Lab Code: 200167-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Trimble Navigation Limited

935 Stewart Drive
Sunnyvale, CA 94085, U.S.A.

FCC ID: JUP-TC900C
Model: TC900C, SNR900

This Report Concerns:	Product Type:
☒ Original Report	900 MHz radio-modem

Test Engineer:	Dan Coronia
Report No.:	R0610241
Report Date:	2006-10-28
Reviewed By:	Test Engineer: Daniel Deng
Prepared By: (tz)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave. Sunnyvale, CA 94089, U.S.A. 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 900MHz frequency offers for the construction site:

- Immune to inference
- Low-latency, high-speed link allows two-way data between office and site machines
- Ideal operating range for construction sites
- Single Radio for ATS or GPS and Two Way IP Data

Mechanic Description

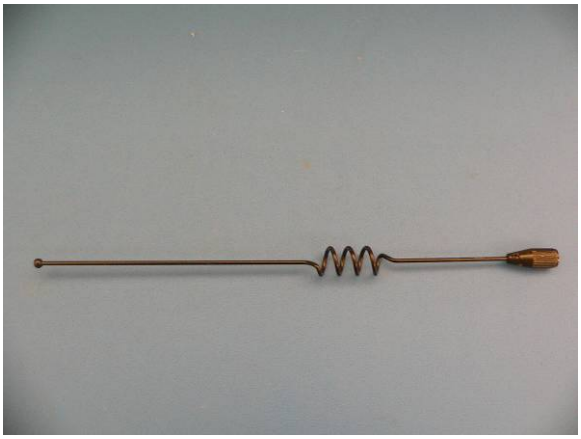
The *Trimble Navigation Ltd.*, FCC ID: *JUP-TC900C*, model: TC900C, SNR900 or the "EUT" as referred to in this report is a 900 MHz radio-modem, which measures approximately 85mmW x 250mm H. The EUT is a frequency-hopping device, which operates at the ISM frequency range of 902– 928MHz, with the maximum conducted output power of 29.14dBm (820.35mW).

** The test data gathered are from a production sample, S/N: 1006J027RZ, provided by the manufacturer. TC900C and SNR900 are electrically identical, except for outer color and labeling.*

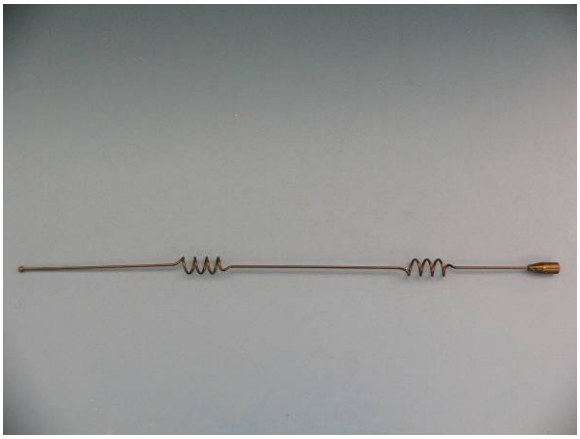
EUT Photo

0 dBi Low-Profile Maxrad antenna, P/N 41236 Omni Antenna View

0 dBi whip antenna, P/N 32317



3 dBi whip antenna, P/N 32316



5 dBi whip antenna, P/N 32318

Additional photos in Exhibit B

Objective

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

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.

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
Trimble	AC Adaptor	SW112	N/A

Interface Ports and Cabling

Cable Description	Length (M)	From	To
Power cable	1.5	Adapter	SiteNet 900
Serial Port	2.98	Laptop	8-Pin Bendix to SiteNet 900

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Trimble	8-Pin Bendix	N/A	N/A
DELL	Laptop	PP11L	H5914 A03

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	N/A
§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

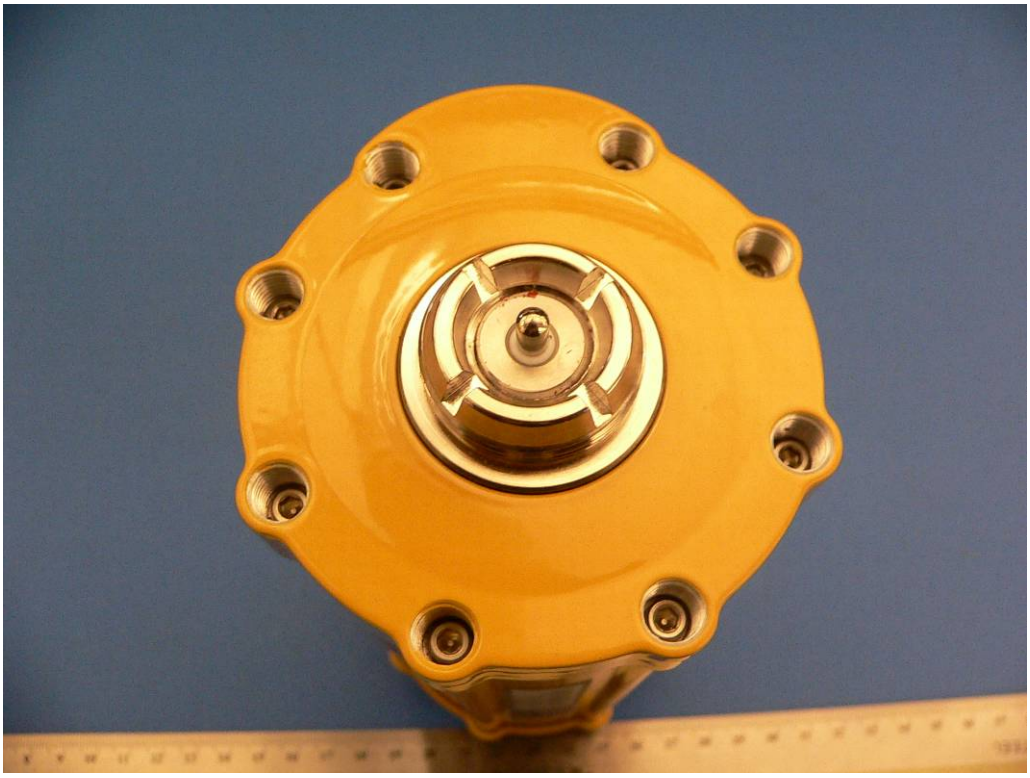
ANTENNA REQUIREMENTS

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 and omni antenna. The gain of dipole whip antenna used for transmitting is 5dBi and omni antenna 0dBi. Please see EUT photo for details.

The photo shows a reverse polarity SMA.



§15.207 (a) - CONDUCTED EMISSIONS

NOTE: This test is Not Applicable (N/A) to the EUT. The EUT is designed to be connected to direct current power source (battery) and is not designed to be connected to the public utility (AC) power line.

§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 chamber 3 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	2006-08-21
Sunol Sciences	Antenna	JB3	A020106-3/S006628	2006-03-14
A. R.A	Horn Antenna	DRG-118/A	1132	2006-08-17

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

Environmental Conditions

Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

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:

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

Margin = Corrected Amplitude - 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 Maxrad Omni Antenna 0dBi

-7.6 dB at **1805.25 MHz** in the **Horizontal** polarization, Low Channel, 3 meters

-19.30 dB at **1830.73 MHz** in the **Vertical** polarization, Middle Channel, 3 meters

-27.5 dB at **2782.75 MHz** in the **Vertical** polarization, High Channel, 3 meters

For Whip Antenna 5dBi

-28.40 dB at **1805.25 MHz** in the **Vertical** polarization, Low Channel, 3 meters

-29.8 dB at **3661.46 MHz** in the **Horizontal** polarization, Middle Channel, 3 meters

-29.6 dB at **1855.11 MHz** in the **Vertical** polarization, High Channel, 3 meters

Radiated Emissions Test Data @ 3 meter

Run#1 Radiated Harmonics and Spurious Emissions (EUT – Use the Maxrad Omni Antenna with 0dBi gain)

Low Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
902.6250	128.0	117	1.4	V	23.6	0.7	37.4	114.9			Peak
902.6250	127.6	83	1.2	H	23.6	0.7	37.4	114.5			Peak
1805.2500	56.0	245	1.1	H	24.8	1.5	35.9	46.4	54	-7.6	Ave
1805.2500	48.3	239	1.1	V	24.8	1.5	35.9	38.7	54	-15.3	Ave
2707.8750	42.0	210	1.0	V	28.9	1.5	35.1	37.3	54	-16.7	Ave
2707.8750	57.2	210	1.0	V	28.9	1.5	35.1	52.5	74	-21.5	Peak
2707.8750	36.3	181	1.0	H	28.9	1.5	35.1	31.7	54	-22.3	Ave
1805.2500	56.1	239	1.1	V	24.8	1.5	35.9	46.5	74	-27.5	Peak
1805.2500	56.1	239	1.1	V	24.8	1.5	35.9	46.5	74	-27.5	Peak
3610.5000	28.5	180	2.0	V	30.0	1.8	34.9	25.4	54	-28.6	Ave
3610.5000	28.1	90	2.0	H	30.0	1.8	34.9	25.0	54	-29.0	Ave
2707.8750	47.3	181	1.0	H	28.9	1.5	35.1	42.7	74	-31.3	Peak
3610.5000	39.3	90	2.0	V	30.0	1.8	34.9	36.2	74	-37.8	Peak
3610.5000	38.2	180	2.0	H	30.0	1.8	34.9	35.1	74	-38.9	Peak

Middle Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
915.3660	125.3	360	1.5	V	23.2	0.7	37.0	112.2			Peak
915.3660	121.1	321	1.1	H	23.2	0.7	37.0	108.0			Peak
1830.7320	44.3	270	2.4	V	24.8	1.5	35.9	34.7	54	-19.3	Ave
1830.7320	43.9	90	2.1	H	24.8	1.5	35.9	34.3	54	-19.7	Ave
2746.0980	38.5	270	2.4	V	28.9	1.5	35.1	33.8	54	-20.2	Ave
2746.0980	37.9	90	2.1	H	28.9	1.5	35.1	33.2	54	-20.8	Ave
3661.4640	30.6	180	2.0	V	30.0	1.8	34.9	27.5	54	-26.5	Ave
3661.4640	30.1	90	2.0	H	30.0	1.8	34.9	27.0	54	-27.0	Ave
1830.7320	48.3	160	1.5	V	24.8	1.5	35.9	38.7	74	-35.3	Peak
1830.7320	45.3	162	2.0	H	24.8	1.5	35.9	35.7	74	-38.3	Peak
2746.0980	40.3	270	2.4	V	28.9	1.5	35.1	35.6	74	-38.4	Peak
2746.0980	40.1	90	2.1	H	28.9	1.5	35.1	35.4	74	-38.6	Peak
3661.4640	37.6	90	2.0	V	30.0	1.8	34.9	34.5	74	-39.5	Peak
3661.4640	37.3	180	2.0	H	30.0	1.8	34.9	34.2	74	-39.8	Peak

High Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
927.5850	128.3	291	1.7	V	23.4	0.7	37.2	115.2			Peak
927.5850	122.0	255	1.3	H	23.4	0.7	37.2	108.9			Peak
1855.1700	40.3	165	1.6	V	24.8	1.5	36.3	30.3	74	-43.7	Peak
1855.1700	37.3	243	2.0	H	24.8	1.5	36.3	27.3	74	-46.7	Peak
2782.7550	31.6	297	1.0	V	28.9	1.5	35.5	26.5	54	-27.5	Ave
3710.3400	27.9	147	1.7	V	30.0	1.8	34.8	24.8	54	-29.2	Ave
3710.3400	27.6	164	1.3	H	30.0	1.8	34.8	24.5	54	-29.5	Ave
2782.7550	28.0	221	2.0	H	28.9	1.5	35.5	23.0	54	-31.1	Ave
1855.1700	32.5	235	1.5	V	24.8	1.5	36.3	22.4	54	-31.7	Ave
1855.1700	25.9	253	1.9	H	24.8	1.5	36.3	15.8	54	-38.2	Ave
3710.3400	38.9	205	2.2	V	30.0	1.8	34.8	35.8	74	-38.2	Peak
3710.3400	38.6	264	1.5	H	30.0	1.8	34.8	35.5	74	-38.5	Peak
2782.7550	38.7	194	1.8	V	28.9	1.5	35.5	33.6	74	-40.4	Peak
2782.7550	38.5	202	1.5	H	28.9	1.5	35.5	33.4	74	-40.6	Peak

Run#2 Radiated Harmonics and Spurious Emissions (EUT – Use the Whip Antenna with 5dBi gain)

Low Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
902.6250	127.9	117	1.4	V	23.6	0.7	37.4	114.7			Peak
902.6250	127.8	199	1.2	H	23.6	0.7	37.4	114.7			Peak
1805.2500	35.3	236	2.0	V	24.8	1.5	35.9	25.7	54	-28.4	Ave
2707.8750	27.9	230	1.3	V	28.9	1.5	35.1	23.3	54	-30.8	Ave
2707.8750	27.7	233	1.3	H	28.9	1.5	35.1	23.1	54	-30.9	Ave
3610.5000	26.6	262	1.5	V	30.0	1.8	34.9	23.5	54	-30.5	Ave
3610.5000	25.8	280	1.3	H	30.0	1.8	34.9	22.7	54	-31.3	Ave
1805.2500	26.3	190	1.1	H	24.8	1.5	35.9	16.7	54	-37.3	Ave
3610.5000	38.2	273	1.6	V	30.0	1.8	34.9	35.1	74	-38.9	Peak
2707.8750	38.7	248	1.8	V	28.9	1.5	35.1	34.0	74	-40.0	Peak
2707.8750	38.2	256	1.7	H	28.9	1.5	35.1	33.5	74	-40.5	Peak
3610.5000	37.1	258	1.3	H	30.0	1.8	34.9	34.0	74	-40.0	Peak
1805.2500	39.7	272	1.9	V	24.8	1.5	35.9	30.1	74	-43.9	Peak
1805.2500	37.0	243	1.7	V	24.8	1.5	35.9	27.4	74	-46.7	Peak

Middle Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
915.3660	128.0	231	1.2	V	23.2	0.7	37.0	114.9			Peak
915.3660	127.0	203	1.1	H	23.2	0.7	37.0	113.9			Peak
3661.4640	27.3	220	1.2	H	30.0	1.8	34.9	24.2	54	-29.8	Ave
3661.4640	27.1	231	1.6	V	30.0	1.8	34.9	23.9	54	-30.1	Ave
2746.0980	28.1	214	1.1	V	28.9	1.5	35.1	23.4	54	-30.6	Ave
2746.0980	27.4	228	1.8	H	28.9	1.5	35.1	22.7	54	-31.3	Ave
1831.0045	29.9	393	1.1	V	24.8	1.5	35.9	20.3	54	-33.7	Ave
1831.0045	26.0	252	1.3	H	24.8	1.5	35.9	16.4	54	-37.6	Ave
3661.4640	37.7	220	1.0	V	30.0	1.8	34.9	34.6	74	-39.4	Peak
3661.4640	37.6	206	1.2	H	30.0	1.8	34.9	34.5	74	-39.5	Peak
2746.0980	37.7	264	1.5	V	28.9	1.5	35.1	33.0	74	-41.0	Peak
2746.0980	37.2	272	1.4	H	28.9	1.5	35.1	32.5	74	-41.5	Peak
1831.0045	37.9	259	1.3	V	24.8	1.5	35.9	28.3	74	-45.8	Peak
1831.0045	36.5	217	1.3	H	24.8	1.5	35.9	26.9	74	-47.1	Peak

High Channel

Frequency	Reading	Azimouth	Height	Polar	Antenna Factor	Cable loss	Amplifier Gain	Corrected Reading	15.247	15.247	
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
927.5850	128.0	219	1.2	V	23.4	0.7	37.2	114.9			Peak
927.5850	127.0	200	1.1	H	23.4	0.7	37.2	113.8			Peak
1855.1110	37.1	225	1.4	H	24.8	1.5	36.3	27.1	74	-46.9	Peak
1855.1110	34.1	244	1.9	V	24.8	1.5	36.3	24.1	74	-49.9	Peak
1855.1110	34.5	182	1.2	V	24.8	1.5	36.3	24.4	54	-29.6	Ave
3710.3400	27.5	221	1.3	H	30.0	1.8	34.8	24.4	54	-29.6	Ave
3710.3400	27.3	210	1.6	V	30.0	1.8	34.8	24.2	54	-29.8	Ave
2786.6347	28.0	325	1.6	V	28.9	1.5	35.5	22.9	54	-31.1	Ave
2786.6347	28.0	221	2.0	H	28.9	1.5	35.5	23.0	54	-31.1	Ave
1855.1110	26.1	253	1.5	H	24.8	1.5	36.3	16.0	54	-38.0	Ave
3710.3400	38.2	227	1.6	V	30.0	1.8	34.8	35.1	74	-38.9	Peak
3710.3400	37.9	265	1.8	H	30.0	1.8	34.8	34.8	74	-39.2	Peak
2786.6347	29.8	162	1.2	V	28.9	1.5	35.5	24.7	74	-49.3	Peak
2786.6347	27.8	246	1.2	H	28.9	1.5	35.5	22.7	74	-51.3	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

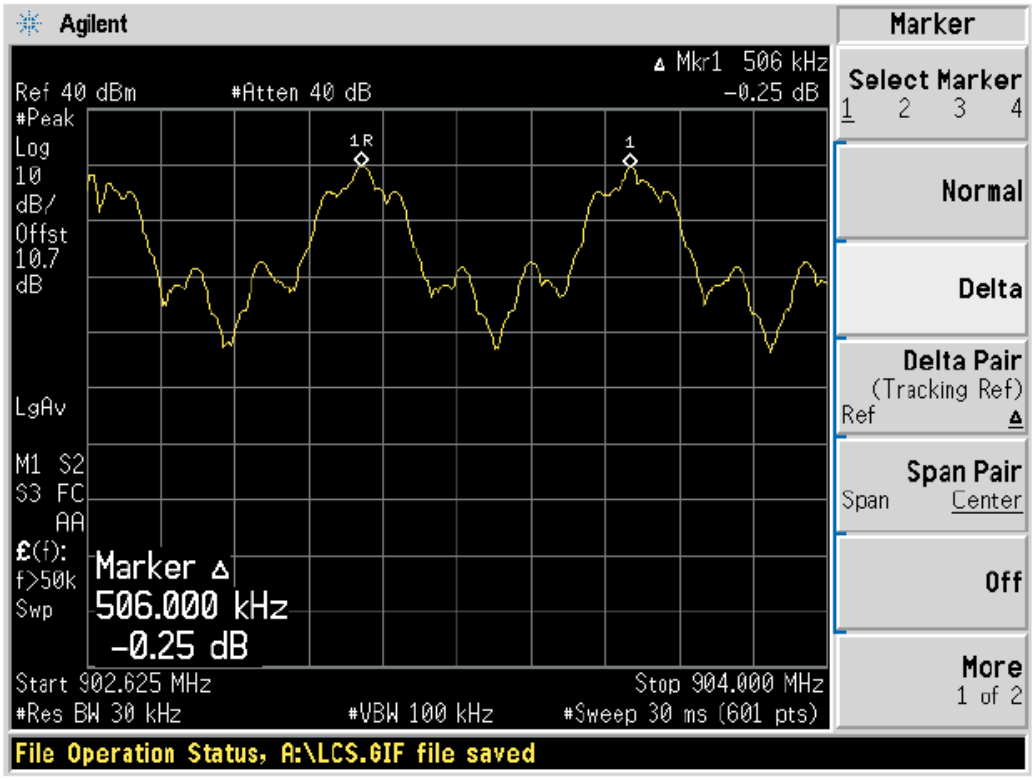
Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

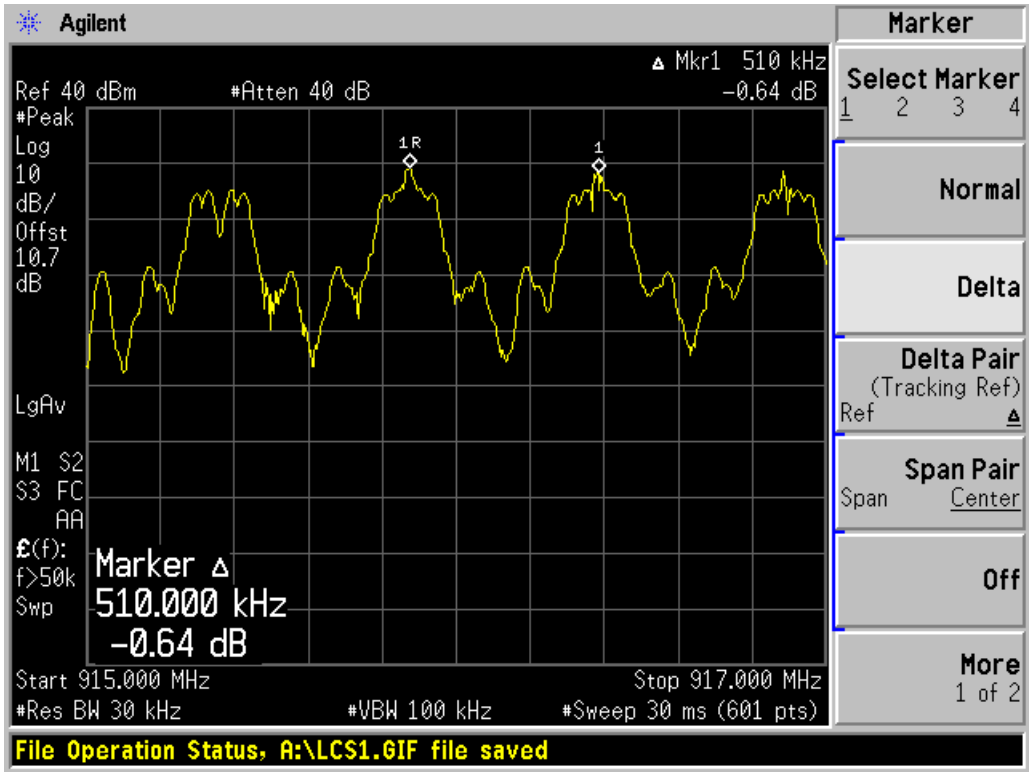
Measurement Results

Please refer to the following plots.

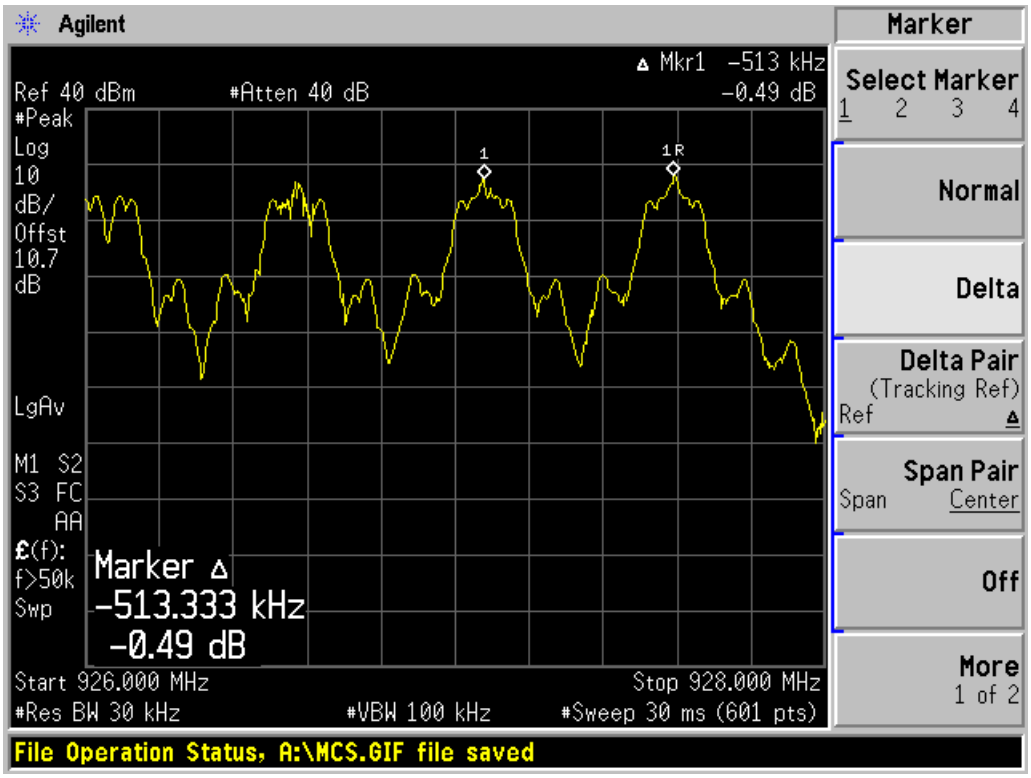
Low Channel



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

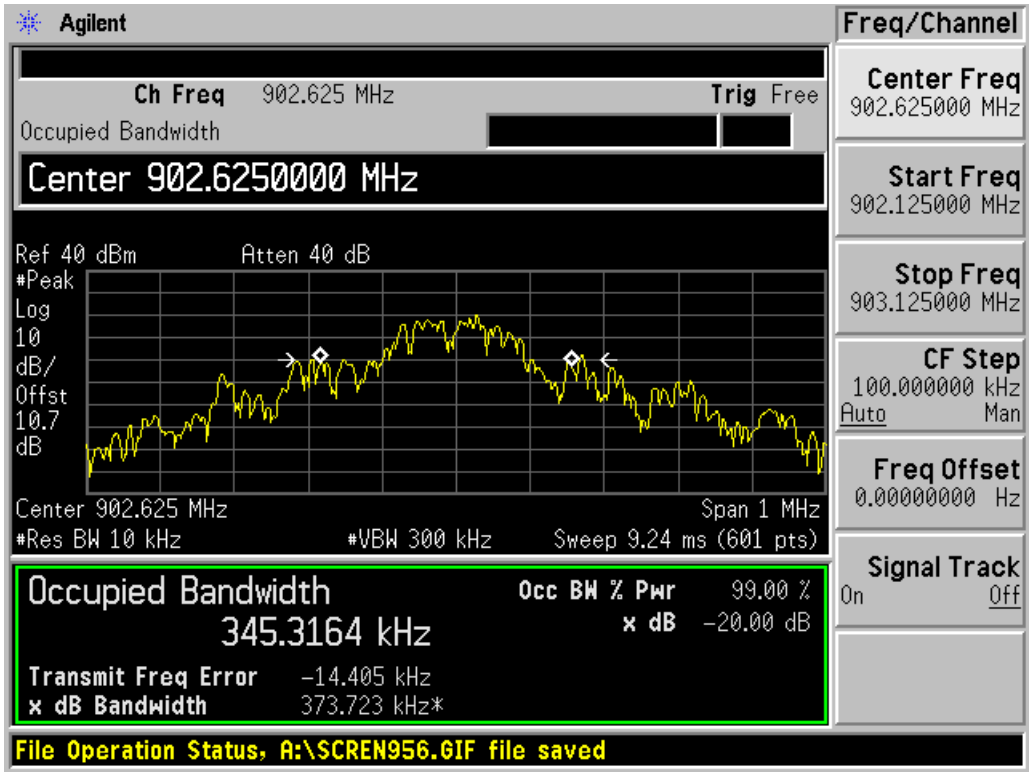
Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

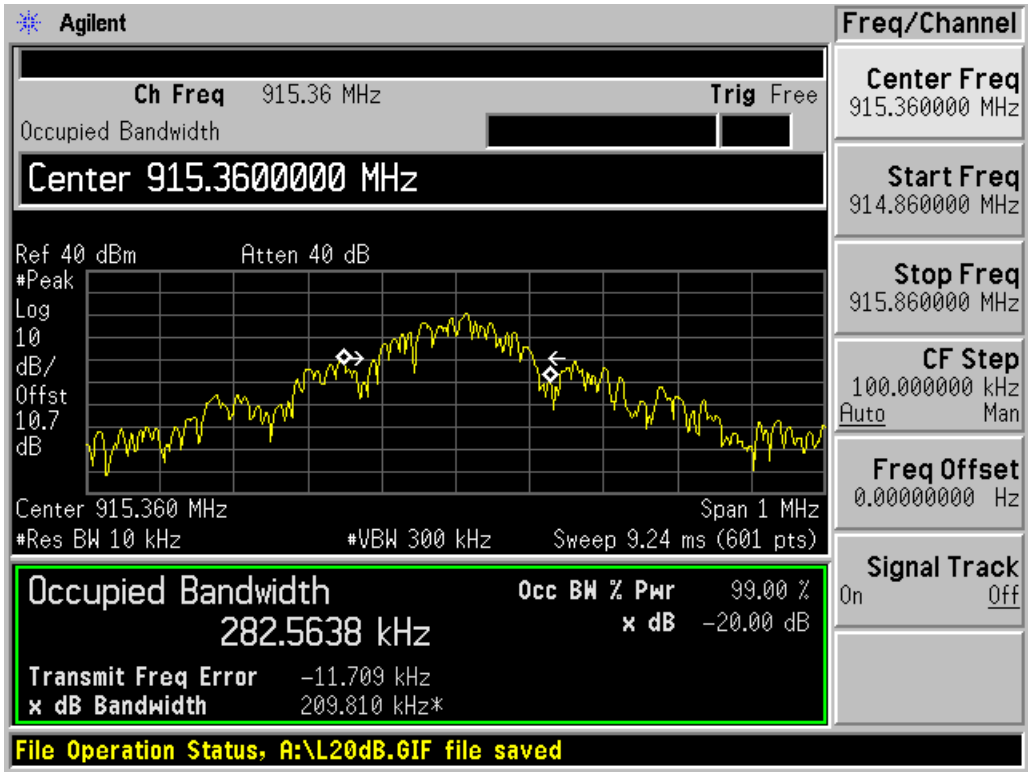
Measurement Result

Please see the following plots

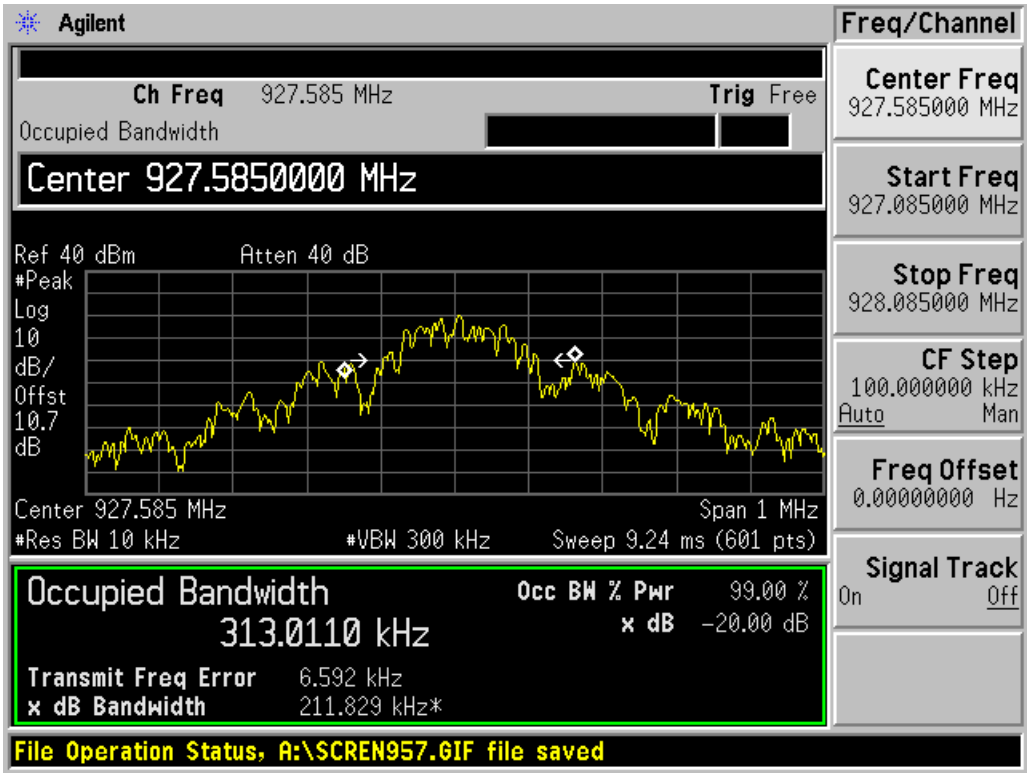
Low Channel



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

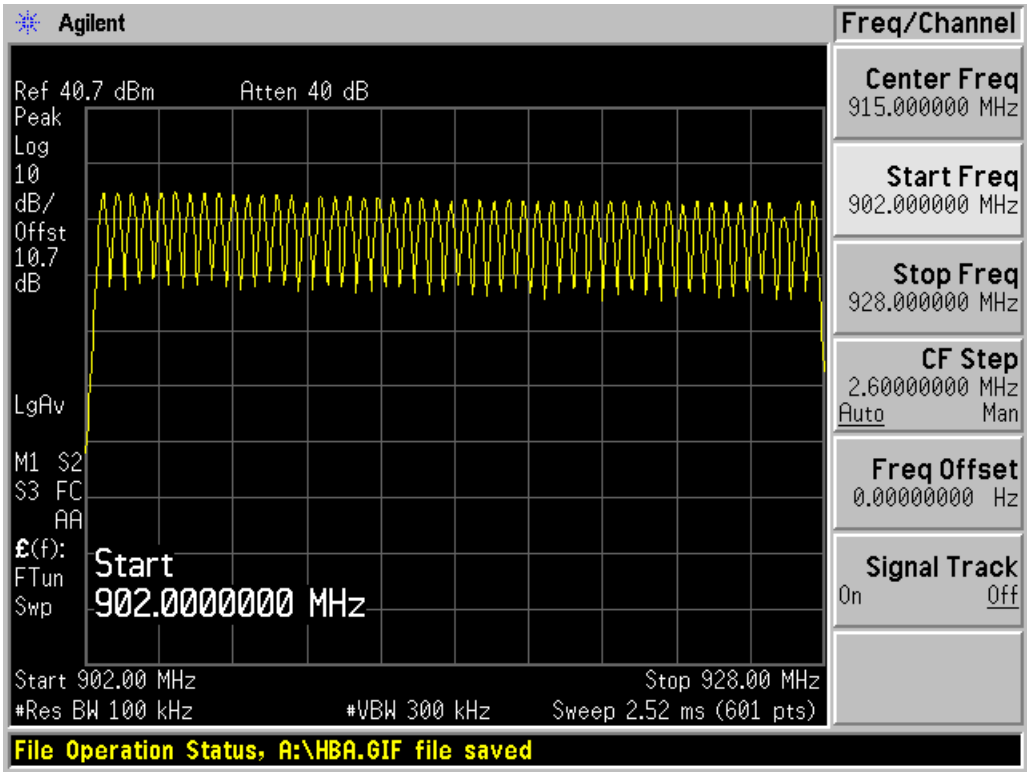
Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

Measurement Results:

50 – Hopping Channel

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:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

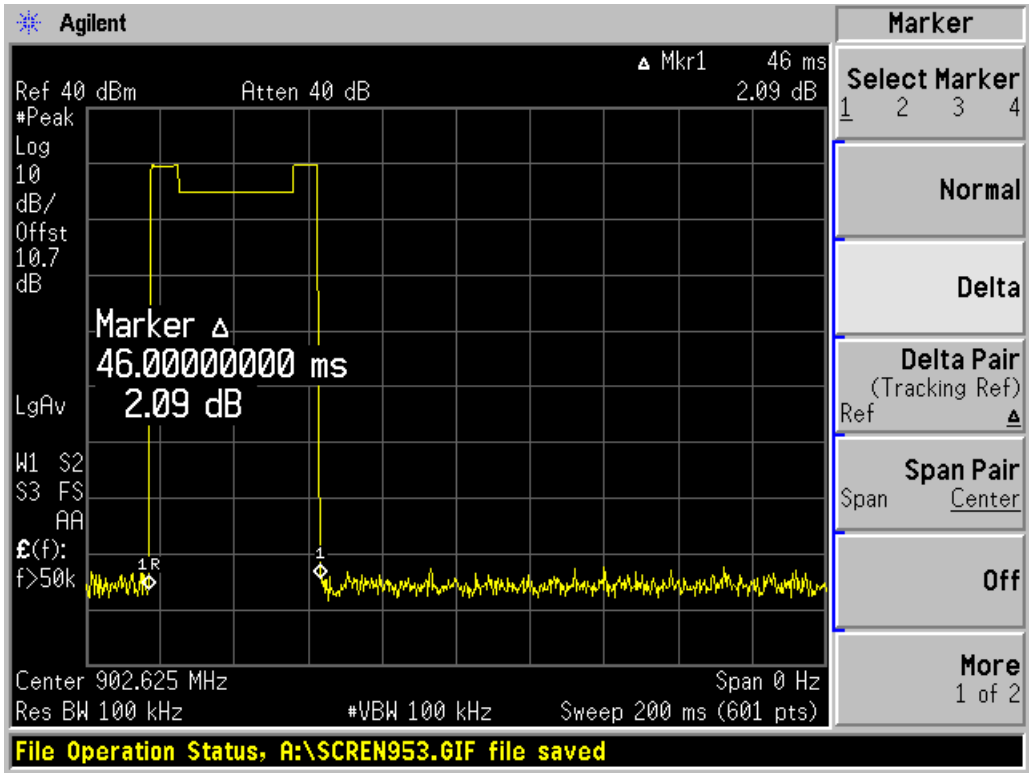
**The testing was performed by Dan Coronia on 2006-10-28.*

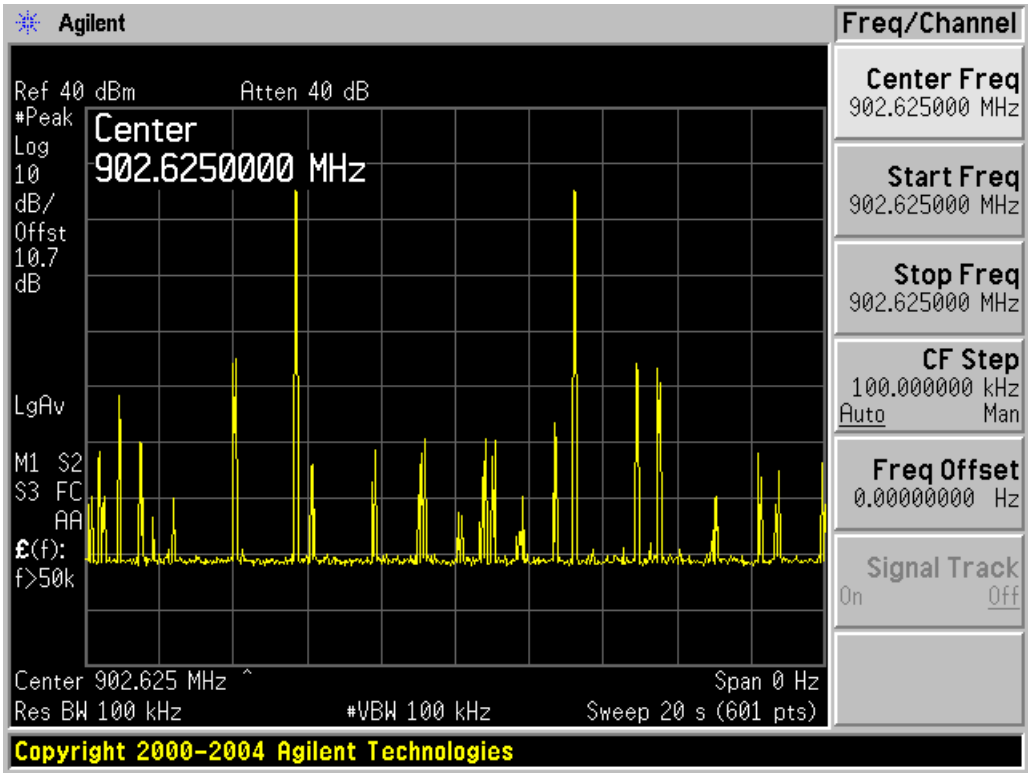
Measurement Results:

Channel	Frequency MHz	Pulse Width ms	Dwell Time Sec	Occupied time within 20 sec period	Limit Sec	Result
Low	902.625	46	0.092	2	0.4	Pass
Mid	915.365	46	0.046	1	0.4	Pass
High	927.585	46	0.138	3	0.4	Pass

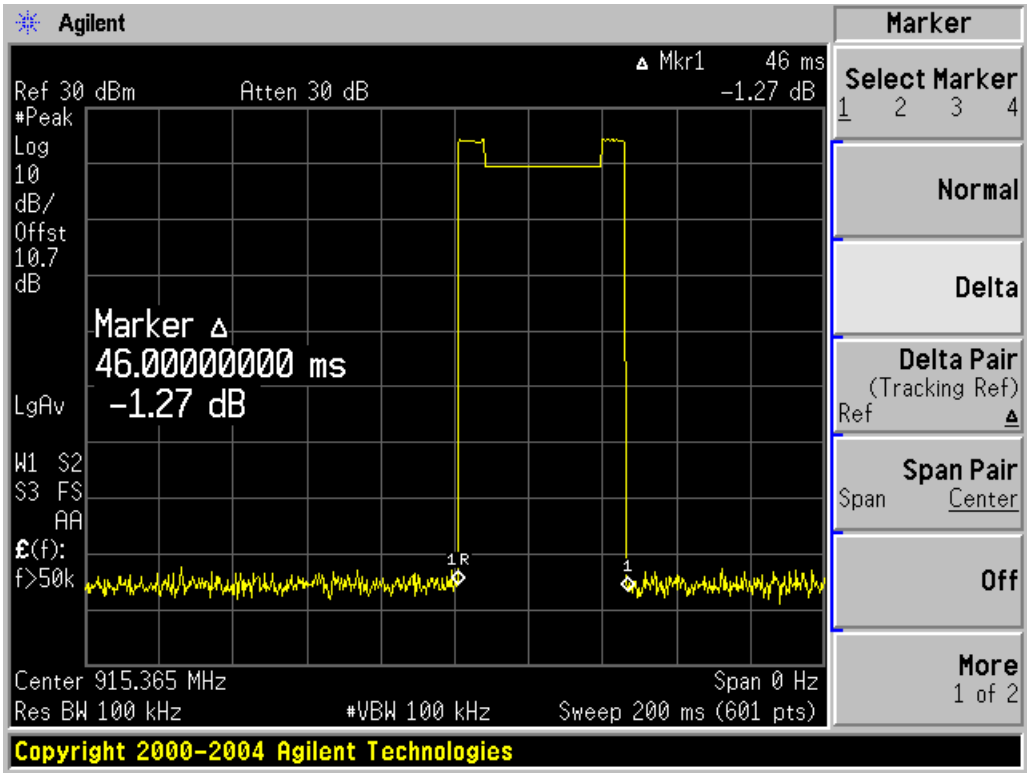
Please refer the following plots.

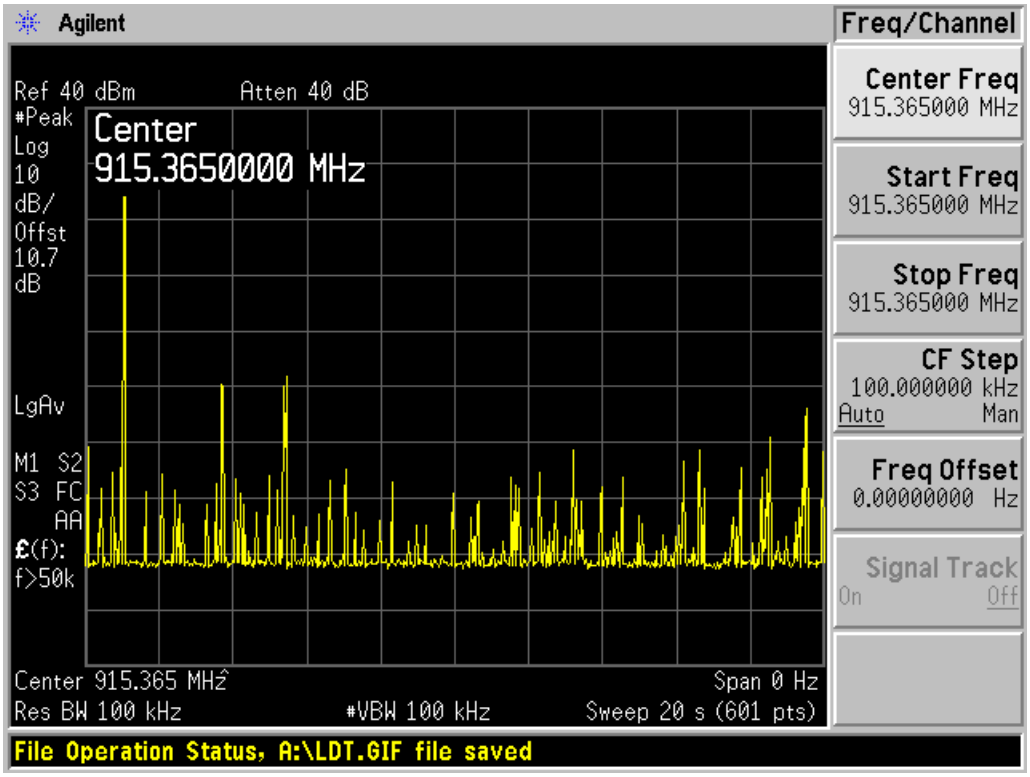
Low Channel



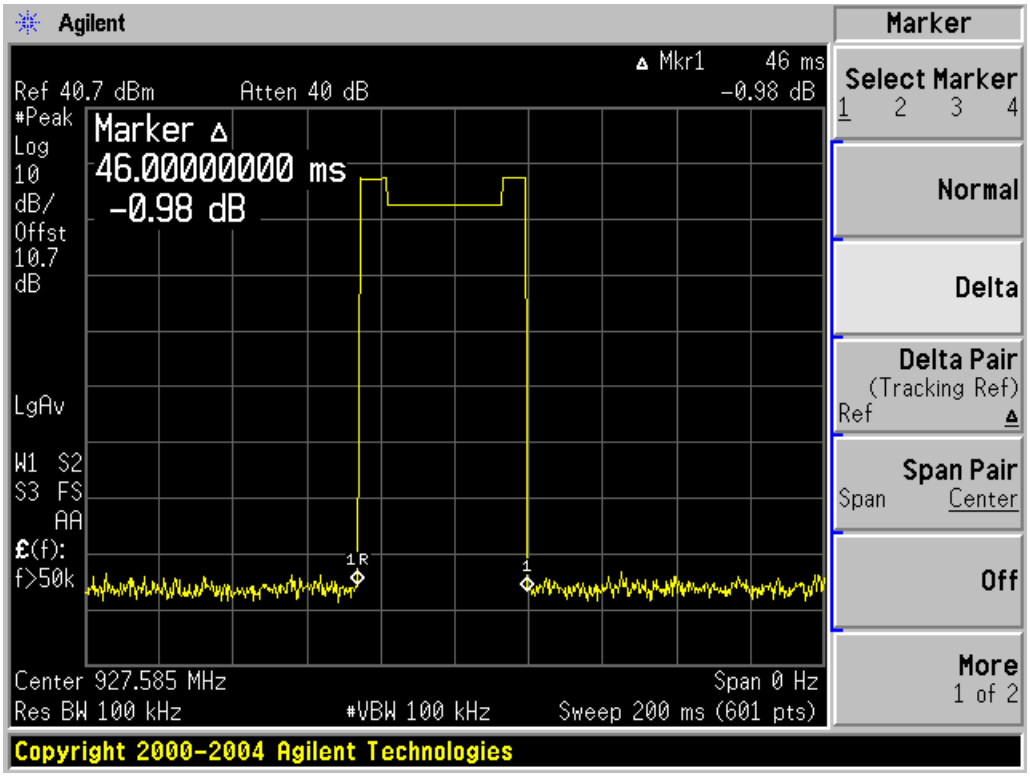


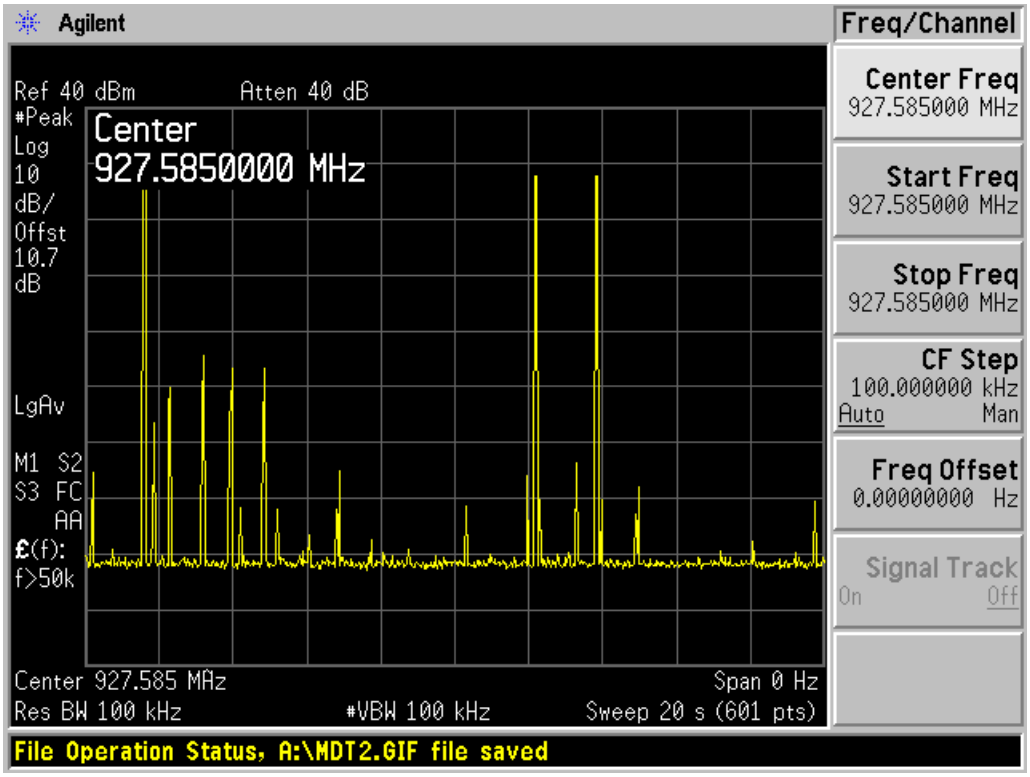
Middle Channel





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:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

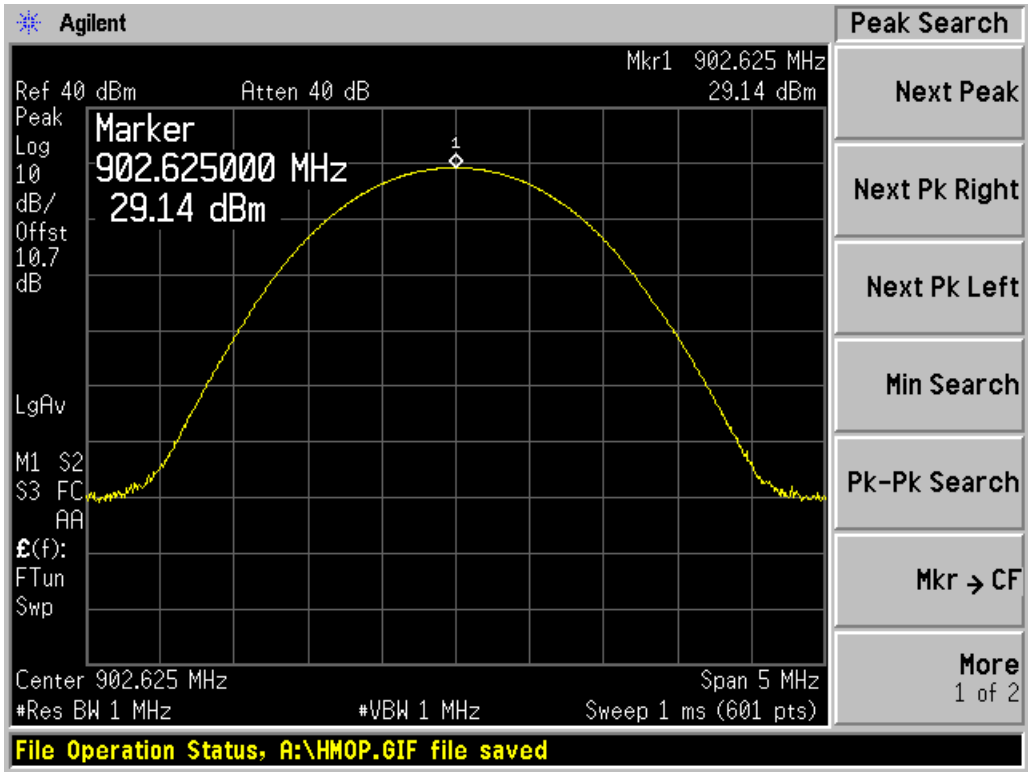
Measurement Result

Channel	Frequency MHz	Max Peak Output Power		Limit (mW)	Result
		(dBm)	(mW)		
Low	902.200	29.14	820.35	1000	Pass
Mid	915.250	26.93	493.17	1000	Pass
High	927.800	27.73	529.93	1000	Pass

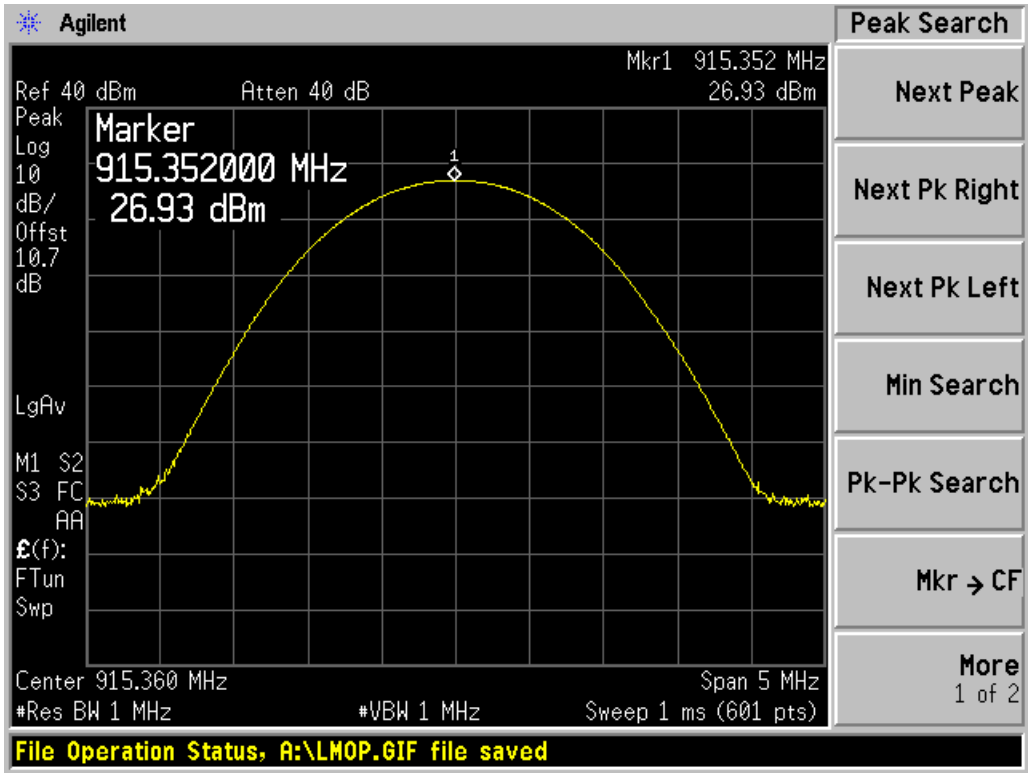
Plots of Maximum Peak Output Power

Please see the following plots

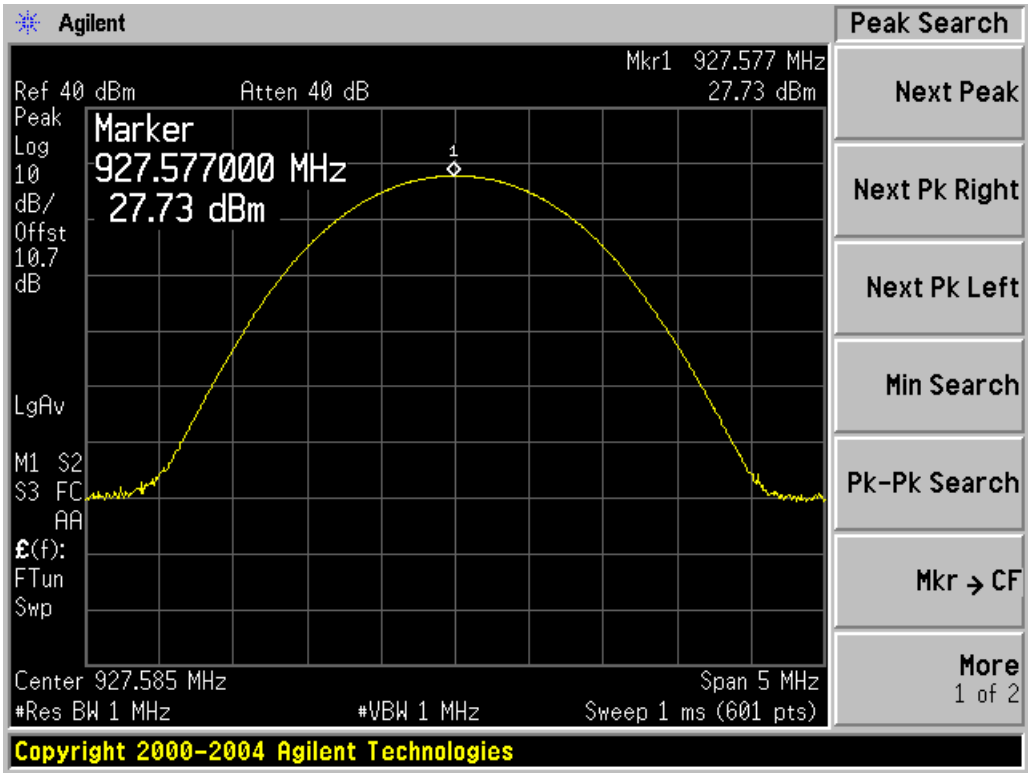
Low Channel



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

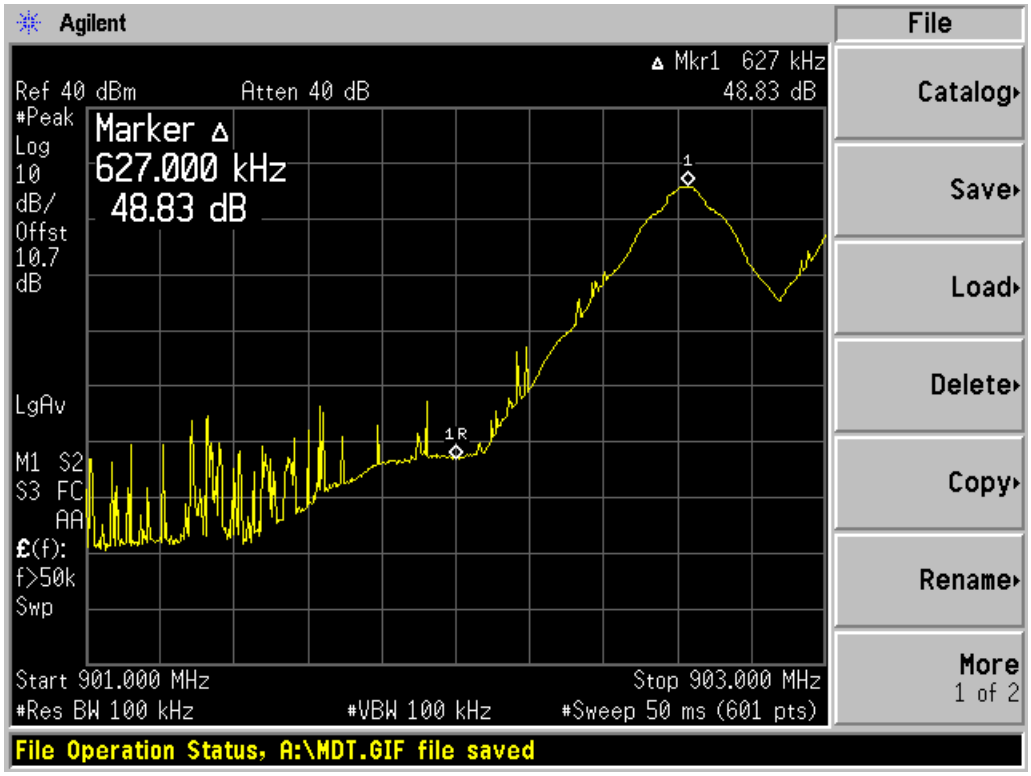
Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

**The testing was performed by Dan Coronia on 2006-10-28.*

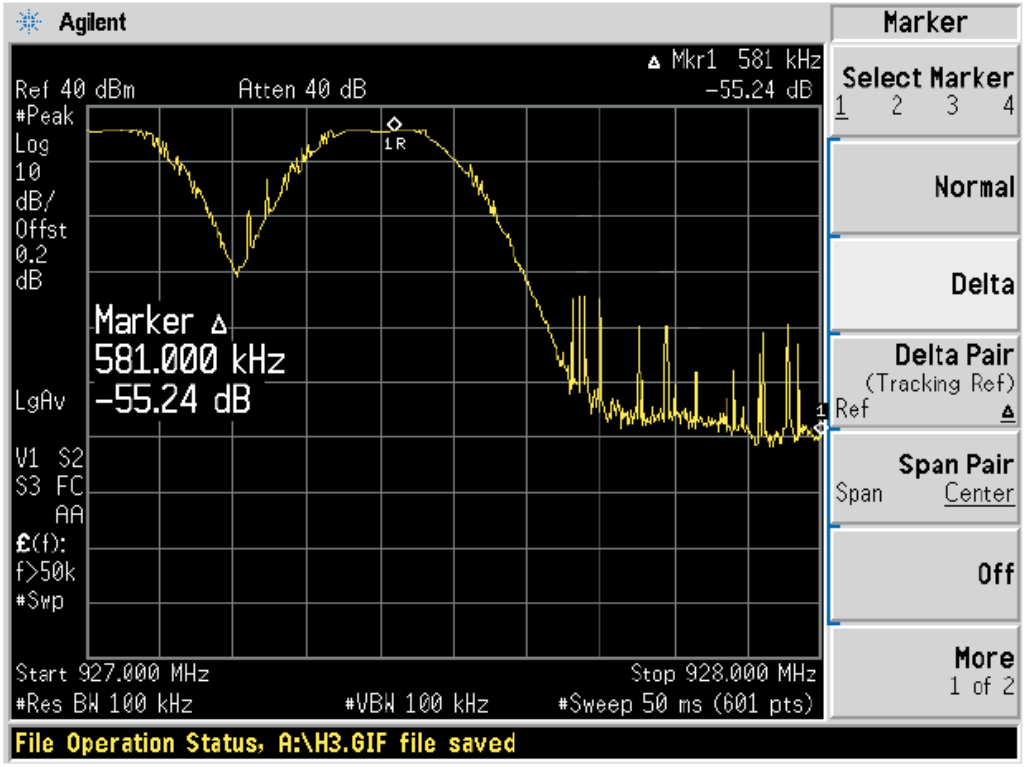
Plots of 100 KHz Bandwidth of Band Edge

Please refer the following plots.

Low Channel



High Channel



§2.1051 SPURIOUS EMISSIONS AT ANTENNA PORT

Applicable Standard

CFR 47, §2.1051.

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

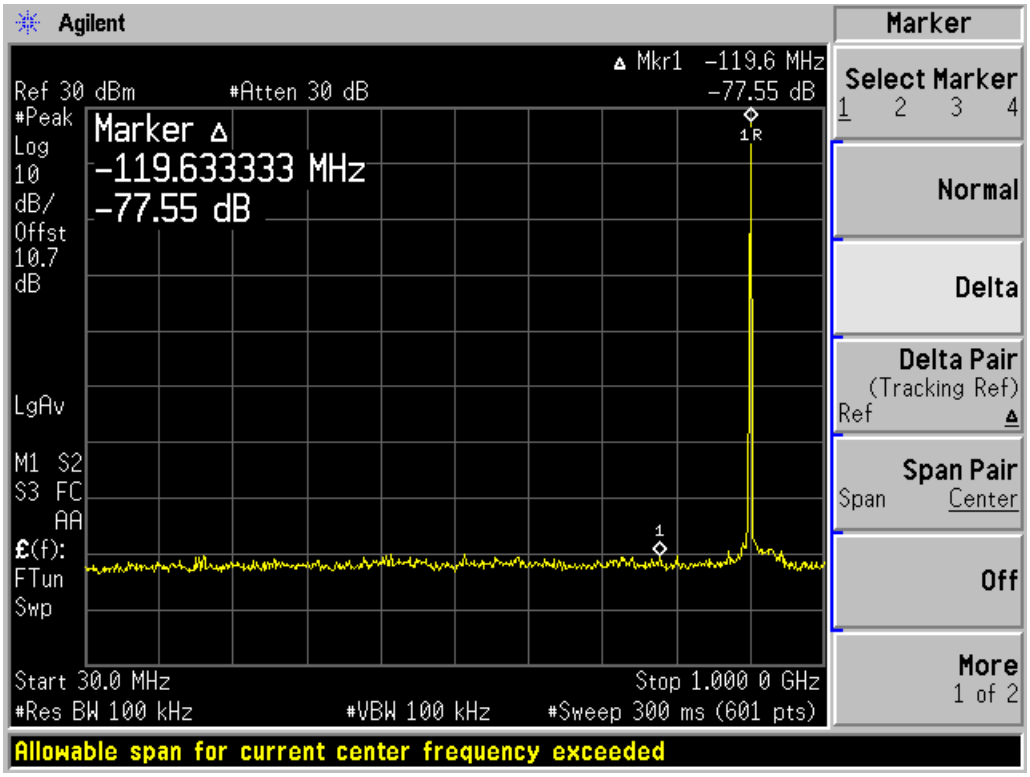
Temperature:	23° C
Relative Humidity:	62%
ATM Pressure:	1022 mbar

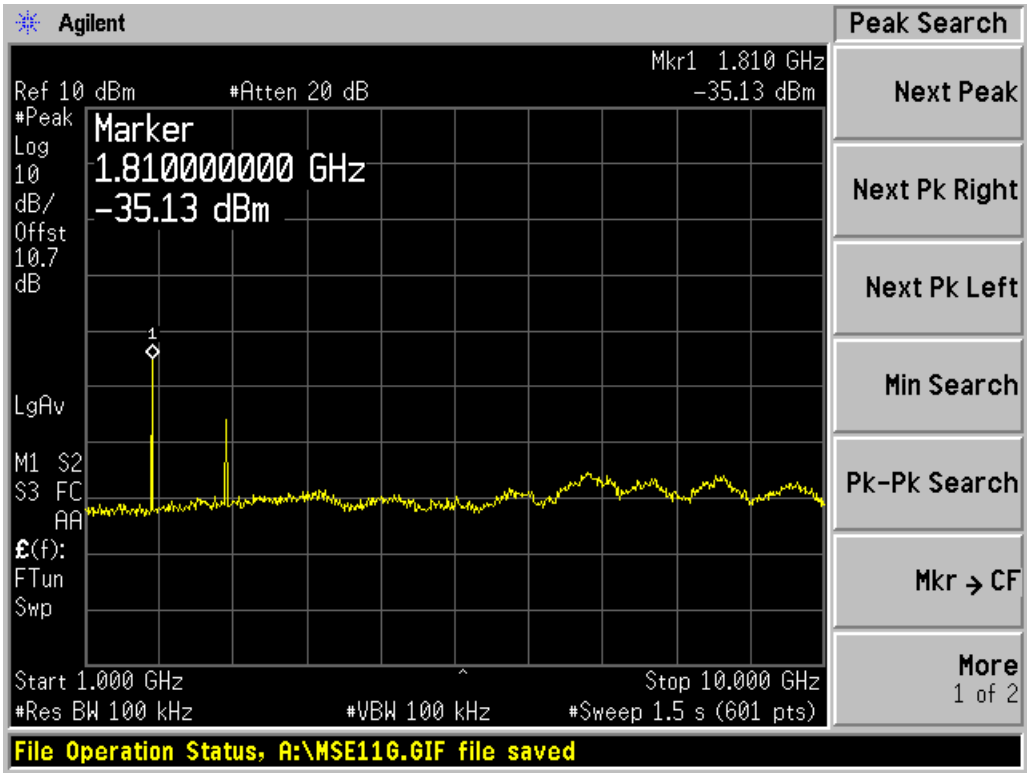
**The testing was performed by Dan Coronia on 2006-10-28.*

Measurement Results

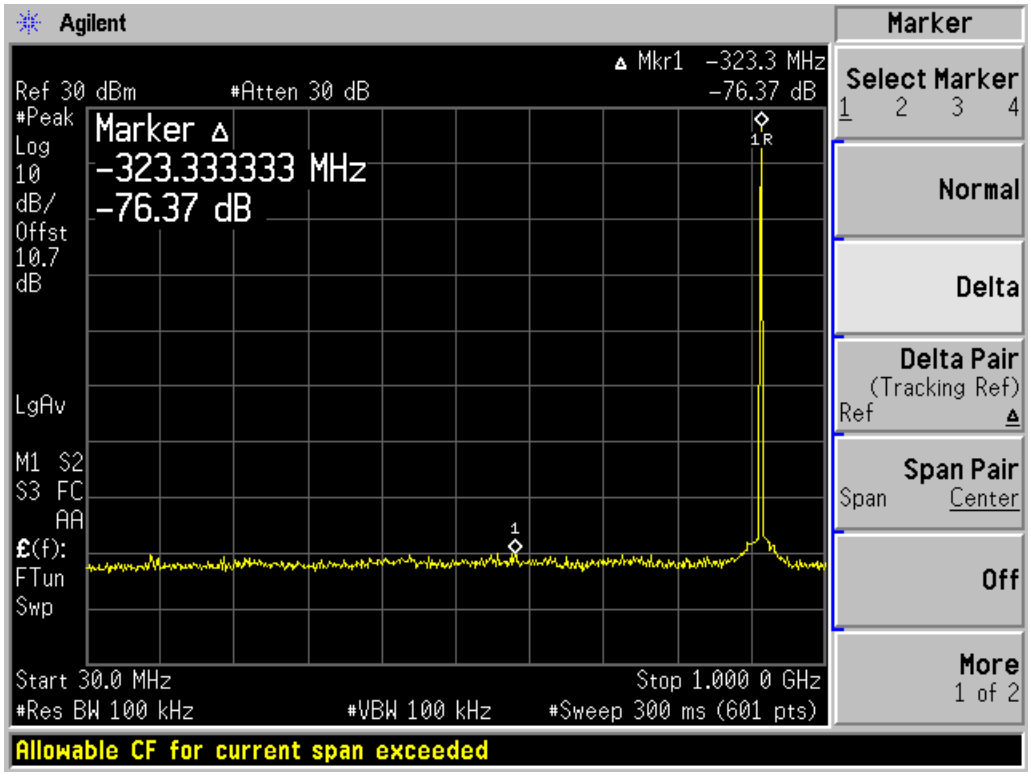
Please refer to the following plots.

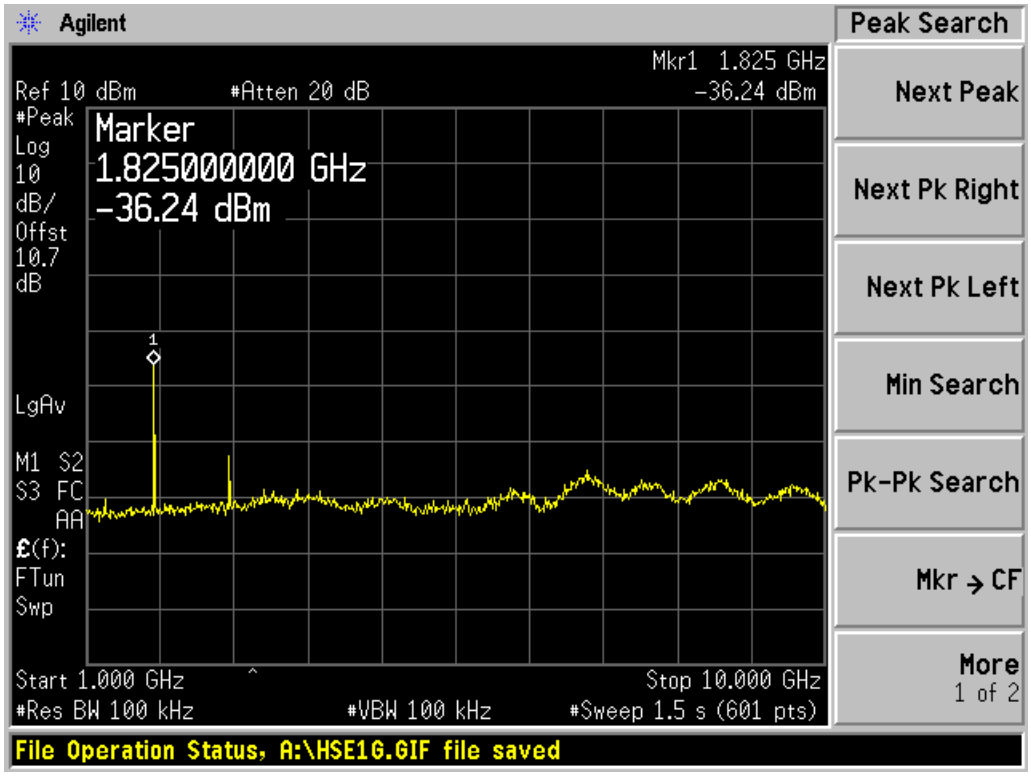
Low Channel


Agilent
Marker
Mkr1 -119.6 MHz
-77.55 dB
Ref 30 dBm
#Atten 30 dB
#Peak
Log
10
dB/
Offst
10.7
dB
Marker Δ
-119.633333 MHz
-77.55 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 30.0 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 1.000 0 GHz
#Sweep 300 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Allowable span for current center frequency exceeded


Agilent
Peak Search
Mkr1 1.810 GHz
-35.13 dBm
Ref 10 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
10.7
dB
Marker
1.810000000 GHz
-35.13 dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
#Sweep 1.5 s (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\MSE11G.GIF file saved

Mid Channel


Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Mkr1 -323.3 MHz
-76.37 dB
Ref 30 dBm
#Atten 30 dB
#Peak
Log
10
dB/
Offst
10.7
dB
Marker
-323.333333 MHz
-76.37 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 30.0 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 1.000 0 GHz
#Sweep 300 ms (601 pts)
Allowable CF for current span exceeded


Agilent
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Mkr1 1.825 GHz
-36.24 dBm
Ref 10 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
10.7
dB
Marker
1.825000000 GHz
-36.24 dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
#Sweep 1.5 s (601 pts)
File Operation Status, A:\HSE1G.GIF file saved

High Channel