ISM Test Report

AIR-RM1520G-A-K9 802.11b/g Radio Module

FCC ID: LDK102064

Against the following Specifications:

CFR47 Part 15.247

RSS210

Cisco Systems

170 West Tasman Drive

San Jose, CA 95134

Author: James Nicholson

Approved By:

Title:

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Section 1: Overview

1.1 Test Summary

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

Emission	Immunity
CFR47 Part 15.247(a) CFR47 Part 15.247(a)(2) CFR47 Part 15.247a3 (RSS210) CFR47 Part 15: 2005 CFR47 Part 15: 2005 (CAN/CSA-CISPR 22-02)	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. This list is not a one to one match to the front cover for one or more of the following reasons.

1. Basic standards call up many different test phenomena specifications such as the 61000-4-X series. The basic standards define which elements and levels shall be applied from these specifications and as such it is not appropriate to list the individual specifications on the front cover.
2. A Standard listed on the front cover may be required in a particular country but is not appropriate for the particular technologies included in the equipment under test. E.g. You cannot test a DC product to the mains Harmonics requirements in EN61000-3-2. See section 3.2.
3. Test results against a particular standard or specification may be included in a different test report. See section 3.2 for an EDCS reference of this data.
4. Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
5. Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.
6. Testing may have been performed to an equivalent test that satisfies the requirements of the standards and specifications listed on the front cover of the report. See section 3.2.
7. Where radiated emissions testing has been performed to EN55022/CISPR22 the additional requirements of VCCI: V- 3/2006.04, EN55022: 1994 +A1/2 and CAN/CSA- CISPR 22-02 have also been evaluated unless otherwise stated.
8. Testing to the requirements of CFR47 Part 15 was performed against the CISPR22 limits. The results are therefore deemed satisfactory evidence of compliance with Industry Canada Interference Causing Equipment Standard ICES-003.
9. Where assessment has been performed to CISPR24, all the applicable test requirements may have not been covered. Refer to the results section for the tests performed.

Notes:

1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
2) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
3) Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.

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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*%

*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.

e) All AC testing was performed at one or more of the following supply voltages:
110V 60 Hz (+/-20%)
220V 50 Hz (+/-20%)

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2.2 Date of start of testing

06-Mar-2007

2.3 Report Issue Date

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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

James Nicholson

2.5 Equipment Assessed (EUT)

AIR-RM1520G-A-K9 802.11b/g Radio Module.

2.6 EUT Description

The AIR-RM1520G-A-K9 802.11b/g radio module operates exclusively in the AIR-LAP1520 series access point, and may operate simultaneously with the AIR-RM1520A-A-K9 802.11a radio module.

The following antennas are supported by this product.

AIR-ANT2450V-N	2400-2483.5 MHz	5.5 dBi Omni-directional
AIR-ANT2480V-N	2400-2483.5 MHz	8.0 dBi Omni-directional

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Section 3: Sample Details

Sample No.	Equipment Details	Part Number	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	802.11b/g Radio Module	AIR-RM1520G-A-K9	Cisco Systems	NA	NA	NA	NA
S02	Mesh Access Point	AIR-LAP1522AG-A-K9	Cisco Systems	NA	NA	NA	NA
S03	8.0 dBi Omni Antenna	AIR-ANT2480V-N	Cisco Systems	NA	NA	NA	NA
S04	5.5 dBi Patch Antenna	AIR-ANT2450V-N	Cisco Systems	NA	NA	NA	NA

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Appendix A: Emission Test Results
Testing Laboratory: Cisco Systems, Inc., 4125 Highlander Parkway, Richfield, OH, USA

Average Output Power

Average Power with up to 5.5 and 8 dBi Antennas

Frequency (MHz)	Data Rate (Mbps)	Antenna Gain (dBi)	Target Power Level (dBm)	Actual Power Level (dBm)
2412	11	8	28	27.8
2412	36	5.5	25	24.8
2412	36	8	24	23.7
2437	11	8	28	28.0
2437	36	8	27	26.8
2462	11	8	28	27.7
2462	36	5.5	25	24.8
2462	36	8	24	23.9

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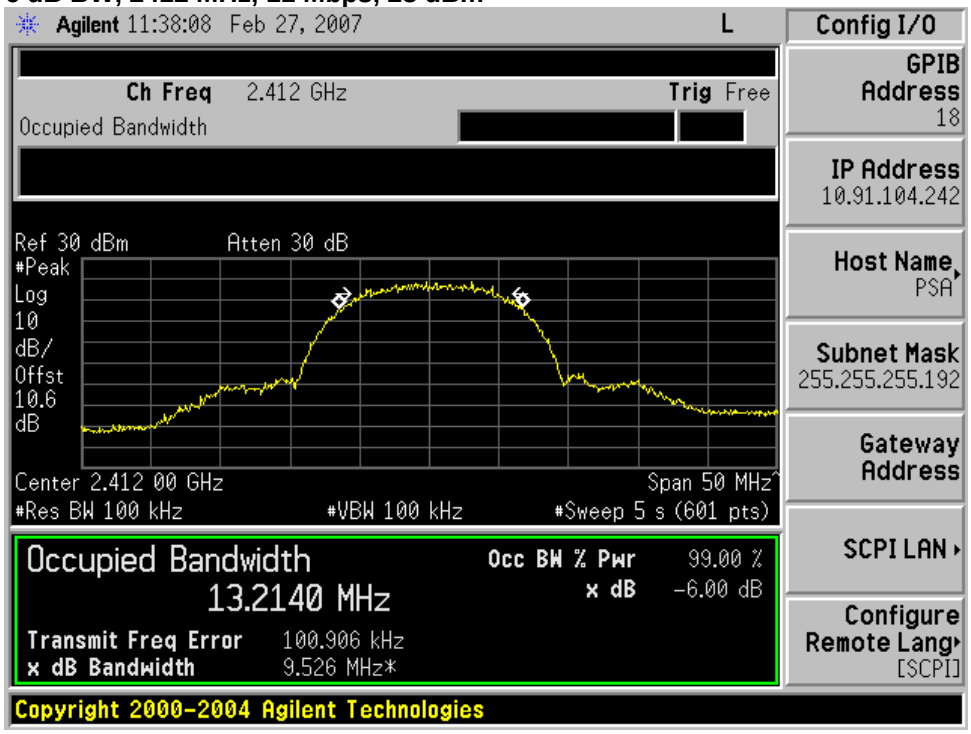
6dB Bandwidth

15.247: Systems using digital modulation techniques may operate in the 2400-2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.

Frequency (MHz)	Data Rate (Mbps)	6dB BW (MHz)	Limit (kHz)	Margin (kHz)
2412	11	9.5	>500	9000
2412	36	16.5	>500	16000
2437	11	9.6	>500	9100
2437	36	16.6	>500	16100
2462	11	10.0	>500	9500
2462	36	16.5	>500	16000

6 dB BW, 2412 MHz, 11 Mbps, 28 dBm



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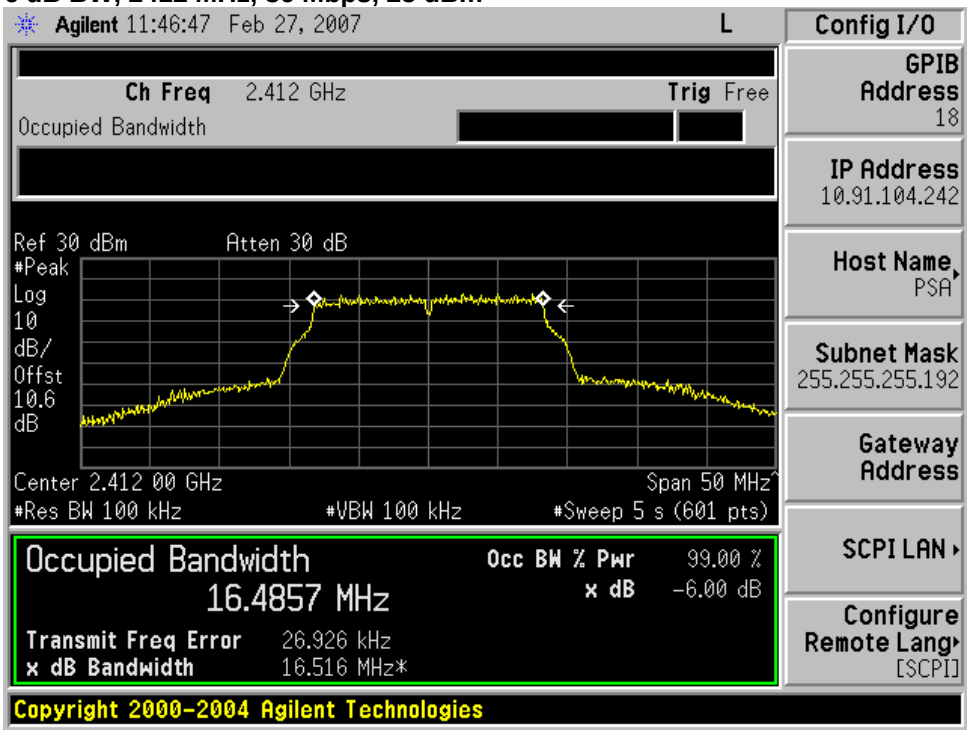
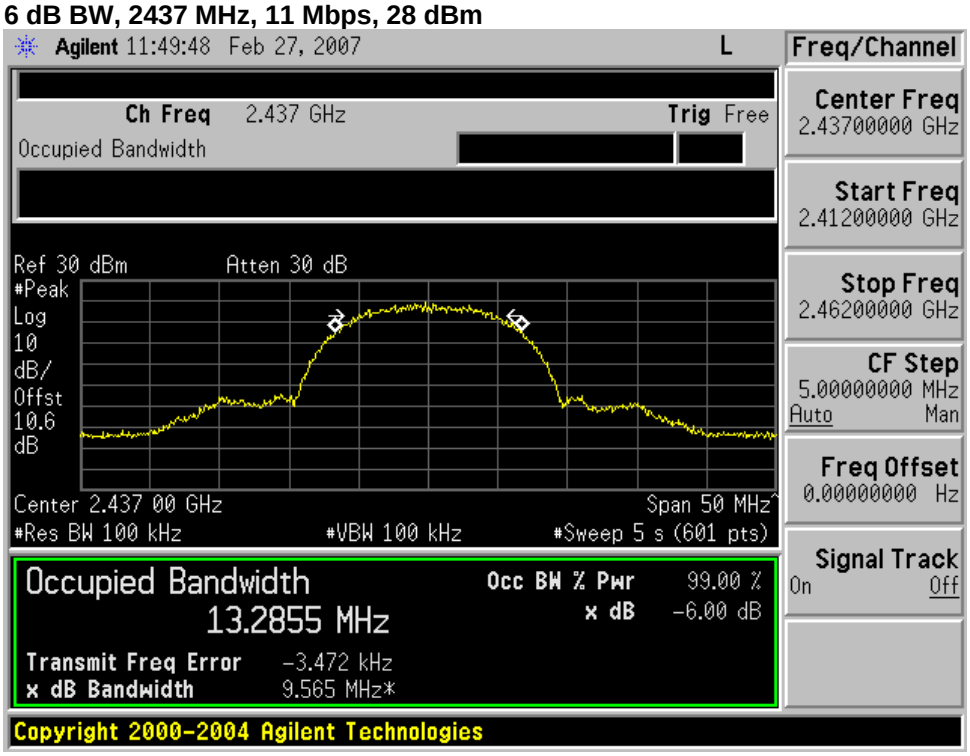
6 dB BW, 2412 MHz, 36 Mbps, 25 dBm



6 dB BW, 2437 MHz, 11 Mbps, 28 dBm



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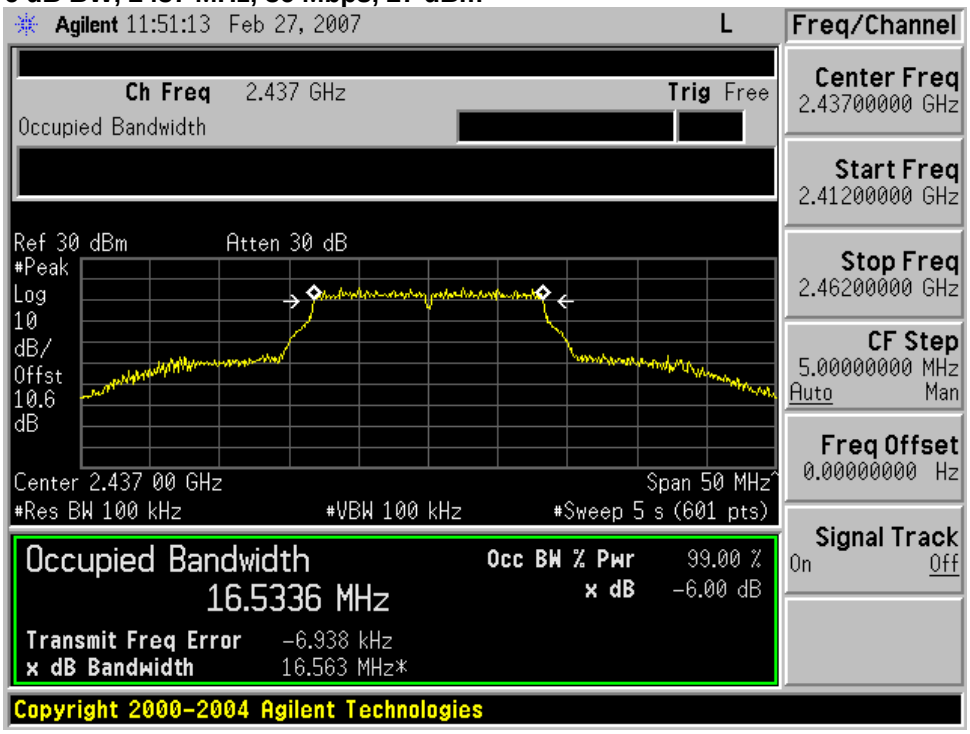
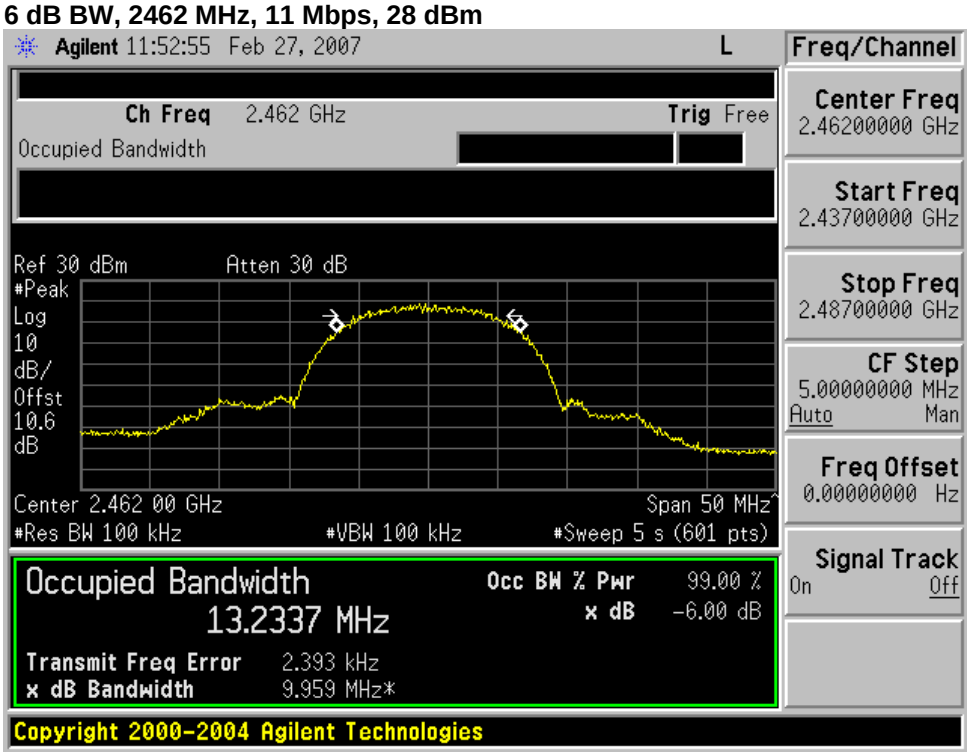
6 dB BW, 2437 MHz, 36 Mbps, 27 dBm



6 dB BW, 2462 MHz, 11 Mbps, 28 dBm



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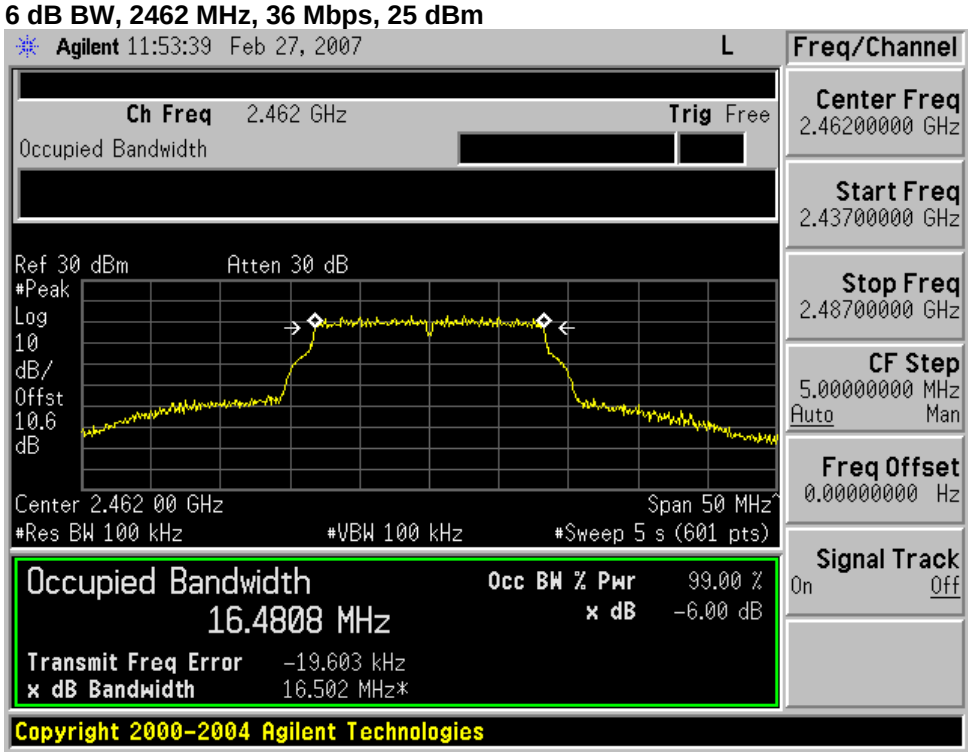
6 dB BW, 2462 MHz, 36 Mbps, 25 dBm



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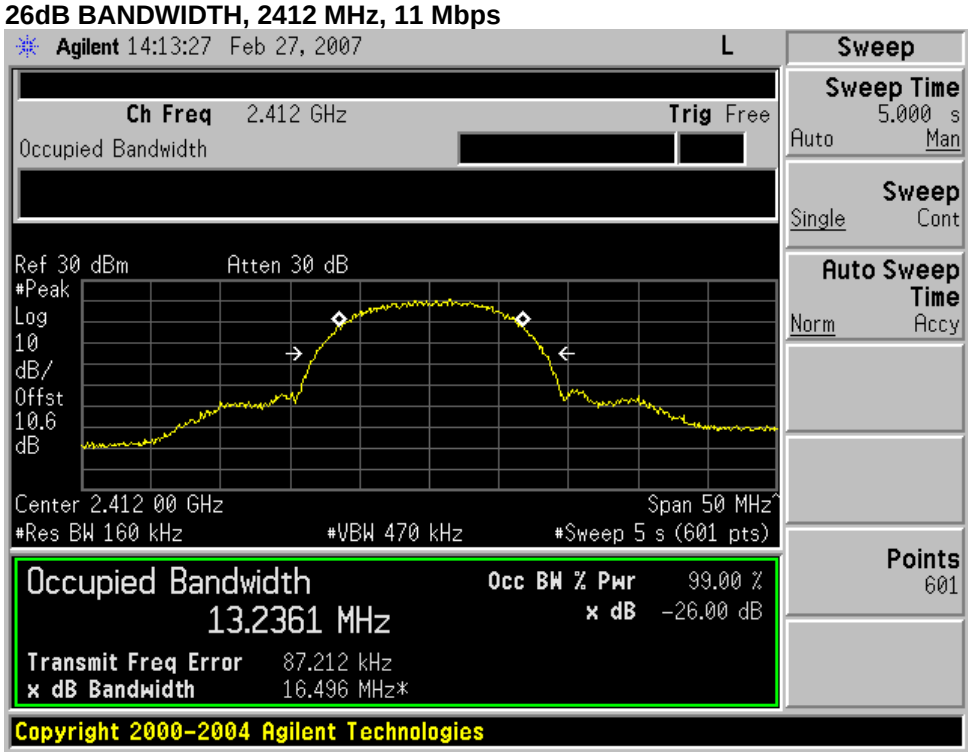
99% and 26dB Bandwidth

Frequency (MHz)	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
2412	11	16.6	13.2
2412	36	20.2	16.6
2437	11	16.4	13.3
2437	36	20.4	16.7
2462	11	16.4	13.2
2462	36	20.1	16.6

26dB BANDWIDTH, 2412 MHz, 11 Mbps



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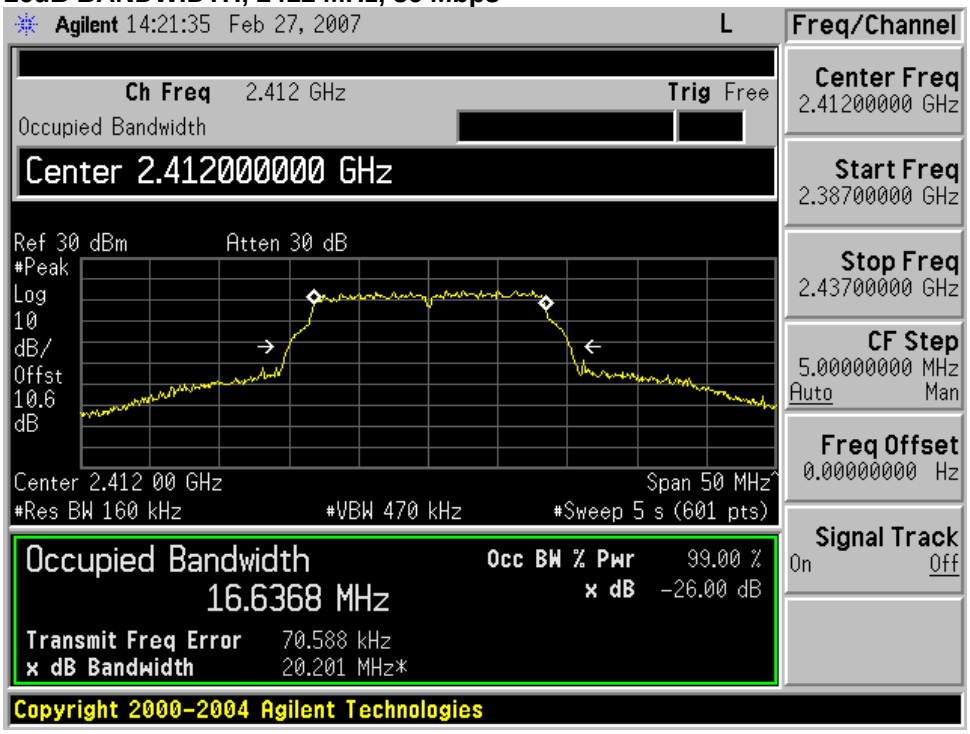
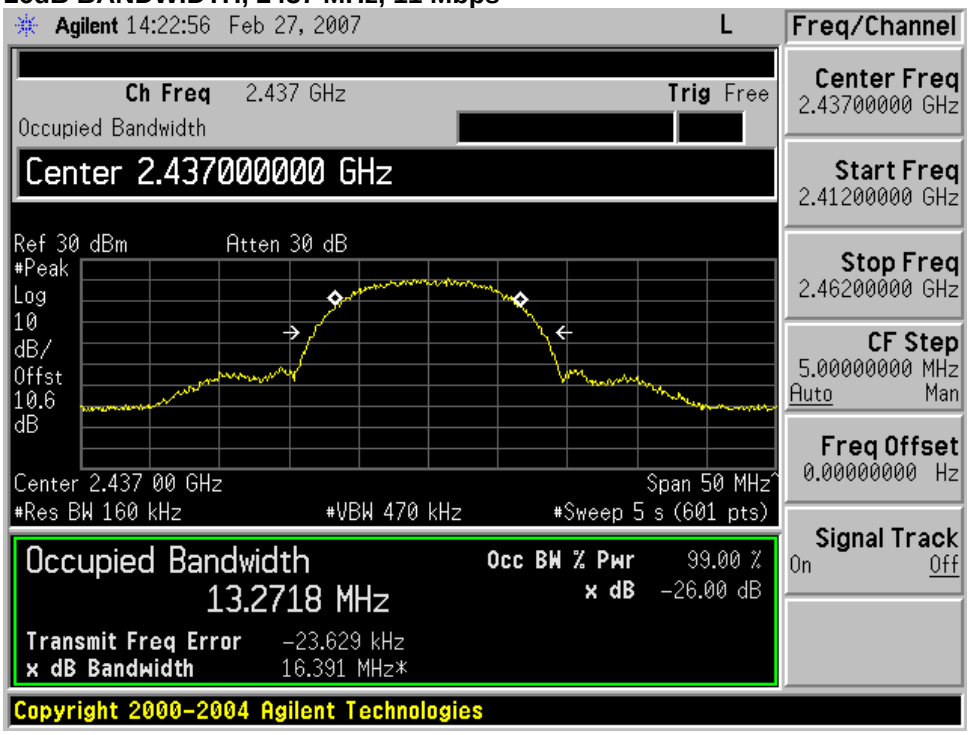
26dB BANDWIDTH, 2412 MHz, 36 Mbps



26dB BANDWIDTH, 2437 MHz, 11 Mbps



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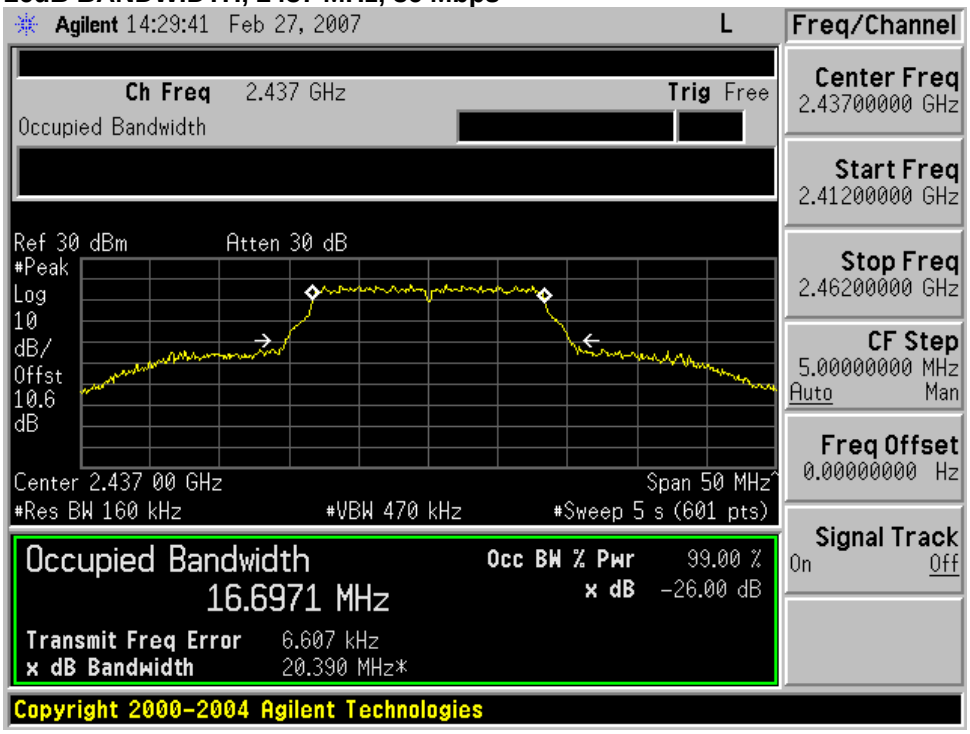
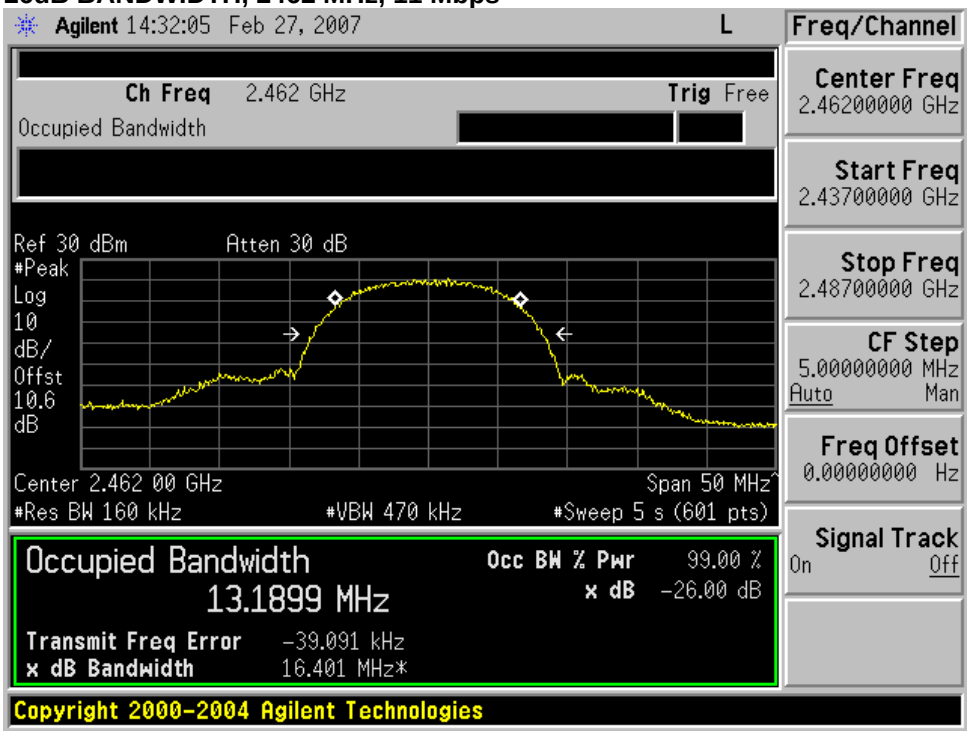
26dB BANDWIDTH, 2437 MHz, 36 Mbps



26dB BANDWIDTH, 2462 MHz, 11 Mbps



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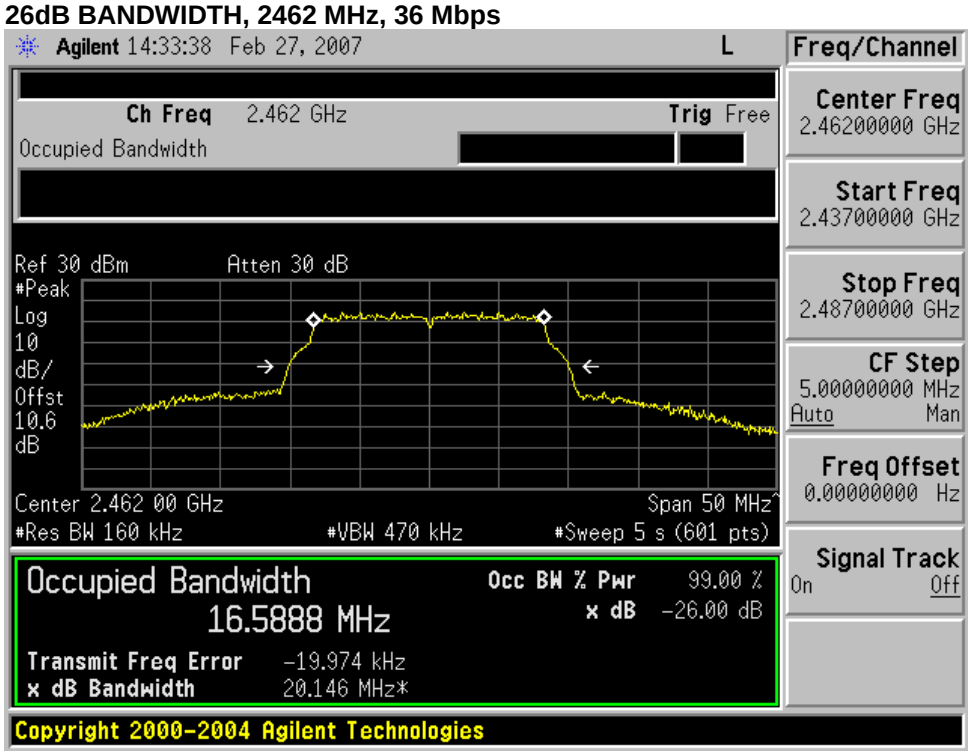
26dB BANDWIDTH, 2462 MHz, 36 Mbps



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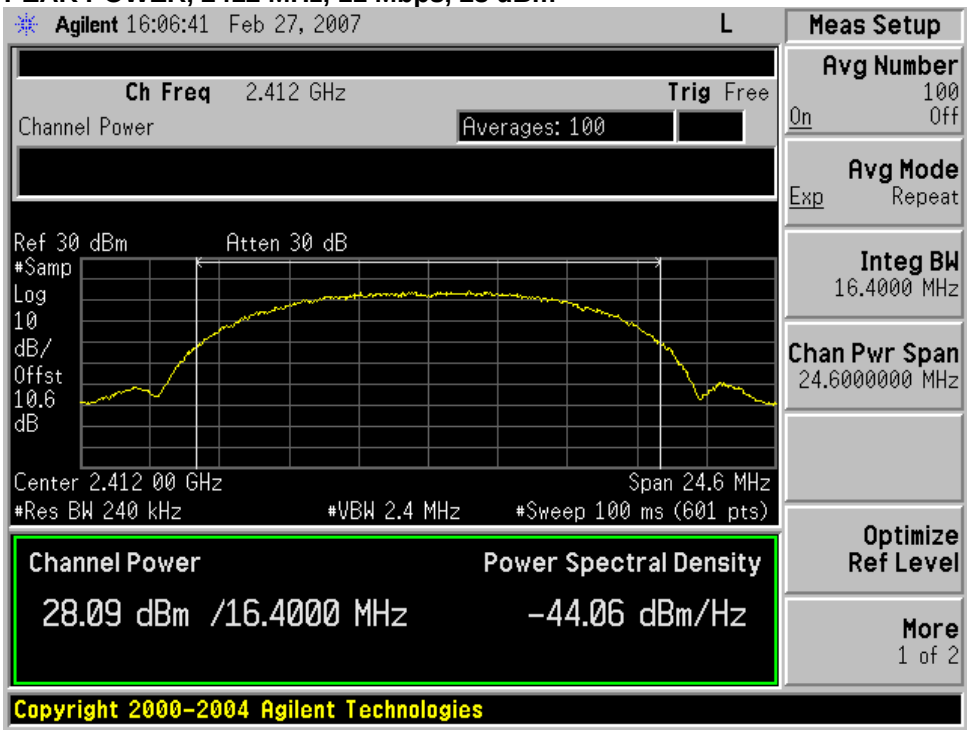
Peak Output Power

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.

- For the 8 dBi Omni-directional antenna, the maximum allowable output power must be reduced by 8dBi-6dbi = 2dB, for a maximum peak conducted output power of 28 dBm.

Frequency (MHz)	Data Rate (Mbps)	Antenna Gain (dBi)	Target Power Level (dBm)	Peak Power (dBm)
2412	11	8	28	28.1
2412	36	5.5	25	24.8
2412	36	8	24	24.0
2437	11	8	28	28.3
2437	36	8	27	26.9
2462	11	8	28	28.2
2462	36	5.5	25	25.1
2462	36	8	24	24.1

PEAK POWER, 2412 MHz, 11 Mbps, 28 dBm



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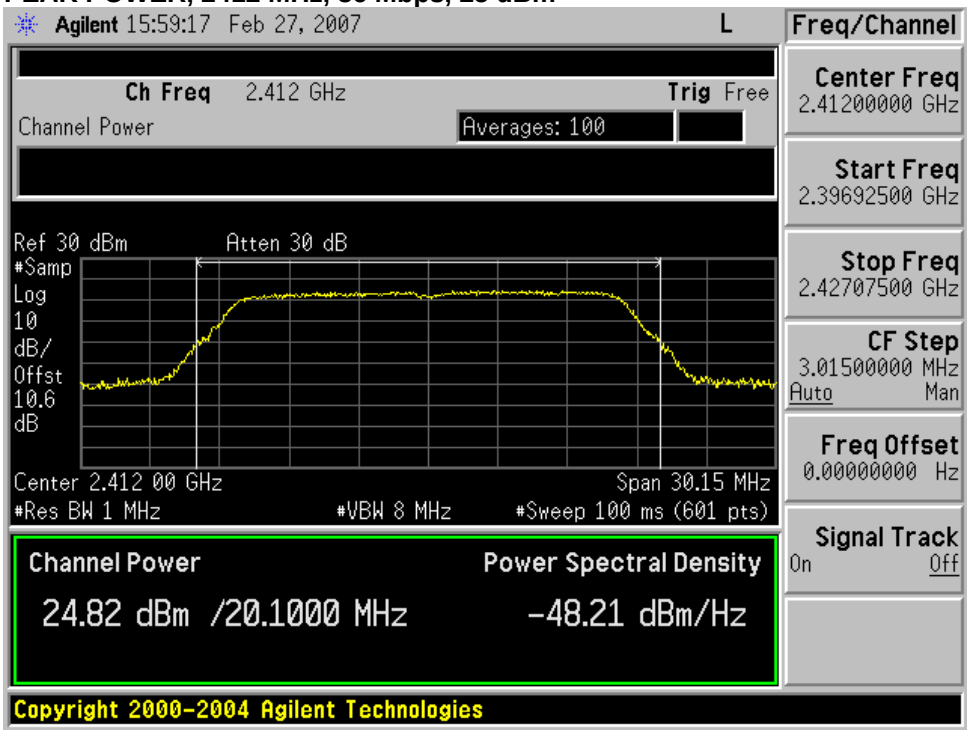
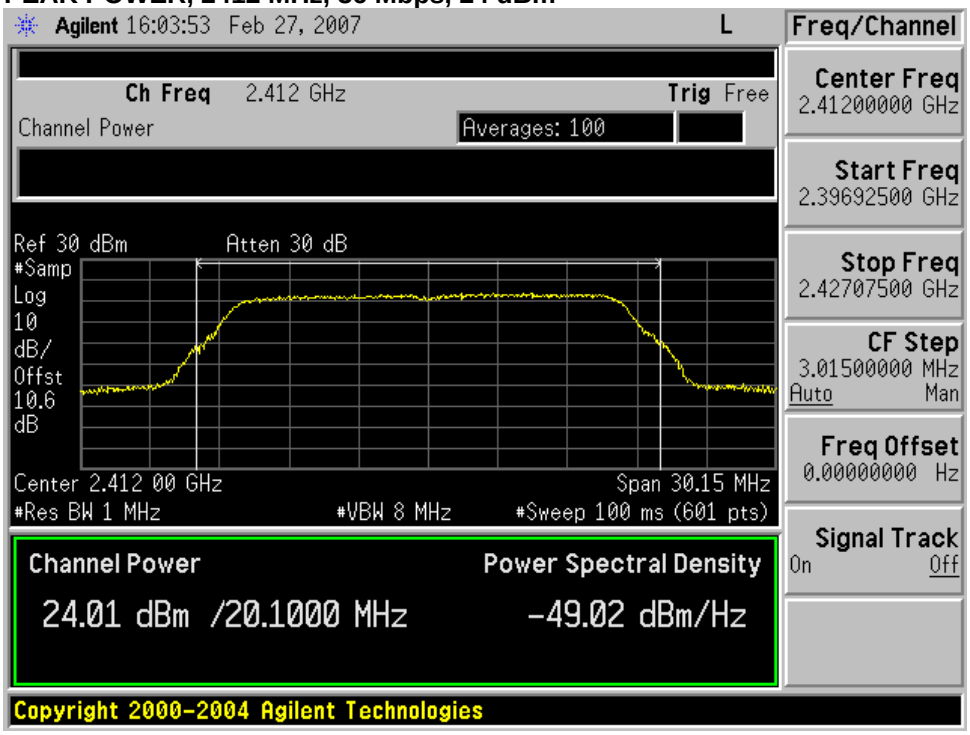
PEAK POWER, 2412 MHz, 36 Mbps, 25 dBm



PEAK POWER, 2412 MHz, 36 Mbps, 24 dBm



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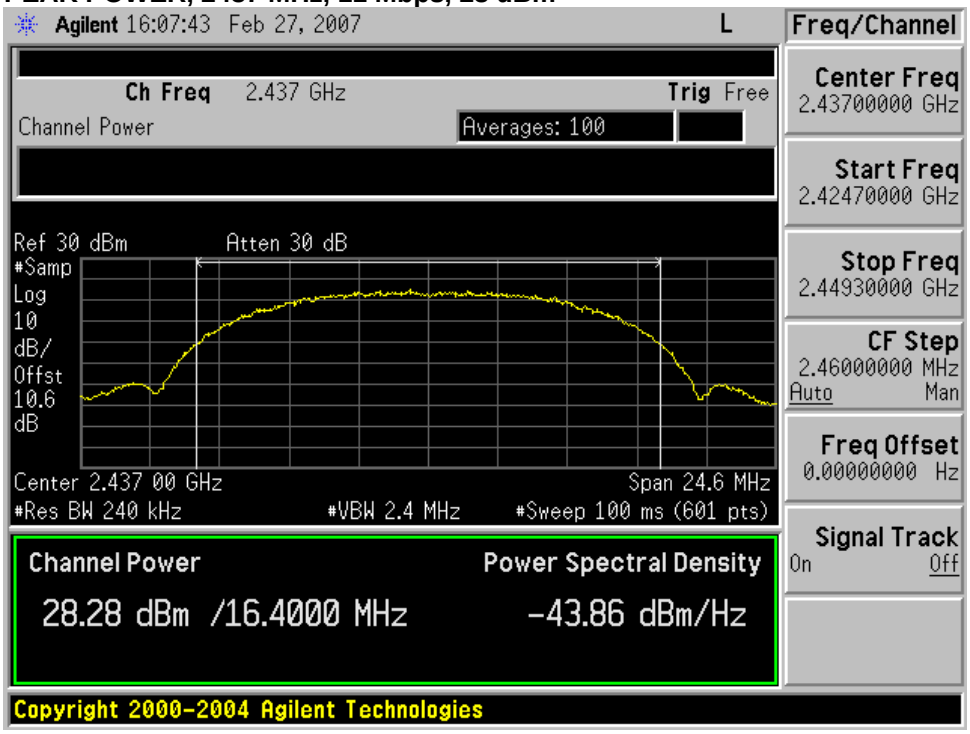
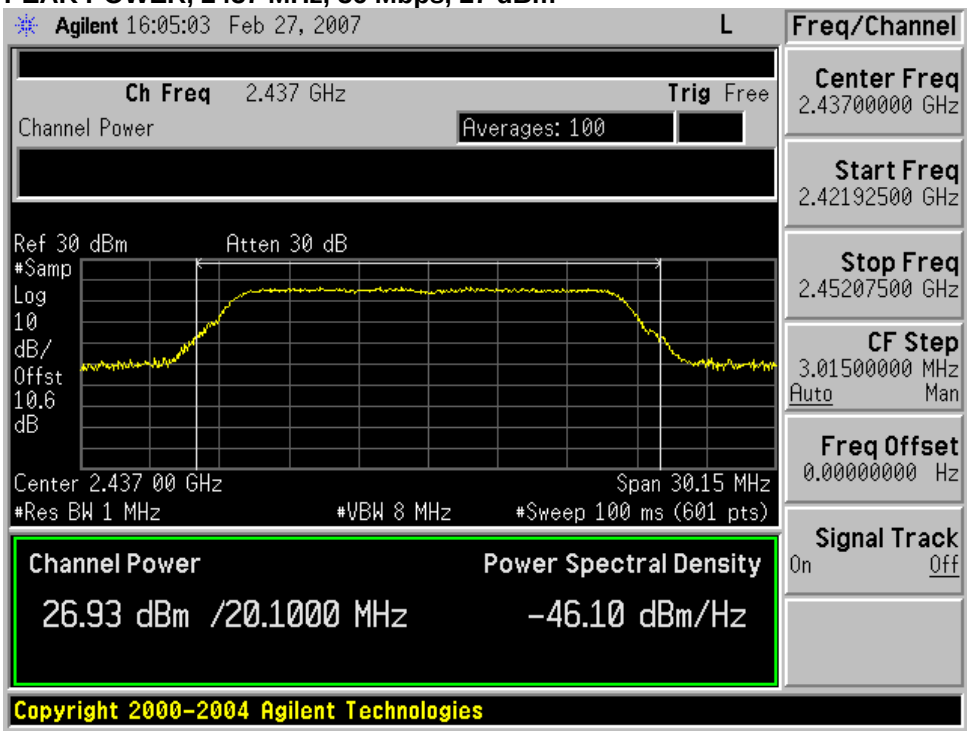
PEAK POWER, 2437 MHz, 11 Mbps, 28 dBm



PEAK POWER, 2437 MHz, 36 Mbps, 27 dBm



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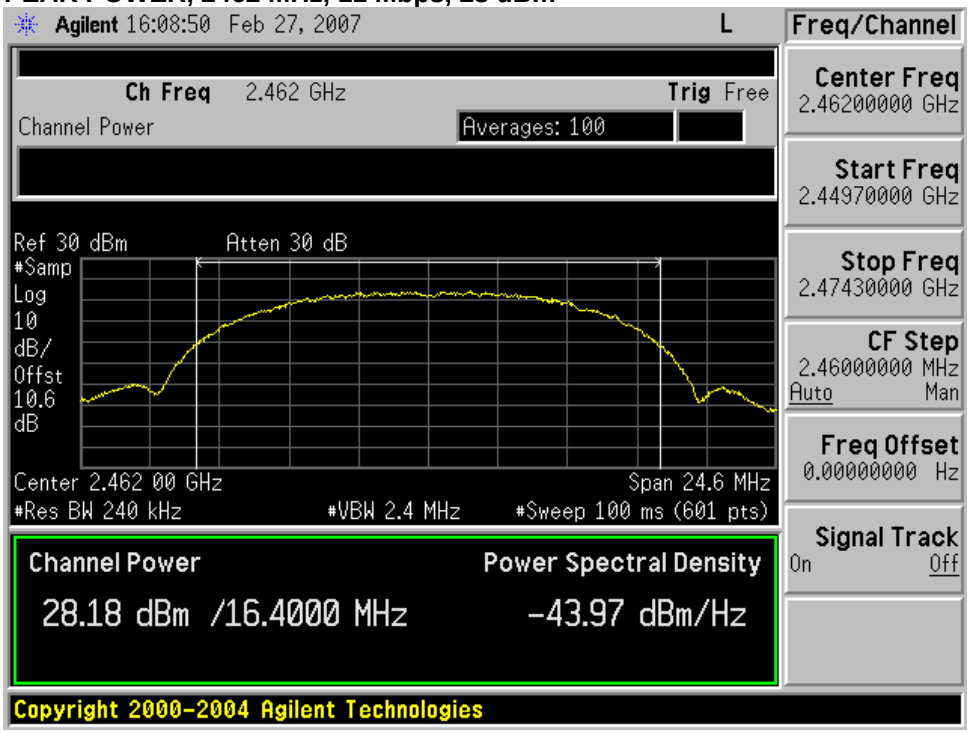
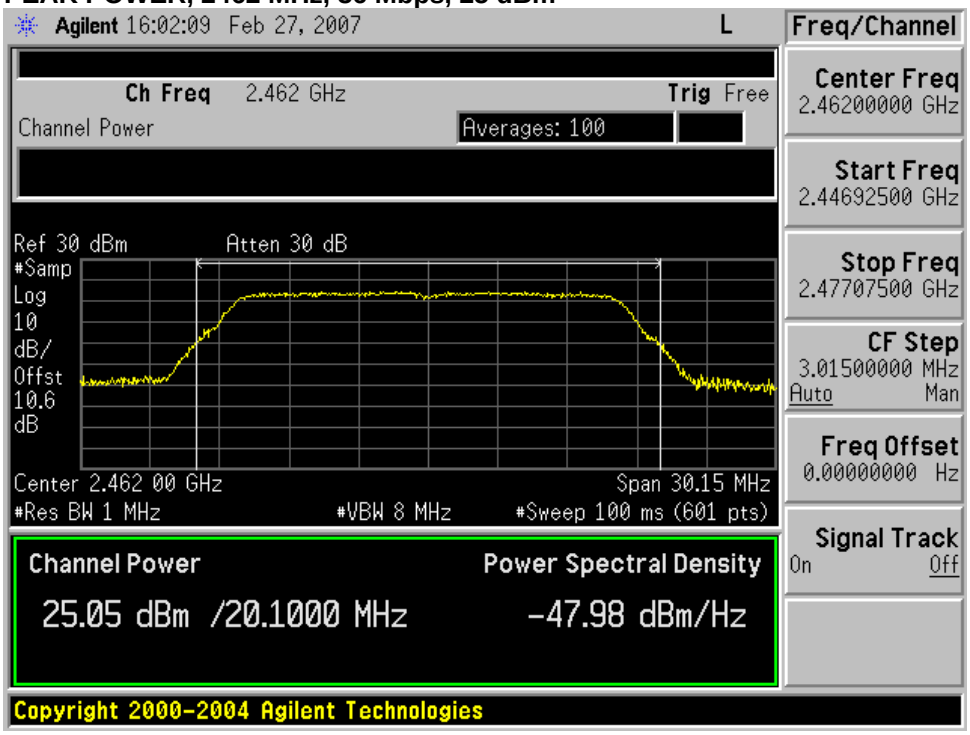
PEAK POWER, 2462 MHz, 11 Mbps, 28 dBm



PEAK POWER, 2462 MHz, 36 Mbps, 25 dBm



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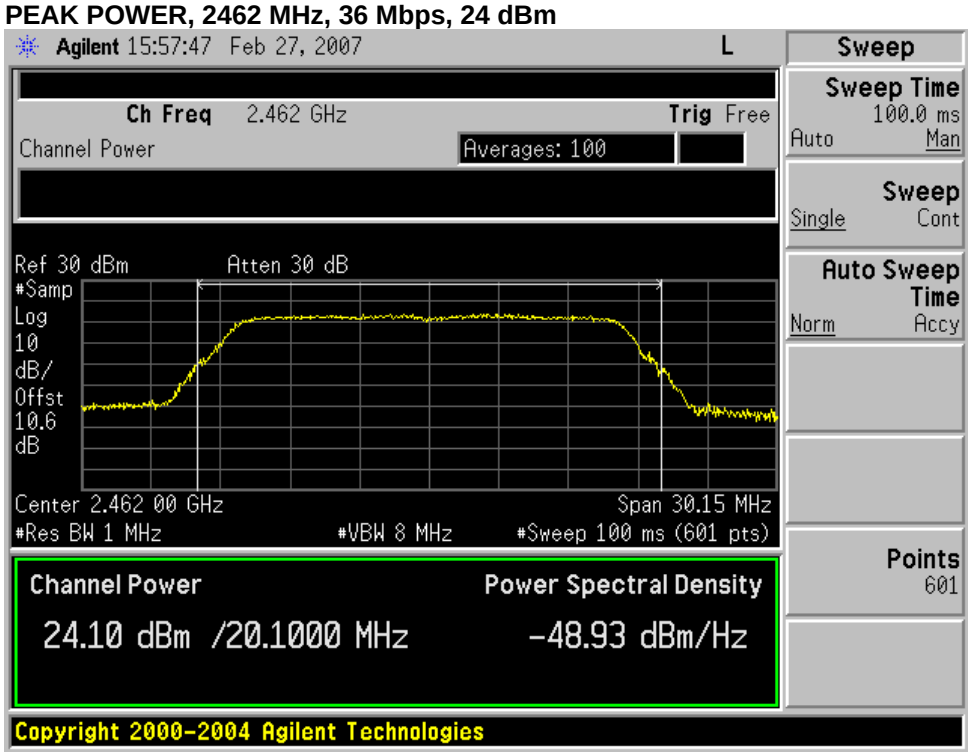
PEAK POWER, 2462 MHz, 36 Mbps, 24 dBm



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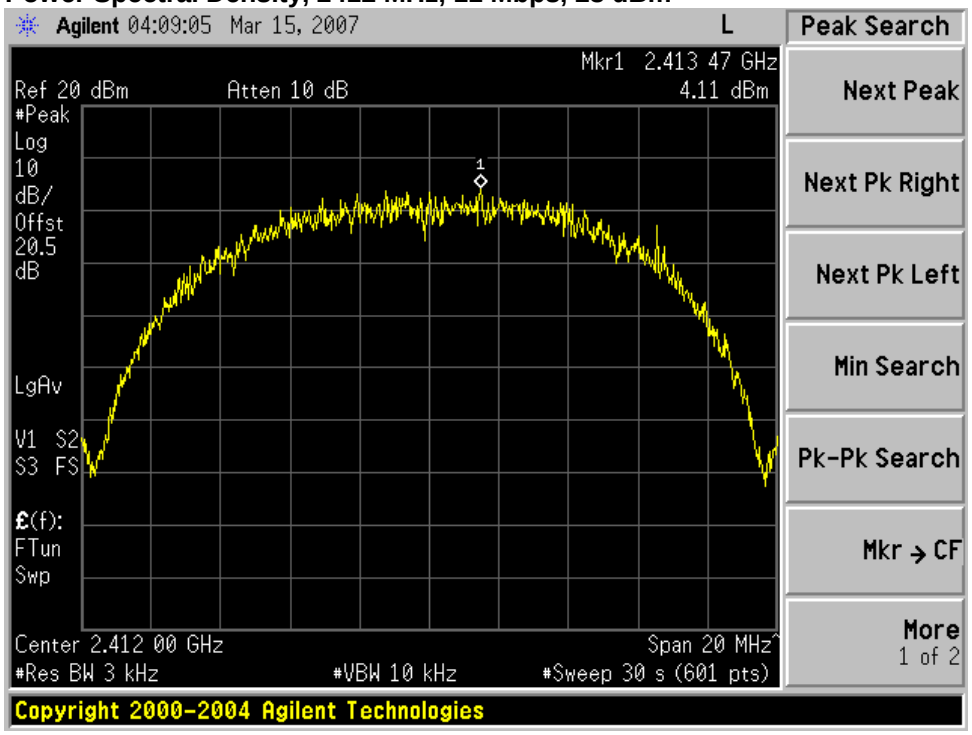
Power Spectral Density

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.

Frequency (MHz)	Data Rate (Mbps)	Target Power Level (dBm)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
2412	11	28	4.1	8.0	3.9
2412	36	25	-1.5	8.0	9.5
2437	11	28	6.6	8.0	1.4
2437	36	27	0.6	8.0	7.4
2462	11	28	3.9	8.0	4.1
2462	36	25	-1.4	8.0	9.4

Power Spectral Density, 2412 MHz, 11 Mbps, 28 dBm



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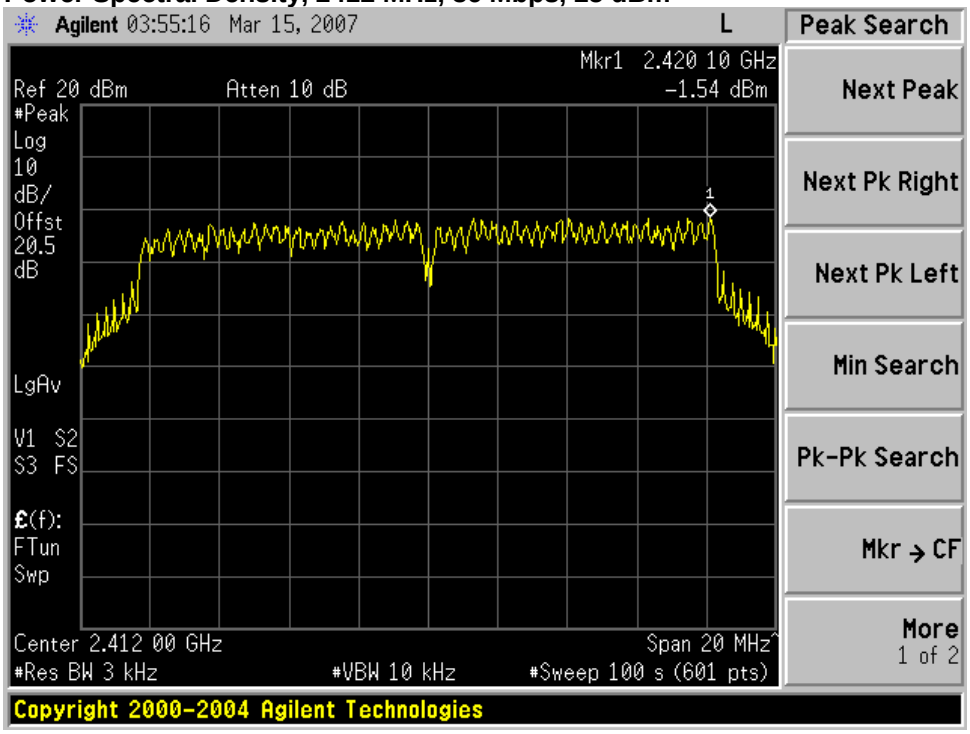
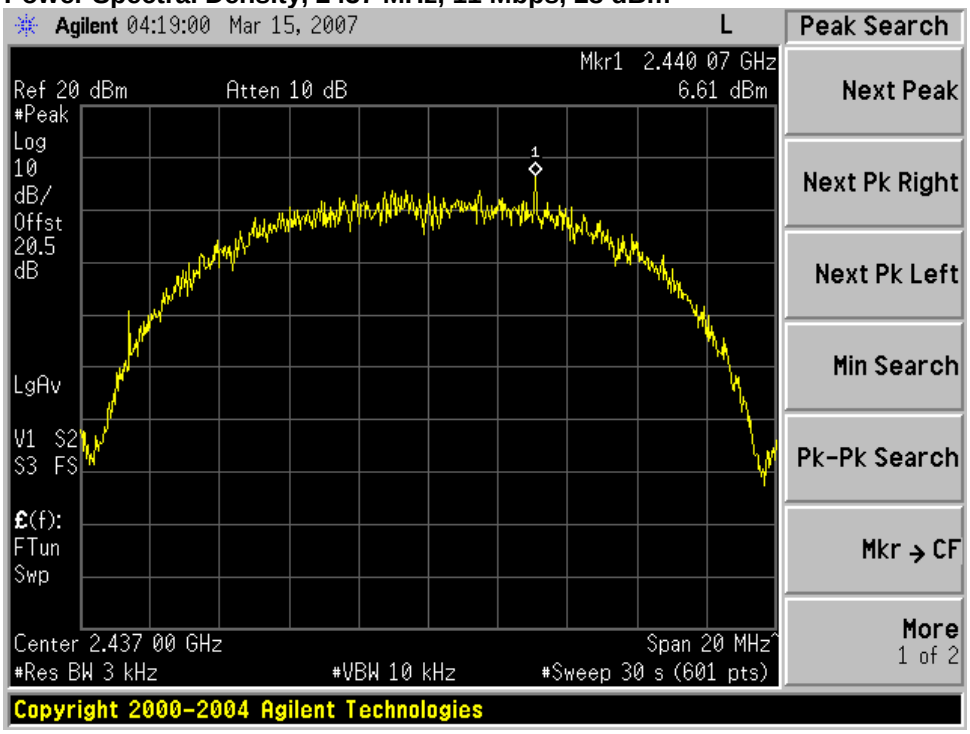
Power Spectral Density, 2412 MHz, 36 Mbps, 25 dBm



Power Spectral Density, 2437 MHz, 11 Mbps, 28 dBm



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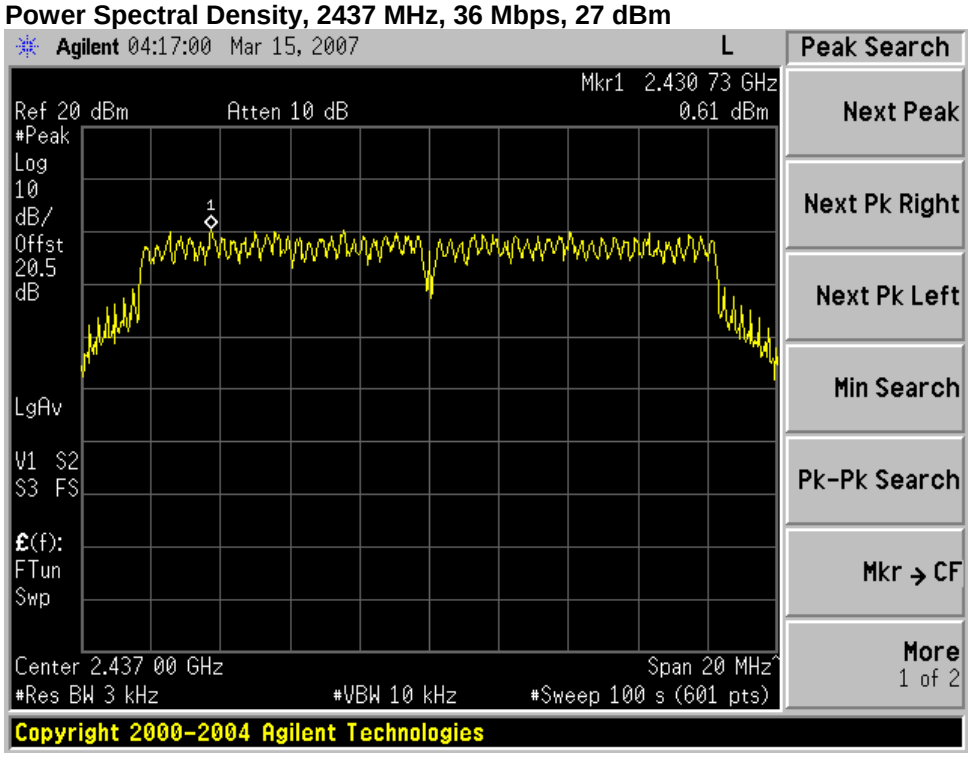
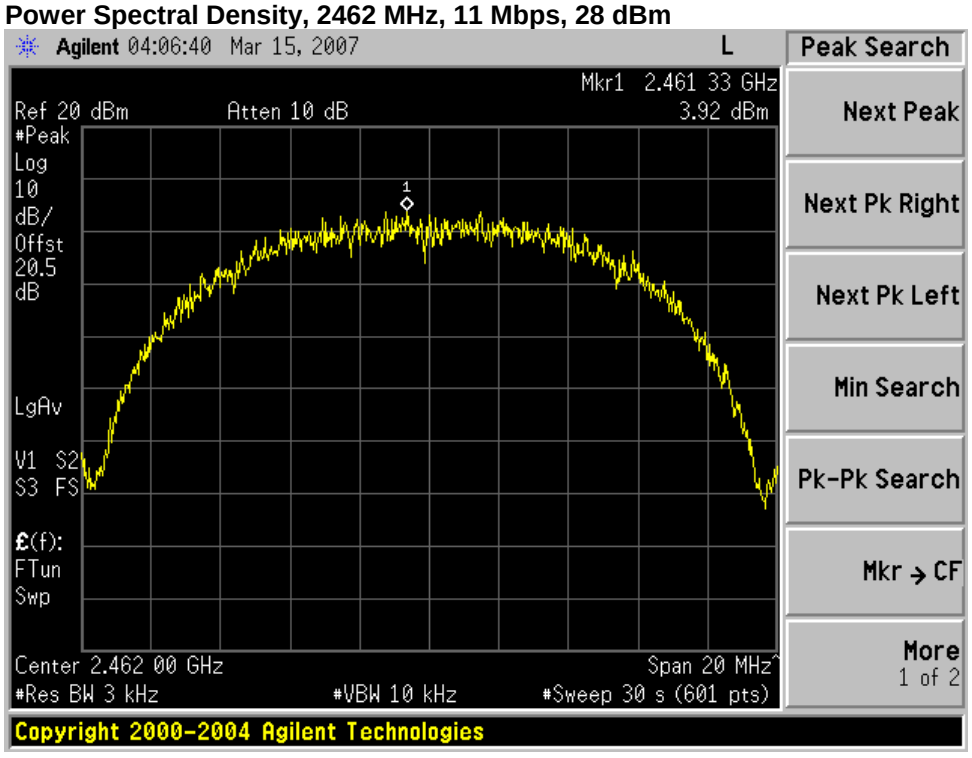
Power Spectral Density, 2437 MHz, 36 Mbps, 27 dBm



Power Spectral Density, 2462 MHz, 11 Mbps, 28 dBm



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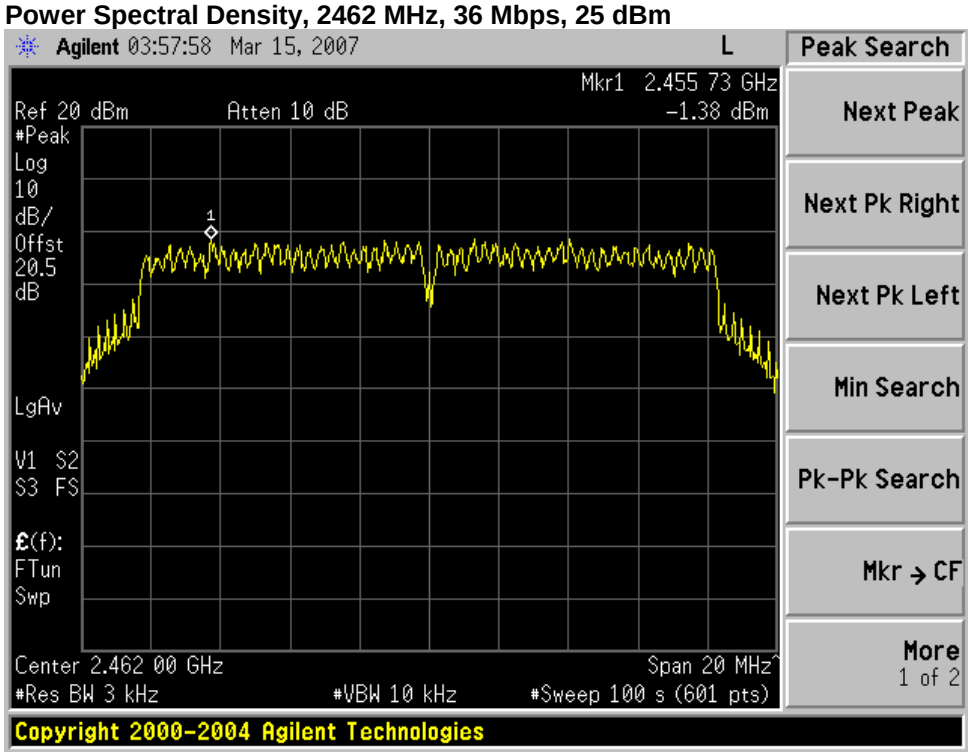
Power Spectral Density, 2462 MHz, 36 Mbps, 25 dBm



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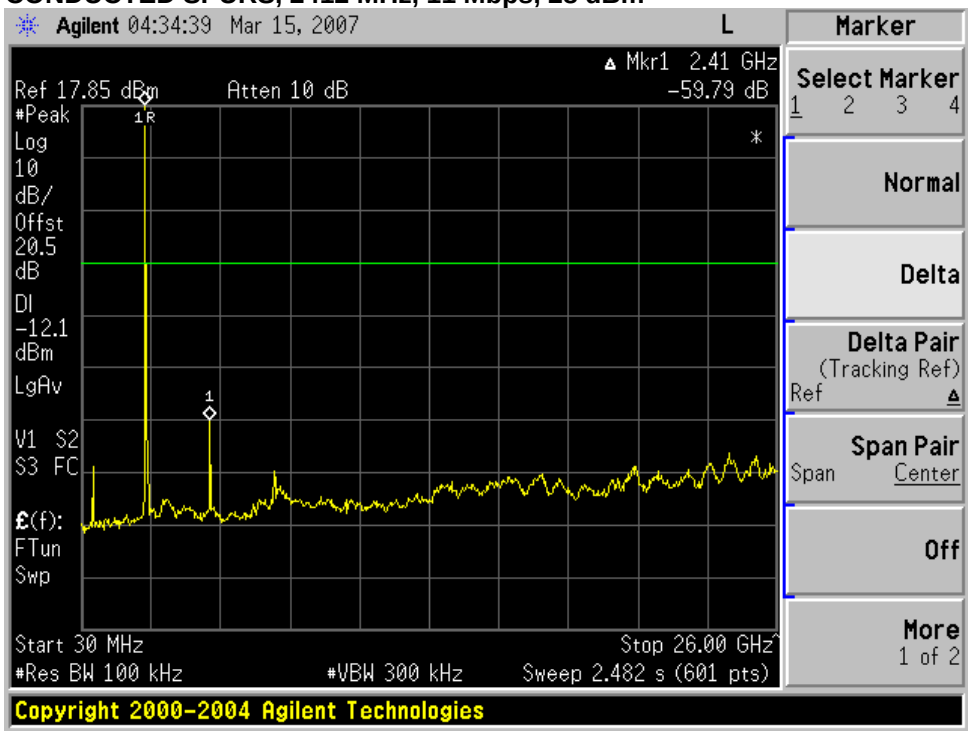
Conducted Spurious Emissions

15.247: In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Frequency (MHz)	Data Rate (Mbps)	Target Power Level (dBm)	Conducted Spurs
2412	11	28	>30dBc
2412	36	25	>30dBc
2437	11	28	>30dBc
2437	36	27	>30dBc
2462	11	28	>30dBc
2462	36	25	>30dBc

CONDUCTED SPURS, 2412 MHz, 11 Mbps, 28 dBm



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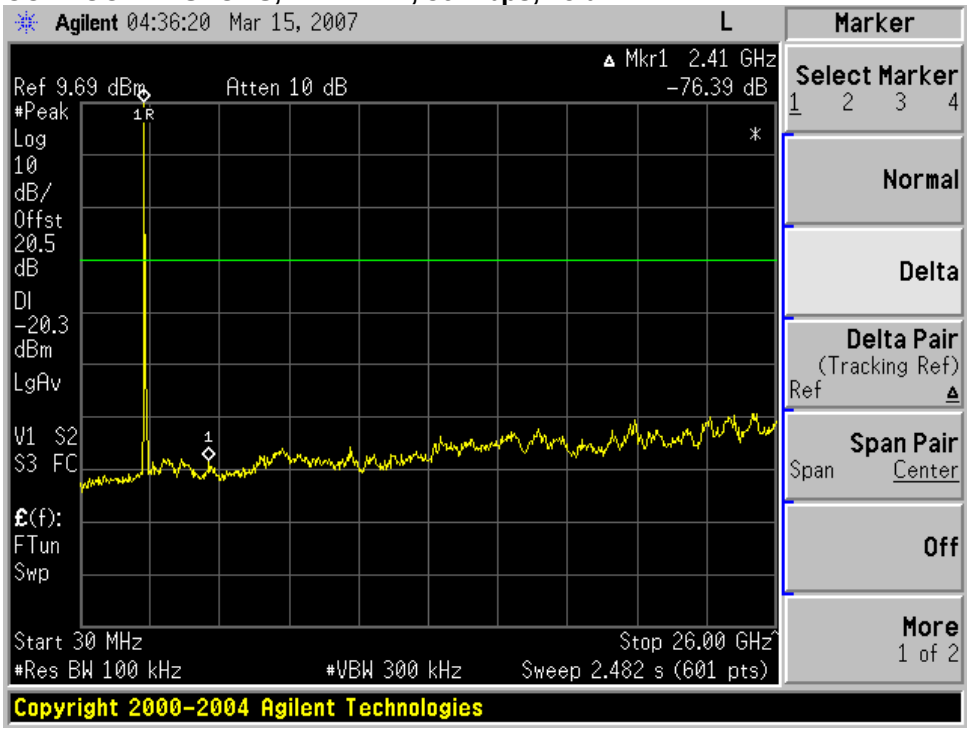
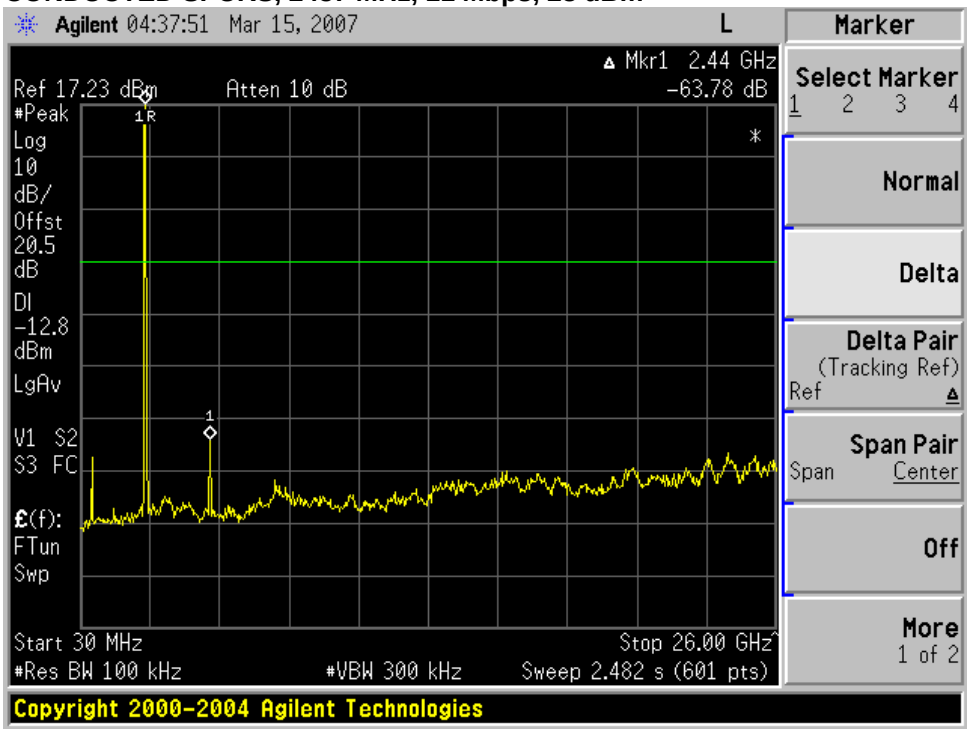
CONDUCTED SPURS, 2412 MHz, 36 Mbps, 25 dBm



CONDUCTED SPURS, 2437 MHz, 11 Mbps, 28 dBm



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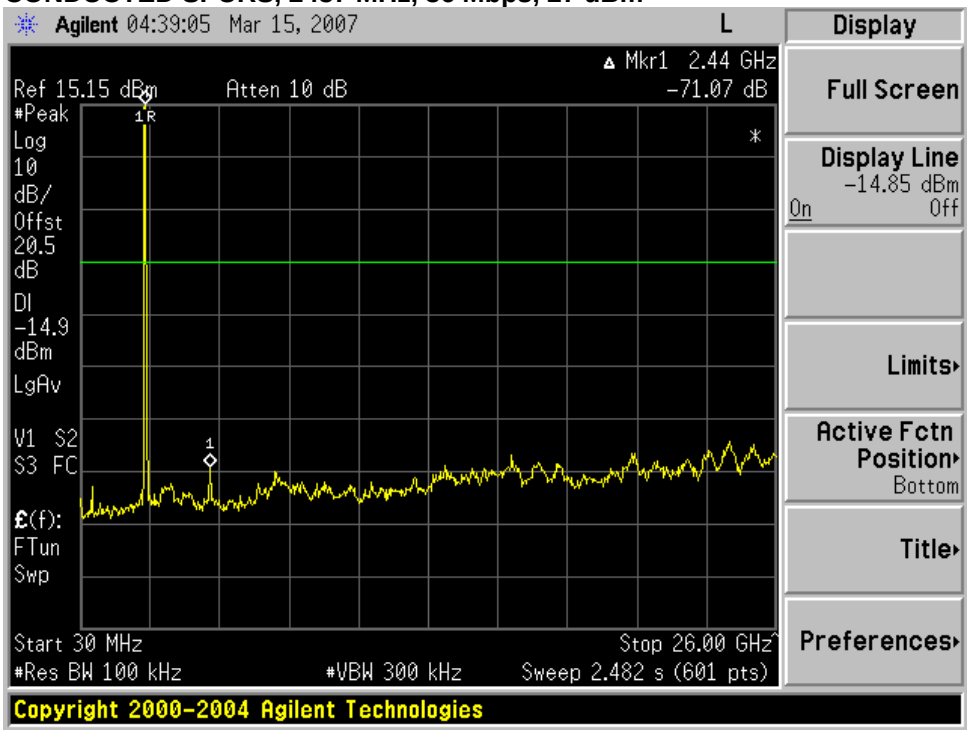
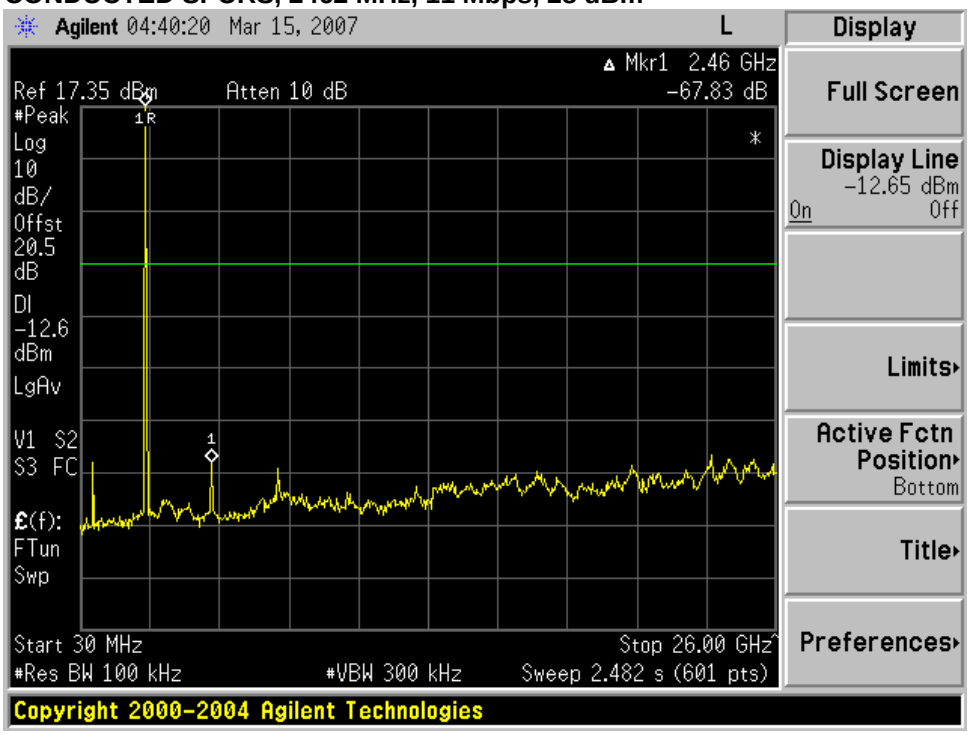
CONDUCTED SPURS, 2437 MHz, 36 Mbps, 27 dBm



CONDUCTED SPURS, 2462 MHz, 11 Mbps, 28 dBm



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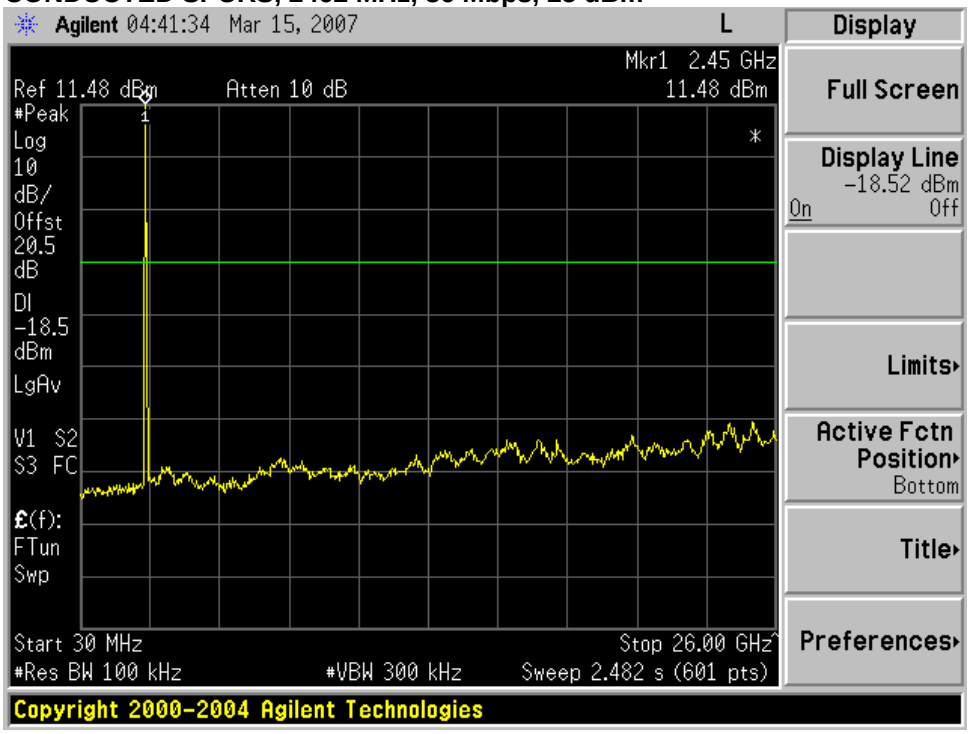
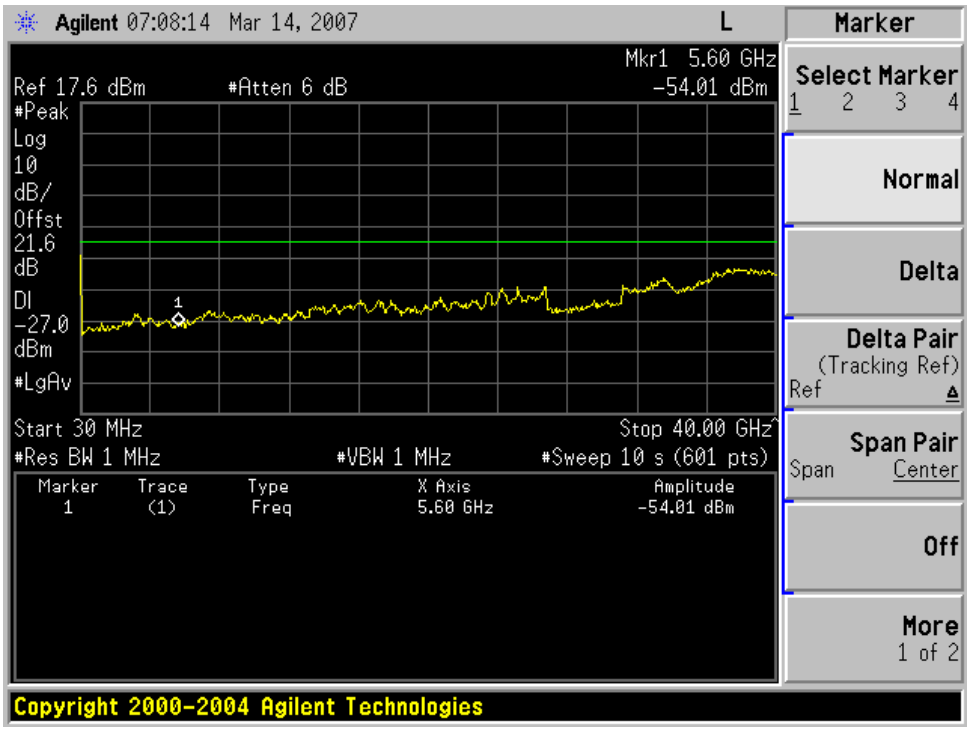
CONDUCTED SPURS, 2462 MHz, 36 Mbps, 25 dBm



CONDUCTED Rx SPURS



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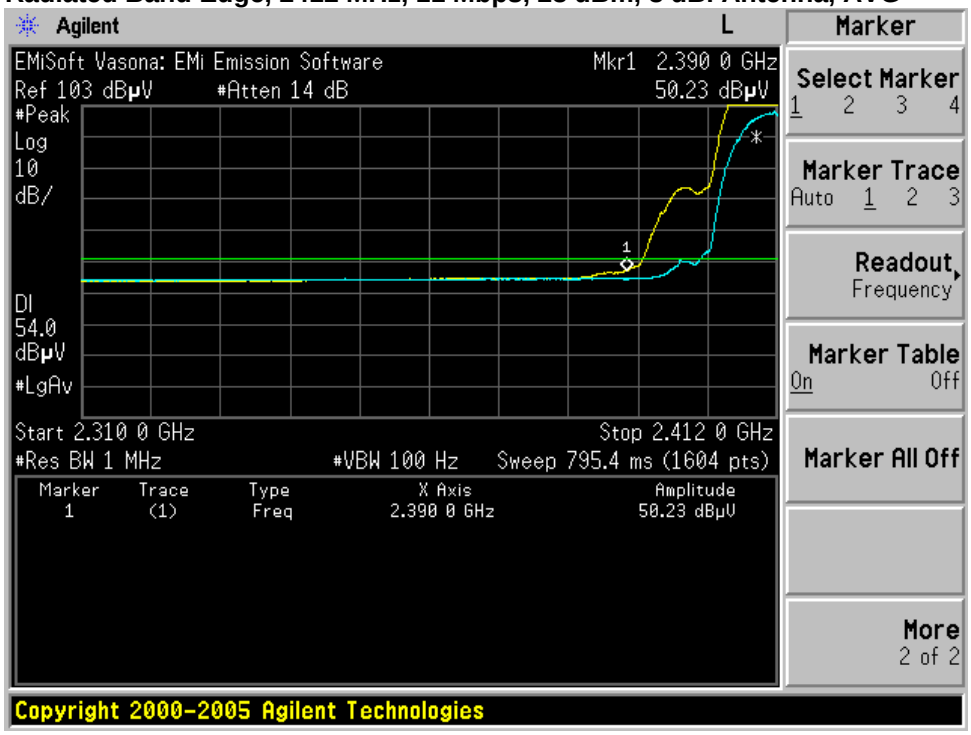
Appendix B: Emission Test Results
Testing Laboratory: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134, USA

Radiated Band Edge Emissions

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

Frequency (MHz)	Data Rate (Mbps)	Antenna Gain (dBi)	Target Power Level (dBm)	Radiated Bandedge Margin
2412	11	8	28	3.8
2412	36	5.5	25	0.5
2412	36	8	24	0.1
2462	11	8	28	5.2
2462	36	5.5	25	0.2
2462	36	8	24	0.2

Radiated Band Edge, 2412 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna, AVG



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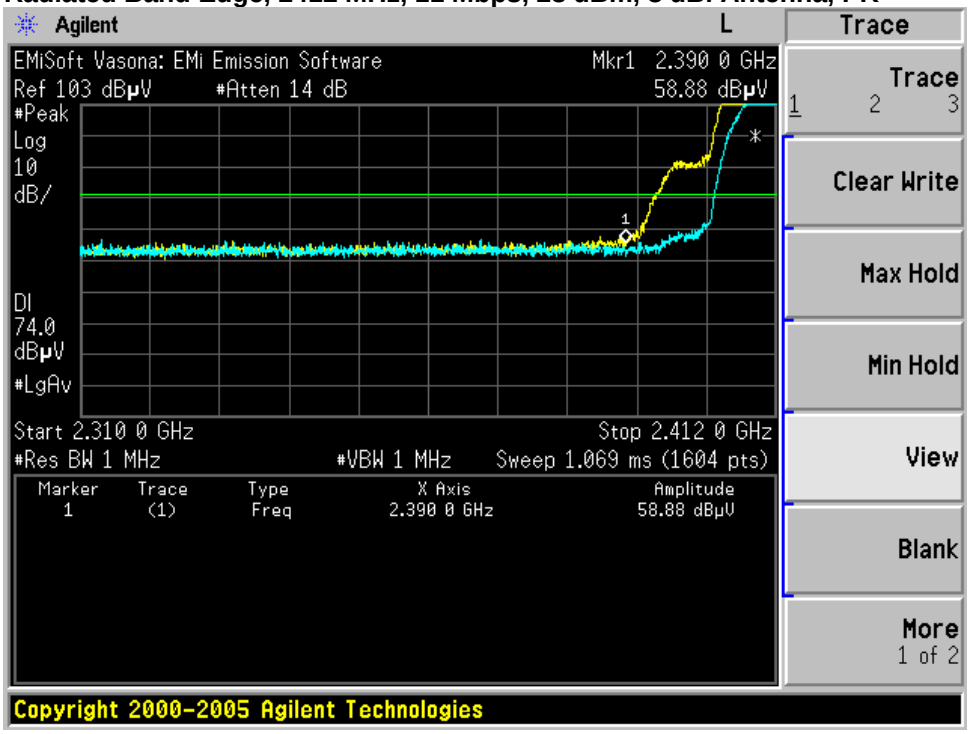
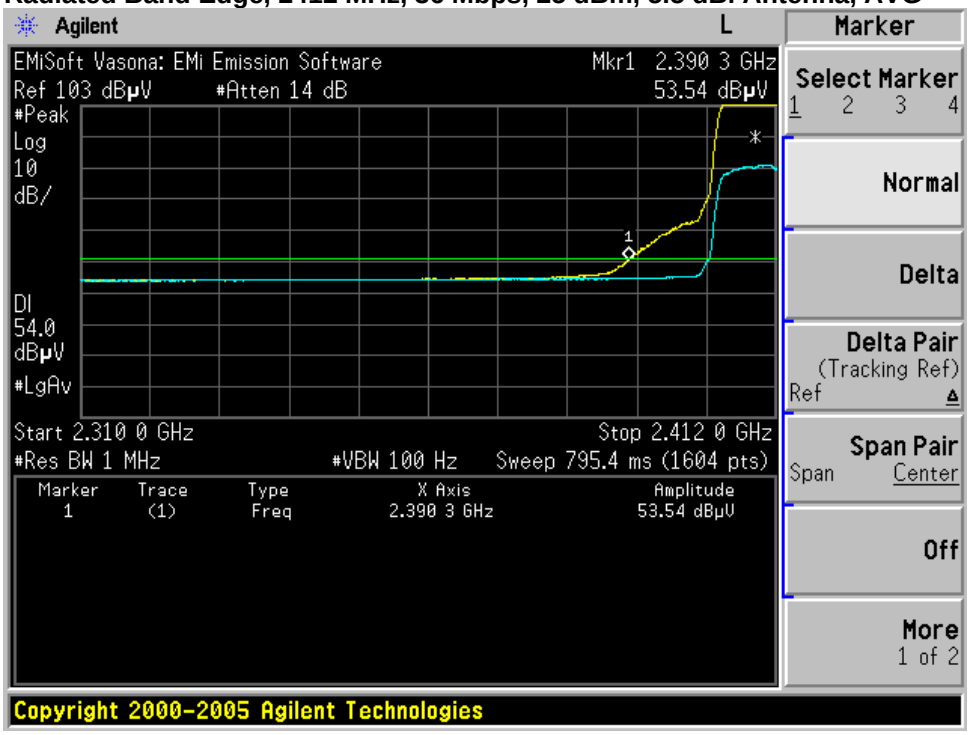
Radiated Band Edge, 2412 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna, PK



Radiated Band Edge, 2412 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna, AVG



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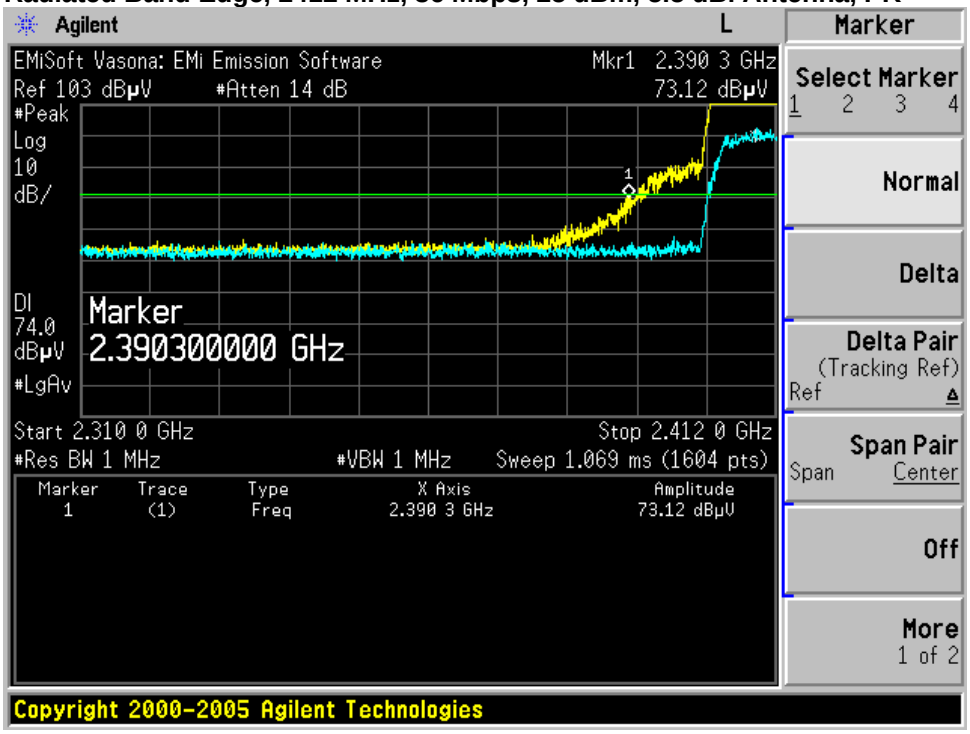
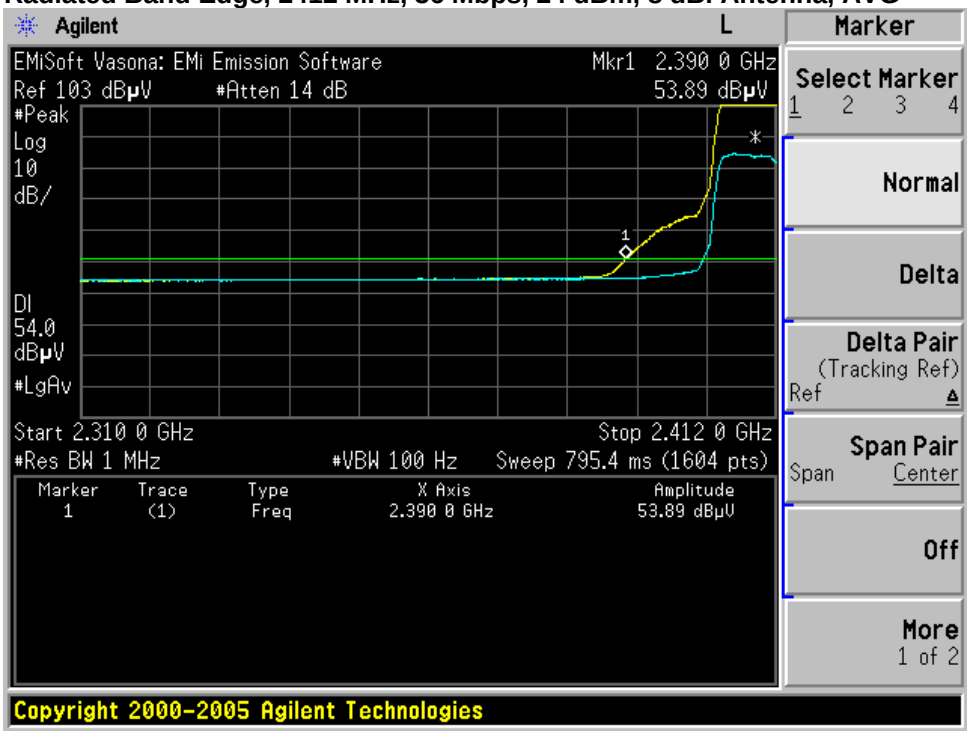
Radiated Band Edge, 2412 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna, PK



Radiated Band Edge, 2412 MHz, 36 Mbps, 24 dBm, 8 dBi Antenna, AVG



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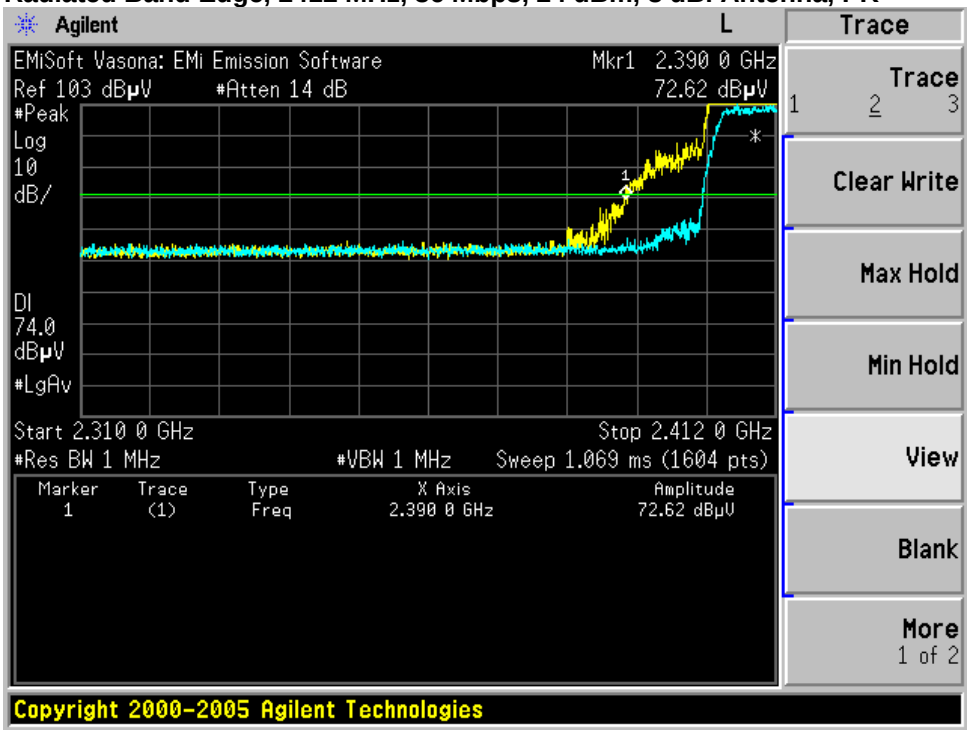
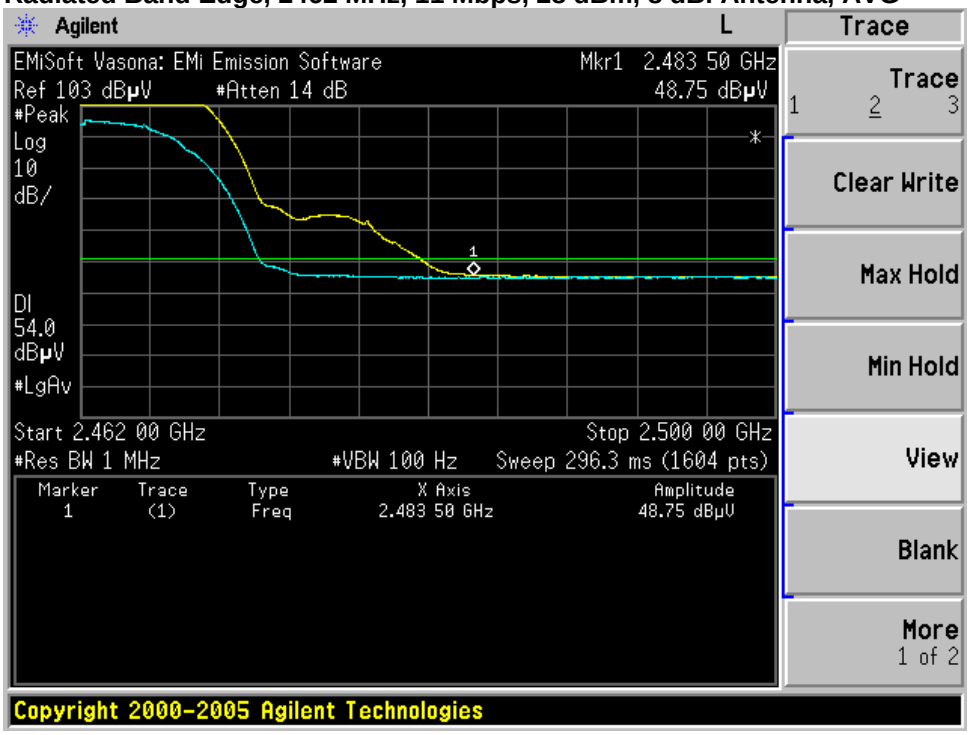
Radiated Band Edge, 2412 MHz, 36 Mbps, 24 dBm, 8 dBi Antenna, PK



Radiated Band Edge, 2462 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna, AVG



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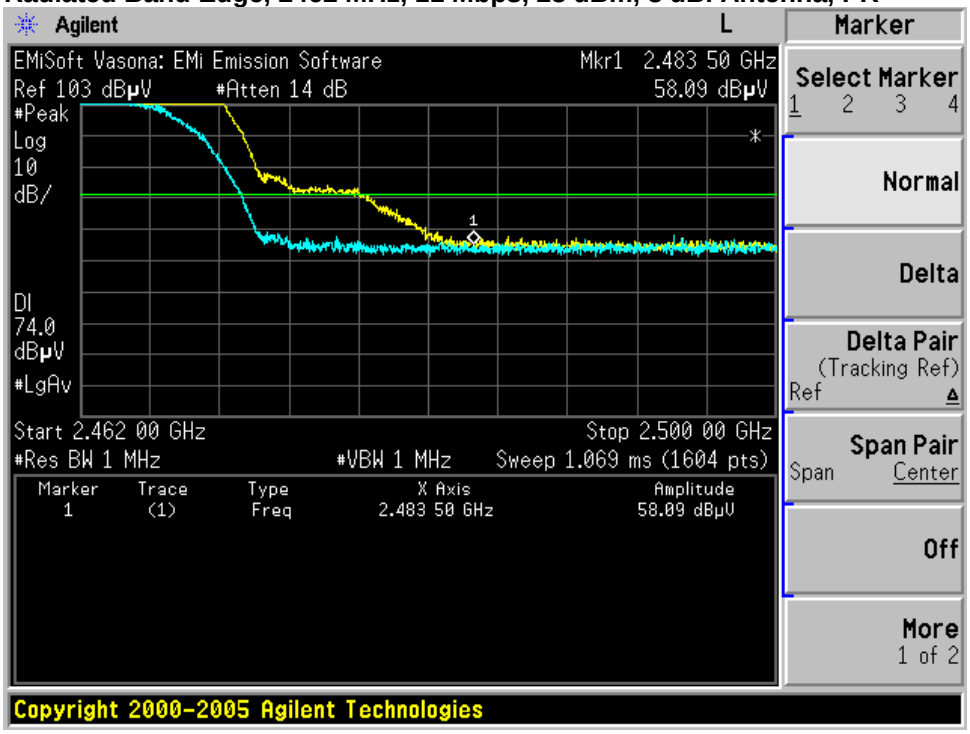
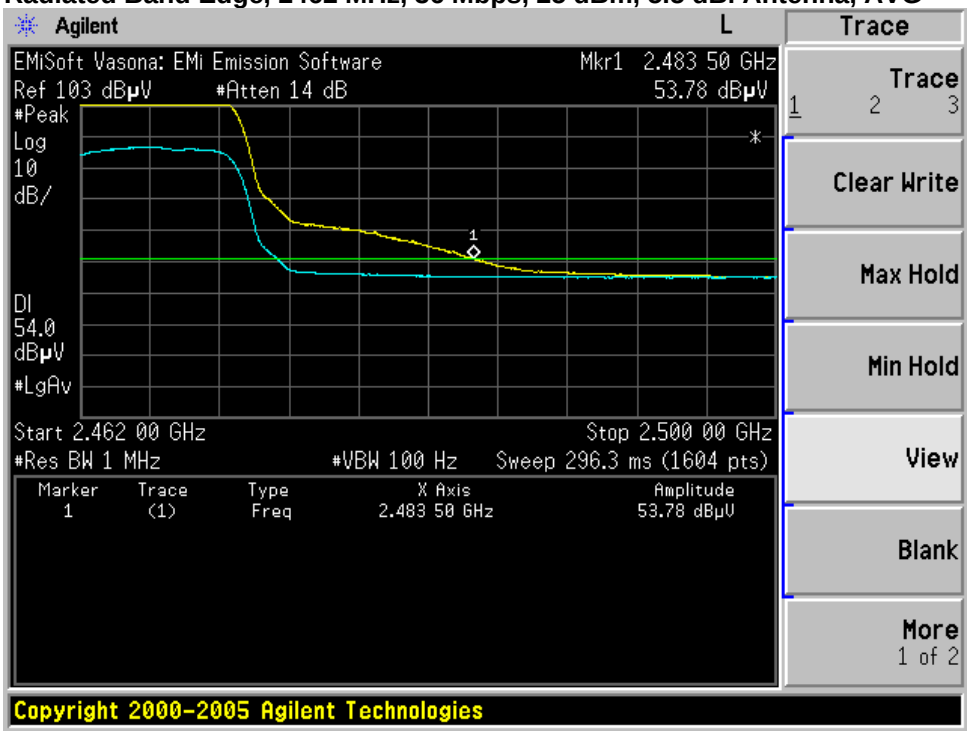
Radiated Band Edge, 2462 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna, PK



Radiated Band Edge, 2462 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna, AVG



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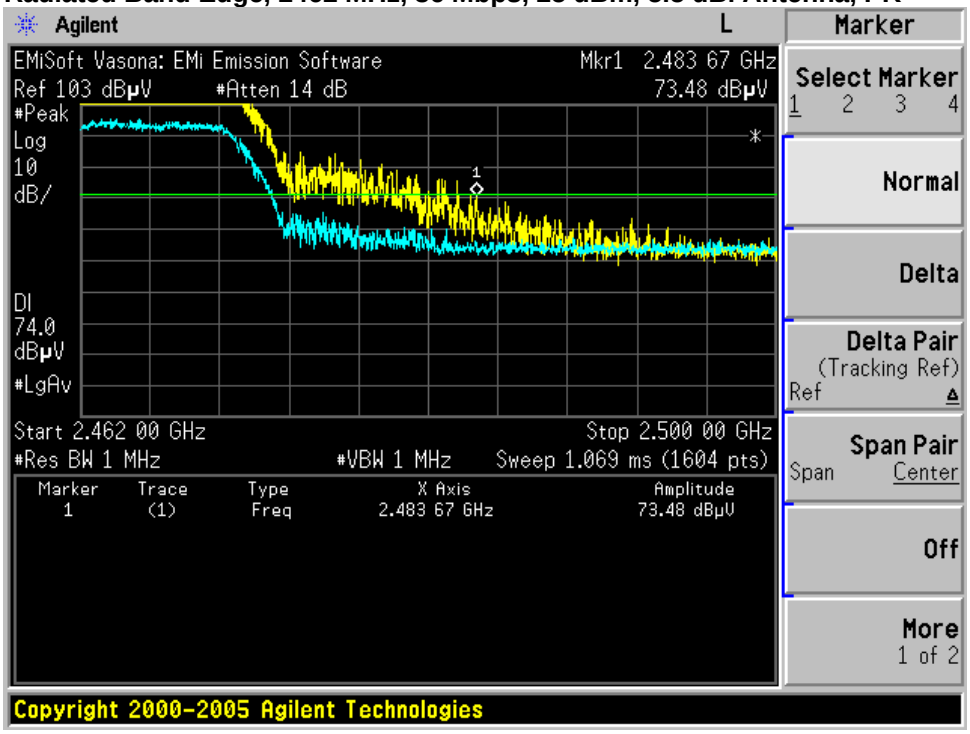
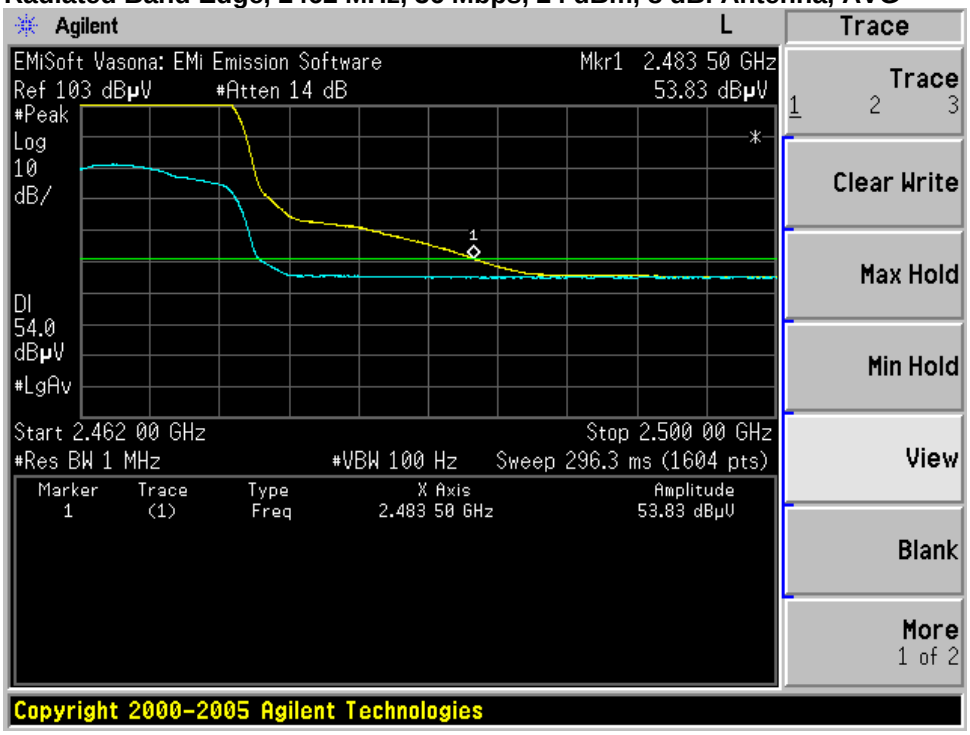
Radiated Band Edge, 2462 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna, PK



Radiated Band Edge, 2462 MHz, 36 Mbps, 24 dBm, 8 dBi Antenna, AVG



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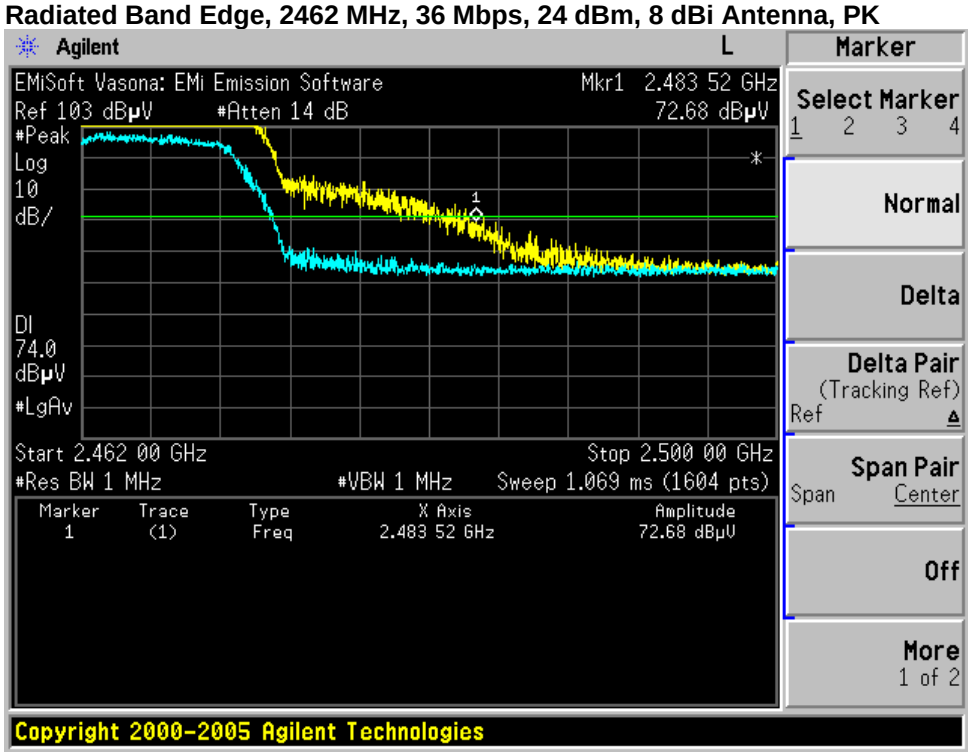
Radiated Band Edge, 2462 MHz, 36 Mbps, 24 dBm, 8 dBi Antenna, PK



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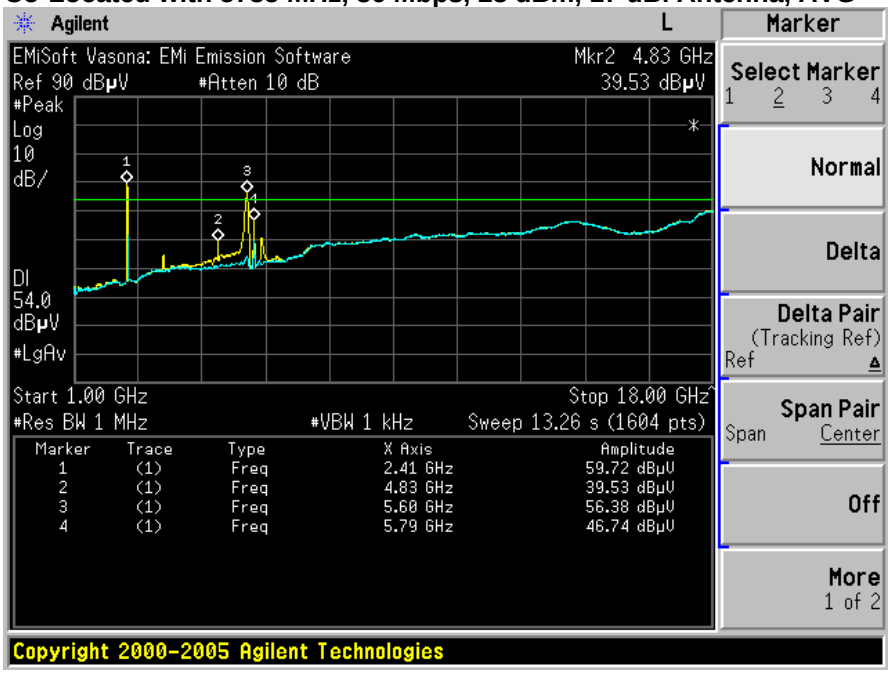
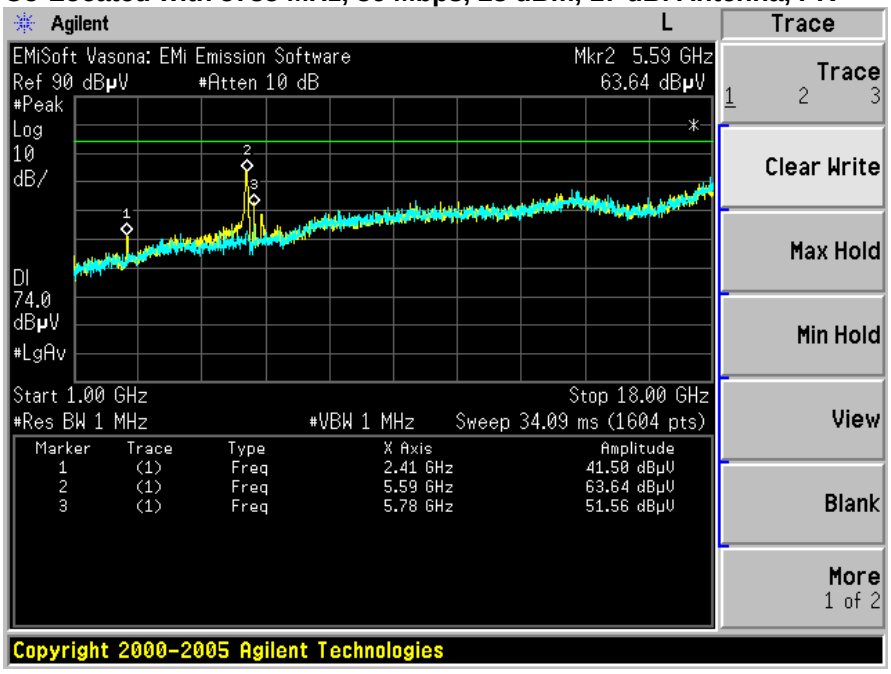
Radiated Spurs and Harmonics with All Antennas

There were no measurable emissions above 18GHz for any of the channel/antenna combinations. The data is a worst case representation of all configurations.

Radiated Spurious Emissions, 2412 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2412 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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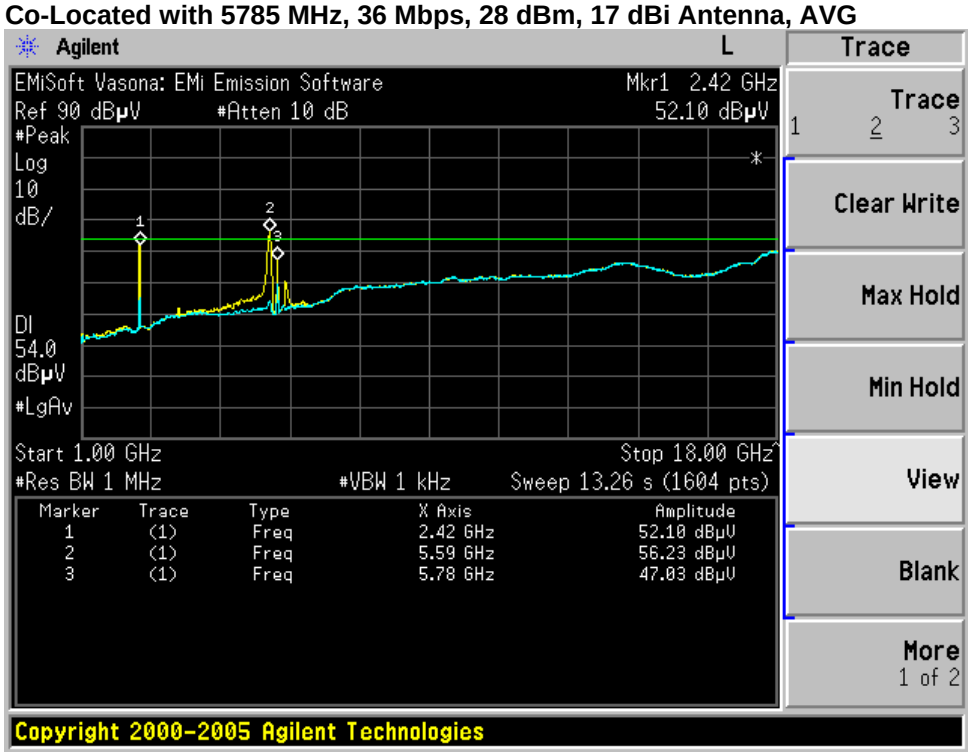
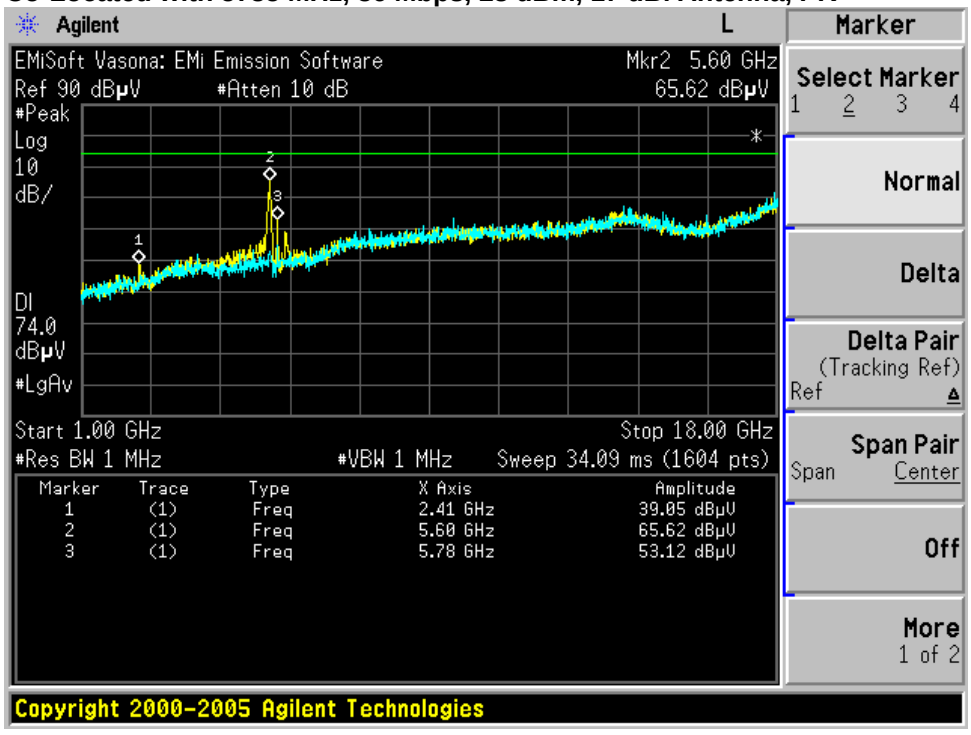
Radiated Spurious Emissions, 2412 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2412 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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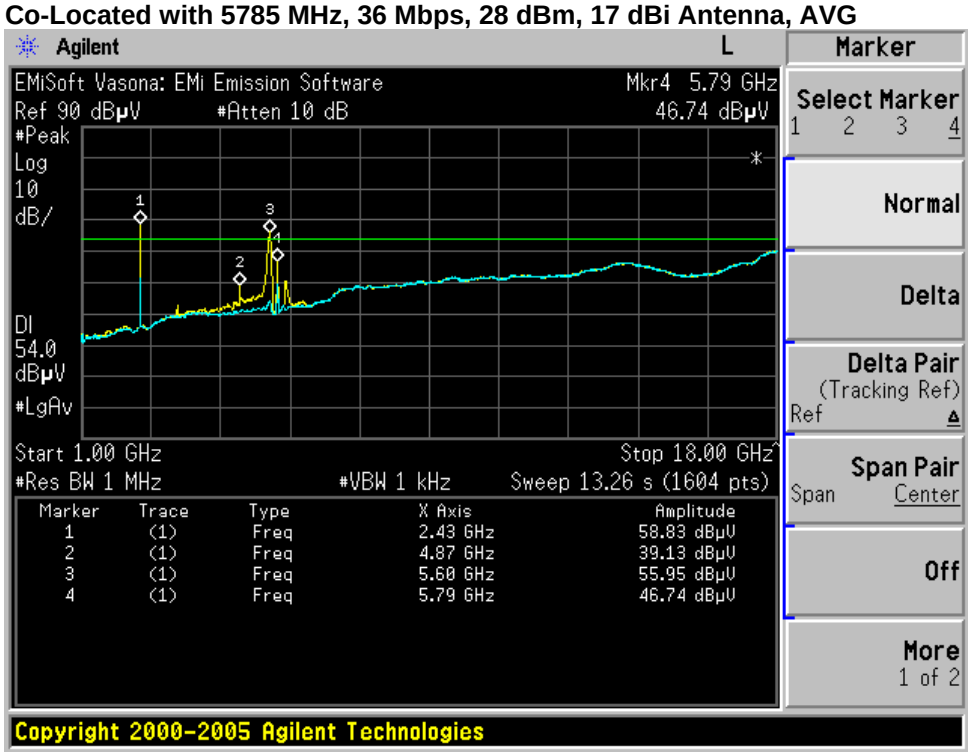
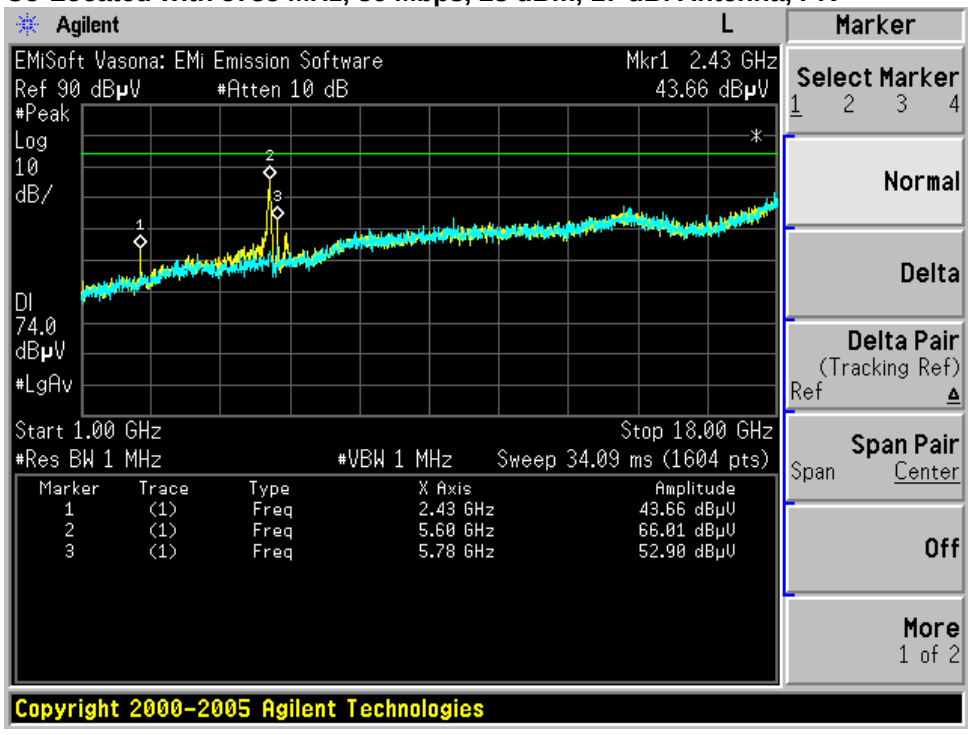
Radiated Spurious Emissions, 2437 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2437 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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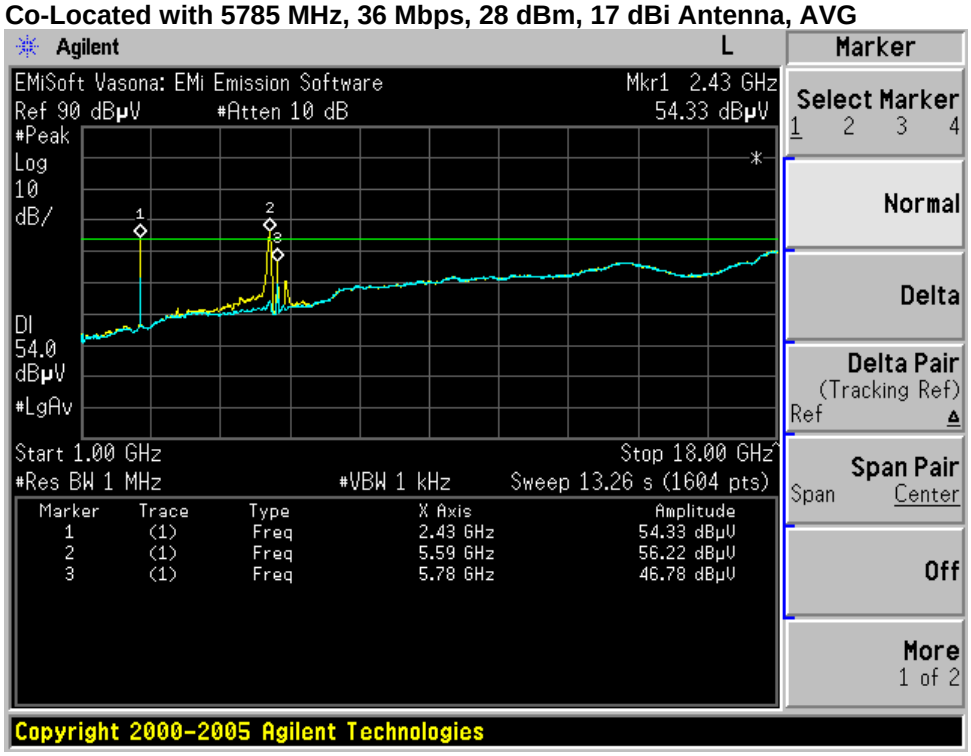
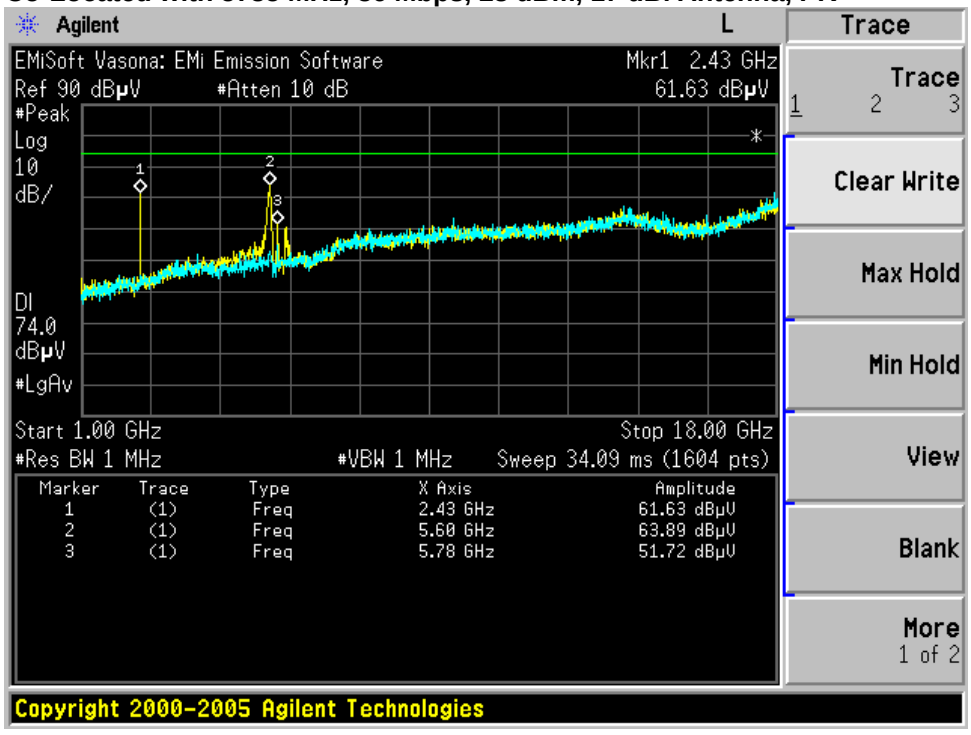
Radiated Spurious Emissions, 2437 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2437 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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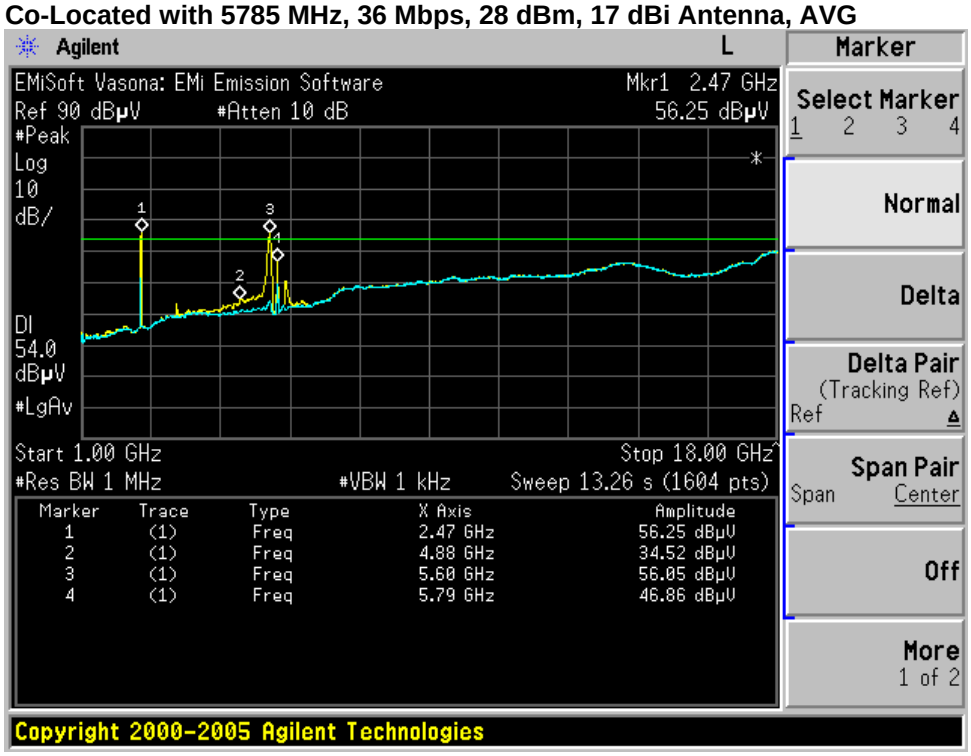
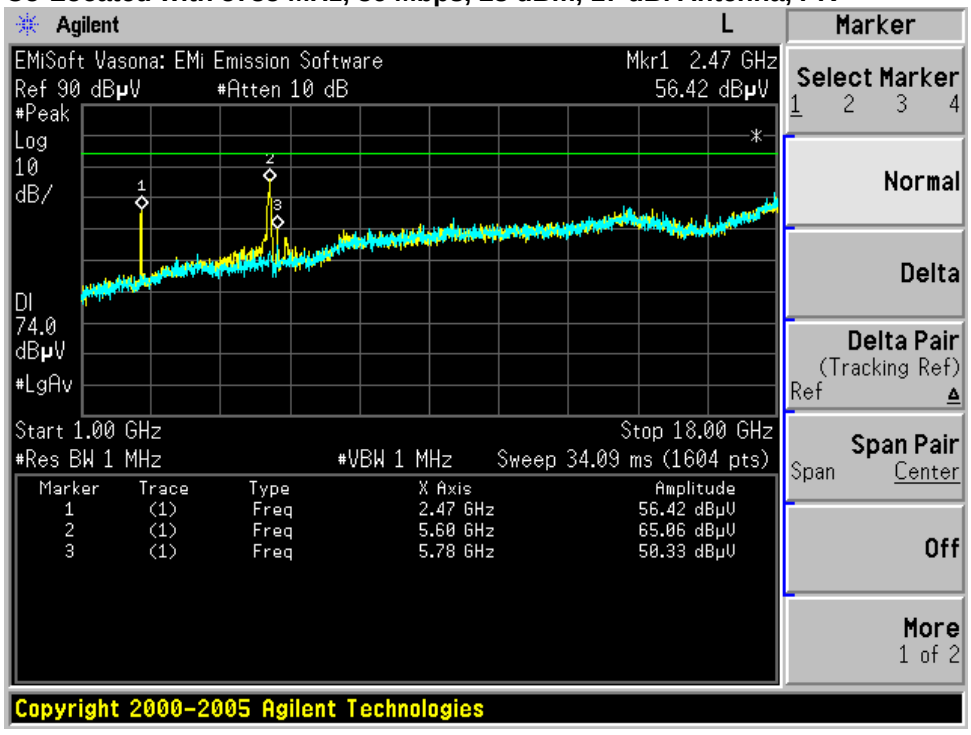
Radiated Spurious Emissions, 2462 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2462 MHz, 11 Mbps, 28 dBm, 8 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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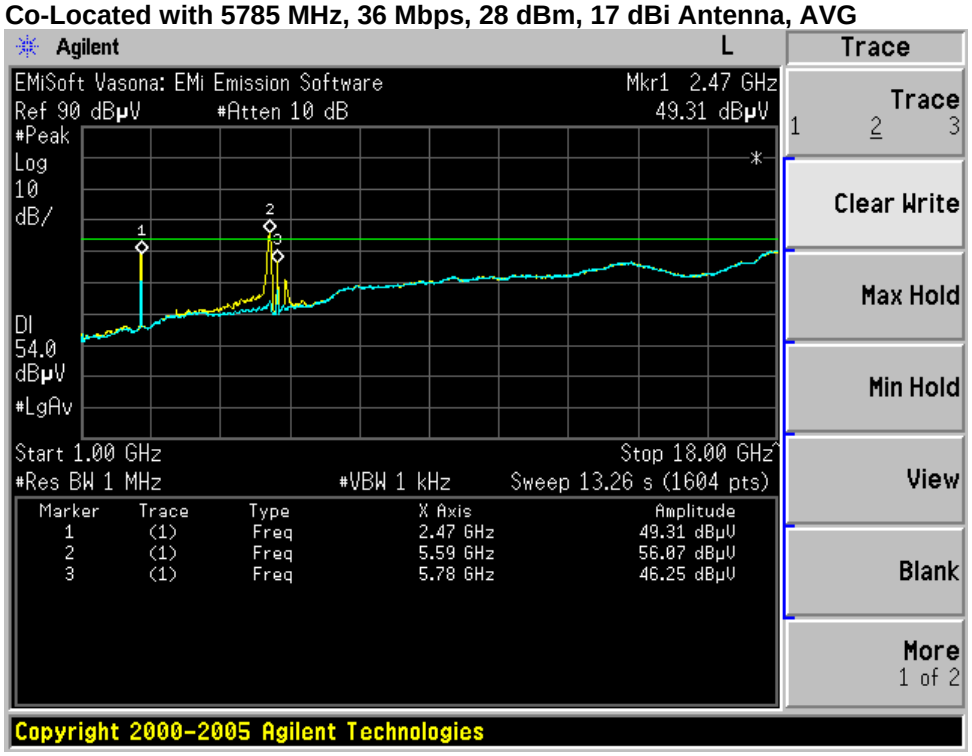
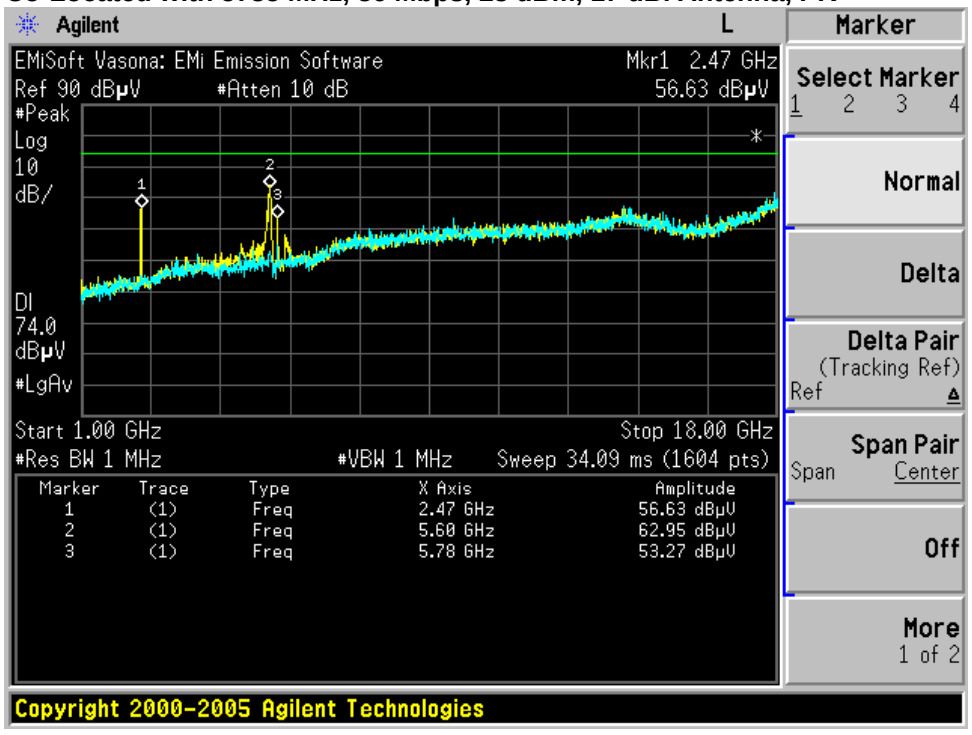
Radiated Spurious Emissions, 2462 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, AVG



Radiated Spurious Emissions, 2462 MHz, 36 Mbps, 25 dBm, 5.5 dBi Antenna Co-Located with 5785 MHz, 36 Mbps, 28 dBm, 17 dBi Antenna, PK



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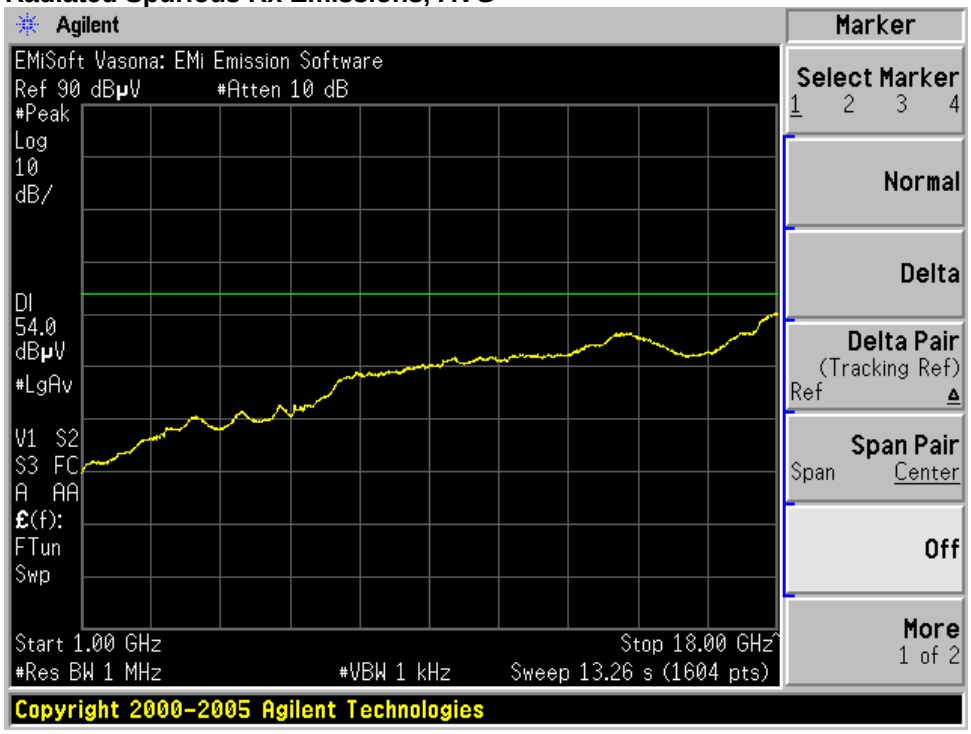
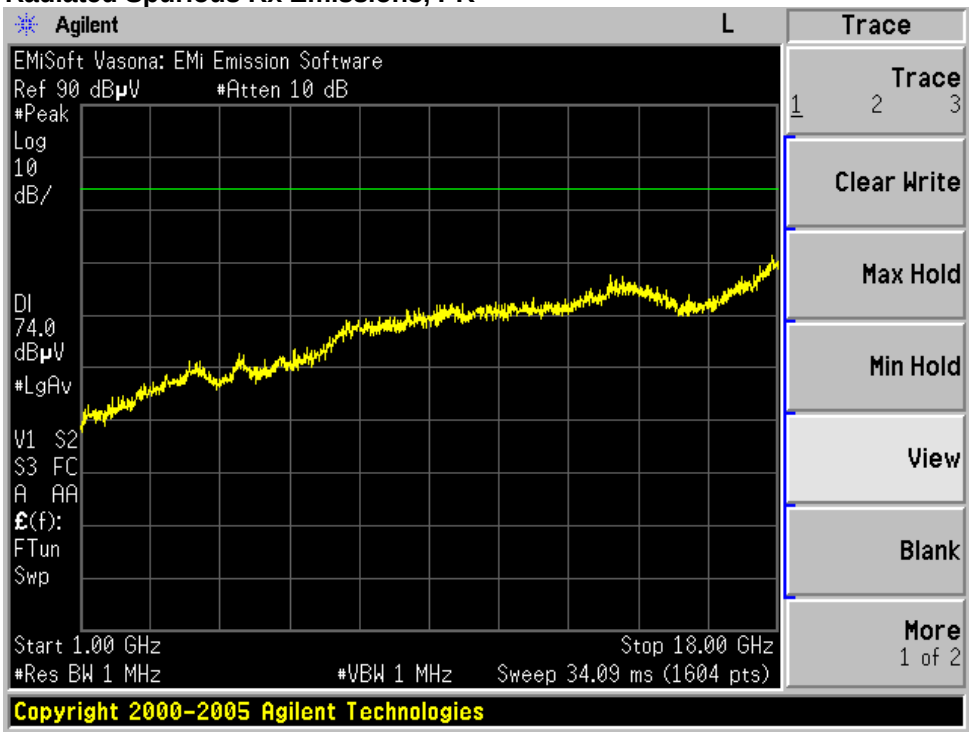
Radiated Spurious Rx Emissions, AVG



Radiated Spurious Rx Emissions, PK



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Powerline Conducted emissions

Test Number: 26067 **Spec ID:** 484				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15.207 (LP0002 2.2.3, RSS210)	AC Power Line	B	0.150MHz - 30MHz	
Operating Mode	**Mode :** 1, Continuous			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

Subtest Number: 26067 - 1	**Subtest Date:** 07-Mar-2007
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Line Under Test	Power Input
Transducer	LISN
Subtest Result	Pass
Highest Frequency	30.0
Lowest Frequency	0.15
Comments on the above Test Results	No further comments

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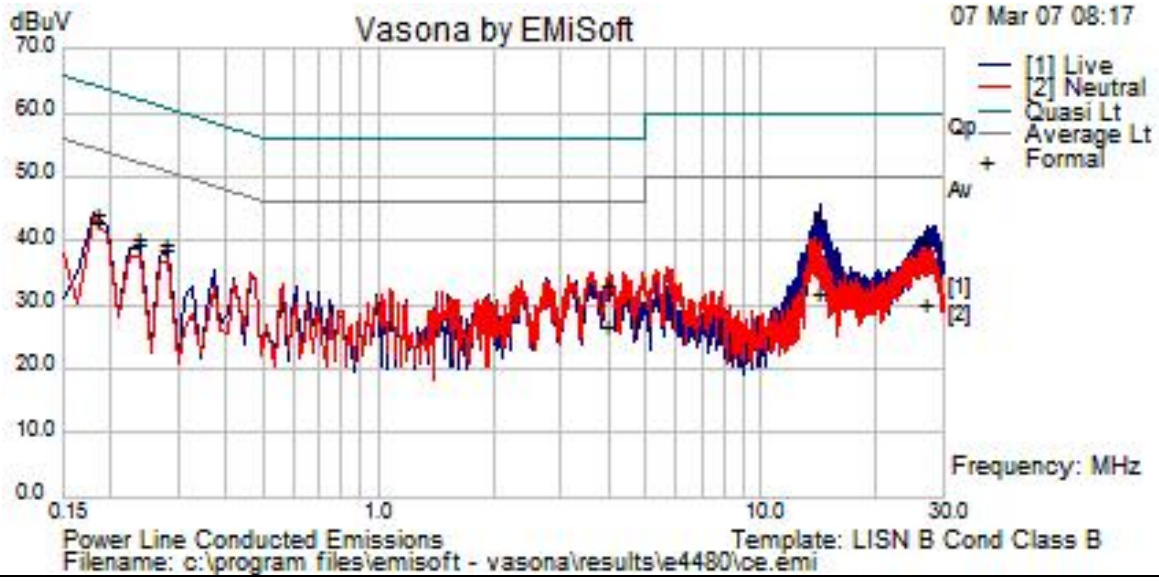

Title: N/A

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.187	20.2	20.3	0.2	40.8	Av	L	54.2	-13.4	Pass	
0.187	21.5	20.3	0.2	42	Qp	L	64.2	-22.1	Pass	
0.236	17.8	20.2	0.1	38.2	Qp	L	62.2	-24	Pass	
0.236	16.9	20.2	0.1	37.3	Av	L	52.2	-14.9	Pass	
0.283	17.2	20.2	0.1	37.6	Qp	L	60.7	-23.2	Pass	
0.283	16.4	20.2	0.1	36.6	Av	L	50.7	-14.1	Pass	
4.03	10.9	20	0.1	31	Qp	N	56	-25	Pass	
4.03	4.3	20	0.1	24.4	Av	N	46	-21.6	Pass	
14.338	20.9	20.2	0.2	41.3	Qp	L	60	-18.7	Pass	
14.338	9.3	20.2	0.2	29.7	Av	L	50	-20.3	Pass	
27.091	16.1	20.5	1.2	37.8	Qp	L	60	-22.2	Pass	
27.091	6.3	20.5	1.2	28	Av	L	50	-22	Pass	

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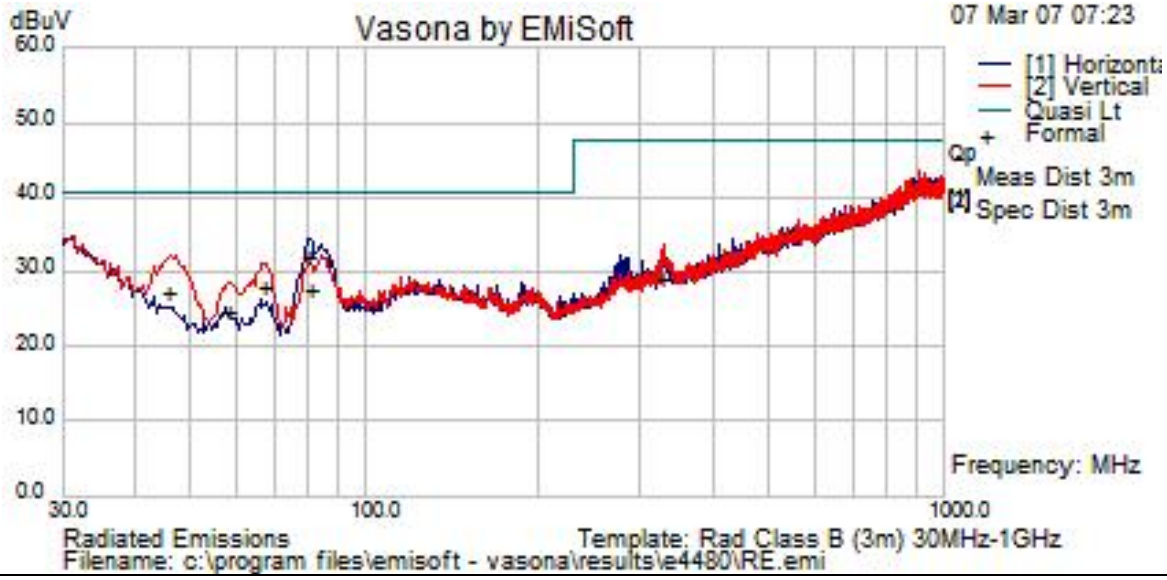
Unintentional Radiated emissions

Subtest Number: 26044 - 1	**Subtest Date:** 07-Mar-2007
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	RE
Subtest Result	Pass
Highest Frequency	1000.0
Lowest Frequency	30.0
Comments on the above Test Results	No further comments

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: N/A

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
46.162	16.9	0.7	7.8	25.4	Qp	V	138	216	40.5	-15.1	Pass	
58.599	16.5	0.7	5.6	22.7	Qp	V	105	241	40.5	-17.8	Pass	
67.554	19	0.7	6.2	26	Qp	V	103	212	40.5	-14.4	Pass	
80.113	23.4	0.8	5.8	30.1	Qp	H	233	249	40.5	-10.4	Pass	
80.778	19.4	0.8	5.8	25.9	Qp	V	107	56	40.5	-14.6	Pass	
328.239	12.5	1.7	13.3	27.4	Qp	V	115	204	47.5	-20.1	Pass	

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Maximum Permissible Exposure (MPE) Calculations

15.247: ISM 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=√(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=√((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*√((30*(P/1000)*G)/(3770*S))
d=0.282*√(P*G/S)

where

d=Distance in cm
P=Power in mW
G=Numerica 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)/√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

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Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile or fixed location transmitters such as an access point, the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less.

S=1mW/cm^2 maximum. Using the peak power levels and antenna gains 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	28.1	8	18.00	20	2.00
2412	36	1	24.8	5.5	9.23	20	10.77
2412	36	1	24.0	8	11.23	20	8.77
2437	11	1	28.3	8	18.42	20	1.58
2437	36	1	26.9	8	15.68	20	4.32
2462	11	1	28.2	8	18.21	20	1.79
2462	36	1	25.1	5.5	9.56	20	10.44
2462	36	1	24.1	8	11.36	20	8.64

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 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	20	28.1	8	0.81	1	0.19
2412	36	20	24.8	5.5	0.21	1	0.79
2412	36	20	24.0	8	0.32	1	0.68
2437	11	20	28.3	8	0.85	1	0.15
2437	36	20	26.9	8	0.61	1	0.39
2462	11	20	28.2	8	0.83	1	0.17
2462	36	20	25.1	5.5	0.23	1	0.77
2462	36	20	24.1	8	0.32	1	0.68

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Appendix C: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	Megahertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	µV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	µA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	µS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	µS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

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

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Number(s)
004883	EMC Test Systems/ 3115	Double Ridged Guide Horn Antenna	19-APR-06	19-APR-07	[26022], [26032], [26044]
005568	HP/ 8449B	PreAmplifier (1-26.5GHz)	08-SEP-06	08-SEP-07	[26044]
005691	Miteq/ NSP1800-25-S1	Broadband Preamplifier (1-18GHz)	09-OCT-06	09-OCT-07	[26022], [26032], [26044]
008136	Huber + Suhner/ SF106A	7m Sucoflex cable	05-JAN-07	05-JAN-08	[26044]
008370	Andrew/ F4A-PNMNM	49 ft Heliax Cable	16-MAR-06	16-MAR-07	[26067]
008591	Fischer Custom Communications/ FCC-RFM2F-520R	LISN AC Adaptor - Std 120V outlet	16-MAR-06	16-MAR-07	[26067]
019209	TTE/ H785-150K-50-21378	Hi Pass Filter 150KHz	02-JAN-07	02-JAN-08	[26067]
020975	Micro-Coax/ UFB311A-0-1344-520520	RF Coaxial Cable, to 18GHz, 134.4 in	16-MAR-06	16-MAR-07	[26022], [26032], [26044]
024905	Agilent/ E4440A	Precision Spectrum Analyzer	14-FEB-07	14-FEB-08	[26022], [26032], [26044]
025640	Micro-Coax/ UFB311A-0-2720-520520	RF Coaxial Cable, to 18GHz, 272 in	05-JAN-07	05-JAN-08	[26044]
025655	Micro-Coax/ UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 84 in	17-MAR-06	17-MAR-07	[26022], [26032], [26044]
025657	Micro-Coax/ UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 84 in	19-AUG-06	19-AUG-07	[26022], [26032], [26044], [26067]
025660	Micro-Coax/ UFB311A-1-0840-504504	Coaxial Cable, 84.0 in. to 18GHz	05-JAN-07	05-JAN-08	[26044]
030495	Agilent/ 8761B	SPDT RF Switch, to 18GHz	07-APR-06	07-APR-07	[26022], [26032], [26044]
030496	Agilent/ 8761B	SPDT RF Switch, to 18GHz	08-SEP-06	08-SEP-07	[26044]
030563	Micro-Coax/ UFB311A-1-0950-504504	RF Coaxial Cable, to 18GHz, 95 in	05-JAN-07	05-JAN-08	[26044]
030652	Sunol Sciences/ JB1	Combination Antenna, 30MHz-2GHz	06-JUL-06	06-JUL-07	[26044]
032455	Midwest Microwave/ CSY-MNMN-82-273001	RF Coaxial Cable to 18 GHz	11-SEP-06	11-MAR-07	[26022], [26032], [26044]

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032801	ETS-Lindgren/ 3117	Double Ridged Waveguide Horn Antenna	28-JUL-06	28-JUL-07	[26044]
034188	Micro-Tronics/ BRC50703-02	Notch Filter, SB:5.150-5.350GHz, to 11GHz	17-JUL-06	17-JUL-07	[26044]
034189	Micro-Tronics/ BRC50704-02	Notch Filter, SB:5.470-5.725GHz, to 12GHz	17-JUL-06	17-JUL-07	[26044]
034304	Micro-Tronics/ BRM50702-02	Notch Filter, SB:2.4-2.5GHz, to 18GHz	17-JUL-06	17-JUL-07	[26044]
034974	Midwest Microwave/ ATT-0640-20-29M-02	Attenuator, 20dB, DC-40GHz	09-MAY-06	09-MAY-07	[26022], [26032]
035040	Micro-Tronics/ HPM50112-02	High pass Filter, 6.4-18GHz	17-JUL-06	17-JUL-07	[26044]
035624	Rohde & Schwarz/ ESCI	EMI Test Receiver	28-JUN-06	28-JUN-07	[26044], [26067]
036716	Cisco/ RF Coaxial Cable-SMA	Radio Test Cable, SMA-SMA	11-DEC-06	11-DEC-07	[26022], [26032], [26044]
038396	Micro-Coax/ UFB293C-Q-1200-50U50L	RF Coaxial Cable, 120 Inches, to 18GHz	13-JUL-06	13-JUL-07	[26044]

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