



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/CDMA/WCDMA/LTE PHONE + BLUETOOTH, with DTS/UNII a/b/g/n/ac & NFC

MODEL NUMBER: LG-LS991, LS991, LGLS991

FCC ID: ZNFLS991

REPORT NUMBER: 15I20286-E2

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC
EUT DESCRIPTION: GSM/CDMA/WCDMA/LTE PHONE + BLUETOOTH, with DTS/UNII a/b/g/n/ac & NFC
MODEL: LG-LS991, LS991, LGLS991
SERIAL NUMBER: 1TLT3 (Conducted) and 1TLT7 (Radiated)
DATE TESTED: MARCH 10- APRIL 7, 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
☒ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☐ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☒ Chamber G(IC: 2324B-7)
	☐ 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 GSM/CDMA/WCDMA/LTE PHONE + BLUETOOTH, with DTS/UNII a/b/g/n/ac & NFC

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	9.84	9.64
2402 - 2480	Enhanced 8PSK	8.53	7.13

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 -1.21 dBi.

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-04WD2	EAY62991904	N/A
Smart Case Cover	LG	LG-P1	DK0227	N/A
Wireless Charger	LG	WCD-110	LF1212625283010049	N/A
Earphone	LG	N/A	N/A	N/A

I/O CABLES

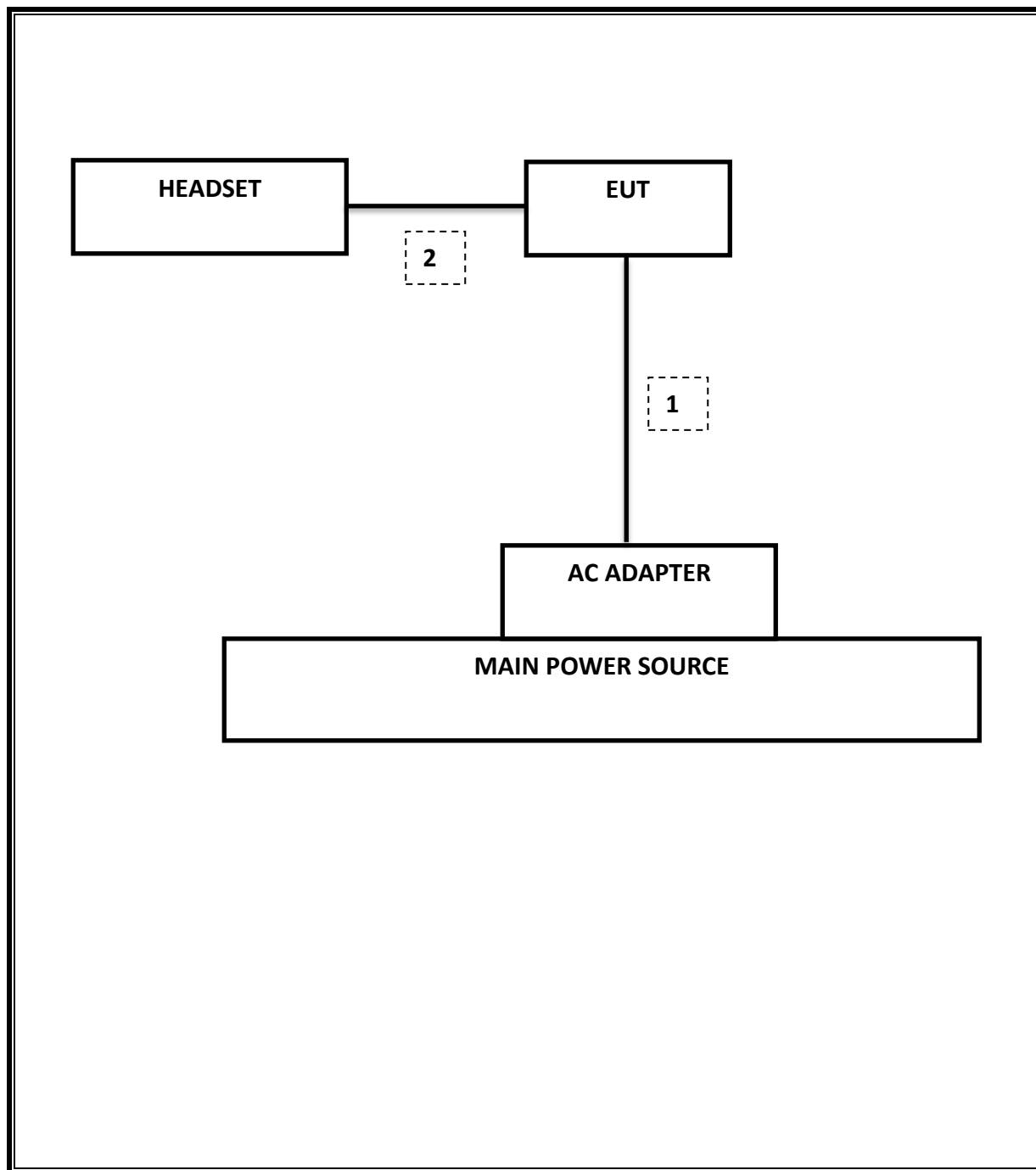
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

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

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	AFS42-00101800-25-S-42	740	01/26/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	123	10/28/15
CBT Bluetooth Tester	R & S	CBT	258	07/08/15
Peak Power Meter	Agilent / HP	E4416A	84	01/26/16
Peak / Average Power Sensor	Agilent / HP	8481A	224	12/10/15
LISN, 30 MHz	FCC	50/250-25-2	24	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	1.223 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-54.3 dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	9.84 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 ch
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.21 s
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	44.15 dBuV(AV)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	36.75 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

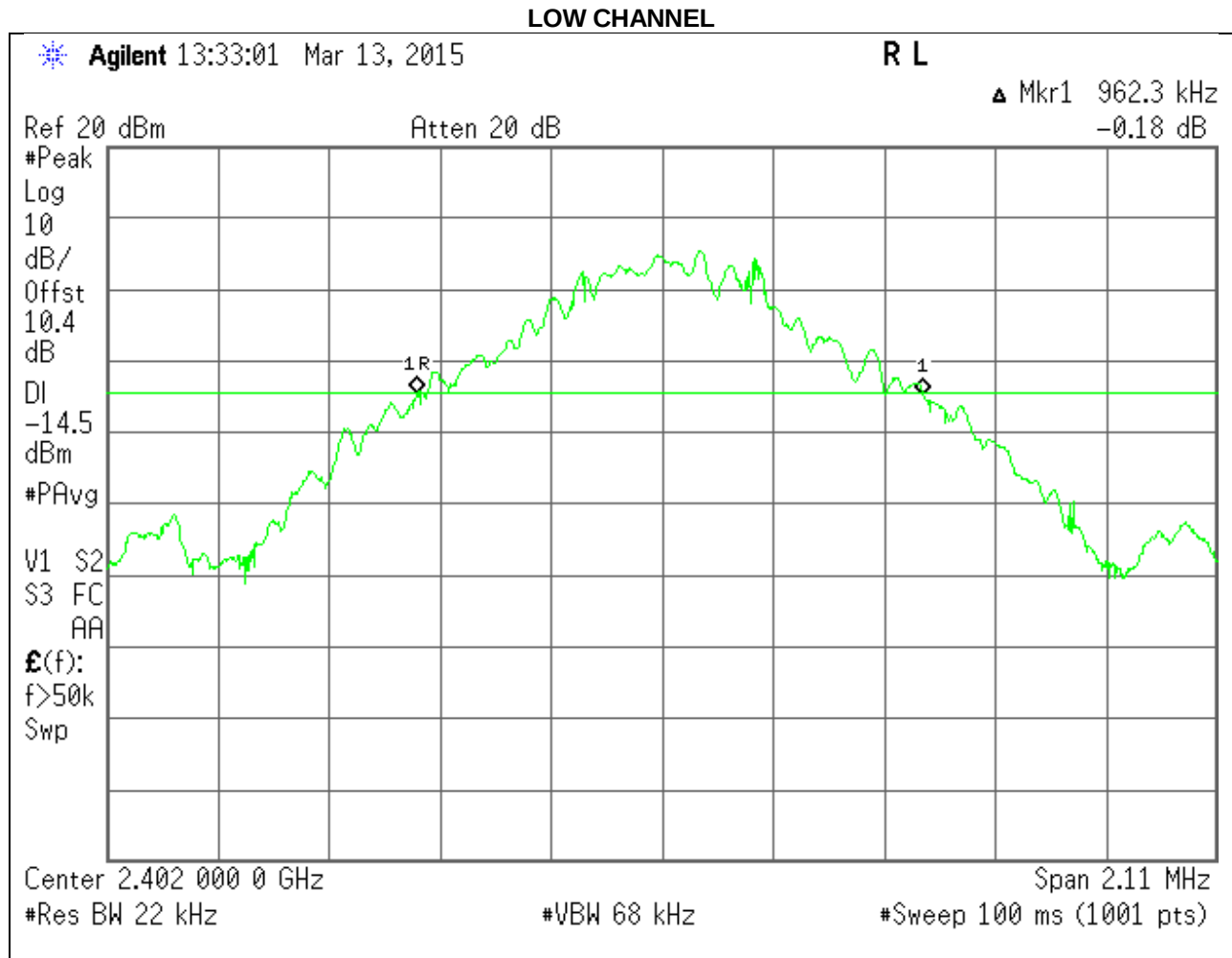
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.9623	0.9015
Middle	2441	0.9624	0.9020
High	2480	0.9625	0.9023
Worst		0.9625	0.9023

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

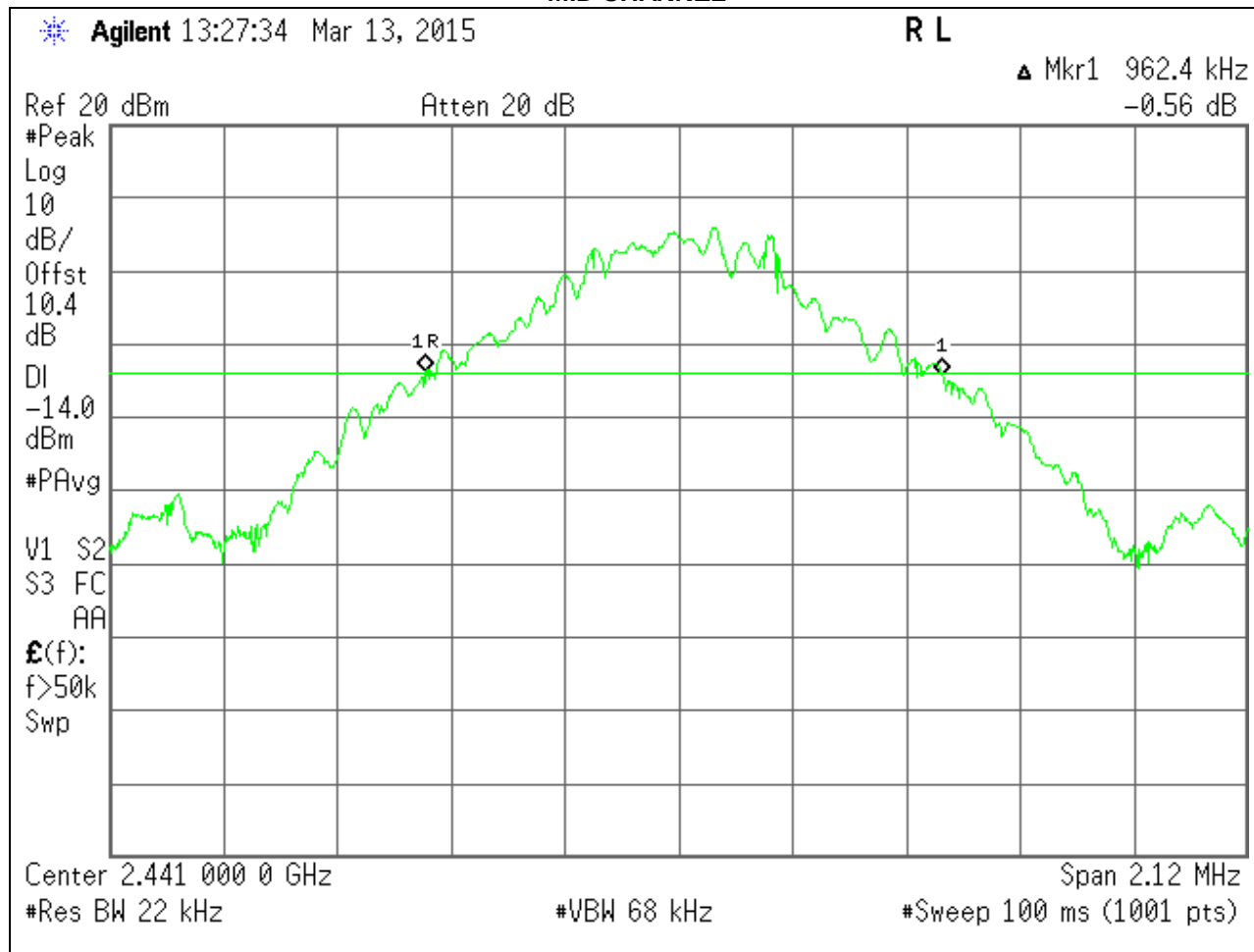
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.341	1.223
Middle	2441	1.339	1.223
High	2480	1.339	1.219
Worst		1.341	1.223

8.1.3. 20 dB AND 99% BANDWIDTH PLOTS

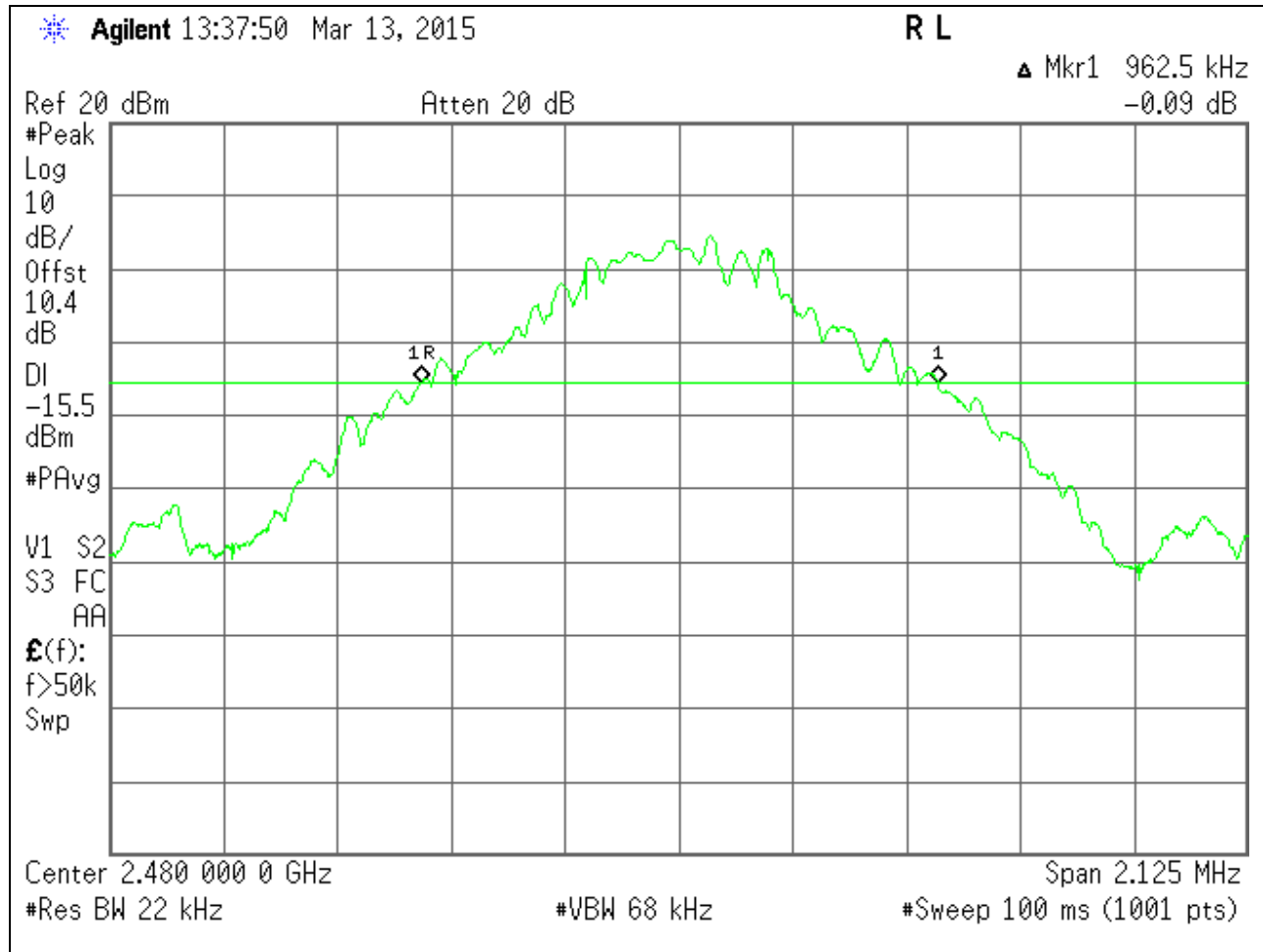
GFSK 20 dB BANDWIDTH



MID CHANNEL

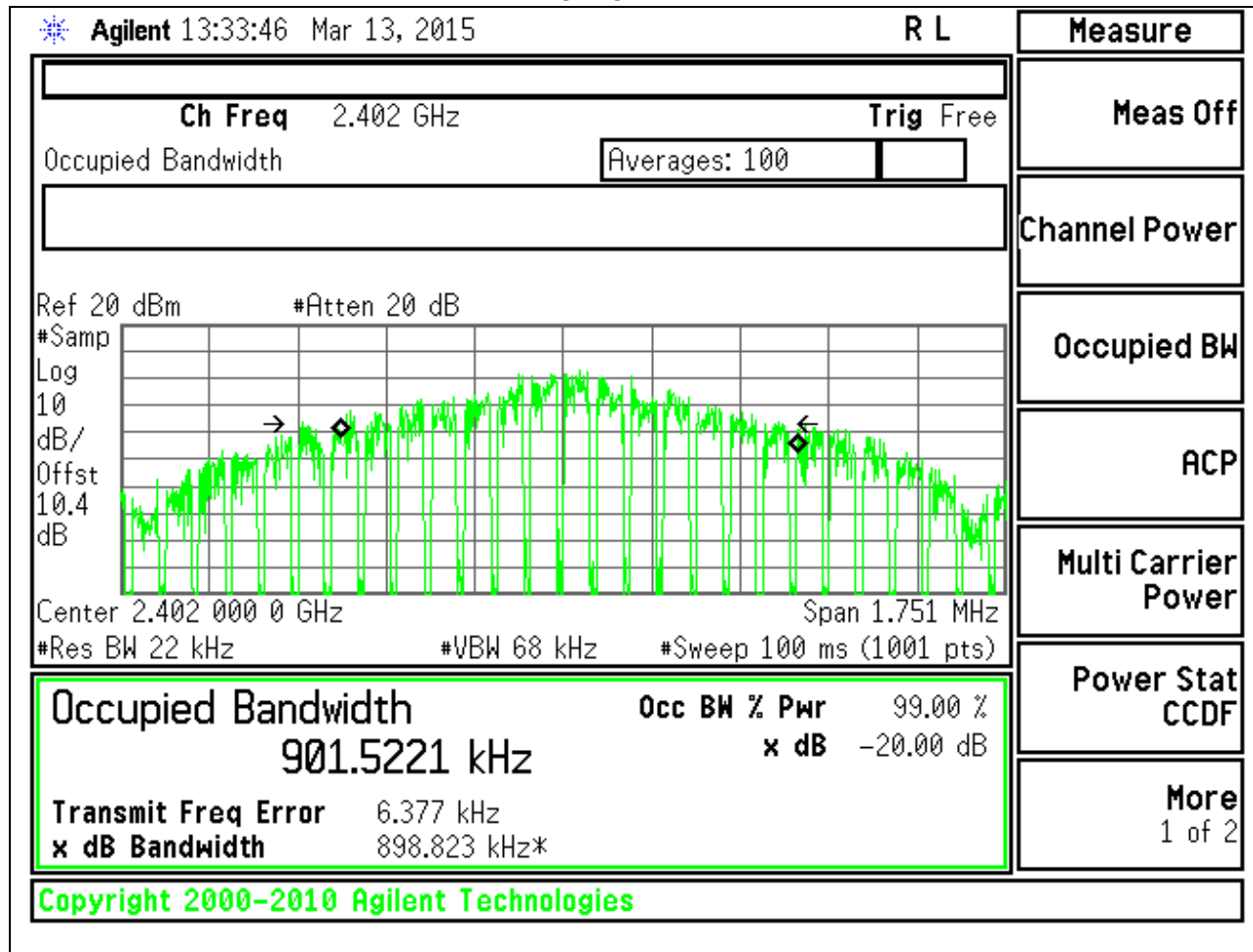


HIGH CHANNEL

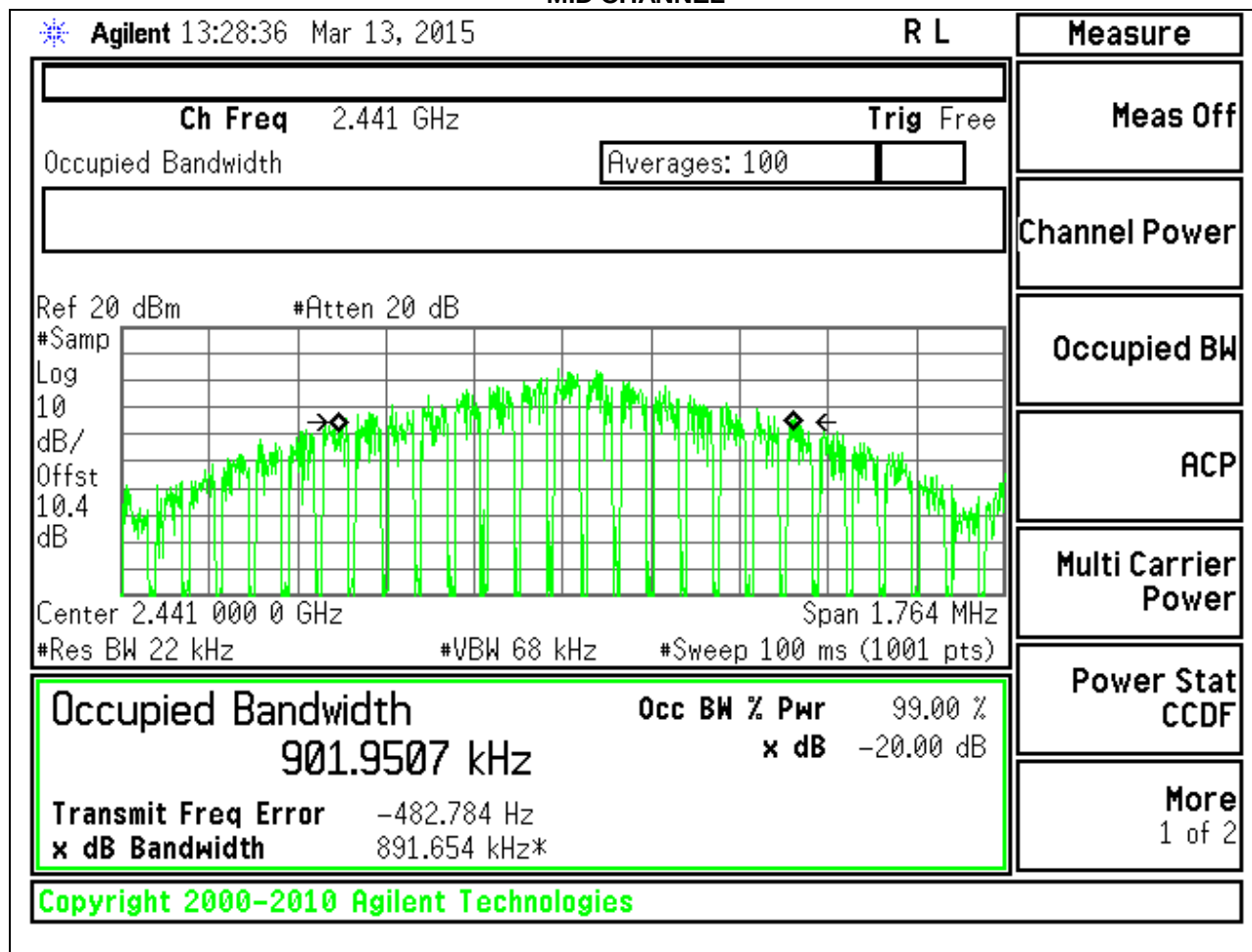


GFSK 99% BANDWIDTH

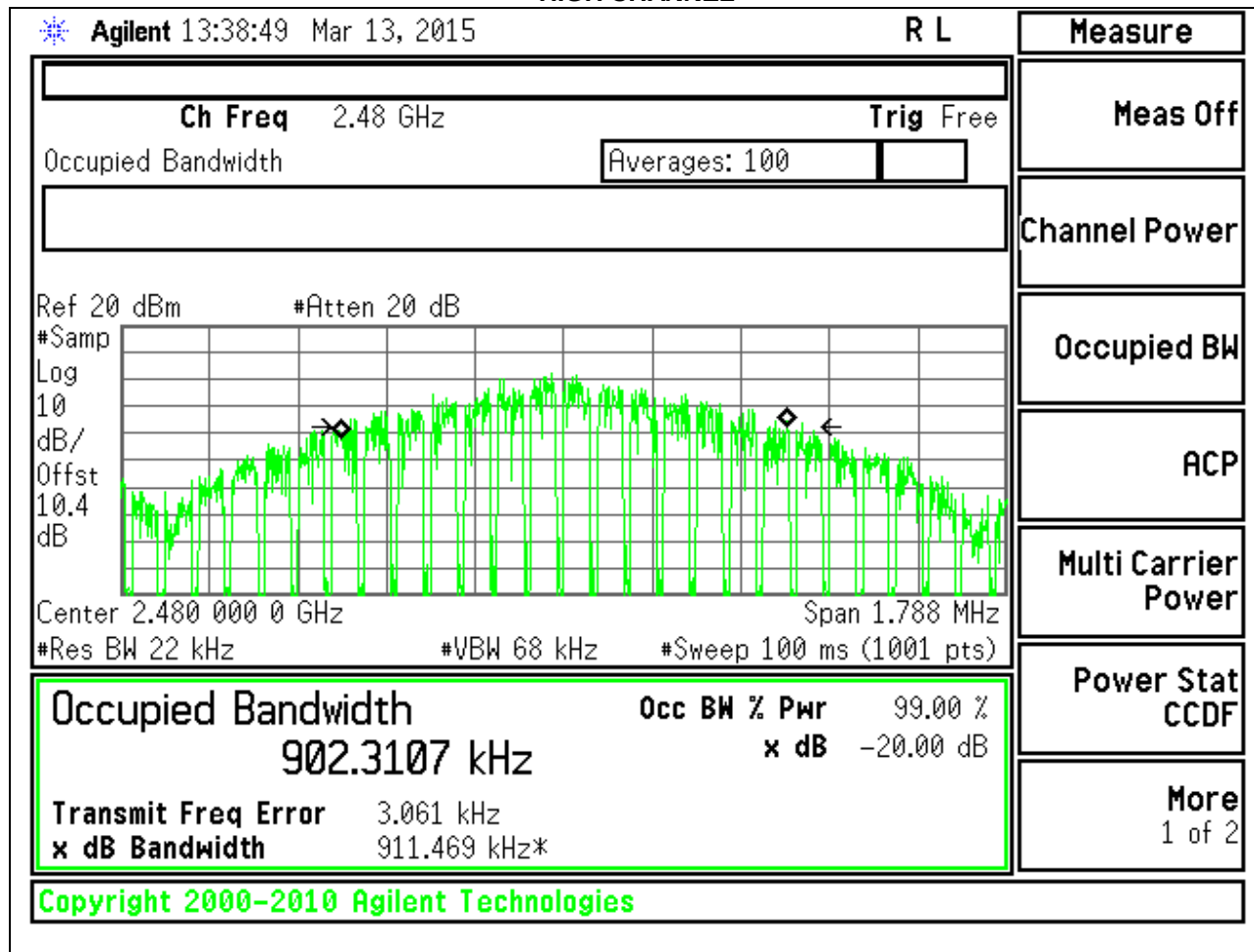
LOW CHANNEL



MID CHANNEL

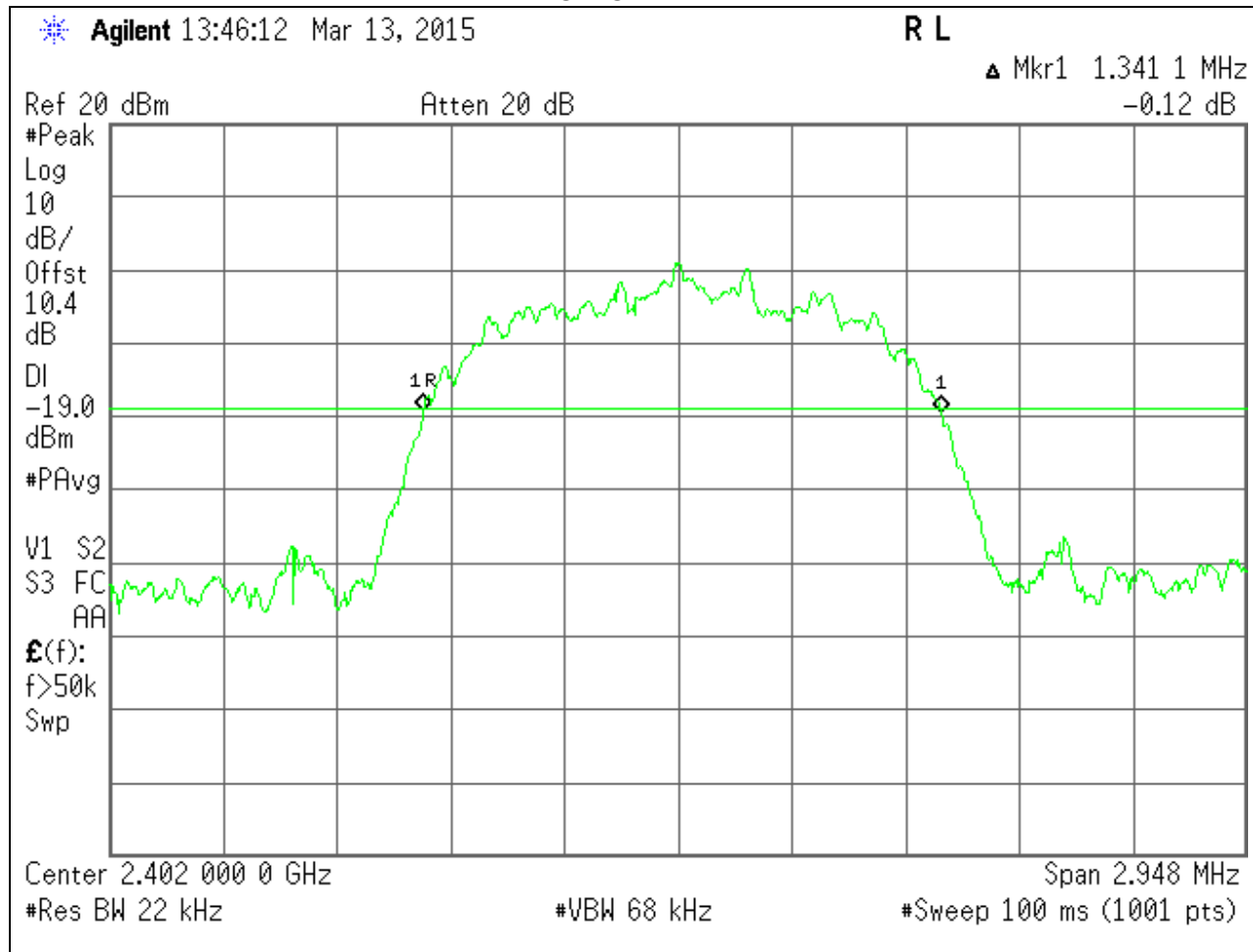


HIGH CHANNEL

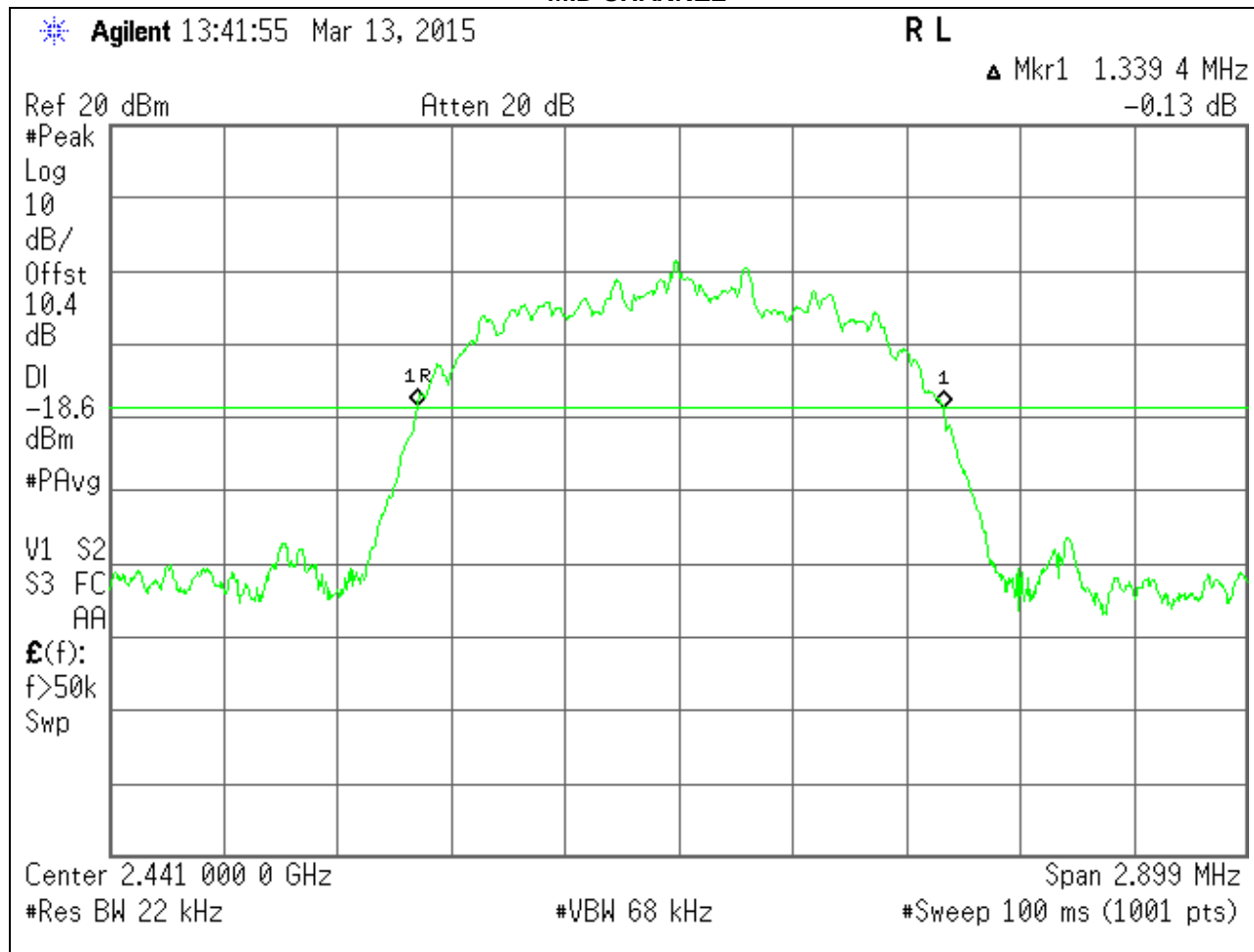


8PSK 20 dB BANDWIDTH

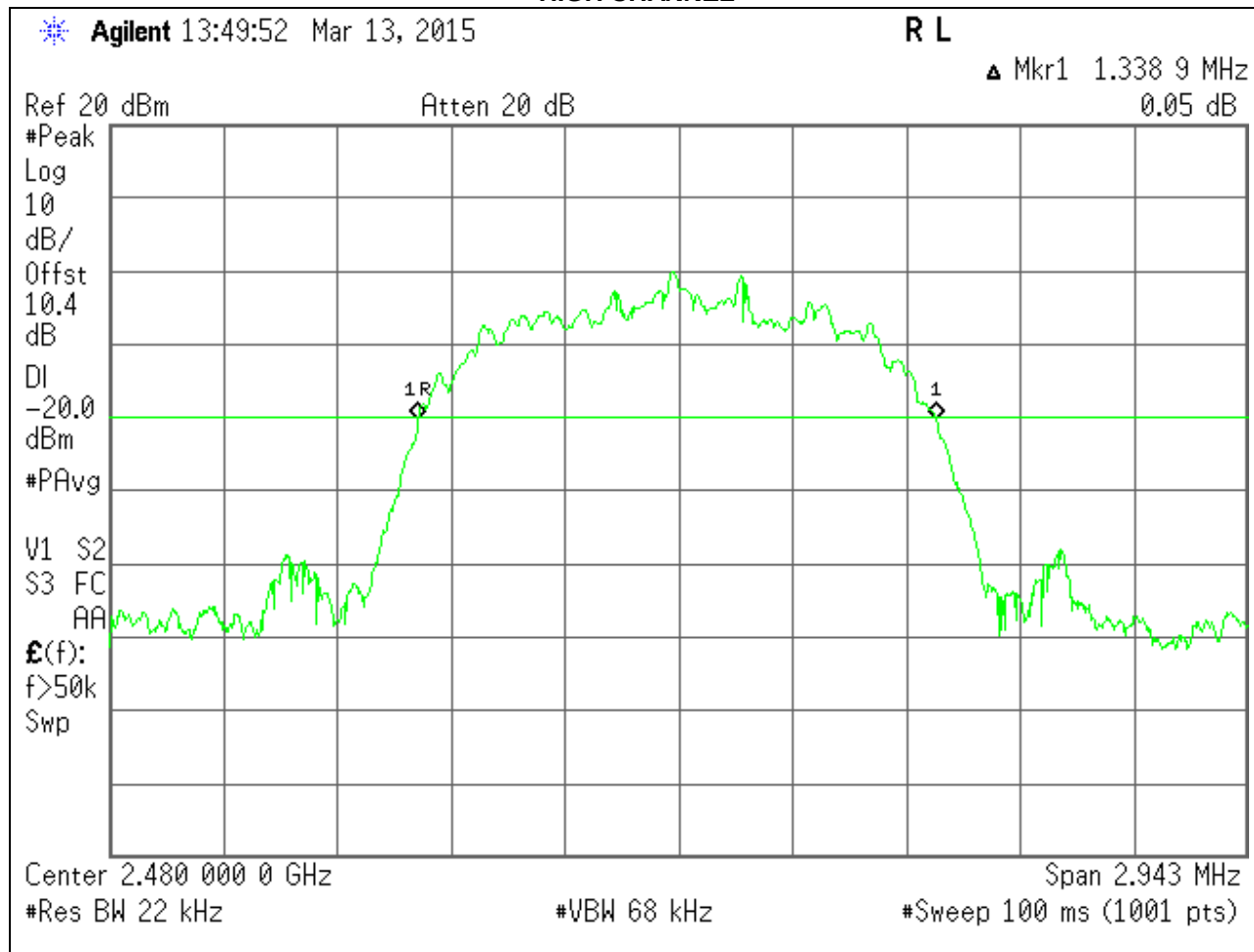
LOW CHANNEL



MID CHANNEL

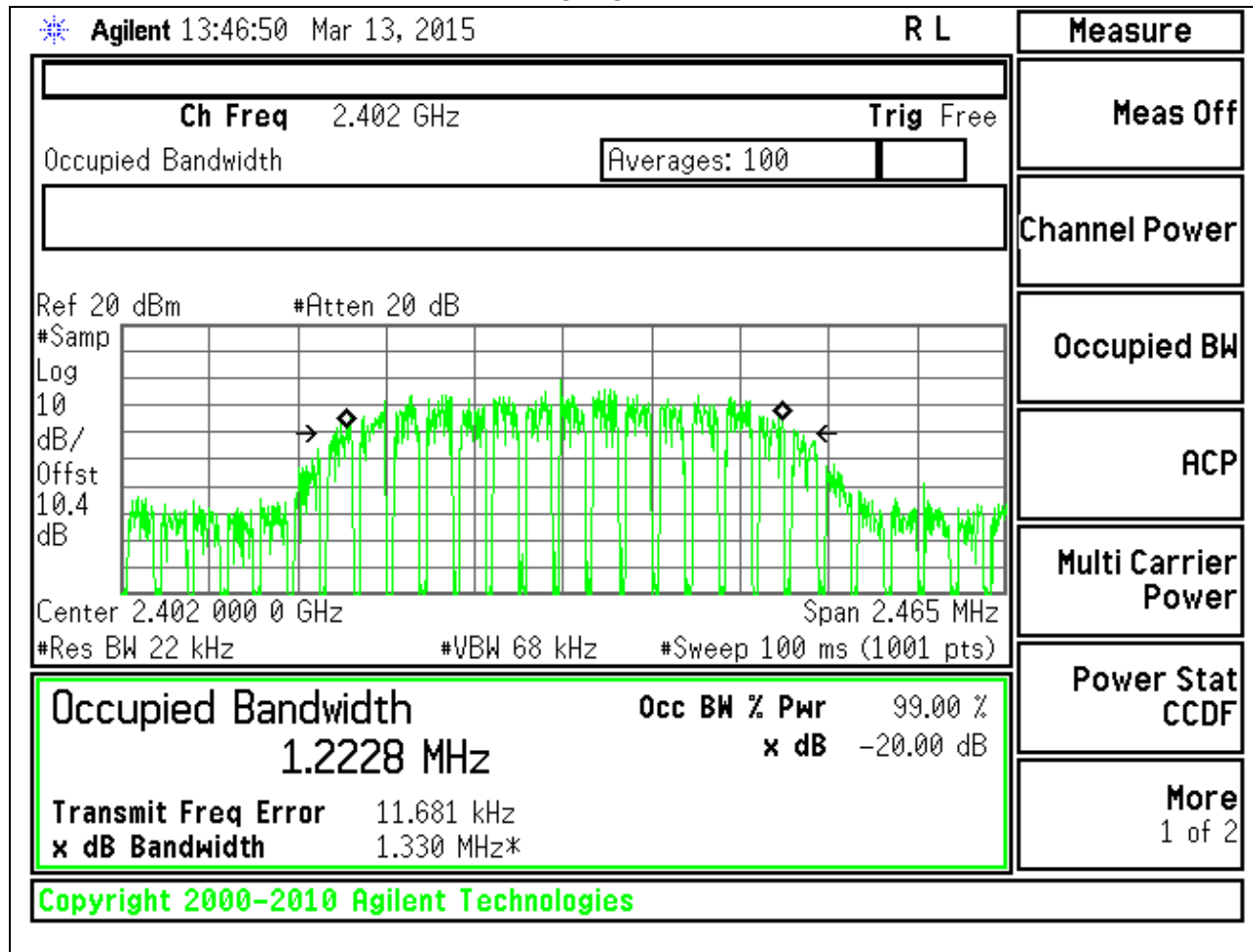


HIGH CHANNEL

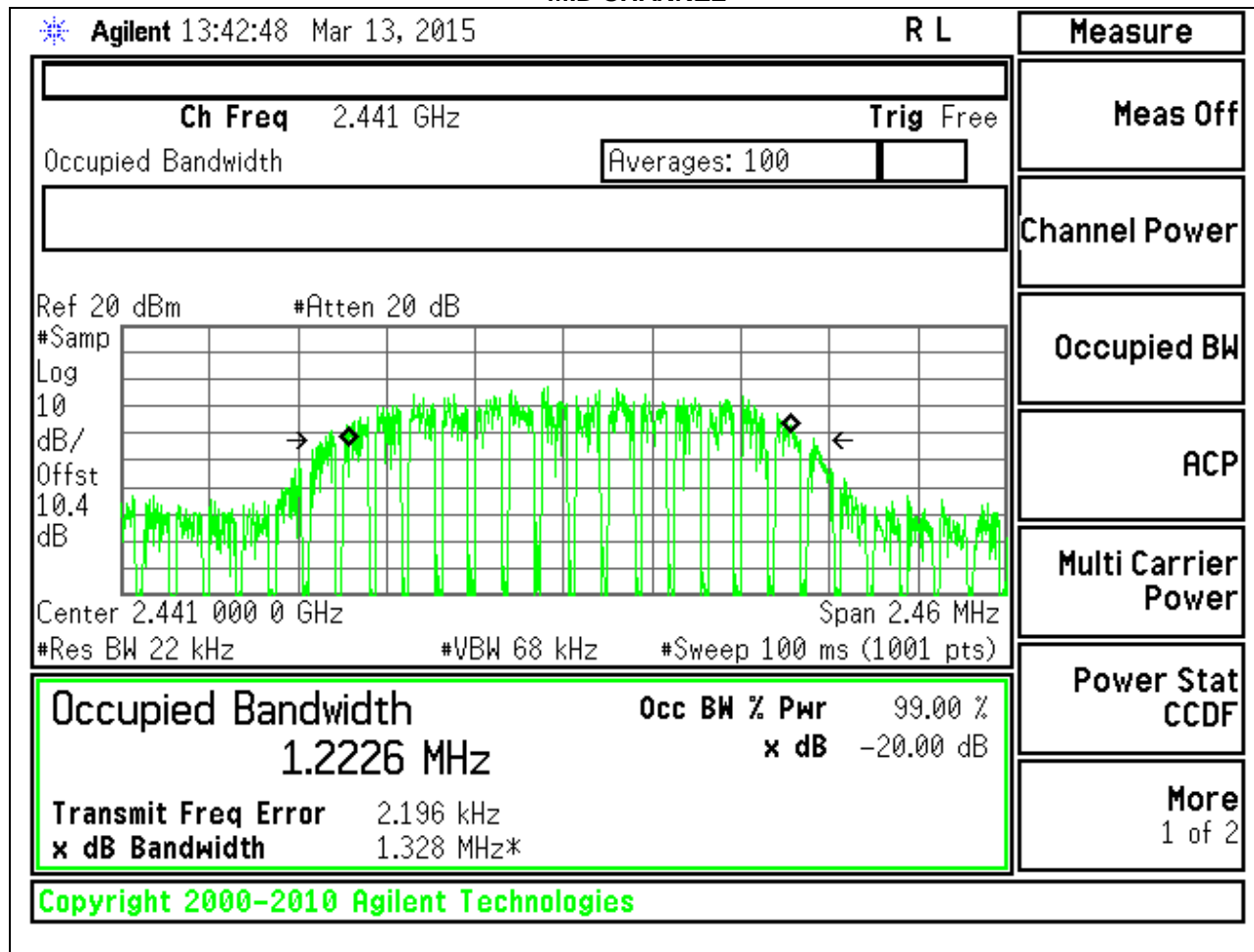


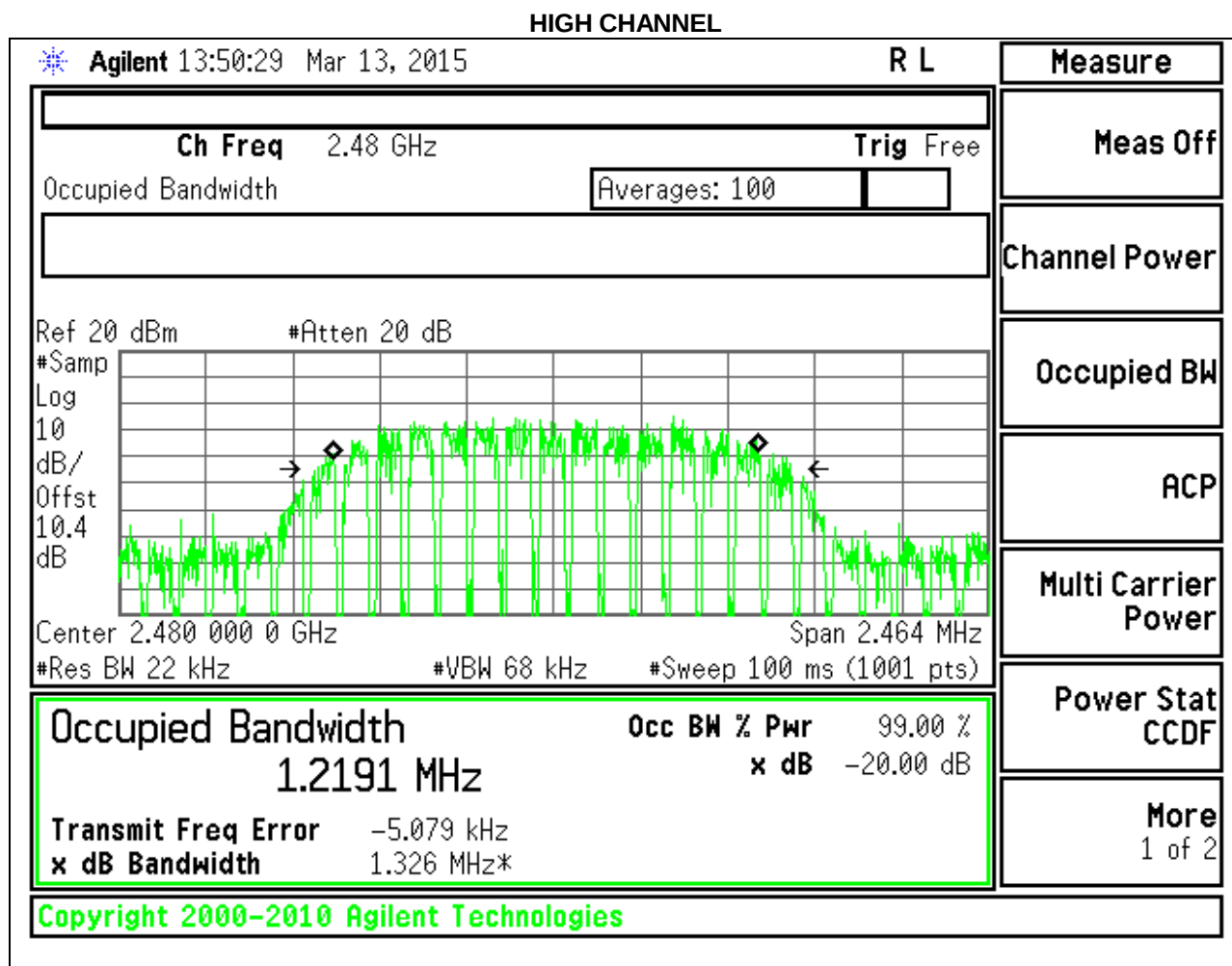
8PSK 99% BANDWIDTH

LOW CHANNEL



MID CHANNEL





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.

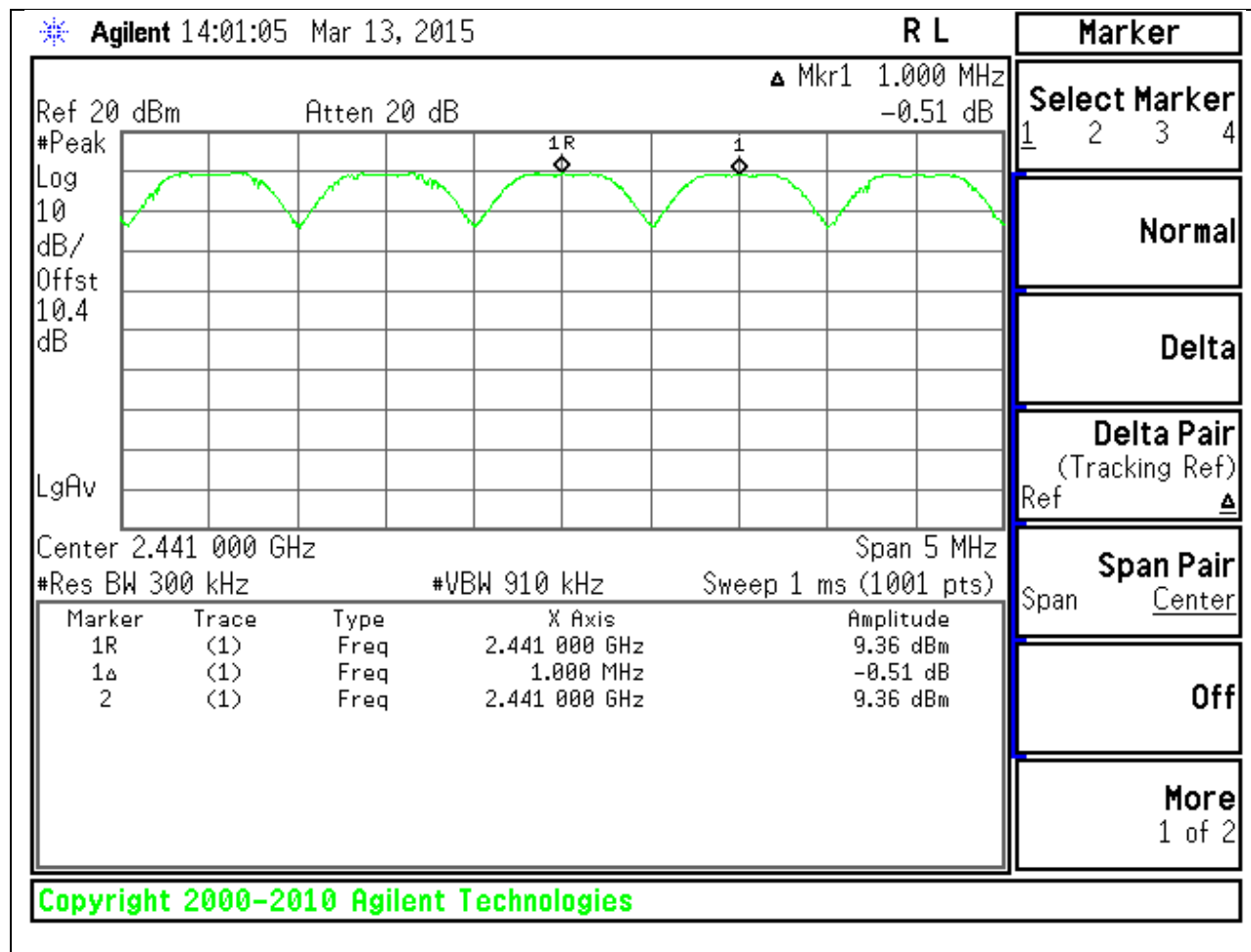
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

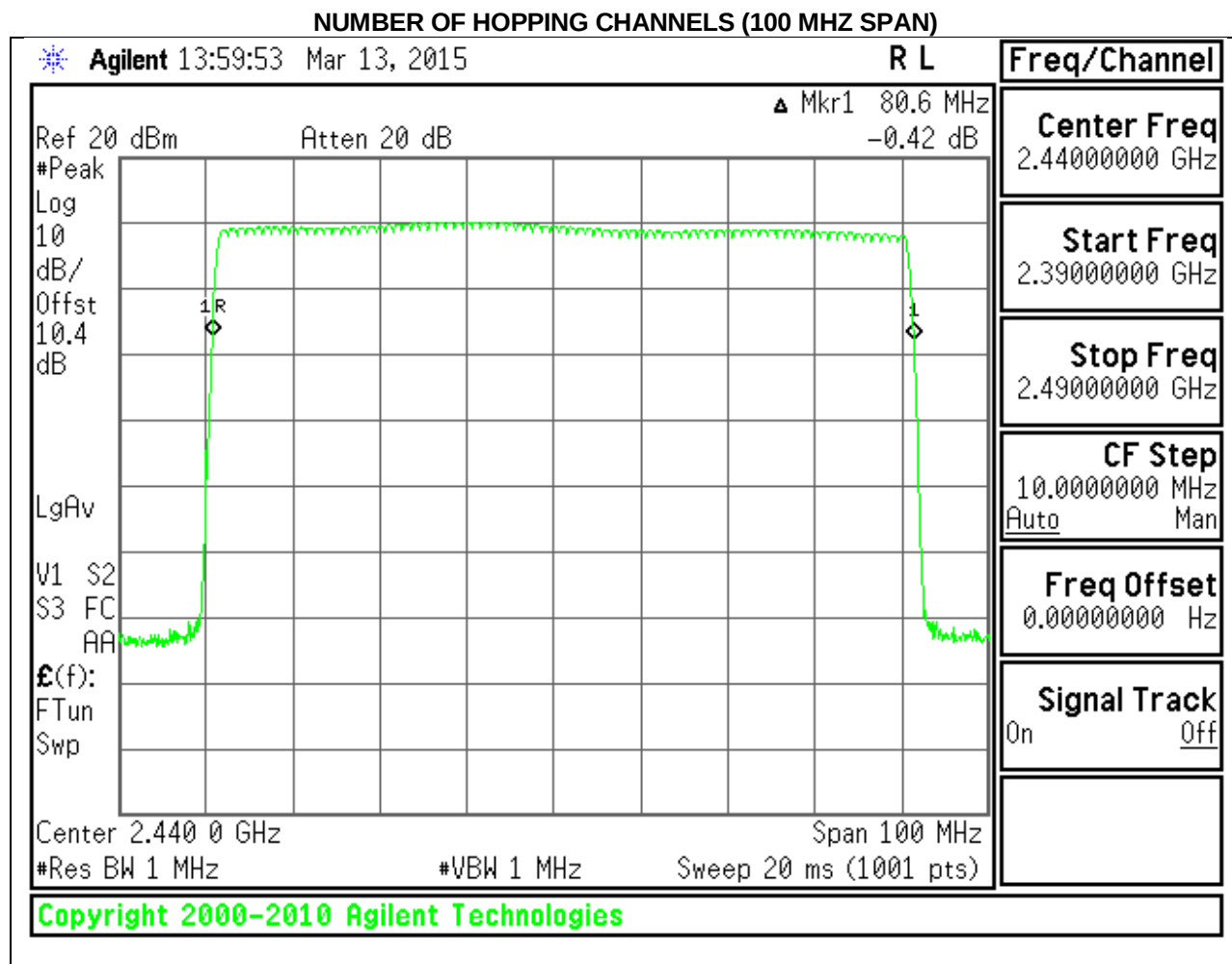
TEST PROCEDURE

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.

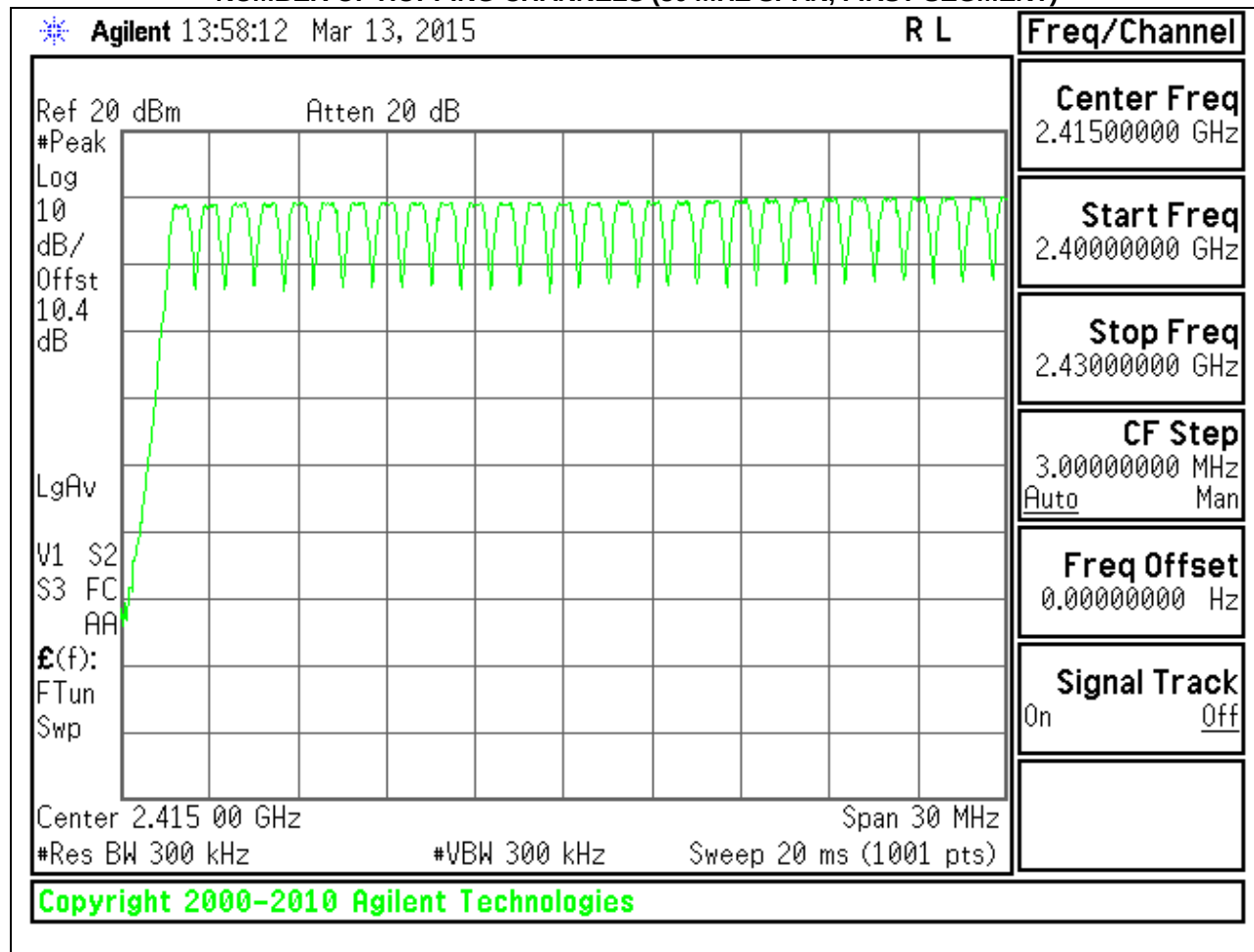
RESULTS

Normal Mode: 79 Channels observed.

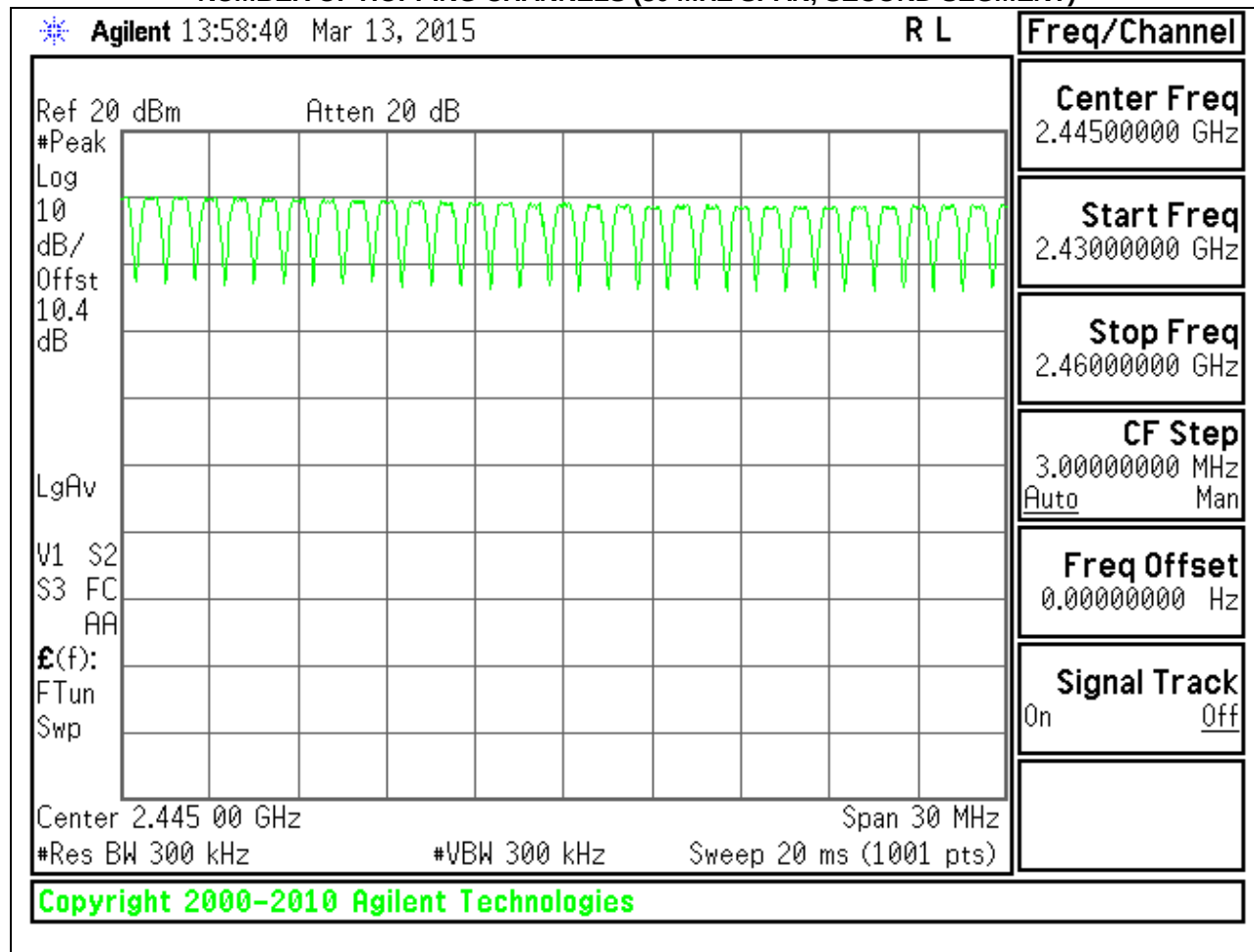
NUMBER OF HOPPING CHANNELS PLOTS



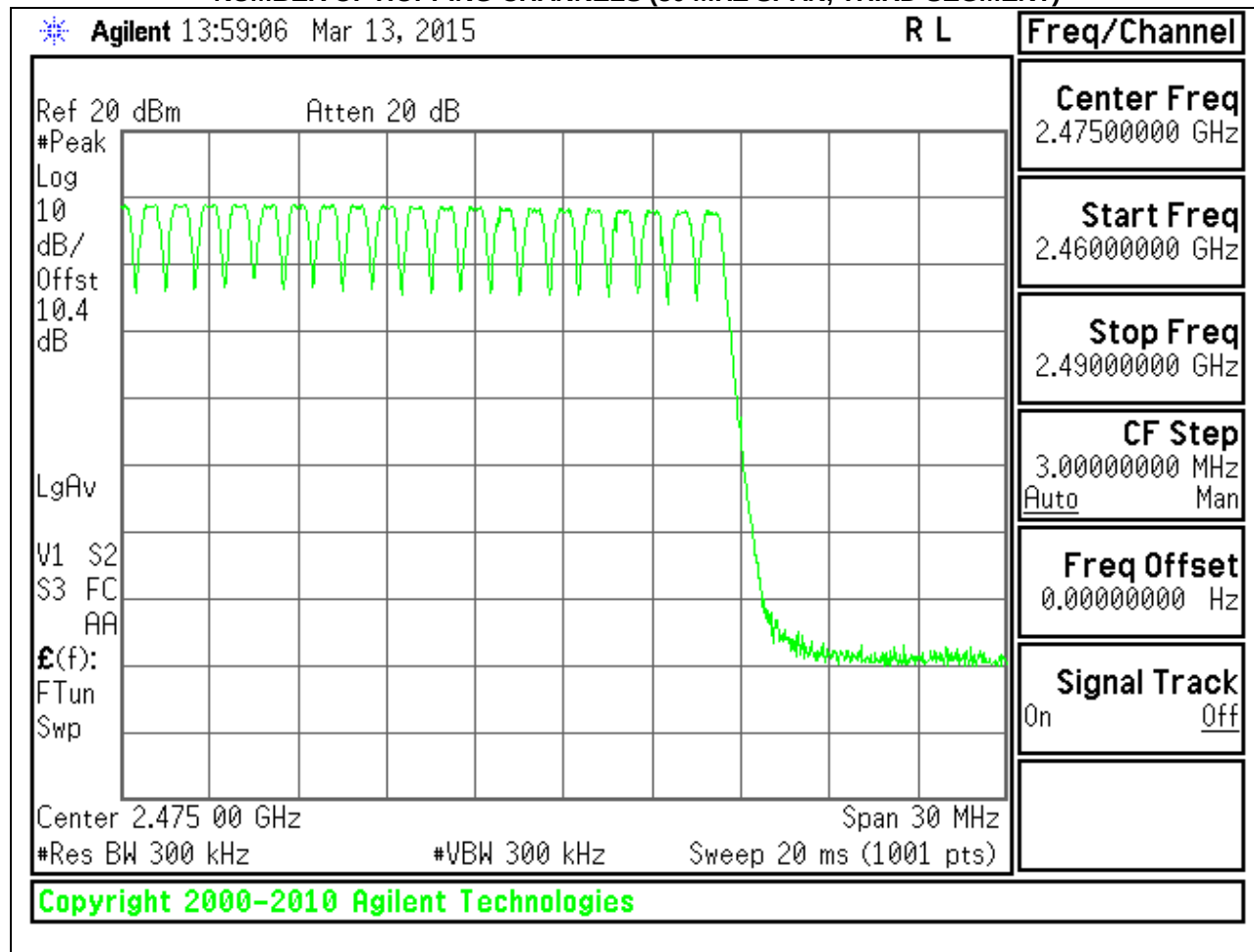
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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.

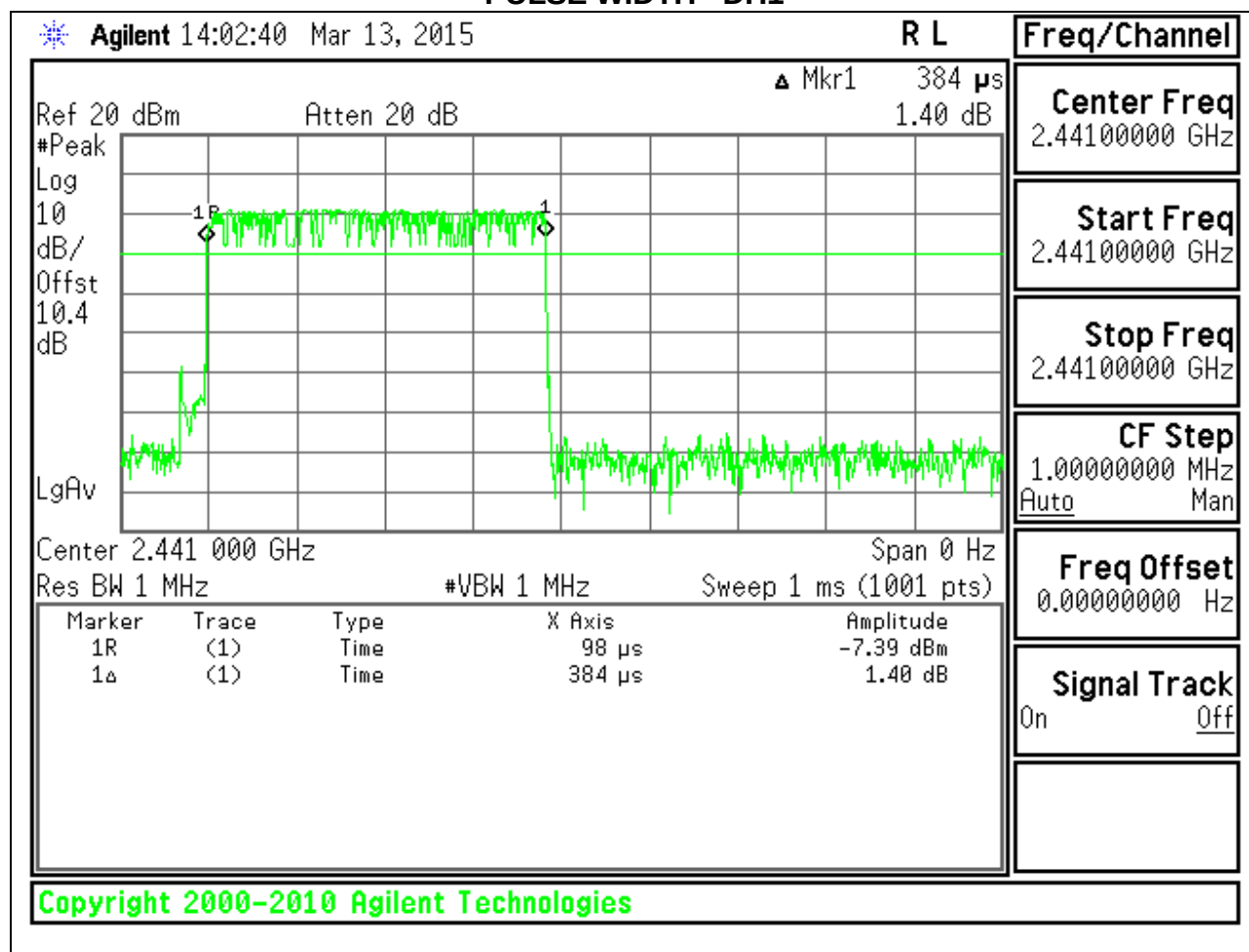
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

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.

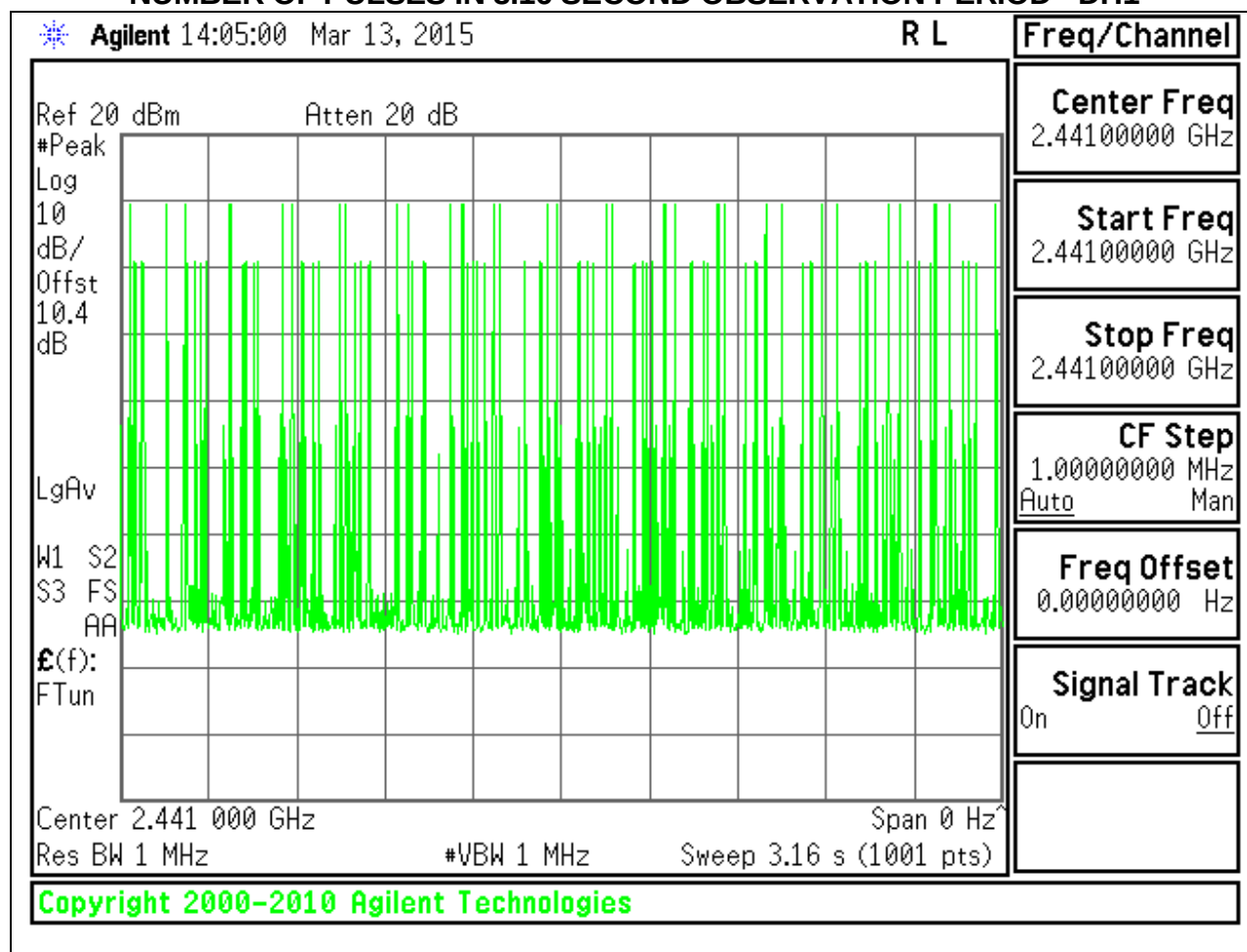
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.384	31	0.119	0.4	-0.281
DH3	1.64	13	0.213	0.4	-0.187
DH5	2.888	6	0.173	0.4	-0.227
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.38	7.75	0.030	0.4	-0.370
DH3	1.64	3.25	0.053	0.4	-0.347
DH5	2.89	1.50	0.043	0.4	-0.357

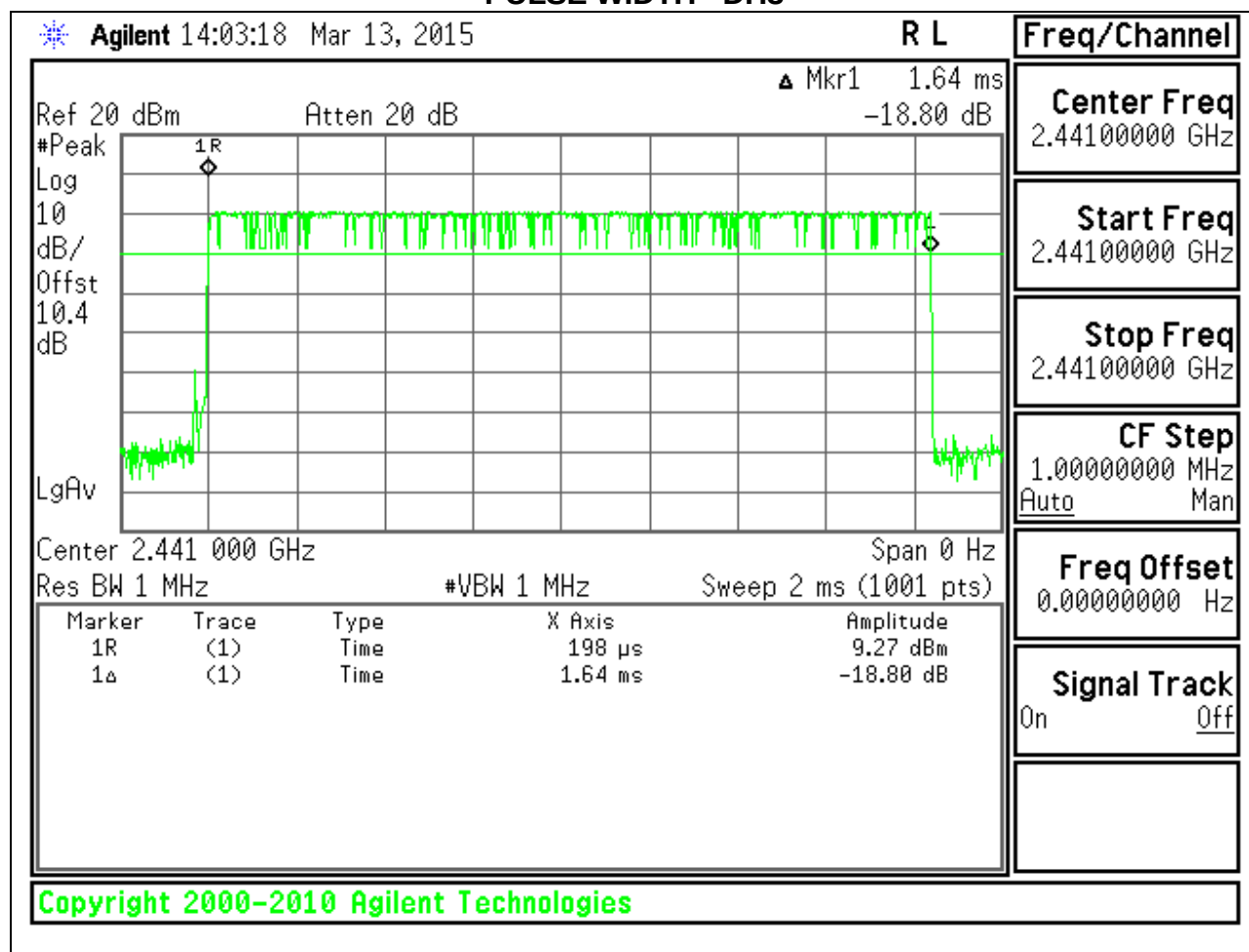
PULSE WIDTH - DH1



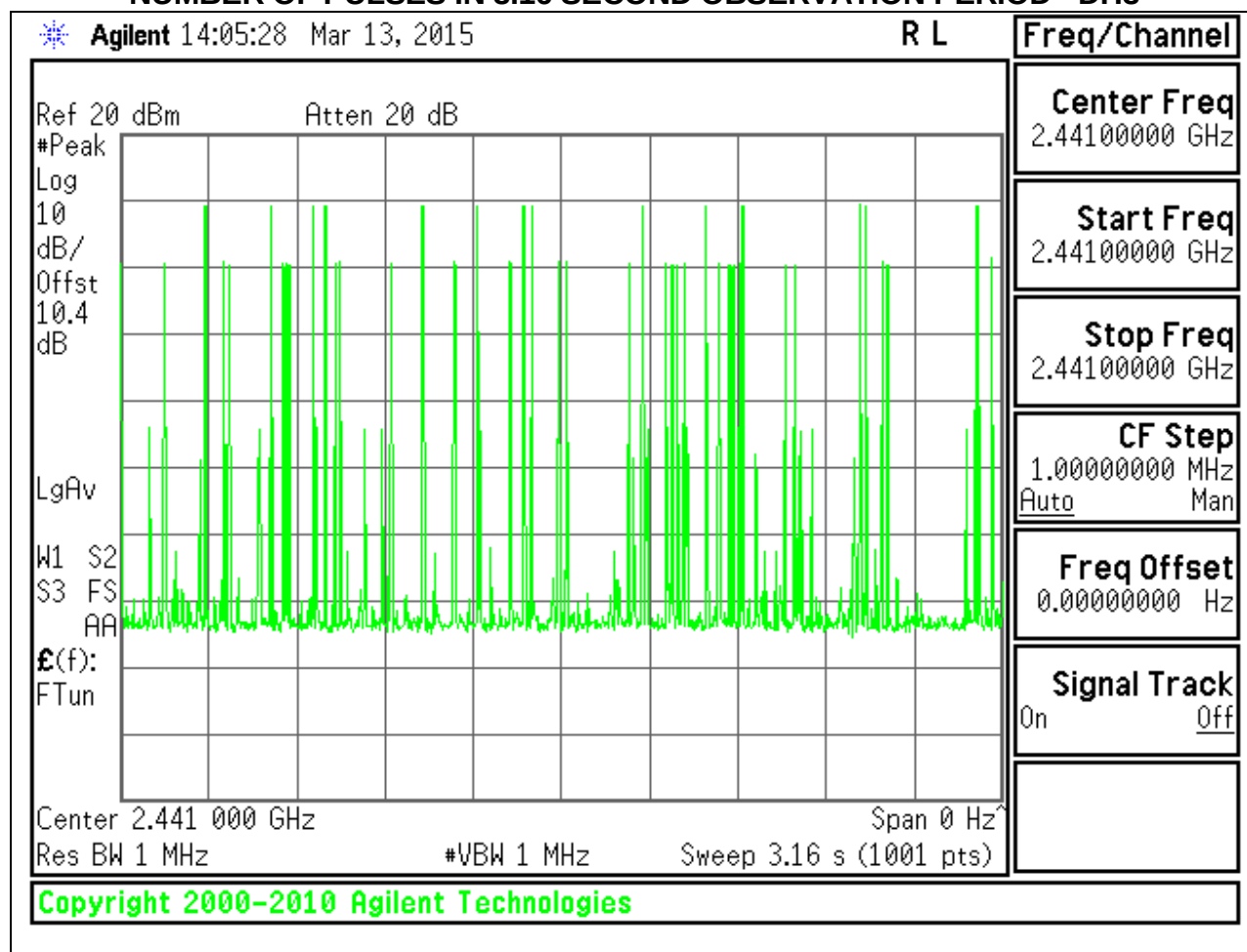
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



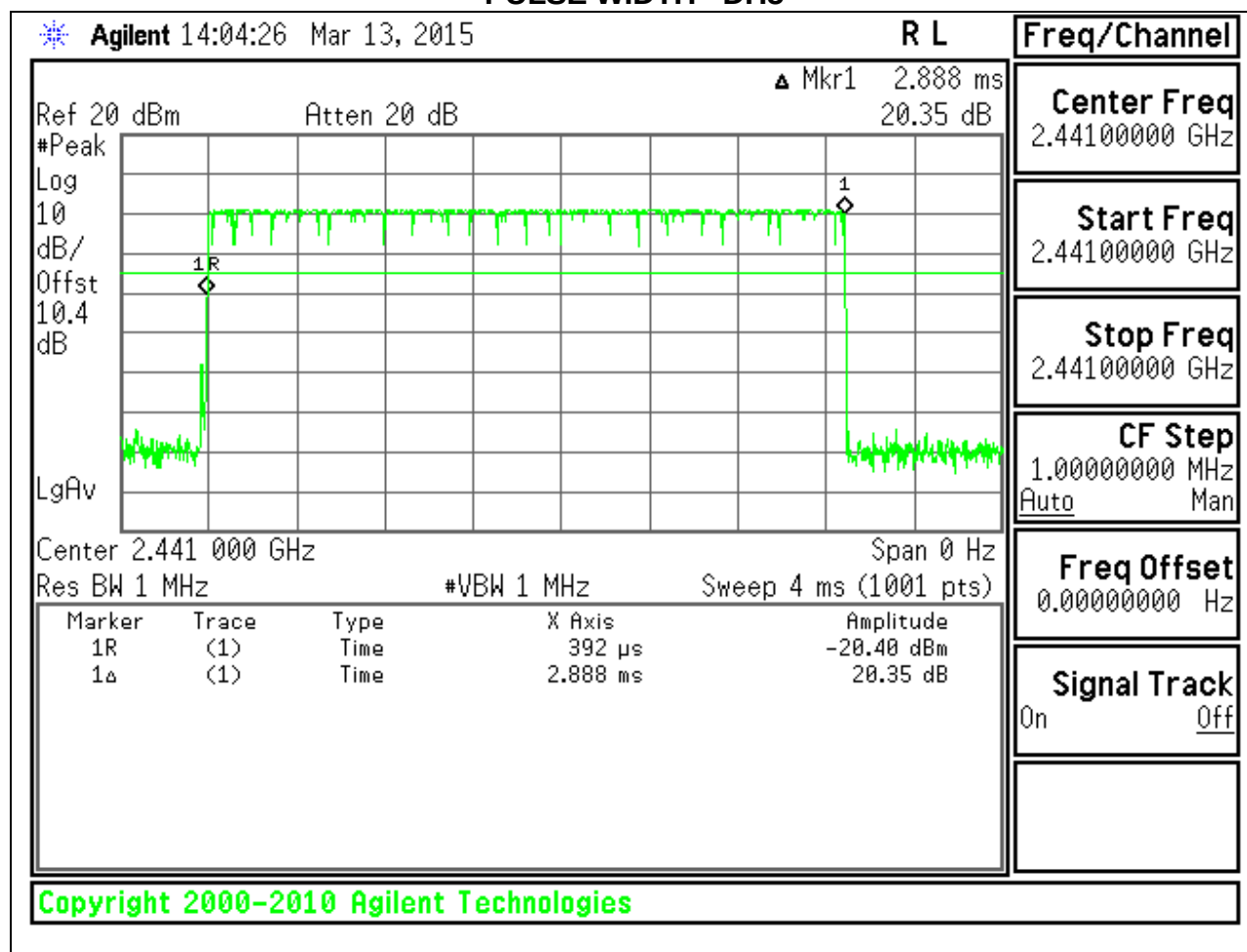
PULSE WIDTH - DH3



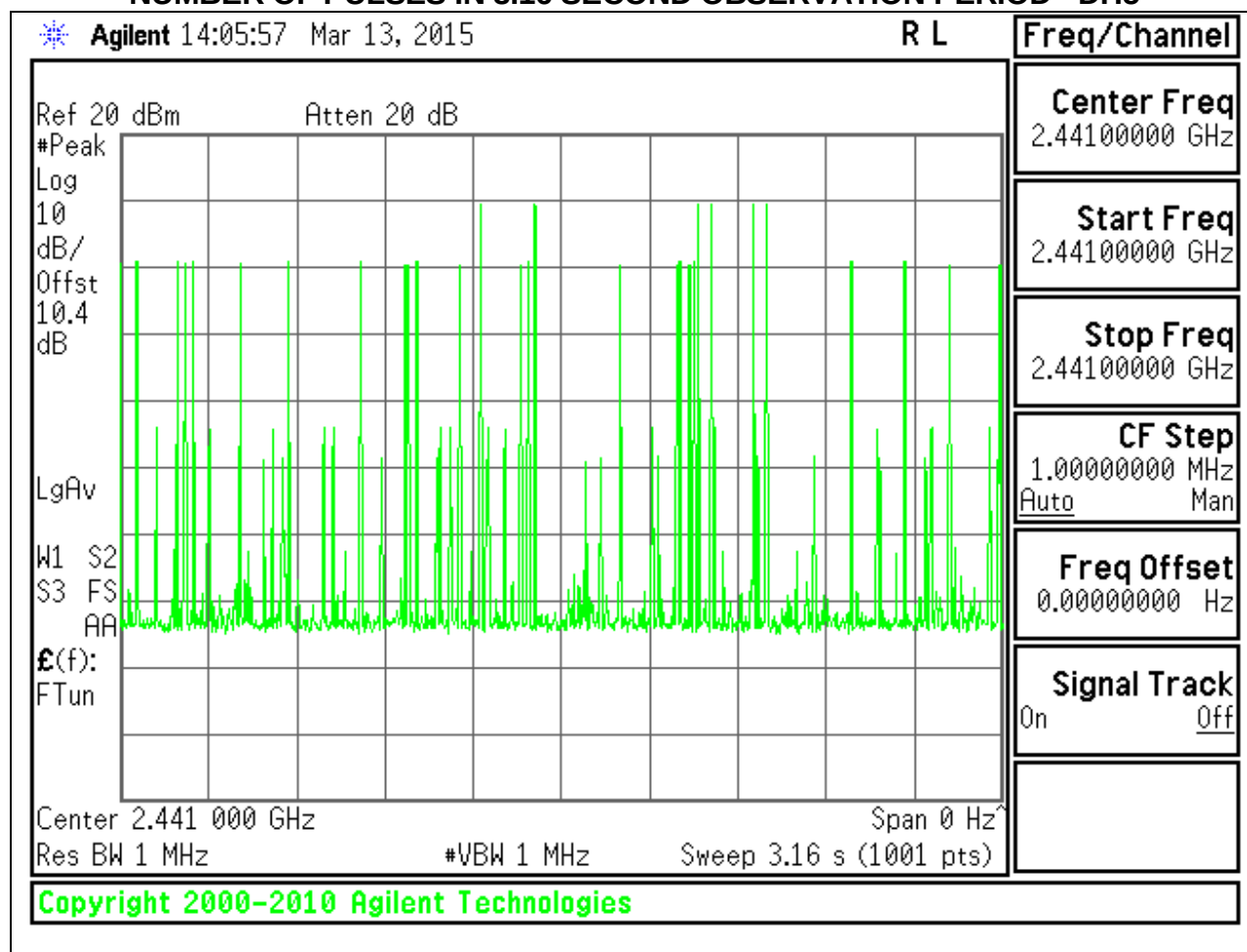
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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

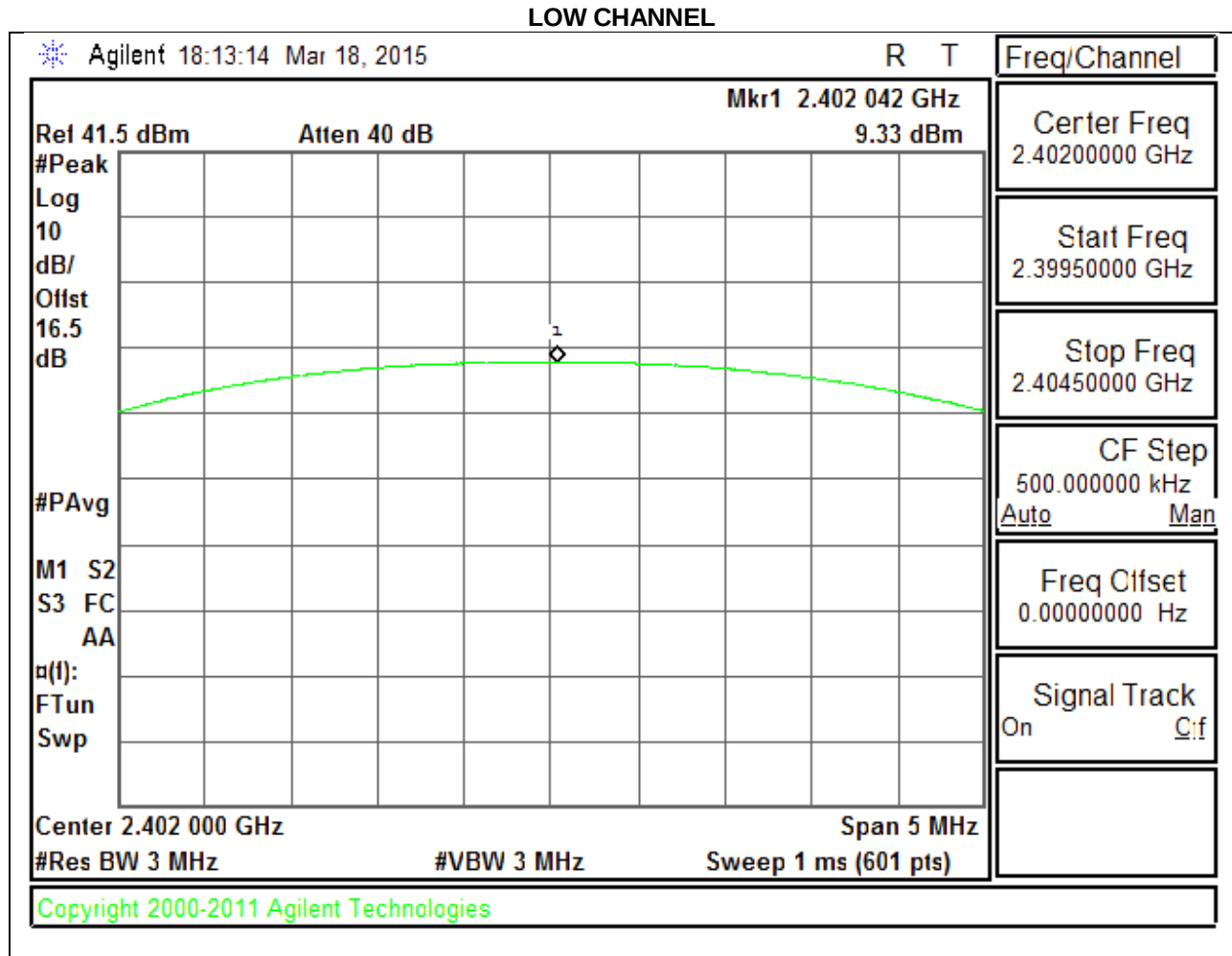
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.33	21	-11.67
Middle	2441	9.84	21	-11.16
High	2480	8.86	21	-12.14
Worst		9.84		-11.16

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

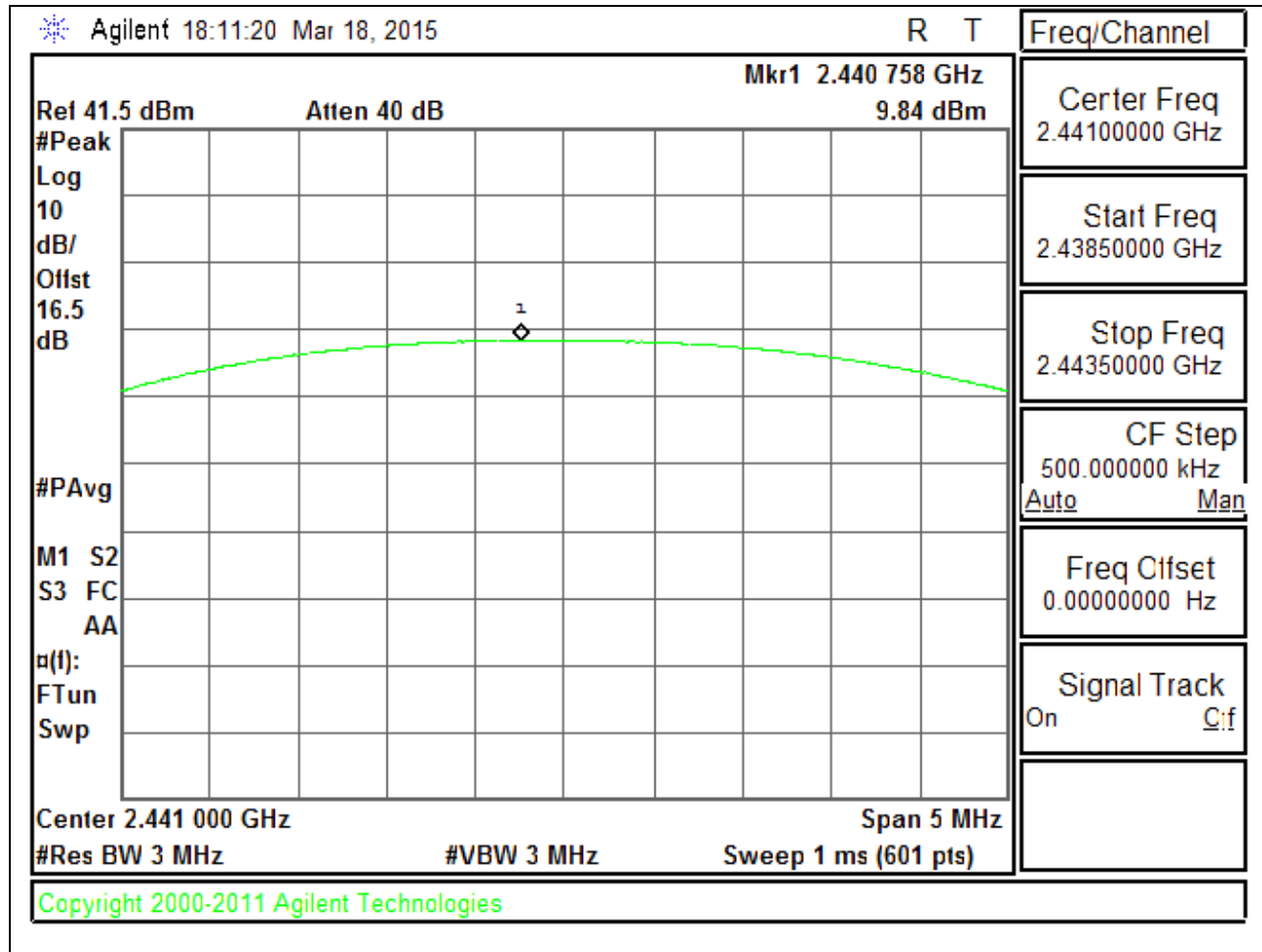
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.34	21	-12.66
Middle	2441	8.53	21	-12.47
High	2480	7.69	21	-13.31
Worst		8.53		-12.47

8.5.3. OUTPUT POWER PLOTS

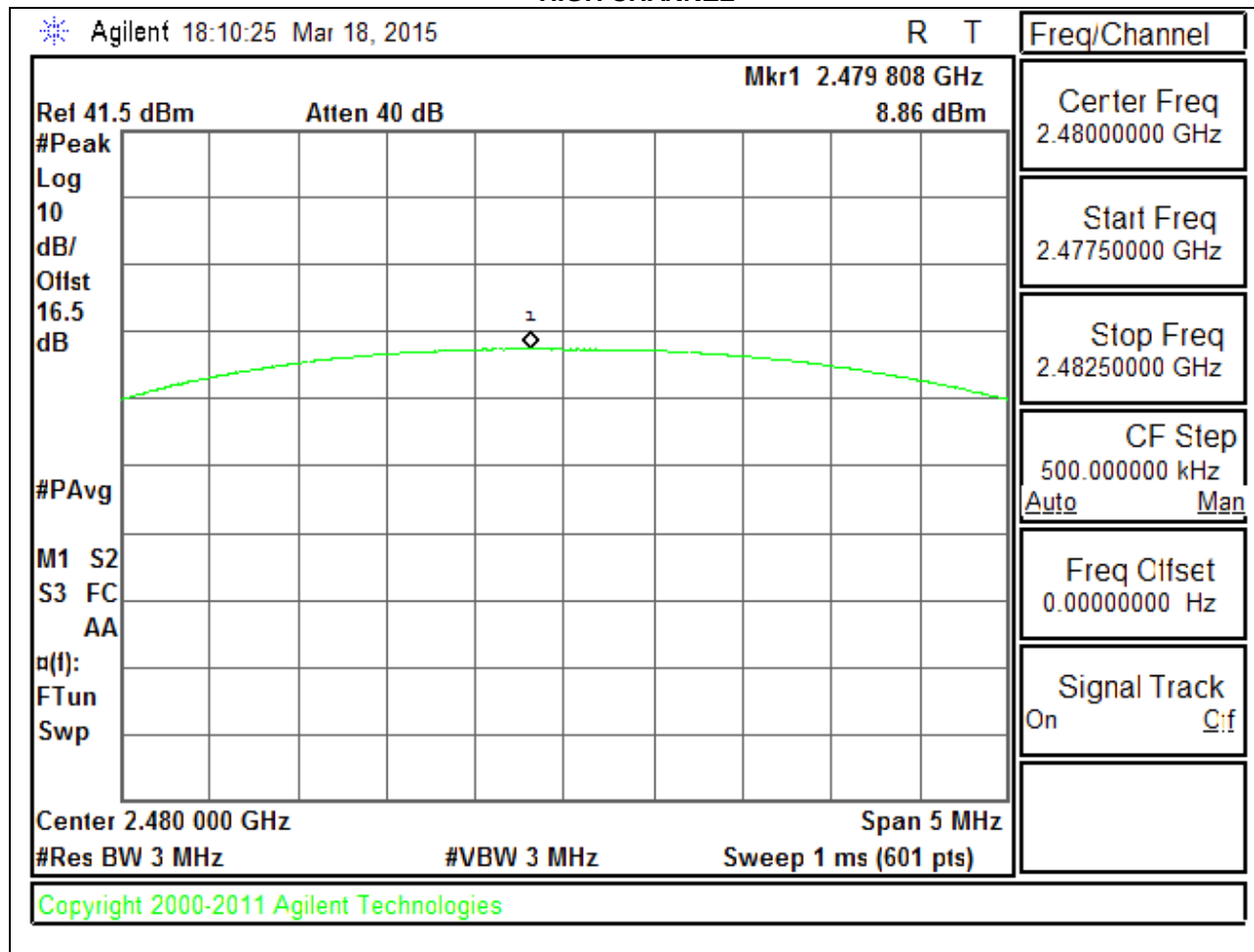
GFSK OUTPUT POWER



MID CHANNEL

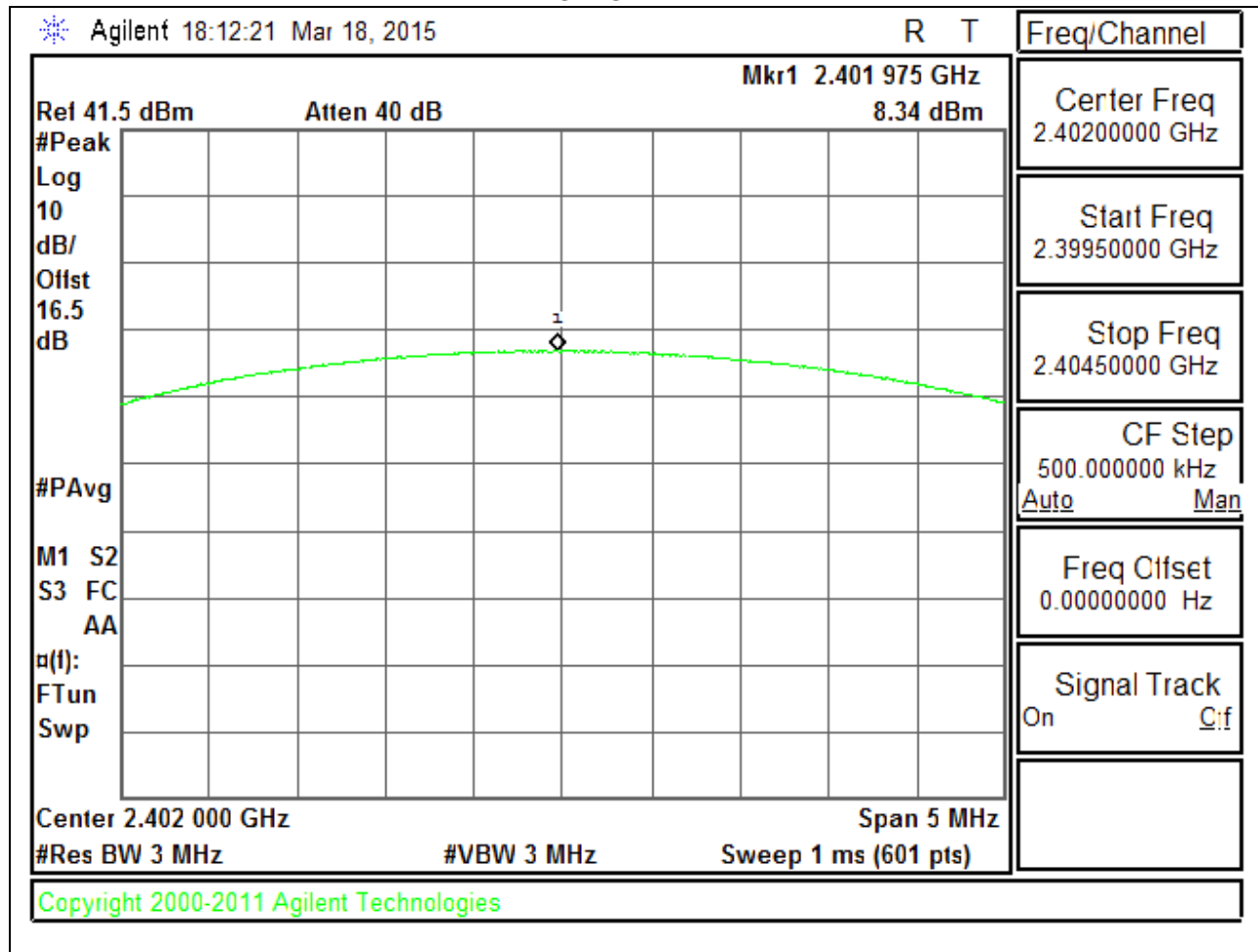


HIGH CHANNEL

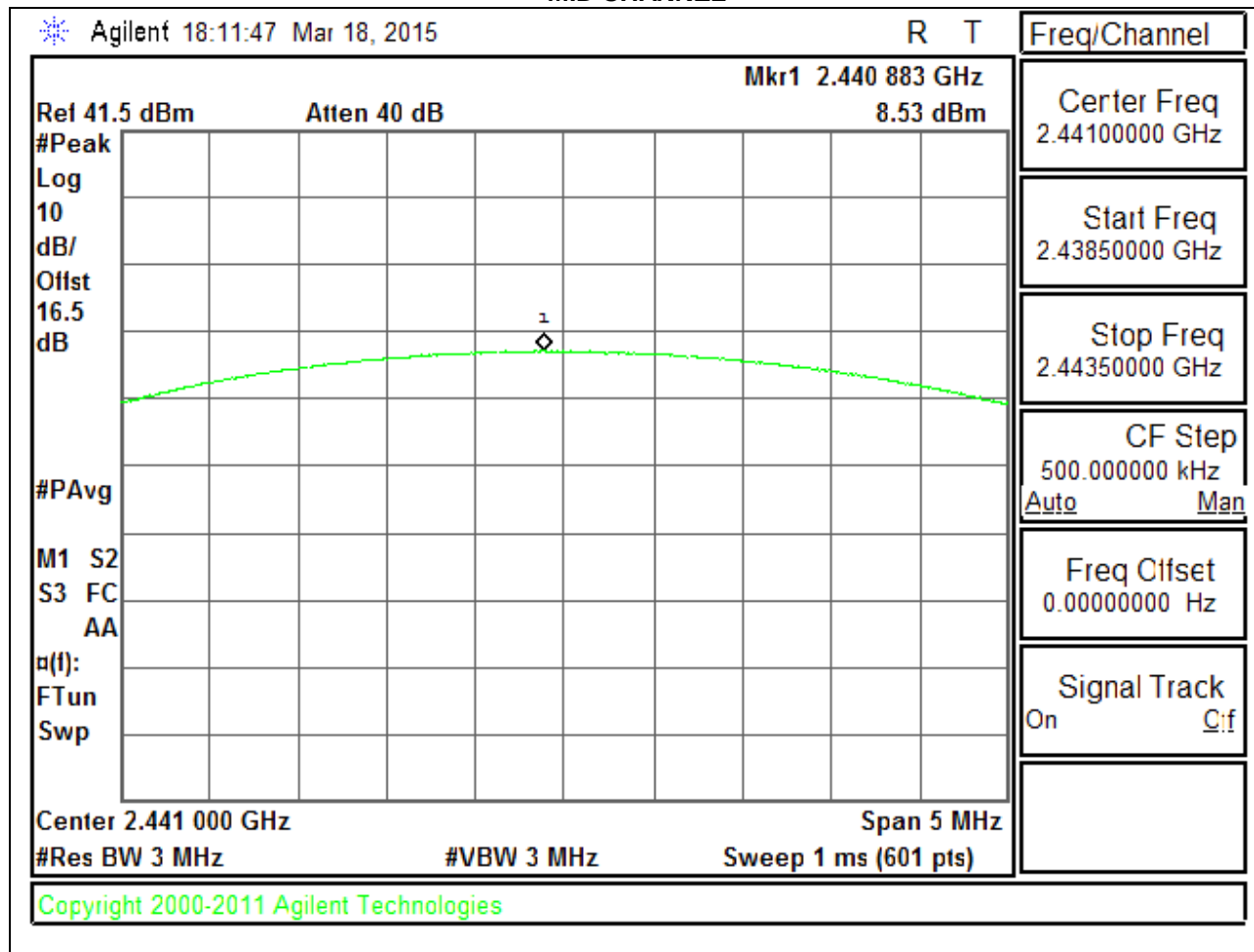


8PSK OUTPUT POWER

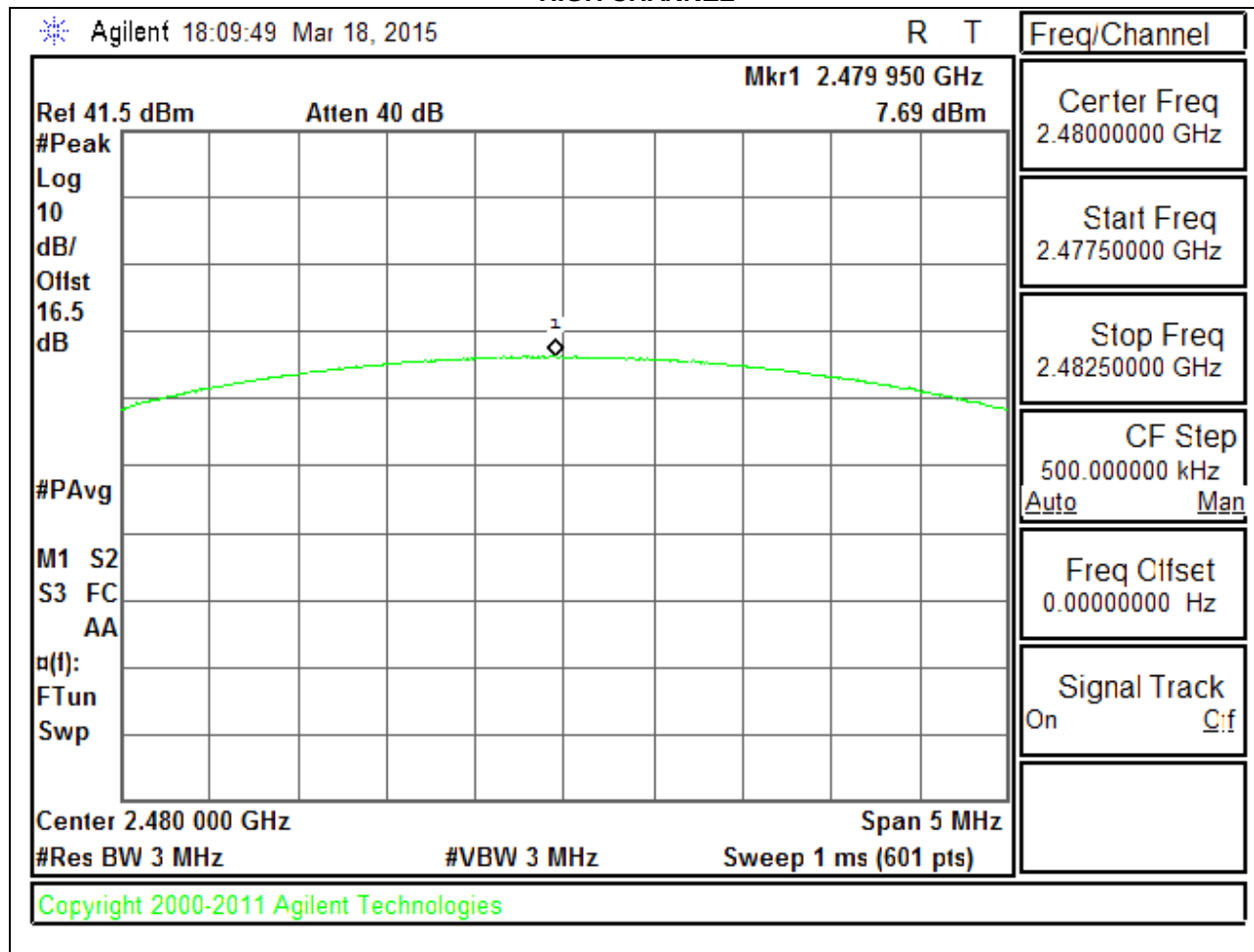
LOW CHANNEL



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	9.4
Middle	2441	9.7
High	2480	8.5
Worst		9.7

8.6.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.1
Middle	2441	5.9
High	2480	4.7
Worst		6.1

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.

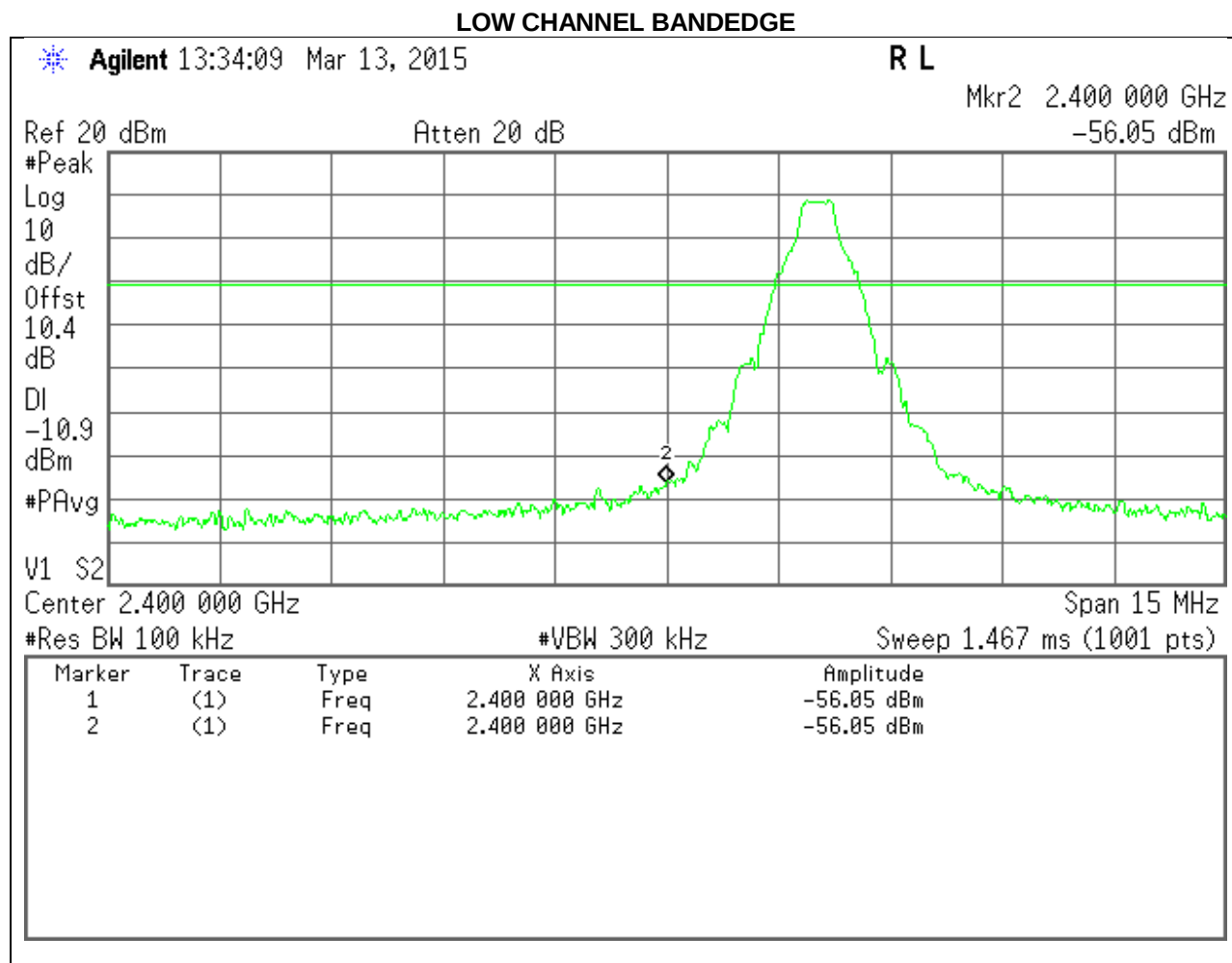
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

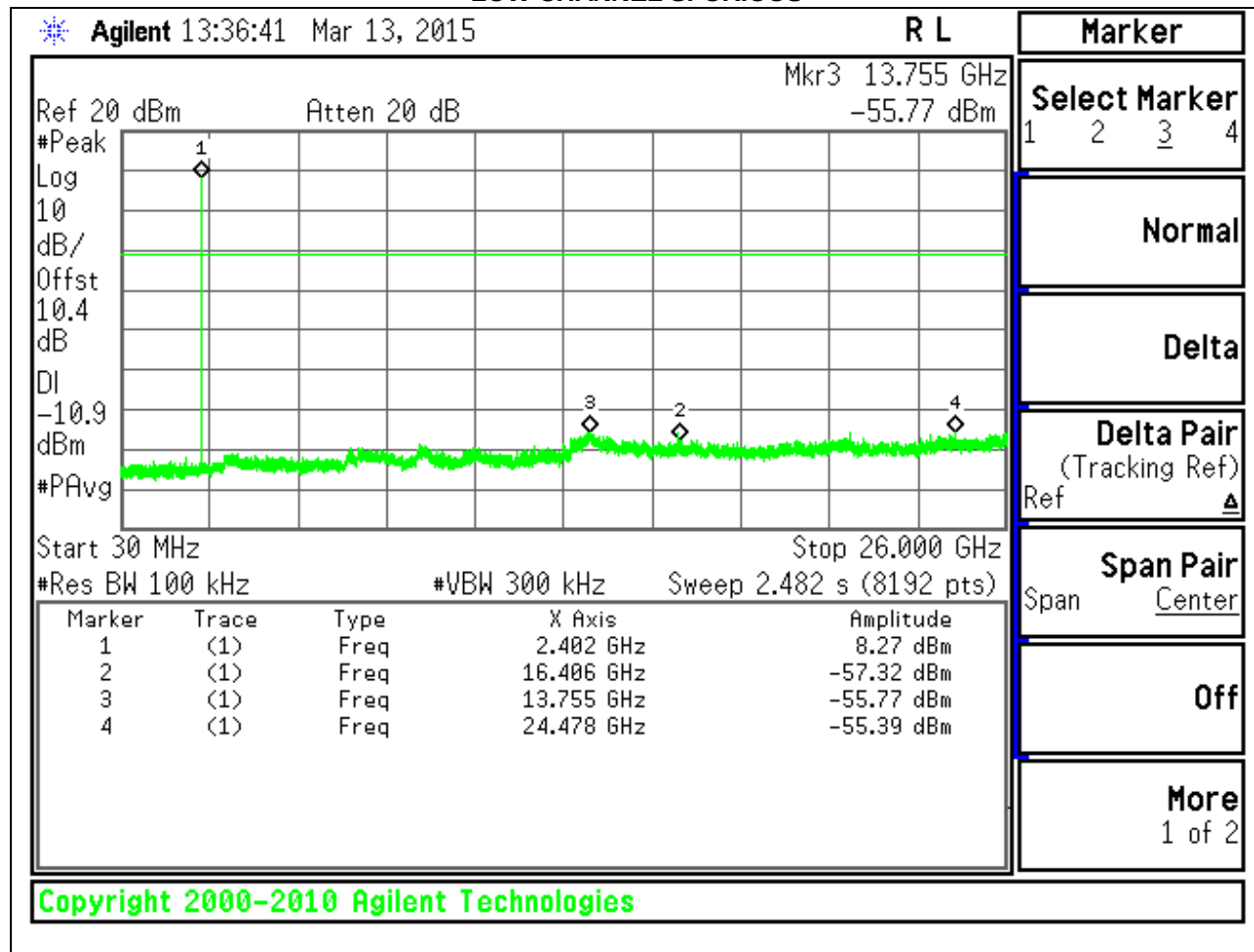
RESULTS

8.7.1. BASIC DATA RATE GFSK MODULATION

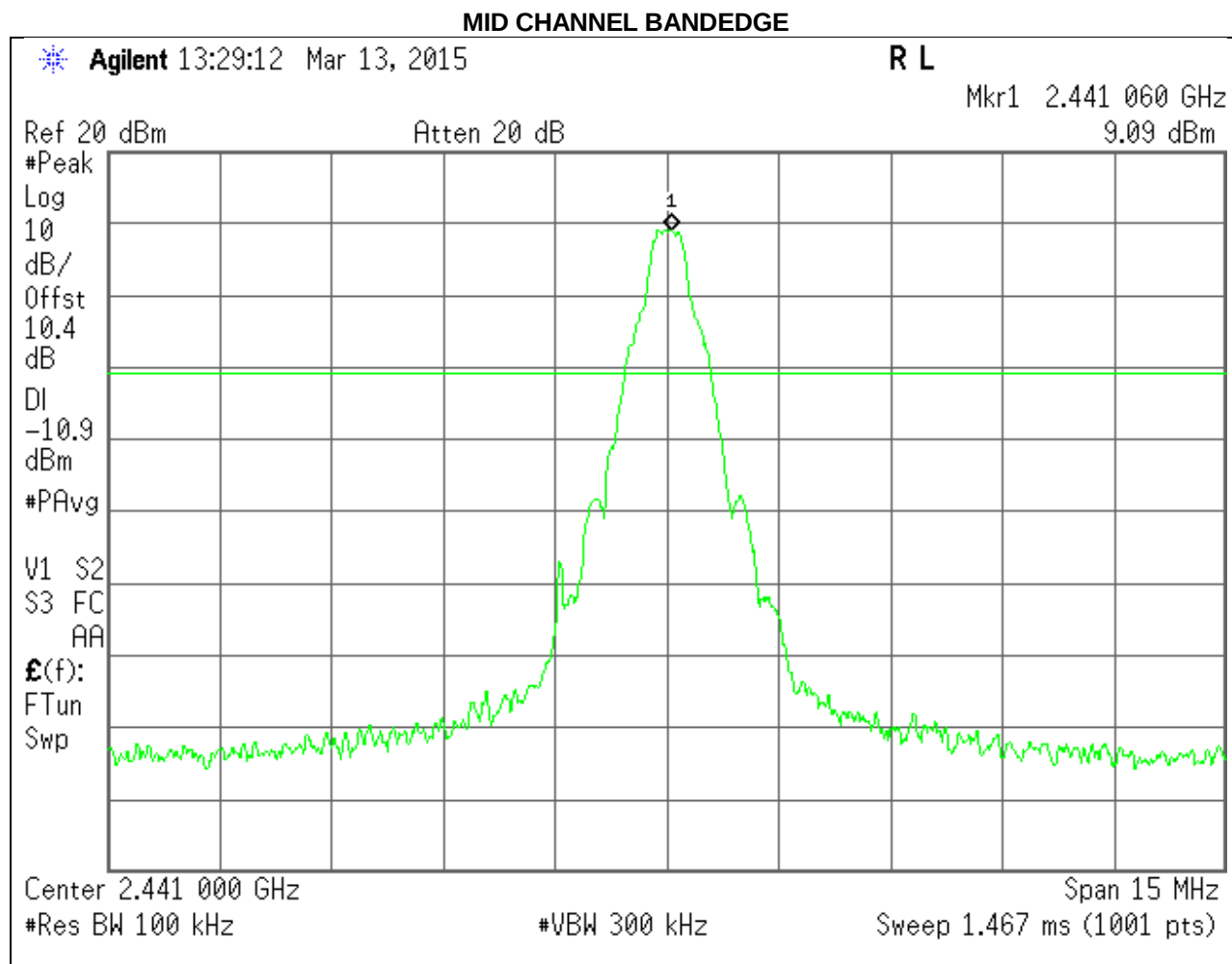
SPURIOUS EMISSIONS, LOW CHANNEL



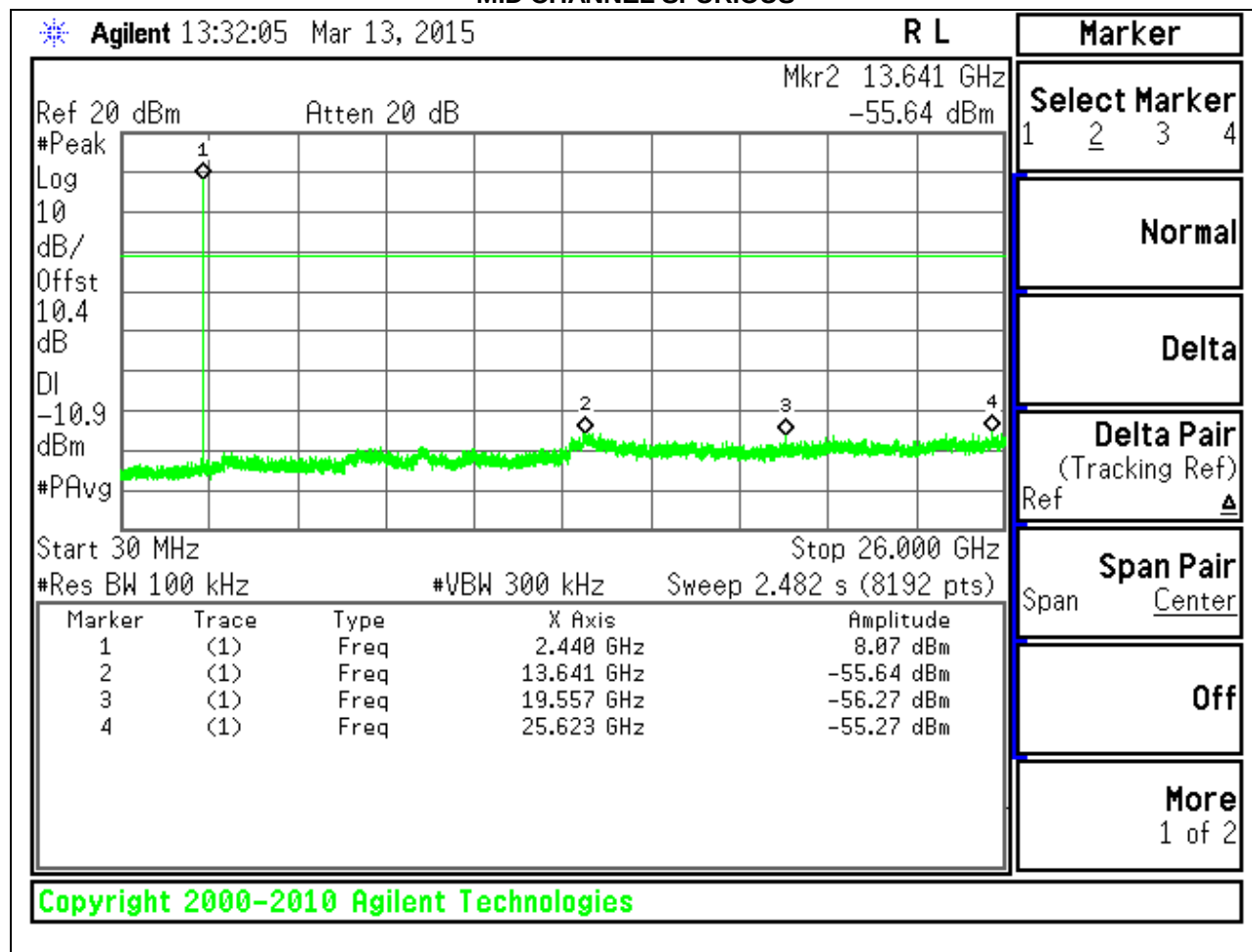
LOW CHANNEL SPURIOUS



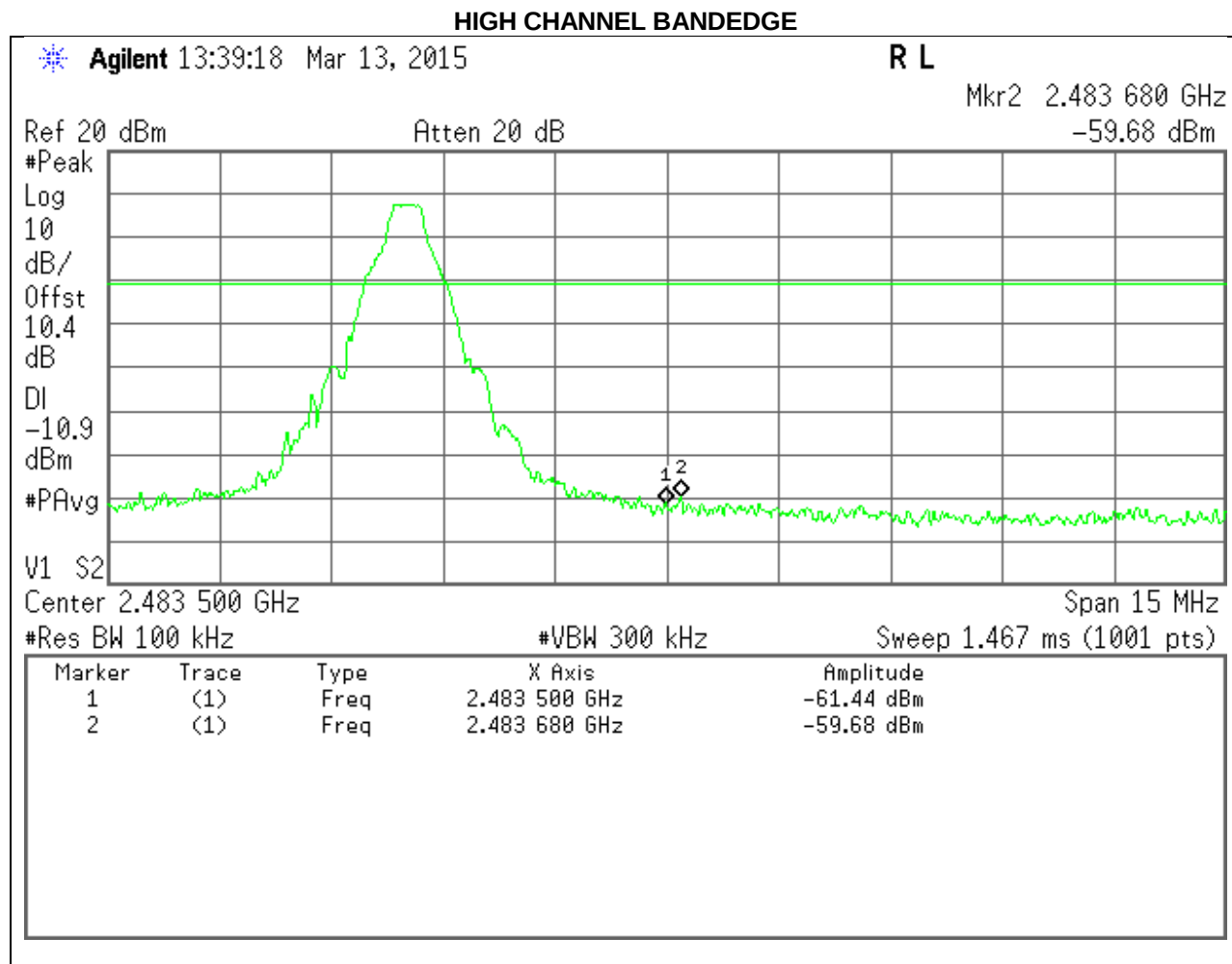
SPURIOUS EMISSIONS, MID CHANNEL



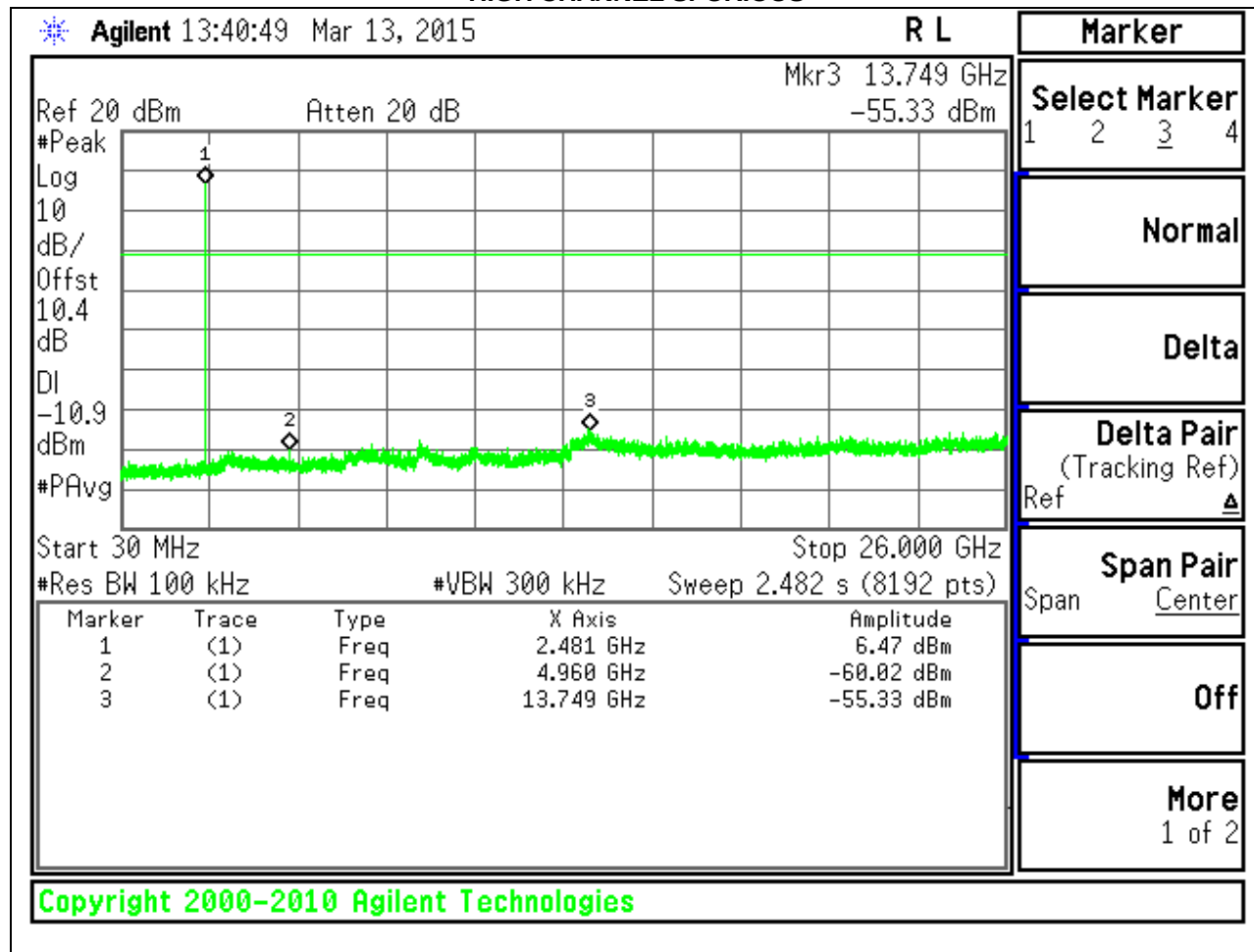
MID CHANNEL SPURIOUS



SPURIOUS EMISSIONS, HIGH CHANNEL

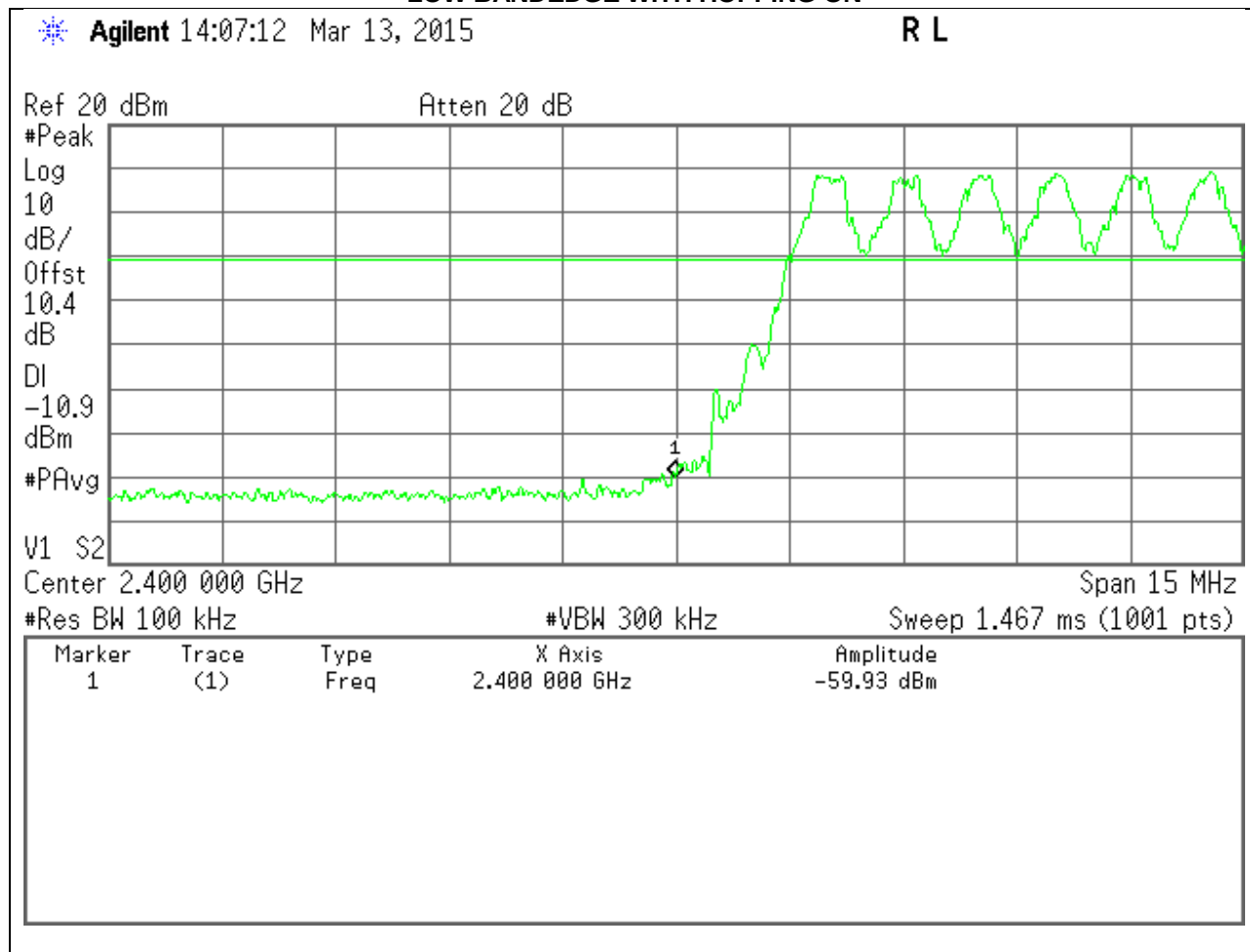


HIGH CHANNEL SPURIOUS

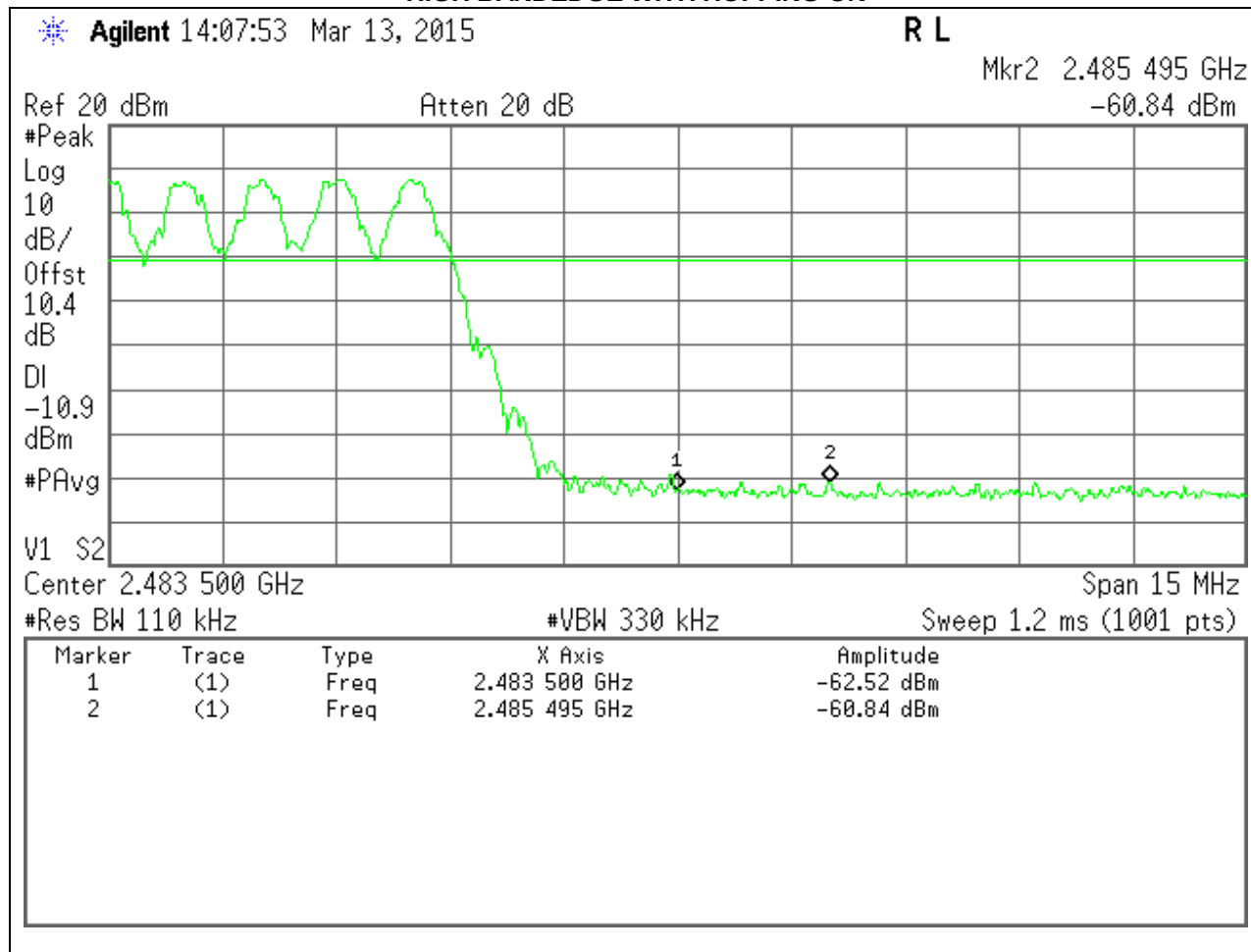


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON

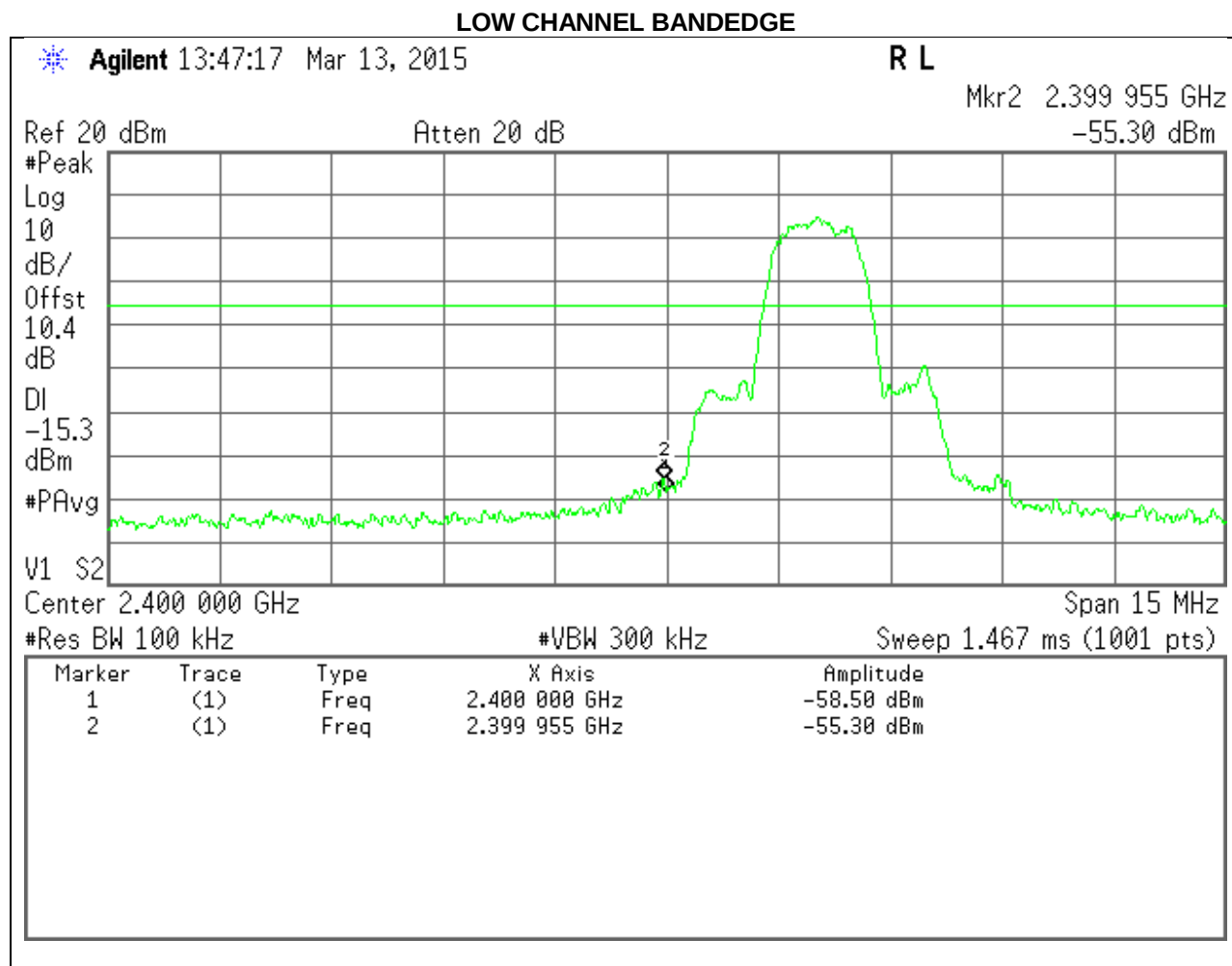


HIGH BANDEDGE WITH HOPPING ON

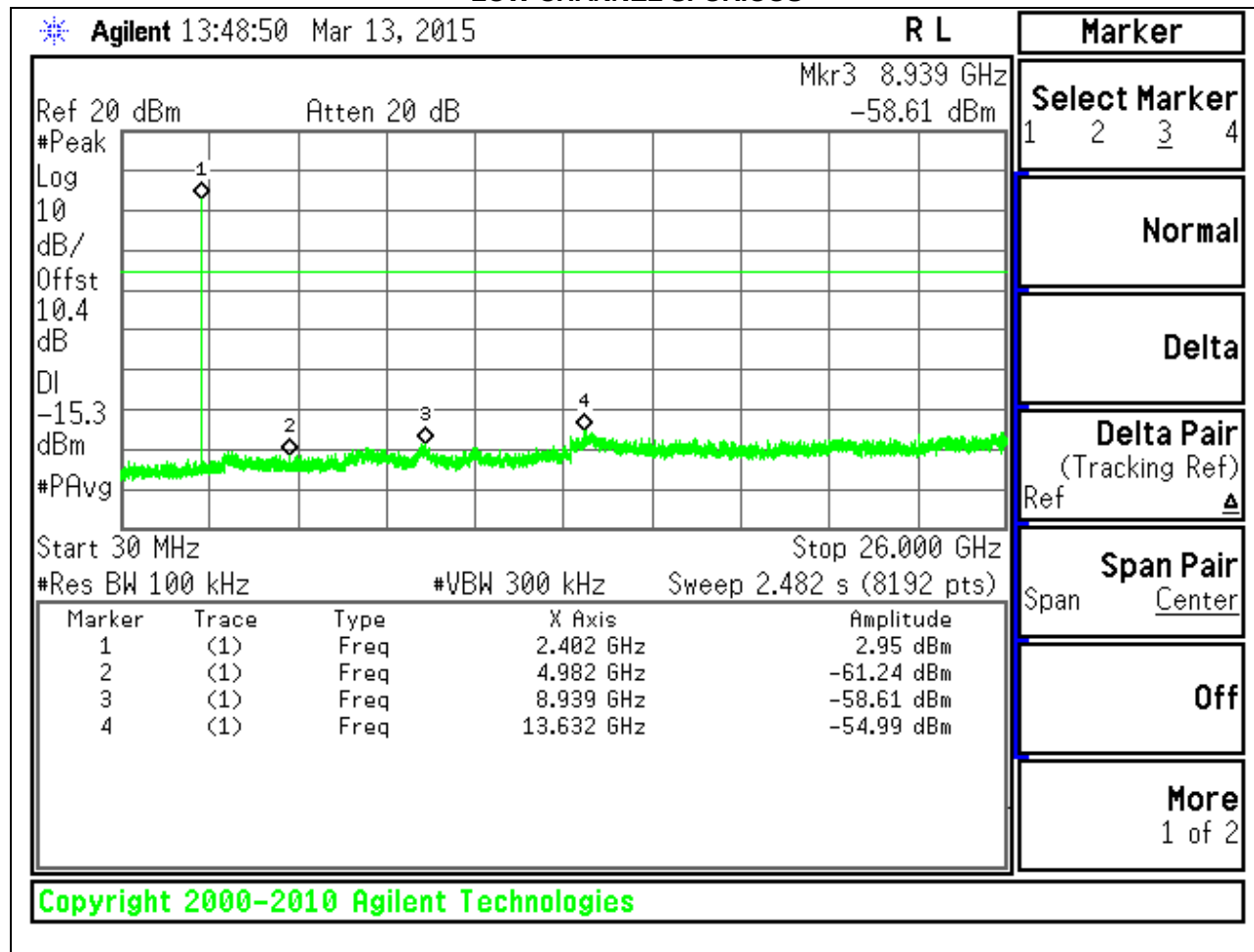


8.7.2. ENHANCED DATA RATE 8PSK MODULATION

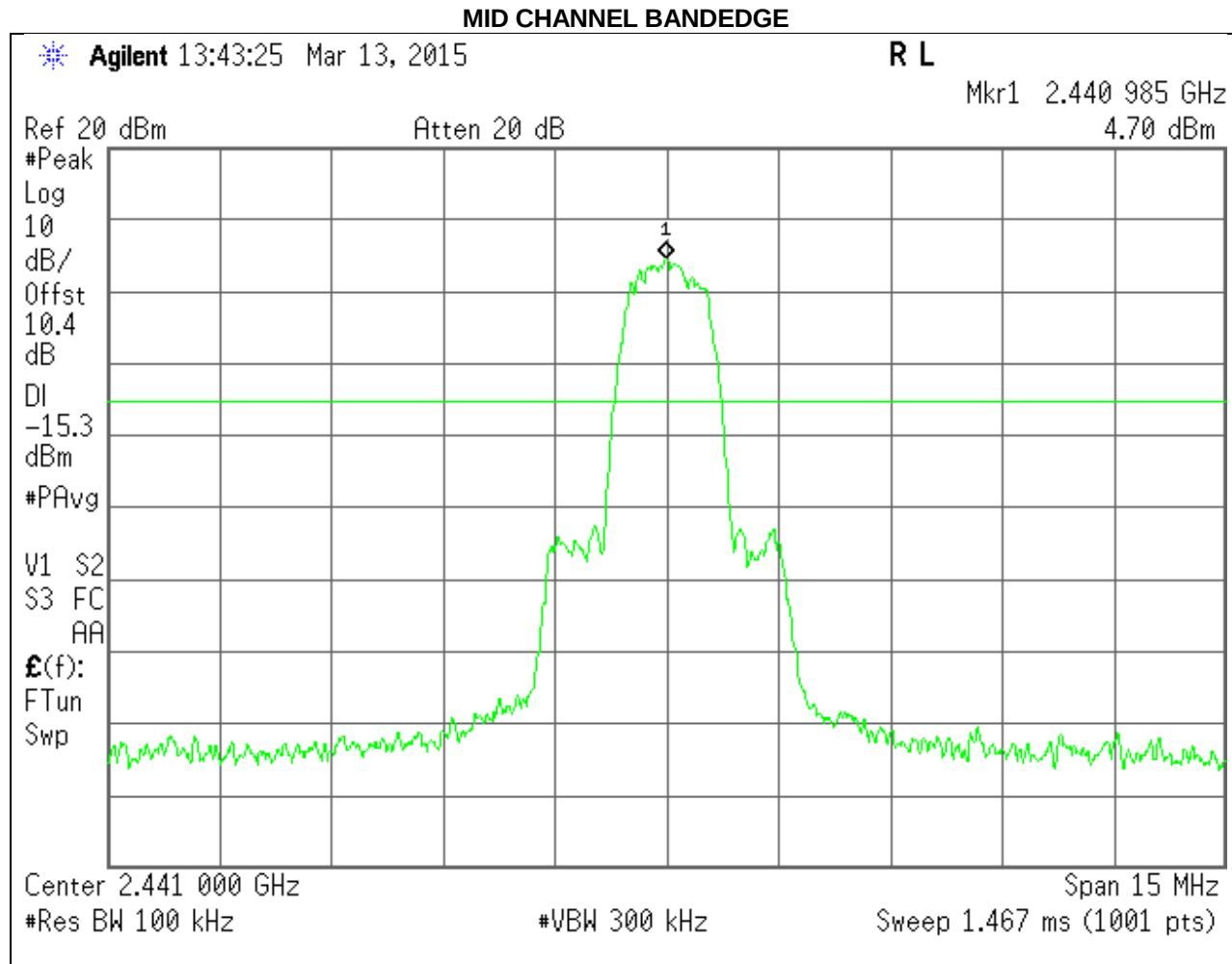
SPURIOUS EMISSIONS, LOW CHANNEL



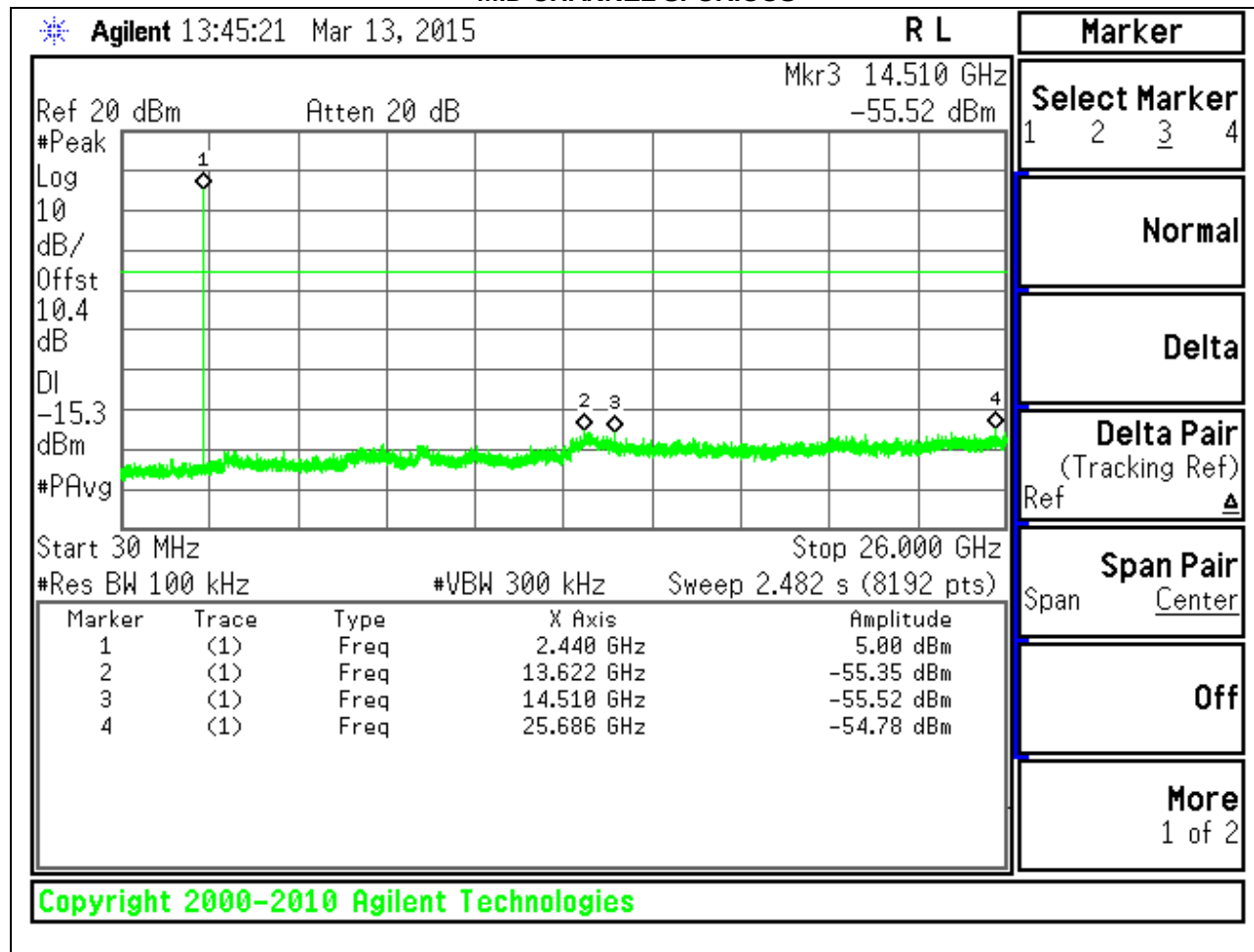
LOW CHANNEL SPURIOUS



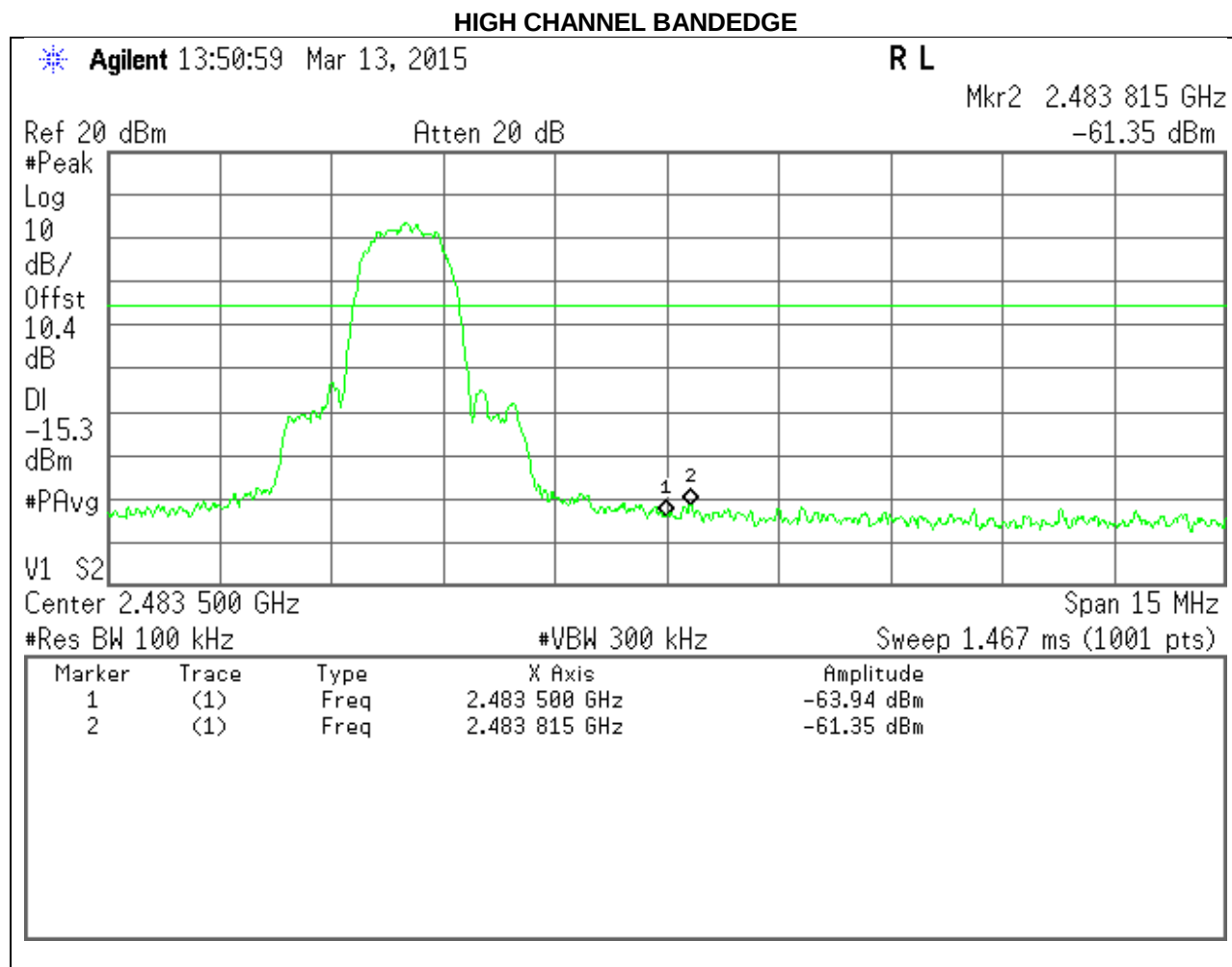
SPURIOUS EMISSIONS, MID CHANNEL



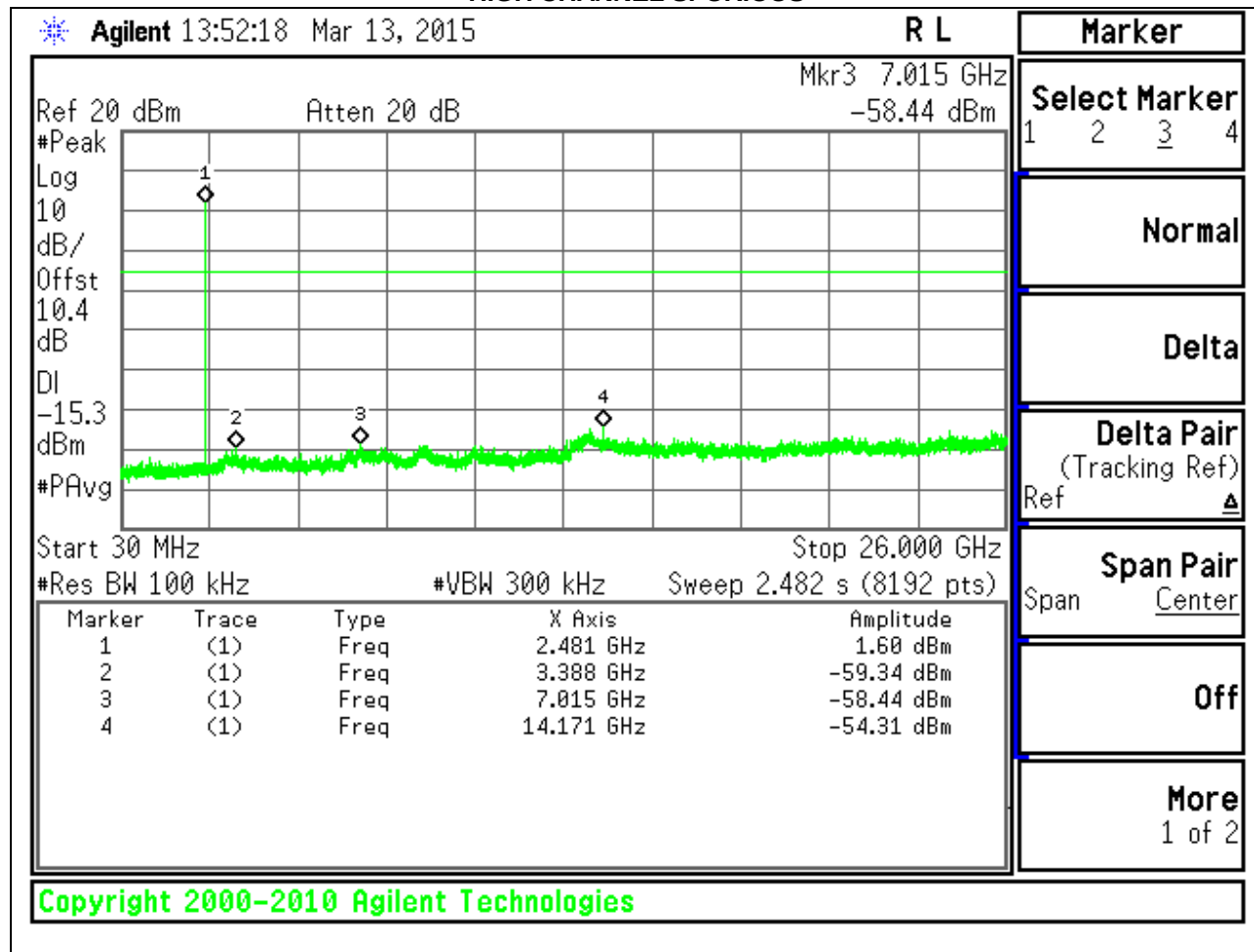
MID CHANNEL SPURIOUS



SPURIOUS EMISSIONS, HIGH CHANNEL

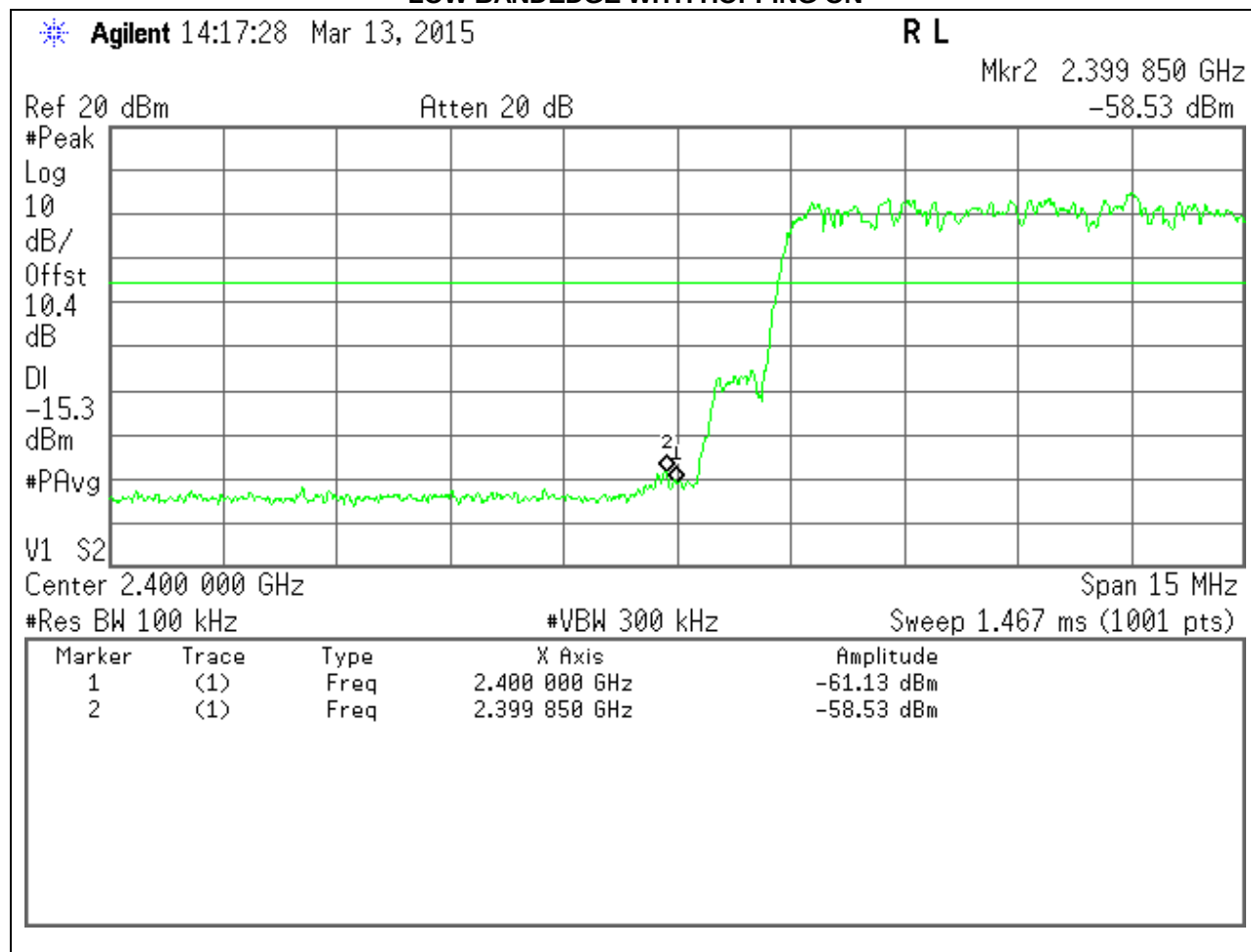


HIGH CHANNEL SPURIOUS

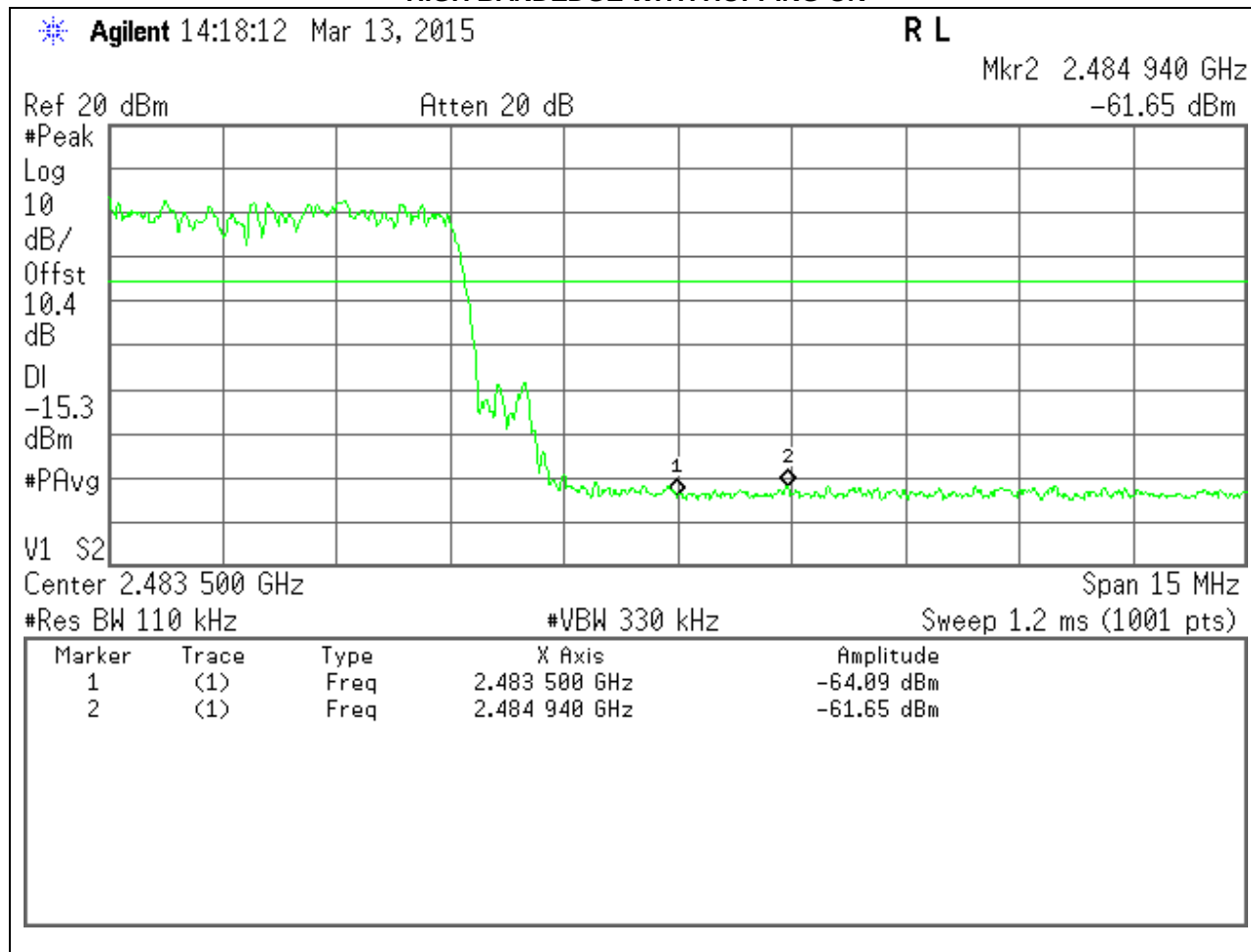


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

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 ($\mu\text{V}/\text{m}$) at 3 m	Field Strength Limit (dB $\mu\text{V}/\text{m}$) 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.
 $\text{GFSK} = 1/T = 1 / 0.00375\text{S} = 360\text{Hz}$.

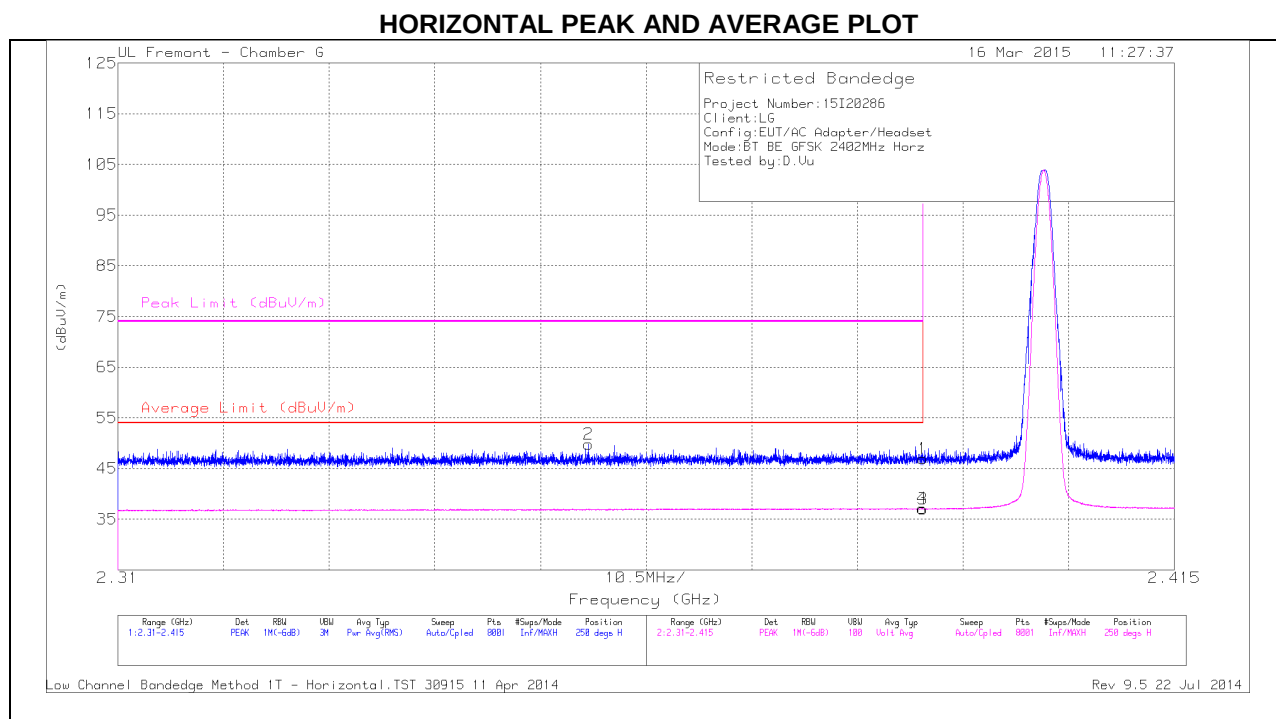
The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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

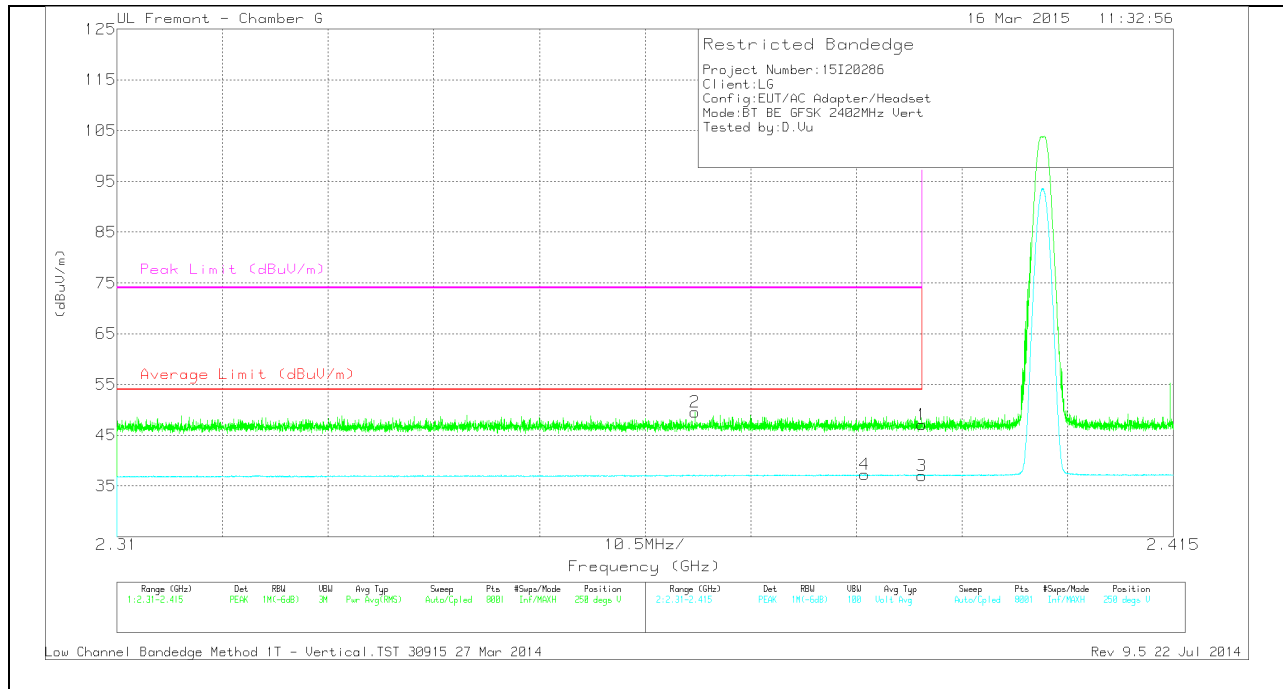
RESTRICTED BANDEDGE (LOW CHANNEL)



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/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	* 2.39	40.03	PK	31.8	-24.9	0	46.93	-	-	74	-27.07	250	293	H
2	* 2.357	43.09	PK	31.7	-25	0	49.79	-	-	74	-24.21	250	293	H
3	* 2.39	30.11	VB1T	31.8	-24.9	0	37.01	54	-16.99	-	-	250	293	H
4	* 2.39	30.23	VB1T	31.8	-24.9	0	37.13	54	-16.87	-	-	250	293	H

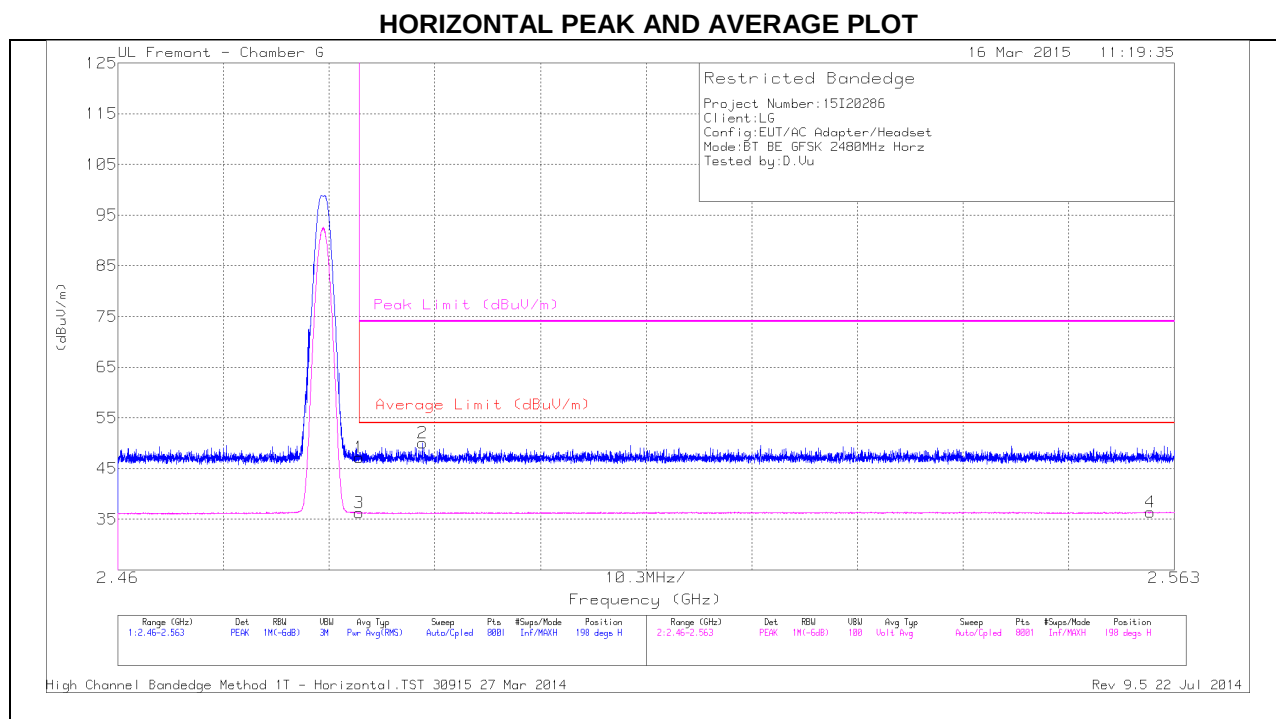
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/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	40.11	PK	31.8	-24.9	0	47.01	-	-	74	-26.99	250	293	V
2	* 2.367	42.76	PK	31.7	-24.9	0	49.56	-	-	74	-24.44	250	293	V
3	* 2.39	30.09	VB1T	31.8	-24.9	0	36.99	54	-17.01	-	-	250	293	V
4	* 2.384	30.34	VB1T	31.8	-24.9	0	37.24	54	-16.76	-	-	250	293	V

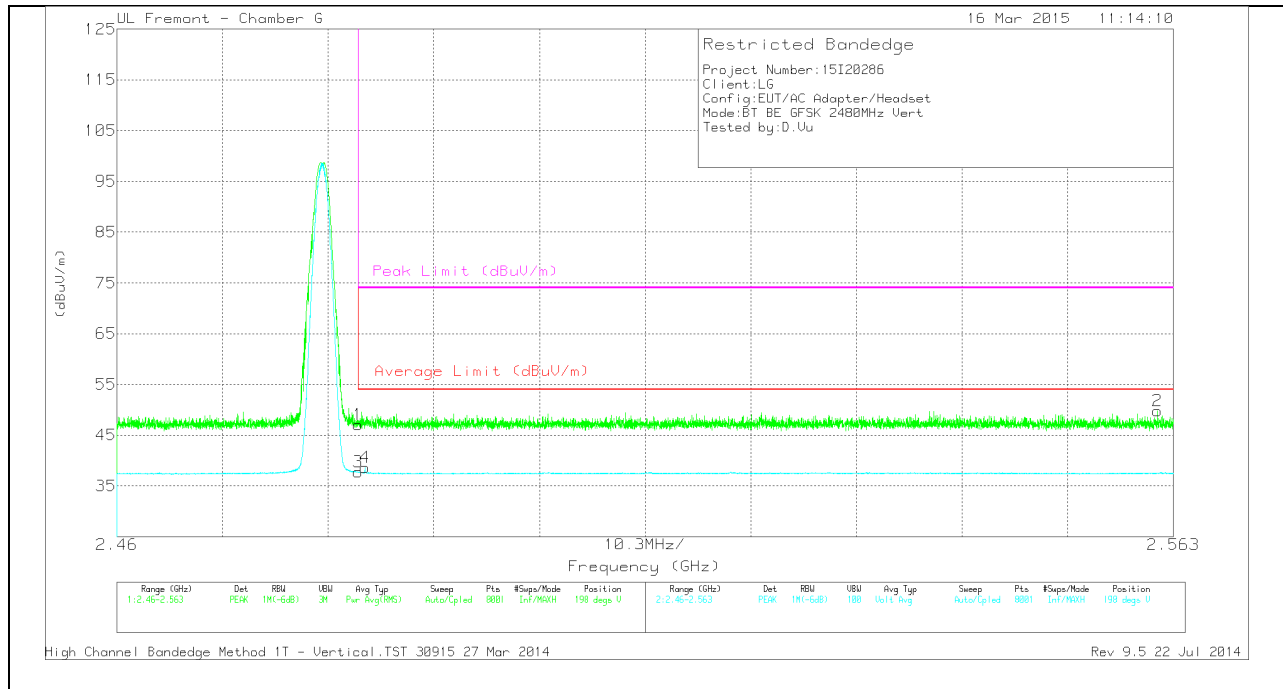
AUTHORIZED BANDEDGE (HIGH CHANNEL)



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fitr/Pad (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	40.05	PK	32	-24.9	47.15	-	-	74	-26.85	198	344	H
2	* 2.49	42.91	PK	32	-24.9	50.01	-	-	74	-23.99	198	344	H
3	* 2.484	29.12	VB1T	32	-24.9	36.22	54	-17.78	-	-	198	344	H
4	2.561	29.3	VB1T	32	-24.9	36.4	54	-17.6	-	-	198	344	H

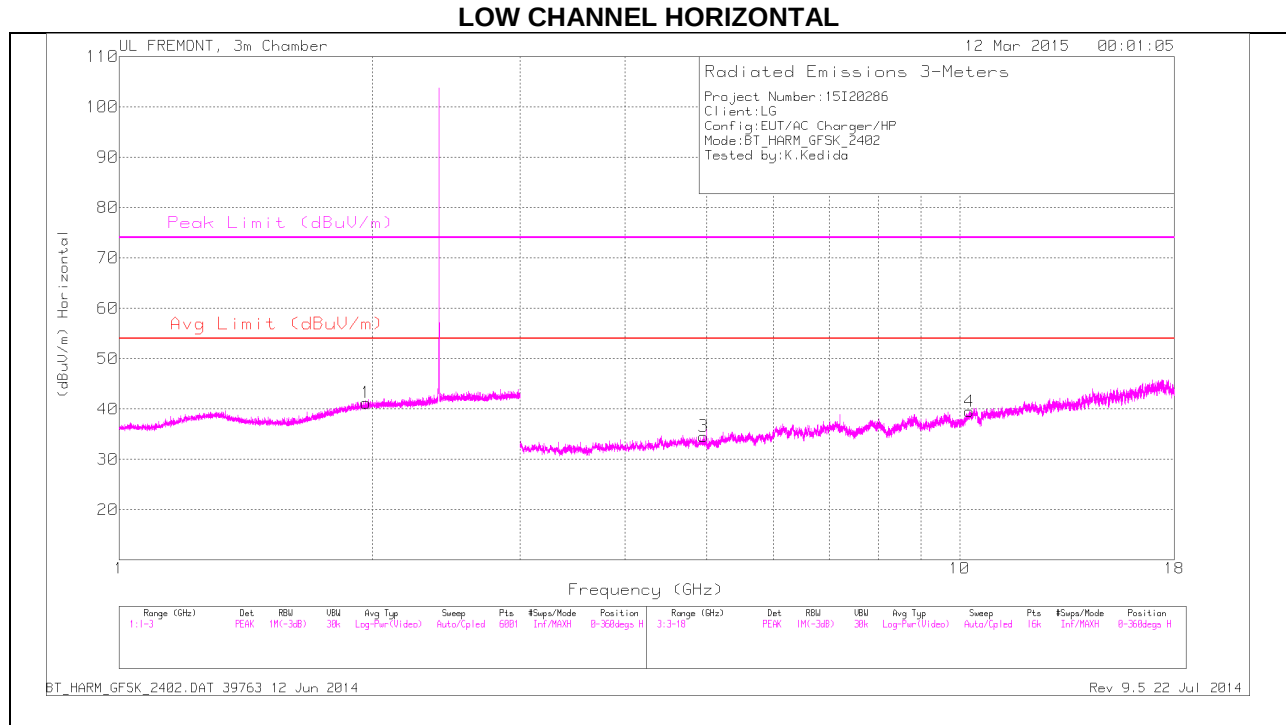
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

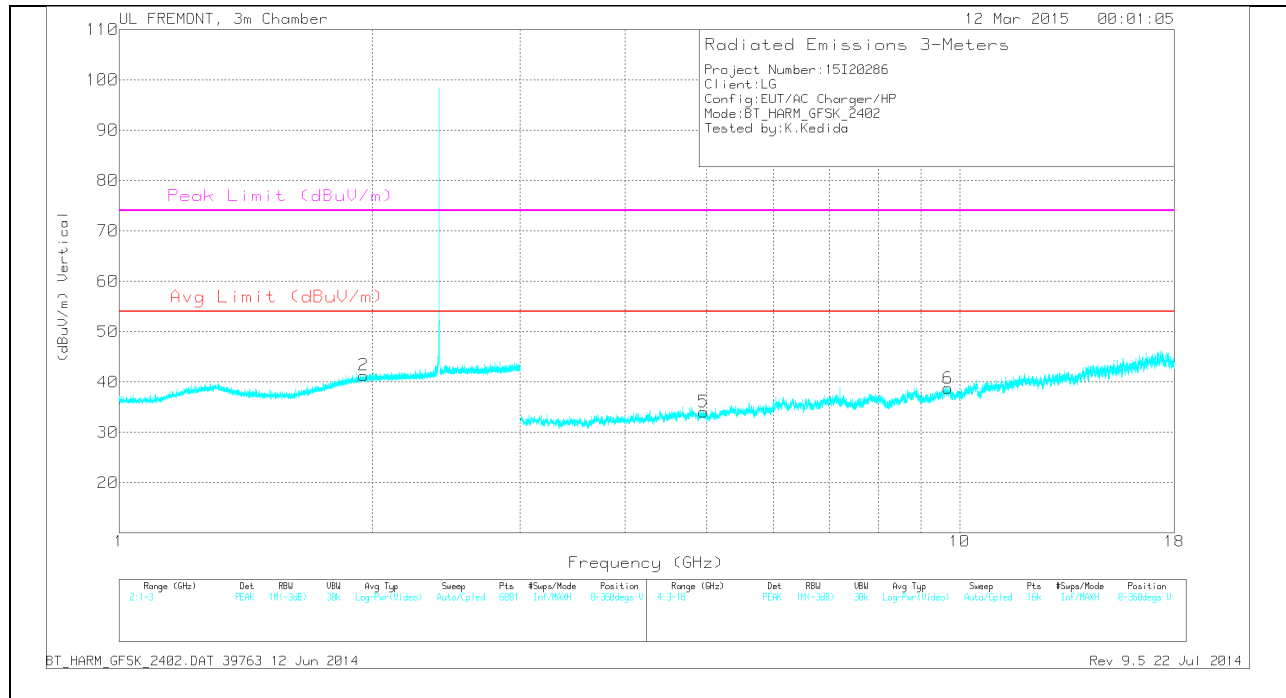
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.91	PK	32	-24.9	0	47.01	-	-	74	-26.99	198	344	V
3	* 2.484	30.62	VB1T	32	-24.9	0	37.72	54	-16.28	-	-	198	344	V
4	* 2.484	31.47	VB1T	32	-24.9	0	38.57	54	-15.43	-	-	198	344	V
2	2.561	42.72	PK	32	-24.9	0	49.82	-	-	74	-24.18	198	344	V

HARMONICS AND SPURIOUS EMISSIONS



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 T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	1.955	33.24	PK	31.3	-23.2	41.34	-	-	-	-	0-360	200	V
1	1.967	32.94	PK	31.4	-23.1	41.24	-	-	-	-	0-360	200	H
5	4.96	31.08	PK	34	-31	34.08	-	-	74	-39.92	0-360	100	V
3	4.961	31.58	PK	34	-31	34.58	-	-	74	-39.42	0-360	200	H
6	9.685	27.36	PK	36.8	-25.4	38.76	-	-	-	-	0-360	100	V
4	10.274	28.12	PK	37.1	-25.7	39.52	-	-	-	-	0-360	100	H

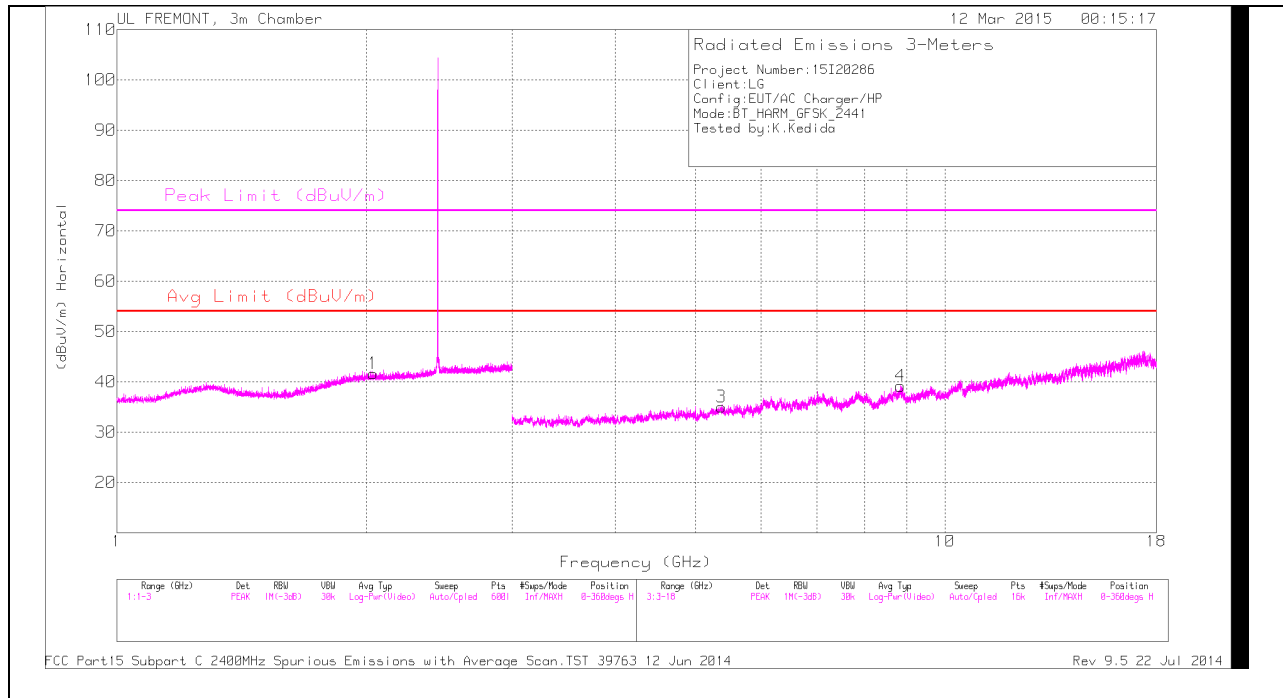
PK - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.999	42.59	PK3	31.5	-23.2	50.89	-	-	-	-	360	100	H
2.005	29.61	VB1T	31.5	-23.2	37.91	-	-	-	-	360	100	H

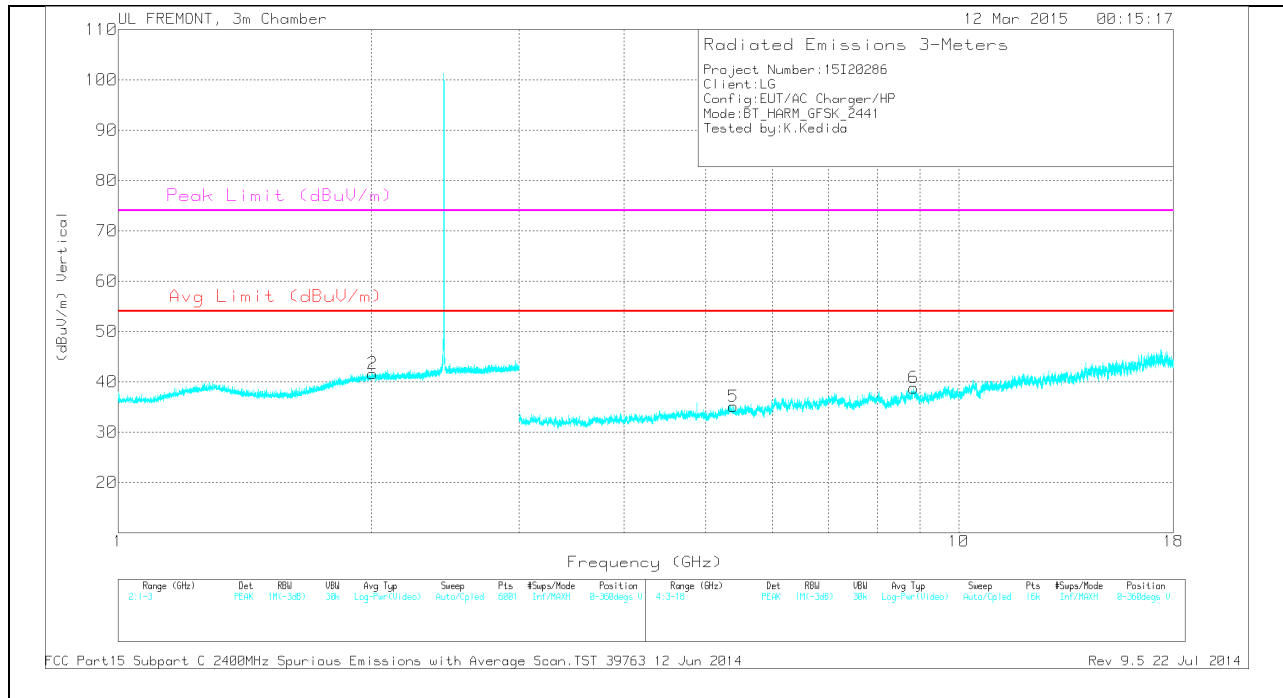
FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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 T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.008	33.31	PK	31.5	-23.2	41.61	-	-	-	-	0-360	200	V
1	2.041	33.33	PK	31.5	-23.2	41.63	-	-	-	-	0-360	100	H
3	5.371	30.71	PK	34.6	-30.3	35.01	-	-	74	-38.99	0-360	200	H
5	5.391	31.18	PK	34.6	-30.7	35.08	-	-	74	-38.92	0-360	200	V
6	8.846	29.39	PK	35.9	-26.5	38.79	-	-	-	-	0-360	200	V
4	8.847	29.77	PK	35.9	-26.5	39.17	-	-	-	-	0-360	200	H

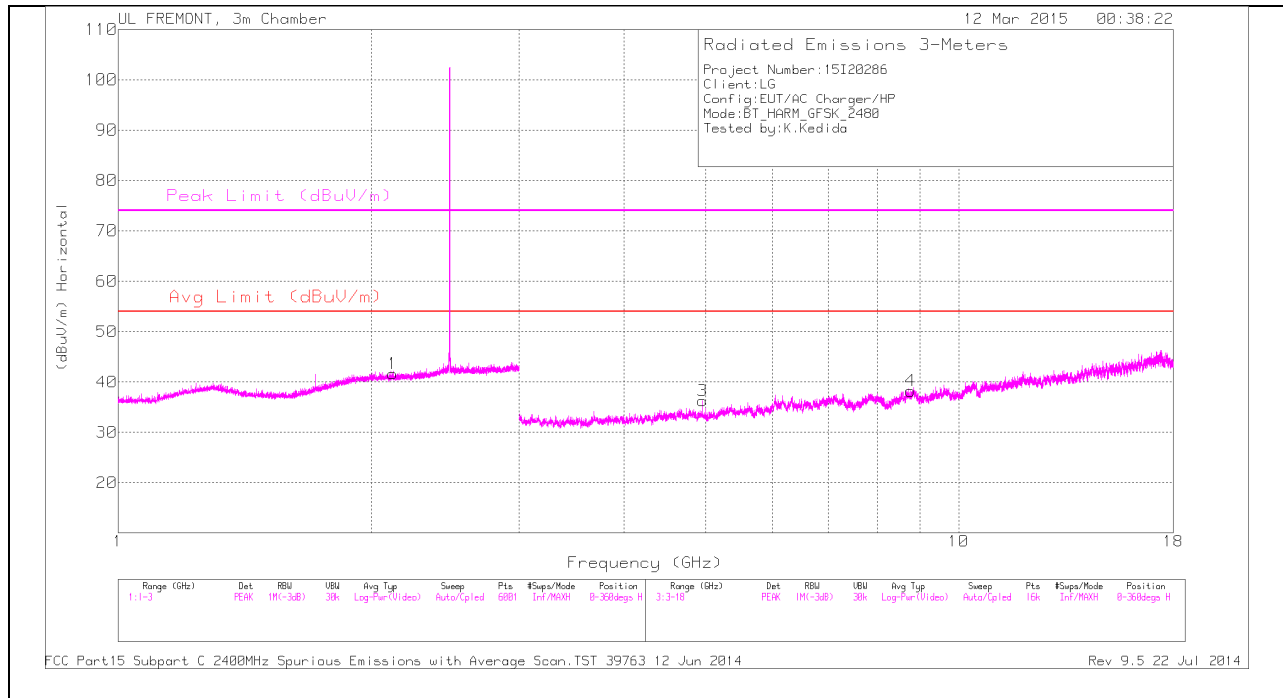
PK - Peak detector

RADIATED EMISSIONS

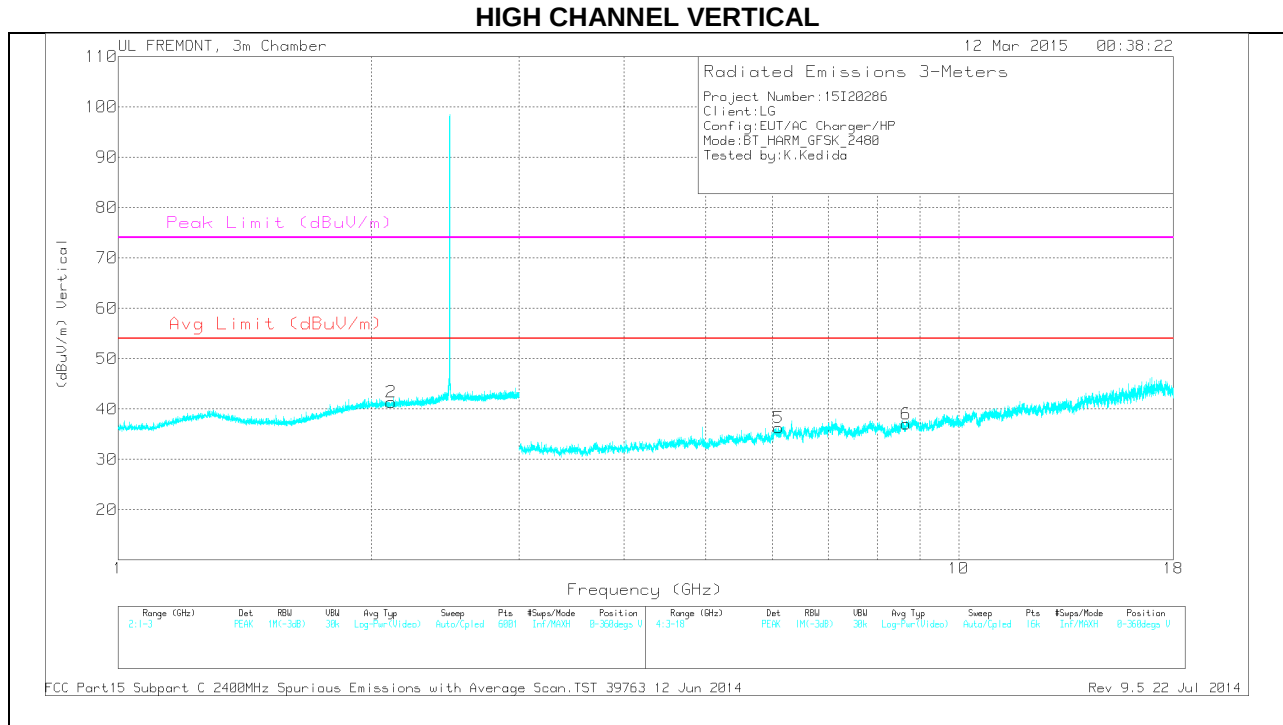
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5.369	40.81	PK3	34.5	-30.3	45.01	-	-	74	-28.99	360	200	H
5.37	27.29	VB1T	34.5	-30.3	31.49	54	-22.51	-	-	360	200	H

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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.



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 T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.113	32.85	PK	31.5	-23	41.35	-	-	-	-	0-360	200	V
1	2.123	33.12	PK	31.5	-23	41.62	-	-	-	-	0-360	100	H
3	4.96	33.25	PK	34	-31	36.25	-	-	74	-37.75	0-360	200	H
5	6.108	29.89	PK	35.2	-28.8	36.29	-	-	-	-	0-360	100	V
6	8.659	27.93	PK	35.9	-26.8	37.03	-	-	-	-	0-360	100	V
4	8.766	29.74	PK	35.9	-27.4	38.24	-	-	-	-	0-360	100	H

PK - Peak detector

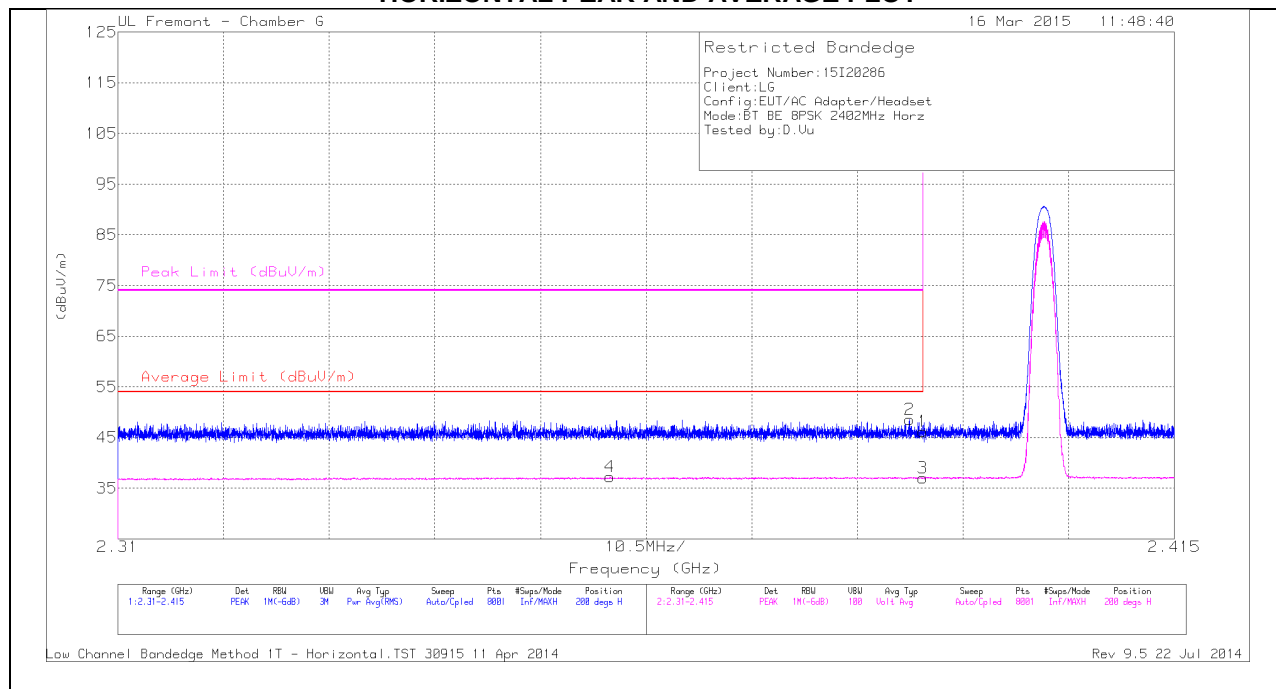
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.96	41.54	PK3	34	-31	44.54	-	-	74	-29.46	3	200	H
4.96	29.72	VB1T	34	-31	32.72	54	-21.28	-	-	3	200	H

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

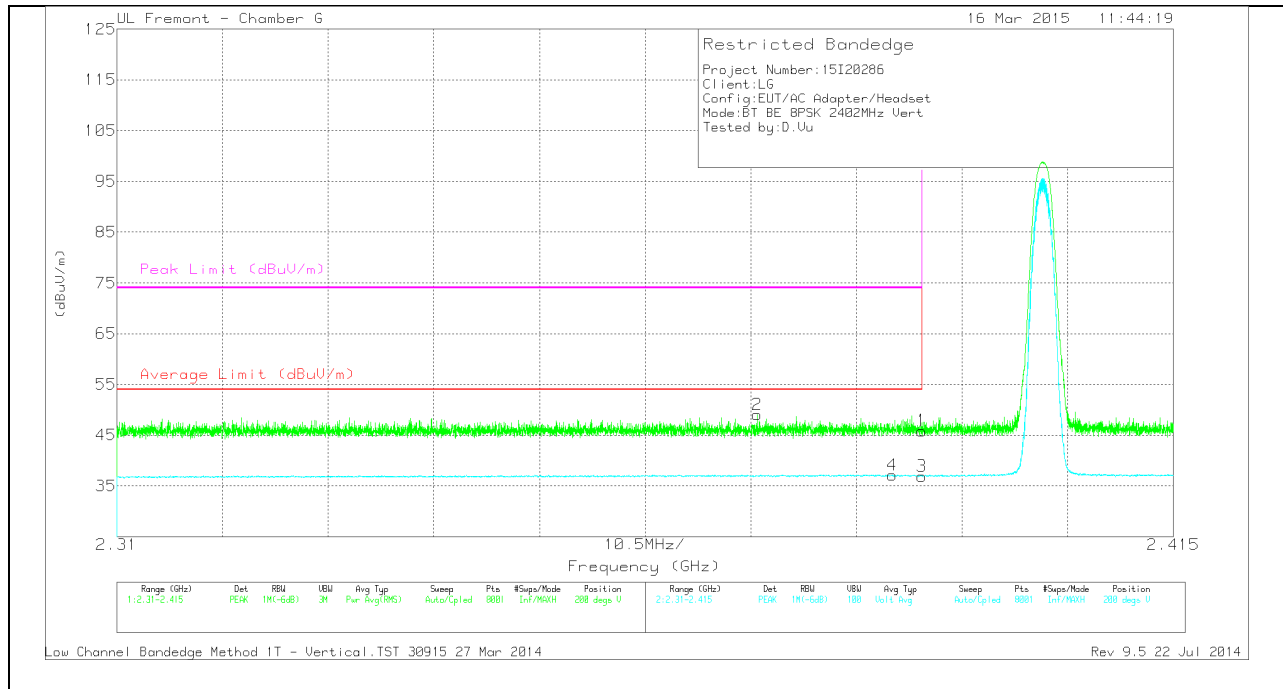
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/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	* 2.39	39.31	PK	31.8	-24.9	0	46.21	-	-	74	-27.79	200	375	H
2	* 2.389	41.7	PK	31.8	-24.9	0	48.6	-	-	74	-25.4	200	375	H
3	* 2.39	30.06	VB1T	31.8	-24.9	0	36.96	54	-17.04	-	-	200	375	H
4	* 2.359	30.51	VB1T	31.7	-25	0	37.21	54	-16.79	-	-	200	375	H

VERTICAL PEAK AND AVERAGE PLOT

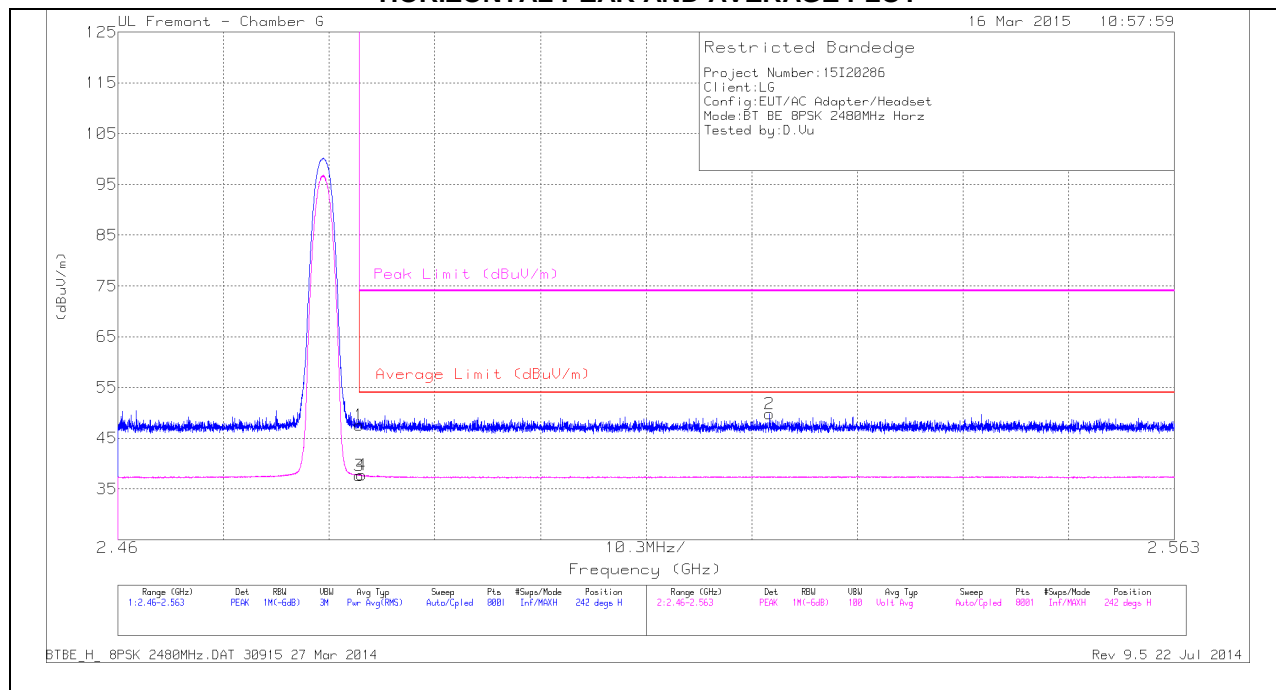


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/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	38.98	PK	31.8	-24.9	0	45.88	-	-	74	-28.12	200	375	V
2	* 2.374	42.3	PK	31.7	-24.9	0	49.1	-	-	74	-24.9	200	375	V
3	* 2.39	30.04	VB1T	31.8	-24.9	0	36.94	54	-17.06	-	-	200	375	V
4	* 2.387	30.27	VB1T	31.8	-24.9	0	37.17	54	-16.83	-	-	200	375	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

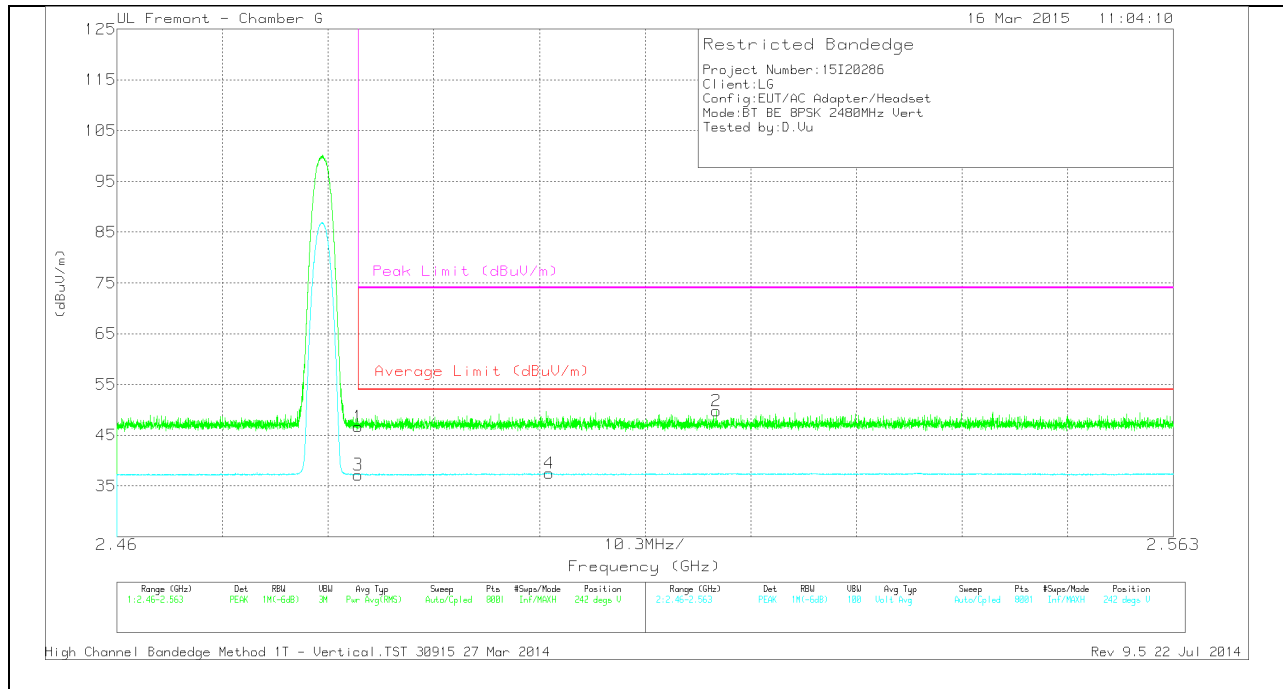
HORIZONTAL PEAK AND AVERAGE PLOT



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	40.51	PK	32	-24.9	0	47.61	-	-	74	-26.39	242	272	H
3	* 2.484	30.58	VB1T	32	-24.9	0	37.68	54	-16.32	-	-	242	272	H
4	* 2.484	30.62	VB1T	32	-24.9	0	37.72	54	-16.28	-	-	242	272	H
2	2.524	42.66	PK	32	-24.9	0	49.76	-	-	74	-24.24	242	272	H

VERTICAL PEAK AND AVERAGE PLOT

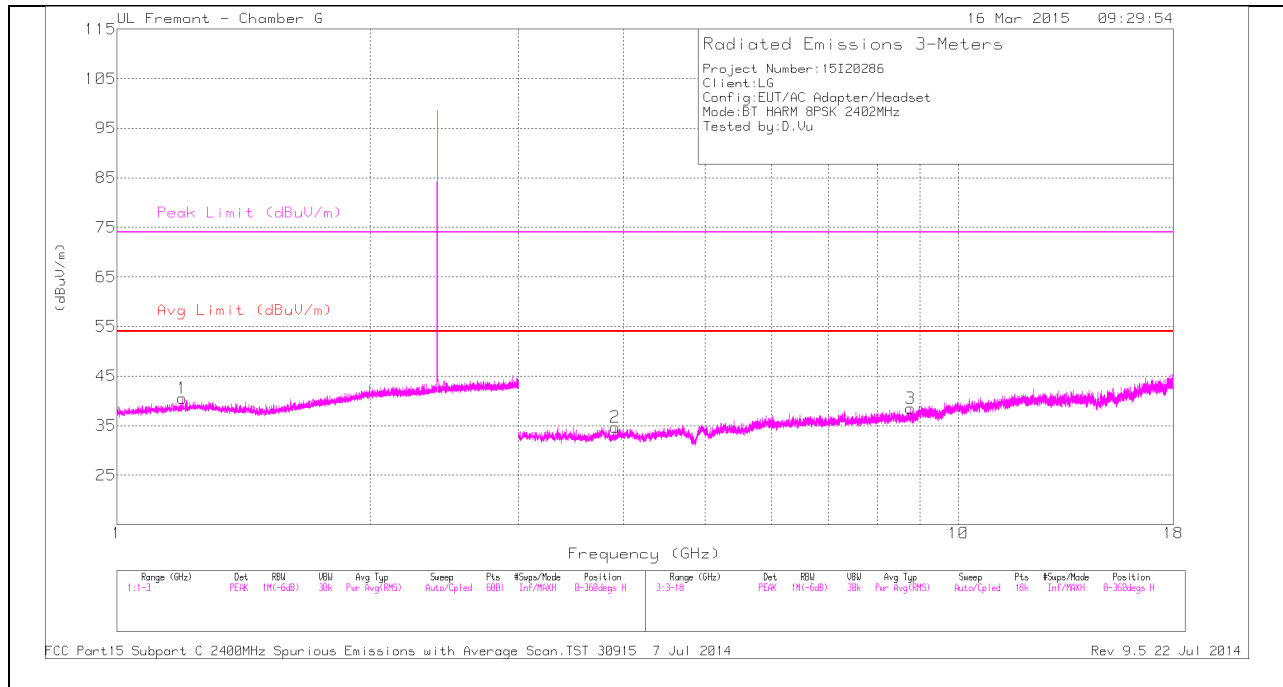


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/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	39.57	PK	32	-24.9	0	46.67	-	-	74	-27.33	242	272	V
3	* 2.484	30.09	VB1T	32	-24.9	0	37.19	54	-16.81	-	-	242	272	V
4	2.502	30.46	VB1T	32	-24.9	0	37.56	54	-16.44	-	-	242	272	V
2	2.518	42.71	PK	32	-24.9	0	49.81	-	-	74	-24.19	242	272	V

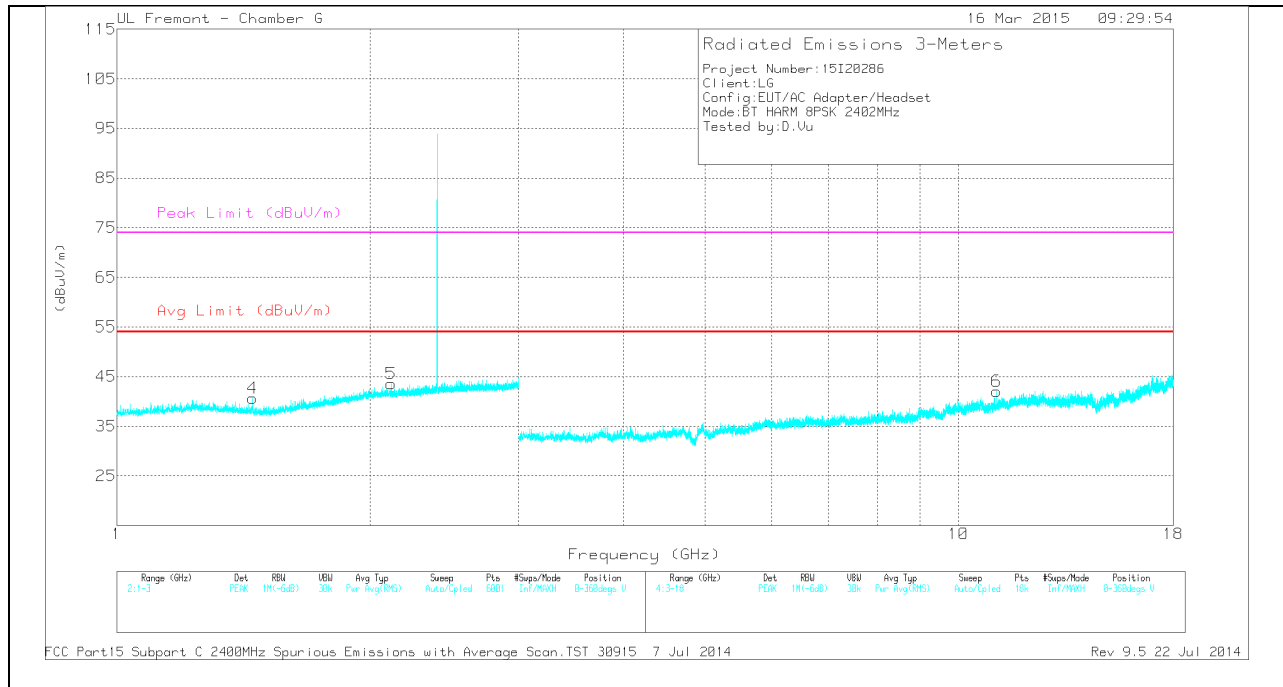
HARMONICS AND SPURIOUS EMISSIONS

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/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.195	37.61	PK	28.9	-26	40.51	-	-	74	-33.49	0-360	101	H
4	* 1.449	38.19	PK	28.2	-25.7	40.69	-	-	74	-33.31	0-360	201	V
2	* 3.907	35.36	PK	33.2	-33.9	34.66	-	-	74	-39.34	0-360	101	H
6	* 11.091	31.45	PK	37.9	-27.3	42.05	-	-	74	-31.95	0-360	101	V
5	2.118	37.25	PK	31.4	-25.1	43.55	-	-	-	-	0-360	101	V
3	8.769	31.85	PK	36	-29.3	38.55	-	-	-	-	0-360	101	H

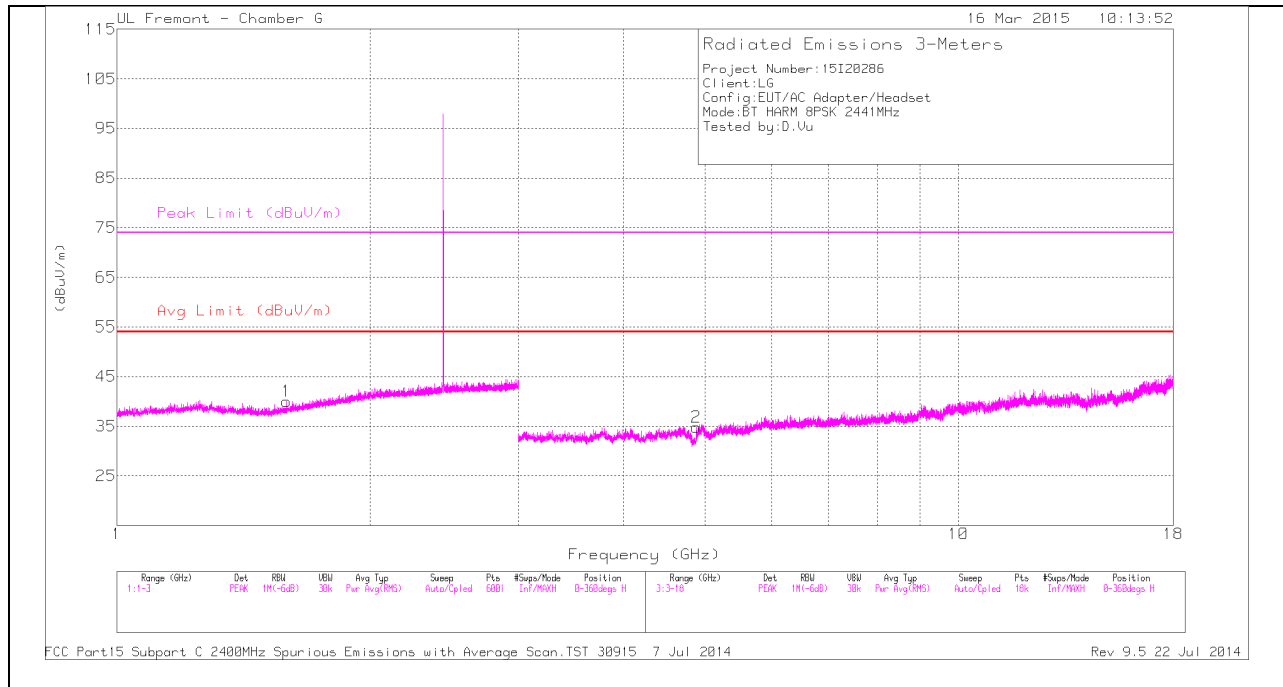
PK - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.195	43.98	PK3	28.9	-26	46.88	-	-	74	-27.12	84	281	H
* 1.196	31.62	VB1T	28.9	-26	34.52	54	-19.48	-	-	84	281	H
* 3.908	42.03	PK3	33.2	-33.9	41.33	-	-	74	-32.67	40	218	H
* 3.907	29.65	VB1T	33.2	-33.9	28.95	54	-25.05	-	-	40	218	H
* 11.092	36.91	PK3	37.9	-27.3	47.51	-	-	74	-26.49	143	193	V
* 11.092	24.99	VB1T	37.9	-27.3	35.59	54	-18.41	-	-	143	193	V

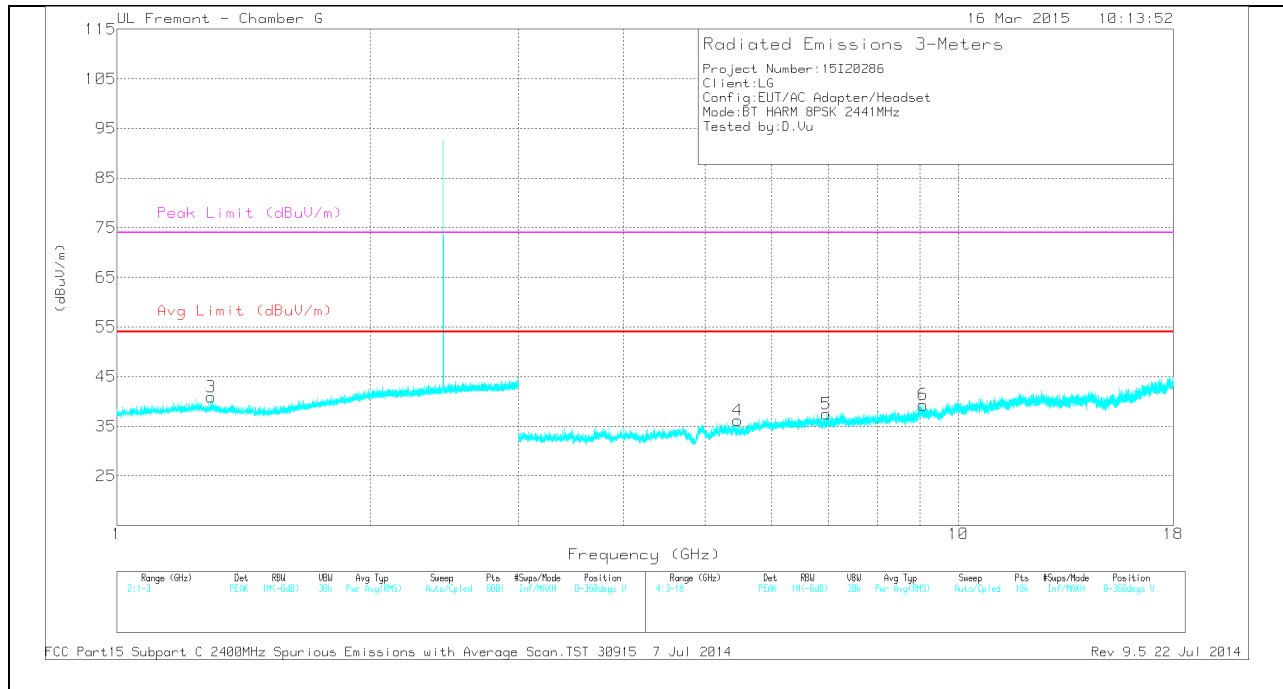
FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.59	37.02	PK	28.5	-25.5	40.02	-	-	74	-33.98	0-360	201	H
3	* 1.294	37.91	PK	29	-26	40.91	-	-	74	-33.09	0-360	201	V
2	* 4.882	33.73	PK	34.1	-33	34.83	-	-	74	-39.17	0-360	201	H
6	* 9.079	31.82	PK	36.4	-28.9	39.32	-	-	74	-34.68	0-360	201	V
4	5.469	34.49	PK	34.7	-33	36.19	-	-	-	-	0-360	101	V
5	6.963	33.29	PK	35.6	-31.4	37.49	-	-	-	-	0-360	101	V

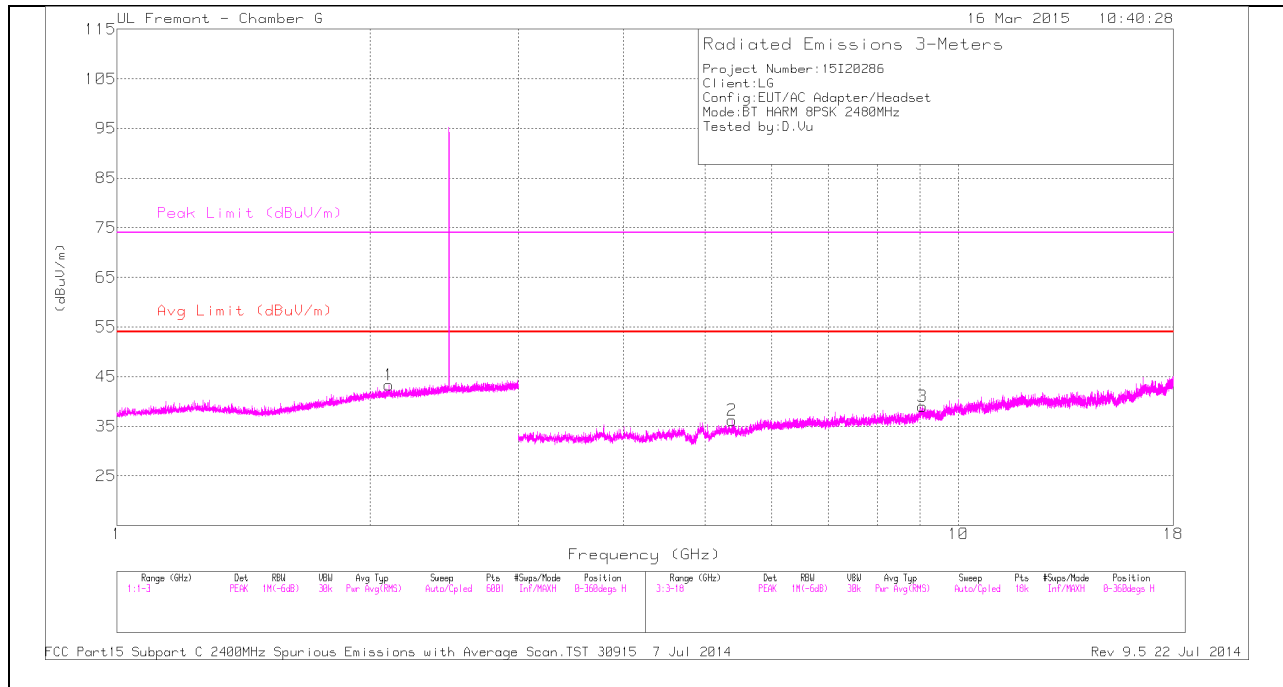
PK - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.591	44.71	PK3	28.5	-25.5	47.71	-	-	74	-26.29	224	171	H
* 1.59	31.23	VB1T	28.5	-25.5	34.23	54	-19.77	-	-	224	171	H
* 4.881	39.74	PK3	34.1	-33	40.84	-	-	74	-33.16	45	388	H
* 4.882	28.42	VB1T	34.1	-33	29.52	54	-24.48	-	-	45	388	H
* 9.079	37.99	PK3	36.4	-28.8	45.59	-	-	74	-28.41	184	189	V
* 9.08	25.96	VB1T	36.4	-28.8	33.56	54	-20.44	-	-	184	189	V

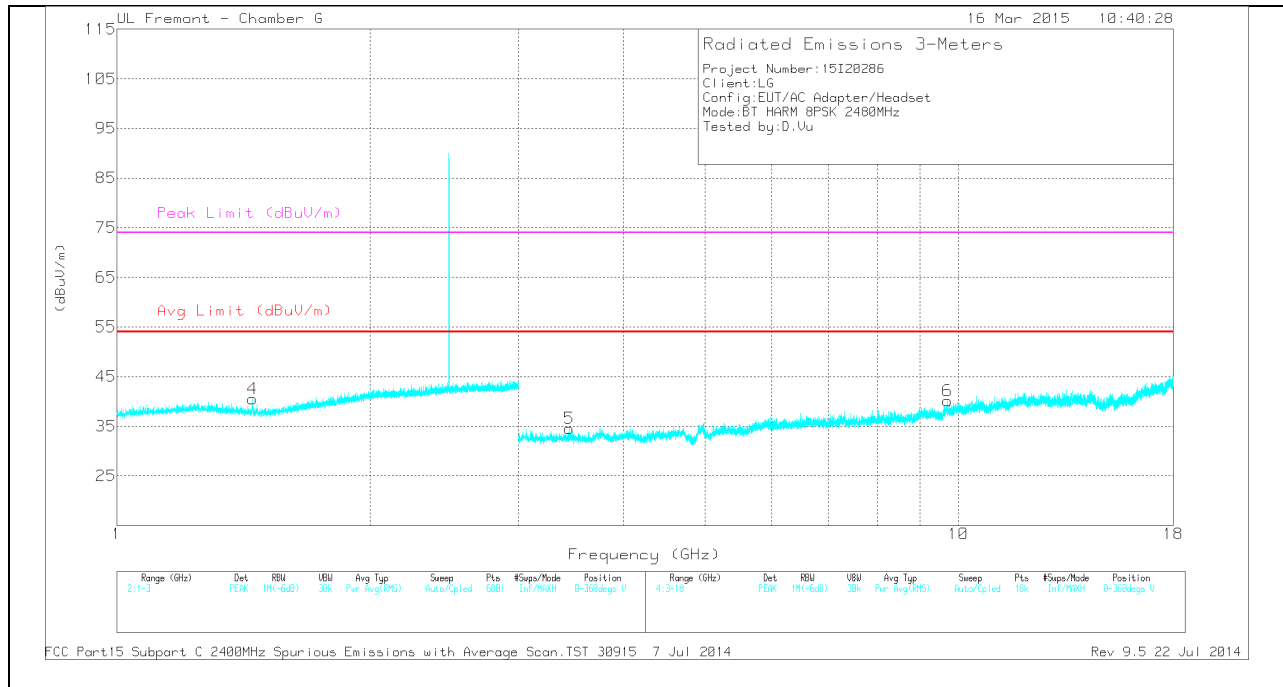
FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.45	37.98	PK	28.2	-25.7	40.48	-	-	74	-33.52	0-360	201	V
2	* 5.38	33.98	PK	34.6	-32.4	36.18	-	-	74	-37.82	0-360	101	H
3	* 9.057	31.01	PK	36.4	-28.4	39.01	-	-	74	-34.99	0-360	101	H
1	2.106	36.99	PK	31.4	-25.1	43.29	-	-	-	-	0-360	201	H
5	3.447	34.74	PK	32.8	-33	34.54	-	-	-	-	0-360	101	V
6	9.71	31.13	PK	37	-28	40.13	-	-	-	-	0-360	101	V

PK - Peak detector

RADIATED EMISSIONS

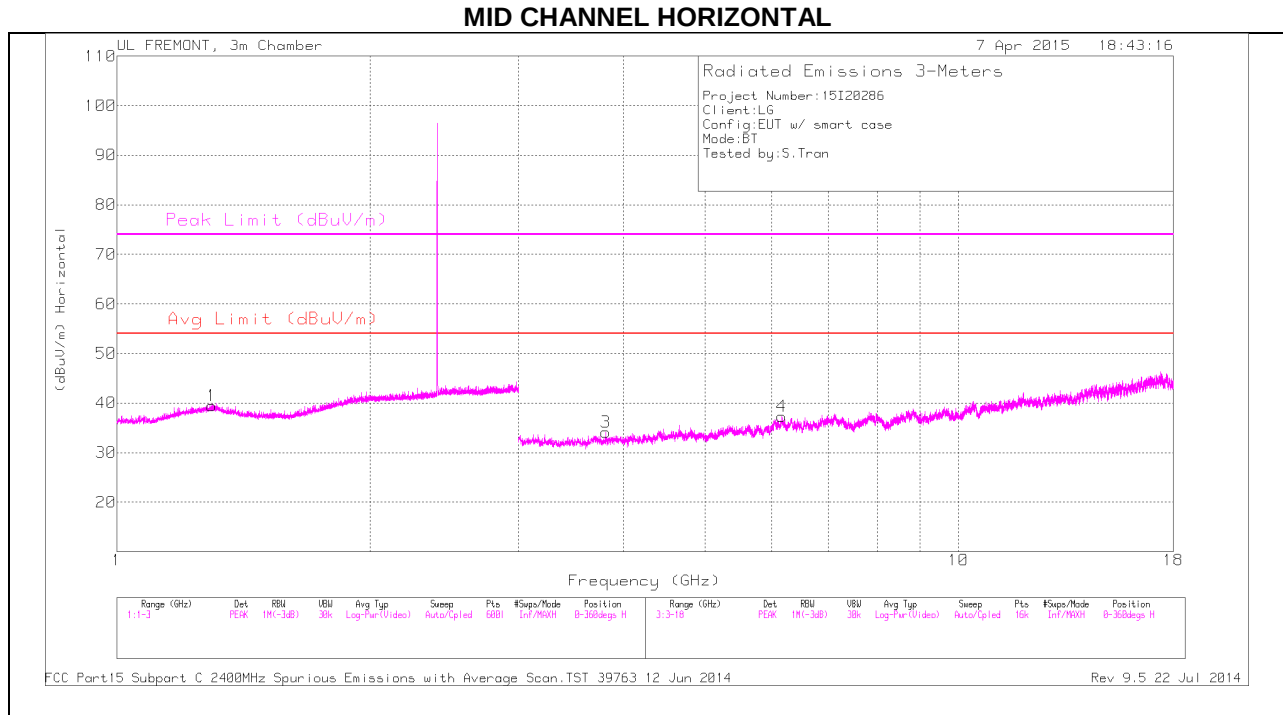
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.45	45.34	PK3	28.2	-25.7	47.84	-	-	74	-26.16	220	193	V
* 1.449	34.25	VB1T	28.2	-25.7	36.75	54	-17.25	-	-	220	193	V
* 9.056	37.79	PK3	36.4	-28.3	45.89	-	-	74	-28.11	331	281	H
* 9.057	25.73	VB1T	36.4	-28.4	33.73	54	-20.27	-	-	331	281	H

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

9.3. ADDITIONAL TESTS (PHONE WITH SMART COVER)

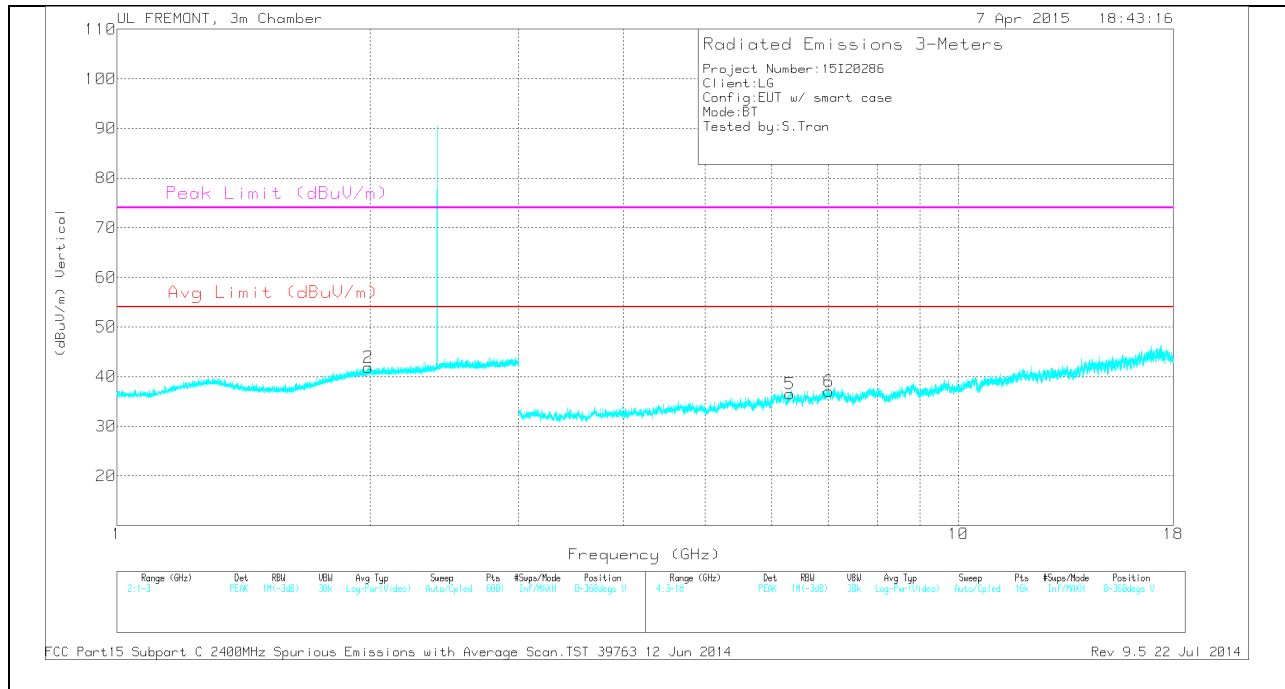
9.3.1. BASIC DATA RATE GFSK MODULATION (WORST CASE)

HARMONICS AND SPURIOUS EMISSIONS



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

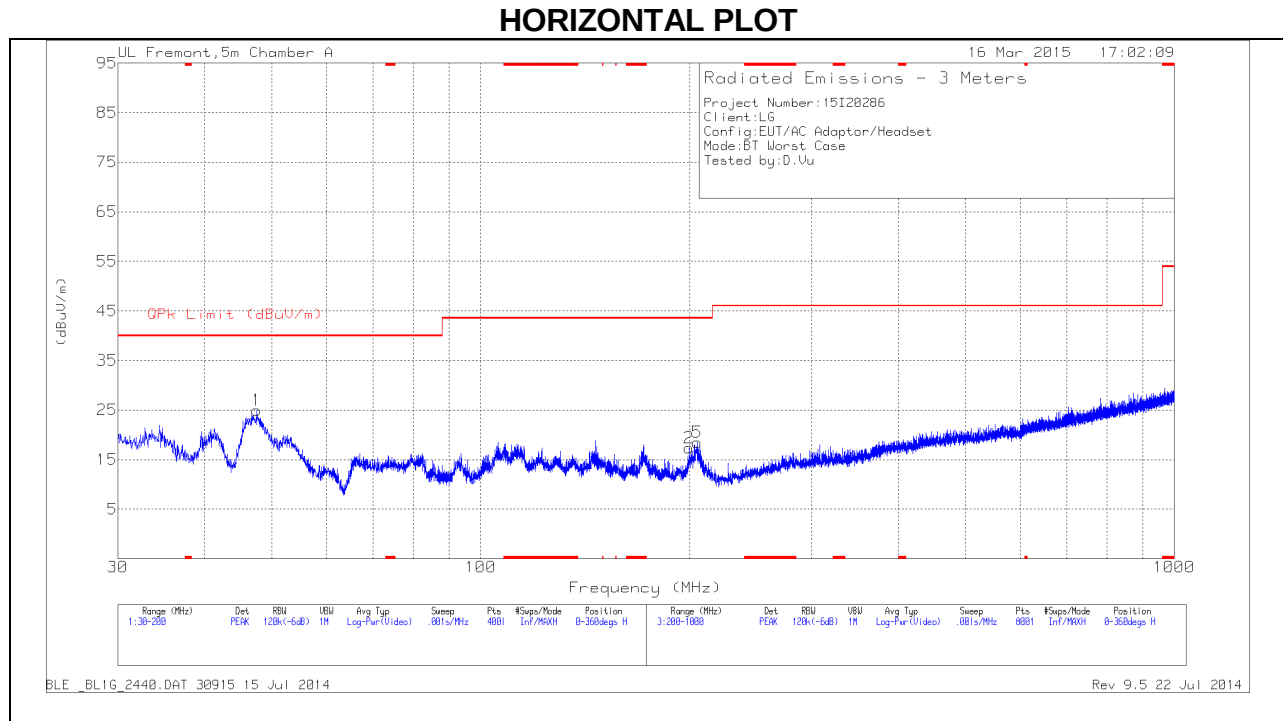
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.295	33.44	PK	29.8	-23.8	39.44	-	-	74	-34.56	0-360	100	H
2	1.987	33.52	PK	31.5	-23.2	41.82	-	-	-	-	0-360	200	V
3	3.809	32.21	PK	33.1	-31.2	34.11	-	-	74	-39.89	0-360	200	H
4	6.165	31.75	PK	35.3	-29.8	37.25	-	-	-	-	0-360	200	H
5	6.308	30.94	PK	35.4	-29.8	36.54	-	-	-	-	0-360	100	V
6	7.019	30.37	PK	35.6	-28.9	37.07	-	-	-	-	0-360	200	V

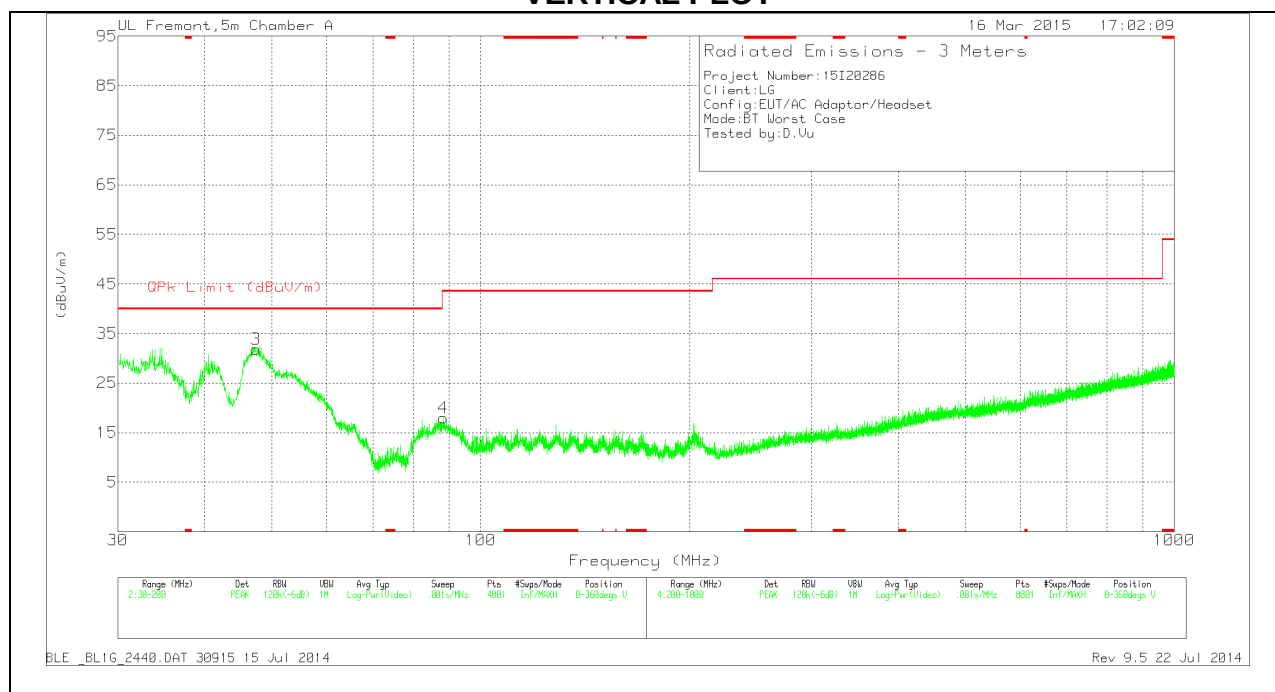
PK - Peak detector

9.4. WORST-CASE BELOW 1 GHz

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



VERTICAL PLOT



BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	47.425	50.72	PK	12.1	-31	31.82	40	-8.18	0-360	100	V
1	47.595	43.93	PK	12	-31	24.93	40	-15.07	0-360	401	H
4	88.4375	38.19	PK	10.4	-30.6	17.99	43.52	-25.53	0-360	100	V
2	199.8725	31.45	PK	15.6	-29.7	17.35	43.52	-26.17	0-360	100	H
5	205.1	32.94	PK	15.1	-29.6	18.44	43.52	-25.08	0-360	100	H

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.

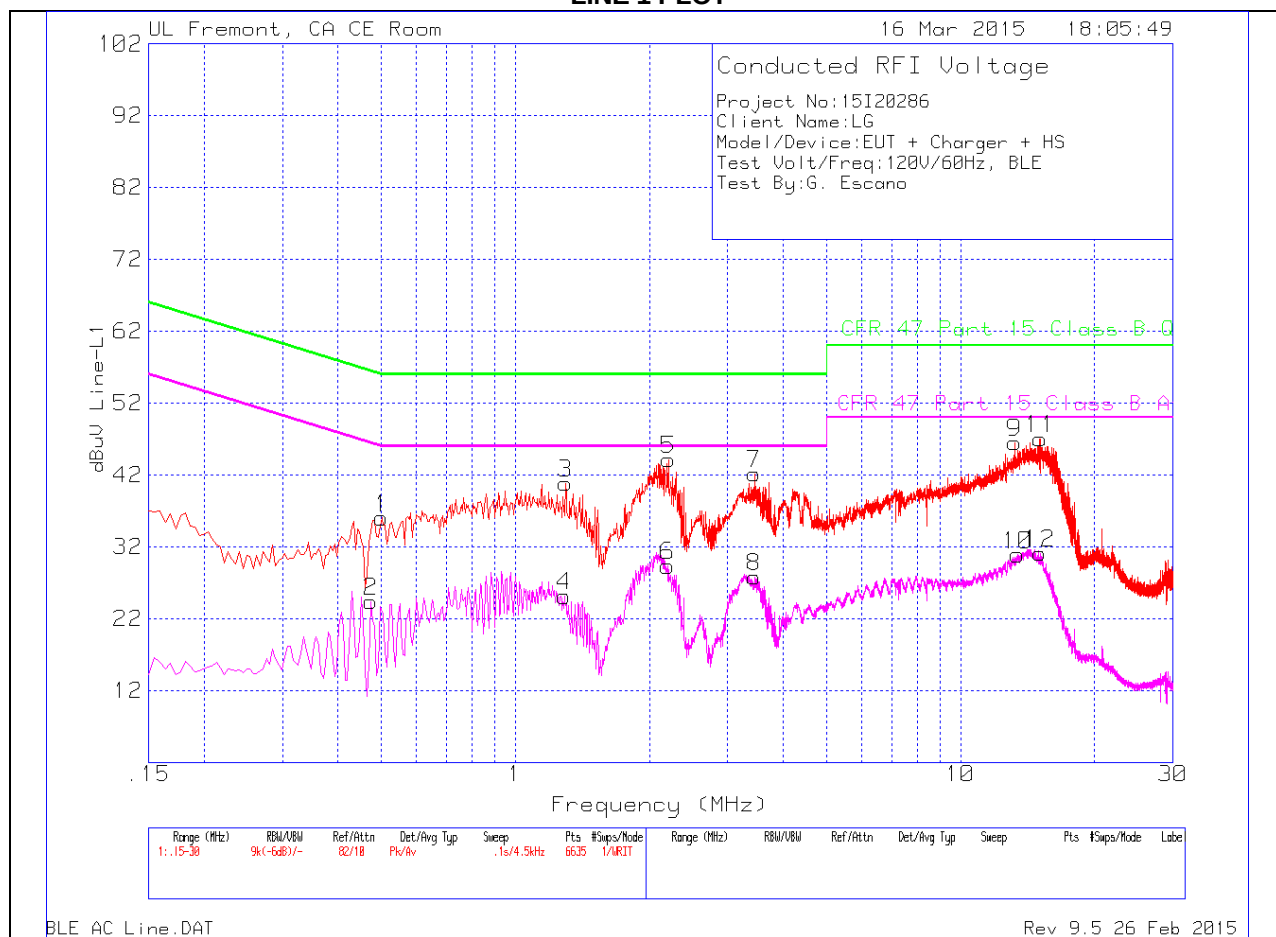
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT

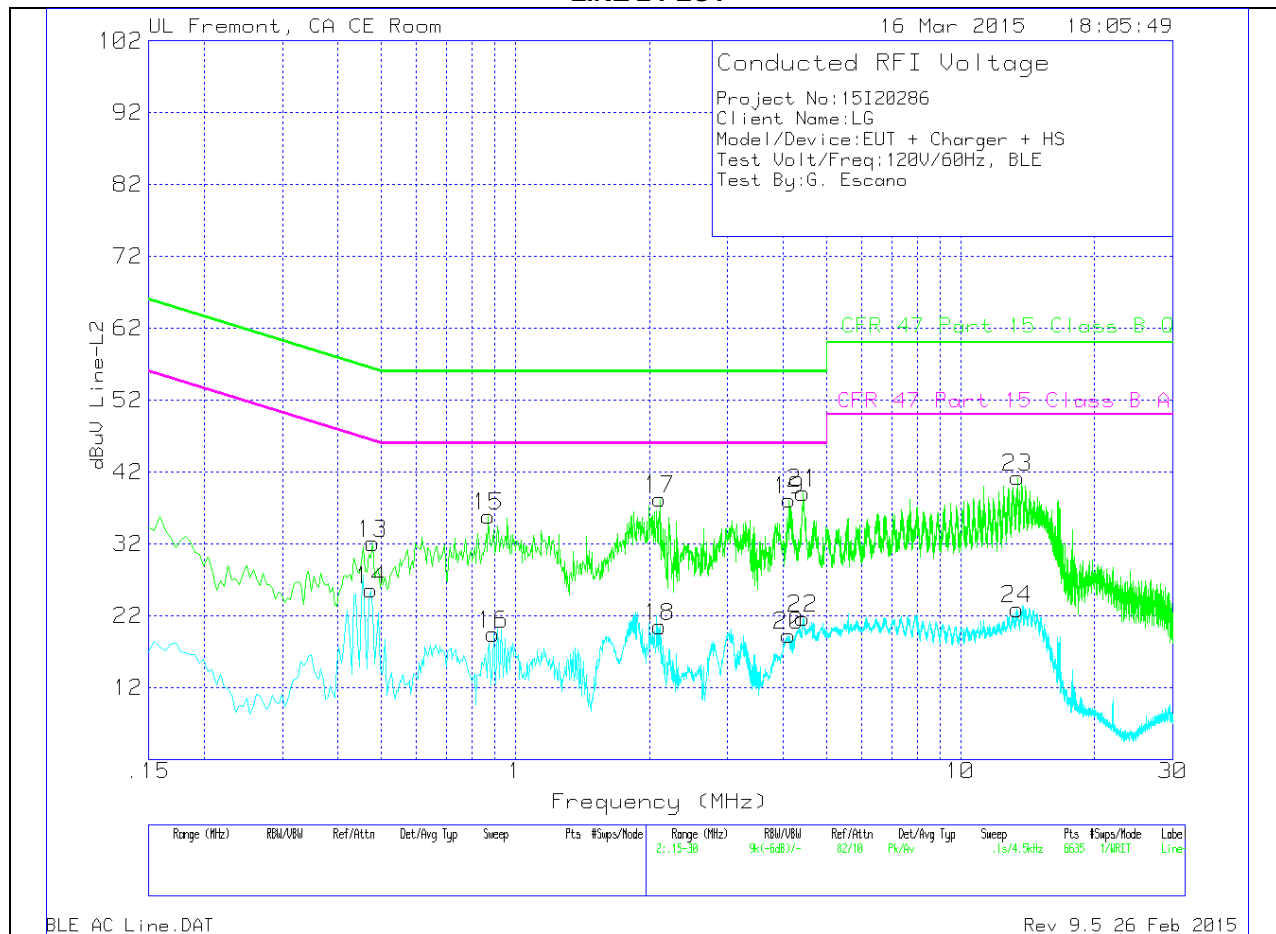


LINE 1 RESULTS

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
1	.501	35.74	Pk	.3	0	36.04	56	-19.96	-	-
2	.474	24.04	Av	.4	0	24.44	-	-	46.44	-22
3	1.2975	40.57	Pk	.2	.1	40.87	56	-15.13	-	-
4	1.2885	24.86	Av	.2	.1	25.16	-	-	46	-20.84
5	2.211	43.85	Pk	.2	.1	44.15	56	-11.85	-	-
6	2.1975	29.07	Av	.2	.1	29.37	-	-	46	-16.63
7	3.444	41.88	Pk	.2	.1	42.18	56	-13.82	-	-
8	3.444	27.52	Av	.2	.1	27.82	-	-	46	-18.18
9	13.2405	46.12	Pk	.2	.2	46.52	60	-13.48	-	-
10	13.434	30.53	Av	.2	.2	30.93	-	-	50	-19.07
11	15.108	46.53	Pk	.3	.2	47.03	60	-12.97	-	-
12	15.0855	30.65	Av	.3	.2	31.15	-	-	50	-18.85

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	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
13	.4785	31.72	Pk	.4	0	32.12	56.37	-24.25	-	-
14	.474	25.19	Av	.4	0	25.59	-	-	46.44	-20.85
15	.87	35.55	Pk	.3	0	35.85	56	-20.15	-	-
16	.8925	19.18	Av	.3	0	19.48	-	-	46	-26.52
17	2.112	37.96	Pk	.2	.1	38.26	56	-17.74	-	-
18	2.112	20.21	Av	.2	.1	20.51	-	-	46	-25.49
19	4.1235	37.82	Pk	.2	.1	38.12	56	-17.88	-	-
20	4.11	18.97	Av	.2	.1	19.27	-	-	46	-26.73
21	4.425	38.8	Pk	.2	.1	39.1	56	-16.9	-	-
22	4.425	21.35	Av	.2	.1	21.65	-	-	46	-24.35
23	13.4295	40.86	Pk	.2	.2	41.26	60	-18.74	-	-
24	13.3845	22.52	Av	.2	.2	22.92	-	-	50	-27.08