



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT**

FOR

WI-FI CELLULAR BASESTATION

MODEL NUMBER: TROPOS 51102100, TROPOS 51103000

BRAND NAME: TROPOS 5110

FCC ID: P9J-51102100

REPORT NUMBER: 03U2102-1

ISSUE DATE: JULY 30, 2003

Prepared for
**TROPOS NETWORKS
1710 S. AMPHLETT BLVD.
SAN MATEO, CA 94402, USA**

Prepared by
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1. TEST RESULT CERTIFICATION

COMPANY NAME: TROPOS NETWORKS
1710 S. AMPHLETT BLVD.
SAN MATEO, CA. 94402
USA

EUT DESCRIPTION: WI-FI CELLULAR BASESTATION

MODEL: TROPOS 511002100, TROPOS 51103000

MODEL DIFFERENCE: TROPOS 511003000 (stand alone Wi-Fi Cellular Base Station with unit Attached 7.4dBi omni antennas).
TROPOS 51102100 (stand alone Wi-Fi Cellular Base Station without Antennas; professional installation only).
The difference is only for marketing purpose.

DATE TESTED: JULY 21 – 25, 2003

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	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:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES



VIEN TRAN
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11b WI-FI CELLULAR BASESTATION operating in the 2400 – 2483.5 MHz band with a peak output power of 28.53dBm (712.85mW) has a peak antenna gain of 7.4dBi.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

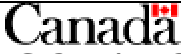
4. FACILITIES AND ACCREDITATION

4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	 R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	 ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	 ELA-171
Taiwan	BSMI	CNS 13438	 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	 IC2324 A,B,C, and F

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

5.2. MEASUREMENT UNCERTAINTY

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

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				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/26/2004
Quasi-Peak Adaptor	HP	85650A	2521A01038	4/15/2004
Preamplifier, 1300 MHz	HP	8447D	2944A06550	8/22/2003
Antenna, Biconical	Eaton	94455-1	1214	3/6/2004
Antenna, Log Periodic 200 ~ 1000 MHz	EMCO	3146	9107-3163	3/6/2004
SA Display Section 3	HP	85662A	2314A04793	4/15/2004
SA RF Section, 1.5 GHz	HP	85680A	2314A02604	11/26/2003
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2003
Line Filter	Lindgren	LMF-3489	497	CNR
LISN, 10 kHz ~ 30 MHz	Solar	012-50-R-24-BN	837990	9/6/2003
EMI Test Receiver	R & S	ESHS 20	827129/006	4/17/2004
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/20/2003
RF Filter Section	HP	85420E	3705A00256	11/20/2003
BILOG ANTENNA	A.R.A	LPB-2520/A	1185	3/6/2004
PSA Spectrum analyzer	Agilent	E4440A	US41421366	4/15/2004

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

TEST PERIPHERALS				
Device Type	Manufacturer	Model Number	Serial Number	FCC ID
LAPTOP	IBM	2658	AK-VNGMV	DOC
AC ADAPTER	3COM	3CNJPSE	61-0127-00	DOC
AC POWER CORD	AMPHENOL	N/A	T3109-100	N/A

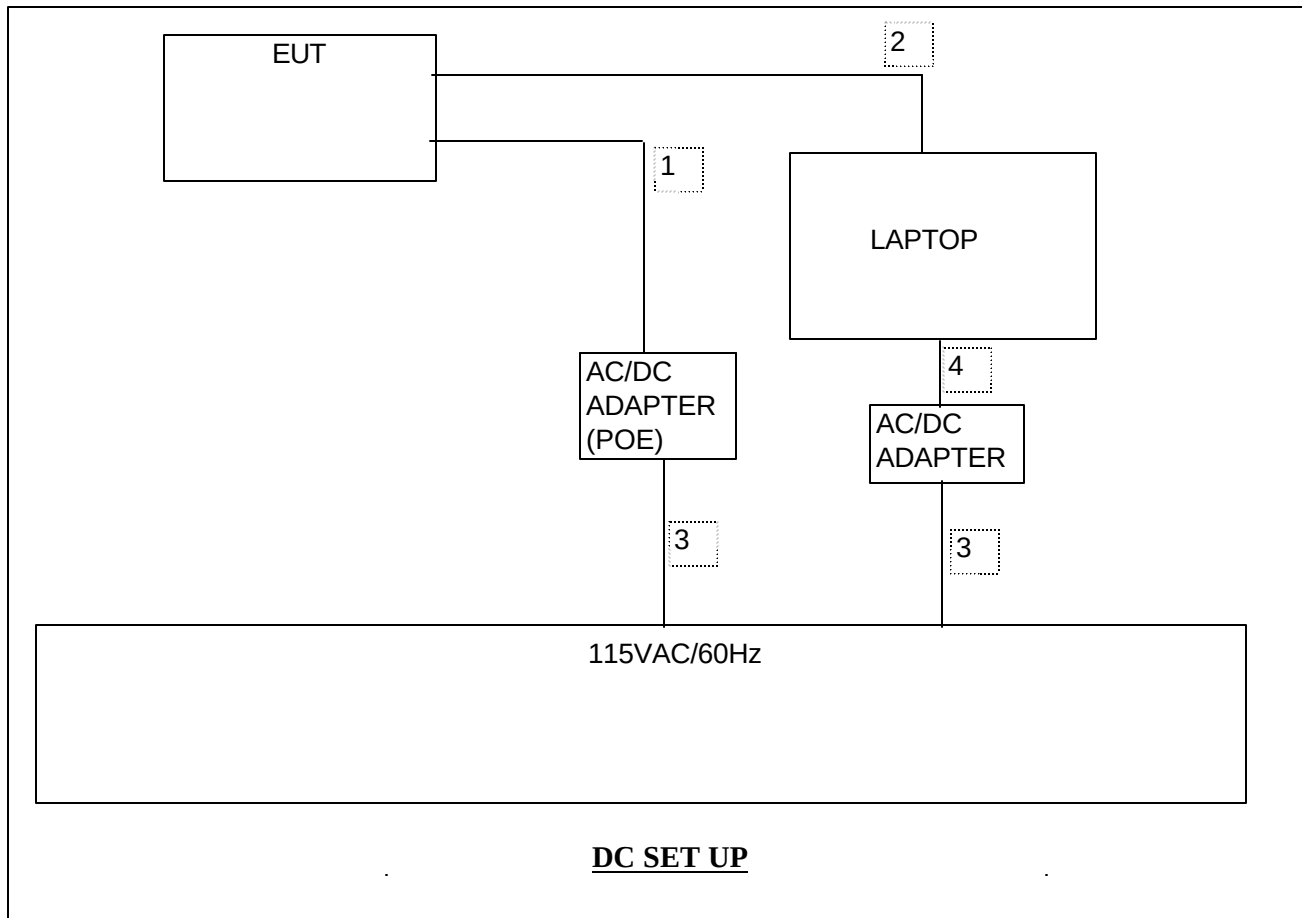
I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	ETHERNET	2	RJ45	UN-SHIELED	3m	YES	NO	N/A
2	DC	1	DC	UN-SHIELED	2m	NO	NO	N/A
3	AC	2	US115V	UN-SHIELED	2m	NO	NO	N/A
4	AC POWER CORD	1	4-PRONG	UN-SHIELED	3m	NO	NO	N/A

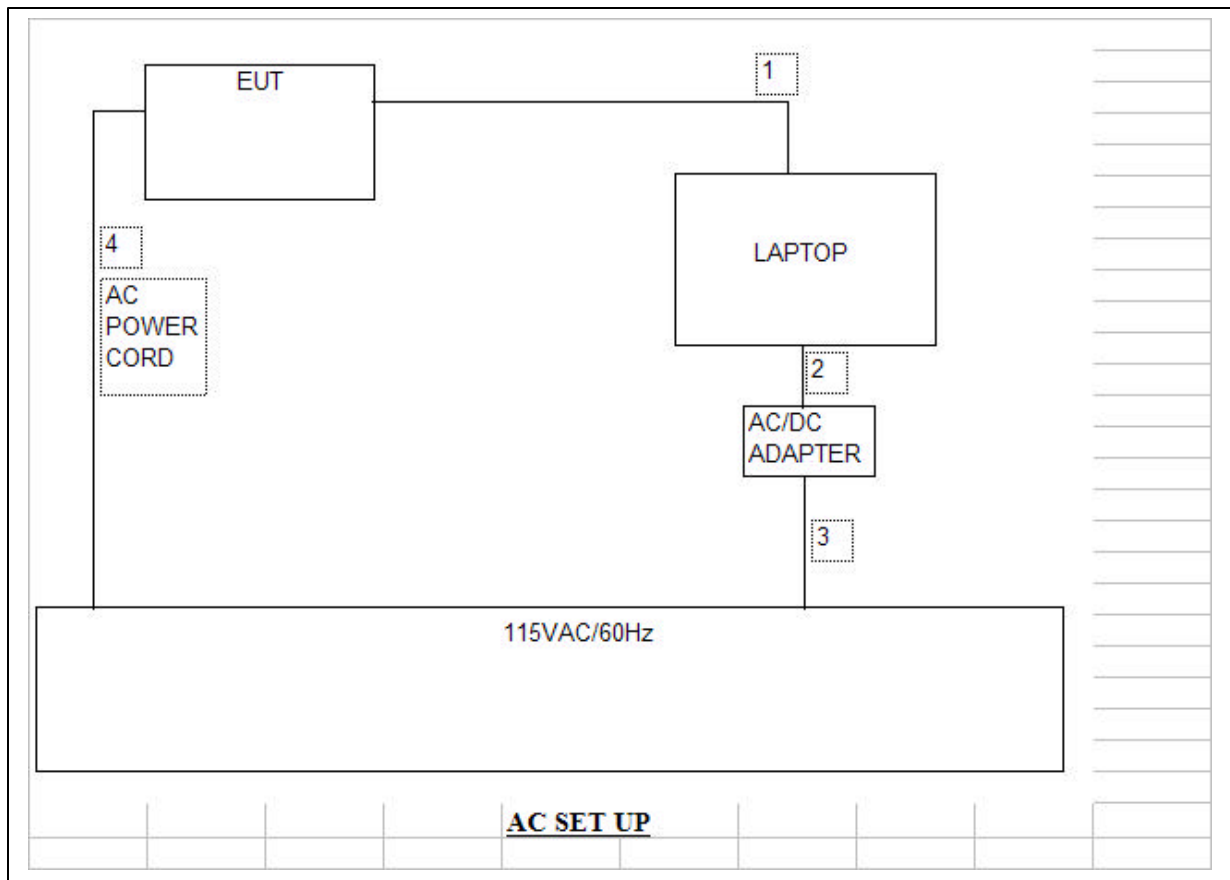
TEST SETUP

The EUT was tested with the host computer and operated via a test program.

SETUP DIAGRAM - DC SET UP



SETUP DIAGRAM - AC SET UP



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 6 dB BANDWIDTH

LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

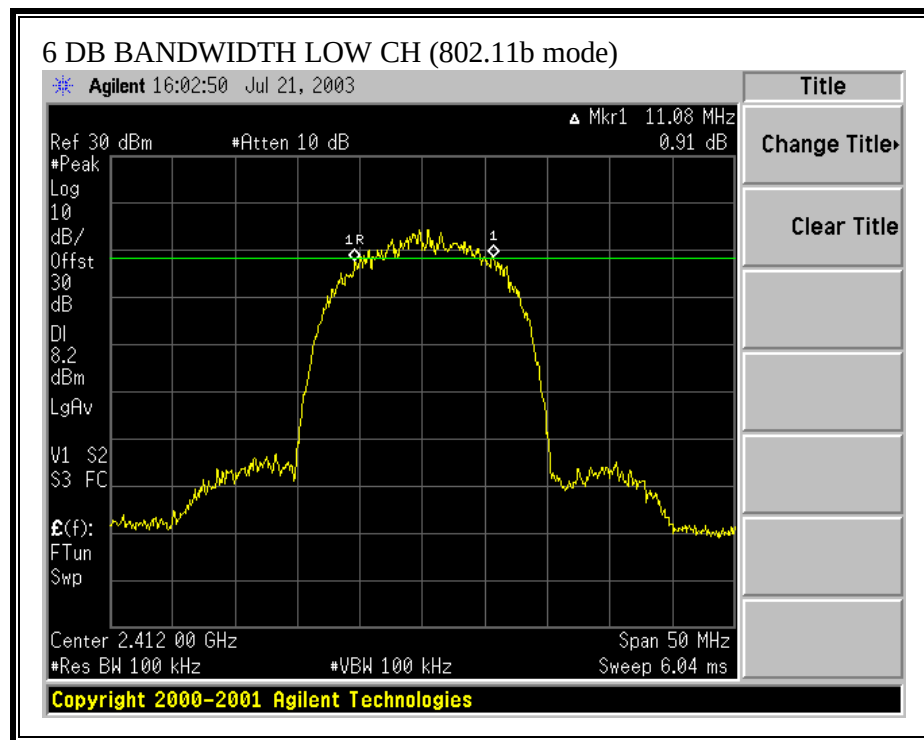
TEST PROCEDURE

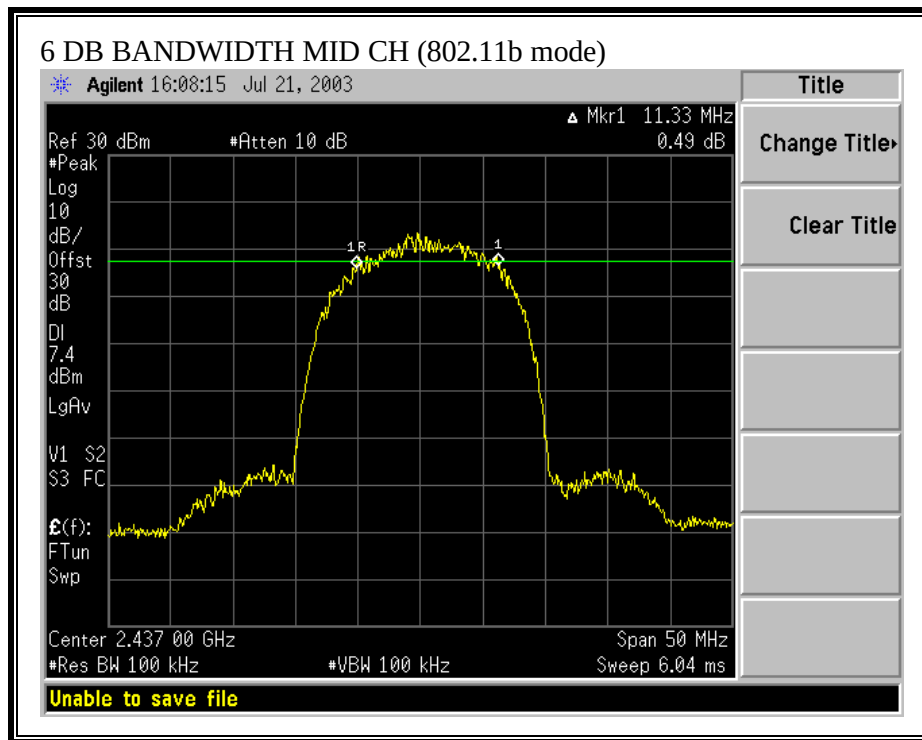
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

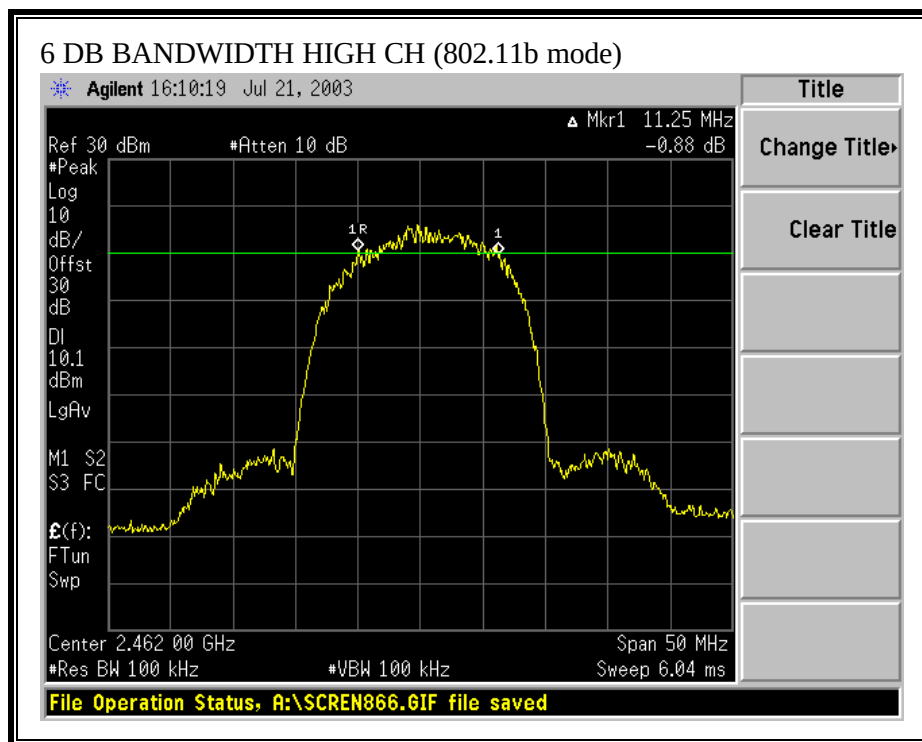
RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	6 dB Bandwidth (KHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	11080	500	10580.00
Middle	2437	11330	500	10830.00
High	2462	11250	500	10750.00







7.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the 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. The spectrum analyzer internal 99% bandwidth function is utilized.

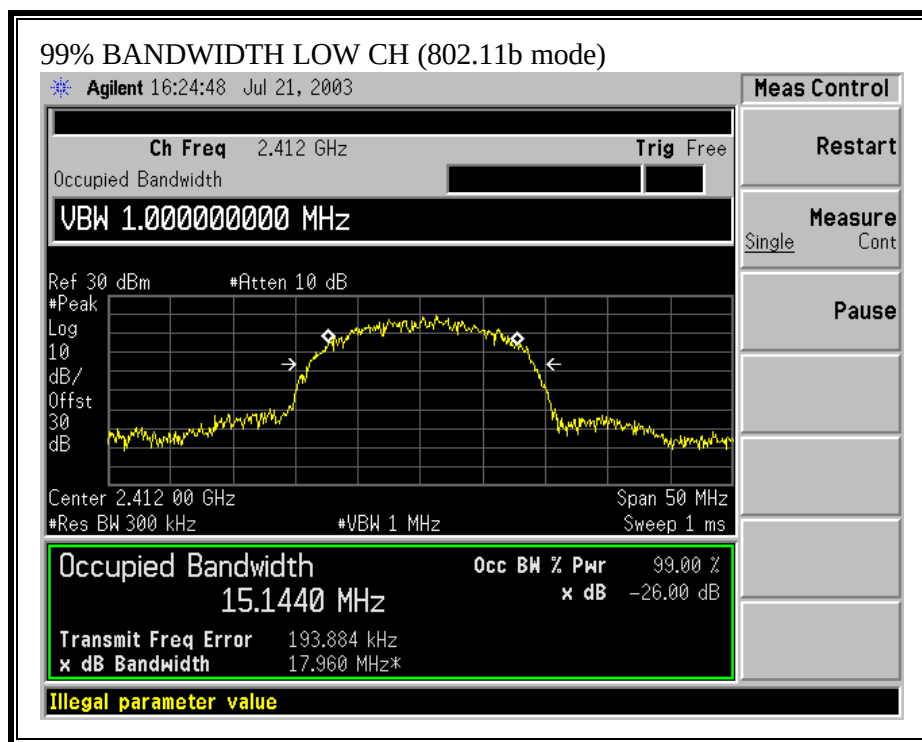
RESULTS

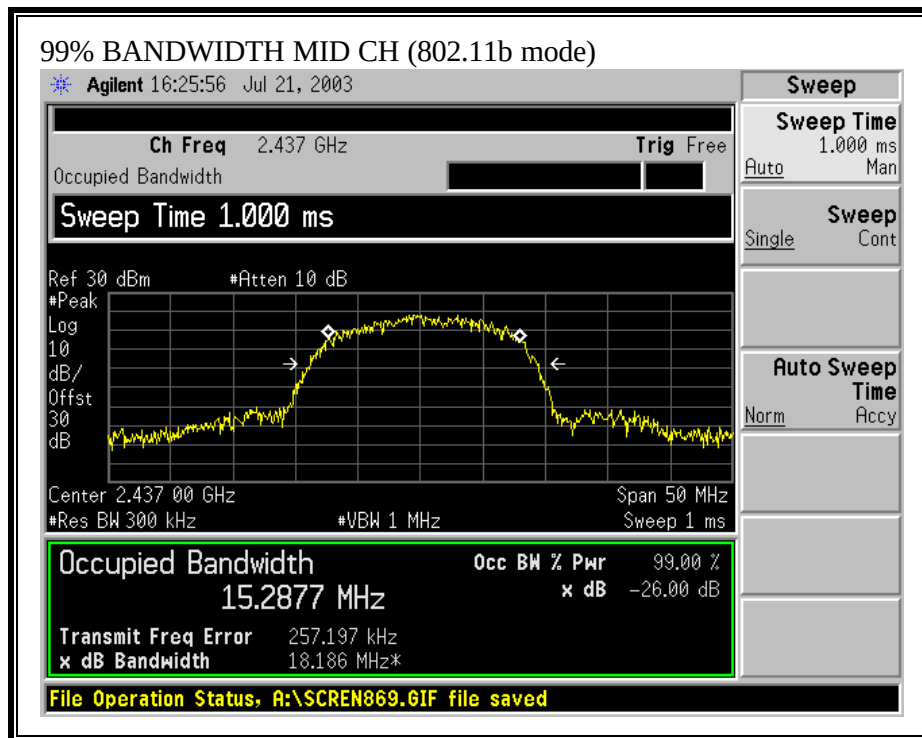
No non-compliance noted:

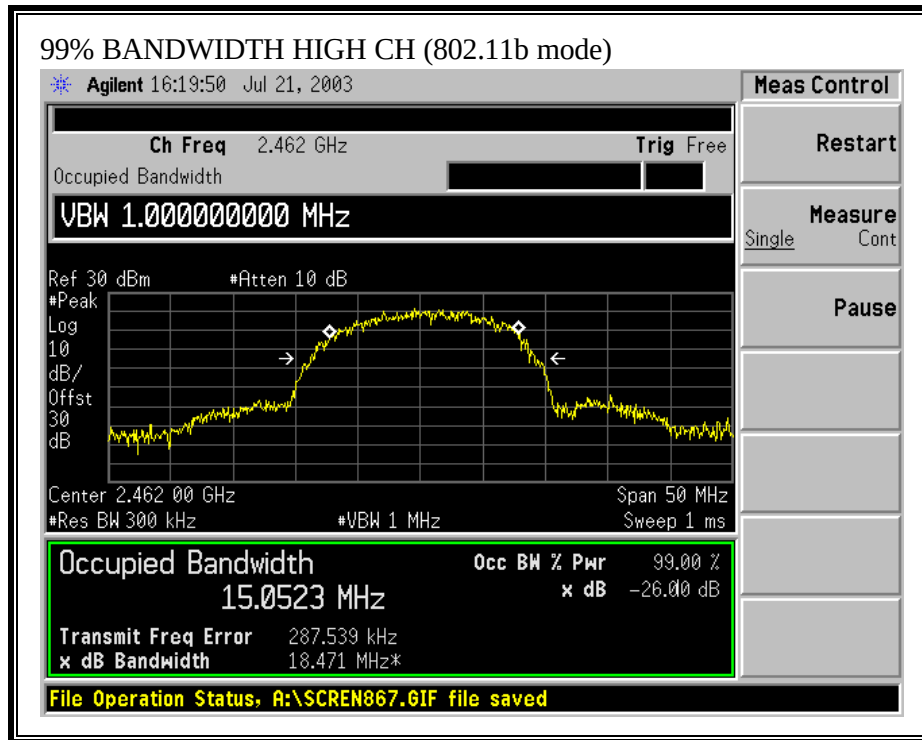
802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.144
Middle	2437	15.2877
High	2462	15.0523

99% BANDWIDTH (802.11b MODE)







7.3. 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.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 7.4 dBi, therefore the limit is 28.6 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over the 99% bandwidth.

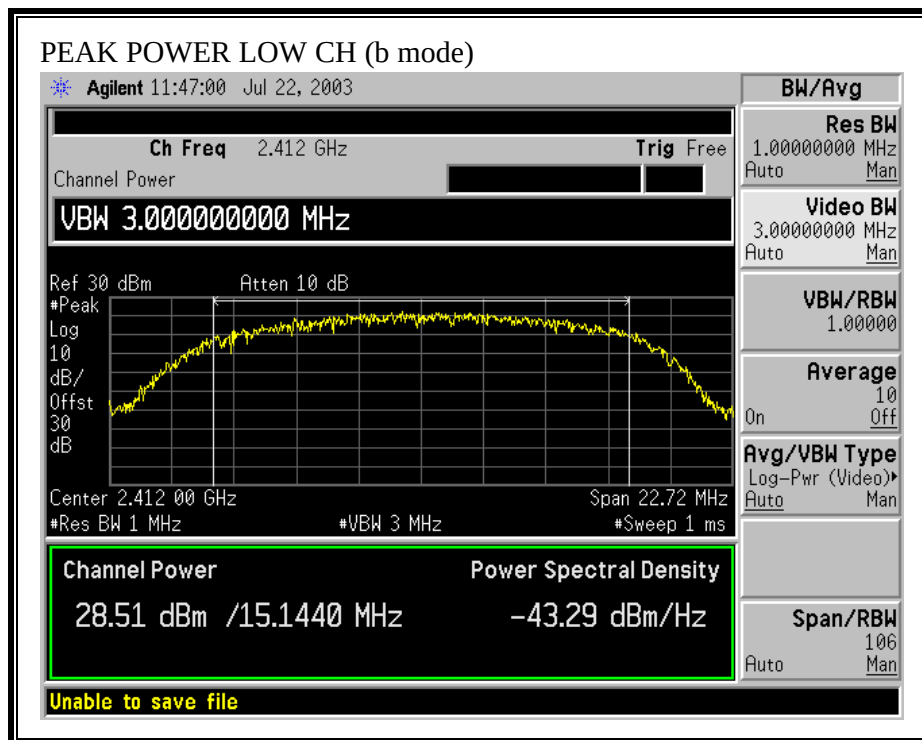
RESULTS

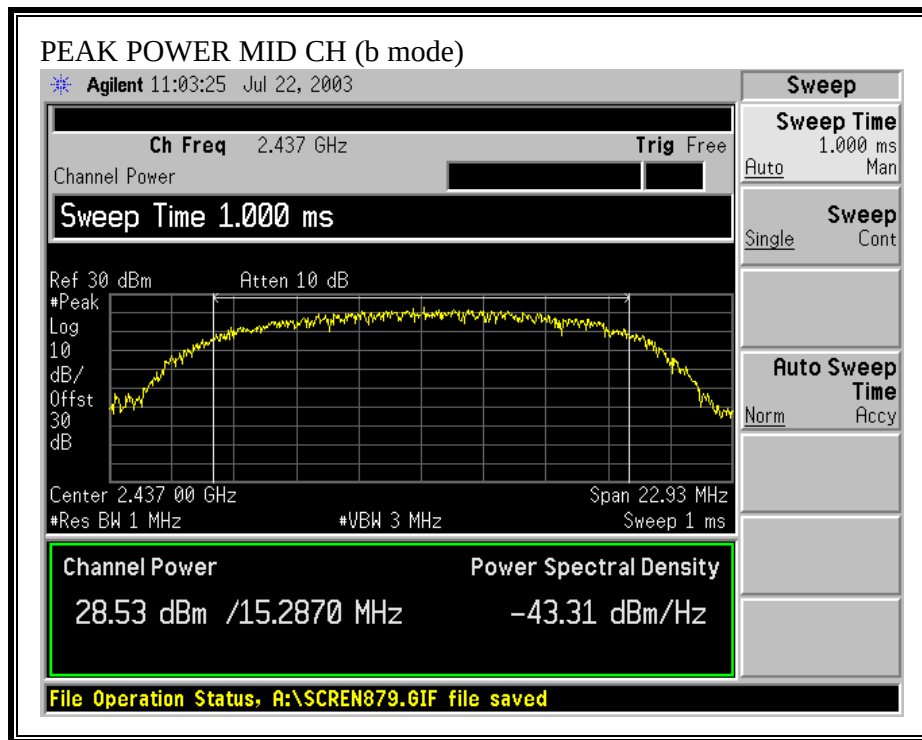
No non-compliance noted:

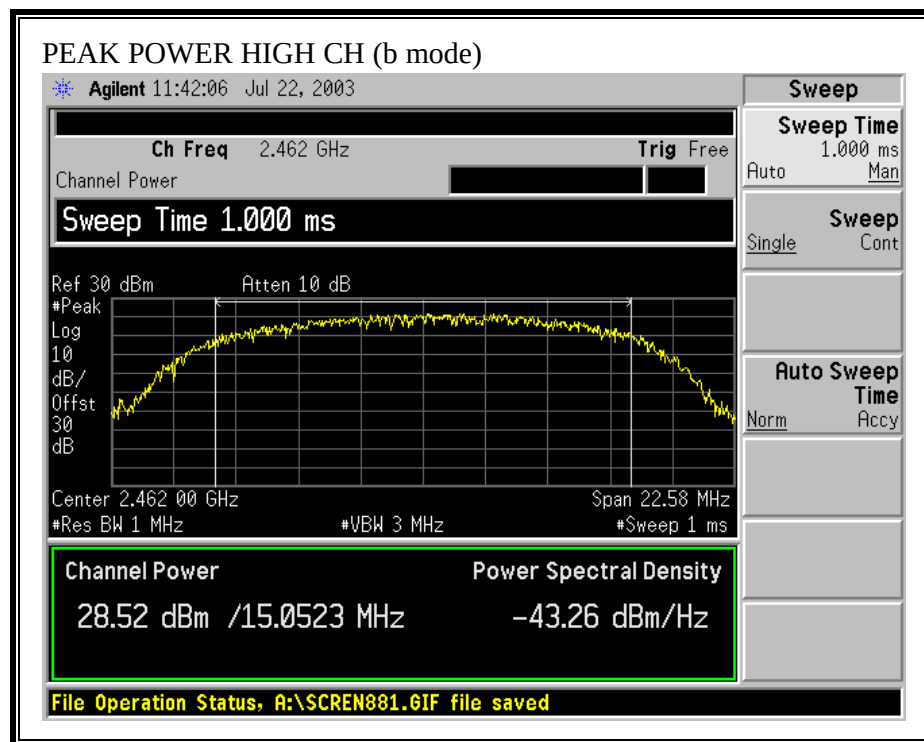
802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	28.51	28.6	-0.09
Middle	2437	28.53	28.6	-0.07
High	2462	28.52	28.6	-0.08

OUTPUT POWER (802.11b MODE)







7.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

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 mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

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 / cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW / cm²

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

LIMITS

S = 1.0 mW / cm² from 1.1310 Table 1

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm ²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	28.53	7.40	17.65

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.

7.5. 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 30 was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	28.45
Middle	2437	28.48
High	2462	28.46

7.6. PEAK POWER SPECTRAL DENSITY

LIMIT

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

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

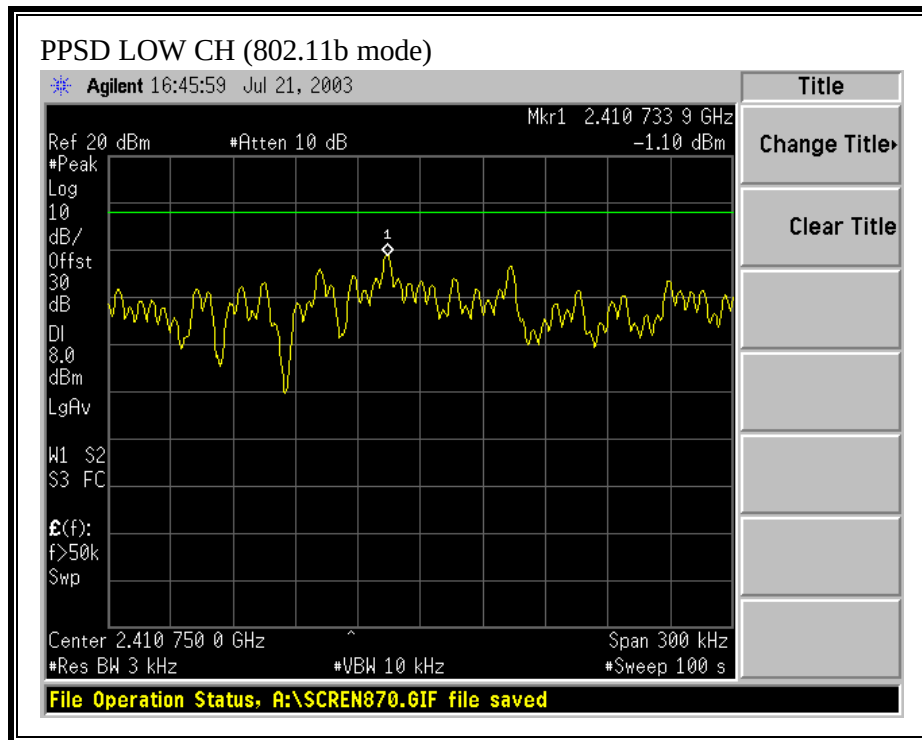
RESULTS

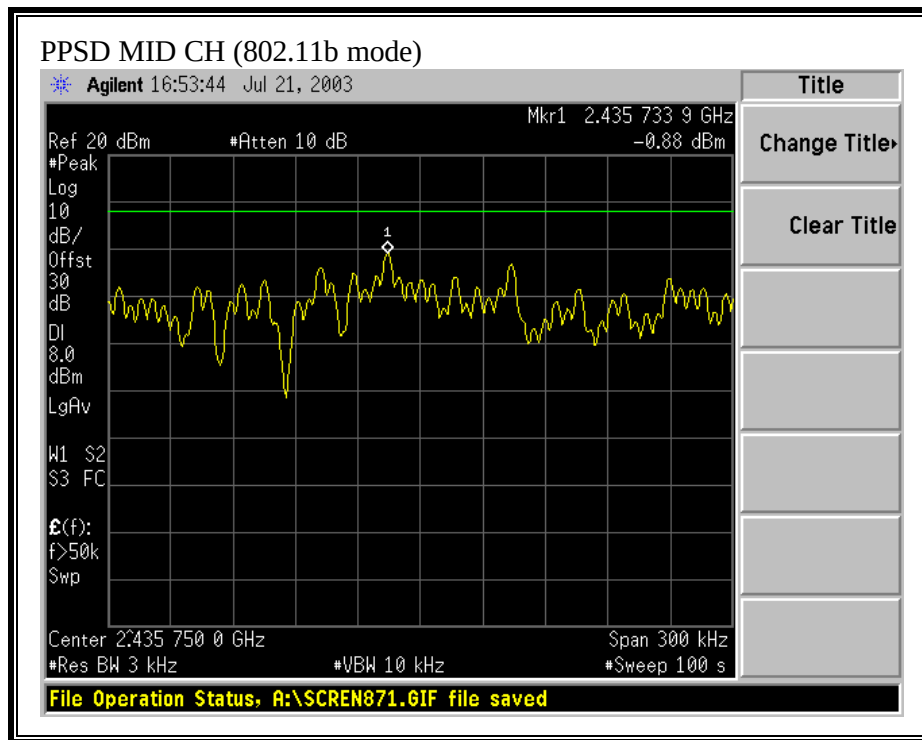
No non-compliance noted:

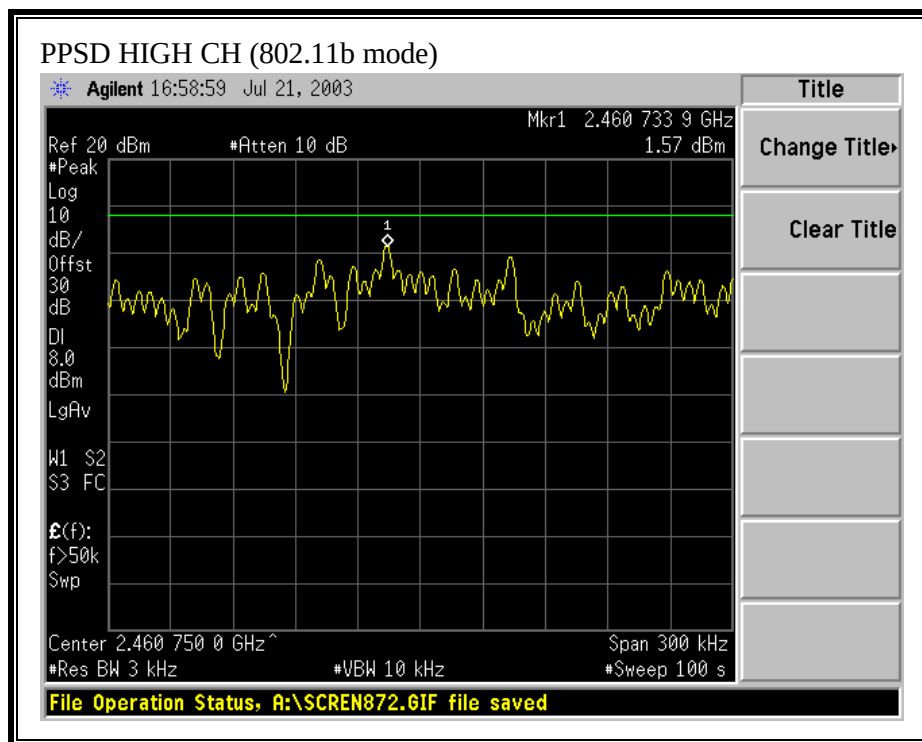
802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-1.10	8	-9.10
Middle	2437	-0.88	8	-8.88
High	2462	1.57	8	-6.43

PEAK POWER SPECTRAL DENSITY (802.11b MODE)







7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

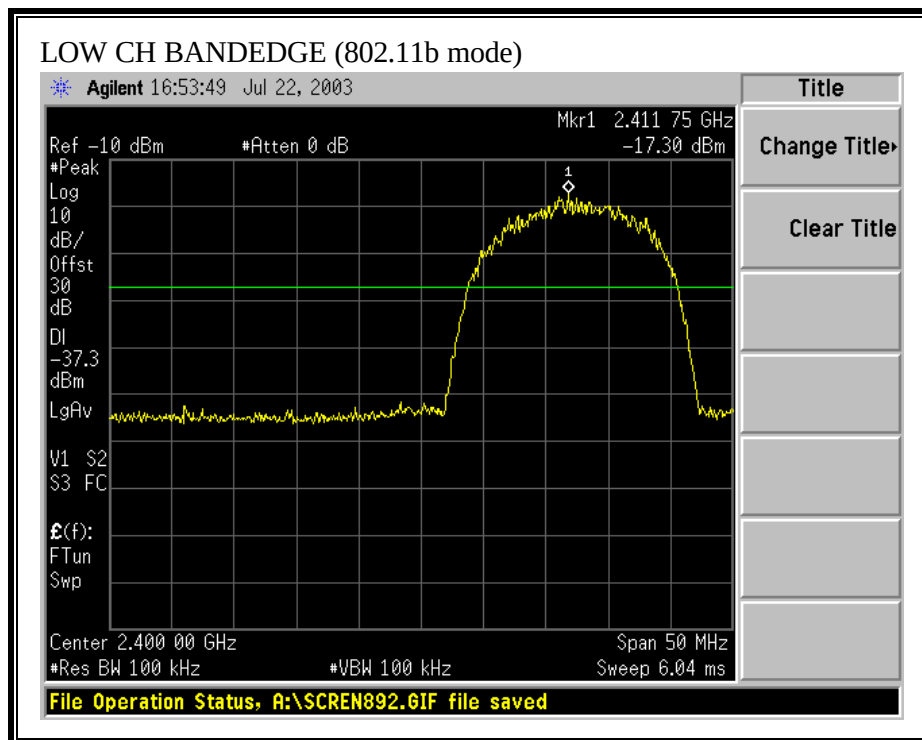
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

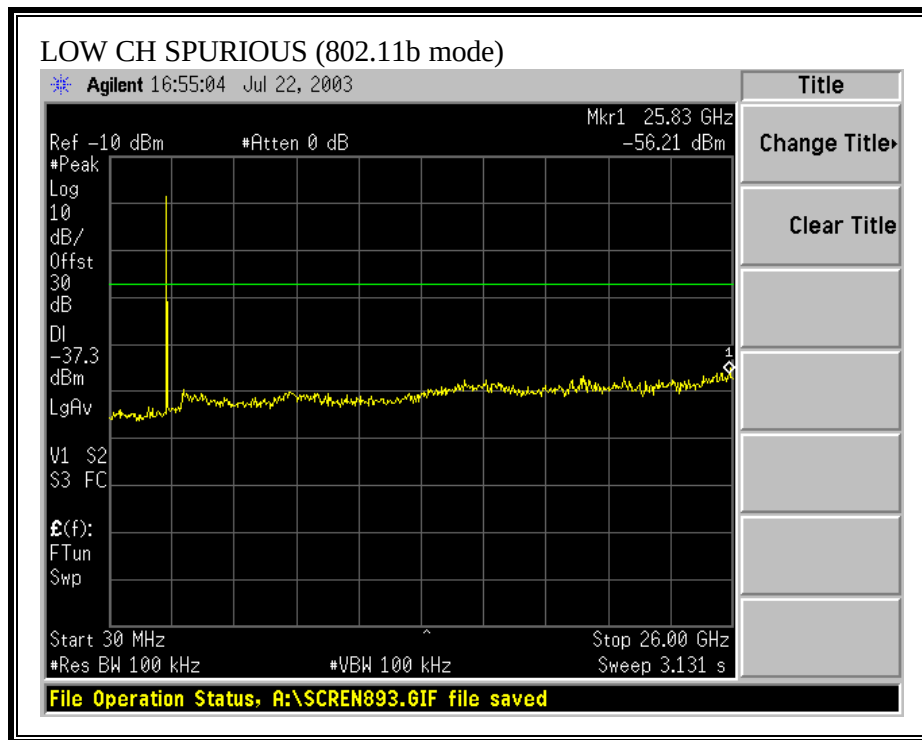
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

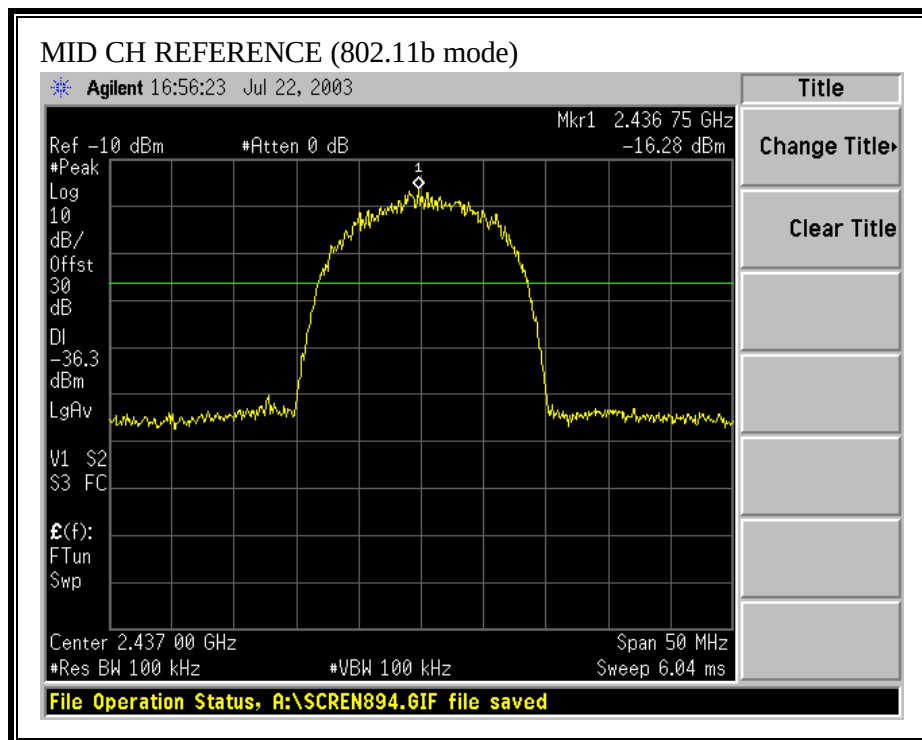
No non-compliance noted:

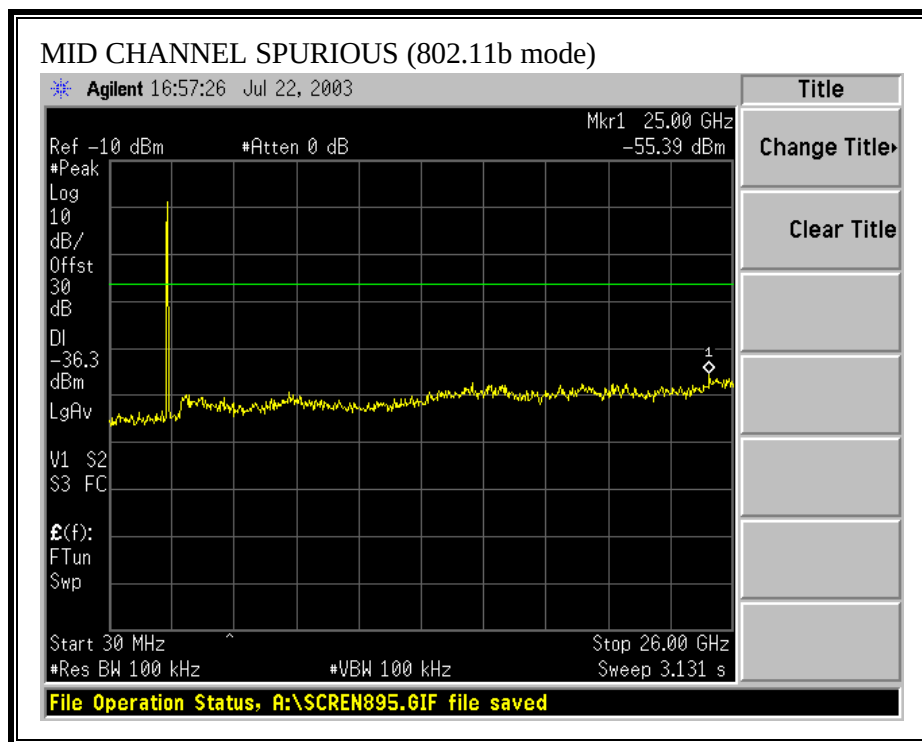
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



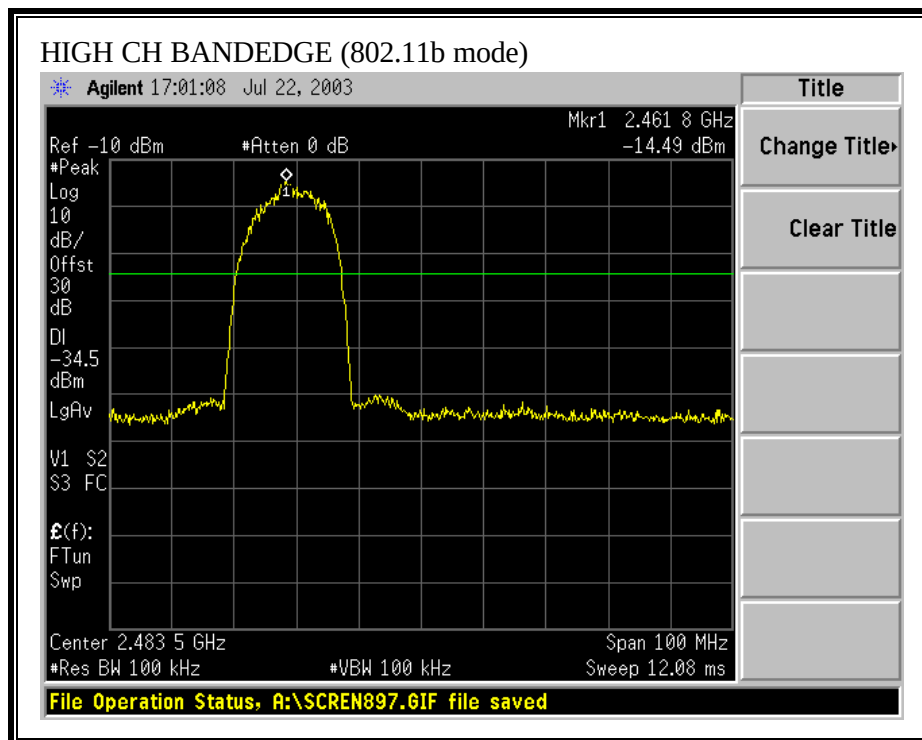


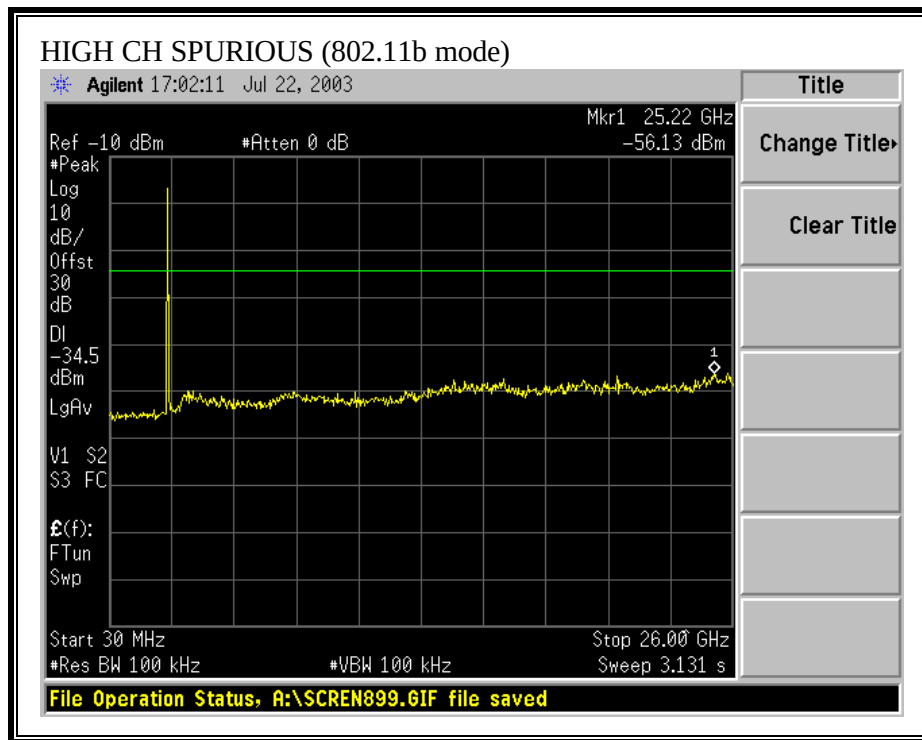
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)





7.8. RADIATED 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 should not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (Micro volts/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.

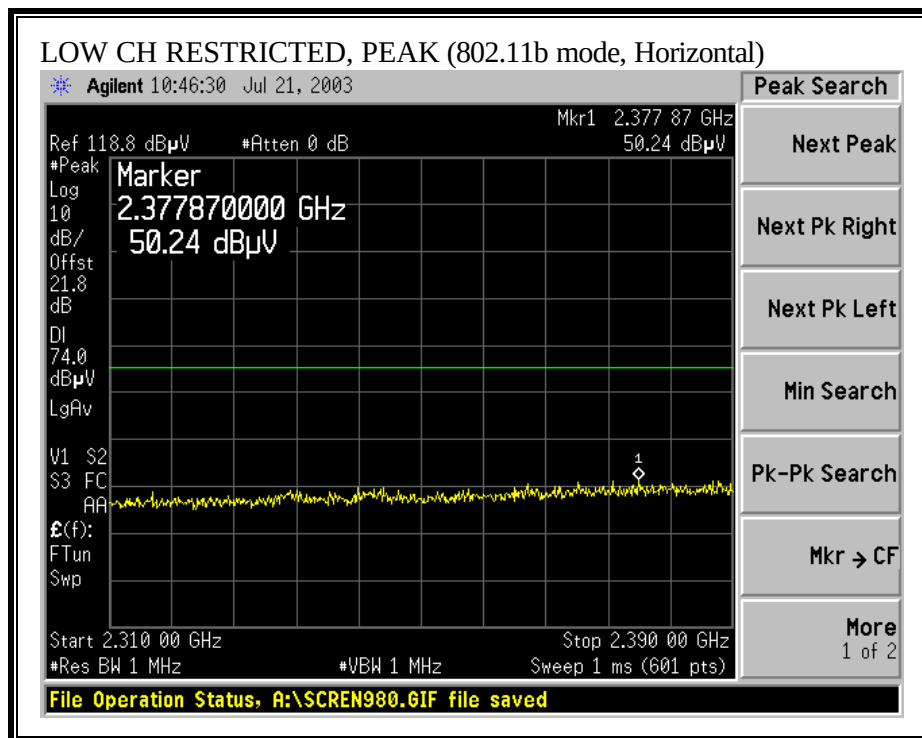
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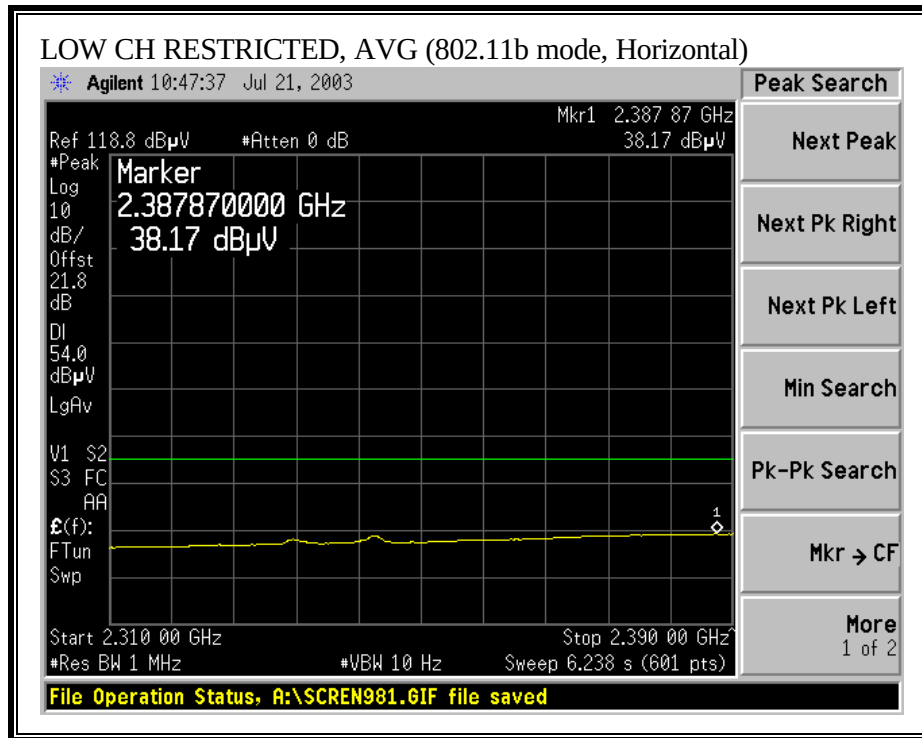
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

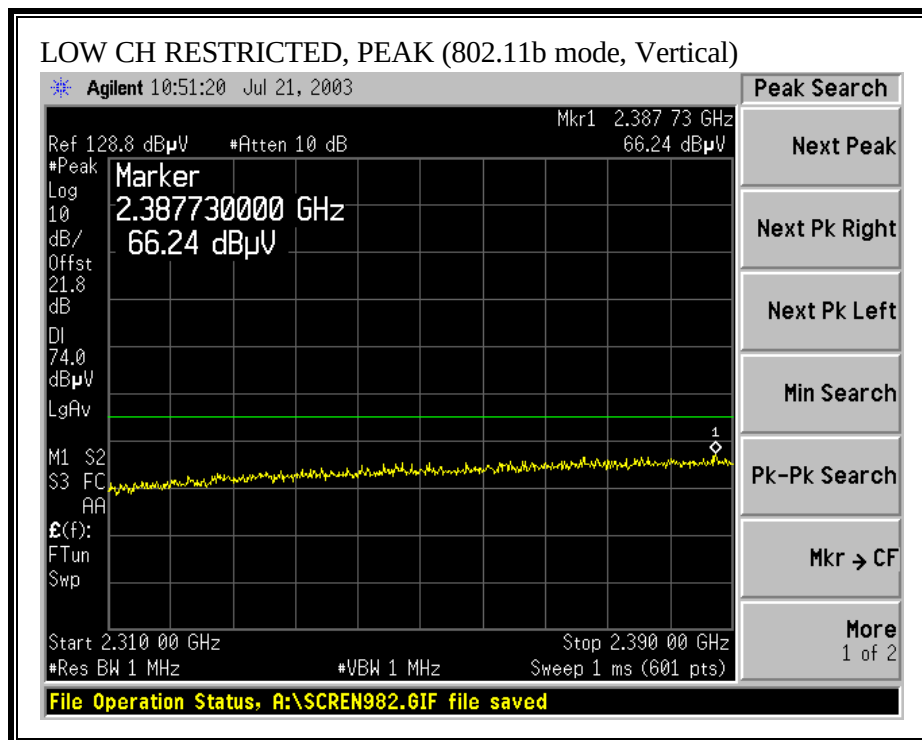
No non-compliance noted:

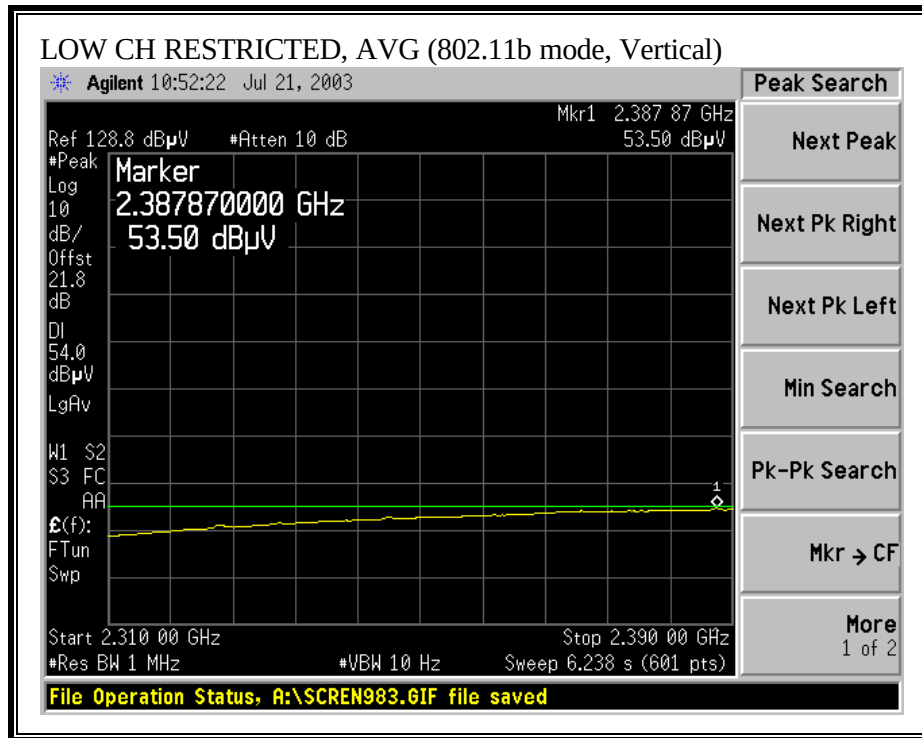
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)
TESTED WITH AC/DC ADAPTER



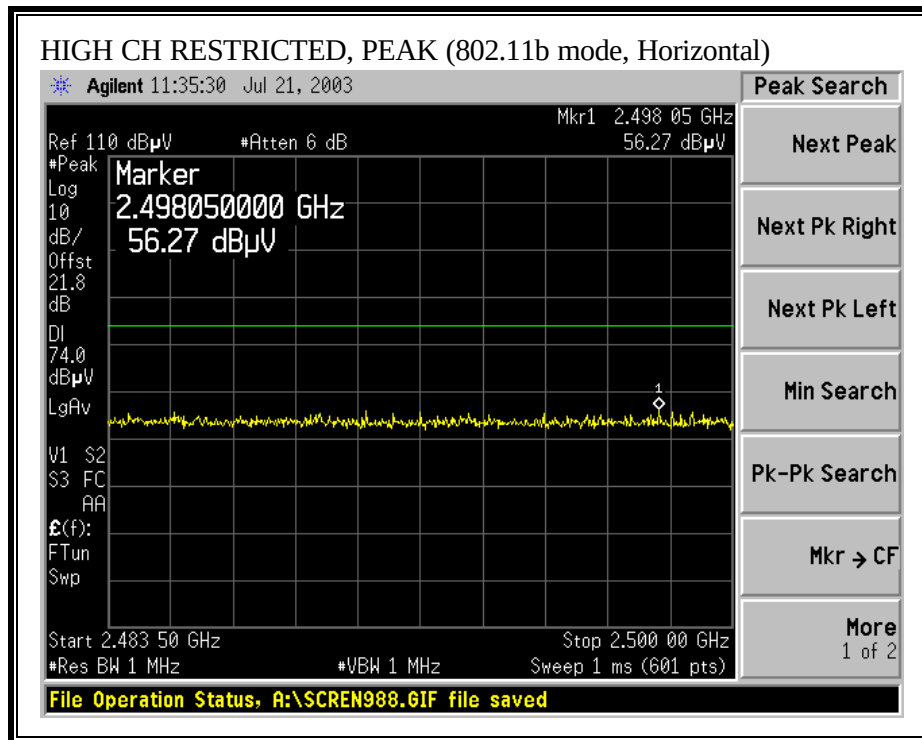


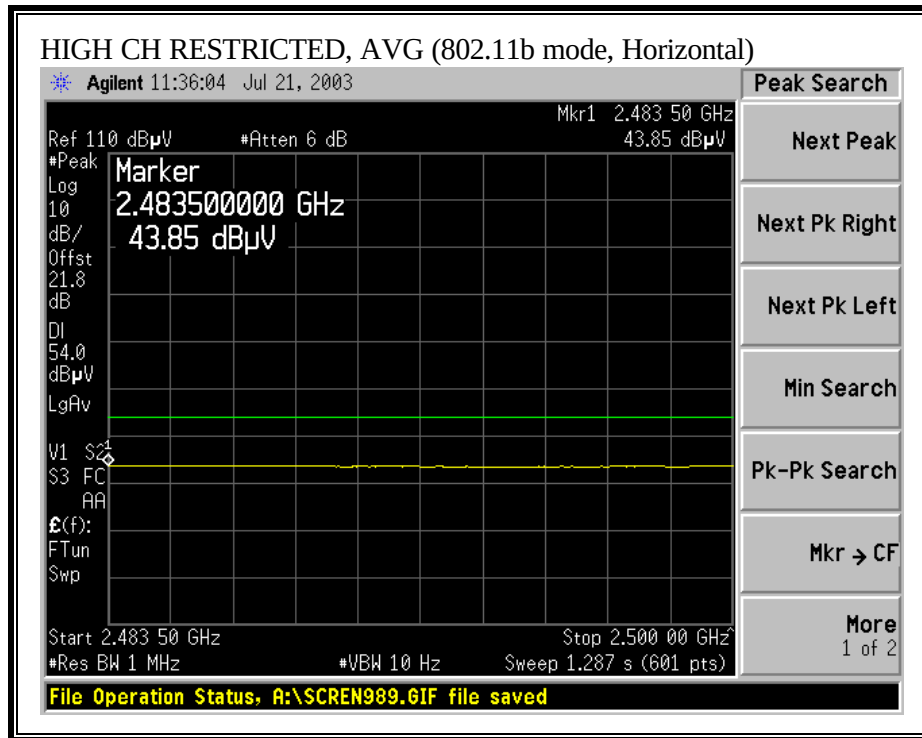
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



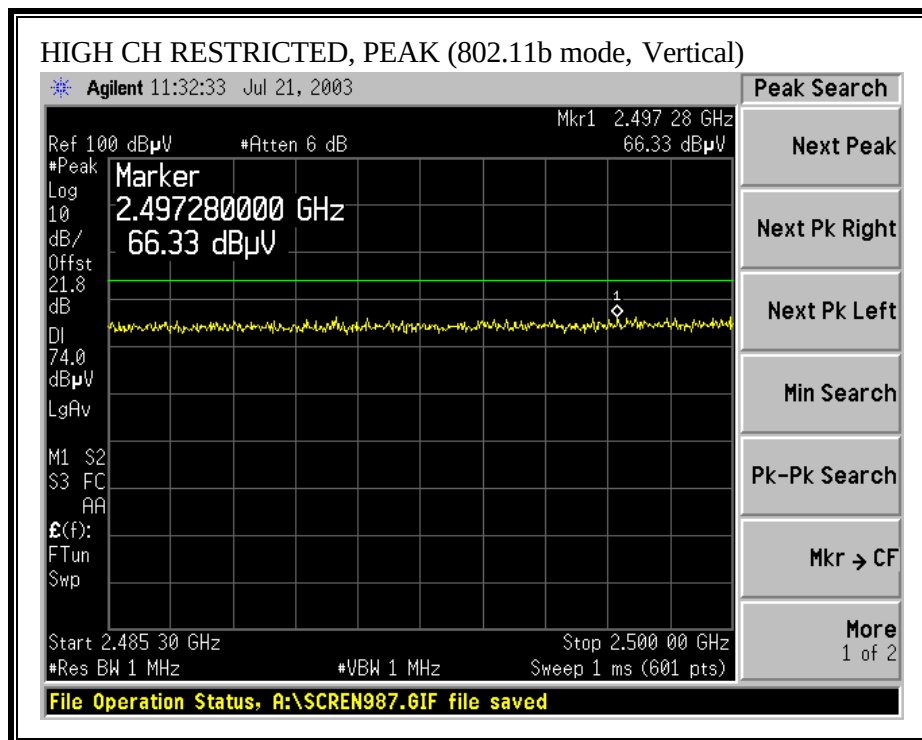


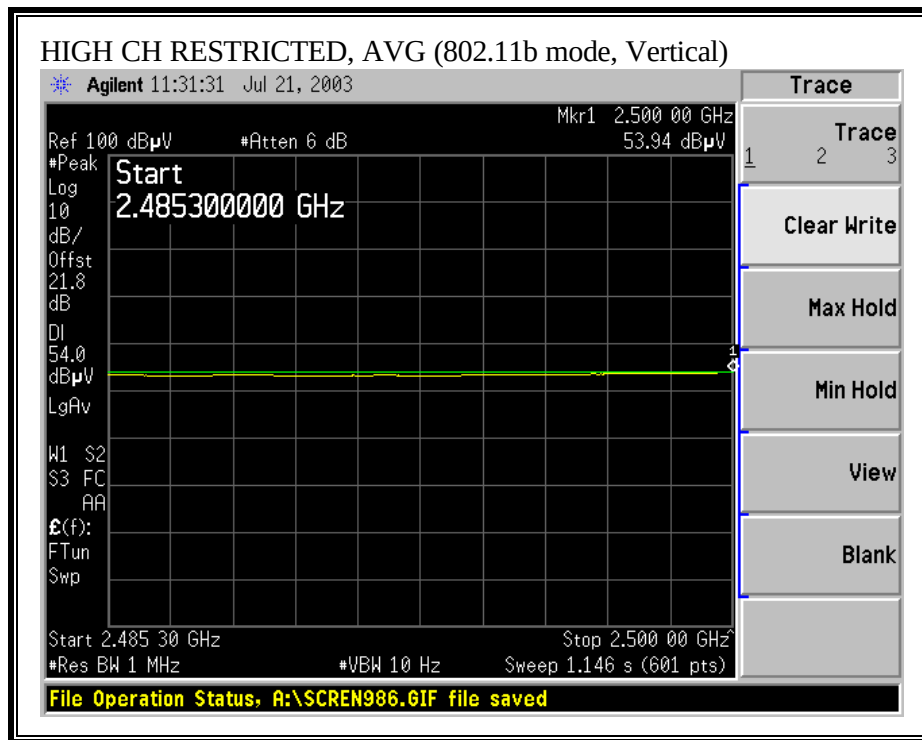
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)





THE DATA OF AC POWER CORD ARE SIMILAR COMPARED TO AD/DC ADPATER DATA

ADJACENT RESTRICTED BAND (802.11b) - TESTED WITH AC POWER CORD

VERIFIED ONLY SOME CRITICAL POINTS _ Antenna Vertical Orientation _ Average Measurement

	FREQUENCY READING (MHz)	AVERAGE READING (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)
LOW CH	2389	53.40	54	-0.60
HI CH	2500	53.89	54	-0.11

HARMONICS AND SPURIOUS EMISSIONS (b MODE, LOW / MIDLE / HIGH CHANNEL)
TESTED WITH AC/DC ADPATER

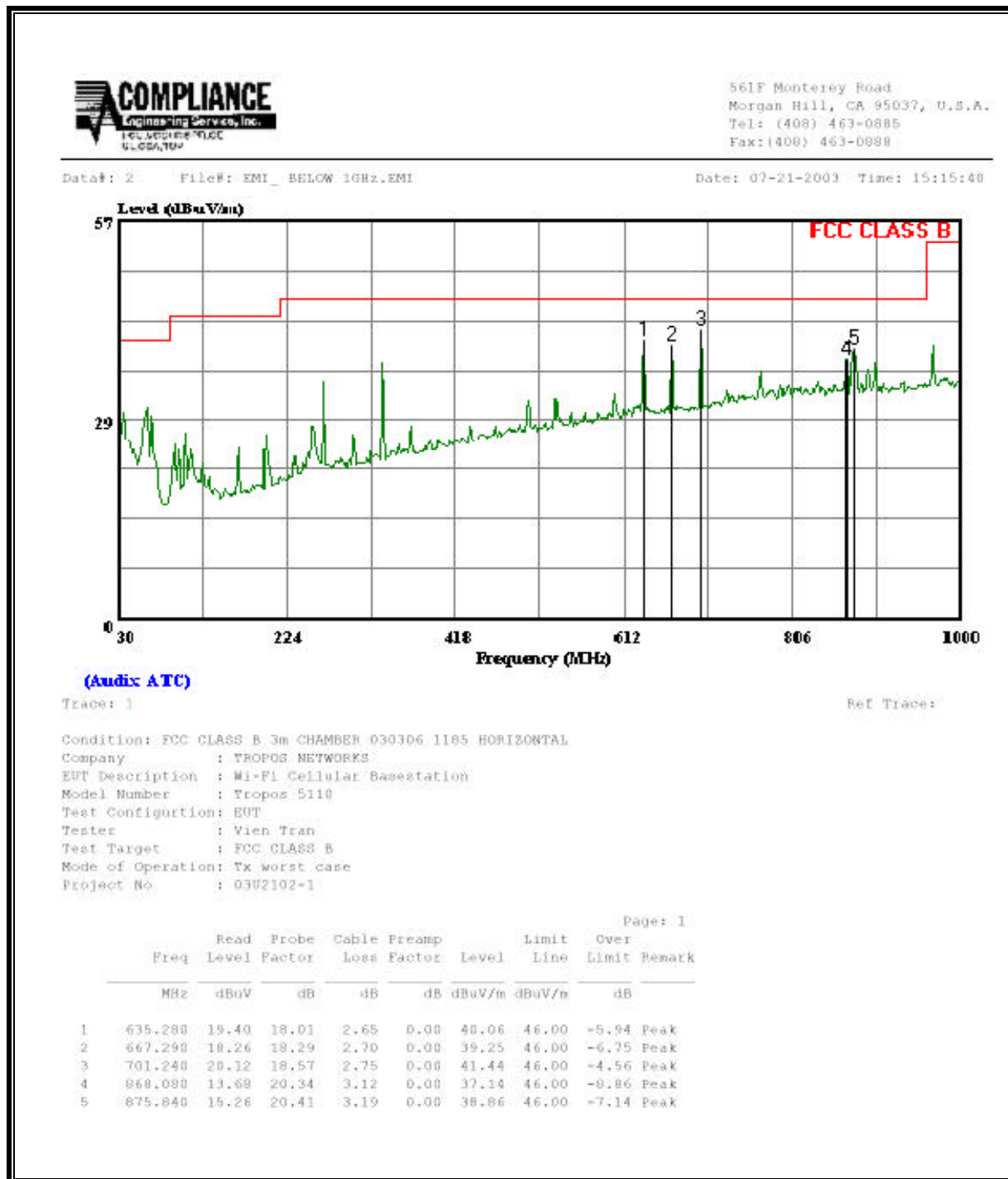
07/21/03 High Frequency Measurement																
Compliance Certification Services, Morgan Hill Open Field Site																
Test Eng: VIEN TRAN																
Project #: 03U2102-1																
Company: TROPOS NETWORKS																
EUT Descr.: WI-FI CELLULAR BASESTATION																
EUT M/N: TROPOS 5110																
Test Target: FCC15.247																
Mode Oper: TRANSMITTING																
Test Equipment:																
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Spectrum Analyzer		Horn > 18GHz		Limit								
173; S/N: 6717 @3m		T63 Mireq 646456		Agilent E4446A Analyzer				FCC 15.209								
RF Frequency Cables ☐ (2 ft) ☐ (2 ~ 3 ft) ☒ (4 ~ 6 ft) ☒ (12 ft)																
Peak Measurements: 1 MHz Resolution Bandwidth Average Measurements: 1 MHz Resolution Bandwidth 15Hz Video 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	
LOW CH = 2.412GHz																
4.824	9.8	41.4	29.6	33.4	3.4	-35.3	0.0	1.0	43.8	32.0	74.0	54.0	-30.2	-22.0	V	
7.274	9.8	41.2	29.7	35.8	4.4	-34.6	0.0	1.0	47.7	36.3	74.0	54.0	-36.3	-17.7	V	
4.824	9.8	41.6	29.5	33.4	3.4	-35.3	0.0	1.0	44.0	31.9	74.0	54.0	-30.0	-22.1	H	
7.274	9.8	42.6	29.6	35.8	4.4	-34.6	0.0	1.0	49.1	36.1	74.0	54.0	-24.9	-17.9	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
MID CH = 2.437GHz																
4.874	9.8	43.1	30.2	33.4	3.4	-35.3	0.0	1.0	45.6	32.7	74.0	54.0	-28.4	-21.3	V	
7.311	9.8	43.3	30.1	35.8	4.4	-34.6	0.0	1.0	49.9	36.8	74.0	54.0	-24.1	-17.2	V	
4.874	9.8	42.6	29.8	33.4	3.4	-35.3	0.0	1.0	45.0	32.3	74.0	54.0	-29.0	-21.7	H	
7.311	9.8	41.7	30.0	35.8	4.4	-34.6	0.0	1.0	48.4	36.6	74.0	54.0	-28.6	-17.4	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
HIGH CH = 2.462GHz																
4.925	9.8	42.9	29.5	33.5	3.5	-35.3	0.0	1.0	45.5	32.1	74.0	54.0	-28.5	-21.9	V	
7.387	9.8	42.4	29.8	36.0	4.4	-34.5	0.0	1.0	49.3	36.7	74.0	54.0	-24.7	-17.3	V	
4.925	9.8	42.6	29.7	33.5	3.5	-35.3	0.0	1.0	45.2	32.3	74.0	54.0	-28.8	-21.7	H	
7.387	9.8	42.8	29.5	36.0	4.4	-34.5	0.0	1.0	49.6	36.4	74.0	54.0	-24.4	-17.6	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
f	Measurement Frequency			Amp	Presamp 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											

HARMONICS AND SPURIOUS EMISSIONS (b MODE, LOW / MIDLE / HIGH CHANNEL)
TESTED WITH AC POWER CORD

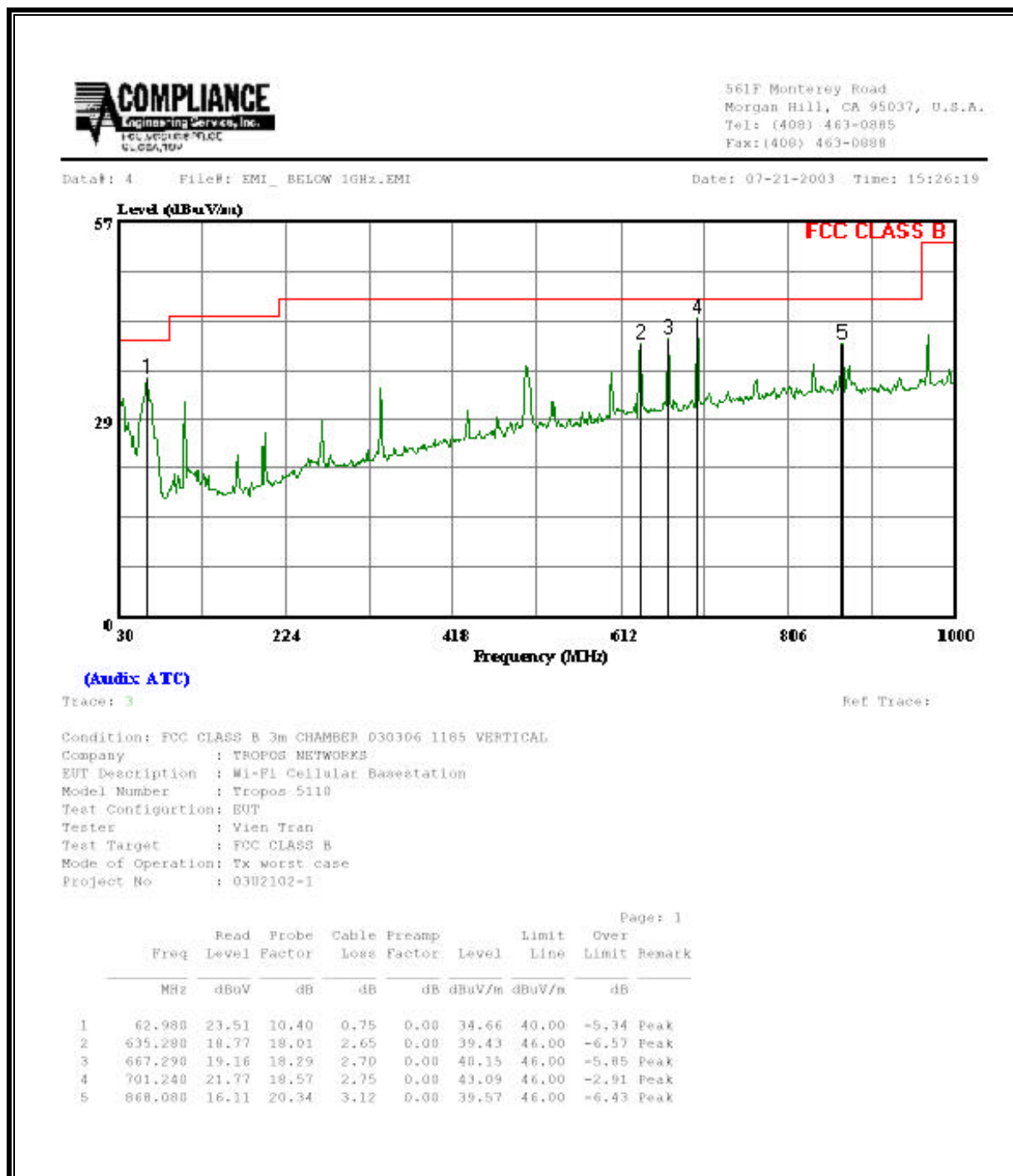
07/21/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: VIEN TRAN Project #: 03U2102-1 Company: TROPOS NETWORKS EUT Descrip.: WI-FI CELLULAR BASESTATION EUT M/N: TROPOS 5110 Test Target: FCC15.247 Mode Oper: TRANSMITTING																
Test Equipment:																
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T63 Miteq 646456		Spectrum Analyzer Agilent E4446A Analyzer		Horn > 18GHz		Limit FCC 15.209								
Hi Frequency Cables ☐ (2 ft) ☐ (2 - 3 ft) ☒ (4 - 6 ft) ☒ (12 ft)																
Peak Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth																
Average Measurements: 1 MHz Resolution Bandwidth 100Hz 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	
LOW CH = 2.412GHz																
4.824	9.8	41.0	29.1	33.4	3.4	-35.3	0.0	1.0	43.4	31.5	74.0	54.0	-30.6	-22.5	V	
7.274	9.8	39.7	29.0	35.8	4.4	-34.6	0.0	1.0	46.2	35.6	74.0	54.0	-27.8	-18.5	V	
4.824	9.8	41.3	29.2	33.4	3.4	-35.3	0.0	1.0	43.7	31.6	74.0	54.0	-30.3	-22.4	H	
7.274	9.8	42.2	29.3	35.8	4.4	-34.6	0.0	1.0	48.7	35.8	74.0	54.0	-25.3	-18.2	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
MID CH = 2.437GHz																
4.874	9.8	42.4	29.8	33.4	3.4	-35.3	0.0	1.0	44.9	32.3	74.0	54.0	-29.1	-21.7	V	
7.311	9.8	41.8	29.2	35.8	4.4	-34.6	0.0	1.0	48.4	35.8	74.0	54.0	-25.6	-18.2	V	
4.874	9.8	41.0	29.1	33.4	3.4	-35.3	0.0	1.0	43.8	31.6	74.0	54.0	-30.8	-22.4	H	
7.311	9.8	39.4	29.3	35.8	4.4	-34.6	0.0	1.0	46.0	35.9	74.0	54.0	-28.0	-18.1	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
HI CH = 2.462GHz																
4.925	9.8	42.4	29.8	33.5	3.5	-35.3	0.0	1.0	45.0	32.1	74.0	54.0	-29.0	-21.9	V	
7.387	9.8	41.8	29.7	36.0	4.4	-34.5	0.0	1.0	48.7	36.6	74.0	54.0	-25.3	-17.4	V	
4.925	9.8	42.2	29.2	33.5	3.5	-35.3	0.0	1.0	44.8	31.8	74.0	54.0	-29.2	-22.2	H	
7.387	9.8	42.0	29.0	36.0	4.4	-34.5	0.0	1.0	48.9	35.9	74.0	54.0	-25.1	-18.1	H	
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																
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									

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)
TESTED WITH AC/DC ADAPTER

HORIZONTAL



VERTICAL



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)
TESTED WITH AC POWER CORD

						Project #: 03U2102-1 Report #: 03U2102-1 C SITE Date& Time: 07/22/03 9:47 AM Test Engr: VIEN TRAN					
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP 561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888											
Company: TROPOS NETWORKS EUT Description: WI-FI CELLULAR BASESTATION Test Configuration: EUT / AC POWER CORD / ETHERNET CABLE Type of Test: FCC CLASS B Mode of Operation: TX WORSE CASE											
<< Main Sheet											
Freq.	Reading	AF	Closs	Pre-amp	Level	Limit	Margin	Pol	Az	Height	Mark
(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	FCC B	(dB)	(H/V)	(Deg)	(Meter)	(P/Q/A)
668.17	46.50	20.35	4.83	27.89	43.80	46.00	-2.20	3mV	0.00	1.00	P
833.36	43.70	21.66	5.46	27.40	43.42	46.00	-2.58	3mV	0.00	1.00	P
701.24	44.30	21.28	4.96	27.92	42.63	46.00	-3.37	3mV	0.00	1.00	P
100.00	54.10	11.38	1.62	27.06	40.04	43.50	-3.47	3mV	0.00	1.00	P
643.77	43.80	19.64	4.74	27.85	40.32	46.00	-5.68	3mV	0.00	1.00	P
369.00	47.40	15.10	3.39	26.89	39.00	46.00	-7.00	3mV	0.00	1.00	P
6 Worst Data											

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 μ H/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

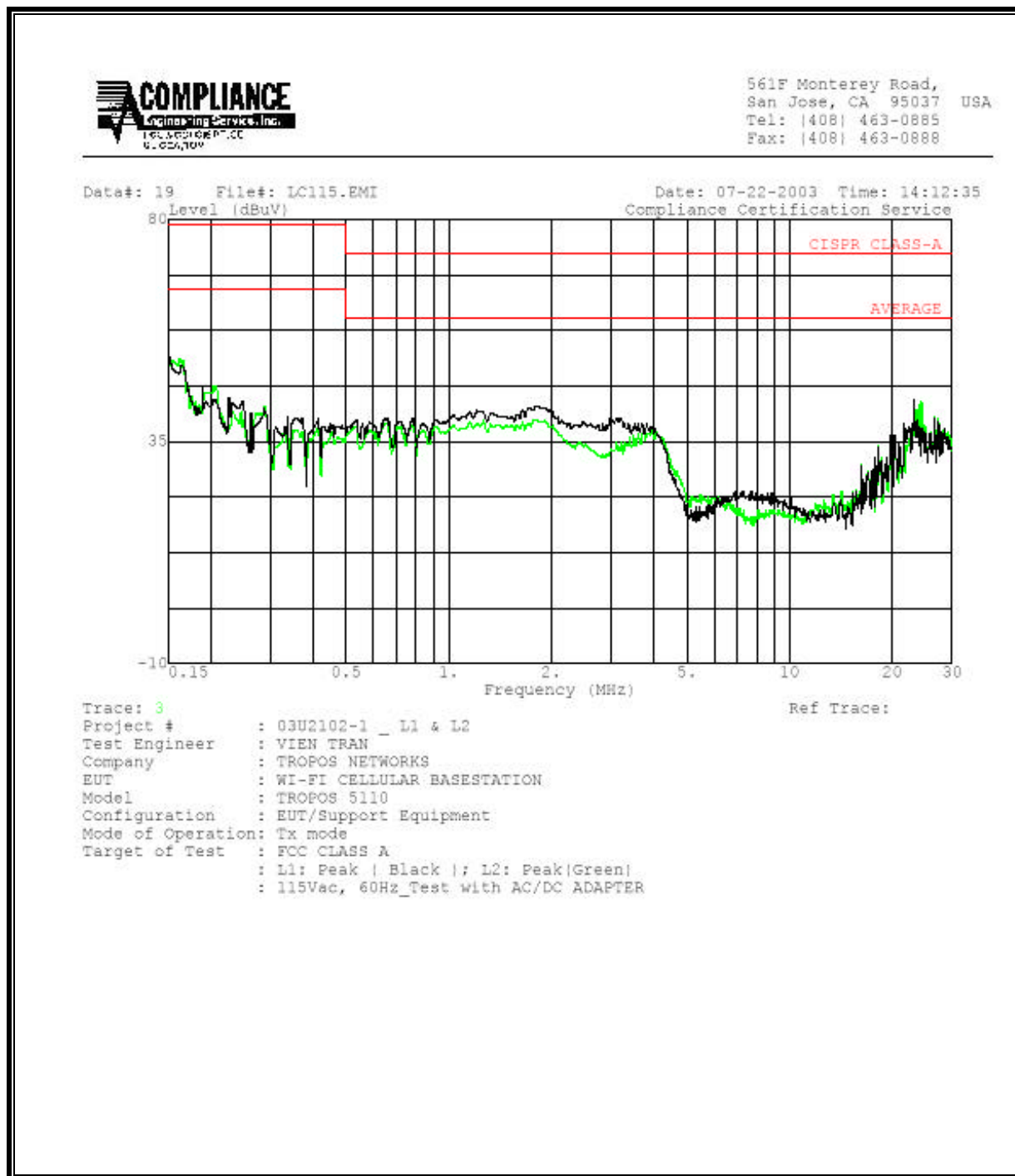
AC/DC ADAPTER

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_A	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	51.78	--	--	0.00	79.00	66.00	-27.22	-14.22	L1
0.20	46.80	--	--	0.00	79.00	66.00	-32.20	-19.20	L1
24.40	43.30	--	--	0.00	73.00	60.00	-29.70	-16.70	L1
0.15	50.75	--	--	0.00	79.00	66.00	-28.25	-15.25	L2
0.20	46.76	--	--	0.00	79.00	66.00	-32.24	-19.24	L2
23.02	44.95	--	--	0.00	73.00	60.00	-28.05	-15.05	L2
6 Worst Data									
TESTED WITH AC/DC ADAPTER									

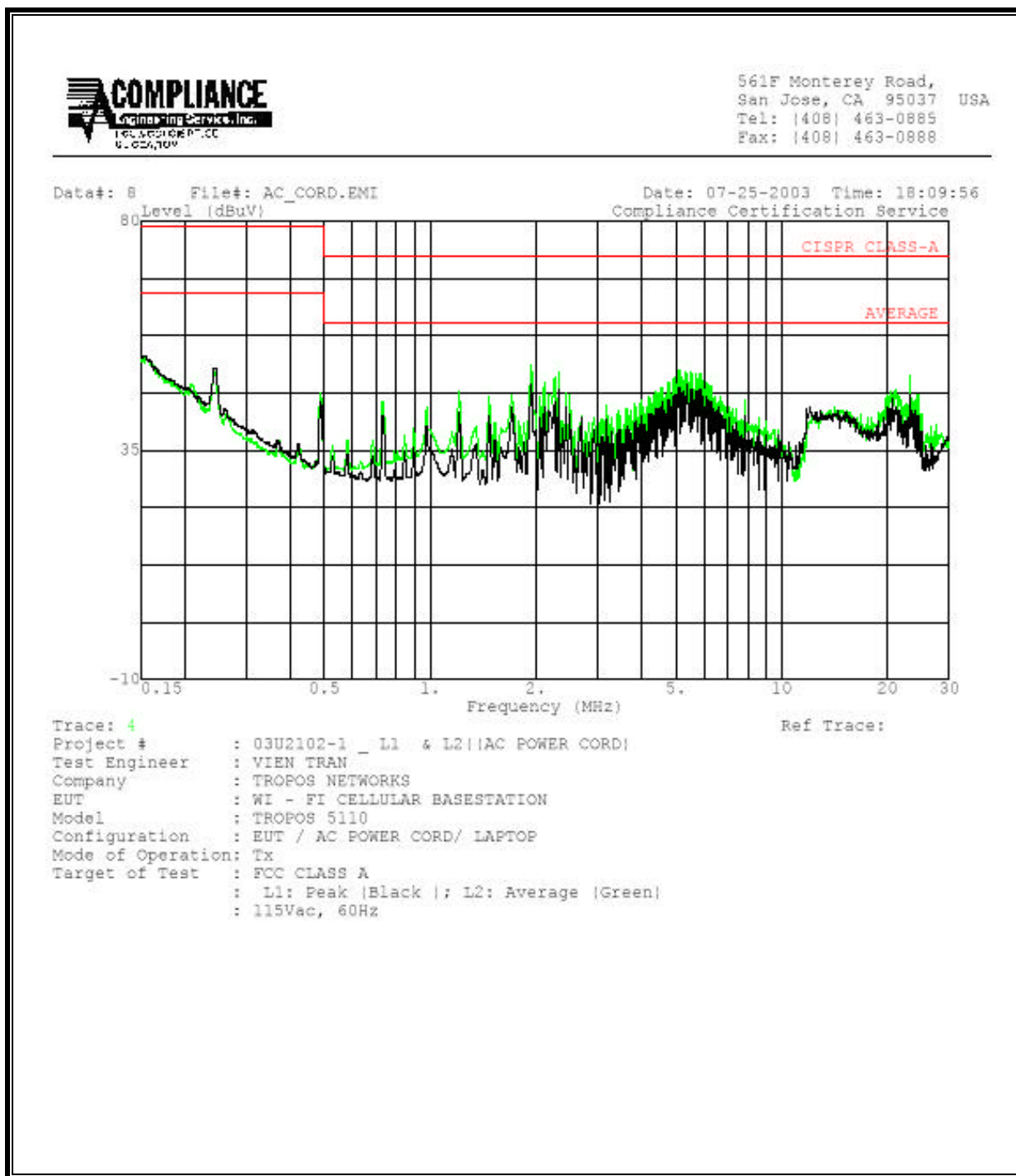
AC POWER CORD

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_A	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
1.95	53.74	--	--	0.00	73.00	60.00	-19.26	-6.26	L1
23.02	50.86	--	--	0.00	73.00	60.00	-22.14	-9.14	L1
1.20	46.58	--	--	0.00	73.00	60.00	-26.42	-13.42	L1
1.95	47.74	--	--	0.00	73.00	60.00	-25.26	-12.26	L2
23.02	46.44	--	--	0.00	73.00	60.00	-26.56	-13.56	L2
1.20	43.11	--	--	0.00	73.00	60.00	-29.89	-16.89	L2
6 Worst Data									
TESTED WITH AC POWER CORD									

LINE 1 AND LINE 2 RESULTS (AC/DC ADPATER)

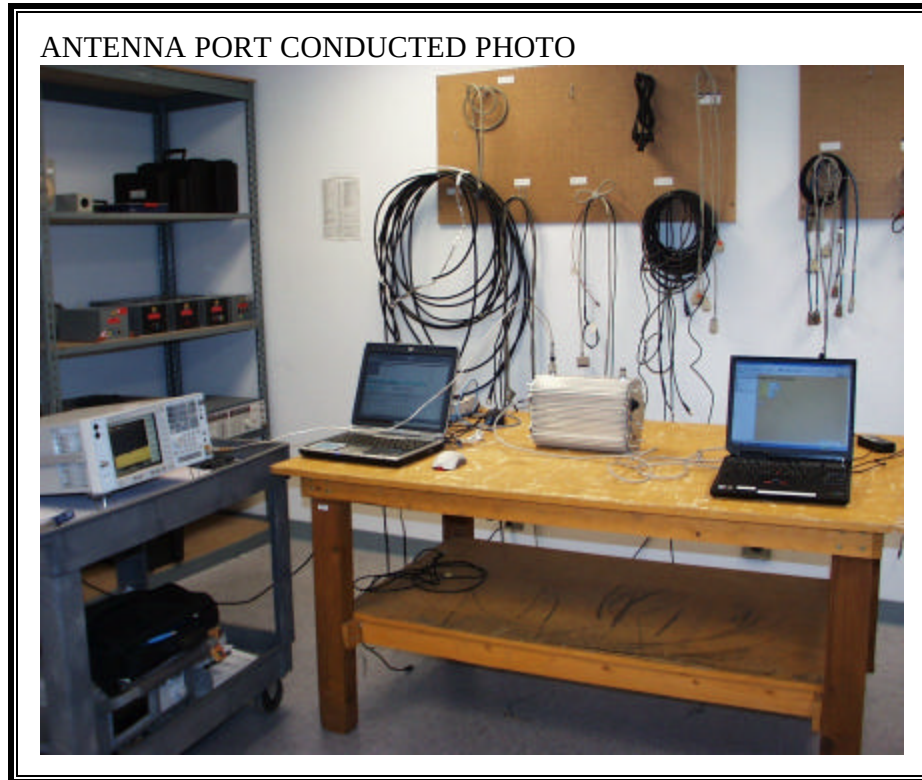


LINE 1 AND LINE 2 RESULTS (AC POWER CORD)

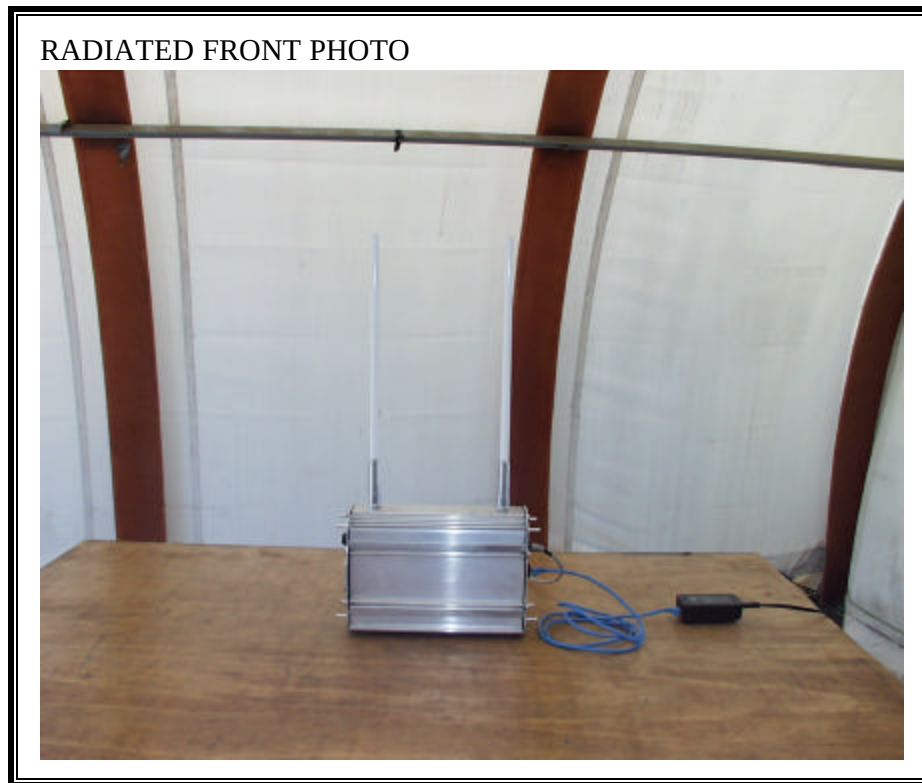


8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



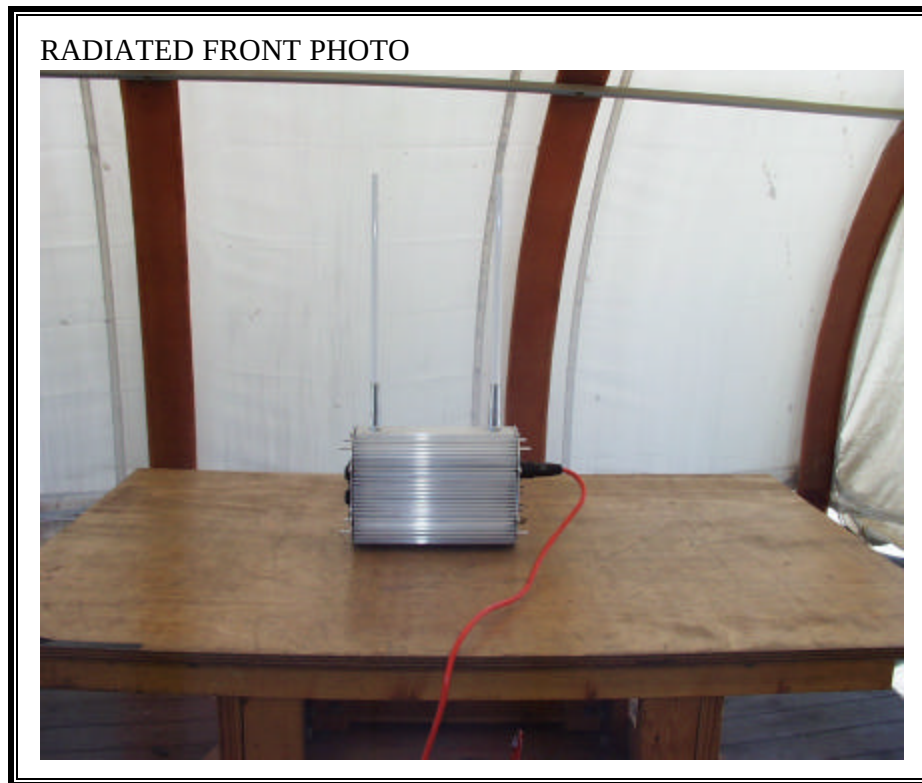
RADIATED RF MEASUREMENT SETUP (AC/DC ADAPTER)



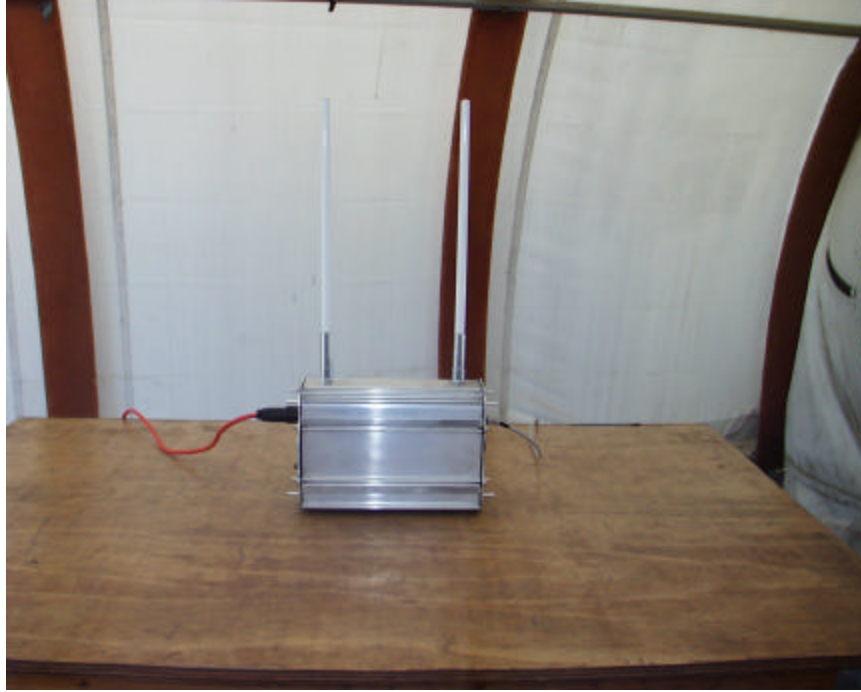
RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP (AC POWER CORD)

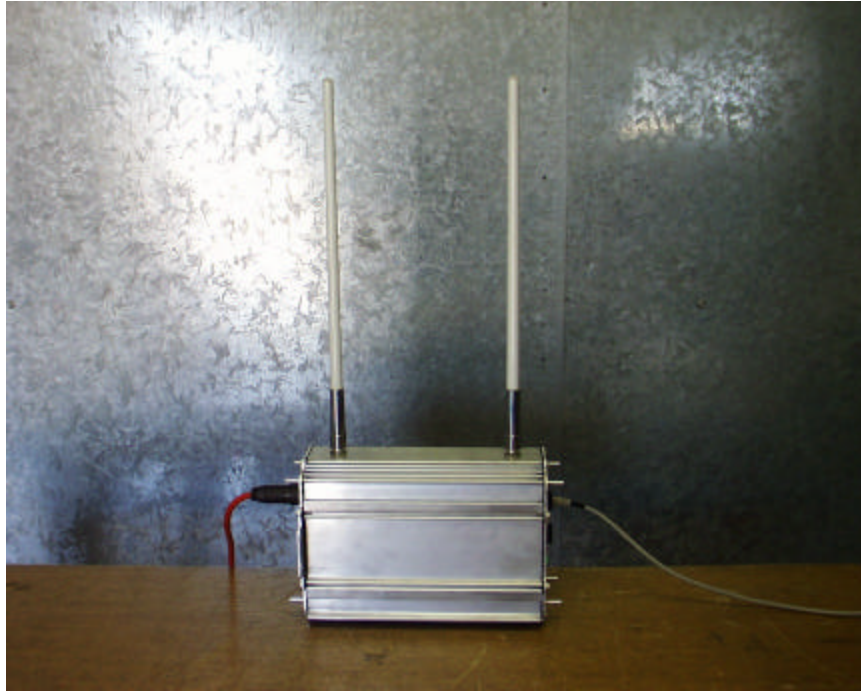


RADIATED BACK PHOTO

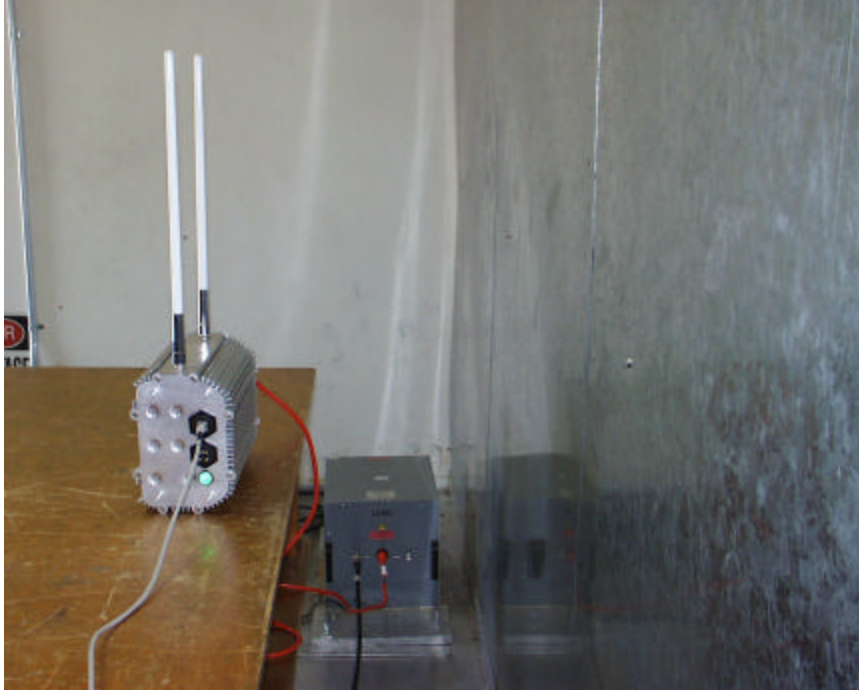


POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP (AC POWER CORD)

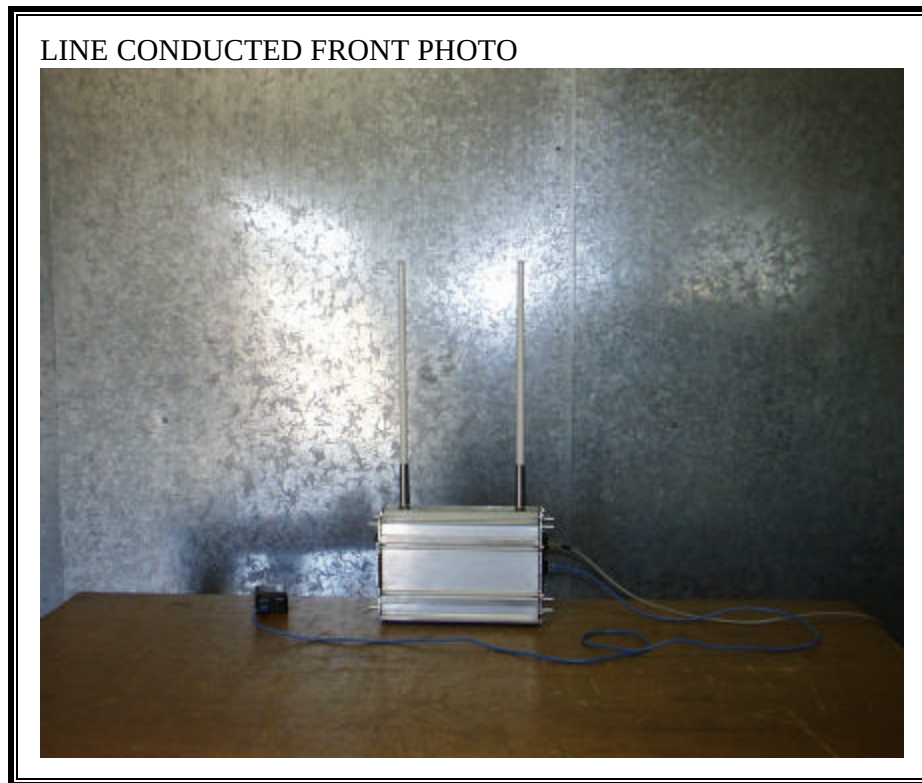
LINE CONDUCTED FRONT PHOTO



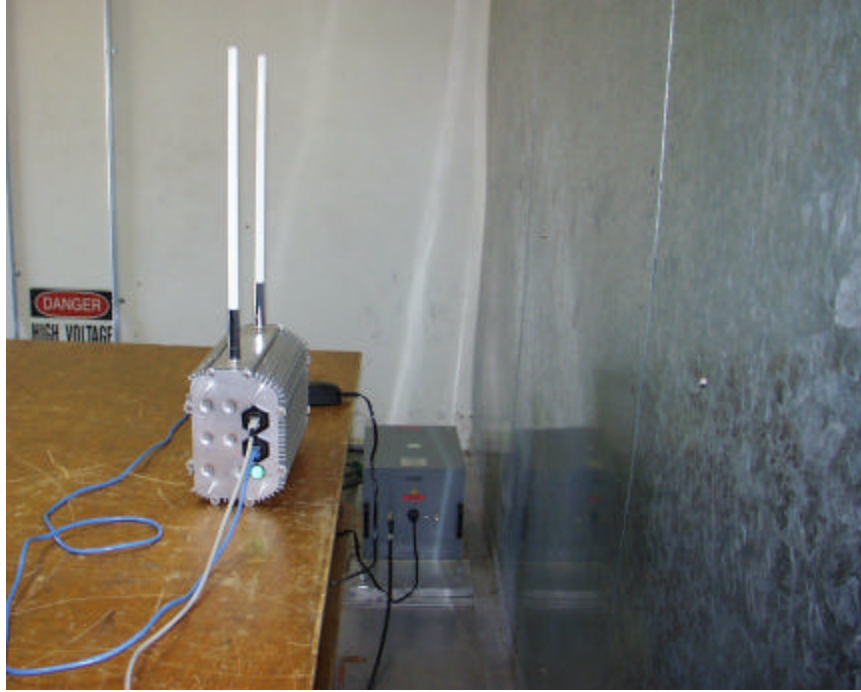
LINE CONDUCTED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP (AC/DC ADAPTER)



LINE CONDUCTED BACK PHOTO



END OF REPORT