



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

FOR

POINT TO MULTIPOINT WIRELESS INTERNET SYSTEM

MODEL NUMBER: AX1655-ER, AX1655-EC

FCC ID: PLRAX165500

REPORT NUMBER: 06U10203-1

ISSUE DATE: MAY 5, 2006

Prepared for
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Revision History

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY.....	5
4.1. MEASURING INSTRUMENT CALIBRATION.....	5
4.2. MEASUREMENT UNCERTAINTY.....	5
5. EQUIPMENT UNDER TEST.....	6
5.1. DESCRIPTION OF EUT	6
5.2. DESCRIPTION OF MODEL DIFFERENCES	6
5.3. MAXIMUM OUTPUT POWER	6
5.4. SOFTWARE AND FIRMWARE	6
5.5. WORST-CASE CONFIGURATION AND MODE.....	6
5.6. DESCRIPTION OF TEST SETUP	7
6. TEST AND MEASUREMENT EQUIPMENT	8
7. LIMITS AND RESULTS	10
7.1. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND	10
7.1.1. 6 dB BANDWIDTH	10
7.1.2. 99% BANDWIDTH.....	14
7.1.3. PEAK POWER	18
7.1.4. MAXIMUM PERMISSIBLE EXPOSURE	22
7.1.5. AVERAGE POWER.....	25
7.1.6. PEAK POWER SPECTRAL DENSITY	26
7.1.7. CONDUCTED SPURIOUS EMISSIONS.....	30
7.2. RADIATED EMISSIONS.....	37
7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS	37
7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND	40
7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz	42
7.3. POWERLINE CONDUCTED EMISSIONS	50
8. SETUP PHOTOS	54

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ARCWAVE, INC
100 ALBRIGH WAY, SUITE A
LOS GATOS, CA 95032
U.S.A.

EUT DESCRIPTION: POINT TO MULTIPOINT WIRELESS INTERNET SYSTEM

MODEL: AX1655-ER, AX1655-EC

SERIAL NUMBER: 001

DATE TESTED: MARCH 29 - MAY 5, 2006

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: 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.

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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. 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 point-to-multipoint wireless Internet system, for Coax Enhanced 5.8GHz WPE solution is a layer one wireless bridge device that provides wireless connectivity between a coaxial cable plant and one or more customer sites. It is provided with a Patch Array Antenna with a gain of either 15 dBi or 19 dBi.

5.2. DESCRIPTION OF MODEL DIFFERENCES

The circuitry, layout, and design of the two models is identical; the model numbers correspond the two available antennas. The AX1655-ER is provided with the 19 dBi Antenna while the AX1655-EC is provided with the 15 dBi Antenna.

5.3. MAXIMUM OUTPUT POWER

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

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5813 - 5843	DOCSIS Based Propriety	16.18	41.50

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Internet Explorer 6.0.

The test utility software used during testing was WEB base command line interface.

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 5831 MHz.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT EQUIPMENT & PERIPHERALS(AT REMOTE SITE)

- a) Toner AC Combiner, PN: TGP1
- b) CM1000-Sunrise Telecom Cable Meter
- c) Linsys HUB Model: EW5HUB, SN: 802002096
- d) Arris Cable modem, PN:TC00DA1450, SN: 37GBP3101205540, MAC: 0000CA42D2D9.
- e) Cornerstone CMTS 1100, Model: ARC000145, SN: 011800491201
- f) Spectrum Analyzer HP8563EC, SN: 411A01279
- g) Power Meter, Agilent, E44181A, SN: US38261427
- h) Agilent Power Sensor, E4412A, SN: US38487607
- i) Arcwave CPE, Model: AX3155, SN: 80388
- j) Augut DC Inserter, PN: SSPIFN, 12VDC Power Pack PN: 120V-U
- k) Regal Two-way Splitter, PN: DS2DGH10
- l) Blonder Tongue Diplexer, PN: ZUVSJ
- m) Channel Vision 6dB, 10dB & 20dB Attenuator, PN: 3000-6,-10,-20
- n) RF Absorber
- o) Sony laptop computer with SNMPc V5.1 & Internet Explorer

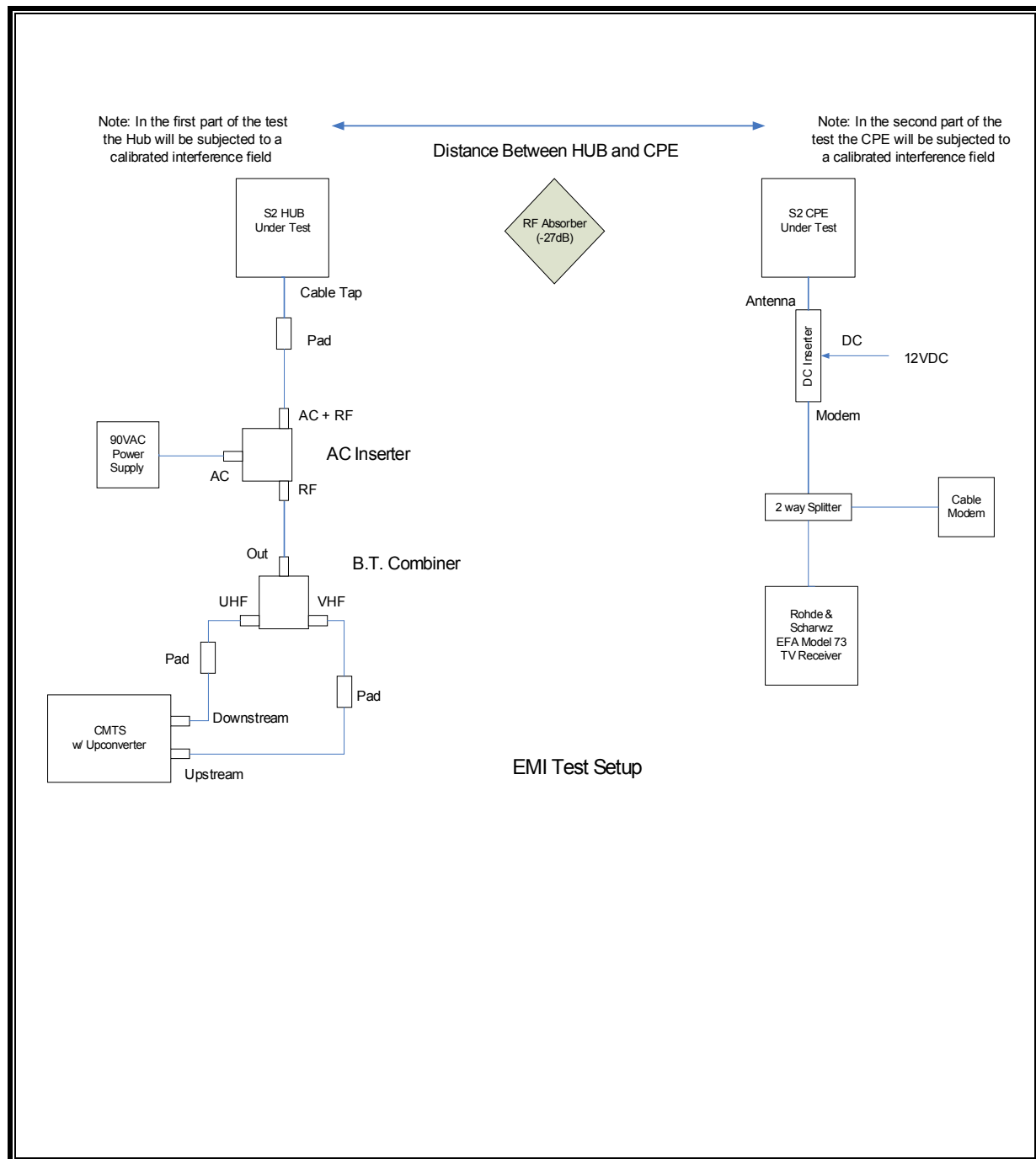
I/O CABLES

- a) TFC (Times Fiber) RG59 mini coax (75 OHM) cable, quad shield (#707314), male F-connector (DIGICON F59MINI) with conical crimp, 30ft, Qty 2
- b) Coax Cable Belden-T 9116R dual shield with Male F-connectors (RG6) 4ft, Qty 5
- c) Coax Cable Belden-T 9116R dual shield with Male F-connectors (RG6) 4ft, Qty 3

TEST SETUP

The EUT is set up as a wireless point to point system using a CMTS at the hub to simulate the cable system operator's coaxial plant. The cable modem at the CPE simulates the customer site.

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
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	4/22/2007
Preamplifier, 1 ~ 26 GHz	HP	8449B	3008A00931	6/24/2006
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2006
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42510266	10/19/2006
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	7/26/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/2007
RF Filter Section	HP	85420E	3705A00256	3/29/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2007
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	8/30/2006

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

7.1.1. 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

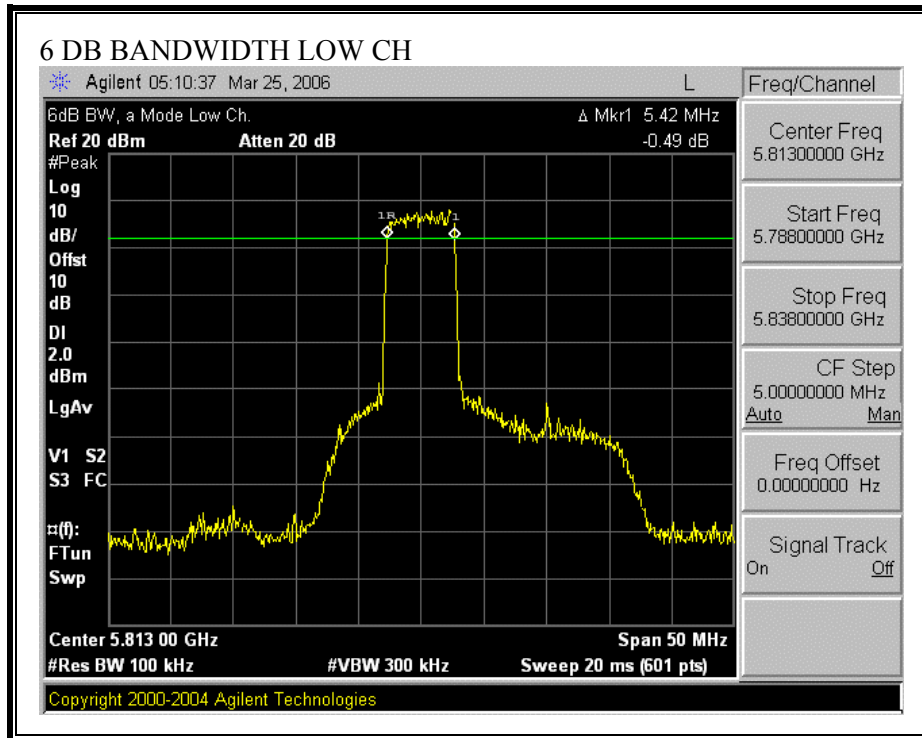
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

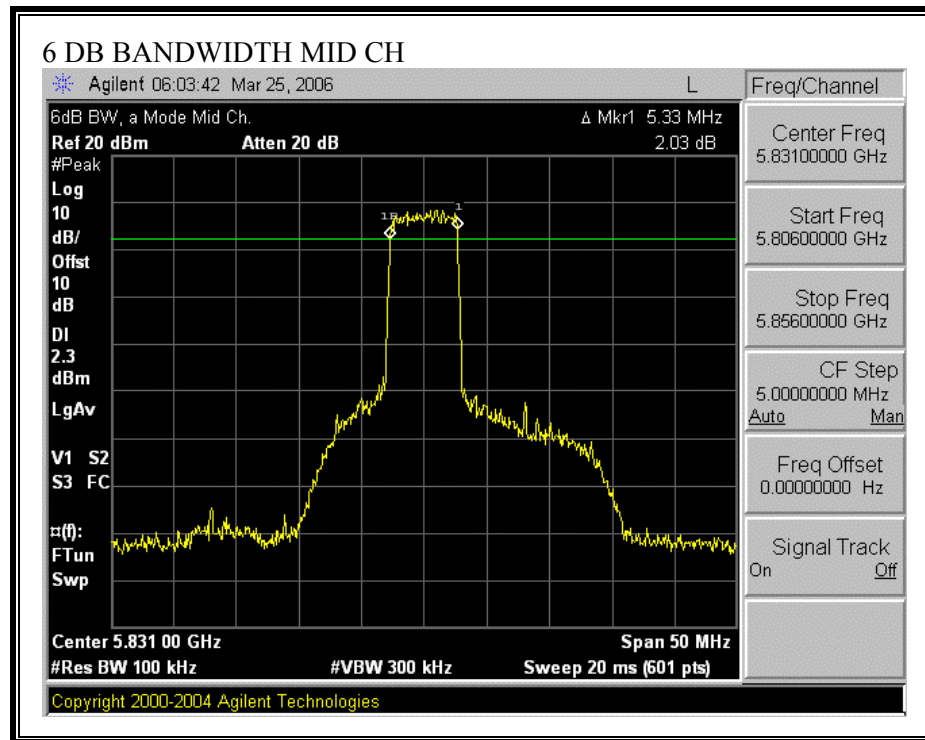
RESULTS

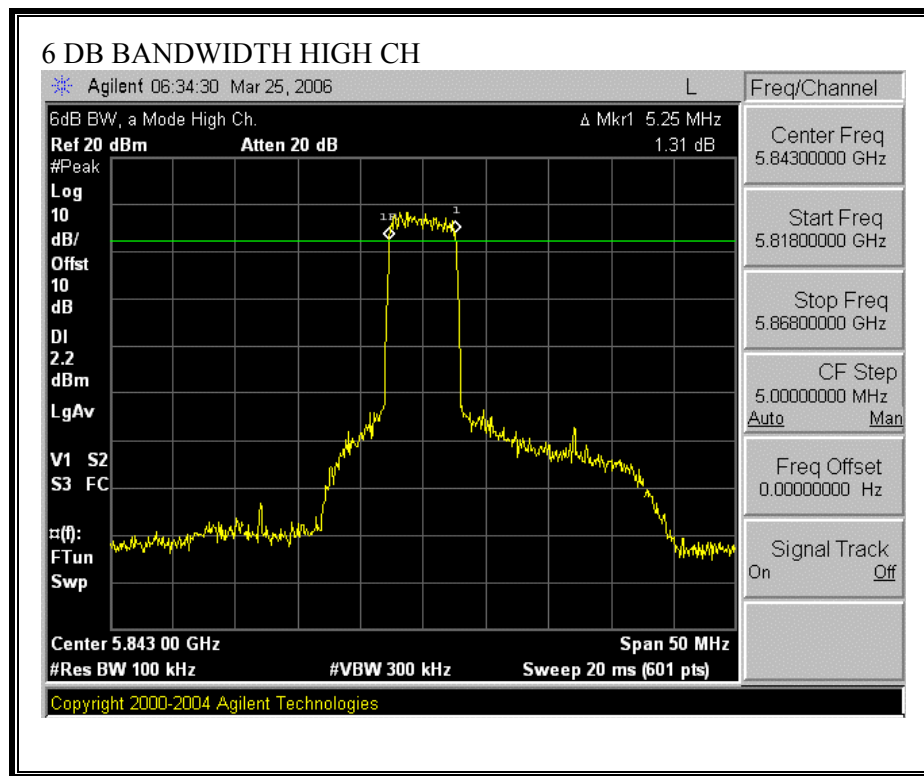
No non-compliance noted:

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5813	5420	500	4920
Middle	5831	5300	500	4800
High	5843	5250	500	4750

6 DB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

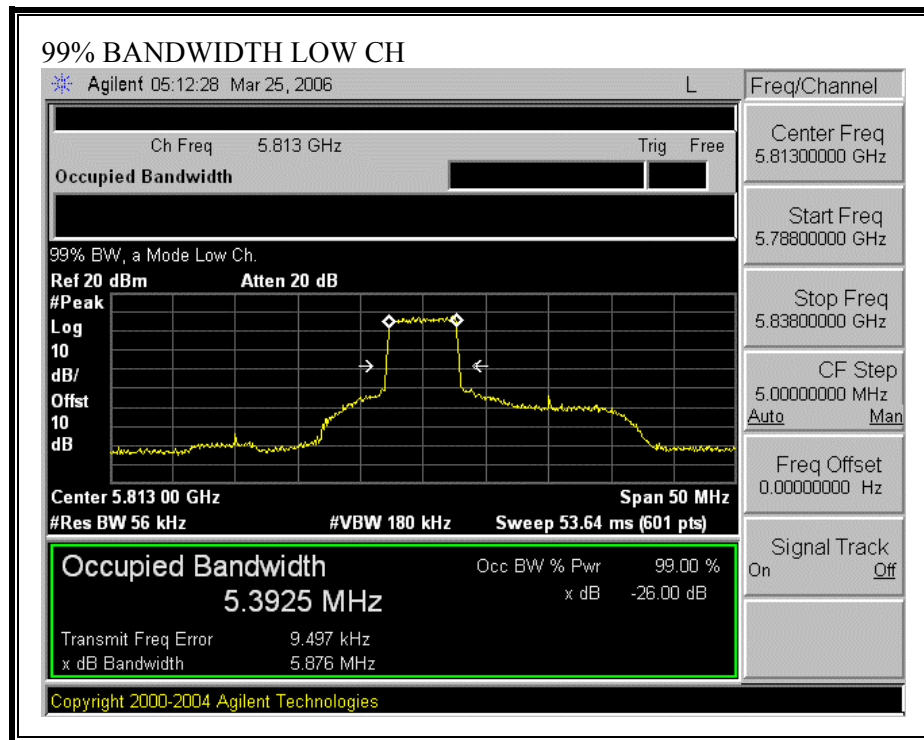
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

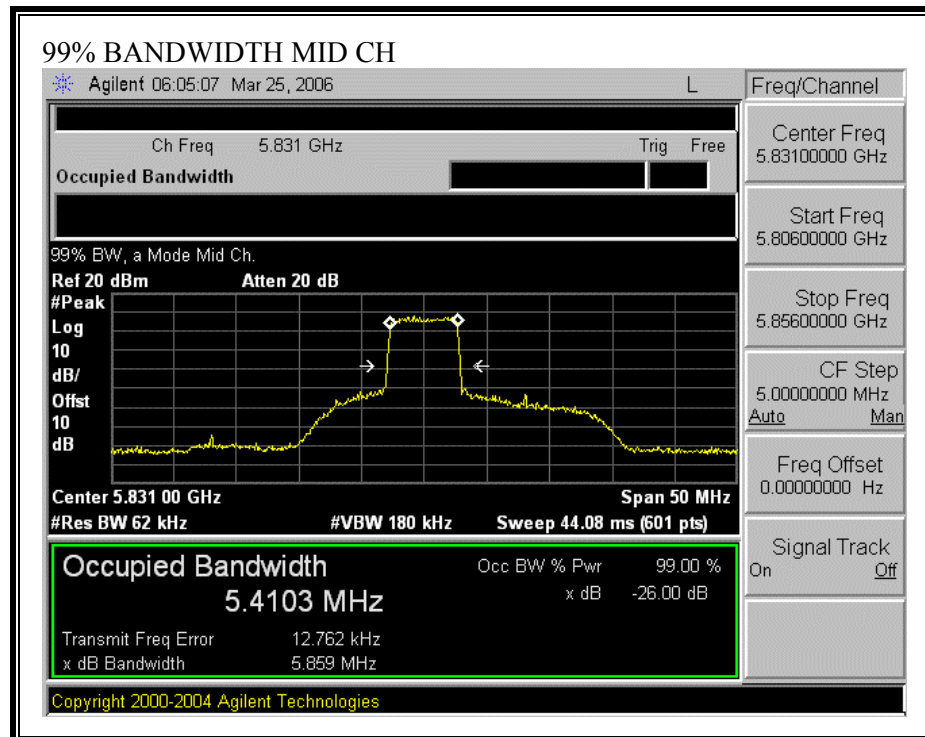
RESULTS

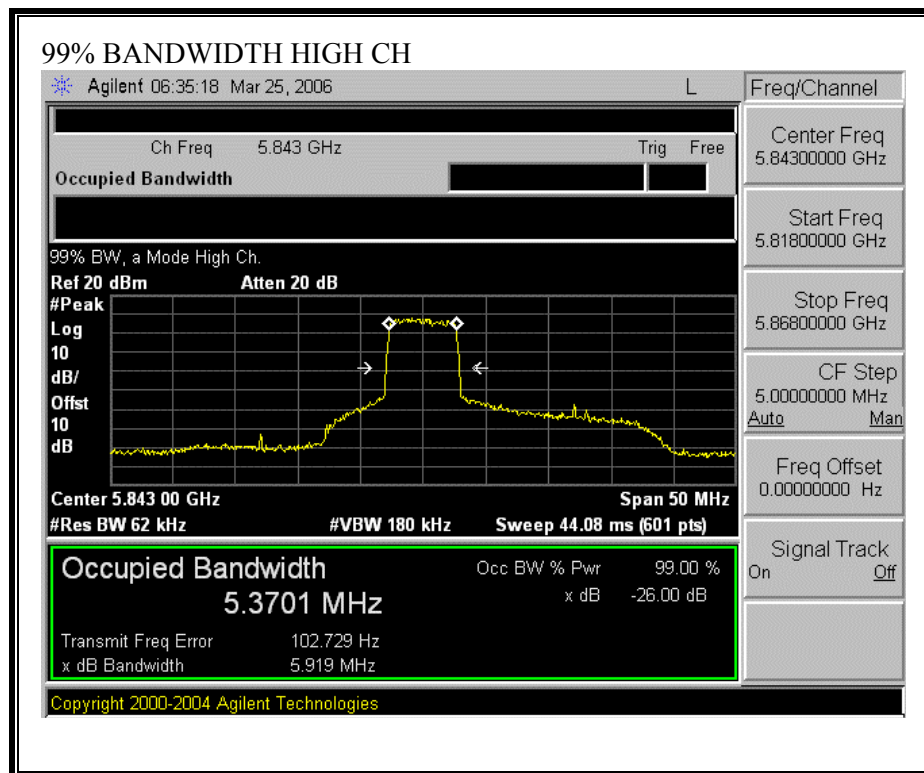
No non-compliance noted:

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5813	5.3925
Middle	5831	5.4103
High	5843	5.3701

99% BANDWIDTH







7.1.3. PEAK 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.

§15.247 (b) (4) (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

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 a bandwidth greater than or equal to the 99% bandwidth.

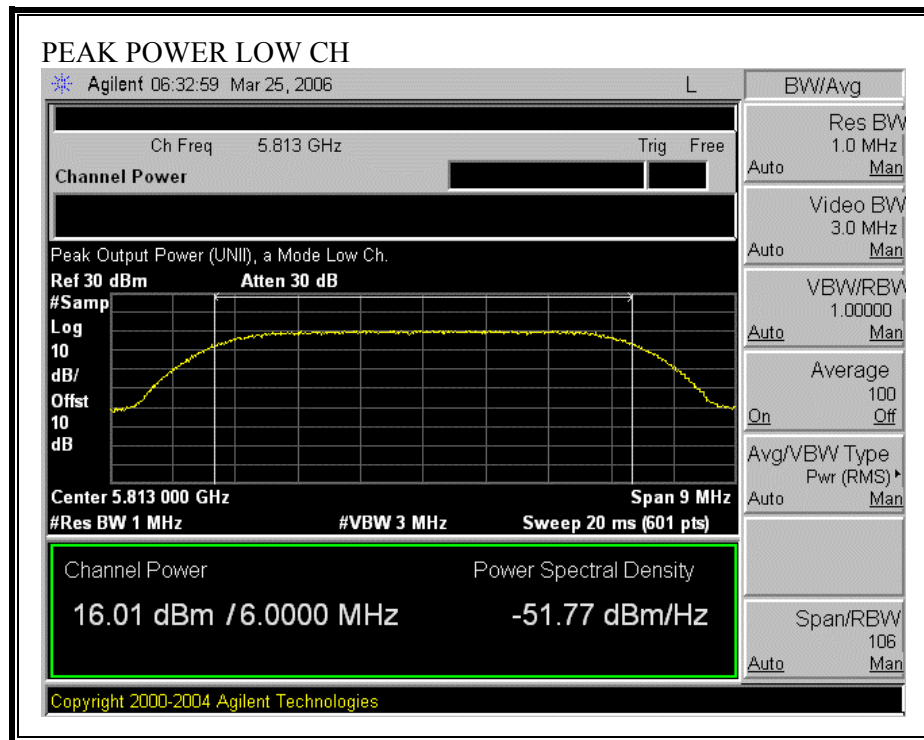
RESULTS

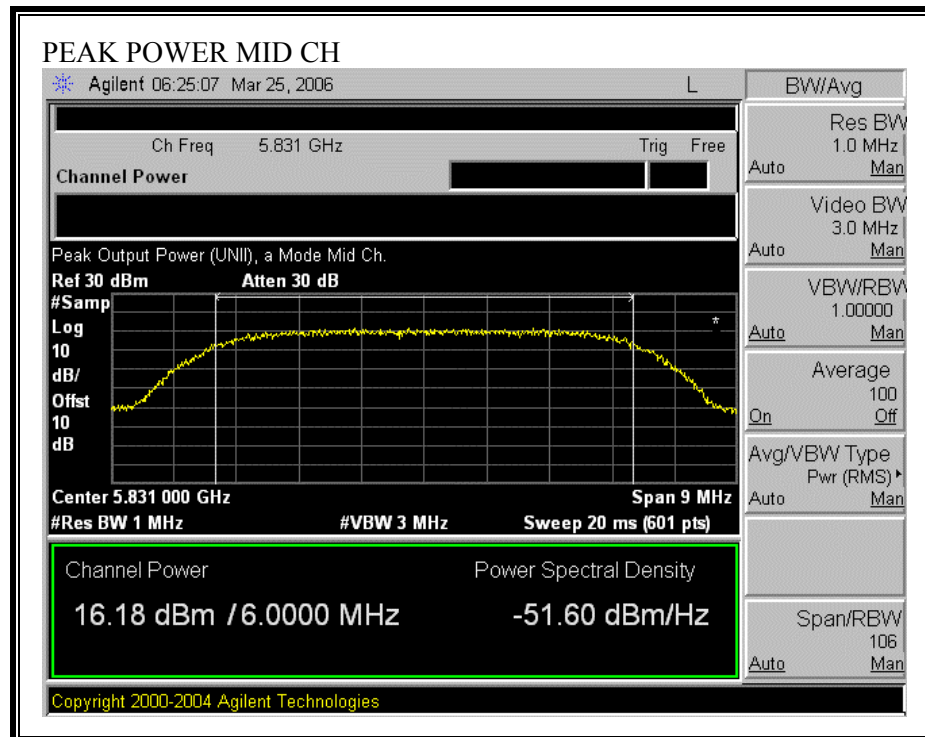
The maximum antenna gain is 19 dBi for other than fixed, point-to-point operations; therefore the limit is 17 dBm.

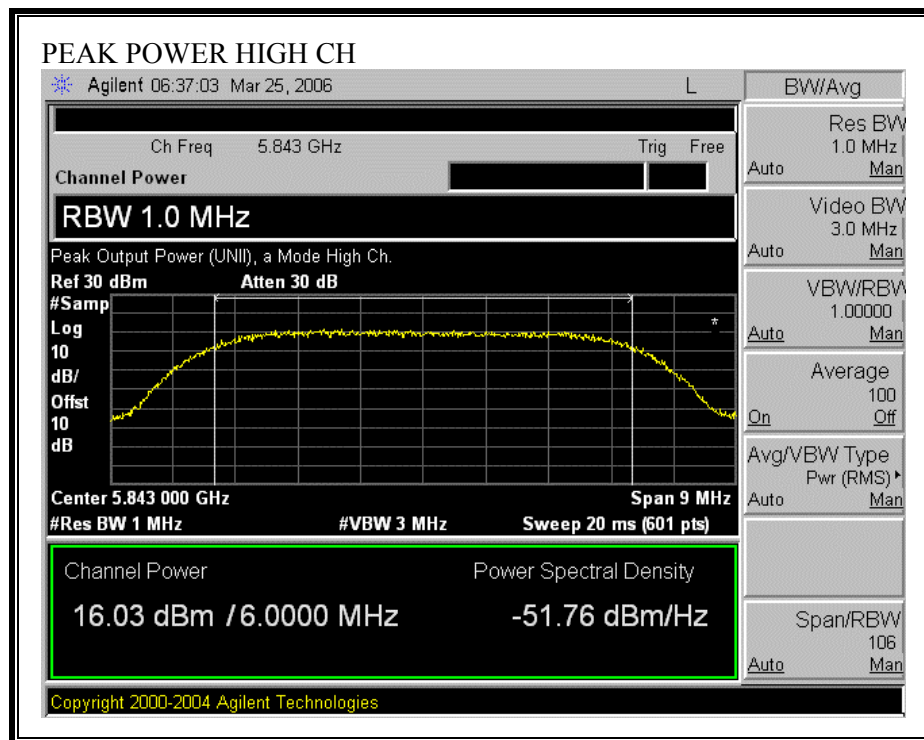
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	5813	16.01	17	-0.99
Middle	5831	16.18	17	-0.82
High	5843	16.03	17	-0.97

PEAK POWER







7.1.4. 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:

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

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

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

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

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 $S = 1.0 \text{ mW/cm}^2$

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)
DOCSIS	20.0	16.18	19.00	0.66

7.1.5. 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 10 dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	5813	16.35
Middle	5831	16.50
High	5843	16.24

7.1.6. 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

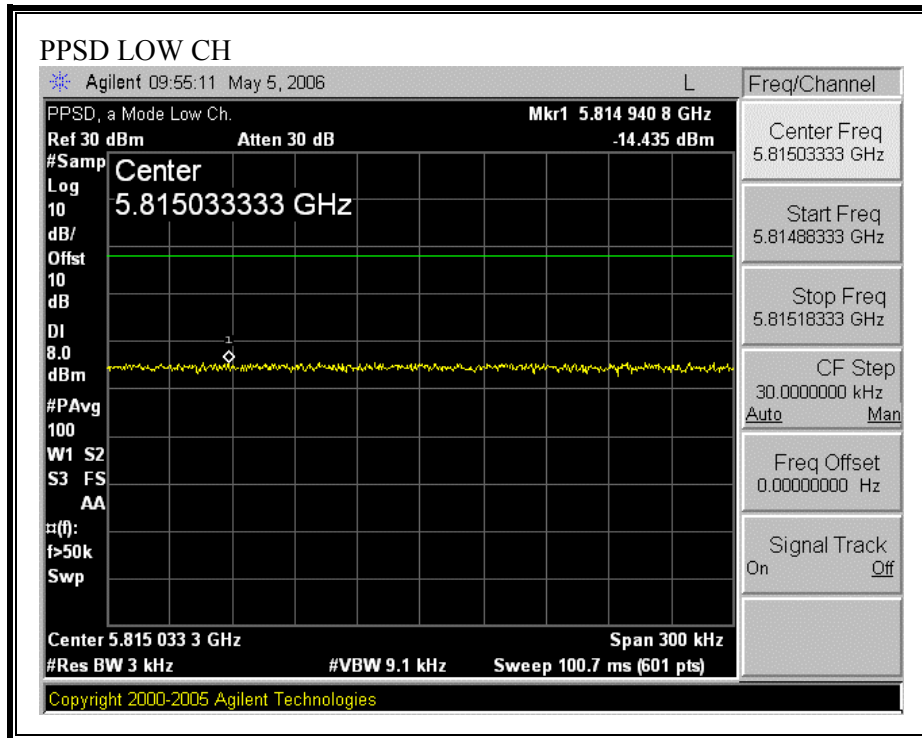
The test is performed in accordance with PSD Option 2 as documented in the FCC procedure “Measurement of Digital Transmission Systems Operating under Section 15.247”, dated March 23, 2005.

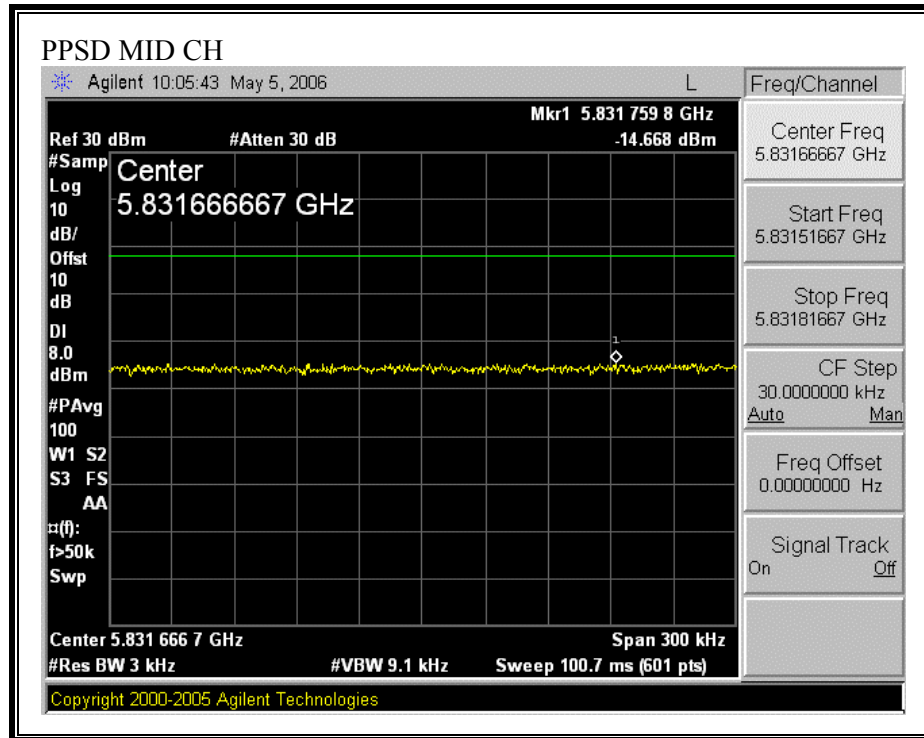
RESULTS

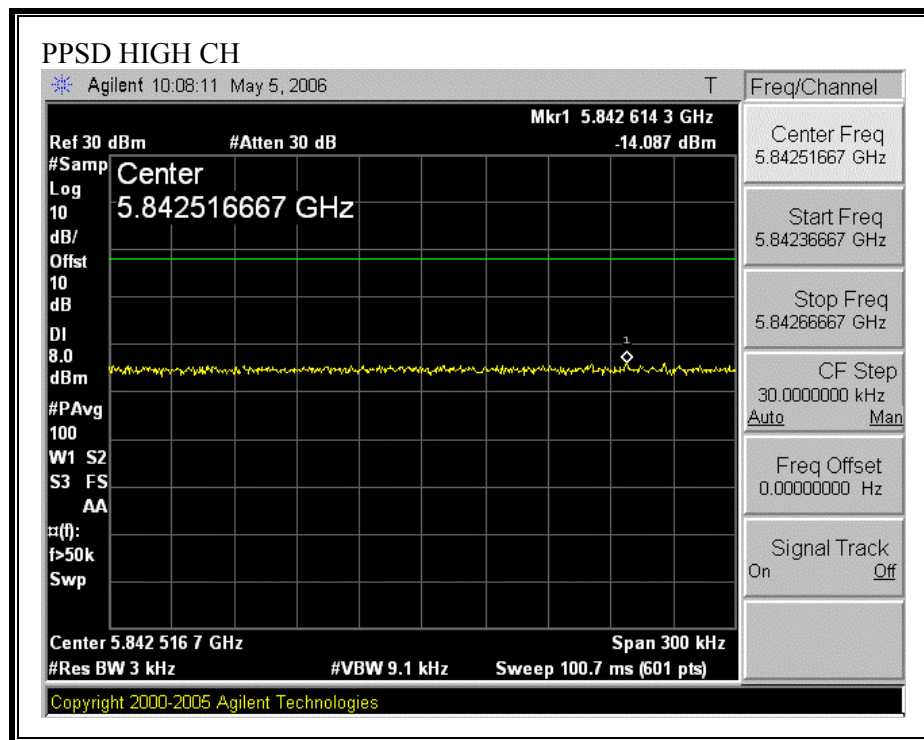
No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5813	-14.44	8	-22.44
Middle	5831	-14.67	8	-22.67
High	5843	-14.09	8	-22.09

PEAK POWER SPECTRAL DENSITY







7.1.7. 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

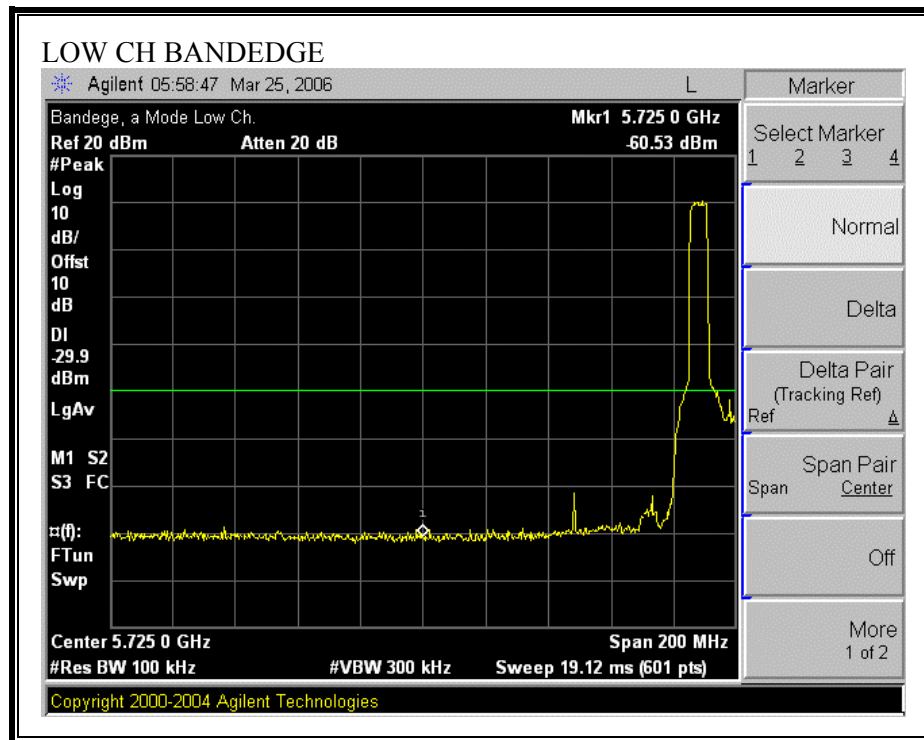
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

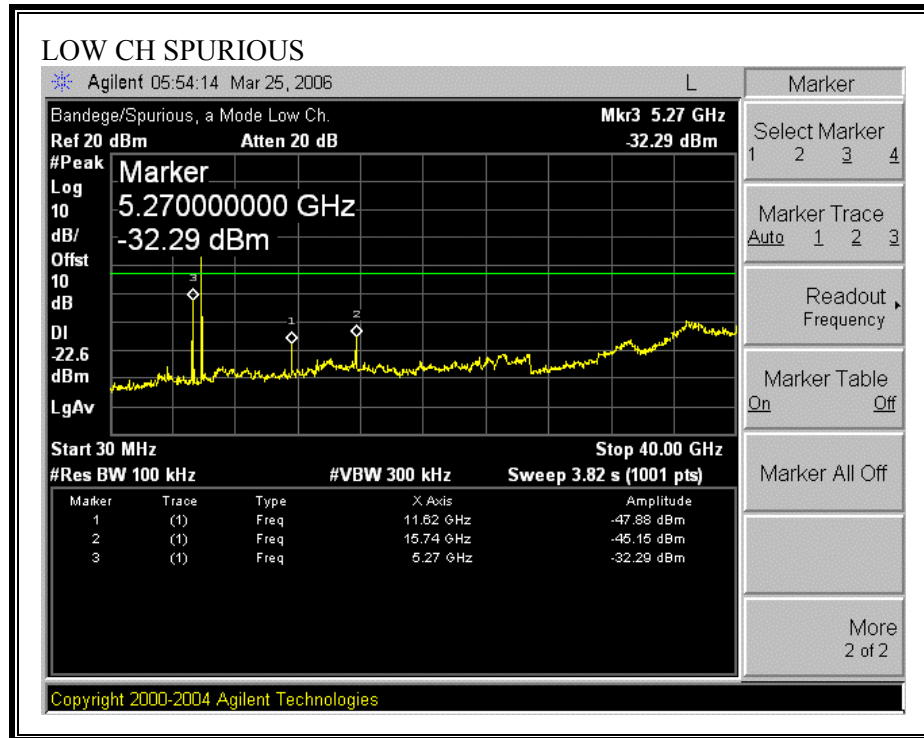
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

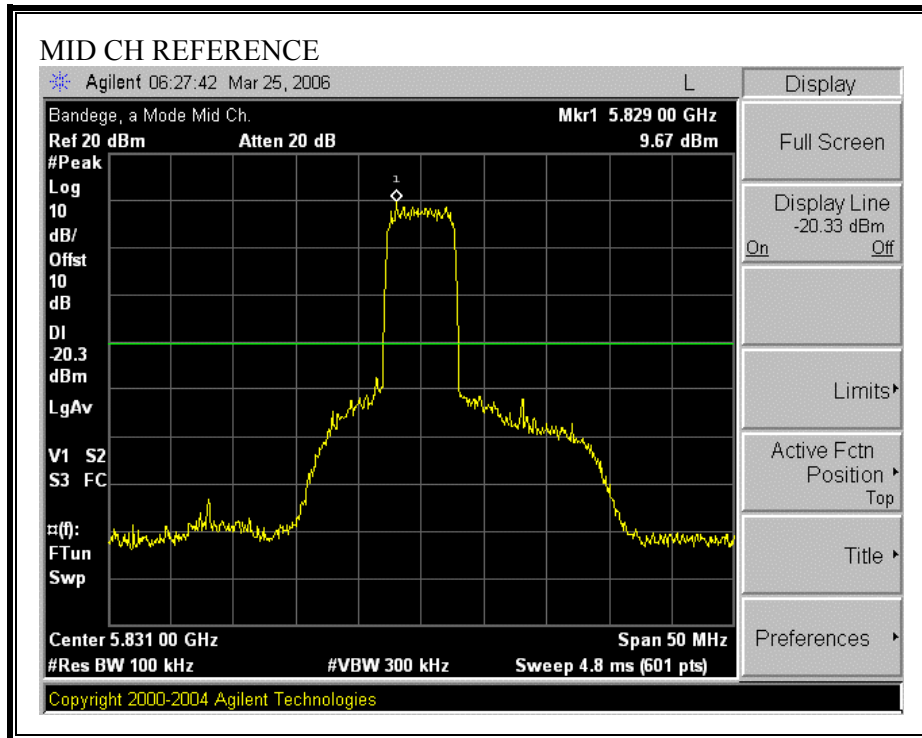
No non-compliance noted:

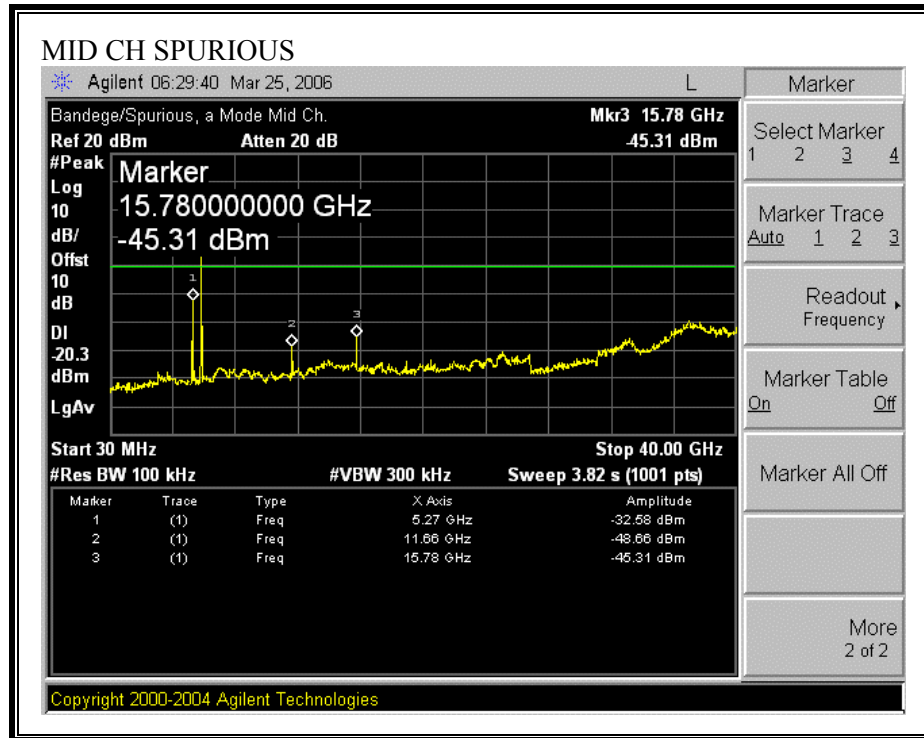
SPURIOUS EMISSIONS, LOW CHANNEL



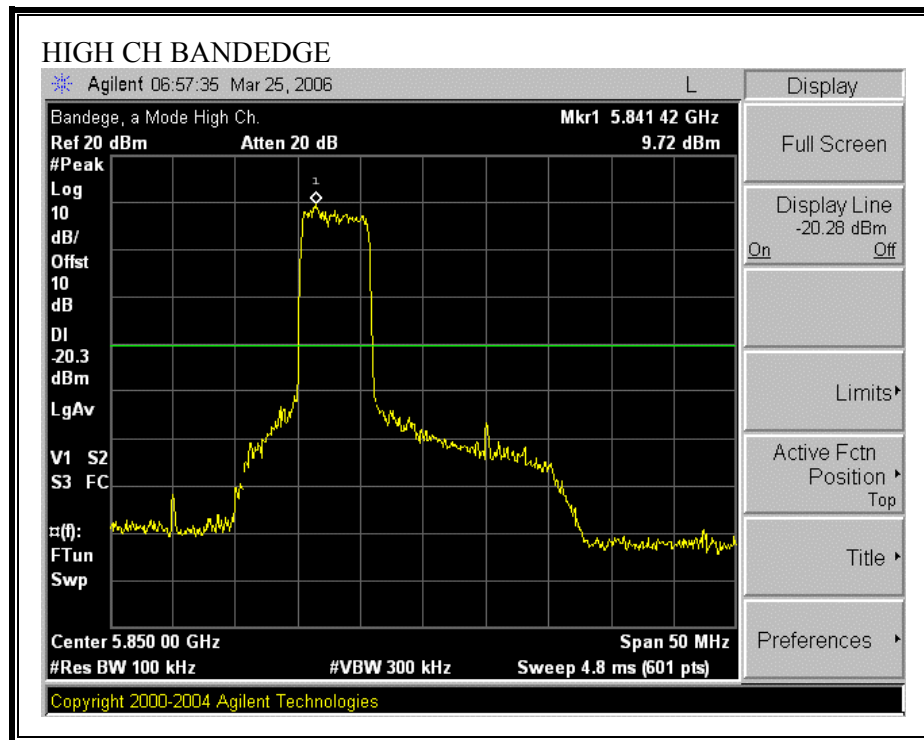


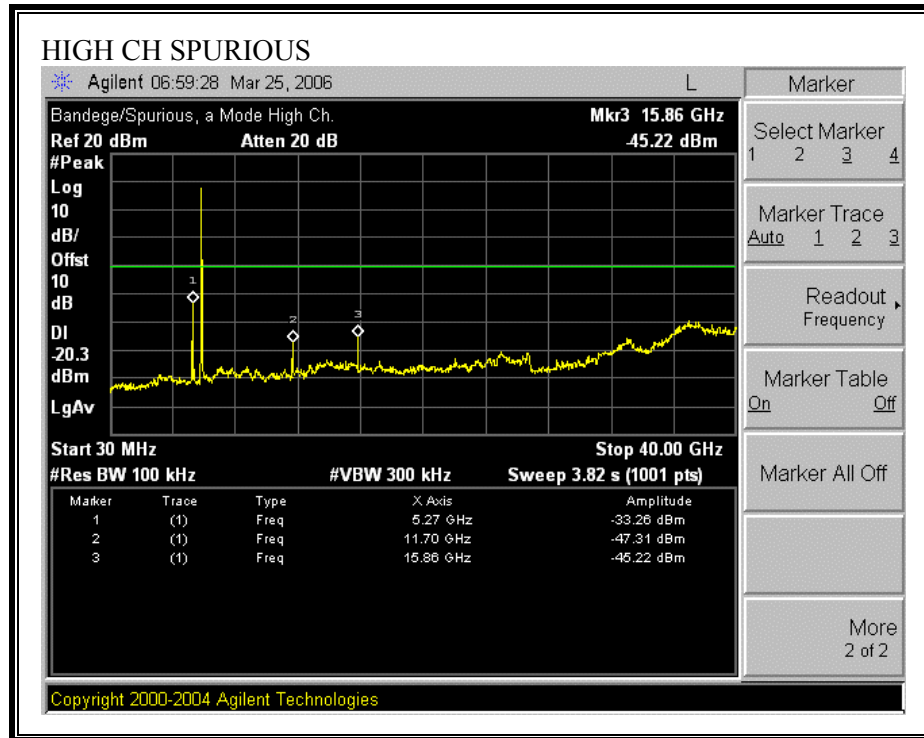
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. RADIATED EMISSIONS

7.2.1. 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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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

7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND

HARMONICS AND SPURIOUS EMISSIONS WITH AX1655-ER ANTENNA

03/29/06 High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Test Engineer:		Thanh Nguyen													
Project #:		06U10203													
Company:		Arcwave													
EUT Description:		5.8 GHz Hub													
EUT M/N:		AX1655 w/EC antenna													
EUT S/N:		"001"													
Test Target:		FCC 15.247													
Mode Of Operation:		TX ON with 16dBm power output.													
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T119; S/N: 29301 @3m		T144 Miteq 3008A00931				T89; ARA 18-26GHz; S/N:1049		FCC 15.205							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz; VBW=10Hz					
		Thanh 187215003		Thanh 208946003		HPF_7.6GHz									
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Fundamental-5813 MHz															
11.626	3.0	54.6	40.1	38.1	4.3	-35.7	0.0	0.7	61.9	47.4	74	54	-12.1	-6.6	H, high power
11.626	3.0	59.6	38.5	38.1	4.3	-35.7	0.0	0.7	66.9	45.8	74	54	-7.1	-8.2	H, high power
TX LO 5.248GHz															
15.744	3.0	46.0	33.5	40.2	5.2	-34.7	0.0	0.7	57.5	45.1	74	54	-16.5	-8.9	V
15.744	3.0	48.5	34.6	40.2	5.2	-34.7	0.0	0.0	59.3	45.4	74	54	-14.7	-8.6	H
TX 5.831 GHz															
11.662	3.0	53.6	38.8	38.1	4.3	-35.7	0.0	0.0	60.3	45.5	74	54	-13.7	-8.5	H, high power
11.662	3.0	55.5	40.3	38.1	4.3	-35.7	0.0	0.0	62.1	46.9	74	54	-11.9	-7.1	V, high power
TX LO 5.264GHz															
15.792	3.0	46.3	33.2	40.3	5.3	-34.6	0.0	0.7	57.9	44.8	74	54	-16.1	-9.2	V
15.792	3.0	46.7	34.3	40.3	5.3	-34.6	0.0	0.0	57.6	45.2	74	54	-16.4	-8.8	H
TX Fund. 5.843GHz															
11.685	3.0	52.8	40.5	38.1	4.3	-35.7	0.0	0.0	59.5	47.3	74	54	-14.5	-6.7	V, high power
11.685	3.0	55.8	42.7	38.1	4.3	-35.7	0.0	0.0	62.5	49.4	74	54	-11.5	-4.6	H, high power
TX LO 5.280GHz															
15.840	3.0	45.4	38.9	40.3	5.3	-34.6	0.0	0.7	57.1	50.5	74	54	-16.9	-3.5	H, high power
15.840	3.0	46.6	36.2	40.3	5.3	-34.6	0.0	0.0	57.6	47.2	74	54	-16.4	-6.8	V, high power
EUT was scanned from 1 GHz to 26 GHz, no other signals were detected															
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											

HARMONICS AND SPURIOUS EMISSIONS WITH AX1655-EC ANTENNA

03/29/06 High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Test Engineer:		Thanh Nguyen													
Project #:		06U10203													
Company:		Arcwave													
EUT Description:		5.8 GHz Hub													
EUT M/N:		AX1655 w/EC antenna													
EUT S/N:		"001"													
Test Target:		FCC 15.247													
Mode Of Operation:		TX ON with 16dBm power output.													
Test Equipment:															
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit			
T119; S/N: 29301 @3m			T144 Miteq 3008A00931						T89; ARA 18-26GHz; S/N:1049			FCC 15.205			
Hi Frequency Cables															
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			
			Thanh 187215003			Thanh 208946003			HPF_7.6GHz						
													Peak Measurements RBW=VBW=1MHz		
													Average Measurements RBW=1MHz; VBW=10Hz		
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Fundamental=5813 MHz															
11.626	3.0	48.6	36.1	38.1	4.3	-35.7	0.0	0.7	55.9	43.4	74	54	-18.1	-10.6	V, high power
11.626	3.0	57.0	42.9	38.1	4.3	-35.7	0.0	0.7	64.3	50.2	74	54	-9.7	-3.8	H, high power
TX LO 5.248GHz															
15.744	3.0	46.9	37.2	40.2	5.2	-34.7	0.0	0.7	58.4	48.7	74	54	-15.6	-5.3	H
15.744	3.0	46.0	33.7	40.2	5.2	-34.7	0.0	0.0	56.8	44.5	74	54	-17.2	-9.5	V
TX 5.831GHz															
11.662	3.0	50.9	37.6	38.1	4.3	-35.7	0.0	0.0	57.6	44.3	74	54	-16.4	-9.7	H, high power
11.662	3.0	55.4	41.9	38.1	4.3	-35.7	0.0	0.0	62.1	48.5	74	54	-11.9	-5.5	V, high power
TX LO 5.264GHz															
15.792	3.0	48.6	36.6	40.3	5.3	-34.6	0.0	0.7	60.2	48.2	74	54	-13.8	-5.8	V
15.792	3.0	46.3	34.0	40.3	5.3	-34.6	0.0	0.0	57.2	44.9	74	54	-16.8	-9.1	H
TX Fund. 5.843GHz															
11.685	3.0	52.2	36.5	38.1	4.3	-35.7	0.0	0.0	58.9	43.2	74	54	-15.1	-10.8	V, high power
11.685	3.0	56.1	42.2	38.1	4.3	-35.7	0.0	0.0	62.8	48.9	74	54	-11.2	-5.1	H, high power
TX LO 5.280GHz															
15.840	3.0	48.8	41.5	40.3	5.3	-34.6	0.0	0.7	60.5	53.2	74	54	-13.5	-0.8	H, high power
15.840	3.0	48.1	40.7	40.3	5.3	-34.6	0.0	0.0	59.0	51.6	74	54	-15.0	-2.4	V, high power
f	Measurement Frequency		Amp	Preamp Gain		Avg Lim	Average Field Strength Limit								
Dist	Distance to Antenna		D Corr	Distance Correct to 3 meters		Pk Lim	Peak Field Strength Limit								
Read	Analyzer Reading		Avg	Average Field Strength @ 3 m		Avg Mar	Margin vs. Average Limit								
AF	Antenna Factor		Peak	Calculated Peak Field Strength		Pk Mar	Margin vs. Peak Limit								
CL	Cable Loss		HPF	High Pass Filter											

7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

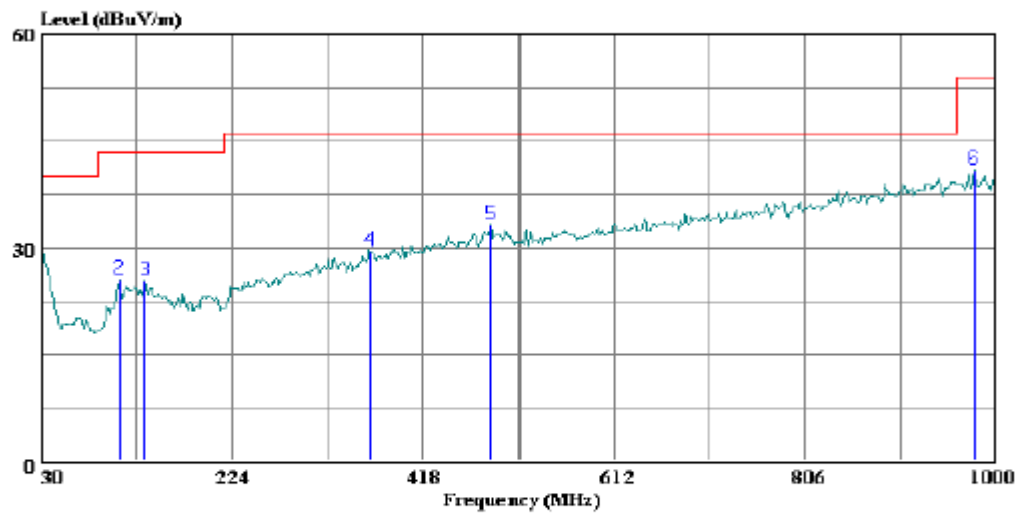
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE WITH AX1655-ER ANTENNA)

HORIZONTAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 16 File#: AX3655.BMI Date: 03-30-2006 Time: 08:34:00



Trace: 15

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator : Thanh Nguyen
Project # : 06U10203
Company : ARCWAVE INC.
EUT : 5.8GHZ HUB and CPE 2 antennas
Model No : ARCEXTEND AX1655 ER
Configuration : EUT standalone
Mode of operation: High Power Tx High Channel, Rx High Ch
Target of Test : FCC part 15.247

HORIZONTAL DATA

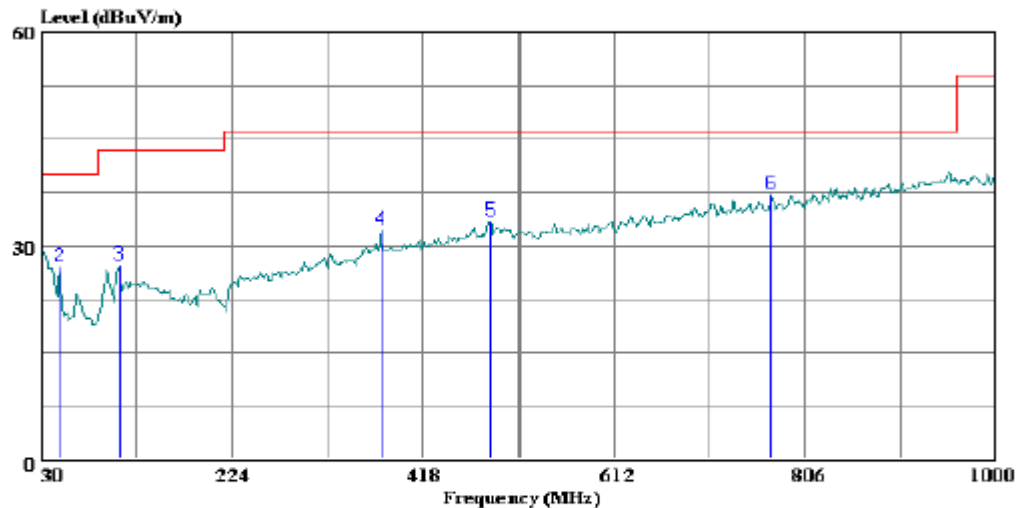
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.19	20.45	29.64	40.00	-10.36	Peak
2	109.540	12.10	13.44	25.54	43.50	-17.97	Peak
3	135.730	10.34	14.96	25.30	43.50	-18.20	Peak
4	364.650	12.30	17.25	29.55	46.00	-16.45	Peak
5	487.840	13.17	20.00	33.17	46.00	-12.83	Peak
6	977.690	14.10	26.75	40.85	54.00	-13.15	Peak

VERTICAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 14 File#: AX3655.BMI Date: 03-30-2006 Time: 08:31:07



(Auxiliary)

Trace: 13

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator : Thanh Nguyen
Project # : 06U10203
Company : ARCWAVE INC.
EUT : 5.8GHZ HUB and CPE 2 antennas
Model No : ARCEXTEND AX1655 ER
Configuration : EUT standalone
Mode of operation: High Power Tx High Channel, Rx High Ch
Target of Test : FCC part 15.247

VERTICAL DATA

		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.40	20.45	29.85	40.00	-10.15	Peak
2	48.430	16.74	10.29	27.03	40.00	-12.97	Peak
3	109.540	13.81	13.44	27.25	43.50	-16.26	Peak
4	376.290	14.66	17.53	32.19	46.00	-13.81	Peak
5	487.840	13.52	20.00	33.52	46.00	-12.48	Peak
6	771.080	12.94	24.17	37.11	46.00	-8.89	Peak

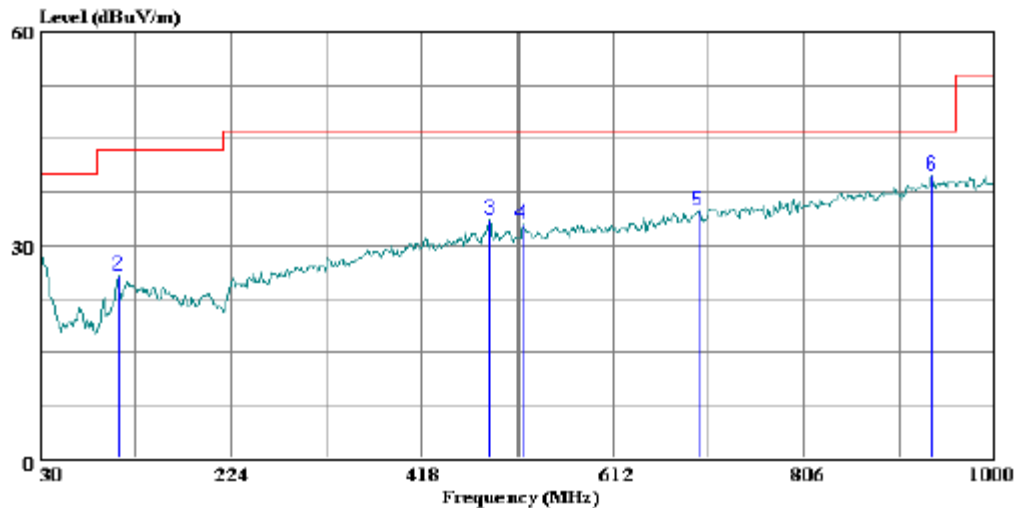
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE WITH AX1655-EC ANTENNA)

HORIZONTAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 22 File#: AX3655.EMI Date: 03-30-2006 Time: 08:51:37



(Auxiliary ATC)

Trace: 21

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator : Thanh Nguyen
Project # : 06U10203
Company : ARCWAVE INC.
EUT : 5.8GHZ HUB and CPE 2 antennas
Model No : ARCEXTEND AX1655 EC
Configuration : EUT standalone
Mode of operation: High Power Tx Low Channel, Rx Low Ch
Target of Test : FCC part 15.247

HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.16	20.45	29.61	40.00	-10.39	Peak
2	109.540	12.40	13.44	25.84	43.50	-17.67	Peak
3	487.840	13.68	20.00	33.68	46.00	-12.32	Peak
4	518.880	12.53	20.54	33.07	46.00	-12.93	Peak
5	698.330	11.71	23.08	34.79	46.00	-11.21	Peak
6	935.980	13.59	26.33	39.92	46.00	-6.08	Peak

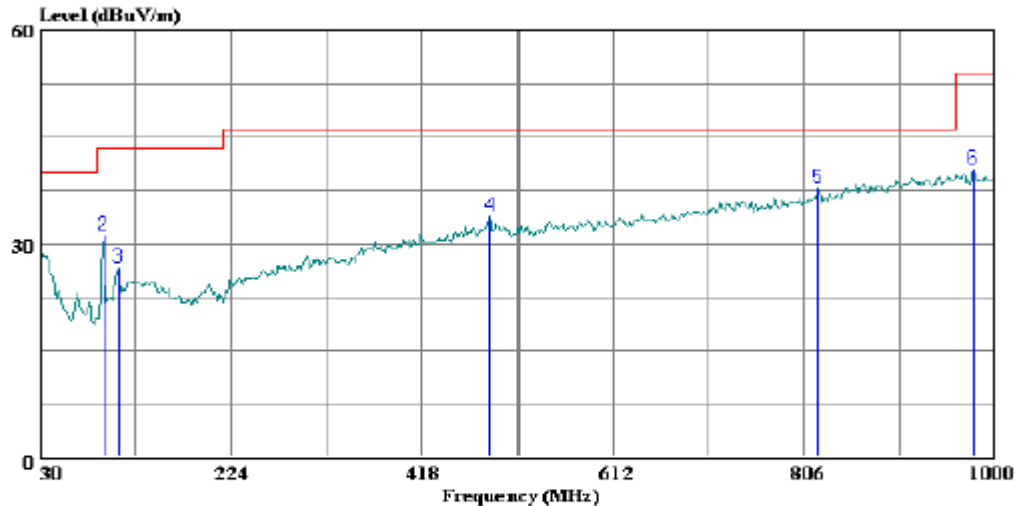
VERTICAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 24 File#: AX3655.EMI

Date: 03-30-2006 Time: 08:56:12



(Aux ATC)

Trace: 23

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator : Thanh Nguyen
Project # : 06U10203
Company : ARCWAVE INC.
EUT : 5.8GHz HUB and CPE 2 antennas
Model No : ARCEXTEND AX1655 BC
Configuration : EUT standalone
Mode of operation: High Power Tx Low Channel, Rx Low Ch
Target of Test : FCC part 15.247

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.16	20.45	29.61	40.00	-10.39	Peak
2	94.990	21.10	10.12	31.22	43.50	-12.28	Peak
3	109.540	13.09	13.44	26.53	43.50	-16.98	Peak
4	487.840	13.81	20.00	33.81	46.00	-12.19	Peak
5	819.580	12.97	24.84	37.81	46.00	-8.19	Peak
6	977.690	13.67	26.75	40.42	54.00	-13.58	Peak

7.3. 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.

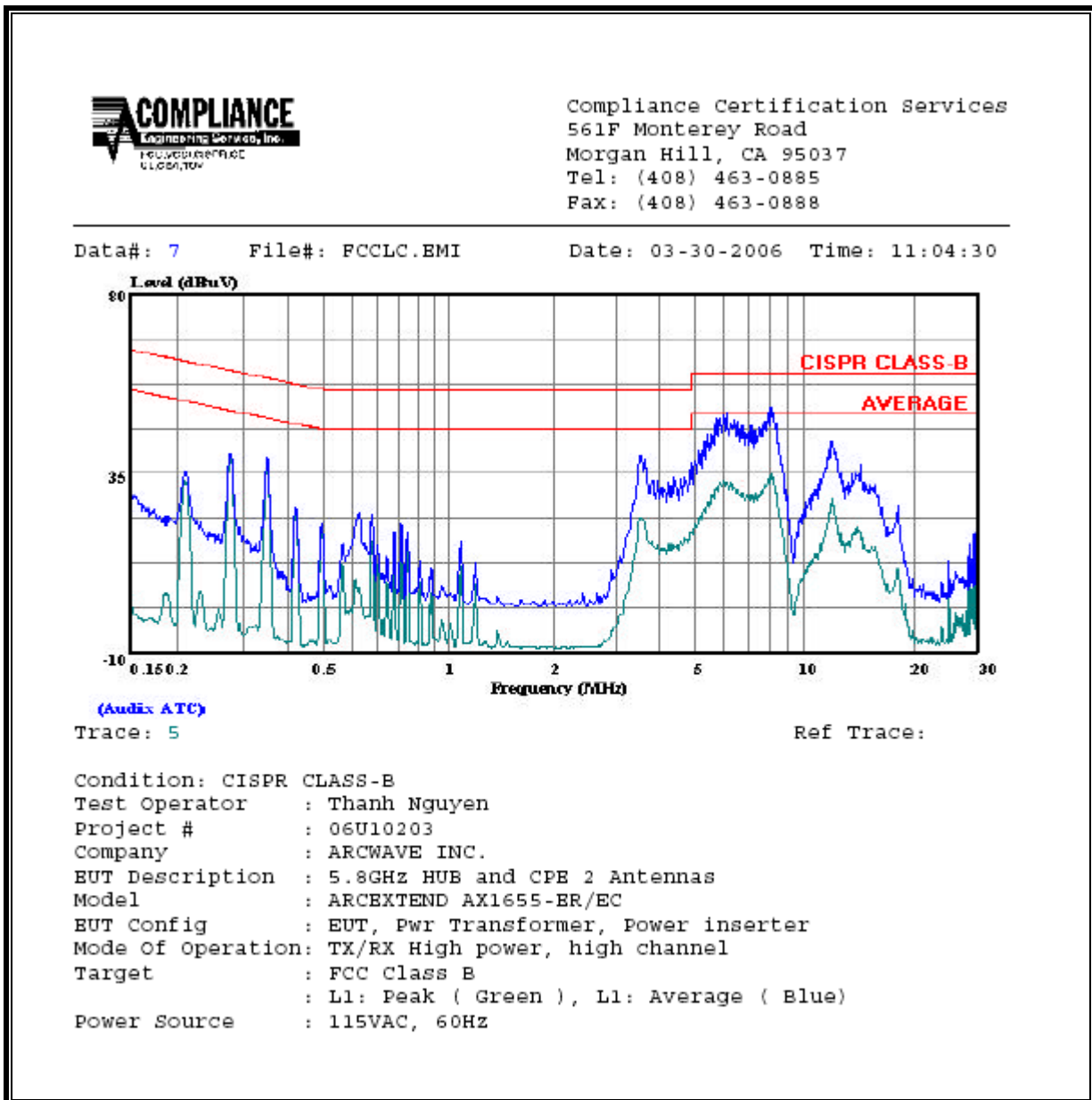
RESULTS

No non-compliance noted:

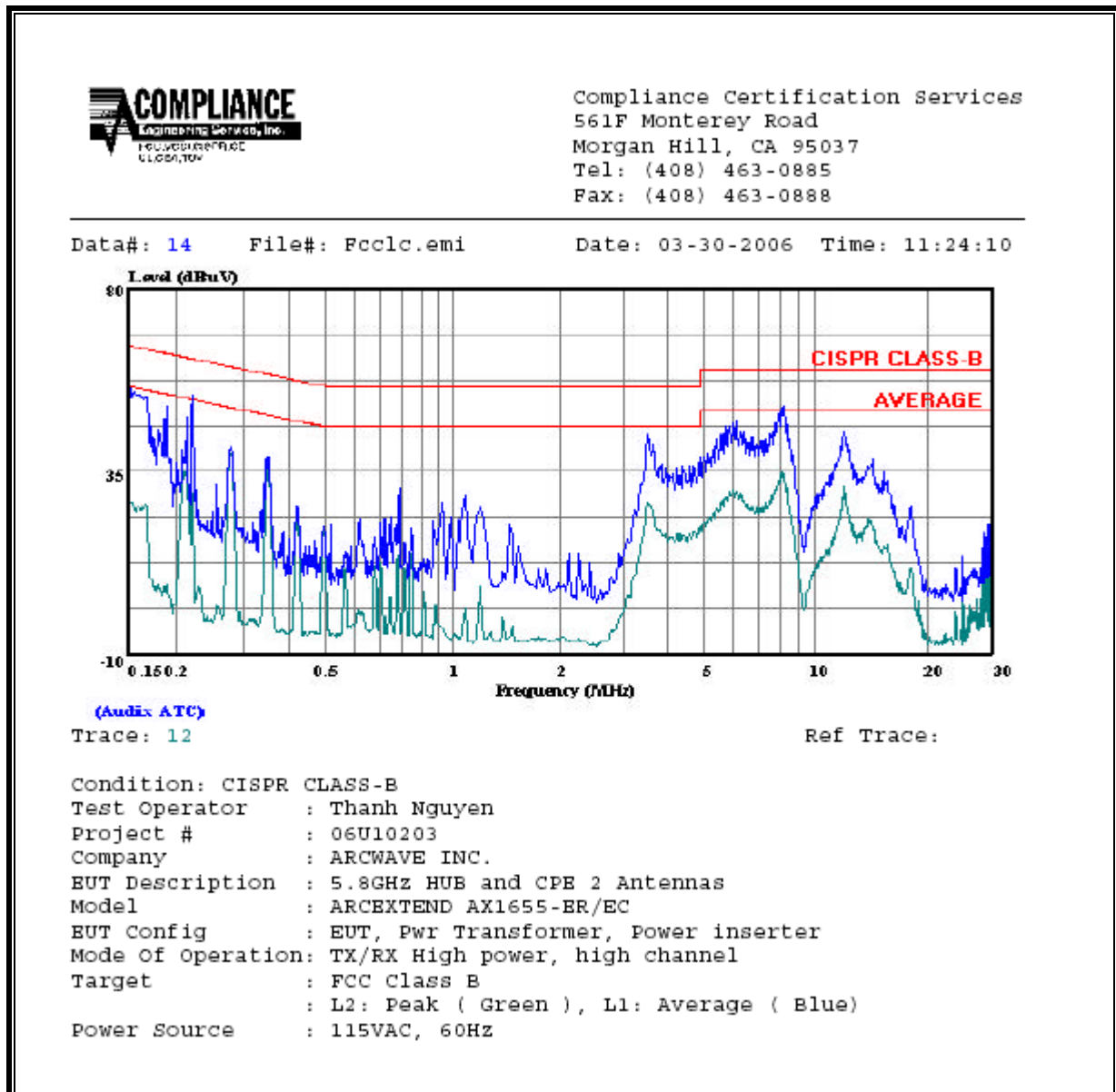
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
3.64	39.46	--	24.00	0.00	56.00	46.00	-16.54	-22.00	L1
6.25	50.36	--	33.21	0.00	60.00	50.00	-9.64	-16.79	L1
8.19	51.62	--	34.99	0.00	60.00	50.00	-8.38	-15.01	L1
0.22	53.94	--	35.05	0.00	62.74	52.74	-8.80	-17.69	L2
6.25	47.52	--	30.02	0.00	60.00	50.00	-12.48	-19.98	L2
8.32	51.06	--	34.66	0.00	60.00	50.00	-8.94	-15.34	L2
6 Worst Data									

LINE 1 RESULTS

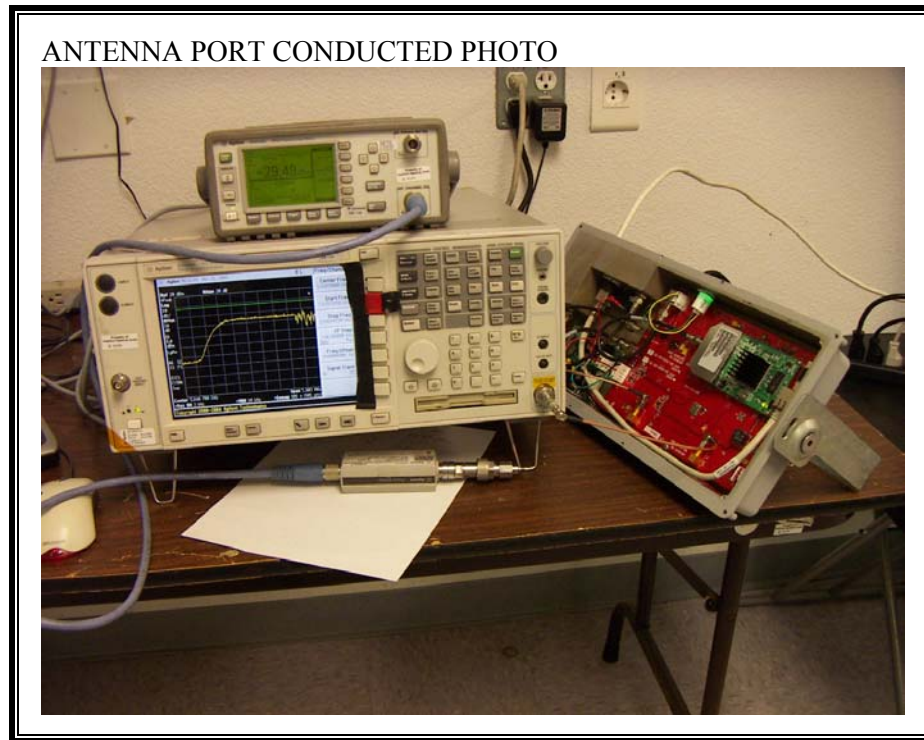


LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



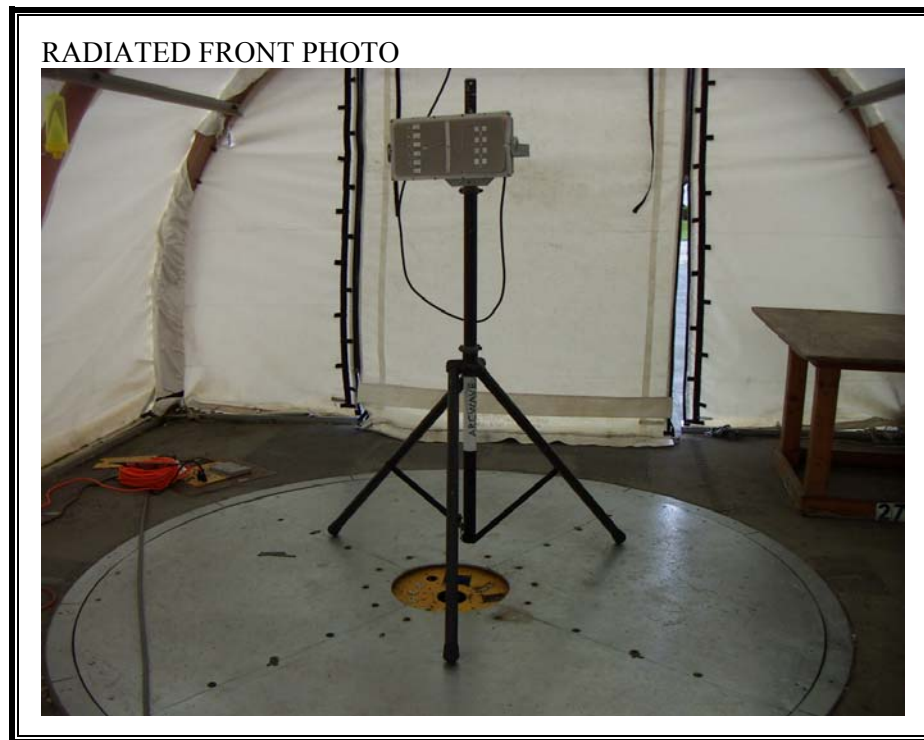
RADIATED RF MEASUREMENT SETUP WITH AX1655-ER ANTENNA



RADIATED BACK PHOTO



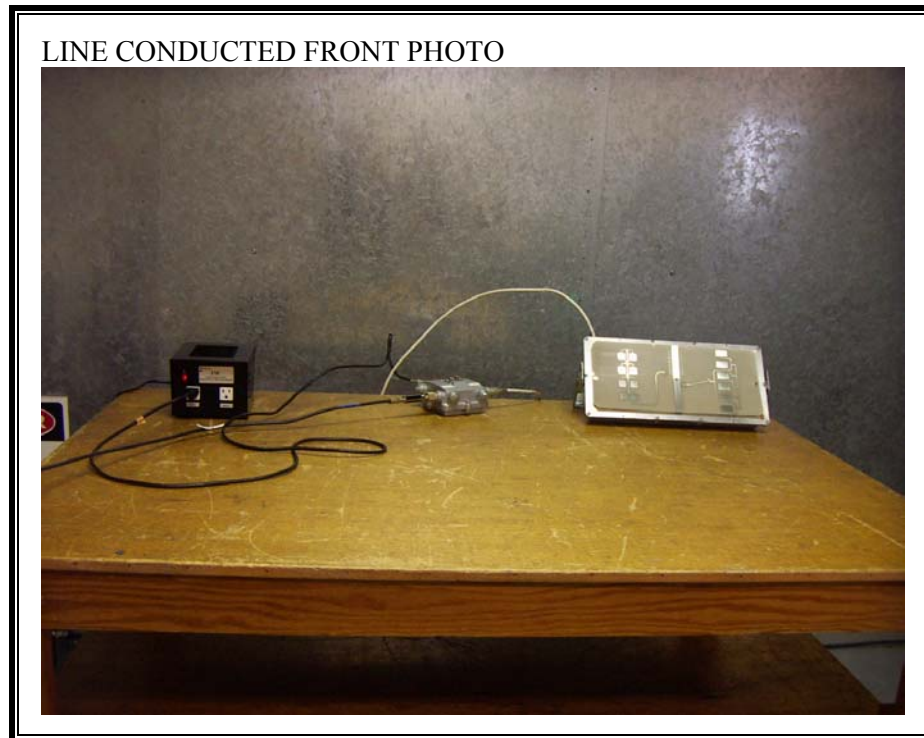
RADIATED RF MEASUREMENT SETUP WITH AX1655-EC ANTENNA



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



LINE CONDUCTED BACK PHOTO



END OF REPORT