



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

**FOR**

**UHF RFID READER**

**MODEL NUMBER: MPR 2010BR**

**FCC ID: OGSR27CA012**

**REPORT NUMBER: 06U10328-1, Revision D**

**ISSUE DATE: JULY 19, 2006**

*Prepared for*

**APPLIED WIRELESS ID  
18300 SUTTER BLVD.  
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*Prepared by*

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**LAB CODE:200065-0**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	6/30/06	Initial Issue	MH
B	7/6/06	Added radiated data before modifications	MH
C	7/14/06	Corrected Typos, Added MPE Calculations	MH
D	7/19/06	Revised Maximum Antenna Gain	MH

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLIED WIRELESS ID  
18300 SUTTER BLVD.  
MORGAN HILL, CA 95037, USA

**EUT DESCRIPTION:** UHF RFID READER

**MODEL:** MPR 2010BR

**SERIAL NUMBER:** 0520-13-0074

**DATE TESTED:** MAY 30 - JUNE 22, 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.

Approved & Released For CCS By:

Tested By:



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ENGINEERING MANAGER  
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CHIN PANG  
EMC ENGINEER  
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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 PCMCIA RFID Reader card.

The radio module is manufactured by Applied Wireless ID.

### 5.2. MAXIMUM OUTPUT POWER

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

Base Unit

Channel	Frequency (MHz)	Power (dBm)	Power (mW)
Low	905.11	28.82	762.1
Middle	911.26	28.57	719.4
High	917.17	28.58	721.1

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a circularly polarized patch antenna. Several models are available, and the maximum linearly polarized antenna assembly gain is 5.59 dBi.

### 5.4. DESCRIPTION OF MODIFICATIONS

The radio was modified in order to comply with all of the FCC regulatory requirements.

Mini-shields over specific sections of the circuitry were added to the PCB assembly, underneath the overall shield, in order to reduce harmonic emissions.

In order to comply with the emissions requirement in the adjacent restricted band that starts at 960 MHz the frequency of the highest channel was moved from 927.26 MHz to 917.17 MHz by reducing the frequency separation from 500 kHz to 250 kHz.

## **5.5. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during final testing was 3.15M.

The EUT driver software installed in the host Computer equipment during final testing was MPR\_test\_Aide\_V1.4

The test utility software used during testing was MPR Test Aide V1.4.

## **5.6. WORST-CASE CONFIGURATION AND MODE**

Preliminary testing demonstrated that the worst-case mode is ePC C1 Mode, therefore all final testing was performed in this mode.

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 905.11 MHz.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Compaq	Presario V4000	2CE6160QH5	DoC
AC Adapter	HP	PPP009H	F306013176200B	DoC
AC Adapter	Hon-Kwang	HK-B118-A09	S050404857	NA
USB Serial cable Converter	NA	NA	NA	NA

### I/O CABLES

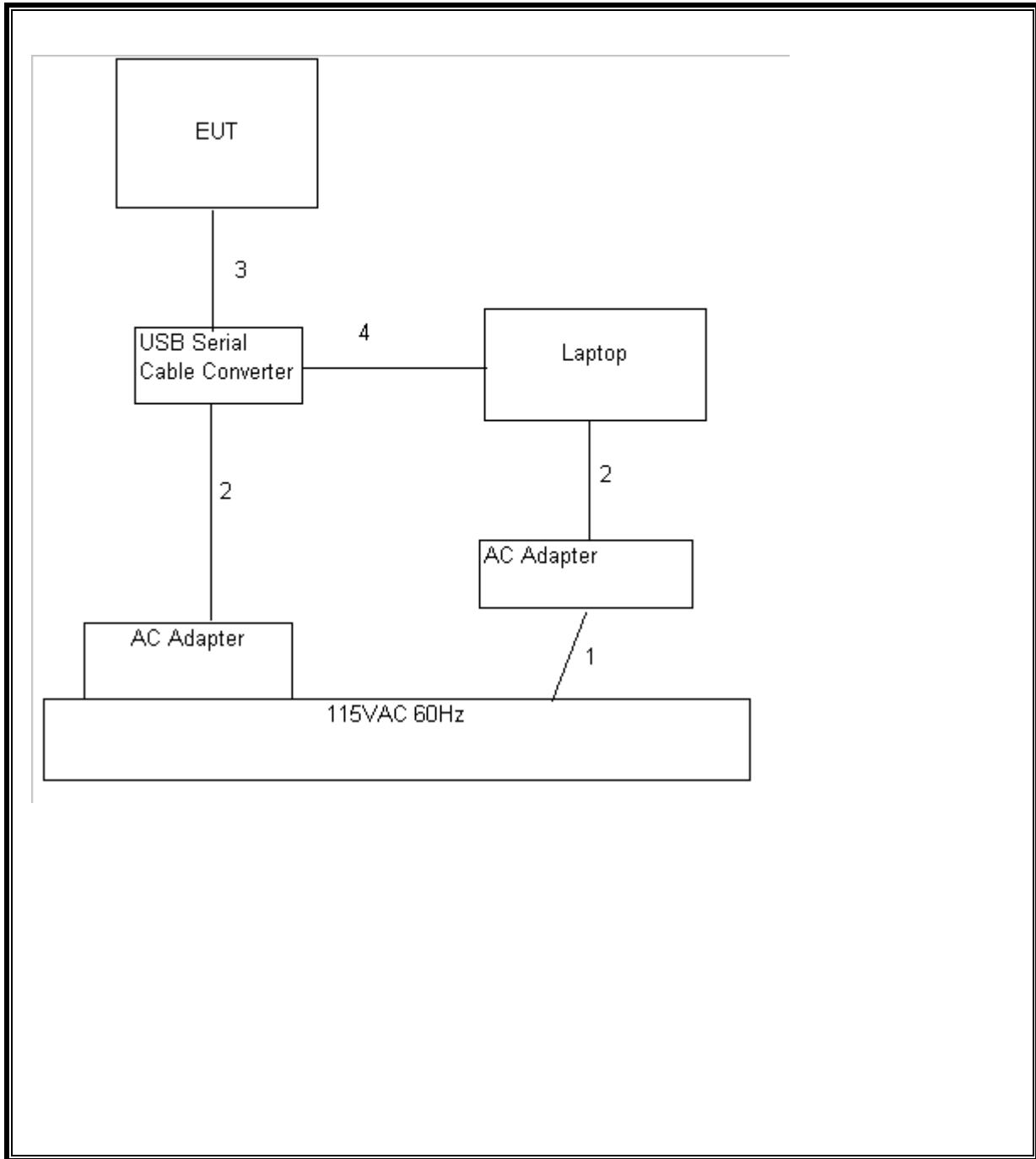
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	No
2	DC	2	DC	Un-shielded	2m	No
3	Serial	1	DB9	Un-shielded	1m	Yes
4	USB	1	USB	Un-shielded	1m	Yes

### TEST SETUP

The EUT is connected to a host laptop via a USB serial cable connector.



**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
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00931	6/24/2006
Quasi-Peak Adaptor	Agilent / HP	85650A	3145A01654	1/21/08
SA Display Section 2	Agilent / HP	85662A	2816A16696	4/7/08
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	1/7/08
Antenna, Bilog 30 ~ 2000 MHz	Chase	CBL6112B	2586	3/3/06
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/19/06
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/07
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/07
EMI Test Receiver	R & S	ESHS 20	827129/006	11/3/06
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/06
1.5GHz HPF	MicroTronic	HPM13193	2	CNR

## 7. LIMITS AND RESULTS

### 7.1. ANTENNA PORT CHANNEL TESTS

#### 7.1.1. 20 dB BANDWIDTH

##### LIMIT

None; for reporting purposes only.

##### TEST PROCEDURE

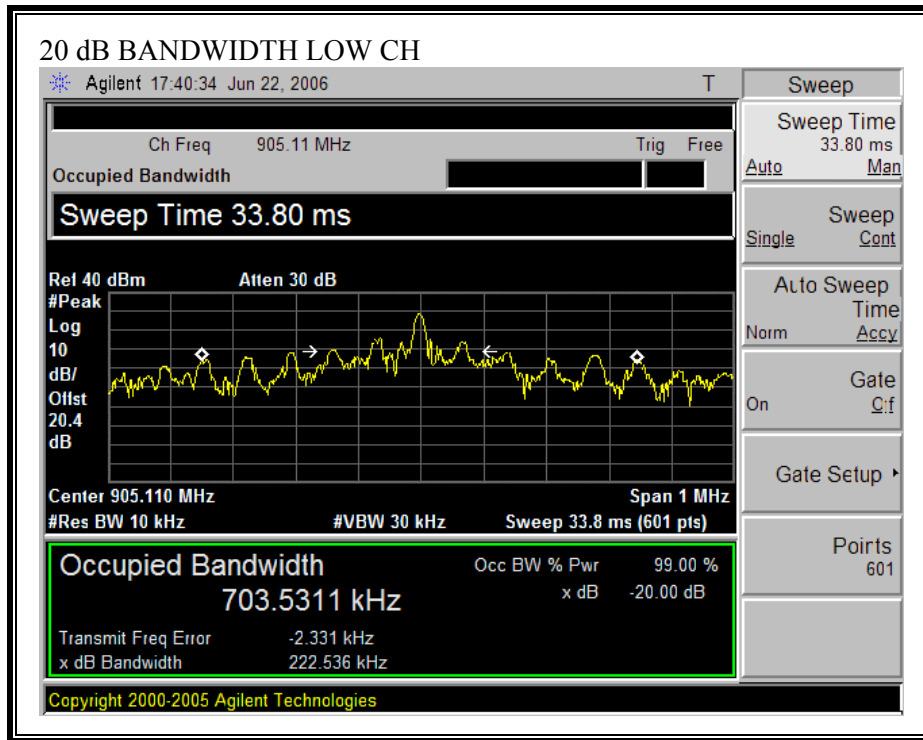
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

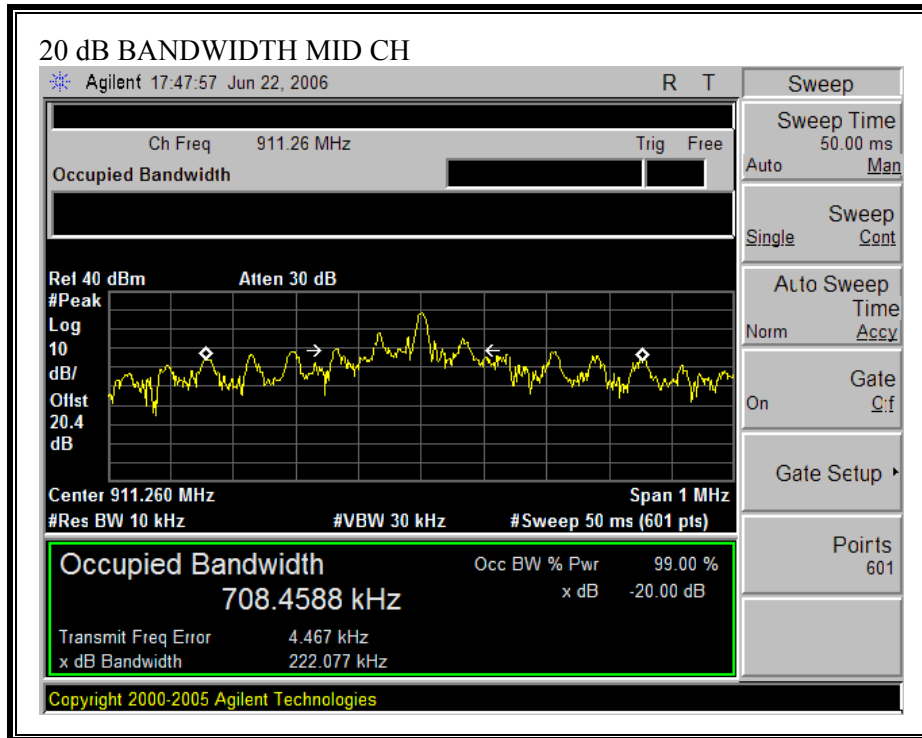
##### RESULTS

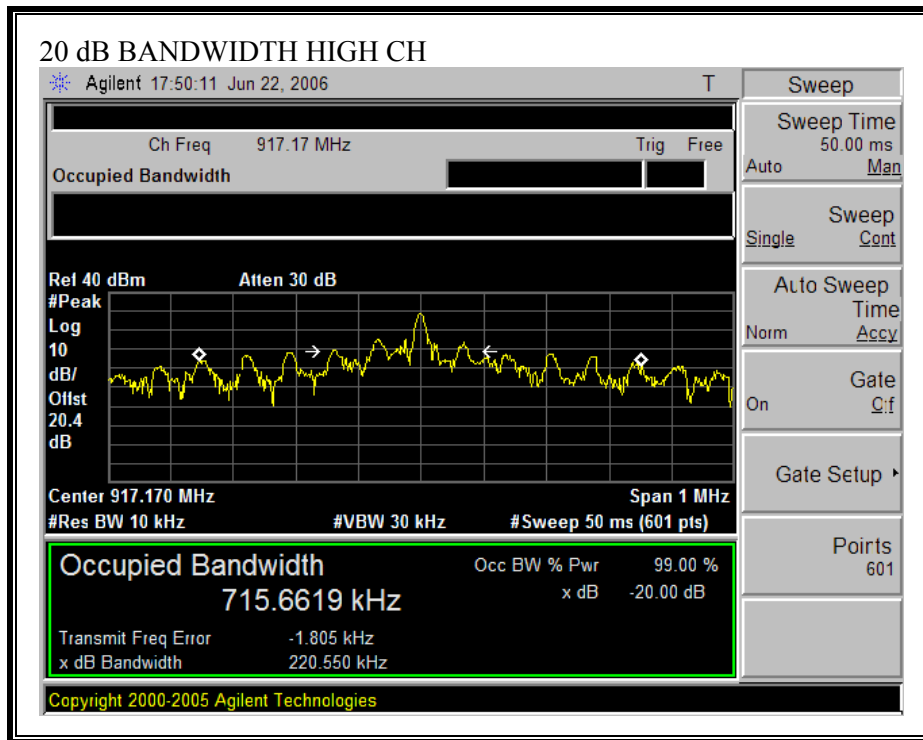
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	905.11	222.536
Middle	911.26	222.077
High	917.17	220.55

**20 dB BANDWIDTH**







## **7.1.2. HOPPING FREQUENCY SEPARATION**

### **LIMIT**

§15.247 (a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

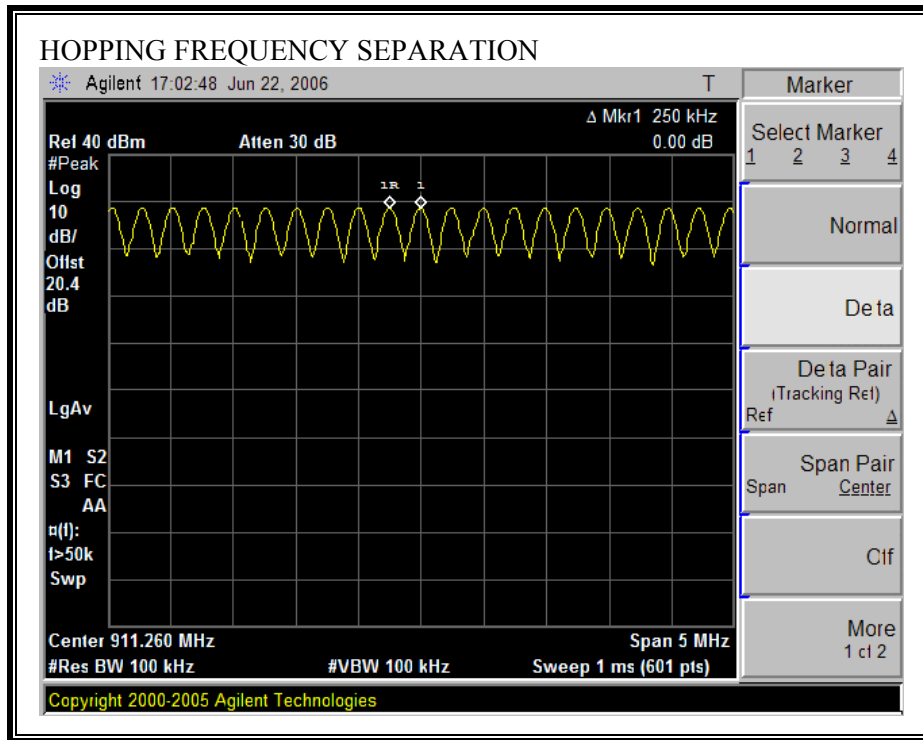
### **TEST PROCEDURE**

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:

**HOPPING FREQUENCY SEPARATION**





### **7.1.3. NUMBER OF HOPPING CHANNELS**

#### **LIMIT**

§15.247 (a) (1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

#### **TEST PROCEDURE**

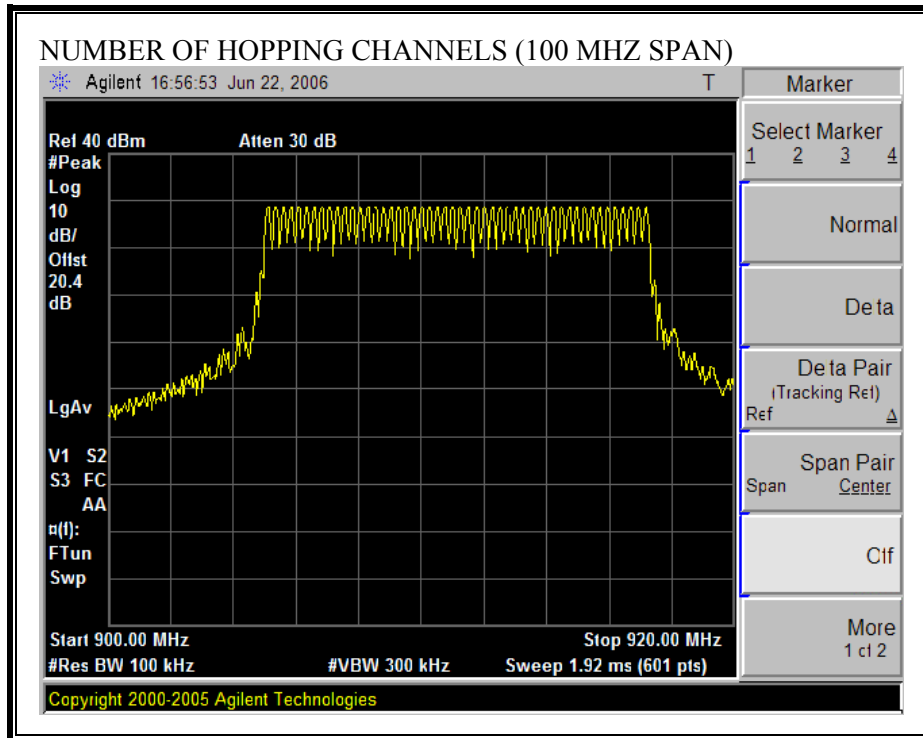
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

#### **RESULTS**

No non-compliance noted:

50 Channels observed.

**NUMBER OF HOPPING CHANNELS**



## 7.1.4. AVERAGE TIME OF OCCUPANCY

### LIMIT

§15.247 (a) (1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The selected channel will be displayed at the highest amplitude, while all other channels will be at lower amplitude due to the response of the RBW filter in the spectrum analyzer. The threshold is set between the amplitude of the selected channel and the amplitude of any other channel. The total aggregate ON time is calculated by counting the number of spectrum analyzer bins that exceed the threshold and the following equation:

Time of Occupancy = (Number of Bins showing Transmission) \* (Dwell Time per bin)

The sweep time is set to 5 seconds to provide adequate resolution in the time domain, then the result of the above equation is multiplied by 4 to yield the Time of Occupancy during the specified 20 second period.

### RESULTS

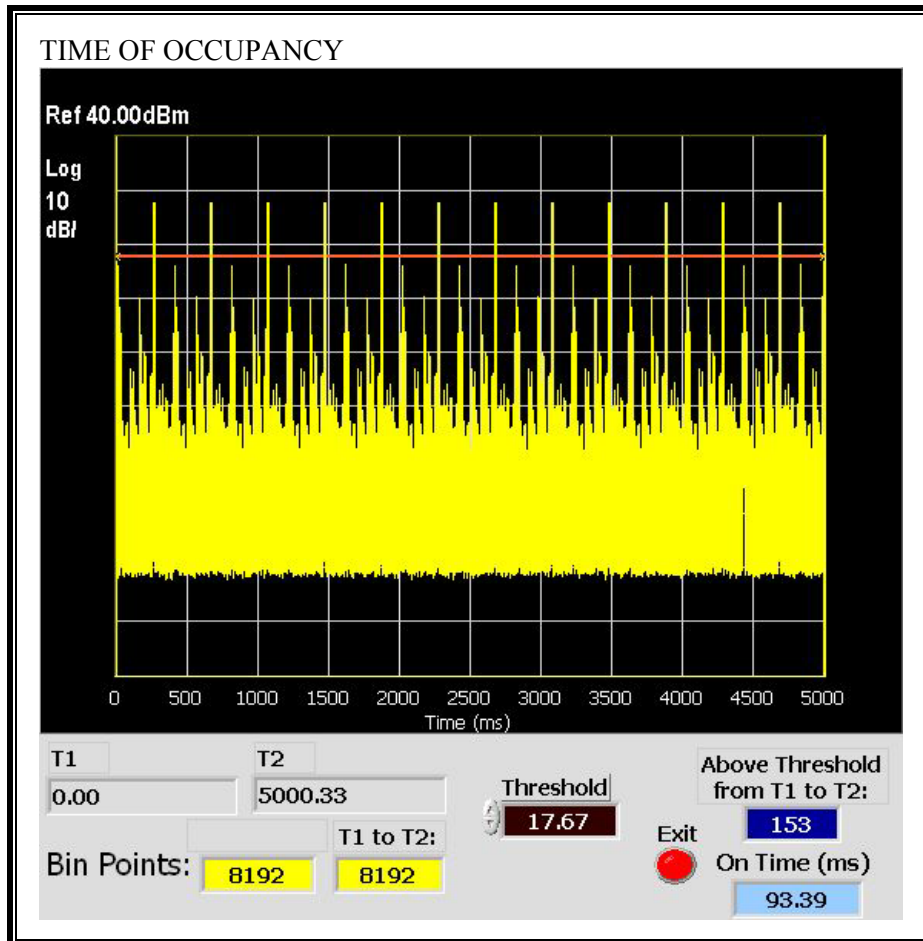
No non-compliance noted:

Measured Time of Occupancy = 4 \* 93.39 ms = 373.56 msec

Limit = 400 msec

Margin = 26.44 msec

**TIME OF OCCUPANCY**



## 7.1.5. 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) (2) For frequency hopping systems operating in the 902-928 MHz band, employing at least 50 hopping channels: 1 watt; and  
employing less than 50 hopping channels, but at least 25 hopping channels: 0.25 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.

### TEST PROCEDURE

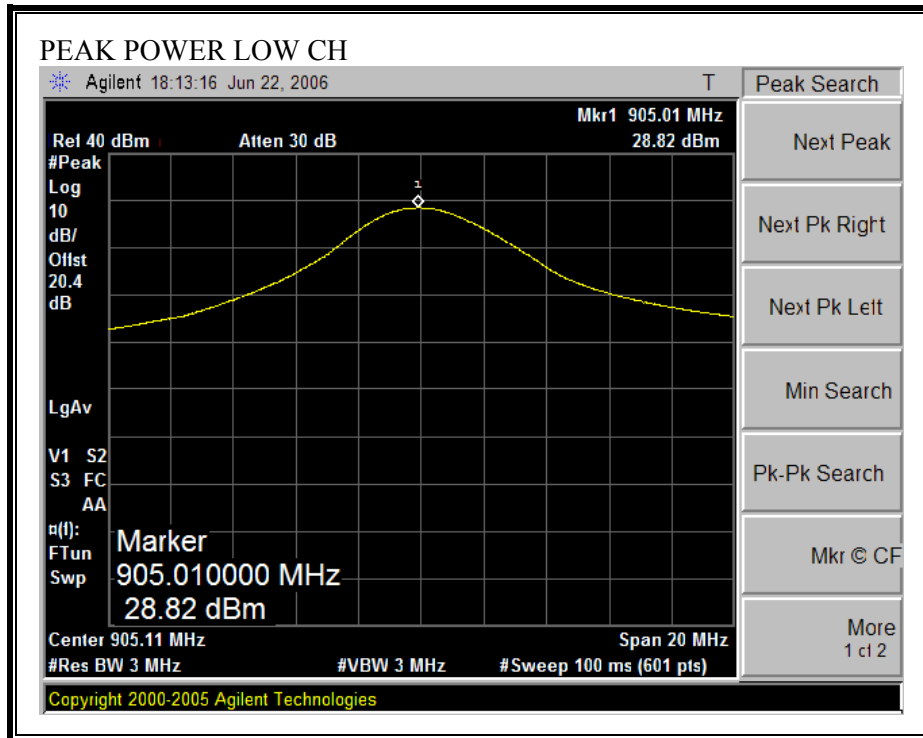
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

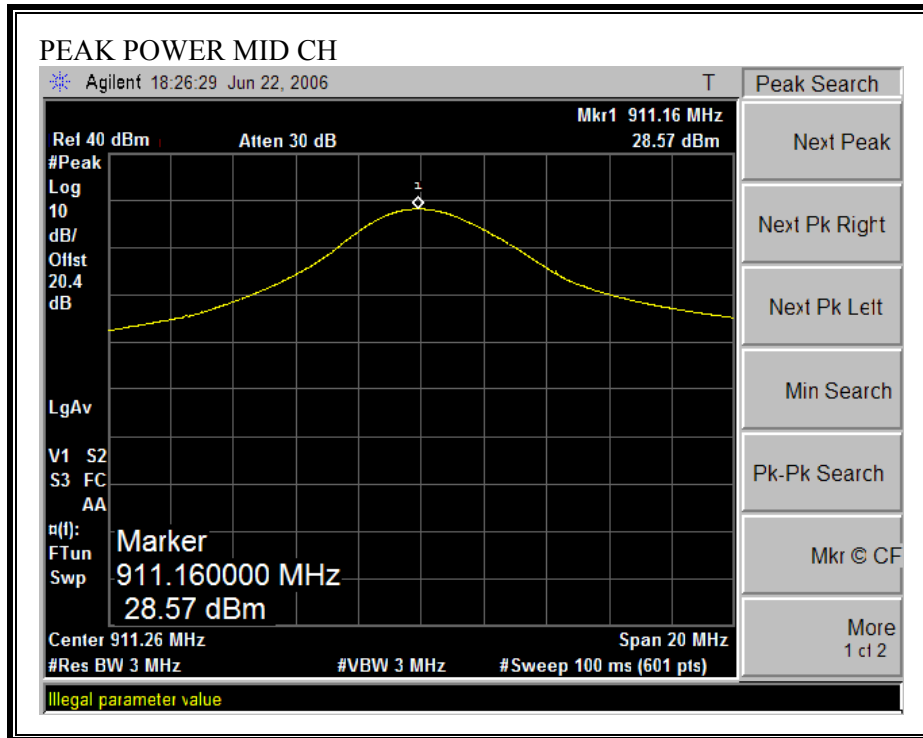
### RESULTS

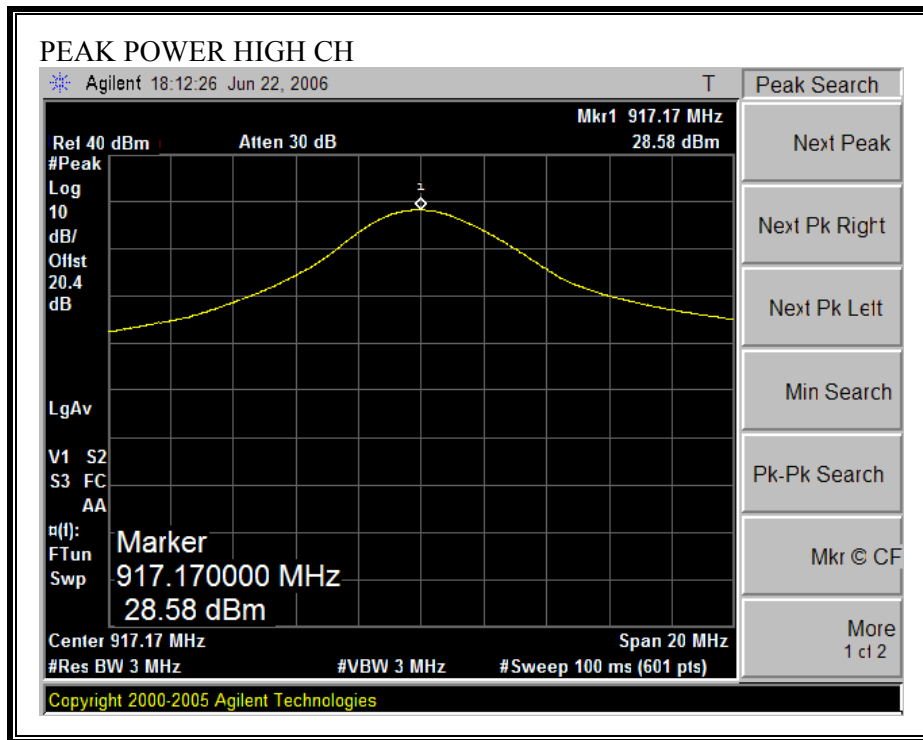
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.11	28.82	30	-1.18
Middle	911.26	28.57	30	-1.43
High	917.17	28.58	30	-1.42

**OUTPUT POWER**









## 7.1.6. 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 20.4dB (including 20 dB pad and 0.4 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	905.11	28.70
Middle	911.26	28.54
High	917.17	28.52

## 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

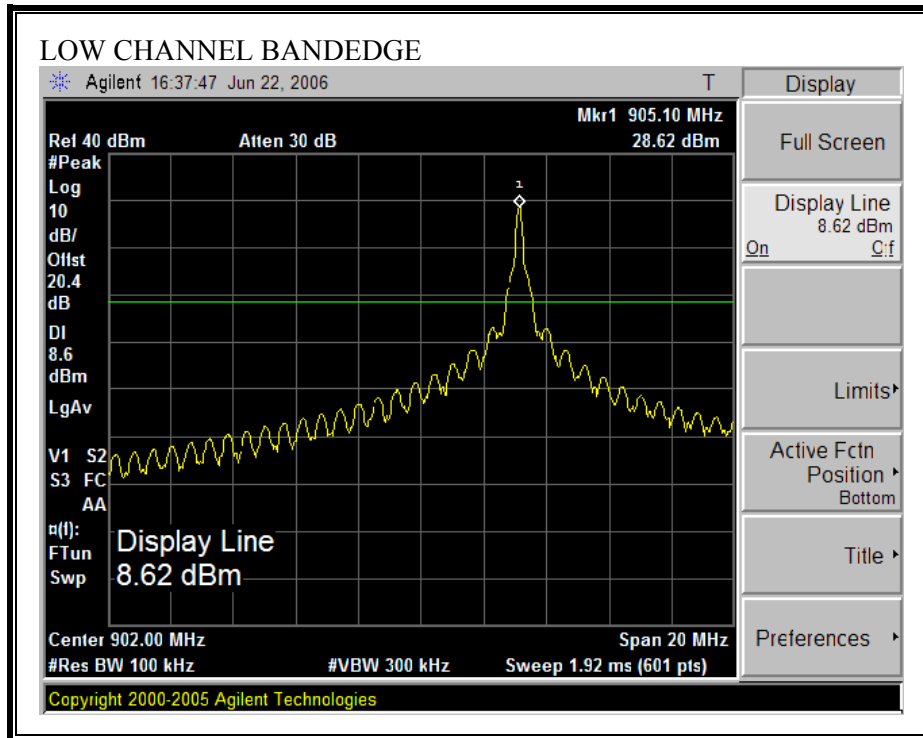
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

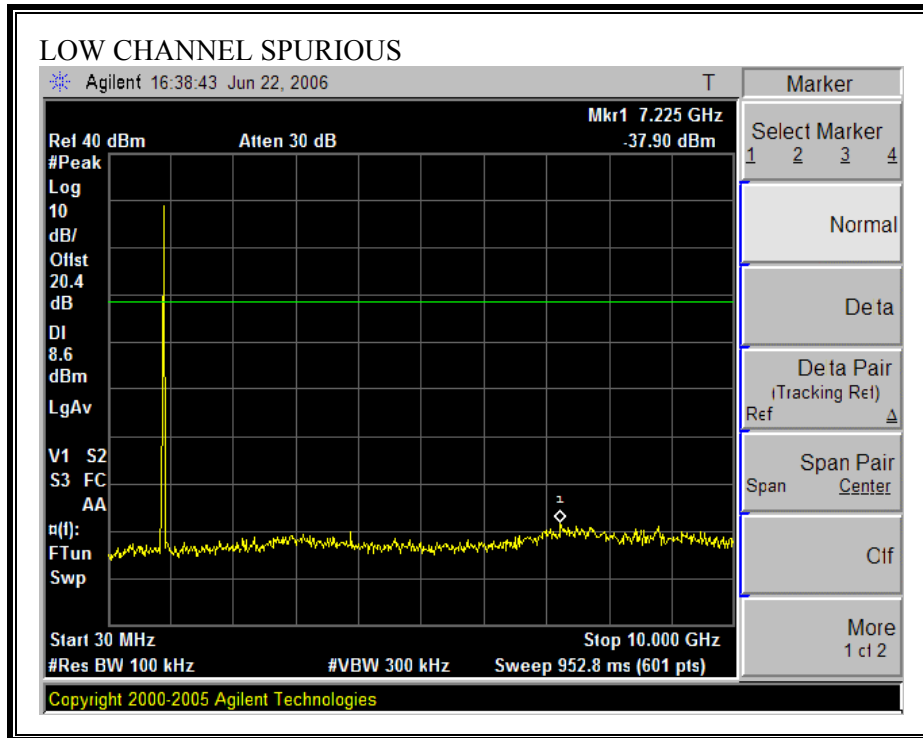
The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### RESULTS

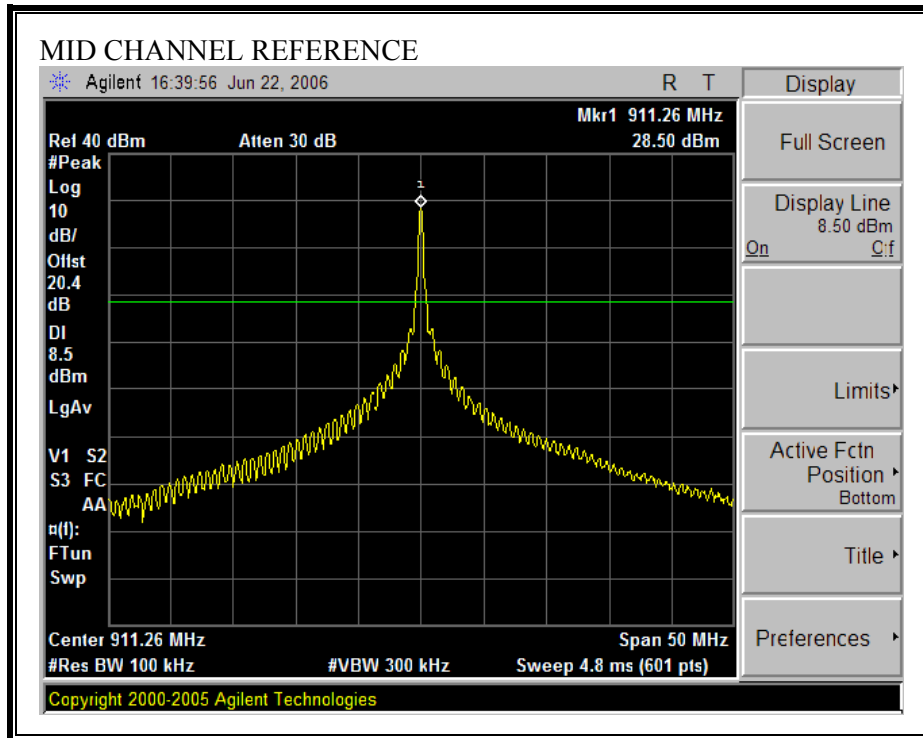
No non-compliance noted:

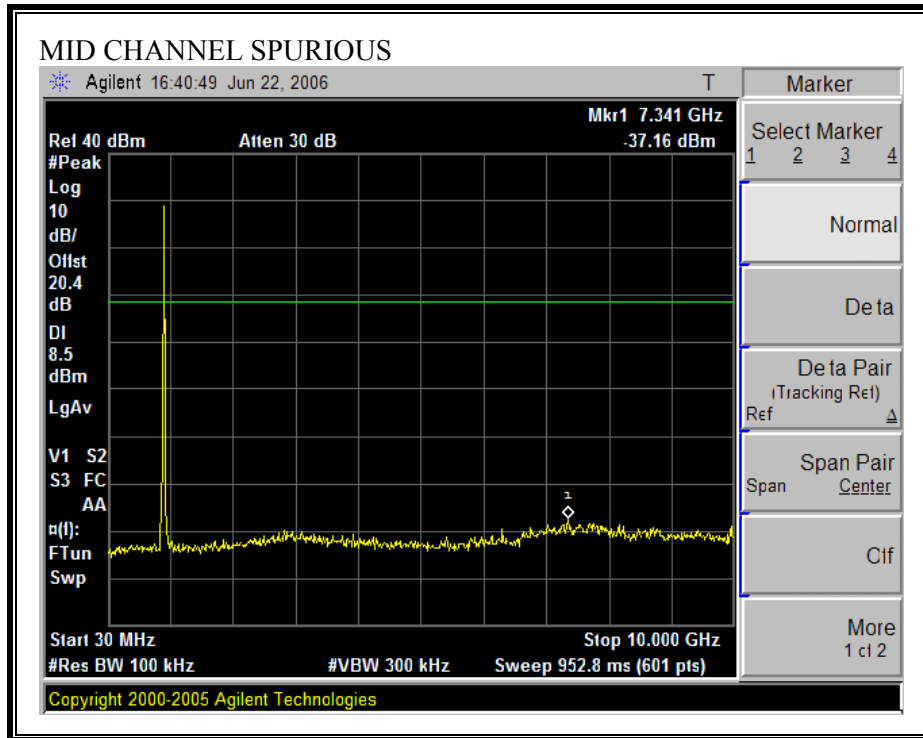
**SPURIOUS EMISSIONS, LOW CHANNEL**



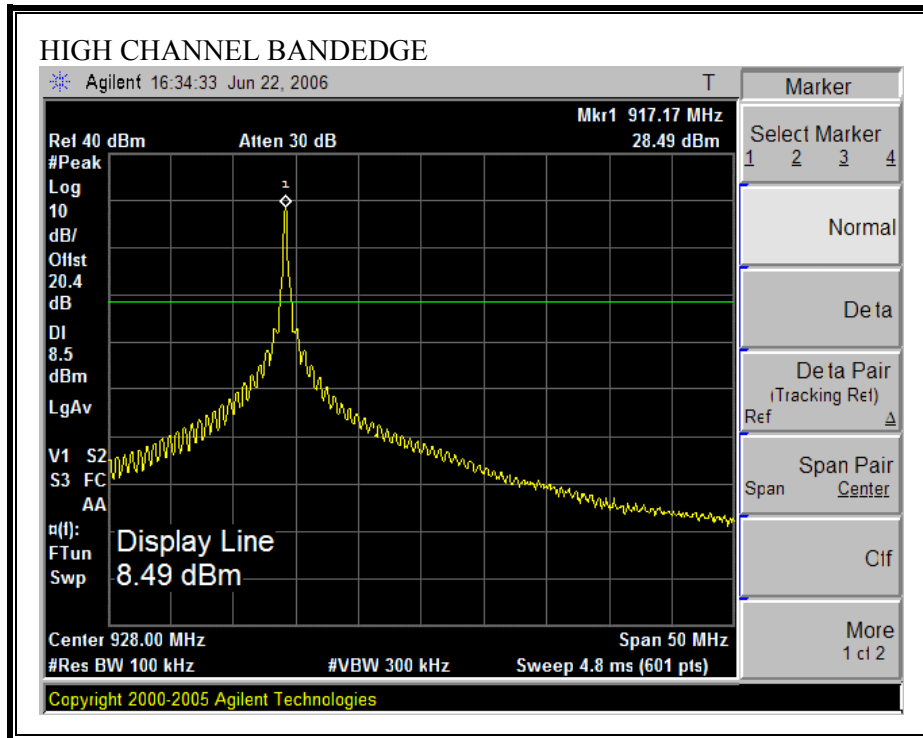


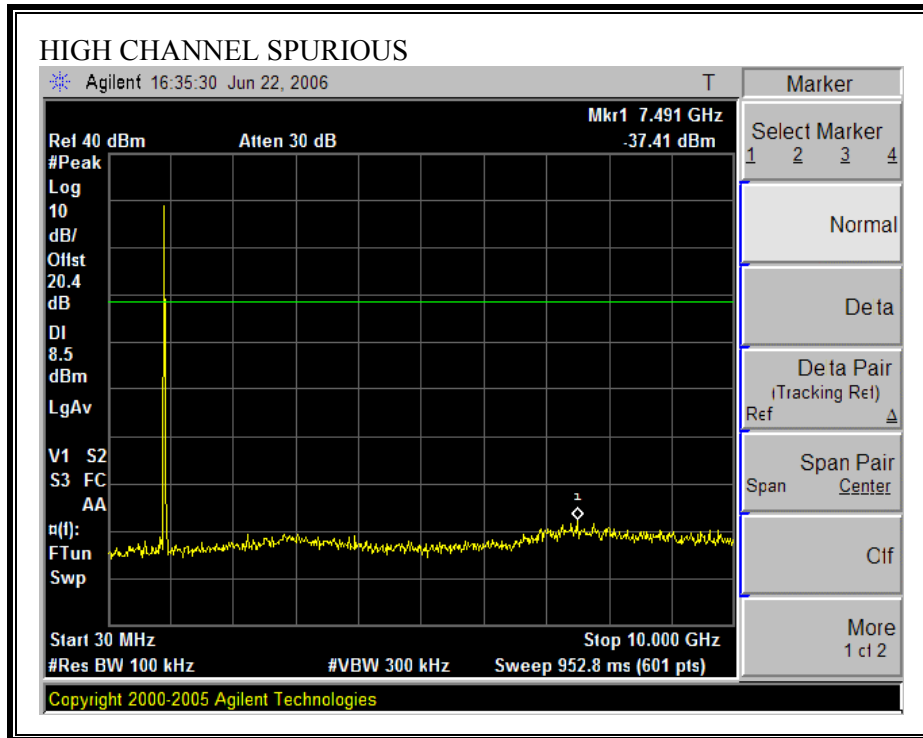
**SPURIOUS EMISSIONS, MID CHANNEL**





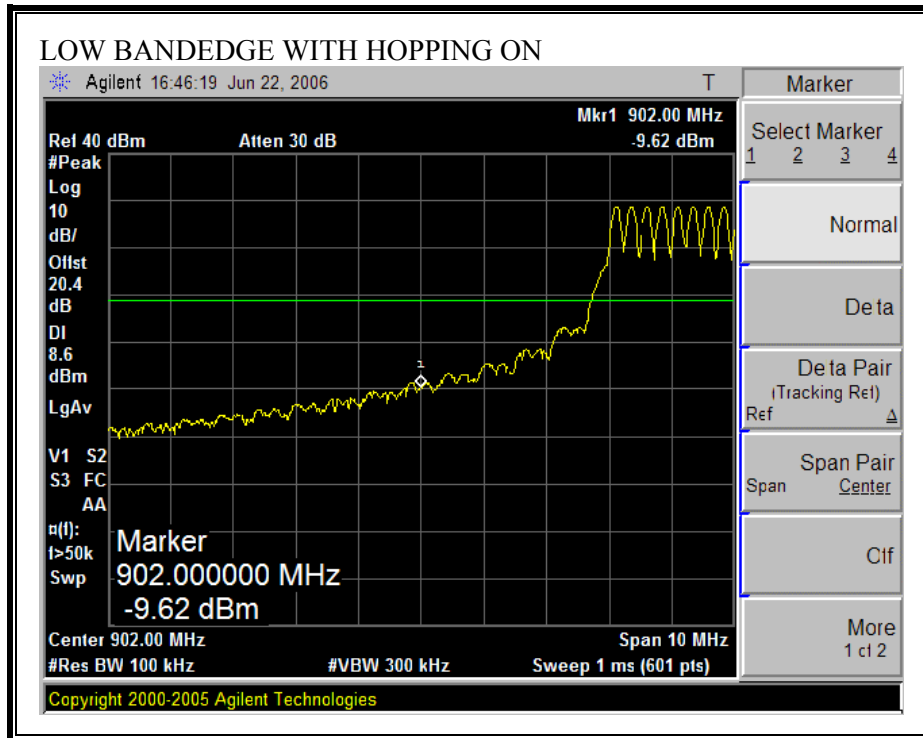
**SPURIOUS EMISSIONS, HIGH CHANNEL**

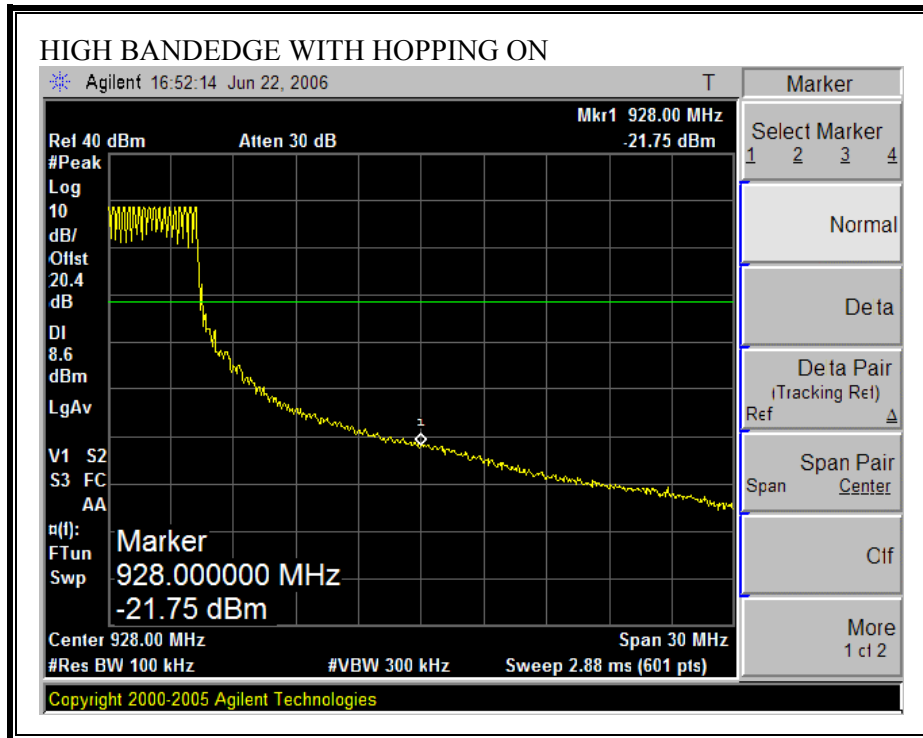






**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





### 7.1.8. 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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 yields:

$$S = (30 * P * G) / (3770 * (d^2))$$

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

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

$$d (m) = d (cm) / 100$$

and substituting the logarithmic form of power and gain using:

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

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

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

**LIMITS**

From §1.1310 Table 1 (B), the maximum value of  $S = f/1500 \text{ mW/cm}^2$   
For the lowest frequency of 902 MHz,  $S = 0.6 \text{ mW/cm}^2$

**RESULTS**

No non-compliance noted:

<b>Band (MHz)</b>	<b>MPE Distance (cm)</b>	<b>Output Power (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>
902 to 928	20.0	28.82	5.59	0.55

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. 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
<sup>1</sup> 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	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> 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.

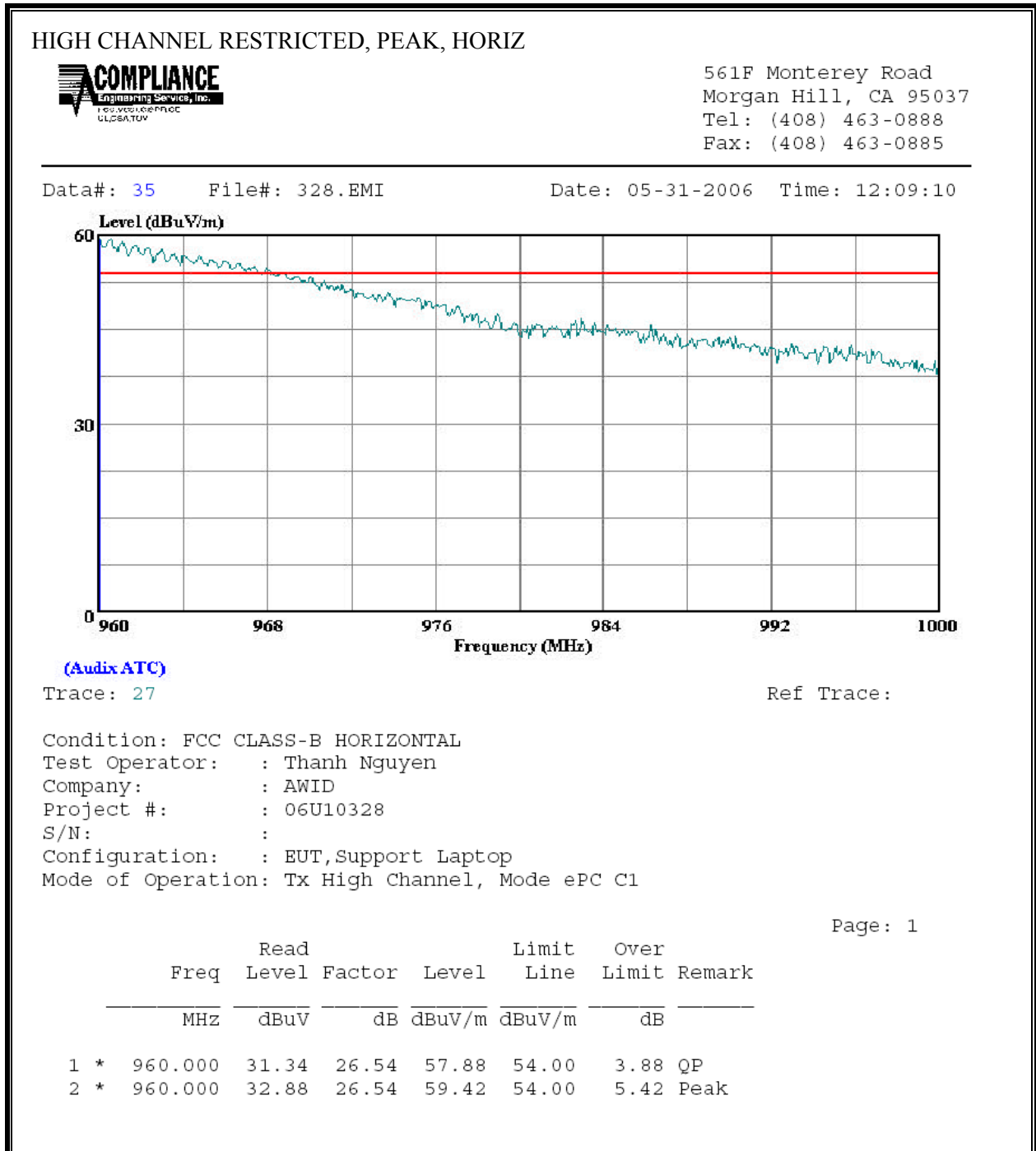
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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 RADIATED EMISSIONS BEFORE MODIFICATIONS

### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



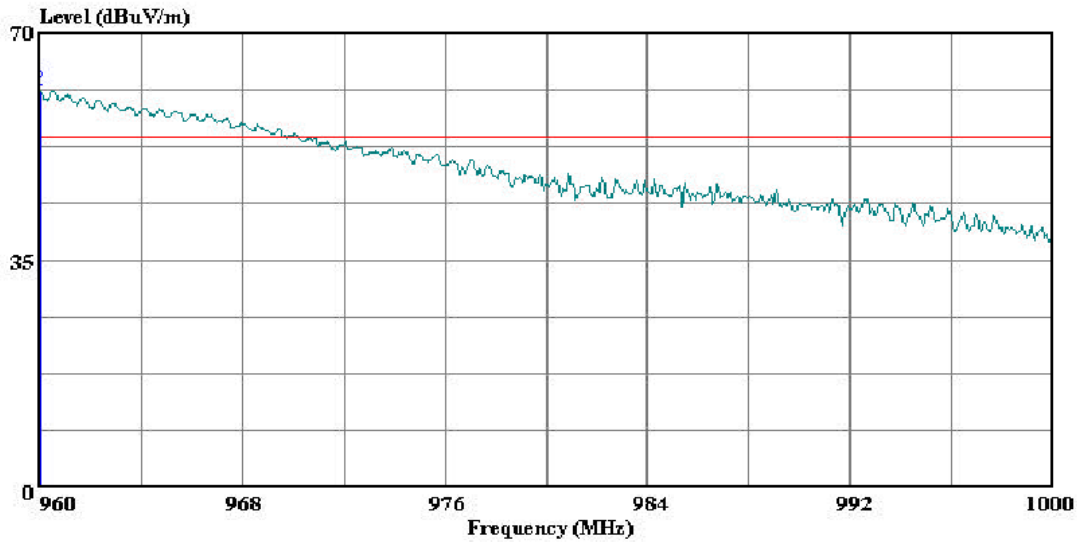
**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

HIGH CHANNEL RESTRICTED, PEAK, VERT



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

Data#: 13 File#: 328.EMI Date: 05-31-2006 Time: 11:07:19



(Audix.ATC)

Trace: 10

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
 Test Operator: : Thanh Nguyen  
 Company: : AWID  
 Project #: : 06U10328  
 S/N: :  
 Configuration: : EUT,Support Laptop  
 Mode of Operation: Tx High Channel, Mode ePC C1

Page: 1

	Read		Limit	Over	
Freq	Level	Factor	Level	Line	Limit Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1 *	960.000	33.26	26.54	59.80	54.00 5.80 QP
2 *	960.000	34.51	26.54	61.05	54.00 7.05 Peak

**HARMONICS AND SPURIOUS EMISSIONS**

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

Company: AVID  
 Project #: 06U10328  
 Date: 05/31/06  
 Test Engineer: Can Ming Chung  
 Configuration: EUT, laptop  
 Mode: Low Ch in ePC C1 Mode

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC Class B

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
Thanh 177079008		Thanh 208946003	HPF_1.5GHz		Average Measurements RBW=1MHz ; VBW=10Hz

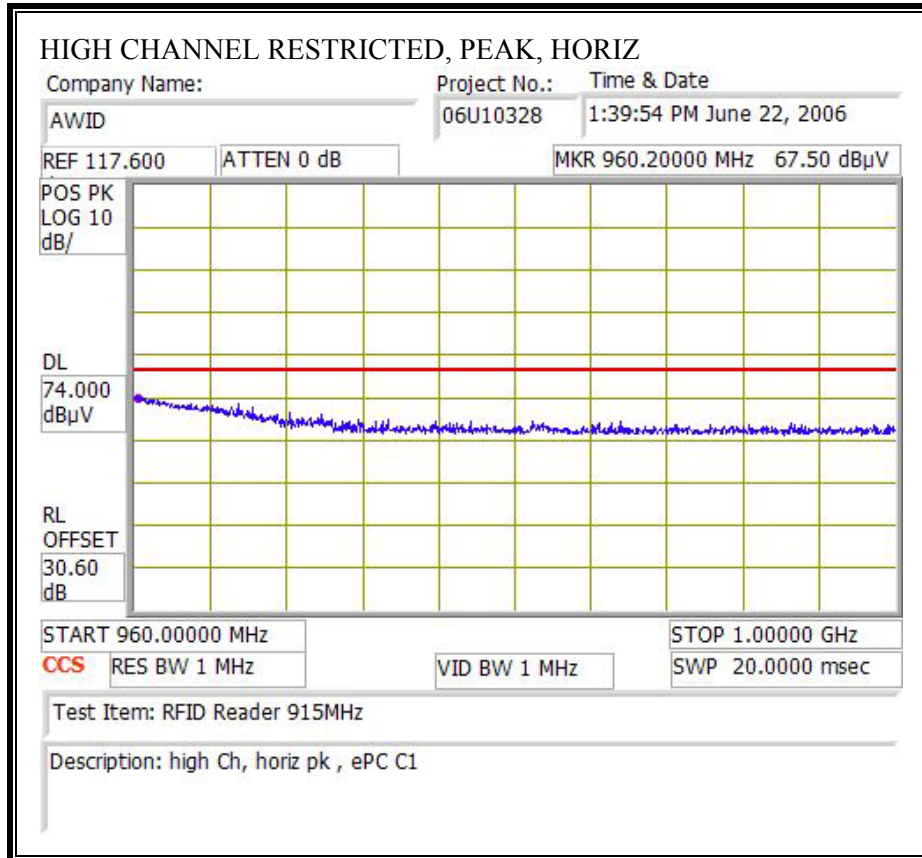
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
EPC C1															
2.769	3.0	70.0	69.4	29.3	2.2	-37.4	0.0	0.6	64.7	64.0	74	54	-9.3	10.0	V
3.695	3.0	61.1	59.6	31.8	2.4	-36.8	0.0	0.6	59.0	57.5	74	54	-15.0	3.5	V
5.539	3.0	58.0	56.7	33.8	3.0	-36.4	0.0	0.5	58.9	57.6	74	54	-15.1	3.6	V
2.769	3.0	76.8	76.6	29.3	2.2	-37.4	0.0	0.6	71.5	71.2	74	54	-2.5	17.2	H
3.695	3.0	65.5	65.0	31.8	2.4	-36.8	0.0	0.6	63.5	62.9	74	54	-10.5	8.9	H
5.539	3.0	65.3	64.9	33.8	3.0	-36.4	0.0	0.5	66.2	65.9	74	54	-7.8	11.9	H

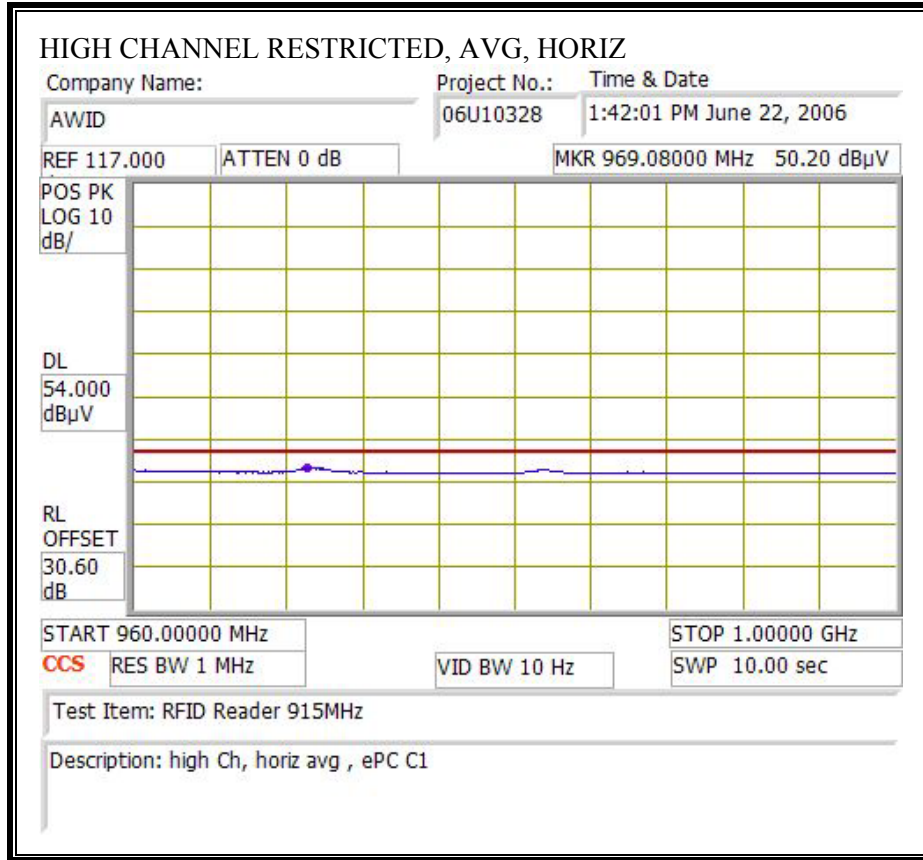
Rev. 5.1.6

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		

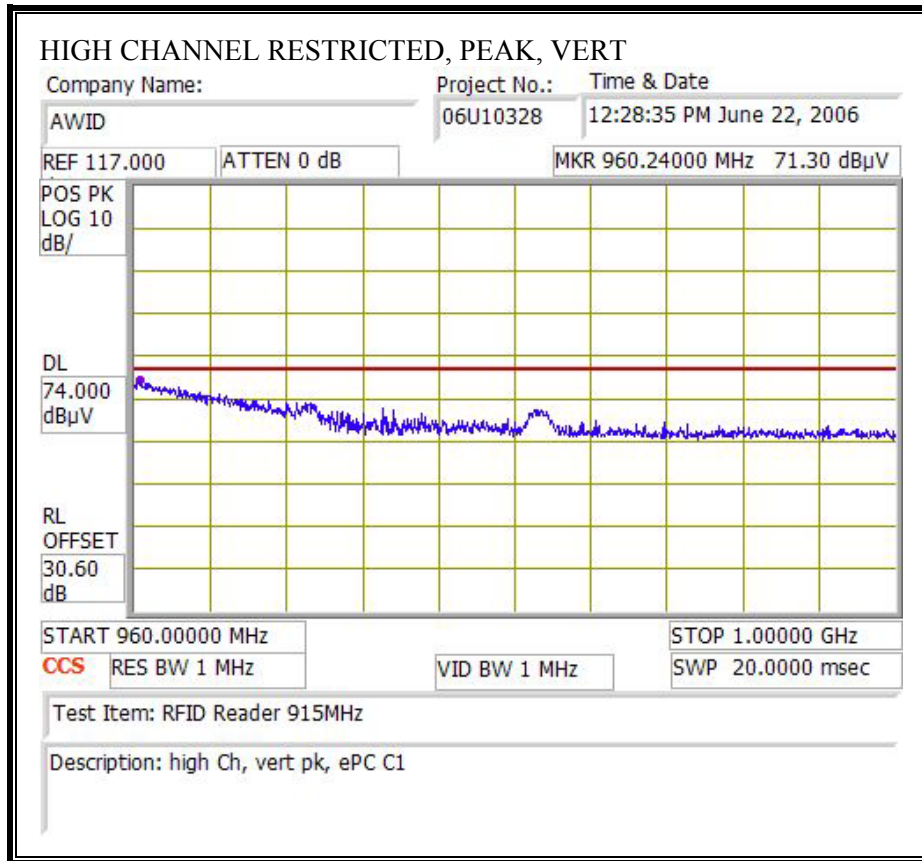
### 7.2.3. TRANSMITTER RADIATED EMISSIONS AFTER MODIFICATIONS

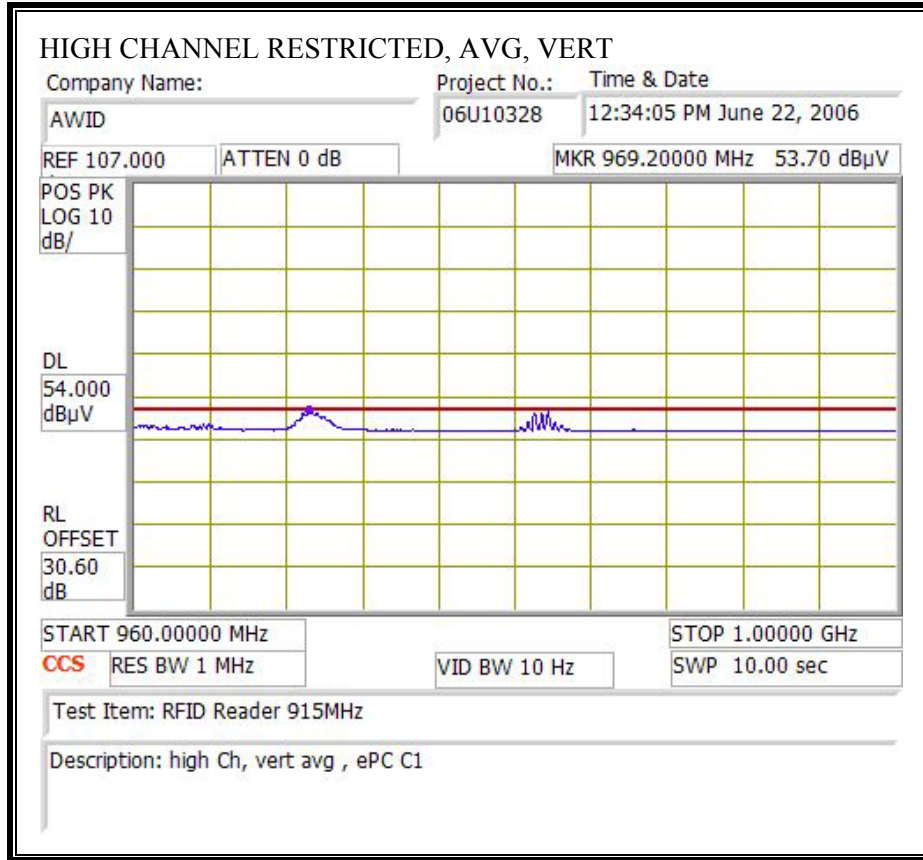
#### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





**HARMONICS AND SPURIOUS EMISSIONS**

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

Compan: AWID  
 Project # 06U10328  
 Date: 06/22/06  
 Test Engineer: Chin Pang  
 Configuration: EUT, laptop  
 Mode: TX, ePC C1 Protocol

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
	Chin 197538001	Chin 200354001	HPF_1.5GHz		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	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Ch, 905.11MHz</b>															
1.810	3.0	46.8	35.7	27.5	1.9	-38.3	0.0	0.3	38.1	27.0	74	54	-35.9	-27.0	V
2.715	3.0	54.0	50.5	29.6	2.3	-37.4	0.0	0.6	49.0	45.5	74	54	-25.0	-8.5	V
3.620	3.0	45.6	34.0	31.7	2.7	-36.9	0.0	0.6	43.7	32.1	74	54	-30.3	-21.9	V
1.810	3.0	47.5	36.0	27.5	1.9	-38.3	0.0	0.3	38.8	27.3	74	54	-35.2	-26.7	H
2.715	3.0	55.0	52.0	29.6	2.3	-37.4	0.0	0.6	50.0	47.0	74	54	-24.0	-7.0	H
3.620	3.0	46.0	35.5	31.7	2.7	-36.9	0.0	0.6	44.1	33.6	74	54	-29.9	-20.4	H
<b>Mid Ch, 911.26MHz</b>															
1.822	3.0	48.0	38.8	27.5	1.9	-38.3	0.0	0.3	39.4	30.2	74	54	-34.6	-23.8	V
2.733	3.0	52.8	50.0	29.6	2.3	-37.4	0.0	0.6	47.9	45.1	74	54	-26.1	-8.9	V
3.645	3.0	46.6	39.0	31.7	2.7	-36.9	0.0	0.6	44.8	37.2	74	54	-29.2	-16.8	V
1.822	3.0	49.9	43.0	27.5	1.9	-38.3	0.0	0.3	41.3	34.4	74	54	-32.7	-19.6	H
2.733	3.0	54.6	51.5	29.6	2.3	-37.4	0.0	0.6	49.7	46.6	74	54	-24.3	-7.4	H
3.645	3.0	45.5	35.4	31.7	2.7	-36.9	0.0	0.6	43.7	33.6	74	54	-30.3	-20.4	H
<b>High Ch, 917.11MHz</b>															
1.834	3.0	50.0	43.6	27.5	1.9	-38.3	0.0	0.3	41.5	35.1	74	54	-32.5	-18.9	V
2.751	3.0	57.0	52.0	29.7	2.3	-37.4	0.0	0.6	52.2	47.2	74	54	-21.8	-6.8	V
3.668	3.0	47.0	41.0	31.8	2.7	-36.9	0.0	0.6	45.2	39.2	74	54	-28.8	-14.8	V
1.834	3.0	50.8	45.0	27.5	1.9	-38.3	0.0	0.3	42.3	36.5	74	54	-31.7	-17.5	H
2.751	3.0	56.2	54.3	29.7	2.3	-37.4	0.0	0.6	51.4	49.5	74	54	-22.6	-4.5	H
3.668	3.0	45.7	35.7	31.8	2.7	-36.9	0.0	0.6	43.9	33.9	74	54	-30.1	-20.1	H

Rev. 5.1.6  
 Note: No other emissions were detected above the system noise floor.

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



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

HORIZONTAL DATA

Condition: FCC CLASS-B HORIZONTAL  
Test Operator: : Chin Pang  
Company: : AWID  
Project #: : 06U10328  
S/N: :  
Configuration: : EUT with Laptop  
Mode of Operation: TX

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	74.820	24.67	9.12	33.79	40.00	-6.21	Peak
2	98.060	17.06	10.67	27.73	43.50	-15.78	Peak
3	197.660	19.28	14.24	33.52	43.50	-9.98	Peak
4	302.240	19.04	15.70	34.73	46.00	-11.27	Peak
5	531.320	14.45	20.67	35.11	46.00	-10.89	Peak
6	845.060	14.29	25.17	39.46	46.00	-6.54	Peak

VERTICAL DATA

Condition: FCC CLASS-B VERTICAL  
Test Operator: : Chin Pang  
Company: : AWID  
Project #: : 06U10328  
S/N: : xxx  
Configuration: : EUT, with Laptop  
Mode of Operation: TX

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	34.150	16.17	18.84	35.01	40.00	-4.99	Peak
2	98.890	20.17	11.11	31.28	43.50	-12.22	Peak
3	210.110	27.13	13.11	40.24	43.50	-3.26	Peak
4	301.410	22.76	15.70	38.46	46.00	-7.54	Peak
5	581.120	16.92	21.30	38.22	46.00	-7.78	Peak
6	855.850	17.94	25.36	43.30	46.00	-2.70	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  $\mu$ 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.

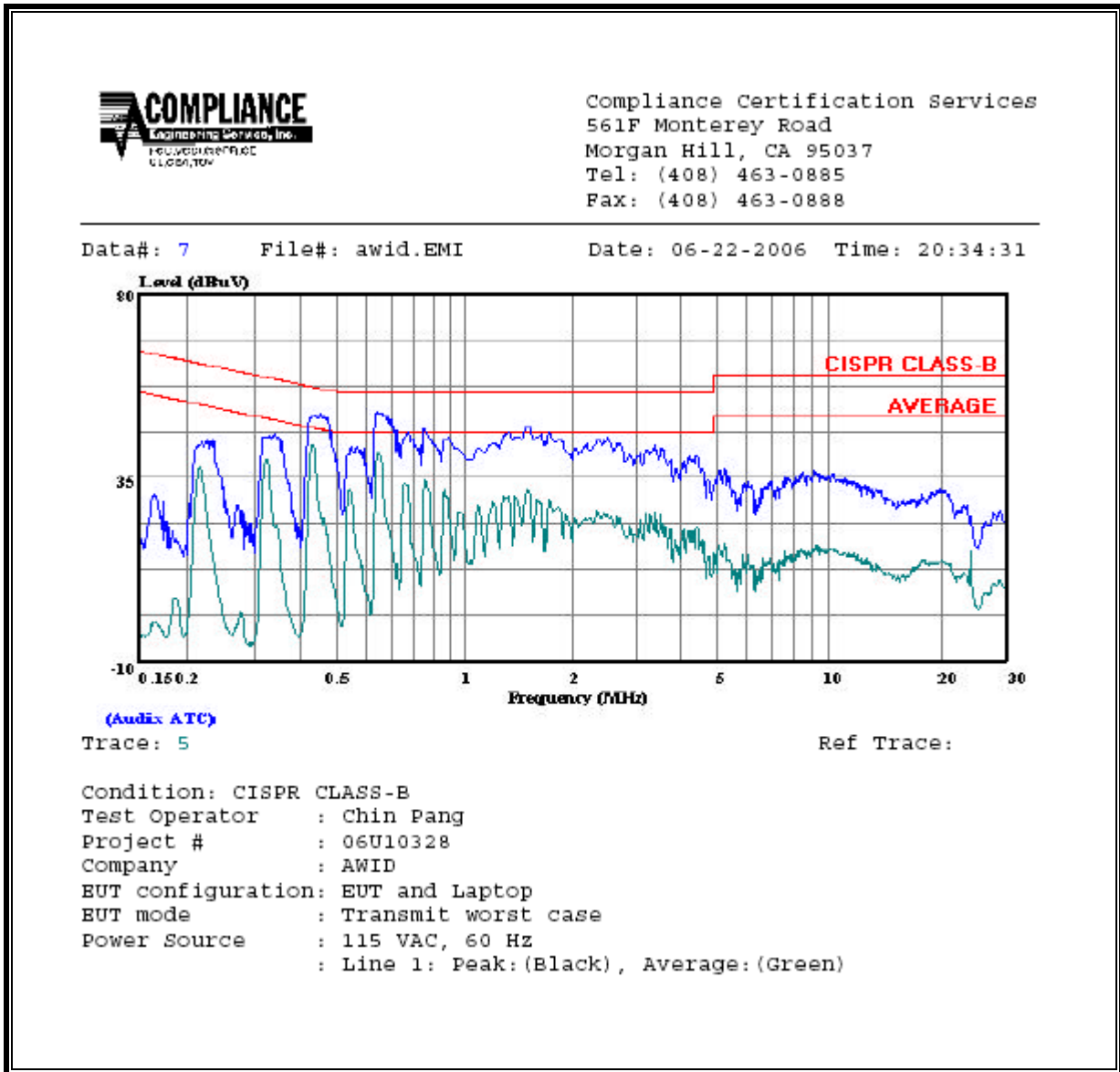
#### RESULTS

No non-compliance noted:

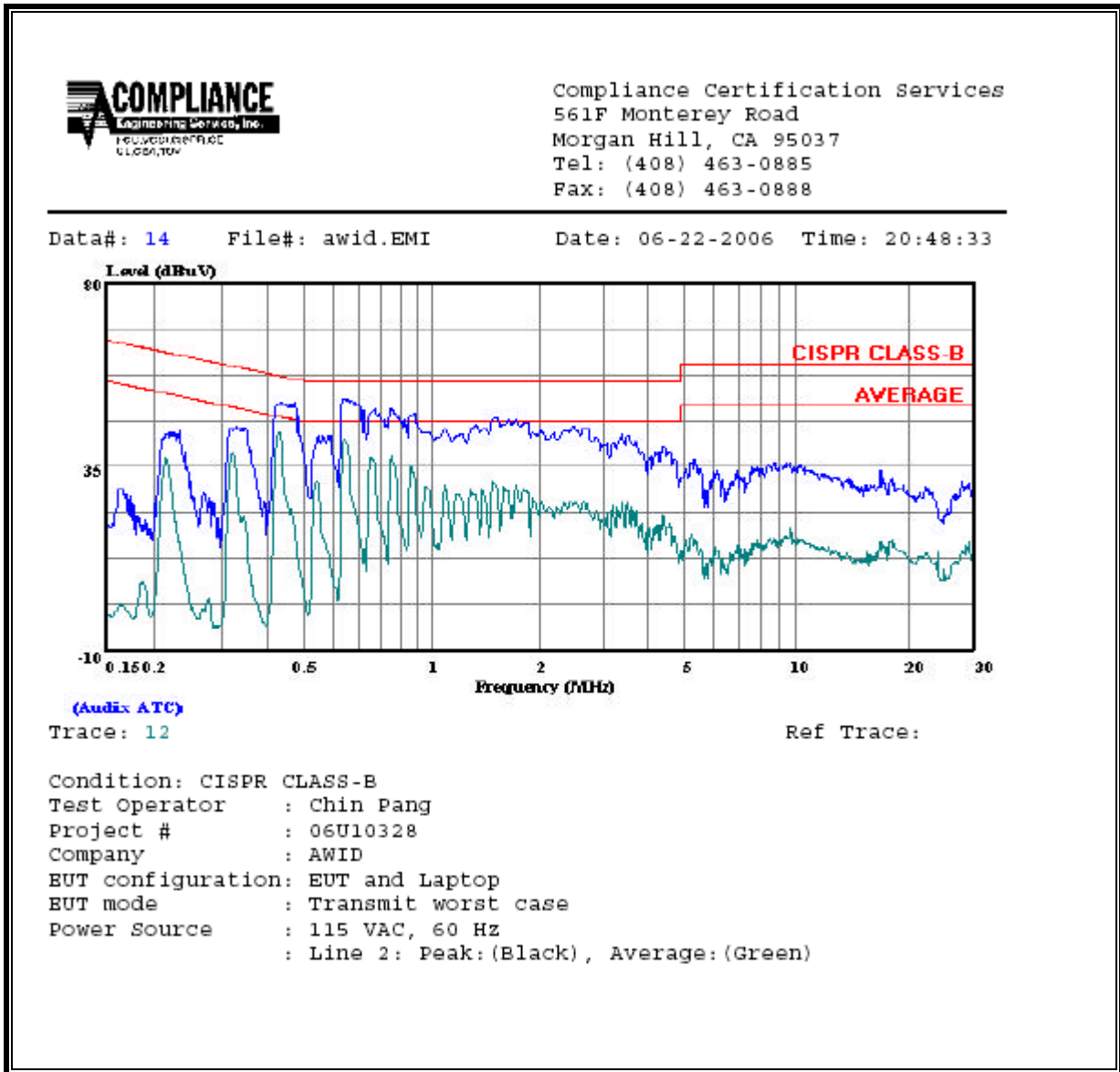
**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)		QP	AV	QP (dB)	AV (dB)	
0.46	50.48	--	42.78	0.00	56.77	46.77	-6.29	-3.99	L1
0.66	50.73	--	41.02	0.00	56.00	46.00	-5.27	-4.98	L1
1.64	47.14	--	31.62	0.00	56.00	46.00	-8.86	-14.38	L1
0.44	50.54	--	43.40	0.00	56.99	46.99	-6.45	-3.59	L2
0.65	51.50	--	41.89	0.00	56.00	46.00	-4.50	-4.11	L2
1.64	46.90	--	31.29	0.00	56.00	46.00	-9.10	-14.71	L2
6 Worst Data									

**LINE 1 RESULTS**

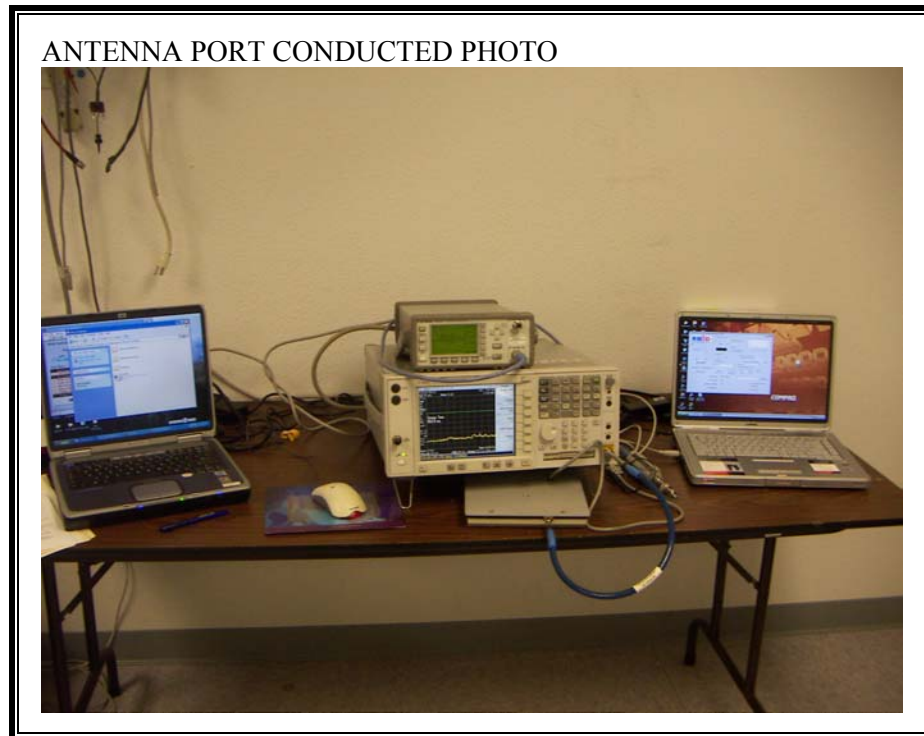


**LINE 2 RESULTS**



## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



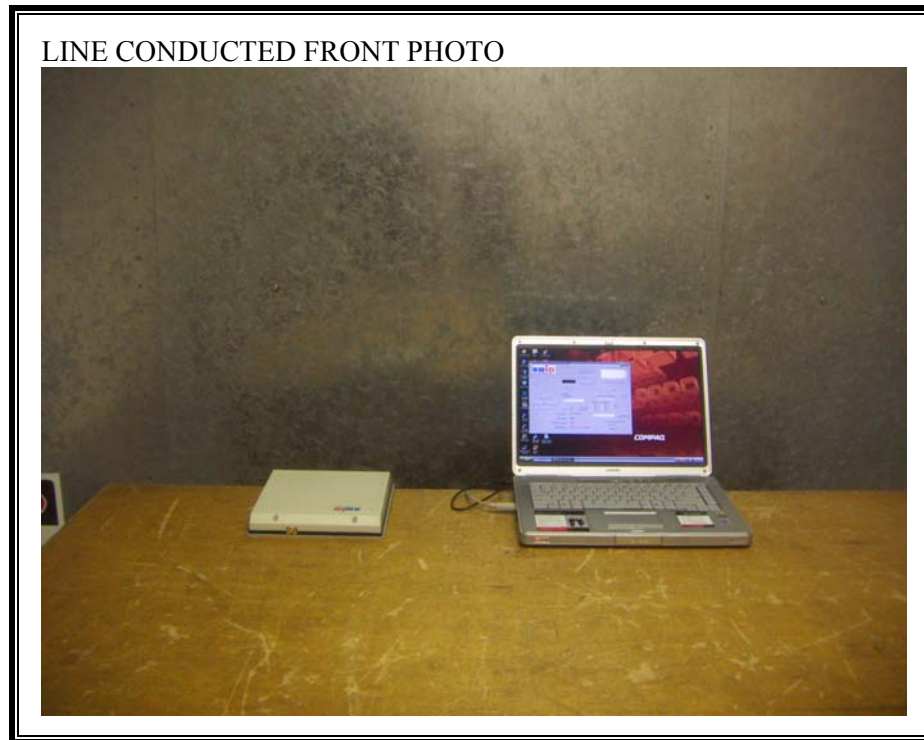
**RADIATED RF MEASUREMENT SETUP**







**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**



LINE CONDUCTED BACK PHOTO



**END OF REPORT**