FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

UHF RFID READER MODULE

MODEL NUMBER: 2.7c1

FCC ID: OGSM27CA

REPORT NUMBER: 06U10496-1

ISSUE DATE: NOVEMBER 06, 2006

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

Prepared by
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LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/06/06	Initial Issue	MH

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 MODULE

MODEL: 2.7c1

SERIAL NUMBER: 01809

DATE TESTED: SEPTEMBER 18-OCTOBER 02, 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:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

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:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.11	29.17	30	-0.83
Middle	910.89	29.02	30	-0.98
High	917.17	28.89	30	-1.11

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 1.0.2336.14474

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

5.5. WORST-CASE MODE

Preliminary testing was performed to determine the worst-case mode. The modes evaluated were the EM, ePC C0, ePC C1, ePC V1.19, Gen 2, and ISO B modes. In our opinion preliminary testing of 99% bandwidth, 20 dB bandwidth, conducted bandedge and spurious with fixed L/M/H channels, and conducted bandedge with hopping on demonstrate that the ePC C1 mode is worst-case.

Therefore all final testing was performed in the ePC C1 mode.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Channel	Frequency (MHz)	Average Power (dBm)
Low	905.11	28.88
Middle	910.89	28.95
High	917.17	28.77

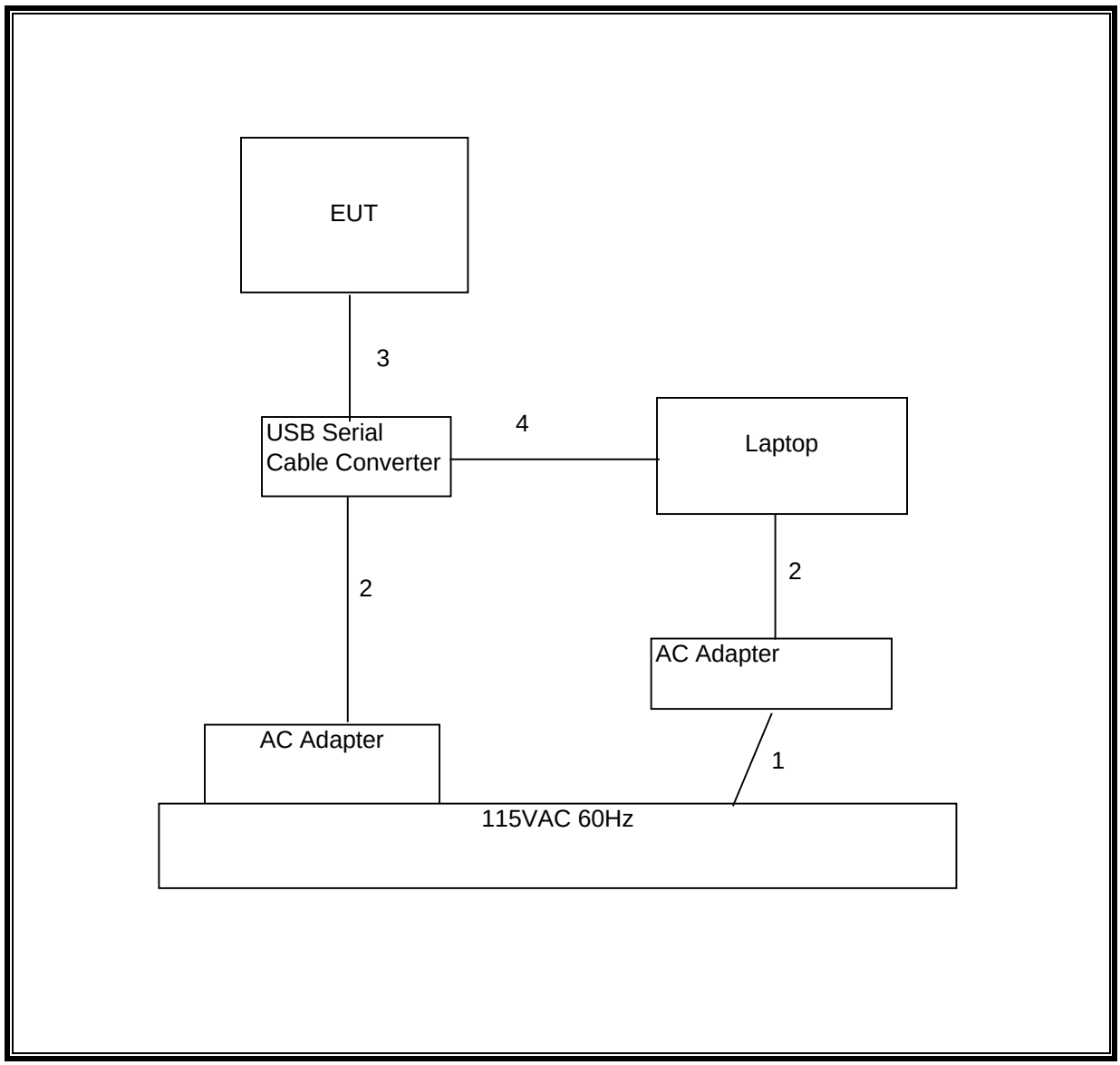
I/O CABLES

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	Serial	1	DB9	Un-shielded	1m	N/A
4	USB	1	USB	Un-shielded	1m	N/A

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**
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY45300064	12/19/2006
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/07
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/07
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/07
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/07
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	4/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/07
1.5GHz HPF	MicroTronic	HPM13193	2	CNR

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS

7.1.1. 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.

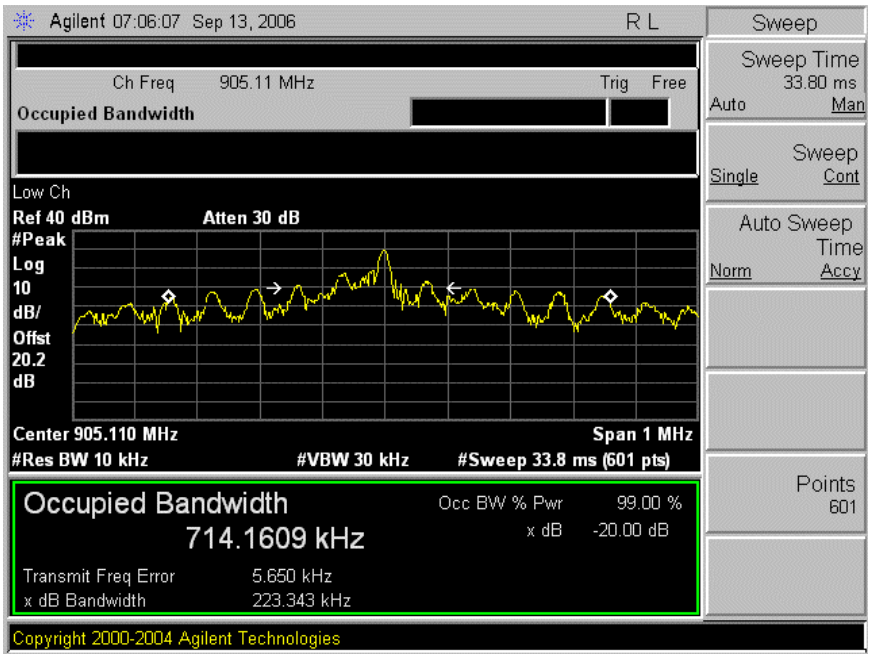
RESULTS

No non-compliance noted:

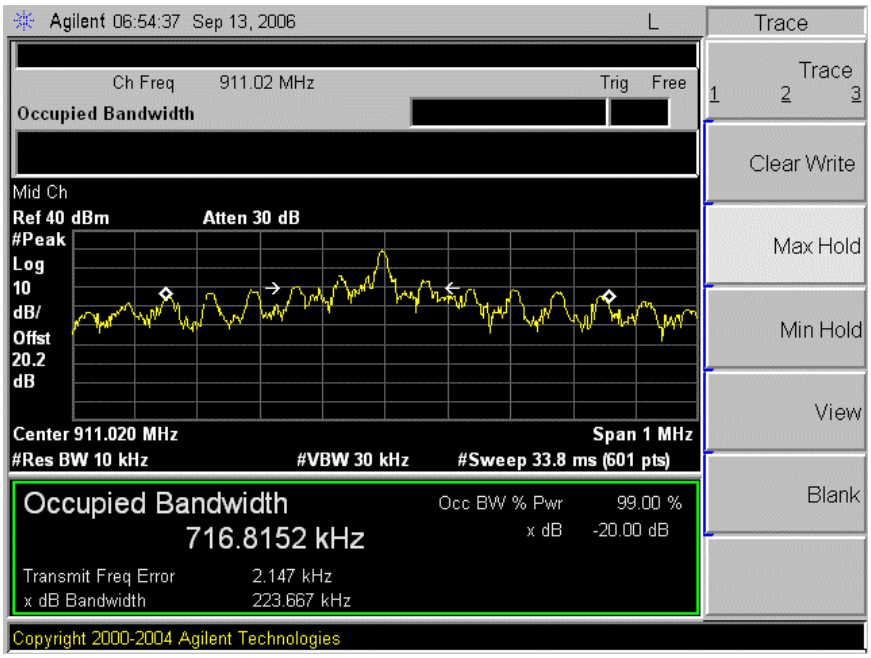
Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	905.11	714.1609
Middle	910.89	716.8152
High	907.17	723.5527

99% BANDWIDTH

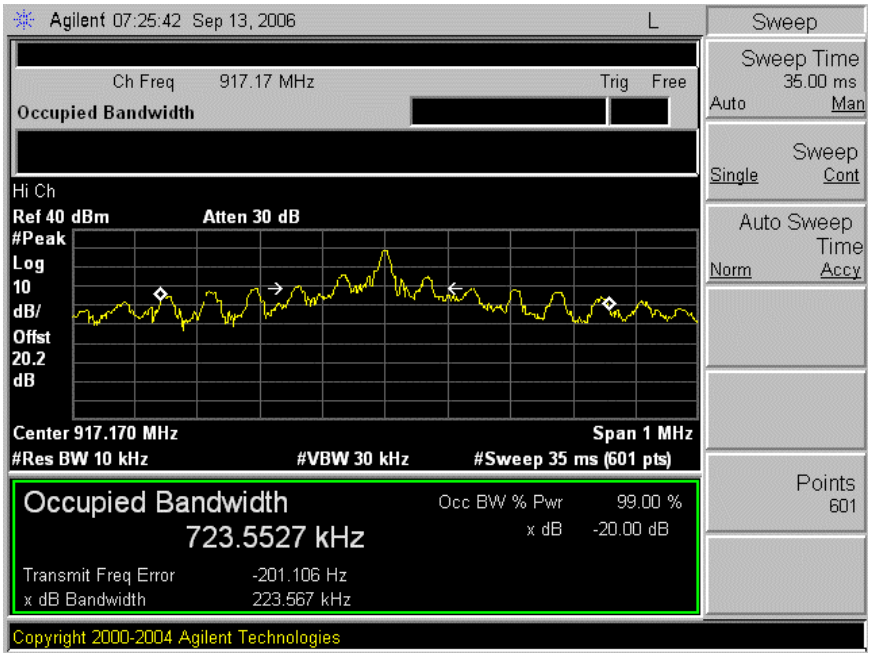
99% BANDWIDTH LOW CHANNEL



99% BANDWIDTH MID CHANNEL



99% BANDWIDTH HIGH CHANNEL



7.1.2. 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.

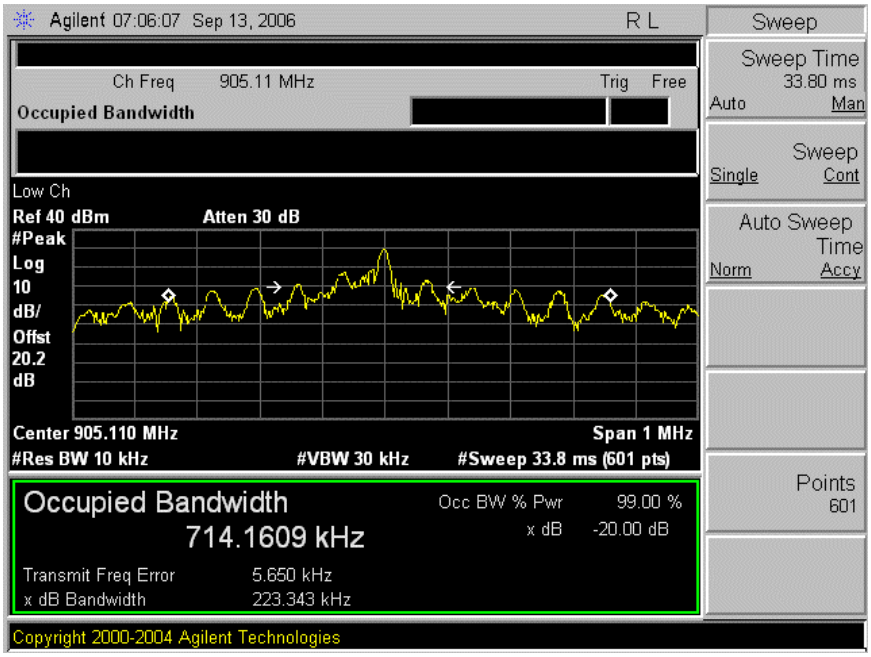
RESULTS

No non-compliance noted:

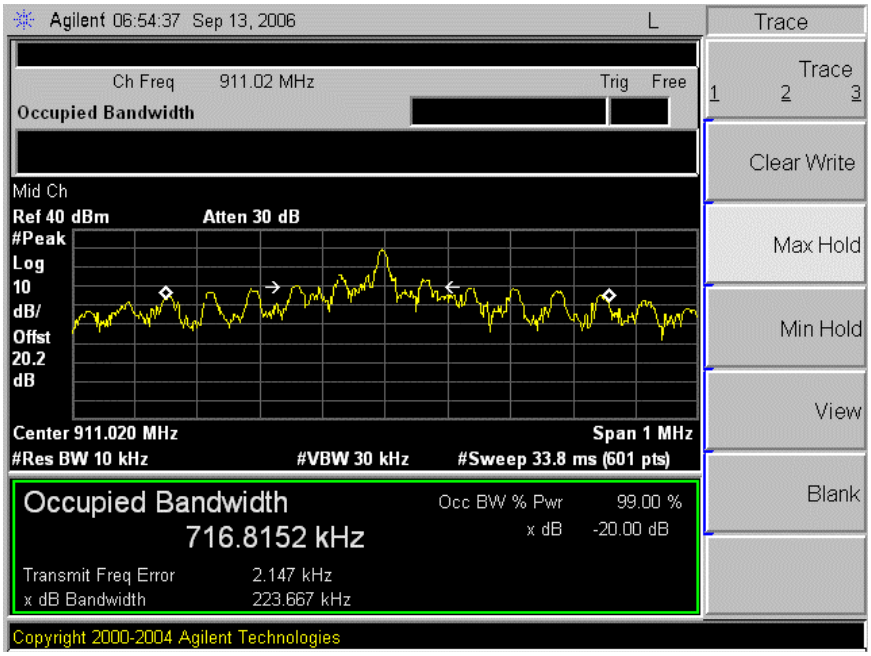
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
Low	905.11	223.343	500	276.7
Middle	911.02	223.667	500	276.3
High	917.17	223.567	500	276.4

20 dB BANDWIDTH

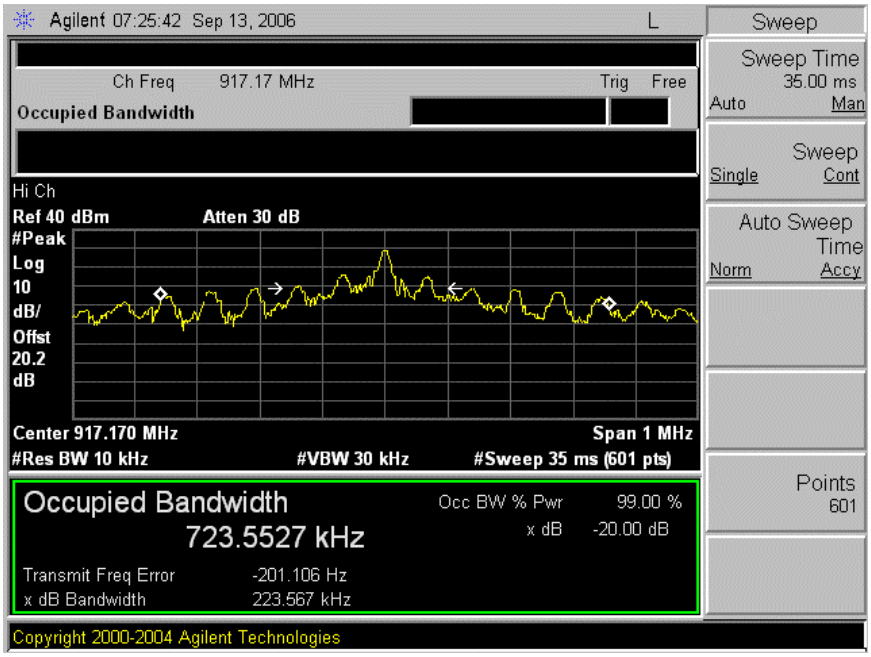
20 dB BANDWIDTH LOW CH



20 dB BANDWIDTH MID CH



20 dB BANDWIDTH HIGH CH



7.1.3. 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.

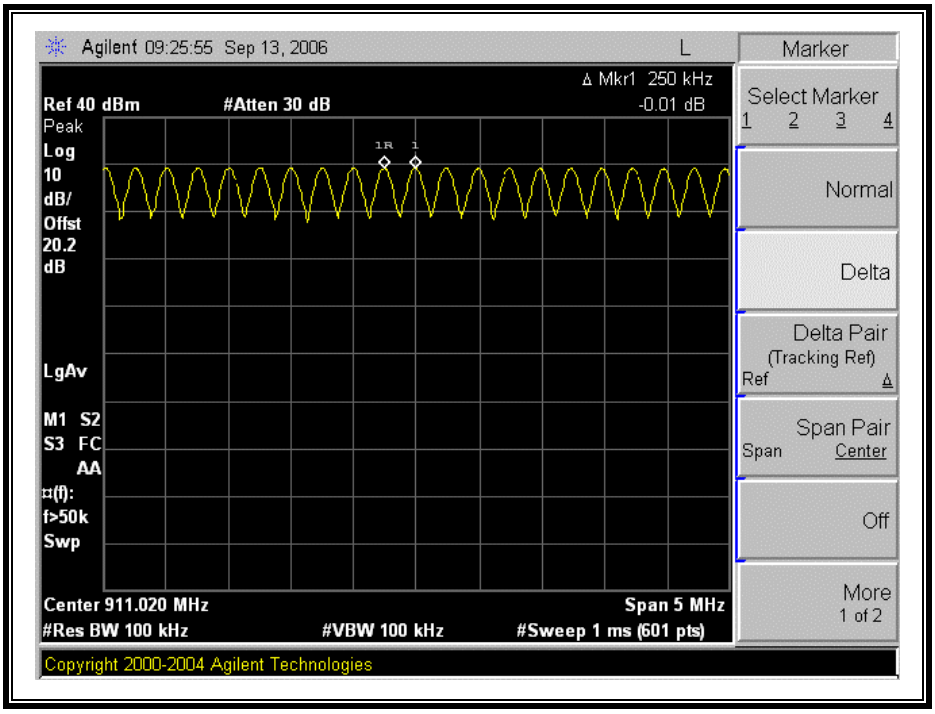
TEST PROCEDURE

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



7.1.4. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247 (a) (1) (i) For frequency hopping systems operating in the 902–928 MHz band: … 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.

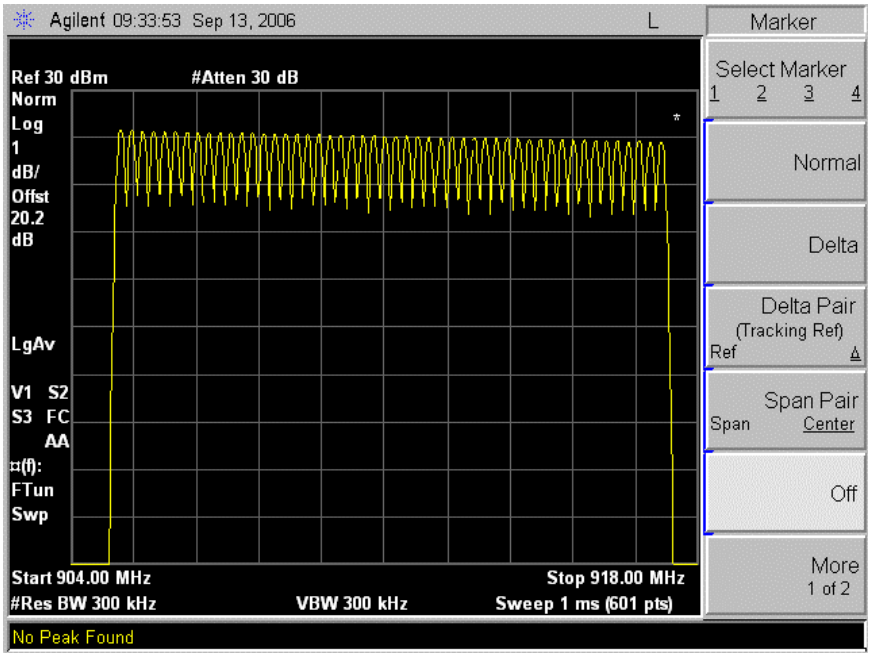
RESULTS

No non-compliance noted:

50 Channels observed.

NUMBER OF HOPPING CHANNELS

NUMBER OF HOPPING CHANNELS



7.1.5. 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 alower 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 reesult ov the above equation is multiplied by 4 to yield the Time of Occupancy during the specified 20 second period.

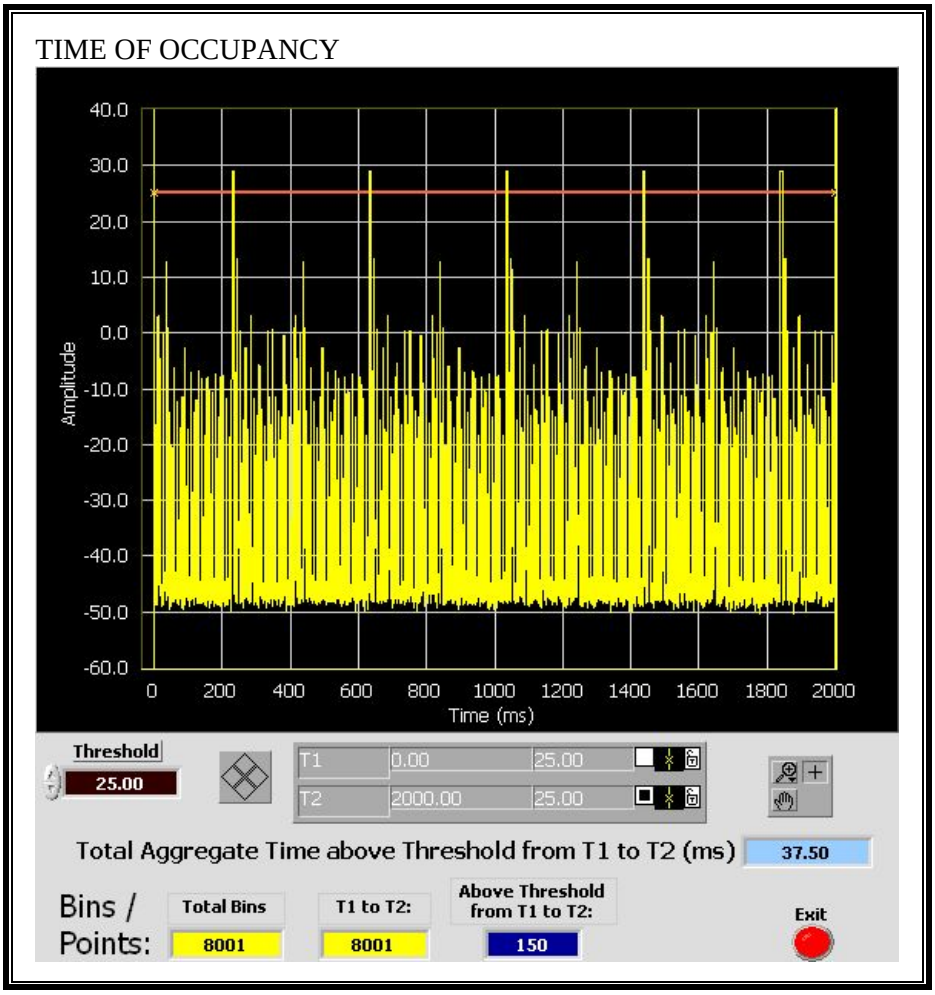
RESULTS

No non-compliance noted:

The sweep time is set to 2 seconds to provide adequate resolution in the time domain, then the reesult of the above equation is multiplied by 10 to yield the Time of Occupancy during the specified 20 second period.

Measured Aggregate Time (msec)	Factor	Time of Occupancy (msec)	Limit (msec)	Margin (msec)
37.5	10	375.00	400	-25.00

TIME OF OCCUPANCY



7.1.6. 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.

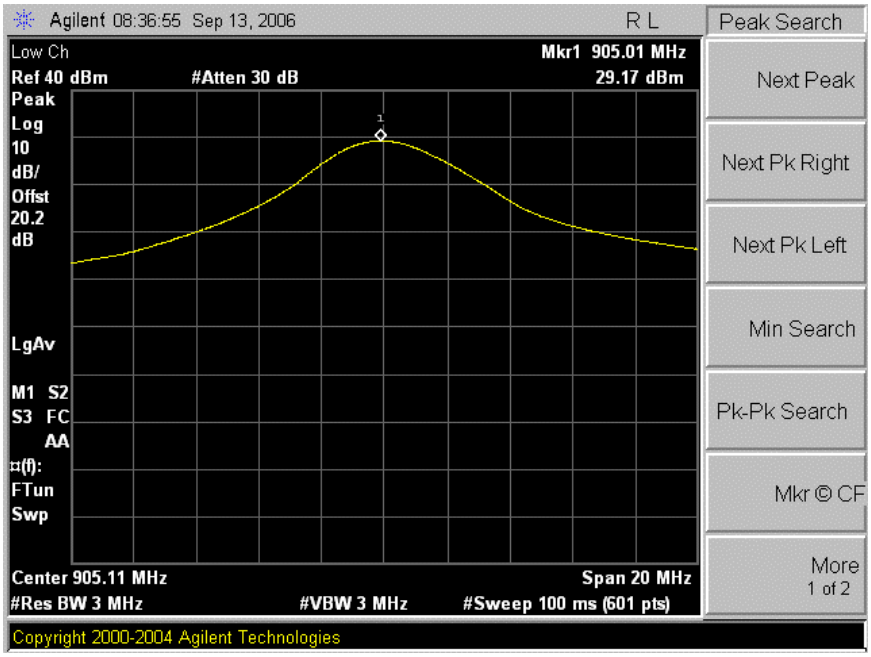
RESULTS

No non-compliance noted:

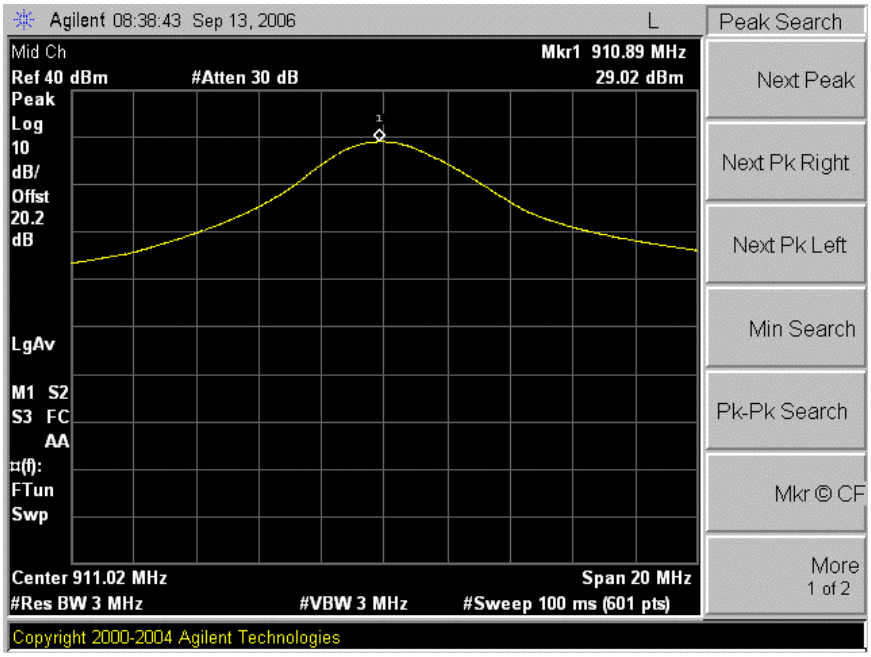
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.11	29.17	30	-0.83
Middle	910.89	29.02	30	-0.98
High	917.17	28.89	30	-1.11

OUTPUT POWER

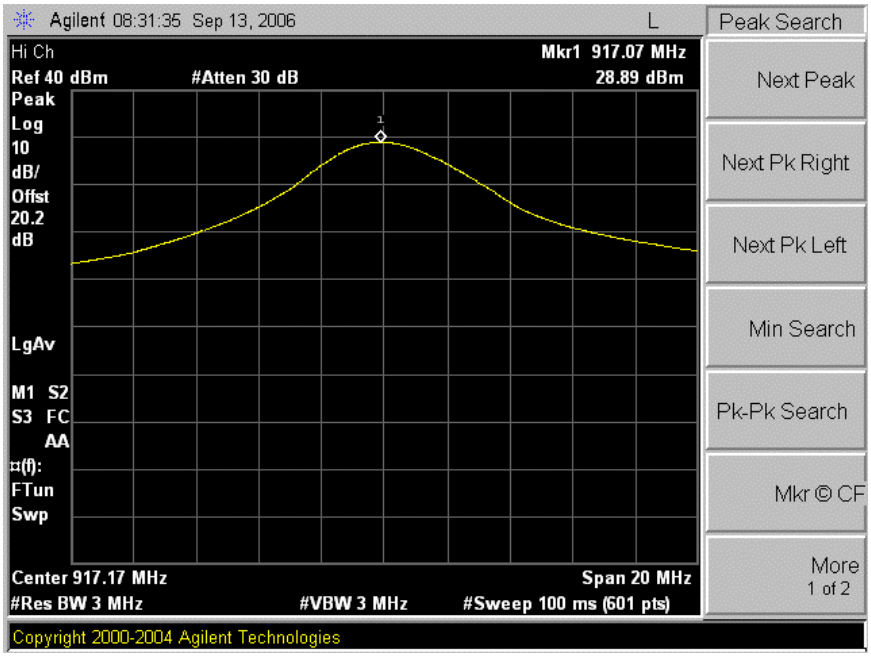
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



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	905.11	28.88
Middle	910.89	28.95
High	917.17	28.77

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^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 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 and
d (m) = d (cm) / 100

and substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (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^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: (MPE distance equals 20 cm)

MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
20.0	29.02	5.59	0.57

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.1.9. 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.

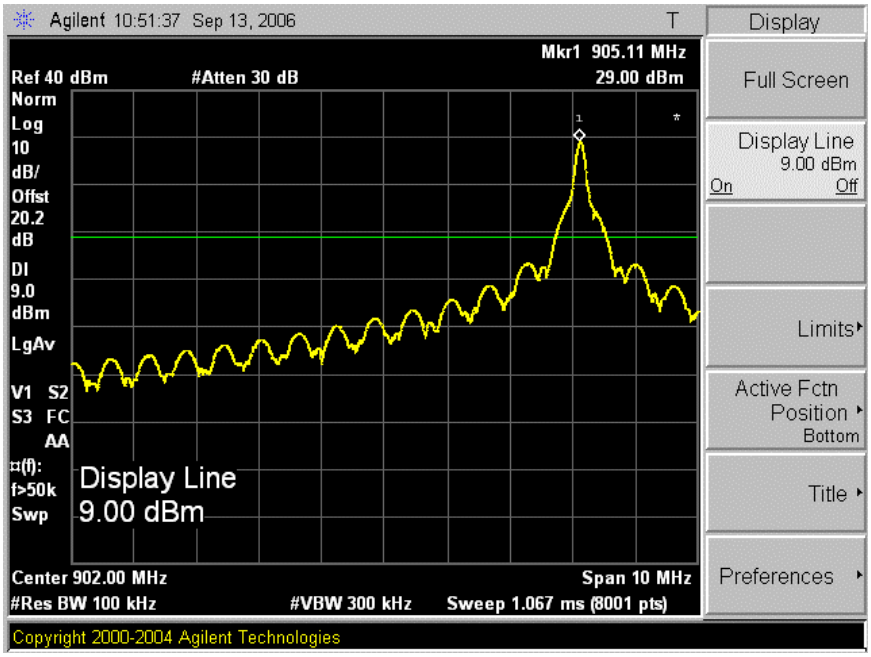
The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

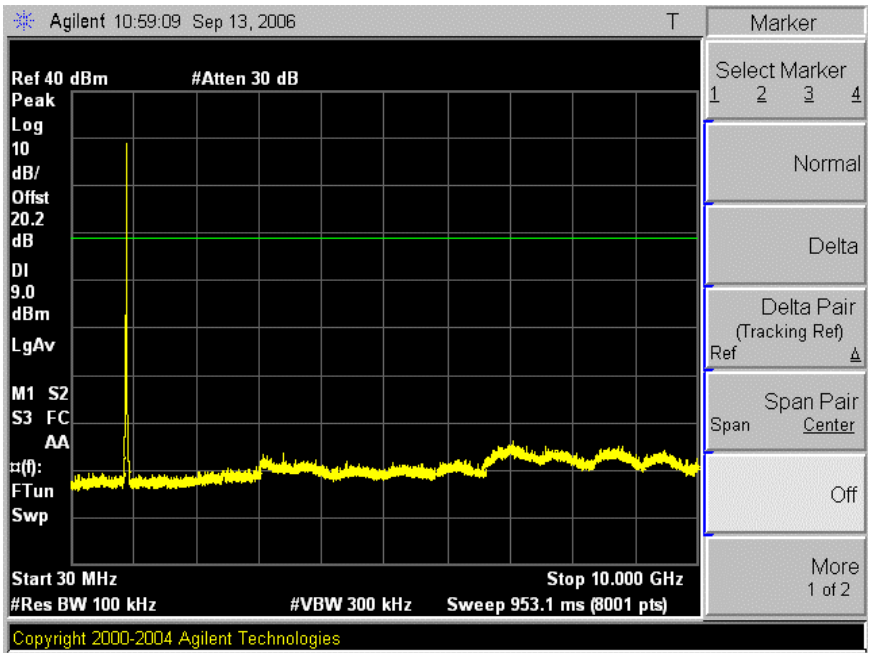
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

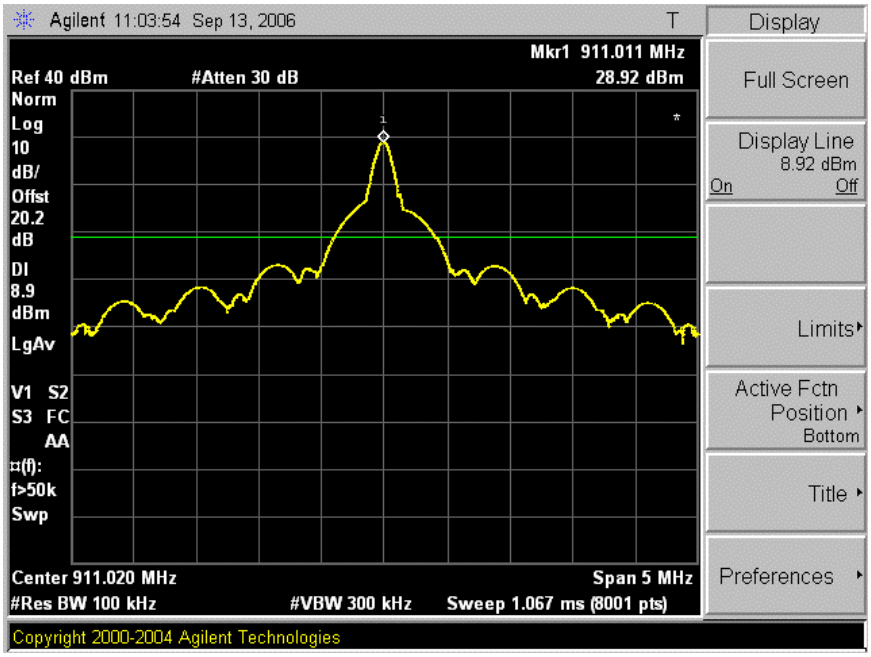


LOW CHANNEL SPURIOUS

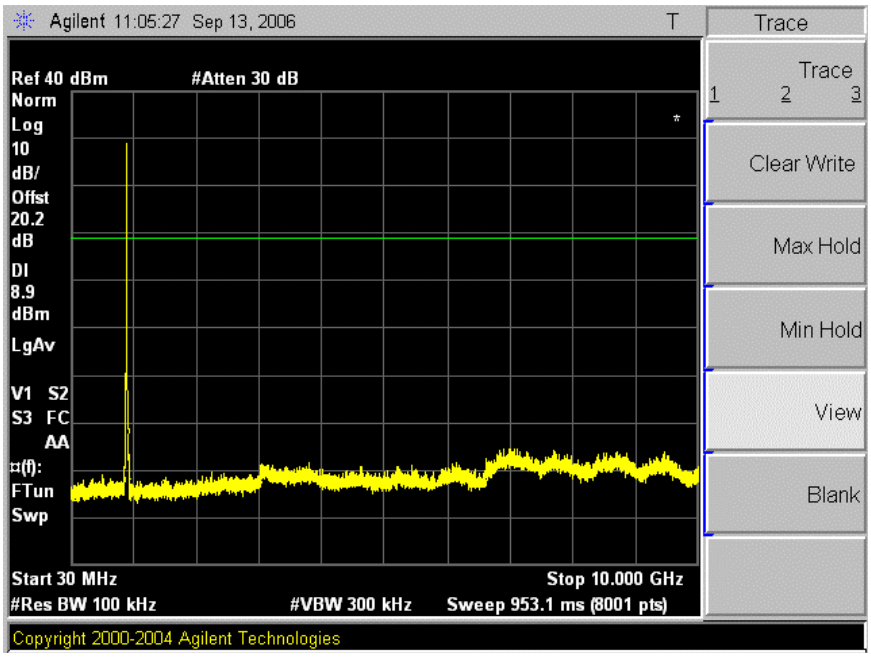


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

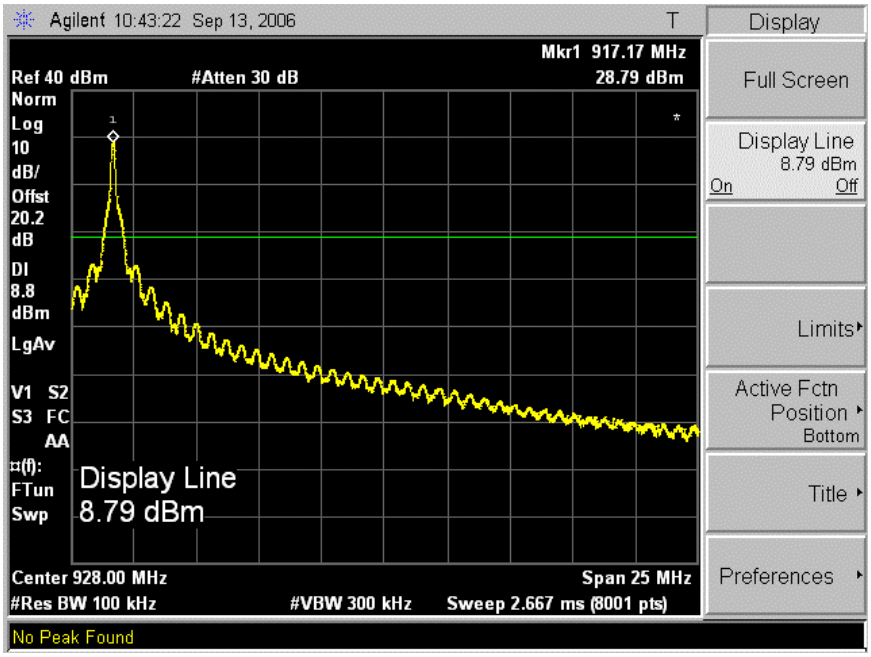


MID CHANNEL SPURIOUS

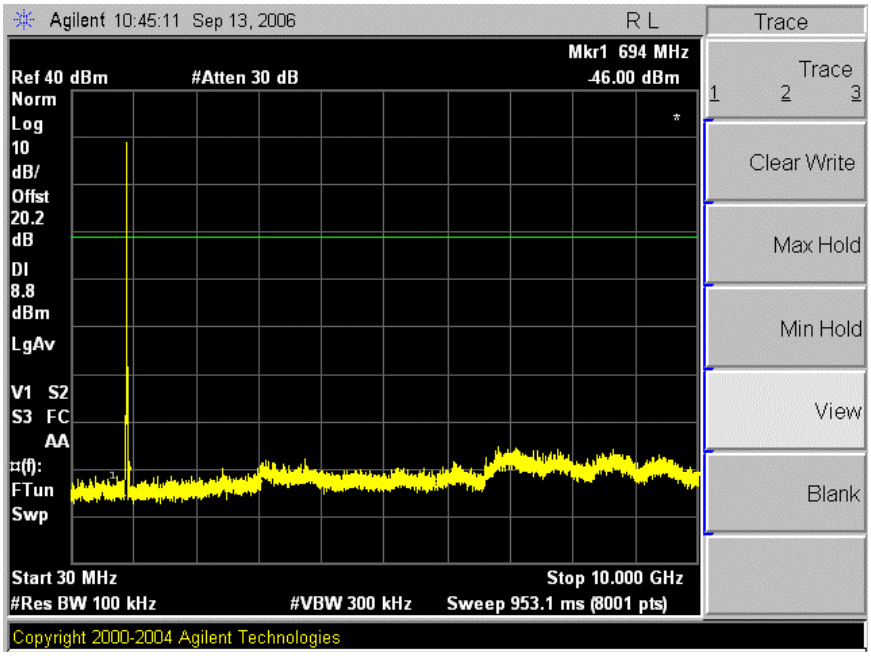


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

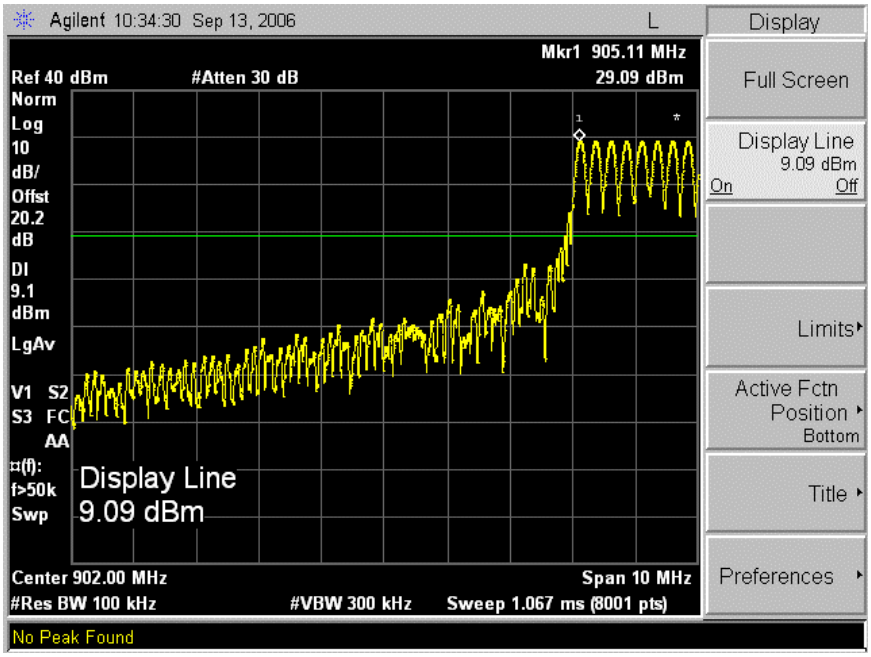


HIGH CHANNEL SPURIOUS

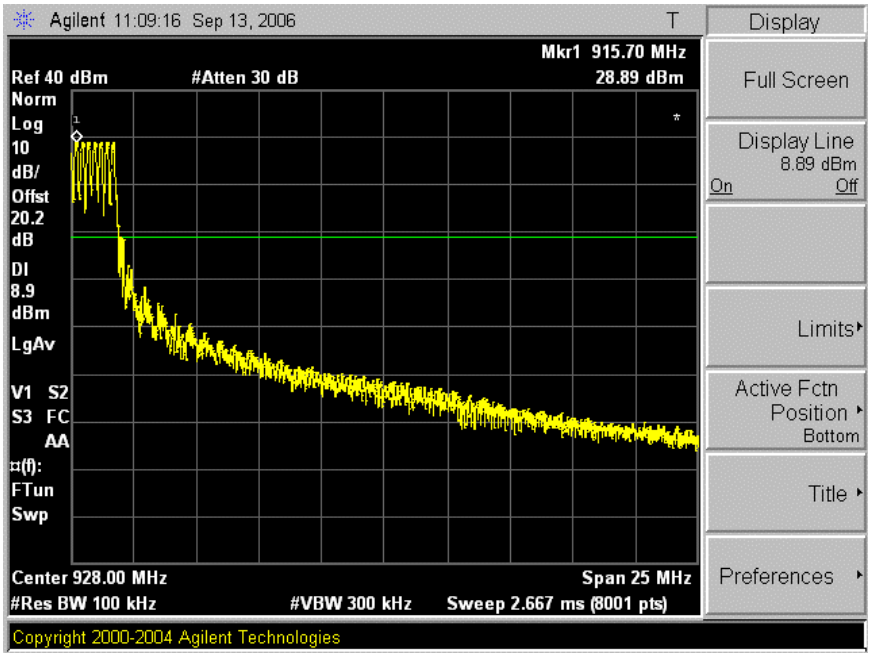


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.2. RADIATED EMISSIONS

7.2.1. 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.

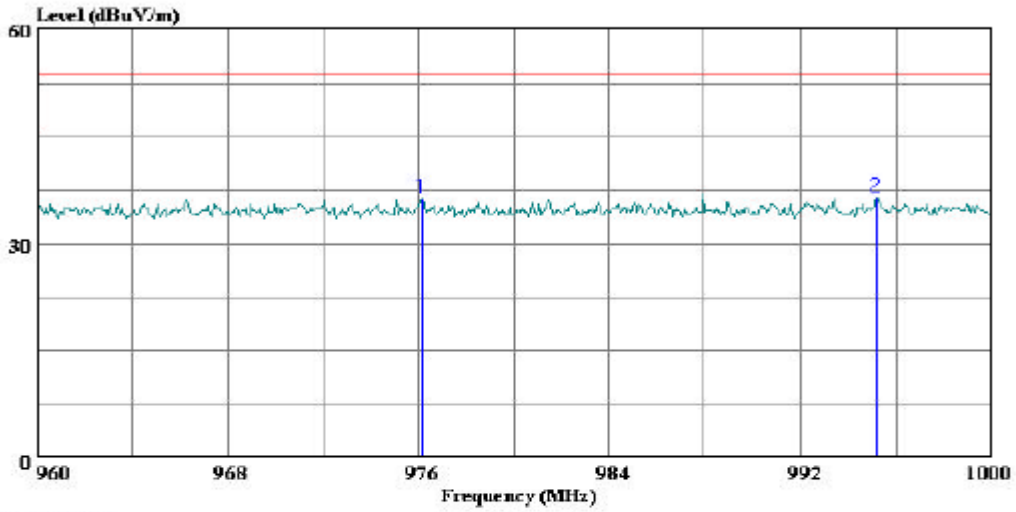
7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE THE FUNDAMENTAL – PATCH ANTENNA

RESTRICTED BANDEDGE - HORIZONTAL

HORIZONTAL DATA

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

Data#: 14 File#: awid emi.EMI Date: 09-20-2006 Time: 16:13:34



(Audix ATC)
Trace: 13 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Patch antenna
Mode of Operation: TX

Page: 1

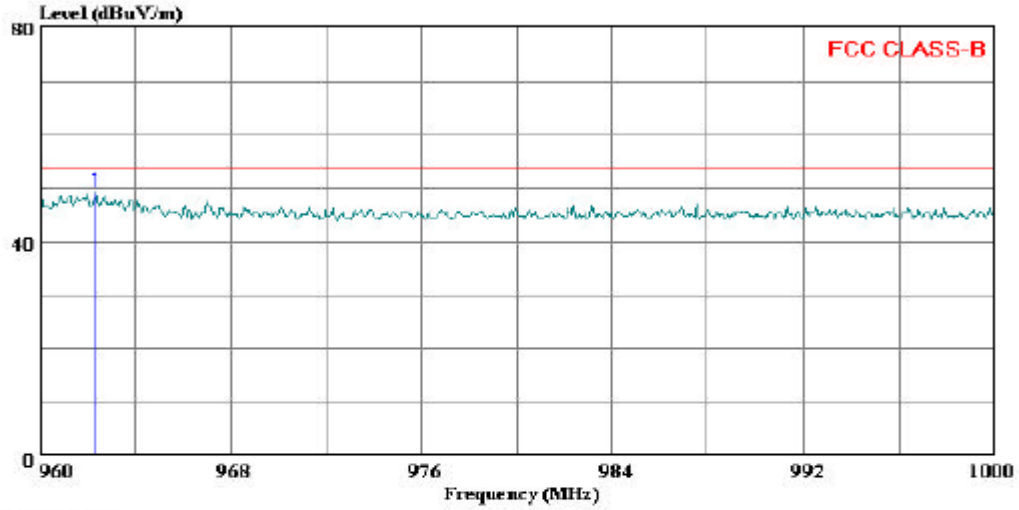
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	976.160	9.72	26.72	36.44	54.00	-17.56	Peak
2	995.160	9.57	26.92	36.49	54.00	-17.51	Peak

RESTRICTED BANDEDGE – VERTICAL

VERTICAL DATA

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

Data#: 33 File#: awid emi.EMI Date: 09-20-2006 Time: 17:12:25



(Audix ATC)
Trace: 32 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Patch antenna
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	962.360	22.71	26.60	49.32	54.00	-4.68	Peak

HARMONICS AND SPURIOUS EMISSIONS

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

Company: AWID
Project #: 06U10496
Date: 09/19/06
Test Engineer: Frank Ibrahim
Configuration: EUT with Patch Antenna
S/N: 0612-12-0031
Mode: TX ON

Test Equipment:

Horn 1-18GHz: T120; S/N: 29310 @3m
Pre-amplifer 1-26GHz: T144 Miteq 3008A00931
Pre-amplifer 26-40GHz:
Horn > 18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable: Frank 177080001
12 foot cable: Frank 187209001

HPF: HPF_1.5GHz
Reject Filter:

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 (905.11 MHz)															
2.71533	3.0	54.00	50.40	32.2	3.0	-37.4	0.0	0.6	52.4	48.8	74	54	-21.6	-5.2	V
4.52555	3.0	47.86	40.14	33.4	3.8	-36.5	0.0	0.6	49.2	41.5	74	54	-24.8	-12.5	V
5.43066	3.0	51.19	47.16	34.0	4.2	-36.3	0.0	0.5	53.5	49.5	74	54	-20.5	-4.5	V
2.71533	3.0	52.07	47.52	32.2	3.0	-37.4	0.0	0.6	50.5	45.9	74	54	-23.5	-8.1	H
3.62044	3.0	47.23	35.95	32.9	3.4	-36.9	0.0	0.6	47.2	36.0	74	54	-26.8	-18.0	H
4.52555	3.0	49.08	44.38	33.4	3.8	-36.5	0.0	0.6	50.4	45.7	74	54	-23.6	-8.3	H
5.43066	3.0	50.10	46.20	34.0	4.2	-36.3	0.0	0.5	52.4	48.5	74	54	-21.6	-5.5	H
Mid Channel (911.02 MHz)															
2.73306	3.0	52.73	49.41	32.3	3.0	-37.4	0.0	0.6	51.2	47.9	74	54	-22.8	-6.1	V
4.55510	3.0	51.04	47.46	33.4	3.9	-36.5	0.0	0.6	52.4	48.8	74	54	-21.6	-5.2	V
2.73306	3.0	52.59	47.97	32.3	3.0	-37.4	0.0	0.6	51.1	46.4	74	54	-22.9	-7.6	H
4.55510	3.0	51.23	47.48	33.4	3.9	-36.5	0.0	0.6	52.6	48.8	74	54	-21.4	-5.2	H
High Channel (917.17 MHz)															
2.75151	3.0	54.83	51.32	32.3	3.0	-37.4	0.0	0.6	53.3	49.8	74	54	-20.7	-4.2	V
3.66868	3.0	47.50	40.19	32.9	3.5	-36.9	0.0	0.6	47.6	40.3	74	54	-26.4	-13.7	V
4.58585	3.0	49.67	45.29	33.5	3.9	-36.5	0.0	0.6	51.1	46.7	74	54	-22.9	-7.3	V
5.03020	3.0	50.66	46.71	33.9	4.1	-36.4	0.0	0.6	52.8	48.8	74	54	-21.2	-5.2	V
2.75151	3.0	54.55	51.54	32.3	3.0	-37.4	0.0	0.6	53.1	50.1	74	54	-20.9	-3.9	H
3.66868	3.0	46.33	34.99	32.9	3.5	-36.9	0.0	0.6	46.4	35.1	74	54	-27.6	-18.9	H
4.58585	3.0	51.50	47.14	33.5	3.9	-36.5	0.0	0.6	52.9	48.6	74	54	-21.1	-5.4	H
5.03020	3.0	52.48	49.86	33.9	4.1	-36.4	0.0	0.6	54.6	52.0	74	54	-19.4	-2.0	H

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		

EUT was scanned from 1 GHz to 10 GHz, no other emissions from EUT were detected.

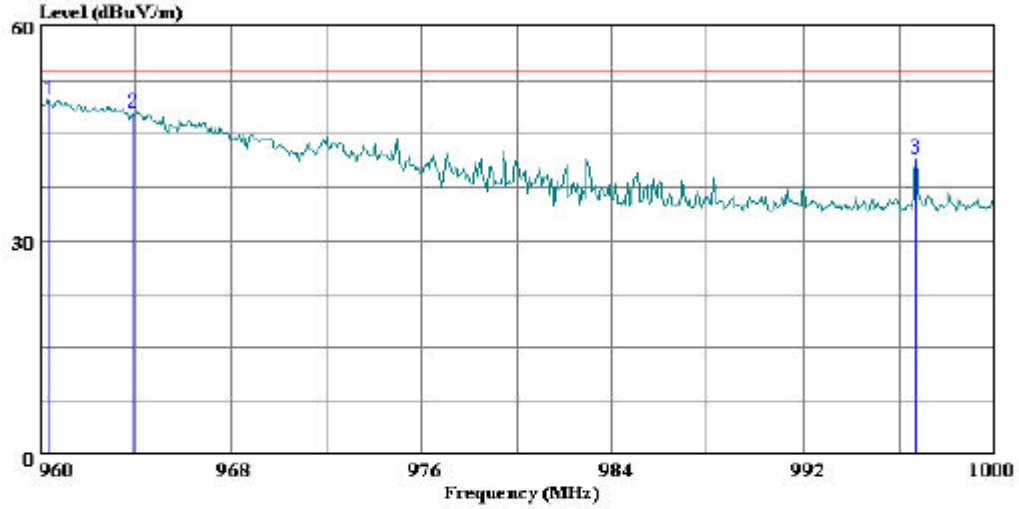
7.2.3. TRANSMITTER RADIATED EMISSIONS ABOVE THE FUNDAMENTAL – DIPOLE ANTENNA

RESTRICTED BANDEDGE - HORIZONTAL

HORIZONTAL DATA

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

Data#: 12 File#: awid emi.EMI Date: 09-20-2006 Time: 16:07:42



(Audix ATC)
Trace: 11 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Dipole antenna
Mode of Operation: TX

Page: 1

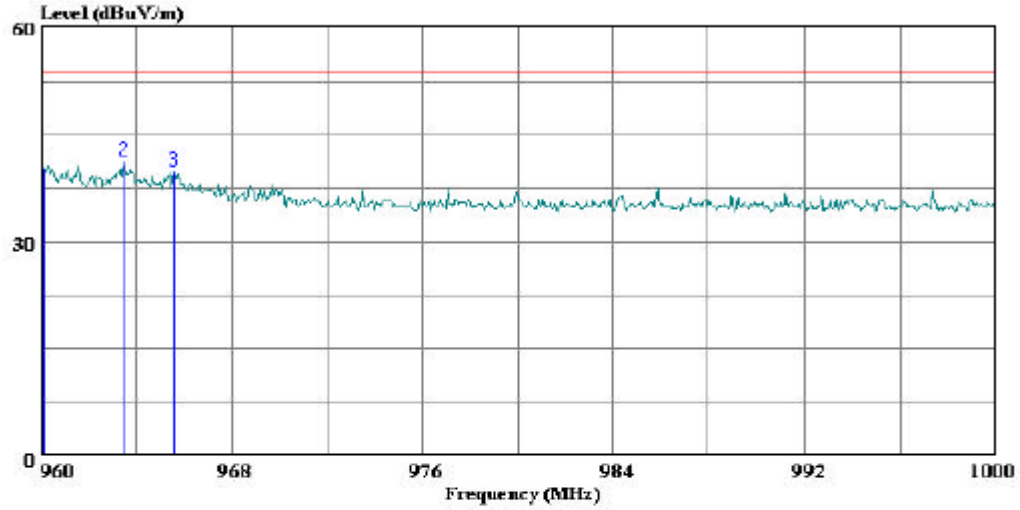
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	960.360	23.22	26.56	49.78	54.00	-4.22	Peak
2	963.880	21.33	26.62	47.95	54.00	-6.05	Peak
3	996.680	14.57	26.91	41.48	54.00	-12.52	Peak

RESTRICTED BANDEDGE – VERTICAL

VERTICAL Data

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

Data#: 6 File#: awid emi.EMI Date: 09-20-2006 Time: 15:44:48



(Audix ATC)
Trace: 5 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Dipole antenna
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	960.120	13.68	26.54	40.23	54.00	-13.77	Peak
2	963.480	14.81	26.62	41.43	54.00	-12.57	Peak
3	965.560	13.29	26.63	39.92	54.00	-14.08	Peak

HARMONICS AND SPURIOUS EMISSIONS

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

Company: AWID
Project #: 06U10496
Date: 09/19/06
Test Engineer: Frank Ibrahim
Configuration: EUT with Dipole Antenna
S/N: 0612-12-0031
Mode: TX ON

Test Equipment:

Horn 1-18GHz: T119; S/N: 29301 @3m
Pre-amplifer 1-26GHz: T145 Agilent 3008A005
Pre-amplifer 26-40GHz:
Horn > 18GHz:
Hi Frequency Cables
2 foot cable:
3 foot cable: Thanh 187215003
12 foot cable: Thanh 208946003
HPF: HPF_1.5GHz
Reject Filter:

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 (905.11 MHz)															
2.71533	3.0	56.88	53.37	32.2	3.0	-37.4	0.0	0.6	55.3	51.8	74	54	-18.7	-2.2	V
3.62044	3.0	50.85	46.57	32.9	3.4	-36.9	0.0	0.6	50.9	46.6	74	54	-23.1	-7.4	V
4.52555	3.0	49.55	44.37	33.4	3.8	-36.5	0.0	0.6	50.9	45.7	74	54	-23.1	-8.3	V
5.43066	3.0	54.08	49.60	34.0	4.2	-36.3	0.0	0.5	56.4	51.9	74	54	-17.6	-2.1	V
2.71533	3.0	55.56	52.90	32.2	3.0	-37.4	0.0	0.6	54.0	51.3	74	54	-20.0	-2.7	H
3.62044	3.0	50.17	46.12	32.9	3.4	-36.9	0.0	0.6	50.2	46.1	74	54	-23.8	-7.9	H
4.52555	3.0	49.35	42.35	33.4	3.8	-36.5	0.0	0.6	50.7	43.7	74	54	-23.3	-10.3	H
5.43066	3.0	51.39	47.41	34.0	4.2	-36.3	0.0	0.5	53.7	49.7	74	54	-20.3	-4.3	H
Mid Channel (911.02 MHz)															
2.73306	3.0	54.27	51.44	32.2	2.1	-35.2	0.0	0.6	54.0	51.1	74	54	-20.0	-2.9	V
3.64411	3.0	49.45	44.75	33.0	2.3	-34.9	0.0	0.6	50.4	45.7	74	54	-23.6	-8.3	V
4.55510	3.0	45.52	37.71	33.6	2.5	-34.8	0.0	0.6	47.3	39.5	74	54	-26.7	-14.5	V
2.73306	3.0	53.98	51.21	32.2	2.1	-35.2	0.0	0.6	53.7	50.9	74	54	-20.3	-3.1	H
3.64411	3.0	47.25	40.01	33.0	2.3	-34.9	0.0	0.6	48.2	41.0	74	54	-25.8	-13.0	H
4.55512	3.0	45.93	38.65	33.6	2.5	-34.8	0.0	0.6	47.8	40.5	74	54	-26.2	-13.5	H
7.28816	3.0	44.76	31.30	35.2	3.7	-34.7	0.0	0.6	49.6	36.1	74	54	-24.4	-17.9	H
High Channel (917.17 MHz)															
2.75151	3.0	55.79	53.12	32.2	2.1	-35.2	0.0	0.6	55.5	52.8	74	54	-18.5	-1.2	V
3.66868	3.0	47.03	39.89	33.0	2.3	-34.9	0.0	0.6	48.0	40.9	74	54	-26.0	-13.1	V
4.58585	3.0	48.46	42.34	33.6	2.5	-34.8	0.0	0.6	50.3	44.2	74	54	-23.7	-9.8	V
5.03020	3.0	53.87	51.45	33.8	2.8	-34.9	0.0	0.6	56.2	53.8	74	54	-17.8	-0.2	V
2.75151	3.0	54.43	51.93	32.2	2.1	-35.2	0.0	0.6	54.1	51.6	74	54	-19.9	-2.4	H
3.66868	3.0	46.65	38.48	33.0	2.3	-34.9	0.0	0.6	47.6	39.5	74	54	-26.4	-14.5	H
4.58585	3.0	46.16	37.78	33.6	2.5	-34.8	0.0	0.6	48.0	39.6	74	54	-26.0	-14.4	H
5.03020	3.0	50.95	46.23	33.8	2.8	-34.9	0.0	0.6	53.3	48.6	74	54	-20.7	-5.4	H

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		

EUT was scanned from 1 GHz to 10 GHz, no other emissions from EUT were detected.

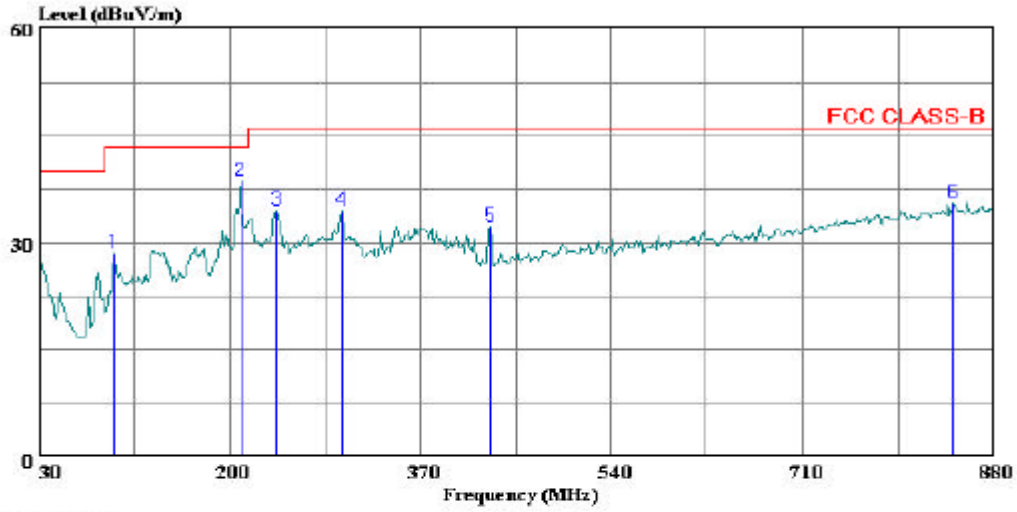
7.2.4. WORST-CASE RADIATED EMISSIONS BELOW THE FUNDAMENTAL – PATCH ANTENNA

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL DATA

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

Data#: 16 File#: awid emi.EMI Date: 09-20-2006 Time: 16:17:35



(Audix ATC)
Trace: 15 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Patch antenna
Mode of Operation: TX

Page: 1

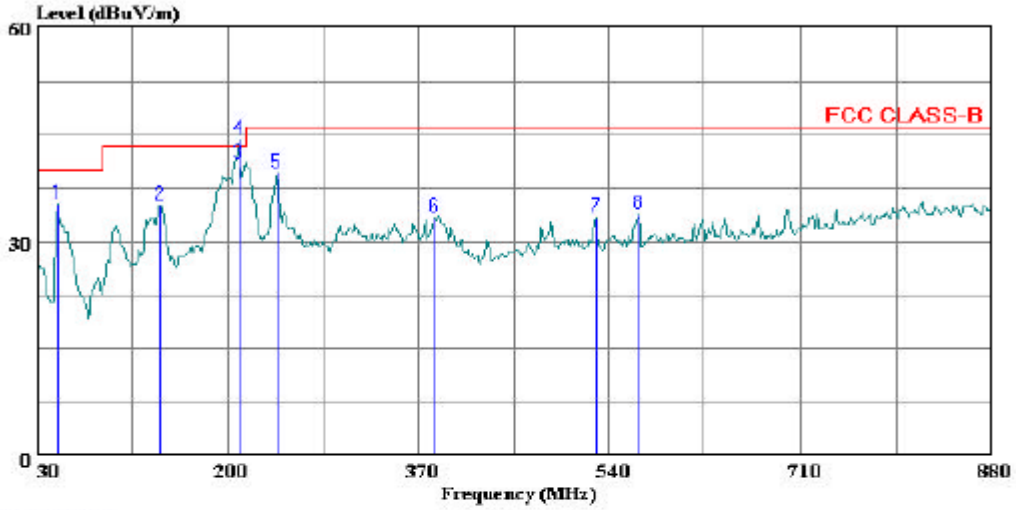
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	97.150	17.85	10.67	28.52	43.50	-14.98	Peak
2	210.200	25.50	13.11	38.61	43.50	-4.89	Peak
3	241.650	20.80	13.58	34.38	46.00	-11.62	Peak
4	299.450	18.81	15.65	34.46	46.00	-11.54	Peak
5	432.900	13.43	18.79	32.22	46.00	-13.78	Peak
6	843.450	10.27	25.14	35.41	46.00	-10.59	Peak

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL DATA

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

Data#: 22 File#: awid emi.EMI Date: 09-20-2006 Time: 16:30:02



(Audix ATC)
Trace: 19 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator : Chin Pang
Company : AWID
Project #: : 06U10496
Configuration: : EUT with Patch antenna
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		48.700	25.23	10.13	35.36	40.00	-4.64	Peak
2		139.650	20.35	14.83	35.18	43.50	-8.32	Peak
3		210.200	27.80	13.11	40.91	43.50	-2.59	QP
4	*	210.200	31.26	13.11	44.37	43.50	0.87	Peak
5		244.200	25.87	13.69	39.56	46.00	-6.44	Peak
6		384.450	15.82	17.70	33.52	46.00	-12.48	Peak
7		528.950	12.70	20.64	33.34	46.00	-12.66	Peak
8		567.200	12.68	21.12	33.80	46.00	-12.20	Peak

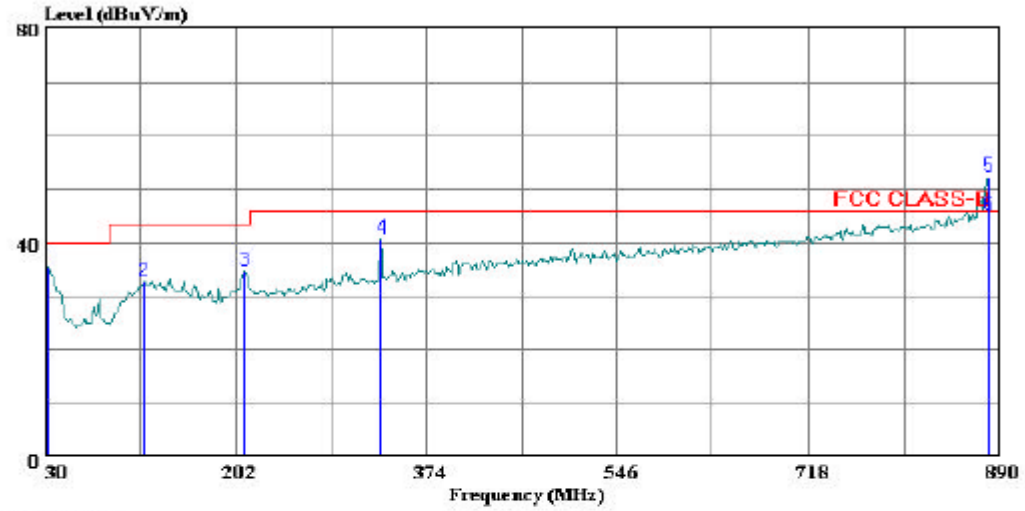
7.2.5. WORST-CASE RADIATED EMISSIONS BELOW THE FUNDAMENTAL – DIPOLE ANTENNA

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL DATA

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

Data#: 31 File#: awid emi.EMI Date: 09-20-2006 Time: 17:09:47



Trace: 23 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : AWID
Project #: : 06U10496
Configuration: : EUT with Dipole antenna
Mode of Operation: TX

Page: 1

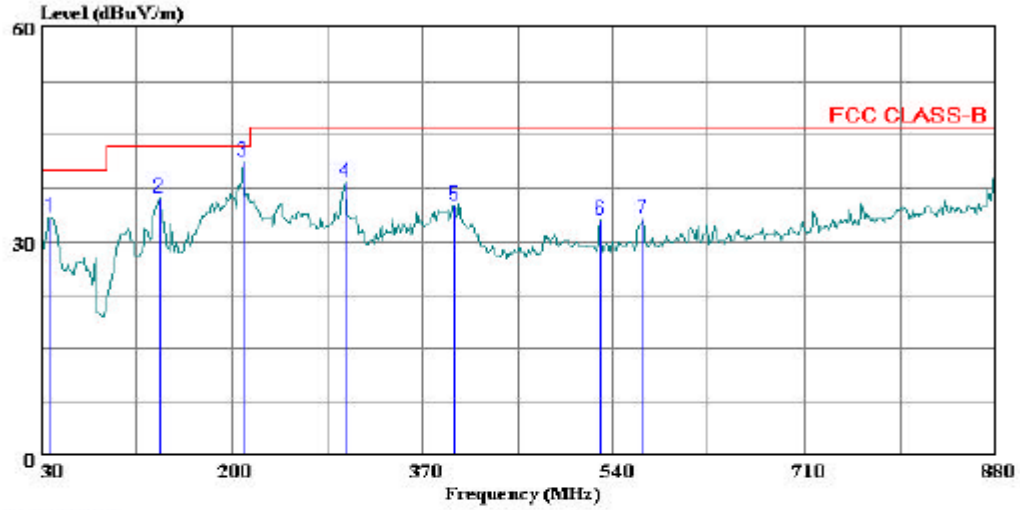
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	32.550	15.57	19.99	35.56	40.00	-4.44	Peak
2	119.250	17.66	15.05	32.71	43.50	-10.79	Peak
3	210.200	21.48	13.11	34.59	43.50	-8.91	Peak
4	333.450	24.28	16.50	40.78	46.00	-5.22	Peak
5 *	880.000	26.71	25.70	52.41	46.00	6.41	Peak
6	880.000	19.30	25.70	45.00	46.00	-1.00	QP

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL DATA

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

Data#: 4 File#: awid emi.EMI Date: 09-20-2006 Time: 15:39:13



(Audix ATC)
Trace: 3 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator : Chin Pang
Company : AWID
Project #: : 06U10496
Configuration: : EUT with Dipole antenna
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	38.500	17.23	16.21	33.44	40.00	-6.56	Peak
2	135.400	21.21	14.99	36.20	43.50	-7.30	Peak
3	210.200	28.11	13.11	41.22	43.50	-2.28	Peak
4	301.150	22.69	15.70	38.39	46.00	-7.61	Peak
5	398.900	16.98	18.01	34.99	46.00	-11.01	Peak
6	528.950	12.28	20.64	32.92	46.00	-13.08	Peak
7	567.200	12.07	21.12	33.19	46.00	-12.81	Peak
8	880.000	15.35	25.70	41.05	46.00	-4.95	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:

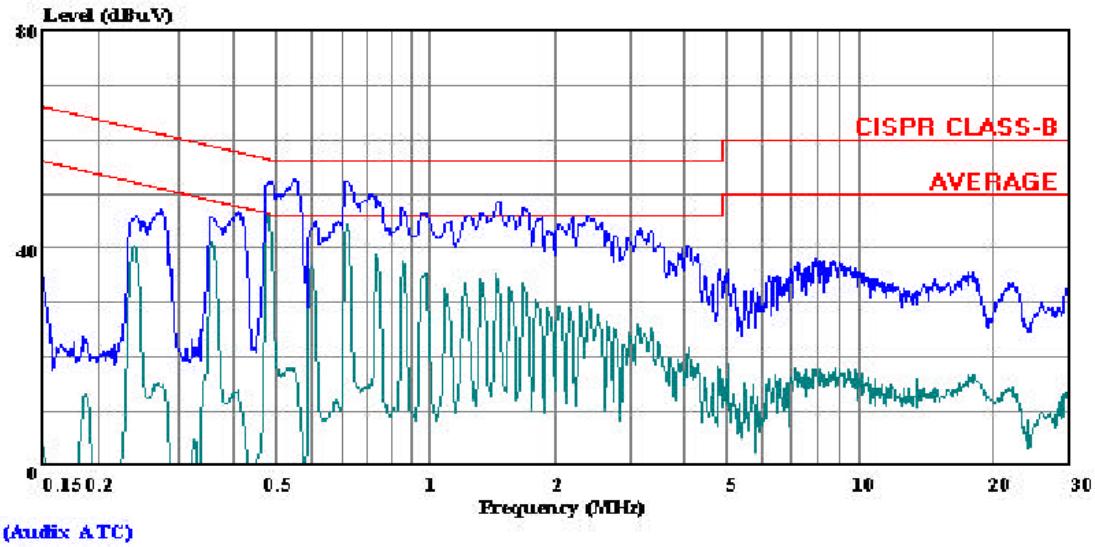
6 WORST EMISSIONS

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
0.28	47.02	--	40.60	0.00	60.94	50.94	-13.92	-10.34	L1
0.55	52.54	--	45.80	0.00	56.00	46.00	-3.46	-0.20	L1
0.72	52.56	--	44.46	0.00	56.00	46.00	-3.44	-1.54	L1
0.29	46.08	--	39.34	0.00	60.55	50.55	-14.47	-11.21	L2
0.58	50.14	--	42.99	0.00	56.00	46.00	-5.86	-3.01	L2
0.72	48.50	--	38.49	0.00	56.00	46.00	-7.50	-7.51	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#: 14 File#: .15-30MHz L2.EMI Date: 09-29-2006 Time: 16:11:59



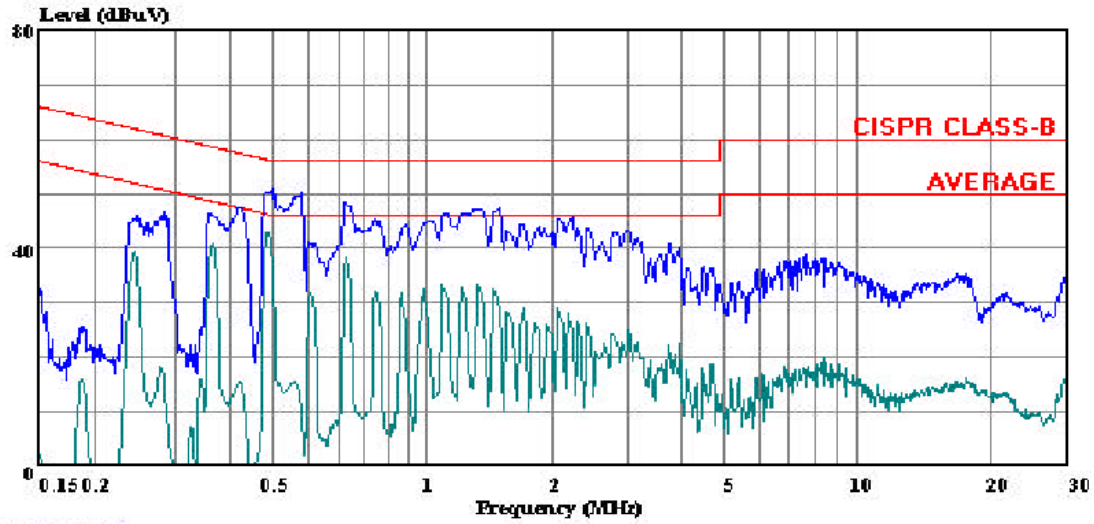
Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Mengistu Mekuria
Project # : 06U10496
Company : AWID
EUT configuration: EUT, Patch Antenna & laptop
Mode of operation: Tx Worst Case
Power Source : 115Vac, 60 Hz
: 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#: 7 File#: .15-30MHz L2.EMI Date: 09-29-2006 Time: 15:43:38



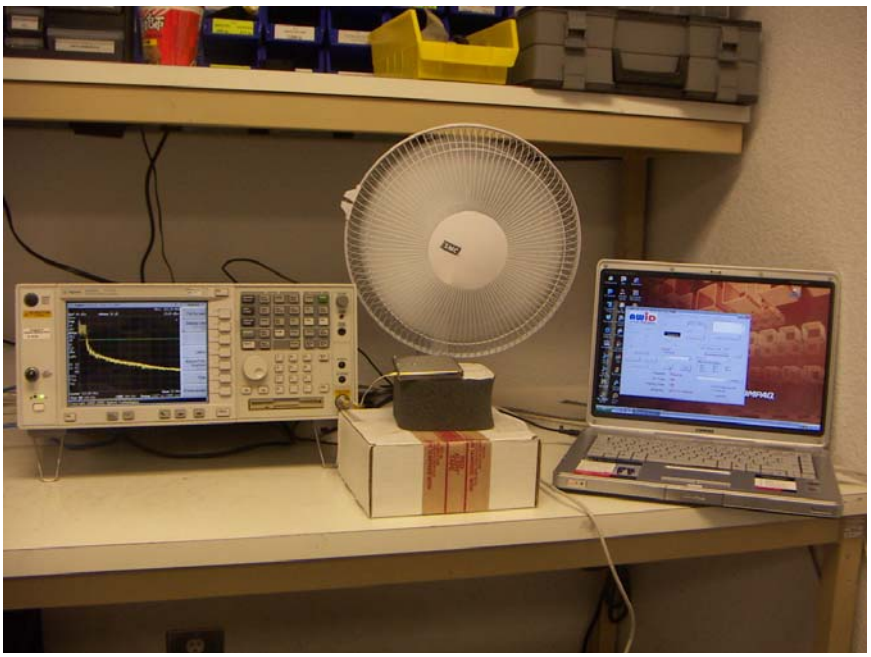
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Mengistu Mekuria
Project # : 06U10496
Company : AWID
EUT configuration: EUT, Patch Antenna & laptop
Mode of operation: Tx Worst Case
Power Source : 115Vac, 60 Hz
: L2: Peak(Blue): Avg(Green)

8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

DIPOLE

RADIATED FRONT PHOTO

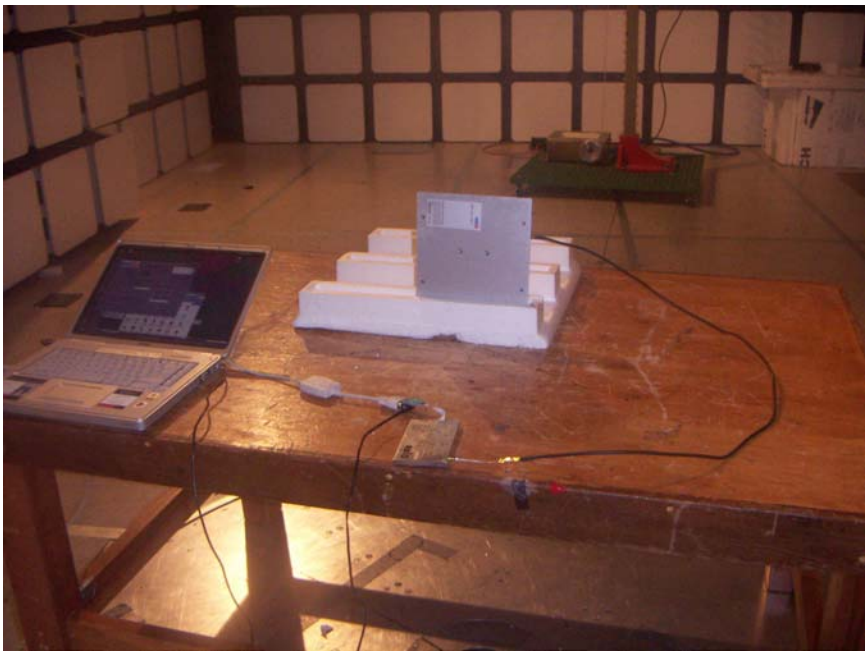
RADIATED BACK PHOTO

RADIATED RF MEASUREMENT SETUP

PATCH

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT