

FCC Part 15C Measurement and Test Report

For

ATI Electronics (ShenZhen) Co. Ltd

**1/F, B Tower, Shengdelan Industrial Park, Kukeng Village, Guanlan Town,
Shenzhen, China.**

FCC ID: SF4-WSP300

FCC Rule(s):	<u>FCC Part 15.247</u>
Product Description:	<u>Smart Wireless Wifi Speaker</u>
Tested Model:	<u>WSP300B</u>
Report No.:	<u>STR18098319I</u>
Sample Receipt Date:	<u>2018-09-26</u>
Tested Date:	<u>2018-09-27 to 2018-10-19</u>
Issued Date:	<u>2018-10-22</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: ATI Electronics (ShenZhen) Co. Ltd
Address of applicant: 1/F, B Tower, Shengdelan Industrial Park, Kukeng Village, Guanlan Town, Shenzhen, China

Manufacturer: ATI Electronics (ShenZhen) Co. Ltd
Address of manufacturer: 1/F, B Tower, Shengdelan Industrial Park, Kukeng Village, Guanlan Town, Shenzhen, China

General Description of EUT	
Product Name:	Smart Wireless Wifi Speaker
Trade Name:	billboard
Model No.:	WSP300B
Adding Model(s):	BB2113, WSP300C, SB-1, WSP300
Rated Voltage:	DC 3.7V by a 18650 battery or DC 5V 1000mA by adapter
<i>Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model WSP300B, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n-HT20, 802.11n-HT40
Frequency Range:	2412-2462MHz for 802.11b/g/n-HT20 2422-2452MHz for 802.11n-HT40
RF Output Power:	9.90dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 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:	Integral Antenna
Antenna Gain:	2dBi
Lowest Internal Frequency of EUT:	32.768kHz

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 v05: 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 v05

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

FCC – Registration No.: 125990

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

Industry Canada (IC) Registration No.: 11464A

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

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	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

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

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
DC CABLE	1.2	Unshielded	Without Core

Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AUX CABLE	0.8	Unshielded	Without Core

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	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18



2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	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

3.1 Standard Applicable

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

3.2 Test Result

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

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Evaluation Information

This product has an Integral Antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

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

5.2 Test Procedure

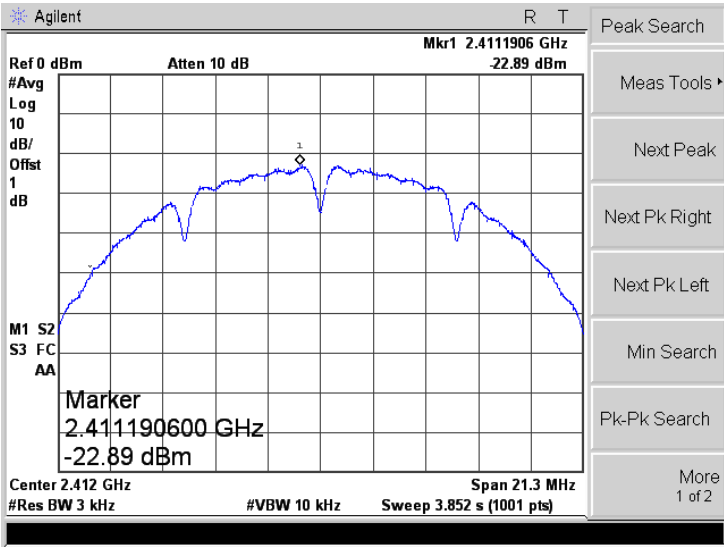
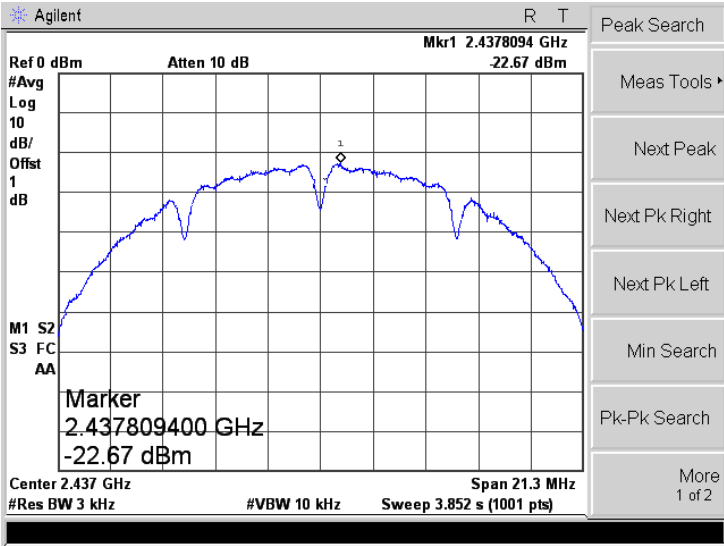
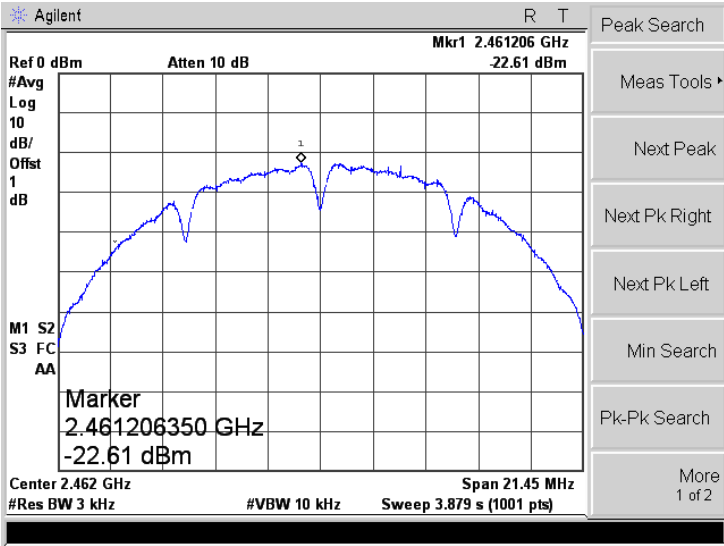
According to the KDB 558074 D01 v05 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.3, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

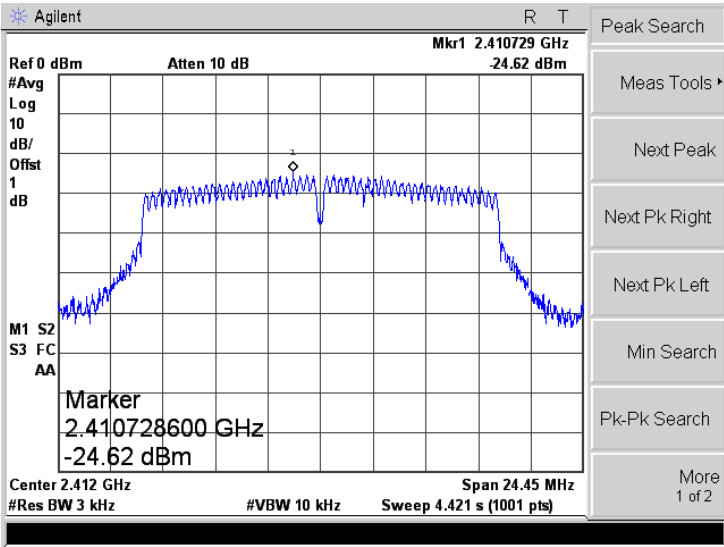
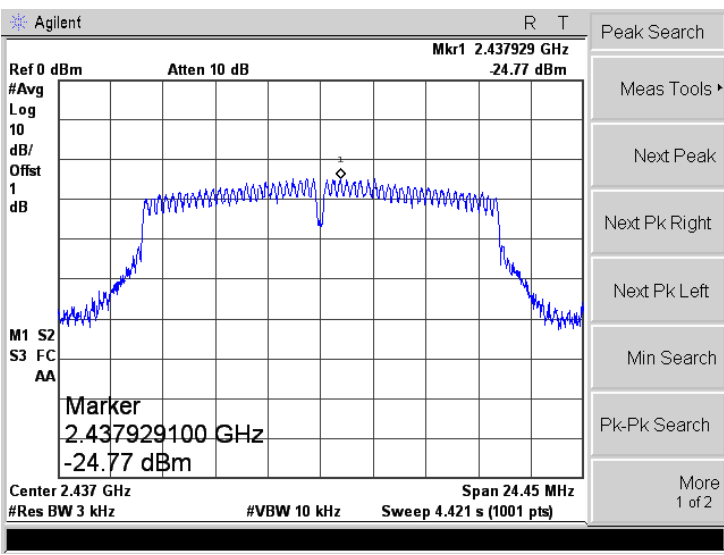
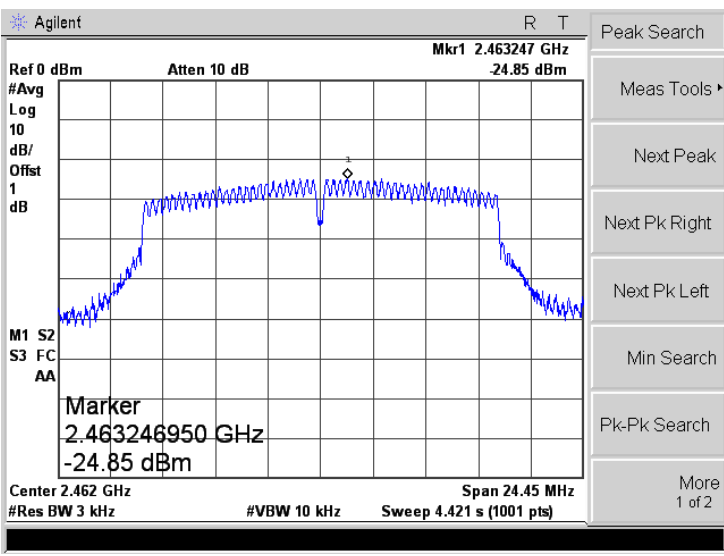
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set span to at least 1.5 times the OBW.
- c) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set VBW $\geq 3 \times \text{RBW}$.
- e) Detector = power averaging (RMS) or sample detector (when RMS not available).
- f) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- g) Sweep time = auto couple.
- h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i) Use the peak marker function to determine the maximum amplitude level.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

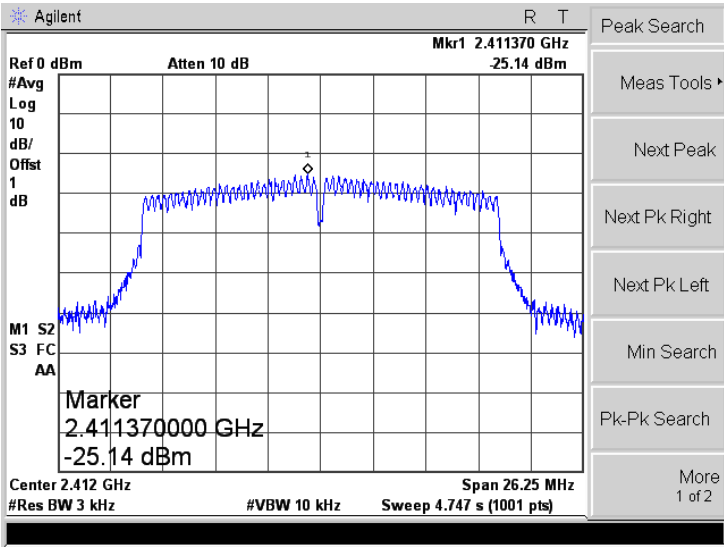
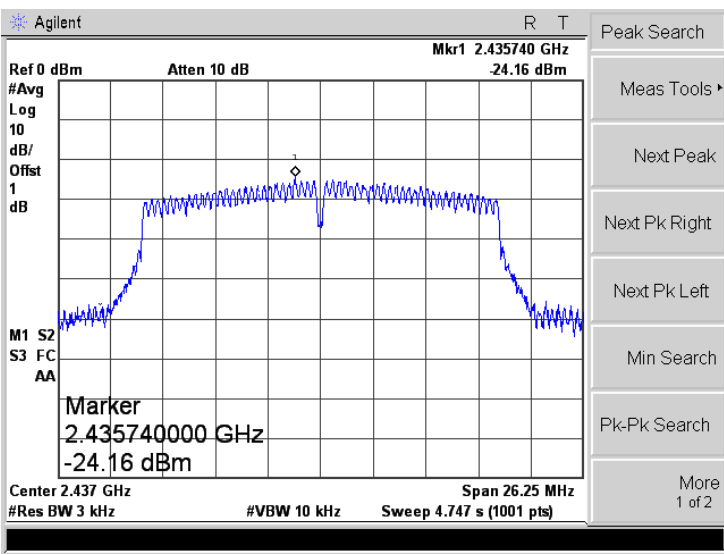
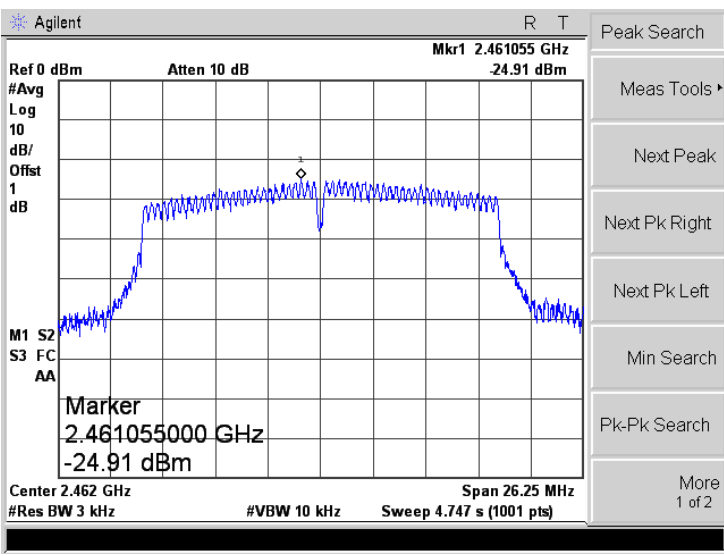
5.3 Summary of Test Results/Plots

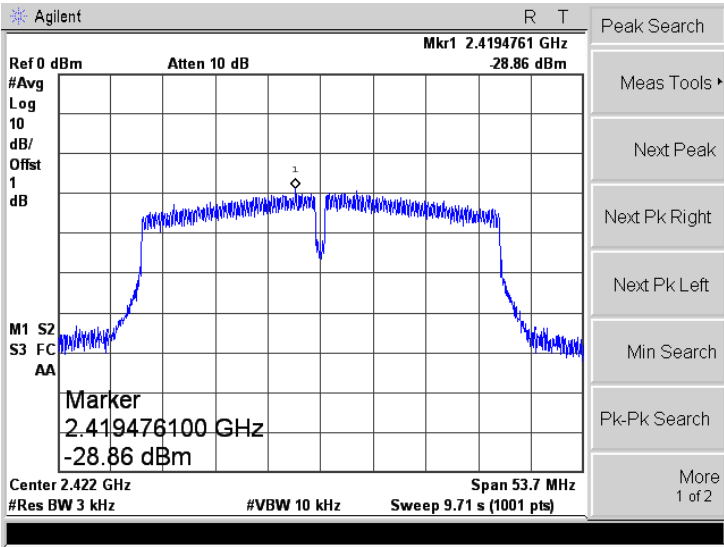
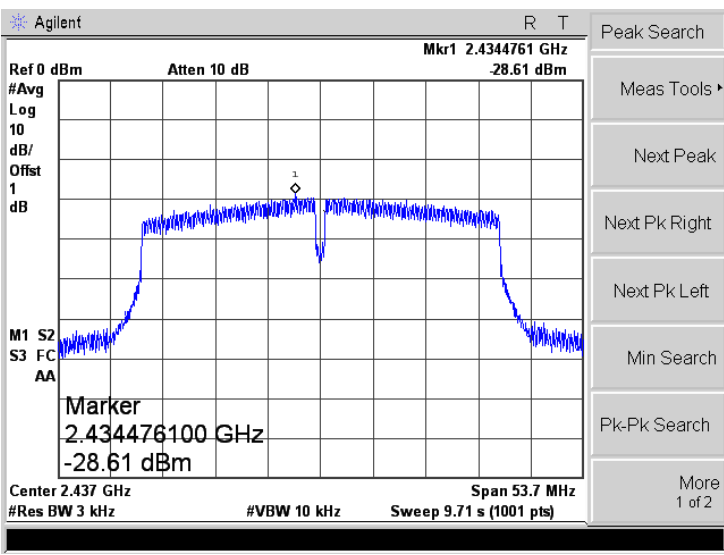
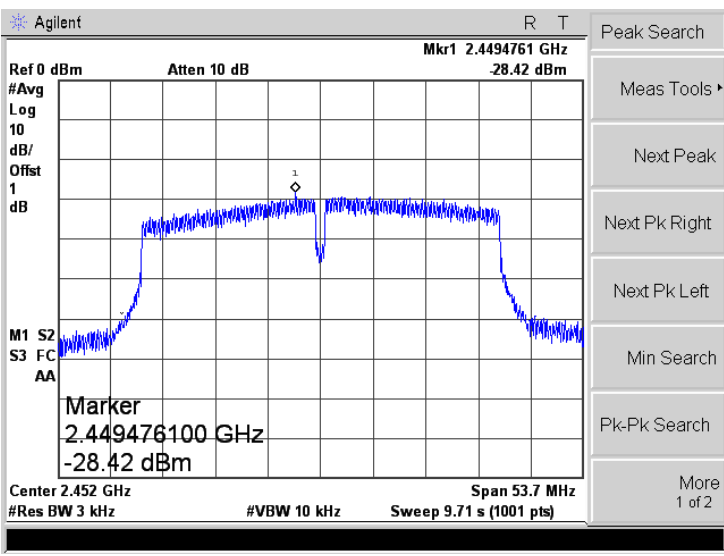
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b_11Mbps	2412	-22.89	8
	2437	-22.67	8
	2462	-22.61	8
802.11g_54Mbps	2412	-24.62	8
	2437	-24.77	8
	2462	-24.85	8
802.11n-HT20_MCS7	2412	-25.14	8
	2437	-24.16	8
	2462	-24.91	8
802.11n-HT40_MCS7	2422	-28.86	8
	2437	-28.61	8
	2452	-28.42	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>802.11g-Middle</p>	
<p>802.11g-High</p>	

<p>802.11n-HT20-Low</p>	
<p>802.11n-HT20-Middle</p>	
<p>802.11n-HT20-High</p>	

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

6. DTS Bandwidth

6.1 Standard Applicable

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

6.2 Test Procedure

According to the KDB 558074 D01 v05 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

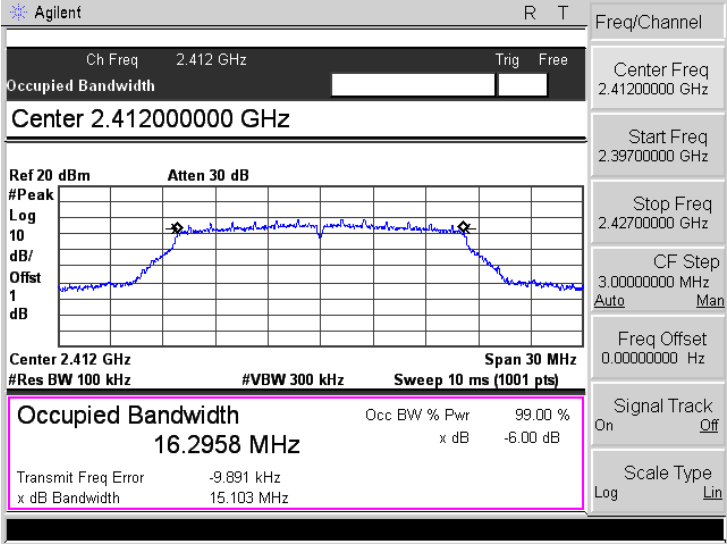
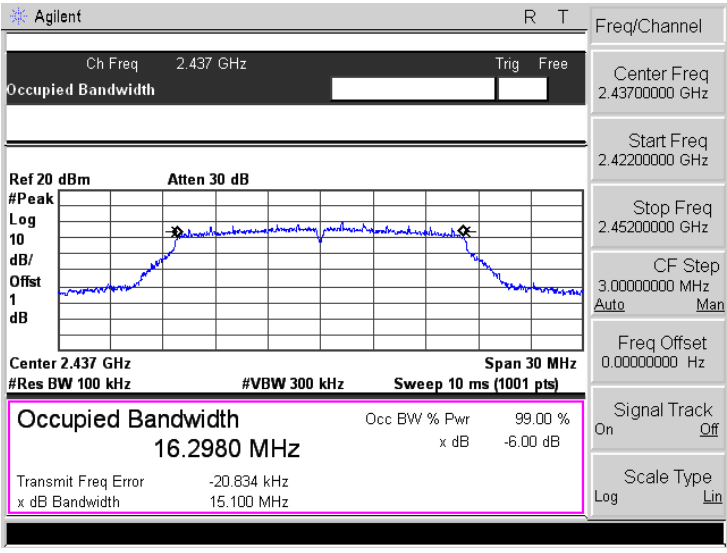
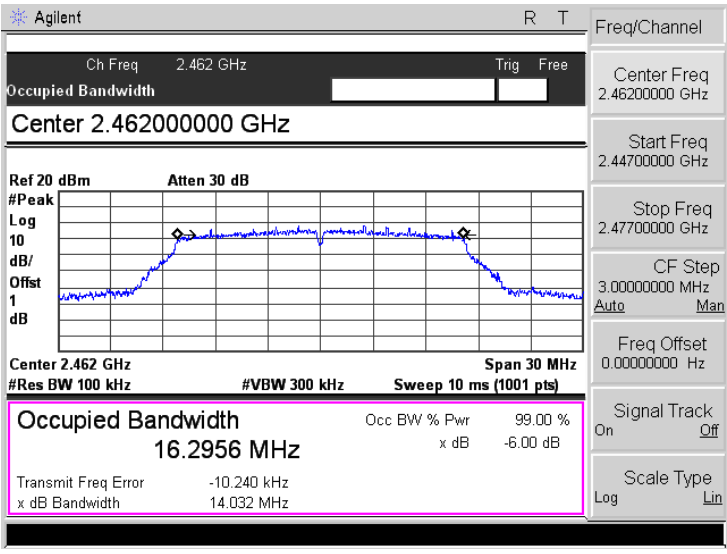
- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two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

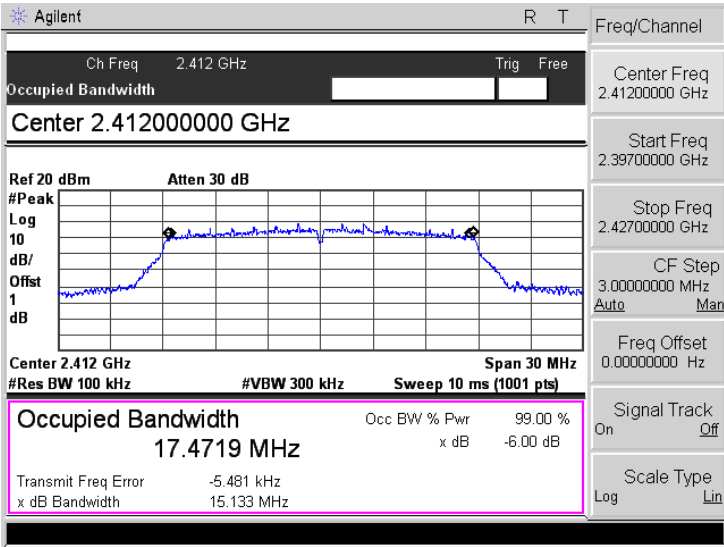
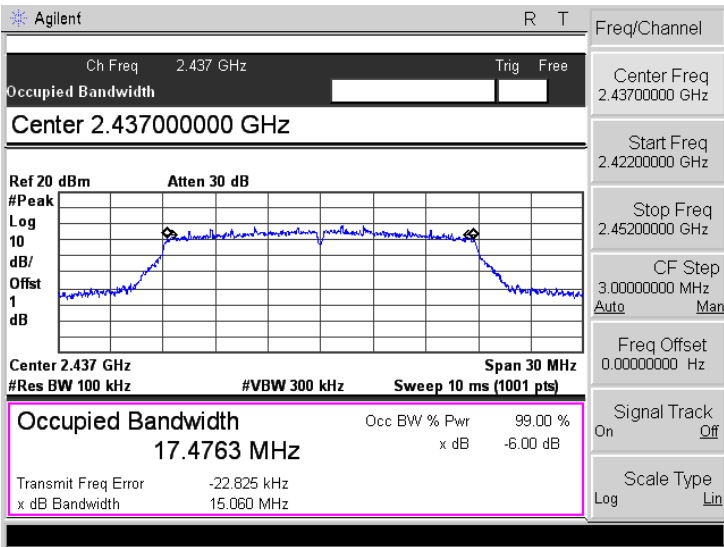
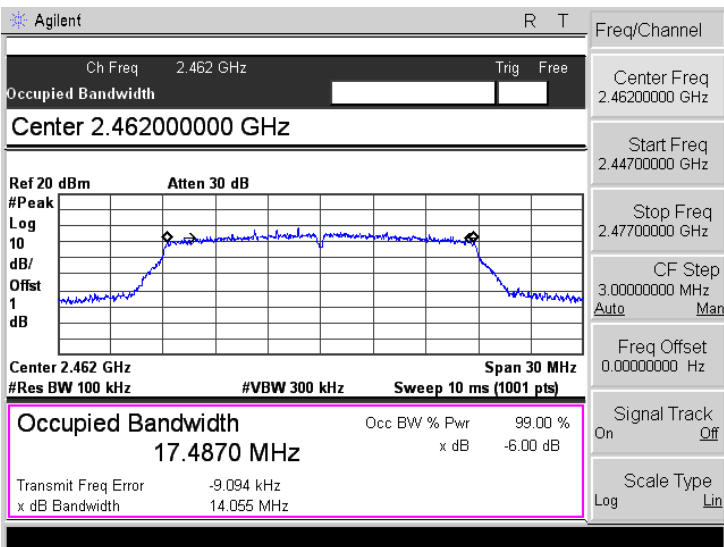
6.3 Summary of Test Results/Plots

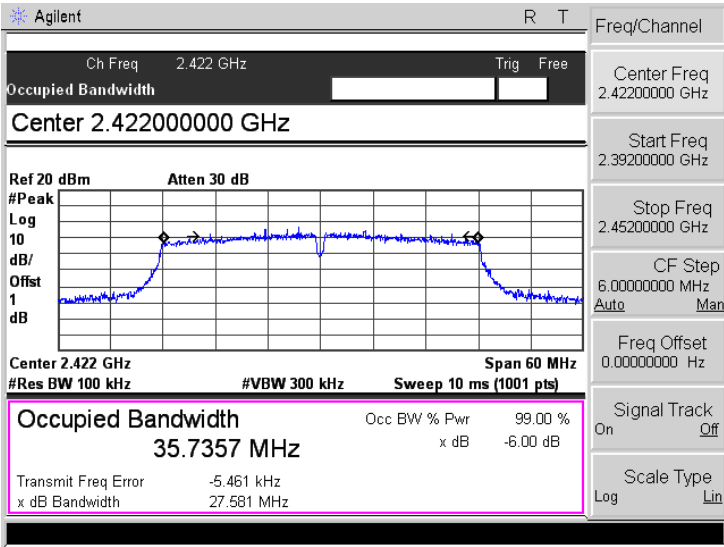
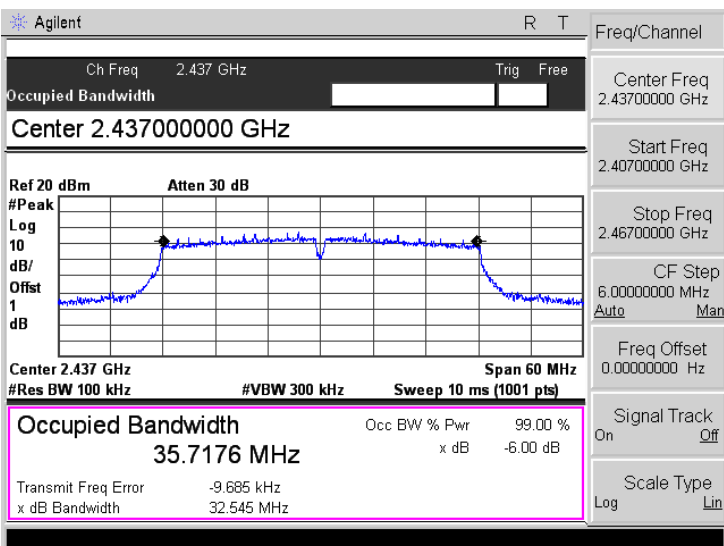
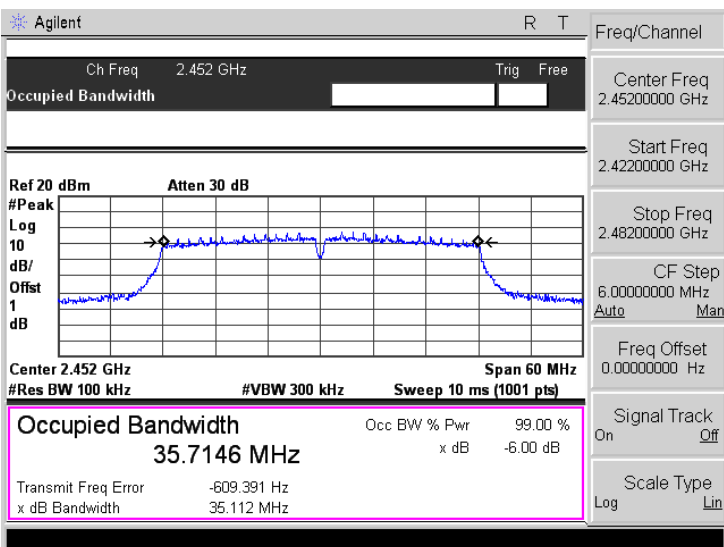
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	Limit kHz
802.11b_11Mbps	2412	10.009	≥ 500
	2437	9.524	≥ 500
	2462	10.032	≥ 500
802.11g_54Mbps	2412	15.103	≥ 500
	2437	15.100	≥ 500
	2462	14.032	≥ 500
802.11n-HT20_MCS7	2412	15.133	≥ 500
	2437	15.060	≥ 500
	2462	14.055	≥ 500
802.11n-HT40_MCS7	2422	27.581	≥ 500
	2437	32.545	≥ 500
	2452	35.112	≥ 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>Center 2.41200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 14.1483 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -9.961 kHz</p> <p>x dB Bandwidth 10.009 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>802.11b-Middle</p>	<p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.43700000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 14.1963 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -17.218 kHz</p> <p>x dB Bandwidth 9.524 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>802.11b-High</p>	<p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.46200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 14.2650 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error 17.914 kHz</p> <p>x dB Bandwidth 10.032 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>802.11g-Low</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.41200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 16.2958 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -9.891 kHz</p> <p>x dB Bandwidth 15.103 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>Center 2.437 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 16.2980 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -20.834 kHz</p> <p>x dB Bandwidth 15.100 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>Center 2.46200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak</p> <p>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>Occupied Bandwidth 16.2956 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -10.240 kHz</p> <p>x dB Bandwidth 14.032 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-HT20-Low</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.41200000 GHz</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>Occupied Bandwidth 17.4719 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -5.481 kHz</p> <p>x dB Bandwidth 15.133 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>Center 2.43700000 GHz</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>Occupied Bandwidth 17.4763 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -22.825 kHz</p> <p>x dB Bandwidth 15.060 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>Center 2.46200000 GHz</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>Occupied Bandwidth 17.4870 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -9.094 kHz</p> <p>x dB Bandwidth 14.055 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 2.42200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</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>Occupied Bandwidth 35.7357 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -5.461 kHz</p> <p>x dB Bandwidth 27.581 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.42200000 GHz</p> <p>Start Freq 2.39200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 6.00000000 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-Middle</p>	 <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.43700000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 60 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p>Occupied Bandwidth 35.7176 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -9.685 kHz</p> <p>x dB Bandwidth 32.545 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.40700000 GHz</p> <p>Stop Freq 2.46700000 GHz</p> <p>CF Step 6.00000000 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-High</p>	 <p>Agilent R T</p> <p>Ch Freq 2.452 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.45200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.452 GHz Span 60 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p>Occupied Bandwidth 35.7146 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -609.391 Hz</p> <p>x dB Bandwidth 35.112 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.45200000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.48200000 GHz</p> <p>CF Step 6.00000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>

7. RF Output Power

7.1 Standard Applicable

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

7.2 Test Procedure

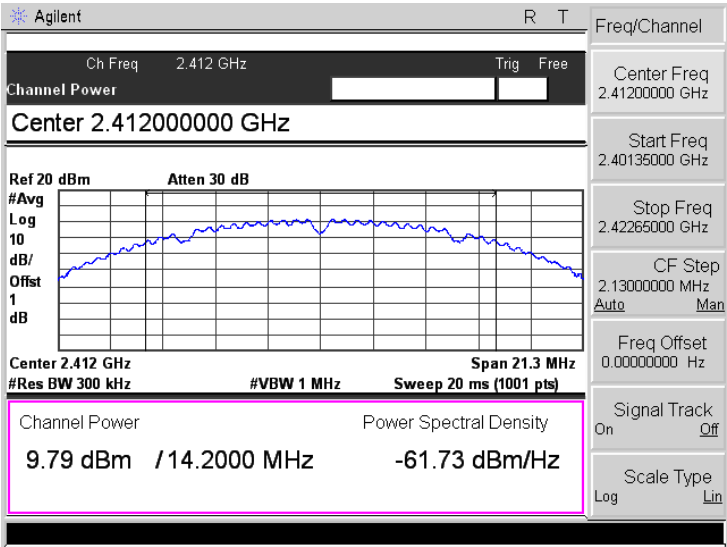
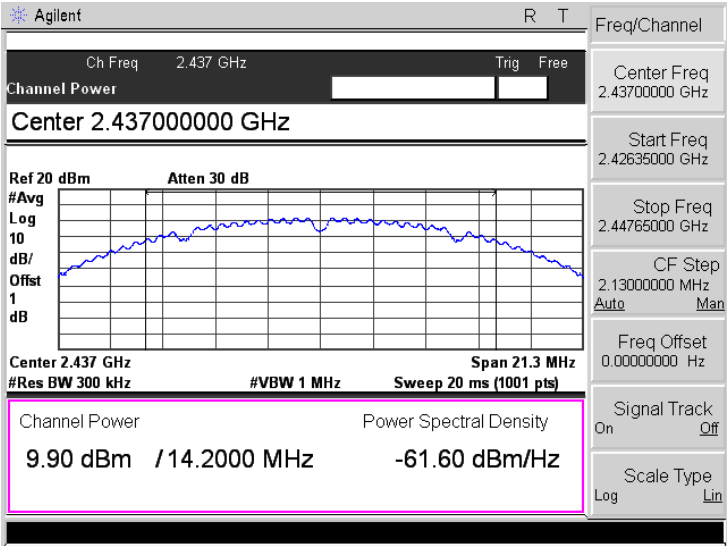
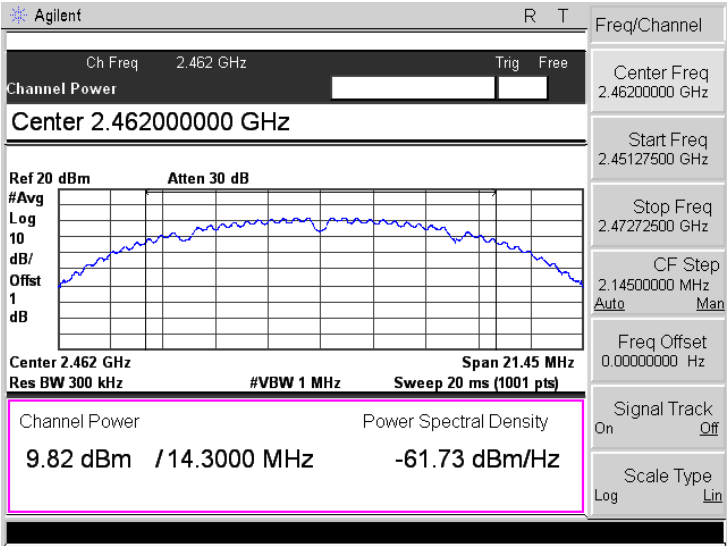
According to the KDB-558074 D01 v05 Subclause 8.3.2.2 and ANSI C63.10-2013 Subclause 11.9.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

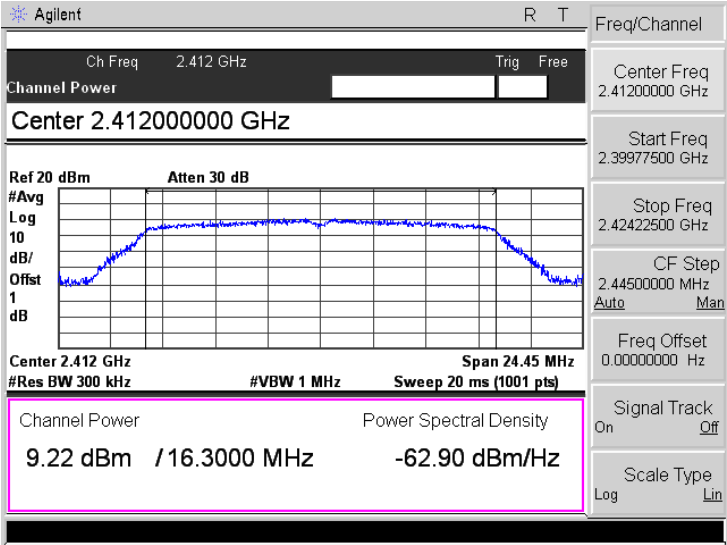
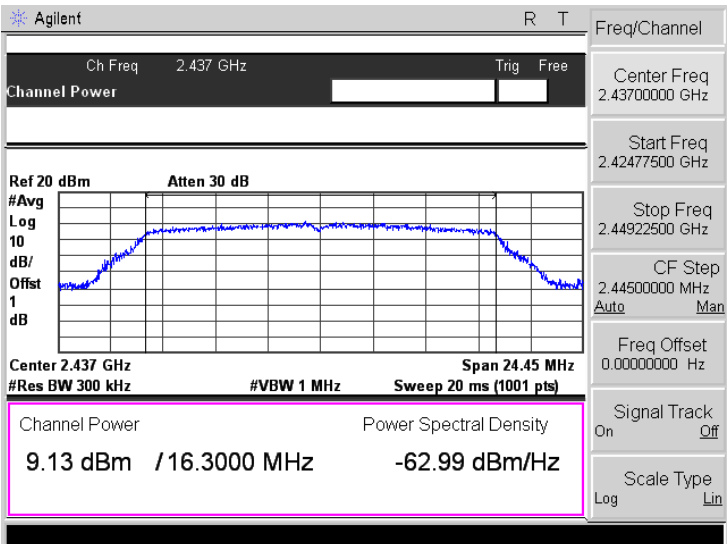
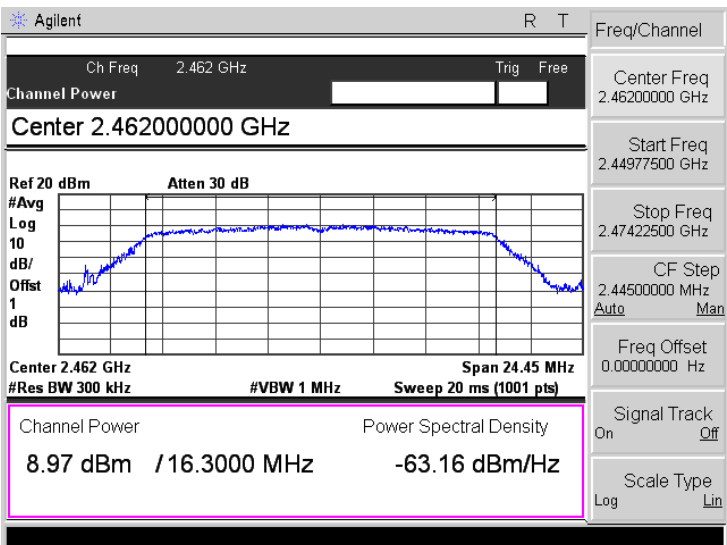
- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW $\geq 3 \times$ RBW.
- d) Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.)
- 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 ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run” .
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

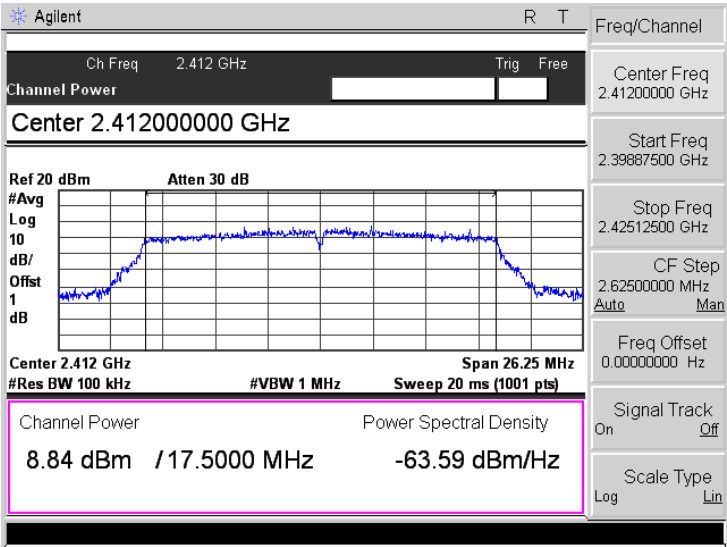
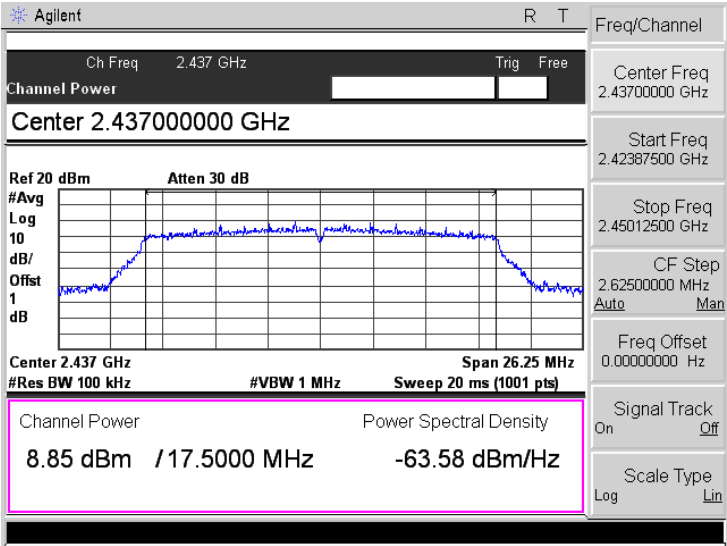
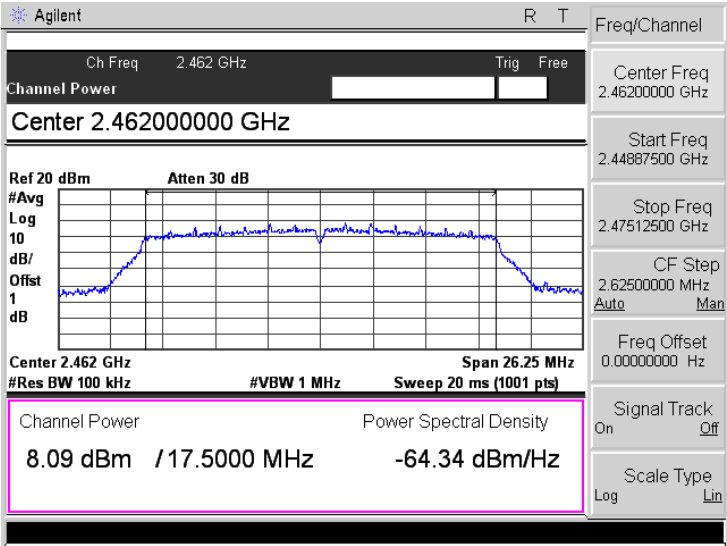
7.3 Summary of Test Results/Plots

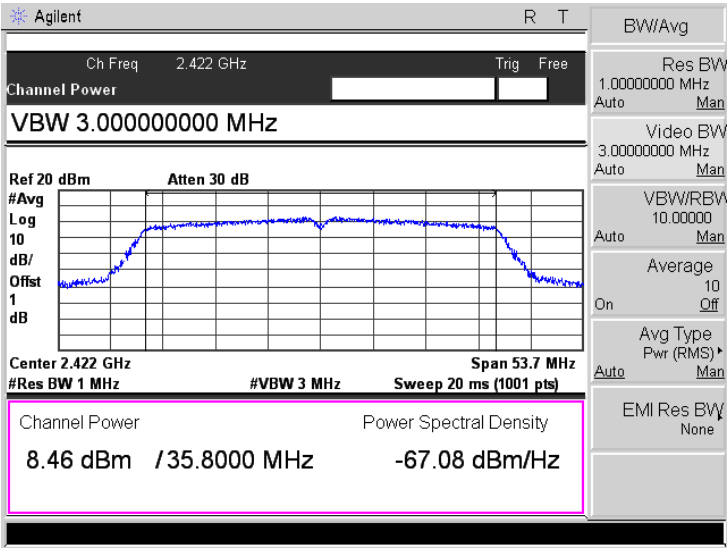
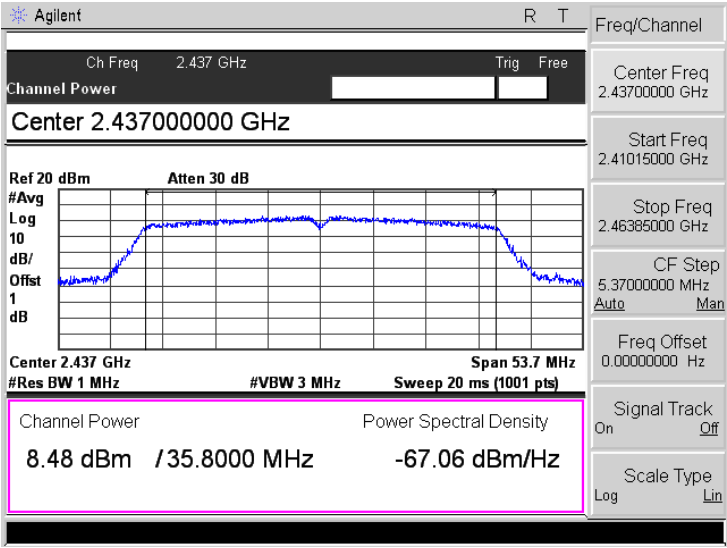
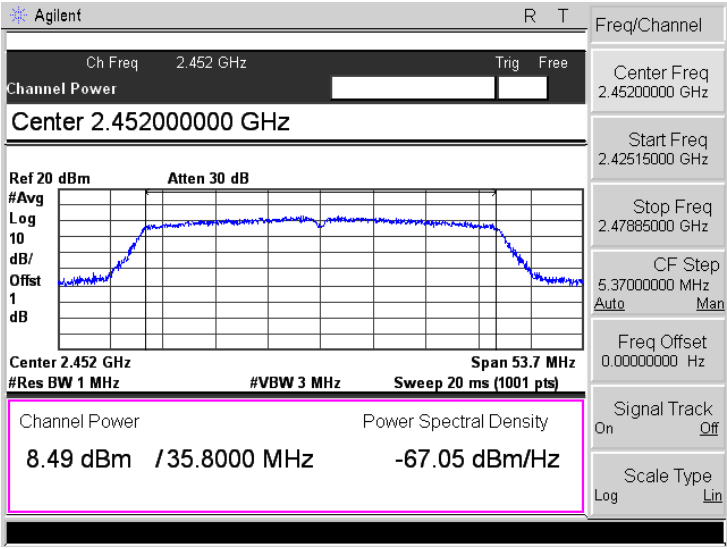
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_11Mbps	2412	9.79	9.53	1000
	2437	9.90	9.77	1000
	2462	9.82	9.59	1000
802.11g_54Mbps	2412	9.22	8.36	1000
	2437	9.13	8.18	1000
	2462	8.97	7.89	1000
802.11n HT20_MCS7	2412	8.84	7.66	1000
	2437	8.85	7.67	1000
	2462	8.09	6.44	1000
802.11n HT40_MCS7	2422	8.46	7.01	1000
	2437	8.48	7.05	1000
	2452	8.49	7.06	1000

Please refer to the following test plots:

<p>802.11b-Low 11Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.41200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 21.3 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density 9.79 dBm / 14.2000 MHz -61.73 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.40135000 GHz</p> <p>Stop Freq 2.42265000 GHz</p> <p>CF Step 2.13000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11b-Middle 11Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.43700000 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 21.3 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density 9.90 dBm / 14.2000 MHz -61.60 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42635000 GHz</p> <p>Stop Freq 2.44765000 GHz</p> <p>CF Step 2.13000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>
<p>802.11b-High 11Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.46200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 21.45 MHz Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density 9.82 dBm / 14.3000 MHz -61.73 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.45127500 GHz</p> <p>Stop Freq 2.47272500 GHz</p> <p>CF Step 2.14500000 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-Low 54Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.41200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 24.45 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>9.22 dBm / 16.3000 MHz -62.90 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39977500 GHz</p> <p>Stop Freq 2.42422500 GHz</p> <p>CF Step 2.44500000 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 54Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.437 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 24.45 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>9.13 dBm / 16.3000 MHz -62.99 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42477500 GHz</p> <p>Stop Freq 2.44922500 GHz</p> <p>CF Step 2.44500000 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 54Mbps</p>	 <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.46200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 24.45 MHz</p> <p>#Res BW 300 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>8.97 dBm / 16.3000 MHz -63.16 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44977500 GHz</p> <p>Stop Freq 2.47422500 GHz</p> <p>CF Step 2.44500000 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-Low MCS7</p>	 <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.41200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.412 GHz Span 26.25 MHz</p> <p>#Res BW 100 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>8.84 dBm / 17.5000 MHz -63.59 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39887500 GHz</p> <p>Stop Freq 2.42512500 GHz</p> <p>CF Step 2.62500000 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 MCS7</p>	 <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.43700000 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 26.25 MHz</p> <p>#Res BW 100 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>8.85 dBm / 17.5000 MHz -63.58 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42387500 GHz</p> <p>Stop Freq 2.45012500 GHz</p> <p>CF Step 2.62500000 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 MCS7</p>	 <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Channel Power</p> <p>Center 2.46200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Avg Log 10 dB/ Offst 1 dB</p> <p>Center 2.462 GHz Span 26.25 MHz</p> <p>#Res BW 100 kHz #VBW 1 MHz Sweep 20 ms (1001 pts)</p> <p>Channel Power Power Spectral Density</p> <p>8.09 dBm / 17.5000 MHz -64.34 dBm/Hz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44887500 GHz</p> <p>Stop Freq 2.47512500 GHz</p> <p>CF Step 2.62500000 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 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

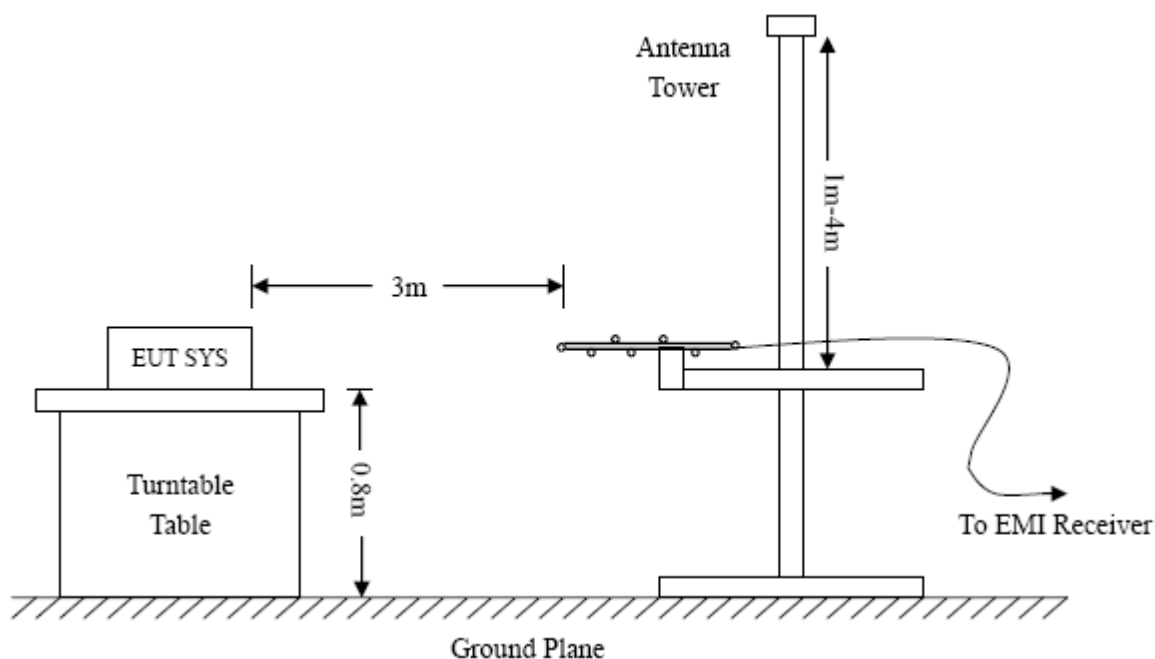
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

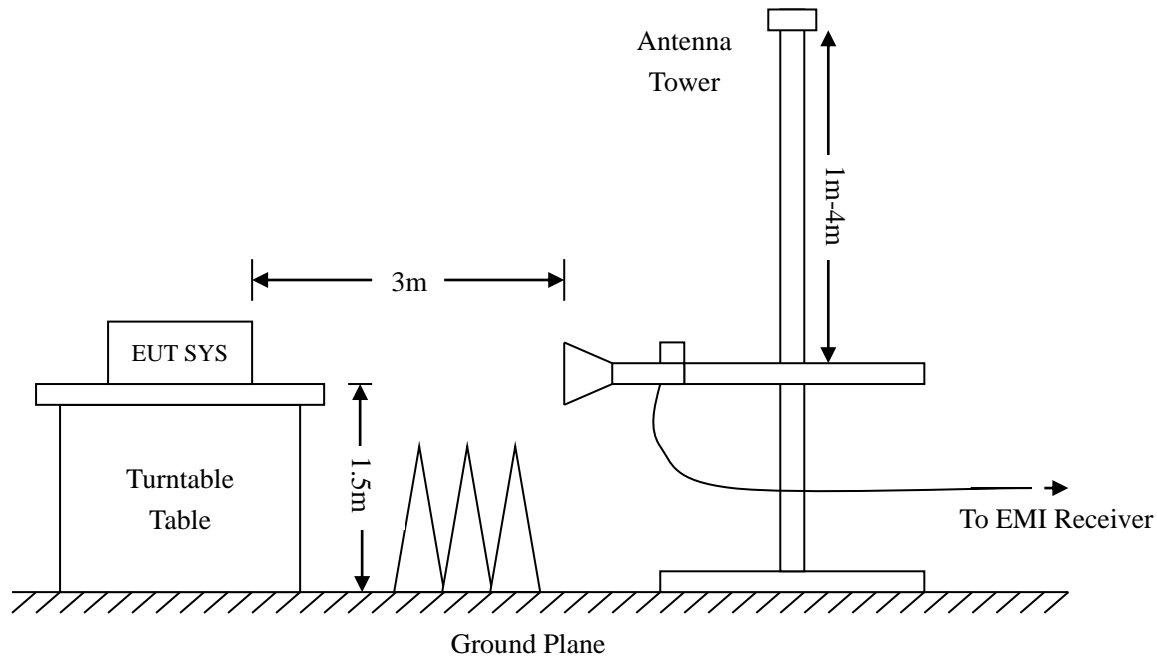
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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.





Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=360KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

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

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

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

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

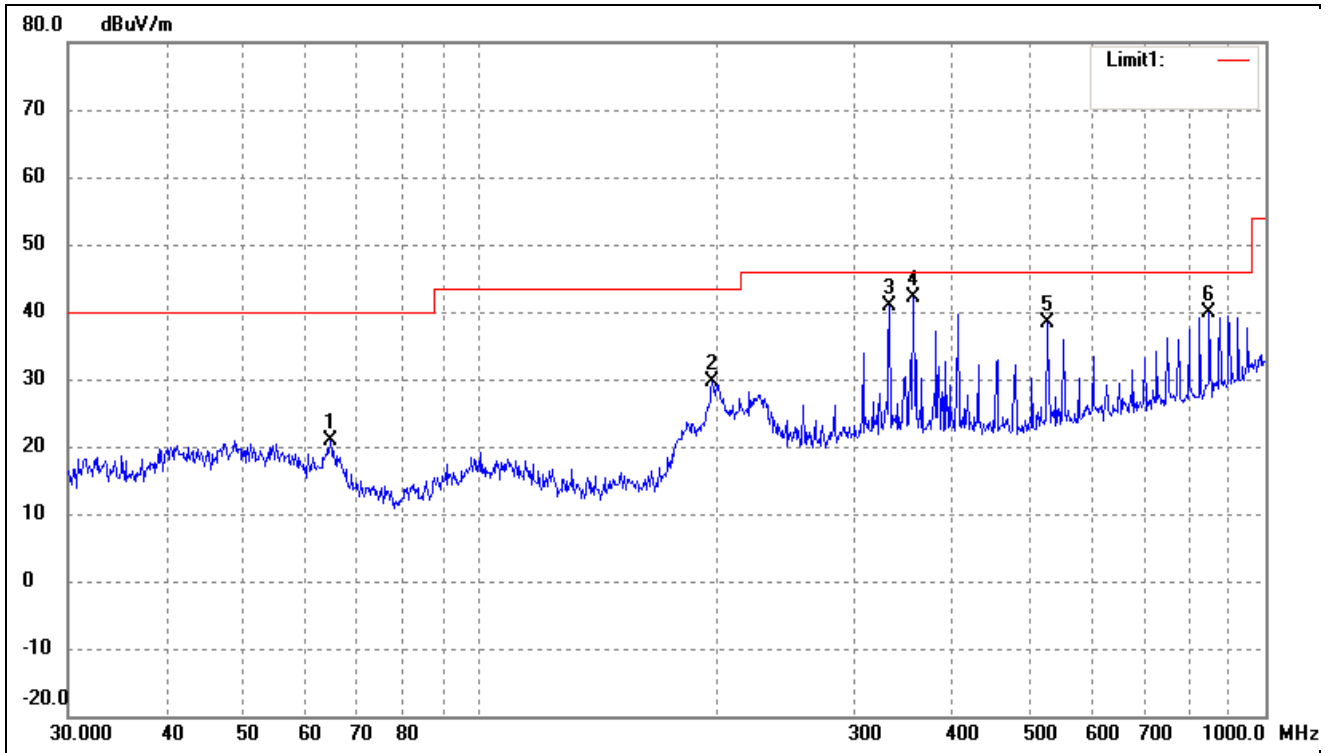
8.4 Summary of Test Results/Plots

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 is recorded in this report.

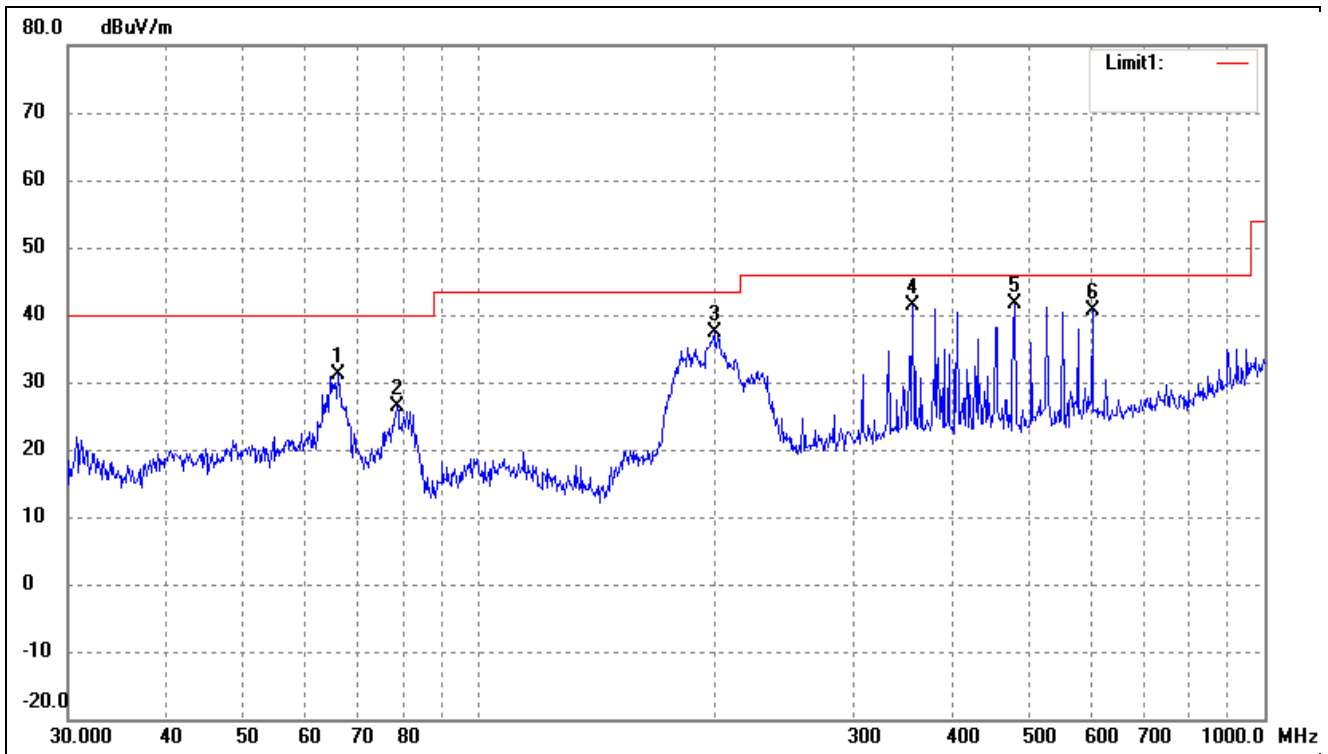
➤ Spurious Emissions Below 1GHz

802.11b_11Mbps			
Test Channel	Low	Polarity:	Horizontal



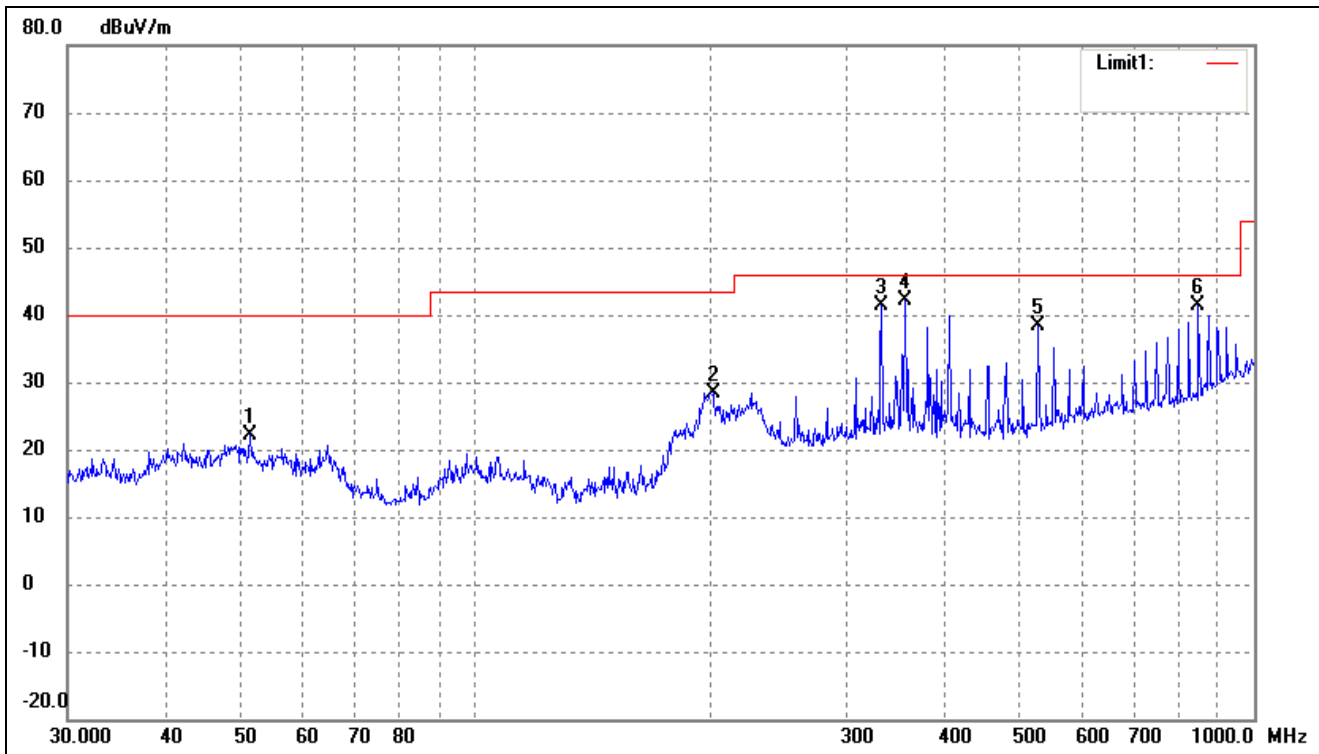
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	64.6594	36.08	-15.18	20.90	40.00	-19.10	253	100	peak
2	197.8928	42.01	-12.35	29.66	43.50	-13.84	91	100	peak
3	332.5187	47.68	-6.71	40.97	46.00	-5.03	235	100	peak
4	356.6758	48.77	-6.69	42.08	46.00	-3.92	106	100	peak
5	528.2458	43.95	-5.56	38.39	46.00	-7.61	180	100	peak
6	848.0563	40.22	-0.28	39.94	46.00	-6.06	178	100	peak

802.11b_11Mbps			
Test Channel	Low	Polarity:	Vertical



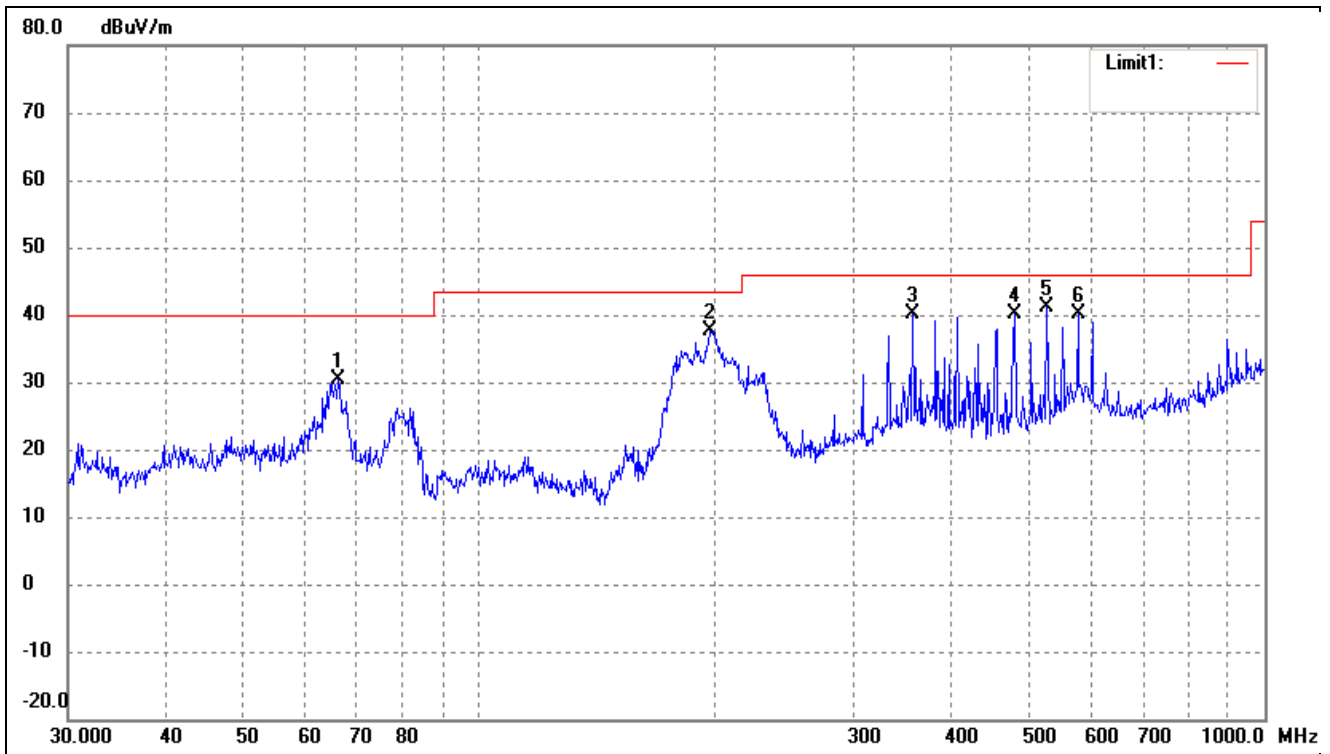
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	66.2662	46.96	-15.73	31.23	40.00	-8.77	316	100	peak
2	78.6888	45.17	-18.75	26.42	40.00	-13.58	90	100	peak
3	199.2855	49.61	-12.19	37.42	43.50	-6.08	222	100	peak
4	356.6758	48.12	-6.69	41.43	46.00	-4.57	102	100	peak
5	480.5276	47.64	-6.13	41.51	46.00	-4.49	164	100	peak
6	603.5392	44.60	-3.95	40.65	46.00	-5.35	199	100	peak

802.11b_11Mbps			
Test Channel	Middle	Polarity:	Horizontal



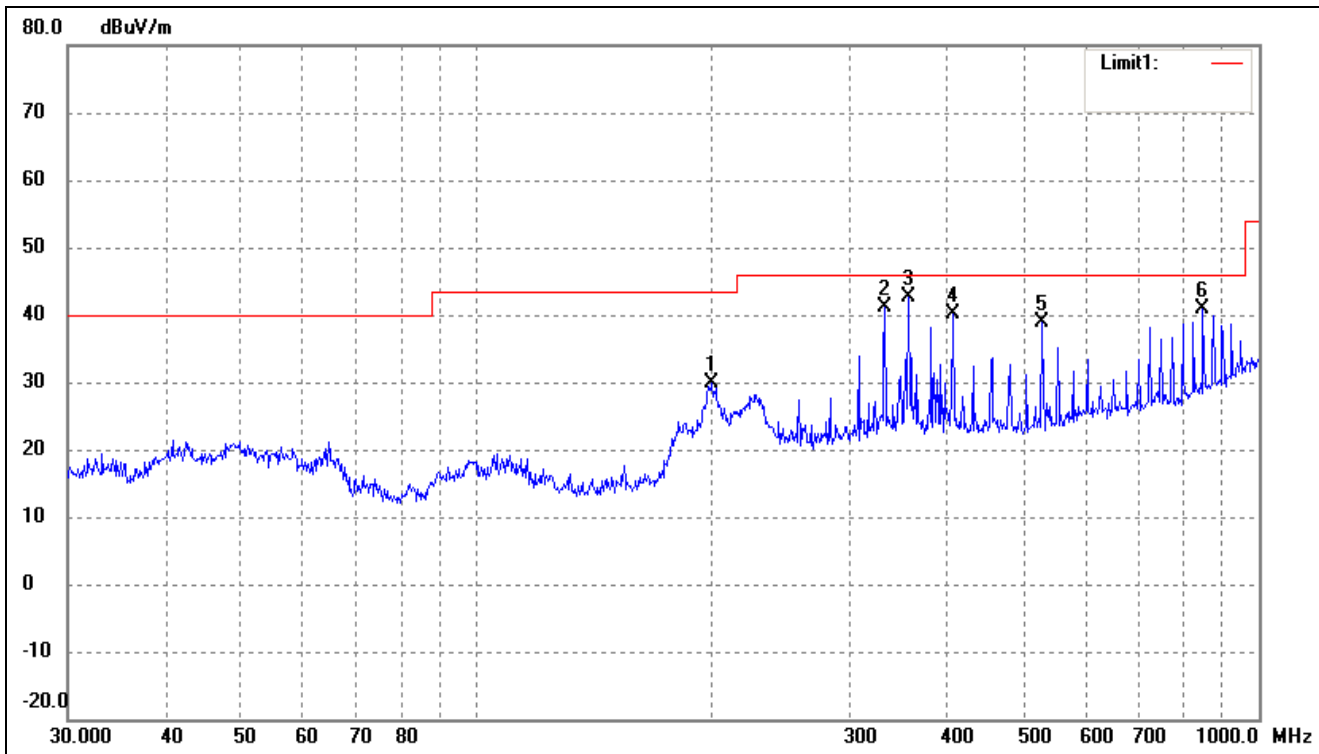
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	51.4807	35.02	-12.85	22.17	40.00	-17.83	271	100	peak
2	202.1005	40.62	-12.19	28.43	43.50	-15.07	295	100	peak
3	332.5187	48.04	-6.71	41.33	46.00	-4.67	88	100	peak
4	356.6758	48.82	-6.69	42.13	46.00	-3.87	110	100	peak
5	528.2458	44.06	-5.56	38.50	46.00	-7.50	292	100	peak
6	848.0563	41.57	-0.28	41.29	46.00	-4.71	118	100	peak

802.11b_11Mbps			
Test Channel	Middle	Polarity:	Vertical



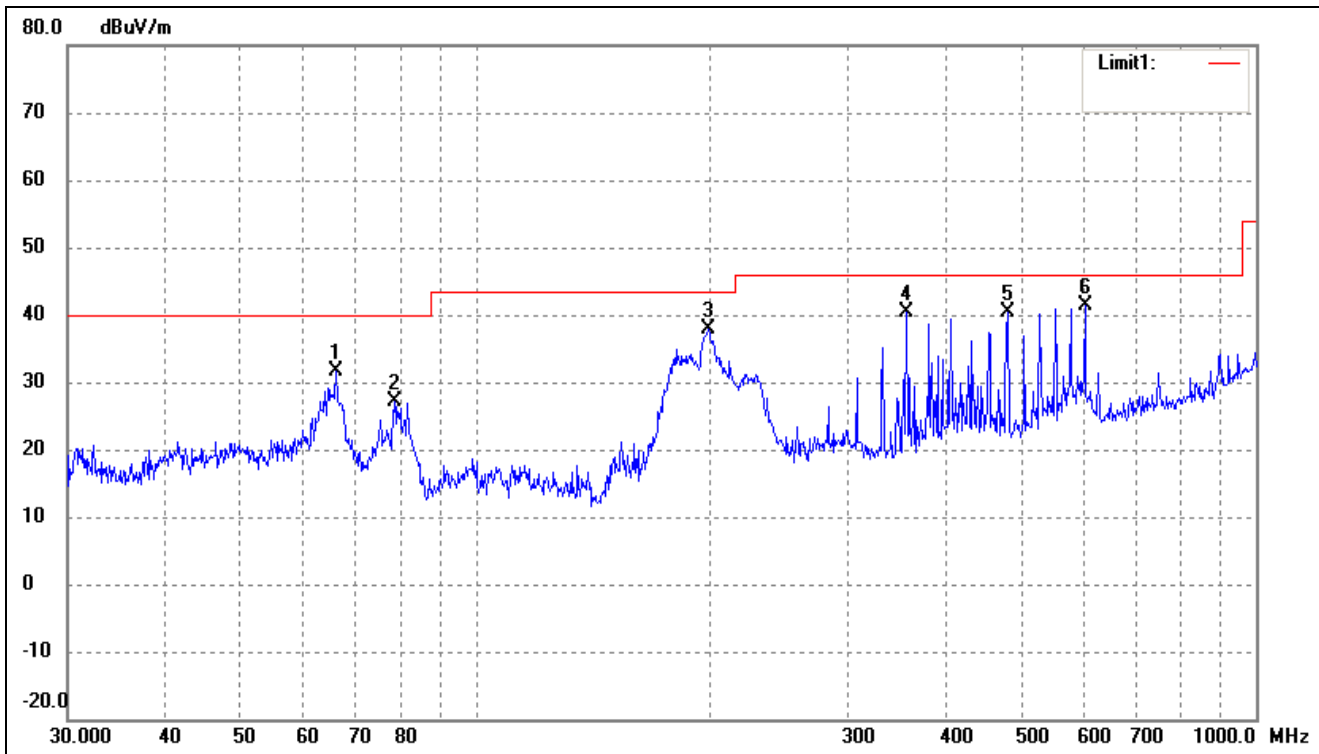
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	66.2662	46.05	-15.73	30.32	40.00	-9.68	150	100	peak
2	197.2001	50.07	-12.43	37.64	43.50	-5.86	107	100	peak
3	356.6758	46.81	-6.69	40.12	46.00	-5.88	89	100	peak
4	480.5276	46.28	-6.13	40.15	46.00	-5.85	293	100	peak
5	528.2458	46.76	-5.56	41.20	46.00	-4.80	189	100	peak
6	578.6699	44.54	-4.45	40.09	46.00	-5.91	339	100	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	199.9856	41.98	-12.10	29.88	43.50	-13.62	103	100	peak
2	332.5187	47.82	-6.71	41.11	46.00	-4.89	127	100	peak
3	356.6758	49.37	-6.69	42.68	46.00	-3.32	106	100	peak
4	406.0880	46.36	-6.34	40.02	46.00	-5.98	124	100	peak
5	528.2458	44.34	-5.56	38.78	46.00	-7.22	168	100	peak
6	848.0563	41.23	-0.28	40.95	46.00	-5.05	320	100	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	66.2662	47.29	-15.73	31.56	40.00	-8.44	51	100	peak
2	78.6888	45.94	-18.75	27.19	40.00	-12.81	128	100	peak
3	198.5880	50.20	-12.27	37.93	43.50	-5.57	102	100	peak
4	356.6758	47.14	-6.69	40.45	46.00	-5.55	115	100	peak
5	480.5276	46.46	-6.13	40.33	46.00	-5.67	153	100	peak
6	603.5392	45.22	-3.95	41.27	46.00	-4.73	146	100	peak

- Spurious Emissions Below 1GHz
- Test Mode: 802.11b_11Mbps (worst case)

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	57.51	-3.87	53.64	74	-20.36	H	PK
4824.000	41.63	-3.87	37.76	54	-16.24	H	AV
7236.000	62.60	1.14	63.74	74	-10.26	H	PK
7236.000	42.94	1.19	44.13	54	-9.87	H	AV
4824.000	61.50	-3.86	57.64	74	-16.36	V	PK
4824.000	46.53	-3.86	42.67	54	-11.33	V	AV
7236.000	58.65	1.10	59.75	74	-14.25	V	PK
7236.000	46.54	1.10	47.64	54	-6.36	V	AV
Middle Channel-2437MHz							
4874.000	59.76	-3.74	56.02	74	-17.98	H	PK
4874.000	43.85	-3.74	40.11	54	-13.89	H	AV
7311.000	57.61	1.47	59.08	74	-14.92	H	PK
7311.000	42.06	1.47	43.53	54	-10.47	H	AV
4874.000	62.08	-3.74	58.34	74	-15.66	V	PK
4874.000	52.57	-3.74	48.83	54	-5.17	V	AV
7311.000	63.56	1.47	65.03	74	-8.97	V	PK
7311.000	42.03	1.47	43.50	54	-10.50	V	AV
High Channel-2462MHz							
4924.000	55.66	-3.59	52.07	74	-21.93	H	PK
4924.000	40.64	-3.59	37.05	54	-16.95	H	AV
7386.000	56.87	1.79	58.66	74	-15.34	H	PK
7386.000	42.23	1.79	44.02	54	-9.98	H	AV
4924.000	64.44	-3.59	60.85	74	-13.15	V	PK
4924.000	49.31	-3.59	45.72	54	-8.28	V	AV
7386.000	62.23	1.79	64.02	74	-9.98	V	PK
7386.000	46.34	1.79	48.13	54	-5.87	V	AV

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

9. Out of Band Emissions

9.1 Standard Applicable

According to §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Test Procedure

According to the KDB 558074D01 v05 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 v05 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

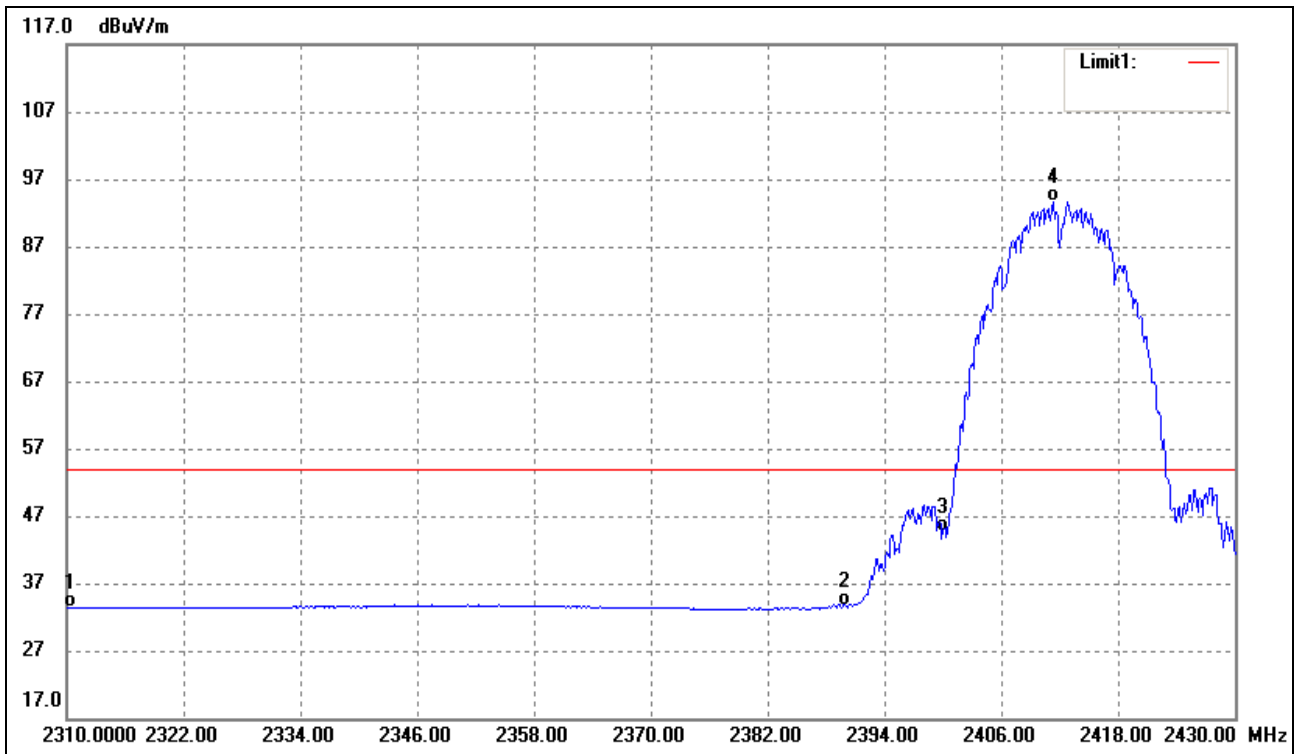
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

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

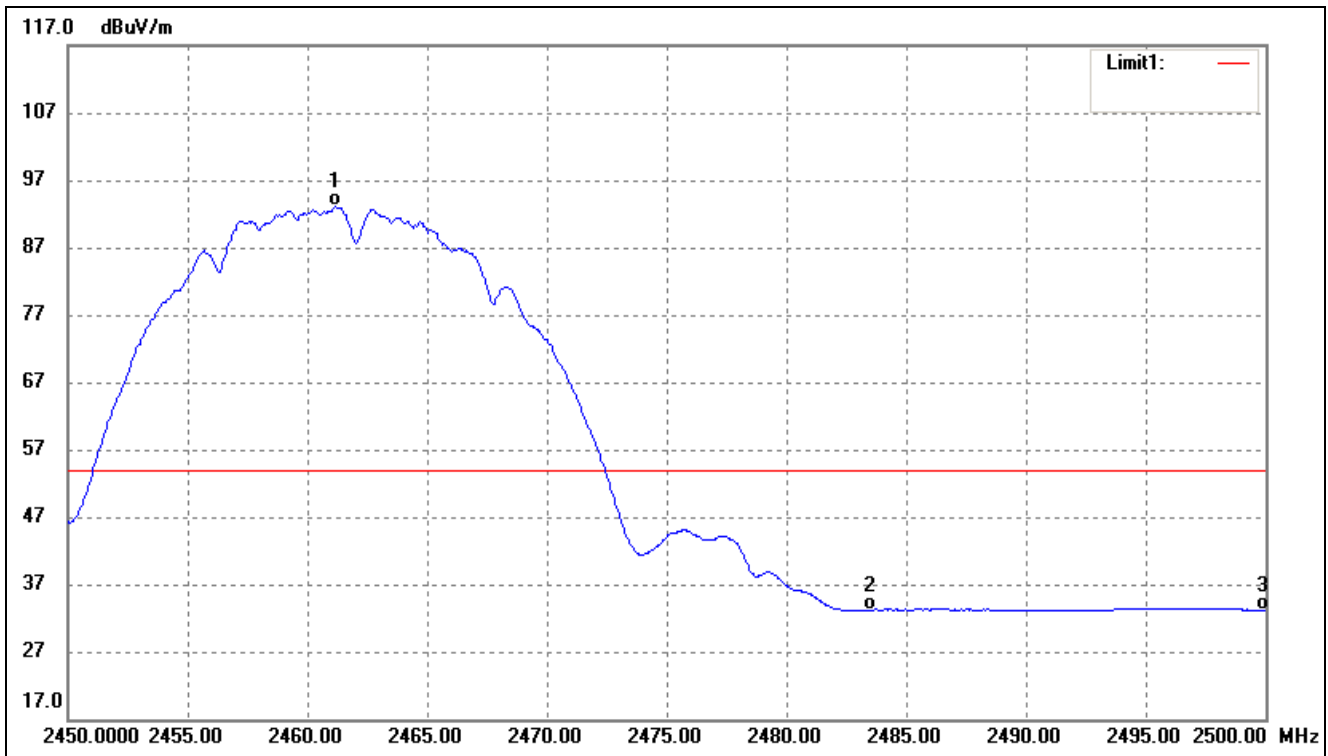
➤ Radiated test

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



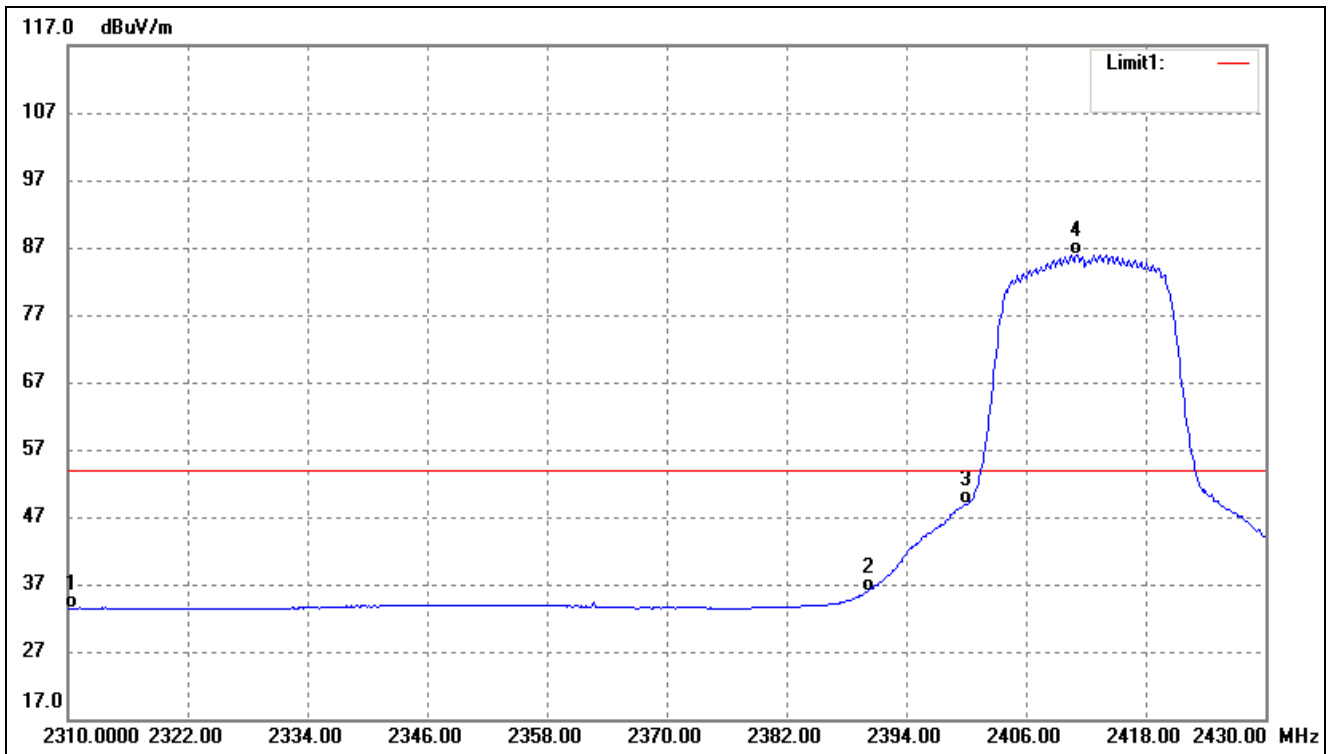
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.20	-7.78	33.42	54.00	-20.58	Average Detector
	2310.000	53.51	-7.78	45.73	74.00	-28.27	Peak Detector
2	2390.000	41.06	-7.32	33.74	54.00	-20.26	Average Detector
	2390.000	53.64	-7.32	46.32	74.00	-27.68	Peak Detector
3	2400.000	51.90	-7.26	44.64	Delta=48.97dBc		Average Detector
4	2411.400	100.80	-7.19	93.61			Average Detector

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



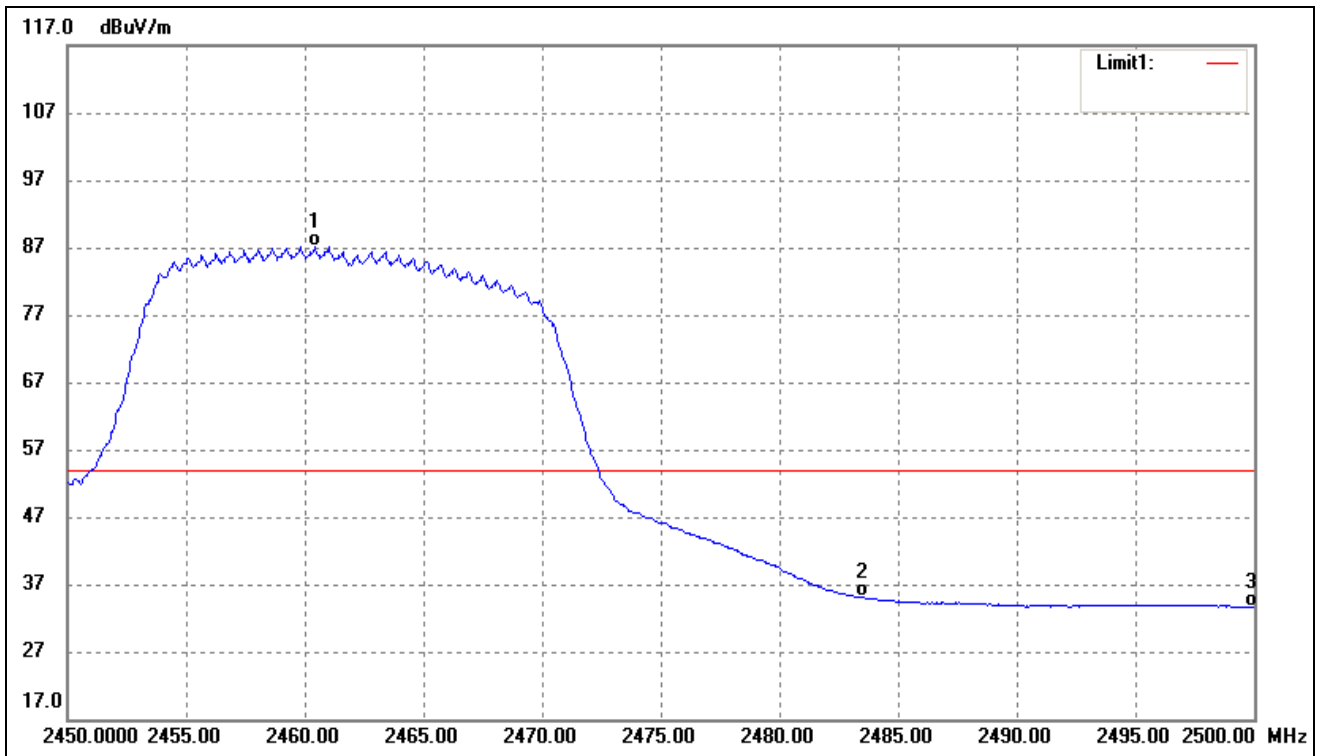
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2461.150	99.99	-6.90	93.09	/	/	Average Detector
	2460.500	107.16	-6.90	100.26	/	/	Peak Detector
2	2483.500	39.98	-6.77	33.21	54.00	-20.79	Average Detector
	2483.500	54.27	-6.77	47.50	74.00	-26.50	Peak Detector
3	2500.000	39.80	-6.67	33.13	54.00	-20.87	Average Detector
	2500.000	53.21	-6.67	46.54	74.00	-27.46	Peak Detector

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



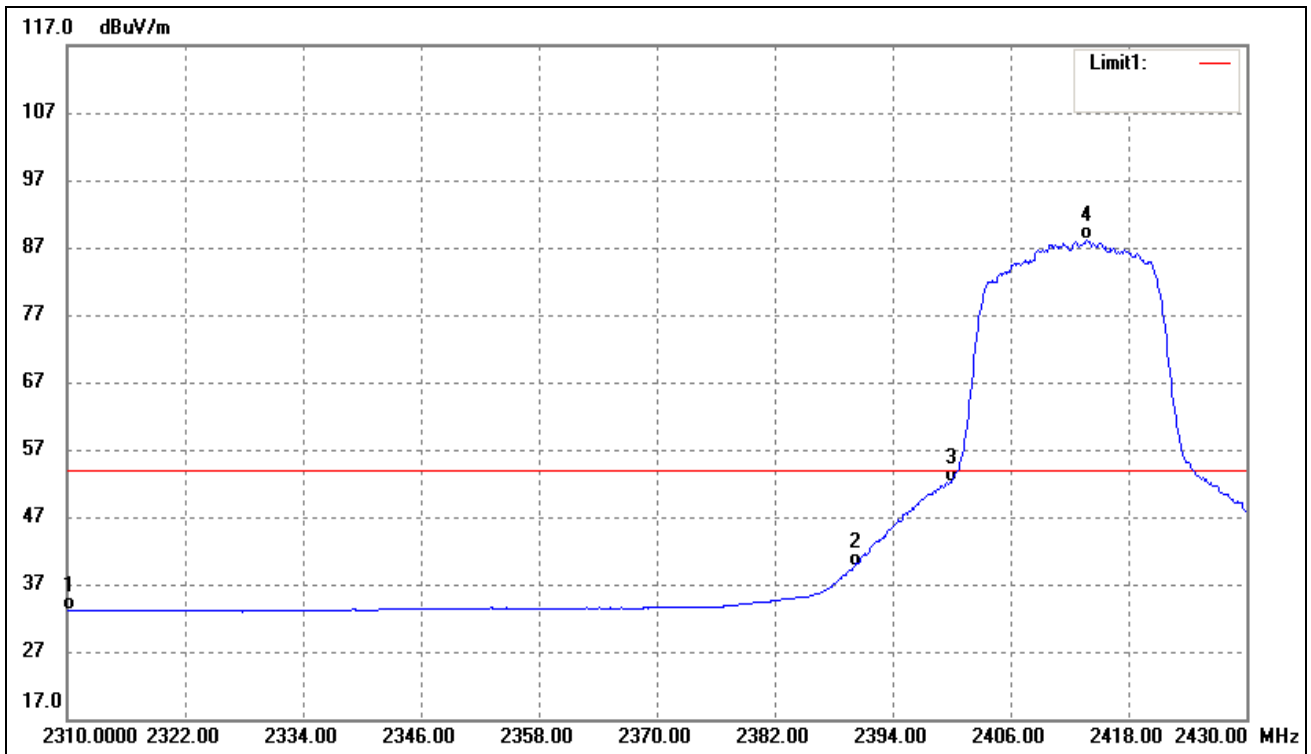
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.28	-7.78	33.50	54.00	-20.50	Average Detector
	2310.000	52.95	-7.78	45.17	74.00	-28.83	Peak Detector
2	2390.000	43.25	-7.32	35.93	54.00	-18.07	Average Detector
	2390.000	64.40	-7.32	57.08	74.00	-16.92	Peak Detector
3	2400.000	56.04	-7.26	48.78	Delta=37.21dBc		Average Detector
4	2411.040	93.18	-7.19	85.99			Average Detector

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



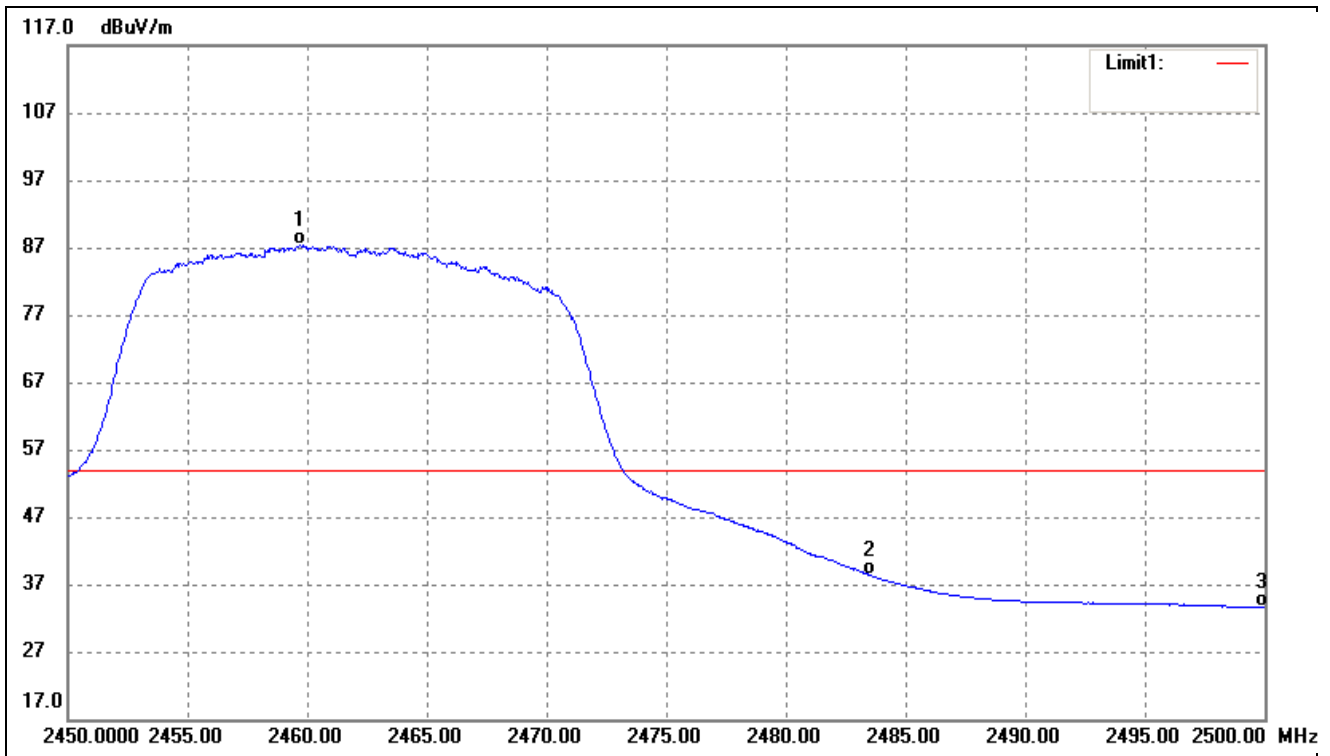
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.400	93.94	-6.90	87.04	/	/	Average Detector
	2457.300	107.76	-6.92	100.84	/	/	Peak Detector
2	2483.500	41.89	-6.77	35.12	54.00	-19.88	Average Detector
	2483.500	55.03	-6.77	48.26	74.00	-25.74	Peak Detector
3	2500.000	40.36	-6.67	33.69	54.00	-20.31	Average Detector
	2500.000	51.39	-6.67	44.72	74.00	-29.28	Peak Detector

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



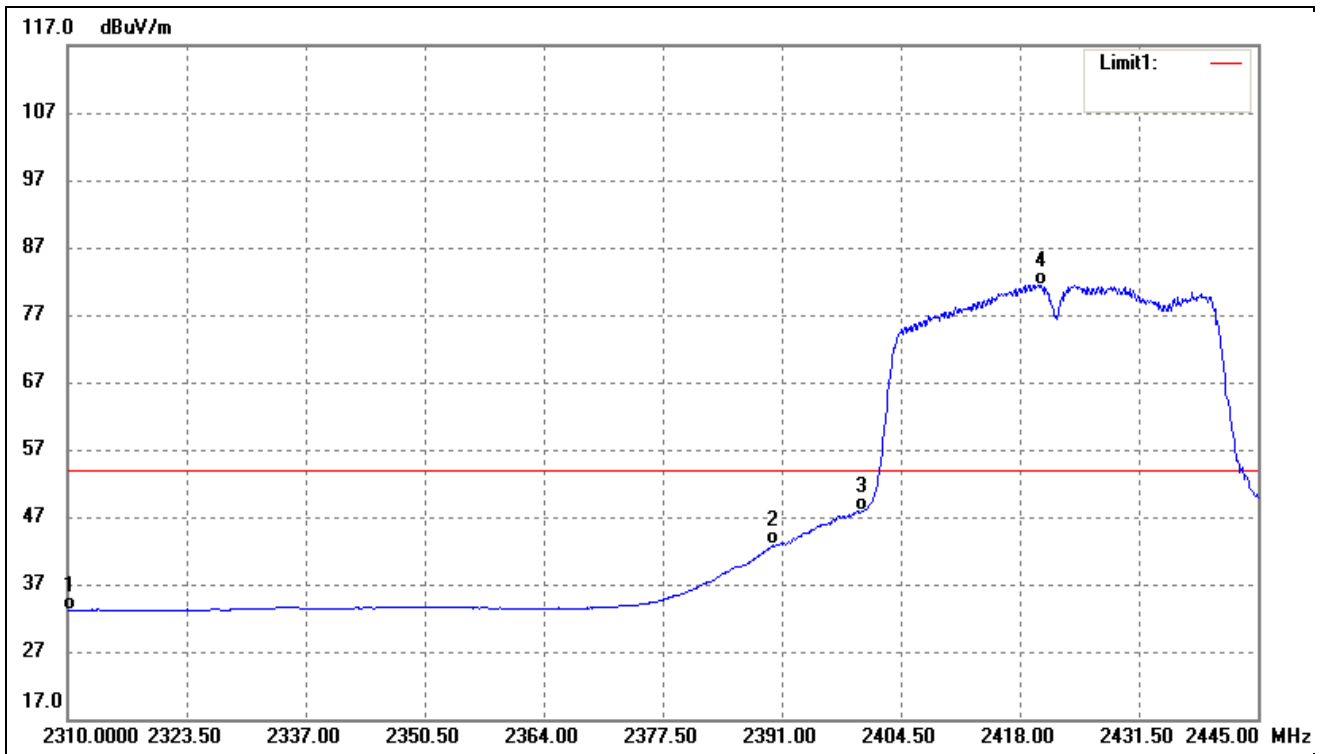
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	40.87	-7.78	33.09	54.00	-20.91	Average Detector
	2310.000	52.43	-7.78	44.65	74.00	-29.35	Peak Detector
2	2390.000	46.92	-7.32	39.60	54.00	-14.40	Average Detector
	2390.000	64.50	-7.32	57.18	74.00	-16.82	Peak Detector
3	2400.000	59.46	-7.26	52.20	Delta=35.83dBc		Average Detector
4	2413.800	95.21	-7.18	88.03			Average Detector

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



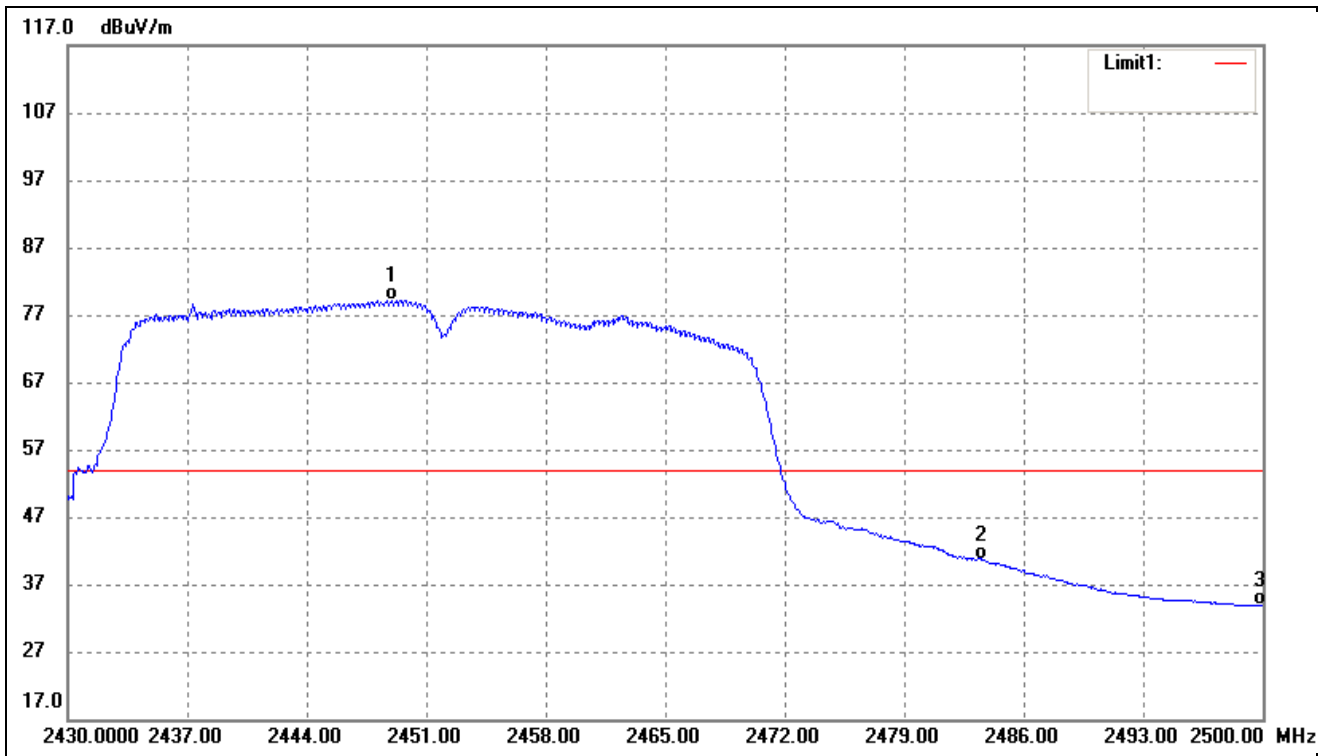
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2459.700	94.23	-6.90	87.33	/	/	Average Detector
	2457.400	107.24	-6.92	100.32	/	/	Peak Detector
2	2483.500	45.16	-6.77	38.39	54.00	-15.61	Average Detector
	2483.500	58.37	-6.77	51.60	74.00	-22.40	Peak Detector
3	2500.000	40.26	-6.67	33.59	54.00	-20.41	Average Detector
	2500.000	53.20	-6.67	46.53	74.00	-27.47	Peak Detector

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.00	-7.78	33.22	54.00	-20.78	Average Detector
	2310.000	53.72	-7.78	45.94	74.00	-28.06	Peak Detector
2	2390.000	50.12	-7.32	42.80	54.00	-11.20	Average Detector
	2390.000	67.66	-7.32	60.34	74.00	-13.66	Peak Detector
3	2400.000	55.06	-7.26	47.80	Delta=33.65dBc		Average Detector
4	2420.430	88.59	-7.14	81.45			Peak Detector

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

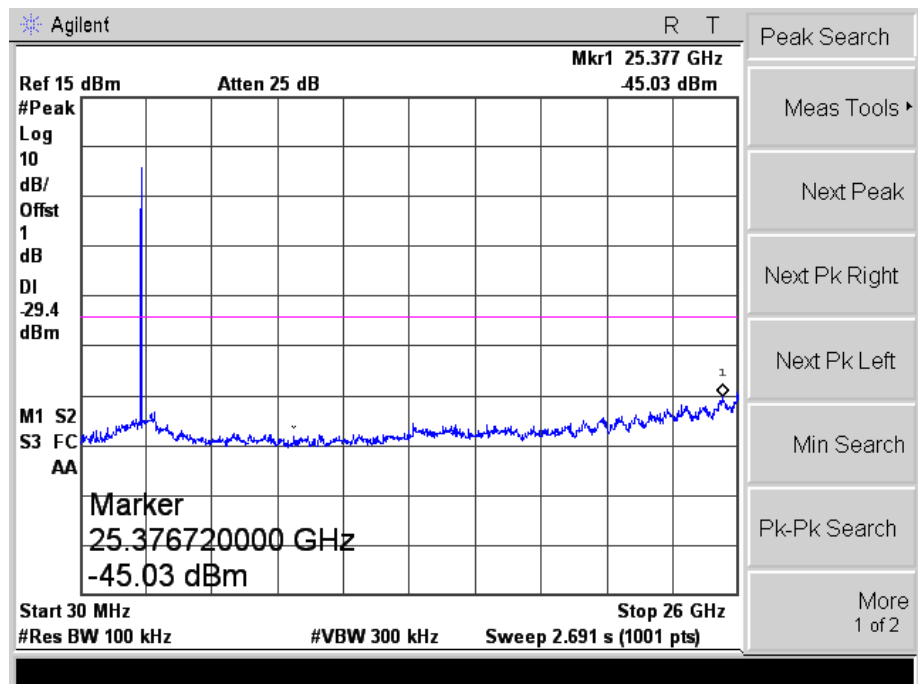
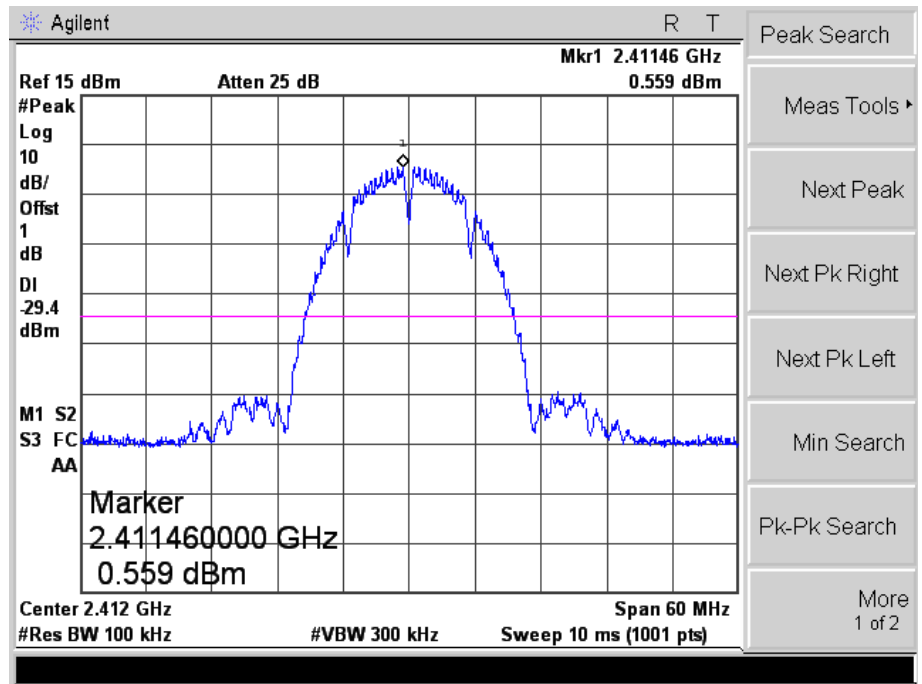


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2448.970	86.10	-6.97	79.13	/	/	Average Detector
	2448.760	105.82	-6.97	98.85	/	/	Peak Detector
2	2483.500	47.45	-6.77	40.68	54.00	-13.32	Average Detector
	2483.500	63.99	-6.77	57.22	74.00	-16.78	Peak Detector
3	2500.000	40.43	-6.67	33.76	54.00	-20.24	Average Detector
	2500.000	52.71	-6.67	46.04	74.00	-27.96	Peak Detector

➤ Conducted test

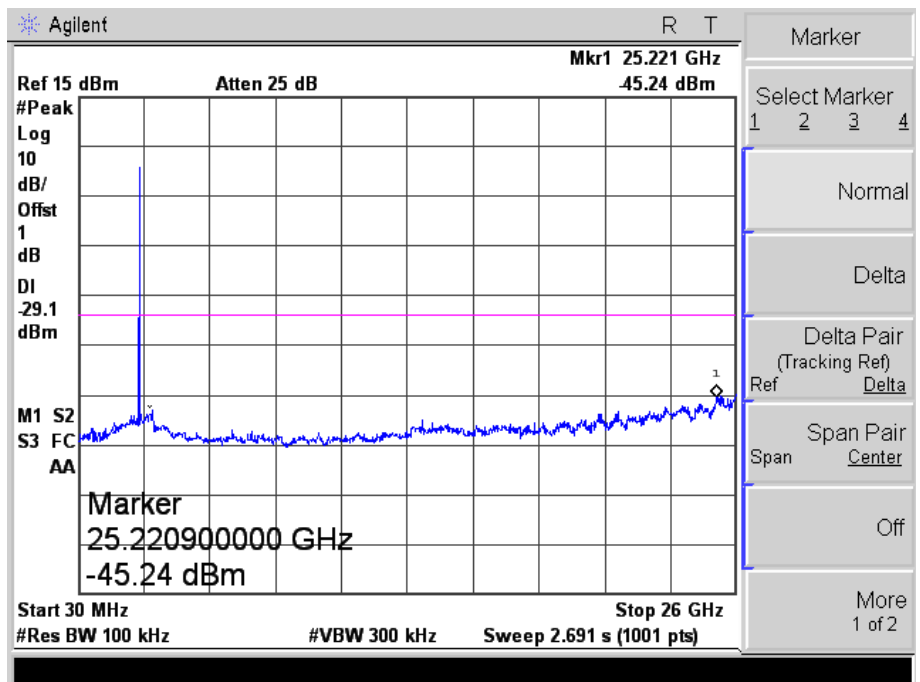
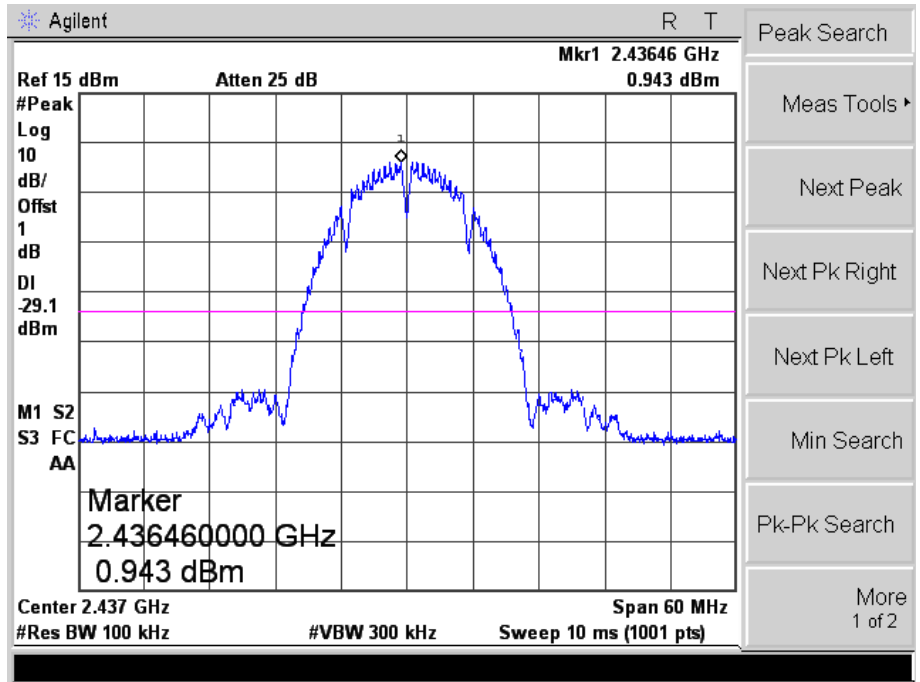
802.11b_11Mbps

Low



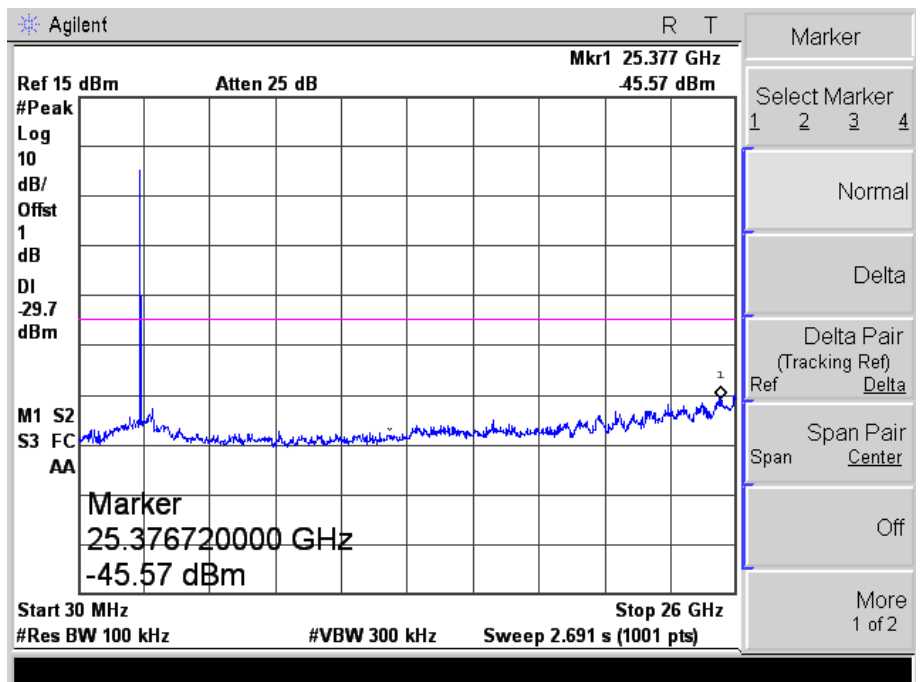
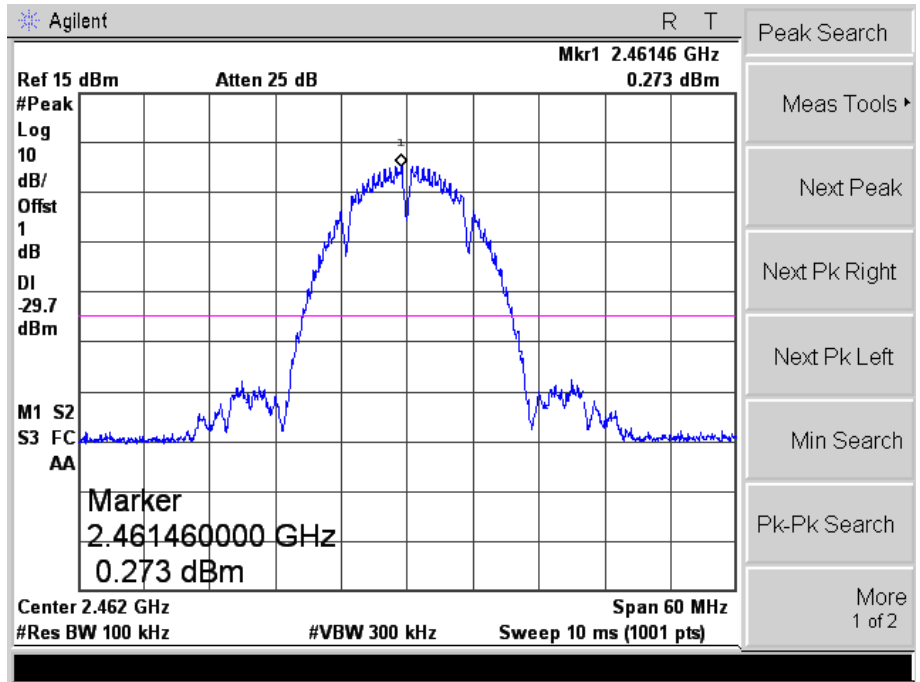
802.11b_11Mbps

Middle



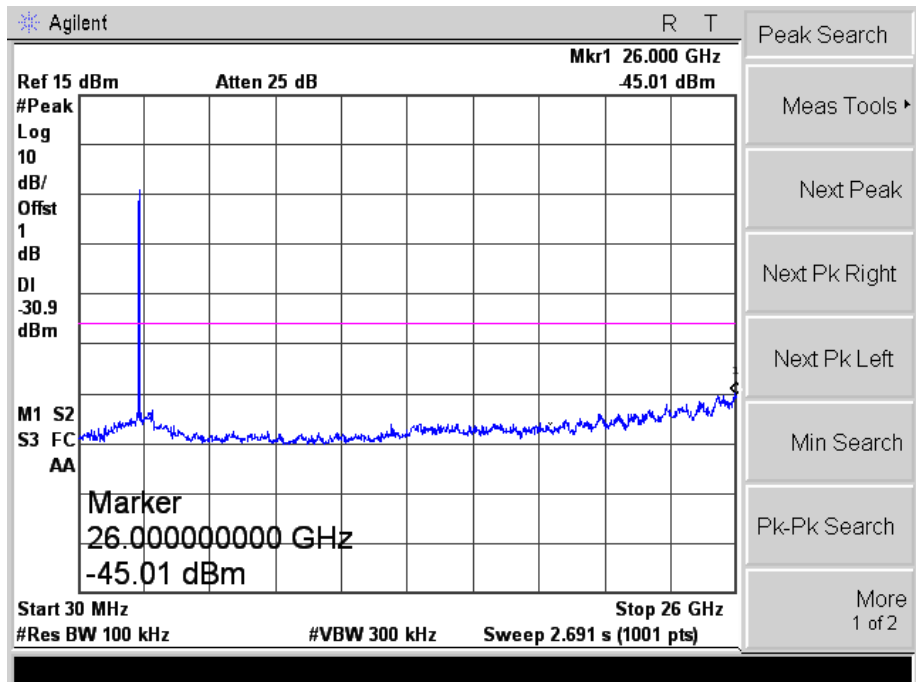
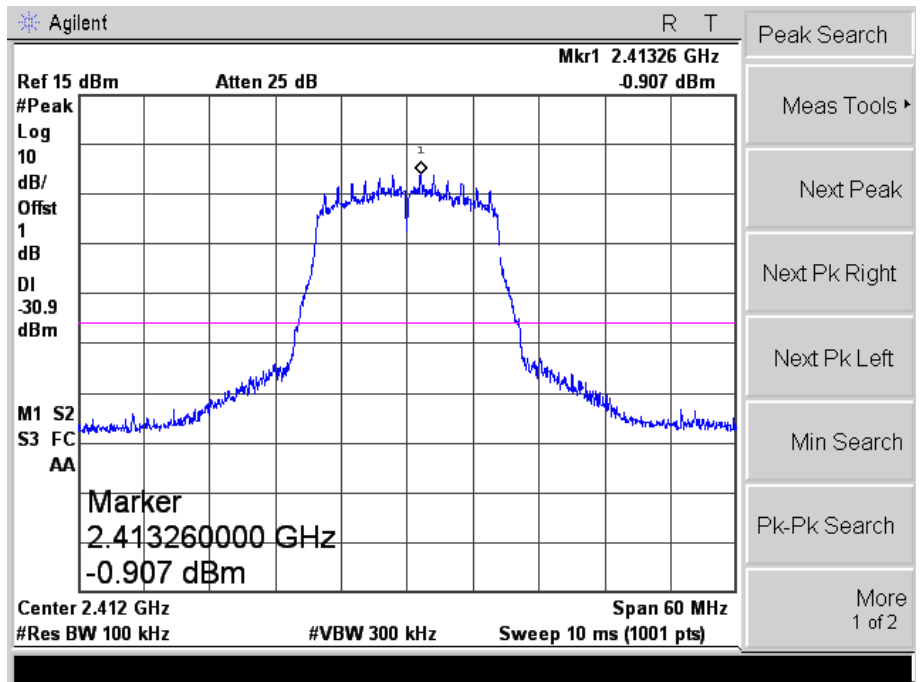
802.11b_11Mbps

High



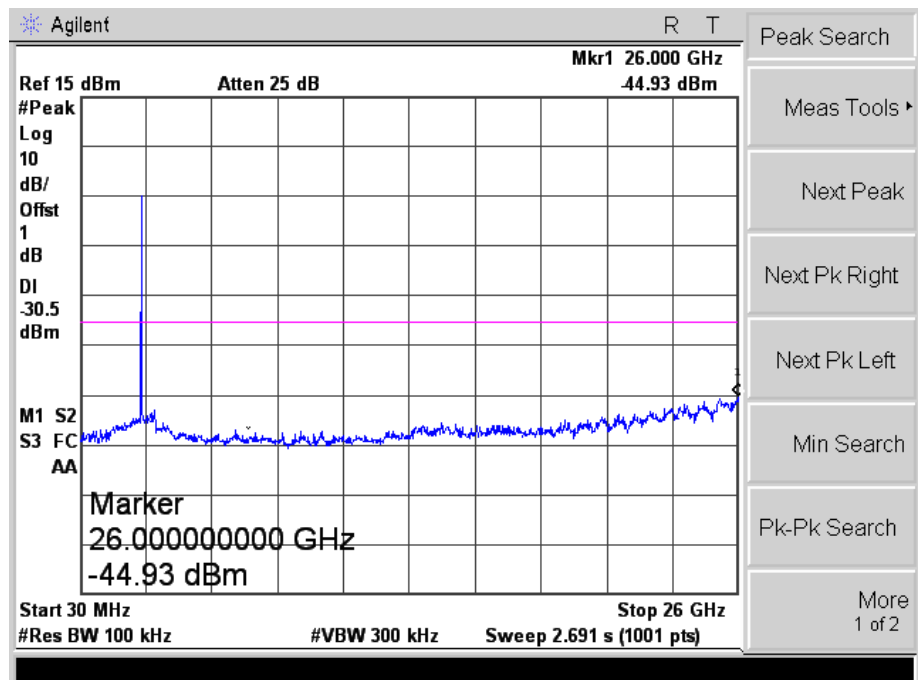
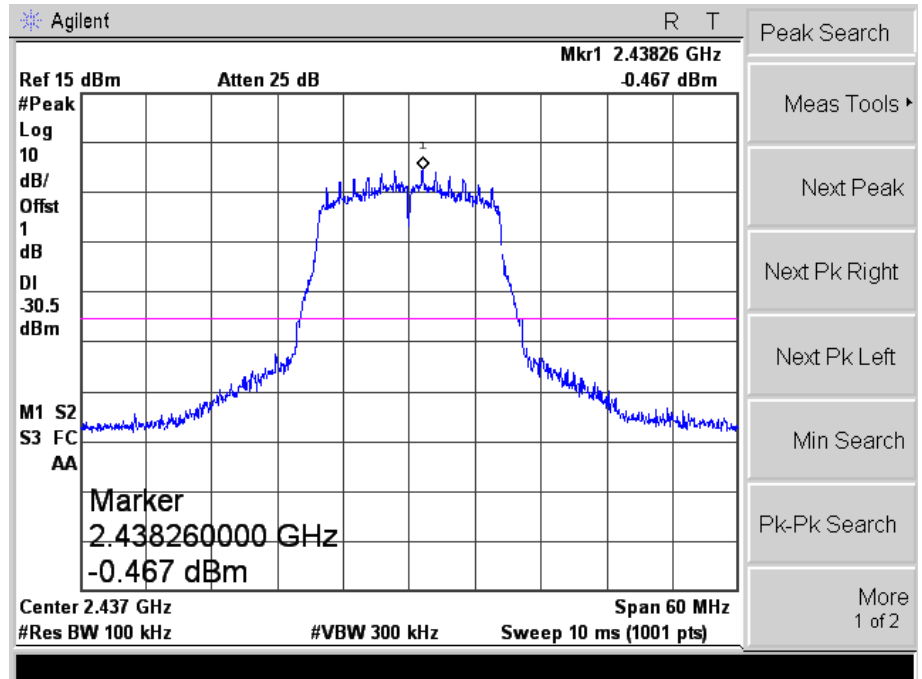
802.11g_54Mbps

Low



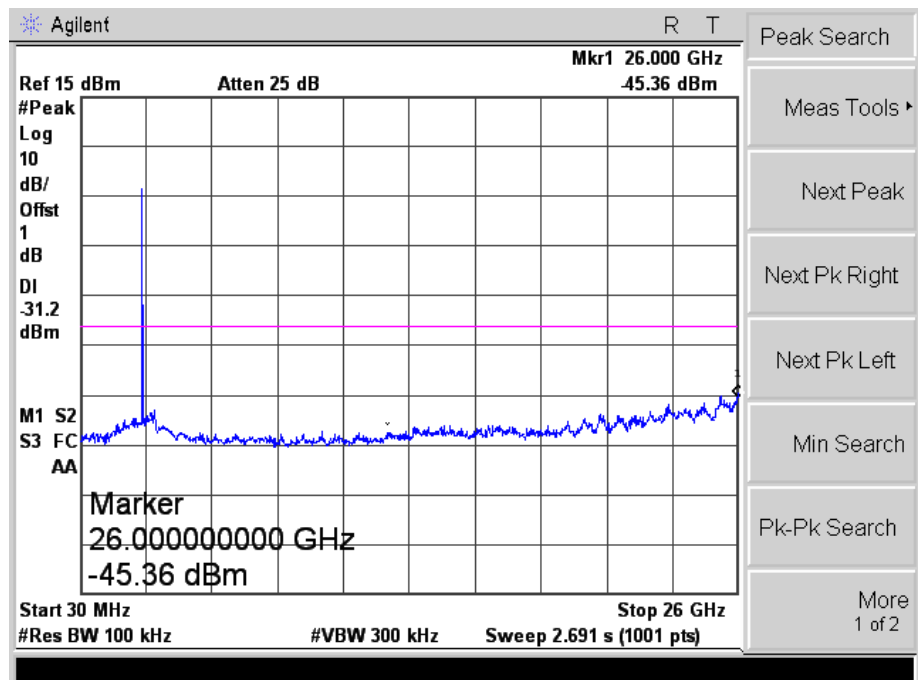
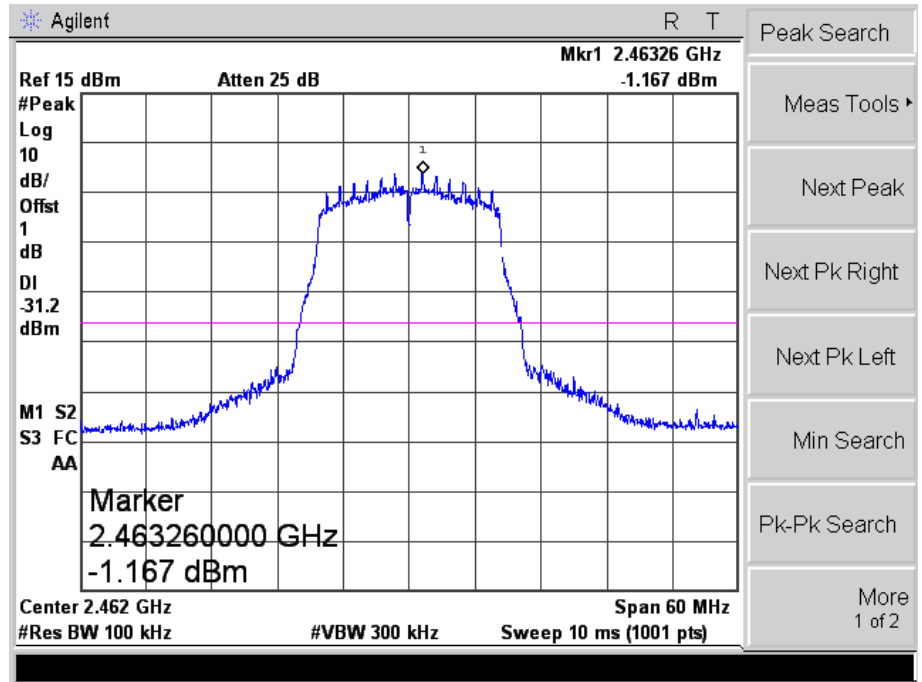
802.11g_54Mbps

Middle



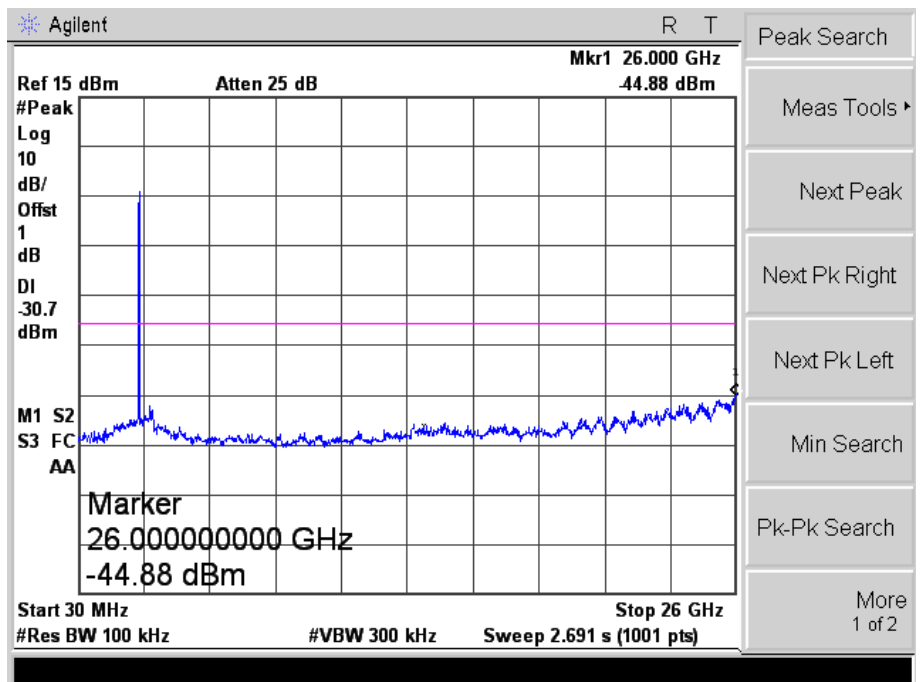
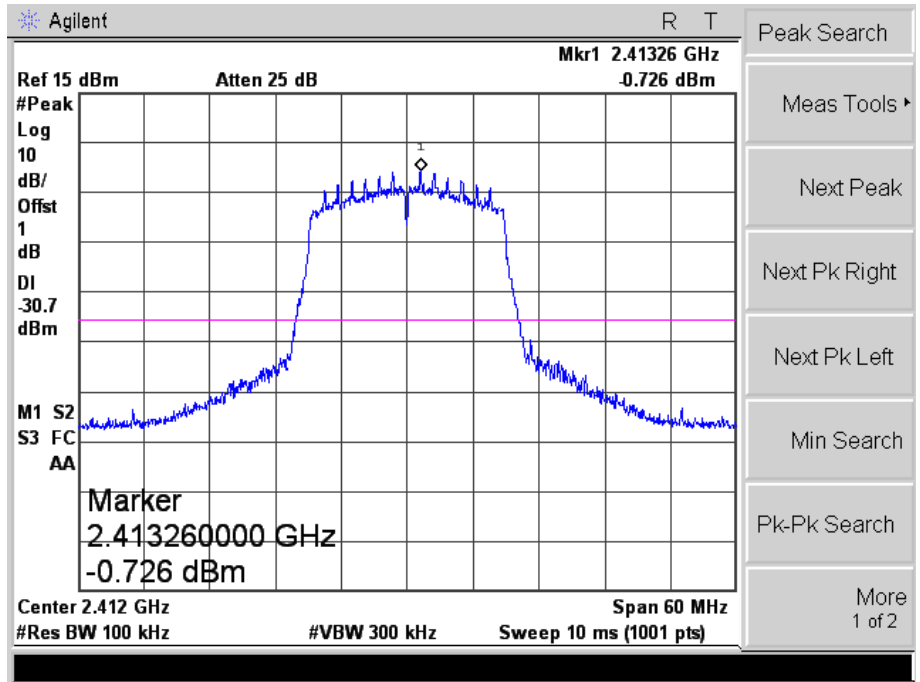
802.11g_54Mbps

High



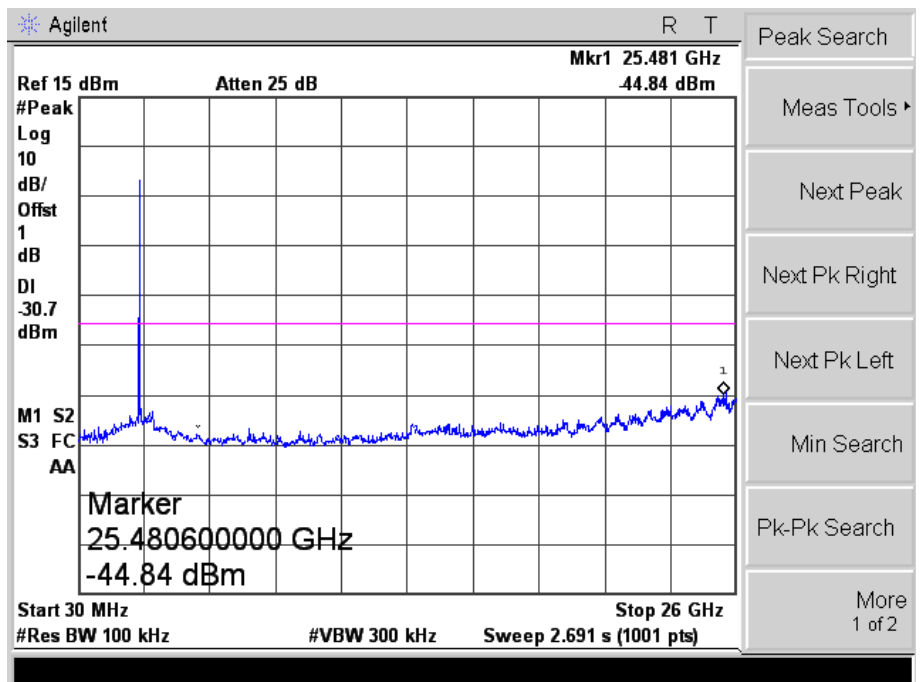
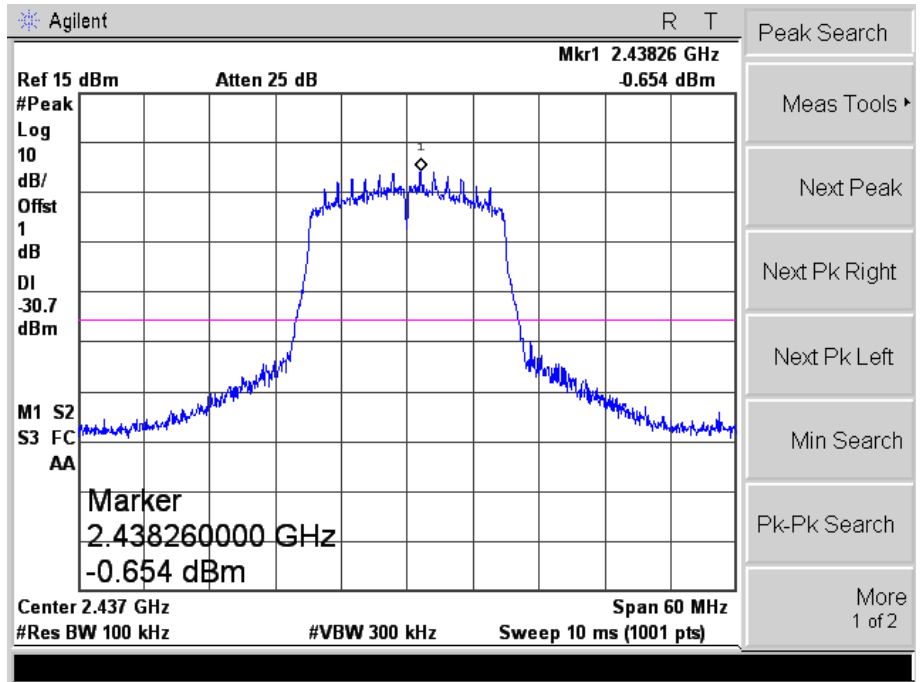
802.11n-HT20_MCS7

Low



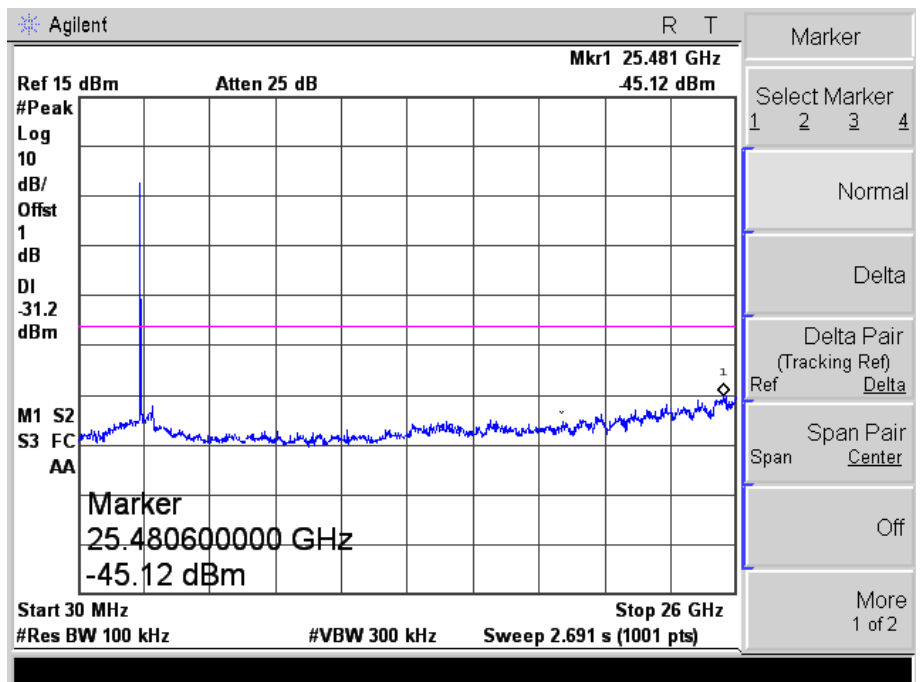
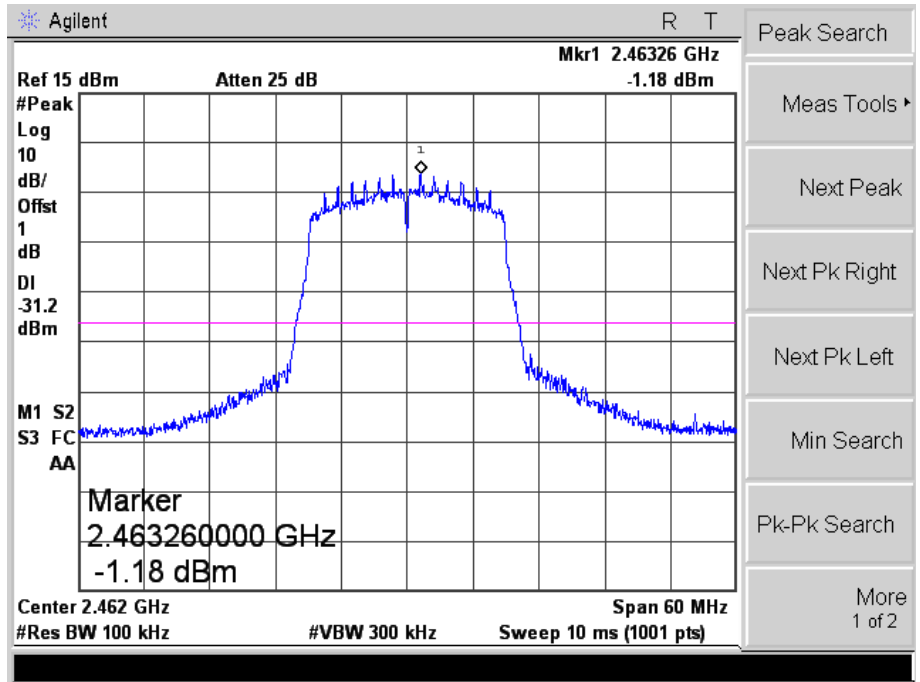
802.11n-HT20_MCS7

Middle



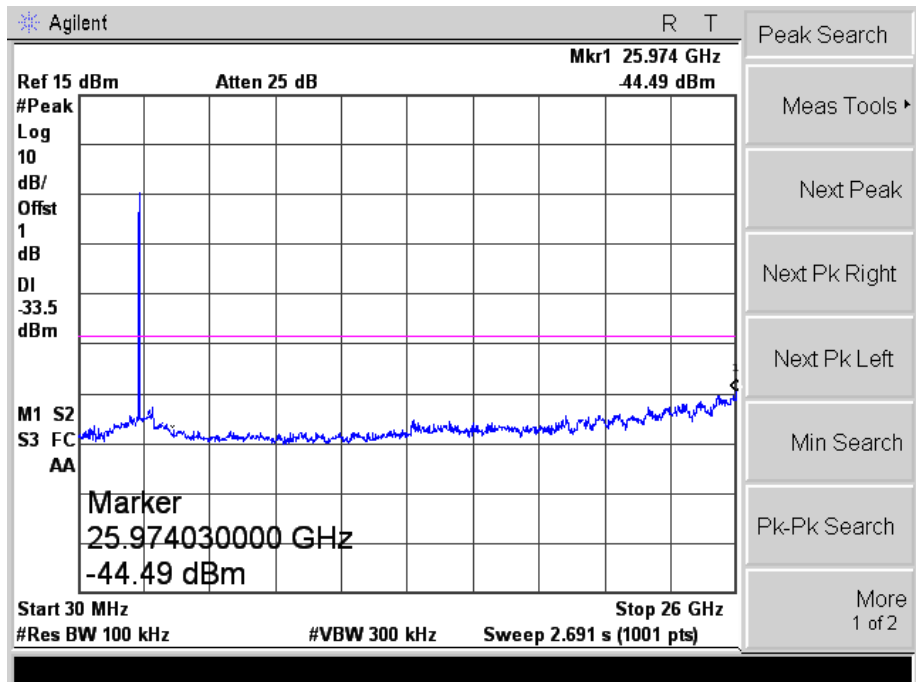
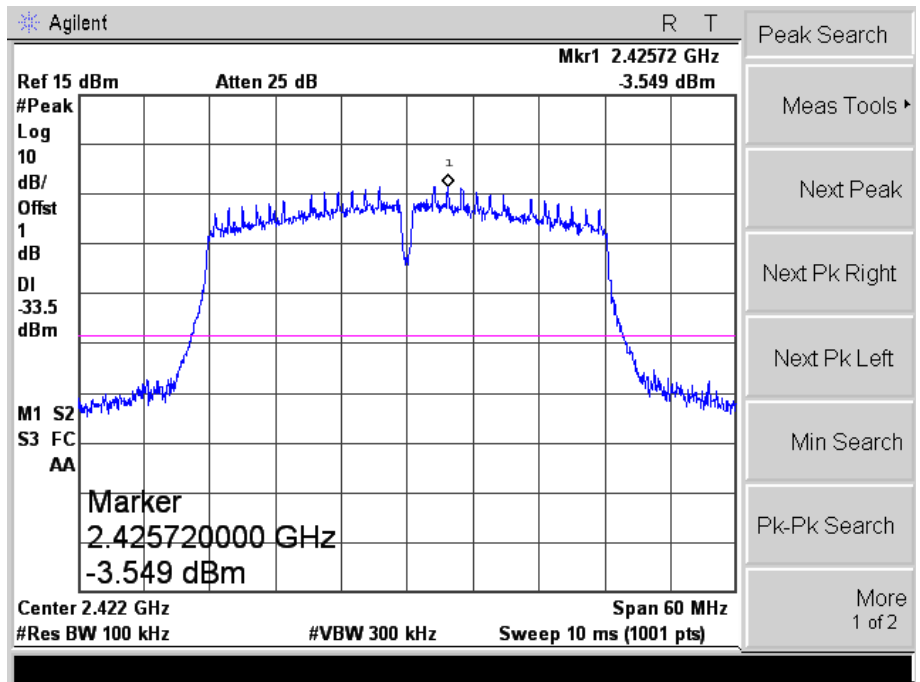
802.11n-HT20_MCS7

High



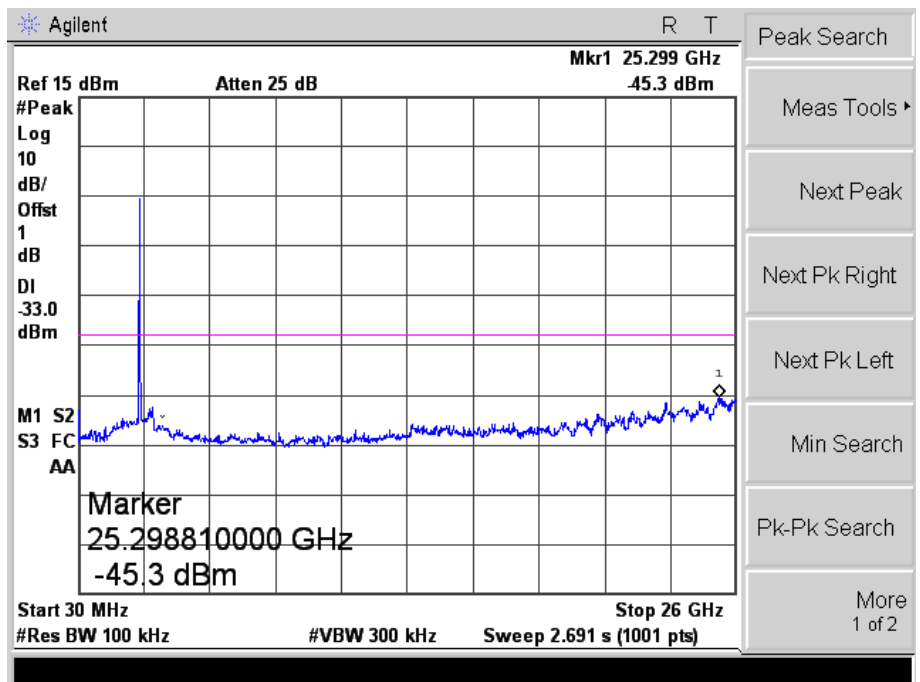
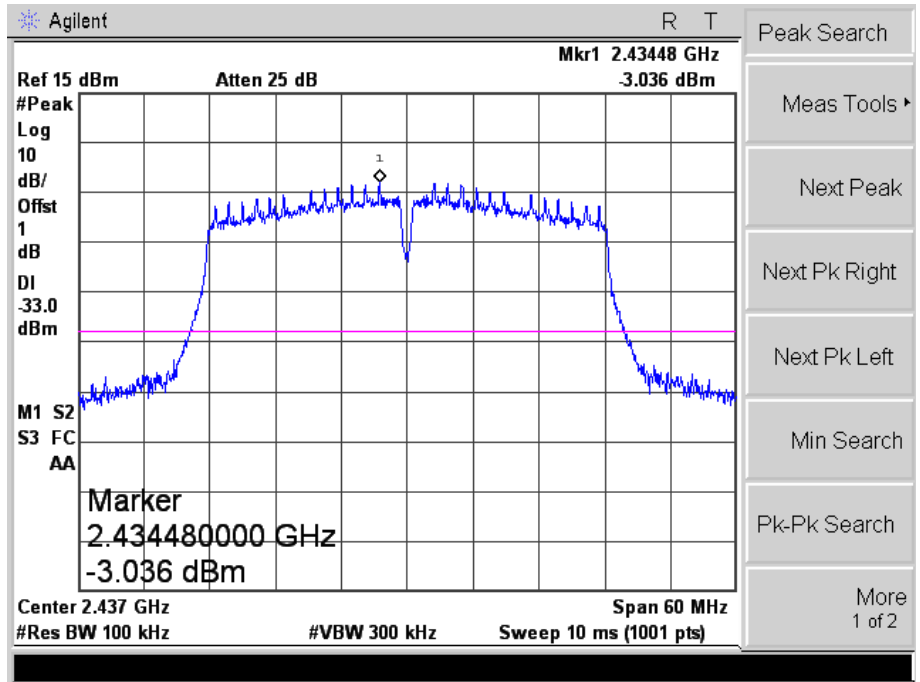
802.11n-HT40_MCS7

Low



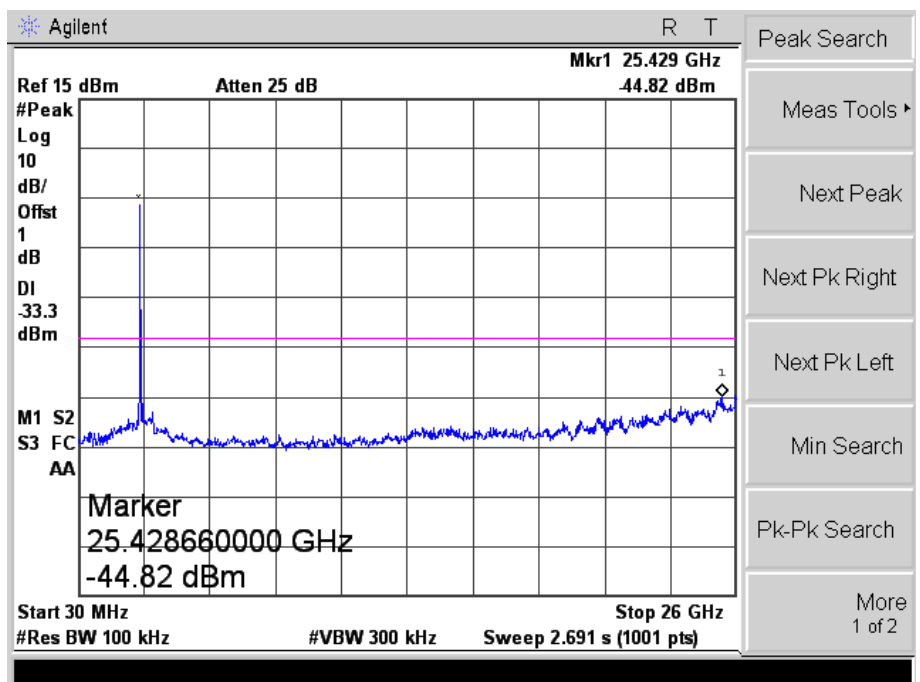
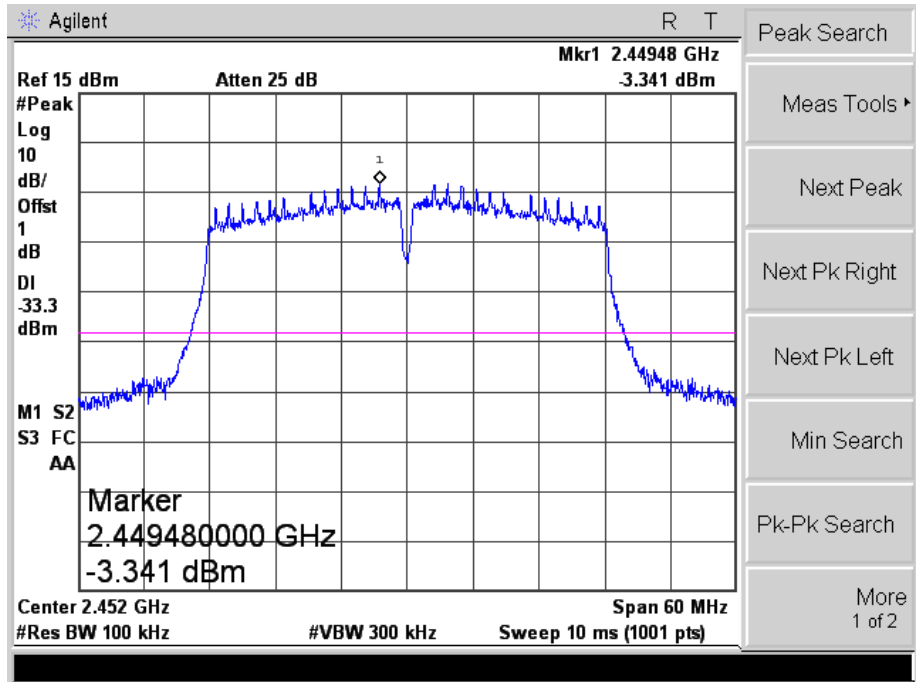
802.11n-HT40_MCS7

Middle



802.11n-HT40_MCS7

High



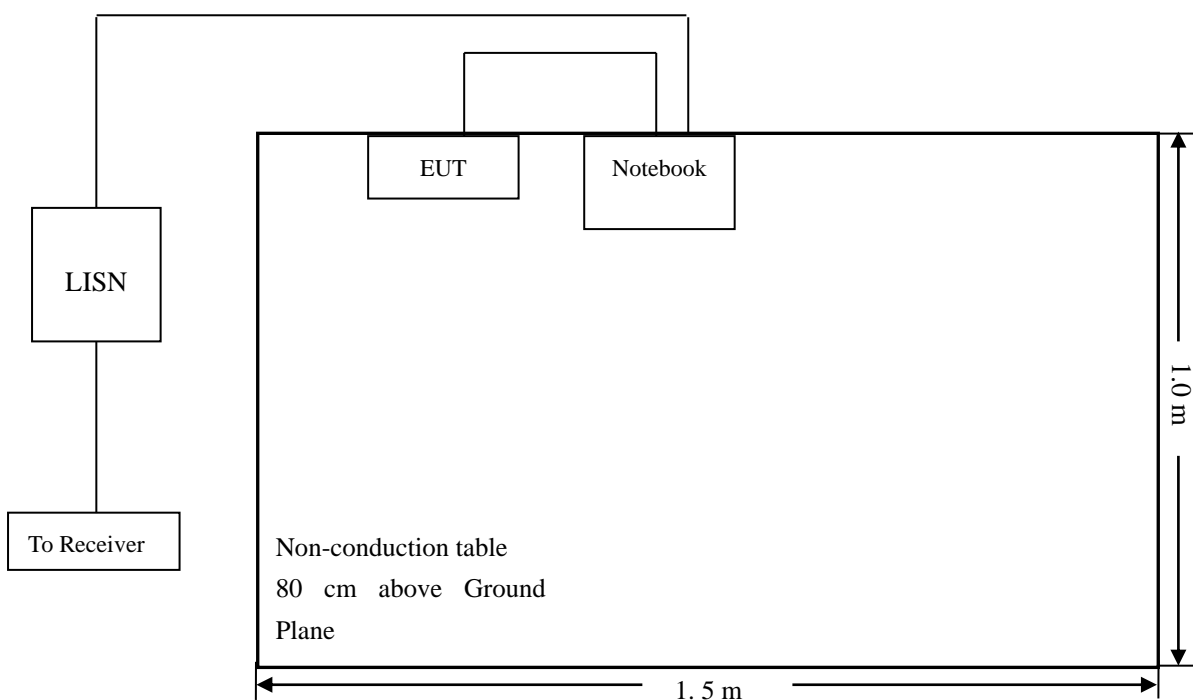
10. Conducted Emissions

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



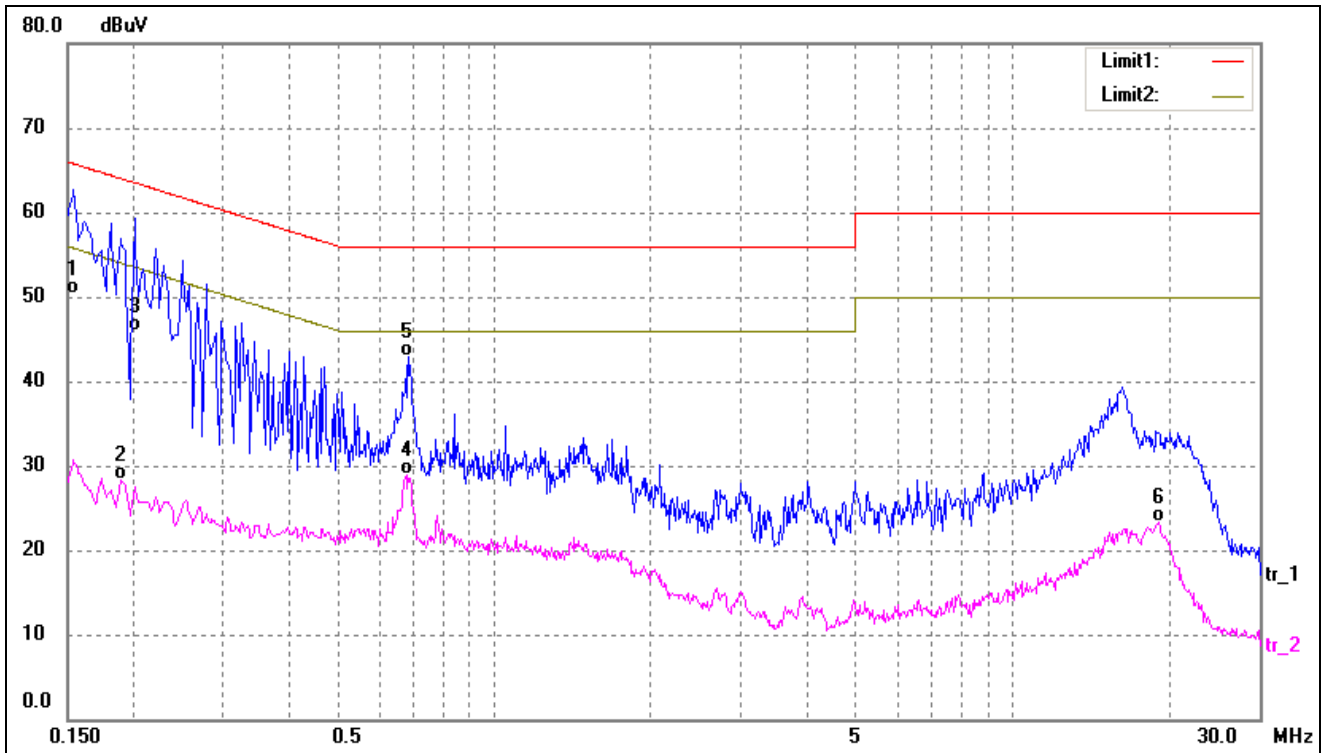
10.3 Test Receiver Setup

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

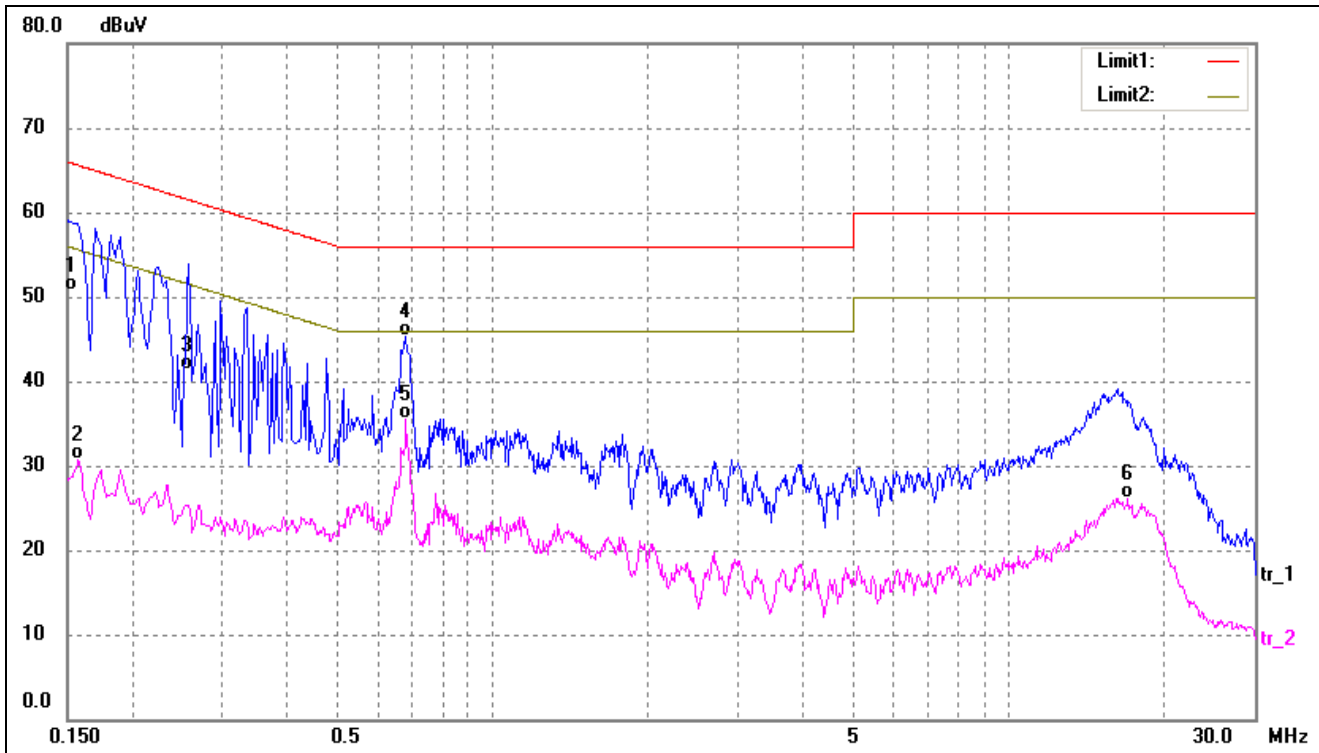
10.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1540	40.26	10.10	50.36	65.78	-15.42	QP
2	0.1900	18.23	10.12	28.35	54.04	-25.69	AVG
3	0.2020	35.79	10.12	45.91	63.53	-17.62	QP
4	0.6780	18.60	10.38	28.98	46.00	-17.02	AVG
5*	0.6860	32.51	10.39	42.90	56.00	-13.10	QP
6	19.1780	12.11	11.15	23.26	50.00	-26.74	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	40.69	10.10	50.79	66.00	-15.21	QP
2	0.1580	20.61	10.10	30.71	55.57	-24.86	AVG
3	0.2580	31.24	10.16	41.40	61.50	-20.10	QP
4	0.6780	34.98	10.38	45.36	56.00	-10.64	QP
5*	0.6820	25.12	10.38	35.50	46.00	-10.50	AVG
6	17.0860	15.06	11.09	26.15	50.00	-23.85	AVG

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