



**FCC 47 CFR PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR**

**CDMA/LTE PHONE + BLUETOOTH, DTS/b/g/n**

**MODEL NUMBER: LGLS751, LG-LS751, LS751**

**FCC ID: ZNFLS751**

**REPORT NUMBER: 15I20232-E2**

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**NVLAP LAB CODE 200065-0**

Revision History

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---	03/23/15	Initial Issue	D. Corona

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LG ELECTRONICS MOBILECOMM U.S.A., INC  
**EUT DESCRIPTION:** CDMA/LTE PHONE + BLUETOOTH, DTS b/g/n  
**MODEL:** LGLS751, LG-LS751, LS751  
**SERIAL NUMBER:** 2067407 (Radiated), 206740 (Conducted)  
**DATE TESTED:** MARCH 4-5, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. 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 UL Verification Services Inc. 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.

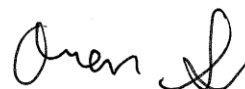
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, FCC CFR 47 Part 2, and FCC CFR 47 Part 15C.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input checked="" type="checkbox"/> Chamber A(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 2324B-4)
<input type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 2324B-5)
<input type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 2324B-6)
	<input checked="" type="checkbox"/> Chamber G(IC: 2324B-7)
	<input type="checkbox"/> Chamber H(IC: 2324B-8)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 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:

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

### 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 18000 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 CDMA/LTE PHONE + BLUETOOTH, DTS/b/g/n

### 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	8.93	7.82
2402 - 2480	Enhanced 8PSK	9.20	8.32

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.9dBi.

### 5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.



## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS-02WR	RA4Y1031433	N/A
Earphone	LG	N/A	N/A	N/A

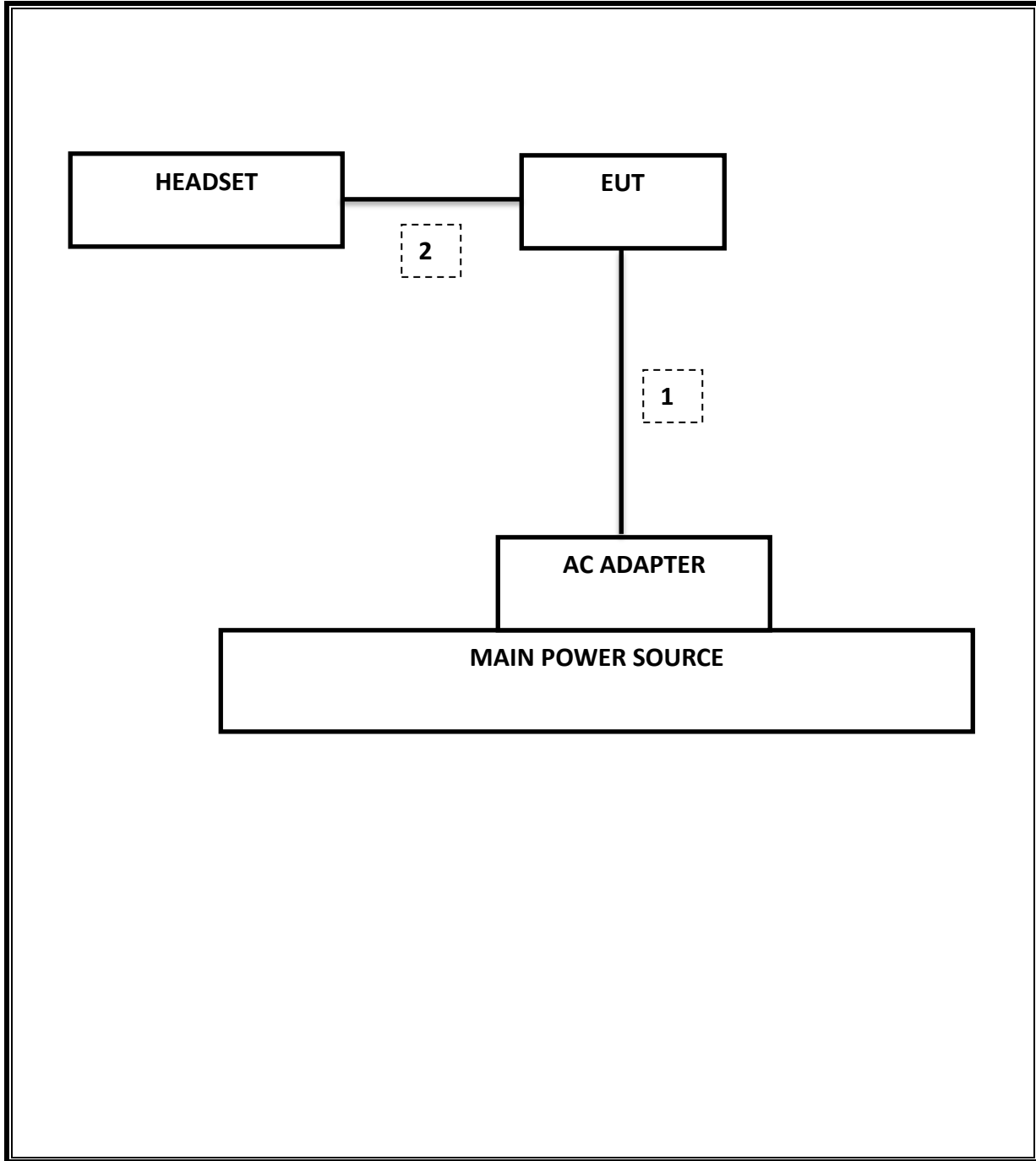
### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.  
EUT was set in the Hidden menu mode to enable BT communications.

**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	Tnumber	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	122	02/13/16
Antenna, Horn, 18GHz	EMCO	3115	60	10/25/16
Antenna, Horn, 26.5 GHz	ARA	MWH-1826	89	11/14/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/16/16
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
Conducted Software	UL	UL EMC	Ver 9.5, May 17 2012	
CLT Software	UL	UL RF	Ver 1.0, Feb 2 2015	
Antenna Port Software	UL	UL RF	Ver 2.1.1.1, Jan 20 2015	

## 7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 4.6	Occupied Band width (99%)	N/A	Conducted	Pass	0.8869 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-52.23 dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	9.20 dBm
15.247 (a)(1)	RSS-210 A8.1(b)	Hopping frequency separation	> 25KHz		Pass	1 MHz
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.1804 s
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10		Radiated	Pass
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m	Pass		40.73 dBuV/m

## 8. ANTENNA PORT TEST RESULTS

### 8.1. 20 dB AND 99% BANDWIDTH

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

DA 00-705: 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

##### 8.1.1. BASIC DATA RATE GFSK MODULATION

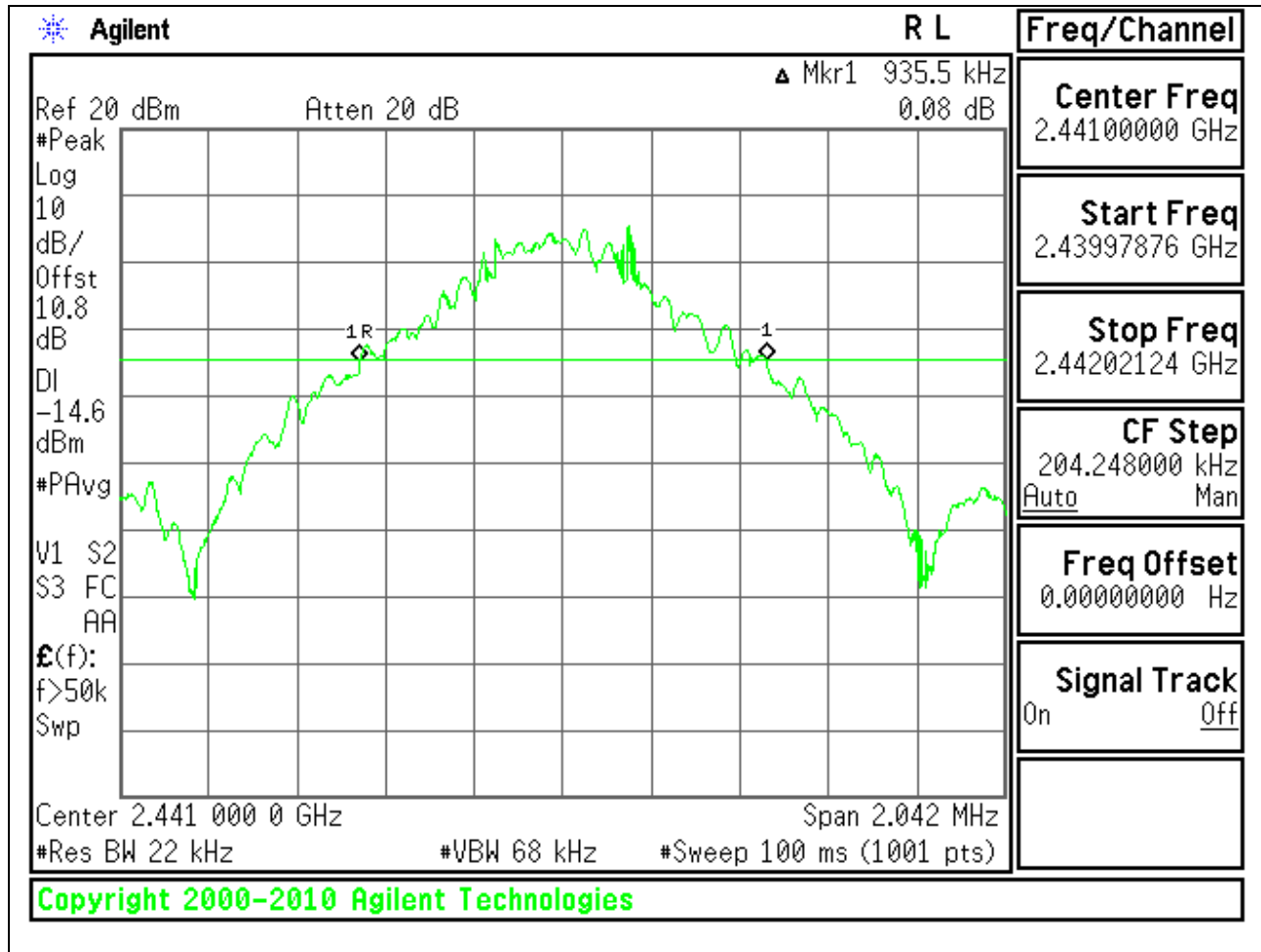
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.9383	0.8976
Middle	2441	0.9355	0.8996
High	2480	0.9381	0.8869
Worst		0.9383	0.8996

##### 8.1.2. ENHANCED DATA RATE 8PSK MODULATION

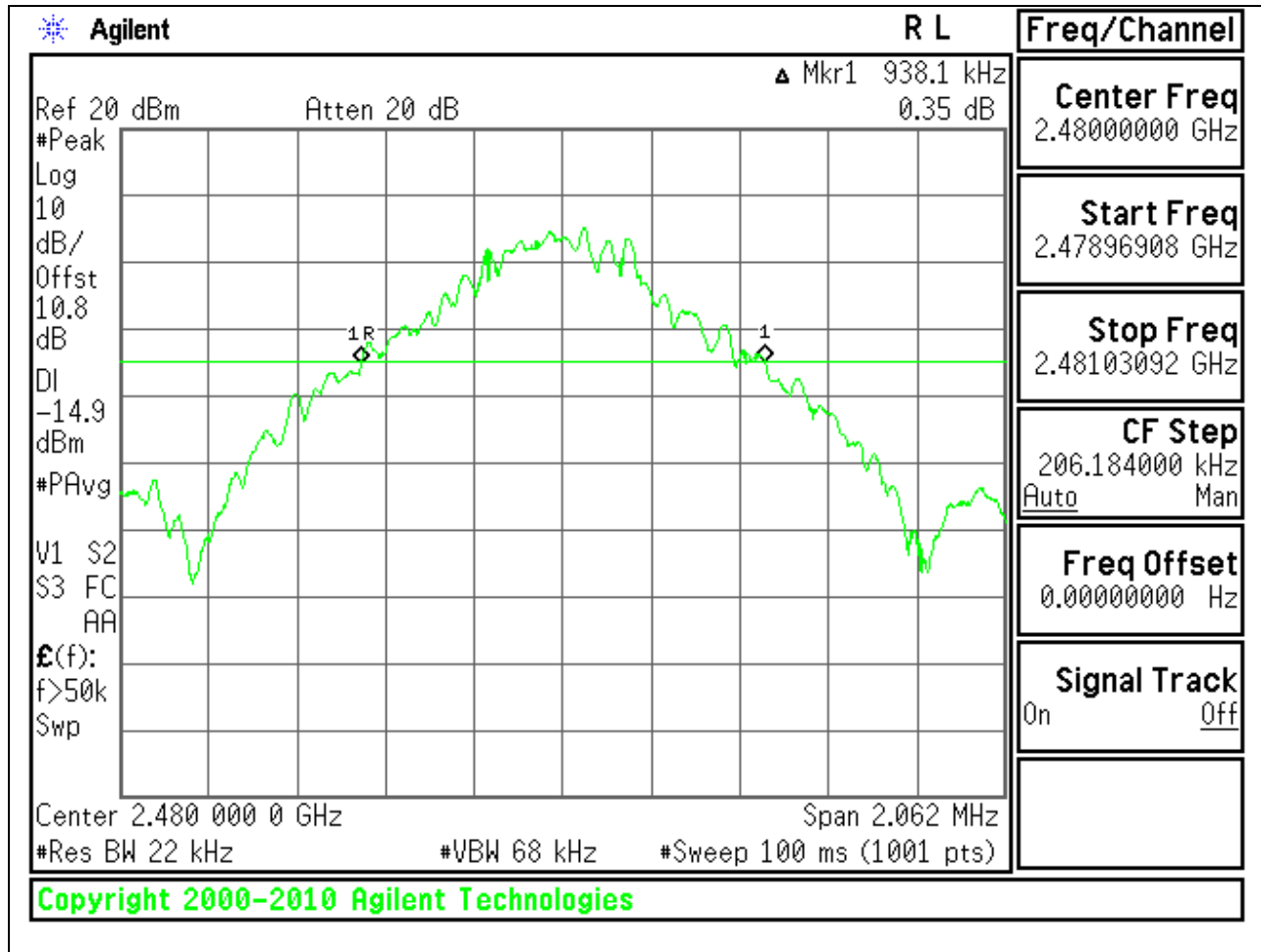
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.2817	1.1837
Middle	2441	1.2817	1.1854
High	2480	1.284	1.1852
Worst		1.284	1.1854



MID CHANNEL



**HIGH CHANNEL**





**GFSK 99% BANDWIDTH**

**LOW CHANNEL**

		R L	Measure
<b>Ch Freq</b> 2.402 GHz		Trig Free	Meas Off
Occupied Bandwidth		Averages: 100	Channel Power
Ref 20 dBm #Atten 20 dB			Occupied BW
#Samp Log 10 dB/Offst 10.8 dB			ACP
Center 2.402 000 0 GHz Span 1.744 MHz			Multi Carrier Power
#Res BW 22 kHz #VBW 68 kHz #Sweep 100 ms (1001 pts)			Power Stat CCDF
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	More 1 of 2
897.6434 kHz		<b>x dB</b> -20.00 dB	
<b>Transmit Freq Error</b> -14.289 kHz			
<b>x dB Bandwidth</b> 885.341 kHz*			
Copyright 2000-2010 Agilent Technologies			

MID CHANNEL

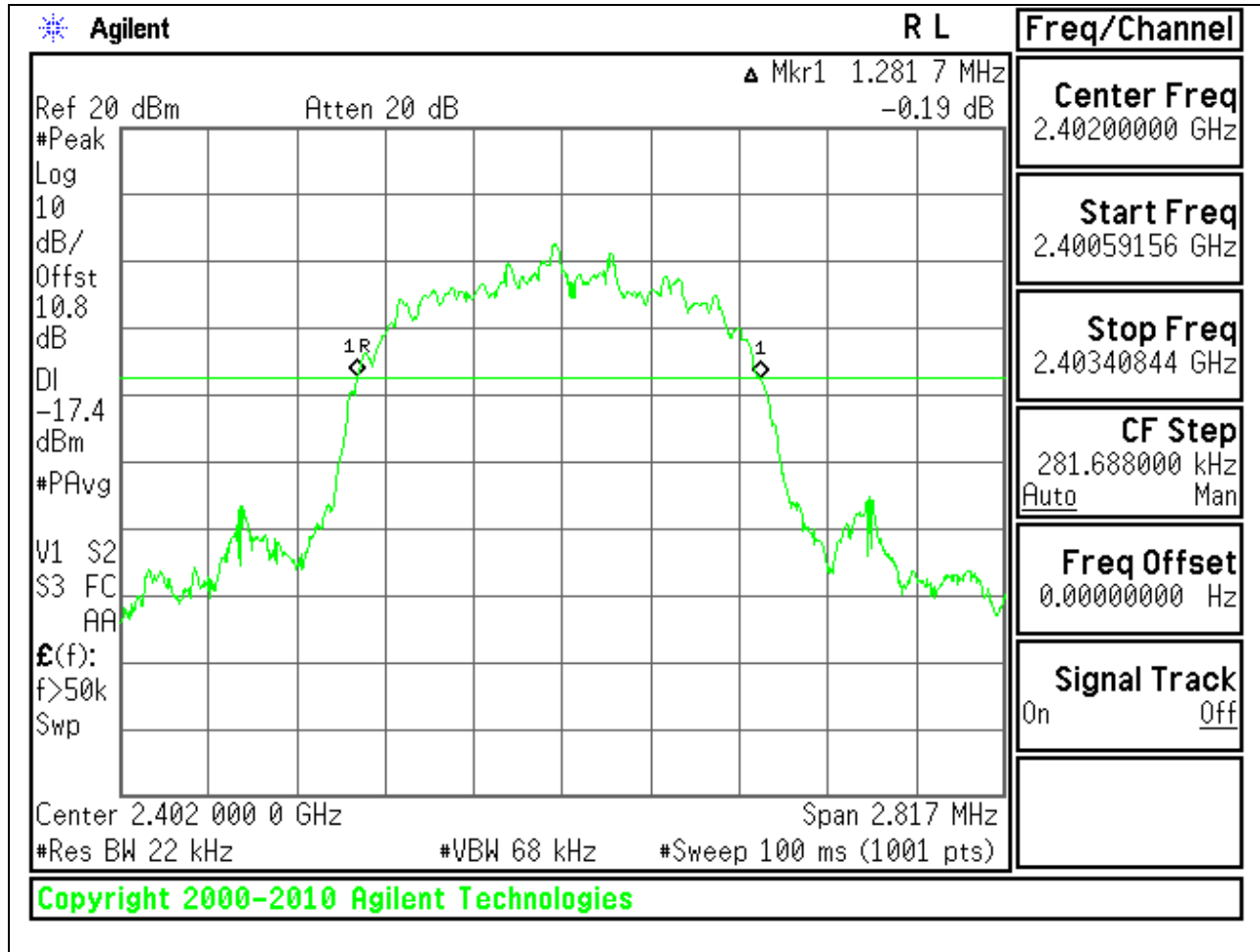
		R L	Measure
<b>Ch Freq</b> 2.441 GHz		<b>Trig</b> Free	Meas Off
Occupied Bandwidth		Averages: 100	Channel Power
Ref 20 dBm #Atten 20 dB			Occupied BW
			ACP
Center 2.441 000 0 GHz Span 1.781 MHz #Res BW 22 kHz #VBW 68 kHz #Sweep 100 ms (1001 pts)			Multi Carrier Power
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	Power Stat CCDF
899.6164 kHz		<b>x dB</b> -20.00 dB	More
<b>Transmit Freq Error</b> -15.255 kHz			1 of 2
<b>x dB Bandwidth</b> 890.297 kHz*			
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**HIGH CHANNEL**

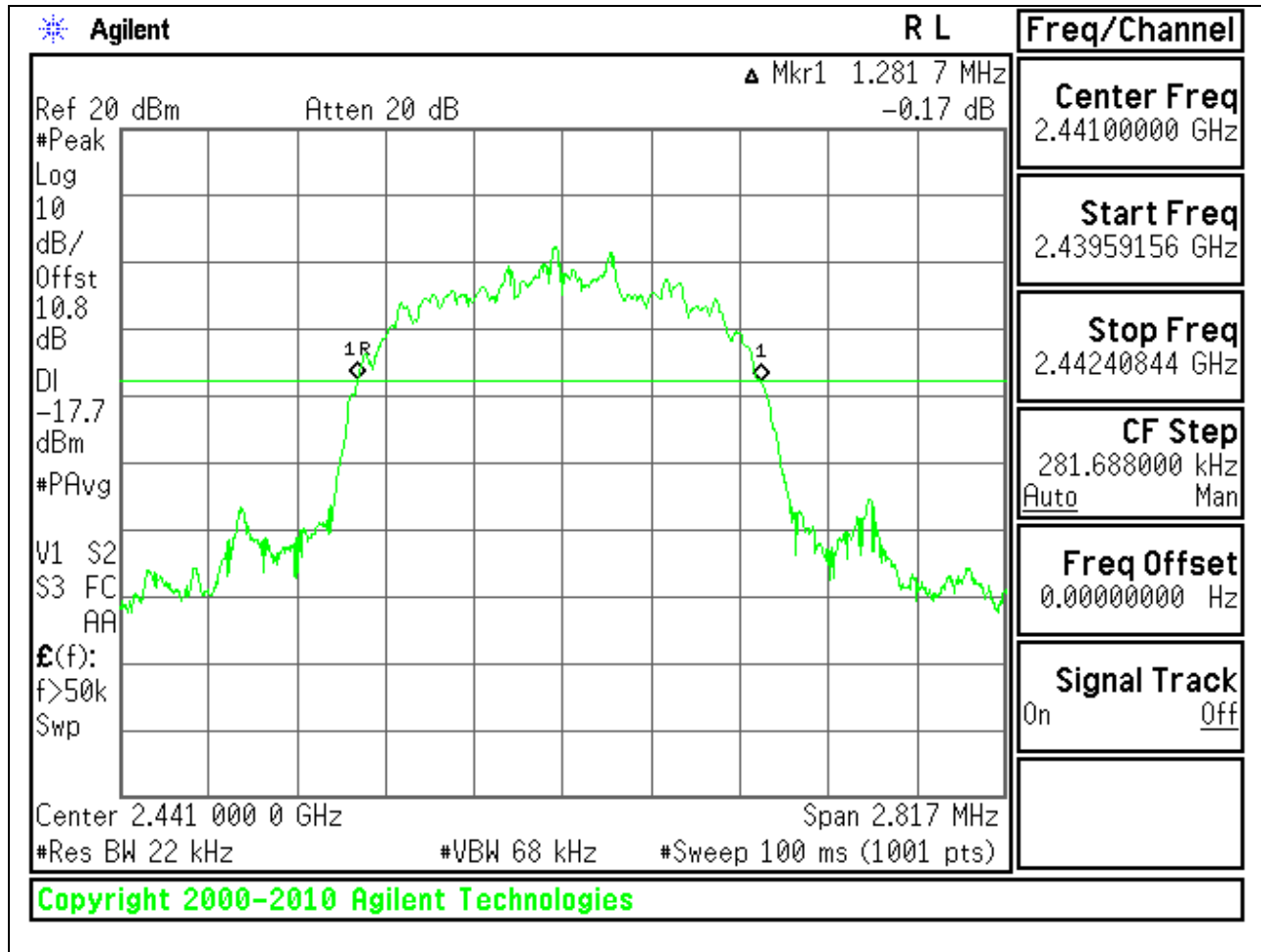
<b>Agilent</b>		<b>R L</b>	<b>Measure</b>
<b>Ch Freq</b> 2.48 GHz		<b>Trig</b> Free	<b>Meas Off</b>
Occupied Bandwidth		Averages: 100	<b>Channel Power</b>
Ref 20 dBm      #Atten 20 dB			<b>Occupied BW</b>
#Samp Log 10 dB/ Offst 10.8 dB			<b>ACP</b>
Center 2.480 000 0 GHz		Span 1.761 MHz	<b>Multi Carrier Power</b>
#Res BW 22 kHz		#VBW 68 kHz	#Sweep 100 ms (1001 pts)
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	<b>Power Stat</b>
886.8686 kHz		<b>x dB</b> -20.00 dB	<b>CCDF</b>
<b>Transmit Freq Error</b> -2.288 kHz			<b>More</b>
<b>x dB Bandwidth</b> 877.422 kHz*			1 of 2
Copyright 2000-2010 Agilent Technologies			

**8PSK 20 dB BANDWIDTH**

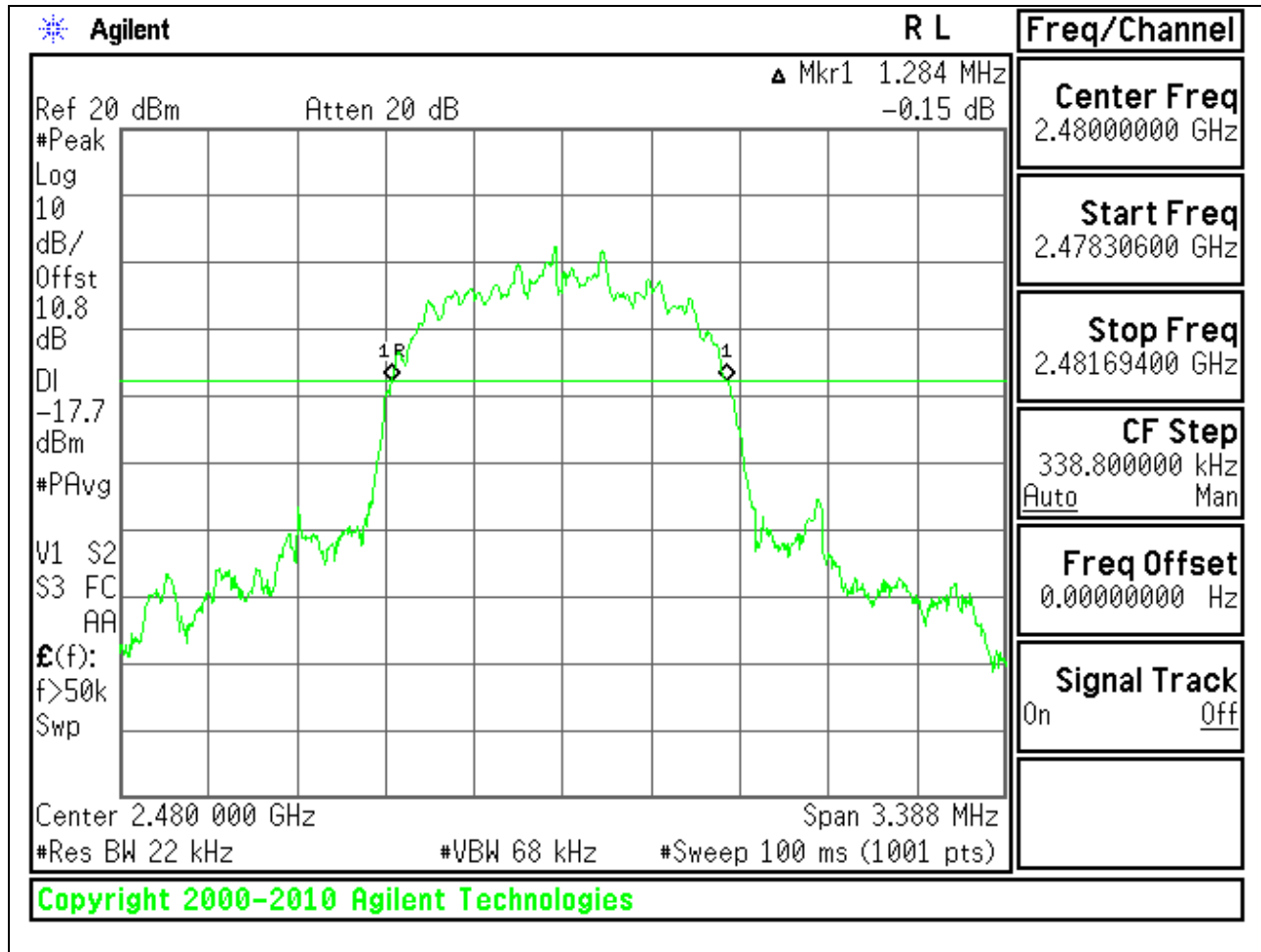
**LOW CHANNEL**



MID CHANNEL



**HIGH CHANNEL**



**8PSK 99% BANDWIDTH**

**LOW CHANNEL**

		R L	<b>Measure</b>
<b>Ch Freq</b> 2.402 GHz		<b>Trig</b> Free	
Occupied Bandwidth		Averages: 100	
Ref 20 dBm      #Atten 20 dB			<b>Channel Power</b>
#Samp Log 10 dB/ Offst 10.8 dB			<b>Occupied BW</b>
			<b>ACP</b>
Center 2.402 000 0 GHz      Span 2.329 MHz #Res BW 22 kHz      #VBW 68 kHz      #Sweep 100 ms (1001 pts)			<b>Multi Carrier Power</b>
<b>Occupied Bandwidth</b> 1.1837 MHz		<b>Occ BW % Pwr</b> 99.00 % <b>x dB</b> -20.00 dB	
<b>Transmit Freq Error</b> -7.453 kHz <b>x dB Bandwidth</b> 1.283 MHz*		<b>Power Stat CCDF</b>	
			<b>More</b> 1 of 2
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MID CHANNEL

Agilent		R L	Measure
<b>Ch Freq</b> 2.441 GHz		Trig Free	Meas Off
Occupied Bandwidth		Averages: 100	Channel Power
Ref 20 dBm #Atten 20 dB #Samp Log 10 dB/Offst 10.8 dB 			Occupied BW
Center 2.441 000 0 GHz Span 2.334 MHz #Res BW 22 kHz #VBW 68 kHz #Sweep 100 ms (1001 pts)			ACP
<b>Occupied Bandwidth</b> 1.1854 MHz		<b>Occ BW % Pwr</b> 99.00 % <b>x dB</b> -20.00 dB	Multi Carrier Power
<b>Transmit Freq Error</b> -9.593 kHz <b>x dB Bandwidth</b> 1.286 MHz*			Power Stat CCDF
Copyright 2000-2010 Agilent Technologies			<b>More</b> 1 of 2



**HIGH CHANNEL**

		R L	<b>Measure</b>
<b>Ch Freq</b> 2.48 GHz		<b>Trig</b> Free	<b>Meas Off</b>
Occupied Bandwidth <input type="text" value="Averages: 100"/>			<b>Channel Power</b>
Ref 20 dBm #Atten 20 dB			<b>Occupied BW</b>
			<b>ACP</b>
Center 2.480 000 0 GHz Span 2.331 MHz #Res BW 22 kHz #VBW 68 kHz #Sweep 100 ms (1001 pts)			<b>Multi Carrier Power</b>
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	<b>Power Stat</b>
1.1852 MHz		<b>x dB</b> -20.00 dB	<b>CCDF</b>
<b>Transmit Freq Error</b> -9.959 kHz			<b>More</b>
<b>x dB Bandwidth</b> 1.278 MHz*			1 of 2
<b>Copyright 2000-2010 Agilent Technologies</b>			

## **8.2. HOPPING FREQUENCY SEPARATION**

### **LIMIT**

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.

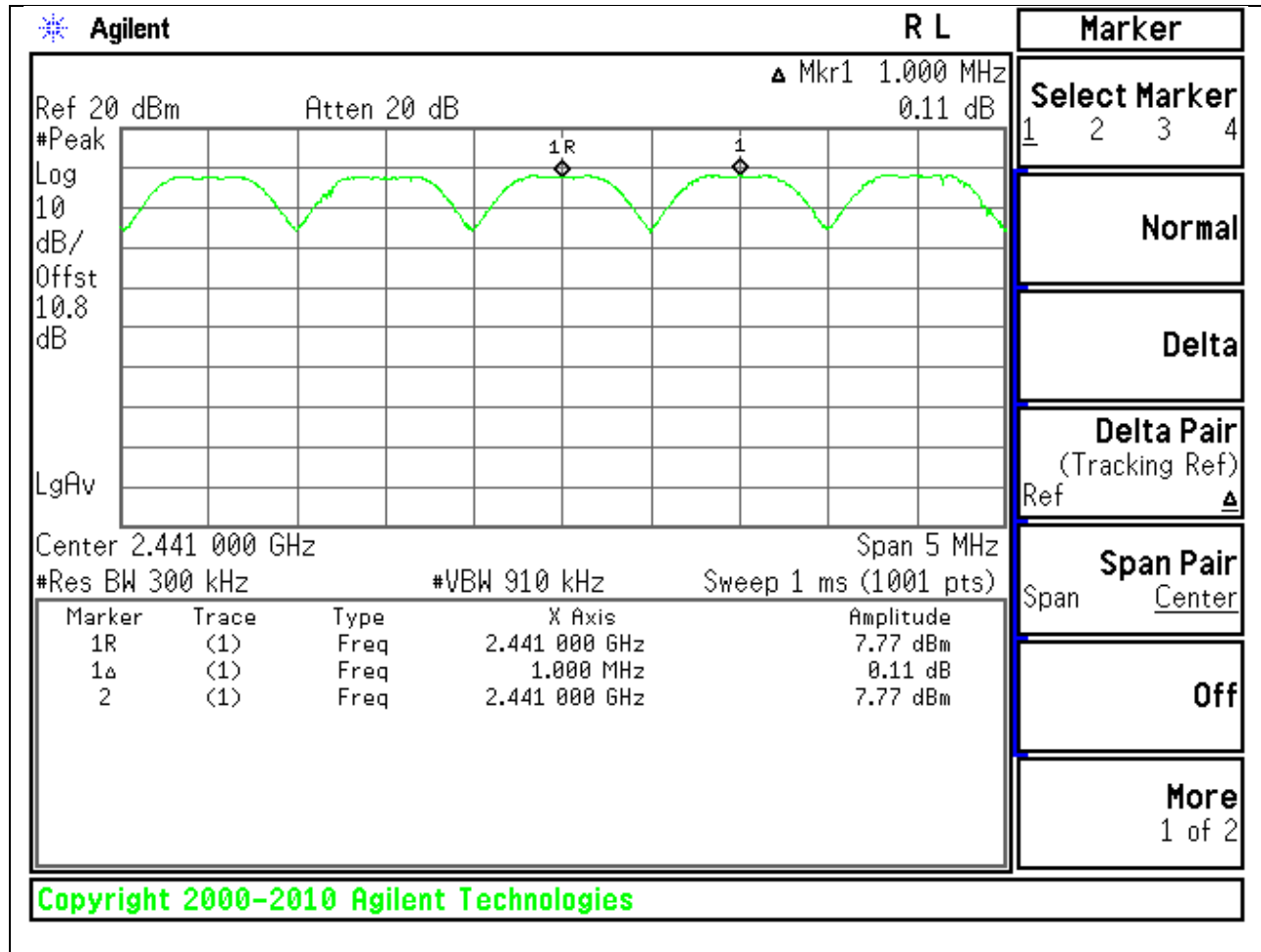
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

### **TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

### **RESULTS**

**HOPPING FREQUENCY SEPARATION PLOT**



### **8.3. NUMBER OF HOPPING CHANNELS LIMIT**

FCC §15.247 (a) (1) (iii)

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

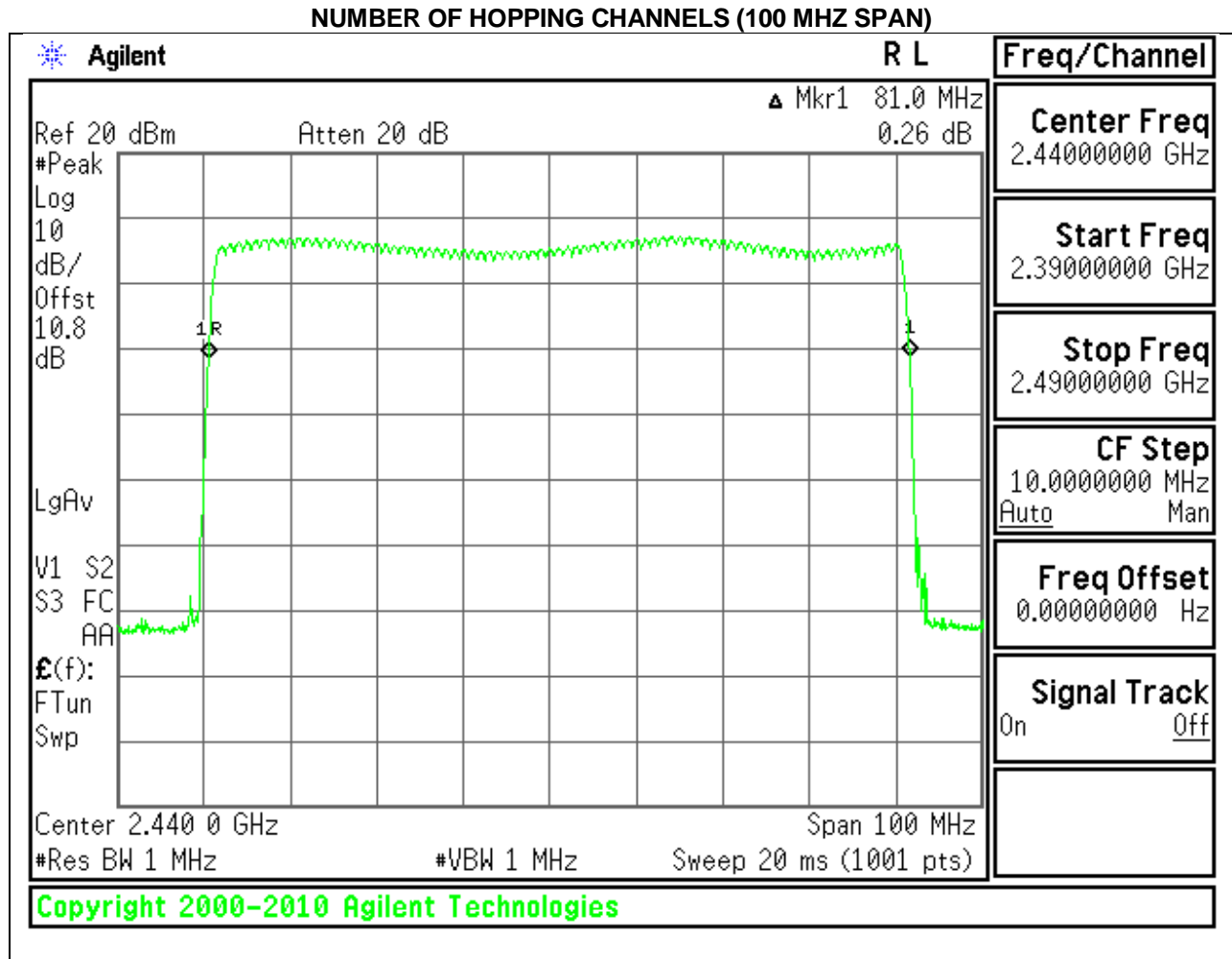
### **TEST PROCEDURE**

DA 00-705: 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.

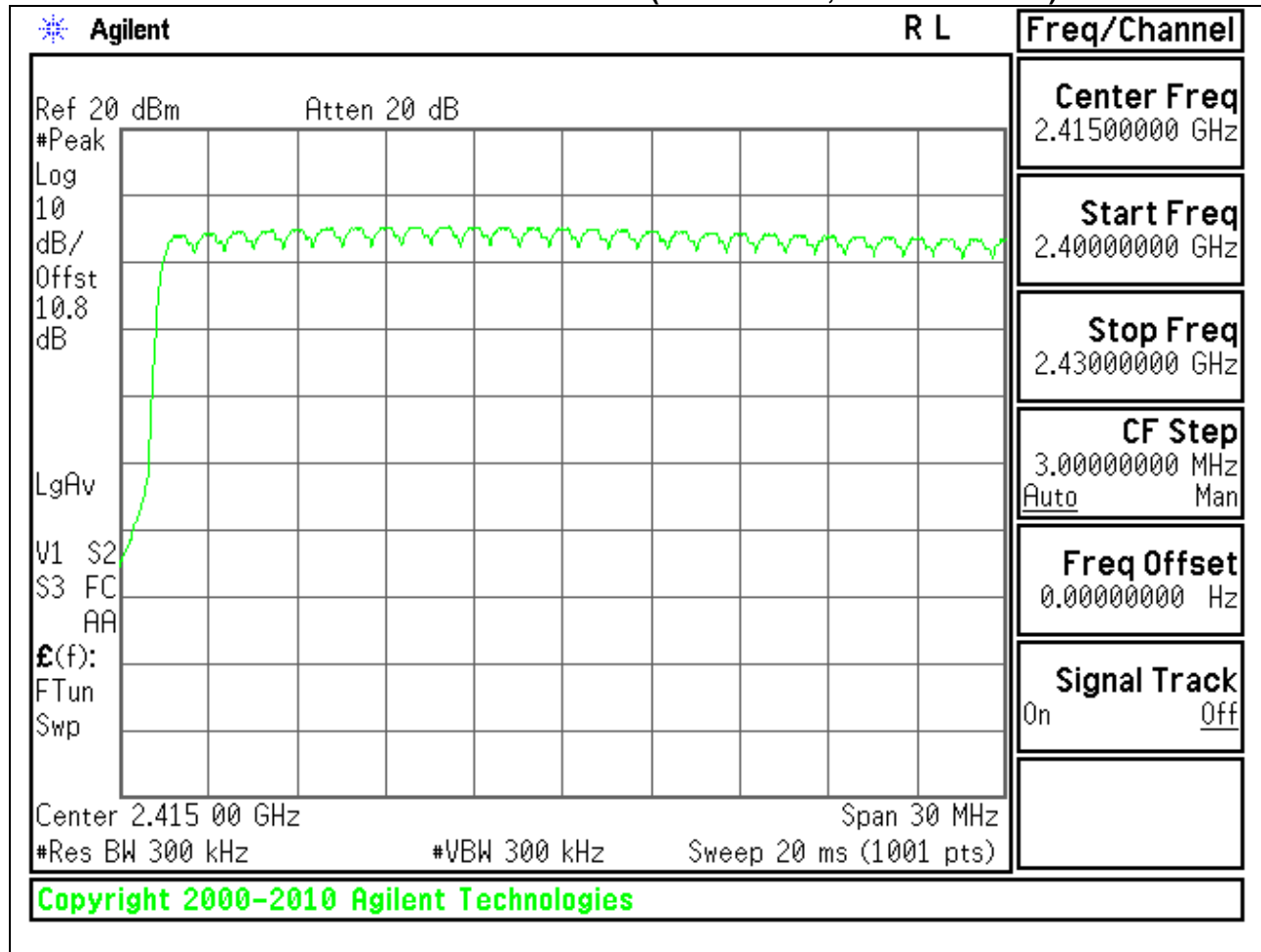
### **RESULTS**

Normal Mode: 79 Channels observed.

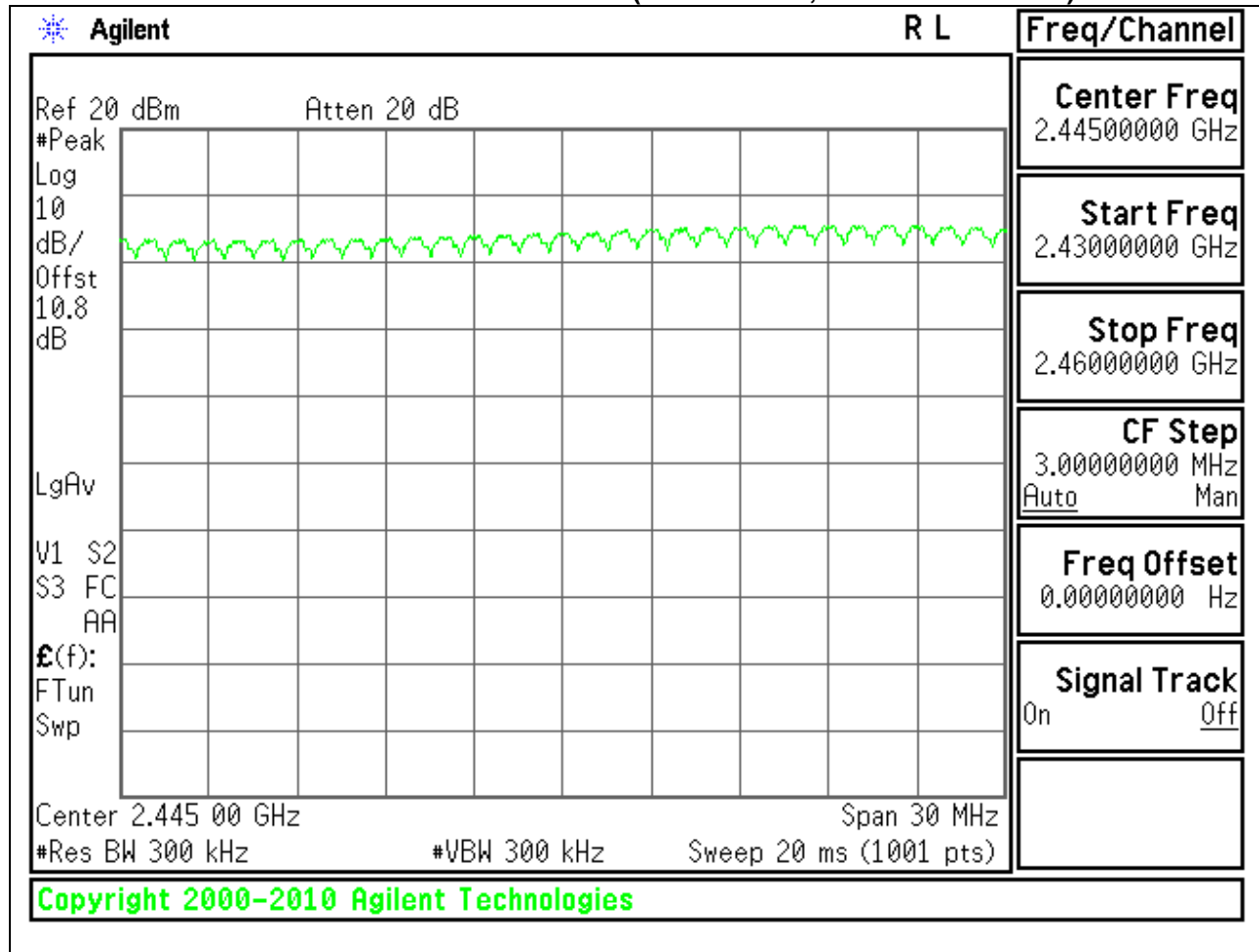
**NUMBER OF HOPPING CHANNELS PLOTS**



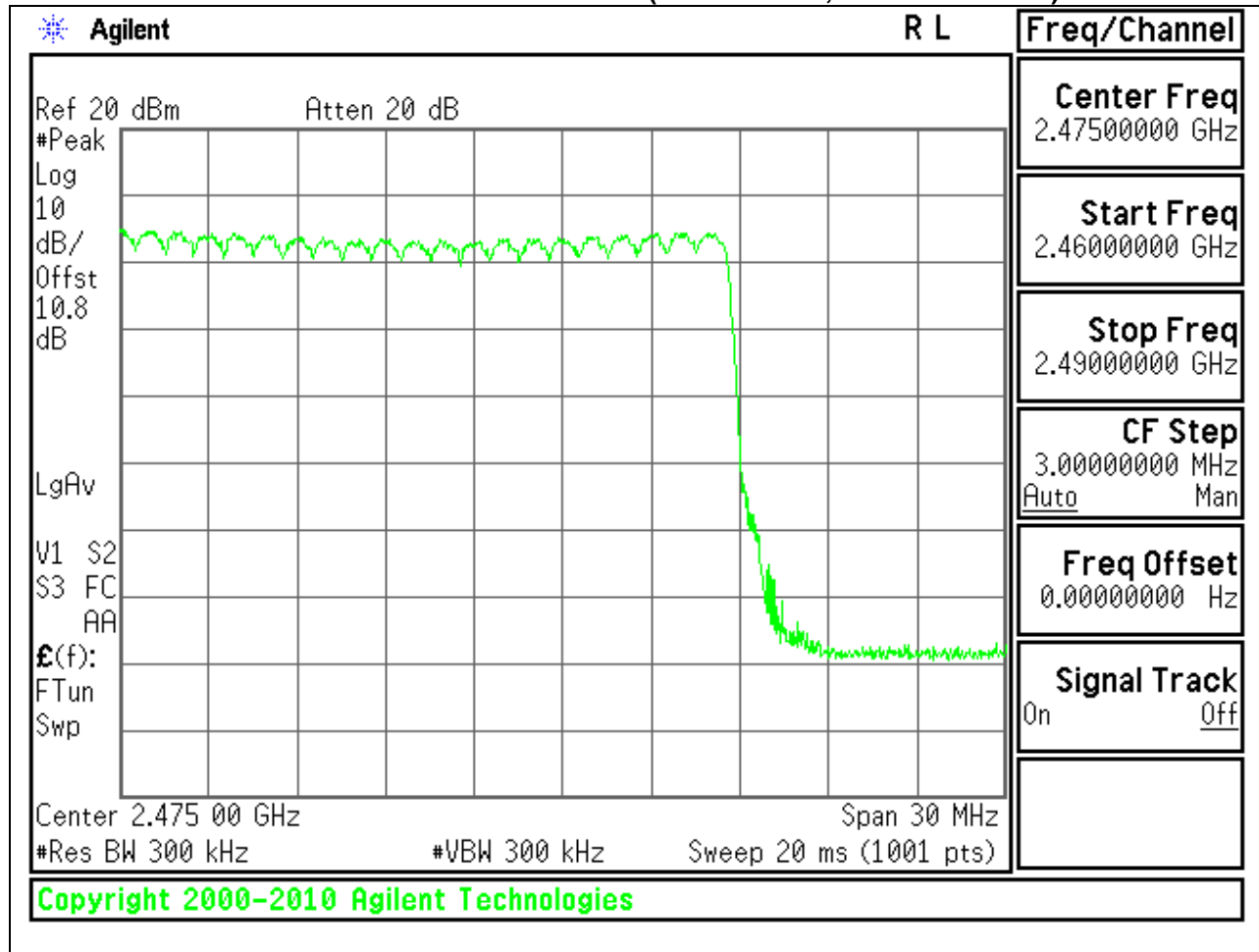
**NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)**



**NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)**



**NUMBER OF HOPPING CHANNELS (30 MHz SPAN, THIRD SEGMENT)**





**8.4. AVERAGE TIME OF OCCUPANCY  
 LIMIT**

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.

**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 second scan, to enable resolution of each occurrence.

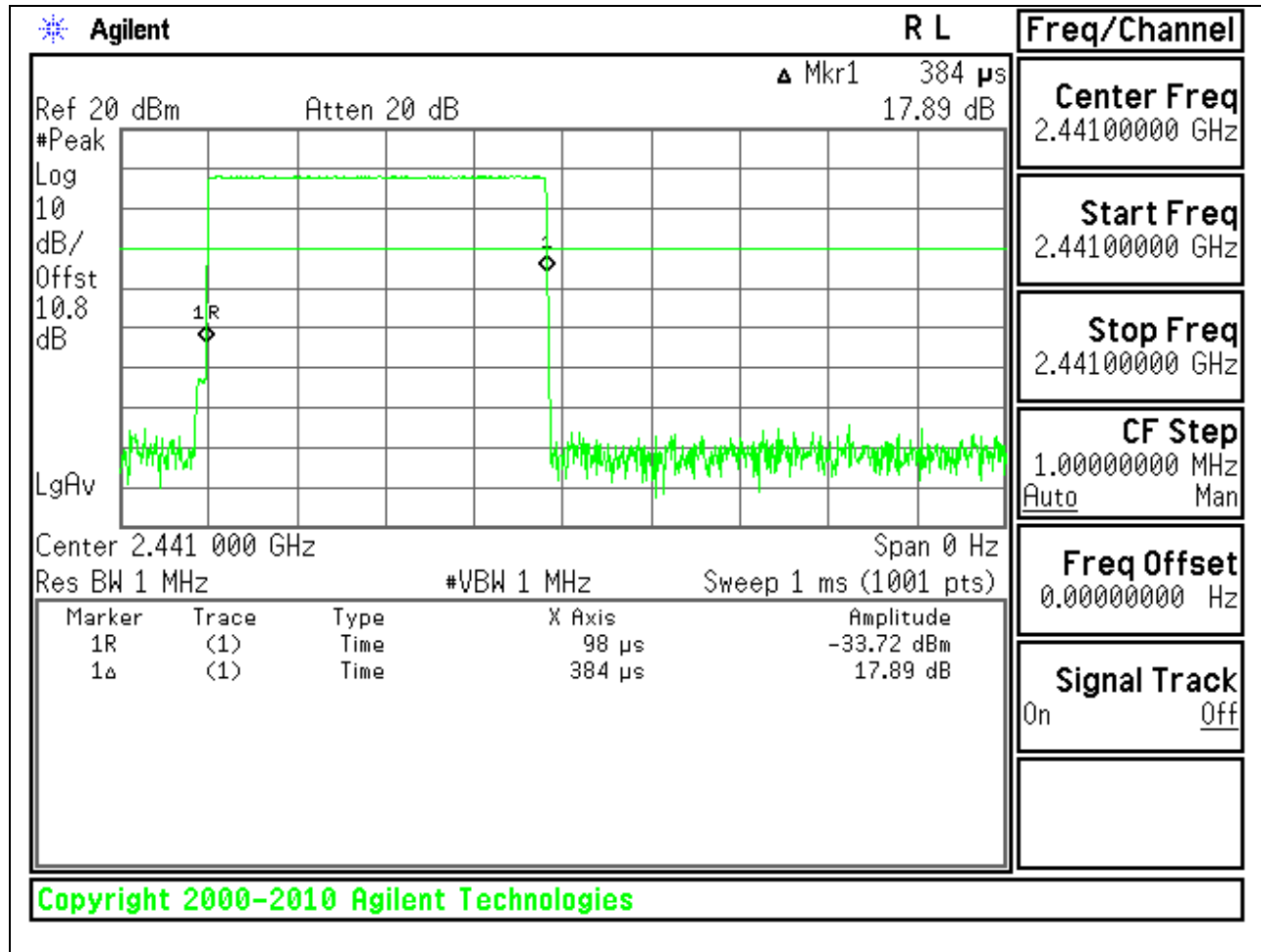
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 10 \* (# of pulses in 3.16 s) \* pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to 10 \* (# of pulses in 0.8 s) \* pulse width.

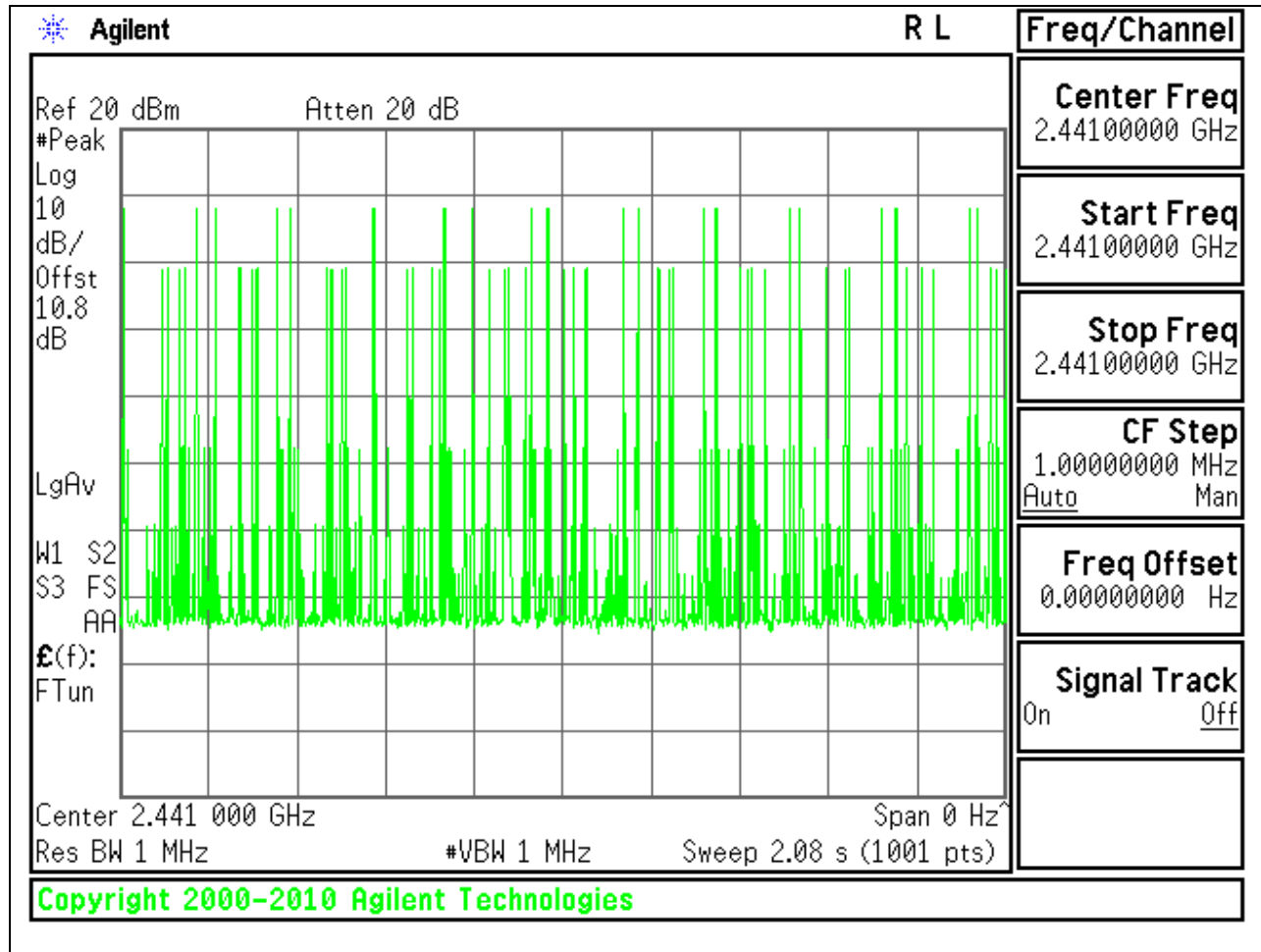
**RESULTS**

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
<b>GFSK Normal Mode</b>					
DH1	0.384	20	0.0768	0.4	-0.3232
DH3	1.64	11	0.1804	0.4	-0.2196
DH5	2.888	6	0.17328	0.4	-0.22672
<b>GFSK AFH Mode</b>					
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.384	5	0.0192	0.4	-0.3808
DH3	1.64	2.75	0.0451	0.4	-0.3549
DH5	2.888	1.5	0.04332	0.4	-0.35668

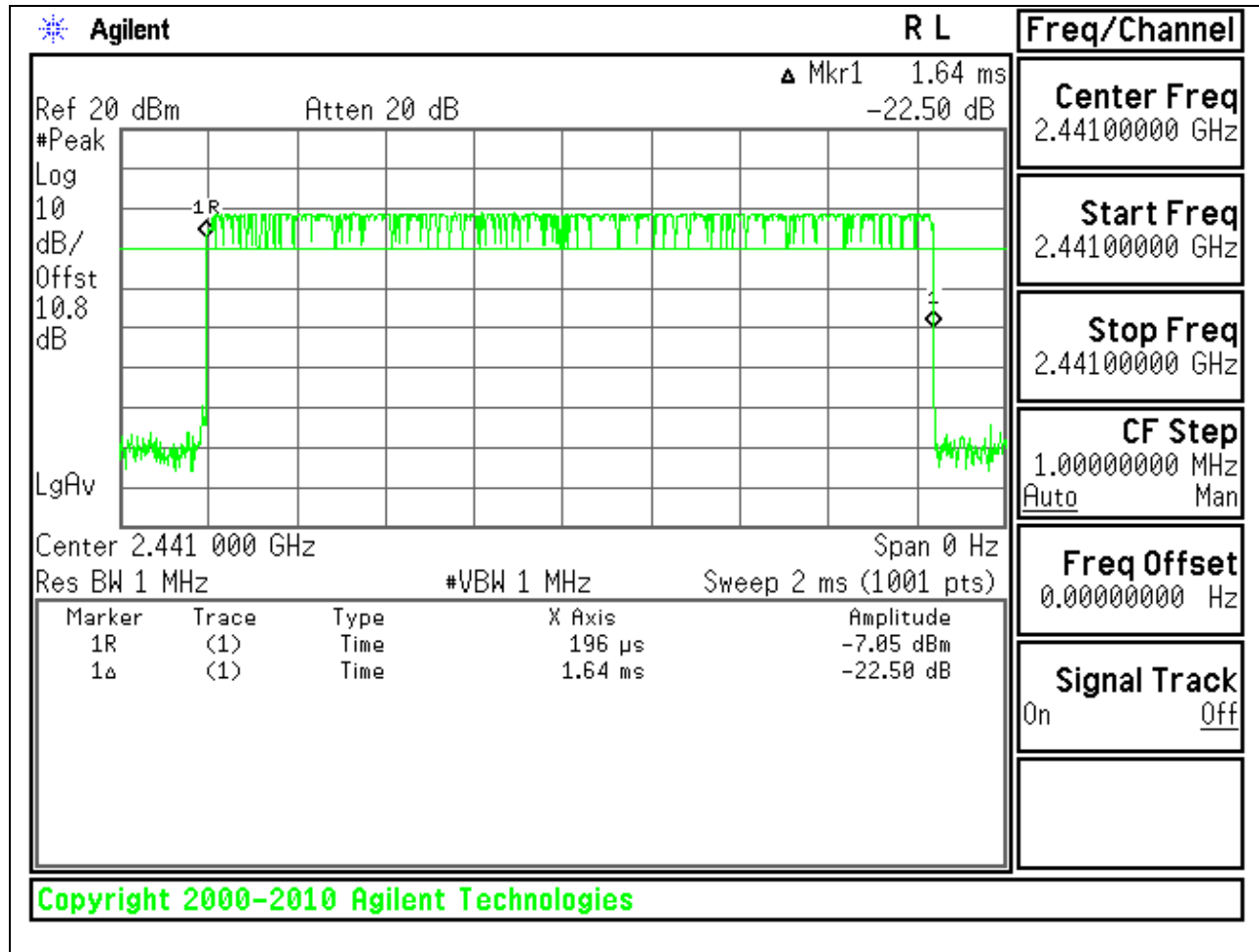
PULSE WIDTH - DH1



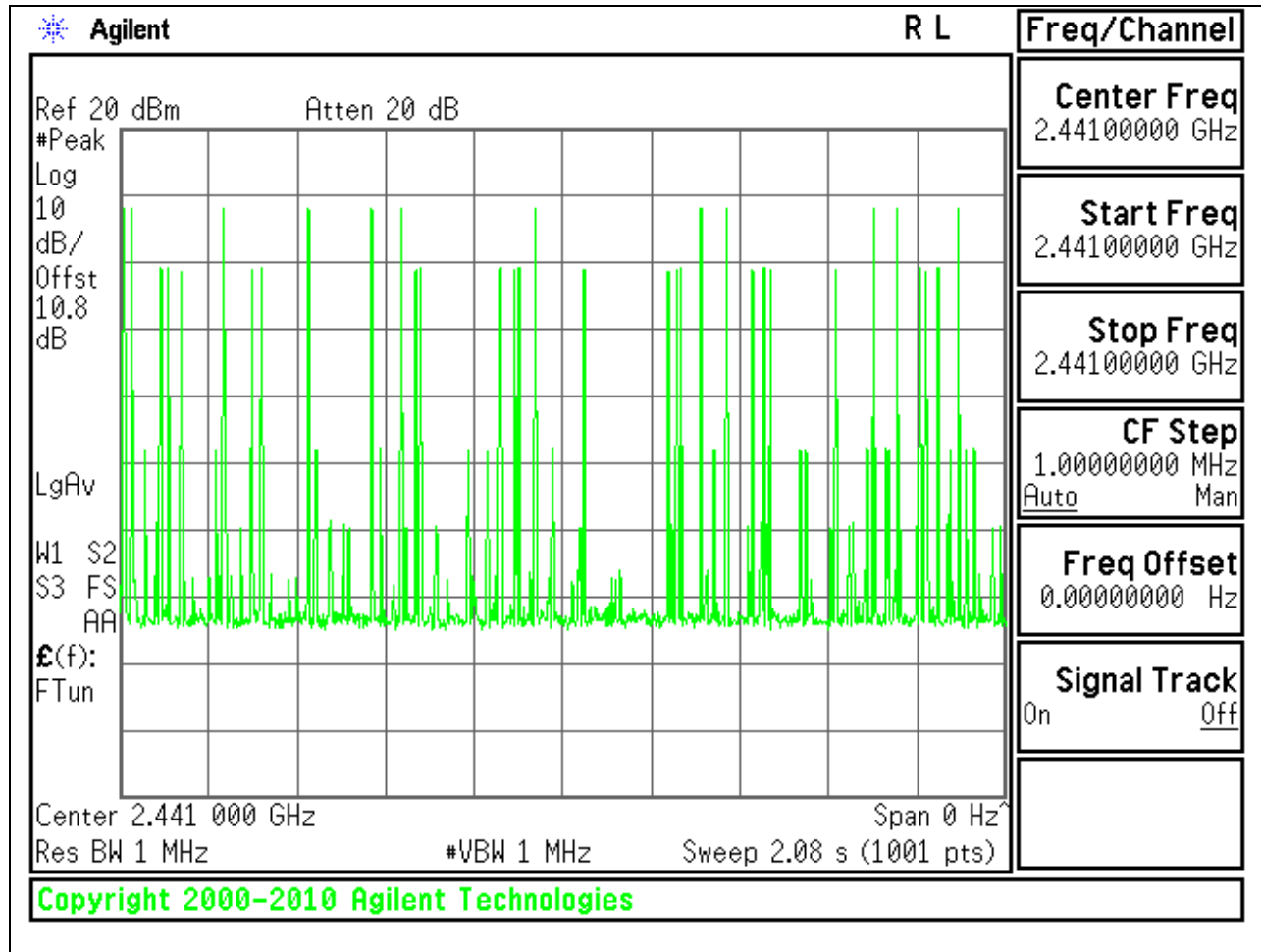
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



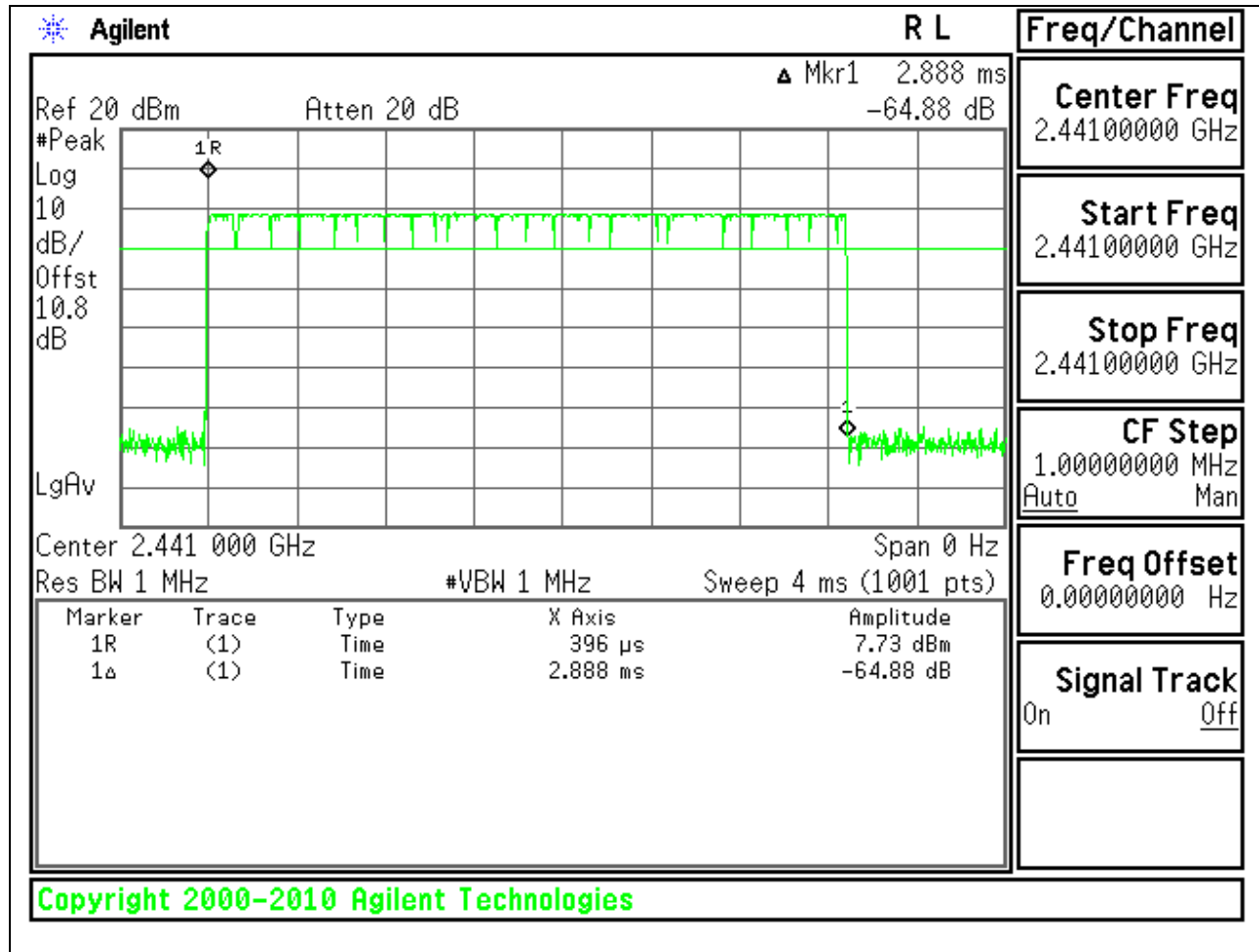
**PULSE WIDTH - DH3**



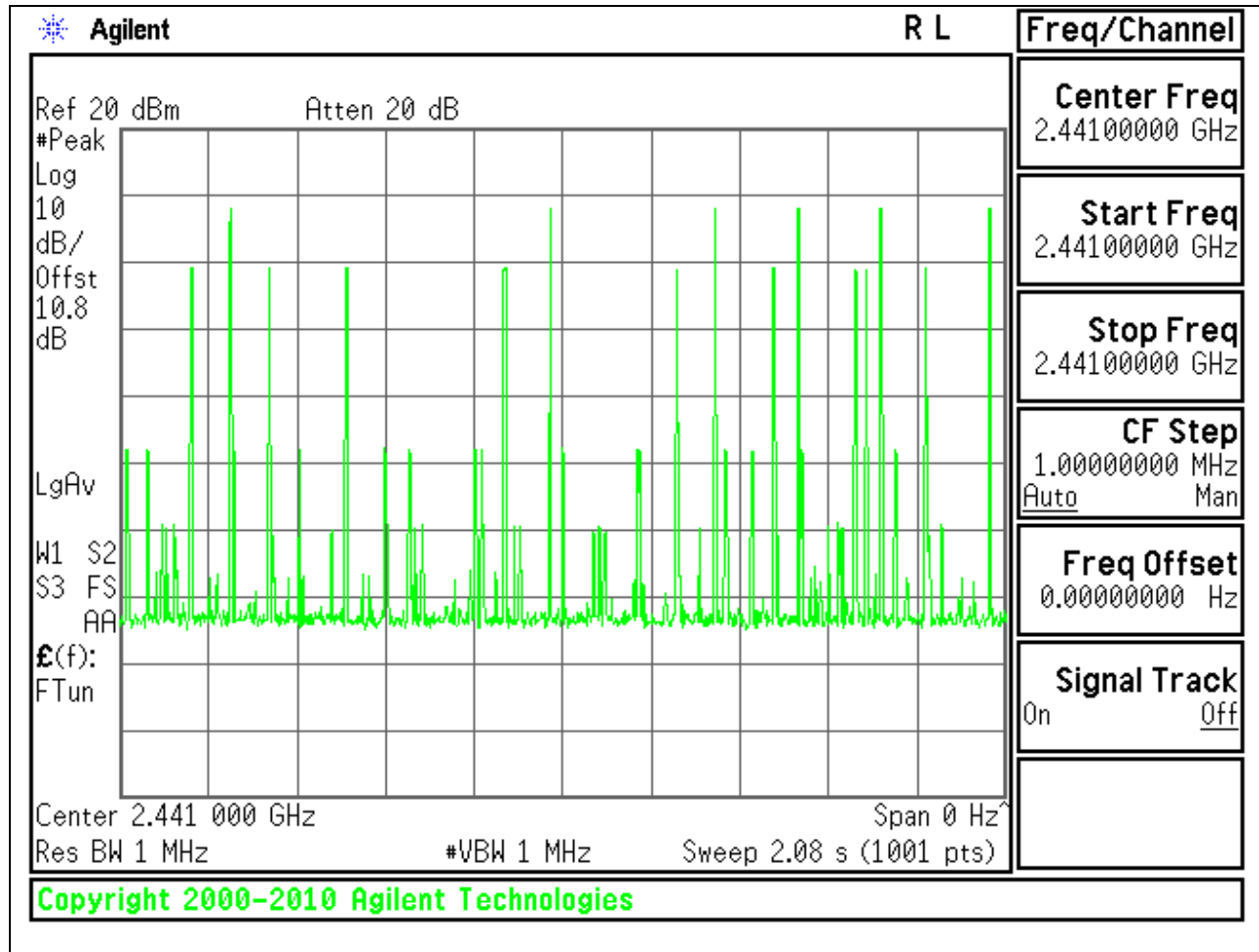
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3**



PULSE WIDTH - DH5



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5**



## **8.5. OUTPUT POWER LIMIT**

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

### **TEST PROCEDURE**

DA 00-705: 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.

### **RESULTS**

#### **8.5.1. BASIC DATA RATE GFSK MODULATION**

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.83	21	-12.17
Middle	2441	8.06	21	-12.94
High	2480	8.93	21	-12.07
Worst		8.93		-12.07

#### **8.5.2. ENHANCED DATA RATE 8PSK MODULATION**

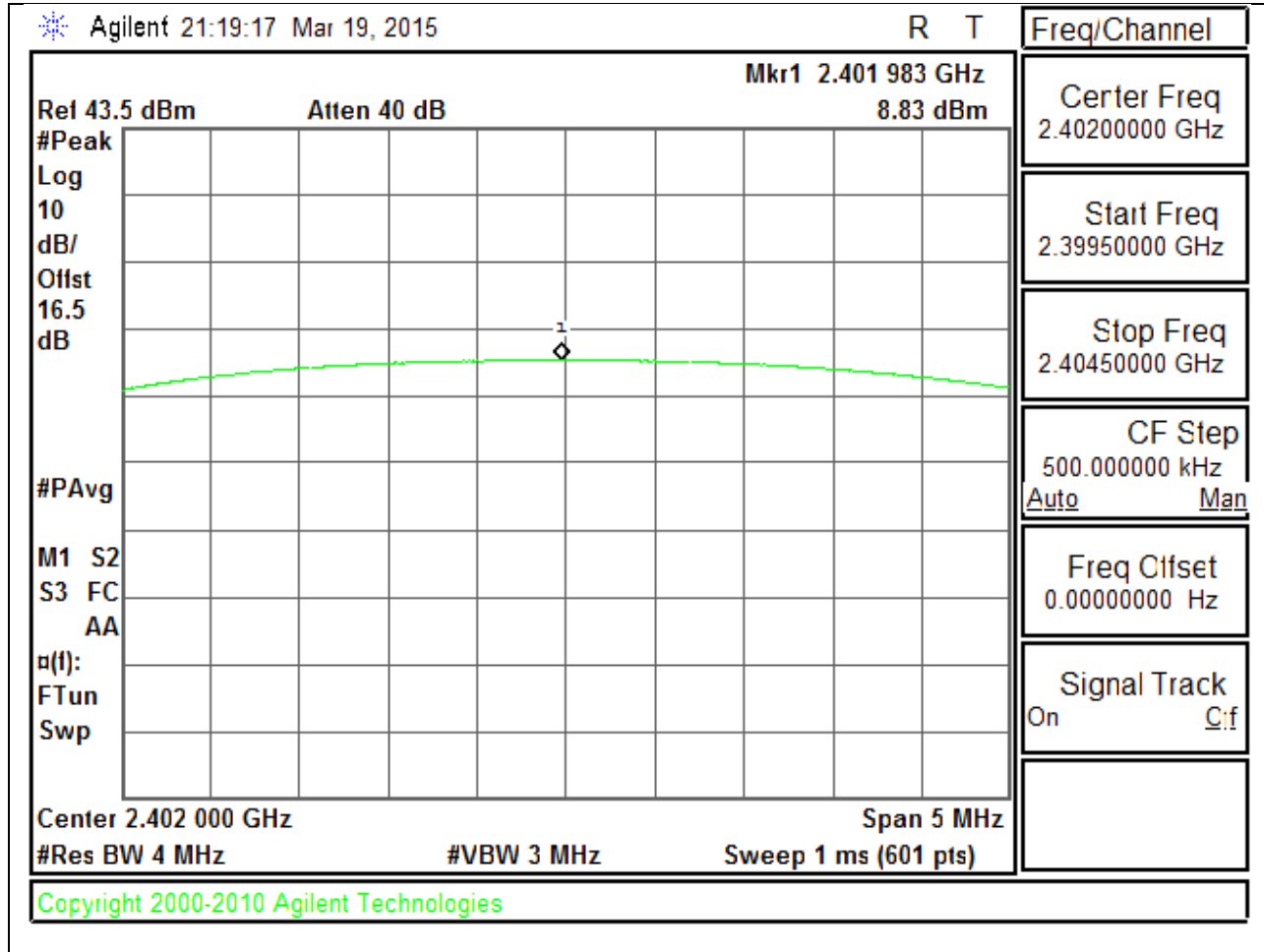
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.07	21	-11.93
Middle	2441	8.36	21	-12.64
High	2480	9.2	21	-11.8
Worst		9.2		-11.8



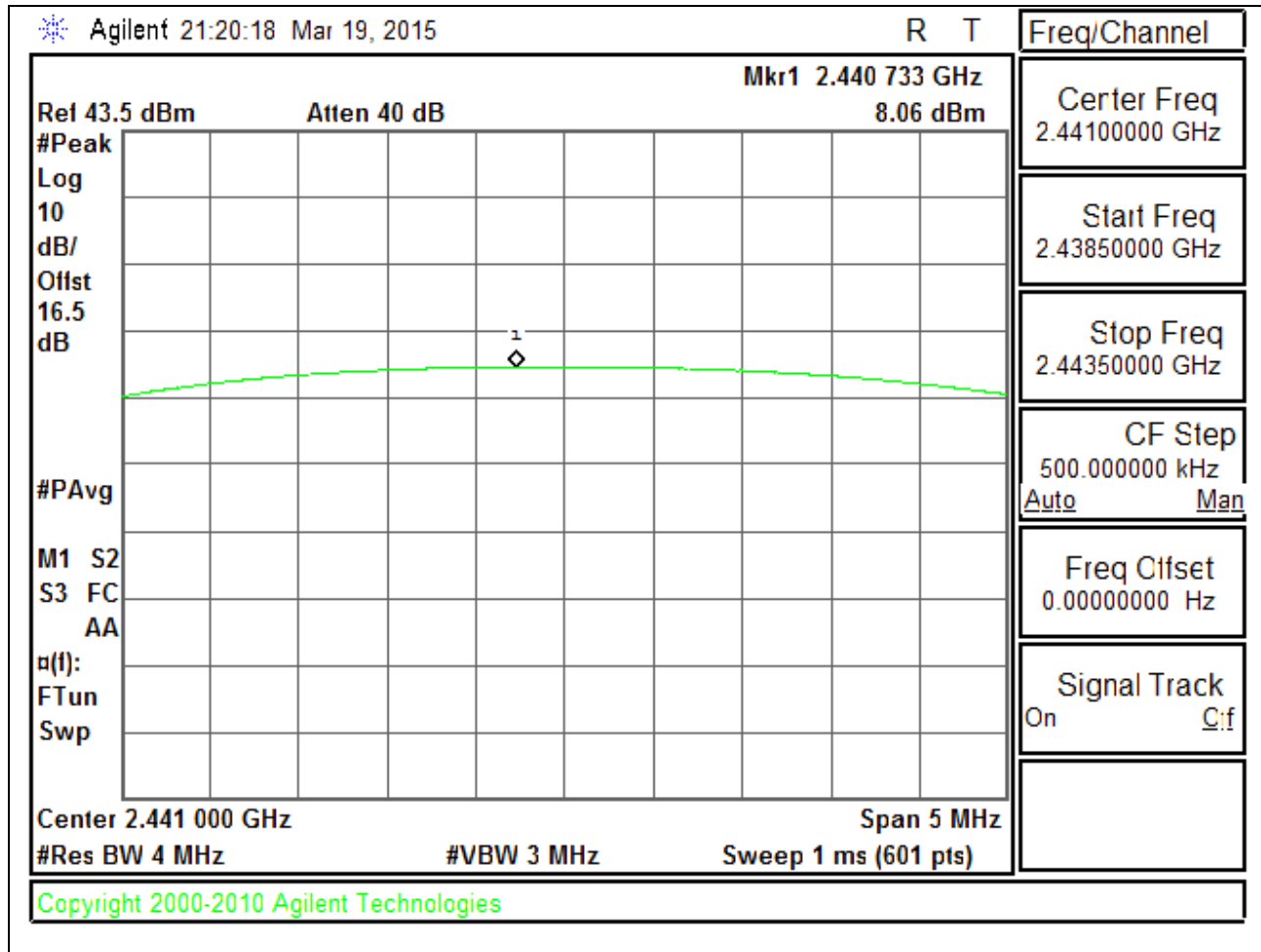
### 8.5.3. OUTPUT POWER PLOTS

#### GFSK OUTPUT POWER

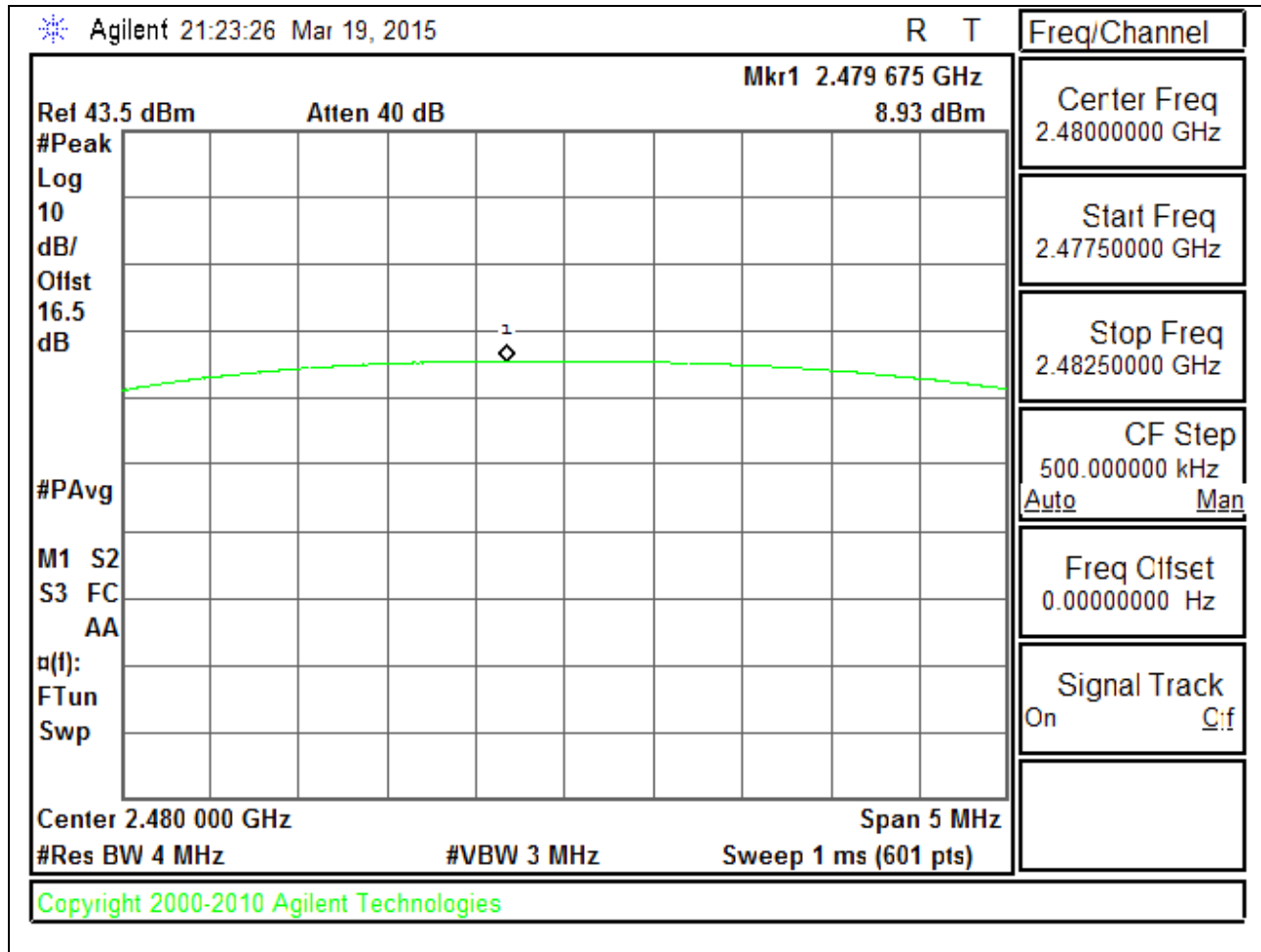
#### LOW CHANNEL



MID CHANNEL

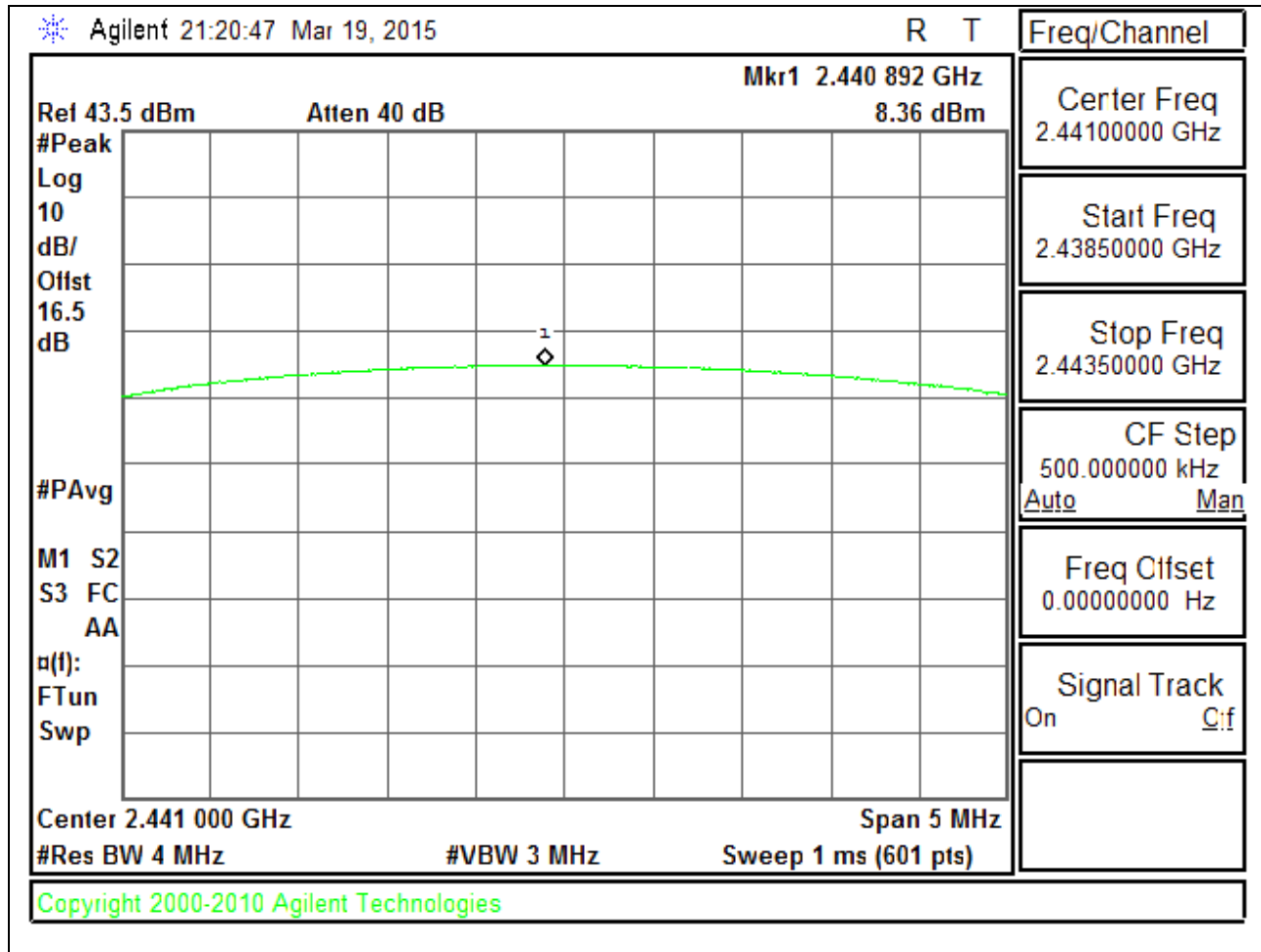


**HIGH CHANNEL**

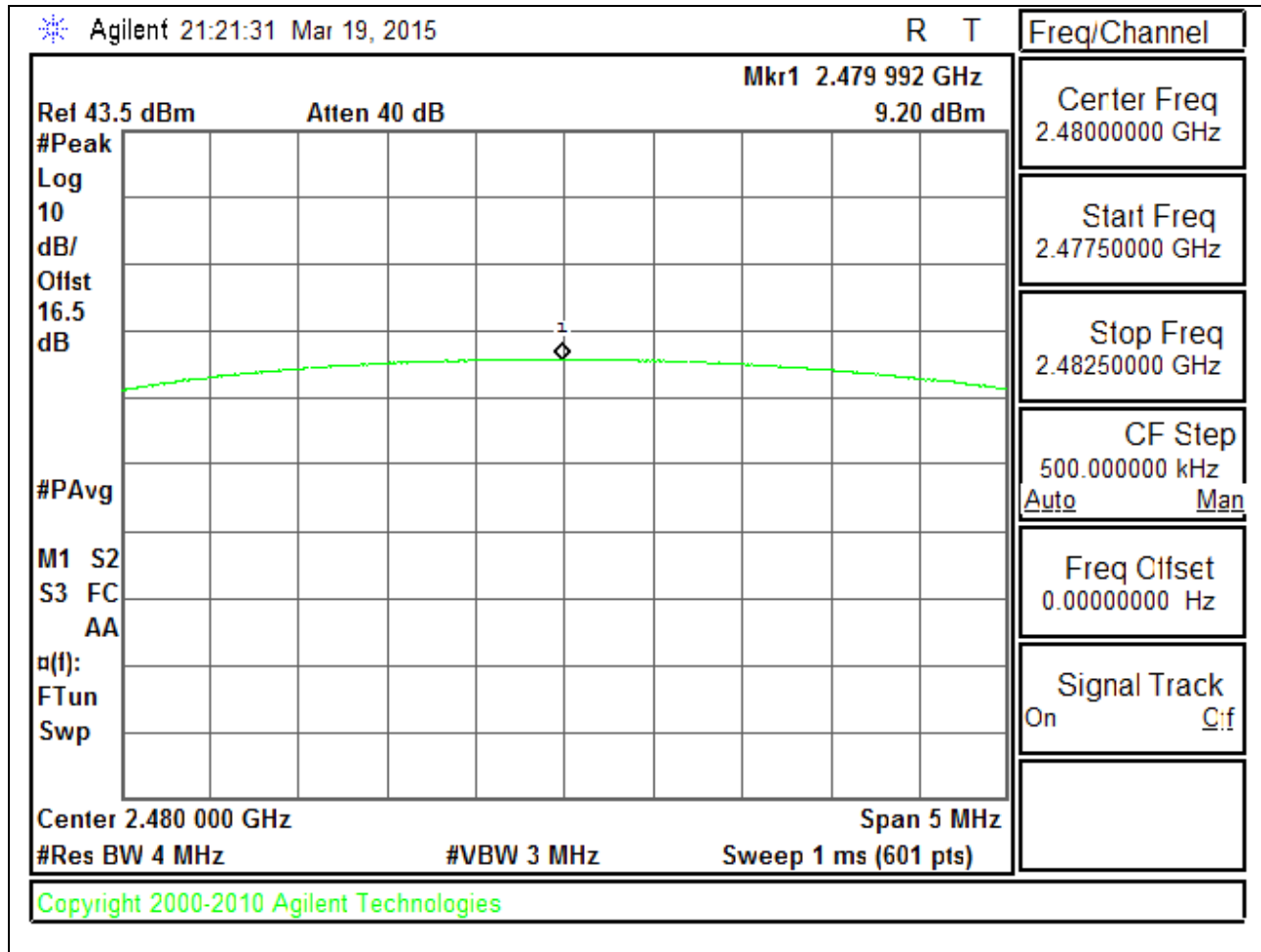




MID CHANNEL



**HIGH CHANNEL**



## 8.6. AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

### RESULTS

#### 8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.0
Middle	2441	7.9
High	2480	8.2
Worst		8.2

#### 8.6.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.6
Middle	2441	5.5
High	2480	5.8
Worst		5.8

## **8.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

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

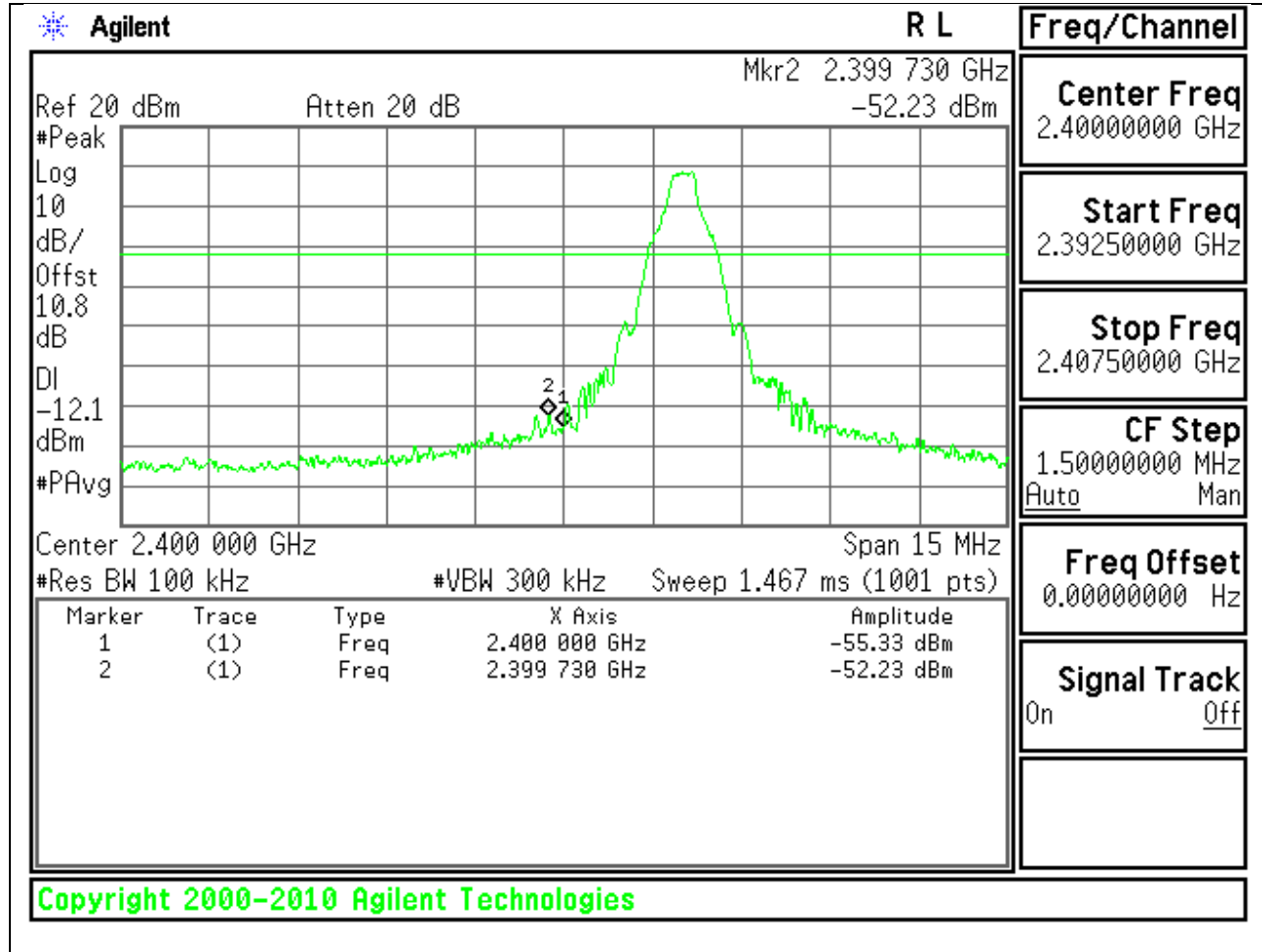
### **RESULTS**



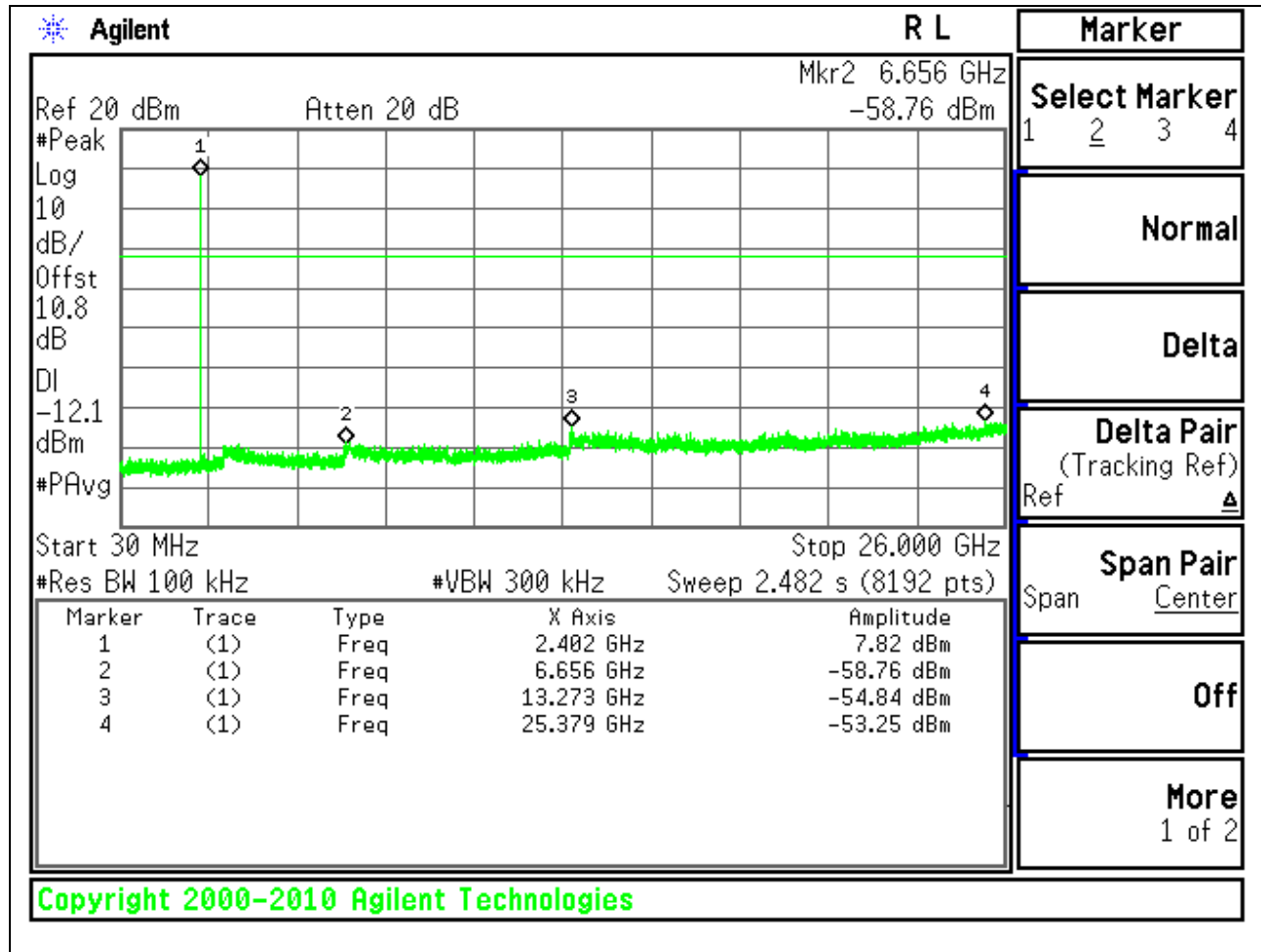
### 8.7.1. BASIC DATA RATE GFSK MODULATION

#### SPURIOUS EMISSIONS, LOW CHANNEL

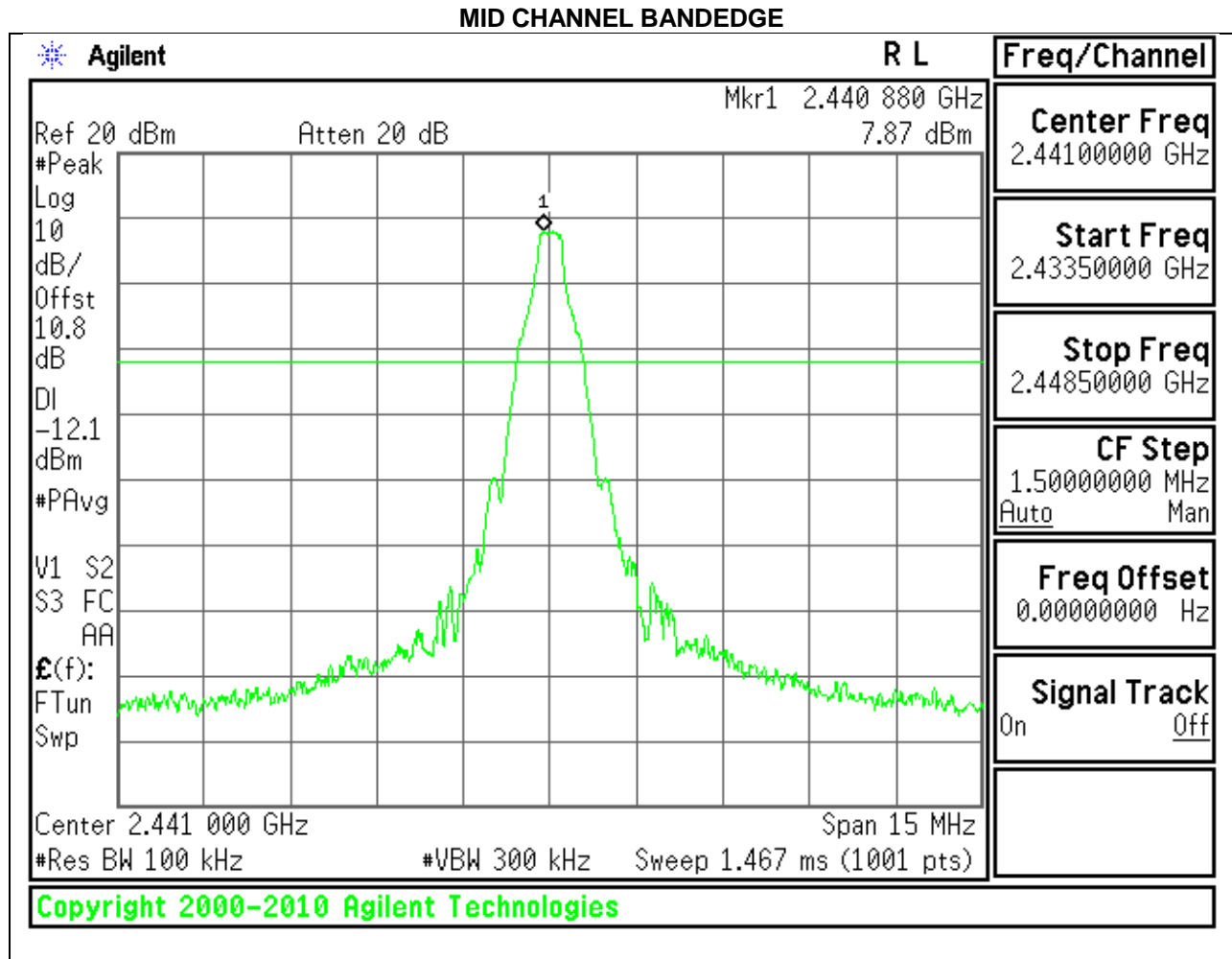
#### LOW CHANNEL BANDEDGE



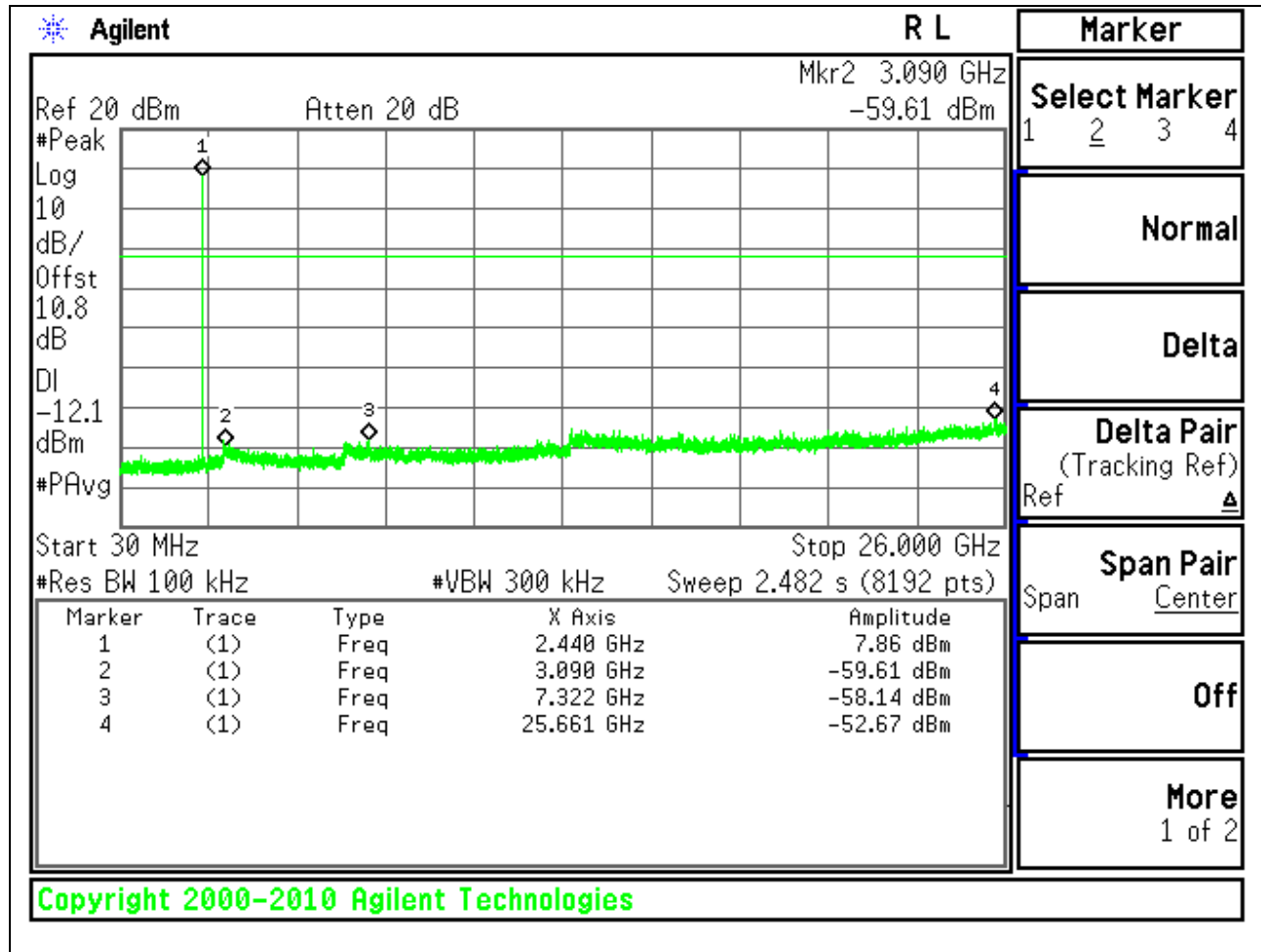
**LOW CHANNEL SPURIOUS**



**SPURIOUS EMISSIONS, MID CHANNEL**

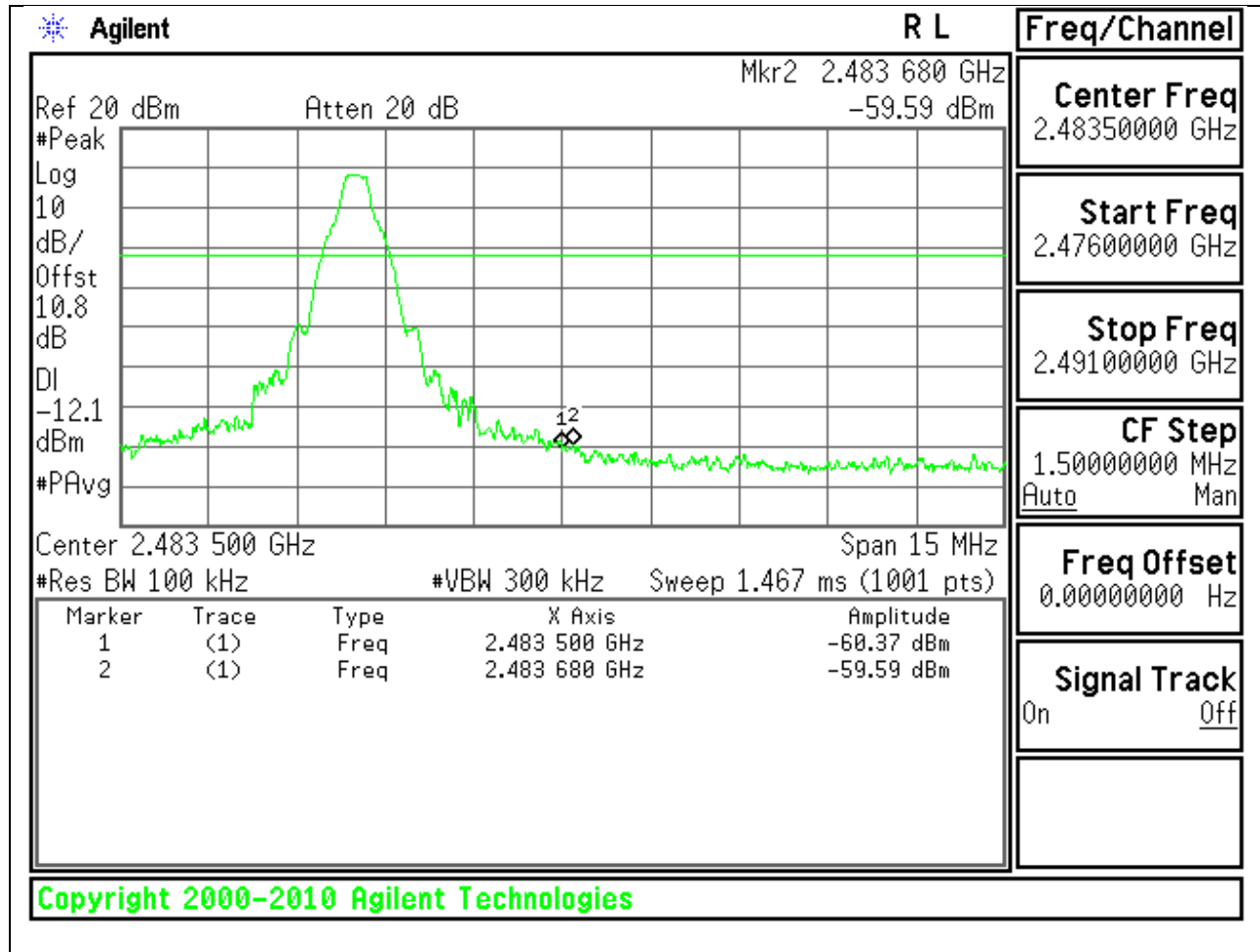


**MID CHANNEL SPURIOUS**

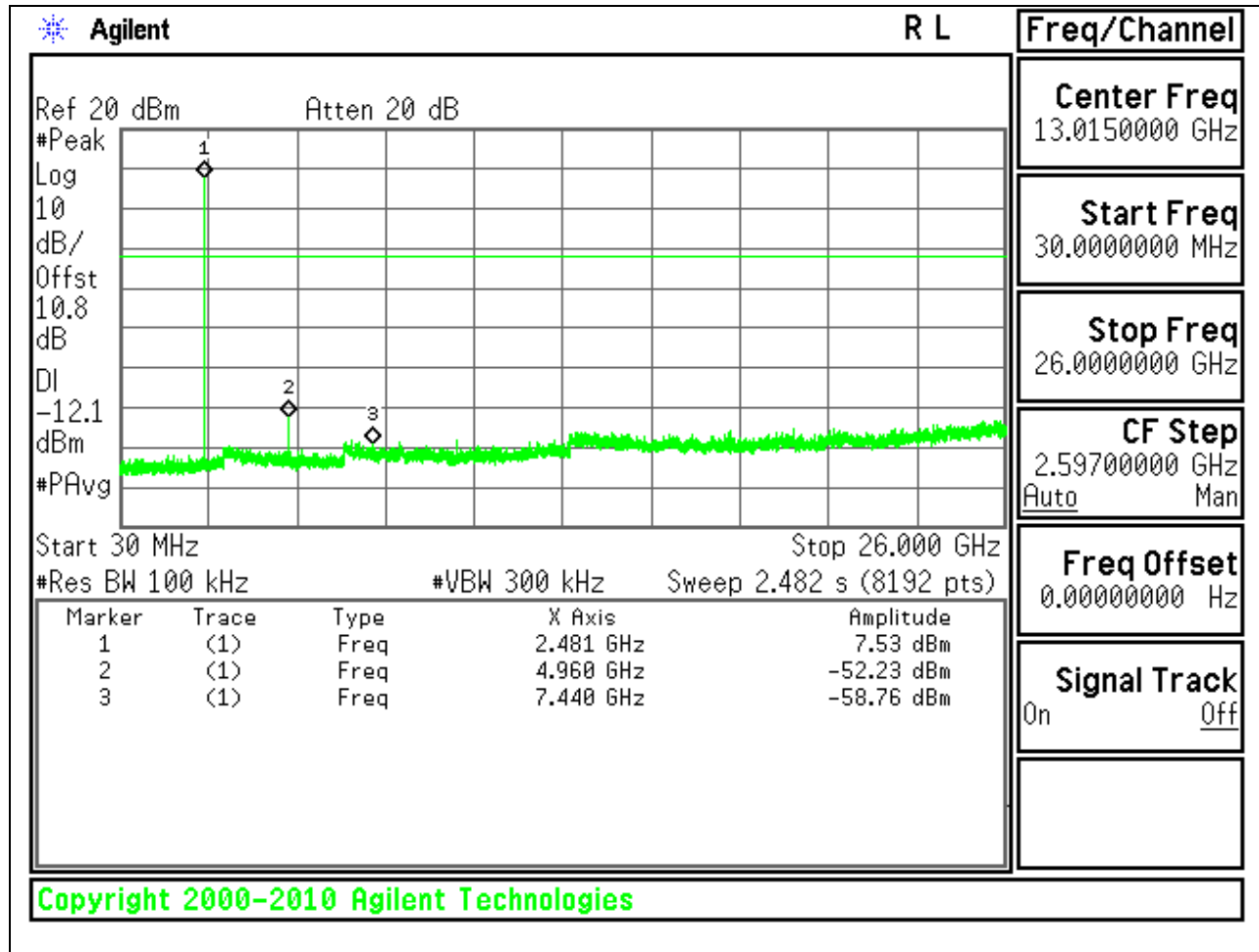


**SPURIOUS EMISSIONS, HIGH CHANNEL**

**HIGH CHANNEL BANDEDGE**

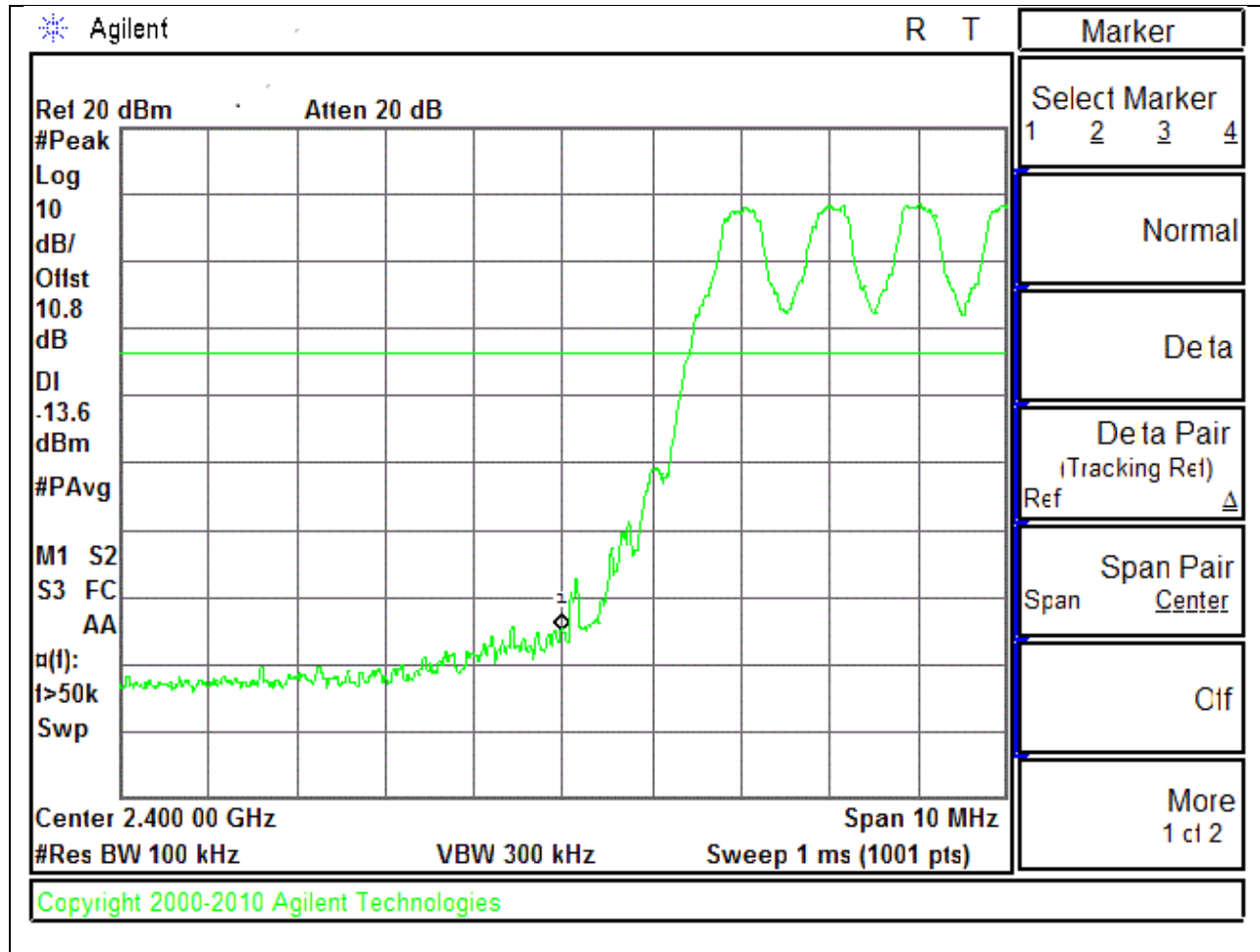


**HIGH CHANNEL SPURIOUS**

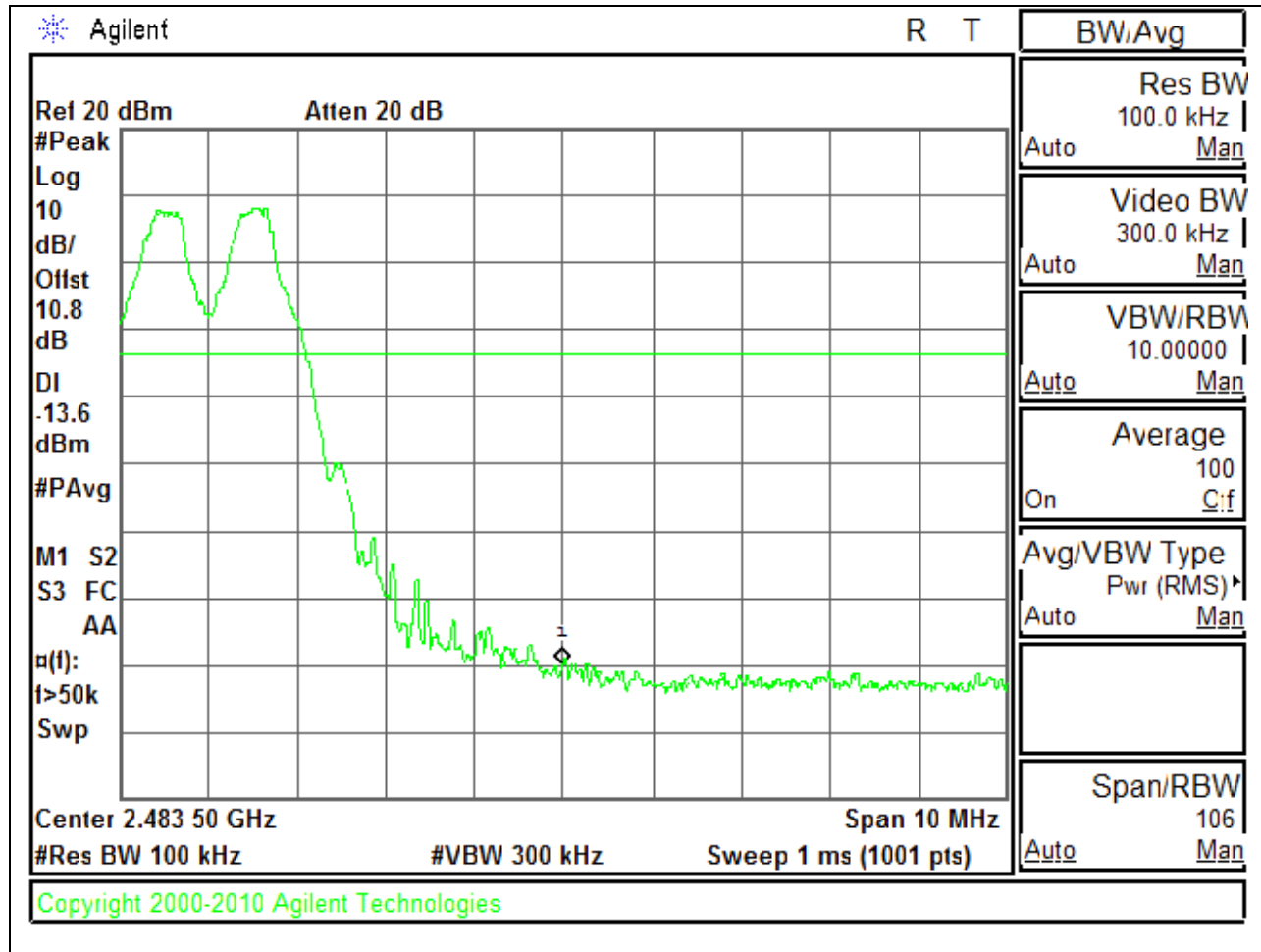


**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**

**LOW BANDEDGE WITH HOPPING ON**



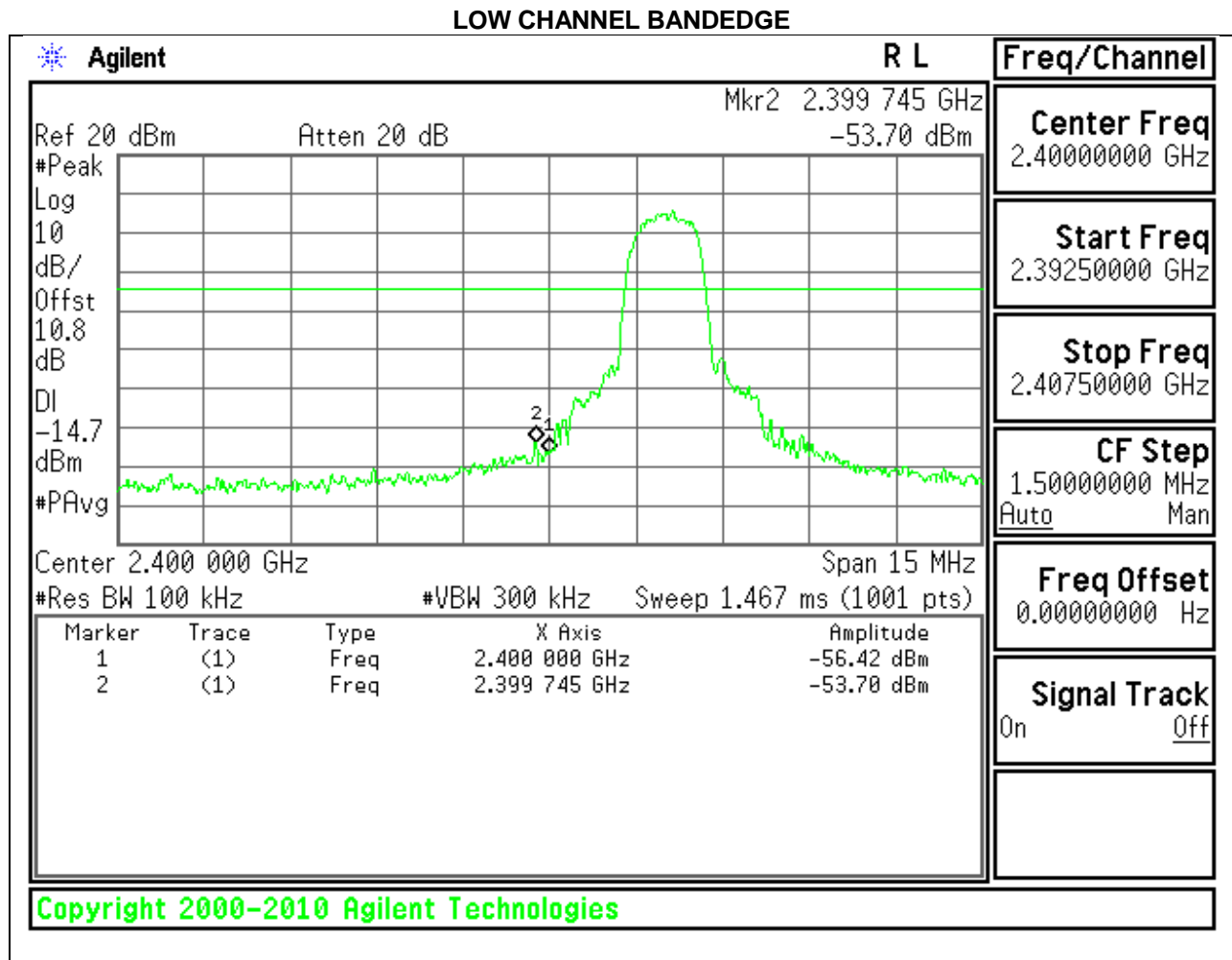
**HIGH BANDEDGE WITH HOPPING ON**



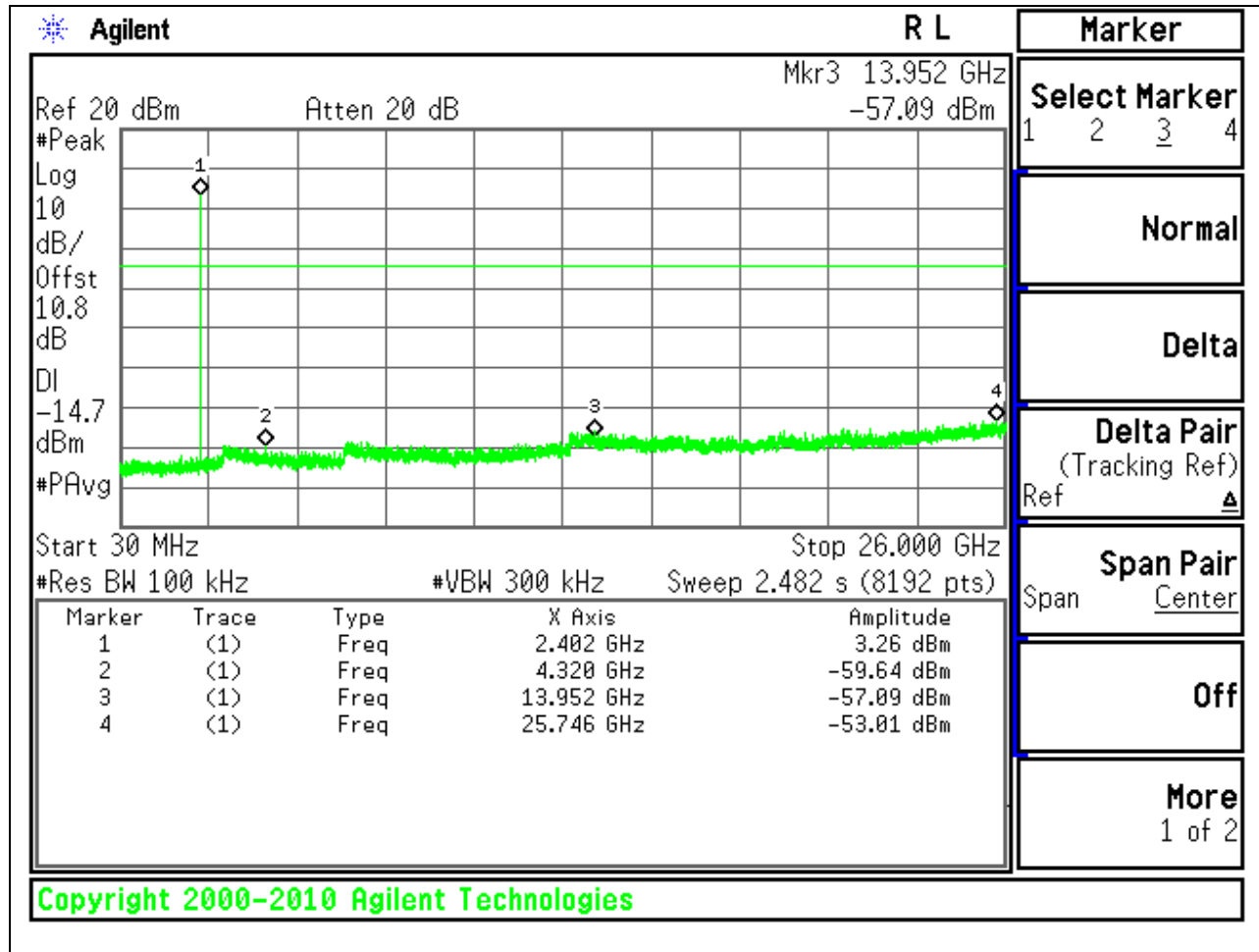


### 8.7.2. ENHANCED DATA RATE 8PSK MODULATION

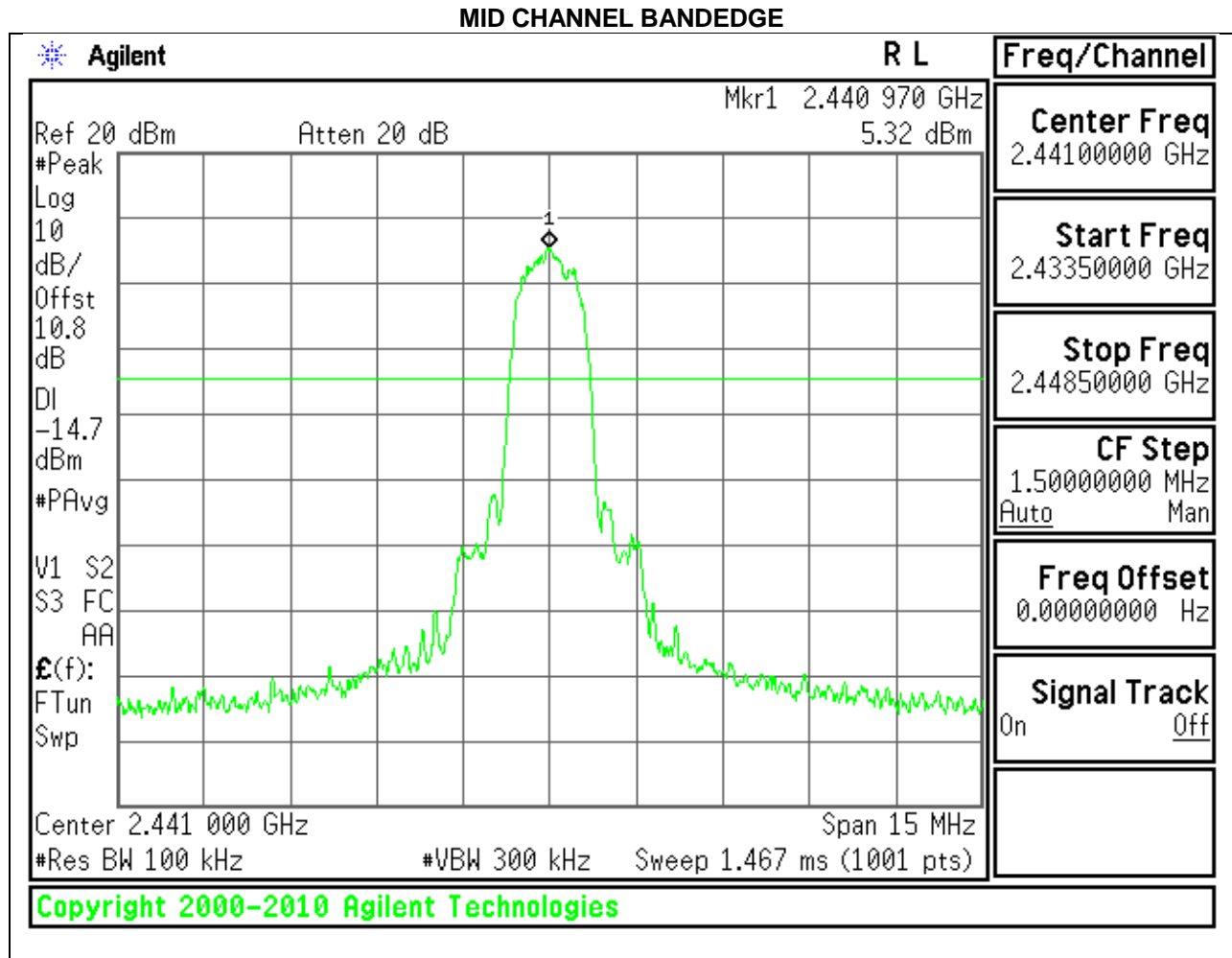
#### SPURIOUS EMISSIONS, LOW CHANNEL



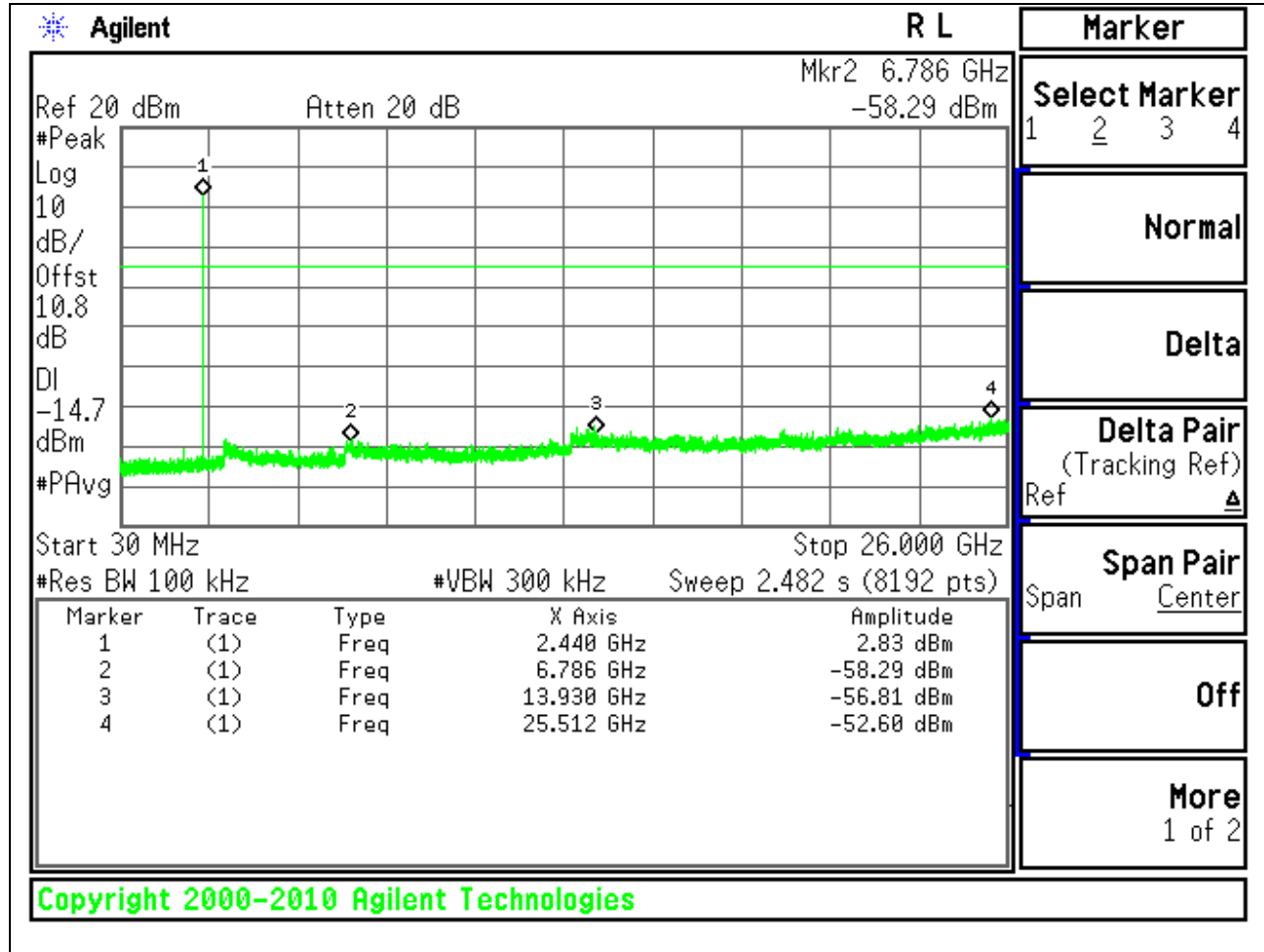
**LOW CHANNEL SPURIOUS**



**SPURIOUS EMISSIONS, MID CHANNEL**

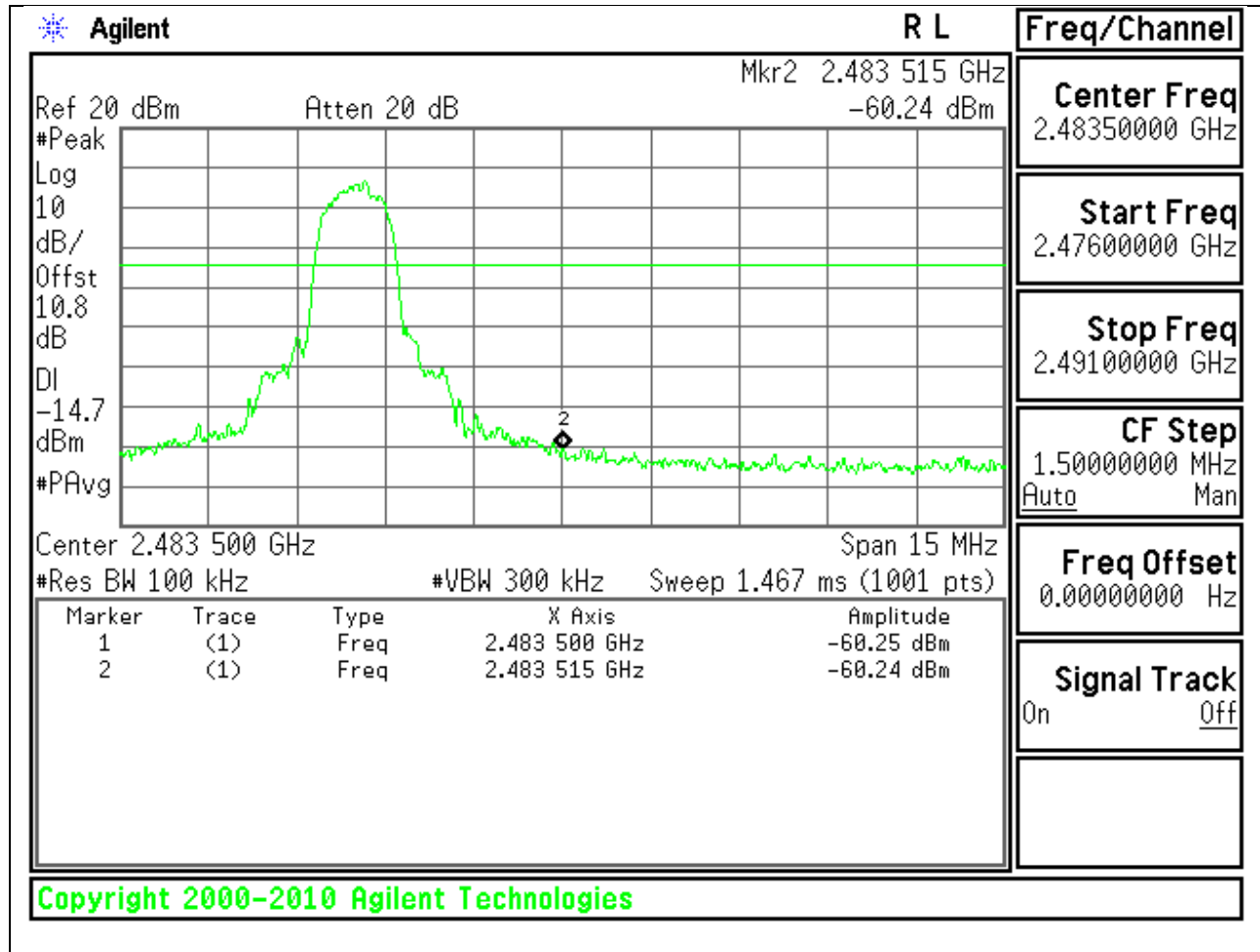


**MID CHANNEL SPURIOUS**

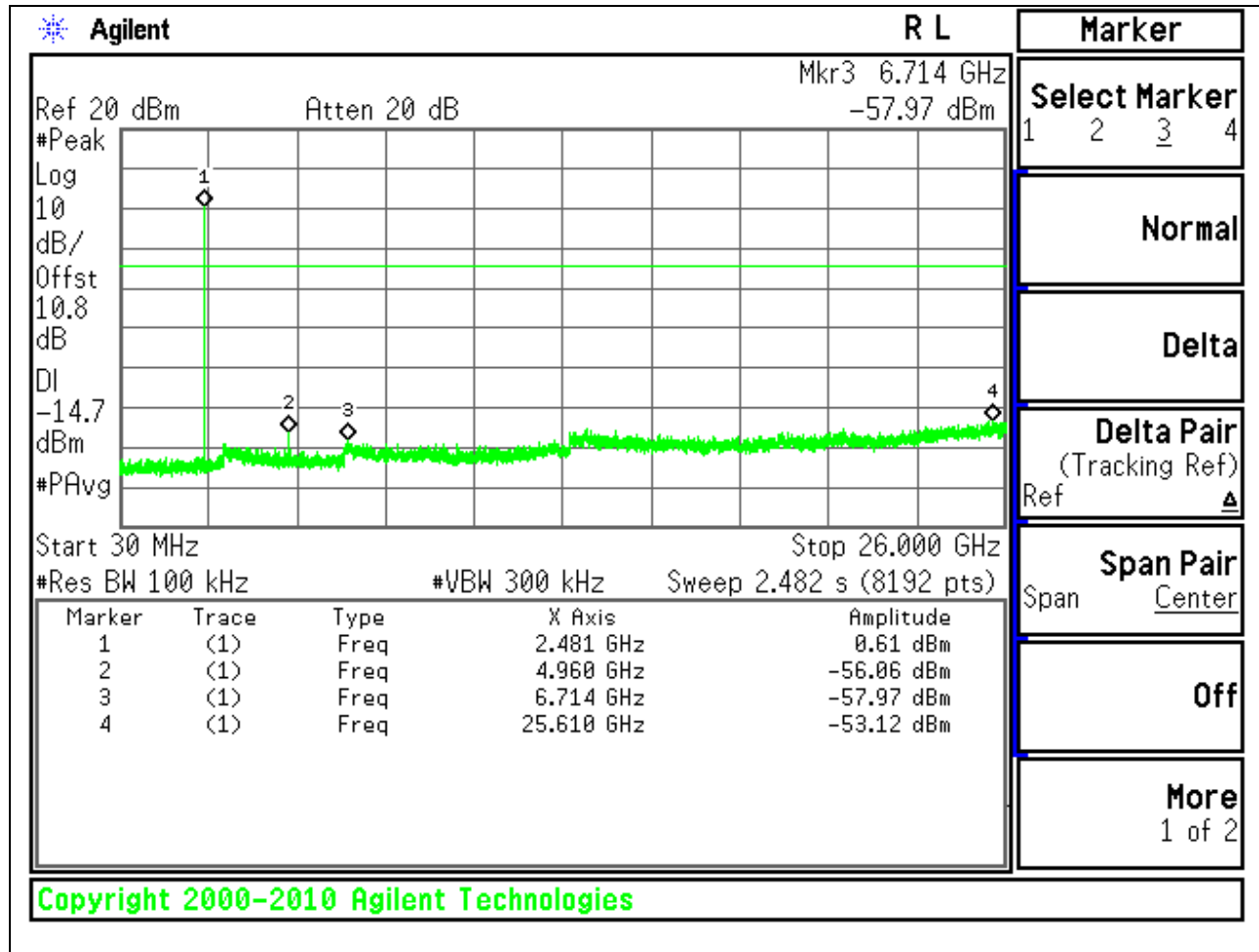


**SPURIOUS EMISSIONS, HIGH CHANNEL**

**HIGH CHANNEL BANDEDGE**

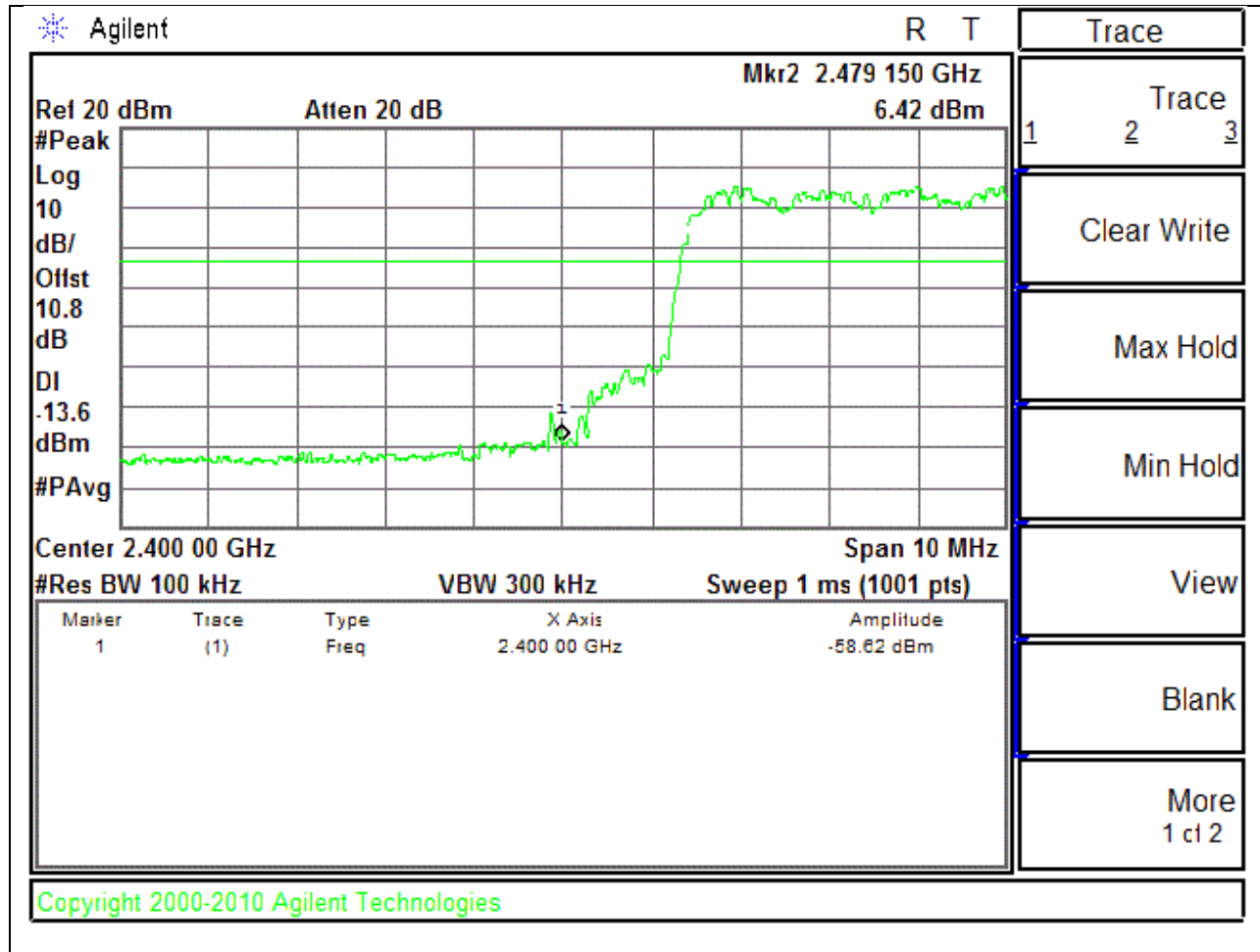


**HIGH CHANNEL SPURIOUS**

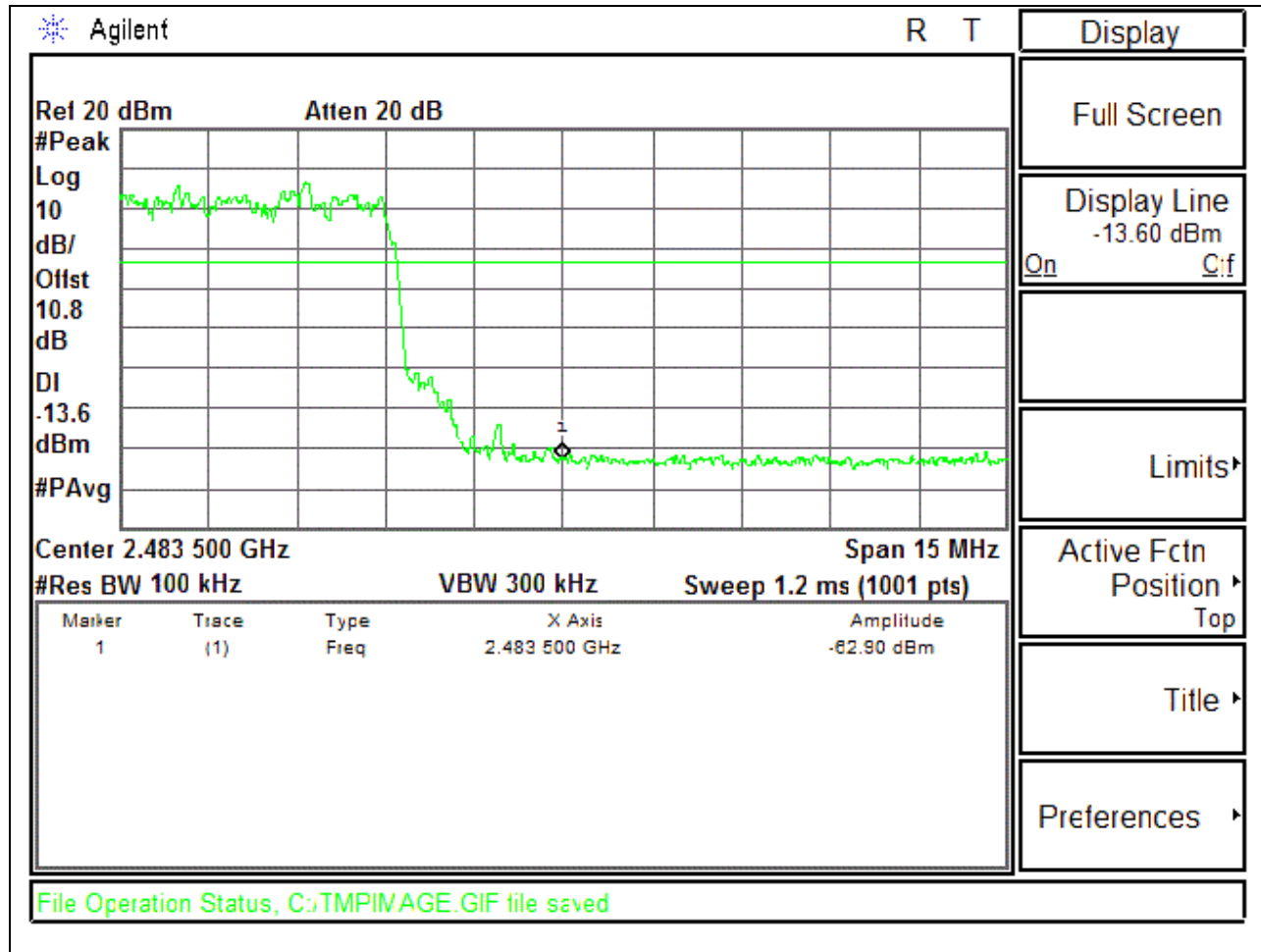


**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**

**LOW BANDEDGE WITH HOPPING ON**



**HIGH BANDEDGE WITH HOPPING ON**





## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

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 band edge 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 1/T (on time) for average measurement.

$$GFSK = 1/T = 1 / 0.00288S = 347Hz.$$

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

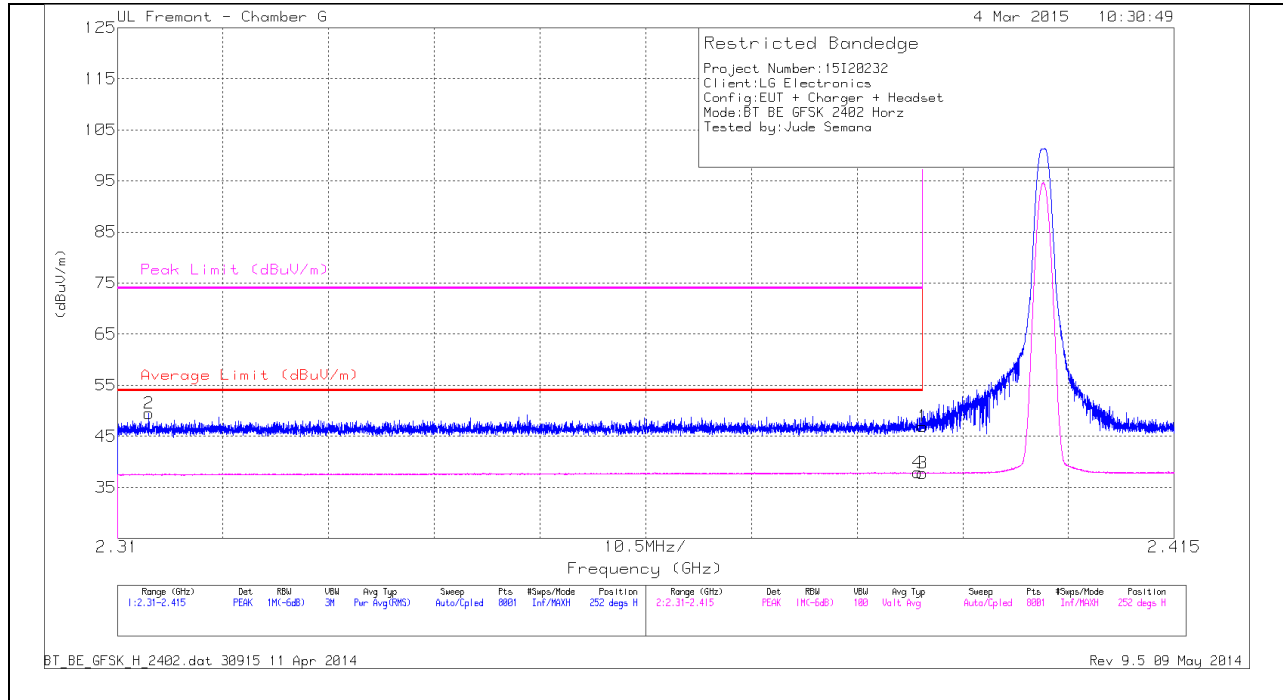
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 9.2. TRANSMITTER ABOVE 1 GHz

### 9.2.1. BASIC DATA RATE GFSK MODULATION

#### RESTRICTED BANDEDGE (LOW CHANNEL)

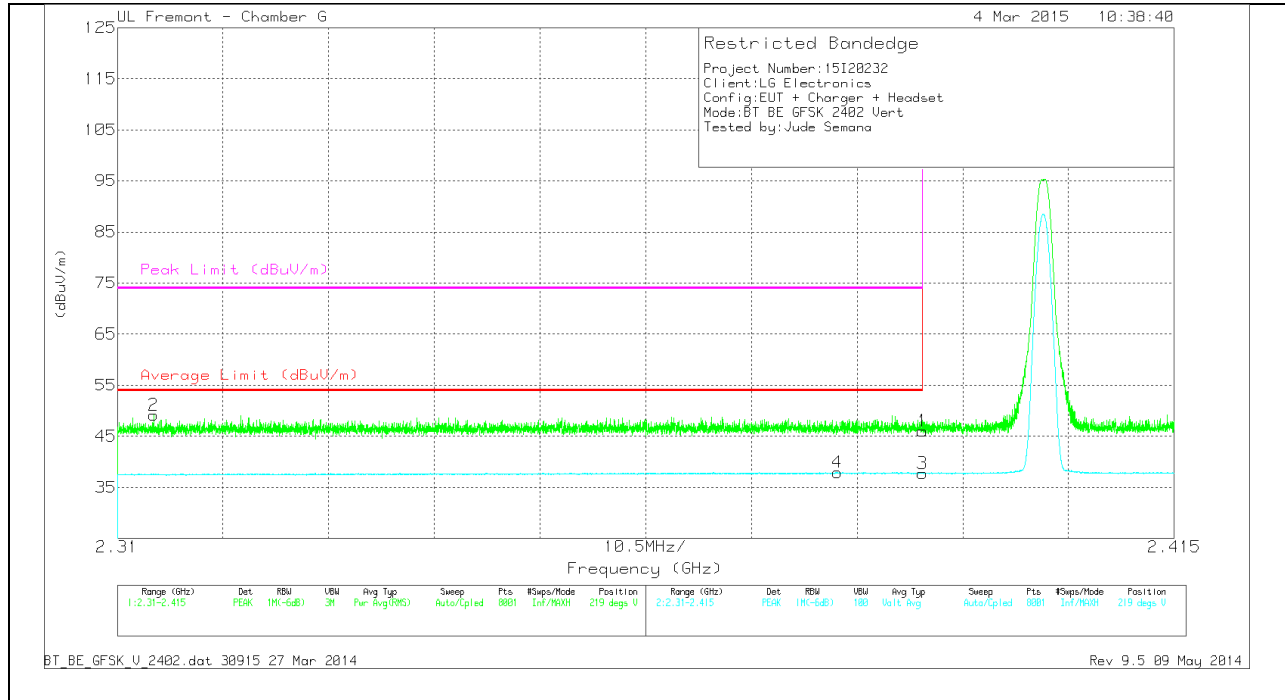
##### HORIZONTAL PEAK AND AVERAGE PLOT



##### HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.04	PK	31.8	-24.9	0	46.94	-	-	74	-27.06	252	219	H
2	* 2.313	42.91	PK	31.6	-25	0	49.51	-	-	74	-24.49	252	219	H
3	* 2.39	30.89	VB1T	31.8	-24.9	1.9	39.69	54	-14.31	-	-	252	219	H
4	* 2.39	31.01	VB1T	31.8	-24.9	1.9	39.81	54	-14.19	-	-	252	219	H

**VERTICAL PEAK AND AVERAGE PLOT**

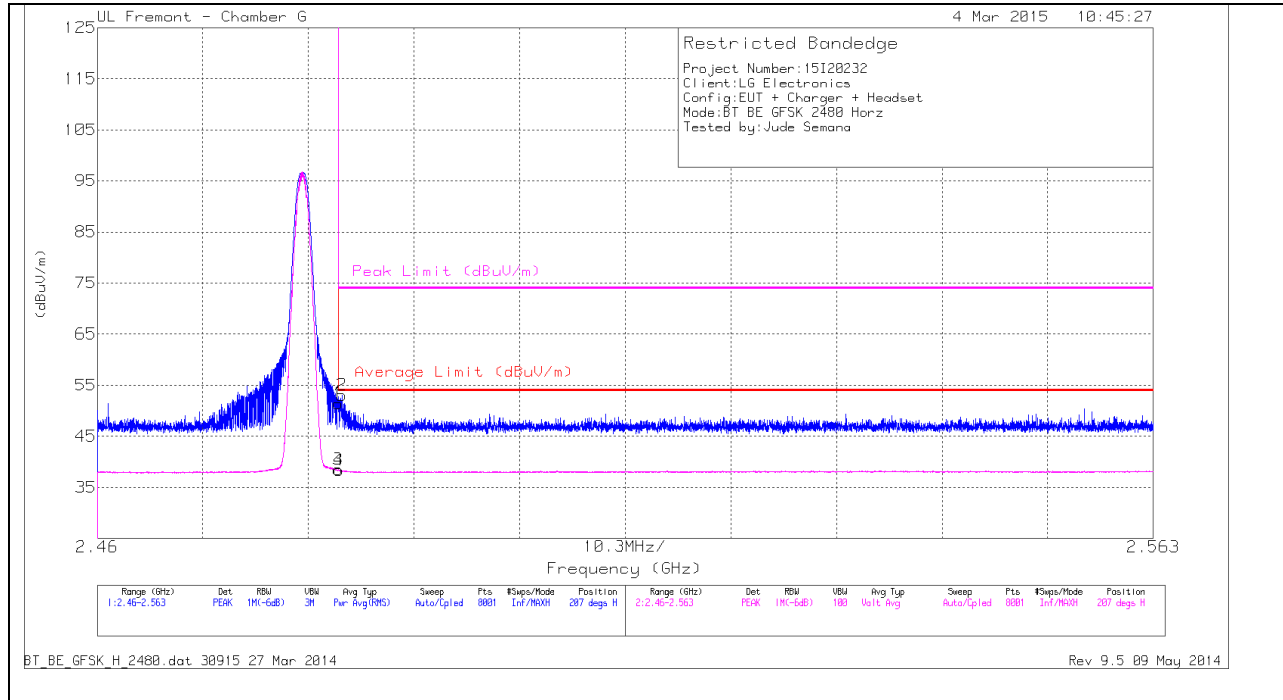


**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fitter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.314	42.55	PK	31.6	-25	0	49.15	-	-	74	-24.85	219	274	V
4	* 2.382	31.07	VB1T	31.8	-24.9	1.9	39.87	54	-14.13	-	-	219	274	V
1	* 2.39	39.12	PK	31.8	-24.9	0	46.02	-	-	74	-27.98	219	274	V
3	* 2.39	30.83	VB1T	31.8	-24.9	1.9	39.63	54	-14.37	-	-	219	274	V

**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

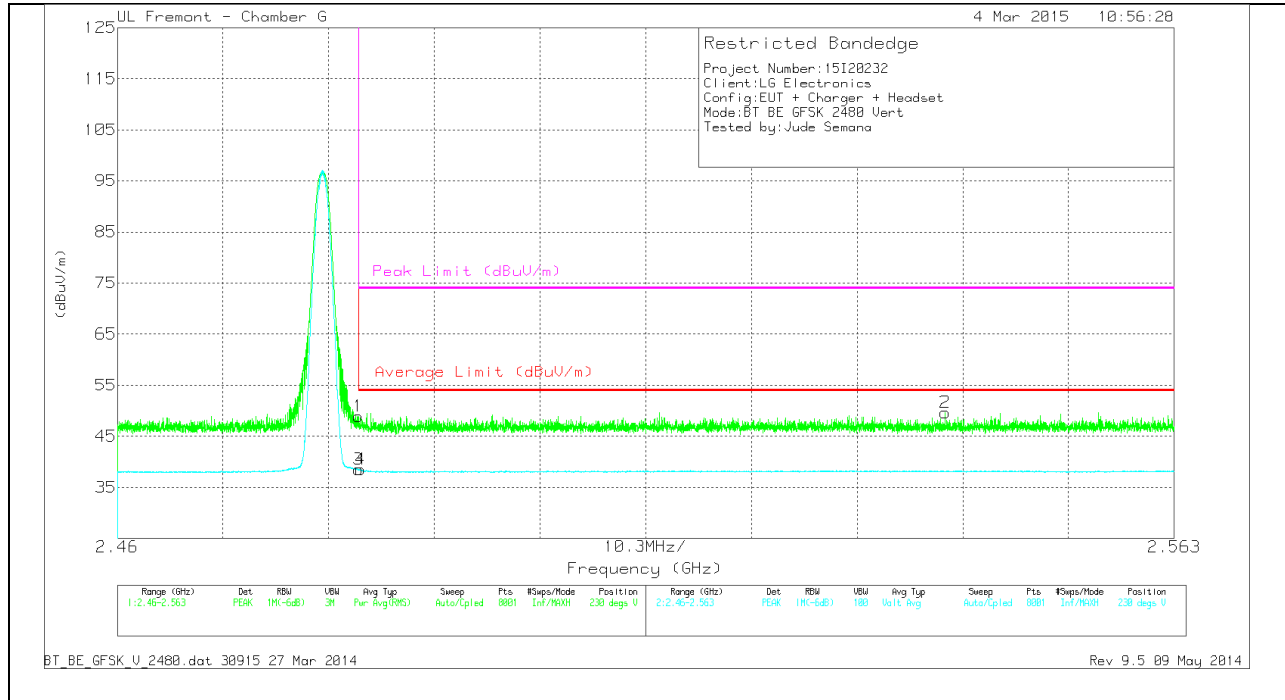
**HORIZONTAL PEAK AND AVERAGE PLOT**



**HORIZONTAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	44.28	PK	32	-24.9	0	51.38	-	-	74	-22.62	207	179	H
2	* 2.484	45.99	PK	32	-24.9	0	53.09	-	-	74	-20.91	207	179	H
3	* 2.484	31.4	VB1T	32	-24.9	1.9	40.4	54	-13.6	-	-	207	179	H
4	* 2.484	31.32	VB1T	32	-24.9	1.9	40.32	54	-13.68	-	-	207	179	H

**VERTICAL PEAK AND AVERAGE PLOT**

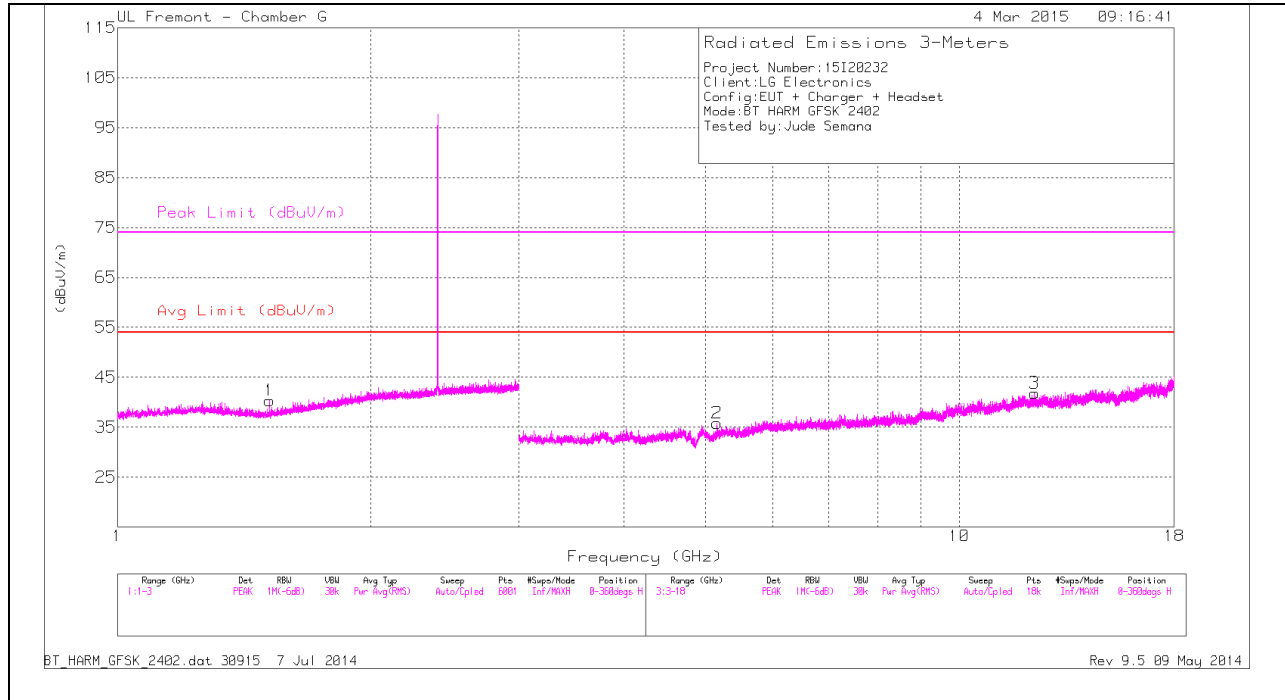


**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fitter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.84	PK	32	-24.9	0	48.94	-	-	74	-25.06	230	262	V
3	* 2.484	31.44	VB1T	32	-24.9	1.9	40.44	54	-13.56	-	-	230	262	V
4	* 2.484	31.4	VB1T	32	-24.9	1.9	40.4	54	-13.6	-	-	230	262	V
2	2.541	42.58	PK	32	-24.9	0	49.68	-	-	74	-24.32	230	262	V

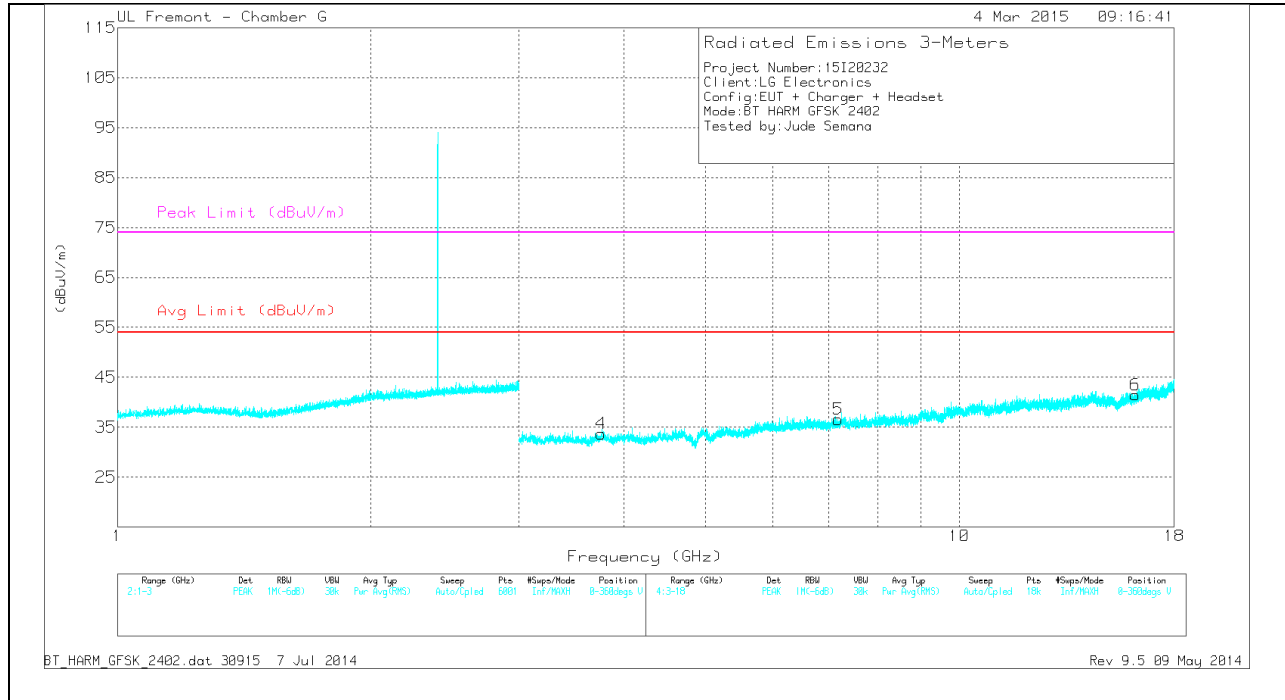
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**LOW CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**LOW CHANNEL DATA**

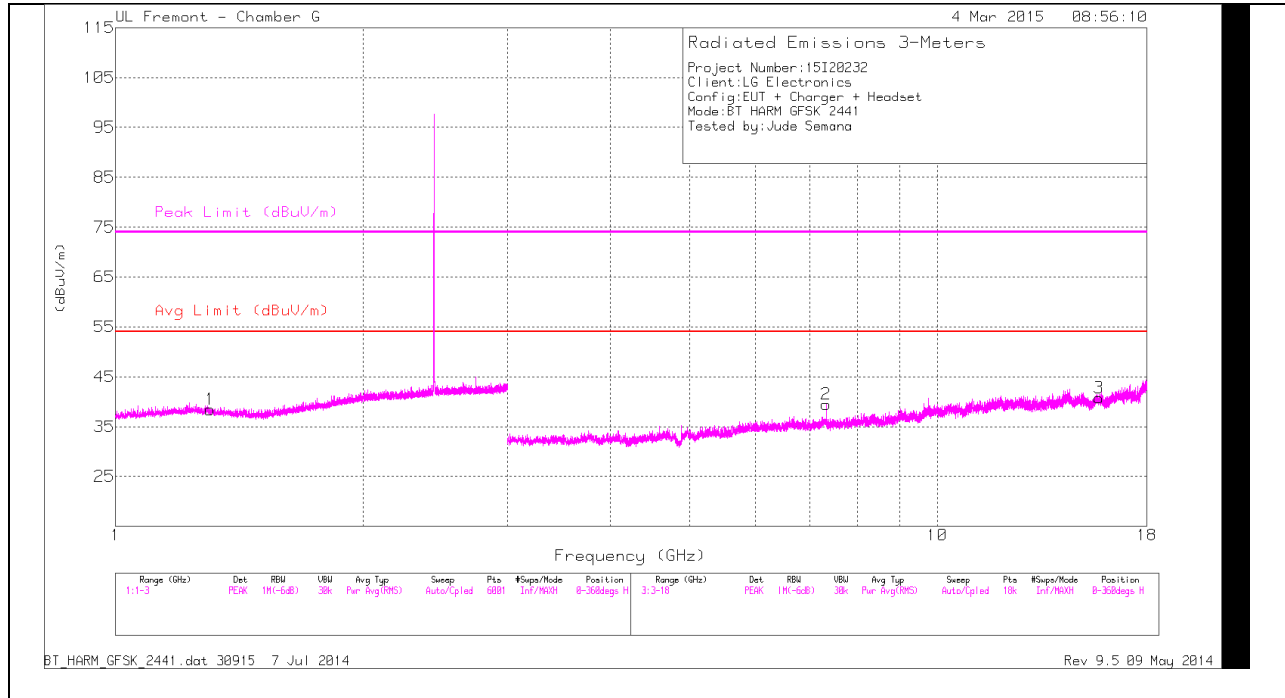
*TRACE MARKERS*

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.517	37.93	PK	28	-25.6	0	40.33	-	-	74	-33.67	0-360	101	H
3	* 12.284	29.21	PK	38.8	-26.2	0	41.81	-	-	74	-32.19	0-360	201	H
4	* 3.757	33.12	PK	32.9	-32.3	0	33.72	-	-	74	-40.28	0-360	201	V
6	* 16.188	27.79	PK	40.7	-27	0	41.49	-	-	74	-32.51	0-360	201	V
2	5.155	34.45	PK	34.3	-32.9	0	35.85	-	-	-	-	0-360	201	H
5	7.179	32.51	PK	35.6	-31.5	0	36.61	-	-	-	-	0-360	101	V

PK - Peak detector

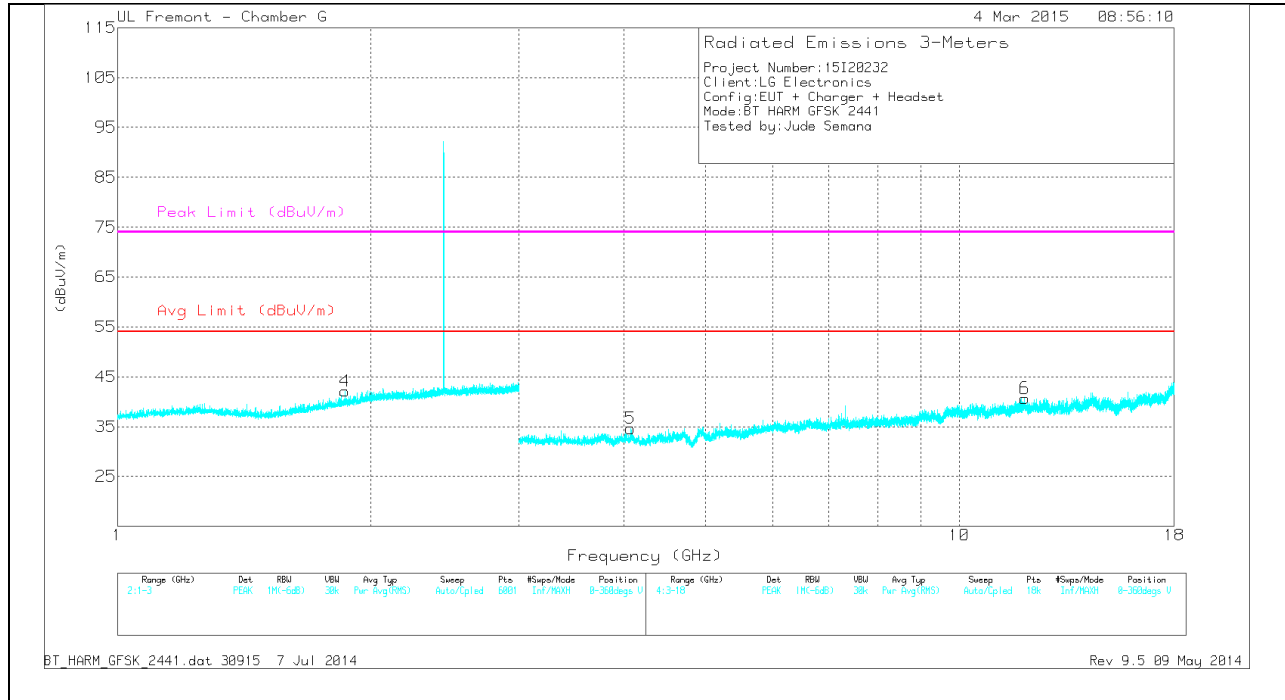


**MID CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL DATA**

*TRACE MARKERS*

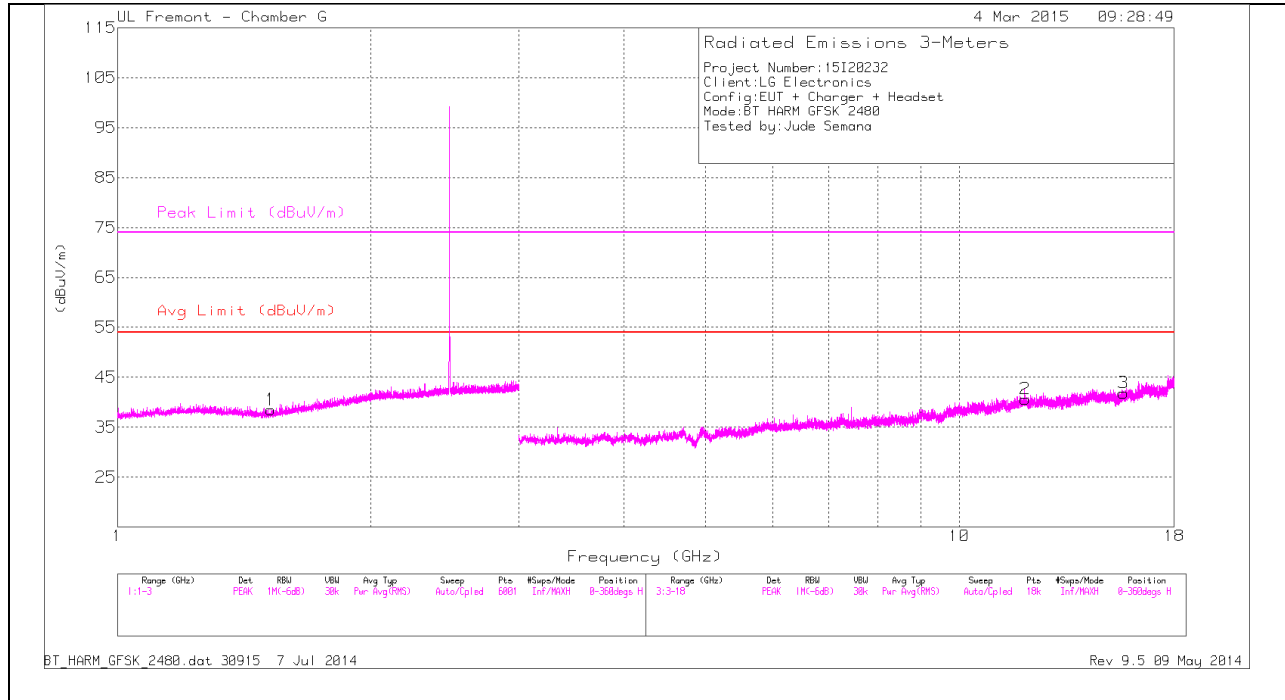
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.303	35.57	PK	28.9	-26	0	38.47	-	-	74	-35.53	0-360	201	H
2	* 7.322	34.96	PK	35.6	-31.1	0	39.46	-	-	74	-34.54	0-360	101	H
3	* 15.725	28.07	PK	40.2	-27.5	0	40.77	-	-	74	-33.23	0-360	201	H
5	* 4.072	33.98	PK	33.4	-32.7	0	34.68	-	-	74	-39.32	0-360	201	V
6	* 11.96	27.95	PK	38.8	-26.1	0	40.65	-	-	74	-33.35	0-360	101	V
4	1.865	37.24	PK	30.4	-25.5	0	42.14	-	-	-	-	0-360	201	V

PK - Peak detector

*RADIATED EMISSIONS*

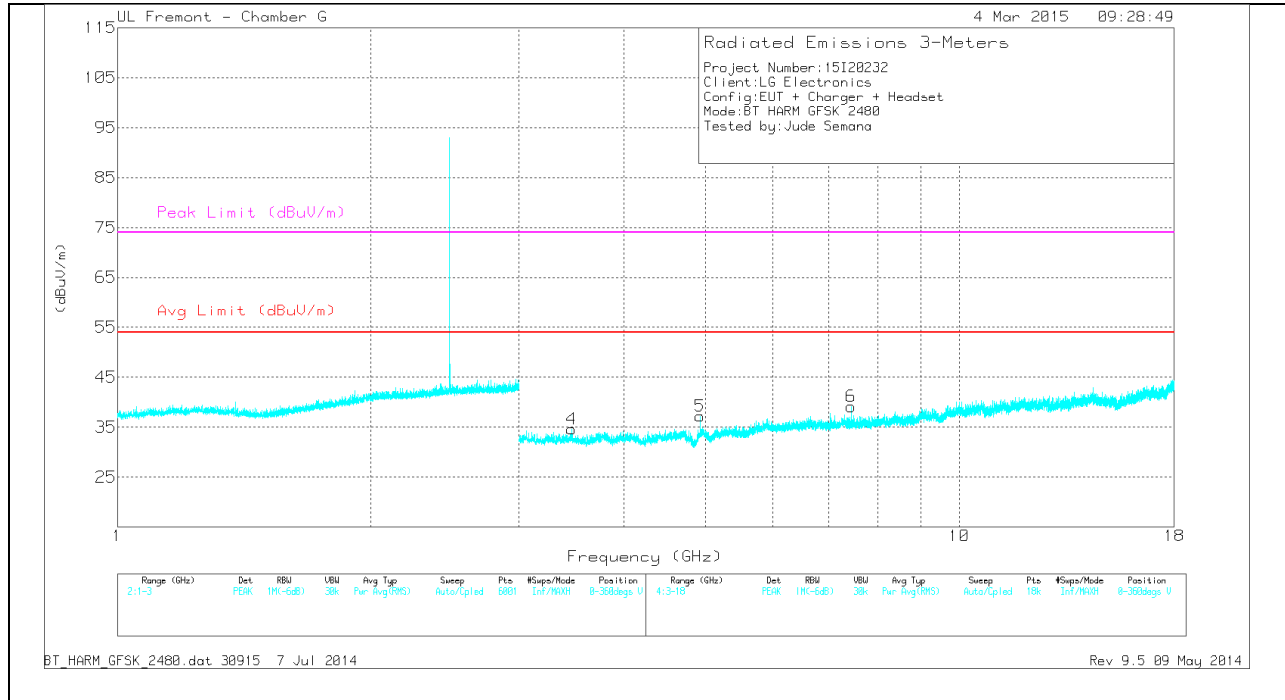
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.323	42.48	PK3	35.6	-31.1	0	46.98	-	-	74	-27.02	120	153	H
* 7.323	30.96	VB10	35.6	-31.1	1.9	37.36	54	-16.64	-	-	120	153	H

**HIGH CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**HIGH CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**HIGH CHANNEL DATA**

*TRACE MARKERS*

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.522	36.1	PK	28	-25.6	0	38.5	-	-	74	-35.5	0-360	101	H
2	* 11.979	28.03	PK	38.8	-26.2	0	40.63	-	-	74	-33.37	0-360	201	H
3	* 15.671	29.25	PK	40.1	-27.5	0	41.85	-	-	74	-32.15	0-360	101	H
5	* 4.924	36.25	PK	34.1	-33.1	0	37.25	-	-	74	-36.75	0-360	101	V
6	* 7.44	34.95	PK	35.6	-31.4	0	39.15	-	-	74	-34.85	0-360	101	V
4	3.465	35.07	PK	32.8	-33.2	0	34.67	-	-	-	-	0-360	101	V

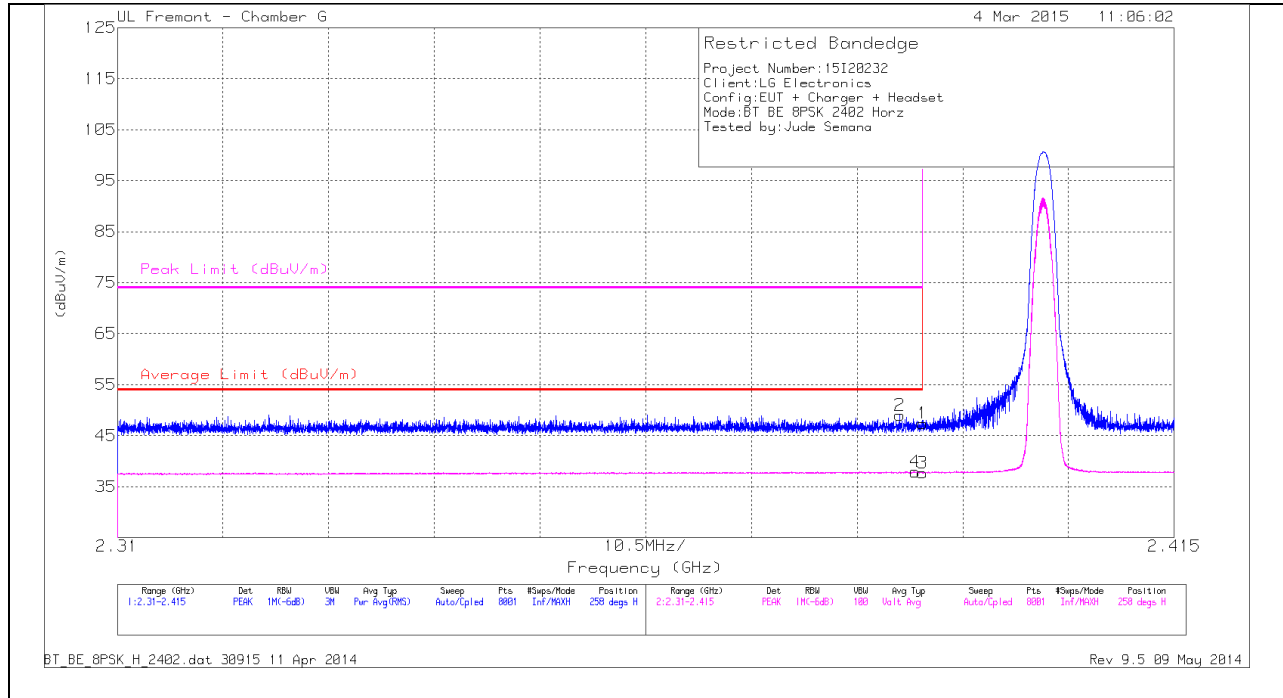
PK - Peak detector

*RADIATED EMISSIONS*

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.441	42.52	PK3	35.6	-31.4	0	46.72	-	-	74	-27.28	146	142	V
* 7.44	31.75	VB10	35.6	-31.4	1.9	37.85	54	-16.15	-	-	146	142	V

## 9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

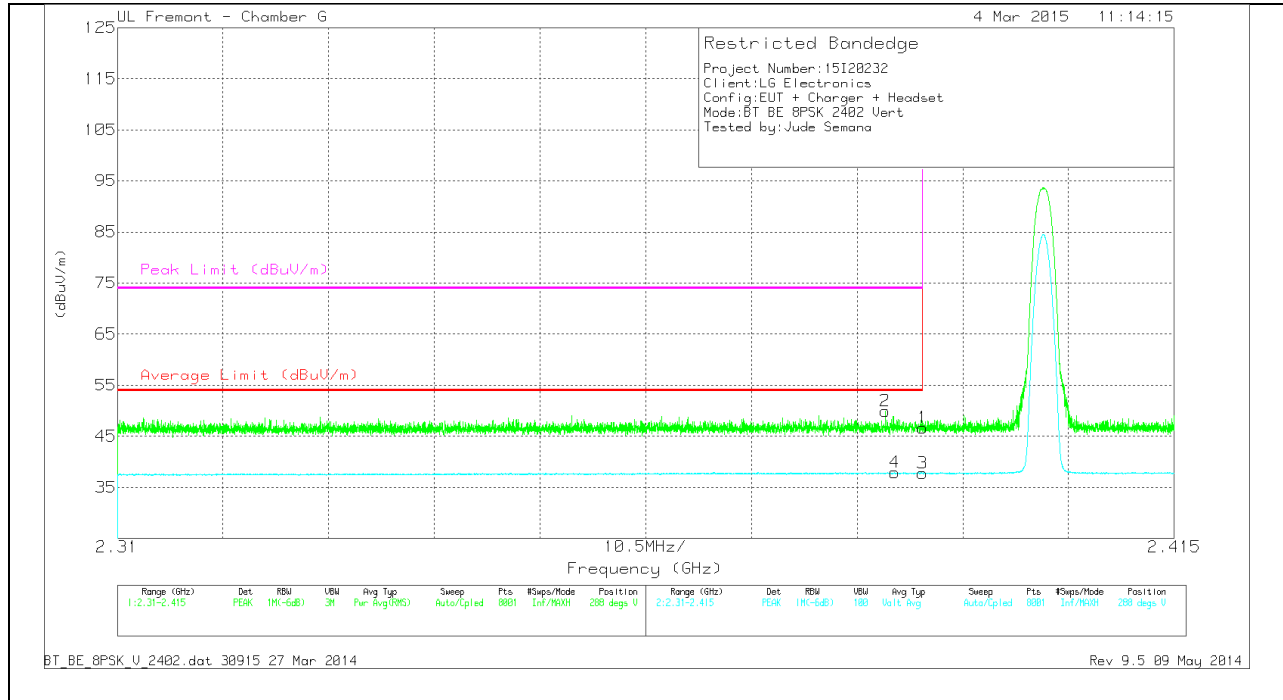
### HORIZONTAL PEAK AND AVERAGE PLOT



### HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.388	42.1	PK	31.8	-24.9	0	49	-	-	74	-25	258	268	H
4	* 2.389	31.03	VB1T	31.8	-24.9	1.9	39.83	54	-14.17	-	-	258	268	H
1	* 2.39	40.49	PK	31.8	-24.9	0	47.39	-	-	74	-26.61	258	268	H
3	* 2.39	30.8	VB1T	31.8	-24.9	1.9	39.6	54	-14.4	-	-	258	268	H

**VERTICAL PEAK AND AVERAGE PLOT**



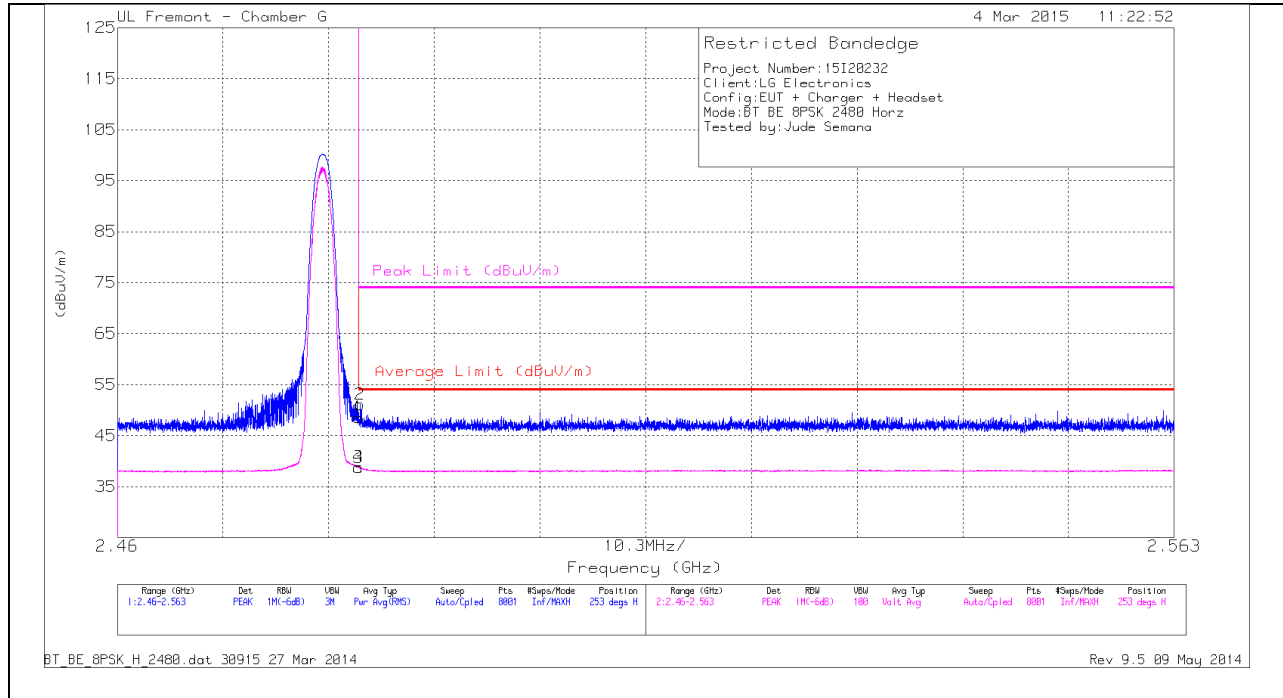
**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fitter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.386	43.07	PK	31.8	-24.9	0	49.97	-	-	74	-24.03	288	267	V
4	* 2.387	31.02	VB1T	31.8	-24.9	1.9	39.82	54	-14.18	-	-	288	267	V
1	* 2.39	39.79	PK	31.8	-24.9	0	46.69	-	-	74	-27.31	288	267	V
3	* 2.39	30.88	VB1T	31.8	-24.9	1.9	39.68	54	-14.32	-	-	288	267	V



**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

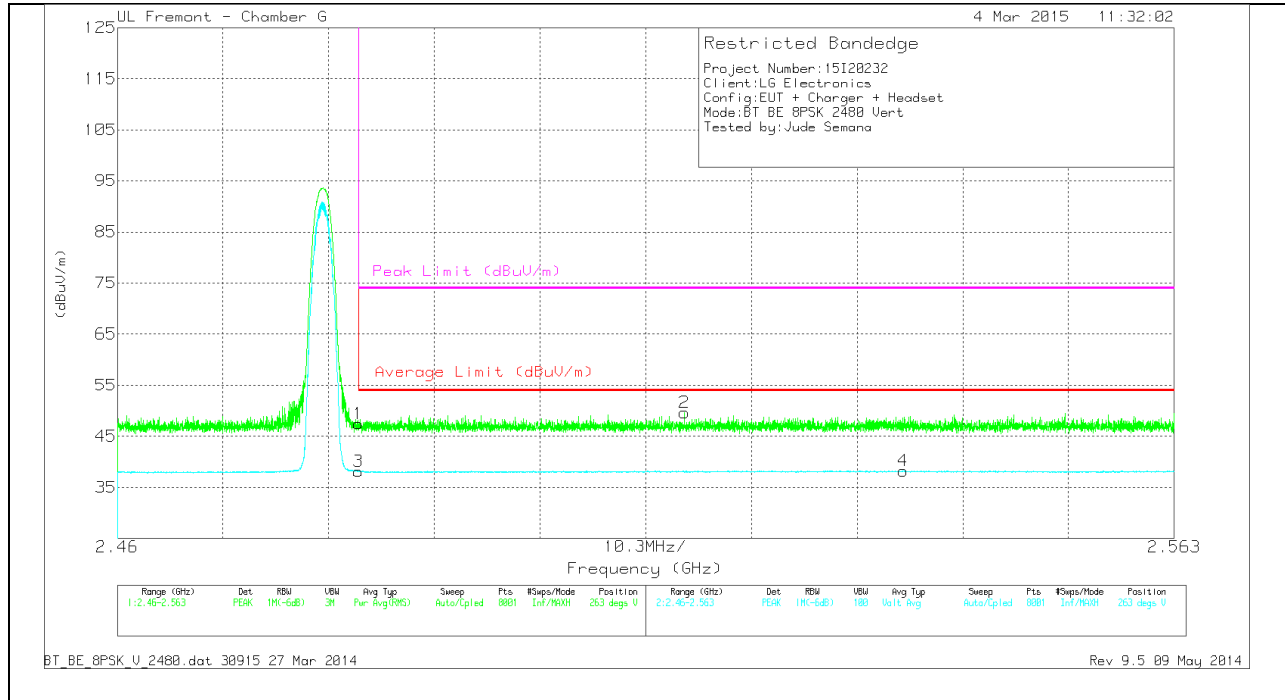
**HORIZONTAL PEAK AND AVERAGE PLOT**



**HORIZONTAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.45	PK	32	-24.9	0	48.55	-	-	74	-25.45	253	250	H
2	* 2.484	44.04	PK	32	-24.9	0	51.14	-	-	74	-22.86	253	250	H
3	* 2.484	31.66	VB1T	32	-24.9	1.9	40.66	54	-13.34	-	-	253	250	H
4	* 2.484	31.73	VB1T	32	-24.9	1.9	40.73	54	-13.27	-	-	253	250	H

**VERTICAL PEAK AND AVERAGE PLOT**

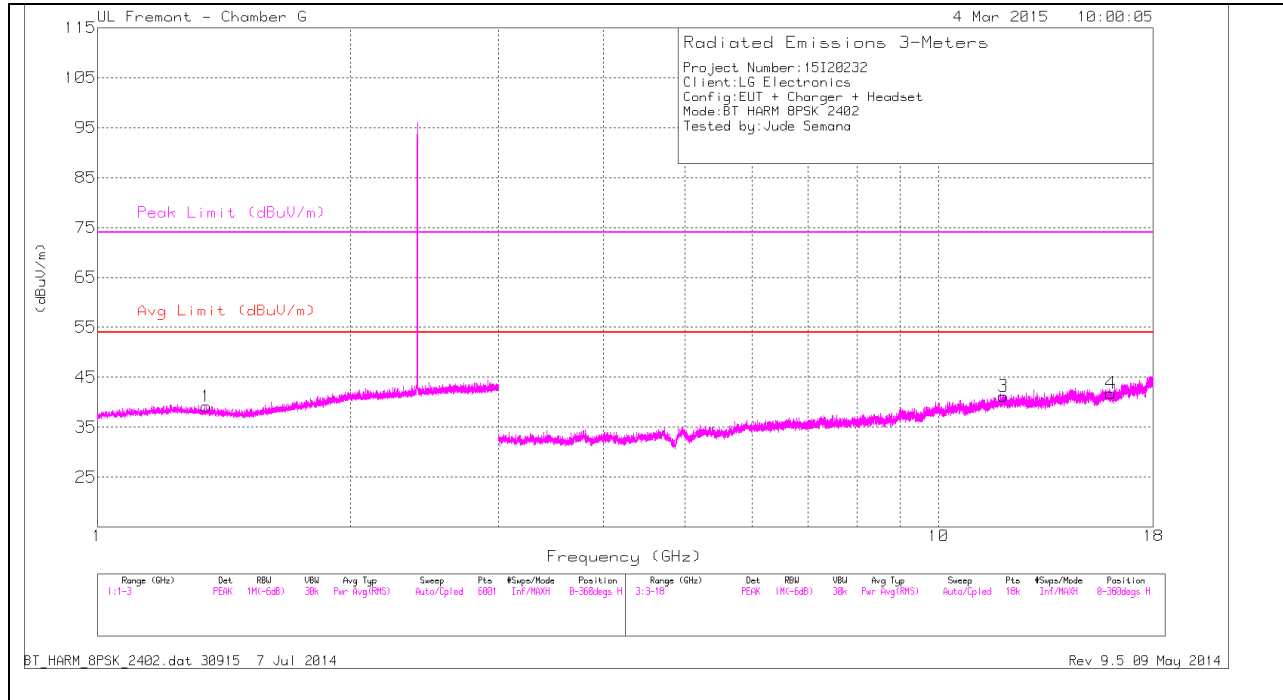


**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fitter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.38	PK	32	-24.9	0	47.48	-	-	74	-26.52	263	256	V
3	* 2.484	31.03	VB1T	32	-24.9	1.9	40.03	54	-13.97	-	-	263	256	V
2	2.515	42.52	PK	32	-24.9	0	49.62	-	-	74	-24.38	263	256	V
4	2.537	31.16	VB1T	32	-24.9	1.9	40.16	54	-13.84	-	-	263	256	V

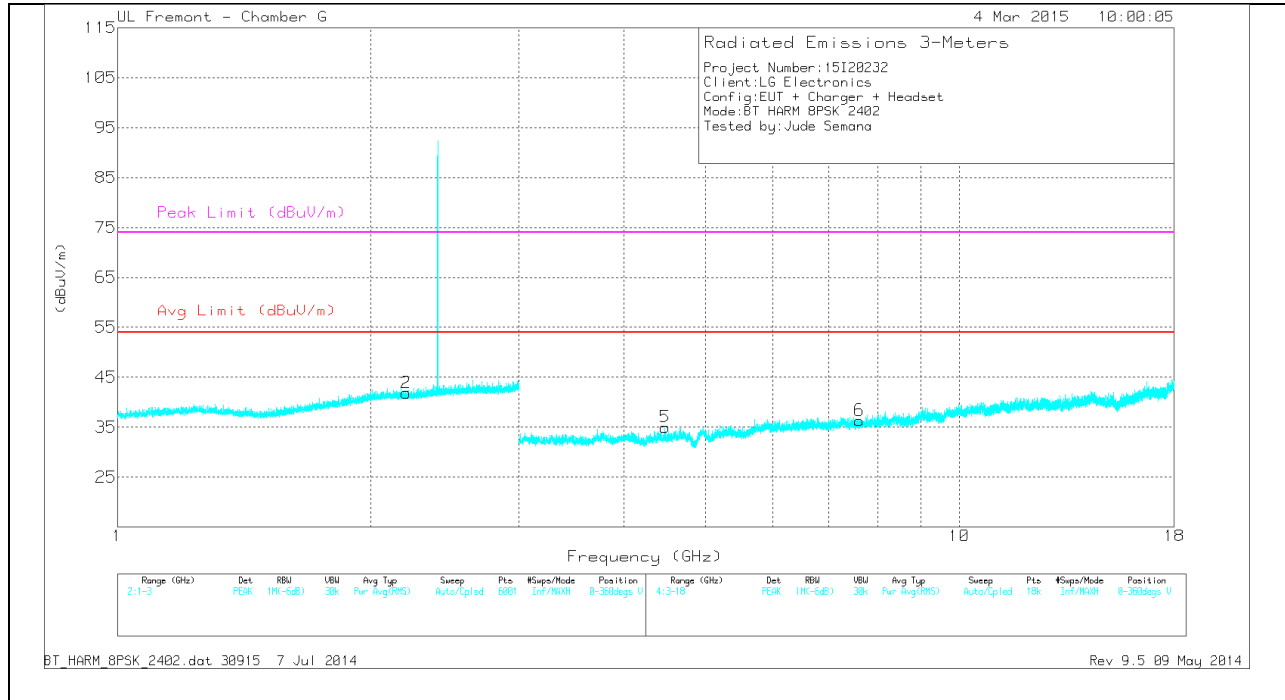
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**LOW CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

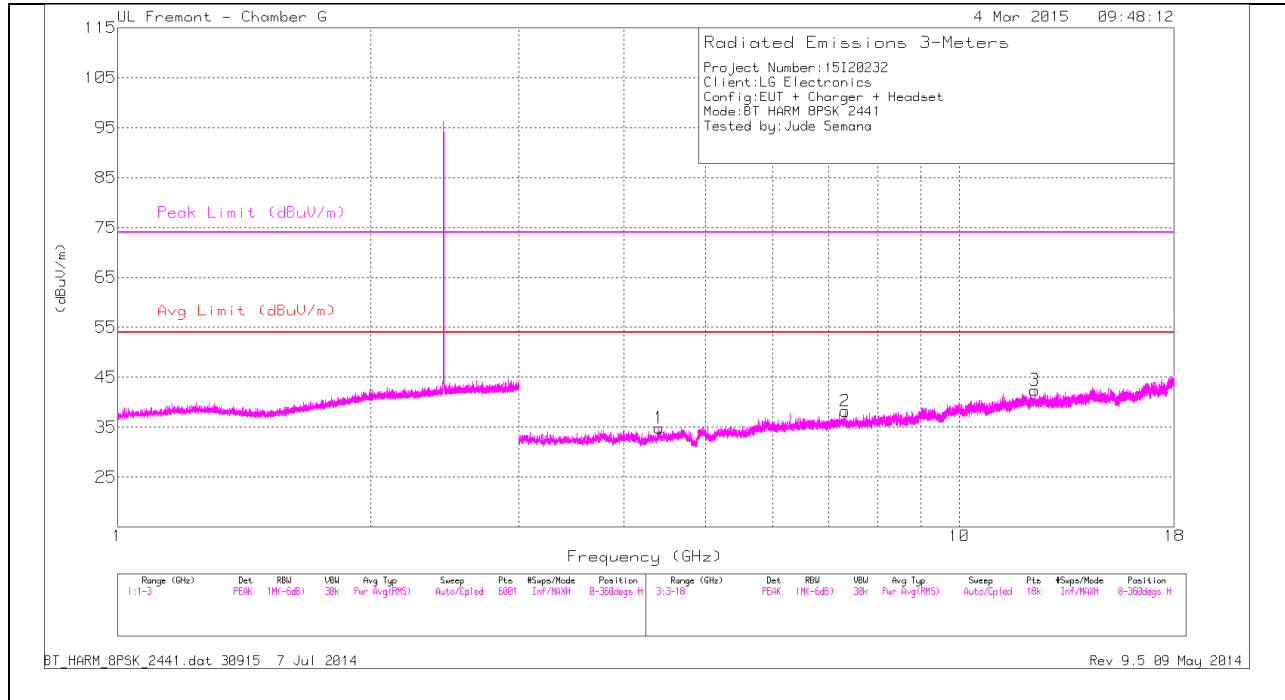
**LOW CHANNEL DATA**

*TRACE MARKERS*

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.348	36.36	PK	28.7	-25.9	0	39.16	-	-	74	-34.84	0-360	101	H
2	* 2.204	35.46	PK	31.5	-25.1	0	41.86	-	-	74	-32.14	0-360	101	V
3	* 11.945	28.62	PK	38.8	-26.2	0	41.22	-	-	74	-32.78	0-360	201	H
4	* 16.032	28.52	PK	40.5	-27.2	0	41.82	-	-	74	-32.18	0-360	201	H
6	* 7.611	31.55	PK	35.6	-30.8	0	36.35	-	-	74	-37.65	0-360	201	V
5	4.472	34.73	PK	33.7	-33.4	0	35.03	-	-	-	-	0-360	101	V

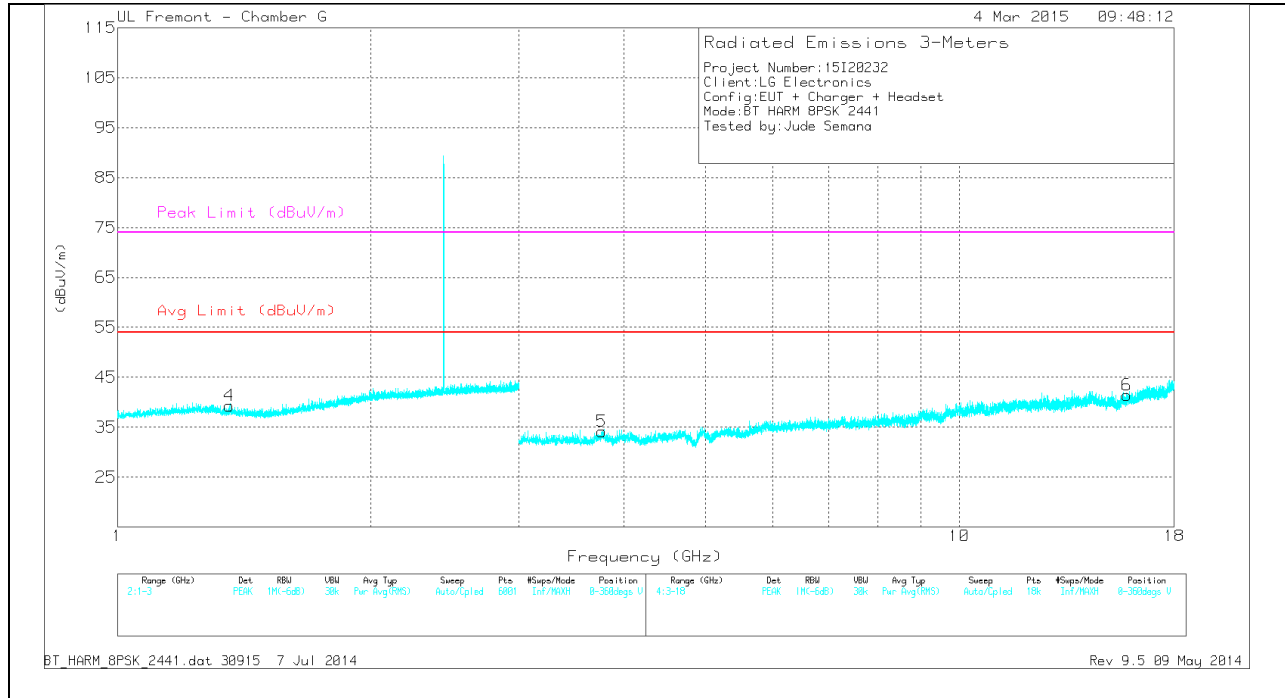
PK - Peak detector

**MID CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL DATA**

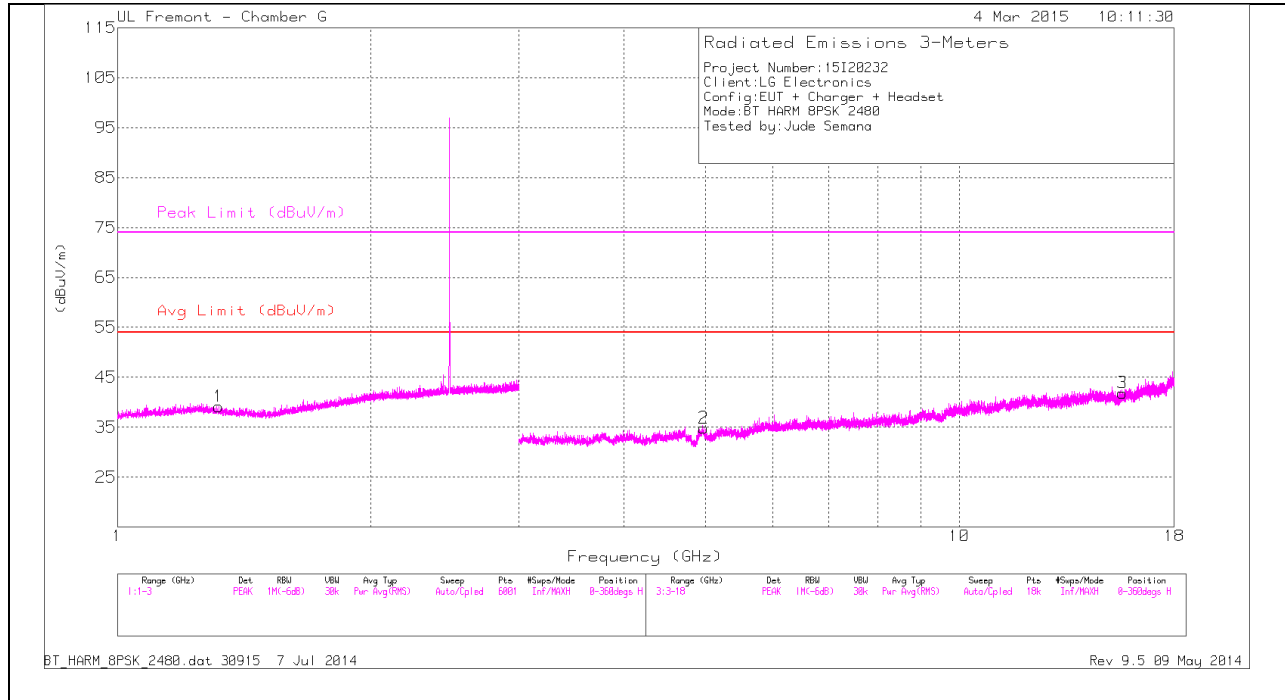
*TRACE MARKERS*

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.359	36.61	PK	28.6	-25.9	0	39.31	-	-	74	-34.69	0-360	201	V
1	* 4.399	34.14	PK	33.6	-32.9	0	34.84	-	-	74	-39.16	0-360	201	H
2	* 7.322	33.76	PK	35.6	-31.1	0	38.26	-	-	74	-35.74	0-360	101	H
3	* 12.301	30.32	PK	38.8	-26.7	0	42.42	-	-	74	-31.58	0-360	201	H
5	* 3.764	33.54	PK	32.9	-32.3	0	34.14	-	-	74	-39.86	0-360	201	V
6	* 15.814	28.62	PK	40.3	-27.5	0	41.42	-	-	74	-32.58	0-360	101	V

PK - Peak detector

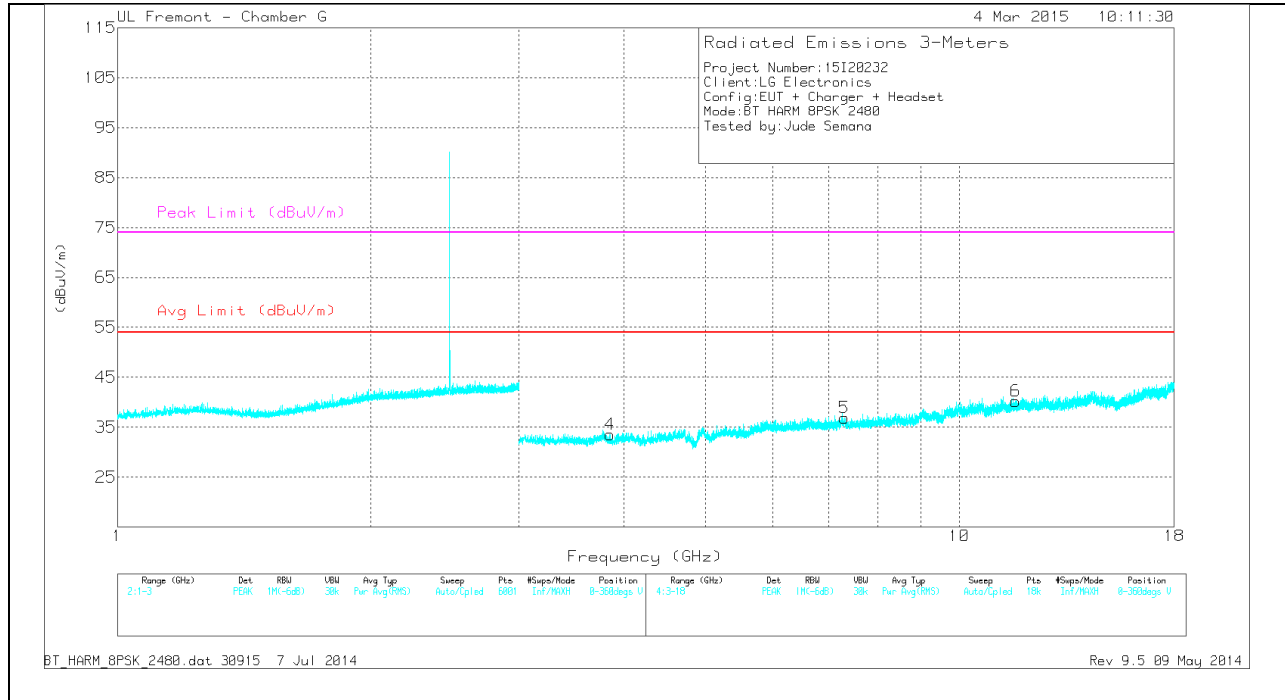


**HIGH CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**HIGH CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**HIGH CHANNEL DATA**

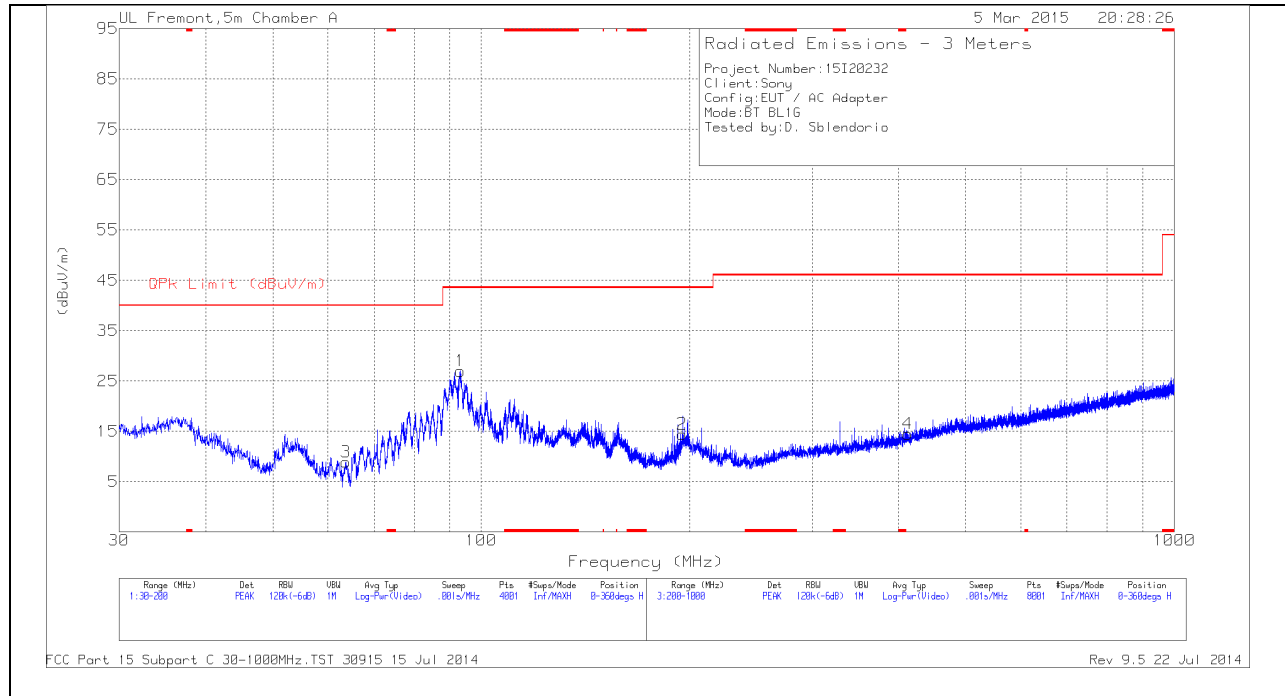
*TRACE MARKERS*

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.32	36.33	PK	28.8	-26	0	39.13	-	-	74	-34.87	0-360	101	H
2	* 4.972	33.74	PK	34.1	-33	0	34.84	-	-	74	-39.16	0-360	201	H
3	* 15.633	29.45	PK	40.1	-27.7	0	41.85	-	-	74	-32.15	0-360	101	H
4	* 3.847	34.13	PK	33.1	-33.7	0	33.53	-	-	74	-40.47	0-360	201	V
5	* 7.306	32.17	PK	35.6	-30.9	0	36.87	-	-	74	-37.13	0-360	201	V
6	* 11.67	28.24	PK	38.6	-26.6	0	40.24	-	-	74	-33.76	0-360	201	V

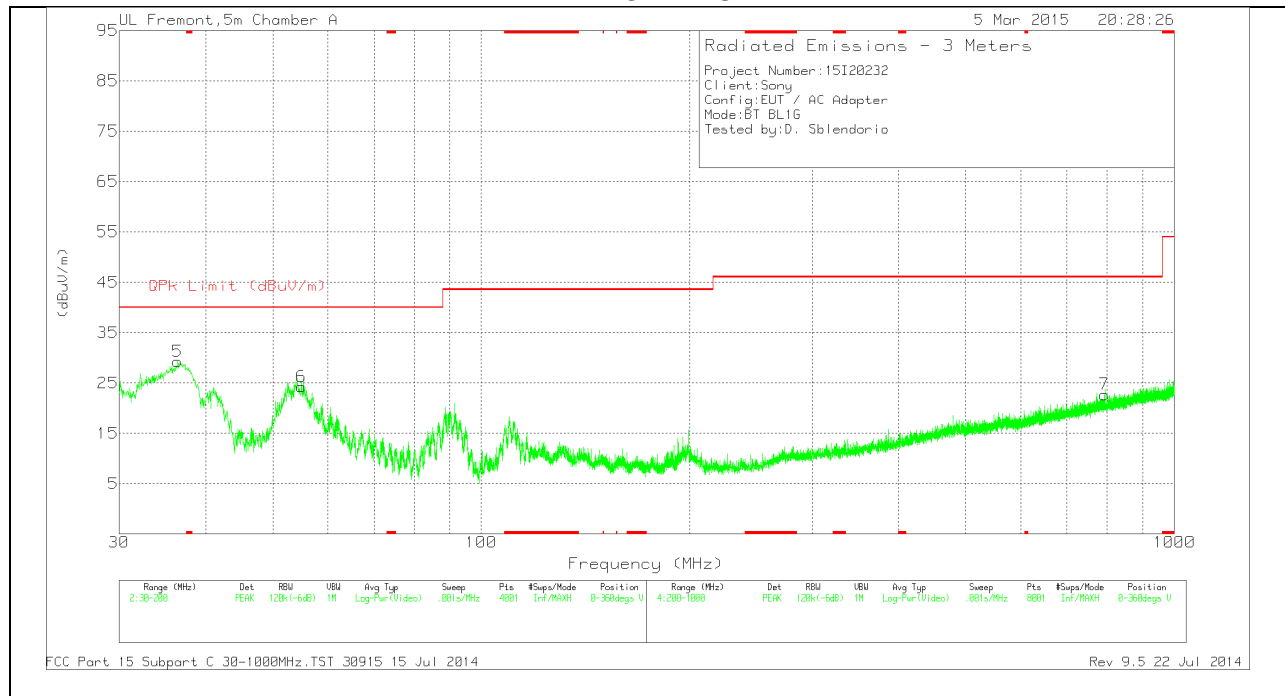
PK - Peak detector

### 9.3. TRANSMITTER BELOW 1 GHz GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

#### HORIZONTAL PLOT



#### VERTICAL PLOT



**BELOW 1 GHz TABLE**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	36.46	43.77	PK	16.7	-31.2	29.27	40	-10.73	0-360	101	V
6	54.9475	48.26	PK	7	-31	24.26	40	-15.74	0-360	101	V
3	63.745	31.88	PK	7.9	-30.9	8.88	40	-31.12	0-360	400	H
1	93.24	49.28	PK	8.3	-30.6	26.98	43.52	-16.54	0-360	200	H
2	194.9425	32.44	PK	12	-30	14.44	43.52	-29.08	0-360	100	H
4	412.6	27.88	PK	15.7	-29.1	14.48	46.02	-31.54	0-360	300	H
7	793	29.61	PK	21.2	-28.1	22.71	46.02	-23.31	0-360	101	V

PK - Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

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.

### 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.

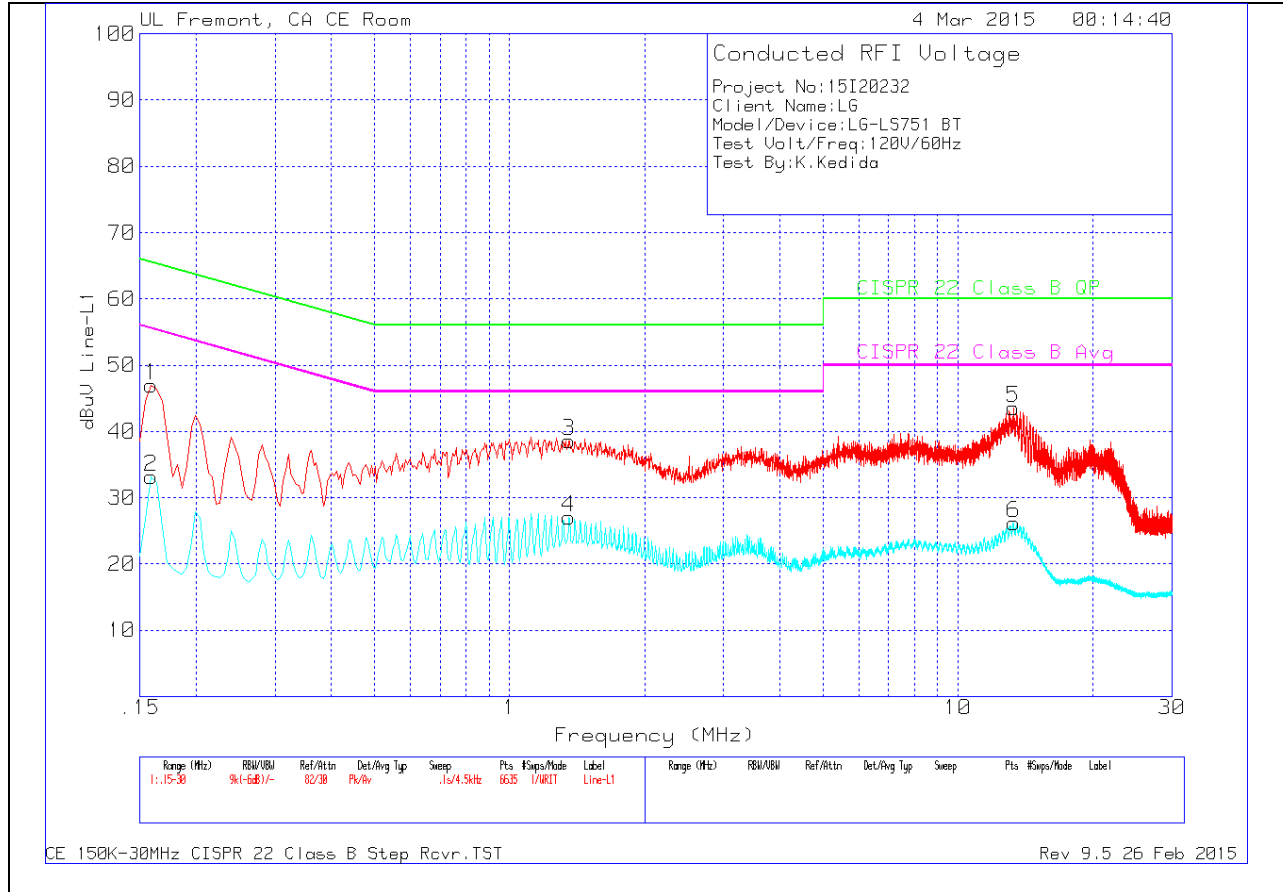
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

### RESULTS

**6 WORST EMISSIONS**

**LINE 1 PLOT**

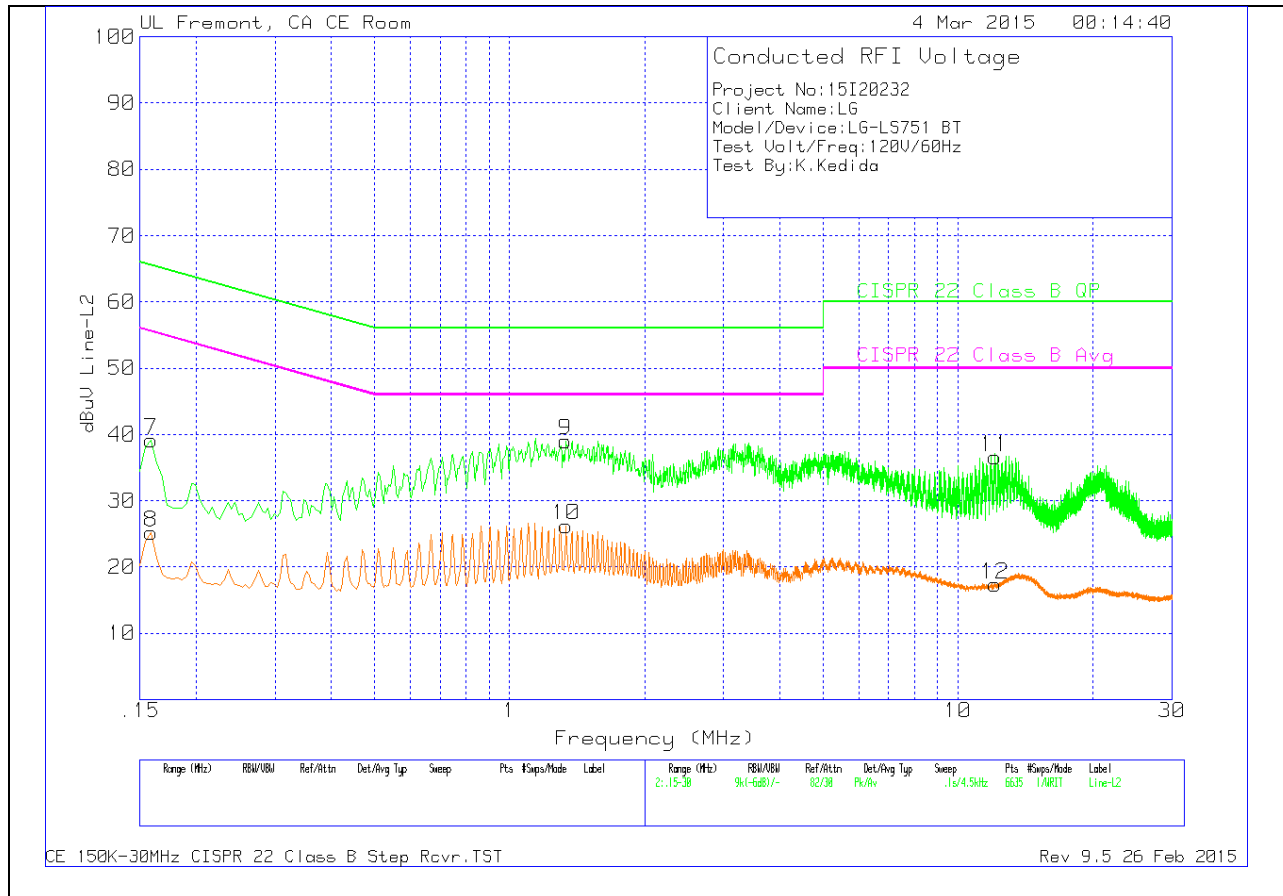


**LINE 1 RESULTS**

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	QP Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.159	45.69	Pk	1.3	0	46.99	-	-	-	-
2	.159	31.89	Av	1.3	0	33.19	-	-	55.52	-22.33
3	1.356	38.3	Pk	.2	.1	38.6	-	-	-	-
4	1.356	26.75	Av	.2	.1	27.05	-	-	46	-18.95
5	13.2855	43.12	Pk	.2	.2	43.52	-	-	-	-
6	13.308	25.79	Av	.2	.2	26.19	-	-	50	-23.81

**LINE 2 PLOT**



**LINE 2 RESULTS**

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	QP Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
7	.159	37.78	Pk	1.4	0	39.18	-	-	-	-
8	.159	23.82	Av	1.4	0	25.22	-	-	55.52	-30.3
9	1.3335	38.75	Pk	.2	.1	39.05	-	-	-	-
10	1.338	25.95	Av	.2	.1	26.25	-	-	46	-19.75
11	12.0795	36.19	Pk	.2	.2	36.59	-	-	-	-
12	12.0975	16.94	Av	.2	.2	17.34	-	-	50	-32.66