FCC CFR47 PART 15 SUBPART C

Test Report

5.8 GHz 802.11n High-power Mini-PCI card

Model No: SPEAR

FCC ID: P9J-5805

Report Number: 08PR017REV1

Issue Date: 25 September 2008

Prepared for

Tropos Networks
555 Del Ray Avenue
Sunnyvale CA 94085

Prepared by

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1. TEST AND TEST LOCATION INFORMATION

COMPANY NAME: TROPOS NETWORKS
555 DEL RAY AVENUE
SUNNYVALE CA 94085

EUT DESCRIPTION: 5.8 GHz 802.11n High-power Mini-PCI card

FCC ID: **P9J-5805**
MODEL No: SPEAR

DATE TESTED: 12 May -26 August 2008, 24 September 2008

All radiated and AC line conducted tests were performed by

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue
Sunnyvale, CA 94089

All antenna port output conducted test were performed by

Tropos Networks
555 Del Ray Avenue
Sunnyvale CA 94085

25 September 2008

T.N. Cokenias
Agent for Tropos Networks

REPORT REVISION HISTORY

Revision Number	Description	Date
-	Original issue	9 Sept 2008
REV 1	Correct test procedure reference Add AC Line conducted test data using laptop Update test configuration photos (AC line) Add addtional RFx calculations for all antennas	25 Sept 2008

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. EQUIPMENT UNDER TEST

3.1. DESCRIPTION OF EUT

The EUT is a 5.8 GHz 802.11n transceiver module operating in the unlicensed 5725-5850 MHz band. Modulation is 802.11a in 20 MHz channel bandwidths.

3.2. MAXIMUM OUTPUT POWER

	(MHz)	(dBm)	(mW)
Low	5745	26.15	412
Middle	5785	26.36	432.5
High	5825	25.72	373.3

3.3. DESCRIPTION OF AVAILABLE ANTENNAS

The following antennas were qualified for this radio:

Antenna type	Antenna gain	Manufacturer	Model No.
Omni monopole	9.1 dBi	Comet Co. Ltd.	SF-5818N
90 deg Sector	17 dBi	Hyperlink Technologies	HG5817P-090
Patch	19 dBi	Hyperlink Technologies	HG5819P

Note: The antenna and the EUT are professionally installed.

3.4. SOFTWARE AND FIRMWARE

Test software used to exercise the equipment was Atheros Radio Test (ART) Revision 0.5 Build #26 ART_11N

3.5. WORST-CASE CONFIGURATION AND MODE

Radiated and conducted emissions tests were performed. Worst-case emissions are reported.

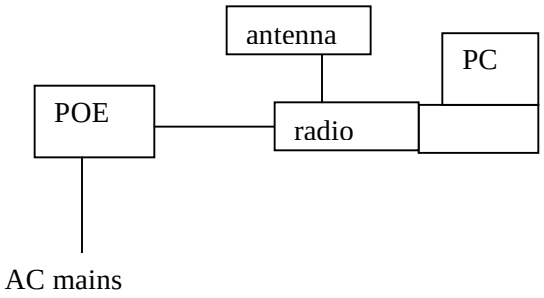
3.6. DESCRIPTION OF TEST SETUP

TEST SETUP

The radio module was placed in a test fixture connected to the pcmcia port of a laptop computer.

The laptop sets the channels and power levels of the radio via the IDU.

SETUP DIAGRAM FOR TESTS



Manufacturer	Description	Model	Serial Number	Calibration Date
DELL	Host PC	Latitude D505	CN-0H2049-48643-4Cn-1418	NA
Cincon	POE	TR60A-POE-L	006511	NA
DPS	Power Supply	DPS-3050	305002262	NA
HP	Host PC	HP Pavilion	00045648759531	NA

NOTE: HP pc was used for AC line conducted testing. Dell malfunctioned during AC line test.

3.7 Modifications to EUT

NONE.

TEST AND MEASUREMENT EQUIPMENT

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

BACL Test Equipment: Radiated and AC Line Conducted Emissions

Equipment Description	Model No.	Capability Range	Manufacturer	Serial No.	Last Cal	Cal Due
Analyzer, Spectrum	E4446A	DC-44.8G	Agilent	US44300386	2008-05-19	2009-05-19
Receiver, EMI Test	ESCI 1166.5950K03	9 KHz ~ 3GHz	Rohde & Schwarz	100338	2008-05-07	2009-05-07
LISN	9252-R-24-BNC		Solar Electronics	511213	2008-07-31	2009-07-31
Antenna	JB1	30 - 2000 MHz	Sunol Sciences	A103105-3	2008-03-25	2009-03-25
Amplifier, Pre	ZKL-2	30 MHz - 1GHz	Mini-Circuits	7786100643	2008-01-02	2009-01-02

Tropos Networks Test Equipment: Antenna Port Conducted Tests

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer	Agilent	E4440A	MY46186111	8/21/08

LIMITS AND RESULTS

3.7. ANTENNA PORT CHANNEL TESTS

3.7.1. 6 dB BANDWIDTH and 99% BANDWIDTH

LIMIT

Section 15.247(2): The 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

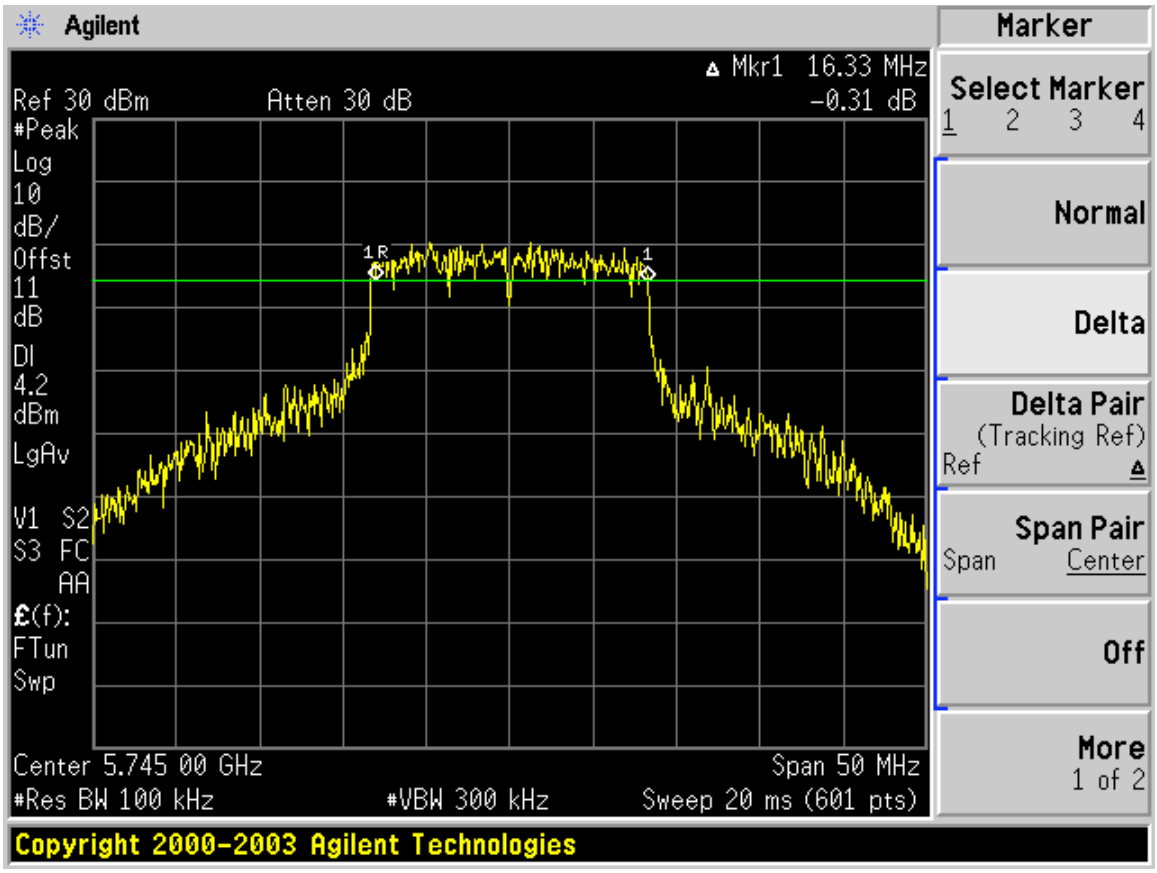
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 6dB or 99% bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

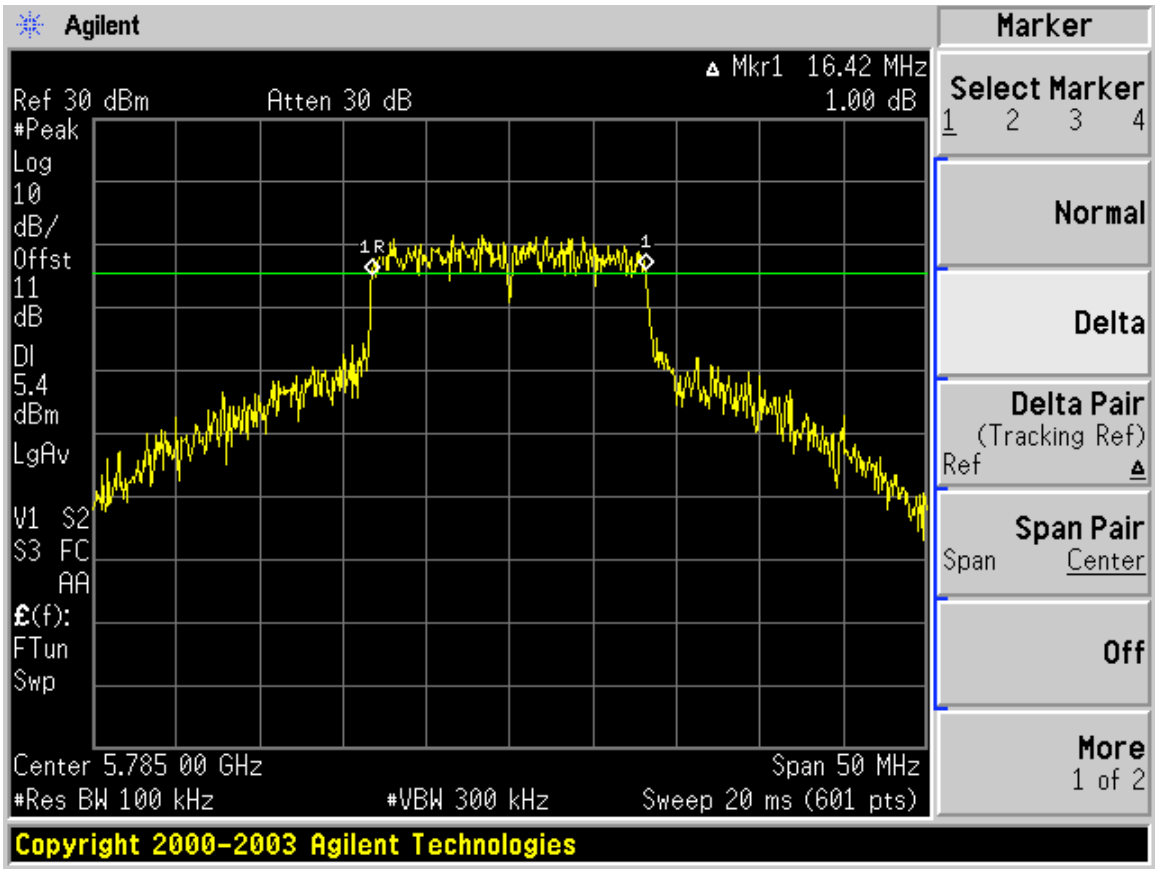
No non-compliance noted: minimum 6 dB BW requirement 500 kHz

Frequency	6 dB BW, MHz	99% BW, MHz
Low: 5745 MHz	16,33	16.56
Mid: 5785 MHz	16.42	16.62
High: 5825 MHz	16.50	16.55

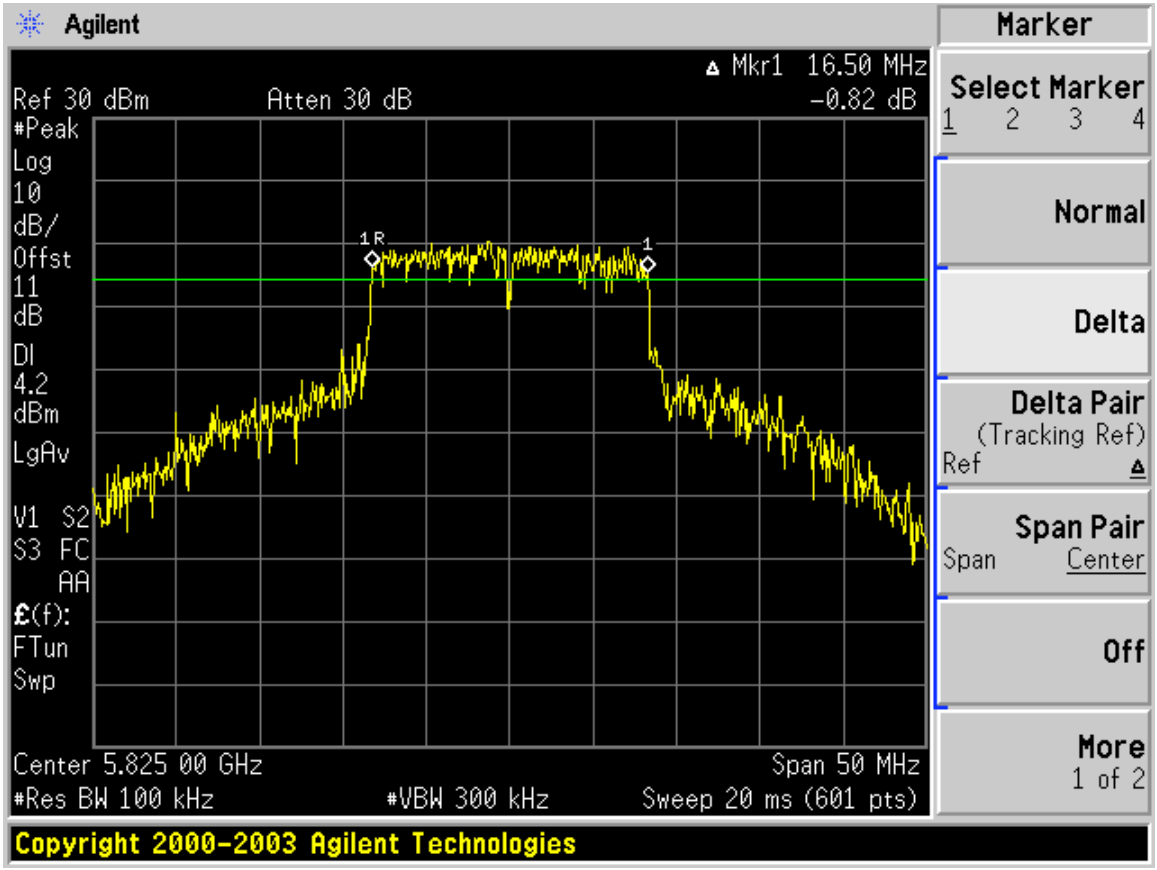
6 dB BANDWIDTH LOW CHANNEL



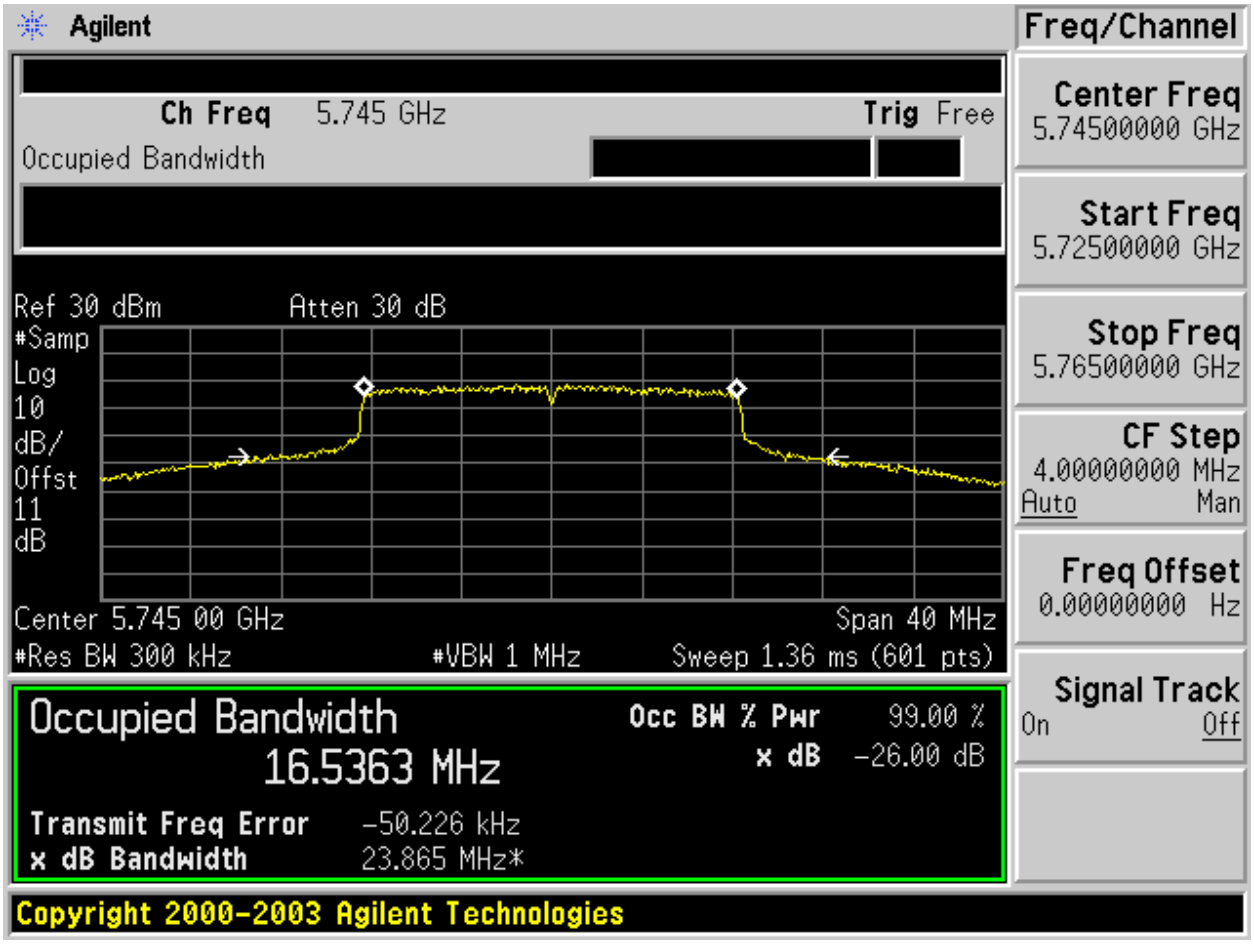
6 dB BANDWIDTH MID CHANNEL



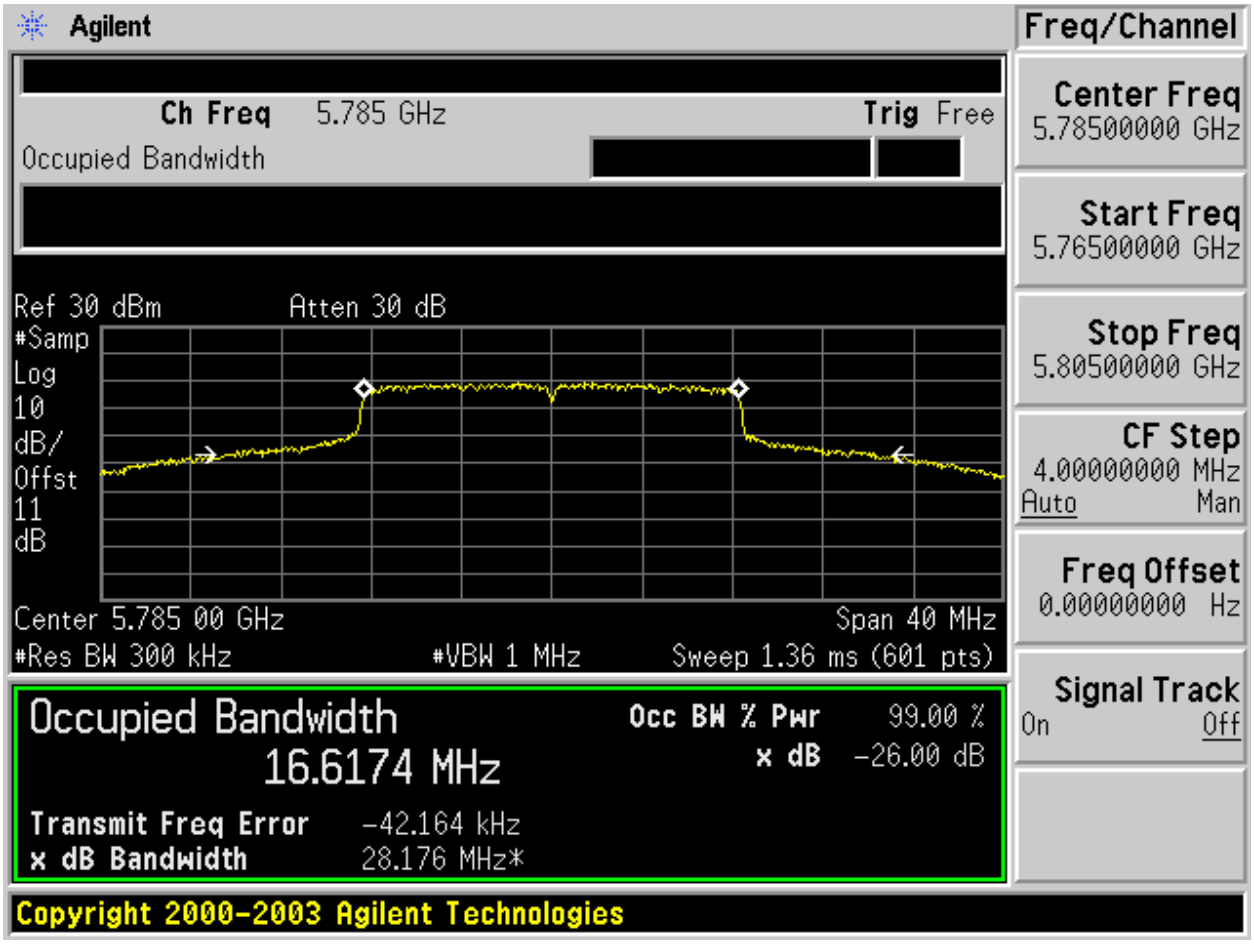
6 dB BANDWIDTH HIGH CHANNEL


Agilent
Marker
Mkr1 16.50 MHz
-0.82 dB
Ref 30 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
11
dB
Dl
4.2
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1R
1
Center 5.825 00 GHz
Span 50 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 20 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2003 Agilent Technologies

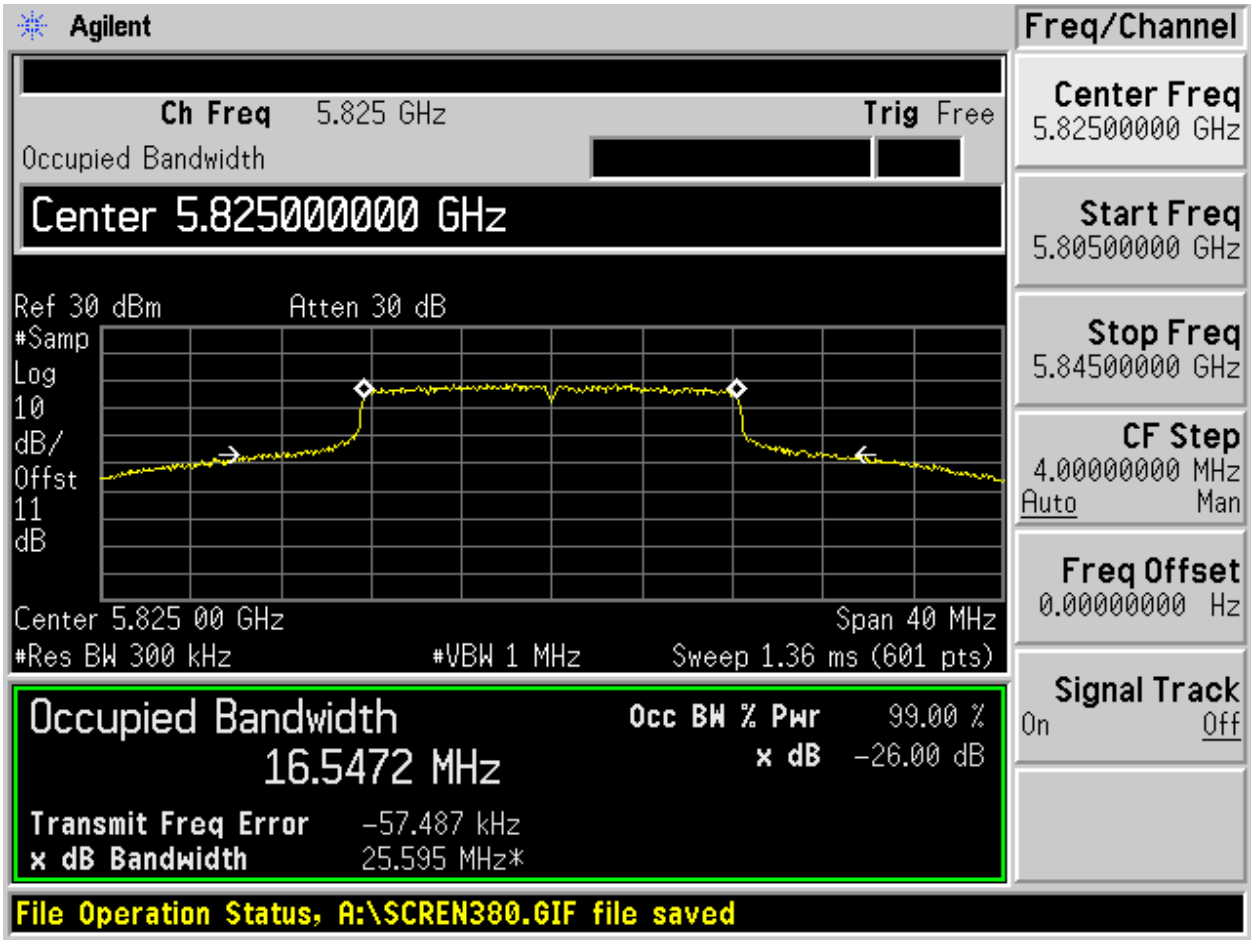
99% BANDWIDTH LOW CHANNEL



99% BANDWIDTH MID CHANNEL



99% BANDWIDTH HIGH CHANNEL



POWER SPECTRAL DENSITY

LIMIT

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

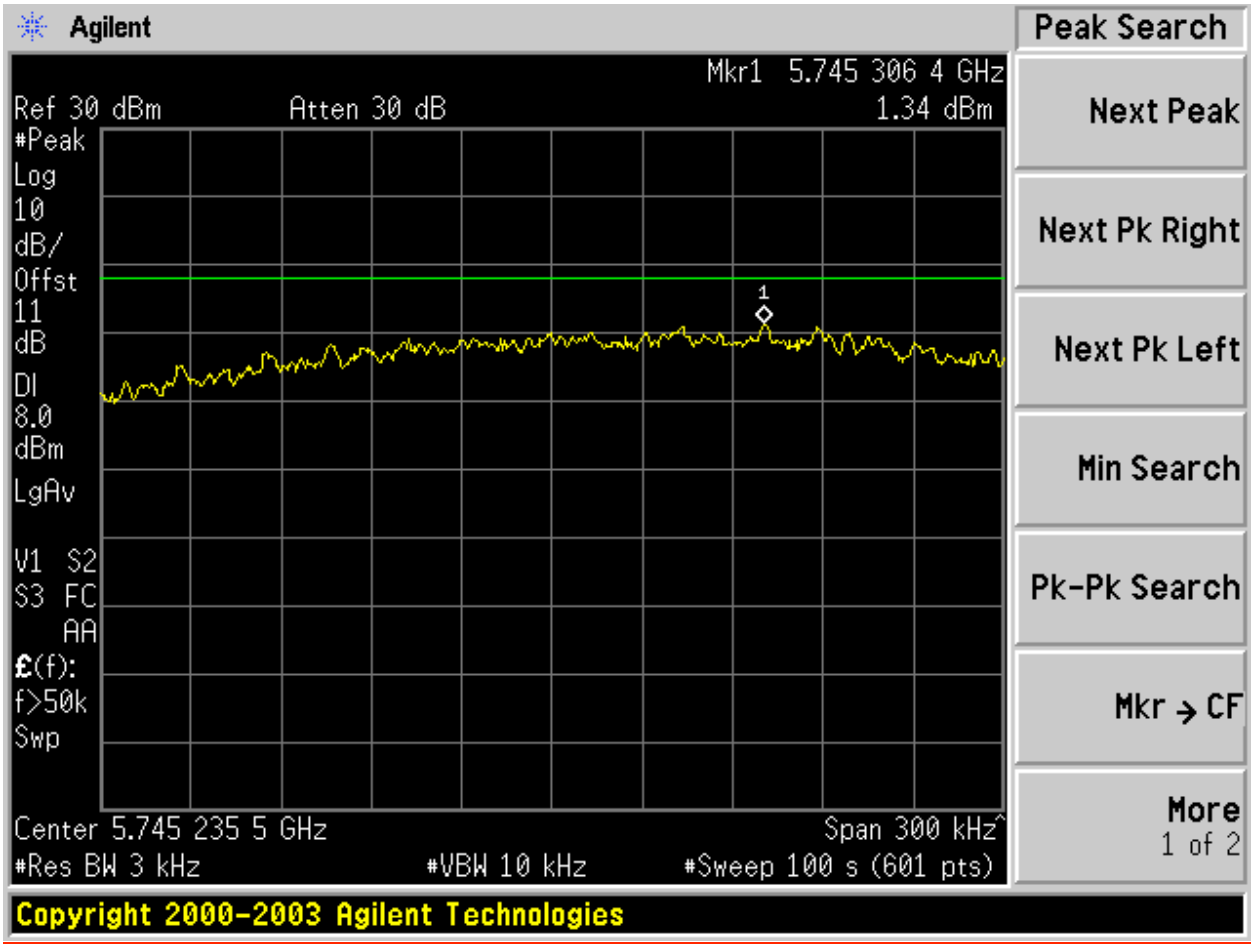
TEST PROCEDURE

Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 kHz, VBW > RBW, sweep= (SPAN/3 kHz) = 300 kHz span/3kHz = 100 seconds. Record highest level using PEAK detector and PEAK SEARCH function.

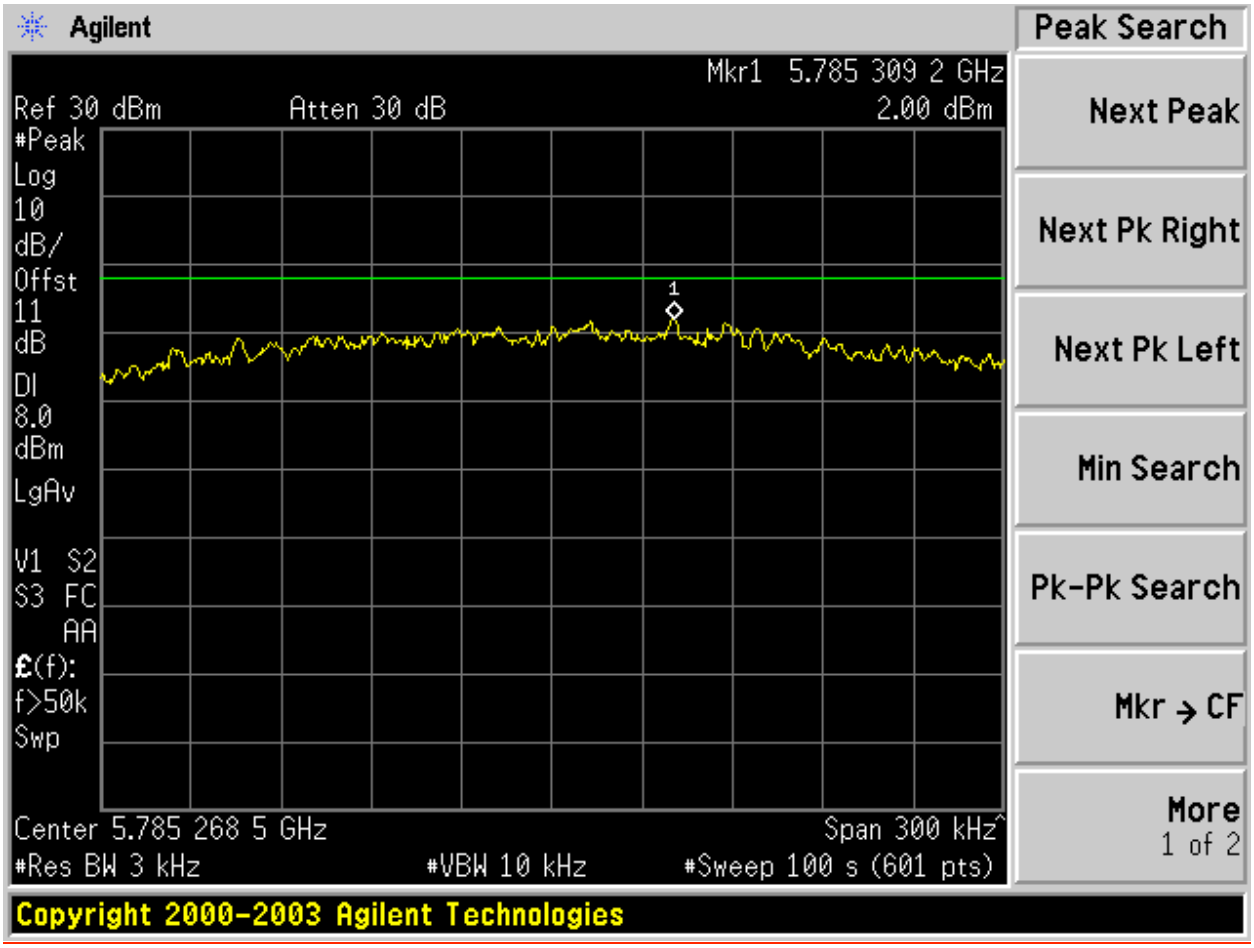
RESULTS

No non-compliance noted:

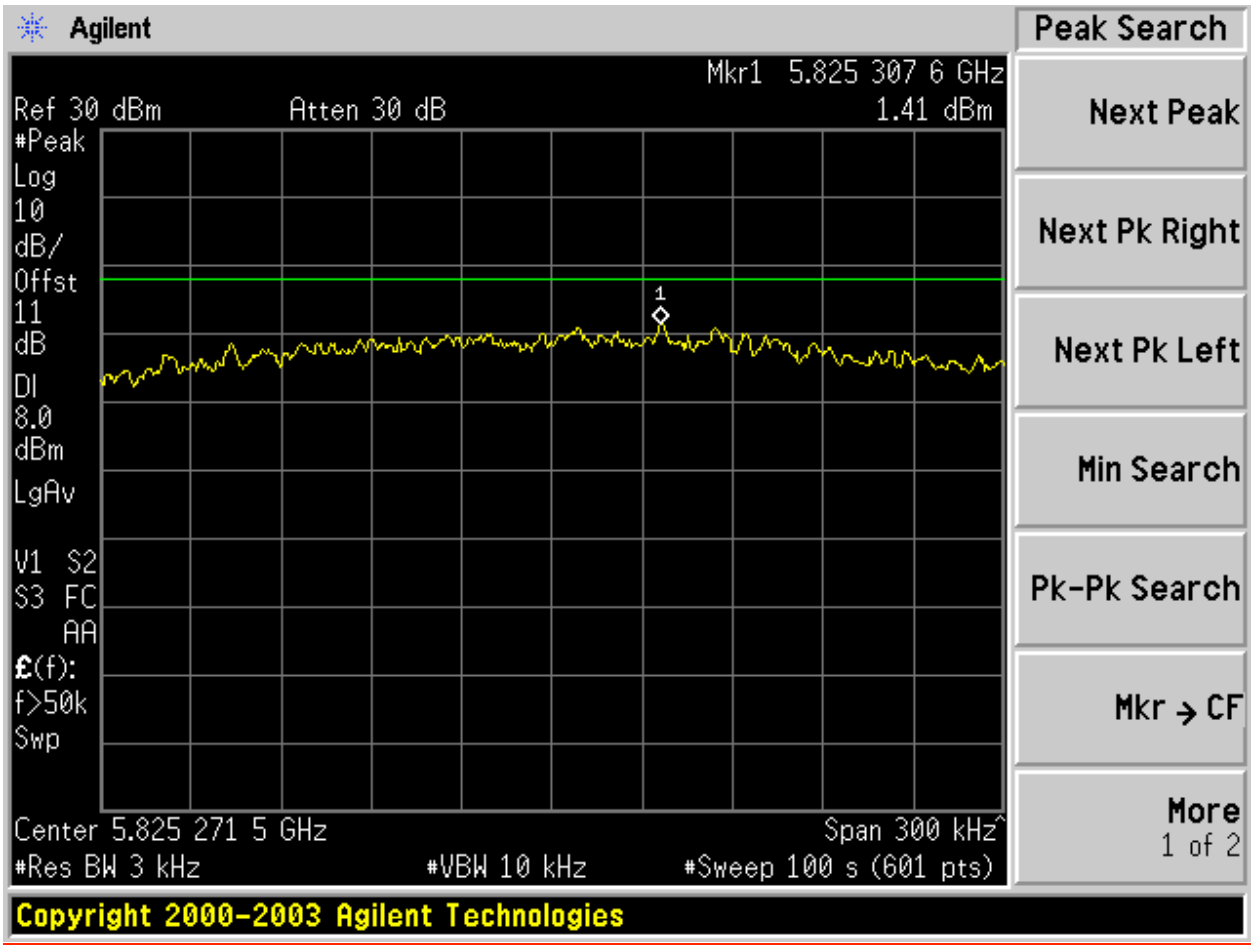
PSD LOW CHANNEL



PSD MID CHANNEL



PSD HIGH CHANNEL



PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) 3. For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

TEST PROCEDURE

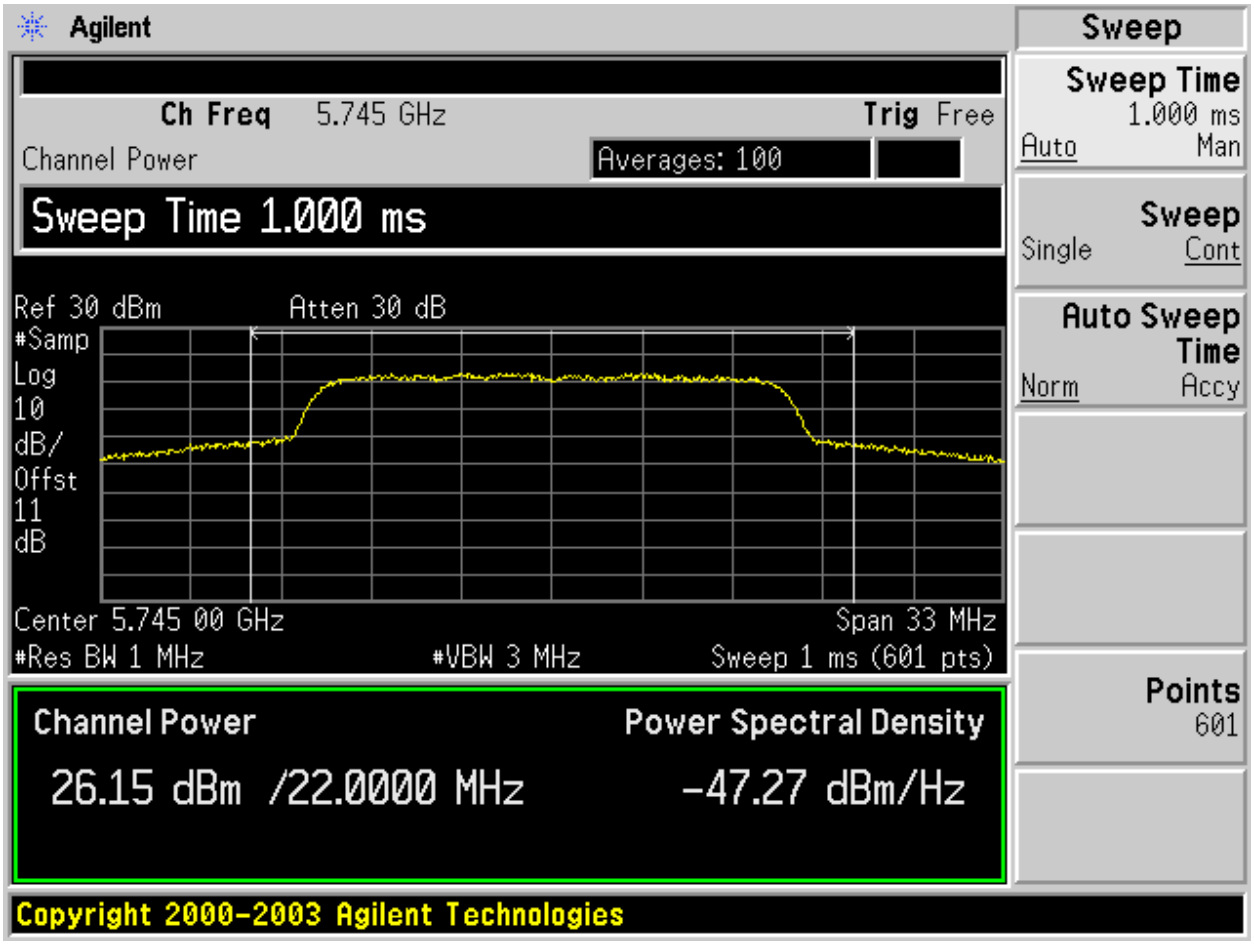
The transmitter output is connected to a spectrum analyzer. The built-in Channel Power function was used to measure Maximum Conducted Output power, following procedures in FCC Public Notice DA 02-2138, dated August 30, 2002 (U-NII test procedures). Spurious and out of band emissions are compared to a -30 dBc limit as per 15.247(d).

RESULTS

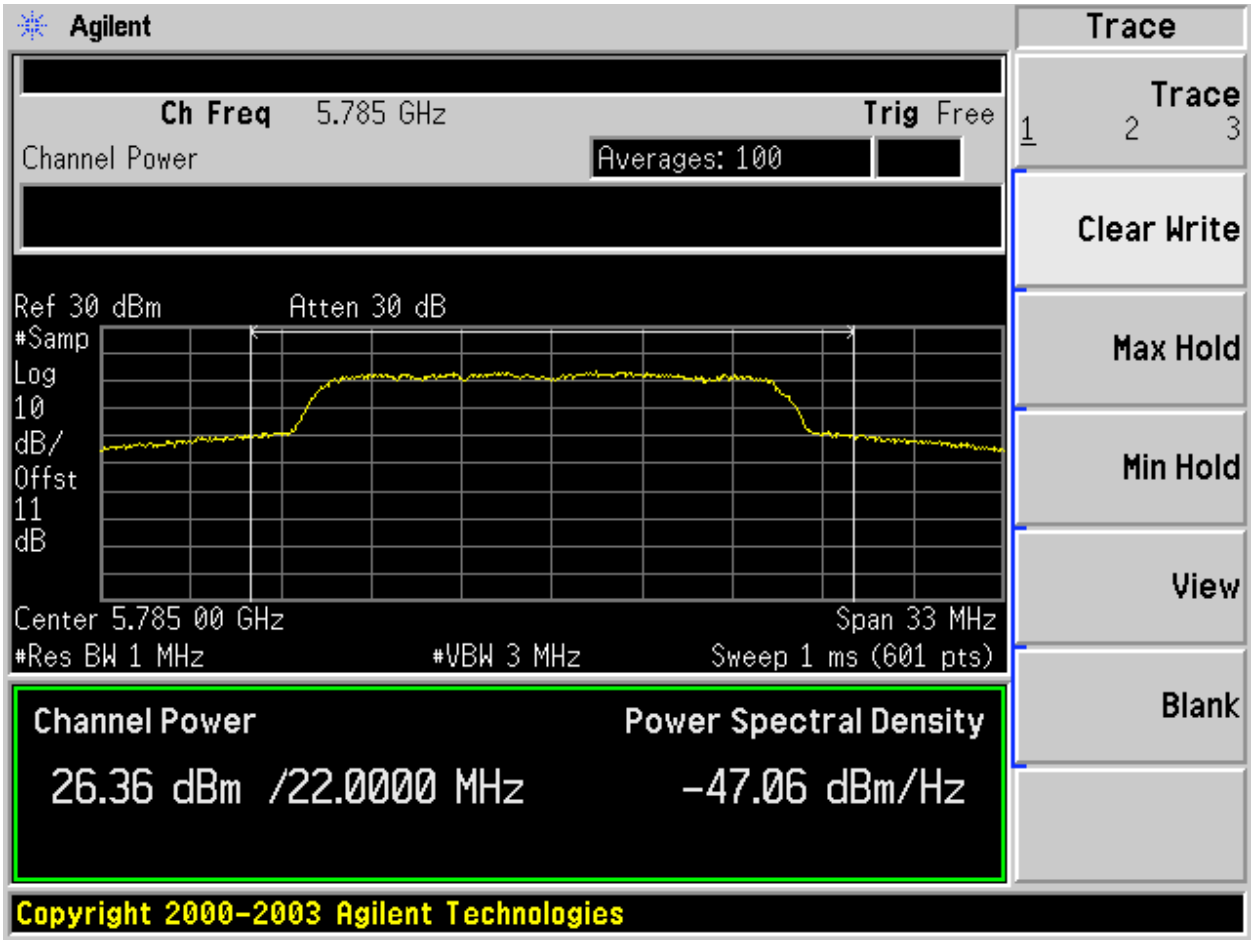
No non-compliance noted:

	(MHz)	(dBm)	(mW)
Low	5745	26.15	412
Middle	5785	26.36	432.5
High	5825	25.72	373.3

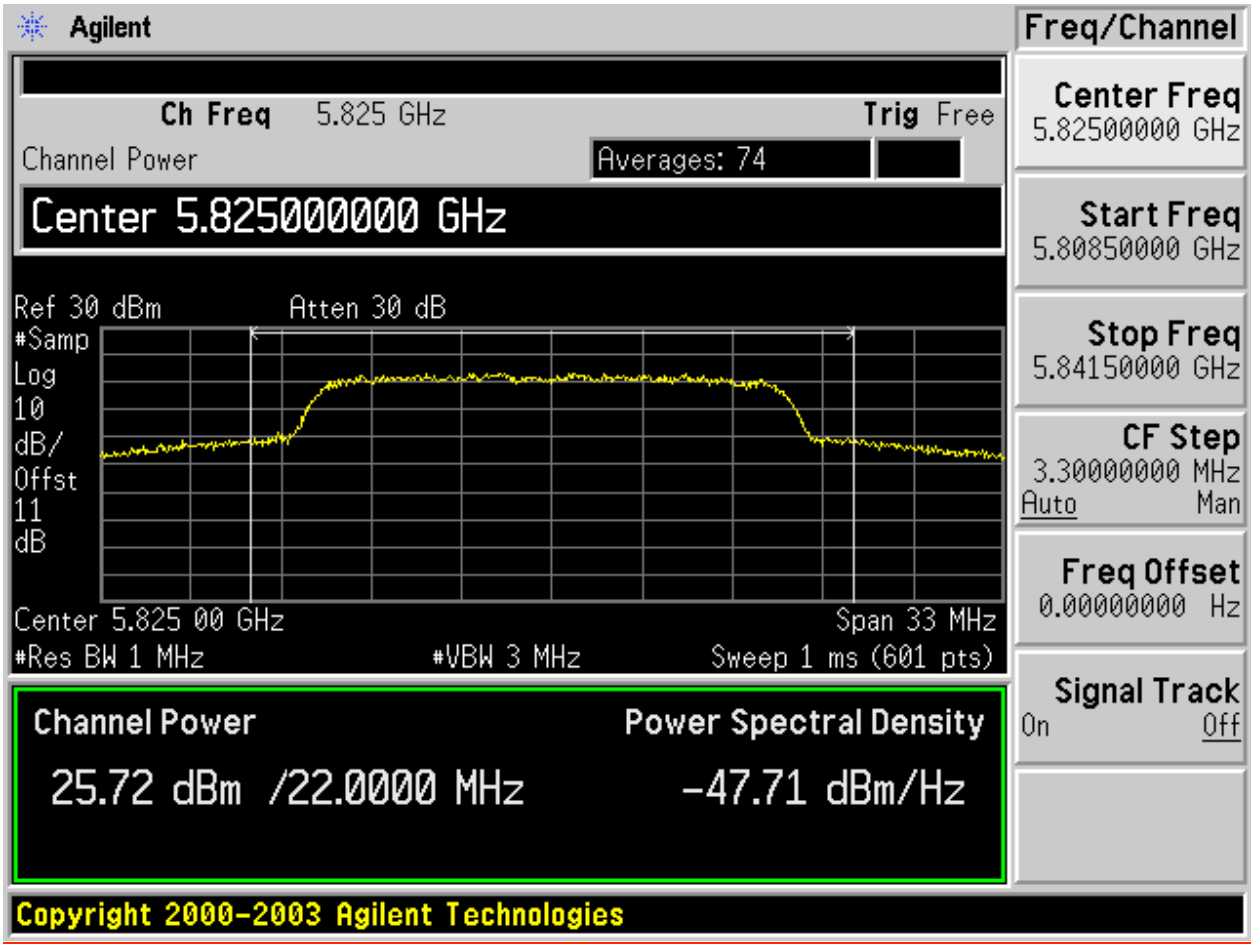
OUTPUT POWER LOW CHANNEL



OUTPUT POWER MID CHANNEL



OUTPUT POWER HIGH CHANNEL



3.7.2. 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:

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.

Tropos Networks										
FCC ID: P9J-5805										
Dual radio wireless router						**Calculate mW/cm2 here. Enter frequency in MHz:**				
5.8 GHz 802.11a DTS radio module										
RF Hazard Distance Calculation						Calculation of Limits from 1.1310 Table 1				
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 from Table1:		1.00				F(MHz)	**Actual F, MHz**		Occ, mW/c2	Gen, mW/cm2
						0.3-3	0.5		100.0	100.0
Max RF Power	TX Antenna	MPE distance	S, mW/cm@	Comment		*3.0 - 30.0*	*5*		*180.0*	*36.0*
P, dBm	G, dBi	cm	at 20 cm			**30.0-300**	**55**		**1.0**	**0.2**
						300-1500	*902*		*3.0*	*0.60*
26.4	19.00	52.3	-	P2P patch		1500-100000	5555		5.0	1.0
26.4	9.1	16.8	0.71	P2MP Omni						
26.4	17.0	41.7	-	P2P Sector						
19.0	17.0	17.8	0.79	P2MP Sector		**Enter P(mW)**	Equivalent dBm	**Enter dBm**	Equivalent Watts	
Basis of Calculations:						***895.4***	**29.52**	***29.52***	895.4	
E^2/3770 = S, mW/cm2										
E, V/m = (Pwatts*Ggain*30)^.5/d, meters										
d = ((Pwatts*G*30)/3770*S))^0.5			Pwatts*Ggain = 10^(PdBm-30+GdBi)/10)							
S@20cm = 20 log (MPE dist/20cm)										
NOTE: For mobile or fixed location transmitters, minimum separation distance is for FCC compliance is 20 cm,										
even if calculations indicate MPE distance is less										

3.7.3. CONDUCTED SPURIOUS EMISSIONS

LIMITS

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

TEST PROCEDURE

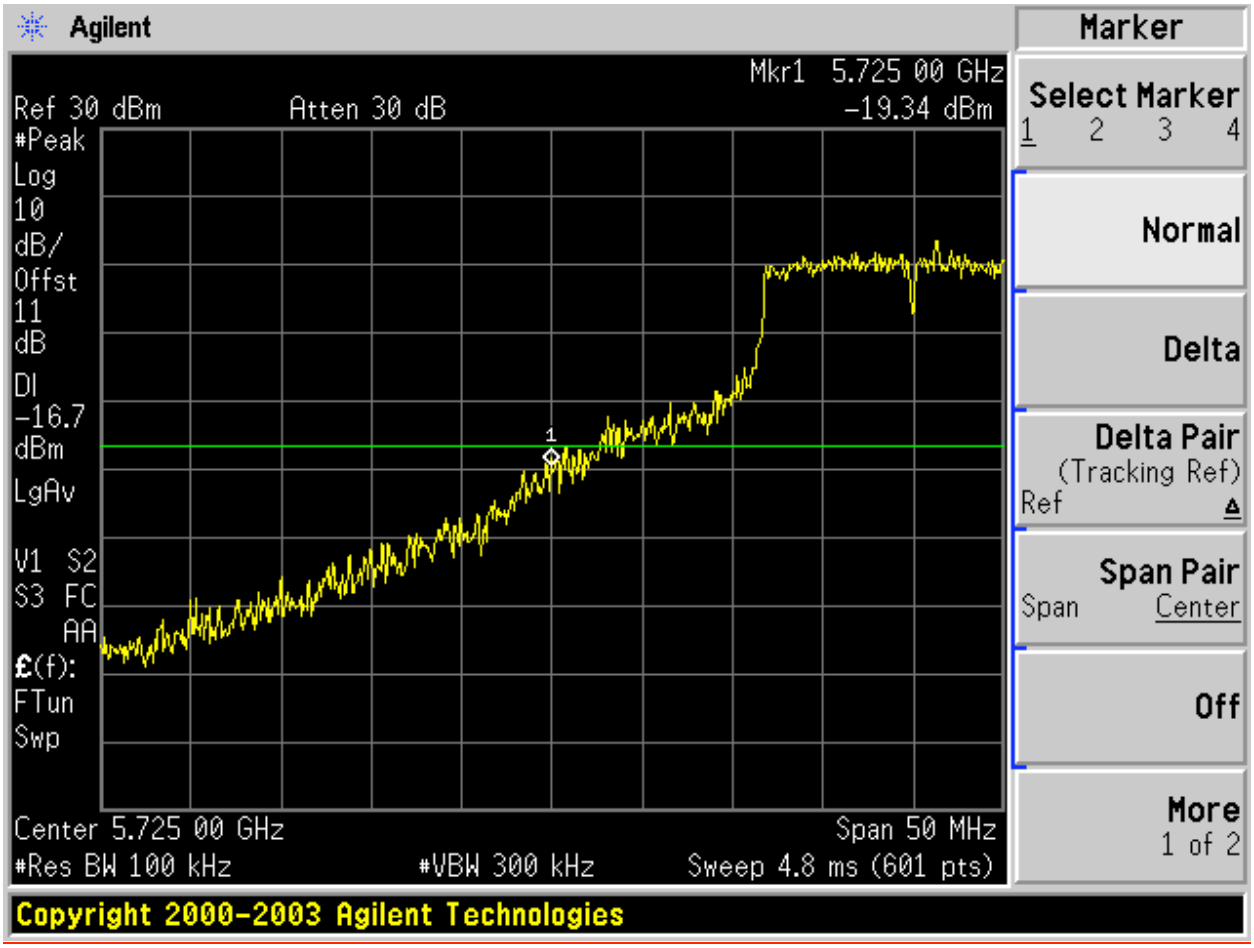
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

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

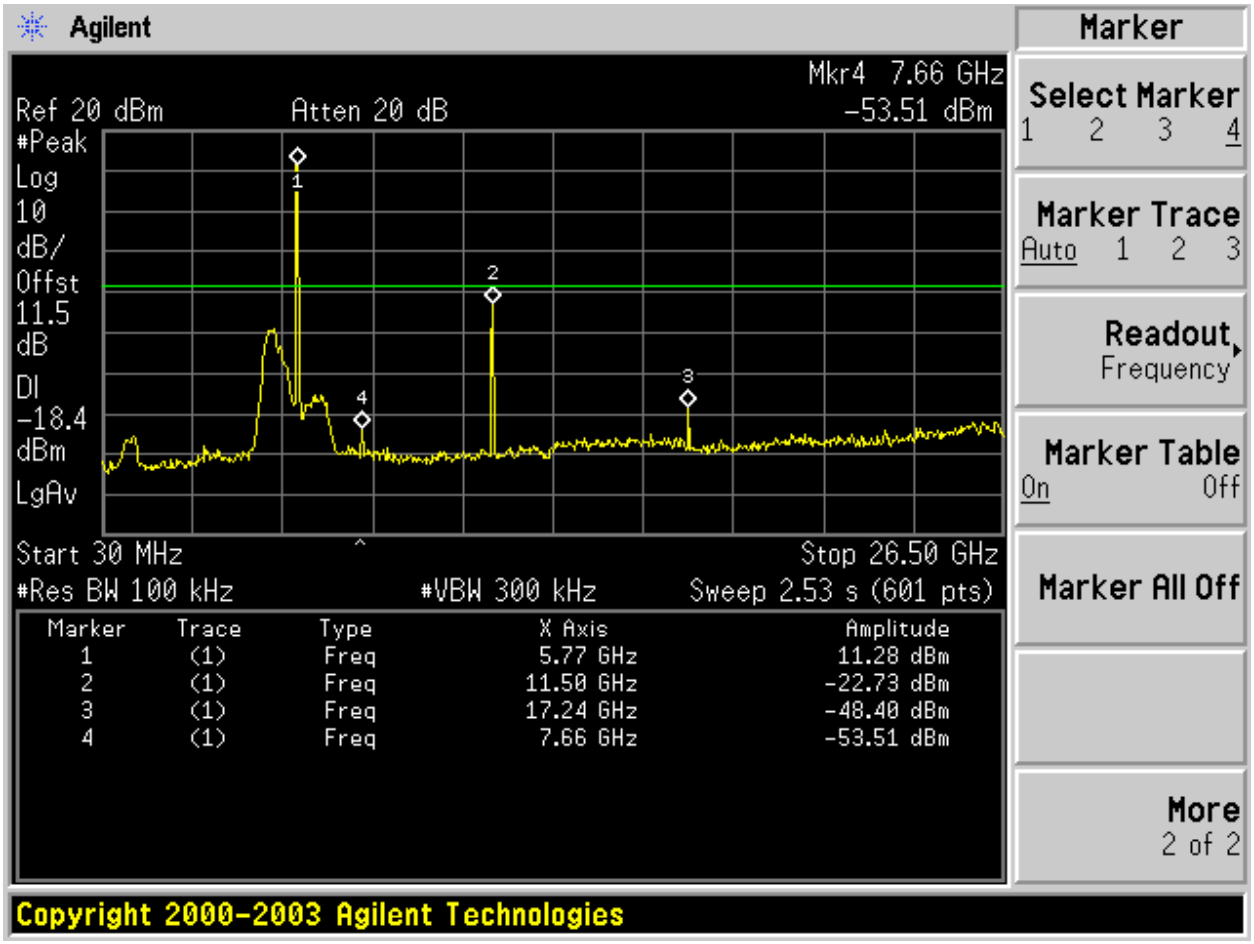
RESULTS

No non-compliance noted. All conducted emissions outside passband less than -30 dBc.

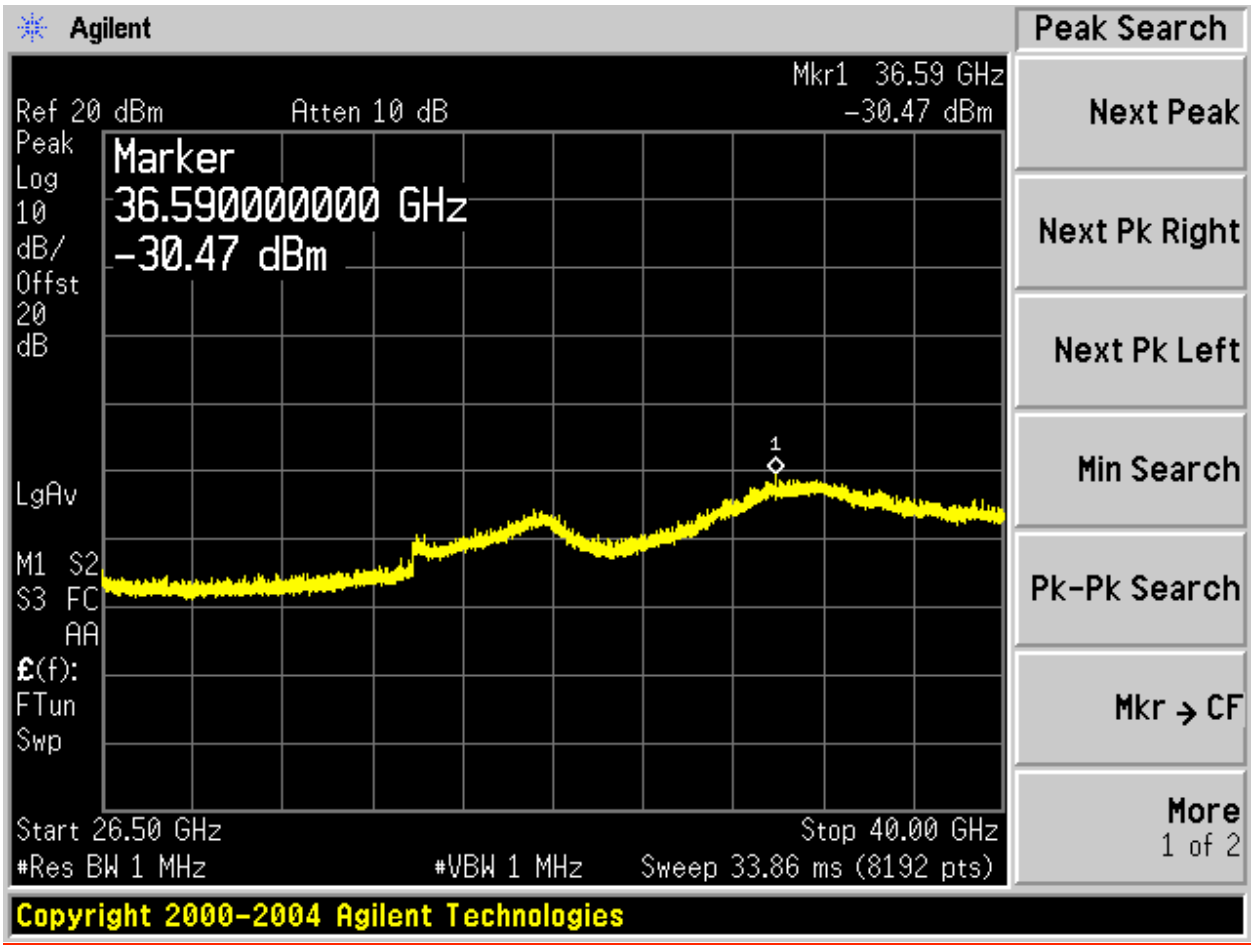
SPURIOUS EMISSIONS, LOW CHANNEL (1 of 3)



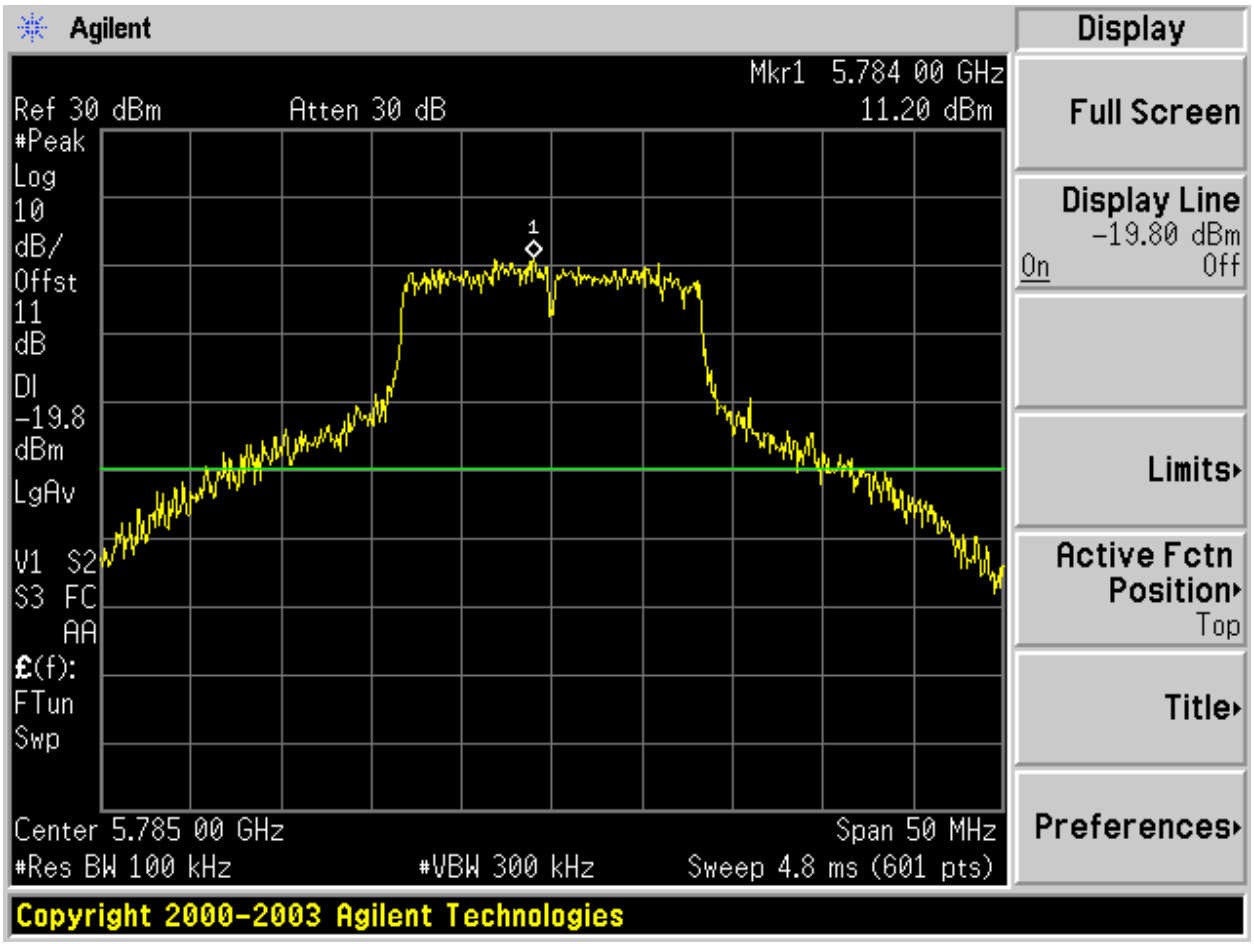
SPURIOUS EMISSIONS, LOW CHANNEL (2 of 3)



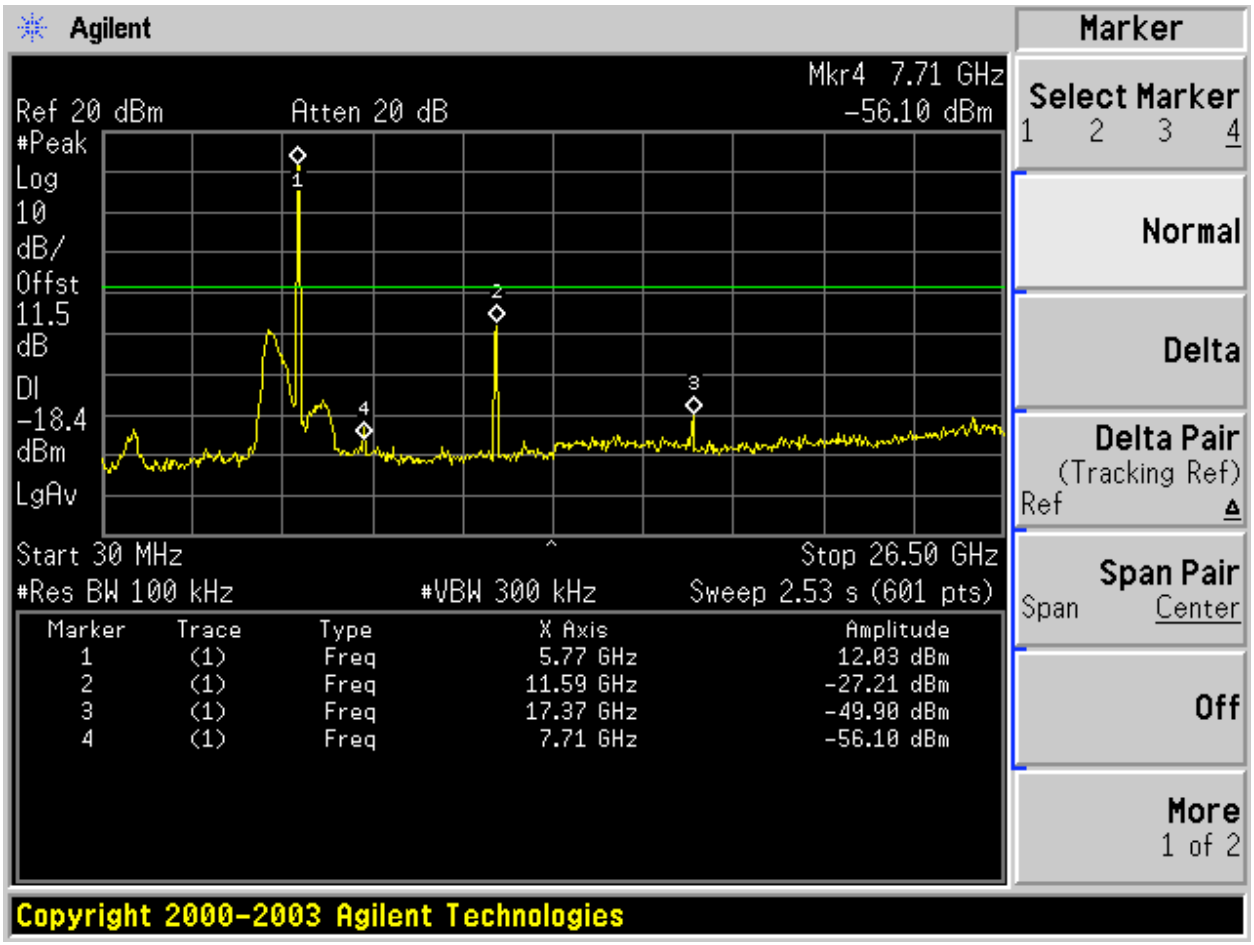
SPURIOUS EMISSIONS, LOW CHANNEL (3 of 3)



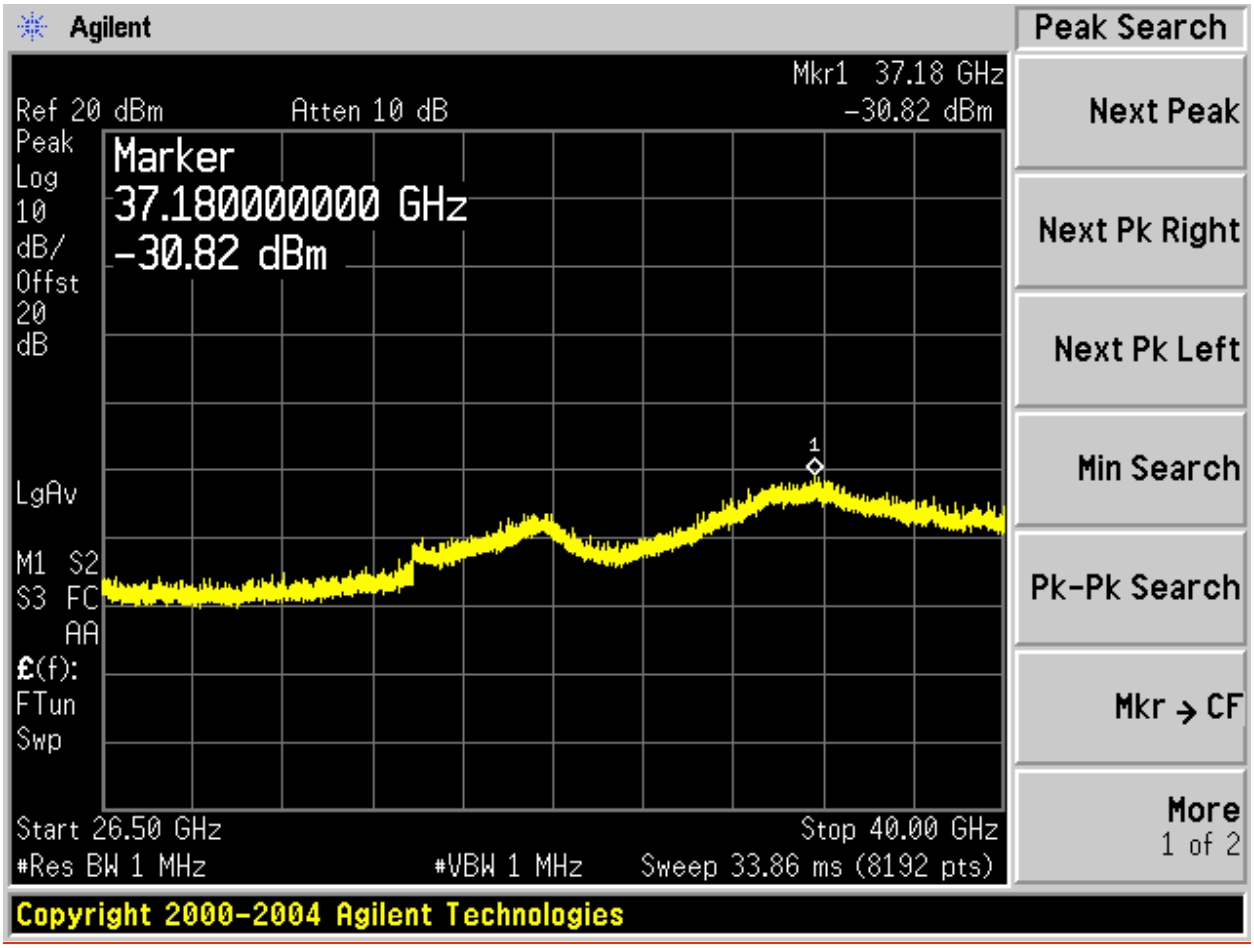
SPURIOUS EMISSIONS, MID CHANNEL (1 of 3)



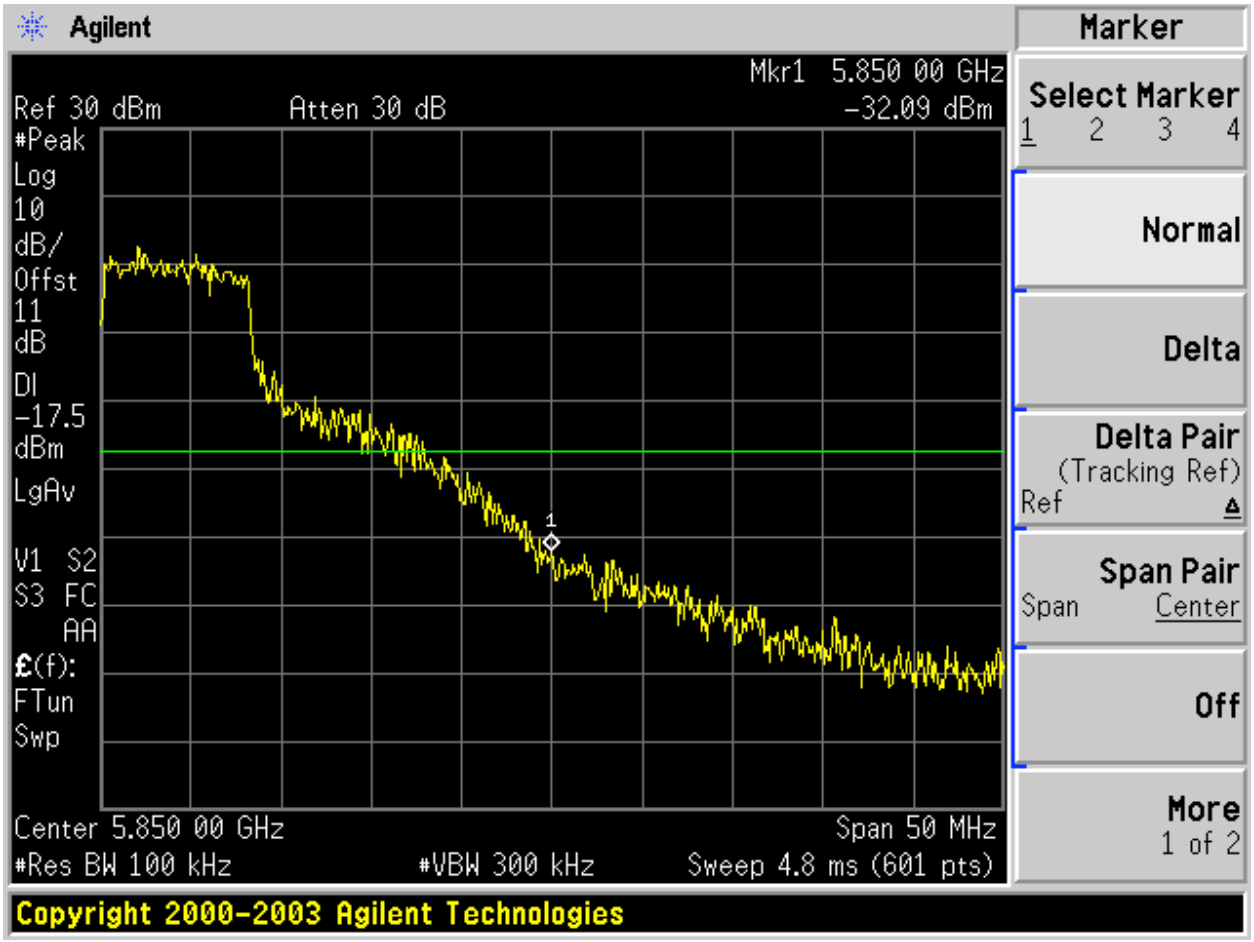
SPURIOUS EMISSIONS, MID CHANNEL (2 of 3)



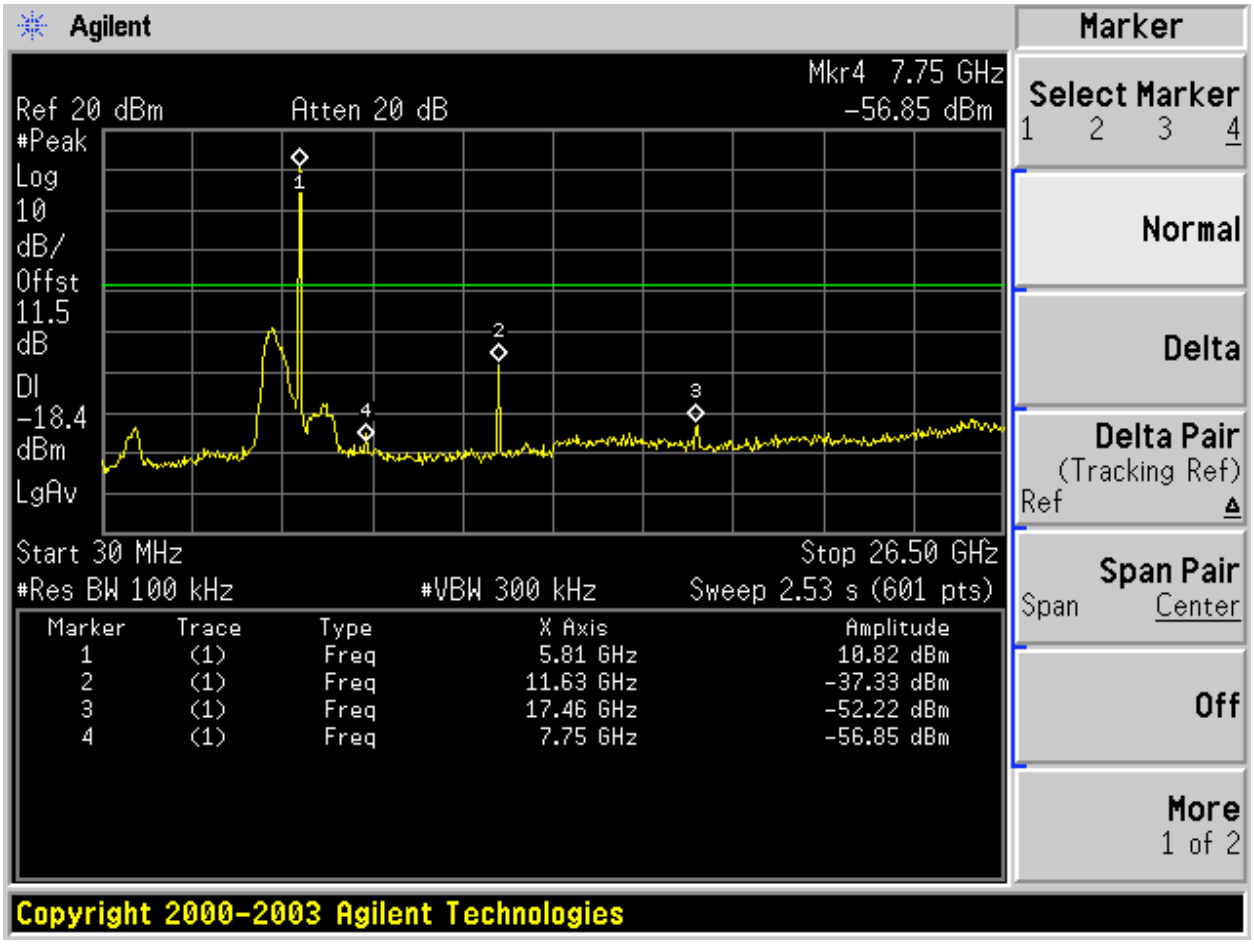
SPURIOUS EMISSIONS, MID CHANNEL (3 of 3)



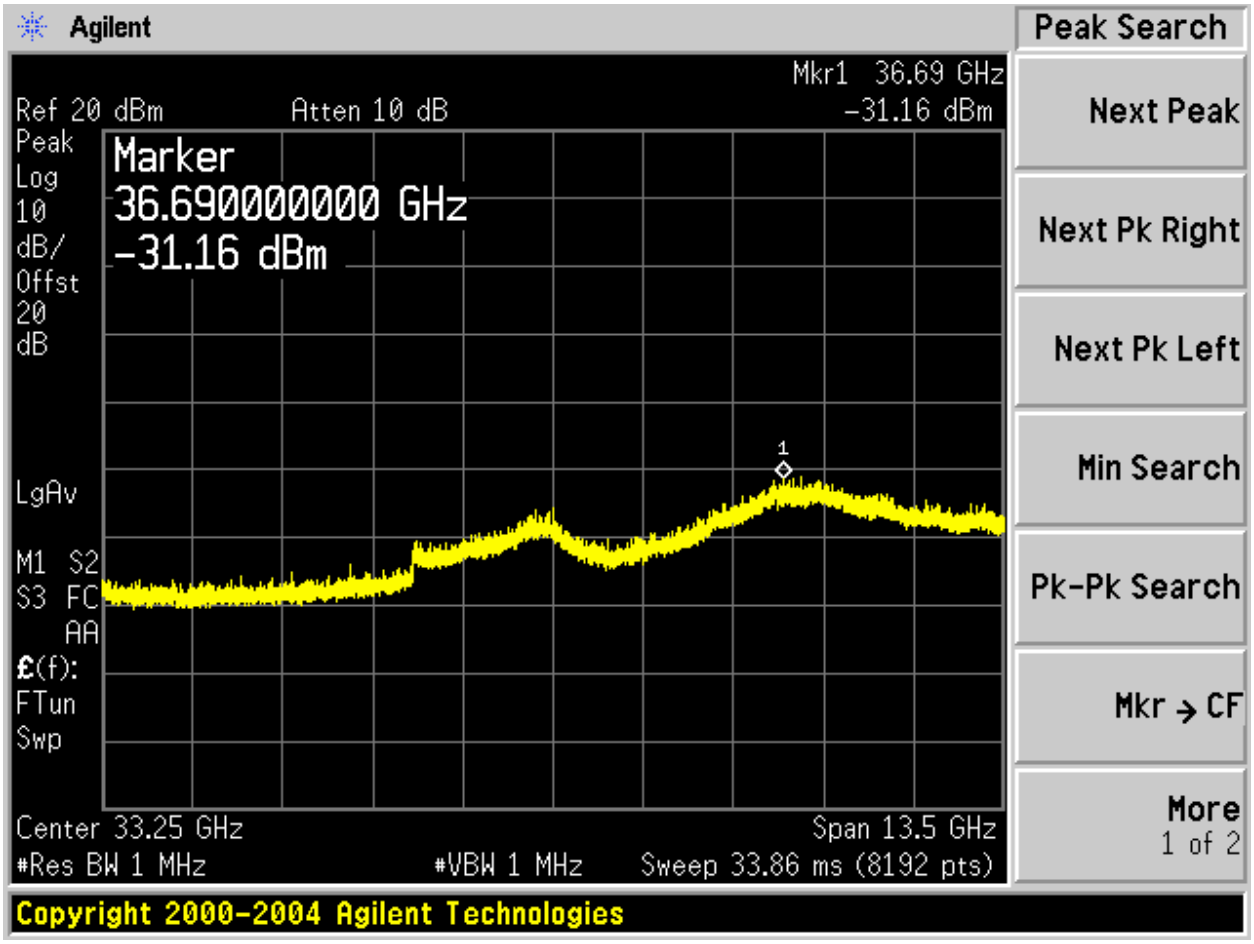
SPURIOUS EMISSIONS, HIGH CHANNEL (1 of 3)



SPURIOUS EMISSIONS, HIGH CHANNEL (2 of 3)



SPURIOUS EMISSIONS, HIGH CHANNEL (3 of 3)



3.8. RADIATED EMISSIONS

3.8.1. 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 high transmit channels: 5745 MHz, 5785 MHz and 5825 MHz.

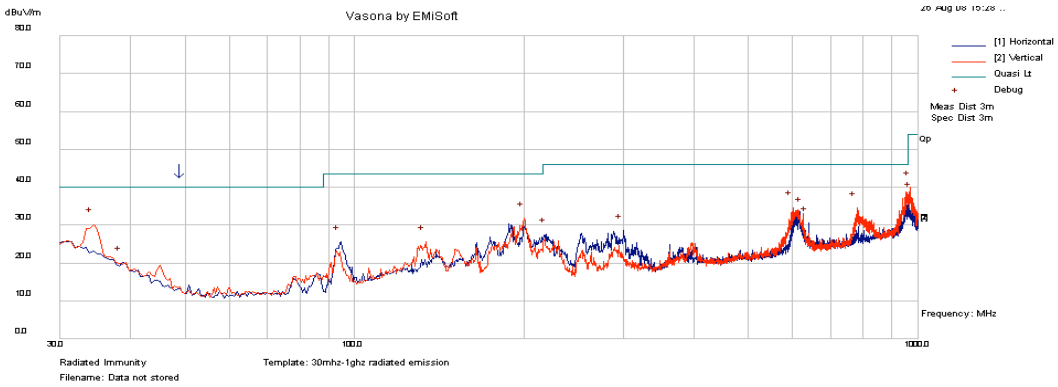
Testing was performed with three antennas: 9.1 dBi omni, 17 dBi sector, and 19 dBi patch.

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.

3.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ HARMONICS AND SPURIOUS EMISSIONS

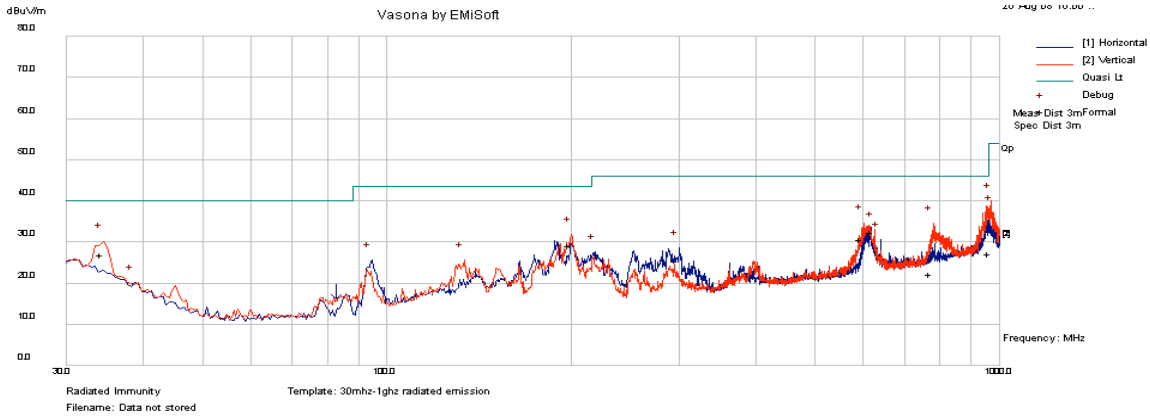
1. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

T0808262
8/26/08
Company: Tropos Networks
FCC Radiated Emission
Tested in Chamber #2 By Victor Zhang



Peak Measurement

Vasona Data : List of Debug Frequencies												
No	Frequency	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measureme	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail
1	34.365	29.44	10.35	-9.69	30.1	Peak [Scan	V	100	0	40	-9.9	Pass
2	600.36	32.7	11.5	-9.59	34.6	Peak [Scan	V	200	0	46	-11.4	Pass
3	779.81	29.75	11.7	-6.94	34.51	Peak [Scan	V	100	0	46	-11.49	Pass
4	200.235	35.57	10.7	-14.48	31.78	Peak [Scan	V	200	0	43.5	-11.72	Pass
5	626.065	30.54	11.5	-9	33.04	Peak [Scan	V	100	0	46	-12.96	Pass
6	971.385	32.25	12	-4.34	39.91	Peak [Scan	V	100	0	54	-14.09	Pass
7	640.13	27.47	11.5	-8.5	30.47	Peak [Scan	H	100	0	46	-15.53	Pass
8	977.69	29.44	12	-4.4	37.04	Peak [Scan	V	100	0	54	-16.96	Pass
9	300.145	30.96	11	-13.4	28.56	Peak [Scan	H	100	0	46	-17.44	Pass
10	133.79	29.07	10.6	-14.08	25.58	Peak [Scan	V	100	0	43.5	-17.92	Pass
11	94.505	34.22	10.6	-19.31	25.51	Peak [Scan	H	200	0	43.5	-17.99	Pass
12	219.15	32.93	10.79	-16.15	27.57	Peak [Scan	H	100	0	46	-18.43	Pass
13	38.73	22.78	10.39	-13.09	20.08	Peak [Scan	H	400	0	40	-19.92	Pass



QP Measurement

Vasona Data : Formally Assessed Peaks												
No	Frequency	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measureme	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail
1	34.482	22.24	10.35	-9.79	22.8	Quasi Max	V	118	63	40	-17.2	Pass
2	600.449	24.57	11.5	-9.59	26.48	Quasi Max	V	99	308	46	-19.52	Pass
3	779.894	13.38	11.7	-6.94	18.14	Quasi Max	V	238	341	46	-27.86	Pass

3.9. 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

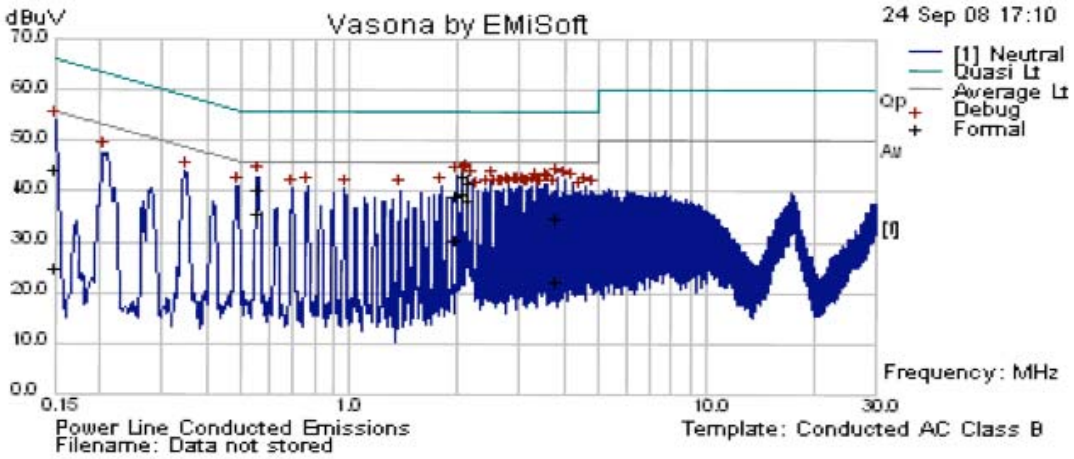
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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.

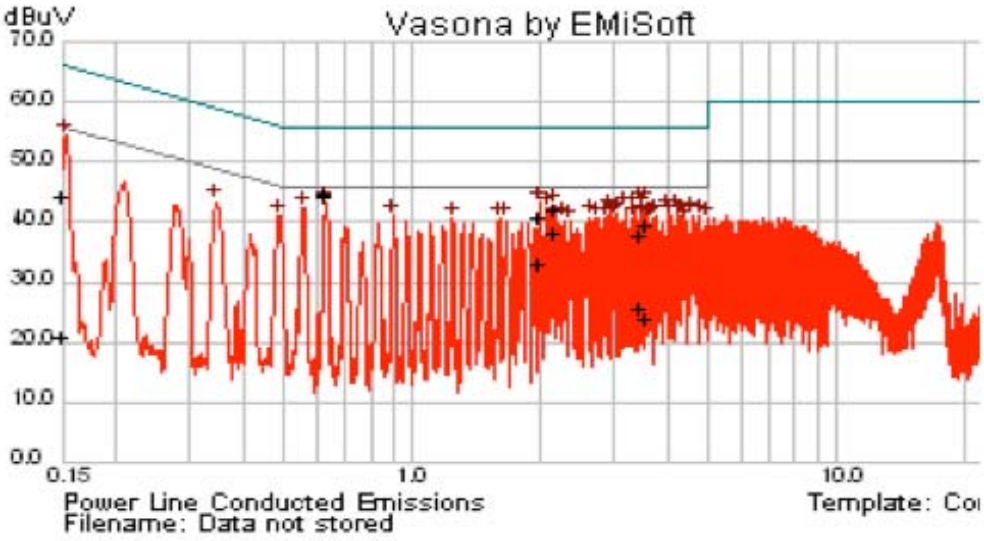
RESULTS

No non-compliance noted:



Vasona Data : Formally Assessed Peaks

No	Frequency	Raw dBuV	Cable Los	Factors dB	Level dBu	Measurem	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.15	32.22	10.13	0	42.35	Quasi Peak	Neutral	65.99	-23.64	Pass	
2	2.169	29.39	10.41	0	39.8	Quasi Peak	Neutral	56	-16.2	Pass	
3	2.012	26.54	10.4	0	36.94	Quasi Peak	Neutral	56	-19.06	Pass	
4	2.097	30.55	10.41	0	40.96	Quasi Peak	Neutral	56	-15.04	Pass	
5	0.554	28.29	10.25	0	38.54	Quasi Peak	Neutral	56	-17.46	Pass	
6	3.811	22.24	10.54	0	32.78	Quasi Peak	Neutral	56	-23.22	Pass	
7	0.15	12.75	10.13	0	22.88	Average	Neutral	55.99	-33.11	Pass	
8	2.169	25.9	10.41	0	36.31	Average	Neutral	46	-9.69	Pass	
9	2.012	17.81	10.4	0	28.21	Average	Neutral	46	-17.79	Pass	
10	2.097	27.27	10.41	0	37.68	Average	Neutral	46	-8.32	Pass	
11	0.554	23.17	10.25	0	33.43	Average	Neutral	46	-12.57	Pass	

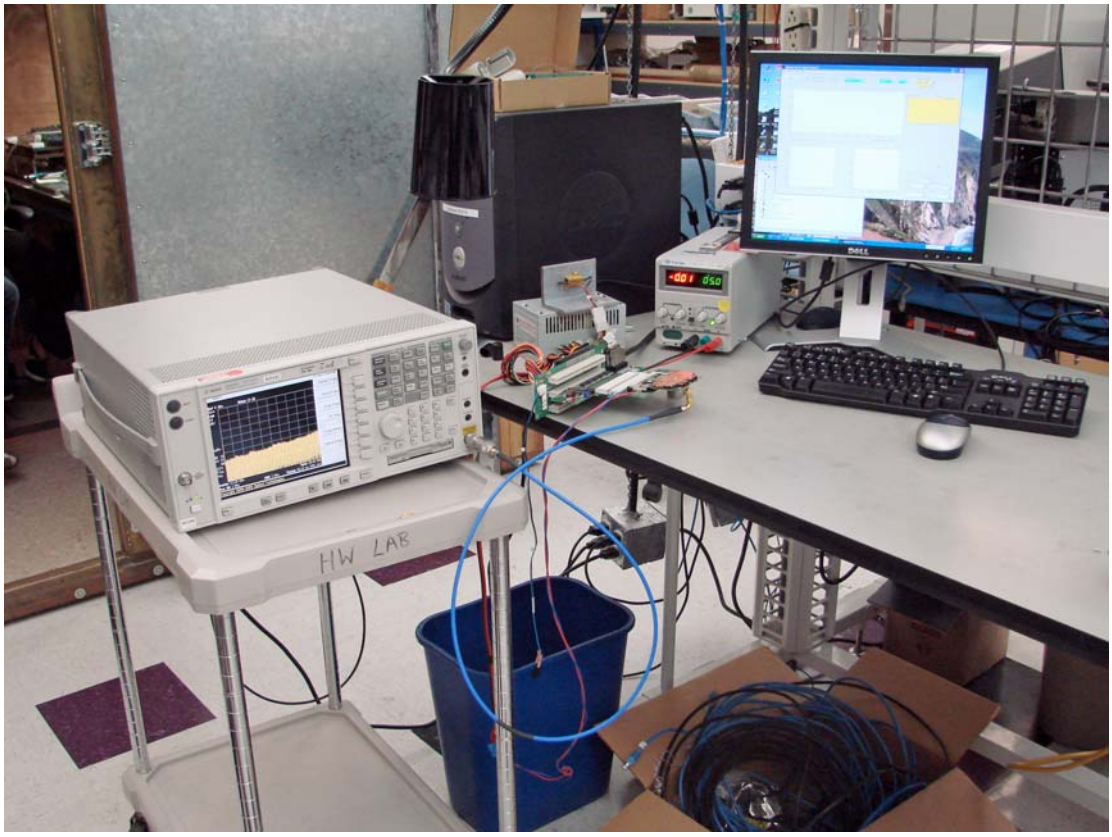


Vasona Data : Formally Assessed Peaks

No	Frequency	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement	Line	Limit dBuV
1	0.151	32.15	10.13	0	42.28	Quasi Peak	Neutral	65.97
2	2.011	28.37	10.4	0	38.77	Quasi Peak	Neutral	56
3	3.467	25.04	10.53	0	35.57	Quasi Peak	Neutral	56
4	0.627	32.47	10.27	0	42.74	Quasi Peak	Neutral	56
5	3.563	26.92	10.53	0	37.46	Quasi Peak	Neutral	56
6	2.157	29.47	10.41	0	39.88	Quasi Peak	Neutral	56
7	0.151	8.81	10.13	0	18.94	Average	Neutral	55.97
8	2.011	20.77	10.4	0	31.17	Average	Neutral	46
9	3.467	13.08	10.53	0	23.6	Average	Neutral	46
10	0.627	32.06	10.27	0	42.33	Average	Neutral	46
11	3.563	11.16	10.53	0	21.69	Average	Neutral	46
12	2.157	25.77	10.41	0	36.18	Average	Neutral	46

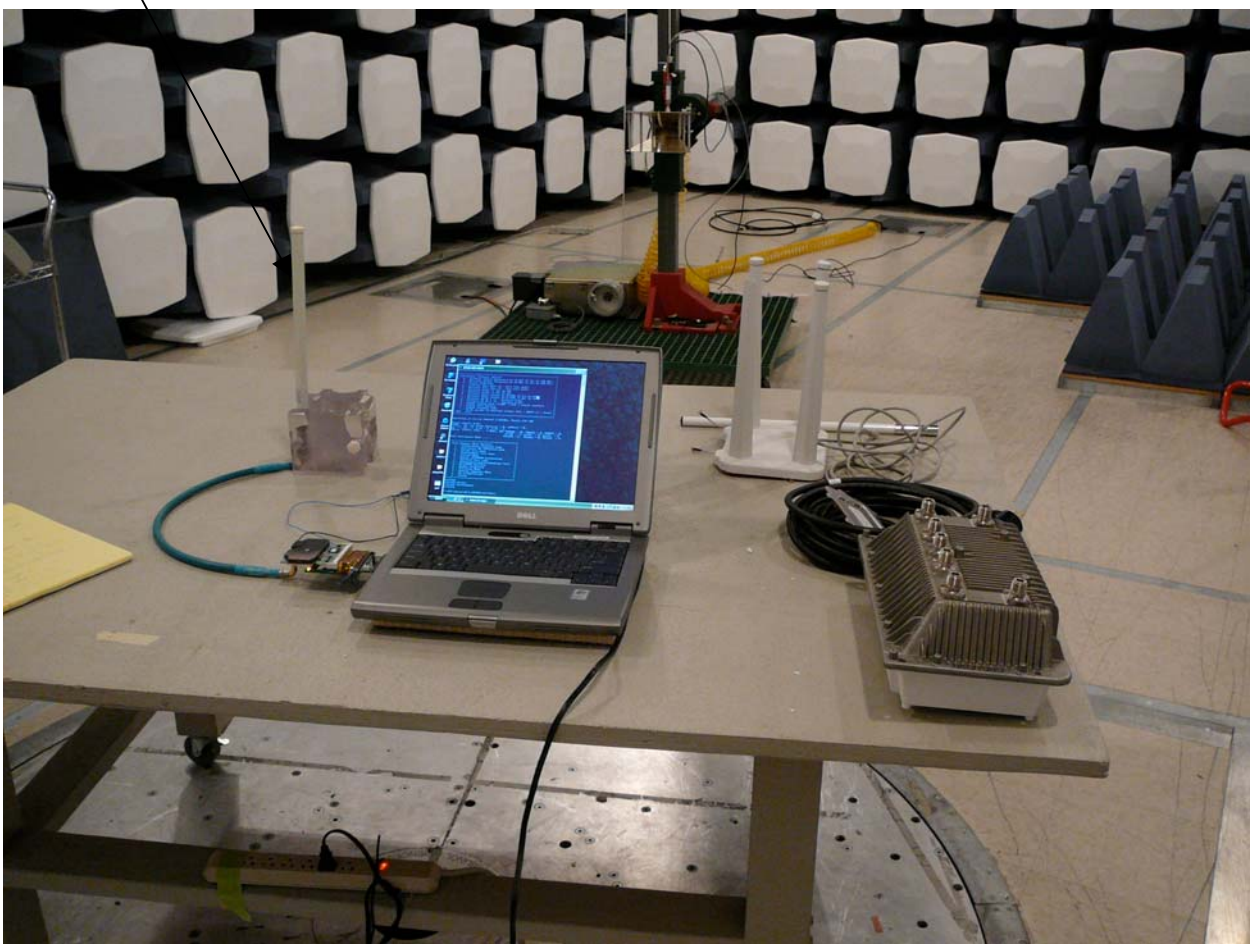
4. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



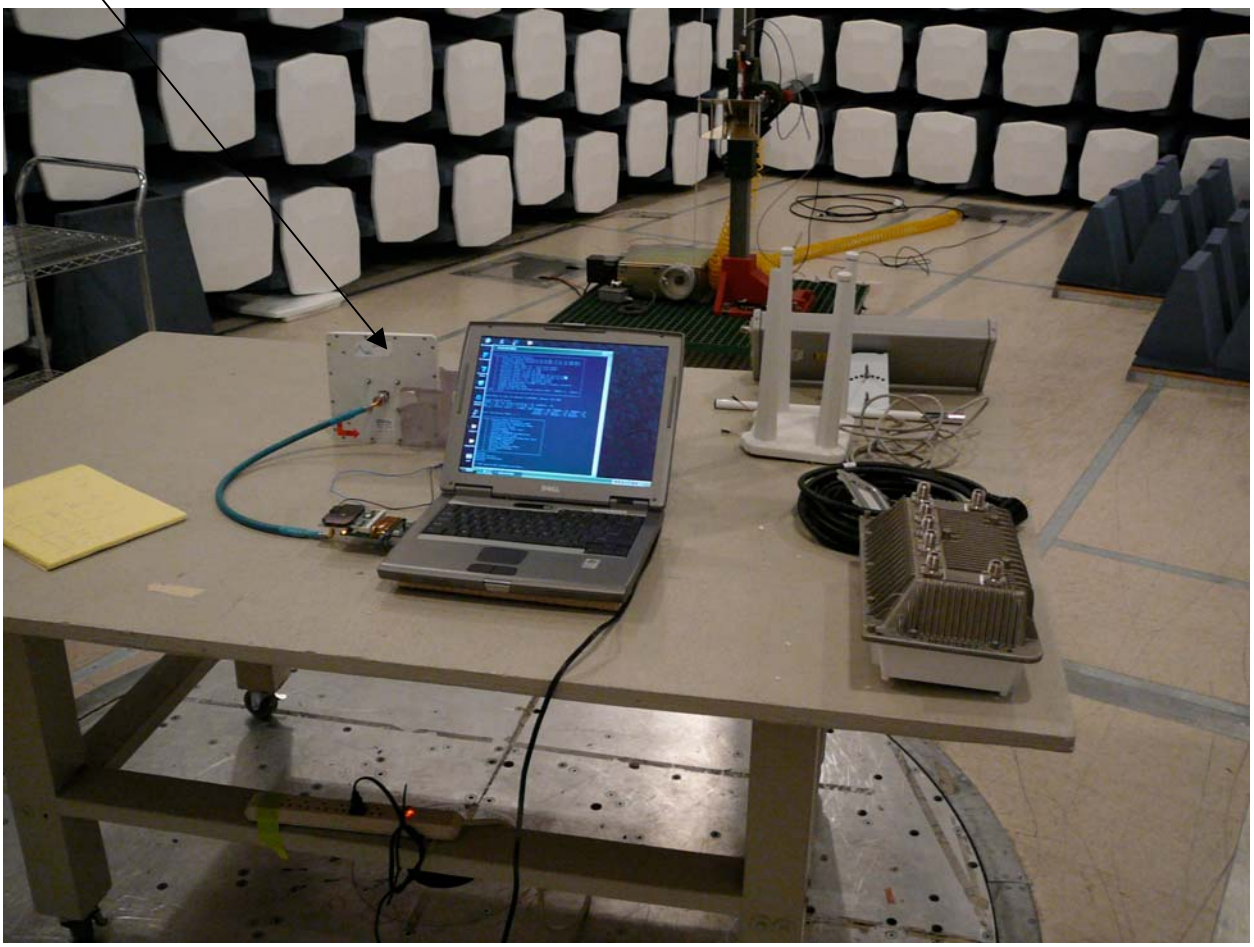
RADIATED RF MEASUREMENT SETUP

9.1 dBi Antenna

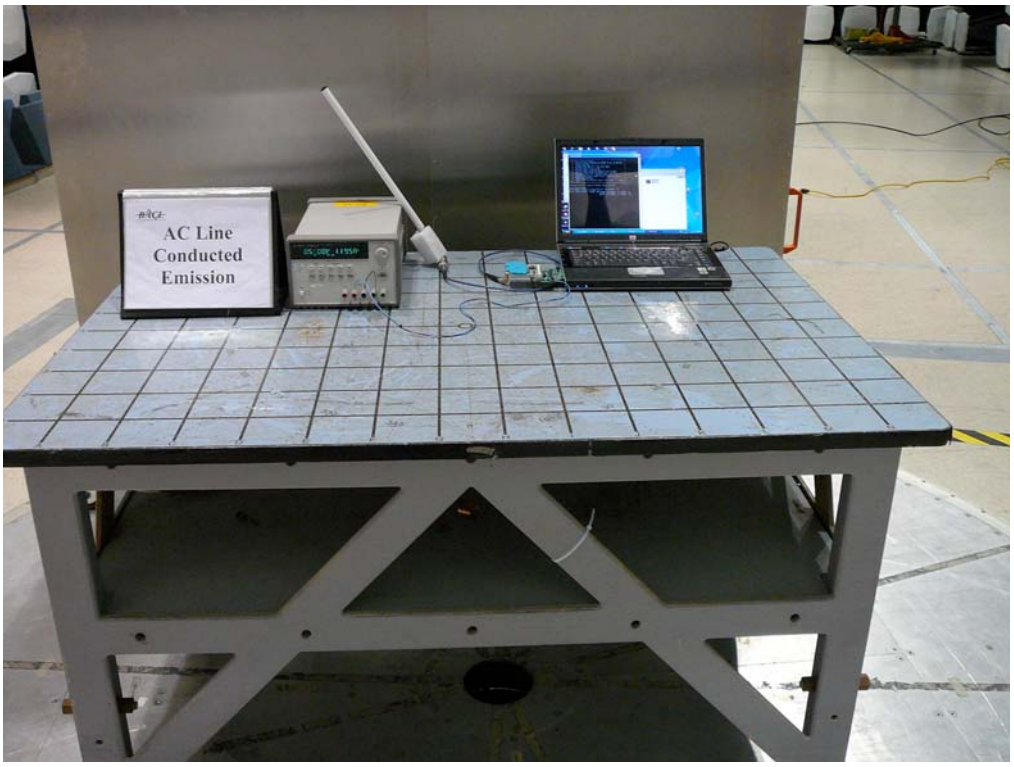


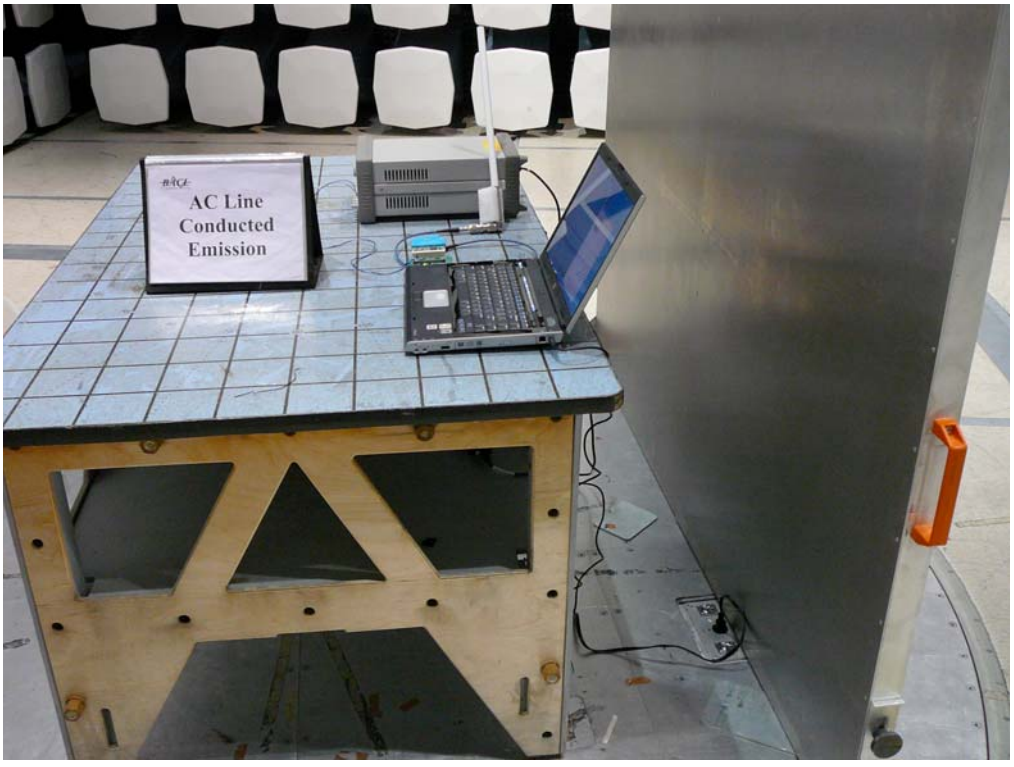
17 dBi

19 dBi antenna



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





END OF REPORT