Lab Code: 200167-0

FCC PART 15.247

TEST AND MEASUREMENT REPORT

For

Arrayent, Inc.

2317 Broadway Street, Suite 140,

Redwood City, CA 94063, USA

FCC ID: Y4B-AIC-EGW

Report Type:	**Product Type:**
Original Report	900 MHz Ethernet Gateway Transmitter

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Report Number:	R1011182-247
Report Date:	2011-01-31
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1011182-247	Original Report	2011-01-31

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Arrayent, Inc.* product, *Model: AIC-EGW, FCC ID: Y4B-AIC-EQW* or the "EUT" as referred to this report. The Ethernet Gateway automatically sets up a 900 MHz radio network. When turned on it scans the 908 to 918 MHz frequency range and auto-selects an available channel. This allows multiple EGWs to operate in close proximity without interference. This behavior also alleviates interference from other radio devices in the 900 MHz band. The RF protocol used by the P`ower Control Ecosystem is designed for whole house coverage. The protocol uses carrier sensing to check for traffic in order to implement collision avoidance, and uses link layer acknowledge and retries to handle packet collisions and signal fade. With this protocol, the radio has a range of 130 meters line-of-sight at 1 meter above ground. The modulation scheme is GFSK at 100 K baud and operating frequency is from 908.40 MHz to 919.65 MHz with 11 Channels.

1.2 Mechanical Description of EUT

The *EUT* measures approximately 82 mm **(L)** x 25 mm **(W)** x 15 mm **(H)**, weighing approximately *15* g.

The data gathered are from a production sample provided by the manufacturer. Serial number: R1011182-1, assigned by BACL.

1.3 Objective

This report is prepared on behalf of *Arrayent, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

No related submittals.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2001670.htm

2 System Test Configuration

2.1 Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

N/A

2.3 Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturers	Descriptions	Model Number	Serial Numbers
-	-	-	-

2.6 EUT Internal Configuration and Details

Manufacturers	Descriptions	Model Number	Serial Numbers
Arrayent Inc	PCB Board	-	e318580

2.7 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
-	-	-	-

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth & 99% Bandwidth	Compliant
§15.247 (b)(3)	Maximum Peak Output Power	Compliant
§ 15.247 (d)	Band Edge/Out of Band Emissions	Compliant
§15.247 (e)	Power Spectral Density	Compliant
§15.205, §15.209 & §15.247(c)	Radiated Spurious Emissions	Compliant
§15.205, §15.209	Restricted Band	Compliant
§15.247 (i), §2.1091	RF Exposure Info	Compliant

4 FCC §15.203 - Antenna Requirement

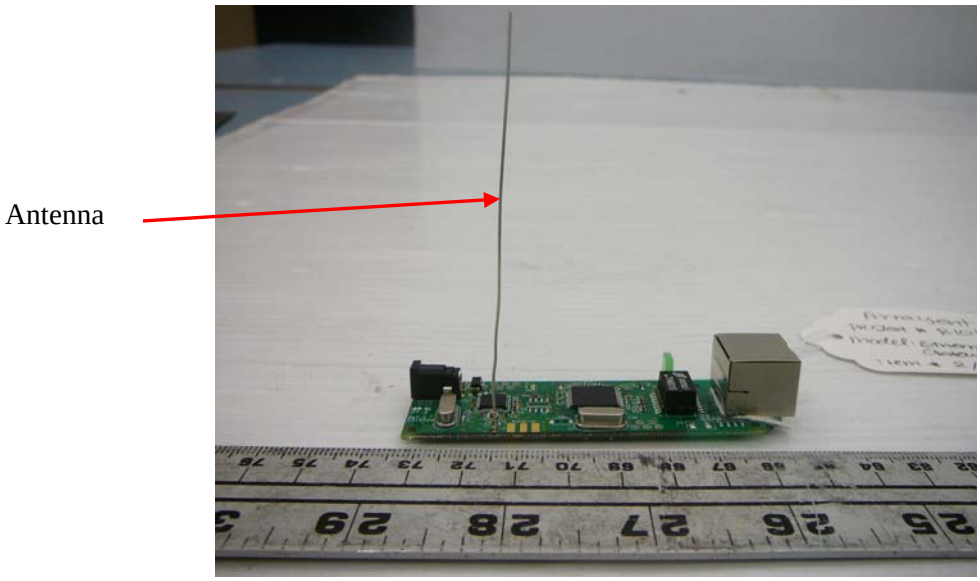
4.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Results

The EUT has an integral antenna with a maximum gain of 7.3 dBi, which is accordance to sections FCC Part 15.203 and considered sufficient to comply with the provisions of these sections.



5 FCC §15.207 – AC Line Conducted Emissions

5.1 Applicable Standard

As per FCC §15.207 conducted emissions limits:

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 frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 [1]	56 to 46[1]
0.5-5	56	46
5-30	60	50

[1] *Decreases with the logarithm of the frequency.*

5.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.2 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

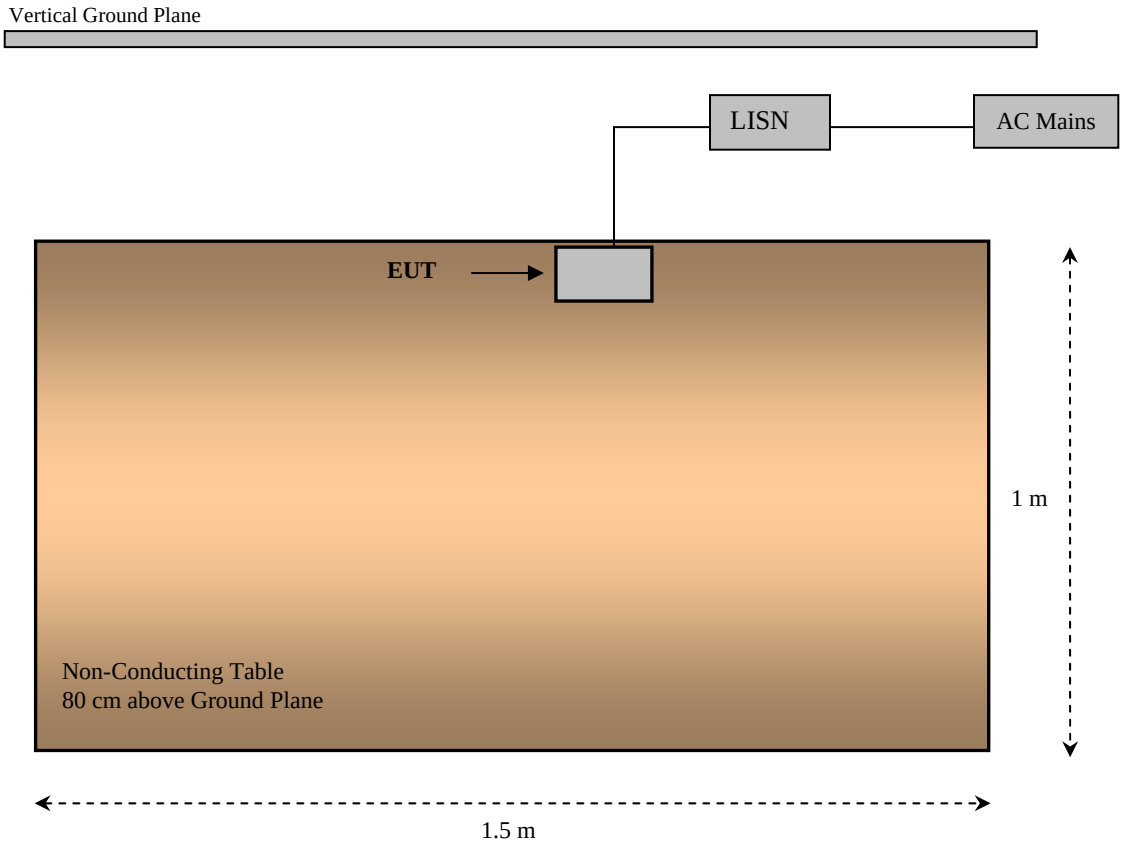
The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

5.3 Test Equipment List and Details

Manufacturer	Description	Models	Serial Number	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Solar Electronics	LISN	9252-R-24-BNC	511205	2010-06-25
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2010-06-10

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

5.4 Test Setup Block Diagram



5.5 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a "QP." Average readings are distinguished with an "Ave".

5.6 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

The testing was performed by Dennis Huang on 2010-12-22 in 5 meter 3.

5.7 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

5.8 Summary of Test Results

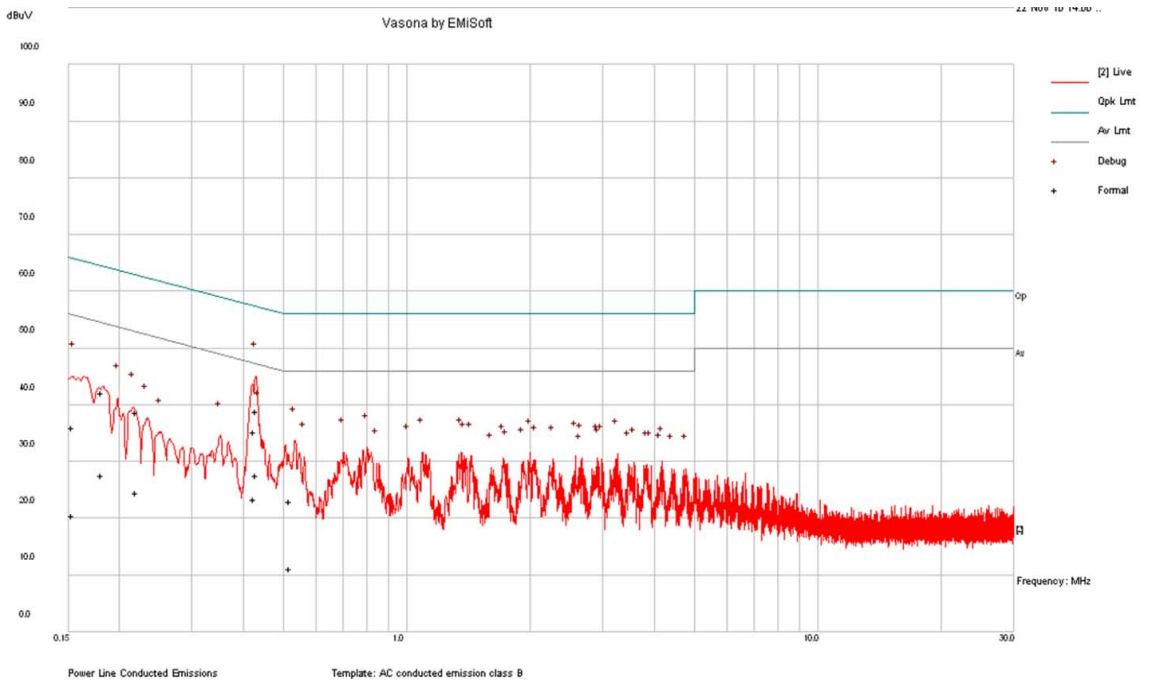
According to the recorded data in following table, the EUT complied with the FCC and IC RSS-Gen conducted emissions limits, with the margin reading of:

Test on the worst channel

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-15.64	0.429363	Neutral	0.15 to 30

5.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



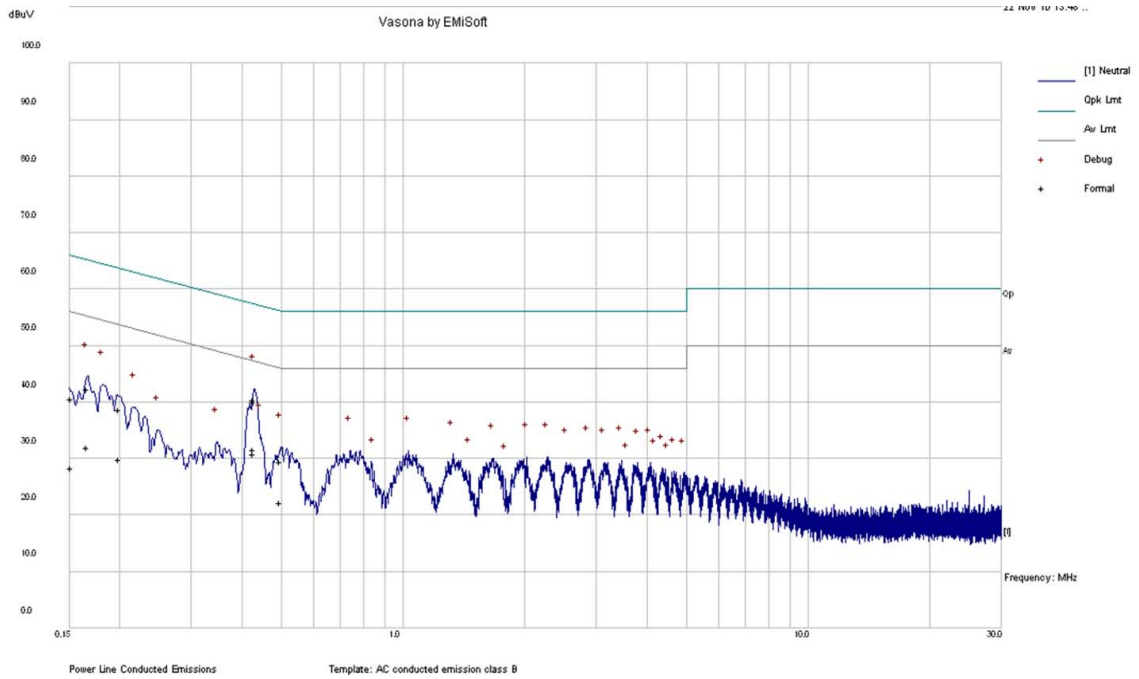
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.430686	38.95	Line	57.24	-18.29
0.425997	35.26	Line	57.33	-22.07
0.181848	42.1	Line	64.4	-22.30
0.219897	38.74	Line	62.82	-24.08
0.154449	35.99	Line	65.76	-29.76
0.519924	23.02	Line	56	-32.98

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.430686	27.64	Line	47.24	-19.60
0.425997	23.36	Line	47.33	-23.97
0.181848	27.67	Line	54.40	-26.74
0.219897	24.57	Line	52.82	-28.25
0.519924	11.24	Line	46.00	-34.76
0.154449	20.51	Line	55.76	-35.25

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/ Neutral)	Limit (dBµV)	Margin (dB)
0.429363	40.42	Neutral	57.27	-16.85
0.428406	40.05	Neutral	57.28	-17.23
0.166476	42.31	Neutral	65.13	-22.83
0.199968	38.73	Neutral	63.61	-24.88
0.151803	40.62	Neutral	65.9	-25.28
0.500328	29.57	Neutral	56	-26.43

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/ Neutral)	Limit (dBµV)	Margin (dB)
0.429363	31.62	Neutral	47.27	-15.64
0.428406	30.92	Neutral	47.28	-16.36
0.166476	32.03	Neutral	55.13	-23.1
0.199968	29.89	Neutral	53.61	-23.72
0.500328	22.26	Neutral	46	-23.74
0.151803	28.41	Neutral	55.9	-27.49

6 FCC §15.247(a)(2) – 6 dB Occupied Bandwidth

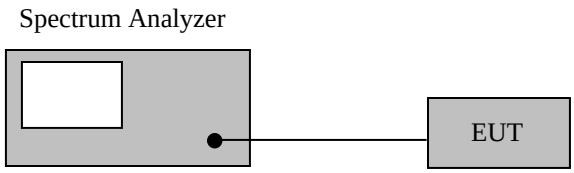
6.1 Applicable Standard

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emissions bandwidth. (6 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

6.3 Test Setup Block Diagram



6.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.5 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

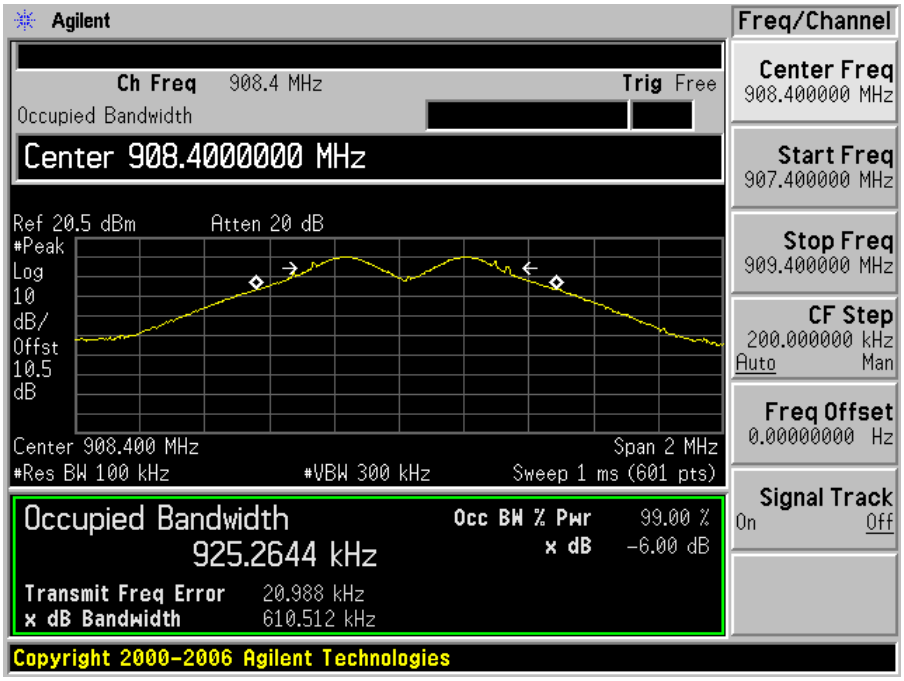
The testing was performed by Dennis Huang on 2010-11-23 at RF Site.

6.6 Test Results

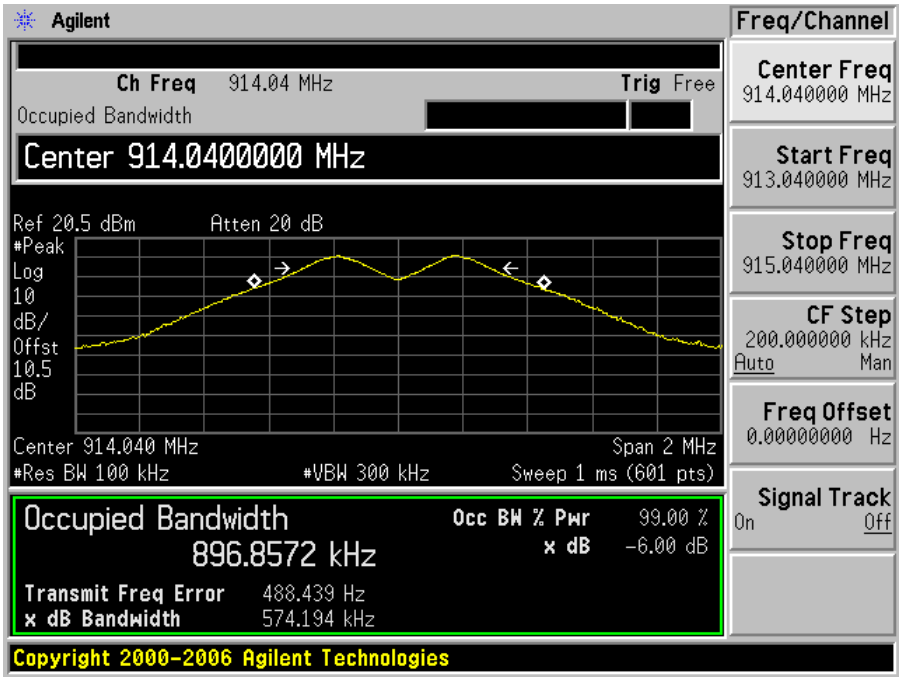
Channel	Frequency (MHz)	6 dB OBW (MHz)	99% OBW (MHz)	Limit (MHz)
Low	908.40	0.61	0.925	> 0.5
Middle	914.04	0.574	0.896	> 0.5
High	919.65	0.576	0.956	> 0.5

Please refer to the following plots for detailed test results

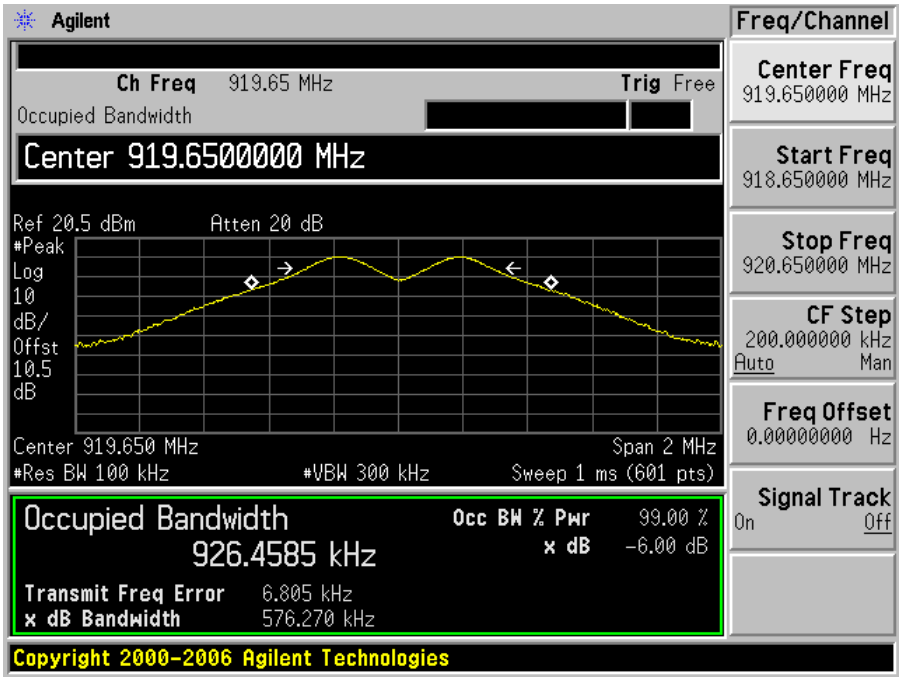
Low Channel



Middle Channel



High Channel



7 FCC §15.247(b) - Peak Output Power

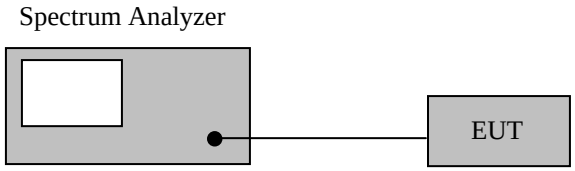
7.1 Applicable Standard

According to §15.247(b) (3) for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

7.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.

7.3 Test Setup Block Diagram



7.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.5 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

The testing was performed by Dennis Huang on 2010-11-23 at RF Site.

7.6 Test Results

Channel	Frequency (MHz)	Max Power (dBm)	Max Power (mW)	Limit (mW)	Result
Low	908.40	10.89	12.27	1000	Compliant
Mid	914.04	10.94	12.42	1000	Compliant
High	919.65	11.00	12.59	1000	Compliant

8 FCC §15.247(d) – Out of Band Emissions

8.1 Applicable Standard

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c)).

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

8.3 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

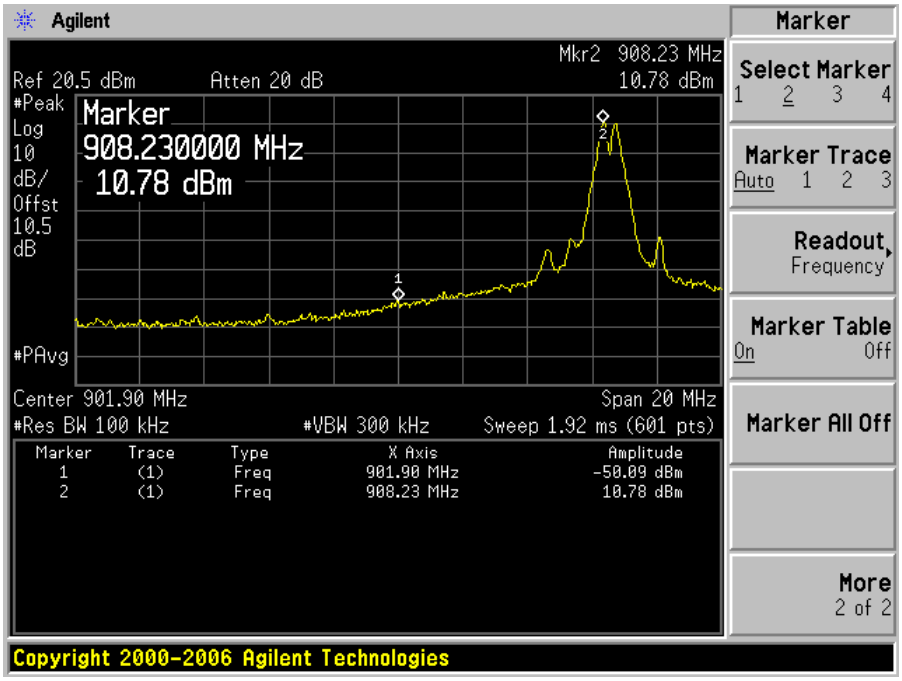
Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

8.4 Test Environmental Conditions

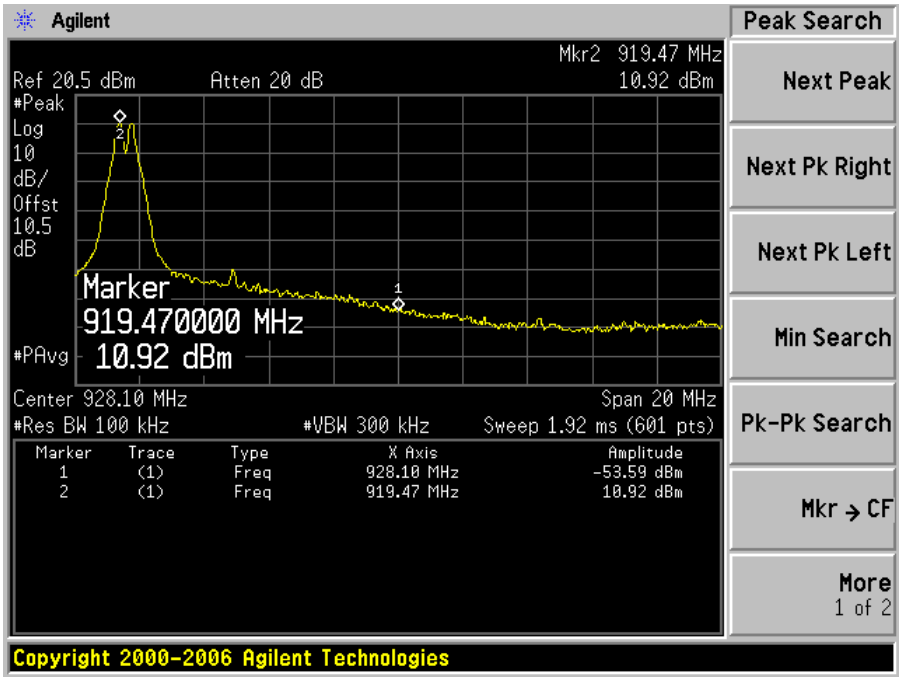
Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

The testing was performed by Dennis Huang on 2010-11-23 at RF Site.

Lowest Channel

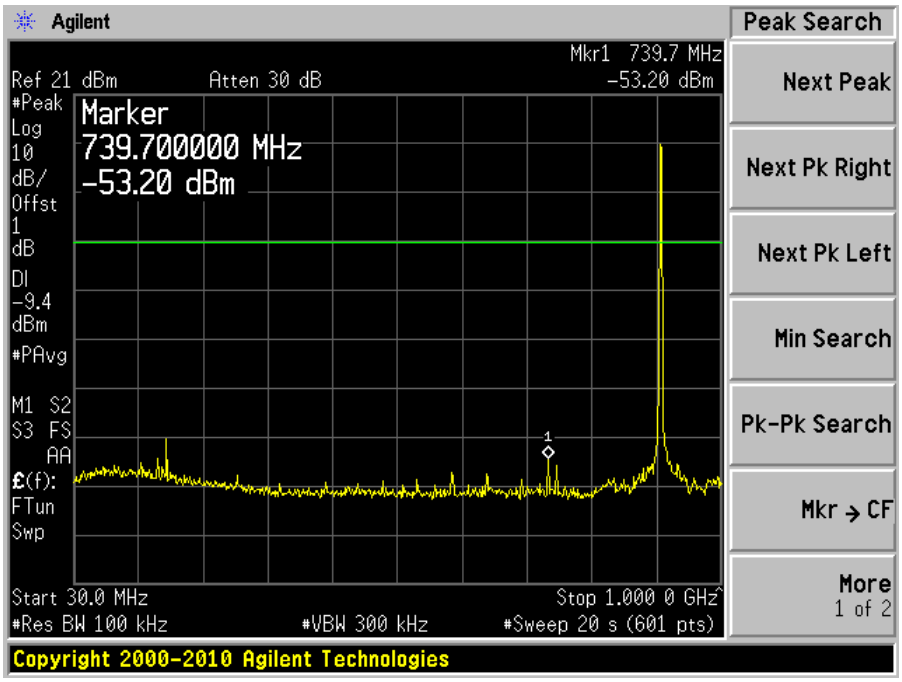


Highest Channel

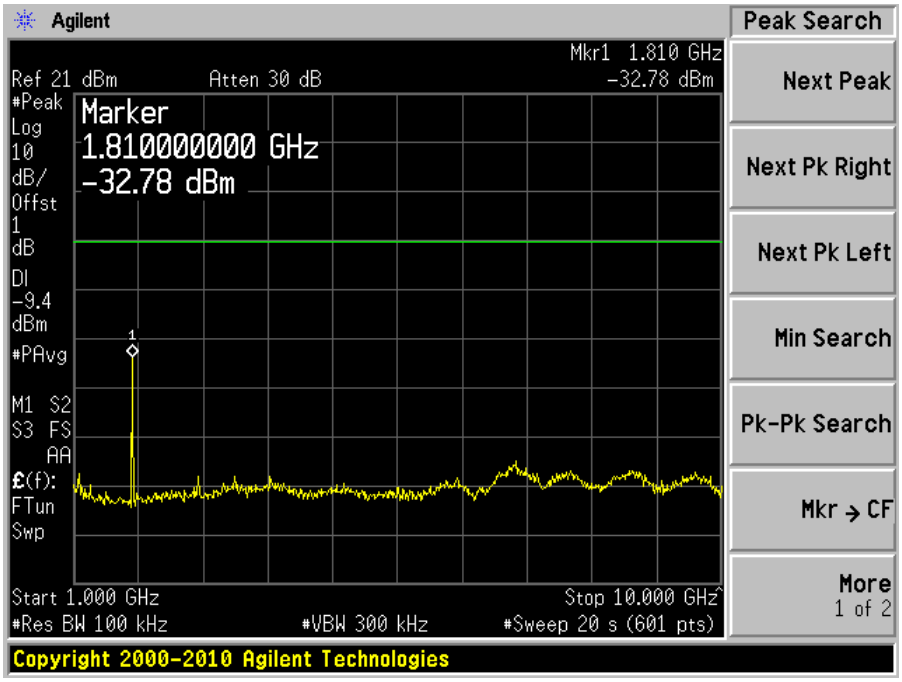


Plots of spurious emission at antenna port

Low Channel

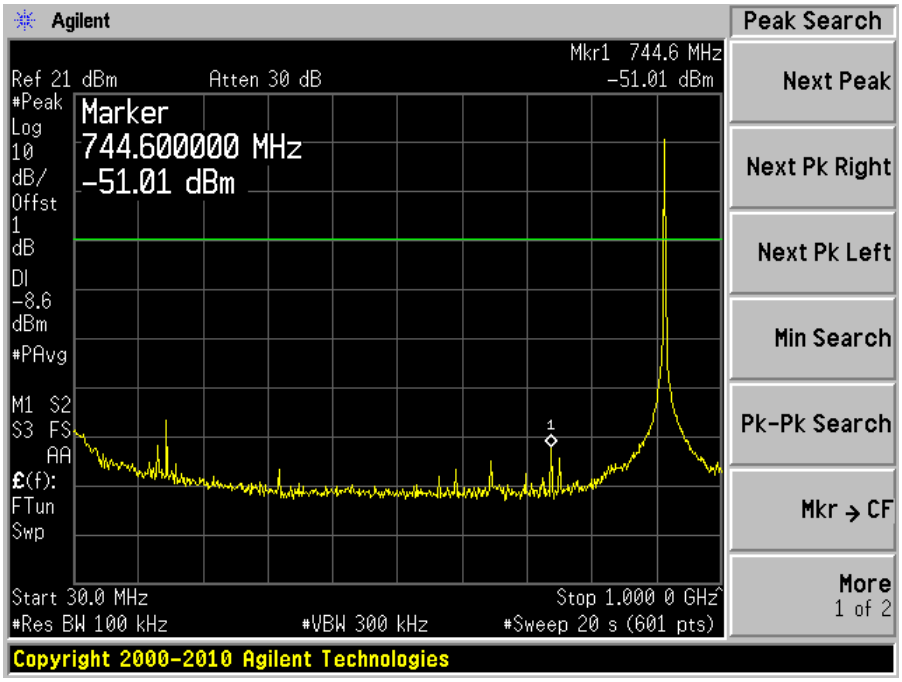


Plot 1: 30 MHz~1GHz

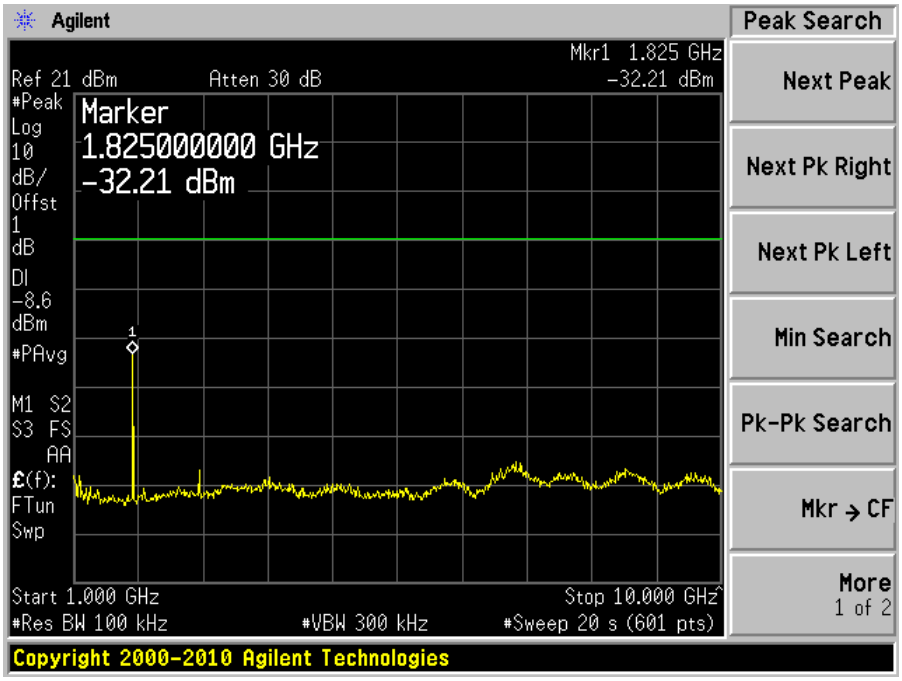


Plot 2: 1 ~10 GHz

Middle Channel

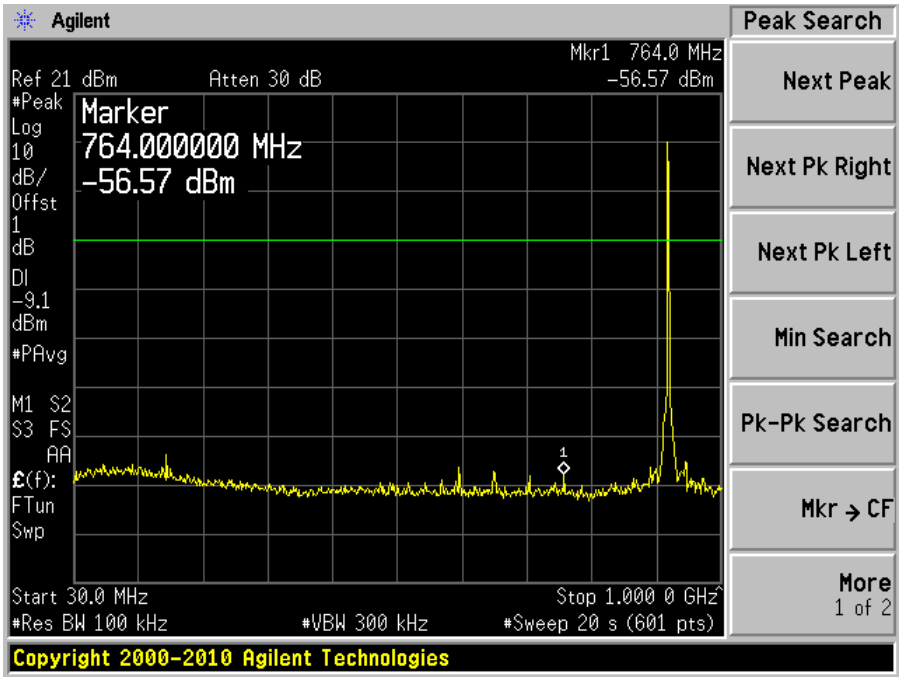


Plot 1: 30 MHz~1GHz

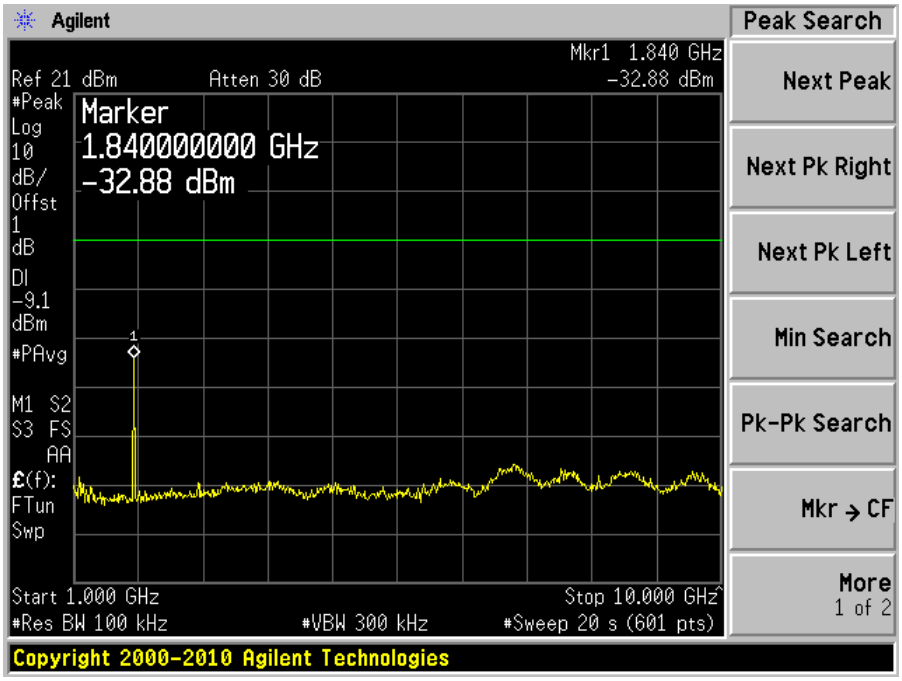


Plot 2: 1 ~ 10 GHz

High Channel



Plot 1: 30 MHz~1 GHz



Plot 2: 1 ~ 10 GHz

9 FCC §15.247(e) - Power Spectral Density

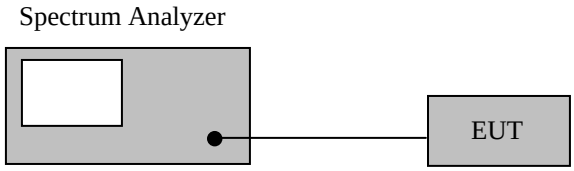
9.1 Applicable Standard

According to §15.247 (e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Measure the power spectral density as follows:
   A. Tune the analyzer to the highest point of the maximized fundamental emission. Reset the analyzer to a RBW = 3 kHz, VBW > RBW, span = 99% OBW, sweep = (span/3kHz) second.
   B. From the peak level obtained in (A), derive the field strength, E, by applying the appropriate antenna factor, cable loss, pre-amp gain, etc.
4. P = (E x d) squared / (30 x G)
   G = the numeric gain of the transmitting antenna over an isotropic radiator.
   d = the distance in meters from which the field strength was measured.
   P = the power in watts for which you are solving:
5. Using the equation listed in (4), calculate a power level for comparison to the + 8 dBm limit.

9.3 Test Setup Block Diagram



9.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

9.5 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

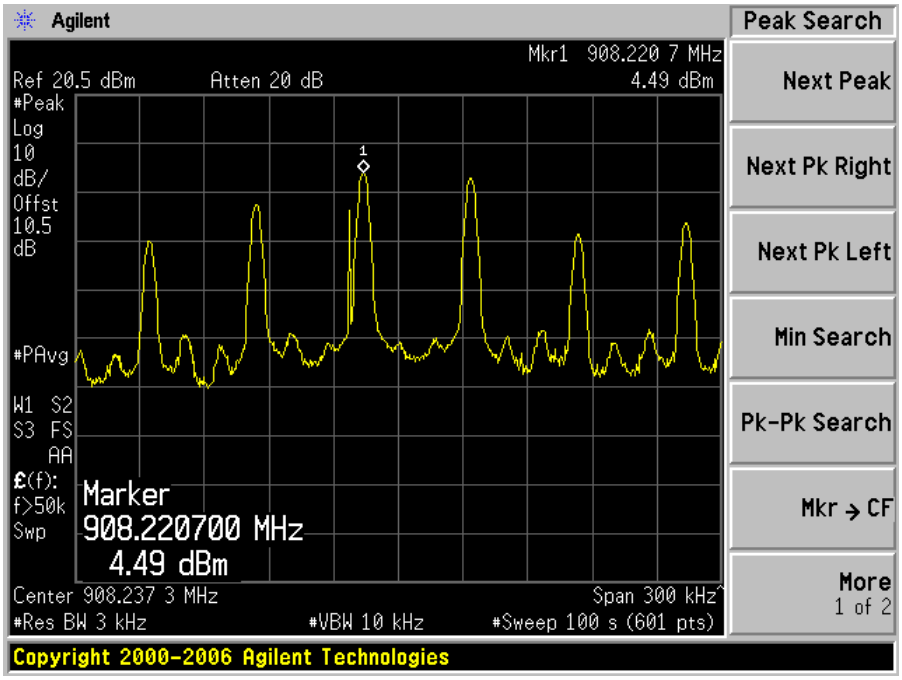
The testing was performed by Dennis Huang on 2010-11-23 at RF Site.

9.6 Test Results

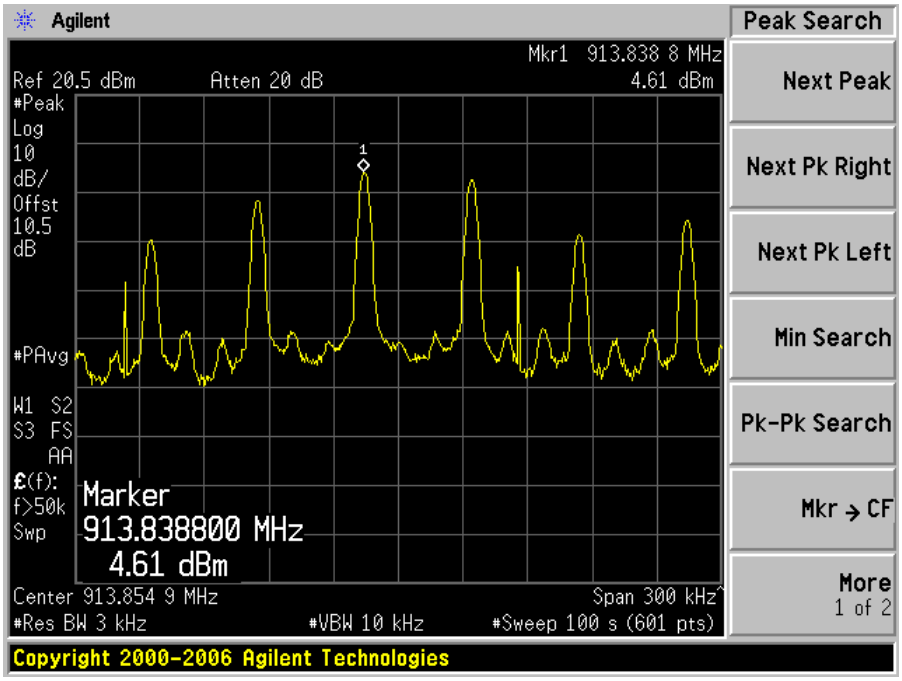
Frequency (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
908.40	4.49	8	Compliant
914.04	4.61	8	Compliant
919.65	4.62	8	Compliant

Please refer to the following plots for detailed test results

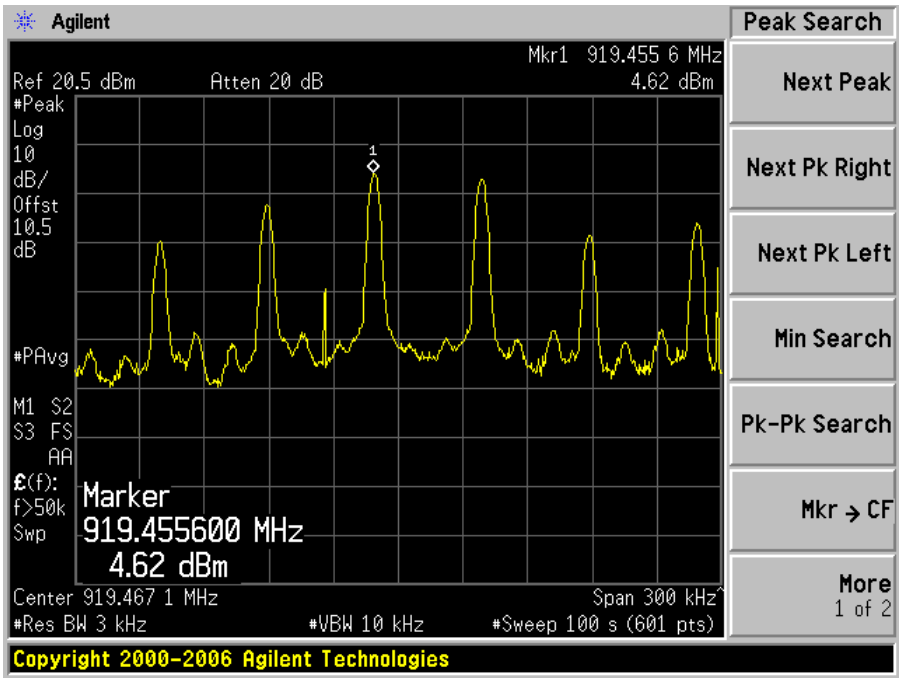
Low Channel



Middle Channel



High Channel



10 FCC §15.205, §15.209 & §15.247(c) - Spurious Radiated Emissions

10.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §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 (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
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.

As Per FCC §15.205(a) except as show 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3332 – 3339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3345.8 – 3358	23.6 – 24.0
12.29 – 12.293	240 – 285	3600 – 4400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §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)).

10.2 Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C.

10.3 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

10.4 Test Procedure

For the radiated emissions test, the EUT was two AA battery.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meters away from the testing antenna, which is varied from 1-4 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz/VBW = 1MHz/Sweep = Auto
(2) Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

10.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

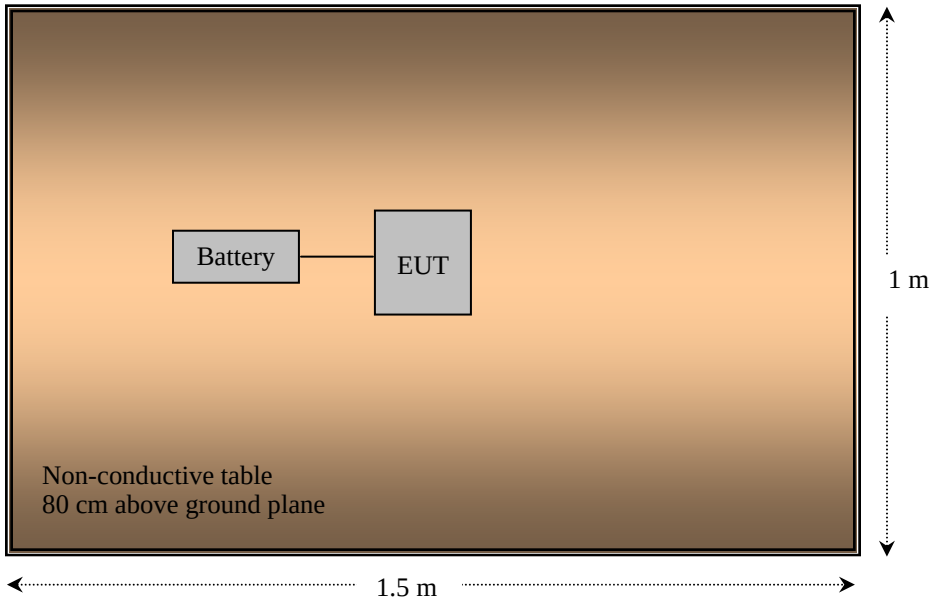
Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

10.6 Test Setup Block Diagrams

Radiated Emission



10.7 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18
Sunol Sciences	Antenna	JB1	A020106-1	2010-05-28
A.R.A	Horn Antenna	DRG-118/A	1132	2010-11-29
Mini-Circuits	Amplifier	ZVA-183-S	570400946	2010-05-10
HP	Pre-Amplifier	8447D	2944A06639	2010-06-18

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

10.8 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	55%
ATM Pressure:	101kPa

The testing was performed by Dennis Huang on 2010-12-22 in 5 meter 3.

10.9 Test Results

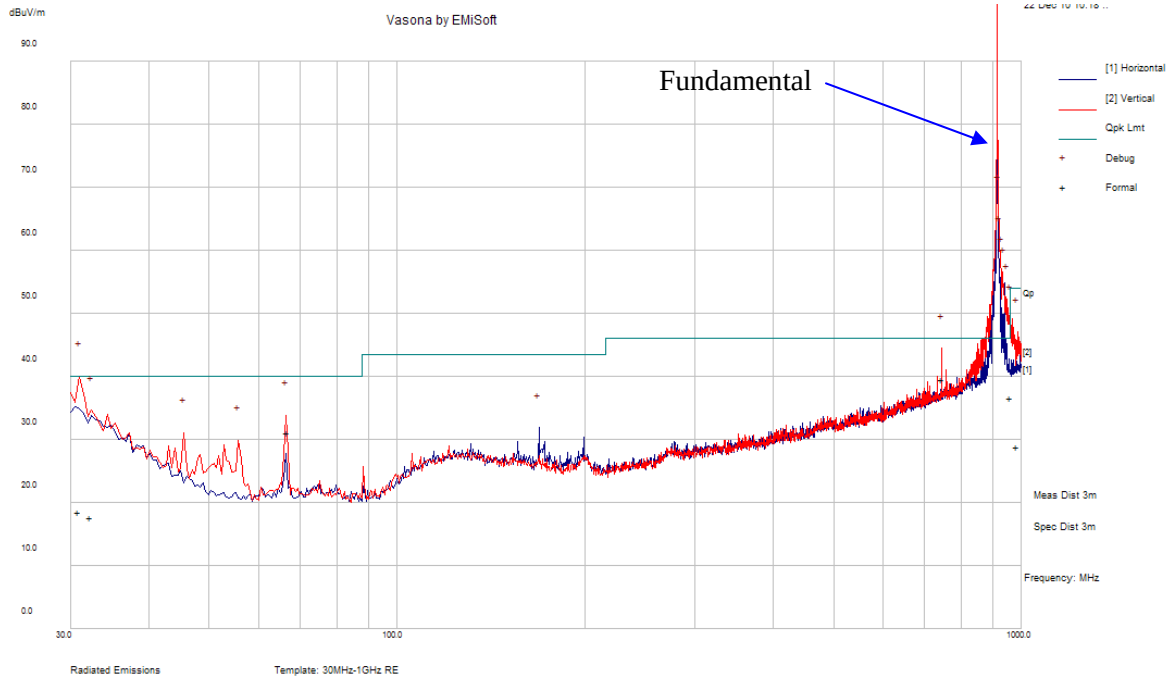
According to the data hereinafter, the EUT complied with the FCC requirements, and had the worst margin readings of:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-6.37	745.1355	Vertical	30 to 1000 MHz
-4.95	2758.95	Vertical	Above 1 GHz

10.10 Radiated Emissions Test Plot & Data

30 MHz – 1 GHz measured at 3 meters

Worst Case - Middle Channel



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
745.1355	39.63	101	V	43	46	-6.37
66.60125	31.08	106	V	67	40	-8.92
960.4718	36.67	168	V	360	54	-17.33
30.91025	18.48	246	V	217	40	-21.52
32.28075	17.68	255	V	350	40	-22.32
985.4345	28.81	268	V	91	54	-25.19

Above 1 GHz

Low Channel: 908.4 MHz

Spurious/Harmonics Emissions measured at 3 meters (Above 1 GHz)

Freq. (MHz)	S.A. Reading (dBµV)	Azimuth Degrees	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	Margin (dB)	Comments
			Height (cm)	Polar. (H/V)	Factor (dB)						
2725.2	42.29	140	100	V	29.6	3.27	27.9	47.26	54	-6.74	Ave
2725.2	31.09	169	100	H	29.6	3.27	27.9	36.06	54	-17.94	Ave
2725.2	49.66	140	100	V	29.6	3.27	27.9	54.63	74	-19.37	Peak
2725.2	42.56	169	100	H	29.6	3.27	27.9	47.53	74	-26.47	Peak
3633.6	38.12	199	105	V	31.2	3.8	28	45.12	54	-8.88	Ave
3633.6	48.42	199	105	V	31.2	3.8	28	55.42	74	-18.58	Peak
3633.6	28.15	170	100	H	31.2	3.8	28	35.15	54	-18.85	Ave
3633.6	42.71	170	100	H	31.2	3.8	28	49.71	74	-24.29	Peak
4542	34.84	286	247	V	32.3	4.33	27.5	43.97	54	-10.03	Ave
4542	34.37	35	199	H	32.3	4.33	27.5	43.5	54	-10.5	Ave
4542	47.77	35	199	H	32.3	4.33	27.5	56.9	74	-17.1	Peak
4542	47.74	286	247	V	32.3	4.33	27.5	56.87	74	-17.13	Peak

Middle Channel: 914.04 MHz

Spurious/Harmonics Emissions measured at 3 meters (Above 1 GHz)

Freq. (MHz)	S.A. Reading (dBµV)	Azimuth Degrees	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	Margin (dB)	Comments
			Height (cm)	Polar. (H/V)	Factor (dB)						
2742	50.92	209	114	V	29.6	3.27	27.9	55.89	74	-18.11	Peak
2742	41.59	142	174	H	29.6	3.27	27.9	46.56	74	-27.44	Peak
2742	44.05	209	114	V	29.6	3.27	27.9	49.02	54	-4.98	Ave
2742	29.4	142	174	H	29.6	3.27	27.9	34.37	54	-19.63	Ave
3656	48.35	185	100	V	31.2	3.8	28	55.35	74	-18.65	Peak
3656	44.67	59	178	H	31.2	3.8	28	51.67	74	-22.33	Peak
3656	37.28	185	100	V	31.2	3.8	28	44.28	54	-9.72	Ave
3656	31.9	59	178	H	31.2	3.8	28	38.9	54	-15.1	Ave
4570	47.06	288	181	V	32.3	4.33	27.5	56.19	74	-17.81	Peak
4570	47.73	33	199	H	32.3	4.33	27.5	56.86	74	-17.14	Peak
4570	33.98	288	181	V	32.3	4.33	27.5	43.11	54	-10.89	Ave
4570	34.84	33	199	H	32.3	4.33	27.5	43.97	54	-10.03	Ave

High Channel: 919.65 MHz

Spurious/Harmonics Emissions measured at 3 meters (Above 1 GHz)

Freq. (MHz)	S.A. Reading (dBµV)	Azimuth Degrees	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	Margin (dB)	Comments
			Height (cm)	Polar. (H/V)	Factor (dB)						
2758.95	50.47	177	113	V	29.6	3.27	27.9	55.44	74	-18.56	Peak
2758.95	43.61	31	138	H	29.6	3.27	27.9	48.58	74	-25.42	Peak
2758.95	44.08	177	113	V	29.6	3.27	27.9	49.05	54	-4.95	Ave
2758.95	33.35	31	138	H	29.6	3.27	27.9	38.32	54	-15.68	Ave
3678.6	47.93	190	103	V	31.2	3.8	28	54.93	74	-19.07	Peak
3678.6	43.16	356	100	H	31.2	3.8	28	50.16	74	-23.84	Peak
3678.6	37.28	190	109	V	31.2	3.8	28	44.28	54	-9.72	Ave
3678.6	29.39	356	100	H	31.2	3.8	28	36.39	54	-17.61	Ave
4598.25	45.59	169	100	V	32.3	4.33	27.5	54.72	74	-19.28	Peak
4598.25	43.91	180	203	H	32.3	4.33	27.5	53.04	74	-20.96	Peak
4598.25	32.32	169	100	V	32.3	4.33	27.5	41.45	54	-12.55	Ave
4598.25	31.03	180	203	H	32.3	4.33	27.5	40.16	54	-13.84	Ave

11 FCC §15.247(i) & § 2.1091 - RF Exposure Information

11.1 Applicable Standard

According to §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
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
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

11.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal (dBm):	11.00
Maximum peak output power at antenna input terminal (mW):	12.59
Prediction distance (cm):	20
Prediction frequency (MHz):	919.65
Maximum Antenna Gain, typical (dBi):	7.3
Maximum Antenna Gain (numeric):	5.37
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0134
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.6104

11.3 Test Result

The power density level at 20 cm distance is 0.0134 mW/cm^2, which is below the uncontrolled exposure limit of 0.6104 mW/cm^2.