FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT
FOR

UHF RFID READER

MODEL NUMBER: 2.7e1

FCC ID: OGSM27EA

REPORT NUMBER: 06U10609-1, Revision B

ISSUE DATE: NOVEMBER 10, 2006

Prepared for
APPLIED WIRELESS ID
18300 SUTTER BLVD.
MORGAN HILL, CA 95037, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/6/06	Initial Issue	MH
B	11/10/06	Revised model number.	SR

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: UHF RFID READER

MODEL: 2.7e1

SERIAL NUMBER: 01815

DATE TESTED: SEPTEMBER 15 - OCTOBER 12, 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:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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 UHF RFID Reader Module.

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:

Frequency Range (MHz)	Power (dBm)	Power (mW)
902.75 - 927.25	29.27	845.3

The power is adjustable.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a circularly polarized patch antenna or a linearly polarized dipole antenna. For the available patch antennas, the maximum linearly polarized antenna assembly gain is 5.59 dBi. The maximum dipole antenna assembly gain is 2.15 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during final testing was MPR 1.0.2467.33681

The test utility software used during testing was MPR Test Aide V1.5.

5.5. WORST-CASE CONFIGURATION AND MODE

Preliminary testing was performed to determine the worst-case mode. The modes evaluated were the EM, ePC C1, ePC C1 Gen 2, ISO 18000-6B, and Intellitag modes. In our opinion, preliminary testing of 99% bandwidth, 20 dB bandwidth, conducted band-edge and spurious with fixed L/M/H channels, and conducted band-edge with hopping on show that the Intellitag mode is worst-case.

Therefore all final testing was performed in the Intellitag mode.

5.6. 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	S5 0404857	NA
USB Serial cable Converter	Radio Shack	NA	NA	NA

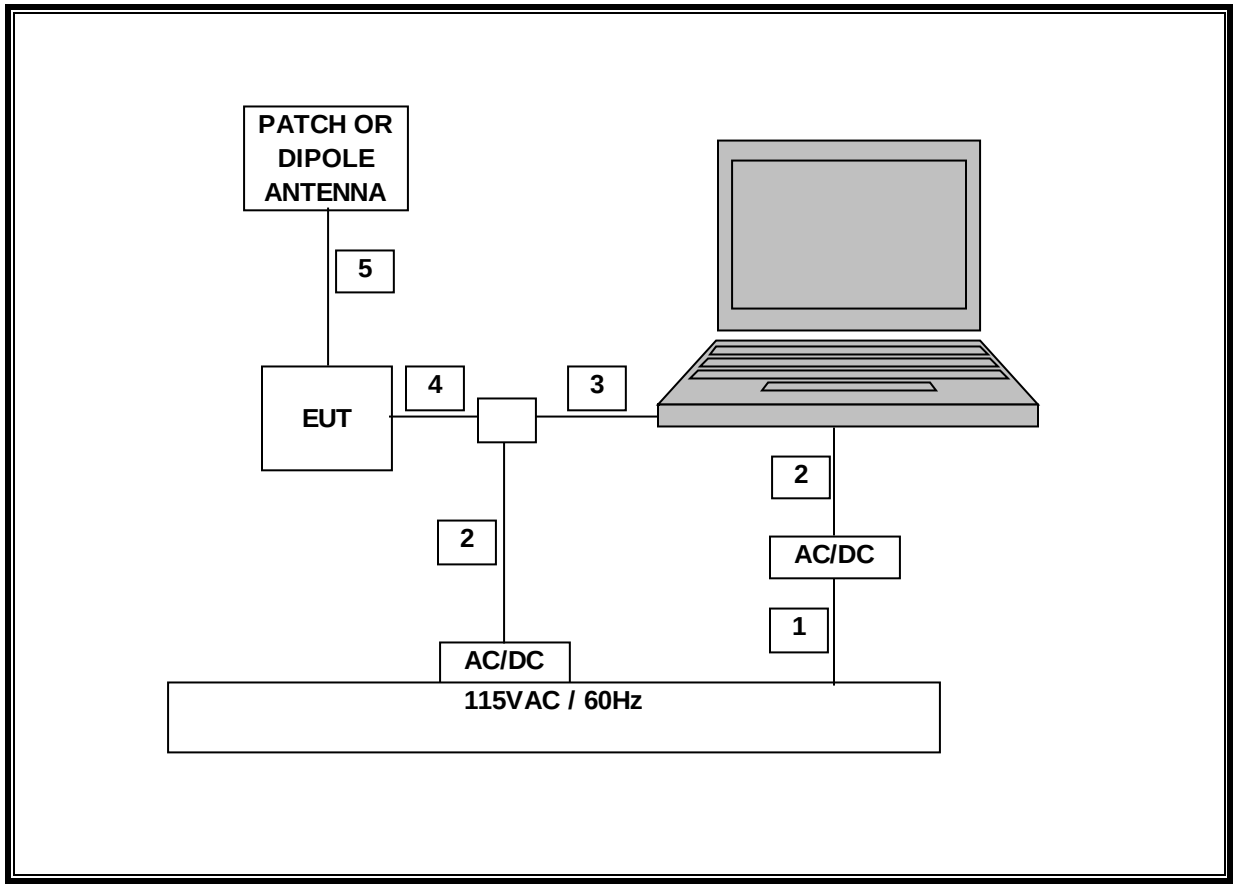
I/O CABLES

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	N/A
2	DC	2	DC	Un-shielded	2m	N/A
3	USB	1	USB	Un-shielded	1m	N/A
4	Serial	1	DB9	Un-shielded	.05m	N/A
5 (Patch)	RF	1	SMA	Shielded	1m	Reverse Polarity Female
5 (Dipole)	RF	1	MMCX/TNC	Shielded	.5m	Reverse Polarity Female

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**
1.5 GHz Highpass Filter	Micro-Tronics	HPM13193	002	CNR
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	02/04/07
RF Filter Section	Agilent / HP	85420E	3705A00256	02/04/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	08/13/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	05/03/07
Preamplifier, 1 ~ 26 GHz	Agilent / HP	8449B	3008A00931	08/01/07
Antenna, Horn 1 ~ 18 GHz	ETS	3117	35234	04/22/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	04/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/03/07
EMI Test Receiver	R & S	ESHS 20	827129/006	11/03/06
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	09/15/07

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS

7.1.1. 20 dB BANDWIDTH

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 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.

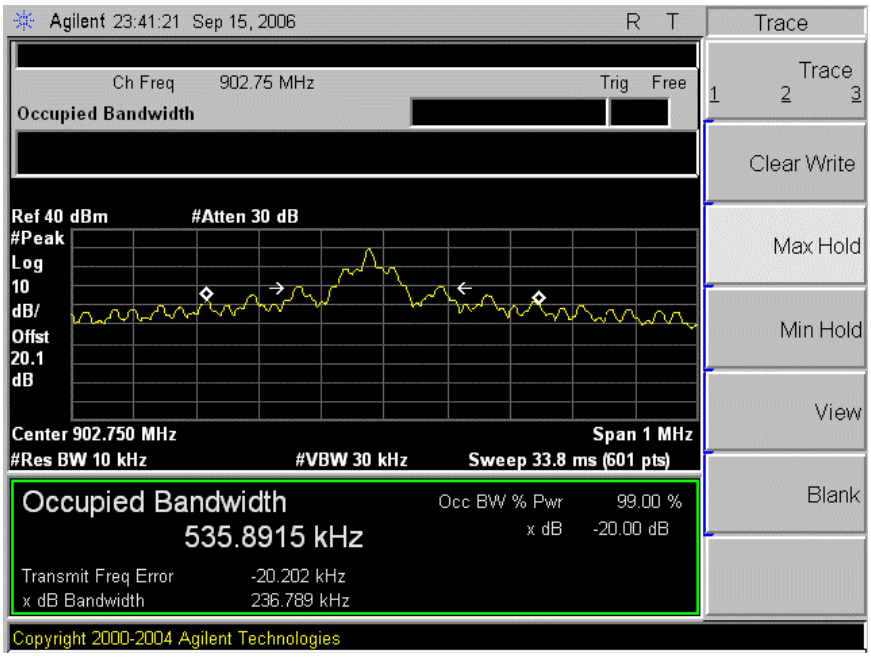
RESULTS

No non-compliance noted:

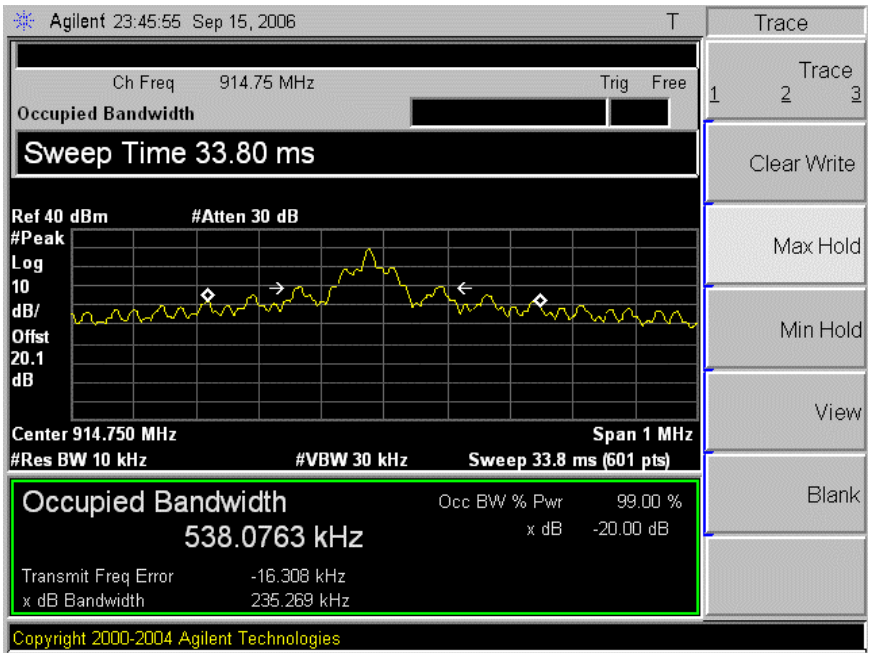
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
Low	902.75	236.789	500	263.2
Middle	914.75	235.269	500	264.7
High	927.25	235.478	500	264.5

20 dB BANDWIDTH

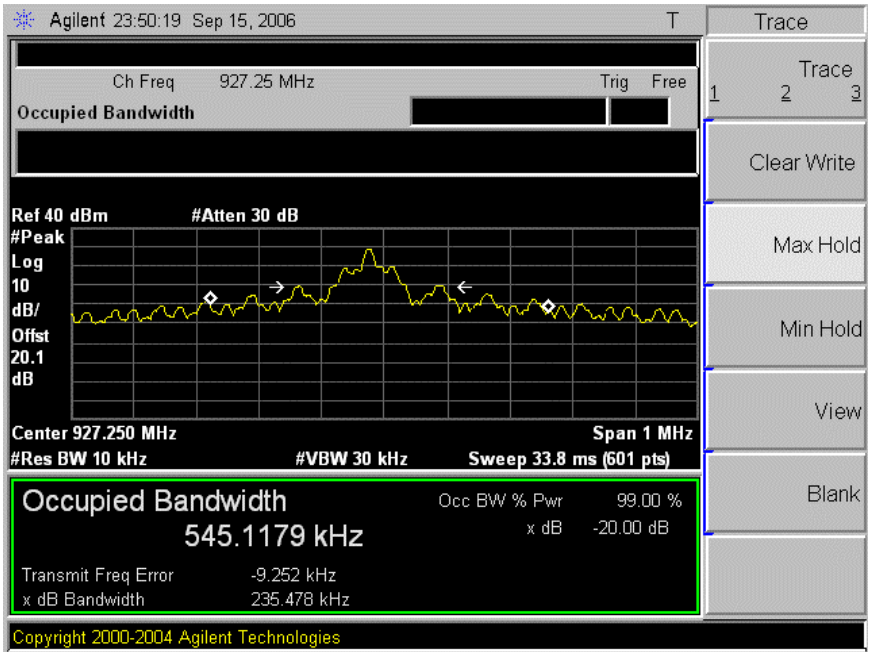
20 dB BANDWIDTH LOW CH



20 dB BANDWIDTH MID CH



20 dB BANDWIDTH HIGH CH



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 hoping channel, whichever is greater.

TEST PROCEDURE

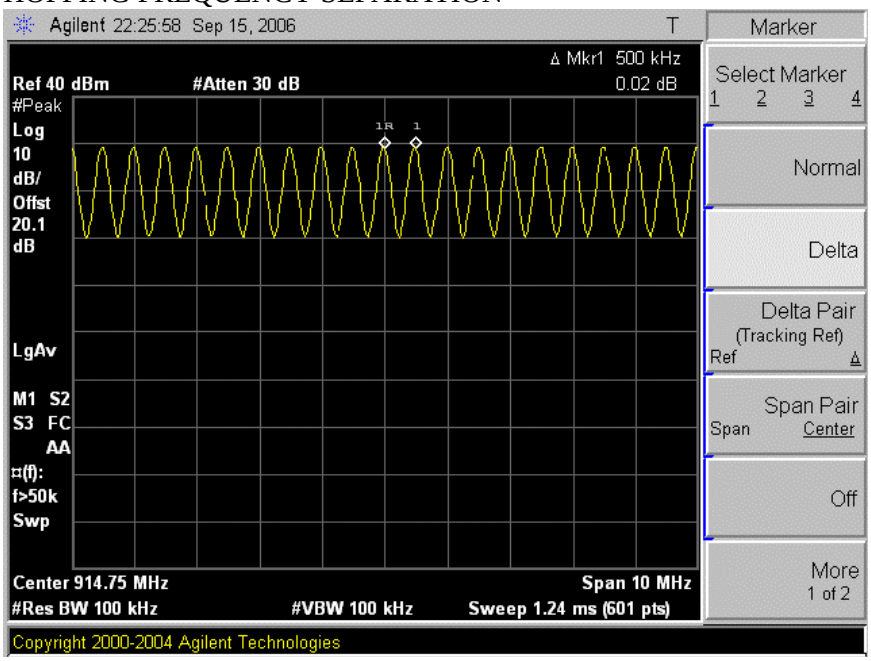
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

HOPPING FREQUENCY SEPARATION

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.

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.

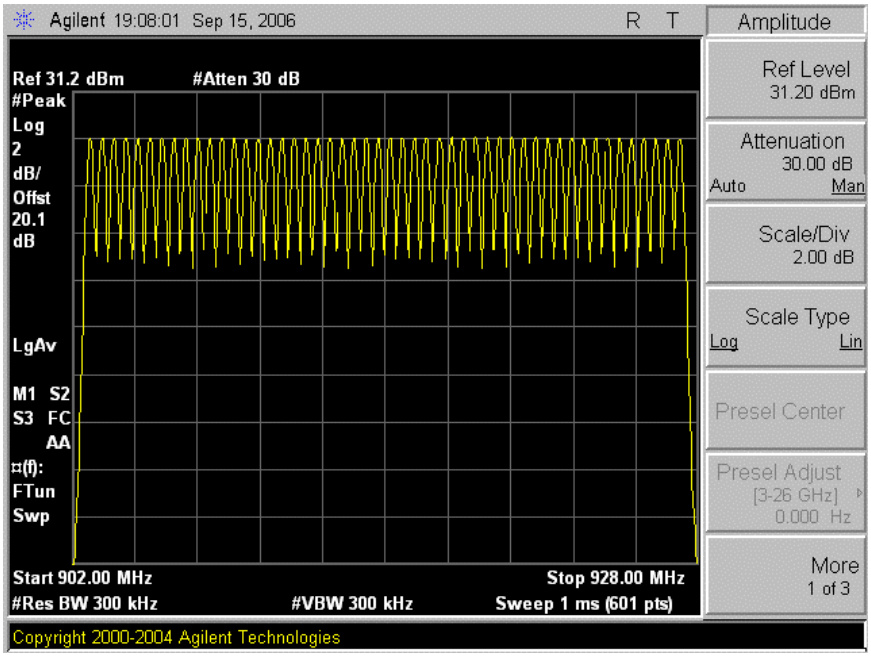
RESULTS

No non-compliance noted:

50 Channels observed.

NUMBER OF HOPPING CHANNELS

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.

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 a 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:

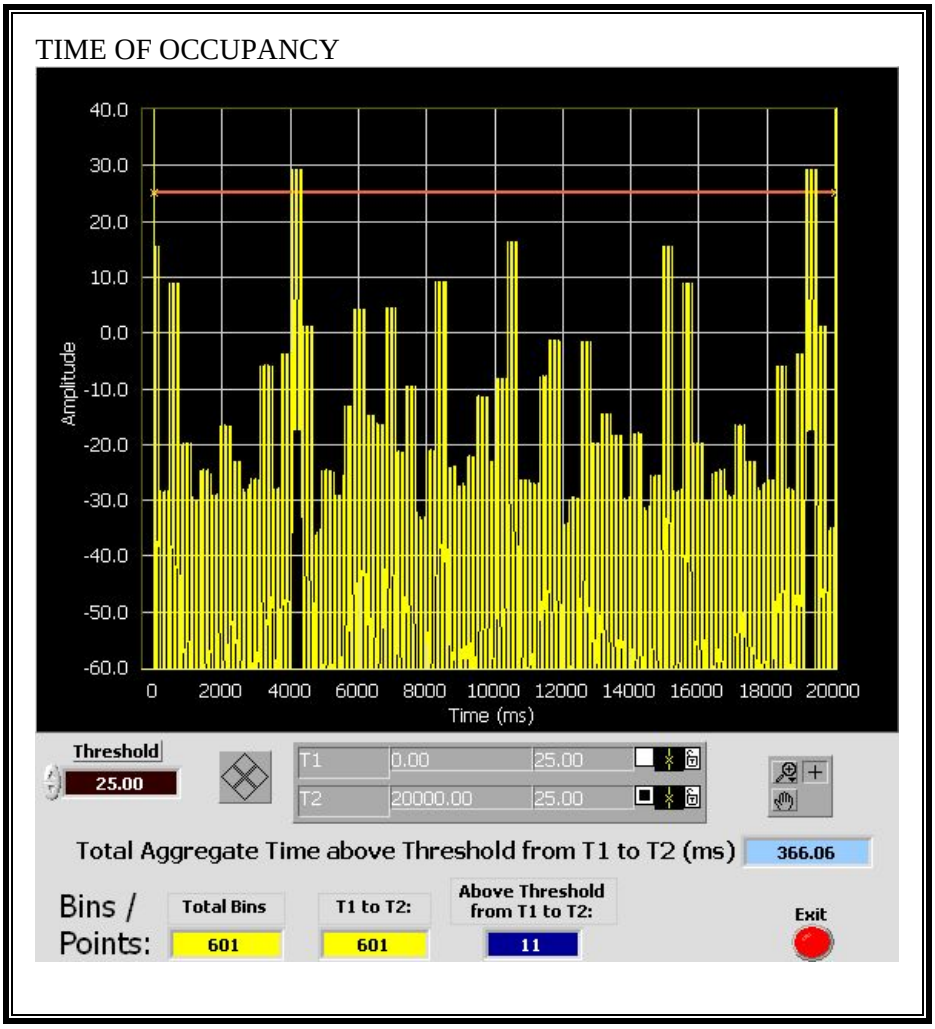
Time of Occupancy = (Number of Bins showing Transmission) * (Dwell Time per bin)

RESULTS

No non-compliance noted:

Time of Occupancy (msec)	Limit (msec)	Margin (msec)
366.06	400	-33.94

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.

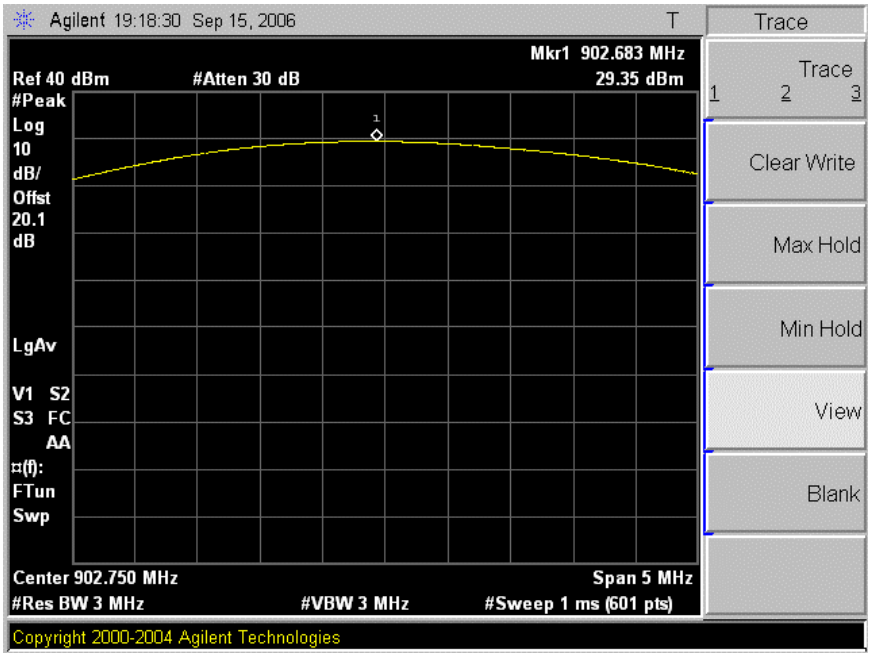
RESULTS

No non-compliance noted:

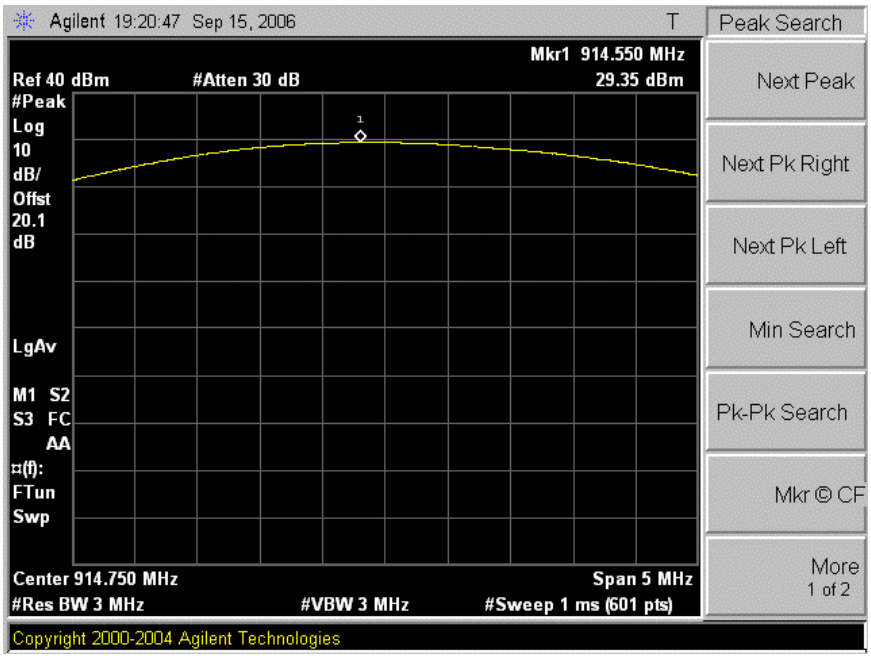
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.75	29.35	30	-0.65
Middle	914.75	29.35	30	-0.65
High	927.25	29.27	30	-0.73

OUTPUT POWER

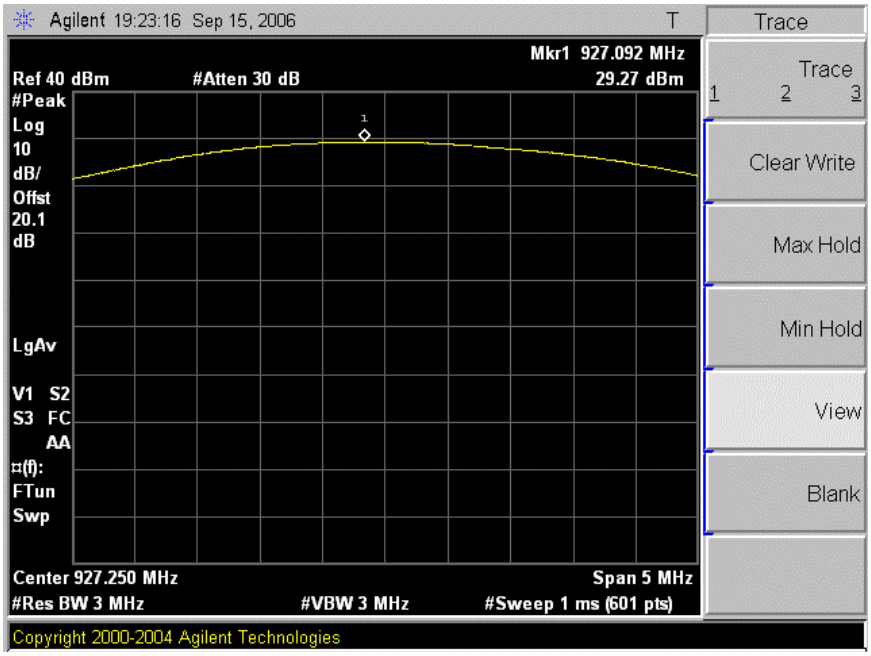
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.1.6. 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

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

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

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

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

where

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

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

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

LIMITS

From §1.1310 Table 1 (B), the maximum value of S = f/1500 mW/cm^2

For the lowest frequency of 902 MHz, S = 0.6 mW/cm^2

RESULTS

No non-compliance noted:

Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
0.6	29.35	5.59	20.33

7.1.7. 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 20.14 dB (including 20 dB pad and 0.14 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	902.75	28.15
Middle	914.75	28.20
High	927.25	28.18

7.1.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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.

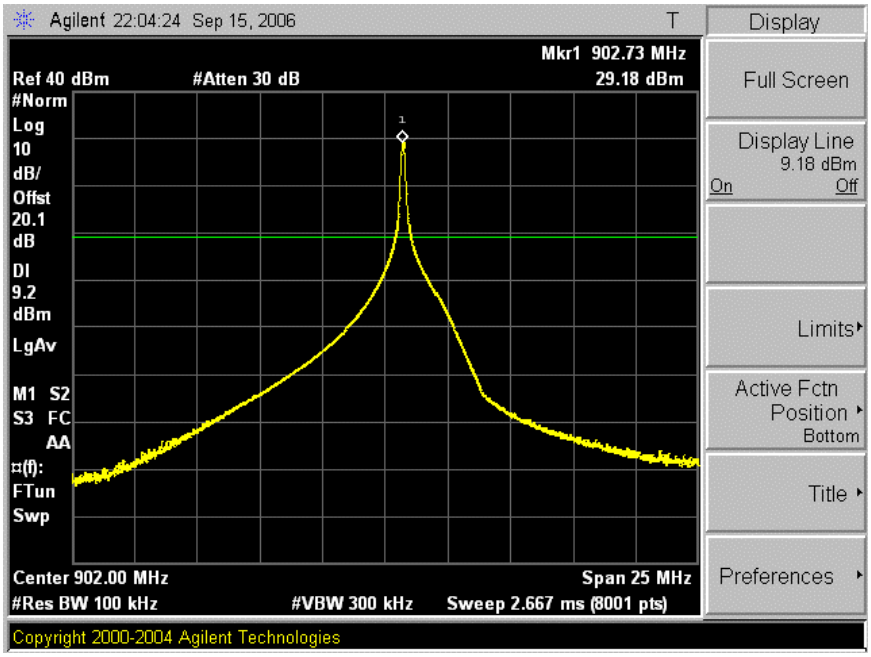
The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

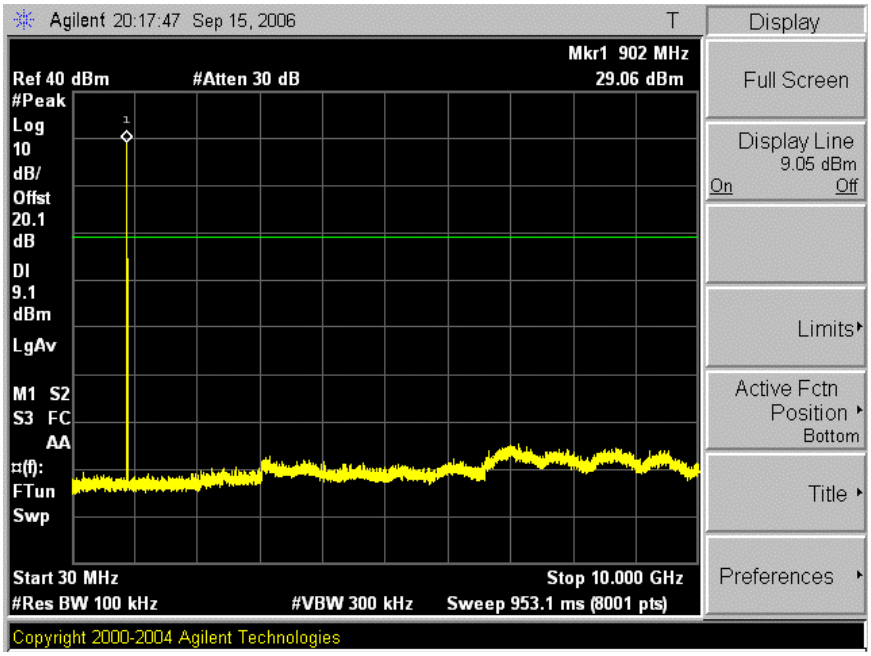
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

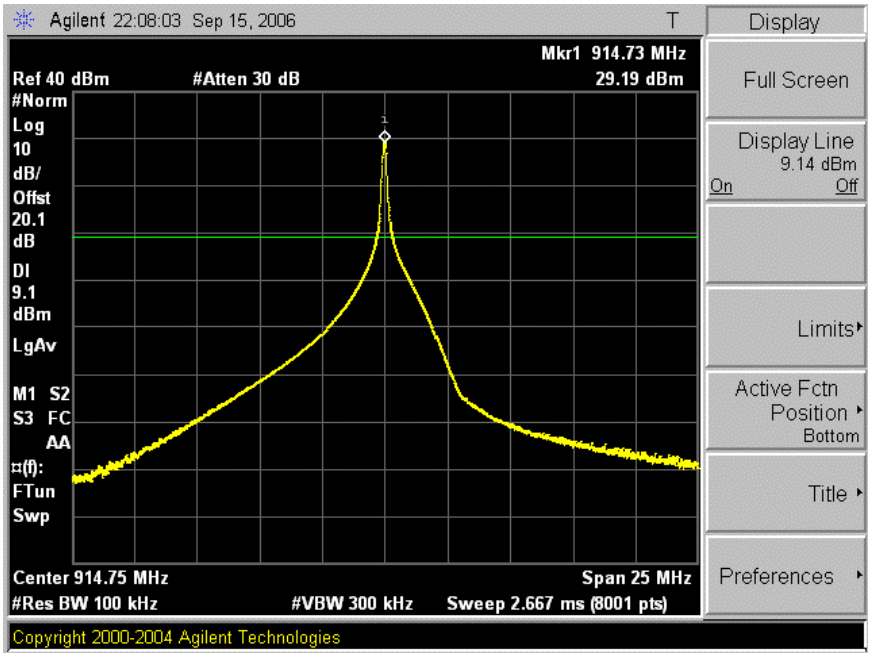


LOW CHANNEL SPURIOUS

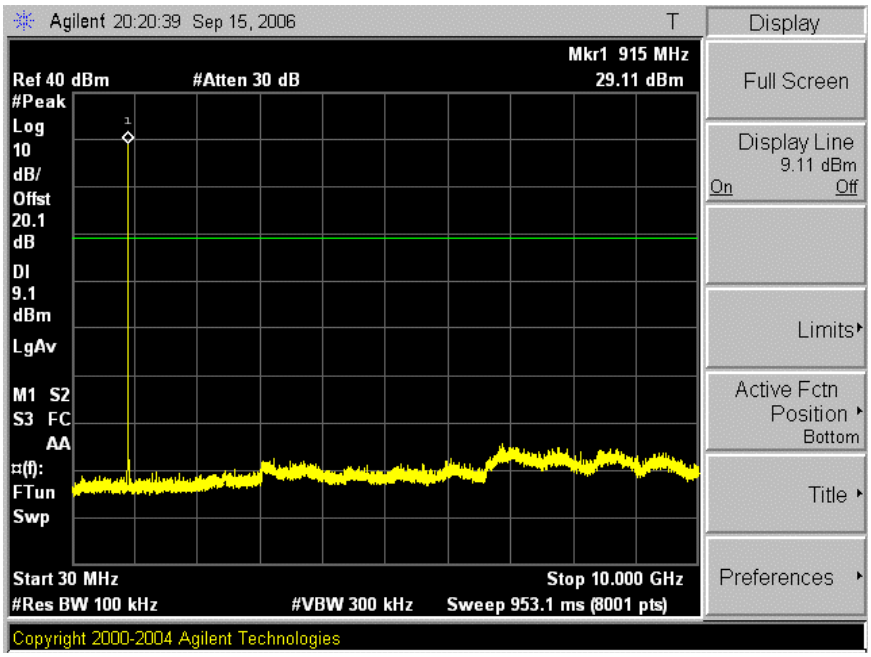


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

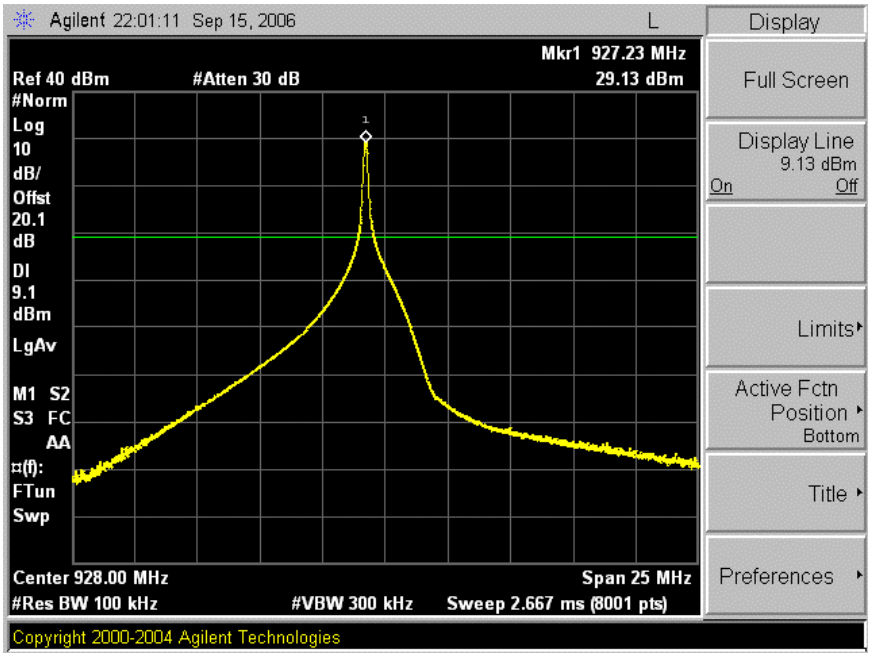


MID CHANNEL SPURIOUS

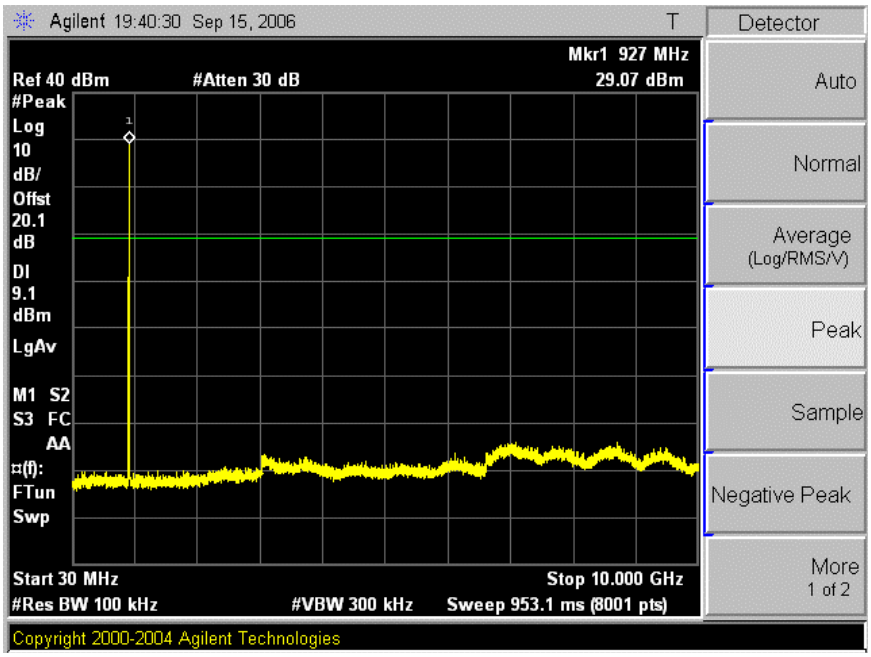


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

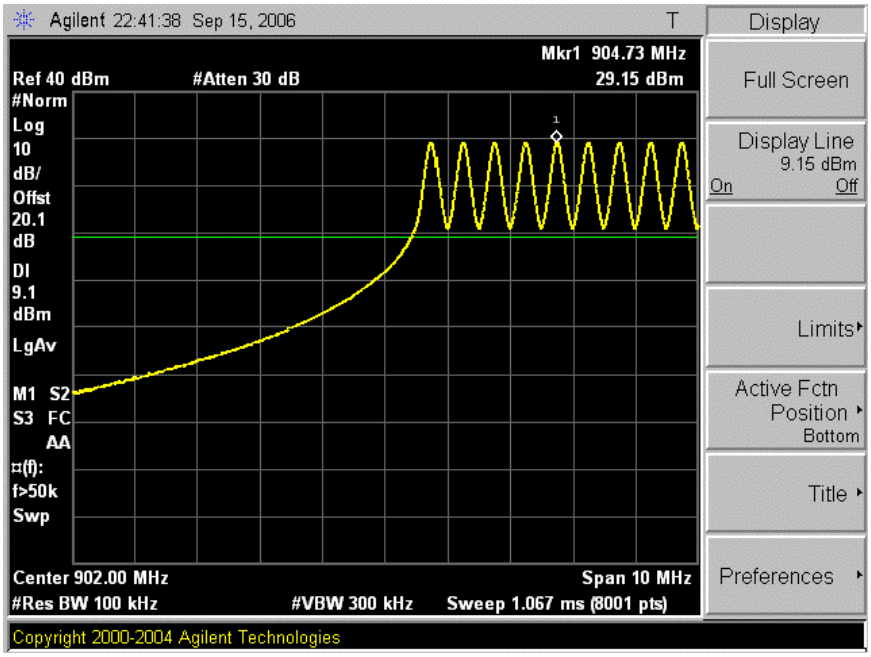


HIGH CHANNEL SPURIOUS

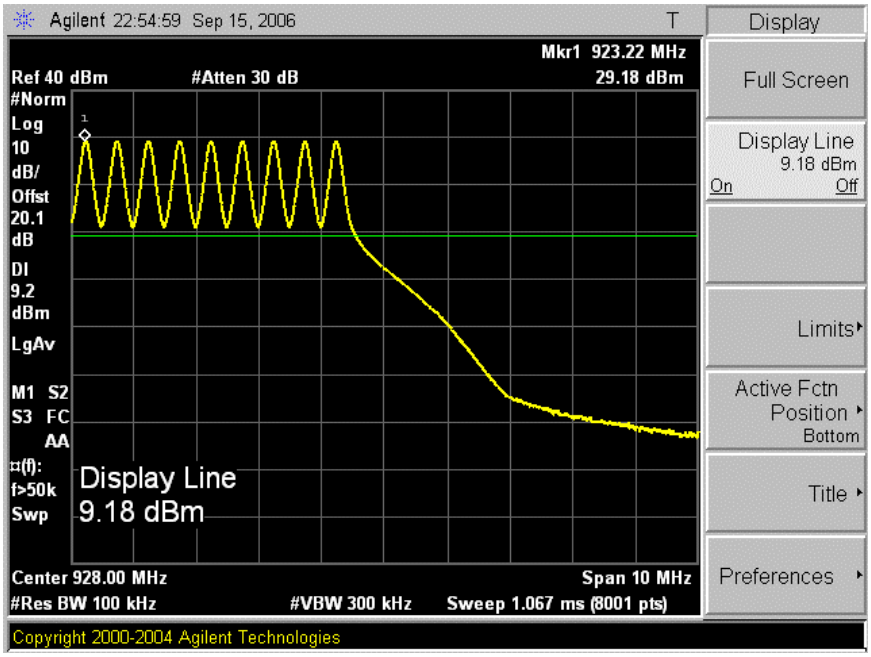


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



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 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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.

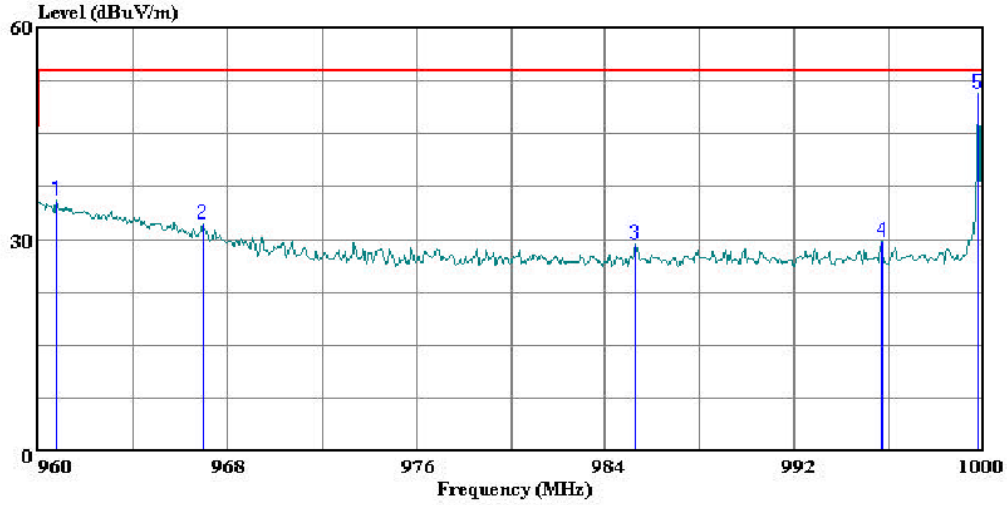
7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE THE FUNDAMENTAL – PATCH ANTENNA

RESTRICTED BANDEDGE – HORIZONTAL

HORIZONTAL DATA

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

Data#: 54 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 20:54:32



(Audix ATC)

Trace: 53 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Patch Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: High Channel

Page: 1

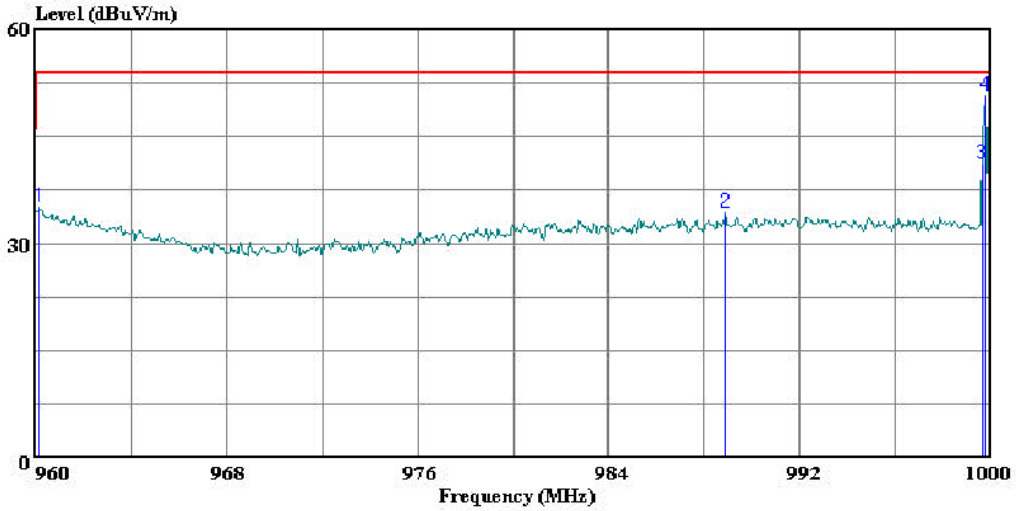
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	960.760	8.99	26.58	35.57	54.00	-18.43	Peak
2	966.960	5.61	26.64	32.25	54.00	-21.75	Peak
3	985.280	2.56	26.78	29.34	54.00	-24.66	Peak
4	995.680	2.74	26.92	29.66	54.00	-24.34	Peak
5	999.760	23.79	26.88	50.67	54.00	-3.33	Peak

RESTRICTED BANDEDGE – VERTICAL

VERTICAL DATA

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

Data#: 52 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 20:49:16



(Audix ATC)
Trace: 51 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Patch Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: High Channel

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	960.160	8.50	26.55	35.05	54.00	-18.95	Peak
2	988.880	7.43	26.86	34.29	54.00	-19.71	Peak
3	999.640	14.21	26.88	41.09	54.00	-12.91	Peak
4	999.760	23.75	26.88	50.63	54.00	-3.37	Peak

HARMONICS AND SPURIOUS EMISSIONS

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

Company: AWID
Project #: 06U10609
Date: 10/12.2006
Test Engineer: Mengistu Mekuria
Configuration: EUT With Patch Antenna
Mode: Tx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-	Horn > 18GHz
T136; M/N: 3117 @3m	T144 Miteq 3008A00931		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Joseph 187207005		Gordon 203134001	HPF_1.5GHz	

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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (902.75MHz)															
2.708	3.0	45.7	45.7	32.1	2.4	-37.4	0.0	0.6	43.3	43.3	74	54	-30.7	-10.7	V
3.610	3.0	54.2	49.8	32.9	2.7	-36.9	0.0	0.6	53.4	49.1	74	54	-20.6	-4.9	V
4.513	3.0	48.6	48.6	33.5	3.0	-36.5	0.0	0.6	49.2	49.2	74	54	-24.8	-4.8	V
5.416	3.0	45.1	45.1	34.2	3.3	-36.3	0.0	0.5	46.8	46.8	74	54	-27.2	-7.2	V
9.027	3.0	47.1	47.1	35.7	3.9	-36.7	0.0	0.7	50.8	50.8	74	54	-23.2	-3.2	V
2.708	3.0	51.9	51.9	32.1	2.4	-37.4	0.0	0.6	49.5	49.5	74	54	-24.5	-4.5	H
3.610	3.0	55.3	51.7	32.9	2.7	-36.9	0.0	0.6	54.5	51.0	74	54	-19.5	-3.0	H
4.513	3.0	48.8	48.8	33.5	3.0	-36.5	0.0	0.6	49.4	49.4	74	54	-24.6	-4.6	H
5.416	3.0	45.5	45.5	34.2	3.3	-36.3	0.0	0.5	47.2	47.2	74	54	-26.8	-6.8	H
9.027	3.0	47.6	40.9	35.7	3.9	-36.7	0.0	0.7	51.3	44.6	74	54	-22.7	-9.4	H
Mid Channel (914.75MHz)															
2.744	3.0	49.9	49.9	32.1	2.4	-37.4	0.0	0.6	47.6	47.6	74	54	-26.4	-6.4	V
3.658	3.0	53.7	48.7	32.9	2.7	-36.9	0.0	0.6	53.0	48.0	74	54	-21.0	-6.0	V
4.573	3.0	48.4	48.4	33.6	3.0	-36.5	0.0	0.6	49.0	49.0	74	54	-25.0	-5.0	V
9.147	3.0	46.8	46.8	35.8	3.9	-36.7	0.0	0.7	50.5	50.5	74	54	-23.5	-3.5	V
2.744	3.0	52.5	52.5	32.1	2.4	-37.4	0.0	0.6	50.2	50.2	74	54	-23.8	-3.8	H
3.658	3.0	50.9	50.9	32.9	2.7	-36.9	0.0	0.6	50.2	50.2	74	54	-23.8	-3.8	H
4.573	3.0	50.3	50.3	33.6	3.0	-36.5	0.0	0.6	50.9	50.9	74	54	-23.1	-3.1	H
9.147	3.0	49.1	43.4	35.8	3.9	-36.7	0.0	0.7	52.9	47.2	74	54	-21.1	-6.8	H
High Channel (927.25MHz)															
2.781	3.0	48.7	48.7	32.1	2.4	-37.4	0.0	0.6	46.4	46.4	74	54	-27.6	-7.6	V
3.709	3.0	57.5	54.4	32.9	2.7	-36.8	0.0	0.6	56.9	53.8	74	54	-17.1	-0.2	V
4.636	3.0	47.4	47.4	33.6	3.0	-36.5	0.0	0.6	48.1	48.1	74	54	-25.9	-5.9	V
8.345	3.0	45.2	45.2	35.5	3.7	-36.4	0.0	0.7	48.8	48.8	74	54	-25.2	-5.2	V
2.781	3.0	51.5	51.5	32.1	2.4	-37.4	0.0	0.6	49.2	49.2	74	54	-24.8	-4.8	H
3.709	3.0	56.7	54.2	32.9	2.7	-36.8	0.0	0.6	56.1	53.6	74	54	-17.9	-0.4	H
4.636	3.0	47.9	47.9	33.6	3.0	-36.5	0.0	0.6	48.6	48.6	74	54	-25.4	-5.4	H
8.345	3.0	45.3	45.3	35.5	3.7	-36.4	0.0	0.7	48.9	48.9	74	54	-25.1	-5.1	H
Note: No other emission were observed above noise floor															
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		

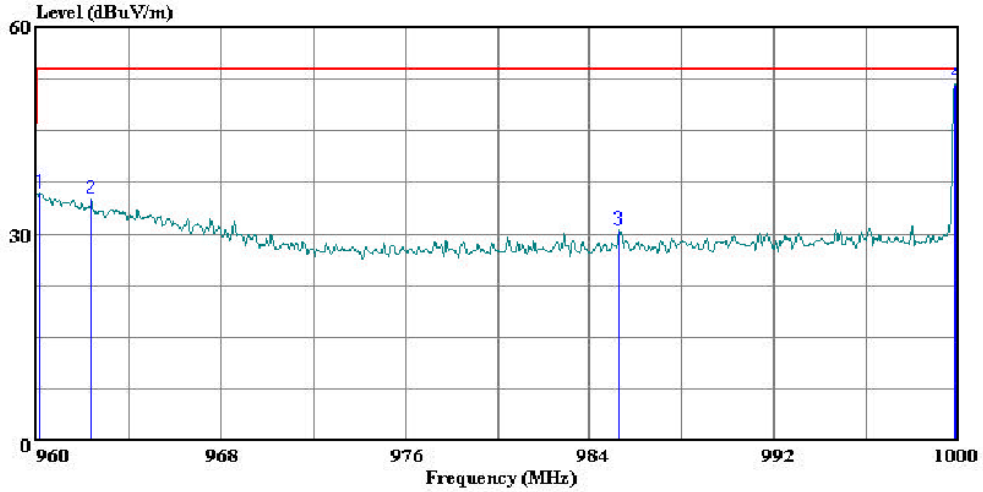
7.2.3. TRANSMITTER RADIATED EMISSIONS ABOVE THE FUNDAMENTAL – DIPOLE ANTENNA

RESTRICTED BANDEDGE - HORIZONTAL

HORIZONTAL DATA

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

Data#: 14 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 12:17:00



Trace: 13 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Y-pos Dipole Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: High Ch

Page: 1

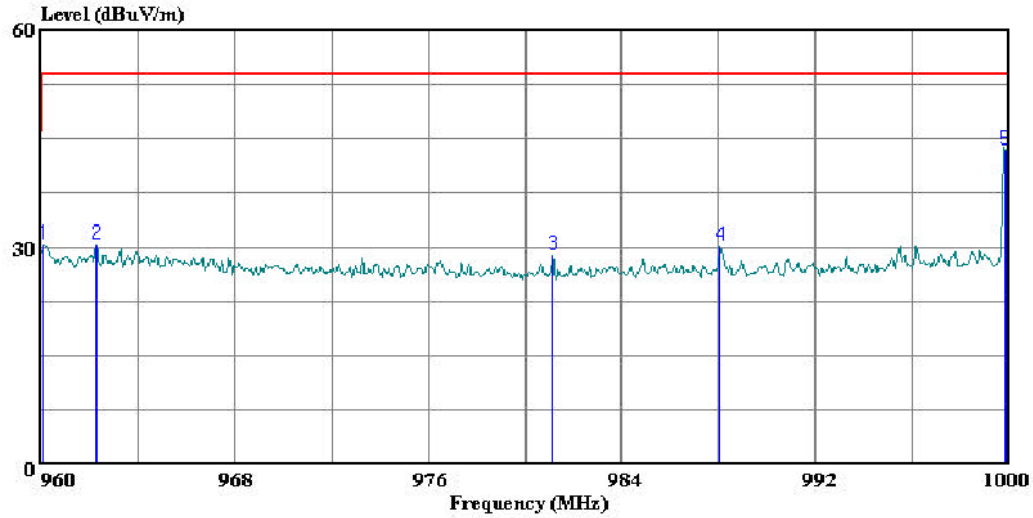
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	960.160	9.45	26.55	36.00	54.00	-18.00	Peak
2	962.360	8.50	26.60	35.11	54.00	-18.89	Peak
3	985.280	3.66	26.78	30.44	54.00	-23.56	Peak
4	999.880	24.80	26.88	51.68	54.00	-2.32	Peak

RESTRICTED BANDEDGE – VERTICAL

VERTICAL DATA

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

Data#: 16 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 12:22:21



(Audix ATC)

Trace: 15 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Y-pos Dipole Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: High Ch

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	960.080	3.85	26.54	30.39	54.00	-23.61	Peak
2	962.280	3.68	26.60	30.28	54.00	-23.72	Peak
3	981.160	2.20	26.74	28.94	54.00	-25.06	Peak
4	988.080	3.27	26.83	30.10	54.00	-23.90	Peak
5	999.840	16.48	26.88	43.36	54.00	-10.64	Peak

HARMONICS AND SPURIOUS EMISSIONS

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

Company: AWID
Project #: 06U10609
Date: 10/12.2006
Test Engineer: Mengistu Mekuria
Configuration: EUT With Dipole Antenna
Mode: Tx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-	Pre-amplifer 26-	Horn > 18GHz
T136; M/N: 3117 @3m	T144 Miteq 3008A00931		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Joseph 187207005		Gordon 203134001	HPF_1.5GHz	

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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (902.75MHz)															
2.708	3.0	47.2	47.2	32.1	2.4	-37.4	0.0	0.6	44.8	44.8	74	54	-29.2	-9.2	V
3.610	3.0	44.3	44.3	32.9	2.7	-36.9	0.0	0.6	43.5	43.5	74	54	-30.5	-10.5	V
4.513	3.0	48.1	48.1	33.5	3.0	-36.5	0.0	0.6	48.6	48.6	74	54	-25.4	-5.4	V
5.416	3.0	44.7	44.7	34.2	3.3	-36.3	0.0	0.5	46.4	46.4	74	54	-27.6	-7.6	V
9.028	3.0	47.3	47.3	35.7	3.9	-36.7	0.0	0.7	51.0	51.0	74	54	-23.0	-3.0	V
2.708	3.0	51.7	51.7	32.1	2.4	-37.4	0.0	0.6	49.4	49.4	74	54	-24.6	-4.6	H
3.610	3.0	47.8	47.8	32.9	2.7	-36.9	0.0	0.6	47.0	47.0	74	54	-27.0	-7.0	H
4.513	3.0	50.7	50.7	33.5	3.0	-36.5	0.0	0.6	51.3	51.3	74	54	-22.7	-2.7	H
5.416	3.0	45.0	45.0	34.2	3.3	-36.3	0.0	0.5	46.7	46.7	74	54	-27.3	-7.3	H
Mid Channel (914.75MHz)															
2.744	3.0	51.9	51.9	32.1	2.4	-37.4	0.0	0.6	49.5	49.5	74	54	-24.5	-4.5	H
3.658	3.0	46.7	46.7	32.9	2.7	-36.9	0.0	0.6	46.0	46.0	74	54	-28.0	-8.0	H
4.573	3.0	48.5	48.5	33.6	3.0	-36.5	0.0	0.6	49.1	49.1	74	54	-24.9	-4.9	H
9.147	3.0	49.3	40.4	35.8	3.9	-36.7	0.0	0.7	53.1	44.2	74	54	-20.9	-9.8	H
2.744	3.0	50.1	50.1	32.1	2.4	-37.4	0.0	0.6	47.7	47.7	74	54	-26.3	-6.3	V
3.658	3.0	46.9	46.9	32.9	2.7	-36.9	0.0	0.6	46.2	46.2	74	54	-27.8	-7.8	V
4.573	3.0	48.6	48.6	33.6	3.0	-36.5	0.0	0.6	49.3	49.3	74	54	-24.7	-4.7	V
9.147	3.0	46.6	46.6	35.8	3.9	-36.7	0.0	0.7	50.3	50.3	74	54	-23.7	-3.7	V
High Channel (927.25MHz)															
2.781	3.0	48.8	48.8	32.1	2.4	-37.4	0.0	0.6	46.6	46.6	74	54	-27.4	-7.4	V
3.709	3.0	54.5	51.4	32.9	2.7	-36.8	0.0	0.6	53.9	50.8	74	54	-20.1	-3.2	V
4.636	3.0	47.1	47.1	33.6	3.0	-36.5	0.0	0.6	47.8	47.8	74	54	-26.2	-6.2	V
7.417	3.0	45.2	45.2	35.3	3.5	-36.2	0.0	0.6	48.4	48.4	74	54	-25.6	-5.6	V
8.345	3.0	46.4	46.4	35.5	3.7	-36.4	0.0	0.7	49.9	49.9	74	54	-24.1	-4.1	V
2.781	3.0	47.2	47.2	32.1	2.4	-37.4	0.0	0.6	45.0	45.0	74	54	-29.0	-9.0	H
3.709	3.0	49.0	49.0	32.9	2.7	-36.8	0.0	0.6	48.4	48.4	74	54	-25.6	-5.6	H
4.636	3.0	46.3	46.3	33.6	3.0	-36.5	0.0	0.6	47.0	47.0	74	54	-27.0	-7.0	H
7.417	3.0	45.0	45.0	35.3	3.5	-36.2	0.0	0.6	48.1	48.1	74	54	-25.9	-5.9	H
8.345	3.0	46.1	46.1	35.5	3.7	-36.4	0.0	0.7	49.7	49.7	74	54	-24.3	-4.3	H
Note: No other emission were observed above noise floor															
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		

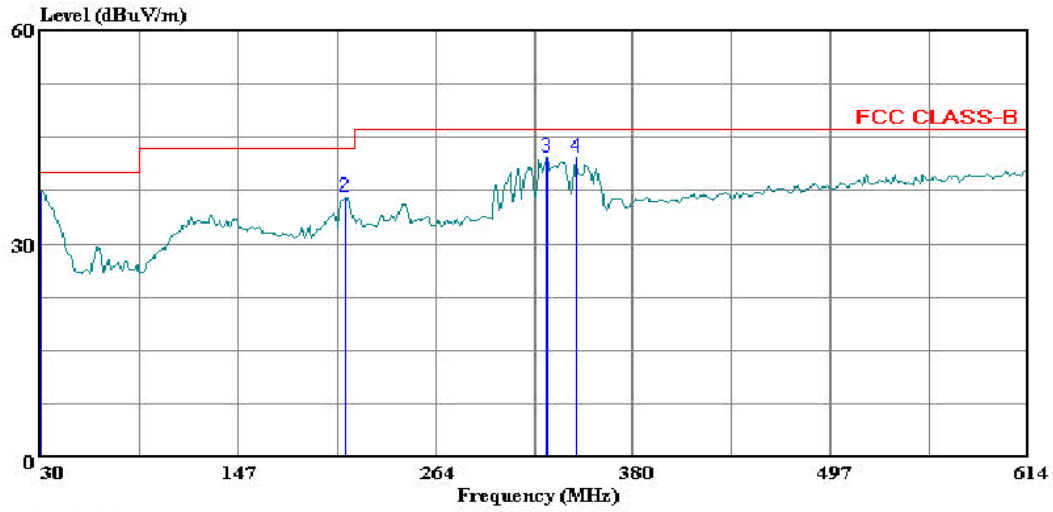
7.2.4. WORST-CASE RADIATED EMISSIONS BELOW THE FUNDAMENTAL – PATCH ANTENNA

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL DATA

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 46 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 20:04:13



(Audix ATC)

Trace: 44 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Patch Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: Low Channel

Page: 1

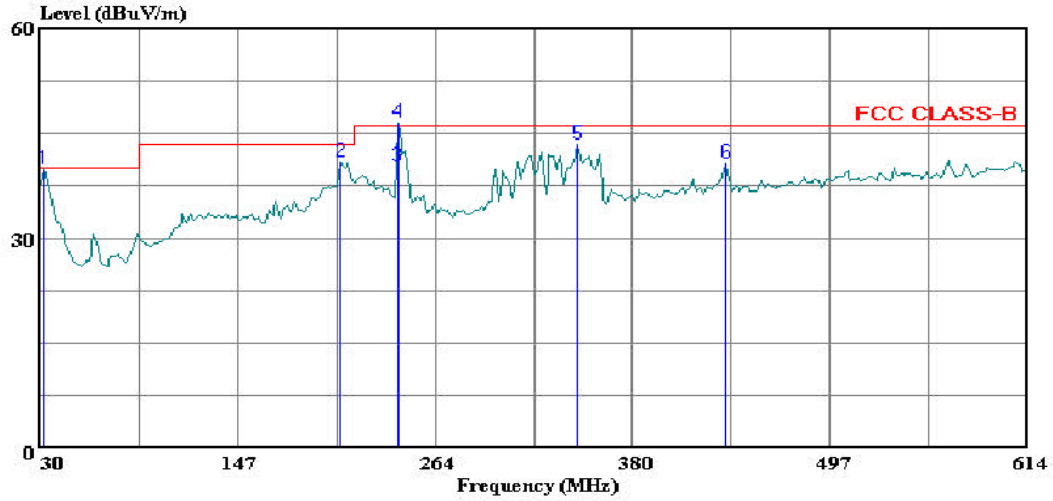
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	17.00	20.45	37.45	40.00	-2.55	Peak
2	210.200	23.35	13.11	36.46	43.50	-7.04	Peak
3	329.200	25.66	16.40	42.06	46.00	-3.94	Peak
4	346.200	25.30	16.83	42.13	46.00	-3.87	Peak

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL DATA

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

Data#: 50 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 20:12:32



(Audix ATC)

Trace: 47 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Patch Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: Low Channel

Page: 1

		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		31.700	19.91	19.99	39.90	40.00	-0.10	Peak
2		207.650	27.55	13.40	40.95	43.50	-2.55	Peak
3		241.650	26.70	13.58	40.28	46.00	-5.72	QP
4	*	241.650	33.02	13.58	46.60	46.00	0.60	Peak
5		347.900	26.55	16.84	43.39	46.00	-2.61	Peak
6		435.450	21.75	18.86	40.61	46.00	-5.39	Peak

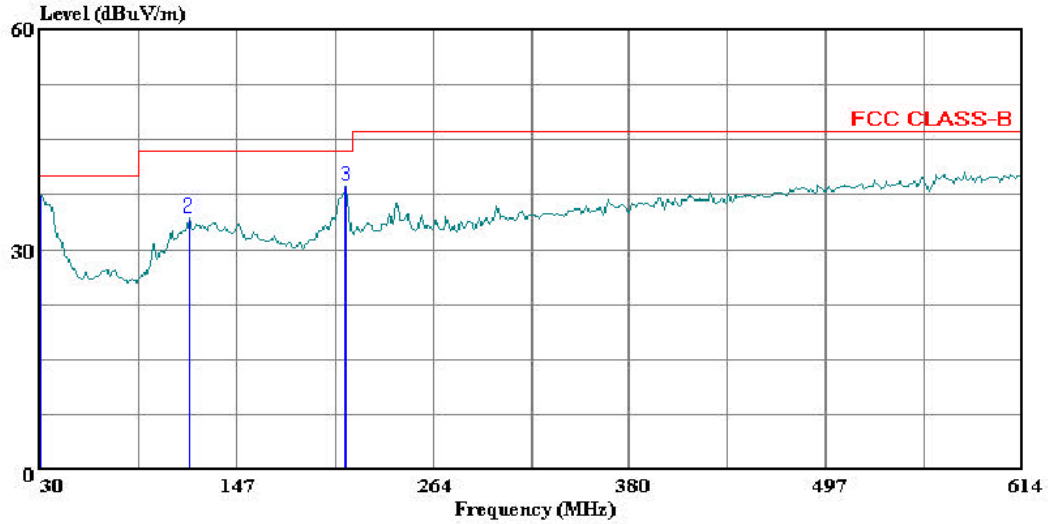
1. WORST-CASE RADIATED EMISSIONS BELOW THE FUNDAMENTAL – DIPOLE ANTENNA

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL DATA

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 66 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 18:39:20



(Audix ATC)

Trace: 37 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Y-pos Dipole Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: Low Channel

Page: 1

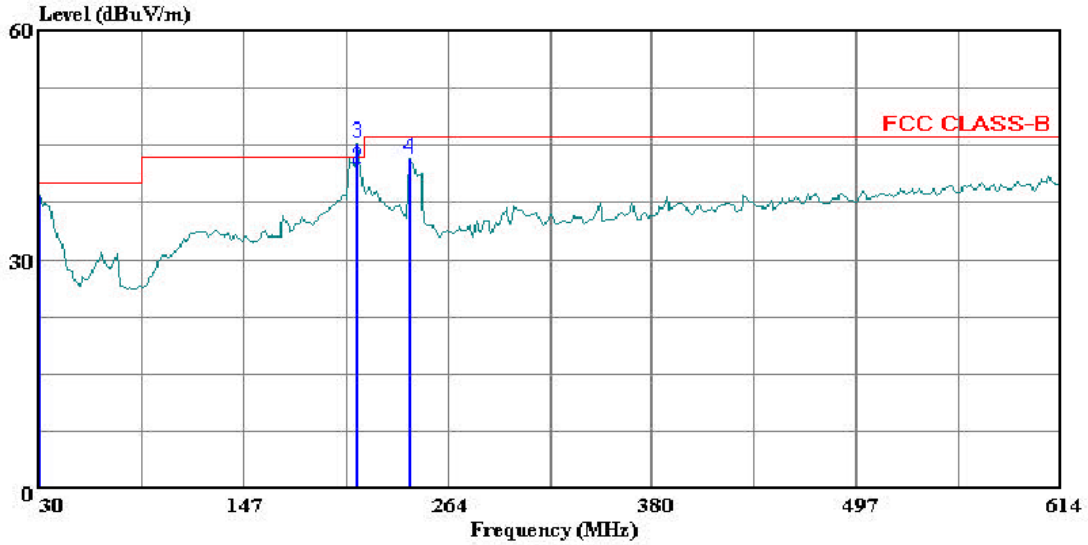
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	16.97	20.45	37.42	40.00	-2.58	Peak
2	118.400	19.27	14.97	34.24	43.50	-9.26	Peak
3	211.900	25.78	12.92	38.70	43.50	-4.80	Peak
4	654.750	19.55	22.43	41.97	46.00	-4.03	Peak

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL DATA

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

Data#: 65 File#: Awid 06U10609.EMI Date: 10-06-2006 Time: 16:56:22



(Audix ATC)

Trace: 34 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Company: : AWID
Project #: : 06U10609
Configuration:: EUT/Y-pos Dipole Antenna
Mode of Oper.:: TX
Target: : FCC Class B
: Low Channel

Page: 1

		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		30.000	17.87	20.45	38.32	40.00	-1.68	Peak
2		211.900	29.04	12.92	41.96	43.50	-1.54	QP
3	*	211.900	32.37	12.92	45.29	43.50	1.79	Peak
4		241.650	29.59	13.58	43.17	46.00	-2.83	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 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

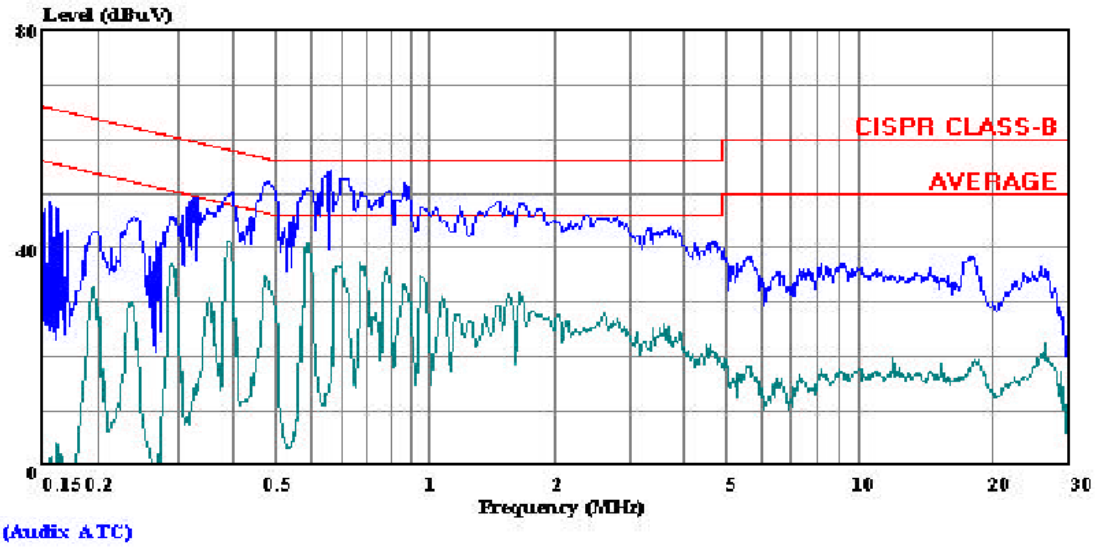
6 WORST EMISSIONS

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
0.48	52.42	--	34.92	0.00	56.36	46.36	-3.94	-11.44	L1
0.67	54.48	--	36.74	0.00	56.00	46.00	-1.52	-9.26	L1
0.70	52.80	--	37.34	0.00	56.00	46.00	-3.20	-8.66	L1
0.29	46.80	--	38.72	0.00	60.47	50.47	-13.67	-11.75	L2
0.39	50.64	--	38.10	0.00	58.13	48.13	-7.49	-10.03	L2
0.59	51.10	--	41.38	0.00	56.00	46.00	-4.90	-4.62	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 28 File#: .15-30MHz L1.EMI Date: 10-12-2006 Time: 17:22:15



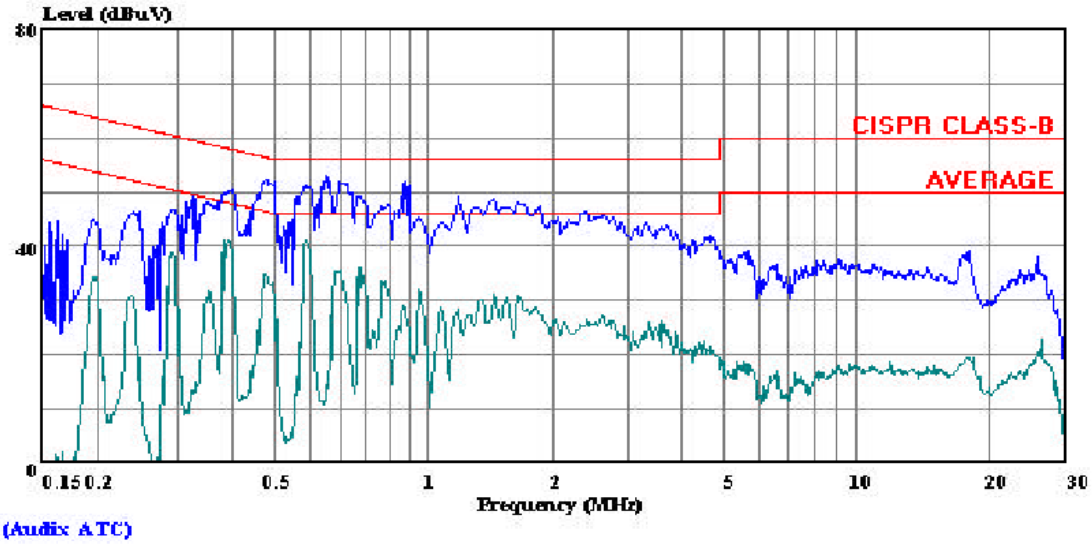
Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Mengistu Mekuria
Project # : 06U10606
Company : AWID
EUT configuration: EUTwith Patch Antenna
Mode of operation: TX Mode
Power Source : 115VAC/ 60Hz
: L1: Peak(Blue): Avg(Green)

LINE 2 RESULTS

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

Data#: 21 File#: .15-30MHz L1.EMI Date: 10-12-2006 Time: 17:06:37



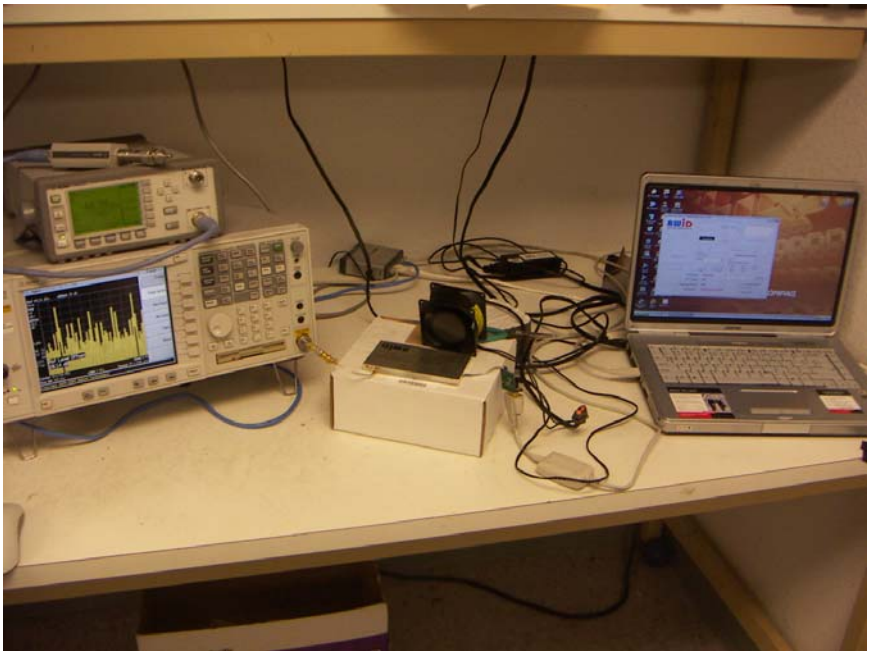
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Mengistu Mekuria
Project # : 06U10606
Company : AWID
EUT configuration: EUTwith Patch Antenna
Mode of operation: TX Mode
Power Source : 115VAC/ 60Hz
: L2: Peak(Blue): Avg(Green)

8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

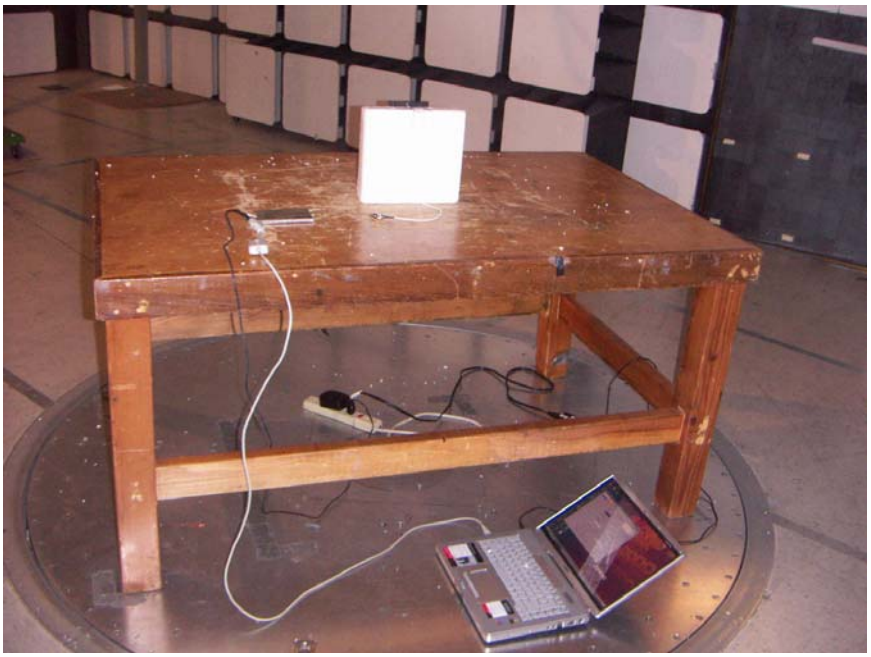
ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP WITH DIPOLE ANTENNA

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP WITH PATCH ANTENNA

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT