FCC CFR47 PART 15 SUBPART E
CLASS II PERMISSIVE CHANGE

TEST REPORT

FOR

802.11A CARDBUS RADIO MODULE

MODEL NUMBER: AIR-RM21A-A-K9 and AIR-RM22A-A-K9

FCC ID: LDK102053

REPORT NUMBER: 04U2586-1

ISSUE DATE: AUGUST 16, 2004

Prepared for
CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA 95134

Prepared by
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1. TEST RESULT CERTIFICATION

COMPANY NAME: CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA 95134

EUT DESCRIPTION: 802.11a CARDBUS RADIO MODULE

MODEL: AIR-RM21A-A-K9 and AIR-RM22A-A-K9

DATE TESTED: MARCH 29 – AUGUST 25, 2004

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

YAN ZHENG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11a transceiver module.

The transmitter has a maximum peak conducted output power as follows:

5150 to 5250 MHz Authorized Band

Frequency Band (MHz)	Antenna	Output Power (dBm)	Output Power (mW)
5180 - 5250	5 dBi Integral	15.00	31.62
5180 - 5250	All except 5 dBi Integral	11.22	13.24

5250 to 5350 MHz Authorized Band

Frequency Band (MHz)	Antenna	Output Power (dBm)	Output Power (mW)
5260 - 5320	All	17.42	55.21

5725 to 5825 MHz Authorized Band

Frequency Band (MHz)	Antenna	Output Power (dBm)	Output Power (mW)
5725 - 5825	All	17.72	59.16

The radio was originally certified for use with an integral antenna with a maximum gain of 5 dBi.

The Class II Permissive change is to add one integral antenna and four external antennas, and to add co-location with the 802.11b/g AIR-MP21G-A-K9 radio module, FCC ID: LDK102049, which operates in the 2400 to 2483.5 MHz band.

The new integral antenna has a gain of 9 dBi. The external antennas are a 4.5 dBi Omni, 6 dBi Omni, 7 dBi Patch, and 9.5 dBi Patch.

Models AIR-RM21A-A-K9 and AIR-RM22A-A-K9 are identical radio modules. Model AIR-RM21A-A-K9 is used with integral antennas, and AIR-RM22A-A-K9 is used with external antennas.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	10/1/2004
Spectrum Analyzer	Agilent	E4446A	MY43360112	1/13/2005
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004
RF Filter Section	HP	85420E	3705A00256	11/21/2004
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	2/4/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2005
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-1826/B	1013	2/4/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29301	12/26/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/2005
	Micronics	HPM13351	1	CNR
PreAmplifier 26-40 GHz		NSP4000-SP2	924343	6/1/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/13/2004
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	10/13/2004
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
Power Meter	Agilent	E4416A	GB41291160	11/7/2004
5.15-5.35 Rejection Filter	Micronics	BRC 13190	1	CNR
5.47-5.725 Rejection Filter	Micronics	BRC 13191	1	CNR
5.75-5.875 Rejection Filter	Micronics	BRC 13192	1	CNR

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	IBM	T20	78-B3952	DOC
DC Power Supply	KRM	AEEEG-350	9712154746	None
DC Power Supply	Kenwood	PA36-3A	7060074	None
Extender Card	Sycard	PCC Extend 135	C135A-1066	None
AC Adapter	IBM	02K6750	11S02K67050Z1Z2U P25G0L	DOC

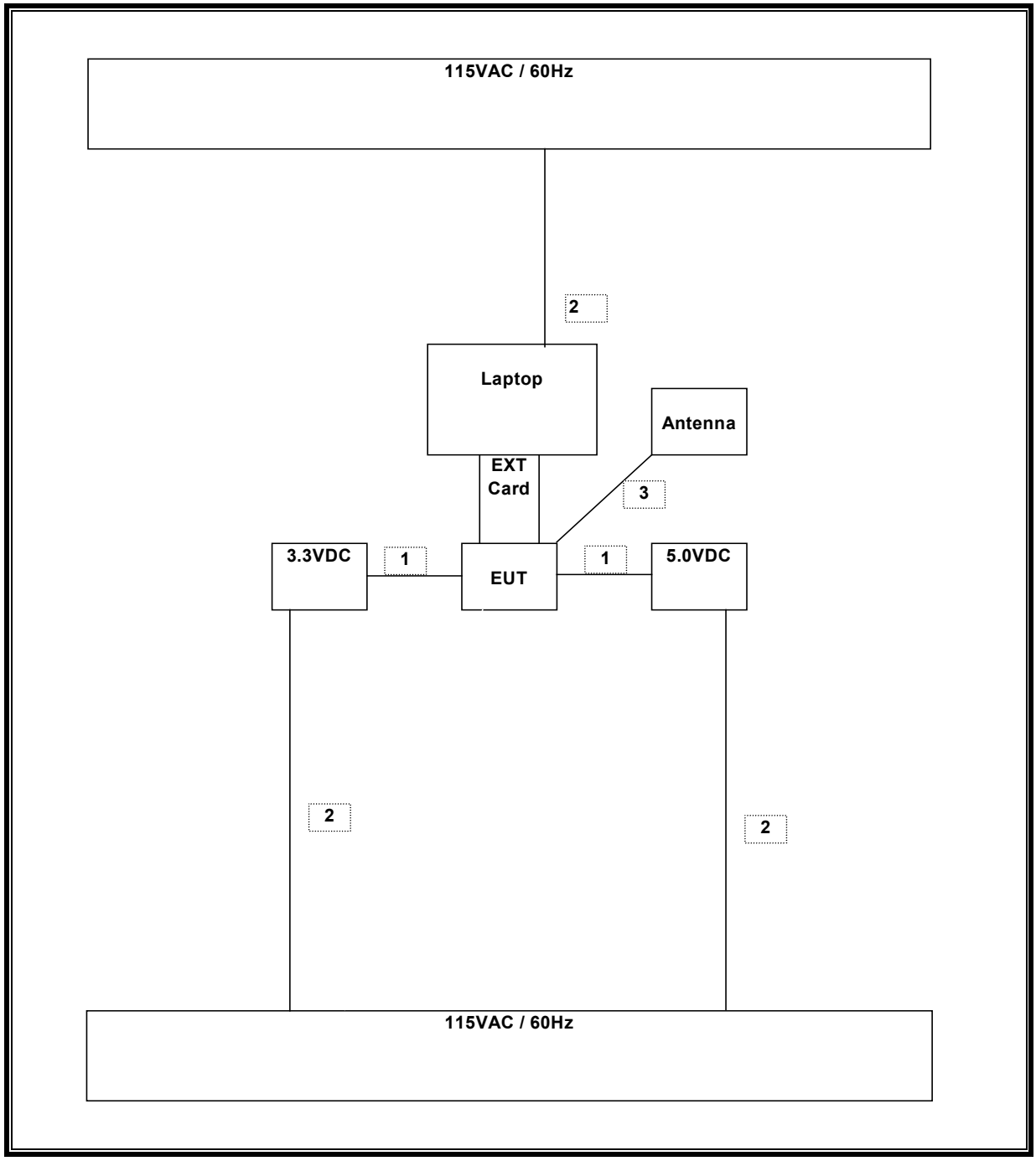
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	Extender	2	Bananan to clip	DC supply	1m	Connected on Extender Card
2	AC	3	IEC	AC	1m	
3	Antenna Cable	2				connect the radio to antenna

TEST SETUP

The EUT is installed in a host laptop computer via a cardbus-to-miniPCI adapter / extension card during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. EMISSION BANDWIDTH

LIMIT

§15.403 (c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

802.11a Mode, 5.2 GHz Band

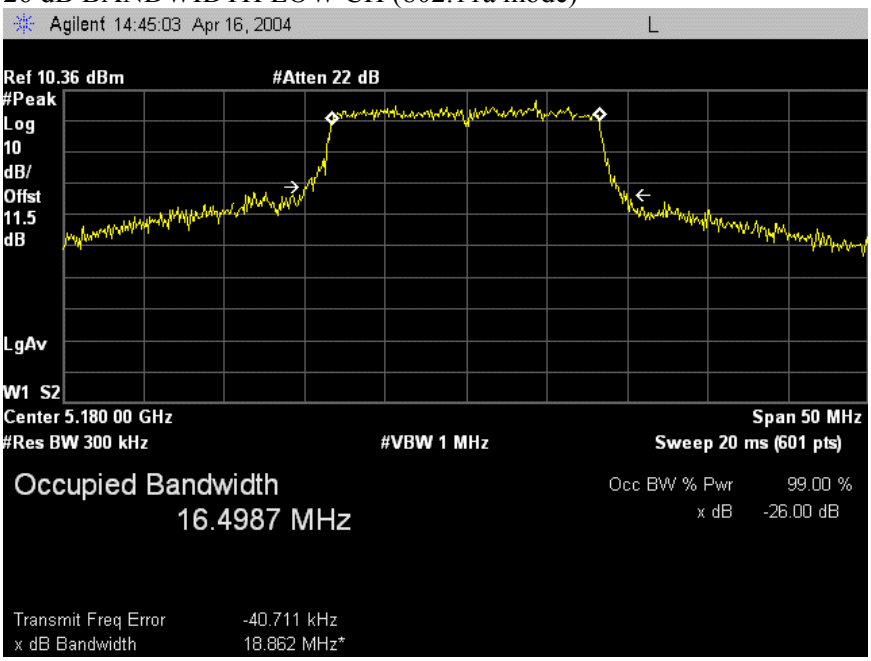
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5180	16.50	12.17
Middle	5260	16.41	12.15
High	5320	16.40	12.15

802.11a Mode, 5.8GHz Band

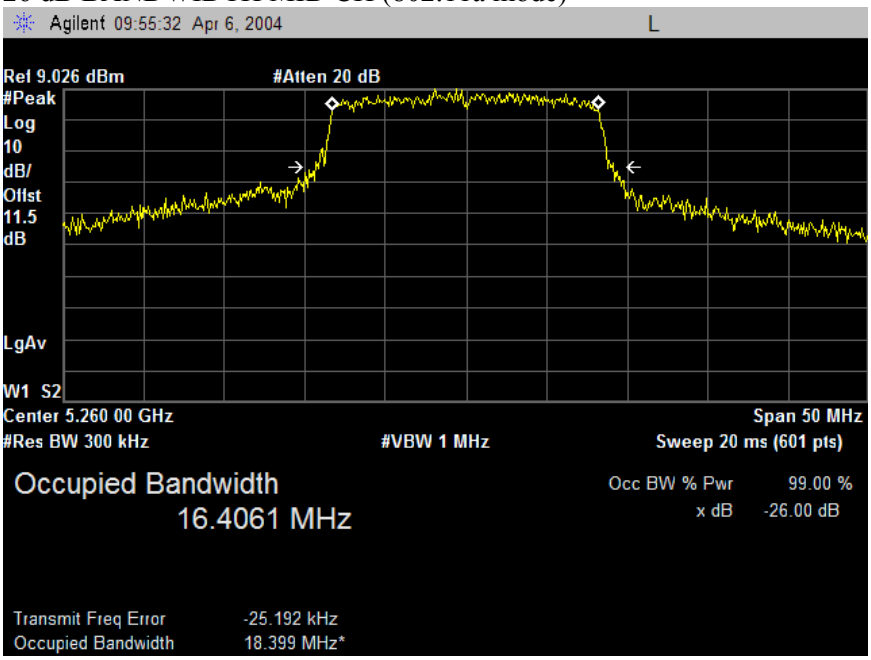
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5745	16.38	12.14
Middle	5785	16.35	12.14
High	5805	16.34	12.13

26 dB EMISSION BANDWIDTH (802.11a MODE, 5.2 GHz BAND)

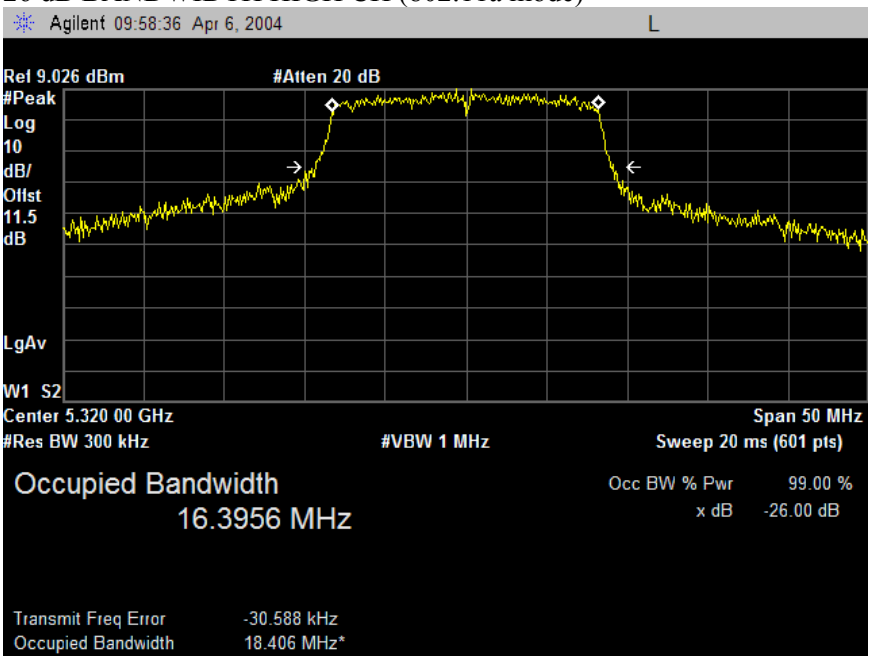
26 dB BANDWIDTH LOW CH (802.11a mode)



26 dB BANDWIDTH MID CH (802.11a mode)

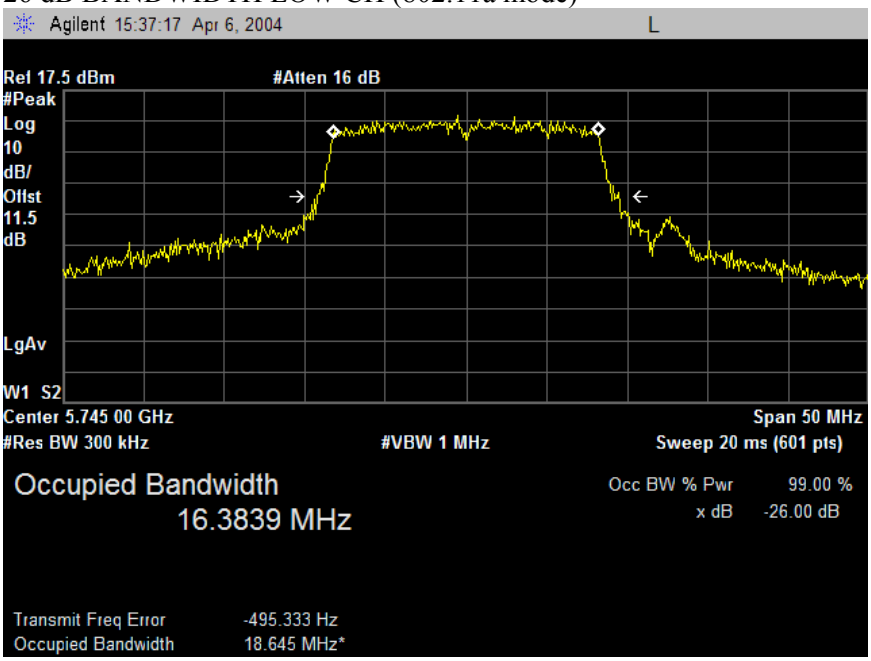


26 dB BANDWIDTH HIGH CH (802.11a mode)

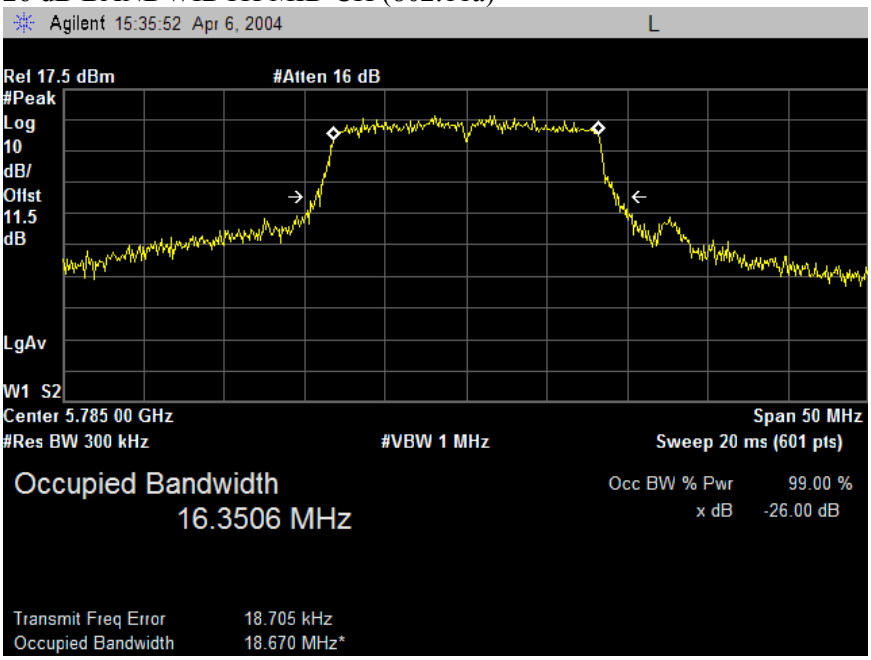


26 dB EMISSION BANDWIDTH (802.11a MODE, 5.8 GHz BAND)

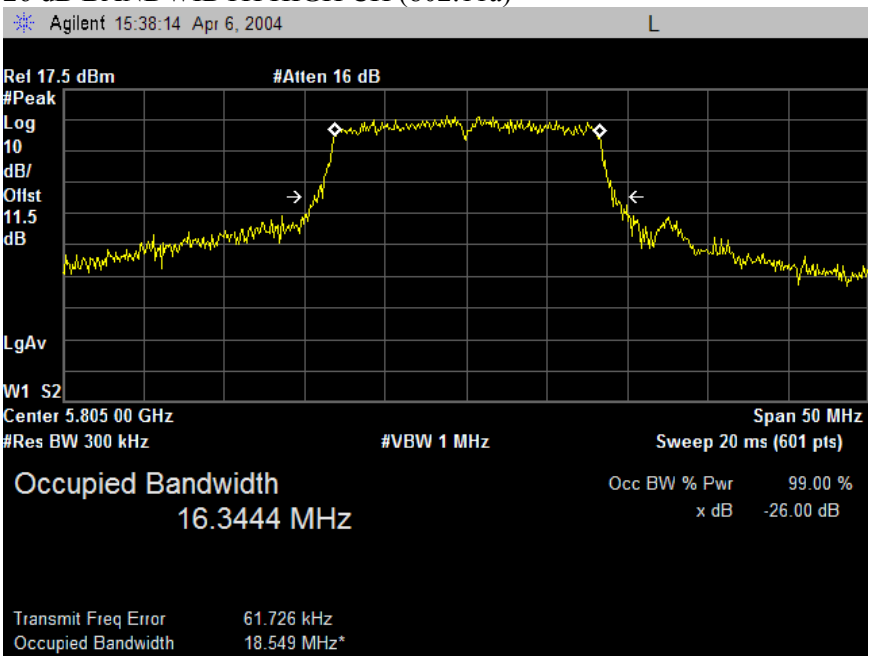
26 dB BANDWIDTH LOW CH (802.11a mode)



26 dB BANDWIDTH MID CH (802.11a)



26 dB BANDWIDTH HIGH CH (802.11a)



7.2. PEAK POWER

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (2) For the band 5.25-5.35 GHz and 5.47-5.725 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (3) For the band 5.725-5.825 GHz, the peak transmit power the peak transmit power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point to point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23dBi, a 1 dB reduction in peak transmitter power and peak spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omni directional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that the systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS

The reduction to the limit is 3.5 dB due to excess antenna gain of the highest gain (9.5 dBi) additional antenna.

No non-compliance noted:

Limit in 5150 to 5250 MHz Band

Mode	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
802.11a	5180	17	16.50	16.17	9.50	12.67

Limit in 5250 to 5350 MHz Band

Mode	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
802.11a	5260	24	16.41	23.15	9.50	19.65
802.11a	5320	24	16.40	23.15	9.50	19.65

Limit in 5725 to 5825 MHz Band

Mode	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	17 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
802.11a	5745	30	16.38	29.14	9.50	25.64
802.11a	5785	30	16.35	29.14	9.50	25.64
802.11a	5805	30	16.34	29.13	9.50	25.63

802.11a mode Results

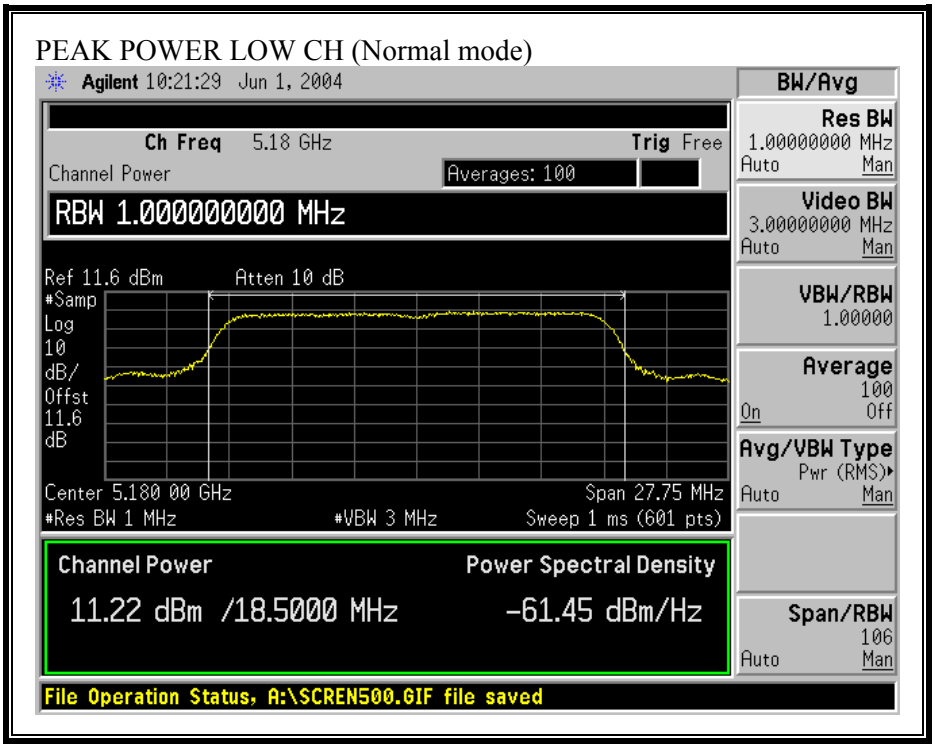
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.22	12.67	-1.45
Middle	5260	17.42	19.65	-2.23
High	5320	11.33	19.65	-8.32

802.11a mode Results

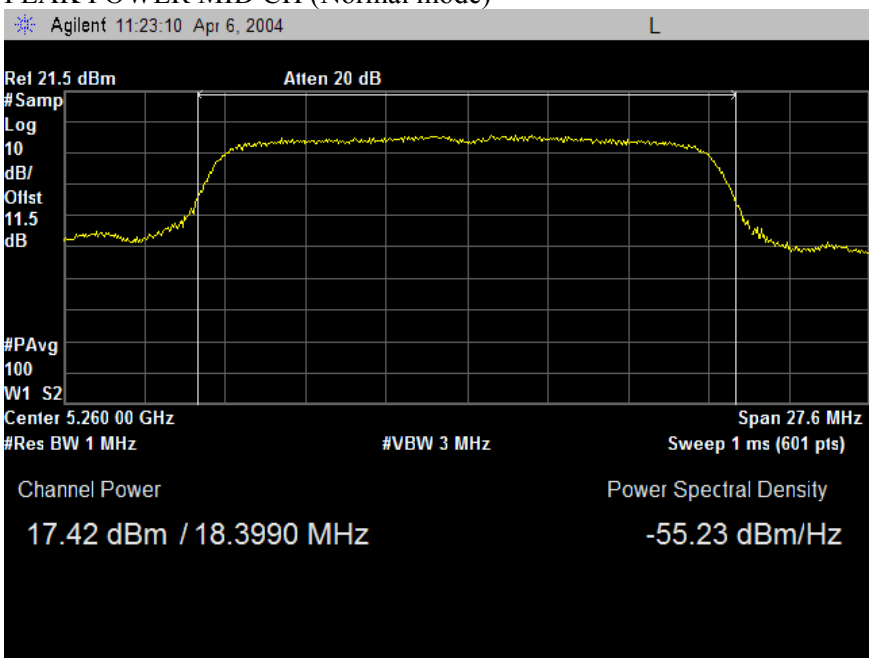
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	17.72	25.64	-7.92
Middle	5785	17.53	25.64	-8.11
High	5805	17.44	25.63	-8.19

PEAK POWER (NORMAL MODE, 5.2 GHz BAND)

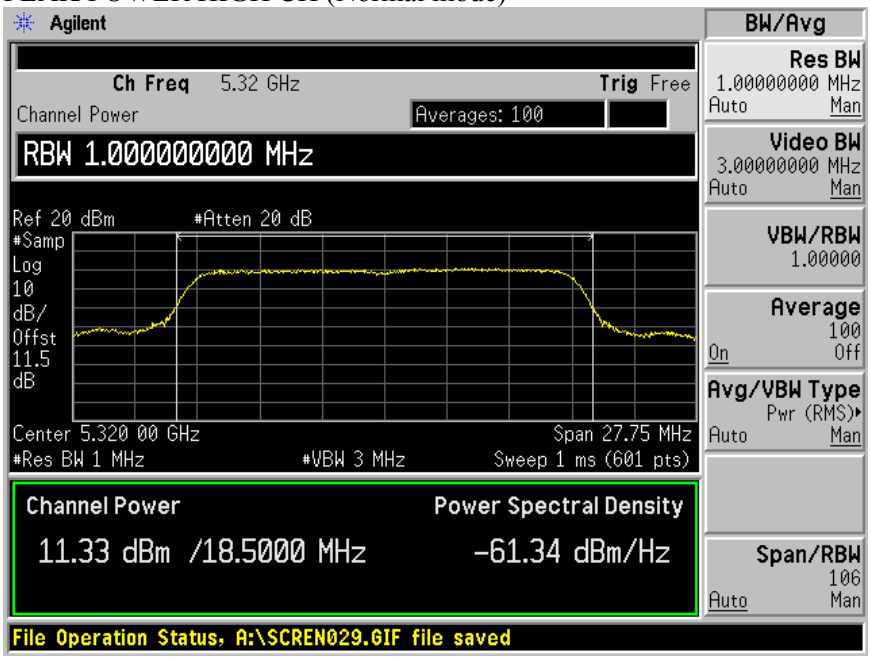
PEAK POWER LOW CH (Normal mode)



PEAK POWER MID CH (Normal mode)

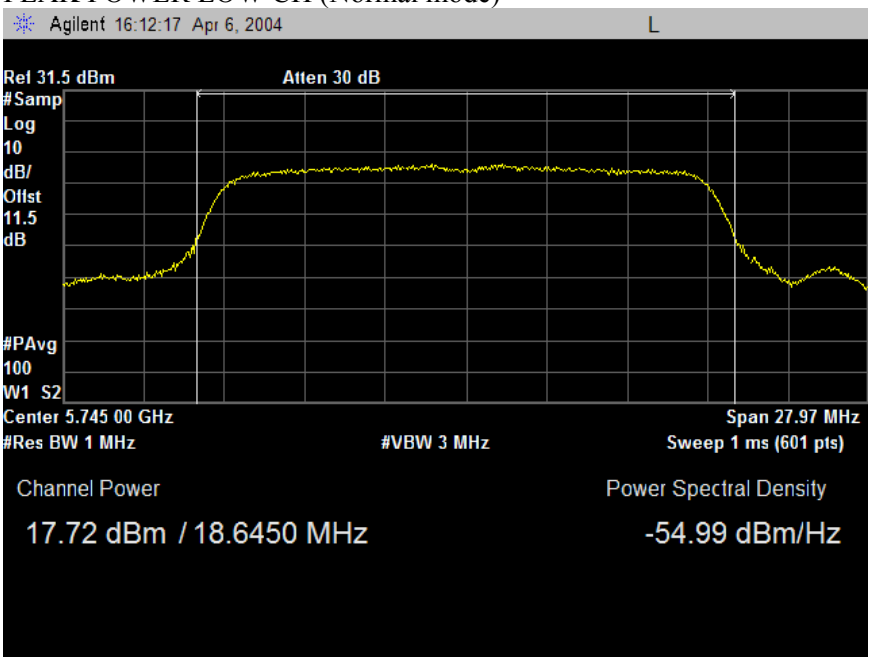


PEAK POWER HIGH CH (Normal mode)

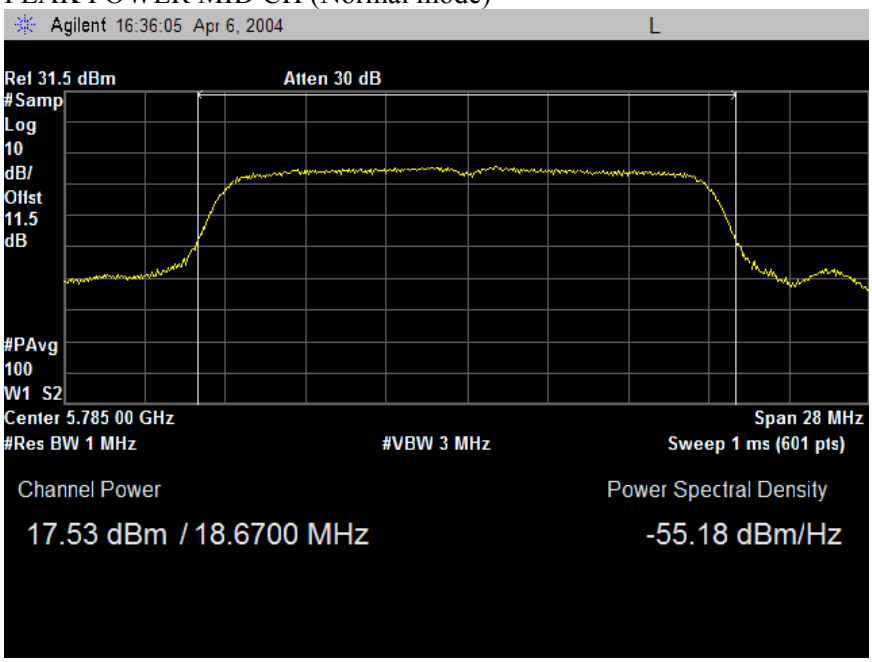


PEAK POWER (NORMAL MODE, 5.8 GHz BAND)

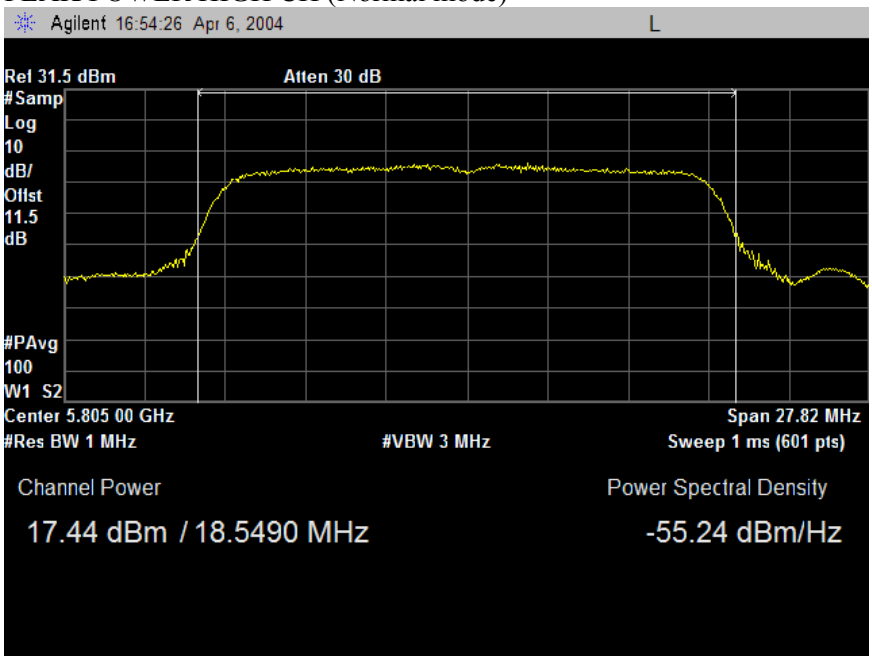
PEAK POWER LOW CH (Normal mode)



PEAK POWER MID CH (Normal mode)



PEAK POWER HIGH CH (Normal mode)



7.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

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 milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
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 = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

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

where

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

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Band (MHz)	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
5150-5250 MHz	1.0	11.22	9.50	3.06
5250-5320 MHz	1.0	17.42	9.50	6.26
5725-5825 MHz	1.0	17.72	9.50	6.48

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.4. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 12 dB (including 10 dB pad and 2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode

Channel	Frequency (MHz)	Antenna	Average Power (dBm)
Low	5180	All except 5 dBi Integral	11.20
Middle	5260	All	17.00
High	5320	All except 5 dBi Integral	11.10

802.11a Mode

Channel	Frequency (MHz)	Antenna	Average Power (dBm)
Low	5745	All	17.20
Middle	5785	All	17.10
High	5805	All	17.00

7.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (2) For the band 5.25-5.35 GHz and 5.47-5.725 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (3) For the band 5.725-5.825 GHz, the peak transmit power the peak transmit power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point to point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23dBi, a 1 dB reduction in peak transmitter power and peak spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omni directional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that the systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

LIMITS AND RESULTS

The reduction to the limit is 3.5 dB due to excess antenna gain of the highest gain (9.5 dBi) additional antenna.

No non-compliance noted:

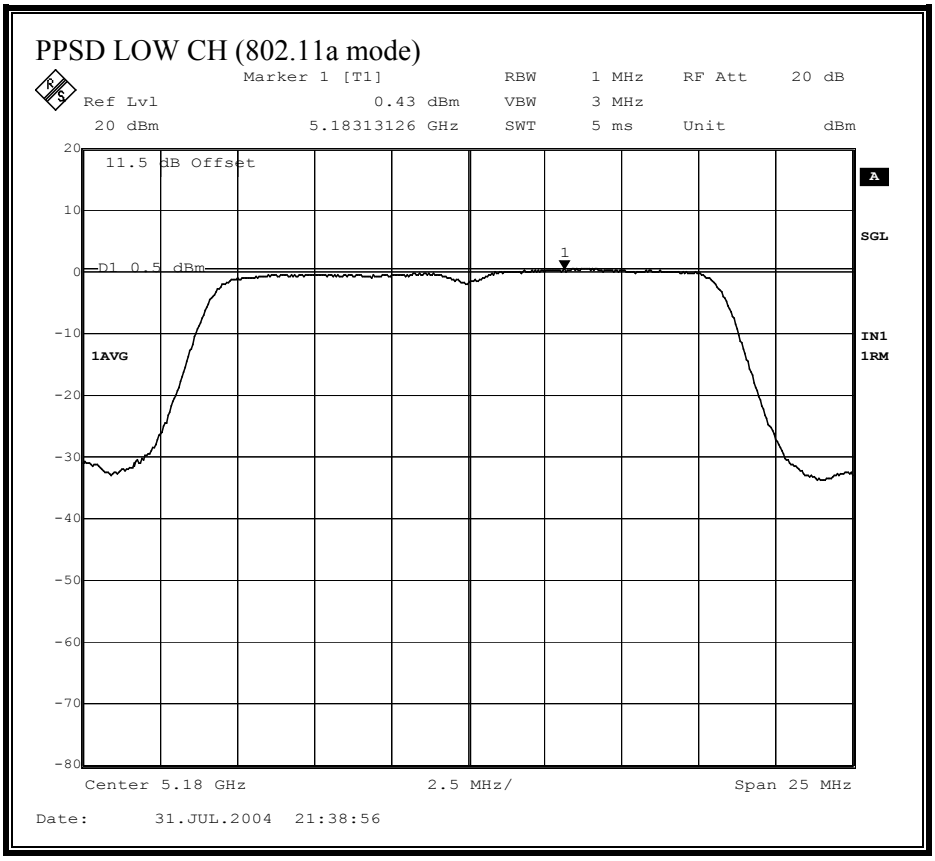
802.11a Mode, 5.2 GHz Band

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.43	0.50	-0.07
Middle	5260	6.75	7.50	-0.75
High	5320	-0.51	7.50	-8.01

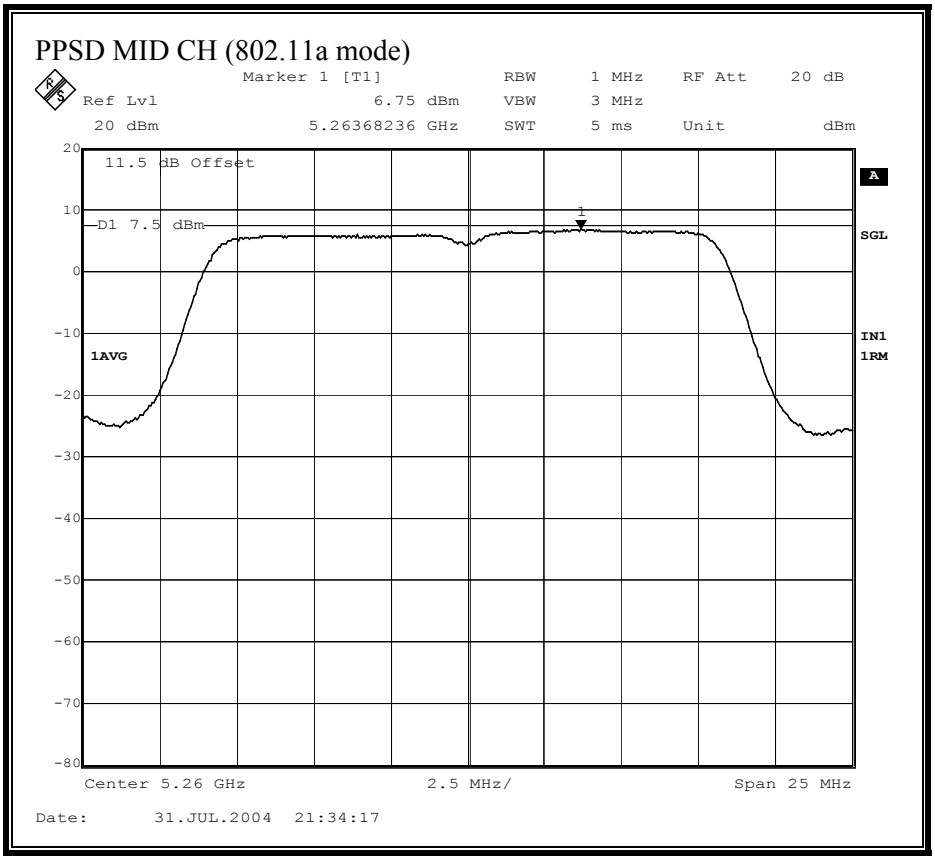
802.11a Mode. 5.8 GHz Band

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	7.56	13.50	-5.94
Middle	5785	7.18	13.50	-6.32
High	5805	7.61	13.50	-5.89

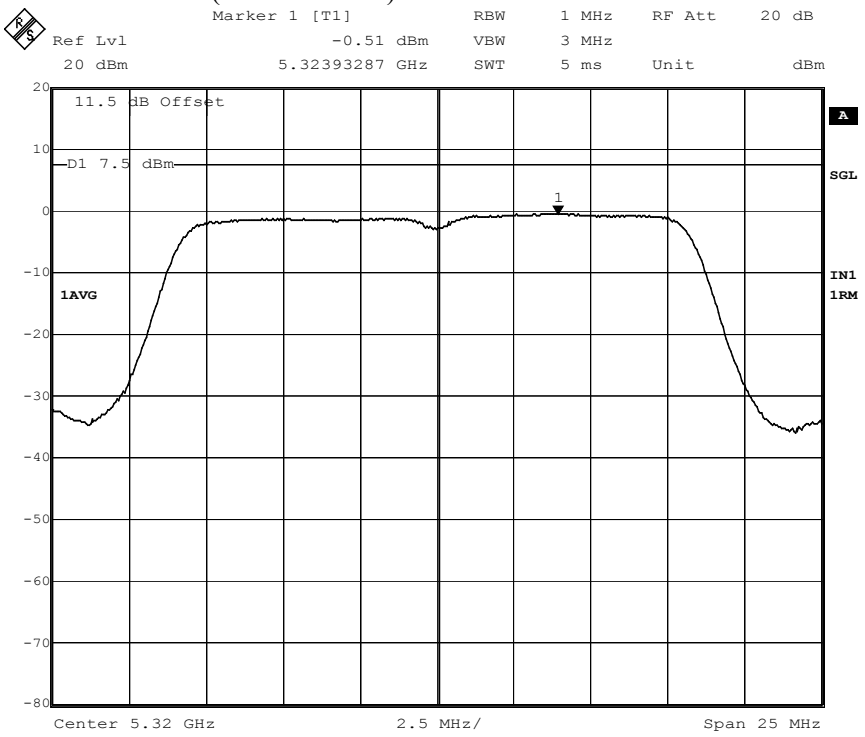
PEAK POWER SPECTRAL DENSITY (802.11a MODE, 5.2 GHZ BAND)



PPSD MID CH (802.11a mode)

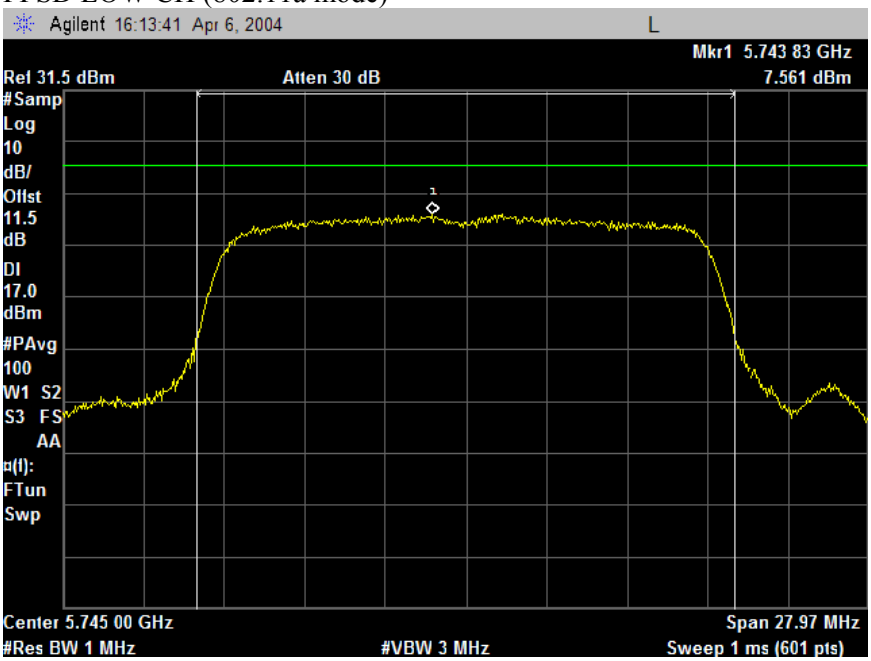


PPSD HIGH CH (802.11a mode)

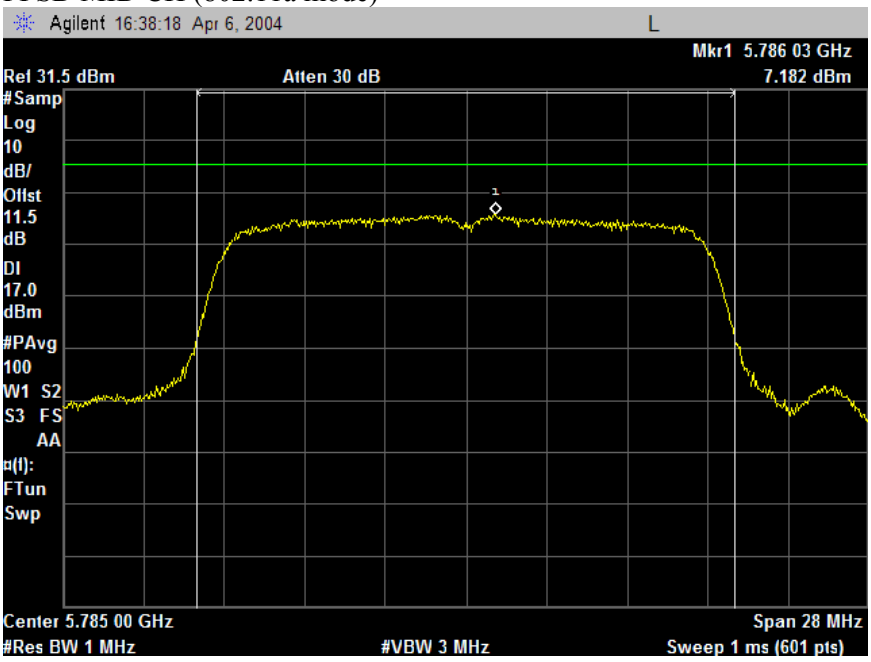


PEAK POWER SPECTRAL DENSITY (802.11a MODE, 5.8GHZ BAND)

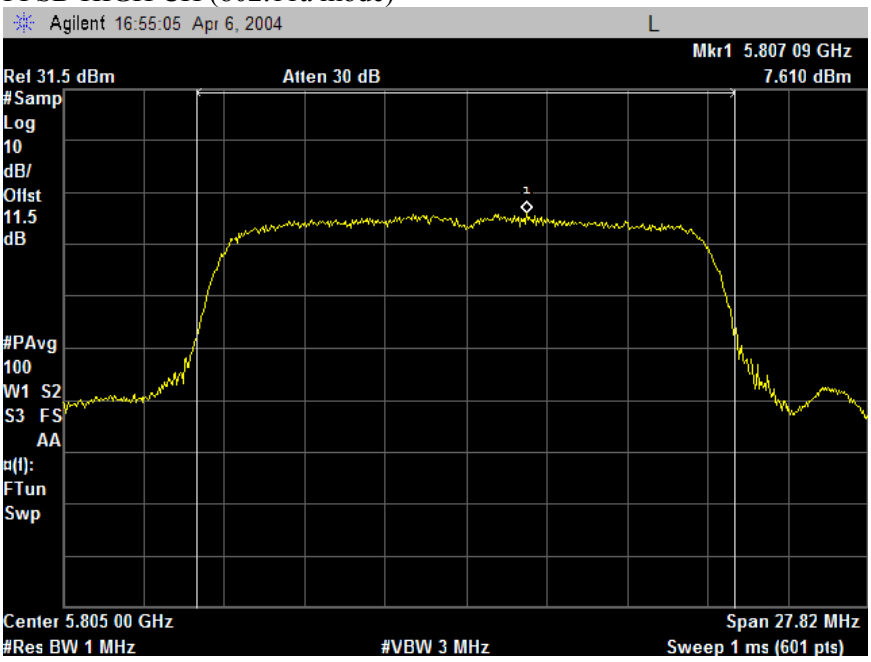
PPSD LOW CH (802.11a mode)



PPSD MID CH (802.11a mode)



PPSD HIGH CH (802.11a mode)



7.6. PEAK EXCURSION

LIMIT

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

No non-compliance noted:

802.11a Mode, 5.2 GHz Band

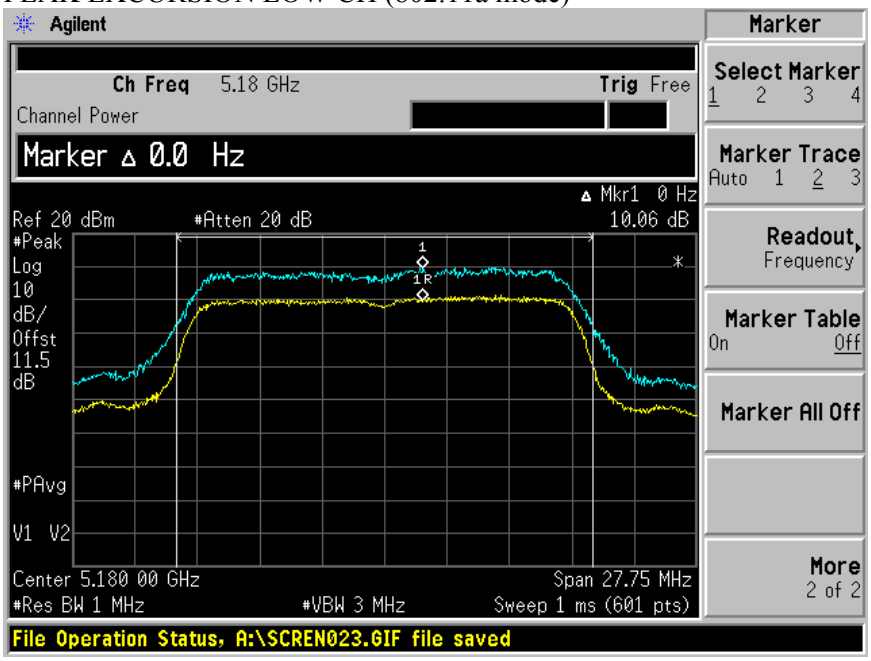
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	10.06	13	-2.94
Middle	5260	10.14	13	-2.86
High	5320	10.62	13	-2.38

802.11a Mode, 5.8 GHz Band

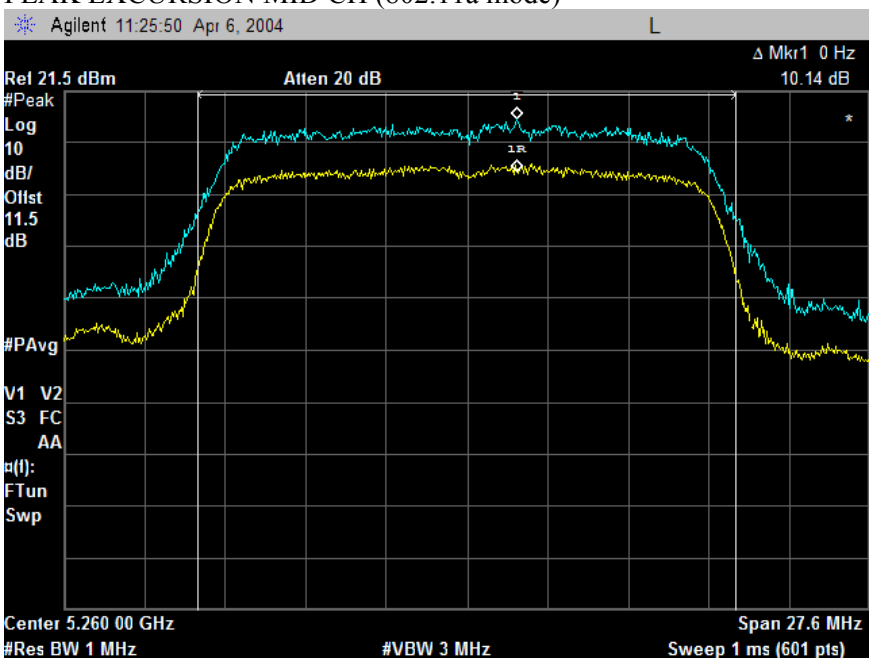
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5745	8.56	13	-4.44
Middle	5785	7.40	13	-5.60
High	5805	9.24	13	-3.76

PEAK EXCURSION (802.11a MODE, 5.2 GHz BAND)

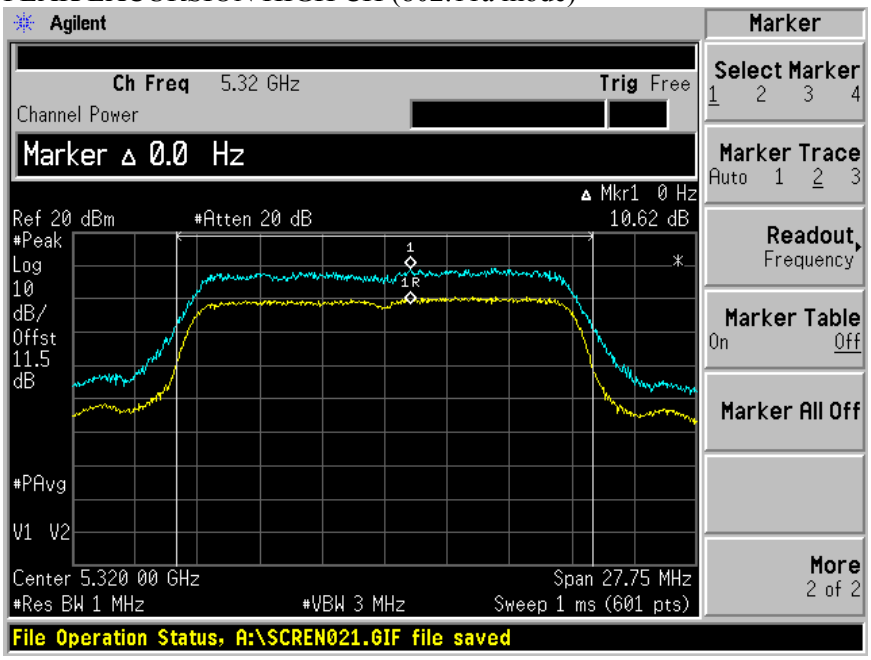
PEAK EXCURSION LOW CH (802.11a mode)



PEAK EXCURSION MID CH (802.11a mode)

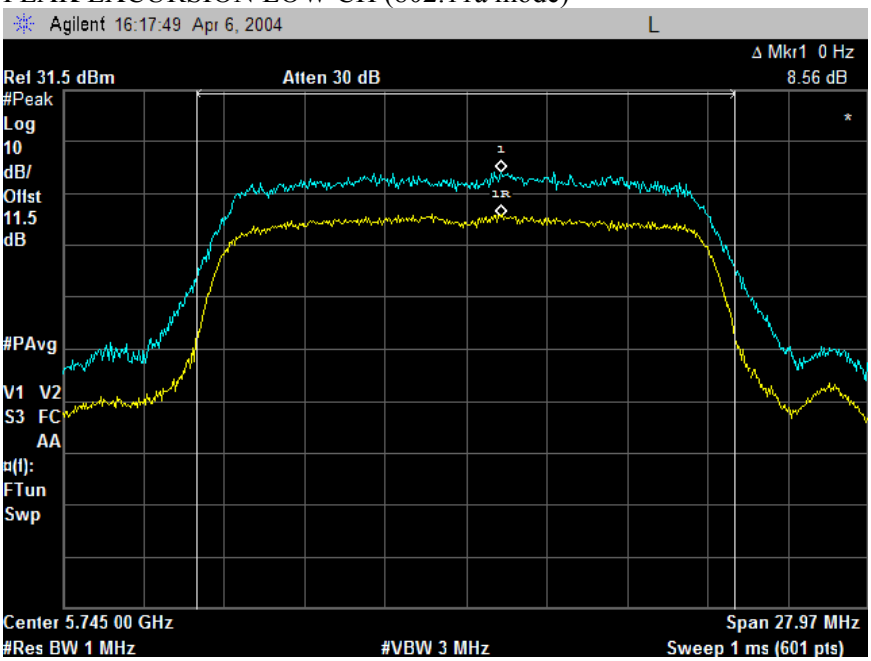


PEAK EXCURSION HIGH CH (802.11a mode)

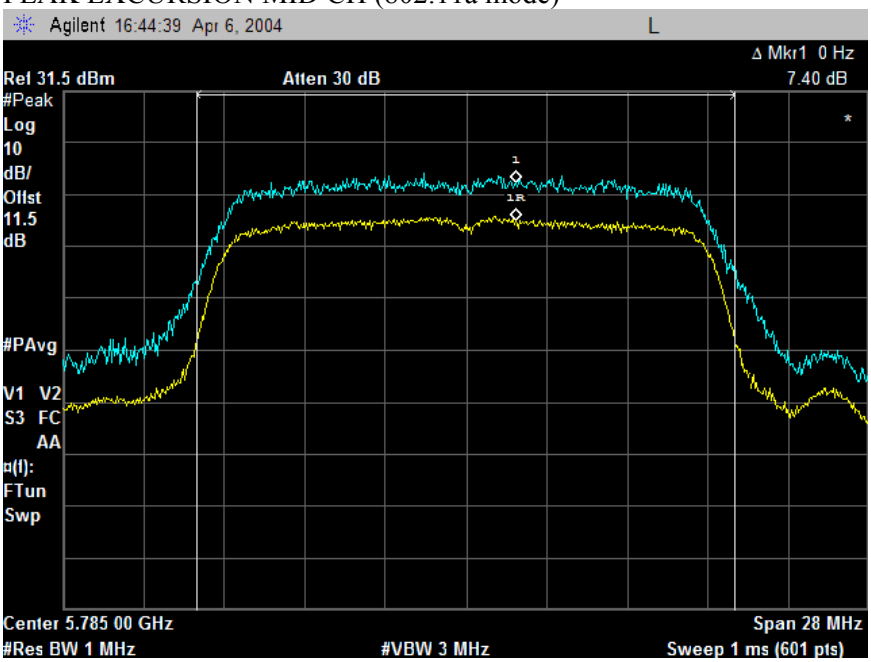


PEAK EXCURSION (802.11a MODE, 5.8GHz BAND)

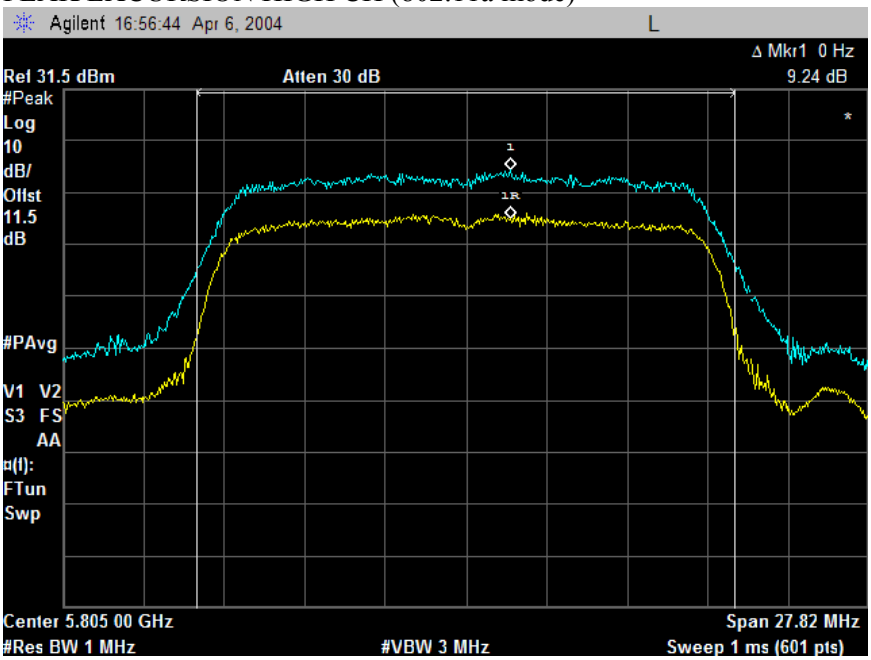
PEAK EXCURSION LOW CH (802.11a mode)



PEAK EXCURSION MID CH (802.11a mode)



PEAK EXCURSION HIGH CH (802.11a mode)



7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

§15.407 (b) (2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of 27 dBm/MHz in the 5.15–5.25 GHz band.

§15.407 (b) (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

§15.407 (b) (4) For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of –27 dBm/MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

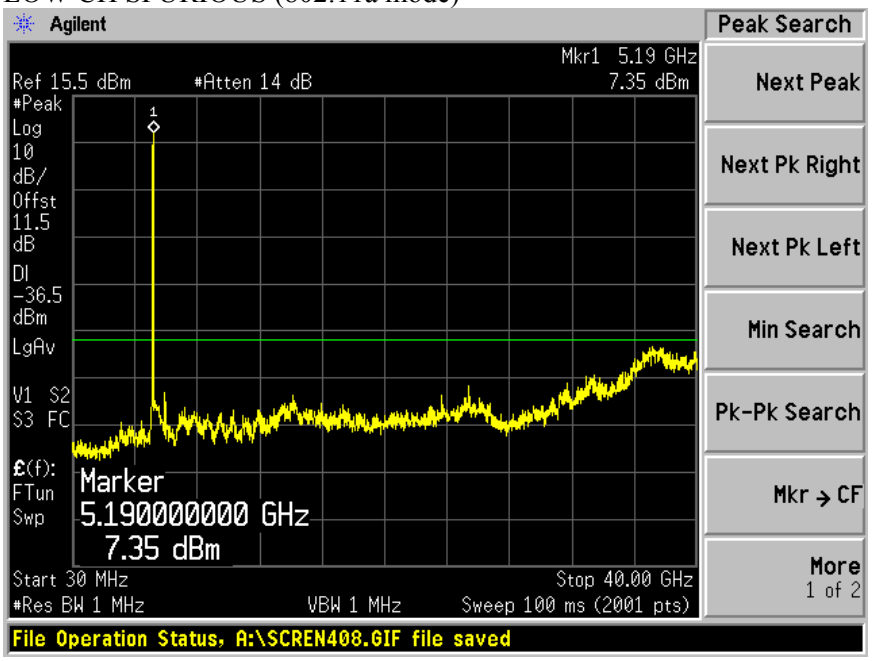
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

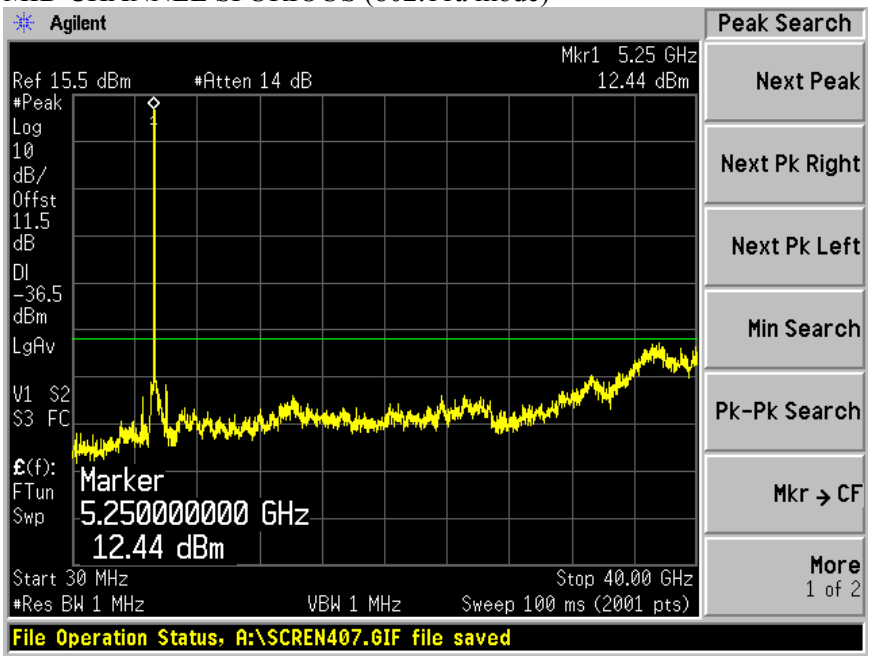
No non-compliance noted:

SPURIOUS EMISSIONS (802.11a MODE, 5.2 GHz BAND)

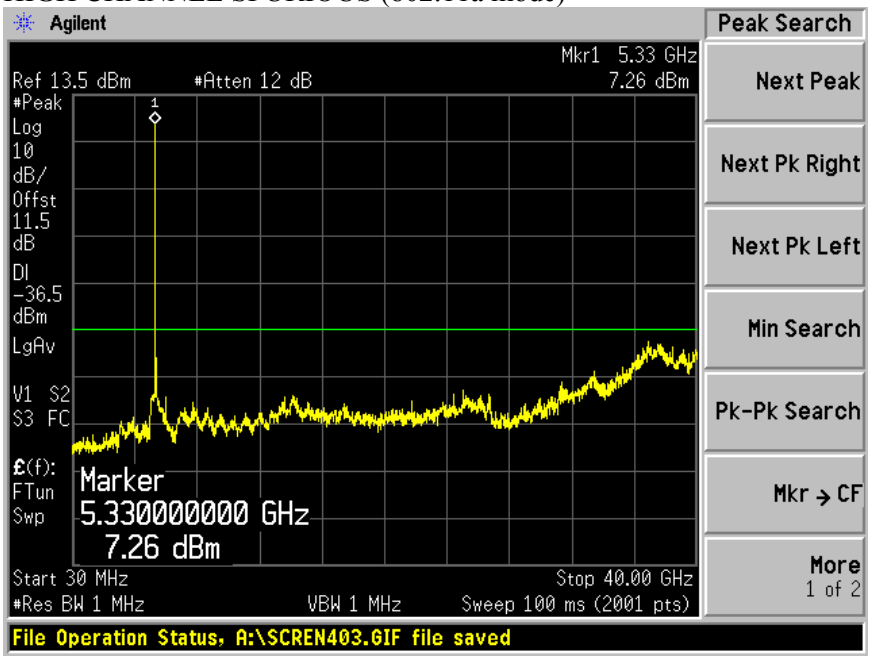
LOW CH SPURIOUS (802.11a mode)



MID CHANNEL SPURIOUS (802.11a mode)

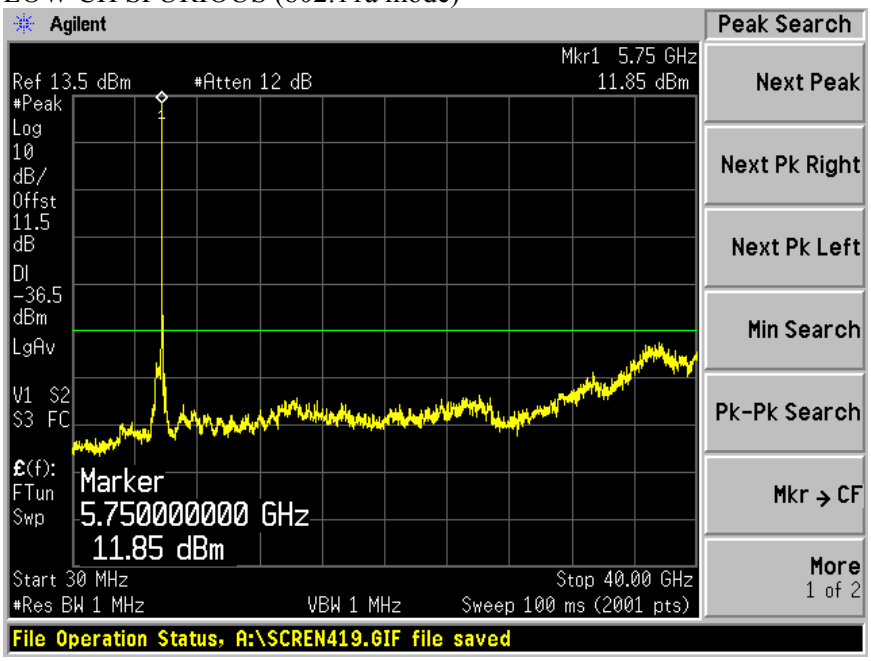


HIGH CHANNEL SPURIOUS (802.11a mode)

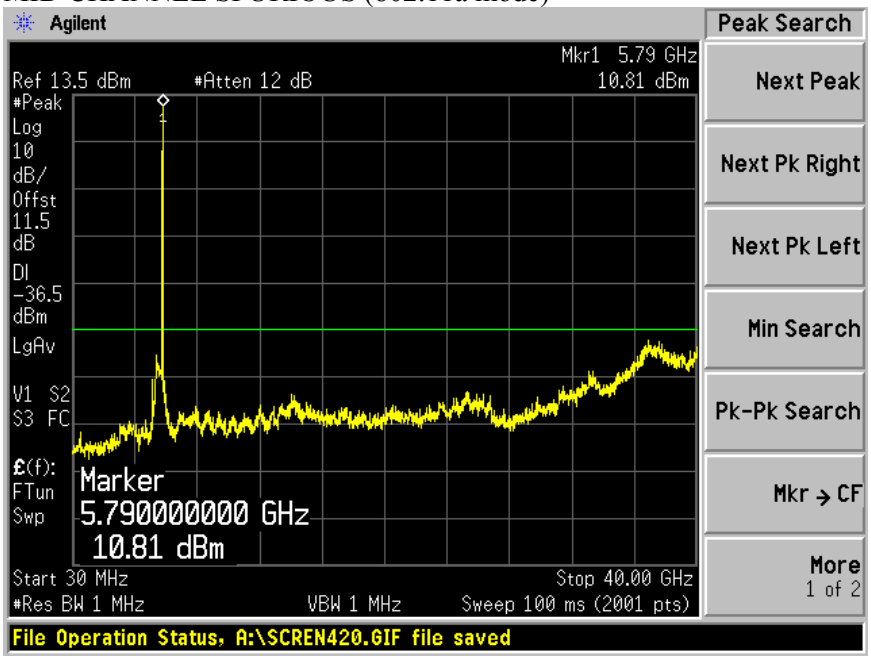


SPURIOUS EMISSIONS (802.11a MODE, 5.8 GHz BAND)

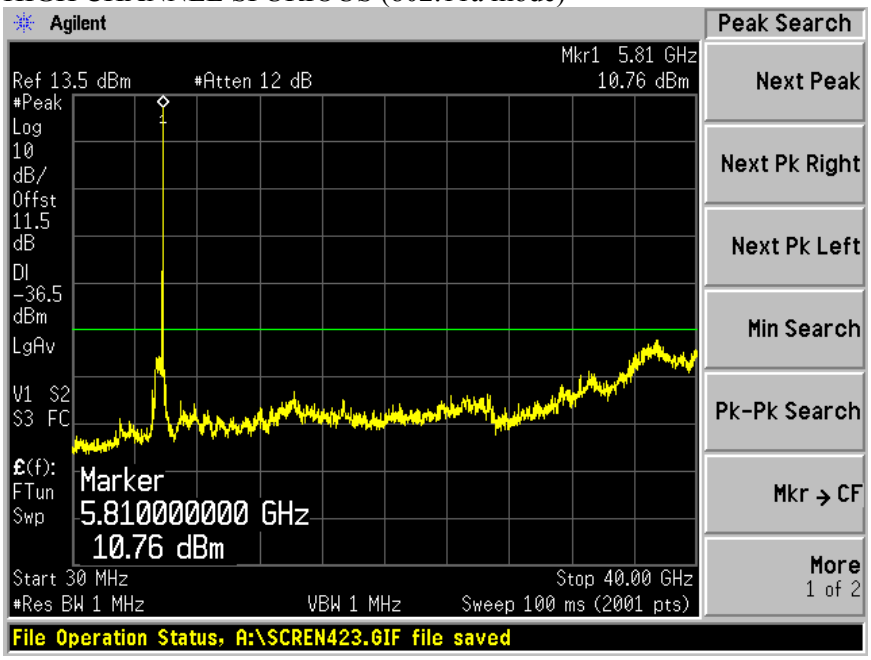
LOW CH SPURIOUS (802.11a mode)



MID CHANNEL SPURIOUS (802.11a mode)



HIGH CHANNEL SPURIOUS (802.11a mode)



7.8. RADIATED EMISSIONS

7.8.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

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

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

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

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels of each band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

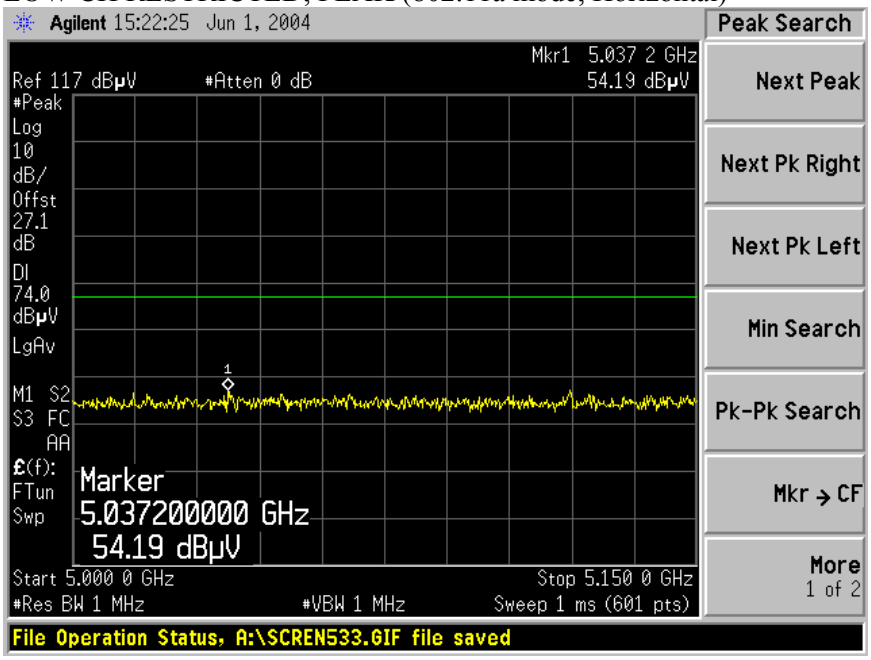
RESULTS

No non-compliance noted:

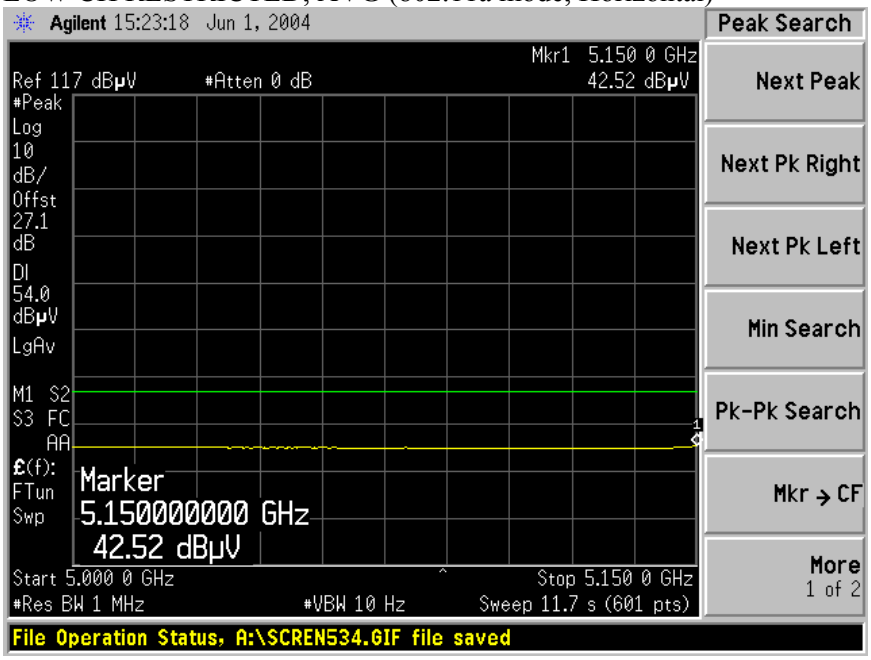
7.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND WITH 9 dBi INTEGRAL ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

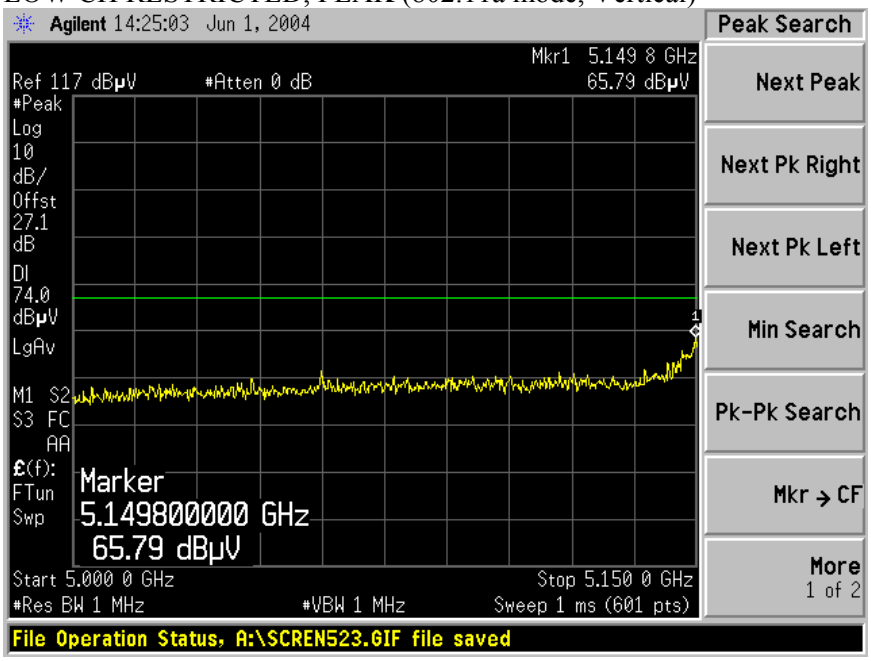


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

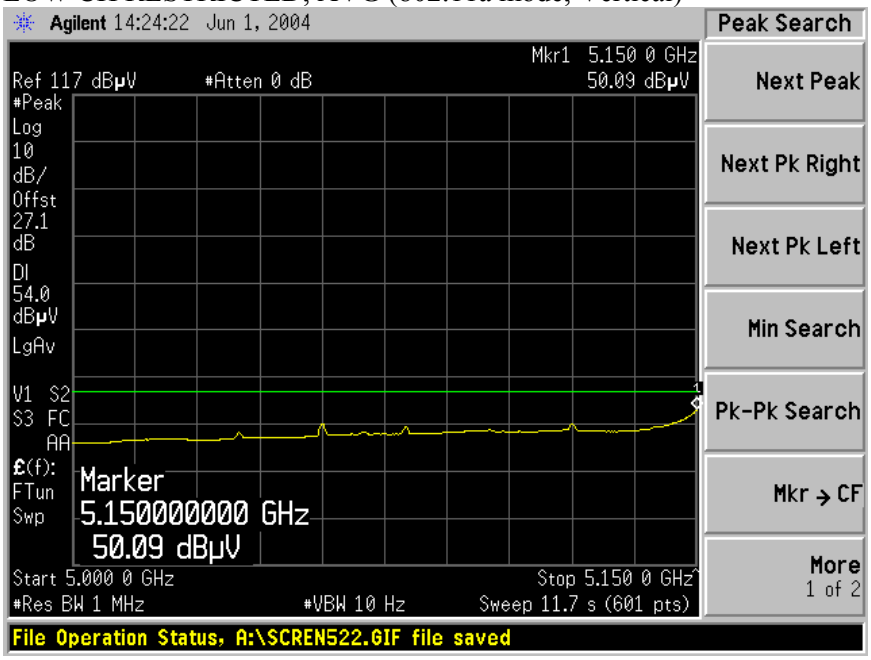


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

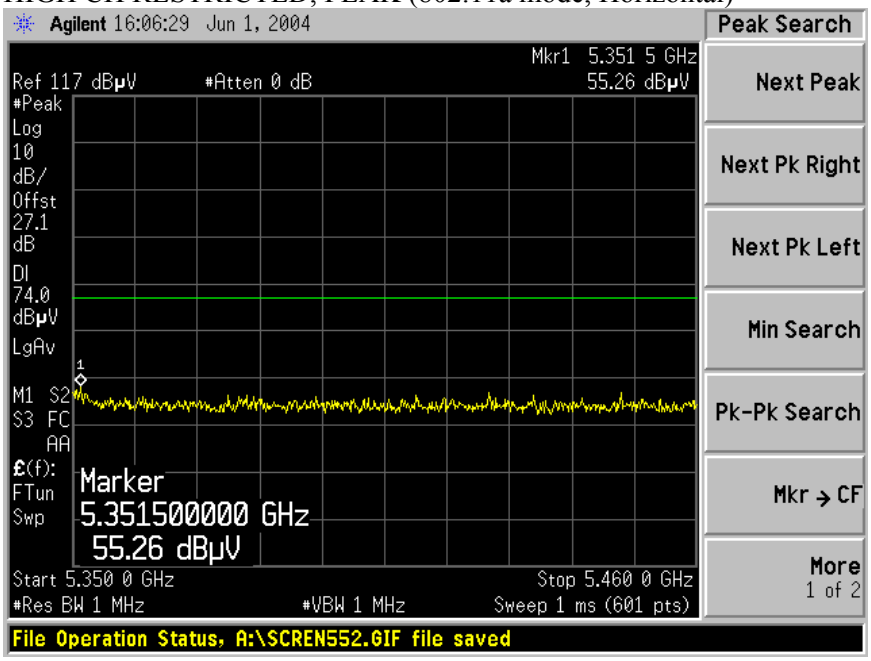


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

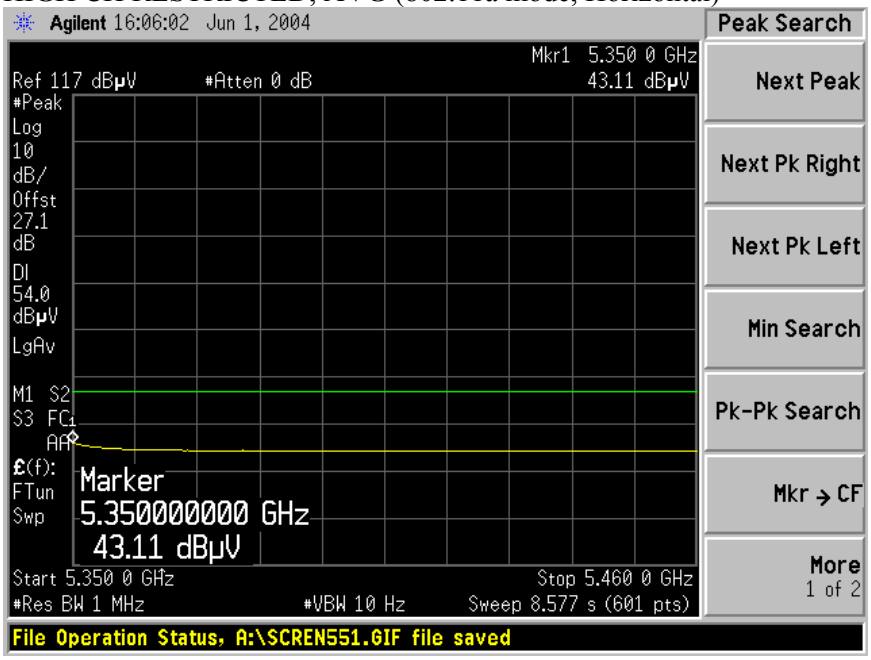


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

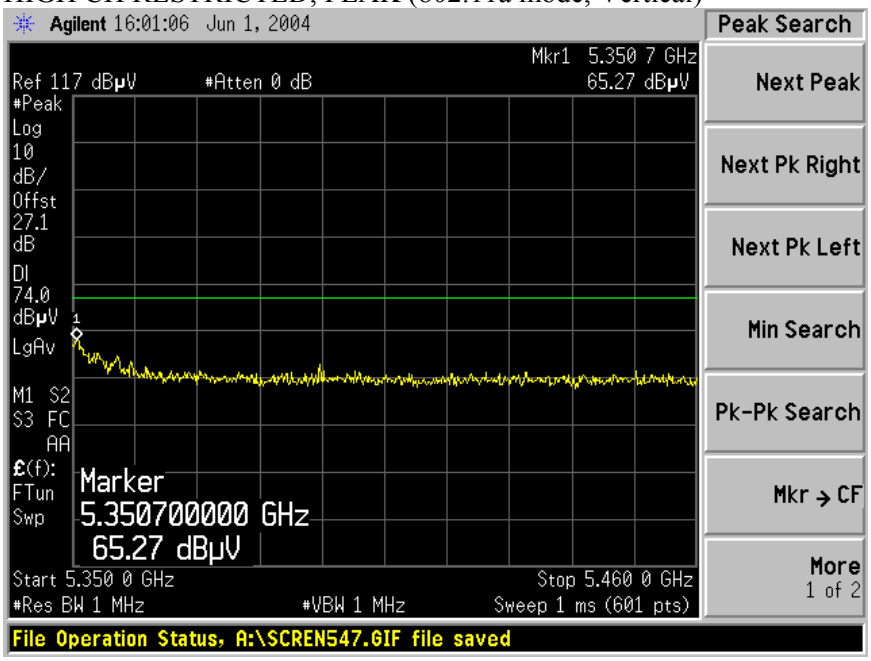


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

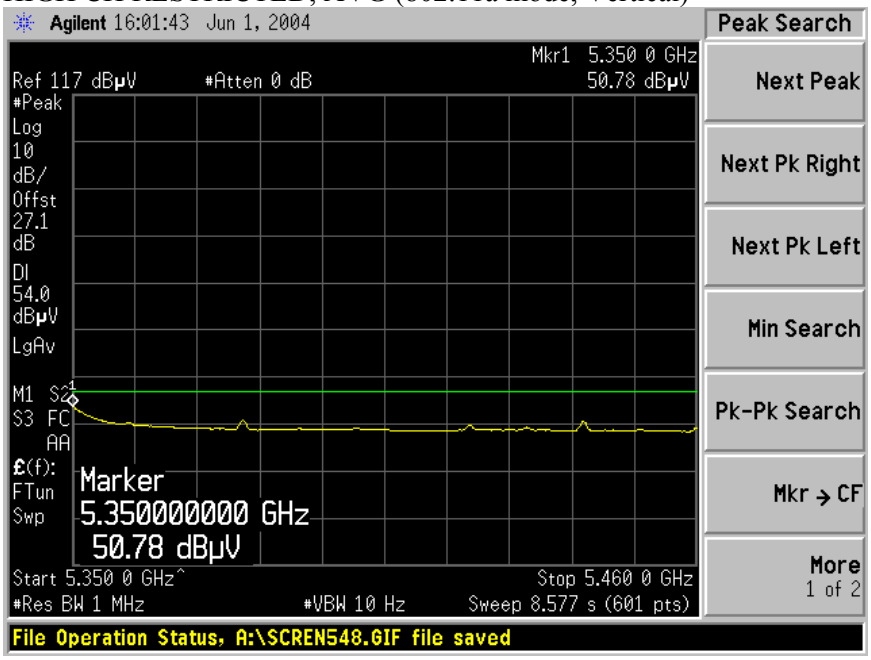


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 9dBi PATCH ANTENNA

06/03/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 9dBi Patch Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.2 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342	T88 Miteq 16-40GHz	T87; ARA 18-26GHz; S/N:1049

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.109

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

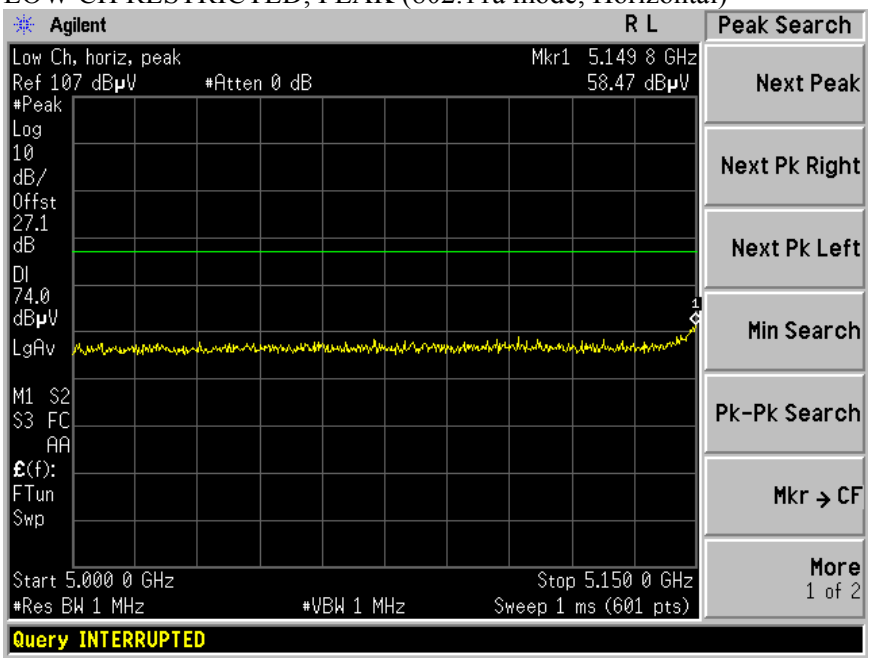
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5180															
15.540	9.8	44.1	32.6	39.5	6.1	-45.5	0.0	1.5	45.7	34.2	74.0	54.0	-28.3	-19.8	V
15.540	9.8	44.7	33.1	39.5	6.1	-45.5	0.0	1.5	46.3	34.7	74.0	54.0	-27.7	-19.3	H
CH 5260															
10.520	9.8	57.5	47.2	37.9	4.8	-41.4	0.0	1.5	60.3	50.0	74.0	54.0	-13.7	-4.0	V
15.780	9.8	48.3	35.3	39.0	6.2	-45.6	0.0	1.5	49.3	36.3	74.0	54.0	-24.7	-17.7	V
10.520	9.8	52.1	39.6	37.9	4.8	-41.4	0.0	1.5	54.9	42.4	74.0	54.0	-19.1	-11.6	H
15.780	9.8	48.1	36.7	39.0	6.2	-45.6	0.0	1.5	49.1	37.7	74.0	54.0	-24.9	-16.3	H
CH 5320															
4.550	9.8	55.9	54.0	32.9	2.9	-44.5	0.0	1.5	48.7	46.8	74.0	54.0	-25.3	-7.2	V
4.550	9.8	54.1	52.3	32.9	2.9	-44.5	0.0	1.5	46.9	45.1	74.0	54.0	-27.1	-8.9	H
10.640	9.8	54.7	43.5	38.0	4.8	-41.3	0.0	1.5	57.7	46.5	74.0	54.0	-16.3	-7.5	V
15.960	9.8	47.4	35.6	38.6	6.2	-45.7	0.0	1.5	48.0	36.2	74.0	54.0	-26.0	-17.8	V
10.640	9.8	49.8	37.4	38.0	4.8	-41.3	0.0	1.5	52.8	40.4	74.0	54.0	-21.2	-13.6	H
15.960	9.8	46.2	34.7	38.6	6.2	-45.7	0.0	1.5	46.8	35.3	74.0	54.0	-27.2	-18.7	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

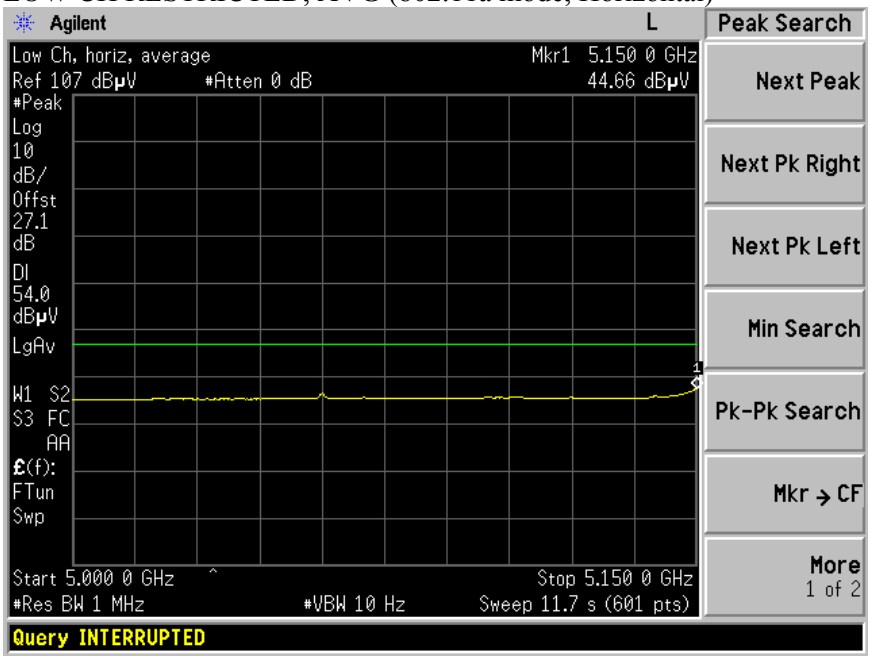
7.8.3. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND WITH 9.5 dBi EXTERNAL ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

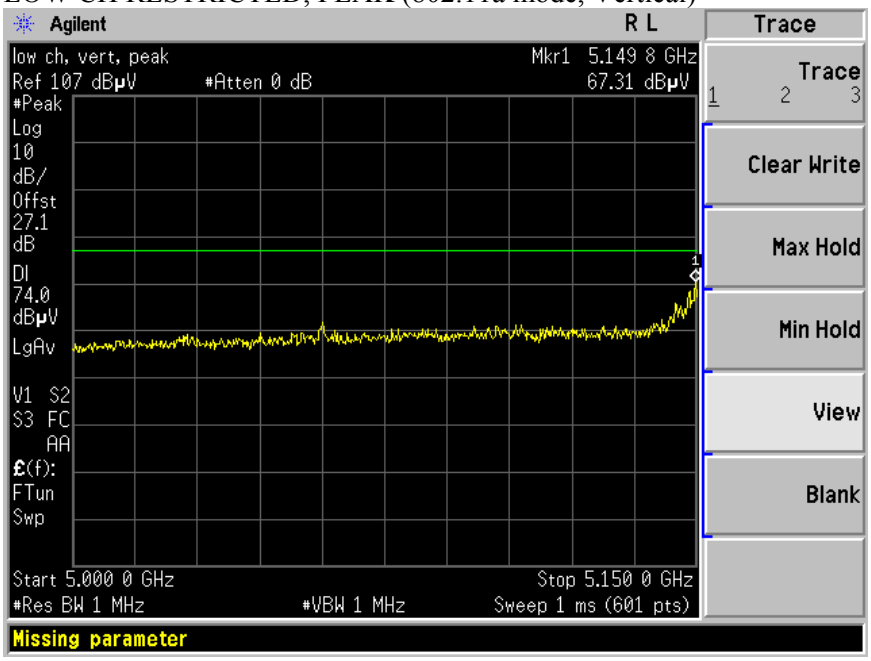


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

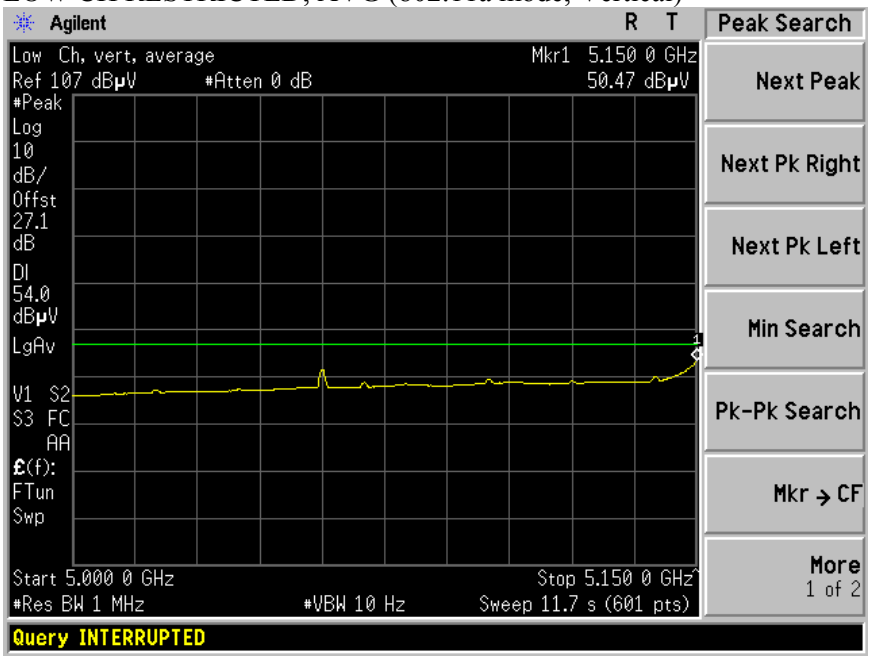


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

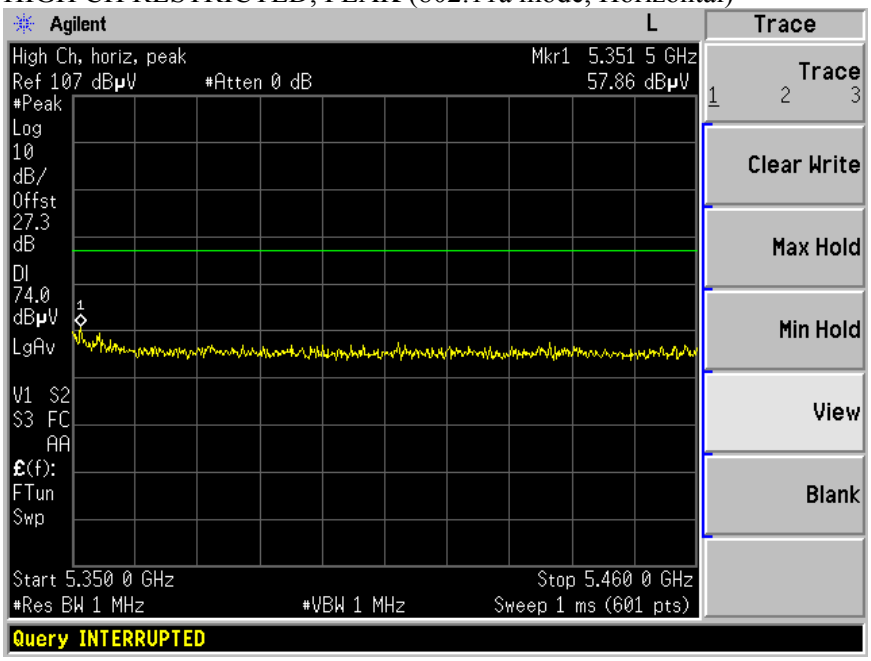


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

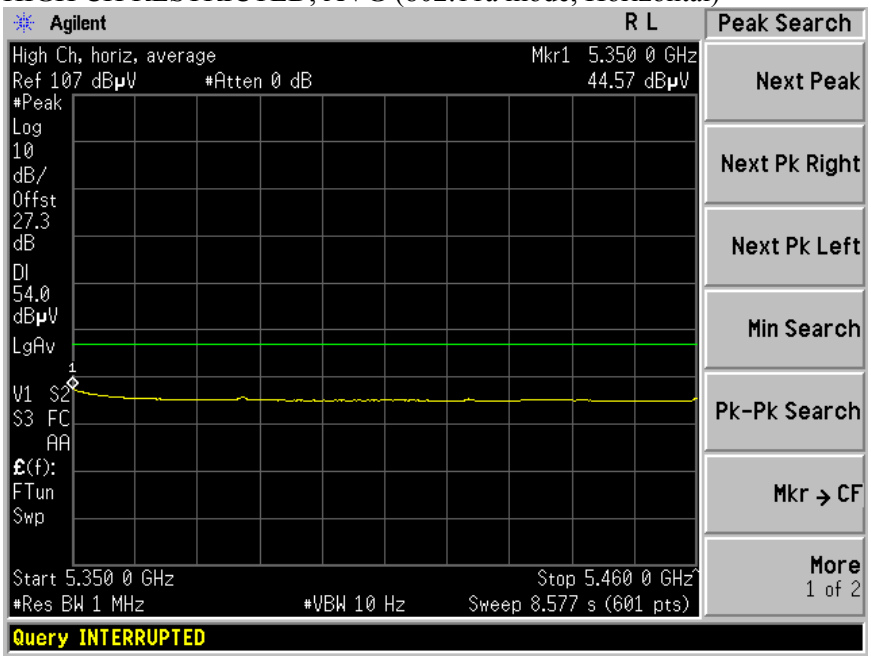


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

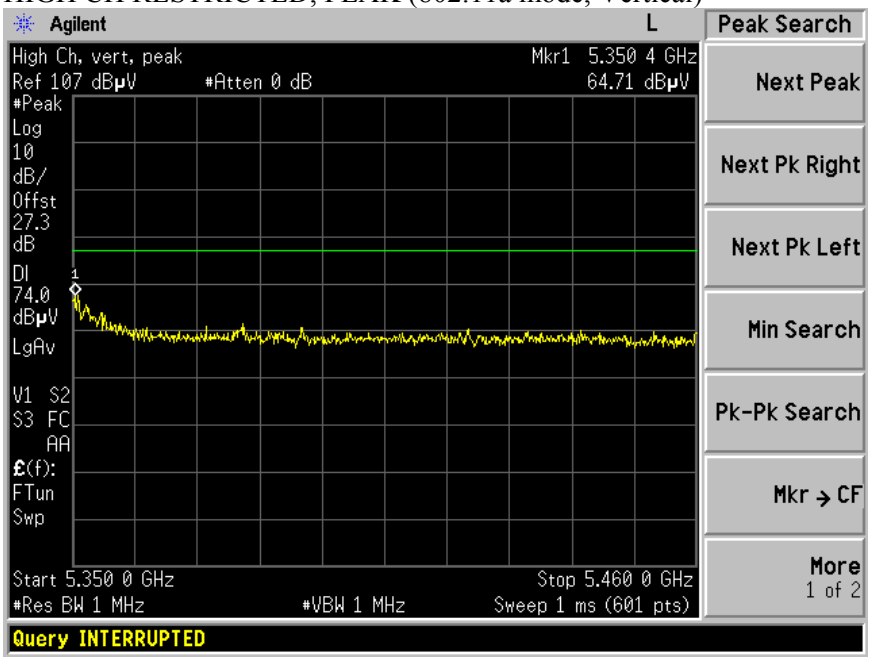


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

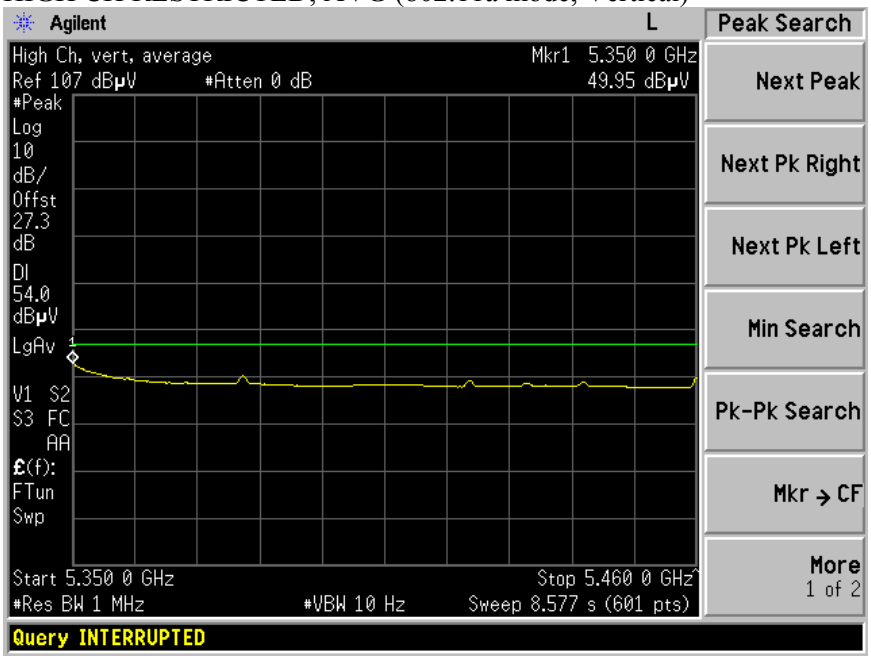


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 9.5dBi ANTENNA,

08/02/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:Chin Pang
Project #:04u2586
Company:Cisco
EUT Descrip.:Kodiak RM22A 802.11a Cardbus radio module with 9.5dBi antenna
EUT M/N:AIR-RM22A-K9 in AIR-AP1200 Access Point
Test Target:FCC UNNI
Mode Oper:Tx

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables
☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

5.2GHz band

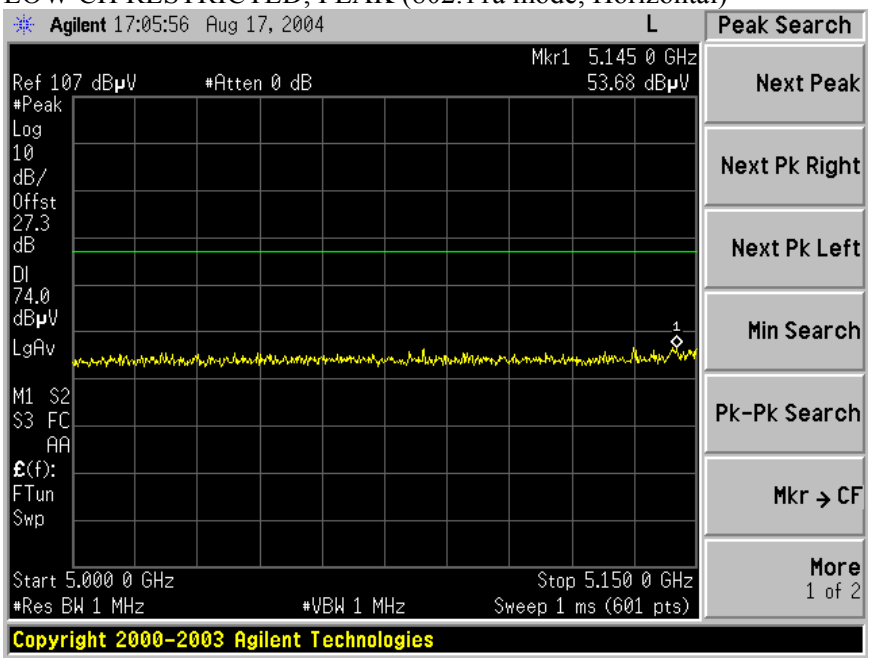
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
low ch, 5180MHz															
4.410	9.8	63.7	60.3	32.9	2.7	-44.3	0.0	0.0	54.9	51.5	74.0	54.0	-19.1	-2.5	V
15.540	9.8	45.5	33.0	39.4	5.6	-45.5	0.0	1.0	45.9	33.4	74.0	54.0	-28.1	-20.6	V
4.410	9.8	60.0	57.8	32.9	2.7	-44.3	0.0	0.0	51.2	49.0	74.0	54.0	-22.8	-5.0	H
15.540	9.8	45.2	32.8	39.4	5.6	-45.5	0.0	1.0	45.6	33.2	74.0	54.0	-28.4	-20.8	H
mid ch, 5260MHz															
4.490	9.8	58.3	56.4	32.9	2.8	-44.4	0.0	0.0	49.5	47.7	74.0	54.0	-24.5	-6.3	V
15.780	9.8	48.0	35.7	38.7	5.7	-45.6	0.0	1.0	47.8	35.5	74.0	54.0	-26.2	-18.5	V
4.490	9.8	58.0	56.3	32.9	2.8	-44.4	0.0	0.0	49.3	47.6	74.0	54.0	-24.7	-6.4	H
15.780	9.8	47.4	35.0	38.7	5.7	-45.6	0.0	1.0	47.2	34.8	74.0	54.0	-26.8	-19.2	H
high ch, 532MHz															
4.550	9.8	58.4	56.7	33.0	2.8	-44.5	0.0	0.0	49.7	48.0	74.0	54.0	-24.3	-6.0	V
10.640	9.8	48.5	35.6	38.2	4.6	-41.3	0.0	1.0	51.0	38.1	74.0	54.0	-23.0	-15.9	V
15.960	9.8	46.0	33.0	38.3	5.7	-45.7	0.0	1.0	45.3	32.3	74.0	54.0	-28.7	-21.7	V
4.550	9.8	56.5	54.0	33.0	2.8	-44.5	0.0	0.0	47.8	45.3	74.0	54.0	-26.2	-8.7	H
10.640	9.8	47.5	33.5	38.2	4.6	-41.3	0.0	1.0	50.0	36.0	74.0	54.0	-24.0	-18.0	H
15.960	9.8	45.8	33.0	38.3	5.7	-45.7	0.0	1.0	45.1	32.3	74.0	54.0	-28.9	-21.7	H
Note: No other emissions were detected above thr system noise floor.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

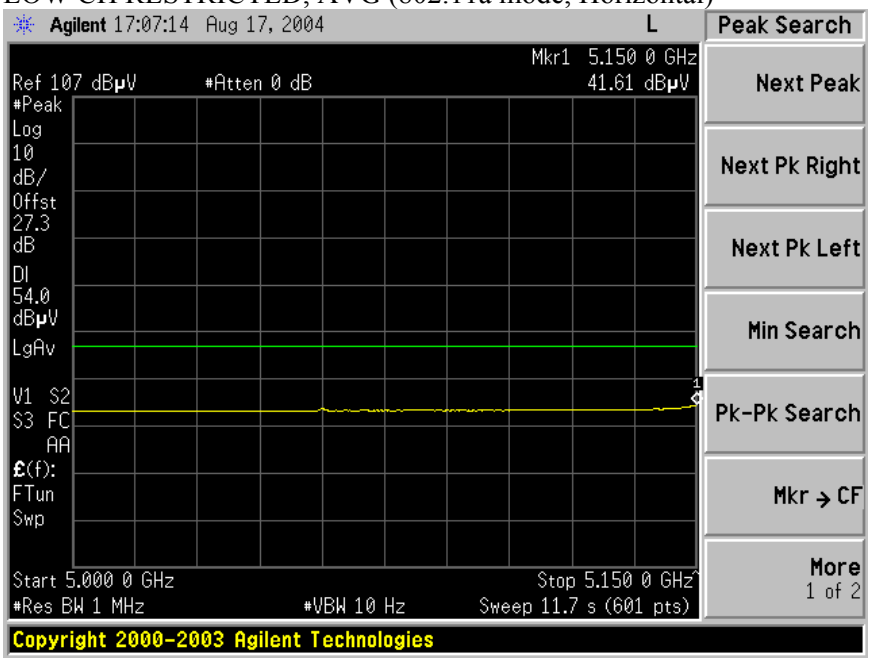
7.8.4. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND WITH 7 dBi EXTERNAL ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

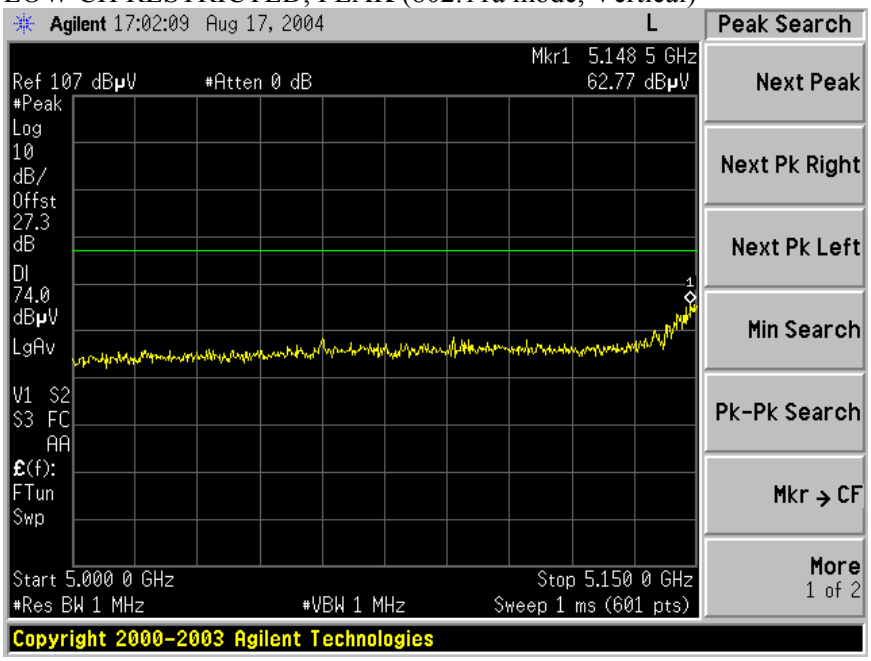


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

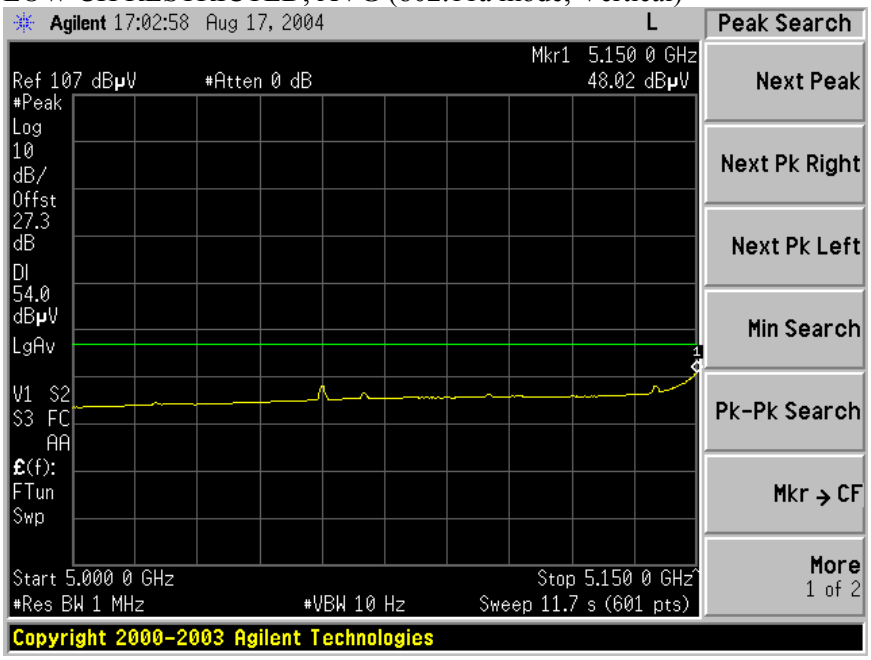


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

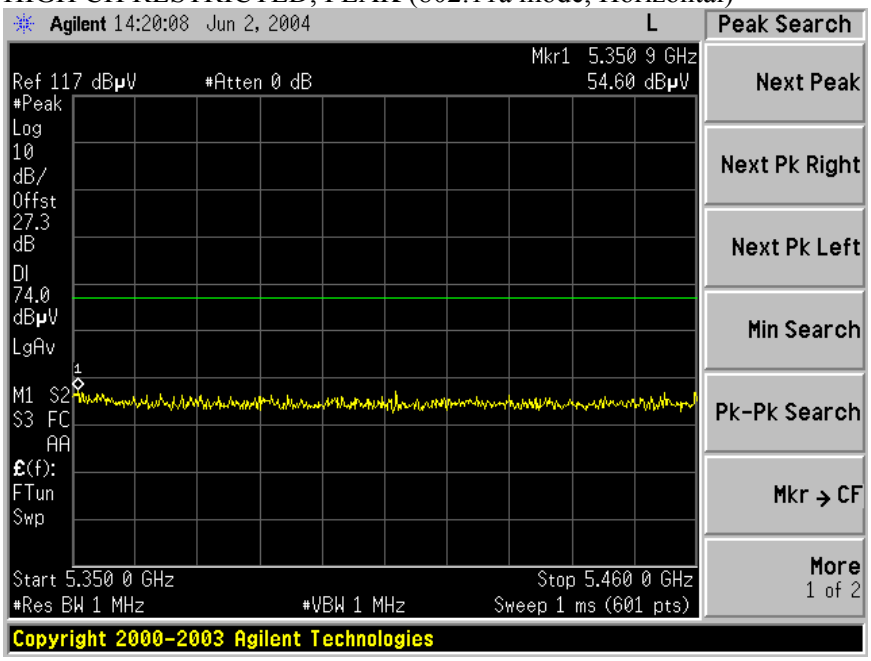


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

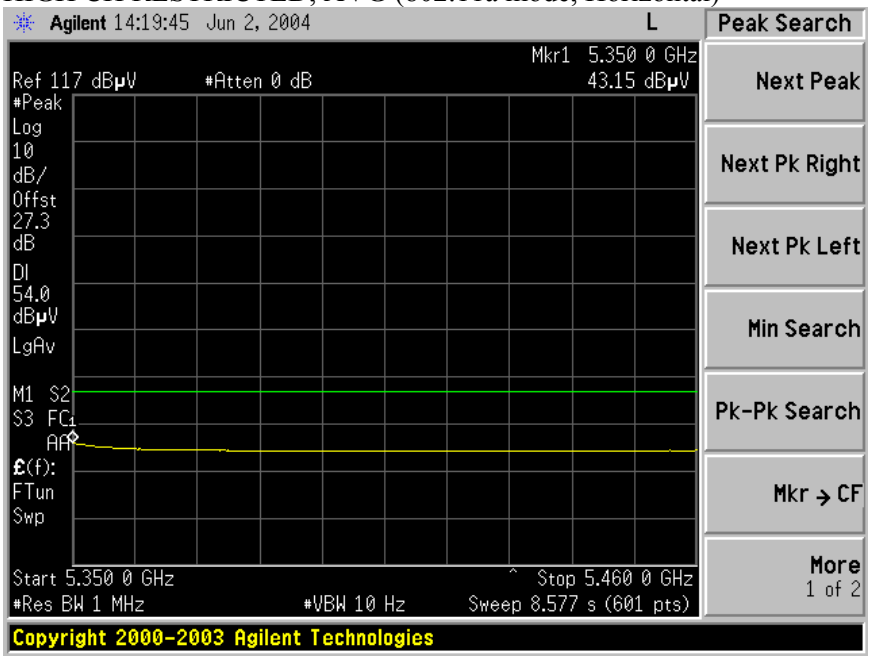


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

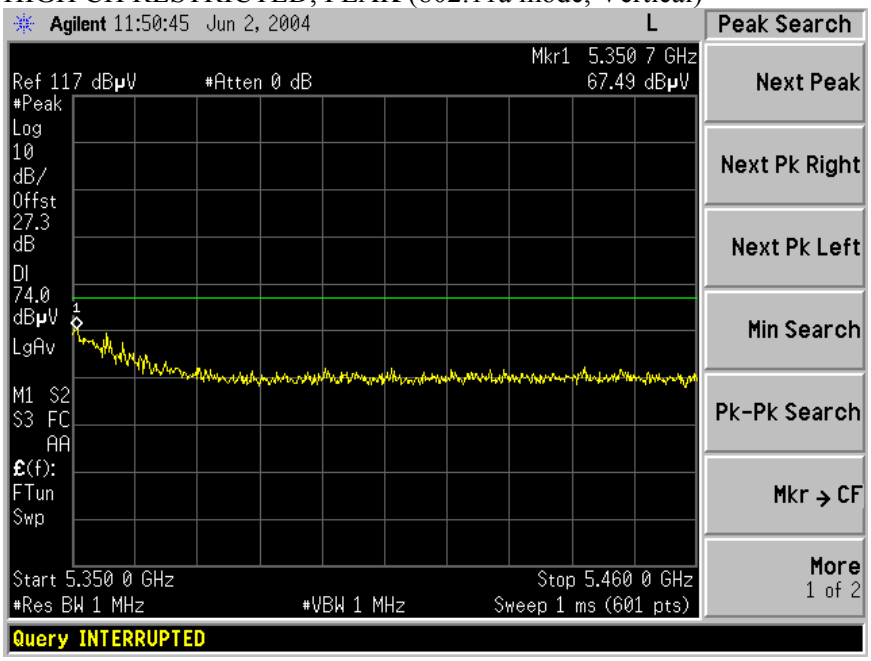


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

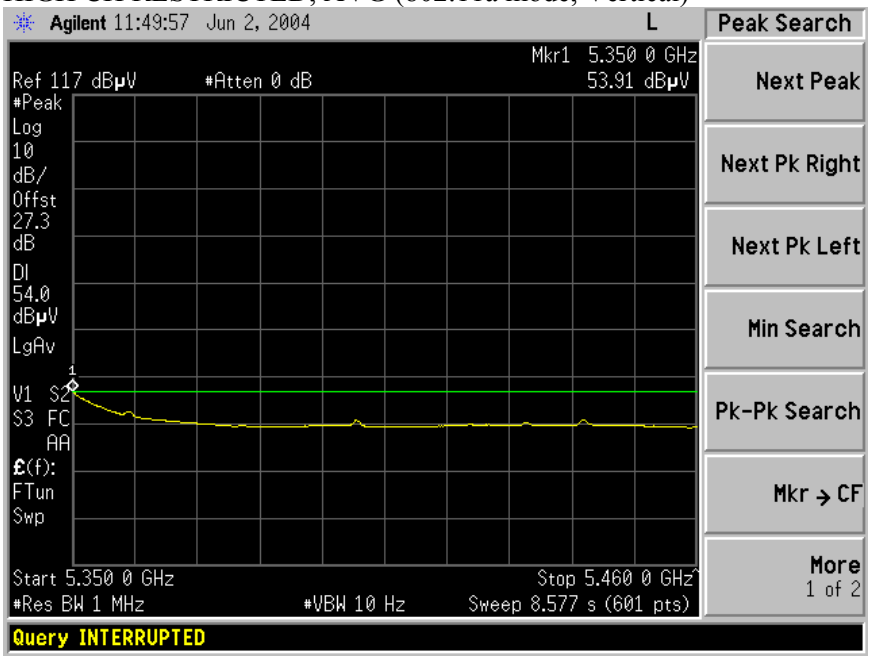


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 7dBi PATCH ANTENNA

06/04/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 7dBi Patch Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.2 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.209

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

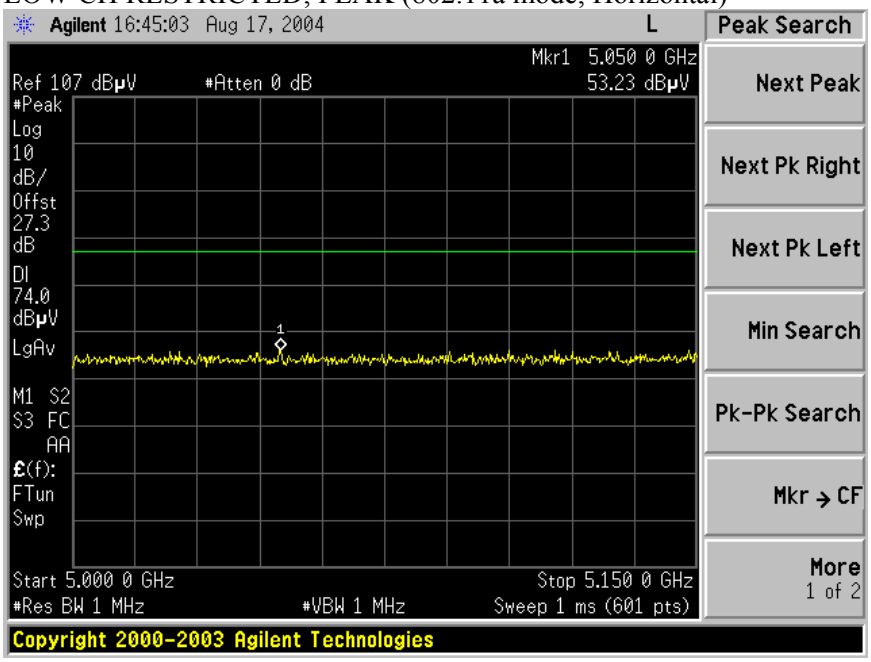
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5180															
15.540	9.8	57.0	43.5	39.5	6.1	-45.5	0.0	1.5	58.6	45.1	74.0	54.0	-15.4	-8.9	V
15.540	9.8	56.0	43.0	39.5	6.1	-45.5	0.0	1.5	57.6	44.6	74.0	54.0	-16.4	-9.4	H
CH 5260															
10.520	9.8	50.3	40.1	37.9	4.8	-41.4	0.0	1.5	53.1	42.9	74.0	54.0	-20.9	-11.1	V
15.780	9.8	48.5	37.4	39.0	6.2	-45.6	0.0	1.5	49.5	38.4	74.0	54.0	-24.5	-15.6	V
10.520	9.8	51.2	40.6	37.9	4.8	-41.4	0.0	1.5	54.0	43.4	74.0	54.0	-20.0	-10.6	H
15.780	9.8	48.1	36.8	39.0	6.2	-45.6	0.0	1.5	49.1	37.8	74.0	54.0	-24.9	-16.2	H
CH 5320															
4.550	9.8	59.7	58.4	32.9	2.9	-44.5	0.0	1.5	52.5	51.2	74.0	54.0	-21.5	-2.8	V
4.550	9.8	54.4	51.5	32.9	2.9	-44.5	0.0	1.5	47.2	44.3	74.0	54.0	-26.8	-9.7	H
10.640	9.8	46.3	35.2	38.0	4.8	-41.3	0.0	1.5	49.3	38.2	74.0	54.0	-24.7	-15.8	V
15.960	9.8	47.4	35.6	38.6	6.2	-45.7	0.0	1.5	48.0	36.2	74.0	54.0	-26.0	-17.8	V
10.640	9.8	48.0	36.2	38.0	4.8	-41.3	0.0	1.5	51.0	39.2	74.0	54.0	-23.0	-14.8	H
15.960	9.8	46.4	34.9	38.6	6.2	-45.7	0.0	1.5	47.0	35.5	74.0	54.0	-27.0	-18.5	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

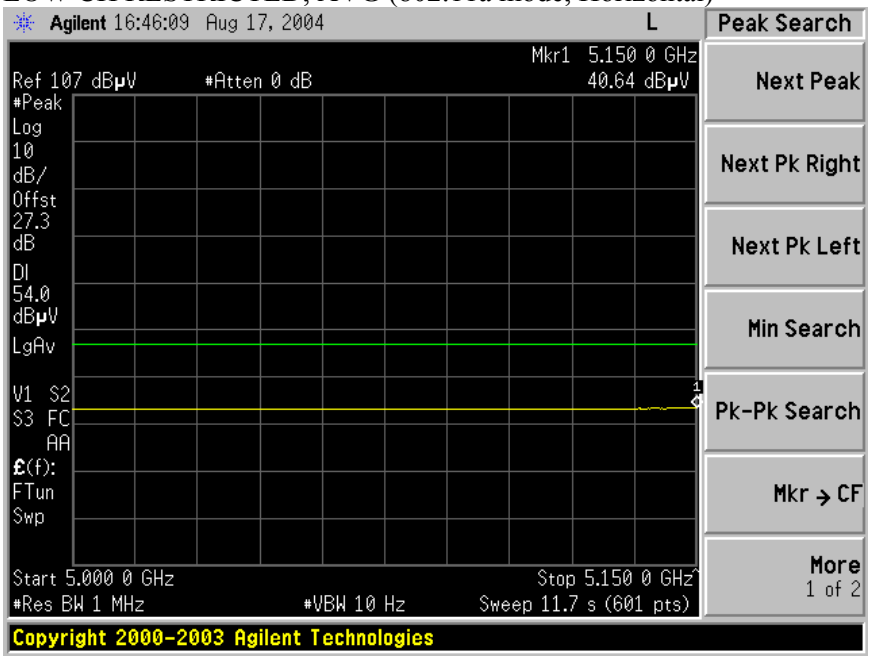
7.8.5. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND WITH 6 dBi EXTERNAL ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

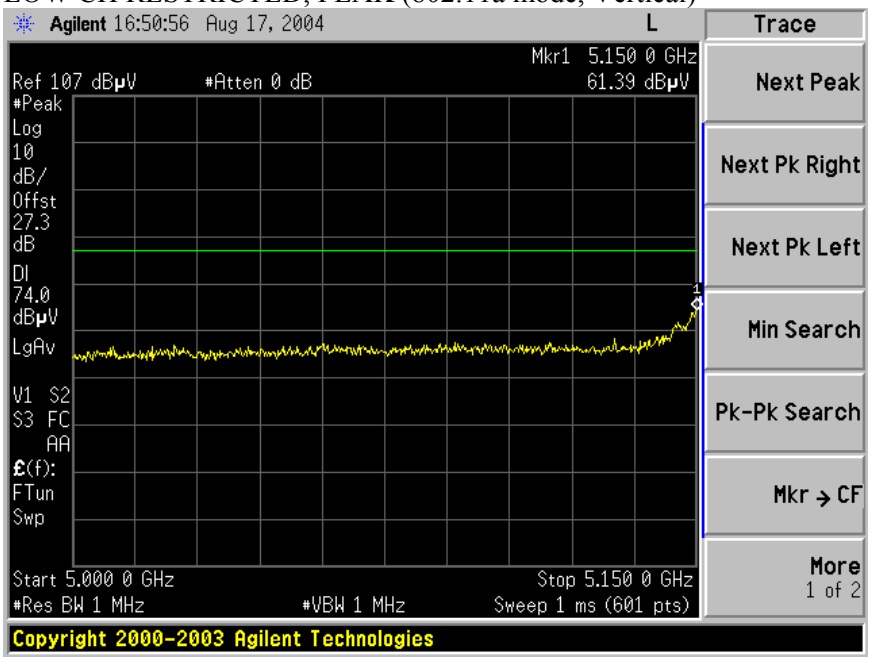


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

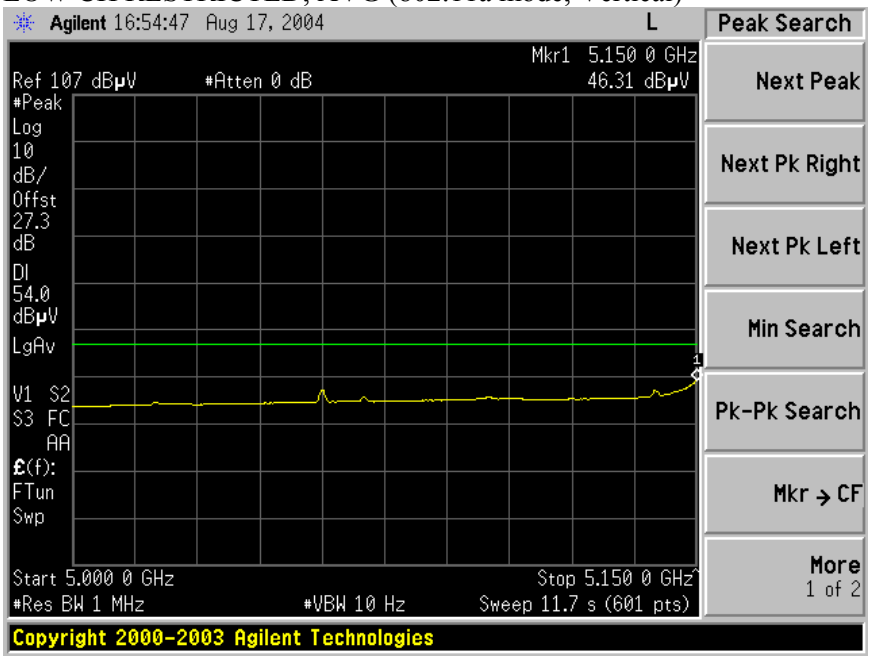


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

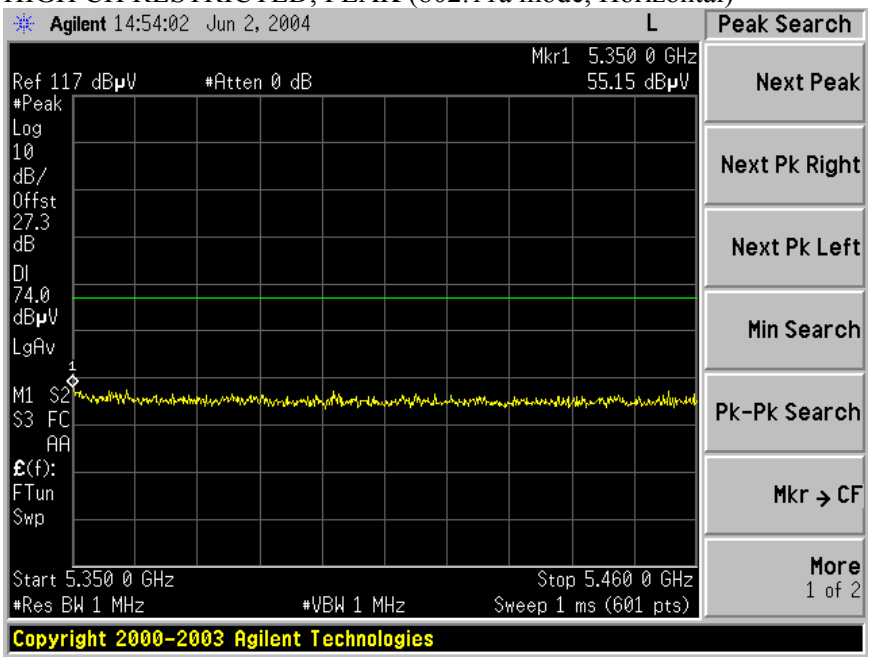


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

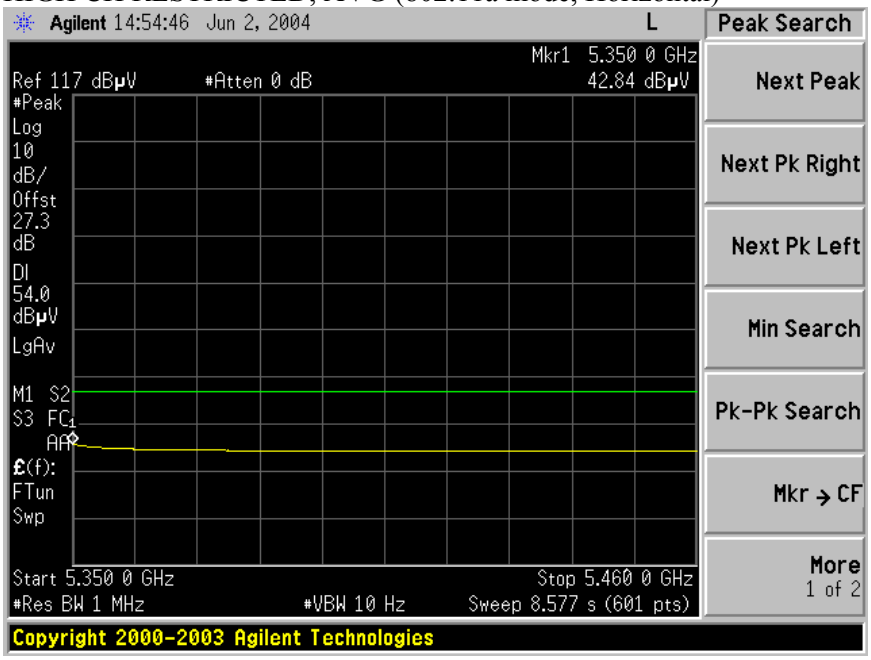


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

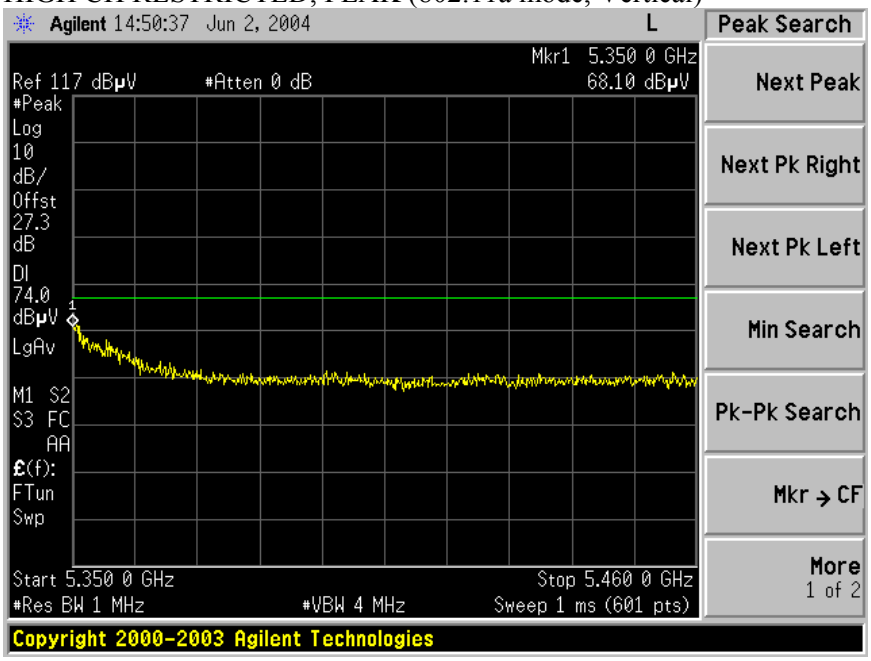


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

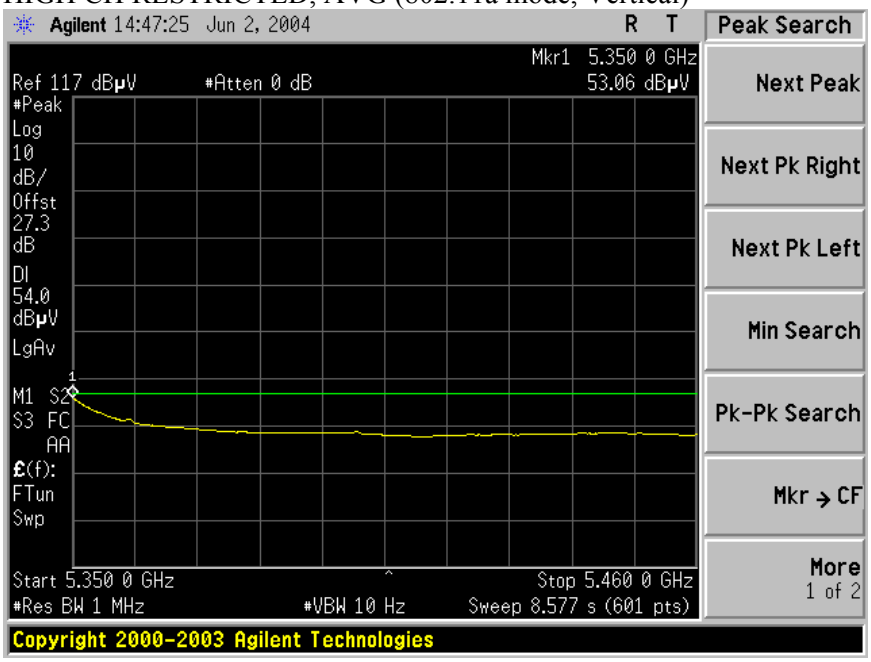


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 6dBi OMNI ANTENNA

06/04/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 6dBi Omni Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.2 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.209

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth

Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

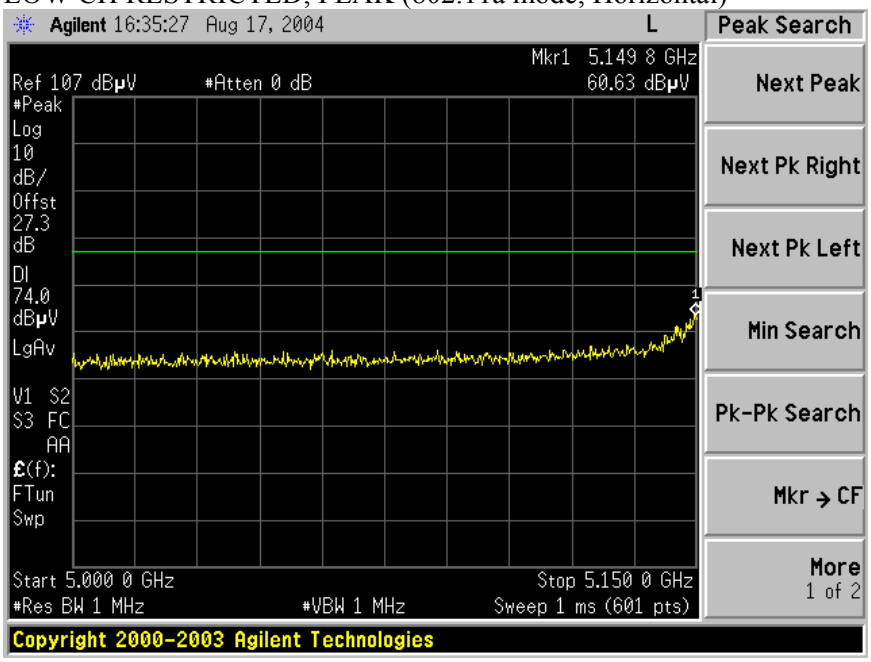
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5180															
15.540	9.8	54.7	41.5	39.5	6.1	-45.5	0.0	1.0	55.8	42.6	74.0	54.0	-18.2	-11.4	V
15.540	9.8	54.9	41.6	39.5	6.1	-45.5	0.0	1.0	56.0	42.7	74.0	54.0	-18.0	-11.3	H
CH 5260															
10.520	9.8	55.7	43.6	37.9	4.8	-41.4	0.0	1.5	58.5	46.4	74.0	54.0	-15.5	-7.6	V
10.520	9.8	54.8	43.0	37.9	4.8	-41.4	0.0	1.5	57.6	45.8	74.0	54.0	-16.4	-8.2	H
15.780	9.8	49.0	37.1	39.0	6.2	-45.6	0.0	1.5	50.0	38.1	74.0	54.0	-24.0	-15.9	V
15.780	9.8	48.7	36.6	39.0	6.2	-45.6	0.0	1.5	49.7	37.6	74.0	54.0	-24.3	-16.4	H
CH 5320															
4.550	9.8	58.7	57.2	32.9	2.9	-44.5	0.0	1.5	51.5	50.0	74.0	54.0	-22.5	-4.0	V
4.550	9.8	53.8	51.2	32.9	2.9	-44.5	0.0	1.5	46.6	44.0	74.0	54.0	-27.4	-10.0	H
10.640	9.8	49.7	37.5	38.0	4.8	-41.3	0.0	1.5	52.7	40.5	74.0	54.0	-21.3	-13.5	V
15.960	9.8	47.4	35.6	38.6	6.2	-45.7	0.0	1.5	48.0	36.2	74.0	54.0	-26.0	-17.8	V
10.640	9.8	48.8	36.5	38.0	4.8	-41.3	0.0	1.5	51.8	39.5	74.0	54.0	-22.2	-14.5	H
15.960	9.8	46.2	34.7	38.6	6.2	-45.7	0.0	1.5	46.8	35.3	74.0	54.0	-27.2	-18.7	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

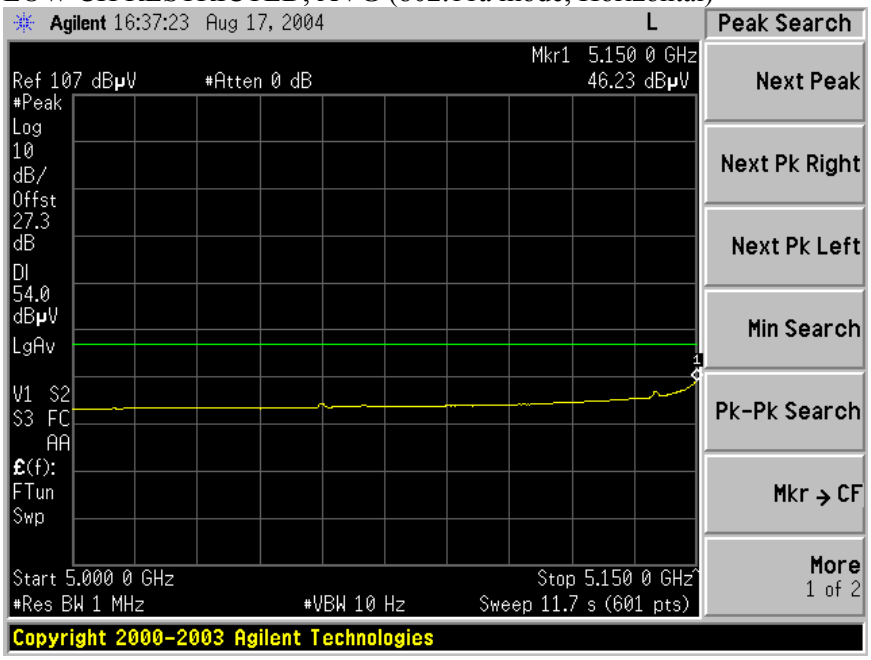
7.8.6. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND WITH 4.5 dBi EXTERNAL ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

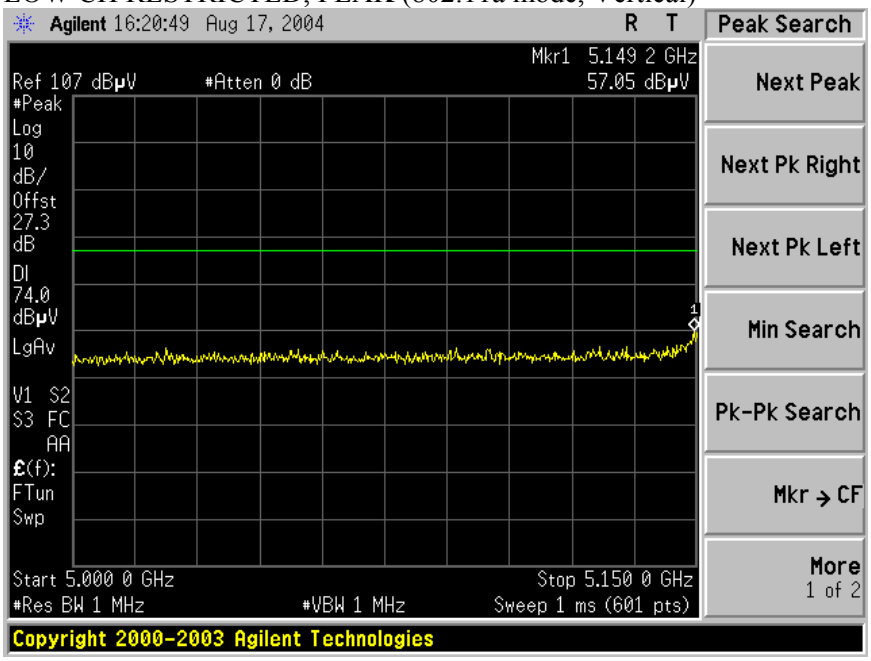


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

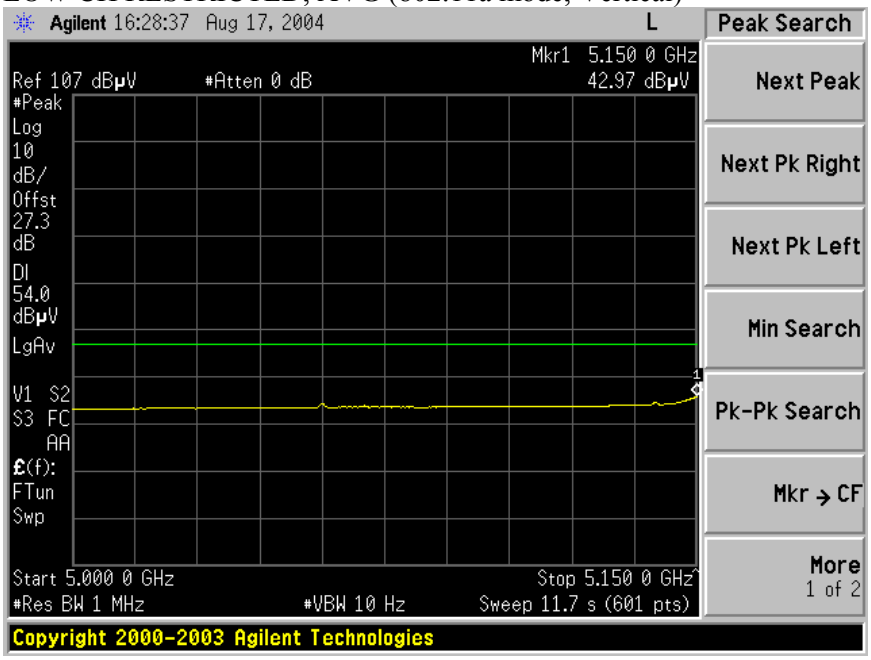


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

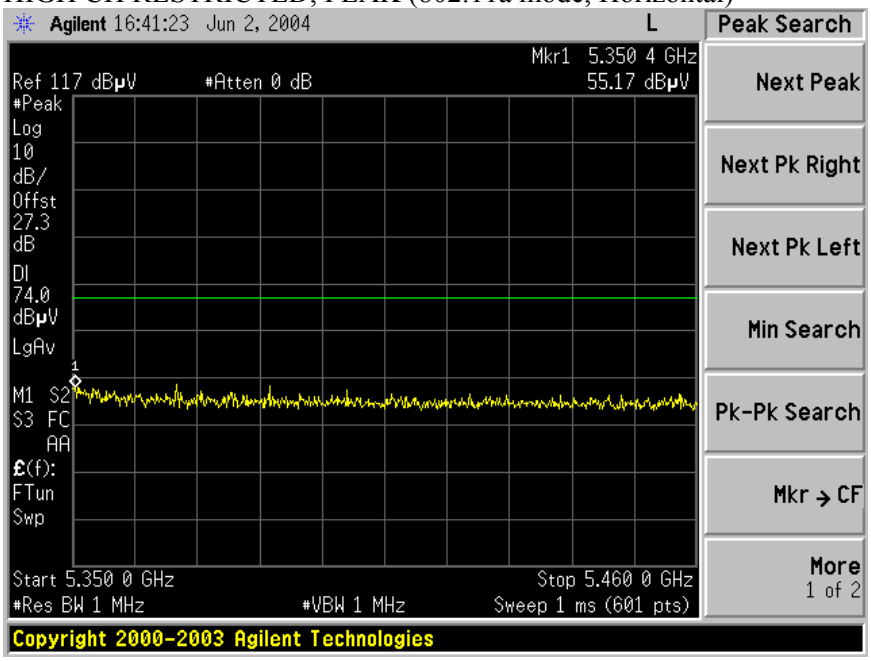


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

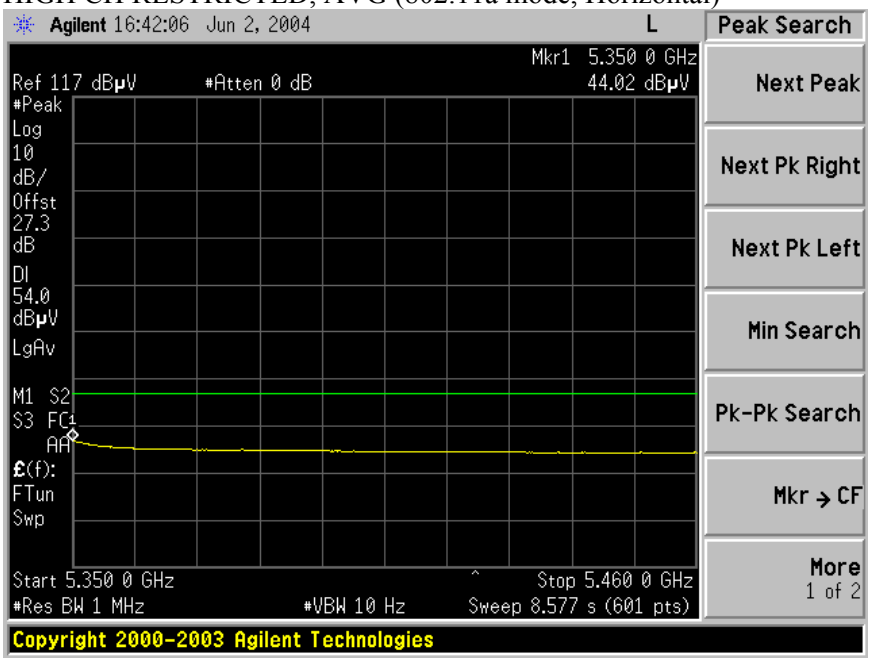


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

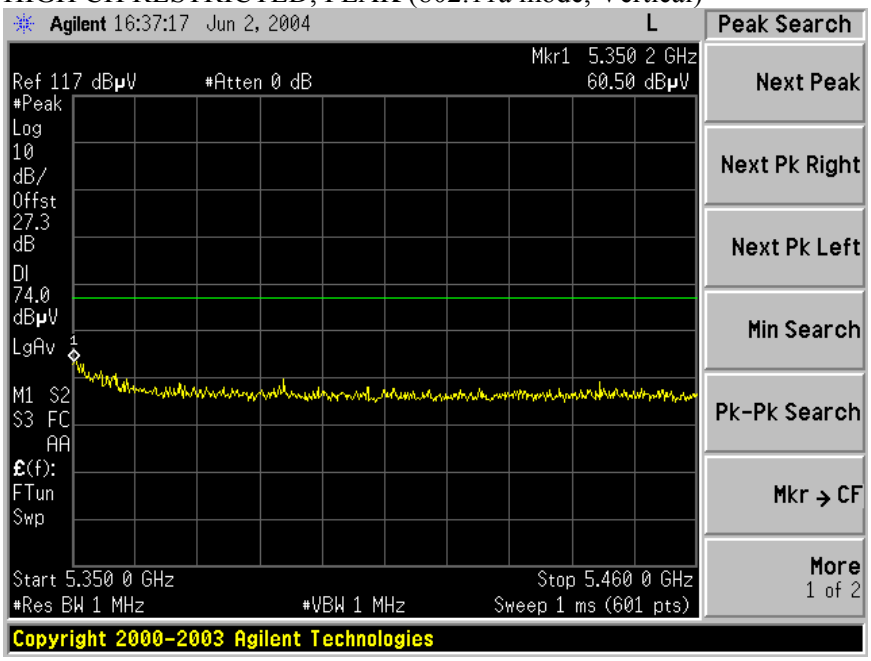


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

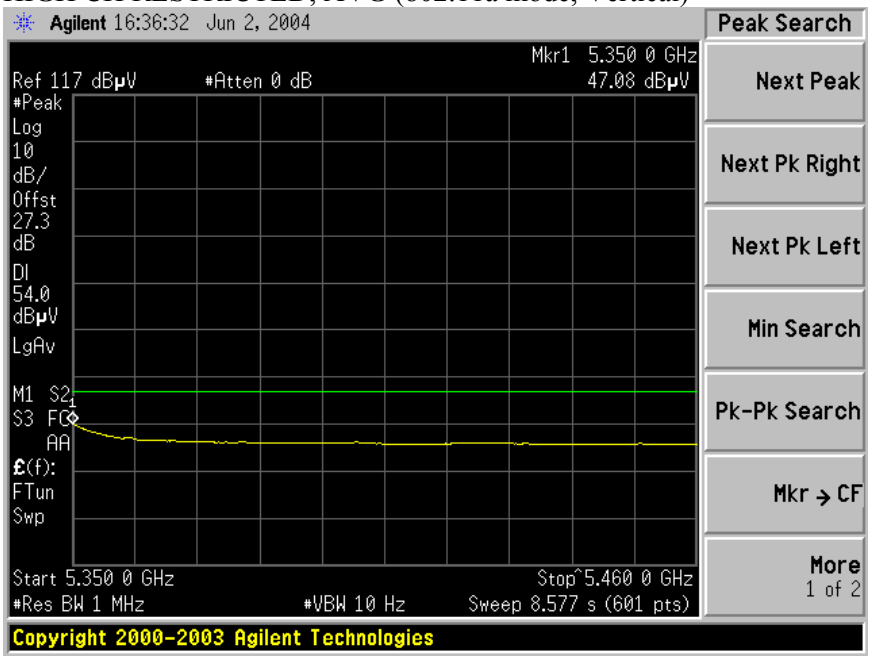


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 4.5dBi OMNI ANTENNA

06/04/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 4.5dBi Omni Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.2 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.209

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth

Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

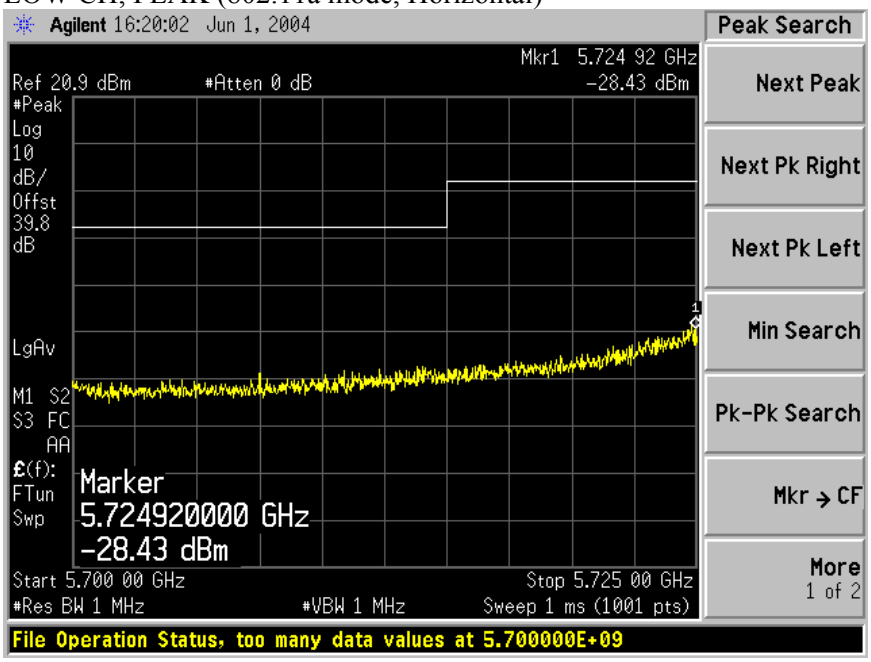
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5180															
15.540	9.8	54.5	41.6	39.5	6.1	-45.5	0.0	1.0	55.6	42.7	74.0	54.0	-18.4	-11.3	V
15.540	9.8	52.0	41.4	39.5	6.1	-45.5	0.0	1.0	53.1	42.5	74.0	54.0	-20.9	-11.5	H
CH 5260															
10.520	9.8	48.2	36.0	37.9	4.8	-41.4	0.0	1.5	51.0	38.8	74.0	54.0	-23.0	-15.2	V
10.520	9.8	47.7	35.5	37.9	4.8	-41.4	0.0	1.5	50.5	38.3	74.0	54.0	-23.5	-15.7	H
15.780	9.8	54.9	42.8	39.0	6.2	-45.6	0.0	1.5	55.9	43.8	74.0	54.0	-18.1	-10.2	V
15.780	9.8	53.3	41.9	39.0	6.2	-45.6	0.0	1.5	54.3	42.9	74.0	54.0	-19.7	-11.1	H
CH 5320															
4.550	9.8	57.5	56.5	32.9	2.9	-44.5	0.0	1.5	50.3	49.3	74.0	54.0	-23.7	-4.7	V
4.550	9.8	55.6	54.4	32.9	2.9	-44.5	0.0	1.5	48.4	47.2	74.0	54.0	-25.6	-6.8	H
10.640	9.8	48.4	36.2	38.0	4.8	-41.3	0.0	1.5	51.4	39.2	74.0	54.0	-22.6	-14.8	V
15.960	9.8	54.4	42.4	38.6	6.2	-45.7	0.0	1.5	55.0	43.0	74.0	54.0	-19.0	-11.0	V
10.640	9.8	48.0	35.8	38.0	4.8	-41.3	0.0	1.5	51.0	38.8	74.0	54.0	-23.0	-15.2	H
15.960	9.8	52.9	41.5	38.6	6.2	-45.7	0.0	1.5	53.5	42.1	74.0	54.0	-20.5	-11.9	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

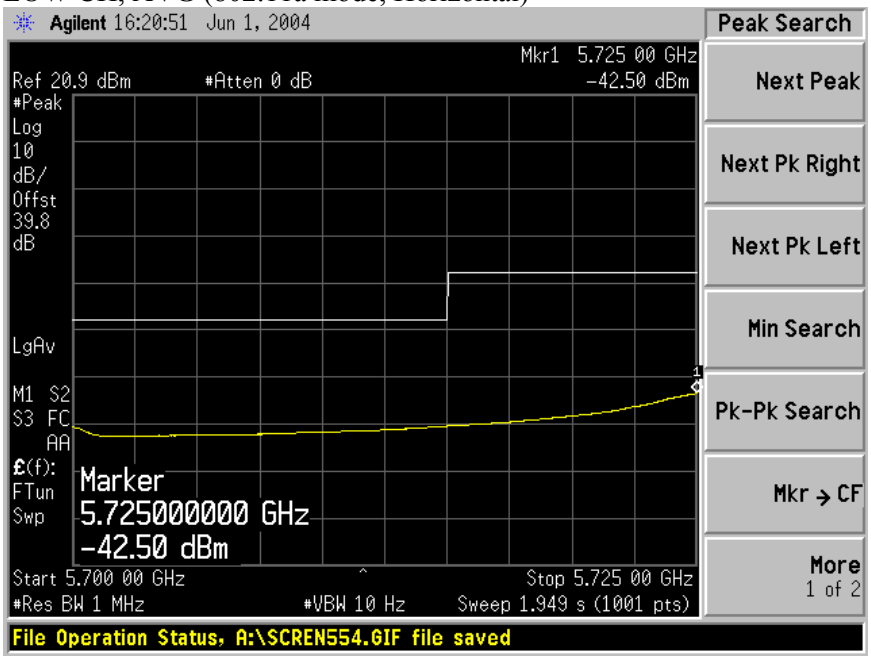
7.8.7. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5725 TO 5825 MHz BAND WITH 9 dBi INTEGRAL ANTENNA

BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH, PEAK (802.11a mode, Horizontal)

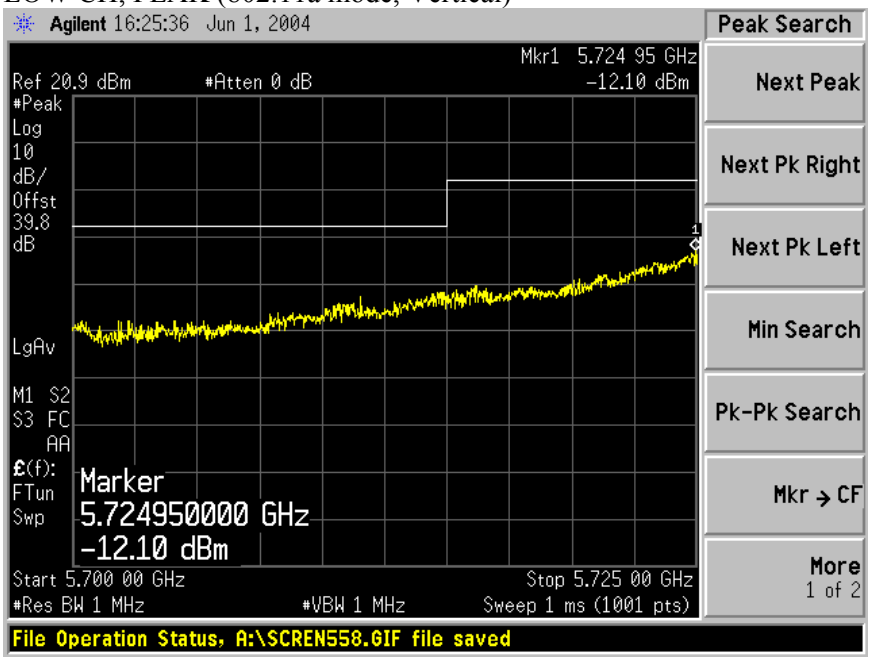


LOW CH, AVG (802.11a mode, Horizontal)

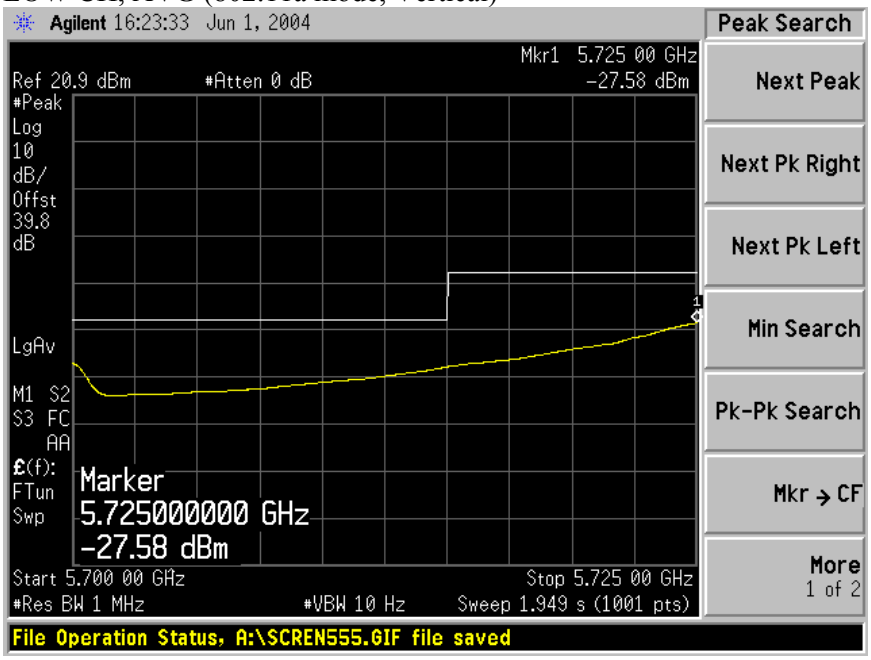


BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH, PEAK (802.11a mode, Vertical)

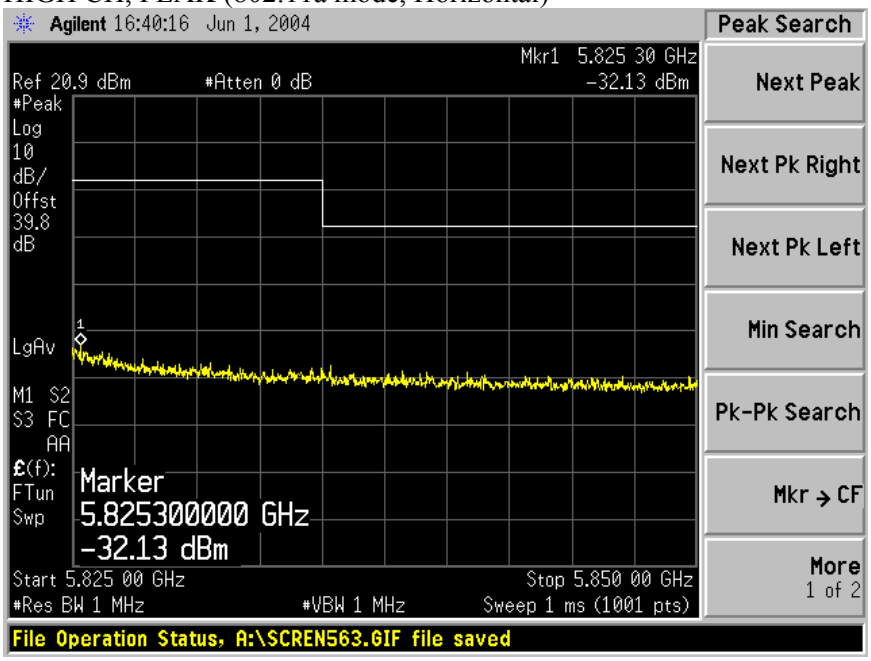


LOW CH, AVG (802.11a mode, Vertical)

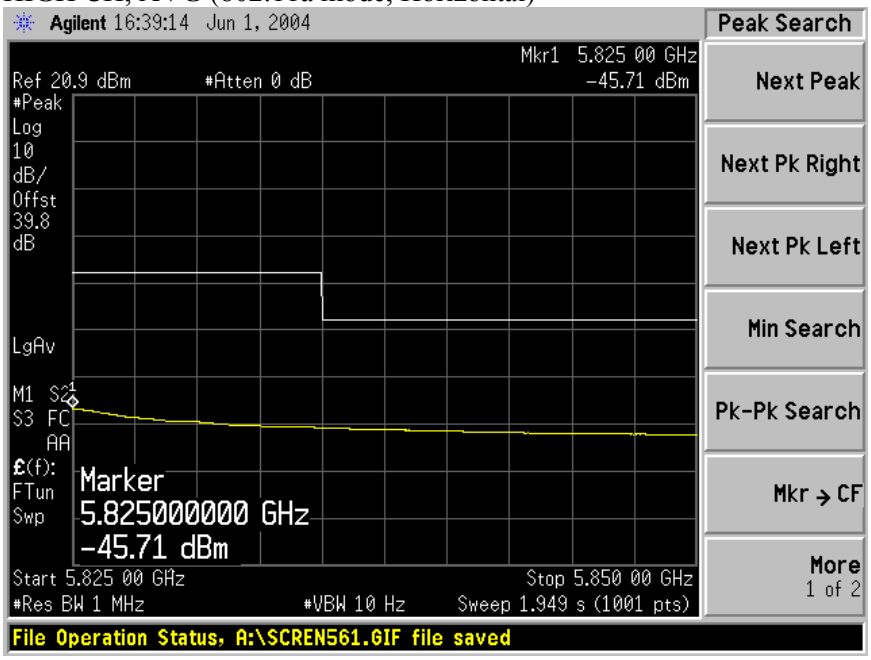


BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH, PEAK (802.11a mode, Horizontal)

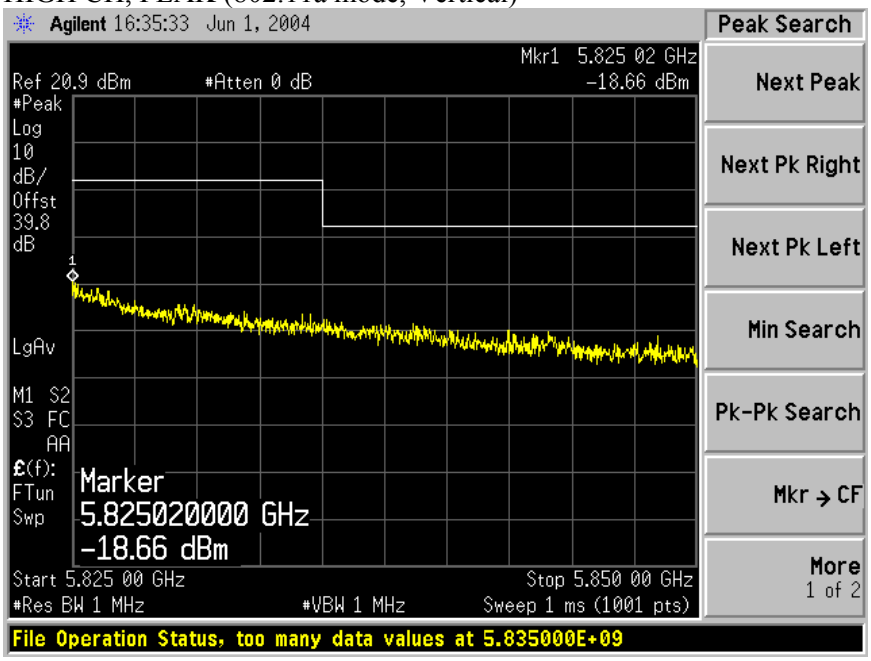


HIGH CH, AVG (802.11a mode, Horizontal)

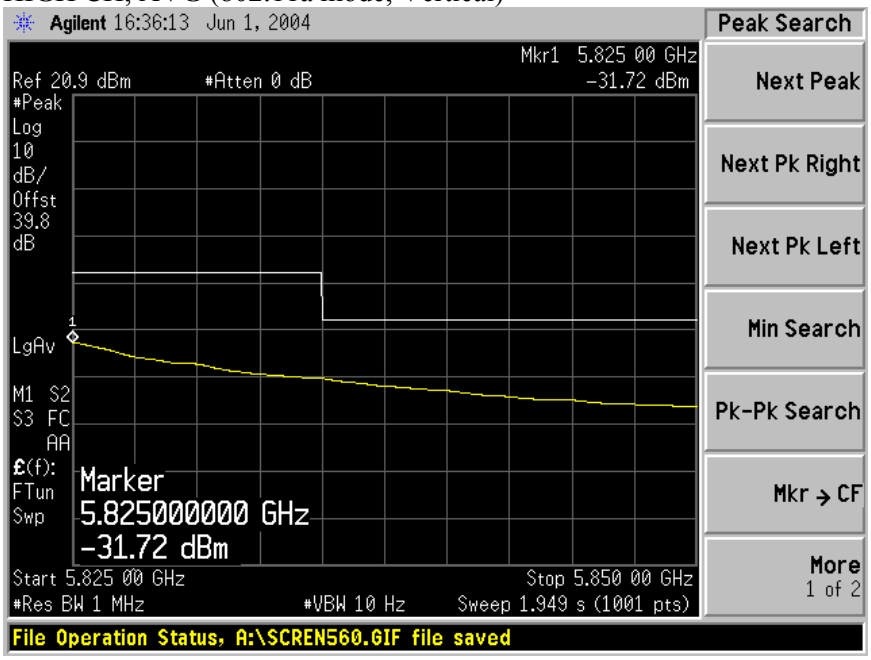


BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH, PEAK (802.11a mode, Vertical)



HIGH CH, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 9dBi PATCH ANTENNA

06/03/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 9dBi Patch Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.8 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth

Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

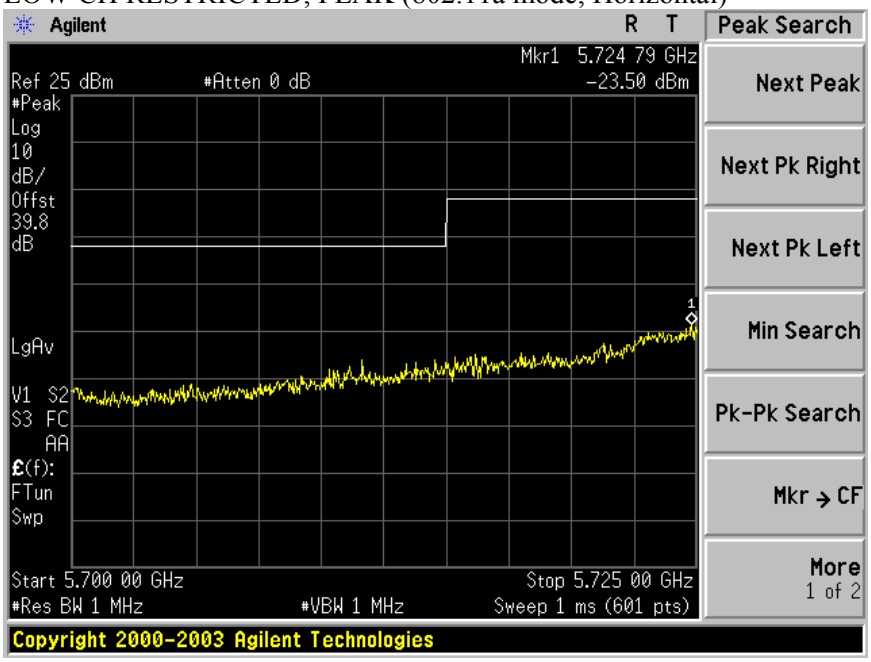
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5745															
4.343	9.8	59.4	58.4	32.8	2.8	-44.3	0.0	1.5	52.2	51.2	74.0	54.0	-21.8	-2.8	V
4.343	9.8	57.8	56.8	32.8	2.8	-44.3	0.0	1.5	50.6	49.6	74.0	54.0	-23.4	-4.4	H
11.490	9.8	48.0	36.2	38.7	5.1	-41.5	0.0	1.5	51.8	40.0	74.0	54.0	-22.2	-14.0	V
11.490	9.8	49.6	36.8	38.7	5.1	-41.5	0.0	1.5	53.4	40.6	74.0	54.0	-20.6	-13.4	H
CH 5785															
4.357	9.8	61.9	61.1	32.8	2.8	-44.3	0.0	1.5	54.7	53.9	74.0	54.0	-19.3	-0.1	V
4.357	9.8	58.1	56.9	32.8	2.8	-44.3	0.0	1.5	50.9	49.7	74.0	54.0	-23.1	-4.3	H
11.570	9.8	46.6	33.9	38.8	5.1	-41.6	0.0	1.5	50.4	37.7	74.0	54.0	-23.6	-16.3	V
11.570	9.8	45.8	33.2	38.8	5.1	-41.6	0.0	1.5	49.6	37.0	74.0	54.0	-24.4	-17.0	H
CH 5805															
4.383	9.8	58.4	56.9	32.8	2.8	-44.3	0.0	1.5	51.2	49.7	74.0	54.0	-22.8	-4.3	V
4.383	9.8	58.8	57.2	32.8	2.8	-44.3	0.0	1.5	51.6	50.0	74.0	54.0	-22.4	-4.0	H
11.610	9.8	46.2	34.5	38.8	5.2	-41.6	0.0	1.5	50.0	38.3	74.0	54.0	-24.0	-15.7	V
11.610	9.8	48.0	36.9	38.8	5.2	-41.6	0.0	1.5	51.8	40.7	74.0	54.0	-22.2	-13.3	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

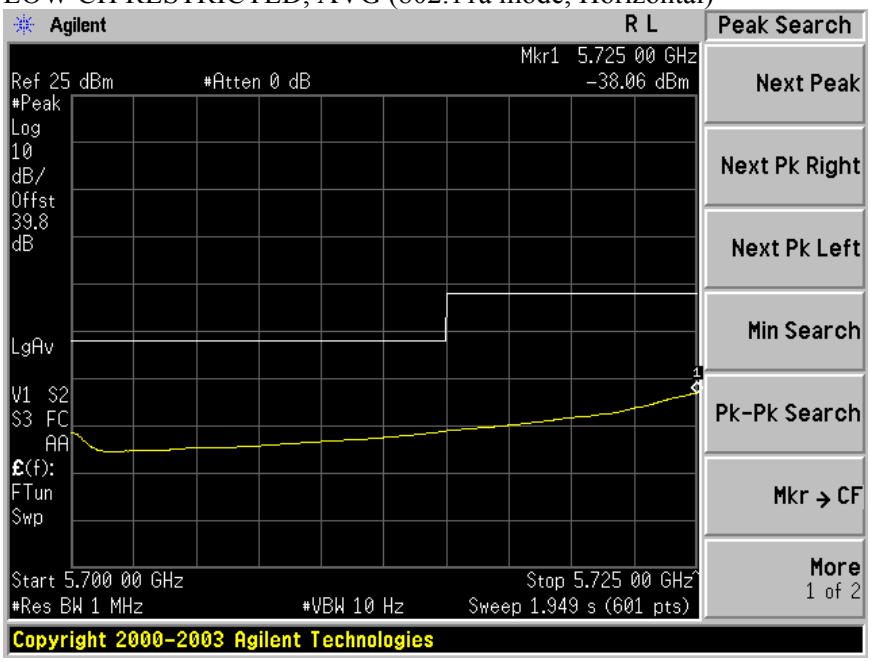
7.8.8. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5725 TO 5825 MHz BAND WITH 9.5 dBi EXTERNAL ANTENNA

RESTRICTED BAND & BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

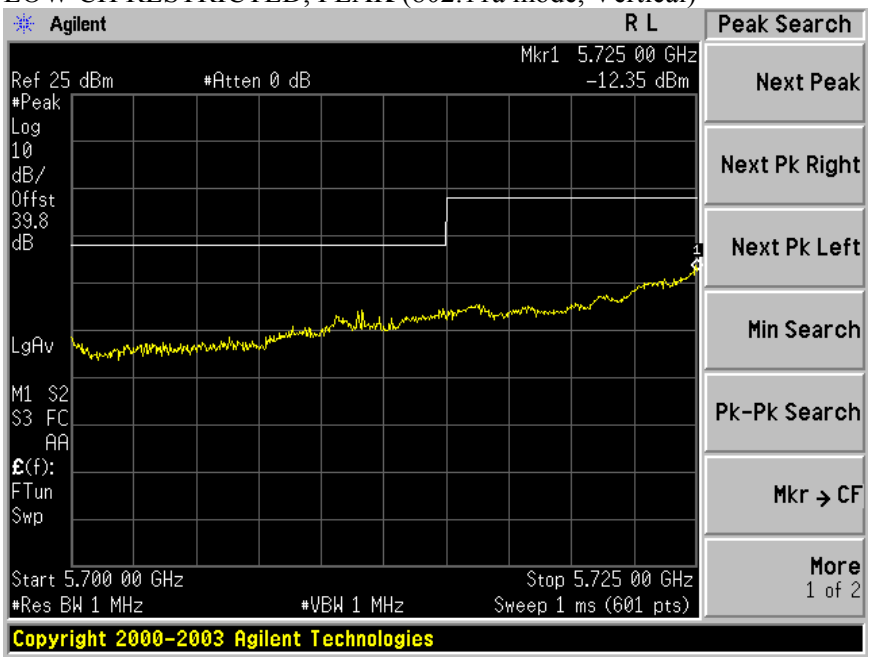


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

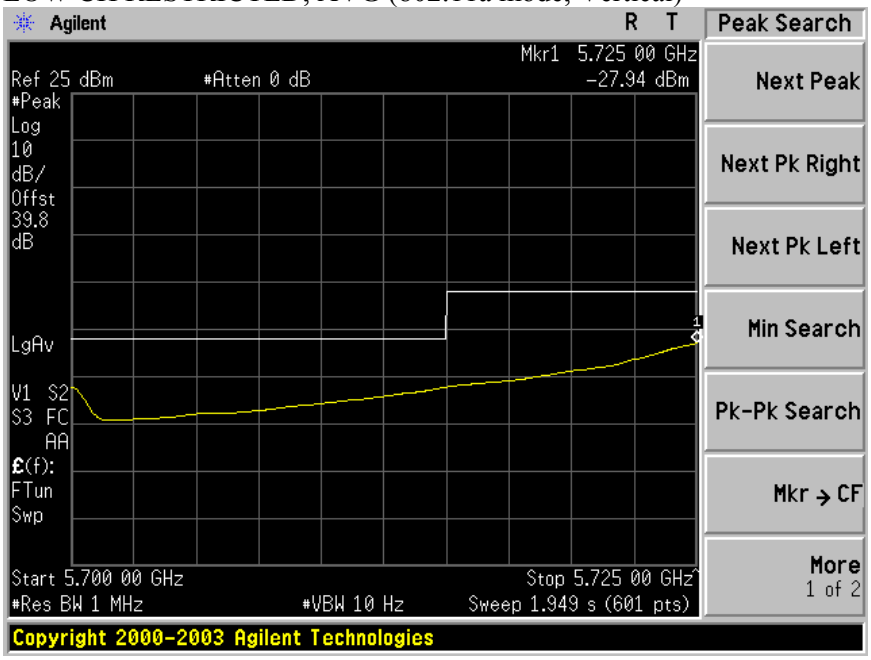


RESTRICTED BAND & BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

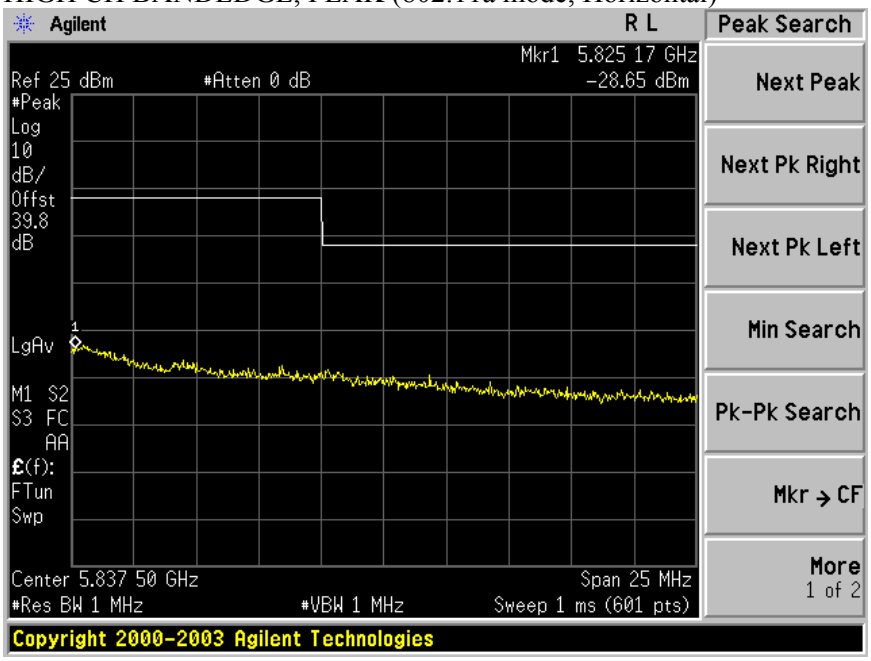


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

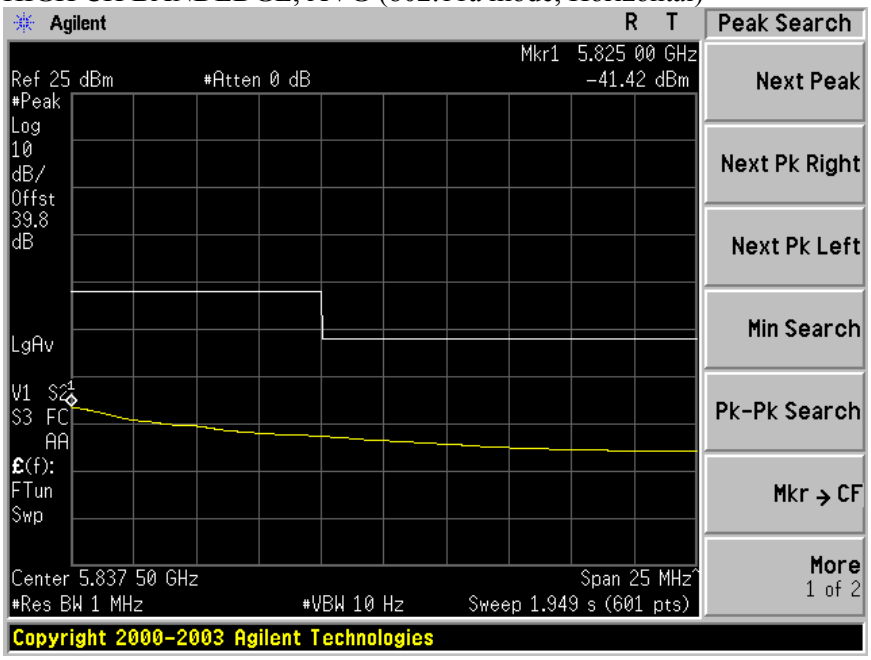


BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH BANDEDGE, PEAK (802.11a mode, Horizontal)

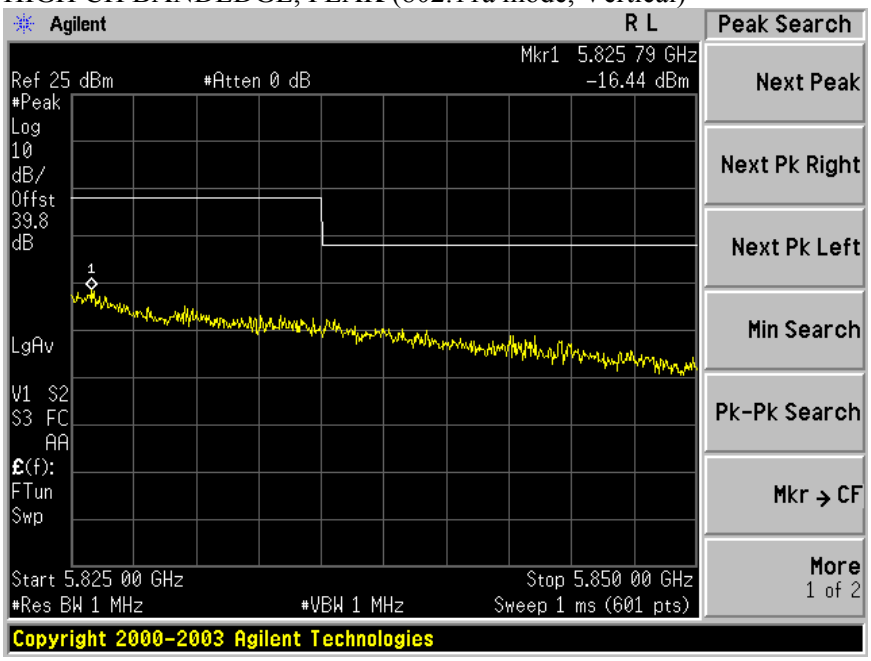


HIGH CH BANDEDGE, AVG (802.11a mode, Horizontal)

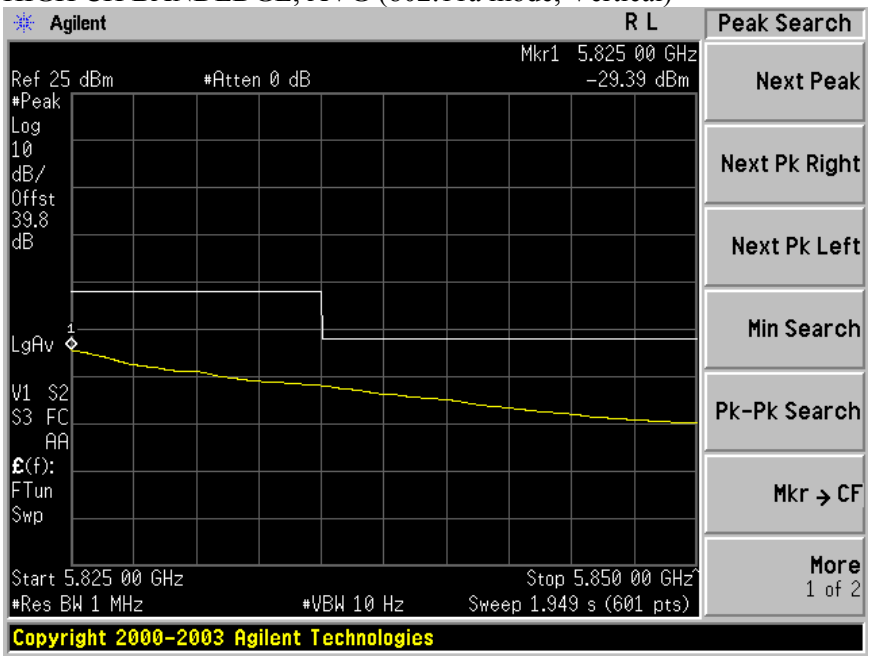


BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH BANDEDGE, PEAK (802.11a mode, Vertical)



HIGH CH BANDEDGE, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 9.5dBi EXTERNAL ANTENNA

08/02/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:Chin Pang
Project #:04u2586
Company:Cisco
EUT Descrip.:Kodiak RM22AQ 802.11a Cardbus radio module with 9.5dBi antenna
EUT M/N:AIR-RM22A-K9 in AP1200 Access Point
Test Target:FCC UNNI
Mode Oper:Tx

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

5.8GHz band

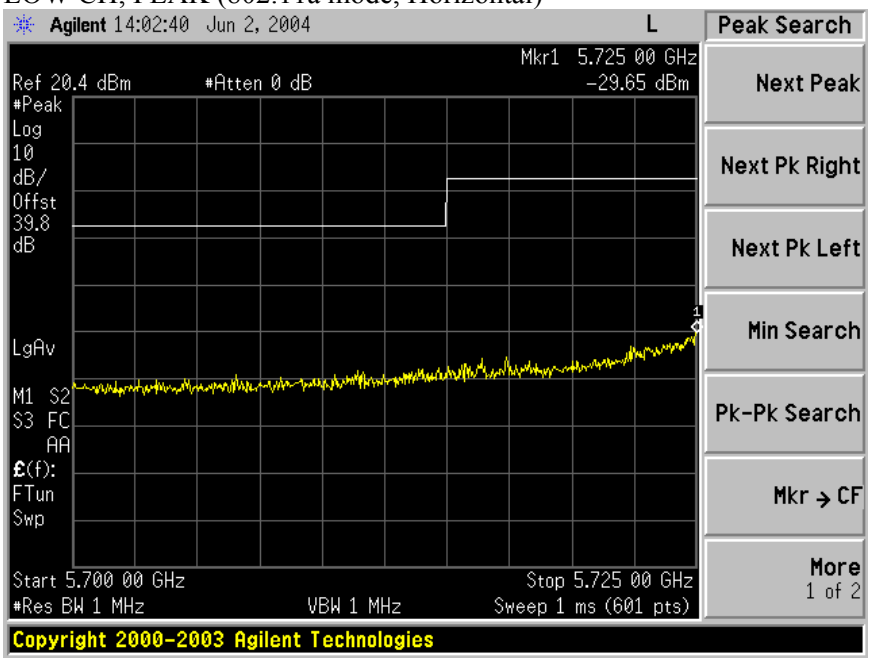
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
low ch, 5745MHz															
4.343	9.8	56.0	53.5	32.8	2.7	-44.3	0.0	0.0	47.2	44.7	74.0	54.0	-26.8	-9.3	V
11.490	9.8	46.8	34.7	38.7	4.9	-41.5	0.0	1.0	49.8	37.7	74.0	54.0	-24.2	-16.3	V
4.343	9.8	56.3	54.0	32.8	2.7	-44.3	0.0	0.0	47.5	45.2	74.0	54.0	-26.5	-8.8	H
11.490	9.8	46.5	33.2	38.7	4.9	-41.5	0.0	1.0	49.5	36.2	74.0	54.0	-24.5	-17.8	H
mid ch, 5765MHz															
4.357	9.8	56.5	55.4	32.8	2.7	-44.3	0.0	0.0	47.7	46.6	74.0	54.0	-26.3	-7.4	V
11.530	9.8	45.7	33.1	38.7	4.9	-41.5	0.0	1.0	48.7	36.1	74.0	54.0	-25.3	-17.9	V
4.357	9.8	58.4	56.4	32.8	2.7	-44.3	0.0	0.0	49.6	47.6	74.0	54.0	-24.4	-6.4	H
11.530	9.8	46.5	34.0	38.7	4.9	-41.5	0.0	1.0	49.5	37.0	74.0	54.0	-24.5	-17.0	H
high ch, 5805MHz															
4.383	9.8	55.7	53.2	32.9	2.7	-44.3	0.0	0.0	46.9	44.4	74.0	54.0	-27.1	-9.6	V
11.610	9.8	45.0	33.0	38.8	4.9	-41.6	0.0	1.0	48.0	36.0	74.0	54.0	-26.0	-18.0	V
4.383	9.8	58.0	57.1	32.9	2.7	-44.3	0.0	0.0	49.2	48.3	74.0	54.0	-24.8	-5.7	H
11.610	9.8	46.1	33.5	38.8	4.9	-41.6	0.0	1.0	49.1	36.5	74.0	54.0	-24.9	-17.5	H
Note: No other emissions were detected above thr system noise floor.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

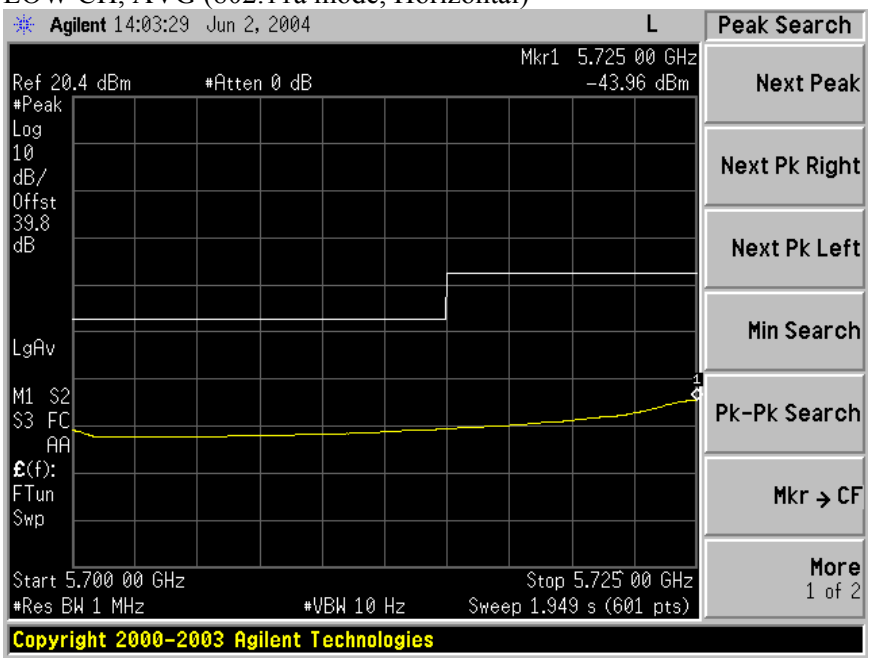
7.8.9. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5725 TO 5825 MHz BAND WITH 7 dBi EXTERNAL ANTENNA

BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH, PEAK (802.11a mode, Horizontal)

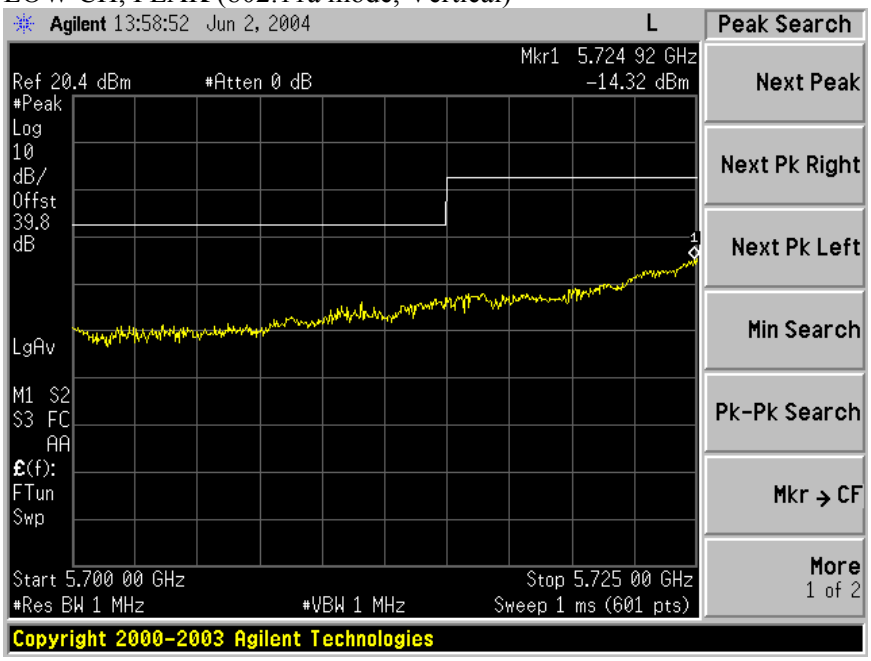


LOW CH, AVG (802.11a mode, Horizontal)

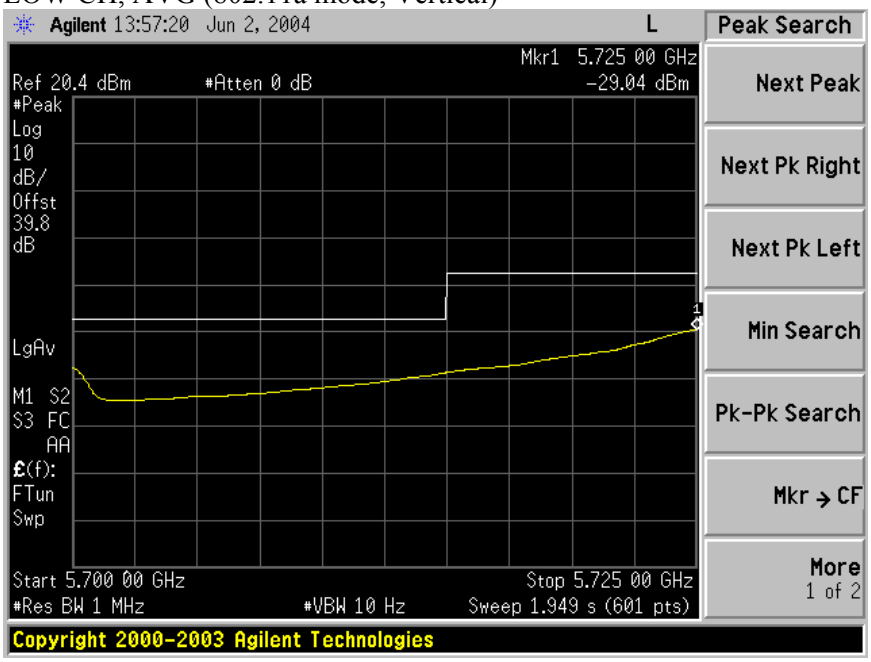


BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH, PEAK (802.11a mode, Vertical)

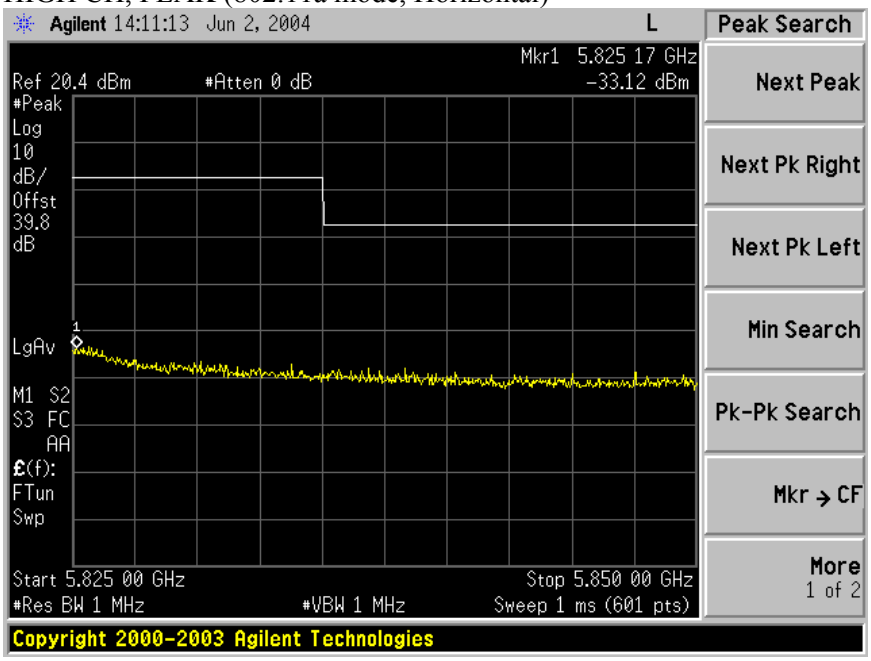


LOW CH, AVG (802.11a mode, Vertical)

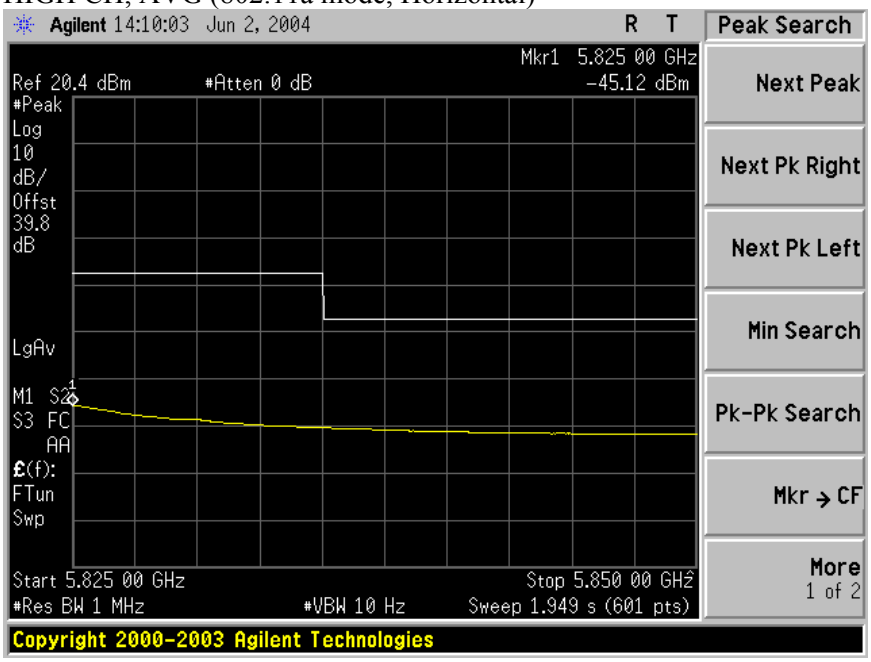


BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH, PEAK (802.11a mode, Horizontal)

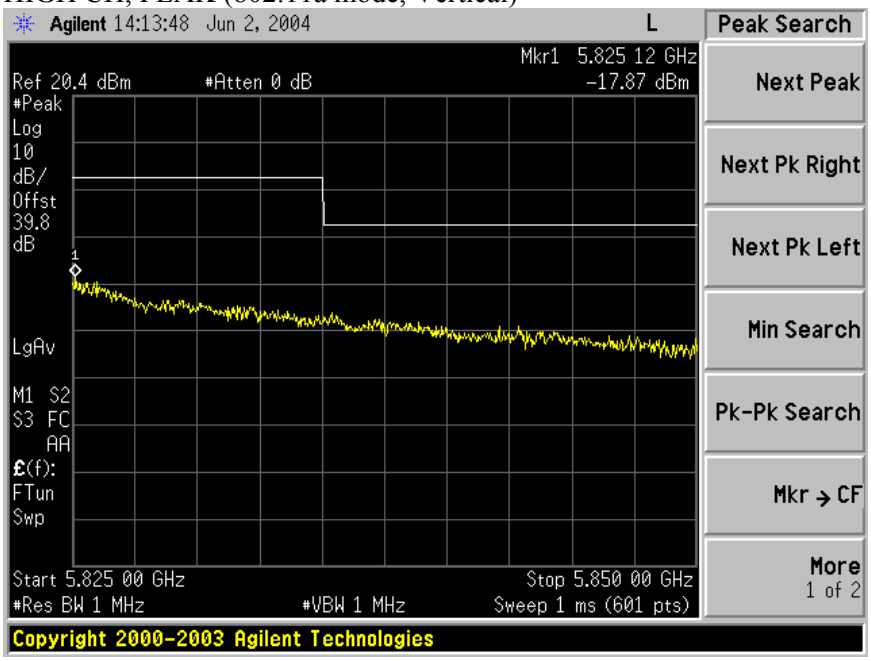


HIGH CH, AVG (802.11a mode, Horizontal)

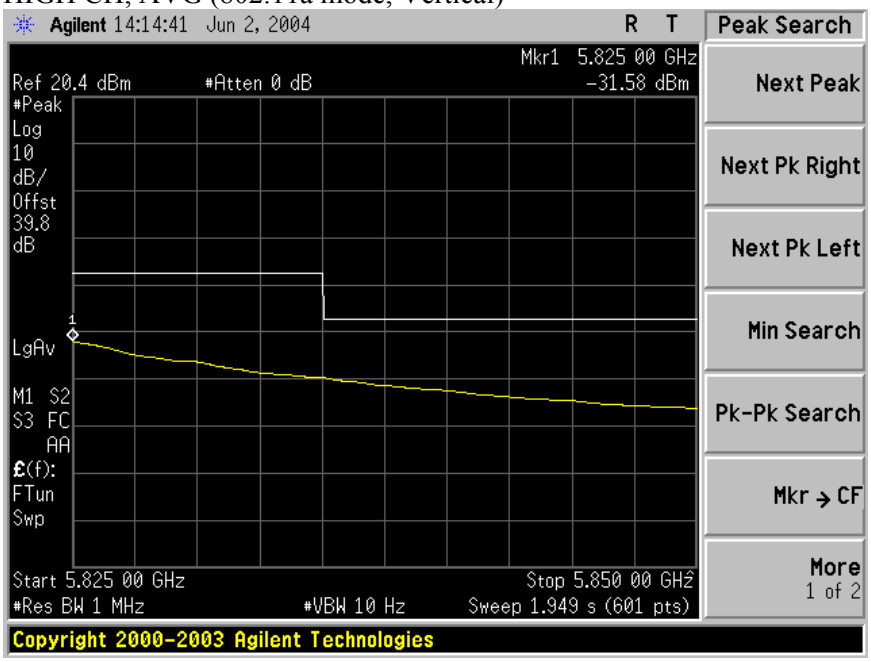


BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH, PEAK (802.11a mode, Vertical)



HIGH CH, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 7dBi PATCH ANTENNA

06/04/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 7dBi Patch Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.8 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

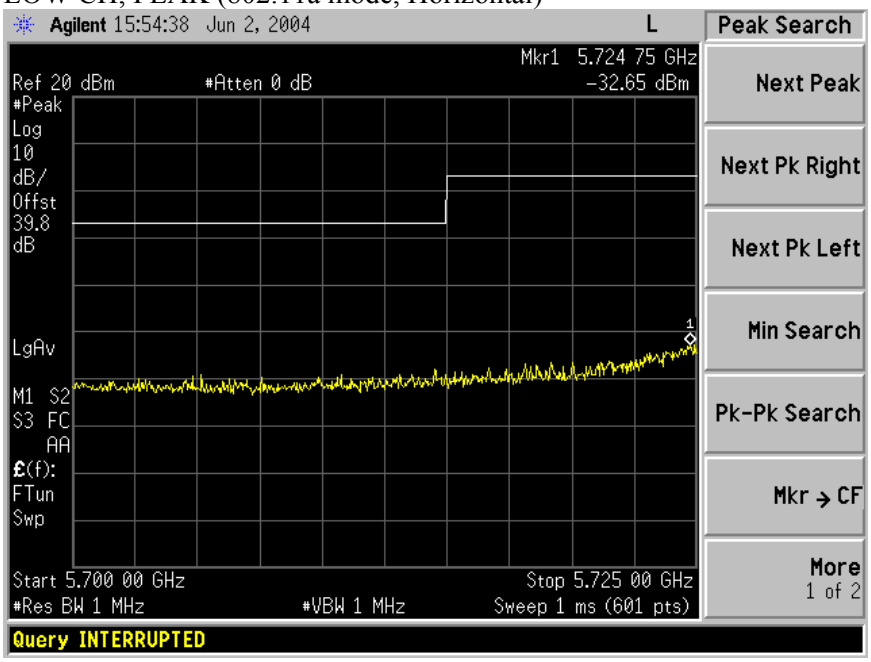
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5745															
4.343	9.8	59.4	58.1	32.8	2.8	-44.3	0.0	1.5	52.2	50.9	74.0	54.0	-21.8	-3.1	V
4.343	9.8	55.7	53.9	32.8	2.8	-44.3	0.0	1.5	48.5	46.7	74.0	54.0	-25.5	-7.3	H
11.490	9.8	47.6	35.7	38.7	5.1	-41.5	0.0	1.5	51.4	39.5	74.0	54.0	-22.6	-14.5	V
11.490	9.8	47.4	35.1	38.7	5.1	-41.5	0.0	1.5	51.2	38.9	74.0	54.0	-22.8	-15.1	H
CH 5785															
4.357	9.8	59.6	58.5	32.8	2.8	-44.3	0.0	1.5	52.4	51.3	74.0	54.0	-21.6	-2.7	V
4.357	9.8	54.9	52.6	32.8	2.8	-44.3	0.0	1.5	47.7	45.4	74.0	54.0	-26.3	-8.6	H
11.570	9.8	47.2	34.8	38.8	5.1	-41.6	0.0	1.5	51.0	38.6	74.0	54.0	-23.0	-15.4	V
11.570	9.8	46.9	34.5	38.8	5.1	-41.6	0.0	1.5	50.7	38.3	74.0	54.0	-23.3	-15.7	H
CH 5805															
4.383	9.8	59.5	58.4	32.8	2.8	-44.3	0.0	1.5	52.3	51.2	74.0	54.0	-21.7	-2.8	V
4.383	9.8	55.9	54.2	32.8	2.8	-44.3	0.0	1.5	48.7	47.0	74.0	54.0	-25.3	-7.0	H
11.610	9.8	47.3	35.4	38.8	5.2	-41.6	0.0	1.5	51.1	39.2	74.0	54.0	-22.9	-14.8	V
11.610	9.8	47.0	35.2	38.8	5.2	-41.6	0.0	1.5	50.8	39.0	74.0	54.0	-23.2	-15.0	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

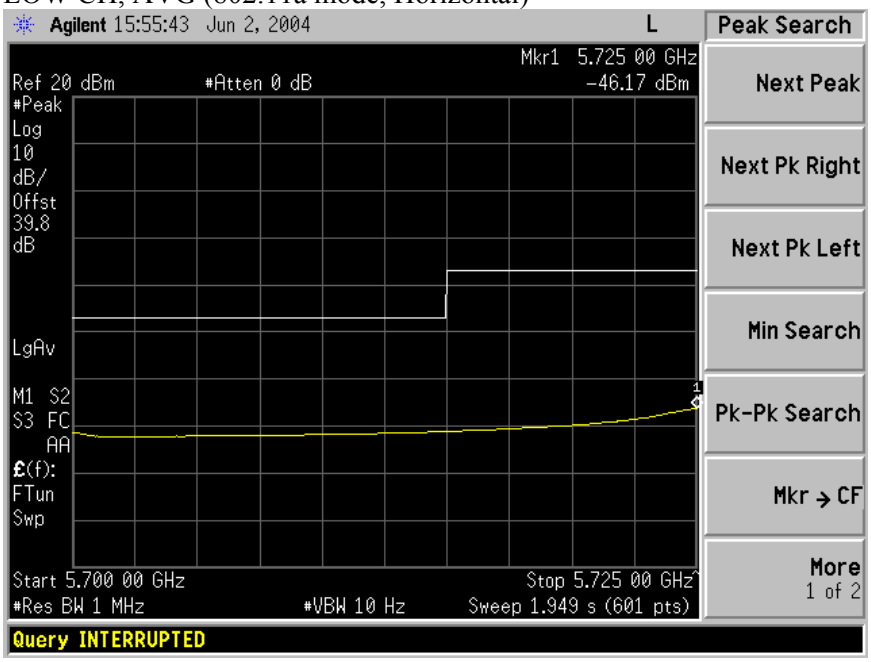
7.8.10. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5725 TO 5825 MHz BAND WITH 6 dBi EXTERNAL ANTENNA

BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH, PEAK (802.11a mode, Horizontal)

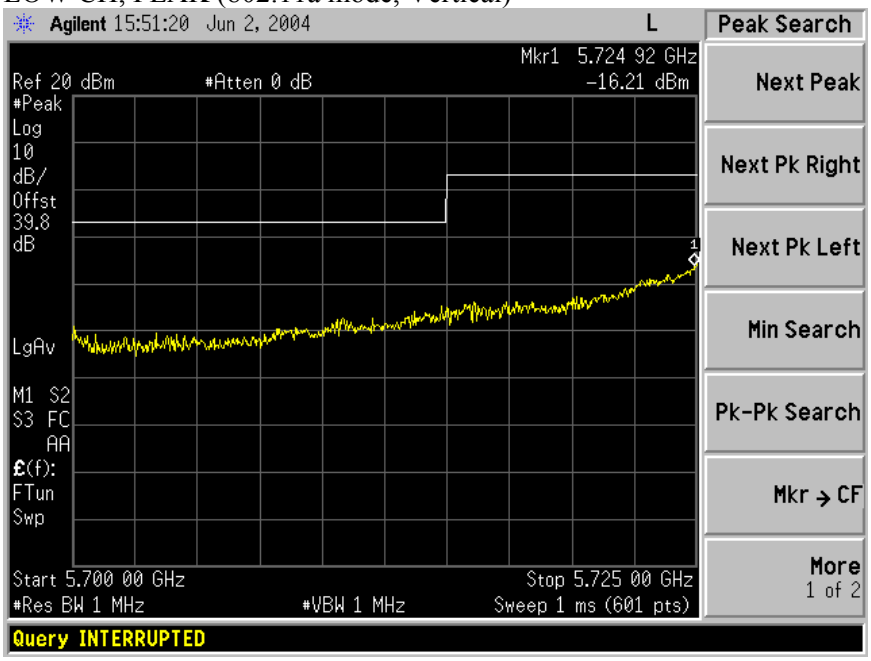


LOW CH, AVG (802.11a mode, Horizontal)

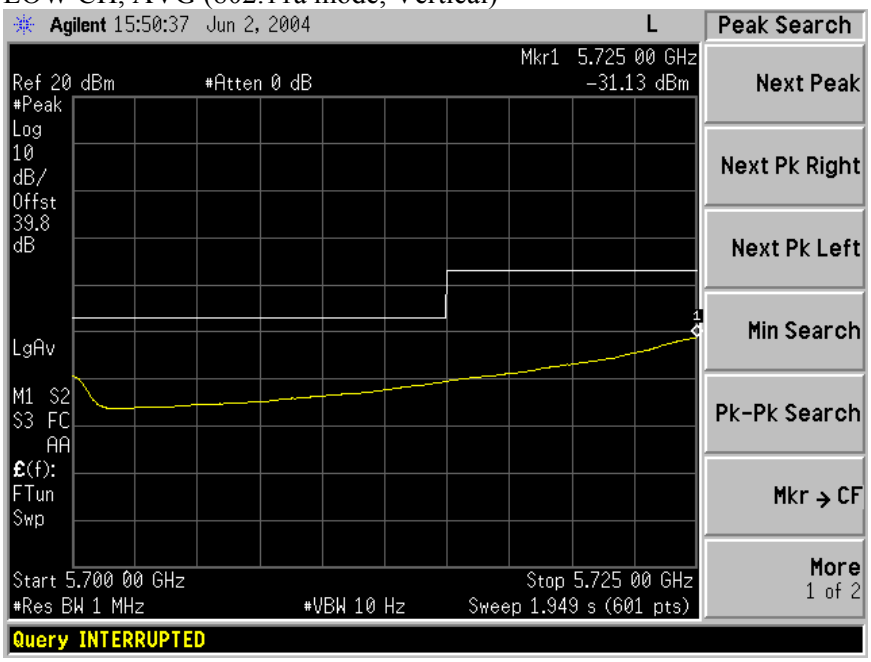


BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH, PEAK (802.11a mode, Vertical)

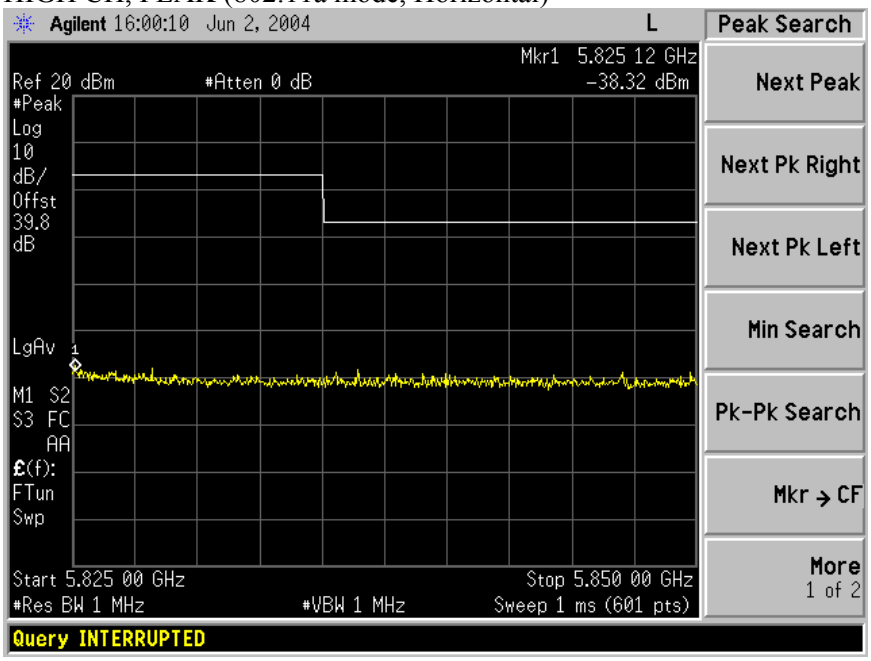


LOW CH, AVG (802.11a mode, Vertical)

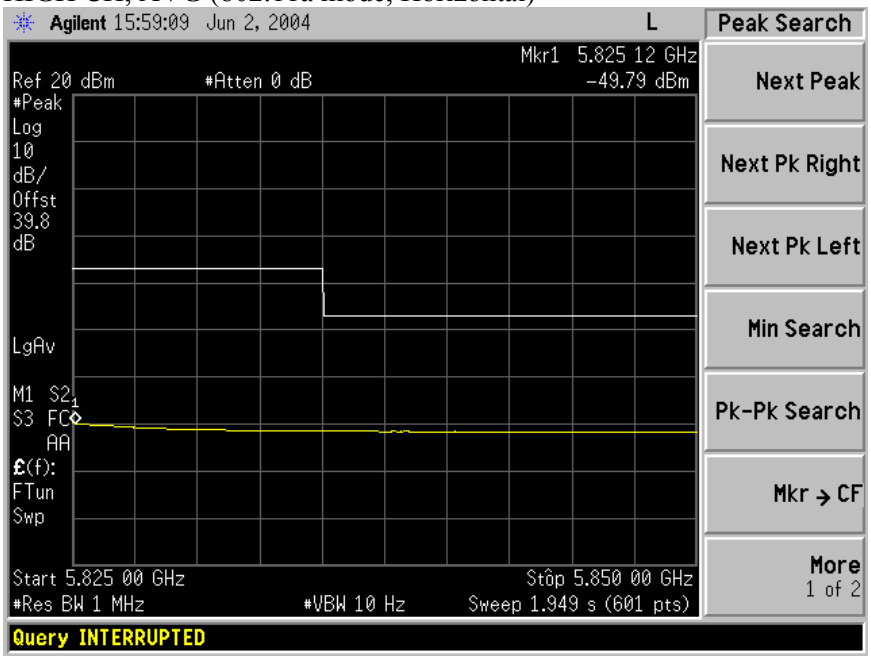


BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH, PEAK (802.11a mode, Horizontal)

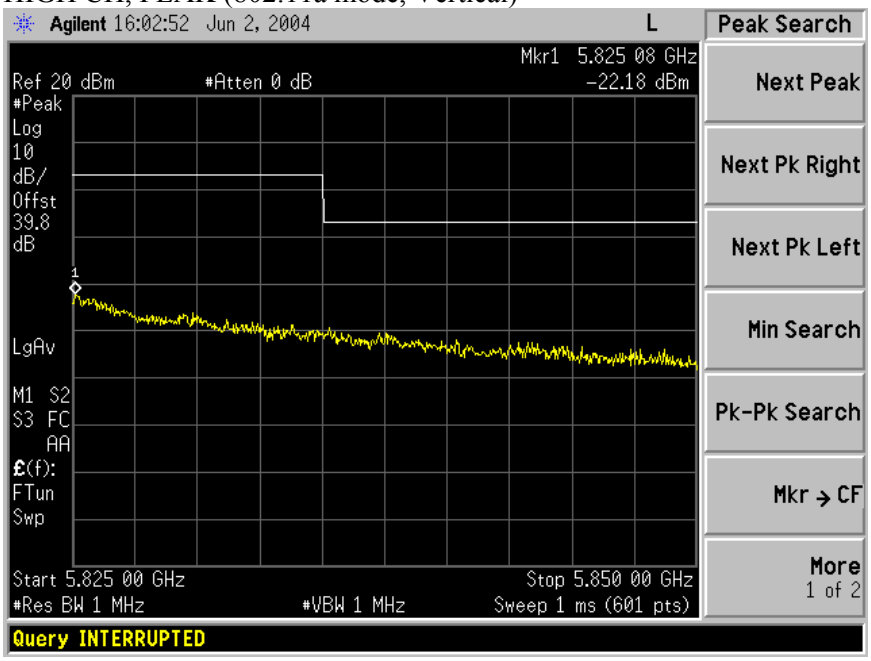


HIGH CH, AVG (802.11a mode, Horizontal)

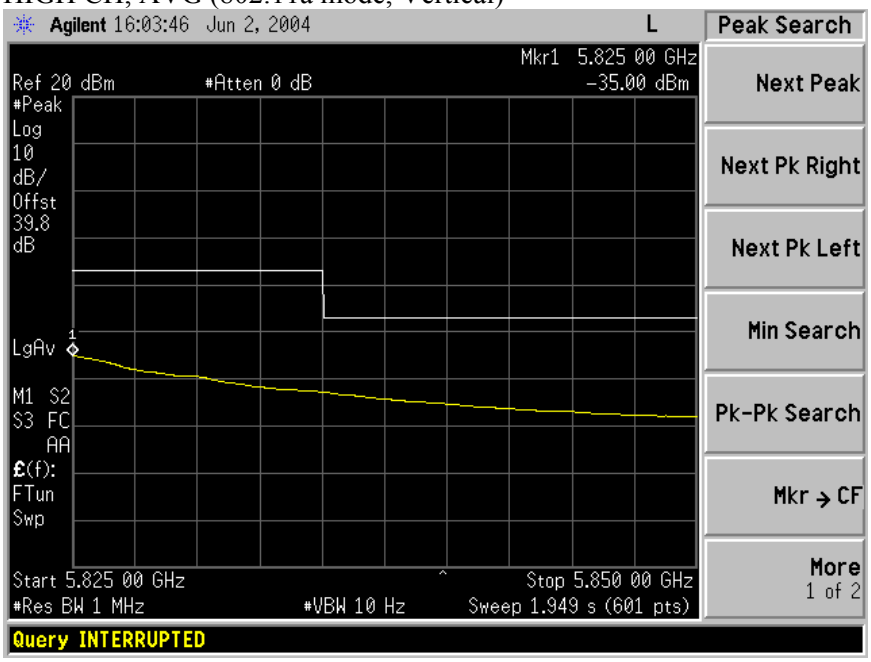


BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH, PEAK (802.11a mode, Vertical)



HIGH CH, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 6dBi OMNI ANTENNA

06/04/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 6dBi Omni Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.8 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth

Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

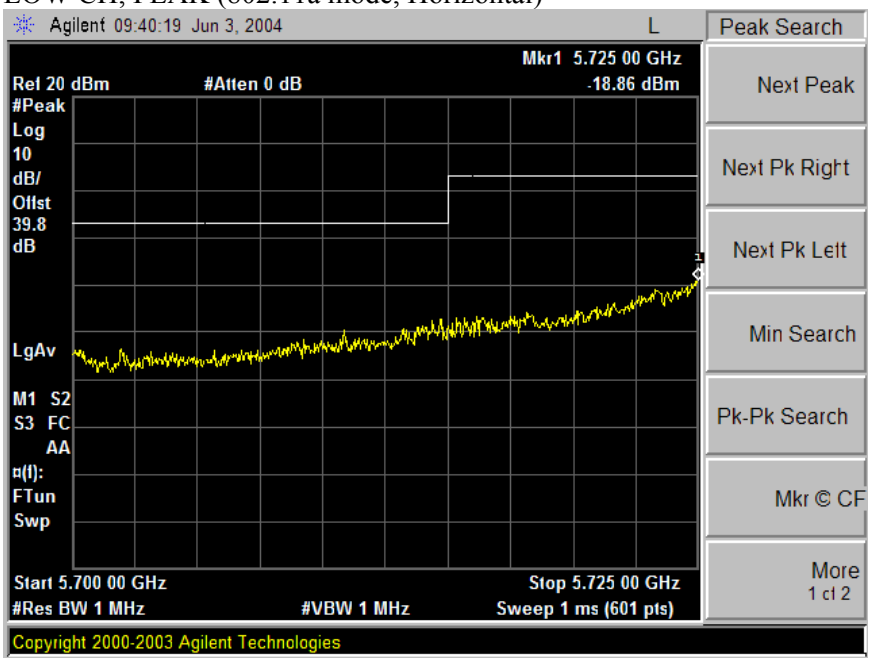
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5745															
4.343	9.8	59.7	58.7	32.8	2.8	-44.3	0.0	1.5	52.5	51.5	74.0	54.0	-21.5	-2.5	V
4.343	9.8	53.2	50.6	32.8	2.8	-44.3	0.0	1.5	46.0	43.4	74.0	54.0	-28.0	-10.6	H
11.490	9.8	45.3	33.5	38.7	5.1	-41.5	0.0	1.5	49.1	37.3	74.0	54.0	-24.9	-16.7	V
11.490	9.8	47.4	35.0	38.7	5.1	-41.5	0.0	1.5	51.2	38.8	74.0	54.0	-22.8	-15.2	H
CH 5785															
4.357	9.8	59.7	58.6	32.8	2.8	-44.3	0.0	1.5	52.5	51.4	74.0	54.0	-21.5	-2.6	V
4.357	9.8	53.4	50.5	32.8	2.8	-44.3	0.0	1.5	46.2	43.3	74.0	54.0	-27.8	-10.7	H
11.570	9.8	46.8	34.3	38.8	5.1	-41.6	0.0	1.5	50.6	38.1	74.0	54.0	-23.4	-15.9	V
11.570	9.8	47.2	34.5	38.8	5.1	-41.6	0.0	1.5	51.0	38.3	74.0	54.0	-23.0	-15.7	H
CH 5805															
4.383	9.8	59.1	57.7	32.8	2.8	-44.3	0.0	1.5	51.9	50.5	74.0	54.0	-22.1	-3.5	V
4.383	9.8	55.8	53.9	32.8	2.8	-44.3	0.0	1.5	48.6	46.7	74.0	54.0	-25.4	-7.3	H
11.610	9.8	48.0	35.2	38.8	5.2	-41.6	0.0	1.5	51.8	39.0	74.0	54.0	-22.2	-15.0	V
11.610	9.8	47.5	34.7	38.8	5.2	-41.6	0.0	1.5	51.3	38.5	74.0	54.0	-22.7	-15.5	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

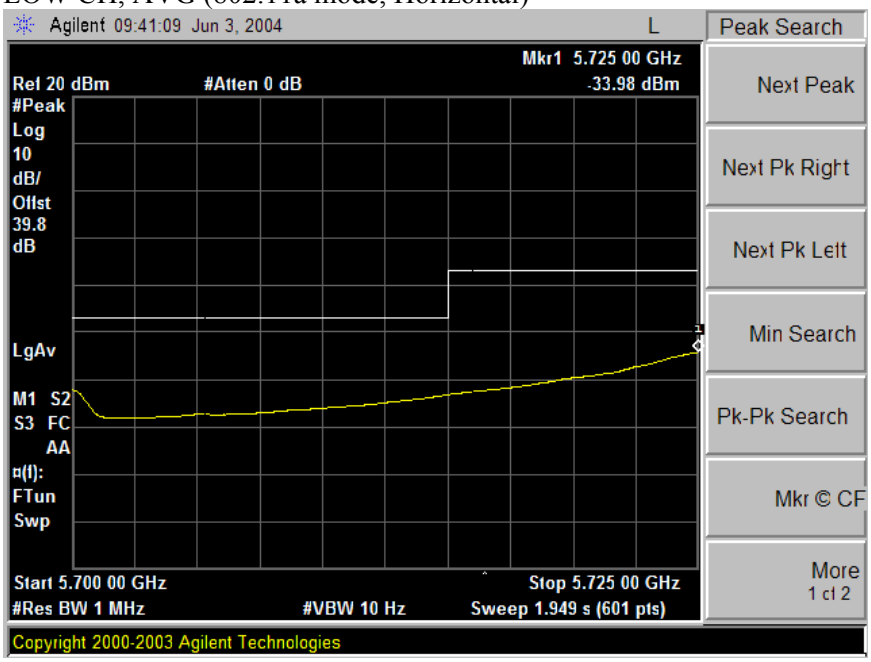
7.8.11. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz FOR 5725 TO 5825 MHz BAND WITH 4.5 dBi EXTERNAL ANTENNA

BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH, PEAK (802.11a mode, Horizontal)

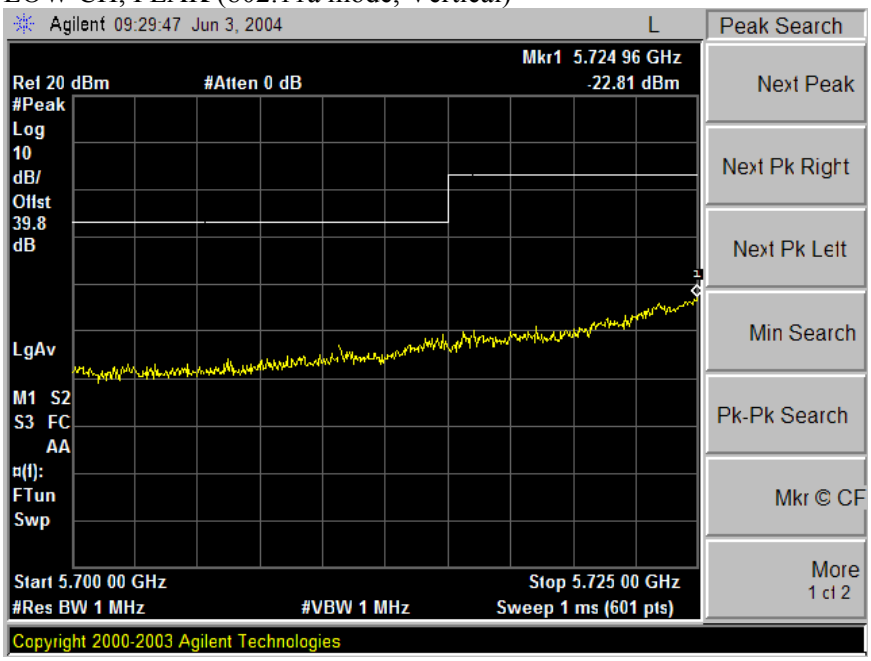


LOW CH, AVG (802.11a mode, Horizontal)

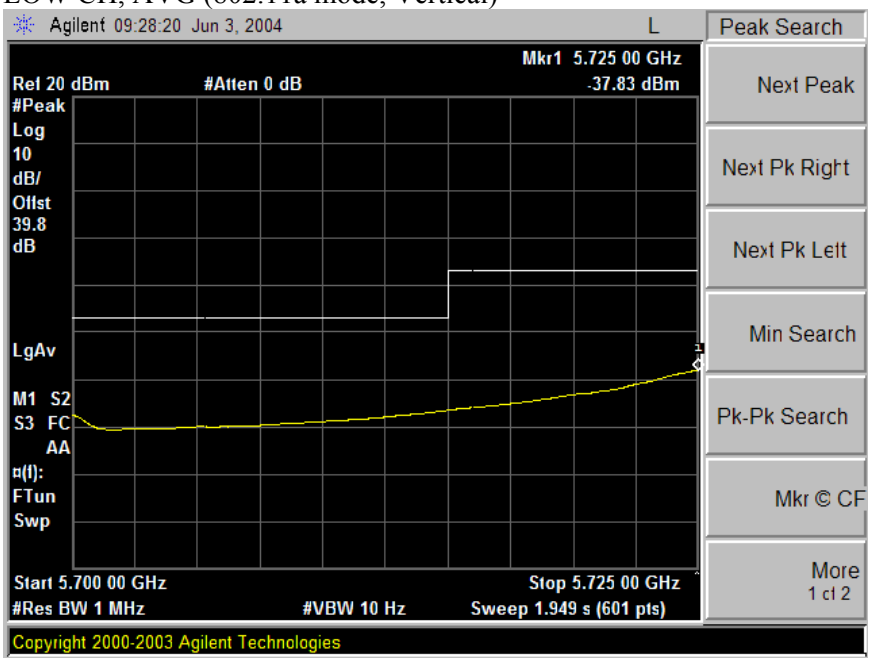


BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH, PEAK (802.11a mode, Vertical)

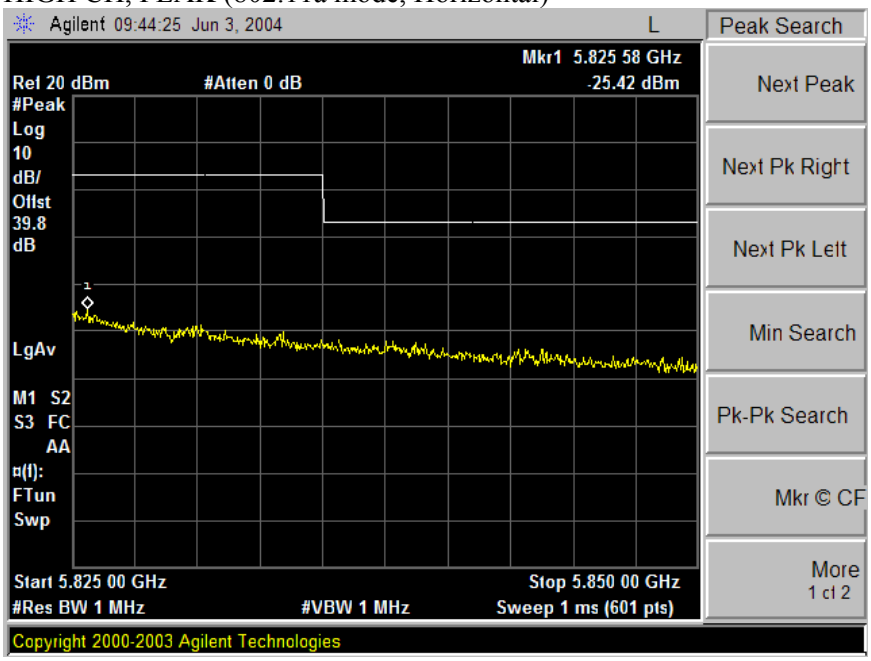


LOW CH, AVG (802.11a mode, Vertical)

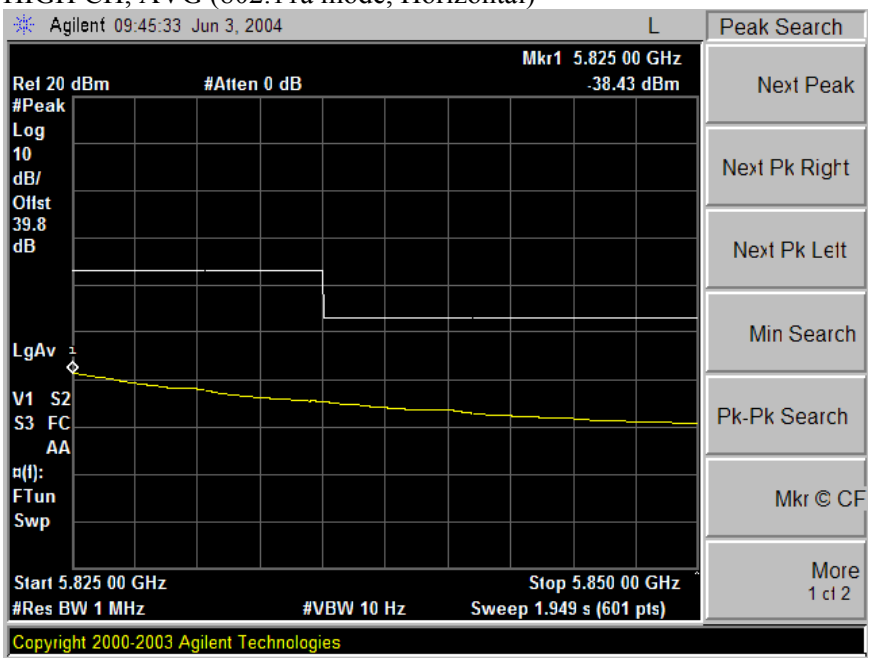


BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH, PEAK (802.11a mode, Horizontal)

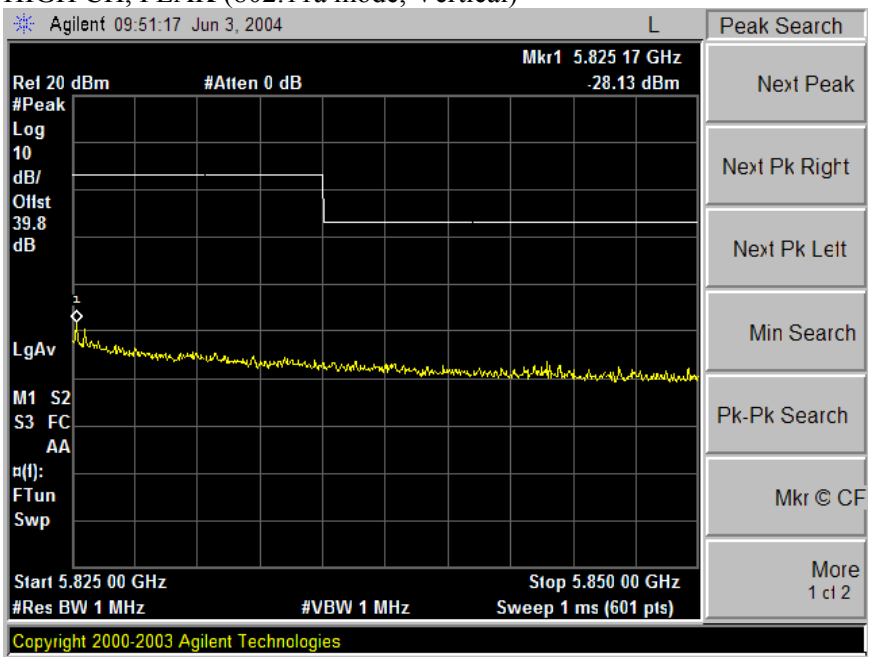


HIGH CH, AVG (802.11a mode, Horizontal)

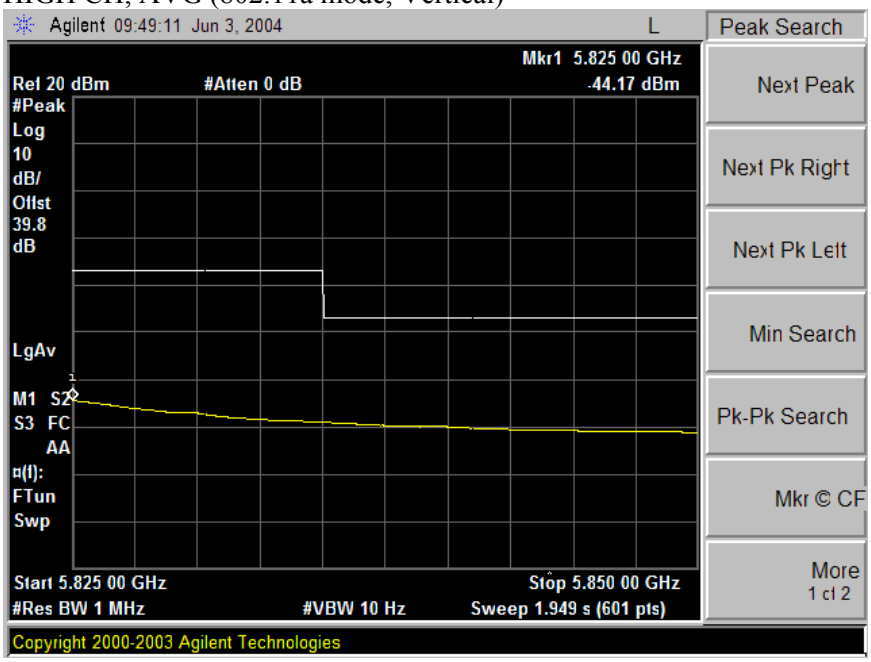


BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH, PEAK (802.11a mode, Vertical)



HIGH CH, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE) WITH 4.5dBi OMNI ANTENNA

06/04/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 4.5dBi Omni Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 5.8 Band

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T59; S/N: 3245 @3m	Agilent E4446A Analyzer	T87 Miteq 924342		

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
CH 5745															
4.343	9.8	58.0	56.7	32.8	2.8	-44.3	0.0	1.5	50.8	49.5	74.0	54.0	-23.2	-4.5	V
4.343	9.8	53.8	52.2	32.8	2.8	-44.3	0.0	1.5	46.6	45.0	74.0	54.0	-27.4	-9.0	H
11.490	9.8	47.5	35.1	38.7	5.1	-41.5	0.0	1.5	51.3	38.9	74.0	54.0	-22.7	-15.1	V
11.490	9.8	47.2	34.8	38.7	5.1	-41.5	0.0	1.5	51.0	38.6	74.0	54.0	-23.0	-15.4	H
CH 5785															
4.357	9.8	58.7	57.1	32.8	2.8	-44.3	0.0	1.5	51.5	49.9	74.0	54.0	-22.5	-4.1	V
4.357	9.8	54.3	52.6	32.8	2.8	-44.3	0.0	1.5	47.1	45.4	74.0	54.0	-26.9	-8.6	H
11.570	9.8	47.9	35.0	38.8	5.1	-41.6	0.0	1.5	51.7	38.8	74.0	54.0	-22.3	-15.2	V
11.570	9.8	47.7	34.7	38.8	5.1	-41.6	0.0	1.5	51.5	38.5	74.0	54.0	-22.5	-15.5	H
CH 5805															
4.383	9.8	58.9	57.8	32.8	2.8	-44.3	0.0	1.5	51.7	50.6	74.0	54.0	-22.3	-3.4	V
4.383	9.8	55.1	53.0	32.8	2.8	-44.3	0.0	1.5	47.9	45.8	74.0	54.0	-26.1	-8.2	H
11.610	9.8	48.2	35.2	38.8	5.2	-41.6	0.0	1.5	52.0	39.0	74.0	54.0	-22.0	-15.0	V
11.610	9.8	47.8	34.5	38.8	5.2	-41.6	0.0	1.5	51.6	38.3	74.0	54.0	-22.4	-15.7	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.8.12. CO-LOCATED TRANSMITTER RADIATED EMISSIONS

SUPPLEMENTAL TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna The dominant transmitter is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter are varied. The spectrum is searched for intermodulation products. Worst-case results are reported.

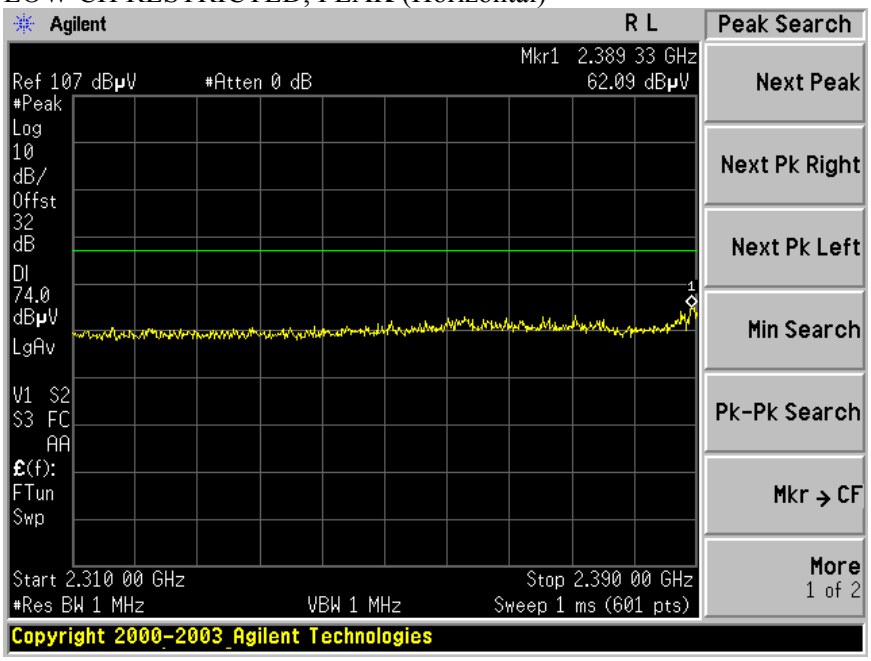
RESULTS

No non-compliance noted:

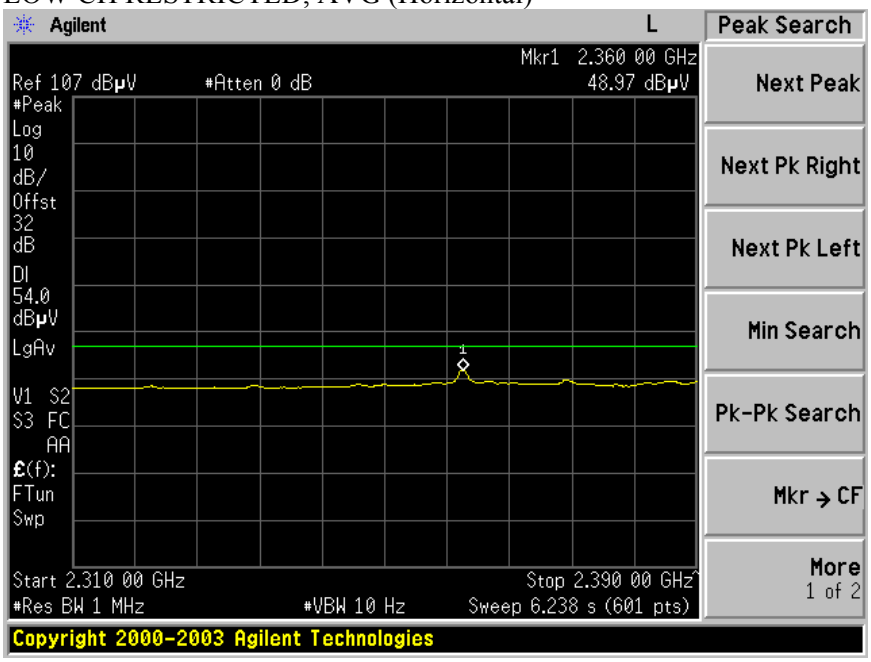
The 802.11 b/g radio is the dominant transmitter, and the 802.11 b mode is the dominant mode.

WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Horizontal)

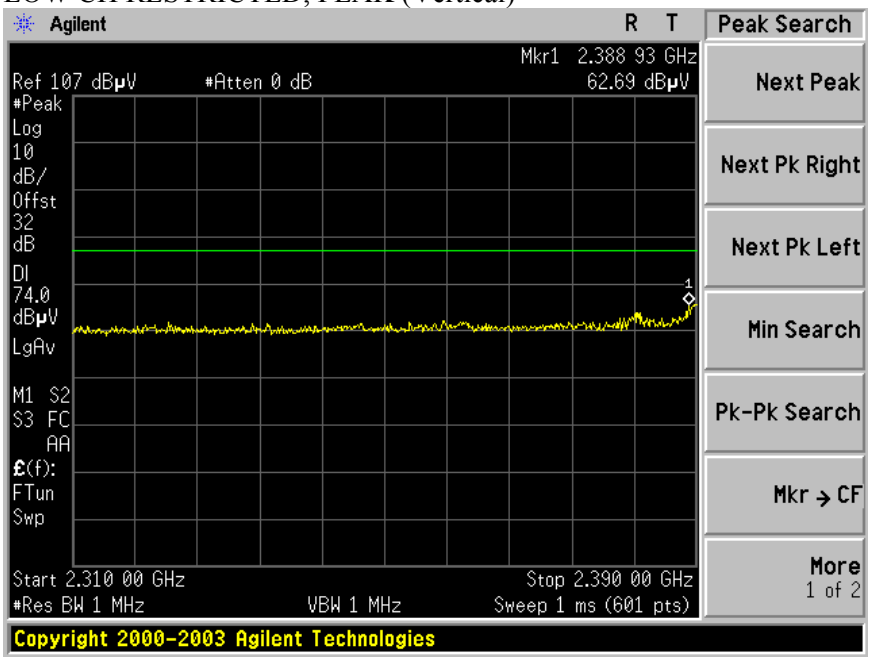


LOW CH RESTRICTED, AVG (Horizontal)

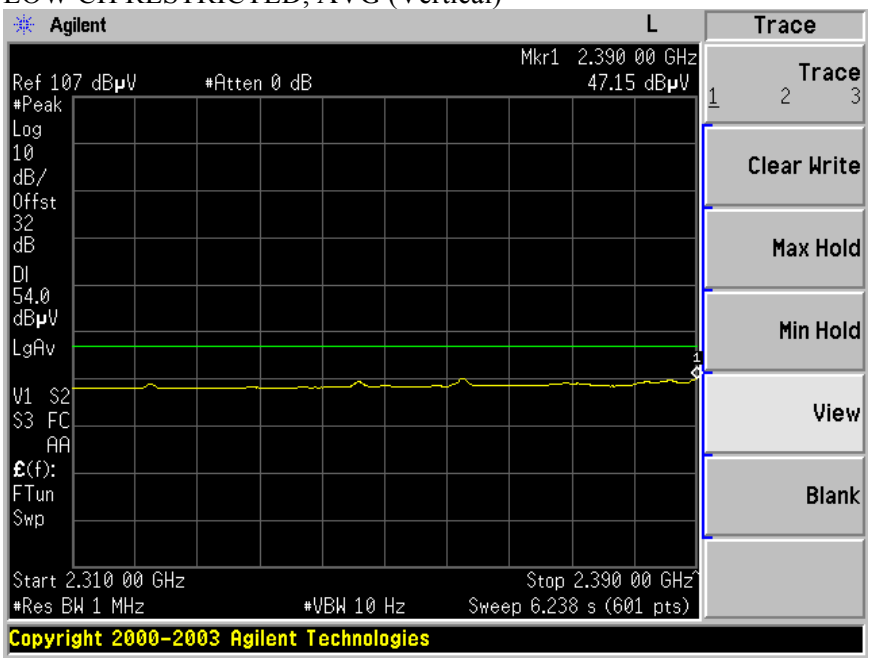


WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (Vertical)

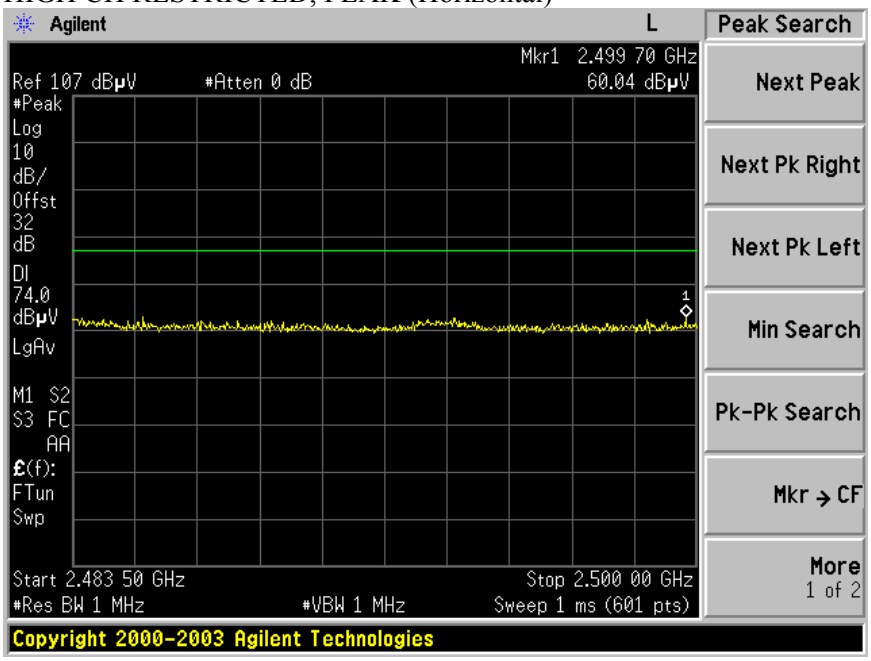


LOW CH RESTRICTED, AVG (Vertical)

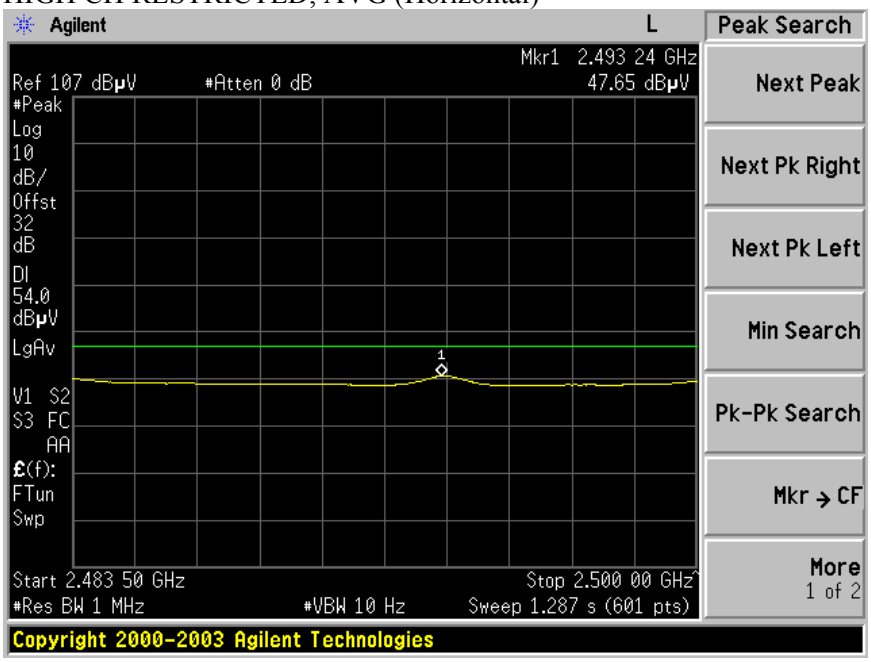


WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (Horizontal)

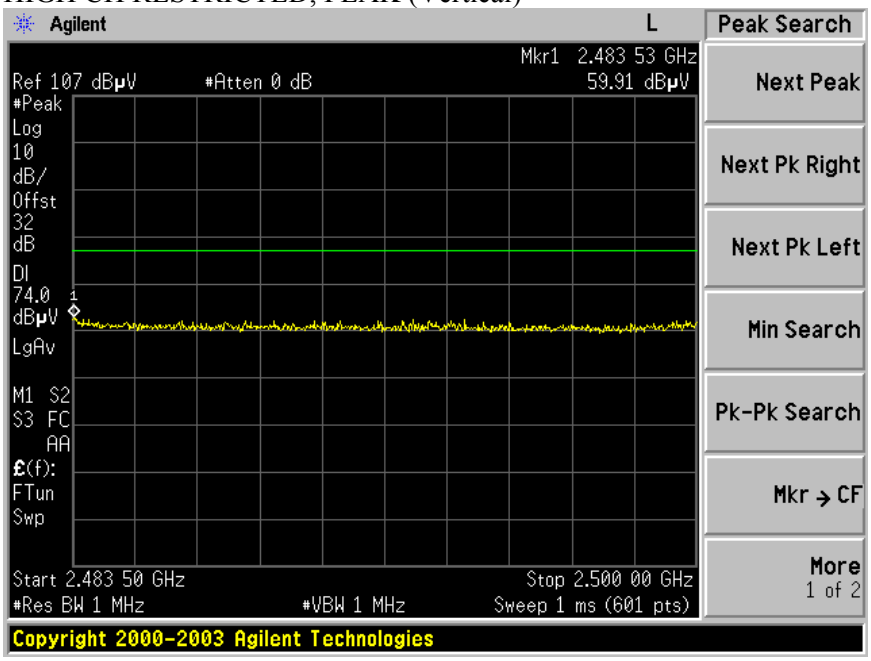


HIGH CH RESTRICTED, AVG (Horizontal)

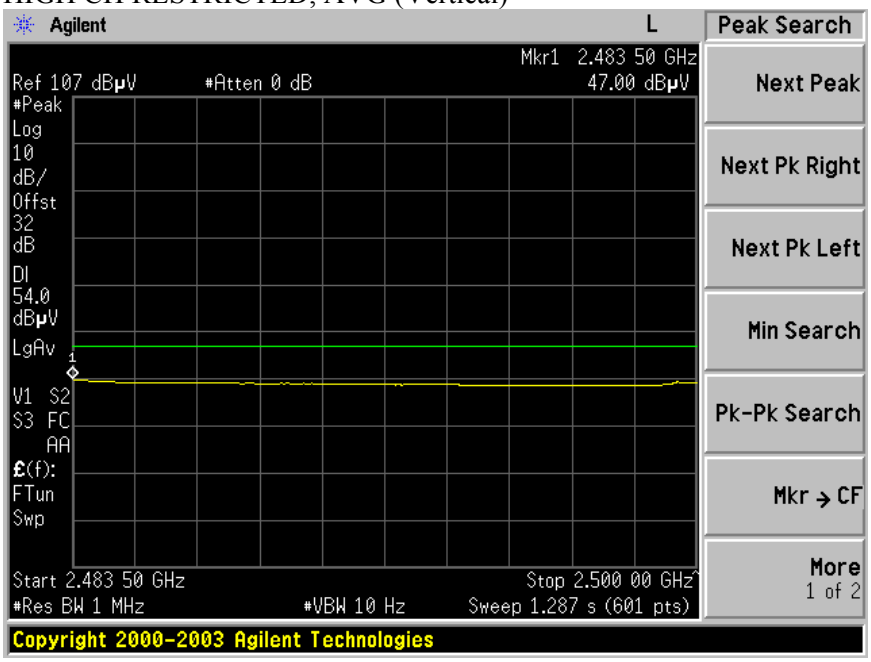


WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (Vertical)



HIGH CH RESTRICTED, AVG (Vertical)



WORST-CASE HARMONICS AND SPURIOUS EMISSIONS

08/20/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Chin Pang
Project #: 04U2586-1
Company: Cisco
EUT Descrip.: Kodiak RM22A 802.11 a CardBus Radio Module with 4.5dBi Omni Antenna
EUT M/N: AIR-RM22A-K9 IN AIR-AP1200 ACCESS POINT
Test Target: FCC Class B
Mode Oper: TX, 11b mode and a WLAN 5745MHz Co-Location

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	Agilent E4446A Analyzer	T86 Miteq 924341		

Hi Frequency Cables: ☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

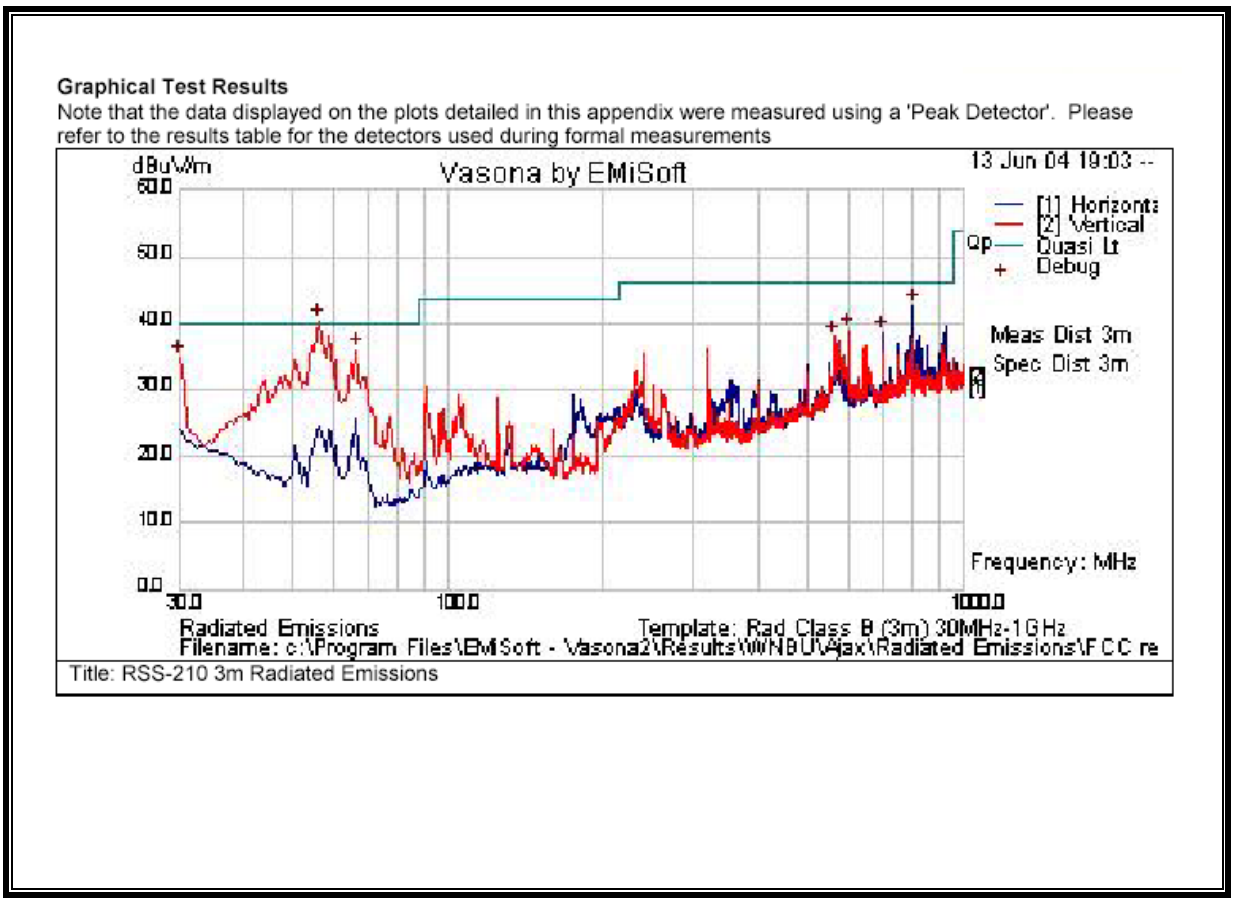
Kodiak

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
Mid Channel 2437MHz															
4.343	9.8	57.8	54.7	32.8	2.7	-44.6	0.0	1.5	50.3	47.2	74.0	54.0	-23.7	-6.8	V
4.874	9.8	60.9	51.0	33.1	2.9	-45.1	0.0	1.5	53.4	43.5	74.0	54.0	-20.6	-10.5	V
7.311	9.8	54.0	42.0	36.2	3.7	-45.3	0.0	1.5	50.0	38.0	74.0	54.0	-24.0	-16.0	V
4.343	9.8	55.0	52.0	32.8	2.7	-44.6	0.0	1.5	47.5	44.5	74.0	54.0	-26.5	-9.5	H
4.874	9.8	56.9	46.3	33.1	2.9	-45.1	0.0	1.5	49.4	38.8	74.0	54.0	-24.6	-15.2	H
7.311	9.8	52.3	41.6	36.2	3.7	-45.3	0.0	1.5	48.3	37.6	74.0	54.0	-25.7	-16.4	H
Note: No other emissions were detected above the system noise floor.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.8.13. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



Test Results Table

Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV/m	Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
30	5.3	0.6	18.6	24.6	Qp	V	98	359	40	-15.4	Pass	
56	29.5	0.8	7	37.4	Qp	V	123	204	40	-2.6	Pass	
66.272	24.8	0.9	6.6	32.4	Qp	V	163	86	40	-7.6	Pass	
560	16.5	2.5	19.2	38.2	Qp	V	98	66	46	-7.8	Pass	
600	15.2	2.6	19	36.8	Qp	V	104	96	46	-9.2	Pass	
700	14.4	2.8	19.3	36.4	Qp	H	307	62	46	-9.6	Pass	
800	16.5	3	20.1	39.6	Qp	H	198	220	46	-6.4	Pass	

7.9. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (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.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

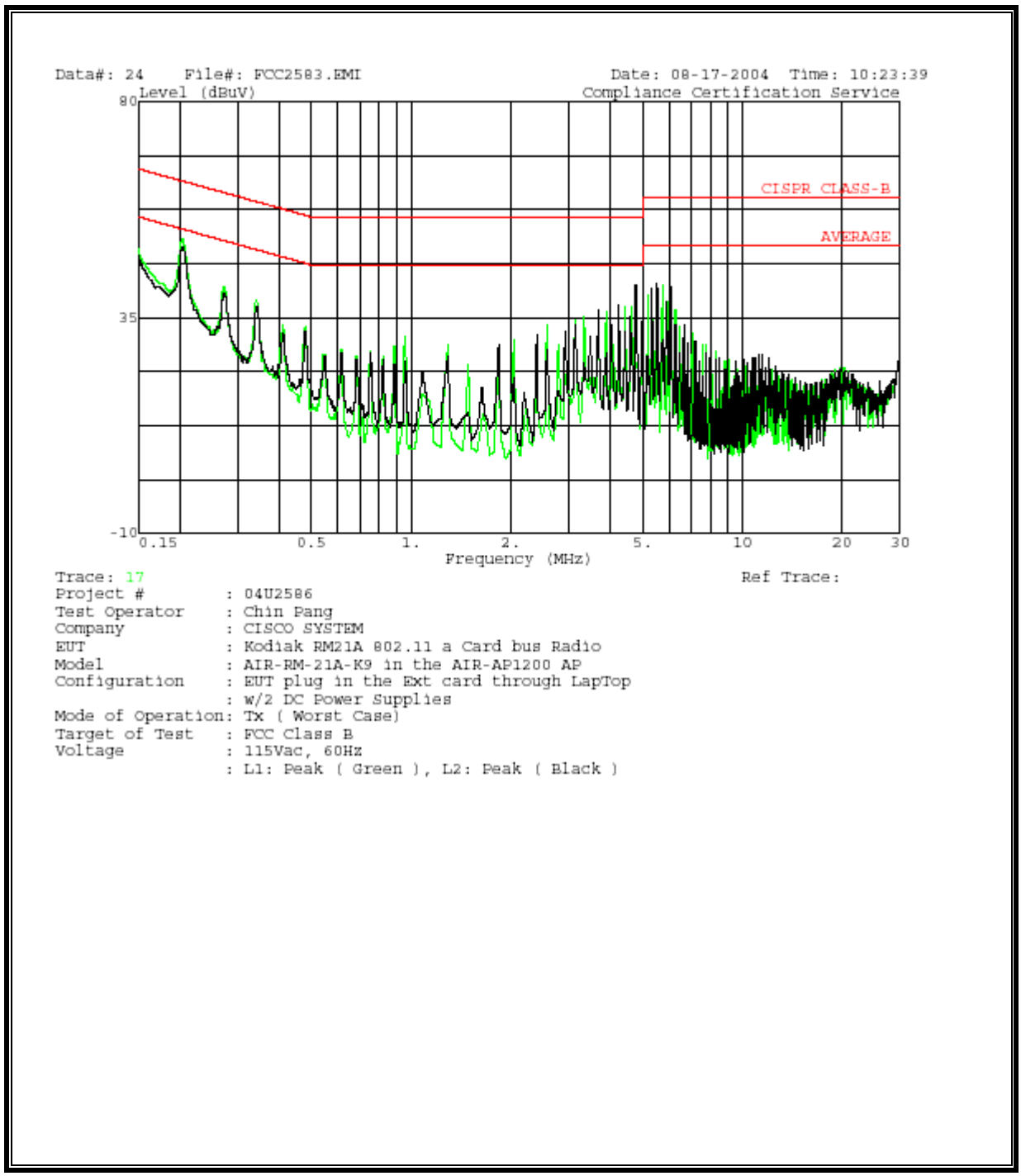
RESULTS

No non-compliance noted:

6 WORST EMISSIONS (AC Adapter)

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.21	51.11	--	--	0.00	64.43	54.43	-13.32	-3.32	L1
0.27	41.30	--	--	0.00	62.49	52.49	-21.19	-11.19	L1
5.74	41.90	--	--	0.00	60.00	50.00	-18.10	-8.10	L1
0.21	49.56	--	--	0.00	64.43	54.43	-14.87	-4.87	L2
4.77	41.80	--	--	0.00	56.00	46.00	-14.20	-4.20	L2
6.07	41.52	--	--	0.00	60.00	50.00	-18.48	-8.48	L2
6 Worst Data									

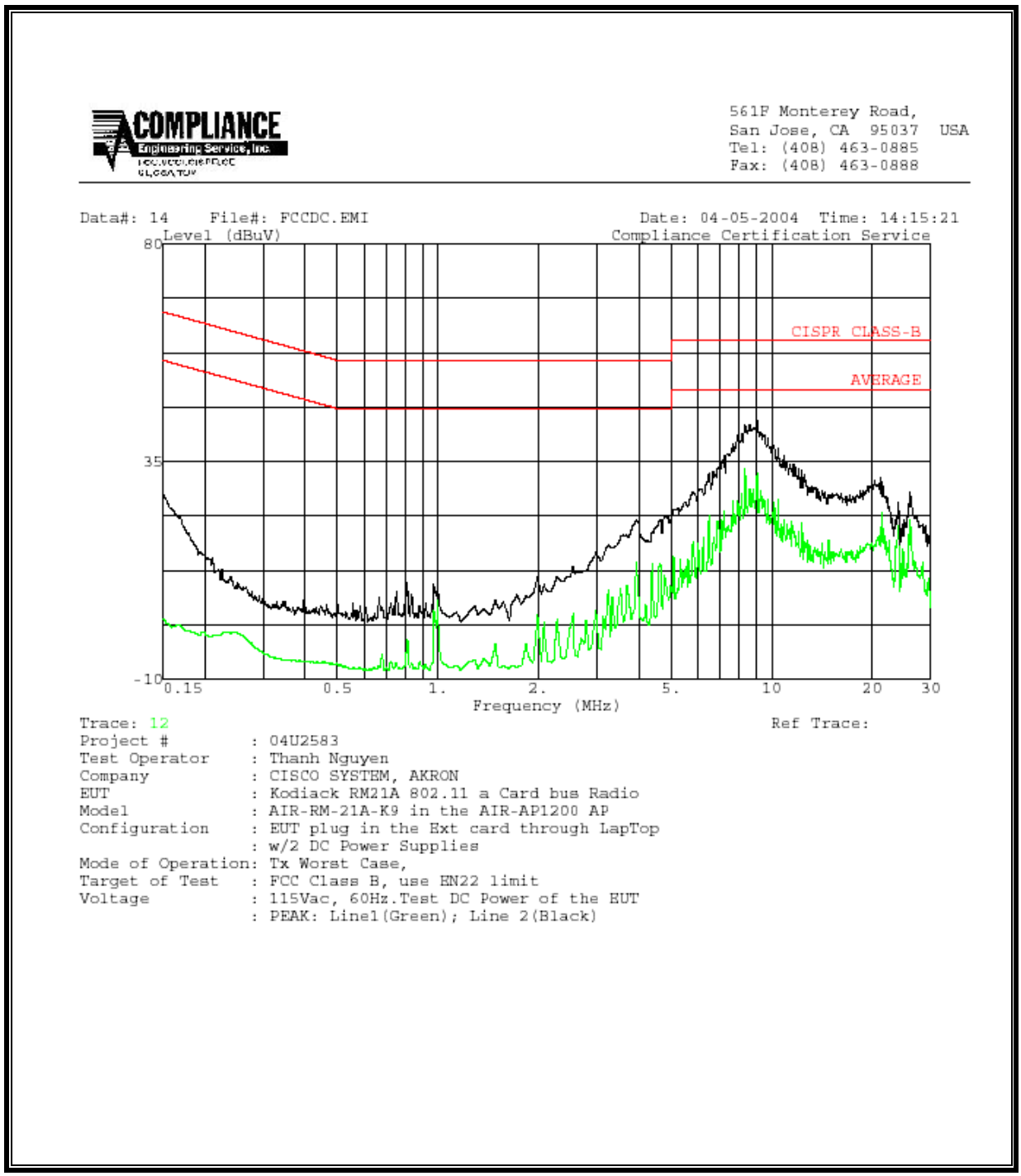
LINE 1 AND LINE 2 RESULTS (AC Power)



6 WORST EMISSIONS (DC Power)

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
8.73	42.88	--	--	0.00	60.00	50.00	-17.12	-7.12	L1
20.06	31.62	--	--	0.00	60.00	50.00	-28.38	-18.38	L1
0.15	27.86	--	--	0.00	66.00	56.00	-38.14	-28.14	L1
9.06	43.40	--	--	0.00	60.00	50.00	-16.60	-6.60	L2
21.15	31.72	--	--	0.00	60.00	50.00	-28.28	-18.28	L2
0.15	28.56	--	--	0.00	66.00	56.00	-37.44	-27.44	L2
6 Worst Data									

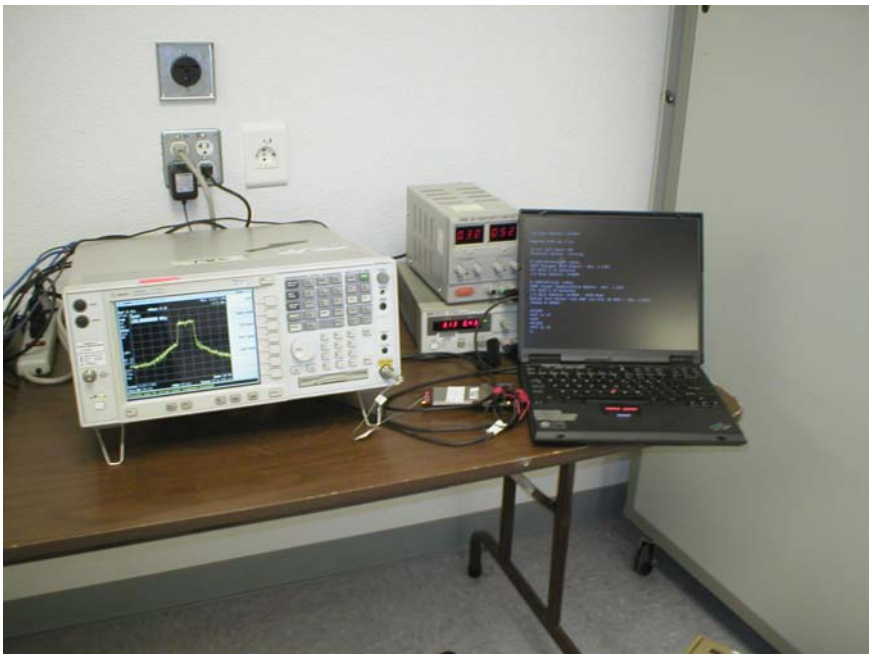
LINE 1 AND LINE 2 RESULTS (DC Power)



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

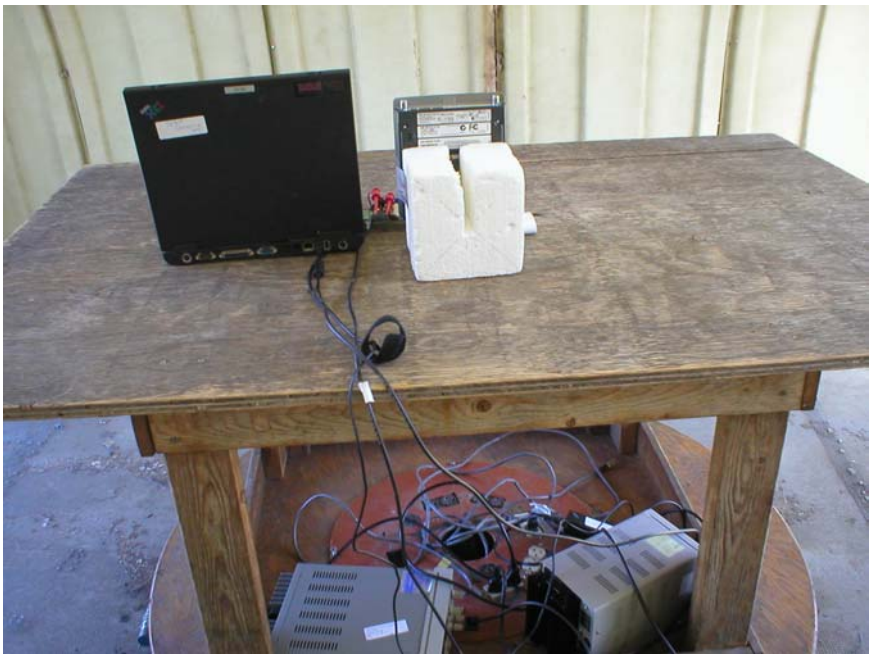
ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP WITH INTERNAL 9 dBi PATCH ANTENNA

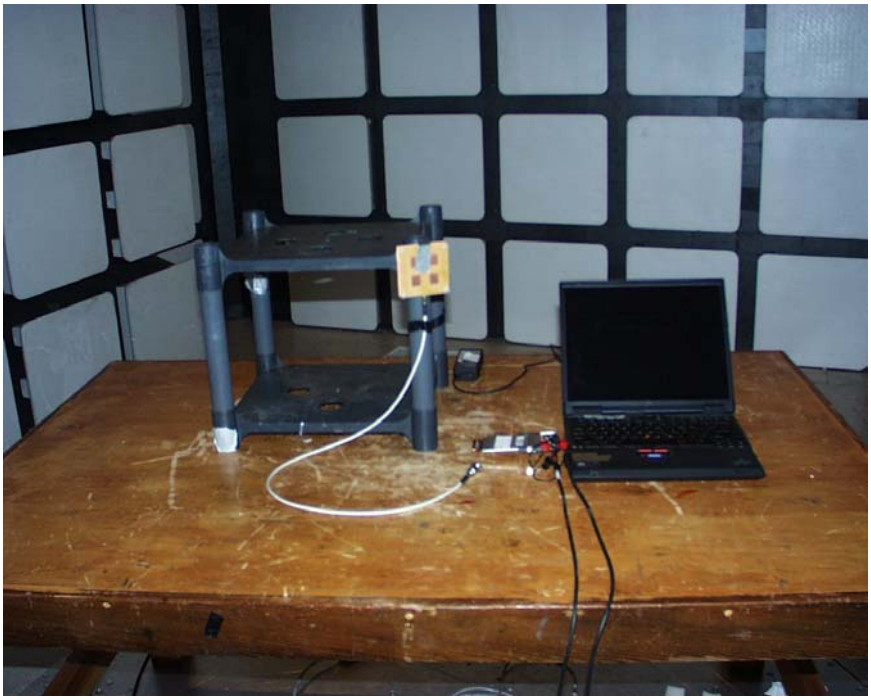
RADIATED FRONT PHOTO

RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP WITH EXTERNAL 9.5 dBi PATCH ANTENNA

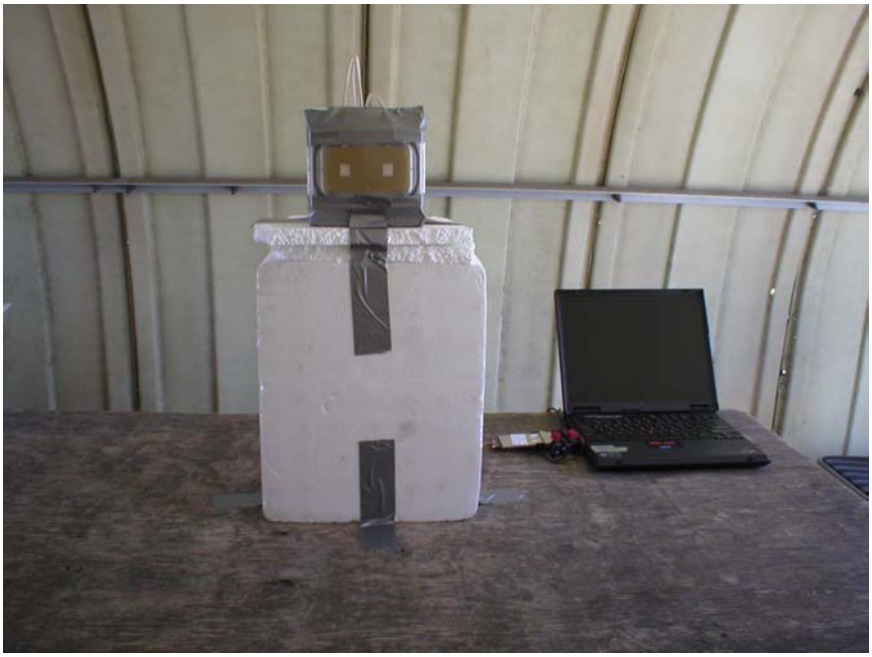
RADIATED FRONT PHOTO



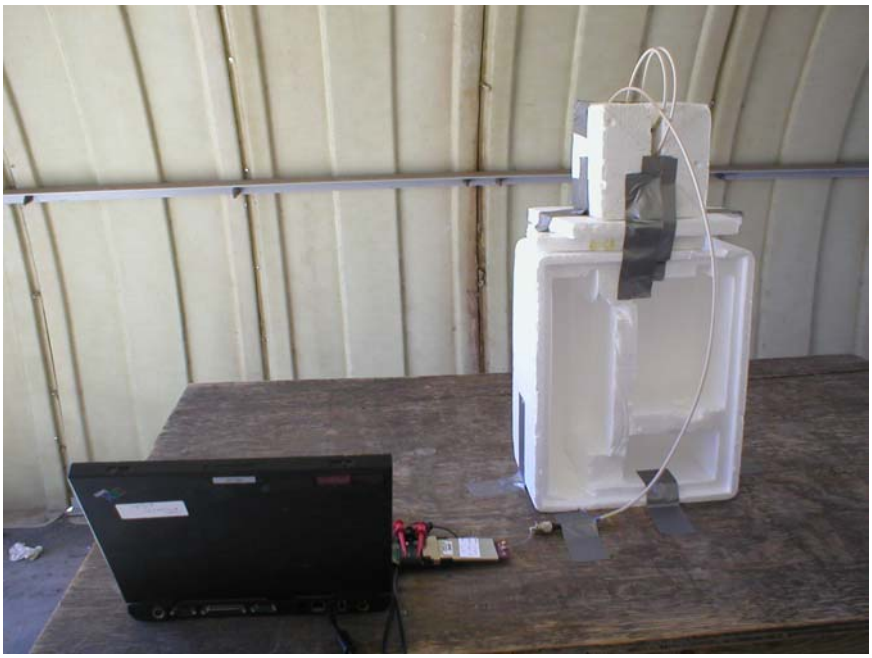
RADIATED BACK PHOTO

RADIATED RF MEASUREMENT SETUP WITH EXTERNAL 7 dBi PATCH ANTENNA

RADIATED FRONT PHOTO



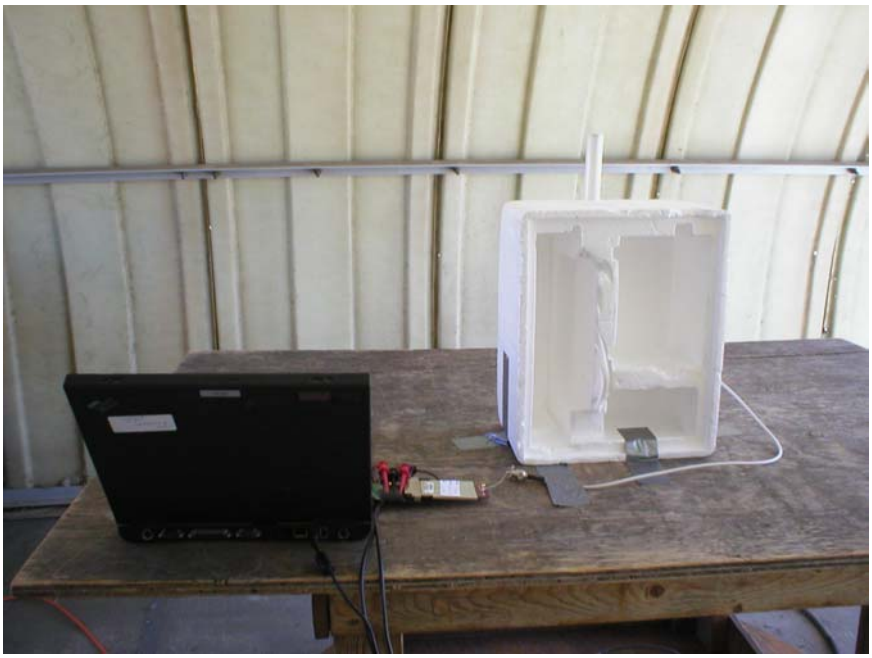
RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP WITH EXTERNAL 6 dBi OMNI ANTENNA

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



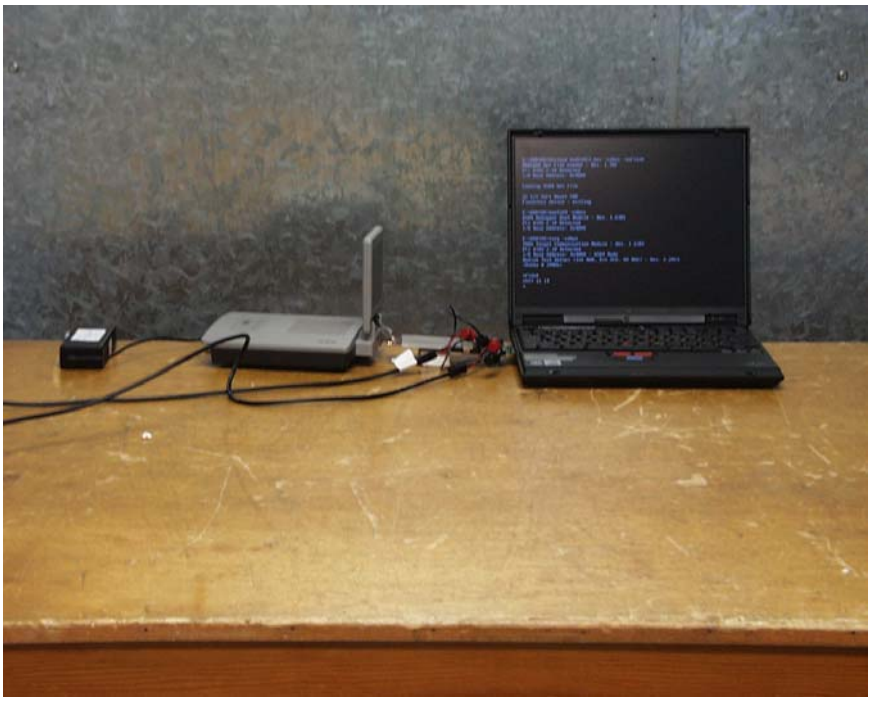
RADIATED RF MEASUREMENT SETUP WITH EXTERNAL 4.5 dBi OMNI ANTENNA

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP WITH AC ADAPTER

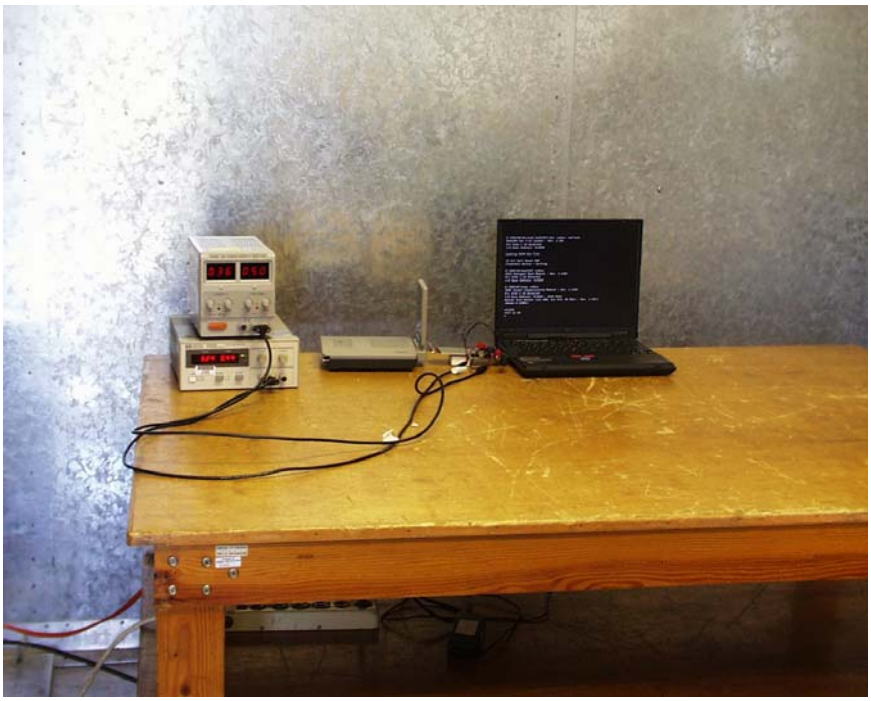
LINE CONDUCTED FRONT PHOTO



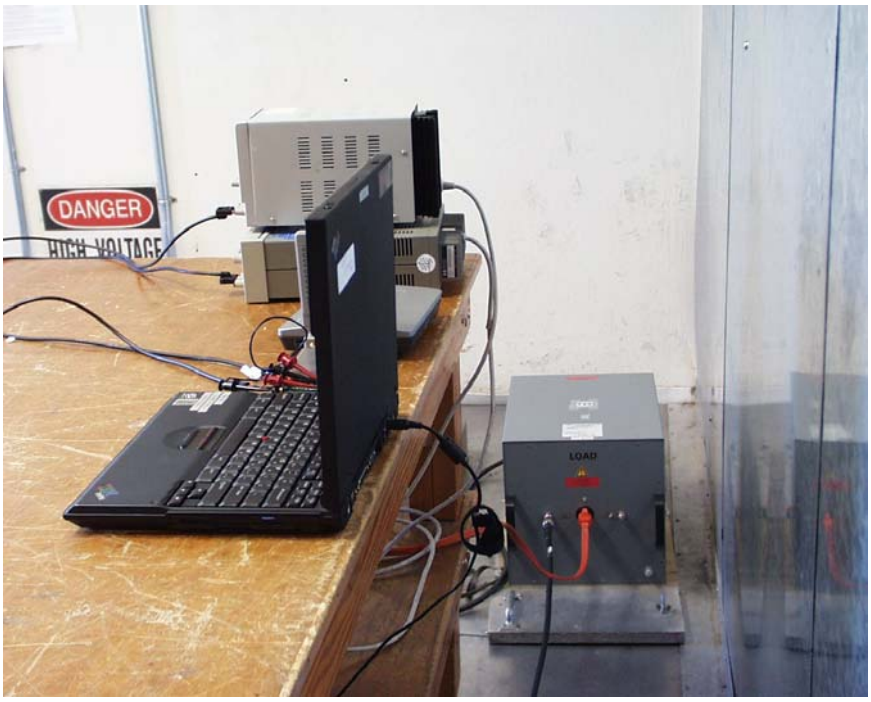
LINE CONDUCTED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP WITH DC POWER

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



END OF REPORT