FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE + BLUETOOTH, DTS/UNII a/b/g/n/ac, ANT+ and NFC

FCC ID: PY7-TM0061

IC: 4170B-TM0061

REPORT NUMBER: 15U120030-E3

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Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/17/15	Initial Issue	CHOON OOI

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 7

4.1. MEASURING INSTRUMENT CALIBRATION 7

4.2. SAMPLE CALCULATION 7

4.3. MEASUREMENT UNCERTAINTY 7

5. EQUIPMENT UNDER TEST 8

5.1. DESCRIPTION OF EUT 8

5.2. MAXIMUM OUTPUT POWER 8

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 8

5.4. WORST-CASE CONFIGURATION AND MODE 9

5.5. DESCRIPTION OF TEST SETUP 10

6. TEST AND MEASUREMENT EQUIPMENT 12

7. SUMMARY TABLE 13

8. ANTENNA PORT TEST RESULTS 14

8.1. 20 dB AND 99% BANDWIDTH 14

8.1.1. BASIC DATA RATE GFSK MODULATION 14
8.1.2. ENHANCED DATA RATE 8PSK MODULATION 14
8.1.3. 20 dB AND 99% BANDWIDTH PLOTS 15

8.2. HOPPING FREQUENCY SEPARATION 27

8.3. NUMBER OF HOPPING CHANNELS 29

8.4. AVERAGE TIME OF OCCUPANCY 34

8.5. OUTPUT POWER 42

8.5.1. BASIC DATA RATE GFSK MODULATION 43
8.5.2. ENHANCED DATA RATE 8PSK MODULATION 43
8.5.3. OUTPUT POWER PLOTS 44

8.6. AVERAGE POWER 50

8.6.1. BASIC DATA RATE GFSK MODULATION 51
8.6.2. DATA RATE PI/4-DQPSK MODULATION 51
8.6.3. ENHANCED DATA RATE 8PSK MODULATION 51

8.7. CONDUCTED SPURIOUS EMISSIONS 52

8.7.1. BASIC DATA RATE GFSK MODULATION 53

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8.7.2. ENHANCED DATA RATE 8PSK MODULATION 61

9. RADIATED TEST RESULTS 69

9.1. LIMITS AND PROCEDURE 69

9.2. TRANSMITTER ABOVE 1 GHz 70

9.2.1. BASIC DATA RATE GFSK MODULATION 70

9.2.2. ENHANCED DATA RATE 8PSK MODULATION 83

9.3. WORST-CASE BELOW 1 GHz 96

10. AC POWER LINE CONDUCTED EMISSIONS 99

11. SETUP PHOTOS 104

12. END OF REPORT 104

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.
EUT DESCRIPTION: GSM/WCDMA/LTE + BLUETOOTH, DTS/UNII a/b/g/n/ac , ANT+ and NFC
SERIAL NUMBER: CB5A23Q9M5 (Conducted), CB5A23Q1WM (Radiated)
DATE TESTED: FEBRUARY 13-MARCH 13, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 ISSUE 8	Pass
INDUSTRY CANADA RSS-GEN ISSUE 4	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, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

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.

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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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE + BLUETOOTH, DTS/UNII a/b/g/n/ac and ANT+

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	8.61	7.26
2402 - 2480	Enhanced 8PSK	7.62	5.78

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 -1.4dBi.

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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.

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	SONY	EP880	3514W 01 S08328	N/A
Earphone	Sony	N/A	N/A	N/A
USB cable	Sony	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.

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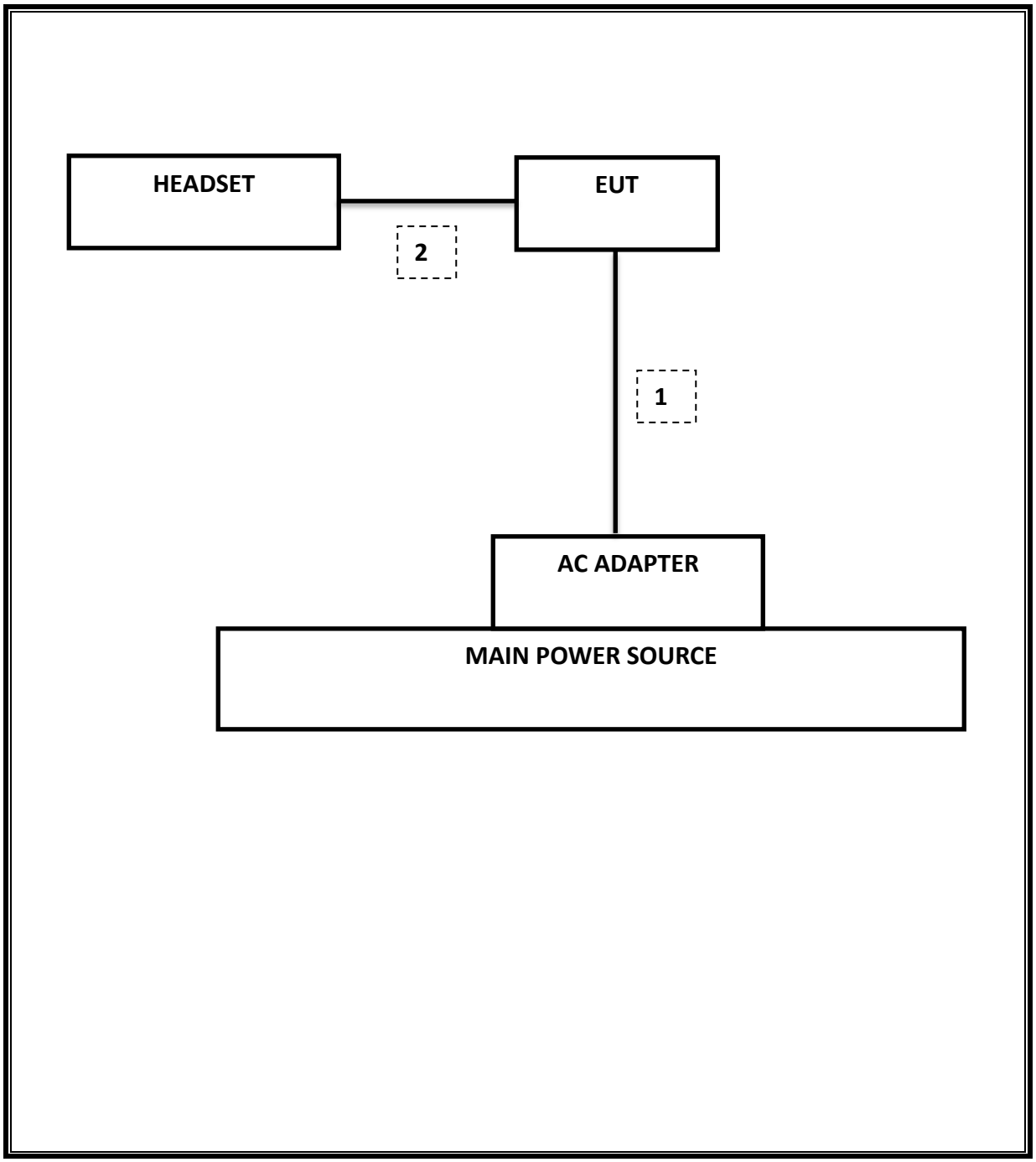
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	100773	08/15/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/15
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	12/08/15
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
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 18GHz	Miteq	AFS42-00101800-25-S-42	1818466	05/09/15
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/15

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
CLT Software	UL	UL RF	Version 1.0, 02/02/15
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

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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	1.252 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-57.95 dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	8.61 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	0.35 s
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	47.3 dBuV (AV)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	37.48 dBuV/m

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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 ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ 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	0.919	0.632
Middle	2441	0.919	0.609
High	2480	0.918	0.603
Worst		0.919	0.632

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.213	1.222
Middle	2441	1.215	1.252
High	2480	1.215	1.227
Worst		1.215	1.252

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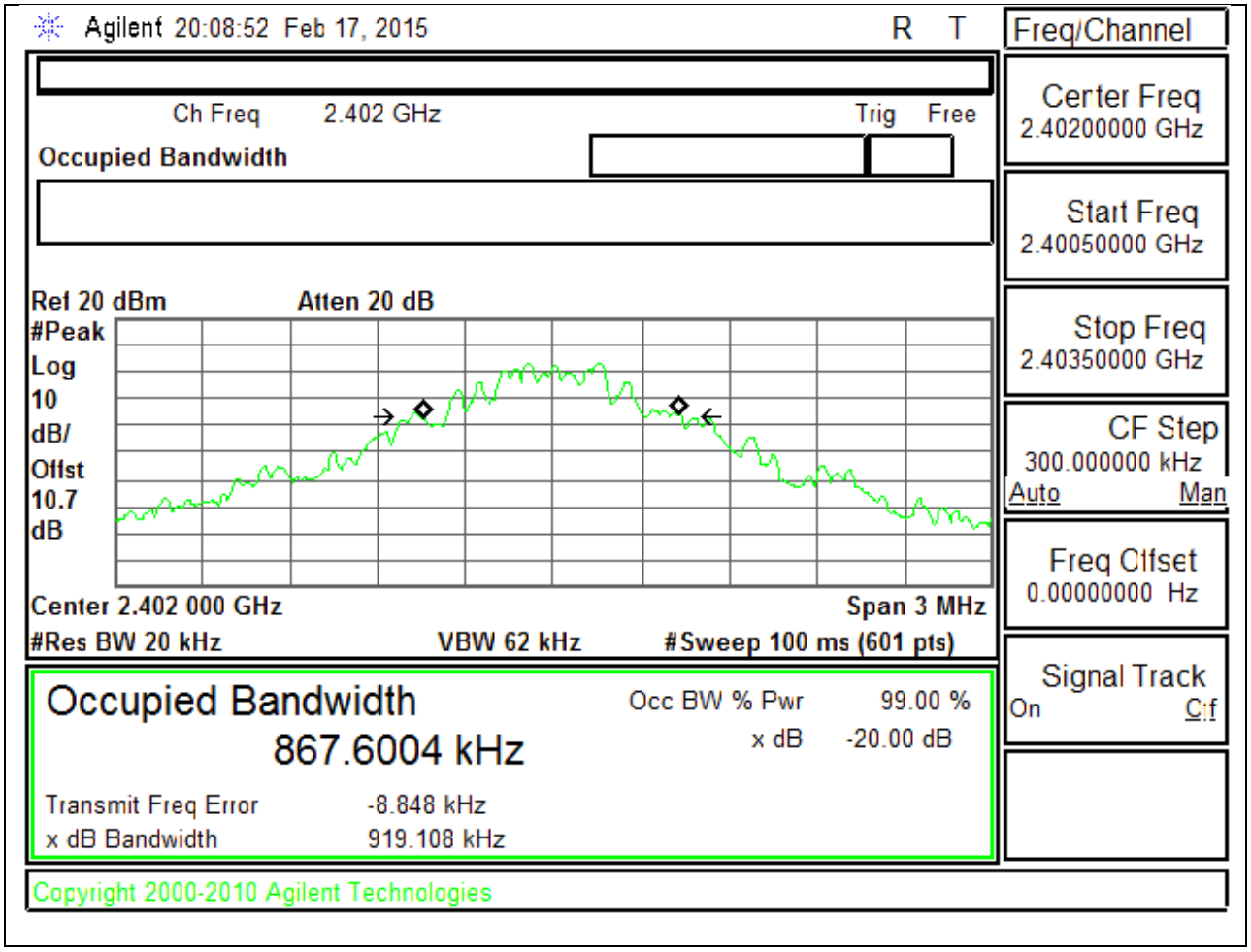
8.1.3. 20 dB AND 99% BANDWIDTH PLOTS

GFSK 20 dB BANDWIDTH

LOW CHANNEL



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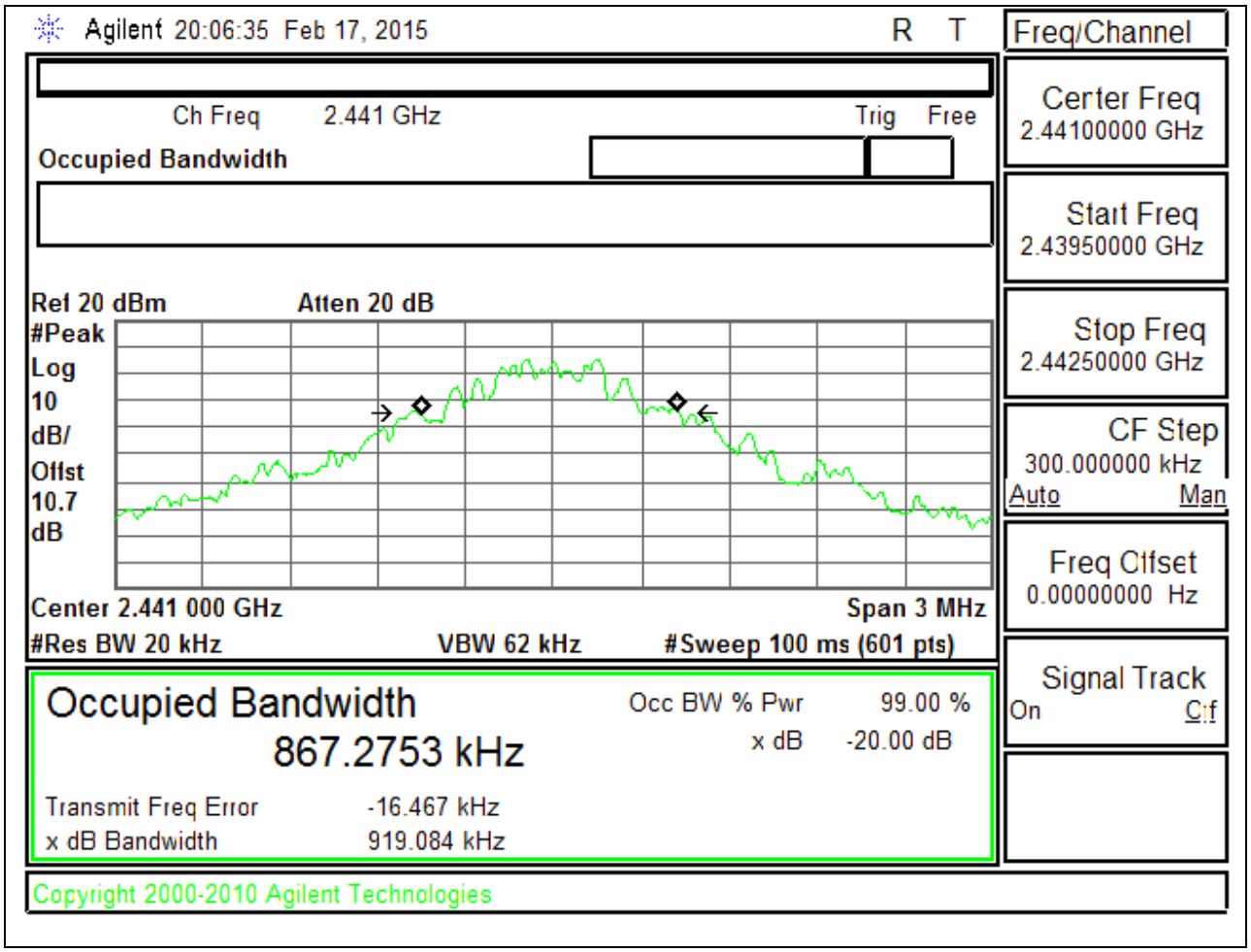
MID CHANNEL



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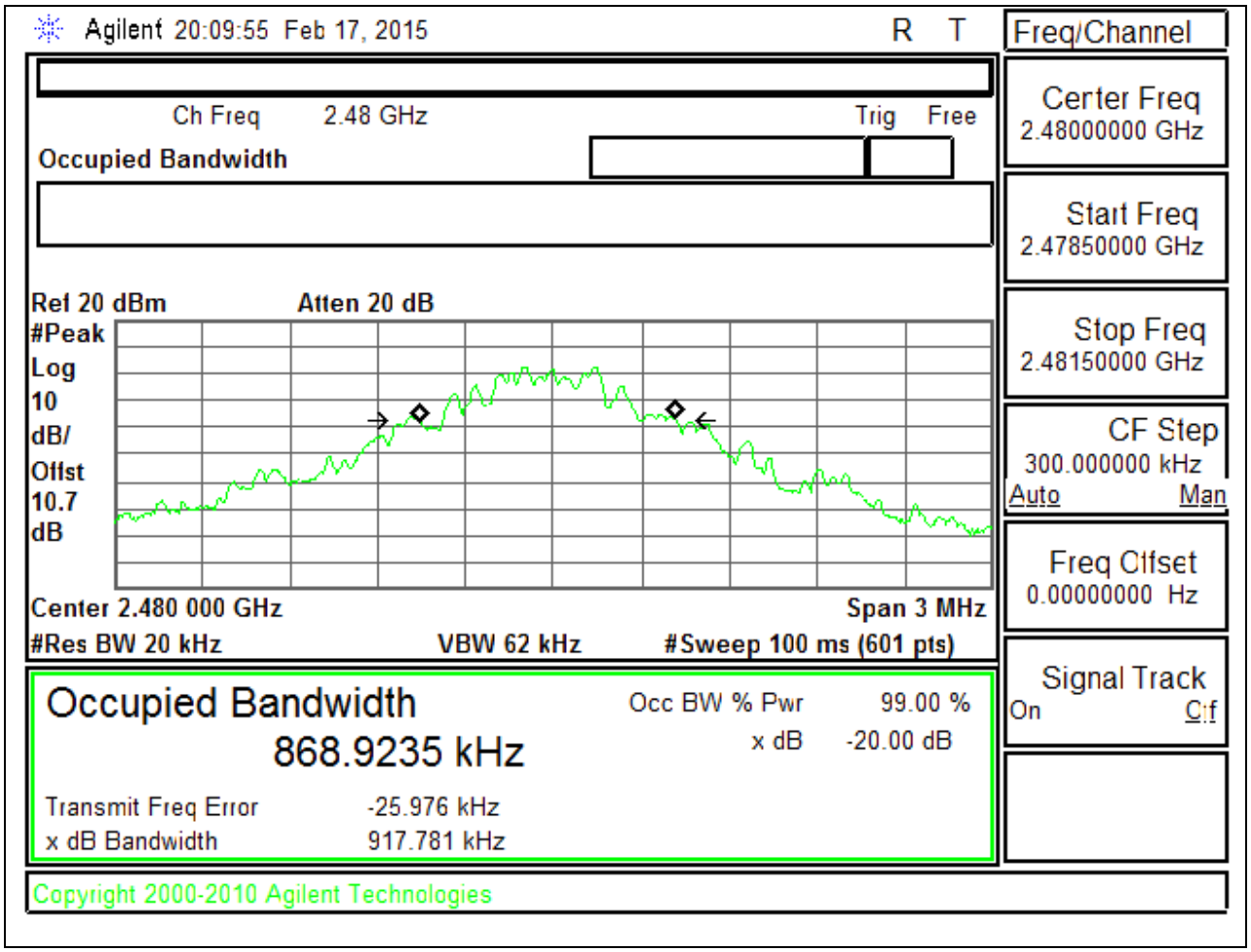
HIGH CHANNEL



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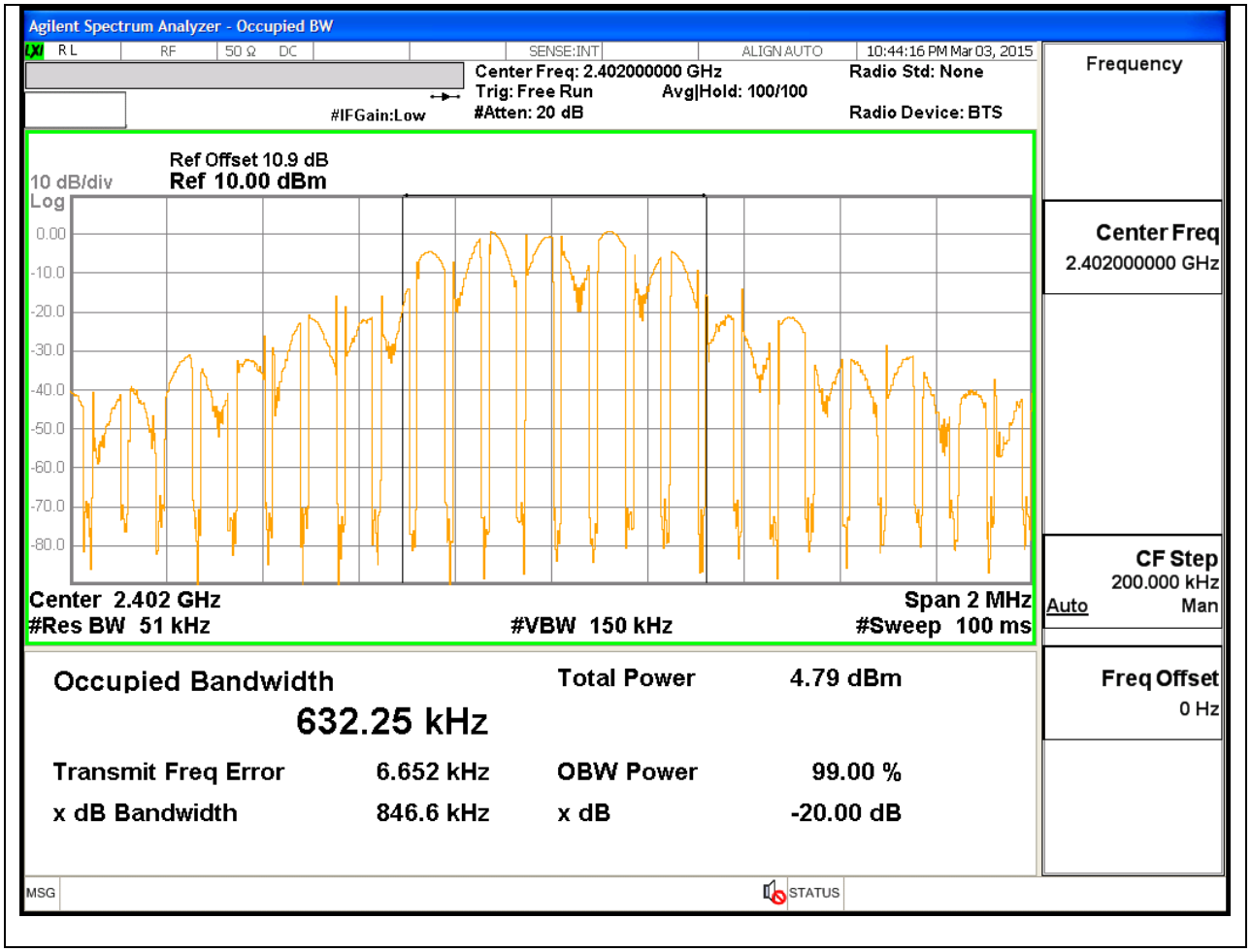
GFSK 99% BANDWIDTH

LOW CHANNEL



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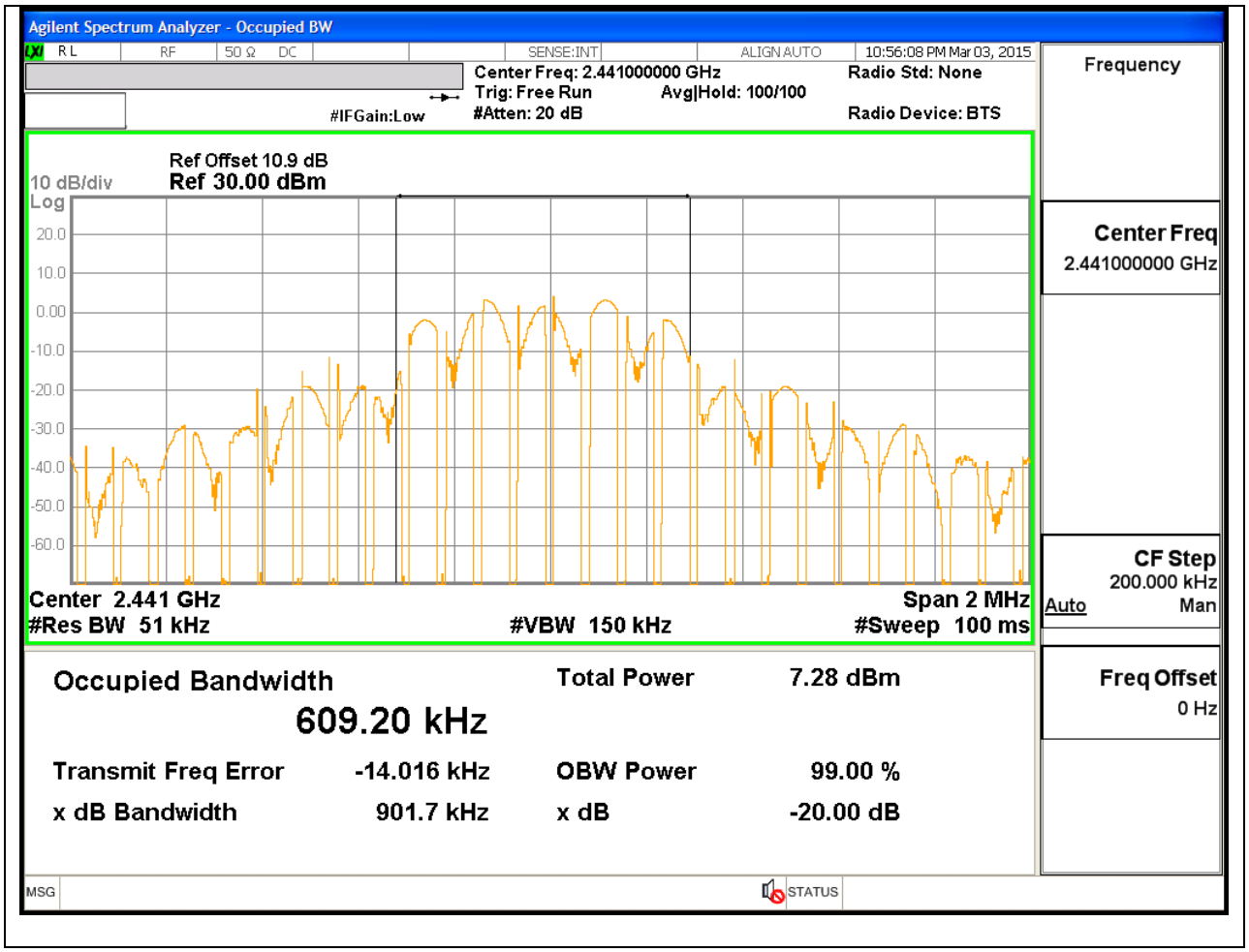
MID CHANNEL



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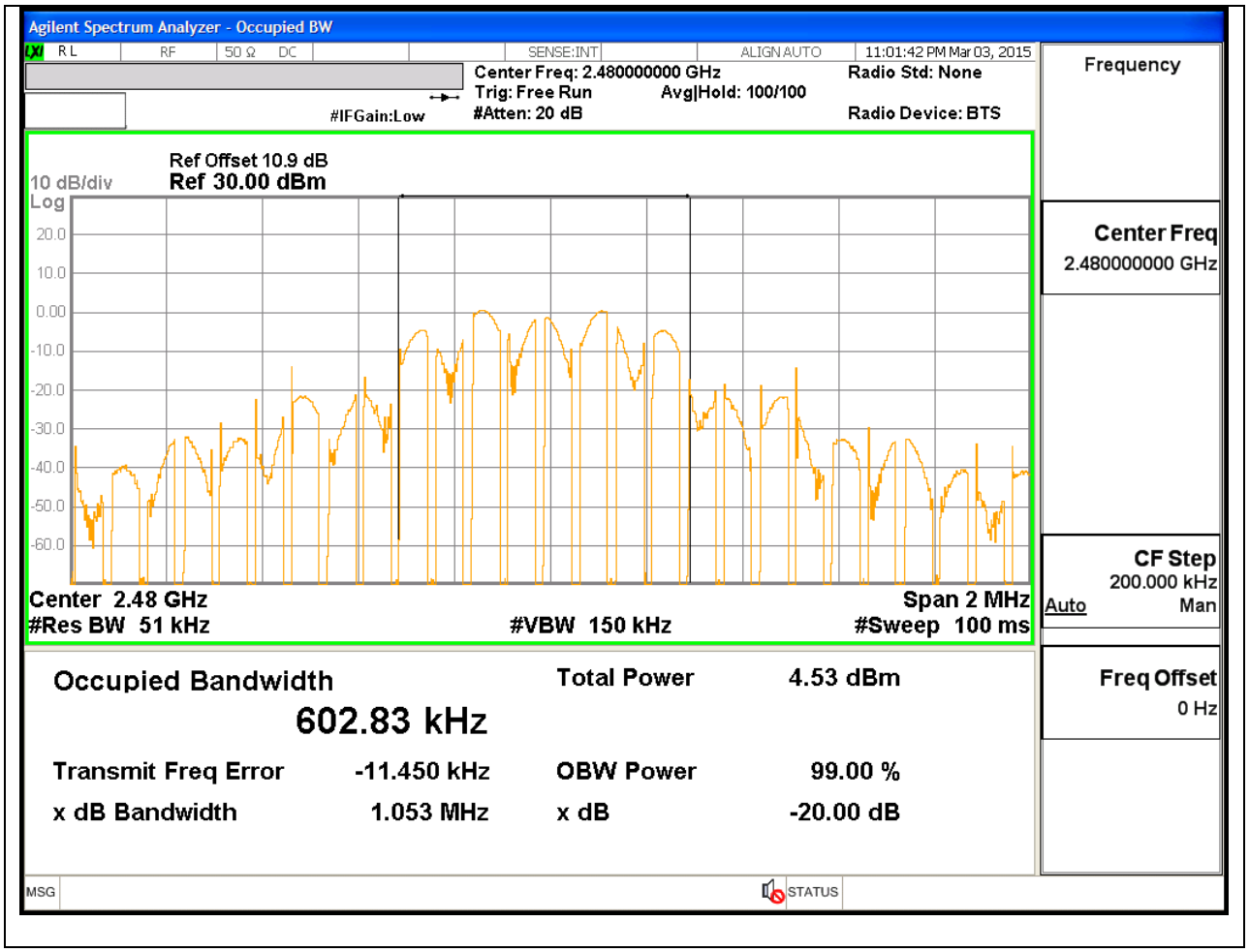
HIGH CHANNEL



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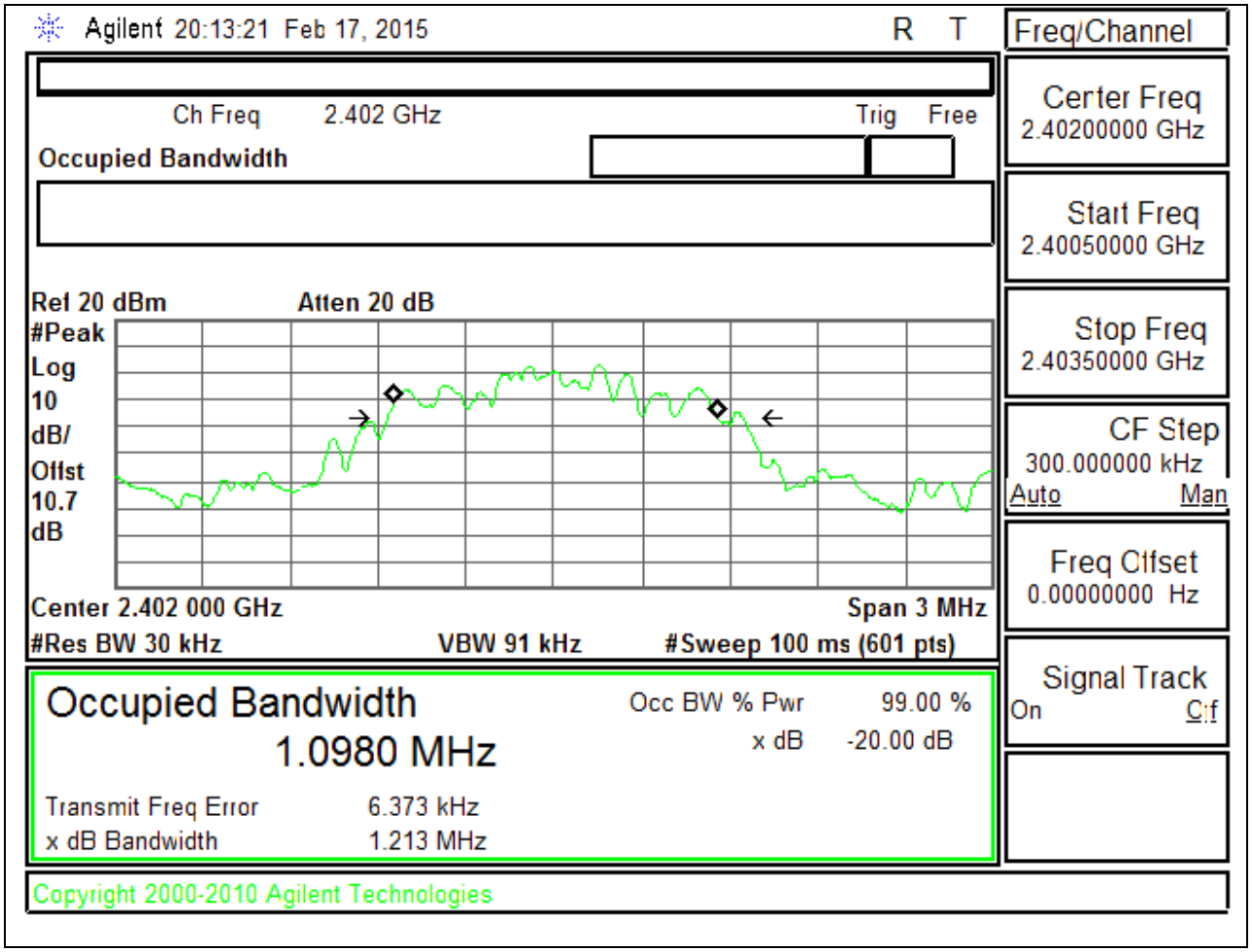
8PSK 20 dB BANDWIDTH

LOW CHANNEL



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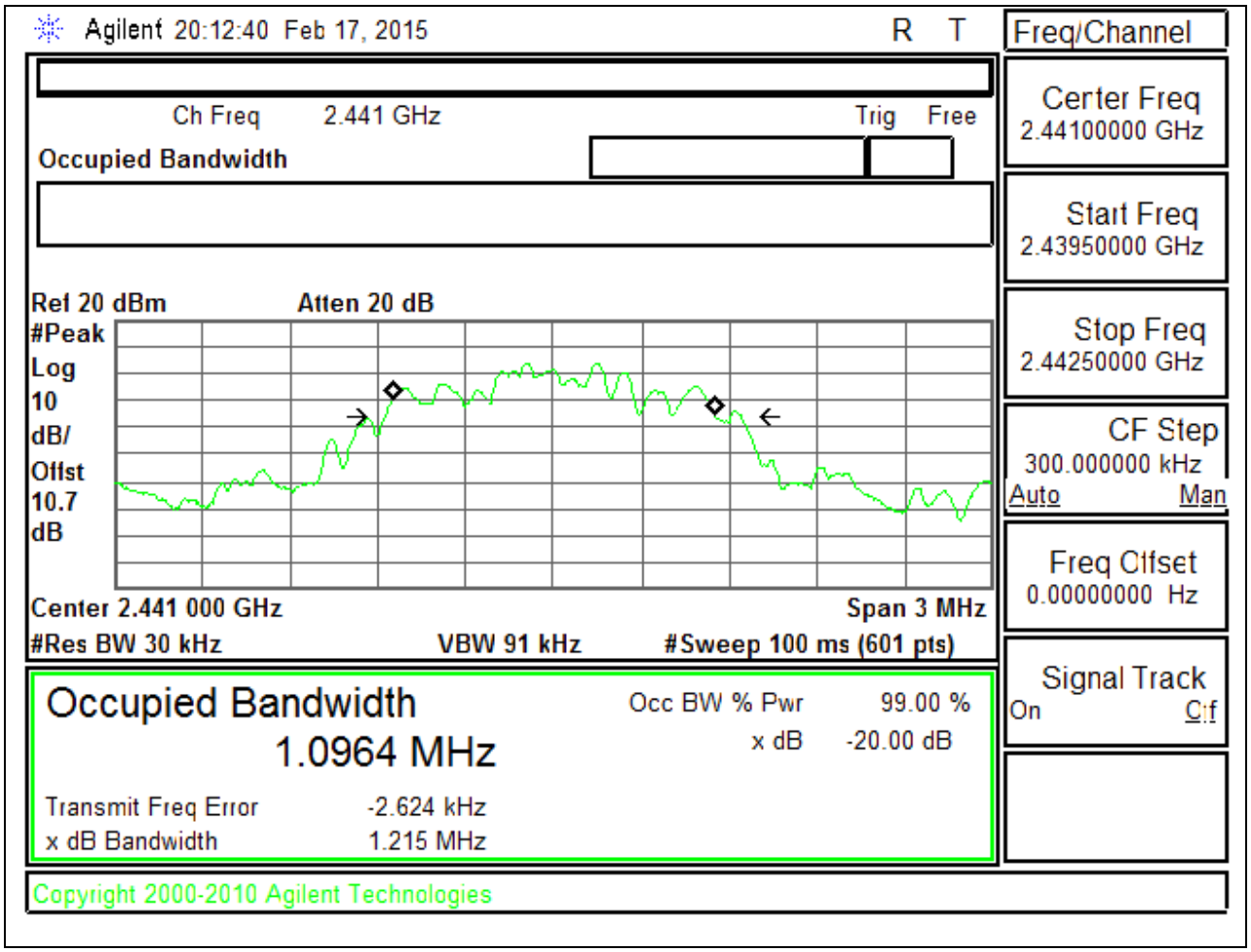
MID CHANNEL



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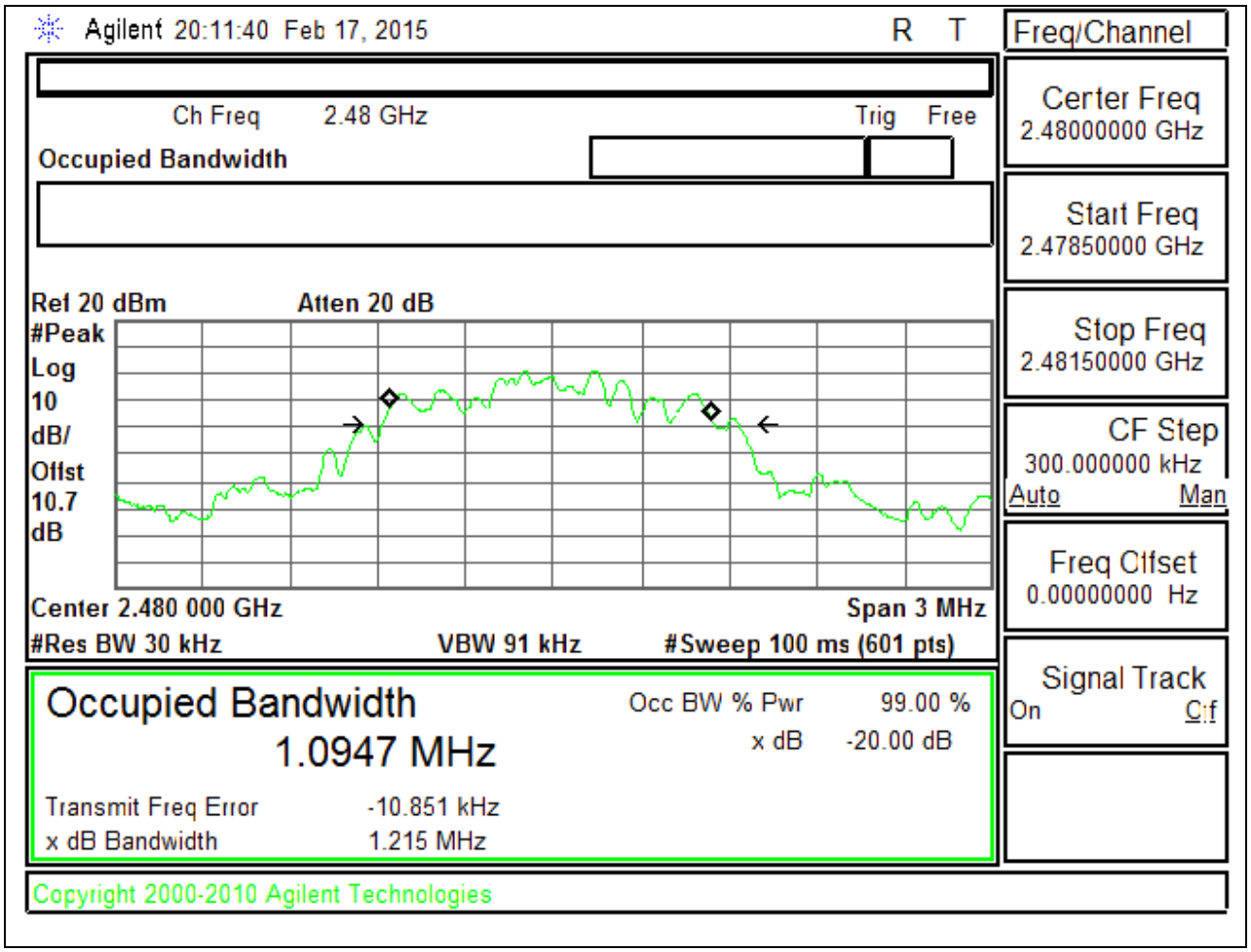
HIGH CHANNEL



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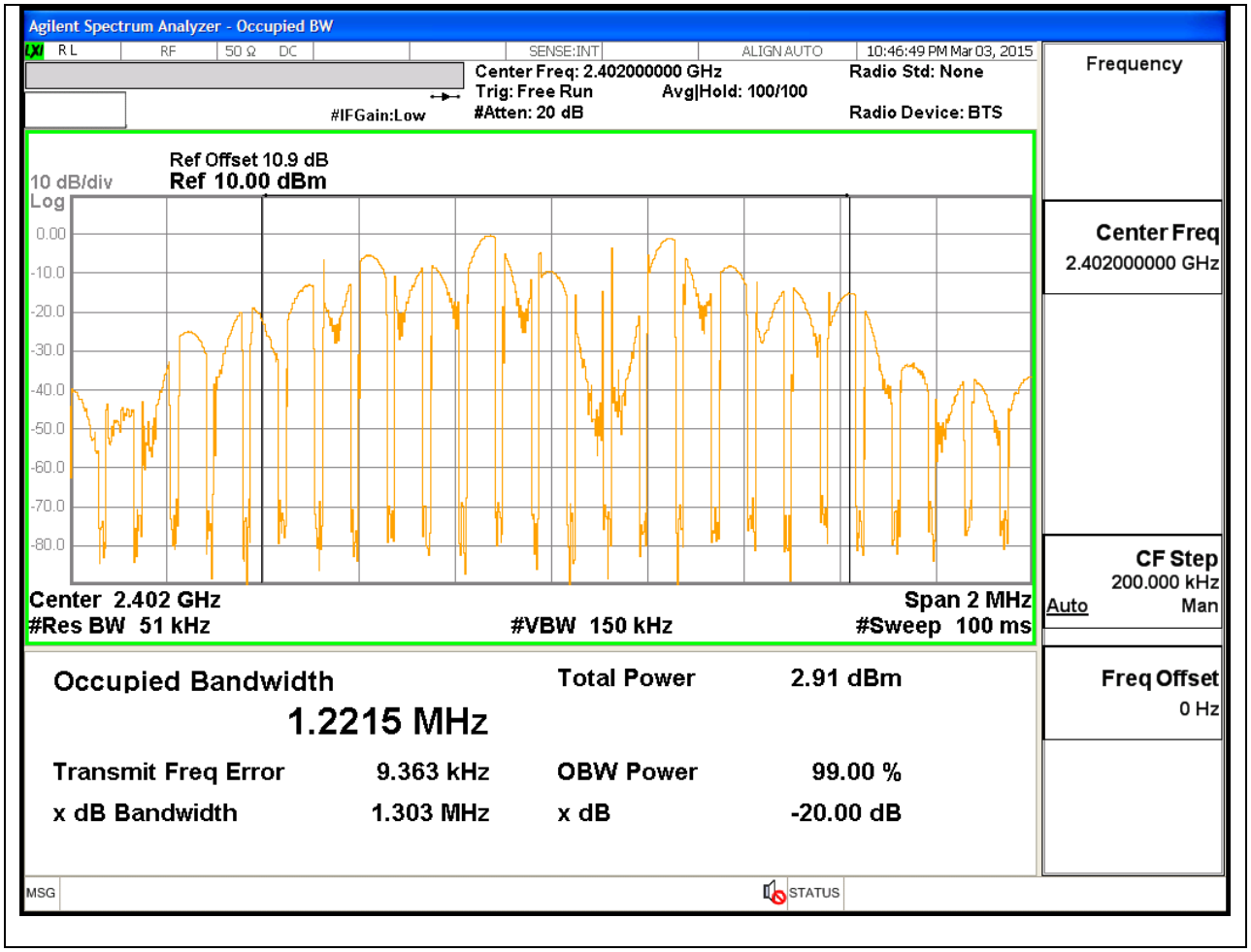
8PSK 99% BANDWIDTH

LOW CHANNEL



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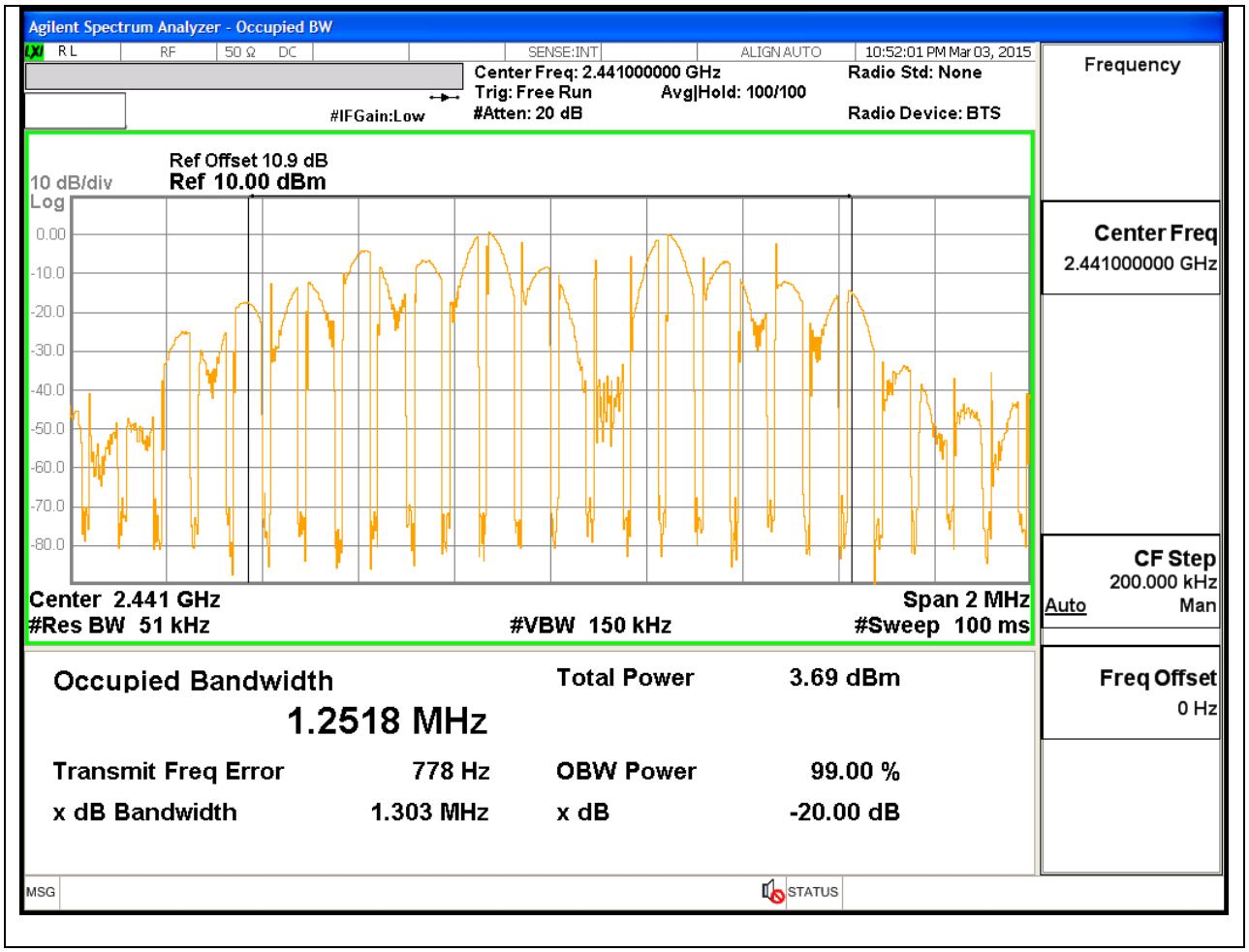
MID CHANNEL



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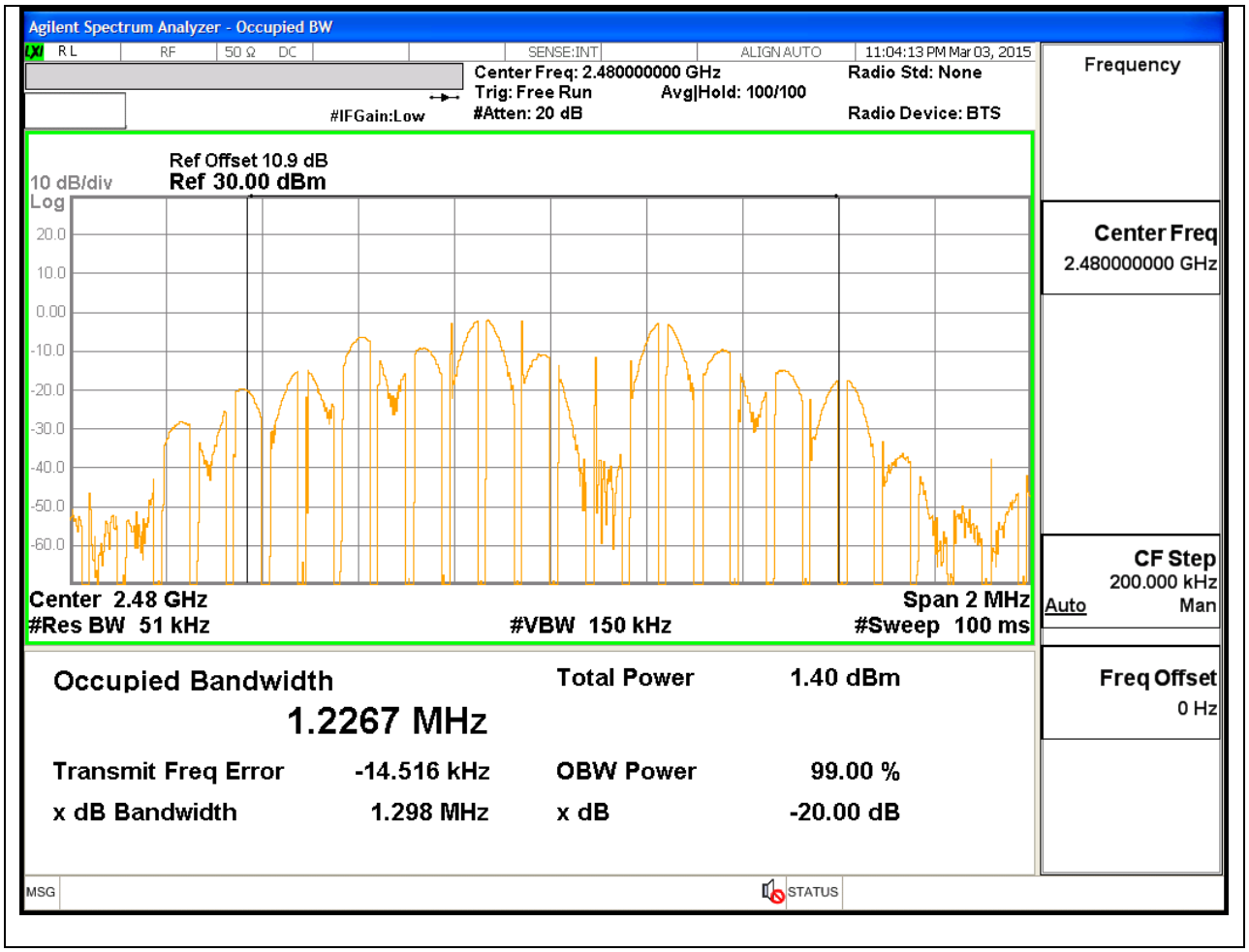
HIGH CHANNEL



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8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping 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

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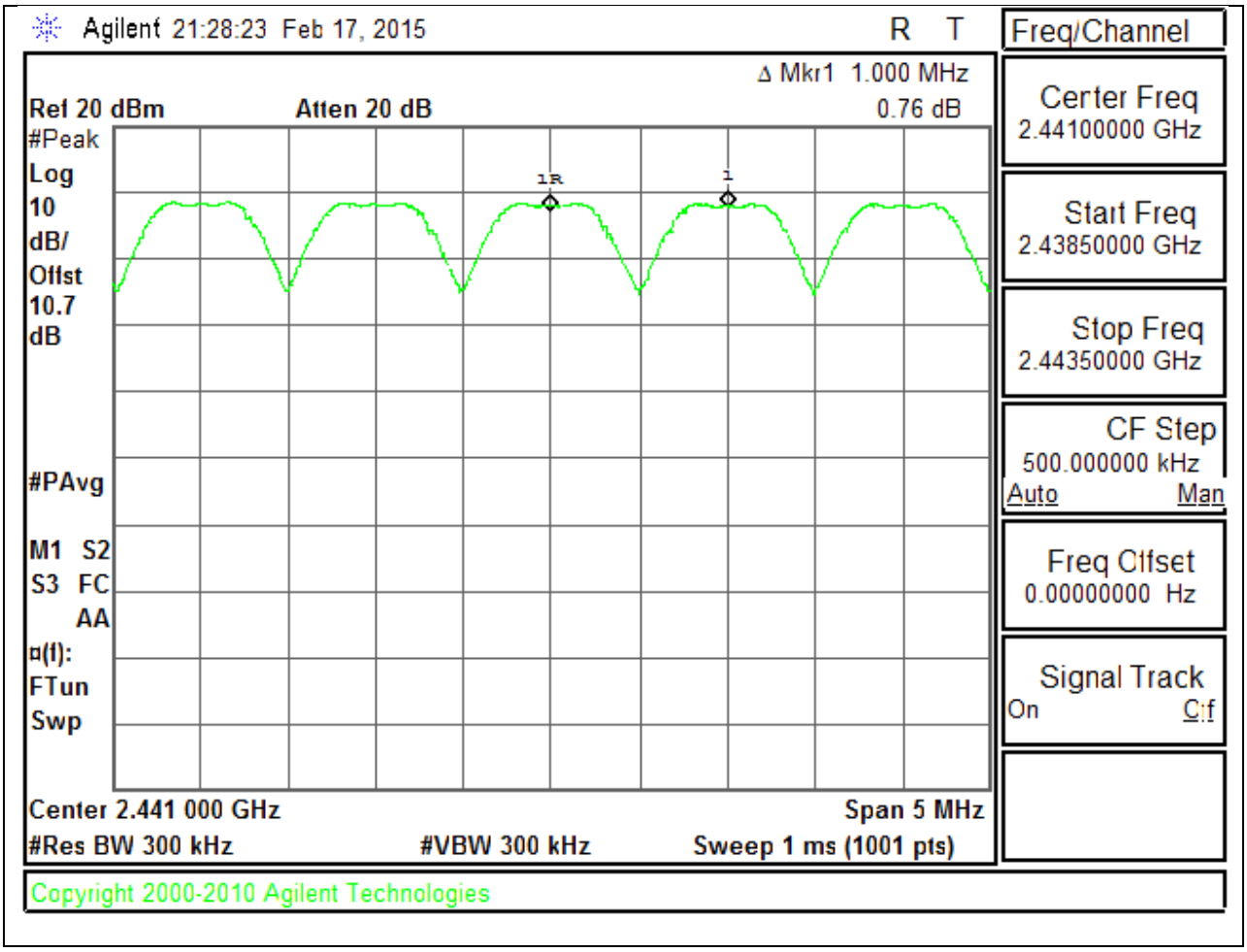
HOPPING FREQUENCY SEPARATION PLOT



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8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

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.

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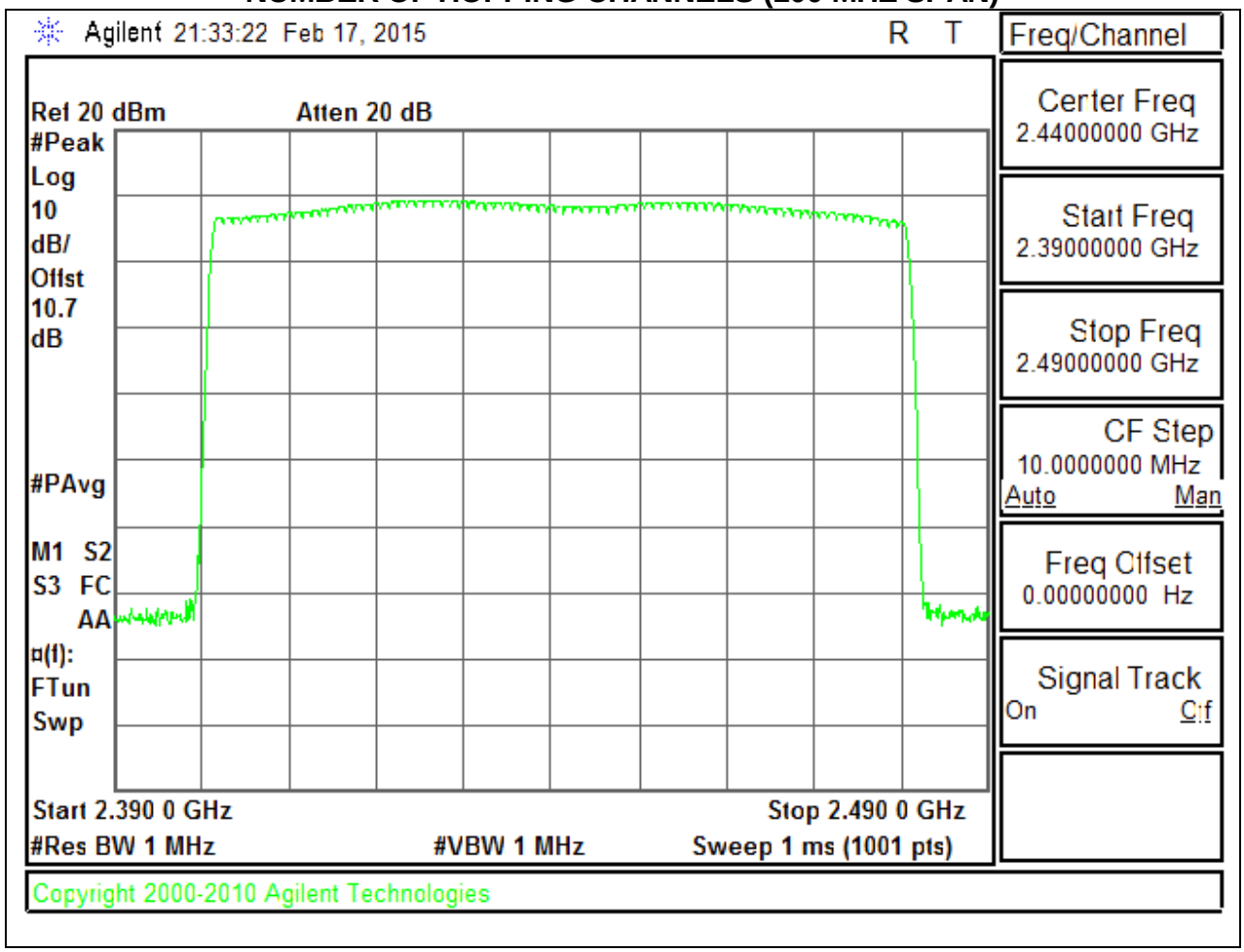
NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



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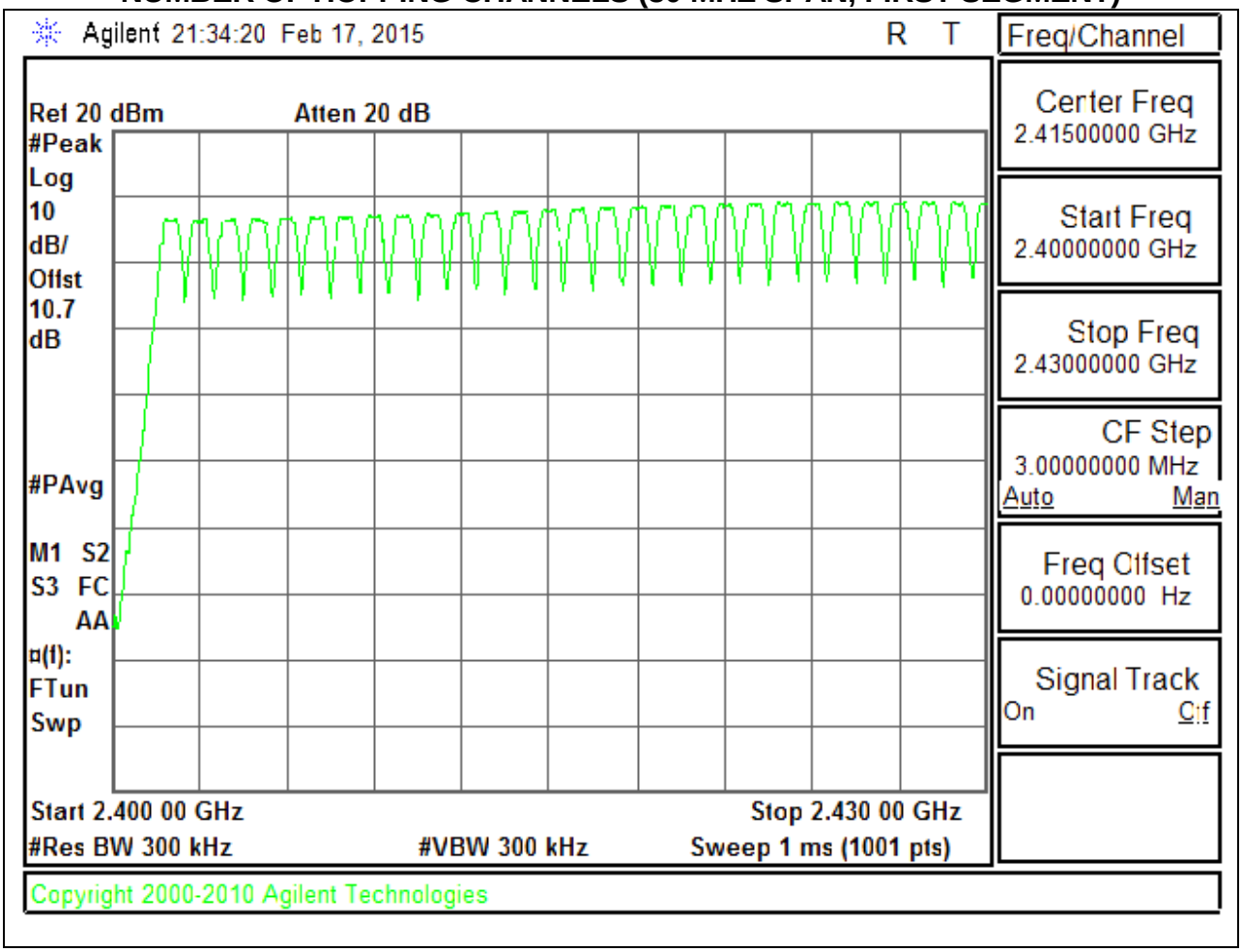
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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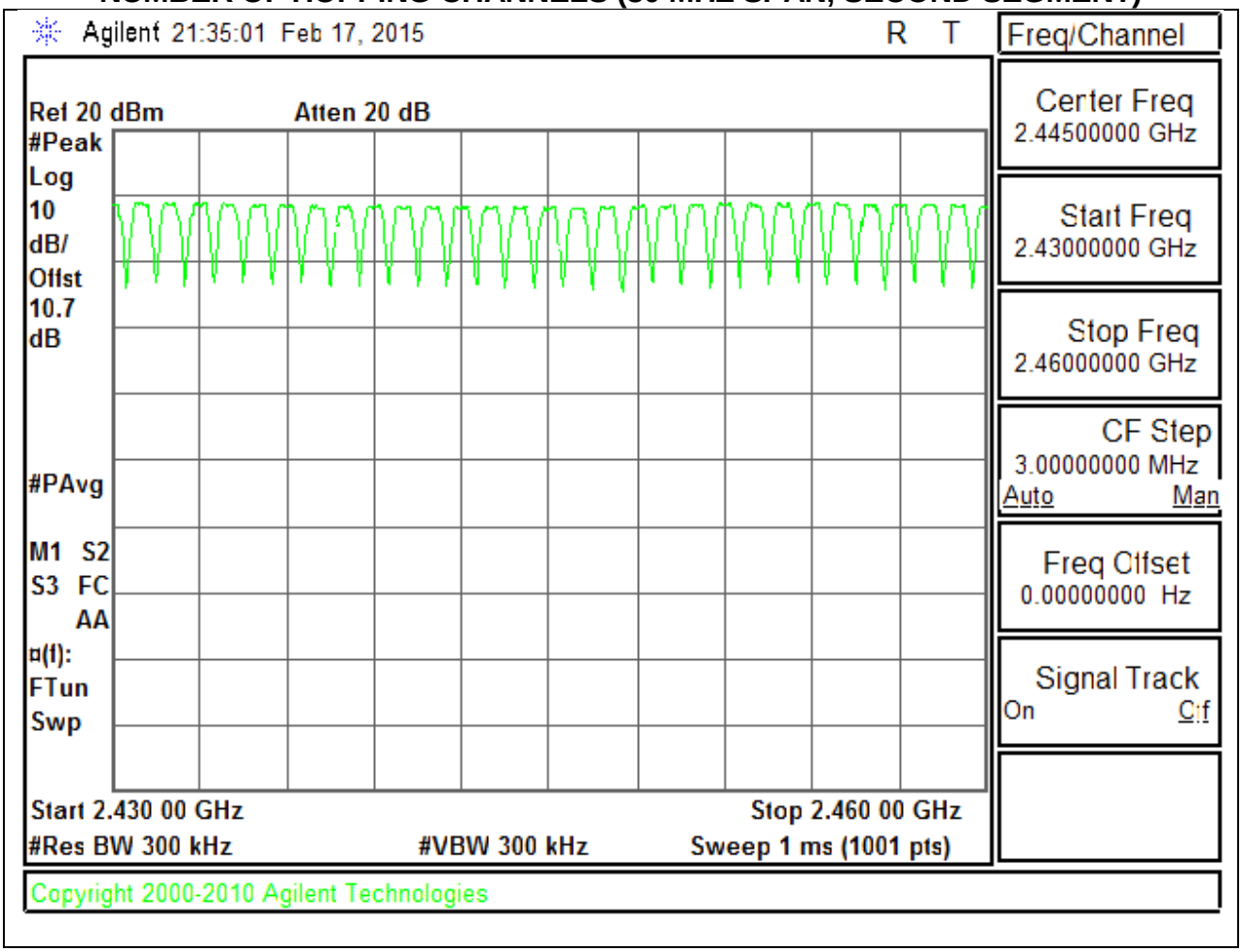
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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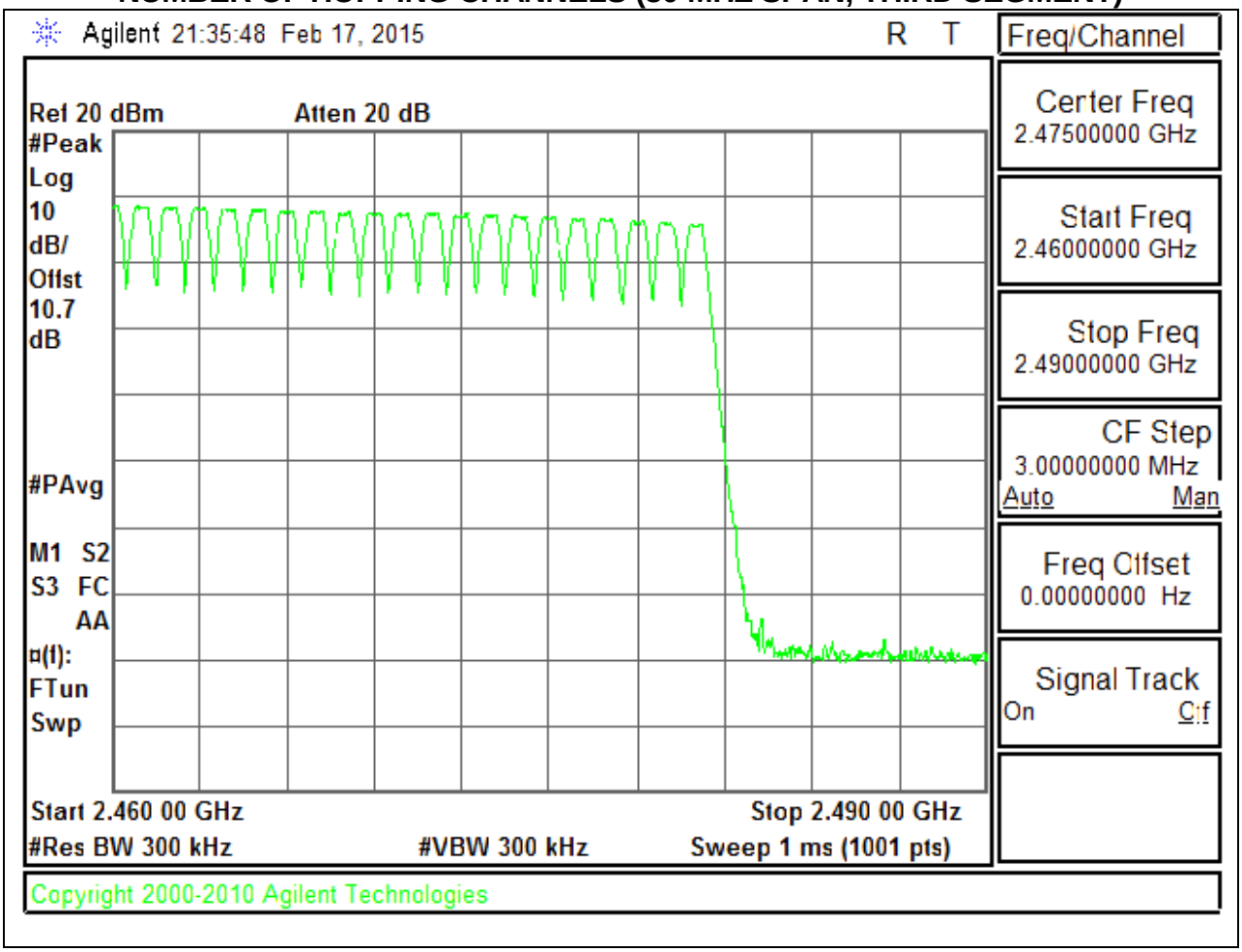
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

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

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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	0.38	30	0.114	0.4	-0.286
DH3	1.63	16	0.2608	0.4	-0.1392
DH5	2.89	12	0.3468	0.4	-0.0532
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	7.5	0.0285	0.4	-0.3715
DH3	1.63	4	0.0652	0.4	-0.3348
DH5	2.89	3	0.0867	0.4	-0.3133

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PULSE WIDTH - DH1

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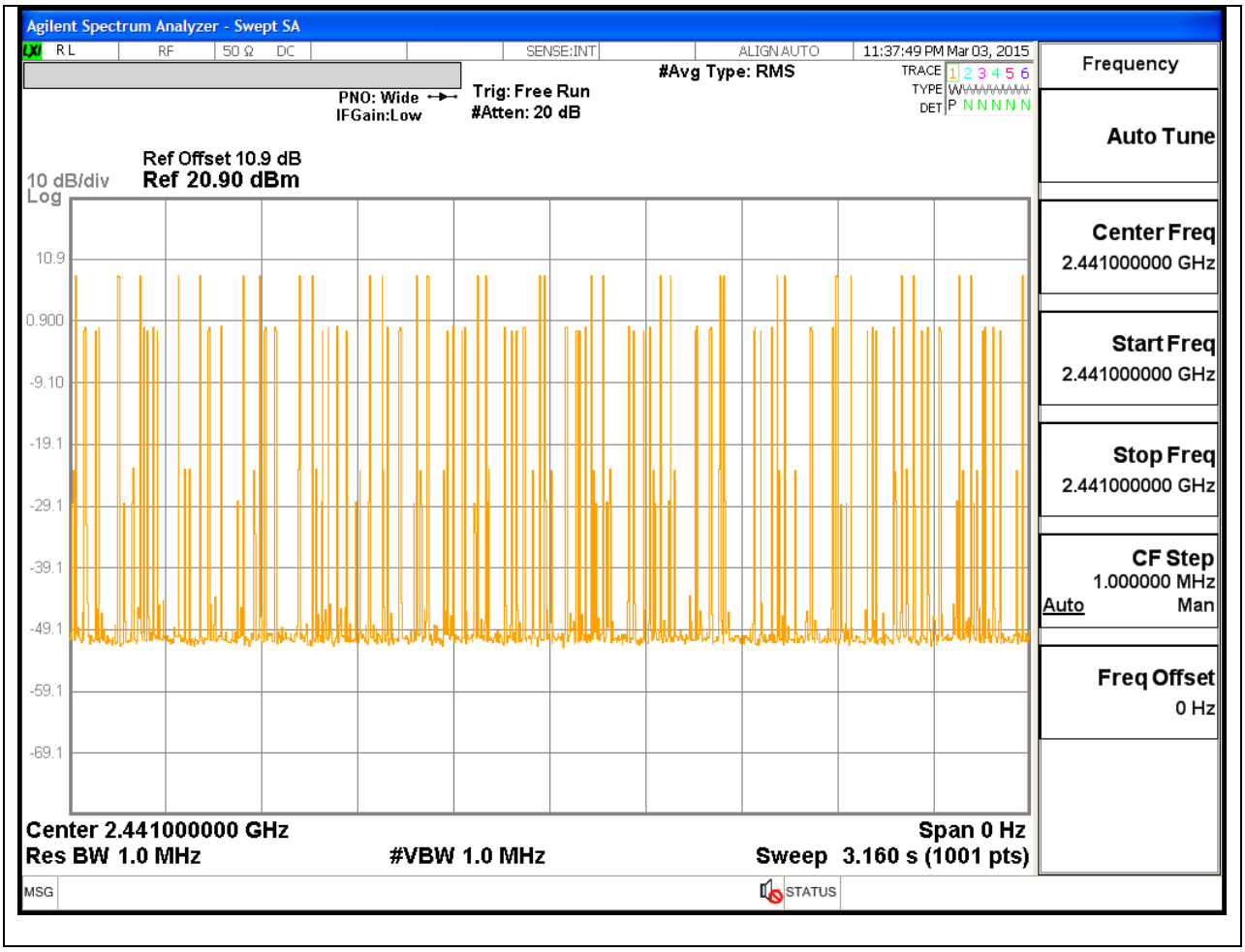
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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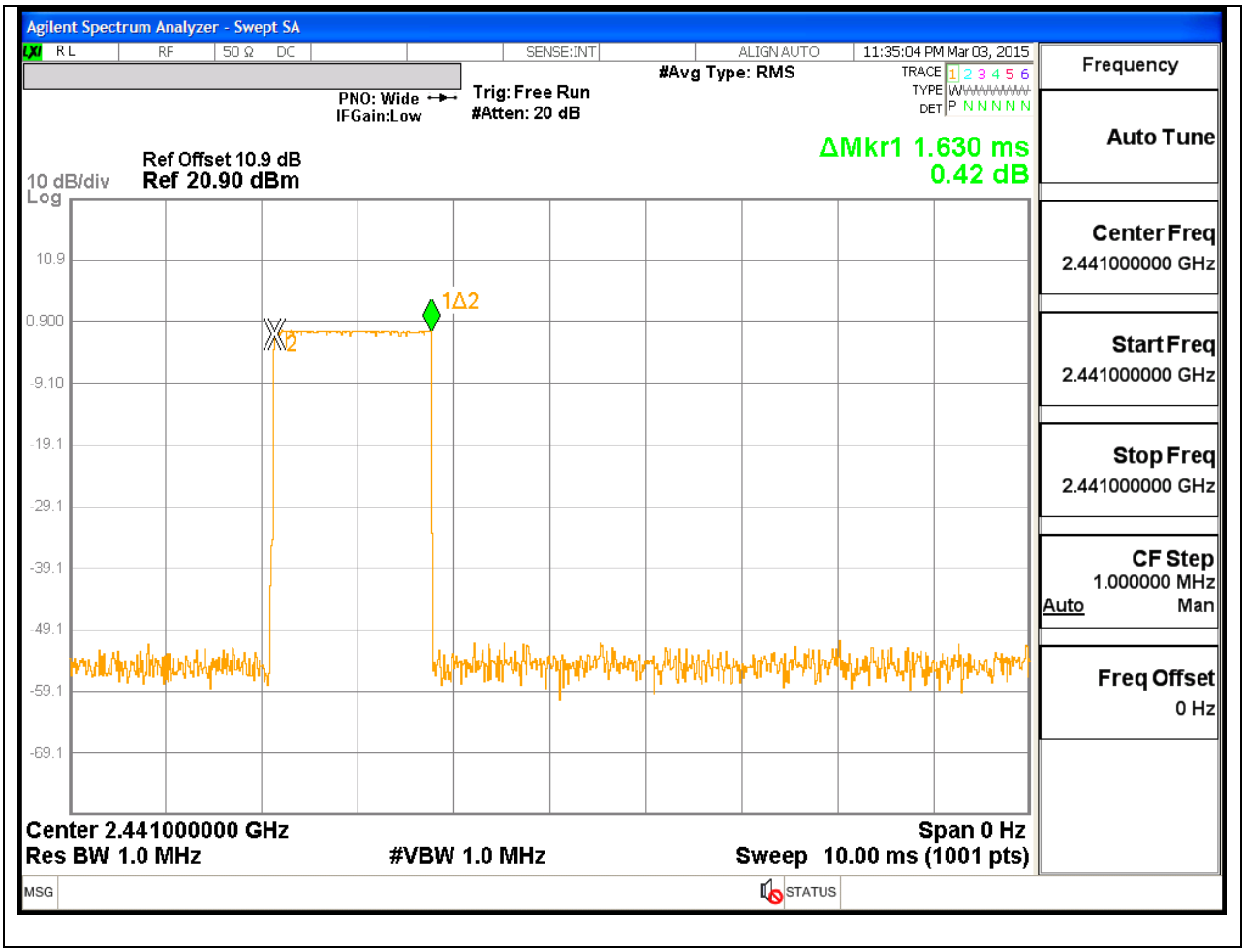
PULSE WIDTH - DH3



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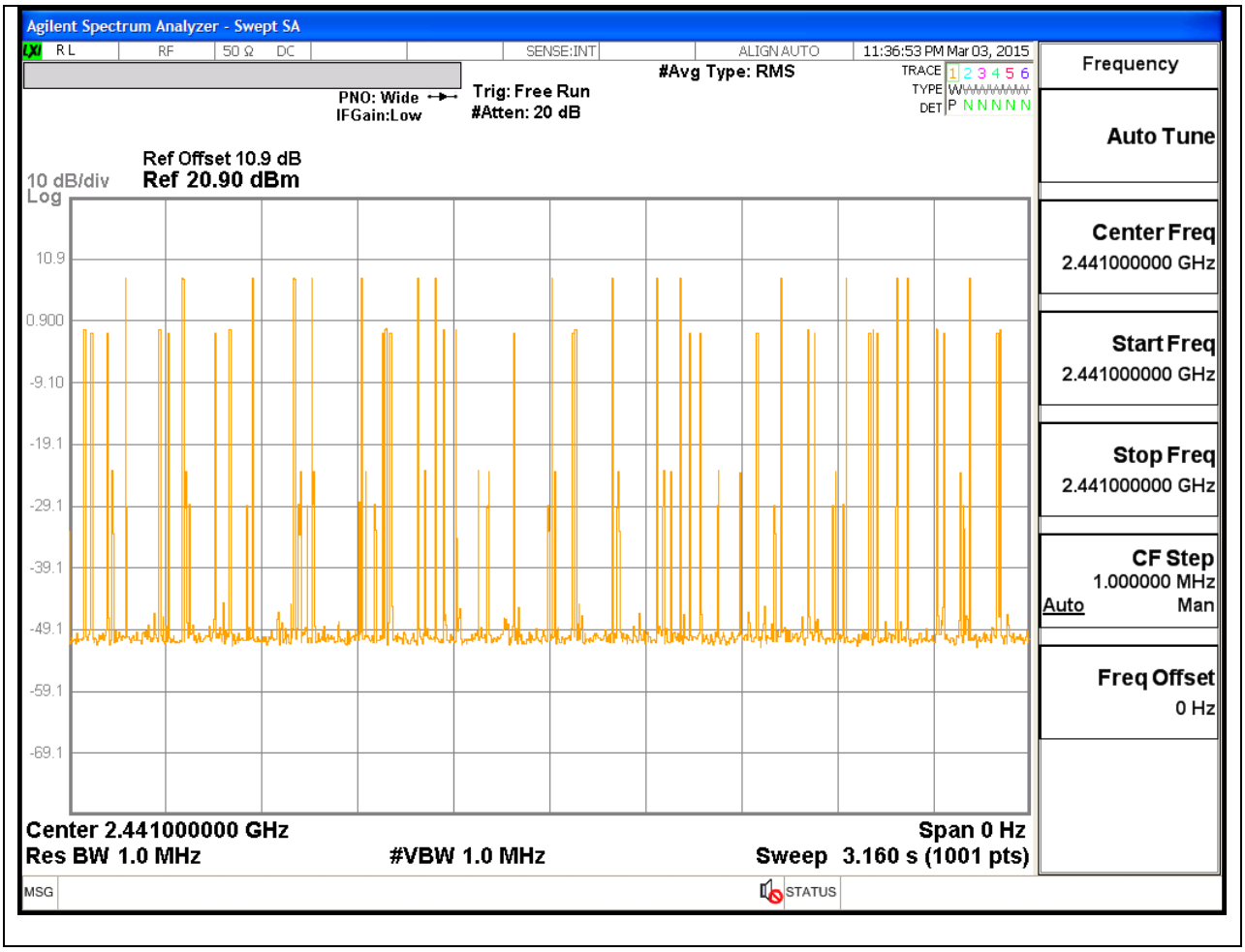
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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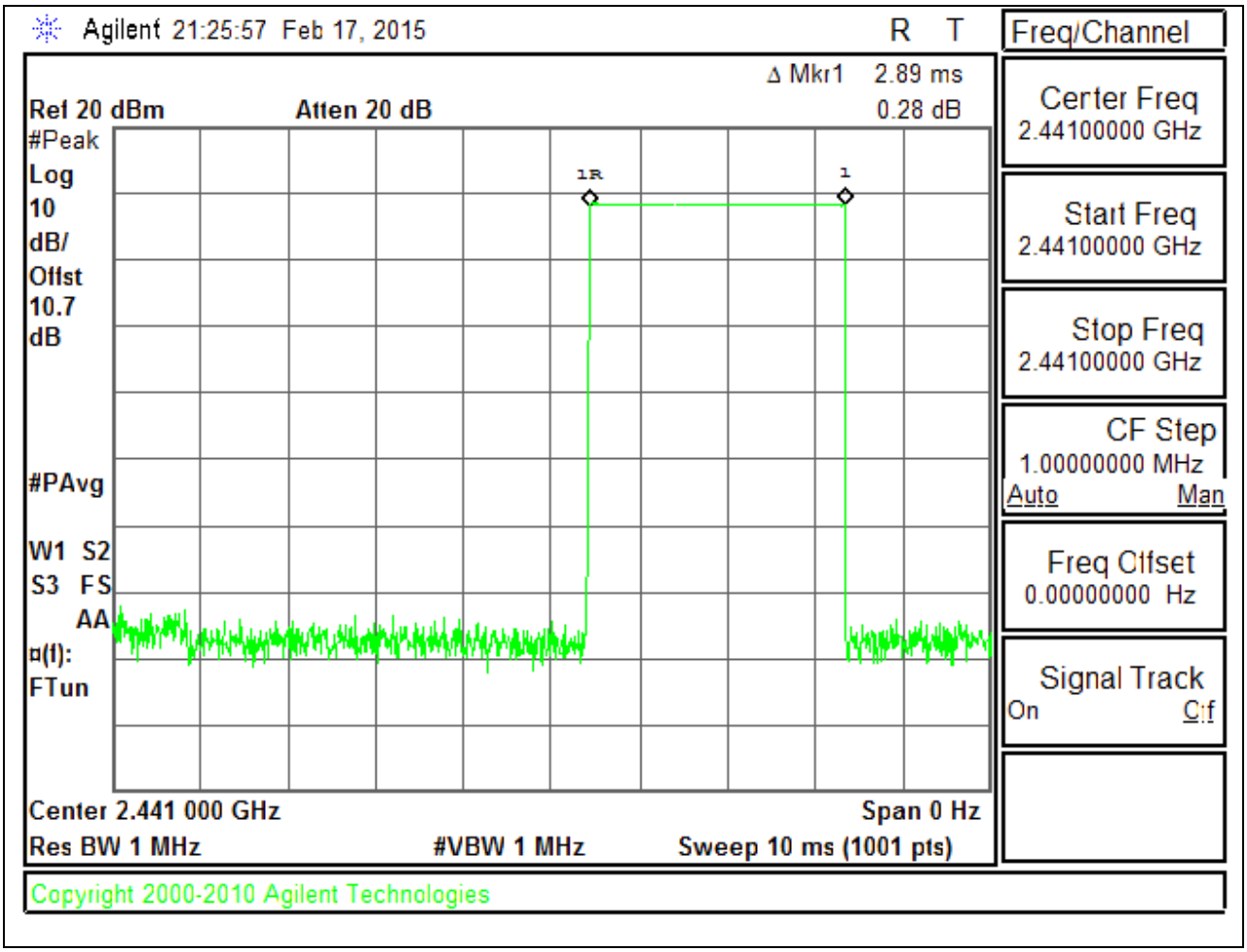
PULSE WIDTH - DH5



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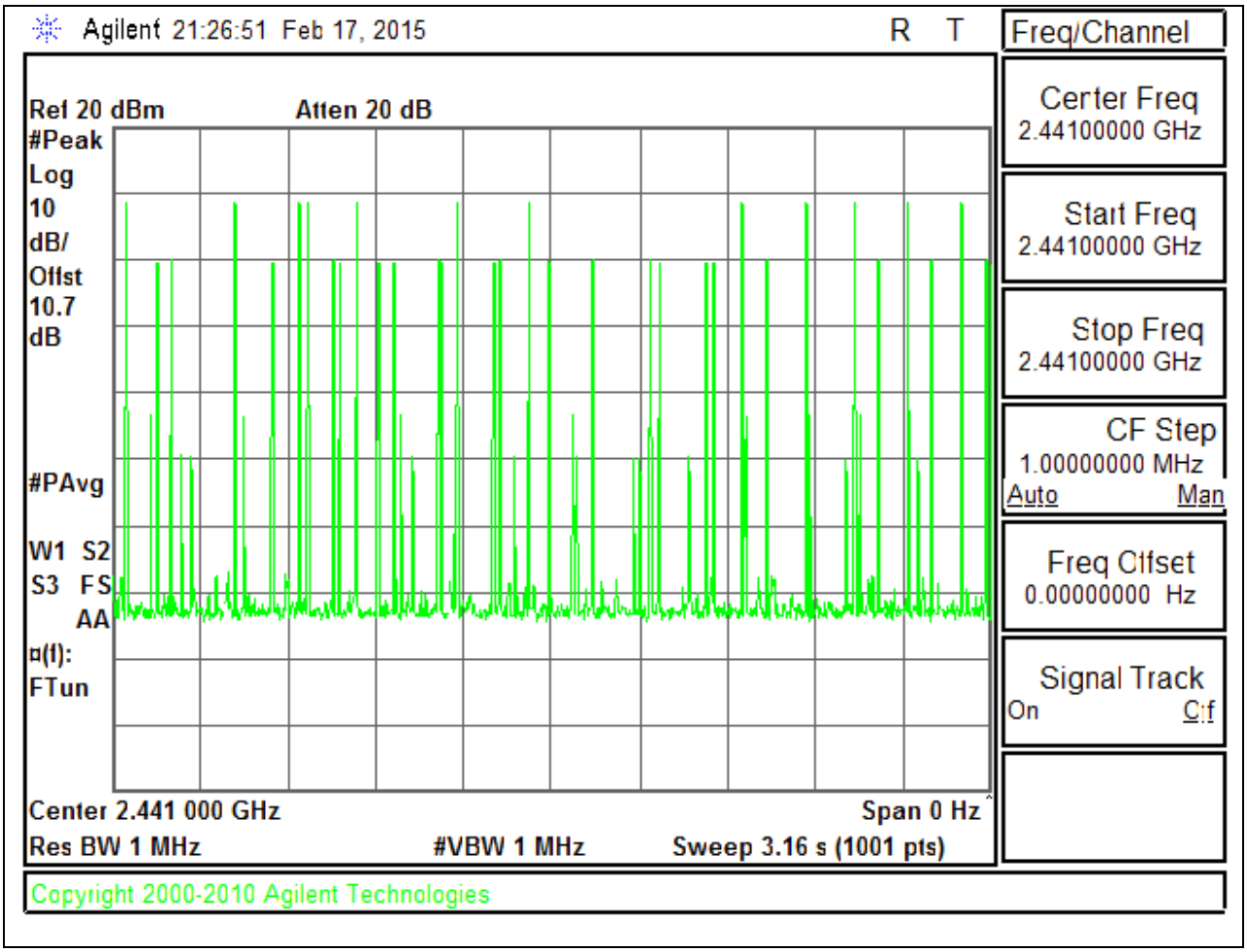
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

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8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.65	21	-14.35
Middle	2441	8.61	21	-12.39
High	2480	6.12	21	-14.88
Worst		8.61		-12.39

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.53	21	-14.47
Middle	2441	7.62	21	-13.38
High	2480	5.08	21	-15.92
Worst		7.62		-13.38

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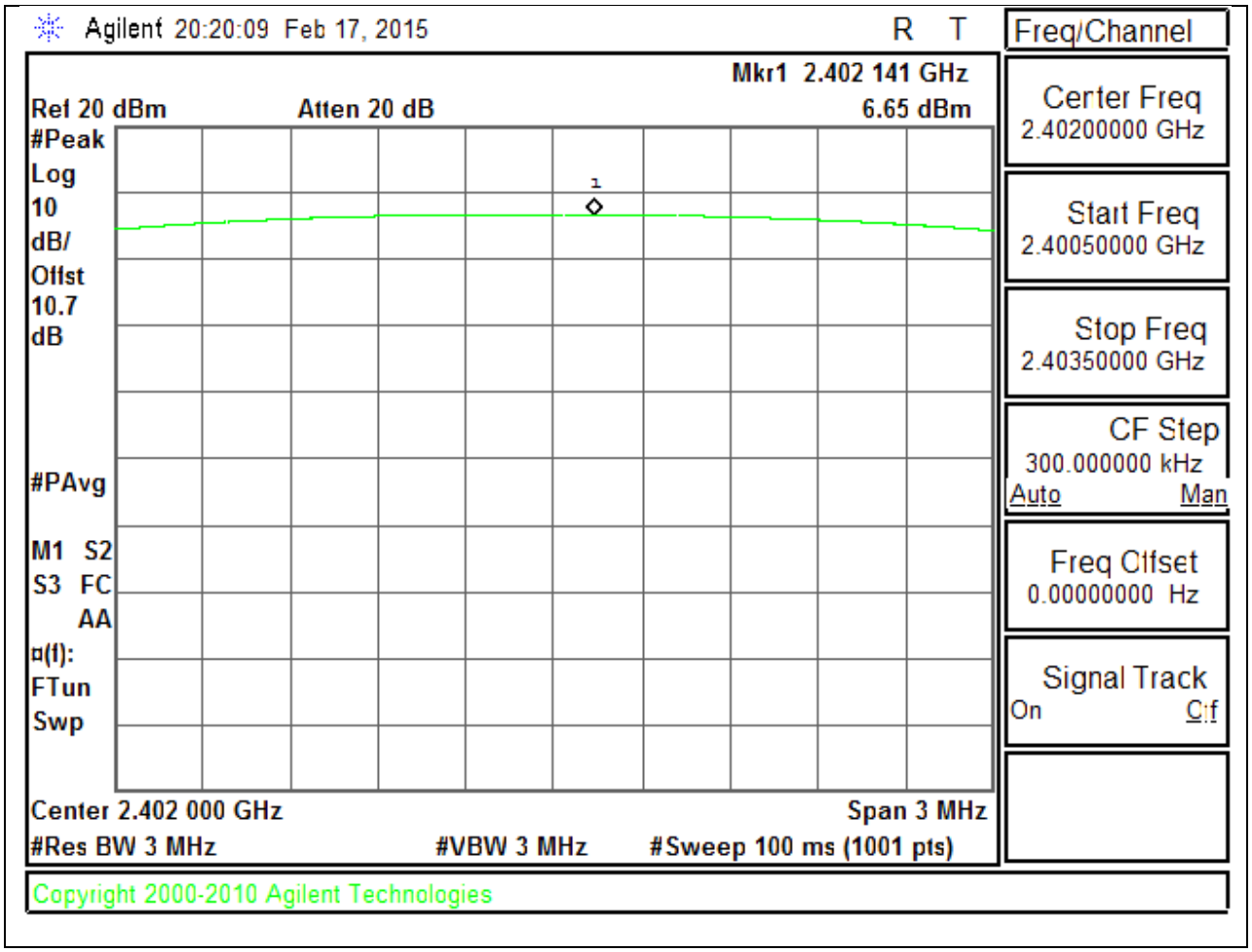
8.5.3. OUTPUT POWER PLOTS

GFSK OUTPUT POWER

LOW CHANNEL



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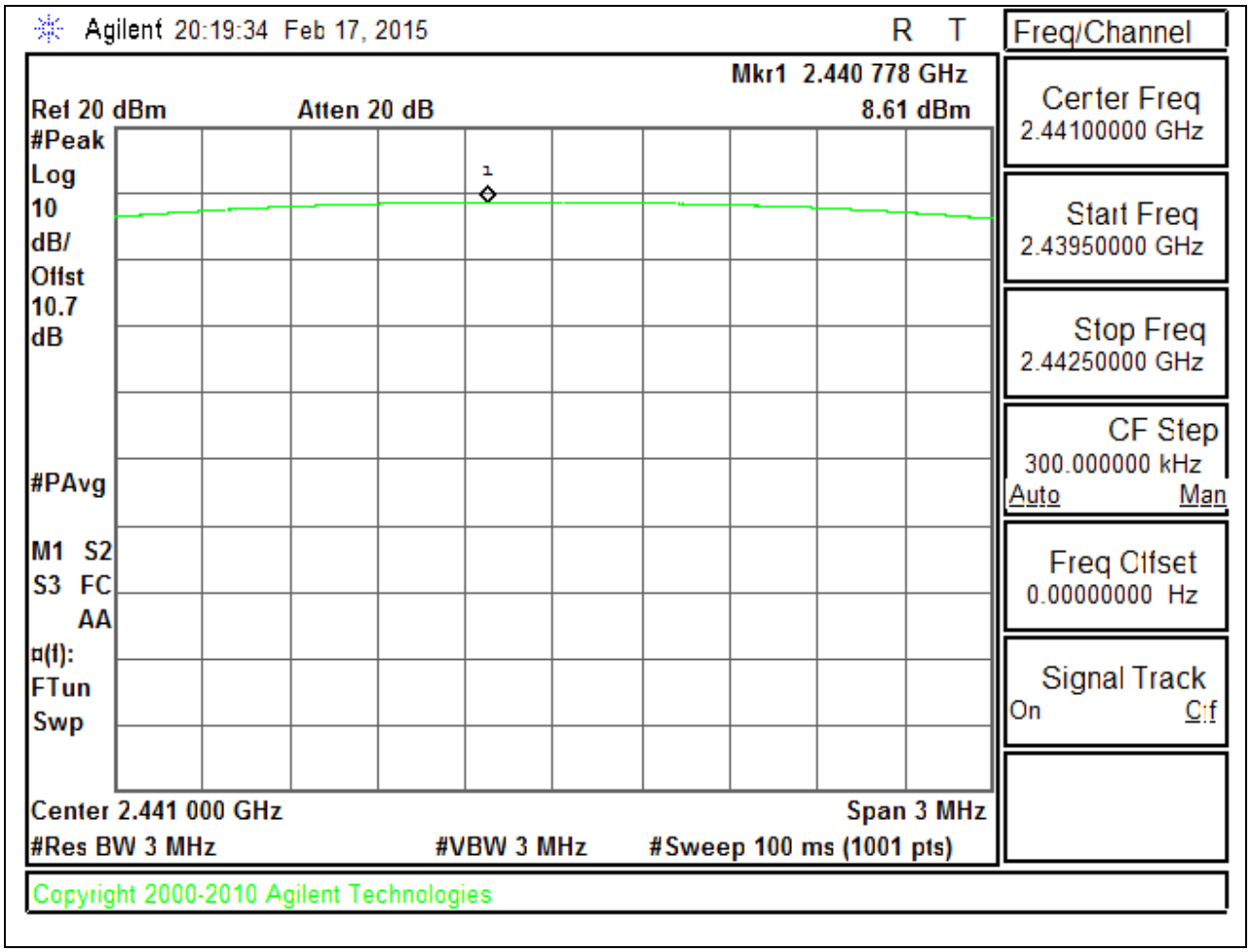
MID CHANNEL



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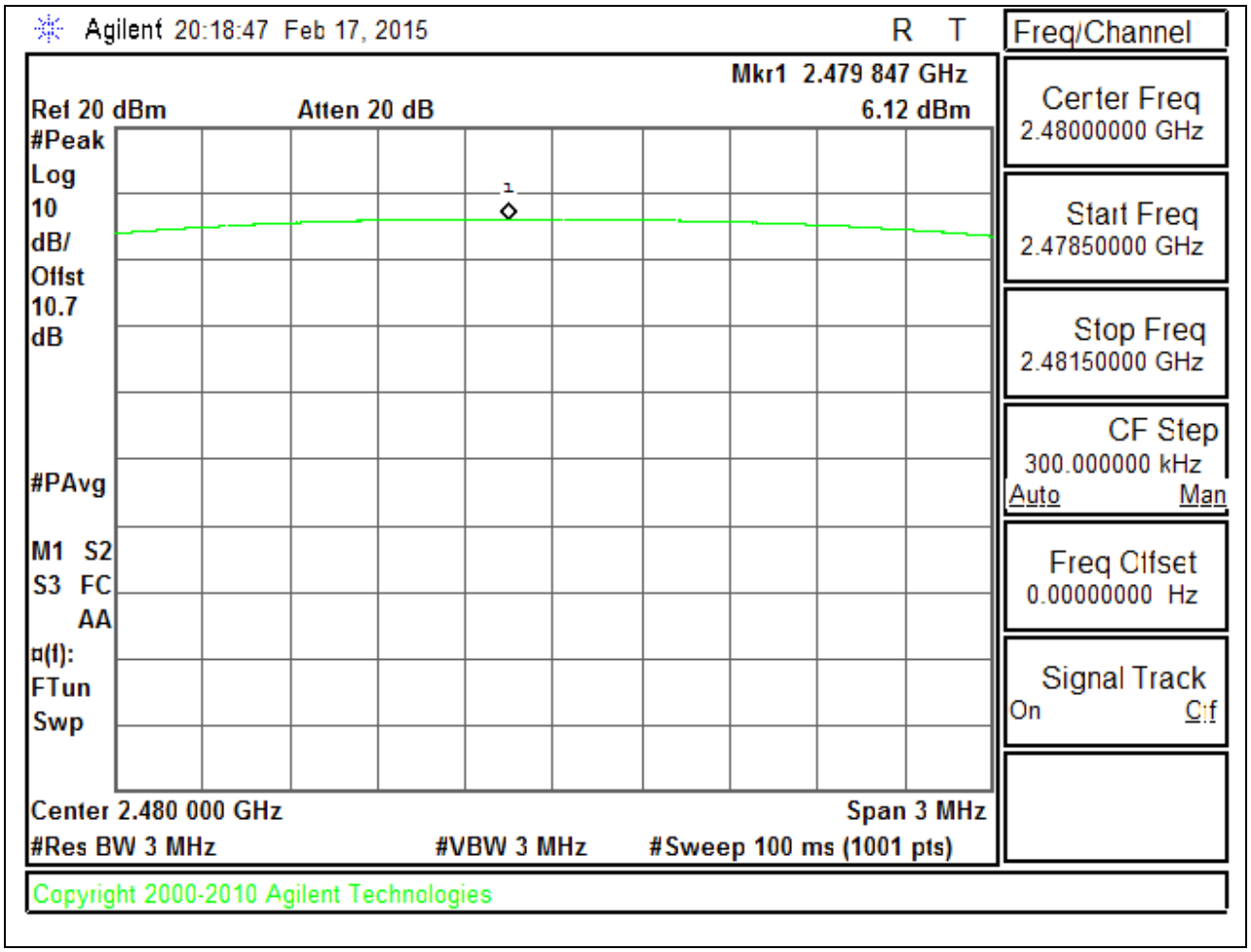
HIGH CHANNEL



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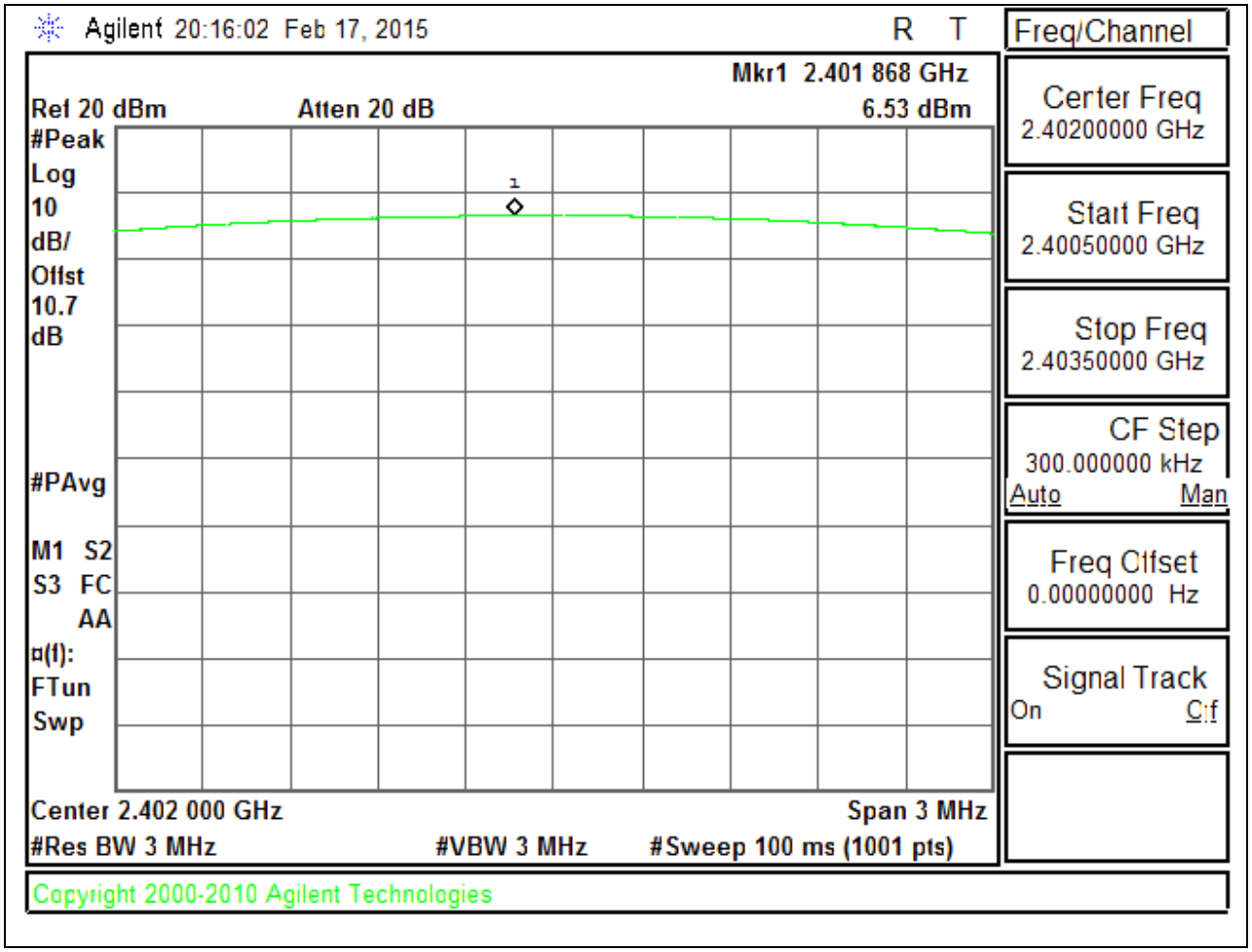
8PSK OUTPUT POWER

LOW CHANNEL



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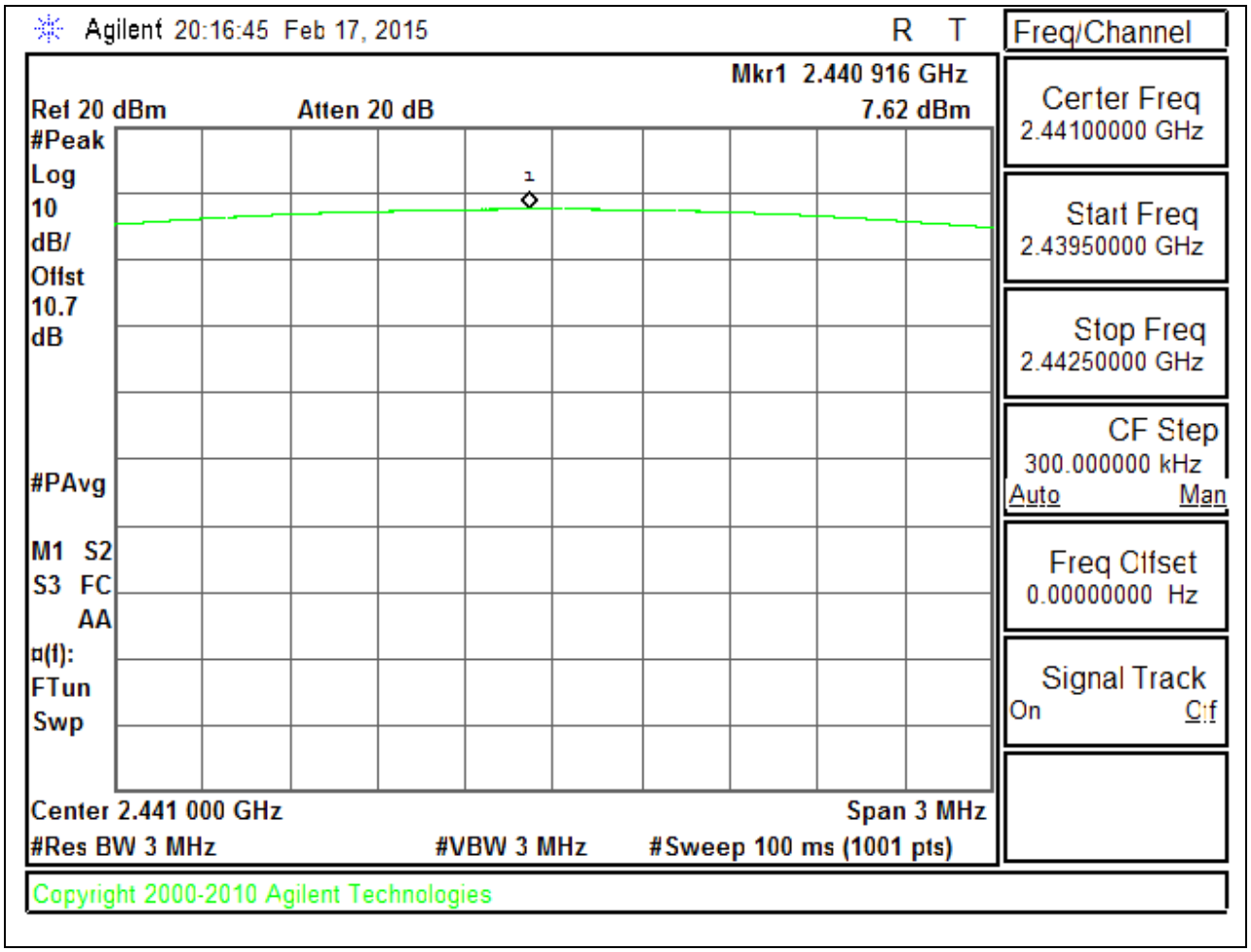
MID CHANNEL



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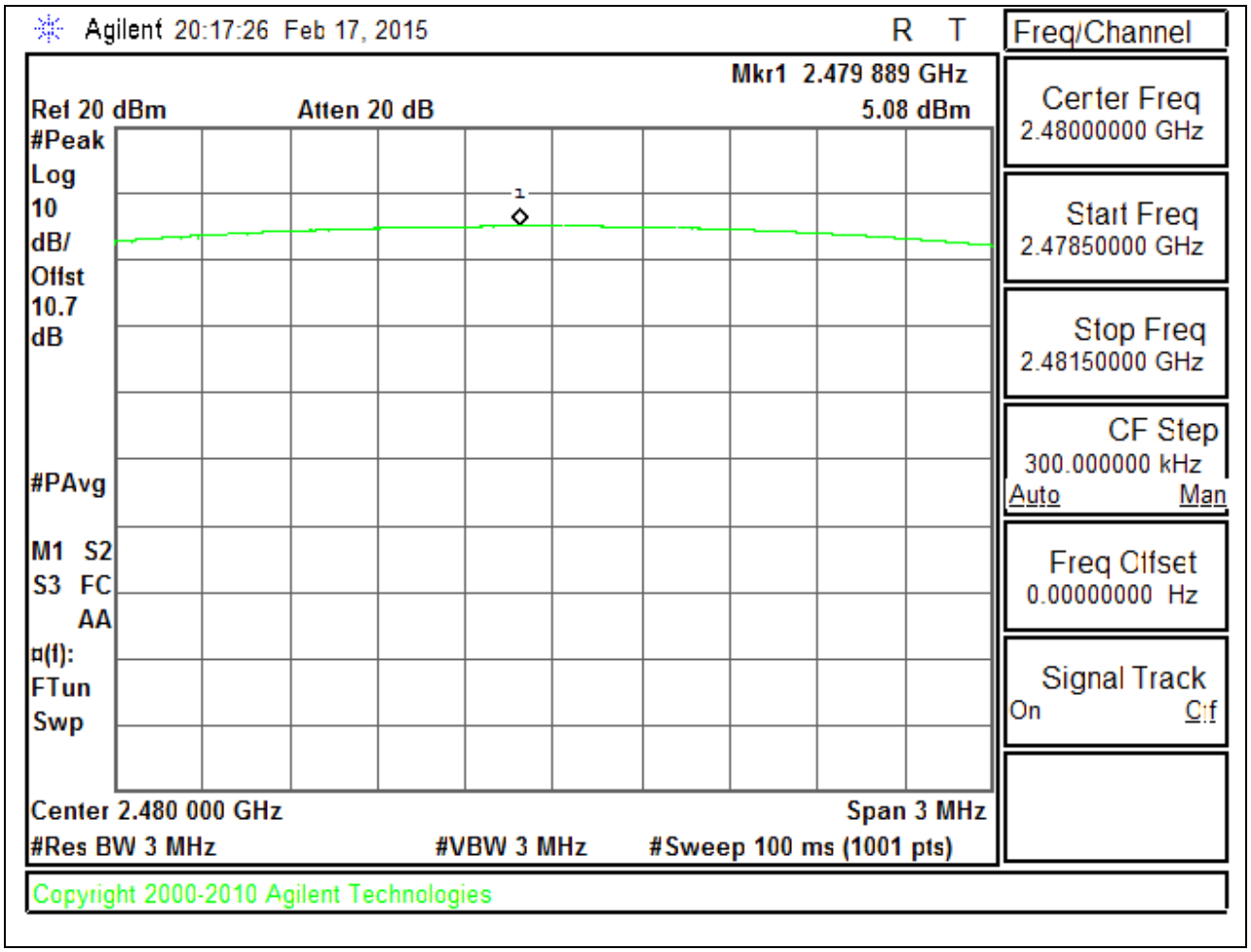
HIGH CHANNEL



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8.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

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.

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8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.1
Middle	2441	8.3
High	2480	5.4
Worst		8.3

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	3.50
Middle	2441	5.40
High	2480	2.40
Worst		5.40

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	3.4
Middle	2441	5.4
High	2480	2.4
Worst		5.4

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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

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

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

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

RESULTS

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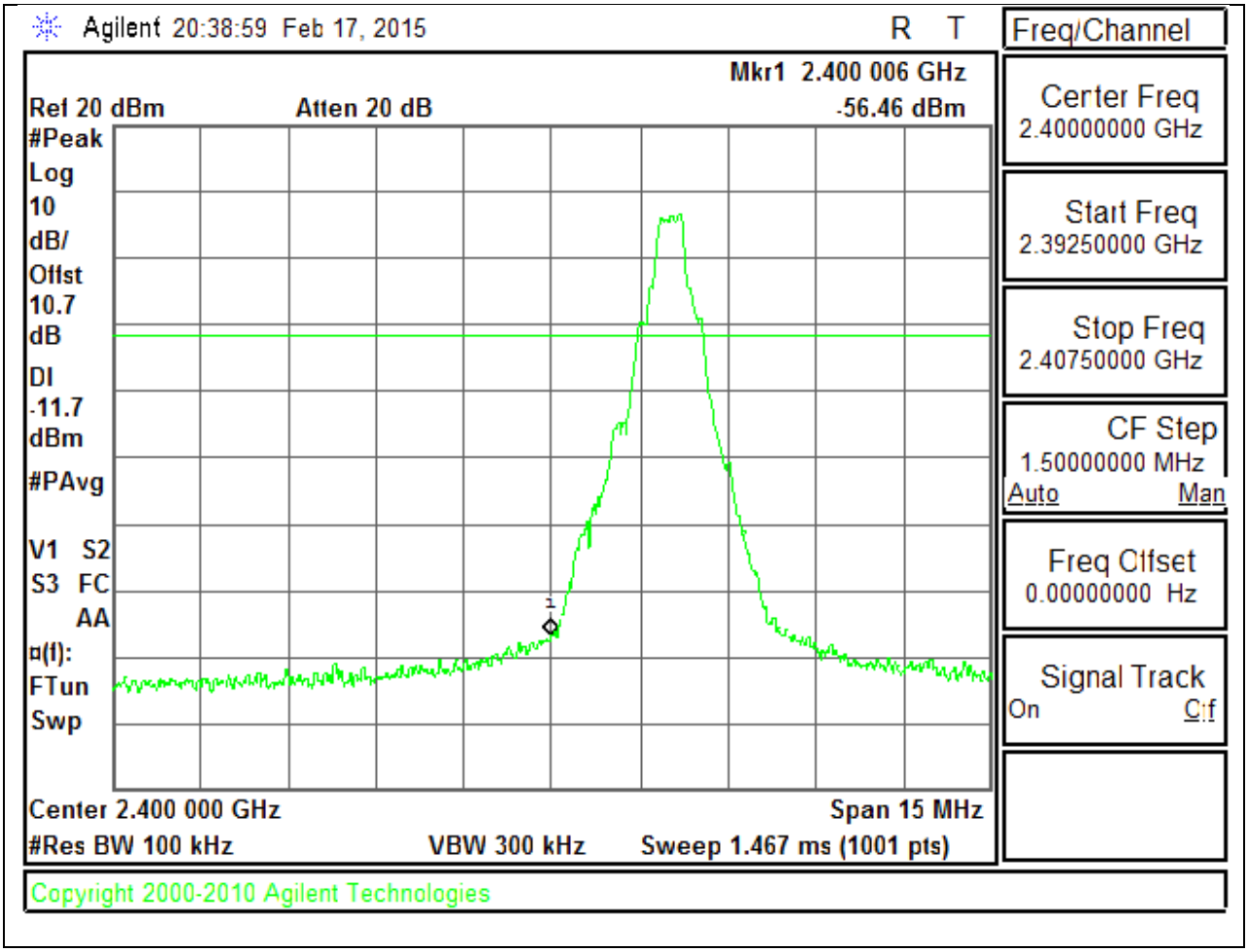
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



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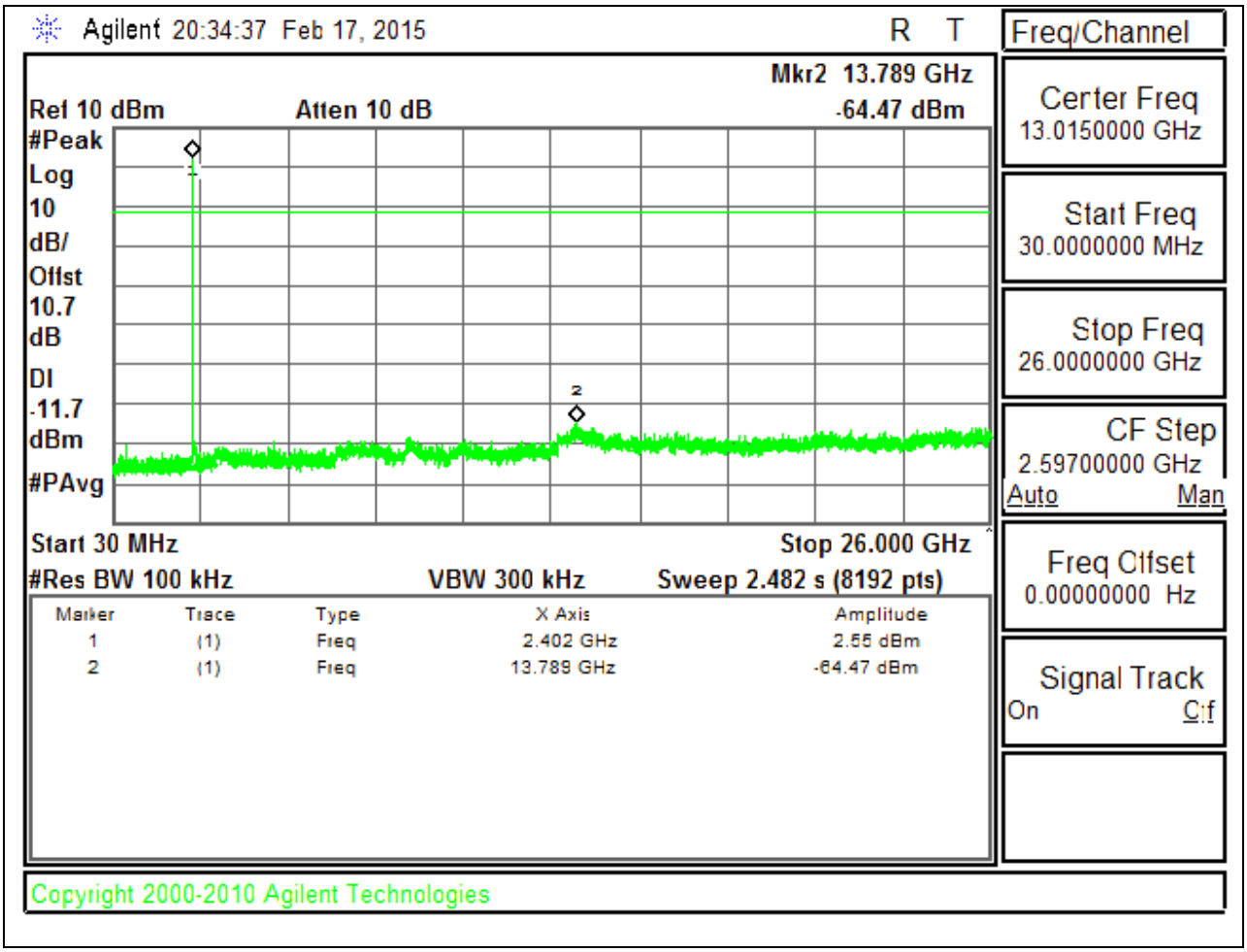
LOW CHANNEL SPURIOUS



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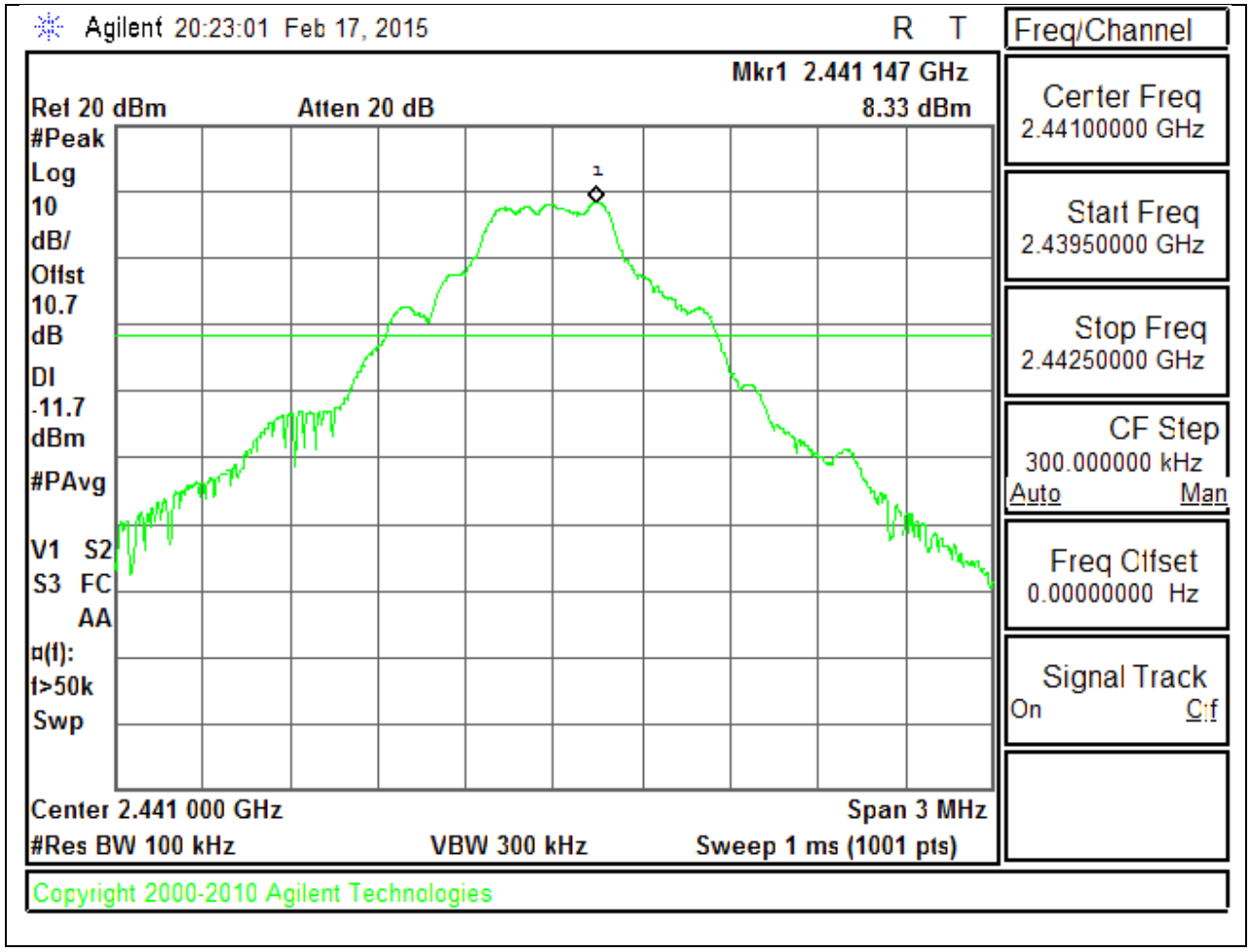
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



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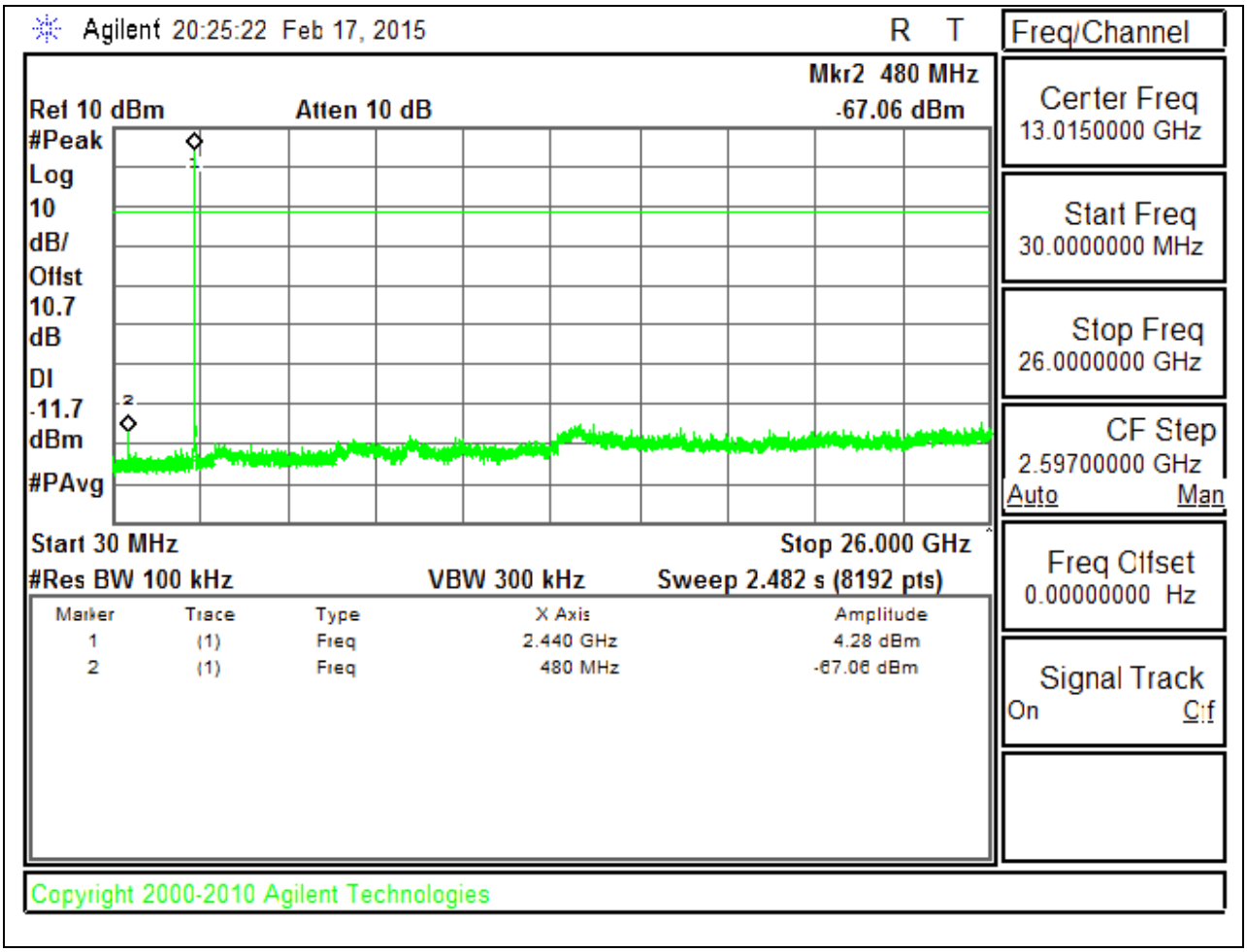
MID CHANNEL SPURIOUS



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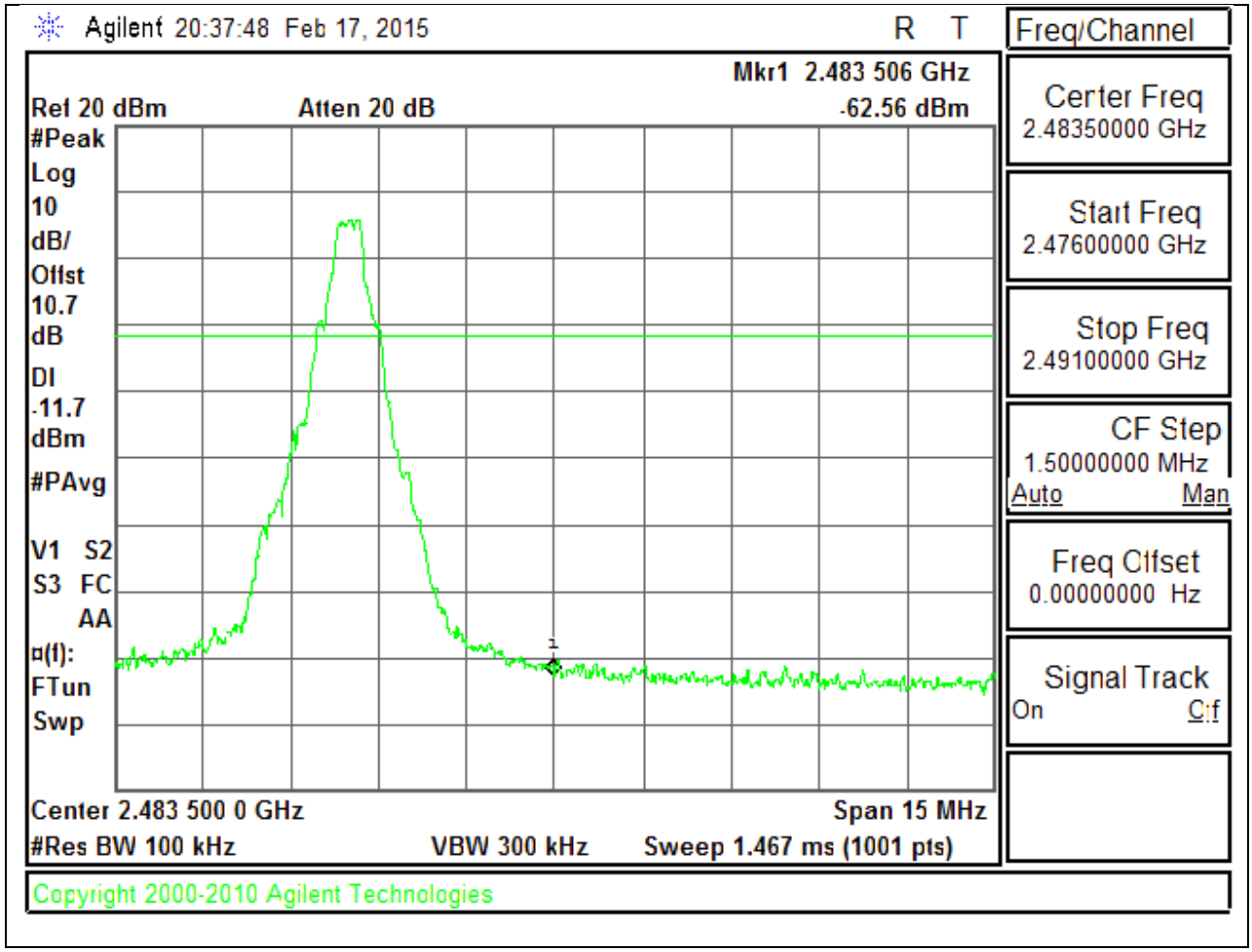
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



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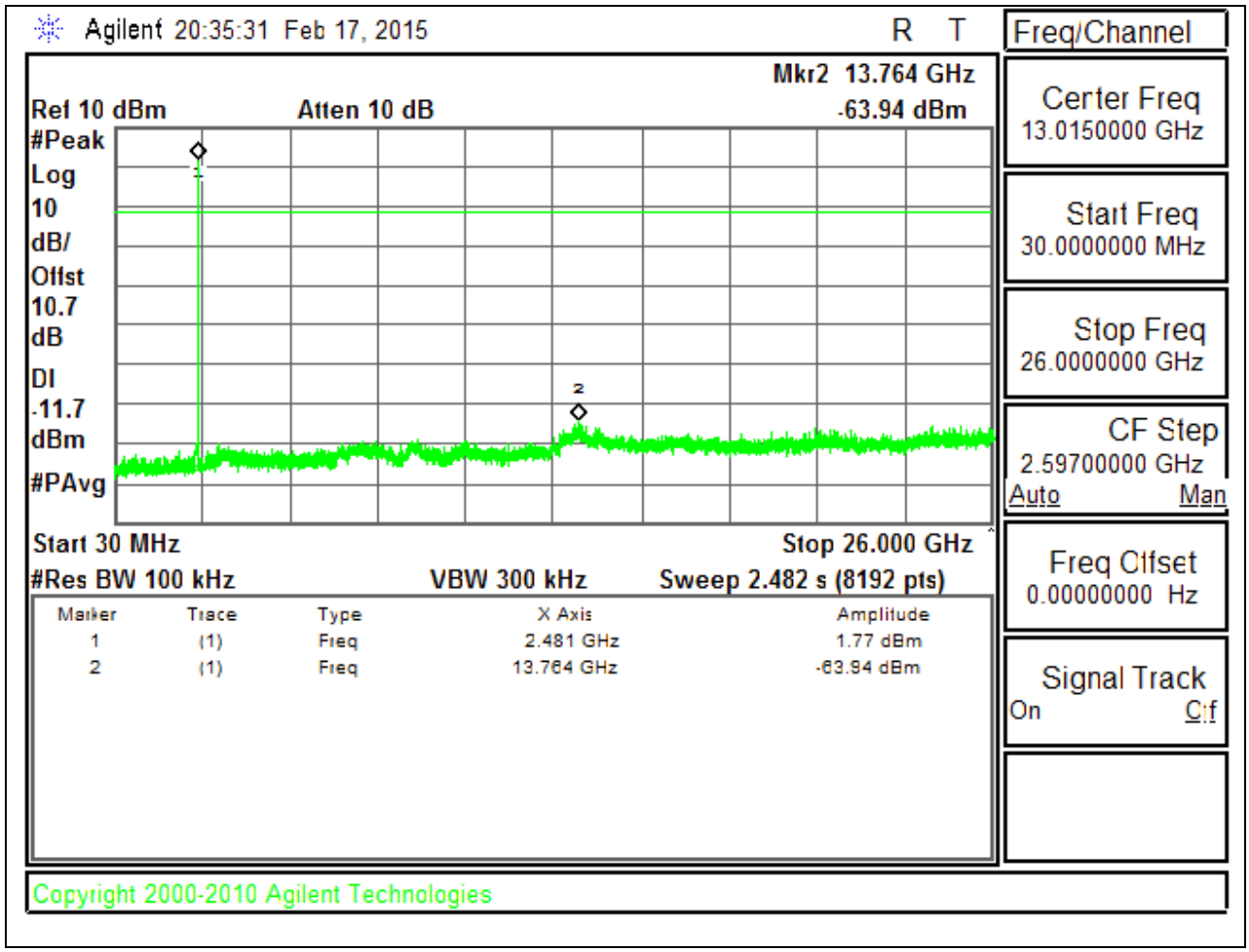
HIGH CHANNEL SPURIOUS



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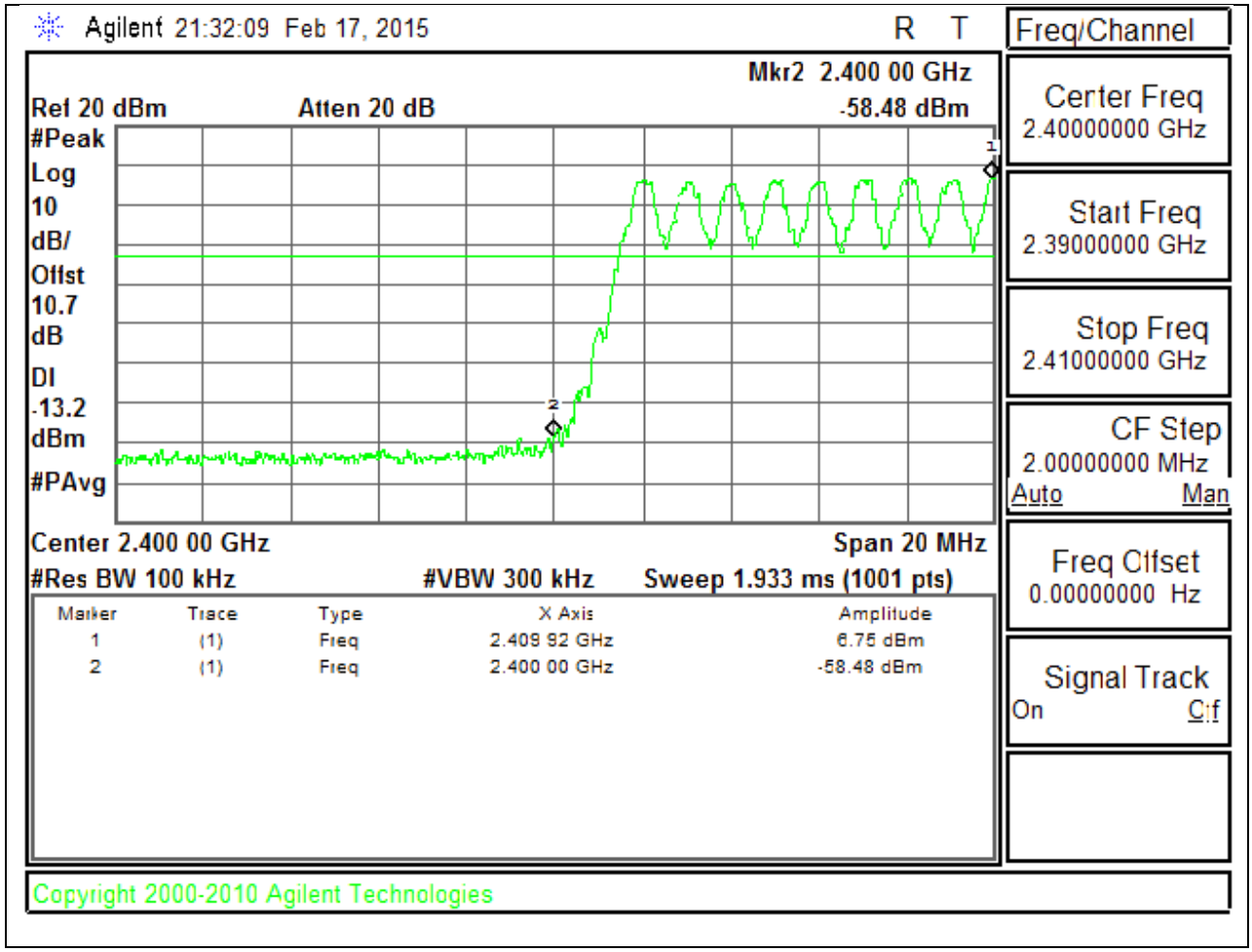
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



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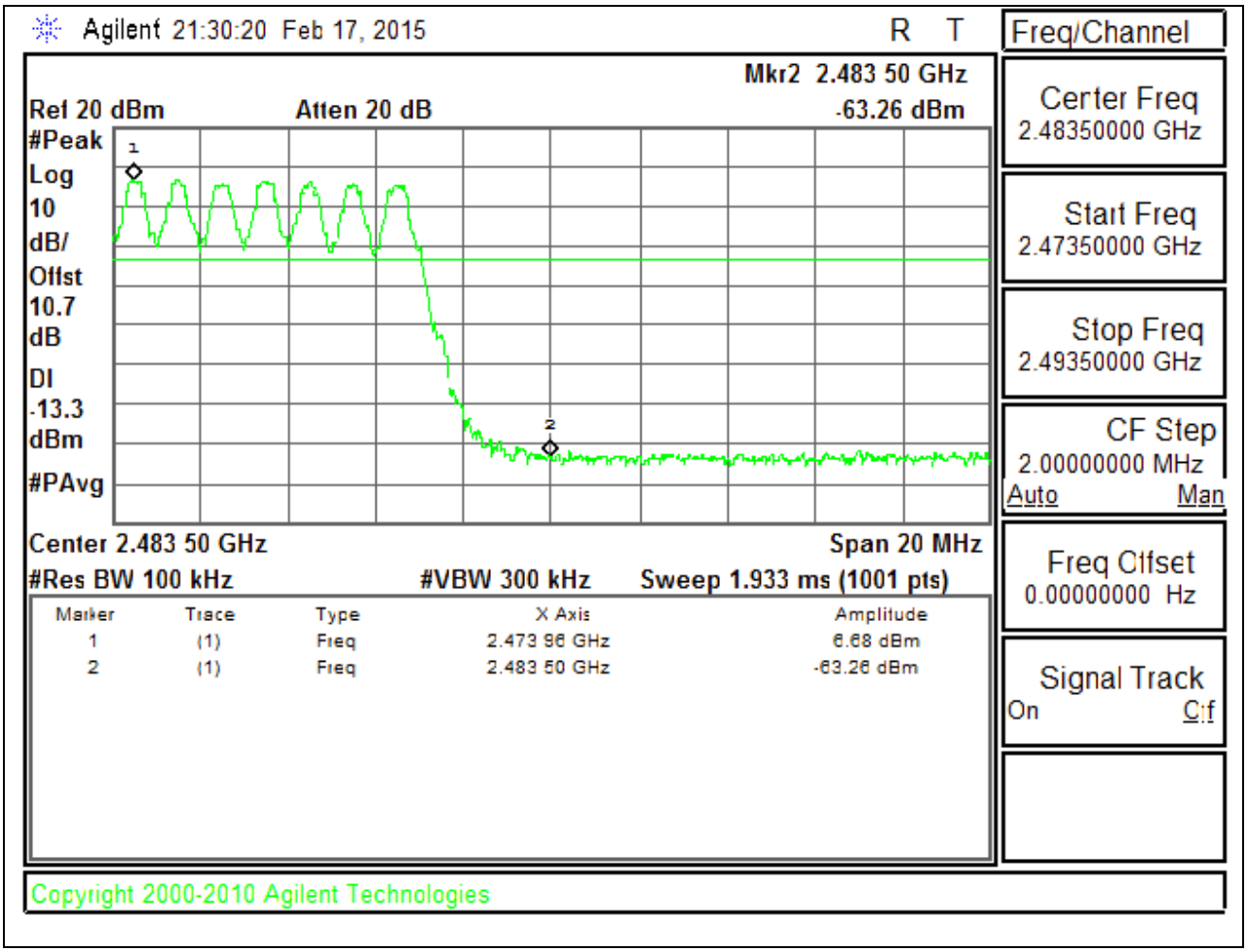
HIGH BANDEDGE WITH HOPPING ON



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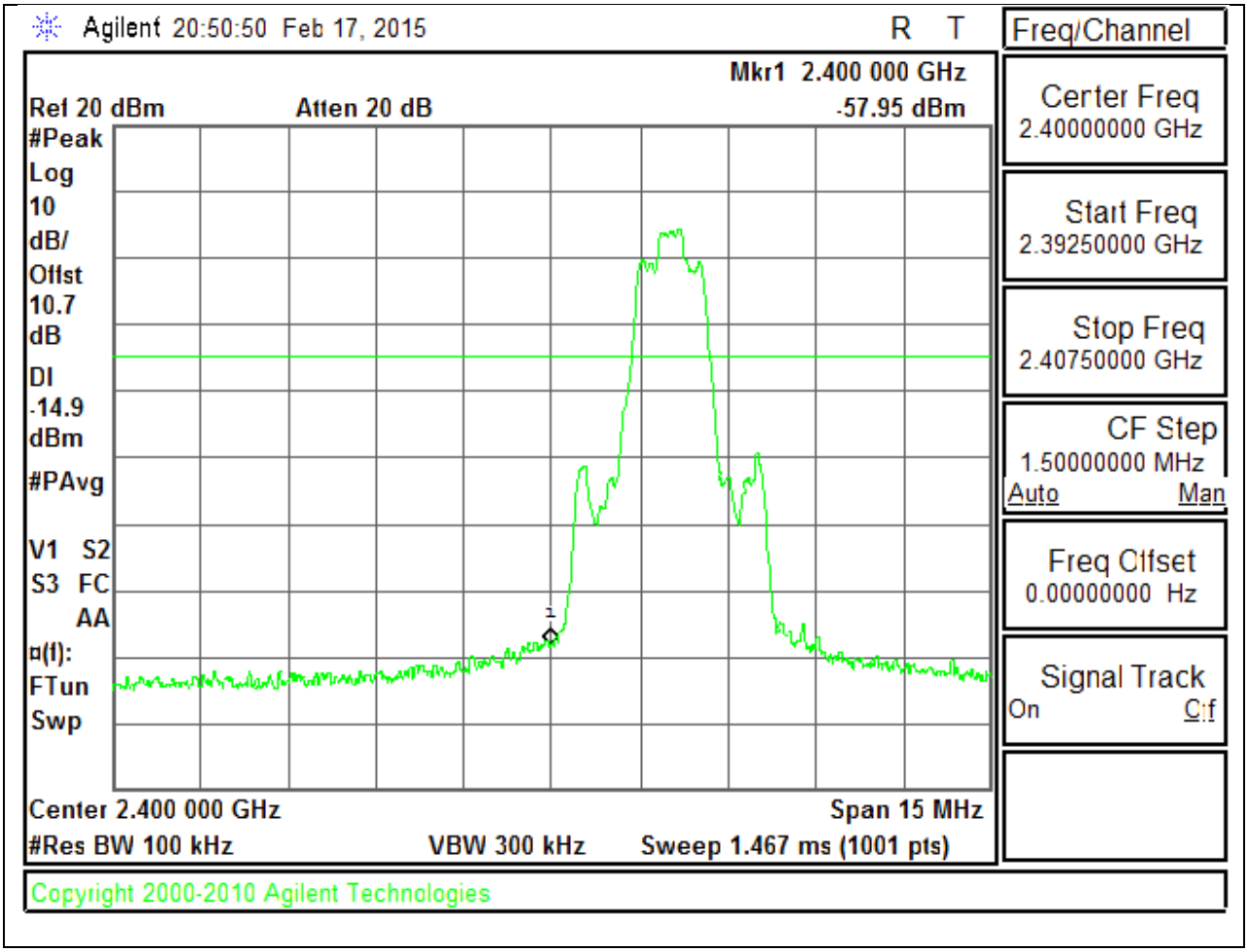
8.7.2. ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



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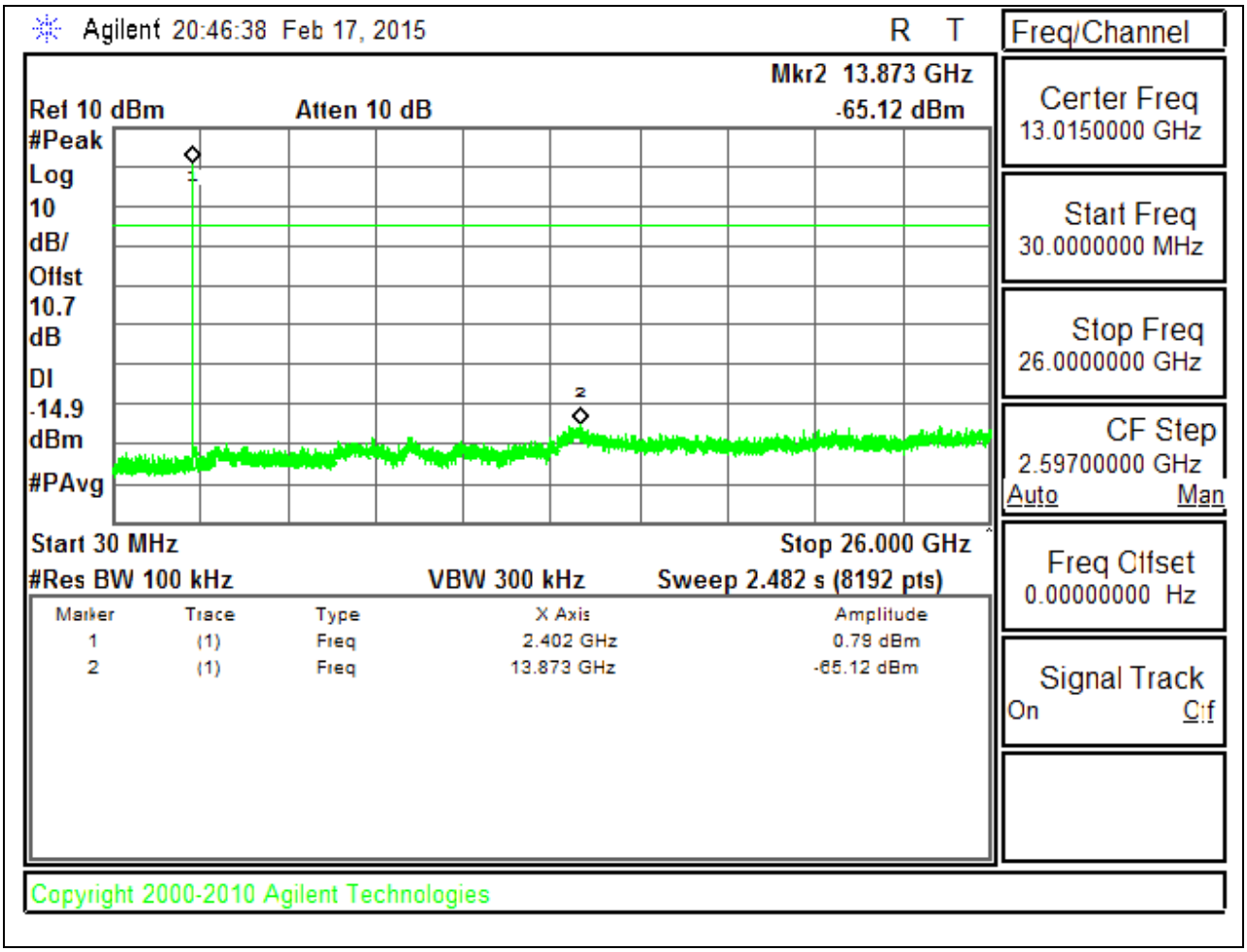
LOW CHANNEL SPURIOUS



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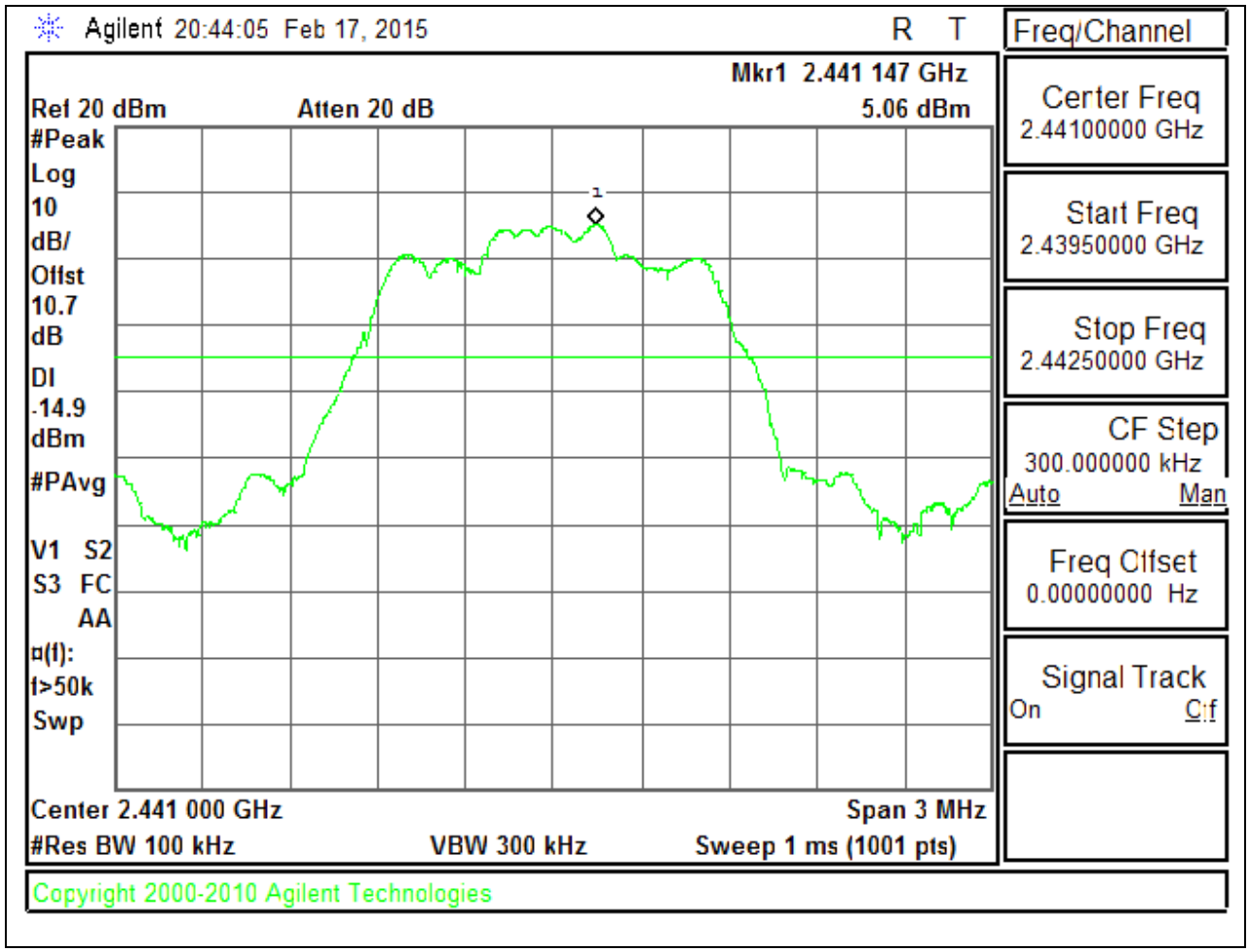
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



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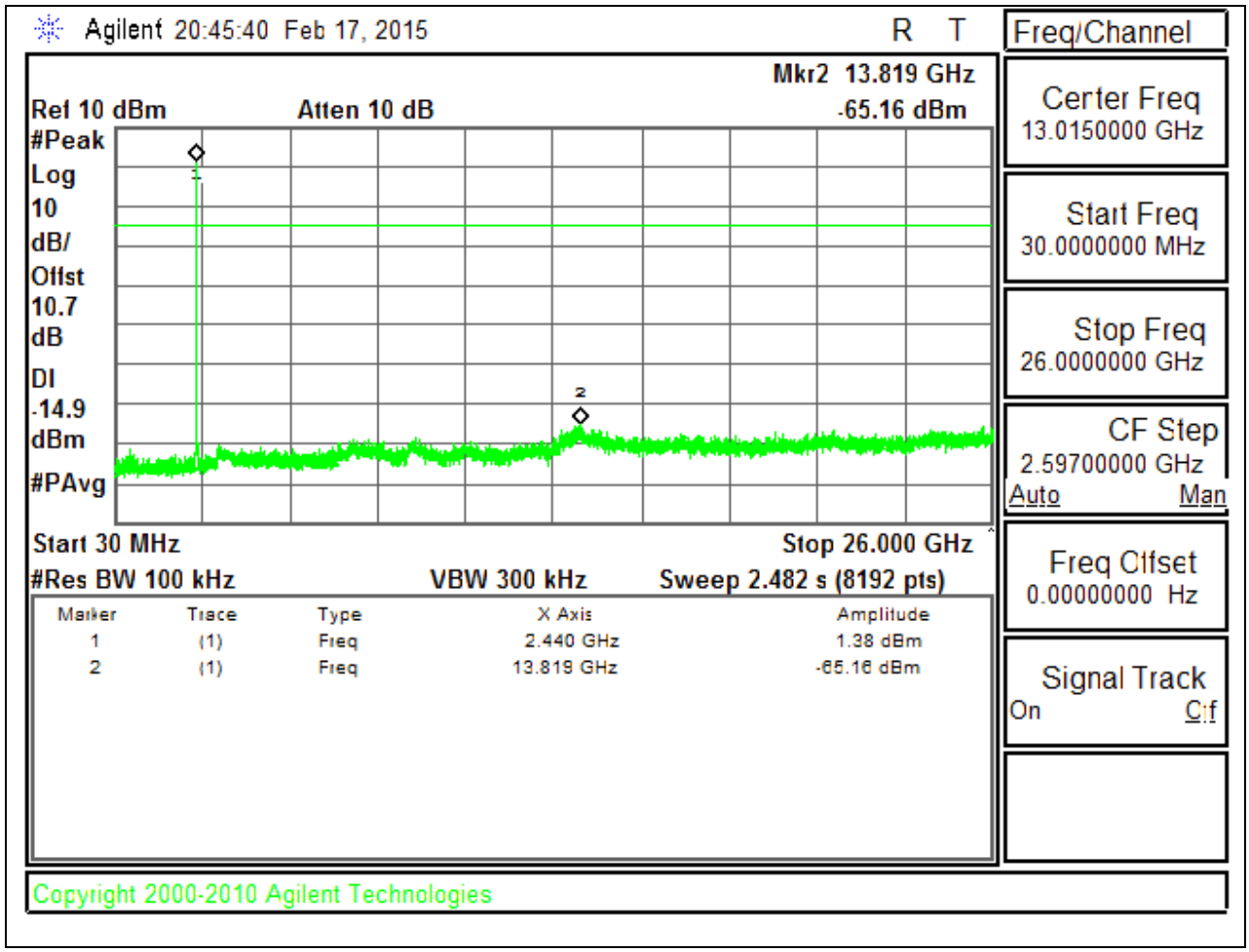
MID CHANNEL SPURIOUS



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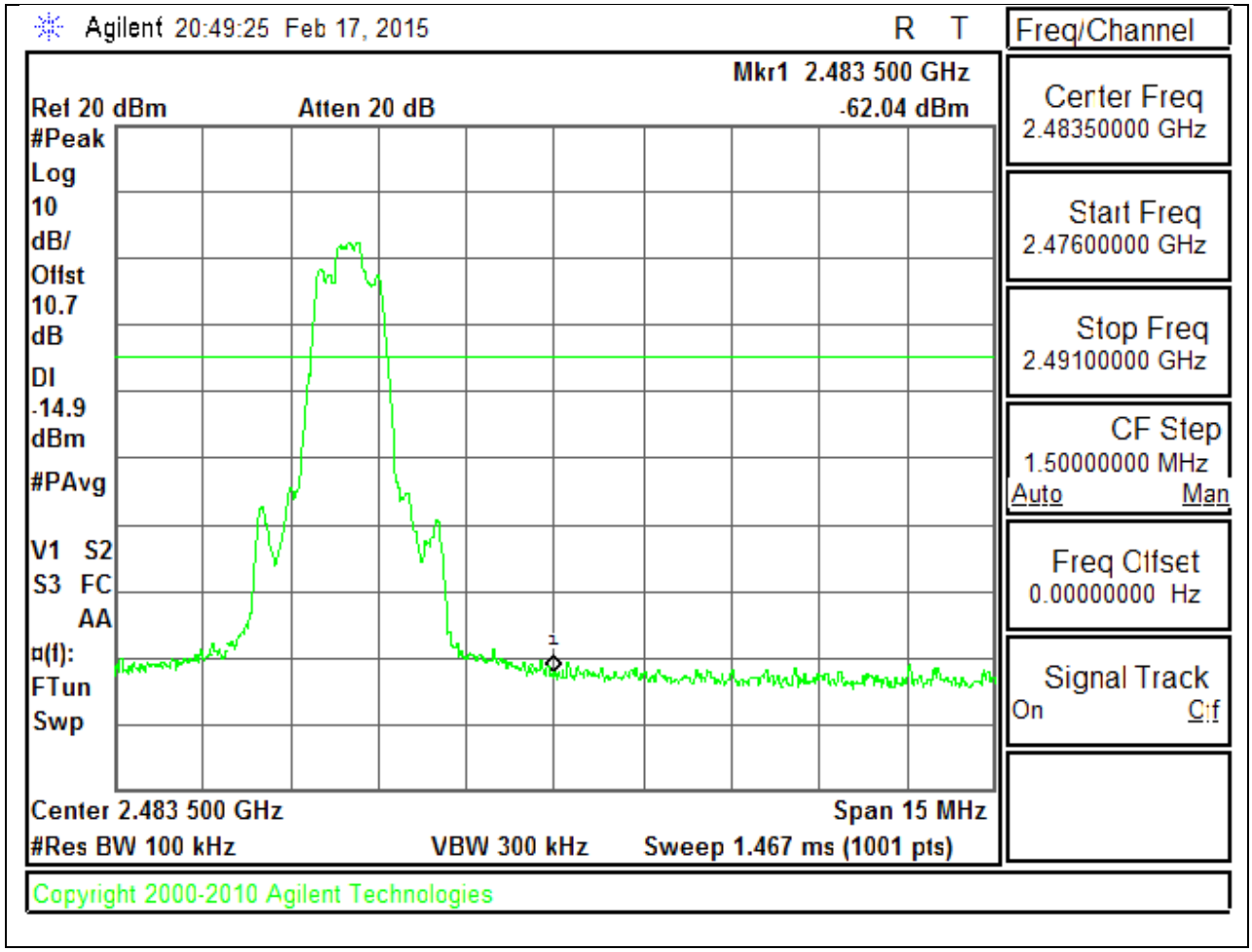
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



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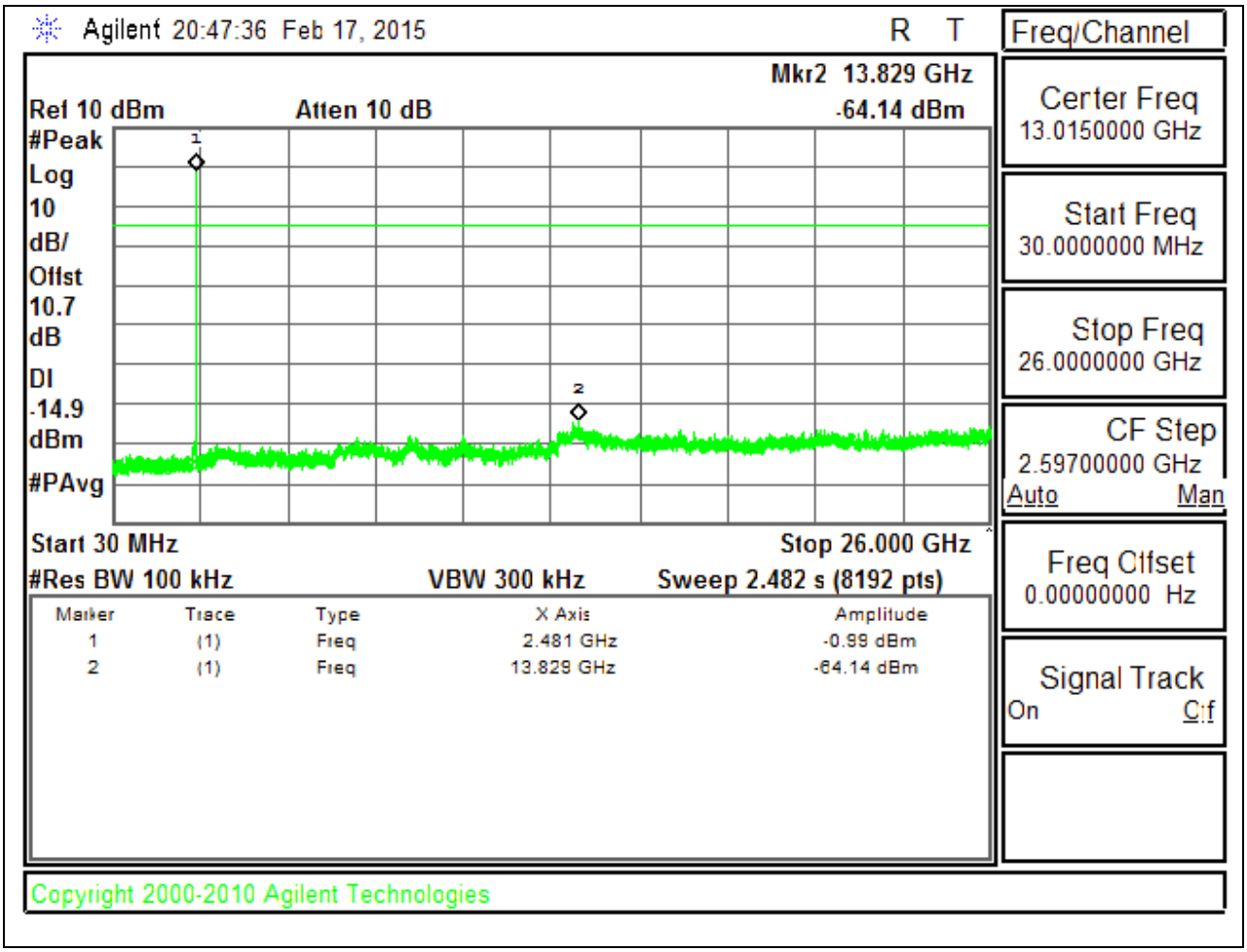
HIGH CHANNEL SPURIOUS



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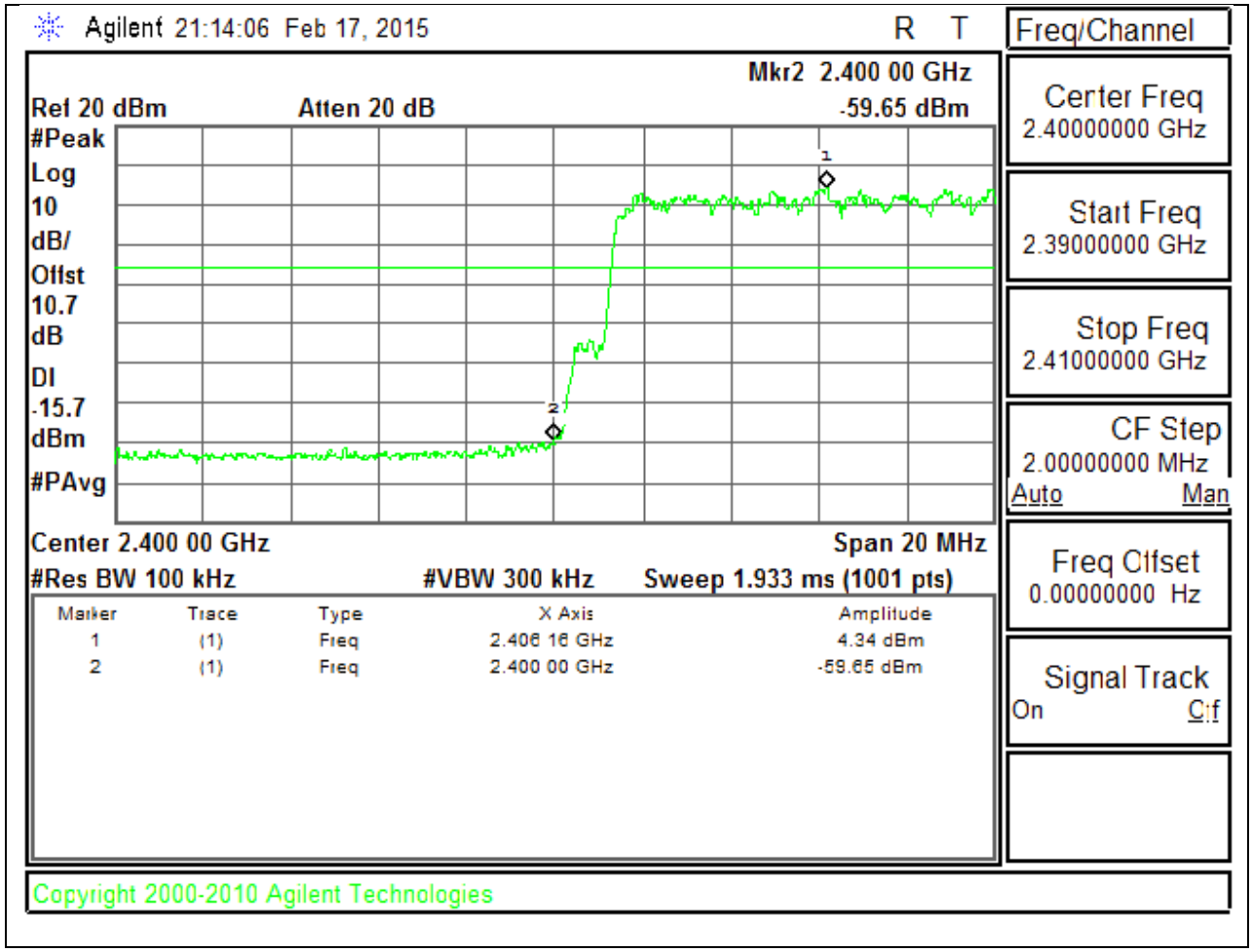
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



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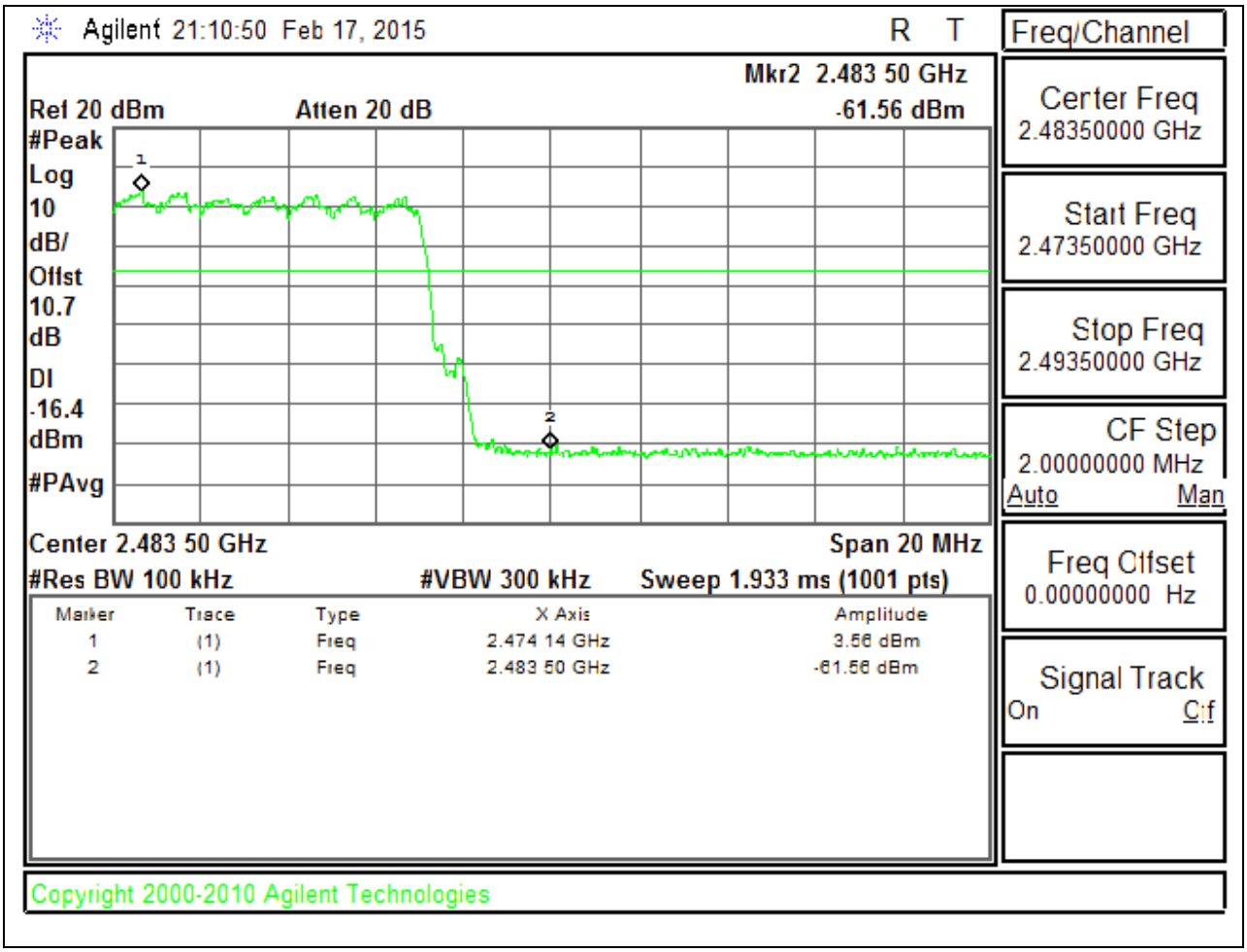
HIGH BANDEDGE WITH HOPPING ON



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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

IC RSS-GEN Clause 7 (Receiver)

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

TEST PROCEDURE

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

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

For 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 / 0.0028S = 360Hz.

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.

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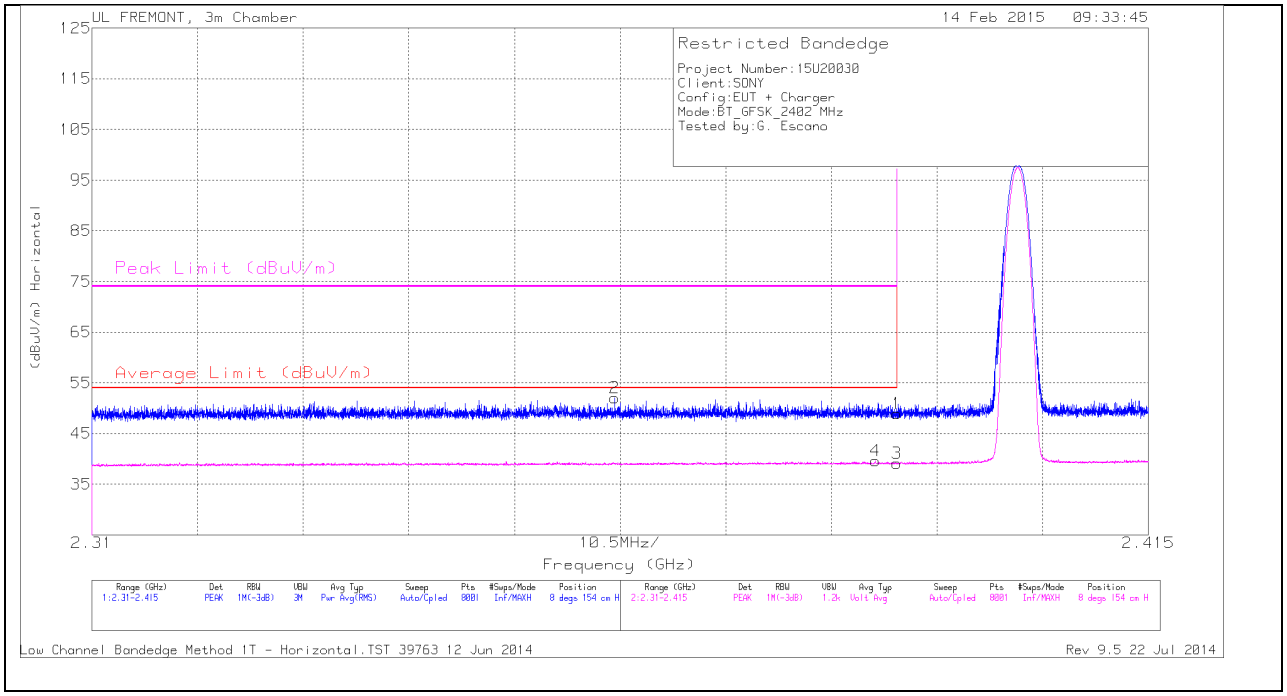
9.2. TRANSMITTER ABOVE 1 GHz

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 T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.362	43.23	PK	31.9	-23.1	52.03	-	-	74	-21.97	8	154	H
4	2.388	30.68	VB1T	32	-23.1	39.58	54	-14.42	-	-	8	154	H
1	2.39	40.05	PK	32	-23.1	48.95	-	-	74	-25.05	8	154	H
3	2.39	30.24	VB1T	32	-23.1	39.14	54	-14.86	-	-	8	154	H

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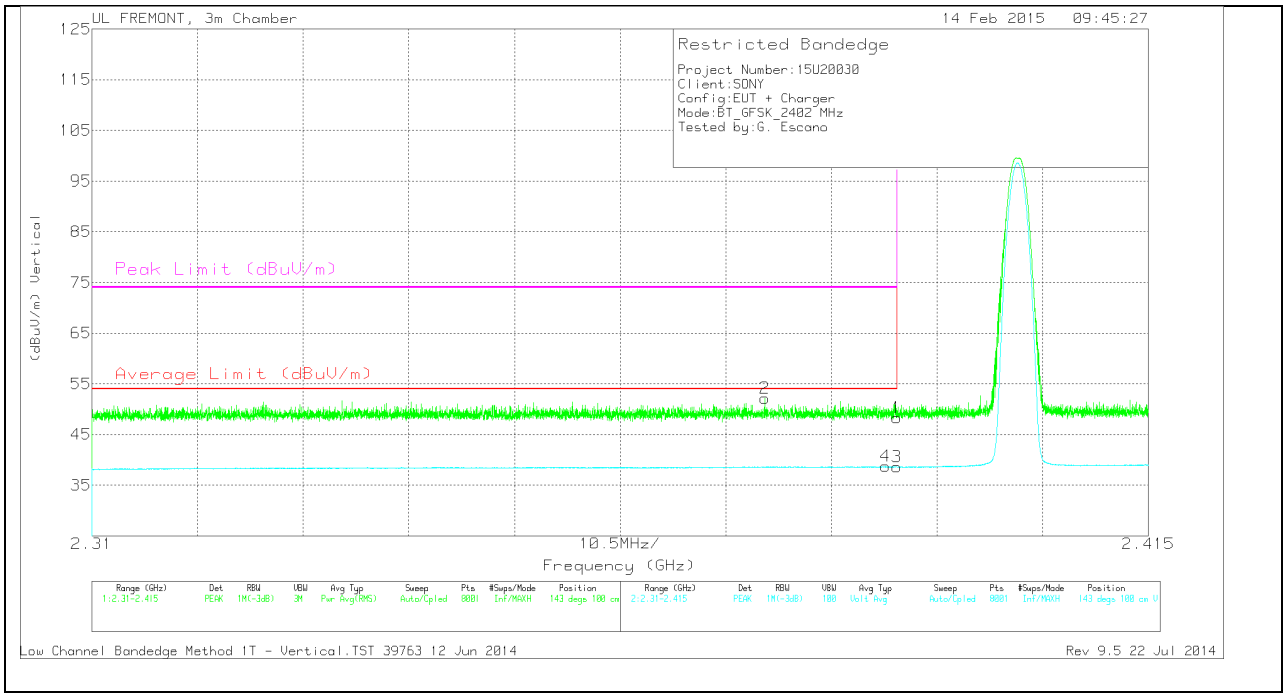
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.377	43.38	PK	31.9	-23.1	52.18	-	-	74	-21.82	143	100	V
4	2.389	29.79	VB1T	32	-23.1	38.69	54	-15.31	-	-	143	100	V
1	2.39	39.45	PK	32	-23.1	48.35	-	-	74	-25.65	143	100	V
3	2.39	29.7	VB1T	32	-23.1	38.6	54	-15.4	-	-	143	100	V

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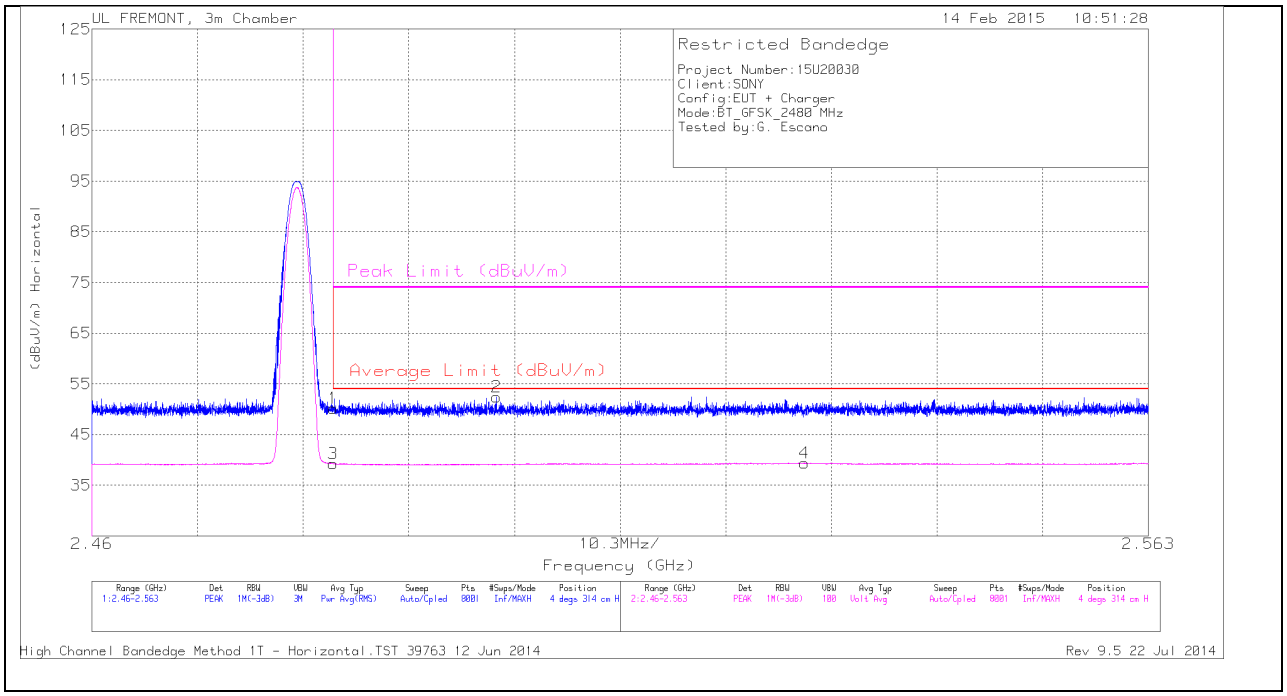
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/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	40.68	PK	32.3	-22.8	50.18	-	-	74	-23.82	4	314	H
3	2.484	29.71	VB1T	32.3	-22.8	39.21	54	-14.79	-	-	4	314	H
2	2.499	42.79	PK	32.3	-22.7	52.39	-	-	74	-21.61	4	314	H
4	2.529	29.57	VB1T	32.4	-22.6	39.37	54	-14.63	-	-	4	314	H

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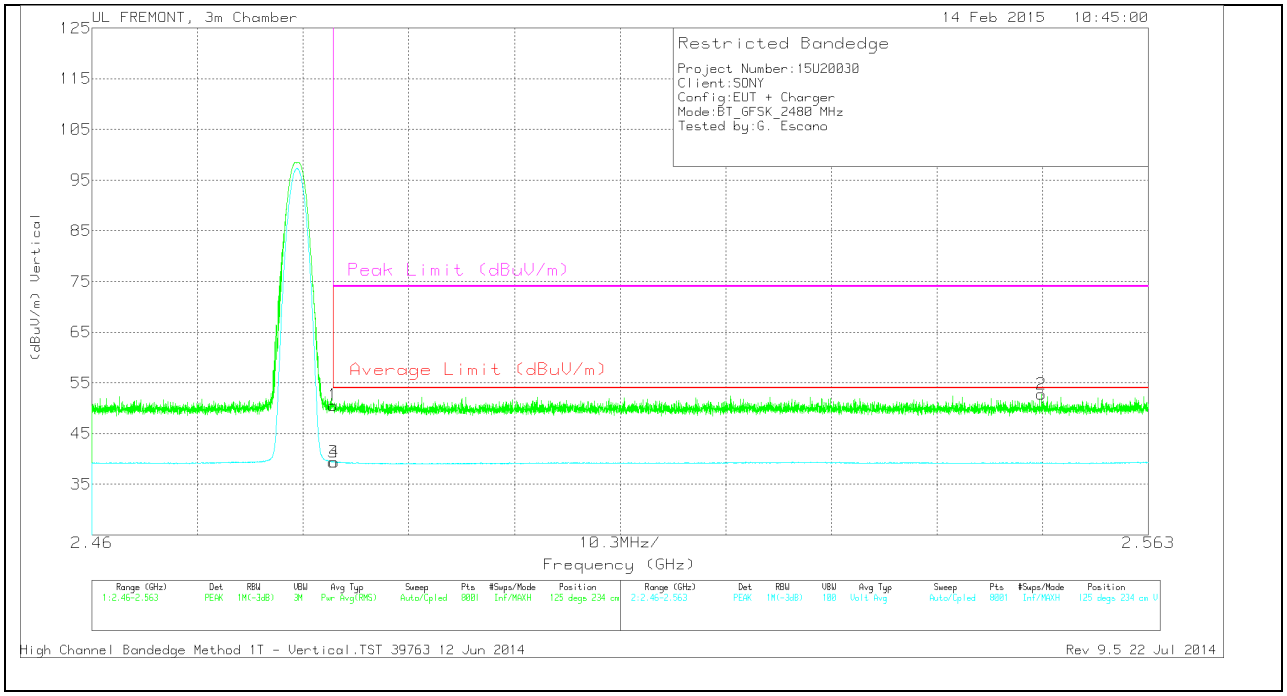
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/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	41.1	PK	32.3	-22.8	50.6	-	-	74	-23.4	125	234	V
3	2.484	29.92	VB1T	32.3	-22.8	39.42	54	-14.58	-	-	125	234	V
4	2.484	29.89	VB1T	32.3	-22.8	39.39	54	-14.61	-	-	125	234	V
2	2.553	43.09	PK	32.4	-22.7	52.79	-	-	74	-21.21	125	234	V

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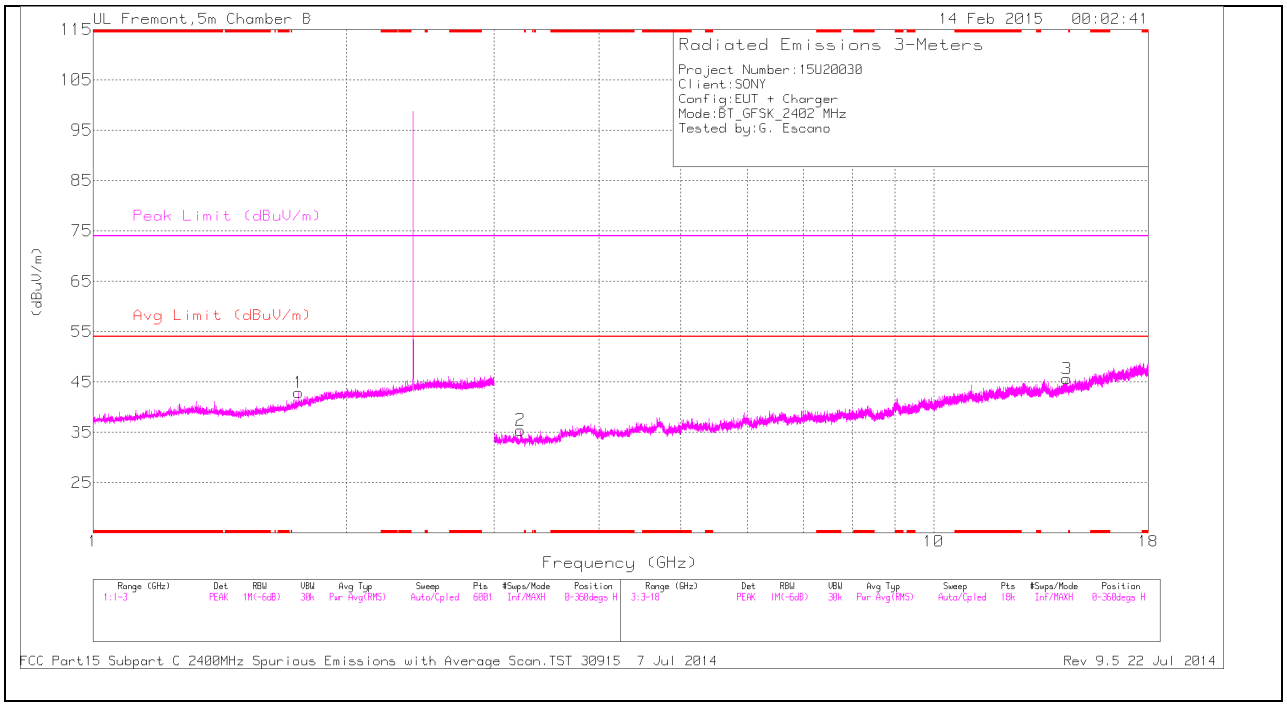
HARMONICS AND SPURIOUS EMISSIONS

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.

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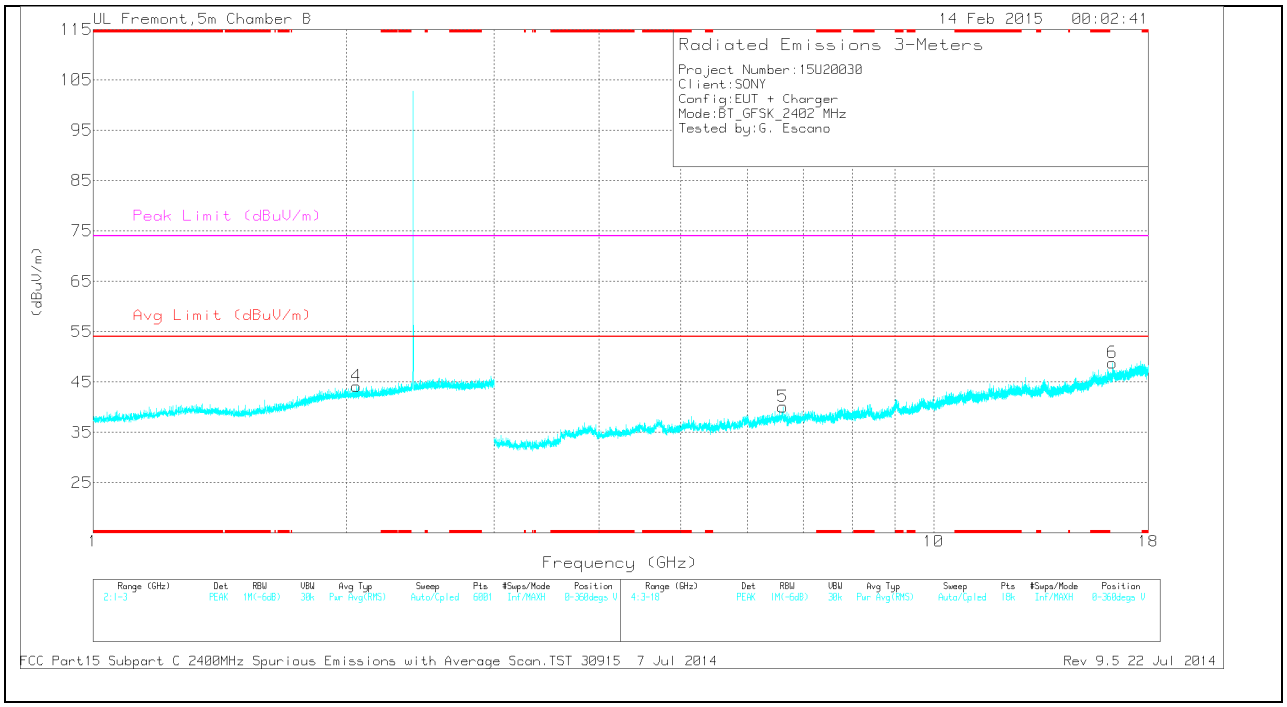
LOW CHANNEL VERTICAL



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

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LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	1.755	36.61	PK	29.7	-23.4	42.91	-	-	-	-	0-360	101	H
4	2.057	35.99	PK	31.3	-23.1	44.19	-	-	-	-	0-360	199	V
2	3.222	33.66	PK	32.8	-31	35.46	-	-	-	-	0-360	101	H
5	6.616	32.5	PK	35.7	-28.1	40.1	-	-	-	-	0-360	101	V
3	14.401	28.25	PK	39.1	-21.7	45.65	-	-	-	-	0-360	101	H
6	16.315	28.24	PK	41.2	-20.6	48.84	-	-	-	-	0-360	200	V

PK - Peak detector

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

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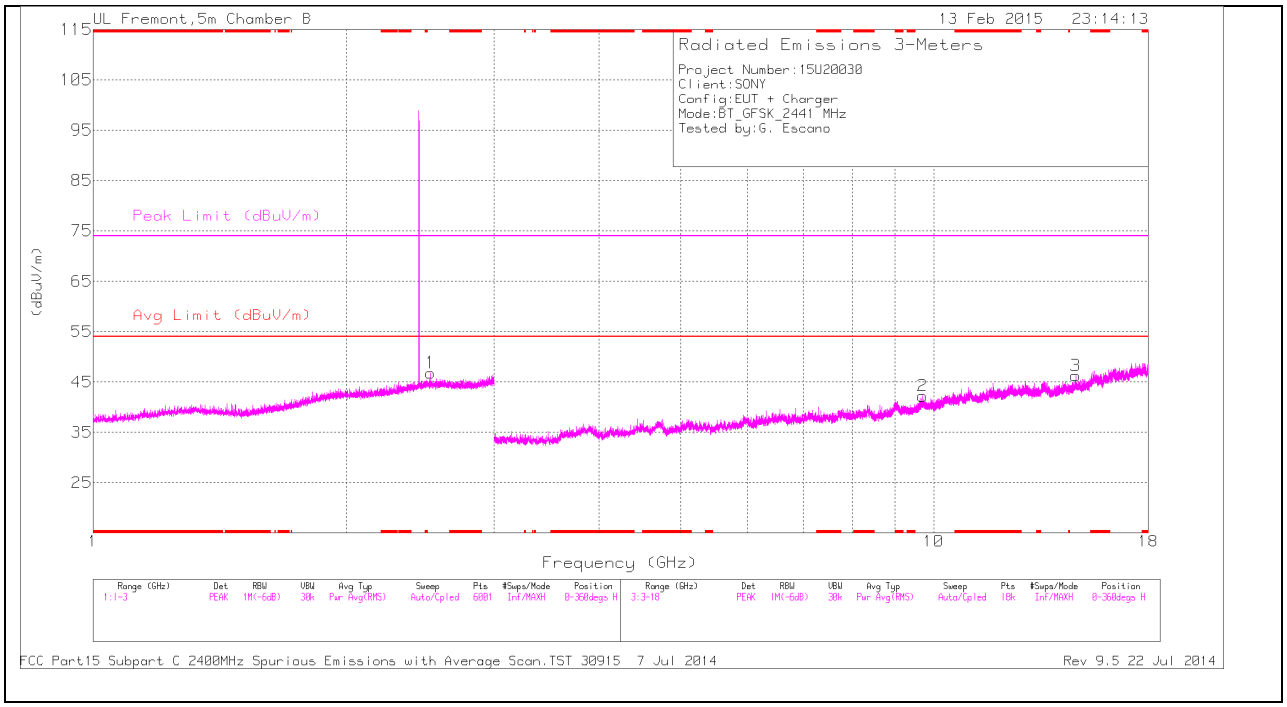
MID CHANNEL HORIZONTAL



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

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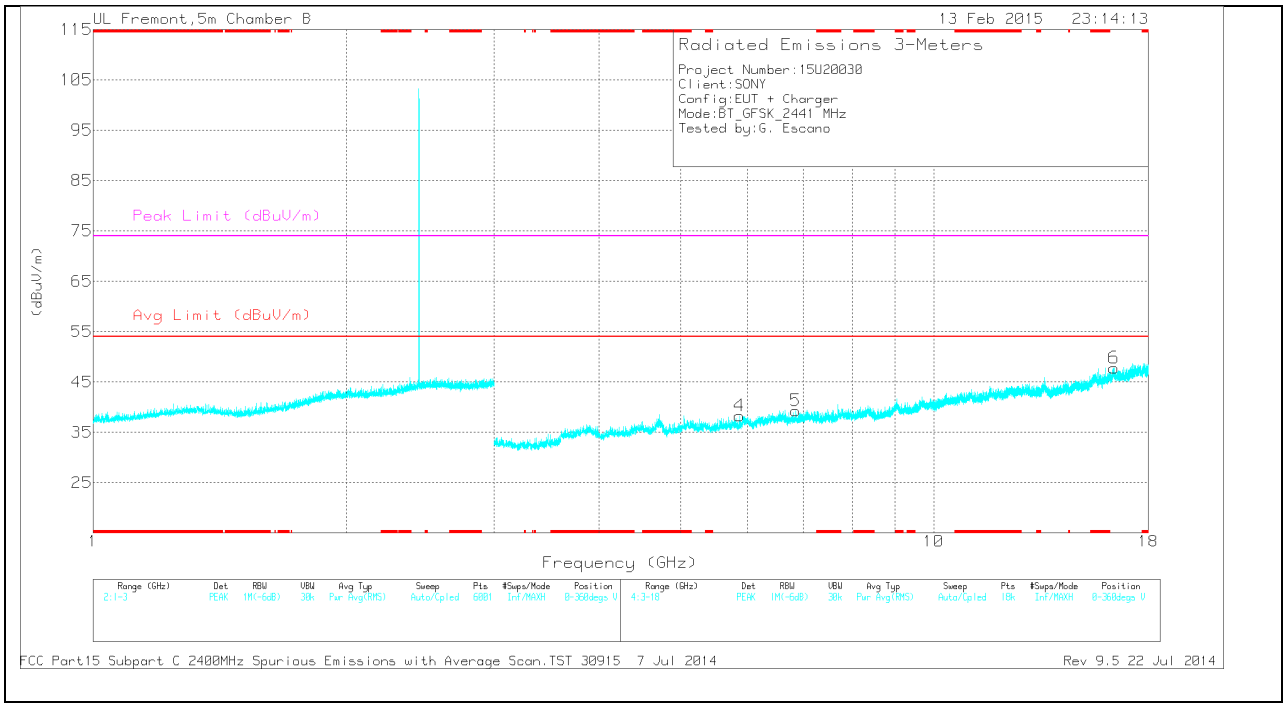
MID CHANNEL VERTICAL



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

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MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	2.52	36.6	PK	32.5	-22.3	46.8	-	-	-	-	0-360	199	H
4	5.875	32.62	PK	34.9	-29.2	38.32	-	-	-	-	0-360	200	V
5	6.852	31.41	PK	35.6	-27.7	39.31	-	-	-	-	0-360	200	V
2	9.705	29.03	PK	36.9	-23.7	42.23	-	-	-	-	0-360	200	H
3	14.752	27.25	PK	39.4	-20.4	46.25	-	-	-	-	0-360	200	H
6	16.388	26.72	PK	41.3	-20.2	47.82	-	-	-	-	0-360	200	V

PK - Peak detector

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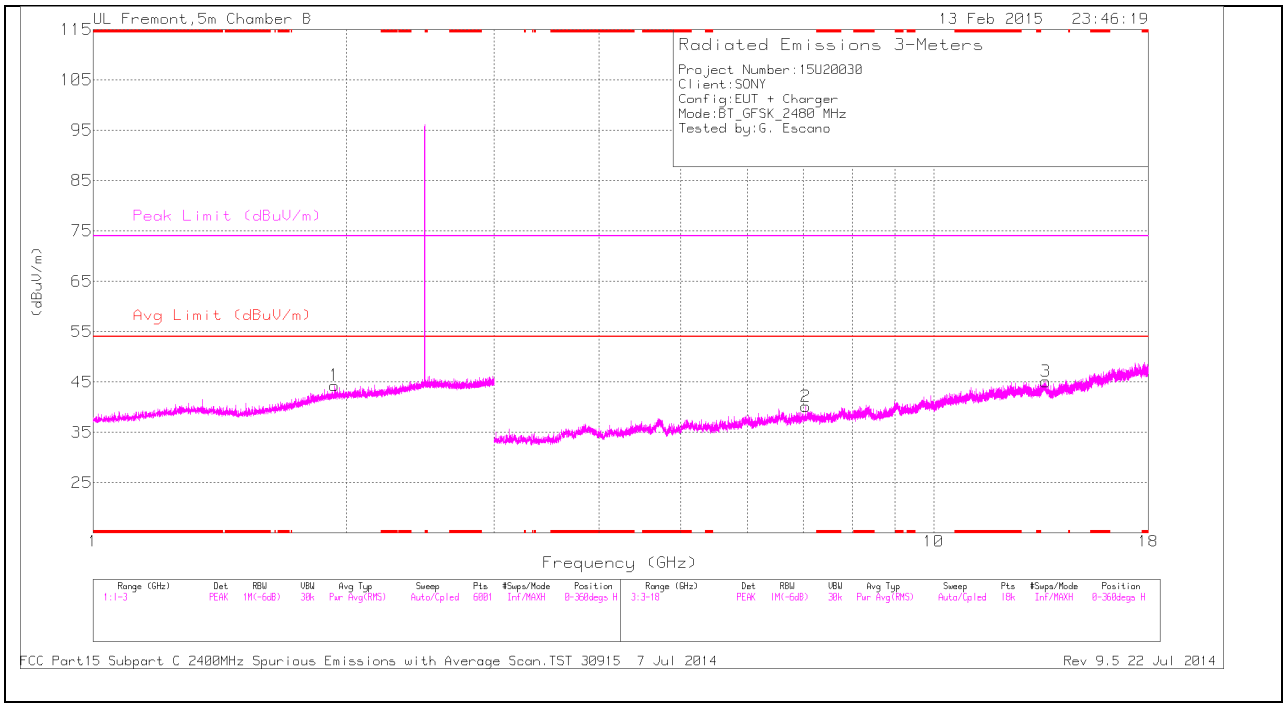
HIGH CHANNEL HORIZONTAL



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

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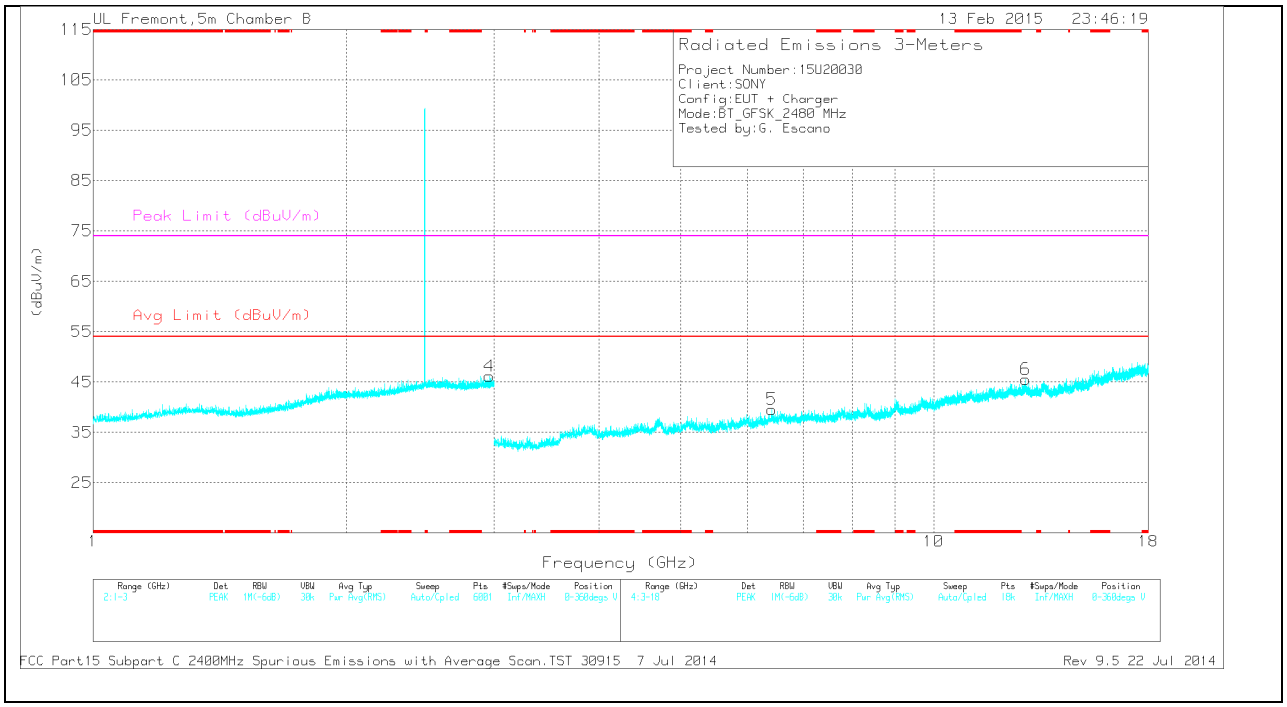
HIGH CHANNEL VERTICAL



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

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HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	1.936	36.31	PK	31.2	-23.2	44.31	-	-	-	-	0-360	199	H
4	2.961	35.46	PK	32.7	-22	46.16	-	-	-	-	0-360	101	V
5	6.416	33.06	PK	35.6	-29.1	39.56	-	-	-	-	0-360	101	V
2	7.041	32.75	PK	35.6	-28.2	40.15	-	-	-	-	0-360	200	H
6	12.859	27.84	PK	39.2	-21.5	45.54	-	-	-	-	0-360	200	V
3	13.603	27.81	PK	38.8	-21.5	45.11	-	-	-	-	0-360	101	H

PK - Peak detector

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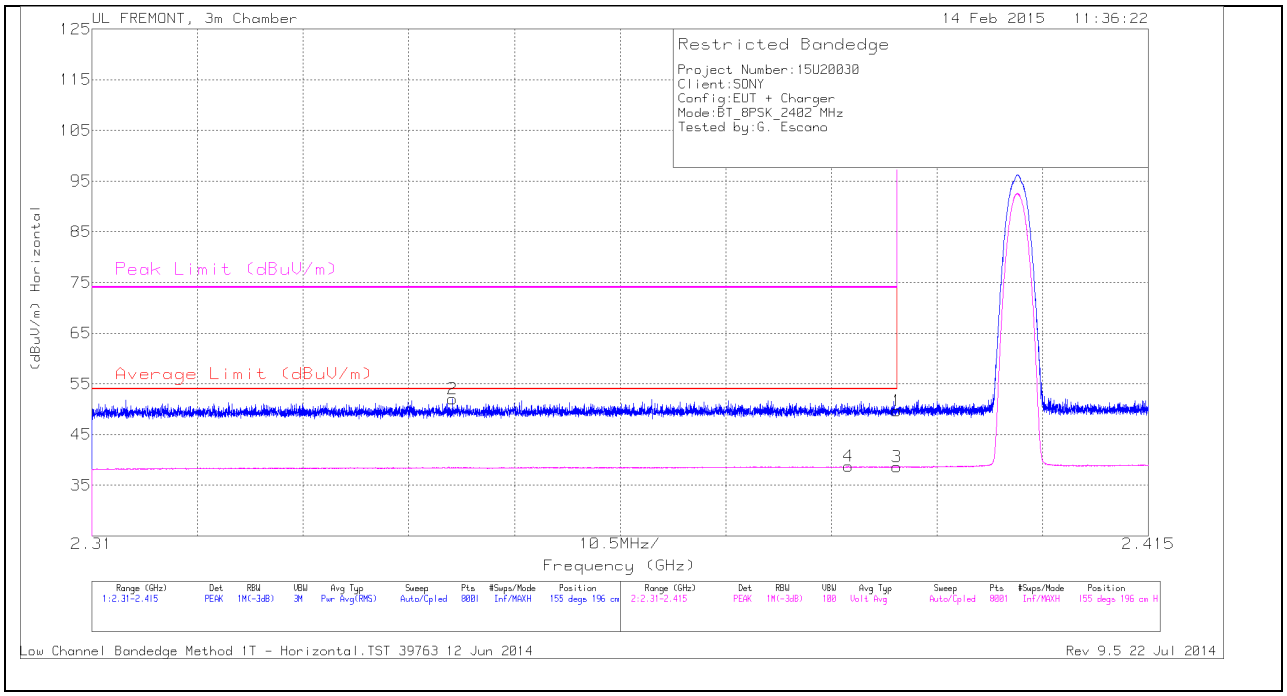
9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.346	43.3	PK	31.8	-23.1	52	-	-	74	-22	155	196	H
4	2.385	29.8	VB1T	32	-23.1	38.7	54	-15.3	-	-	155	196	H
1	2.39	40.78	PK	32	-23.1	49.68	-	-	74	-24.32	155	196	H
3	2.39	29.67	VB1T	32	-23.1	38.57	54	-15.43	-	-	155	196	H

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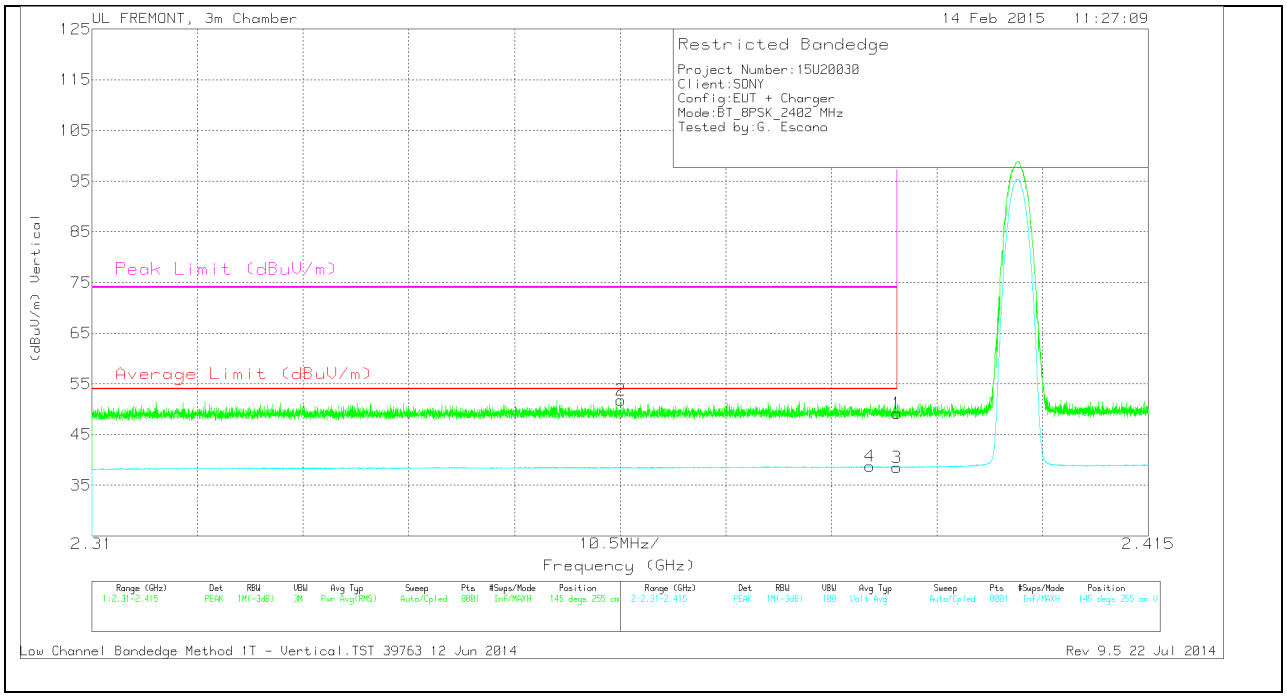
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.363	43.01	PK	31.9	-23.1	51.81	-	-	74	-22.19	145	255	V
4	2.387	29.79	VB1T	32	-23.1	38.69	54	-15.31	-	-	145	255	V
1	2.39	40.24	PK	32	-23.1	49.14	-	-	74	-24.86	145	255	V
3	2.39	29.63	VB1T	32	-23.1	38.53	54	-15.47	-	-	145	255	V

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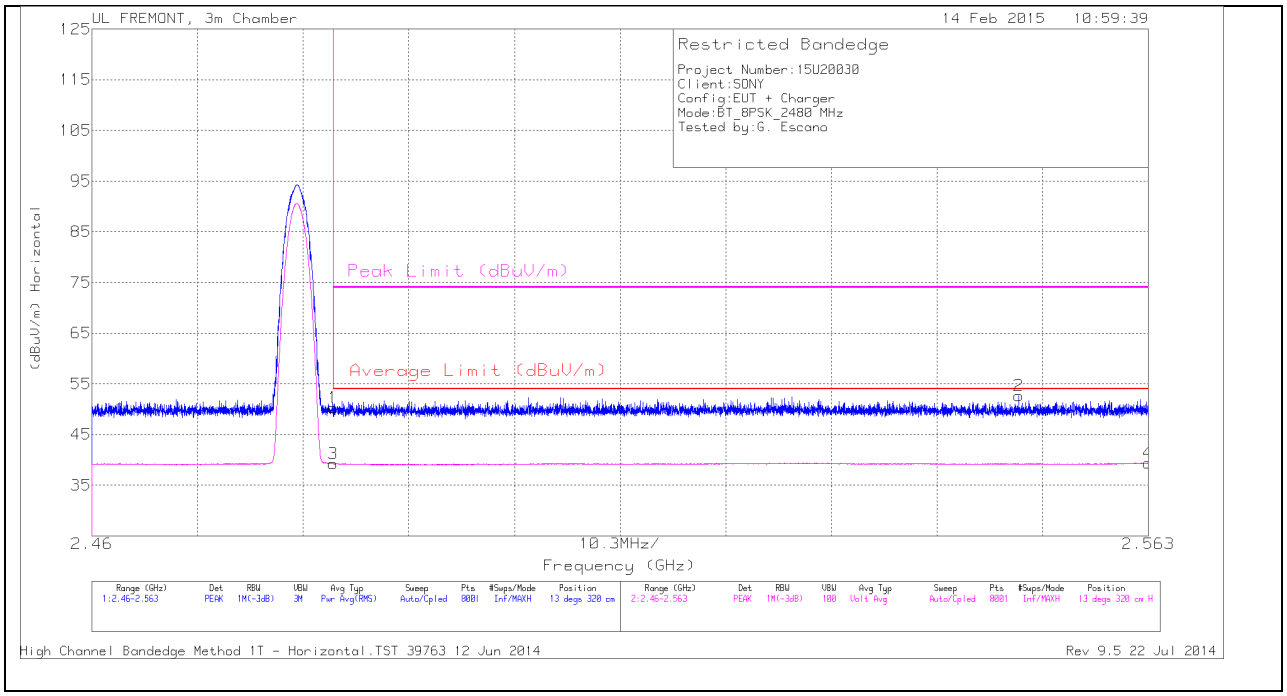
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/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	40.78	PK	32.3	-22.8	50.28	-	-	74	-23.72	13	320	H
3	2.484	29.69	VB1T	32.3	-22.8	39.19	54	-14.81	-	-	13	320	H
2	2.55	43	PK	32.4	-22.7	52.7	-	-	74	-21.3	13	320	H
4	2.563	29.68	VB1T	32.4	-22.7	39.38	54	-14.62	-	-	13	320	H

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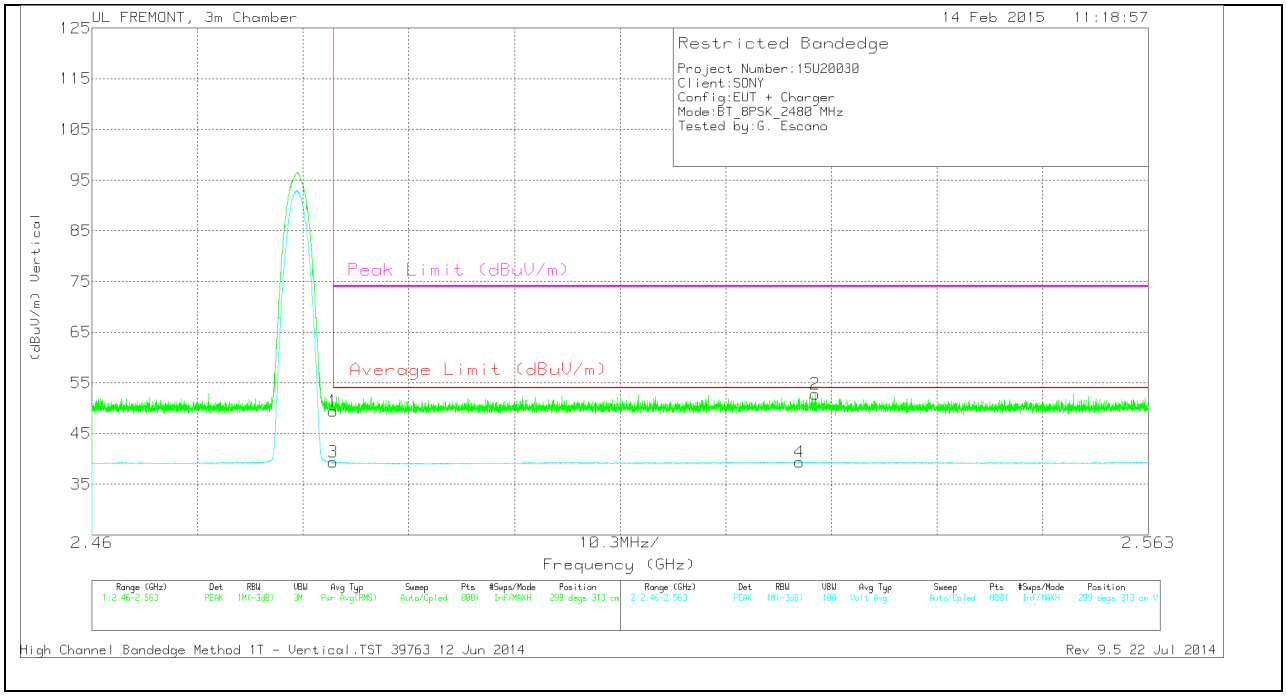
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fltr/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	39.97	PK	32.3	-22.8	49.47	-	-	74	-24.53	299	313	V
3	2.484	29.81	VB1T	32.3	-22.8	39.31	54	-14.69	-	-	299	313	V
4	2.529	29.6	VB1T	32.4	-22.6	39.4	54	-14.6	-	-	299	313	V
2	2.531	43	PK	32.4	-22.6	52.8	-	-	74	-21.2	299	313	V

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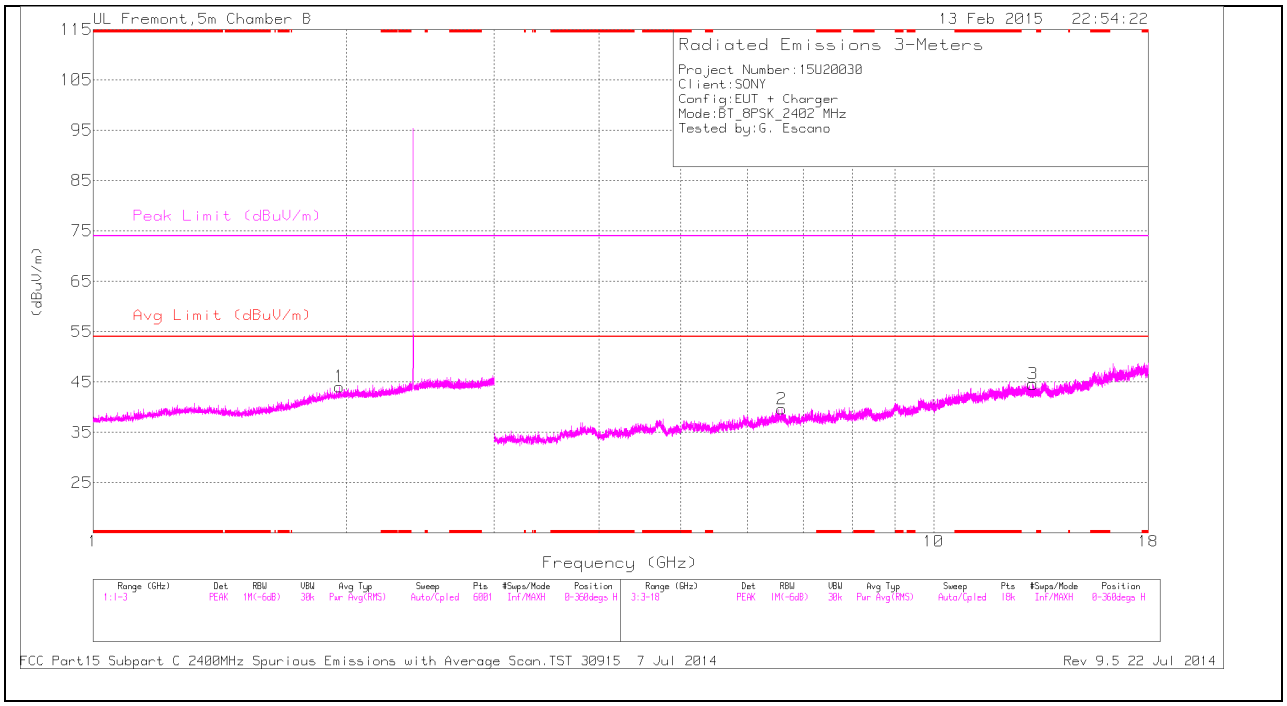
HARMONICS AND SPURIOUS EMISSIONS

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.

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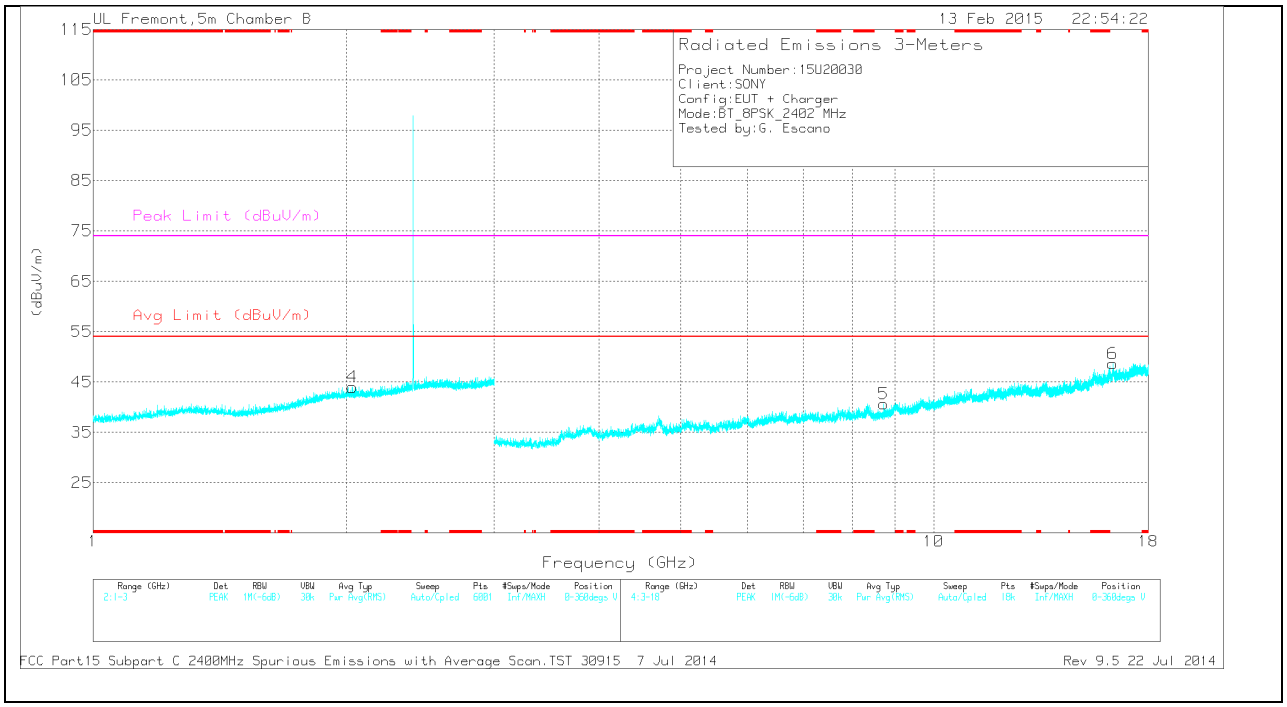
LOW CHANNEL VERTICAL



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

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LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	1.965	35.98	PK	31.3	-23.2	44.08	-	-	-	-	0-360	100	H
4	2.035	35.89	PK	31.3	-23.2	43.99	-	-	-	-	0-360	101	V
2	6.594	31.86	PK	35.8	-28	39.66	-	-	-	-	0-360	101	H
5	8.717	30.33	PK	35.9	-25.6	40.63	-	-	-	-	0-360	101	V
3	13.122	27.9	PK	39.1	-22.4	44.6	-	-	-	-	0-360	199	H
6	16.332	27.55	PK	41.2	-20.1	48.65	-	-	-	-	0-360	199	V

PK - Peak detector

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

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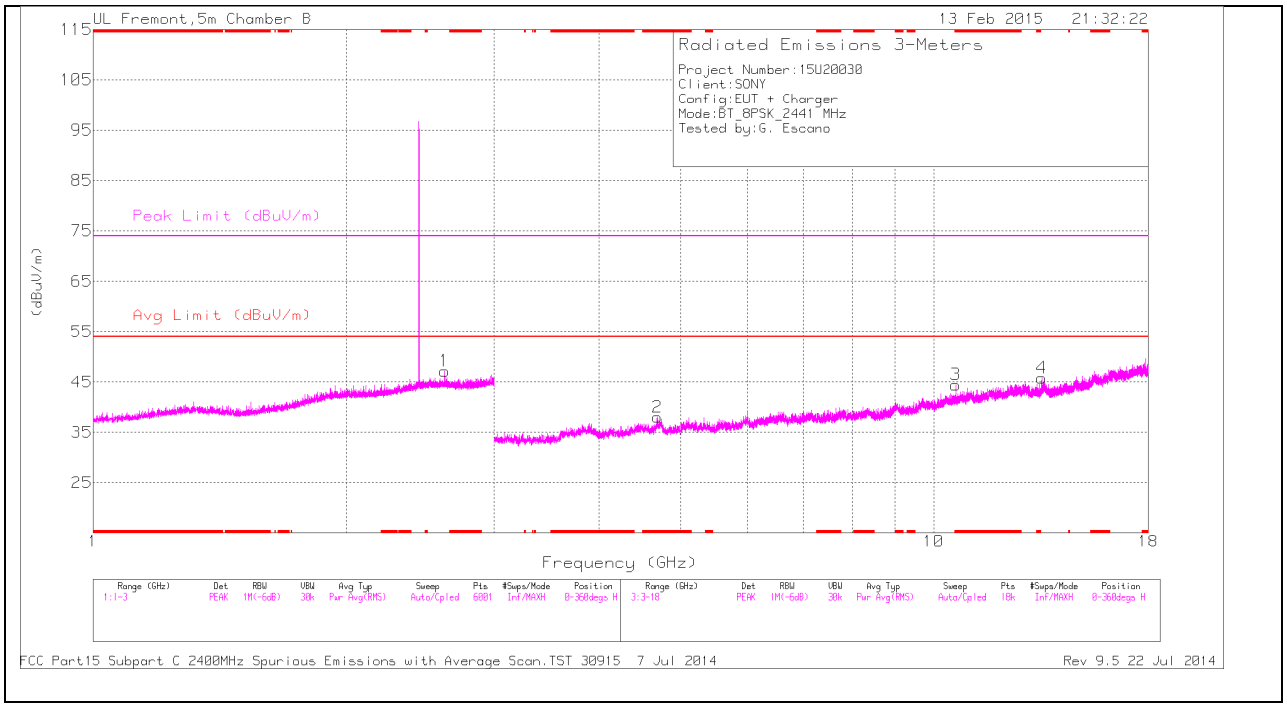
MID CHANNEL HORIZONTAL



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

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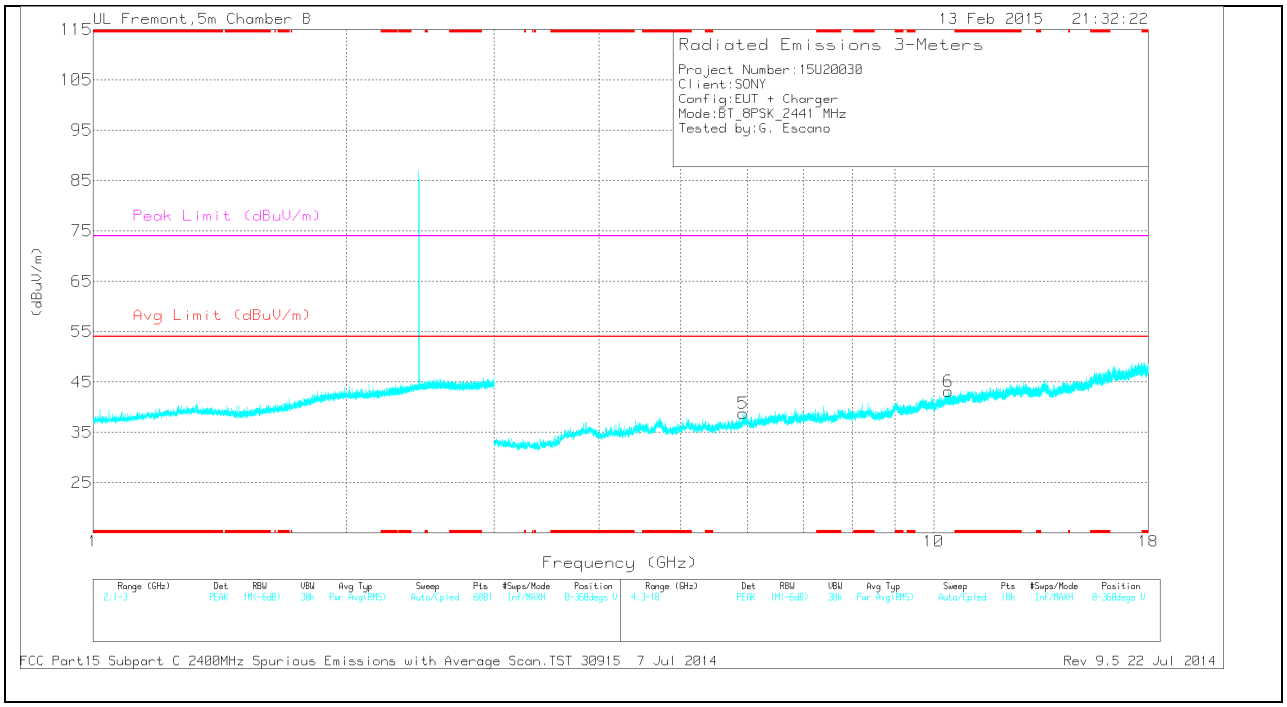
MID CHANNEL VERTICAL



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

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MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	* 4.694	33.41	PK	34.2	-29.6	38.01	-	-	74	-35.99	0-360	101	H
3	* 10.62	29.56	PK	37.7	-22.8	44.46	-	-	74	-29.54	0-360	101	H
1	2.62	37.2	PK	32.4	-22.4	47.2	-	-	-	-	0-360	200	H
5	5.934	32.06	PK	35	-28.3	38.76	-	-	-	-	0-360	101	V
6	10.405	28.92	PK	37.3	-23.1	43.12	-	-	-	-	0-360	101	V
4	13.443	28.1	PK	39.1	-21.4	45.8	-	-	-	-	0-360	199	H

PK - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.694	40.82	PK3	34.2	-29.6	45.42	-	-	74	-28.58	134	101	H
* 4.695	28.03	VB1T	34.2	-29.5	32.73	54	-21.27	-	-	134	101	H
* 10.619	35.76	PK3	37.7	-22.8	50.66	-	-	74	-23.34	207	197	H
* 10.619	22.58	VB1T	37.7	-22.8	37.48	54	-16.52	-	-	207	197	H

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

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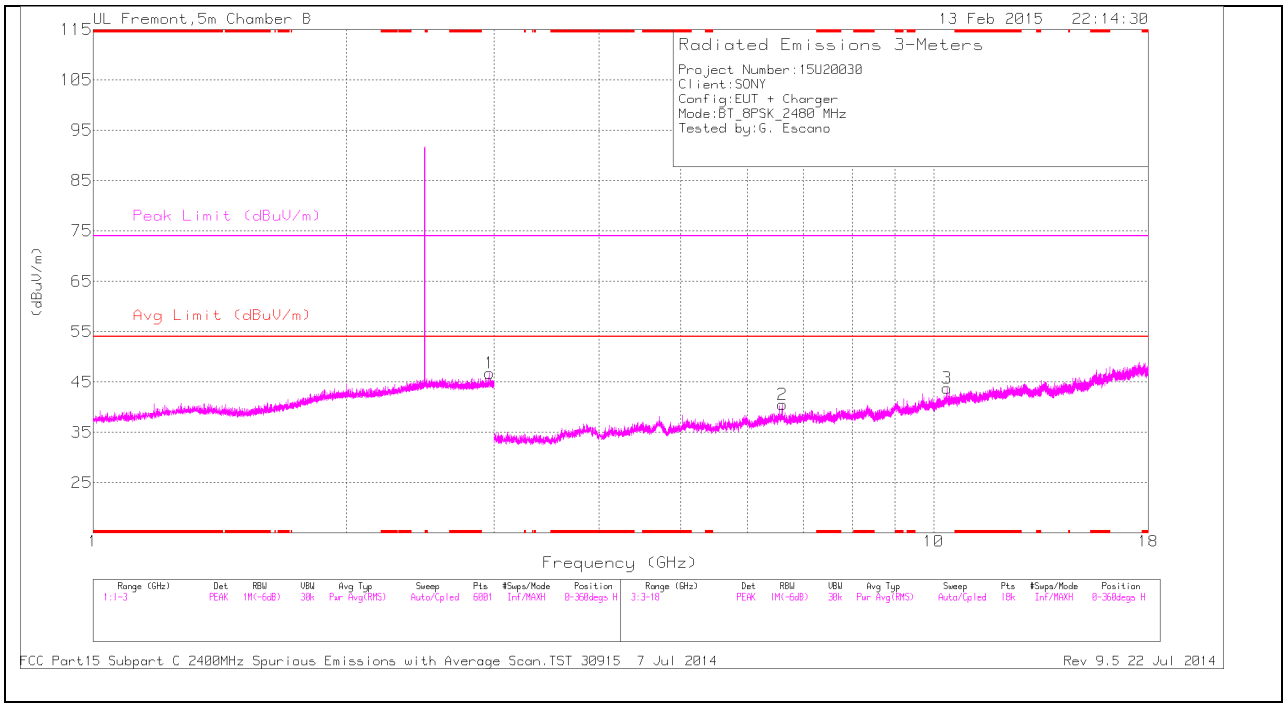
HIGH CHANNEL HORIZONTAL



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

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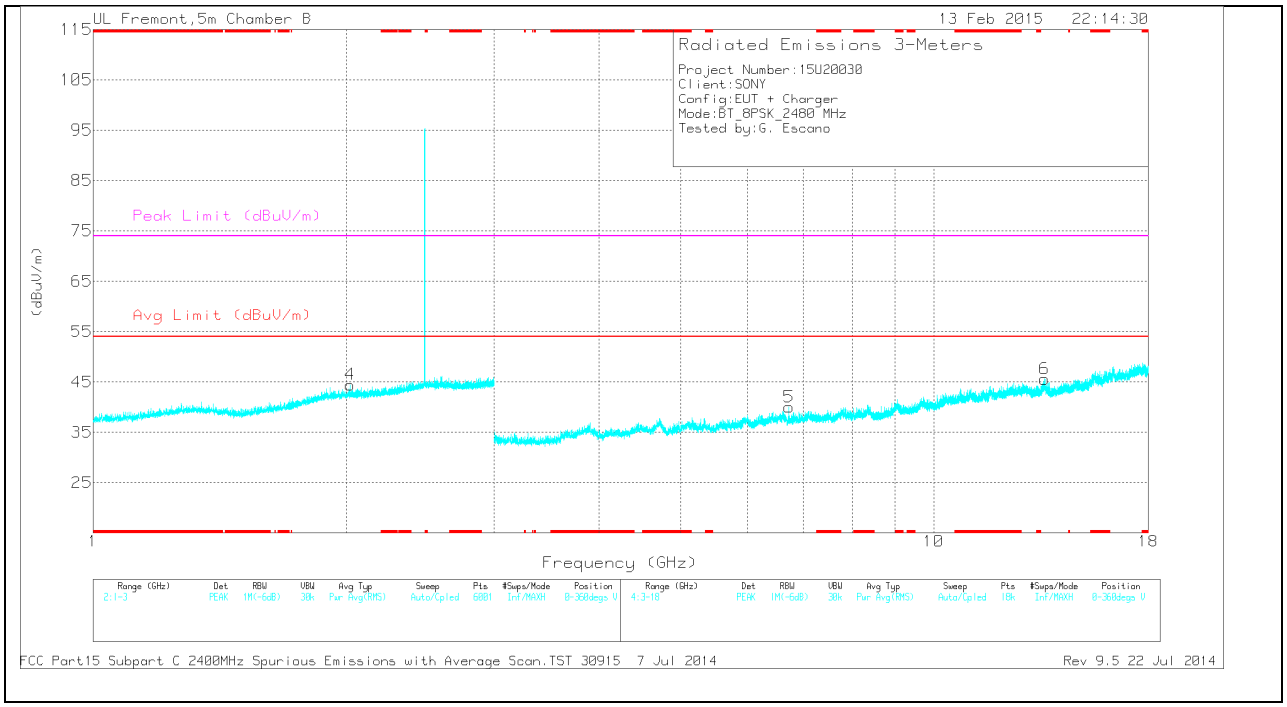
HIGH CHANNEL VERTICAL



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

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HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/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	2.022	36.36	PK	31.3	-23.2	44.46	-	-	-	-	0-360	199	V
1	2.965	36.04	PK	32.7	-22	46.74	-	-	-	-	0-360	101	H
2	6.61	32.8	PK	35.7	-28	40.5	-	-	-	-	0-360	101	H
5	6.729	33.11	PK	35.7	-28.8	40.01	-	-	-	-	0-360	101	V
3	10.381	29.29	PK	37.3	-22.8	43.79	-	-	-	-	0-360	200	H
6	13.542	27.6	PK	38.9	-20.9	45.6	-	-	-	-	0-360	101	V

PK - Peak detector

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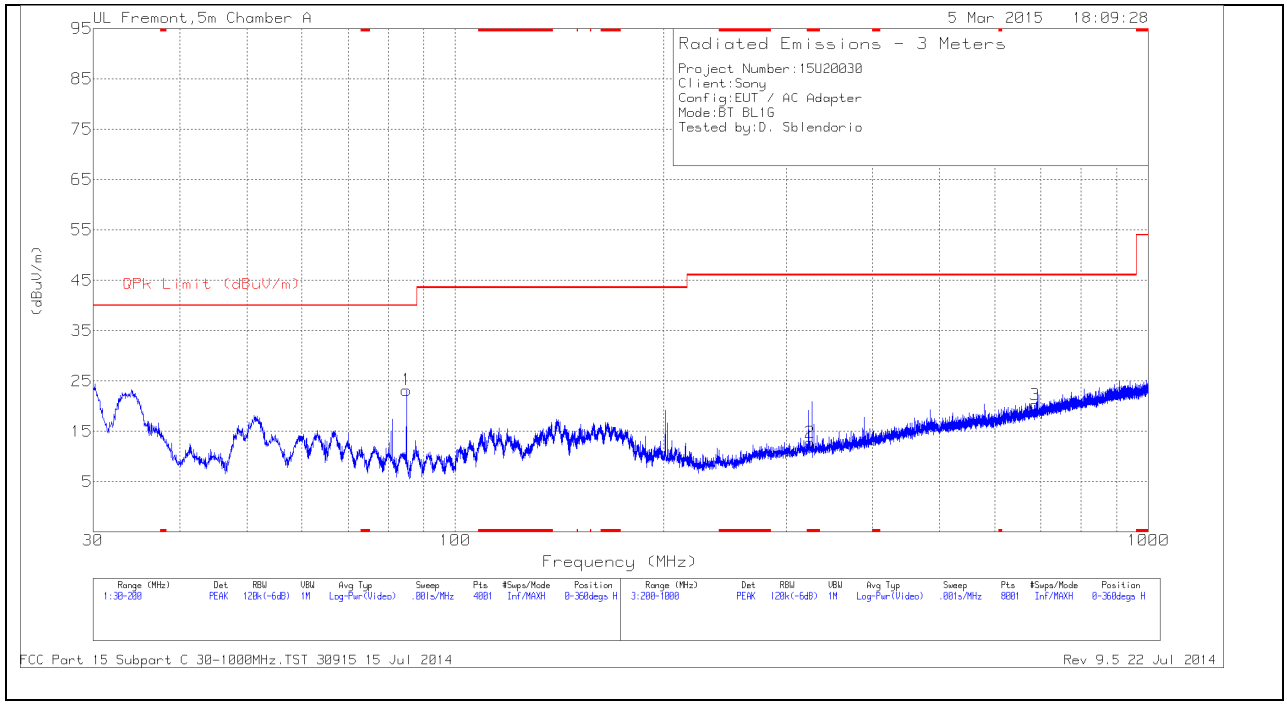
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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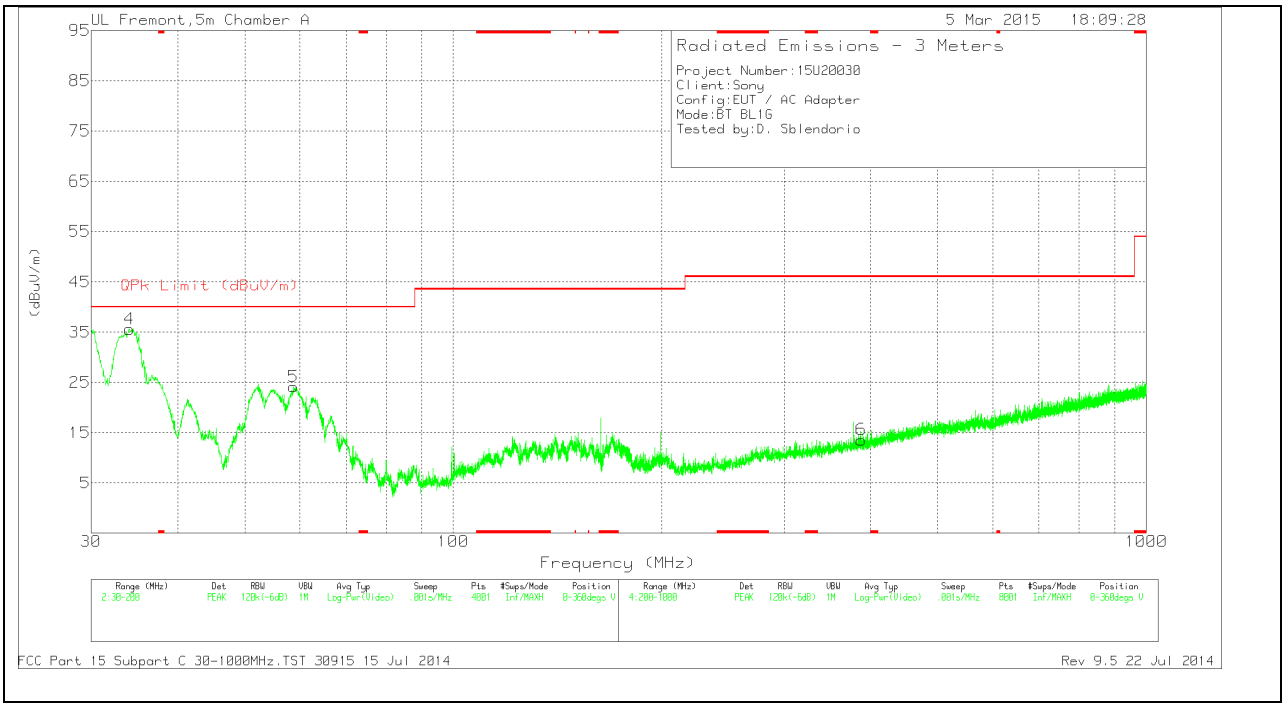
VERTICAL PLOT



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BELOW 1 GHz TABLE

Trace Markers

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
2	* 324.9	27.97	PK	14	-29.2	12.77	46.02	-33.25	0-360	101	H
4	34.08	48.4	PK	18.4	-31.2	35.6	40	-4.4	0-360	101	V
5	58.815	47.55	PK	7.5	-30.9	24.15	40	-15.85	0-360	101	V
1	84.995	46.62	PK	7.3	-30.7	23.22	40	-16.78	0-360	300	H
6	387.9	27.79	PK	14.9	-29.1	13.59	46.02	-32.43	0-360	300	V
3	687.1	28.59	PK	19.9	-28.2	20.29	46.02	-25.73	0-360	300	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

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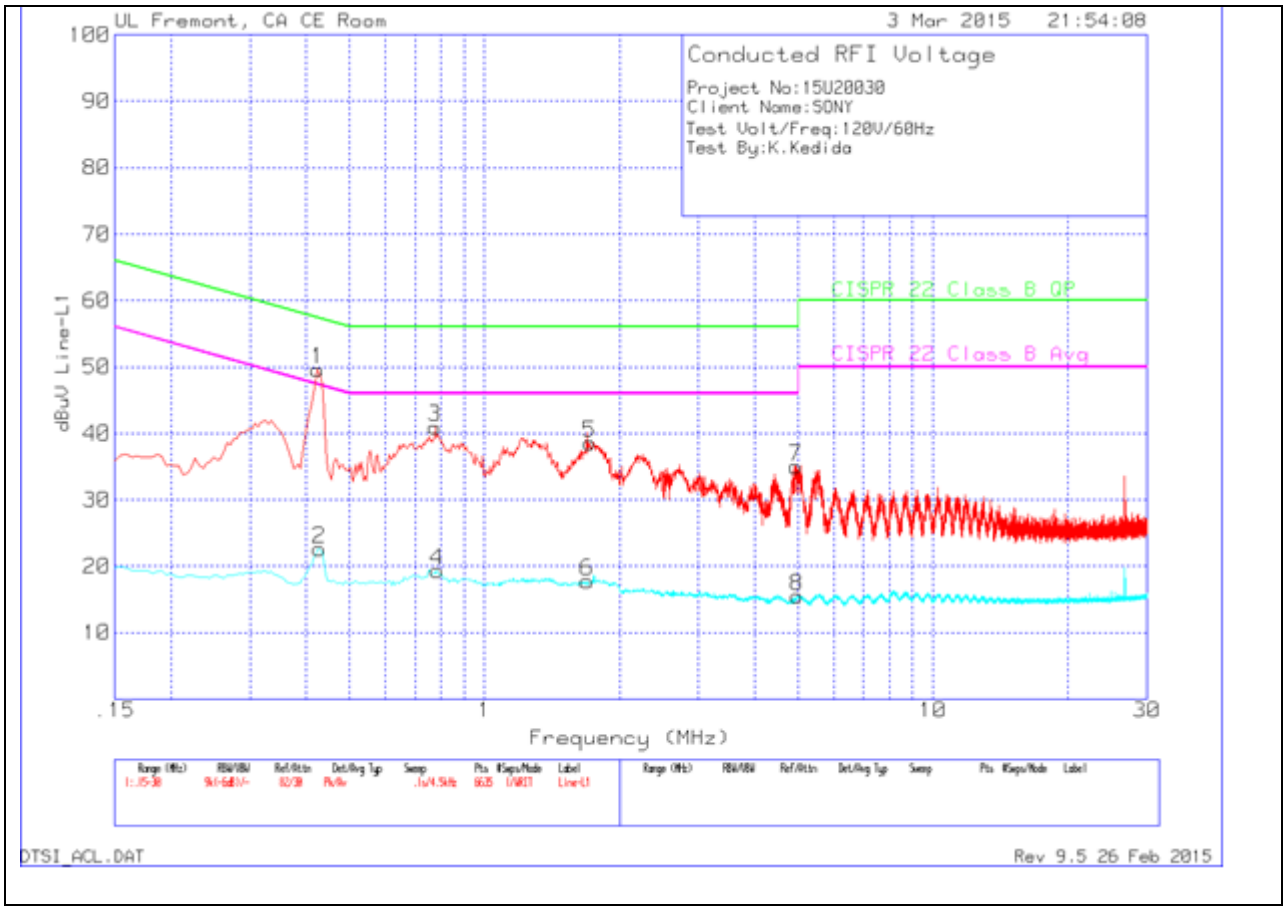
6 WORST EMISSIONS

LINE 1 PLOT



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LINE 1 RESULTS

Trace Markers

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	.4245	49.2	Pk	.4	0	49.6	-	-	-	-
2	.429	22.21	Av	.4	0	22.61	-	-	47.27	-24.66
3	.7755	40.63	Pk	.3	0	40.93	-	-	-	-
4	.7845	19.06	Av	.3	0	19.36	-	-	46	-26.64
5	1.716	38.24	Pk	.2	.1	38.54	-	-	-	-
6	1.6935	17.46	Av	.2	.1	17.76	-	-	46	-28.24
7	4.947	34.71	Pk	.2	.1	35.01	-	-	-	-
8	4.9785	15.21	Av	.2	.1	15.51	-	-	46	-30.49

Pk - Peak detector

Av - Average detection

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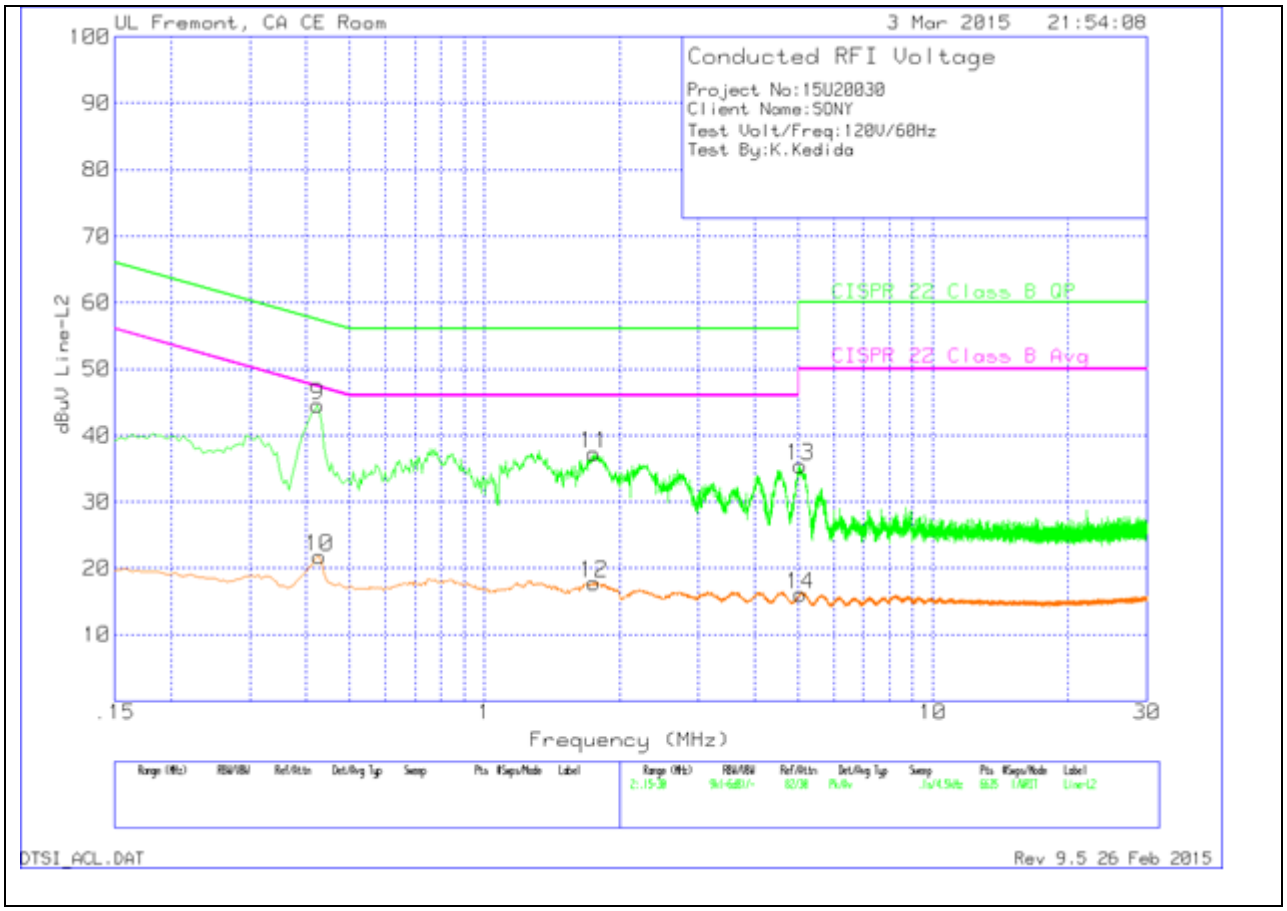
LINE 2 PLOT



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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)
9	.4245	44.12	Pk	.4	0	44.52	-	-	-	-
10	.429	21.35	Av	.4	0	21.75	-	-	47.27	-25.52
11	1.7565	37	Pk	.2	.1	37.3	-	-	-	-
12	1.7565	17.55	Av	.2	.1	17.85	-	-	46	-28.15
13	5.0595	35.18	Pk	.2	.1	35.48	-	-	-	-
14	5.0685	15.76	Av	.2	.1	16.06	-	-	50	-33.94

Pk - Peak detector

Av - Average detection

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