



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 7  
INDUSTRY CANADA RSS-GEN ISSUE 2**

**CERTIFICATION TEST REPORT**

**FOR**

**DATALOGIC BLUETOOTH MODULE**

**MODEL NUMBER: DLBTMCX**

**FCC ID: 09NDLBTMCX  
IC: 3862A-DLBTMCX**

**REPORT NUMBER: 09U12809-1, Revision B**

**ISSUE DATE: OCTOBER 29, 2009**

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/09/09	Initial Issue	F. Ibrahim
A	10/27/09	Revised the output power limits. Revised number of hopping channels section. Revised dwell time section.	F. Ibrahim
B	10/28/09	Revised EUT description. Revised number of hopping channels section. Revised 20 dB BW section. Revised output power section.	F. Ibrahim

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Datalogic Scanning, Inc.  
959 Terry STREET  
Eugene, Oregon, 97402, U.S.A

**EUT DESCRIPTION:** DATALOGIC BLUETOOTH MODULE

**MODEL:** DLBTMCX

**SERIAL NUMBER:** E09900247, E09900239, E09900162, E09900112, E09900110

**DATE TESTED:** SEPTEMBER 22 - OCTOBER 29, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 ISSIE 7 ANNEX 8	Pass
INDUSTRY CANADA RSS-GEN ISSUE 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:



FRANK IBRAHIM  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

TOM CHEN  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a bluetooth radio module manufactured by Datalogic.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	8.92	7.80

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes the following antennas:

- 1) Whip Dipole, manufactured by Nearson/Pulse, gain = 2.14 dBi
- 2) PCB Dipole, NanoBlue (Gain = 2 dBi)
- 3) PCB / Flex Circuit Dipole, NanoBlade, gain = 3.8 dBi
- 4) Black Chip Monopole Antenna, gain = 2 dBi
- 5) Monopole Antenna, manufactured by Johansen, gain = 0.5 dBi
- 6) Coax Dipole Antenna, gain = 3 dBi
- 7) Mini-NanoBlade Antenna, gain = 2 - 2.5dBi

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was version 4841.

The test utility software used during testing was CSR Bluesuit 2.2.

## 5.5. WORST-CASE CONFIGURATION AND MODE

For radiated emissions below 1 GHz, the EUT was tested with each antenna type; the channel with the highest output power was selected. For digital radiated emissions two configurations were tested as follows:

- 1) BC4030 with serial RS232 interface, standing position.
- 2) BC4030 with USB interface, Laid down position.

For the digital portion of the testing, the scanner was placed on the base station, the base station was connected to the laptop, the EUT was set to continuous auto scan mode by scanning continuously a bar code that was placed in front of it on the test table. The scanned number was sent to the laptop PC via the serial or USB interface. Minimum configuration was also used for the digital portion.

For radiated emissions on the radio module, the radio module was tested outside the host since this is Full Modular Approval, X,Y and Z orientations were investigated with each antenna type to find worst-case orientation at the fundamental and that orientation was used for rest of radiated testing.

For power line conducted emissions, the EUT was tested with one antenna only, the channel with highest output power was selected.

Two configurations were tested for power line conducted emissions as follows:

- 1) BC4030 with serial RS232 interface, standing position.
- 2) BC4030 with USB interface, Laid down position.



## 5.6. DESCRIPTION OF TEST SETUP

### RADIO PORTION:

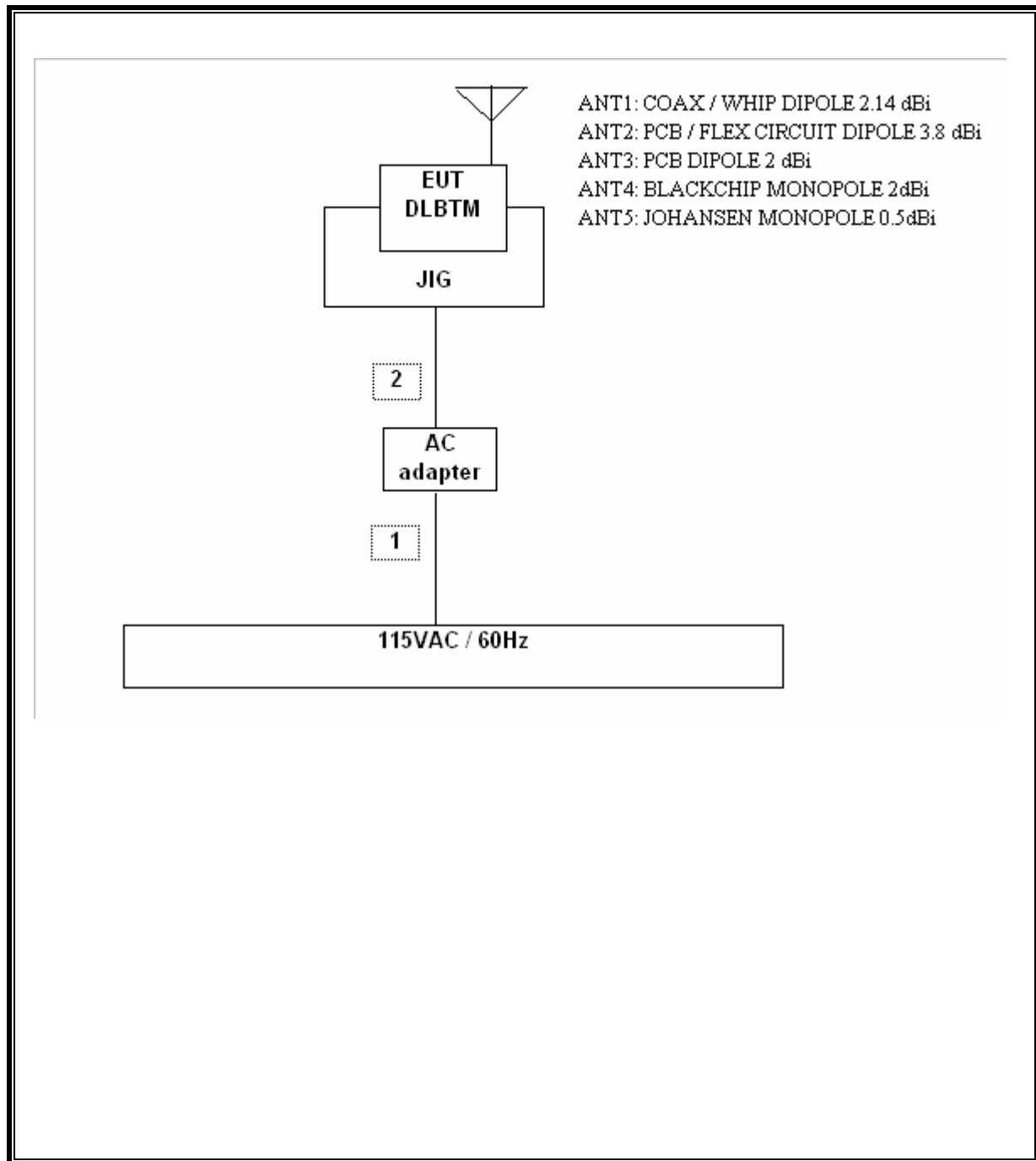
### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	DATALOGIC	SA115B-12U	NA	DoC
JIG BOARD	DATALOGIC	NA	NA	NA
LAPTOP PC	HP	ze4200	CN25110374	DoC
AC Adapter	LITEON	PA-1600-06	5301650901	DoC

### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	North America	Un-Shielded	1.5m	N/A
2	DC	1	DC Plug	Un-Shielded	1.5m	N/A

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01098	11/07/08	02/07/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	12/01/08	12/01/09
Horn Antenna	EMCO	3115	C00872	01/29/09	01/29/10
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	11/07/08	02/07/10
Power Meter	Agilent / HP	437B	N02778	11/04/08	08/04/10
Antenna, Bilog, 2 GHz	Sundt Sciences	JB1	C01011	01/14/09	01/14/10
Power Sensor, 18 GHz	Agilent / HP	8481A	N02784	04/22/08	10/22/09
Antenna, Bilog, 2 GHz	Sundt Sciences	JB1	C01011	01/14/09	01/14/10
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	09/29/07	11/29/09
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	09/16/09	10/16/10
LISN, 30 MHz	FCC	LISN-50/250-25-2	C00626	10/29/08	10/29/09
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/08	10/29/09

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 20 dB AND 99% BANDWIDTH

#### LIMIT

None; for reporting purposes only.

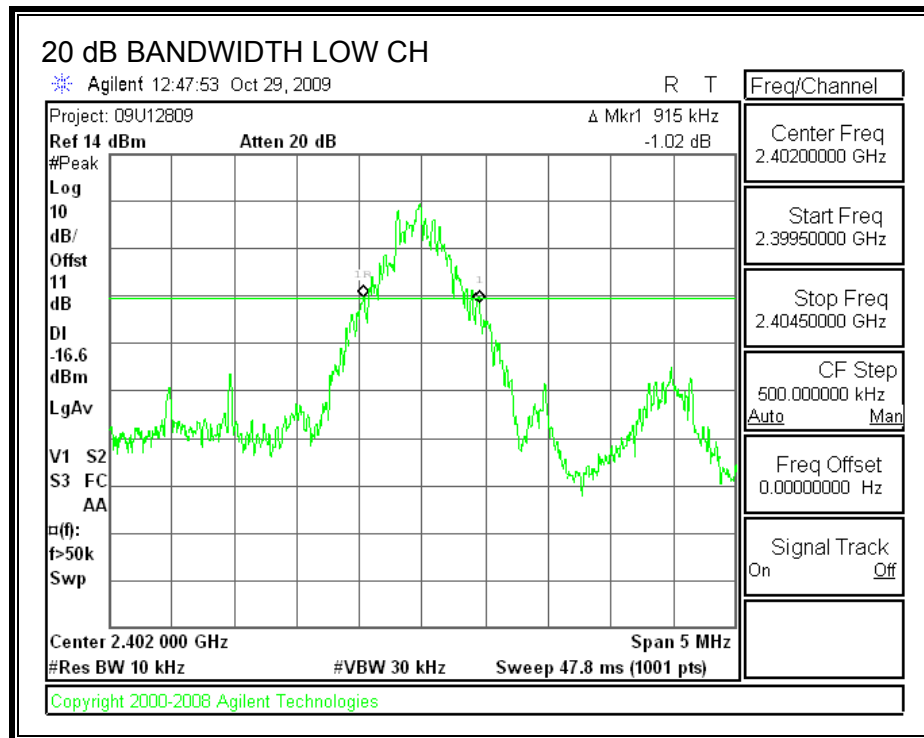
#### TEST PROCEDURE

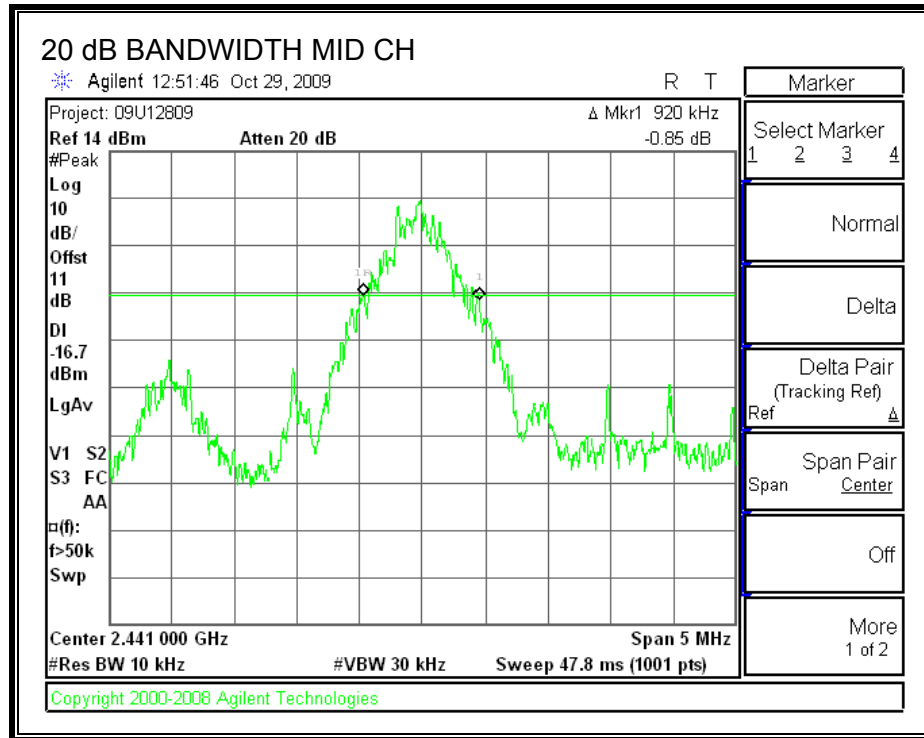
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

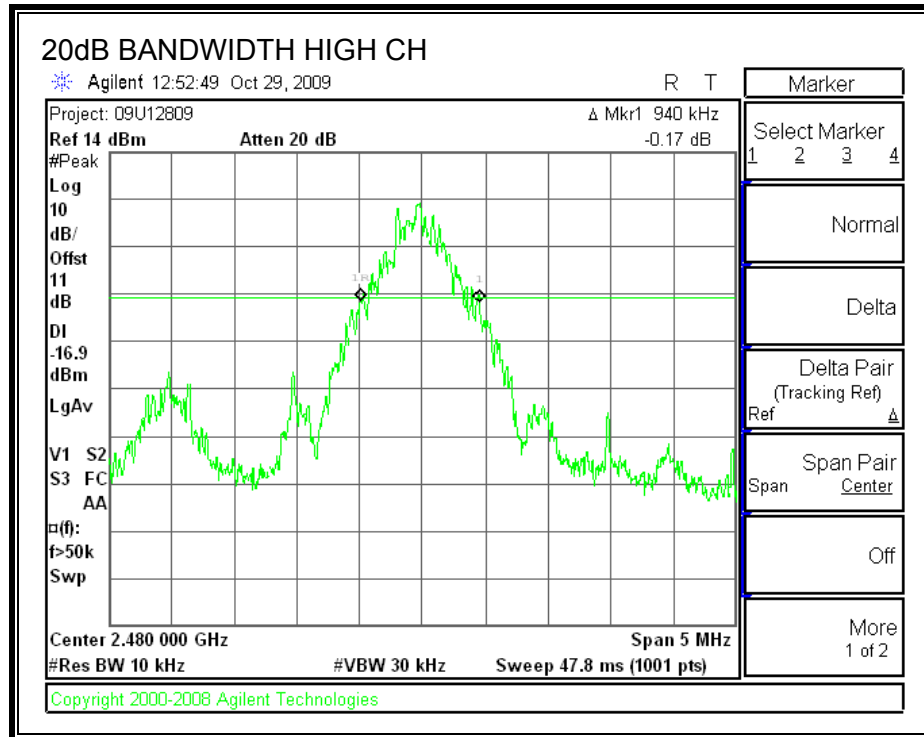
#### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	915	813.53
Middle	2441	920	863.69
High	2480	940	809.99

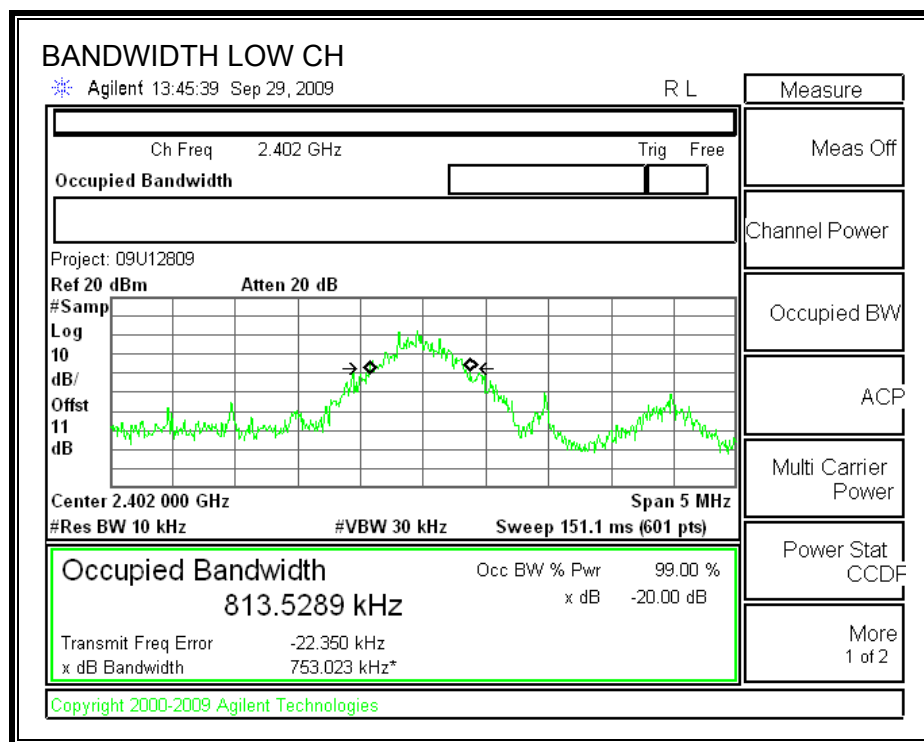
## 20 dB BANDWIDTH



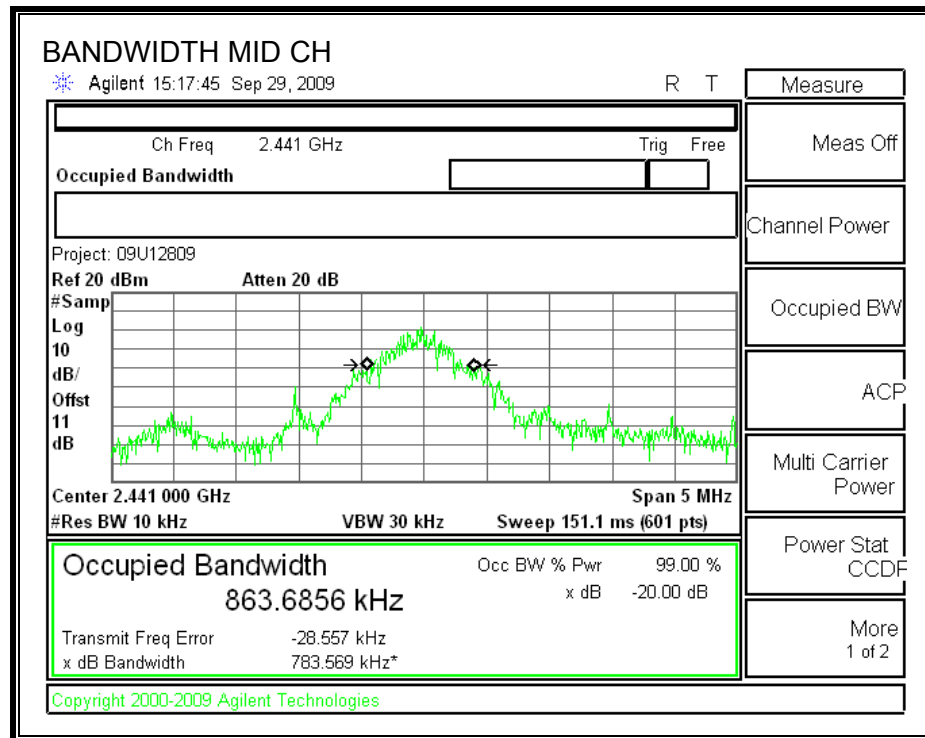


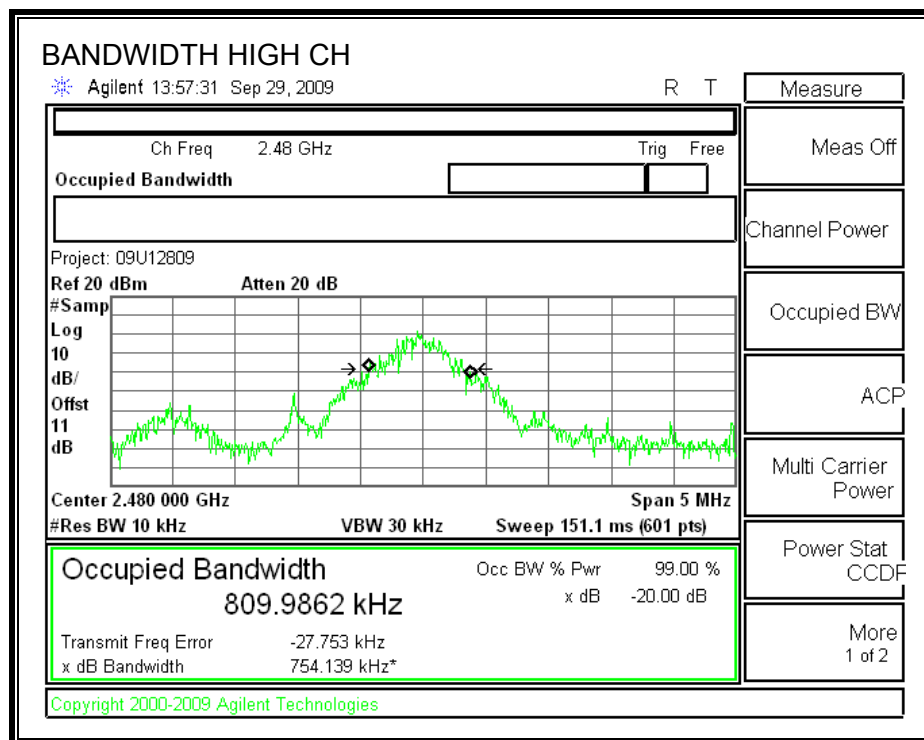


# **99% BANDWIDTH**









## **7.2. HOPPING FREQUENCY SEPARATION**

### **LIMIT**

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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.

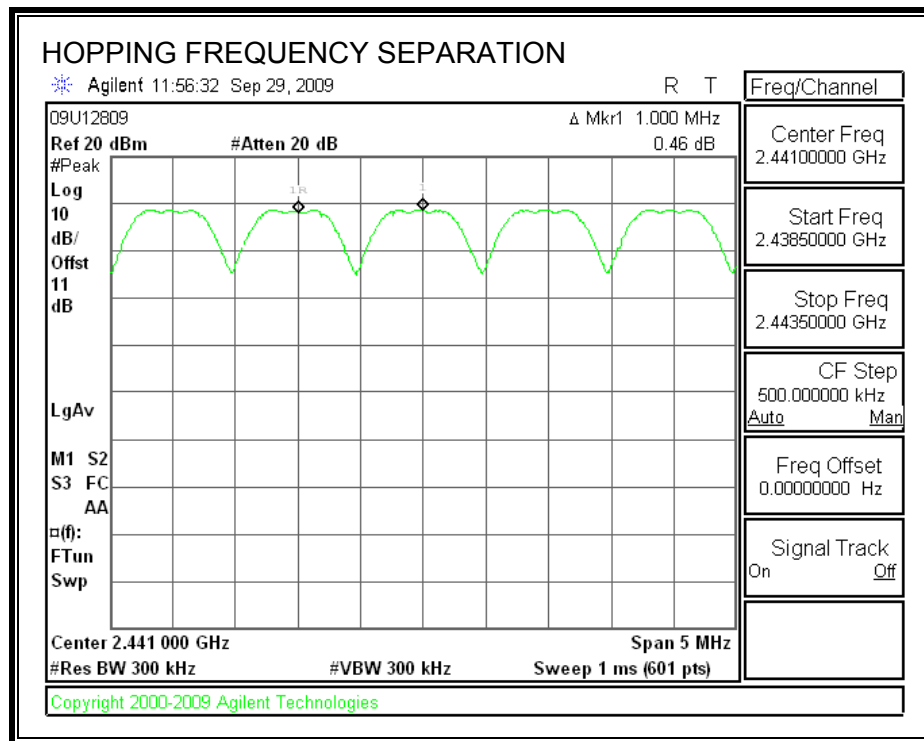
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

## RESULTS

### HOPPING FREQUENCY SEPARATION



### **7.3. NUMBER OF HOPPING CHANNELS**

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

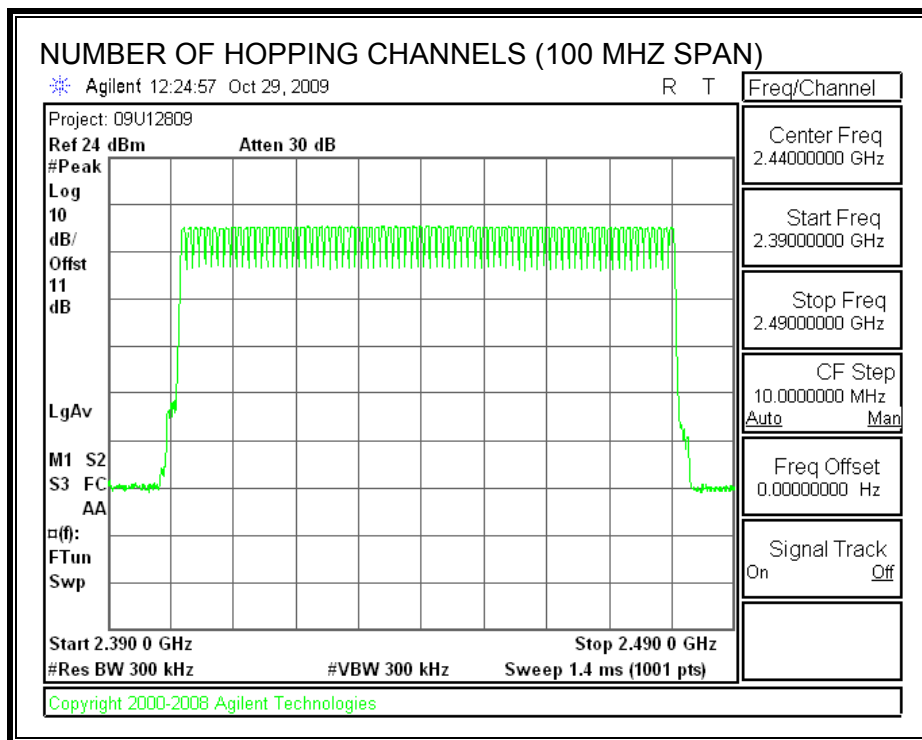
#### **TEST PROCEDURE**

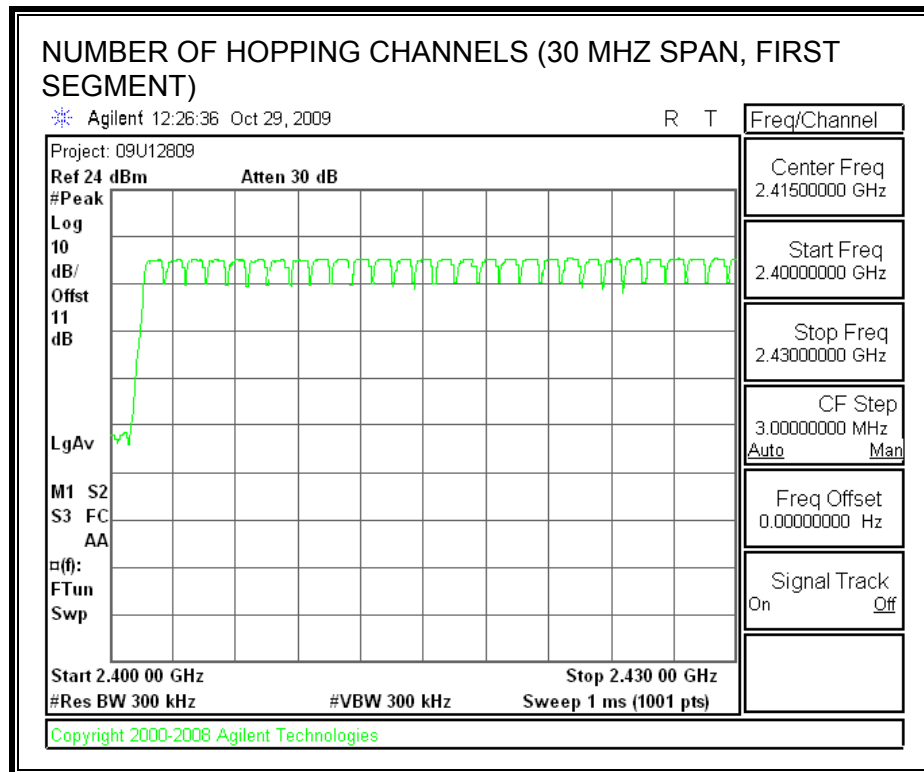
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

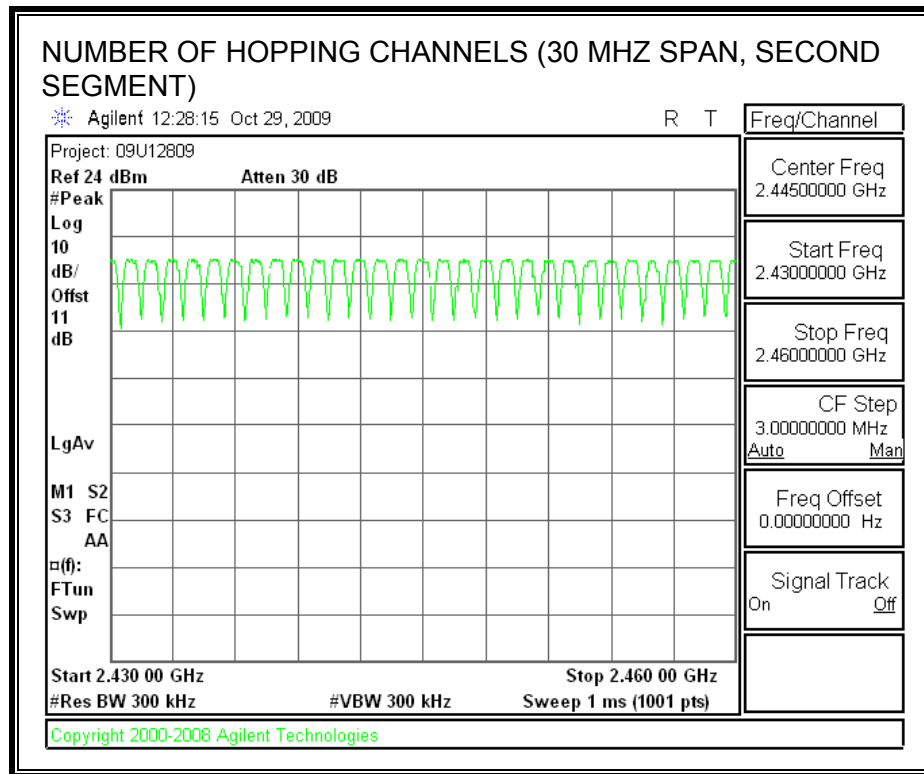
#### **RESULTS**

79 Channels observed.

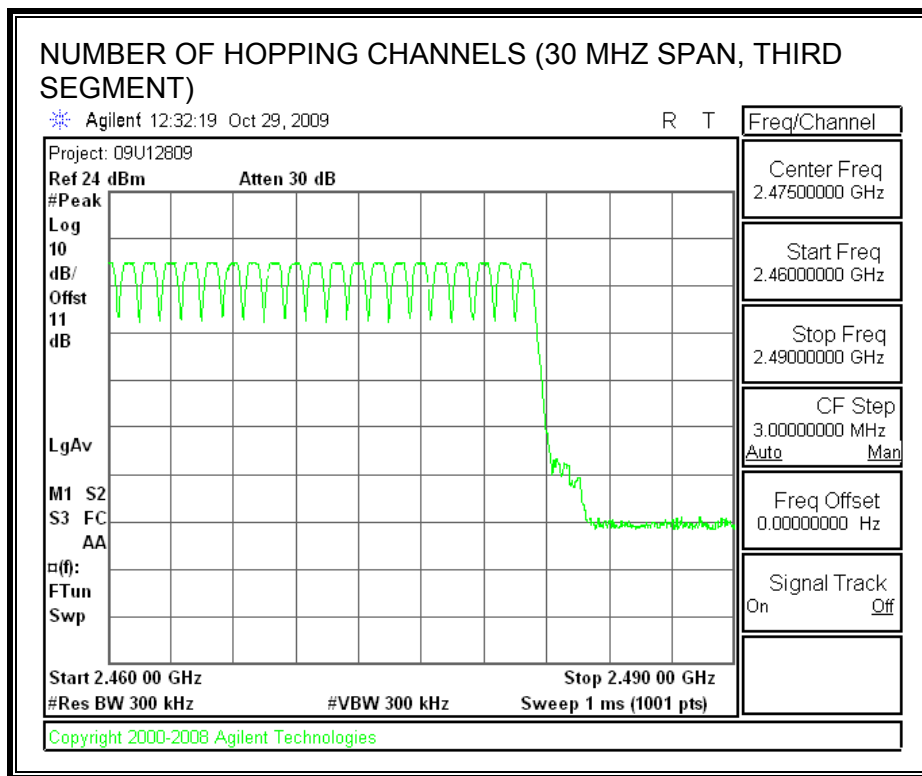
# NUMBER OF HOPPING CHANNELS











## 7.4. AVERAGE TIME OF OCCUPANCY

### LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 Seconds scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 Seconds period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in 3.16 Seconds}) * \text{pulse width}$ .

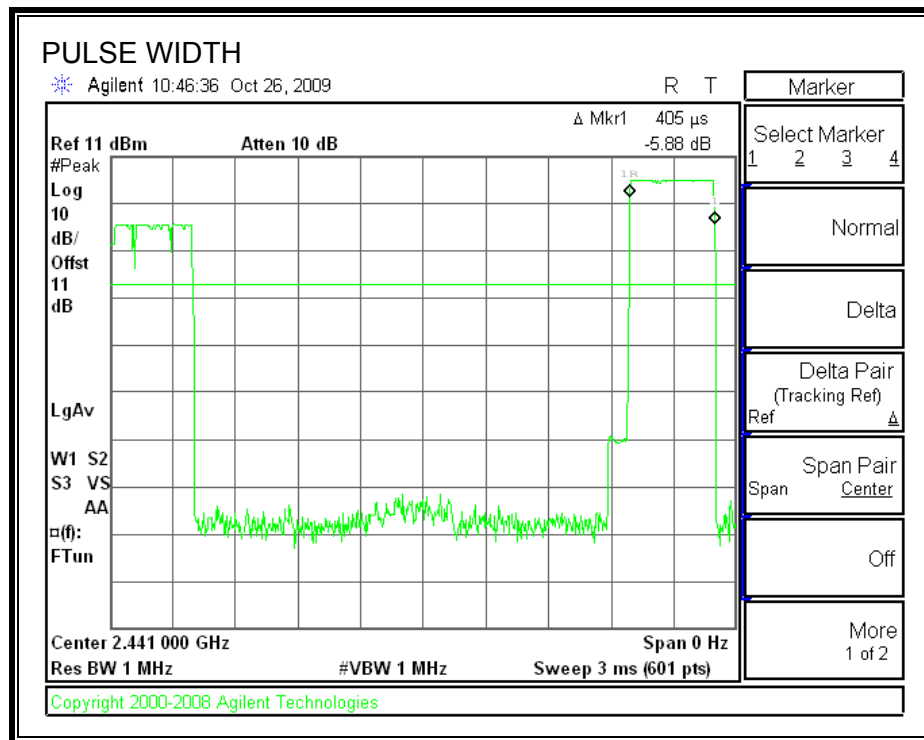
### RESULTS

Time Of Occupancy =  $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

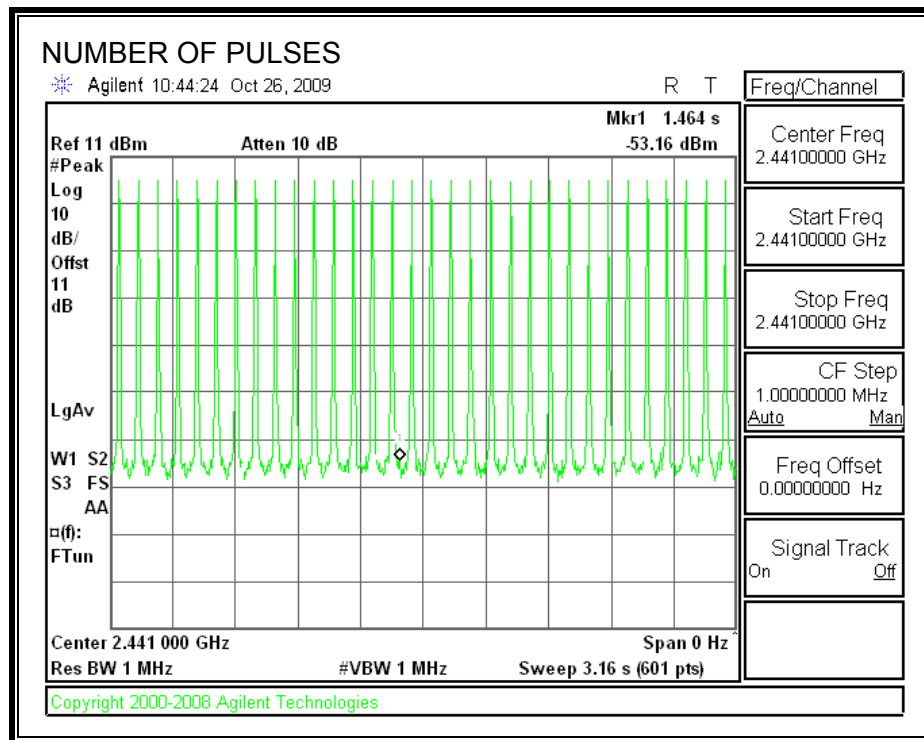
#### GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 secend	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.405	32	0.130	0.4	-0.270
DH3	1.667	16	0.267	0.4	-0.133
DH5	2.925	11	0.322	0.4	-0.078

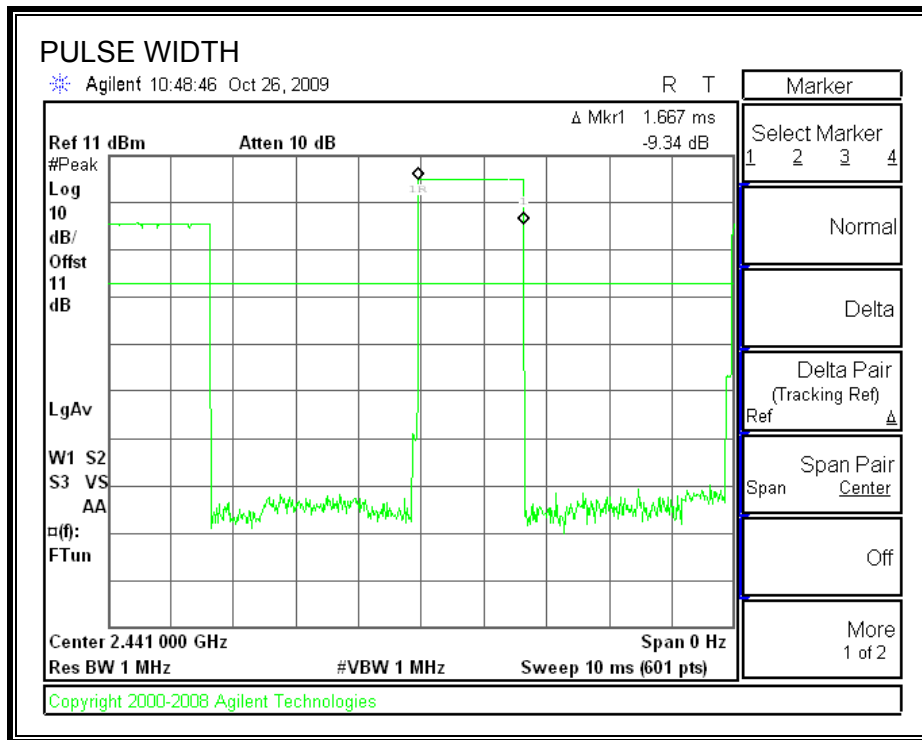
**PULSE WIDTH (DH1)**



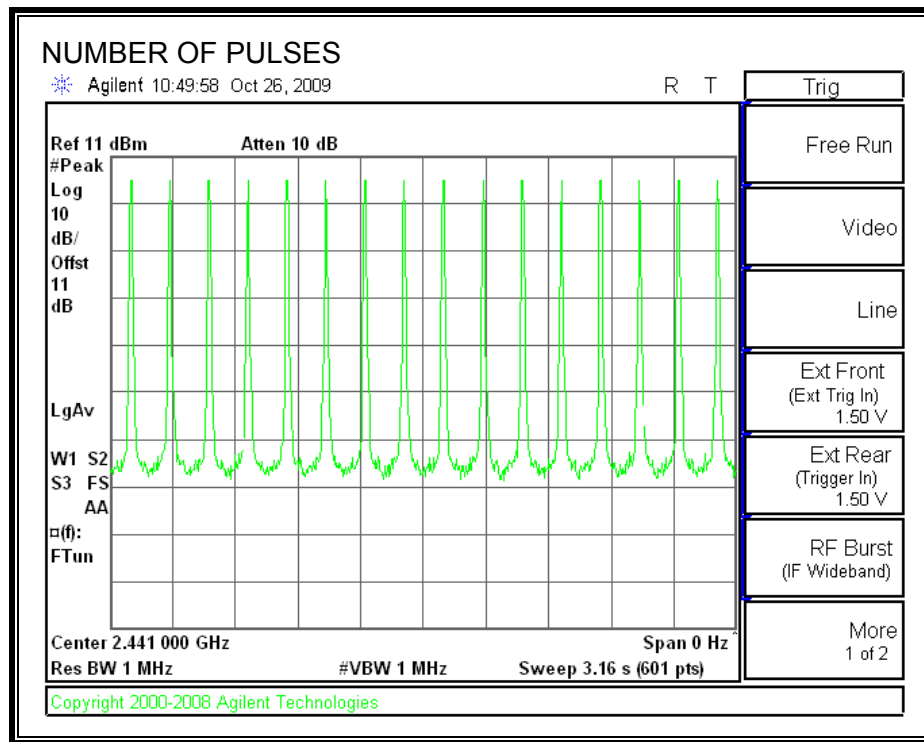
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH1)**



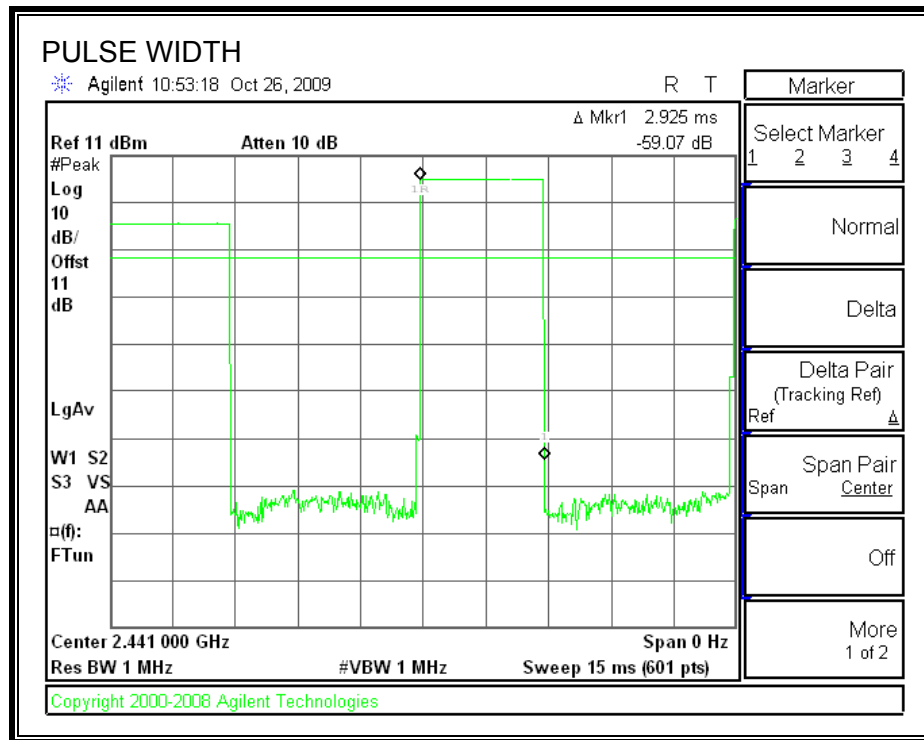
**PULSE WIDTH (DH3)**



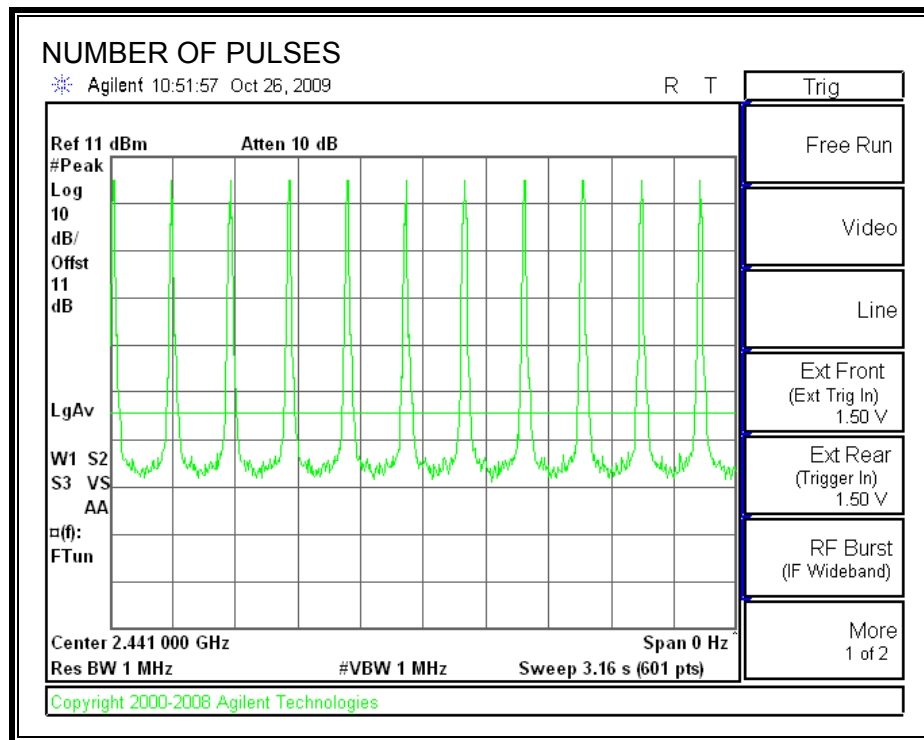
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH3)**



# PULSE WIDTH (DH5)



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH5)**





## **7.5. OUTPUT POWER**

### **LIMIT**

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

### **TEST PROCEDURE**

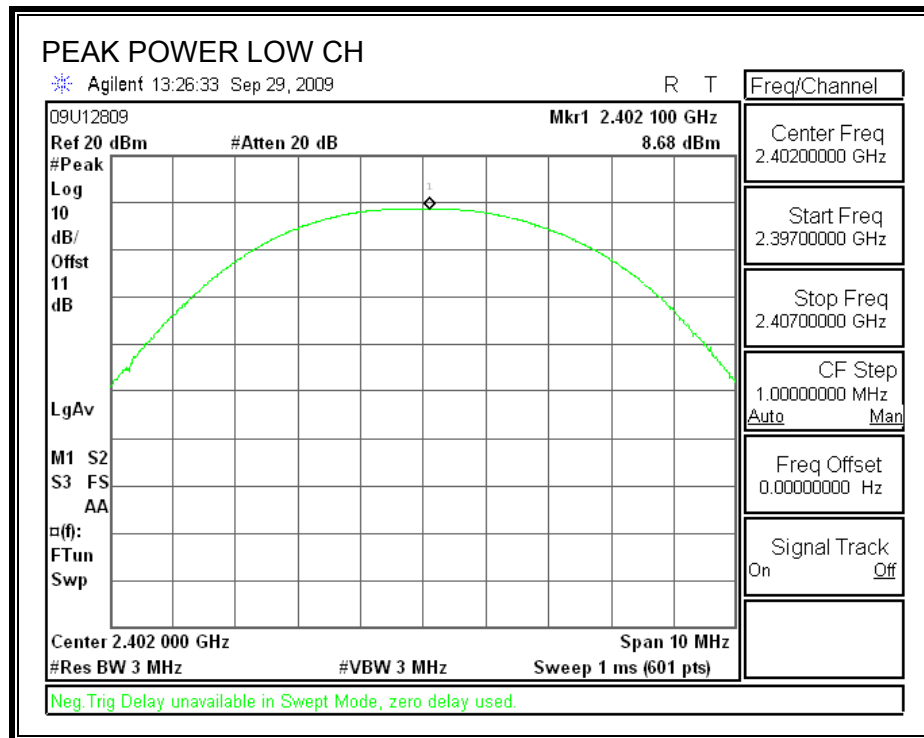
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

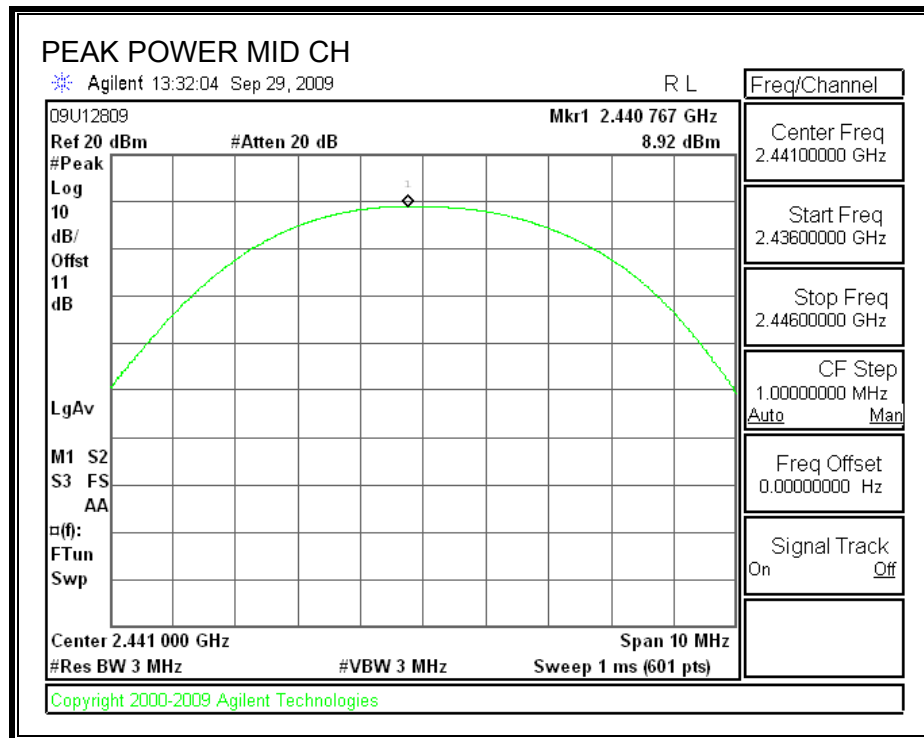
### 7.5.1. CLASS I RESULTS

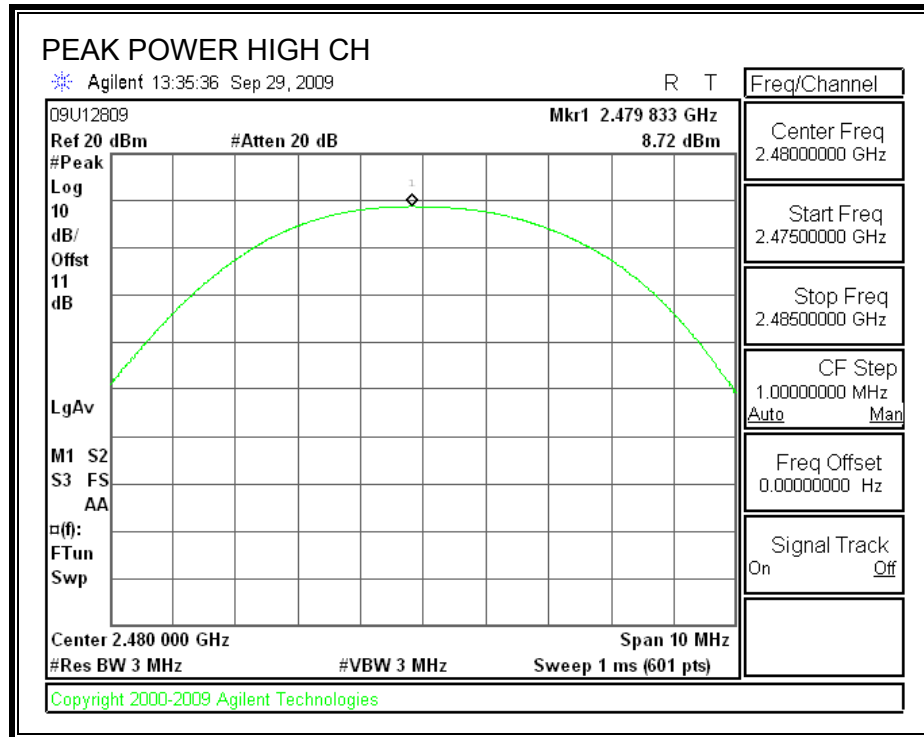
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.68	30	-21.32
Middle	2441	8.92	30	-21.08
High	2480	8.72	30	-21.28

## OUTPUT POWER







## 7.5.2. CLASS II RESULTS

### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.41	30	-26.59
Middle	2441	3.23	30	-26.77
High	2480	2.62	30	-27.38

## **7.6. AVERAGE POWER**

### **LIMIT**

None; for reporting purposes only.

### **TEST PROCEDURE**

The transmitter output is connected to a power meter.

### 7.6.1. CLASS I RESULTS

#### **RESULTS**

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.40
Middle	2441	8.30
High	2480	8.32



## 7.6.2. CLASS II RESULTS

### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	3.15
Middle	2441	3.12
High	2480	2.14

## **7.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

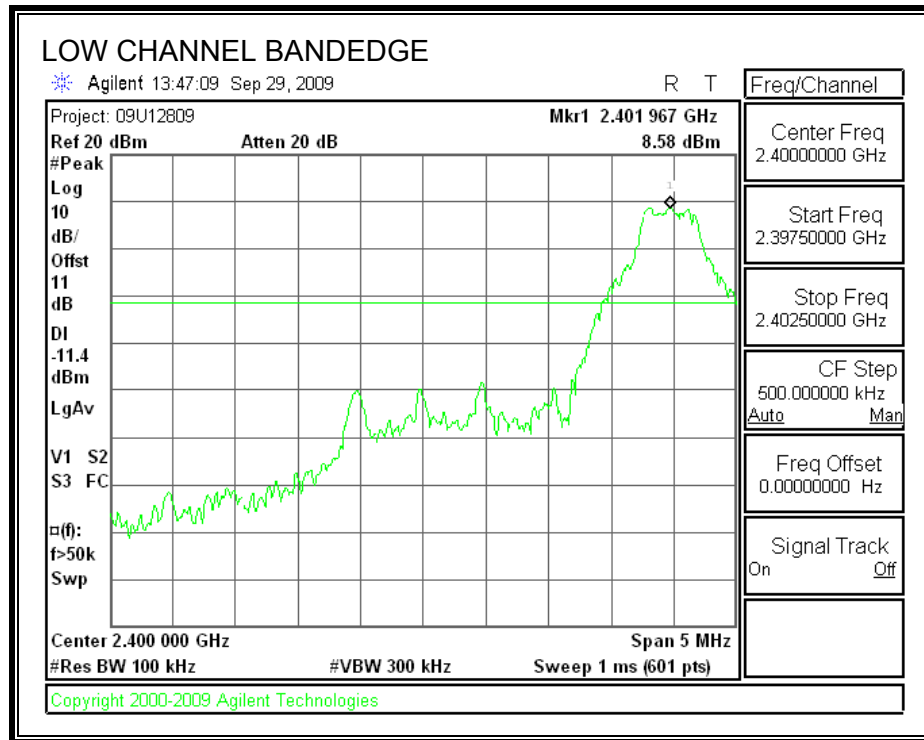
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

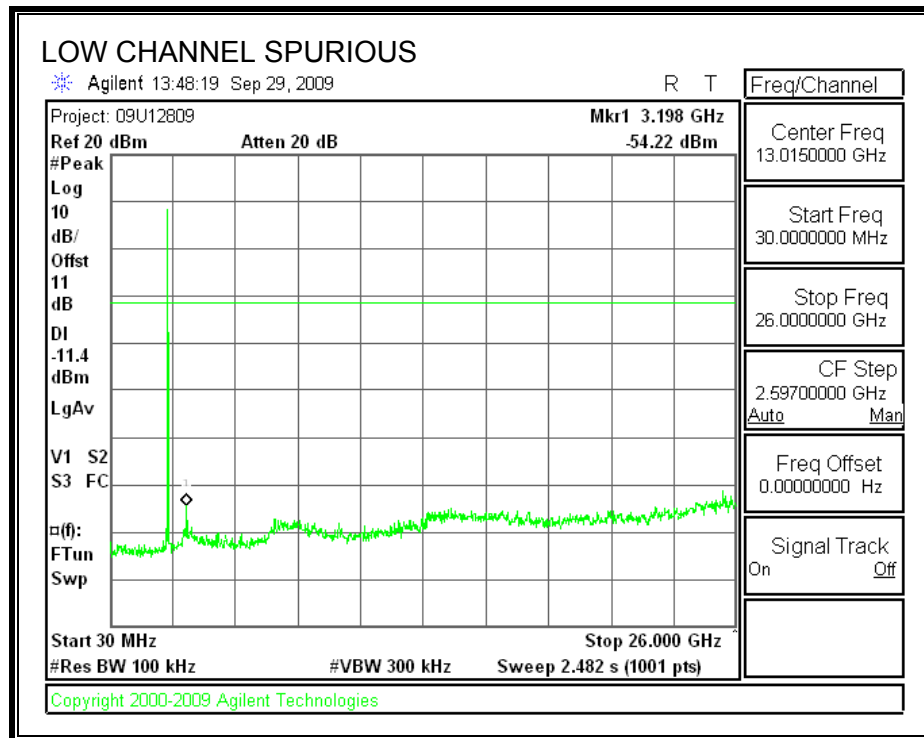
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

## 7.7.1. CLASS I RESULTS

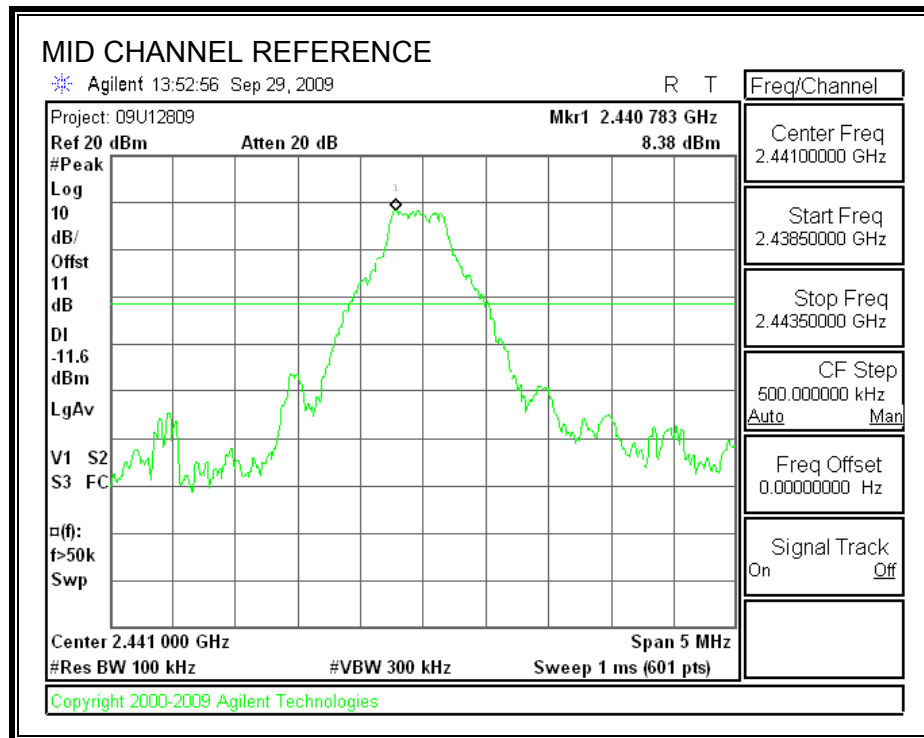
### RESULTS

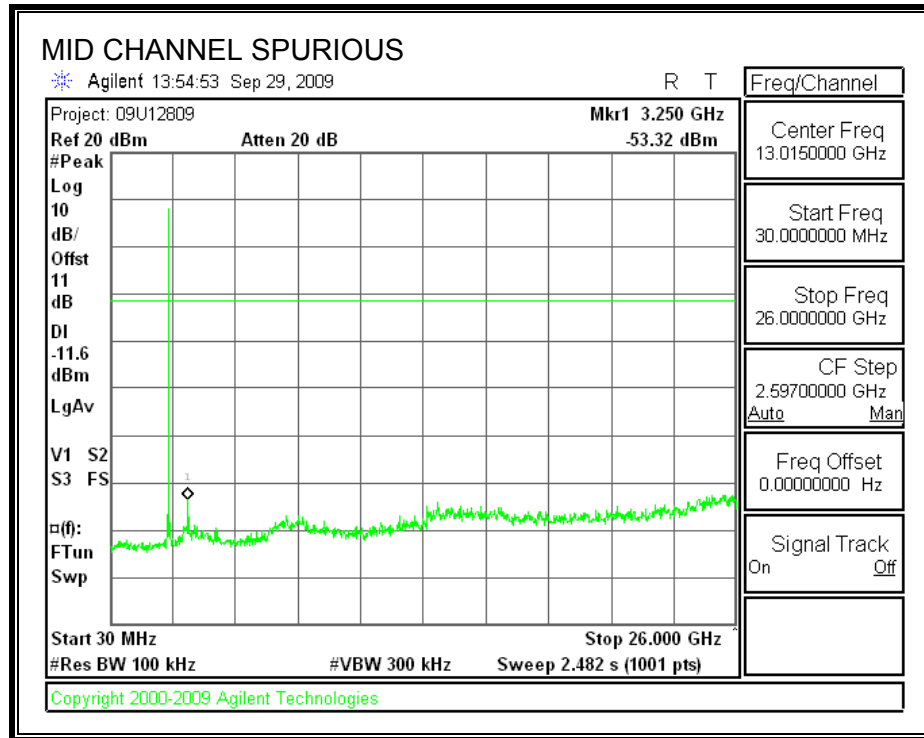
#### SPURIOUS EMISSIONS, LOW CHANNEL



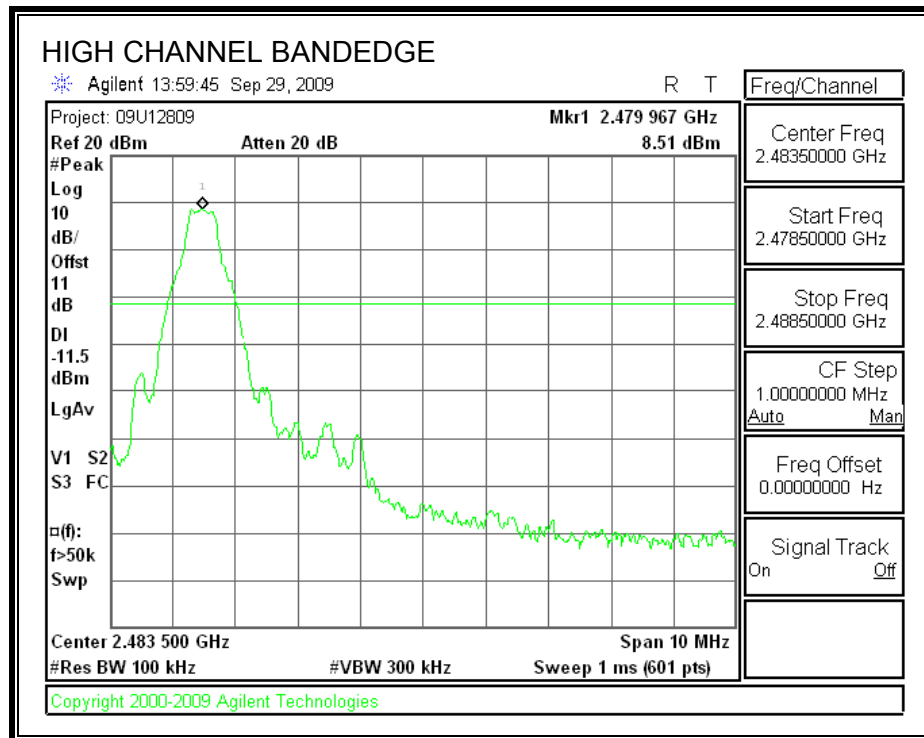


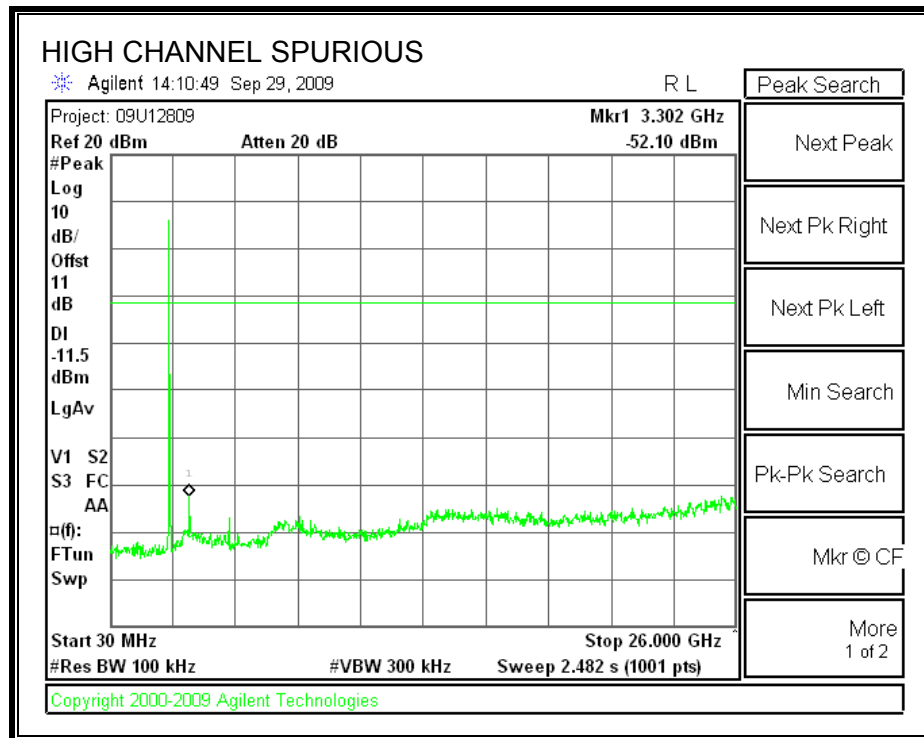
**SPURIOUS EMISSIONS, MID CHANNEL**





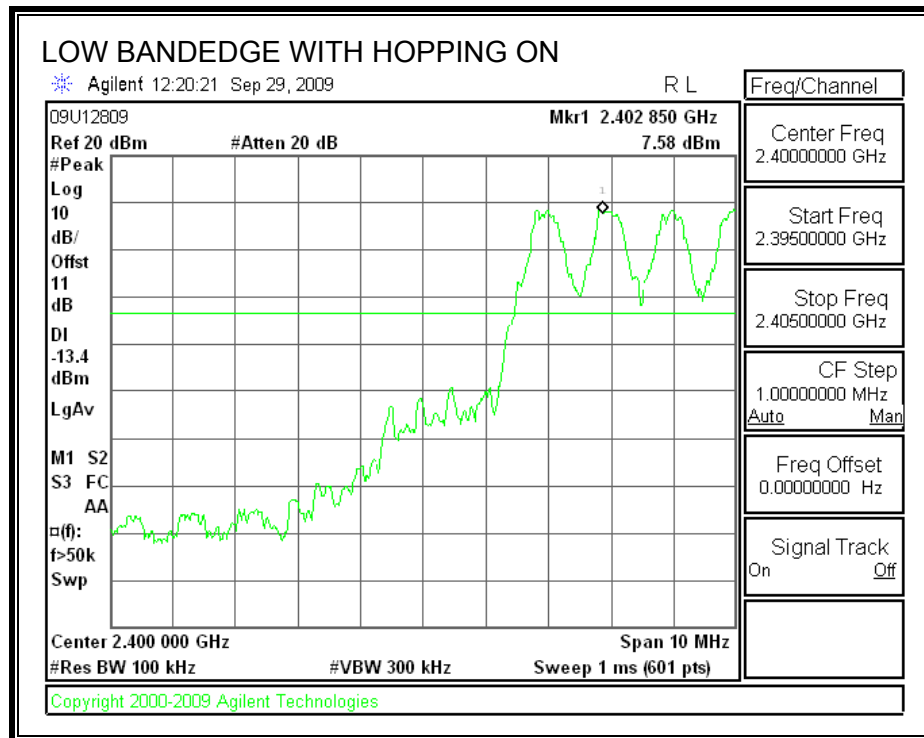
**SPURIOUS EMISSIONS, HIGH CHANNEL**

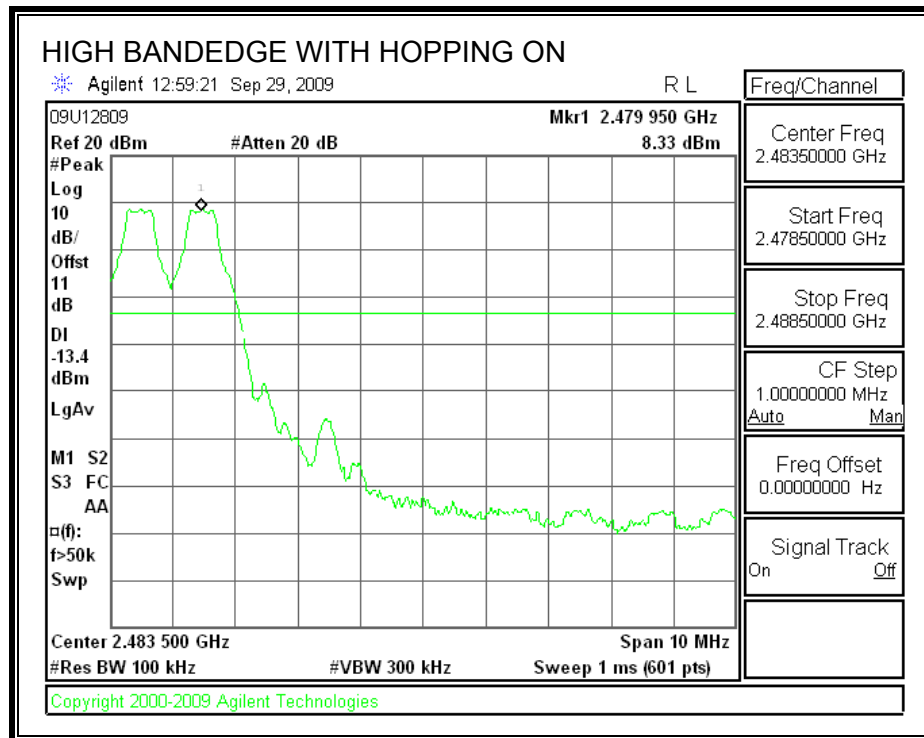






**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**

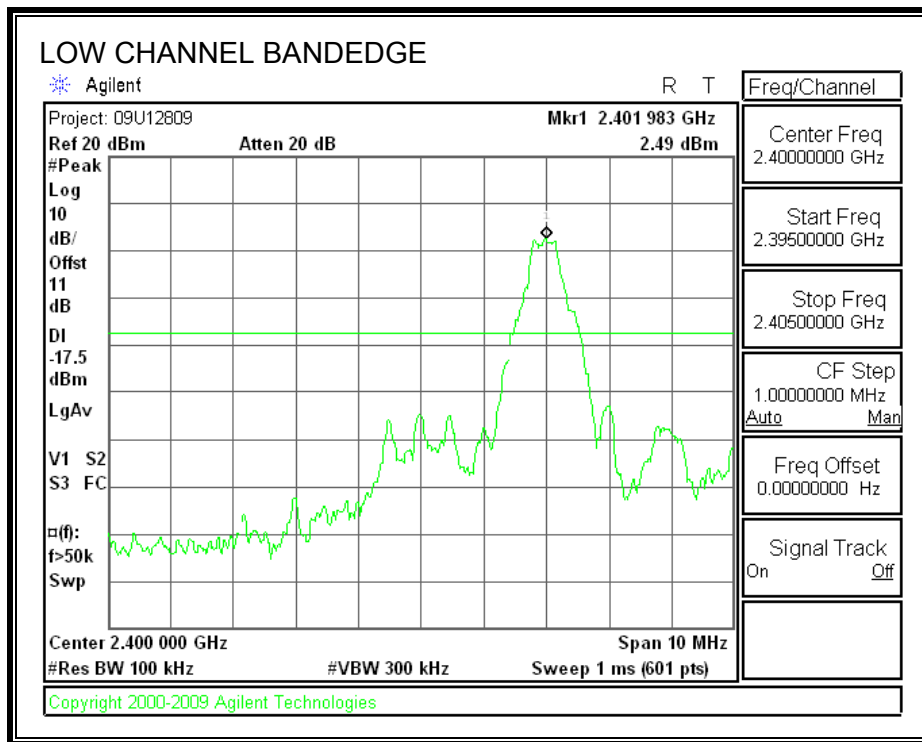


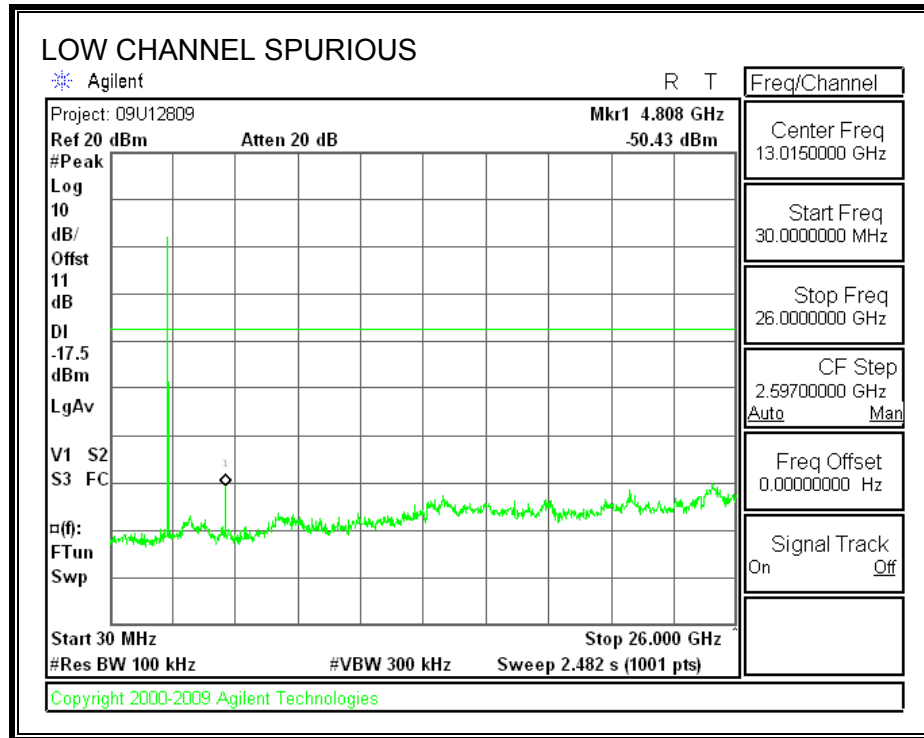


## 7.7.2. CLASS II RESULTS

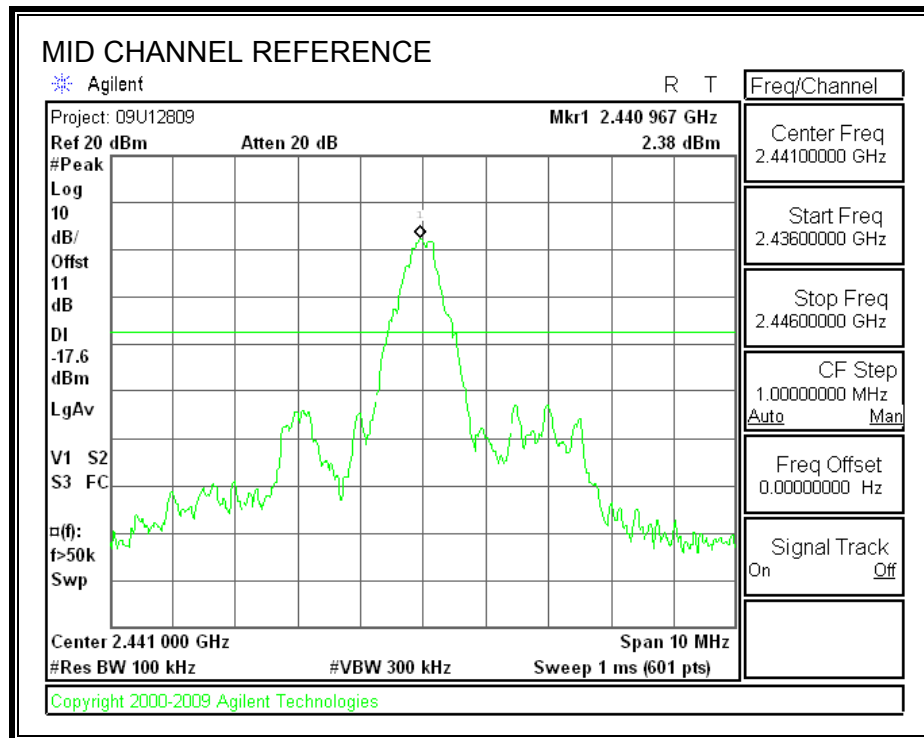
### RESULTS

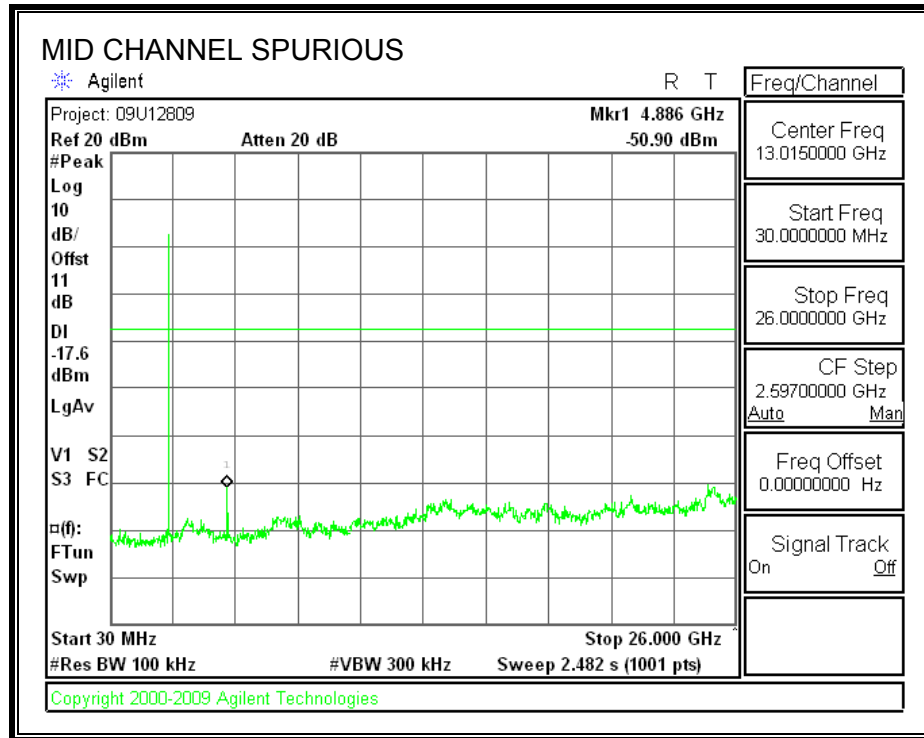
#### SPURIOUS EMISSIONS, LOW CHANNEL



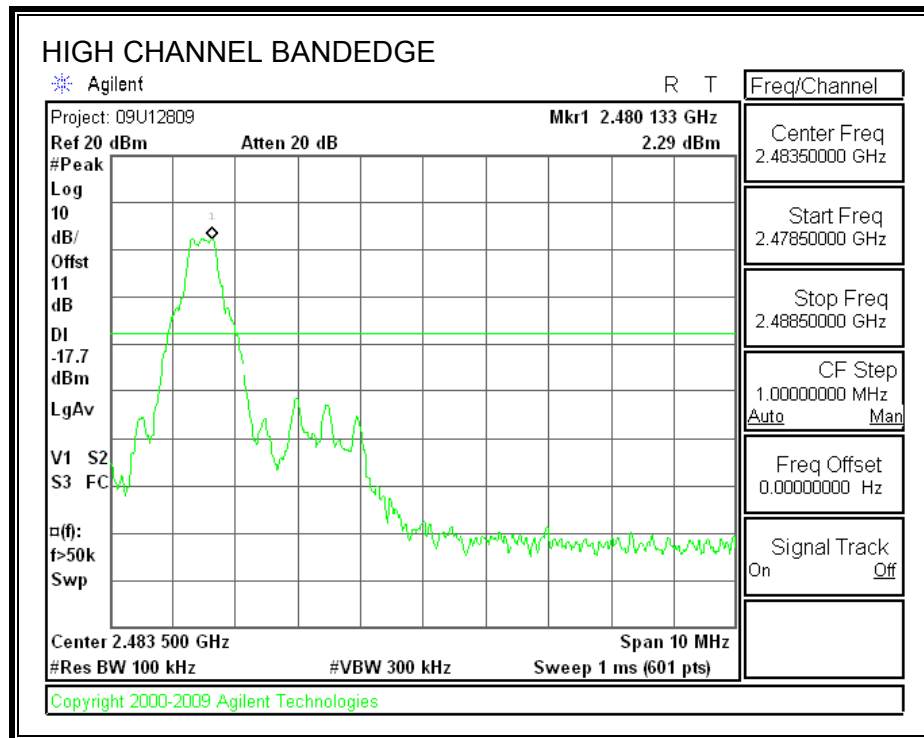


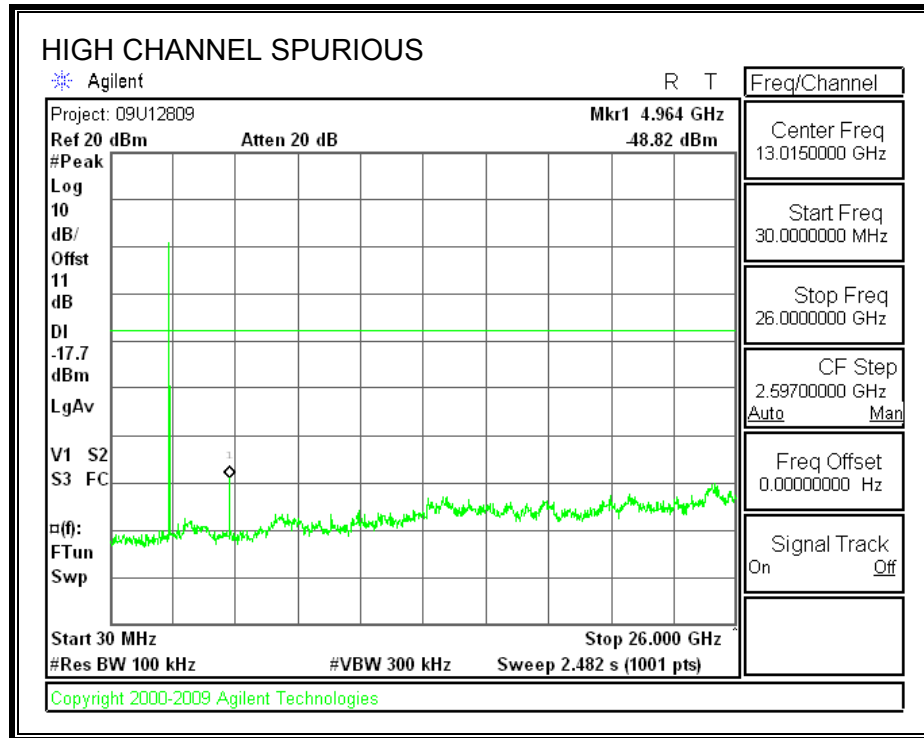
**SPURIOUS EMISSIONS, MID CHANNEL**





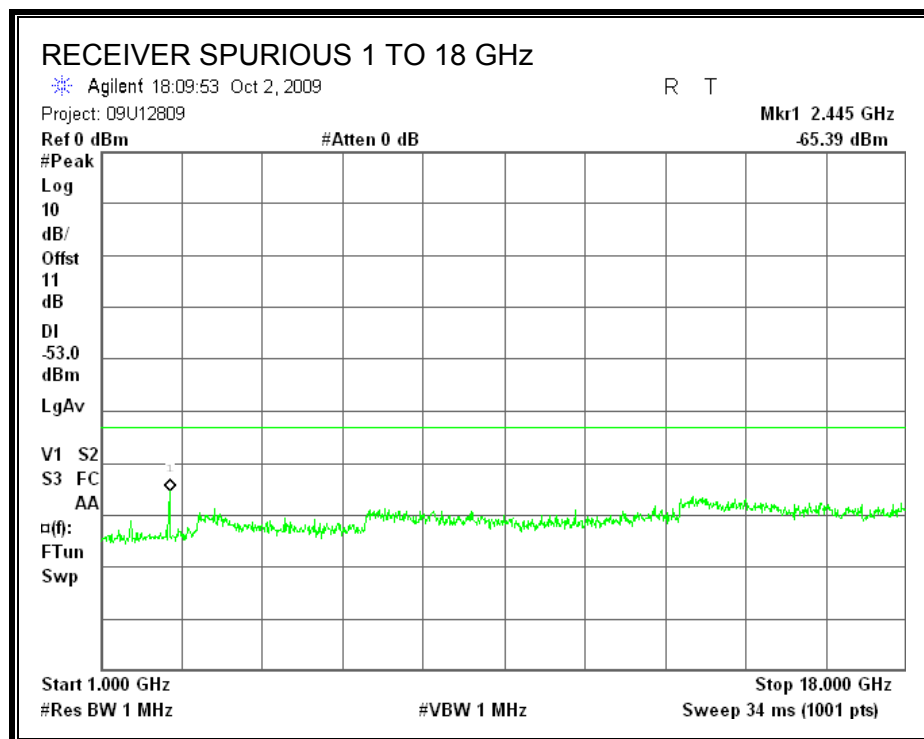
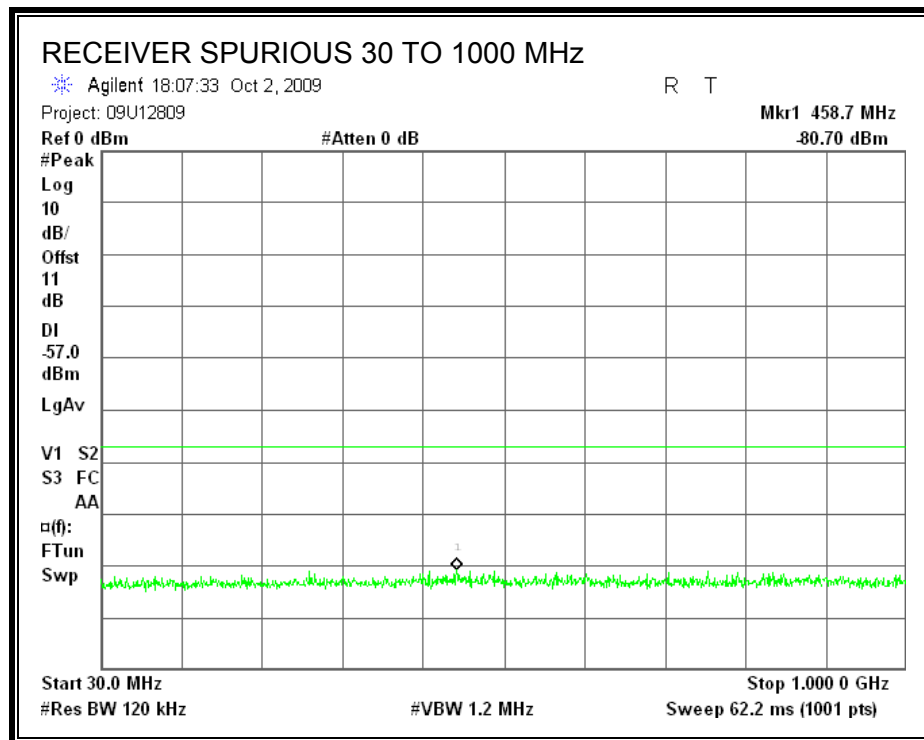
**SPURIOUS EMISSIONS, HIGH CHANNEL**







## 7.8. RECEIVER ABOVE 1 GHz



## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

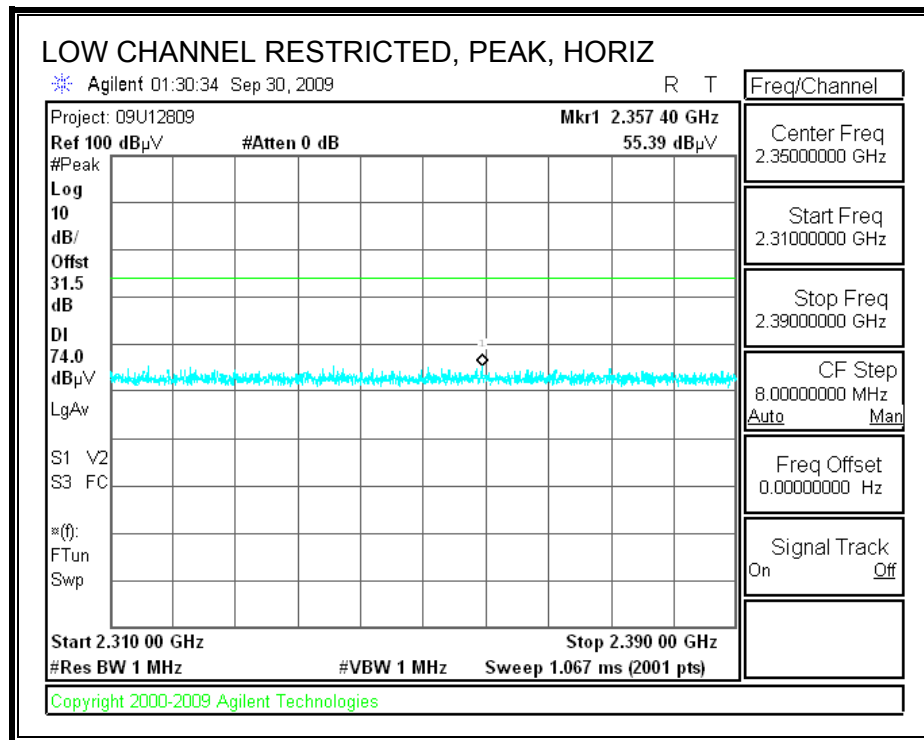
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

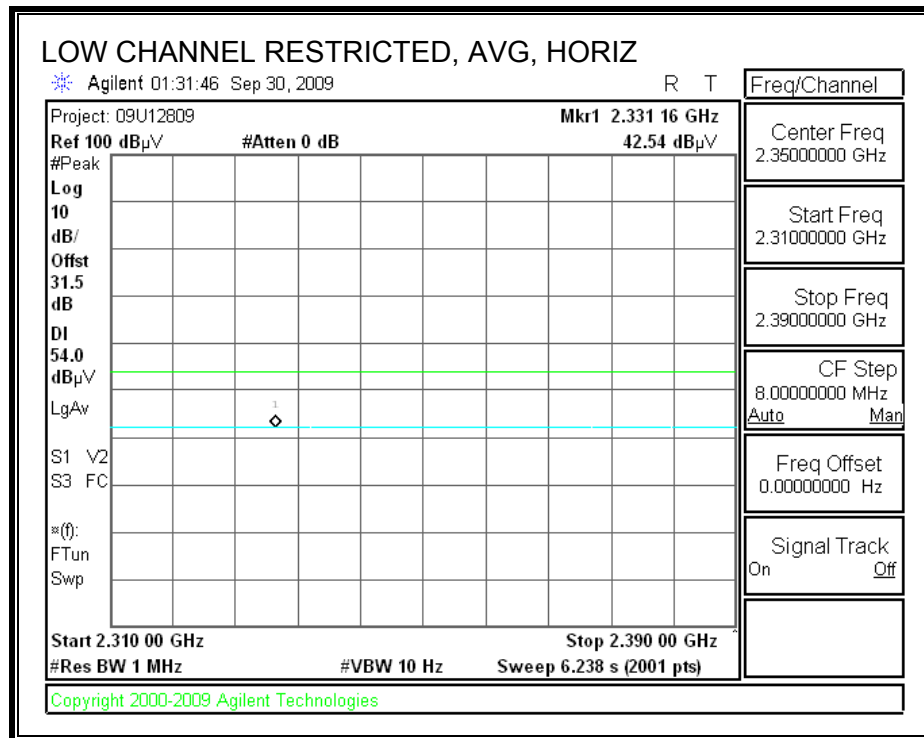
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 8.2. TRANSMITTER ABOVE 1 GHz (CLASS I)

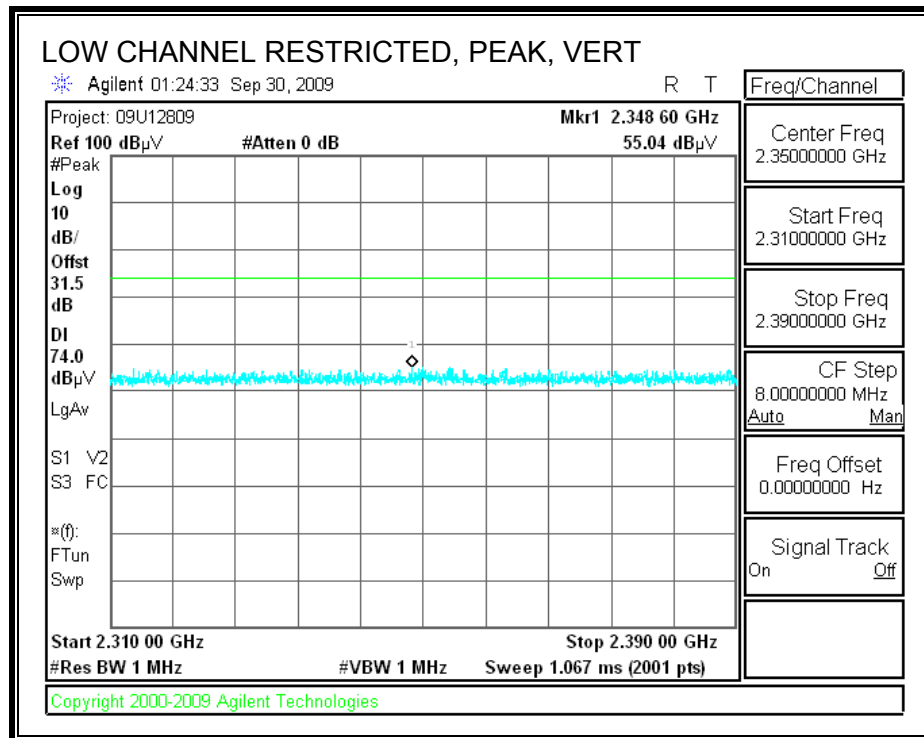
### 8.2.1. WHIP DIPOLE, Nearson/Pulse, 2.14 dBi

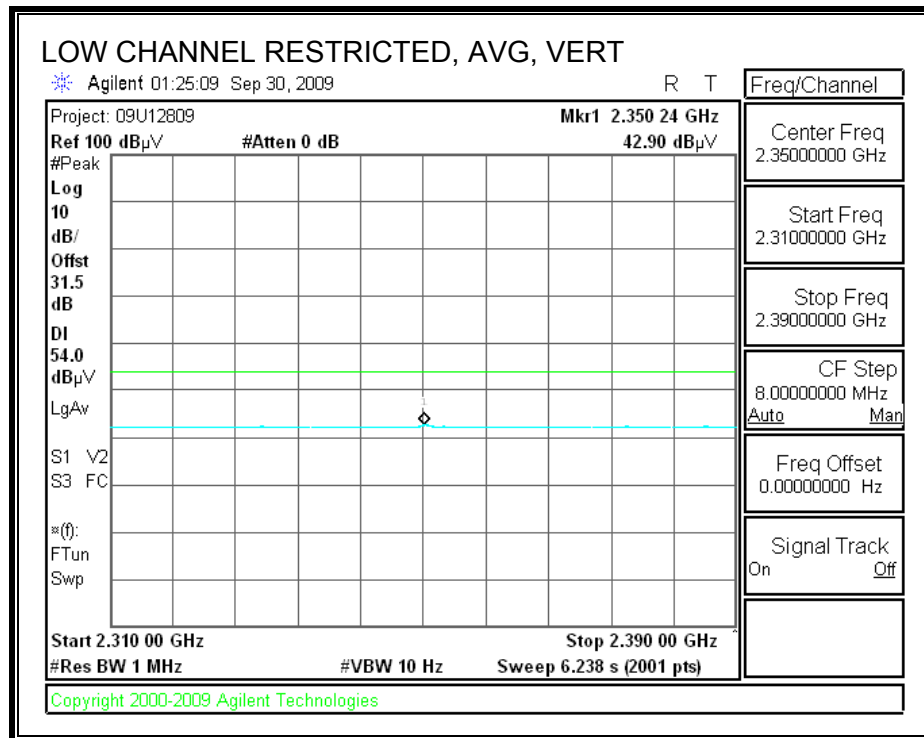
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



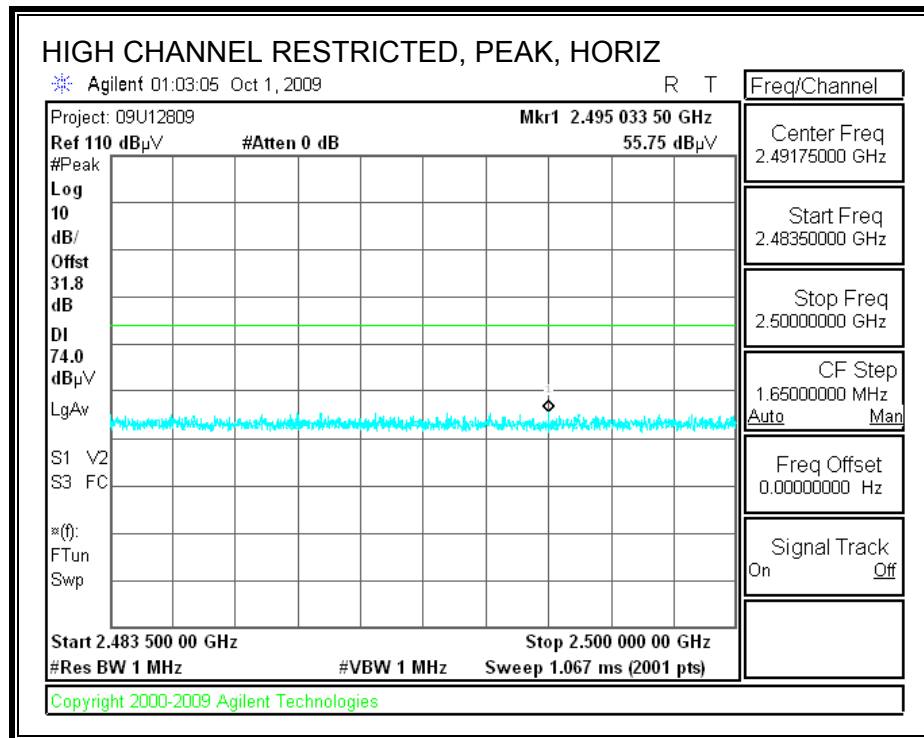


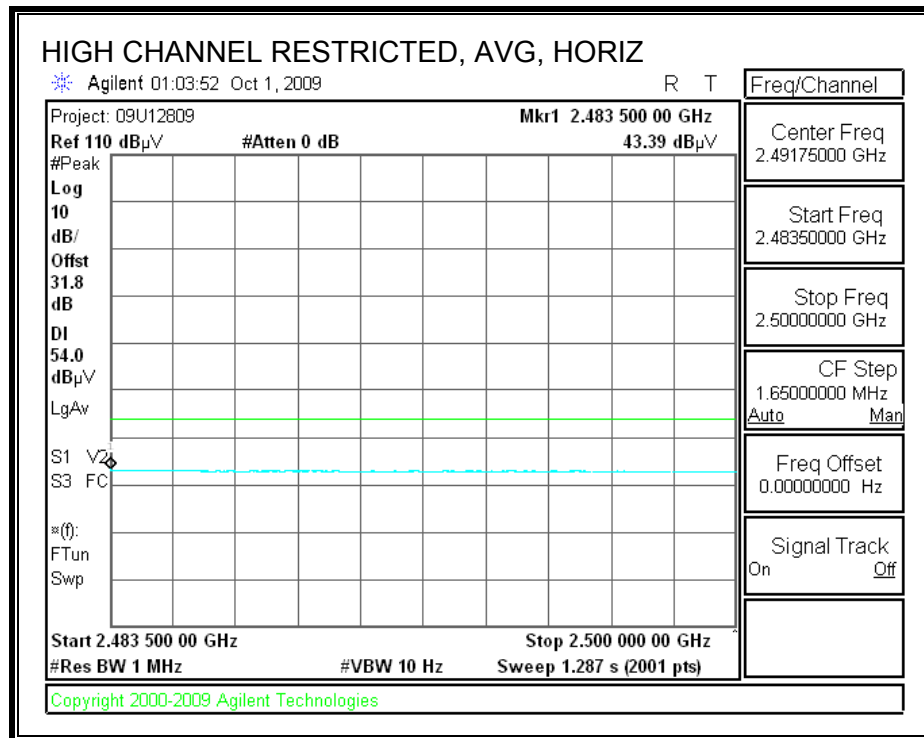
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**





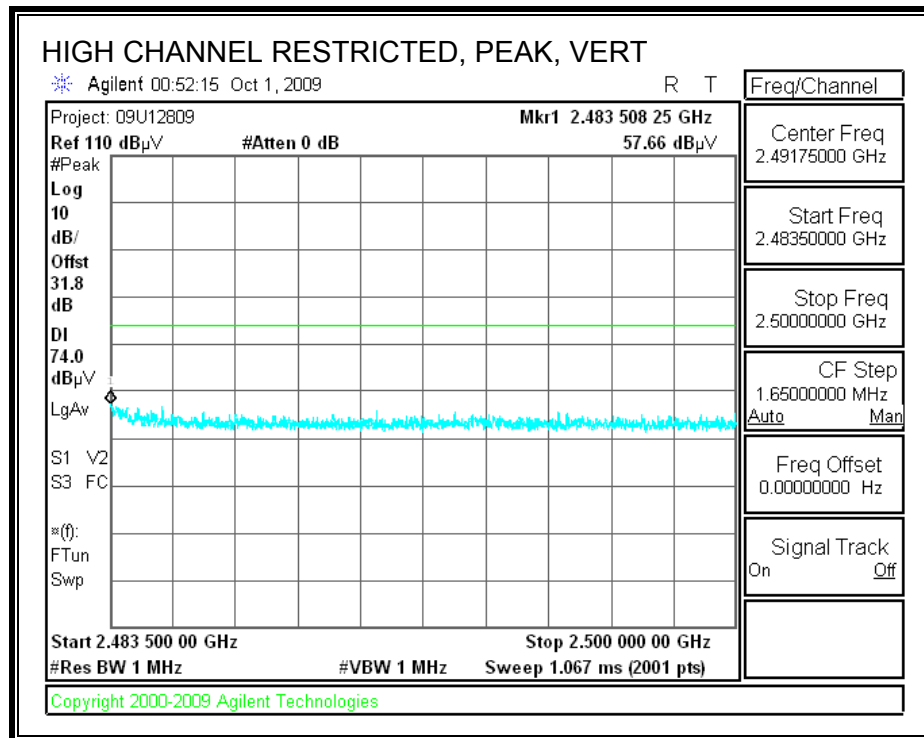
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**

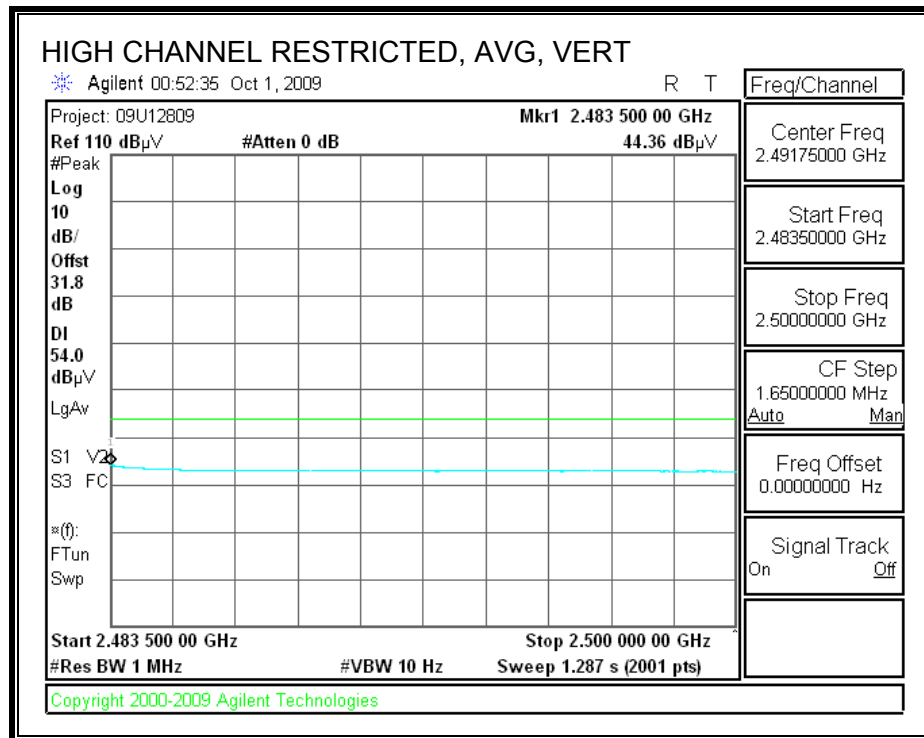






**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





# **HARMONICS AND SPURIOUS EMISSIONS**

## **High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/01/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with WHIP Dipole 2.14 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit  
f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

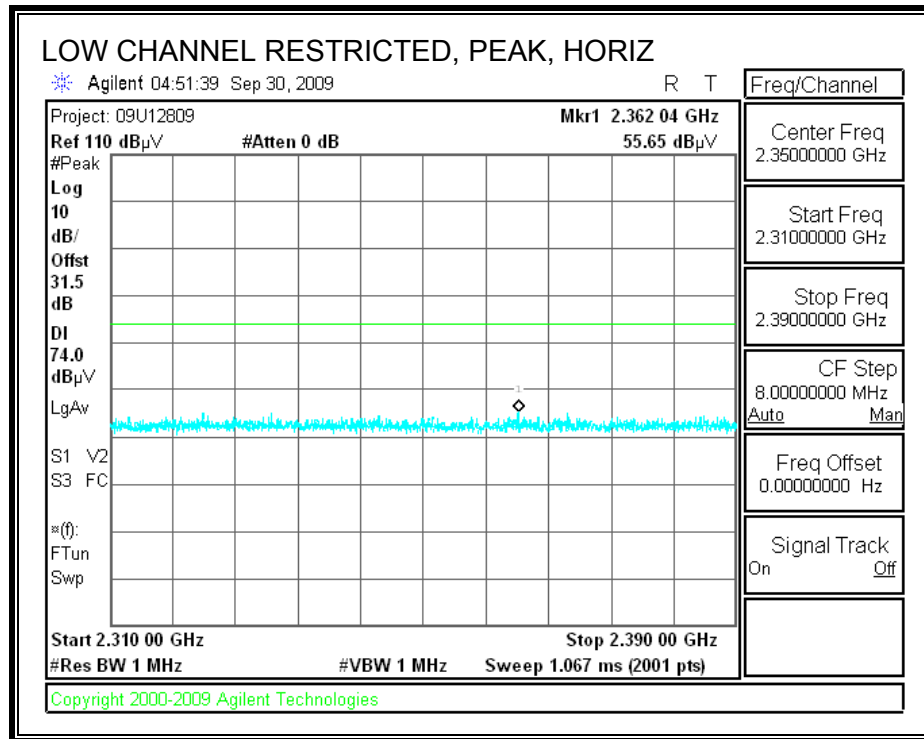
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant Pol V/H	Det P/A/QP	Ant High cm	Table Angle Degree	Notes
<b>Low Channel 2402 MHz</b>															
4.804	3.0	60.5	32.7	5.8	-34.8	0.0	0.0	64.1	74.0	-9.9	H	P	162.0	49.0	Whip dipole 2.14 dBi
4.804	3.0	34.1	32.7	5.8	-34.8	0.0	0.0	37.7	54.0	-16.3	H	A	162.0	49.0	Whip dipole 2.14 dBi
7.206	3.0	35.3	35.4	7.2	-34.2	0.0	0.0	43.7	74.0	-30.3	H	P	162.0	49.0	Whip dipole 2.14 dBi
7.206	3.0	22.5	35.4	7.2	-34.2	0.0	0.0	30.9	54.0	-23.1	H	A	162.0	49.0	Whip dipole 2.14 dBi
4.804	3.0	62.4	32.7	5.8	-34.8	0.0	0.0	66.0	74.0	-8.0	V	P	99.0	226.0	Whip dipole 2.14 dBi
4.804	3.0	34.8	32.7	5.8	-34.8	0.0	0.0	38.4	54.0	-15.6	V	A	99.0	226.0	Whip dipole 2.14 dBi
7.206	3.0	34.0	35.4	7.2	-34.2	0.0	0.0	42.5	74.0	-31.5	V	P	100.0	226.0	Whip dipole 2.14 dBi
7.206	3.0	21.7	35.4	7.2	-34.2	0.0	0.0	30.1	54.0	-23.9	V	A	100.0	226.0	Whip dipole 2.14 dBi
<b>Mid Channel 2441 MHz</b>															
4.882	3.0	56.9	32.7	5.8	-34.8	0.0	0.0	60.6	74.0	-13.4	H	P	100.0	73.0	Whip dipole 2.14 dBi
4.882	3.0	31.1	32.7	5.8	-34.8	0.0	0.0	34.9	54.0	-19.1	H	A	100.0	73.0	Whip dipole 2.14 dBi
7.323	3.0	34.0	35.5	7.3	-34.1	0.0	0.0	42.7	74.0	-31.4	H	P	99.0	73.0	Whip dipole 2.14 dBi
7.323	3.0	21.5	35.5	7.3	-34.1	0.0	0.0	30.1	54.0	-23.9	H	A	99.0	73.0	Whip dipole 2.14 dBi
4.882	3.0	63.4	32.7	5.8	-34.8	0.0	0.0	67.1	74.0	-6.9	V	P	116.0	100.0	Whip dipole 2.14 dBi
4.882	3.0	33.7	32.7	5.8	-34.8	0.0	0.0	37.4	54.0	-16.6	V	A	116.0	100.0	Whip dipole 2.14 dBi
7.323	3.0	34.9	35.5	7.3	-34.1	0.0	0.0	43.6	74.0	-30.4	V	P	116.0	100.0	Whip dipole 2.14 dBi
7.323	3.0	22.4	35.5	7.3	-34.1	0.0	0.0	31.1	54.0	-22.9	V	A	116.0	100.0	Whip dipole 2.14 dBi
<b>High Channel 2480 MHz</b>															
4.960	3.0	59.4	32.8	5.9	-34.8	0.0	0.0	63.3	74.0	-10.7	H	P	172.0	65.0	Whip dipole 2.14 dBi
4.960	3.0	31.5	32.8	5.9	-34.8	0.0	0.0	35.3	54.0	-18.7	H	A	172.0	65.0	Whip dipole 2.14 dBi
7.440	3.0	33.8	35.6	7.3	-34.1	0.0	0.0	42.7	74.0	-31.3	H	P	172.0	64.0	Whip dipole 2.14 dBi
7.440	3.0	21.5	35.6	7.3	-34.1	0.0	0.0	30.4	54.0	-23.6	H	A	172.0	64.0	Whip dipole 2.14 dBi
4.960	3.0	62.9	32.8	5.9	-34.8	0.0	0.0	66.7	74.0	-7.3	V	P	114.0	105.0	Whip dipole 2.14 dBi
4.960	3.0	32.8	32.8	5.9	-34.8	0.0	0.0	36.7	54.0	-17.3	V	A	114.0	105.0	Whip dipole 2.14 dBi
7.440	3.0	33.6	35.6	7.3	-34.1	0.0	0.0	42.5	74.0	-31.5	V	P	113.0	105.0	Whip dipole 2.14 dBi
7.440	3.0	21.4	35.6	7.3	-34.1	0.0	0.0	30.3	54.0	-23.7	V	A	113.0	105.0	Whip dipole 2.14 dBi

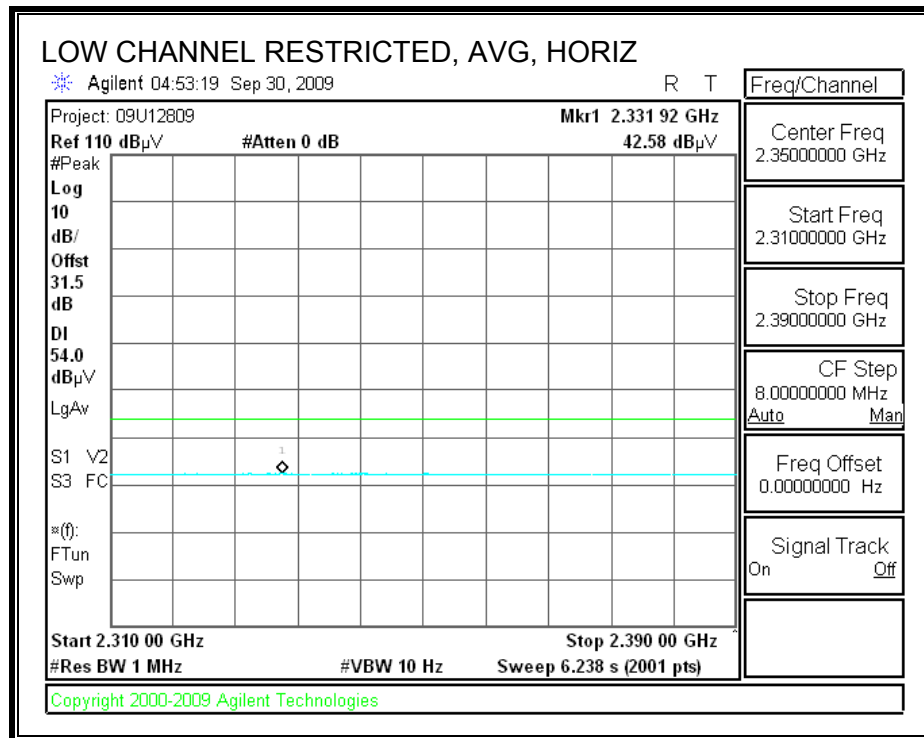
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

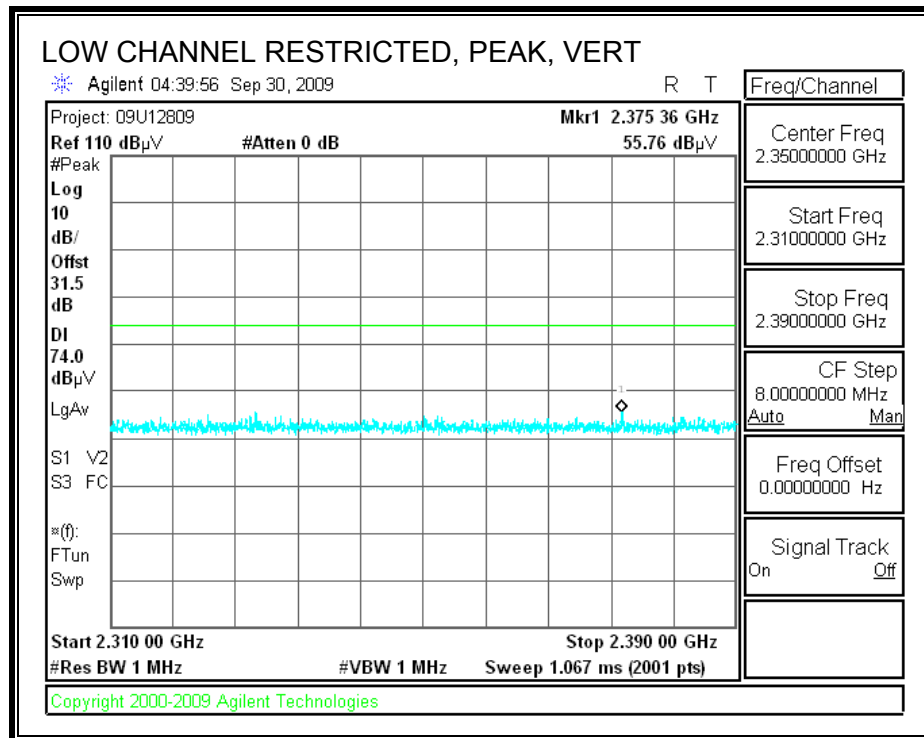
## 8.2.2. PCB/Flex Circuit Dipole, NanoBlade, 3.8dBi

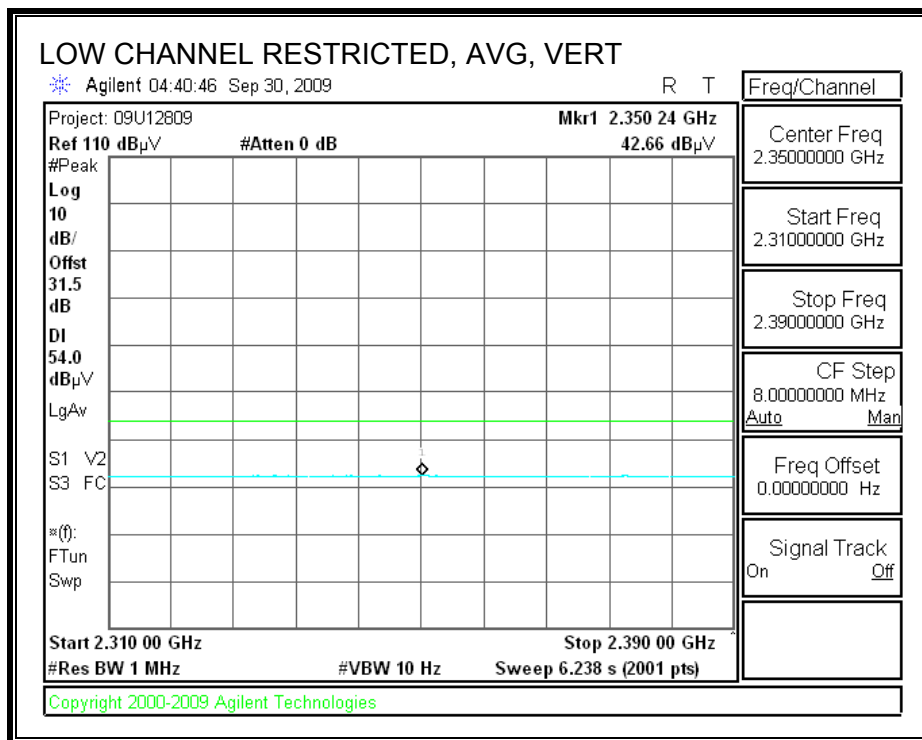
### RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



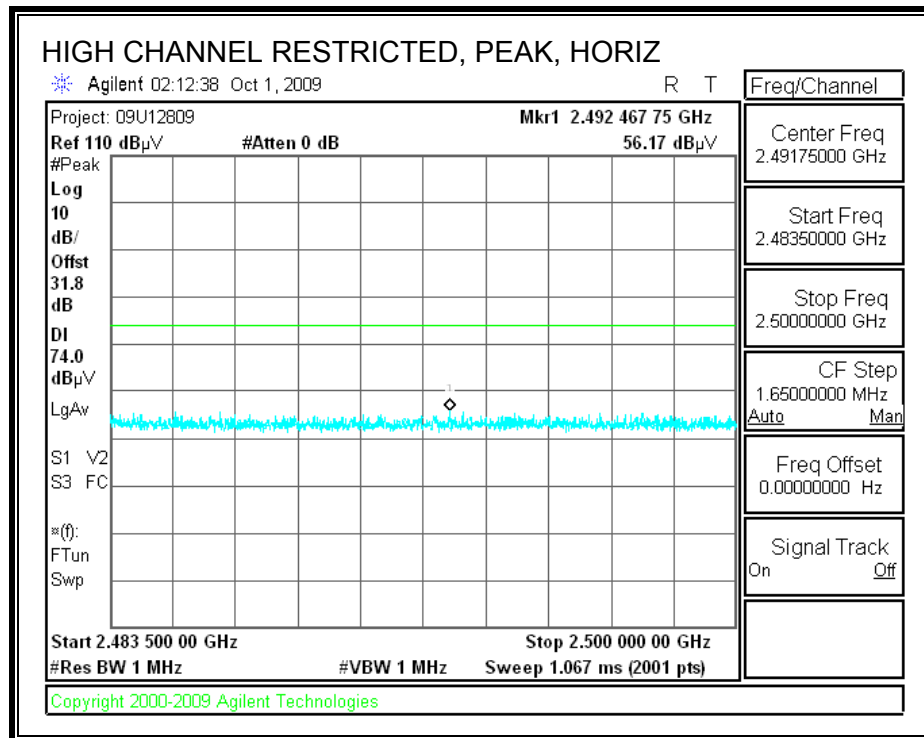


**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

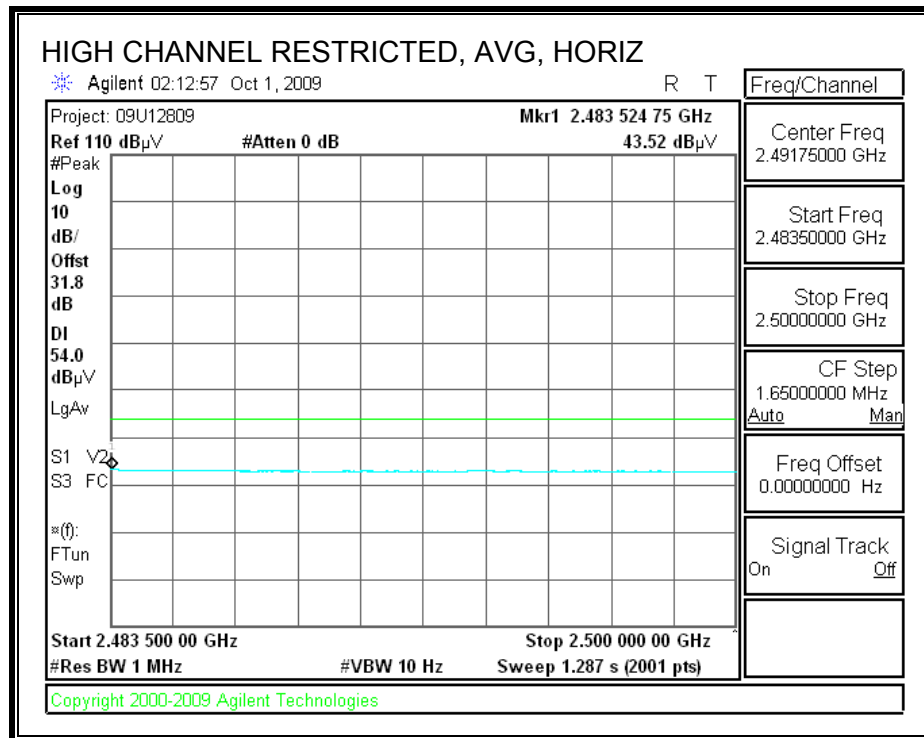




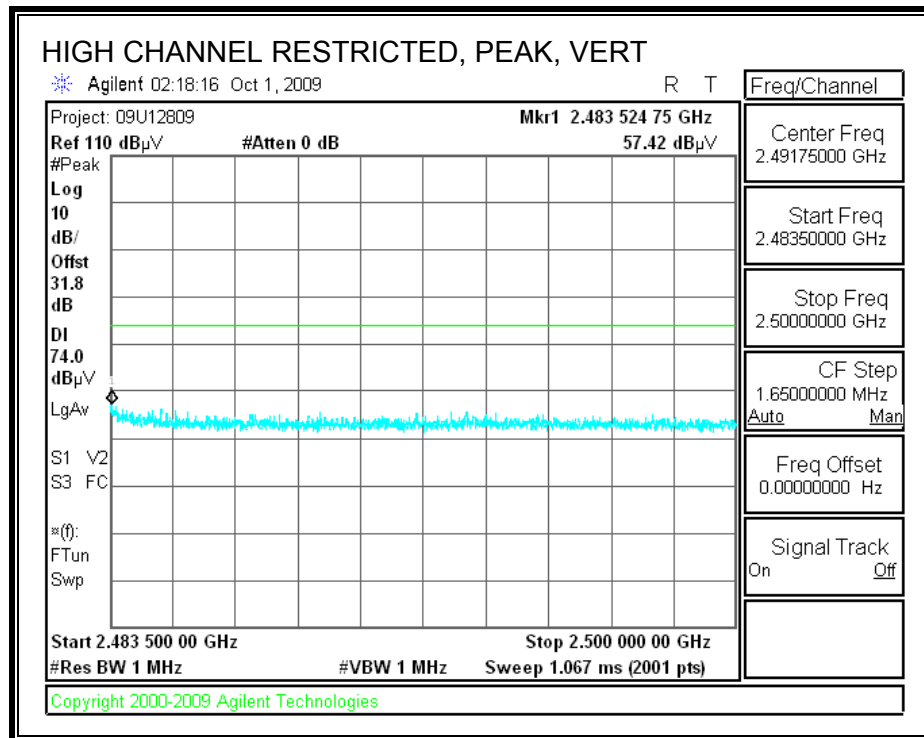
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**

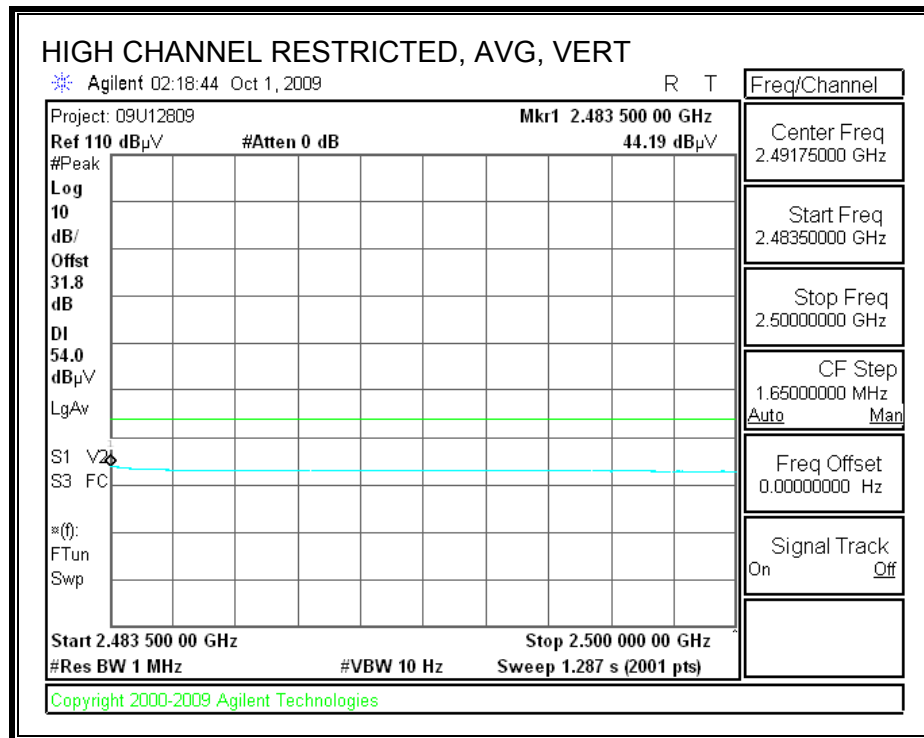






**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





# **HARMONICS AND SPURIOUS EMISSIONS**

## **High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen

Date: 10/01/09

Project #: 09U12809

Company: Datalogic Scanning, Inc.

EUT Description: Bluetooth Modules (CSR chipset) with NanoBlade Dipole 3.8 dBi

EUT M/N: Modules on JIG w/ AC adapter

Test Target: FCC Class B

Mode Oper: Continuous Transmit

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

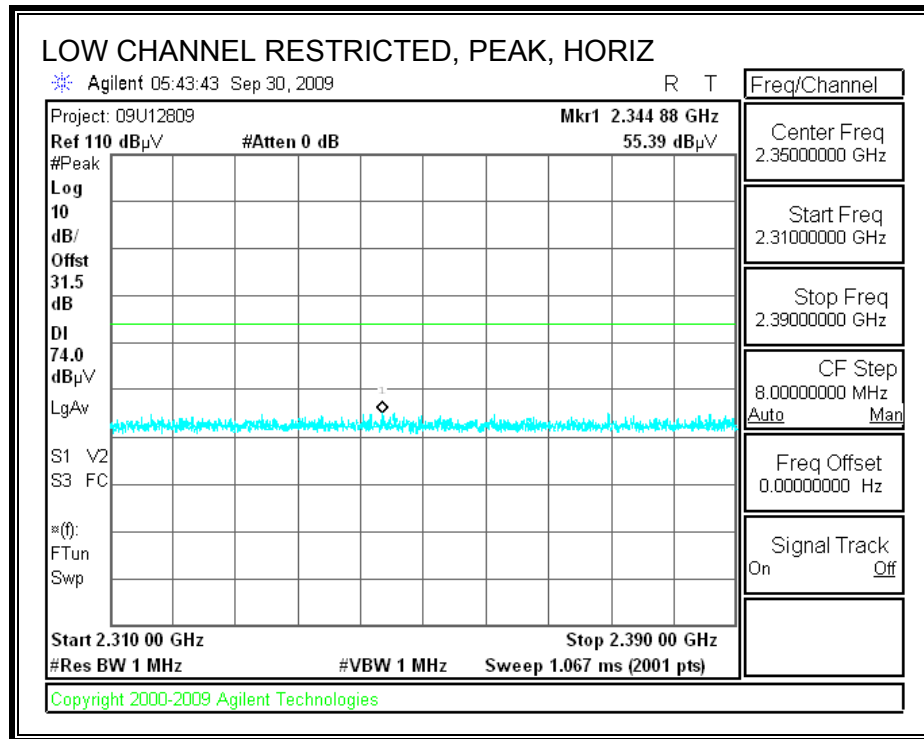
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
<b>Low Channel 2402 MHz</b>															
4.804	3.0	60.2	32.7	5.8	-34.8	0.0	0.0	63.8	74.0	-10.2	H	P	162.0	47.0	NanoBlade dipole 3.8 dBi
4.804	3.0	30.6	32.7	5.8	-34.8	0.0	0.0	34.2	54.0	-19.8	H	A	162.0	47.0	NanoBlade dipole 3.8 dBi
7.206	3.0	33.7	35.4	7.2	-34.2	0.0	0.0	42.2	74.0	-31.8	H	P	161.0	47.0	NanoBlade dipole 3.8 dBi
7.206	3.0	21.5	35.4	7.2	-34.2	0.0	0.0	29.9	54.0	-24.1	H	A	161.0	47.0	NanoBlade dipole 3.8 dBi
4.804	3.0	62.8	32.7	5.8	-34.8	0.0	0.0	66.4	74.0	-7.6	V	P	99.0	226.0	NanoBlade dipole 3.8 dBi
4.804	3.0	32.4	32.7	5.8	-34.8	0.0	0.0	36.0	54.0	-18.0	V	A	99.0	226.0	NanoBlade dipole 3.8 dBi
7.206	3.0	34.8	35.4	7.2	-34.2	0.0	0.0	43.2	74.0	-30.8	V	P	99.0	226.0	NanoBlade dipole 3.8 dBi
7.206	3.0	21.8	35.4	7.2	-34.2	0.0	0.0	30.2	54.0	-23.8	V	A	99.0	226.0	NanoBlade dipole 3.8 dBi
<b>Mid Channel 2441 MHz</b>															
4.882	3.0	60.7	32.7	5.8	-34.8	0.0	0.0	64.5	74.0	-9.5	H	P	172.0	73.0	NanoBlade dipole 3.8 dBi
4.882	3.0	30.5	32.7	5.8	-34.8	0.0	0.0	34.2	54.0	-19.8	H	A	172.0	73.0	NanoBlade dipole 3.8 dBi
7.323	3.0	33.4	35.5	7.3	-34.1	0.0	0.0	42.1	74.0	-31.9	H	P	172.0	73.0	NanoBlade dipole 3.8 dBi
7.323	3.0	21.3	35.5	7.3	-34.1	0.0	0.0	30.0	54.0	-24.0	H	A	172.0	73.0	NanoBlade dipole 3.8 dBi
4.882	3.0	64.8	32.7	5.8	-34.8	0.0	0.0	68.5	74.0	-5.5	V	P	114.0	101.0	NanoBlade dipole 3.8 dBi
4.882	3.0	32.4	32.7	5.8	-34.8	0.0	0.0	36.2	54.0	-17.8	V	A	114.0	101.0	NanoBlade dipole 3.8 dBi
7.323	3.0	35.1	35.5	7.3	-34.1	0.0	0.0	43.8	74.0	-30.2	V	P	114.0	101.0	NanoBlade dipole 3.8 dBi
7.323	3.0	22.9	35.5	7.3	-34.1	0.0	0.0	31.6	54.0	-22.4	V	A	114.0	101.0	NanoBlade dipole 3.8 dBi
<b>High Channel 2480 MHz</b>															
4.960	3.0	59.5	32.8	5.9	-34.8	0.0	0.0	63.4	74.0	-10.6	H	P	156.0	82.0	NanoBlade dipole 3.8 dBi
4.960	3.0	30.7	32.8	5.9	-34.8	0.0	0.0	34.6	54.0	-19.4	H	A	156.0	82.0	NanoBlade dipole 3.8 dBi
7.440	3.0	33.3	35.6	7.3	-34.1	0.0	0.0	42.2	74.0	-31.8	H	P	155.0	82.0	NanoBlade dipole 3.8 dBi
7.440	3.0	21.1	35.6	7.3	-34.1	0.0	0.0	30.0	54.0	-24.0	H	A	155.0	82.0	NanoBlade dipole 3.8 dBi
4.960	3.0	63.3	32.8	5.9	-34.8	0.0	0.0	67.1	74.0	-6.9	V	P	114.0	103.0	NanoBlade dipole 3.8 dBi
4.960	3.0	32.9	32.8	5.9	-34.8	0.0	0.0	36.8	54.0	-17.2	V	A	114.0	103.0	NanoBlade dipole 3.8 dBi
7.440	3.0	34.1	35.6	7.3	-34.1	0.0	0.0	43.0	74.0	-31.0	V	P	113.0	103.0	NanoBlade dipole 3.8 dBi
7.440	3.0	21.7	35.6	7.3	-34.1	0.0	0.0	30.6	54.0	-23.4	V	A	113.0	103.0	NanoBlade dipole 3.8 dBi

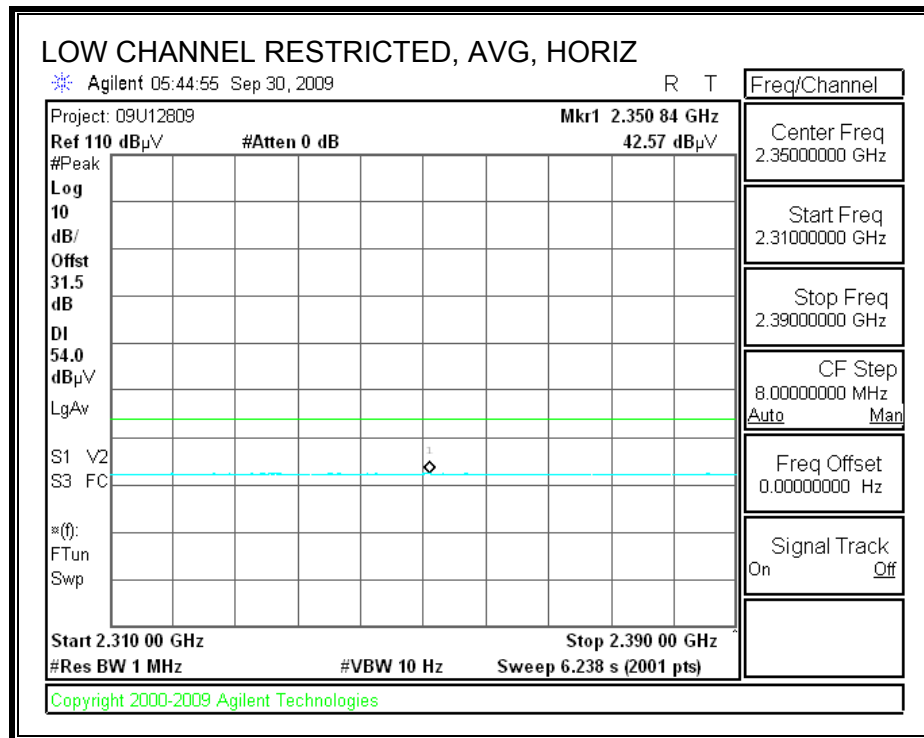
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

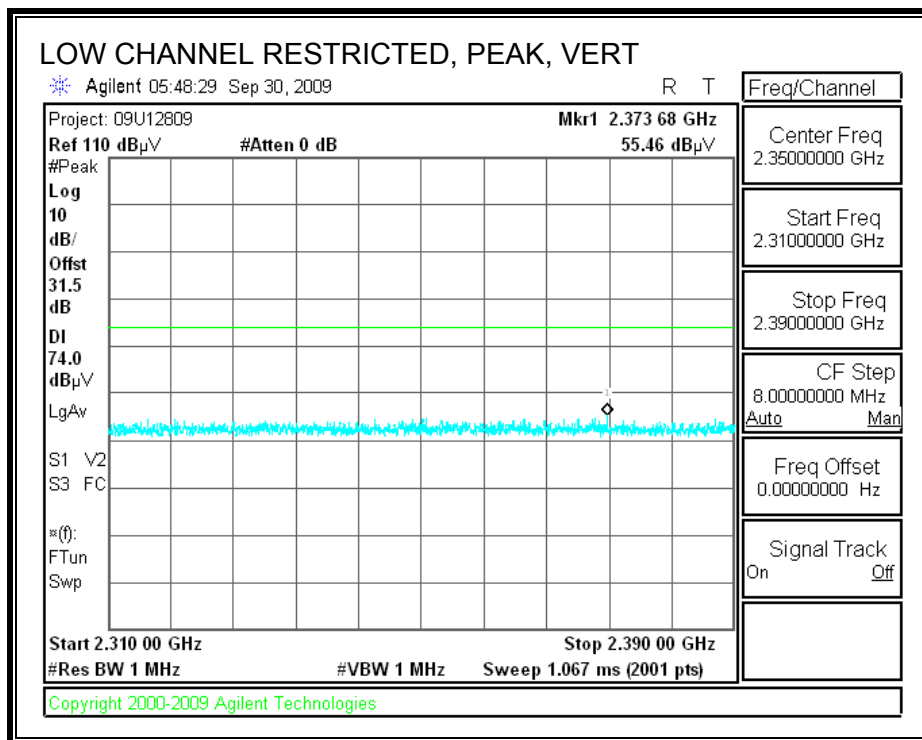
### 8.2.3. PCB Dipole, NanoBlue, 2dBi

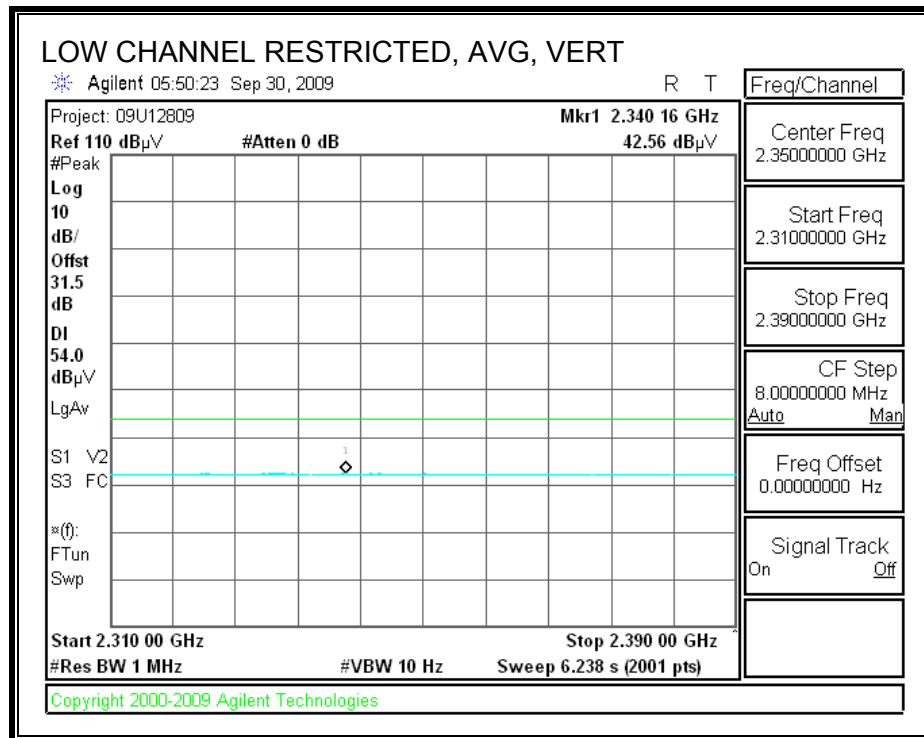
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





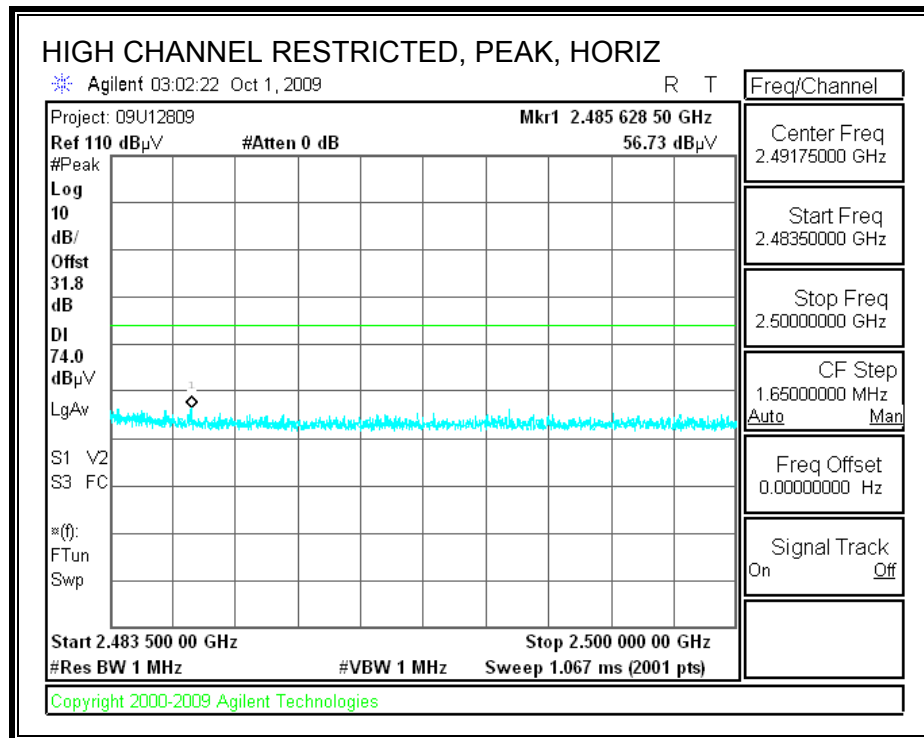
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

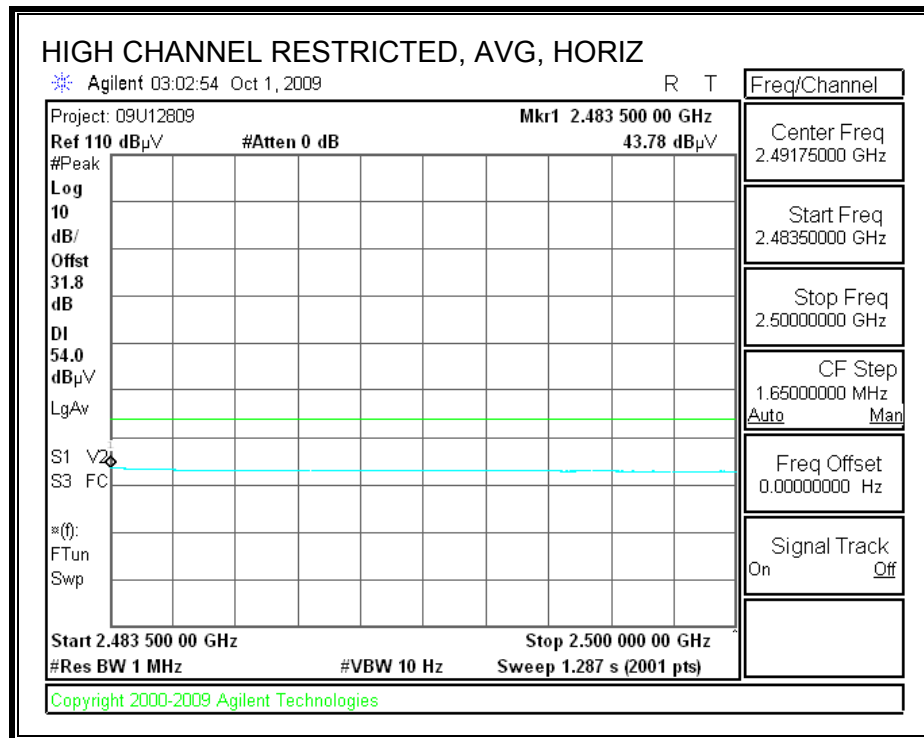




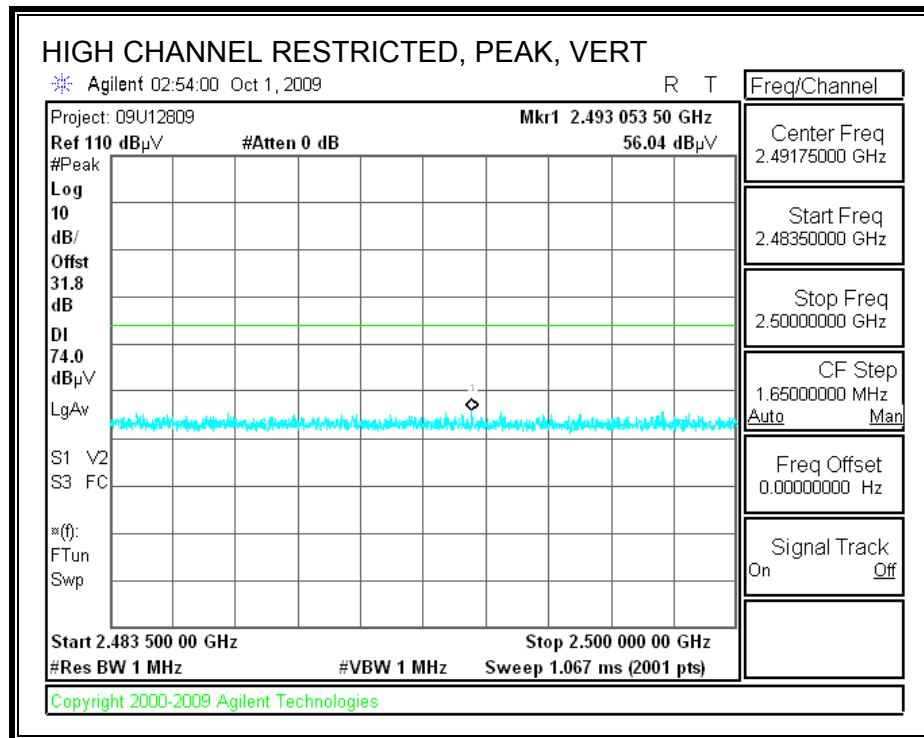


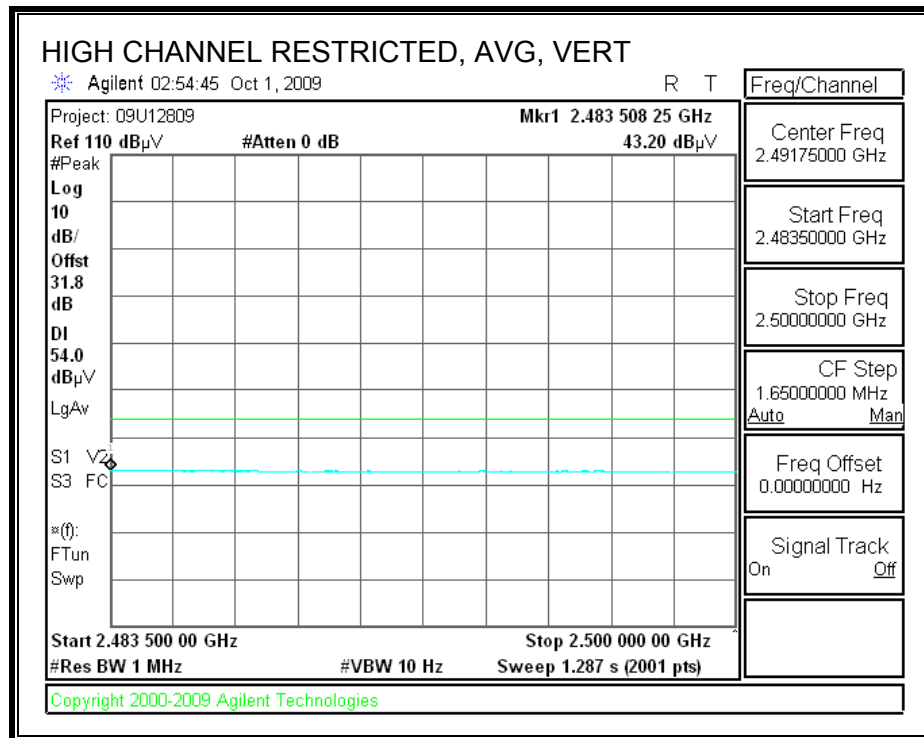
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/01/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with NanoBlue Dipole 2 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit  
f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

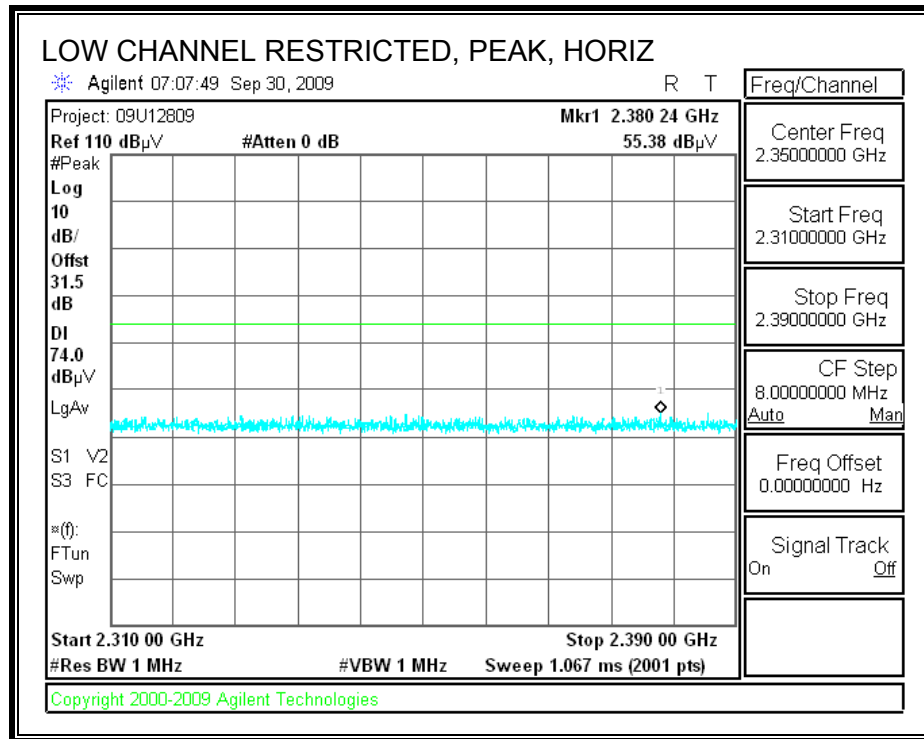
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
<b>Low Channel 2402 MHz</b>															
4.804	3.0	61.7	32.7	5.8	-34.8	0.0	0.0	65.3	74.0	-8.7	H	P	196.0	70.0	NanoBlue dipole 2 dBi
4.804	3.0	35.3	32.7	5.8	-34.8	0.0	0.0	38.9	54.0	-15.1	H	A	196.0	70.0	NanoBlue dipole 2 dBi
7.206	3.0	34.1	35.4	7.2	-34.2	0.0	0.0	42.5	74.0	-31.5	H	P	196.0	70.0	NanoBlue dipole 2 dBi
7.206	3.0	21.4	35.4	7.2	-34.2	0.0	0.0	29.9	54.0	-24.1	H	A	196.0	70.0	NanoBlue dipole 2 dBi
4.804	3.0	63.4	32.7	5.8	-34.8	0.0	0.0	67.0	74.0	-7.0	V	P	100.0	141.0	NanoBlue dipole 2 dBi
4.804	3.0	36.1	32.7	5.8	-34.8	0.0	0.0	39.7	54.0	-14.3	V	A	100.0	141.0	NanoBlue dipole 2 dBi
7.206	3.0	33.9	35.4	7.2	-34.2	0.0	0.0	42.3	74.0	-31.7	V	P	99.0	141.0	NanoBlue dipole 2 dBi
7.206	3.0	21.5	35.4	7.2	-34.2	0.0	0.0	29.9	54.0	-24.1	V	A	99.0	141.0	NanoBlue dipole 2 dBi
<b>Mid Channel 2441 MHz</b>															
4.882	3.0	57.6	32.7	5.8	-34.8	0.0	0.0	61.4	74.0	-12.6	H	P	188.0	68.0	NanoBlue dipole 2 dBi
4.882	3.0	33.0	32.7	5.8	-34.8	0.0	0.0	36.7	54.0	-17.3	H	A	188.0	68.0	NanoBlue dipole 2 dBi
7.323	3.0	33.1	35.5	7.3	-34.1	0.0	0.0	41.8	74.0	-32.2	H	P	188.0	68.0	NanoBlue dipole 2 dBi
7.323	3.0	21.3	35.5	7.3	-34.1	0.0	0.0	30.0	54.0	-24.0	H	A	188.0	68.0	NanoBlue dipole 2 dBi
4.882	3.0	59.8	32.7	5.8	-34.8	0.0	0.0	63.5	74.0	-10.5	V	P	116.0	104.0	NanoBlue dipole 2 dBi
4.882	3.0	34.1	32.7	5.8	-34.8	0.0	0.0	37.9	54.0	-16.1	V	A	116.0	104.0	NanoBlue dipole 2 dBi
7.323	3.0	34.7	35.5	7.3	-34.1	0.0	0.0	43.4	74.0	-30.6	V	P	116.0	104.0	NanoBlue dipole 2 dBi
7.323	3.0	22.6	35.5	7.3	-34.1	0.0	0.0	31.3	54.0	-22.7	V	A	116.0	104.0	NanoBlue dipole 2 dBi
<b>High Channel 2480 MHz</b>															
4.960	3.0	58.5	32.8	5.9	-34.8	0.0	0.0	62.4	74.0	-11.6	H	P	173.0	65.0	NanoBlue dipole 2 dBi
4.960	3.0	28.6	32.8	5.9	-34.8	0.0	0.0	32.4	54.0	-21.6	H	A	173.0	65.0	NanoBlue dipole 2 dBi
7.440	3.0	34.7	35.6	7.3	-34.1	0.0	0.0	43.6	74.0	-30.4	H	P	172.0	65.0	NanoBlue dipole 2 dBi
7.440	3.0	21.2	35.6	7.3	-34.1	0.0	0.0	30.0	54.0	-24.0	H	A	172.0	65.0	NanoBlue dipole 2 dBi
4.960	3.0	60.8	32.8	5.9	-34.8	0.0	0.0	64.7	74.0	-9.3	V	P	113.0	105.0	NanoBlue dipole 2 dBi
4.960	3.0	30.0	32.8	5.9	-34.8	0.0	0.0	33.8	54.0	-20.2	V	A	113.0	105.0	NanoBlue dipole 2 dBi
7.440	3.0	33.6	35.6	7.3	-34.1	0.0	0.0	42.5	74.0	-31.5	V	P	112.0	105.0	NanoBlue dipole 2 dBi
7.440	3.0	21.4	35.6	7.3	-34.1	0.0	0.0	30.3	54.0	-23.7	V	A	112.0	105.0	NanoBlue dipole 2 dBi

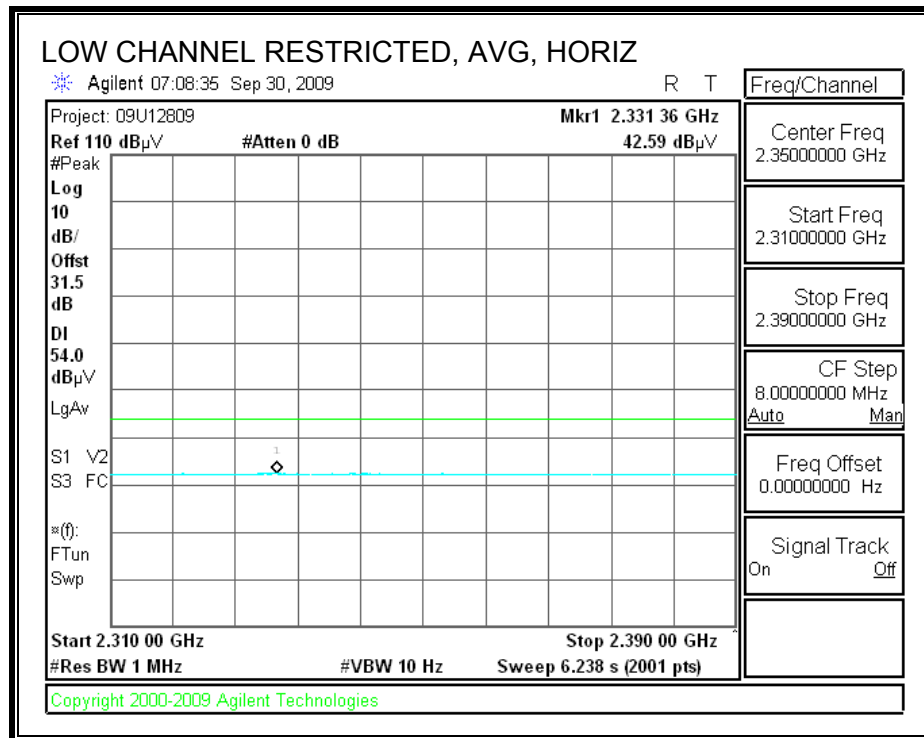
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

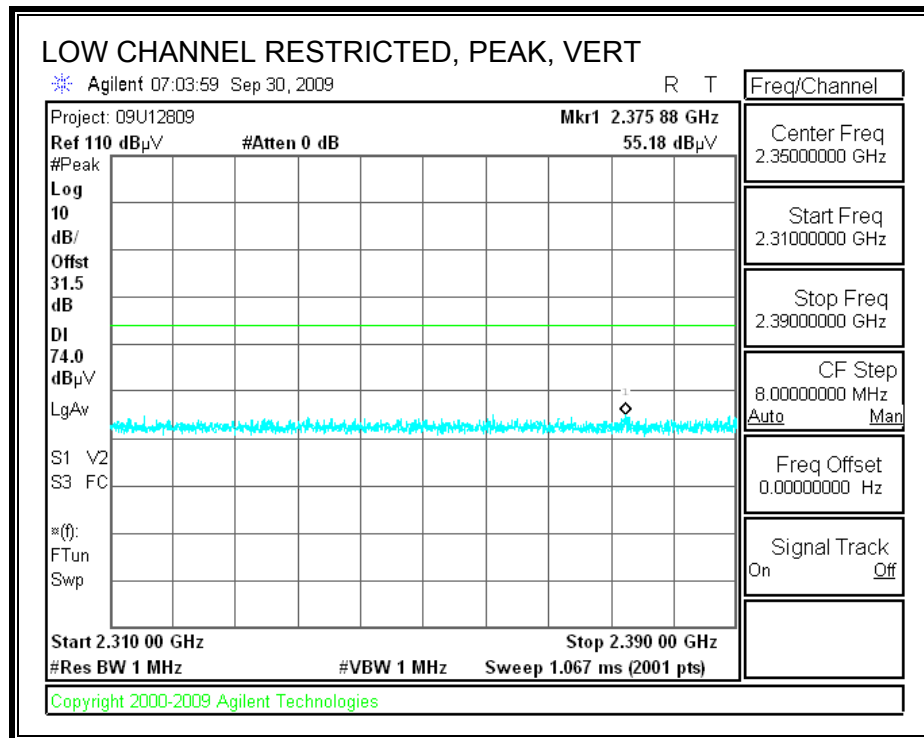
## 8.2.4. Black Chip Monopole, 2dBi

### RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)

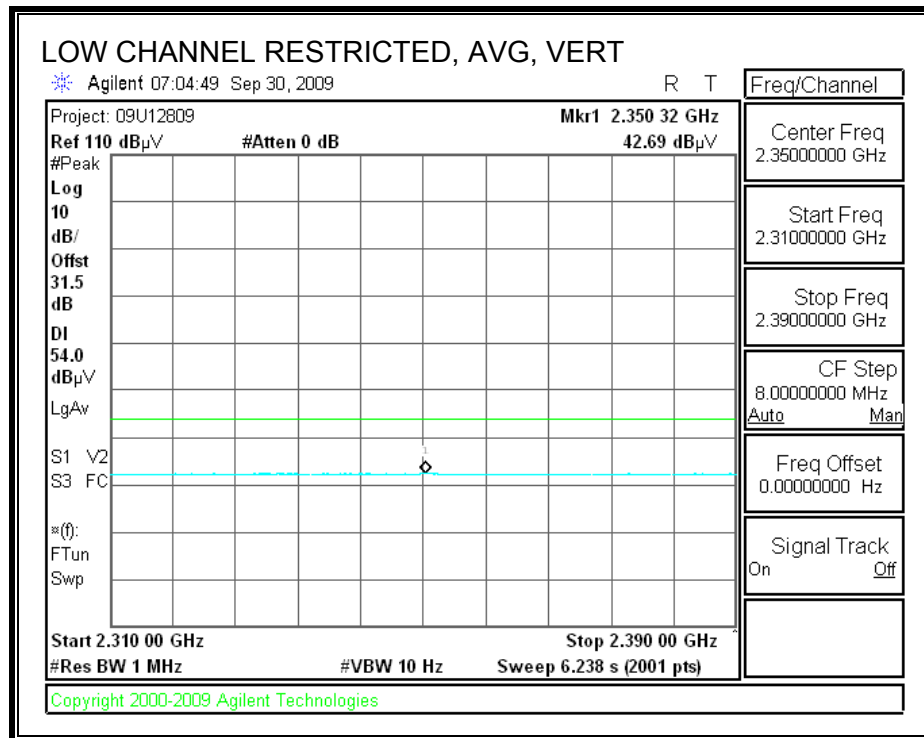




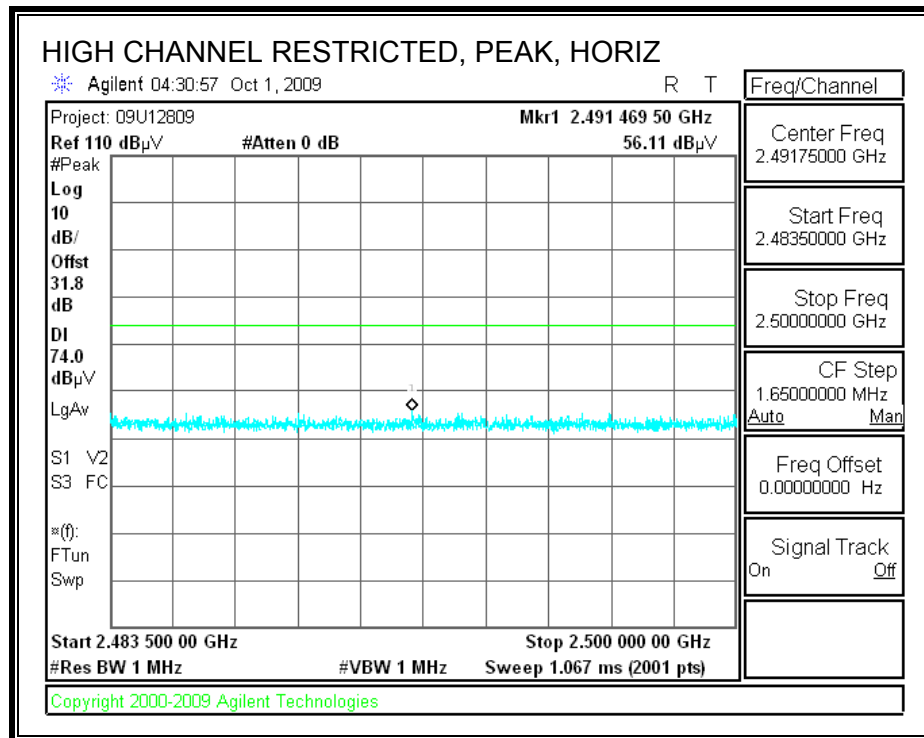
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

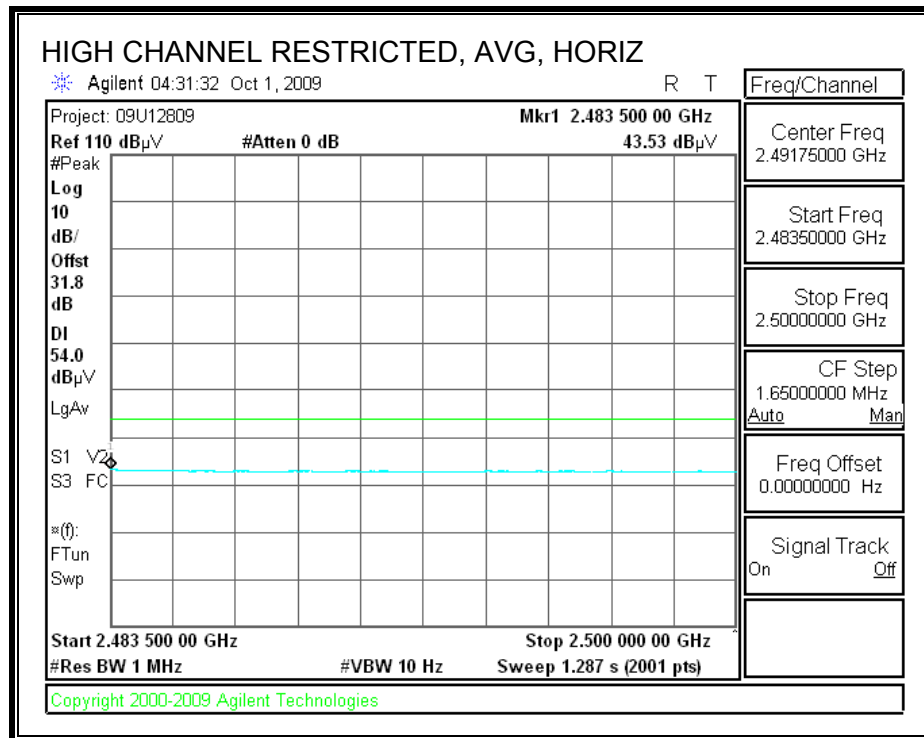




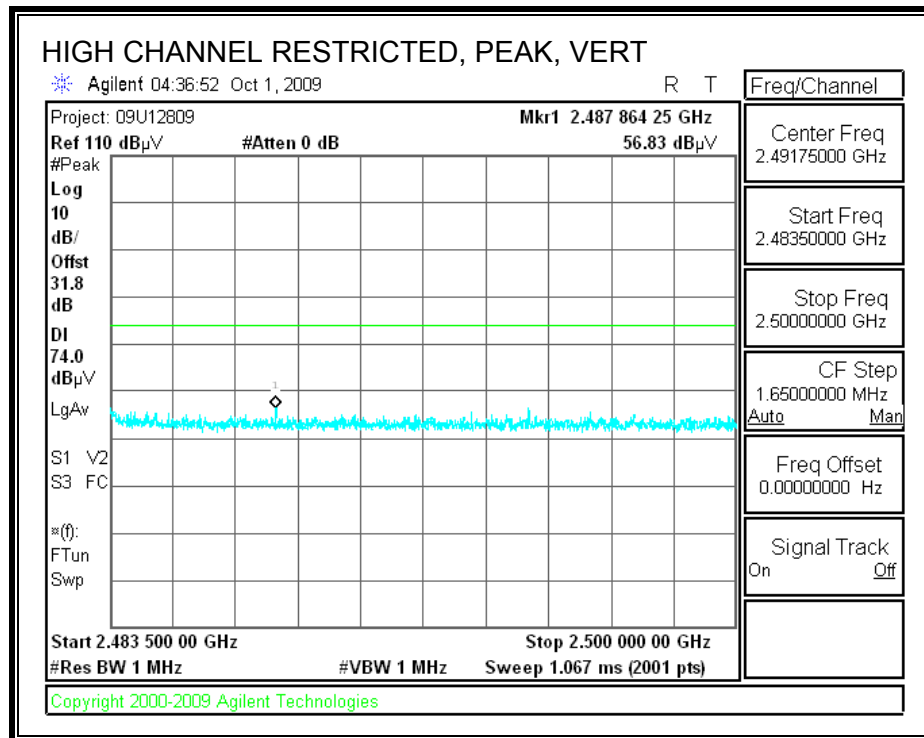


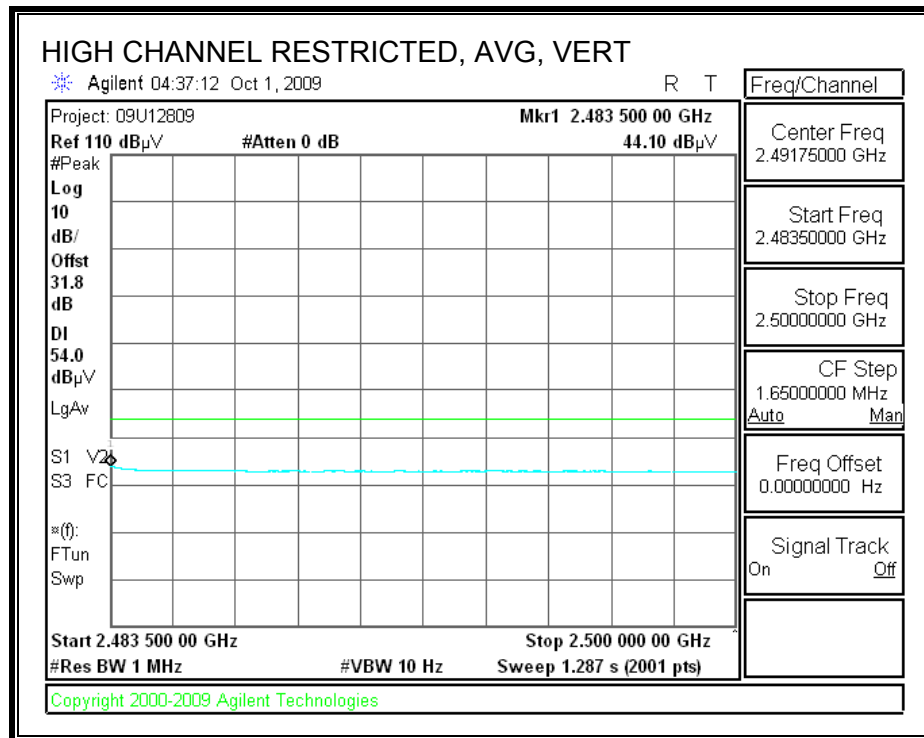
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





# **HARMONICS AND SPURIOUS EMISSIONS**

## **High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen

Date: 10/01/09

Project #: 09U12809

Company: Datalogic Scanning, Inc.

EUT Description: Bluetooth Modules (CSR chipset) with Black chip mono pole 2 dBi

EUT M/N: Modules on JIG w/ AC adapter

Test Target: FCC Class B

Mode Oper: Continuous Transmit

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

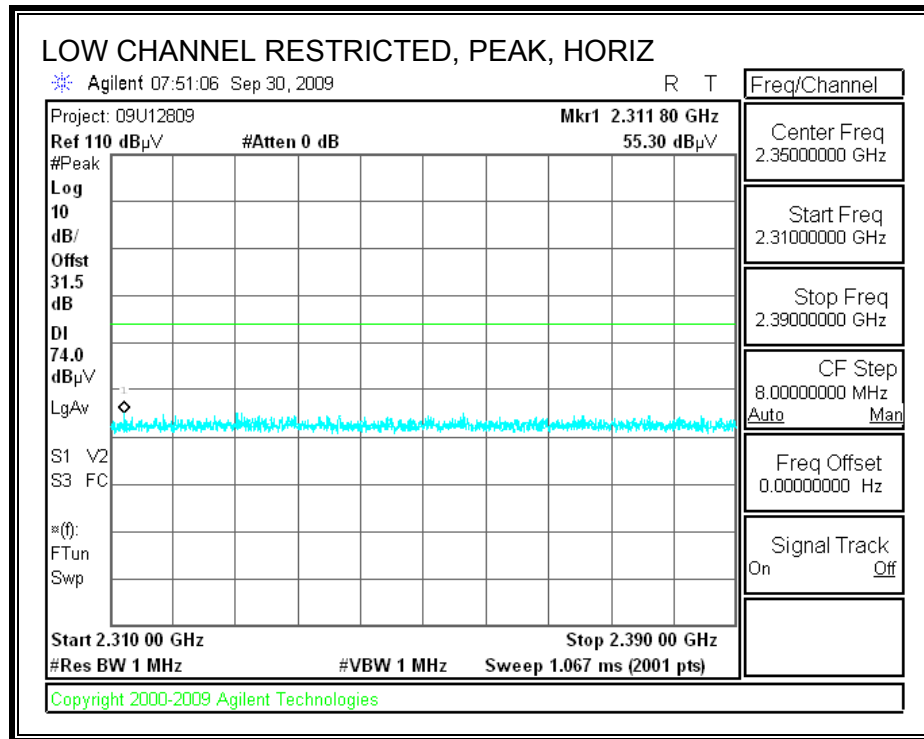
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
<b>Low Channel 2402 MHz</b>															
4.804	3.0	60.2	32.7	5.8	-34.8	0.0	0.0	63.8	74.0	-10.2	H	P	169.0	63.0	Black chip monopole 2 dBi
4.804	3.0	30.2	32.7	5.8	-34.8	0.0	0.0	33.8	54.0	-20.2	H	A	169.0	63.0	Black chip monopole 2 dBi
7.206	3.0	33.0	35.4	7.2	-34.2	0.0	0.0	41.5	74.0	-32.5	H	P	168.0	63.0	Black chip monopole 2 dBi
7.206	3.0	21.0	35.4	7.2	-34.2	0.0	0.0	29.5	54.0	-24.5	H	A	168.0	63.0	Black chip monopole 2 dBi
4.804	3.0	62.6	32.7	5.8	-34.8	0.0	0.0	66.2	74.0	-7.8	V	P	113.0	213.0	Black chip monopole 2 dBi
4.804	3.0	31.0	32.7	5.8	-34.8	0.0	0.0	34.6	54.0	-19.4	V	A	113.0	213.0	Black chip monopole 2 dBi
7.206	3.0	37.3	35.4	7.2	-34.2	0.0	0.0	45.7	74.0	-28.3	V	P	113.0	213.0	Black chip monopole 2 dBi
7.206	3.0	23.4	35.4	7.2	-34.2	0.0	0.0	31.9	54.0	-22.1	V	A	113.0	213.0	Black chip monopole 2 dBi
<b>Mid Channel 2441 MHz</b>															
4.882	3.0	61.2	32.7	5.8	-34.8	0.0	0.0	64.9	74.0	-9.1	H	P	188.0	67.0	Black chip monopole 2 dBi
4.882	3.0	33.2	32.7	5.8	-34.8	0.0	0.0	36.9	54.0	-17.1	H	A	188.0	67.0	Black chip monopole 2 dBi
7.323	3.0	33.9	35.5	7.3	-34.1	0.0	0.0	42.6	74.0	-31.4	H	P	188.0	67.0	Black chip monopole 2 dBi
7.323	3.0	21.4	35.5	7.3	-34.1	0.0	0.0	30.1	54.0	-23.9	H	A	188.0	67.0	Black chip monopole 2 dBi
4.882	3.0	64.4	32.7	5.8	-34.8	0.0	0.0	68.1	74.0	-5.9	V	P	115.0	100.0	Black chip monopole 2 dBi
4.882	3.0	34.2	32.7	5.8	-34.8	0.0	0.0	38.0	54.0	-16.0	V	A	115.0	100.0	Black chip monopole 2 dBi
7.323	3.0	35.0	35.5	7.3	-34.1	0.0	0.0	43.6	74.0	-30.4	V	P	115.0	100.0	Black chip monopole 2 dBi
7.323	3.0	22.4	35.5	7.3	-34.1	0.0	0.0	31.1	54.0	-22.9	V	A	115.0	100.0	Black chip monopole 2 dBi
<b>High Channel 2480 MHz</b>															
4.960	3.0	57.3	32.8	5.9	-34.8	0.0	0.0	61.1	74.0	-12.9	H	P	177.0	152.0	Black chip monopole 2 dBi
4.960	3.0	33.0	32.8	5.9	-34.8	0.0	0.0	36.8	54.0	-17.2	H	A	177.0	152.0	Black chip monopole 2 dBi
7.440	3.0	33.1	35.6	7.3	-34.1	0.0	0.0	42.0	74.0	-32.0	H	P	176.0	151.0	Black chip monopole 2 dBi
7.440	3.0	20.9	35.6	7.3	-34.1	0.0	0.0	29.8	54.0	-24.2	H	A	176.0	151.0	Black chip monopole 2 dBi
4.960	3.0	60.2	32.8	5.9	-34.8	0.0	0.0	64.1	74.0	-9.9	V	P	114.0	110.0	Black chip monopole 2 dBi
4.960	3.0	34.2	32.8	5.9	-34.8	0.0	0.0	38.1	54.0	-15.9	V	A	114.0	110.0	Black chip monopole 2 dBi
7.440	3.0	33.6	35.6	7.3	-34.1	0.0	0.0	42.5	74.0	-31.5	V	P	114.0	110.0	Black chip monopole 2 dBi
7.440	3.0	21.5	35.6	7.3	-34.1	0.0	0.0	30.4	54.0	-23.6	V	A	114.0	110.0	Black chip monopole 2 dBi

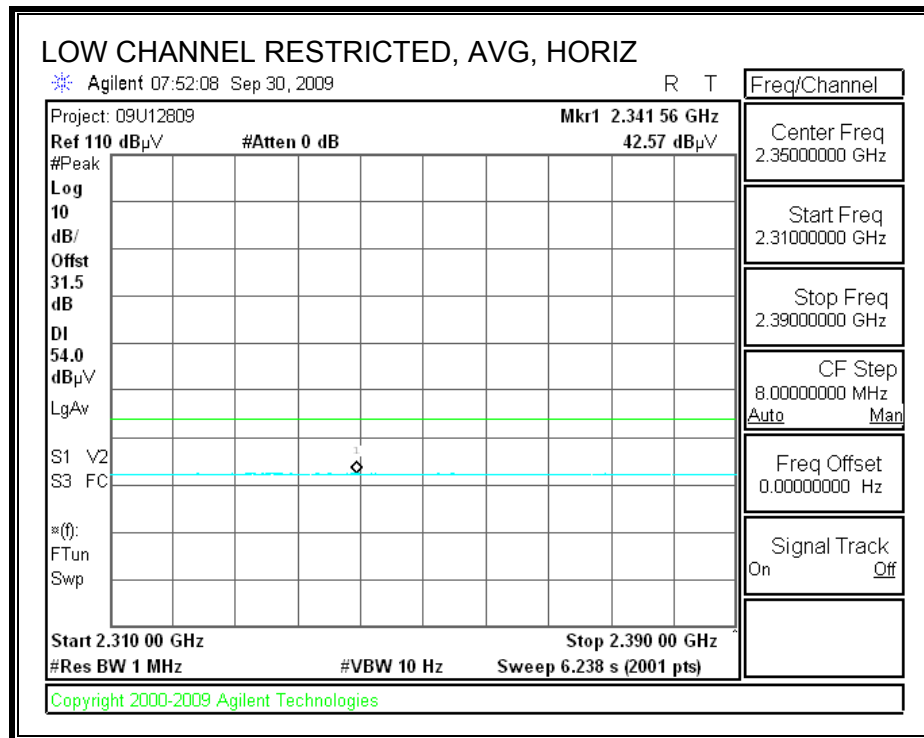
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

## 8.2.5. Johansen Monopole, 0.5dBi

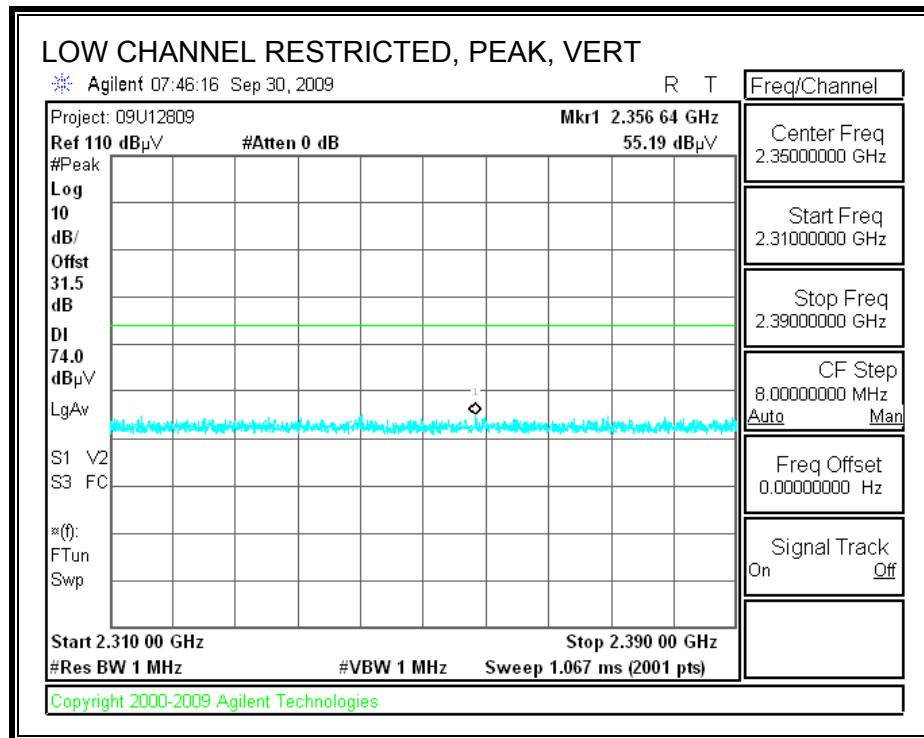
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

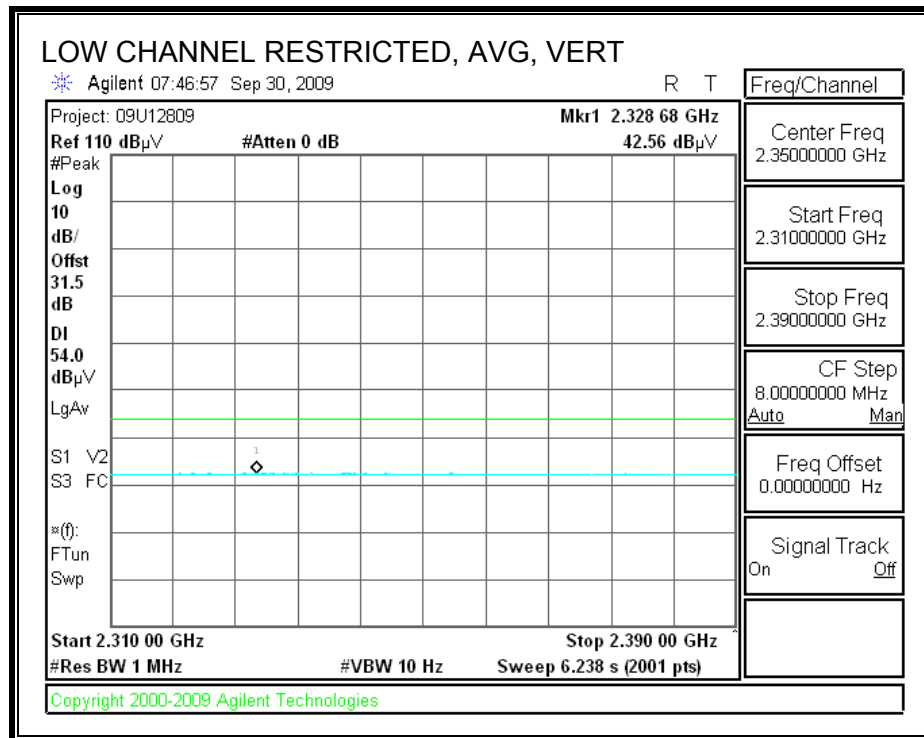




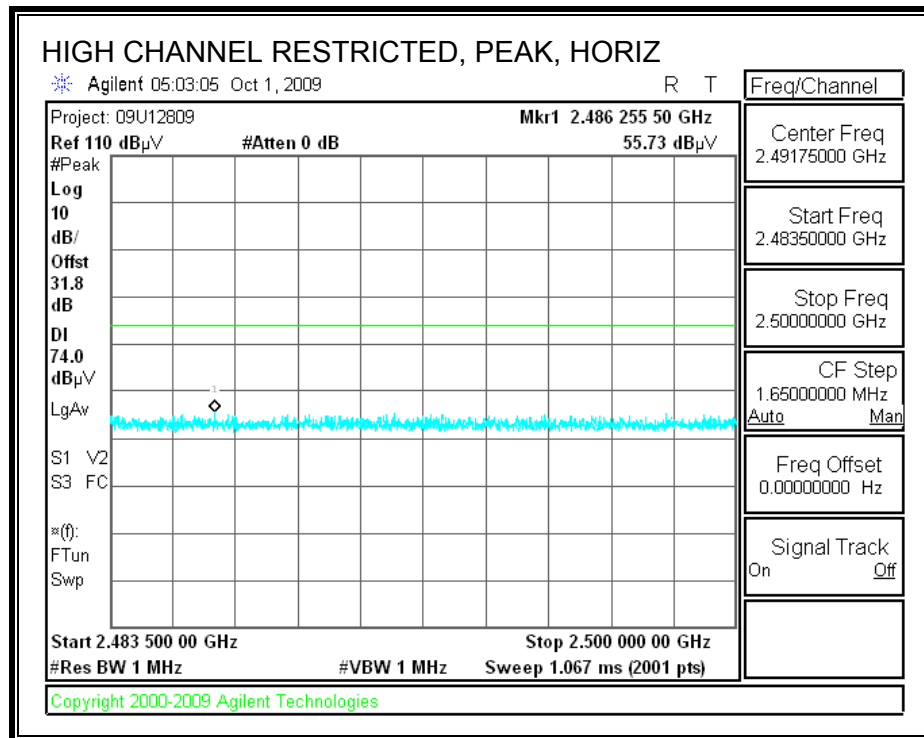


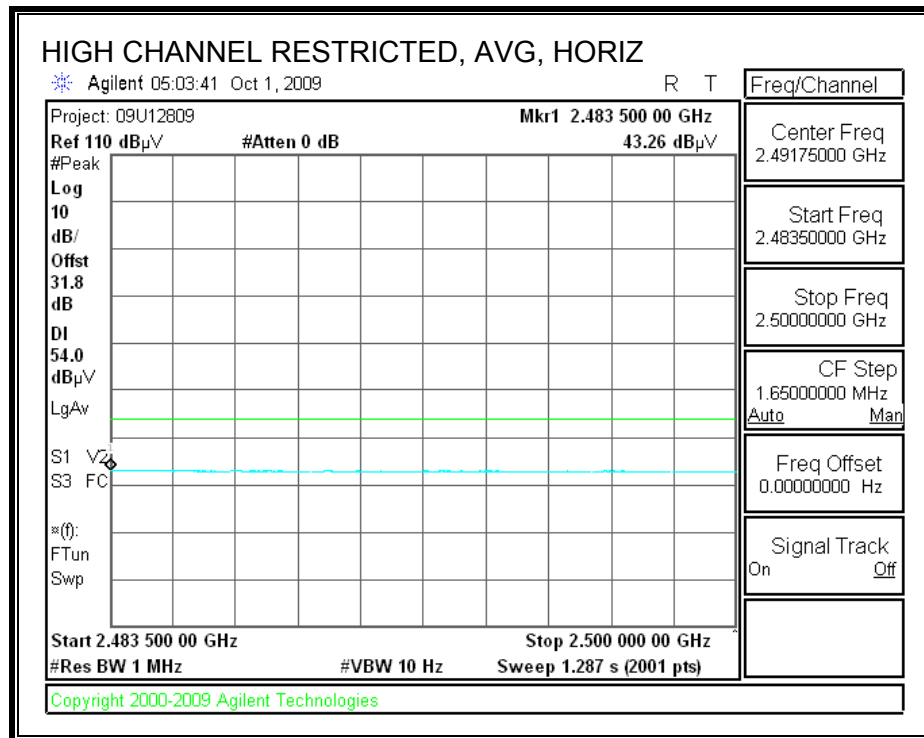
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



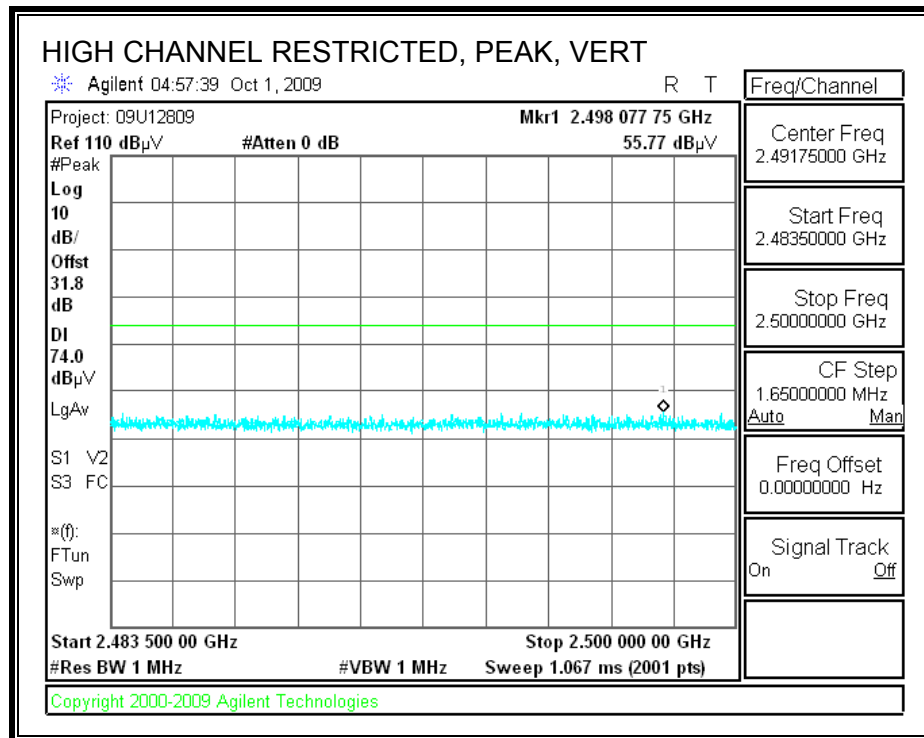


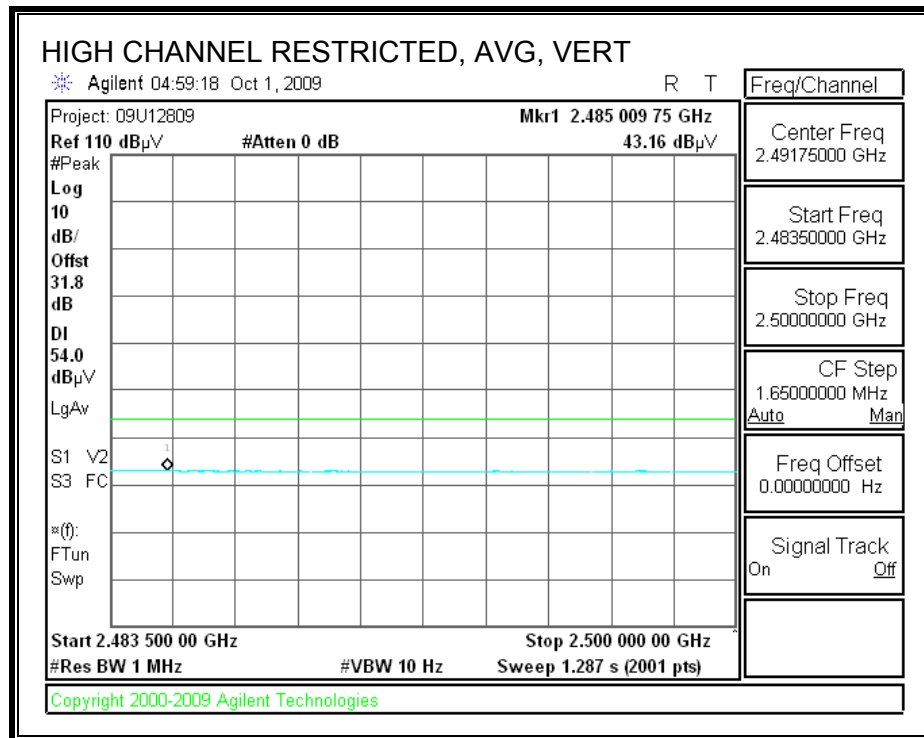
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





# HARMONICS AND SPURIOUS EMISSIONS

## High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/01/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with #2 mono pole 0.5 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
<b>Low Channel 2402 MHz</b>															
4.804	3.0	60.5	32.7	5.8	-34.8	0.0	0.0	64.1	74.0	-9.9	H	P	185.0	73.0	#2 monopole 0.5 dBi
4.804	3.0	34.7	32.7	5.8	-34.8	0.0	0.0	38.3	54.0	-15.7	H	A	185.0	73.0	#2 monopole 0.5 dBi
7.206	3.0	33.8	35.4	7.2	-34.2	0.0	0.0	42.2	74.0	-31.8	H	P	185.0	73.0	#2 monopole 0.5 dBi
7.206	3.0	21.7	35.4	7.2	-34.2	0.0	0.0	30.1	54.0	-23.9	H	A	185.0	73.0	#2 monopole 0.5 dBi
4.804	3.0	63.0	32.7	5.8	-34.8	0.0	0.0	66.6	74.0	-7.4	V	P	113.0	212.0	#2 monopole 0.5 dBi
4.804	3.0	35.7	32.7	5.8	-34.8	0.0	0.0	39.4	54.0	-14.7	V	A	113.0	212.0	#2 monopole 0.5 dBi
7.206	3.0	39.3	35.4	7.2	-34.2	0.0	0.0	47.8	74.0	-26.2	V	P	113.0	212.0	#2 monopole 0.5 dBi
7.206	3.0	25.0	35.4	7.2	-34.2	0.0	0.0	33.4	54.0	-20.6	V	A	113.0	212.0	#2 monopole 0.5 dBi
<b>Mid Channel 2441 MHz</b>															
4.882	3.0	57.2	32.7	5.8	-34.8	0.0	0.0	60.9	74.0	-13.1	H	P	168.0	68.0	#2 monopole 0.5 dBi
4.882	3.0	28.2	32.7	5.8	-34.8	0.0	0.0	31.9	54.0	-22.1	H	A	168.0	68.0	#2 monopole 0.5 dBi
7.323	3.0	33.4	35.5	7.3	-34.1	0.0	0.0	42.0	74.0	-32.0	H	P	167.0	68.0	#2 monopole 0.5 dBi
7.323	3.0	21.3	35.5	7.3	-34.1	0.0	0.0	30.0	54.0	-24.0	H	A	167.0	68.0	#2 monopole 0.5 dBi
4.882	3.0	60.7	32.7	5.8	-34.8	0.0	0.0	64.5	74.0	-9.5	V	P	112.0	173.0	#2 monopole 0.5 dBi
4.882	3.0	29.7	32.7	5.8	-34.8	0.0	0.0	33.4	54.0	-20.6	V	A	112.0	173.0	#2 monopole 0.5 dBi
7.323	3.0	34.9	35.5	7.3	-34.1	0.0	0.0	43.5	74.0	-30.5	V	P	111.0	173.0	#2 monopole 0.5 dBi
7.323	3.0	22.2	35.5	7.3	-34.1	0.0	0.0	30.8	54.0	-23.2	V	A	111.0	173.0	#2 monopole 0.5 dBi
<b>High Channel 2480 MHz</b>															
4.960	3.0	55.4	32.8	5.9	-34.8	0.0	0.0	59.3	74.0	-14.8	H	P	196.0	122.0	#2 monopole 0.5 dBi
4.960	3.0	27.0	32.8	5.9	-34.8	0.0	0.0	30.9	54.0	-23.1	H	A	196.0	122.0	#2 monopole 0.5 dBi
7.440	3.0	33.8	35.6	7.3	-34.1	0.0	0.0	42.7	74.0	-31.3	H	P	195.0	119.0	#2 monopole 0.5 dBi
7.440	3.0	21.2	35.6	7.3	-34.1	0.0	0.0	30.1	54.0	-23.9	H	A	195.0	119.0	#2 monopole 0.5 dBi
4.960	3.0	62.1	32.8	5.9	-34.8	0.0	0.0	66.0	74.0	-8.0	V	P	113.0	105.0	#2 monopole 0.5 dBi
4.960	3.0	29.3	32.8	5.9	-34.8	0.0	0.0	33.1	54.0	-20.9	V	A	113.0	105.0	#2 monopole 0.5 dBi
7.440	3.0	34.1	35.6	7.3	-34.1	0.0	0.0	43.0	74.0	-31.0	V	P	112.0	105.0	#2 monopole 0.5 dBi
7.440	3.0	21.2	35.6	7.3	-34.1	0.0	0.0	30.1	54.0	-23.9	V	A	112.0	105.0	#2 monopole 0.5 dBi

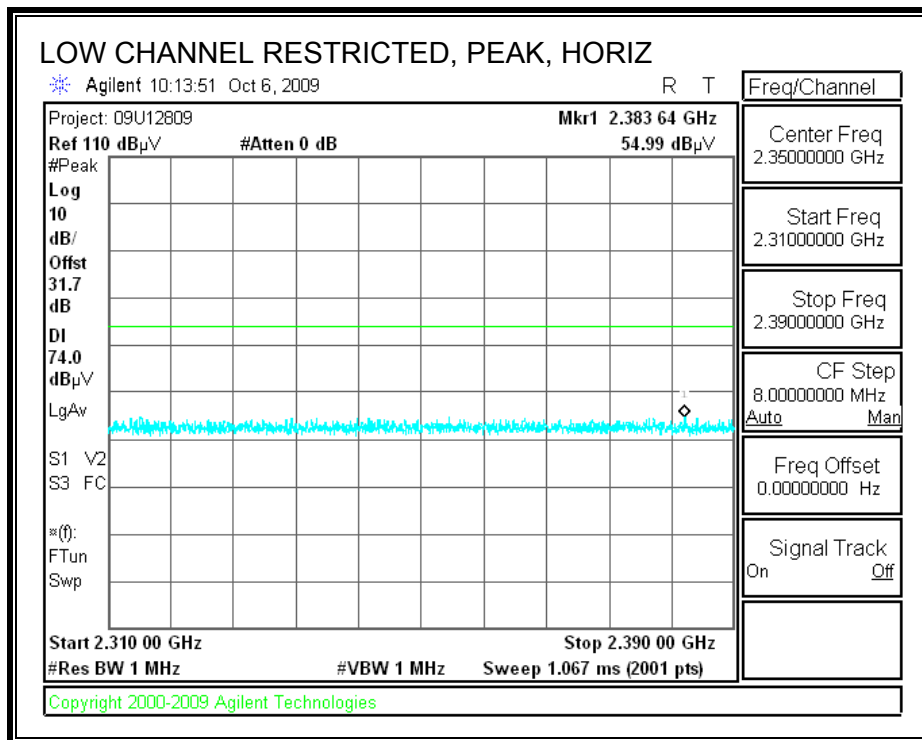
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

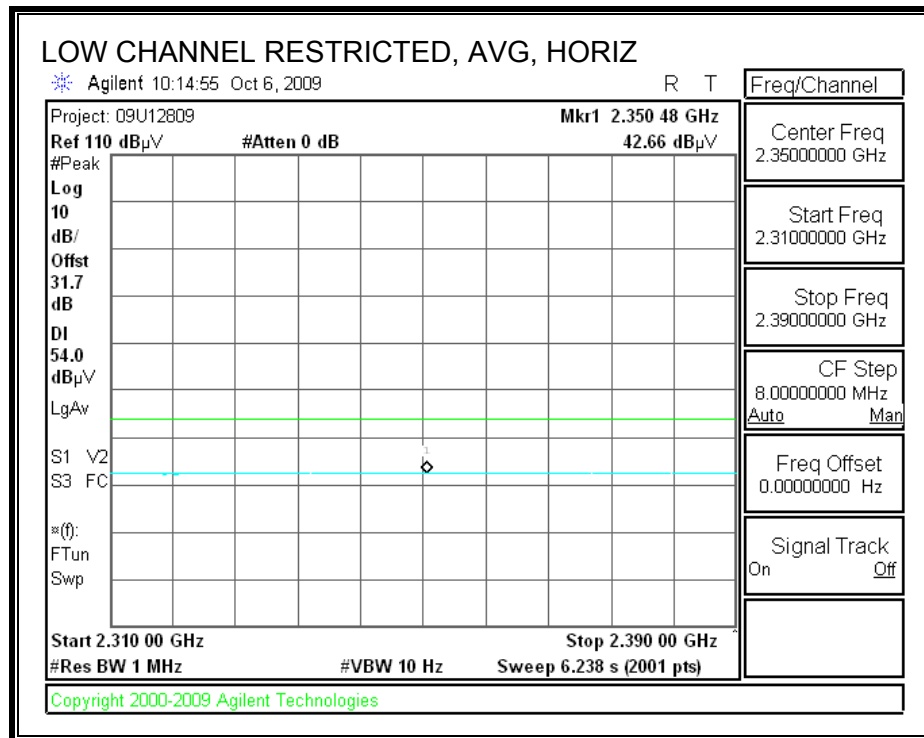
### 8.3. TRANSMITTER ABOVE 1 GHz (CLASS II)

#### 8.3.1. PCB/Flex Circuit Dipole, NanoBlade, 3.8dBi (WORST-CASE ANTENNA)

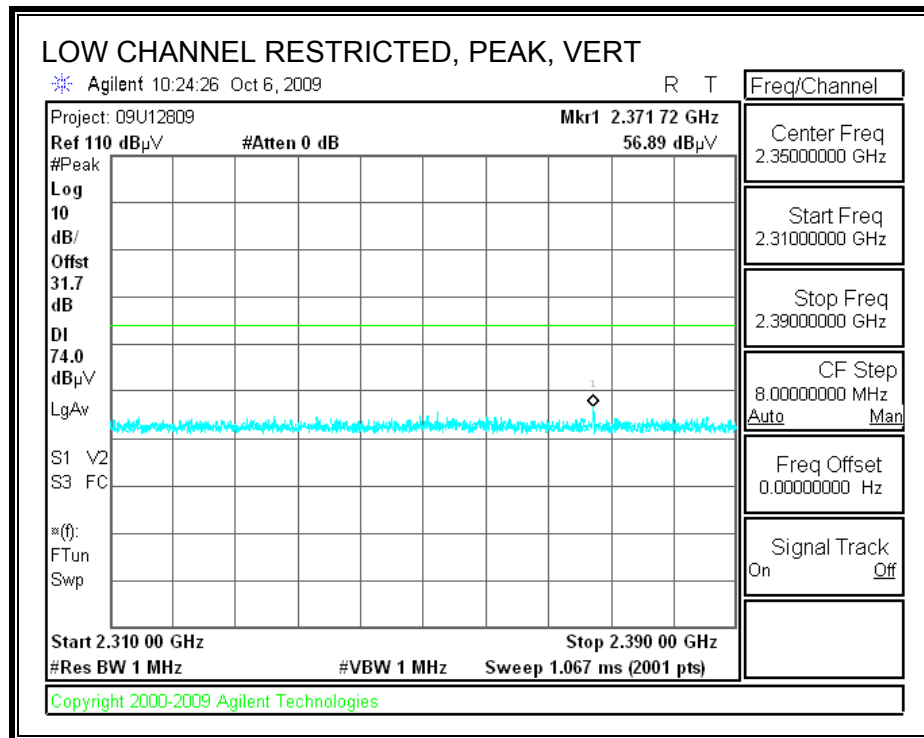
##### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

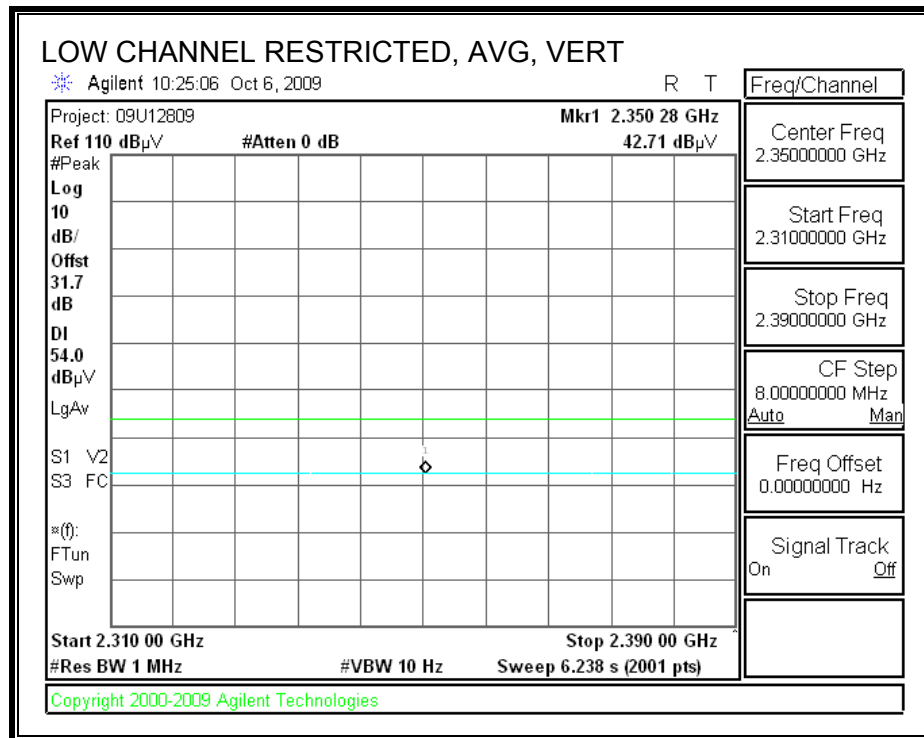




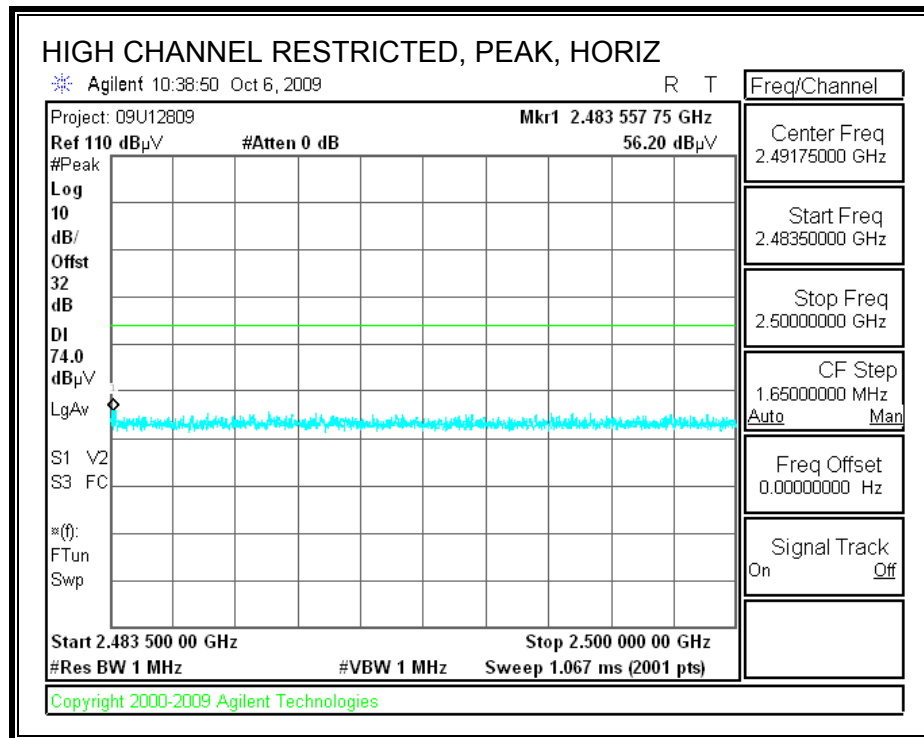


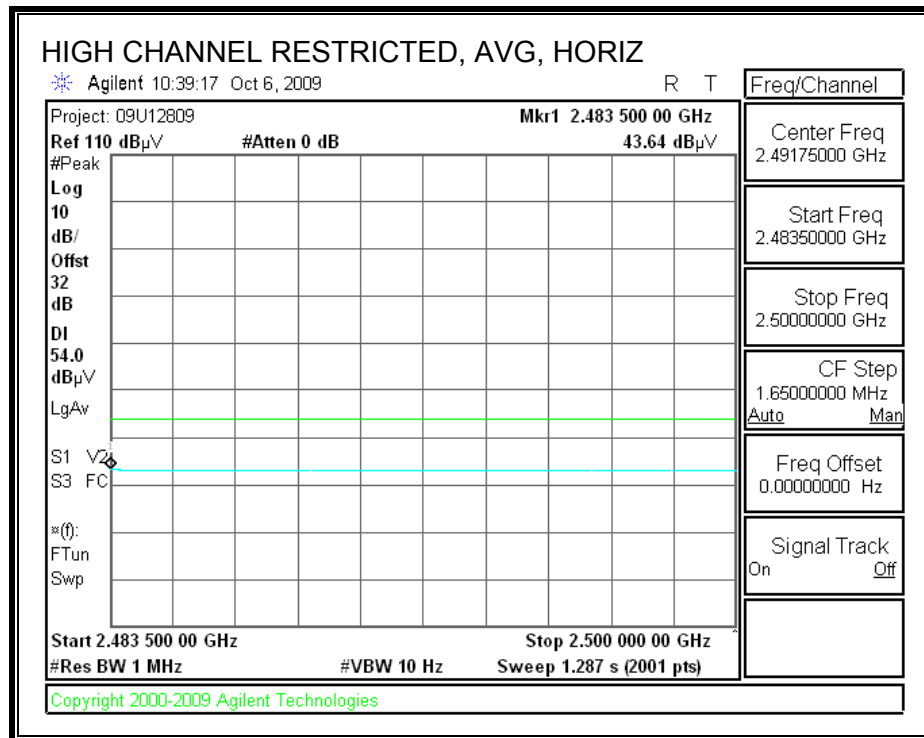
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



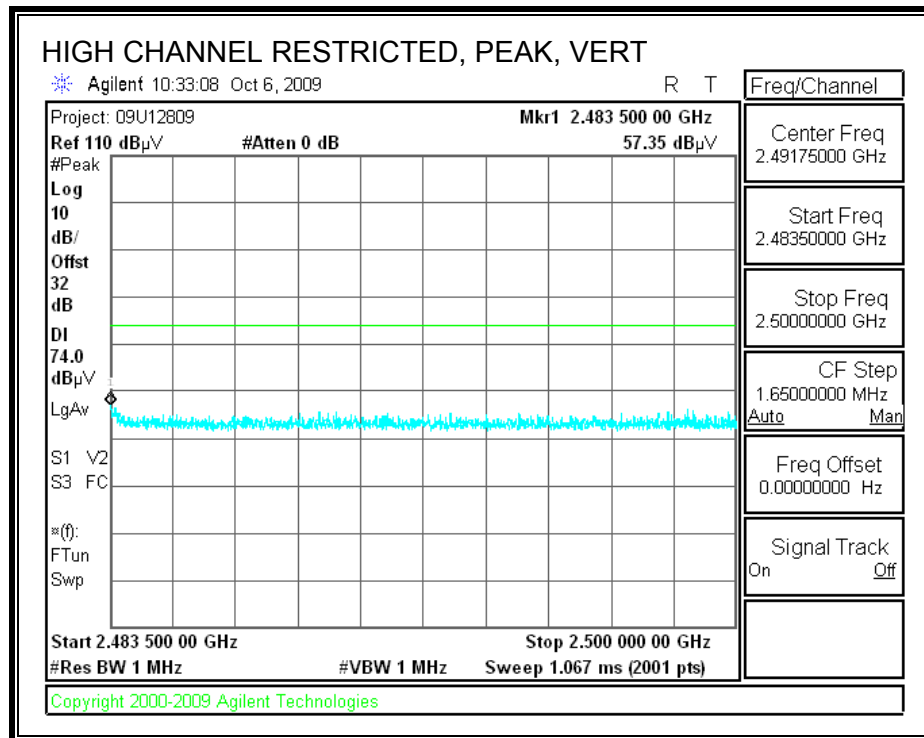


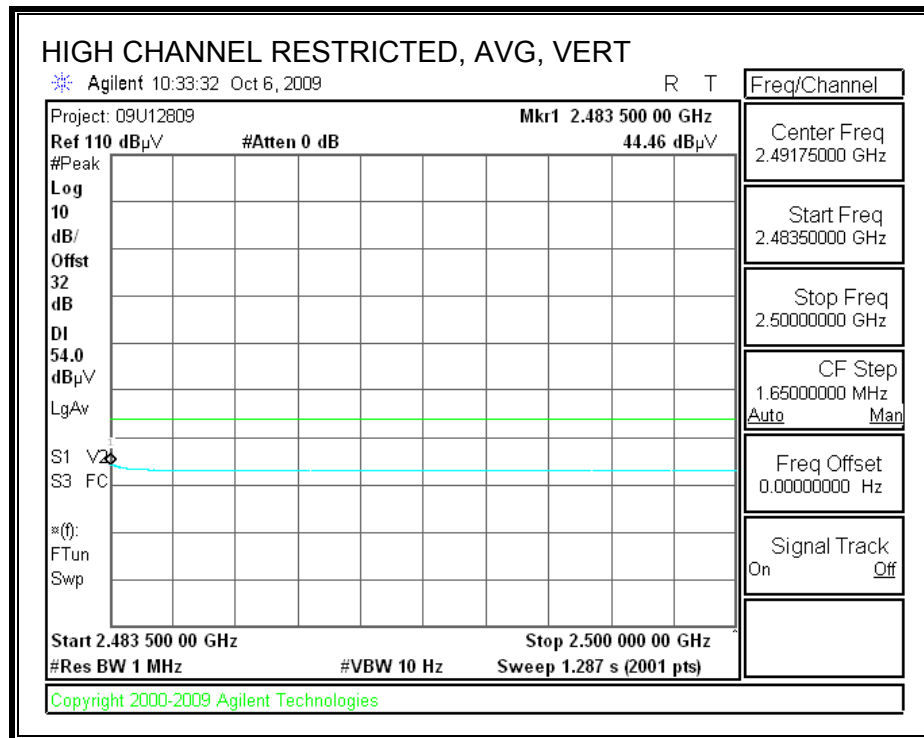
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/06/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset)  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
<b>2402MHz Low CH</b>															
4.804	3.0	63.7	32.8	5.8	-34.8	0.0	0.0	67.4	74.0	-6.6	H	P	154.5	74.4	Hori
4.804	3.0	38.2	32.8	5.8	-34.8	0.0	0.0	41.9	54.0	-12.1	H	A	154.5	74.4	Hori
7.206	3.0	36.7	35.0	7.2	-34.7	0.0	0.0	44.3	74.0	-29.7	H	P	154.5	74.4	Hori
7.206	3.0	24.8	35.0	7.2	-34.7	0.0	0.0	32.4	54.0	-21.6	H	A	154.5	74.4	Hori
4.804	3.0	62.7	32.8	5.8	-34.8	0.0	0.0	66.4	74.0	-7.6	V	P	123.9	93.7	Vert
4.804	3.0	37.8	32.8	5.8	-34.8	0.0	0.0	41.5	54.0	-12.5	V	A	123.9	93.7	Vert
7.206	3.0	38.2	35.0	7.2	-34.7	0.0	0.0	45.7	74.0	-28.3	V	P	123.9	93.7	Vert
7.206	3.0	25.1	35.0	7.2	-34.7	0.0	0.0	32.7	54.0	-21.3	V	A	123.9	93.7	Vert
<b>2441MHz Mid CH</b>															
4.882	3.0	67.9	32.8	5.8	-34.9	0.0	0.0	71.7	74.0	-2.3	V	P	113.9	117.0	Vert
4.882	3.0	39.4	32.8	5.8	-34.9	0.0	0.0	43.2	54.0	-10.8	V	A	113.9	117.0	Vert
7.323	3.0	36.3	35.2	7.3	-34.7	0.0	0.0	44.1	74.0	-29.9	V	P	113.9	117.0	Vert
7.323	3.0	24.7	35.2	7.3	-34.7	0.0	0.0	32.6	54.0	-21.4	V	A	113.9	117.0	Vert
4.882	3.0	65.4	32.8	5.8	-34.9	0.0	0.0	69.2	74.0	-4.8	H	P	154.1	74.8	Hori
4.882	3.0	38.5	32.8	5.8	-34.9	0.0	0.0	42.4	54.0	-11.6	H	A	154.1	74.8	Hori
7.323	3.0	37.3	35.2	7.3	-34.7	0.0	0.0	45.2	74.0	-28.8	H	P	154.1	74.8	Hori
7.323	3.0	24.7	35.2	7.3	-34.7	0.0	0.0	32.5	54.0	-21.5	H	A	154.1	74.8	Hori
<b>2480MHz High CH</b>															
4.960	3.0	64.4	32.9	5.9	-34.9	0.0	0.0	68.3	74.0	-5.7	H	P	164.4	74.0	Hori
4.960	3.0	38.1	32.9	5.9	-34.9	0.0	0.0	42.0	54.0	-12.0	H	A	164.4	74.0	Hori
7.440	3.0	37.4	35.4	7.3	-34.6	0.0	0.0	45.5	74.0	-28.5	H	P	164.0	74.0	Hori
7.440	3.0	25.0	35.4	7.3	-34.6	0.0	0.0	33.0	54.0	-21.0	H	A	164.0	74.0	Hori
4.960	3.0	64.6	32.9	5.9	-34.9	0.0	0.0	68.6	74.0	-5.4	V	P	112.8	116.5	Vert
4.960	3.0	38.1	32.9	5.9	-34.9	0.0	0.0	42.1	54.0	-11.9	V	A	112.8	116.5	Vert
7.440	3.0	38.2	35.4	7.3	-34.6	0.0	0.0	46.3	74.0	-27.7	V	P	112.8	116.5	Vert
7.440	3.0	24.9	35.4	7.3	-34.6	0.0	0.0	33.0	54.0	-21.0	V	A	112.8	116.5	Vert

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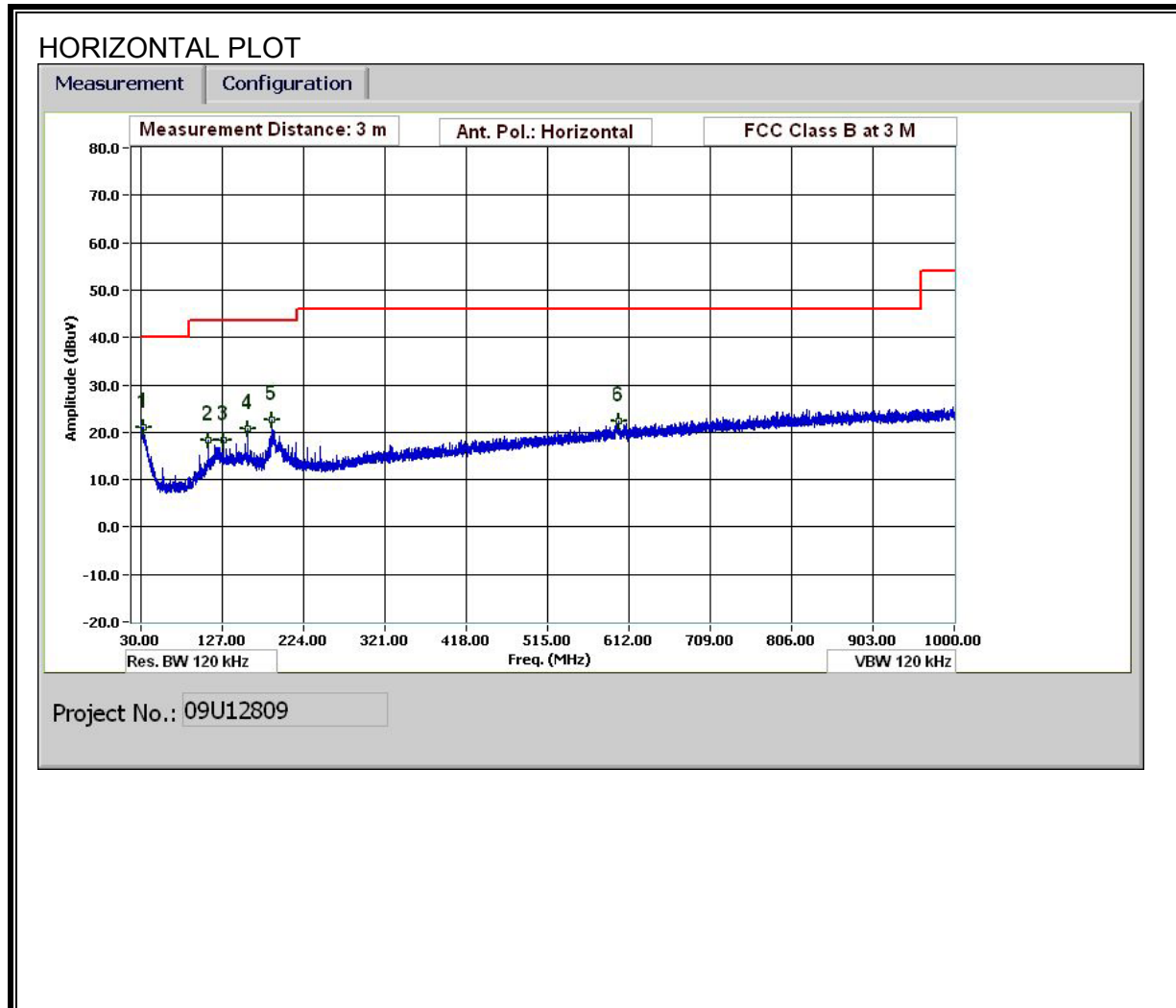
Note: No other emissions were detected above the system noise floor.



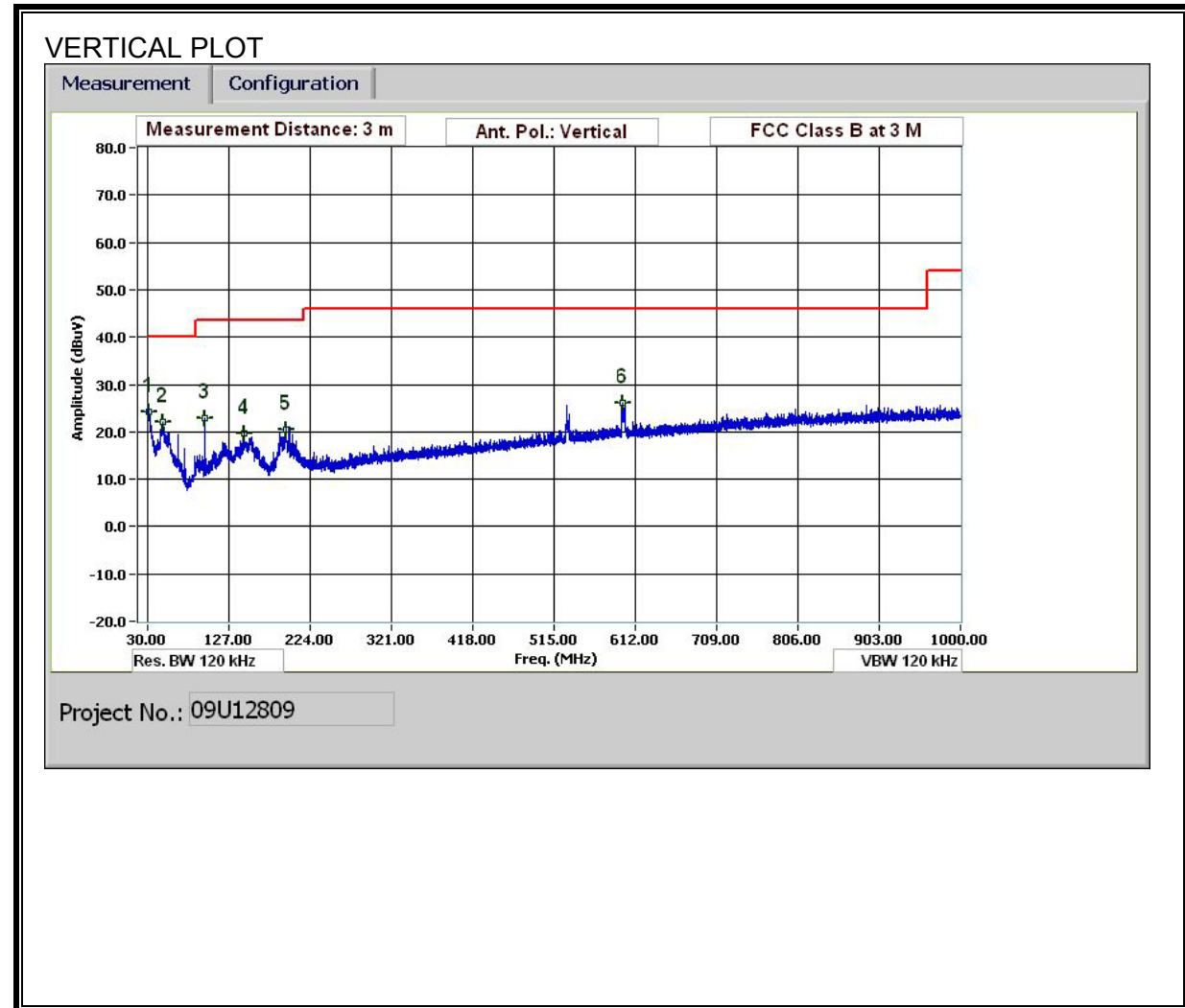
## 8.4. WORST-CASE BELOW 1 GHz

### 8.4.1. WHIP DIPOLE, Nearson/Pulse, 2.14 dBi

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



## HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/02/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with WHIP Dipole 2.14 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters  
Read Analyzer Reading Filter Filter Insert Loss  
AF Antenna Factor Corr Calculated Field Strength  
CL Cable Loss Limit Field Strength Limit

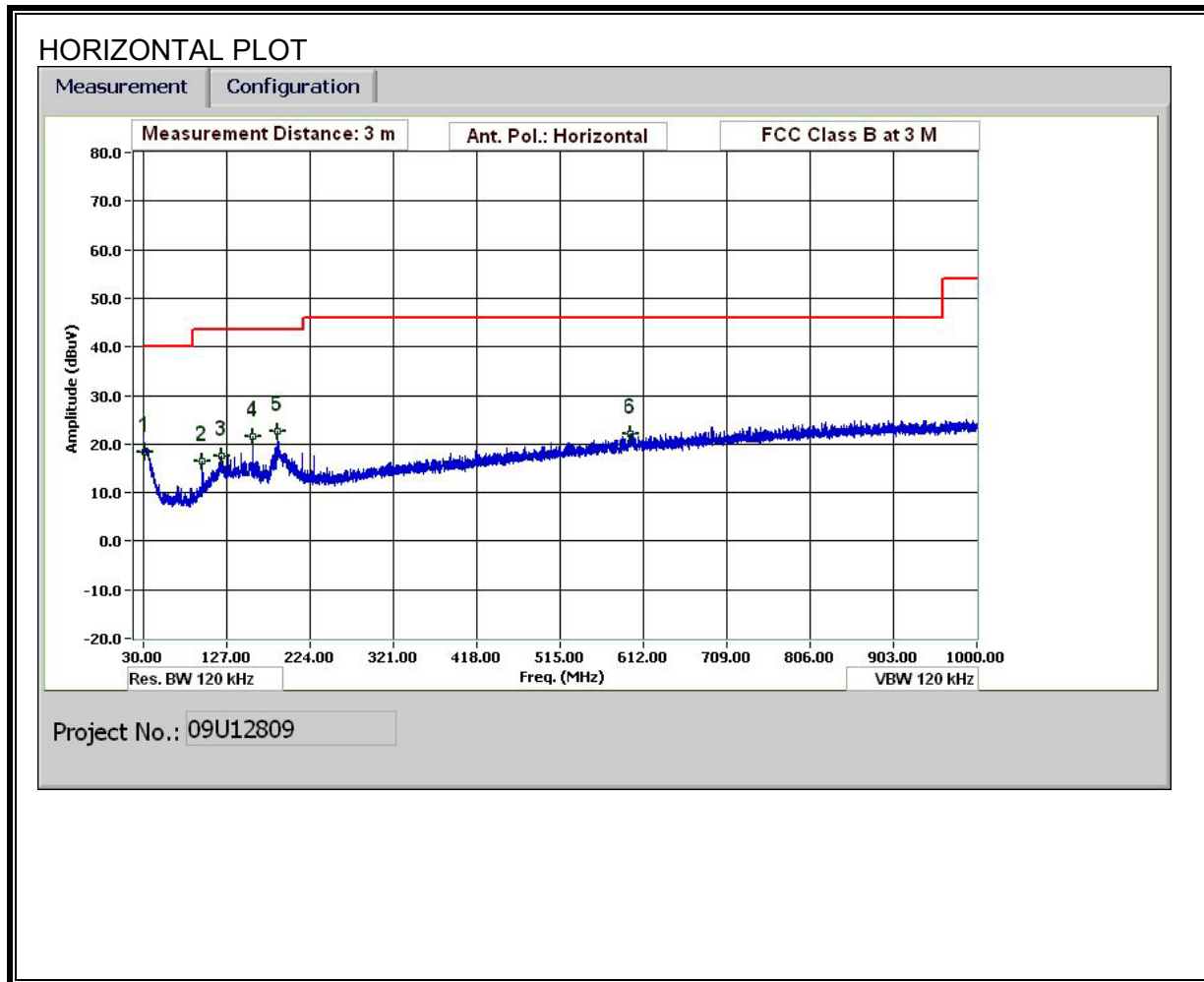
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Mid CH Worst case															
33.000	3.0	30.2	18.8	0.5	28.4	0.0	0.0	21.2	40.0	-18.8	H	EP	100.0	0 - 360	Prescan
111.003	3.0	33.7	12.0	1.0	28.3	0.0	0.0	18.4	43.5	-25.2	H	EP	100.0	0 - 360	Prescan
128.884	3.0	32.0	13.6	1.1	28.3	0.0	0.0	18.4	43.5	-25.1	H	EP	100.0	0 - 360	Prescan
157.565	3.0	36.1	11.9	1.1	28.3	0.0	0.0	20.9	43.5	-22.6	H	EP	100.0	0 - 360	Prescan
186.126	3.0	38.4	11.3	1.2	28.2	0.0	0.0	22.6	43.5	-20.9	H	EP	100.0	0 - 360	Prescan
599.904	3.0	29.3	18.4	2.2	27.5	0.0	0.0	22.5	46.0	-23.5	H	EP	100.0	0 - 360	Prescan
Mid CH Worst case															
31.560	3.0	32.7	19.4	0.5	28.4	0.0	0.0	24.2	40.0	-15.8	V	EP	100.0	0 - 360	Prescan
47.881	3.0	40.5	9.4	0.6	28.4	0.0	0.0	22.2	40.0	-17.8	V	EP	100.0	0 - 360	Prescan
98.883	3.0	40.6	9.7	0.9	28.3	0.0	0.0	22.8	43.5	-20.7	V	EP	100.0	0 - 360	Prescan
144.725	3.0	33.9	13.0	1.1	28.3	0.0	0.0	19.7	43.5	-23.8	V	EP	100.0	0 - 360	Prescan
194.767	3.0	35.7	11.6	1.2	28.2	0.0	0.0	20.4	43.5	-23.1	V	EP	100.0	0 - 360	Prescan
596.903	3.0	33.0	18.4	2.2	27.5	0.0	0.0	26.0	46.0	-20.0	V	EP	100.0	0 - 360	Prescan

Rev. 1.27.09

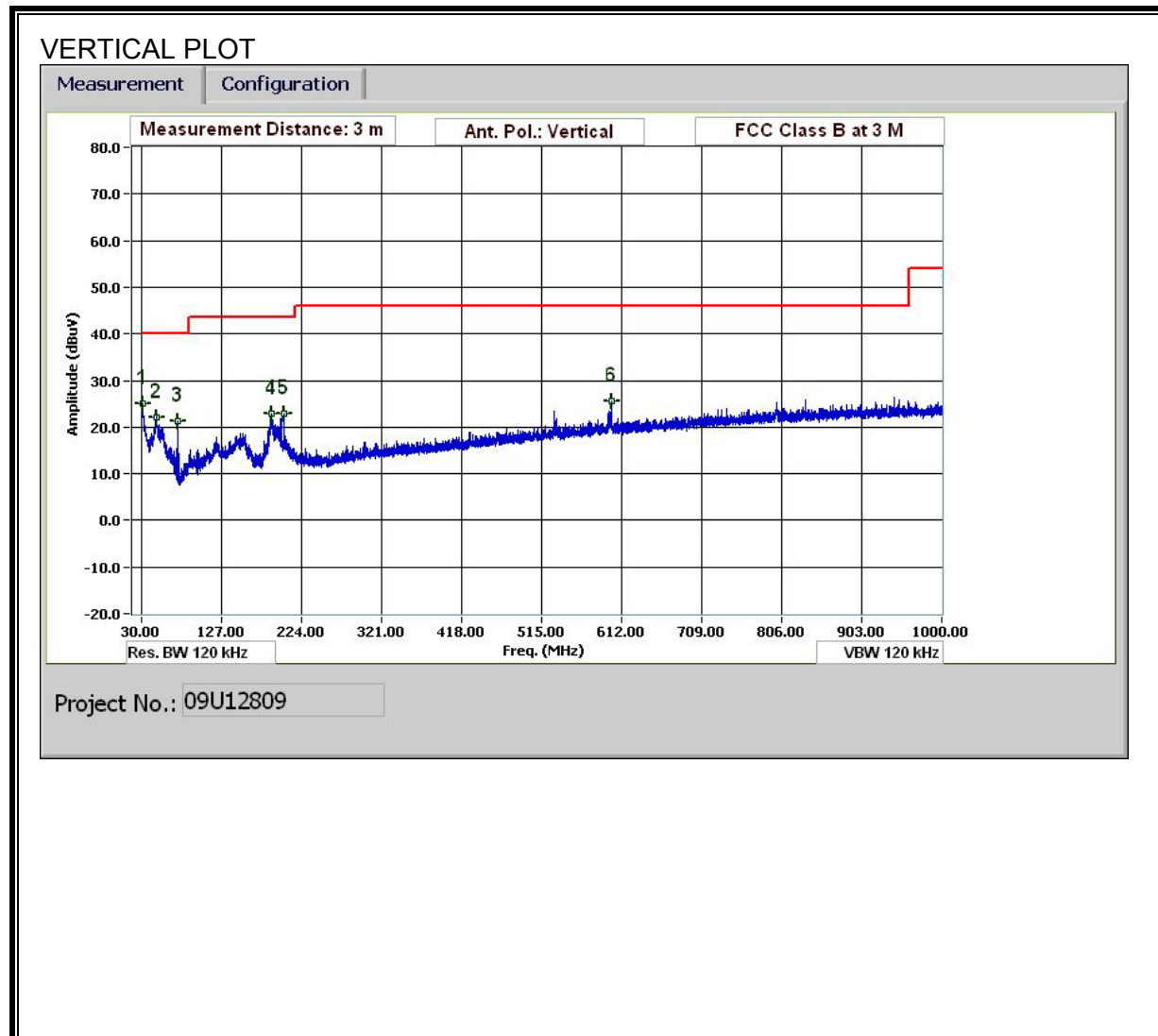
Note: No other emissions were detected above the system noise floor.

### 8.4.2. PCB/Flex Circuit Dipole, NanoBlade, 3.8dBi

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



## HORIZONTAL AND BVERTICAL DATA

30-1000MHz Frequency Measurement  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/02/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with NanoBlade Dipole 3.8 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters  
Read Analyzer Reading Filter Filter Insert Loss  
AF Antenna Factor Corr Calculated Field Strength  
CL Cable Loss Limit Field Strength Limit

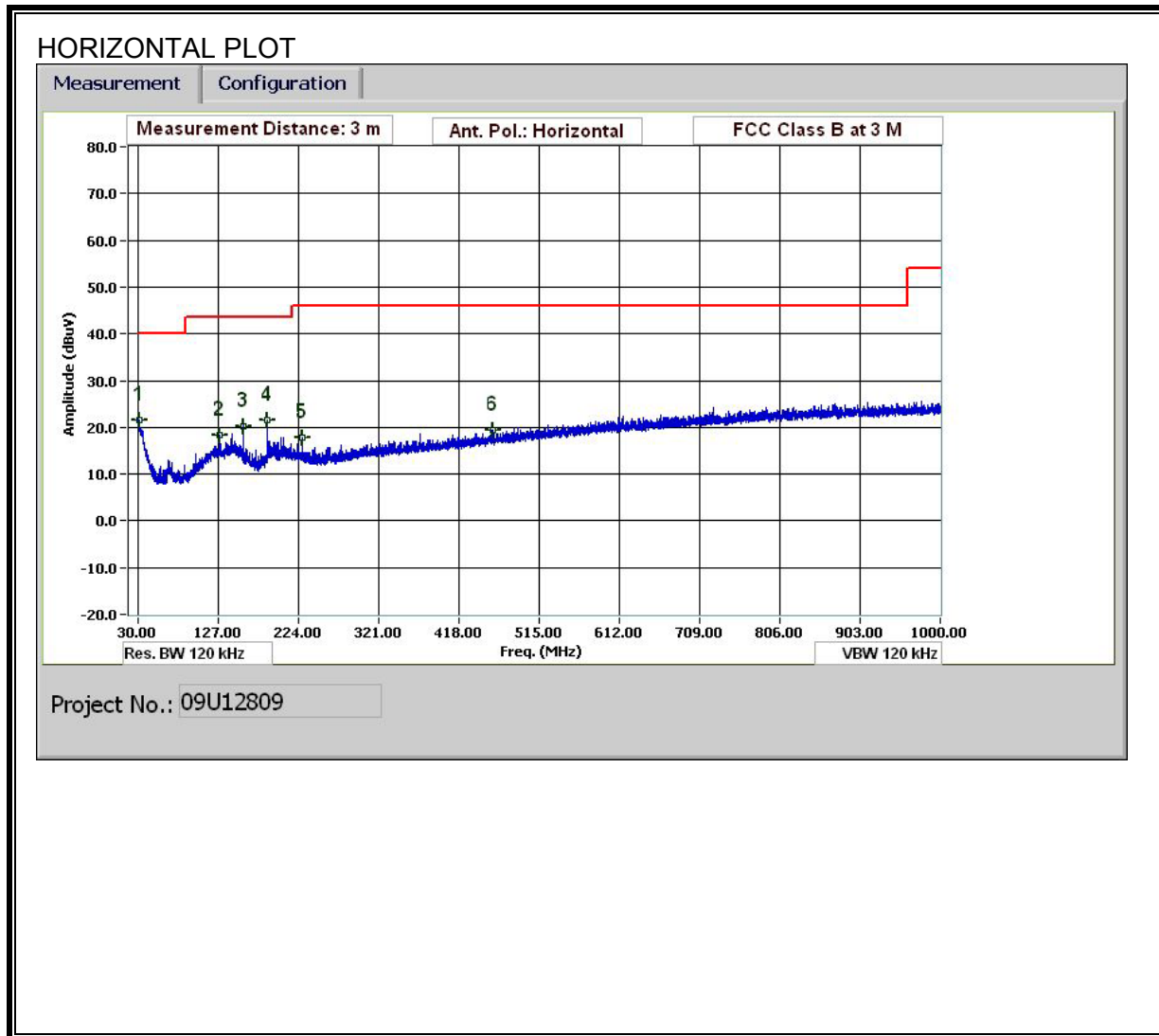
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Mid CH Worst case															
31.560	3.0	26.7	19.4	0.5	28.4	0.0	0.0	18.2	40.0	-21.8	H	EP	100.0	0 - 360	Prescan
98.763	3.0	34.2	9.6	0.9	28.3	0.0	0.0	16.5	43.5	-27.0	H	EP	100.0	0 - 360	Prescan
121.444	3.0	31.0	13.7	1.0	28.3	0.0	0.0	17.4	43.5	-26.1	H	EP	100.0	0 - 360	Prescan
157.565	3.0	36.8	11.9	1.1	28.3	0.0	0.0	21.5	43.5	-22.0	H	EP	100.0	0 - 360	Prescan
186.126	3.0	38.5	11.3	1.2	28.2	0.0	0.0	22.7	43.5	-20.8	H	EP	100.0	0 - 360	Prescan
596.903	3.0	28.9	18.4	2.2	27.5	0.0	0.0	22.0	46.0	-24.0	H	EP	100.0	0 - 360	Prescan
Mid CH Worst case															
31.080	3.0	33.4	19.6	0.5	28.4	0.0	0.0	25.1	40.0	-14.9	V	EP	100.0	0 - 360	Prescan
47.641	3.0	40.4	9.5	0.6	28.4	0.0	0.0	22.2	40.0	-17.8	V	EP	100.0	0 - 360	Prescan
73.802	3.0	41.1	7.8	0.7	28.3	0.0	0.0	21.3	40.0	-18.7	V	EP	100.0	0 - 360	Prescan
187.687	3.0	38.8	11.3	1.2	28.2	0.0	0.0	23.0	43.5	-20.5	V	EP	100.0	0 - 360	Prescan
202.687	3.0	37.8	12.0	1.3	28.2	0.0	0.0	22.9	43.5	-20.6	V	EP	100.0	0 - 360	Prescan
600.024	3.0	32.4	18.4	2.2	27.5	0.0	0.0	25.5	46.0	-20.5	V	EP	100.0	0 - 360	Prescan

Rev. 1.27.09

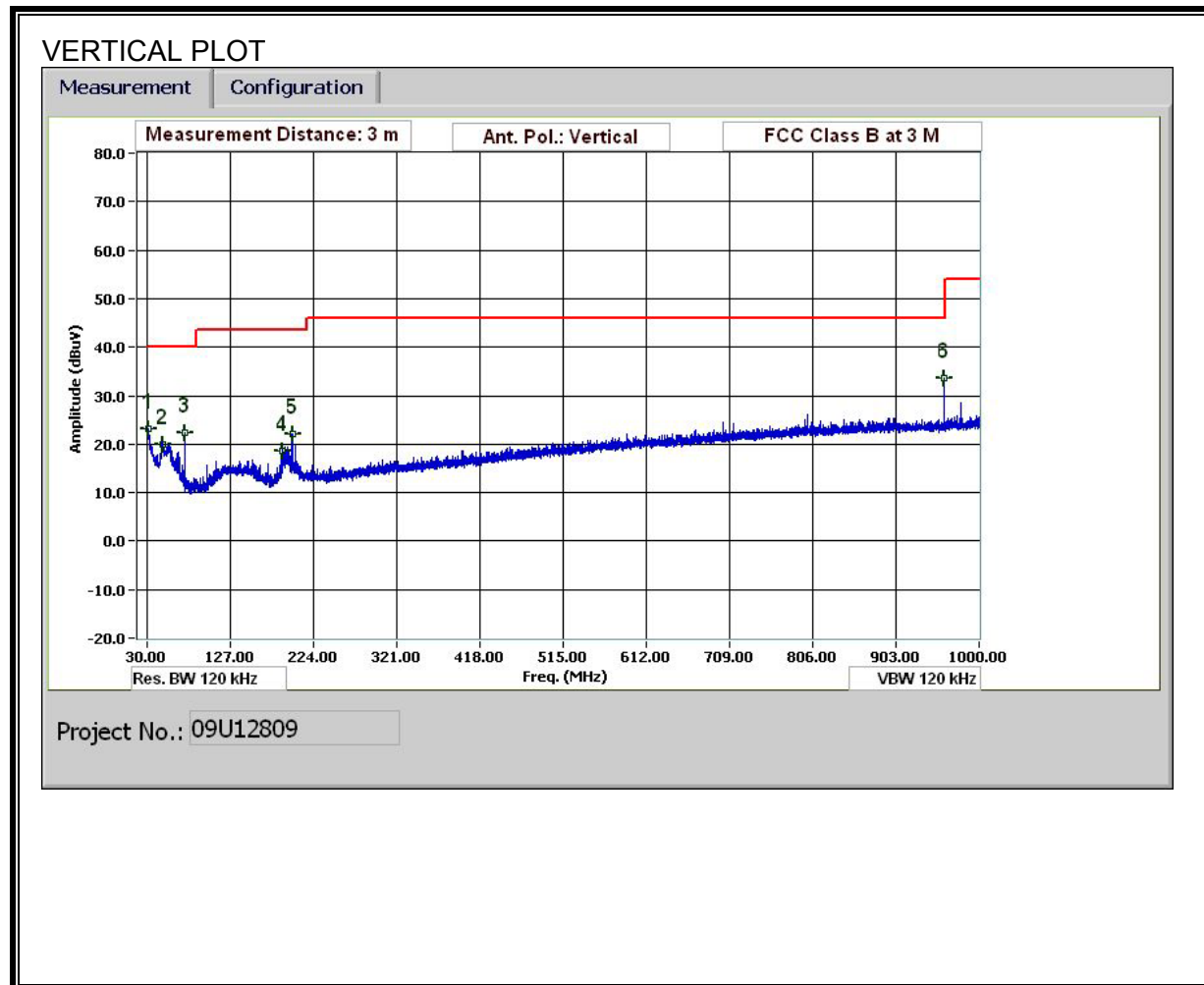
Note: No other emissions were detected above the system noise floor.

### 8.4.3. PCB Dipole, NanoBlue, 2dBi

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**





## HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/02/09  
Project #: 09U12809  
Company: DataLogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with NanoBlue Dipole 2 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters  
Read Analyzer Reading Filter Filter Insert Loss  
AF Antenna Factor Corr Calculated Field Strength  
CL Cable Loss Limit Field Strength Limit

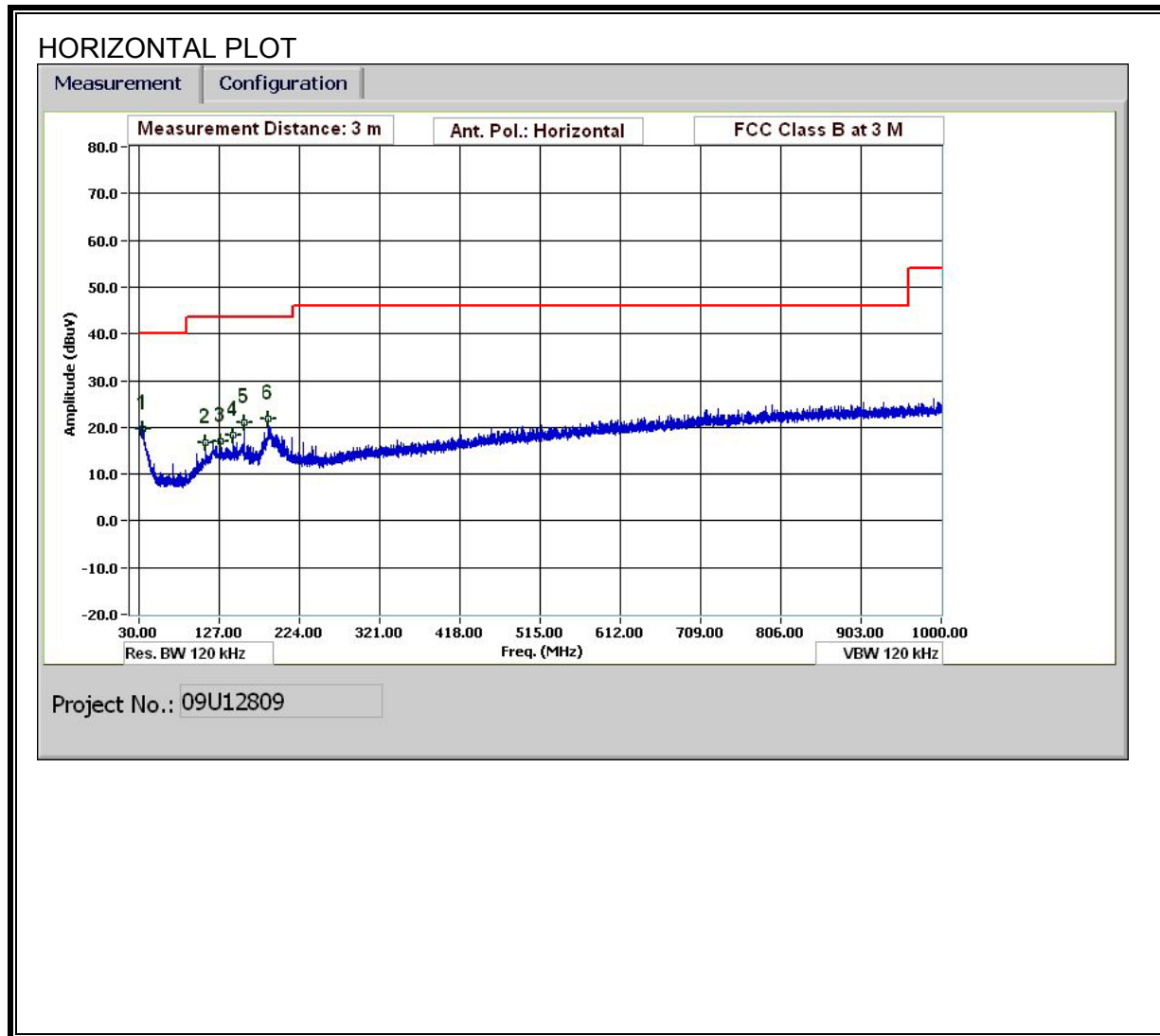
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Low CH Worst case															
31.080	3.0	29.9	19.6	0.5	28.4	0.0	0.0	21.6	40.0	-18.4	H	EP	100.0	0 - 360	Prescan
128.884	3.0	31.9	13.6	1.1	28.3	0.0	0.0	18.2	43.5	-25.3	H	EP	100.0	0 - 360	Prescan
157.565	3.0	35.4	11.9	1.1	28.3	0.0	0.0	20.1	43.5	-23.4	H	EP	100.0	0 - 360	Prescan
186.126	3.0	37.3	11.3	1.2	28.2	0.0	0.0	21.5	43.5	-22.0	H	EP	100.0	0 - 360	Prescan
229.088	3.0	32.8	11.9	1.3	28.2	0.0	0.0	17.7	46.0	-28.3	H	EP	100.0	0 - 360	Prescan
458.178	3.0	29.4	16.0	1.9	27.9	0.0	0.0	19.3	46.0	-26.7	H	EP	100.0	0 - 360	Prescan
Low CH Worst case															
31.800	3.0	31.7	19.3	0.5	28.4	0.0	0.0	23.1	40.0	-16.9	V	EP	100.0	0 - 360	Prescan
47.641	3.0	38.3	9.5	0.6	28.4	0.0	0.0	20.0	40.0	-20.0	V	EP	100.0	0 - 360	Prescan
74.042	3.0	42.2	7.8	0.8	28.3	0.0	0.0	22.3	40.0	-17.7	V	EP	100.0	0 - 360	Prescan
188.047	3.0	34.3	11.3	1.2	28.2	0.0	0.0	18.6	43.5	-24.9	V	EP	100.0	0 - 360	Prescan
199.087	3.0	37.1	11.9	1.2	28.2	0.0	0.0	22.0	43.5	-21.5	V	EP	100.0	0 - 360	Prescan
959.558	3.0	36.4	22.2	2.9	27.9	0.0	0.0	33.7	46.0	-12.3	V	EP	100.0	0 - 360	Prescan

Rev. 1.27.09

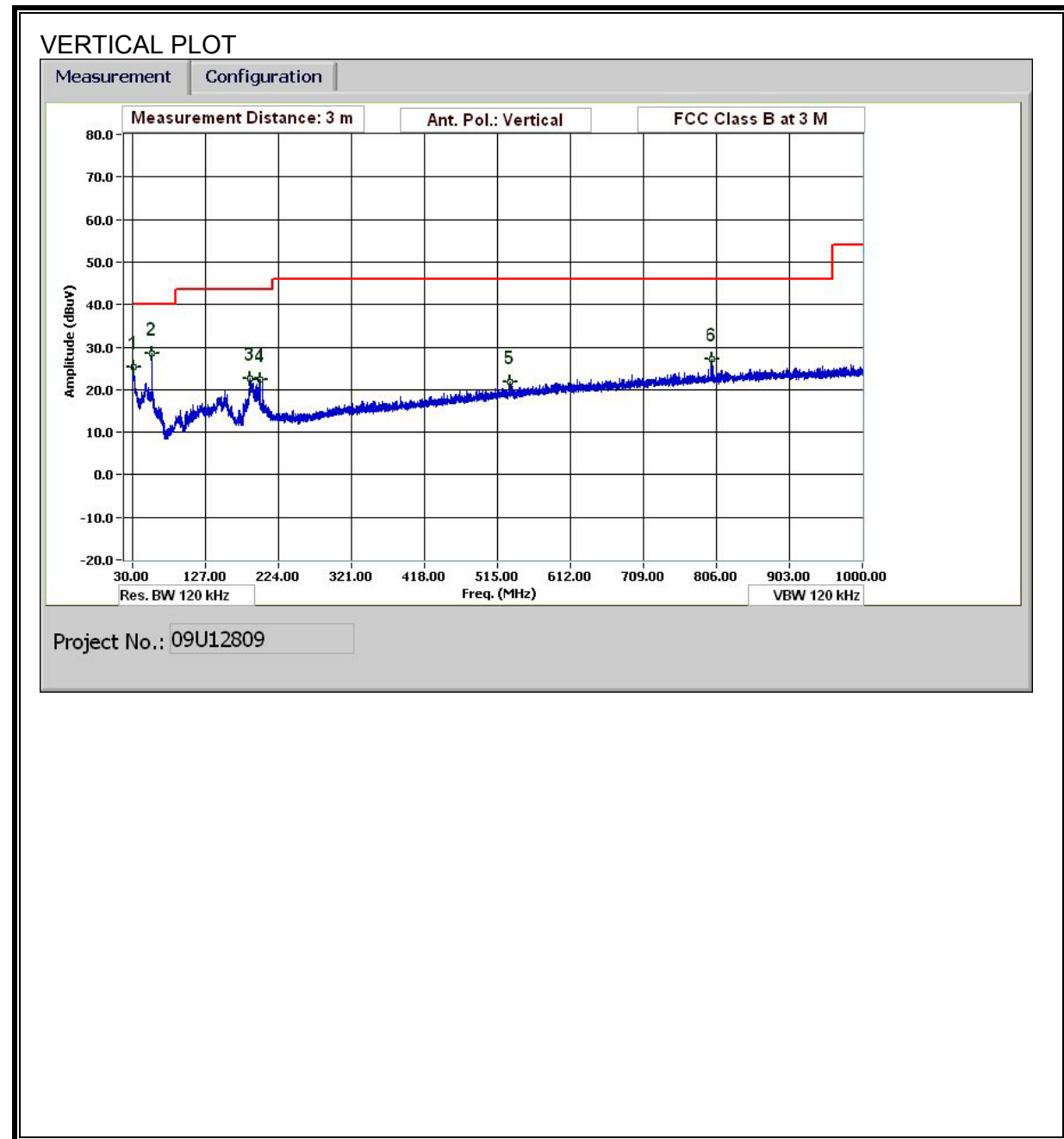
Note: No other emissions were detected above the system noise floor.

#### 8.4.4. Black Chip Monopole, 2dBi

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



## HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
Date: 10/02/09  
Project #: 09U12809  
Company: Datalogic Scanning, Inc.  
EUT Description: Bluetooth Modules (CSR chipset) with Black chip mono pole 2 dBi  
EUT M/N: Modules on JIG w/ AC adapter  
Test Target: FCC Class B  
Mode Oper: Continuous Transmit

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters  
Read Analyzer Reading Filter Filter Insert Loss  
AF Antenna Factor Corr. Calculated Field Strength  
CL Cable Loss Limit Field Strength Limit

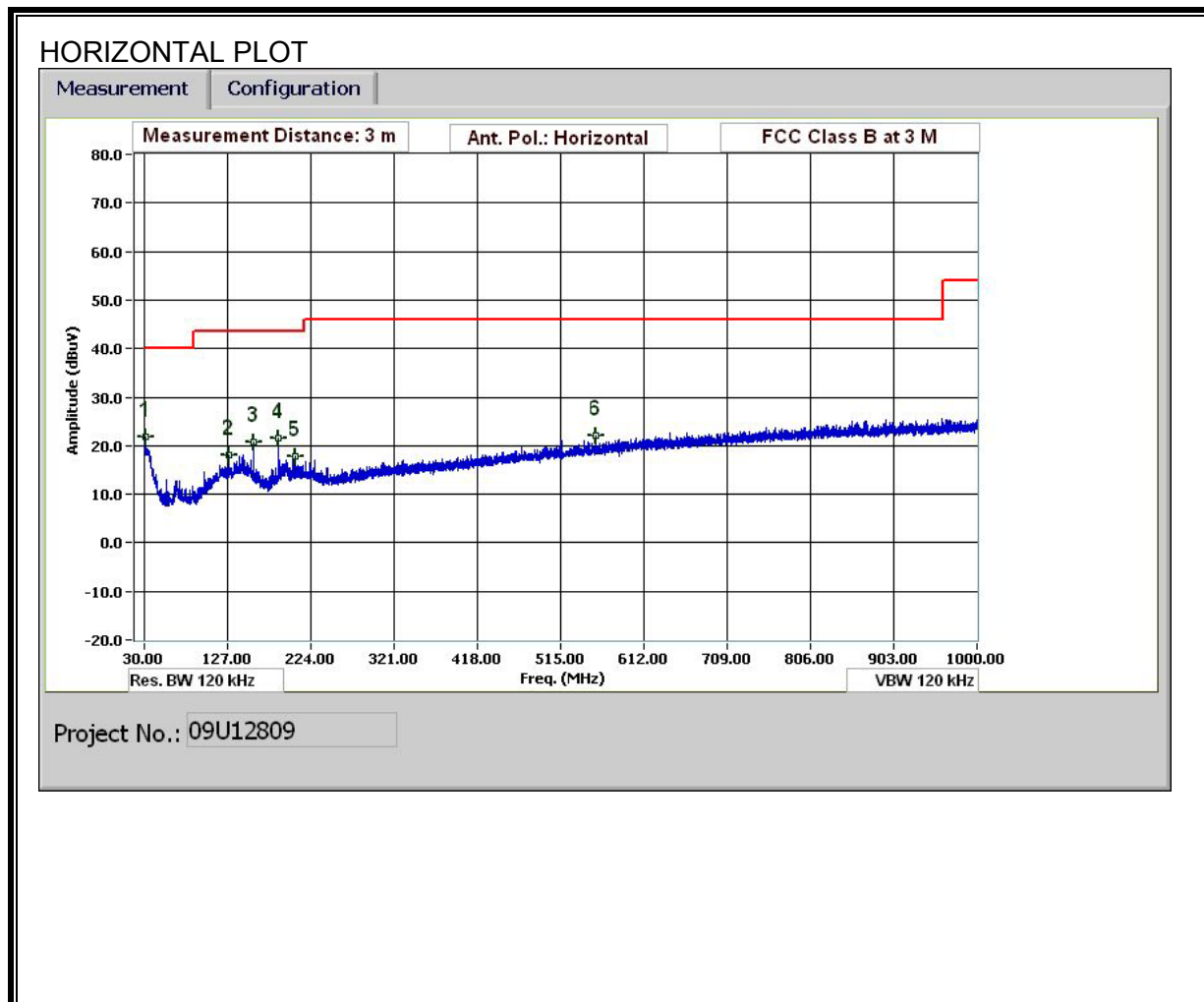
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Mid CH Worst case															
35.280	3.0	29.7	17.7	0.6	28.4	0.0	0.0	19.5	40.0	-20.5	H	EP	100.0	0 - 360	Prescan
110.883	3.0	32.0	11.9	1.0	28.3	0.0	0.0	16.7	43.5	-26.8	H	EP	100.0	0 - 360	Prescan
128.884	3.0	30.8	13.6	1.1	28.3	0.0	0.0	17.1	43.5	-26.4	H	EP	100.0	0 - 360	Prescan
143.165	3.0	32.5	13.1	1.1	28.3	0.0	0.0	18.4	43.5	-25.1	H	EP	100.0	0 - 360	Prescan
157.445	3.0	36.2	11.9	1.1	28.3	0.0	0.0	21.0	43.5	-22.5	H	EP	100.0	0 - 360	Prescan
186.126	3.0	37.6	11.3	1.2	28.2	0.0	0.0	21.8	43.5	-21.7	H	EP	100.0	0 - 360	Prescan
Mid CH Worst case															
30.960	3.0	33.4	19.7	0.5	28.4	0.0	0.0	25.2	40.0	-14.8	V	EP	100.0	0 - 360	Prescan
55.441	3.0	48.0	8.1	0.7	28.4	0.0	0.0	28.4	40.0	-11.6	V	EP	100.0	0 - 360	Prescan
186.126	3.0	38.3	11.3	1.2	28.2	0.0	0.0	22.6	43.5	-20.9	V	EP	100.0	0 - 360	Prescan
199.087	3.0	37.4	11.9	1.2	28.2	0.0	0.0	22.4	43.5	-21.1	V	EP	100.0	0 - 360	Prescan
531.621	3.0	30.3	17.3	2.1	27.7	0.0	0.0	21.9	46.0	-24.1	V	EP	100.0	0 - 360	Prescan
799.832	3.0	31.1	21.0	2.6	27.4	0.0	0.0	27.2	46.0	-18.8	V	EP	100.0	0 - 360	Prescan

Rev. 1.27.09

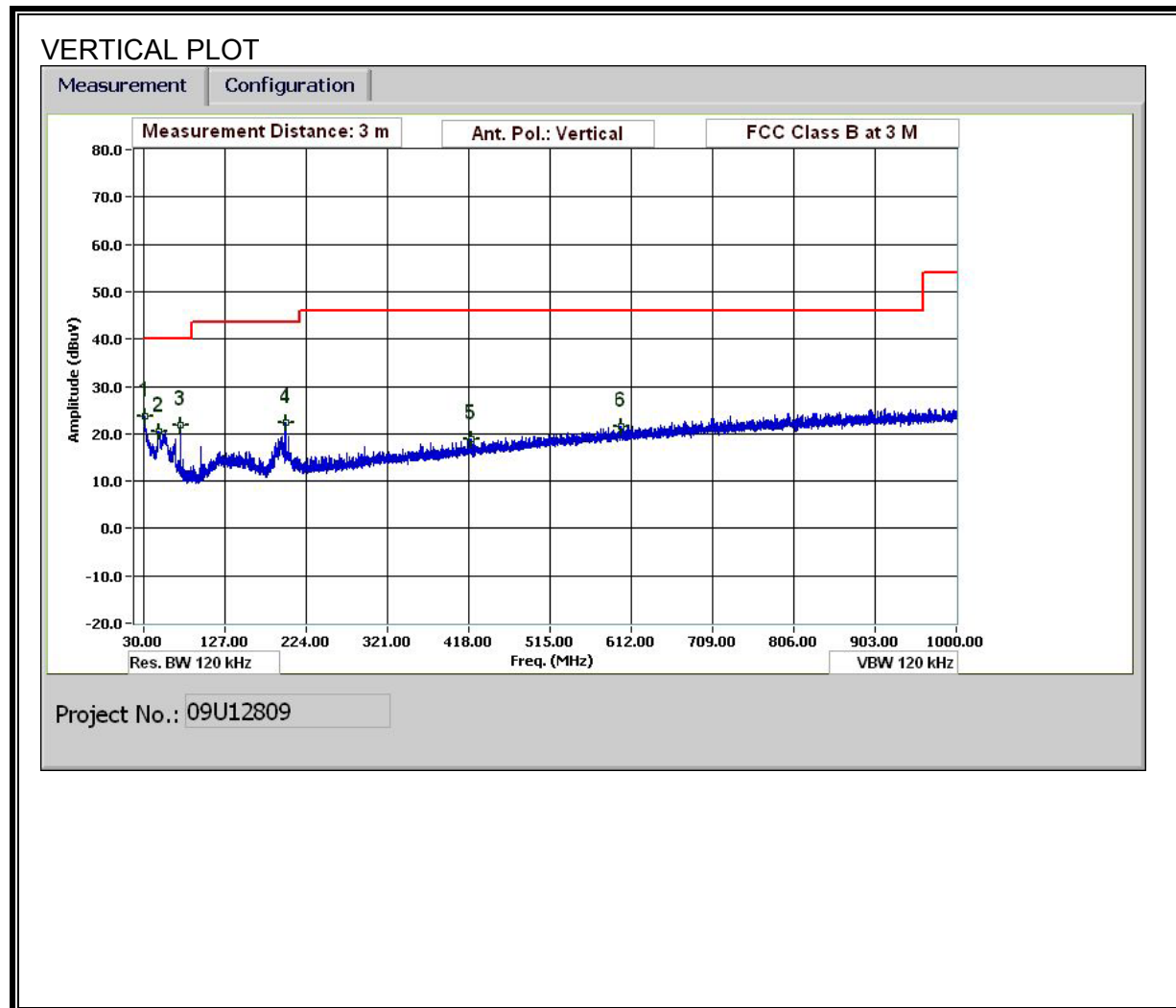
Note: No other emissions were detected above the system noise floor.

### 8.4.5. Johansen Monopole, 0.5dBi

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup> Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

## RESULTS

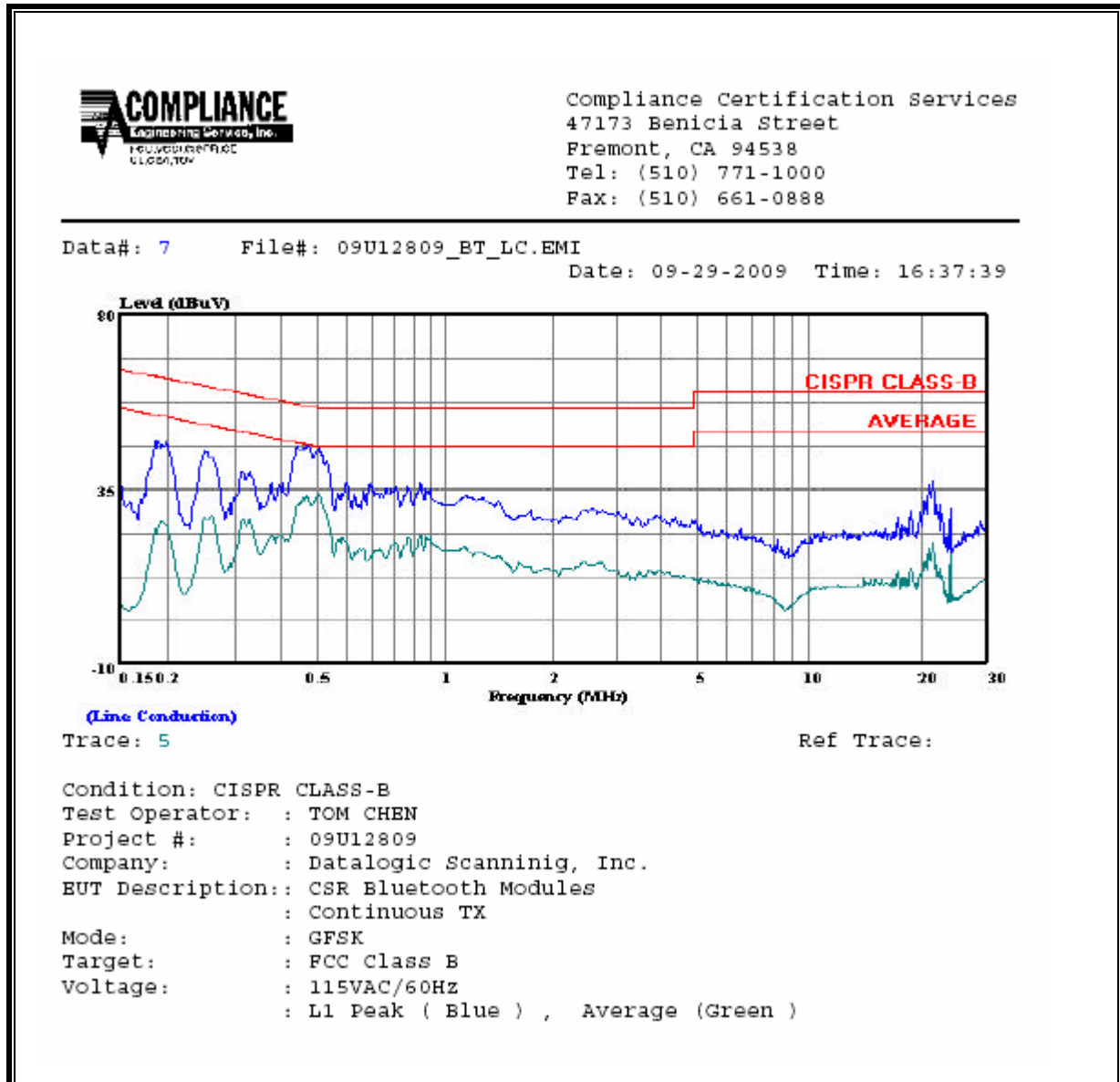
### FOR CSR Bluetooth Module BC6

#### 6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.19	46.80	--	24.72	0.00	64.21	54.21	-17.41	-29.49	L1
0.25	44.67	--	27.96	0.00	61.66	51.66	-16.99	-23.70	L1
0.50	45.46	--	33.96	0.00	56.02	46.02	-10.56	-12.06	L1
0.19	44.35	--	28.31	0.00	64.12	54.12	-19.77	-25.81	L2
0.25	43.46	--	30.81	0.00	61.66	51.66	-18.20	-20.85	L2
0.47	47.15	--	34.57	0.00	56.50	46.50	-9.35	-11.93	L2
6 Worst Data									



## LINE 1 RESULTS



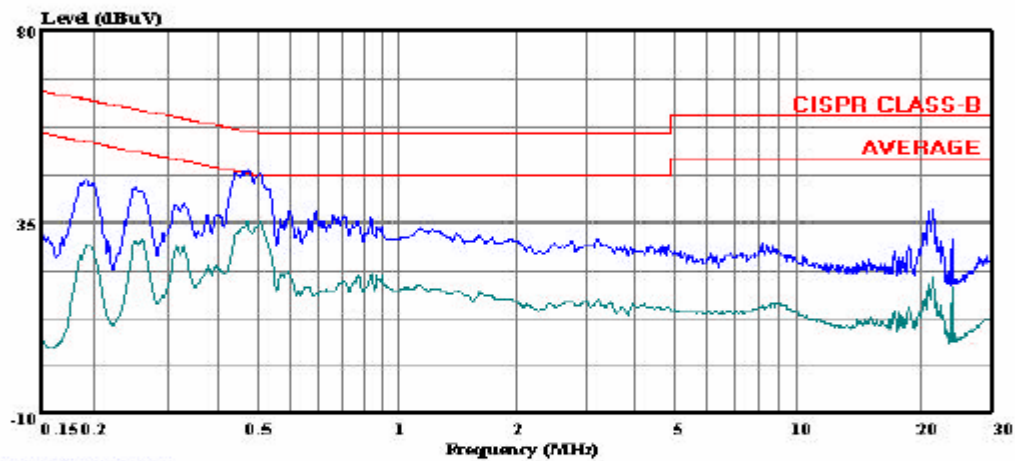
## LINE 2 RESULTS



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 14 File#: 09U12809\_BT\_LC.EMI

Date: 09-29-2009 Time: 16:49:25



(Line Conduction)

Trace: 12

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator: : TOM CHEN  
Project #: : 09U12809  
Company: : Datalogic Scanning, Inc.  
EUT Description: : CSR Bluetooth Modules  
: Continuous TX  
Mode: : GFSK  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L2: Peak ( Blue ) , Average (Green )

## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5**  
**Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

\* Power density limit is applicable at frequencies greater than 100 MHz.

**Notes:** 1. Frequency,  $f$ , is in MHz.  
2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.  
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## **EQUATIONS**

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

where

S = Power density in W/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m<sup>2</sup>

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

## **LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm<sup>2</sup>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

## **RESULTS**

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m <sup>2</sup> )	FCC Power Density (mW/cm <sup>2</sup> )
2.4 GHz	Bluetooth	0.20	8.92	3.80	0.04	0.004

**END OF REPORT**