Lab Code: 200167-0

FCC PART 15.247

TEST AND MEASUREMENT REPORT

For

Wellcore Corporation

2870 Zanker Road, Suite 130,

San Jose, CA 95134, USA

FCC ID: XYG-3
Model: NEWYU01C

Report Type:	**Product Type:**
Original Report	Body-Worn Sensor

Test Engineers:	Quinn Jiang
Report Number:	R1108221-247A
Report Date:	2011-10-18
Reviewed By:	Victor Zhang EMC/RF Lead
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1	R1108221-247A	Original Report	2011-10-18

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Wellcore Corporation* and their product, FCC ID: XYG-3, model: *NWEYU01C*, which will henceforth be referred to as the EUT "Equipment Under Test". The EUT is a body-worn sensor with a Bluetooth Module.

1.2 Mechanical Description of EUT

The EUT measures approximately 5.5cm (L) x 6.5 cm (W) x 1.5 cm (H) and Weigh: 27.5g.

The test data gathered are from sample provided by the manufacturer. The serial number is R1108221-1.

1.3 Objective

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

1.4 Related Submittal(s)/Grant(s)

No Related Submittals.

1.5 Test Methodology

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

1.6 Measurement Uncertainty

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

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

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

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

1.7 Test Facility

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

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

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

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

2 System Test Configuration

2.1 Justification

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

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

2.2 EUT Exercise Software

The software used, New Yu Sensor App, Version: NY_MS_01, provided by client and was verified by BACL Corp. Testing Engineer, Quinn Jiang, to comply with the standard requirements being tested against.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model Number	Serial Number
IBM	Laptop	ThinkPad	-

2.6 EUT Internal Configuration Details

Manufacturers	Descriptions	Model Number	Serial Number
Wellcore Corporation	Main PCB Board	-	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 1m	EUT	PSA

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247 (i), §2.1093	RF Exposure Information	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§2.1051, §15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205	Restricted Bands	Compliance
§15.209 (a), §15.247 (d)	Radiated Spurious Emissions	Compliance
§15.247 (a)(2)	20 dB Emission Bandwidth	Compliance
§15.247 (b)(3)	Maximum Peak Output Power	Compliance
§15.247(a) (1)	Hopping Channel Separation	Compliance
§15.247(a)(1)(iii)	Number of Hopping Frequencies Used	Compliance
§15.247(a)(1)(iii)	Dwell Time	Compliance
§15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliance

4 FCC §15.247 (i) & §2.1093 - RF Exposure Information

4.1 Applicable Standards

FCC §2.1093, §15.247(i).

According to FCC KDB 447498 section 1)

General test requirements and specific FCC test procedures

a) When required, portable devices must be evaluated using the *specific FCC test procedures*, and the SAR measurement techniques of OET Bulletin 65 Supplement C 01-01 and IEEE Std. 1528-2003.

b) When routine evaluation is required for SAR and the output power is $\leq 60/f_{(GHz)}$ mW, the test reduction and test exclusion procedures given herein, or in KDB 616217 and its supplement or KDB 648474, are applicable.[4]

c) Unless excluded by *specific FCC test procedures*, portable devices with output power > $60/f_{(GHz)}$ mW shall include SAR data for equipment approval. The FCC Laboratory may be contacted if SAR is expected to be very low, especially for devices operating below 300 MHz, to determine if SAR evaluation is necessary.[5]

d) When applicable, 802.11 a/b/g devices should be tested according to the antenna diversity procedures in KDB 248227.[6] Contact the FCC Laboratory for antenna diversity test requirements, such as MIMO and beam-forming, in other product configurations.

4.2 Evaluation Result

The maximum conducted output power of this device is -12.93 dBm, the antenna gain is 0.5 dBi, the maximum e.i.r.p. is -12.93 + 0.5 = -12.43 dBm, i.e. 0.057 mW which is less than the SAR threshold of 60/2.402 = 24.9 mW. SAR evaluation is not required.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

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

And according to FCC §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.

5.2 Antenna Connector Construction

EUT has one Transmitter/Receiver antenna which is permanent attachment to the EUT chassis as well as non-standard connector. The Transmitter antenna has a max gain of 0.5 dBi which fulfills the requirements of FCC §15.203.

Frequency Band	Antenna Gain (dBi)
2.4 ~ 2.4835 GHz	0.5

6 FCC §15.207 – AC Line Conducted Emissions

6.1 Applicable Standard

As per FCC §15.207, 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.*

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Part15.207 limits.

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

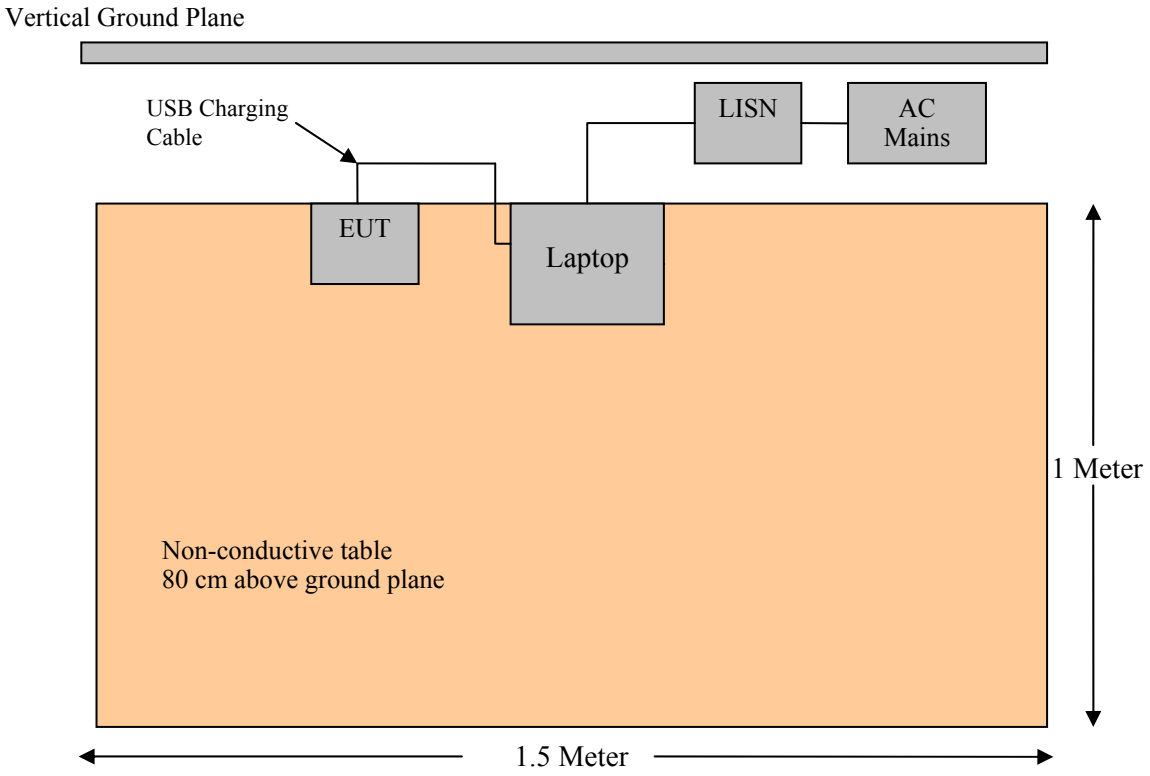
The AC/DC power adapter of the Supporting Laptop which connects the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Model Numbers	Serial Numbers	Calibration Dates
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
TTE	Filter, High Pass	H962-150k-50-21378	K7132	2011-06-10
Solar Electronics Co	LISN	9252-R-24-BNC	511205	2011-06-25

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

6.4 Test Setup Block Diagram



6.5 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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”.

6.6 Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

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

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

Margin = Corrected Amplitude - Limit

6.7 Test Environmental Conditions

Temperature:	22-25°C
Relative Humidity:	44-49 %
ATM Pressure:	101.2 -102 kPa

Testing was performed by Quinn Jiang on 2011-08-24 and 2011-08-29 in chamber 3.

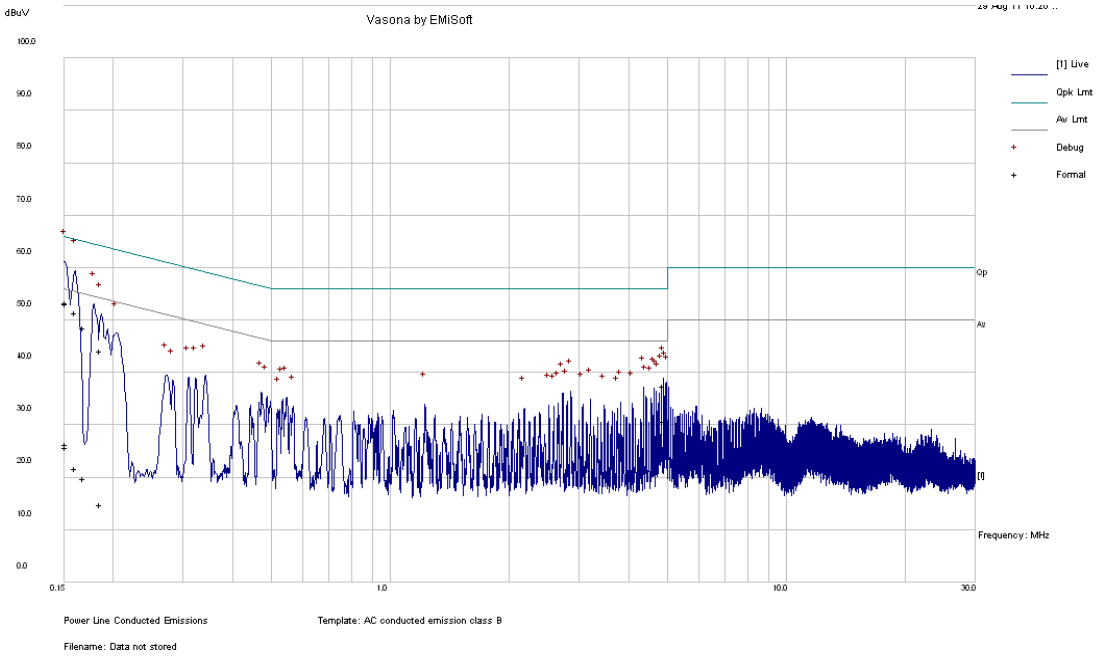
6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-10.25	0.15582	Neutral	0.15 to 30

6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



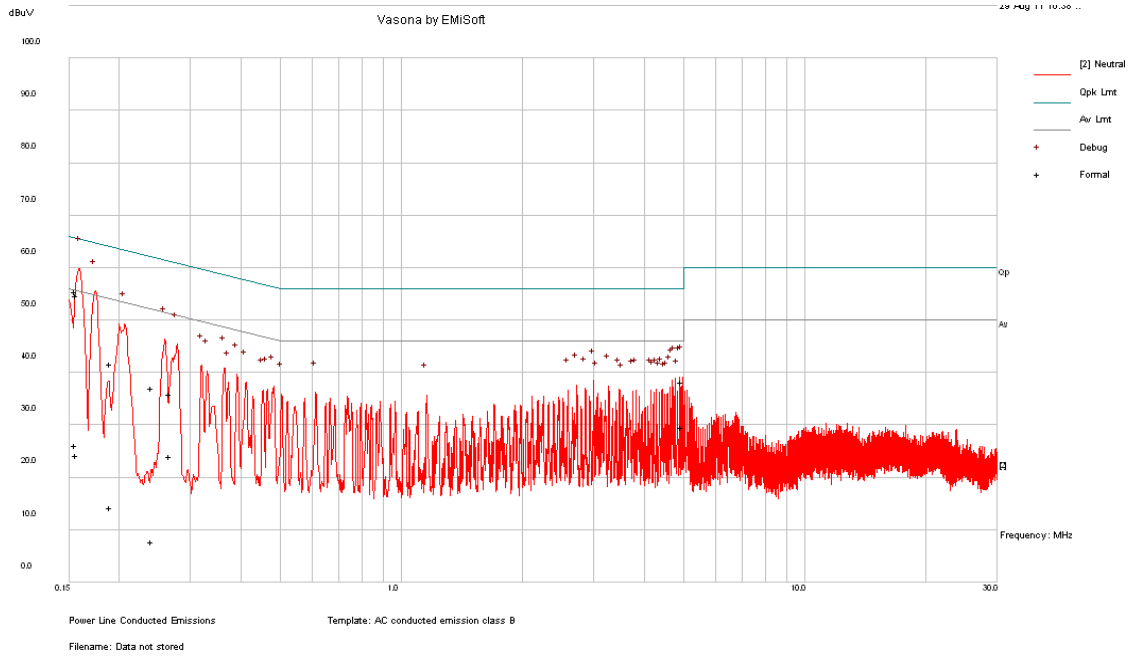
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.152247	53.37	Line	65.88	-12.51
0.152235	53.20	Line	65.88	-12.68
0.161157	51.54	Line	65.40	-13.86
0.169125	48.53	Line	65.00	-16.48
4.899479	37.47	Line	56.00	-18.53
0.186204	44.24	Line	64.20	-19.96

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
4.899479	30.71	Line	46.00	-15.29
0.152235	26.44	Line	55.88	-29.44
0.152247	25.84	Line	55.88	-30.04
0.161157	21.68	Line	55.4	-33.72
0.169125	19.76	Line	55.00	-35.24
0.186204	14.80	Line	54.20	-39.41

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.155820	55.43	Neutral	65.68	-10.25
0.156384	54.65	Neutral	65.65	-11.00
4.967129	38.25	Neutral	56.00	-17.75
0.190284	41.61	Neutral	64.02	-22.41
0.241395	37.09	Neutral	62.05	-24.95
0.268011	35.97	Neutral	61.18	-25.21

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
4.967129	29.65	Neutral	46.00	-16.35
0.268011	24.02	Neutral	51.18	-27.16
0.155820	26.15	Neutral	55.68	-29.53
0.156384	24.27	Neutral	55.65	-31.38
0.190284	14.24	Neutral	54.02	-39.78
0.241395	7.85	Neutral	52.05	-44.20

7 FCC §2.1051 & §15.247(d) - Spurious Emissions at Antenna Terminals

7.1 Applicable Standard

As per FCC §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

7.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

7.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

7.4 Test Environmental Conditions

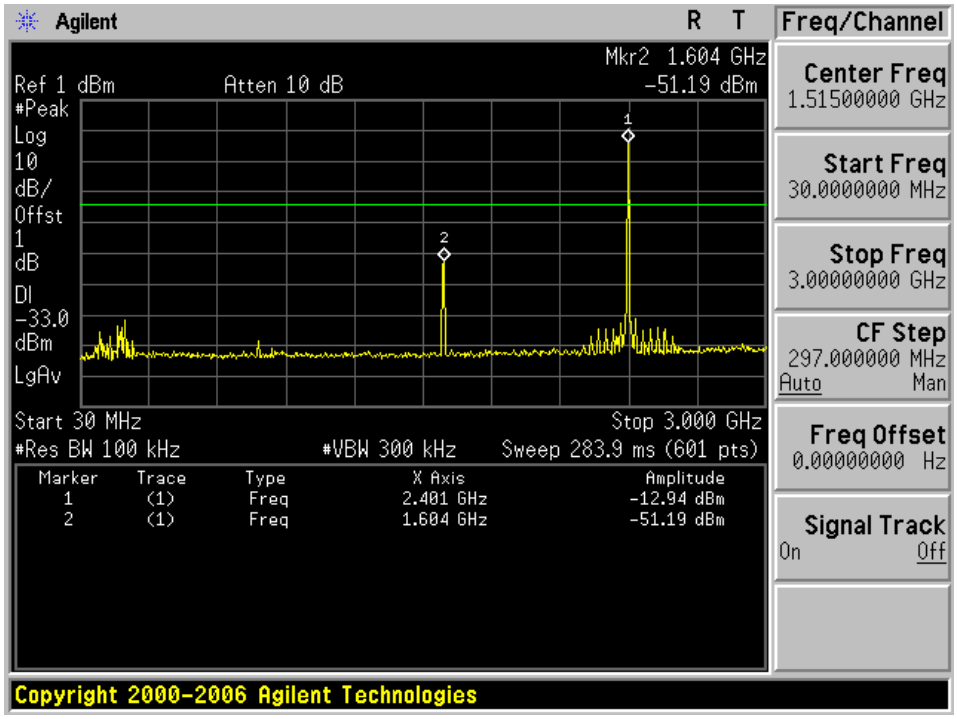
Temperature:	24°C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

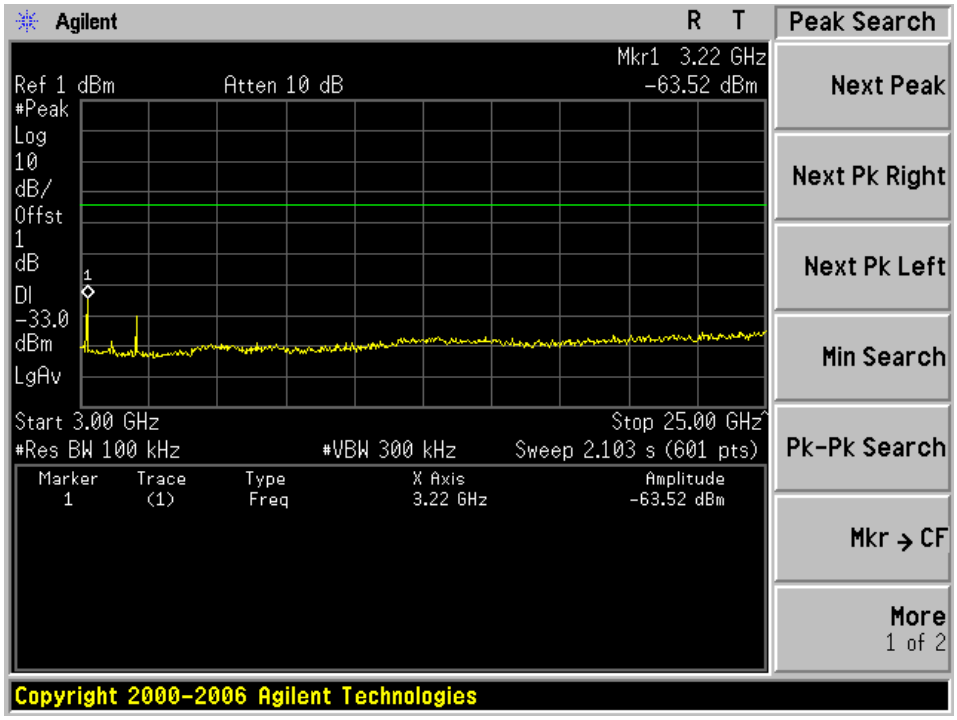
Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

7.5 Test Results

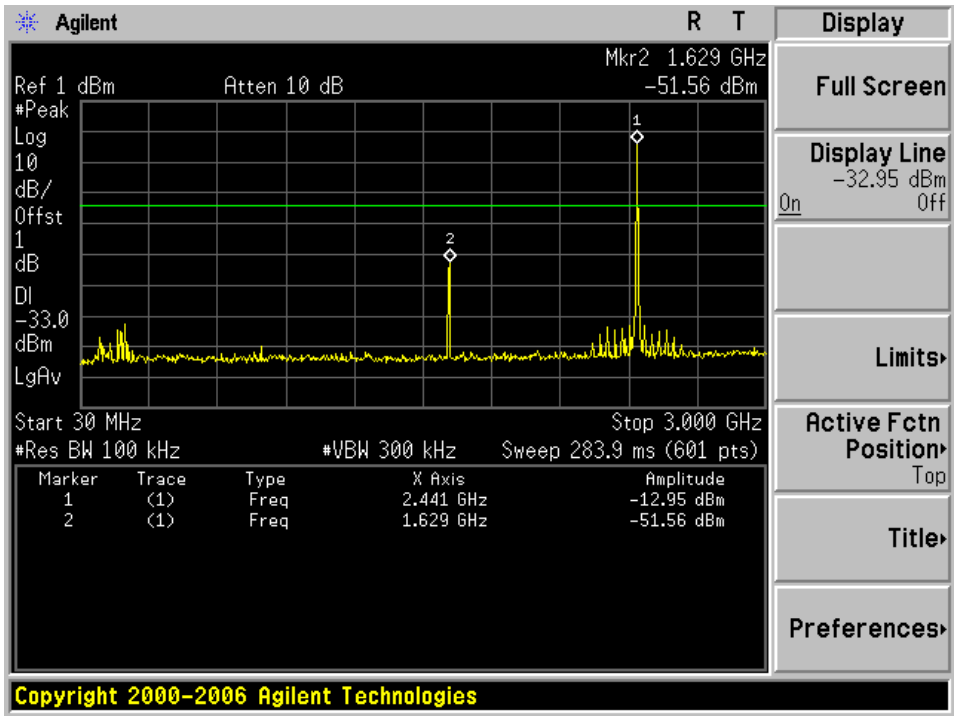
Please refer to following plots of spurious emissions.

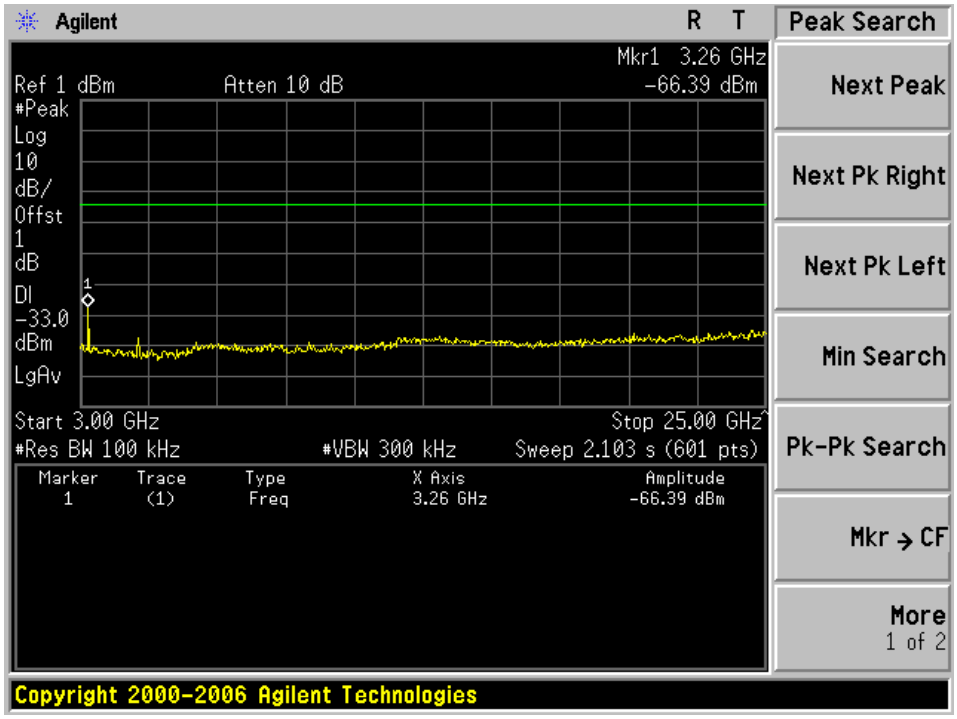
Low Channel, 2402 MHz



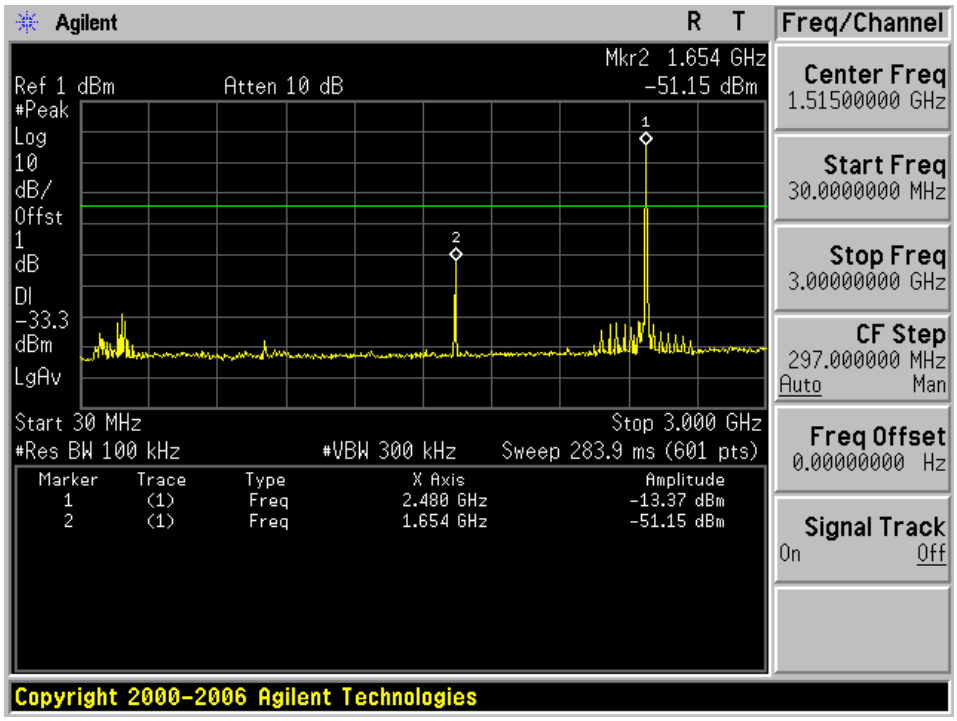


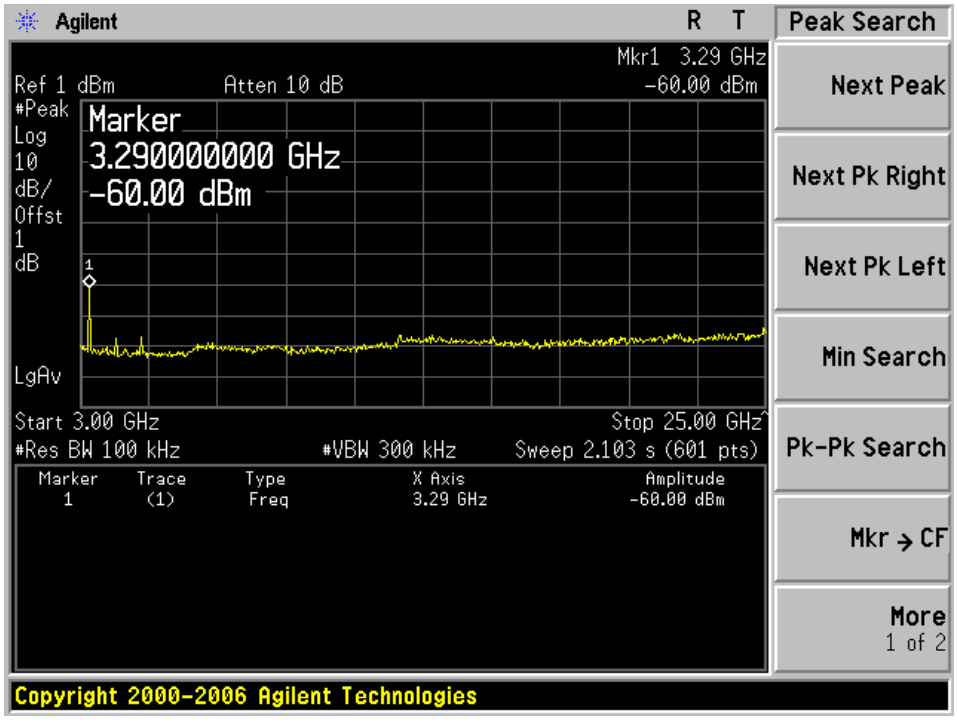
Middle Channel, 2441 MHz





High Channel, 2480 MHz





8 FCC §15.205, §15.209 & §15.247(d) – Spurious Radiated Emissions

8.1 Applicable Standard

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

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

8.2 Test Setup

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

The spacing between the peripherals was 10 centimeters.

8.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude - Limit

8.5 Test Equipment List and Details

Manufacturer	Description	Model Numbers	Serial Numbers	Calibration Date
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-18
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2011-05-17
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11
A.R.A.	Antenna, Horn	DRG-118/A	1132	2010-11-29
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2011-05-08

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

8.6 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

The testing was performed by Quinn Jiang on 2011-08-22 in 5 meter chamber 3.

8.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.205, 15.209 and 15.247 standard's radiated emissions limits, and had the worst margin of:

Mode: Transmitting, 30-1000 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-18.69	105.6795	Vertical	Middle, 30 MHz – 1 GHz

Mode: Transmitting, above 1 GHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-1.513	4960	Vertical	High, 1 – 25 GHz

Please refer to the following table and plots for specific test result details

8.8 Radiated Emissions Test Result Data

1) Radiated Emission at 3 meters, 30 MHz – 1 GHz

Worst Case: Middle Channel (2441 MHz)

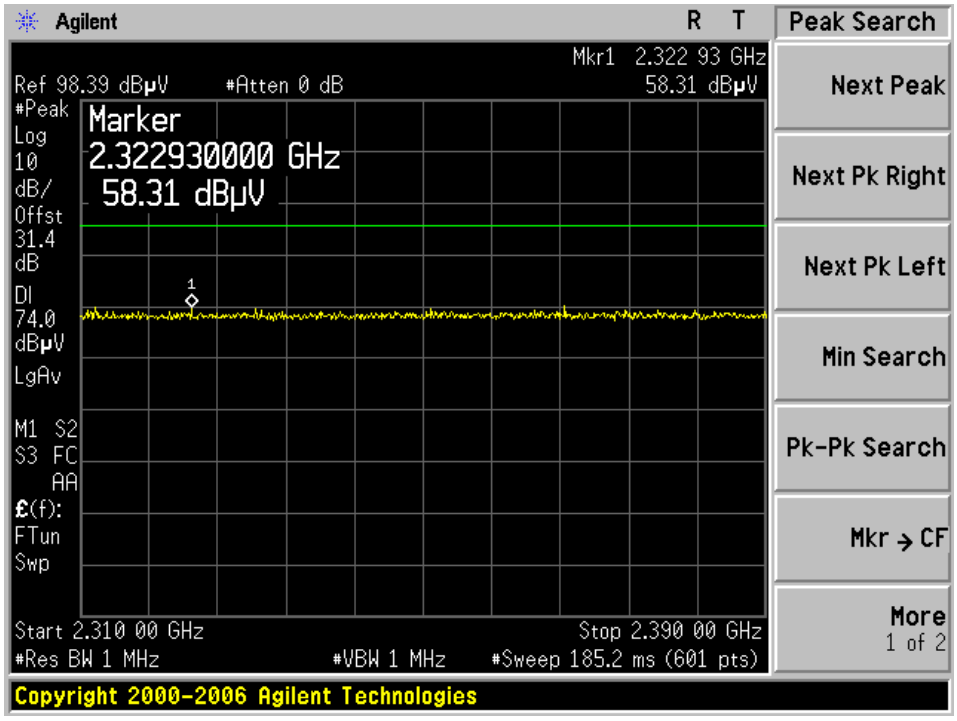
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
824.2770	18.22	364	H	147	46.0	-27.78
30.00173	13.92	364	V	119	40.0	-26.08
48.72175	2.05	213	V	151	40.0	-37.95
105.6795	24.81	159	V	65	43.5	-18.69
118.9843	8.74	145	H	86	43.5	-34.76
126.7805	8.23	173	H	325	43.5	-35.27

2) Radiated Emission at 3 meters, above 1 GHz

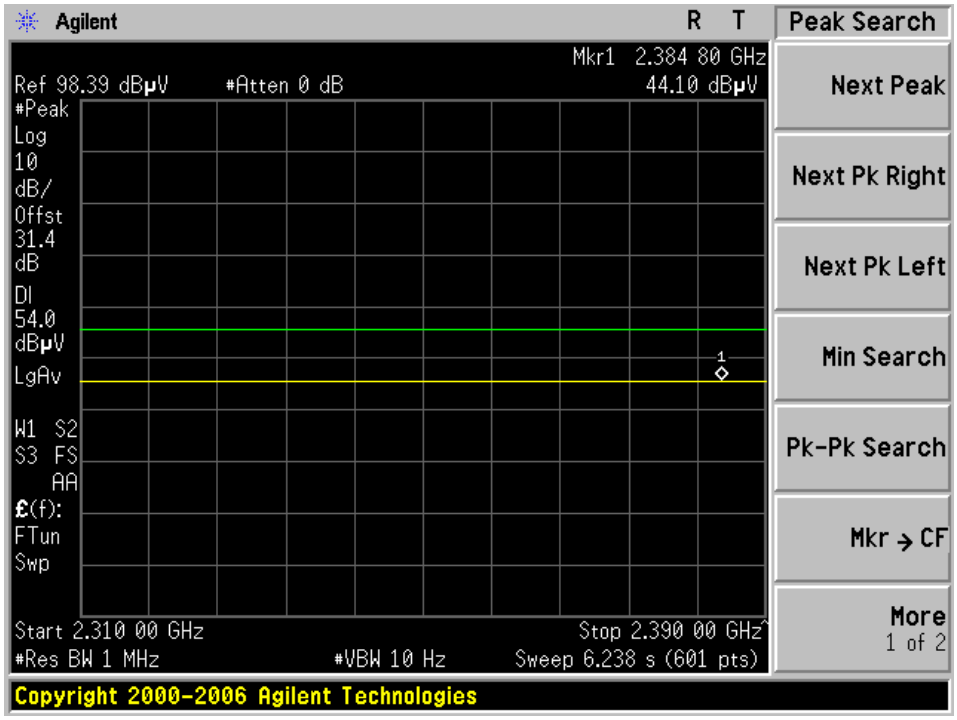
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz, measured at 3 meters											
4804.1	40.33	21	126	H	33.721	5.56	27.5	52.111	74	-21.889	Peak
4804.1	43.94	276	150	V	33.721	5.56	27.5	55.721	74	-18.279	Peak
4804.1	32.67	21	126	H	33.721	5.56	27.5	44.451	54	-9.549	Ave
4804.1	38.96	276	150	V	33.721	5.56	27.5	50.741	54	-3.259	Ave
Middle channel 2441 MHz measured at 3 meters											
4882.1	40.29	22	157	H	33.737	5.52	27.4	52.147	74	-21.853	Peak
4882.1	43.85	152	100	V	33.737	5.52	27.4	55.707	74	-18.293	Peak
4882.1	32.11	22	157	H	33.737	5.52	27.4	43.967	54	-10.033	Ave
4882.1	39.00	152	100	V	33.737	5.56	27.4	50.897	54	-3.103	Ave
High channel 2480 MHz measured at 3 meters											
4960	40.74	169	155	H	33.737	5.57	27.4	52.647	74	-21.353	Peak
4960	44.72	134	156	V	33.737	5.57	27.4	56.627	74	-17.373	Peak
4960	33.28	169	155	H	33.737	5.57	27.4	45.187	54	-8.813	Ave
4960	40.58	134	156	V	33.737	5.57	27.4	52.487	54	-1.513	Ave

3) Restricted Band Emissions

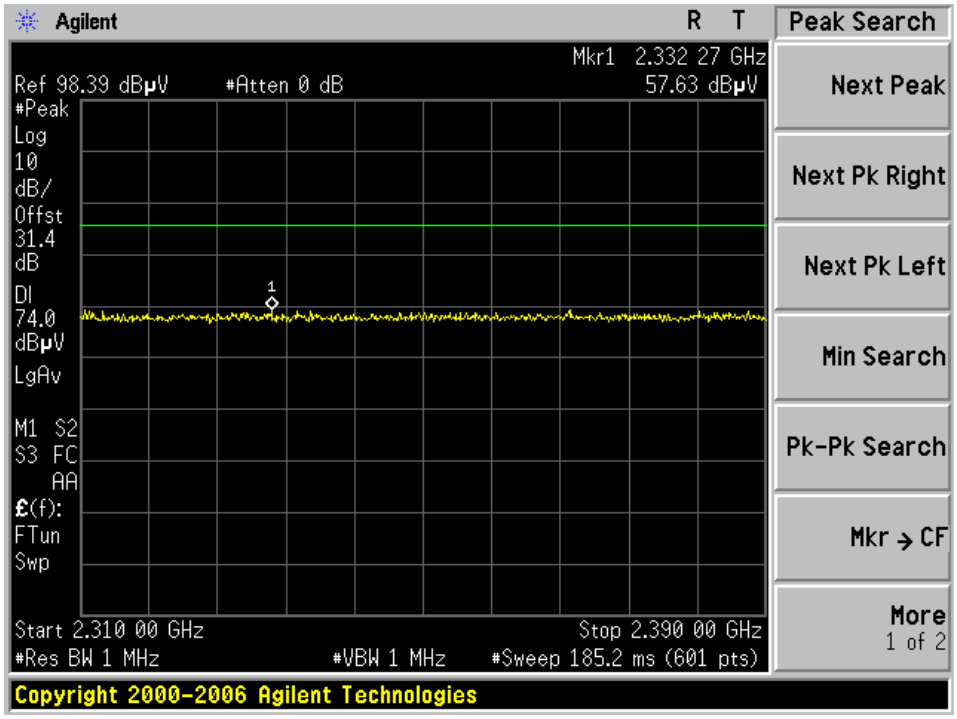
Lowest Channel at Horizontal, Peak



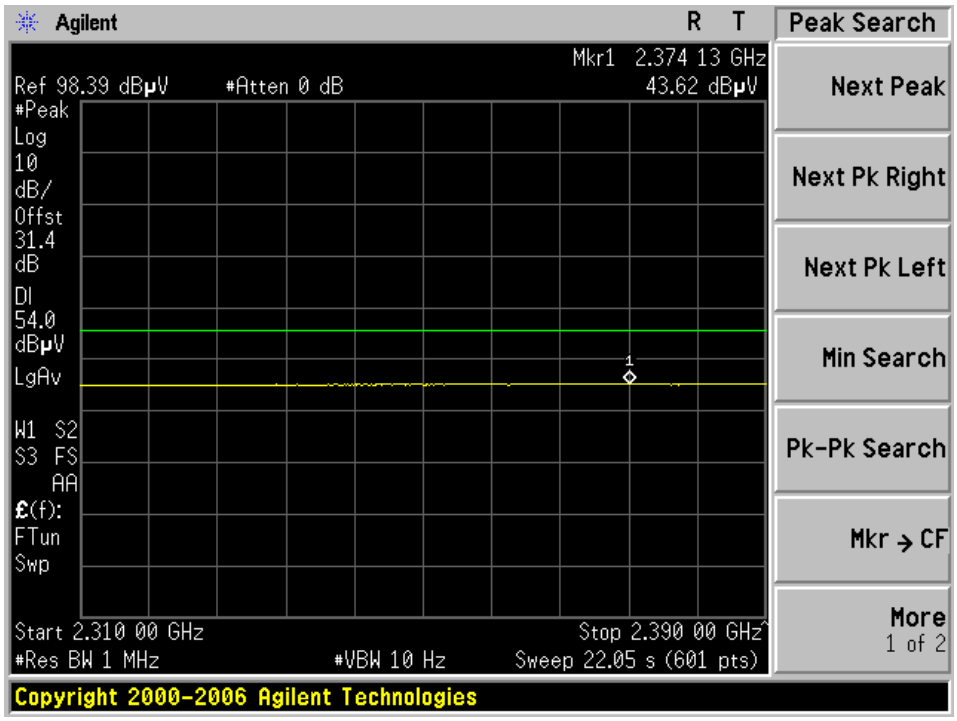
Lowest Channel at Horizontal, Average



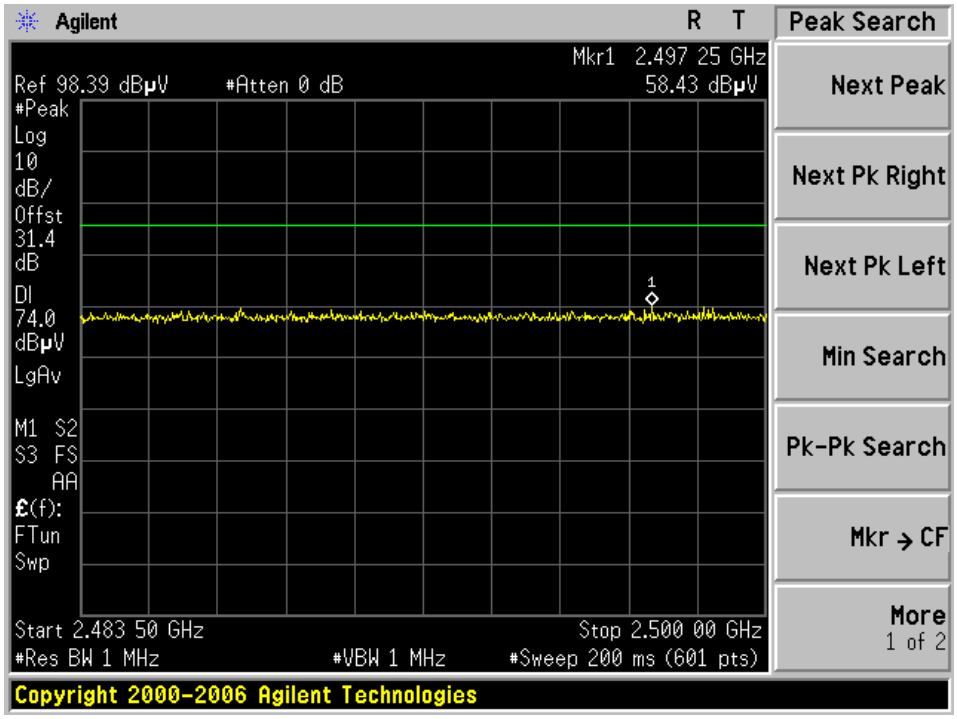
Lowest Channel at Vertical, Peak



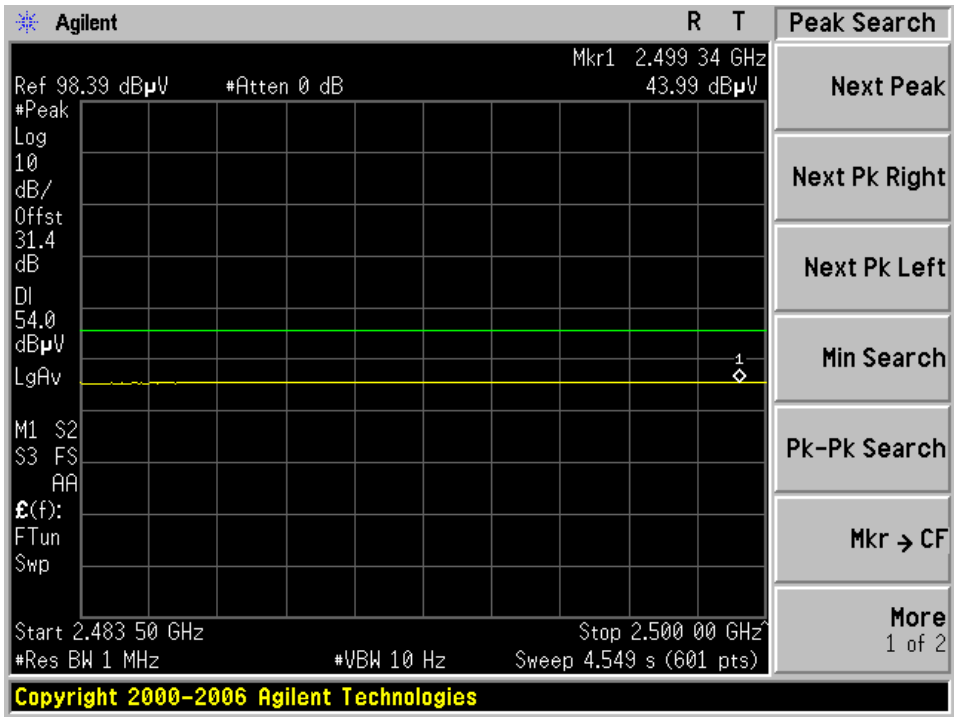
Lowest Channel at Vertical, Average



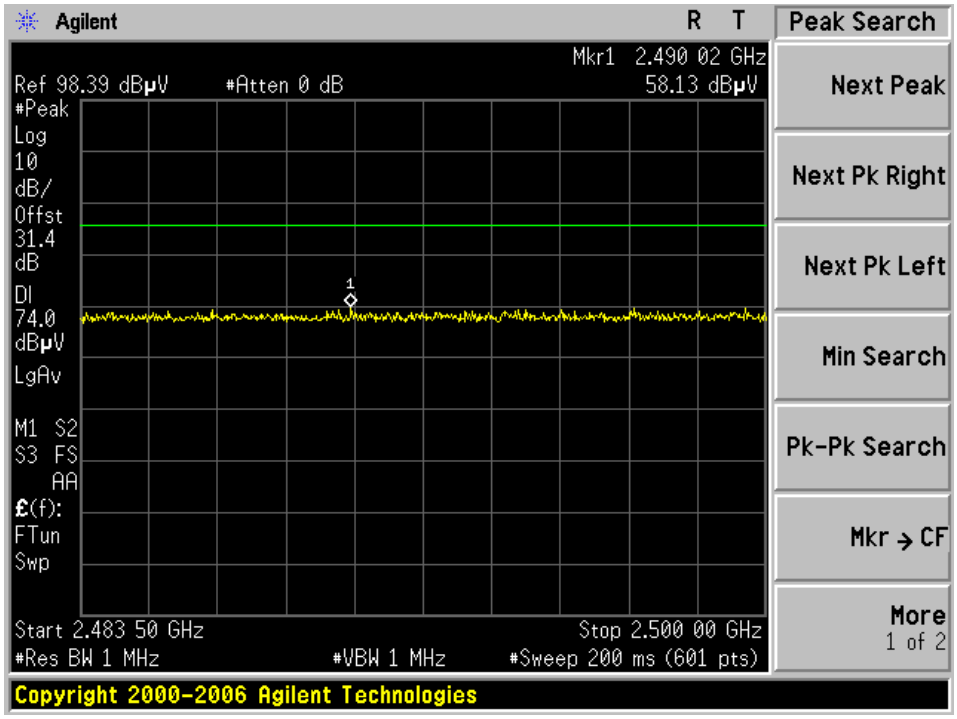
Highest Channel at Horizontal, Peak



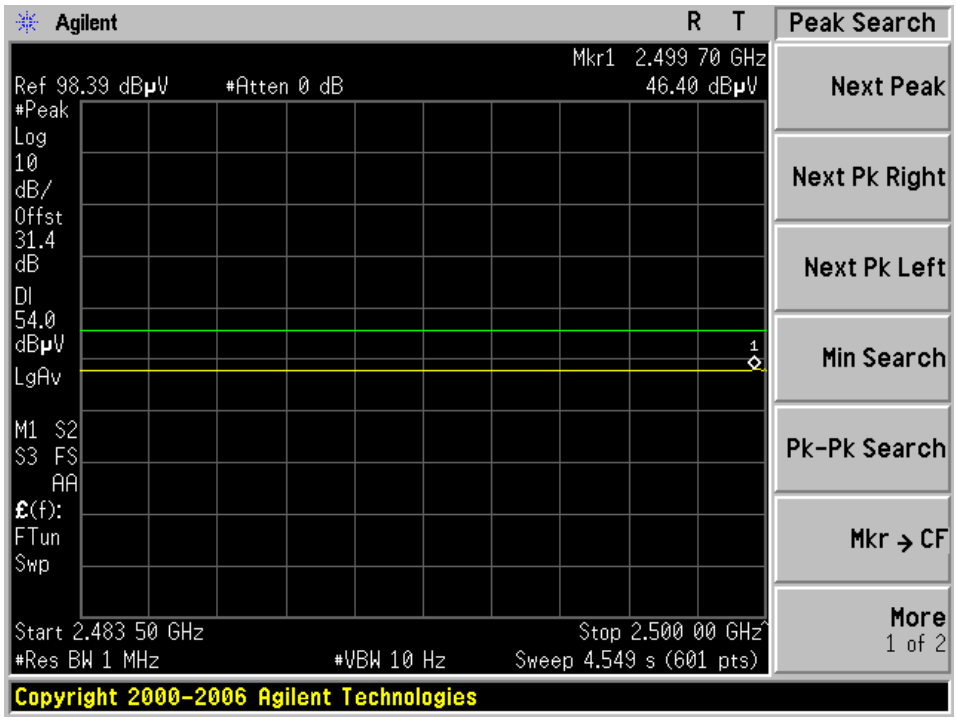
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak



Highest Channel at Vertical, Average



9 FCC §15.247(a)(2) – 20 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §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.

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

9.2 Test Procedure

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

9.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

9.4 Test Environmental Conditions

Temperature:	24 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

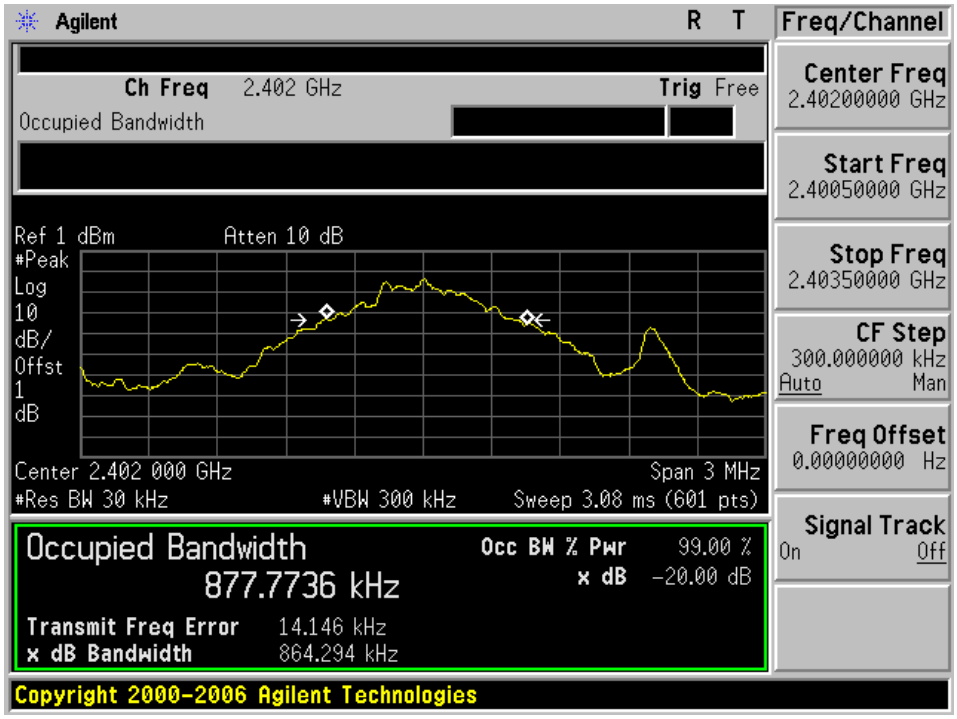
Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

9.5 Test Results

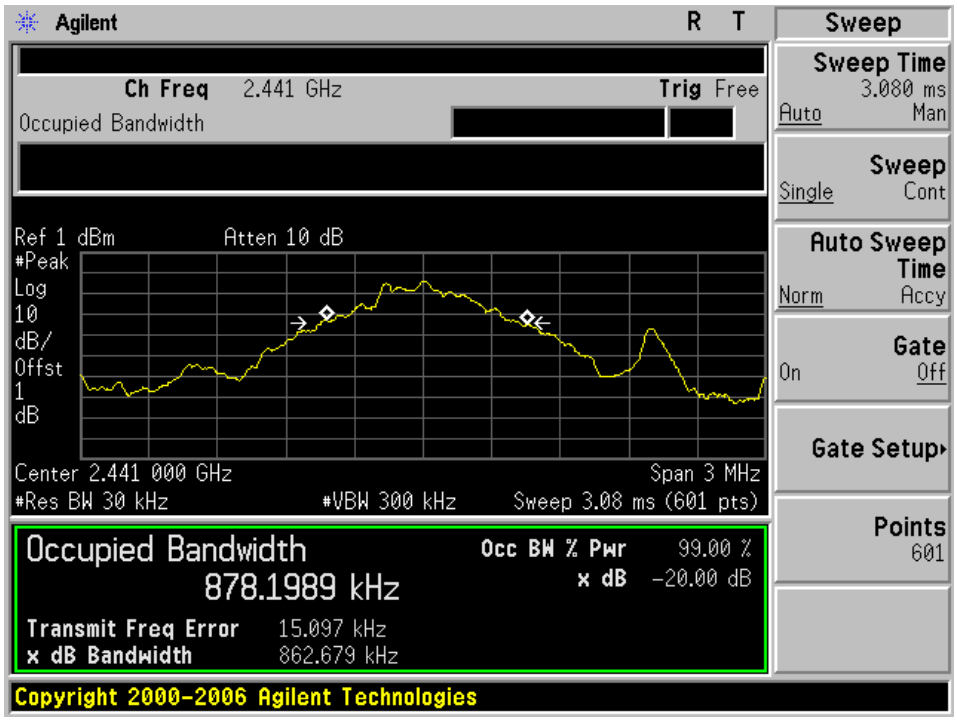
Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)
Low	2402	864.294
Mid	2441	862.679
High	2480	866.190

Please refer to the following plots for detailed test results:

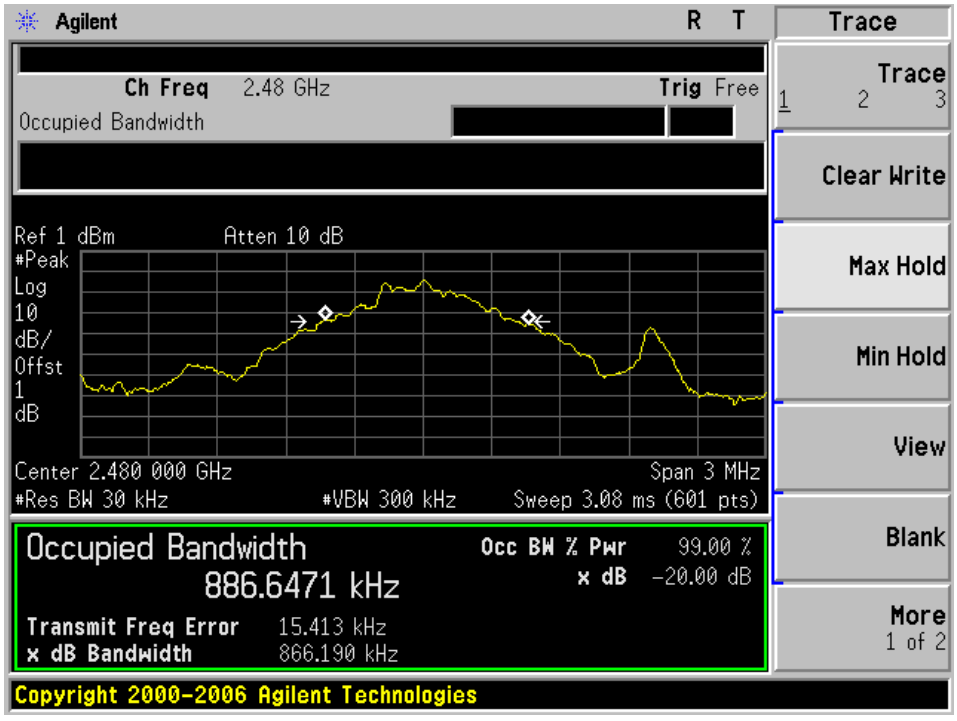
Low Channel 2402 MHz



Middle Channel 2441 MHz



High Channel 2480 MHz



10 FCC §15.247(b) - Peak Output Power Measurement

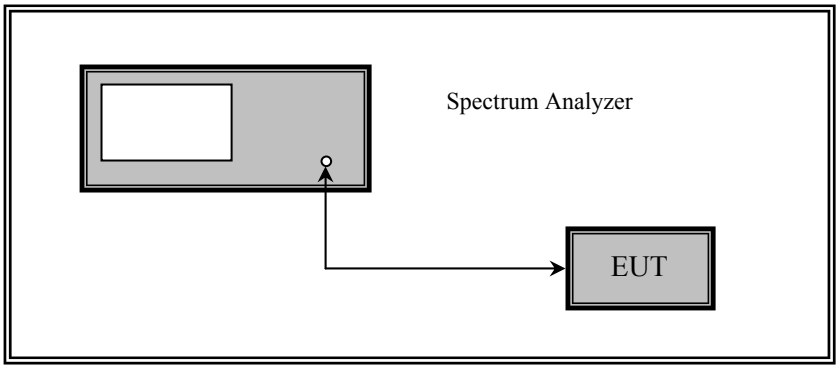
10.1 Applicable Standard

According to FCC §15.247(b)(3) for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

10.2 Test Procedure

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



10.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

10.4 Test Environmental Conditions

Temperature:	24 °C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

10.5 Test Results

Channel	Frequency (MHz)	Max. Conducted Peak Output Power		Limit (mw)	Result
		(dBm)	(mw)		
Low	2402	-12.93	0.051	125	Pass
Mid	2441	-12.94	0.051	125	Pass
High	2480	-13.44	0.045	125	Pass

11 FCC §15.247(d) - 100 kHz Bandwidth of Band Edges

11.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

11.2 Test Procedure

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

11.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

11.4 Test Environmental Conditions

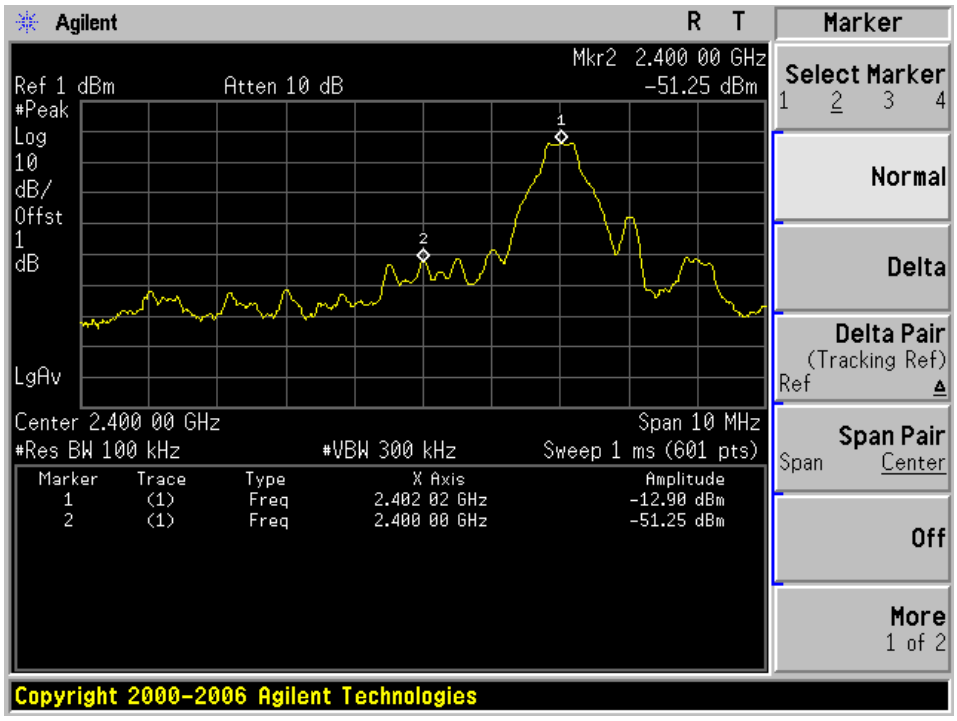
Temperature:	24°C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

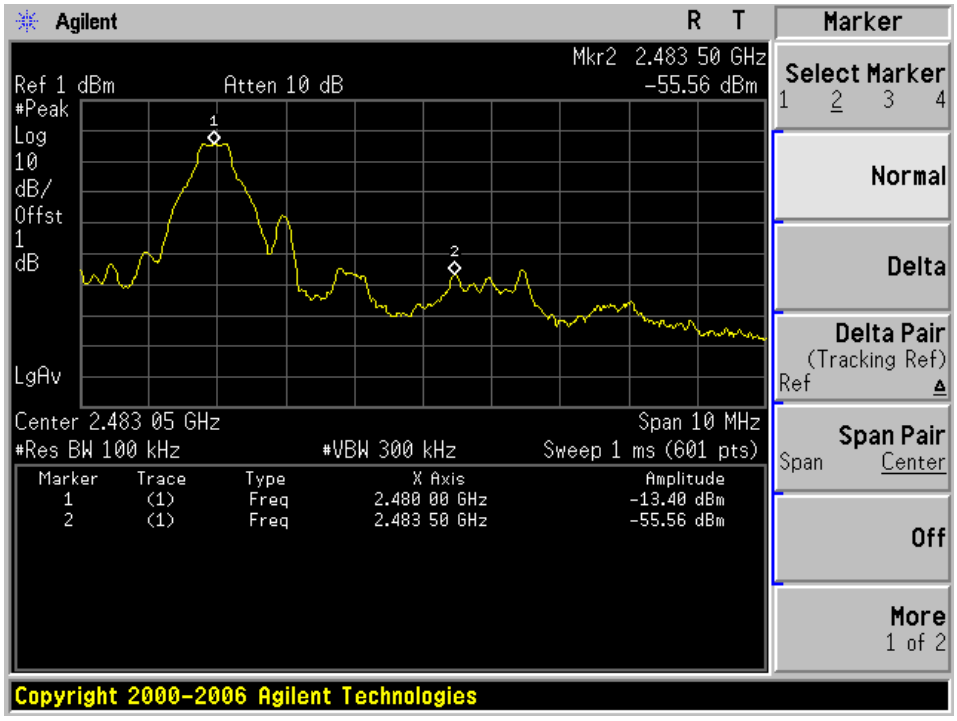
11.5 Test Results

Please refer to following pages for plots of band edge.

Bluetooth, Low Band Edge



Bluetooth, High Band Edge



12 FCC §15.247(a)(1) - Hopping Channel Separation

12.1 Applicable Standard

According to FCC §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.

12.2 Test 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 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.

12.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

12.4 Test Environmental Conditions

Temperature:	24°C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

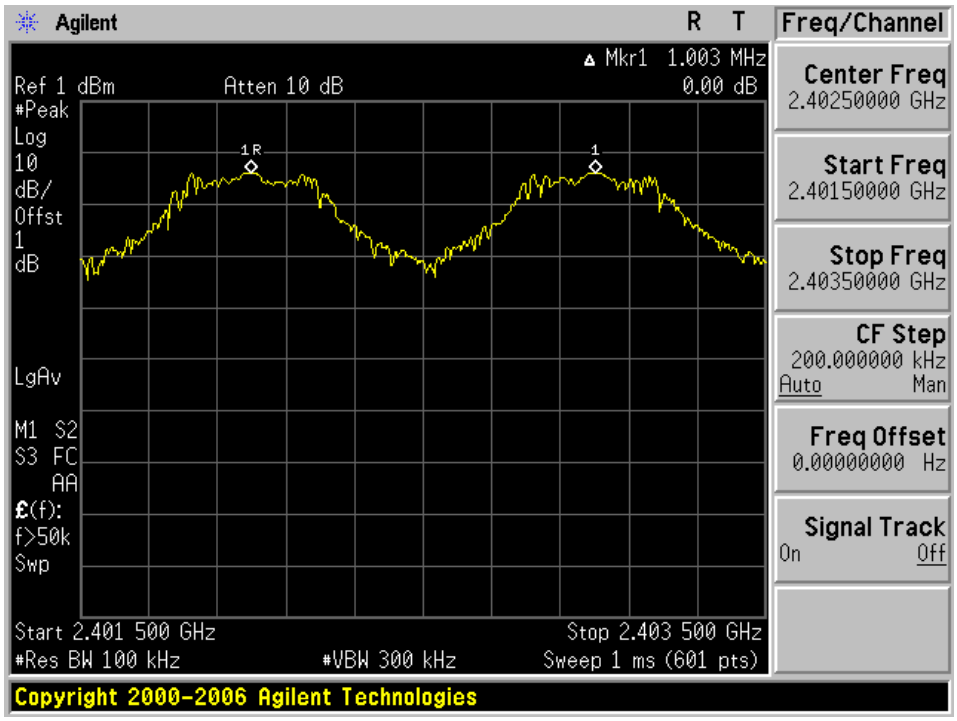
Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

12.5 Test Results

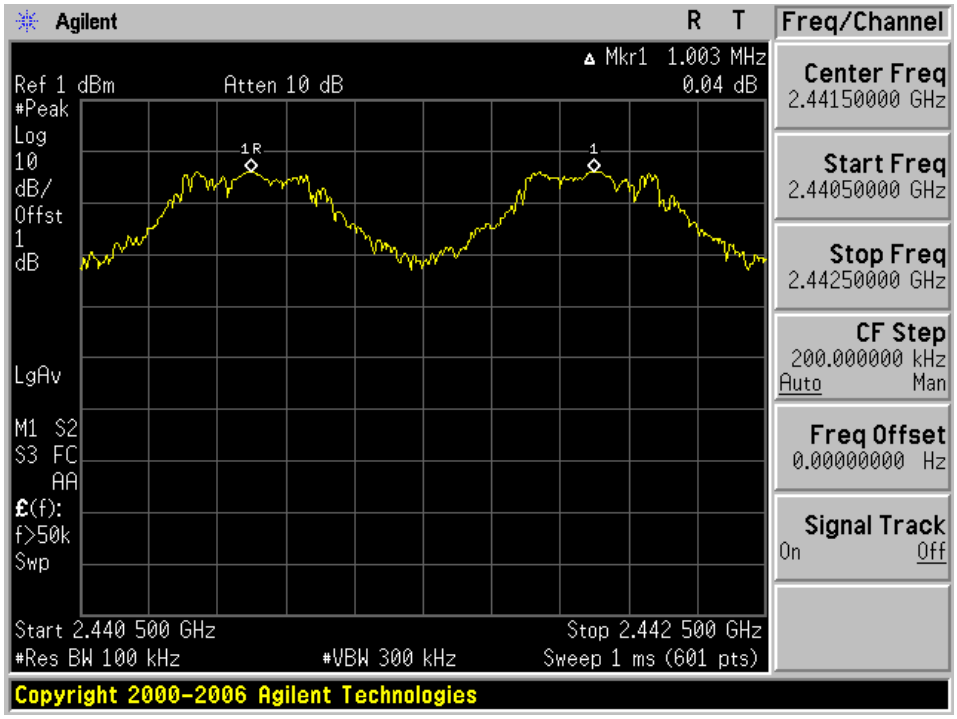
Channel	Frequency (MHz)	Channel Separation (kHz)	Limit > 2/3 20 dB OBW (kHz)
Low	2402	1003	576.1960
Mid	2441	1003	575.1193
High	2480	1010	577.4600

Please refer to the following plots.

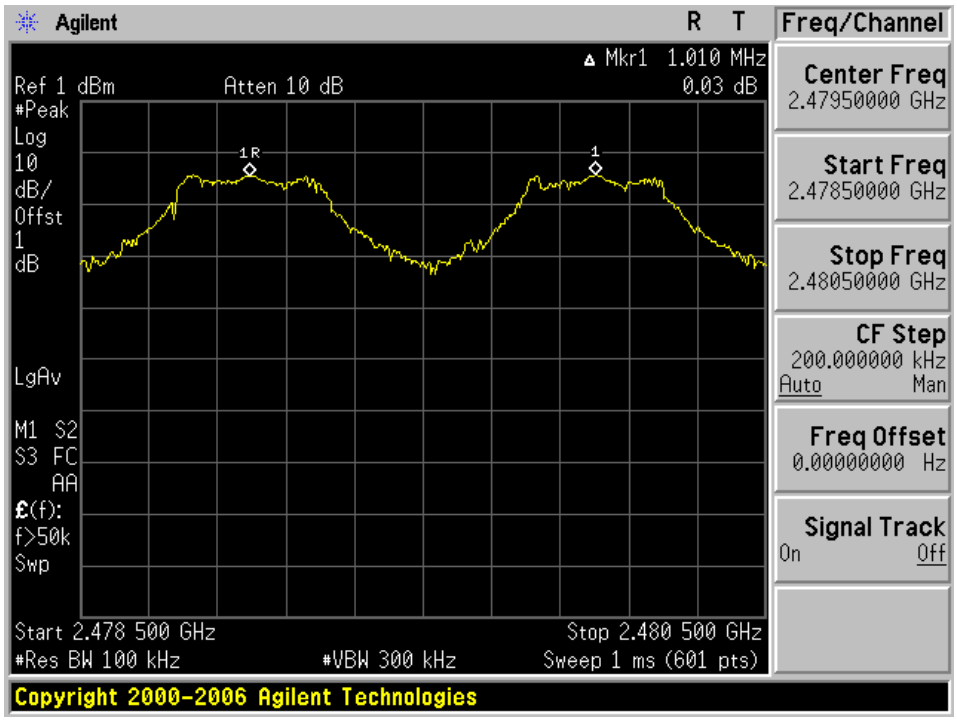
Low Channel



Middle Channel



High Channel



13 FCC §15.247(a)(1)(iii) – Number of Hopping Frequencies Used

13.1 Applicable Standard

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

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 the bench without connection to measurement instrument. Turn on the EUT and 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.

13.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

13.4 Test Environmental Conditions

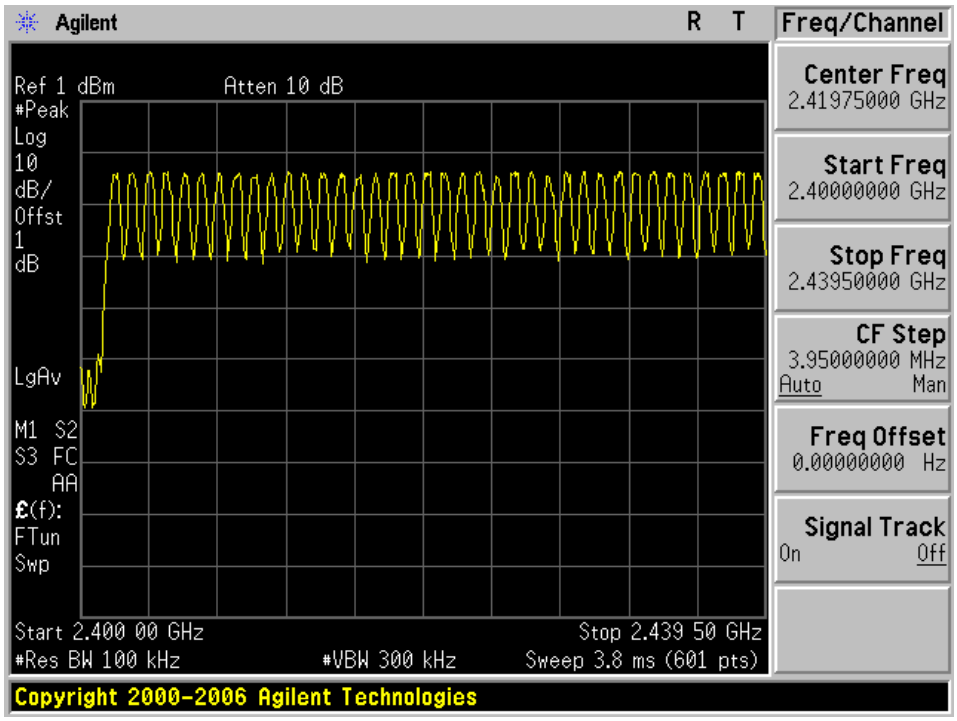
Temperature:	24°C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

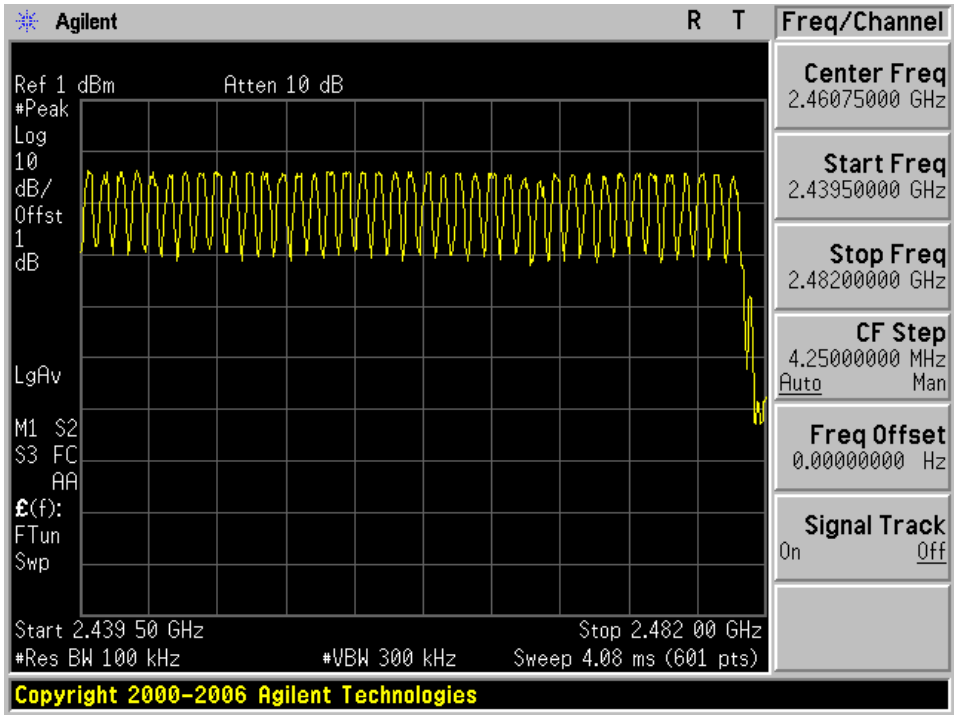
13.5 Test Results

79 channels please refer to the following plots.

Hopping Channel Number



38 Channels between 2400 to 2439.5 MHz



41 Channels between 2439.5 to 2482 MHz

14 FCC §15.247(a)(1)(iii) - Dwell Time

14.1 Applicable Standard

According to FCC §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.

14.2 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.

14.3 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2011-08-11

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

14.4 Test Environmental Conditions

Temperature:	24°C
Relative Humidity:	44 %
ATM Pressure:	101.2 kPa

Testing was performed by Quinn Jiang on 2011-08-29 in the RF Site.

14.5 Test Results

DH1

Channel	Frequency (MHz)	Pulse Width (ms)	Dwell Time (Sec.)	Limit (Sec.)	Results
Low	2402	0.393	0.13	0.4	Compliance
Mid	2441	0.393	0.13	0.4	Compliance
High	2480	0.390	0.12	0.4	Compliance

DH3

Channel	Frequency (MHz)	Pulse Width (ms)	Dwell Time (Sec.)	Limit (Sec.)	Results
Low	2402	1.68	0.27	0.4	Compliance
Mid	2441	1.687	0.27	0.4	Compliance
High	2480	1.68	0.27	0.4	Compliance

DH5

Channel	Frequency (MHz)	Pulse Width (ms)	Dwell Time (Sec.)	Limit (Sec.)	Results
Low	2402	2.933	0.31	0.4	Compliance
Mid	2441	2.942	0.31	0.4	Compliance
High	2480	2.933	0.31	0.4	Compliance

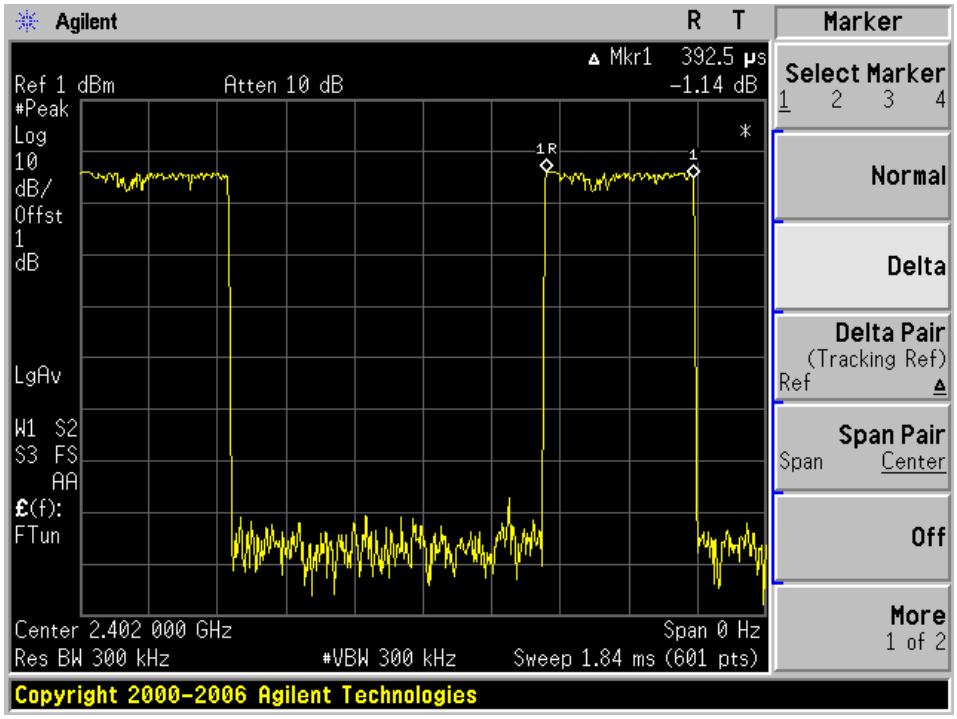
Note: Dwell time = Pulse time(hop rate/2/number of channels)*31.6 sec (DH1)*
Dwell time = Pulse time(hop rate/4/number of channels)*31.6 sec (DH3)*
Dwell time = Pulse time(hop rate/6/number of channels)*31.6 sec (DH5)*

• Hop Rate = 1600, • Number of Channels = 79

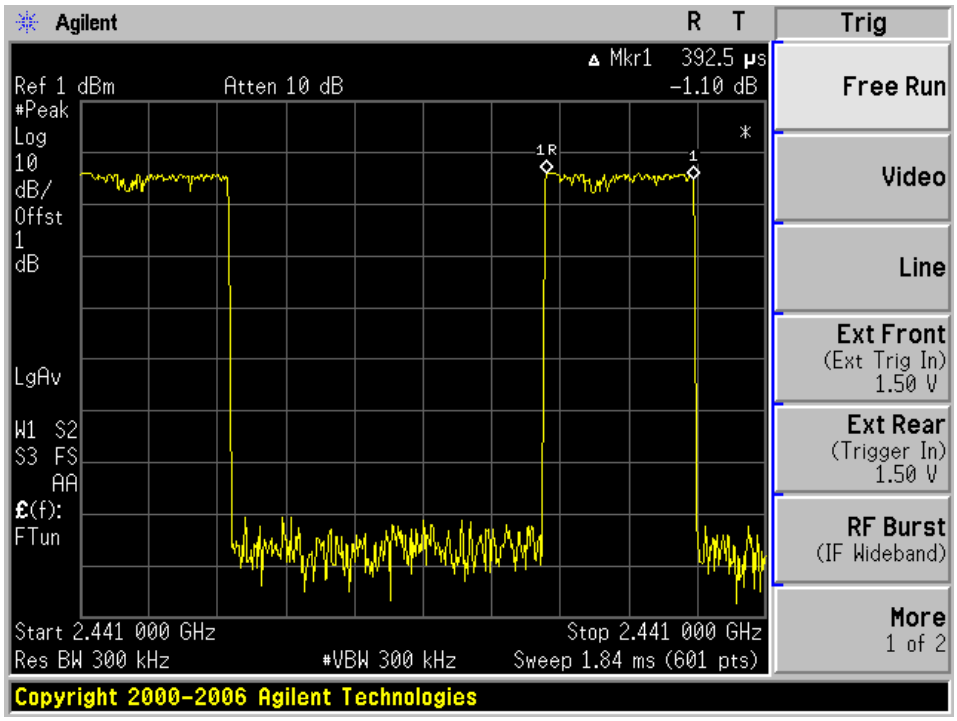
Please refer the following plots.

DH1

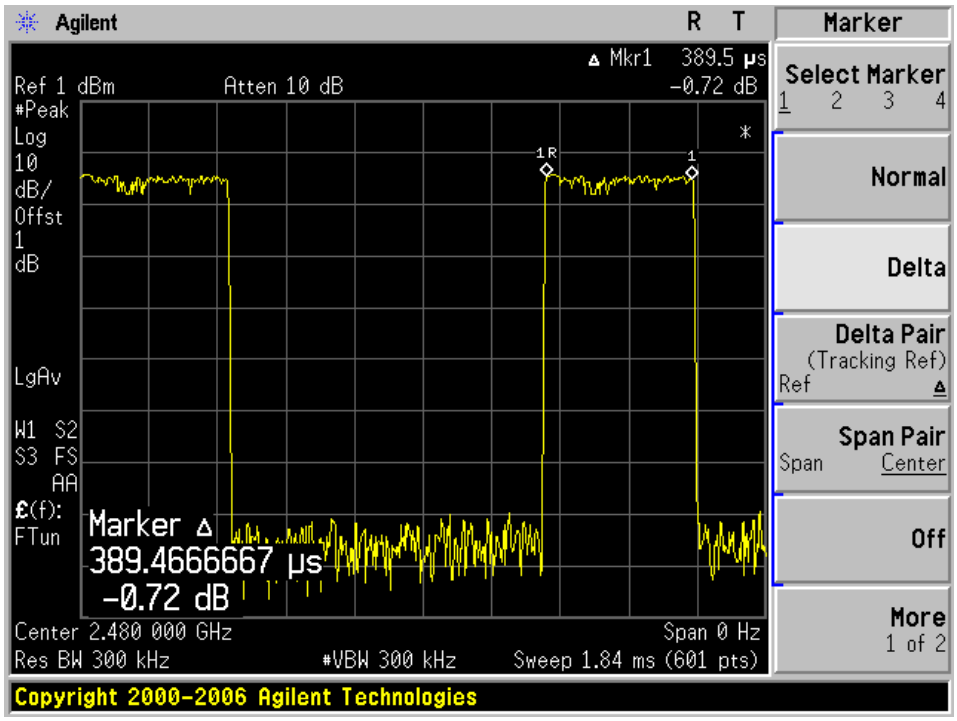
Low Channel



Middle Channel

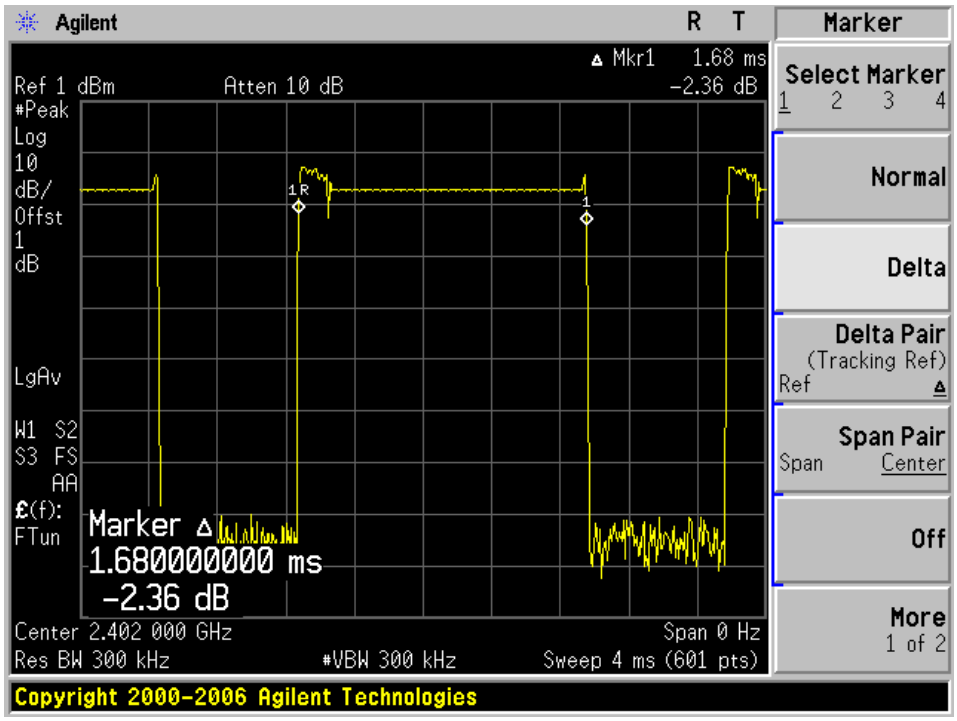


High Channel

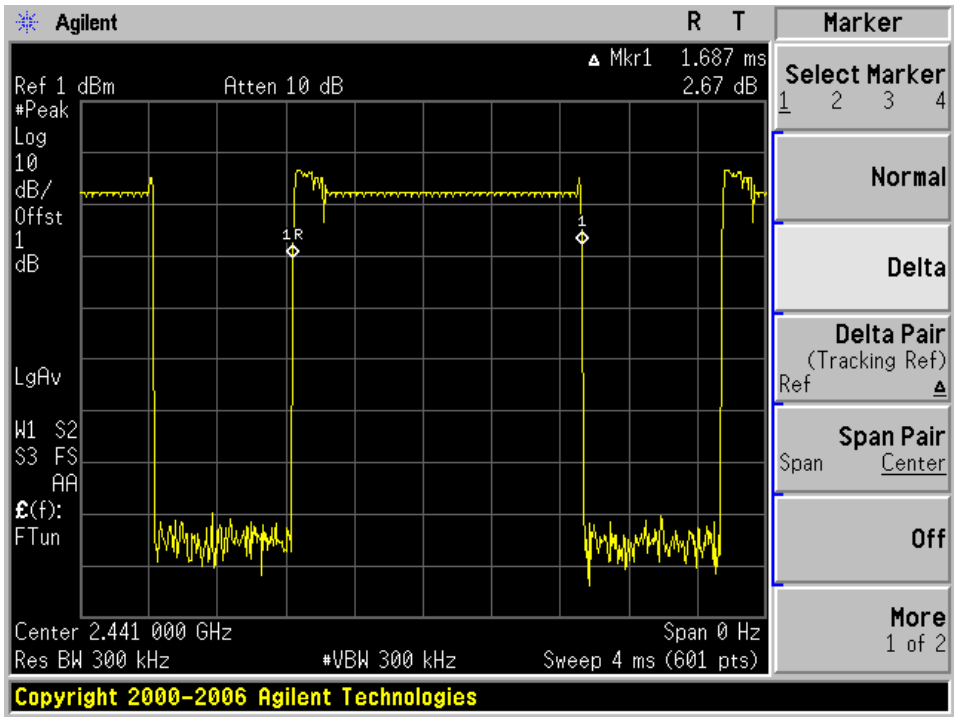


DH3

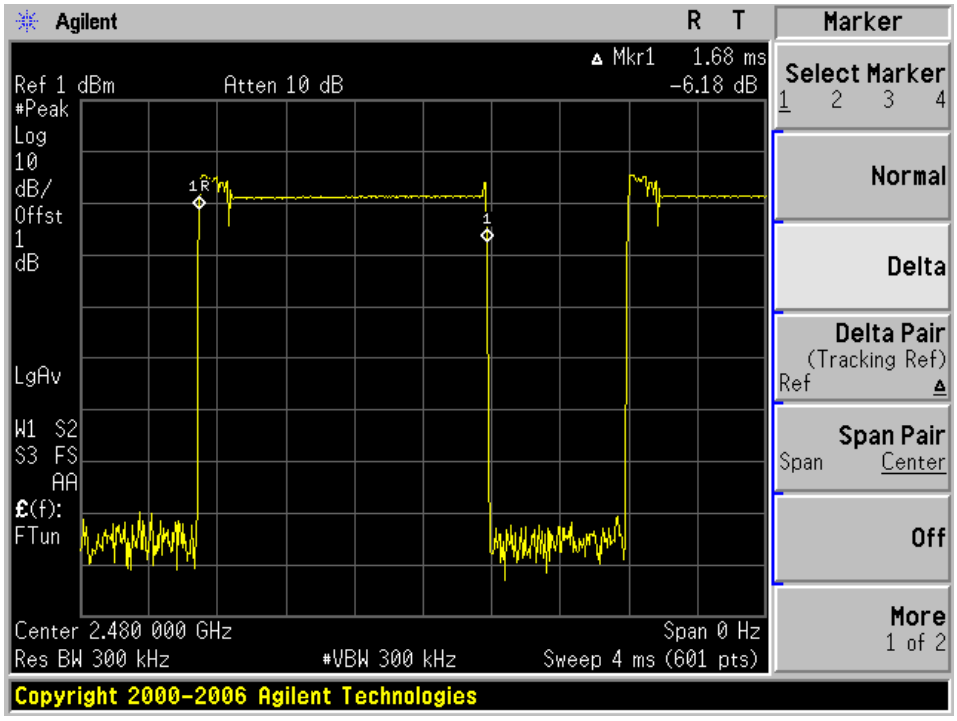
Low Channel



Middle Channel

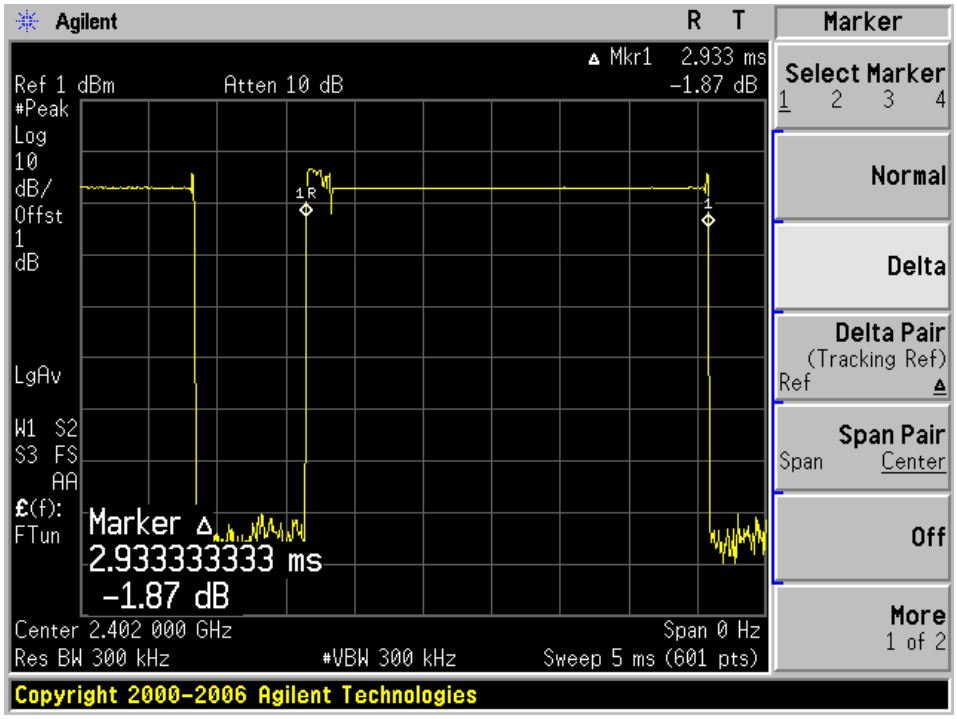


High Channel

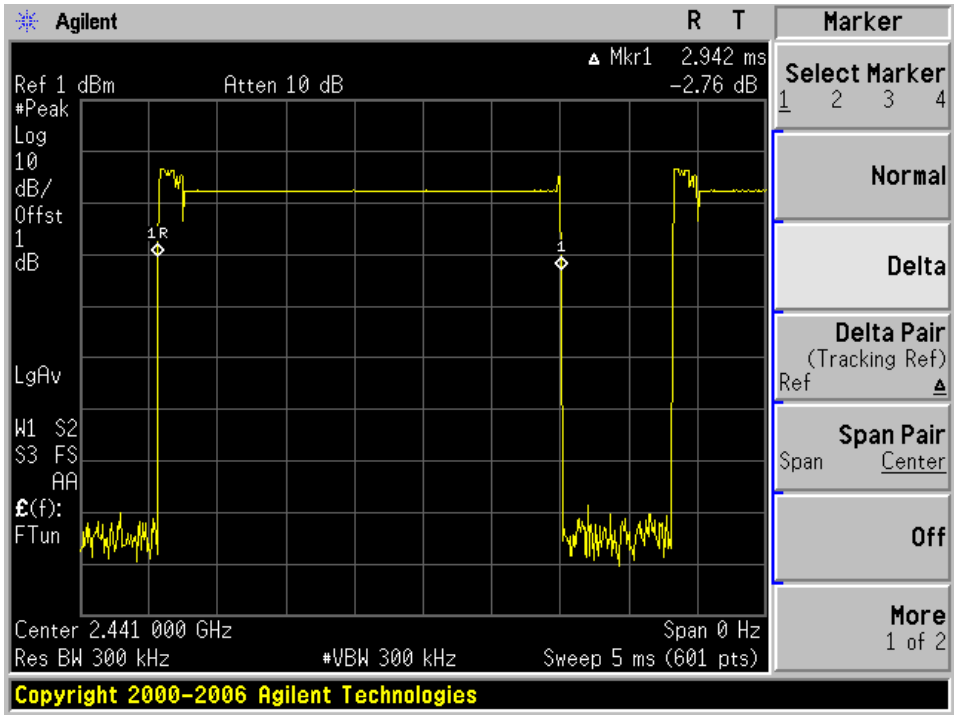


DH5

Low Channel



Middle Channel



High Channel