Test Report

AIR-CAP1552xx-A-K9 Series

Cisco Aironet 802.11n Single Band Mesh Access Points

FCC ID: LDK102074P

IC: 2461B-102074P

(Also covers AIR-CAP1552xx-N-K9 and AIR-CAP1552xx-T-K9 Series)

2400-2483.5 MHz

Class II Permissive Change

Against the following Specifications:

CFR47 Part 15.247

RSS210

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134

ACCREDITED

No. 1178-01

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Section 1: Overview

Test Summary – This report presents data to support the addition of higher gain antennas to the AIR-CAP1552xx series 802.11n Dual Band Mesh Access Point

1.1

Samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Emission	Immunity
CFR47 Part 15.247 RSS210	N/A

The specifications listed above represent actual tests performed to demonstrate compliance against the specifications and basic standards listed on the front cover of this report.

Notes:

1) Measurements were made in accordance with FCC 789033 D01 UNII General Test Procedures v01 , ET docket 96-8, KDB Publication No. 558074, ANSI C63.10 & measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.

Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.

b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.

c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).

d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:
110V 60 Hz (+/-20%)

2.2 Date of start of testing

26 January 2012

2.3 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,	Cisco Systems, Inc.
4125 Highlander Parkway	170 West Tasman Drive
Richfield, OH 44286	San Jose, CA 95134
USA	USA

Test Engineers

Bud Chiller

James Nicholson

2.5 Equipment Assessed (EUT)

AIR-CAP1552E-A-K9 Cisco Aironet 802.11n Dual Band Mesh Access Point

2.6 EUT Description

The AIR-CAP1552 Series Cisco Aironet 802.11n Uni-Band Mesh Access Points require professional installation, and supports the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes.

Legacy CCK, Single Antenna, 1 to 11 Mbps
Legacy CCK, Dual Antennas, 1 to 11 Mbps
Legacy OFDM, Non HT-20, Single Antenna, 6 to 54 Mbps
Legacy OFDM, Non HT-20, Dual Antennas, 6 to 54 Mbps
Legacy OFDM , Non HT-20 Dual Antennas with Beam Forming, 6 to 54 Mbps
HT-20, Single Antenna, M0 to M7
HT-20, Dual Antennas, M0 to M15

The following antennas are being added to this product series. The data included in this report represent the worst case data for all antennas.

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
2.4 GHz			
	AIR-ANT2450V-N	2.4GHz Omni,	5
	AIR-ANT2480V-N	2.4GHz Omni,	8
	AIR-ANT2413P2M-N=	2.5GHz 2x2 Patch array, dual polarized	13

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing.

4.1 Sample Details

Sample No.	Equipment Details	Part Number	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-CAP1552E-A-K9		Cisco Systems	NA	NA	NA	
S02	AIR-ANT2450V-N						

4.2 System Details

System #	Description	Samples
1	EUT	S01, S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting

Appendix A: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 4125 Highlander Parkway, Richfield, OH, USA

Average Output Power

Connect the antenna(s) to the power meter at the average power sensor input. Configure the power meter to measure average power for the transmitter frequencies listed below (enter all losses between the transmitter output and the power meter).

Place the radio in continuous transmit mode and record the reading on the power meter.

Frequency	Modek	Data Rate	Target Power Level			Actual Power Level
			Tx A Set	Tx B Set	Total Set	Total
2412	Legacy CCK, Single Tx Path	11	25	Off	25	**23.8**
2412	Legacy CCK, Dual Tx Path	11	25	25	28	**26.5**
2412	Non HT-20, Single Tx Path	6	25	Off	25	**23.9**
2412	Non HT-20, Dual Tx Path	6	24	24	27	**25.3**
2412	Non HT-20 Beam Forming	6	22	22	25	**23.4**
2437	Legacy CCK, Dual Tx Path	11	25	25	28	**27.4**
2437	Non HT-20 Beam Forming	6	25	25	28	**26.1**
2462	Legacy CCK, Single Tx Path	11	25	Off	25	**23.5**
2462	Legacy CCK, Dual Tx Path	11	25	25	28	**27.3**
2462	Non HT-20, Single Tx Path	6	25	Off	25	**23.5**
2462	Non HT-20, Dual Tx Path	6	23	23	26	**25.5**
2462	Non HT-20 Beam Forming	6	22	22	25	**23.0**

Peak Output Power

15.247: The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

The maximum supported antenna gains are listed in the tables below. The tables also list the calculated Maximum Peak Power for each of the listed gains, as well as the associated Peak Power levels supported by this product. All of the supported power levels comply with the Maximum Peak Power levels.

Antenna Gain (dBi)	Required Power Reduction (dB)	Maximum Peak Power Limit (dBm)	Supported Peak Power (dBm)
8	2	30	28
13	3	30	27

Beam Forming Mode

Antenna Gain (dBi)	Required Power Reduction (dB)	Maximum Peak Power Limit (dBm)	Supported Peak Power (dBm)
11	2	28	28
16	4	26	26

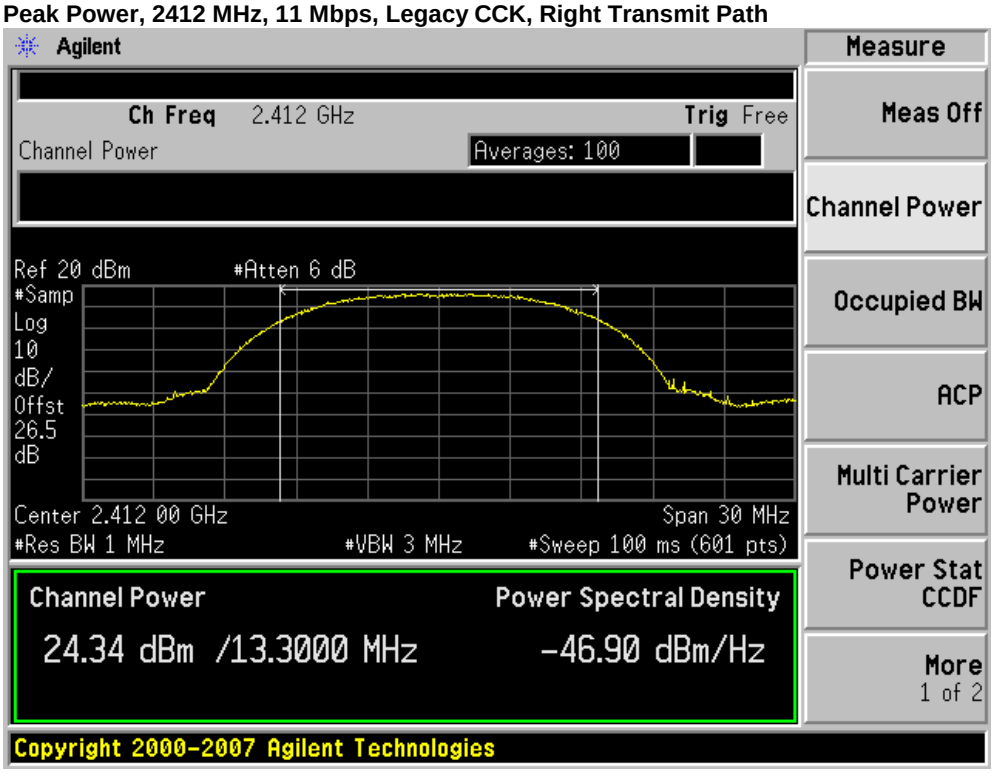
Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below.

Enable "Channel Power" function of analyzer
Center Frequency: Frequency from table below
Span: 20 MHz (must be greater than 26dB bandwidth, adjust as necessary)
Ref Level Offset: Correct for attenuator and cable loss.
Reference Level: 20 dBm
Attenuation: 20 dB
Sweep Time: 100ms, Single sweep
Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz
Detector: Sample
Trace: Trace Average 100 traces in Power Averaging Mode
Integration BW: =26 dB BW from 26 dB Bandwidth Data

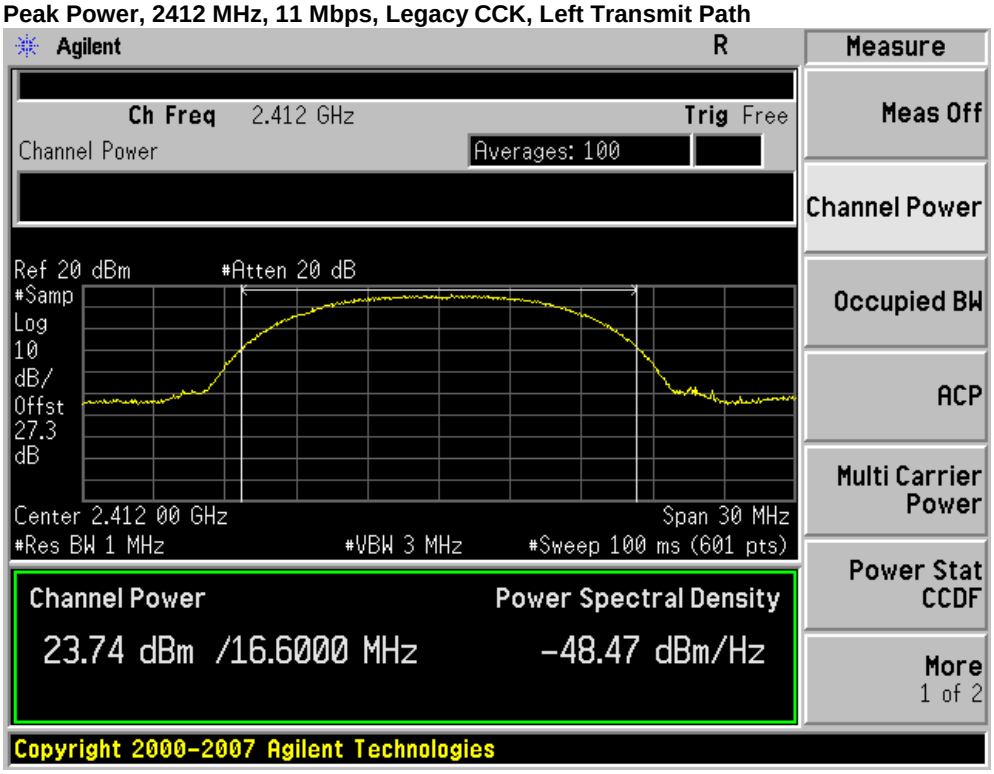
After averaging 100 traces of the transmitter waveform on the spectrum analyzer, record the spectrum analyzer Channel Power.

Frequency (MHz)	Mode	Data Rate (Mbps)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
2412	Legacy CCK, Single Tx Path	11	**24.3**	27.5	3.2
2412	Legacy CCK, Dual Tx Path	11	**27.1**	27.5	0.4
2412	Non HT-20, Single Tx Path	6	**24.1**	27.5	3.4
2412	Non HT-20, Dual Tx Path	6	**26.6**	27.5	0.9
2412	Non HT-20 Beam Forming	6	**23.4**	26.5	3.1
2437	Legacy CCK, Dual Tx Path	11	**26.4**	27.5	1.1
2437	Non HT-20 Beam Forming	6	**26.3**	26.5	0.2
2462	Legacy CCK, Single Tx Path	11	**23.4**	27.5	4.1
2462	Legacy CCK, Dual Tx Path	11	**26.4**	27.5	1.1
2462	Non HT-20, Single Tx Path	6	**23.5**	27.5	4.1
2462	Non HT-20, Dual Tx Path	6	**26.4**	27.5	1.1
2462	Non HT-20 Beam Forming	6	**22.8**	26.5	3.7

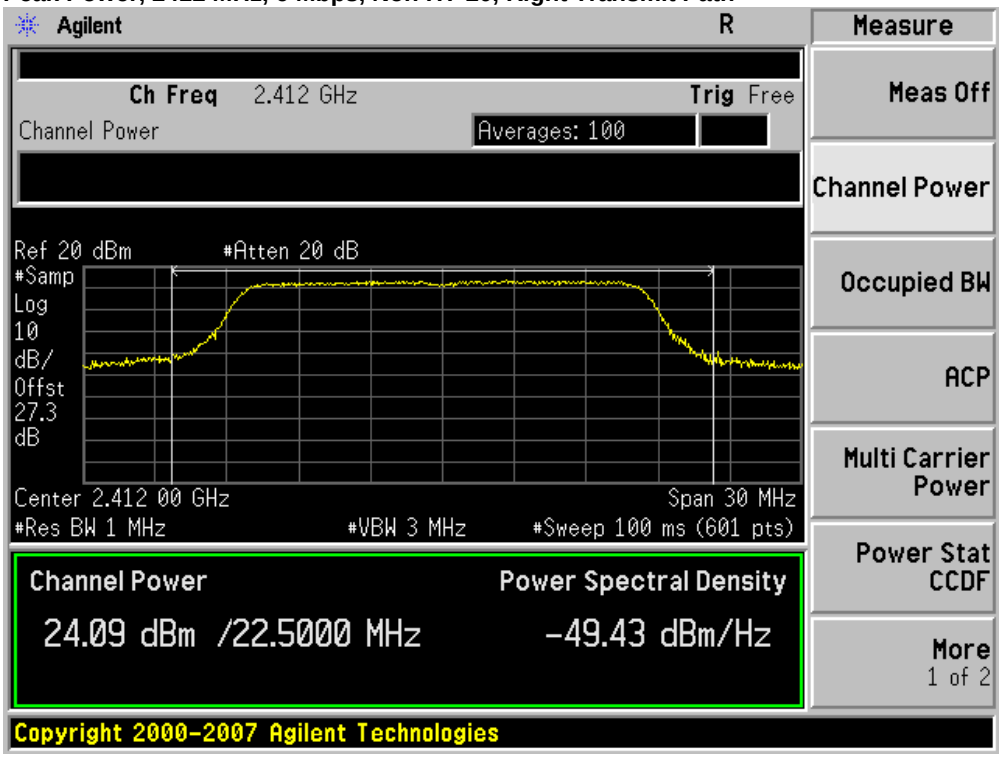
Peak Power, 2412 MHz, 11 Mbps, Legacy CCK, Right Transmit Path



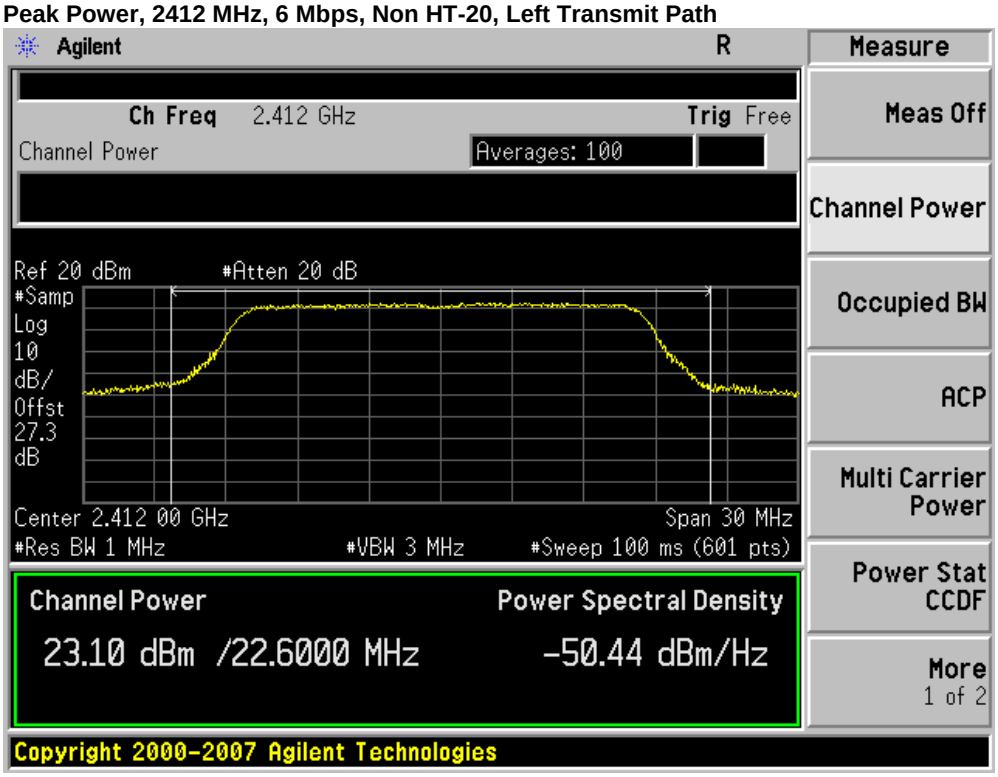
Peak Power, 2412 MHz, 11 Mbps, Legacy CCK, Left Transmit Path



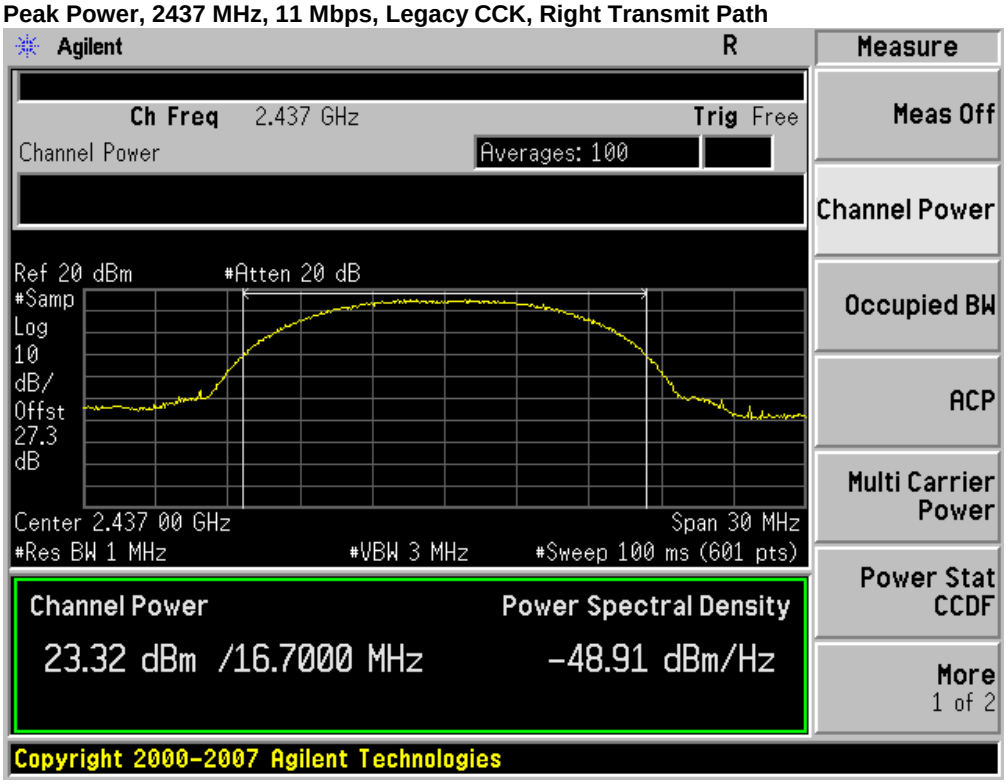
Peak Power, 2412 MHz, 6 Mbps, Non HT-20, Right Transmit Path



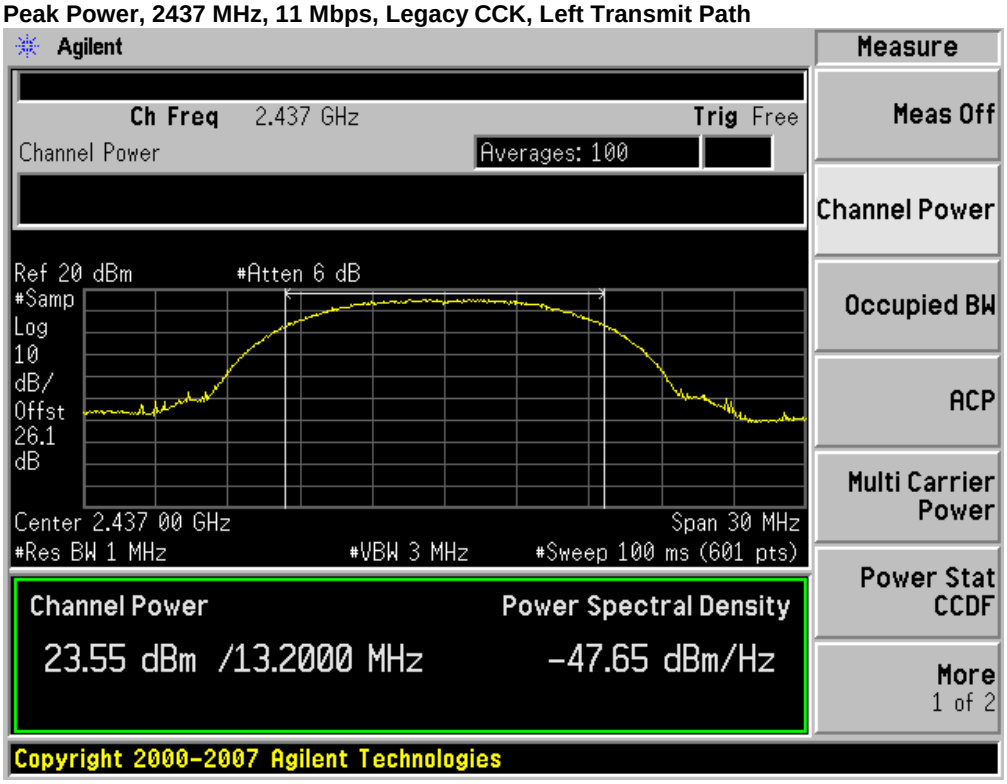
Peak Power, 2412 MHz, 6 Mbps, Non HT-20, Left Transmit Path



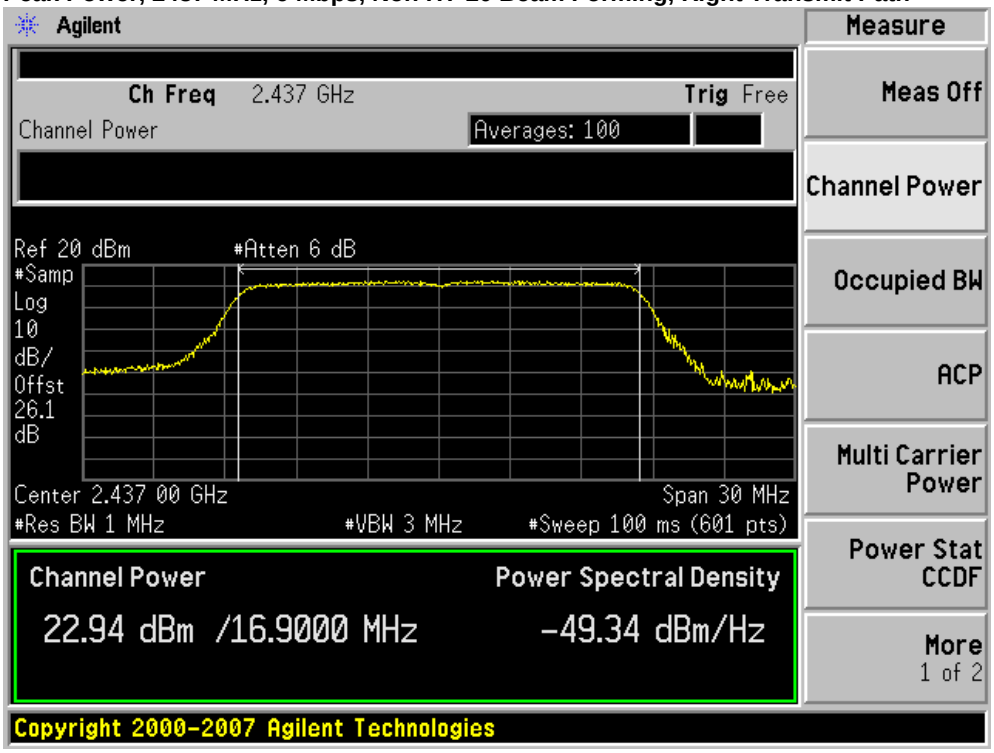
Peak Power, 2437 MHz, 11 Mbps, Legacy CCK, Right Transmit Path



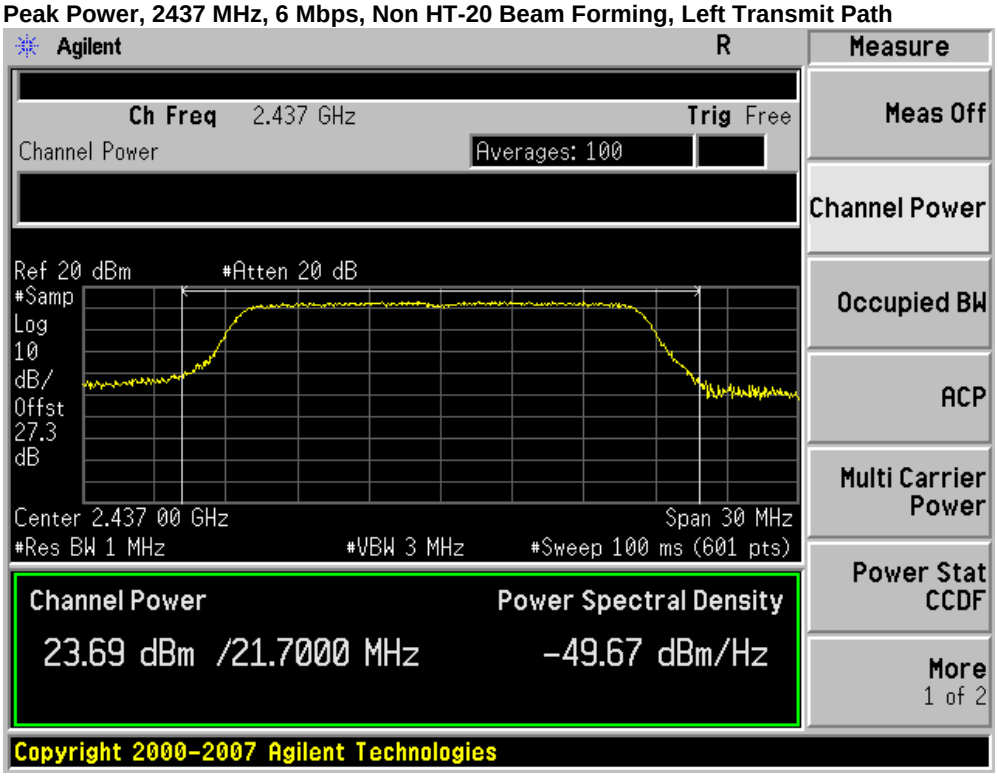
Peak Power, 2437 MHz, 11 Mbps, Legacy CCK, Left Transmit Path



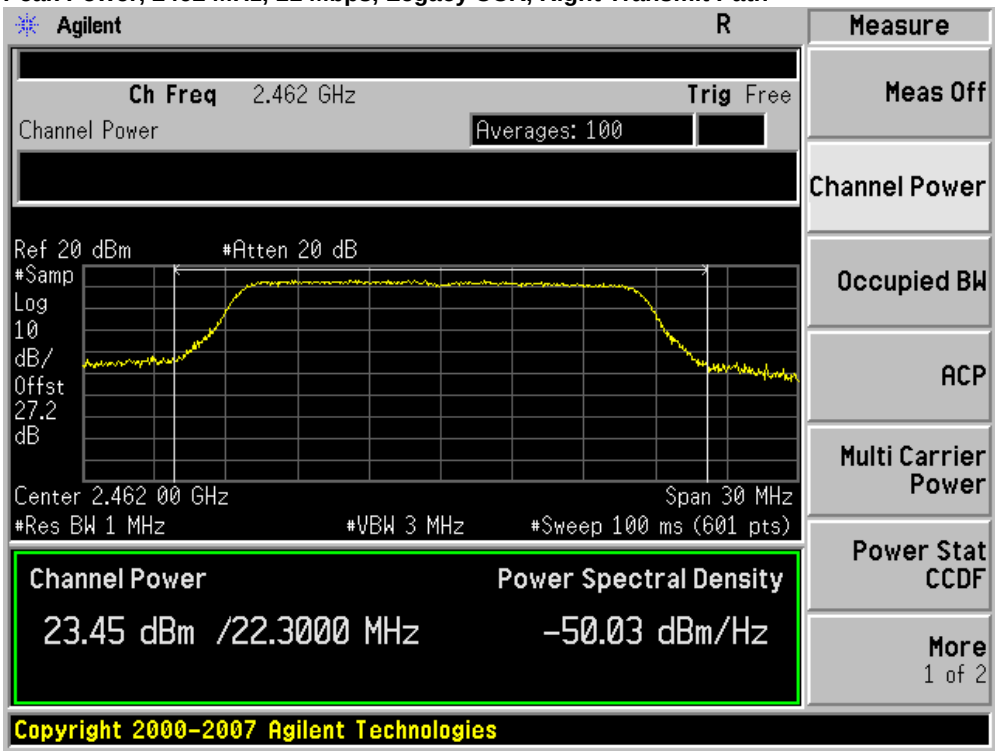
Peak Power, 2437 MHz, 6 Mbps, Non HT-20 Beam Forming, Right Transmit Path



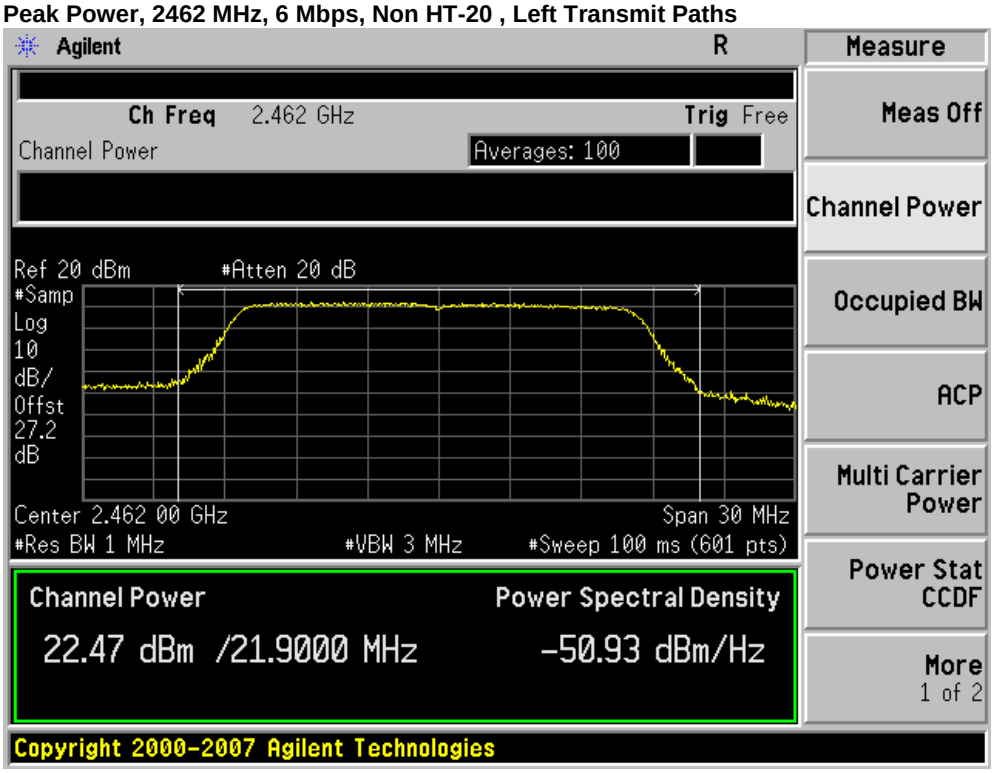
Peak Power, 2437 MHz, 6 Mbps, Non HT-20 Beam Forming, Left Transmit Path



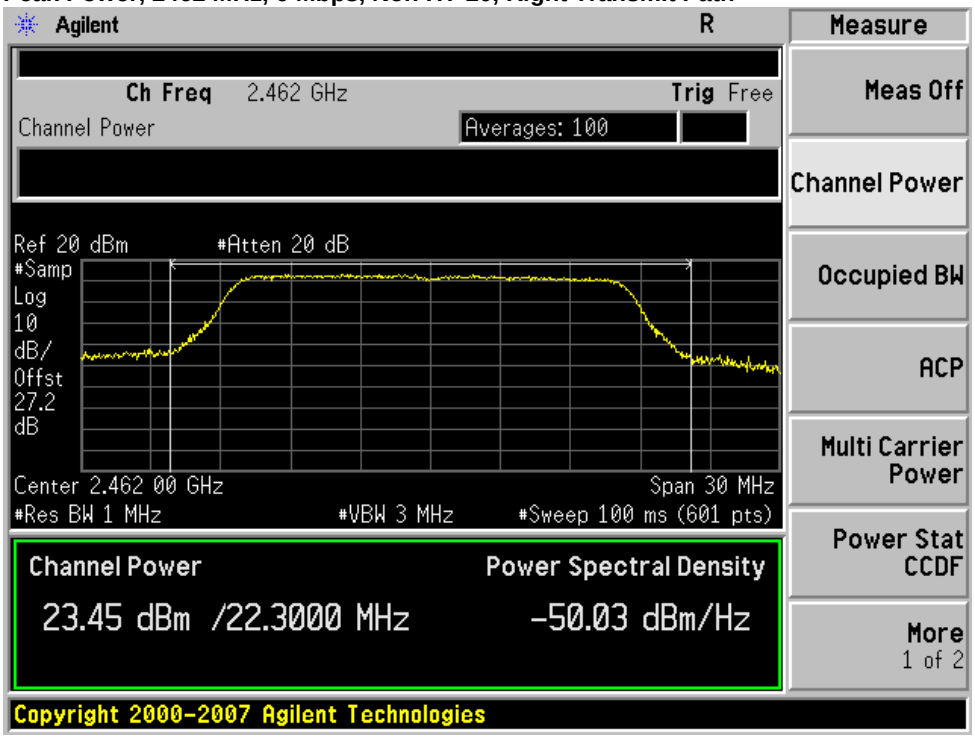
Peak Power, 2462 MHz, 11 Mbps, Legacy CCK, Right Transmit Path



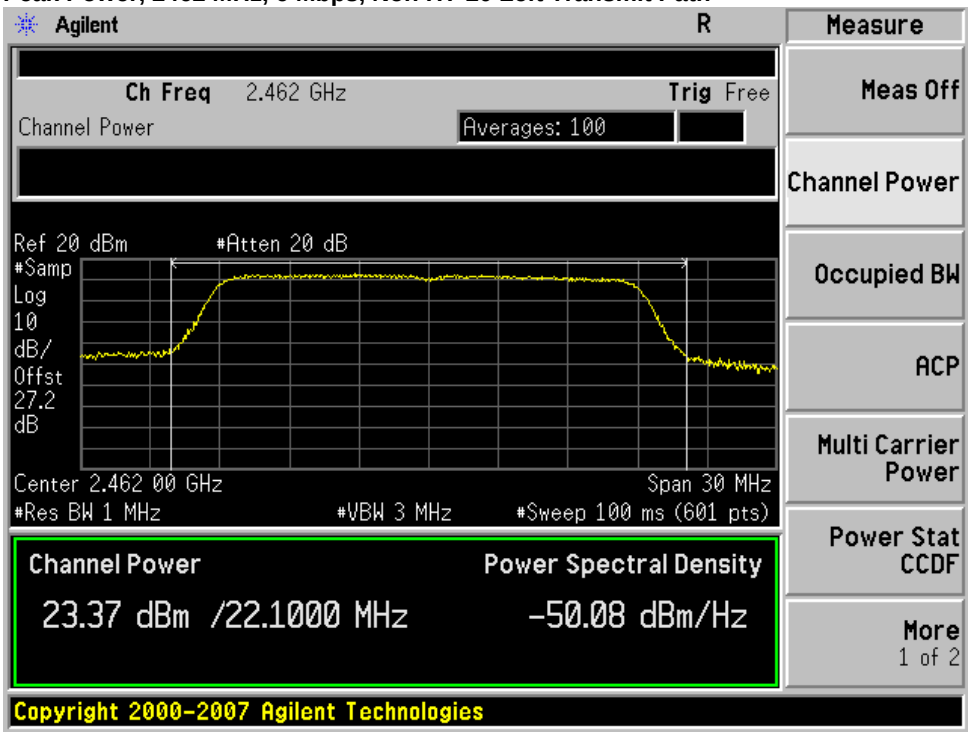
Peak Power, 2462 MHz, 6 Mbps, Non HT-20 , Left Transmit Paths



Peak Power, 2462 MHz, 6 Mbps, Non HT-20, Right Transmit Path



Peak Power, 2462 MHz, 6 Mbps, Non HT-20 Left Transmit Path



Power Spectral Density

15.247: For digitally modulated systems, the peak 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.

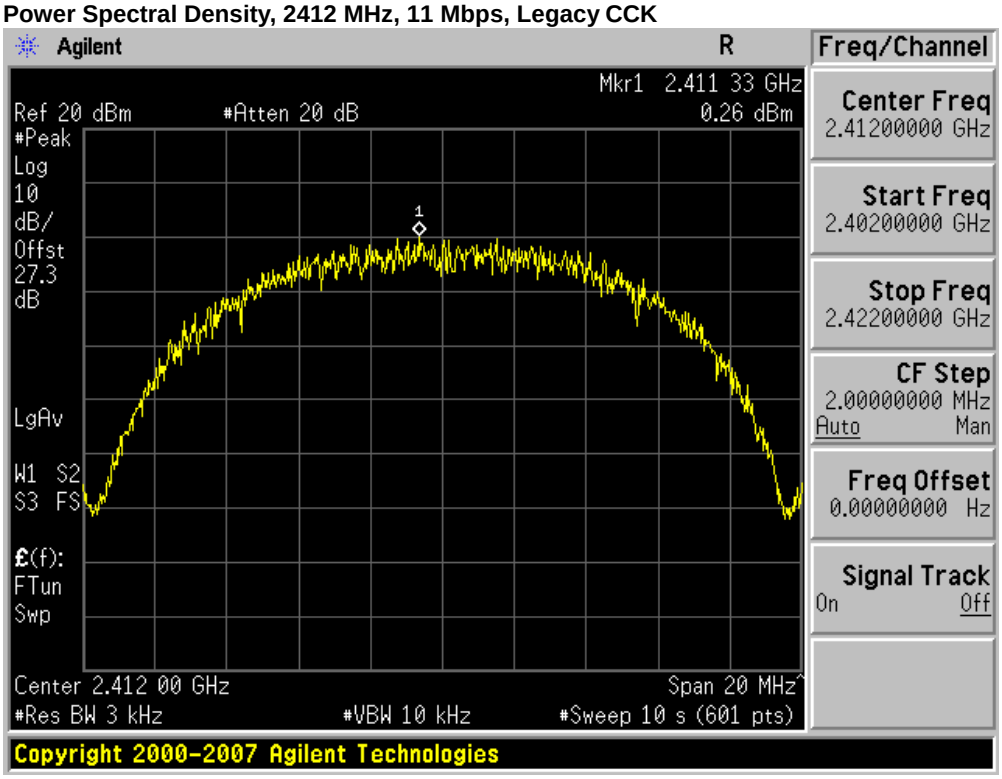
Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below.

Center Frequency:	Frequency from table below
Span:	20 MHz
Ref Level Offset:	Correct for attenuator and cable loss.
Reference Level:	20 dBm
Attenuation:	20 dB
Sweep Time:	10s
Resolution Bandwidth:	3 kHz
Video Bandwidth:	10 kHz
Detector:	Peak
Trace:	Single
Marker:	Peak Search

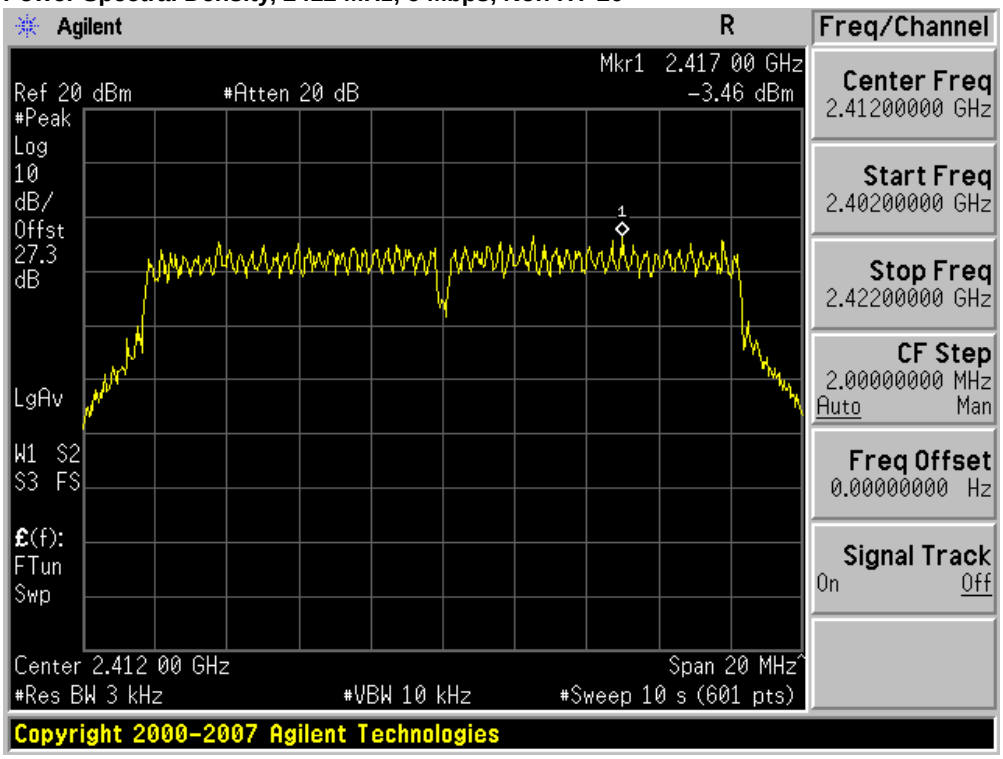
Record the Marker value.

Frequency (MHz)	Mode	Data Rate (Mbps)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
2412	Legacy CCK, Single Tx Path	11	**0.3**	8	7.7
2412	Non HT-20, Single Tx Path	6	**-3.5**	8	11.5
2437	Legacy CCK, Single Tx Path	11	**-12.9**	8	20.9
2437	Non HT-20, Single Tx Path	6	**-3.4**	8	11.4
2462	Legacy CCK, Single Tx Path	11	**0.0**	8	8.0
2462	Non HT-20, Single Tx Path	6	**-3.8**	8	11.8

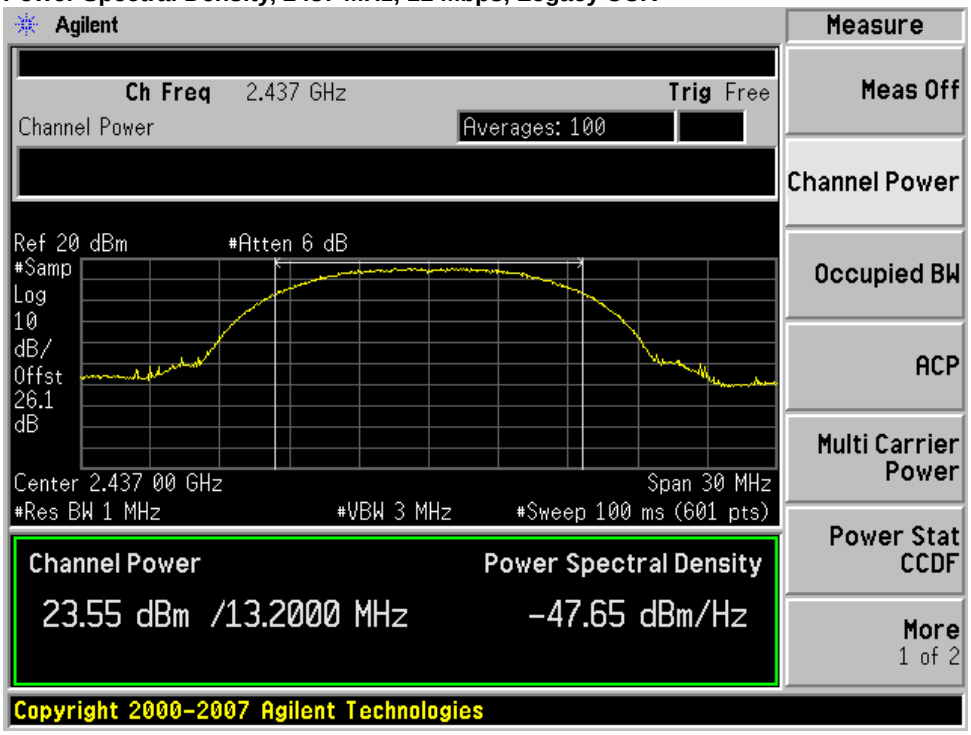
Power Spectral Density, 2412 MHz, 11 Mbps, Legacy CCK



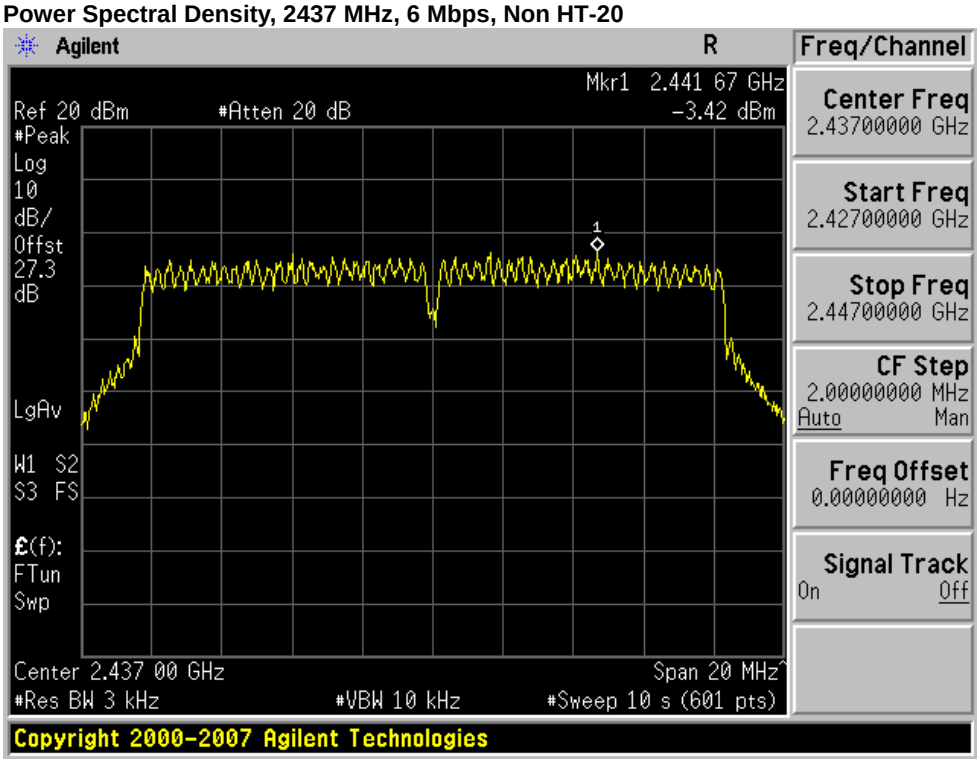
Power Spectral Density, 2412 MHz, 6 Mbps, Non HT-20



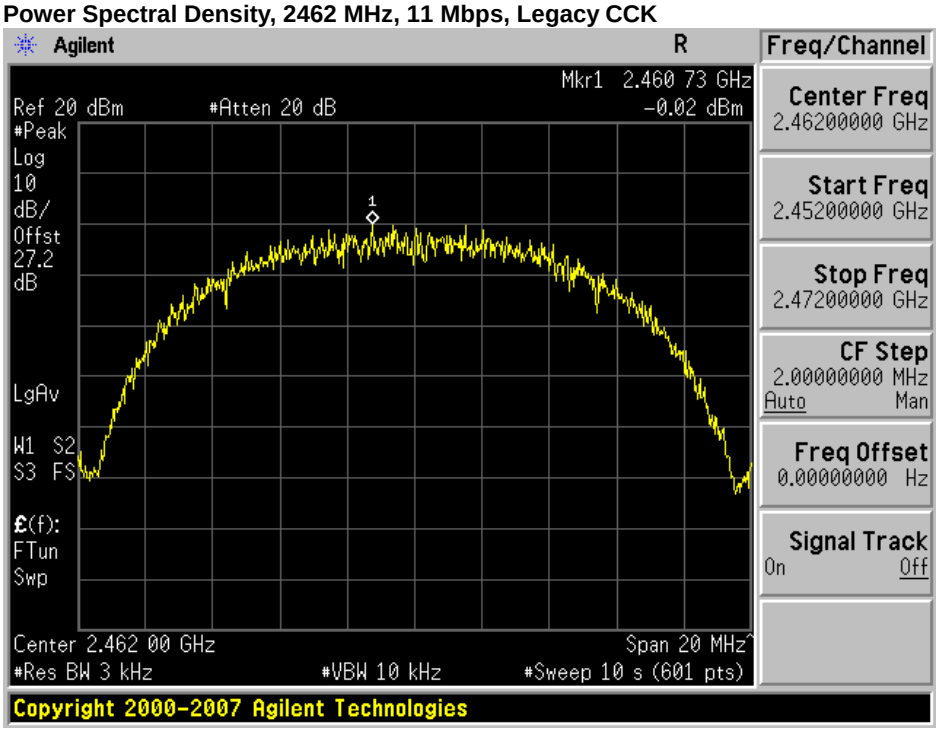
Power Spectral Density, 2437 MHz, 11 Mbps, Legacy CCK



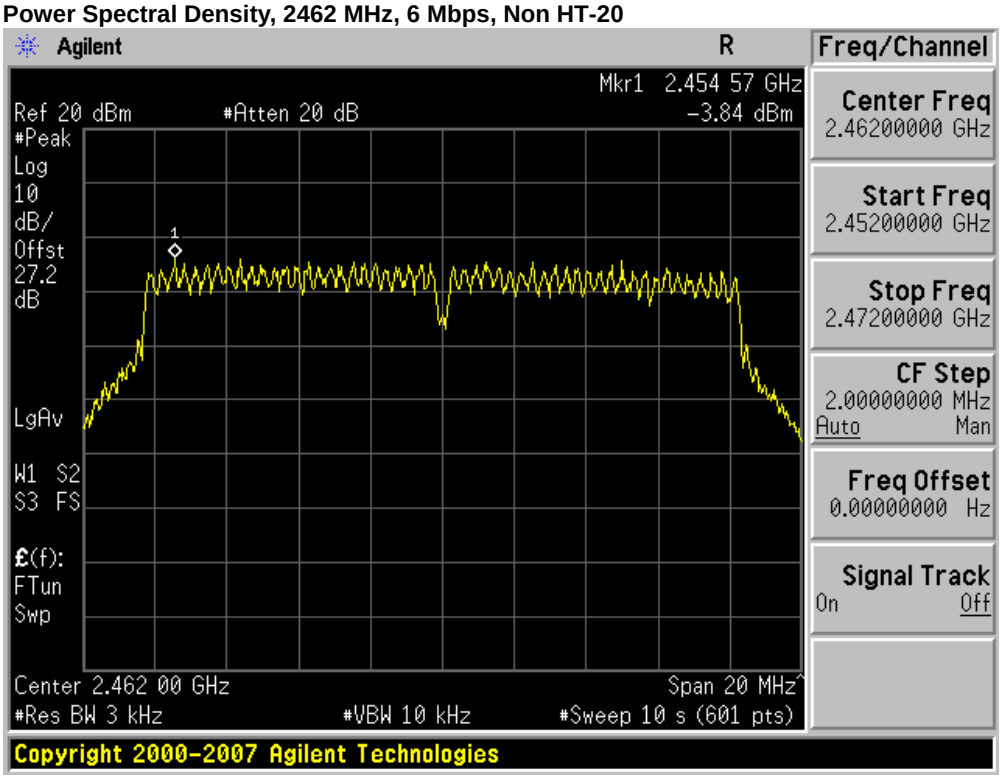
Power Spectral Density, 2437 MHz, 6 Mbps, Non HT-20



Power Spectral Density, 2462 MHz, 11 Mbps, Legacy CCK



Power Spectral Density, 2462 MHz, 6 Mbps, Non HT-20



Conducted Bandedge

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Use the procedures in 718828 D01 DTS Meas Guidance v01 to substitute conducted measurements in place of radiated measurements.
Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Be sure to enter all losses between the transmitter output and the spectrum analyzer.

Reference Level:	10 dBm
Attenuation:	4 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 100 Hz for average
Detector:	Peak

Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= -41.25 dBm eirp (54dBuV @3m)
2) Peak plot (Vertical and Horizontal), Limit = -21.25 dBm eirp (74dBuV @3m)

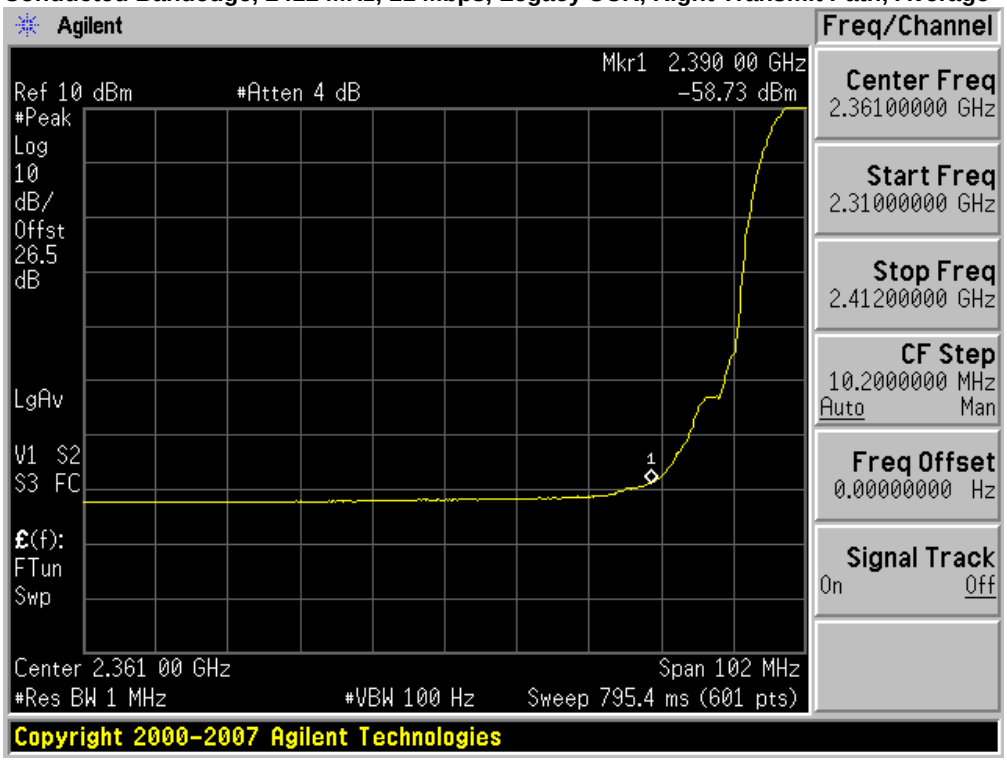
Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands.

The “measure-and-sum technique” is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units.

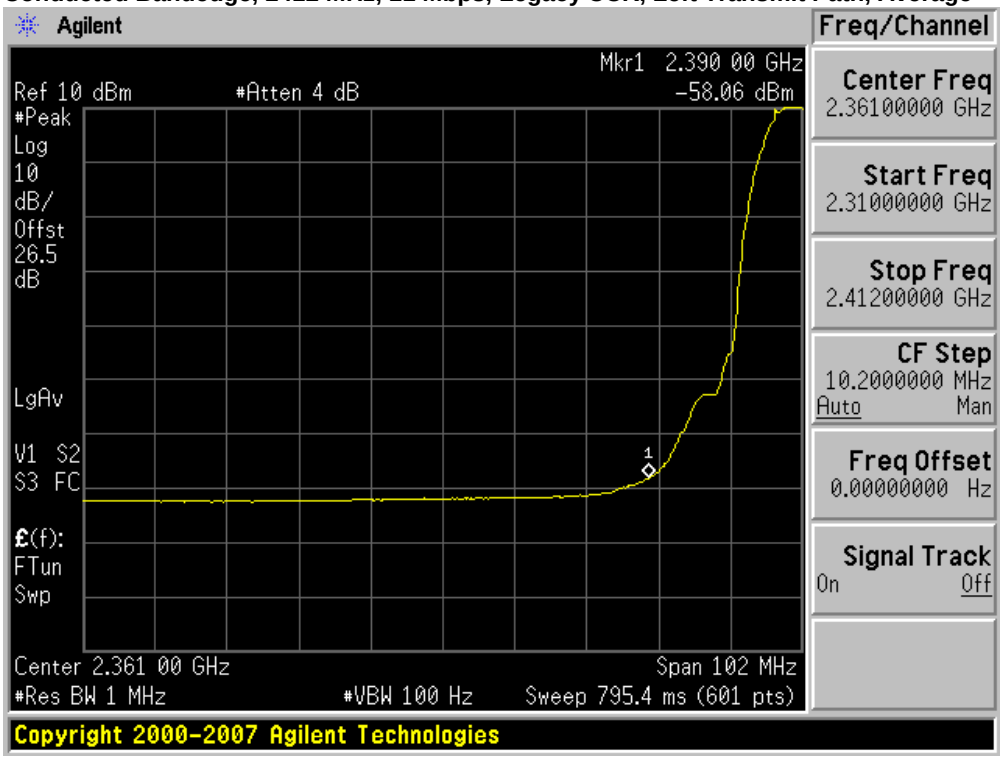
The following data represents the worst case data for all supported antennas from **4.1 – 8 dBi.**

Frequency (MHz)	Mode	Data Rate (Mbps)	Target Total TransmitPower Level (dBm)	Radiated Band Edge Level (dBm)	Limit (dBm)	Margin (dB)
2412	Legacy CCK, Single Tx Path	11	23	**-58.1**	-41.5	16.6
2412	Legacy CCK, Dual Tx Path	11	26	**-55.4**	-41.5	13.9
2412	Non HT-20, Single Tx Path	6	22	**-51.8**	-41.5	10.3
2412	Non HT-20, Dual Tx Path	6	24	**-49.4**	-41.5	7.9
2412	Non HT-20 Beam Forming	6	23	**-53.6**	-41.5	12.1
2462	Legacy CCK, Single Tx Path	11	23	**-56.9**	-41.5	15.4
2462	Legacy CCK, Dual Tx Path	11	26	**-54.3**	-41.5	12.8
2462	Non HT-20, Single Tx Path	6	22	**-54.0**	-41.5	12.5
2462	Non HT-20, Dual Tx Path	6	23	**-52.1**	-41.5	10.6
2462	Non HT-20 Beam Forming	6	21	**-55.7**	-41.5	14.2

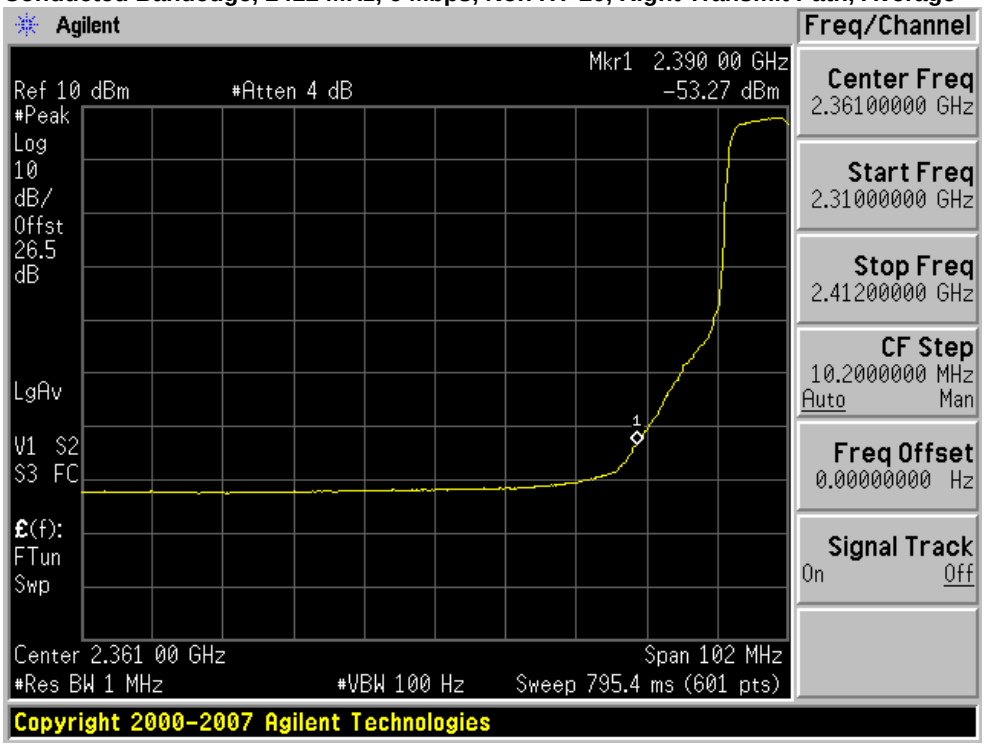
Conducted Bandedge, 2412 MHz, 11 Mbps, Legacy CCK, Right Transmit Path, Average



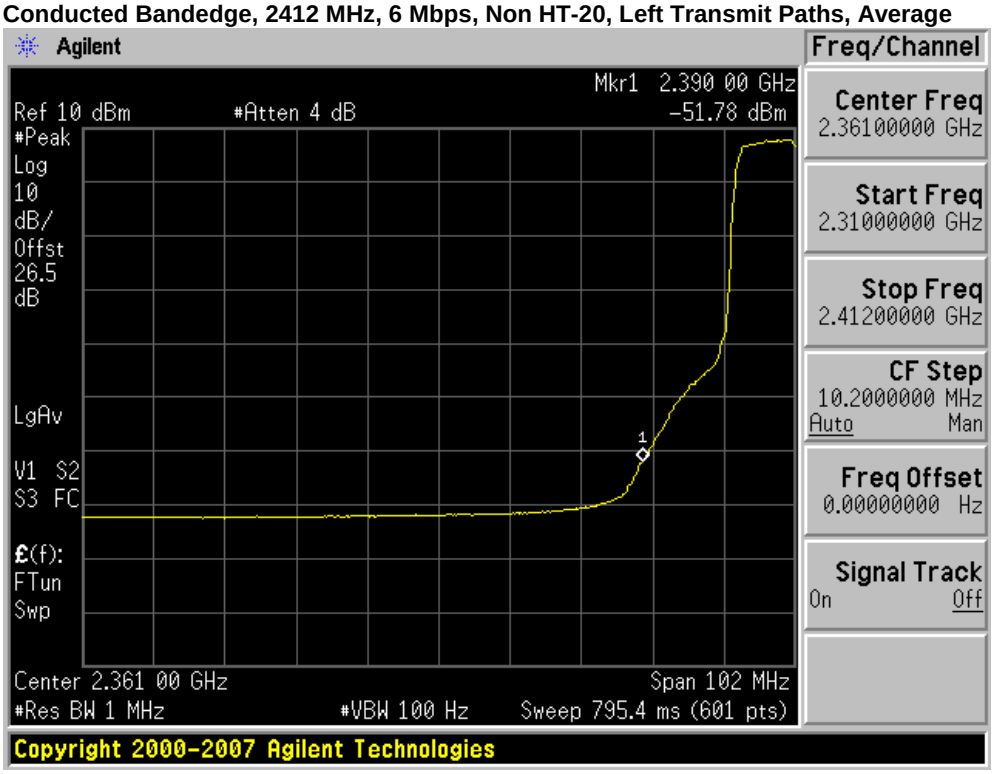
Conducted Bandedge, 2412 MHz, 11 Mbps, Legacy CCK, Left Transmit Path, Average



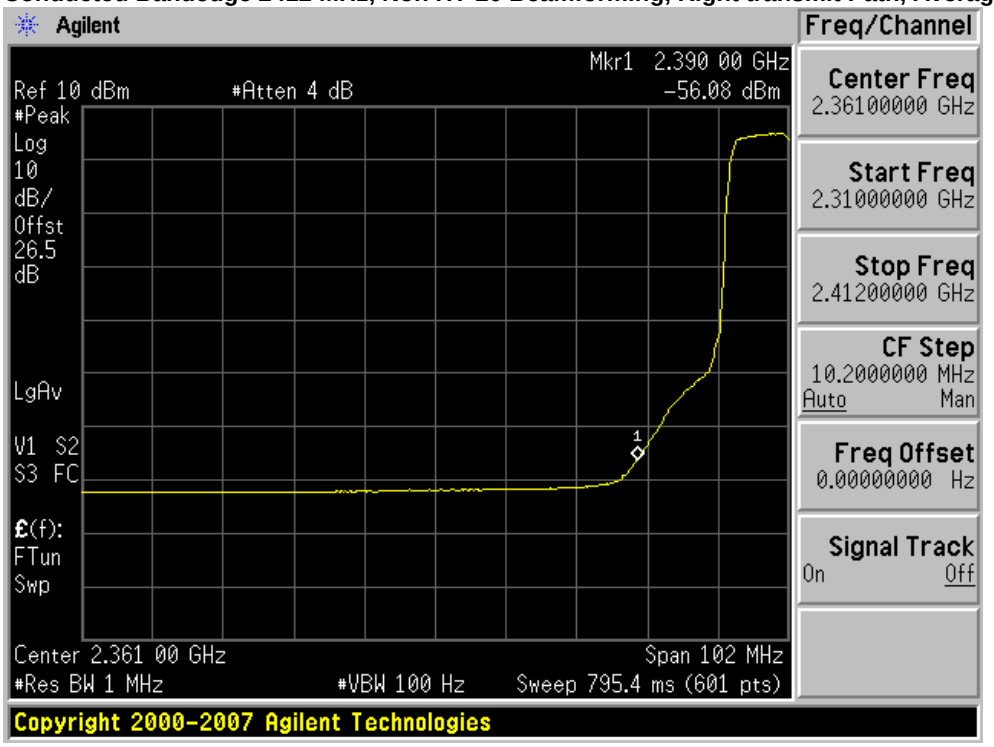
Conducted Bandedge, 2412 MHz, 6 Mbps, Non HT-20, Right Transmit Path, Average



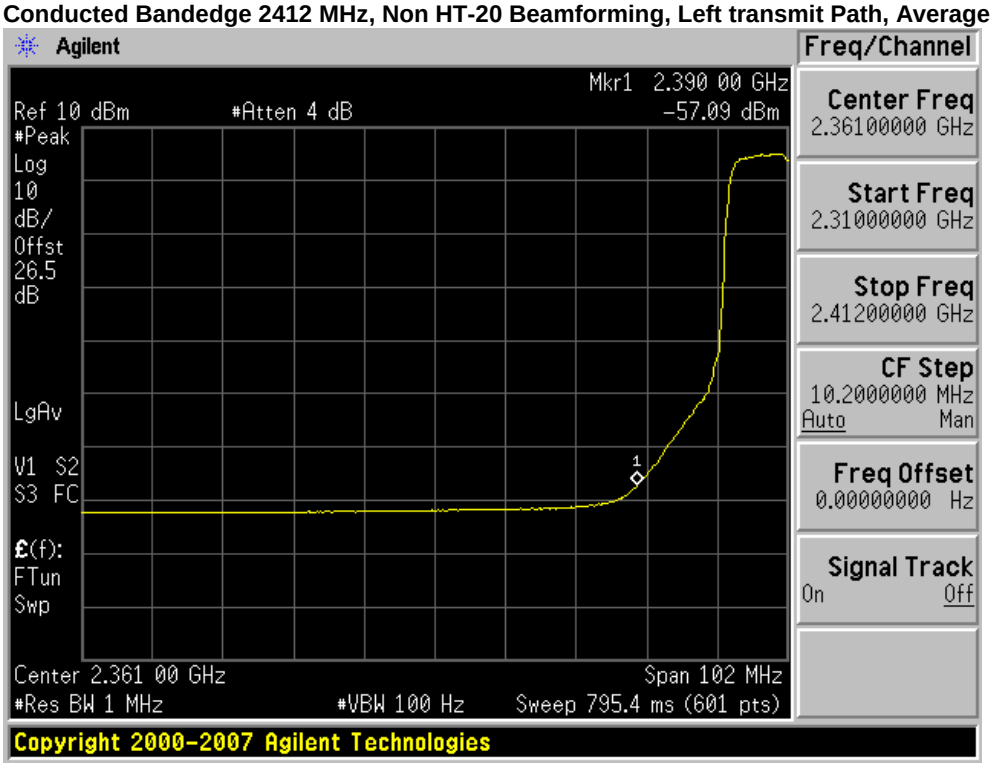
Conducted Bandedge, 2412 MHz, 6 Mbps, Non HT-20, Left Transmit Paths, Average



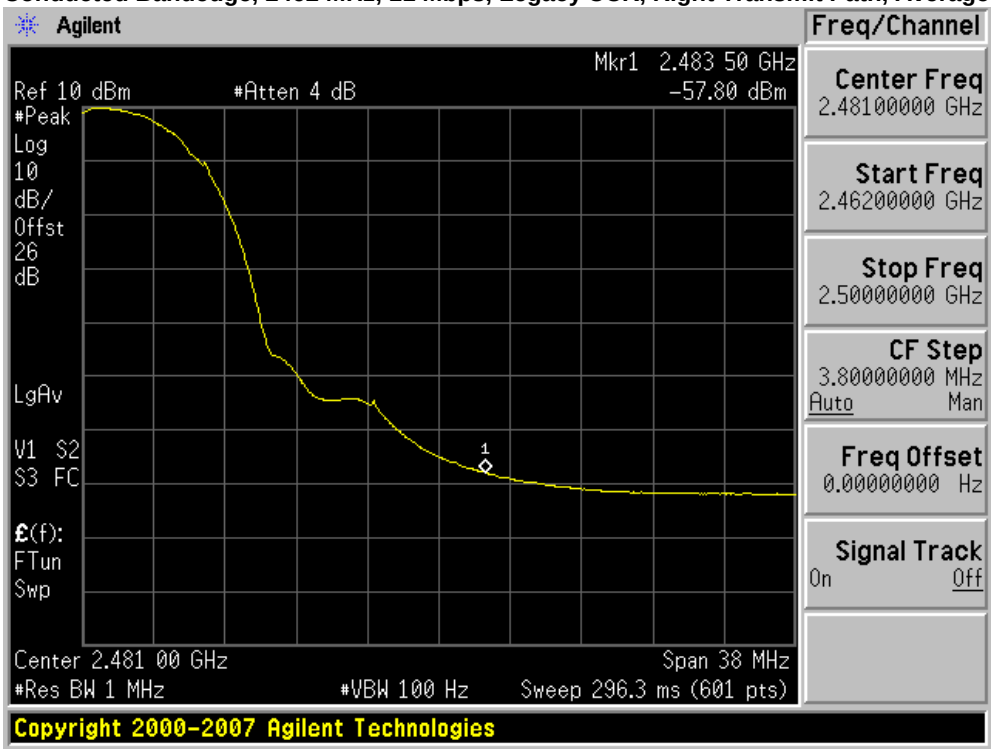
Conducted Bandedge 2412 MHz, Non HT-20 Beamforming, Right transmit Path, Average



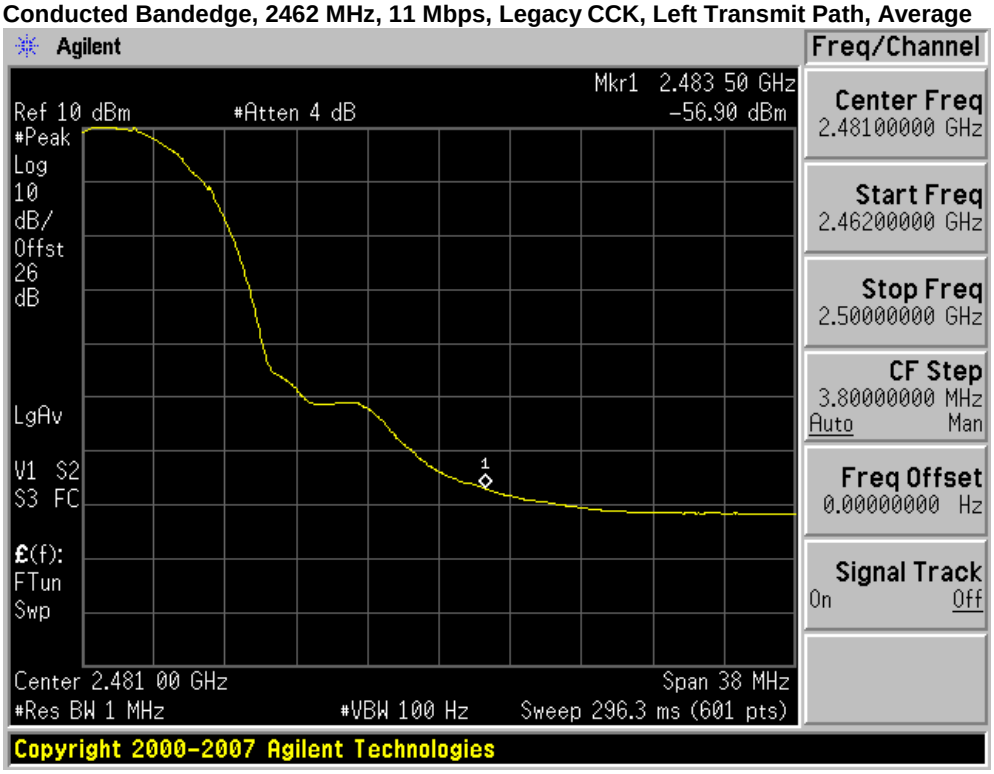
Conducted Bandedge 2412 MHz, Non HT-20 Beamforming, Left transmit Path, Average



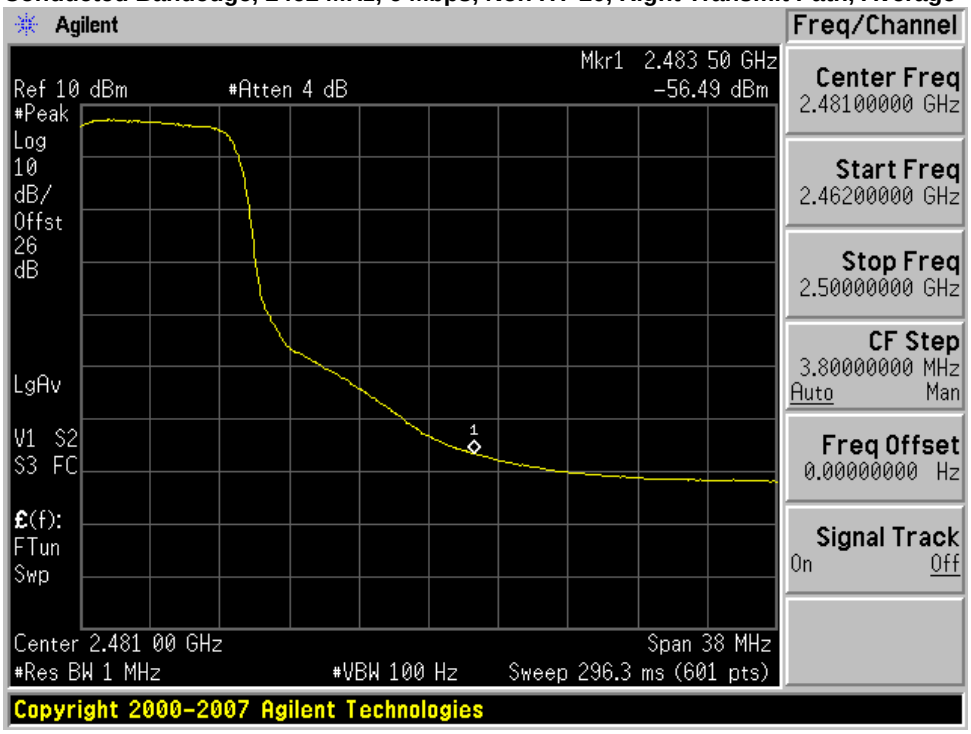
Conducted Bandedge, 2462 MHz, 11 Mbps, Legacy CCK, Right Transmit Path, Average



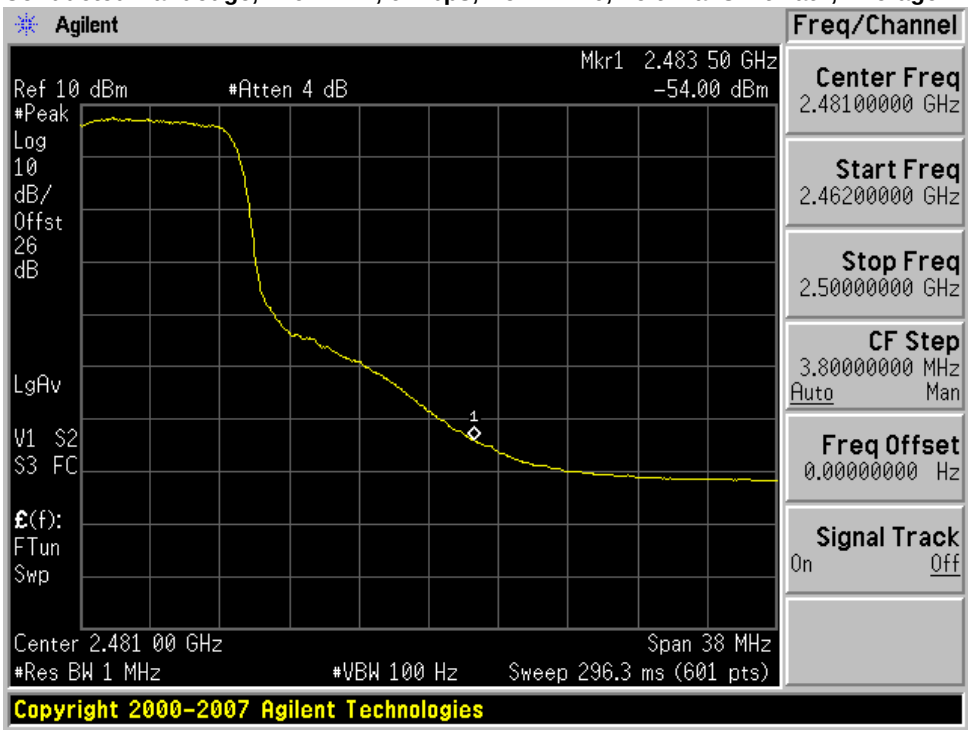
Conducted Bandedge, 2462 MHz, 11 Mbps, Legacy CCK, Left Transmit Path, Average



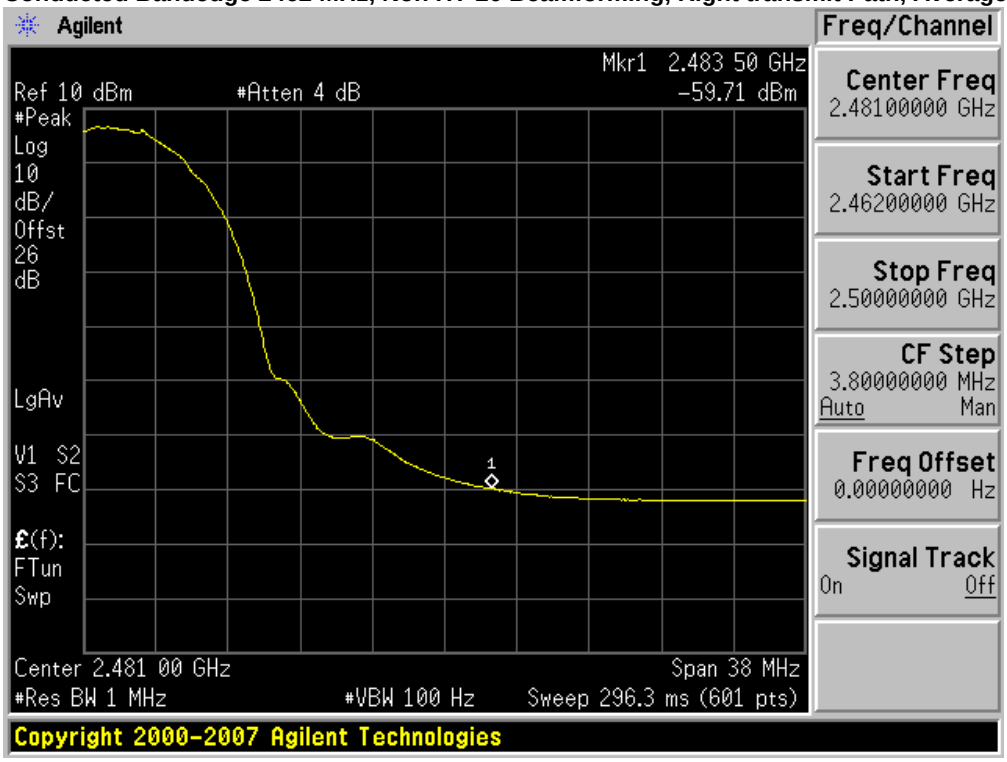
Conducted Bandedge, 2462 MHz, 6 Mbps, Non HT-20, Right Transmit Path, Average



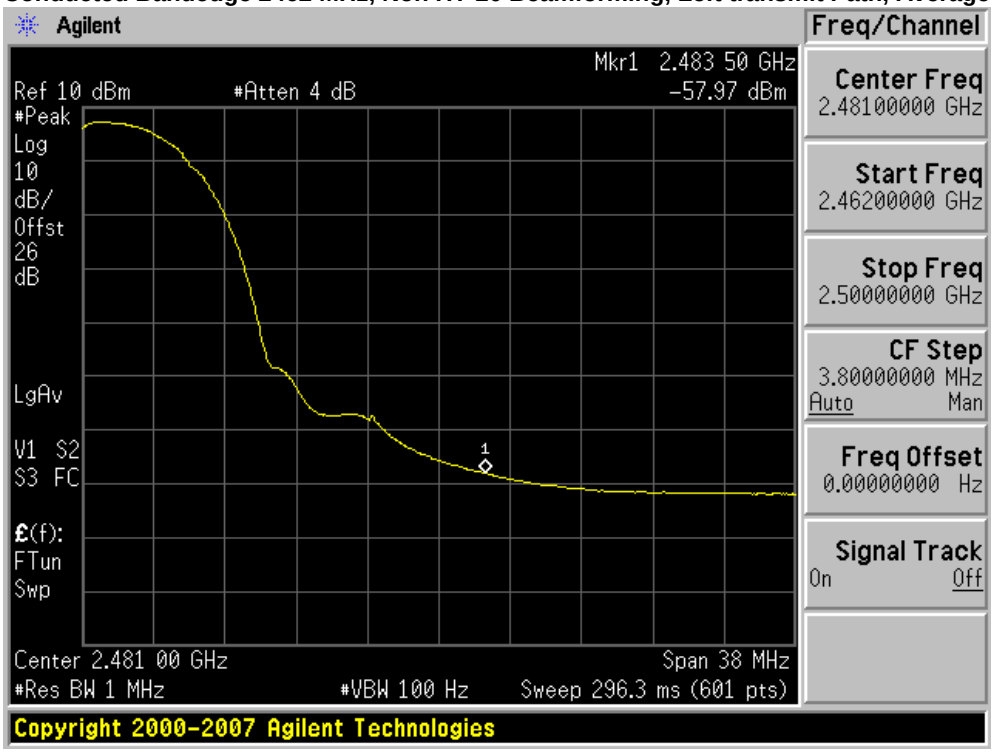
Conducted Bandedge, 2462 MHz, 6 Mbps, Non HT-20, Left Transmit Path, Average



Conducted Bandedge 2462 MHz, Non HT-20 Beamforming, Right transmit Path, Average



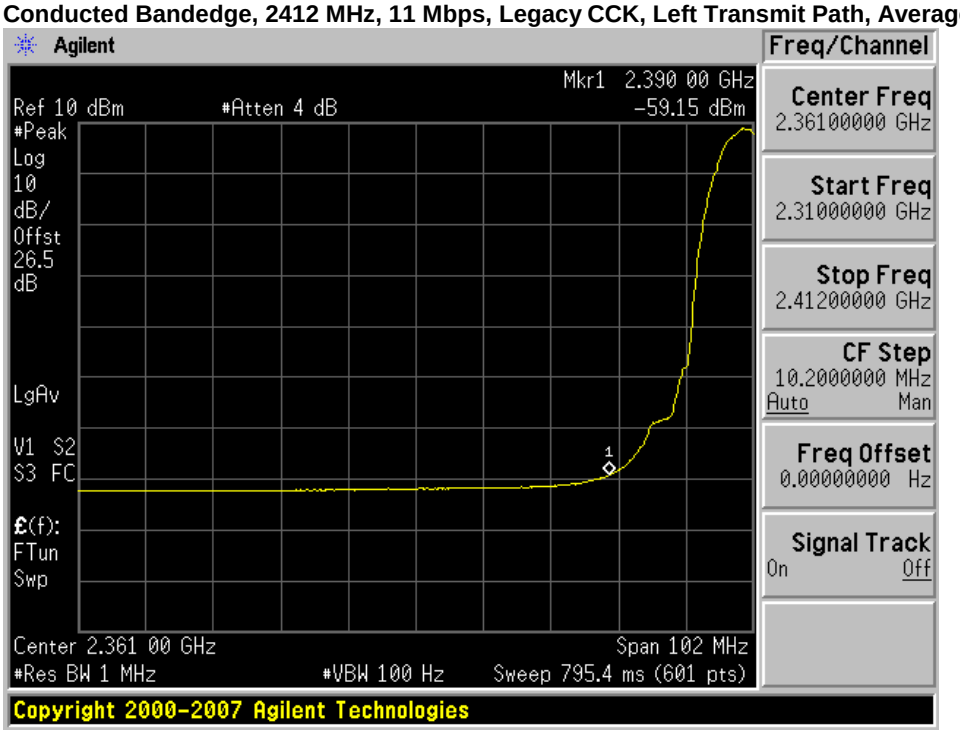
Conducted Bandedge 2462 MHz, Non HT-20 Beamforming, Left transmit Path, Average



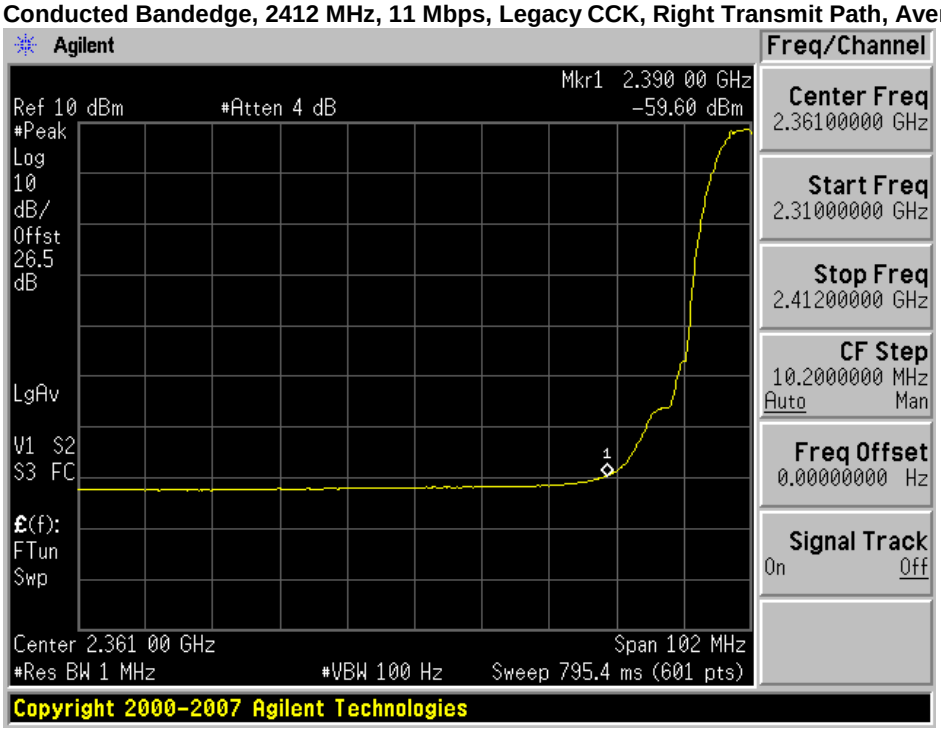
The following data represents the worst case data for all supported antennas from **8.1 – 13 dBi.**

Frequency (MHz)	Mode	Data Rate (Mbps)	Target Total TransmitPower Level (dBm)	Radiated Band Edge Level (dBm)	Limit (dBm)	Margin (dB)
2412	Legacy CCK, Single Tx Path	11	20	**-59.2**	-41.5	17.7
2412	Legacy CCK, Dual Tx Path	11	21	**-56.6**	-41.5	15.1
2412	Non HT-20, Single Tx Path	6	20	**-54.7**	-41.5	13.2
2412	Non HT-20, Dual Tx Path	6	20	**-52.3**	-41.5	10.8
2412	Non HT-20 Beam Forming	6	18	**-56.2**	-41.5	14.7
2462	Legacy CCK, Single Tx Path	11	20	**-57.7**	-41.5	16.2
2462	Legacy CCK, Dual Tx Path	11	21	**-55.3**	-41.5	13.8
2462	Non HT-20, Single Tx Path	6	20	**-55.5**	-41.5	14.0
2462	Non HT-20, Dual Tx Path	6	19	**-54.4**	-41.5	12.9
2462	Non HT-20 Beam Forming	6	18	**-56.9**	-41.5	15.4

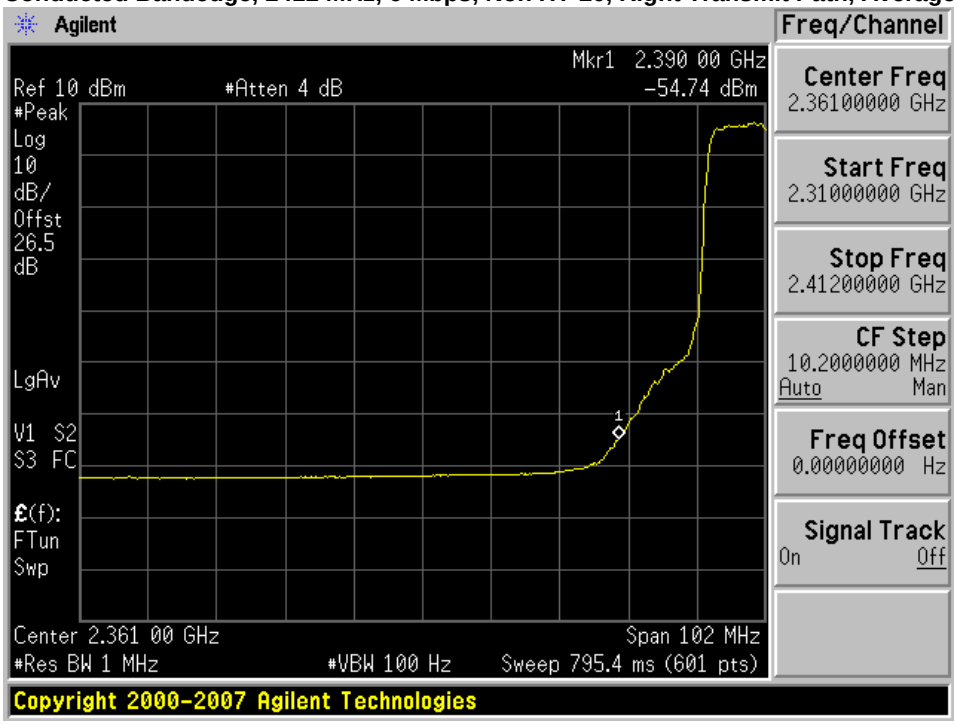
Conducted Bandedge, 2412 MHz, 11 Mbps, Legacy CCK, Left Transmit Path, Average



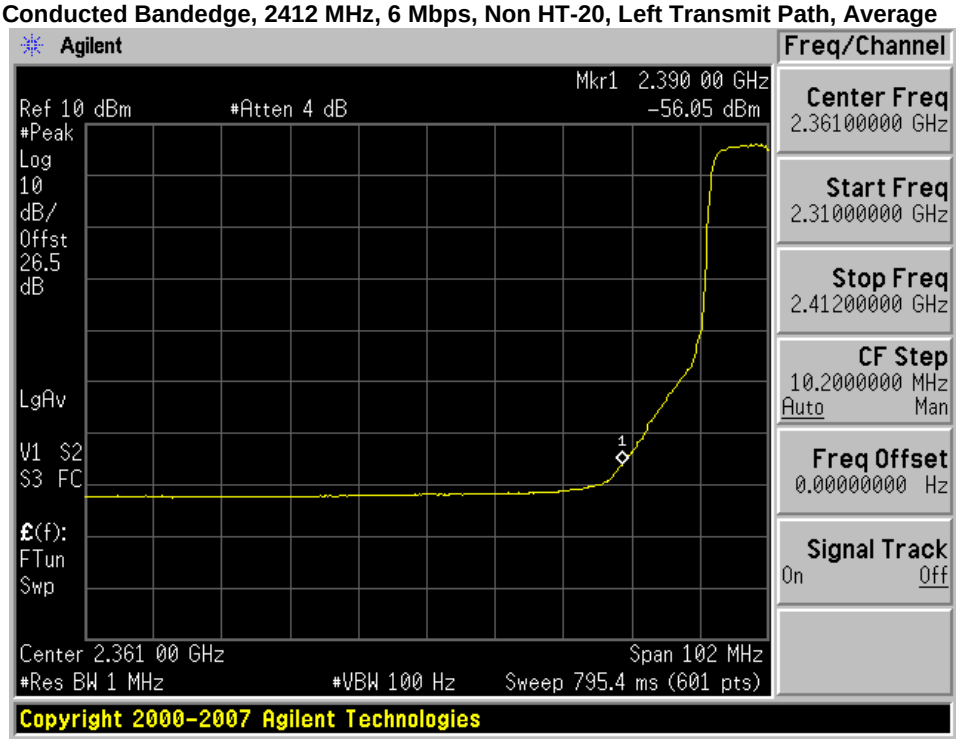
Conducted Bandedge, 2412 MHz, 11 Mbps, Legacy CCK, Right Transmit Path, Average



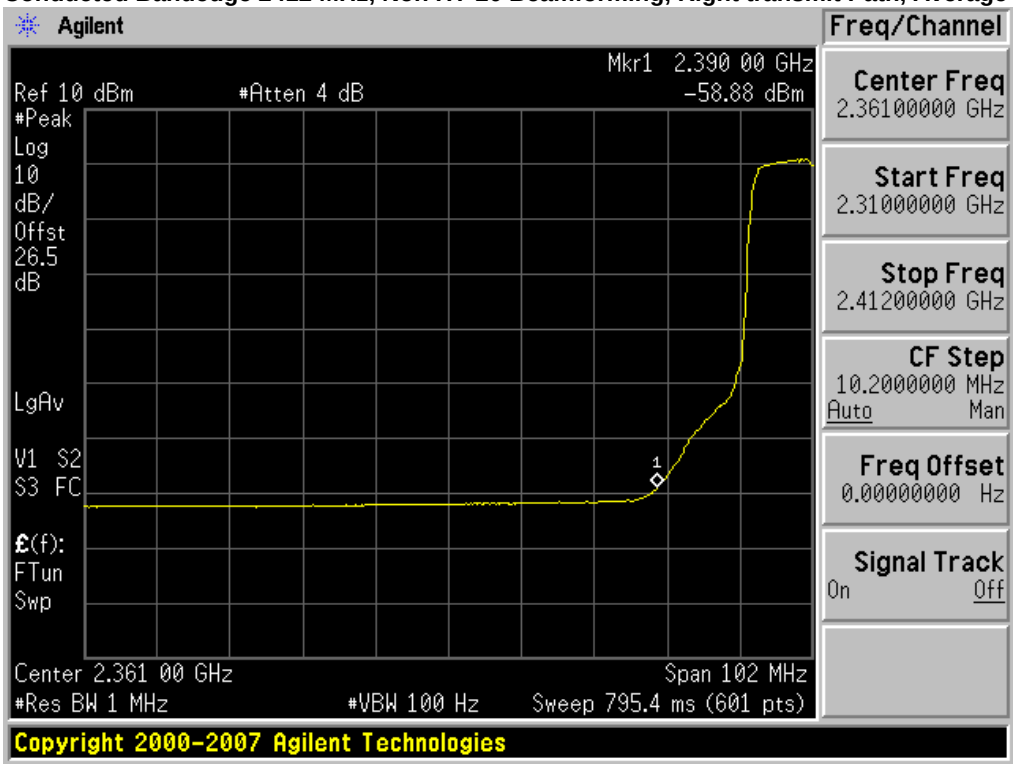
Conducted Bandedge, 2412 MHz, 6 Mbps, Non HT-20, Right Transmit Path, Average



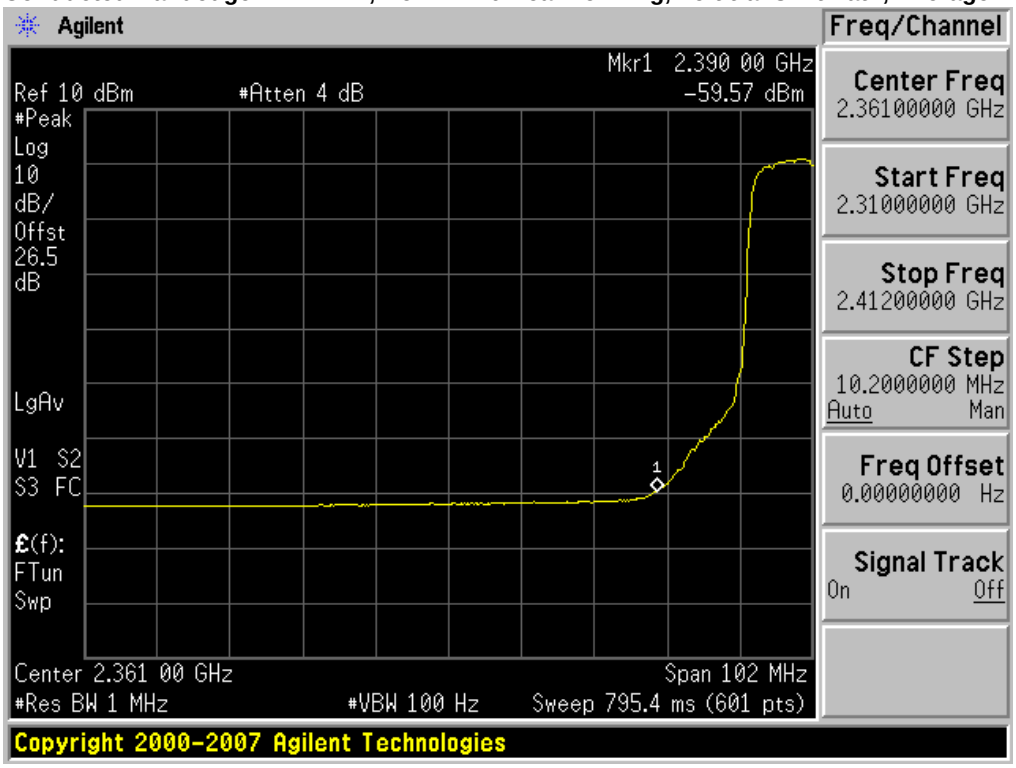
Conducted Bandedge, 2412 MHz, 6 Mbps, Non HT-20, Left Transmit Path, Average



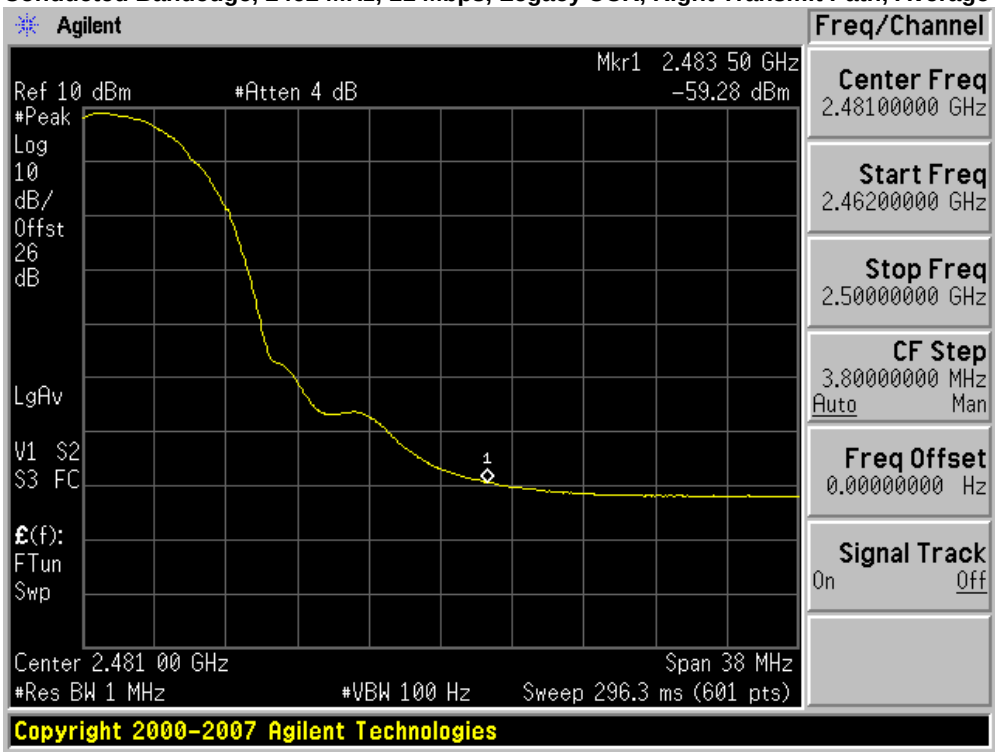
Conducted Bandedge 2412 MHz, Non HT-20 Beamforming, Right transmit Path, Average



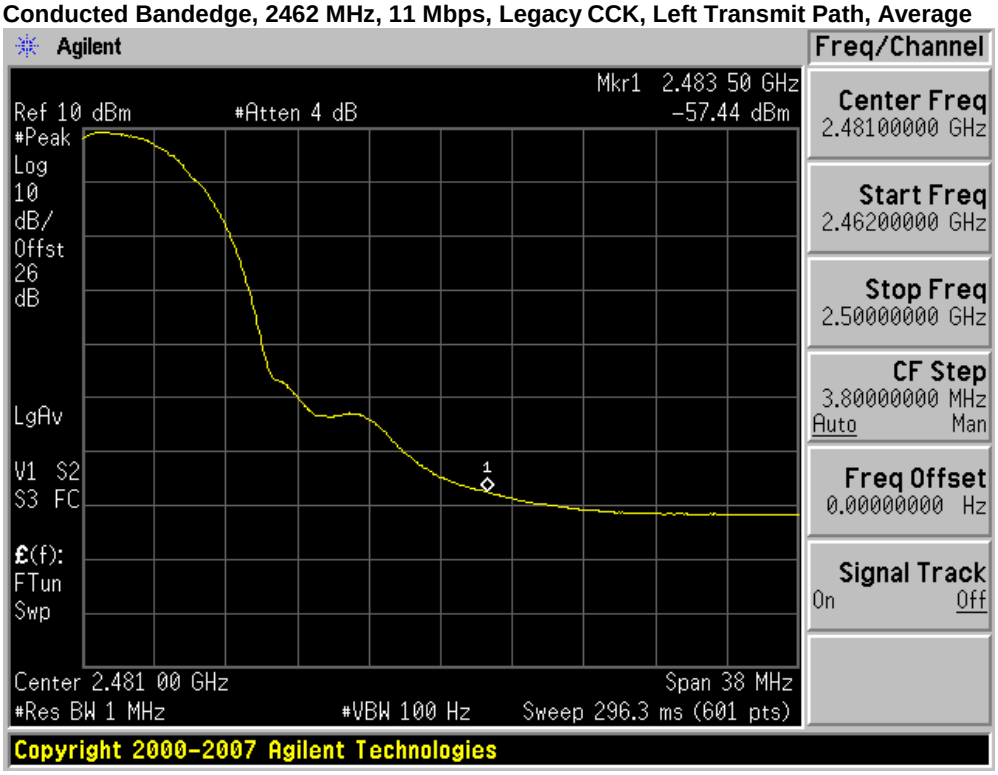
Conducted Bandedge 2412 MHz, Non HT-20 Beamforming, Left transmit Path, Average



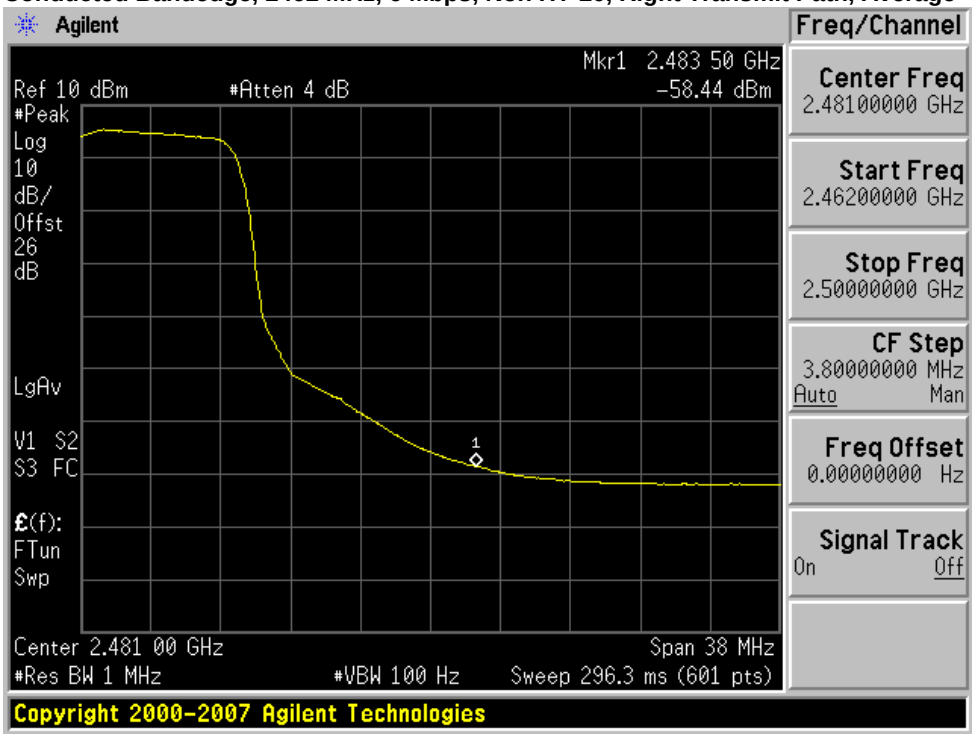
Conducted Bandedge, 2462 MHz, 11 Mbps, Legacy CCK, Right Transmit Path, Average



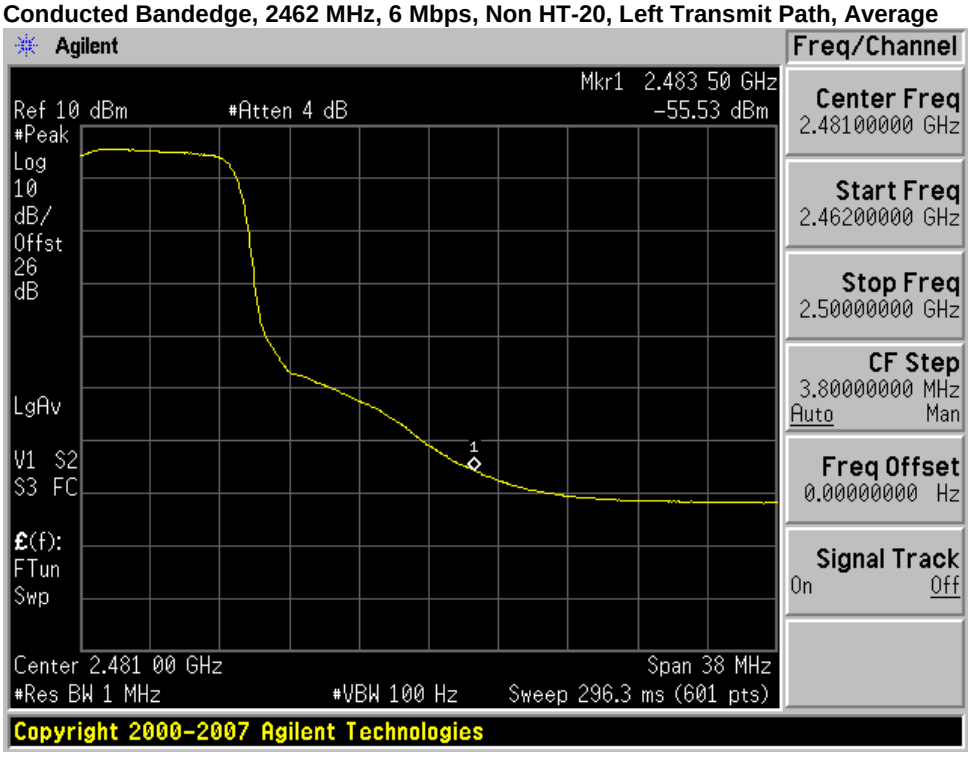
Conducted Bandedge, 2462 MHz, 11 Mbps, Legacy CCK, Left Transmit Path, Average



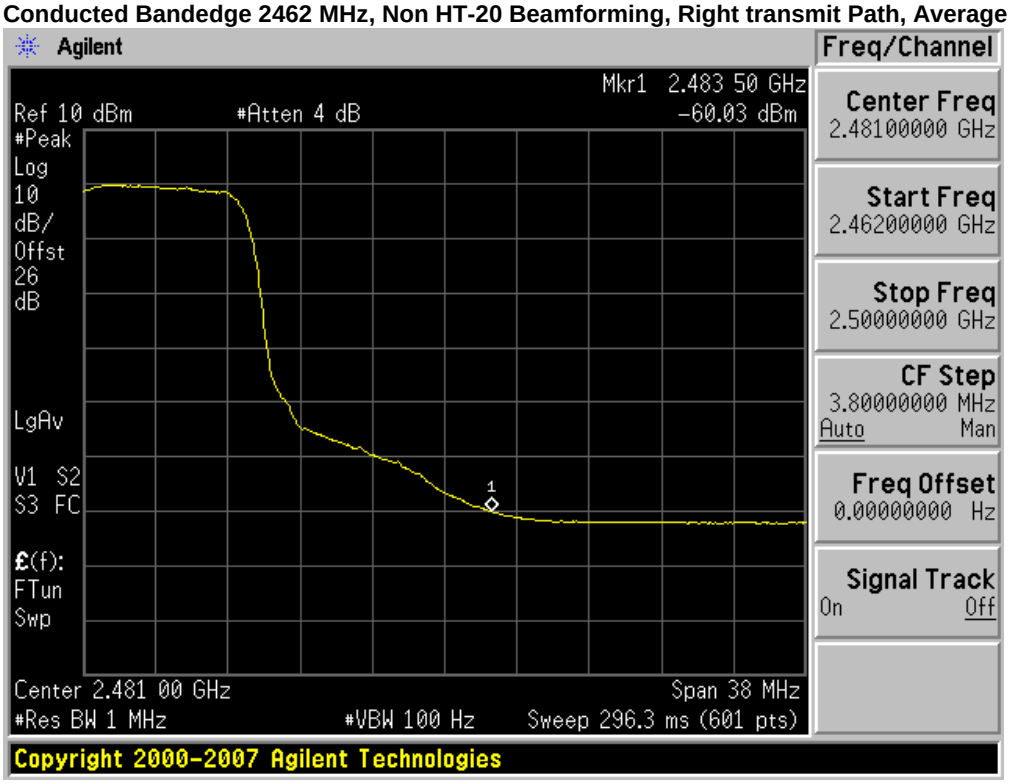
Conducted Bandedge, 2462 MHz, 6 Mbps, Non HT-20, Right Transmit Path, Average



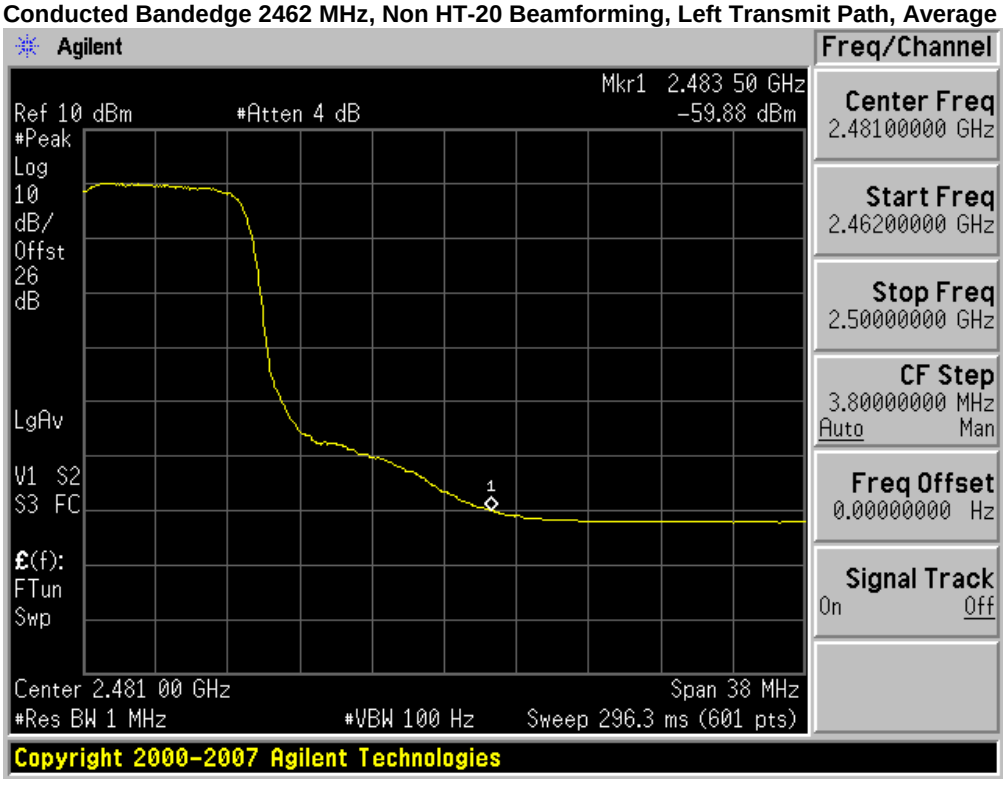
Conducted Bandedge, 2462 MHz, 6 Mbps, Non HT-20, Left Transmit Path, Average



Conducted Bandedge 2462 MHz, Non HT-20 Beamforming, Right transmit Path, Average



Conducted Bandedge 2462 MHz, Non HT-20 Beamforming, Left Transmit Path, Average



Maximum Permissible Exposure (MPE) Calculations

15.247: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled'' environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

$E=\sqrt{(30*P*G)/d}$ and $S=E^2/3770$

where

E=Field Strength in Volts/meter
P=Power in Watts
G=Numeric Antenna Gain
d=Distance in meters
S=Power Density in mW/cm^2

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

$d=\sqrt{((30*P*G)/(3770*S))}$

Changing to units of power in mW and distance in cm, using:

$P(mW)=P(W)/1000$ $d(cm)=100*d(m)$

yields

$d=100*\sqrt{((30*(P/1000)*G)/(3770*S))}$

$d=0.282*\sqrt{(P*G/S)}$

where

d=Distance in cm
P=Power in mW
G=Numerical Antenna Gain
S=Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

$P(mW)=10^{(P(dBm)/10)}$ $G(numeric)=10^{(G(dBi)/10)}$

yields

$d=0.282*10^{((P+G)/20)}/\sqrt{S}$ Equation (1)

and

$s=((0.282*10^{((P+G)/20)})/d)^2$ Equation (2)

where

d=MPE distance in cm
P=Power in dBm
G=Antenna Gain in dBi
S=Power Density in mW/cm^2

Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile transmitters the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less. For fixed outdoor installations the minimum separation distance is 40 cm.

S=1mW/cm^2 maximum. The highest supported antenna gain is 13 dBi. Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Bit Rate (Mbps)	Power Density (mW/cm^2)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
2412	11	1	27.1	8	**16.04**	20	3.96
2437	11	1	26.4	8	**14.80**	20	5.20
2462	11	1	26.4	8	**14.80**	20	5.20
2412	6	1	26.6	13	**26.93**	40	13.07
2437	6	1	26.3	13	**26.02**	40	13.98
2462	6	1	22.8	13	**17.39**	40	22.61

MPE Calculations

Use is permitted with antenna gain not exceeding 13 dBi, as described in filing, with a minimum separation distance of 40 cm between the antenna and all persons during normal operation.

Use is permitted with antenna gain not exceeding 8 dBi, as described in filing, with a minimum separation distance of 20 cm between the antenna and all persons during normal operation.

Using Equation 2, the MPE levels (s) at 40 cm are calculated as follows:

Frequency (MHz)	Bit Rate (Mbps)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
2412	11	40	27.1	11	**0.32**	1	0.68
2437	11	40	26.3	11	**0.27**	1	0.73
2462	11	40	26.4	11	**0.27**	1	0.73
2412	6	40	26.6	16	**0.90**	1	0.10
2437	6	40	26.4	16	**0.86**	1	0.14
2462	6	40	26.4	16	**0.86**	1	0.14

Appendix C: Test Equipment/Software Used to perform the test

Equip #	Manufacturer	Model	Description	Last Cal	Next Due
CIS004882	EMC Test Systems	3115	Double Ridged Guide Horn Antenna	26-May-11	26-May-12
CIS005691	Miteq	NSP1800-25-S1	Broadband Preamplifier	31-Jan-12	31-Jan-13
COM000210	TTE	H785-150K-50-21378	Hi Pass Filter - 150KHz cutoff	17-Aug-11	17-Aug-12
COM000213	Fischer	FCC-LISN-50-50-2M	Turntable LISN (150KHz-30MHz)	5-Mar-11	5-Mar-12
CIS021117	Micro-Coax	UFB311A-0-2484-520520	RF Coaxial Cable, to 18GHz, 248.4 in	24-Aug-11	24-Aug-12
CIS030564	Micro-Coax	UFB311A-1-0950-504504	RF Coaxial Cable, to 18GHz, 95 in	24-Aug-11	24-Aug-12
COM000233	Sunol Sciences	JB1	Combination Antenna, 30MHz-2GHz	13-Jul-11	13-Jul-12
COM000239	Rohde & Schwarz	ESI40	EMI Test Receiver	21-Jun-11	21-Jun-12
COM000443	Sonoma Instrument	310N	Amplifier 9kHz-1GHz	8-Apr-11	8-Apr-12
CIS034972	Midwest Microwave	ATT-0640-20-29M-02	Attenuator, 20dB	17-May-11	16-May-12
CIS043116	Huber + Suhner	Sucoflex 104PE	N & SMA RF cable	14-Dec-11	14-Dec-12
CIS040603	Agilent	E4440A	Spectrum Analyzer	5-Aug-11	5-Aug-12
CIS040053	Agilent	E4448A	Spectrum Analyzer	29-Apr-11	28-Apr-12