

# TEST REPORT

Reference No..... : WTX20X07043384W-1  
FCC ID ..... : VEP-RB313  
Applicant ..... : K-Mark Industrial Limited.  
Address ..... : Flat A, 7/F., Mai On Ind. Bldg 17-21 Kung Yip St., Kwai Chung Hong Kong  
Product Name ..... : IQ Digital Lock Box  
Test Model. .... : DLB  
Standards ..... : FCC Part 15.247  
Date of Receipt sample .... : Jul.08, 2020  
Date of Test..... : Jul.08, 2020 to Jul.18, 2020  
Date of Issue ..... : Jul.18, 2020  
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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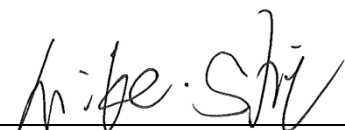
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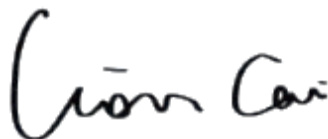
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Silin Chen / Manager

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**Report version**

Version No.	Date of issue	Description
Rev.00	Jul.18, 2020	Original
/	/	/

## 1. GENERAL INFORMATION

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### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: K-Mark Industrial Limited.  
 Address of applicant: Flat A, 7/F., Mai On Ind. Bldg 17-21 Kung Yip St., Kwai Chung  
 Hong Kong

Manufacturer: Robern Inc.  
 Address of manufacturer: James A. DeHope 701 North Wilson Ave Bristol, PA 19007  
 USA

Factory: NEW JIN DIAN TECHNOLOGY (SHENZHEN) COMPANY  
 LIMITED.  
 Address of Factory: Building 1/3 NO 43 Jinshi Road,Guangpei Community,  
 Guanlan Street,Longhua New District, Shenzhen,Guangdong  
 Province,China.

General Description of EUT	
Product Name:	IQ Digital Lock Box
Trade Name:	/
Model No.:	DLB
Adding Model(s):	/
Rated Voltage:	Battery:1.5V*4 "AA"
Serial Number :	MXLA-001-0-000067, MXLA-001-0-000082
Firmware Version:	2.02
Hardware Version:	V1.0
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

<b>Technical Characteristics of EUT</b>	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n-HT20 2422-2452MHz for 802.11n-HT40
RF Output Power:	14.74dBm (Conducted)
Type of Modulation:	DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11 for 802.11b/g/n-HT20 7 for 802.11n-HT40
Channel Separation:	5MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	3.0dBi

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.247**: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

**558074 D01 15.247 Meas Guidance v05r02**: Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under section 15.247 of the Fcc rules.

**ANSI C63.10-2013**: American National Standard for Testing Unlicensed Wireless Devices.

**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, KDB 558074 D01 15.247 Meas Guidance v05r02.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Test Facility

### **Address of the test laboratory**

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

### **FCC – Registration No.: 125990**

Waltek Testing Group (Shenzhen) 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. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) 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

Use “espRFTool\_2.3.exe” and follow the instructions given by the manufacturer, you can start to test. During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. Test use the customer default power level, 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	Low:2412MHz, Middle:2437MHz,High:2462MHz
TM2	802.11g	Low:2412MHz, Middle:2437MHz,High:2462MHz
TM3	802.11n-HT20	Low:2412MHz, Middle:2437MHz,High:2462MHz
TM4	802.11n-HT40	Low:2422MHz, Middle:2437MHz,High:2452MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~56 %.
ATM Pressure:	1019 mbar

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

Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

## 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	2020-04-28	2021-04-27
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2020-04-28	2021-04-27
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2020-04-28	2021-04-27
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2020-04-28	2021-04-27
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2020-04-28	2021-04-27
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2020-04-28	2021-04-27
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2020-04-28	2021-04-27
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2020-04-28	2021-04-27
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2020-04-28	2021-04-27
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2020-04-28	2021-04-27
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2020-04-28	2021-04-27
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2020-04-28	2021-04-27
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2020-04-28	2021-04-27
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2020-04-28	2021-04-27
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2020-03-17	2021-03-16
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2020-03-17	2021-03-16
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2020-03-17	2021-03-16
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2020-03-17	2021-03-16
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16

<b>Software List</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Version</b>
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

\*Remark: indicates software version used in the compliance certification testing

## 2. SUMMARY OF TEST RESULTS

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<b>FCC Rules</b>	<b>Description of Test Item</b>	<b>Result</b>
§2.1091	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	N/A
§15.247(e)	Power Spectral Density	Compliant
§15.247(a)(2)	DTS 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 §2.1091, the fixed 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.

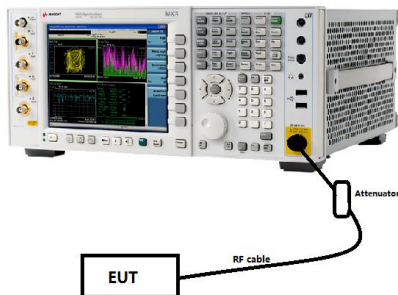
## 5. Power Spectral Density

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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 Setup Block Diagram



### 5.3 Test Procedure

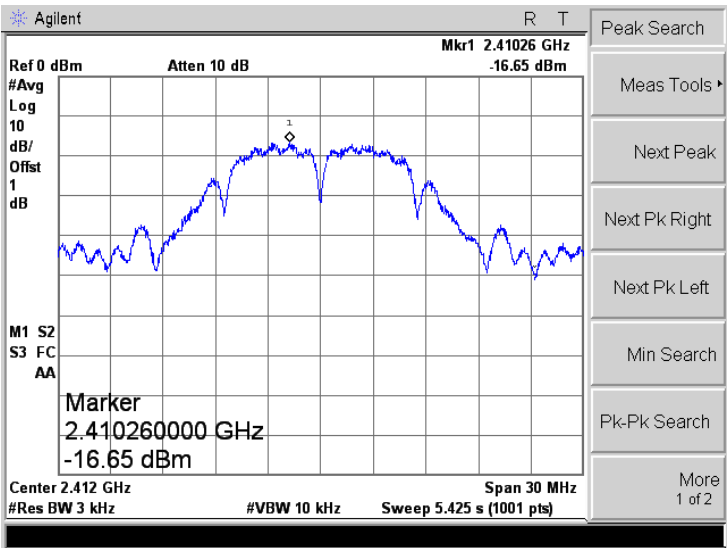
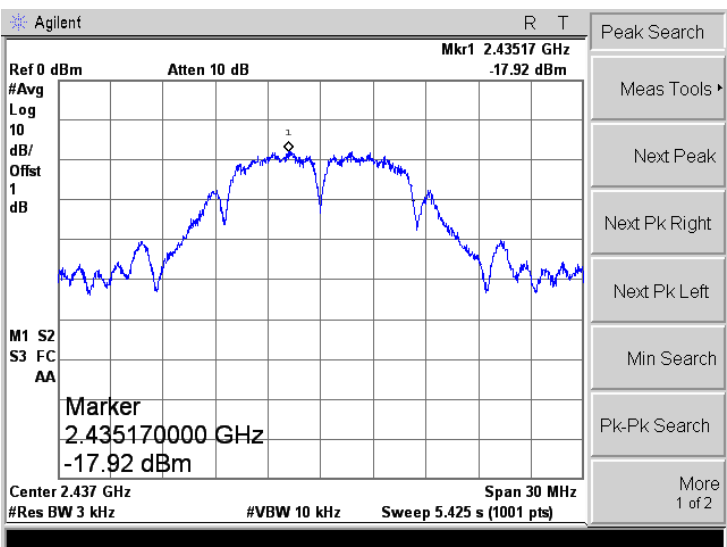
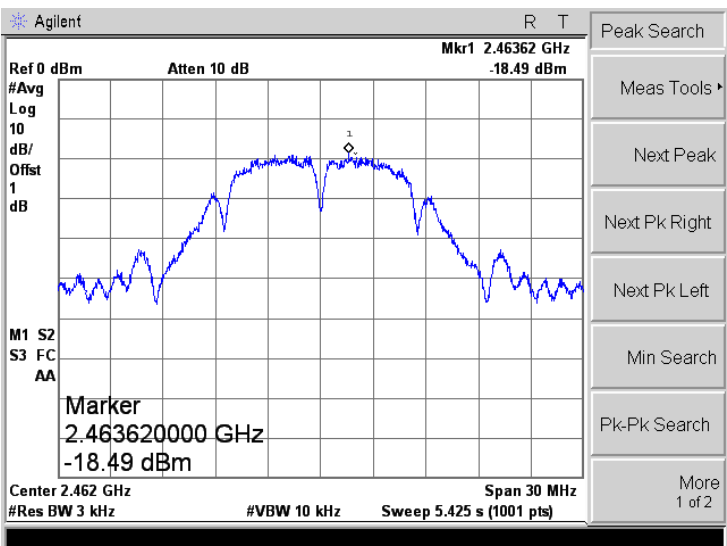
According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.3, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set VBW  $\geq 3 \times \text{RBW}$ .
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- 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).

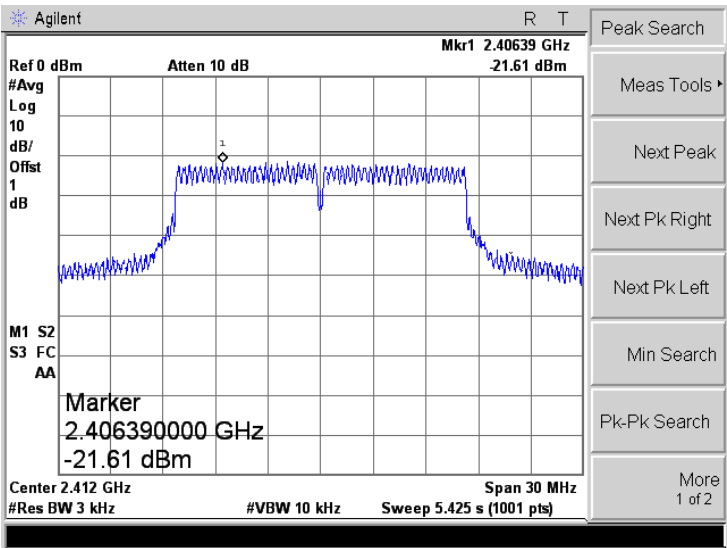
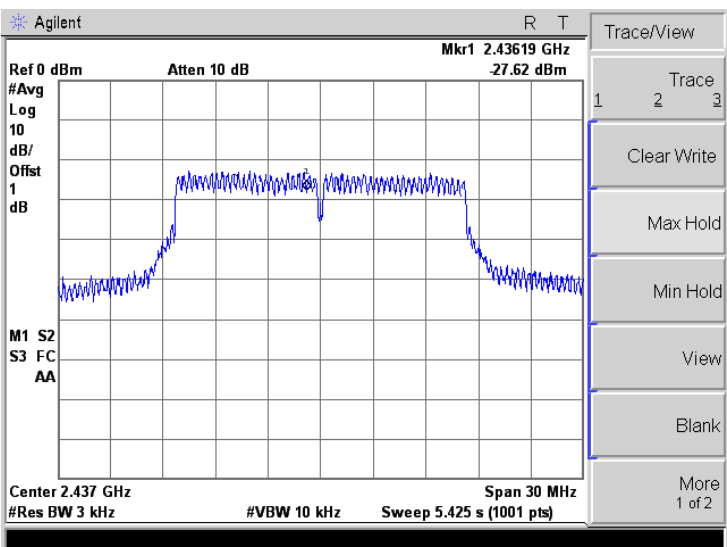
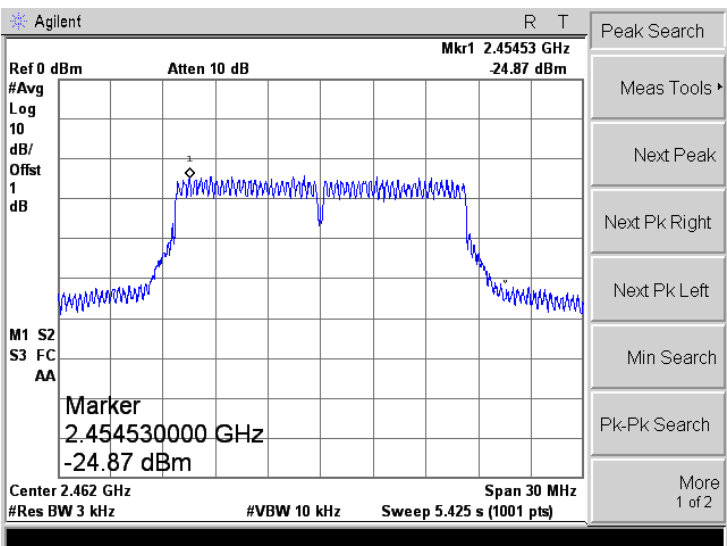
### 5.4 Summary of Test Results/Plots

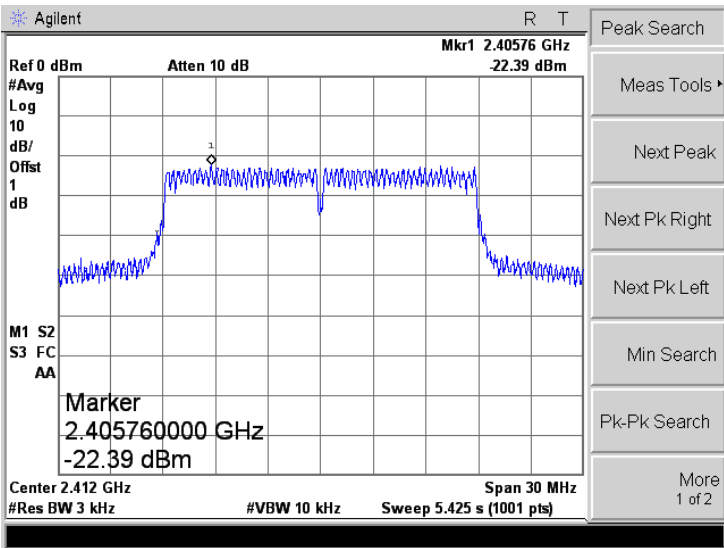
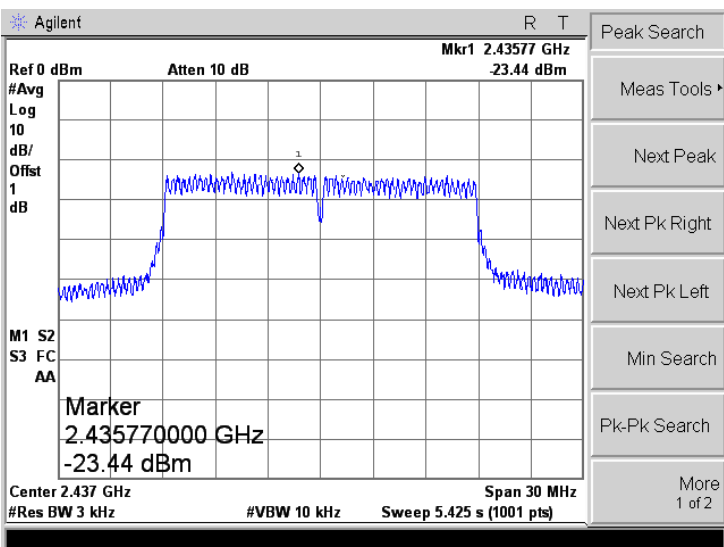
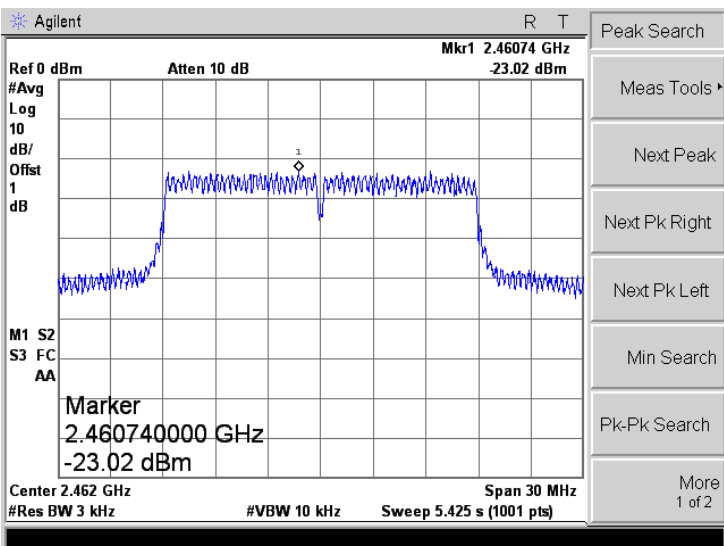
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b_11Mbps	2412	-16.65	8
	2437	-17.92	8
	2462	-18.49	8
802.11g_54Mbps	2412	-21.61	8
	2437	-27.62	8
	2462	-24.87	8
802.11n-HT20_MCS7	2412	-22.39	8
	2437	-23.44	8
	2462	-23.02	8
802.11n-HT40_MCS7	2422	-26.05	8
	2437	-26.21	8
	2452	-26.04	8

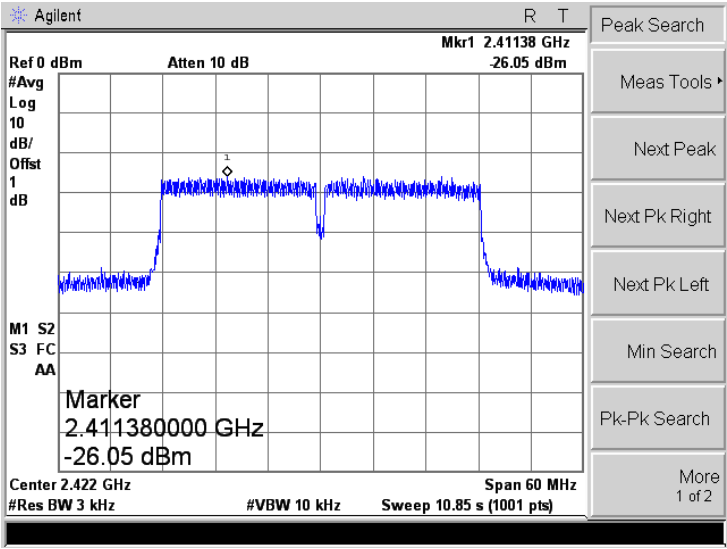
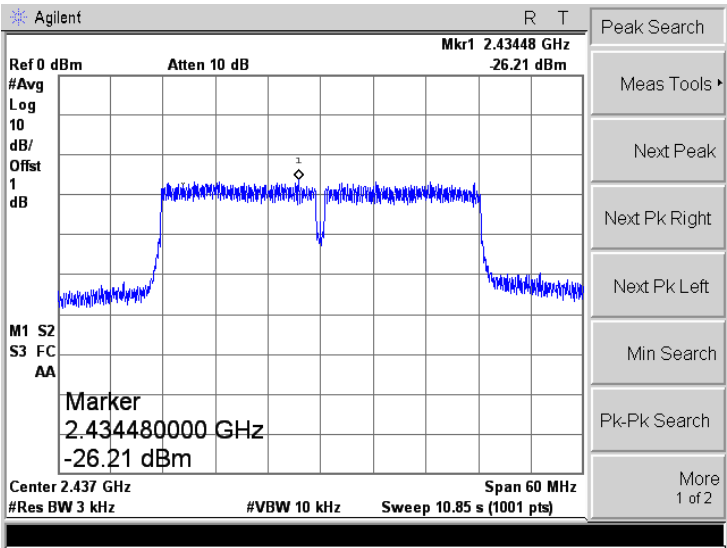
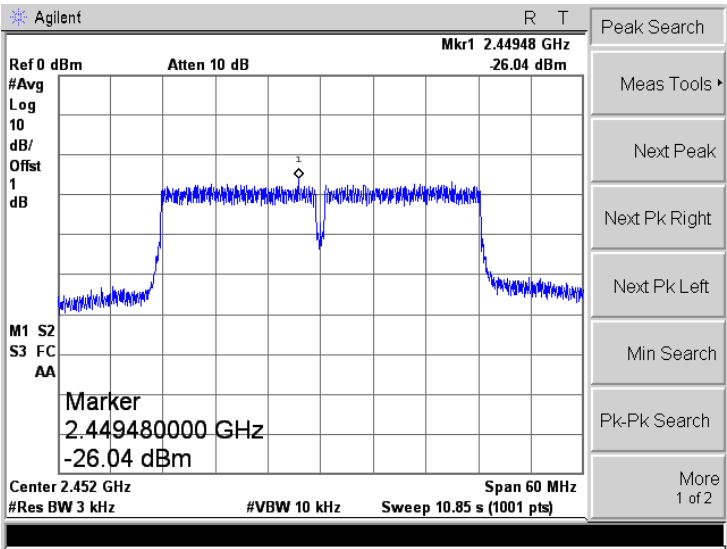
Please refer to the following test plots:

<p>802.11b-Low</p>	
<p>802.11b-Middle</p>	
<p>802.11b-High</p>	



<p>802.11g-Low</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.40639 GHz -21.61 dBm          #Avg 10 Log dB/Offst 1 dB          M1 S2 S3 FC AA          Marker 2.406390000 GHz -21.61 dBm          Center 2.412 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>
<p>802.11g-Middle</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.43619 GHz -27.62 dBm          #Avg 10 Log dB/Offst 1 dB          M1 S2 S3 FC AA          Center 2.437 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>
<p>802.11g-High</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.45453 GHz -24.87 dBm          #Avg 10 Log dB/Offst 1 dB          M1 S2 S3 FC AA          Marker 2.454530000 GHz -24.87 dBm          Center 2.462 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>

<p>802.11n-HT20-Low</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.40576 GHz -22.39 dBm          #Avg Log 10 dB/ Offst 1 dB          M1 S2 S3 FC AA          Marker 2.405760000 GHz -22.39 dBm          Center 2.412 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>
<p>802.11n-HT20-Middle</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.43577 GHz -23.44 dBm          #Avg Log 10 dB/ Offst 1 dB          M1 S2 S3 FC AA          Marker 2.435770000 GHz -23.44 dBm          Center 2.437 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>
<p>802.11n-HT20-High</p>	 <p>Agilent R T          Ref 0 dBm Atten 10 dB Mkr1 2.46074 GHz -23.02 dBm          #Avg Log 10 dB/ Offst 1 dB          M1 S2 S3 FC AA          Marker 2.460740000 GHz -23.02 dBm          Center 2.462 GHz Span 30 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 5.425 s (1001 pts)</p>

<p>802.11n-HT40-Low</p>	
<p>802.11n-HT40-Middle</p>	
<p>802.11n-HT40-High</p>	

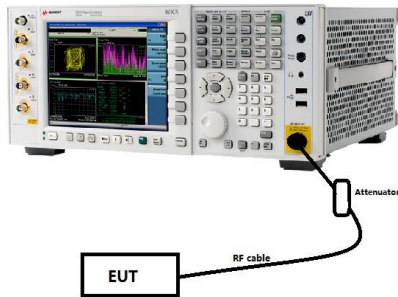
## 6. DTS Bandwidth

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### 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 Setup Block Diagram



### 6.3 Test Procedure

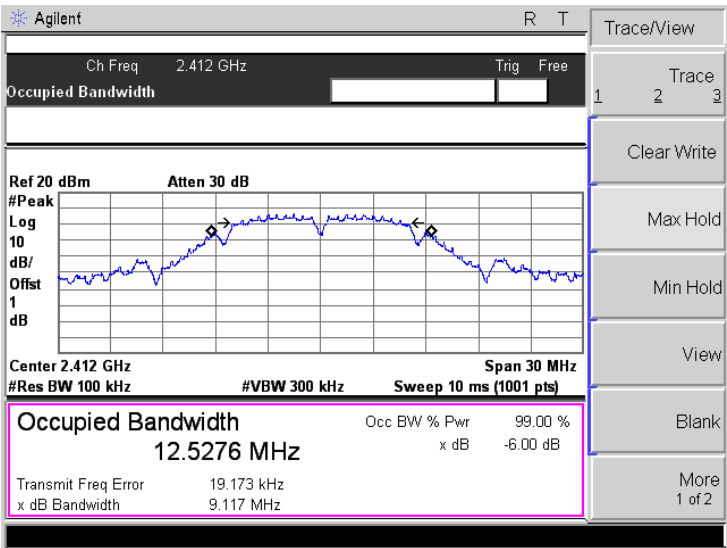
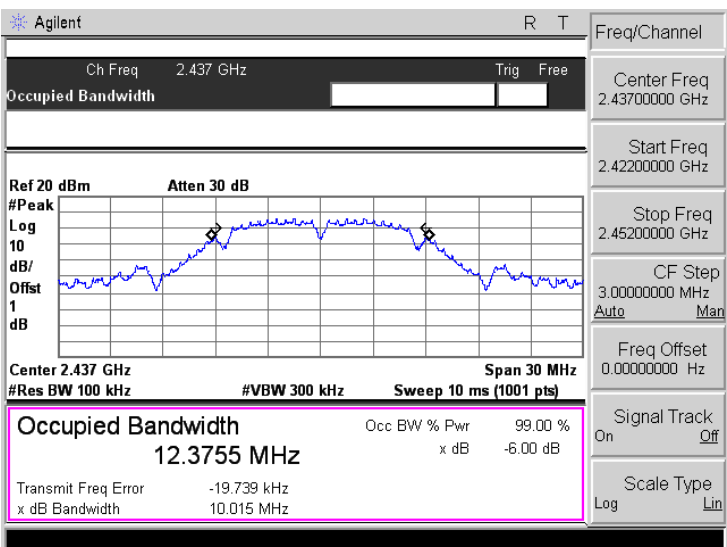
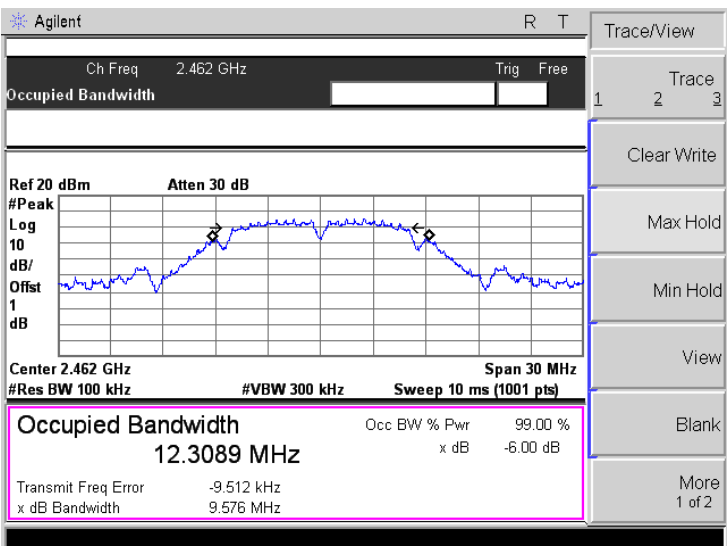
According to the KDB 558074 D01 v05r02 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

- 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 Summary of Test Results/Plots

<b>Test Mode</b>	<b>Test Channel MHz</b>	<b>6 dB Bandwidth MHz</b>	<b>Limit kHz</b>
802.11b_11Mbps	2412	9.117	≥500
	2437	10.015	≥500
	2462	9.576	≥500
802.11g_54Mbps	2412	16.353	≥500
	2437	16.342	≥500
	2462	16.366	≥500
802.11n-HT20_MCS7	2412	17.600	≥500
	2437	17.579	≥500
	2462	17.590	≥500
802.11n-HT40	2422	36.284	≥500
	2437	36.300	≥500
	2452	36.355	≥500

Please refer to the following test plots:

<p>802.11b-Low</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>Log 10 dB/</p> <p>Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 12.5276 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error 19.173 kHz</p> <p>x dB Bandwidth 9.117 MHz</p> <p>Trace/View</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>
<p>802.11b-Middle</p>	 <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>Log 10 dB/</p> <p>Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 12.3755 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -19.739 kHz</p> <p>x dB Bandwidth 10.015 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11b-High</p>	 <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>Log 10 dB/</p> <p>Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 12.3089 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -9.512 kHz</p> <p>x dB Bandwidth 9.576 MHz</p> <p>Trace/View</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>

<p>802.11g-Low</p>	<p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 16.485 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 8.198 kHz x dB Bandwidth 16.353 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11g-Middle</p>	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 16.4480 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -11.747 kHz x dB Bandwidth 16.342 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11g-High</p>	<p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 16.4318 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 2.710 kHz x dB Bandwidth 16.366 MHz</p> <p>Trace/View</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>

<p>802.11n-HT20-Low</p>	<p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 17.6374 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 7.408 kHz</p> <p>x dB Bandwidth 17.600 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11n-HT20-Middle</p>	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 17.6330 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -10.246 kHz</p> <p>x dB Bandwidth 17.579 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11n-HT20-High</p>	<p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> 17.6334 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -8.789 kHz</p> <p>x dB Bandwidth 17.590 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44700000 GHz</p> <p>Stop Freq 2.47700000 GHz</p> <p>CF Step 3.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>



<p>802.11n-HT40-Low</p>	<p>Agilent R T</p> <p>Ch Freq 2.422 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.422 GHz Span 60 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Occupied Bandwidth 36.0865 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 13.421 kHz x dB Bandwidth 36.284 MHz</p> <p>Freq/Channel Center Freq 2.42200000 GHz Start Freq 2.39200000 GHz Stop Freq 2.45200000 GHz CF Step 6.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin</p>
<p>802.11n-HT40-Middle</p>	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.437000000 GHz Span 60 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Occupied Bandwidth 36.1556 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -14.410 kHz x dB Bandwidth 36.300 MHz</p> <p>Freq/Channel Center Freq 2.43700000 GHz Start Freq 2.40700000 GHz Stop Freq 2.46700000 GHz CF Step 6.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin</p>
<p>802.11n-HT40-High</p>	<p>Agilent R T</p> <p>Ch Freq 2.452 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.452000000 GHz Span 60 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Occupied Bandwidth 36.1420 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 12.158 kHz x dB Bandwidth 36.355 MHz</p> <p>Freq/Channel Center Freq 2.45200000 GHz Start Freq 2.42200000 GHz Stop Freq 2.48200000 GHz CF Step 6.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin</p>

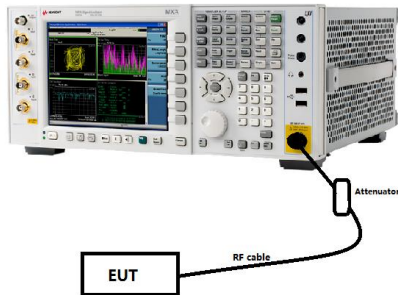
## 7. RF Output Power

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### 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 Setup Block Diagram



### 7.3 Test Procedure

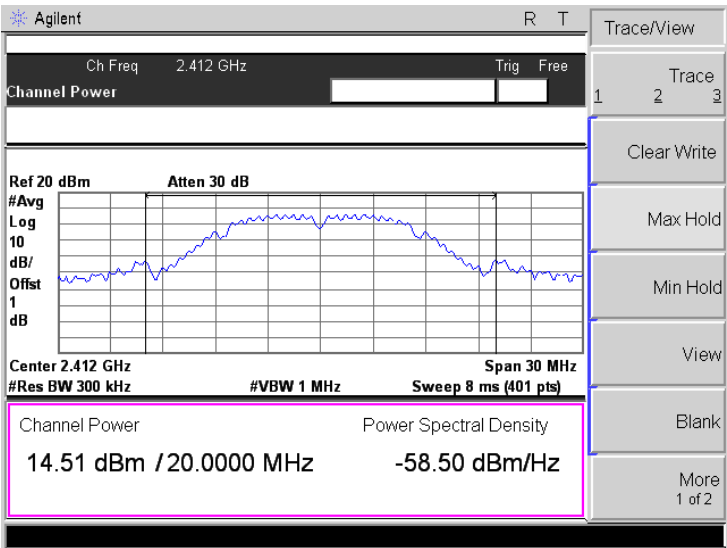
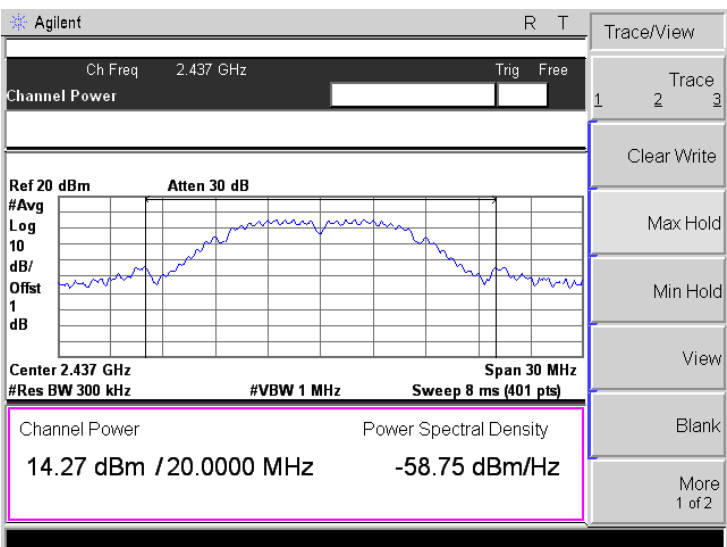
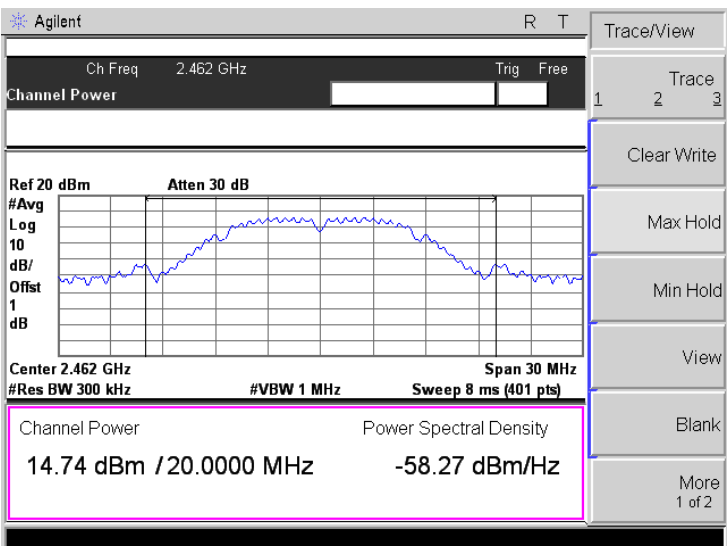
According to the KDB-558074 D01 v05r02 Subclause 8.3.2.2 and ANSI C63.10-2013 Subclause 11.9.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

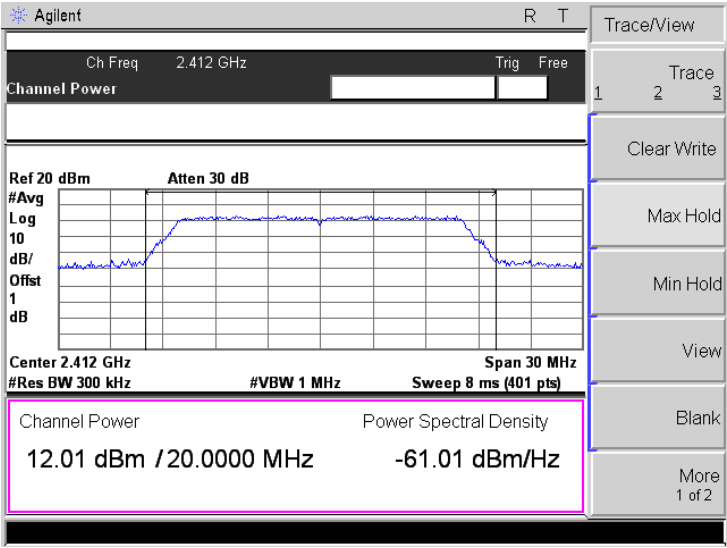
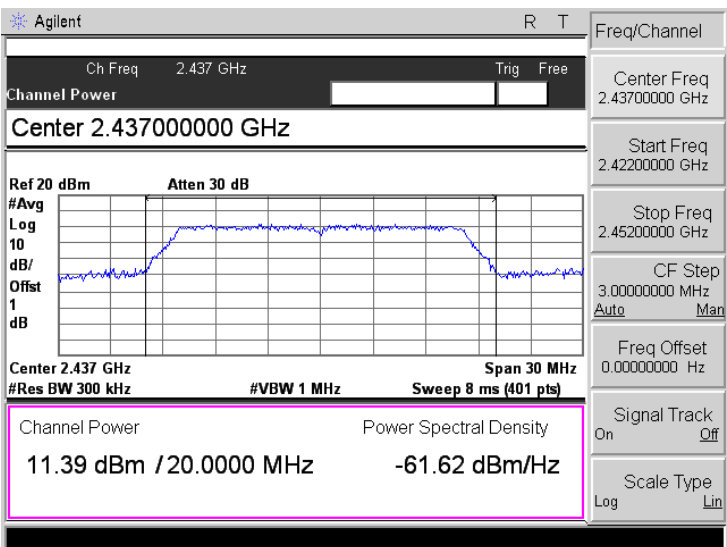
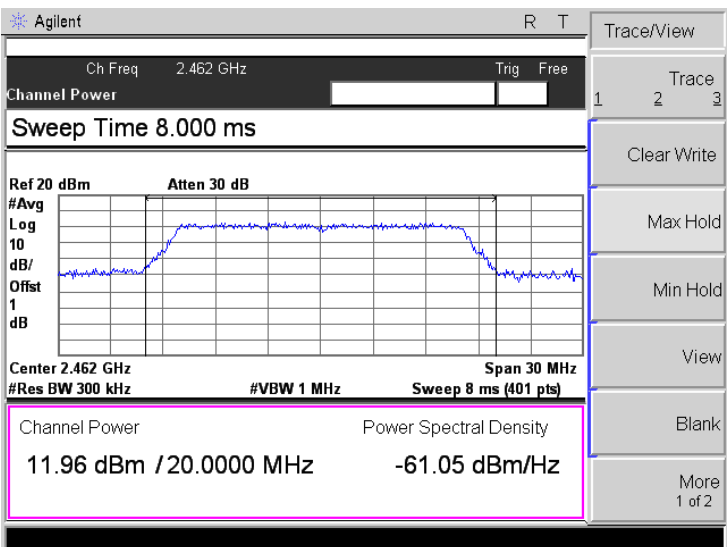
- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Number of points in sweep  $\geq 2 \times$  span / RBW. (This gives bin-to-bin spacing  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- 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.

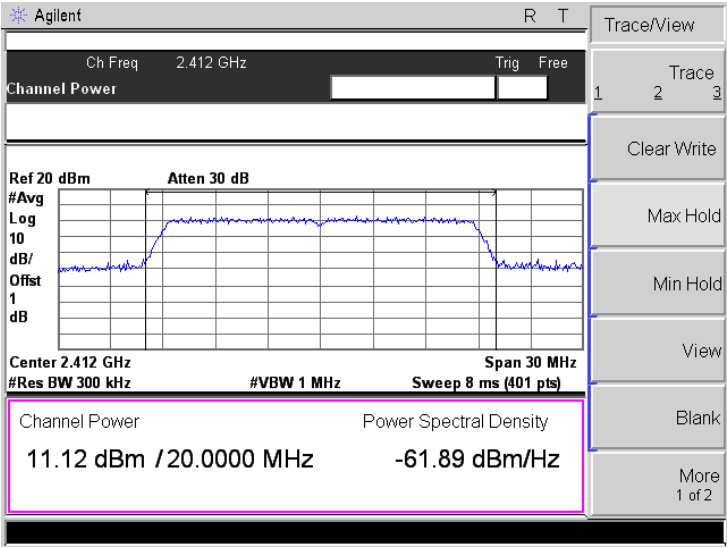
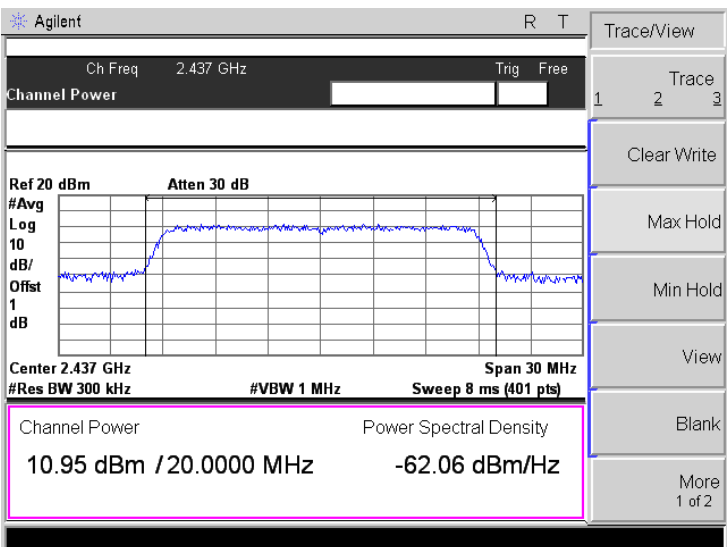
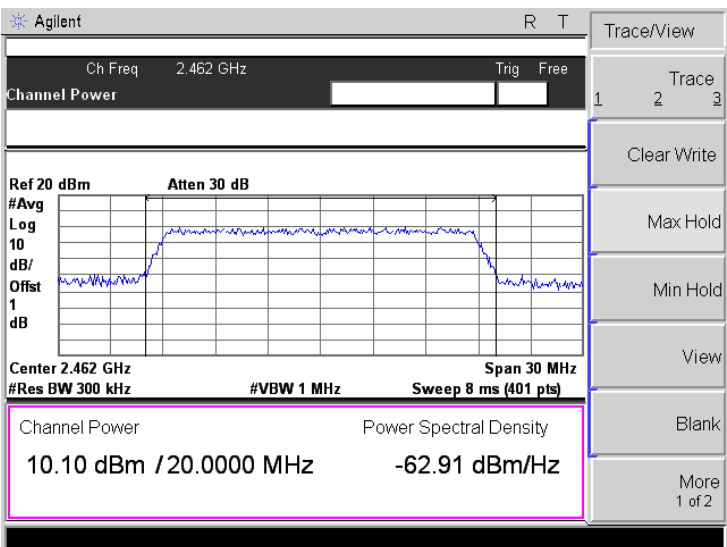
### 7.4 Summary of Test Results/Plots

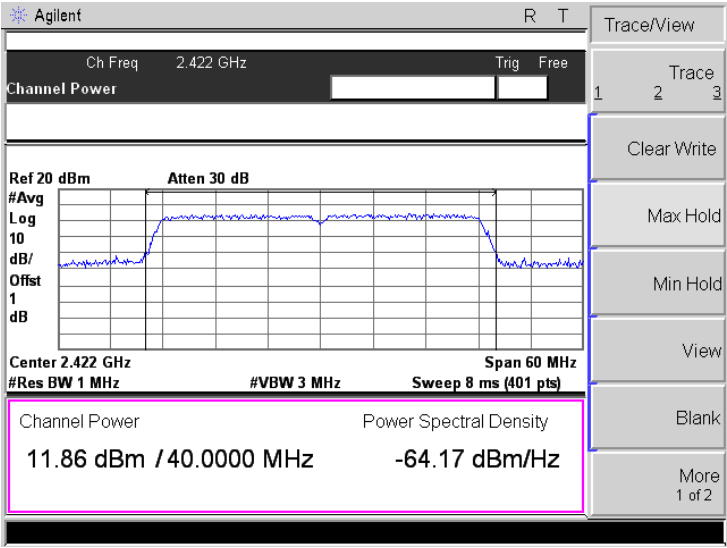
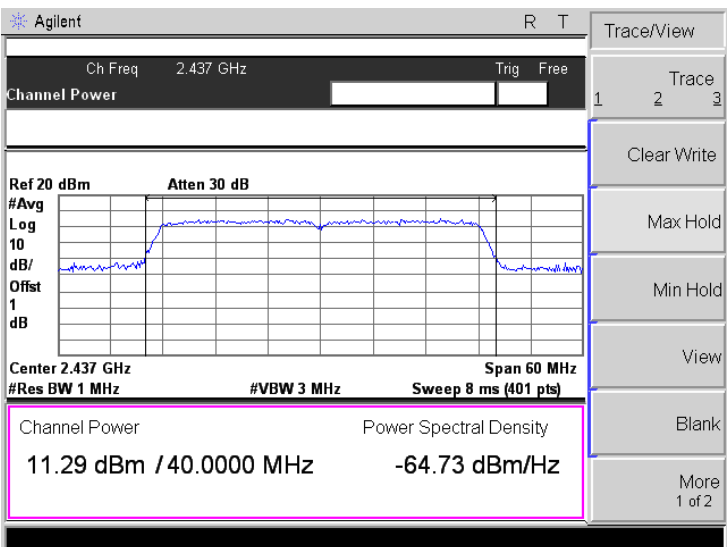
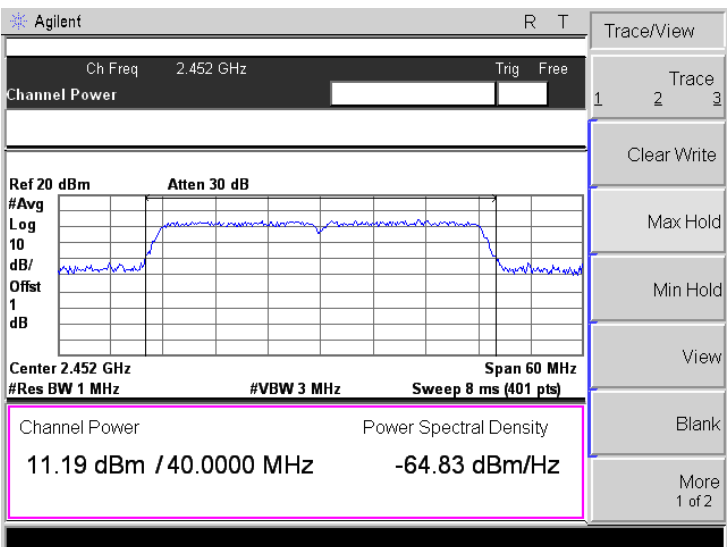
<b>Test Mode</b>	<b>Frequency MHz</b>	<b>Reading dBm</b>	<b>Output Power mW</b>	<b>Limit mW</b>
802.11b_11Mbps	2412	14.51	28.25	1000
	2437	14.27	26.73	1000
	2462	14.74	29.79	1000
802.11g_54Mbps	2412	12.01	15.89	1000
	2437	11.39	13.77	1000
	2462	11.96	15.70	1000
802.11n HT20_MCS7	2412	11.12	12.94	1000
	2437	10.95	12.45	1000
	2462	10.10	10.23	1000
802.11n HT40_MCS7	2422	11.86	15.35	1000
	2437	11.29	13.46	1000
	2452	11.19	13.15	1000

Please refer to the following test plots:

<p>802.11b-Low 11Mbps</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>14.51 dBm / 20.0000 MHz -58.50 dBm/Hz</p>
<p>802.11b-Middle 11Mbps</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>14.27 dBm / 20.0000 MHz -58.75 dBm/Hz</p>
<p>802.11b-High 11Mbps</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>14.74 dBm / 20.0000 MHz -58.27 dBm/Hz</p>

<p>802.11g-Low 54Mbps</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>12.01 dBm / 20.0000 MHz -61.01 dBm/Hz</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>
<p>802.11g-Middle 54Mbps</p>	 <p>Agilent R T Freq/Channel</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.437000000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>11.39 dBm / 20.0000 MHz -61.62 dBm/Hz</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11g-High 54Mbps</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Sweep Time 8.000 ms</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>11.96 dBm / 20.0000 MHz -61.05 dBm/Hz</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>

<p>802.11n-HT20-Low MCS7</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>11.12 dBm / 20.0000 MHz -61.89 dBm/Hz</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>
<p>802.11n-HT20-Middle MCS7</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>10.95 dBm / 20.0000 MHz -62.06 dBm/Hz</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>
<p>802.11n-HT20-High MCS7</p>	 <p>Agilent R T Trace/View</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 8 ms (401 pts)</p> <p>Channel Power Power Spectral Density</p> <p>10.10 dBm / 20.0000 MHz -62.91 dBm/Hz</p> <p>Trace 1 2 3</p> <p>Clear Write</p> <p>Max Hold</p> <p>Min Hold</p> <p>View</p> <p>Blank</p> <p>More 1 of 2</p>

<p>802.11n-HT40-Low MCS7</p>	
<p>802.11n-HT40-Middle MCS7</p>	
<p>802.11n-HT40-High MCS7</p>	

## 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.

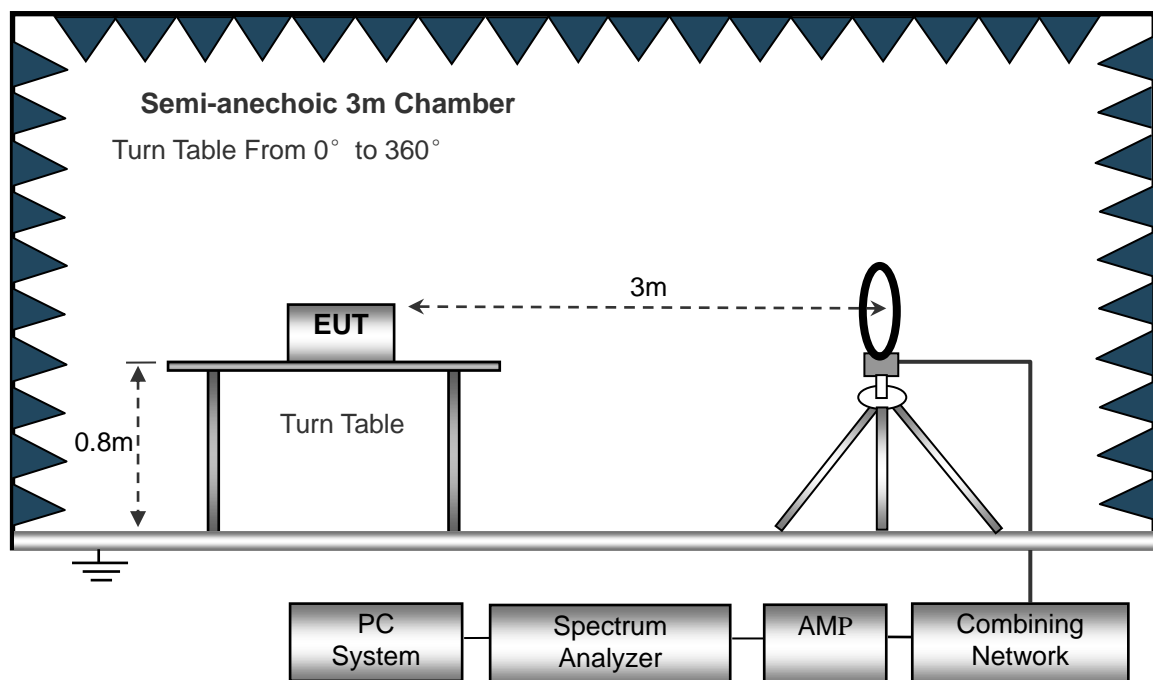
### 8.2 Test Procedure

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.

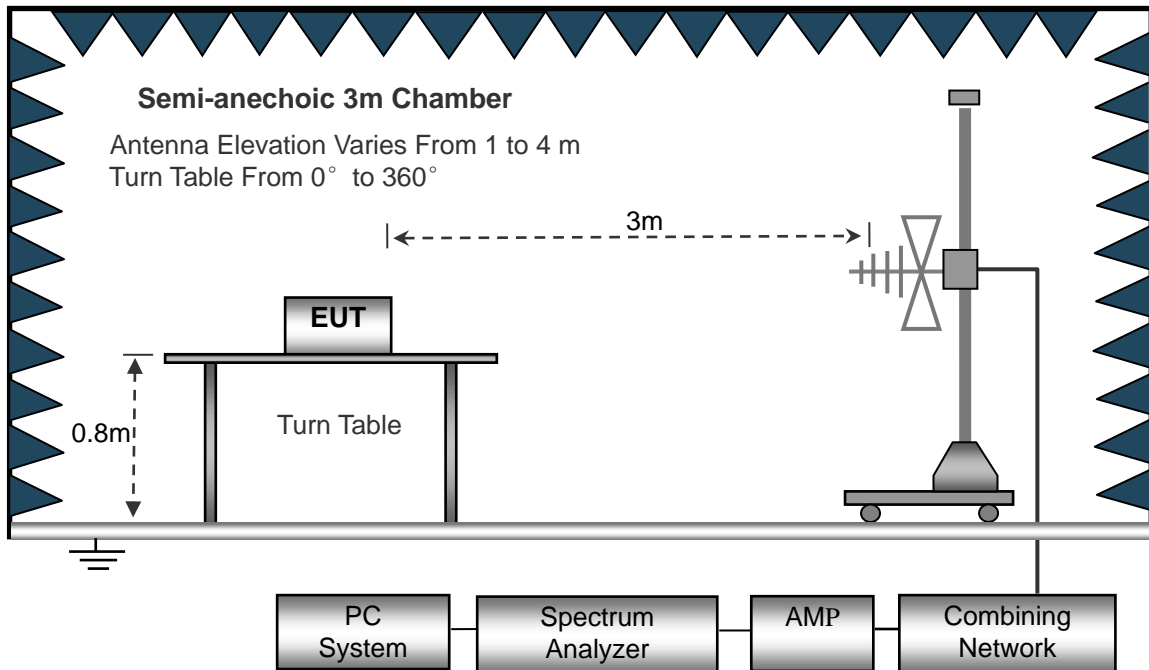
The spacing between the peripherals was 10 cm.

The test setup for emission measurement below 30MHz..

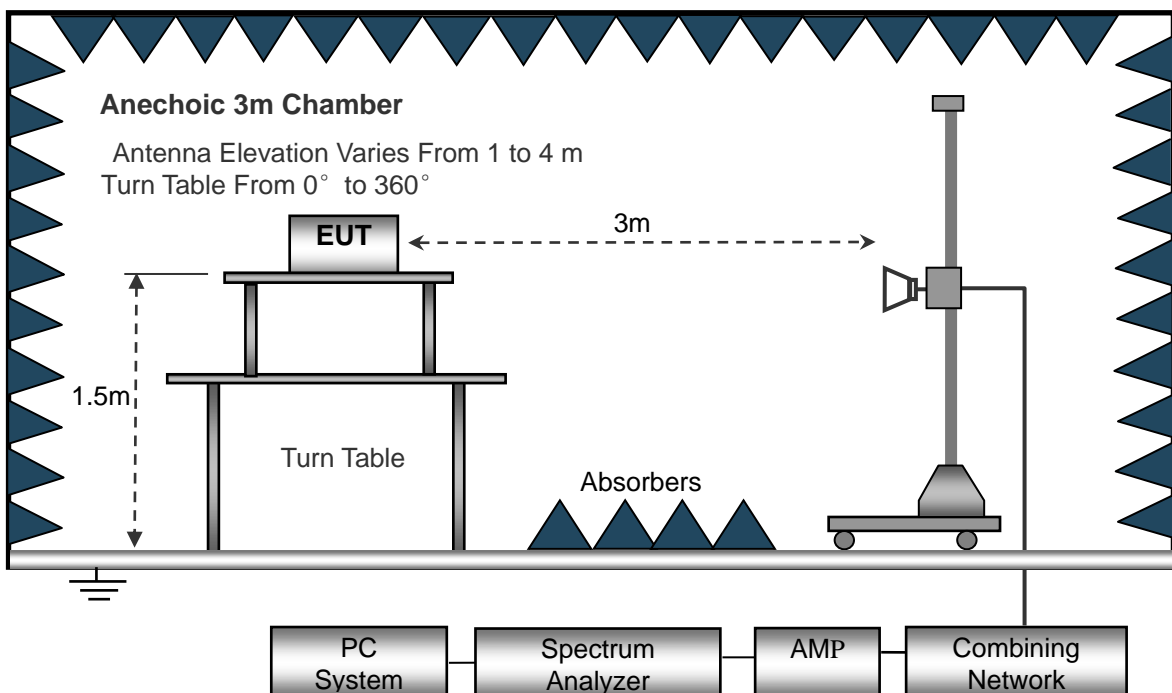




The test setup for emission measurement from 30 MHz to 1 GHz..



The test setup for emission measurement above 1 GHz..



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:

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

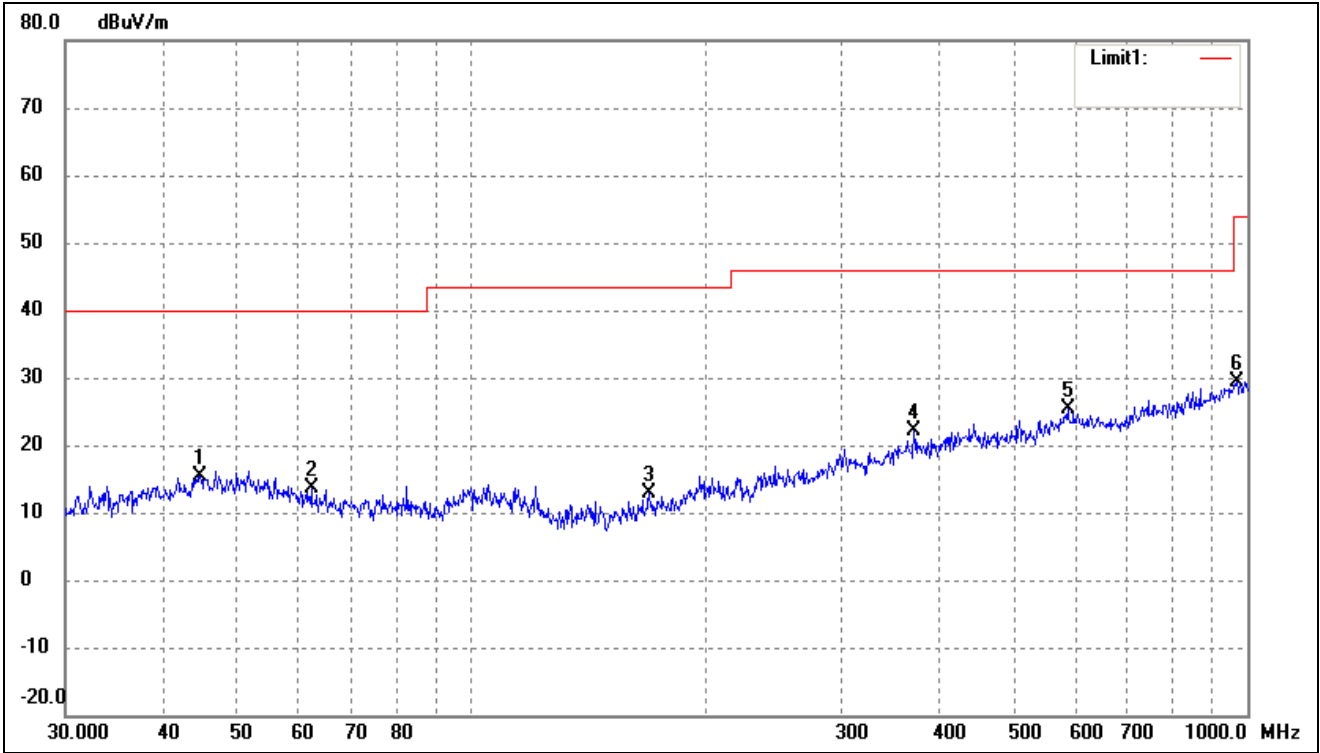
### 8.4 Summary of Test Results/Plots

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

*All test modes (different data rate and different modulation) are performed, but only the worst case(802.11b\_11Mbps) is recorded in this report.*

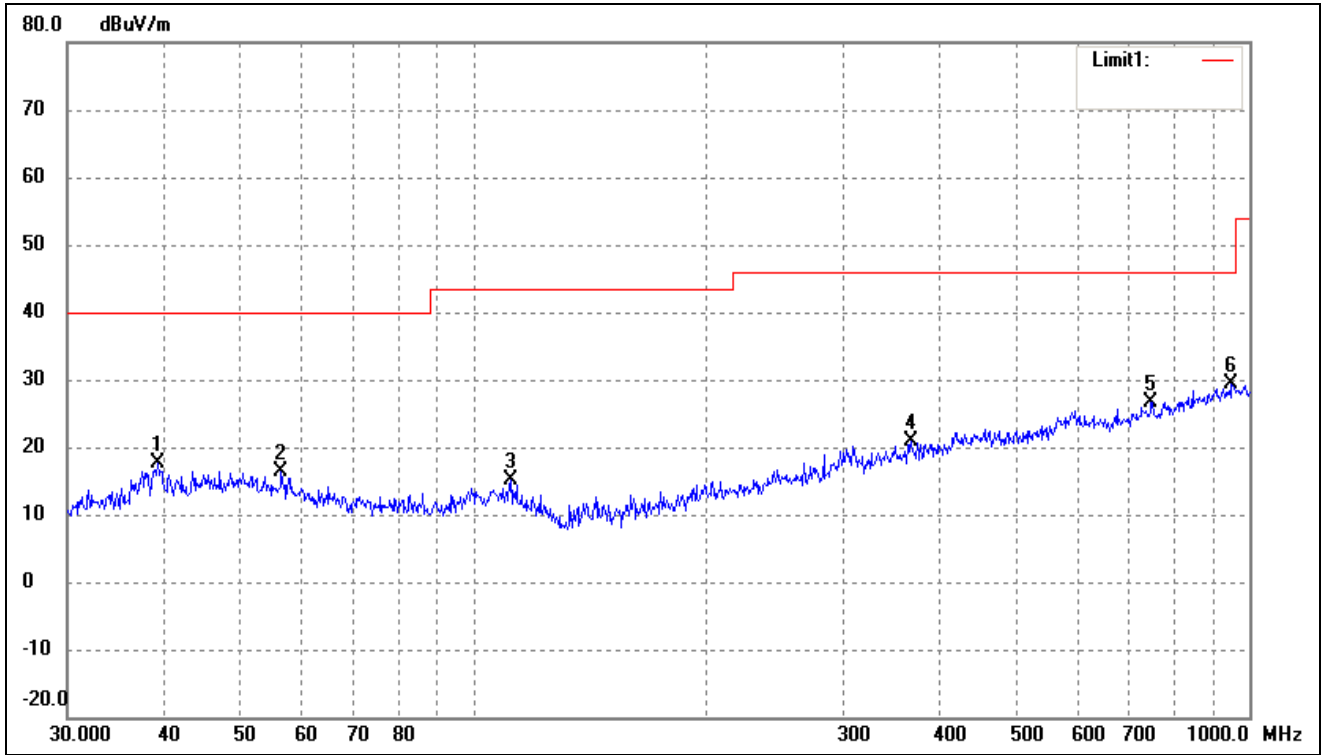
➤ Spurious Emissions Below 1GHz

802.11b_11Mbps			
Test Channel	Low	Polarity:	Horizontal



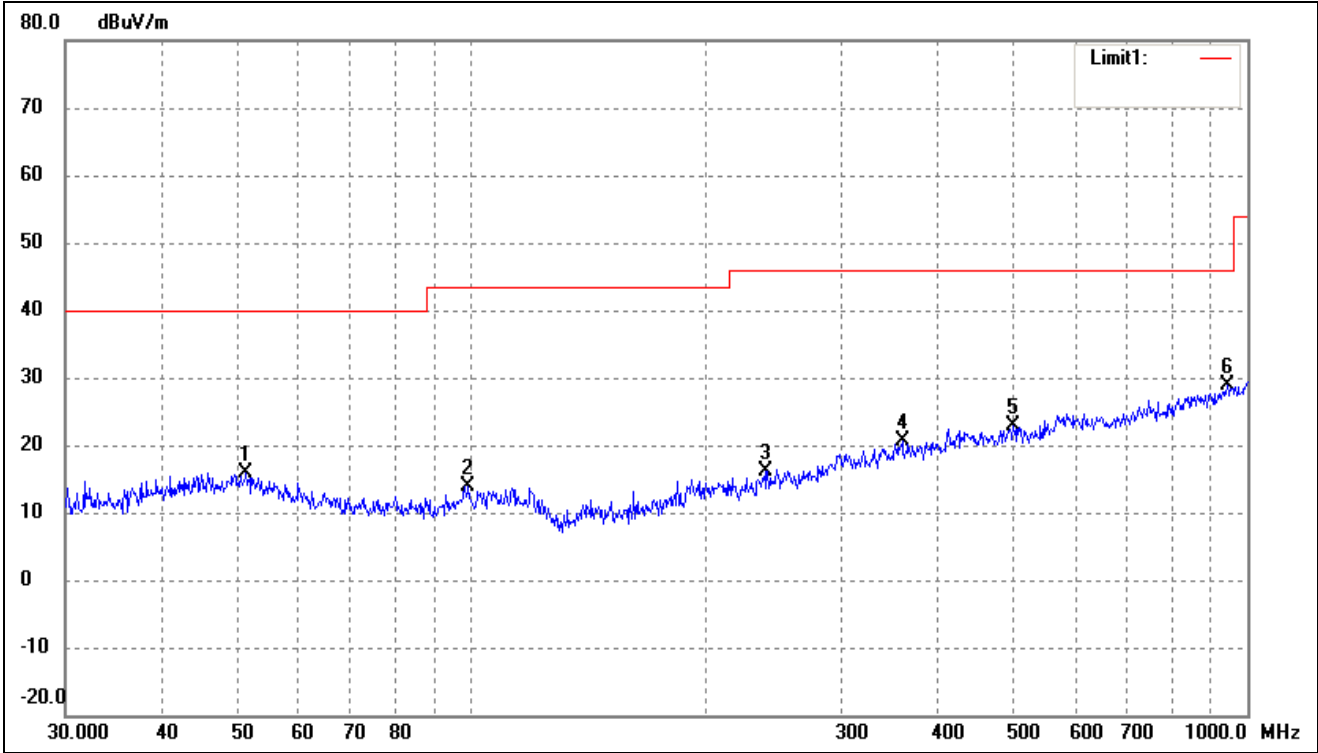
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	44.7434	26.00	-10.63	15.37	40.00	-24.63	-	-	peak
2	62.2128	26.22	-12.66	13.56	40.00	-26.44	-	-	peak
3	169.5990	26.54	-13.69	12.85	43.50	-30.65	-	-	peak
4	372.0045	27.82	-5.74	22.08	46.00	-23.92	-	-	peak
5	586.8437	27.71	-2.43	25.28	46.00	-20.72	-	-	peak
6	968.9338	26.62	2.64	29.26	54.00	-24.74	-	-	peak

802.11b_11Mbps			
Test Channel	Low	Polarity:	Vertical



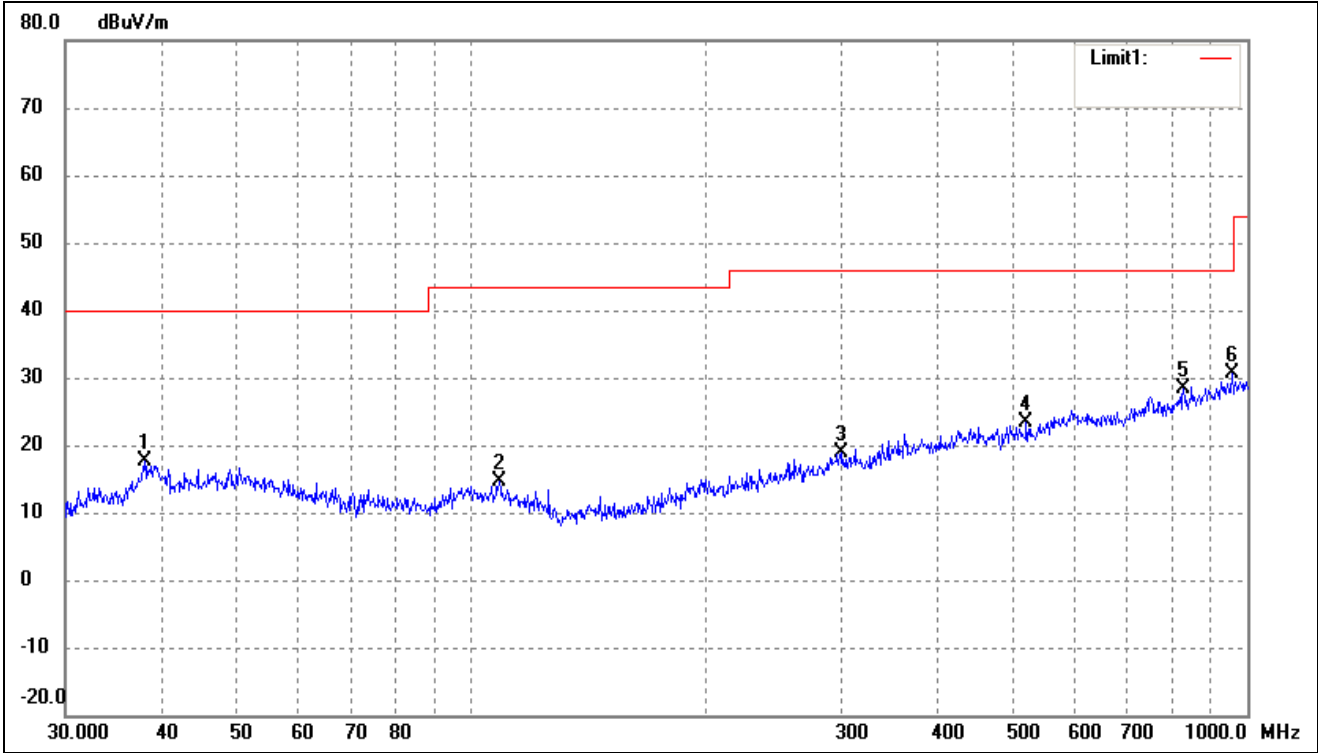
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	39.2991	29.43	-11.88	17.55	40.00	-22.45	-	-	peak
2	56.5929	28.05	-11.62	16.43	40.00	-23.57	-	-	peak
3	111.7380	27.35	-12.34	15.01	43.50	-28.49	-	-	peak
4	366.8231	26.60	-5.84	20.76	46.00	-25.24	-	-	peak
5	747.4826	27.52	-0.91	26.61	46.00	-19.39	-	-	peak
6	948.7610	26.92	2.40	29.32	46.00	-16.68	-	-	peak

802.11b_11Mbps			
Test Channel	Middle	Polarity:	Horizontal



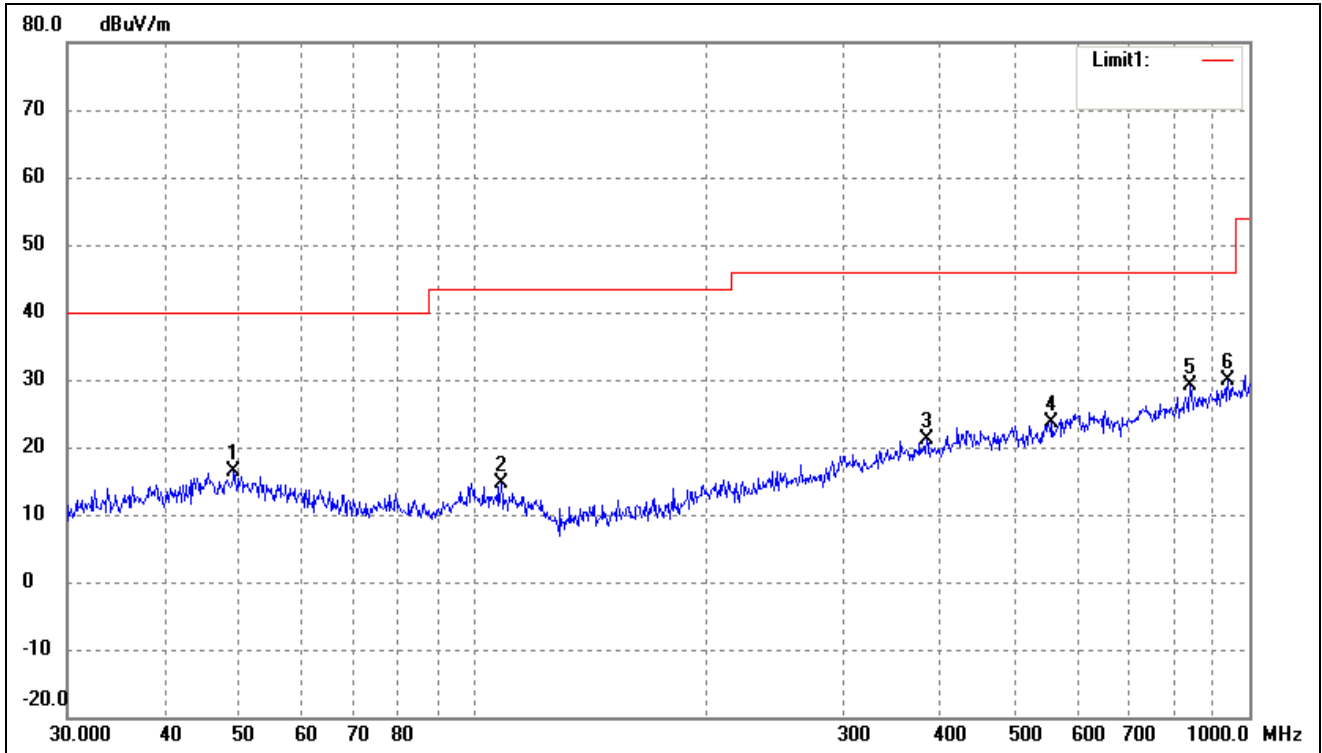
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	51.3005	26.40	-10.47	15.93	40.00	-24.07	-	-	peak
2	99.1797	26.41	-12.54	13.87	43.50	-29.63	-	-	peak
3	239.1473	26.12	-9.94	16.18	46.00	-29.82	-	-	peak
4	359.1860	26.48	-5.97	20.51	46.00	-25.49	-	-	peak
5	499.4247	27.38	-4.49	22.89	46.00	-23.11	-	-	peak
6	942.1305	26.65	2.31	28.96	46.00	-17.04	-	-	peak

802.11b_11Mbps			
Test Channel	Middle	Polarity:	Vertical



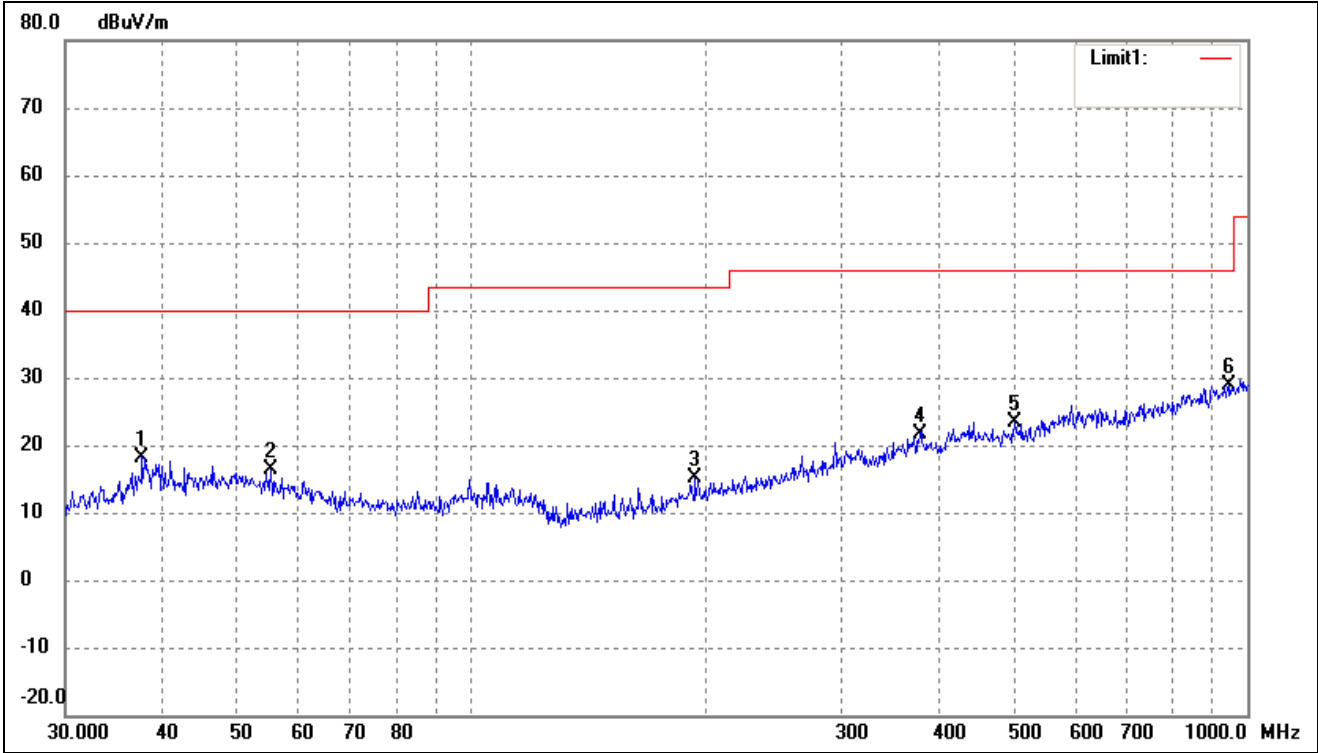
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	37.9450	29.63	-12.11	17.52	40.00	-22.48	-	-	peak
2	108.6470	26.83	-12.18	14.65	43.50	-28.85	-	-	peak
3	300.3673	26.15	-7.23	18.92	46.00	-27.08	-	-	peak
4	519.0649	27.73	-4.45	23.28	46.00	-22.72	-	-	peak
5	827.4934	27.97	0.31	28.28	46.00	-17.72	-	-	peak
6	955.4381	28.13	2.48	30.61	46.00	-15.39	-	-	peak

802.11b_11Mbps			
Test Channel	High	Polarity:	Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	49.1866	26.65	-10.25	16.40	40.00	-23.60	-	-	peak
2	108.6470	26.91	-12.18	14.73	43.50	-28.77	-	-	peak
3	383.9318	26.74	-5.72	21.02	46.00	-24.98	-	-	peak
4	556.7744	27.20	-3.46	23.74	46.00	-22.26	-	-	peak
5	839.1818	28.52	0.50	29.02	46.00	-16.98	-	-	peak
6	938.8326	27.64	2.25	29.89	46.00	-16.11	-	-	peak

802.11b_11Mbps			
Test Channel	High	Polarity:	Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	37.6798	30.40	-12.15	18.25	40.00	-21.75	-	-	peak
2	55.2207	27.79	-11.32	16.47	40.00	-23.53	-	-	peak
3	194.4534	26.75	-11.72	15.03	43.50	-28.47	-	-	peak
4	378.5843	27.20	-5.68	21.52	46.00	-24.48	-	-	peak
5	501.1790	27.94	-4.47	23.47	46.00	-22.53	-	-	peak
6	948.7610	26.52	2.40	28.92	46.00	-17.08	-	-	peak

Remark: '-' Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.



- 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							
4824.00	65.00	-3.87	61.13	74	-12.87	H	PK
4824.00	46.95	-3.87	43.08	54	-10.92	H	AV
7236.00	56.65	1.14	57.79	74	-16.21	H	PK
7236.00	42.78	1.19	43.97	54	-10.03	H	AV
4824.00	63.63	-3.86	59.77	74	-14.23	V	PK
4824.00	45.12	-3.86	41.26	54	-12.74	V	AV
7236.00	56.66	1.10	57.76	74	-16.24	V	PK
7236.00	38.20	1.10	39.30	54	-14.70	V	AV
Middle Channel-2437MHz							
4874.00	64.83	-3.74	61.09	74	-12.91	H	PK
4874.00	49.35	-3.74	45.61	54	-8.39	H	AV
7311.00	56.84	1.47	58.31	74	-15.69	H	PK
7311.00	40.17	1.47	41.64	54	-12.36	H	AV
4874.00	64.06	-3.74	60.32	74	-13.68	V	PK
4874.00	46.40	-3.74	42.66	54	-11.34	V	AV
7311.00	56.94	1.47	58.41	74	-15.59	V	PK
7311.00	39.68	1.47	41.15	54	-12.85	V	AV
High Channel-2462MHz							
4924.00	64.60	-3.59	61.01	74	-12.99	H	PK
4924.00	48.84	-3.59	45.25	54	-8.75	H	AV
7386.00	53.97	1.79	55.76	74	-18.24	H	PK
7386.00	40.76	1.79	42.55	54	-11.45	H	AV
4924.00	63.04	-3.59	59.45	74	-14.55	V	PK
4924.00	45.92	-3.59	42.33	54	-11.67	V	AV
7386.00	58.05	1.79	59.84	74	-14.16	V	PK
7440.00	39.09	1.79	40.88	54	-13.12	V	AV

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

## 9. Out of Band Emissions

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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 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the emissions in nonrestricted frequency bands test method as follows:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the emissions in restricted frequency bands test method as follows:

#### A. Radiated emission measurements:

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.

#### B. Antenna-port conducted measurements

Peak emission levels are measured by setting the instrument as follows:

- a) RBW = as specified in Table 9.
- b) VBW  $\geq [3 \times \text{RBW}]$ .
- c) Detector = peak.
- d) Sweep time = auto.
- e) Trace mode = max hold.
- f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

**Table 9—RBW as a function of frequency**

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1000 MHz	100 kHz to 120 kHz
>1000 MHz	1 MHz

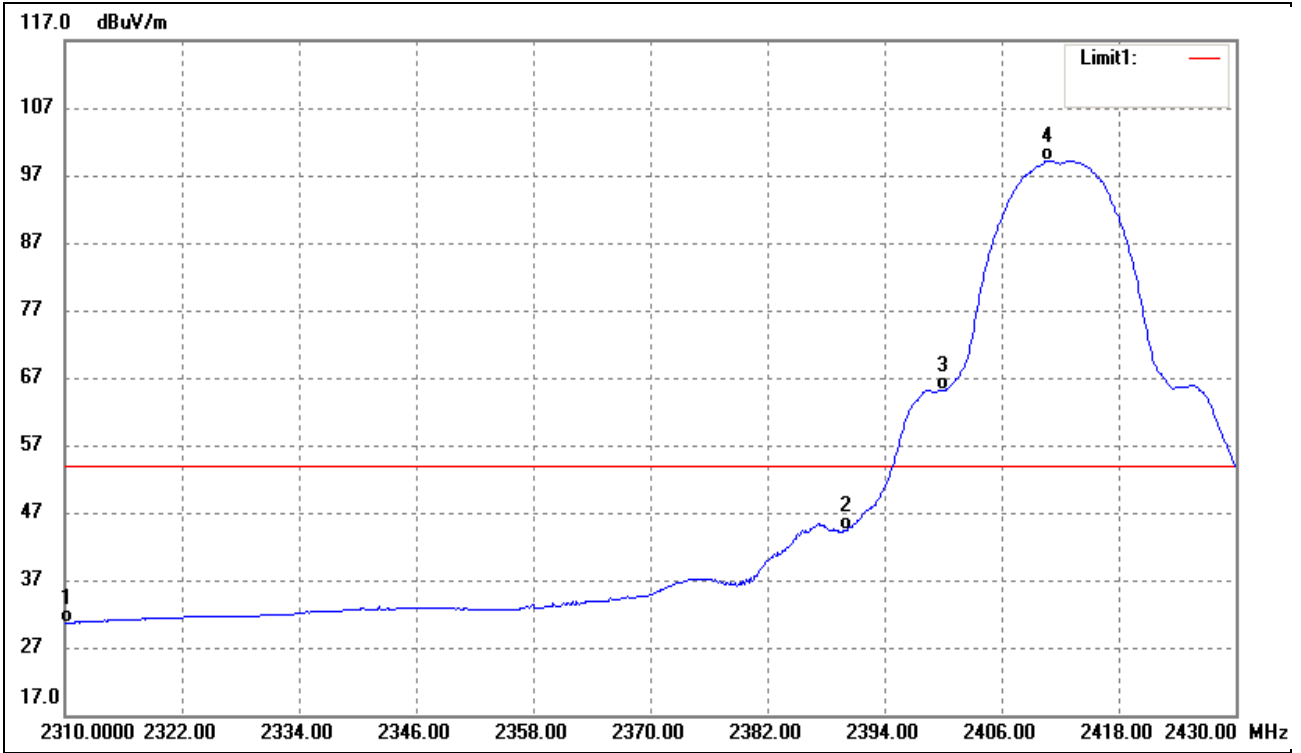
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

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 Summary of Test Results/Plots

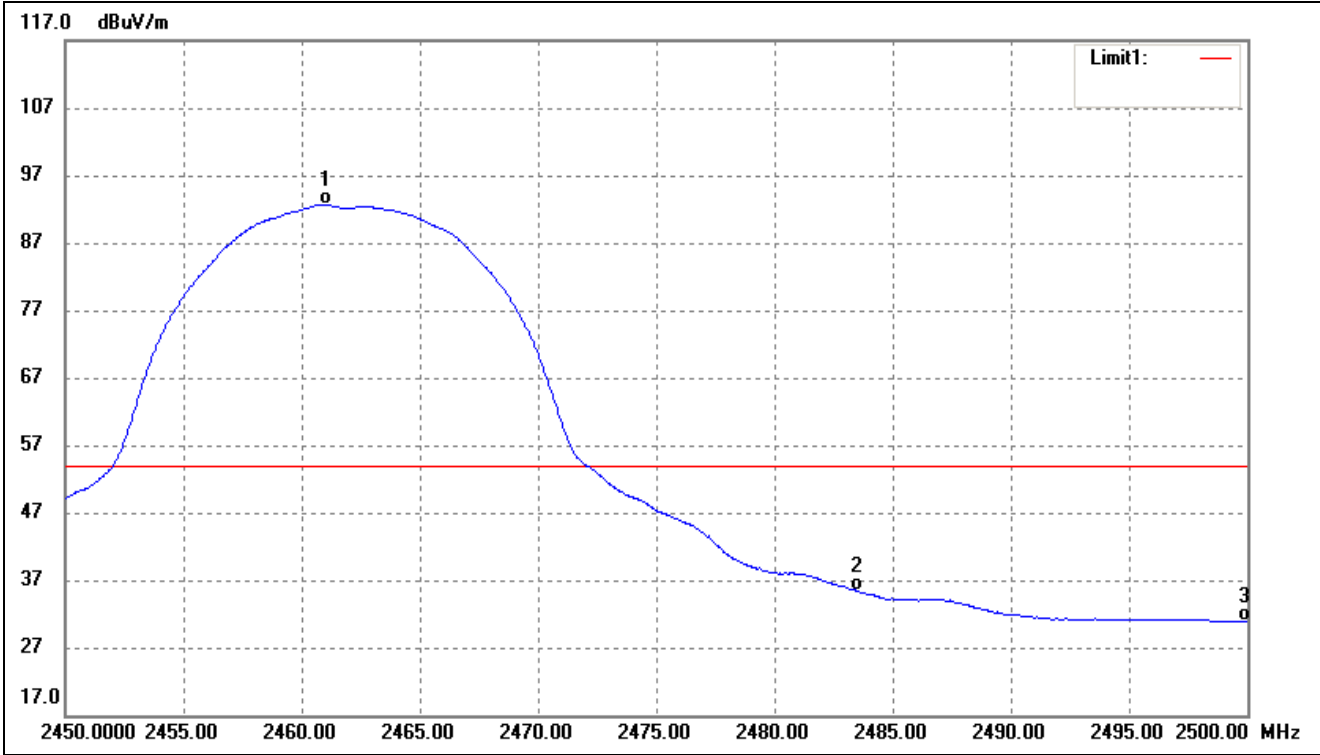
➤ Radiated test

802.11b_11Mbps			
Test Channel	Low	Polarity:	Horizontal (worst case)



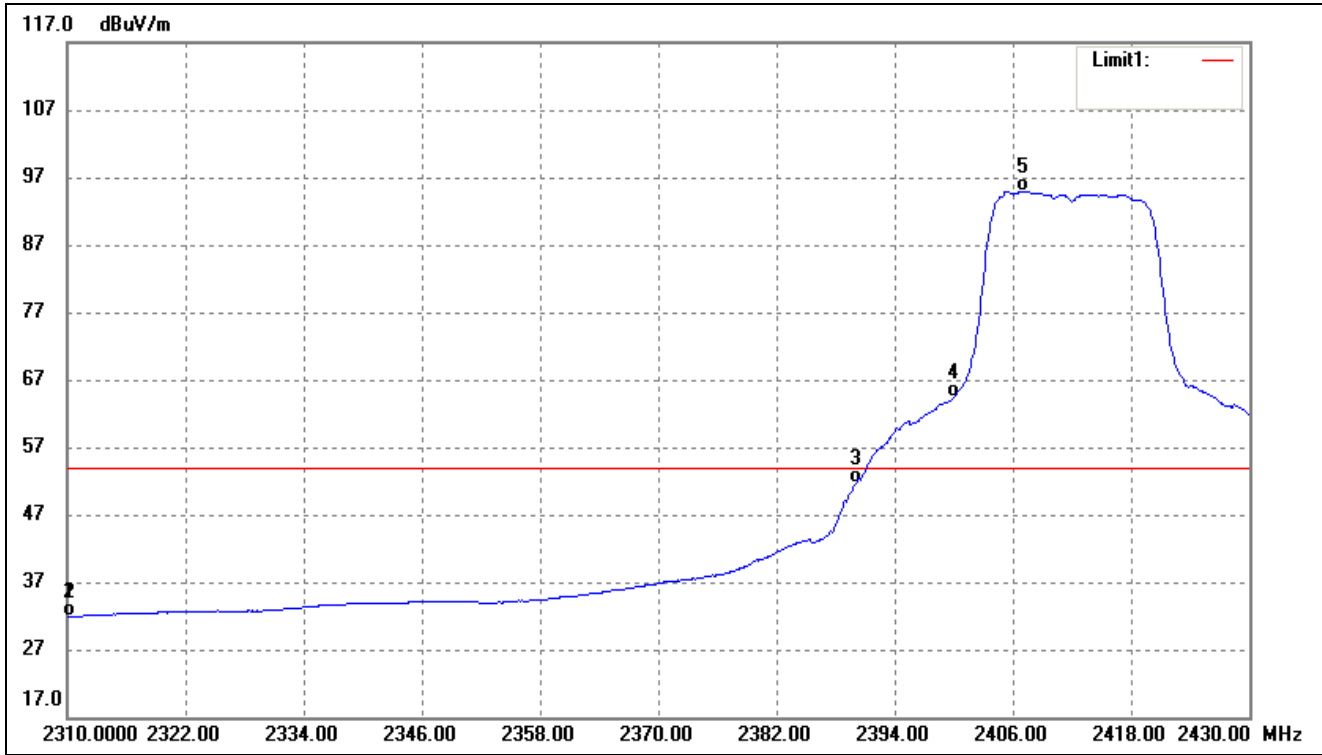
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	40.38	-9.66	30.72	54.00	-23.28	Average Detector
		51.90	-9.66	42.24	74.00	-31.76	Peak Detector
2	2390.000	53.95	-9.50	44.45	54.00	-9.55	Average Detector
		65.44	-9.50	55.94	74.00	-18.06	Peak Detector
3	2400.000	74.56	-9.48	65.08	Delta=34.09dBc		Average Detector
4	2410.680	108.63	-9.46	99.17			Average Detector

802.11b_11Mbps			
Test Channel	High	Polarity:	Horizontal (worst case)



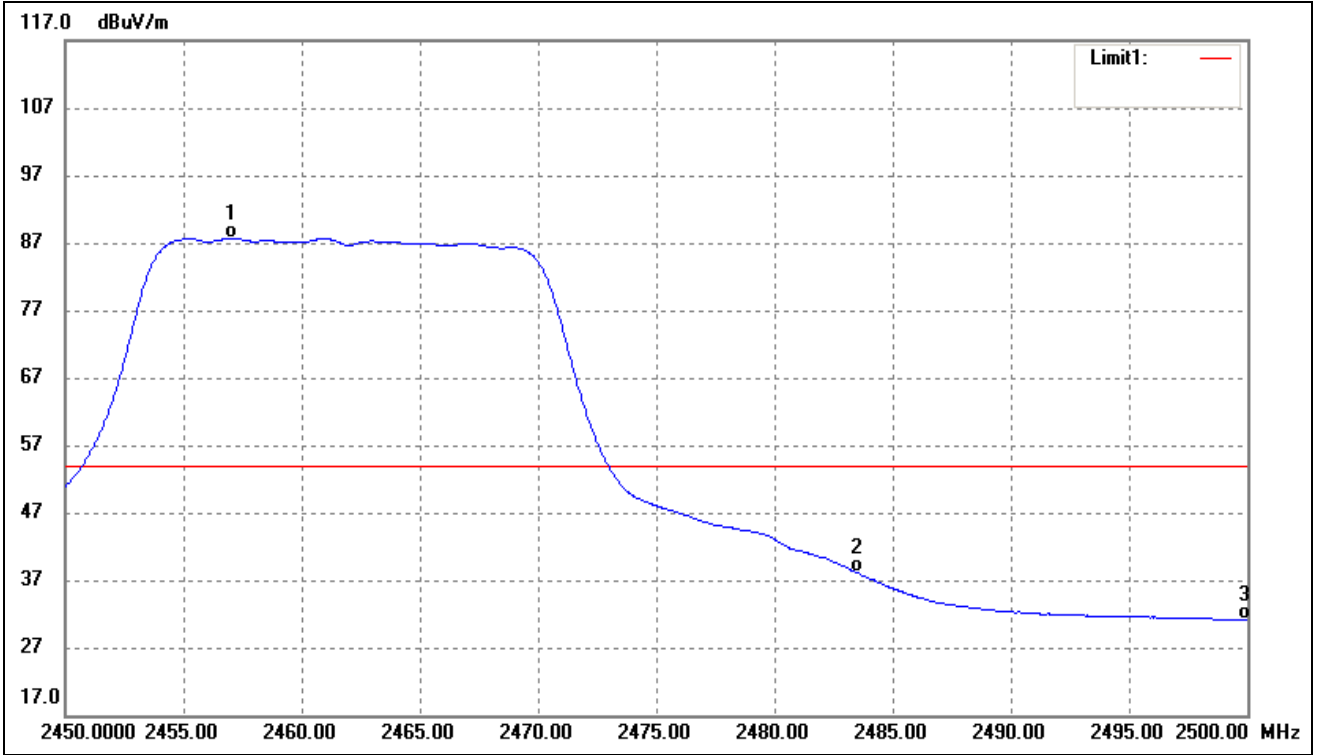
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2461.000	101.99	-9.36	92.63	/	/	Average Detector
	2461.800	111.76	-9.36	102.40	/	/	Peak Detector
2	2483.500	44.66	-9.31	35.35	54.00	-18.65	Average Detector
	2483.500	56.76	-9.31	47.45	74.00	-26.55	Peak Detector
3	2500.000	40.15	-9.28	30.87	54.00	-23.13	Average Detector
	2500.000	52.44	-9.28	43.16	74.00	-30.84	Peak Detector

802.11g_54Mbps			
Test Channel	Low	Polarity:	Horizontal (worst case)



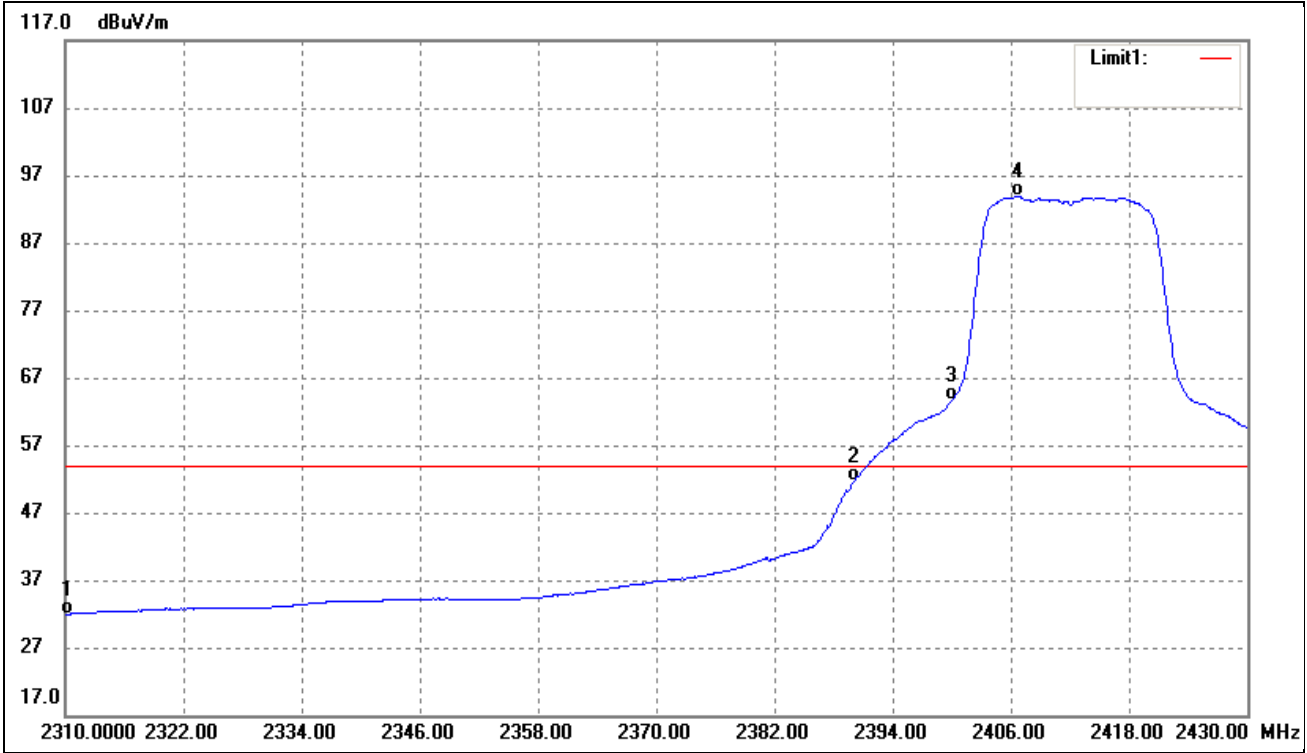
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.51	-9.66	31.85	54.00	-22.15	Average Detector
	/	/	/	/	/	/	Peak Detector
2	2310.000	41.51	-9.66	31.85	54.00	-22.15	Average Detector
	2310.000	53.43	-9.66	43.77	74.00	-30.23	Peak Detector
3	2390.000	61.19	-9.50	51.69	54.00	-2.31	Average Detector
	2390.000	79.76	-9.50	70.26	74.00	-3.74	Peak Detector
4	2400.000	73.91	-9.48	64.43	Delta=30.57dBc		Average Detector
5	2407.080	104.47	-9.47	95.00			Average Detector

802.11g_54Mbps			
Test Channel	High	Polarity:	Horizontal (worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2457.050	97.00	-9.36	87.64	/	/	Average Detector
	2456.500	107.76	-9.36	98.40	/	/	Peak Detector
2	2483.500	47.37	-9.31	38.06	54.00	-15.94	Average Detector
	2483.500	62.27	-9.31	52.96	74.00	-21.04	Peak Detector
3	2500.000	40.32	-9.28	31.04	54.00	-22.96	Average Detector
	2500.000	51.53	-9.28	42.25	74.00	-31.75	Peak Detector

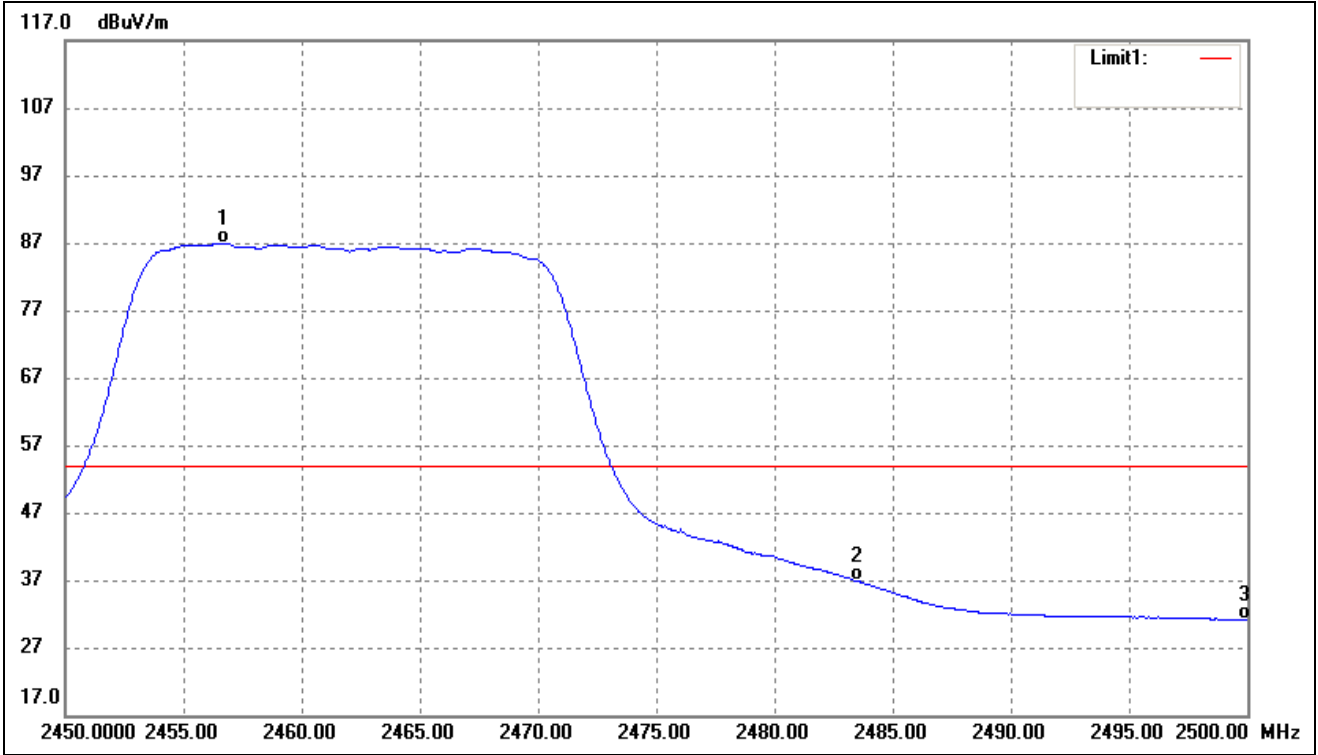
802.11n-HT20_MCS7			
Test Channel	Low	Polarity:	Horizontal (worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.61	-9.66	31.95	54.00	-22.05	Average Detector
	2310.000	54.08	-9.66	44.42	74.00	-29.58	Peak Detector
2	2390.000	61.05	-9.50	51.55	54.00	-2.45	Average Detector
	2390.000	79.54	-9.50	70.04	74.00	-3.96	Peak Detector
3	2400.000	73.12	-9.48	63.64	Delta=30.30dBc		Average Detector
4	2406.720	103.41	-9.47	93.94			Average Detector

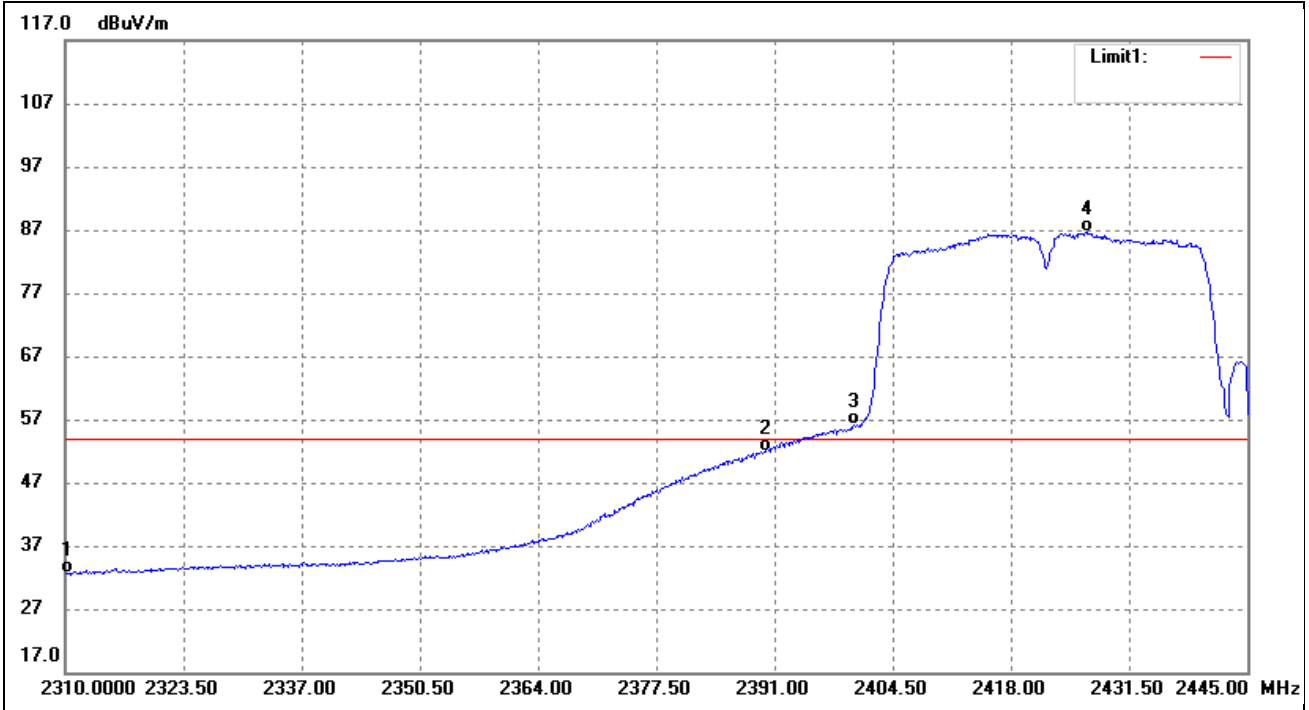


802.11n-HT20_MCS7			
Test Channel	High	Polarity:	Horizontal (worst case)



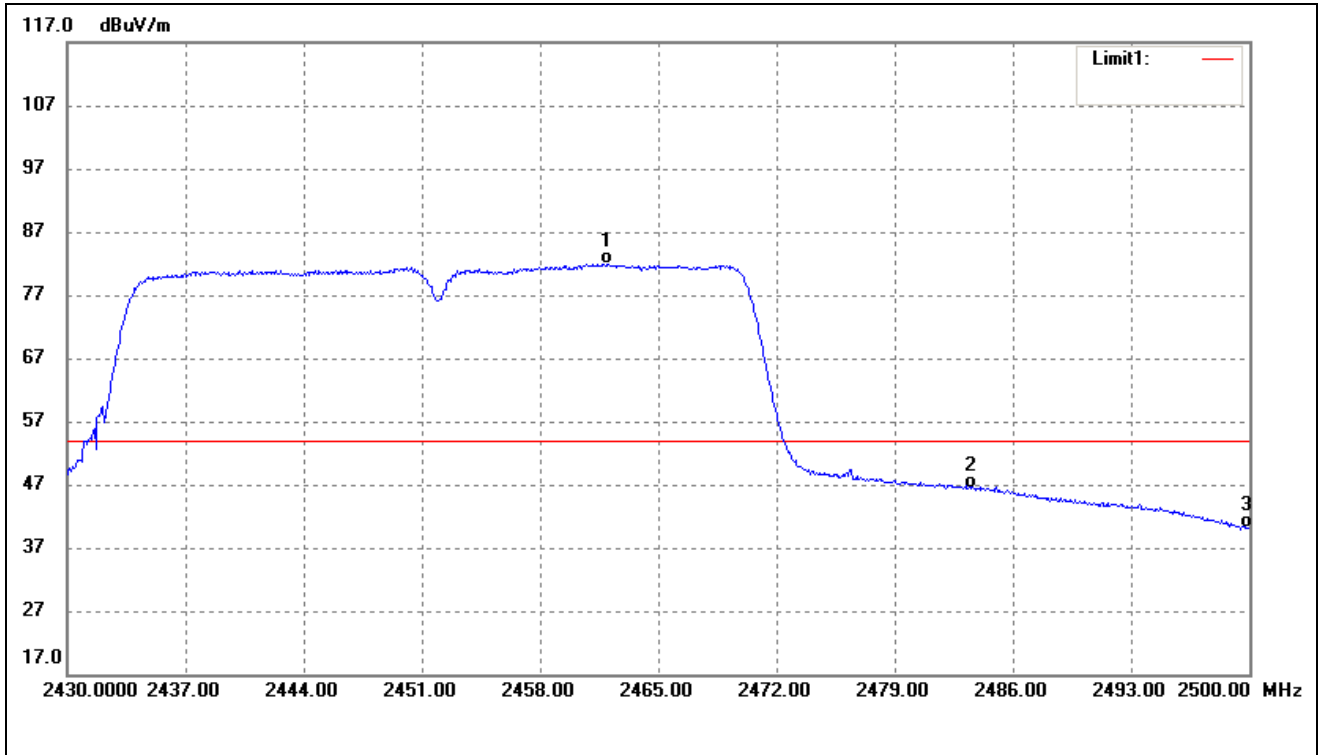
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2456.700	96.34	-9.36	86.98	/	/	Average Detector
	2460.900	107.61	-9.36	98.25	/	/	Peak Detector
2	2483.500	46.14	-9.31	36.83	54.00	-17.17	Average Detector
	2483.500	61.69	-9.31	52.38	74.00	-21.62	Peak Detector
3	2500.000	40.35	-9.28	31.07	54.00	-22.93	Average Detector
	2500.000	53.09	-9.28	43.81	74.00	-30.19	Peak Detector

802.11n-HT40_MCS7			
Test Channel	Low	Polarity:	Horizontal (worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.96	-9.35	32.61	54.00	-21.39	Average Detector
		54.93	-9.35	45.58	74.00	-28.42	Peak Detector
2	2390.000	60.98	-9.22	51.76	54.00	-2.24	Average Detector
		79.01	-9.22	69.79	74.00	-4.21	Peak Detector
3	2400.000	65.22	-9.20	56.02	Delta=30.58dBc		Average Detector
4	2426.775	95.76	-9.16	86.60			Average Detector

802.11n-HT40_MCS7			
Test Channel	High	Polarity:	Horizontal (worst case)

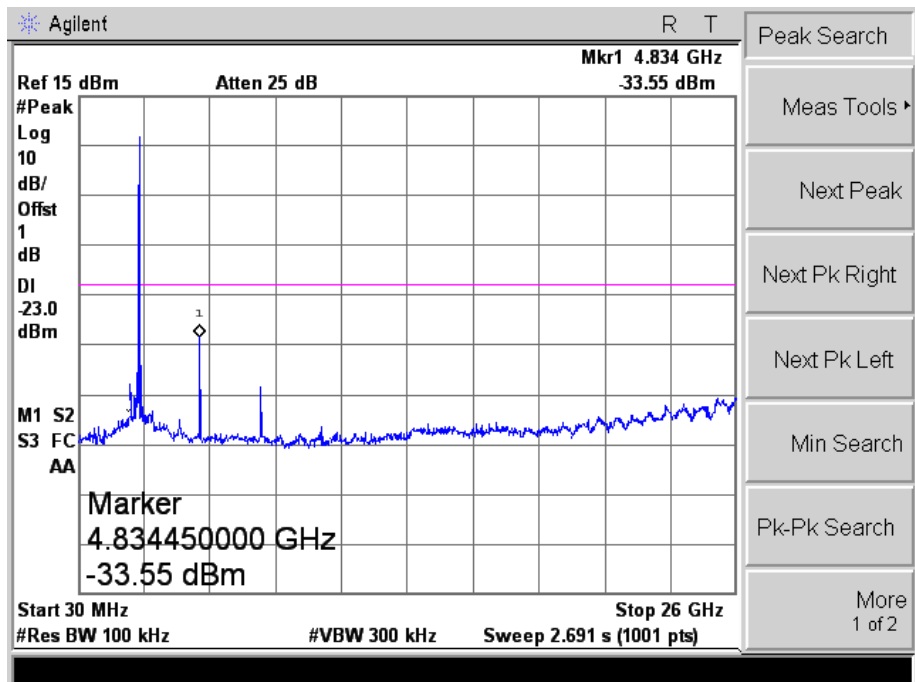
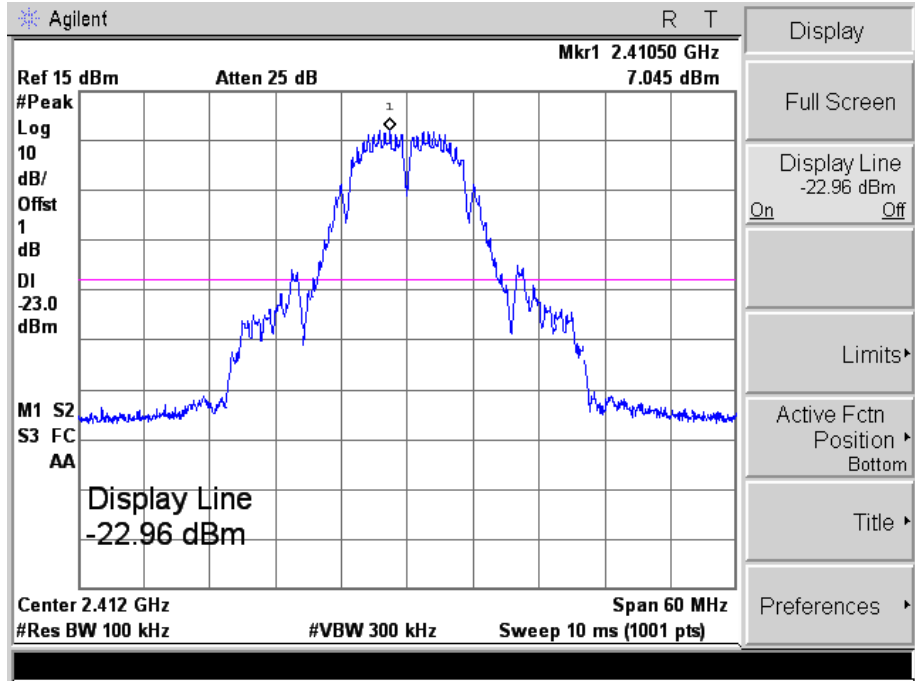


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2461.920	91.09	-9.10	81.99	/	/	Average Detector
	2462.410	103.39	-9.10	94.29	/	/	Peak Detector
2	2483.500	55.33	-9.07	46.26	54.00	-7.74	Average Detector
	2483.500	70.86	-9.07	61.79	74.00	-12.21	Peak Detector
3	2500.000	49.12	-9.03	40.09	54.00	-13.91	Average Detector
	2500.000	65.59	-9.03	56.56	74.00	-17.44	Peak Detector

➤ Conducted test

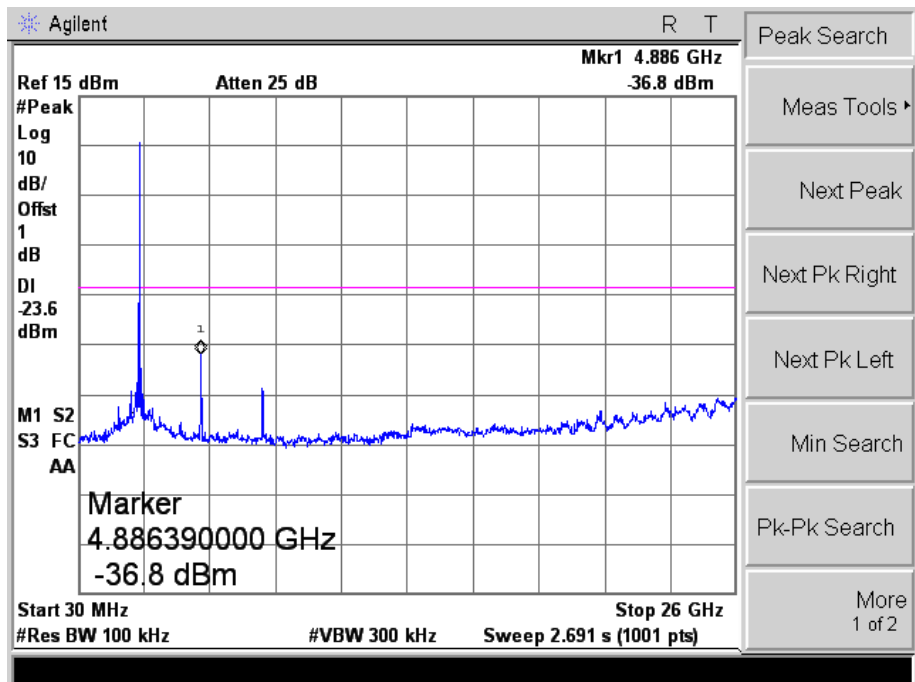
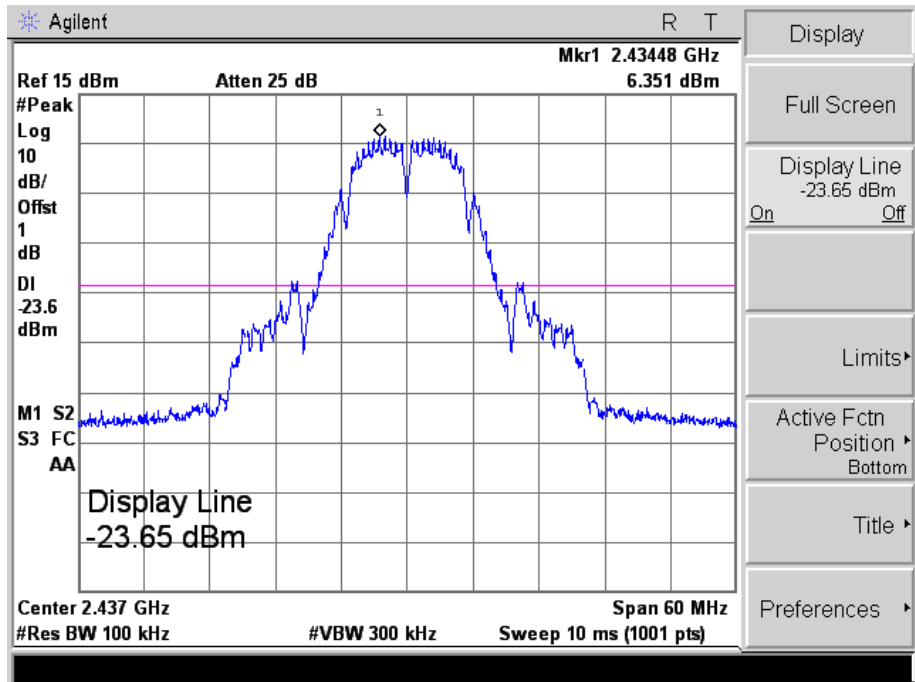
802.11b\_11Mbps

Low



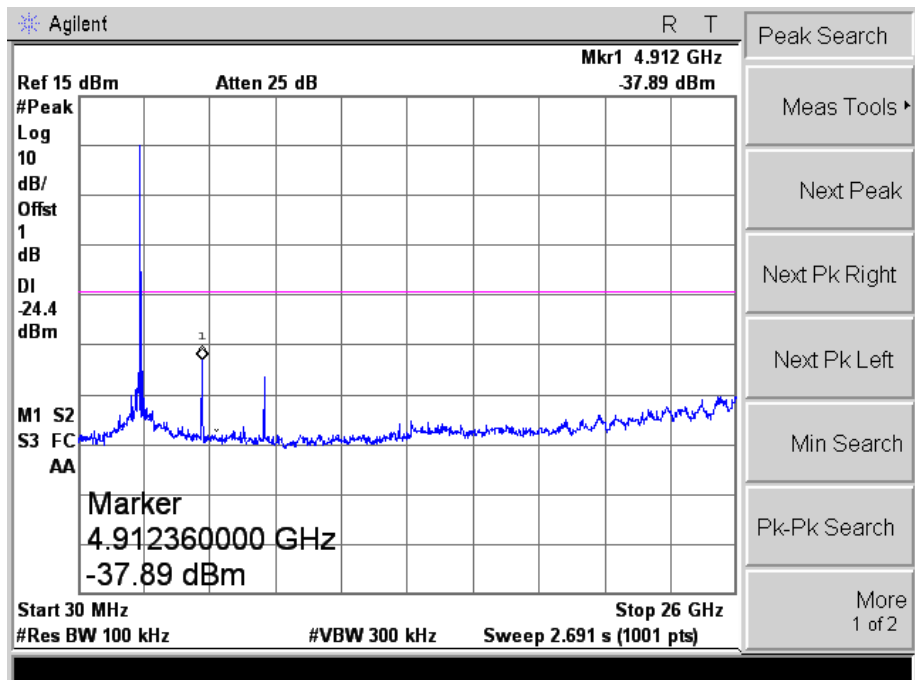
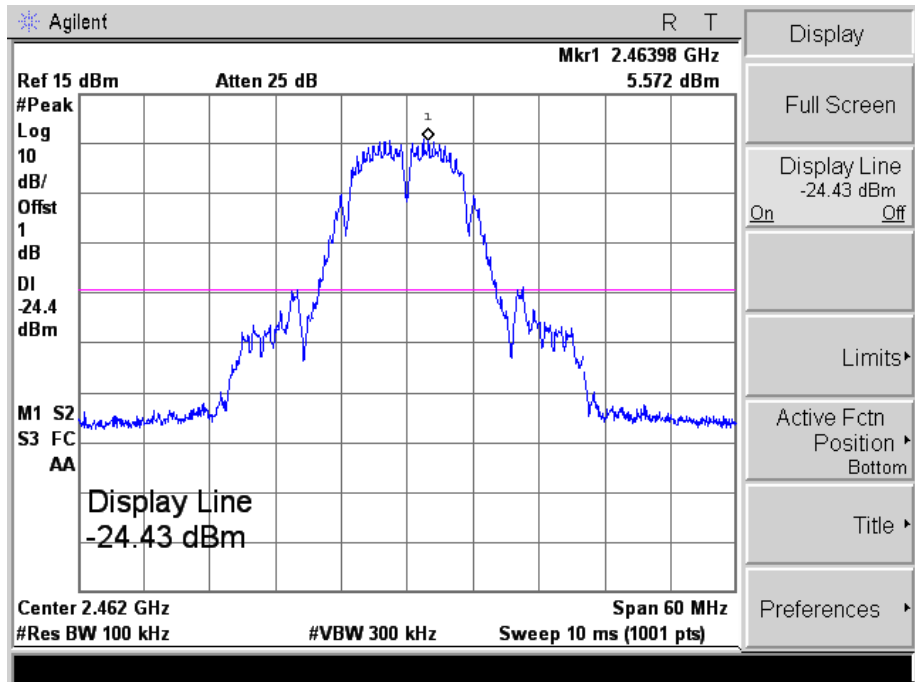
802.11b\_11Mbps

Middle



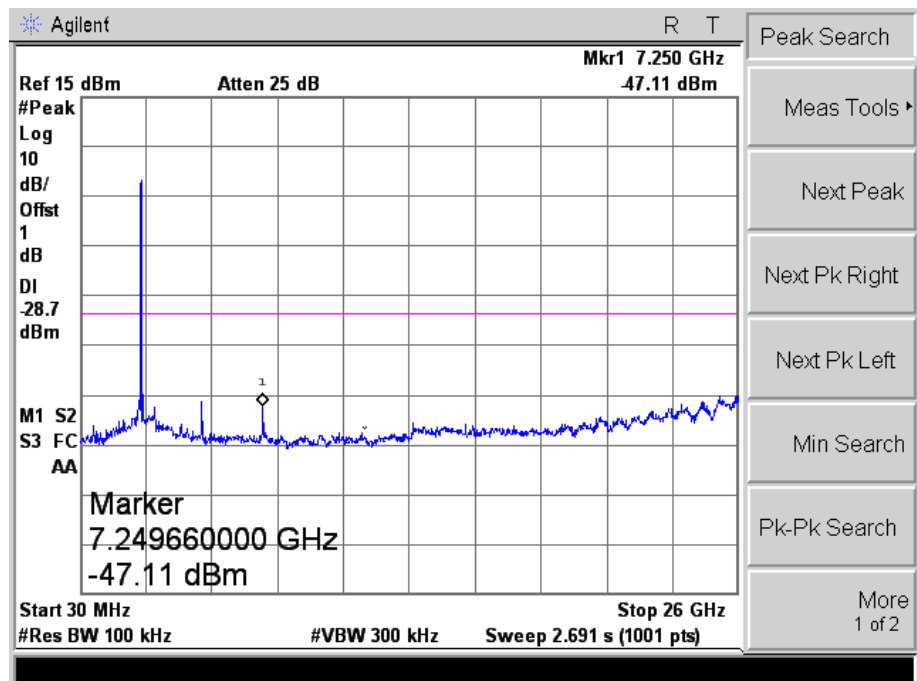
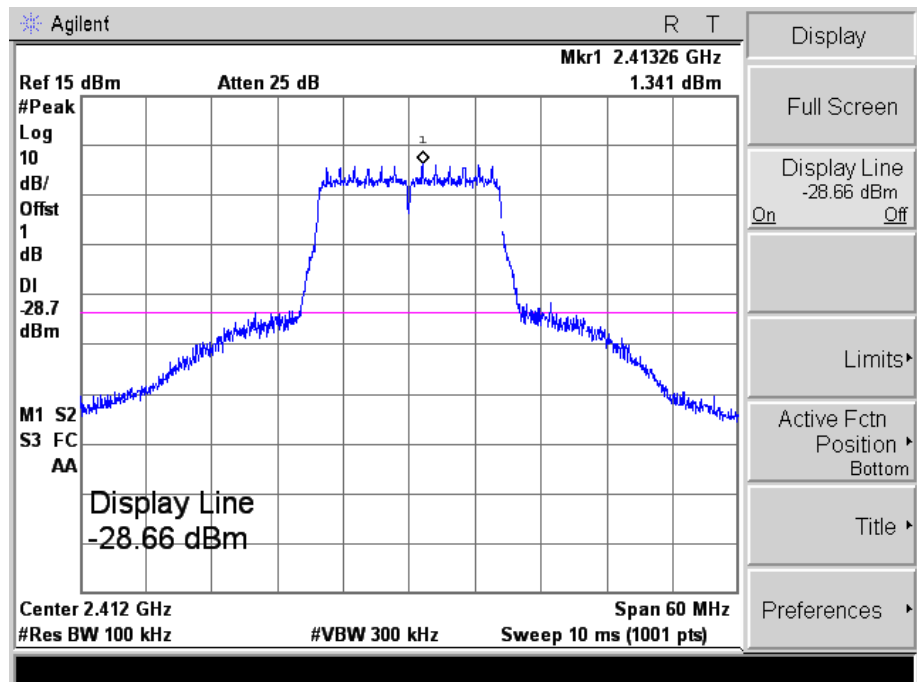
802.11b\_11Mbps

High



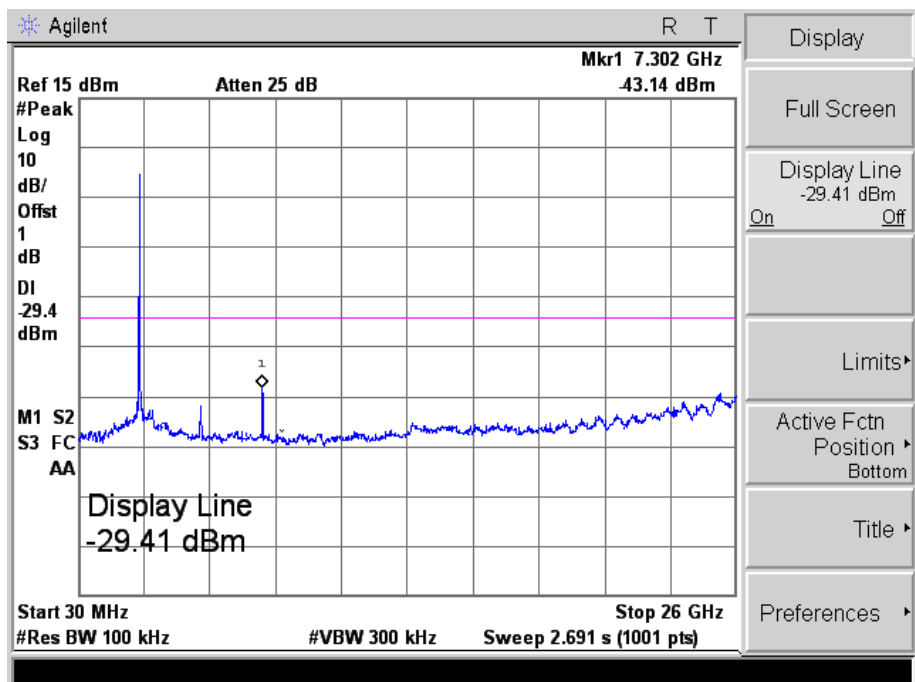
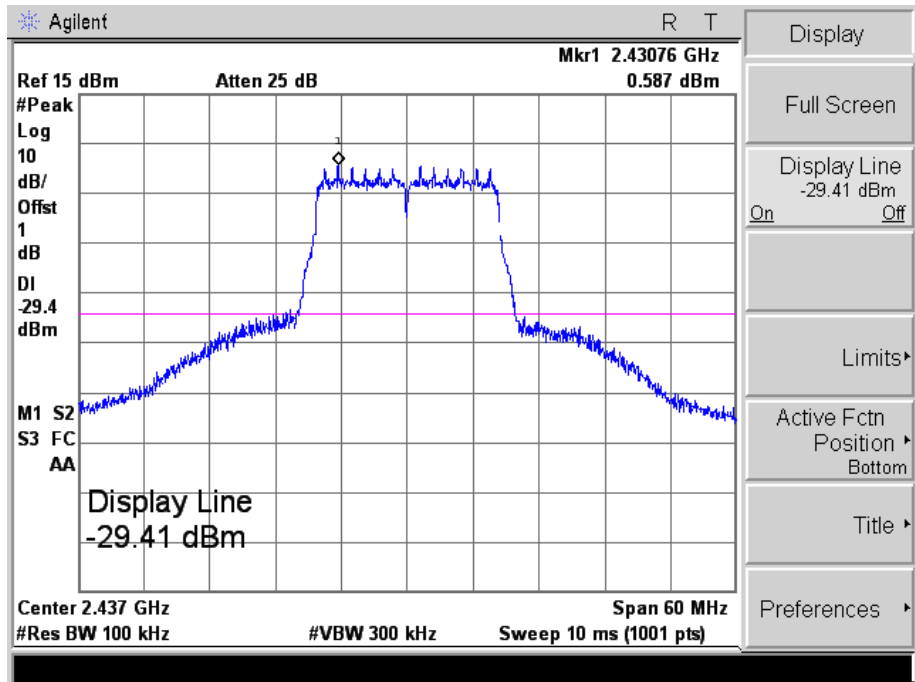
802.11g\_54Mbps

Low



802.11g\_54Mbps

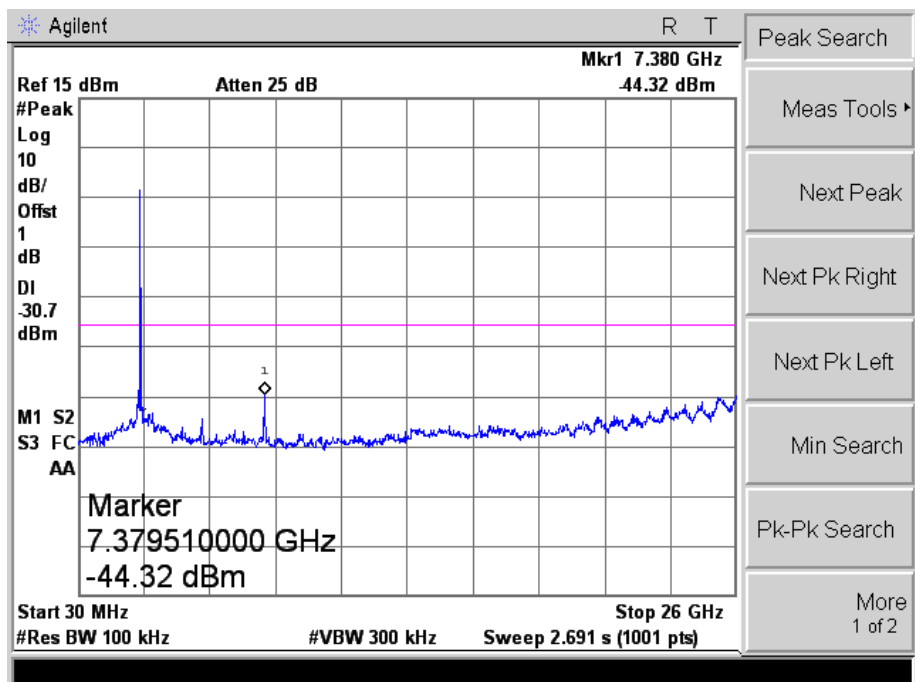
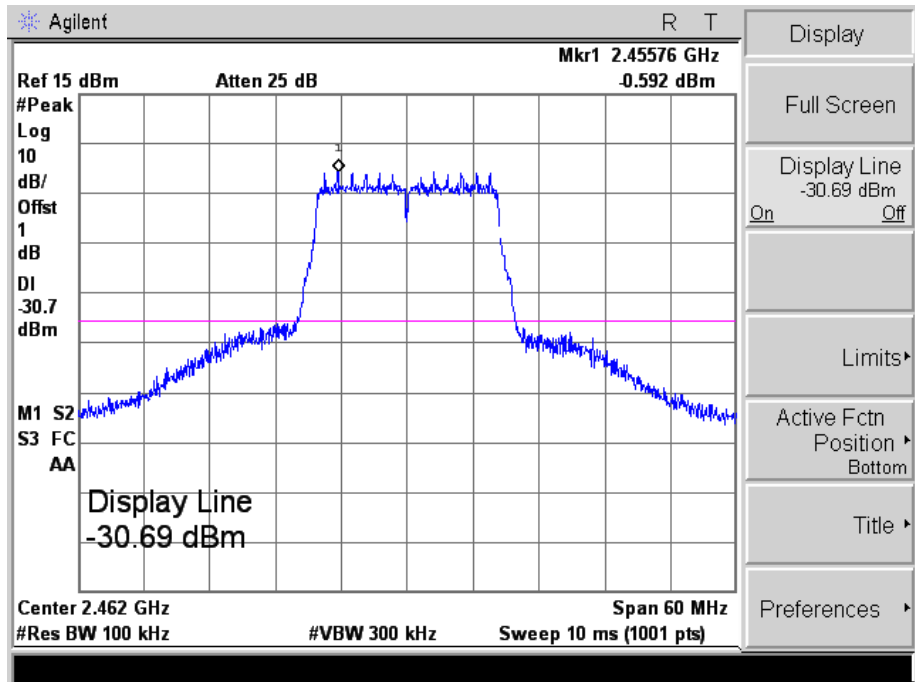
Middle





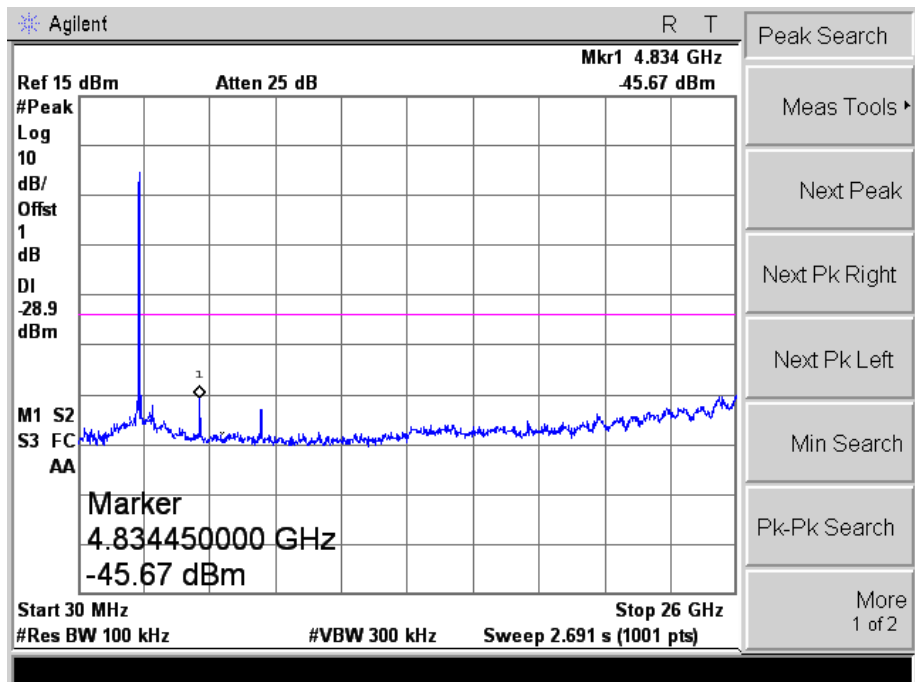
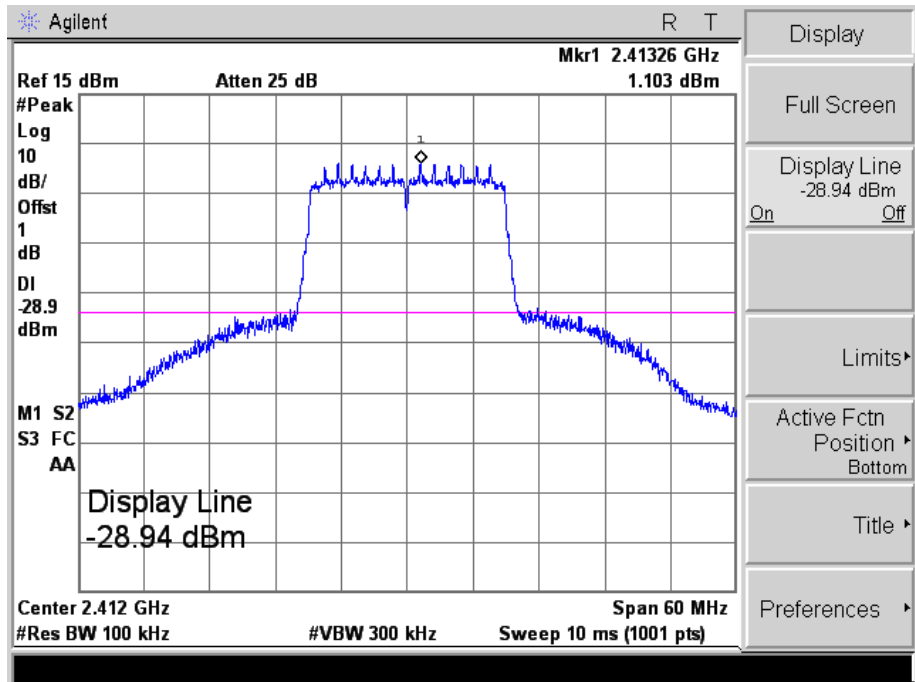
802.11g\_54Mbps

High



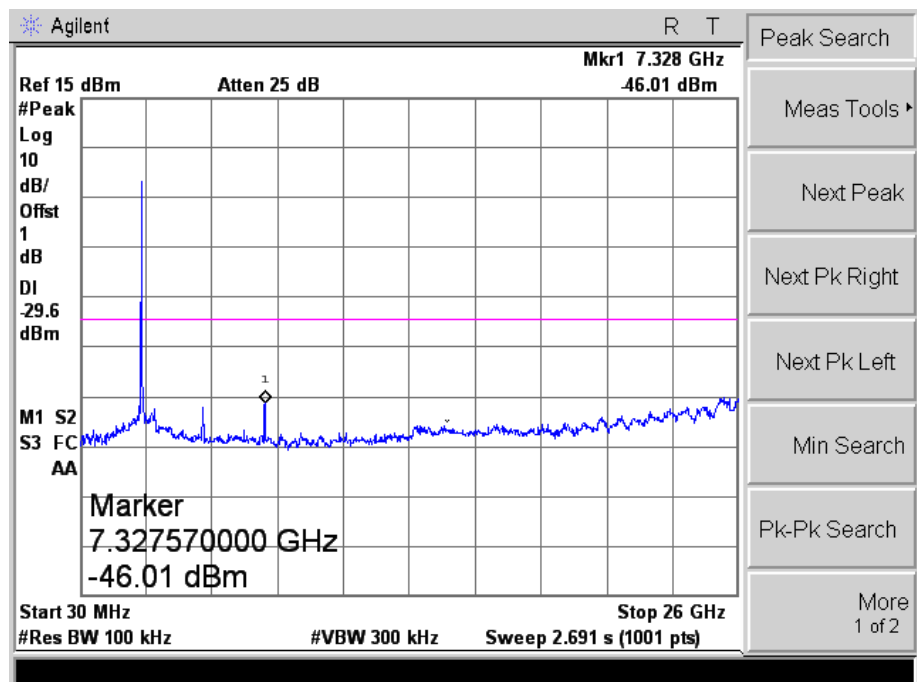
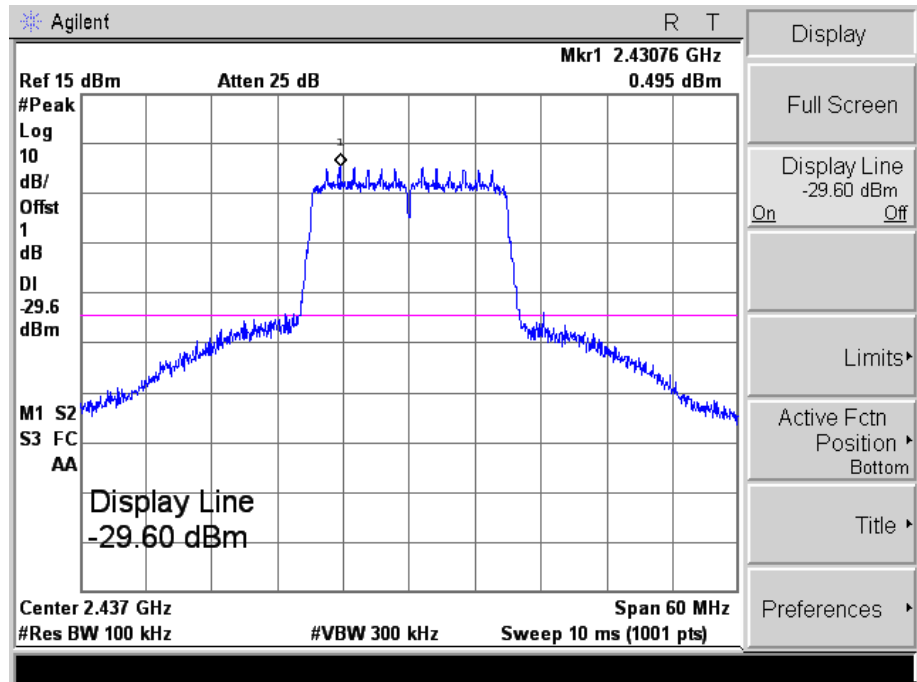
802.11n-HT20\_MCS7

Low



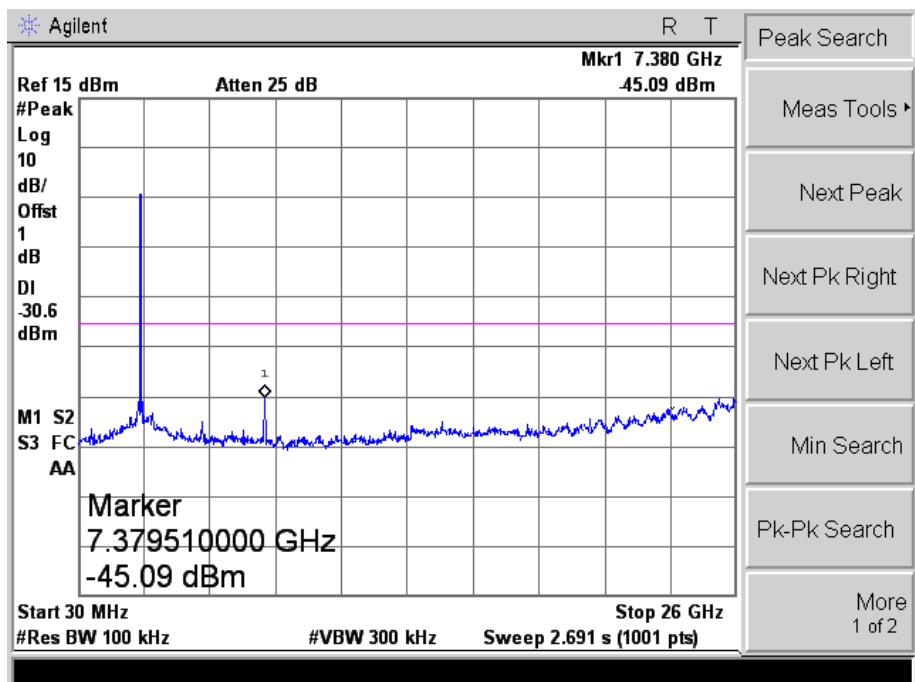
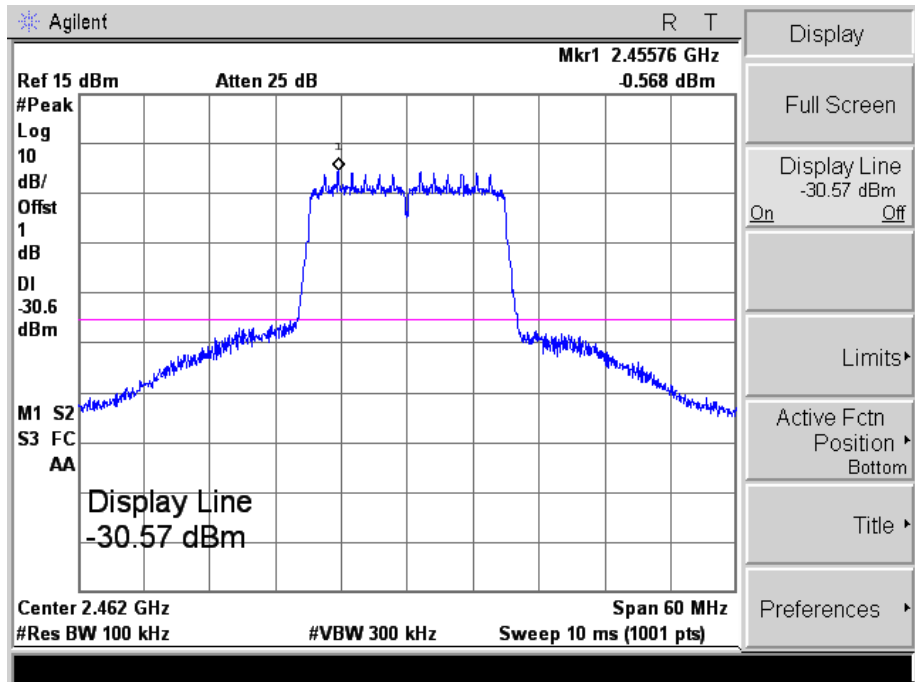
802.11n-HT20\_MCS7

Middle



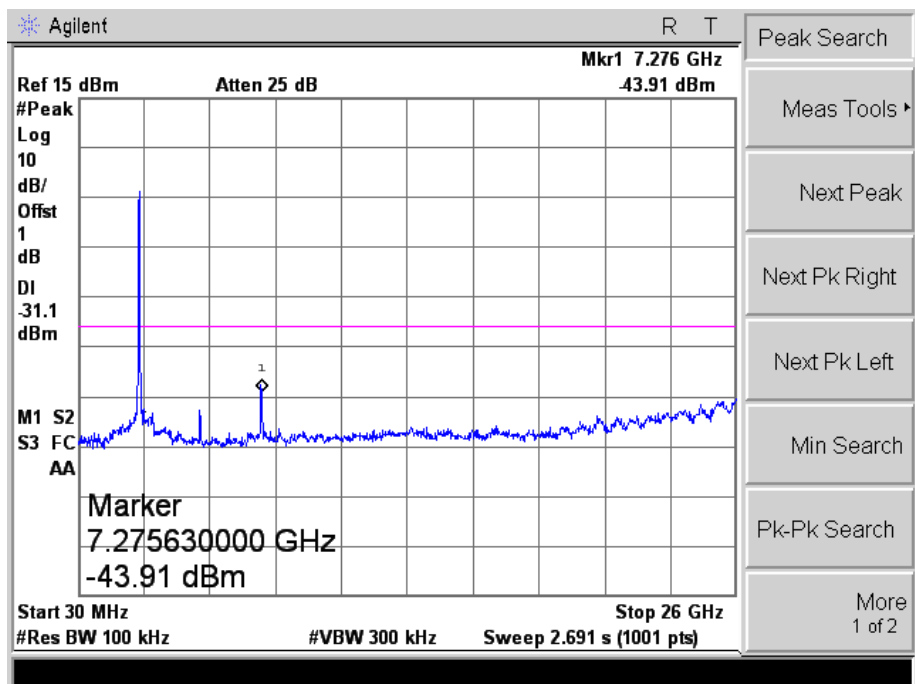
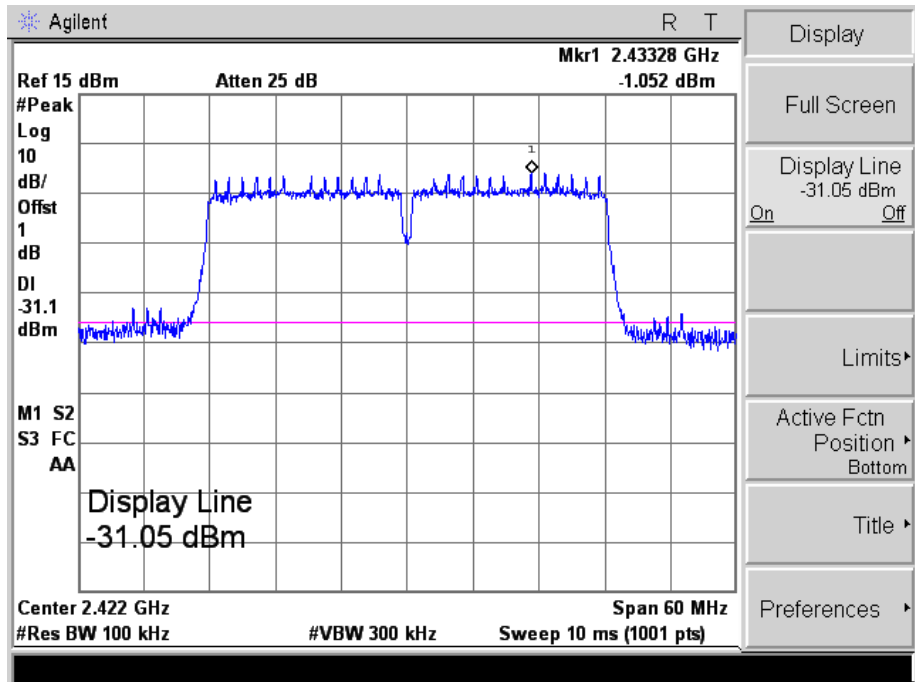
802.11n-HT20\_MCS7

High



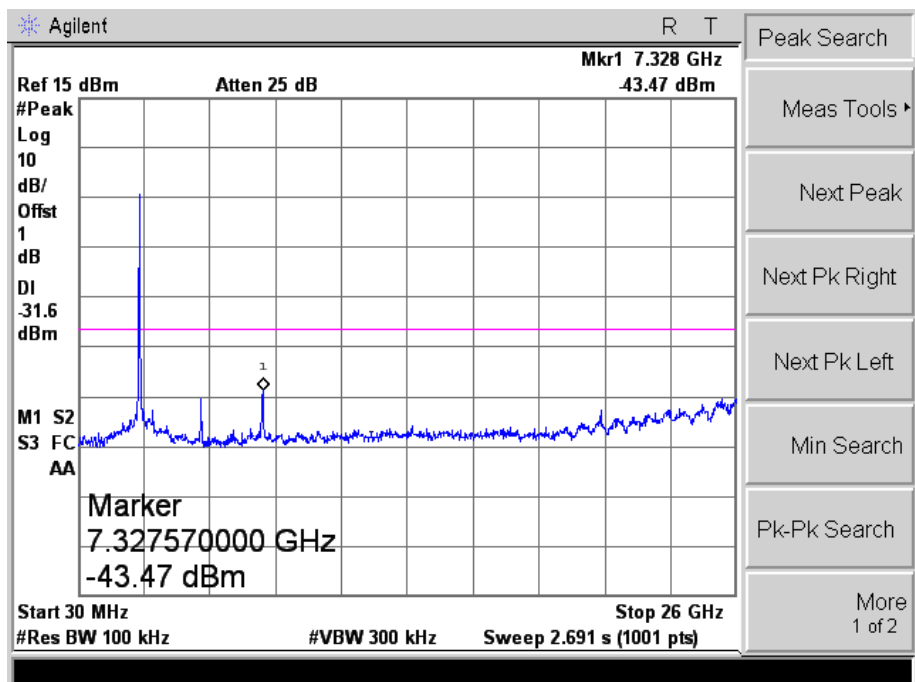
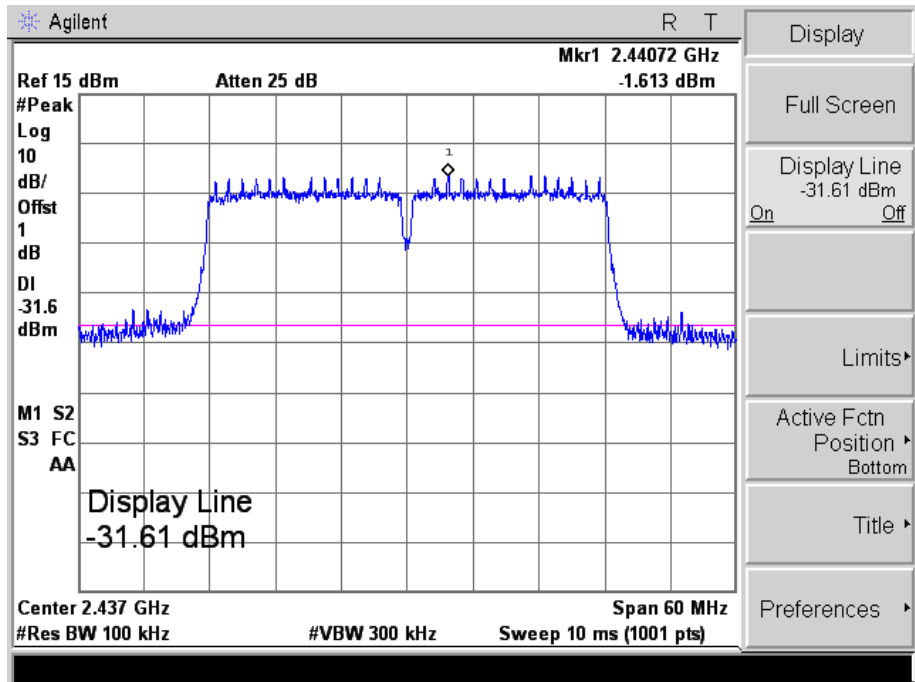
802.11n-HT40\_MCS7

Low



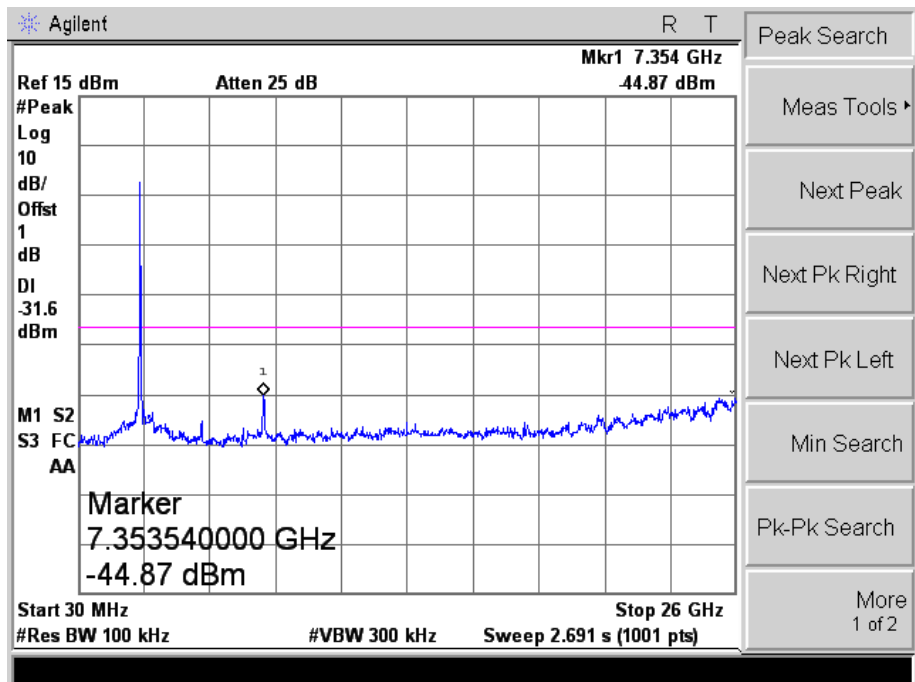
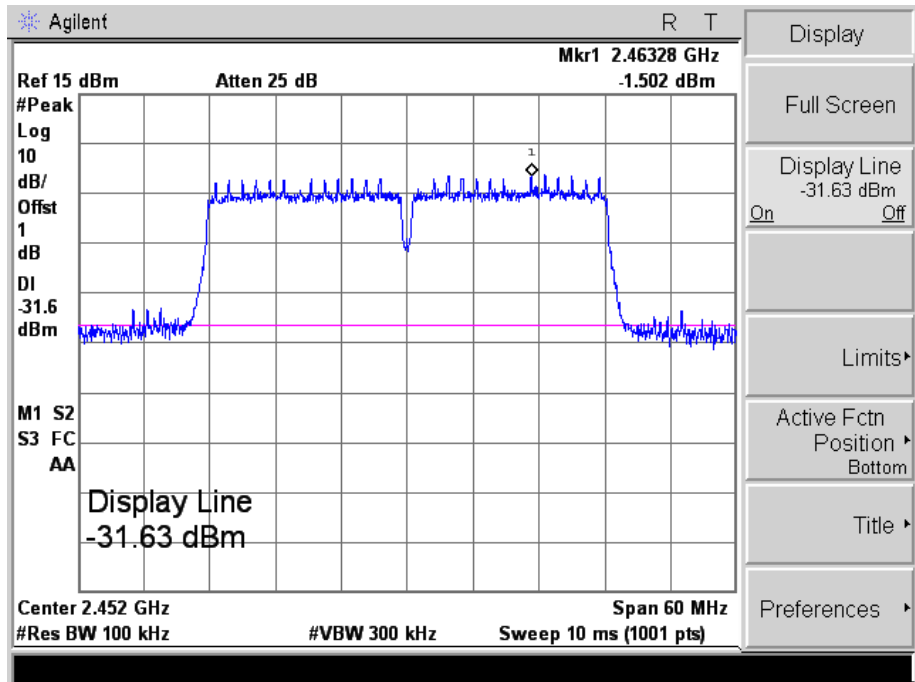
802.11n-HT40\_MCS7

Middle



802.11n-HT40\_MCS7

High



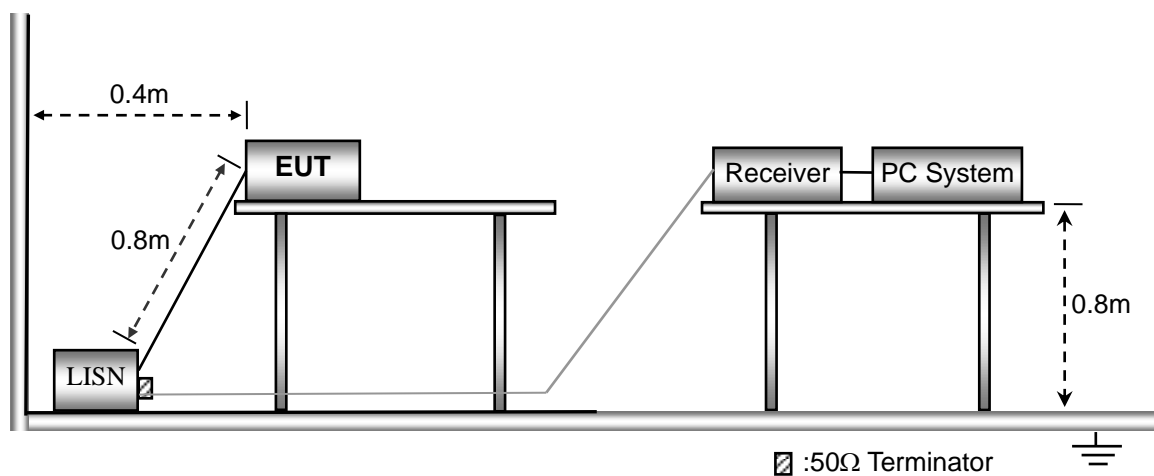
## 10. Conducted Emissions

### 10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 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 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

### 10.4 Summary of Test Results/Plots

Not applicable

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