FCC CFR47 PART 90 SUBPART Y
CERTIFICATION
TEST REPORT

FOR

DUAL BAND WIRELESS ACCESS POINT WITH BUILT-IN AMPLIFIER

MODEL NUMBER: AP4900MR-LR

FCC ID: HZB-4900LR

REPORT NUMBER: 06U10518-1, REVISION C

ISSUE DATE: OCTOBER 18, 2006

Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
	10/4/06	Initial Issue.	A.I.
B	10/05/06	Changed FCC ID.	S.R.
C	10/18/06	Removed 5 MHz nominal bandwidth data. Clarify Methodology, Clarify Transmitter Radiated Spurious Procedure in Section 7.3	A.I.

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PROXIM WIRELESS CORPORATION
2115 O'NEL DRIVE
SAN JOSE, CA 95131
U.S.A.

EUT DESCRIPTION: DUAL BAND WIRELESS ACCESS POINT WITH BUILT-IN AMPLIFIER

MODEL: AP4900MR-LR

SERIAL NUMBER: 06FC22570399

DATE TESTED: SEPTEMBER 18 – 22, 2006

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 90 SUBPART Y	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: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By: Tested By:

ALVIN ILARINA
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

FRANK IBRAHIM
EMC EMNGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with EIA/TIA-603-C-2004, FCC CFR 47 Part 2 and FCC CFR 47 Part 90.

3. 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.

4. CALIBRATION AND UNCERTAINTY

4.1. 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.

4.2. 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. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a DUAL BAND WIRELESS ACCESS POINT WITH BUILT-IN AMPLIFIER.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
4945 - 4985	10 MHz Bandwidth	16.89	48.87
4950 - 4980	20 MHz Bandwidth	19.90	97.72

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio may be used with a variety of antennas providing that for antenna gain over 9 dBi the conducted output power is adjusted as required to meet EIRP and MPE limits:

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was ART, rev. 5 build #11 Mainline.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 4965 MHz for 20 MHz channel bandwidth operation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	IBM	A20P	78-M4293	DoC
AC Adapter	IBM	AA21131	02K6657	N/A
AC Adapter	FUJITSU	N/A	CP277622-02	N/A
48 VDC POE	TERABEAM	N/A	104-10048	N/A

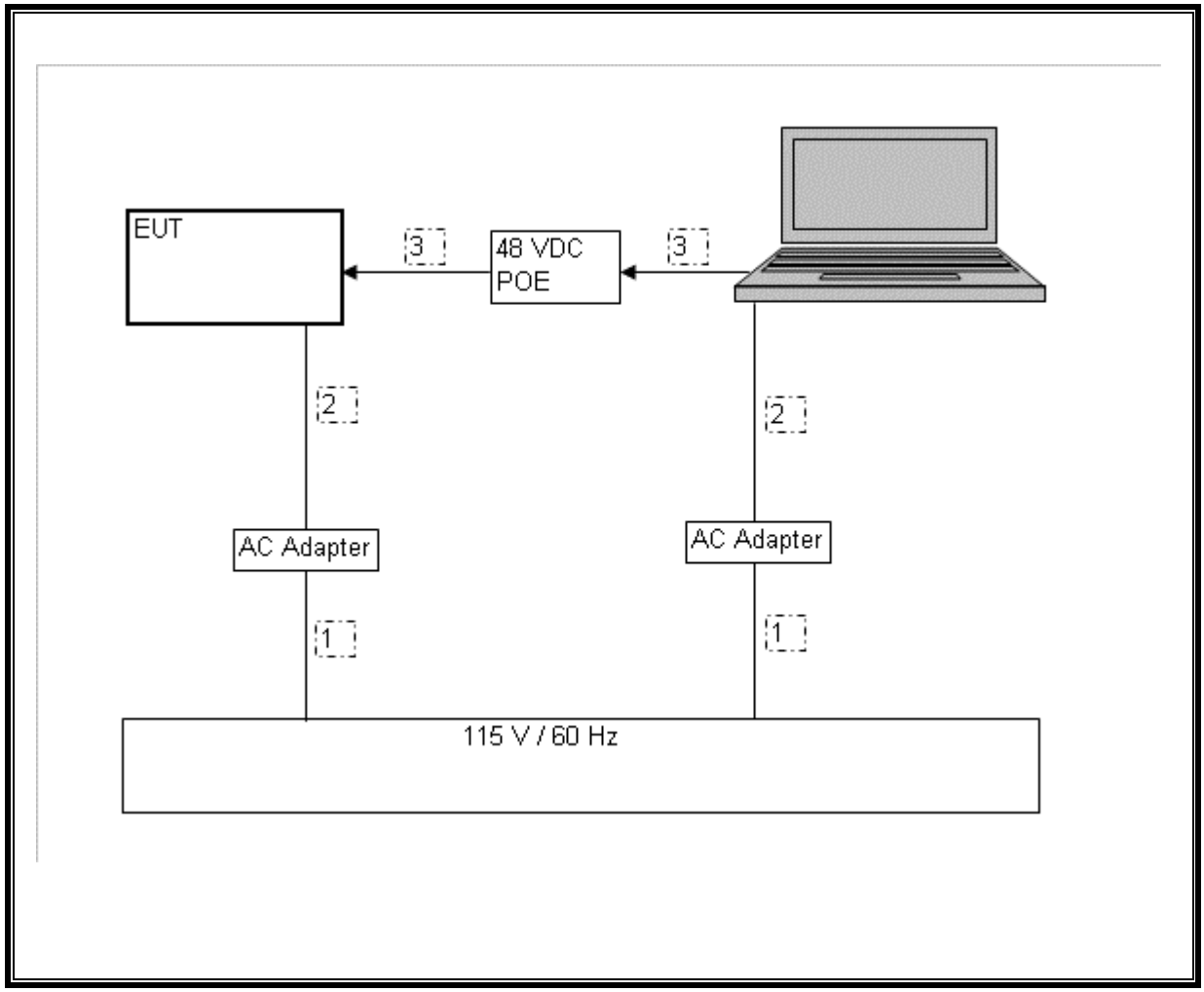
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	US115	Unshielded	1m	No
2	DC	2	DC	Unshielded	1m	No
3	Ethernet	2	RJ45	Unshielded	1.5m	Yes

TEST SETUP

The EUT is connected to a host laptop computer via an unshielded crossover LAN cable during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. 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 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	05/03/07
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/02/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/02/07
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	29800	06/10/07
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	02/04/07
RF Filter Section	Agilent / HP	85420E	3705A00256	02/04/07
Antenna, Bilog 30 MHz ~ 2 GHz	Sunol Sciences	JB1	A121003	09/03/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	04/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00931	06/24/07
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29310	04/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/03/07
7.6 GHz HPF	Micro-Tronics	HPM13195	002	C.N.R.

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR 10 MHz CHANNEL BANDWIDTH MODE

7.1.1. 99% EMISSION BANDWIDTH

LIMIT

For reporting purposes only.

TEST PROCEDURE

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

RESULTS

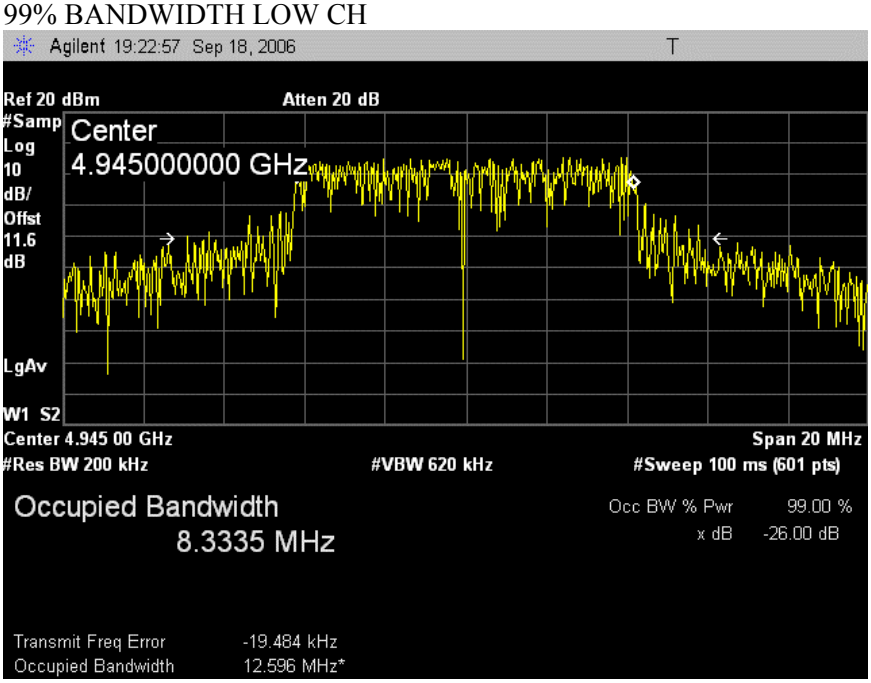
No non-compliance noted:

99% Bandwidth

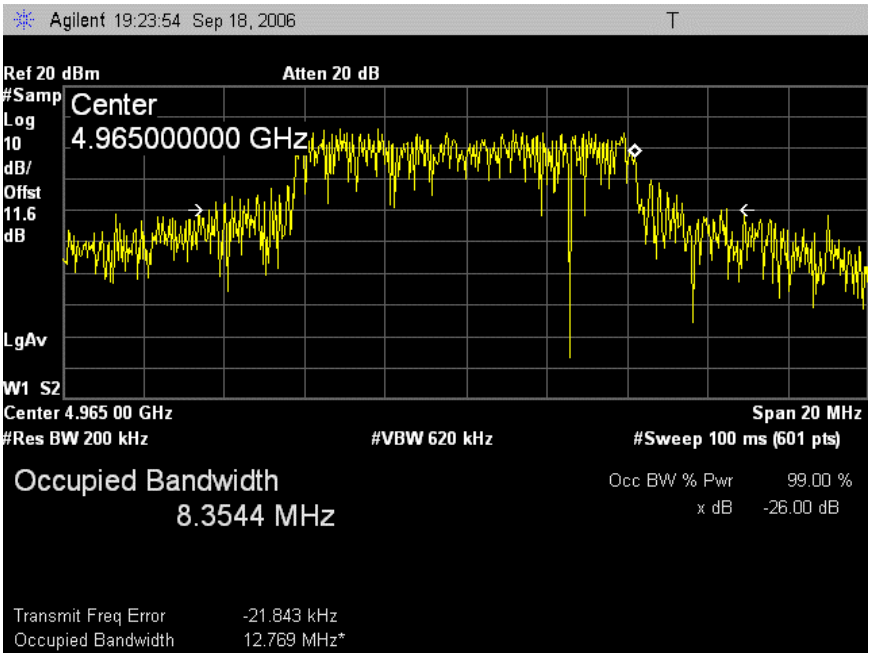
Channel	Frequency (MHz)	99% BW (MHz)
Low	4945	8.3335
Middle	4965	8.3544
High	4985	8.3416

99% EMISSION BANDWIDTH

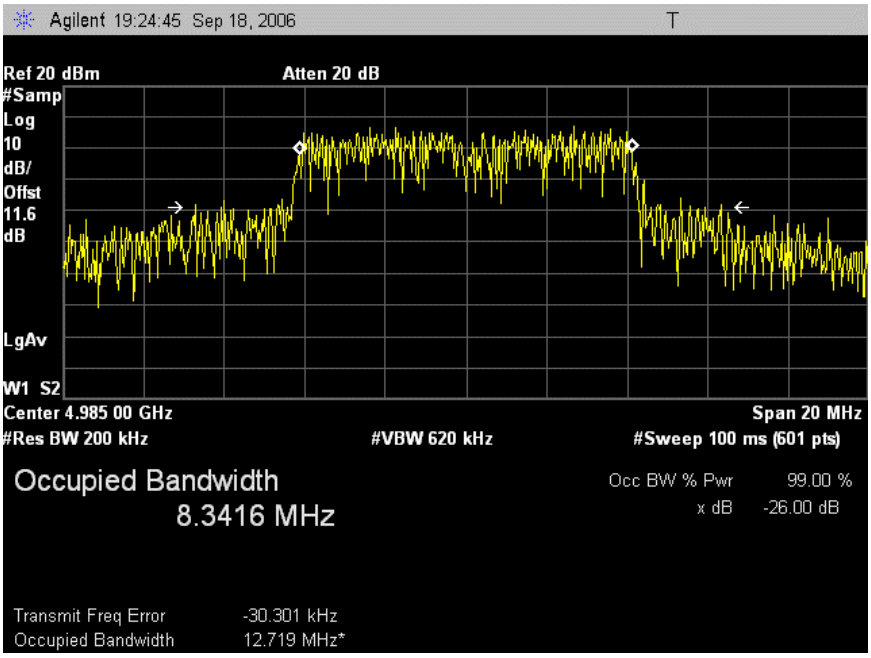
99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.1.2. PEAK OUTPUT POWER

PEAK POWER LIMIT

§ 90.1215 The transmitting power of stations operating in the 4940–4990 MHz band must not exceed the maximum limits in this section.

(a) The peak transmit power should not exceed:

Channel bandwidth (MHz)	Low power Device Peak transmitter Power (dBm)	High power Device Peak transmitter Power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. High power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi

TEST PROCEDURE

The test is performed using peak power spectral integration.

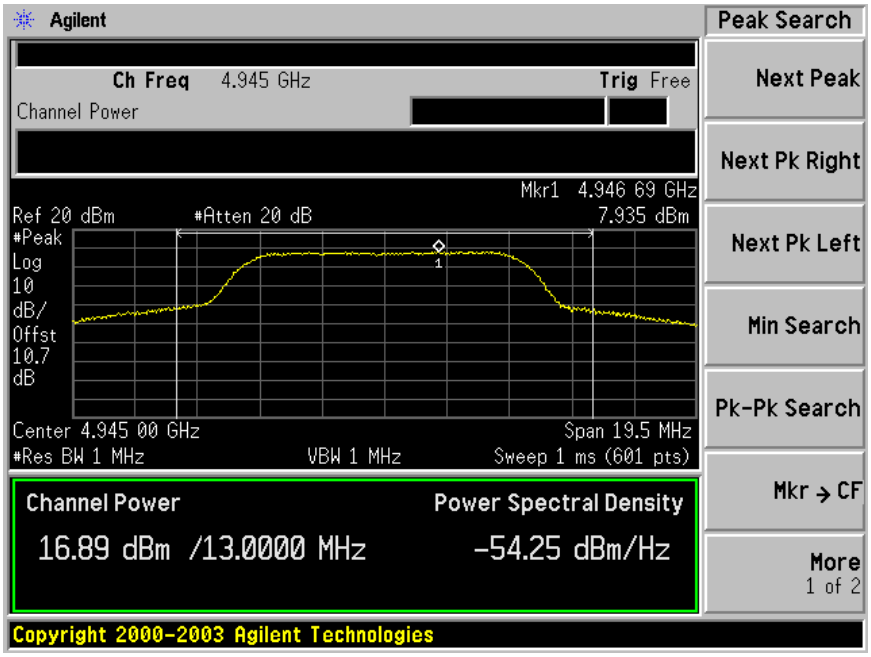
RESULTS

No non-compliance noted:

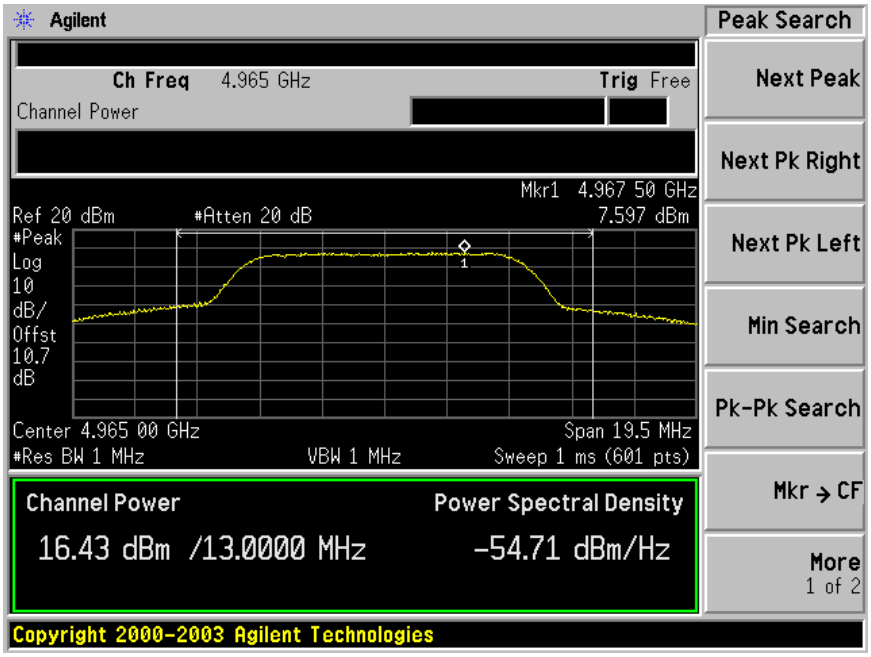
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	4945	16.89	17	-0.11
Middle	4965	16.43	17	-0.57
High	4985	16.67	17	-0.33

OUTPUT POWER (802.11a MODE)

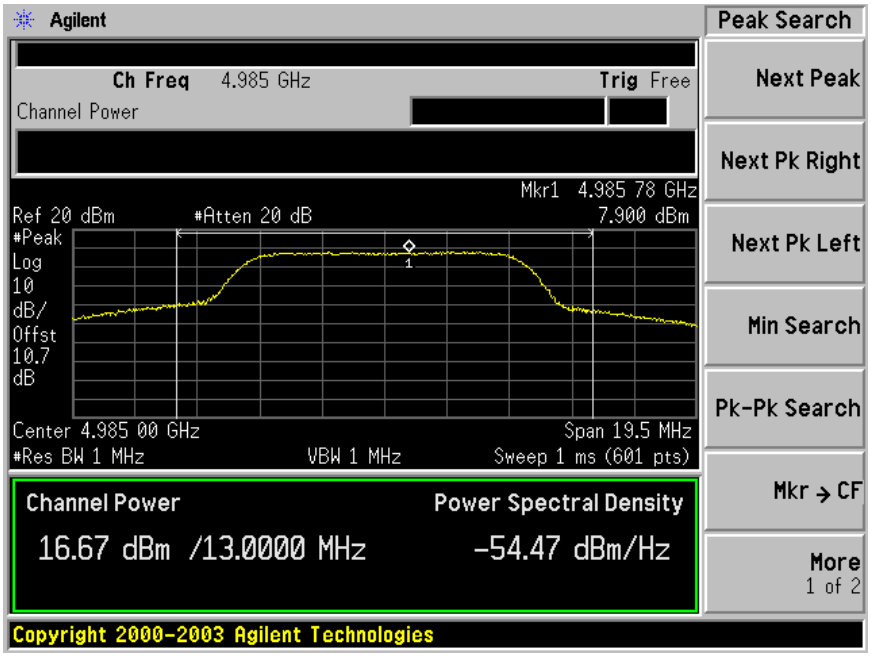
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.1.3. 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

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

where

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

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

LIMITS

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

RESULTS

No non-compliance noted:

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
10 MHz Channel BW	20.0	16.89	0.00	0.0097

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.

7.1.4. 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 11 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	4945	15.76
Middle	4965	15.82
High	4985	15.06

7.1.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§ 90.1215 (b) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi..

(c) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 1 MHz bandwidth is measured with the spectrum analyzer using RBW = 1 MHz and VBW 1 MHz. The PPSD is the highest level found across the emission in any 1 MHz band.

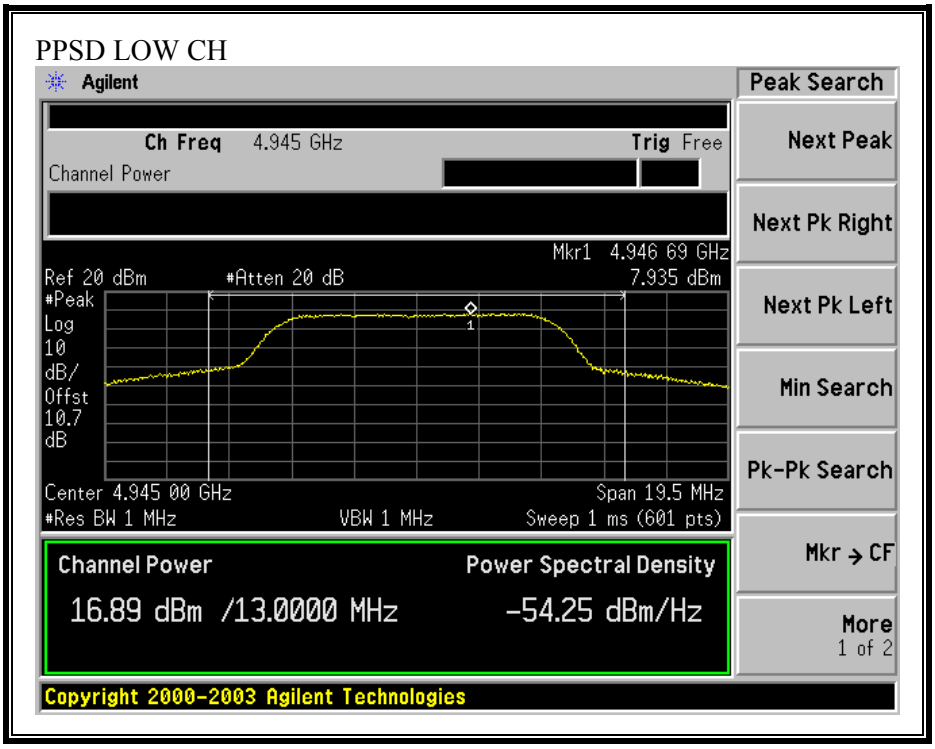
RESULTS

No non-compliance noted:

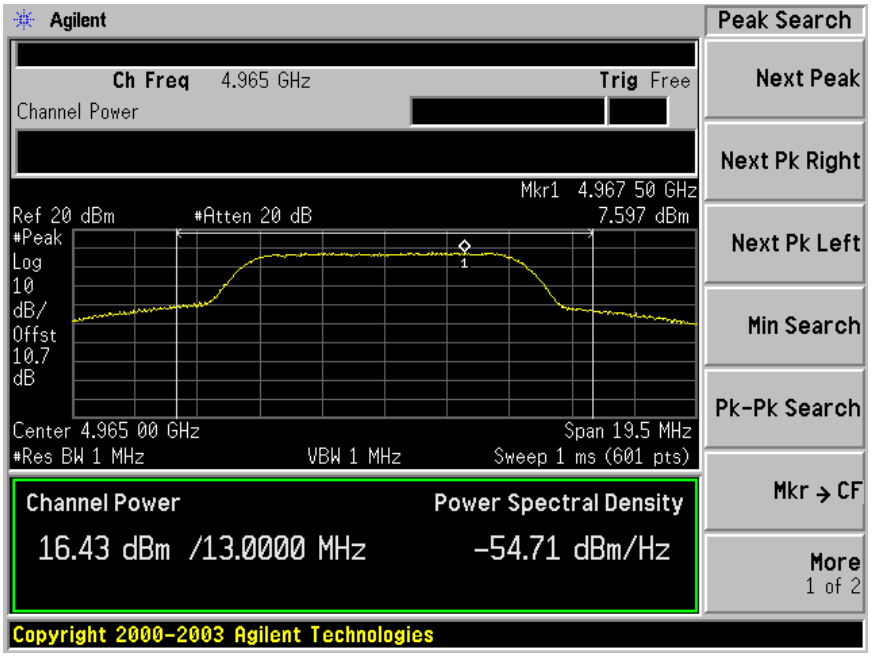
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	4945	7.935	8	-0.07
Middle	4965	7.597	8	-0.40
High	4985	7.900	8	-0.10

PEAK POWER SPECTRAL DENSITY

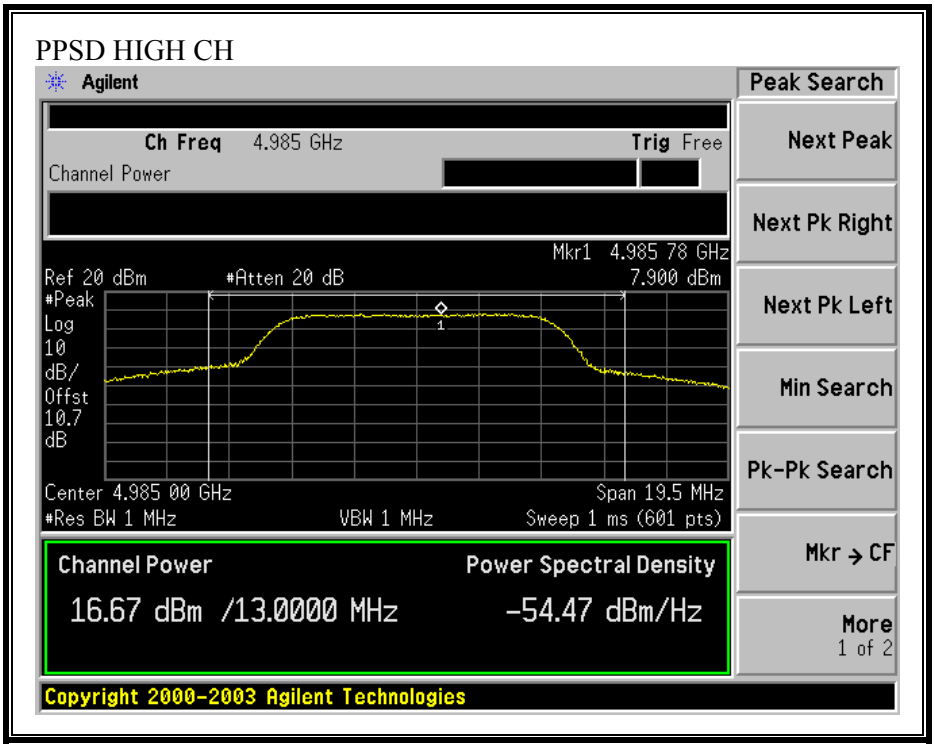
PPSD LOW CH



PPSD MID CH



PPSD HIGH CH



7.1.6. EMISSION MASK AND CONDUCTED SPURIOUS

§ 90.210 (l) Emission Mask L. For low power transmitters (20 dBm or less) operating in the 4940–4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0–45% of the authorized bandwidth (BW): 0 dB.
(2) On any frequency removed from the assigned frequency between 45–50% of the authorized bandwidth: 219 log (% of (BW)/45) dB.
(3) On any frequency removed from the assigned frequency between 50–55% of the authorized bandwidth: 10 + 242 log (% of (BW)/50) dB.
(4) On any frequency removed from the assigned frequency between 55–100% of the authorized bandwidth: 20 + 31 log (% of (BW)/55) dB attenuation.
(5) On any frequency removed from the assigned frequency between 100–150% of the authorized bandwidth: 28 + 68 log (% of (BW)/100) dB attenuation.
(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 40 dB.
(7) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

TEST PROCEDURE

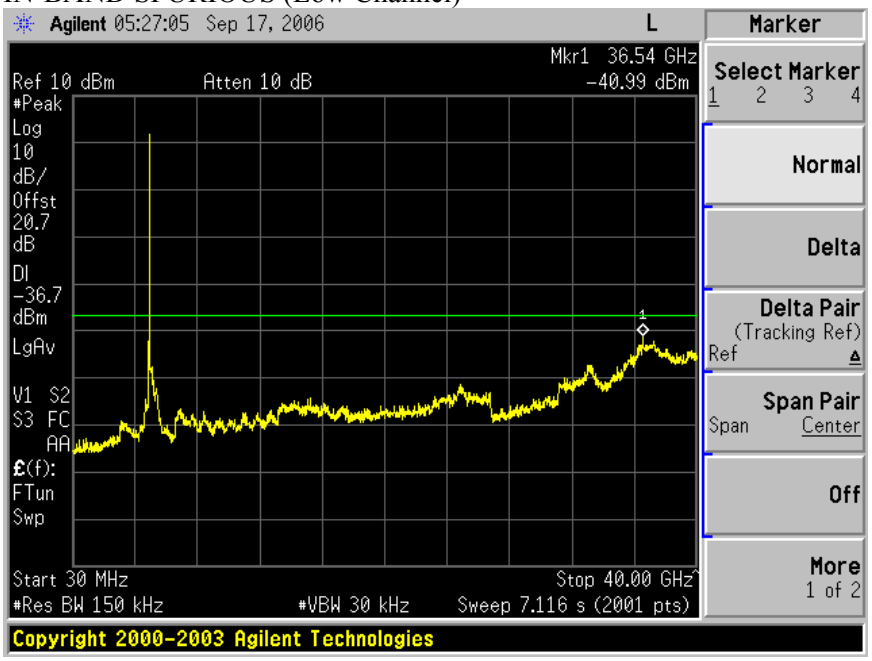
The EUT is connected to the spectrum analyzer, the peak amplitude is used as the 0 dB reference value for the mask, and the trace is compared to the mask.

RESULTS

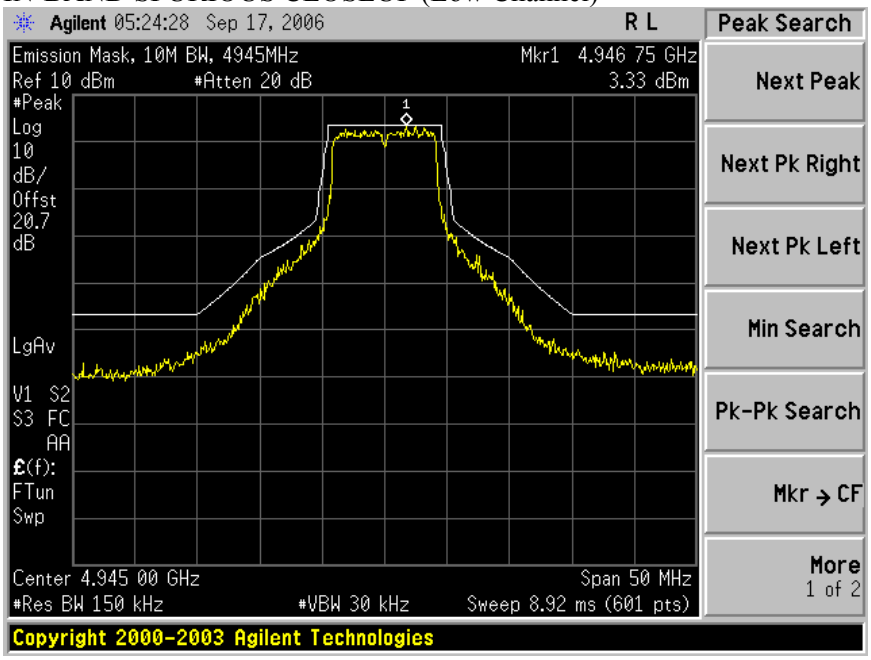
No non-compliance noted:

IN-BAND SPURIOUS EMISSIONS

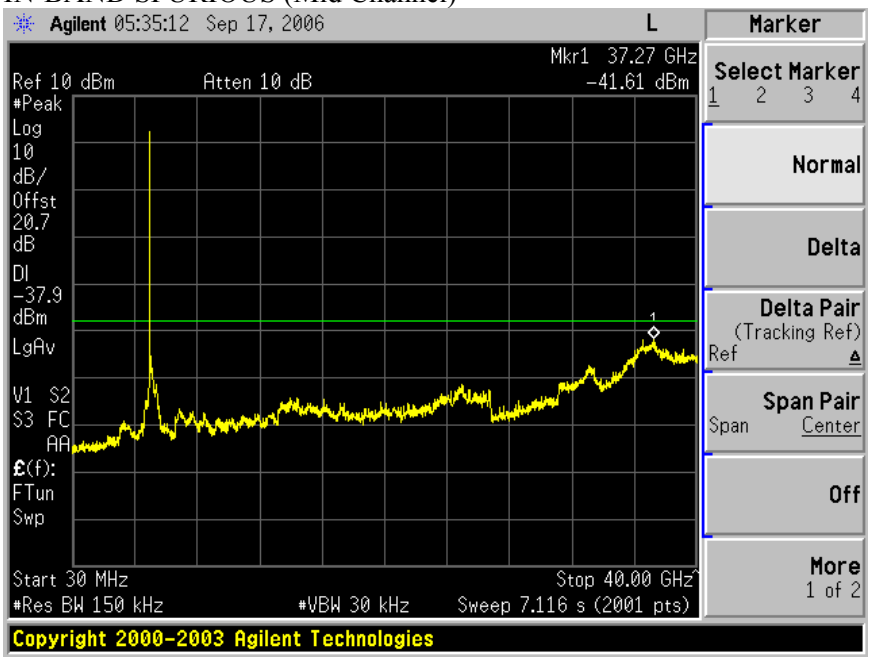
IN-BAND SPURIOUS (Low Channel)



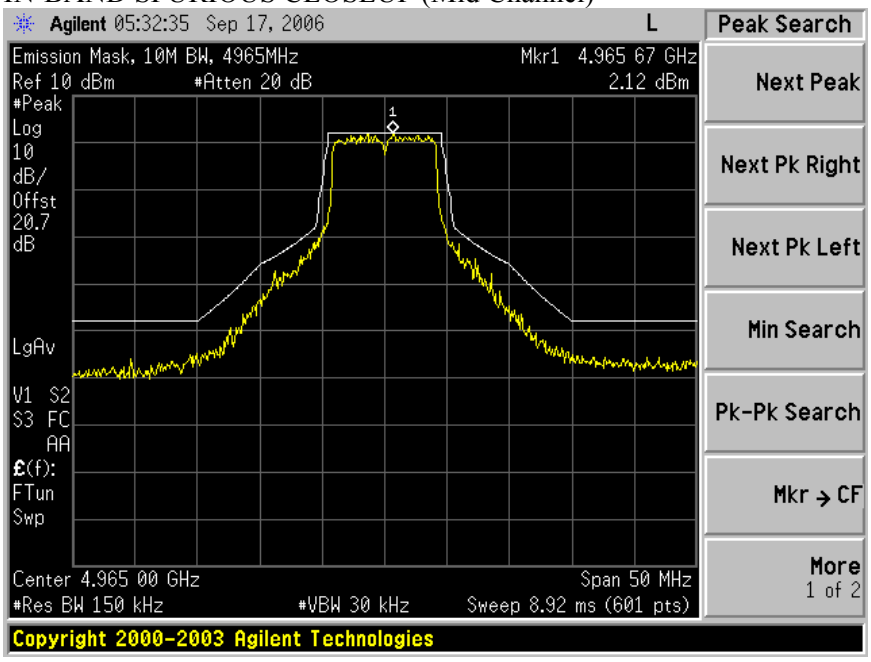
IN-BAND SPURIOUS CLOSEUP (Low Channel)



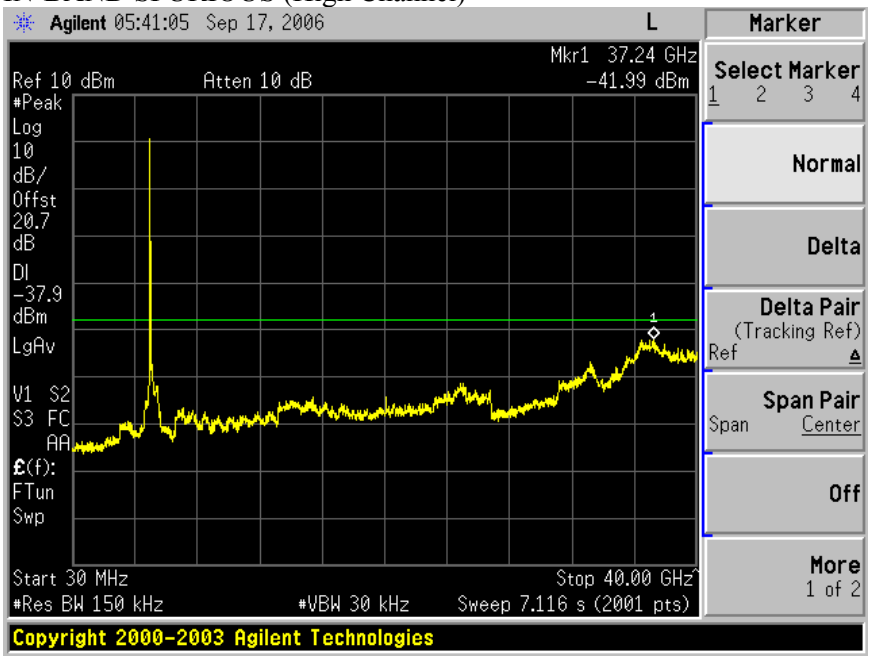
IN-BAND SPURIOUS (Mid Channel)



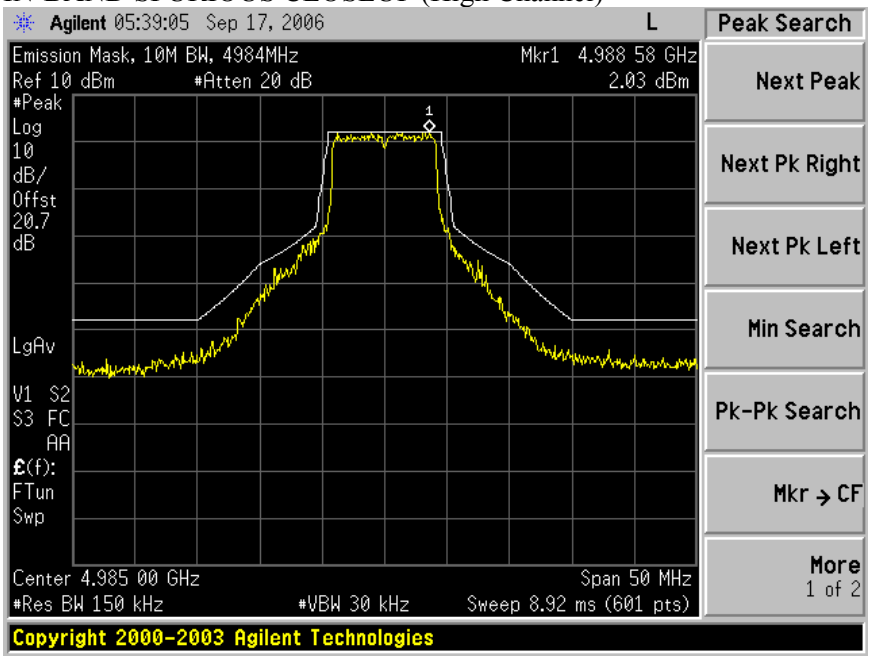
IN-BAND SPURIOUS CLOSEUP (Mid Channel)



IN-BAND SPURIOUS (High Channel)



IN-BAND SPURIOUS CLOSEUP (High Channel)



7.2. CHANNEL TESTS FOR 20 MHz CHANNEL BANDWIDTH MODE

7.2.1. EMISSION BANDWIDTH

LIMIT

For reporting purposes only.

TEST PROCEDURE

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

RESULTS

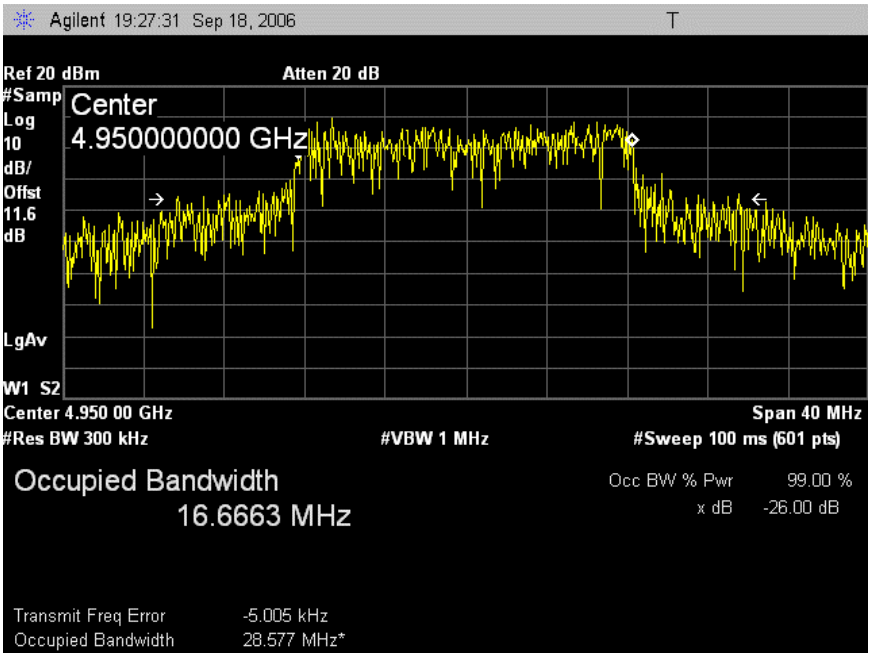
No non-compliance noted:

99% Bandwidth

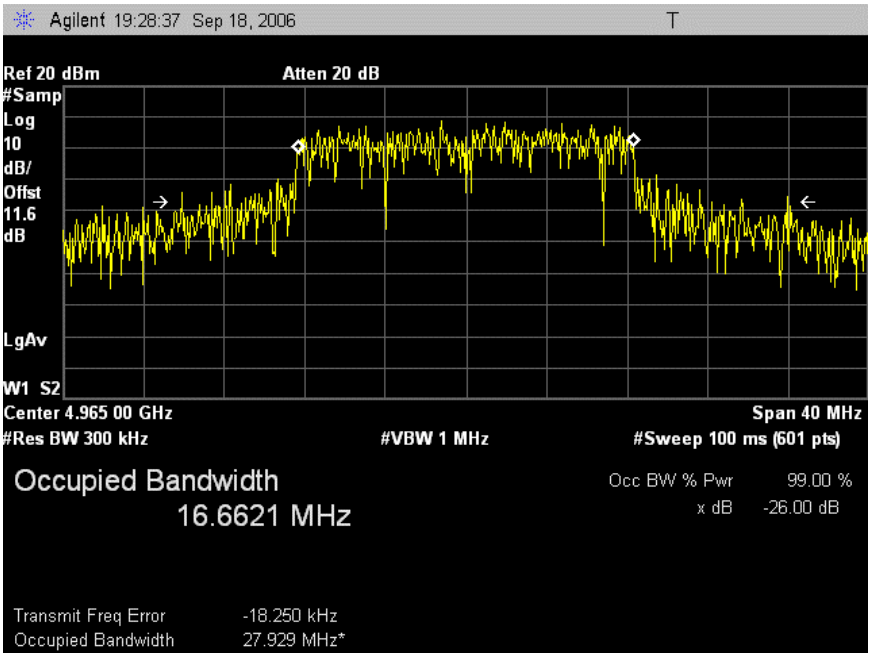
Channel	Frequency (MHz)	99% BW (MHz)
Low	4950	16.6663
Middle	4965	16.6621
High	4980	16.6808

99% EMISSION BANDWIDTH

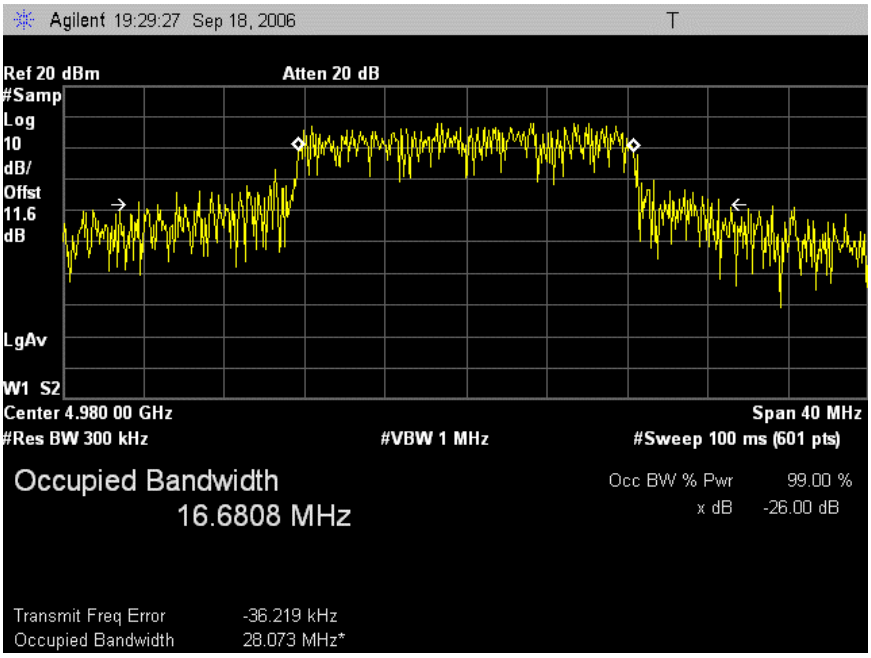
99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.2.2. PEAK OUTPUT POWER

PEAK POWER LIMIT

§ 90.1215 The transmitting power of stations operating in the 4940–4990 MHz band must not exceed the maximum limits in this section.

(a) The peak transmit power should not exceed:

Channel bandwidth (MHz)	Low power Device Peak transmitter Power (dBm)	High power Device Peak transmitter Power (dBm)
1.....	7	20
5.....	14	27
10.....	17	30
15.....	18.8	31.8
20.....	20	33

High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. High power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi

TEST PROCEDURE

The test is performed using peak power spectral integration.

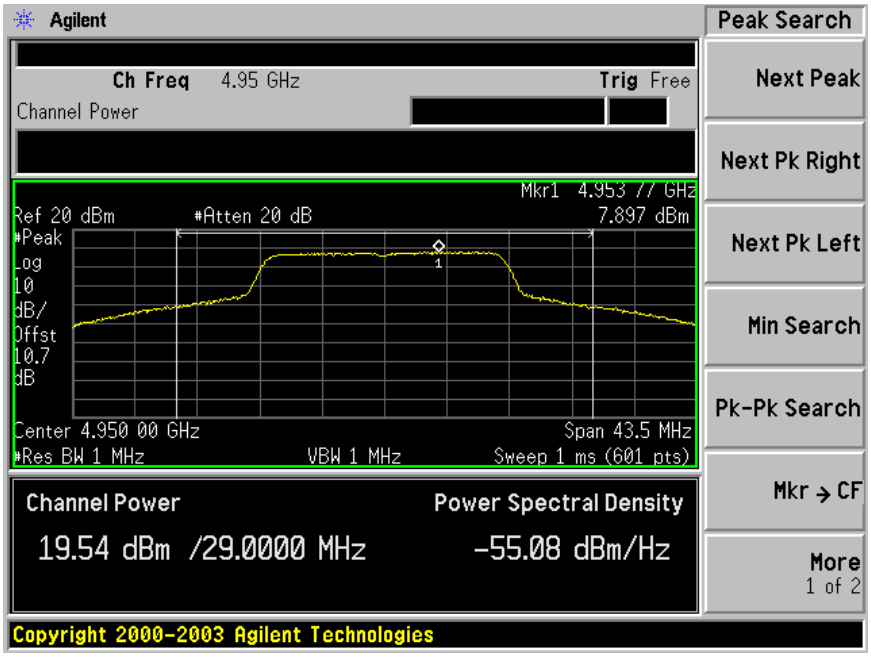
RESULTS

No non-compliance noted:

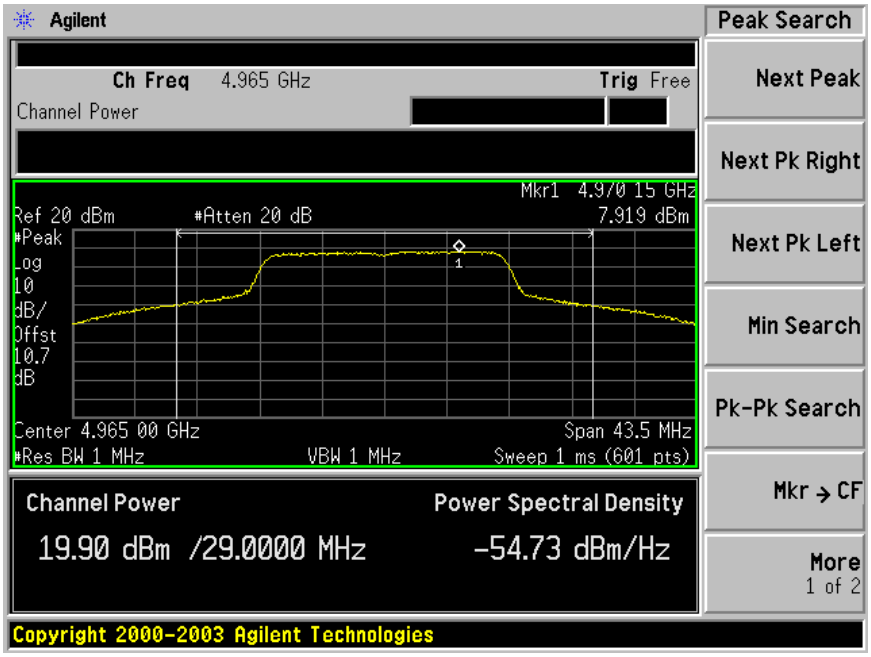
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	4950	19.54	20	-0.46
Middle	4965	19.90	20	-0.10
High	4980	19.88	20	-0.12

OUTPUT POWER (802.11a MODE)

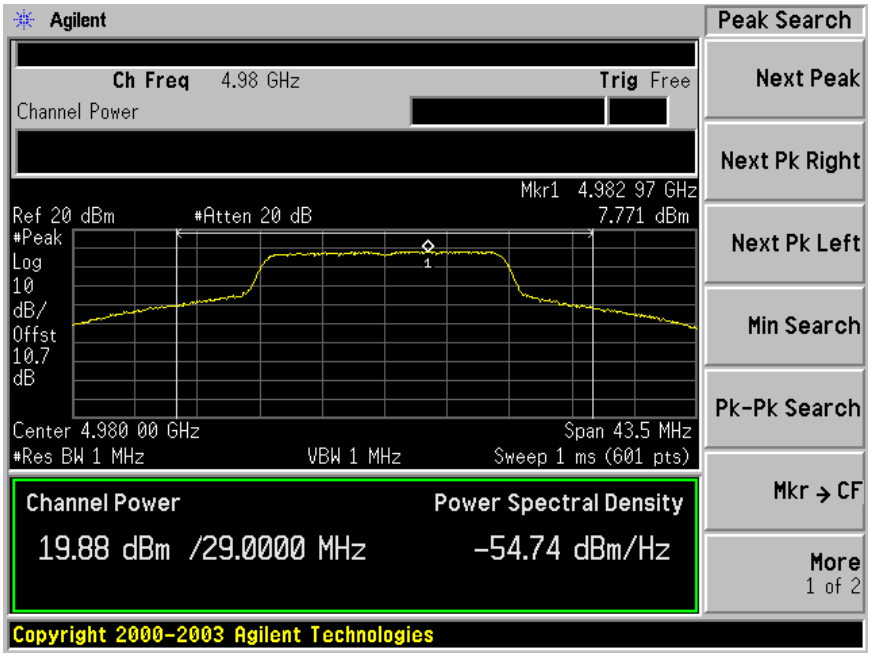
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.2.3. 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

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

where

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

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

LIMITS

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

RESULTS

No non-compliance noted:

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
20 MHz Channel BW	20.0	19.90	0.00	0.0194

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.

7.2.4. 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 11 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	4950	18.30
Middle	4965	18.73
High	4980	18.35

7.2.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§ 90.1215 (b) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi..

(c) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 1 MHz bandwidth is measured with the spectrum analyzer using RBW = 1 MHz and VBW 1 MHz. The PPSD is the highest level found across the emission in any 1 MHz band.

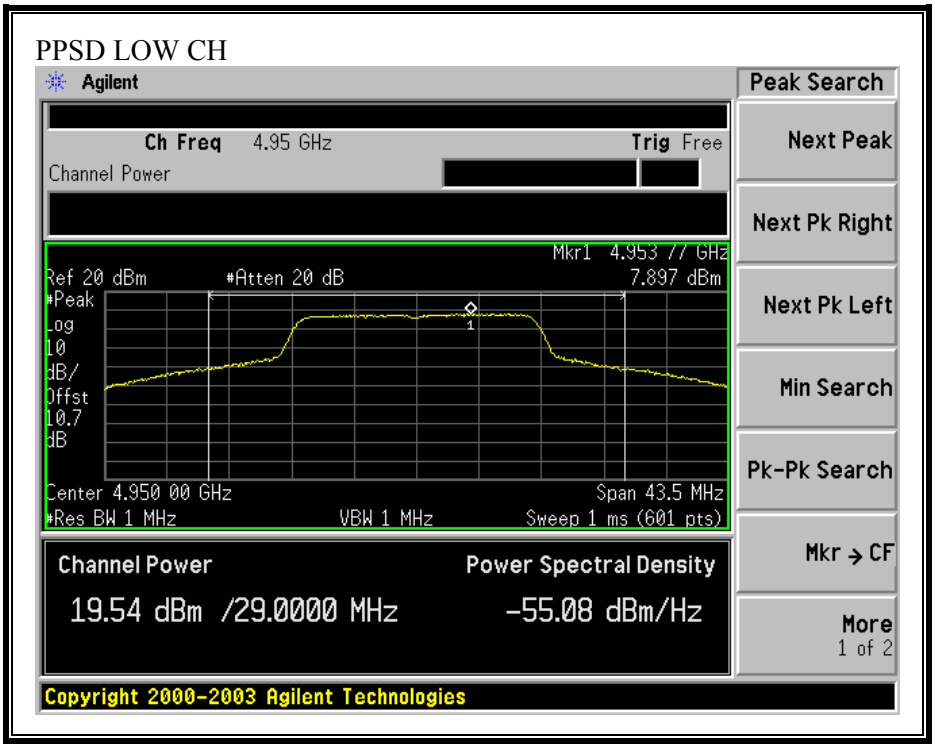
RESULTS

No non-compliance noted:

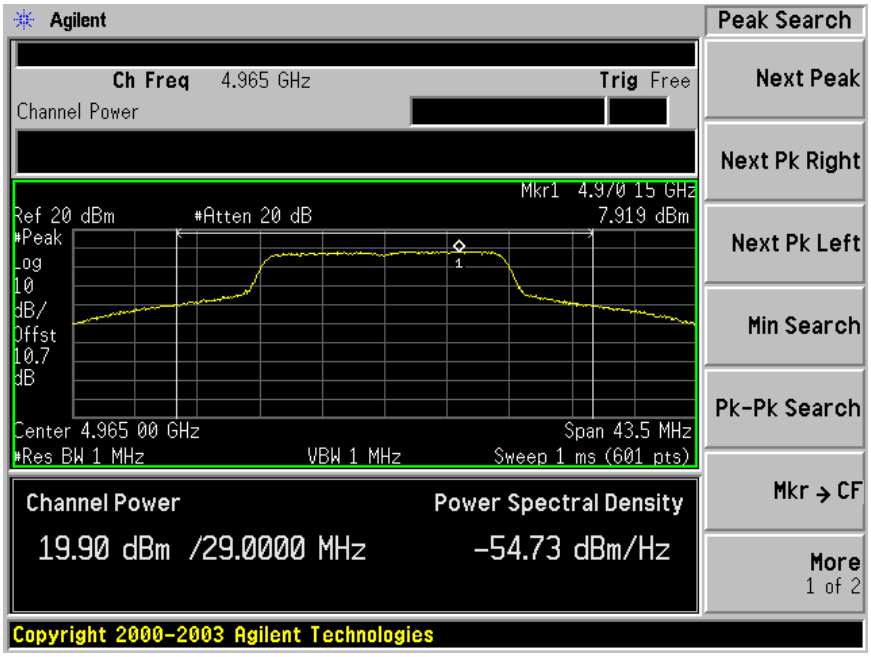
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	4950	7.897	8	-0.10
Middle	4965	7.919	8	-0.08
High	4980	7.771	8	-0.23

PEAK POWER SPECTRAL DENSITY

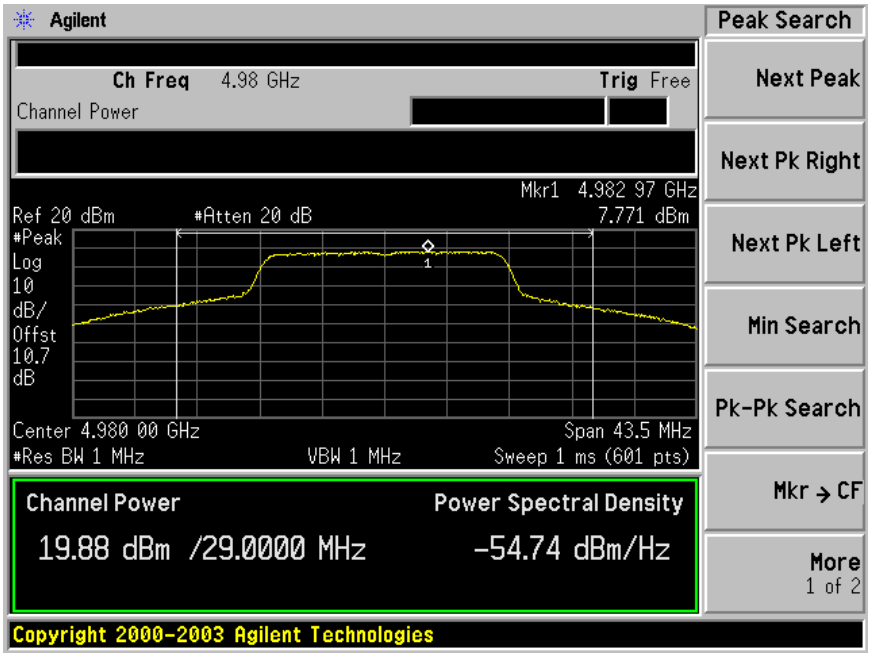
PPSD LOW CH



PPSD MID CH



PPSD HIGH CH



7.2.6. EMISSION MASK AND CONDUCTED SPURIOUS

§ 90.210 (l) Emission Mask L. For low power transmitters (20 dBm or less) operating in the 4940–4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0–45% of the authorized bandwidth (BW): 0 dB.
(2) On any frequency removed from the assigned frequency between 45–50% of the authorized bandwidth: 219 log (% of (BW)/45) dB.
(3) On any frequency removed from the assigned frequency between 50–55% of the authorized bandwidth: 10 + 242 log (% of (BW)/50) dB.
(4) On any frequency removed from the assigned frequency between 55–100% of the authorized bandwidth: 20 + 31 log (% of (BW)/55) dB attenuation.
(5) On any frequency removed from the assigned frequency between 100–150% of the authorized bandwidth: 28 + 68 log (% of (BW)/100) dB attenuation.
(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 40 dB.
(7) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

TEST PROCEDURE

The EUT is connected to the spectrum analyzer, the peak amplitude is used as the 0 dB reference value for the mask, and the trace is compared to the mask.

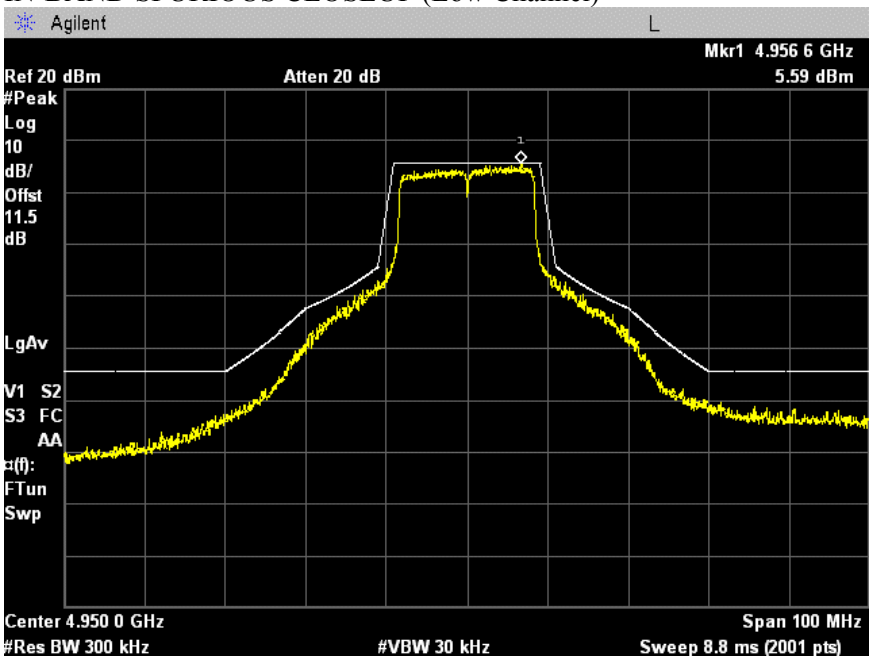
RESULTS

No non-compliance noted:

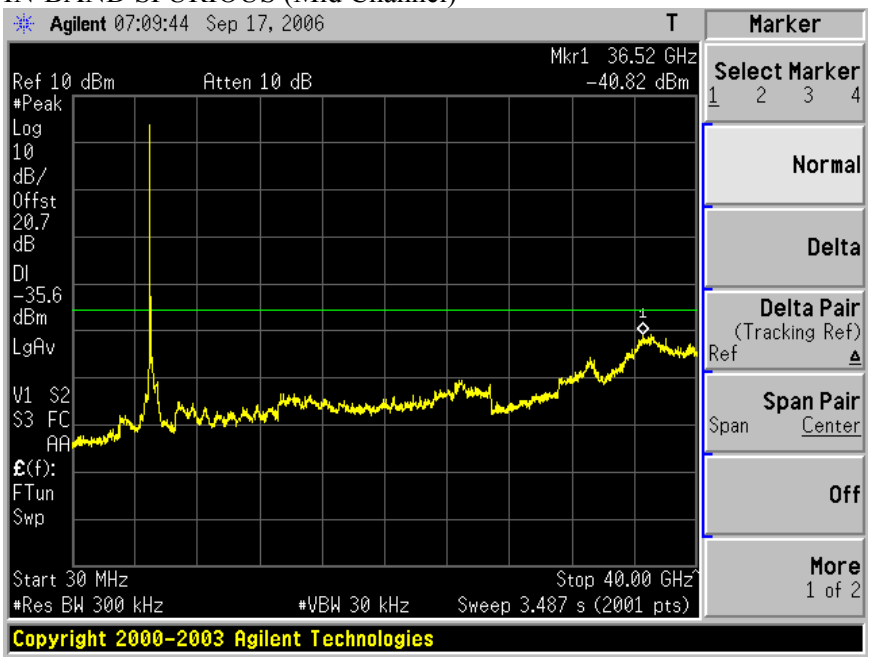
IN-BAND SPURIOUS EMISSIONS

IN-BAND SPURIOUS (Low Channel)

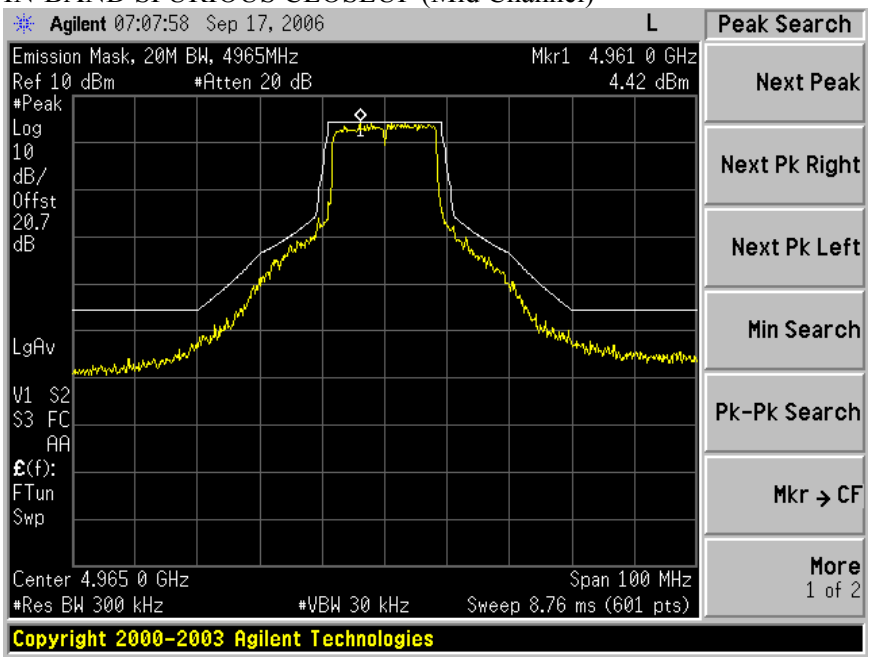
IN-BAND SPURIOUS CLOSEUP (Low Channel)



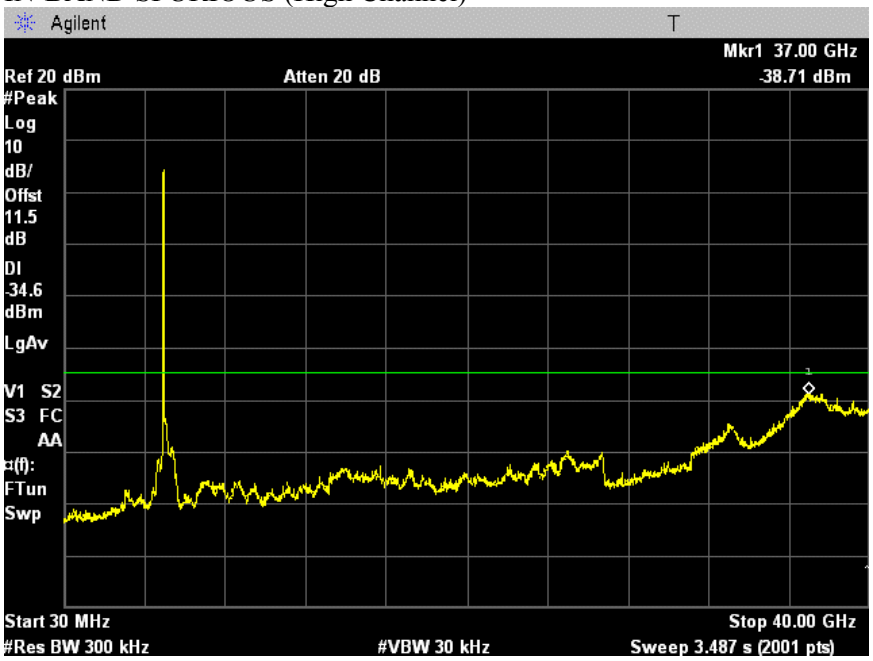
IN-BAND SPURIOUS (Mid Channel)



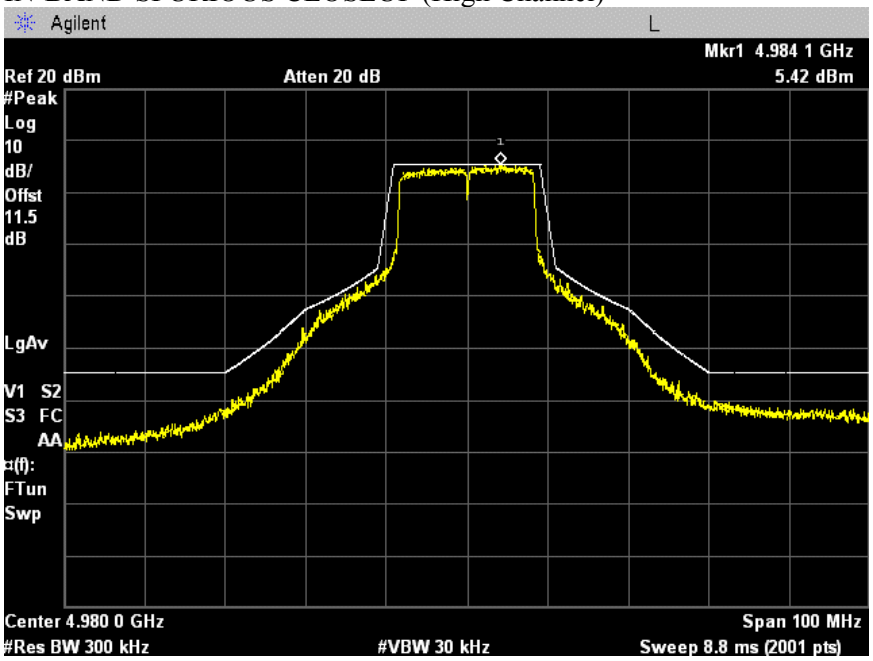
IN-BAND SPURIOUS CLOSEUP (Mid Channel)



IN-BAND SPURIOUS (High Channel)



IN-BAND SPURIOUS CLOSEUP (High Channel)



7.3. RADIATED EMISSIONS

7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§ 2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

§ 90.210 (l) Emission Mask L. For low power transmitters (20 dBm or less) operating in the 4940–4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 40 dB.

The zero dB reference is set to the power spectral density of the device along with the max antenna gain without requiring power reduction.

Limit = PPSD + Antenna Gain – 40dB

Antenna Gain = 9 dBi

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.12 signal substitution.

The equipment antenna port is terminated with a 50-Ohm load in order to test for case radiation.

7.3.2. TRANSMITTER ABOVE 1 GHz FOR 10 MHZ CHANNEL BANDWIDTH

HARMONICS AND SPURIOUS EMISSIONS (WITH 50 OHM LOADS)

High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Proxim
Project #: 06U10518
Date: 9/20/2006
Test Engineer: Frank Ibrahim
Configuration: EUT connected to a host Laptop PC, EUT RF ports terminated with 50 ohm loads
Mode: 10 MHz Mode
EUT S/N: 06FC22570399

Test Equipment:

EMCO Horn 1-18GHz: T120; S/N: 29310 @3m
Horn > 18GHz: T87; ARA 18-26GHz; S/N:1049
Limit: FCC 90
Hi Frequency Cables: (2 ft) (2 ~ 3 ft) (4 ~ 6 ft) (12 ft)
Pre-amplifer 1-26GHz: T145 Agilent 3008A
Pre-amplifer 26-40GHz: T88 Miteq 26-40GHz

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Channel (4945 MHz)										
9.890	42.02	H	-53.0	5.6	12.8	10.7	-47.9	-23.1	-24.8	ART=9
14.840	40.84	H	-47.0	7.1	15.2	13.0	-41.1	-23.1	-18.0	ART=9
19.780	39.37	H	-59.2	8.8	22.8	20.7	-47.3	-23.1	-24.3	ART=9
9.890	39.61	V	-55.4	5.6	12.8	10.7	-50.3	-23.1	-27.2	ART=9
14.840	40.68	V	-47.9	7.1	15.2	13.0	-42.0	-23.1	-18.9	ART=9
19.780	39.33	V	-58.4	8.8	22.8	20.7	-46.6	-23.1	-23.5	ART=9
Mid Channel (4965 MHz)										
9.930	40.84	H	-54.0	5.6	12.8	10.7	-49.0	-23.4	-25.6	ART=7.5
14.890	40.77	H	-47.0	7.2	15.2	13.0	-41.1	-23.4	-17.7	ART=7.5
19.860	37.61	H	-61.0	8.8	22.9	20.8	-49.1	-23.4	-25.7	ART=7.5
9.930	40.42	V	-54.5	5.6	12.8	10.7	-49.4	-23.4	-26.0	ART=7.5
14.890	40.70	V	-47.8	7.2	15.2	13.0	-41.9	-23.4	-18.5	ART=7.5
19.860	40.01	V	-57.8	8.8	22.9	20.8	-45.9	-23.4	-22.5	ART=7.5
Hig Channel (4985 MHz)										
9.970	40.96	H	-53.8	5.6	12.8	10.6	-48.8	-23.1	-25.7	ART=7.5
14.960	40.91	H	-46.8	7.2	15.2	13.0	-40.9	-23.1	-17.8	ART=7.5
19.940	39.79	H	-58.9	8.9	23.0	20.8	-46.9	-23.1	-23.8	ART=7.5
9.970	40.81	V	-54.0	5.6	12.8	10.6	-49.0	-23.1	-25.9	ART=7.5
14.960	40.77	V	-47.6	7.2	15.2	13.0	-41.8	-23.1	-18.7	ART=7.5
19.940	39.78	V	-58.1	8.9	23.0	20.8	-46.1	-23.1	-23.0	ART=7.5

7.3.3. TRANSMITTER ABOVE 1 GHz FOR 20 MHZ CHANNEL BANDWIDTH

HARMONICS AND SPURIOUS EMISSIONS (WITH 50 OHM LOADS)

High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Proxim
Project #: 06U10518
Date: 9/21/2006
Test Engineer: Frank Ibrahim
Configuration: EUT connected to a host Laptop PC, EUT RF ports terminated with 50 ohm loads
Mode: 20 MHz Mode
EUT S/N: 06FC22570399

Test Equipment:

EMCO Horn 1-18GHz: T120; S/N: 29310 @3m
Horn > 18GHz: T87; ARA 18-26GHz; S/N:1049
Limit: FCC 90
Hi Frequency Cables: (2 ft) (2 ~ 3 ft) (4 ~ 6 ft) (12 ft)
Pre-amplifer 1-26GHz: T145 Agilent 3008A
Pre-amplifer 26-40GHz: T88 Miteq 26-40GHz

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Channel (4950 MHz)										
9.900	42.51	H	-52.5	5.6	12.8	10.7	-47.4	-23.1	-24.3	ART=12
14.850	35.78	H	-52.1	7.1	15.2	13.0	-46.2	-23.1	-23.1	ART=12
19.800	34.79	H	-63.8	8.8	22.9	20.7	-51.9	-23.1	-28.8	ART=12
9.900	37.14	V	-57.8	5.6	12.8	10.7	-52.8	-23.1	-29.7	ART=12
14.850	35.04	V	-53.5	7.1	15.2	13.0	-47.6	-23.1	-24.5	ART=12
19.800	38.30	V	-59.5	8.8	22.9	20.7	-47.6	-23.1	-24.5	ART=12
Mid Channel (4965 MHz)										
9.930	39.27	H	-55.6	5.6	12.8	10.7	-50.6	-23.1	-27.5	ART=12
14.895	35.15	H	-52.6	7.2	15.2	13.0	-46.8	-23.1	-23.7	ART=12
19.860	34.57	H	-64.0	8.8	22.9	20.8	-52.1	-23.1	-29.1	ART=12
9.930	37.71	V	-57.2	5.6	12.8	10.7	-52.1	-23.1	-29.1	ART=12
14.895	35.08	V	-53.4	7.2	15.2	13.0	-47.5	-23.1	-24.4	ART=12
19.860	39.61	V	-58.2	8.8	22.9	20.8	-46.3	-23.1	-23.2	ART=12
Hig Channel (4980 MHz)										
9.960	37.90	H	-56.9	5.6	12.8	10.6	-51.9	-23.2	-28.7	ART=11
14.940	34.57	H	-53.2	7.2	15.2	13.0	-47.3	-23.2	-24.1	ART=11
19.920	34.42	H	-64.2	8.9	23.0	20.8	-52.3	-23.2	-29.1	ART=11
9.960	37.74	V	-57.1	5.6	12.8	10.6	-52.1	-23.2	-28.8	ART=11
14.940	34.53	V	-53.9	7.2	15.2	13.0	-48.0	-23.2	-24.8	ART=11
19.920	39.38	V	-58.5	8.9	23.0	20.8	-46.5	-23.2	-23.3	ART=11

7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

30 - 1000MHz Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Proxim
Project #: 06U10518
Date: 9/21/2006
Test Engineer: Frank Ibrahim
Configuration: EUT connected to a host Laptop PC, EUT RF ports terminated with 50 ohm loads
Mode: 20 MHz Mode
EUT S/N: 06FC22570399

Test Equipment:

Bilog Antenna	Cable	Pre-amplifer 8447D	Limit
5m Chamber Sunol Bilog	5m Chamber Cable	T5 8447D	ERP

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
90.60	65.15	H	-48.08	1.3	-0.3	-2.4	-51.77	-23.1	-28.67	20MHz mode, Mid Channel
153.70	54.89	H	-53.87	1.6	0.7	-1.4	-56.87	-23.1	-33.77	20MHz mode, Mid Channel
250.70	55.57	H	-53.40	1.9	6.1	3.9	-51.41	-23.1	-28.30	20MHz mode, Mid Channel
379.20	53.38	H	-51.22	2.3	6.0	3.9	-49.65	-23.1	-26.55	20MHz mode, Mid Channel
549.00	46.41	H	-56.69	2.8	6.5	4.4	-55.08	-23.1	-31.98	20MHz mode, Mid Channel
837.50	46.61	H	-51.85	3.5	6.7	4.6	-50.75	-23.1	-27.65	20MHz mode, Mid Channel
49.40	62.30	V	-52.58	1.0	-5.2	-7.3	-60.96	-23.1	-37.85	20MHz mode, Mid Channel
90.60	61.81	V	-50.26	1.3	-0.3	-2.4	-53.95	-23.1	-30.85	20MHz mode, Mid Channel
379.20	49.13	V	-56.39	2.3	6.0	3.9	-54.82	-23.1	-31.72	20MHz mode, Mid Channel
549.00	51.12	V	-51.66	2.8	6.5	4.4	-50.05	-23.1	-26.95	20MHz mode, Mid Channel
597.60	47.81	V	-54.57	2.9	6.9	4.7	-52.72	-23.1	-29.62	20MHz mode, Mid Channel
696.90	49.15	V	-51.34	3.1	6.8	4.6	-49.85	-23.1	-26.75	20MHz mode, Mid Channel

7.4. FREQUENCY STABILITY

LIMIT

§ 90.213 (a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table (See FCC § 90.1215 rules for table).

Above 2450 MHz: Frequency stability to be specified in the station authorization.

For equipment authorization purposes, this is a reporting requirement only.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted:

NORMAL VOLTAGE EXTREME TEMPERATURE RESULTS

Temp. Celsius	Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	ppm
-30	4964.974006	4964.986627	12.62	-2.54
-20	4964.974006	4964.977704	3.70	-0.74
-10	4964.974006	4964.987429	13.42	-2.70
0	4964.974006	4964.986341	12.34	-2.48
10	4964.974006	4964.980643	6.64	-1.34
20	4964.974006	4964.976957	2.95	-0.59
30	4964.974006	4964.974451	0.45	-0.09
40	4964.974006	4964.973995	-0.01	0.00
50	4964.974006	4964.978191	4.18	-0.84

LOW VOLTAGE NORMAL TEMPERATURE RESULTS

Temp. Celsius	Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	ppm
20	4965	4964.974005	-25.99	5.24

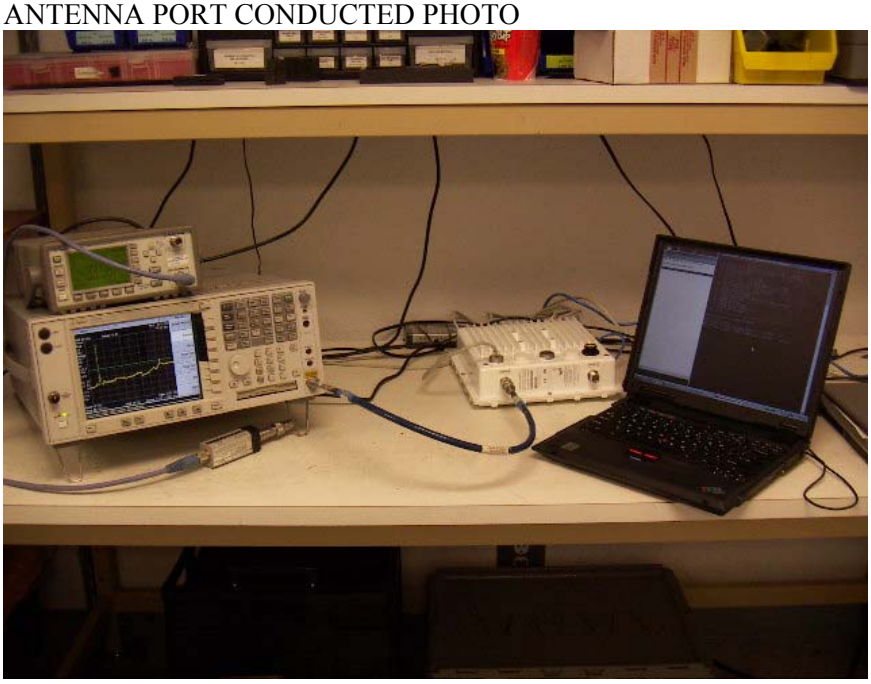
HIGH VOLTAGE NORMAL TEMPERATURE RESULTS

Temp. Celsius	Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	ppm
20	4965	4964.974015	-25.99	5.23

8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



TEMPERATURE CHAMBER MEASUREMENT SETUP

TEMPERATURE CHAMBER PHOTO

RADIATED RF MEASUREMENT SETUP WITH 50 OHM LOADS

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

END OF REPORT