FCC CFR47 PART 15 SUBPART C

Class 2 Permissive Change Test Report

902-928 MHZ RFID READER

Model Numbers: WJR7000, WJR7100

FCC ID: NTTWJMPR7XXX

Report Number: 07PR009

Issue Date: 15 February 2007

Prepared for

WJ Communications Inc.
401 River Oaks Parkway
San Jose 95134

Prepared by

T.N. Cokenias Consulting
P.O. Box 1086
El Granada CA 94018

TABLE OF CONTENTS

Report Revision History

REV	Description	Revised By	Date
1.0	Initial Issue	T. Cokenias	2/15/2007

ATTESTATION OF TEST RESULTS

COMPANY NAME: WJ COMMUNICATIONS
401 RIVER OAKS PARKWAY
SAN JOSE, CA 95134

EUT DESCRIPTION: RFID READER CARD

MODEL: WJR7100

DATA ALSO APPLIES TO: WJR7000

DATE TESTED: 9,12, and 13 February 2007

All radiated emissions testing was performed at Compliance Certification Services in Fremont CA. Antenna port conducted emissions were performed at WJ Communications in San Jose CA.

T.N. Cokenias

1. 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.

2. EQUIPMENT UNDER TEST

2.1. DESCRIPTION OF EUT

Model WJR7100 is a 1 watt RFID Reader card for use with a 6dBi circularly polarized antenna or a 6 dBi linearly polarized antenna. Model WJR7000 is identical, the model number difference is for marketing purposes only..

The EUT uses PR-ASK (phase reversal amplitude shift keying) modulation. Except for the modulation section, the EUT schematic is identical to the previously certified versions of this product

Tests were performed at worst-case modulation, as determined in section 2.5 below.

2.2. MAXIMUM OUTPUT POWER

Channel	Frequency (MHz)	Power (dBm)	Power (mW)
Low	902.75	29.38	867.0
Middle	914.75	29.59	909.9
High	927.25	29.78	950.6

2.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a circularly polarized flat panel antenna, with a maximum gain of 6 dBiL, and a linearly polarized flat panel antenna with a gain of 6 dBi.

2.4. SOFTWARE AND FIRMWARE

The software use during testing was MPR FINAL_TEST.

2.5. WORST-CASE TEST CONFIGURATIONS

Antenna port conducted tests. All tests were performed at highest output power settings for each channel.

Radiated spurious and harmonic emissions – orientation. Harmonic and spurious emissions were measured up to the 10^{th} harmonic of the Low channel frequency (902.75 MHz) for X-plane, Y-plane, and Z-plane orientations. The orientation that yielded the worst-case emission was chosen for tests on the Low and High channels as well.

Test Result: Z-plane orientation

2.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model
Laptop computer	Compaq	Presario V2000CA
EUT DC power supply	CUI	DPS060200UPS-P5-SZ
RFID Tag	Texas Instruments	C1G2 tag

I/O CABLES

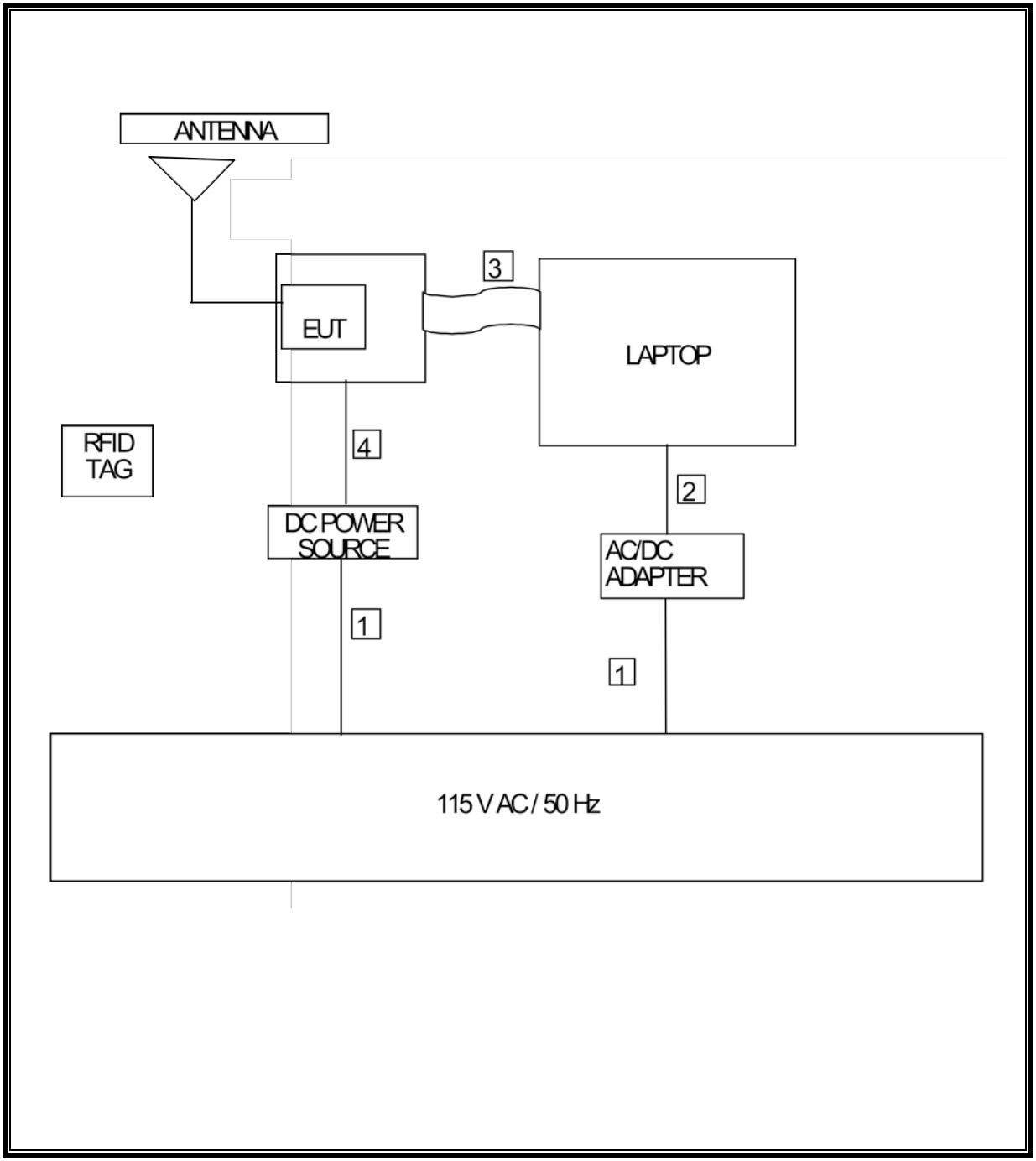
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	AC	Un-shielded	0.5 m	N/A
2	DC	1	DC	Un-shielded	1m	N/A
3	USB/SERIAL	1	RS-232	Un-shielded	1m	N/A
4	DC	1	DC	Un-shielded	0.5m	N/A

TEST SETUP

The EUT is a self-contained RF module. For test purposes, the module was mounted on a pcb on which a power and data interface circuit is also mounted. The interface card is used to connect the RF module to a laptop computer and to an external DC power supply.

The laptop sets channel, modulation, and power output, as well as enabling the hopping function when required.

SETUP DIAGRAM FOR TESTS



3. TEST AND MEASUREMENT EQUIPMENT

The following CCS equipment was utilized for radiated tests documented in this report:

TEST EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Spectrum Analyzer, 1.8 GHz	Agilent / HP	8591A	3009A00791	10/12/2007
Spectrum Analyzer 9KHz ~ 26.5 GHz	Agilent / HP	E4407B	US41444322	8/4/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A0022704	8/13/2007
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	1/23/2007
1.5 GHz Highpass Filter	Micro-Tronics	HPM13193	2	CNR

The following WJ equipment was used to perform antenna port conducted testing documented in this report:

Description of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Spectrum Analyzer	Agilent/HP	E4407B	WJ005	5 Feb 2008

4. LIMITS AND RESULTS

4.1. ANTENNA PORT

4.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

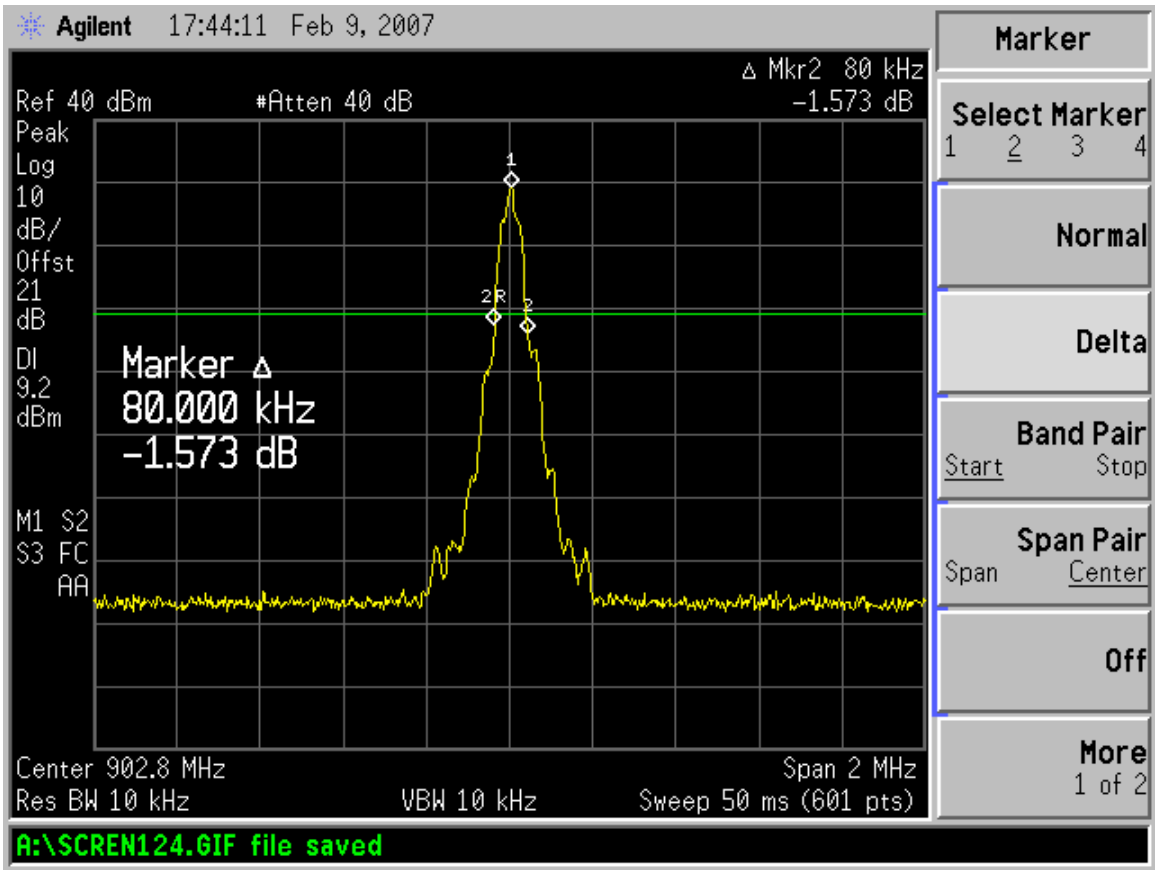
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

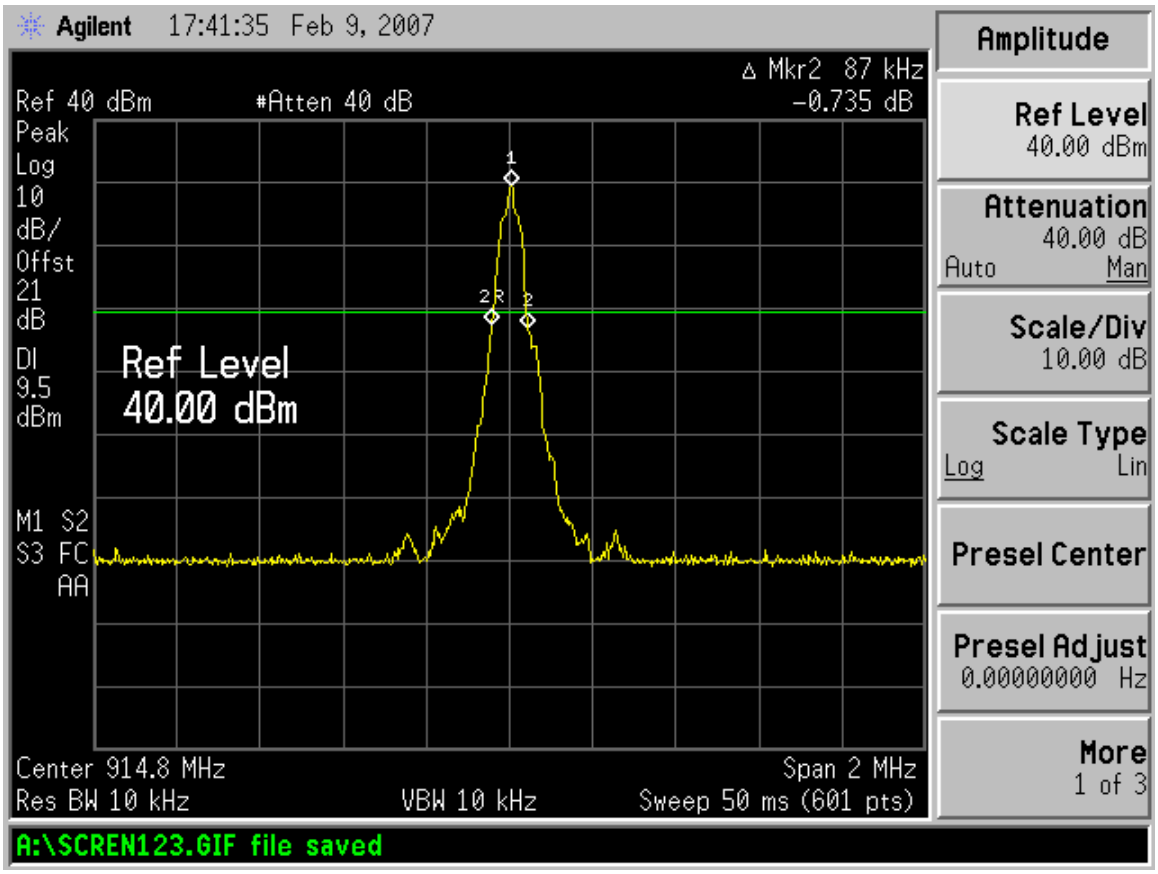
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	902.75	80
Middle	914.75	87
High	927.25	113

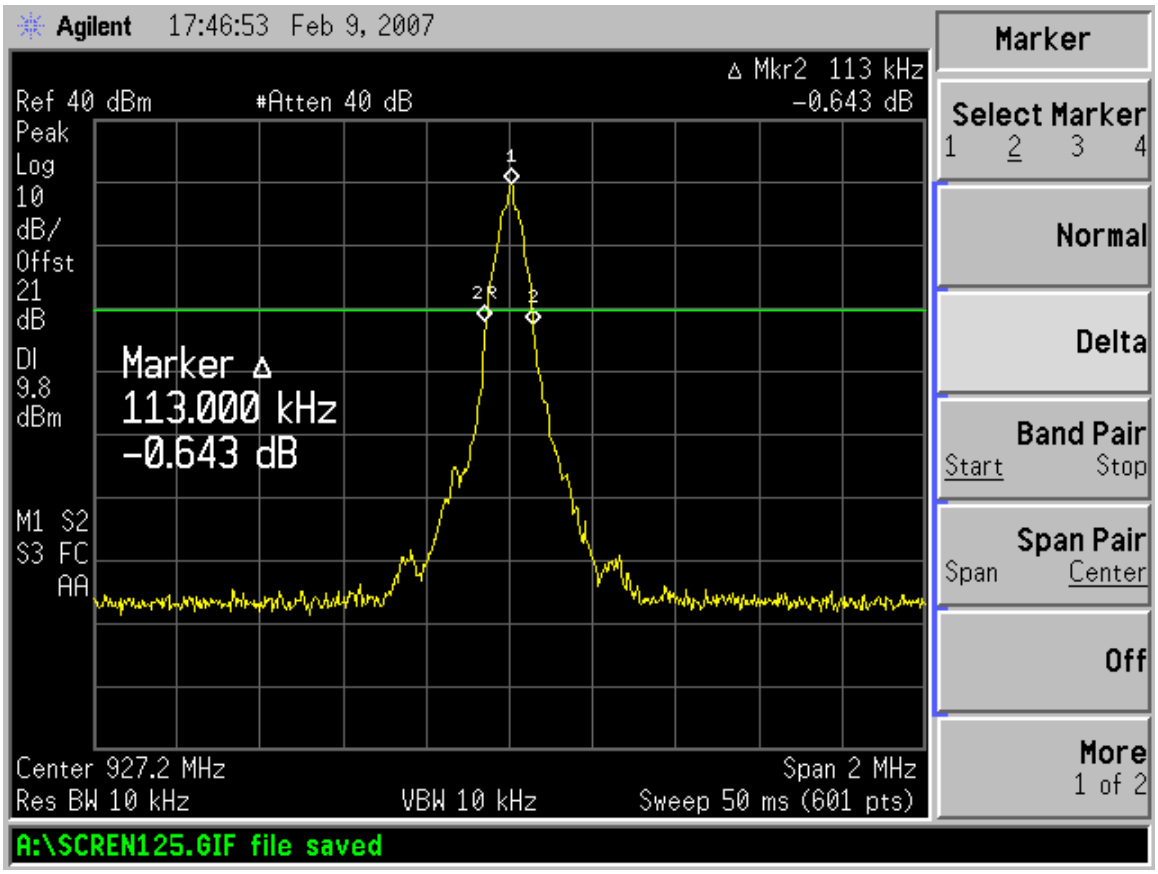
20 dB BANDWIDTH LOW CHANNEL



20 dB BANDWIDTH MID CHANNEL



20 dB BANDWIDTH HIGH CHANNEL



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

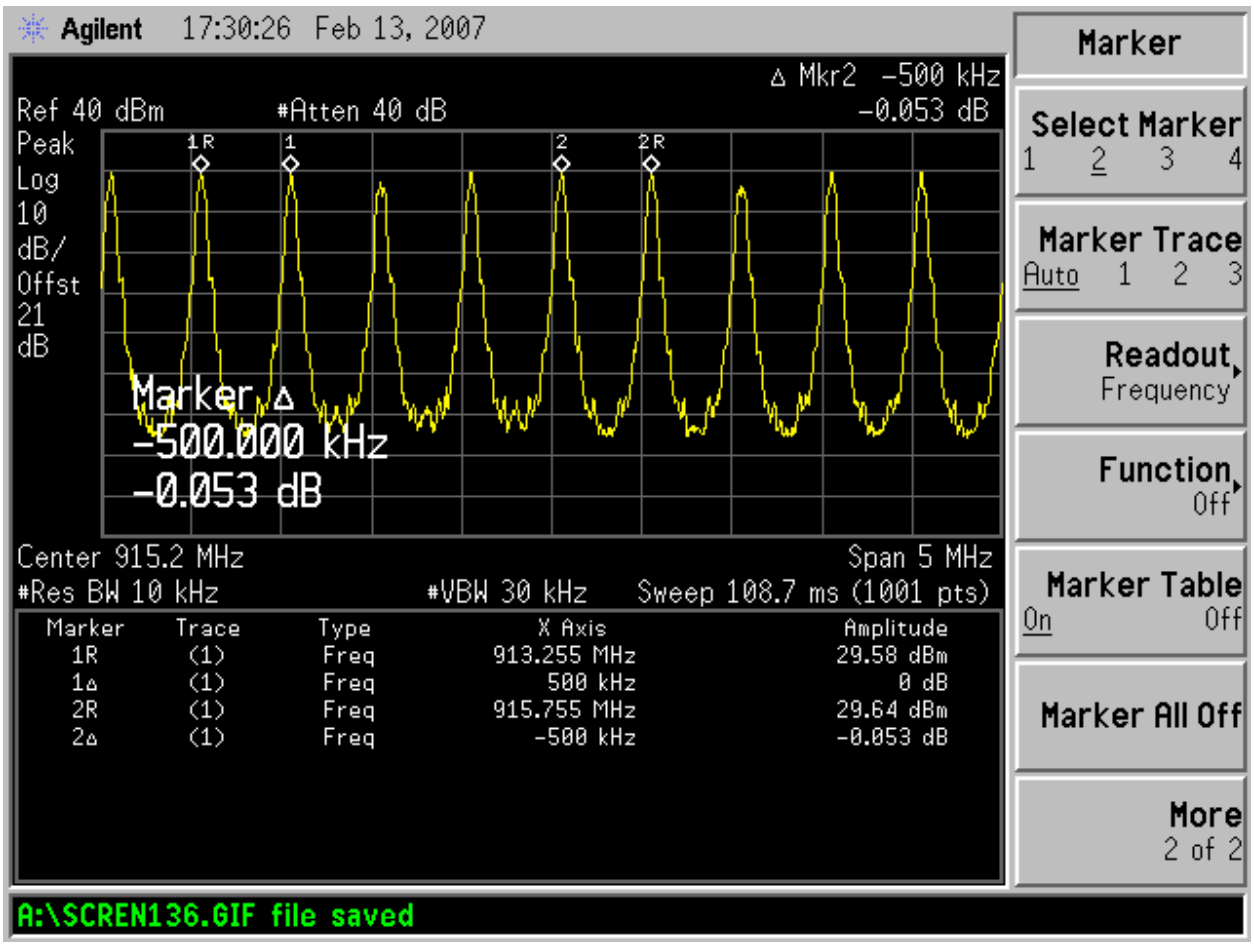
The transmitter output is connected to a spectrum analyzer. The RBW is set to 10 kHz and the VBW is set to 30 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

The separation is 500KHz, greater than the 113kHz maximum 20dB bandwidth.

HOPPING FREQUENCY SEPARATION



4.1.2. 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

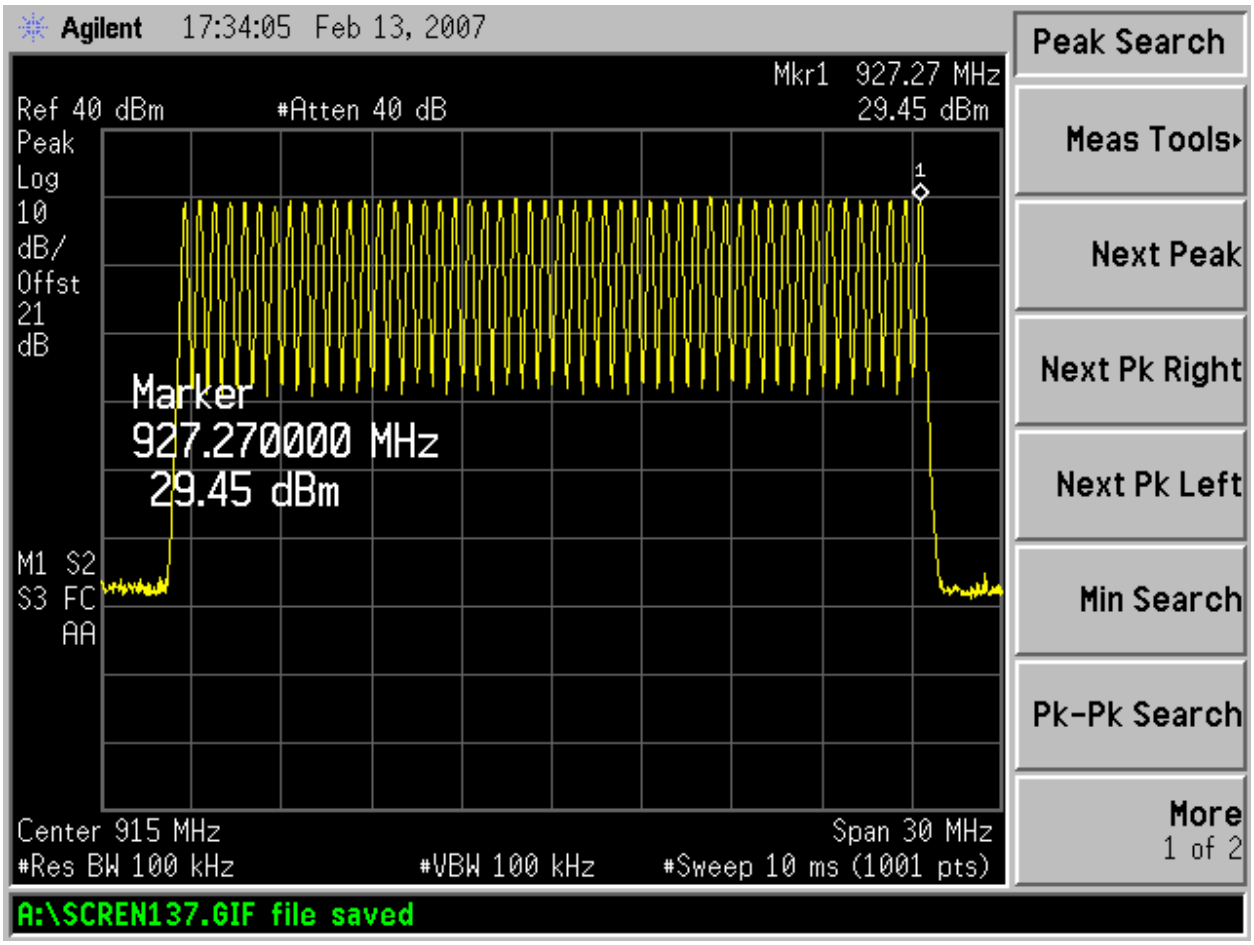
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 3 % of the span. The analyzer is set to Max Hold.

RESULTS

No non-compliance noted:

50 Channels observed.

NUMBER OF HOPPING CHANNELS



4.1.3. 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 width of a single pulse is measured in a fast scan. The number of pulses is measured in a 10 or 20 second scan, depending on 20dB channel bandwidth, to enable resolution of each occurrence.

RESULTS

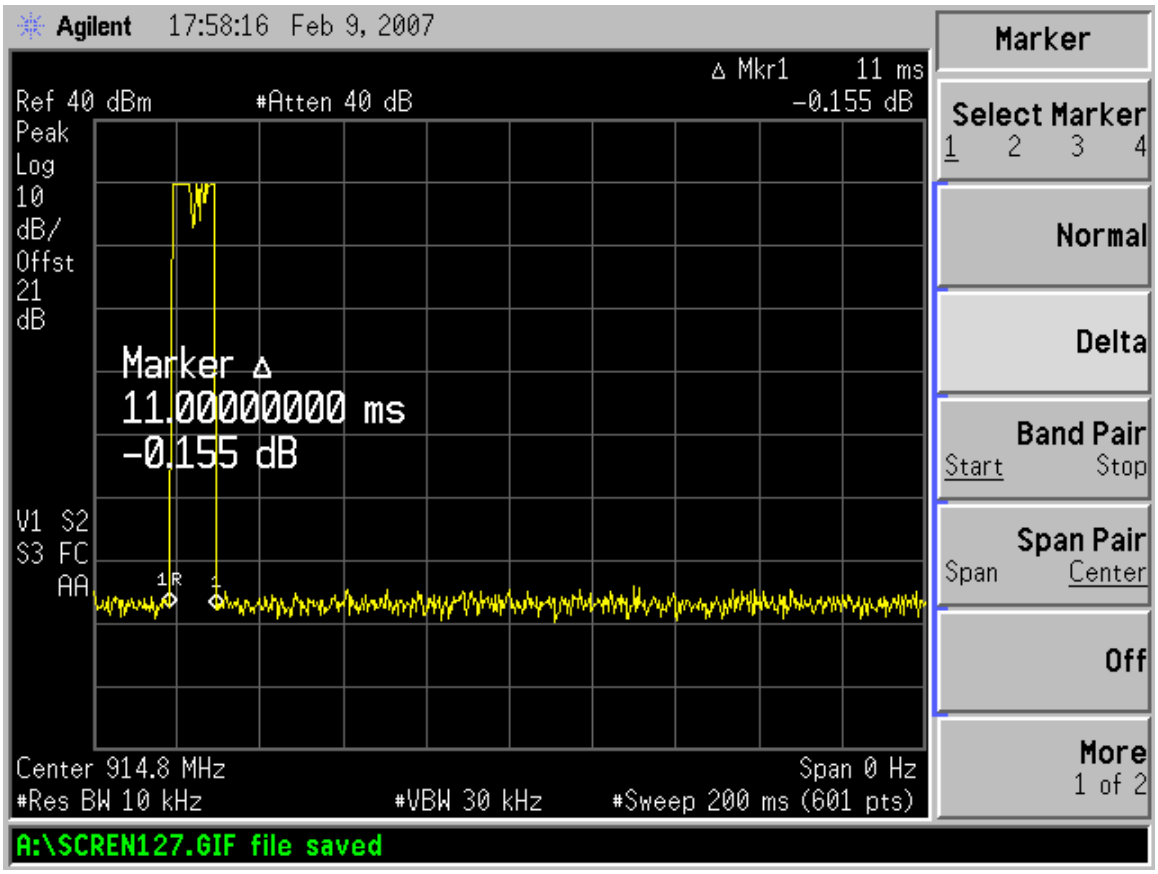
No non-compliance noted:

The system has 50 hopping frequencies.

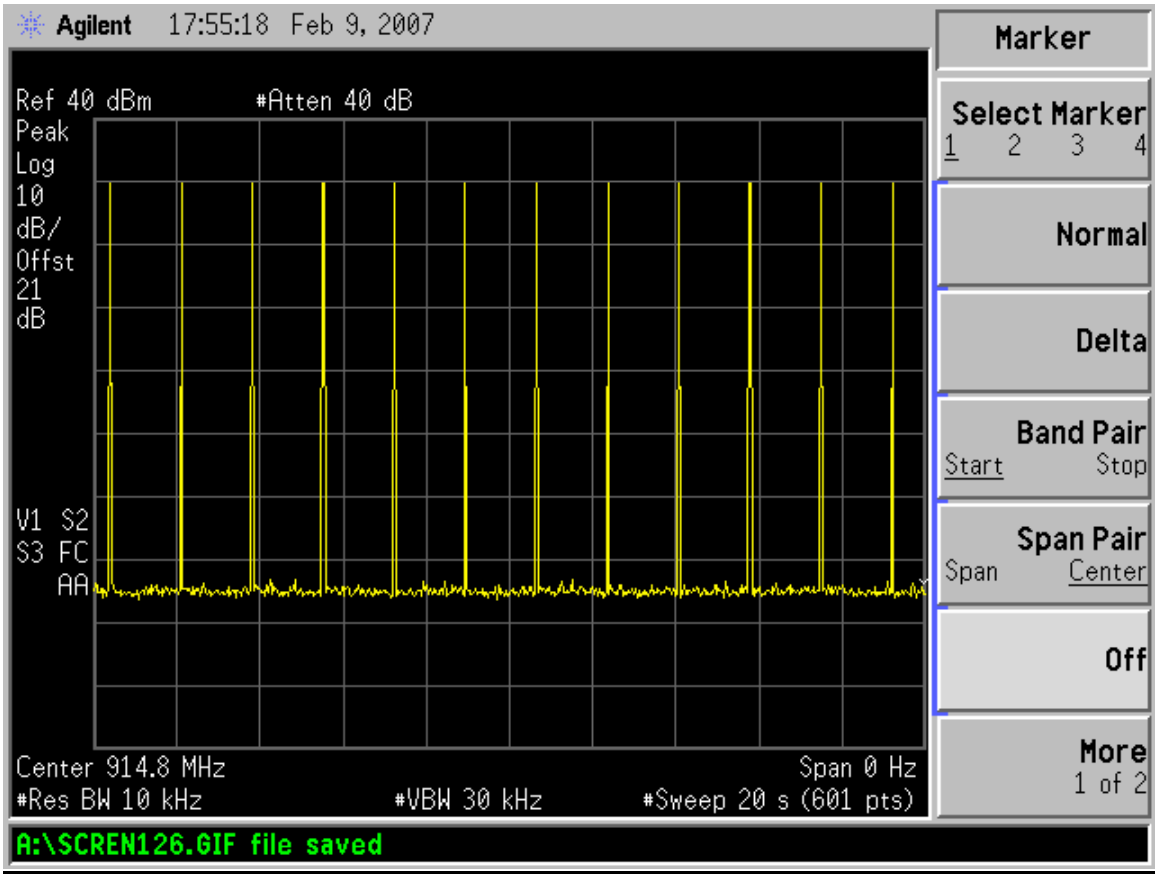
SRE0 Modulation:
Each transmission is 11 mS long. Each transmission takes place on one of 50 different channels in a pseudo-random sequence. All 50 channels are used equally on the average. The algorithm that determines the pseudo-random hop sequence does not allow the device to transmit on the same channel more than 12 times in a 20 second period:

12 x 11msec = 132 msec, less than 0.4 msec maximum allowed by the Rules.

PULSE WIDTH AND OCCUPANCY



NUMBER OF PULSES IN 20 SEC



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.

The maximum antenna gain is 6 dBi, therefore the limit is 30 dBm.

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.

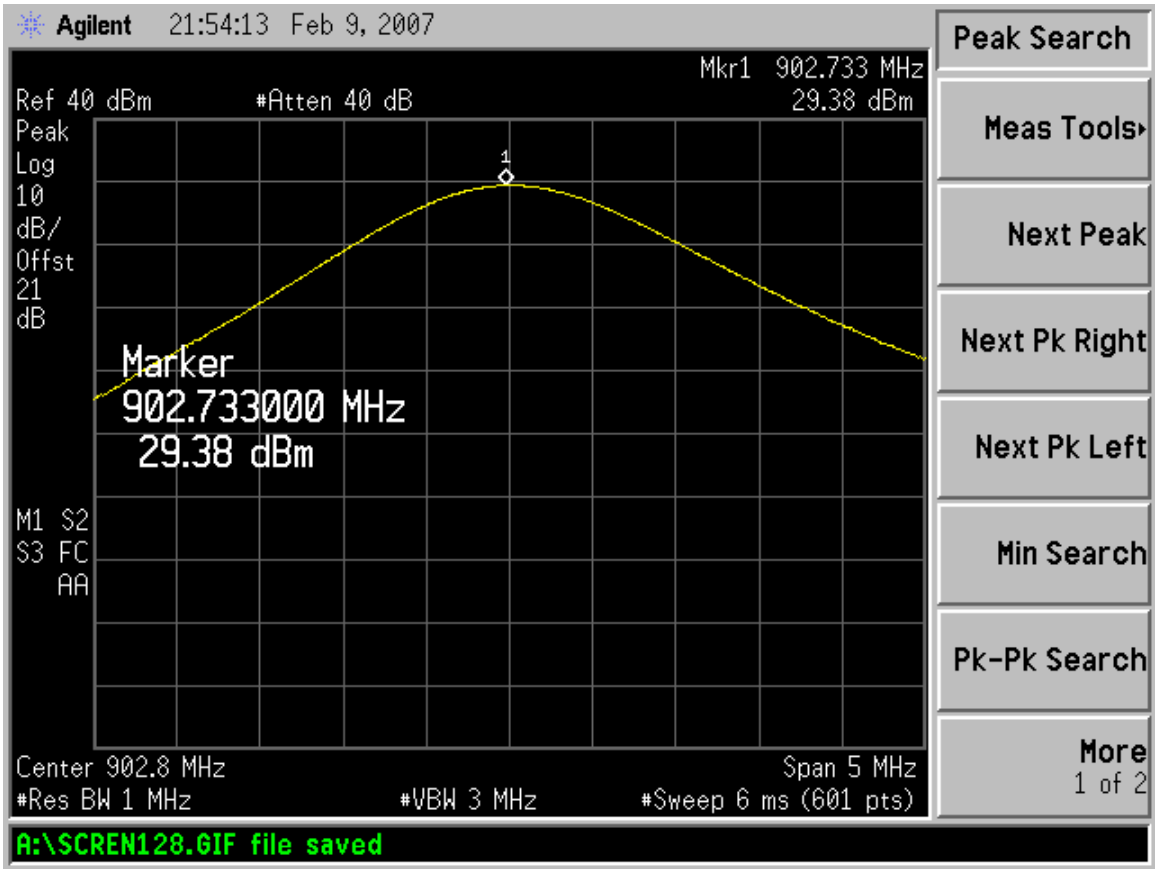
RESULTS

No non-compliance noted:

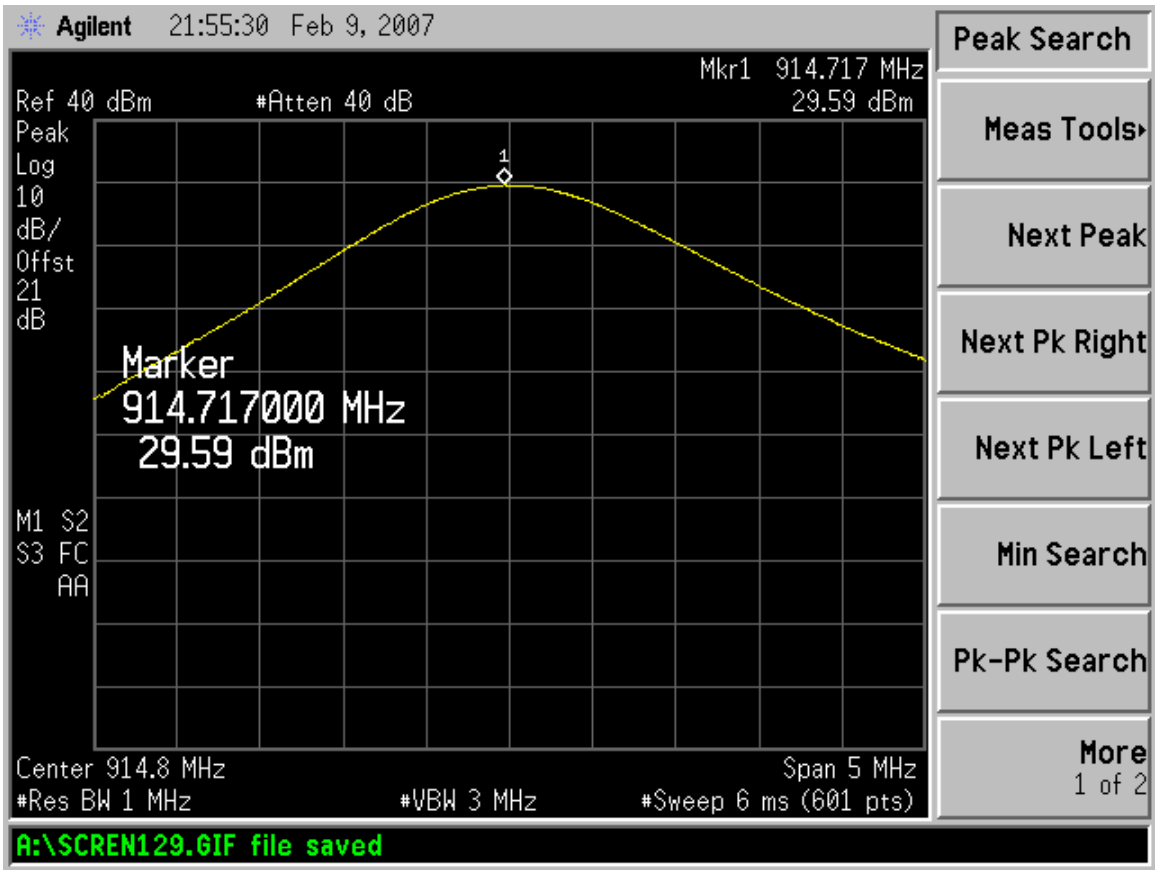
SRE0 Modulation (Worst Case)

Channel	Frequency (MHz)	Power (dBm)	Power (mW)
Low	902.75	29.38	867.0
Middle	914.75	29.59	909.9
High	927.25	29.78	950.6

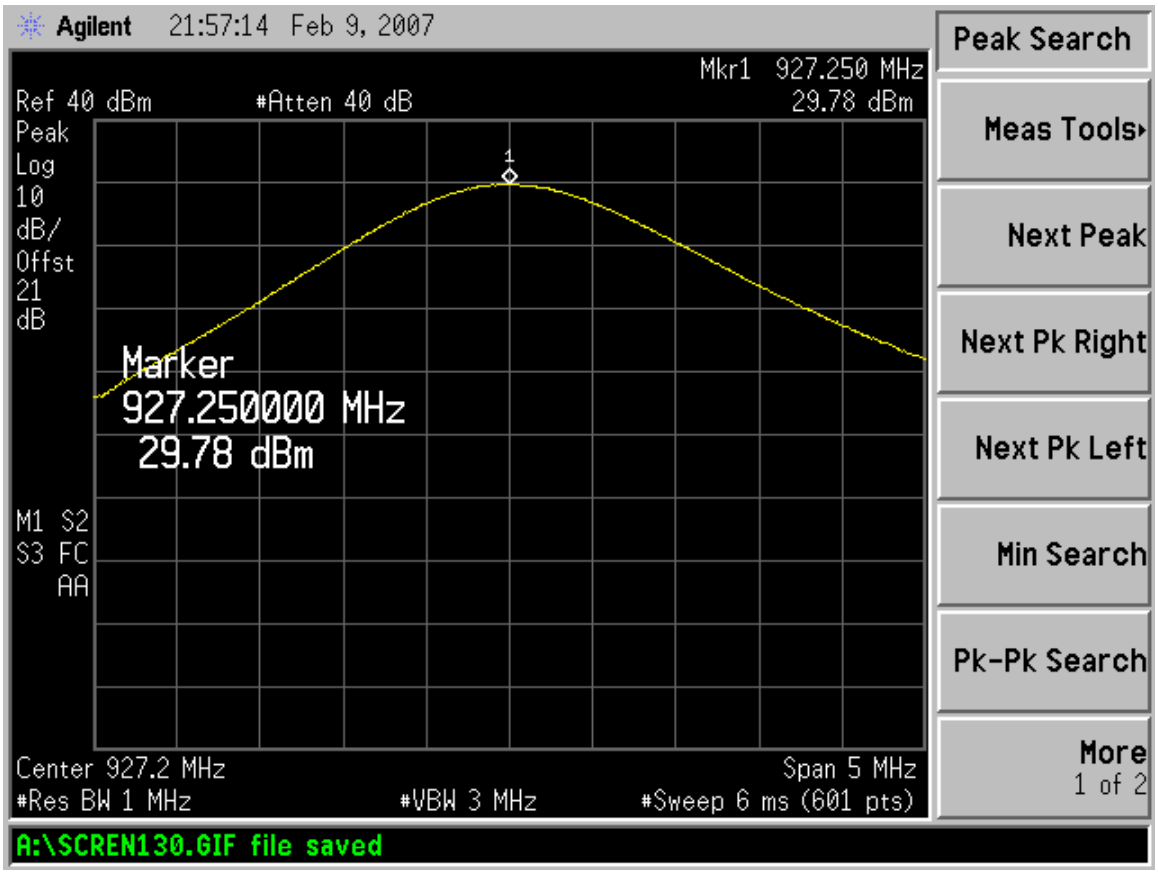
OUTPUT POWER LOW CHANNEL



OUTPUT POWER MID CHANNEL



OUTPUT POWER HIGH CHANNEL



4.1.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

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

and

$S = E ^ 2 / 3770$

where

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

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

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

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

P (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

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

where

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

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

LIMITS

From §1.1310 Table 1 (B), S = 1.0 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	29.78	6.00	22.40

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.

4.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

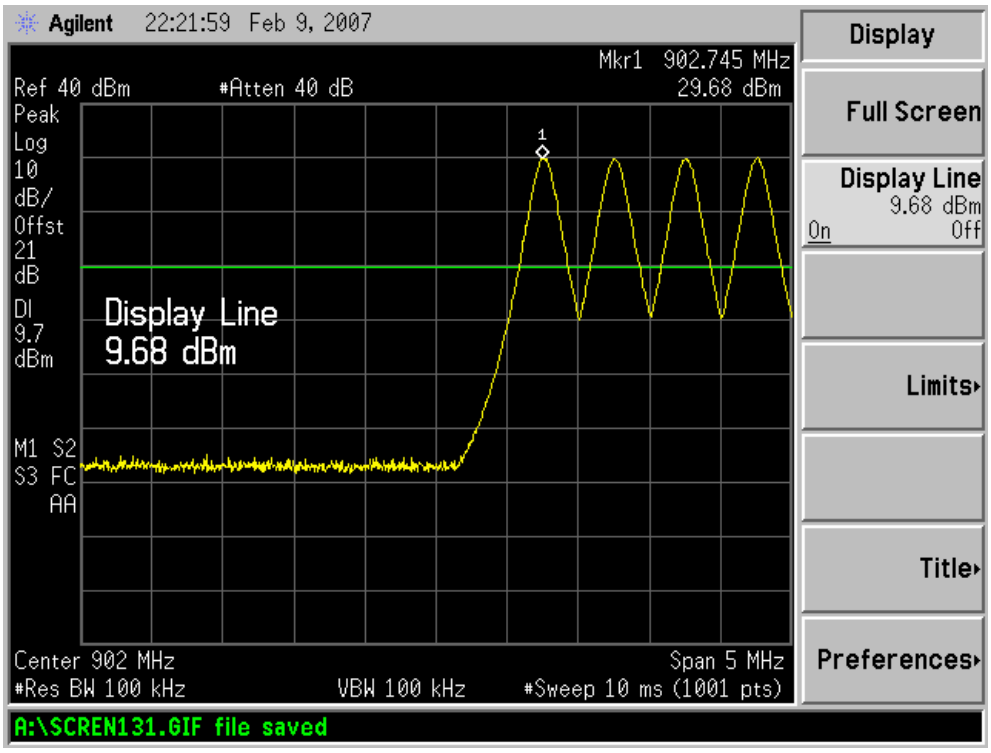
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

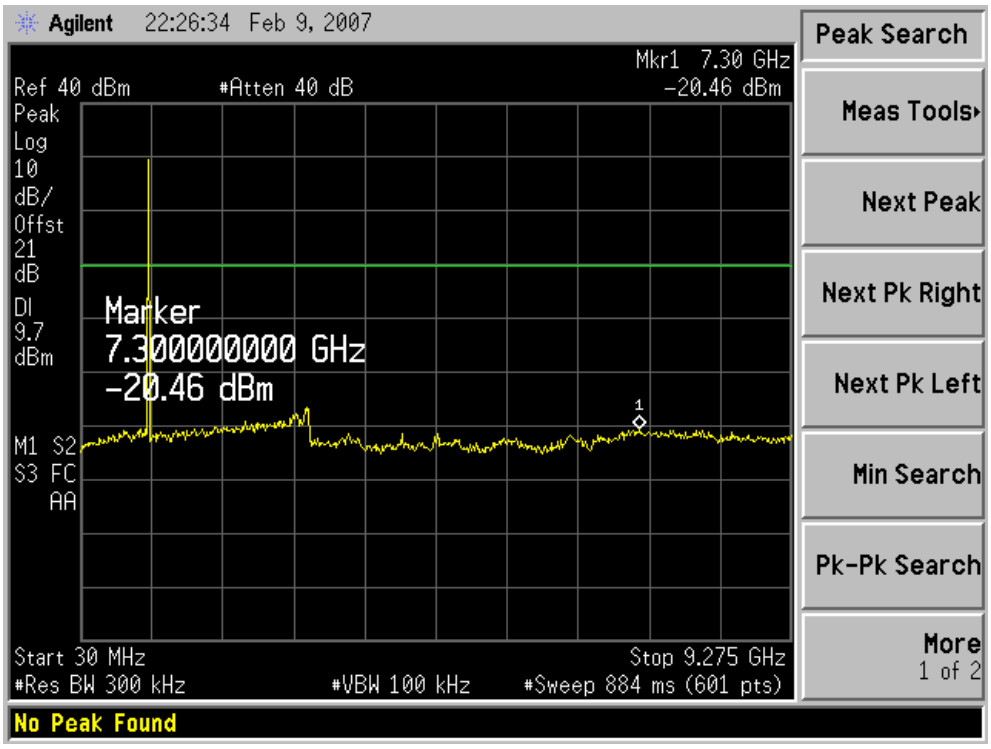
The spectrum from 30 MHz to 9.28 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

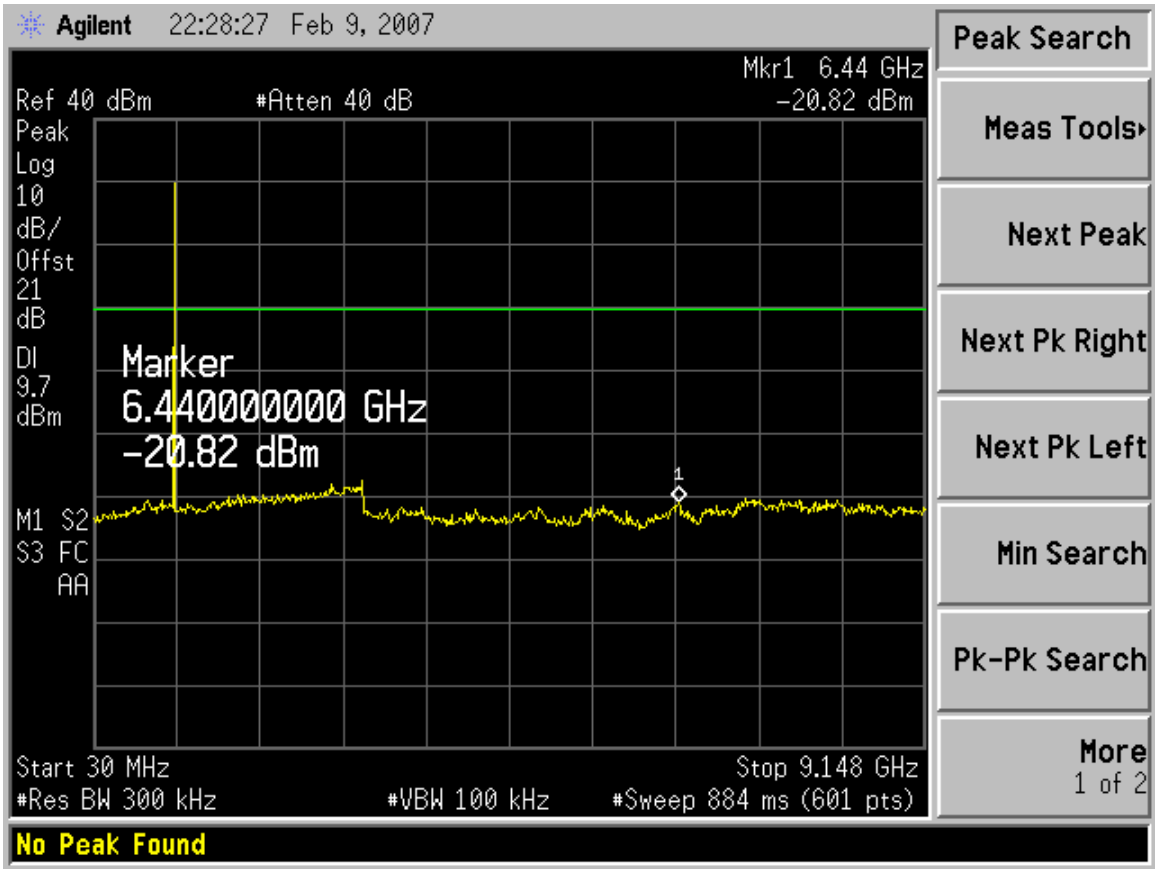
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL

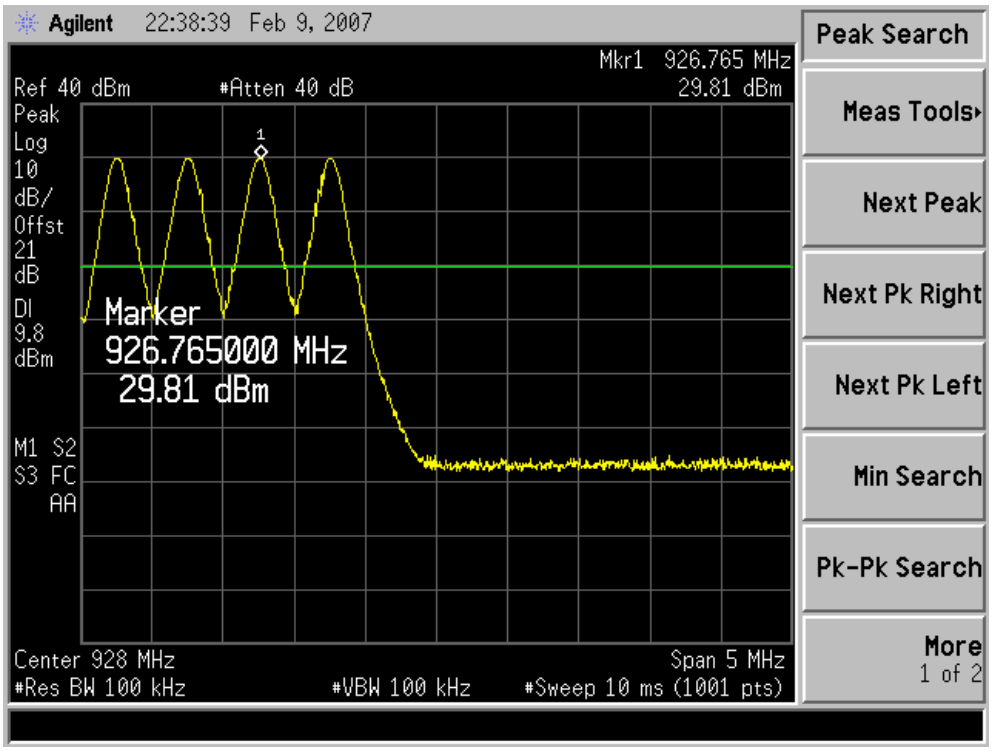


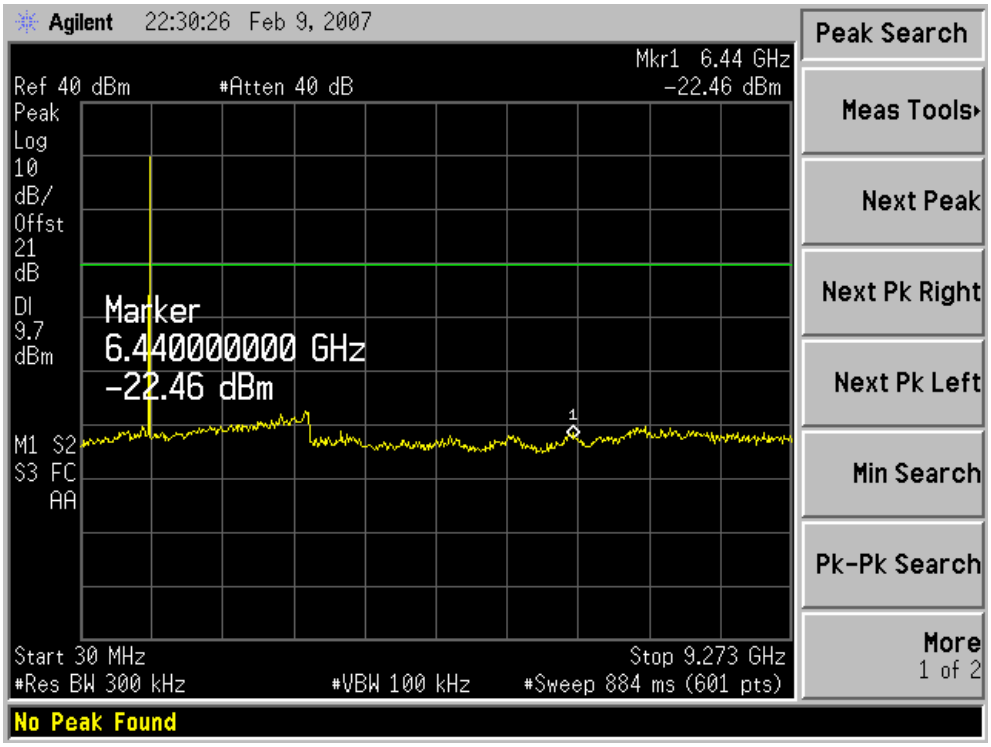


SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL





4.2. RADIATED EMISSIONS

4.2.1. 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 9.28 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 902-928 MHz 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.

The EUT emissions above 1 GHz were measured for 3 EUT operating frequencies:

LOW channel: 902.75 MHz
MID channel: 914.75 MHz
HIGH channel: 926.25 MHz

Determination of worst-case EUT orientation

The EUT was set to produce maximum power at the LOW channel. Emissions were investigated to the 10^{th} harmonic for each of three orientations (X, Y, and Z-plane orientations). The orientation yielding worst-case (highest level) emissions was used to measure emissions at MID and HIGH channels.

Worst-case orientation: Z-plane.

EUT was tested with the following antenna types:
6 dBi linearly polarized panel
6dBiL circularly polarized panel

NOTES Regarding Test Results Below 1 GHz

During tests it was determined that the TX was overloading the pre-amplifier in the test set-up. Furthermore, it was determined that the test pc and serial to USB cable were producing emissions over the FCC class B and 15.209 limits. Emissions were investigated on a frequency-by-frequency basis. By process of elimination most of the emissions coming from pc and USB cable were eliminated. For the remaining frequencies, shown below, the source of the emissions could not be conclusively determined, however, the field strength levels were well below FCC limits.

For reference, plots of the EUT tested stand-alone in idle state are displayed below. During idle state, all circuits are active but the transmitter is off.

4.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ HARMONICS AND SPURIOUS EMISSIONS

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

Company:.WJ Communication
Project: 07U10855
Date: 02/12/2007
Test Engineer: Thanh Nguyen
Configuration: EUT with Linearly Polarized Panel 6dBi.
Mode: Tx Low Channel 902.7425MHz

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: Thanh 177079008
3 foot cable:
12 foot cable: Gordon 203134001
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)
EUT At X position															
Harmonics Spurious															
1.806	3.0	54.0	45.6	30.8	3.8	-35.5	-10.5	0.3	42.9	34.6	105.0	105.0	-62.1	-70.4	-20dBc
2.710	3.0	53.8	35.5	32.1	4.8	-35.2	-10.5	0.6	45.7	27.3	69.5	49.5	-23.8	-22.2	V
3.611	3.0	48.9	32.3	33.0	5.6	-34.9	-10.5	0.6	42.6	26.1	69.5	49.5	-26.9	-23.4	V
4.514	3.0	47.2	37.8	33.5	6.4	-34.8	-10.5	0.6	42.5	33.0	69.5	49.5	-27.0	-16.5	V
5.417	3.0	46.8	34.7	34.1	7.3	-34.9	-10.5	0.5	43.3	31.2	69.5	49.5	-26.2	-18.3	V
7.222	3.0	45.6	33.9	35.2	8.8	-34.7	-10.5	0.6	45.1	33.3	69.5	49.5	-24.4	-16.2	V
1.806	3.0	57.3	49.3	30.8	3.8	-35.5	-10.5	0.3	46.3	38.2	105.0	105.0	-58.7	-66.8	-20 dBc
2.710	3.0	53.0	37.3	32.1	4.8	-35.2	-10.5	0.6	44.8	29.2	69.5	49.5	-24.7	-20.3	H
3.611	3.0	47.0	35.2	33.0	5.6	-34.9	-10.5	0.6	40.8	29.0	69.5	49.5	-28.7	-20.5	H
4.514	3.0	43.9	33.5	33.5	6.4	-34.8	-10.5	0.6	39.2	28.7	69.5	49.5	-30.3	-20.8	H
No other emissions were detected above noise floor															
EUT At Y position															
1.806	3.0	53.3	44.7	30.8	3.8	-35.5	-10.5	0.3	42.2	33.7	105.0	105.0	-62.8	-71.3	-20dBc
2.710	3.0	52.8	35.3	32.1	4.8	-35.2	-10.5	0.6	44.6	27.2	69.5	49.5	-24.9	-22.3	V
3.611	3.0	47.5	32.0	33.0	5.6	-34.9	-10.5	0.6	41.2	25.7	69.5	49.5	-28.3	-23.8	V
4.514	3.0	45.8	36.6	33.5	6.4	-34.8	-10.5	0.6	41.0	31.8	69.5	49.5	-28.5	-17.7	V
5.417	3.0	46.4	35.4	34.1	7.3	-34.9	-10.5	0.5	43.0	31.9	69.5	49.5	-26.5	-17.6	V
7.222	3.0	44.5	33.4	35.2	8.8	-34.7	-10.5	0.6	43.9	32.9	69.5	49.5	-25.6	-16.6	V
1.806	3.0	54.0	44.8	30.8	3.8	-35.5	-10.5	0.3	42.9	33.7	69.5	49.5	-26.6	-15.8	-20dBc
2.710	3.0	52.4	42.6	32.1	4.8	-35.2	-10.5	0.6	44.2	34.4	69.5	49.5	-25.3	-15.1	H
3.611	3.0	48.8	39.3	33.0	5.6	-34.9	-10.5	0.6	42.5	33.0	69.5	49.5	-27.0	-16.5	H
4.514	3.0	44.3	34.8	33.5	6.4	-34.8	-10.5	0.6	39.5	30.0	69.5	49.5	-30.0	-19.5	H
															H
EUT At Z position: WORST CASE															
1.806	3.0	56.6	48.2	30.8	3.8	-35.5	-10.5	0.3	45.6	37.2	105.0	105.0	-59.4	-67.8	-20dBc
2.710	3.0	52.2	44.3	32.1	4.8	-35.2	-10.5	0.6	44.0	36.2	69.5	49.5	-25.5	-13.3	V
3.611	3.0	50.7	45.6	33.0	5.6	-34.9	-10.5	0.6	44.5	39.3	69.5	49.5	-25.0	-10.2	V
4.514	3.0	46.3	37.5	33.5	6.4	-34.8	-10.5	0.6	41.5	32.7	69.5	49.5	-28.0	-16.8	V
5.417	3.0	49.0	38.2	34.1	7.3	-34.9	-10.5	0.5	45.6	34.7	69.5	49.5	-23.9	-14.8	V
7.222	3.0	45.3	35.1	35.2	8.8	-34.7	-10.5	0.6	44.7	34.5	69.5	49.5	-24.8	-15.0	V
1.806	3.0	61.0	53.0	30.8	3.8	-35.5	-10.5	0.3	50.0	41.9	105.0	105.0	-55.0	-63.1	-20dBc
2.710	3.0	57.3	48.7	32.1	4.8	-35.2	-10.5	0.6	49.2	40.6	69.5	49.5	-20.3	-8.9	H
3.611	3.0	50.4	41.2	33.0	5.6	-34.9	-10.5	0.6	44.1	35.0	69.5	49.5	-25.4	-14.5	H
4.514	3.0	44.3	34.8	33.5	6.4	-34.8	-10.5	0.6	39.5	30.0	69.5	49.5	-30.0	-19.5	H
No other emissions were detected 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		

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

Company:.WJ Communication
Project: 07U10855
Date: 02/12/2007
Test Engineer: Thanh Nguyen
Configuration: EUT with Linearly Polarized Panel 6dBi.
Mode: Tx Mid Channel 914.75MHz

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: Thanh 177079008
3 foot cable:
12 foot cable: Gordon 203134001
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)
															H
EUT At Z position, Worst case															
1.830	3.0	54.1	49.1	30.9	3.9	-35.5	0.0	0.3	53.6	48.7	105.0	105.0	-51.4	-56.3	-20dBc
2.744	3.0	54.3	46.3	32.2	4.8	-35.2	0.0	0.6	56.7	48.7	74	54	-17.3	-5.3	V
3.611	3.0	50.7	45.6	33.0	5.6	-34.9	0.0	0.6	54.9	49.7	74	54	-19.1	-4.3	V
4.574	3.0	46.6	35.7	33.6	6.5	-34.8	0.0	0.6	52.4	41.5	74	54	-21.6	-12.5	V
5.417	3.0	49.0	38.2	34.1	7.3	-34.9	0.0	0.5	56.0	45.2	74	54	-18.0	-8.8	V
6.403	3.0	46.0	35.8	34.8	8.2	-34.8	0.0	0.5	54.6	44.5	74	54	-19.4	-9.5	V
7.318	3.0	47.6	37.8	35.2	8.8	-34.7	0.0	0.6	57.6	47.7	74	54	-16.4	-6.3	V
1.830	3.0	58.4	51.0	30.9	3.9	-35.5	0.0	0.3	58.0	50.5	105.0	105.0	-47.0	-54.5	-20dBc
2.744	3.0	53.7	44.3	32.2	4.8	-35.2	0.0	0.6	56.1	46.7	74	54	-17.9	-7.3	H
3.611	3.0	51.8	39.1	33.0	5.6	-34.9	0.0	0.6	56.0	43.3	74	54	-18.0	-10.7	H
4.574	3.0	44.7	35.2	33.6	6.5	-34.8	0.0	0.6	50.5	41.0	74	54	-23.5	-13.0	H
No other emissions were detected above noise floor.															
															H
															H
															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		

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

Company:.WJ Communication
Project: 07U10855
Date: 02/12/2007
Test Engineer: Thanh Nguyen
Configuration: EUT with Linearly Polarized Panel 6dBi.
Mode: Tx High Channel 927.25MHz

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: Thanh 177079008
3 foot cable:
12 foot cable: Gordon 203134001

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)
															H
EUT At Z position, Worst case															
1.854	3.0	52.9	48.3	31.0	3.9	-35.5	0.0	0.3	52.6	48.0	105.0	105.0	-52.4	-57.0	-20dBc
2.782	3.0	53.8	45.4	32.2	4.9	-35.2	0.0	0.6	56.3	47.9	74	54	-17.7	-6.1	V
3.709	3.0	52.3	45.7	33.0	5.7	-34.9	0.0	0.6	56.7	50.1	74	54	-17.3	-3.9	V
4.636	3.0	48.1	37.3	33.6	6.5	-34.8	0.0	0.6	54.0	43.2	74	54	-20.0	-10.8	V
5.563	3.0	48.5	38.5	34.2	7.4	-35.0	0.0	0.5	55.6	45.6	74	54	-18.4	-8.4	V
6.491	3.0	46.7	36.3	34.8	8.3	-34.8	0.0	0.5	55.5	45.2	74	54	-18.5	-8.8	V
7.418	3.0	47.5	38.3	35.2	8.9	-34.6	0.0	0.6	57.5	48.4	74	54	-16.5	-5.6	V
1.854	3.0	60.3	52.3	31.0	3.9	-35.5	0.0	0.3	60.0	52.1	105.0	105.0	-45.0	-52.9	-20dBc
2.782	3.0	55.4	50.8	32.2	4.9	-35.2	0.0	0.6	57.9	53.3	74	54	-16.1	-0.7	H
3.611	3.0	51.8	39.1	33.0	5.6	-34.9	0.0	0.6	56.0	43.3	74	54	-18.0	-10.7	H
4.636	3.0	46.3	38.3	33.6	6.5	-34.8	0.0	0.6	52.1	44.2	74	54	-21.9	-9.8	H
No other emissions were detected 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		

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

Company:.WJ Communication
07U10855
Date: 02/12/2007
Test Engineer: Thanh Nguyen
Configuration: EUT with Circulary Polarized Panel 6dBi L.
Mode: Transmit

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T119; S/N: 29301 @3m	T145 Agilent 3008A005(		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		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)
EUT At Z position, Worst case															
Tx High Channel															
1.854	3.0	59.1	52.9	31.0	3.9	-35.5	0.0	0.3	58.9	52.6	105.0	105.0	-46.1	-52.4	-20dBc V
2.782	3.0	54.1	48.1	32.2	4.9	-35.2	0.0	0.6	56.5	50.6	74	54	-17.5	-3.4	V
3.709	3.0	53.0	48.7	33.0	5.7	-34.9	0.0	0.6	57.4	53.2	74	54	-16.6	-0.8	V
4.636	3.0	47.6	37.3	33.6	6.5	-34.8	0.0	0.6	53.5	43.1	74	54	-20.5	-10.9	V
5.563	3.0	48.4	38.4	34.2	7.4	-35.0	0.0	0.5	55.5	45.5	74	54	-18.5	-8.5	V
6.491	3.0	45.9	36.2	34.8	8.3	-34.8	0.0	0.5	54.7	45.0	74	54	-19.3	-9.0	V
7.418	3.0	46.9	37.8	35.2	8.9	-34.6	0.0	0.6	56.9	47.9	74	54	-17.1	-6.1	V
1.854	3.0	58.7	53.3	31.0	3.9	-35.5	0.0	0.3	58.4	53.0	105.0	105.0	-46.6	-52.0	-20dBc H
2.782	3.0	55.2	51.2	32.2	4.9	-35.2	0.0	0.6	57.6	53.7	74	54	-16.4	-0.3	H
3.709	3.0	53.3	48.6	33.0	5.7	-34.9	0.0	0.6	57.8	53.0	74	54	-16.2	-1.0	H
4.636	3.0	46.8	38.6	33.6	6.5	-34.8	0.0	0.6	52.6	44.4	74	54	-21.4	-9.6	H
Tx Mid Ch 914.75MHz															
1.830	3.0	56.7	50.6	30.9	3.9	-35.5	0.0	0.3	56.2	50.1	105.0	105.0	-48.8	-54.9	-20dBc V
2.744	3.0	52.8	45.4	32.2	4.8	-35.2	0.0	0.6	55.2	47.8	74	54	-18.8	-6.2	V
3.659	3.0	48.7	39.7	33.0	5.6	-34.9	0.0	0.6	53.0	44.0	74	54	-21.0	-10.0	V
4.574	3.0	47.6	37.4	33.6	6.5	-34.8	0.0	0.6	53.4	43.2	74	54	-20.6	-10.8	V
5.417	3.0	48.6	38.3	34.1	7.3	-34.9	0.0	0.5	55.6	45.3	74	54	-18.4	-8.7	V
6.403	3.0	46.4	37.5	34.8	8.2	-34.8	0.0	0.5	55.1	46.2	74	54	-18.9	-7.8	V
7.318	3.0	47.3	38.6	35.2	8.8	-34.7	0.0	0.6	57.3	48.5	74	54	-16.7	-5.5	V
1.830	3.0	58.7	47.1	30.9	3.9	-35.5	0.0	0.3	58.2	46.6	105.0	105.0	-46.8	-58.4	-20dBc H
2.744	3.0	54.7	48.1	32.2	4.8	-35.2	0.0	0.6	57.1	50.5	74	54	-16.9	-3.5	H
3.659	3.0	48.7	41.3	33.0	5.6	-34.9	0.0	0.6	53.0	45.6	74	54	-21.0	-8.4	H
4.574	3.0	45.9	34.6	33.6	6.5	-34.8	0.0	0.6	51.7	40.4	74	54	-22.3	-13.6	H
Tx Low Ch 902.75MHz															
1.806	3.0	58.0	50.4	30.8	3.8	-35.5	0.0	0.3	57.4	49.8	105.0	105.0	-47.6	-55.2	-20dBc V
2.710	3.0	53.3	44.1	32.1	4.8	-35.2	0.0	0.6	55.6	46.4	74	54	-18.4	-7.6	V
3.611	3.0	50.2	41.9	33.0	5.6	-34.9	0.0	0.6	54.4	46.1	74	54	-19.6	-7.9	V
4.514	3.0	46.1	37.4	33.5	6.4	-34.8	0.0	0.6	51.8	43.2	74	54	-22.2	-10.8	V
5.417	3.0	49.0	38.2	34.1	7.3	-34.9	0.0	0.5	56.0	45.2	74	54	-18.0	-8.8	V
6.319	3.0	45.3	35.1	34.7	8.1	-34.8	0.0	0.5	53.8	43.6	74	54	-20.2	-10.4	V
7.222	3.0	46.1	36.4	35.2	8.8	-34.7	0.0	0.6	56.0	46.3	74	54	-18.0	-7.7	V
1.806	3.0	61.2	55.2	30.8	3.8	-35.5	0.0	0.3	60.6	54.6	105.0	105.0	-44.4	-50.4	-20dBc H
2.710	3.0	56.8	48.3	32.1	4.8	-35.2	0.0	0.6	59.1	50.7	74	54	-14.9	-3.3	H
3.611	3.0	48.9	38.3	33.0	5.6	-34.9	0.0	0.6	53.1	42.5	74	54	-20.9	-11.5	H
4.514	3.0	45.2	35.3	33.5	6.4	-34.8	0.0	0.6	50.9	41.0	74	54	-23.1	-13.0	H
No other emissions were detected above noise floor.															

Rev. 5.1.6

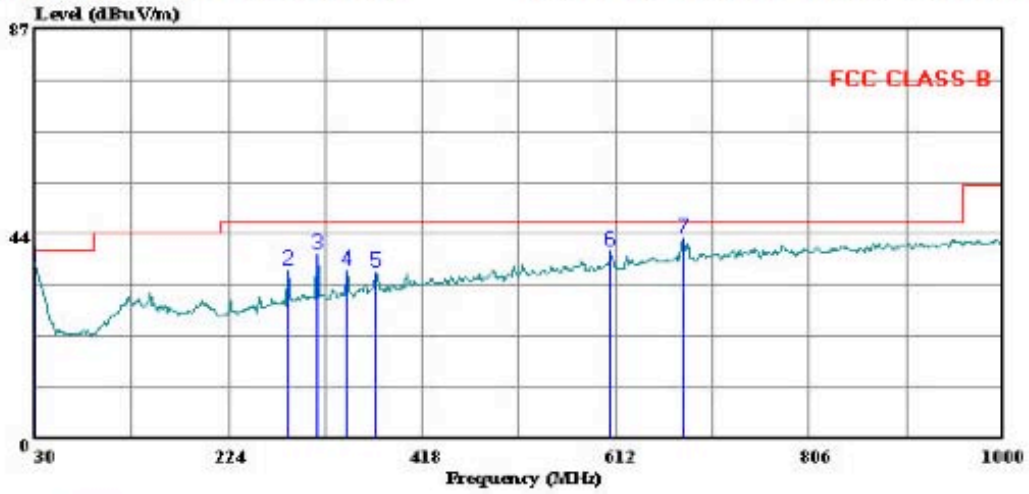
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

Card ON, TX Off, Computer Off, USB/Serial Off

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

Data#: 24 File#: 10855.emi Date: 02-12-2007 Time: 17:48:57



Trace: 23 Ref Trace:

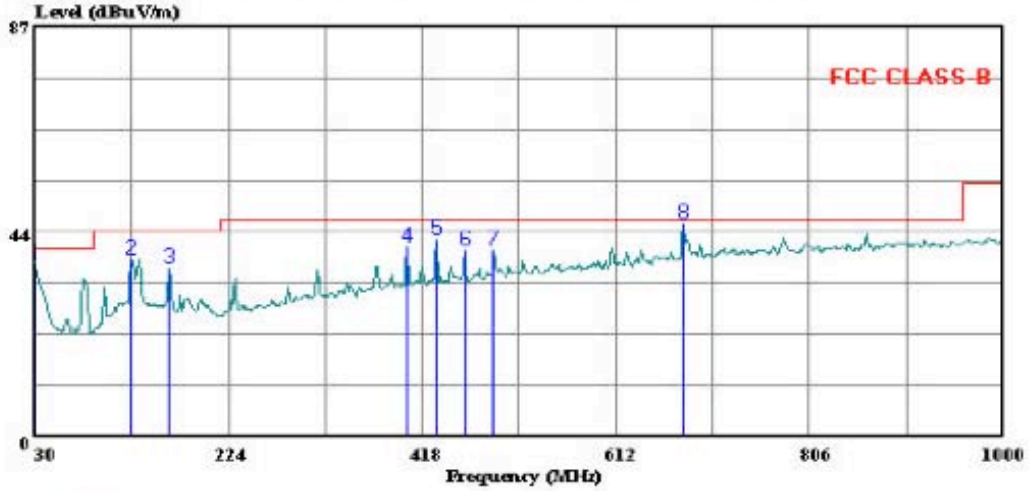
Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Company: : WJ Communication
Project #: : 07U10855
Configuration: : EUT And Circularly Polarize Antenna
Mode of Operation:: Idle Mode
Target: : Fcc Class B
: Card only , no laptop

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	42.17	-5.76	36.41	40.00	-3.59	Peak
2	284.140	48.50	-12.86	35.64	46.00	-10.36	Peak
3	313.240	50.97	-11.91	39.06	46.00	-6.94	Peak
4	342.340	47.14	-11.22	35.92	46.00	-10.08	Peak
5	371.440	45.78	-10.53	35.25	46.00	-10.75	Peak
6	606.180	45.33	-5.27	40.06	46.00	-5.94	Peak
7	678.930	46.41	-3.86	42.55	46.00	-3.45	Peak

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

Data#: 25 File#: 10855.emi Date: 02-12-2007 Time: 17:51:08



Trace: 22 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Company: : WJ Communication
Project #: : 07U10855
Configuration: : EUT And Circularly Polarize Antenna
Mode of Operation:: Idle Mode
Target: : Fcc Class B
: Card only , no laptop

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	42.27	-5.76	36.51	40.00	-3.49	Peak
2	126.030	50.81	-12.99	37.82	43.50	-5.68	Peak
3	164.830	50.07	-14.40	35.67	43.50	-7.83	Peak
4	402.480	50.12	-9.86	40.26	46.00	-5.74	Peak
5	431.580	50.82	-9.06	41.76	46.00	-4.24	Peak
6	460.680	48.01	-8.30	39.71	46.00	-6.29	Peak
7	489.780	47.27	-7.60	39.67	46.00	-6.33	Peak
8	678.930	49.11	-3.86	45.25	46.00	-0.75	Peak

Card ON, TX On, Computer On, USB/Serial ON

Vertical

Freq. MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB
94.9	63.65	-18.29	45.36	105	-59.64
196.84	58.40	-13.96	44.44	105	-60.56
342.34	57.30	-11.22	46.08	105	-58.92
482.99	58.74	-7.74	51.00	105	-54.0
950.53	48.82	-0.82	48.00	105	-57.0

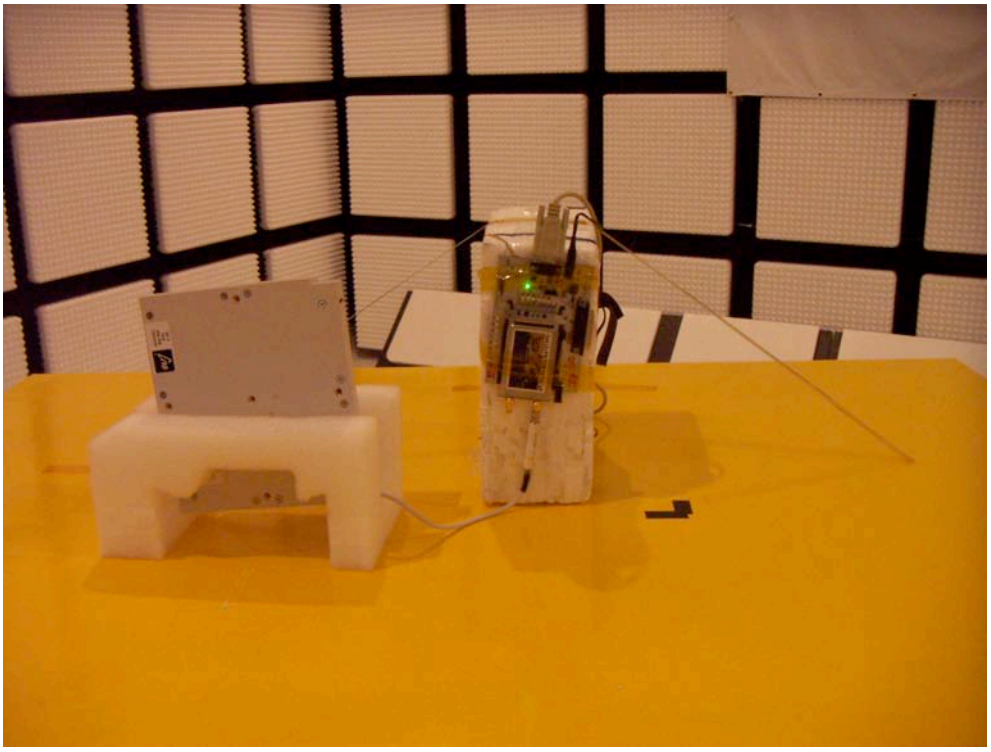
Horizontal

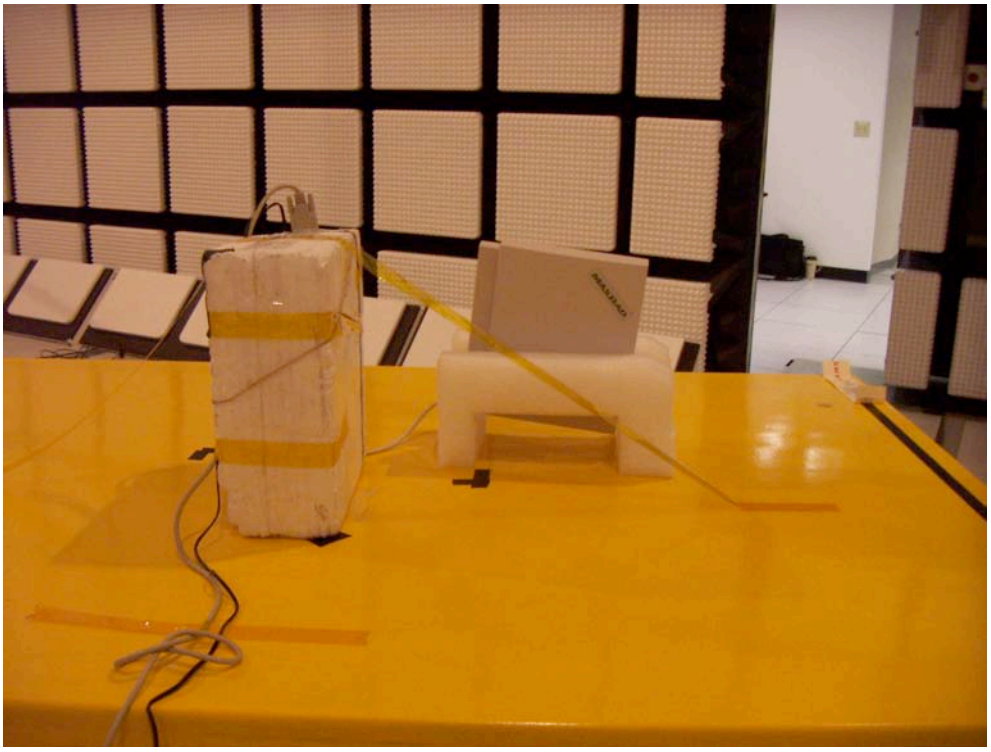
Freq. MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB
150.8	59.36	-11.22	45.41	105	-59.59
342.34	58.07	-11.22	46.85	105	-58.15
482.99	65.65	-7.74	57.91	105	-47.09
521.79	58.49	-6.91	51.58	105	-53.42

SETUP PHOTOS

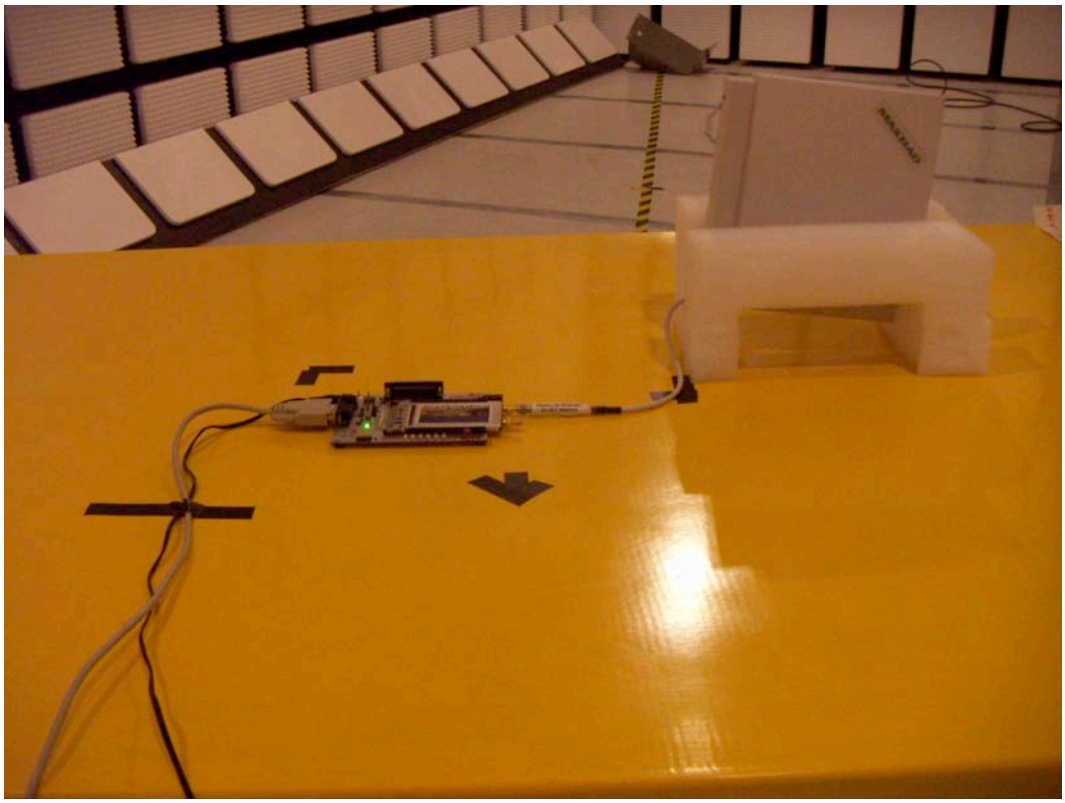
ANTENNA PORT MEASUREMENT SETUP

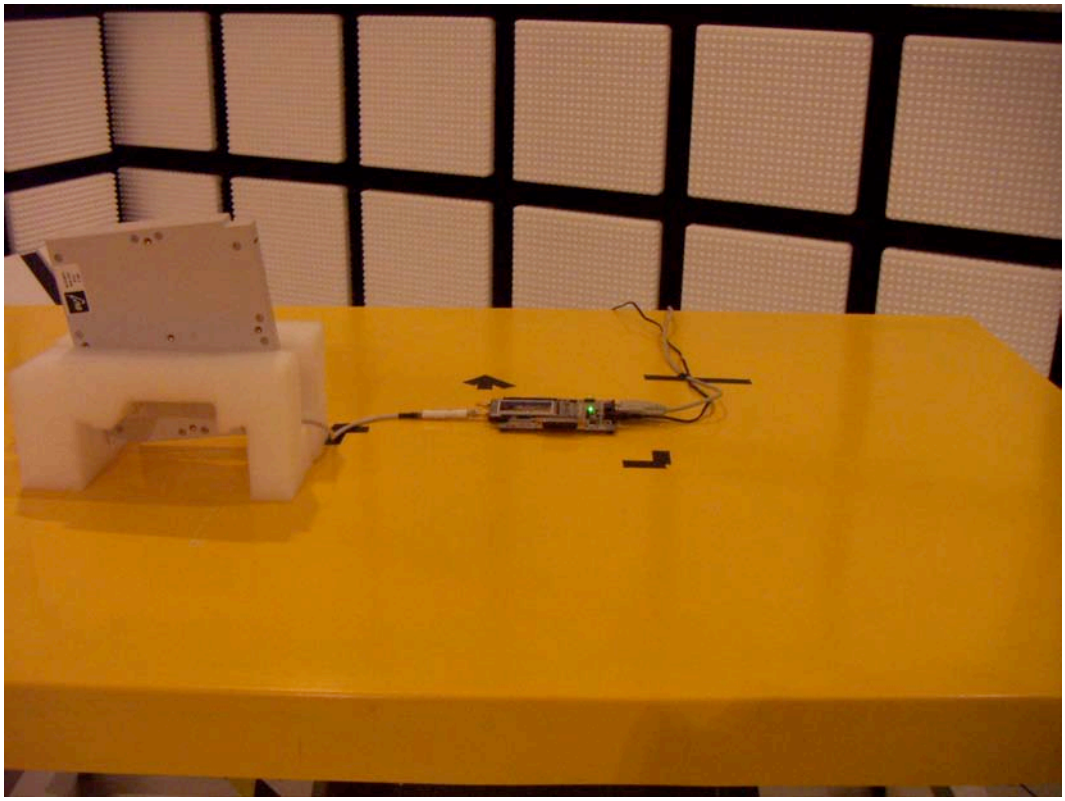
RADIATED RF MEASUREMENT SETUP (Z Orientation, Worst Case)



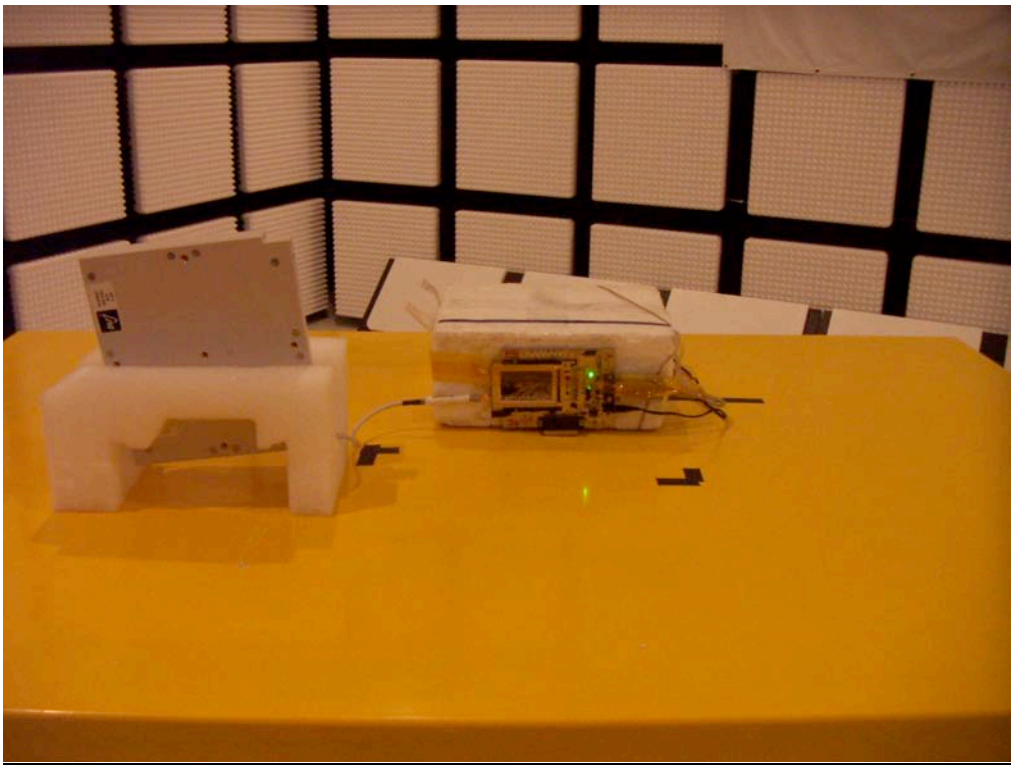


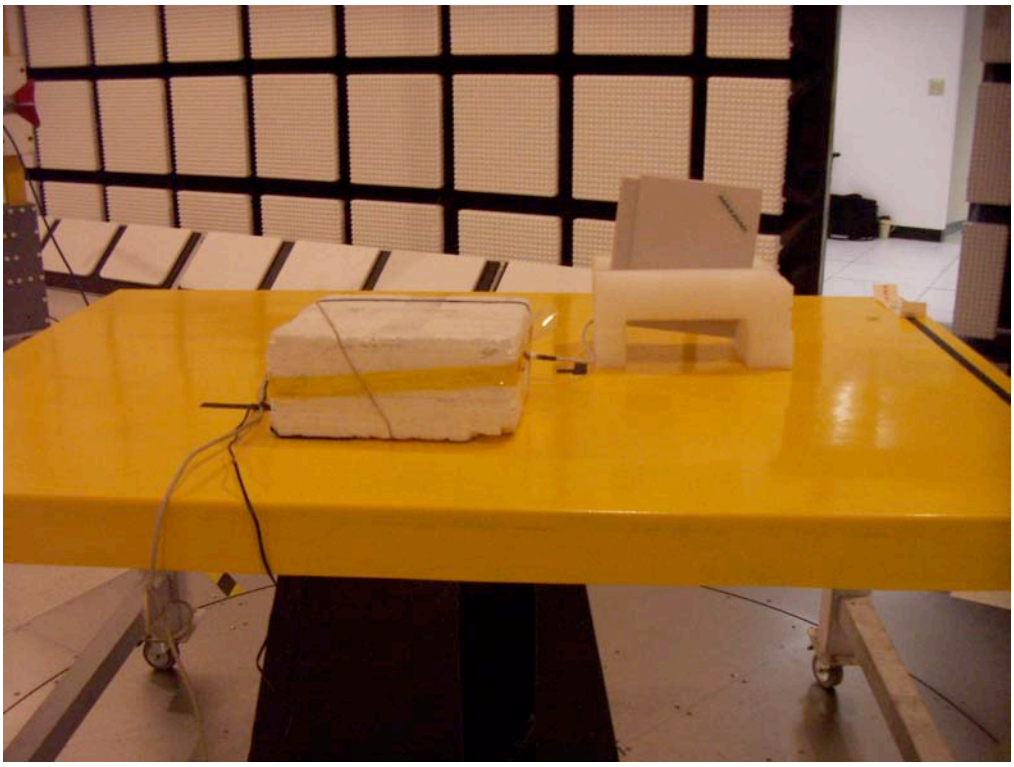
RADIATED RF MEASUREMENT SETUP (X ORIENTATION)





RADIATED RF MEASUREMENT SETUP WORST CASE (Y ORIENTATION)





END OF REPORT