Lab Code: 200167-0

FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

OmniSense, LLC

3401 W. 5th Street, Suite 210
Oxnard, CA 93030

FCC ID: RY20002

This Report Concerns:	Equipment Type:
☒ Original Report	900 MHz Transceiver Module

Test Engineer:	Daniel Deng
Report No.:	R0604217
Report Date:	2006-05-08
Reviewed By:	James Ma
Prepared By:	Bay Area Compliance Laboratory Corporation 1274 Anvilwood Ave. Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732-9164

Note: This test report is specially limited to the above client company and this particular sample only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

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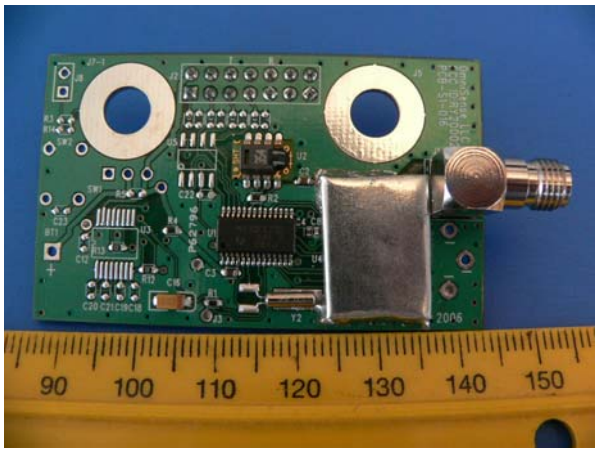
GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *OmniSense, LLC,* FCC ID: *RY20002* or the "EUT" as referred to in this report is a 900 MHz Transceiver Module, which measures approximately 190mmL x 130mm W x 42.5mm H. The EUT is a frequency-hopping device, which operates at the frequency range of 902.2– 927.8MHz, with the maximum conducted output power of 5.93dBm (3.92mW).

** The test data gathered are from a production sample, S/N: PCB-GW-032, provided by the manufacturer.*

EUT Photo



EUT Photo

2.5 dBi Dipole Antenna View

0 dBi Monopole Antenna View

Additional photos please refer to Exhibit B

Objective

This type approval report is prepared on behalf of *OmniSense, LLC* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, and C.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

Test Facility

The semi-anechoic chambers used by BACL to collect radiated and conducted emissions measurement data is located in the building at it's facility in Sunnyvale, California, USA.

BACL's test sites 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 have 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 complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC 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/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

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

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

Special Accessories

As shown in following test block diagram, all interface cables used for compliance testing are shielded.

Equipment Modifications

No modifications were made to the EUT.

Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
FranMar	AC Adaptor	DSA-0051-03 FUS 33040F	001

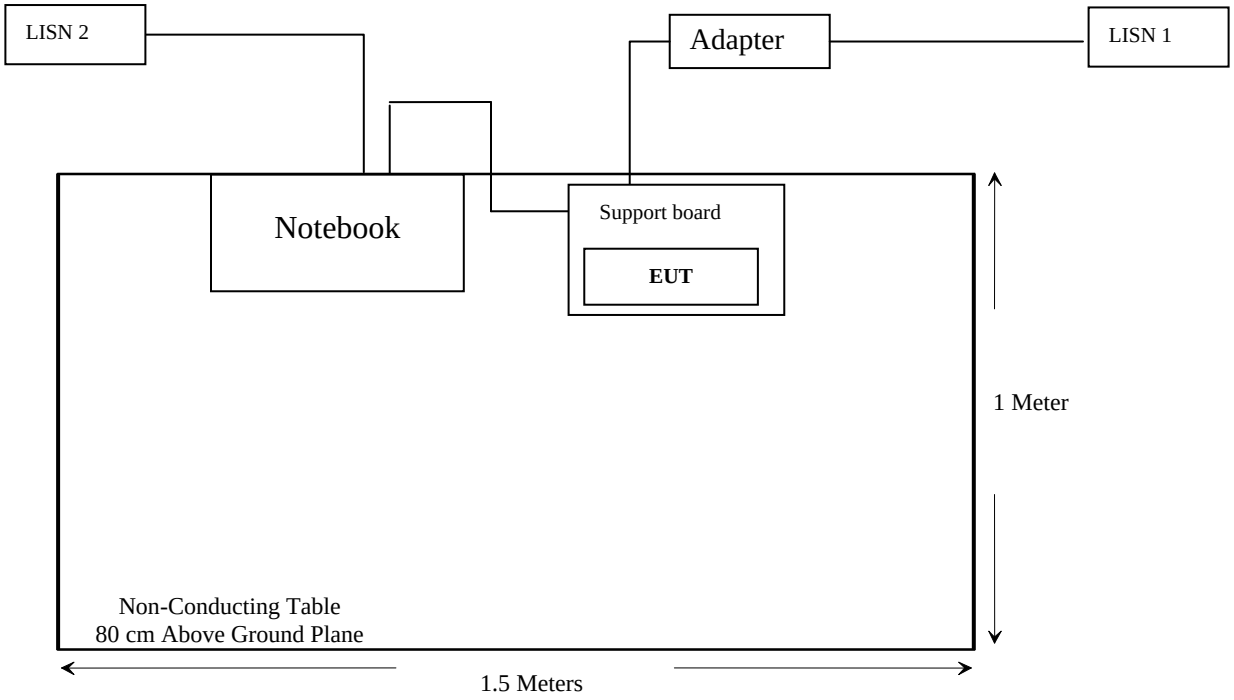
Interface Ports and Cabling

Cable Description	Length (M)	From	To
Power cable	1.5	Adapter	Support board
Ethernet cable	1	laptop	Support board

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
OmniSense	Support board	N/A	00-20-4A-86-38-26
Sony	Laptop	PCG-885L	283520304516747

Test Setup Block Diagram



SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirements	Compliant
§ 15.205	Restricted Bands	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.209	Radiated Emissions	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Compliant
§15.247 (a) (1)	Channel Bandwidth	Compliant
§15.247 (a) (1) (i)	Number of Hopping Frequencies Used	Compliant
§15.247 (a) (1) (i)	Dwell Time of Each Frequency	Compliant
§15.247 (b) (2)	Maximum Peak Output Power	Compliant
§2.1091& §2.1093	RF Safety Requirements	Compliant
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§ 2.1051	Spurious Emissions at Antenna Port	Compliant

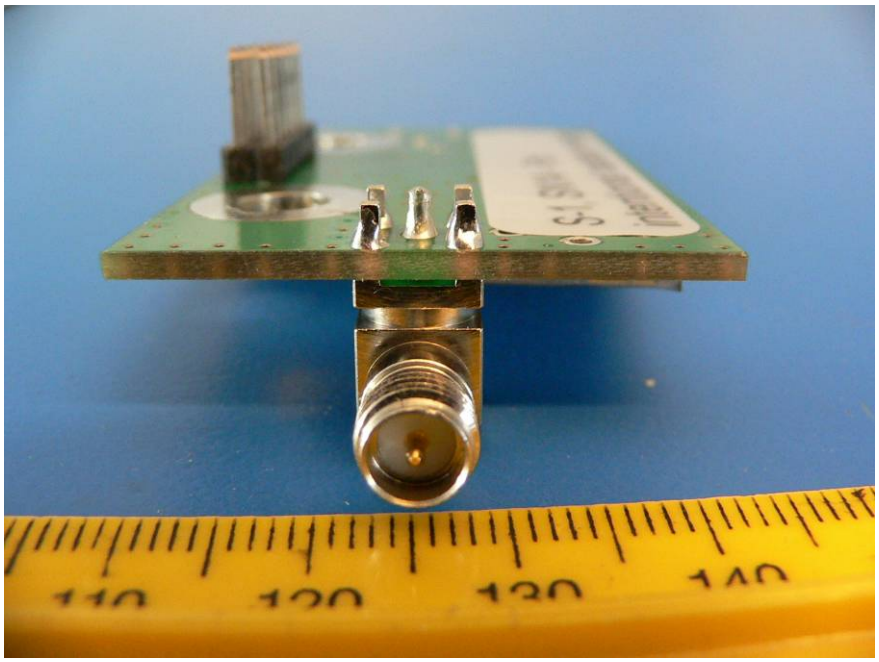
ANTENNA REQUIREMENTS

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.

And according to § 15.247 (b)(4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna for the EUT is a dipole whip antenna. The gain of dipole antenna used for transmitting is 2.5dBi peak and monopole antenna 0dBi. Please see EUT photo for details.

The photo shows a reverse polarity SMA.



§15.207 (a) - CONDUCTED EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are receiver, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

Test Setup

The measurement was performed at shield room, using the same setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC Class B limits.

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

The EUT was connected with LISN-1.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
R&S	Receiver, EMI Test	ESCS30	100176	2006-03-13
R&S	Artificial Mains Network	ESH2-Z5	871884/039	2005-11-14

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

Test Procedure

During the conducted emissions test, the power cord of the EUT was connected to the mains outlet of the LISN-1.

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".

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

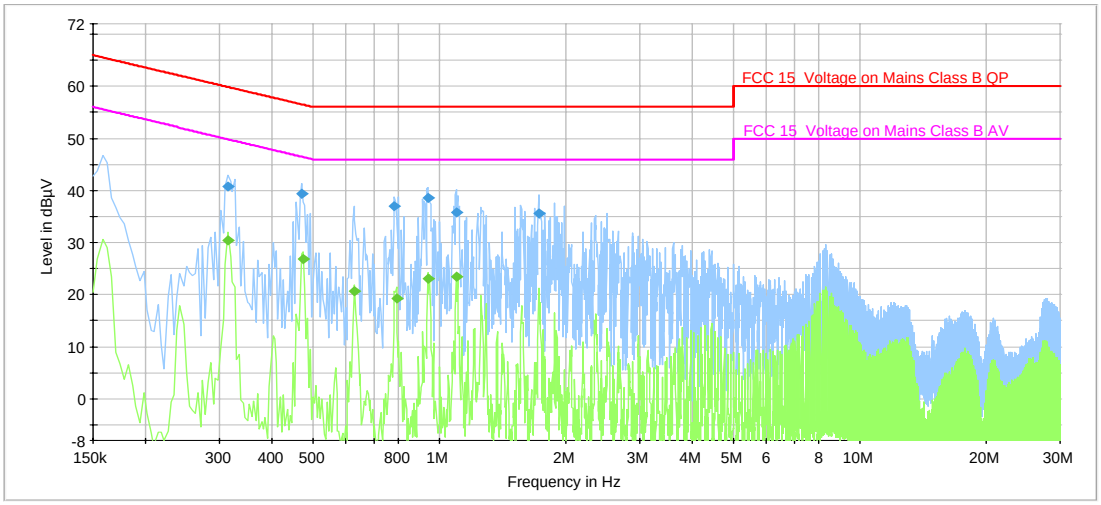
Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Conducted limits for a Class B device, with the *worst* margin reading of:

-12.0 dB at **0.242 MHz** in the **Neutral** conductor

Conducted Emissions Test Data

120V/60Hz - Line



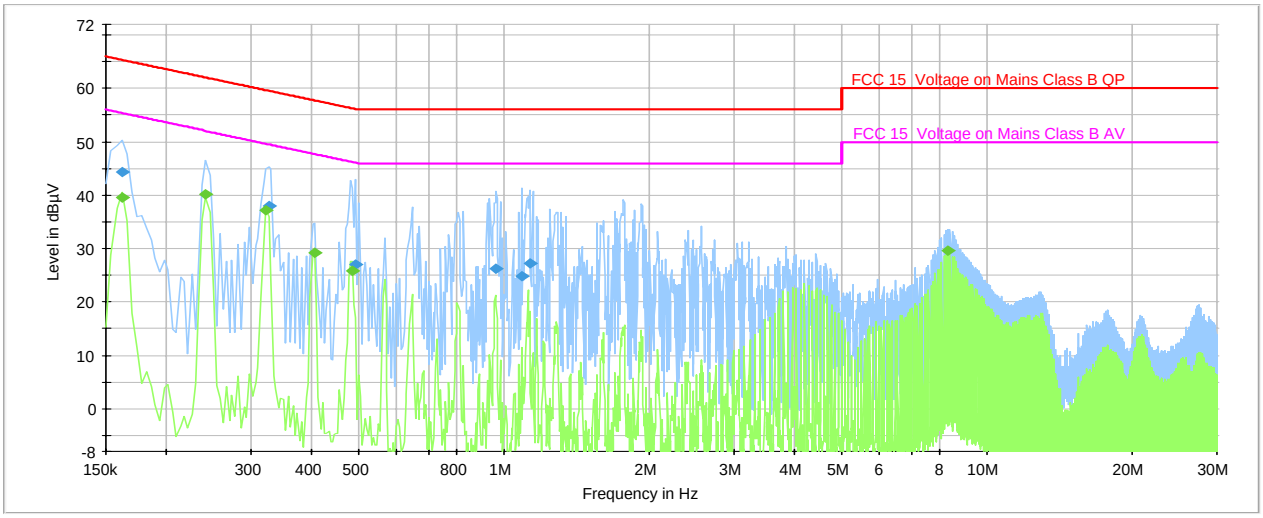
QP Measurements

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.314000	40.7	1000.000	9.000	GN	L1	0.2	19.2	59.9
0.470000	39.4	1000.000	9.000	GN	L1	0.3	17.1	56.5
0.782000	36.9	1000.000	9.000	GN	L1	0.3	19.1	56.0
0.938000	38.5	1000.000	9.000	GN	L1	0.3	17.5	56.0
1.098000	35.8	1000.000	9.000	GN	L1	0.3	20.3	56.0
1.722000	35.6	1000.000	9.000	GN	L1	0.3	20.4	56.0

Average Measurements

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.314000	30.4	1000.000	9.000	GN	L1	0.2	19.5	49.9
0.474000	26.8	1000.000	9.000	GN	L1	0.3	19.6	46.4
1.098000	23.4	1000.000	9.000	GN	L1	0.3	22.6	46.0
0.938000	23.1	1000.000	9.000	GN	L1	0.3	22.9	46.0
0.630000	20.6	1000.000	9.000	GN	L1	0.3	25.4	46.0
0.790000	19.3	1000.000	9.000	GN	L1	0.3	26.7	46.0

120V/60Hz - Neutral



QP Measurements

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.162000	44.4	1000.0	9.000	GND	N	0.1	21.0	65.4
0.326000	37.9	1000.0	9.000	GND	N	0.3	21.6	59.6
0.494000	27.1	1000.0	9.000	GND	N	0.3	29.0	56.1
0.966000	26.2	1000.0	9.000	GND	N	0.3	29.8	56.0
1.090000	24.9	1000.0	9.000	GND	N	0.3	31.1	56.0
1.130000	27.2	1000.0	9.000	GND	N	0.3	28.8	56.0

Average Measurements

Frequency (MHz)	Average (dBµV)	Meas. Time	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.242000	40.1	1000.000	9.000	GND	N	0.2	12.0	52.0
0.322000	37.2	1000.000	9.000	GND	N	0.2	12.4	49.7
0.162000	39.6	1000.000	9.000	GND	N	0.1	15.8	55.4
0.406000	29.2	1000.000	9.000	GND	N	0.4	18.5	47.7
8.322000	29.6	1000.000	9.000	GND	N	0.4	20.4	50.0
0.486000	25.7	1000.000	9.000	GND	N	0.3	20.5	46.2

§15.205, §15.209 & §15.247(c) - RADIATED EMISSIONS

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 best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

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 limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma	Amplifier, Pre	317	260408	2006-02-03
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06
HP	Pre, Amplifier (1 ~ 26.5 GHz)	8449B	3147A00400	2005-08-10
Sunol Sciences	Antenna	JB3	A020106-3/S006628	2006-03-14
A. R.A	Horn Antenna	DRG-118/A	1132	2005-08-17

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

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:

Corr. Ampl. = 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 -7dB means the emissions is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

For Dipole Antenna 2.5 dBi

-6.6 dB at **1804.45 MHz** in the **Vertical** polarization, Low Channel, 3 meters

-9.76 dB at **2744.7 MHz** in the **Vertical** polarization, Middle Channel, 3 meters

-3.8 dB at **1855.65 MHz** in the **Vertical** polarization, High Channel, 3 meters

For Monopole Antenna 0 dBi

-6.7 dB at **1804.5 MHz** in the **Vertical** polarization, Low Channel, 3 meters

-10.7 dB at **1830.1 MHz** in the **Vertical** polarization, Middle Channel, 3 meters

-5.3 dB at **1855.57 MHz** in the **Vertical** polarization, High Channel, 3 meters

Radiated Emissions Test Data @ 3 meter

Run#1 Radiated Harmonics and Spur Emissions with dipole Antenna

Low CH

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1804.45	57.5	275	1.6	v	24.75	1.49	36.34	47.4	54	-6.6	Ave
2706.45	51	230	1.22	v	28.91	1.5	35.5	45.91	54	-8.09	Ave
3608.43	48.83	168	1.18	v	29.99	1.6	34.83	45.59	54	-8.41	Ave
2706.45	45.3	185	1.7	h	28.91	1.5	35.5	40.21	54	-13.79	Ave
3608.43	42.83	140	1.68	h	29.99	1.6	34.83	39.59	54	-14.41	Ave
1127.65	51.6	170	1.56	v	23.27	1.12	36.83	39.16	54	-14.84	Ave
1804.45	47.9	280	1.6	h	24.75	1.49	36.34	37.8	54	-16.2	Ave
4510.95	33.83	290	1.5	v	32.53	1.7	34.83	33.23	54	-20.77	Ave
4510.95	32	250	1.3	h	32.53	1.7	34.83	31.4	54	-22.6	Ave
1127.65	42.7	235	1.6	h	23.27	1.12	36.83	30.26	54	-23.74	Ave
3608.43	52.17	168	1.18	v	29.99	1.6	34.83	48.93	74	-25.07	Peak
1804.45	58.2	275	1.6	v	24.75	1.49	36.34	48.1	74	-25.9	Peak
2706.45	53.1	230	1.22	v	28.91	1.5	35.5	48.01	74	-25.99	Peak
1127.65	58.3	170	1.56	v	23.27	1.12	36.83	45.86	74	-28.14	Peak
3608.43	48.67	140	1.68	h	29.99	1.6	34.83	45.43	74	-28.57	Peak
2706.45	50.2	185	1.7	h	28.91	1.5	35.5	45.11	74	-28.89	Peak
4510.95	43	290	1.5	v	32.53	1.7	34.83	42.4	74	-31.6	Peak
1804.45	51.83	280	1.6	h	24.75	1.49	36.34	41.73	74	-32.27	Peak
4510.95	42.2	250	1.3	h	32.53	1.7	34.83	41.6	74	-32.4	Peak
1127.65	51.3	235	1.6	h	23.27	1.12	36.83	38.86	74	-35.14	Peak

Mid CH

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
2744.7	49.33	275	1.6	v	28.91	1.5	35.5	44.24	54	-9.76	Ave
1830.1	53.5	310	1.8	v	24.75	1.49	36.34	43.4	54	-10.6	Ave
3660.12	44.2	265	1.58	v	29.99	1.6	34.83	40.96	54	-13.04	Ave
3660.12	41.8	260	1.47	h	29.99	1.6	34.83	38.56	54	-15.44	Ave
2744.7	43.33	280	1.16	h	28.91	1.5	35.5	38.24	54	-15.76	Ave
1830.1	46.83	312	1.2	h	24.75	1.49	36.34	36.73	54	-17.27	Ave
4574.68	32.5	180	1.4	v	32.53	1.7	34.83	31.9	54	-22.1	Ave
4574.68	32.1	245	1.22	h	32.53	1.7	34.83	31.5	54	-22.5	Ave
3660.12	49.5	265	1.58	v	29.99	1.6	34.83	46.26	74	-27.74	Peak
2744.7	50.67	275	1.6	v	28.91	1.5	35.5	45.58	74	-28.42	Peak
1830.1	55.67	310	1.8	v	24.75	1.49	36.34	45.57	74	-28.43	Peak
3660.12	48.1	260	1.47	h	29.99	1.6	34.83	44.86	74	-29.14	Peak
4574.68	44.33	180	1.4	v	32.53	1.7	34.83	43.73	74	-30.27	Peak
2744.7	48	280	1.16	h	28.91	1.5	35.5	42.91	74	-31.09	Peak
4574.68	42.5	245	1.22	h	32.53	1.7	34.83	41.9	74	-32.1	Peak
1830.1	50.83	312	1.2	h	24.75	1.49	36.34	40.73	74	-33.27	Peak

High CH

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1855.65	60.3	180	1.4	v	24.75	1.49	36.34	50.2	54	-3.8	Ave
3710.96	49.26	170	1.56	v	29.99	1.6	34.83	46.02	54	-7.98	Ave
2783.4	50.5	280	1.3	v	28.91	1.5	35.5	45.41	54	-8.59	Ave
1855.65	51.3	115	1.8	h	24.75	1.49	36.34	41.2	54	-12.8	Ave
3710.96	42.9	150	1.1	h	29.99	1.6	34.83	39.66	54	-14.34	Ave
2783.4	39.97	170	1.35	h	28.91	1.5	35.5	34.88	54	-19.12	Ave
1391.7	47.67	180	1.2	v	23.27	0.76	36.83	34.87	54	-19.13	Ave
4638.78	34.1	240	1.47	v	32.53	1.7	34.83	33.5	54	-20.5	Ave
1855.65	62.5	180	1.4	v	24.75	1.49	36.34	52.4	74	-21.6	Peak
4638.78	32.1	77	1.17	h	32.53	1.7	34.83	31.5	54	-22.5	Ave
3710.96	52.3	170	1.56	v	29.99	1.6	34.83	49.06	74	-24.94	Peak
2783.4	52.8	280	1.3	v	28.91	1.5	35.5	47.71	74	-26.29	Peak
1855.65	55.6	115	1.8	h	24.75	1.49	36.34	45.5	74	-28.5	Peak
1391.7	37.83	165	1.35	h	23.27	0.76	36.83	25.03	54	-28.97	Ave
3710.96	48.2	150	1.1	h	29.99	1.6	34.83	44.96	74	-29.04	Peak
2783.4	46.84	170	1.35	h	28.91	1.5	35.5	41.75	74	-32.25	Peak
4638.78	41.8	240	1.47	v	32.53	1.7	34.83	41.2	74	-32.8	Peak
4638.78	40.7	77	1.17	h	32.53	1.7	34.83	40.1	74	-33.9	Peak
1391.7	51.17	180	1.2	v	23.27	0.76	36.83	38.37	74	-35.63	Peak
1391.7	47.5	165	1.35	h	23.27	0.76	36.83	34.7	74	-39.3	Peak

Run#2 Radiated Harmonic and Spur Emissions with 1/4 wave monopole antenna

Low CH

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1804.5	57.4	270	1.6	v	24.75	1.49	36.34	47.3	54	-6.7	Ave
3608.55	48.9	170	1.3	v	29.99	1.6	34.83	45.66	54	-8.34	Ave
2706.65	50.5	210	1.3	v	28.91	1.5	35.5	45.41	54	-8.59	Ave
2706.65	45.1	180	1.6	h	28.91	1.5	35.5	40.01	54	-13.99	Ave
3608.55	43.1	160	1.5	h	29.99	1.6	34.83	39.86	54	-14.14	Ave
1127.7	51.5	180	1.5	v	23.27	1.12	36.83	39.06	54	-14.94	Ave
1804.5	47.8	270	1.6	h	24.75	1.49	36.34	37.7	54	-16.3	Ave
4511.25	33.7	310	1.6	v	32.53	1.7	34.83	33.1	54	-20.9	Ave
4511.25	32	270	1.3	h	32.53	1.7	34.83	31.4	54	-22.6	Ave
1127.7	42.8	250	1.6	h	23.27	1.12	36.83	30.36	54	-23.64	Ave
3608.55	52.6	170	1.3	v	29.99	1.6	34.83	49.36	74	-24.64	Peak
1804.5	57.9	270	1.6	v	24.75	1.49	36.34	47.8	74	-26.2	Peak
2706.65	52.5	210	1.3	v	28.91	1.5	35.5	47.41	74	-26.59	Peak
3608.55	49.5	160	1.5	h	29.99	1.6	34.83	46.26	74	-27.74	Peak
1127.7	58.1	180	1.5	v	23.27	1.12	36.83	45.66	74	-28.34	Peak
2706.65	49.8	180	1.6	h	28.91	1.5	35.5	44.71	74	-29.29	Peak
4511.25	42.7	310	1.6	v	32.53	1.7	34.83	42.1	74	-31.9	Peak
4511.25	42.1	270	1.3	h	32.53	1.7	34.83	41.5	74	-32.5	Peak
1804.5	51.5	270	1.6	h	24.75	1.49	36.34	41.4	74	-32.6	Peak
1127.7	51.6	250	1.6	h	23.27	1.12	36.83	39.16	74	-34.84	Peak

Mid CH

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1830.1	53.4	300	1.7	v	24.75	1.49	36.34	43.3	54	-10.7	Ave
2744.85	48.1	260	1.5	v	28.91	1.5	35.5	43.01	54	-10.99	Ave
3660.3	43.3	250	1.7	v	29.99	1.6	34.83	40.06	54	-13.94	Ave
2744.85	43.2	300	1.3	h	28.91	1.5	35.5	38.11	54	-15.89	Ave
3660.3	40.5	230	1.6	h	29.99	1.6	34.83	37.26	54	-16.74	Ave
1830.1	46.7	300	1.5	h	24.75	1.49	36.34	36.6	54	-17.4	Ave
4574.68	32.7	160	1.9	v	32.53	1.7	34.83	32.1	54	-21.9	Ave
4574.68	32	230	1.2	h	32.53	1.7	34.83	31.4	54	-22.6	Ave
3660.3	48.2	250	1.7	v	29.99	1.6	34.83	44.96	74	-29.04	Peak
3660.3	47.9	230	1.6	h	29.99	1.6	34.83	44.66	74	-29.34	Peak
4574.68	45.1	160	1.9	v	32.53	1.7	34.83	44.5	74	-29.5	Peak
1830.1	54.6	300	1.7	v	24.75	1.49	36.34	44.5	74	-29.5	Peak
2744.85	49.5	260	1.5	v	28.91	1.5	35.5	44.41	74	-29.59	Peak
2744.85	48.6	300	1.3	h	28.91	1.5	35.5	43.51	74	-30.49	Peak
4574.68	42.1	230	1.2	h	32.53	1.7	34.83	41.5	74	-32.5	Peak
1830.1	50.5	300	1.5	h	24.75	1.49	36.34	40.4	74	-33.6	Peak

High Ch

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifier	Correction Factor	15.247	15.247	
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
1855.57	58.8	190	1.5	v	24.75	1.49	36.34	48.7	54	-5.3	Ave
3710.58	43.5	185	1.2	v	29.99	1.6	34.83	40.26	54	-13.74	Ave
1855.57	49.67	110	1.9	h	24.75	1.49	36.34	39.57	54	-14.43	Ave
2783.4	44	270	1.22	v	28.91	1.5	35.5	38.91	54	-15.09	Ave
3710.58	41.3	80	1.21	h	29.99	1.6	34.83	38.06	54	-15.94	Ave
1391.7	47.67	180	1.2	v	23.27	0.76	36.83	34.87	54	-19.13	Ave
2783.4	39.2	40	1.55	h	28.91	1.5	35.5	34.11	54	-19.89	Ave
4638.6	31.67	180	1.22	v	32.53	1.7	34.83	31.07	54	-22.93	Ave
4638.6	31.3	210	1.18	h	32.53	1.7	34.83	30.7	54	-23.3	Ave
1855.57	59.1	190	1.5	v	24.75	1.49	36.34	49	74	-25.0	Peak
3710.58	51	185	1.2	v	29.99	1.6	34.83	47.76	74	-26.24	Peak
2783.4	50.3	270	1.22	v	28.91	1.5	35.5	45.21	74	-28.79	Peak
1391.7	37.83	165	1.35	h	23.27	0.76	36.83	25.03	54	-28.97	Ave
3710.58	48	80	1.21	h	29.99	1.6	34.83	44.76	74	-29.24	Peak
4638.6	44.2	180	1.22	v	32.53	1.7	34.83	43.6	74	-30.4	Peak
1855.57	52.83	110	1.9	h	24.75	1.49	36.34	42.73	74	-31.27	Peak
4638.6	42.1	210	1.18	h	32.53	1.7	34.83	41.5	74	-32.5	Peak
1391.7	51.17	180	1.2	v	23.27	0.76	36.83	38.37	74	-35.63	Peak
2783.4	47.17	40	1.55	h	28.91	1.5	35.5	36.08	74	-37.92	Peak
1391.7	47.5	165	1.35	h	23.27	0.76	36.83	34.7	74	-39.3	Peak

§15.247 (a) (1) - HOPPING CHANNEL SEPARATION

Applicable Standard

According to §15.247(a)(1), frequency hopping system 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench 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.
3. By using the Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

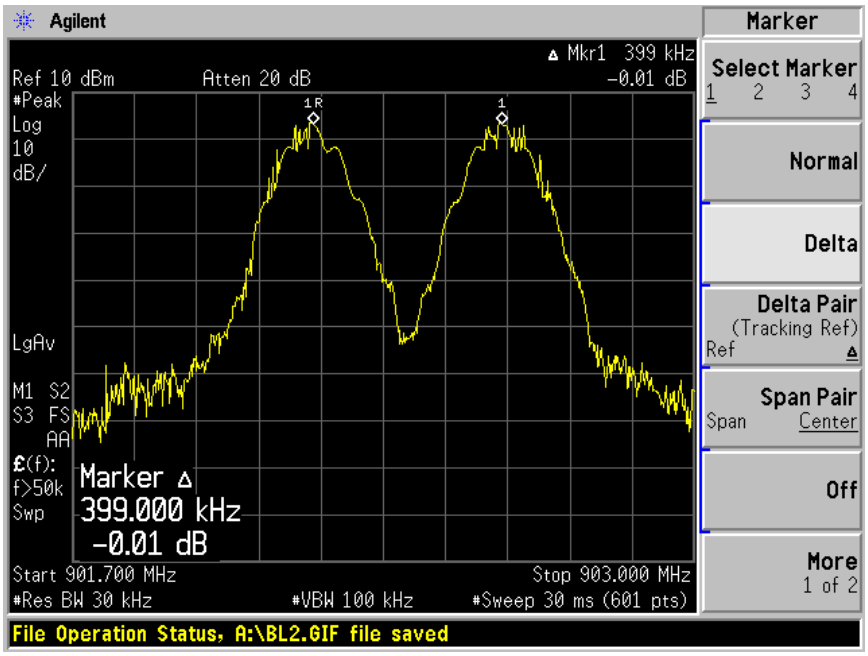
Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

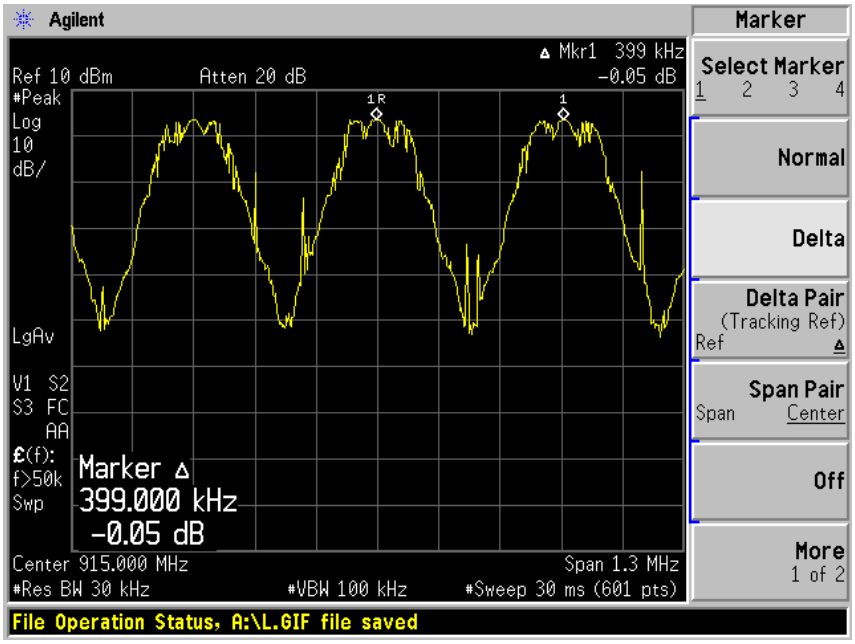
Measurement Results

Please refer to the following plots.

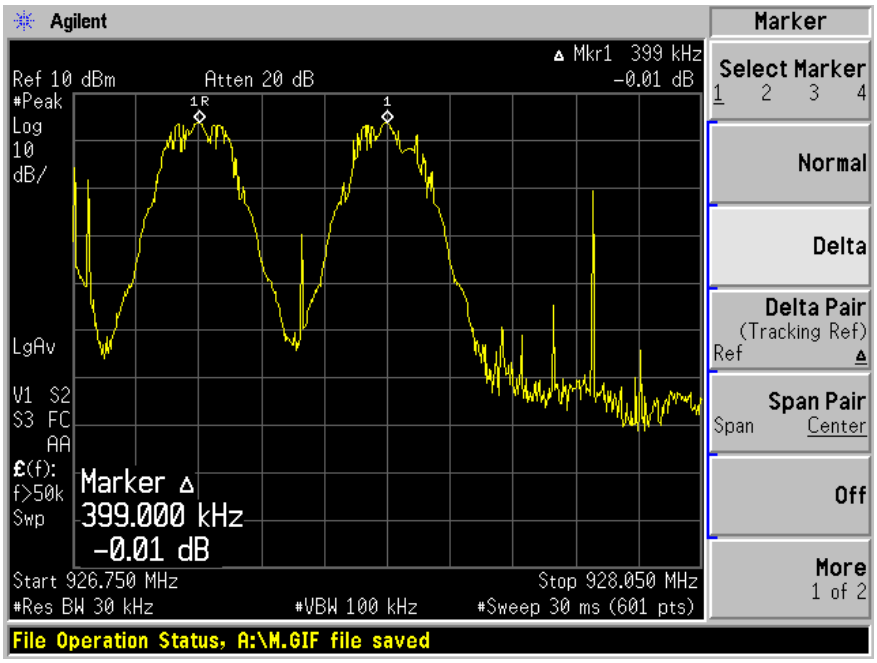
Low Channel



Middle Channel



High Channel



§15.247 (a) (1) - CHANNEL BANDWIDTH

Applicable Standard

According to §15.247(a)(l)(i), The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

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 20 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

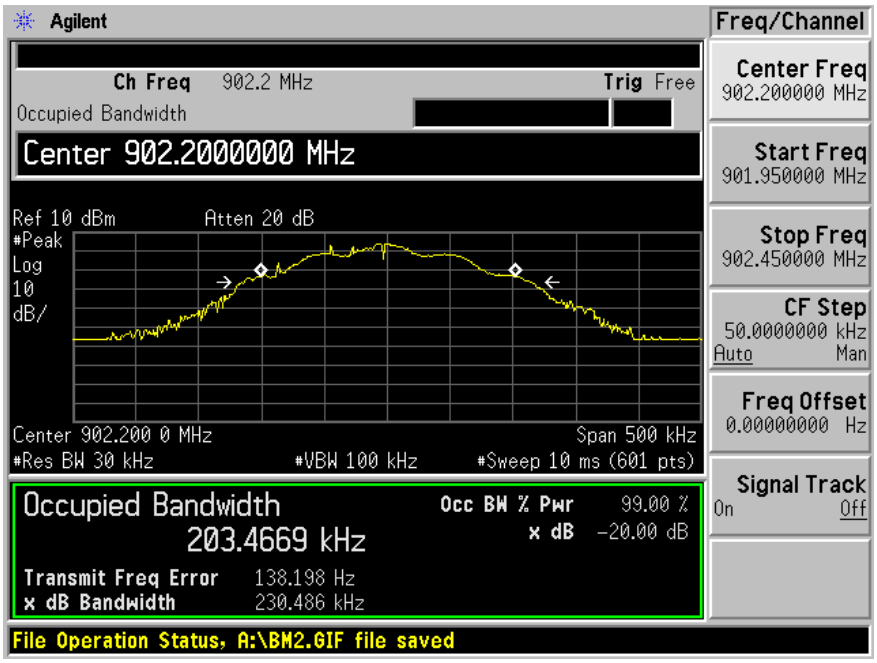
Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

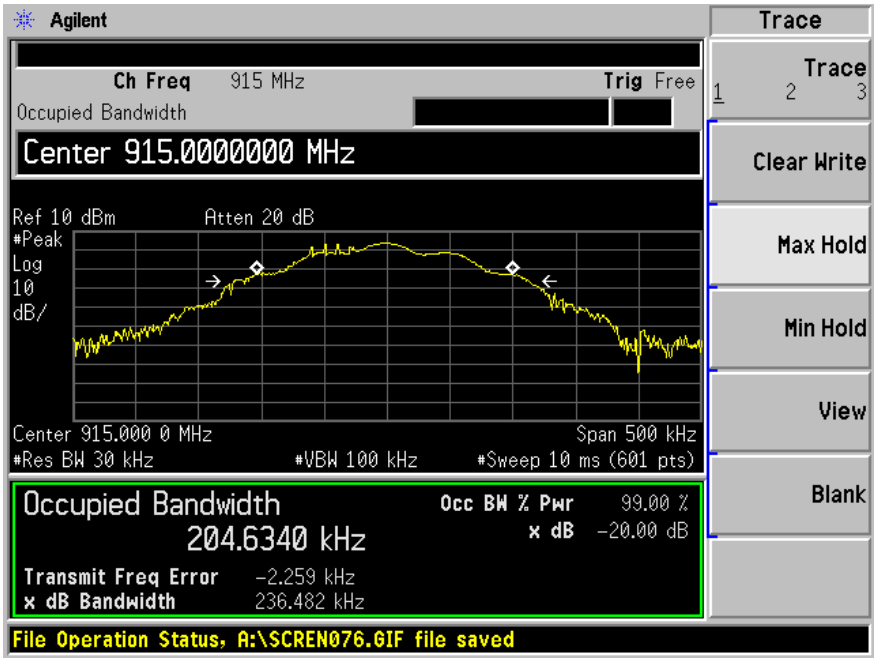
Measurement Result

Please see the following plots

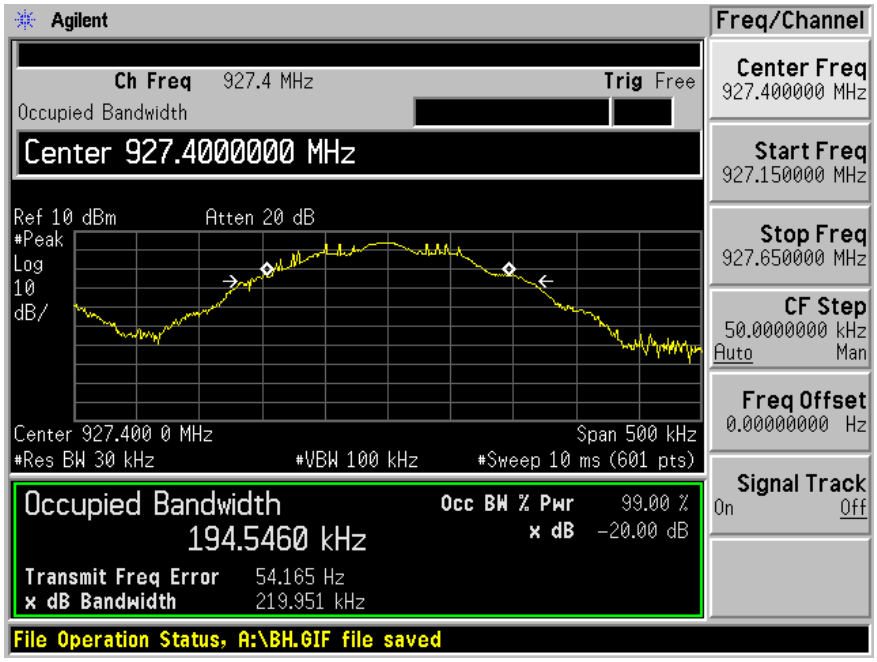
Low Channel



Middle Channel



High Channel



§15.247 (a) (1) (i) - NUMBER OF HOPPING FREQUENCIES USED

Applicable Standard

According to §15.247(a)(1)(iii), 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.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench 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 the SA on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

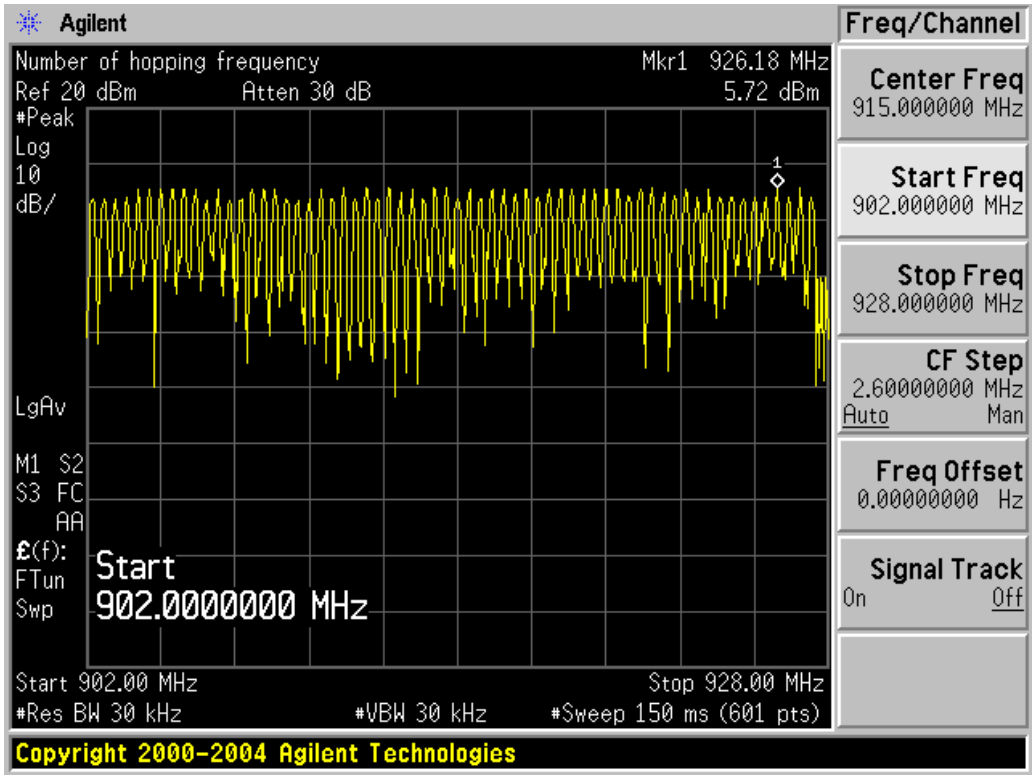
Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

Measurement Results: 64

Please refer to the attached plots.



§15.247(a)(1)(i) - DWELL TIME

Applicable Standard

According to §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.

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. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

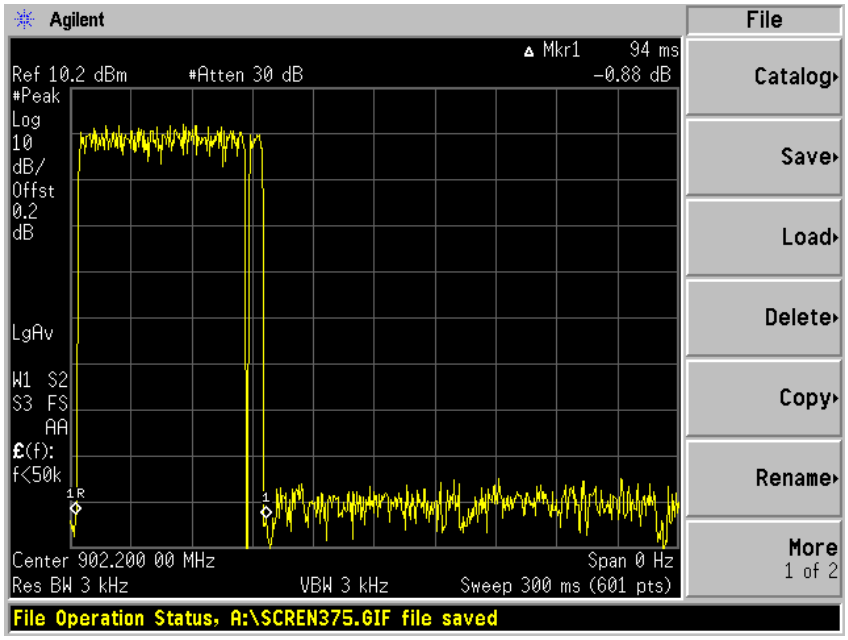
**The testing was performed by Daniel Deng on 2006-04-29.*

Measurement Results:

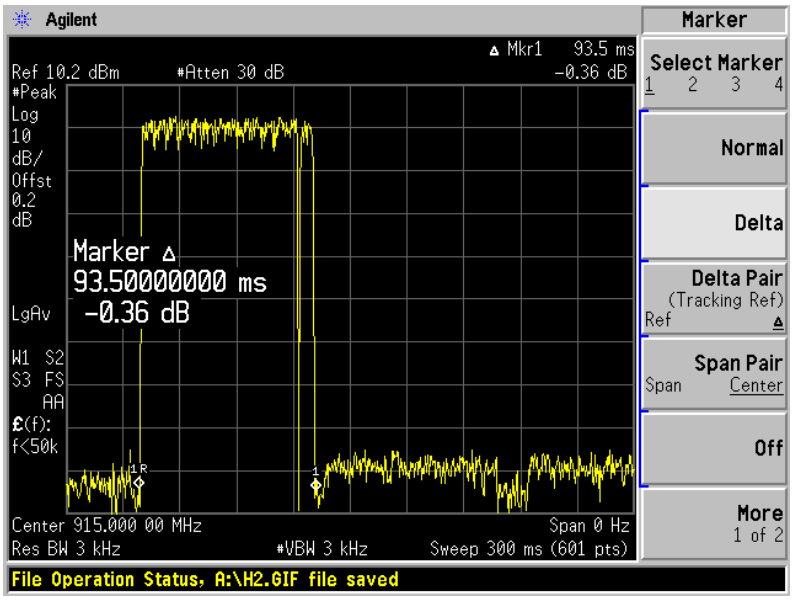
Channel	Frequency MHz	Pulse Width ms	Dwell Time Sec	Limit Sec	Result
Low	902.2	94	0.188	0.4	Pass
Mid	915	93.5	0.2805	0.4	Pass
High	927.8	93.5	0.187	0.4	Pass

Please refer the following plots.

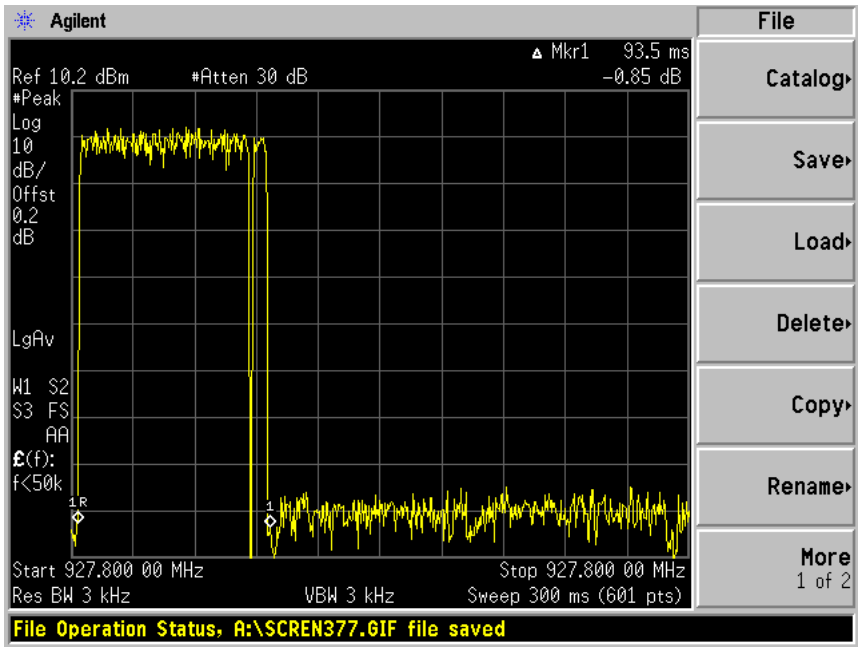
Burst width Low CH:



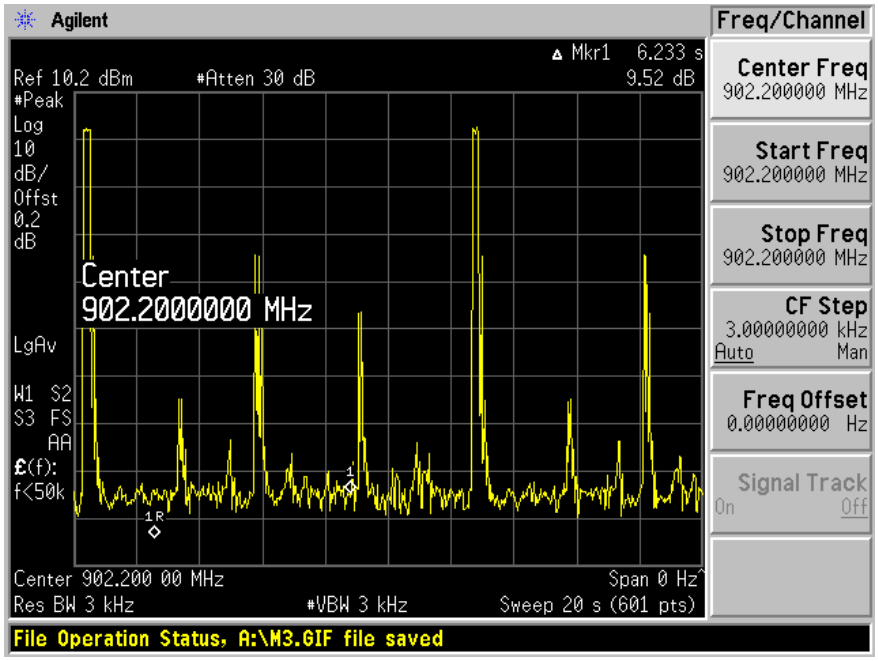
Burst width Mid CH:



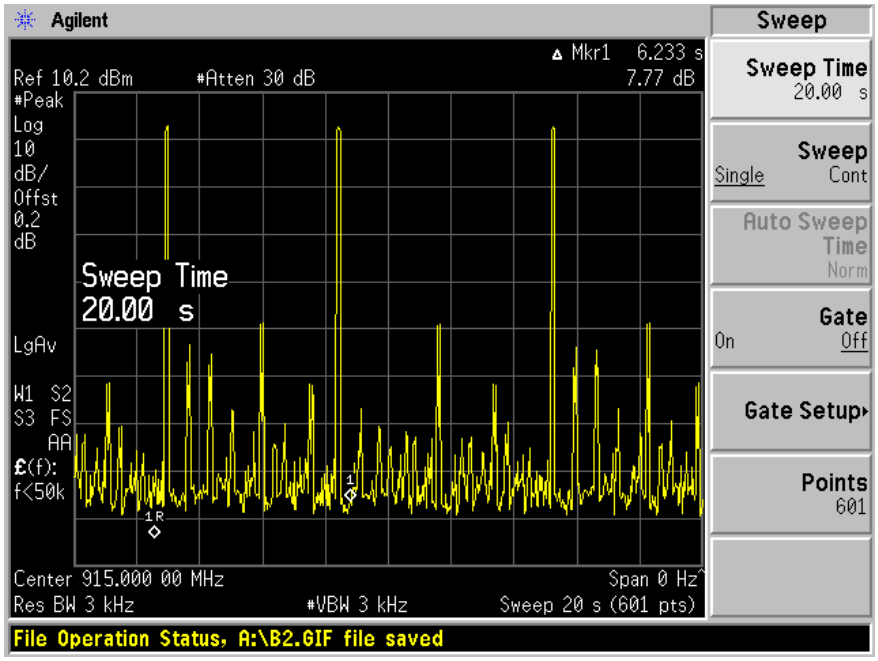
Burst width High CH:



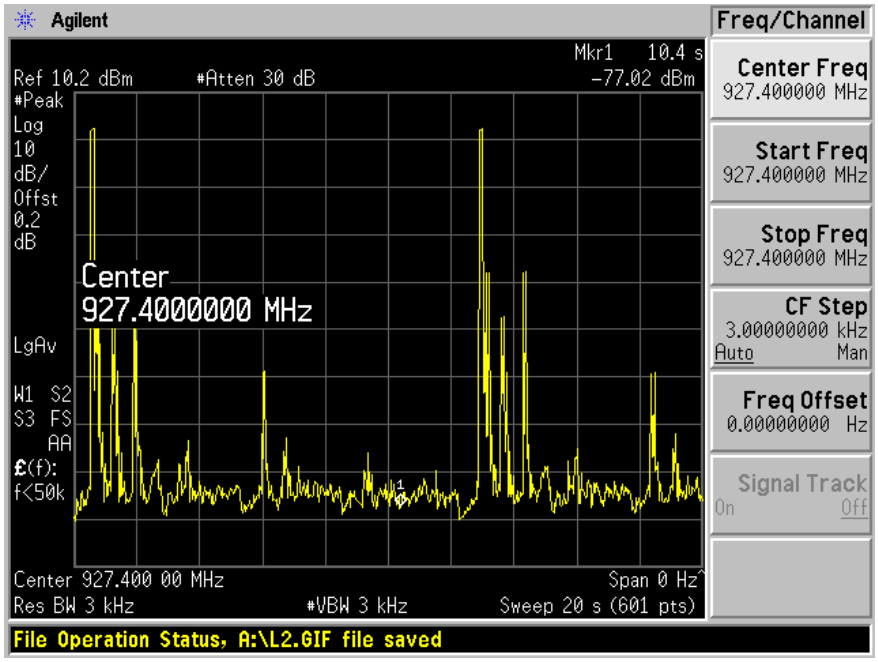
Low Channel



Middle Channel



High Channel



§15.247(b)(2) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to §15.247(b) (2), For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Measurement Procedure

1. Place the EUT on the turntable 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 the spectrum analyzer.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

**The testing was performed by Daniel Deng on 2006-04-29.*

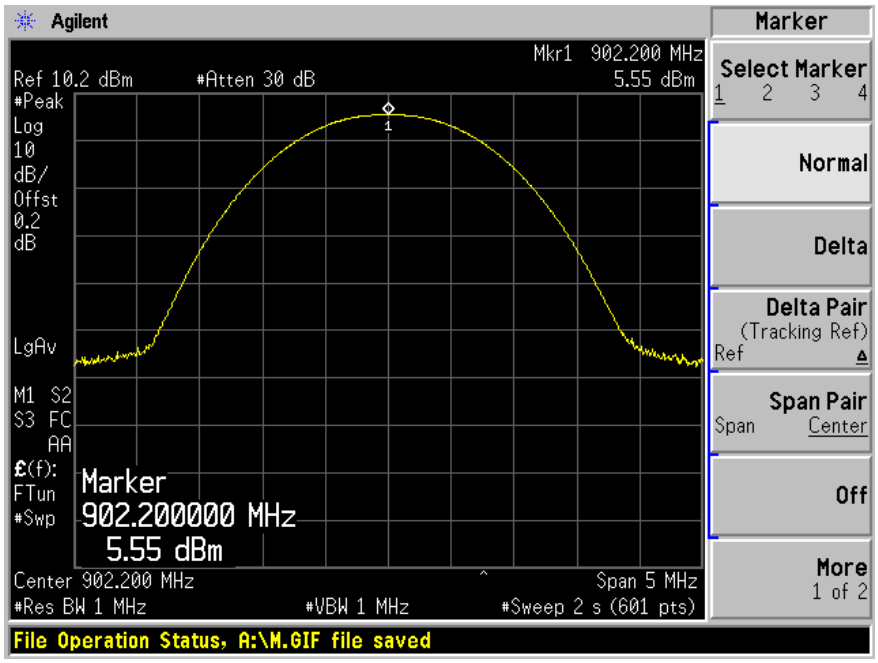
Measurement Result

Channel	Frequency	Max Peak Output Power		Limit	Result
	MHz	(dBm)	(mW)	(mW)	
Low	902.200	5.55	3.59	1000	Pass
Mid	915.250	5.80	3.80	1000	Pass
High	927.800	5.93	3.92	1000	Pass

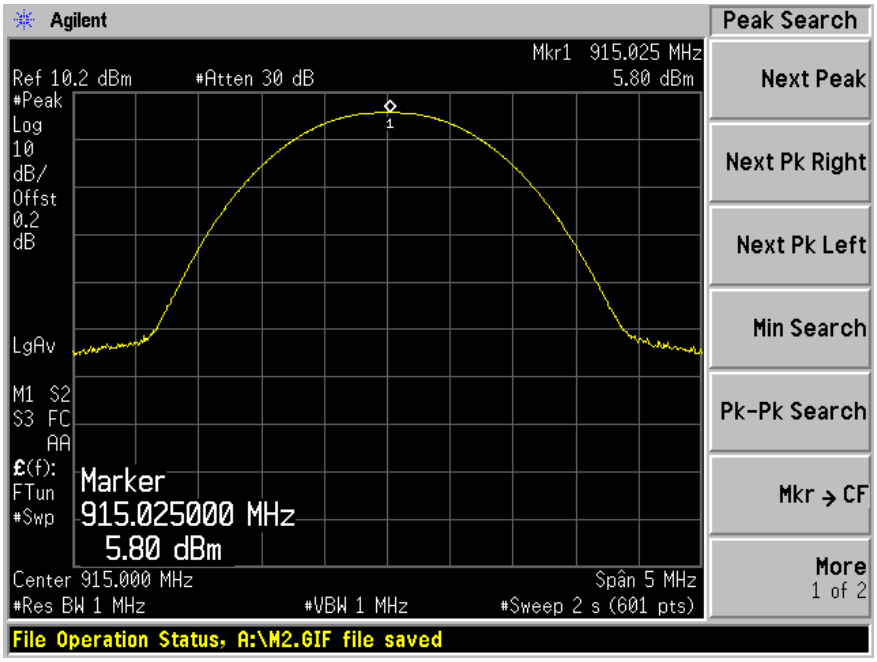
Plots of Maximum Peak Output Power

Please see the following plots

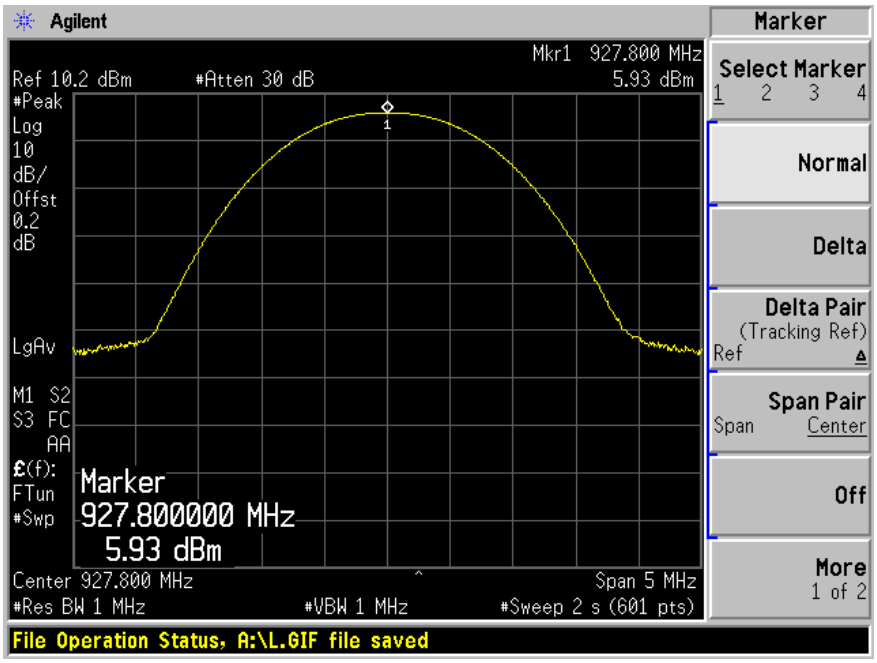
Low Channel



Middle Channel



High Channel



§15.247 (c) - 100 KHz BANDWIDTH OF BAND EDGES

Applicable Standard

According to §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.

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 100kHz 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.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

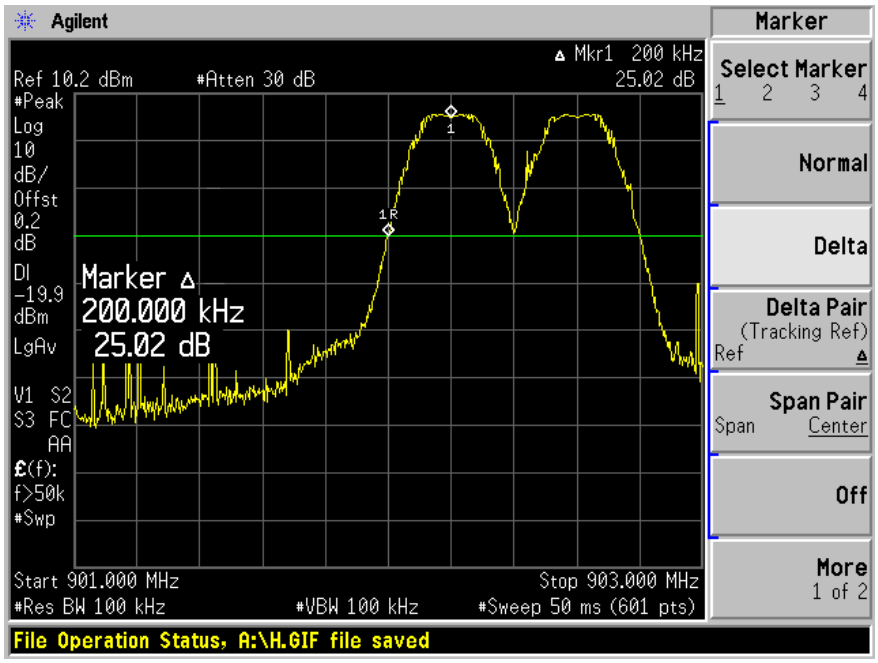
**The testing was performed by Daniel Deng on 2006-04-29.*

Plots of 100kHz Bandwidth of Band Edge

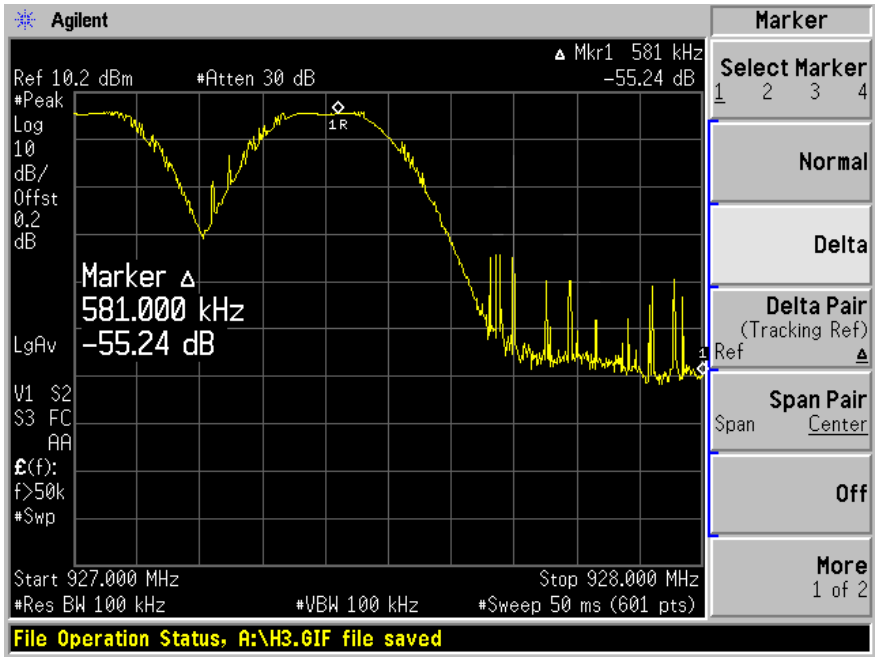
Please refer the following plots.

Hopping Mode:

Low Channel

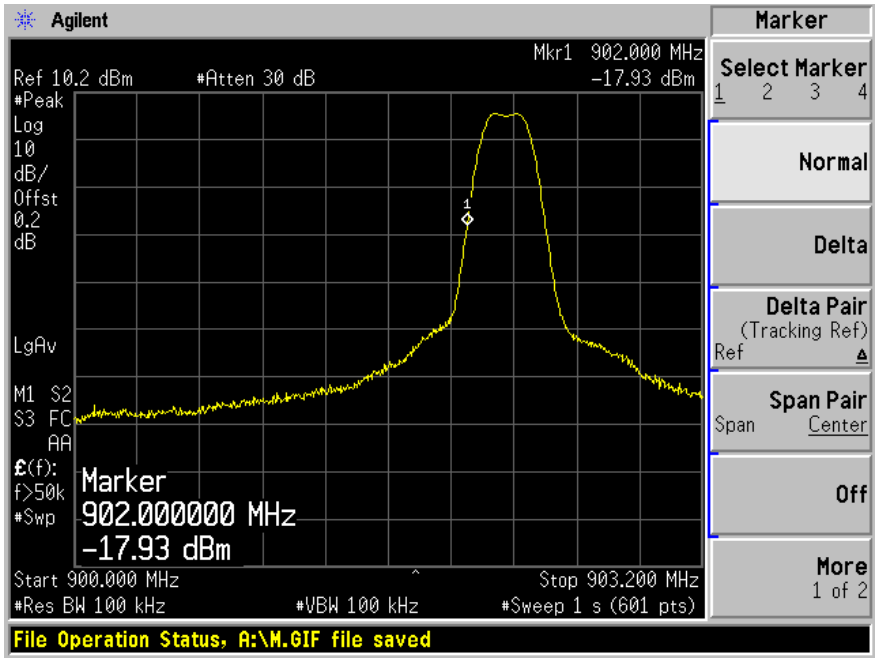


High Channel

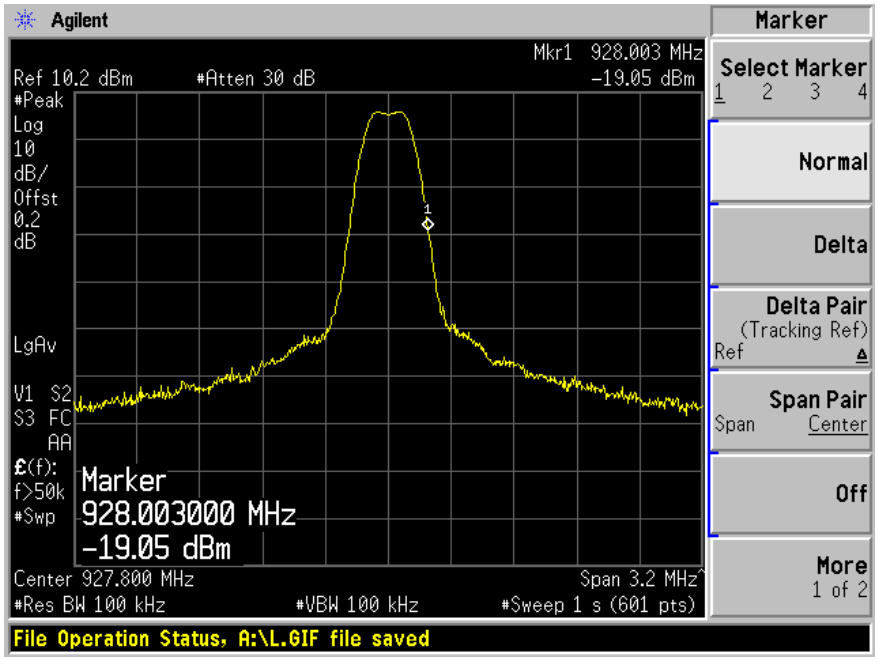


Non-Hopping Mode:

Low Channel



High Channel



SPURIOUS EMISSIONS AT ANTENNA PORT

Applicable Standard

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emissions limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emissions being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Position the EUT on a bench 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 the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.

4. Set the SA on View mode and then plot the result on SA screen.

5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	60%
ATM Pressure:	1022 mbar

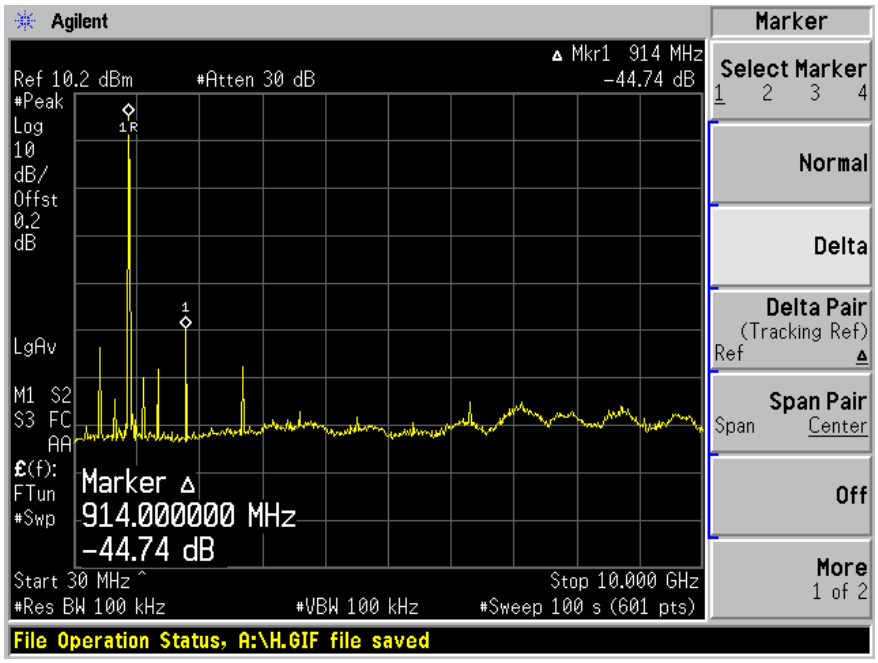
**The testing was performed by Daniel Deng on 2006-04-29.*

Measurement Results

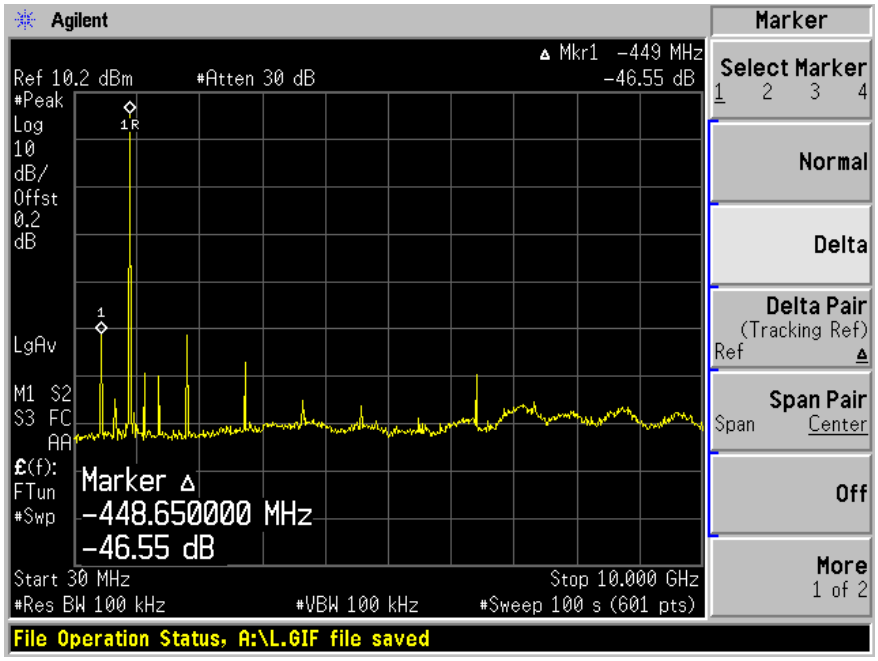
Please refer to the following plots.

Non-Hopping mode:

Low Channel



Mid Channel



High Channel