RF TEST REPORT

Test item	:	WI-FI Module
Model No.	:	TWFM-K301D
Order No.	:	DEMC1308-02483
Date of receipt	:	2013-08-09
Test duration	:	2013-08-23~ 2013-08-30
Date of issue	:	2013-09-02
Use of report	:	FCC Original Grant

Applicant : LG Innotek Co.,Ltd.
978-1, Jangduk-dong, Gwangsan-gu, Gwangju-City, South Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

Test specification	:	FCC Part 15 Subpart C 247 ANSI C63.10-2009, KDB558074 v03r01
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer JaeJin Lee	N/A	Deputy General Manager HongHee Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1309-0838	Sep. 02, 2013	Initial issue

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1. GENERAL INFORMATION

Applicant	:	LG Innotek Co.,Ltd.
Address	:	978-1, Jangduk-dong, Gwangsan-gu, Gwangju-City, South Korea
FCC ID	:	YZP-TWFMK301D
EUT	:	WI-FI Module
Model	:	TWFM-K301D
Additional Model(s)	:	N/A
Data of Test	:	2013-08-23 ~ 2013-08-30
Contact person	:	DukSuOh

2. EUT DESCRIPTION

Product	WI-FI Module
Model Name	TWFM-K301D
Power Supply	DC 3.3 V
Frequency Range	2.4GHz Band ▪ 802.11b/g/n(20MHz): 2412 ~ 2462 MHz ▪ 802.11n(40MHz): 2422~2452 MHz
Max. RF Output Power	2.4GHz Band ▪ 802.11b: 20.23 dBm ▪ 802.11g: 21.73 dBm ▪ 802.11n (HT20): 20.49 dBm ▪ 802.11n (HT40): 19.97 dBm
Modulation Type	802.11b: DSSS/CCK 802.11g/n(HT20/HT40): OFDM
Antenna Specification	Internal PIFA Antenna (1TX 1RX) ▪ 2.4GHz Band Max. peak gain: 1.950 dBi

3. SUMMARY OF TESTS

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.247(a)	RSS-210 [A8.2]	6 dB Bandwidth	> 500 kHz	Conducted	**C**
15.247(b)	RSS-210 [A8.4]	Transmitter Output Power	< 1Watt		**C**
15.247(d)	RSS-210 [A8.5]	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		**C**
15.247(e)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz		**C**
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	RSS-Gen4.6.1		**NA**
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	<FCC 15.209 limits	Radiated	**C**Note.2
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	< FCC 15.207 limits	AC Line Conducted	**C**
15.203	-	Antenna Requirements	FCC 15.203	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: This test item was performed in each axis and the worst case data was reported.

4. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and KDB558074

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 GENERAL TEST PROCEDURES

Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10, the EUT is placed on the turntable, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes according to the requirements in Section 6.3 of ANSI C63.10.

4.4 DESCRIPTION OF TEST MODES

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : 678747

6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203
“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 beconsidered sufficient to comply with the provisions of this section.”

The antennas of this E.U.T are permanently attached on the board using soldering.
Therefore this E.U.T Complies with the requirement of §15.203

8. TEST RESULT

8.1 6dB Bandwidth

Test Requirements and limit, §15.247(a)& RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074.

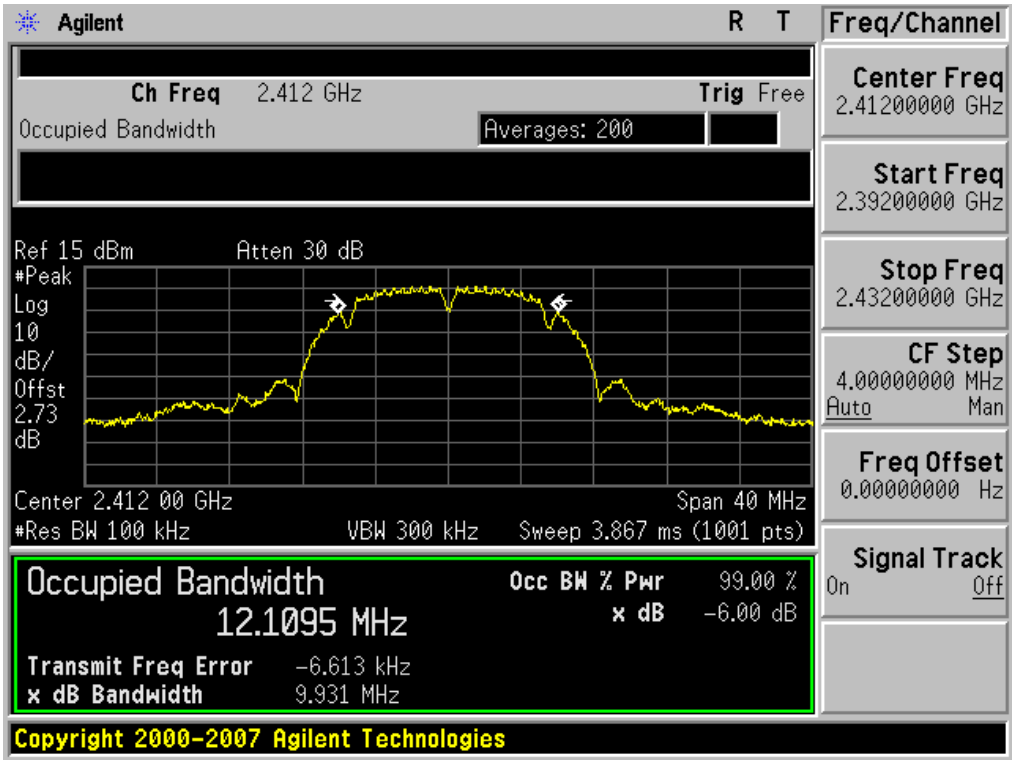
1. Set resolution bandwidth (RBW) = 100 KHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
   (RBW:100KHz/VBW:300KHz)
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associatedwith the two outermost amplitude points (upper and lower) that are attenuated by 6 dBrelative to the maximum level measured in the fundamental emission.

▣TEST RESULTS: Comply

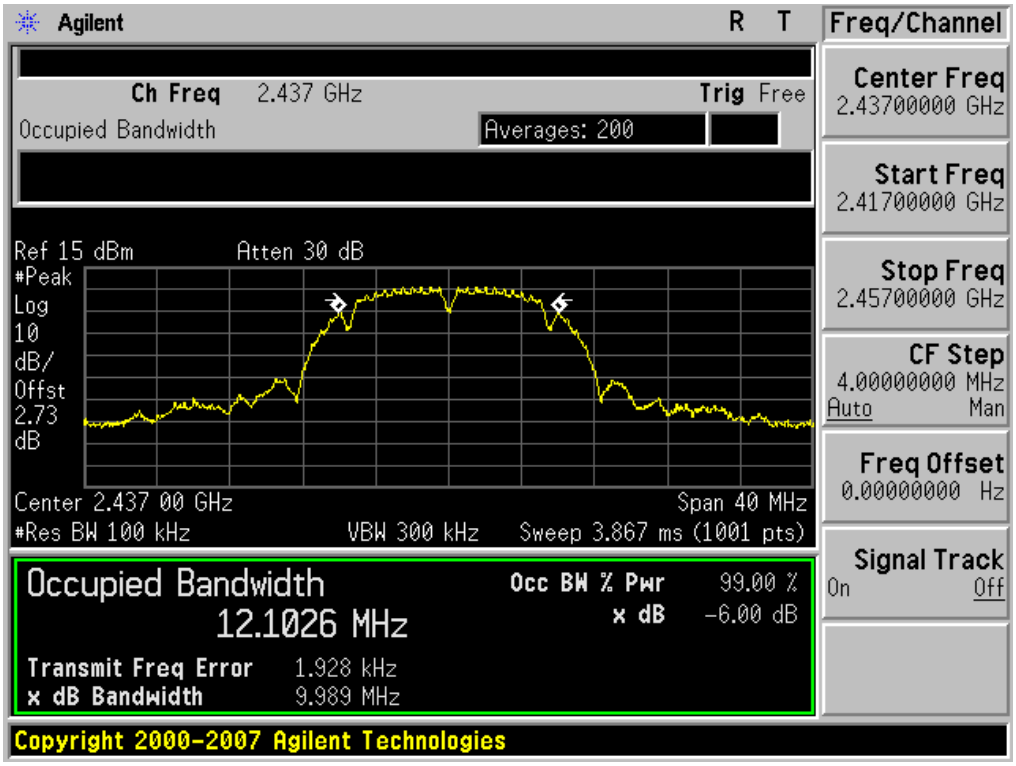
Test Mode	Data Rate	Frequency [MHz]	Test Results[MHz]
802.11b	1Mbps	2412	9.931
		2437	9.989
		2462	9.839
802.11g	6Mbps	2412	16.384
		2437	16.402
		2462	16.381
802.11n (20MHz)	MCS0	2412	17.437
		2437	17.356
		2462	17.068
802.11n (40MHz)	MCS0	2422	35.788
		2437	36.105
		2452	35.775

▣RESULT PLOTS

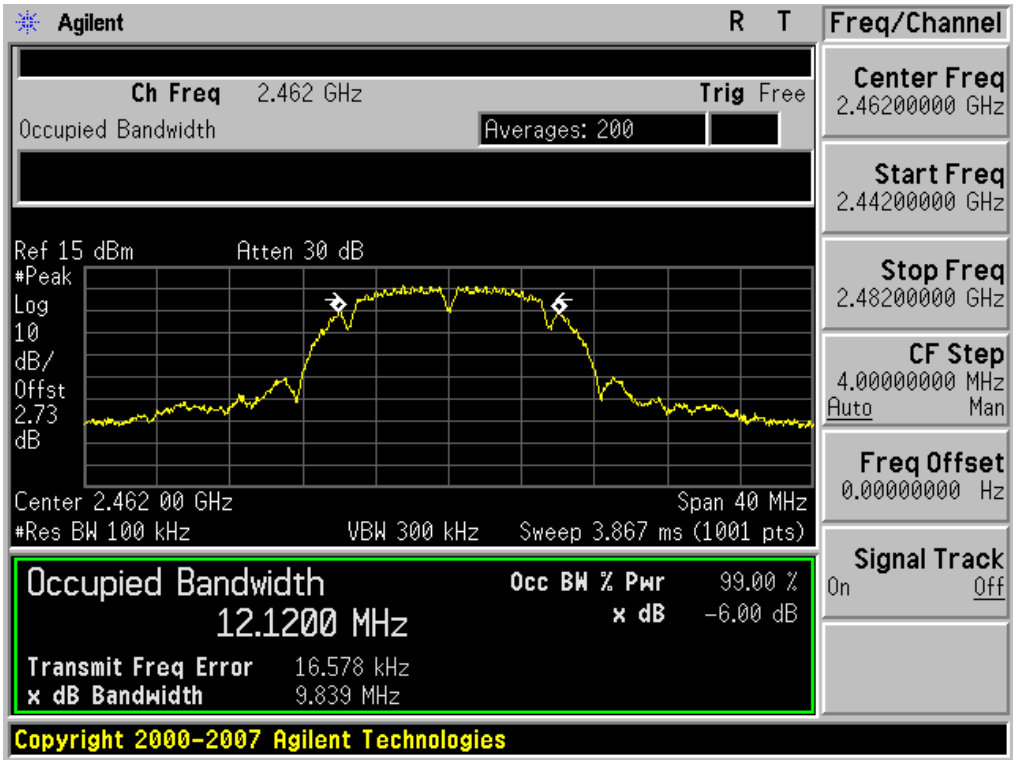
6 dB Bandwidth Test Mode: 802.11b &1Mbps & 2412MHz



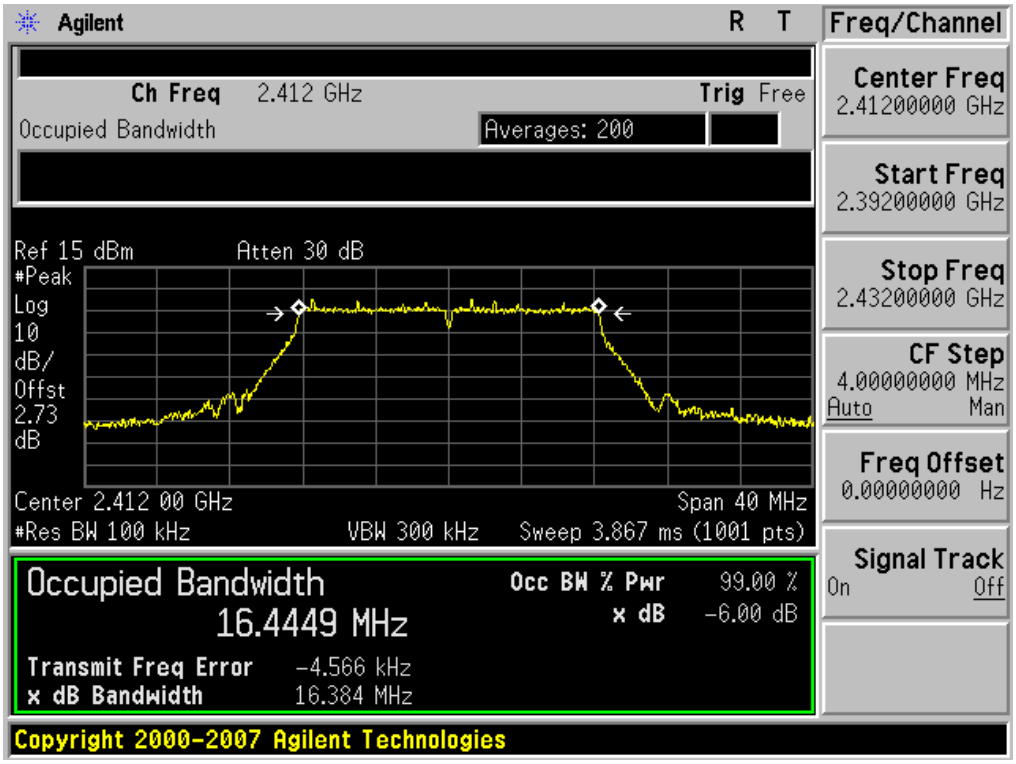
6 dB Bandwidth Test Mode: 802.11b & 1Mbps & 2437MHz



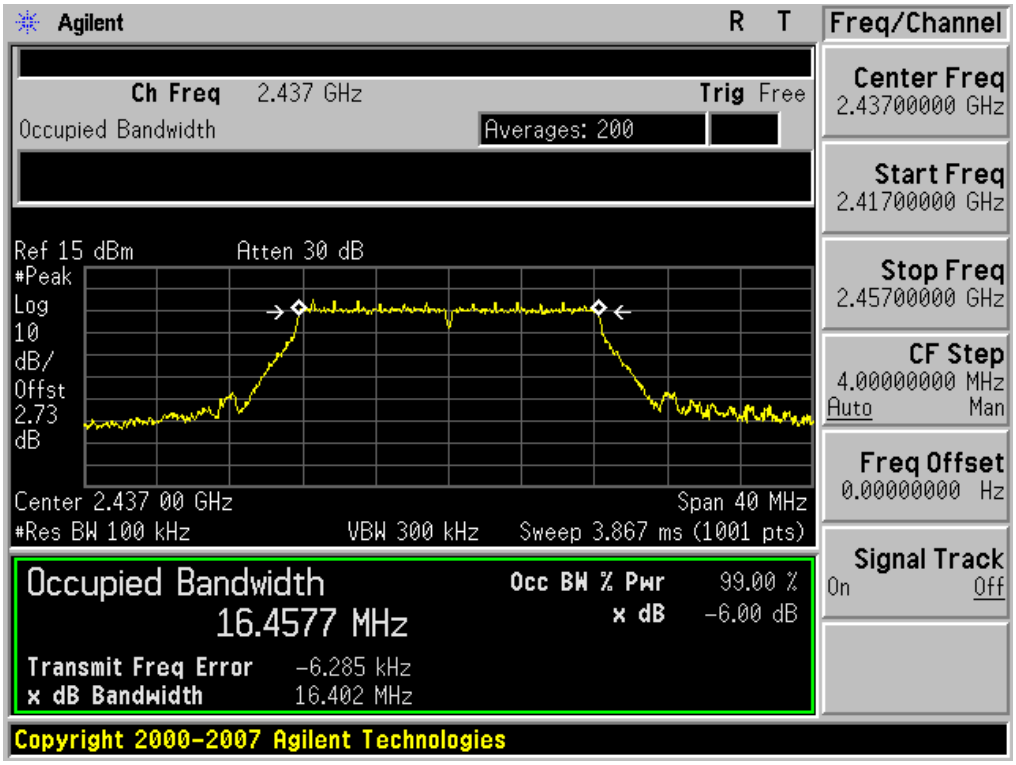
6 dB Bandwidth Test Mode: 802.11b &1Mbps & 2462MHz



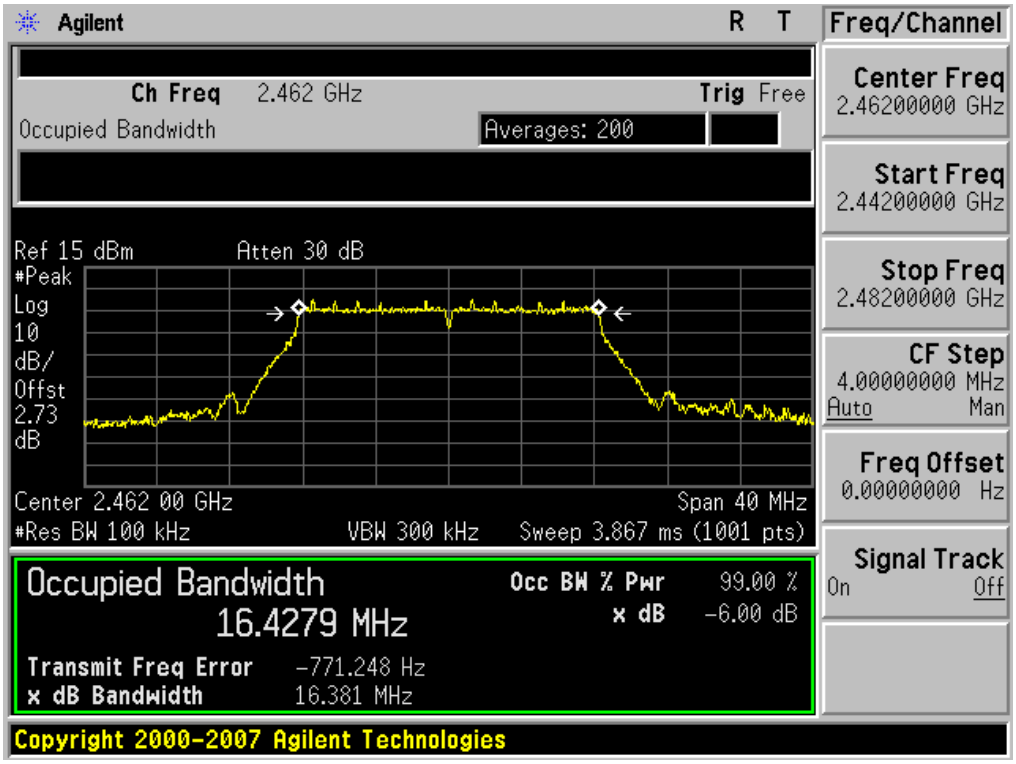
6 dB Bandwidth Test Mode: 802.11g & 6Mbps & 2412MHz



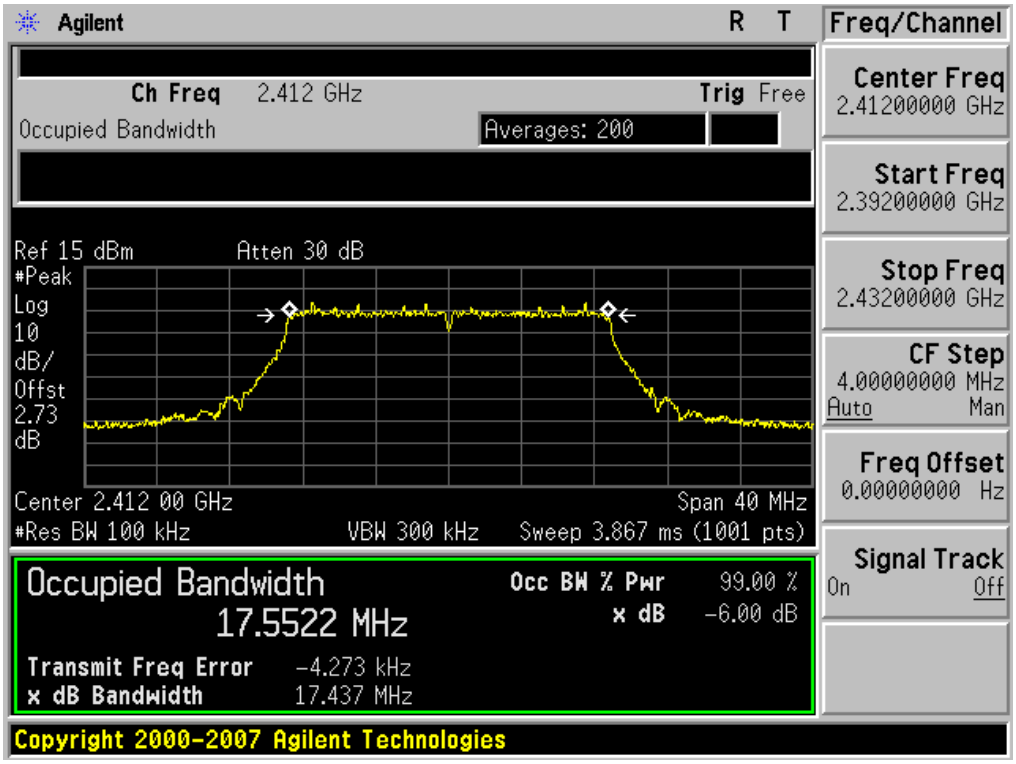
6 dB Bandwidth Test Mode: 802.11g & 6Mbps & 2437MHz



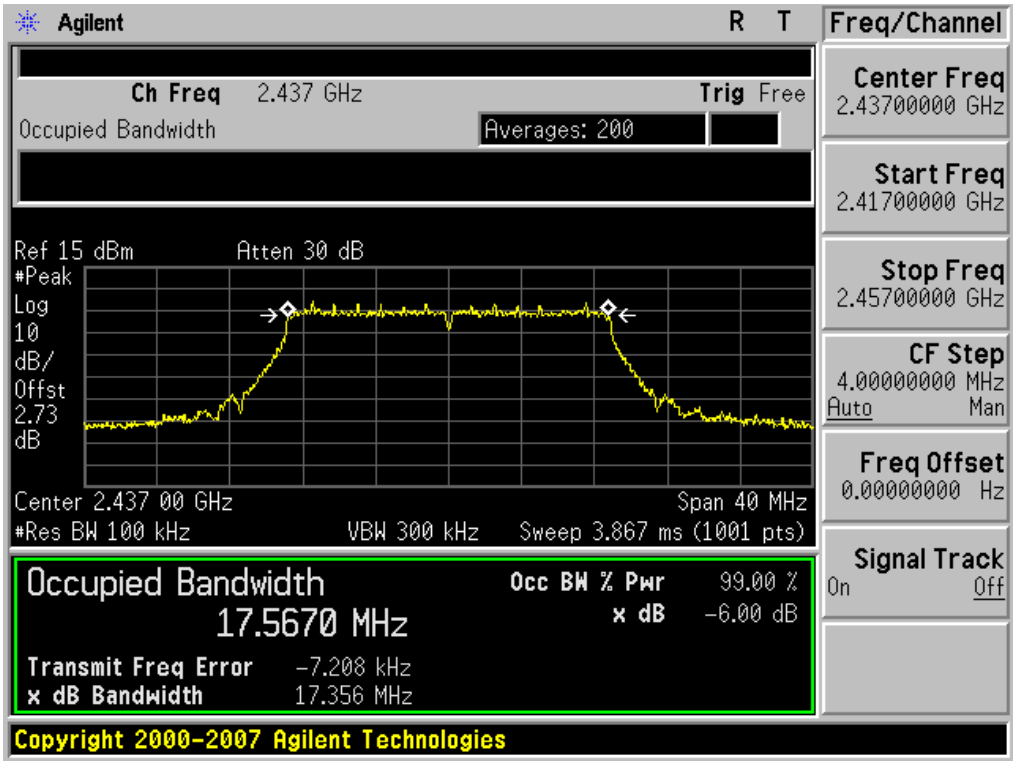
6 dB Bandwidth Test Mode: 802.11g & 6Mbps & 2462MHz



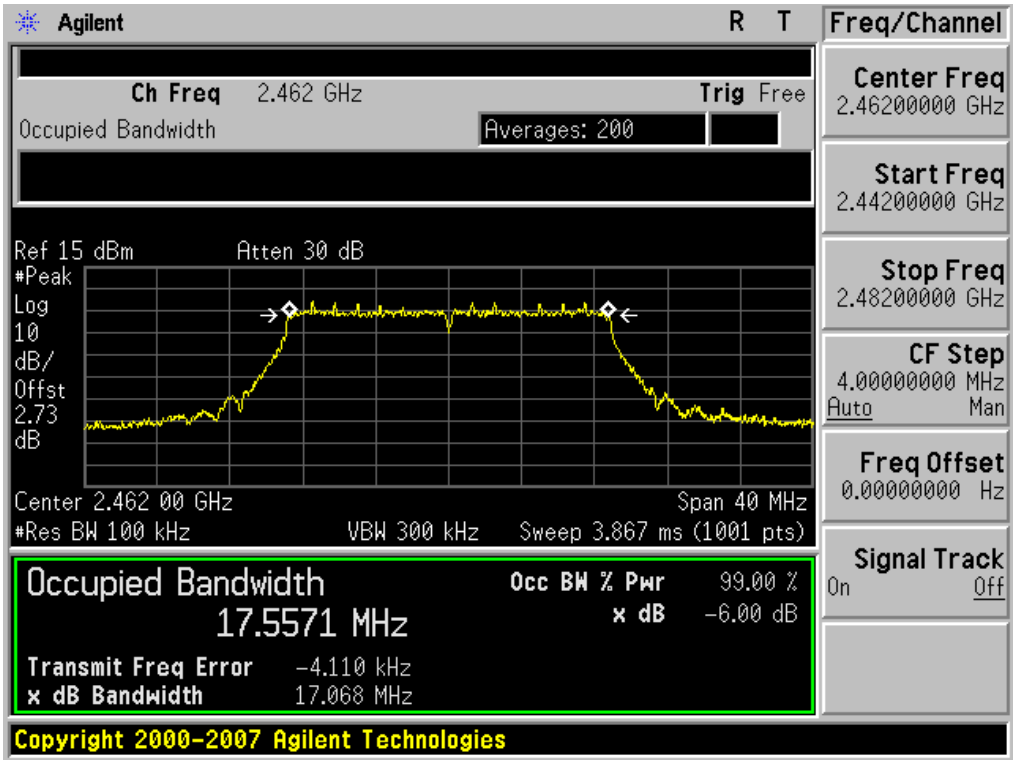
6 dB Bandwidth Test Mode: 802.11n(HT20) & MCS0 & 2412MHz



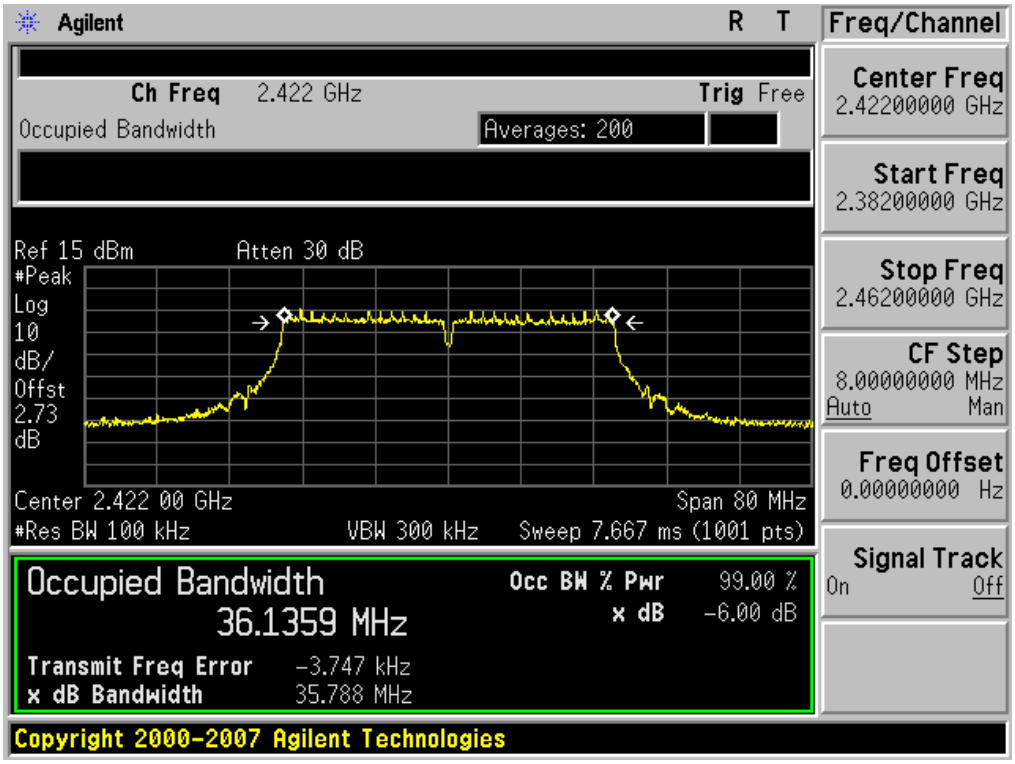
6 dB Bandwidth Test Mode: 802.11n(HT20) & MCS0 & 2437MHz



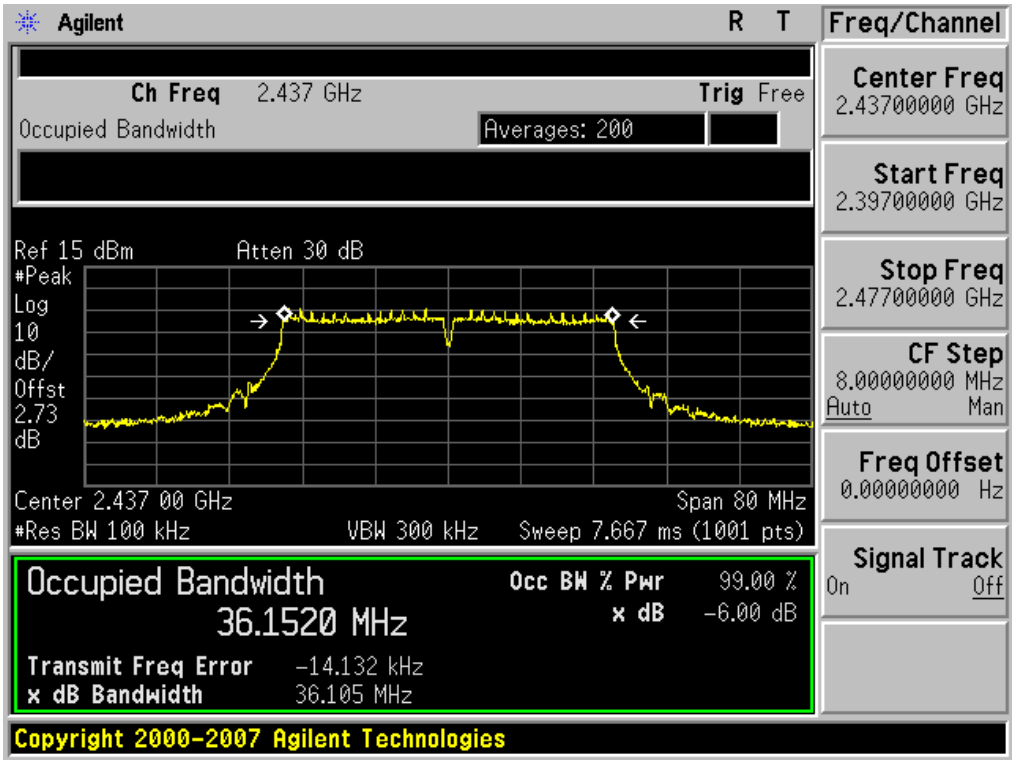
6 dB Bandwidth Test Mode: 802.11n(HT20) & MCS0 & 2462MHz



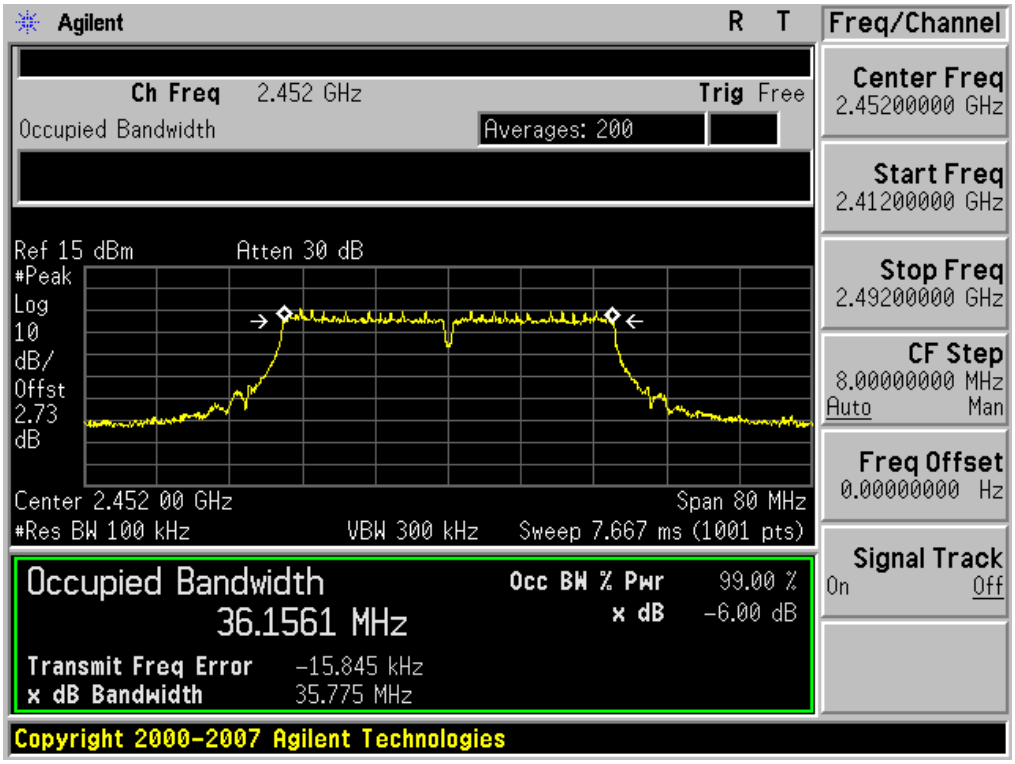
6 dB Bandwidth Test Mode: 802.11n(HT40) & MCS0 & 2422MHz



6 dB Bandwidth Test Mode: 802.11n(HT40) & MCS0 & 2437MHz



6 dB Bandwidth Test Mode: 802.11n(HT40) & MCS0 & 2452MHz

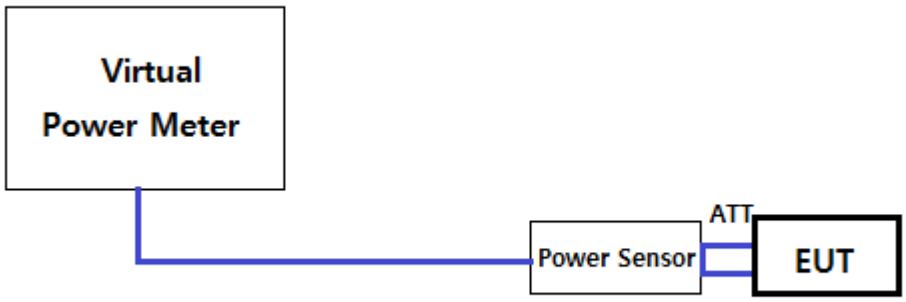


8.2 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(b) & RSS-210 [A8.4]

The maximum permissible conducted output power is **1 Watt.**

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

A transmitter antenna terminal of EUT is connected to the input of a power sensor using an appropriate attenuator and the total path loss between EUT and a Power Sensor was corrected on the final measurement data using a power meter's internal function.

Measurements are made with a broadband power meter capable of making peak and average measurements while the EUT is operating in transmission mode at the appropriatefrequencies.

▣ TEST RESULTS: Comply

- **Measurement Data: Comply**

- **Test Results**

Mode	Channel	Frequency [MHz]	Detector	Test Result [dBm]							
				DATA RATE [Mbps]							
				1	2	5.5	11	N/A	N/A	N/A	N/A
802.11b	1	2412	PK	19.75	19.74	19.42	19.77	-	-	-	-
	6	2437	PK	20.06	19.93	20.03	19.97	-	-	-	-
	11	2462	PK	**20.23**	20.14	20.19	20.21	-	-	-	-

Mode	Channel	Frequency [MHz]	Detector	Test Result [dBm]							
				DATA RATE [Mbps]							
				6	9	12	18	24	36	48	54
802.11g	1	2412	PK	**21.73**	21.48	21.67	21.59	21.48	21.22	21.43	21.15
	6	2437	PK	21.64	21.58	21.64	21.27	21.63	21.31	21.56	21.48
	11	2462	PK	21.53	21.02	21.49	21.44	21.52	21.46	21.46	21.50

Mode	Channel	Frequency [MHz]	Detector	Test Result [dBm]							
				DATA RATE [MCS]							
				0	1	2	3	4	5	6	7
802.11n (HT20)	1	2412	PK	**20.49**	20.16	19.95	19.87	20.01	19.91	20.41	20.18
	6	2437	PK	20.30	20.25	20.28	20.21	20.20	20.24	20.31	20.19
	11	2462	PK	20.34	20.31	19.86	20.11	20.26	19.88	20.31	20.26

Mode	Channel	Frequency [MHz]	Detector	Test Result [dBm]							
				DATA RATE [MCS]							
				0	1	2	3	4	5	6	7
802.11n (HT40)	3	2422	PK	**19.94**	19.92	19.62	19.72	19.65	19.70	19.71	19.64
	6	2437	PK	19.79	19.63	19.59	19.49	19.53	19.40	19.46	19.42
	9	2452	PK	19.97	19.89	19.70	19.62	19.61	19.65	19.76	19.57

8.3 Maximum Power Spectral Density

Test requirements and limit, §15.247(e) & RSS-210[A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard –specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segmentwithin the fundamental EBW during any time interval of continuous transmission.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE:

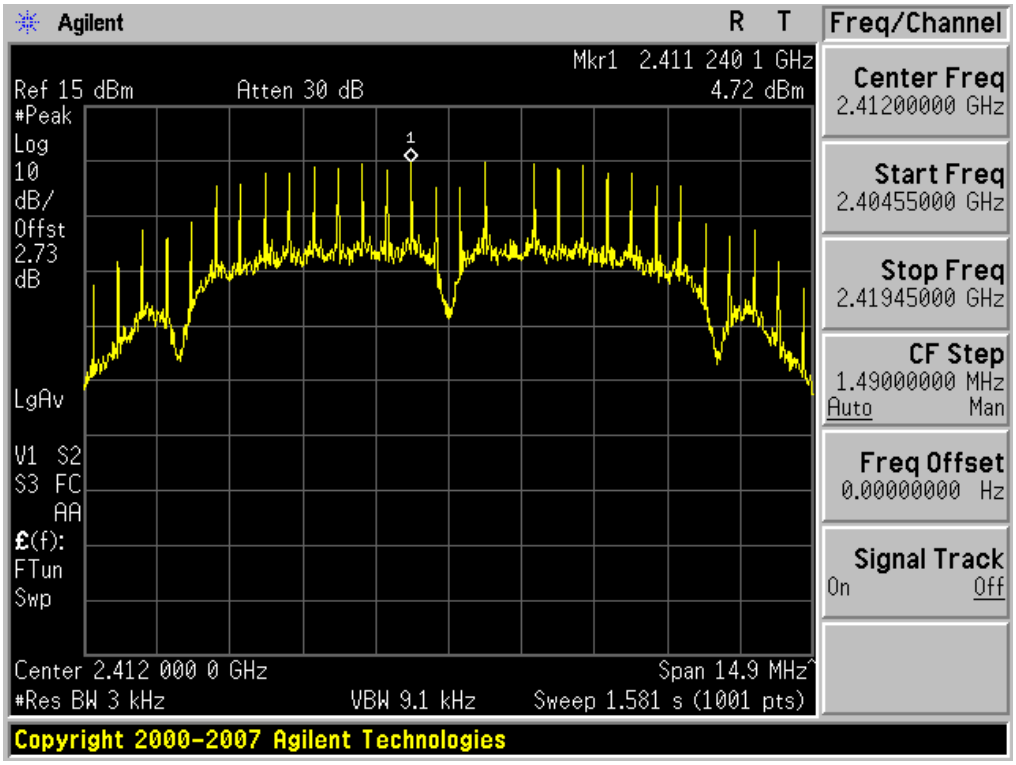
The Measurement Procedure **Method PKPSDof KDB558074** is used.
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz ≤ RBW ≤ 100 kHz**.
4. Set the VBW ≥ **3 x RBW.**
5. Detector = **peak.**
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ TEST RESULTS: Comply

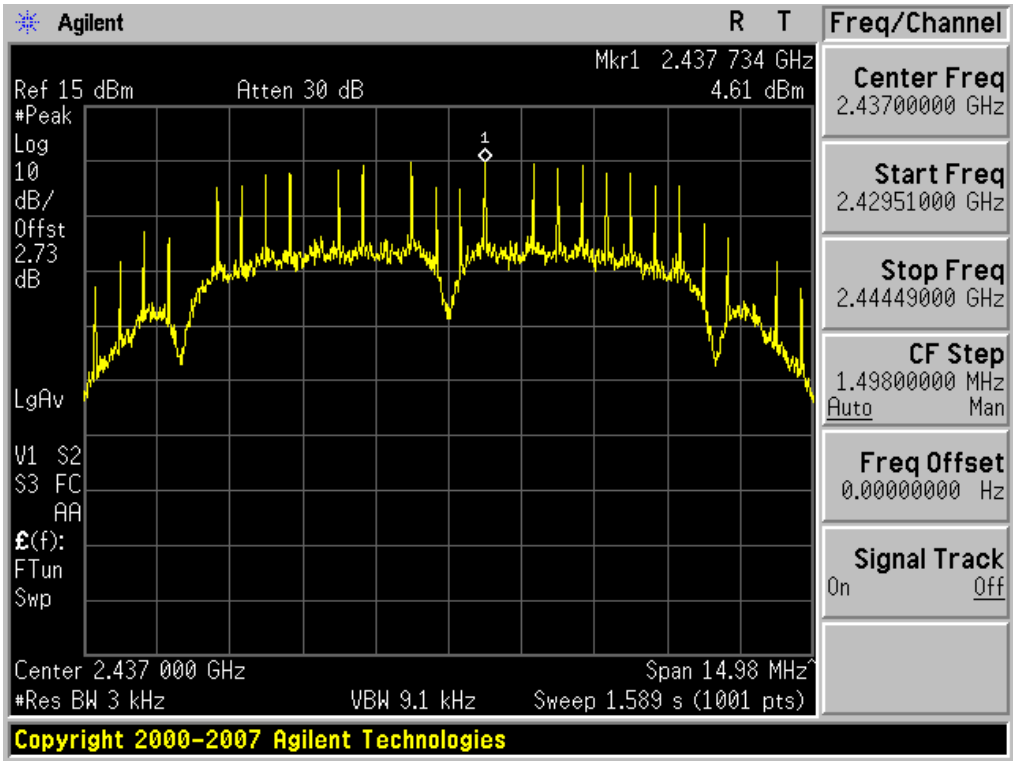
Test Mode	Data Rate	Frequency [MHz]	RBW	PKPSD [dBm]
802.11b	1Mbps	2412	3 kHz	4.72
		2437	3 kHz	4.61
		2462	3 kHz	4.99
802.11g	6Mbps	2412	3 kHz	-16.33
		2437	3 kHz	-15.89
		2462	3 kHz	-16.19
802.11n HT20	MCS0	2412	3 kHz	-16.57
		2437	3 kHz	-16.47
		2462	3 kHz	-17.39
802.11n HT40	MCS0	2422	3 kHz	-20.18
		2437	3 kHz	-19.78
		2452	3 kHz	-20.70

▣RESULT PLOTS

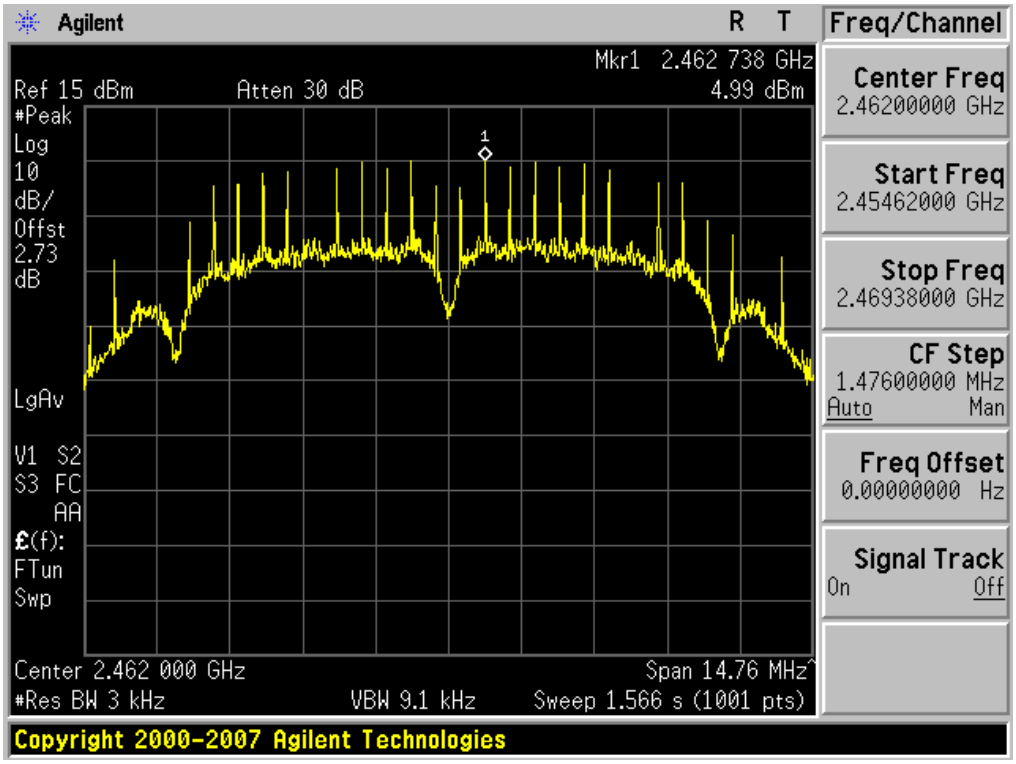
Maximum PKPSD Test Mode: 802.11b & 1Mbps & 2412MHz



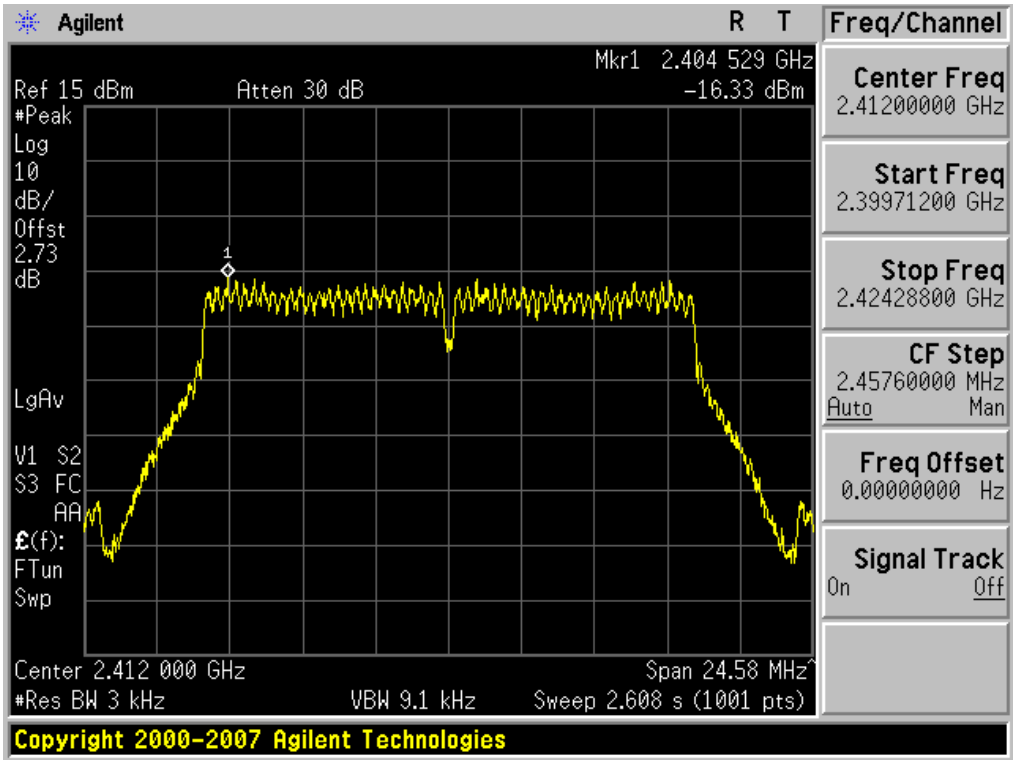
Maximum PKPSD Test Mode: 802.11b & 1Mbps & 2437MHz



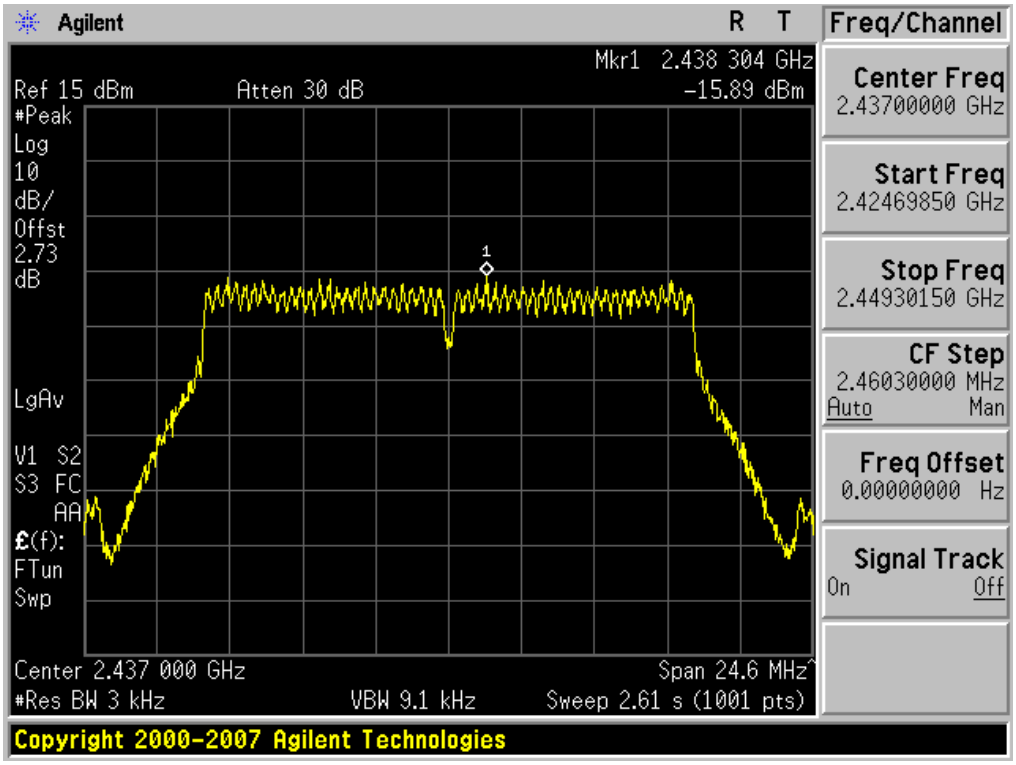
Maximum PKPSD Test Mode: 802.11b & 1Mbps & 2462MHz



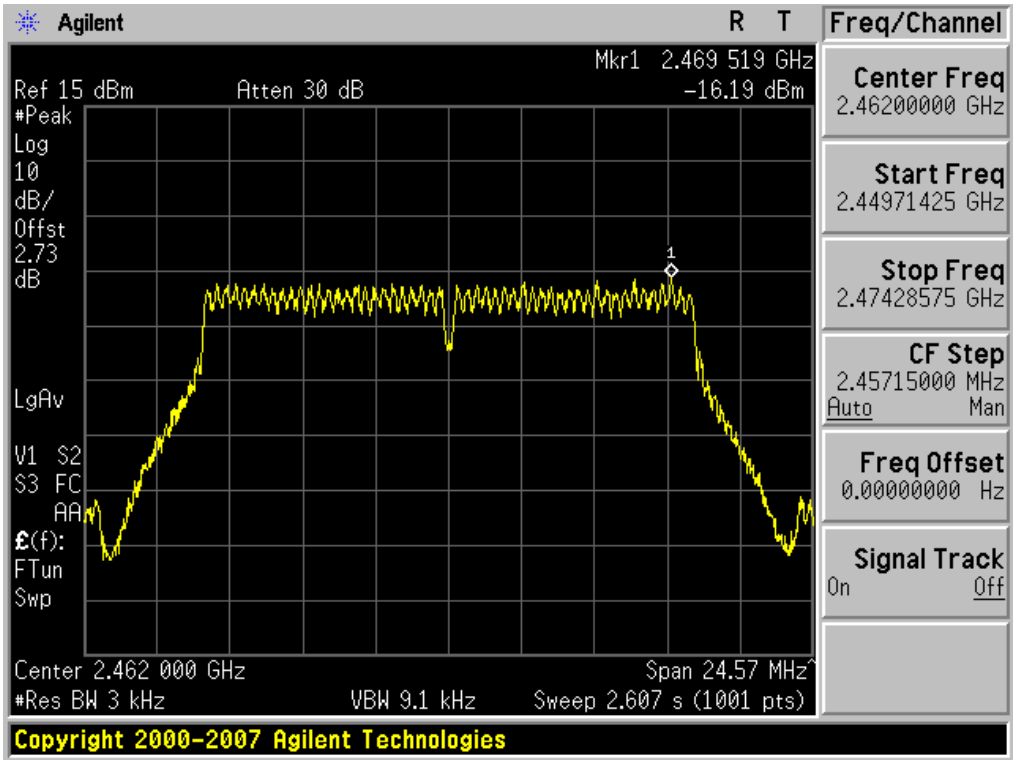
Maximum PKPSD Test Mode: 802.11g & 6Mbps & 2412MHz



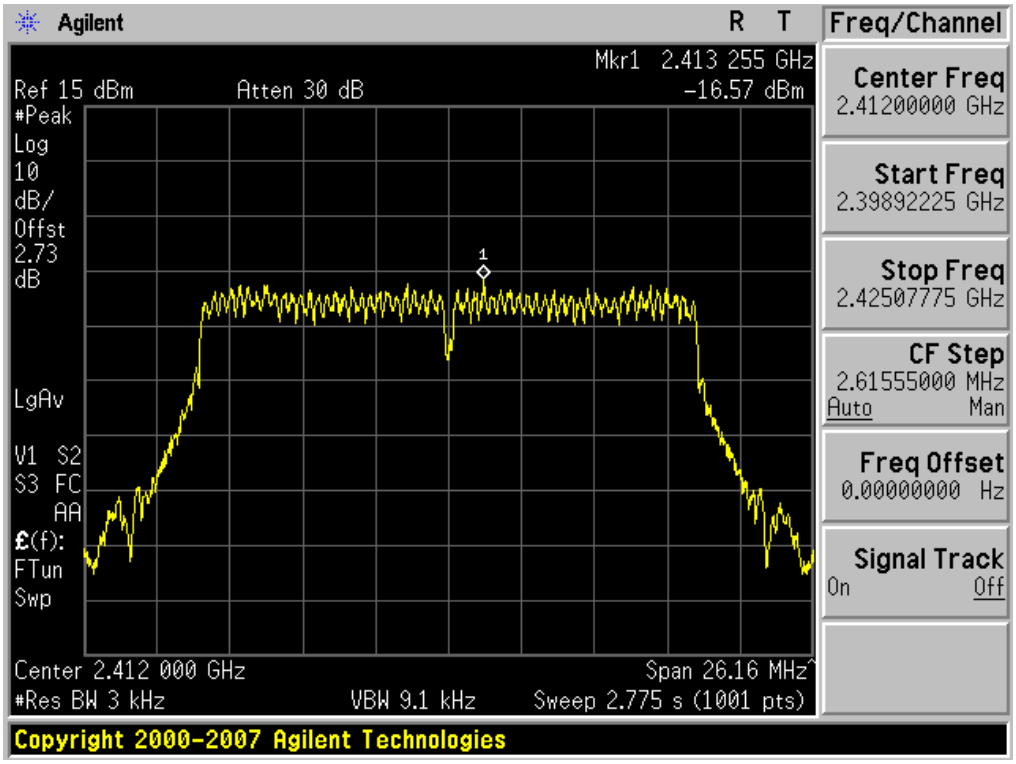
Maximum PKPSD Test Mode: 802.11g & 6Mbps & 2437MHz



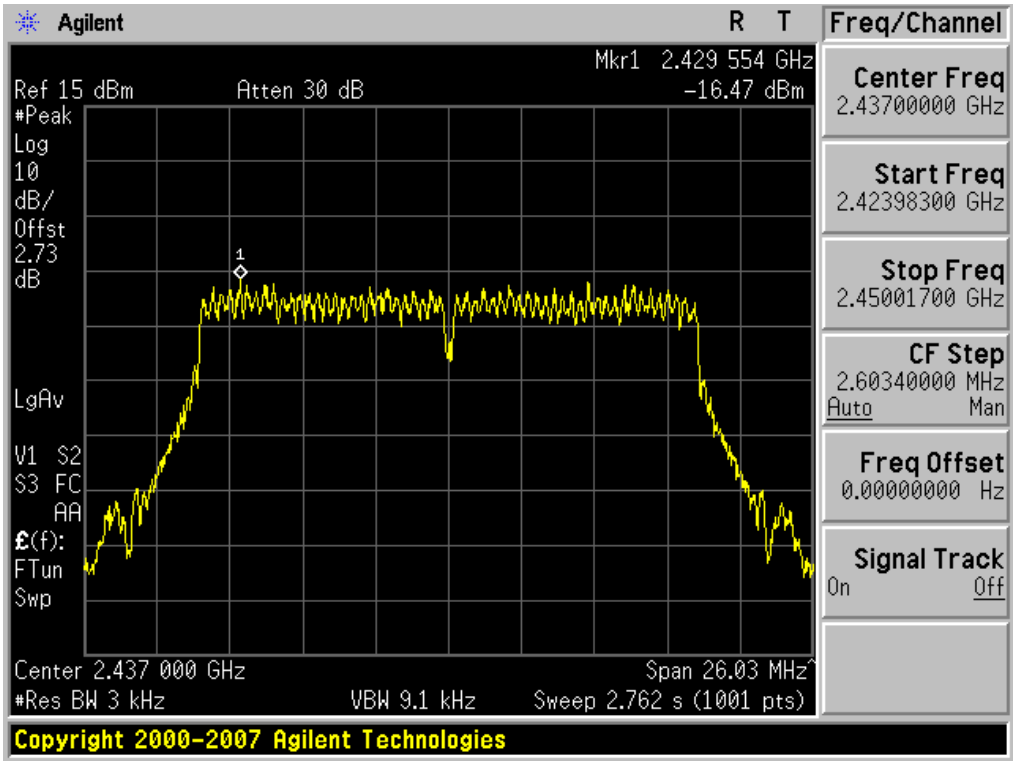
Maximum PKPSD Test Mode: 802.11g & 6Mbps & 2462MHz



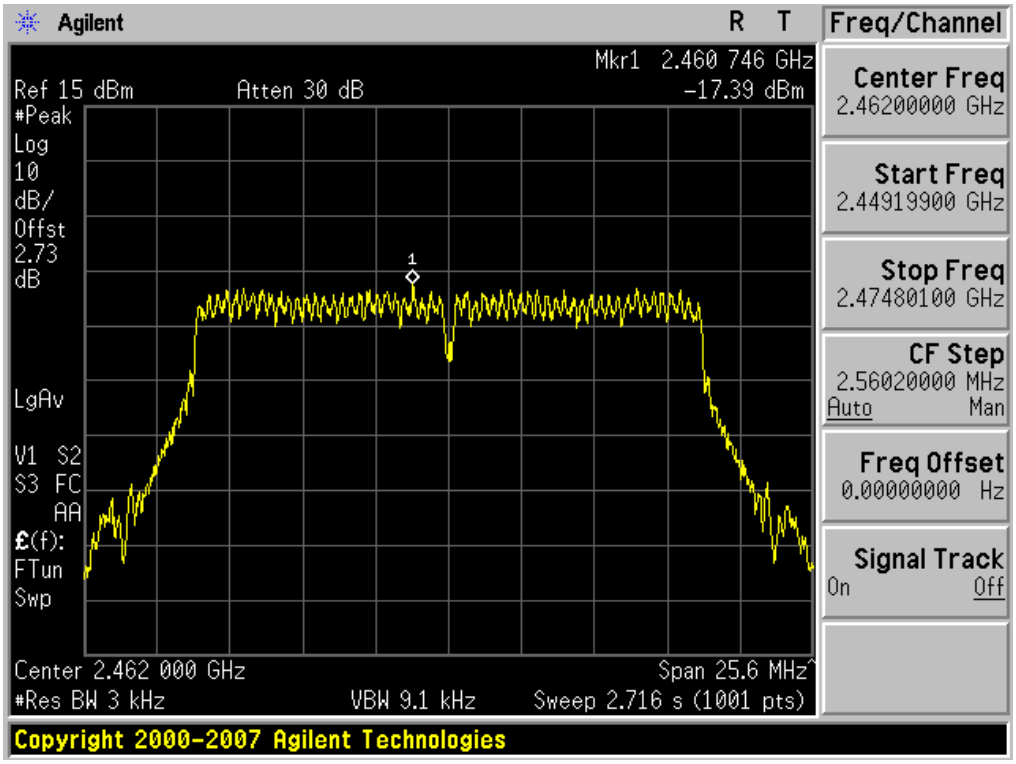
Maximum PKPSD Test Mode: 802.11n(HT20) & MCS0 & 2412MHz



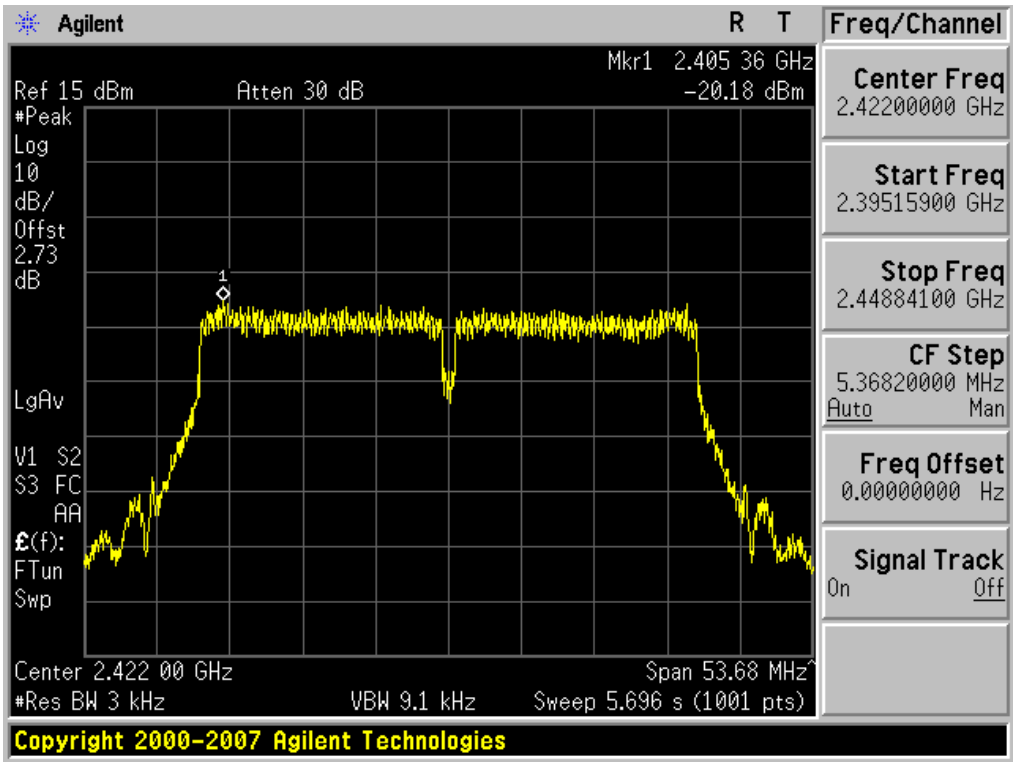
Maximum PKPSD Test Mode: 802.11n(HT20)& MCS0 & 2437MHz



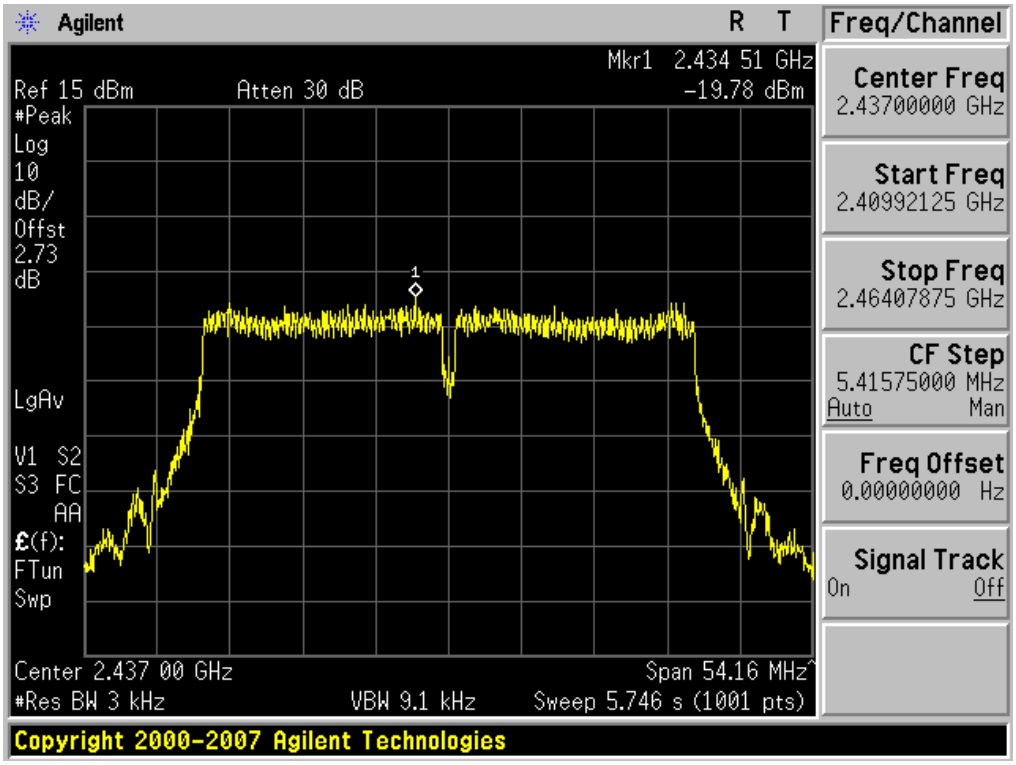
Maximum PKPSD Test Mode: 802.11n(HT20) & MCS0 & 2462MHz



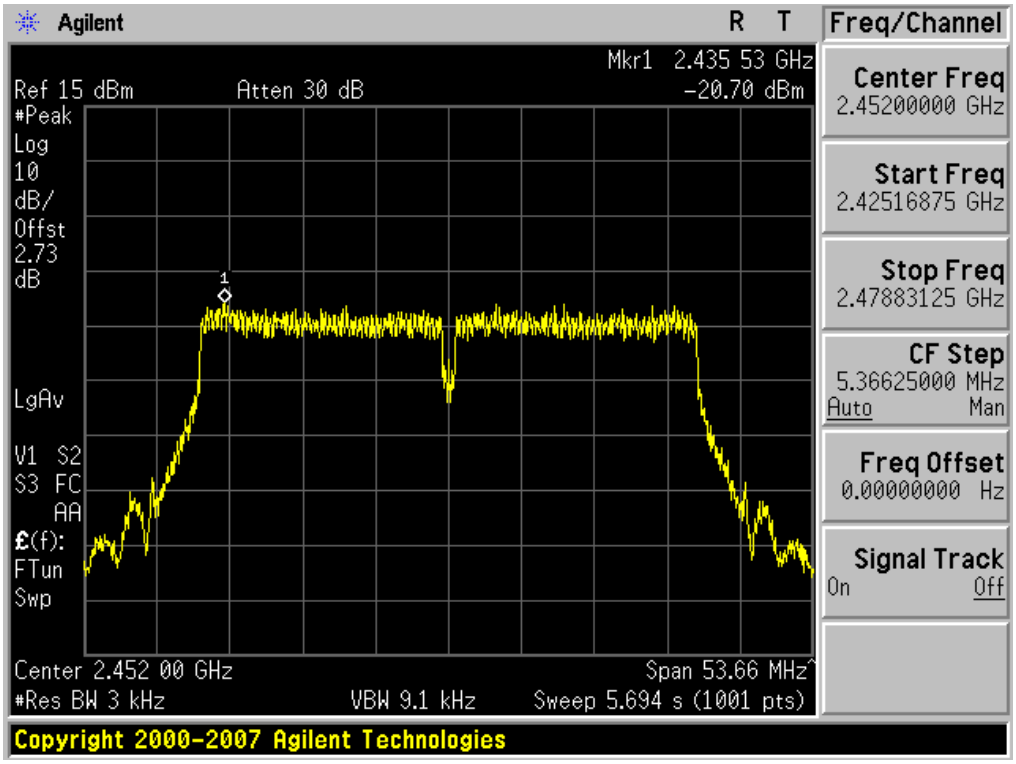
Maximum PKPSD Test Mode: 802.11n(HT40) & MCS0 & 2422MHz



Maximum PKPSD Test Mode: 802.11n(HT40) & MCS0 & 2437MHz



Maximum PKPSD Test Mode: 802.11n(HT40) & MCS0 & 2452MHz



8.4 Conducted Spurious Emissions

Test requirements and limit, §15.247(d) & RSS-210[A8.5]

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, thepower shall be attenuated according to the following conditions:

If **the peak output power procedure**is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣TEST CONFIGURATION

Refer to the APPENDIX I.

▣TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

- Measurement Procedure 2 - Unwanted Emissions

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz.(Actual 1 MHz , See below note)**
3. Set the VBW ≥**3 x RBW.(Actual 3 MHz, See below note)**
4. Detector = **peak**.
5. Ensure that the number of measurement points ≥ span/RBW
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

Note : The conducted spurious emission was tested each ranges were set as below.

Frequency range: 9KHz ~ 30MHz
RBW= 100 kHz, VBW= 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, BINS: 1001
Frequency range: 30MHz~26.5GHz (Tested using S/A's measurement function with total 11 sub ranges.)
RBW= 1 MHz, VBW= 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SPAN = MAX 3 GHz (Below 10 GHz) and MAX 5 GHz (Above 10 GHz) , BINS = at least 2001 (Each 1GHz range)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 KHz, VBW = 300KHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 KHz BW.

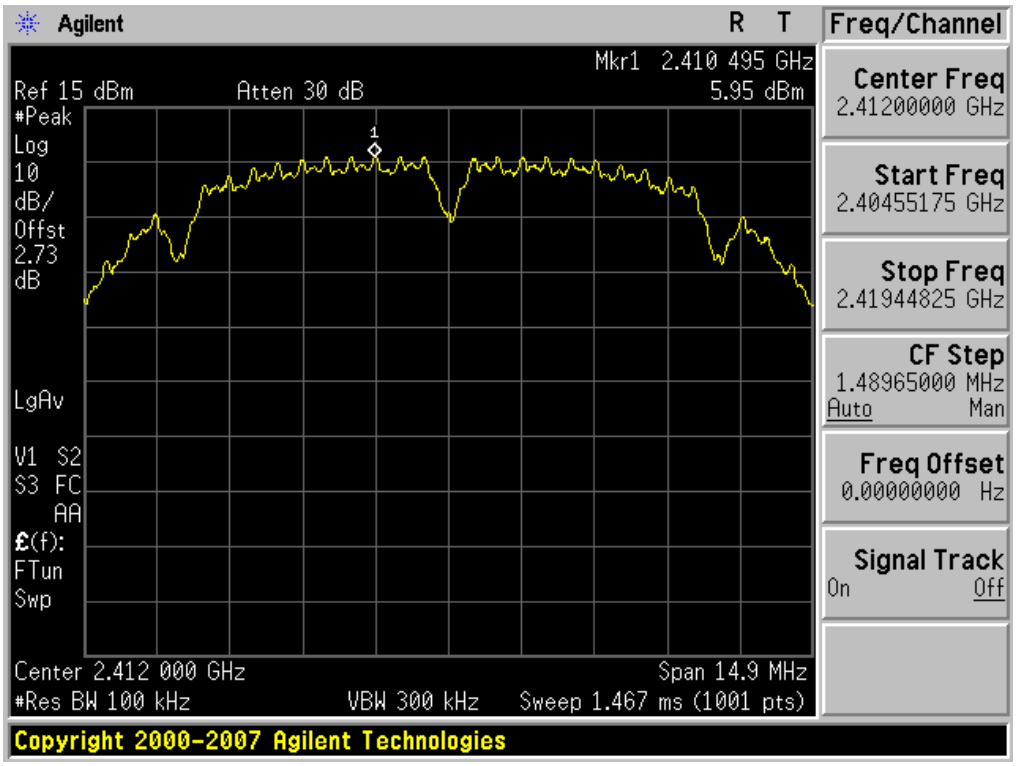
Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

▣ **TEST RESULTS:** Comply

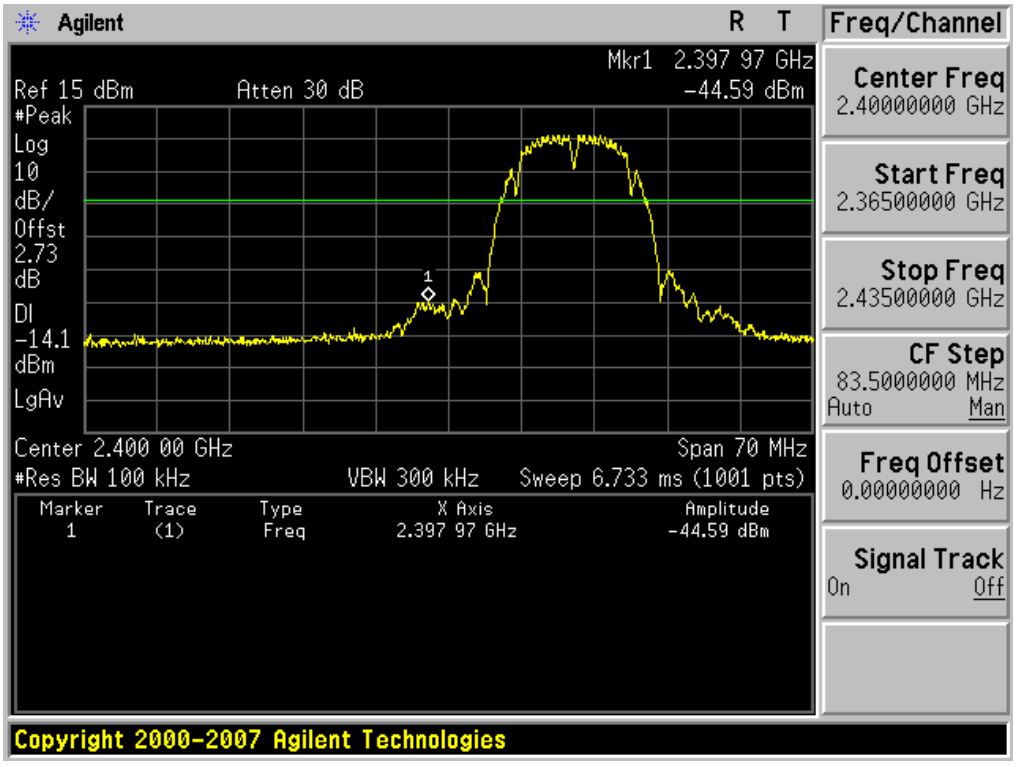
▣ **RESULT PLOTS**

802.11b & 1Mbps & 2412MHz

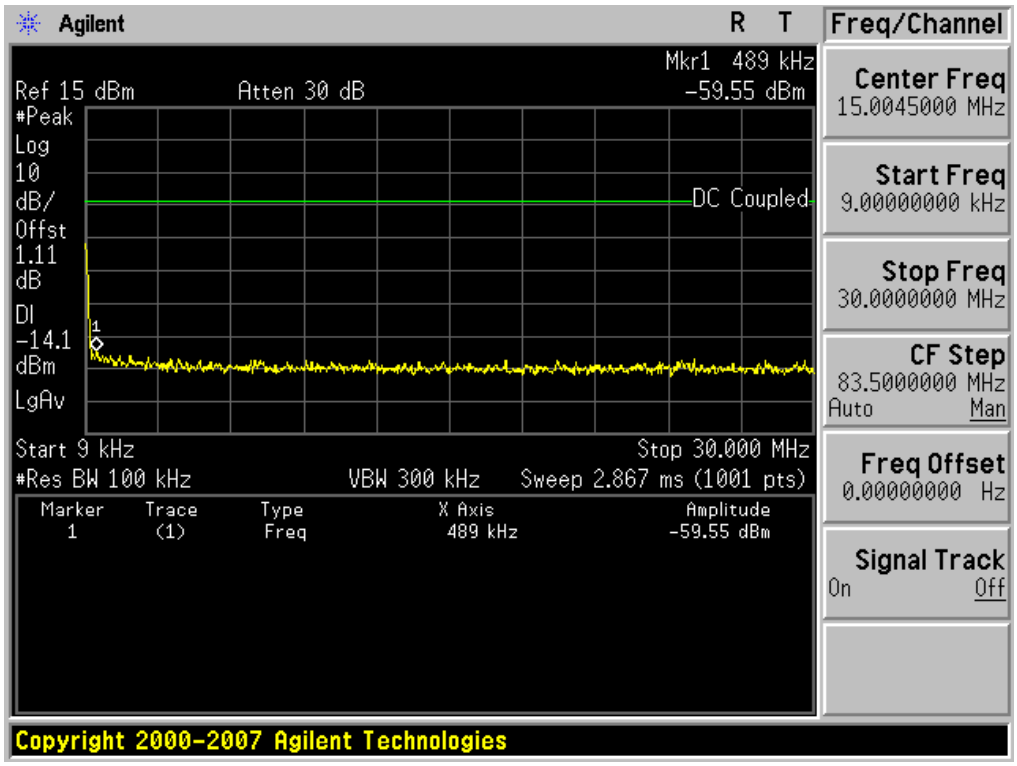
Reference

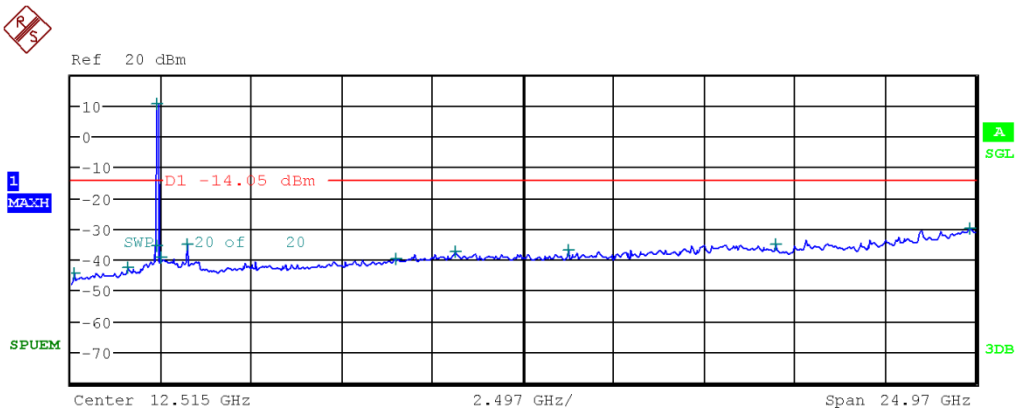


Low Band-edge



Conducted Spurious Emissions

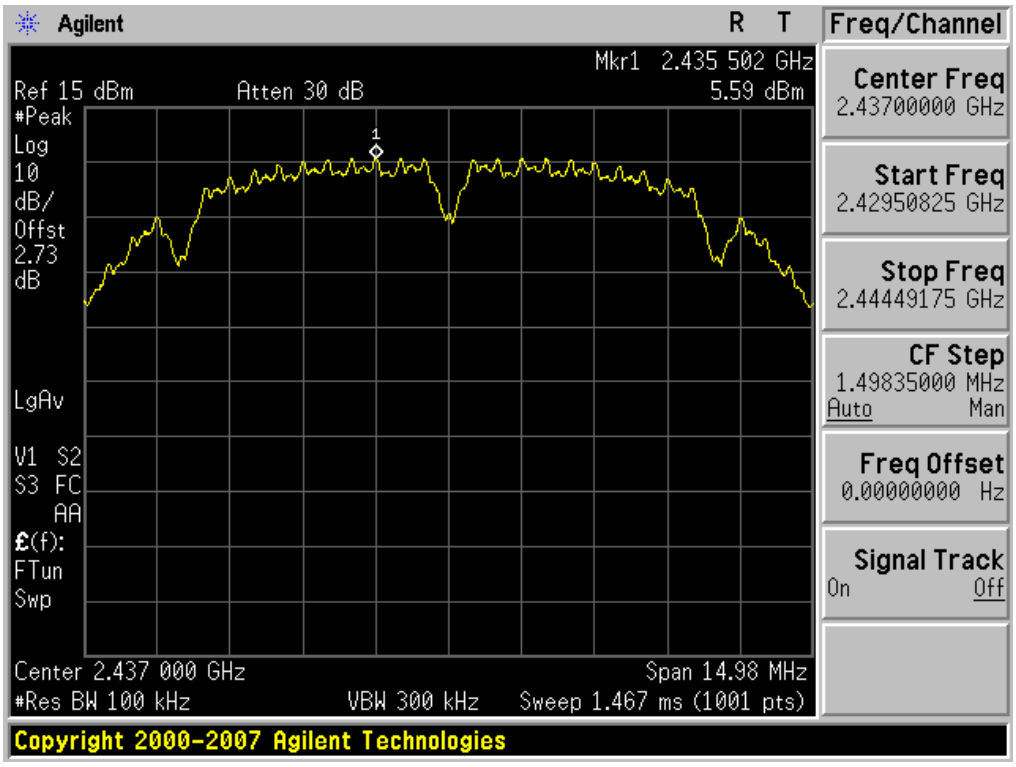




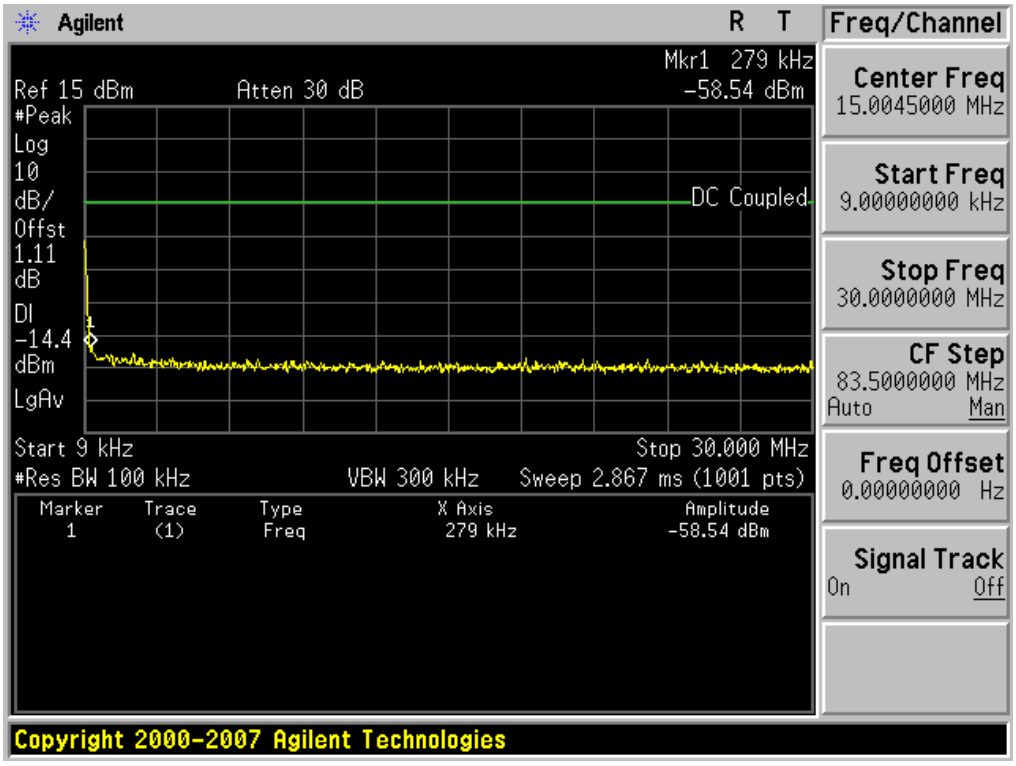
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	97.900000 M	-44.38
1.000 G	2.000 G	1.00 M	1.608000 G	-42.82
2.000 G	2.400 G	1.00 M	2.398080 G	-35.47
2.400 G	2.483 G	1.00 M	2.410872 G	10.46
2.483 G	3.000 G	1.00 M	2.511236 G	-39.55
3.000 G	6.000 G	1.00 M	3.216000 G	-35.00
6.000 G	9.000 G	1.00 M	8.996333 G	-39.68
9.000 G	12.000 G	1.00 M	10.653333 G	-37.73
12.000 G	15.000 G	1.00 M	13.740667 G	-36.98
15.000 G	20.000 G	1.00 M	19.458000 G	-35.38
20.000 G	25.000 G	1.00 M	24.832500 G	-29.99

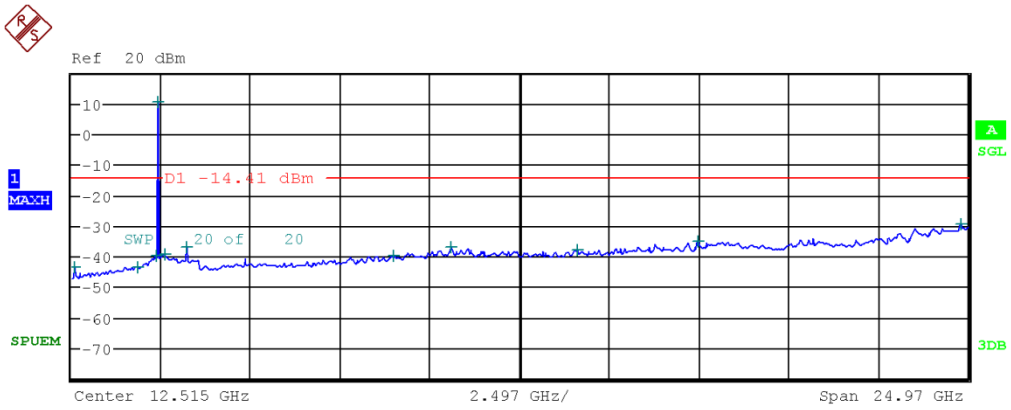
802.11b & 1Mbps & 2437MHz

Reference



Conducted Spurious Emissions

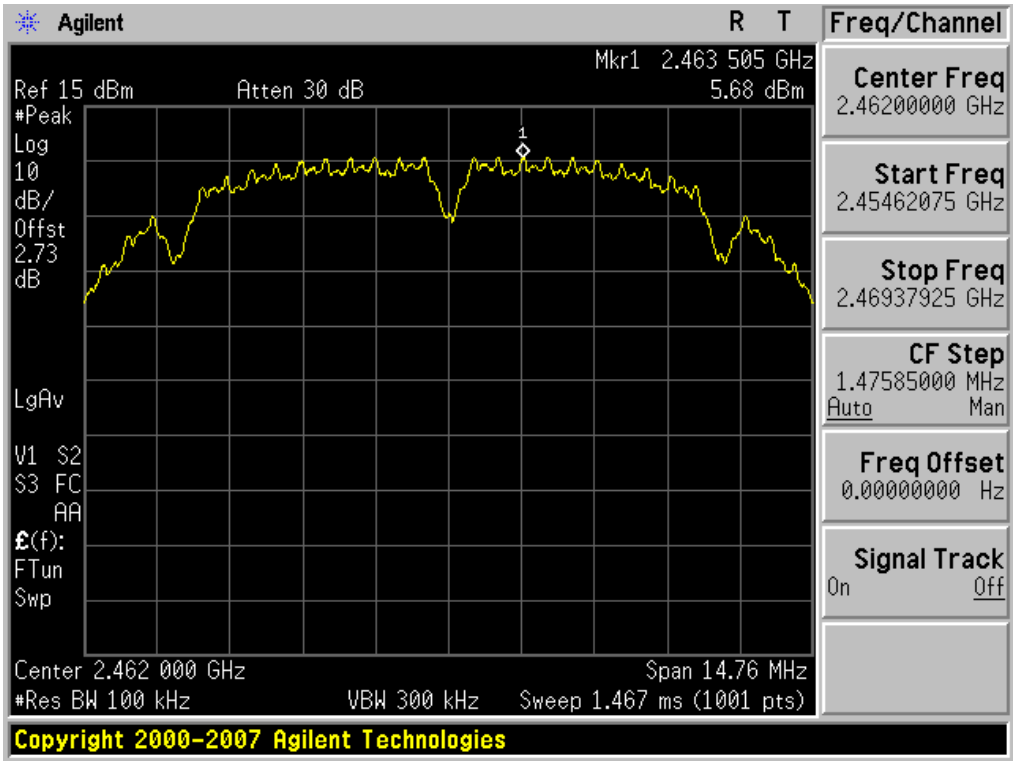




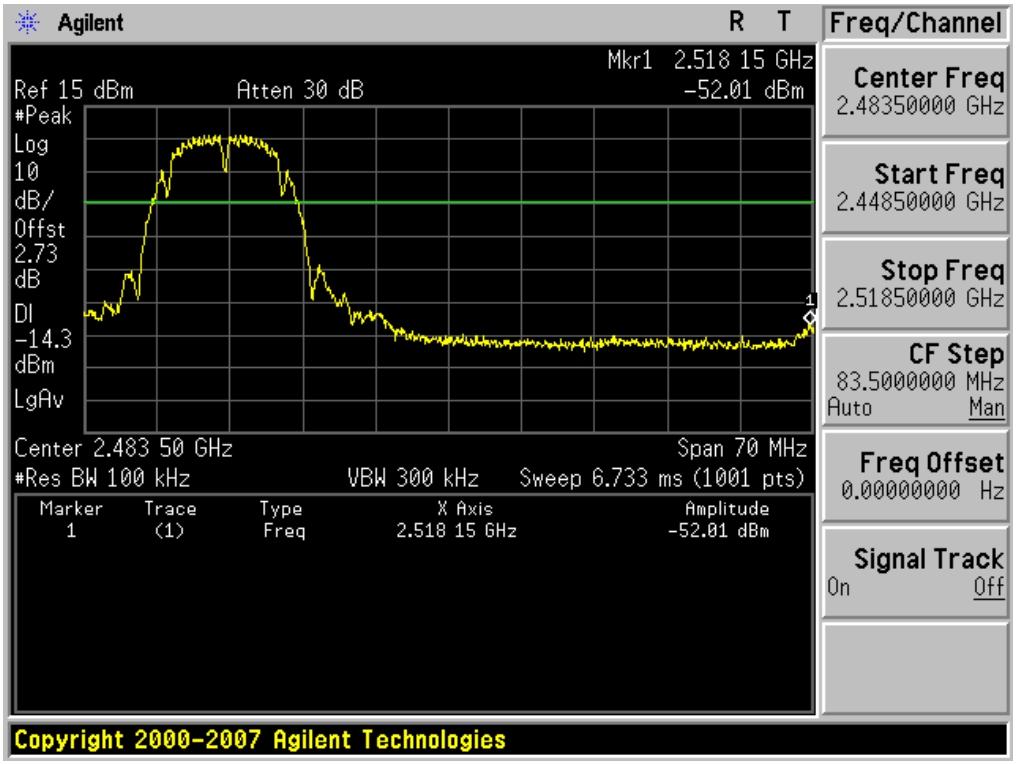
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	122.796667 M	-43.63
1.000 G	2.000 G	1.00 M	1.886667 G	-43.41
2.000 G	2.400 G	1.00 M	2.386880 G	-39.98
2.400 G	2.483 G	1.00 M	2.438410 G	10.27
2.483 G	3.000 G	1.00 M	2.614794 G	-39.37
3.000 G	6.000 G	1.00 M	3.249000 G	-36.86
6.000 G	9.000 G	1.00 M	8.984667 G	-39.83
9.000 G	12.000 G	1.00 M	10.598000 G	-37.27
12.000 G	15.000 G	1.00 M	14.107000 G	-37.81
15.000 G	20.000 G	1.00 M	17.461500 G	-34.94
20.000 G	25.000 G	1.00 M	24.819000 G	-29.68

802.11b & 1Mbps & 2462MHz

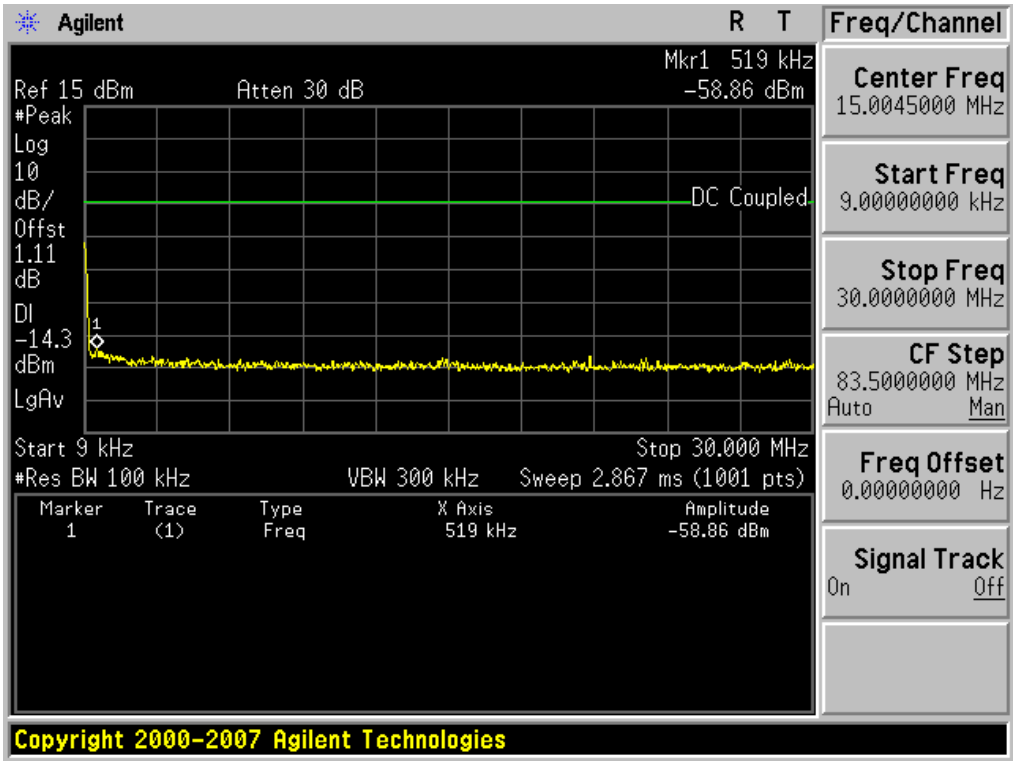
Reference

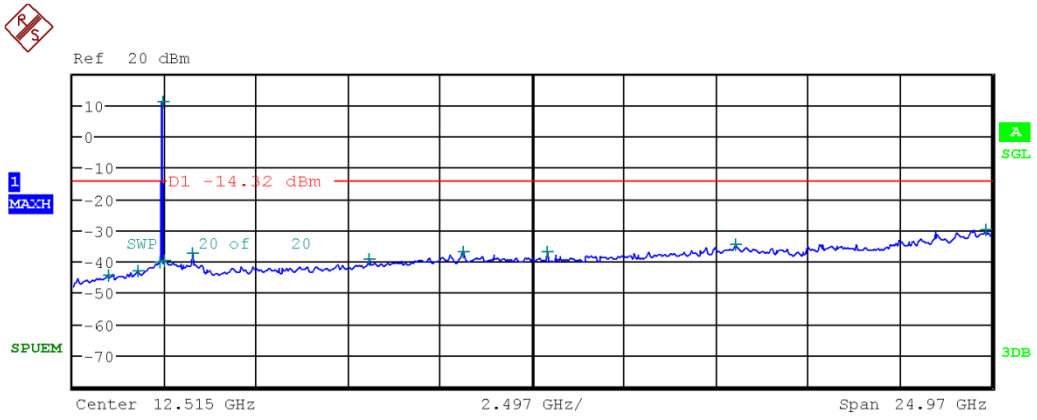


High Band-edge



Conducted Spurious Emissions

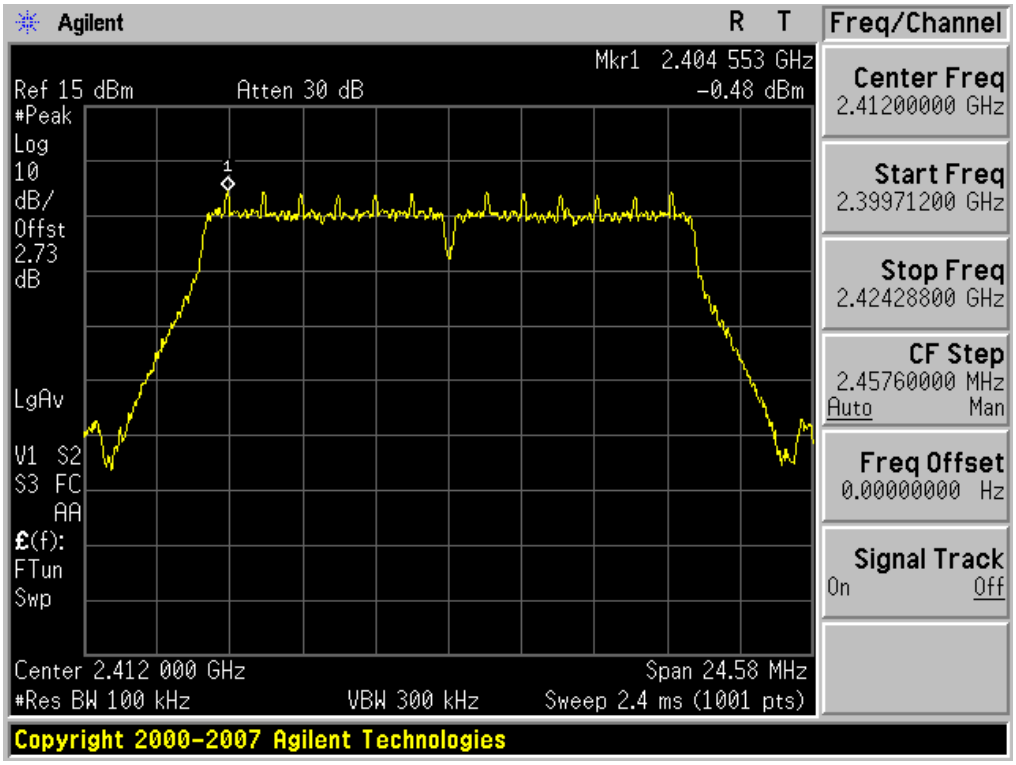




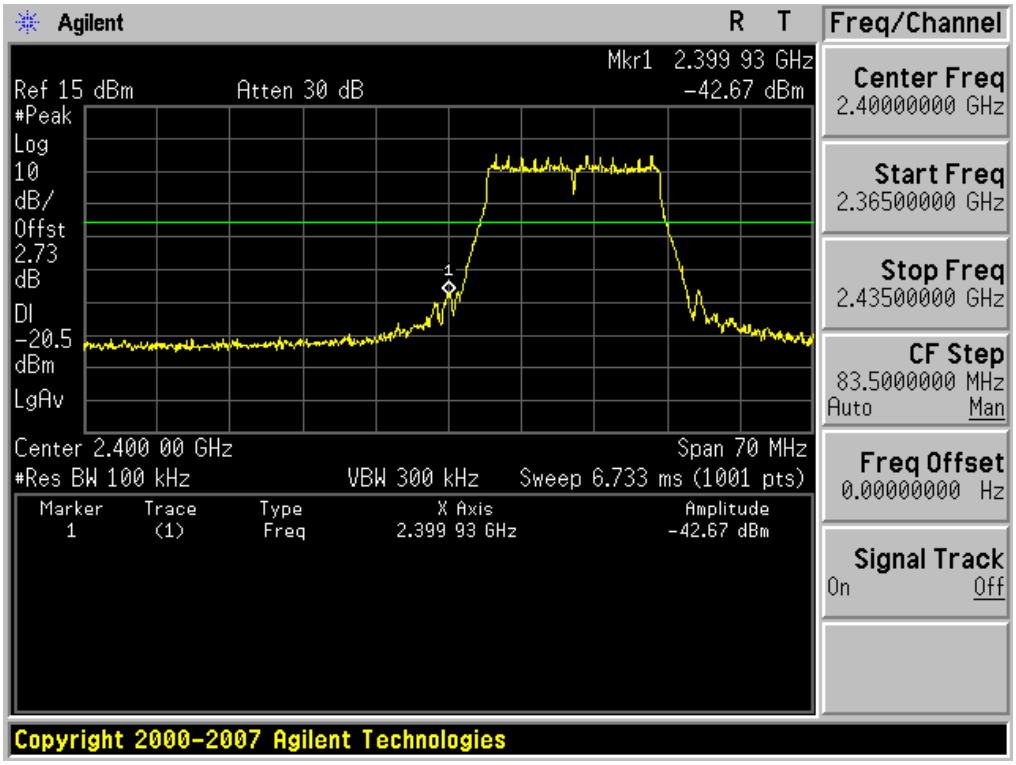
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	999.676667 M	-44.65
1.000 G	2.000 G	1.00 M	1.788000 G	-43.33
2.000 G	2.400 G	1.00 M	2.382280 G	-40.27
2.400 G	2.483 G	1.00 M	2.460546 G	10.75
2.483 G	3.000 G	1.00 M	2.518984 G	-39.66
3.000 G	6.000 G	1.00 M	3.282667 G	-37.62
6.000 G	9.000 G	1.00 M	8.068000 G	-39.58
9.000 G	12.000 G	1.00 M	10.649333 G	-37.19
12.000 G	15.000 G	1.00 M	12.913000 G	-37.16
15.000 G	20.000 G	1.00 M	18.048000 G	-34.88
20.000 G	25.000 G	1.00 M	24.823000 G	-29.84

802.11g & 6Mbps & 2412MHz

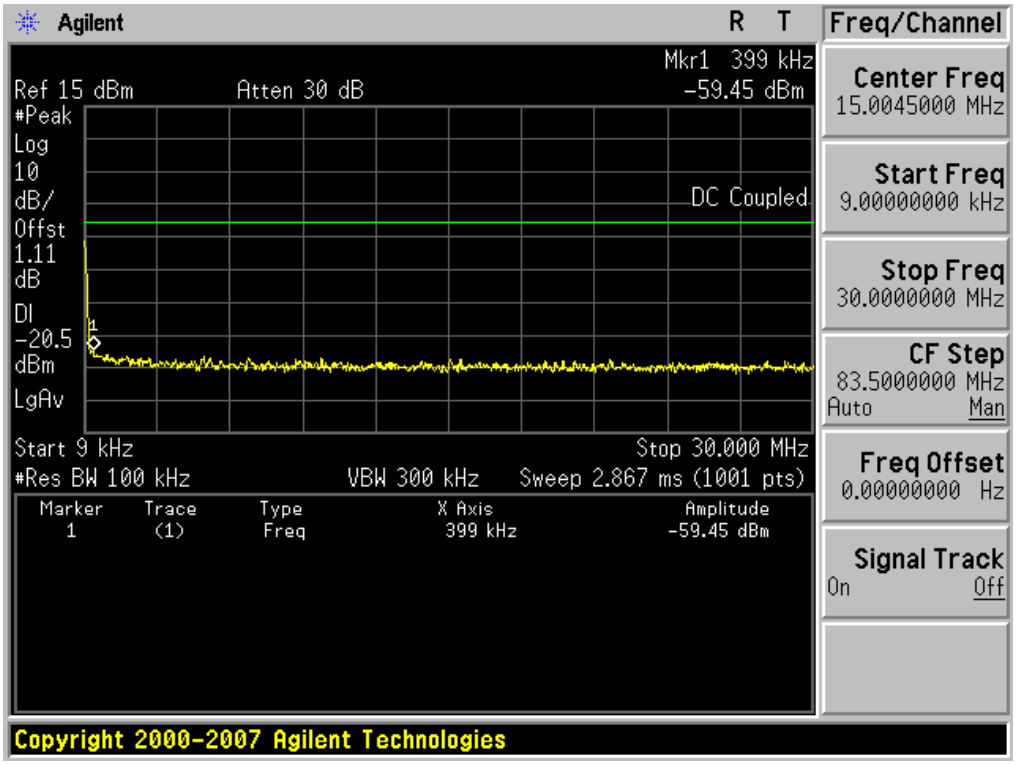
Reference

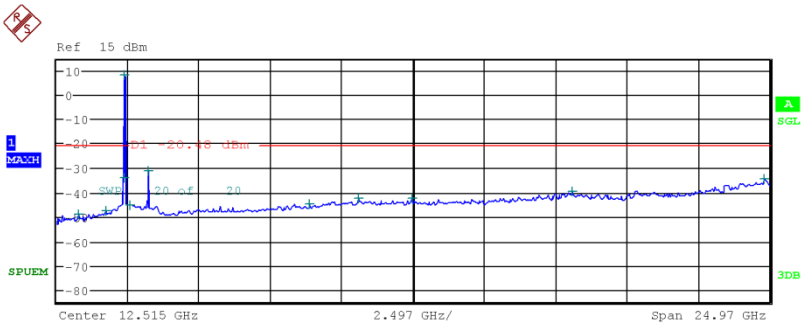


Low Band-edge



Conducted Spurious Emissions

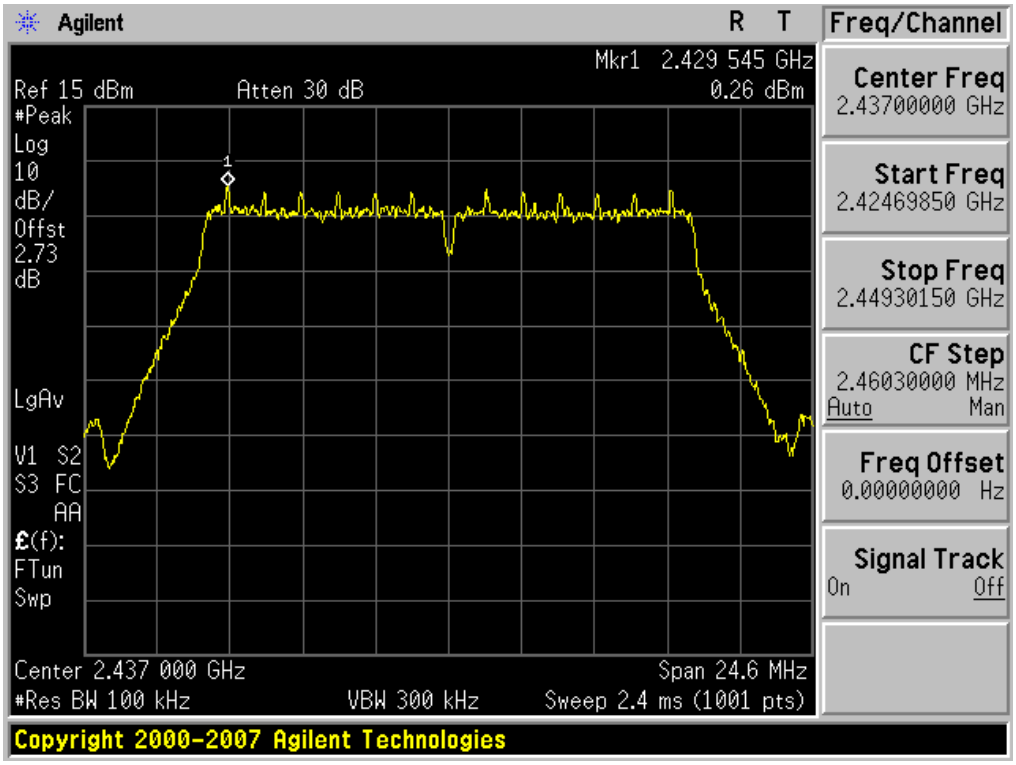




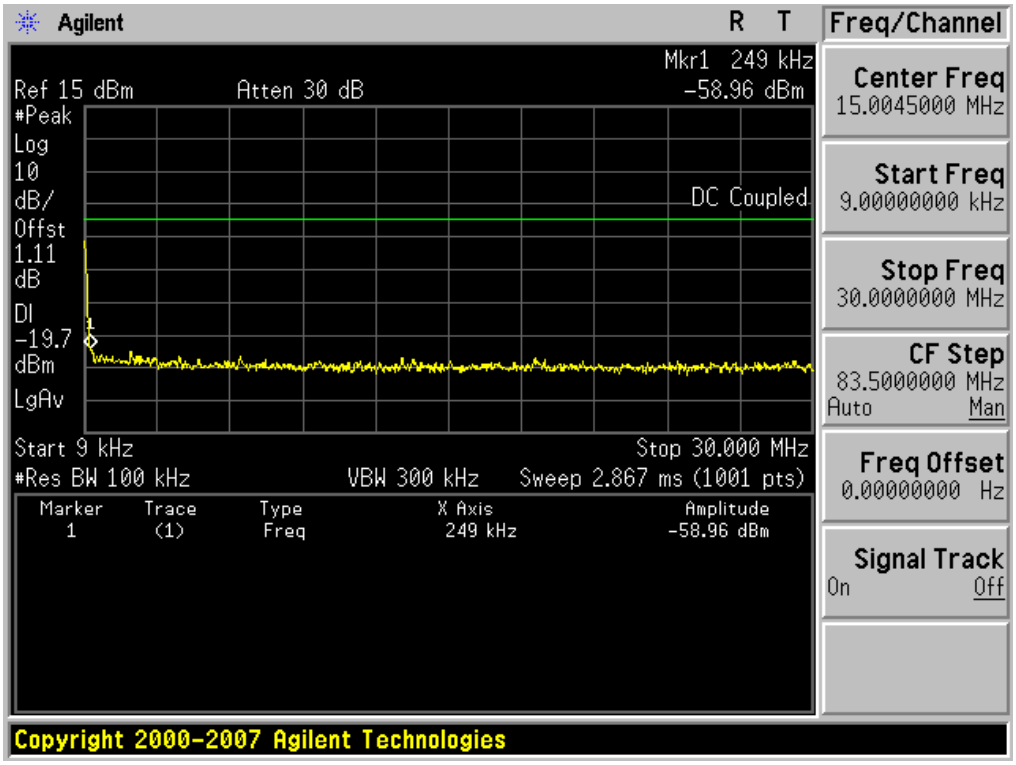
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	809.233333 M	-49.15
1.000 G	2.000 G	1.00 M	1.731333 G	-47.65
2.000 G	2.400 G	1.00 M	2.399680 G	-33.99
2.400 G	2.483 G	1.00 M	2.407231 G	8.35
2.483 G	3.000 G	1.00 M	2.573216 G	-45.13
3.000 G	6.000 G	1.00 M	3.216000 G	-31.19
6.000 G	9.000 G	1.00 M	8.873667 G	-44.63
9.000 G	12.000 G	1.00 M	10.592667 G	-42.66
12.000 G	15.000 G	1.00 M	12.471000 G	-42.44
15.000 G	20.000 G	1.00 M	18.065000 G	-39.83
20.000 G	25.000 G	1.00 M	24.805500 G	-34.46

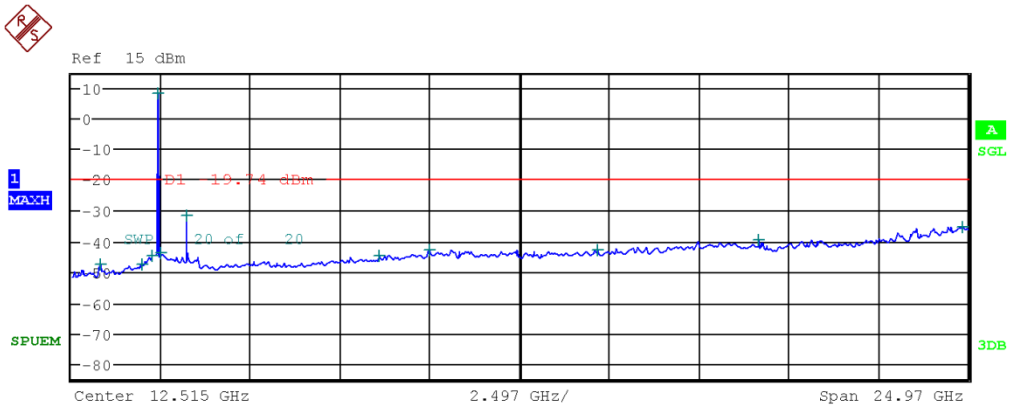
802.11g & 6Mbps & 2437MHz

Reference



Conducted Spurious Emissions

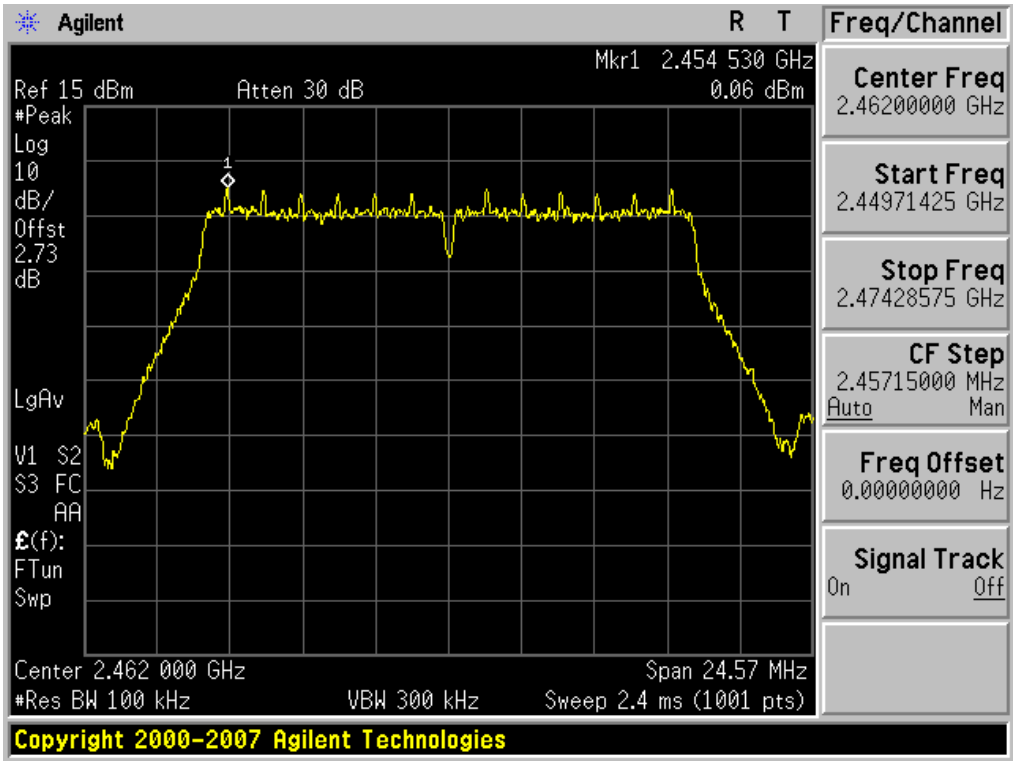




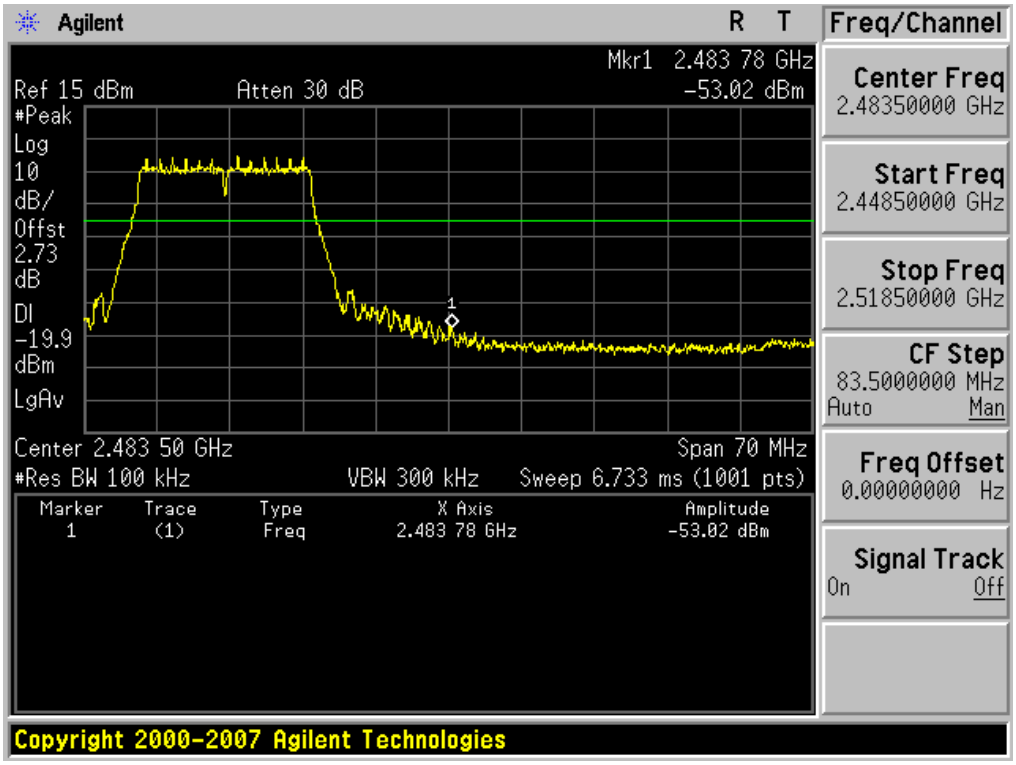
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	813.760000 M	-47.63
1.000 G	2.000 G	1.00 M	1.992000 G	-47.52
2.000 G	2.400 G	1.00 M	2.266760 G	-44.66
2.400 G	2.483 G	1.00 M	2.432406 G	8.18
2.483 G	3.000 G	1.00 M	2.501423 G	-44.12
3.000 G	6.000 G	1.00 M	3.249333 G	-31.88
6.000 G	9.000 G	1.00 M	8.603000 G	-44.70
9.000 G	12.000 G	1.00 M	10.007667 G	-42.95
12.000 G	15.000 G	1.00 M	14.661000 G	-42.80
15.000 G	20.000 G	1.00 M	19.169000 G	-39.71
20.000 G	25.000 G	1.00 M	24.822000 G	-35.33

802.11g & 6Mbps & 2462MHz

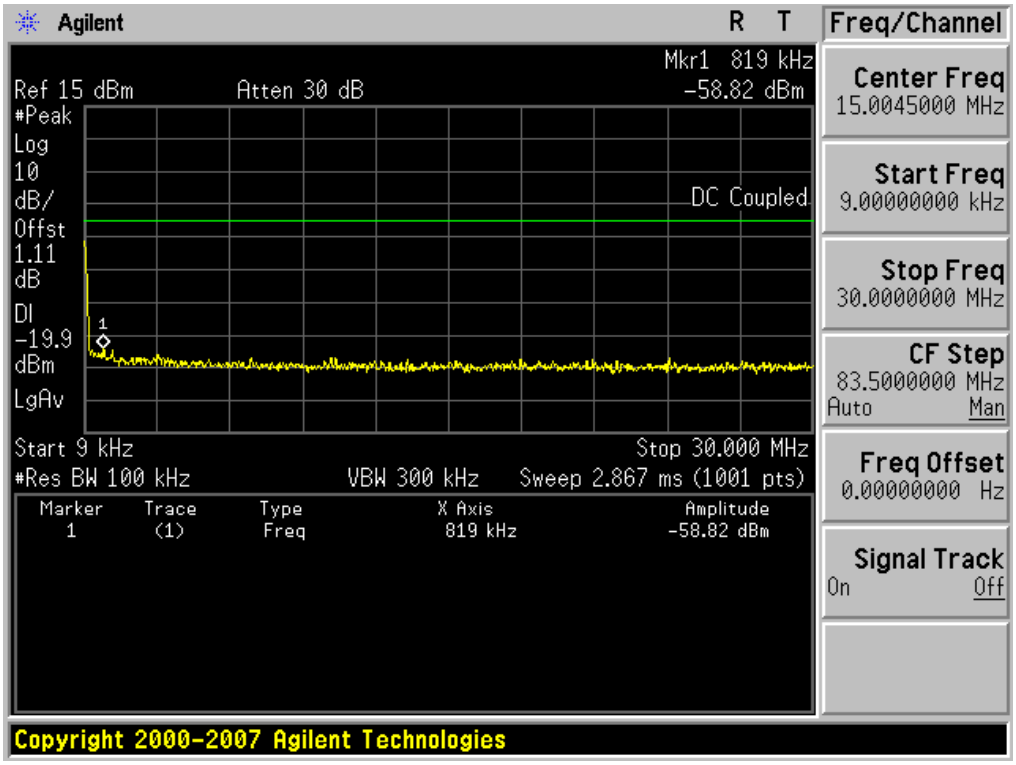
Reference

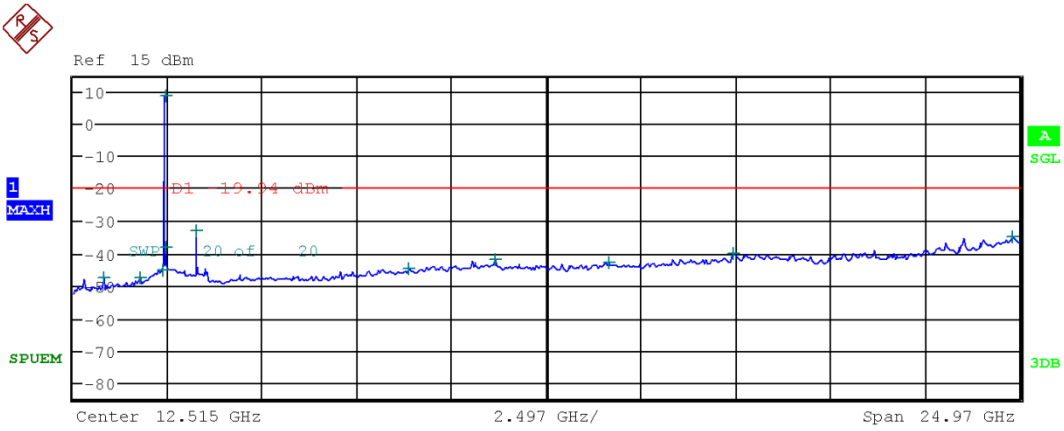


High Band-edge



Conducted Spurious Emissions

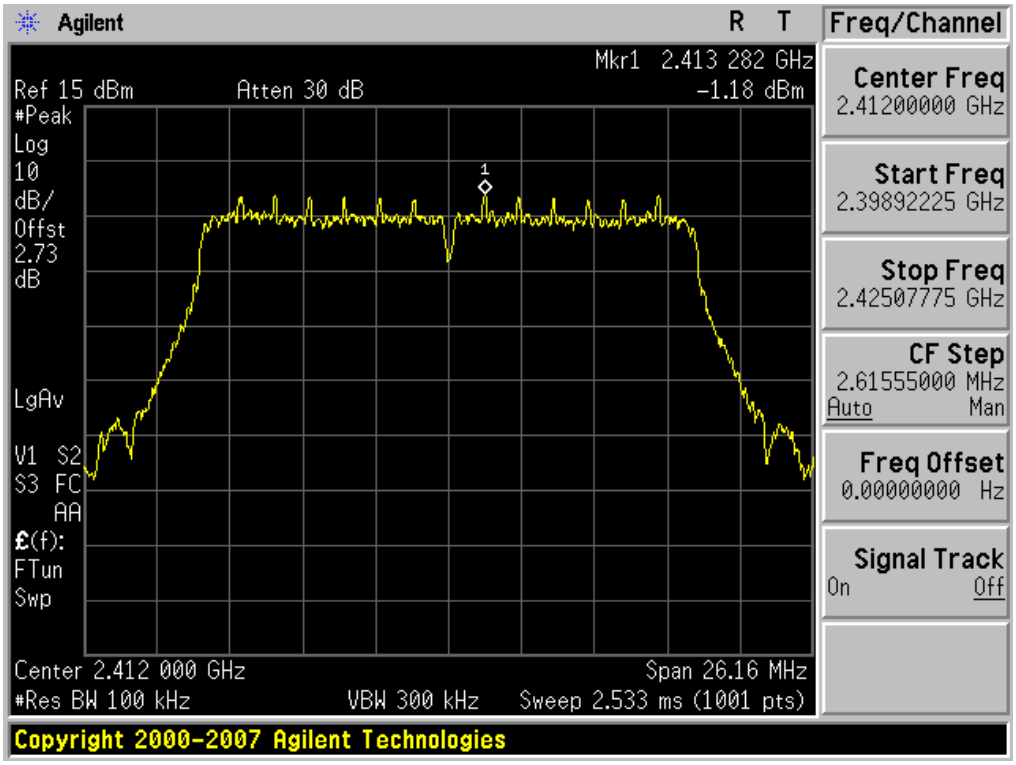




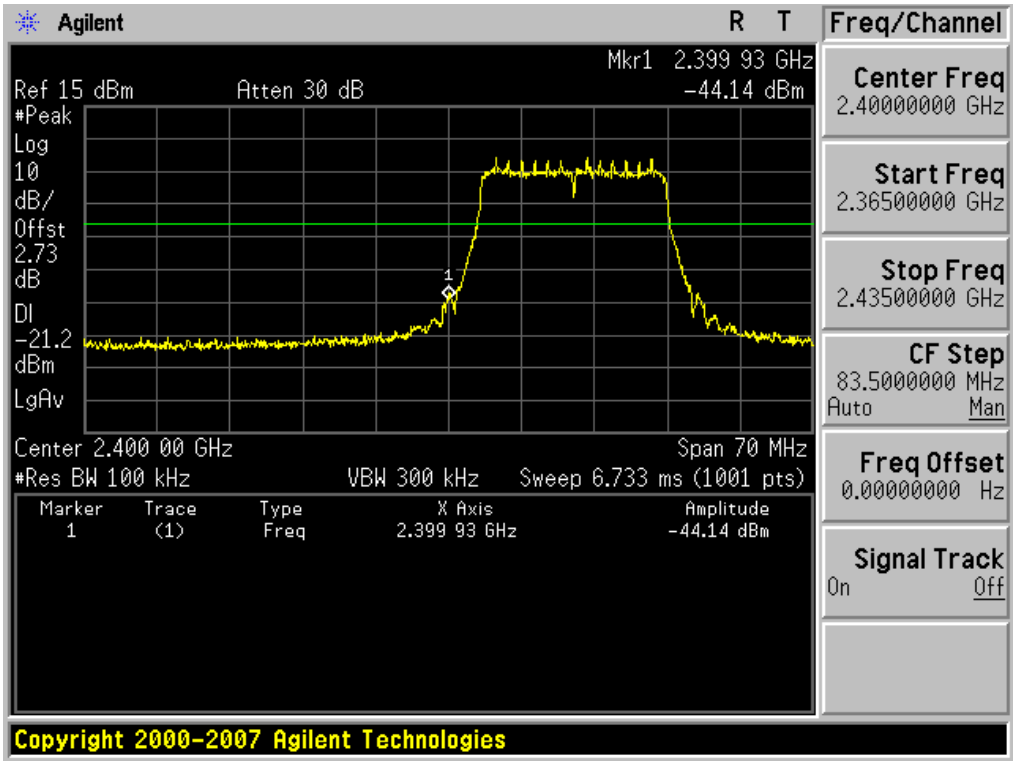
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	821.843333 M	-47.64
1.000 G	2.000 G	1.00 M	1.778667 G	-47.78
2.000 G	2.400 G	1.00 M	2.395760 G	-45.12
2.400 G	2.483 G	1.00 M	2.457239 G	8.57
2.483 G	3.000 G	1.00 M	2.483500 G	-38.14
3.000 G	6.000 G	1.00 M	3.282667 G	-32.99
6.000 G	9.000 G	1.00 M	8.857000 G	-44.64
9.000 G	12.000 G	1.00 M	11.140667 G	-42.19
12.000 G	15.000 G	1.00 M	14.168333 G	-43.05
15.000 G	20.000 G	1.00 M	17.440000 G	-40.27
20.000 G	25.000 G	1.00 M	24.812000 G	-35.19

802.11n(HT20) & MCS0 & 2412MHz

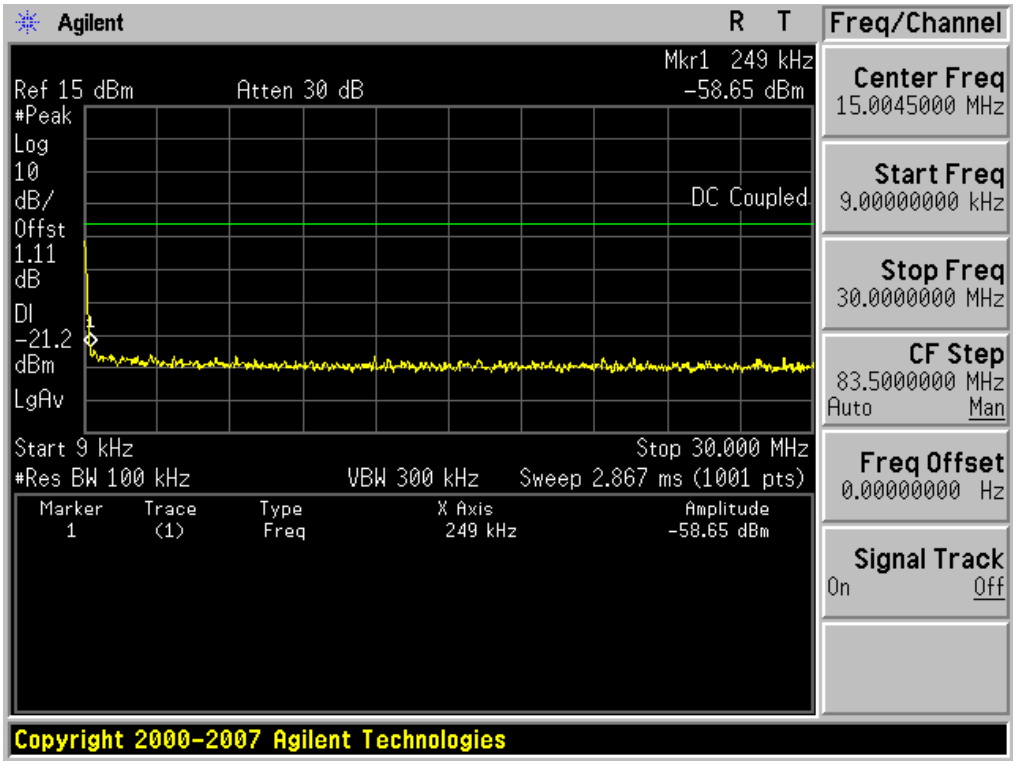
Reference

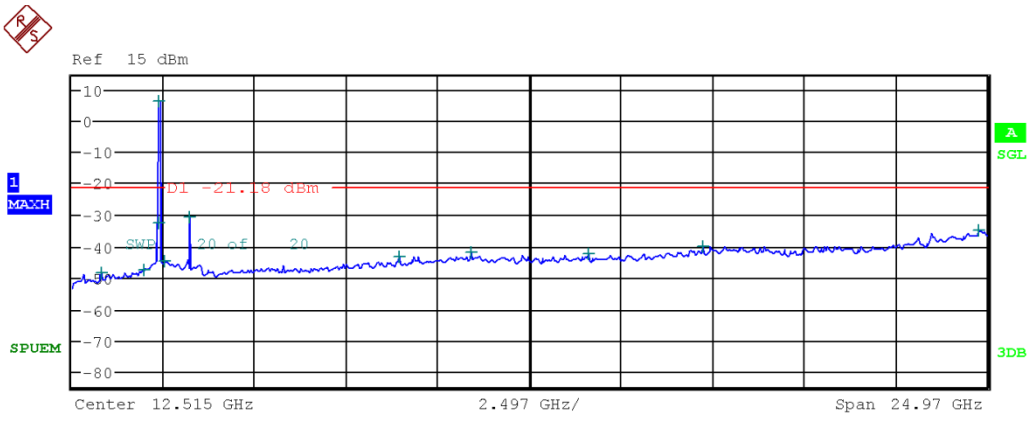


Low Band-edge



Conducted Spurious Emissions

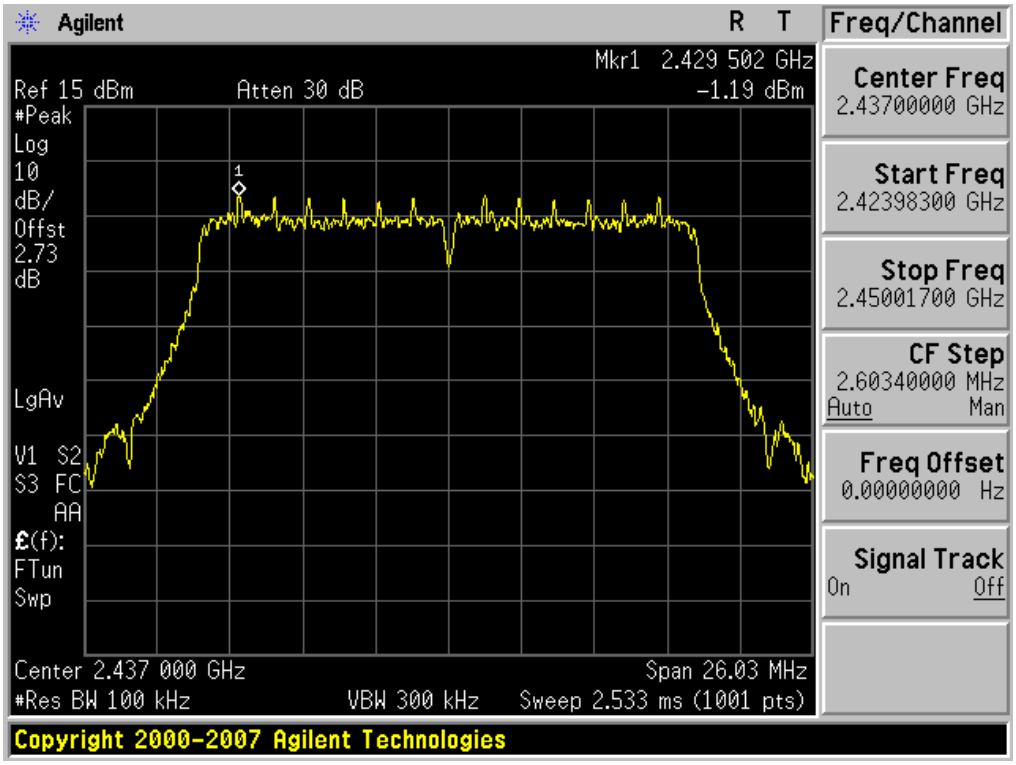




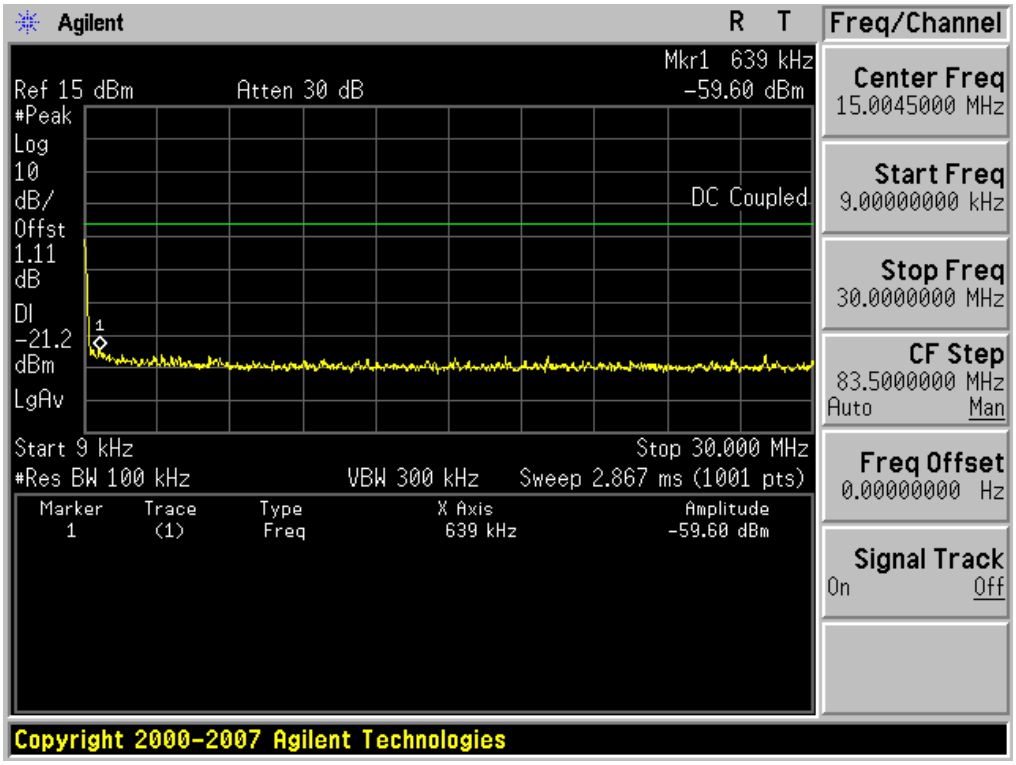
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	812.466667 M	-48.54
1.000 G	2.000 G	1.00 M	1.986000 G	-47.70
2.000 G	2.400 G	1.00 M	2.400000 G	-32.67
2.400 G	2.483 G	1.00 M	2.404542 G	6.47
2.483 G	3.000 G	1.00 M	2.566657 G	-44.85
3.000 G	6.000 G	1.00 M	3.216000 G	-30.99
6.000 G	9.000 G	1.00 M	8.959333 G	-43.58
9.000 G	12.000 G	1.00 M	10.933000 G	-42.21
12.000 G	15.000 G	1.00 M	14.113000 G	-42.62
15.000 G	20.000 G	1.00 M	17.229000 G	-40.09
20.000 G	25.000 G	1.00 M	24.743500 G	-34.97

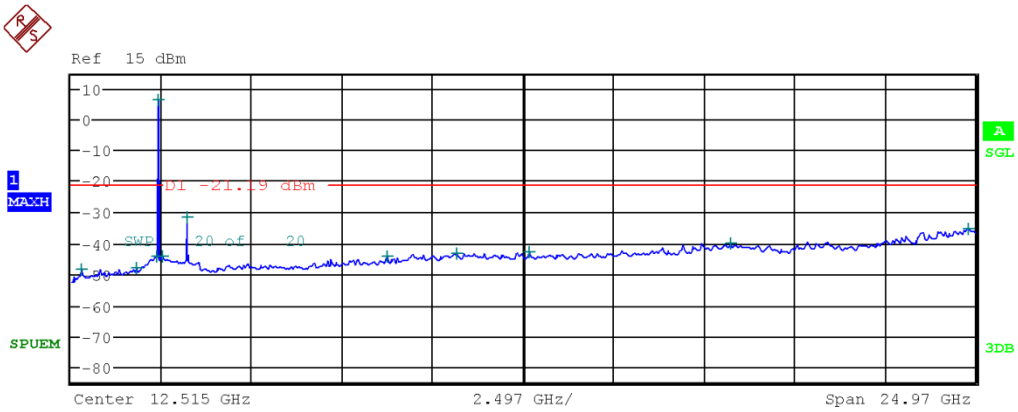
802.11n(HT20) & MCS0 & 2437MHz

Reference



Conducted Spurious Emissions

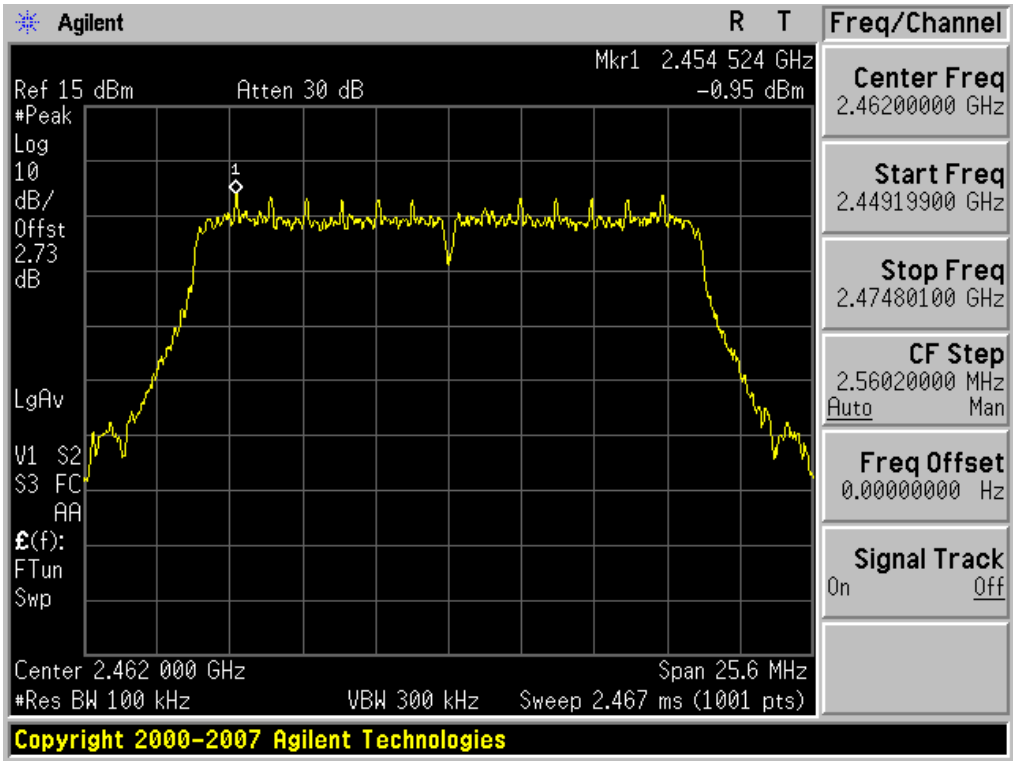




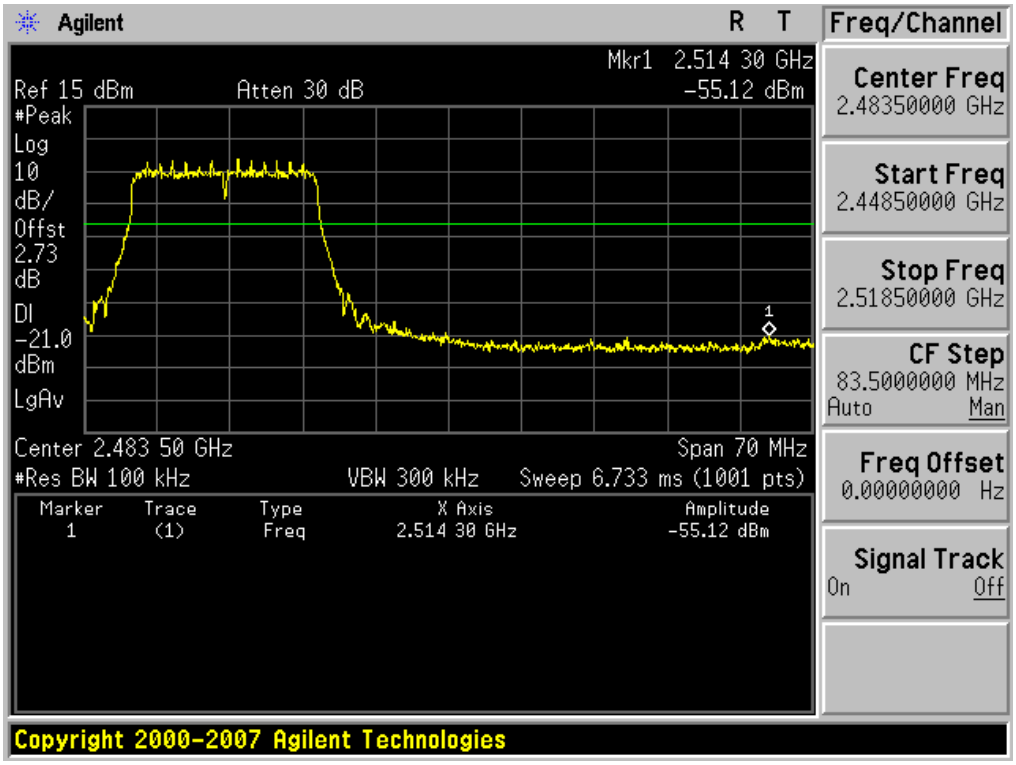
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	320.030000 M	-48.59
1.000 G	2.000 G	1.00 M	1.843000 G	-48.33
2.000 G	2.400 G	1.00 M	2.385480 G	-44.31
2.400 G	2.483 G	1.00 M	2.444372 G	6.17
2.483 G	3.000 G	1.00 M	2.565210 G	-44.49
3.000 G	6.000 G	1.00 M	3.249333 G	-31.55
6.000 G	9.000 G	1.00 M	8.738000 G	-44.50
9.000 G	12.000 G	1.00 M	10.656000 G	-43.27
12.000 G	15.000 G	1.00 M	12.661667 G	-42.85
15.000 G	20.000 G	1.00 M	18.243500 G	-40.16
20.000 G	25.000 G	1.00 M	24.809000 G	-35.36

802.11n(HT20) & MCS0 & 2462MHz

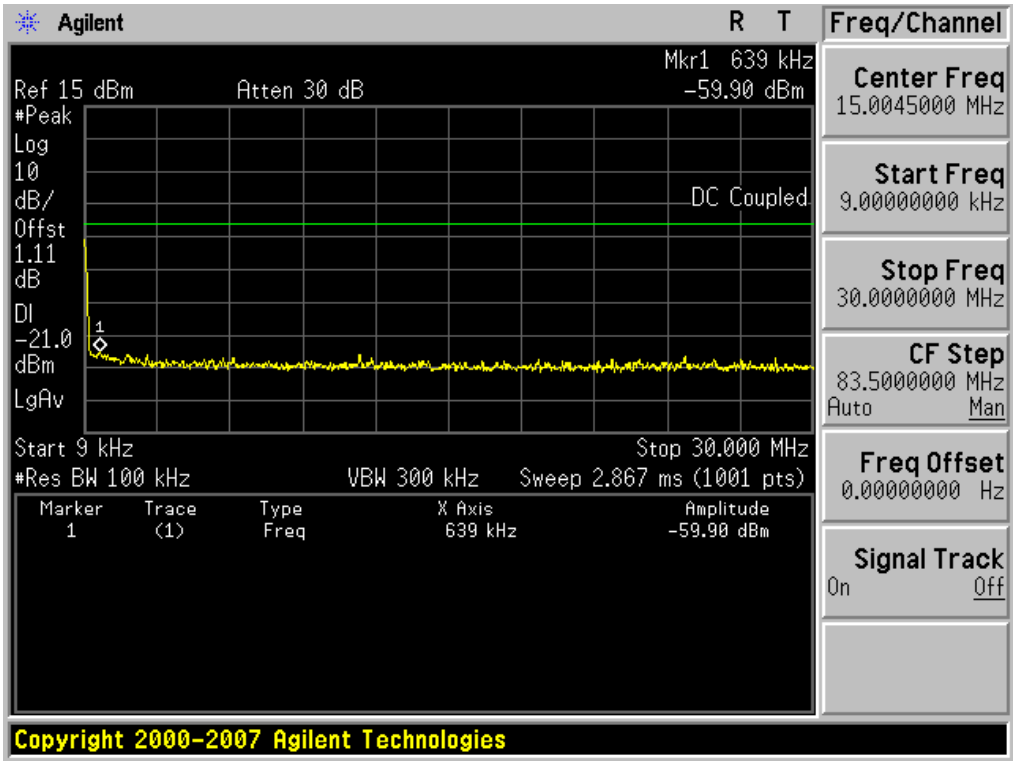
Reference

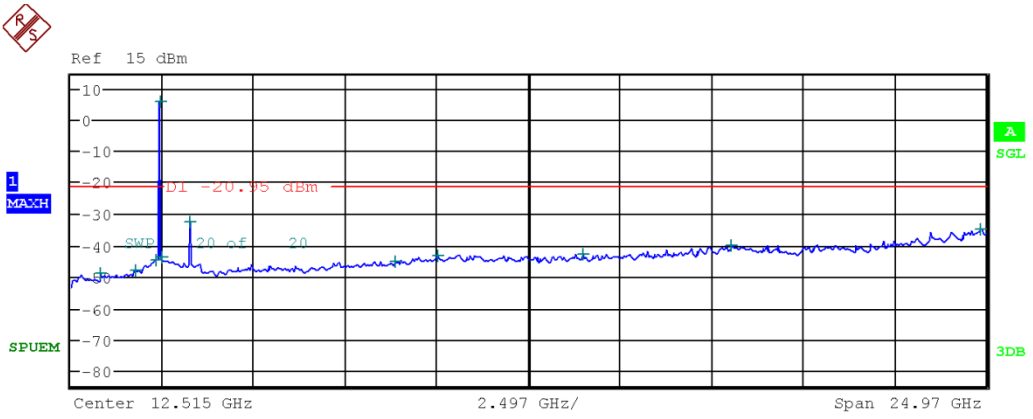


High Band-edge



Conducted Spurious Emissions

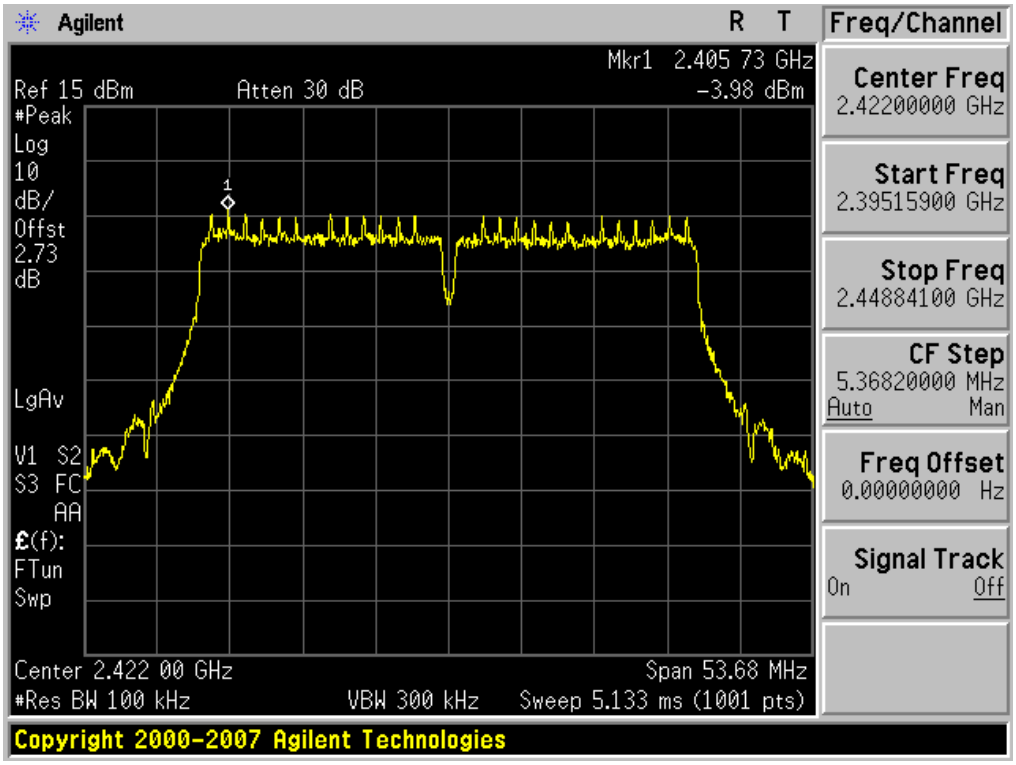




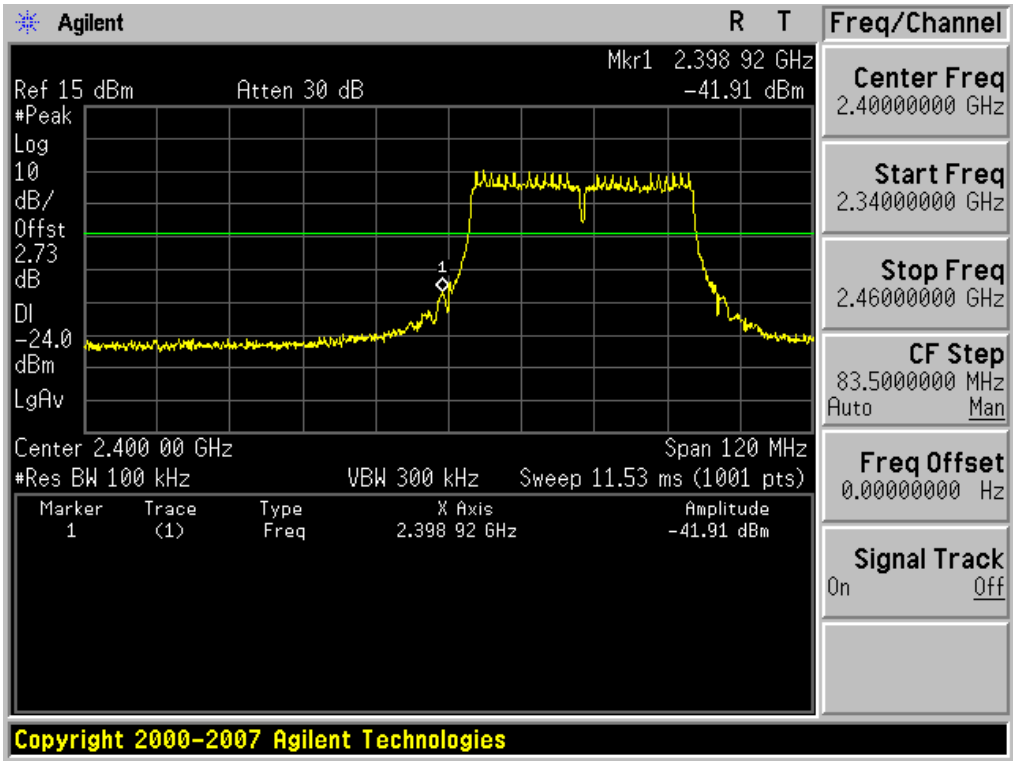
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	817.640000 M	-48.87
1.000 G	2.000 G	1.00 M	1.784000 G	-48.04
2.000 G	2.400 G	1.00 M	2.360960 G	-44.78
2.400 G	2.483 G	1.00 M	2.454759 G	5.97
2.483 G	3.000 G	1.00 M	2.494915 G	-43.87
3.000 G	6.000 G	1.00 M	3.282667 G	-32.51
6.000 G	9.000 G	1.00 M	8.884667 G	-45.21
9.000 G	12.000 G	1.00 M	10.029333 G	-43.37
12.000 G	15.000 G	1.00 M	14.001667 G	-42.93
15.000 G	20.000 G	1.00 M	18.057000 G	-40.16
20.000 G	25.000 G	1.00 M	24.852000 G	-34.80

802.11n(HT40) & MCS0 & 2422MHz

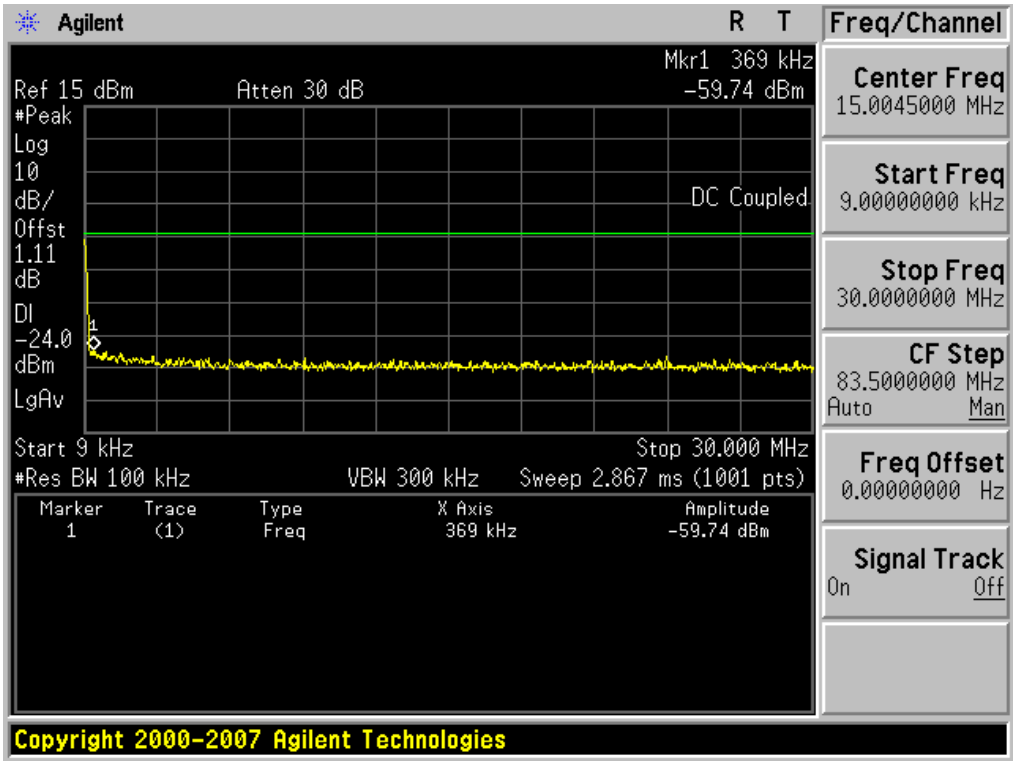
Reference

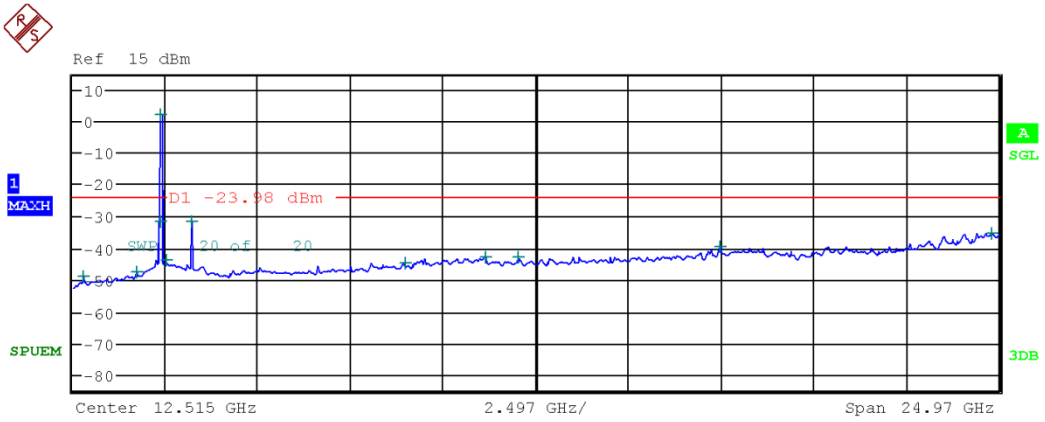


Low Band-edge



Conducted Spurious Emissions

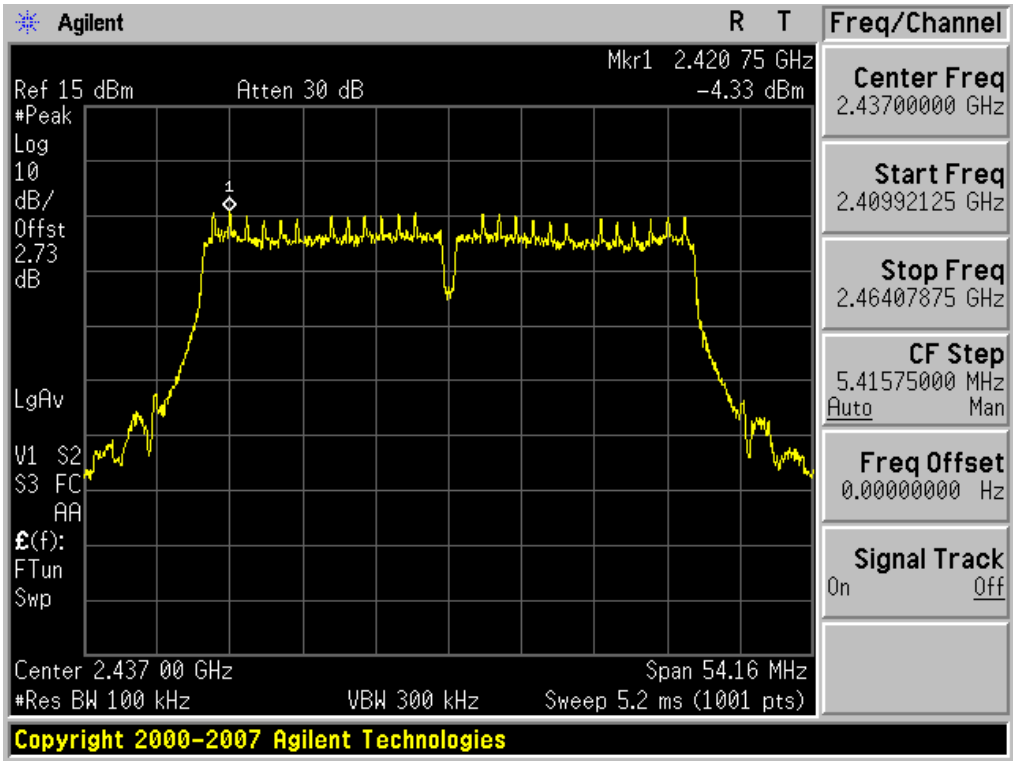




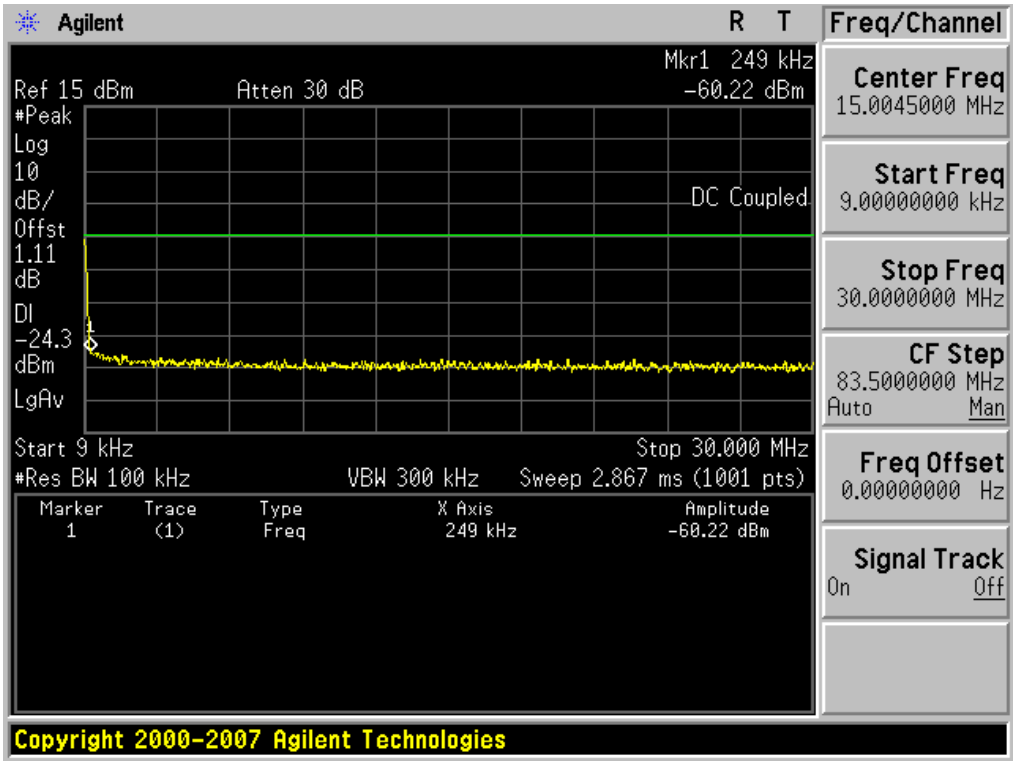
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	320.030000 M	-49.28
1.000 G	2.000 G	1.00 M	1.747667 G	-47.59
2.000 G	2.400 G	1.00 M	2.400000 G	-31.79
2.400 G	2.483 G	1.00 M	2.405135 G	2.28
2.483 G	3.000 G	1.00 M	2.563196 G	-44.10
3.000 G	6.000 G	1.00 M	3.229333 G	-31.56
6.000 G	9.000 G	1.00 M	8.988667 G	-44.84
9.000 G	12.000 G	1.00 M	11.151000 G	-43.01
12.000 G	15.000 G	1.00 M	12.053333 G	-43.00
15.000 G	20.000 G	1.00 M	17.485500 G	-39.55
20.000 G	25.000 G	1.00 M	24.782000 G	-35.38

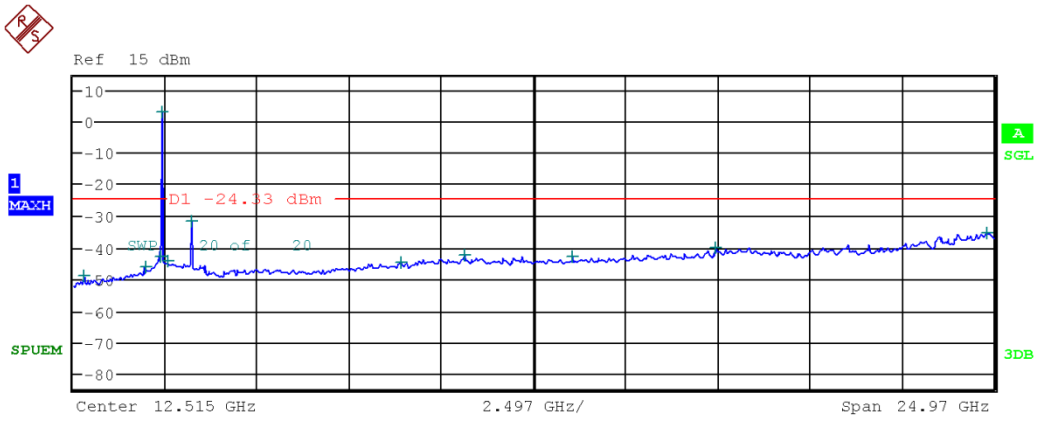
802.11n(HT40) & MCS0 & 2437MHz

Reference



Conducted Spurious Emissions

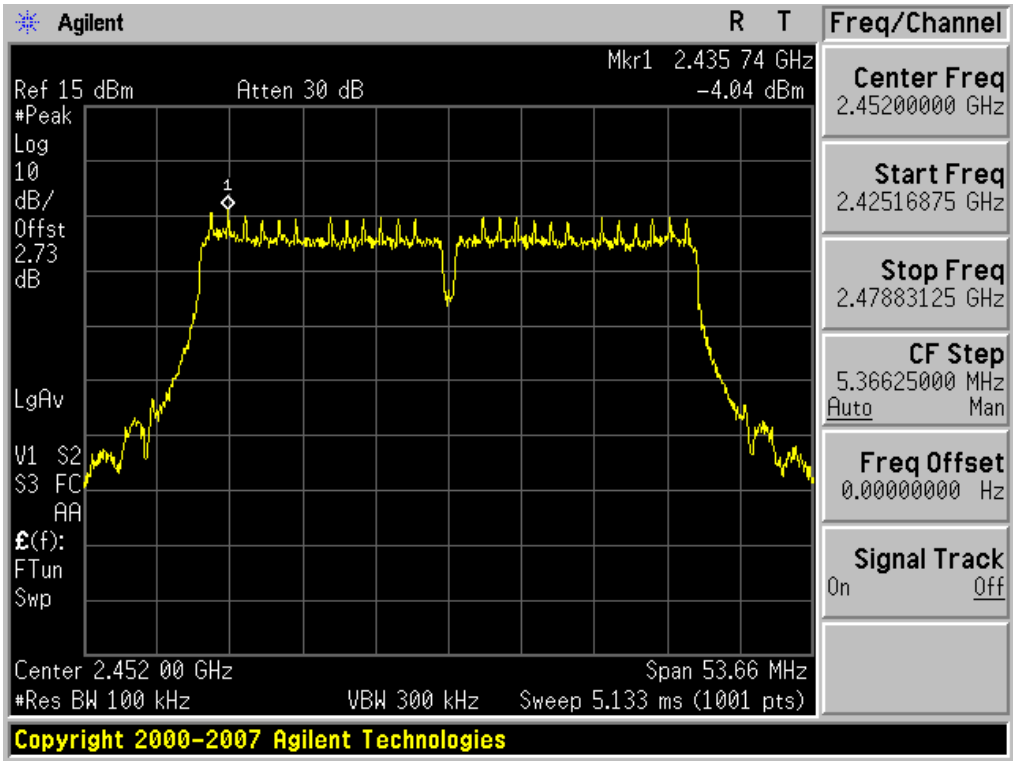




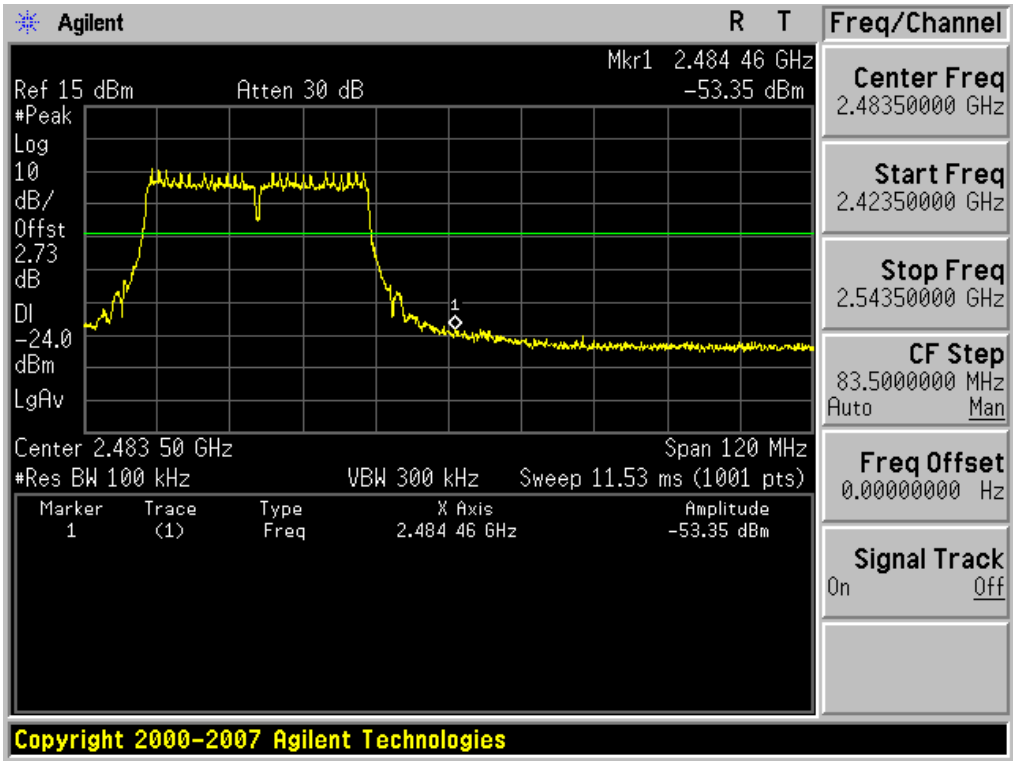
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	320.030000 M	-48.97
1.000 G	2.000 G	1.00 M	1.978000 G	-46.13
2.000 G	2.400 G	1.00 M	2.399160 G	-42.85
2.400 G	2.483 G	1.00 M	2.422061 G	2.80
2.483 G	3.000 G	1.00 M	2.597905 G	-44.42
3.000 G	6.000 G	1.00 M	3.249333 G	-31.78
6.000 G	9.000 G	1.00 M	8.910000 G	-44.93
9.000 G	12.000 G	1.00 M	10.645667 G	-42.49
12.000 G	15.000 G	1.00 M	13.563333 G	-42.96
15.000 G	20.000 G	1.00 M	17.432500 G	-40.19
20.000 G	25.000 G	1.00 M	24.791500 G	-35.66

802.11n(HT40) & MCS0 & 2452MHz

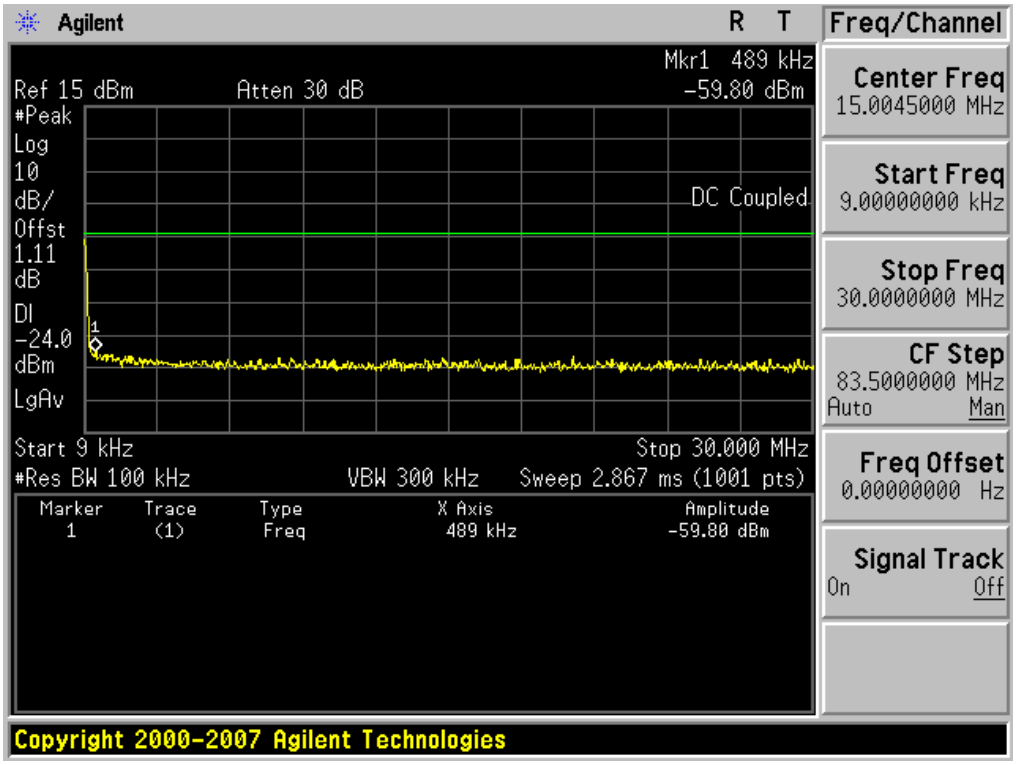
Reference

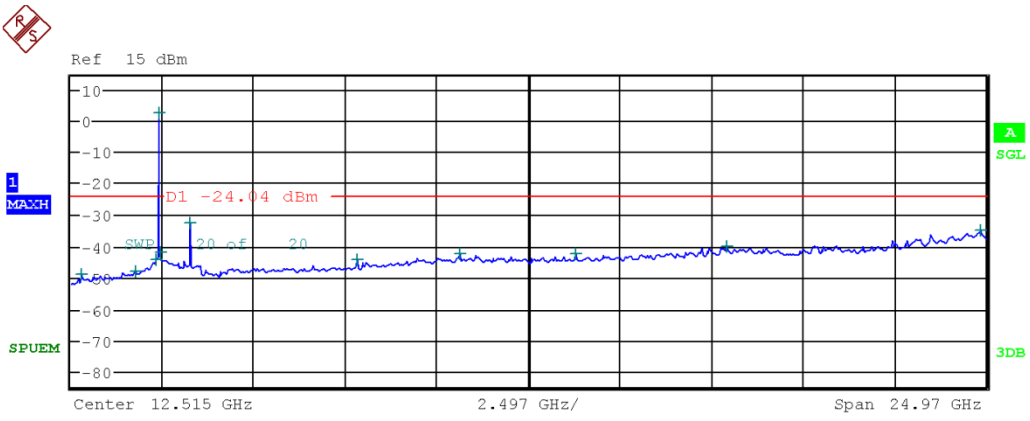


High Band-edge



Conducted Spurious Emissions





Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]
30.000 M	1.000 G	1.00 M	319.383333 M	-49.32
1.000 G	2.000 G	1.00 M	1.776333 G	-48.27
2.000 G	2.400 G	1.00 M	2.338040 G	-44.53
2.400 G	2.483 G	1.00 M	2.437183 G	2.54
2.483 G	3.000 G	1.00 M	2.487684 G	-42.16
3.000 G	6.000 G	1.00 M	3.269333 G	-32.54
6.000 G	9.000 G	1.00 M	7.817000 G	-44.35
9.000 G	12.000 G	1.00 M	10.644333 G	-42.74
12.000 G	15.000 G	1.00 M	13.794333 G	-42.65
15.000 G	20.000 G	1.00 M	17.927500 G	-40.36
20.000 G	25.000 G	1.00 M	24.822000 G	-35.13

8.5 Radiated Spurious Emissions

Test Requirements and limit,§15.247(d), §15.205, §15.209& RSS-210[A8.5]

In any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

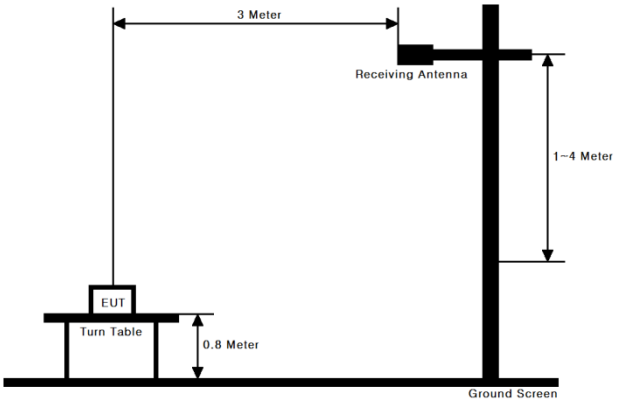
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240			
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Test Configuration



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

Note : Measurement Instrument Setting for Radiated Emission Measurements.

1. **Frequency Range Below 1 GHz**
   RBW = 100 or 120 KHz, VBW = 3 x RBW , Detector = Peak or Quasi Peak
2. **Frequency Range > 1 GHz**
   Peak Measurement
   RBW = 1 MHz , VBW = 3 MHz, Detector = Peak
   Average Measurement
   1.RBW = 1 MHz (unless otherwise specified).
   2. VBW ≥ 3 x RBW.
   3. Detector = RMS
   4. Averaging type = power (i.e., RMS).
   5. Sweep time = auto.
   6. Perform a trace average of at least 100 traces.
   7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
      1) If **power averaging (RMS) mode** was used in step 4, then the applicable correction factor is **10 log(1/x)**, where x is the duty cycle.
      2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
      3) If a specific emission is demonstrated to be **continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction** is required for that emission.

Band	Duty Cycle(%)	T_{on}(ms)	T_{on}+ T_{off}(ms)	DCF (10log(1/Duty)) (dB)
802.11b	97.75	8.680	8.880	0.10
802.11g	87.54	1.440	1.645	0.58
2.4GHz 802.11n(HT20)	87.10	1.350	1.550	0.60
2.4GHz 802.11n(HT40)	76.55	0.666	0.870	1.16

9kHz ~ 25GHz Data(*802.11b &1Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
119.99	H	X	QP	46.10	-12.00	-	-	34.10	40.00	5.90
2389.95	V	Y	PK	59.55	-3.38	-	-	56.17	74.00	17.83
2389.95	V	Y	AV	51.99	-3.38	0.10	-	48.71	54.00	5.29
4823.97	H	Z	PK	49.13	5.43	-	-	54.56	74.00	19.44
4823.98	H	Z	AV	44.27	5.43	0.10	-	49.80	54.00	4.20

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.01	H	X	QP	46.42	-12.00	-	-	34.42	40.00	5.58
4874.10	H	Z	PK	49.98	5.64	-	-	55.62	74.00	18.38
4874.02	H	Z	AV	44.63	5.64	0.10	-	50.37	54.00	3.63

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.00	H	X	QP	45.92	-12.00	-	-	33.92	40.00	6.08
2483.81	V	Y	PK	60.67	-2.79	-	-	57.88	74.00	16.12
2483.53	V	Y	AV	53.96	-2.79	0.10	-	51.27	54.00	2.73
4924.39	H	Z	PK	49.27	5.99	-	-	55.26	74.00	18.74
4923.96	H	Z	AV	43.14	5.99	0.10	-	49.23	54.00	4.77

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
Where,T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCF = Duty Cycle Correction Factor.

9kHz ~ 25GHz Data(*802.11g & 6Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
119.99	H	X	QP	45.28	-12.00	-	-	33.28	40.00	6.72
2389.84	V	Y	PK	71.41	-3.38			68.03	74.00	5.97
2389.68	V	Y	AV	53.02	-3.38	0.58	-	50.22	54.00	3.78
4822.40	H	X	PK	43.56	5.43	-	-	48.99	74.00	25.01
4823.05	H	X	AV	33.21	5.43	0.58	-	39.22	54.00	14.78

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
119.98	H	X	QP	46.02	-12.00	-	-	34.02	40.00	5.98
4876.25	H	X	PK	43.84	5.64	-	-	49.48	74.00	24.52
4876.64	H	X	AV	33.34	5.64	0.58	-	39.56	54.00	14.44

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.05	H	X	QP	45.63	-12.00	-	-	33.63	40.00	6.37
2484.20	V	Y	PK	69.34	-2.79	-	-	66.55	74.00	7.45
2484.81	V	Y	AV	53.42	-2.79	0.58	-	51.21	54.00	2.79
4921.05	H	X	PK	43.94	5.99	-	-	49.93	74.00	24.07
4922.36	H	X	AV	33.20	5.99	0.58	-	39.77	54.00	14.23

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
Where,T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCF = Duty Cycle Correction Factor.

9kHz ~ 25GHz Data(*802.11n HT20 & MCS0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.06	H	X	QP	46.28	-12.00	-	-	34.28	40.00	5.72
2388.96	V	Y	PK	70.19	-3.38	-	-	66.81	74.00	7.19
2389.84	V	Y	AV	52.24	-3.38	0.60	-	49.46	54.00	4.54
4822.05	H	X	PK	44.62	5.43	-	-	50.05	74.00	23.95
4823.97	H	X	AV	33.60	5.43	0.60	-	39.63	54.00	14.37

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.00	H	X	QP	46.39	-12.00	-	-	34.39	40.00	5.61
4873.96	H	X	PK	43.89	5.64	-	-	49.53	74.00	24.47
4874.74	H	X	AV	33.42	5.64	0.60	-	39.66	54.00	14.34

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.03	H	X	QP	46.22	-12.00	-	-	34.22	40.00	5.78
2484.80	V	Y	PK	68.44	-2.79	-	-	65.65	74.00	8.35
2483.58	V	Y	AV	53.83	-2.79	0.60	-	51.64	54.00	2.36
4822.25	H	X	PK	44.66	5.99	-	-	50.65	74.00	23.35
4921.64	H	X	AV	33.15	5.99	0.60	-	39.74	54.00	14.26

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
Where,T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCF = Duty Cycle Correction Factor.

9kHz ~ 25GHz Data(*802.11n HT40 & MCS0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.03	H	X	QP	45.87	-12.00	-	-	33.87	40.00	6.13
2388.68	V	Y	PK	68.64	-3.38	-	-	65.26	74.00	8.74
2389.28	V	Y	AV	53.82	-3.38	1.16	-	51.60	54.00	2.40
4844.96	H	X	PK	43.13	5.43	-	-	48.56	74.00	25.44
4843.12	H	X	AV	32.96	5.43	1.16	-	39.55	54.00	14.45

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
119.99	H	X	QP	46.05	-12.00	-	-	34.05	40.00	5.95
4872.83	H	X	PK	43.27	5.64	-	-	48.91	74.00	25.09
4872.72	H	X	AV	33.27	5.64	1.16	-	40.07	54.00	13.93

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.01	H	X	QP	45.43	-12.00	-	-	33.43	40.00	6.57
2484.27	V	Y	PK	67.10	-2.79	-	-	64.31	74.00	9.69
2483.52	V	Y	AV	53.04	-2.79	1.16	-	51.41	54.00	2.59
4907.50	H	X	PK	43.96	5.99	-	-	49.95	74.00	24.05
4906.12	H	X	AV	33.61	5.99	1.16	-	40.76	54.00	13.24

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
Where,T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCF = Duty Cycle Correction Factor.

8.6 Power-line Conducted Emissions

Test Requirements and limit, §15.207& RSS-Gen [7.2.2]

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections between EUT and supportequipment.

Test Mode

The all modes of EUT operation were investigated and the worst case mode was reported.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference groundplane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

▣RESULT PLOTS

AC Line Conducted Emissions (Graph)

Test Mode: 802.11b (2.4GHz Band)

Digital EMC

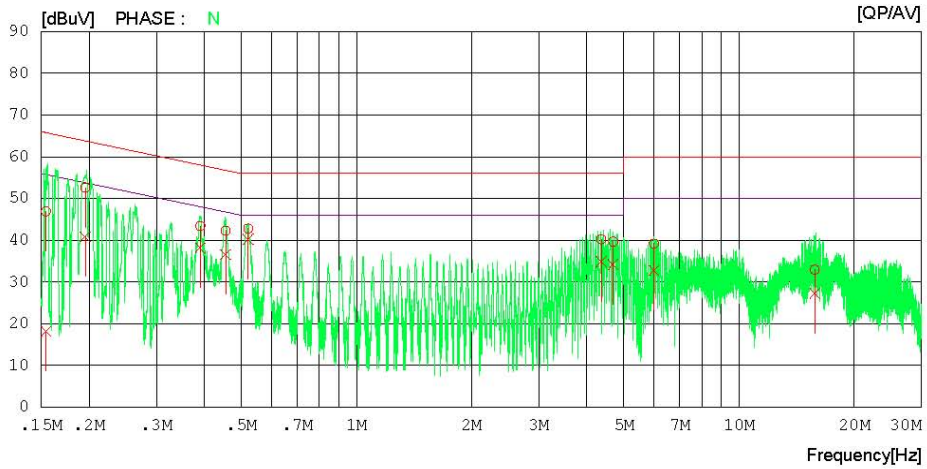
Results of Conducted Emission

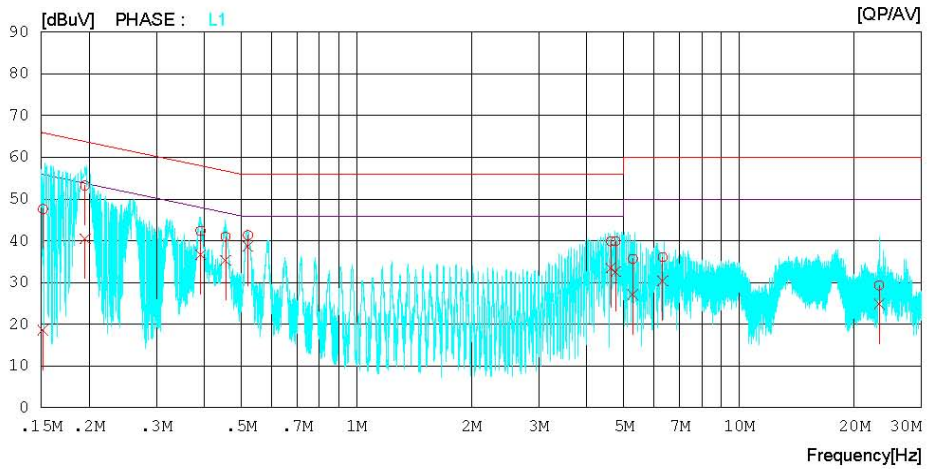
Digital EMC
Date : 2013-08-29

Model No.	:	TWFM-K301D	Referrence No.	:	
Type	:		Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	25 'C 48 % R.H.
Test Condition	:	802.11b	Operator	:	J.J.LEE

Memo :

LIMIT : FCC P15.207 QP
FCC P15.207 AV





AC Line Conducted Emissions (List)

Test Mode: 802.11b(2.4GHz Band)

Results of Conducted Emission

Digital EMC
Date : 2013-08-29

Model No.	: TWFM-K301D	Referrence No.	:	
Type	:	Power Supply	: 120 V 60 Hz	
Serial No.	: Identical prototype	Temp/Humi.	: 25 'C 48 % R.H.	
Test Condition	: 802.11b	Operator	: J.J.LEE	

Memo :

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15437	46.8	18.1	0.1	46.9	18.2	65.8	55.8	18.9	37.6	N
2	0.19560	52.5	40.8	0.1	52.6	40.9	63.8	53.8	11.2	12.9	N
3	0.39087	43.3	38.1	0.1	43.4	38.2	58.0	48.0	14.6	9.8	N
4	0.45515	42.2	36.4	0.1	42.3	36.5	56.8	46.8	14.5	10.3	N
5	0.52133	42.7	40.1	0.1	42.8	40.2	56.0	46.0	13.2	5.8	N
6	4.36240	39.9	34.6	0.3	40.2	34.9	56.0	46.0	15.8	11.1	N
7	4.68780	39.2	33.6	0.5	39.7	34.1	56.0	46.0	16.3	11.9	N
8	5.99240	38.7	32.3	0.5	39.2	32.8	60.0	50.0	20.8	17.2	N
9	15.76480	32.1	26.4	0.8	32.9	27.2	60.0	50.0	27.1	22.8	N
10	0.15161	47.5	18.6	0.1	47.6	18.7	65.9	55.9	18.3	37.2	L1
11	0.19525	53.1	40.5	0.1	53.2	40.6	63.8	53.8	10.6	13.2	L1
12	0.39117	42.3	36.6	0.1	42.4	36.7	58.0	48.0	15.6	11.3	L1
13	0.45538	40.8	35.3	0.1	40.9	35.4	56.8	46.8	15.9	11.4	L1
14	0.52050	41.2	38.6	0.1	41.3	38.7	56.0	46.0	14.7	7.3	L1
15	4.62680	39.3	33.0	0.5	39.8	33.5	56.0	46.0	16.2	12.5	L1
16	4.75820	39.4	32.1	0.5	39.9	32.6	56.0	46.0	16.1	13.4	L1
17	5.27780	35.2	26.7	0.5	35.7	27.2	60.0	50.0	24.3	22.8	L1
18	6.31940	35.6	29.9	0.5	36.1	30.4	60.0	50.0	23.9	19.6	L1
19	23.25480	28.4	24.0	0.9	29.3	24.9	60.0	50.0	30.7	25.1	L1

8.7 Occupied Bandwidth

Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

▣ TEST CONFIGURATION

▣ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted.
Where practical,a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

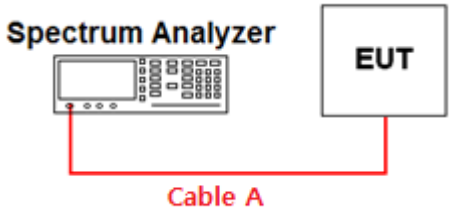
▣ TEST RESULTS: N/A

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Horn Antenna	ETS	3115	13/02/28	15/02/28	00021097
Multimeter	HP	34401A	13/02/27	14/02/27	3146A13475
DC Power Supply	HP	6622A	13/02/27	14/02/27	3448A03760
Signal Analyzer	Rohde Schwarz	FSQ26	13/02/14	14/02/14	200445
Horn Antenna	A.H.Systems Inc.	SAS-574	13/03/20	15/03/20	154
Thermohygrometer	BODYCOM	BJ5478	13/01/14	14/01/14	090205-4
High-pass Filter	Wainwright Instruments	WHKX3.0	12/09/17	13/09/17	9
PreAmplifier	Agilent	8449B	13/02/27	14/02/27	3008A00370
Spectrum Analyzer	Agilent Technologies	E4440A	12/10/22	13/10/22	US45303051
Loop Antenna	Schwarzbeck	FMZB1513	12/09/24	13/09/24	1513-128
Power Meter Power Sensor	Anritsu	ML2495A MA2411B	13/03/06	14/03/06	1306007 011290
MXA Signal Analyzer	Agilent	N9020A	13/04/10	14/04/10	MY50200828
Signal Generator	Rohde Schwarz	SMF100A	13/07/22	14/07/22	102341
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
Amplifier	HP	8447E	13/01/08	14/01/08	2945A02865
EMI TEST RECEIVER	R&S	ESU	13/01/08	14/01/08	100014
EMI TEST RECEIVER	R&S	ESCI	13/02/27	14/02/27	100364
CVCF	KIKUSUI	PCR1000L	12/09/15	13/09/15	14110610
LISN	R&S	ESH2-Z5	12/09/18	13/09/18	828739/006

APPENDIX I
Conducted Test set up Diagram & Path loss Information

▪Conducted Measurement(9KHz ~ 25GHz)



Path loss value information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	1.11	10	4.90
1	2.06	15	6.28
2412~2462	**2.73**	20	6.83
5	3.57	25	8.10

Note. 1: The path loss from EUT to Spectrum analyzer was measured and used for test.
Path loss (=S/A's offset value) = Cable A
Note. 2: For conducted spurious emissions, the path loss values were saved as the transducer factor on the spurious measurement function of the spectrum analyzer and the transducer factor of tested frequency is calculated and corrected automatically by the spectrum analyzer's measurement function.