

# FCC Part 15C Measurement and Test Report

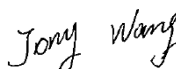
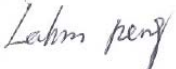

For

**Shenzhen HaiLingKe Electronic co., Ltd**

**3F, 5# Buliding, Minxing Industrial Park, MinKang Rd .Minzhi,**

**Longhua District, Shenzhen, China**

**FCC ID: 2AD56HLK-M30**

<b>FCC Rule(s):</b>	<u>FCC Part 15C</u>
<b>Product Description:</b>	<u>WIFI module</u>
<b>Tested Model:</b>	<u>HLK-M30</u>
<b>Report No.:</b>	<u>STR14128107I</u>
<b>Tested Date:</b>	<u>2014-12-12 to 2014-12-20</u>
<b>Issued Date:</b>	<u>2014-12-20</u>
<b>Tested By:</b>	<u>Jong Wang / Engineer</u> 
<b>Reviewed By:</b>	<u>Lahm Peng / EMC Manager</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: Shenzhen HaiLingKe Electronic co., Ltd  
 Address of applicant: 3F, 5# Buliding, Minxing Industrial Park, MinKang Rd., Minzhi, Longhua District, Shenzhen, China  
 Manufacturer: Shenzhen HaiLingKe Electronic co., Ltd  
 Address of manufacturer: 3F, 5# Buliding, Minxing Industrial Park, MinKang Rd., Minzhi, Longhua District, Shenzhen, China

General Description of EUT	
Product Name:	WIFI module
Trade Name:	HI-LINK
Model No.:	HLK-M30
Adding Model(s):	/
Rated Voltage:	DC 3.3V
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2472MHz for 802.11b/g/n(HT20) 2422-2462MHz for 802.11n(HT40)
RF Output Power:	13.31 dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	13 for 802.11b/g/n(HT20); 9 for 802.11n(HT40)
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	1.5dBi
Lowest Internal Frequency	40MHz

## 1.2 Test Standards

The following report is prepared on behalf of the Shenzhen HaiLingKe Electronic 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 C63.4-2003, 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 V03r02 for digital transmission systems shall be performed also.

## 1.4 Test Facility

### **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

### **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.

### **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2<sup>nd</sup> Road, Bao'an District, Shenzhen, P.R.C (518101).

## 1.5 EUT Setup and Test Mode

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

<b>Test Mode List</b>		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2442MHz, 2472MHz
TM2	802.11g	2412MHz, 2442MHz, 2472MHz
TM3	802.11n-HT20	2412MHz, 2442MHz, 2472MHz
TM4	802.11n-HT40	2422MHz, 2442MHz, 2462MHz

<b>EUT Cable List and Details</b>			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

<b>Special Cable List and Details</b>			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

<b>Auxiliary Equipment List and Details</b>			
Description	Manufacturer	Model	Serial Number
computer	Lenovo	A4600t-10	/

## 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
§ 15.207(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 an integral antenna, fulfill the requirement of this section.



## 5. Power Spectral Density

### 5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 5.3 Test Procedure

According to the KDB 558074 D01 V03r02, 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  $\geq 2 \times \text{span}/\text{RBW}$ .
- 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).

### 5.4 Environmental Conditions

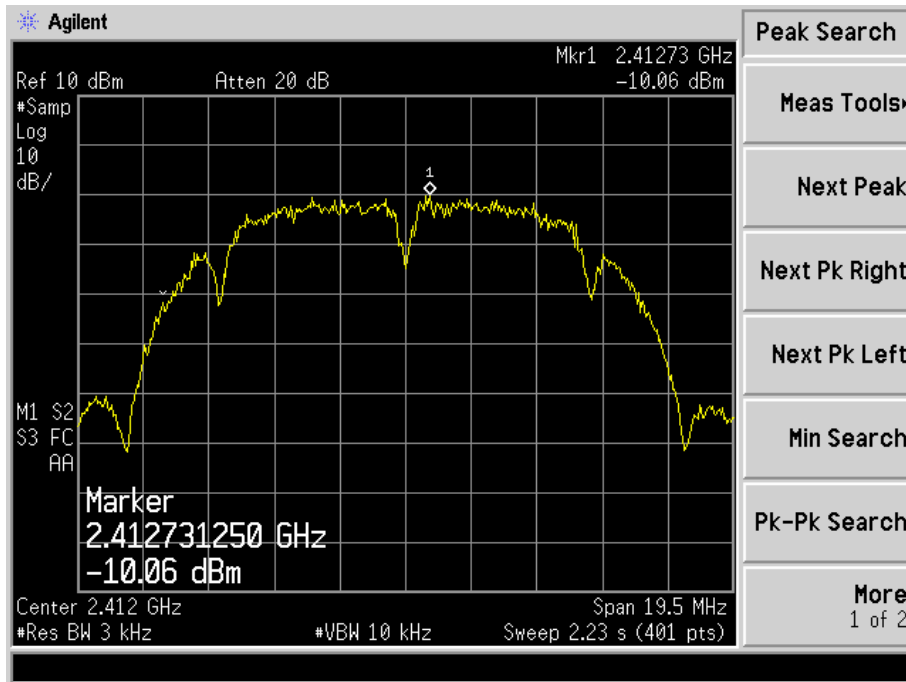
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

## 5.5 Summary of Test Results/Plots

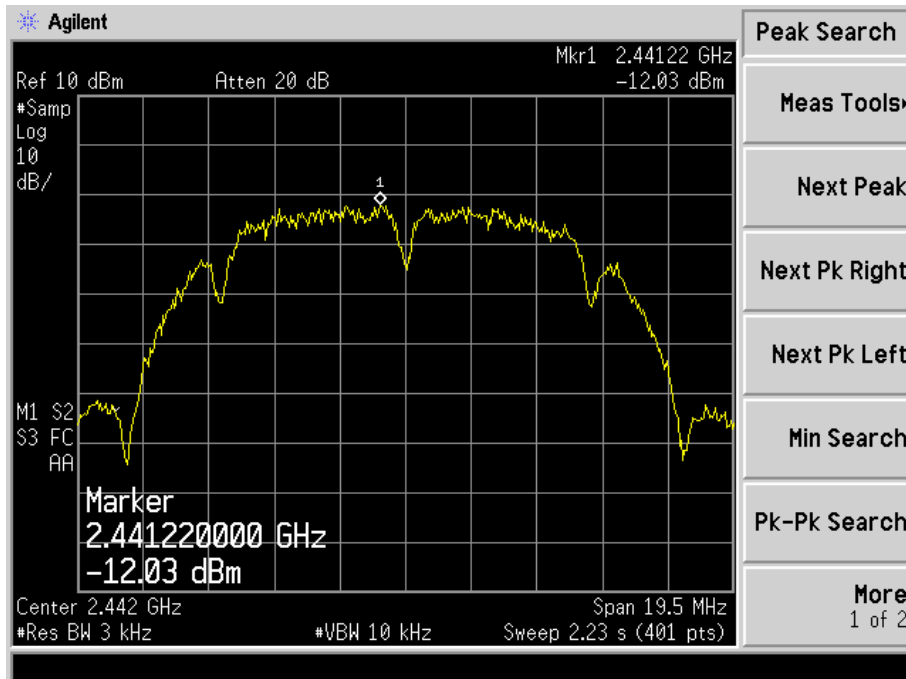
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-10.06	8
	2442	-12.03	8
	2472	-11.60	8
802.11g	2412	-11.83	8
	2442	-14.16	8
	2472	-12.52	8
802.11n HT20	2412	-12.61	8
	2442	-14.35	8
	2472	-13.73	8
802.11n HT40	2422	-16.16	8
	2442	-17.90	8
	2462	-17.01	8

Please refer to the following test plots:

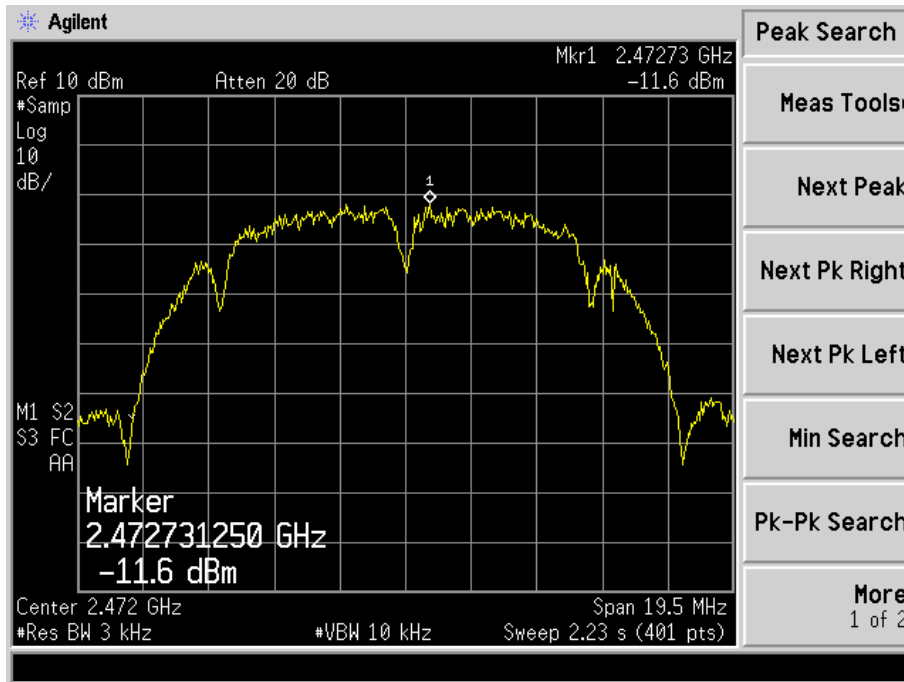
802.11b-Low Channel



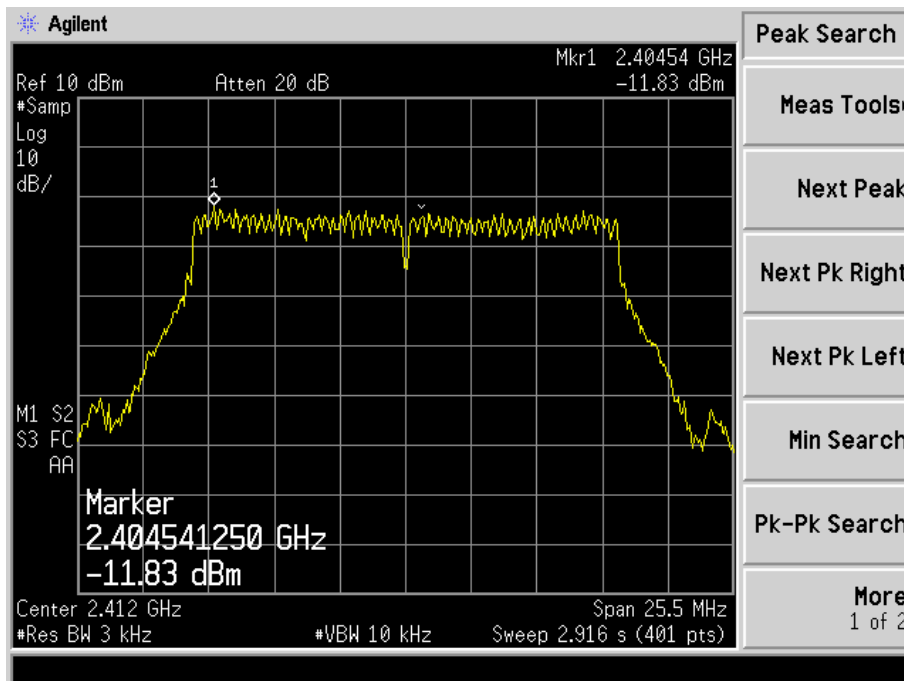
802.11b-Middle Channel



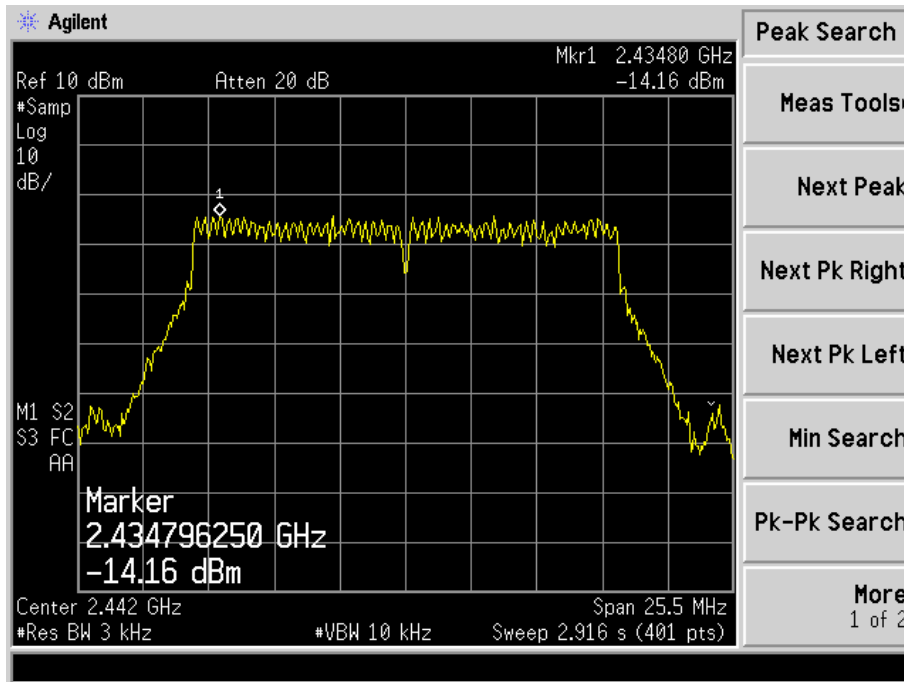
802.11b-High Channel



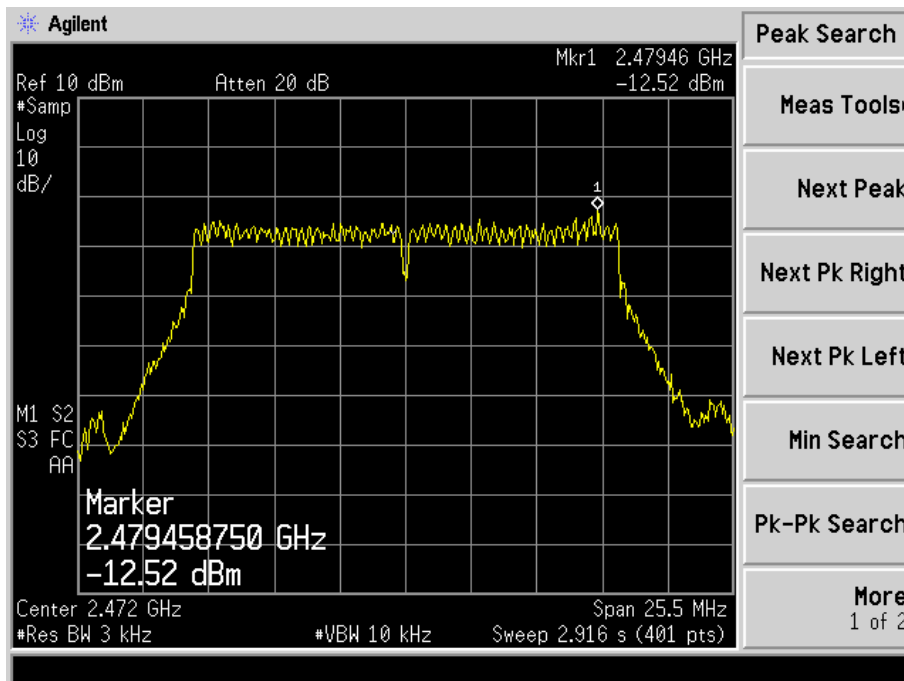
802.11g-Low Channel



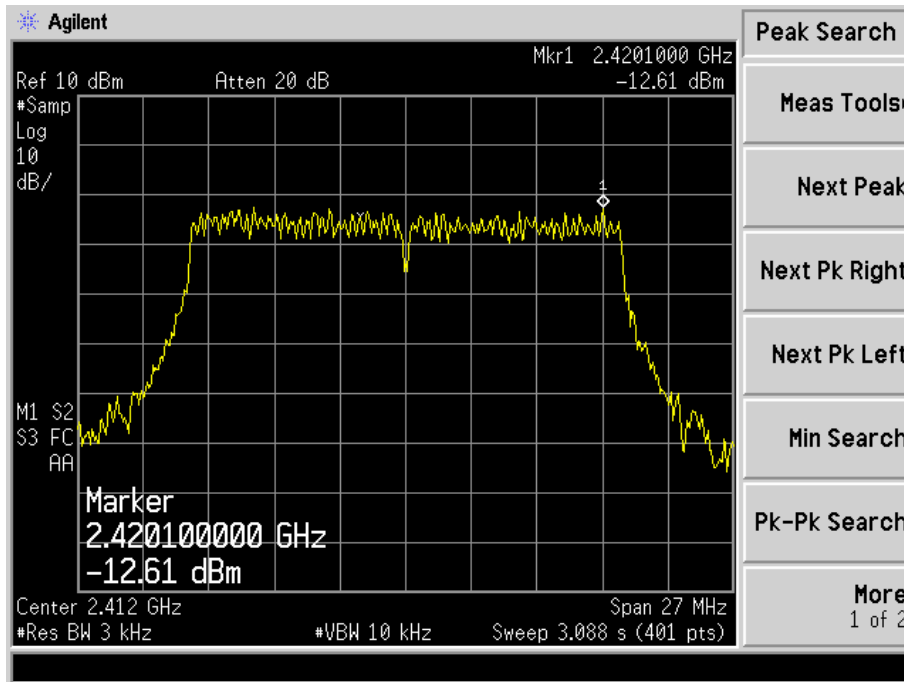
802.11g-Middle Channel



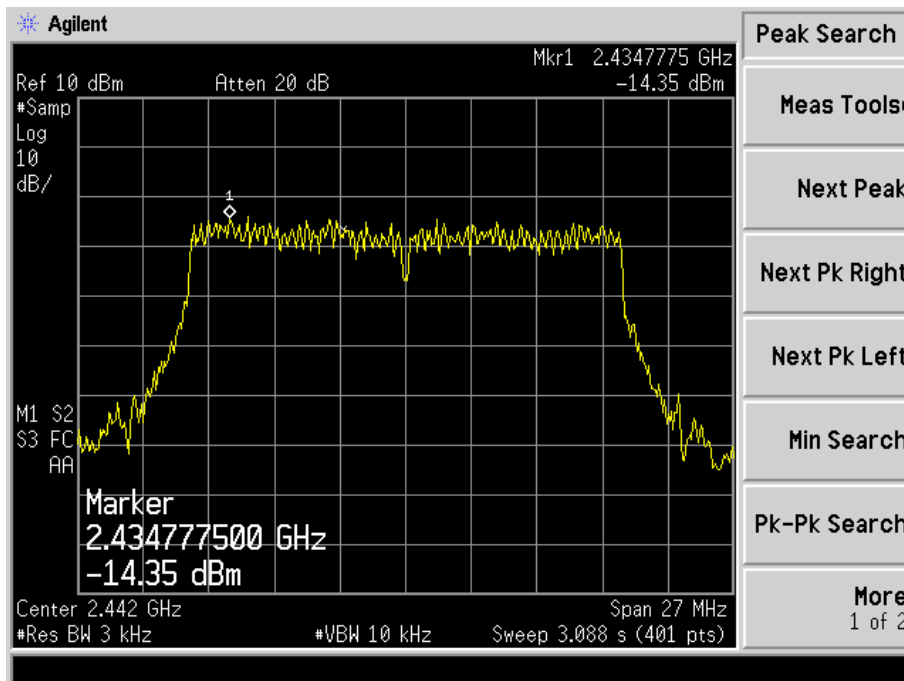
802.11g-High Channel



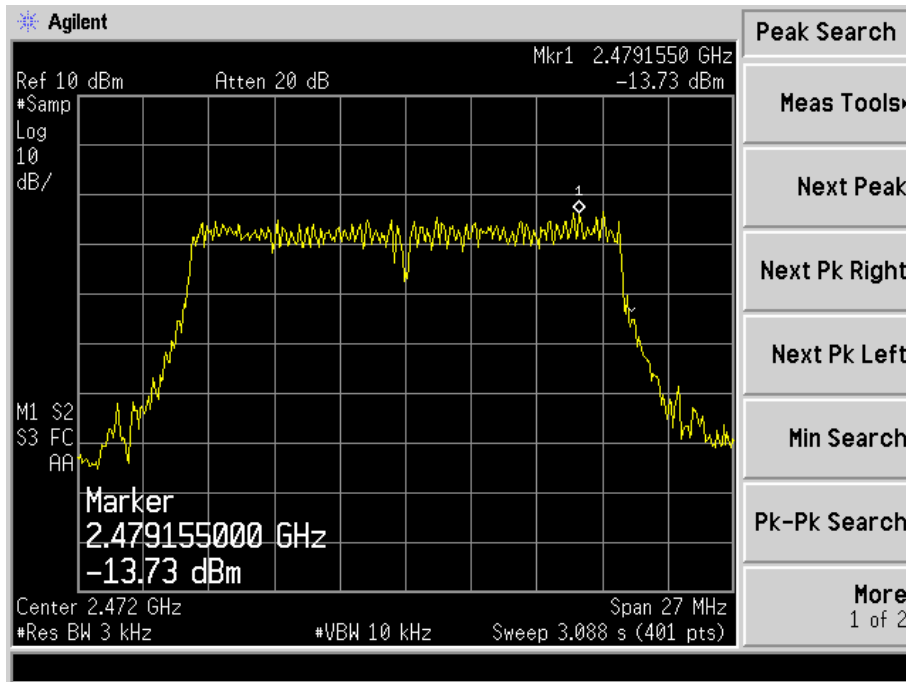
802.11n-HT20-Low Channel



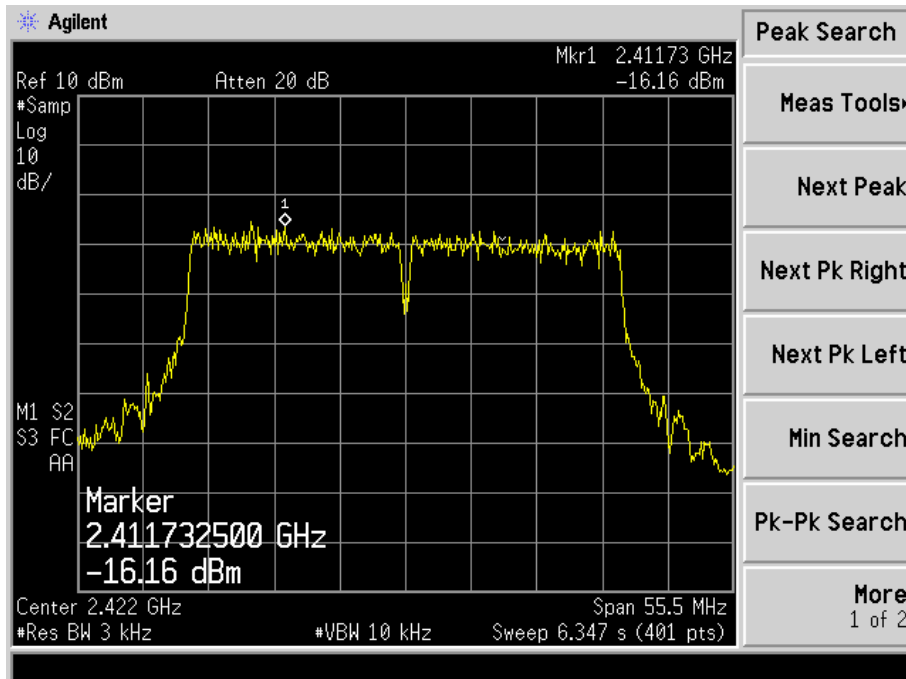
802.11n-HT20-Middle Channel



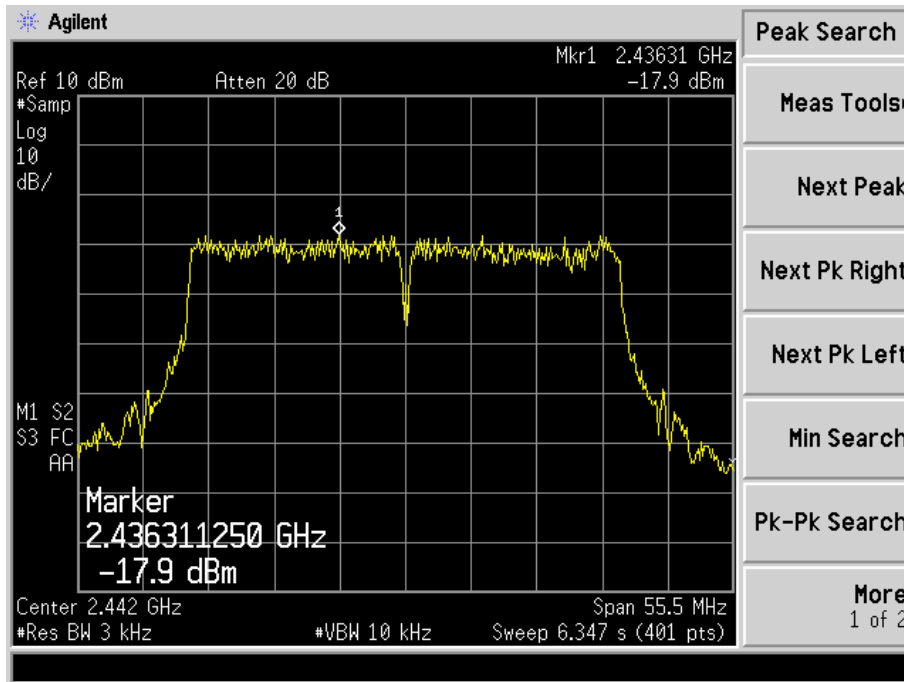
802.11n-HT20-High Channel



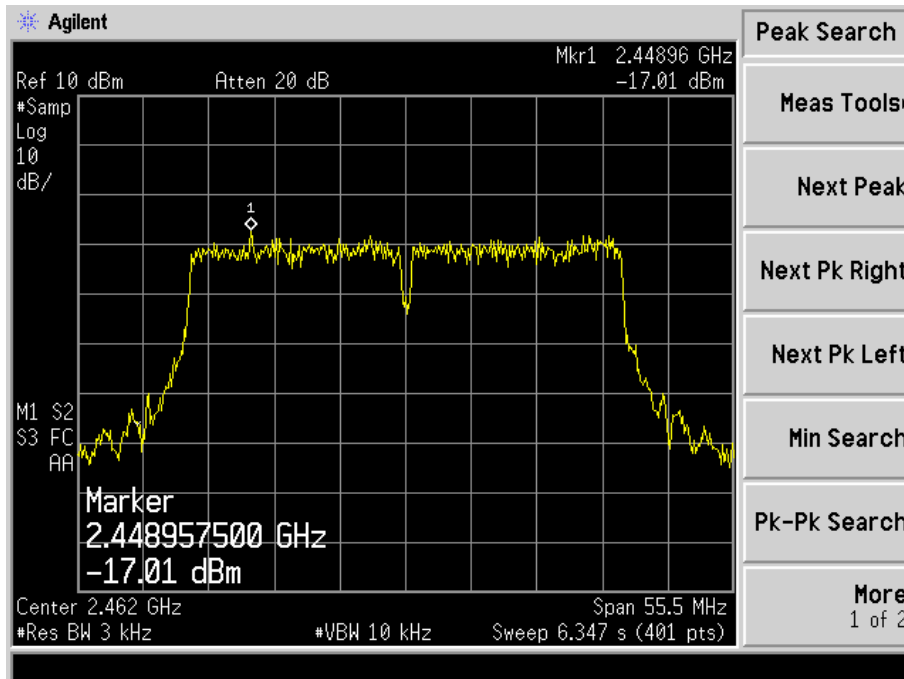
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel





## 6. 6dB Bandwidth

### 6.1 Standard Applicable

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

### 6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 6.3 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.

### 6.4 Environmental Conditions

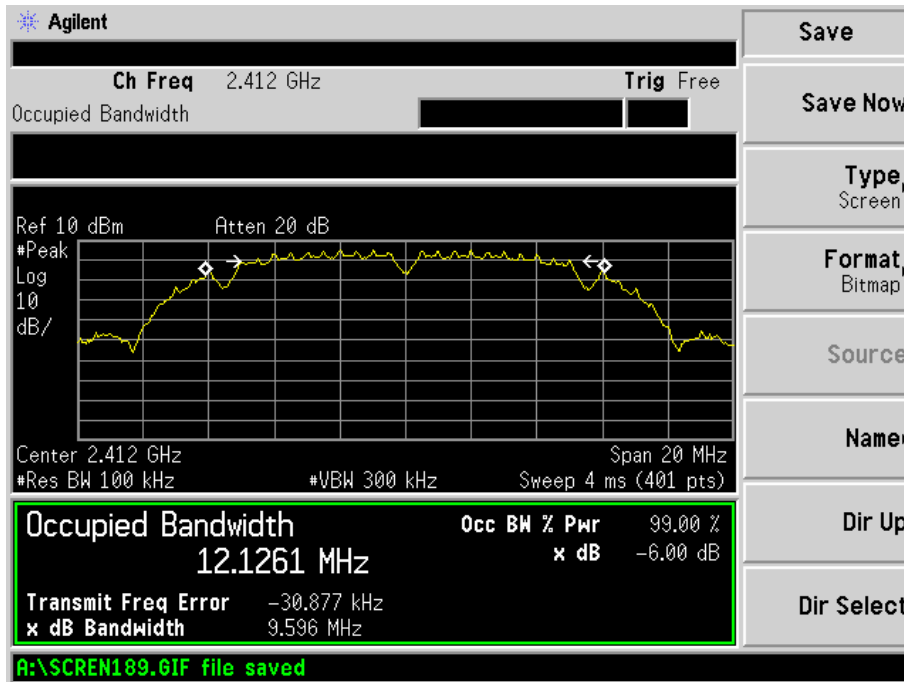
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

## 6.5 Summary of Test Results/Plots

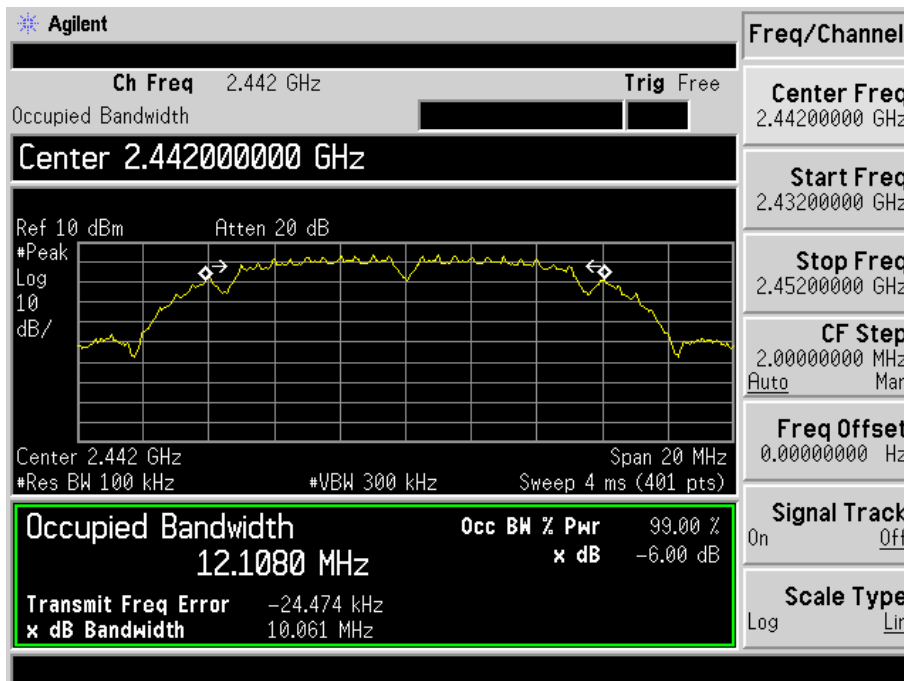
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
802.11b	2412	9596	12126.1	500
	2442	10061	12108.0	500
	2472	9130	12103.5	500
802.11g	2412	16364	16427.6	500
	2442	16412	16435.8	500
	2472	16387	16434.1	500
802.11n-HT20	2412	17389	17512.6	500
	2442	17585	17531.0	500
	2472	17507	17540.3	500
802.11n-HT40	2422	36093	36032.6	500
	2442	36300	36086.8	500
	2462	36263	36069.1	500

Please refer to the following test plots:

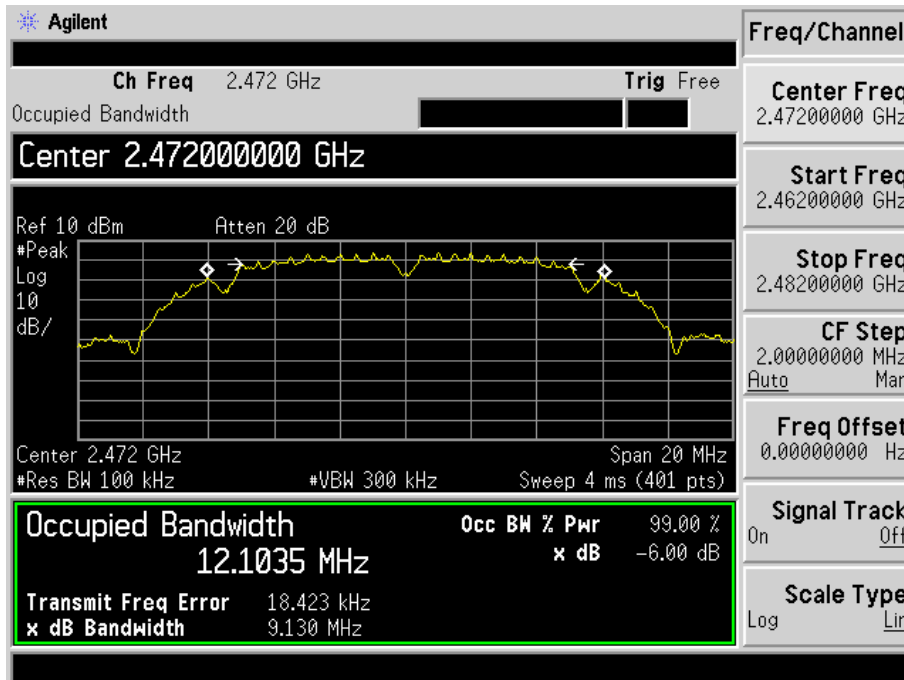
802.11b-Low Channel



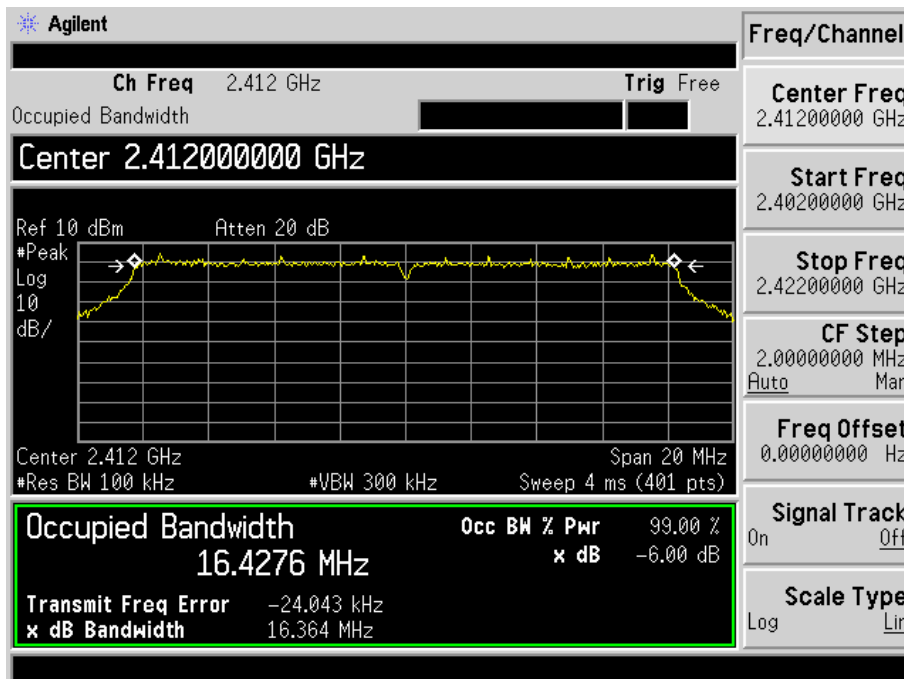
802.11b-Middle Channel



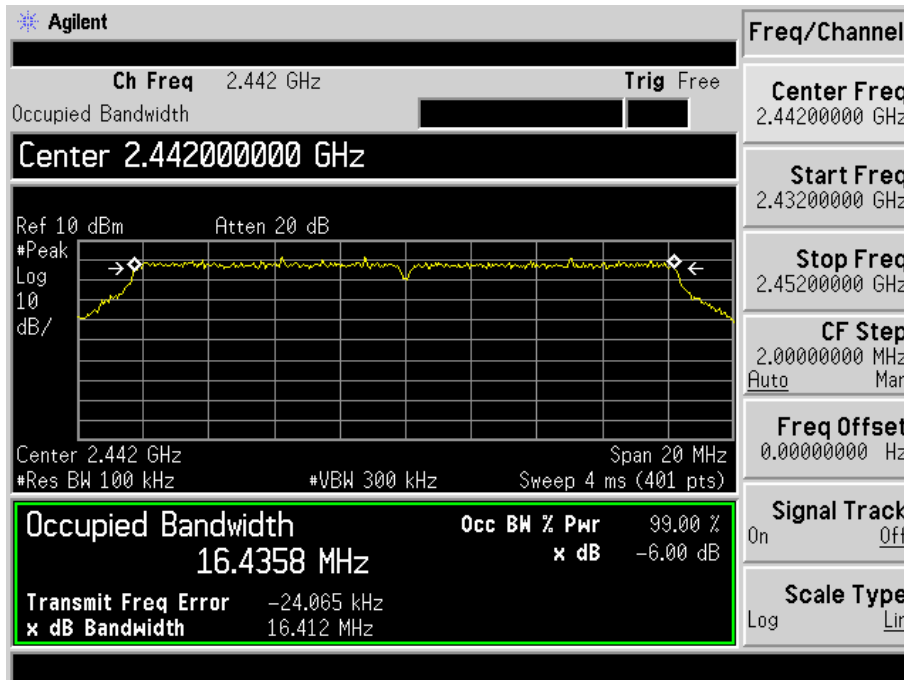
802.11b-High Channel



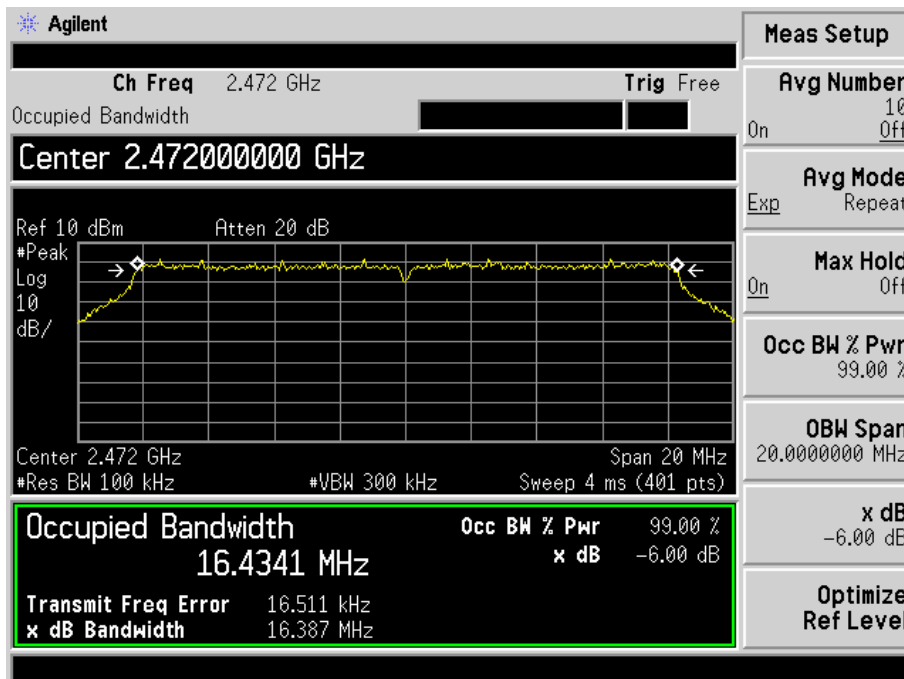
802.11g-Low Channel



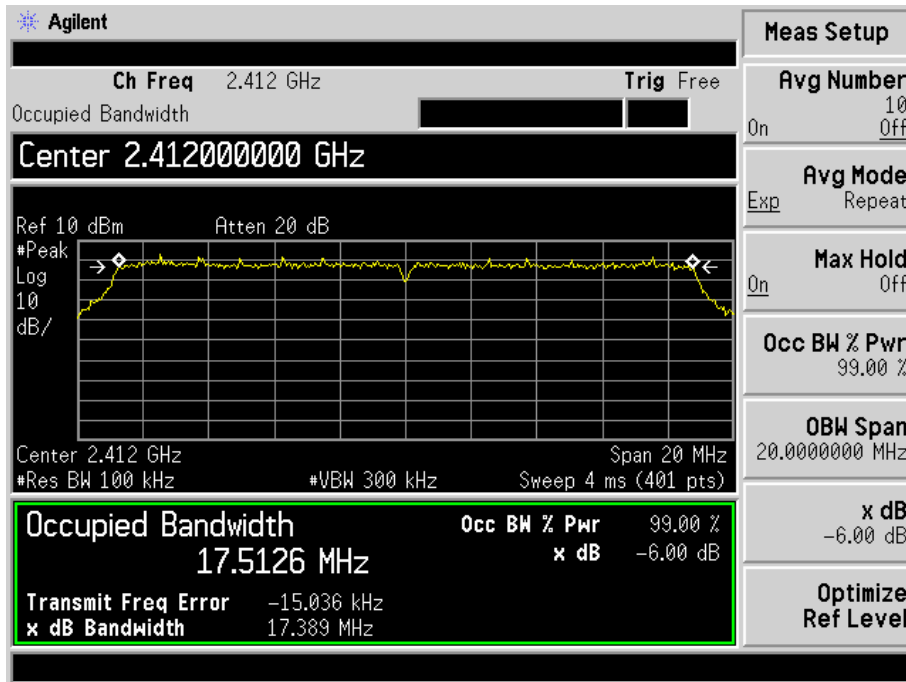
802.11g-Middle Channel



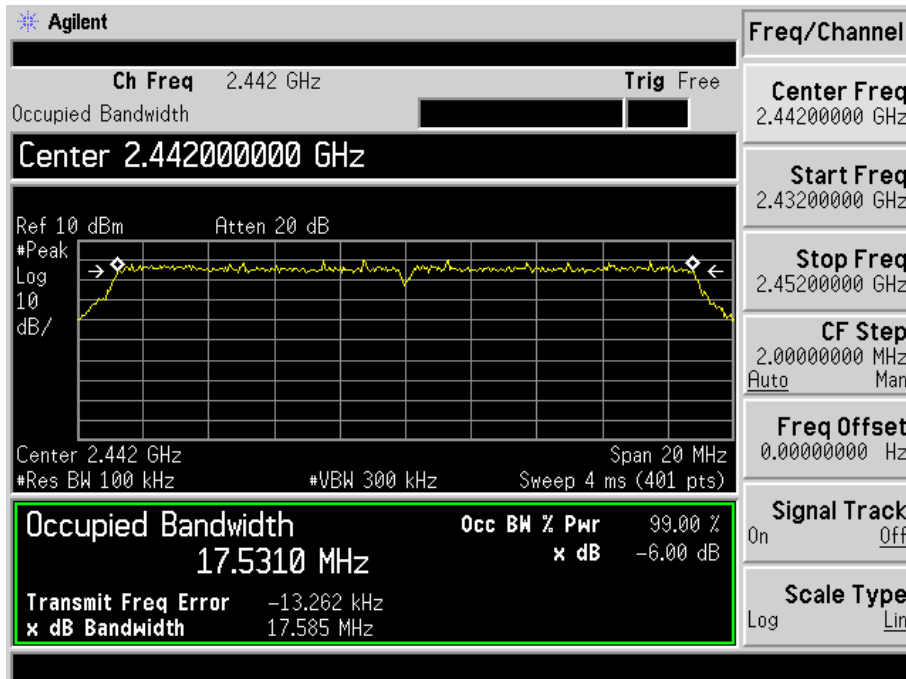
802.11g-High Channel



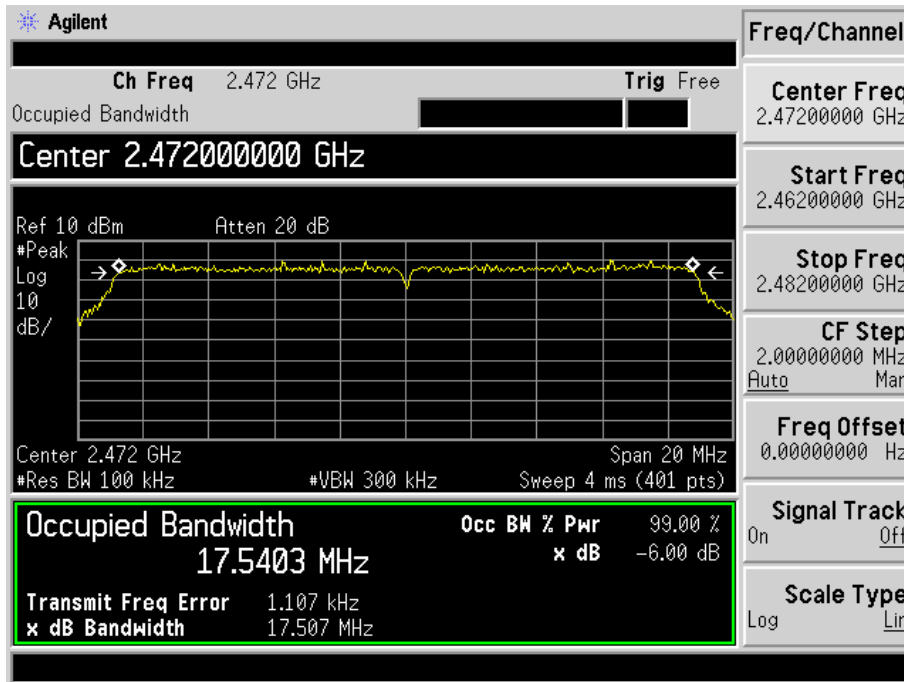
802.11n-HT20-Low Channel



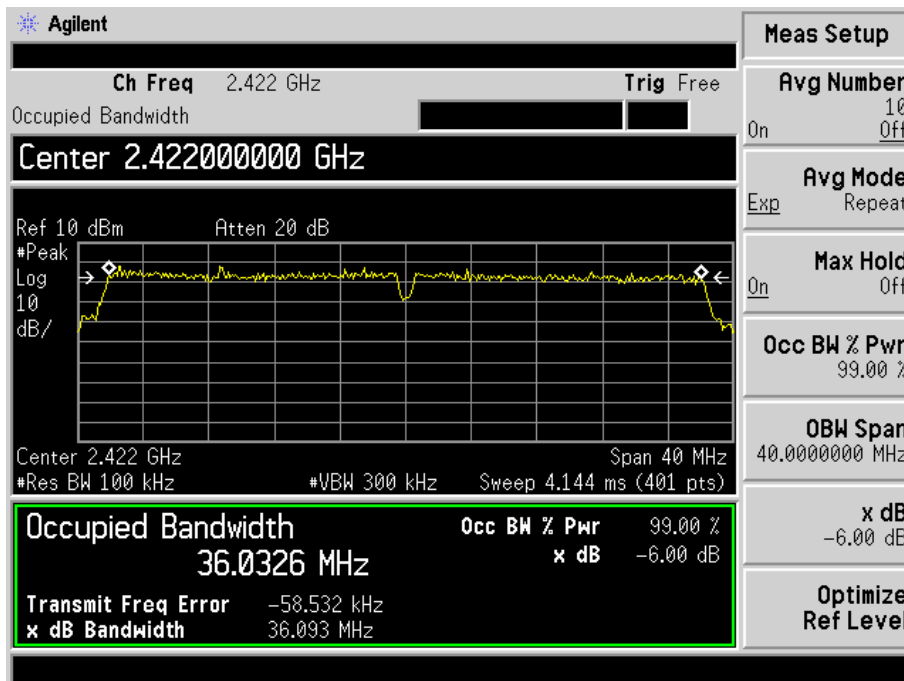
802.11n-HT20-Middle Channel



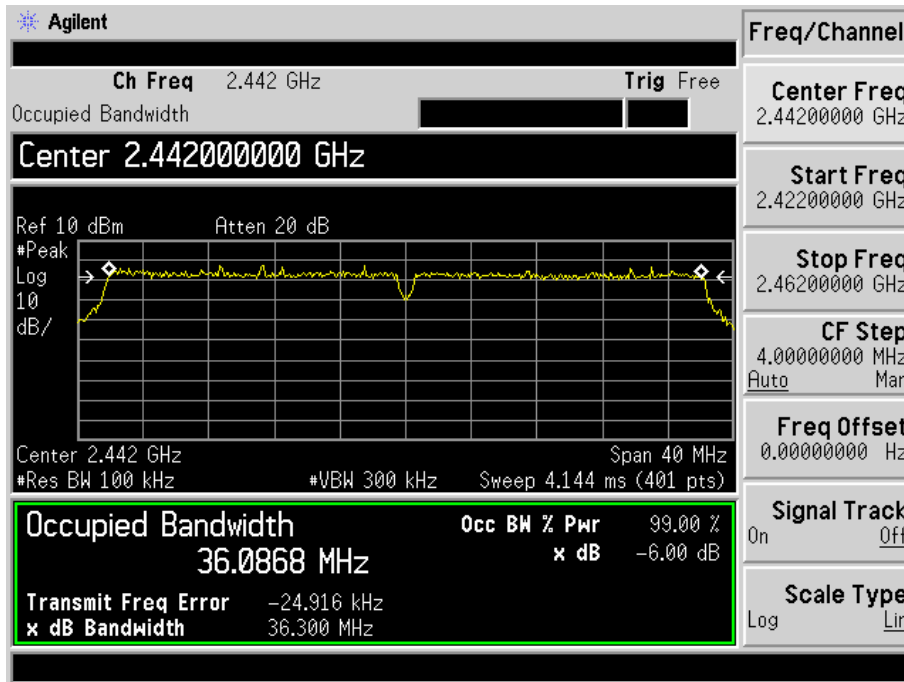
802.11n-HT20-High Channel



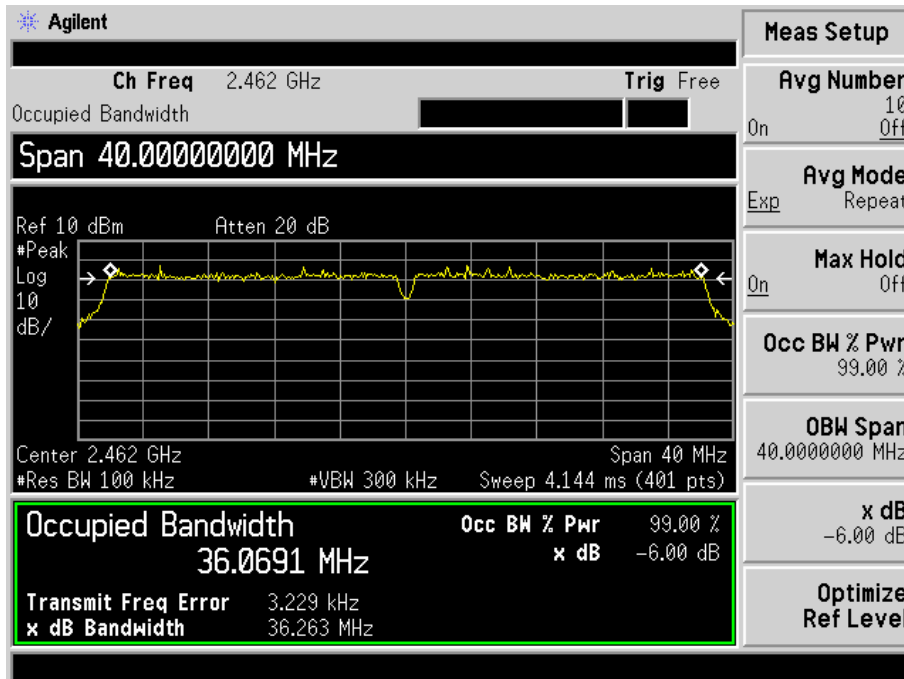
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel





## 7. RF Output Power

### 7.1 Standard Applicable

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

### 7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 7.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 D01 V03r02, 9.2.2.2 (channel integration method) 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.

### 7.4 Environmental Conditions

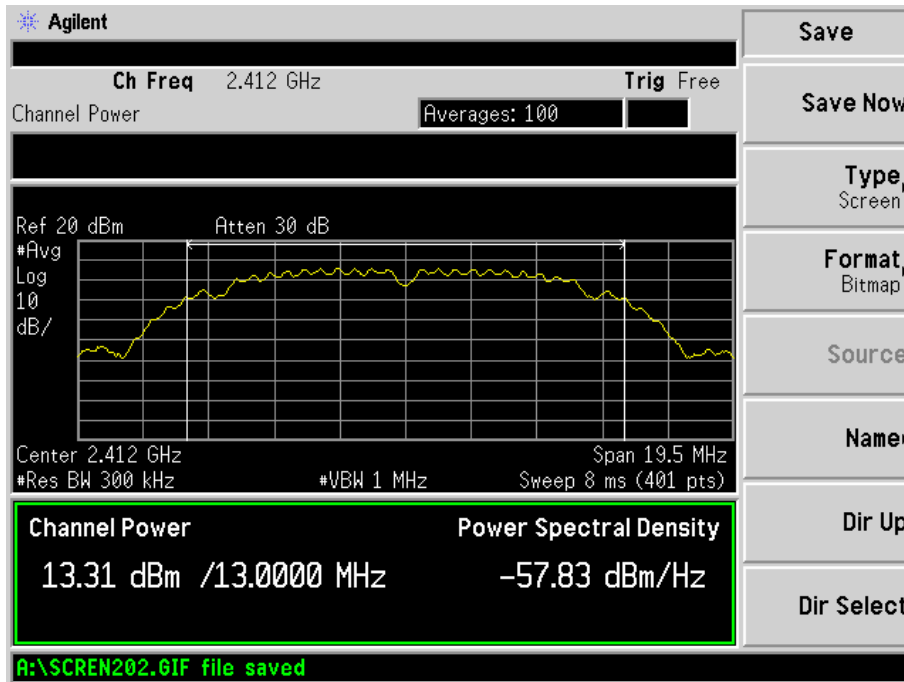
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

### 7.5 Summary of Test Results/Plots

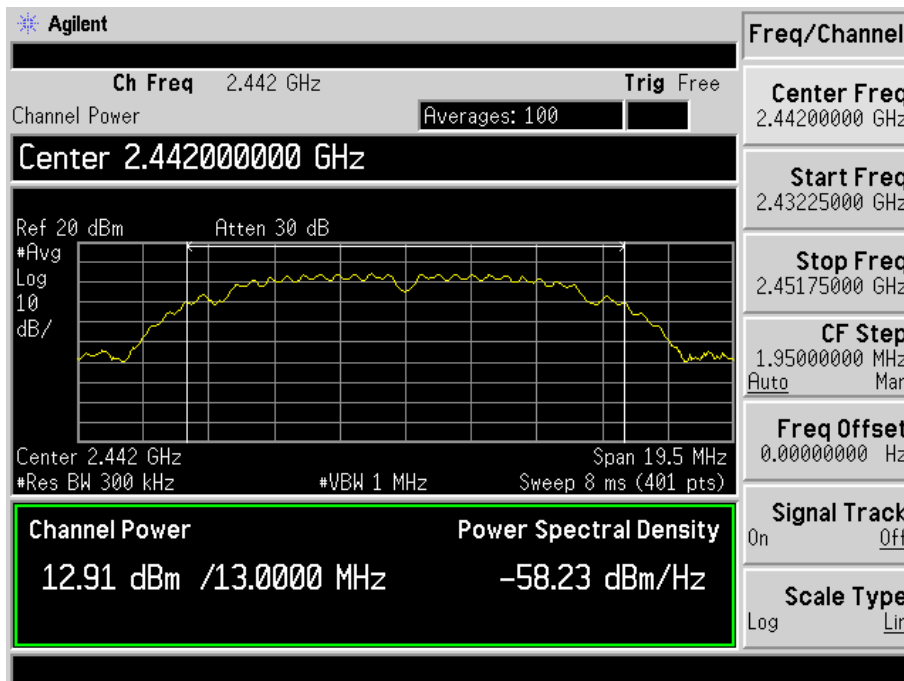
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_11Mbps	2412	13.31	21.43	1000
	2442	12.91	19.54	1000
	2472	12.84	19.23	1000
802.11g_54Mbps	2412	9.44	8.79	1000
	2442	8.53	7.13	1000
	2472	8.68	7.38	1000
802.11n HT20_MCS7	2412	8.56	7.18	1000
	2442	7.17	5.21	1000
	2472	6.87	4.86	1000
802.11n HT40_MCS7	2422	3.89	2.45	1000
	2442	3.01	2.00	1000
	2462	2.88	1.94	1000

Please refer to the following test plots:

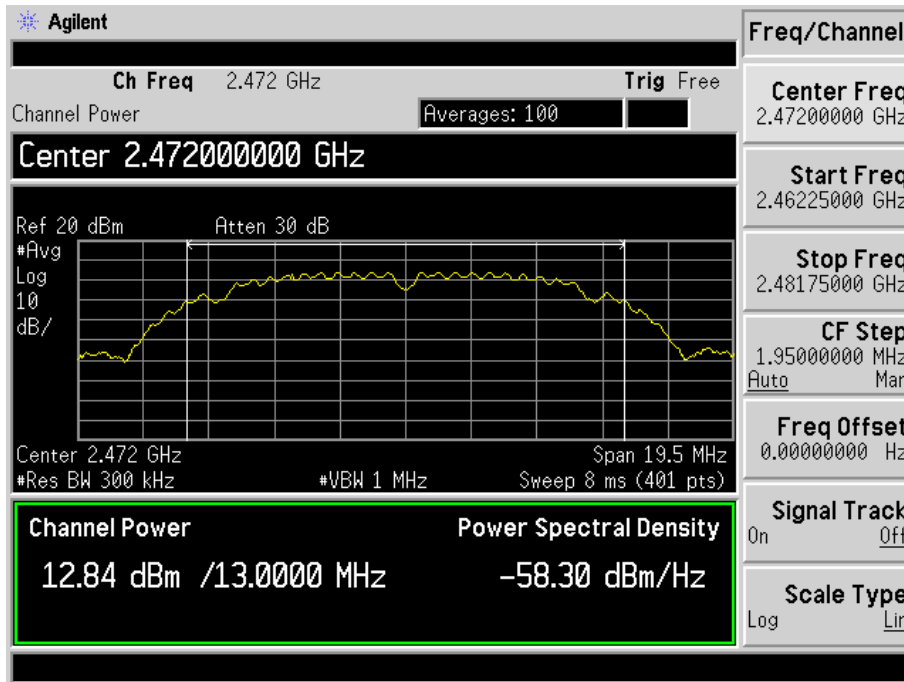
802.11-11Mbps-Low Channel



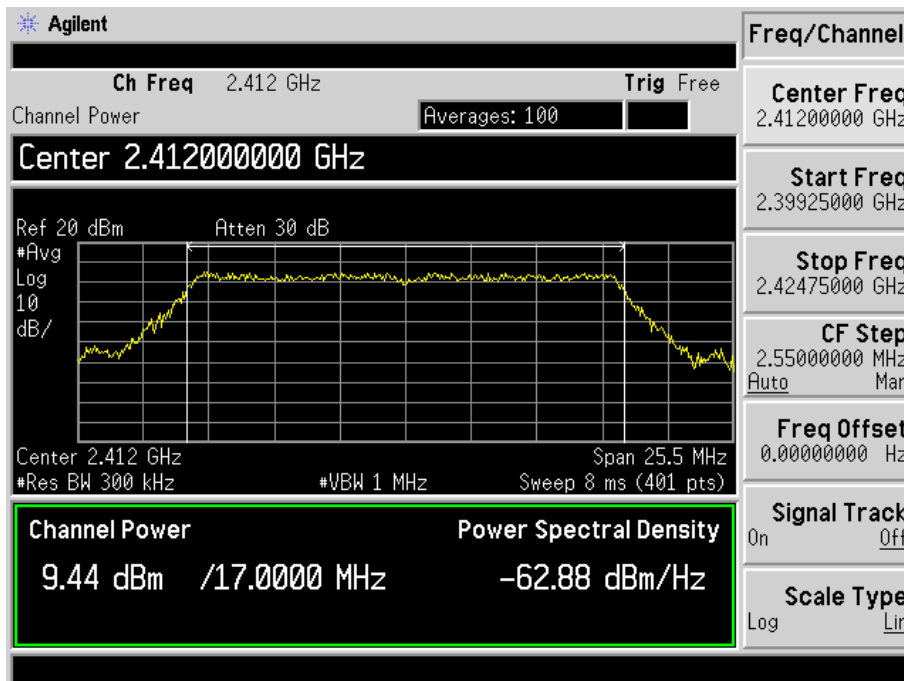
802.11b -11Mbps-Middle Channel



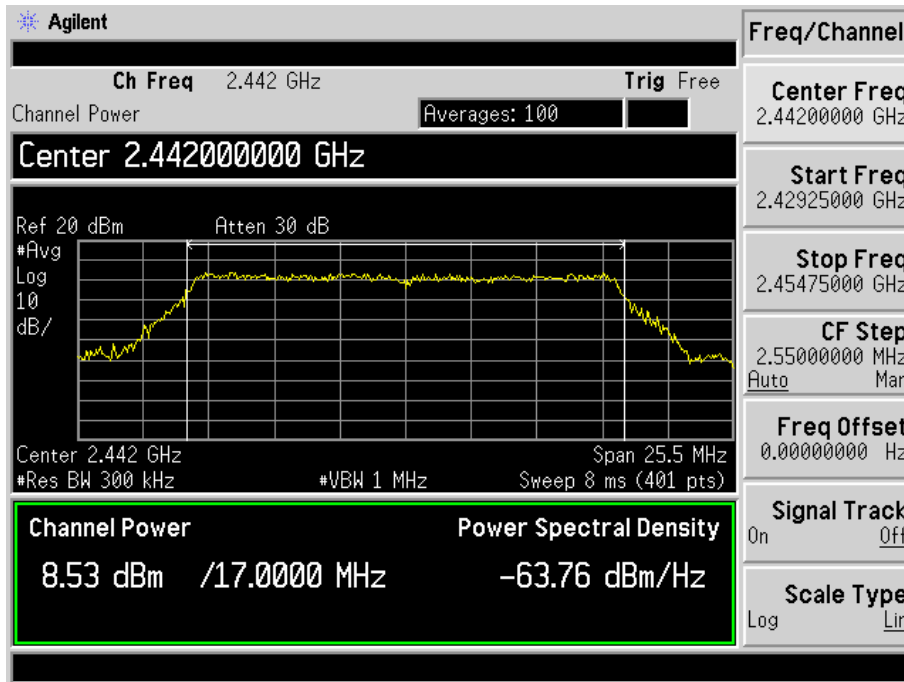
802.11b -11Mbps-High Channel



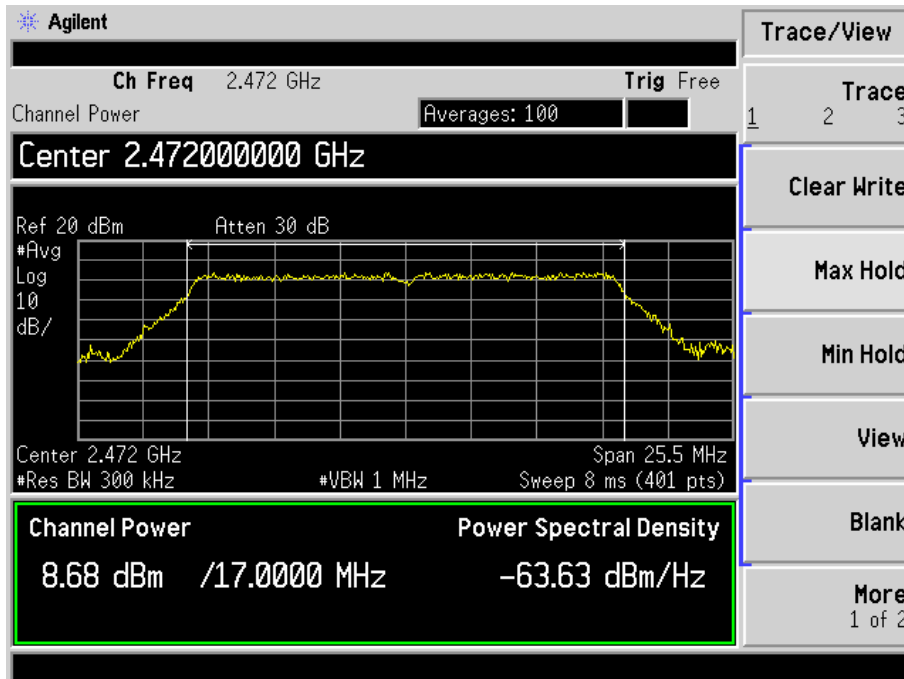
802.11g-54Mbps-Low Channel



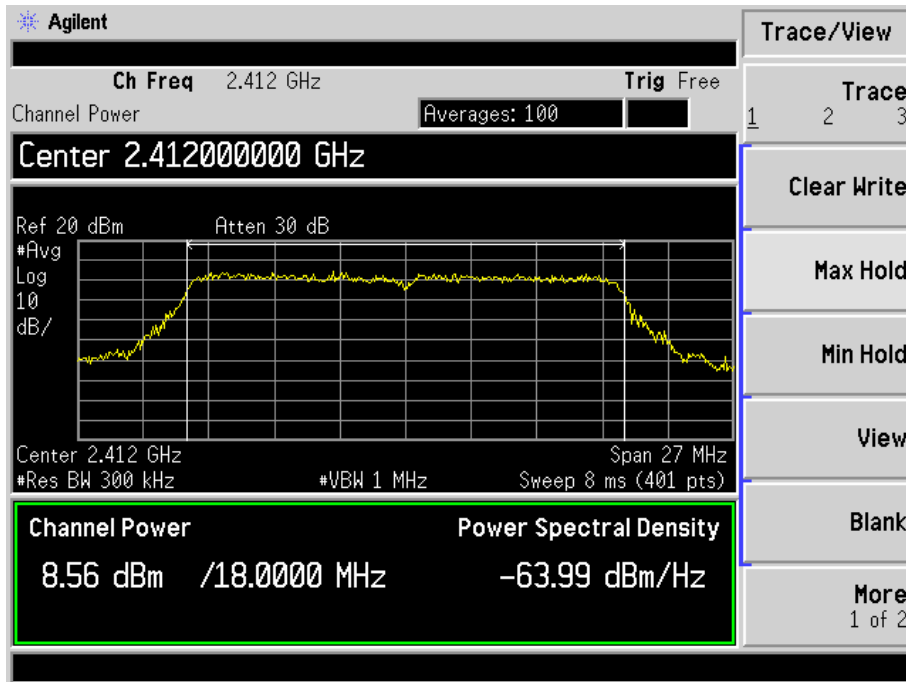
802.11g-54Mbps-Middle Channel



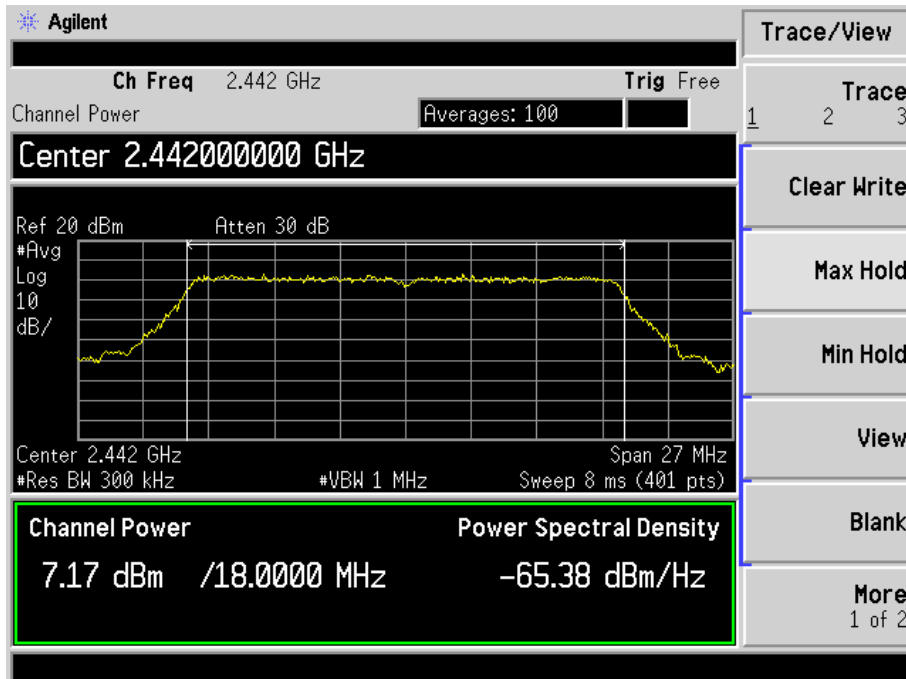
802.11g-54Mbps-High Channel



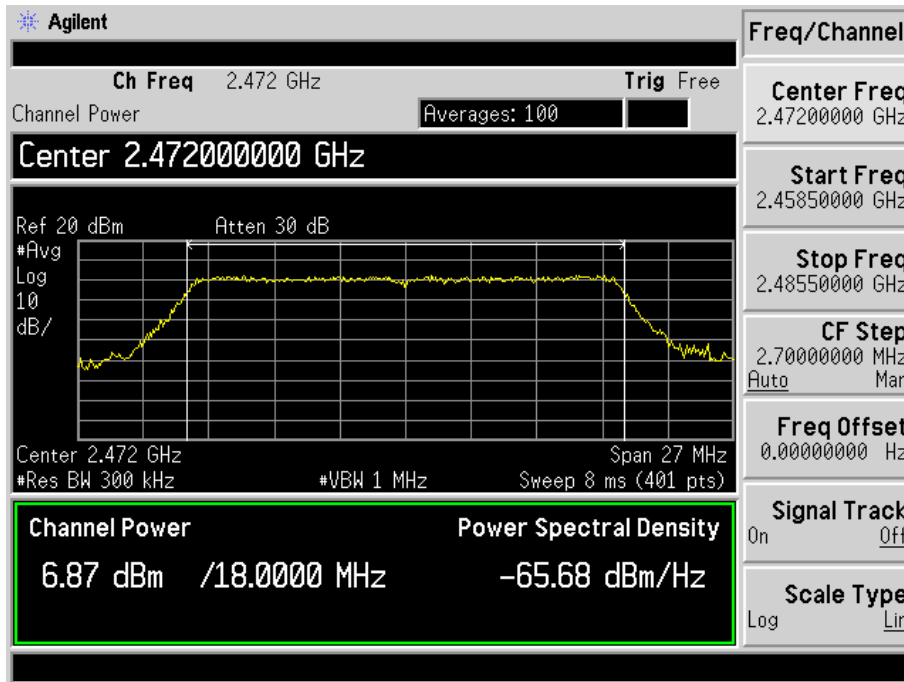
802.11n-HT20-MCS7-Low Channel



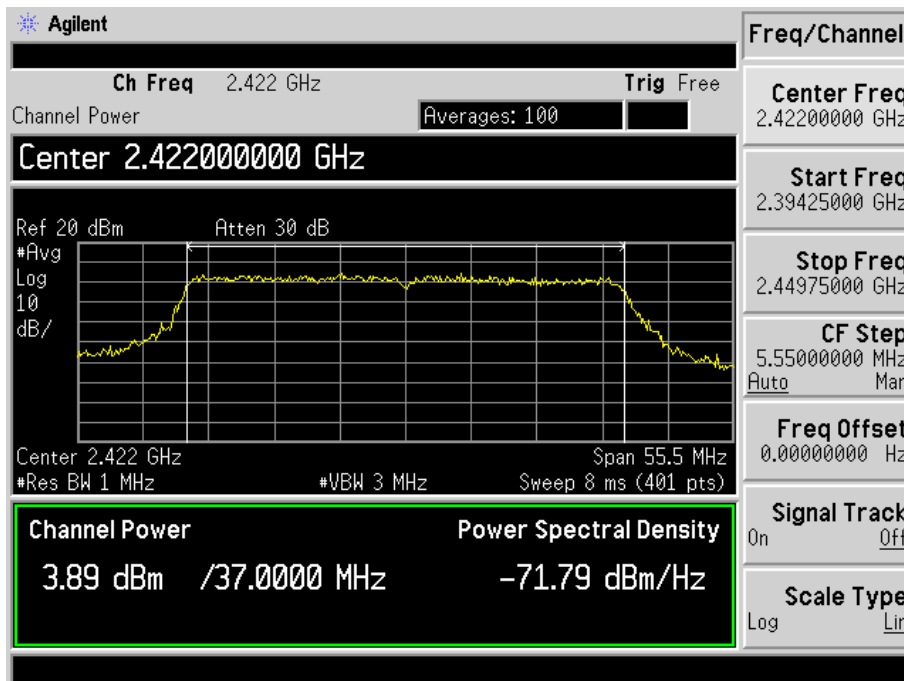
802.11n-HT20-MCS7-Middle Channel



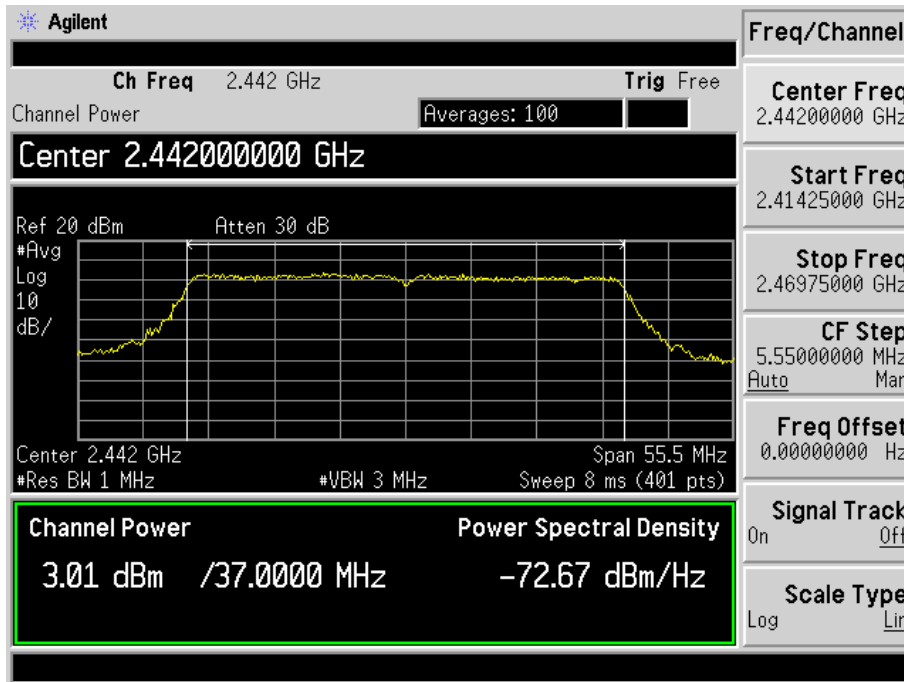
802.11n-HT20-MCS7-High Channel



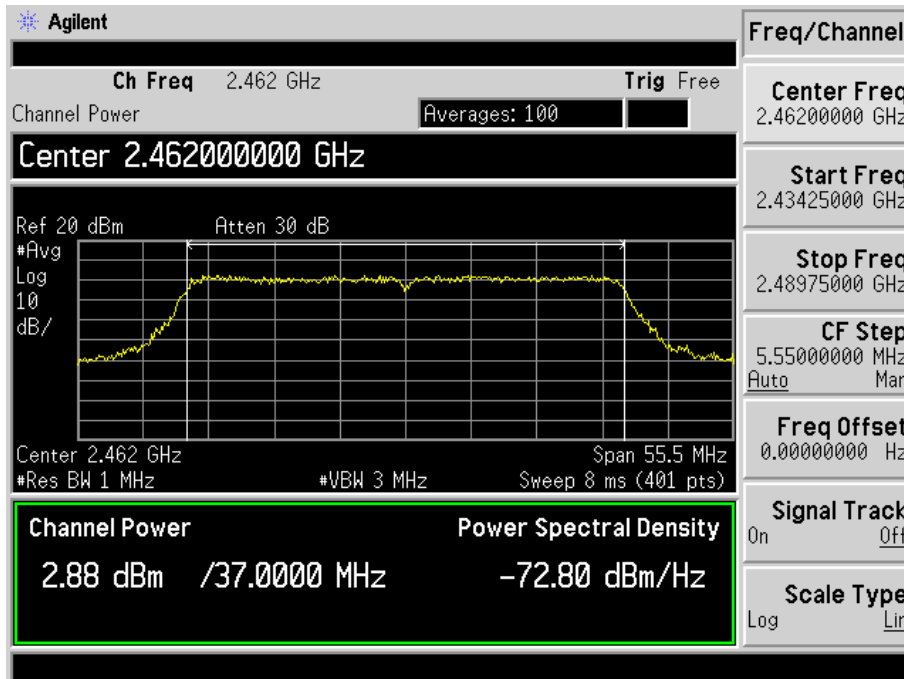
802.11n-HT40-MCS7-Low Channel



802.11n-HT40-MCS7-Middle Channel



802.11n-HT40-MCS7-High Channel





## 8. Field Strength of Spurious Emissions

### 8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is  $\pm 5.10$  dB.

### 8.2 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.

### 8.3 Test Equipment List and Details

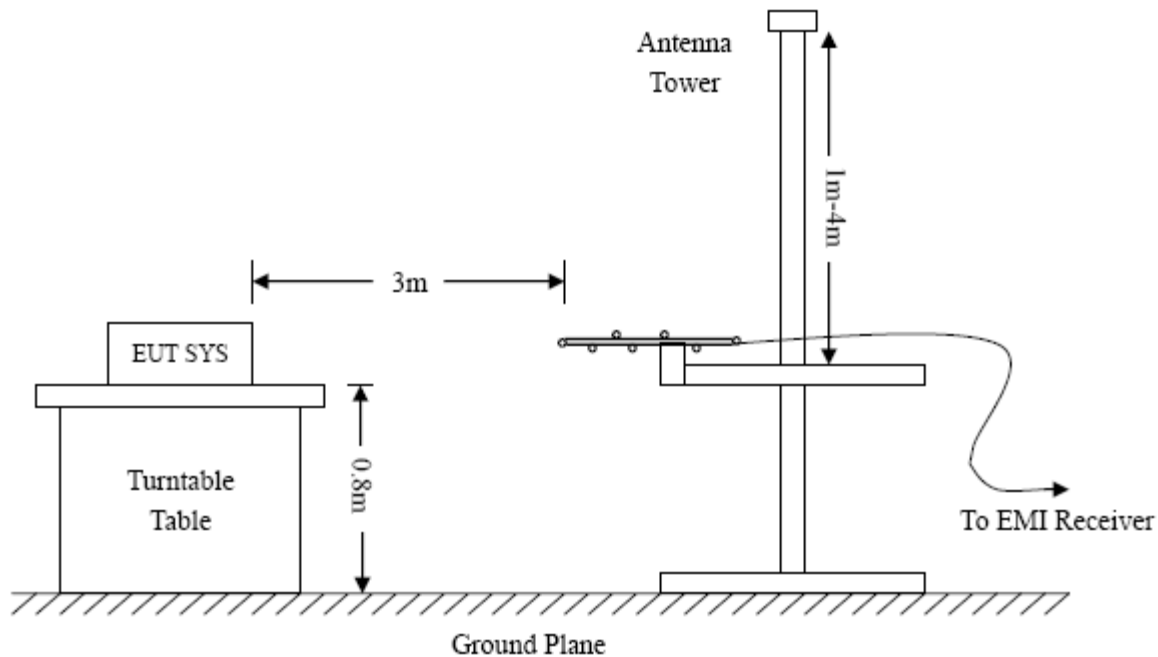
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23
Horn Antenna	ETS	3116B	00088203	2014-05-24	2015-05-23
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2014-05-24	2015-05-23

## 8.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 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=300KHz

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

## 8.5 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 for Class B. The equation for margin calculation is as follows:

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

## 8.6 Environmental Conditions

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

## 8.7 Summary of Test Results/Plots

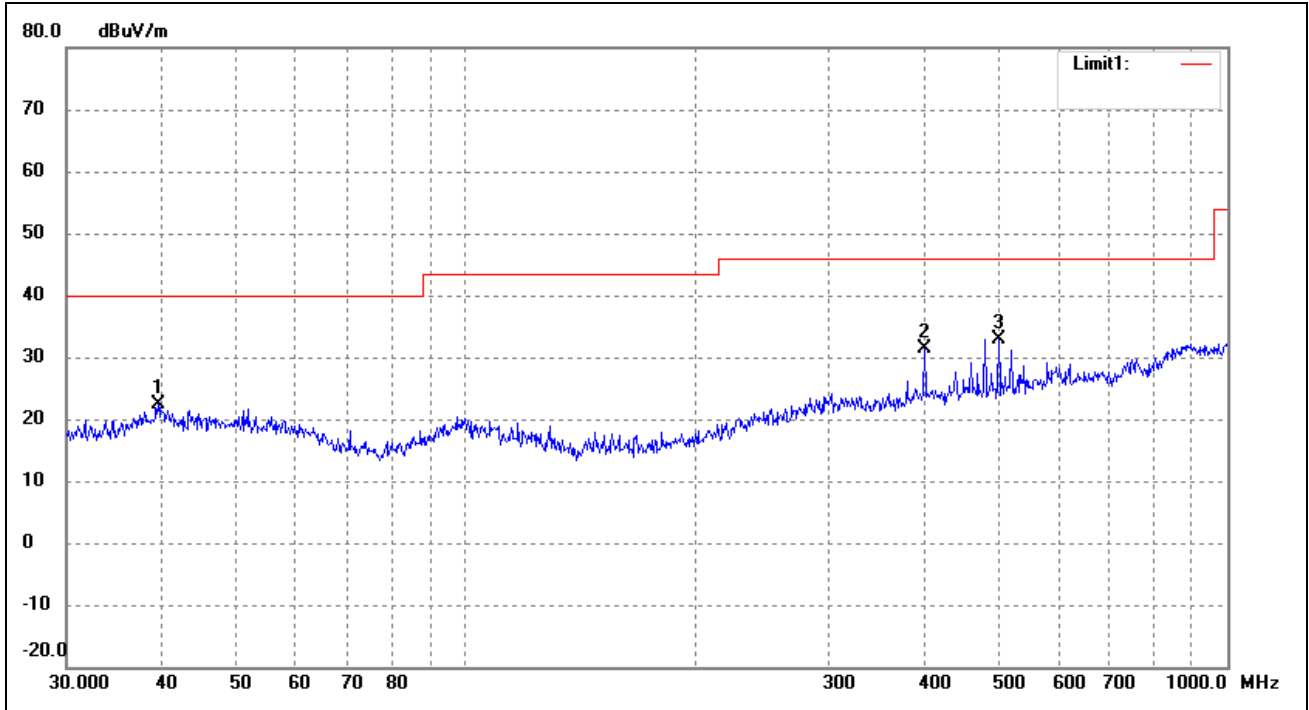
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

*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)**

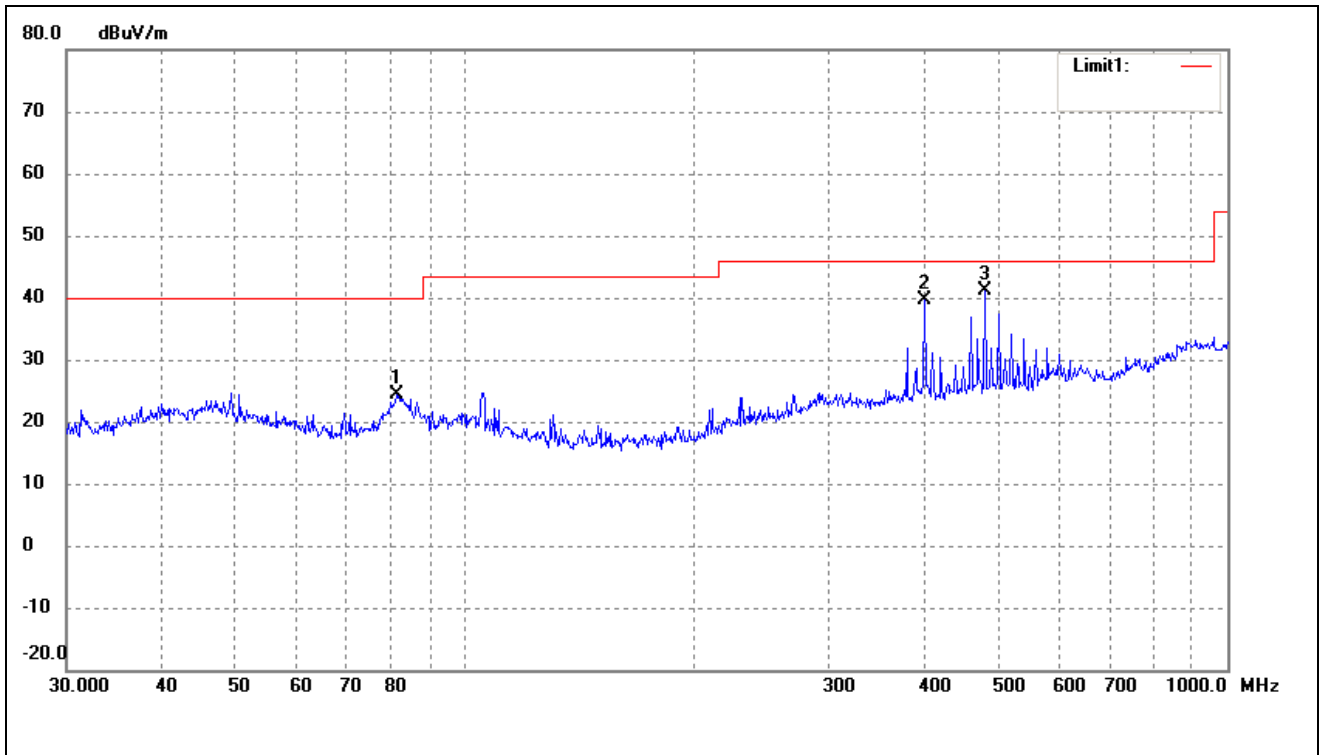
EUT: *WIFI module*  
 Tested Model: *HLK-M30*  
 Operating Condition: *802.11b Transmitting Low Channel-2412MHz*  
 Comment: *DC 3.3V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	15.37	7.13	22.50	40.00	-17.50	52	100	peak
2	400.4319	21.14	10.12	31.26	46.00	-14.74	189	100	peak
3	501.1790	22.04	10.88	32.92	46.00	-13.08	284	100	peak

Test Specification: Vertical

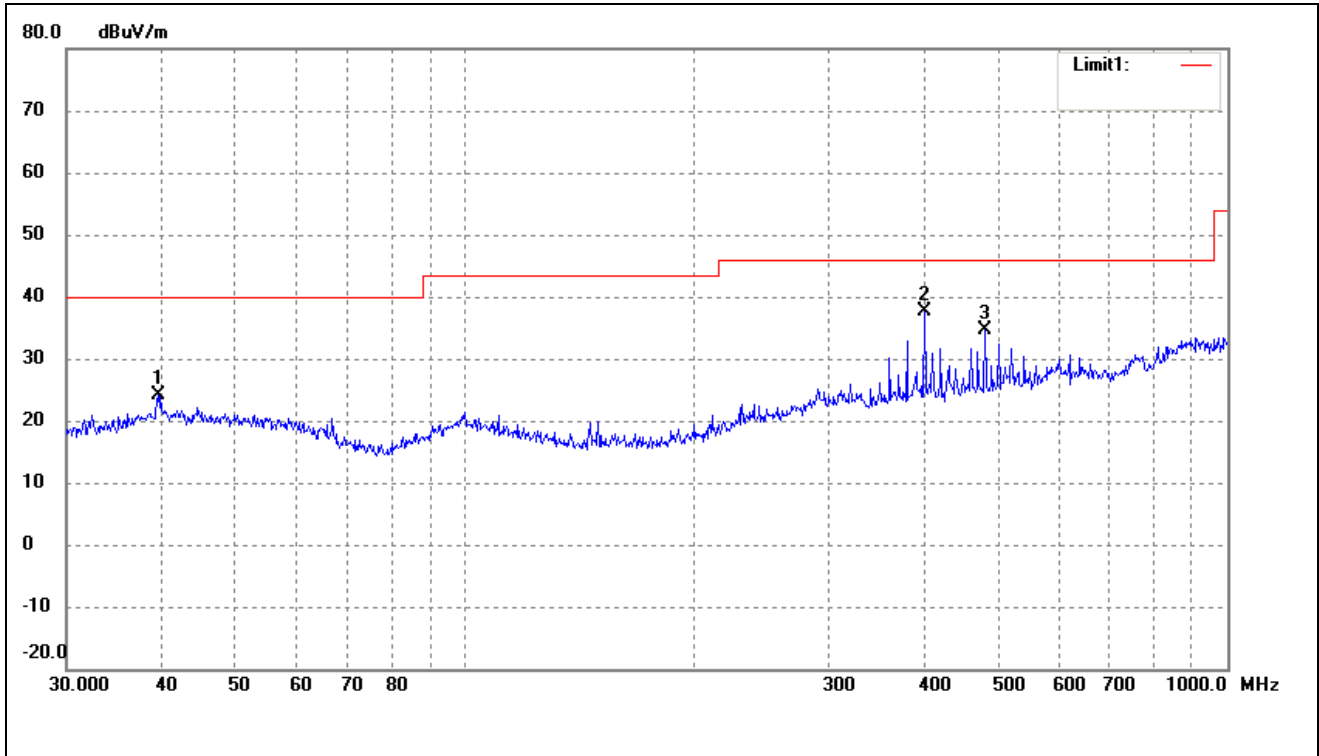


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	81.2117	22.94	1.32	24.26	40.00	-15.74	114	100	peak
2	400.4319	29.56	10.12	39.68	46.00	-6.32	270	100	peak
3	480.5276	30.90	10.12	41.02	46.00	-4.98	303	100	peak

Operating Condition: 802.11b Transmitting Middle Channel-2442MHz

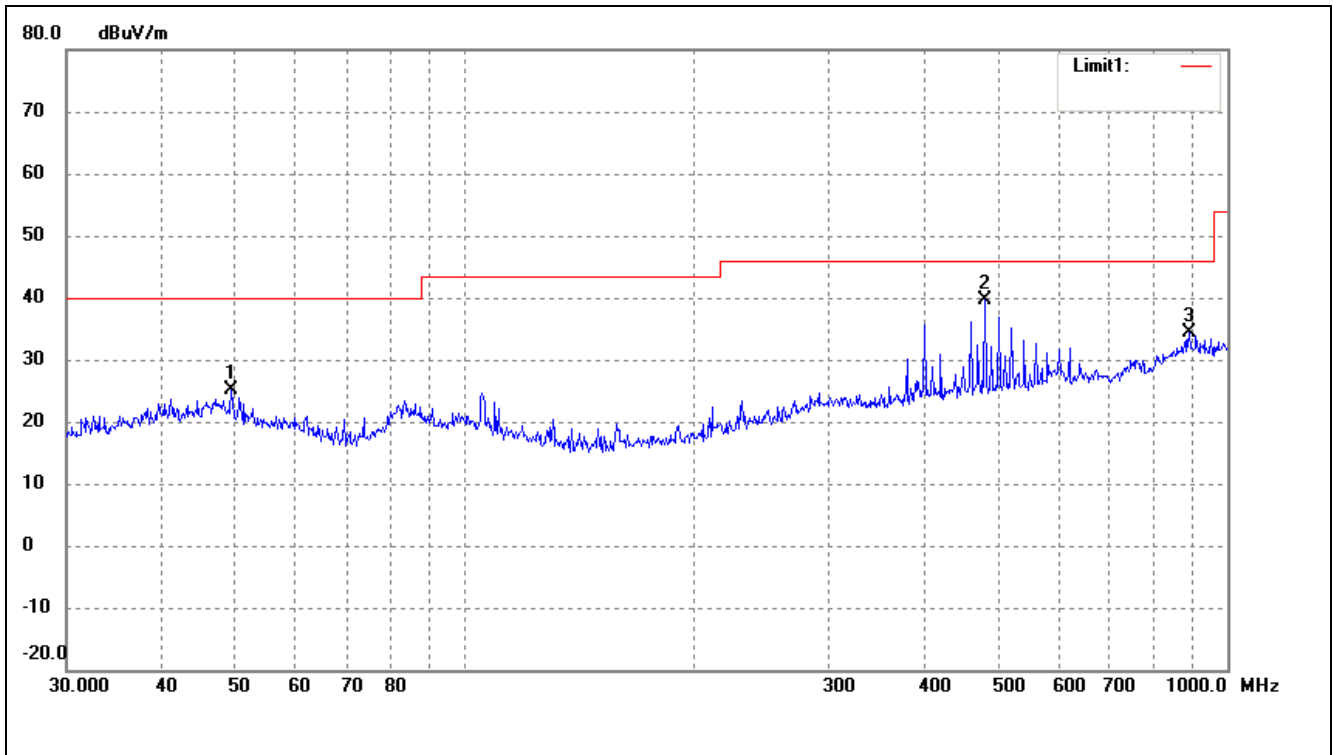
Comment: DC 3.3V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	17.06	7.13	24.19	40.00	-15.81	39	100	peak
2	400.4319	27.61	10.12	37.73	46.00	-8.27	168	100	peak
3	480.5276	24.57	10.12	34.69	46.00	-11.31	205	100	peak

Test Specification: Vertical

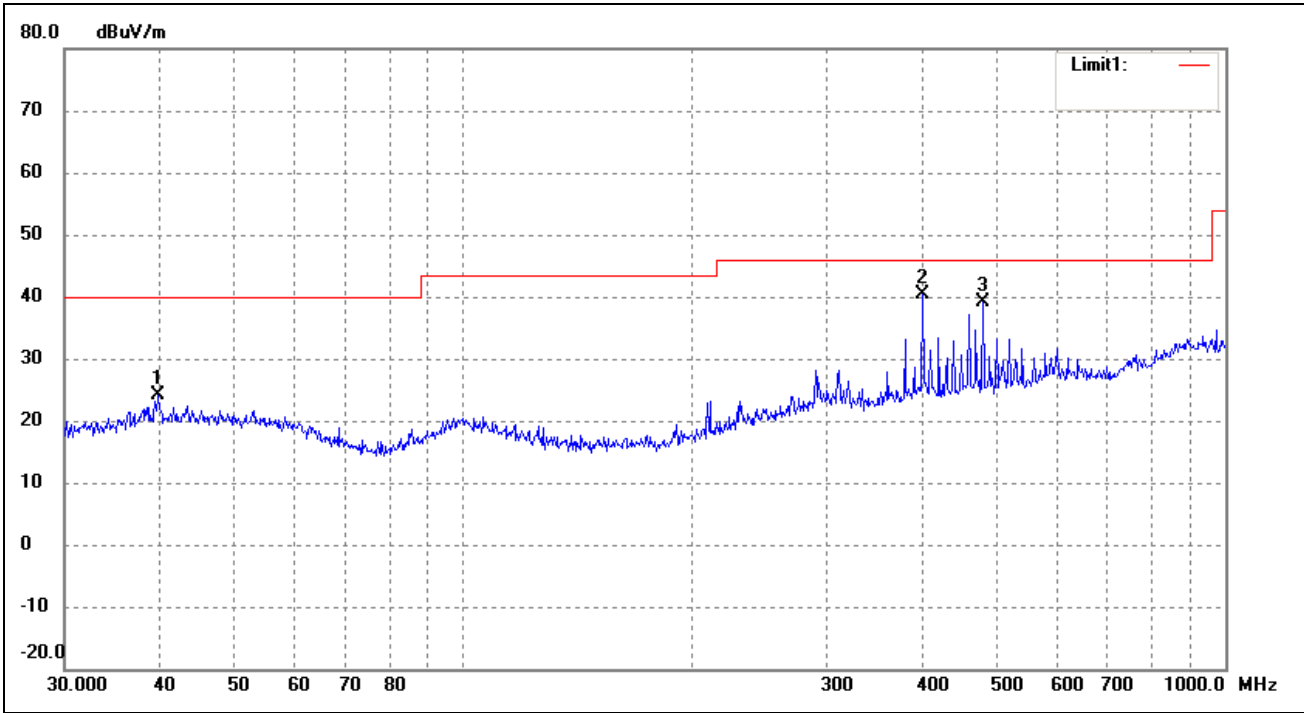


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	18.78	6.45	25.23	40.00	-14.77	65	100	peak
2	480.5276	29.61	10.12	39.73	46.00	-6.27	254	100	peak
3	890.7278	17.55	16.84	34.39	46.00	-11.61	300	100	peak

Operating Condition: 802.11b Transmitting High Channel-2472MHz

Comment: DC 3.3V

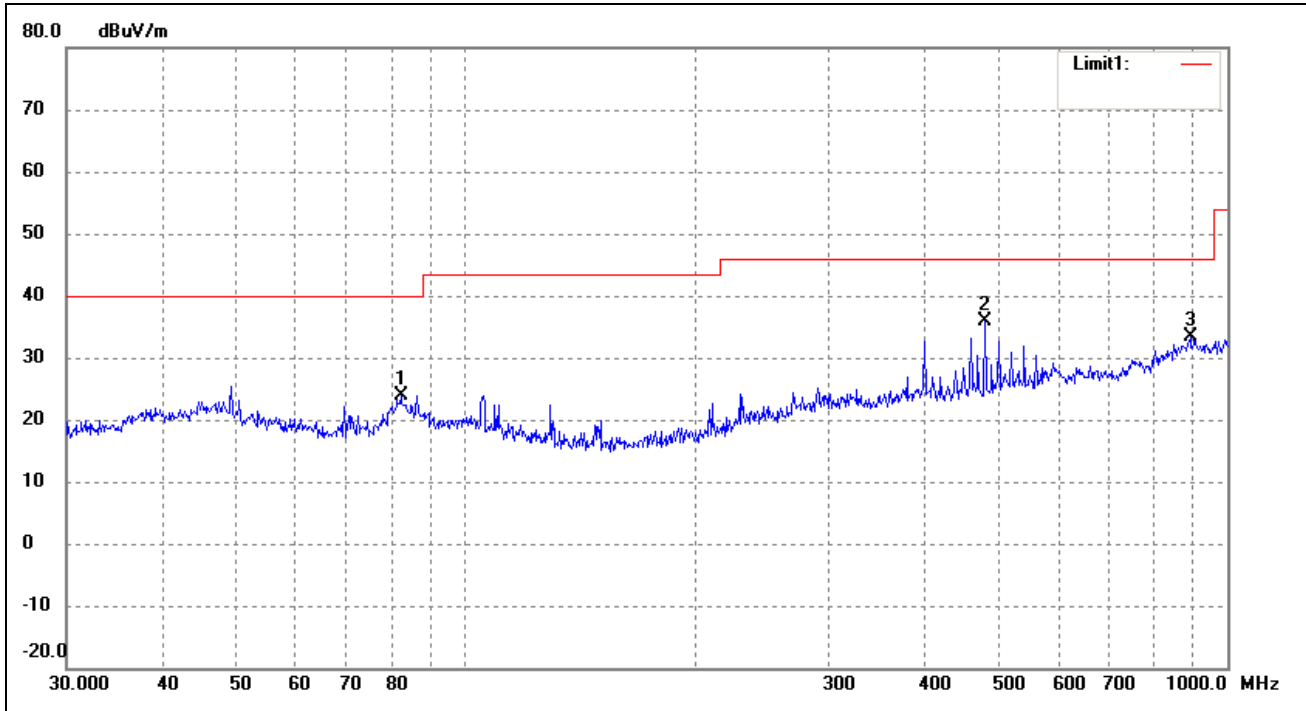
Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.8541	16.95	7.21	24.16	40.00	-15.84	23	100	peak
2	400.4318	30.29	10.12	40.41	46.00	-5.59	169	100	peak
3	480.5276	29.06	10.12	39.18	46.00	-6.82	263	100	peak



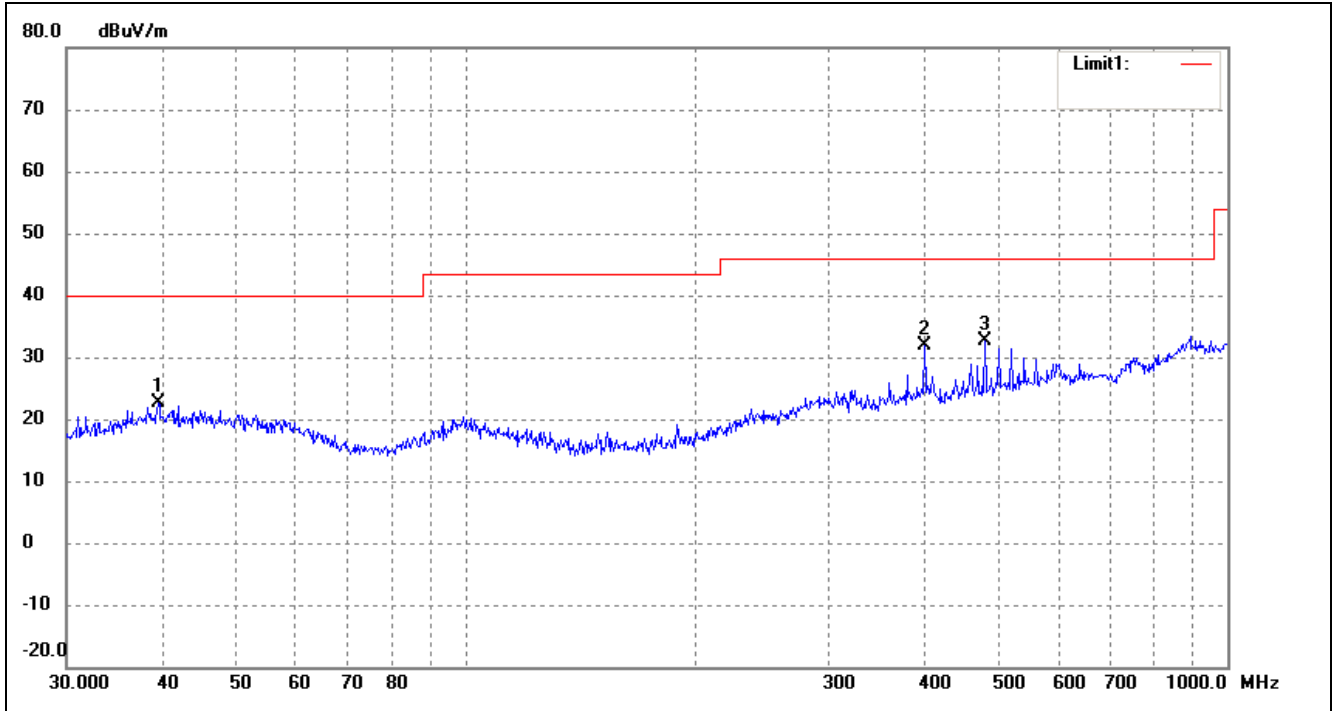
Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	82.3589	22.24	1.62	23.86	40.00	-16.14	88	100	peak
2	480.5276	25.74	10.12	35.86	46.00	-10.14	163	100	peak
3	893.8567	16.64	16.85	33.49	46.00	-12.51	200	100	peak

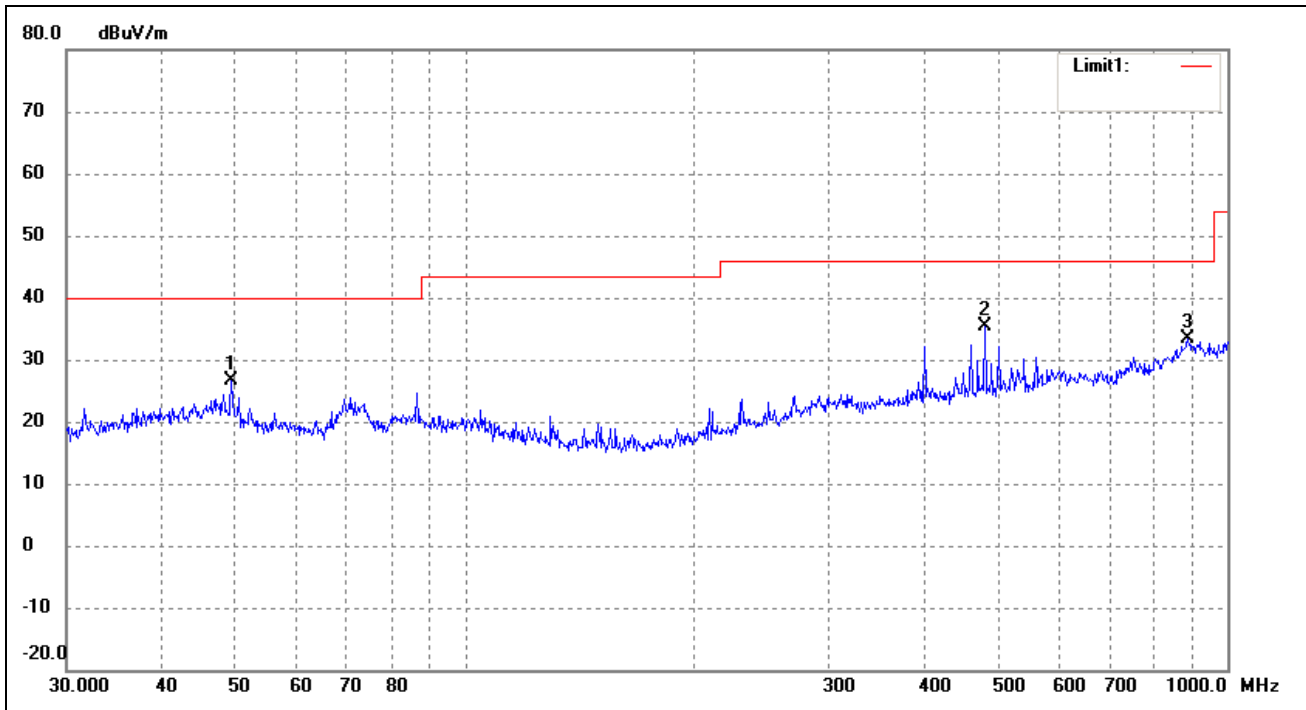
**Plot of Radiated Emissions Test Data (30MHz to 1GHz)**

EUT: *WIFI module*  
 Tested Model: *HLK-M30*  
 Operating Condition: *802.11g Transmitting Low Channel-2412MHz*  
 Comment: *DC 3.3V*  
 Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	15.57	7.13	22.70	40.00	-17.30	44	100	peak
2	400.4319	21.82	10.12	31.94	46.00	-14.06	160	100	peak
3	480.5276	22.50	10.12	32.62	46.00	-13.38	220	100	peak

Test Specification: Vertical

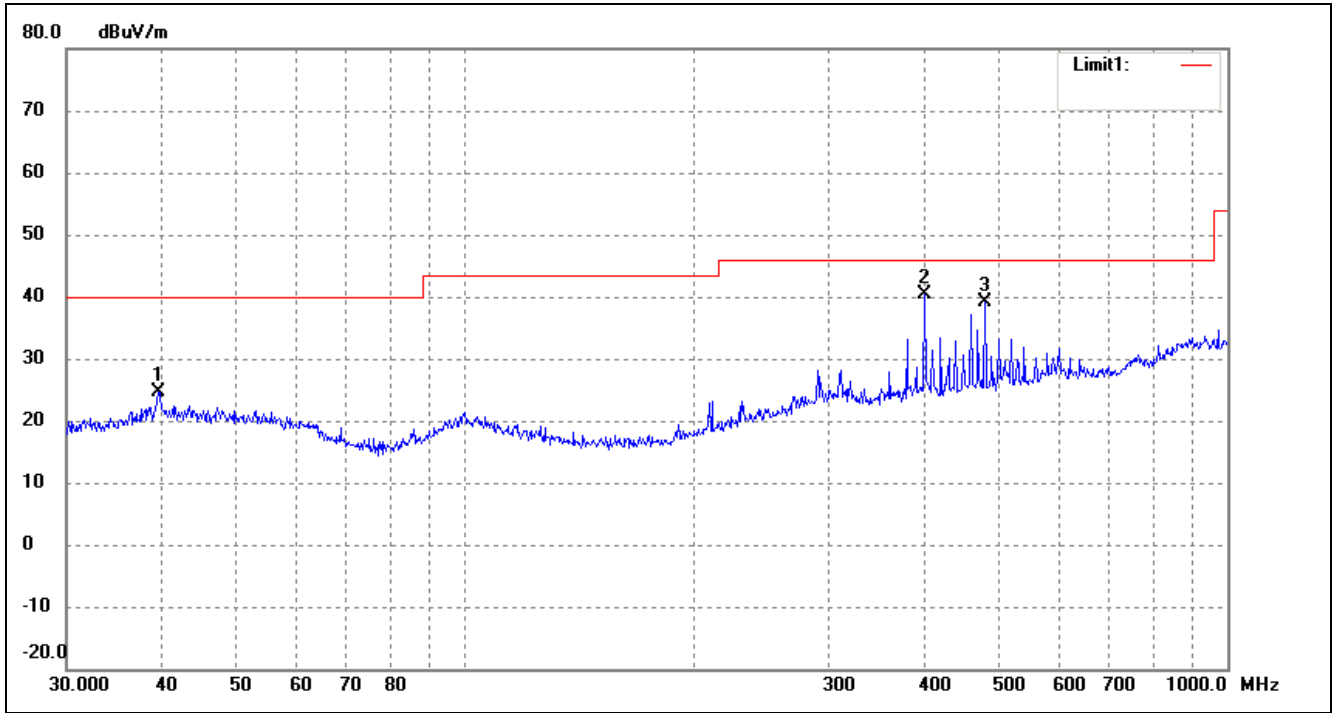


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	20.08	6.45	26.53	40.00	-13.47	76	100	peak
2	480.5276	25.26	10.12	35.38	46.00	-10.62	200	100	peak
3	887.6099	16.50	16.84	33.34	46.00	-12.66	306	100	peak

Operating Condition: 802.11g Transmitting Middle Channel-2442MHz

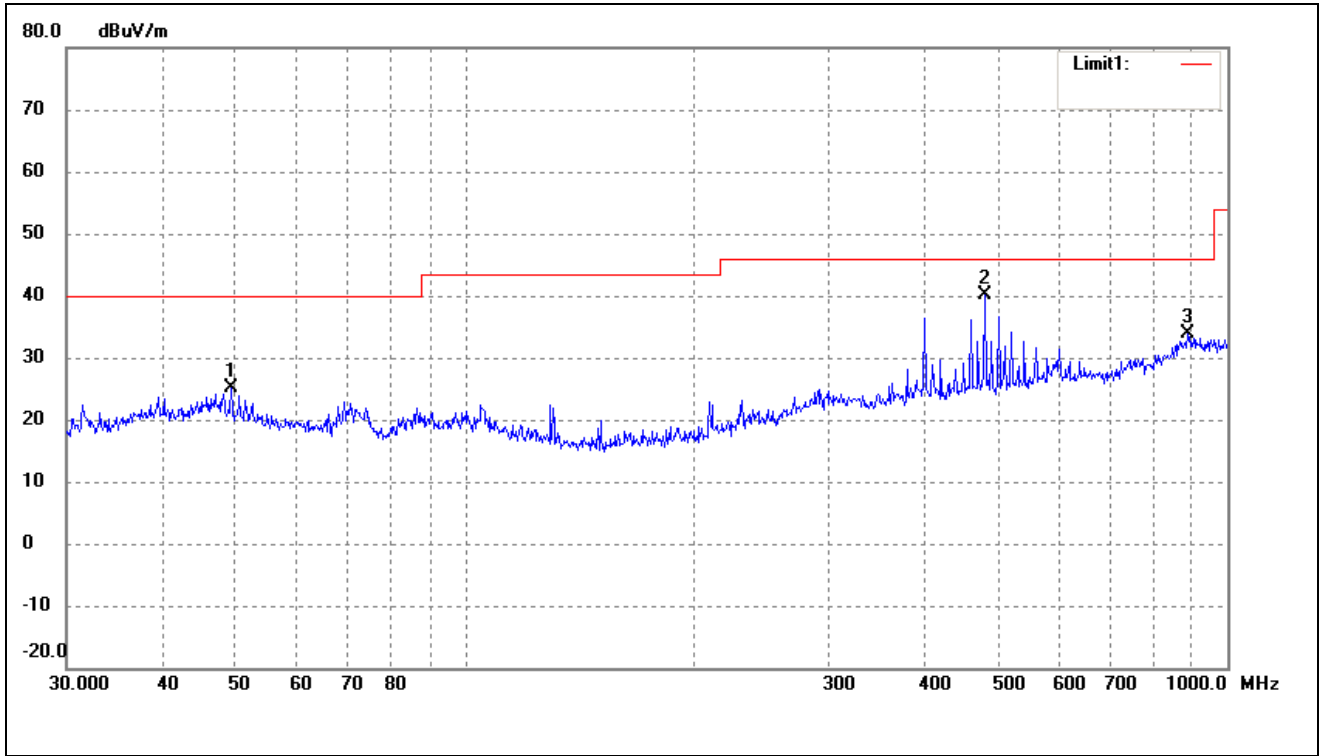
Comment: DC 3.3V

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	113.7143	16.47	4.68	21.15	43.50	-22.35	43	100	peak
2	400.4319	27.01	10.12	37.13	46.00	-8.87	189	100	peak
3	480.5276	24.66	10.12	34.78	46.00	-11.22	236	200	peak

Test Specification: Vertical

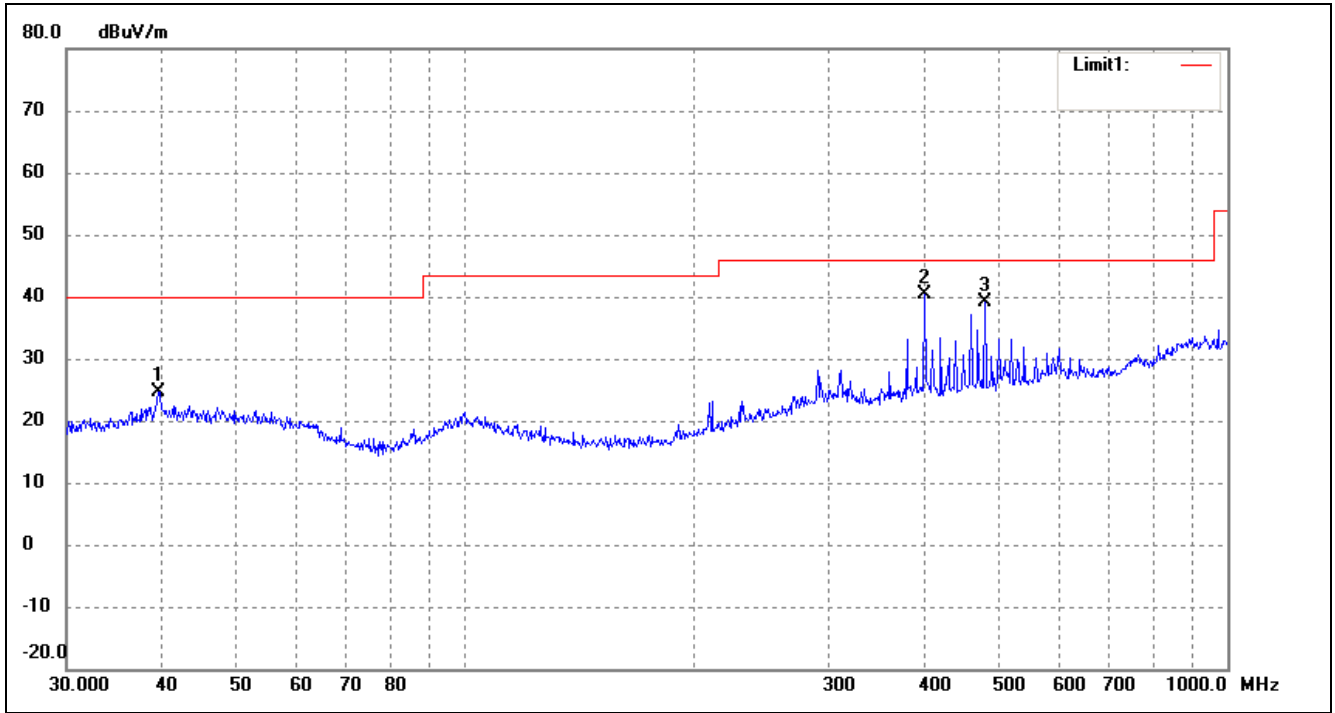


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	18.78	6.45	25.23	40.00	-14.77	53	100	peak
2	480.5276	29.94	10.12	40.06	46.00	-5.94	212	100	peak
3	887.6099	17.08	16.84	33.92	46.00	-12.08	298	100	peak

Operating Condition: 802.11g Transmitting High Channel-2472MHz

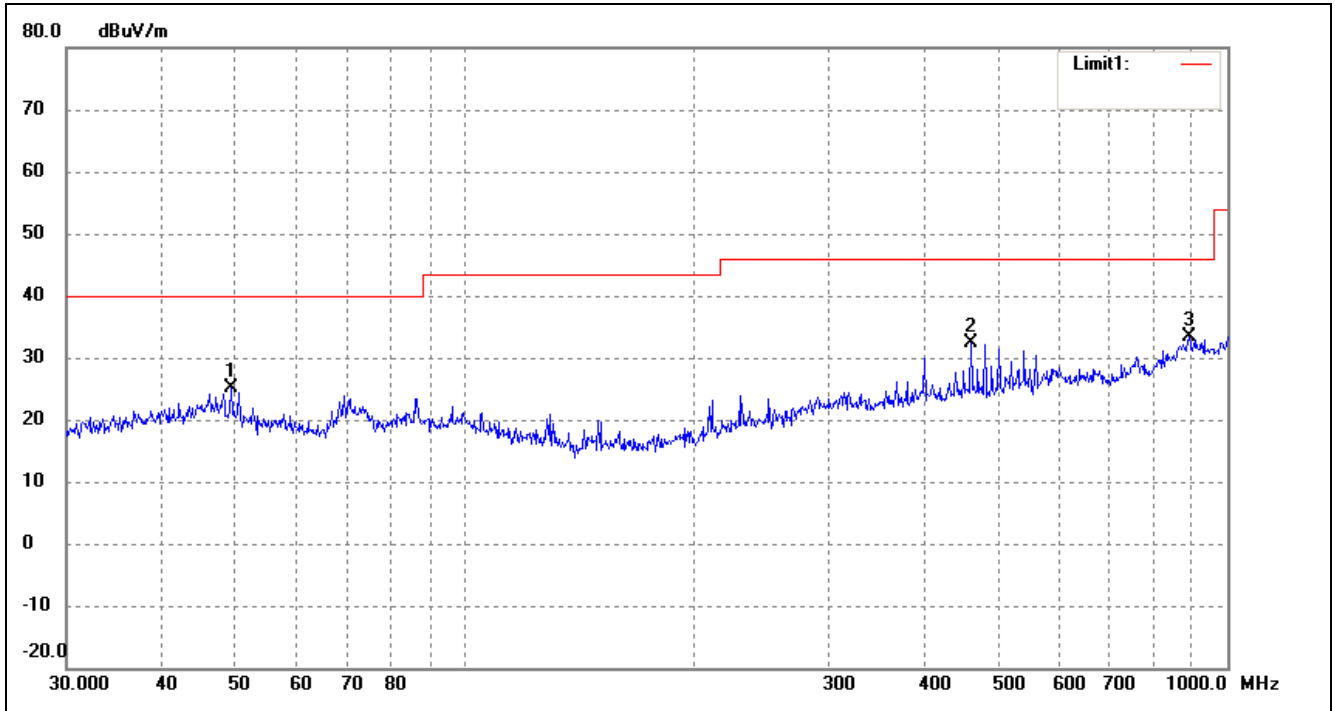
Comment: DC 3.3V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	17.58	7.13	24.71	40.00	-15.29	37	100	peak
2	400.4319	30.29	10.12	40.41	46.00	-5.59	188	100	peak
3	480.5276	29.06	10.12	39.18	46.00	-6.82	256	100	peak

Test Specification: Vertical

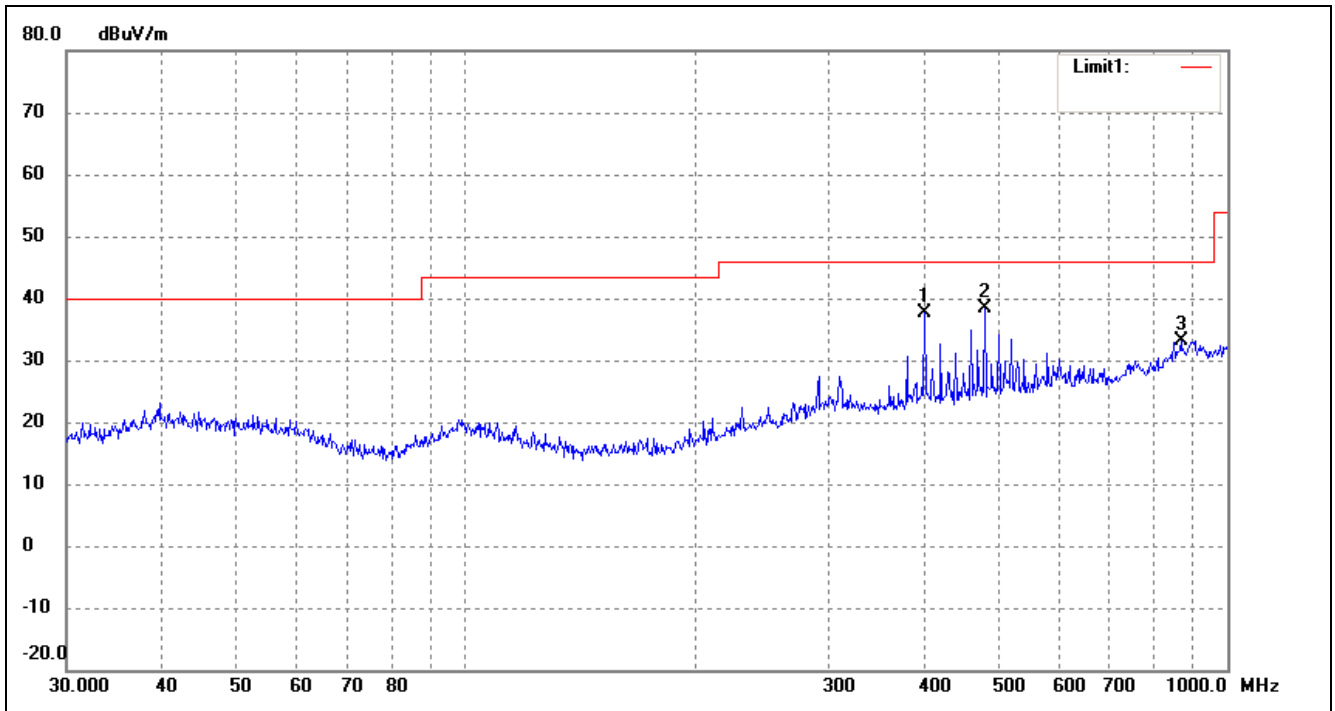


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	18.73	6.45	25.18	40.00	-14.82	65	100	peak
2	460.7271	21.94	10.55	32.49	46.00	-13.51	238	100	peak
3	890.7278	16.47	16.84	33.31	46.00	-12.69	316	100	peak

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

EUT: *WIFI module*  
 Tested Model: *HLK-M30*  
 Operating Condition: *802.11n-HT20 Transmitting Low Channel-2412MHz*  
 Comment: *DC 3.3V*

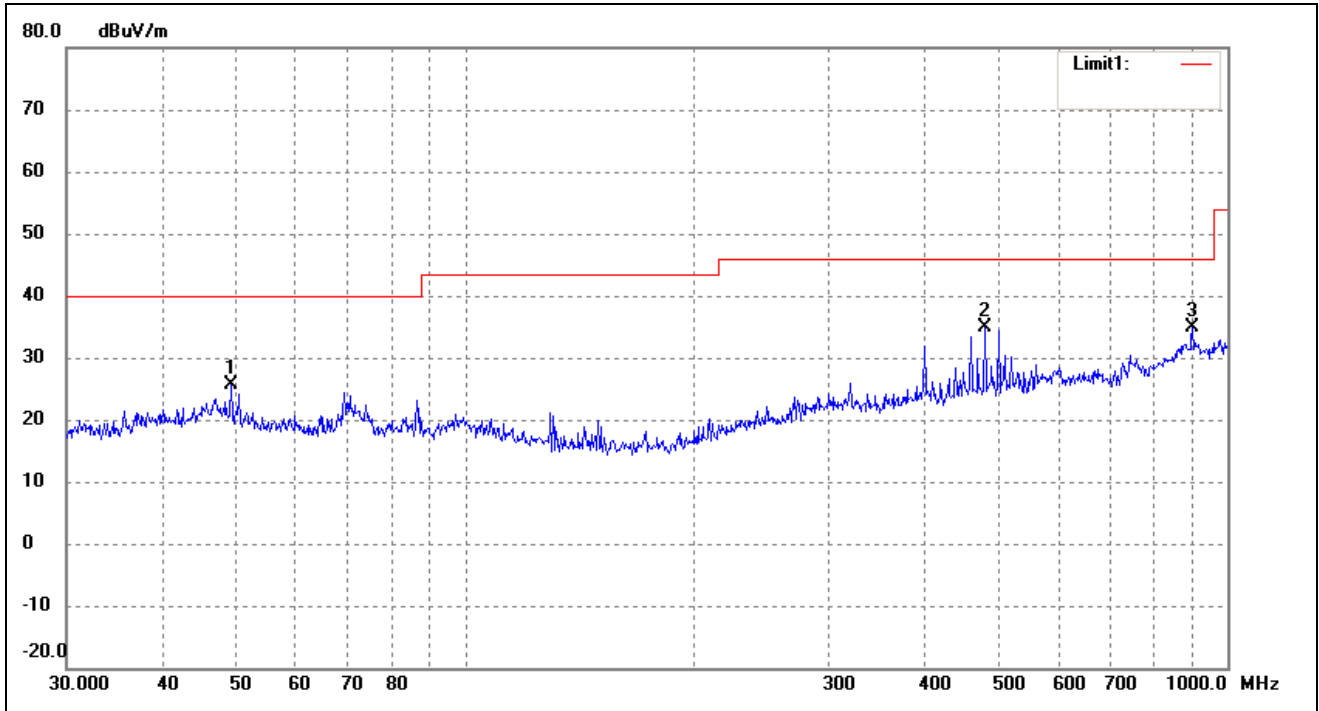
Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	400.4319	27.58	10.12	37.70	46.00	-8.30	194	100	peak
2	480.5276	28.26	10.12	38.38	46.00	-7.62	263	100	peak
3	869.1302	16.52	16.54	33.06	46.00	-12.94	309	100	peak



Test Specification: Vertical

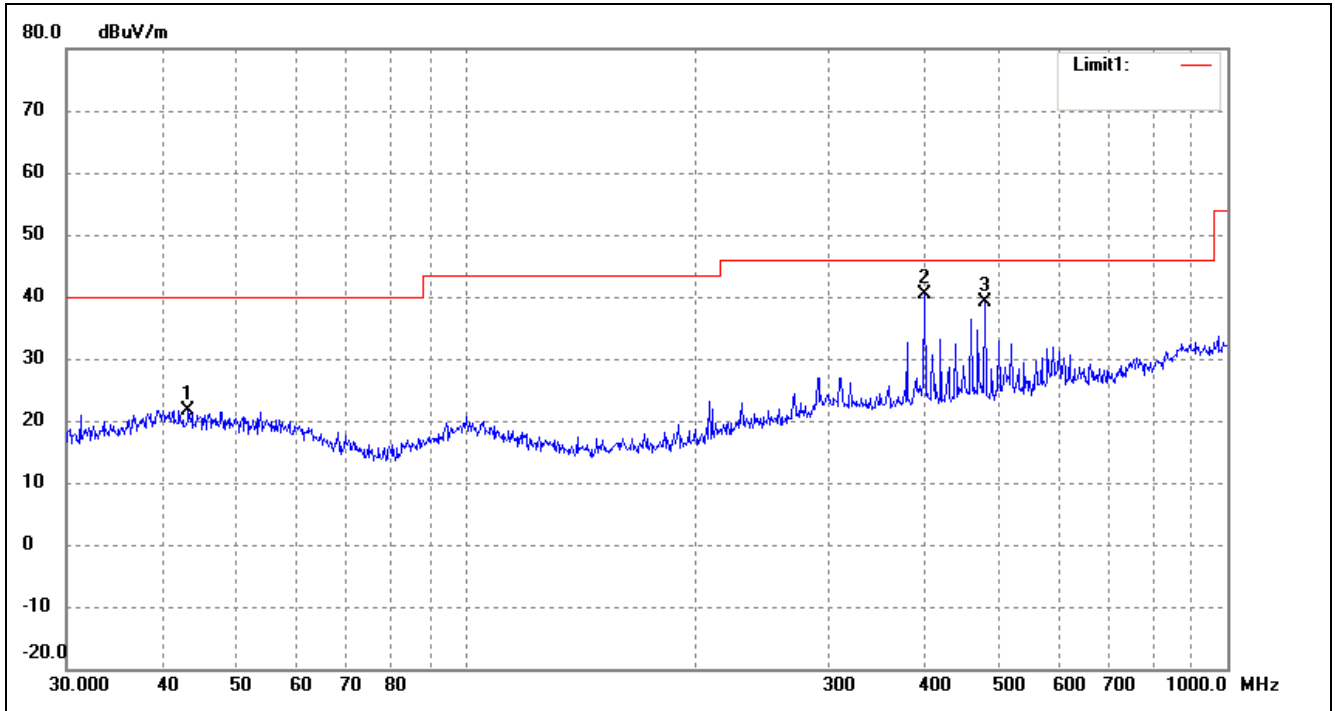


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	19.11	6.45	25.56	40.00	-14.44	55	100	peak
2	480.5276	24.79	10.12	34.91	46.00	-11.09	197	100	peak
3	900.1474	17.98	16.85	34.83	46.00	-11.17	310	100	peak

Operating Condition: 802.11n-HT20 Transmitting Middle Channel-2442MHz

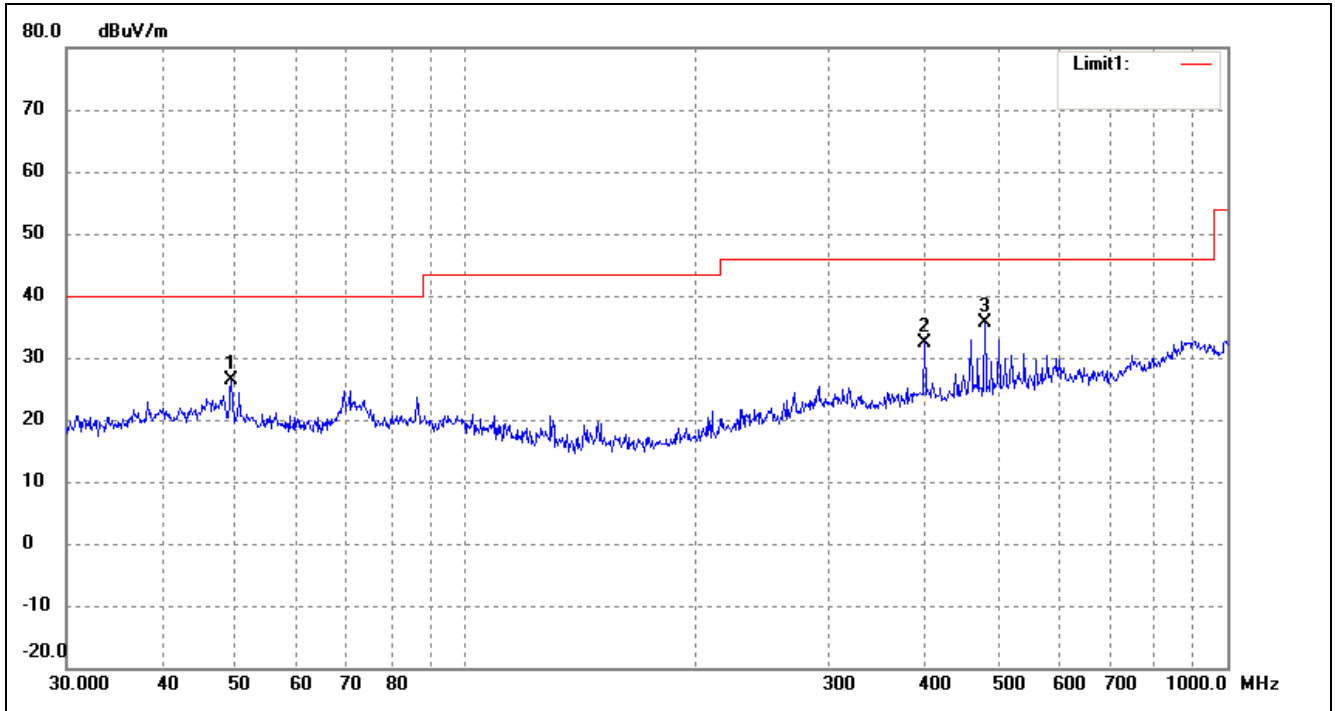
Comment: DC 3.3V

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	43.3534	14.67	6.91	21.58	40.00	-18.42	41	100	peak
2	400.4319	30.24	10.12	40.36	46.00	-5.64	178	100	peak
3	480.5276	28.94	10.12	39.06	46.00	-6.94	234	100	peak

Test Specification: Vertical

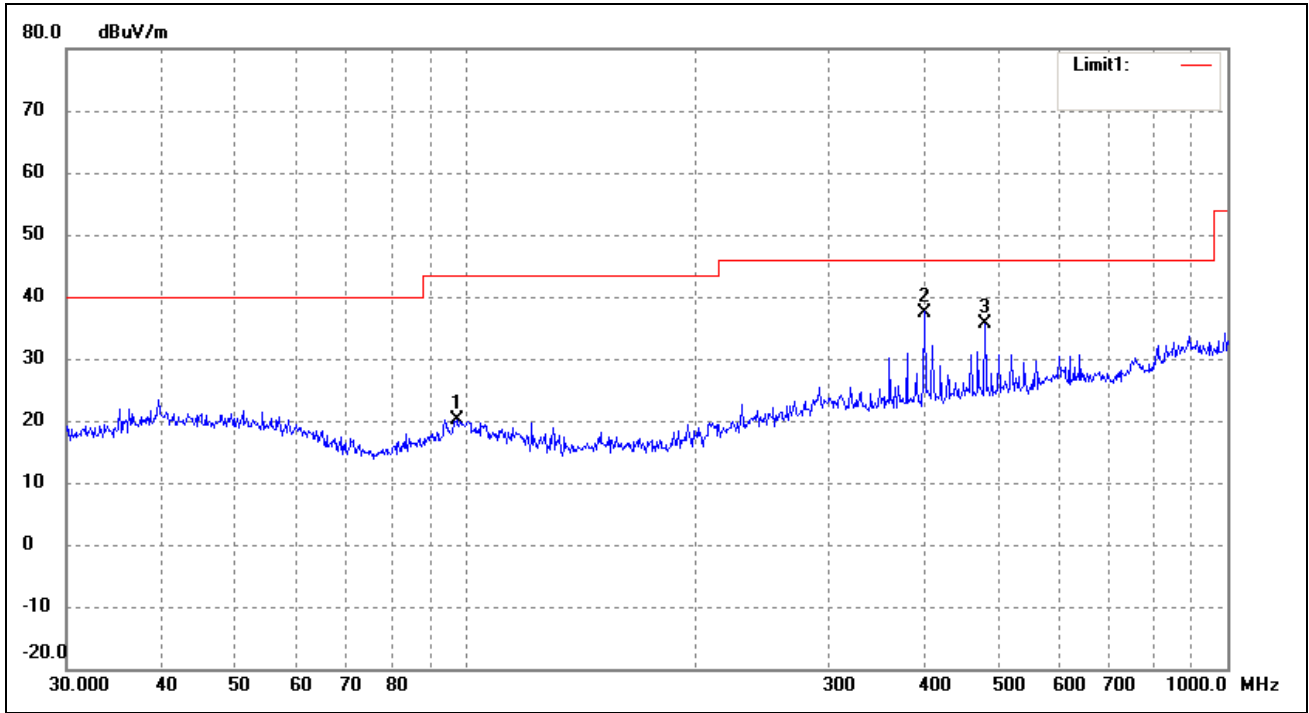


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	19.99	6.45	26.44	40.00	-13.56	62	100	peak
2	400.4319	22.29	10.12	32.41	46.00	-13.59	211	100	peak
3	480.5276	25.58	10.12	35.70	46.00	-10.30	243	100	peak

Operating Condition: 802.11n-HT20 Transmitting High Channel-2472MHz

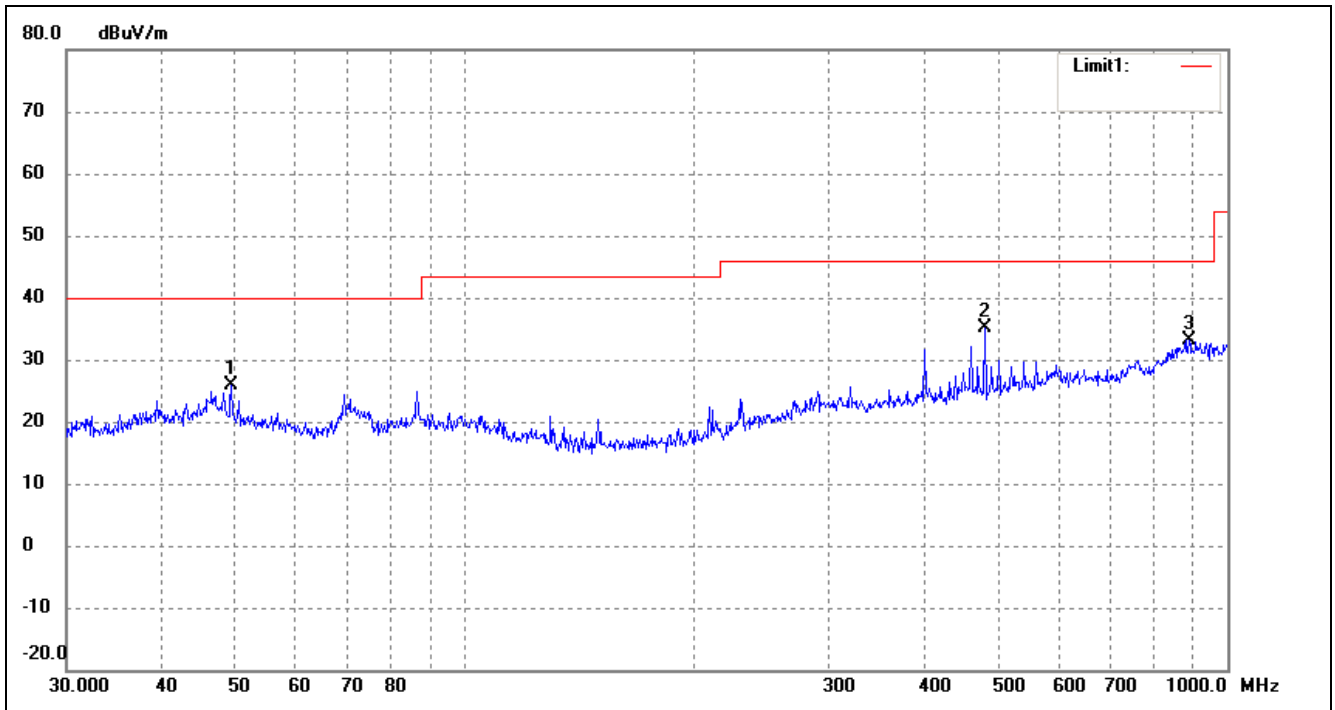
Comment: DC 3.3V

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	97.4560	14.59	5.49	20.08	43.50	-23.42	115	100	peak
2	400.4319	27.38	10.12	37.50	46.00	-8.50	195	100	peak
3	480.5276	25.39	10.12	35.51	46.00	-10.49	236	100	peak

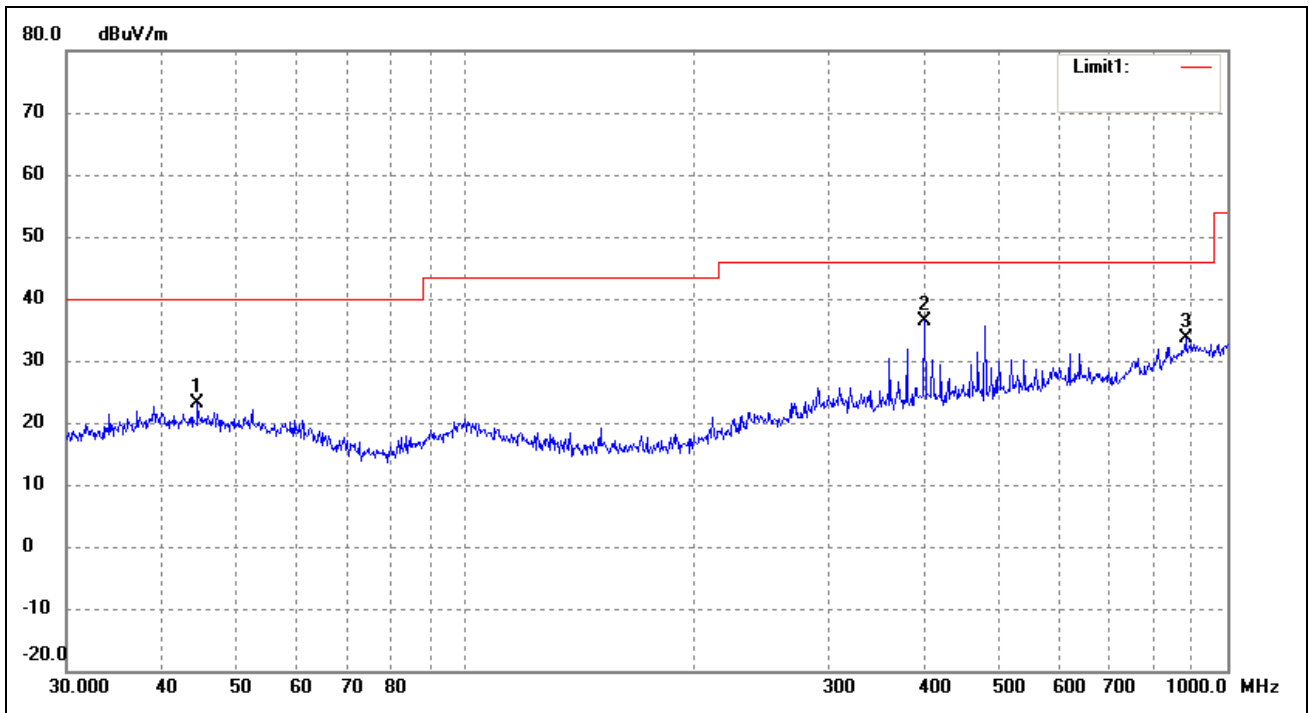
Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	19.44	6.45	25.89	40.00	-14.11	49	100	peak
2	480.5276	25.08	10.12	35.20	46.00	-10.80	228	100	peak
3	890.7278	16.22	16.84	33.06	46.00	-12.94	299	100	peak

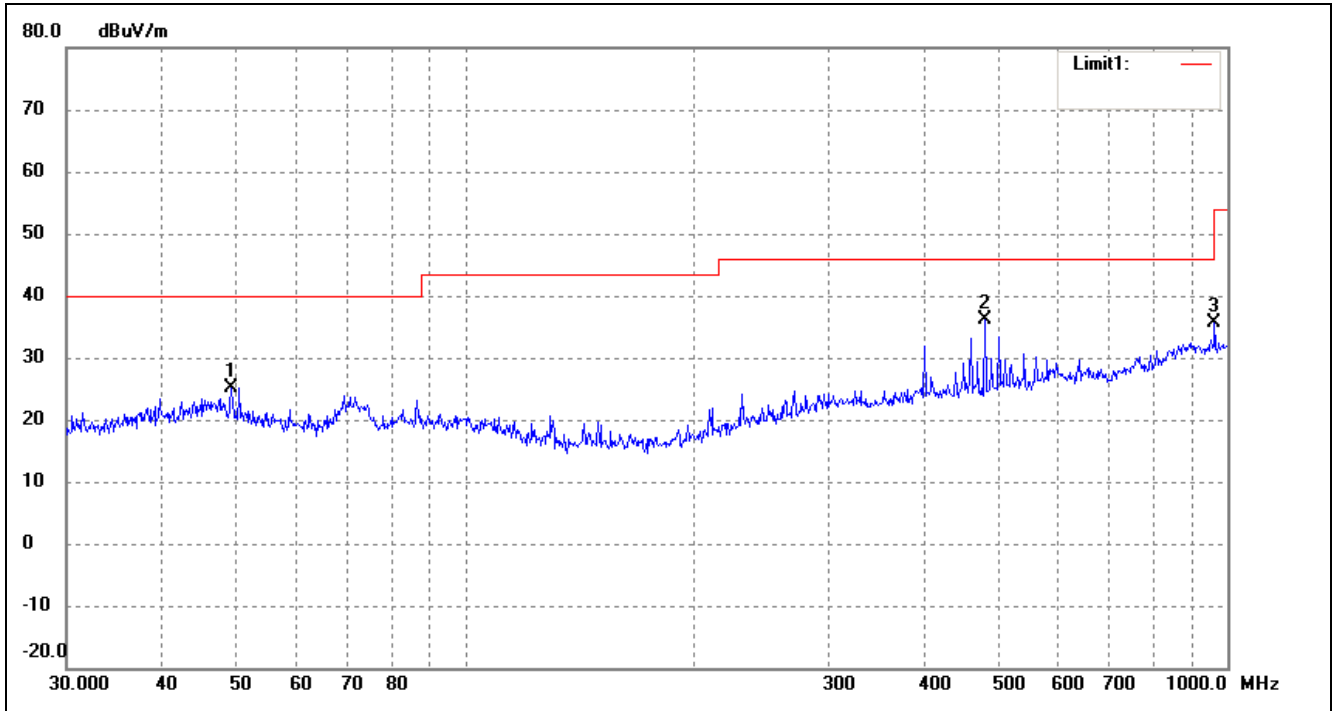
EUT: *WIFI module*  
 Tested Model: *HLK-M30*  
 Operating Condition: *802.11n-HT40 Transmitting Low Channel-2422MHz*  
 Comment: *DC 3.3V*

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	44.5868	16.26	6.80	23.06	40.00	-16.94	53	100	peak
2	400.4319	26.30	10.12	36.42	46.00	-9.58	212	200	peak
3	881.4067	16.69	16.82	33.51	46.00	-12.49	320	200	peak

Test Specification: Vertical

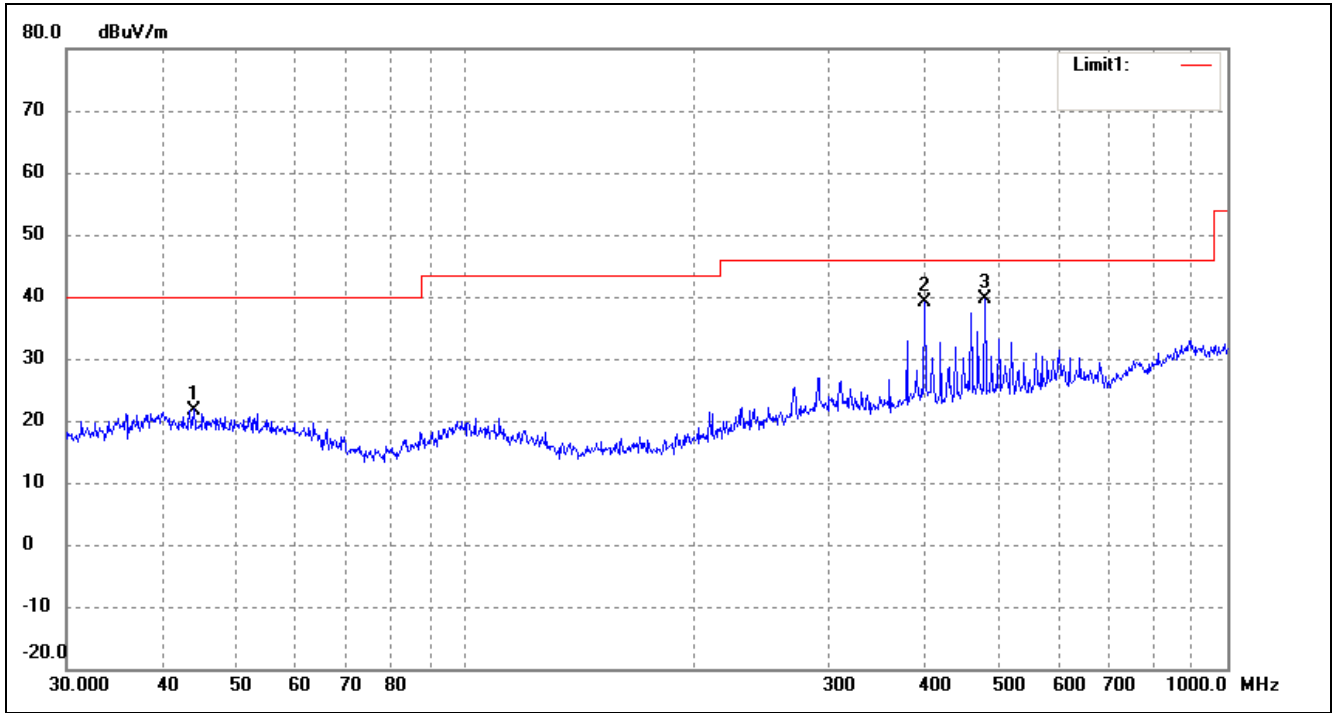


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	49.3594	18.75	6.45	25.20	40.00	-14.80	48	100	peak
2	480.5276	26.07	10.12	36.19	46.00	-9.81	186	100	peak
3	962.1623	19.26	16.38	35.64	54.00	-18.36	342	100	peak

Operating Condition: 802.11n-HT40 Transmitting Middle Channel-2442MHz

Comment: DC 3.3V

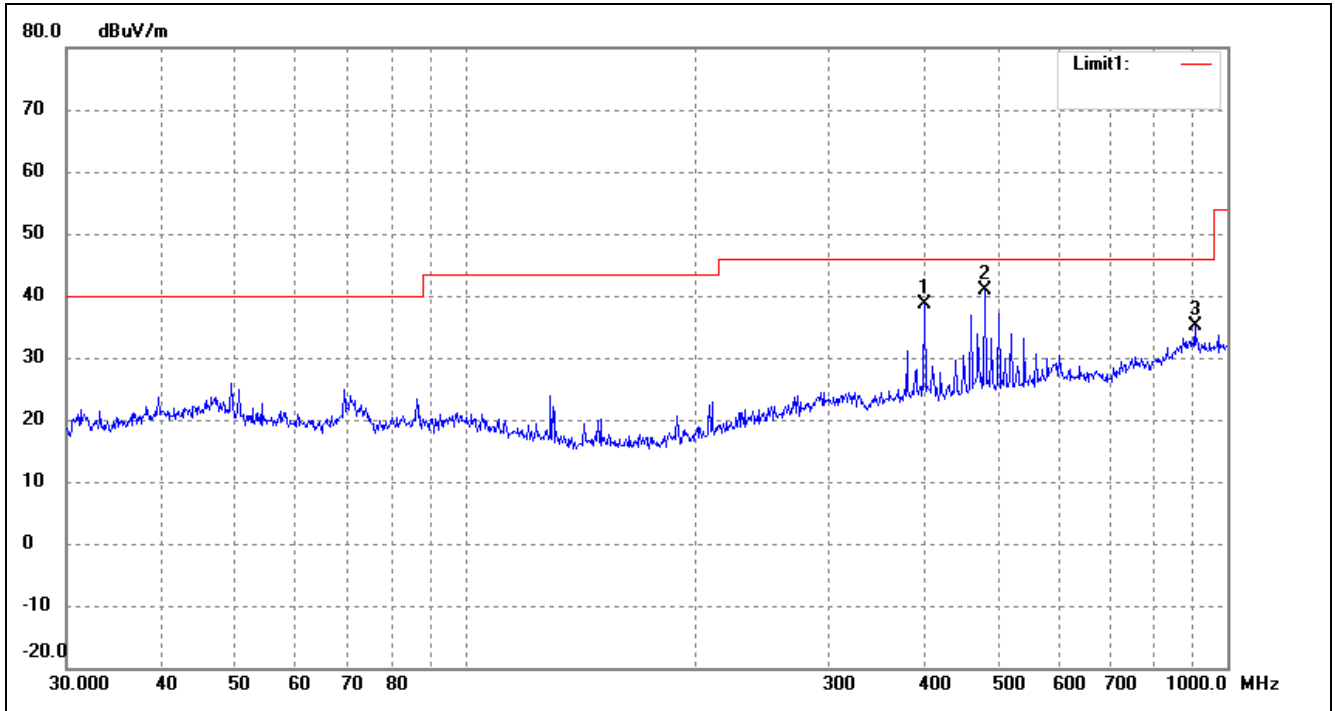
Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	44.1202	14.90	6.85	21.75	40.00	-18.25	25	100	peak
2	400.4319	29.09	10.12	39.21	46.00	-6.79	188	100	peak
3	480.5276	29.51	10.12	39.63	46.00	-6.37	206	100	peak



Test Specification: Vertical

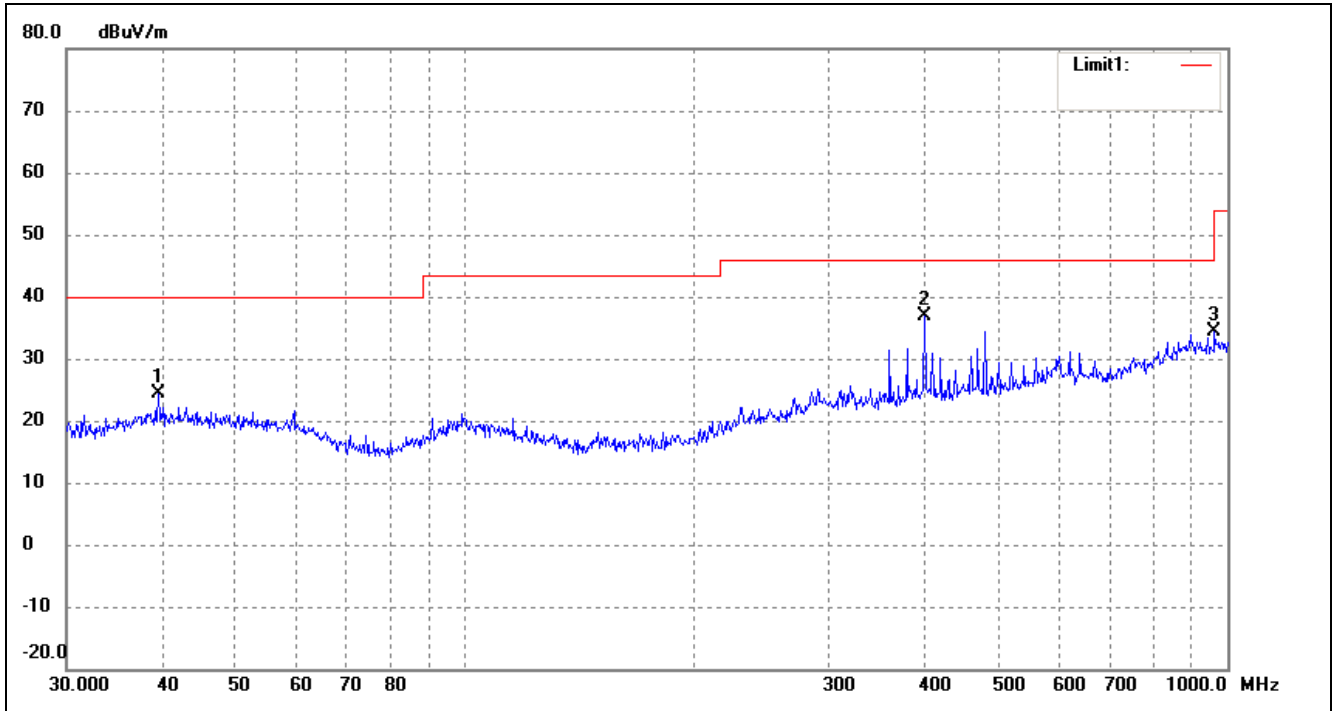


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	400.4319	28.61	10.12	38.73	46.00	-7.27	178	100	peak
2	480.5276	30.80	10.12	40.92	46.00	-5.08	201	100	peak
3	906.4824	18.52	16.73	35.25	46.00	-10.75	297	100	peak

Operating Condition: 802.11n-HT40 Transmitting High Channel-2462MHz

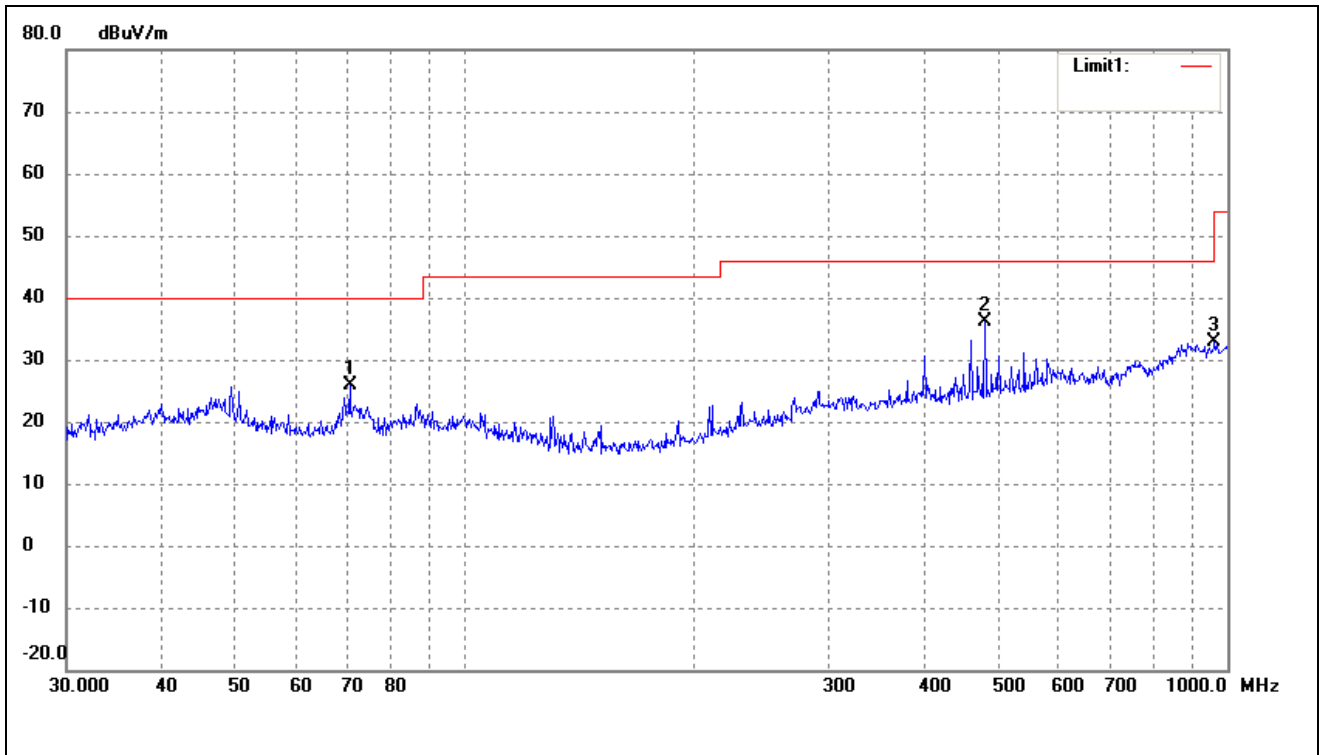
Comment: DC 3.3V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	17.35	7.13	24.48	40.00	-15.52	36	100	peak
2	400.4319	26.80	10.12	36.92	46.00	-9.08	211	100	peak
3	962.1623	17.99	16.38	34.37	54.00	-19.63	342	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	70.5836	23.86	2.12	25.98	40.00	-14.02	78	100	peak
2	480.5276	25.94	10.12	36.06	46.00	-9.94	217	100	peak
3	962.1623	16.38	16.38	32.76	54.00	-21.24	284	100	peak

*Spurious Emissions Above 1GHz**Test Mode: 802.11b*

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	59.24	0.57	59.81	74.00	-14.19	H	PK
4824.000	44.84	0.57	45.41	54.00	-8.59	H	AV
7236.000	35.01	3.69	38.70	74.00	-35.30	H	PK
7236.000	23.58	3.69	27.27	54.00	-26.73	H	AV
4824.000	50.85	0.57	51.42	74.00	-22.58	V	PK
4824.000	37.17	0.57	37.74	54.00	-16.26	V	AV
7236.000	34.80	3.69	38.49	74.00	-35.51	V	PK
7236.000	23.41	3.69	27.10	54.00	-26.90	V	AV
Middle Channel-2442MHz							
4884.000	57.35	0.66	58.01	74.00	-15.99	H	PK
4884.000	42.77	0.66	43.43	54.00	-10.57	H	AV
7326.000	37.61	3.76	41.37	74.00	-32.63	H	PK
7326.000	25.87	3.76	29.63	54.00	-24.37	H	AV
4884.000	51.19	0.66	51.85	74.00	-22.15	V	PK
4884.000	37.61	0.66	38.27	54.00	-15.73	V	AV
7326.000	38.83	3.76	42.59	74.00	-31.41	V	PK
7326.000	25.84	3.76	29.60	54.00	-24.40	V	AV
High Channel-2472MHz							
4944.000	56.32	0.74	57.06	74.00	-16.94	H	PK
4944.000	42.94	0.74	43.68	54.00	-10.32	H	AV
7416.000	37.91	3.83	41.74	74.00	-32.26	H	PK
7416.000	27.26	3.83	31.09	54.00	-22.91	H	AV
4944.000	53.07	0.74	53.81	74.00	-20.19	V	PK
4944.000	39.42	0.74	40.16	54.00	-13.84	V	AV
7416.000	38.69	3.83	42.52	74.00	-31.48	V	PK
7416.000	27.20	3.83	31.03	54.00	-22.97	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	54.00	0.57	54.57	74.00	-19.43	H	PK
4824.000	47.78	0.57	48.35	54.00	-5.65	H	AV
7236.000	35.17	3.69	38.86	74.00	-35.14	H	PK
7236.000	23.82	3.69	27.51	54.00	-26.49	H	AV
4824.000	42.22	0.57	42.79	74.00	-31.21	V	PK
4824.000	33.11	0.57	33.68	54.00	-20.32	V	AV
7236.000	35.08	3.69	38.77	74.00	-35.23	V	PK
7236.000	23.89	3.69	27.58	54.00	-26.42	V	AV
Middle Channel-2442MHz							
4884.000	53.19	0.66	53.85	74.00	-20.15	H	PK
4884.000	46.35	0.66	47.01	54.00	-6.99	H	AV
7326.000	37.62	3.76	41.38	74.00	-32.62	H	PK
7326.000	26.04	3.76	29.80	54.00	-24.20	H	AV
4884.000	43.36	0.66	44.02	74.00	-29.98	V	PK
4884.000	32.19	0.66	32.85	54.00	-21.15	V	AV
7326.000	37.03	3.76	40.79	74.00	-33.21	V	PK
7326.000	26.65	3.76	30.41	54.00	-23.59	V	AV
High Channel-2472MHz							
4944.000	55.79	0.74	56.53	74.00	-17.47	H	PK
4944.000	33.00	0.74	33.74	54.00	-20.26	H	AV
7416.000	37.86	3.83	41.69	74.00	-32.31	H	PK
7416.000	27.21	3.83	31.04	54.00	-22.96	H	AV
4944.000	45.15	0.74	45.89	74.00	-28.11	V	PK
4944.000	33.60	0.74	34.34	54.00	-19.66	V	AV
7416.000	38.93	3.83	42.76	74.00	-31.24	V	PK
7416.000	27.12	3.83	30.95	54.00	-23.05	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	55.85	0.57	56.42	74.00	-17.58	H	PK
4824.000	32.67	0.57	33.24	54.00	-20.76	H	AV
7236.000	34.49	3.69	38.18	74.00	-35.82	H	PK
7236.000	23.28	3.69	26.97	54.00	-27.03	H	AV
4824.000	43.03	0.57	43.60	74.00	-30.40	V	PK
4824.000	31.74	0.57	32.31	54.00	-21.69	V	AV
7236.000	34.59	3.69	38.28	74.00	-35.72	V	PK
7236.000	23.31	3.69	27.00	54.00	-27.00	V	AV
Middle Channel-2442MHz							
4884.000	53.08	0.66	53.74	74.00	-20.26	H	PK
4884.000	31.66	0.66	32.32	54.00	-21.68	H	AV
7326.000	36.80	3.76	40.56	74.00	-33.44	H	PK
7326.000	26.16	3.76	29.92	54.00	-24.08	H	AV
4884.000	44.14	0.66	44.80	74.00	-29.20	V	PK
4884.000	32.41	0.66	33.07	54.00	-20.93	V	AV
7326.000	37.59	3.76	41.35	74.00	-32.65	V	PK
7326.000	25.48	3.76	29.24	54.00	-24.76	V	AV
High Channel-2472MHz							
4944.000	53.25	0.74	53.99	74.00	-20.01	H	PK
4944.000	31.69	0.74	32.43	54.00	-21.57	H	AV
7416.000	38.35	3.83	42.18	74.00	-31.82	H	PK
7416.000	27.19	3.83	31.02	54.00	-22.98	H	AV
4944.000	43.52	0.74	44.26	74.00	-29.74	V	PK
4944.000	31.12	0.74	31.86	54.00	-22.14	V	AV
7416.000	38.66	3.83	42.49	74.00	-31.51	V	PK
7416.000	26.99	3.83	30.82	54.00	-23.18	V	AV

Test Mode: 802.11n-HT40

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2422MHz							
4844.000	53.25	0.60	53.85	74.00	-20.15	H	PK
4824.000	38.25	0.60	38.85	54.00	-15.15	H	AV
7266.000	46.48	3.72	50.20	74.00	-23.80	H	PK
7266.000	32.56	3.72	36.28	54.00	-17.72	H	AV
4844.000	54.22	0.60	54.82	74.00	-19.18	V	PK
4824.000	39.42	0.60	40.02	54.00	-13.98	V	AV
7266.000	48.81	3.72	52.53	74.00	-21.47	V	PK
7266.000	34.78	3.72	38.50	54.00	-15.50	V	AV
Middle Channel-2442MHz							
4884.000	52.53	0.66	53.19	74.00	-20.81	H	PK
4884.000	37.88	0.66	38.54	54.00	-15.46	H	AV
7326.000	44.88	3.76	48.64	74.00	-25.36	H	PK
7326.000	32.03	3.76	35.79	54.00	-18.21	H	AV
4884.000	53.74	0.66	54.40	74.00	-19.60	V	PK
4884.000	39.95	0.66	40.61	54.00	-13.39	V	AV
7326.000	45.78	3.76	49.54	74.00	-24.46	V	PK
7326.000	34.00	3.76	37.76	54.00	-16.24	V	AV
High Channel-2462MHz							
4924.000	52.65	0.72	53.37	74.00	-20.63	H	PK
4924.000	39.37	0.72	40.09	54.00	-13.91	H	AV
7386.000	45.63	3.81	49.44	74.00	-24.56	H	PK
7386.000	30.73	3.81	34.54	54.00	-19.46	H	AV
4924.000	54.84	0.72	55.56	74.00	-18.44	V	PK
4924.000	40.83	0.72	41.55	54.00	-12.45	V	AV
7386.000	48.18	3.81	51.99	74.00	-22.01	V	PK
7386.000	35.12	3.81	38.93	54.00	-15.07	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz.

## 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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23

### 9.3 Test Procedure

According to the KDB 558074D01 v03r02, 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 V03r02, 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.

#### 9.4 Environmental Conditions

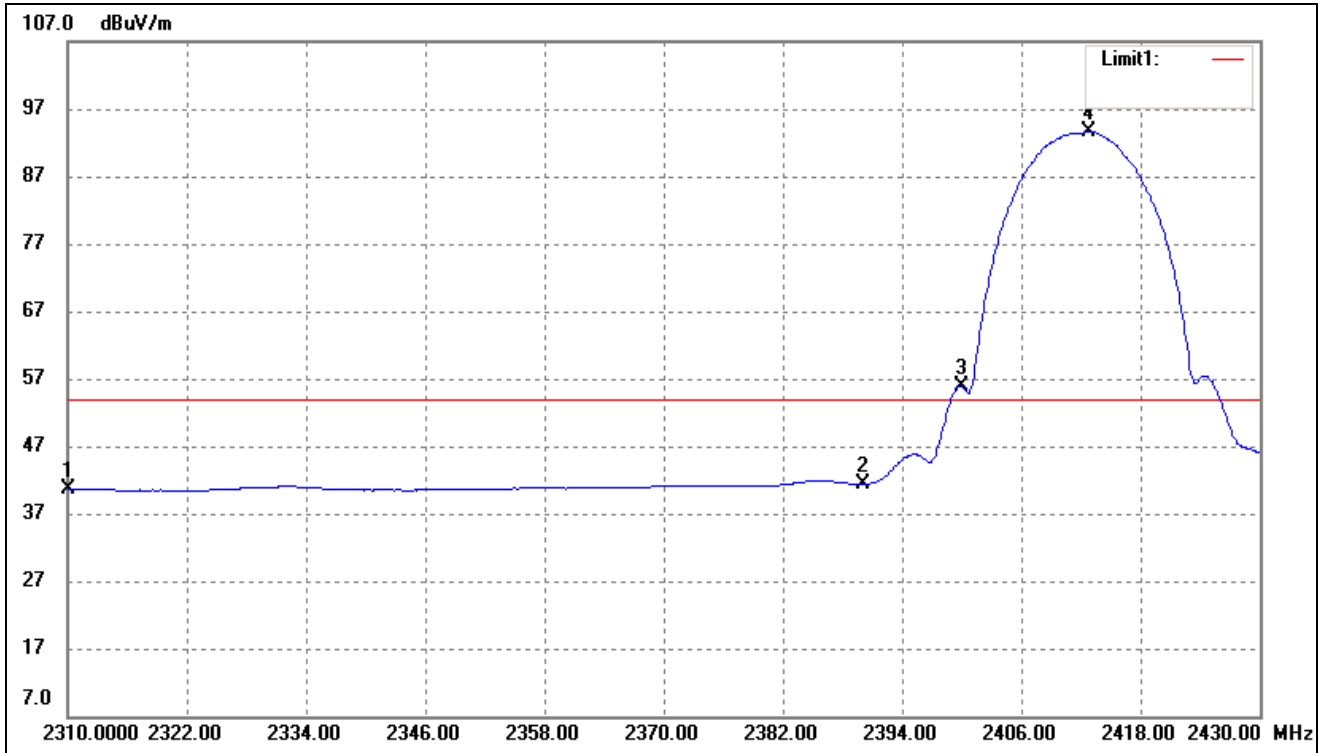
Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

#### 9.5 Summary of Test Results/Plots

Please refer to the test plots as below.

802.11b-Lowest Bandedge

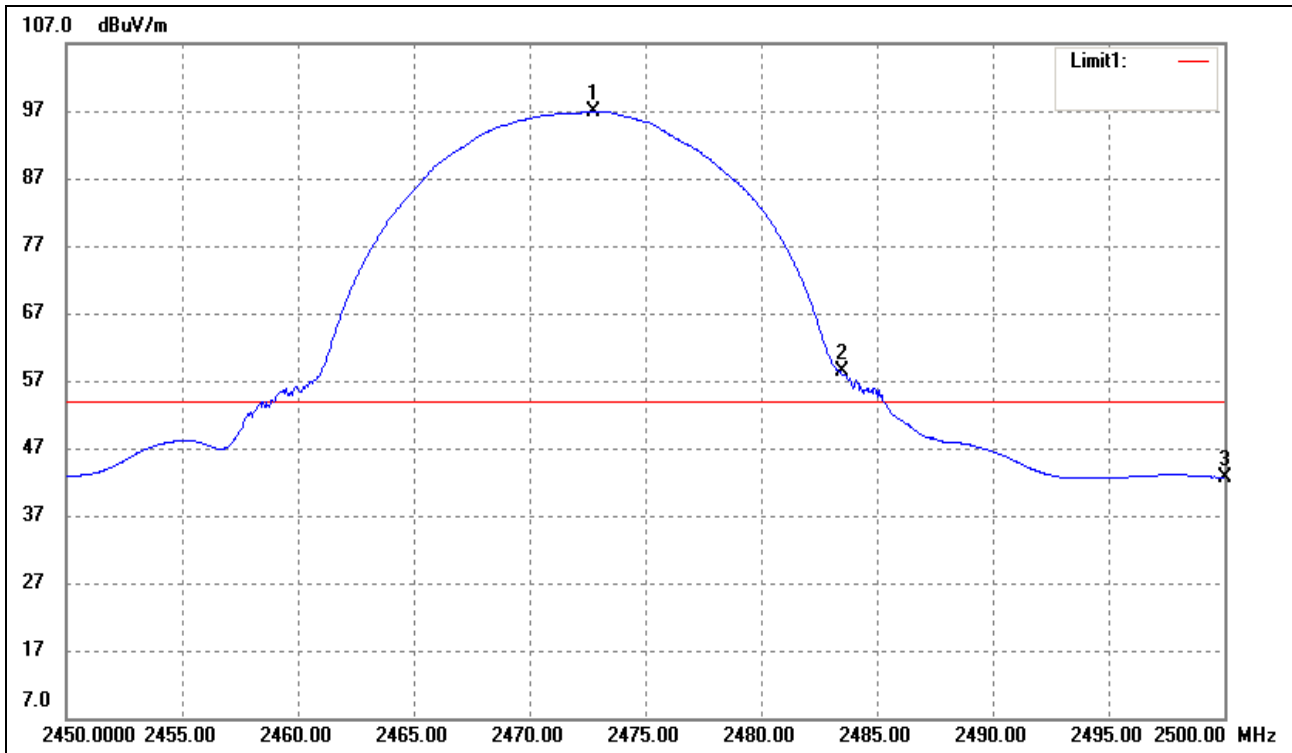
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	24.21	16.34	40.55	54.00	-13.45	Average Detector
		35.53	16.34	51.87	74.00	-22.13	Peak Detector
2	2390.000	24.44	17.03	41.47	54.00	-12.53	Average Detector
		36.77	17.03	53.80	74.00	-20.20	Peak Detector
3	2400.000	38.72	17.11	55.83	Delta=37.86dBc		Average Detector
4	2412.720	76.49	17.20	93.69			Average Detector

802.11b-Highest Bandedge

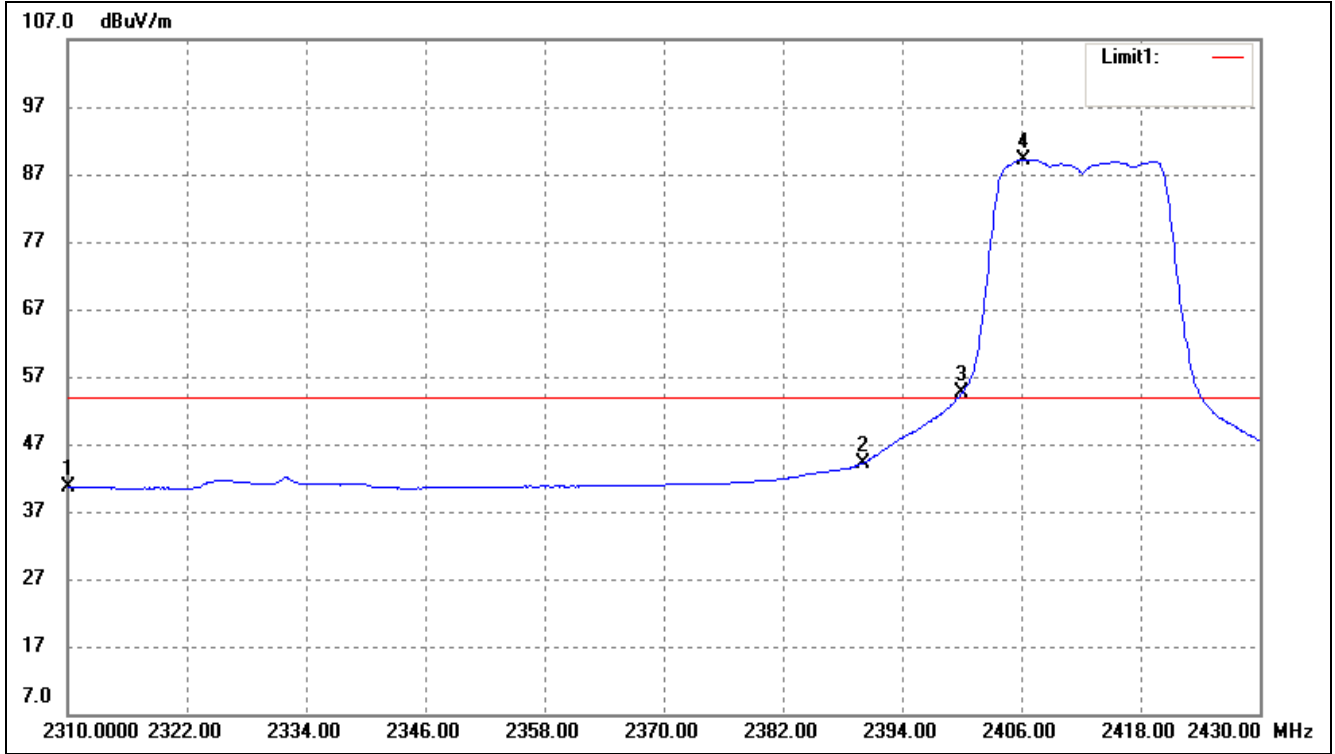
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2472.750	79.30	17.66	96.96	/	/	Average Detector
	2471.750	87.96	17.66	105.62	/	/	Peak Detector
2	2483.500	Delta = 48.03dBc		48.93	54.00	-5.97	Average Detector
	2483.500	Delta = 48.03dBc		57.59	74.00	-16.41	Peak Detector
3	2500.000	24.78	17.86	42.64	54.00	-11.36	Average Detector
	2500.000	36.71	17.86	54.57	74.00	-19.43	Peak Detector

802.11g-Lowest Bandedge

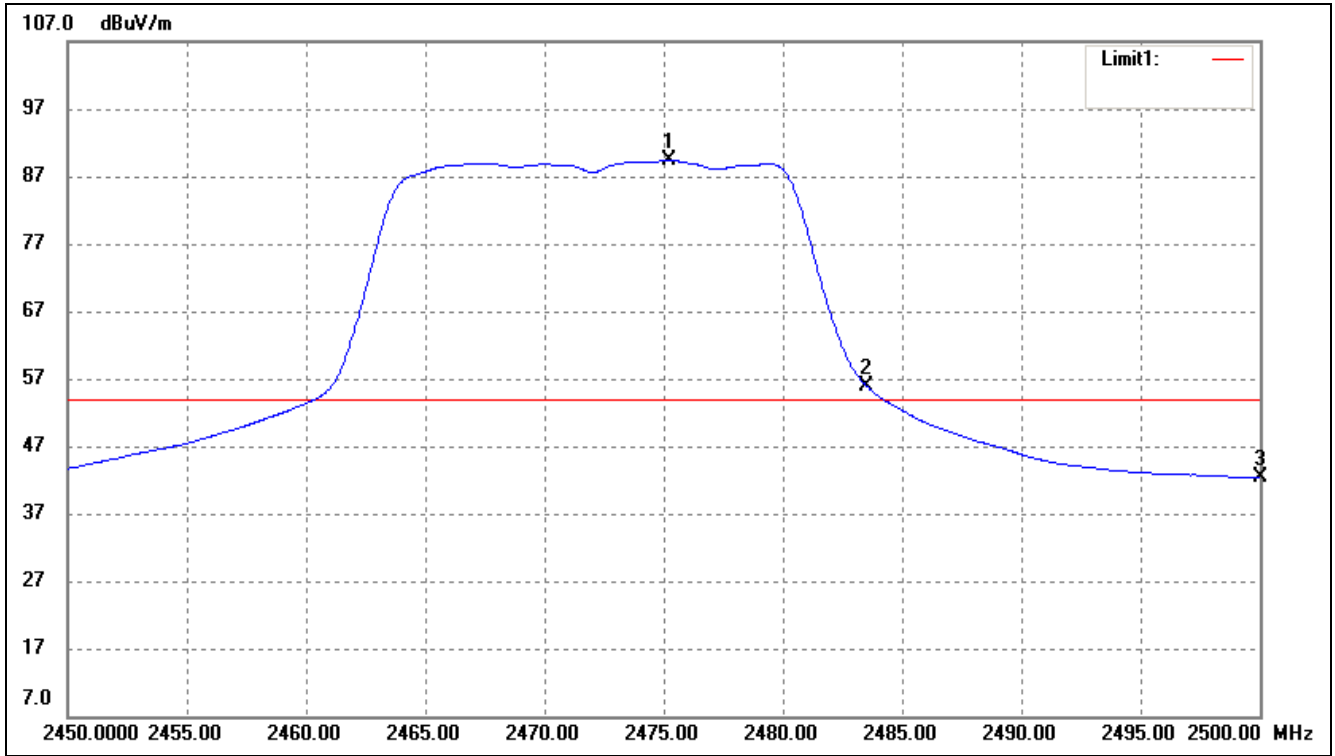
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	24.21	16.34	40.55	54.00	-13.45	Average Detector
	2310.000	35.60	16.34	51.94	74.00	-22.06	Peak Detector
2	2390.000	27.16	17.03	44.19	54.00	-9.81	Average Detector
	2390.000	43.98	17.03	61.01	74.00	-12.99	Peak Detector
3	2400.000	37.41	17.11	54.52	Delta=34.70dBc		Average Detector
4	2406.240	72.07	17.15	89.22			Average Detector

802.11g-Highest Bandedge

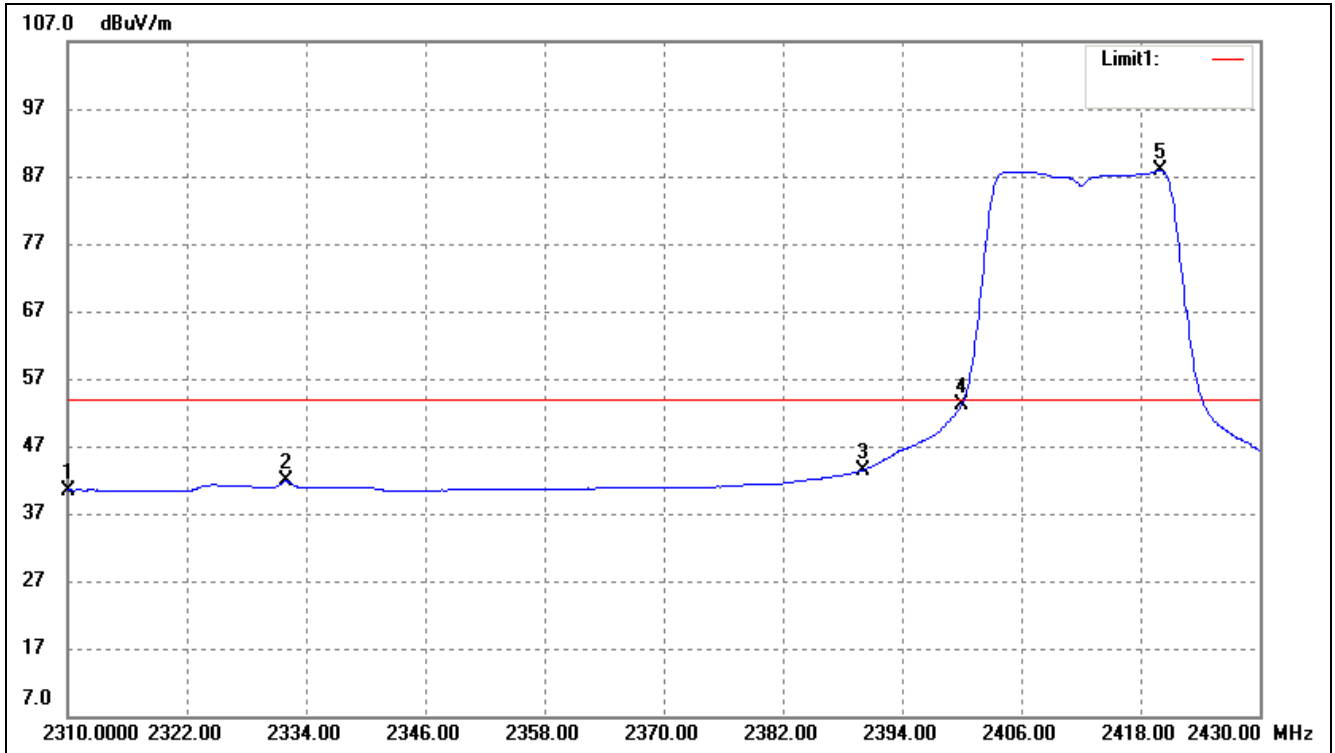
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2475.250	71.66	17.68	89.34	/	/	Average Detector
	2475.250	83.38	17.68	101.06	/	/	Peak Detector
1	2483.500	Delta = 39.32dBc		50.02	54.00	-3.98	Average Detector
	2483.500	Delta = 39.32dBc		61.74	74.00	-12.26	Peak Detector
3	2500.000	24.42	17.86	42.28	54.00	-11.72	Average Detector
	2500.000	37.49	17.85	55.34	74.00	-18.66	Peak Detector

802.11n-HT20-Lowest Bandedge

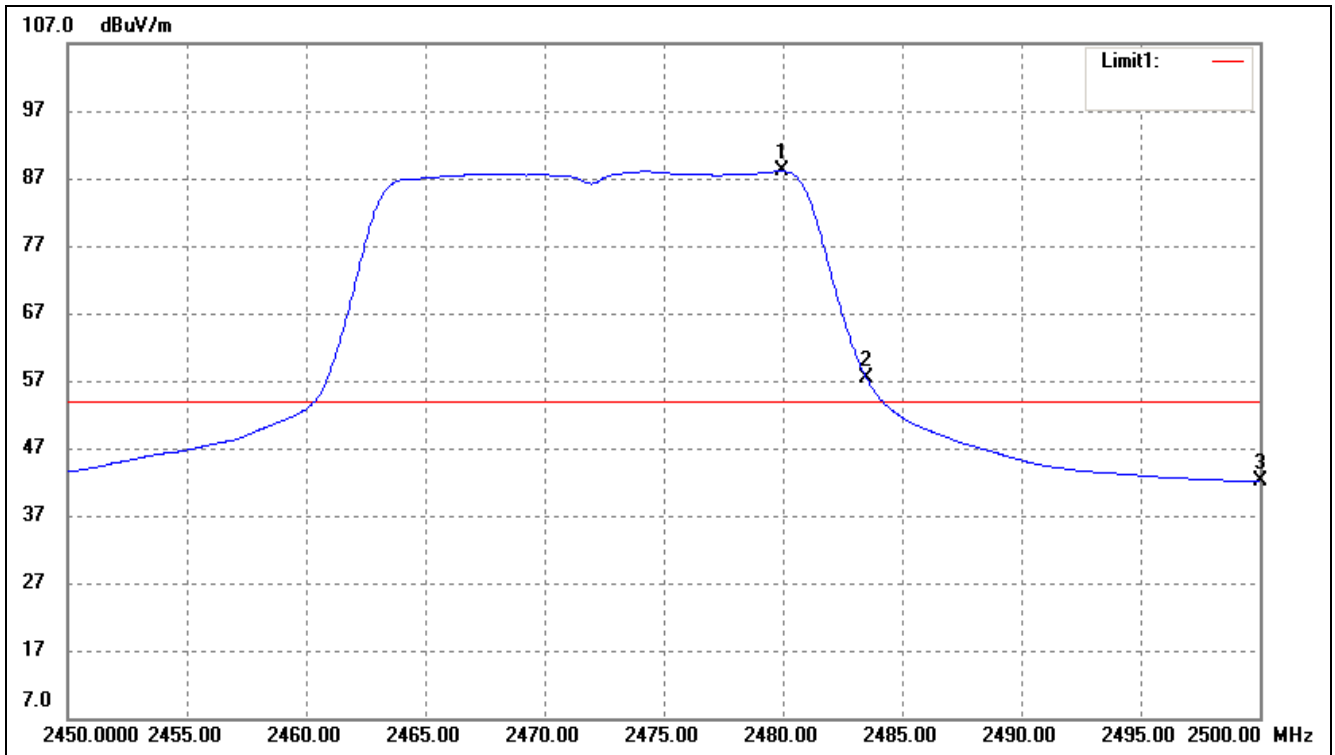
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	24.16	16.34	40.50	54.00	-13.50	Average Detector
		35.59	16.34	51.93	74.00	-22.07	Peak Detector
2	2331.960	25.27	16.53	41.80	54.00	-12.20	Average Detector
3	2390.000	26.43	17.03	43.46	54.00	-10.54	Average Detector
		42.82	17.03	59.85	74.00	-14.15	Peak Detector
4	2400.000	36.06	17.11	53.17	Delta=34.61dBc	Average Detector	
5	2420.040	70.52	17.26	87.78		Average Detector	

802.11n-HT20-Highest Bandedge

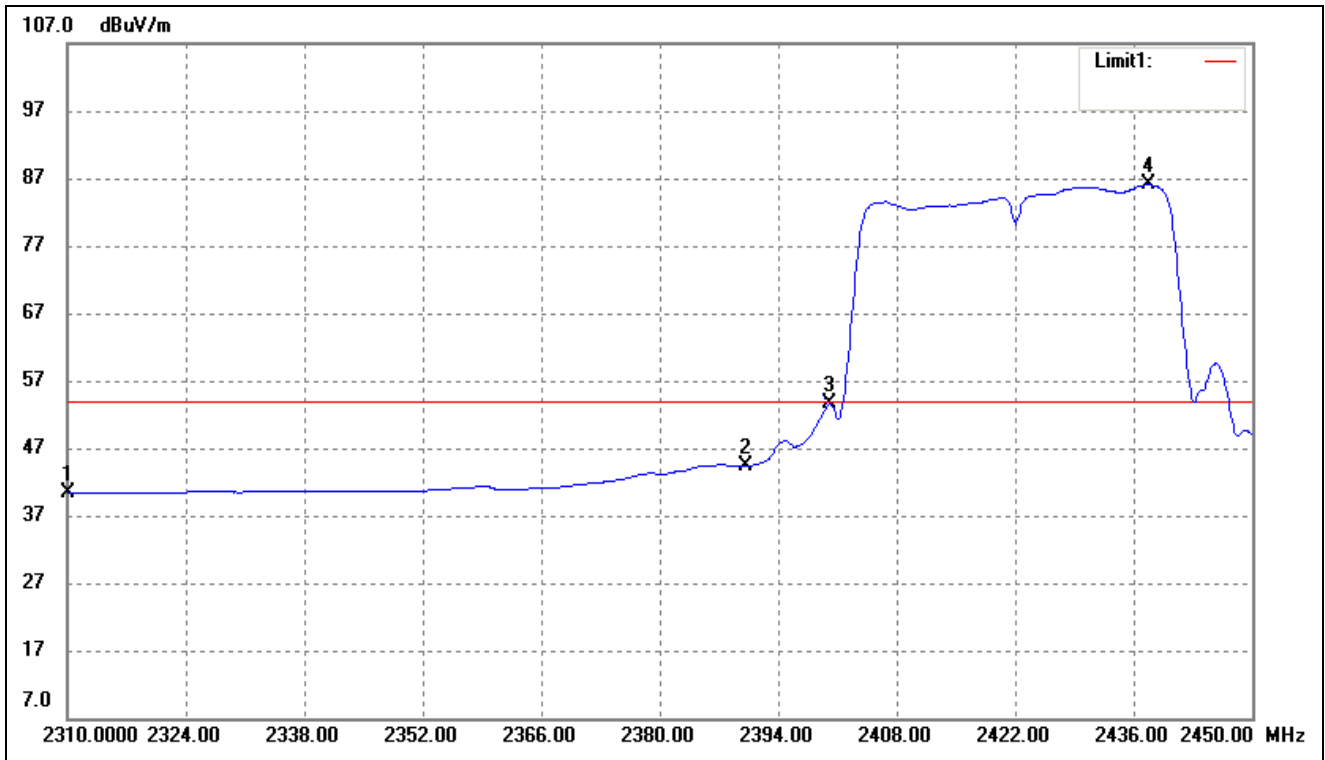
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.950	70.32	17.71	88.03	/	/	Average Detector
	2468.850	81.33	17.61	98.94	/	/	Peak Detector
2	2483.500	Delta = 38.10dBc		49.93	54.00	-4.07	Average Detector
	2483.500			60.84	74.00	-13.16	Peak Detector
3	2500.000	24.23	17.86	42.09	54.00	-11.91	Average Detector
	2500.000	37.55	17.86	55.41	74.00	-18.59	Peak Detector

802.11n-HT40-Lowest Bandedge

Vertical (Worst case)

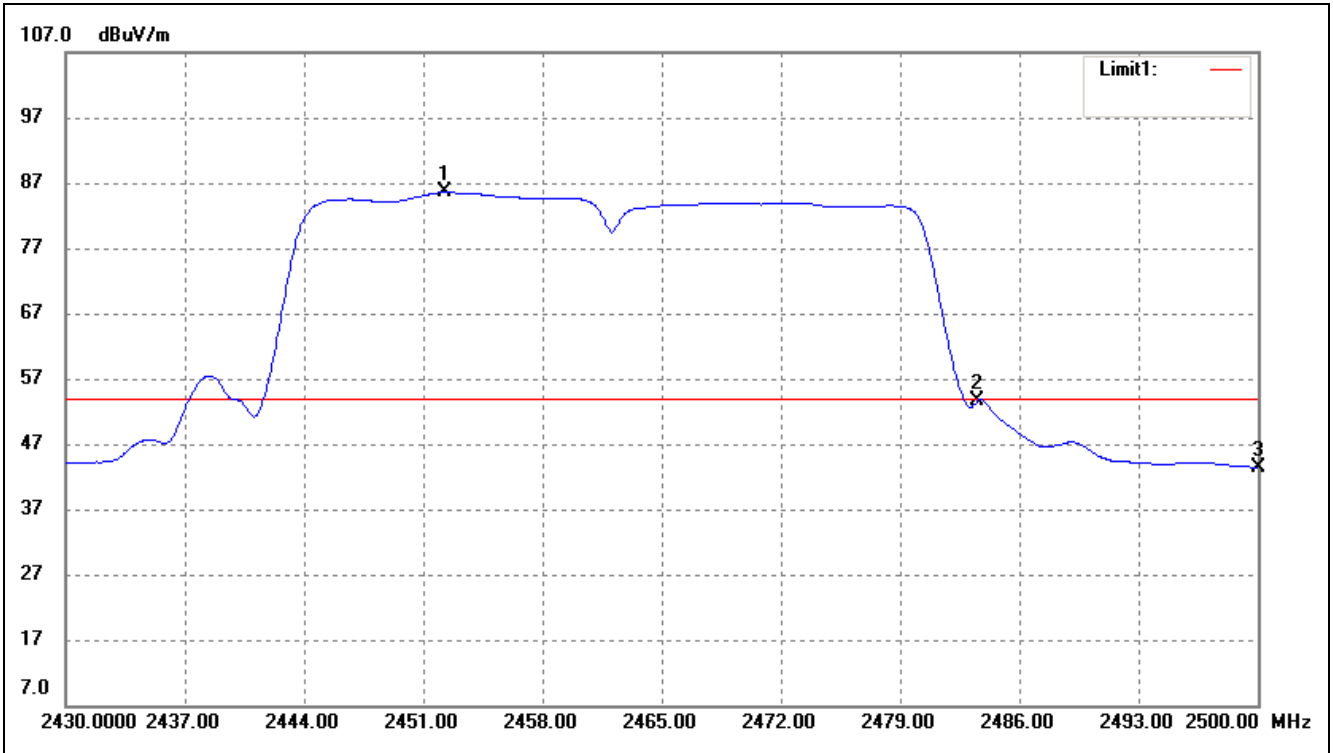


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	24.13	16.34	40.47	54.00	-13.53	Average Detector
		34.54	16.34	50.88	74.00	-23.12	Peak Detector
2	2390.000	27.26	17.03	44.29	54.00	-9.71	Average Detector
		39.52	17.03	56.55	74.00	-17.45	Peak Detector
3	2400.000	36.41	17.11	53.52	Delta=32.51dBc		Average Detector
4	2437.680	68.64	17.39	86.03			Average Detector



802.11n-HT40-Highest Bandedge

Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2452.960	68.04	17.51	85.55	/	/	Average Detector
	2452.960	79.62	17.51	97.13	/	/	Peak Detector
2	2483.500	Delta = 39.48dBc		46.07	54.00	-7.93	Average Detector
	2483.500	Delta = 39.48dBc		57.65	74.00	-16.35	Peak Detector
3	2500.000	25.58	17.86	43.44	54.00	-10.56	Average Detector
	2500.000	37.16	17.86	55.02	74.00	-18.98	Peak Detector

## 10. Conducted Emissions

### 10.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm 2.88$  dB.

### 10.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2014-05-28	2015-05-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2014-05-28	2015-05-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2014-05-28	2015-05-27

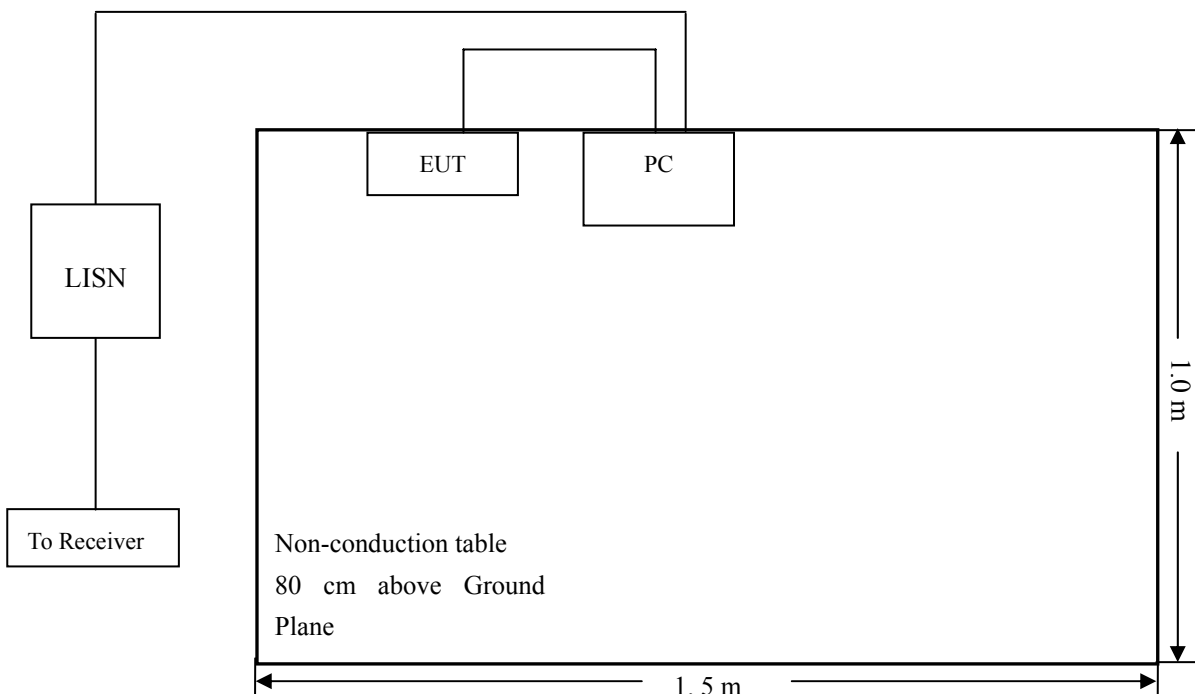
### 10.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 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.

### 10.4 Basic Test Setup Block Diagram



## 10.5 Environmental Conditions

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

## 10.6 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

## 10.7 Summary of Test Results/Plots

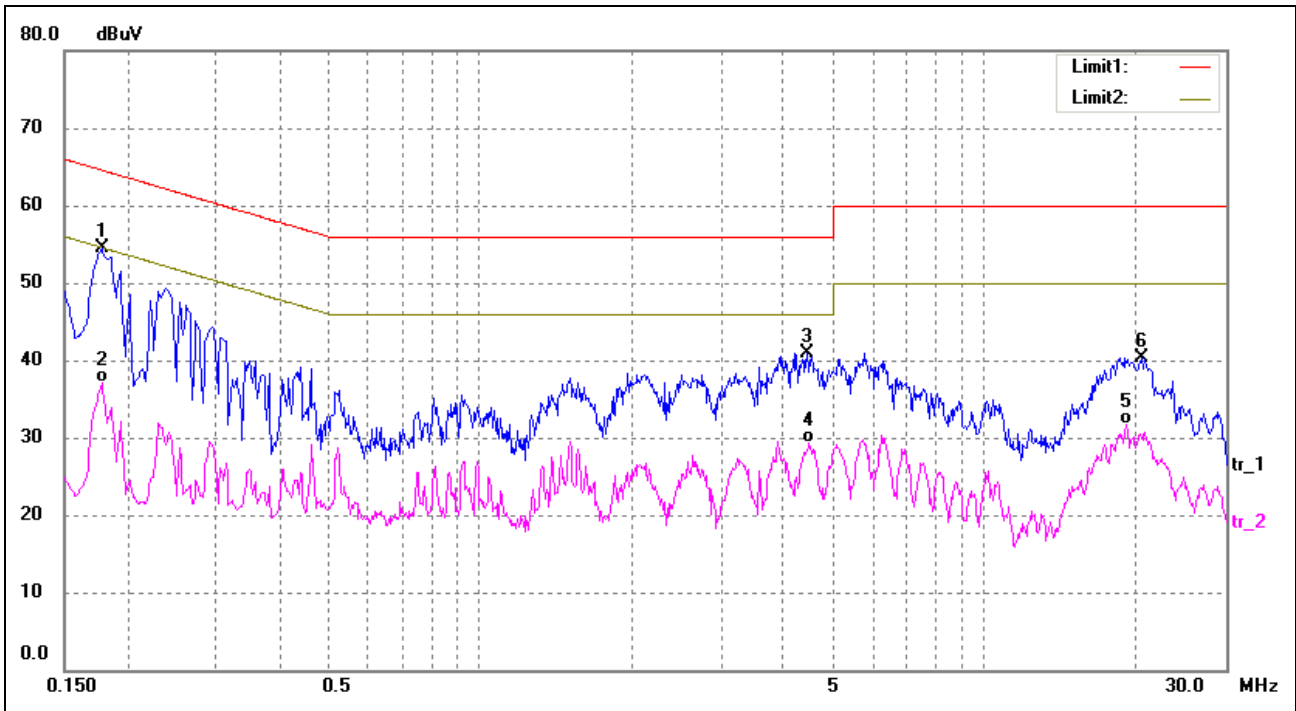
According to the data in section 10.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

**-9.85 dB at 0.1620 MHz** in the **Line** mode, **Peak** detector, **0.15-30MHz**

## 10.8 Conducted Emissions Test Data

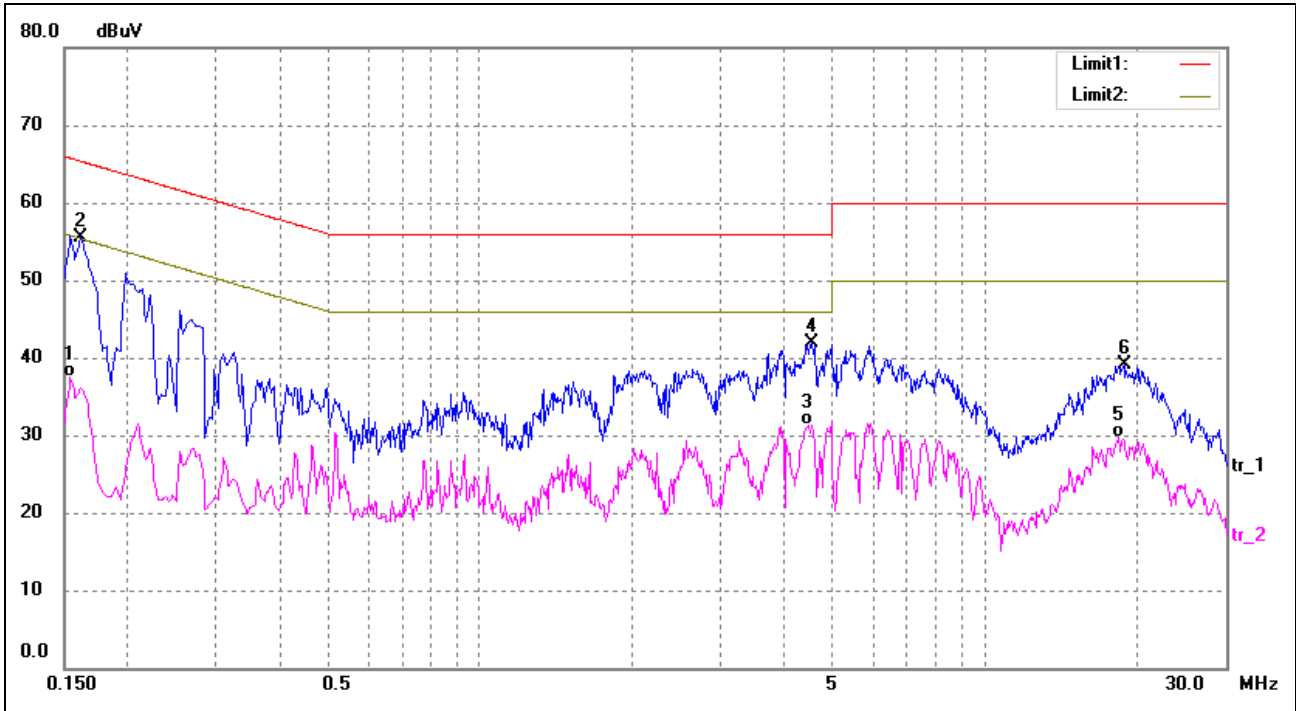
**Plot of Conducted Emissions Test Data**

EUT: *WIFI module*  
 Tested Model: *HLK-M30*  
 Operating Condition: *Transmitting(Wi-Fi)*  
 Comment: *DC 3.3V*  
  
 Test Specification: *Neutral*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1780	44.97	9.50	54.47	64.58	-10.11	peak
2	0.1780	27.65	9.50	37.15	54.58	-17.43	AVG
3	4.4500	30.81	10.00	40.81	56.00	-15.19	peak
4	4.4980	19.23	10.00	29.23	46.00	-16.77	AVG
5	19.0980	19.91	11.82	31.73	50.00	-18.27	AVG
6	20.4500	28.40	12.00	40.40	60.00	-19.60	peak

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1540	28.03	9.50	37.53	55.78	-18.25	AVG
2*	0.1620	46.01	9.50	55.51	65.36	-9.85	peak
3	4.4700	21.40	10.00	31.40	46.00	-14.60	AVG
4	4.5460	31.92	10.00	41.92	56.00	-14.08	peak
5	18.3700	17.99	11.67	29.66	50.00	-20.34	AVG
6	18.8340	27.36	11.77	39.13	60.00	-20.87	peak

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