Lab Code: 200167-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Waxess Inc.

34 Executive Park, Suite 250, Irvine, CA 92614

FCC ID: SNBDM1200E

This Report Concerns:	Equipment Type:
☒ Original Report	CDMA phone with FHSS

Test Engineer:	Oscar Au/ Dan Coronia
Report No.:	R0701043-247
Report Date:	2007-01-15
Reviewed By:	Test Engineer: Daniel Deng
Prepared By: **(ct)**	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave. Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732-9164

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The Waxess Inc.'s product, FCC ID: SNBDM1200E or the "EUT" as referred to in this report is a 2.4GHz digital cordless telephone for dual line connectivity.

1.2 Mechanical Description

Approximate measurement is: 190mm (L) x 175 mm (W) x 45 mm (H) for base.

** The test data gathered are from typical production sample, serial number: 0004021, provided by the manufacturer.*

1.3 EUT Photo

Please see additional photos in Exhibit C

1.4 Objective

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

1.5 Related Submittal(s)/Grant(s)

This device has CDMA module built in and operating in cellular/PCS bands, the grant under FCC part22 and part24 rules has been issued to this device also.

1.6 Test Methodology

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

1.7 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 dB 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.

1.8 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 site at BACL Corp. has 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, 1997 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003 & TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-2463 and C-2698. 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 Corp. 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.

2 - SYSTEM TEST CONFIGURATION

2.1 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.

2.2 Special Accessories

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

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
I.T.E. Power Supply	AC Adaptor (base)	AD-48091000	N/A

2.5 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Midwest Microwave	10dB attenuator pad	ATT-0263-10-000-02	N/A
Inmet Corp.	DC Block	8055	N/A

2.6 Interface Ports and Cabling

Cable Description	Length (m)	From	To
Low loss RF cable	0.1	RF antenna port on EUT	Spectrum analyzer

3 - SUMMARY OF TEST RESULTS FOR FCC PART 15

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

4 - §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.

Refer to statement below for compliance.

"The antenna for this device is an integral antenna that the end user cannot access. Furthermore the device is for indoor/outdoor use as detailed in the Users Manual and Operational Description".

4.2 Antenna Connected Construction

The antenna for this device is an integral antenna that the end user cannot access. It is fully enclosed by the EUT chassis and removal/modification would result in irreparable damage to the device.

☒ **Compliant** ☐ **N/A**

5 - §15.207 – CONDUCTED EMISSIONS

5.1 Applicable Standard

According to FCC §15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

**Decreases with the logarithm of the frequency*

5.2 EUT Setup

The conducted emission tests were performed in the shielded-room test site, using the setup in accordance with ANSI C63.4-2003 measurement procedures. The specification used was FCC §15.107 Class B limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled if necessary.

The adaptor of the EUT was connected to a 120 V, 60 Hz AC line power source.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2006-11-14
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2006-02-07

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

5.4 Test Procedure

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

Maximizing procedures were performed on the six (6) highest provided emissions of the EUT.

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

Environmental Conditions

Temperature:	19° C
Relative Humidity:	46%
ATM Pressure:	1011 mbar

**The testing was performed by Oscar Au on 2007-01-08.*

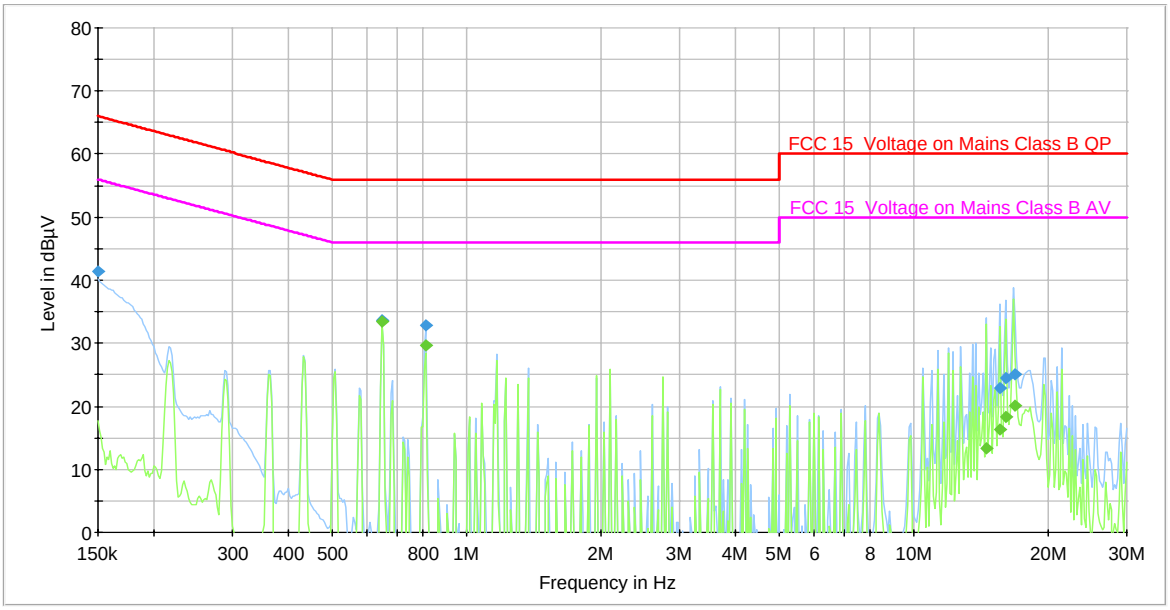
5.5 Summary of Test Results

According to the recorded data, the EUT complied with FCC §15.107 Class B limits, and had the worst margin reading of:

-12.2 dB at **0.8113 MHz** in the **Neutral** conductor mode, 150 kHz to 30 MHz for Base

5.6 Conducted Emissions Test Plots and Data

120 V, 60 Hz - Line



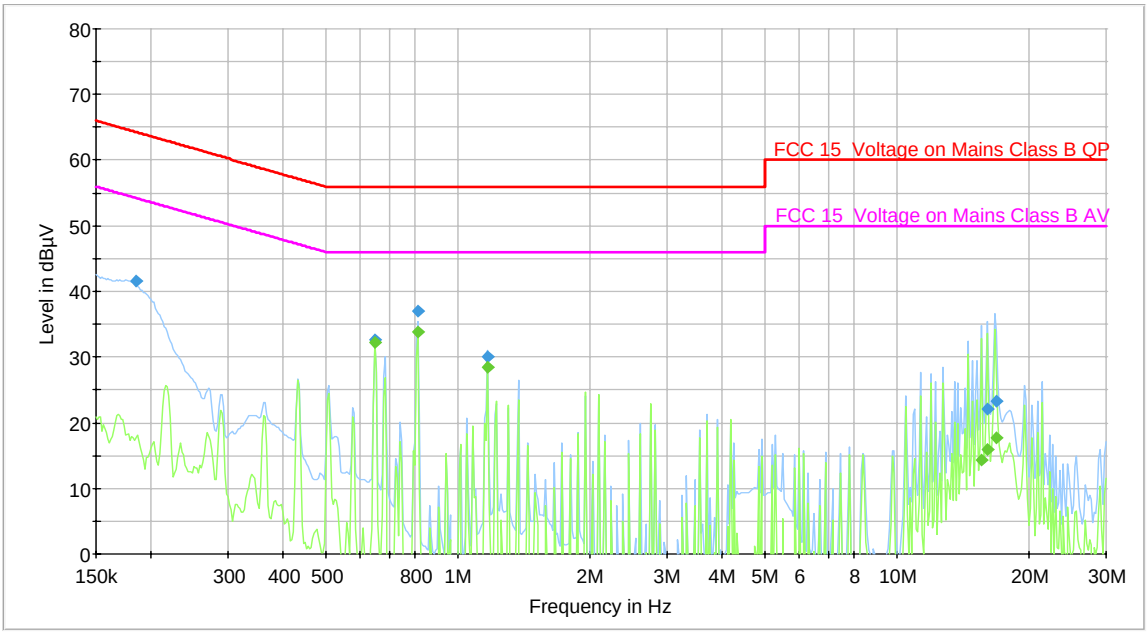
QP Measurements

Frequency (MHz)	Quasi-peak (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.649840	33.6	L	56.0	-22.4
0.811320	32.7	L	56.0	-23.3
0.150000	41.5	L	66.0	-24.6
16.822460	25.1	L	60.0	-34.9
16.077170	24.4	L	60.0	-35.6
15.571420	22.9	L	60.0	-37.1

Average Measurements

Frequency (MHz)	Average (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.649840	33.5	L	46.0	-12.5
0.811320	29.8	L	46.0	-16.3
16.822460	20.2	L	50.0	-29.8
16.077170	18.3	L	50.0	-31.7
15.571420	16.4	L	50.0	-33.6
14.580720	13.4	L	50.0	-36.6

120 V, 60 Hz - Neutral



QP Measurements

Frequency (MHz)	Quasi-peak (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.811320	36.9	N	56.0	-19.1
0.184530	41.6	N	64.3	-22.7
0.649840	32.6	N	56.0	-23.5
1.172760	30.1	N	56.0	-25.9
16.822460	23.4	N	60.0	-36.6
16.077170	22.1	N	60.0	-37.9

Average Measurements

Frequency (MHz)	Average (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.811320	33.9	N	46.0	-12.2
0.649840	32.1	N	46.0	-13.9
1.172760	28.4	N	46.0	-17.6
16.822460	17.7	N	50.0	-32.3
16.077170	16.0	N	50.0	-34.0
15.571420	14.3	N	50.0	-35.7

6 - §15.205 & §15.209 - RADIATED EMISSIONS

6.1 Applicable Standard: FCC §15.205 Restricted bands of operation

(a) Except as shown in 15.205 paragraphs (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.090 – 0.110	8.291 – 8.294	16.69475 – 16.69525	156.7 – 156.9	1435 – 1626.5	3.332 – 3.339	10.6 – 12.7
0.495 – 0.505	8.362 – 8.366	25.5 – 25.67	162.0125 –167.17	1645.5 – 1646.5	3.3458 – 3.358	13.25 – 13.4
2.1735 – 2.1905	8.37625 – 8.38675	37.5 – 38.25	167.72 – 173.2	1660 – 1710	3.600 – 4.400	14.47 – 14.5
4.125 – 4.128	8.41425 – 8.41475	73 – 74.6	240 – 285	1718.8 – 1722.2	4.5 – 5.15	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 – 75.2	322 – 335.4	2200 – 2300	5.35 – 5.46	17.7 – 21.4
4.20725 – 4.20775	12.51975 – 12.52025	108 – 121.94	399.9 – 410	2310 – 2390	7.25 – 7.75	22.01 – 23.12
6.215 – 6.218	12.57675 – 12.57725	123 – 138	608 – 614	2483.5 – 2500	8.025 – 8.5	23.6 – 24.0
6.26775 – 6.26825	13.36 – 13.41	149.9 – 150.05	960 – 1240	2690 – 2900	9.0 – 9.2	31.2 – 31.8
6.31175 – 6.31225	16.42 – 16.423	156.52475 – 156.52525	1300 – 1427	3260 – 3267	9.3 – 9.5	36.43 – 36.5
						Above 38.6

(b) Except as provided in 15.205 paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

☒ **Compliant** ☐ **N/A**

6.2 Applicable Standard: FCC §15.209 Radiated emission limits, general requirements.

(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	Field Strength	Measurement Distance
(MHz)	**(micro volts/meter)**	**(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.*

(b) In the emission table above, the tighter limit applies at the band edges.

☒ **Compliant** ☐ **N/A**

6.3 Test Setup

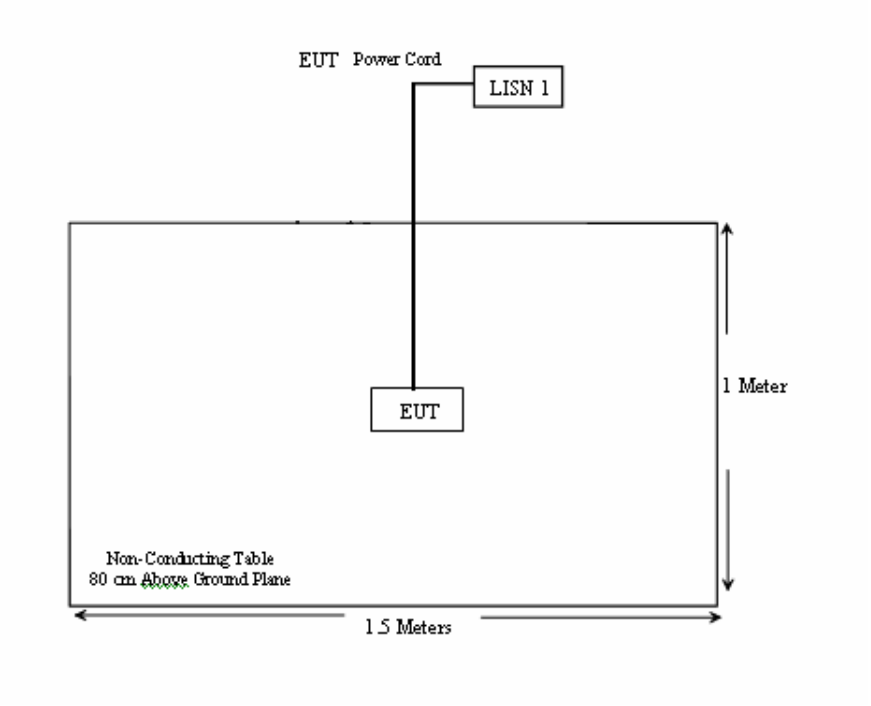
The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

6.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma	Amplifier, Pre	317	260408	2006-02-03
HP	Analyzer, Spectrum	8565EC	3946A00131	2006-01-11
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	2005-08-17

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

6.5 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	45 %
ATM Pressure:	1012 mbar

**The testing was performed by Dan Coronia on 2007-01-13.*

6.6 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.

6.7 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:

Cord. Amp. = 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 emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Cord. Amp. - Limit

6.8 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 standard's radiated emissions limits for class B devices, and had the worst margin of:

-11.3 dB at **7203.18 MHz** in the **Vertical** polarization at **Low** Channel

-3.4 dB at **9766.64 MHz** in the **Vertical** polarization at **Middle** Channel

-2.8 dB at **4964.54 MHz** in the **Vertical** polarization at **High** Channel

Please refer to the following tables for full test results

Radiated Emissions Test Result Data: Measured at 3 meter

Run # 1: Low CH = 2401.06 MHz

Frequency (MHz)	Reading dBuV	Azimuth Degrees	Height Meters	Polarization H / V	Antenna Factor dB/m	Cable Loss dB	Amplifier Gain dB	Corrected Reading dBuV/m	Limit dBuV/m	Margin (dB)	Comments
2401.0600	123.8	286	1.7	v	28.7	2.7	35.8	119.3	-	-	Fund/Peak
2401.0600	117.3	164	1.8	h	28.7	2.7	35.8	112.8	-	-	Fund/Peak
2401.0600	123.7	286	1.7	v	28.7	2.7	35.8	119.2	-	-	Ave
2401.0600	117.0	164	1.8	h	28.7	2.7	35.8	112.5	-	-	Ave
7203.1800	36.1	280	1.4	v	36.7	4.8	34.9	42.7	54	-11.3	Ave
9604.2400	34.0	200	1.4	v	38.1	5.5	36.9	40.7	54	-13.3	Ave
7203.1800	33.9	190	1.3	h	36.7	4.8	34.9	40.5	54	-13.5	Ave
9604.2400	30.6	260	1.5	h	38.1	5.5	36.9	37.3	54	-16.7	Ave
4802.1200	33.5	327	1.2	v	32.5	3.8	34.8	35.0	54	-19.0	Ave
7203.1800	48.0	280	1.4	v	36.7	4.8	34.9	54.6	74	-19.4	Peak
4802.1200	32.7	147	1.4	h	32.5	3.8	34.8	34.2	54	-19.8	Ave
4802.1200	51.8	327	1.2	v	32.5	3.8	34.8	53.4	74	-20.6	Peak
7203.1800	46.1	190	1.3	h	36.7	4.8	34.9	52.7	74	-21.3	Peak
9604.2400	43.8	200	1.4	v	38.1	5.5	36.9	50.5	74	-23.5	Peak
4802.1200	47.5	147	1.4	h	32.5	3.8	34.8	49.0	74	-25.0	Peak
9604.2400	41.3	260	1.5	h	38.1	5.5	36.9	48.0	74	-26.0	Peak

Run # 2: Mid CH = 2441.66 MHz

Frequency (MHz)	Reading dBuV	Azimuth Degrees	Height Meters	Polarization H / V	Antenna Factor dB/m	Cable Loss dB	Amplifier Gain dB	Corrected Reading dBuV/m	Limit dBuV/m	Margin (dB)	Comments
2441.6600	124.3	283	1.6	v	28.7	2.7	35.8	119.8	-	-	Fund/Peak
2441.6600	118.3	265	1.8	h	28.7	2.7	35.8	113.8	-	-	Fund/Peak
2441.6600	124.0	283	1.6	v	28.7	2.7	35.8	119.5	-	-	Ave
2441.6600	118.2	265	1.8	h	28.7	2.7	35.8	113.7	-	-	Ave
9766.6400	43.6	111	1.3	v	38.1	5.6	36.7	50.6	54	-3.4	Ave
4883.3200	46.0	235	1.6	v	32.5	3.8	34.8	47.5	54	-6.5	Ave
4883.3200	45.3	144	1.6	h	32.5	3.8	34.8	46.9	54	-7.1	Ave
7324.9800	34.3	256	1.4	v	36.7	4.8	35.1	40.7	54	-13.3	Ave
7324.9800	34.3	145	1.3	h	36.7	4.8	35.1	40.7	54	-13.3	Ave
9766.6400	33.2	98	1.4	h	38.1	5.6	36.7	40.2	54	-13.8	Ave
7324.9800	49.8	256	1.4	v	36.7	4.8	35.1	56.2	74	-17.8	Peak
4883.3200	53.5	235	1.6	v	32.5	3.8	34.8	55.0	74	-19.0	Peak
7324.9800	48.7	145	1.3	h	36.7	4.8	35.1	55.0	74	-19.0	Peak
4883.3200	53.3	144	1.6	h	32.5	3.8	34.8	54.9	74	-19.1	Peak
9766.6400	44.3	111	1.3	v	38.1	5.6	36.7	51.3	74	-22.7	Peak
9766.6400	43.6	98	1.4	h	38.1	5.6	36.7	50.6	74	-23.4	Peak

Run # 3: High CH = 2482.27 MHz

Frequency (MHz)	Reading dBuV	Azimuth Degrees	Height Meters	Polarization H / V	Antenna Factor dB/m	Cable Loss dB	Amplifier Gain dB	Corrected Reading dBuV/m	Limit dBuV/m	Margin (dB)	Comments
2482.2700	122.7	270	1.6	v	28.7	2.7	35.8	118.2	-	-	Fund/Peak
2482.2700	117.7	265	1.9	h	28.7	2.7	35.8	113.2	-	-	Fund/Peak
2482.2700	122.2	270	1.6	v	28.7	2.7	35.8	117.7	-	-	Ave
2482.2700	117.3	265	1.9	h	28.7	2.7	35.8	112.9	-	-	Ave
4964.5400	49.8	280	1.7	v	32.5	3.9	35.0	51.2	54	-2.8	Ave
4964.5400	42.8	149	1.7	h	32.5	3.9	35.0	44.2	54	-9.8	Ave
9929.0800	36.2	200	1.5	v	38.1	5.7	36.4	43.6	54	-10.4	Ave
9929.0800	32.8	180	1.3	h	38.1	5.7	36.4	40.2	54	-13.8	Ave
7446.8100	33.8	198	1.6	v	36.7	4.8	35.6	39.7	54	-14.3	Ave
7446.8100	32.6	36	1.7	h	36.7	4.8	35.6	38.5	54	-15.5	Ave
4964.5400	56.3	280	1.7	v	32.5	3.9	35.0	57.7	74	-16.3	Peak
7446.8100	49.6	198	1.6	v	36.7	4.8	35.6	55.5	74	-18.5	Peak
7446.8100	48.5	36	1.7	h	36.7	4.8	35.6	54.4	74	-19.6	Peak
4964.5400	51.8	148	1.5	h	32.5	3.9	35.0	53.2	74	-20.8	Peak
9929.0800	43.2	200	1.5	v	38.1	5.7	36.4	50.6	74	-23.4	Peak
9929.0800	42.1	180	1.3	h	38.1	5.7	36.4	49.5	74	-24.5	Peak

7 - §15.247 (a) (1) - HOPPING CHANNEL SEPARATION

7.1 Applicable Standard

According to §15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

7.2 Measurement Procedure

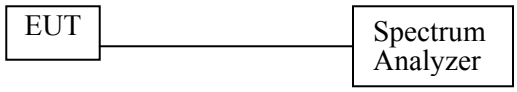
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient 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.

7.3 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.

7.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

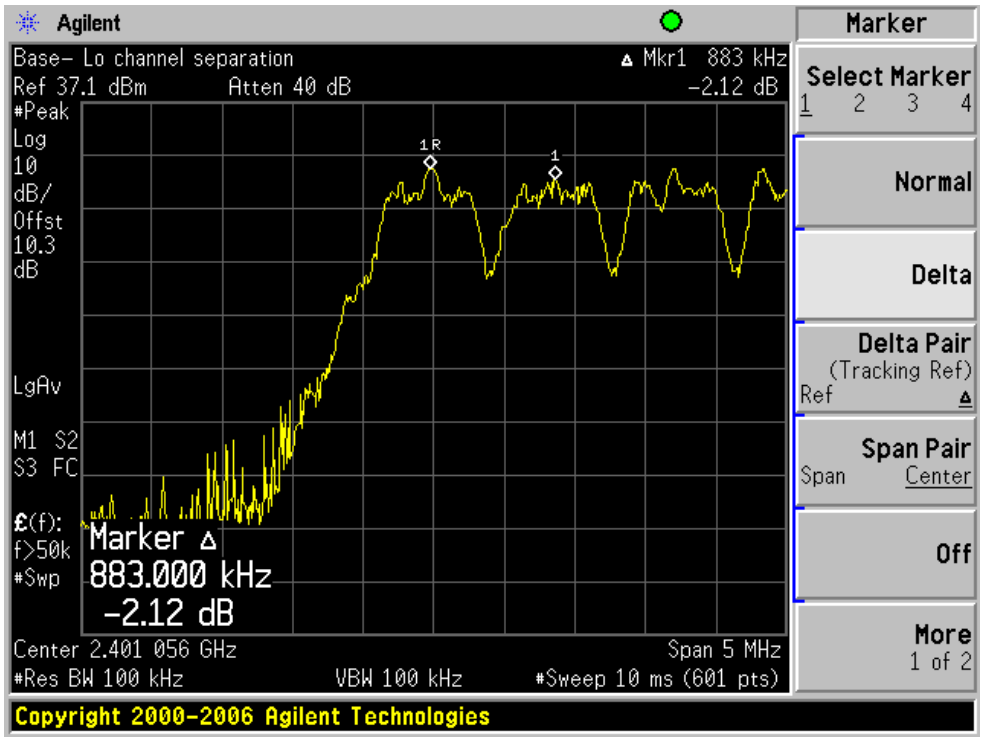
**The testing was performed by Oscar Au on 2007-01-14.*

7.5 Measurement Results

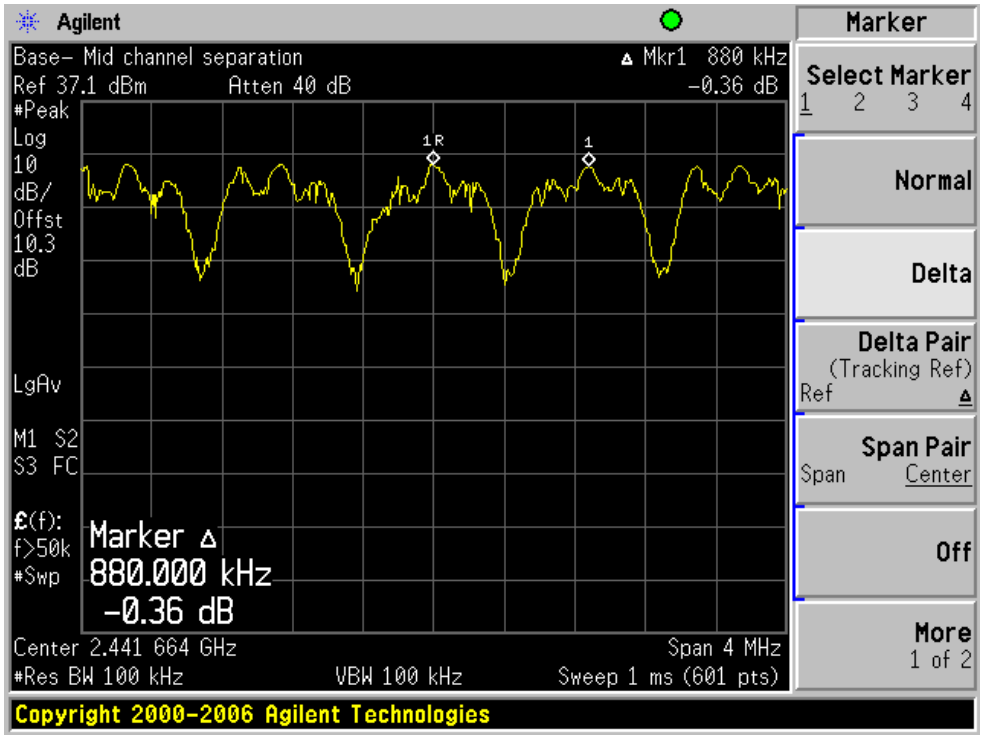
Channel	Frequency (MHz)	Channel Separation (KHz)	Limit >(KHz)
Low	2401.056	883	683.239
Mid	2441.664	880	684.987
High	2482.272	883	694.514

Please refer to the following plots.

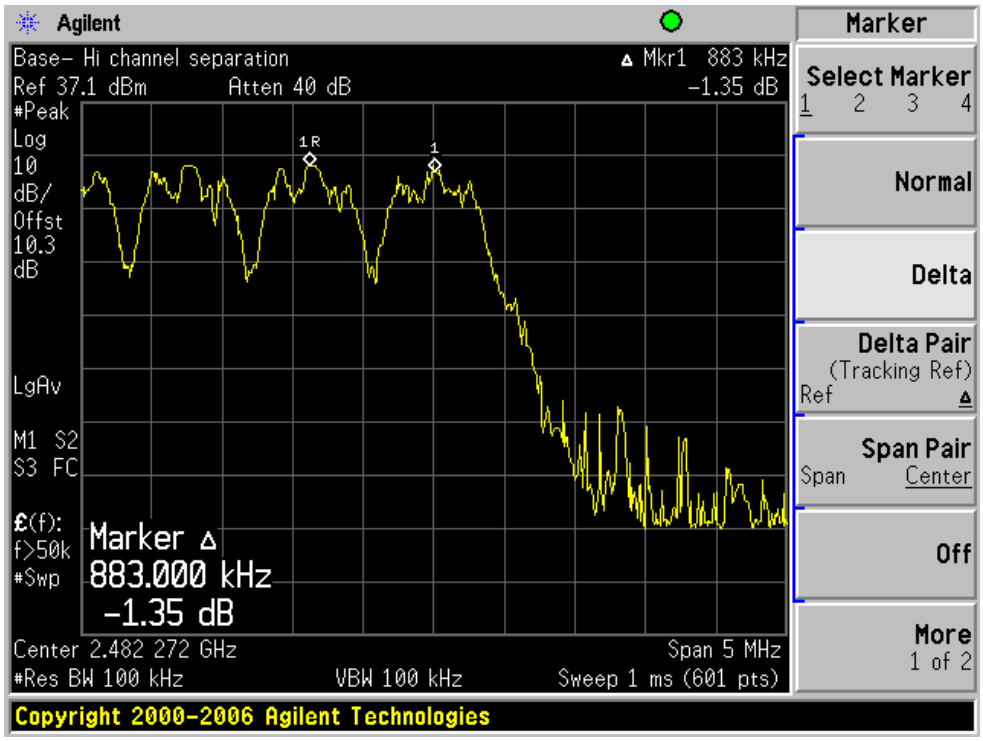
Low Channel



Middle Channel



High Channel



8 - §15.247 (a) (1) – HOPPING CHANNEL BANDWIDTH

8.1 Standard Applicable

According to §15.247(a) (l), the maximum 20 dB bandwidth of the hopping channel shall be presented.

8.2 Measurement Procedure

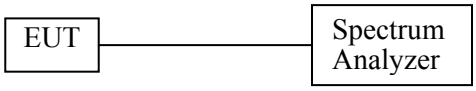
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency 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.

8.3 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.

8.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

**The testing was performed by Oscar Au on 2007-01-14.*

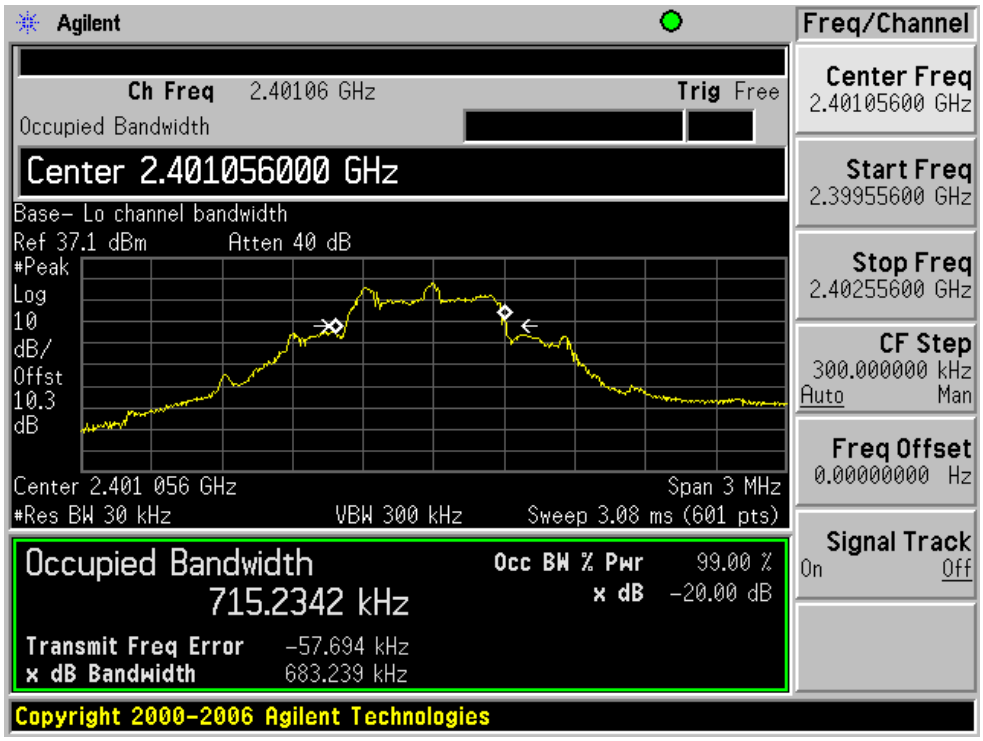
8.5 Measurement Results

Channel	Frequency (MHz)	20 dB Channel Bandwidth (KHz)
Low	2401.056	683.239
Mid	2441.664	684.987
High	2482.272	694.514

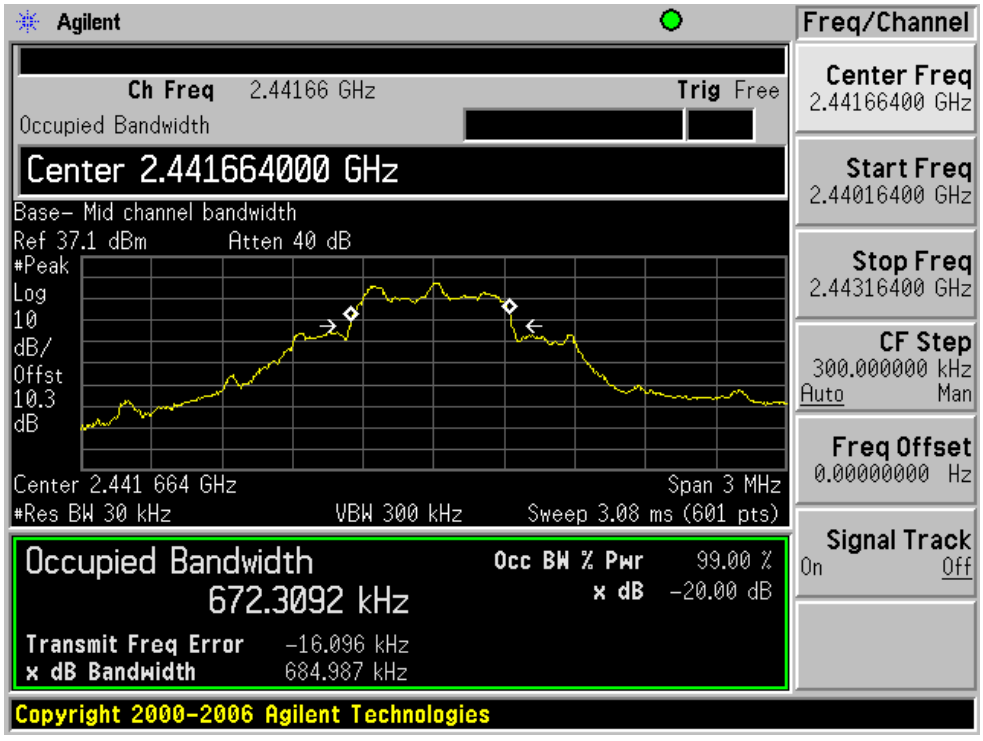
Please refer to the following plots.

8.6 Measurement Test Result

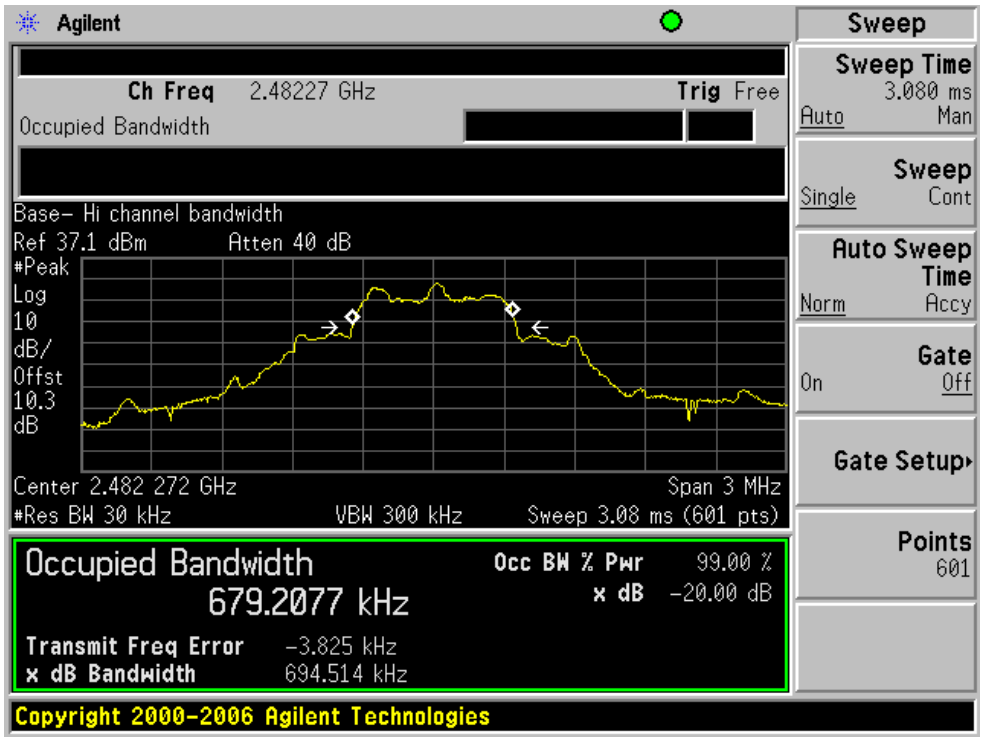
Low Channel



Middle Channel



High Channel



9 - §15.247 (a) (1) (iii) - NUMBER OF HOPPING FREQUENCIES USED

9.1 Standard Applicable

According to §15.247(a) (1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2 Measurement Procedure

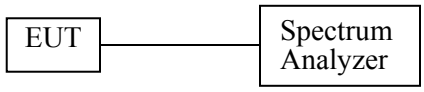
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low 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.

9.3 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.

9.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

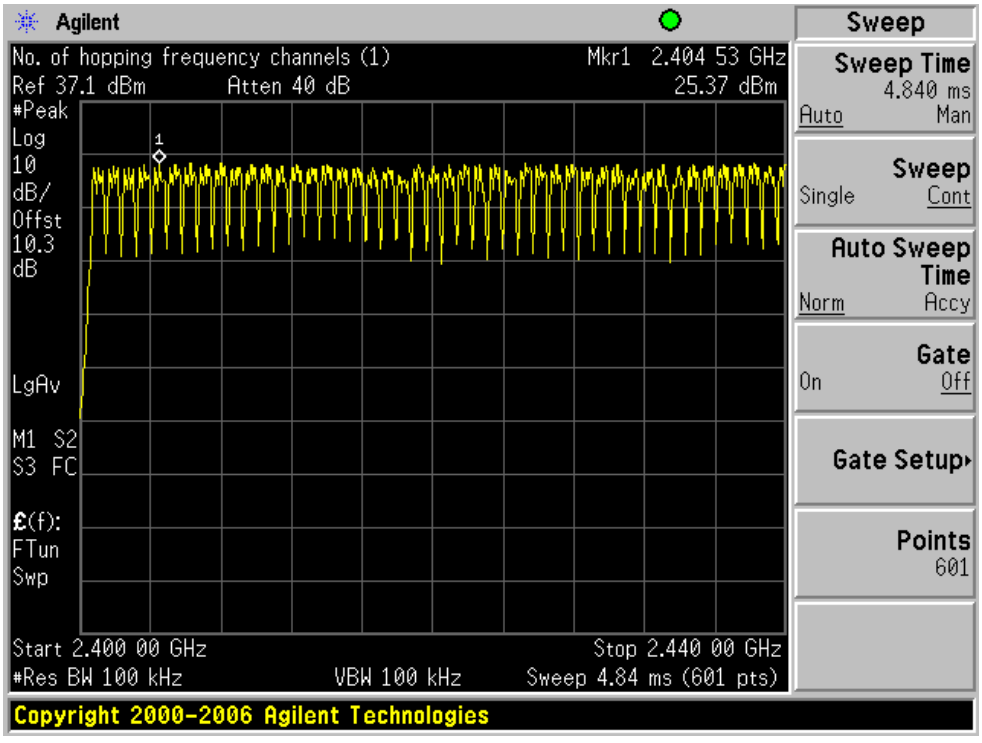
**The testing was performed by Oscar Au on 2007-01-14.*

9.5 Measurement Result

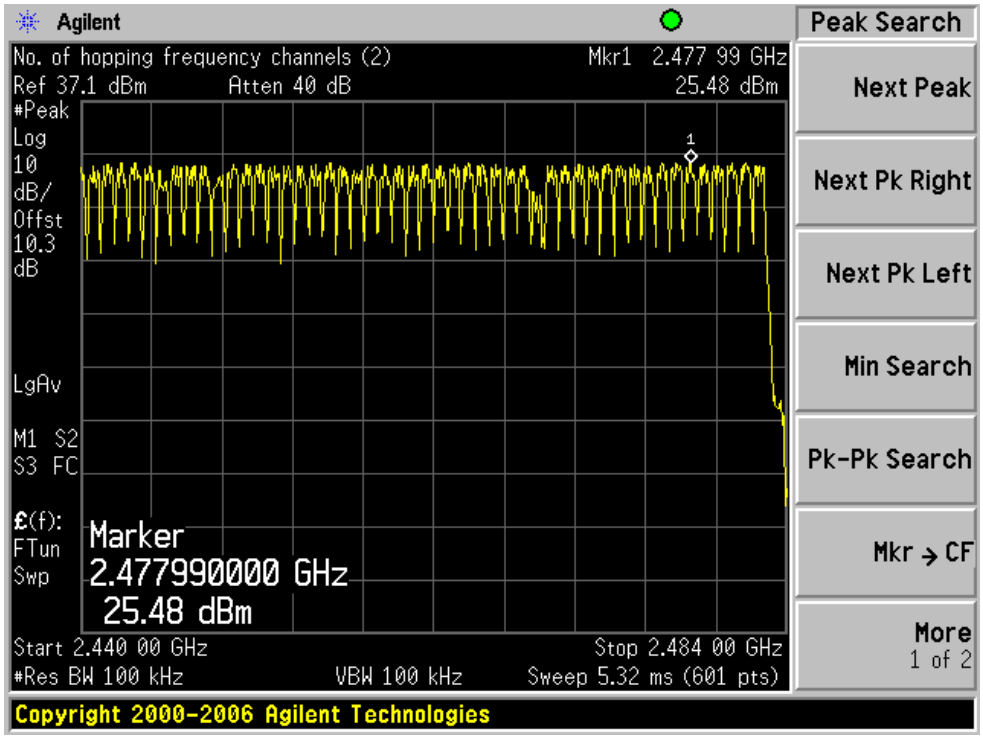
Frequency Range (MHz)	Hopping Channel Number	Limit
2400-2483.5	95	≥15

Please refer to the following plots:

First plot is 46 channels



Second plot is 49 channels



10 - §15.247(a) (1) (iii) - DWELL TIME

10.1 Applicable Standard

According to §15.247 (a)(1)(iii), the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

10.2 Measurement Procedure

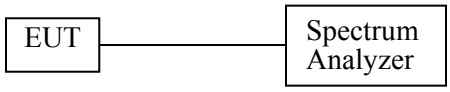
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. 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.

10.3 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.

10.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

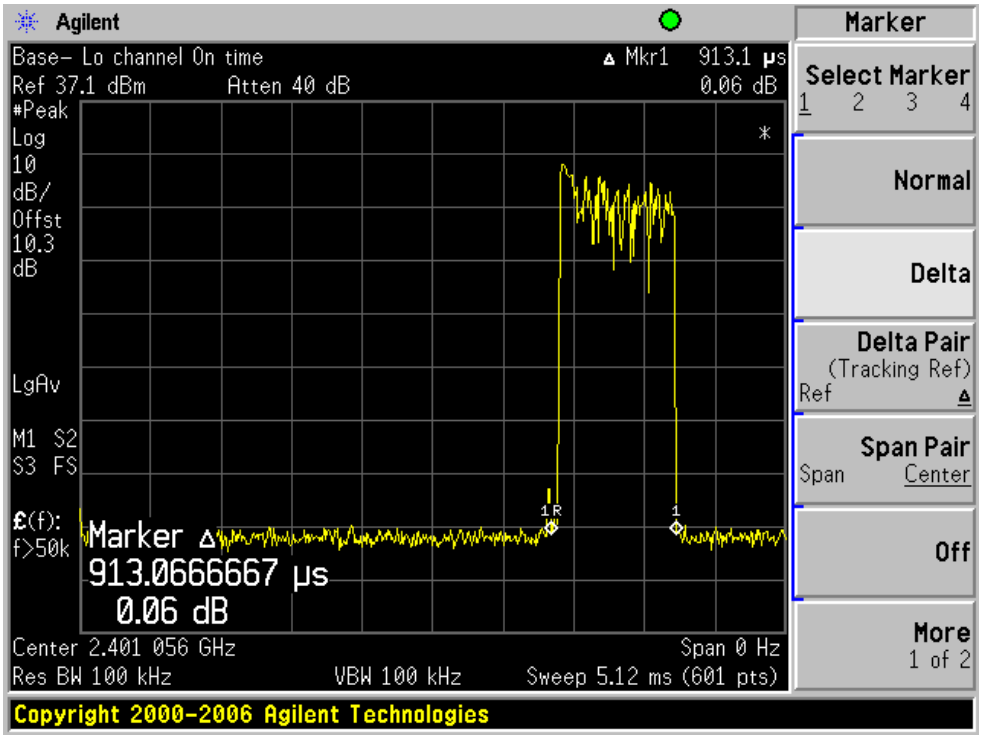
**The testing was performed by Oscar Au on 2007-01-14.*

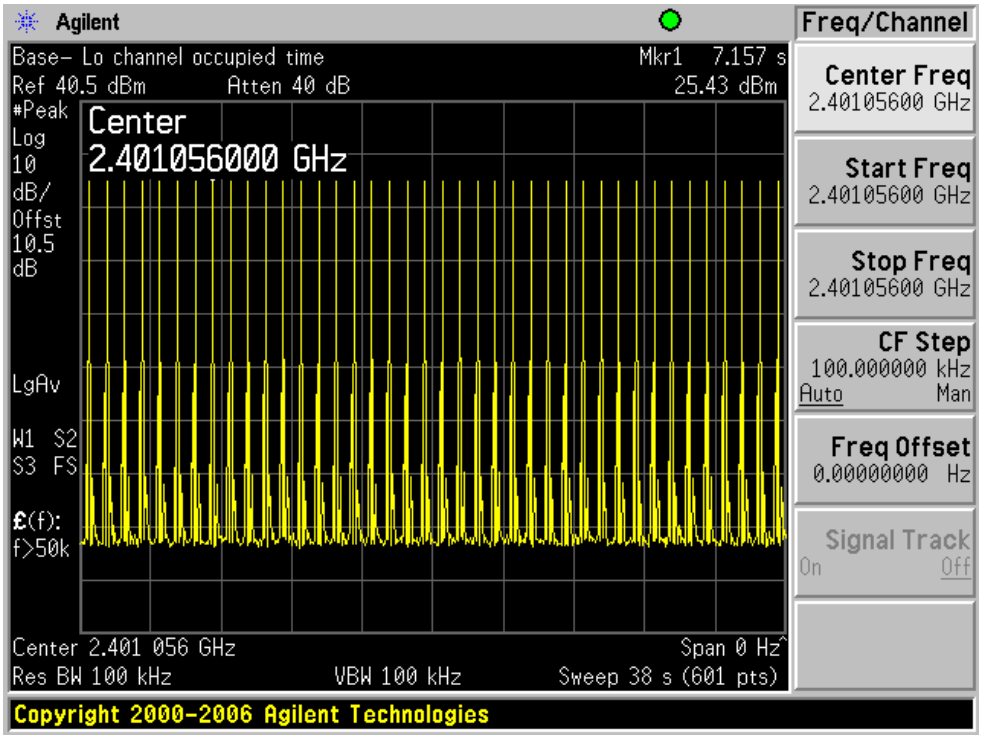
10.5 Measurement Results

Channel	Frequency (MHz)	Pulse Width (ms)	Pulse Quantity	Dwell Time (sec.)	Limit (Sec.)	Result
Low	2401.056	0.913	40	0.0365	0.4	Pass
Mid	2441.664	0.9	40	0.036	0.4	Pass
High	2482.272	0.9	40	0.036	0.4	Pass

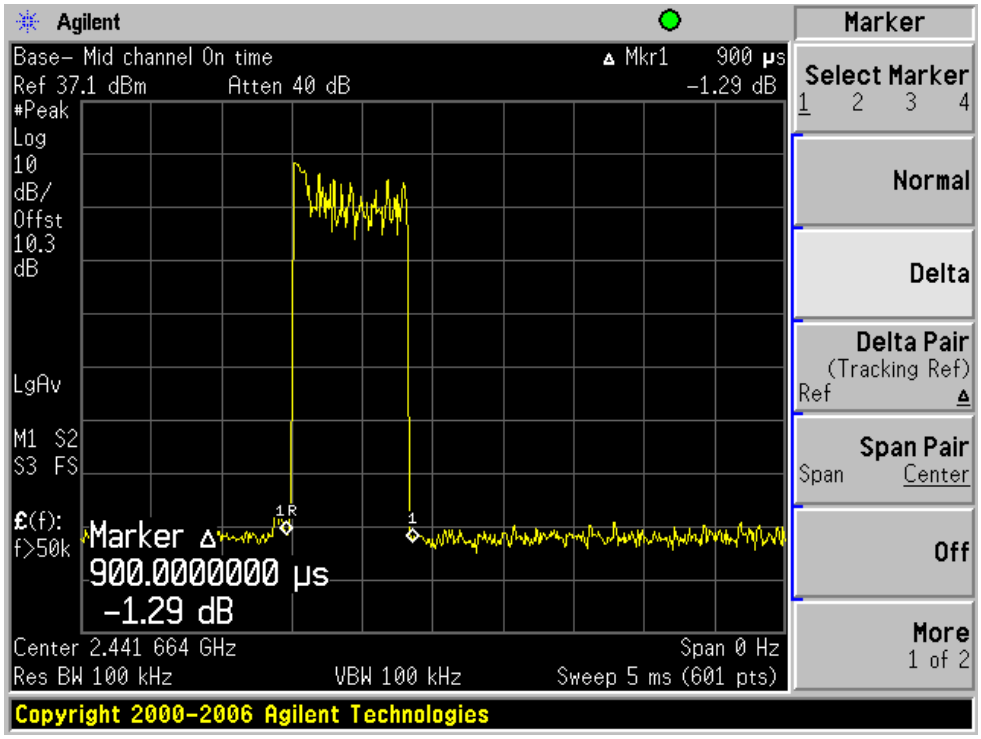
Please refer the following plots.

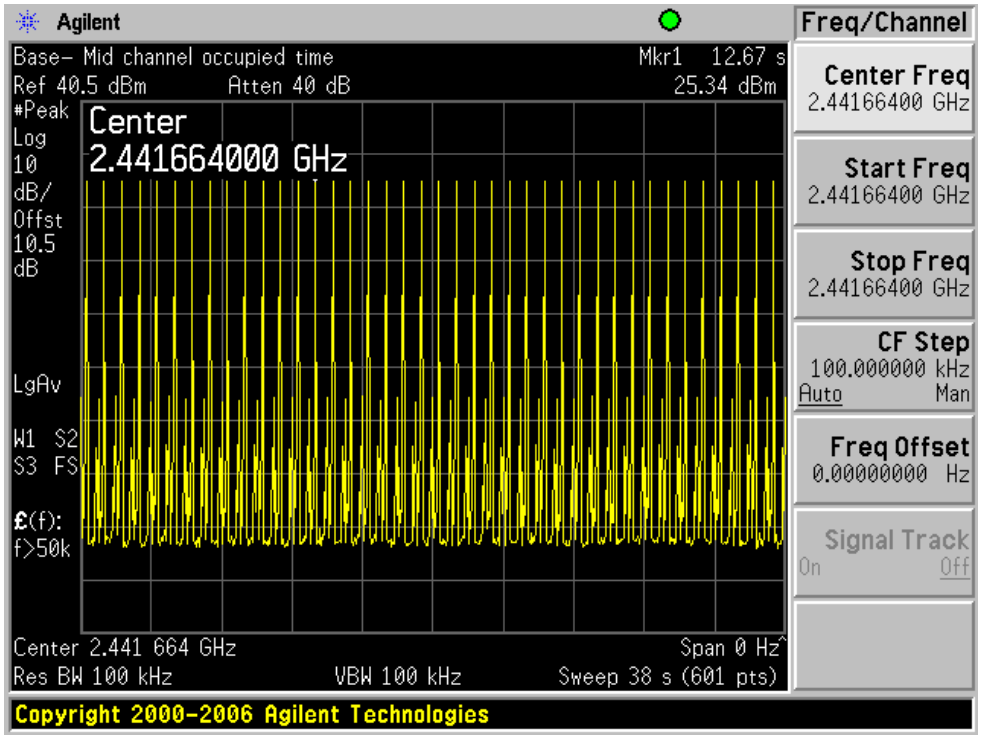
Low CH


Agilent
Base- Lo channel On time
Ref 37.1 dBm
Atten 40 dB
Mkr1 913.1 µs
0.06 dB
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FS
£(f):
f>50k
Marker Δ
913.0666667 µs
0.06 dB
Center 2.401 056 GHz
Res BW 100 kHz
VBW 100 kHz
Span 0 Hz
Sweep 5.12 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies

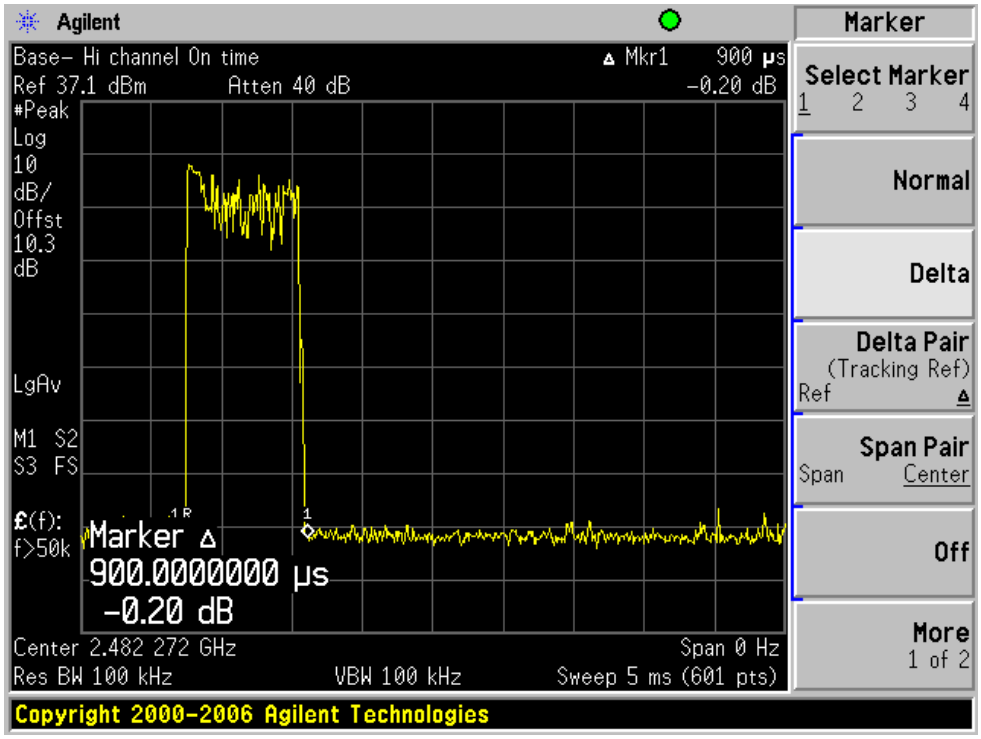

Agilent
Base- Lo channel occupied time
Ref 40.5 dBm
Atten 40 dB
Mkr1 7.157 s
25.43 dBm
#Peak
Log
10
dB/
Offst
10.5
dB
Center
2.401056000 GHz
LgAv
W1 S2
S3 FS
£(f):
f>50k
Center 2.401 056 GHz
Res BW 100 kHz
VBW 100 kHz
Span 0 Hz
Sweep 38 s (601 pts)
Freq/Channel
Center Freq
2.40105600 GHz
Start Freq
2.40105600 GHz
Stop Freq
2.40105600 GHz
CF Step
100.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2006 Agilent Technologies

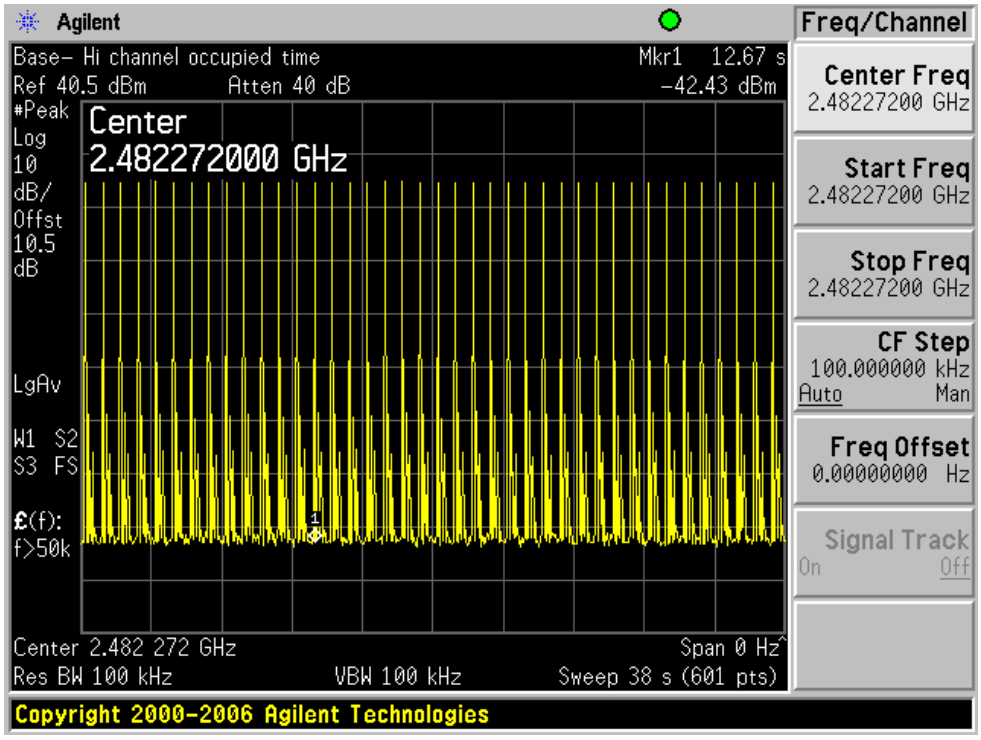
Middle CH


Agilent
Base- Mid channel On time
Ref 37.1 dBm
Atten 40 dB
Mkr1 900 µs
-1.29 dB
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FS
£(f):
f>50k
Marker Δ
900.0000000 µs
-1.29 dB
Center 2.441 664 GHz
Span 0 Hz
Res BW 100 kHz
VBW 100 kHz
Sweep 5 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
Base- Mid channel occupied time
Ref 40.5 dBm
Atten 40 dB
Mkr1 12.67 s
25.34 dBm
#Peak
Log
10
dB/
Offst
10.5
dB
Center
2.441664000 GHz
LgAv
W1 S2
S3 FS
£(f):
f>50k
Center 2.441 664 GHz
Span 0 Hz
Res BW 100 kHz
VBW 100 kHz
Sweep 38 s (601 pts)
Freq/Channel
Center Freq
2.44166400 GHz
Start Freq
2.44166400 GHz
Stop Freq
2.44166400 GHz
CF Step
100.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2006 Agilent Technologies

High CH


Agilent
Base- Hi channel On time
Ref 37.1 dBm
Atten 40 dB
Mkr1 900 µs
-0.20 dB
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FS
£(f):
f>50k
Marker Δ
900.0000000 µs
-0.20 dB
Center 2.482 272 GHz
Span 0 Hz
Res BW 100 kHz
VBW 100 kHz
Sweep 5 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
Base- Hi channel occupied time
Ref 40.5 dBm
Atten 40 dB
Mkr1 12.67 s
-42.43 dBm
#Peak
Log
10
dB/
Offst
10.5
dB
Center
2.482272000 GHz
LgAv
W1 S2
S3 FS
£(f):
f>50k
Center 2.482 272 GHz
Span 0 Hz
Res BW 100 kHz
VBW 100 kHz
Sweep 38 s (601 pts)
Freq/Channel
Center Freq
2.48227200 GHz
Start Freq
2.48227200 GHz
Stop Freq
2.48227200 GHz
CF Step
100.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2006 Agilent Technologies

11 - §15.247(B) (1) - MAXIMUM PEAK OUTPUT POWER

11.1 Standard Applicable

According to §15.247(b) (1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt. For all other frequency hopping system in the 2400 – 2483.5 MHz band, the maximum peak output power of the transmitter shall not exceed 0.125 Watt.

11.2 Measurement Procedure

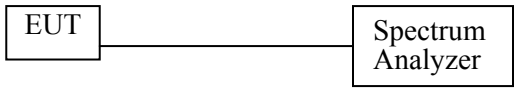
1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

11.3 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.

11.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

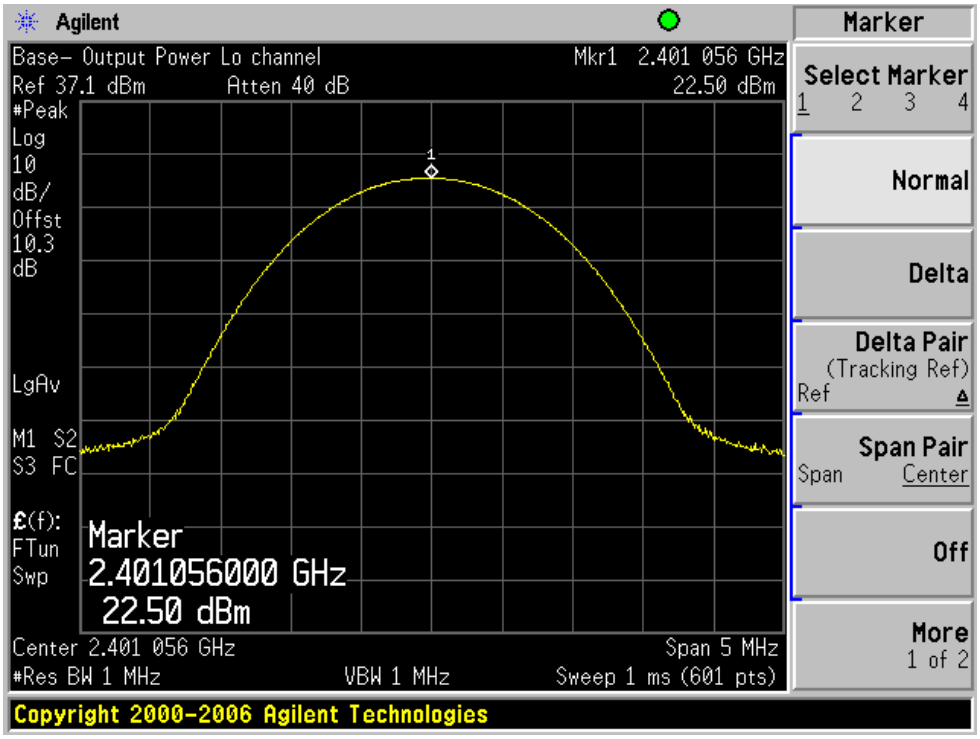
**The testing was performed by Oscar Au on 2007-01-14.*

11.5 Measurement Result

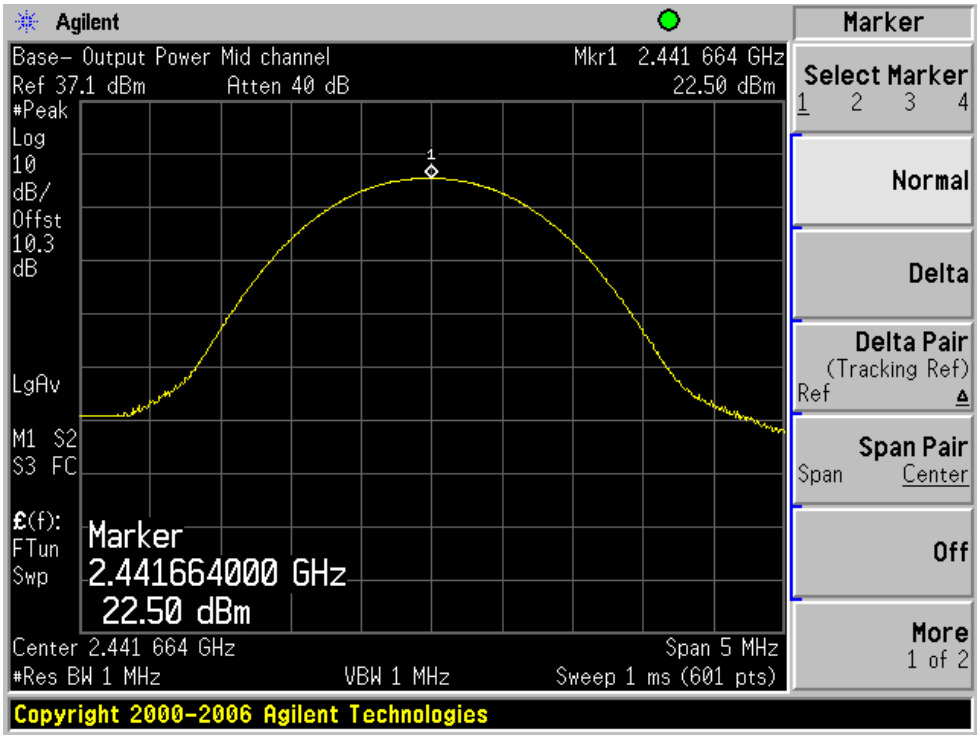
Channel	Frequency (MHz)	Max Peak Output Power		Limit (mw)	Result
		(dBm)	(mw)		
Low	2401.056	22.50	177.83	1000	pass
Mid	2441.664	22.50	177.83	1000	pass
High	2482.272	22.09	161.81	1000	pass

Please see the following plots:

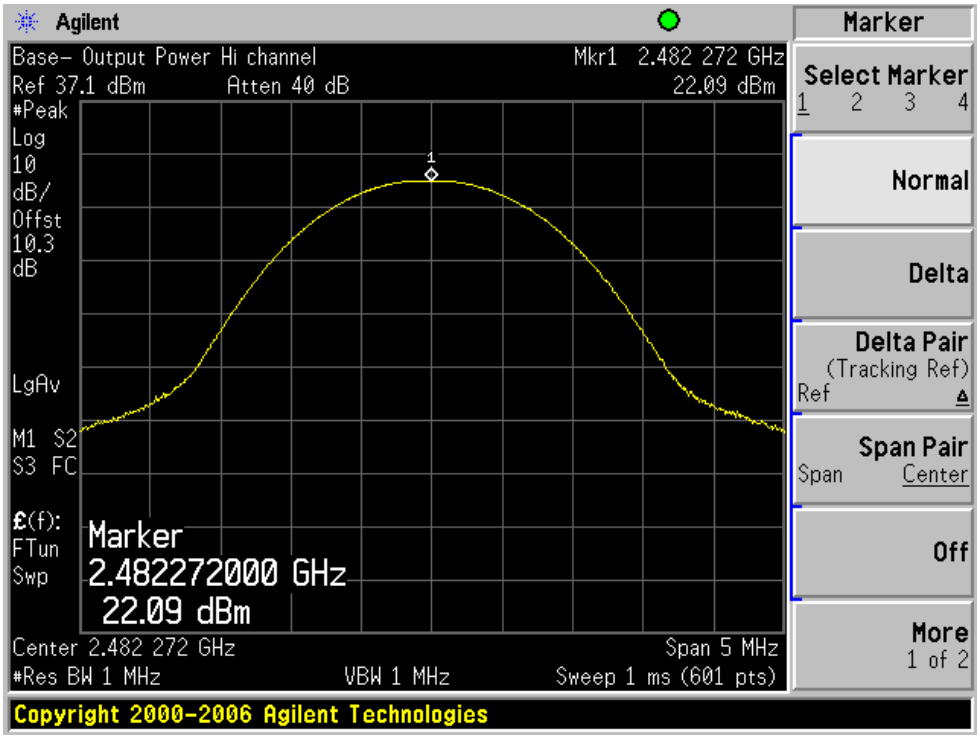
Low Channel



Middle Channel



High Channel



12 - §15.247 (d) - 100 KHz BANDWIDTH OF BAND EDGES

12.1 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.

12.2 Measurement Procedure

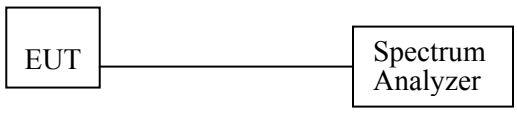
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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 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.

12.3 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.

12.4 Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

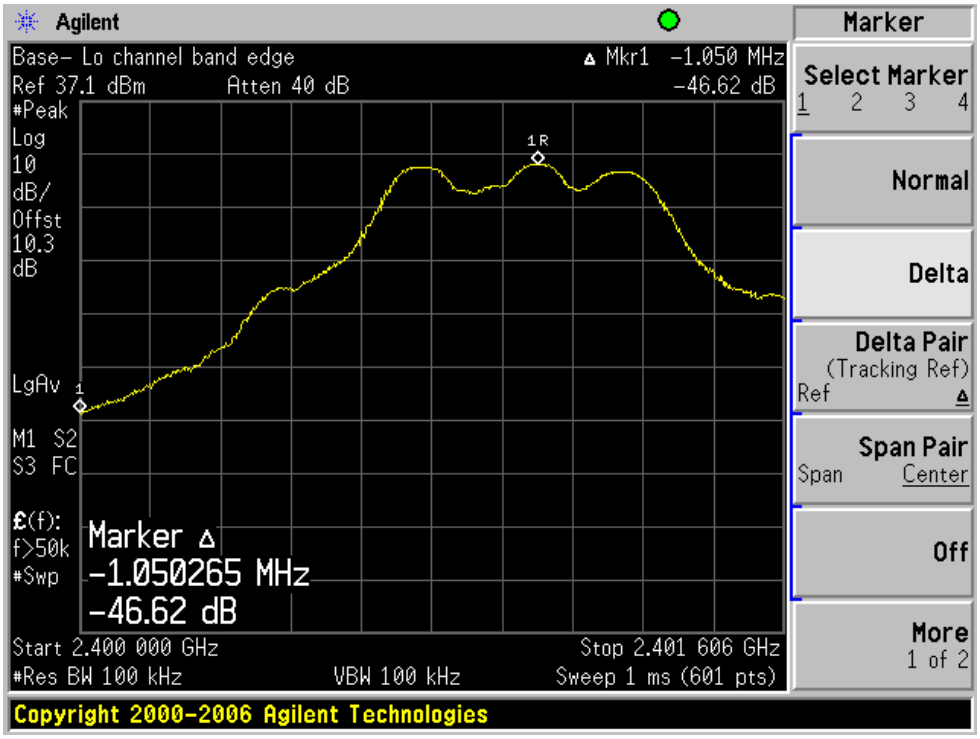
**The testing was performed by Oscar Au on 2007-01-14.*

Please refer to the following plots for results.

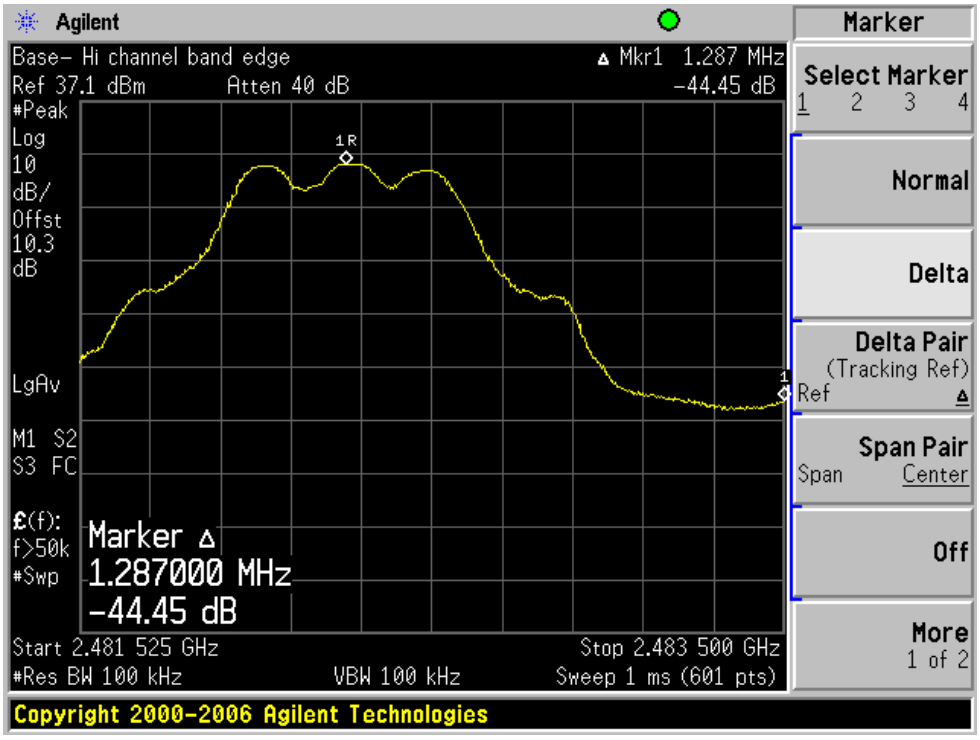
12.5 Plots of 100 KHz Bandwidth of Band Edge

Hopping Mode:

Low Channel



High Channel



13 - §2.1051 SPURIOUS EMISSIONS AT ANTENNA PORT

13.1 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 emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission 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

13.2 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.

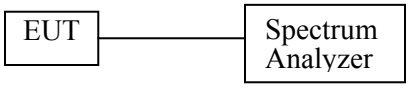
5. Repeat above procedures until all frequencies measured were complete.

13.3 Test Equipment

Manufacturer	Description	Model No.	Serial No.	Calibration Date
HP	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.

13.4 Test Setup Diagram



Environmental Conditions

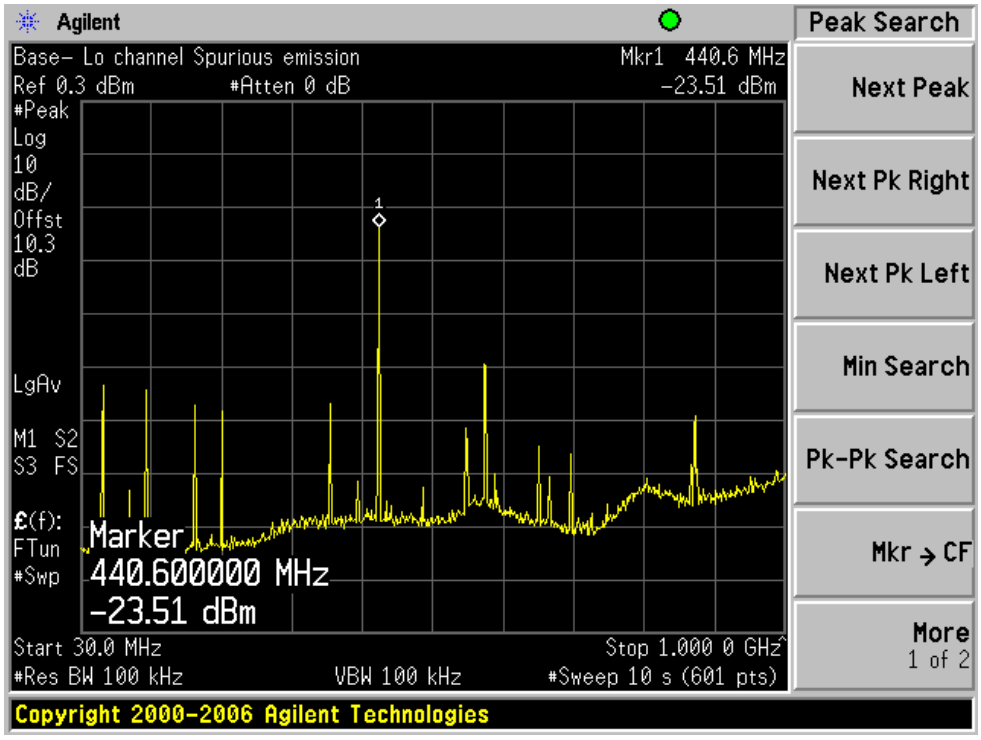
Temperature:	20 ° C
Relative Humidity:	61 %
ATM Pressure:	1013 mbar

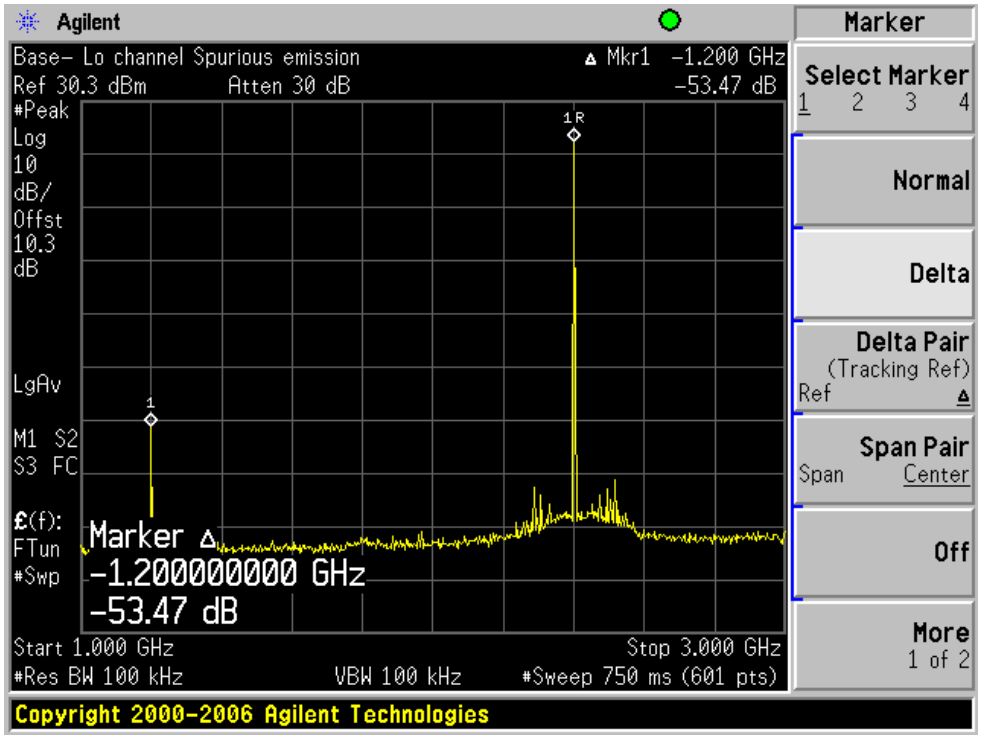
**The testing was performed by Oscar Au on 2007-01-14.*

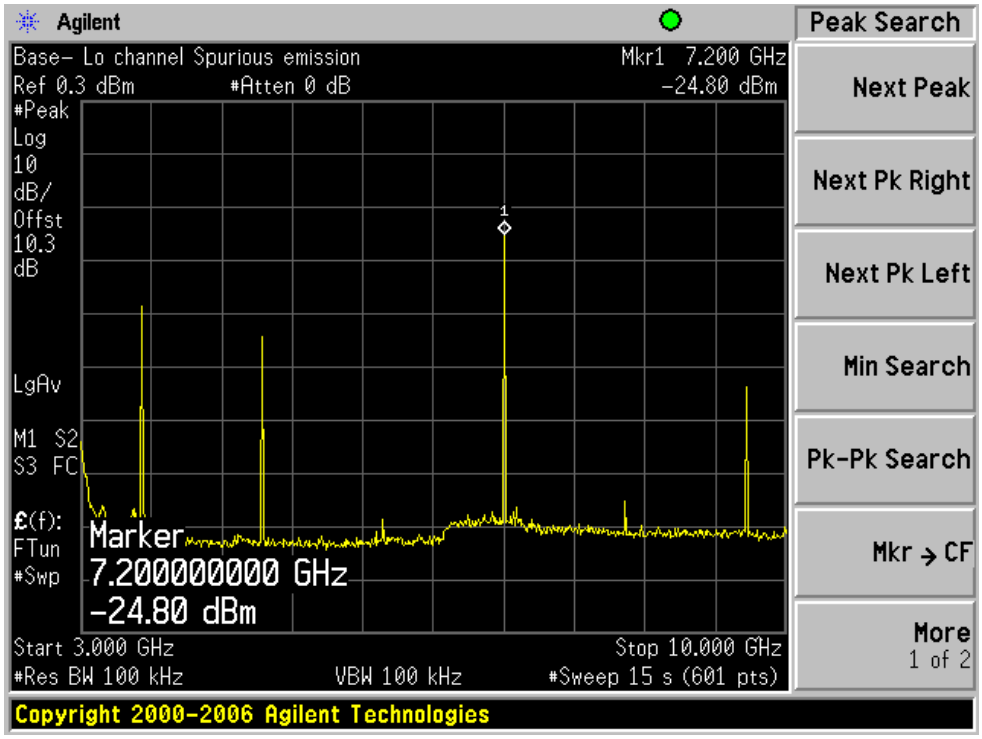
Please refer to the following plots.

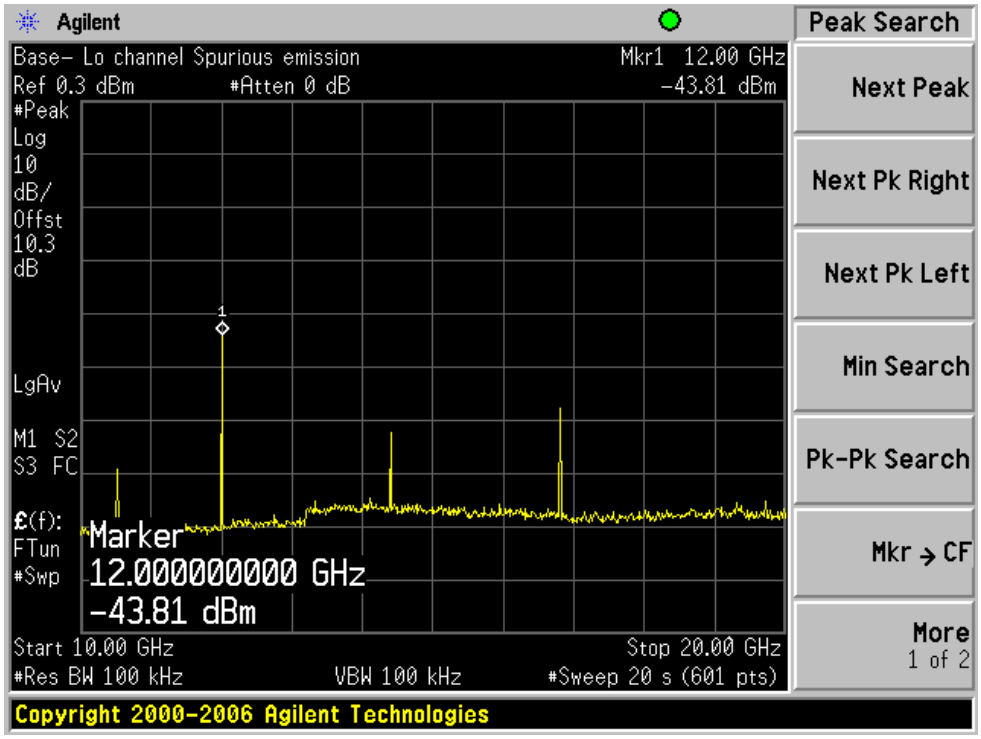
13.5 Measurement Results

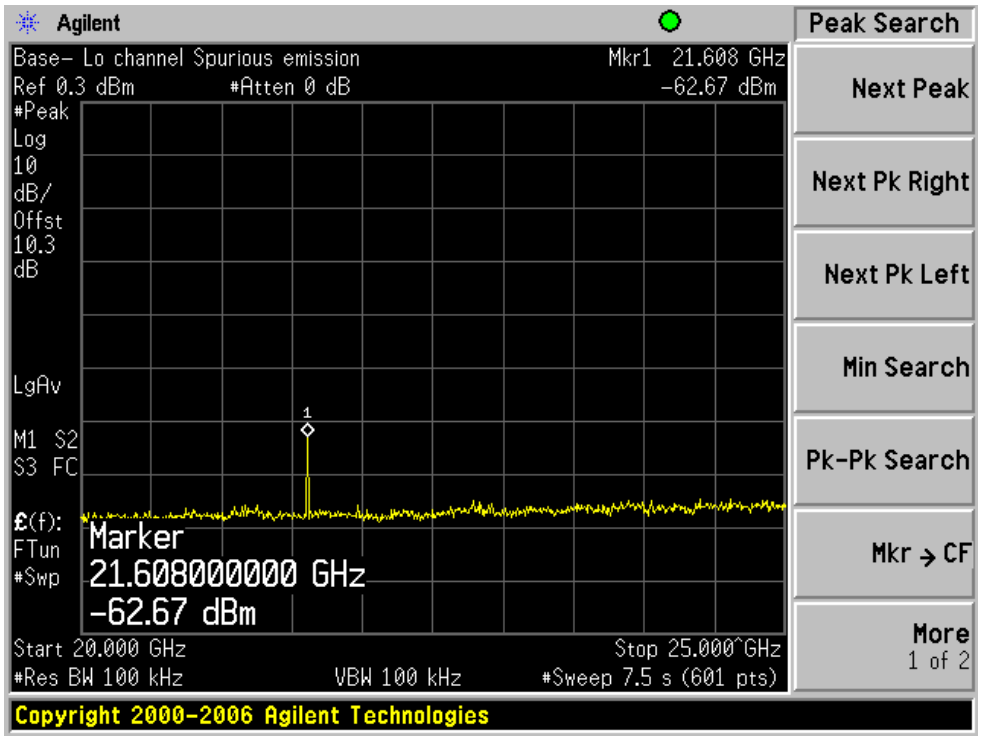
Low CH






Agilent
Peak Search
Base- Lo channel Spurious emission
Mkr1 7.200 GHz
Ref 0.3 dBm
#Atten 0 dB
-24.80 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
7.200000000 GHz
-24.80 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 3.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
VBW 100 kHz
#Sweep 15 s (601 pts)
Copyright 2000-2006 Agilent Technologies


Agilent
Peak Search
Base- Lo channel Spurious emission
Mkr1 12.00 GHz
Ref 0.3 dBm
#Atten 0 dB
-43.81 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
12.000000000 GHz
-43.81 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 10.00 GHz
Stop 20.00 GHz
#Res BW 100 kHz
VBW 100 kHz
#Sweep 20 s (601 pts)
Copyright 2000-2006 Agilent Technologies


Agilent
Base- Lo channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 21.608 GHz
-62.67 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
21.608000000 GHz
-62.67 dBm
Start 20.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 25.000 GHz
#Sweep 7.5 s (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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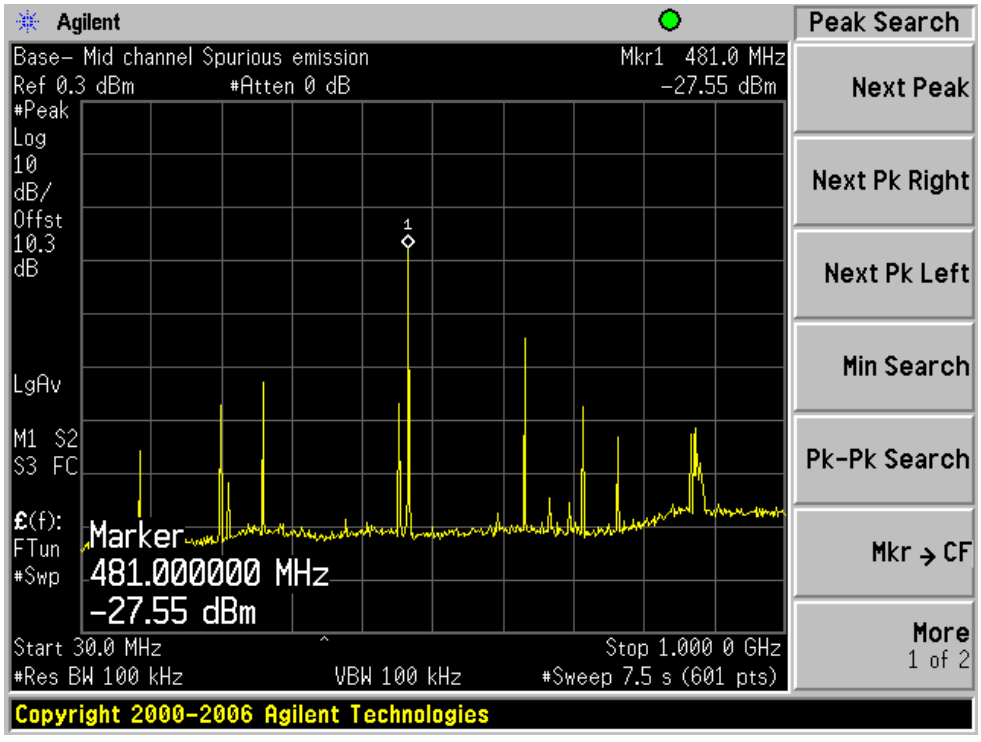
Middle CH


Agilent
Base- Mid channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 481.0 MHz
-27.55 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
481.000000 MHz
-27.55 dBm
Start 30.0 MHz
#Res BW 100 kHz
VBW 100 kHz
Stop 1.000 0 GHz
#Sweep 7.5 s (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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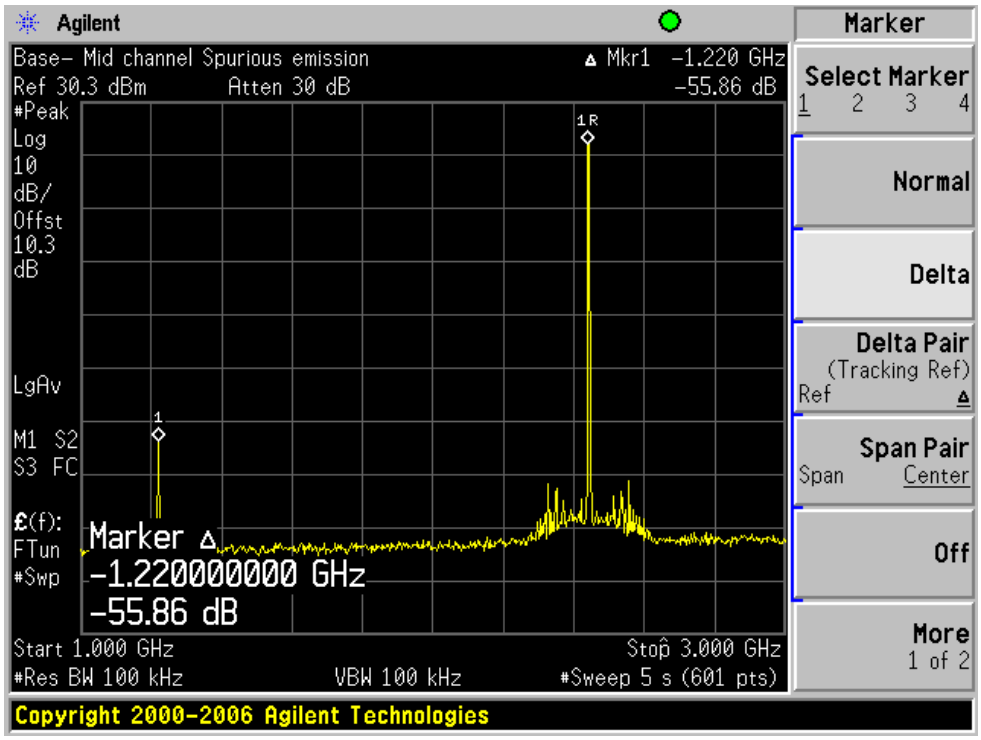
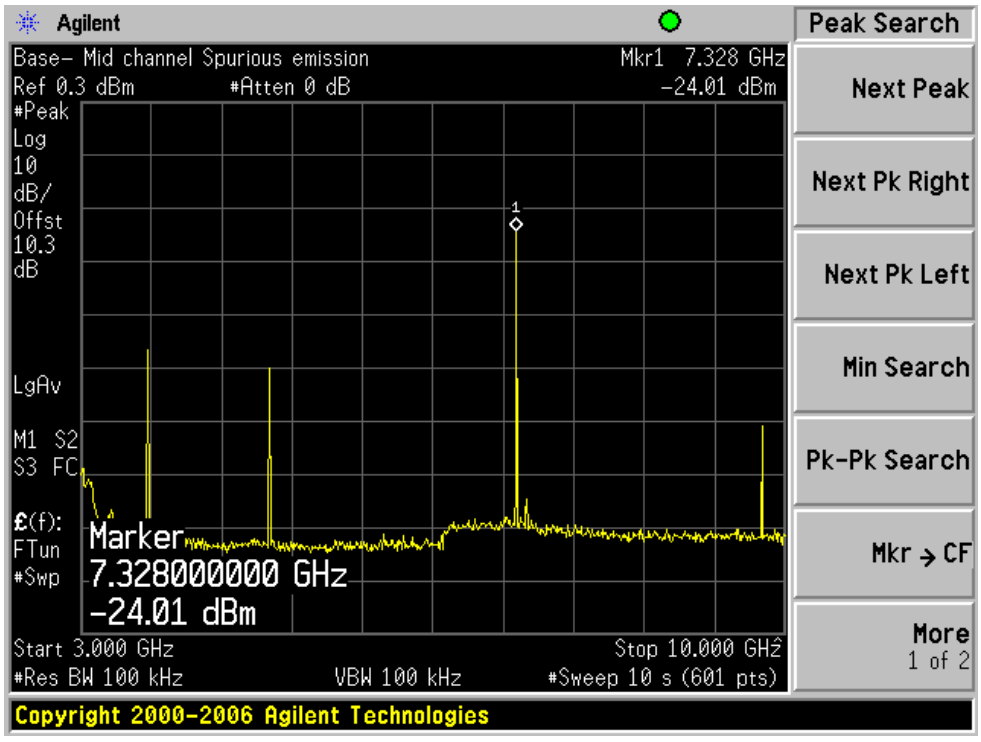

Agilent
Base- Mid channel Spurious emission
Ref 30.3 dBm
Atten 30 dB
Mkr1 -1.220 GHz
-55.86 dB
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker Δ
-1.220000000 GHz
-55.86 dB
Start 1.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 3.000 GHz
#Sweep 5 s (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
Base- Mid channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 7.328 GHz
-24.01 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
7.328000000 GHz
-24.01 dBm
Start 3.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 10.000 GHz
#Sweep 10 s (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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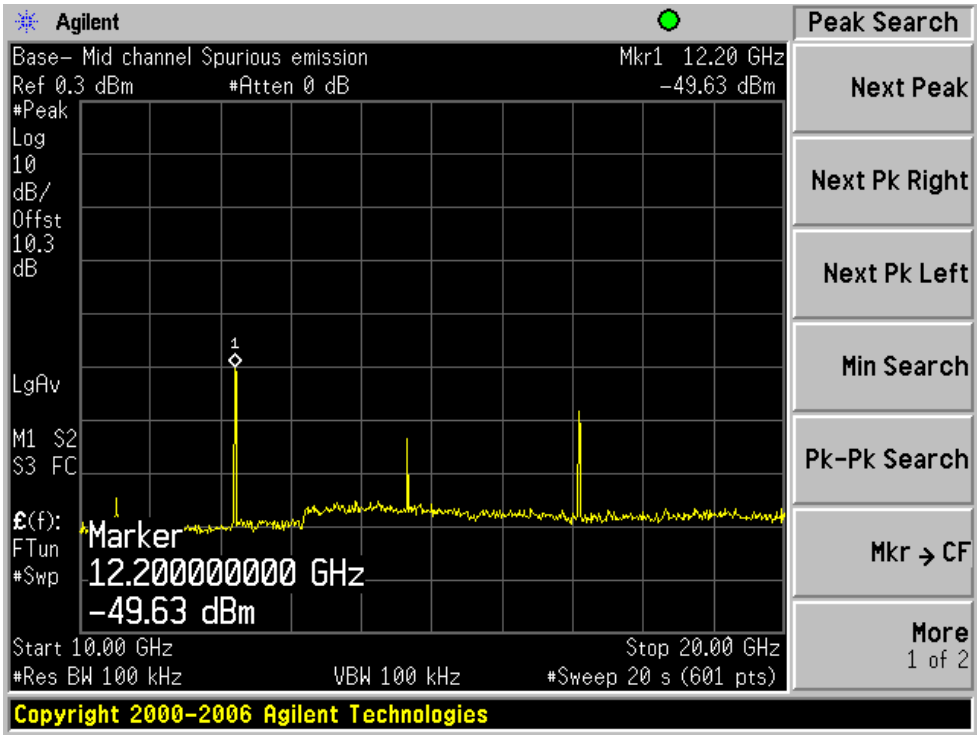
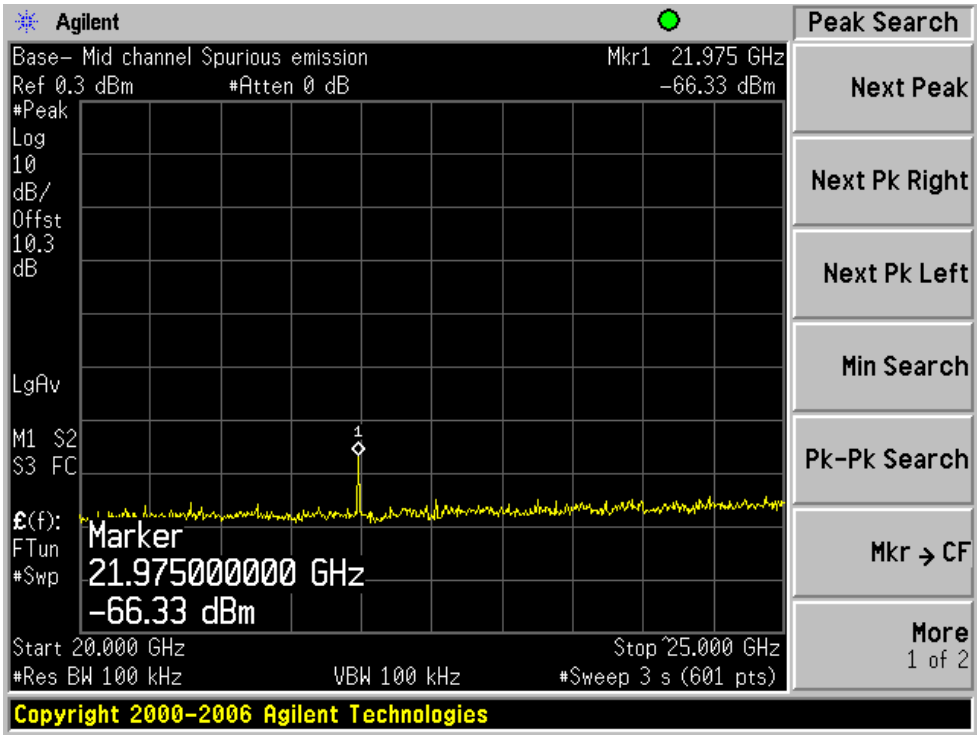

Agilent
Base- Mid channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 12.20 GHz
-49.63 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
12.200000000 GHz
-49.63 dBm
Start 10.00 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 20.00 GHz
#Sweep 20 s (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
Base- Mid channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 21.975 GHz
-66.33 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
21.975000000 GHz
-66.33 dBm
Start 20.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 25.000 GHz
#Sweep 3 s (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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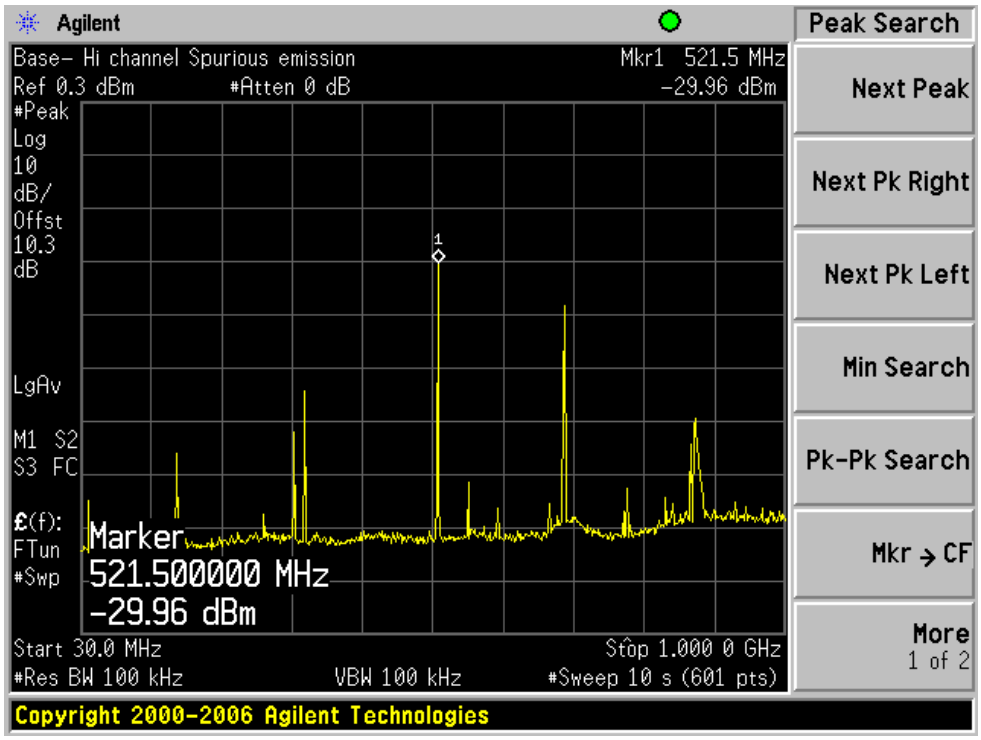
High CH


Agilent
Base- Hi channel Spurious emission
Ref 0.3 dBm
#Atten 0 dB
Mkr1 521.5 MHz
-29.96 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
521.500000 MHz
-29.96 dBm
Start 30.0 MHz
#Res BW 100 kHz
VBW 100 kHz
Stop 1.000 0 GHz
#Sweep 10 s (601 pts)
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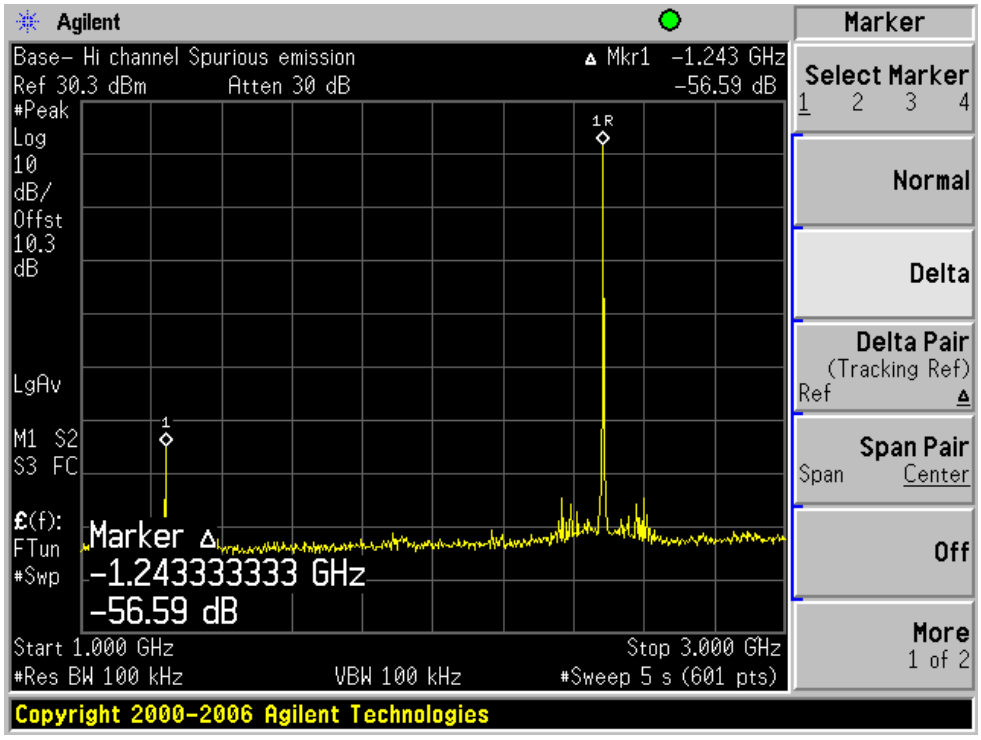
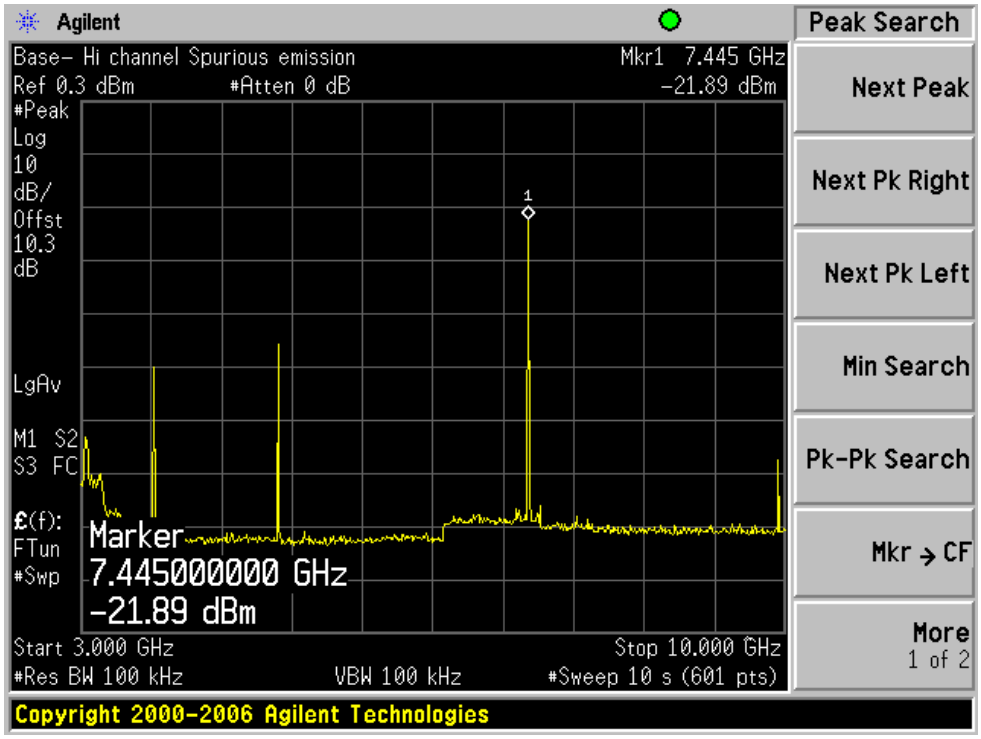
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2


Agilent
Base- Hi channel Spurious emission
Ref 30.3 dBm
Atten 30 dB
Δ Mkr1 -1.243 GHz
-56.59 dB
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker Δ
-1.243333333 GHz
-56.59 dB
Start 1.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 3.000 GHz
#Sweep 5 s (601 pts)
Copyright 2000-2006 Agilent Technologies
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2


Agilent
Peak Search
Base- Hi channel Spurious emission
Mkr1 7.445 GHz
Ref 0.3 dBm
#Atten 0 dB
-21.89 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
7.445000000 GHz
-21.89 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 3.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
VBW 100 kHz
#Sweep 10 s (601 pts)
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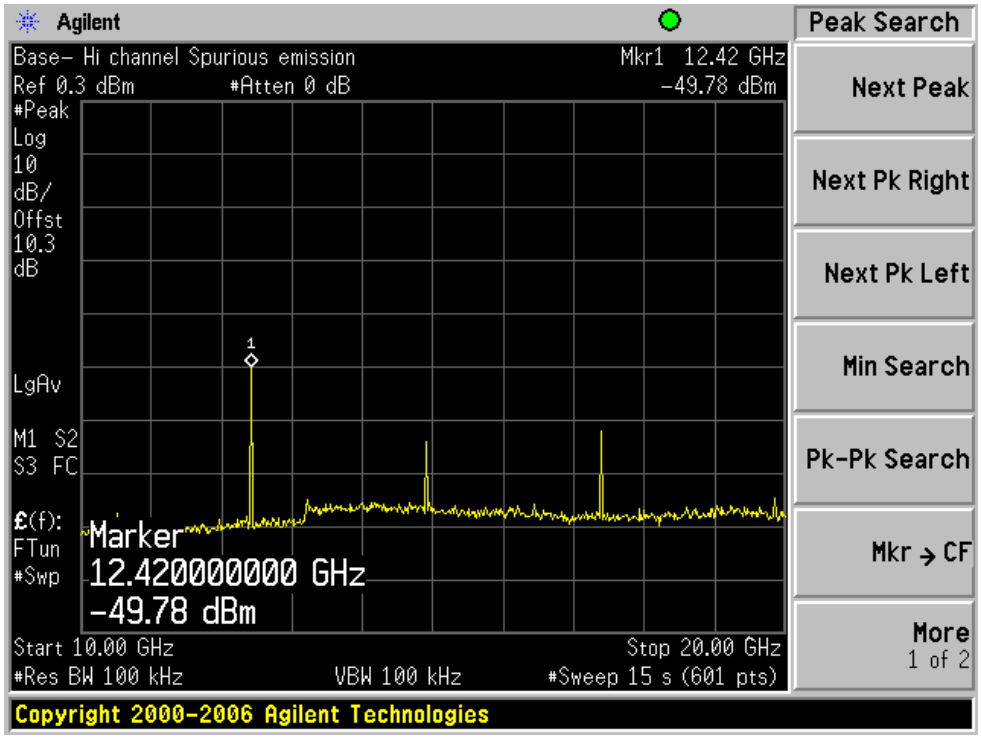
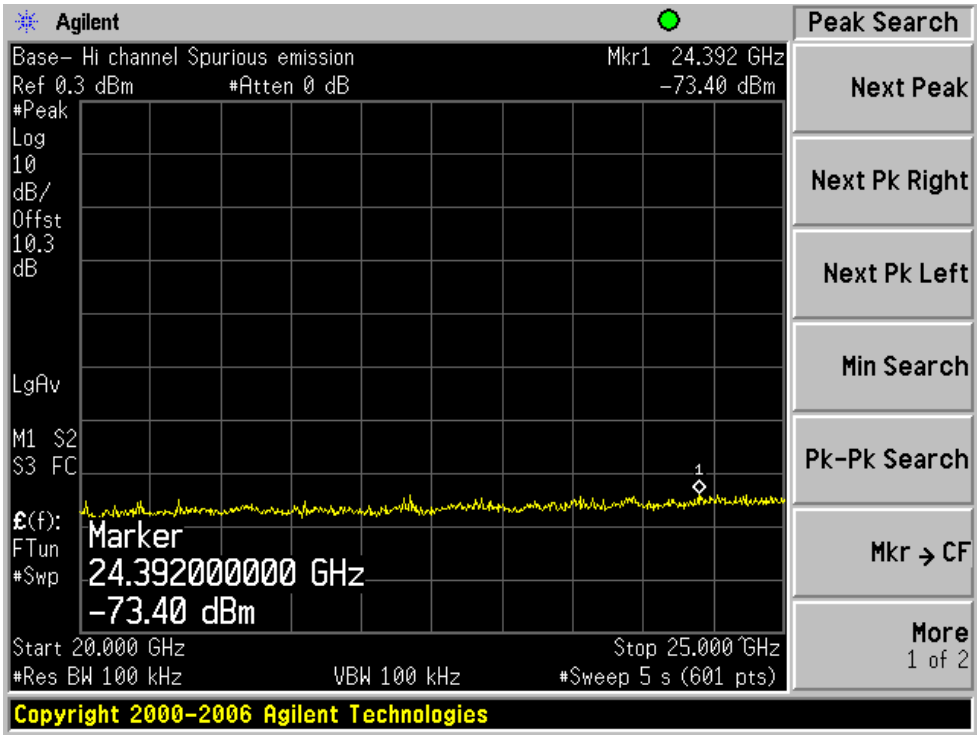

Agilent
Peak Search
Base- Hi channel Spurious emission
Mkr1 12.42 GHz
Ref 0.3 dBm
#Atten 0 dB
-49.78 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Marker
12.420000000 GHz
-49.78 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 10.00 GHz
Stop 20.00 GHz
#Res BW 100 kHz
VBW 100 kHz
#Sweep 15 s (601 pts)
Copyright 2000-2006 Agilent Technologies


Agilent
Peak Search
Base- Hi channel Spurious emission
Mkr1 24.392 GHz
Ref 0.3 dBm
#Atten 0 dB
-73.40 dBm
#Peak
Log
10
dB/
Offst
10.3
dB
Next Peak
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
Pk-Pk Search
£(f):
FTun
#Swp
Marker
24.392000000 GHz
-73.40 dBm
Mkr → CF
More
1 of 2
Start 20.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
#Sweep 5 s (601 pts)
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