

# FCC Part 15C Measurement and Test Report

For

**LM Technologies Ltd.**

**Unit19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP,**

**United Kingdom**

**FCC ID: VVXLM832-0474**

<b>FCC Rule(s):</b>	<u>FCC Part 15C</u>
<b>Product Description:</b>	<u>LM832 Wi-Fi &amp; BT Dual Mode Combi Module</u>
<b>Tested Model:</b>	<u>LM832-0474</u>
<b>Report No.:</b>	<u>STR18028087I-1</u>
<b>Sample Receipt Date:</b>	<u>2018-02-08</u>
<b>Tested Date:</b>	<u>2018-05-24 to 2018-06-04</u>
<b>Issued Date:</b>	<u>2018-06-05</u>
<b>Tested By:</b>	<u>Long Tang/ Engineer</u> <i>Long Tang</i>
<b>Reviewed By:</b>	<u>Silin Chen / EMC Manager</u> <i>Silin Chen</i>
<b>Approved &amp; Authorized By:</b>	<u>Jandy So / PSQ Manager</u> <i>Jandy So</i>
<b>Prepared By:</b>	

**Shenzhen SEM Test Technology Co., Ltd.**

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,  
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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: LM Technologies Ltd.  
Address of applicant: Unit19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP, United Kingdom

Manufacturer: LM Technologies Ltd.  
Address of manufacturer: Unit19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP, United Kingdom

General Description of EUT	
Product Name:	LM832 Wi-Fi & BT Dual Mode Combi Module
Trade Name:	LM Technologies
Model No.:	LM832-0474
Adding Model(s):	LM832-0475, LM832-0472, LM832-0473, LM832-0476, LM832-0477, LM832-0832
Rated Voltage:	DC 3.3V
Battery:	/
Power Adapter Model:	/
<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 LM832-0474, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n(HT20)
Frequency Range:	2412-2462MHz
RF Output Power:	13.08dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 72.2Mbps
Quantity of Channels:	11
Channel Separation:	5MHz
Type of Antenna:	PCB
Antenna Gain:	0dBi
Lowest Internal Frequency:	37.4MHz

### 1.2 Test Standards

The following report is prepared on behalf of the LM Technologies 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
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	E445	/
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

<b>FCC Rules</b>	<b>Description of Test Item</b>	<b>Result</b>
§ 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**

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#### **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**

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### **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 a PCB antenna, fulfill the requirement of this section.

## 5. Power Spectral Density

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### 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

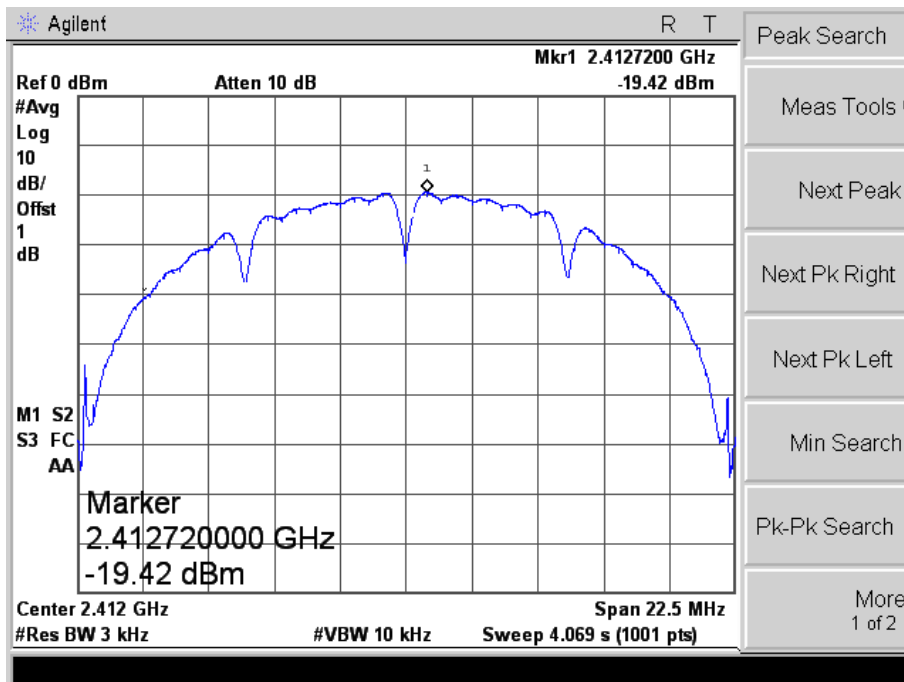
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

## 5.4 Summary of Test Results/Plots

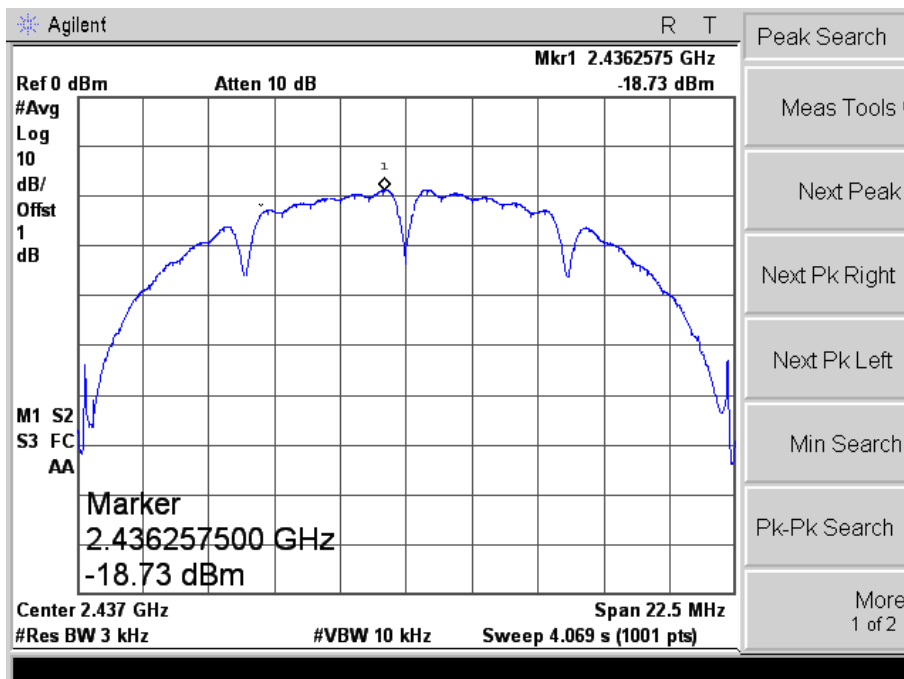
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b_11Mbps	2412	-19.42	8
	2437	-18.73	8
	2462	-19.76	8
802.11g_54Mbps	2412	-21.20	8
	2437	-21.33	8
	2462	-22.53	8
802.11n HT20_MCS7	2412	-22.68	8
	2437	-22.12	8
	2462	-22.10	8

Please refer to the following test plots:

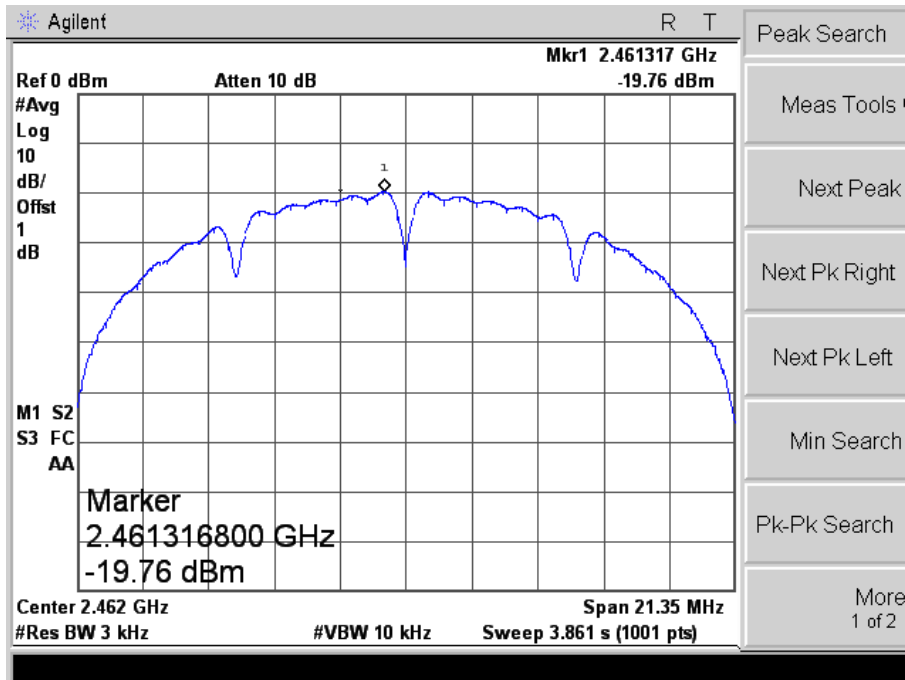
## 802.11b-Low Channel



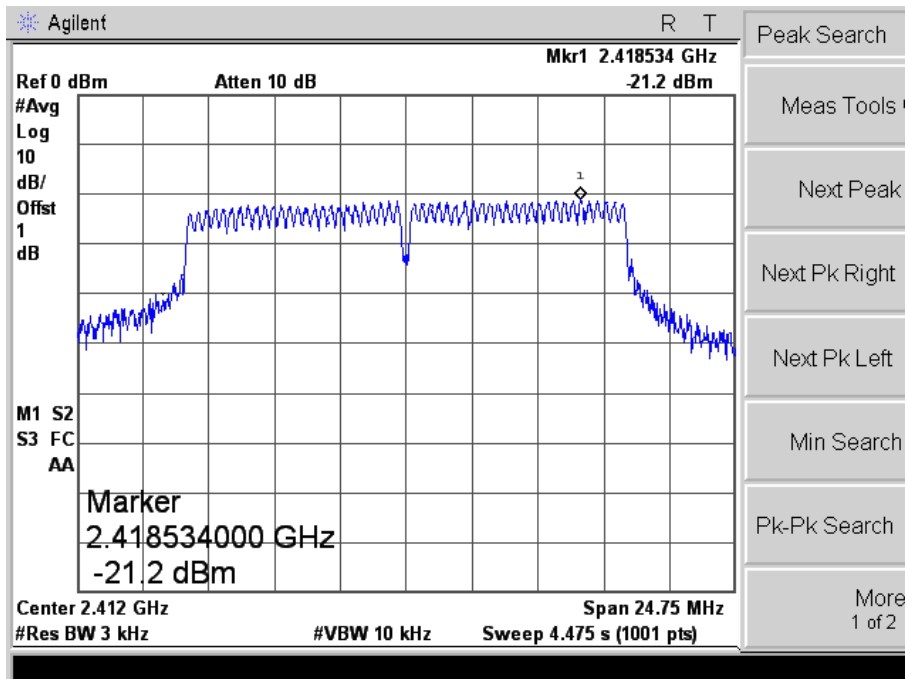
## 802.11b-Middle Channel



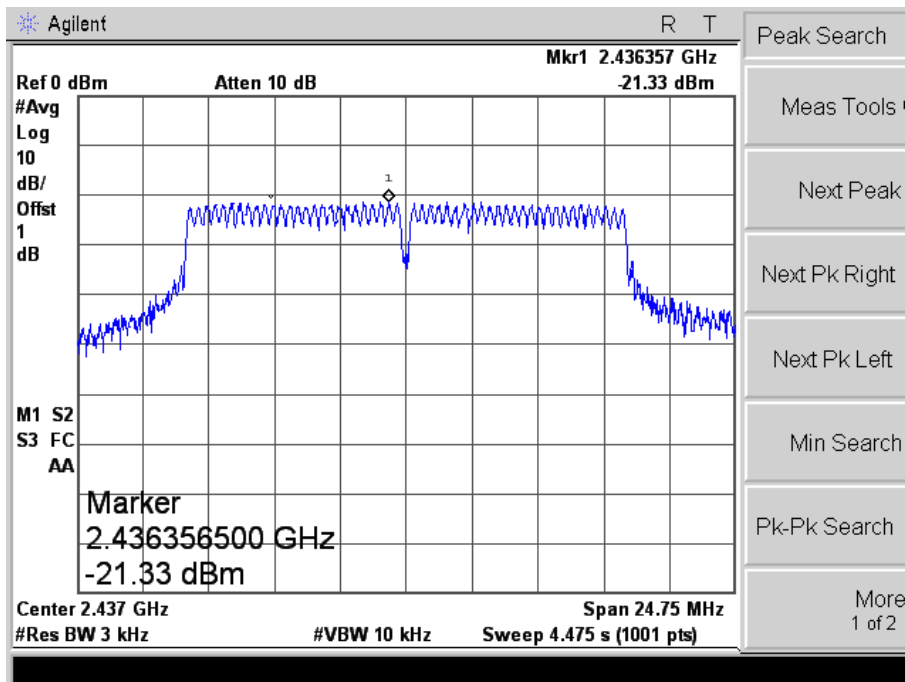
## 802.11b-High Channel



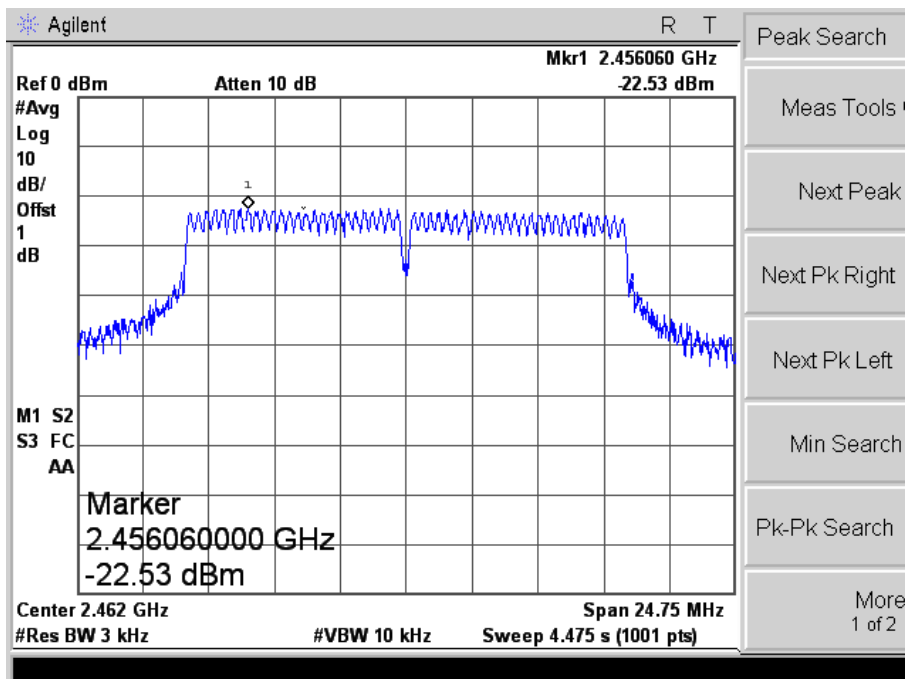
## 802.11g-Low Channel



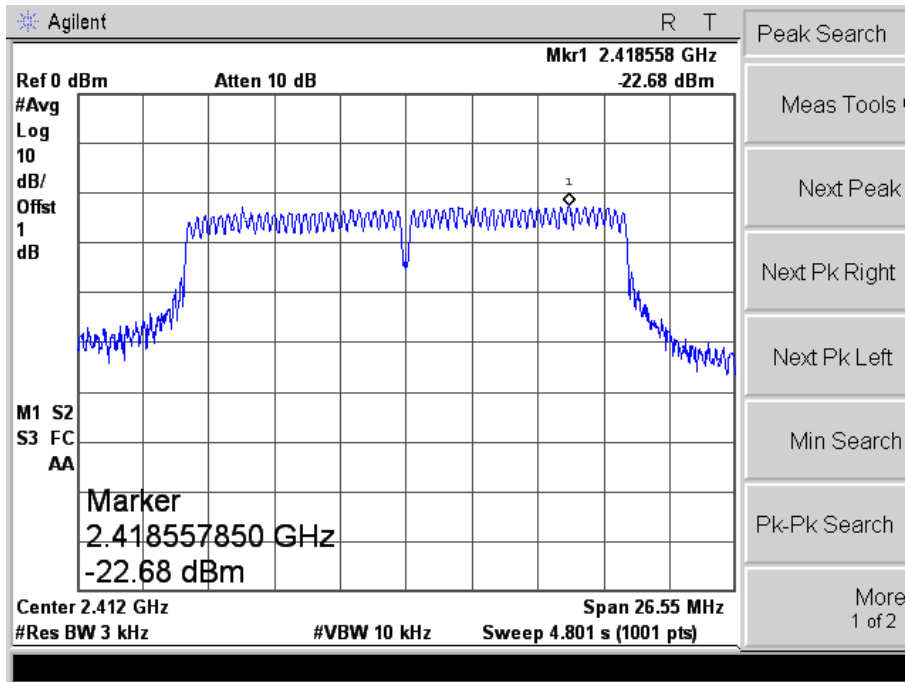
## 802.11g-Middle Channel



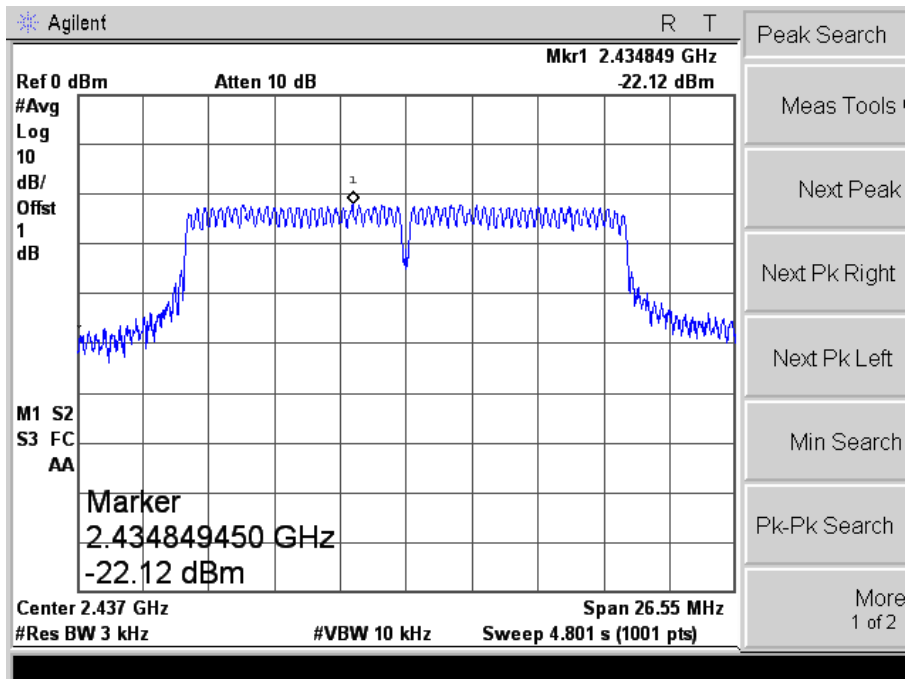
## 802.11g-High Channel



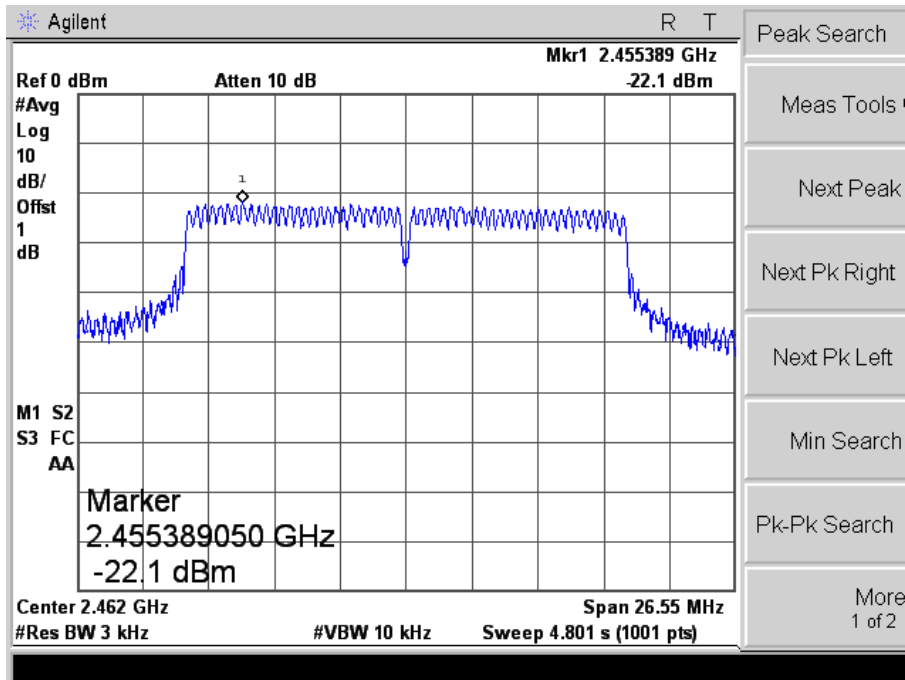
## 802.11n-HT20-Low Channel



## 802.11n-HT20-Middle Channel



## 802.11n-HT20-High Channel





## 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

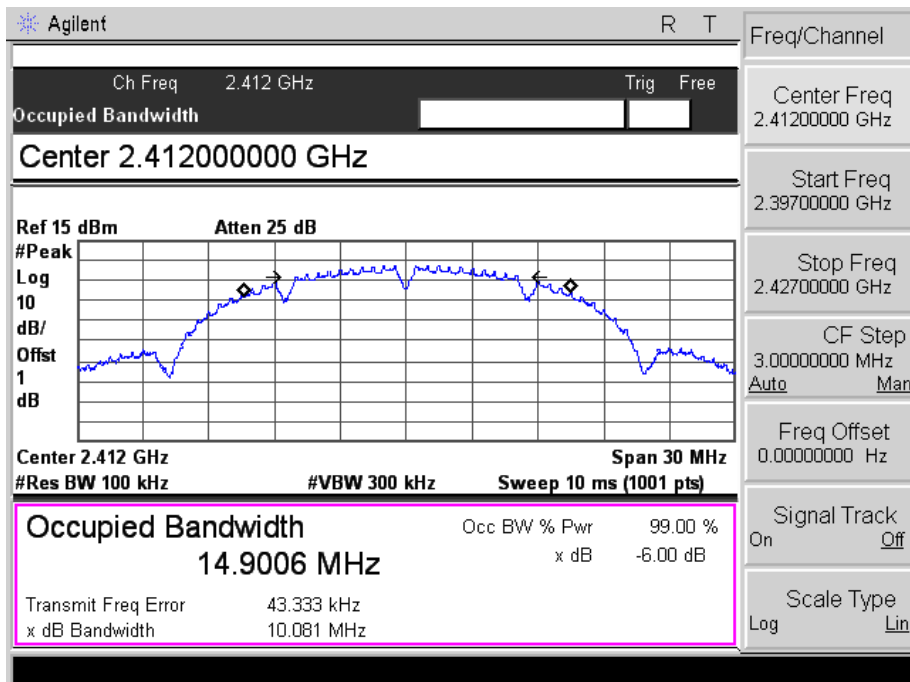
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

### 6.4 Summary of Test Results/Plots

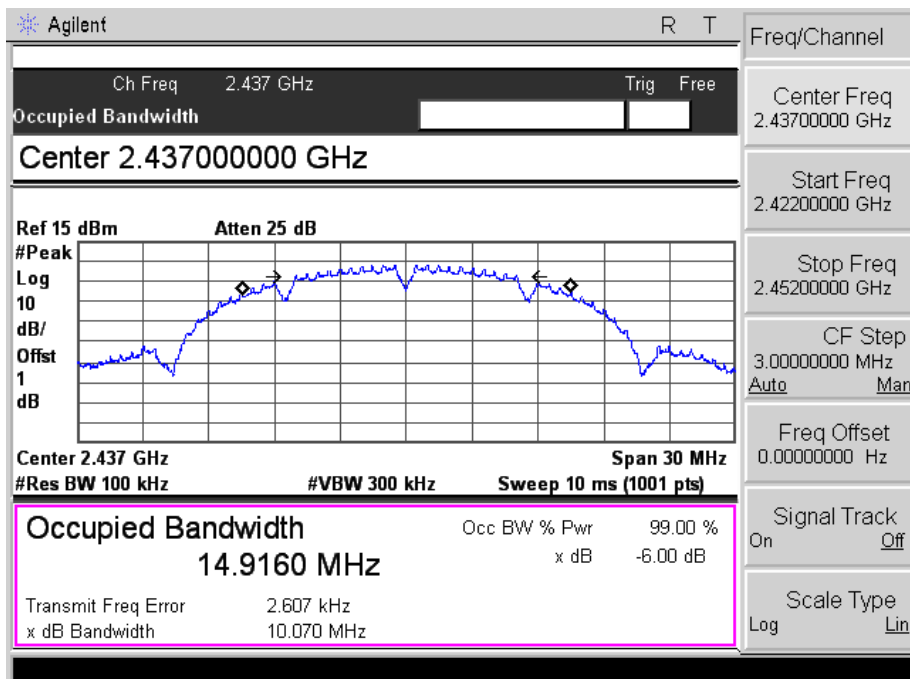
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b_11Mbps	2412	10.081	14.9006	$\geq 500$
	2437	10.070	14.9160	$\geq 500$
	2462	10.067	14.8765	$\geq 500$
802.11g_154Mbps	2412	16.565	16.4517	$\geq 500$
	2437	16.534	16.4374	$\geq 500$
	2462	16.522	16.4342	$\geq 500$
802.11n-HT20_MC S7	2412	17.769	17.6334	$\geq 500$
	2437	17.763	17.6295	$\geq 500$
	2462	17.788	17.6413	$\geq 500$

Please refer to the following test plots:

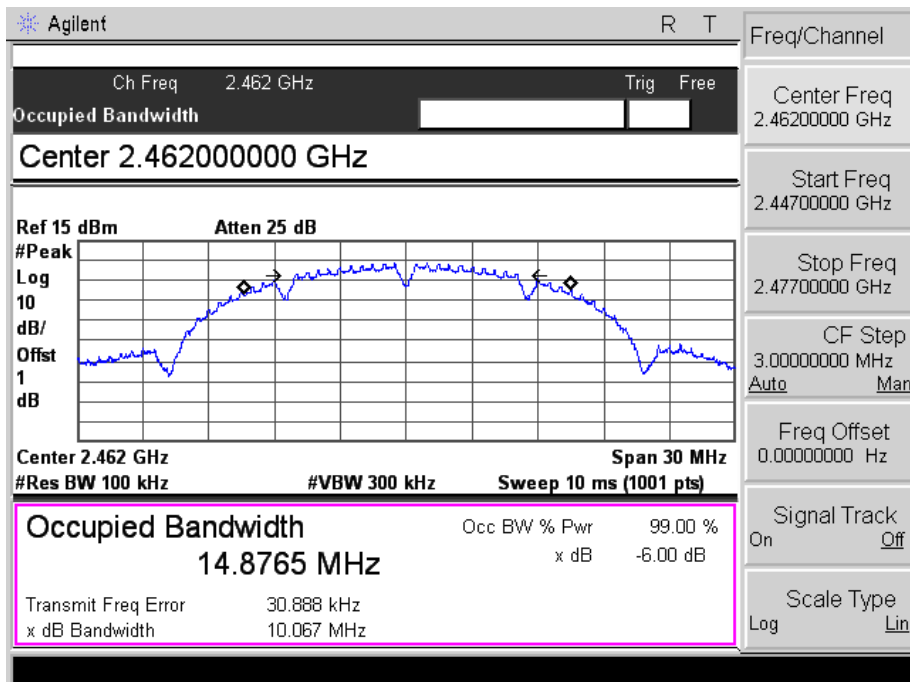
## 802.11b-Low Channel



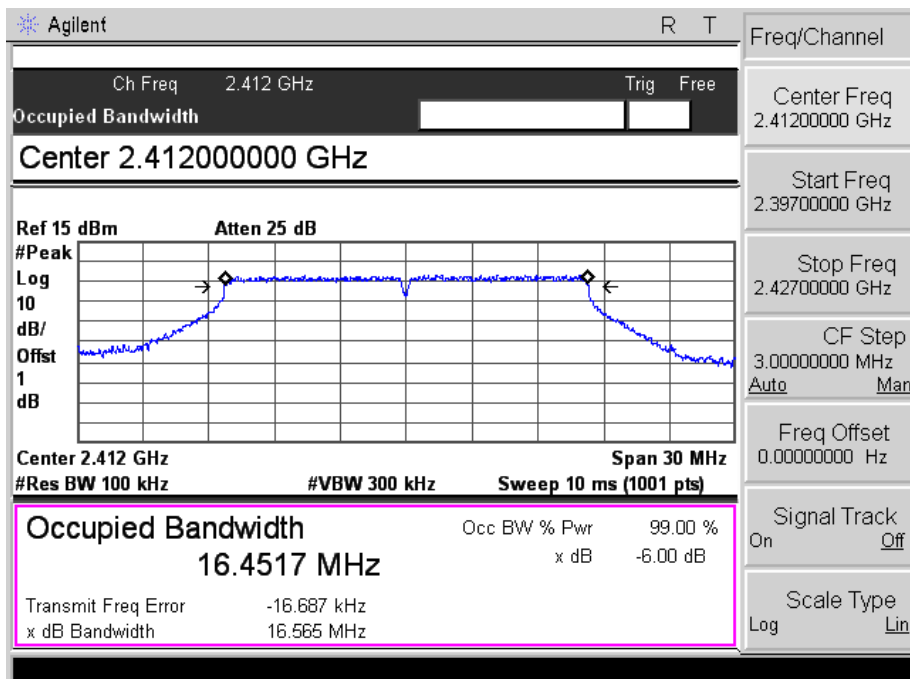
## 802.11b-Middle Channel



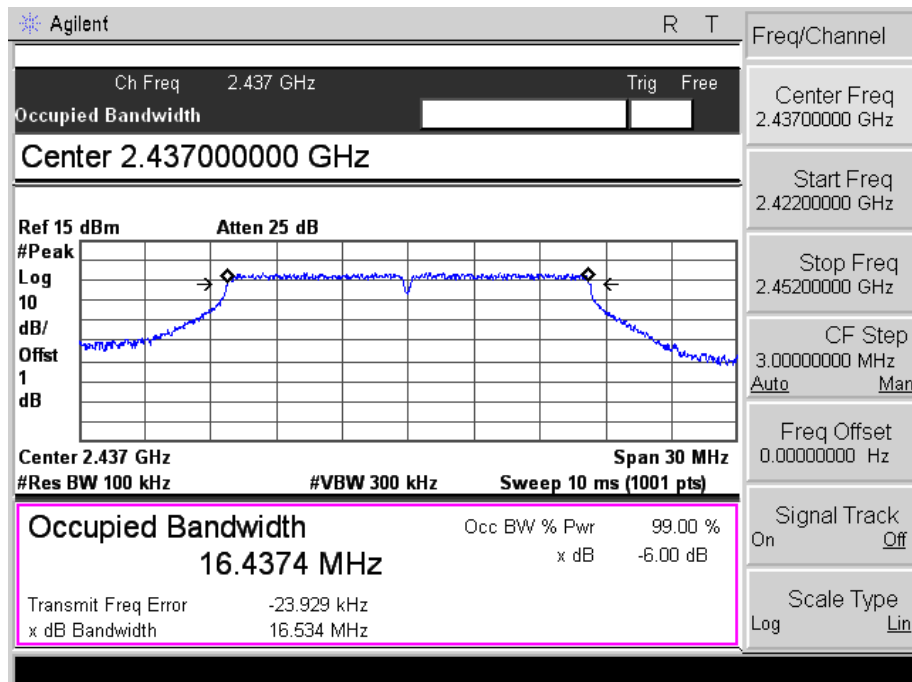
## 802.11b-High Channel



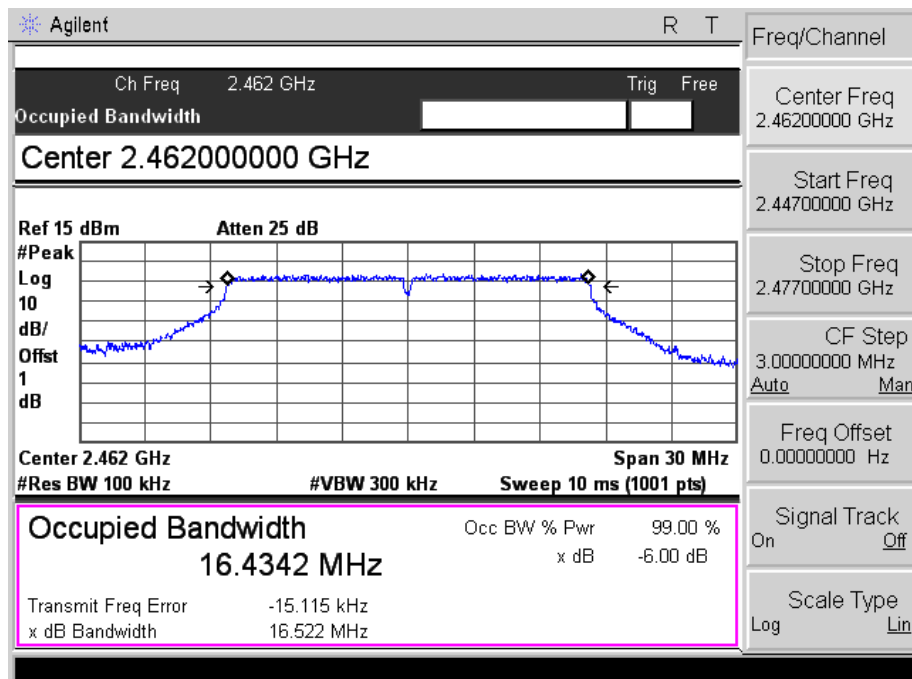
## 802.11g-Low Channel



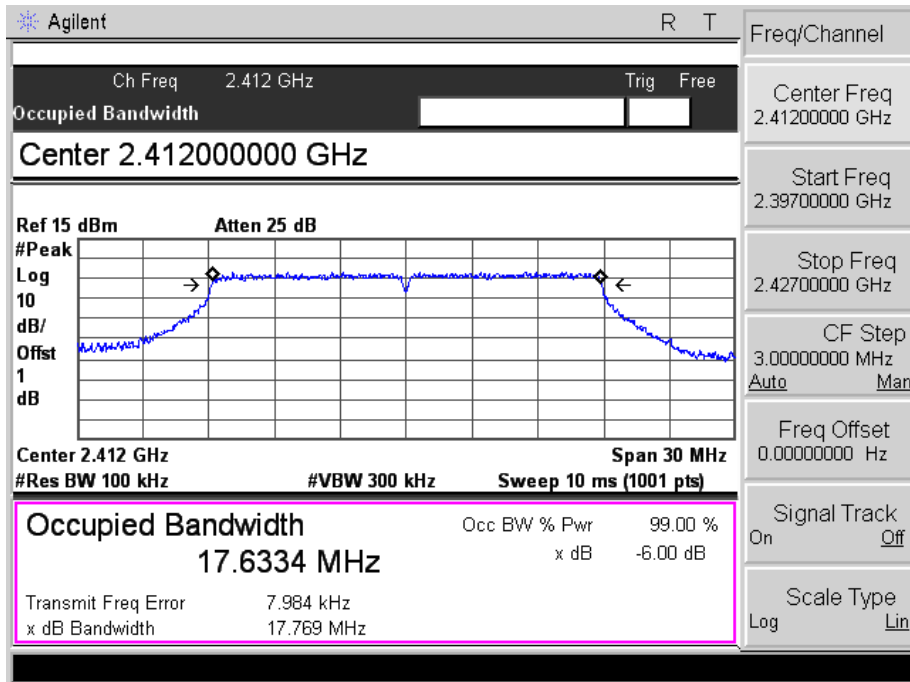
## 802.11g-Middle Channel



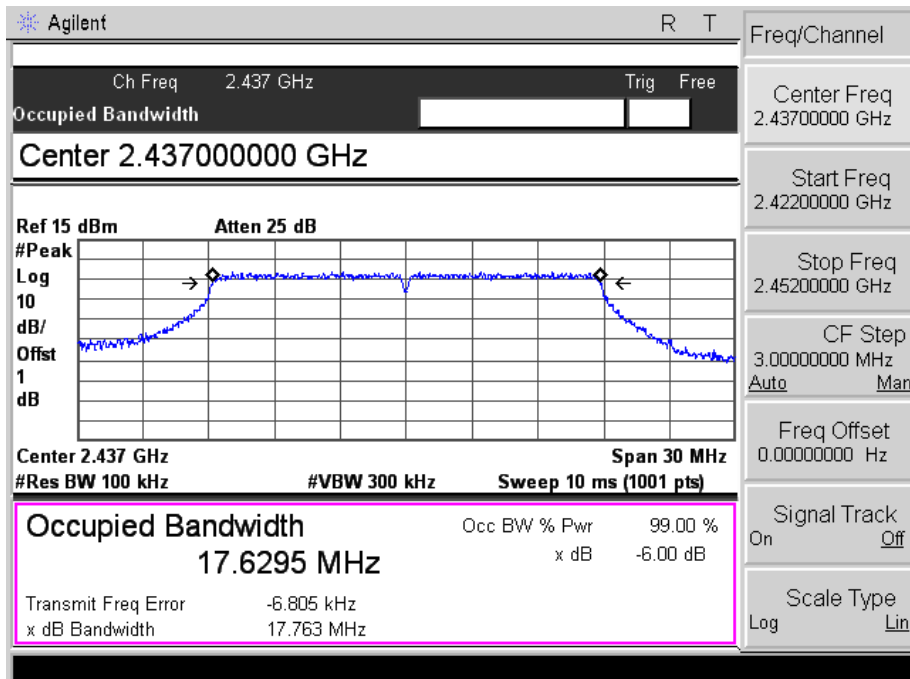
## 802.11g-High Channel



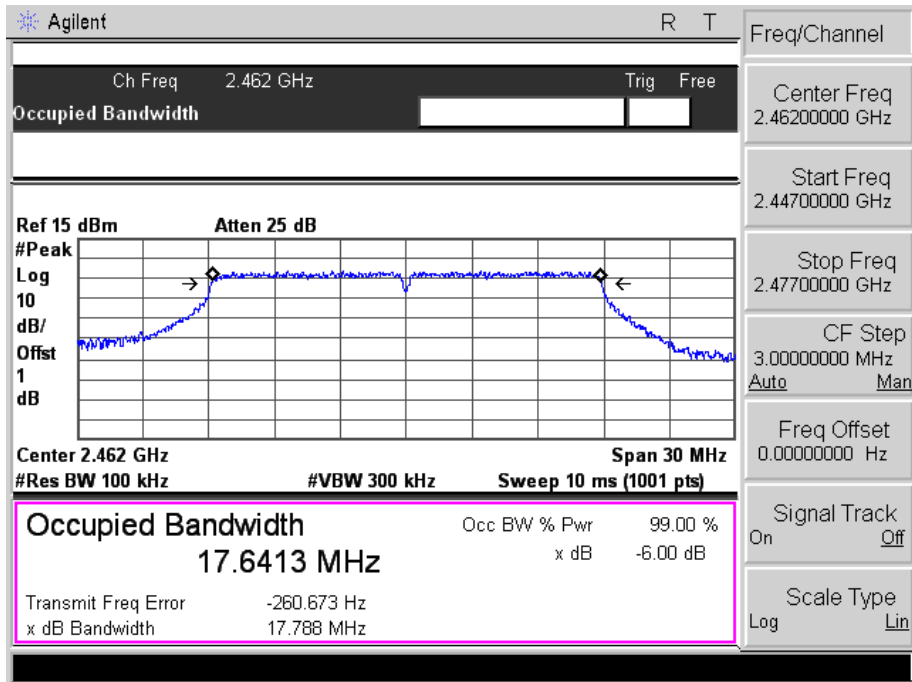
## 802.11n-HT20-Low Channel



## 802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



## 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

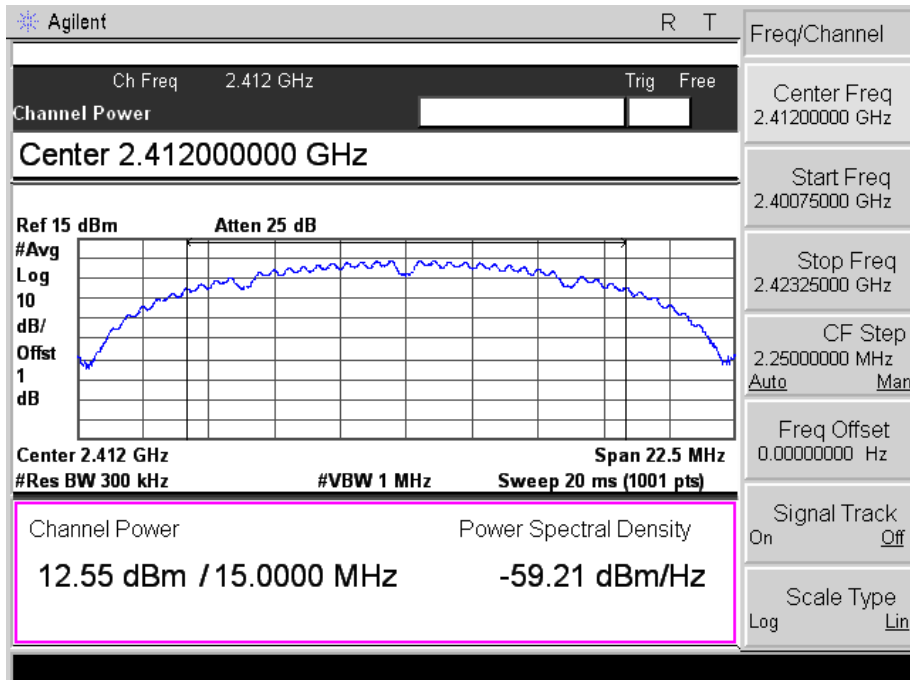
#### 7.4 Summary of Test Results/Plots

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_11Mbps	2412	12.55	17.99	1000
	2437	12.64	18.37	1000
	2462	13.08	20.32	1000
802.11g_54Mbps	2412	12.17	16.48	1000
	2437	12.06	16.07	1000
	2462	12.01	15.89	1000
802.11n HT20_MCS7	2412	11.44	13.93	1000
	2437	11.53	14.22	1000
	2462	11.81	15.17	1000

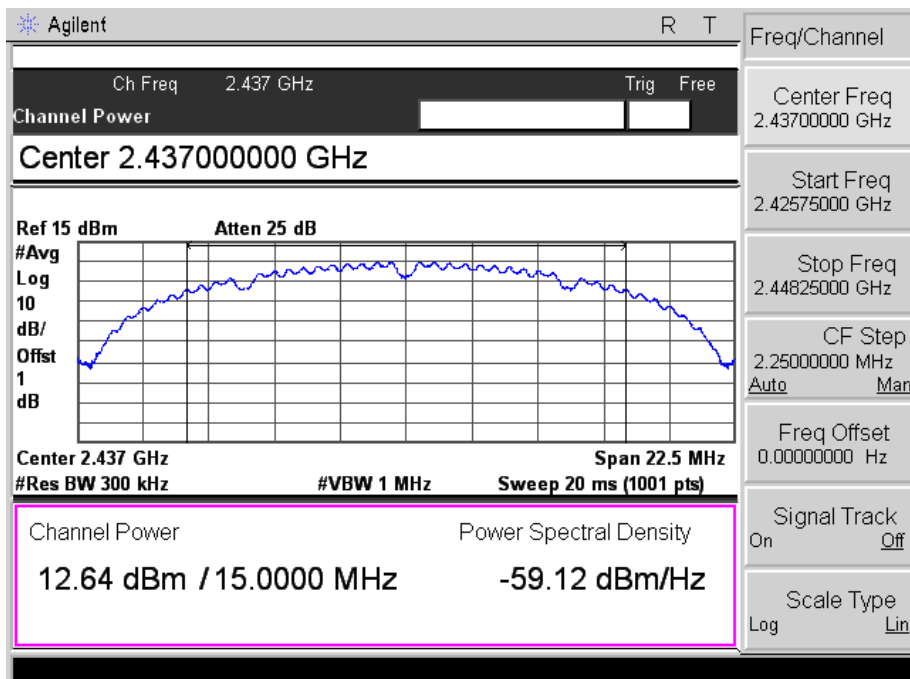
Please refer to the following test plots:



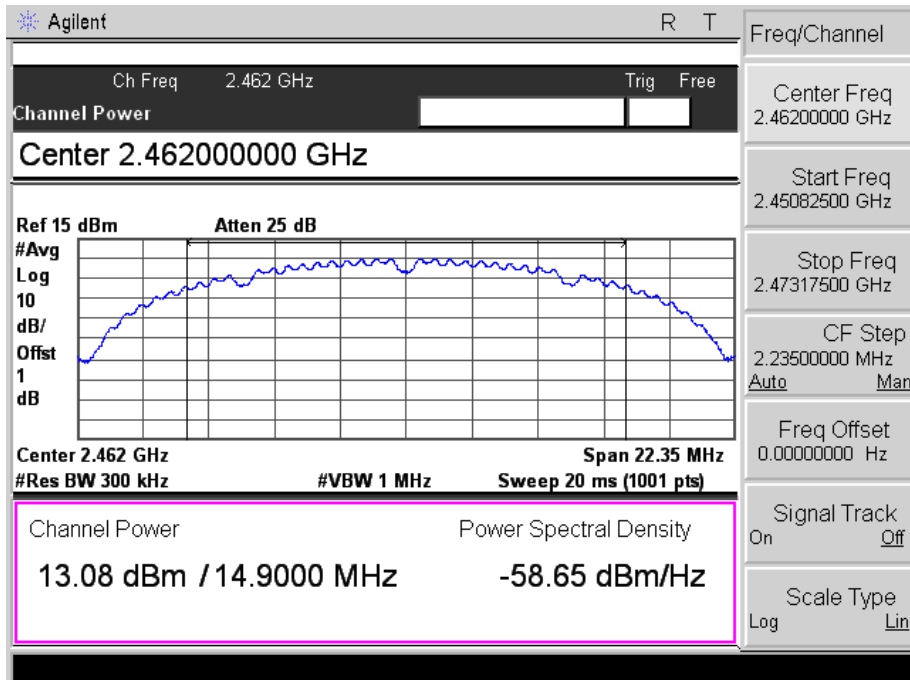
## 802.11b-11Mbps-Low Channel



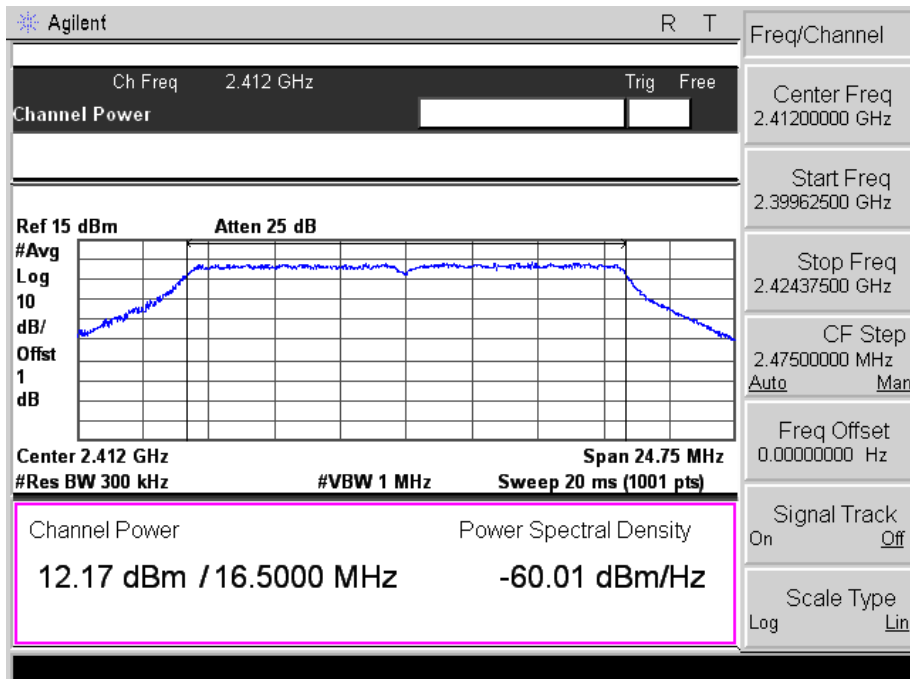
## 802.11b -11Mbps-Middle Channel



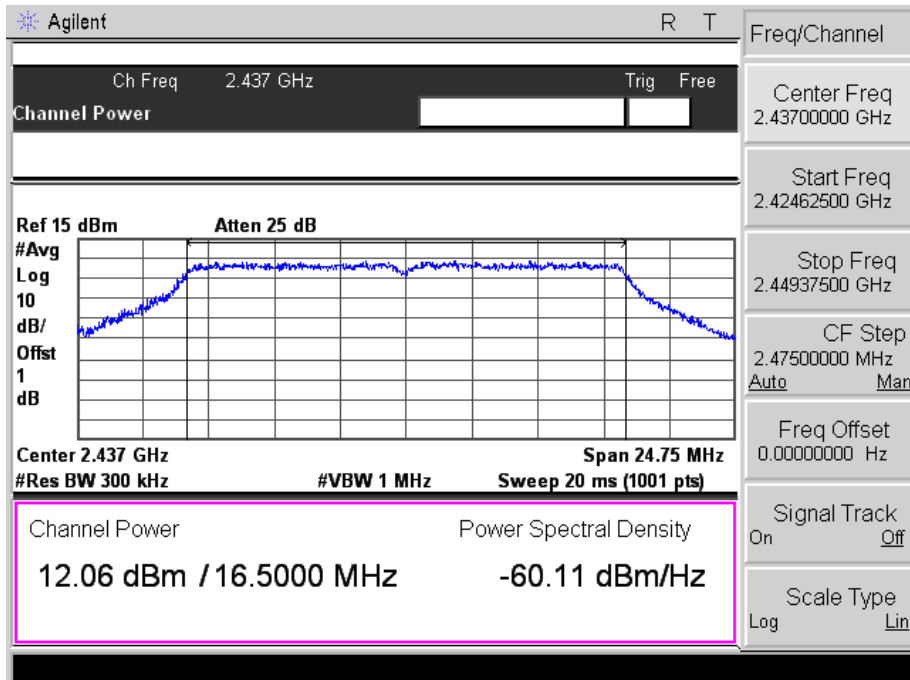
## 802.11b -11Mbps-High Channel



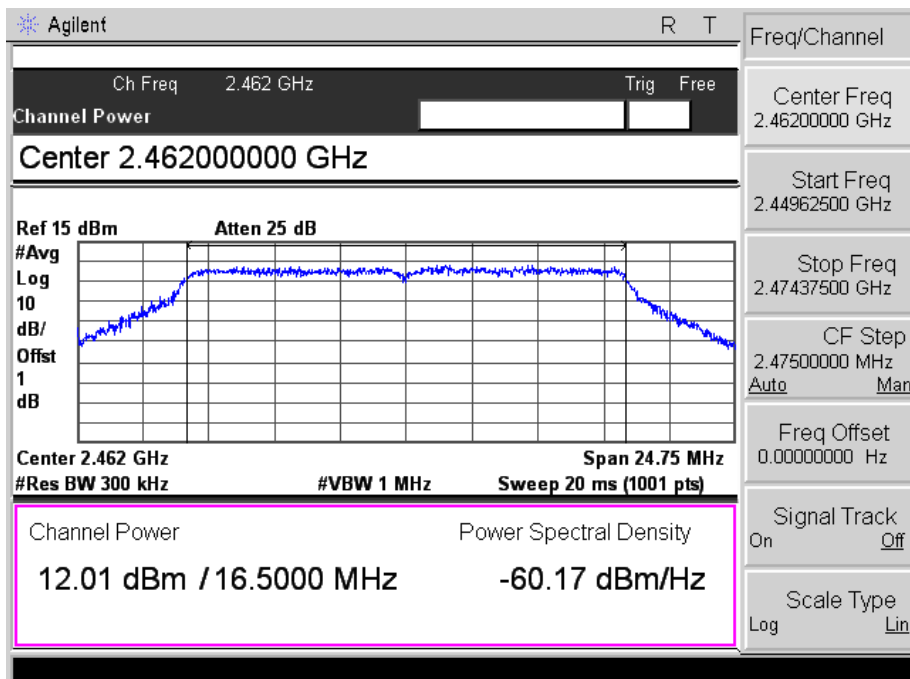
## 802.11g-54Mbps-Low Channel



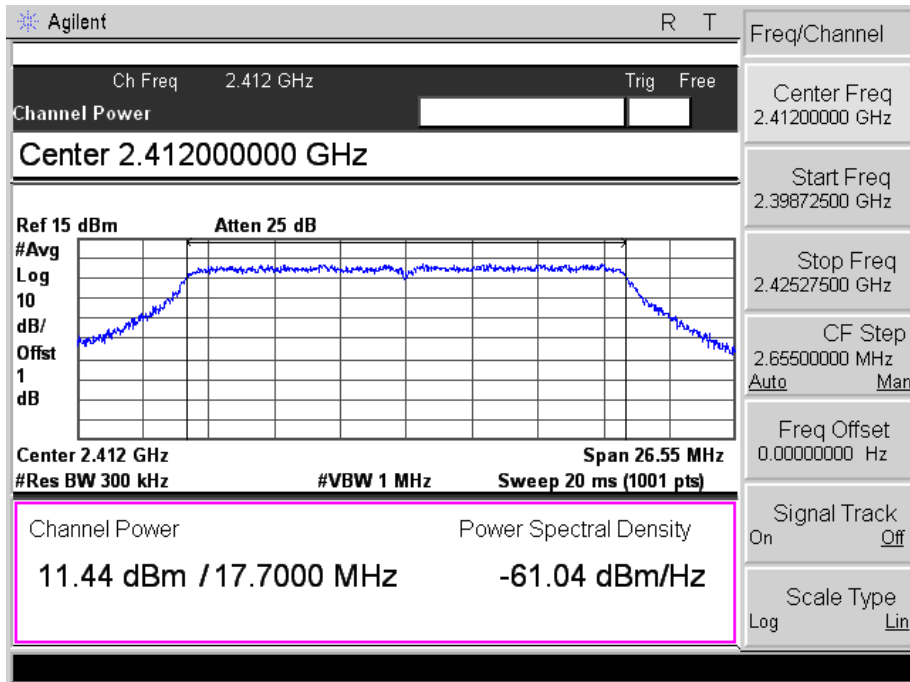
## 802.11g-54Mbps-Middle Channel



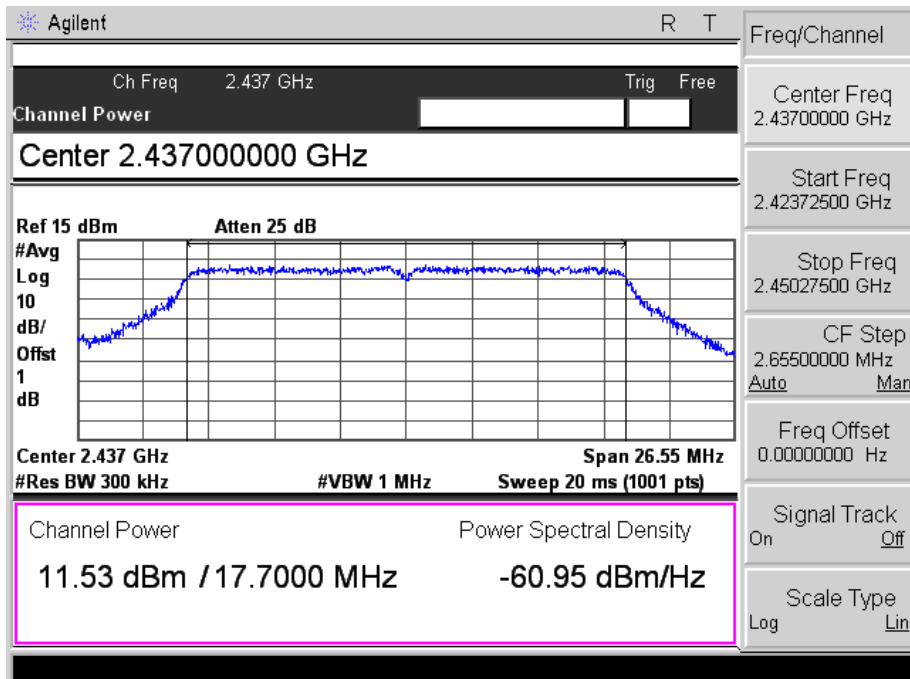
## 802.11g-54Mbps-High Channel



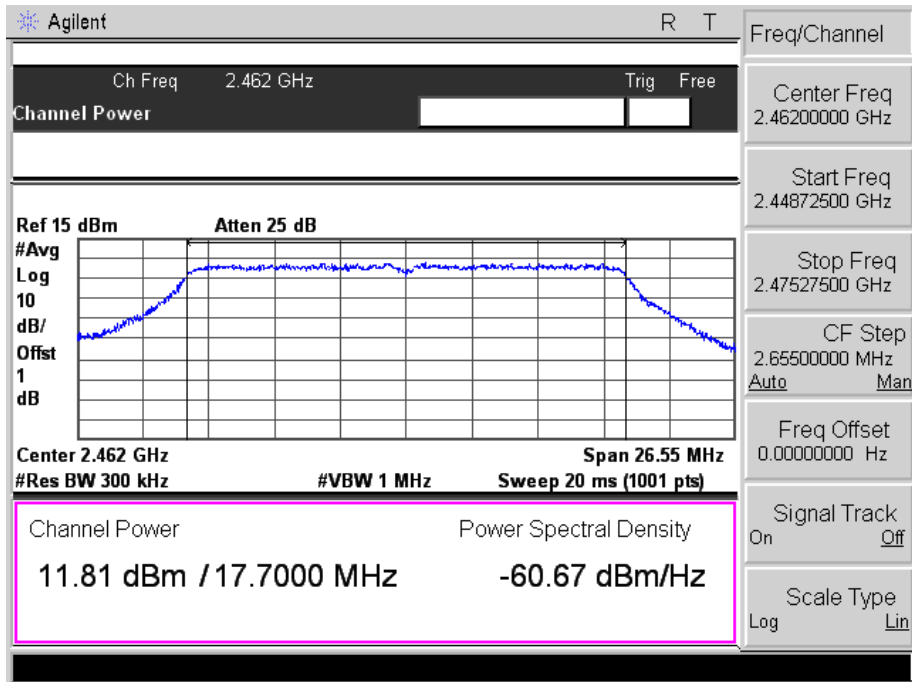
## 802.11n-HT20-MCS7-Low Channel



## 802.11n-HT20-MCS7-Middle Channel



## 802.11n-HT20-MCS7-High Channel



## 8. Field Strength of Spurious Emissions

### 8.1 Standard Applicable

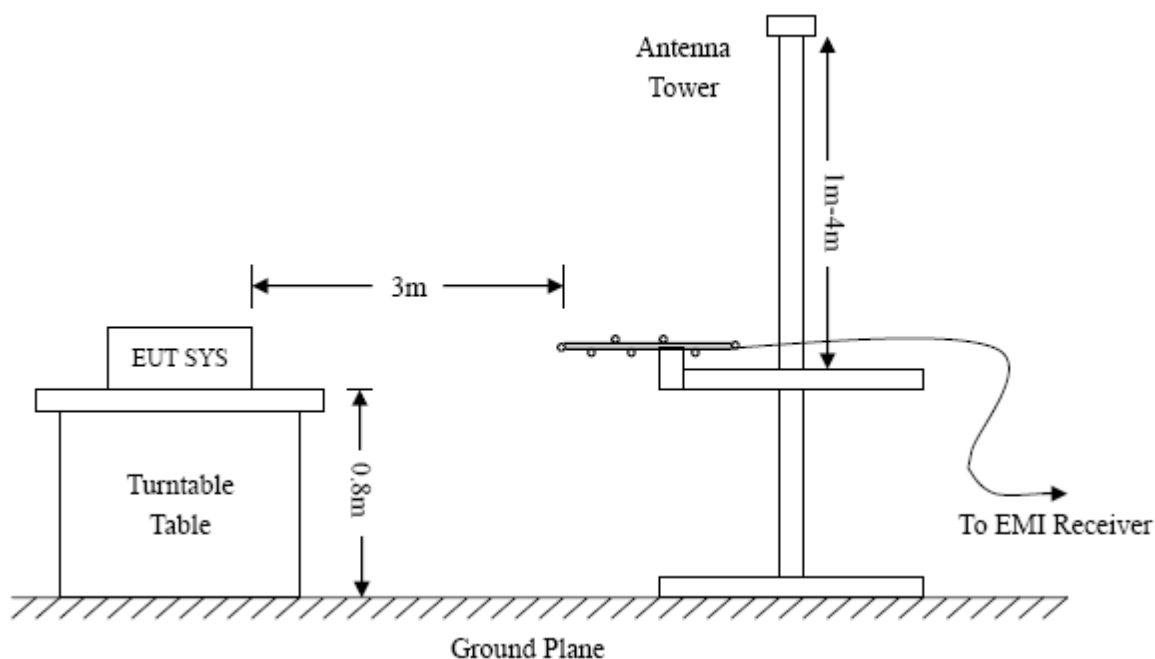
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

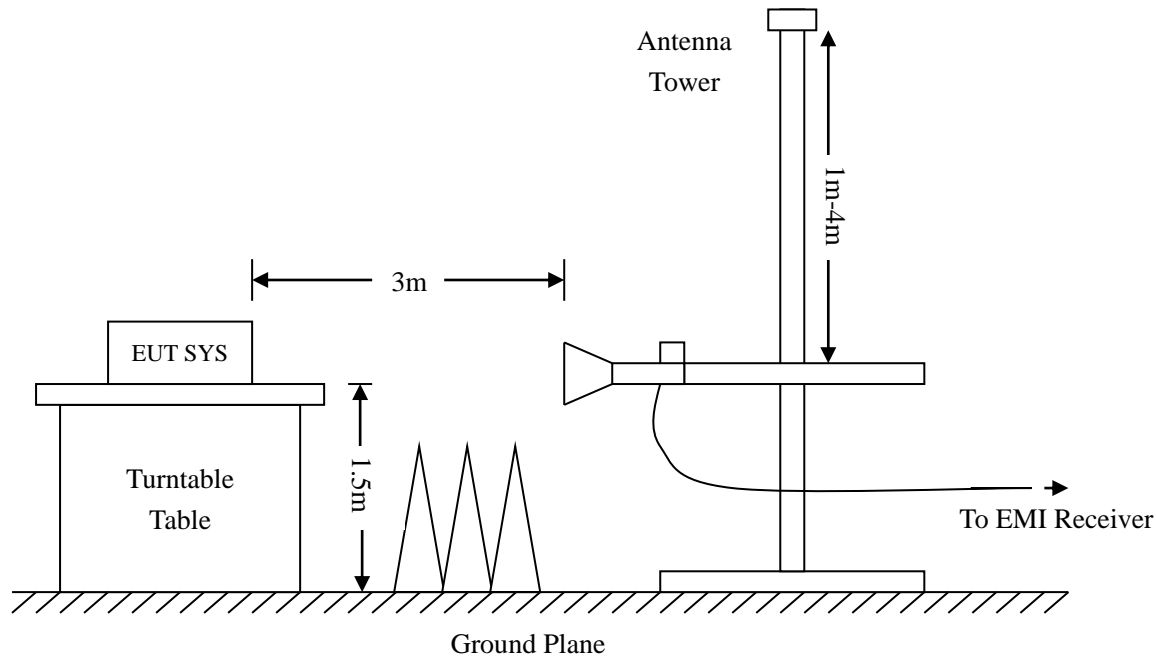
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 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 $\mu$ V means the emission is 6dB $\mu$ 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)

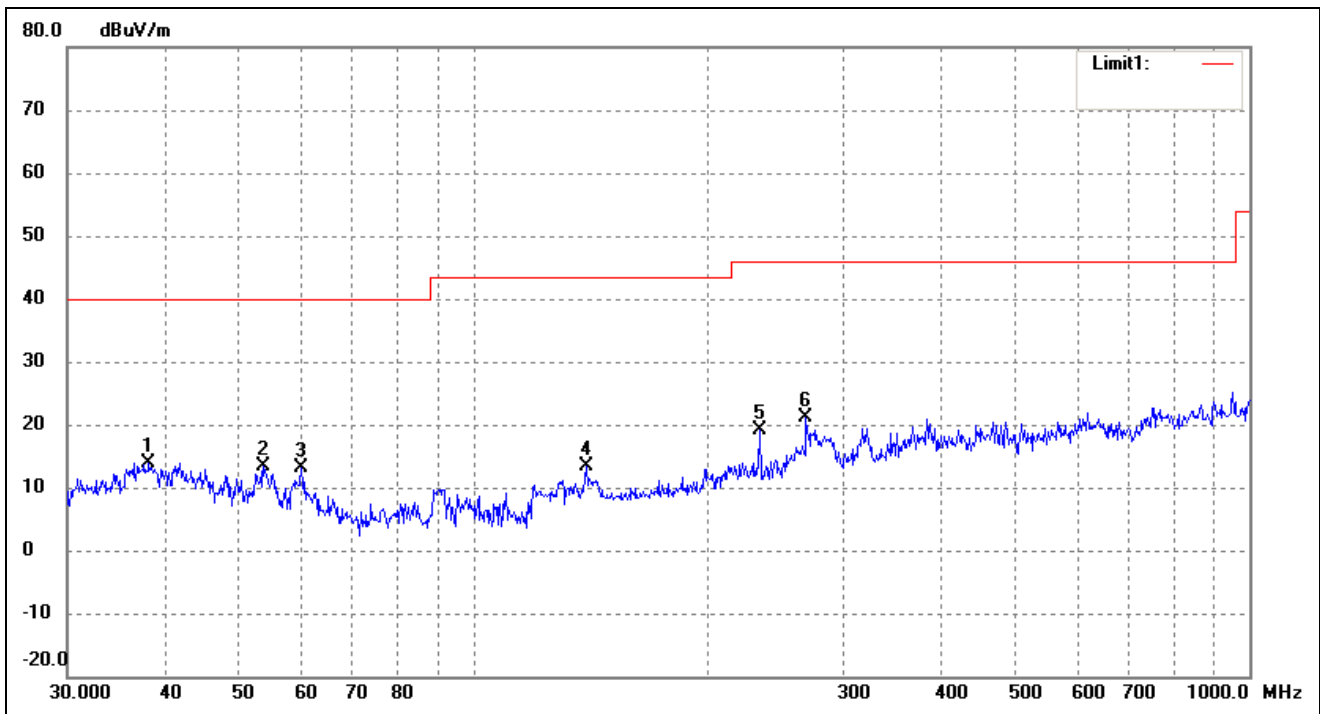
EUT: LM832 Wi-Fi & BT Dual Mode Combi Module

Tested Model: LM832-0474

Operating Condition: 802.11b\_11Mbps Transmitting Low Channel-2412MHz(worst case)

Comment: DC 3.3V from test board

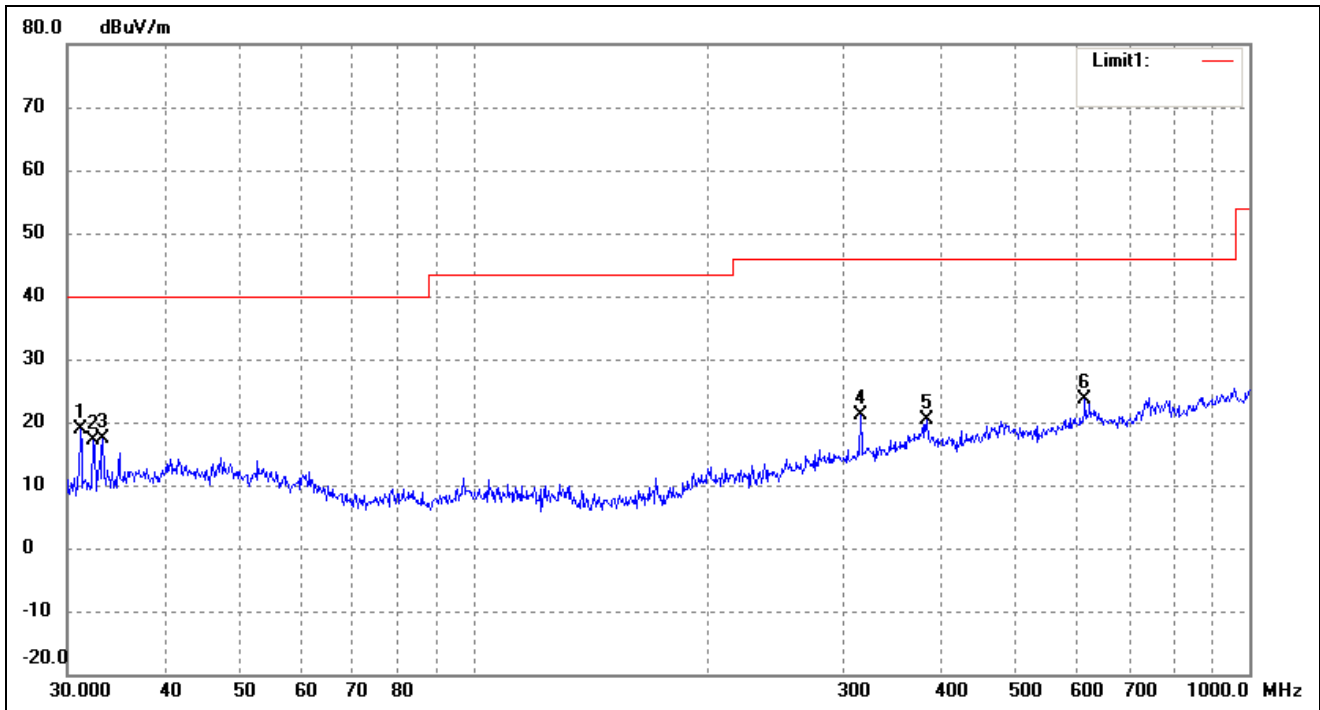
Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	38.2120	22.15	-8.16	13.99	40.00	-26.01	248	100	peak
2	53.6932	22.07	-8.78	13.29	40.00	-26.71	96	100	peak
3	60.0691	22.72	-9.60	13.12	40.00	-26.88	191	100	peak
4	139.8508	25.87	-12.55	13.32	43.50	-30.18	90	100	peak
5	234.1684	27.52	-8.48	19.04	46.00	-26.96	246	100	peak
6	268.4853	27.78	-6.59	21.19	46.00	-24.81	277	100	peak



Test Specification: Vertical

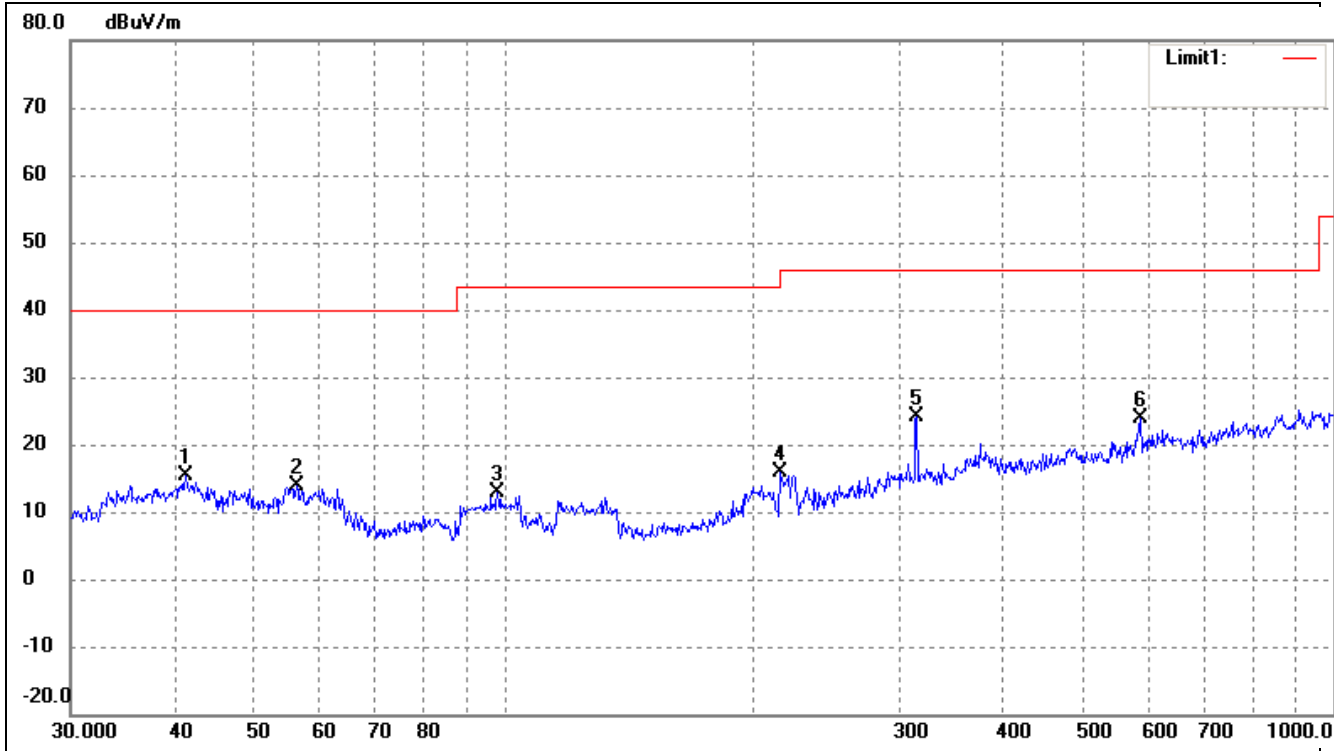


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	31.1798	28.97	-10.01	18.96	40.00	-21.04	270	100	peak
2	32.4059	26.89	-9.69	17.20	40.00	-22.80	92	100	peak
3	33.3279	26.87	-9.46	17.41	40.00	-22.59	185	100	peak
4	315.4808	26.08	-4.85	21.23	46.00	-24.77	92	100	peak
5	383.9318	22.78	-2.30	20.48	46.00	-25.52	295	100	peak
6	614.2142	22.78	0.83	23.61	46.00	-22.39	344	100	peak

Operating Condition: 802.11b\_11Mbps Transmitting Middle Channel-2437MHz(worst case)

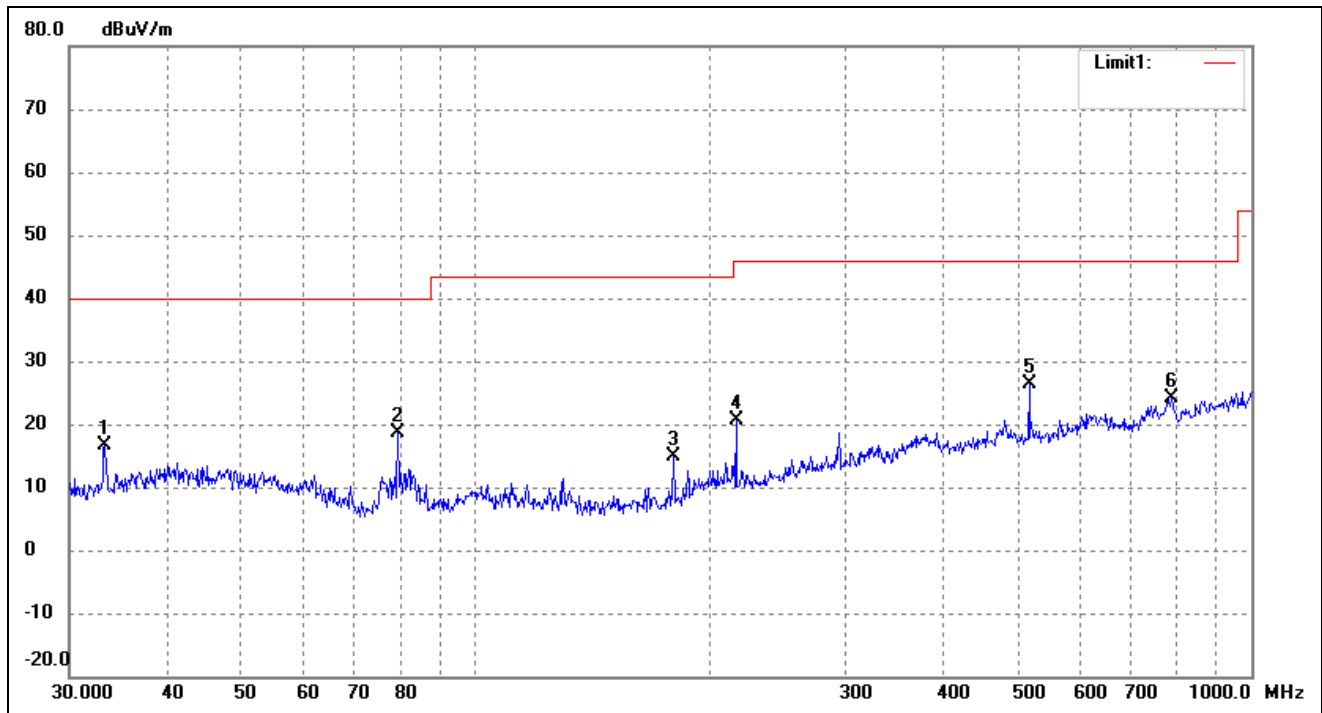
Comment: DC 3.3V from test board

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	41.2765	23.20	-7.75	15.45	40.00	-24.55	213	100	peak
2	56.1974	22.86	-9.10	13.76	40.00	-26.24	298	100	peak
3	98.1419	24.14	-11.28	12.86	43.50	-30.64	99	100	peak
4	215.2678	24.74	-8.79	15.95	43.50	-27.55	289	100	peak
5	314.3765	29.04	-4.92	24.12	46.00	-21.88	69	100	peak
6	584.7895	24.60	-0.77	23.83	46.00	-22.17	337	100	peak

Test Specification: Vertical

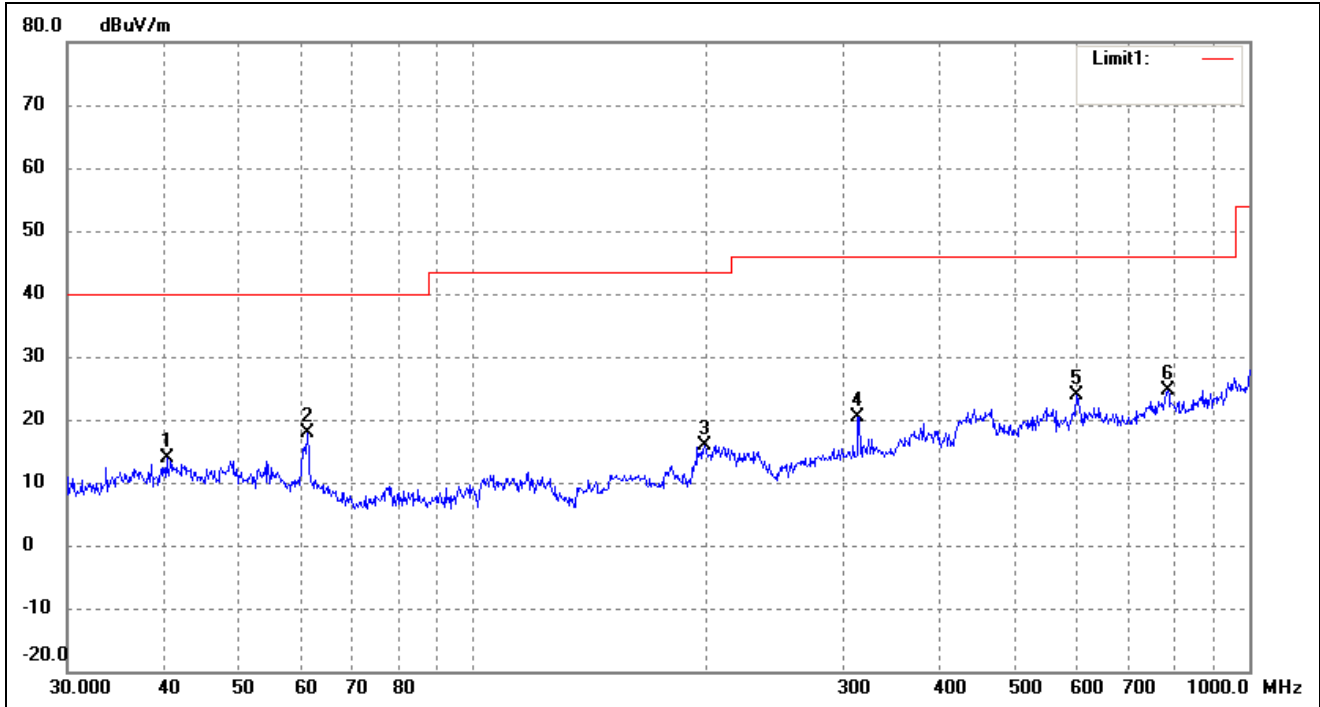


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	33.3279	26.18	-9.46	16.72	40.00	-23.28	259	100	peak
2	79.5209	30.62	-12.03	18.59	40.00	-21.41	321	100	peak
3	180.0165	26.14	-11.36	14.78	43.50	-28.72	84	100	peak
4	216.7828	29.40	-8.81	20.59	46.00	-25.41	193	100	peak
5	517.2480	28.21	-1.94	26.27	46.00	-19.73	263	100	peak
6	790.6188	21.88	2.37	24.25	46.00	-21.75	349	100	peak

Operating Condition: 802.11b\_11Mbps Transmitting High Channel-2462MHz(worst case)

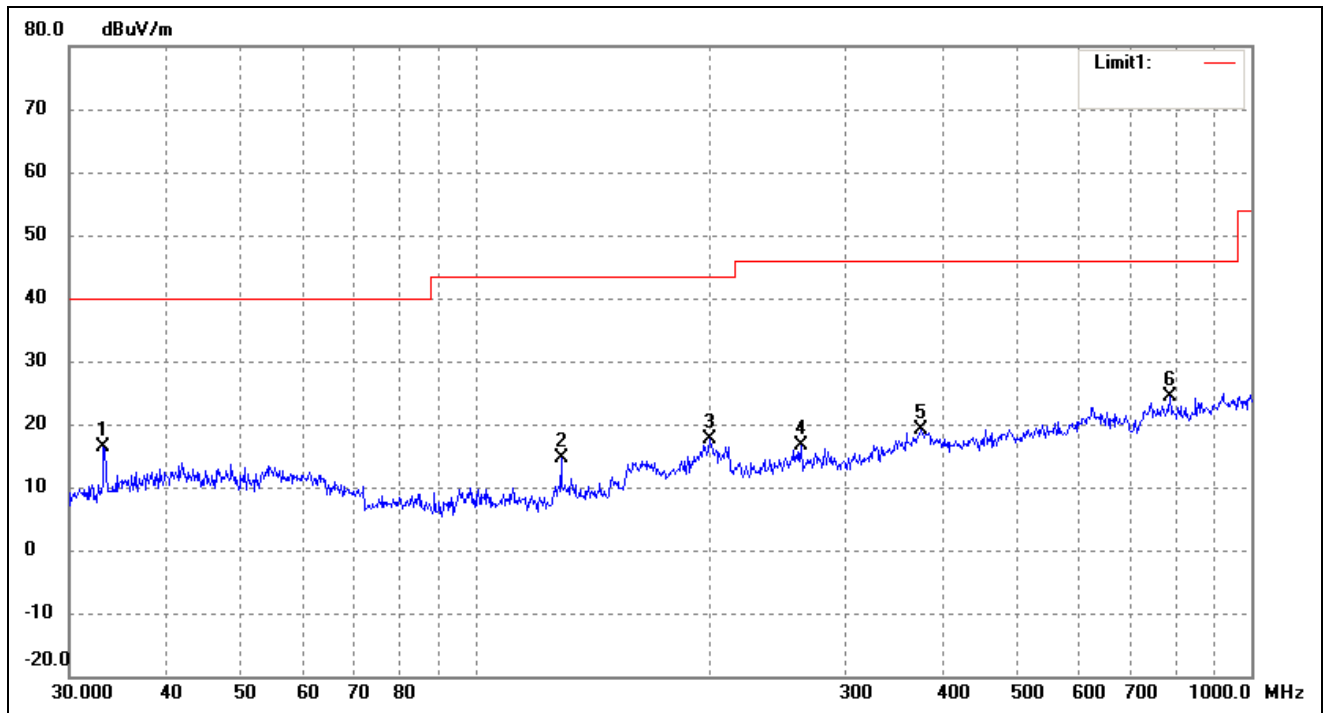
Comment: DC 3.3V from test board

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	40.2757	21.51	-7.69	13.82	40.00	-26.18	92	100	peak
2	61.1316	27.77	-9.94	17.83	40.00	-22.17	185	100	peak
3	198.5880	24.81	-8.85	15.96	43.50	-27.54	92	100	peak
4	313.2760	25.31	-4.97	20.34	46.00	-25.66	295	100	peak
5	599.3213	23.98	-0.17	23.81	46.00	-22.19	344	100	peak
6	785.0935	21.98	2.65	24.63	46.00	-21.37	92	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	25.90	-9.50	16.40	40.00	-23.60	248	100	peak
2	129.0146	26.67	-11.94	14.73	43.50	-28.77	96	100	peak
3	200.6881	26.19	-8.66	17.53	43.50	-25.97	191	100	peak
4	262.8955	23.34	-6.83	16.51	46.00	-29.49	90	100	peak
5	374.6226	21.49	-2.41	19.08	46.00	-26.92	246	100	peak
6	785.0935	21.76	2.65	24.41	46.00	-21.59	277	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	60.4	-3.87	56.53	74	-17.47	H	PK
4824.000	43.14	-3.87	39.27	54	-14.73	H	AV
7236.000	53.31	1.14	54.45	74	-19.55	H	PK
7236.000	40.6	1.19	41.79	54	-12.21	H	AV
4824.000	58.55	-3.86	54.69	74	-19.31	V	PK
4824.000	41.81	-3.86	37.95	54	-16.05	V	AV
7236.000	53.78	1.1	54.88	74	-19.12	V	PK
7236.000	40.84	1.1	41.94	54	-12.06	V	AV
Middle Channel-2437MHz							
4874.000	61.94	-3.74	58.2	74	-15.8	H	PK
4874.000	43.56	-3.74	39.82	54	-14.18	H	AV
7311.000	55.75	1.47	57.22	74	-16.78	H	PK
7311.000	38.4	1.47	39.87	54	-14.13	H	AV
4874.000	60.3	-3.74	56.56	74	-17.44	V	PK
4874.000	42.08	-3.74	38.34	54	-15.66	V	AV
7311.000	53.27	1.47	54.74	74	-19.26	V	PK
7311.000	38.79	1.47	40.26	54	-13.74	V	AV
High Channel-2462MHz							
4924.000	58.41	-3.59	54.82	74	-19.18	H	PK
4924.000	43.28	-3.59	39.69	54	-14.31	H	AV
7386.000	52.22	1.79	54.01	74	-19.99	H	PK
7386.000	40.63	1.79	42.42	54	-11.58	H	AV
4924.000	61.31	-3.59	57.72	74	-16.28	V	PK
4924.000	41.16	-3.59	37.57	54	-16.43	V	AV
7386.000	53.38	1.79	55.17	74	-18.83	V	PK
7386.000	39.88	1.79	41.67	54	-12.33	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.*

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## 9. Out of Band Emissions

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### 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.

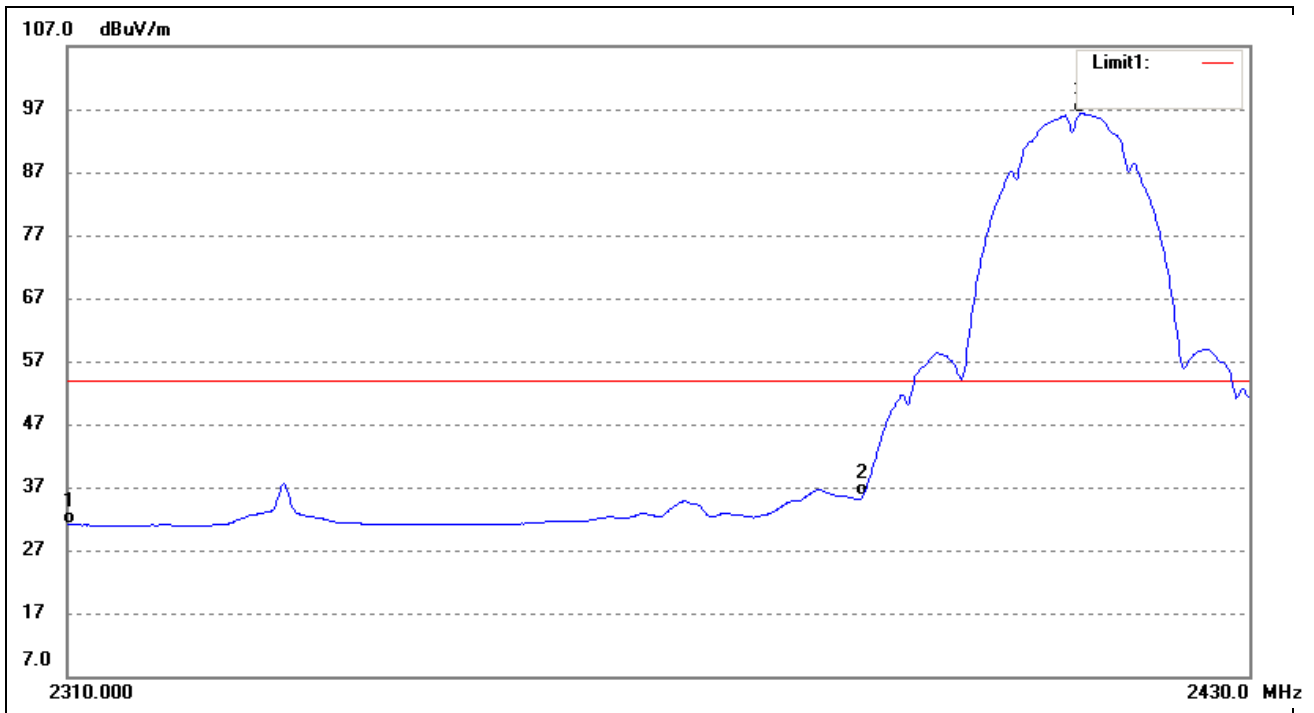
### 9.3 Environmental Conditions

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)

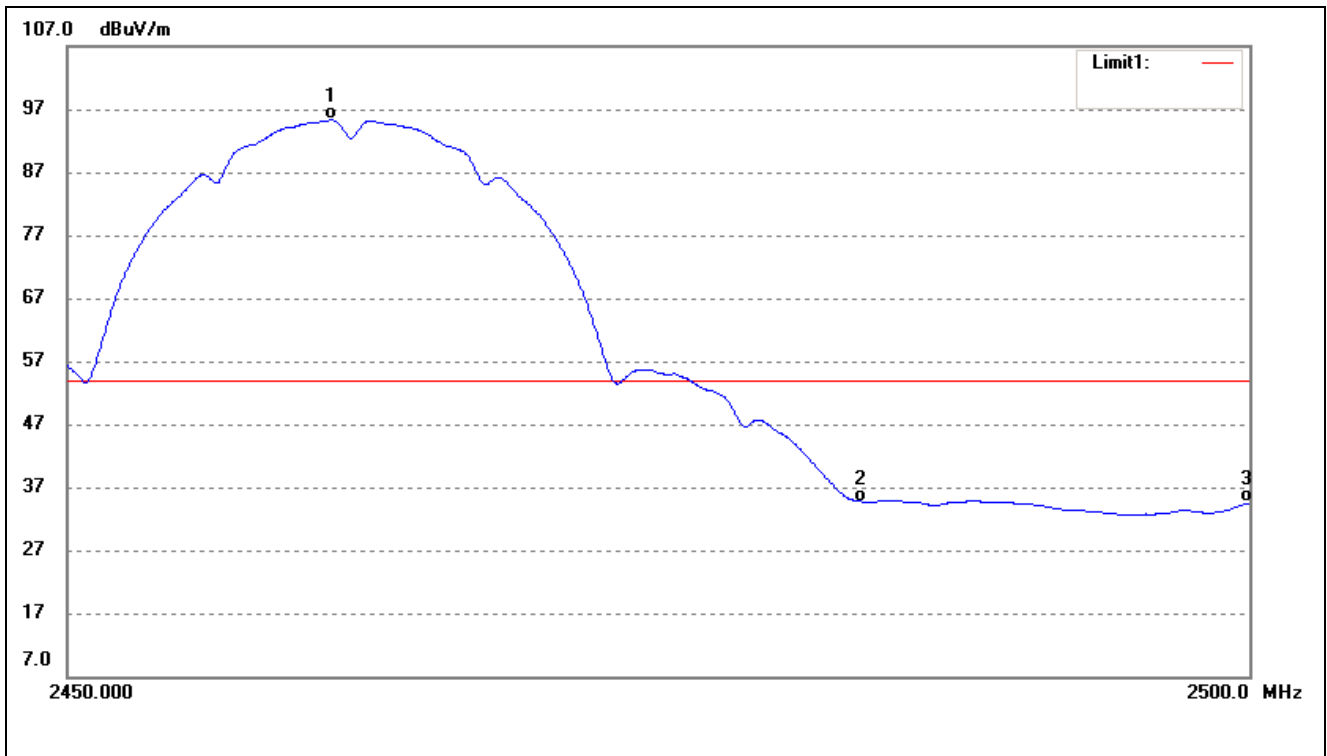


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	37.63	-6.38	31.25	54.00	-22.75	Average Detector
	2310.000	50.16	-6.38	43.78	74.00	-30.22	Peak Detector
2	2390.000	42.78	-7.26	35.52	54.00	-18.48	Average Detector
	2390.000	54.75	-7.26	47.49	74.00	-26.51	Peak Detector
3	2412.465	103.74	-7.40	96.34	/	/	Average Detector
	2412.710	108.48	-7.40	101.08	/	/	Peak Detector



## 802.11b\_11Mbps-Highest Bandedge

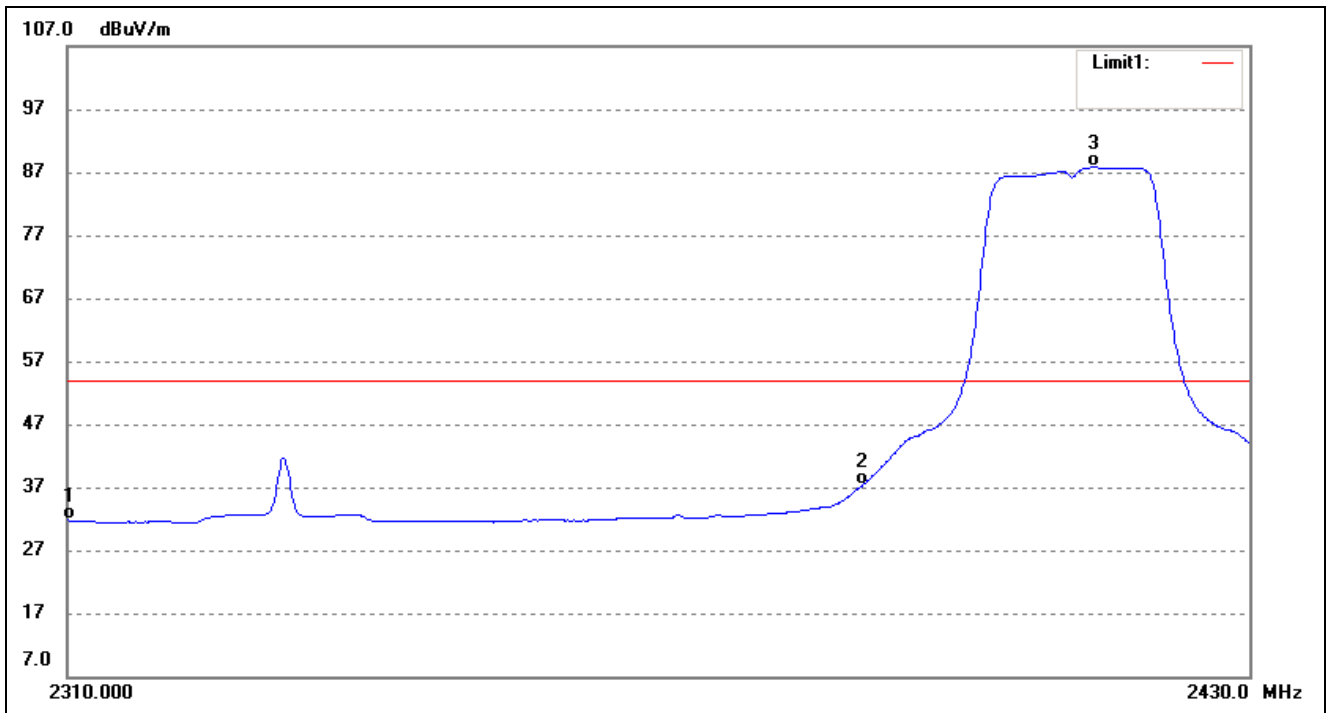
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2461.063	102.62	-7.32	95.30	/	/	Average Detector
	2460.814	106.94	-7.32	99.62	/	/	Peak Detector
2	2483.500	41.99	-7.28	34.71	54.00	-19.29	Average Detector
	2483.500	52.14	-7.28	44.86	74.00	-29.14	Peak Detector
3	2500.000	41.78	-7.25	34.53	54.00	-19.47	Average Detector
	2500.000	50.43	-7.25	43.18	74.00	-30.82	Peak Detector

## 802.11g\_54Mbps-Lowest Bandedge

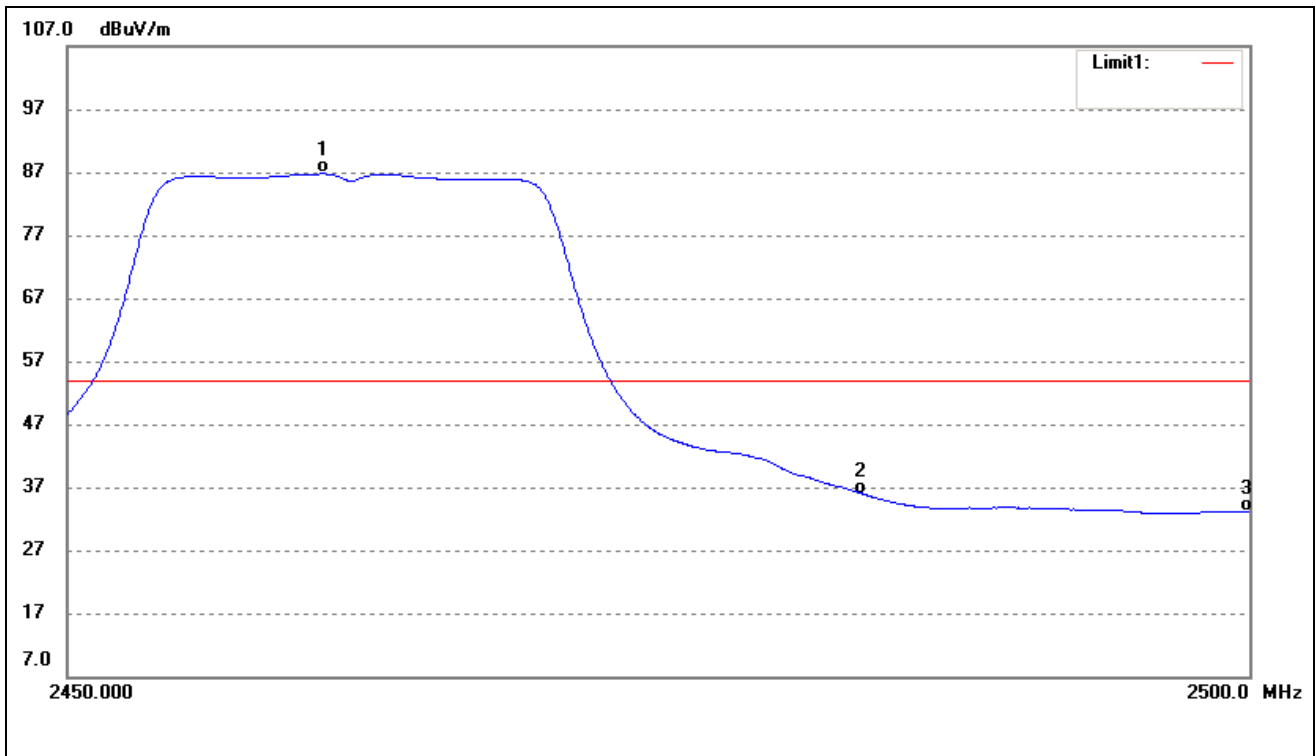
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.17	-6.38	31.79	54.00	-22.21	Average Detector
	2310.000	49.48	-6.38	43.10	74.00	-30.90	Peak Detector
2	2390.000	44.66	-7.26	37.40	54.00	-16.60	Average Detector
	2390.000	61.25	-7.26	53.99	74.00	-20.01	Peak Detector
3	2413.810	95.19	-7.40	87.79	/	/	Average Detector
	2413.198	104.63	-7.40	97.23	/	/	Peak Detector

## 802.11g\_54Mbps-Highest Bandedge

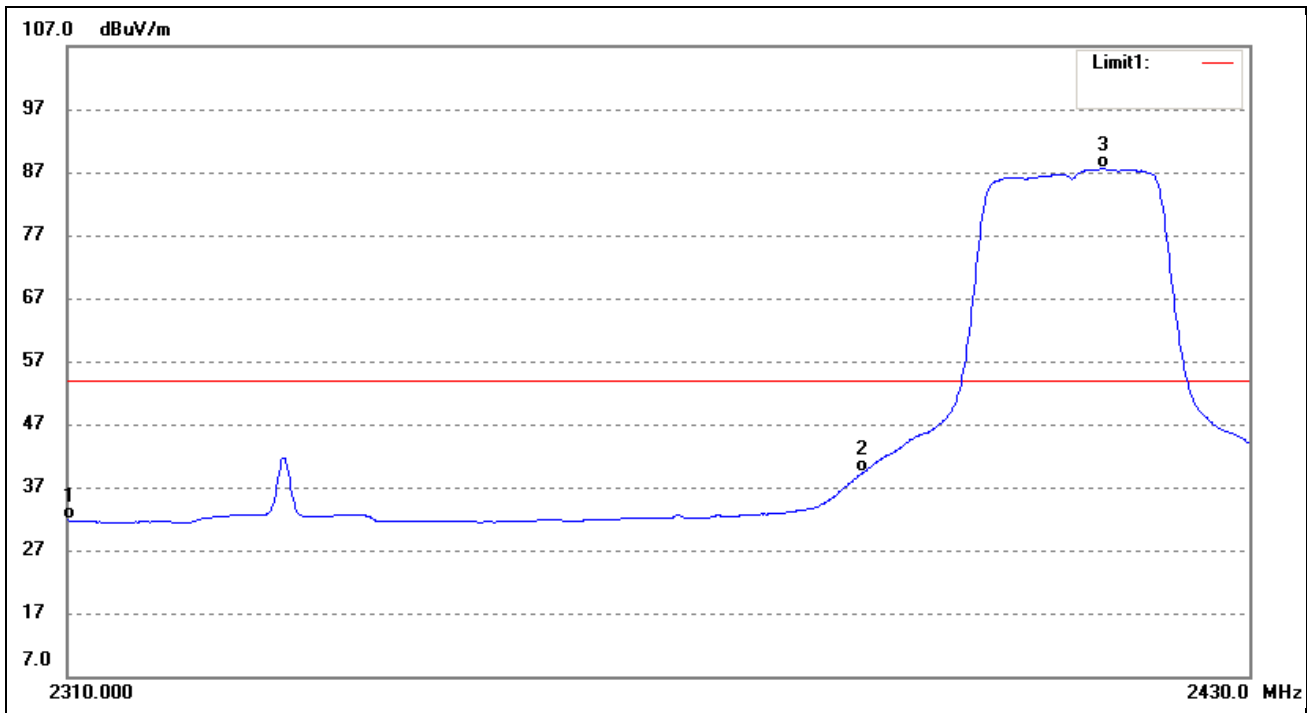
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.715	94.08	-7.32	86.76	/	/	Average Detector
	2463.251	103.29	-7.31	95.98	/	/	Peak Detector
2	2483.500	43.22	-7.28	35.94	54.00	-18.06	Average Detector
	2483.500	53.25	-7.28	45.97	74.00	-28.03	Peak Detector
3	2500.000	40.38	-7.25	33.13	54.00	-20.87	Average Detector
	2500.000	51.87	-7.25	44.62	74.00	-29.38	Peak Detector

802.11n-HT20\_MCS7-Lowest Bandedge

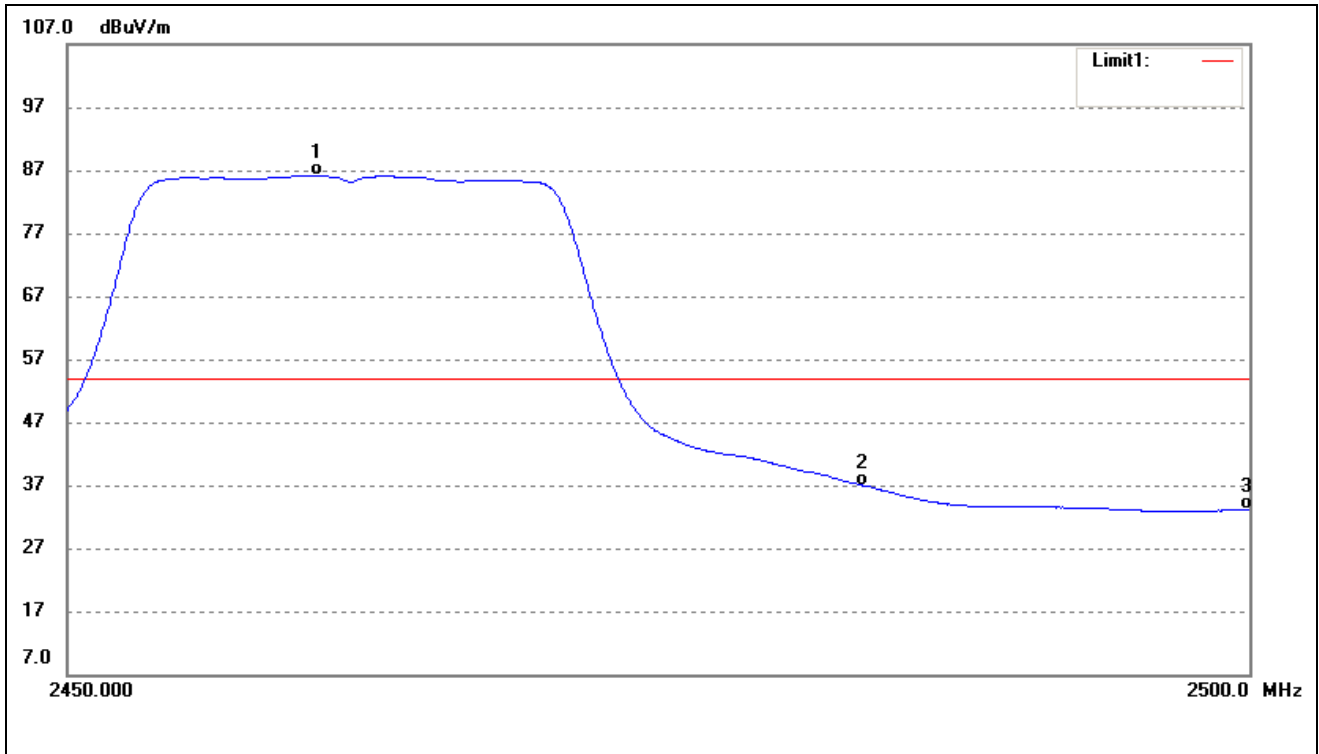
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.17	-6.38	31.79	54.00	-22.21	Average Detector
	2310.000	47.51	-6.38	41.13	74.00	-32.87	Peak Detector
2	2390.000	46.58	-7.26	39.32	54.00	-14.68	Average Detector
	2390.000	65.52	-7.26	58.26	74.00	-15.74	Peak Detector
3	2414.788	94.95	-7.40	87.55	/	/	Average Detector
	2415.032	104.31	-7.40	96.91	/	/	Peak Detector

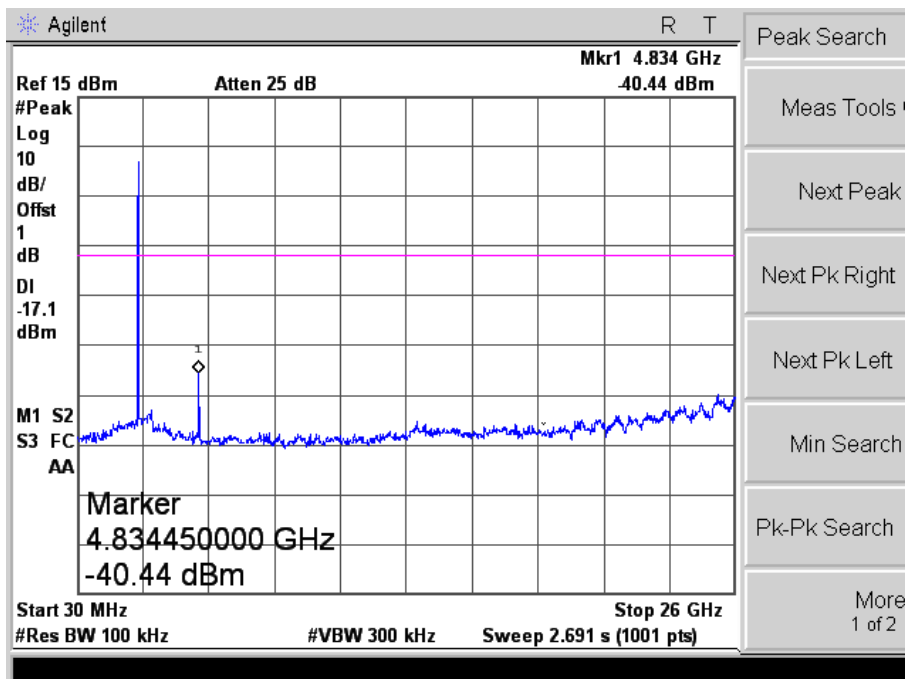
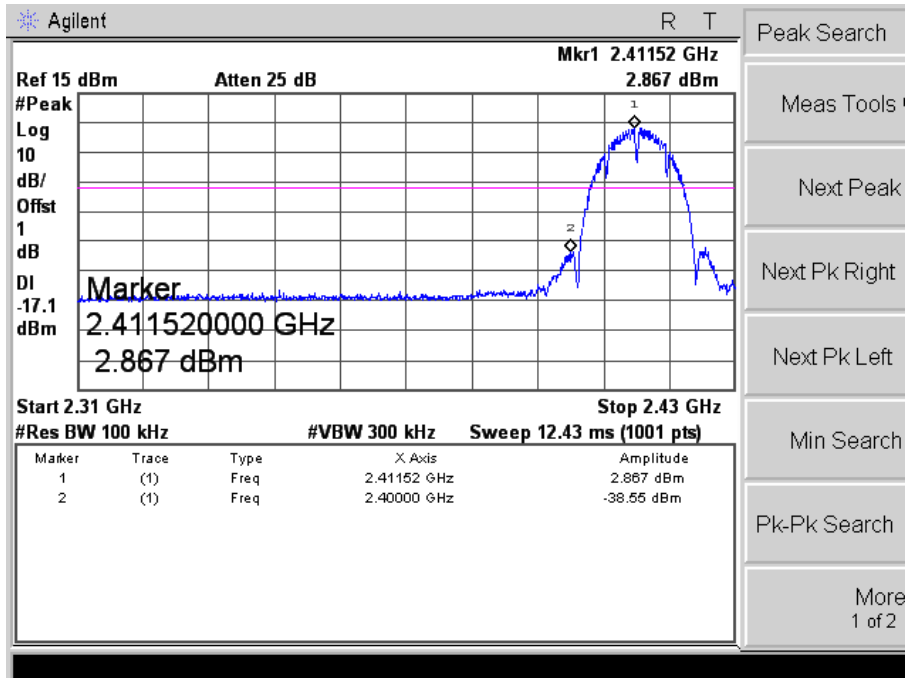
## 802.11n-HT20\_MCS7-Highest Bandedge

Vertical (Worst case)

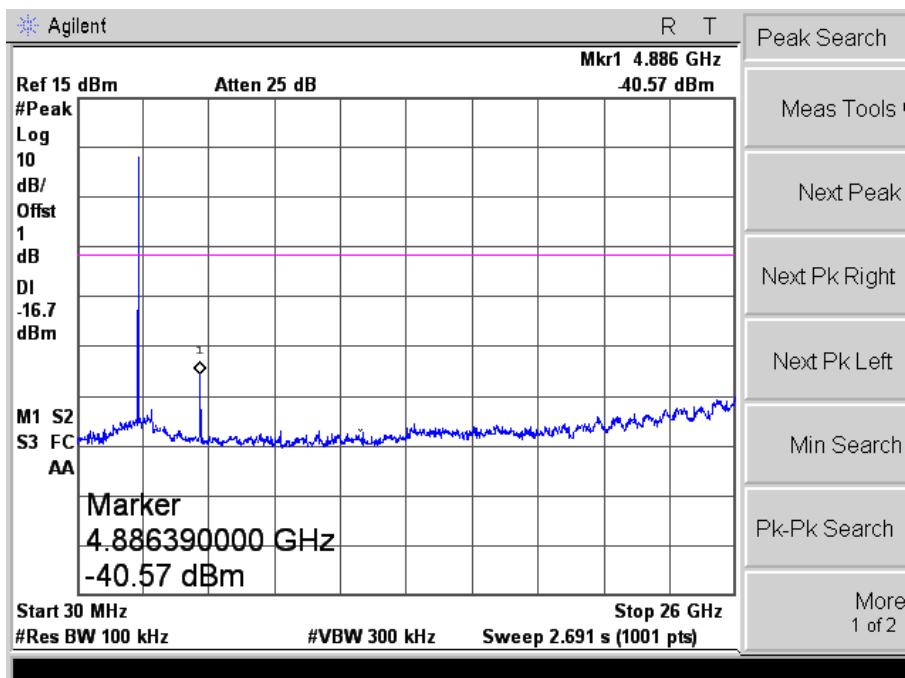
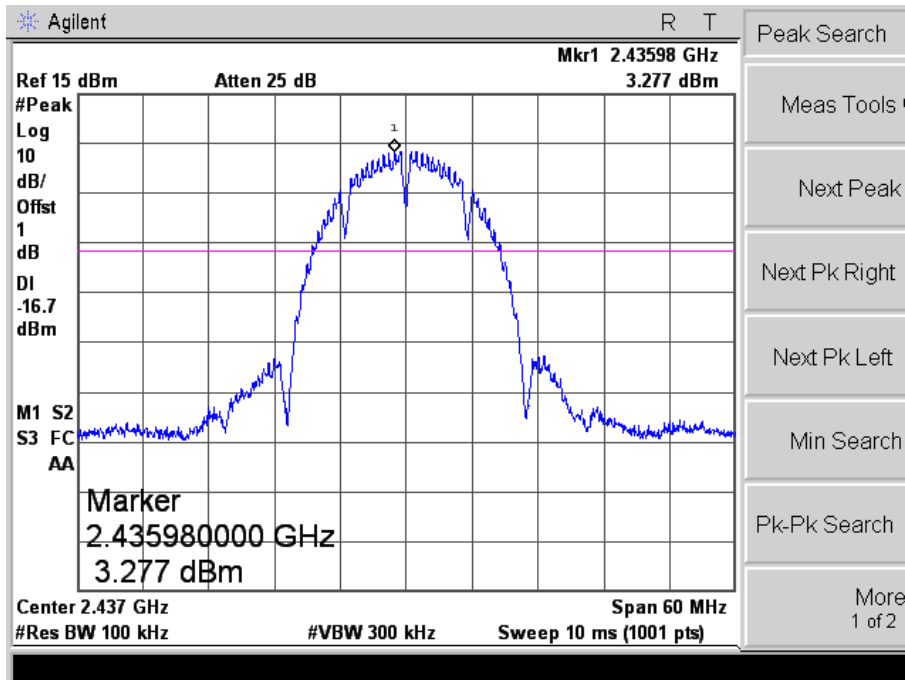


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.466	93.54	-7.32	86.22	/	/	Average Detector
	2458.578	103.14	-7.33	95.81	/	/	Peak Detector
2	2483.500	44.27	-7.28	36.99	54.00	-17.01	Average Detector
	2483.500	58.94	-7.28	51.66	74.00	-22.34	Peak Detector
3	2500.000	40.30	-7.25	33.05	54.00	-20.95	Average Detector
	2500.000	49.91	-7.25	42.66	74.00	-31.34	Peak Detector

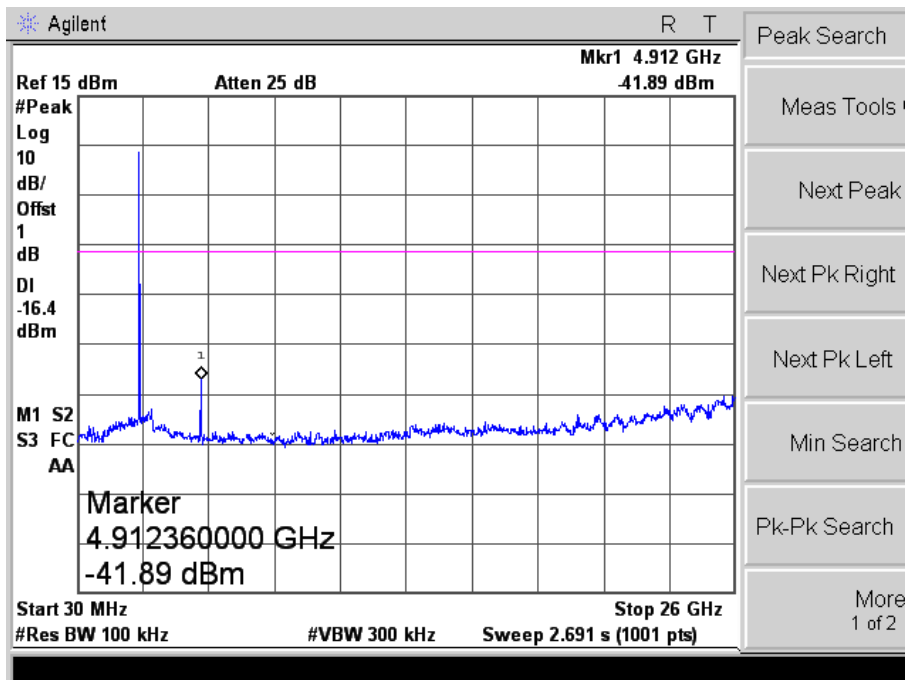
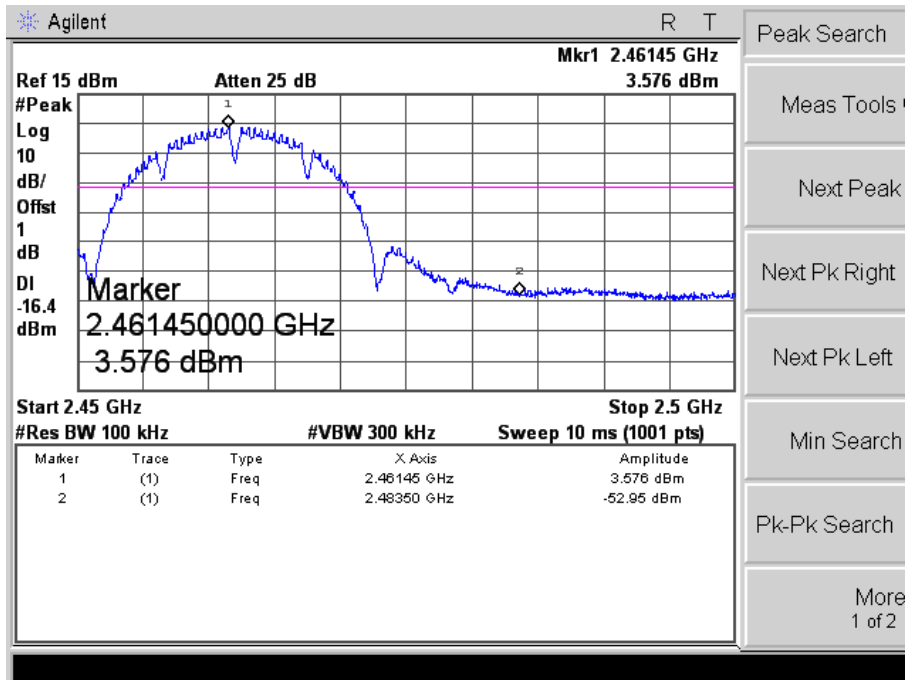
Spurious (Conducted)  
 802.11b\_11Mbps-Lowest  
 Lowest



Middle

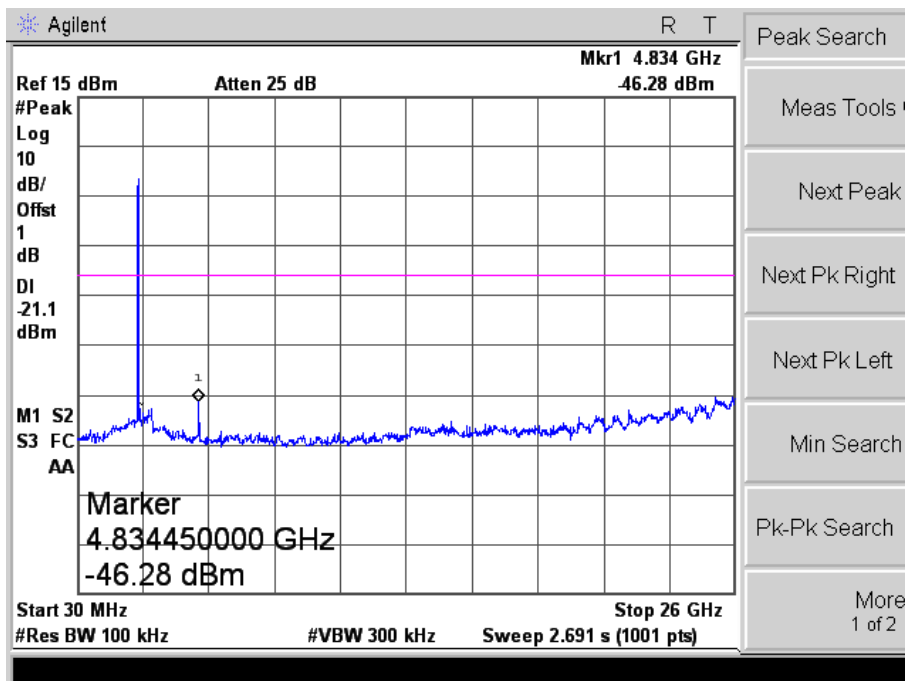
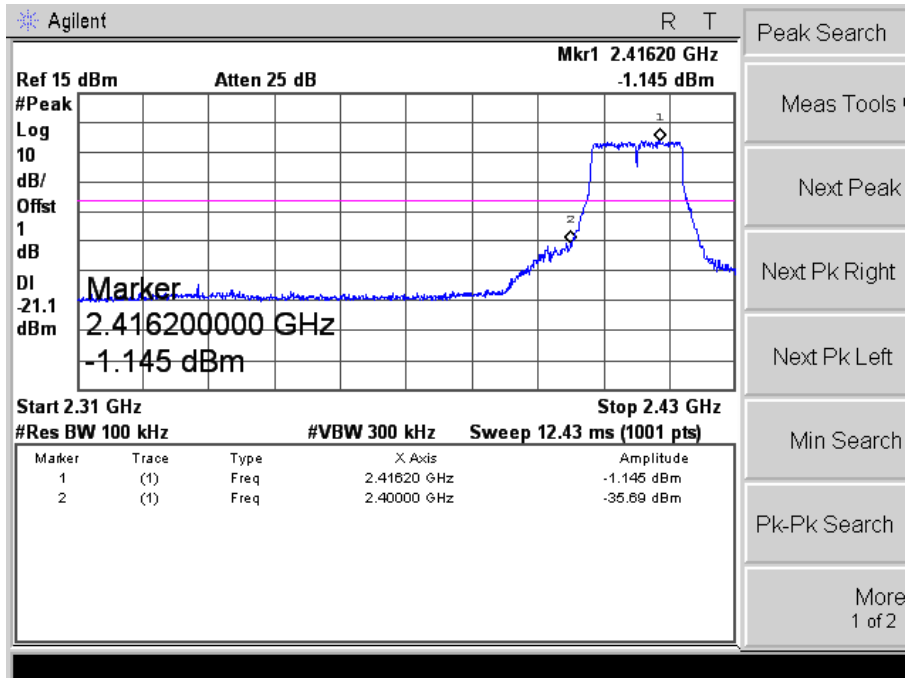


Highest

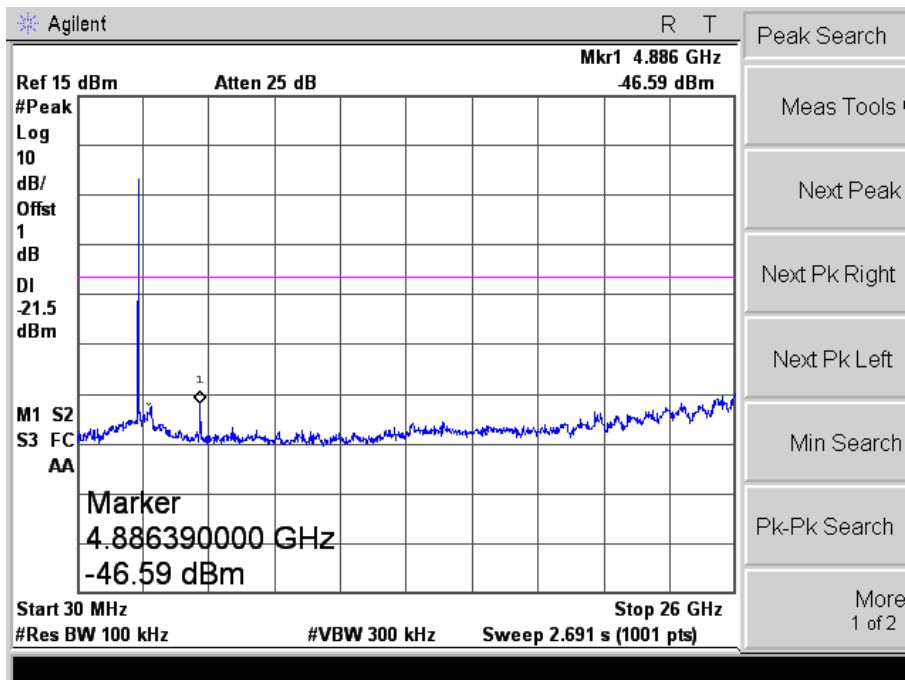
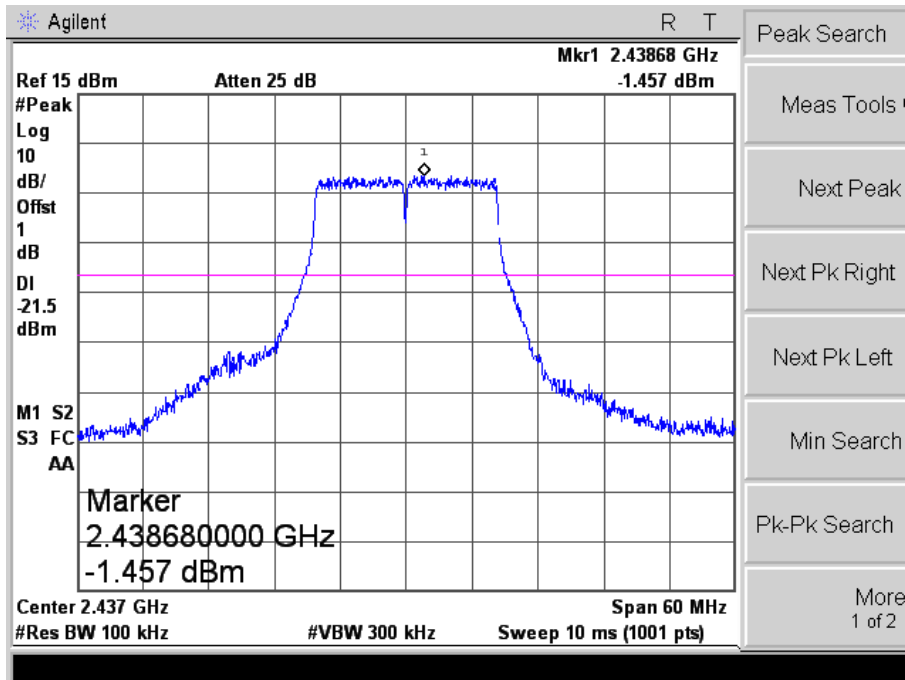




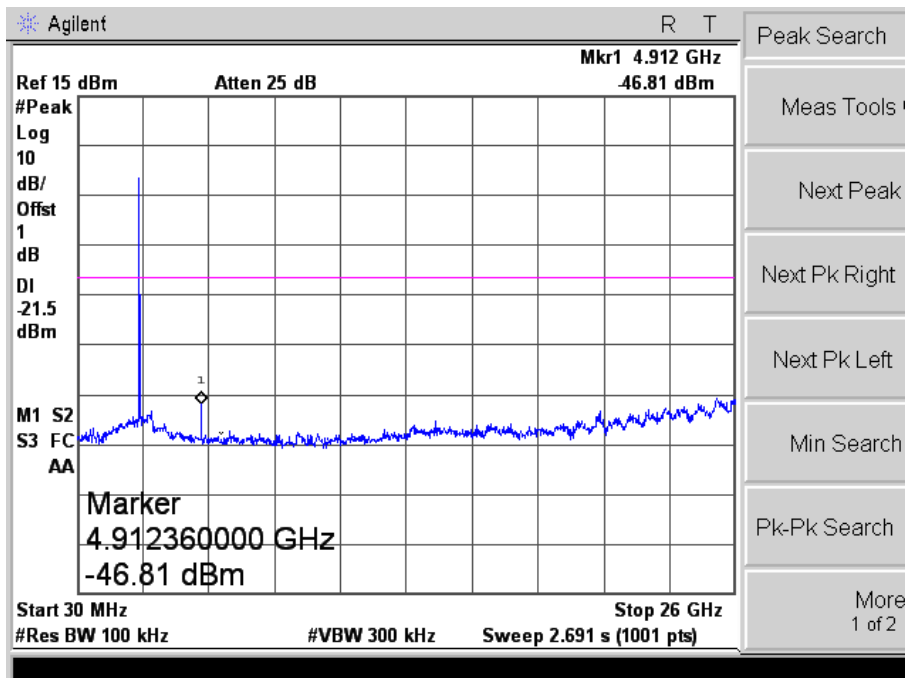
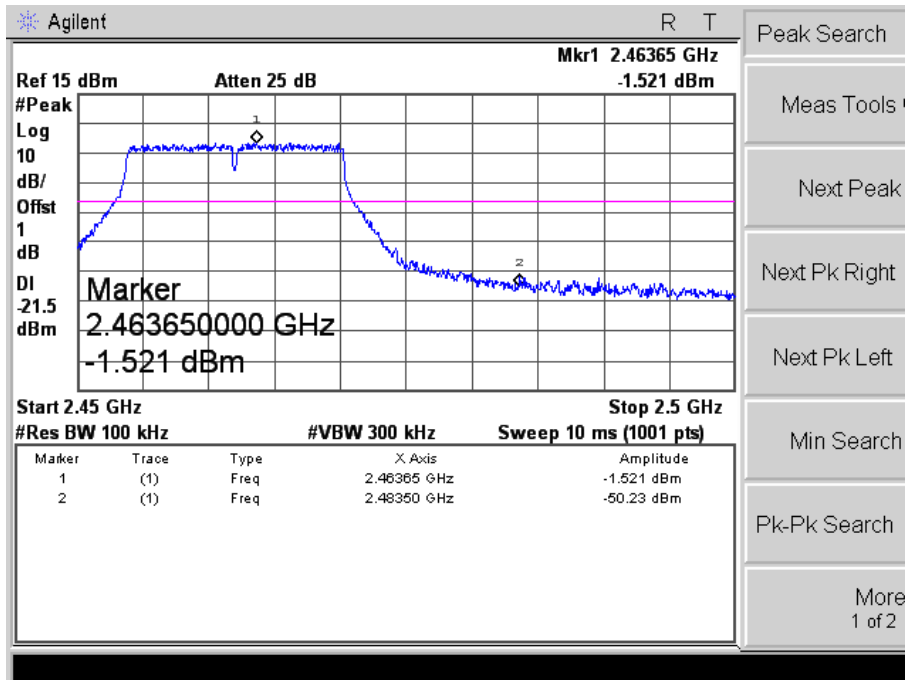
Spurious (Conducted)  
 802.11g\_54Mbps-Lowest  
 Lowest



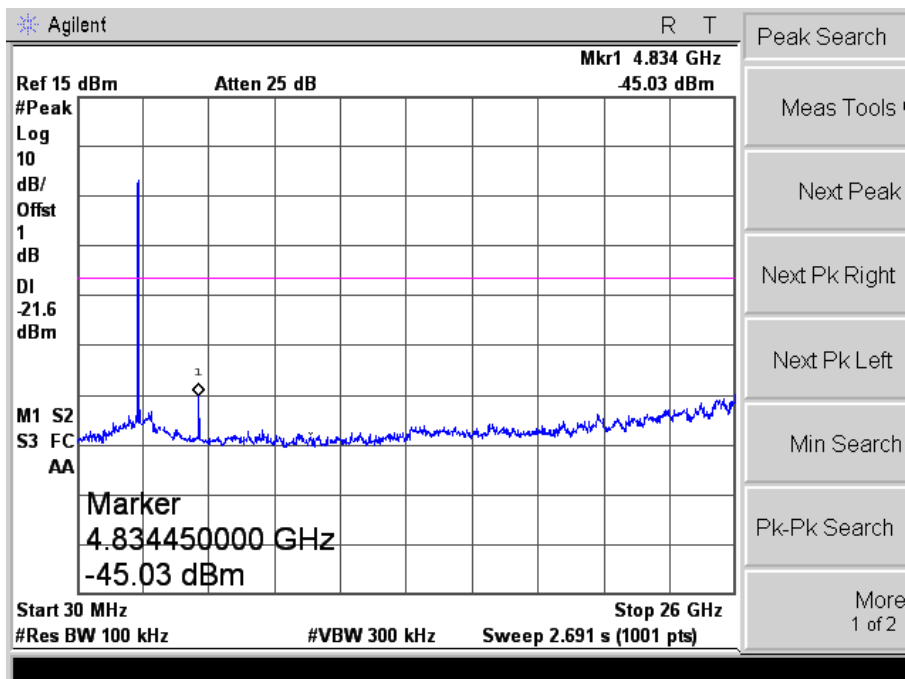
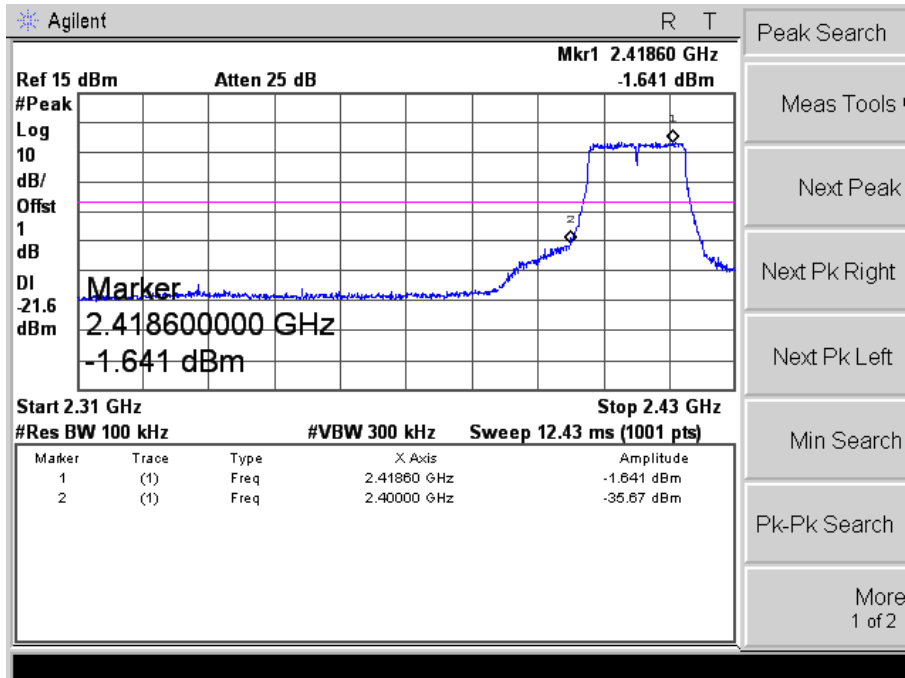
Middle



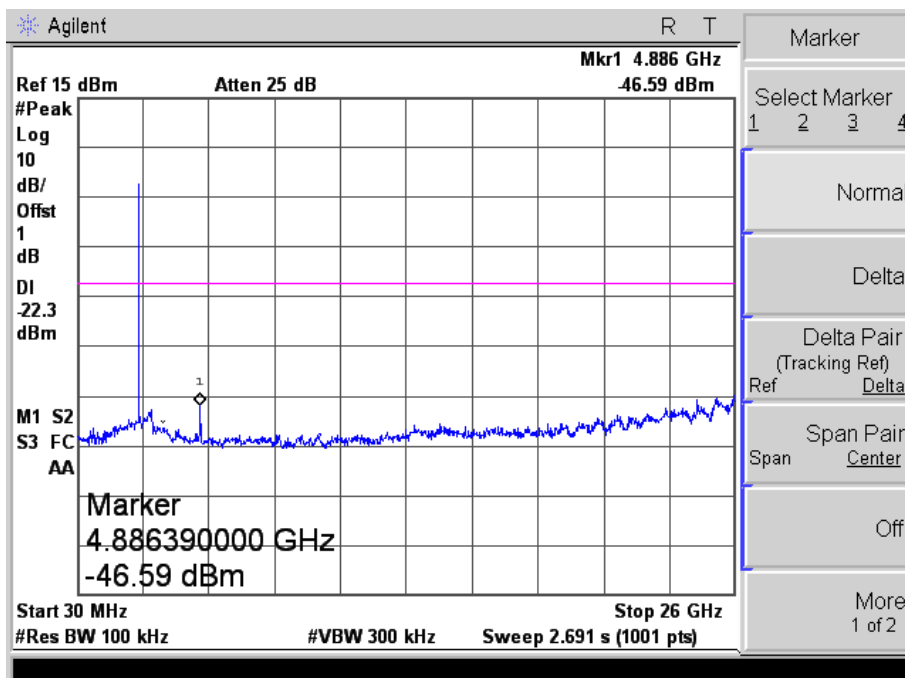
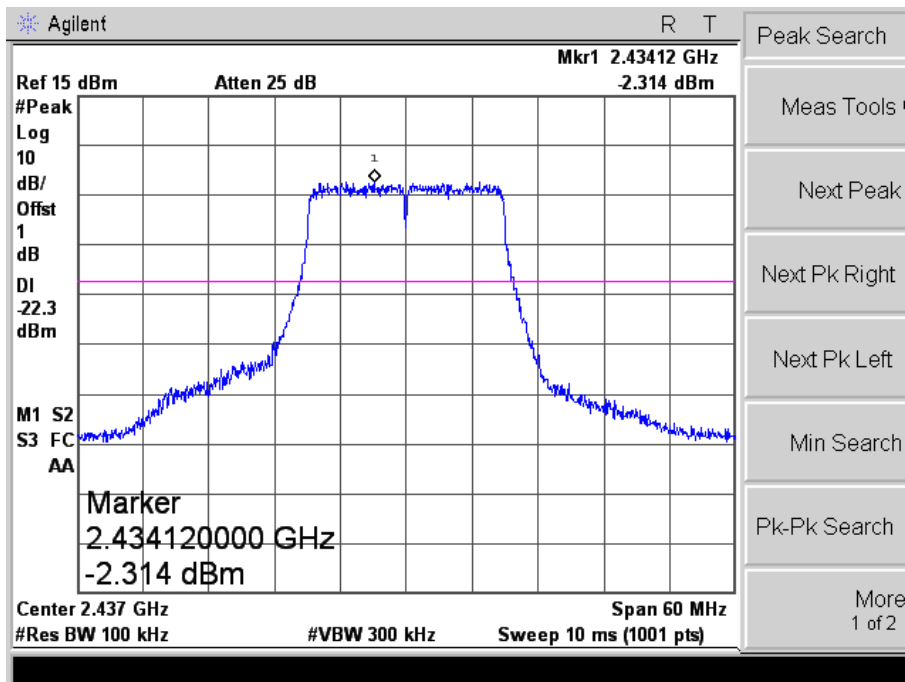
Highest



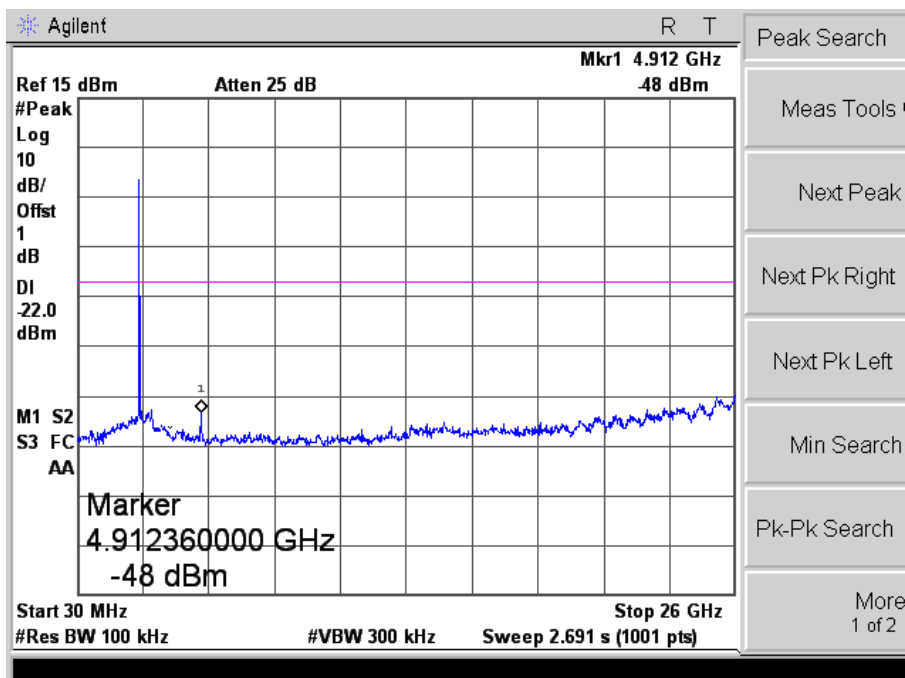
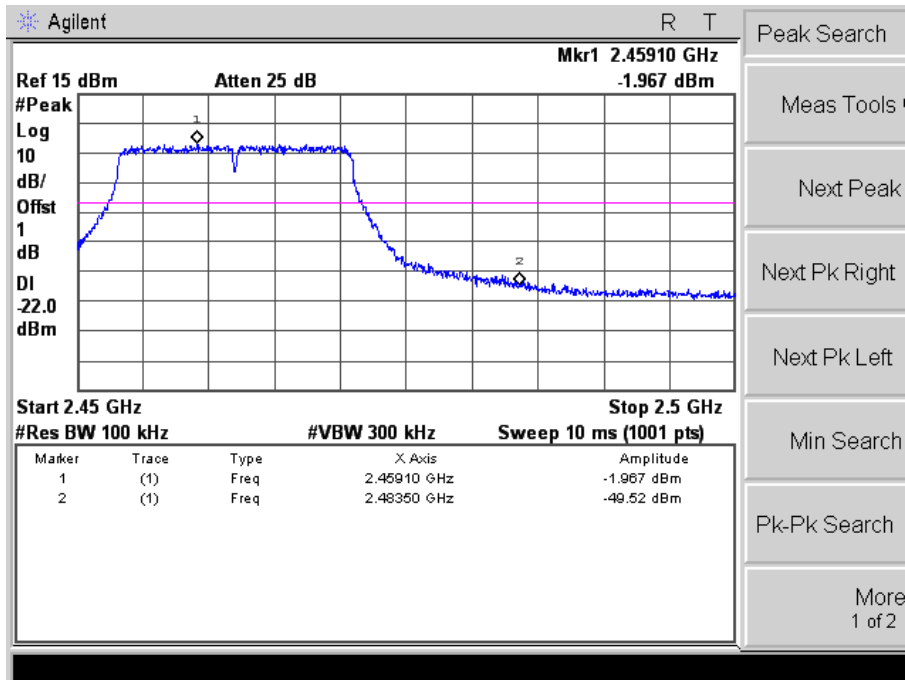
Spurious (Conducted)  
 802.11n-HT20\_MCS7-Lowest  
 Lowest



Middle



Highest



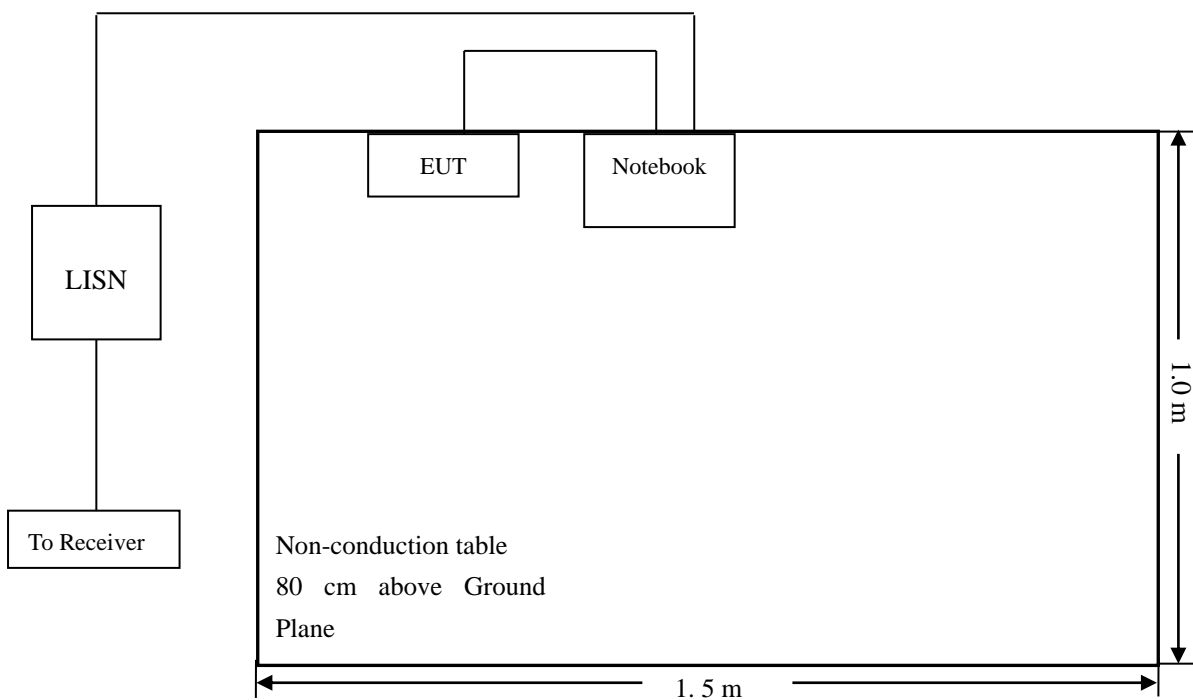
## 10. Conducted Emissions

### 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:

**-16.86 dB at 22.1700 MHz in the Line mode, AVG detector, 0.15-30MHz**

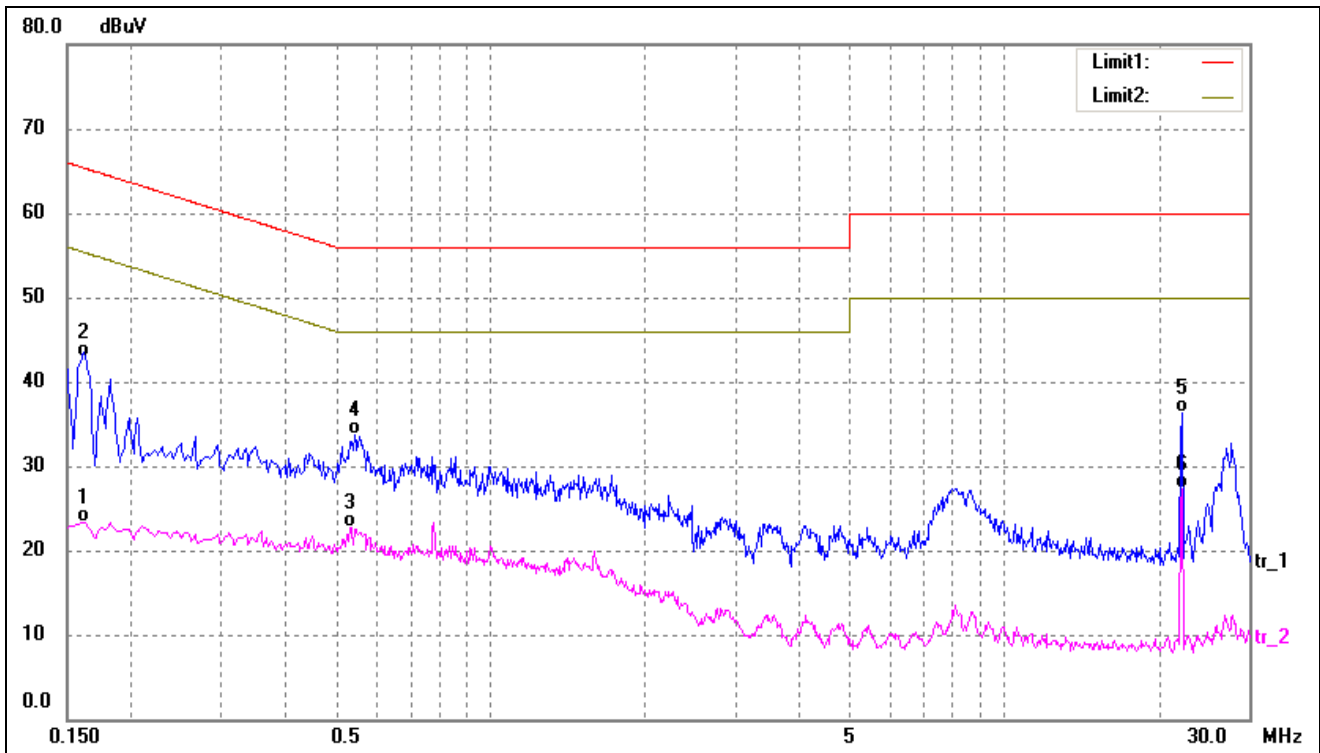
## 10.6 Conducted Emissions Test Data



**Plot of Conducted Emissions Test Data**

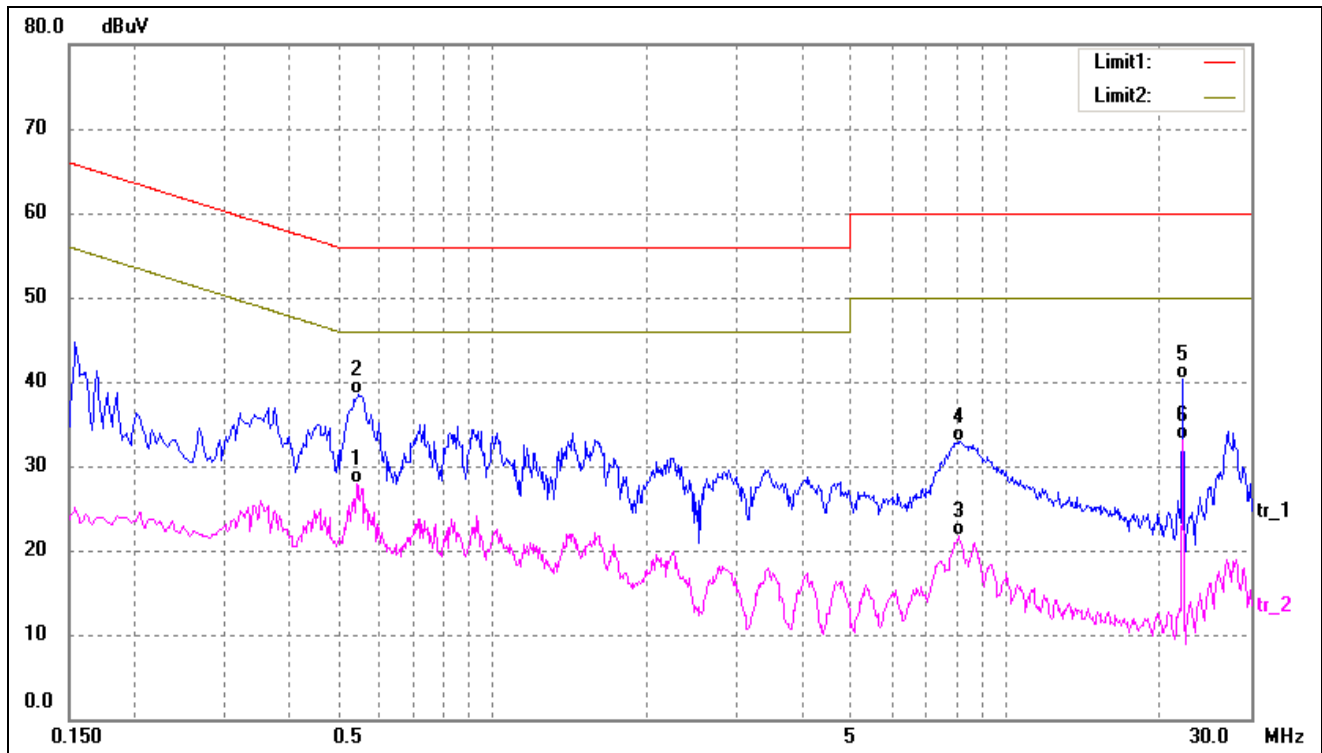
EUT: LM832 Wi-Fi & BT Dual Mode Combi Module  
 Tested Model: LM832-0474  
 Operating Condition: Transmitting(Wi-Fi)  
 Comment: DC 3.3V from test board

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1620	13.54	9.84	23.38	55.36	-31.98	AVG
2	0.1624	32.99	9.84	42.83	65.34	-22.51	QP
3	0.5340	12.97	9.80	22.77	46.00	-23.23	AVG
4*	0.5460	23.93	9.80	33.73	56.00	-22.27	QP
5	22.1820	26.62	9.68	36.30	60.00	-23.70	QP
6	22.1820	17.66	9.68	27.34	50.00	-22.66	AVG

Test Specification: Live



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.5460	18.05	9.80	27.85	46.00	-18.15	AVG
2	0.5500	28.79	9.80	38.59	56.00	-17.41	QP
3	8.0700	12.12	9.57	21.69	50.00	-28.31	AVG
4	8.1660	23.28	9.57	32.85	60.00	-27.15	QP
5	22.1700	30.67	9.68	40.35	60.00	-19.65	QP
6*	22.1700	23.46	9.68	33.14	50.00	-16.86	AVG

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