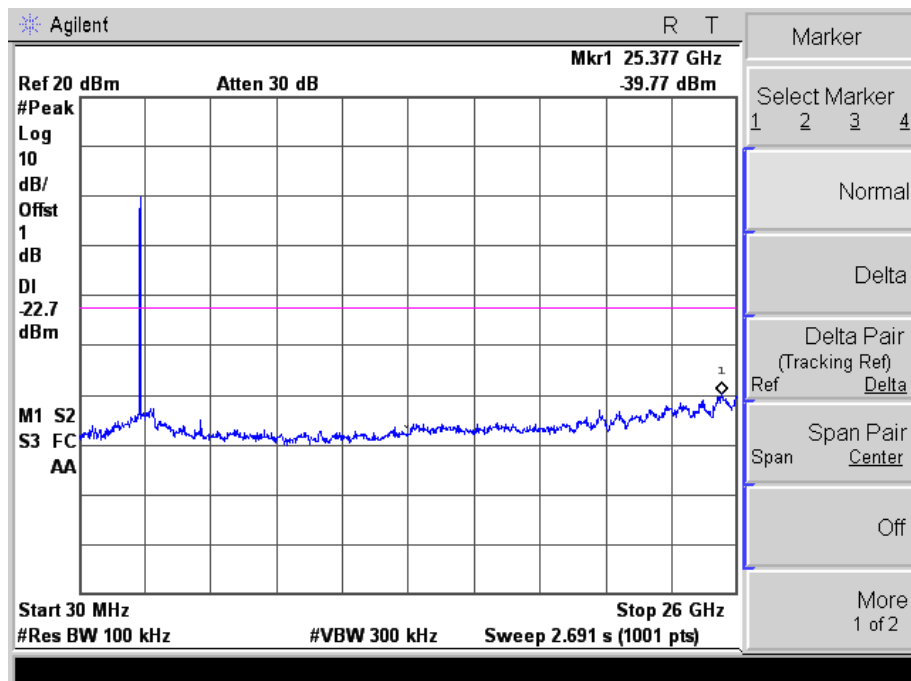
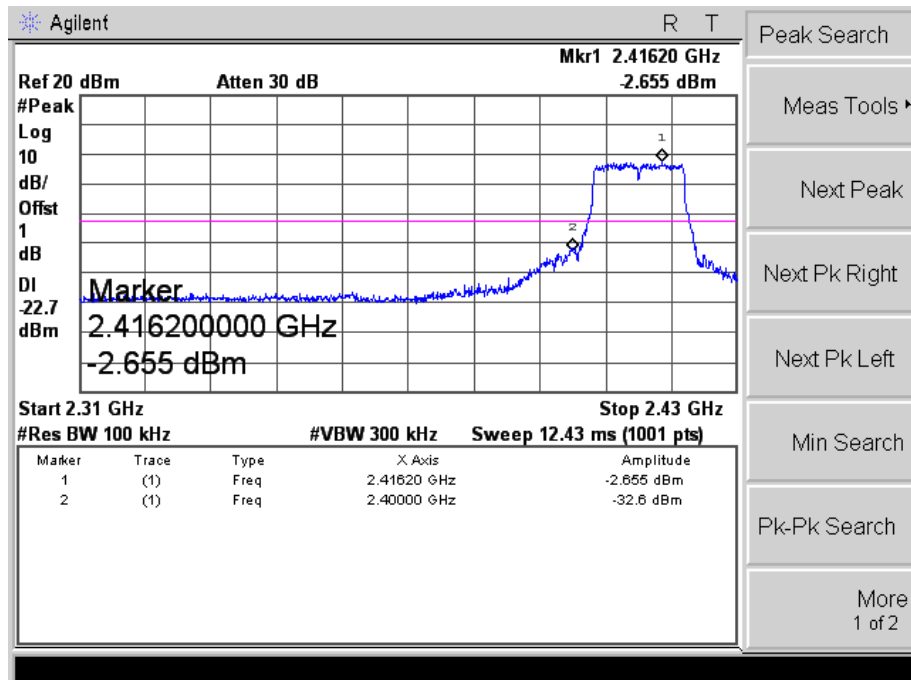
Middle



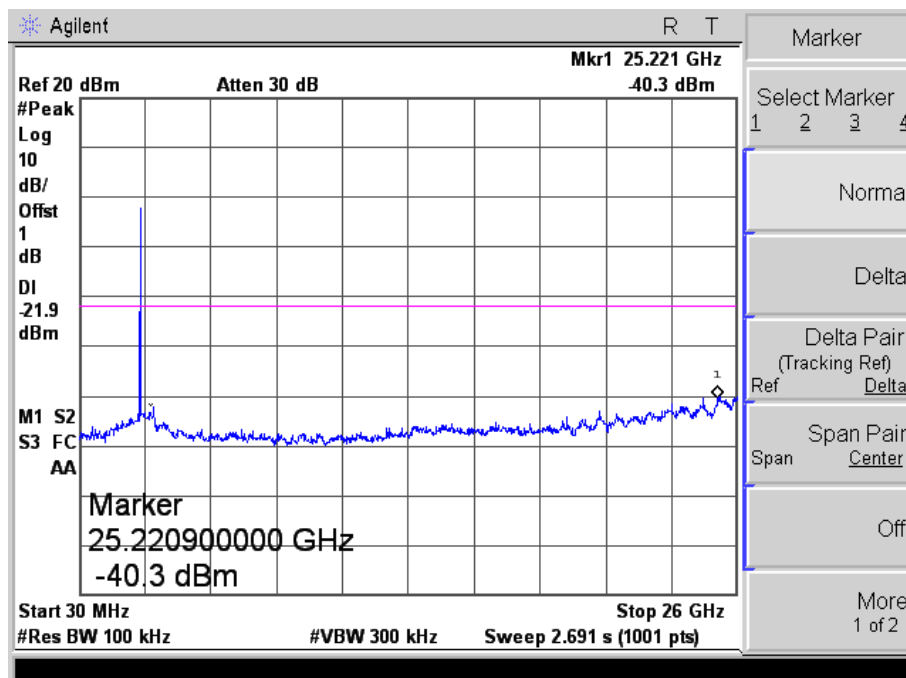
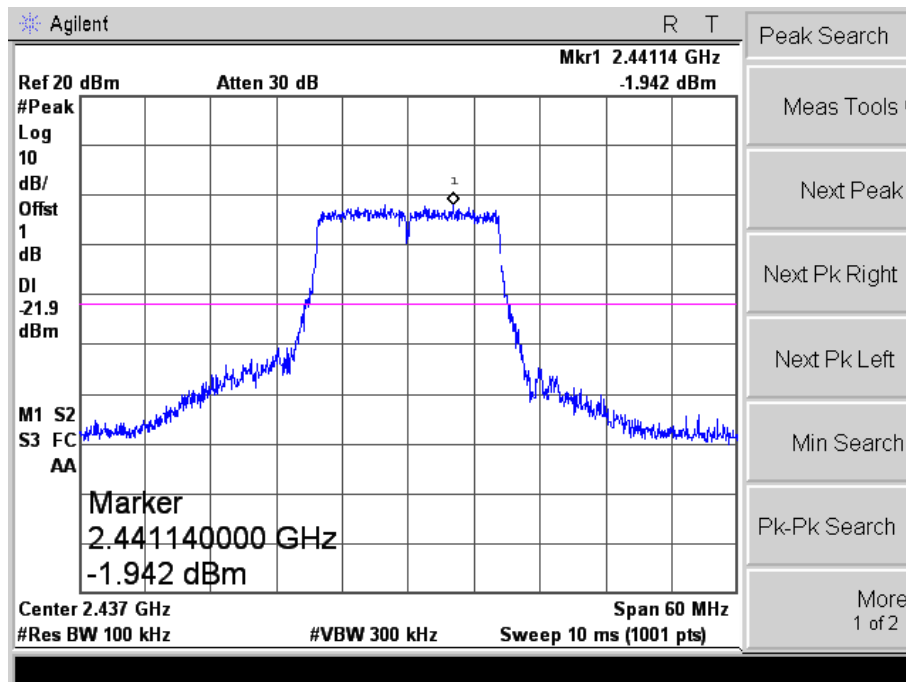
Highest



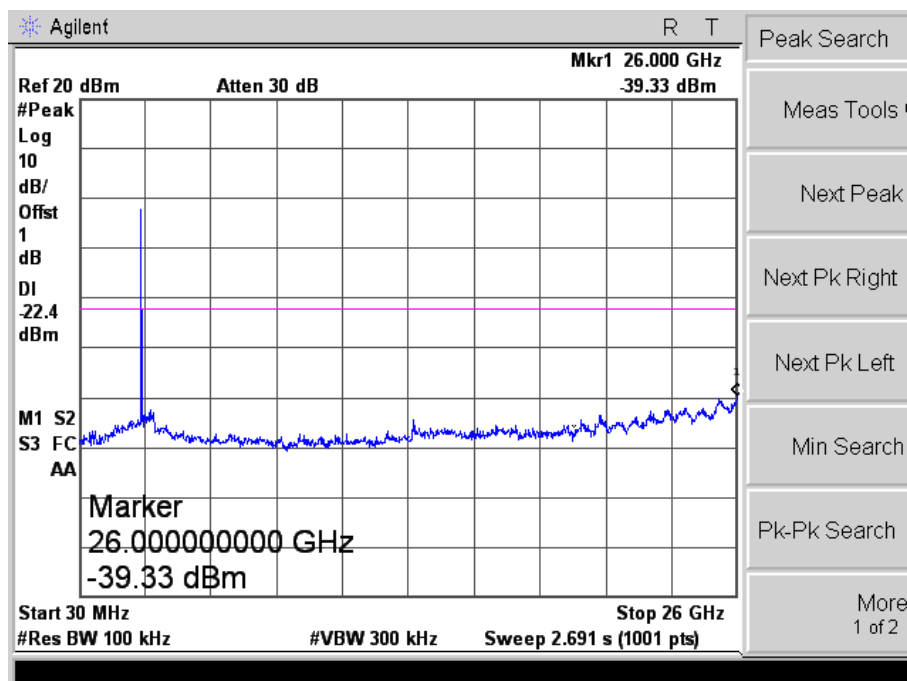
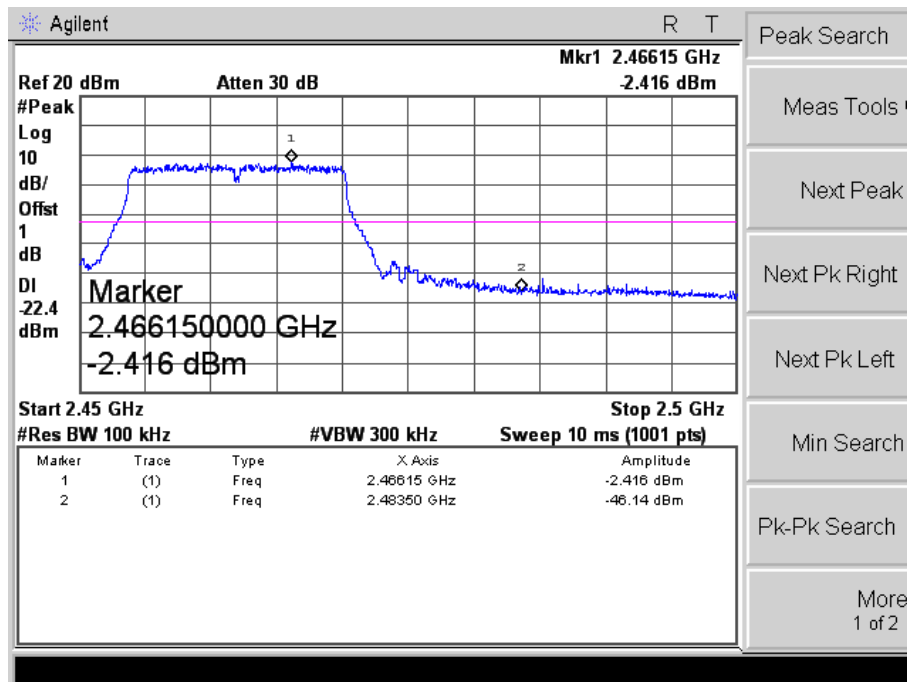
Spurious (Conducted)
802.11g_54Mbps-Lowest
Lowest



Middle



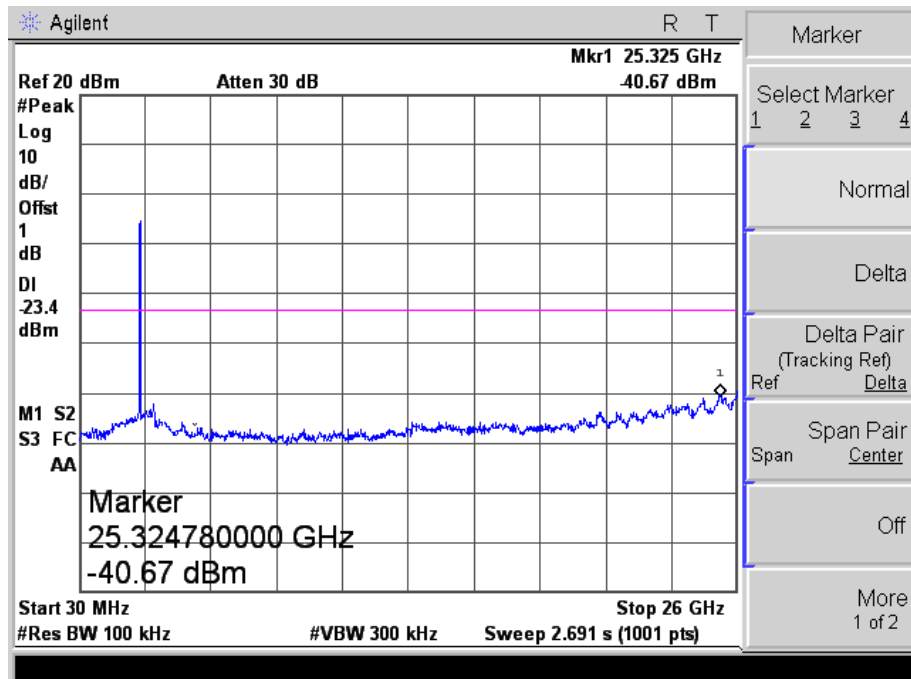
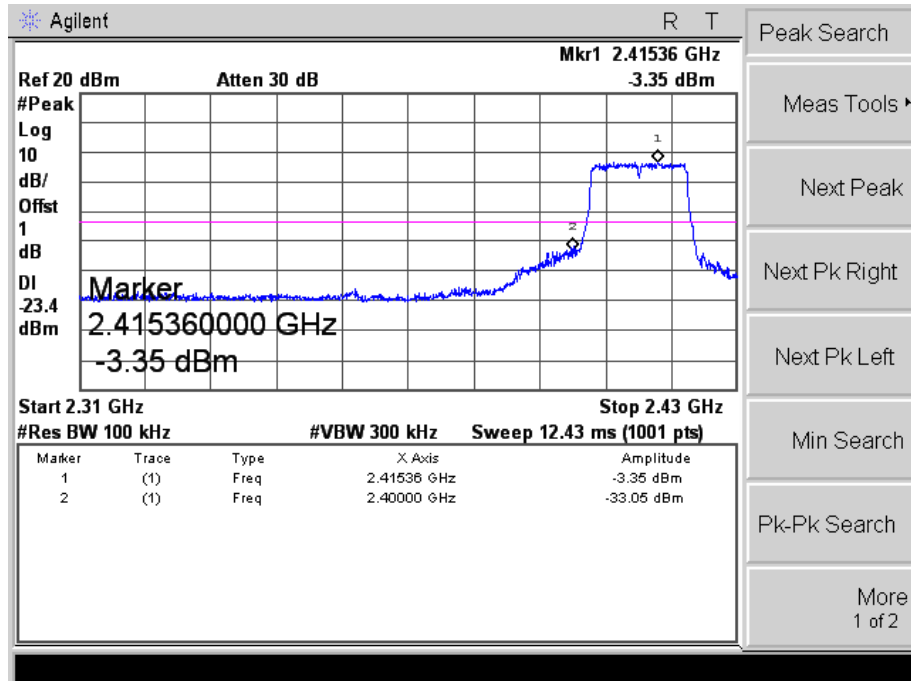
Highest



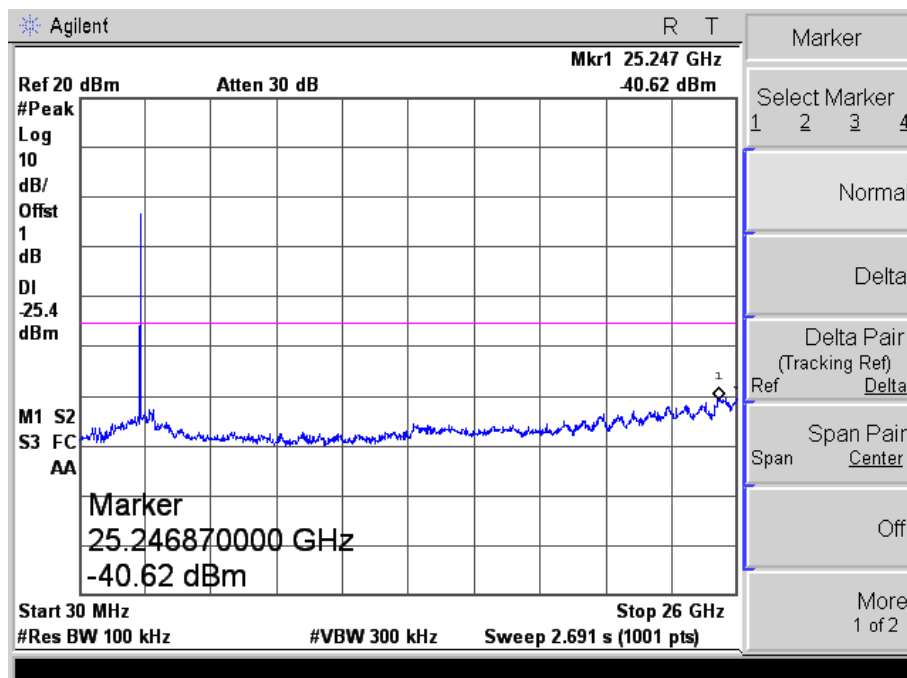
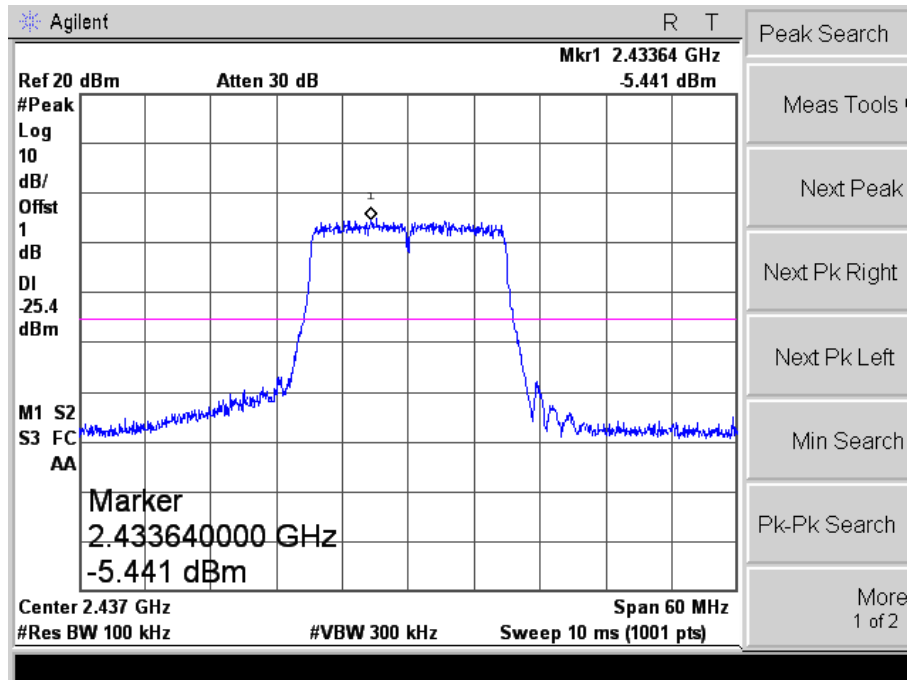
Spurious (Conducted)

802.11n-HT20_MCS7-Lowest

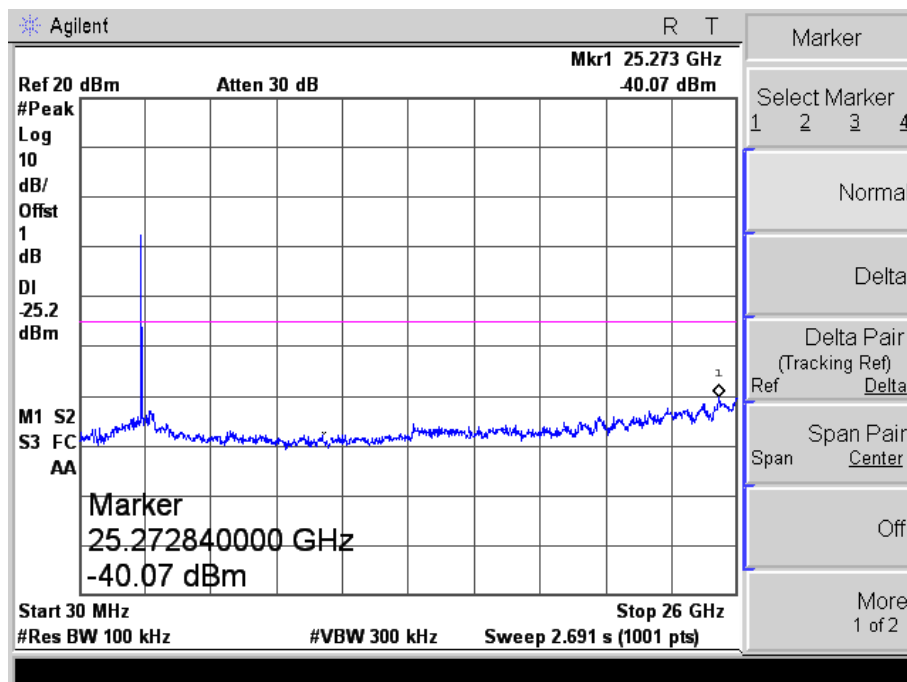
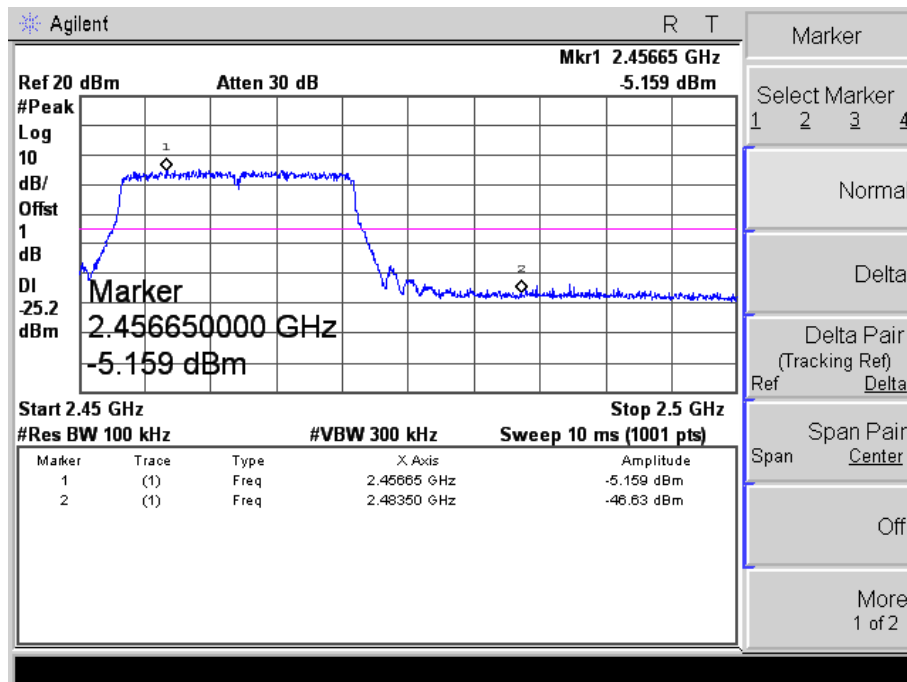
Lowest



Middle



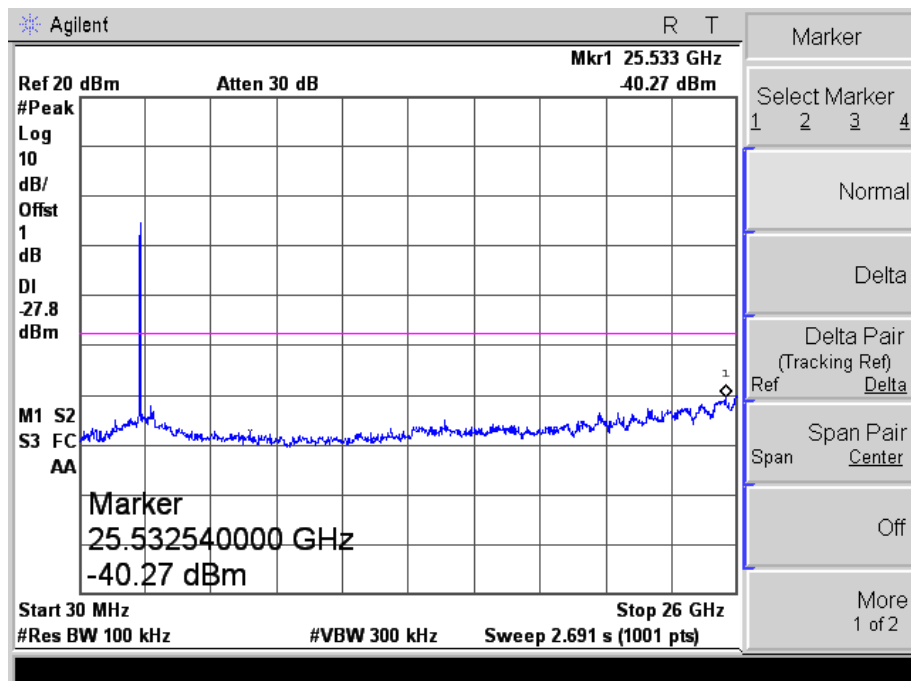
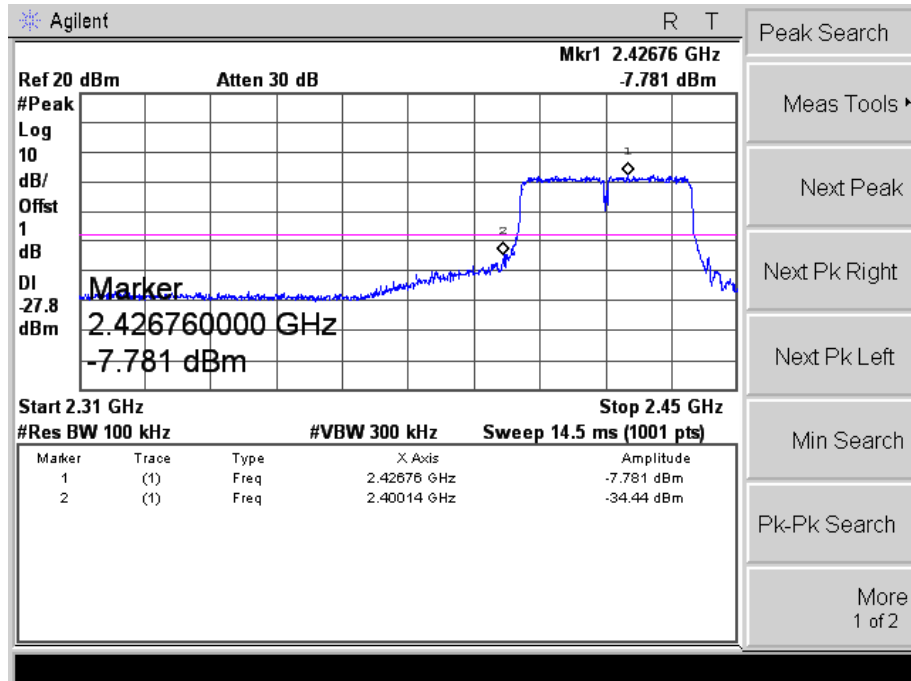
Highest



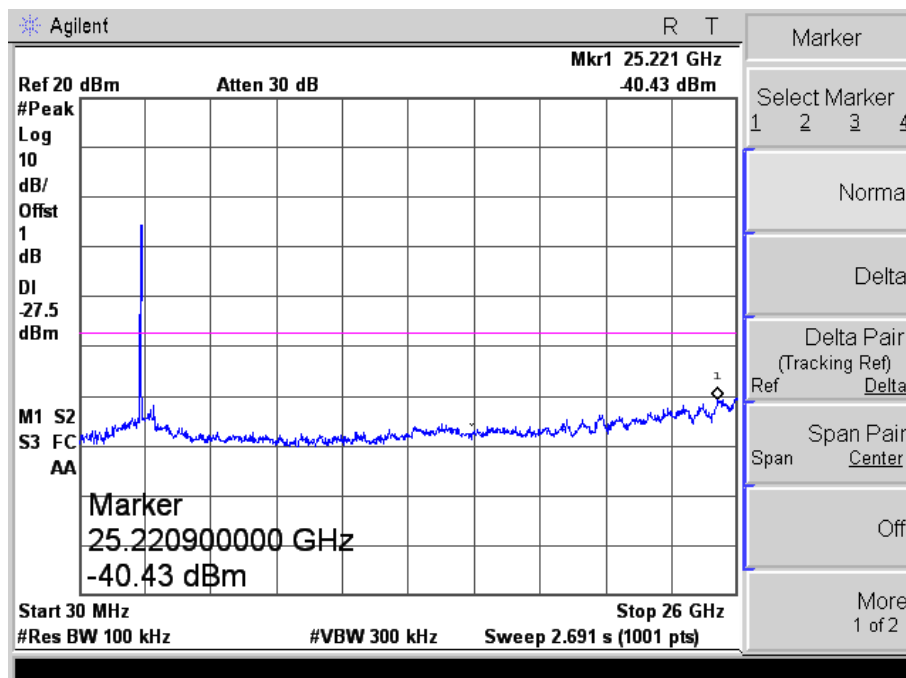
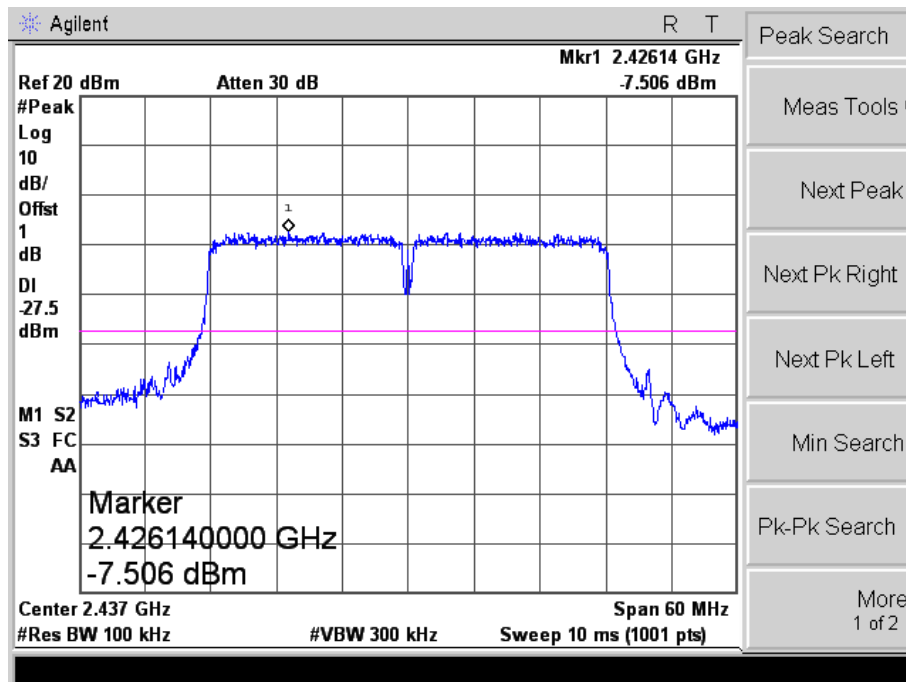
Spurious (Conducted)

802.11n-HT40_MCS7-Lowest

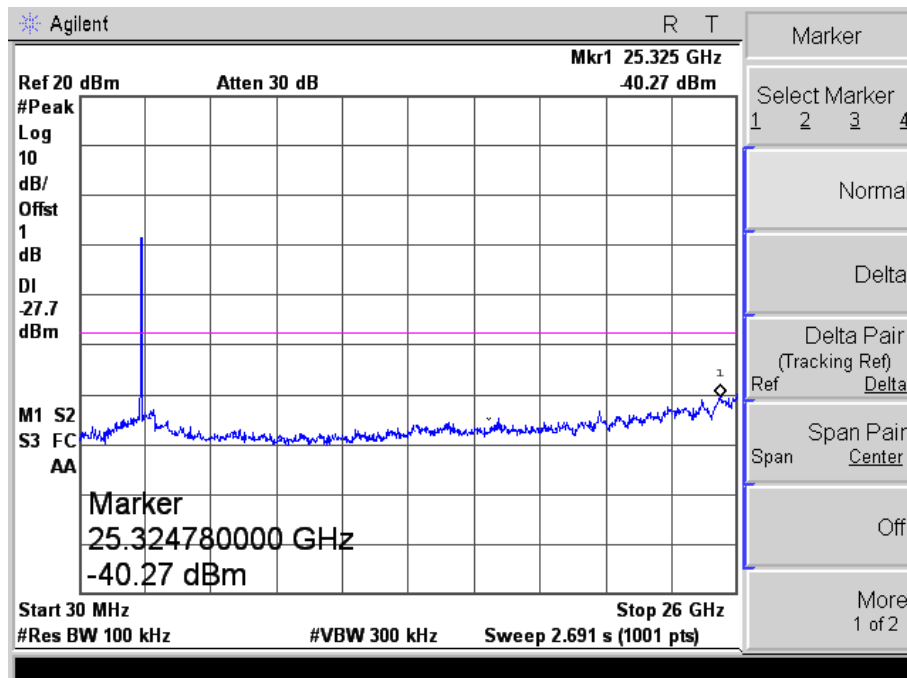
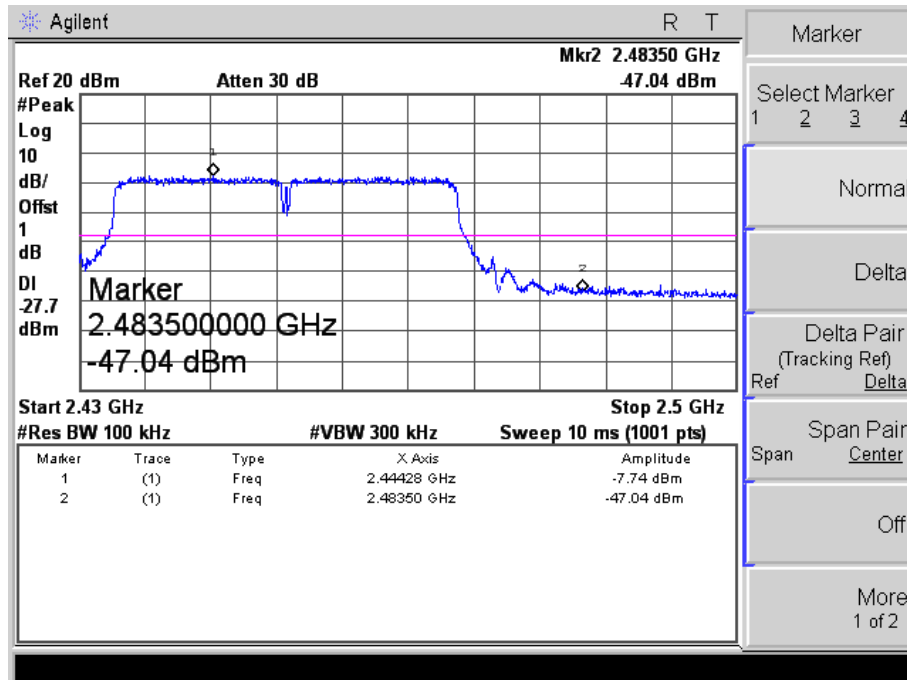
Lowest



Middle



Highest



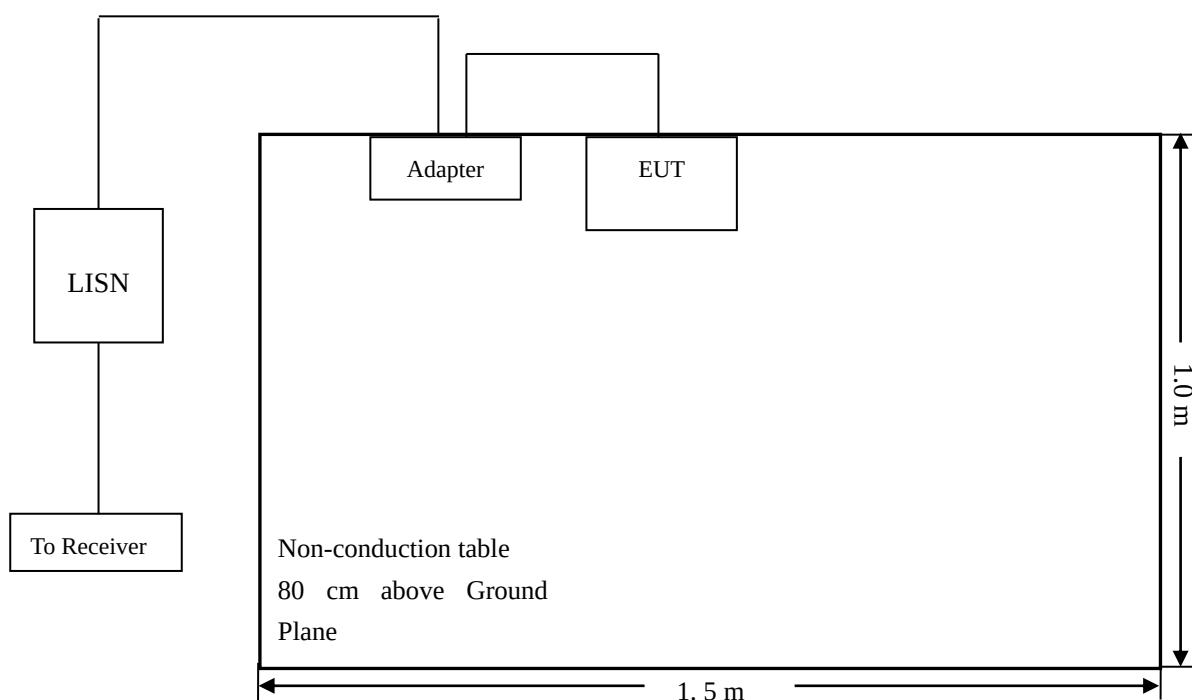
10. Conducted Emissions

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:

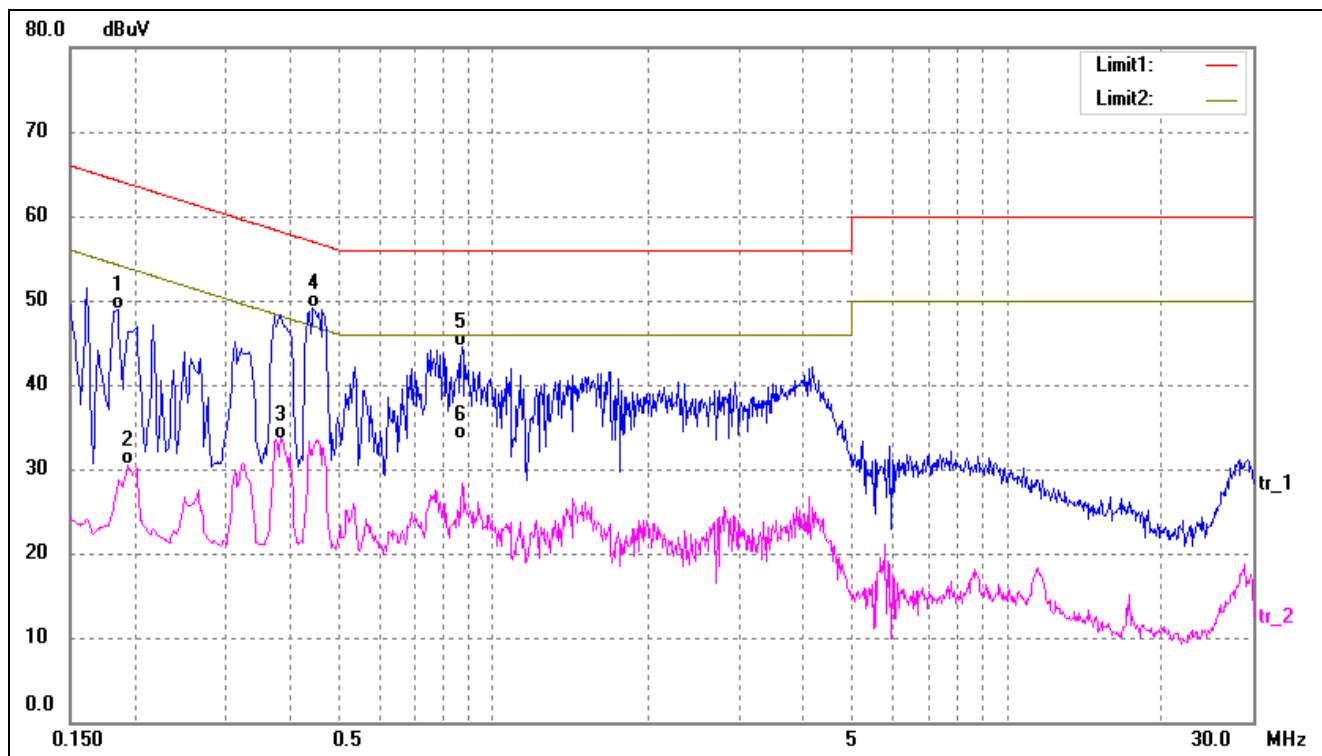
-7.78 dB at 0.4460 MHz in the **Neutral** mode, **QP** detector, **0.15-30MHz**

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

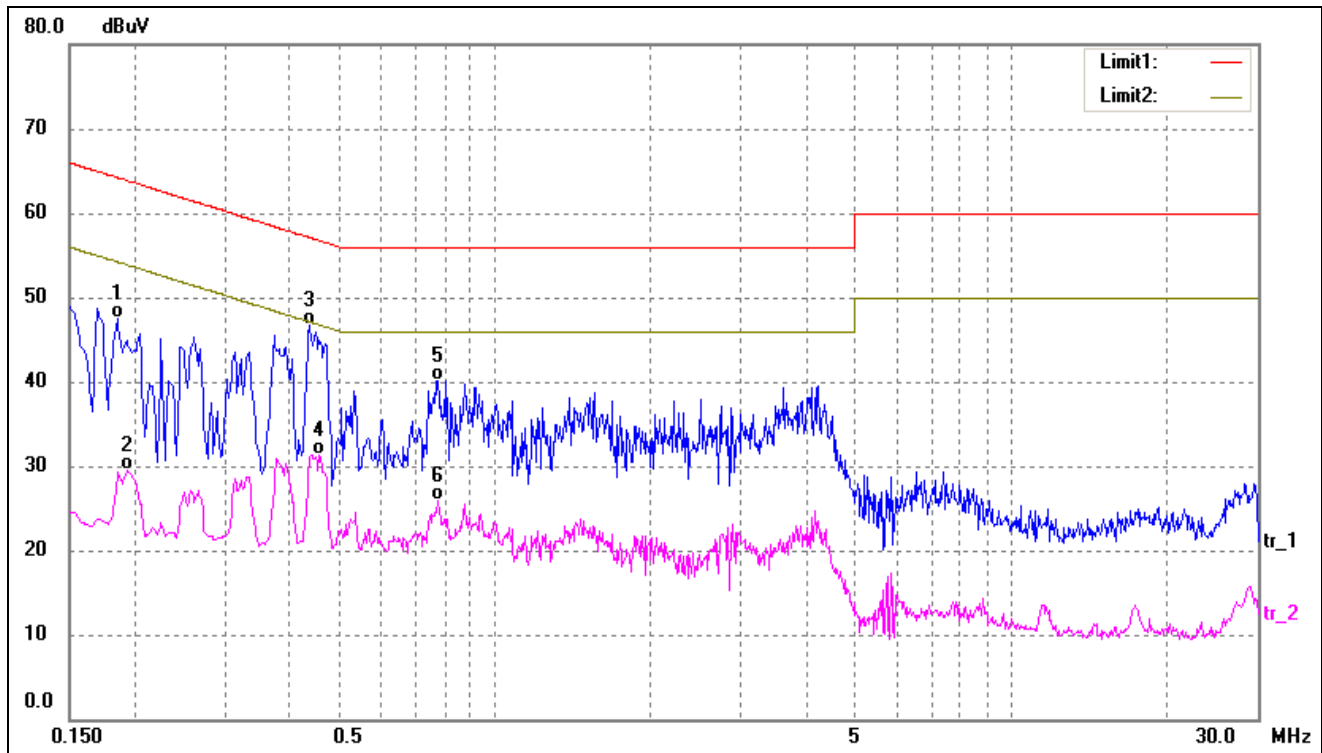
EUT: WIFI module
 Tested Model: HLK-RM04
 Operating Condition: Transmitting(Wi-Fi)
 Comment: AC 120V/60Hz;

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1860	39.08	9.81	48.89	64.21	-15.32	QP
2	0.1940	20.70	9.81	30.51	53.86	-23.35	AVG
3	0.3860	23.80	9.80	33.60	48.15	-14.55	AVG
4*	0.4460	39.37	9.80	49.17	56.95	-7.78	QP
5	0.8700	34.75	9.77	44.52	56.00	-11.48	QP
6	0.8700	23.83	9.77	33.60	46.00	-12.40	AVG

Test Specification: Live



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