FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT
FOR
GSM/WCDMA/LTE Tablet with Bluetooth and DTS/UNII a/b/g/n

MODEL NUMBER: SM-T239M

FCC ID: A3LSMT239M

REPORT NUMBER: 15I20013-E2 REVISION A

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2/16/15	Initial Issue	P. Zhang
A	3/6/15	Update summary table	P. Zhang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	**SAMSUNG ELECTRONICS CO., LTD.**
EUT DESCRIPTION:	**GSM/WCDMA/LTE Tablet with Bluetooth and DTS/UNII a/b/g/n**
MODEL:	**SM-T239M**
SERIAL NUMBER:	**R32G101E1FD (Conducted); R32G1025LTJ(Radiated)**
DATE TESTED:	**JAN 26 – FEB 24, 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, FCC CFR 47 Part 15.

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)

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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 26000 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 Tablet with Bluetooth and DTS/UNII a/b/g/n.

The model FCC ID: A3LSMT239M shares the same enclosure and circuit board as mode FCC ID: A3LSMT239. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units.

The WWAN circuitry and layout, including antenna, are almost identical between the two units. Only Difference is addition of UMTS B4, LTE B2, B4, B17 circuit.

After confirming through preliminary radiated emissions that the performance of the A3LSMT239M WLAN/Bluetooth data remains representative of this model (FCC ID: A3LSMT239). Test data for FCC ID: A3LSMT239 is being submitted for this application.

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	6.72	4.70
2402 - 2480	Enhanced 8PSK	6.31	4.28

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 0.54 dBi.

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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	SAMSUNG	ETA0U83EWE	N/A	N/A
Earphone	SAMSUNG	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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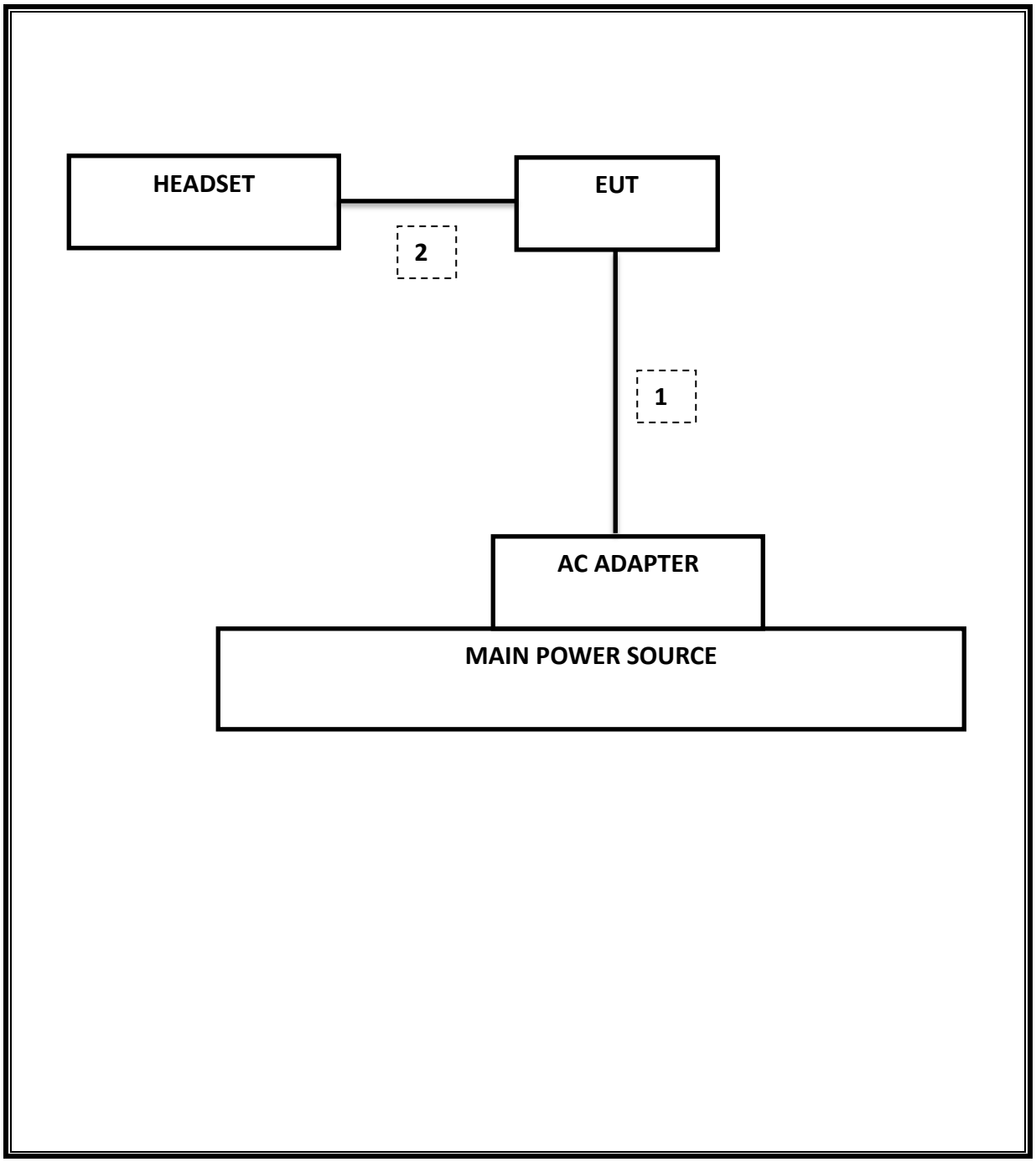
SETUP DIAGRAM FOR TESTS



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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**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/16
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15

Test Equipment 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	1.187MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-41.84dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	6.72dBm
15.247 (a)(1)	RSS-210 A8.1(b)	Hopping frequency separation	> 25KHz		Pass	1MHz
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.2858sec
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	46.34dBuV(PK)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	42.21dBuV/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	0.928	0.872
Middle	2441	0.93	0.873
High	2480	0.931	0.876
Worst		0.931	0.876

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.218	1.185
Middle	2441	1.257	1.184
High	2480	1.266	1.187
Worst		1.266	1.187

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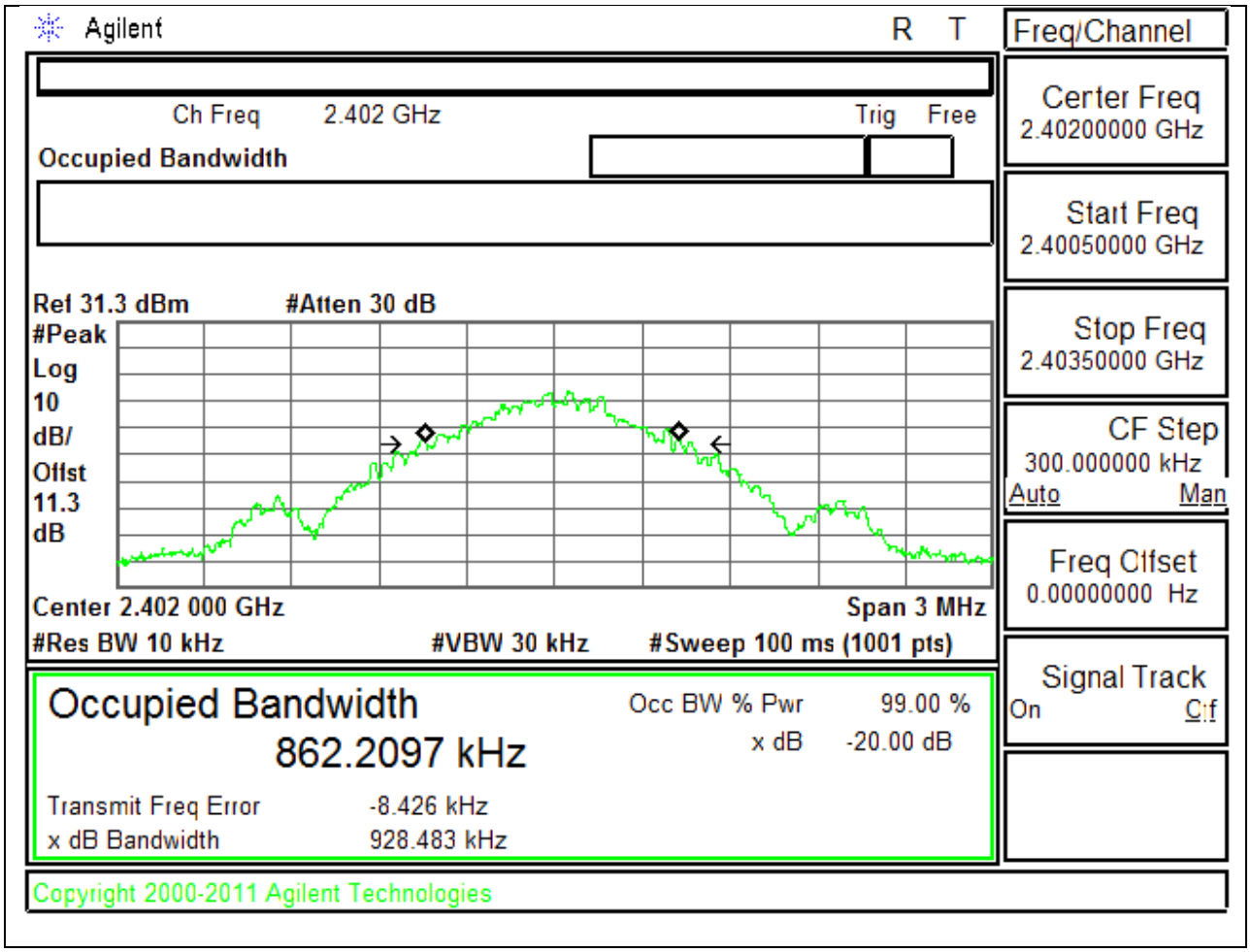
20 dB AND 99% BANDWIDTH PLOTS

GFSK 20 dB BANDWIDTH

LOW CHANNEL



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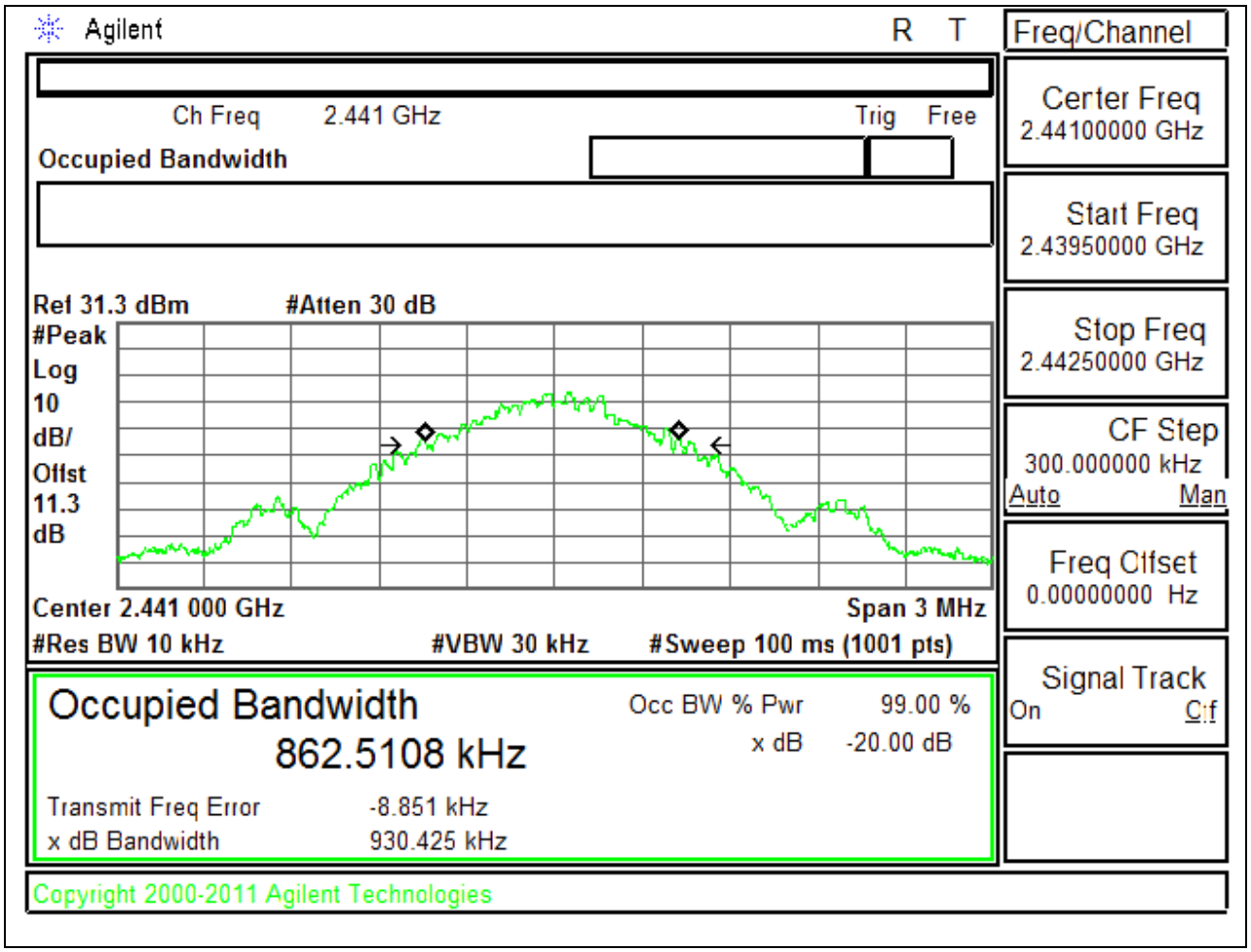
MID CHANNEL



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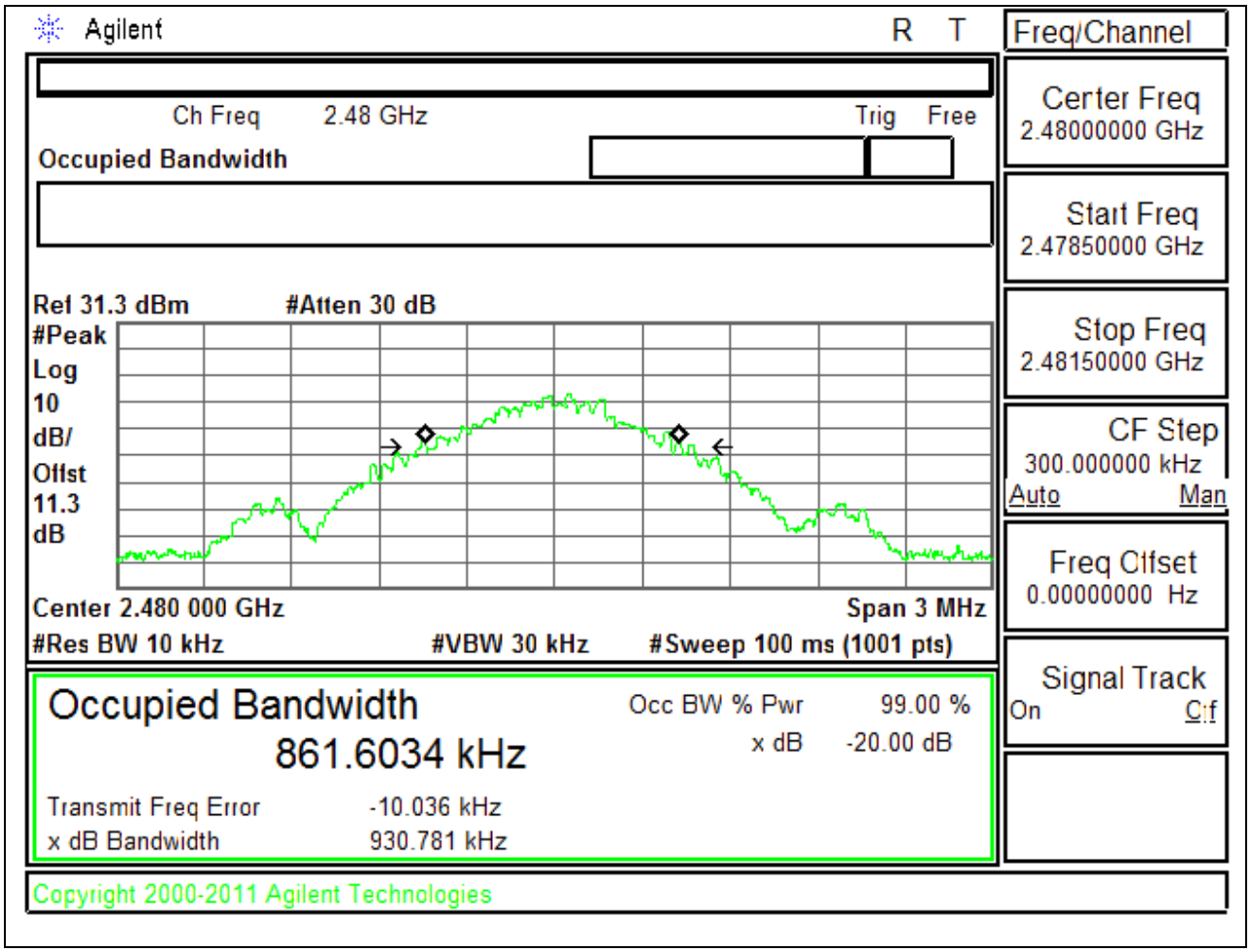
HIGH CHANNEL



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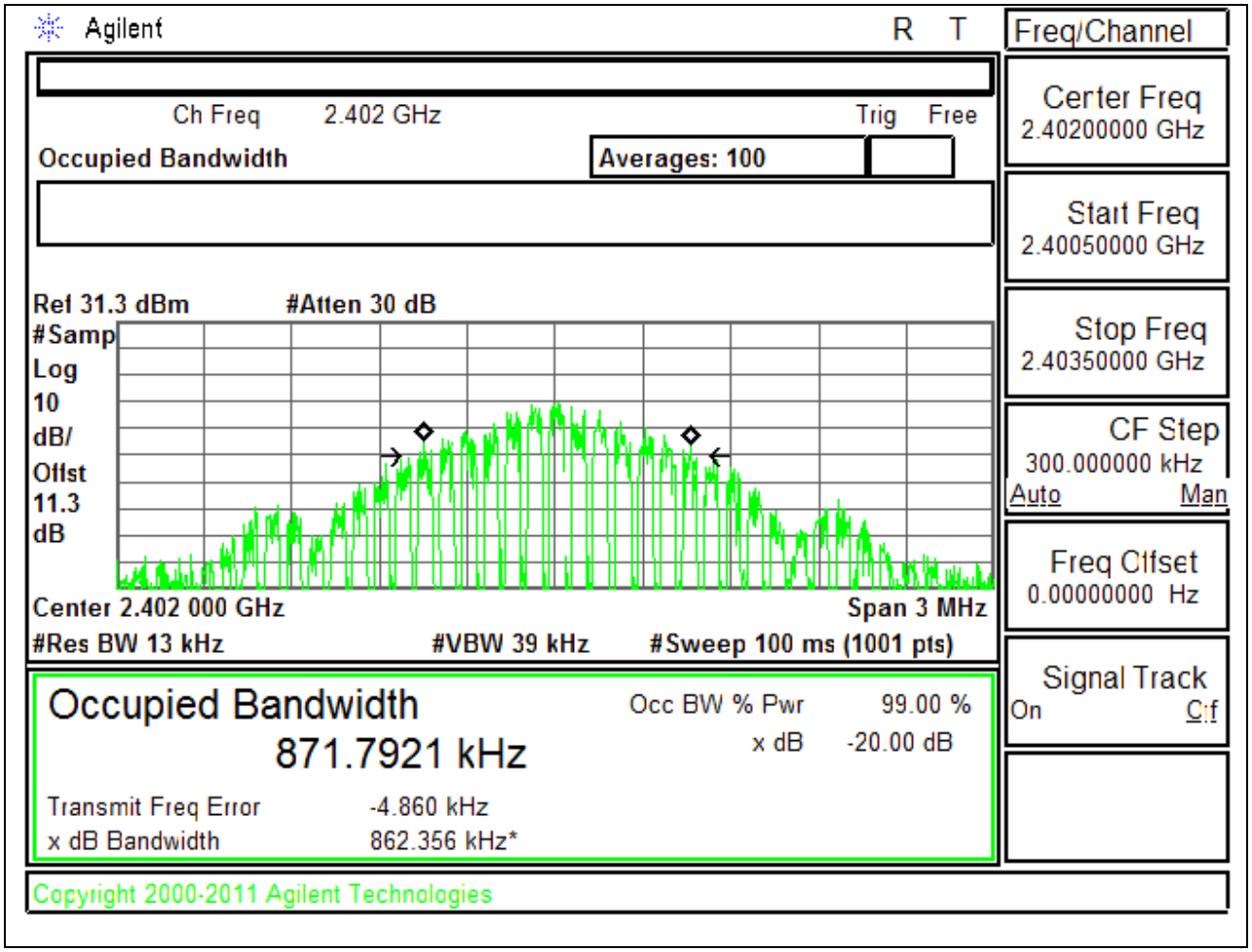
GFSK 99% BANDWIDTH

LOW CHANNEL



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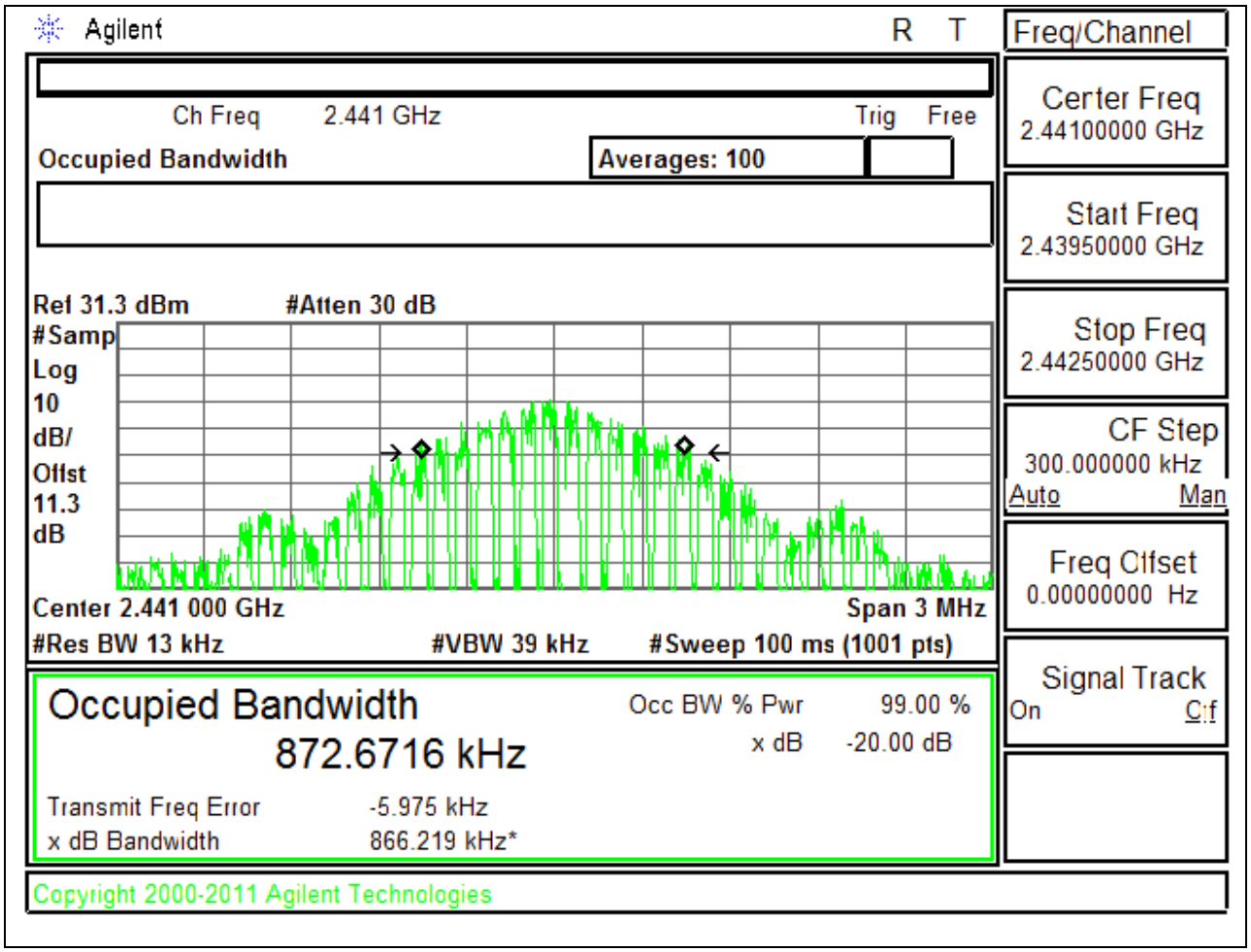
MID CHANNEL



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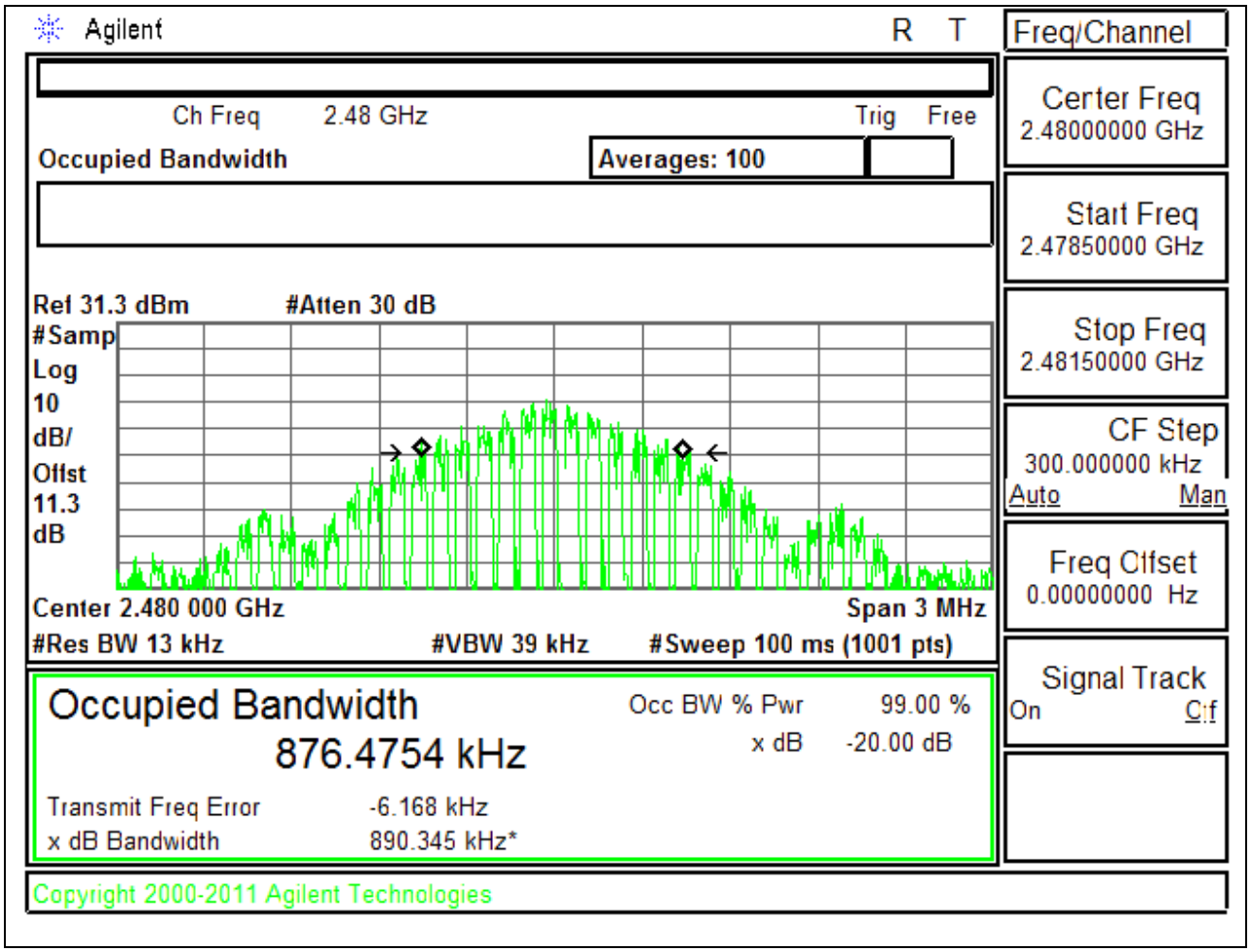
HIGH CHANNEL



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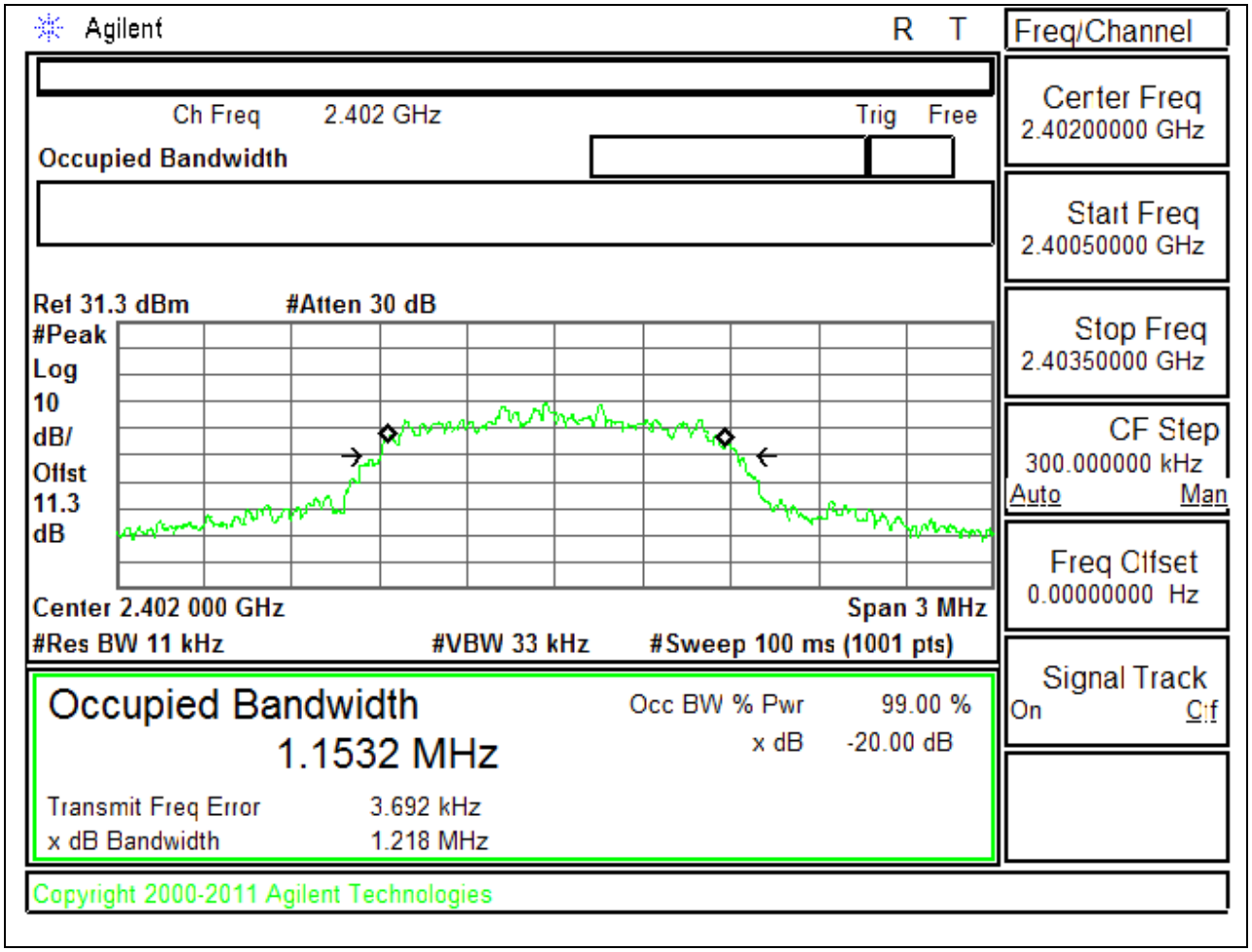
8PSK 20 dB BANDWIDTH

LOW CHANNEL



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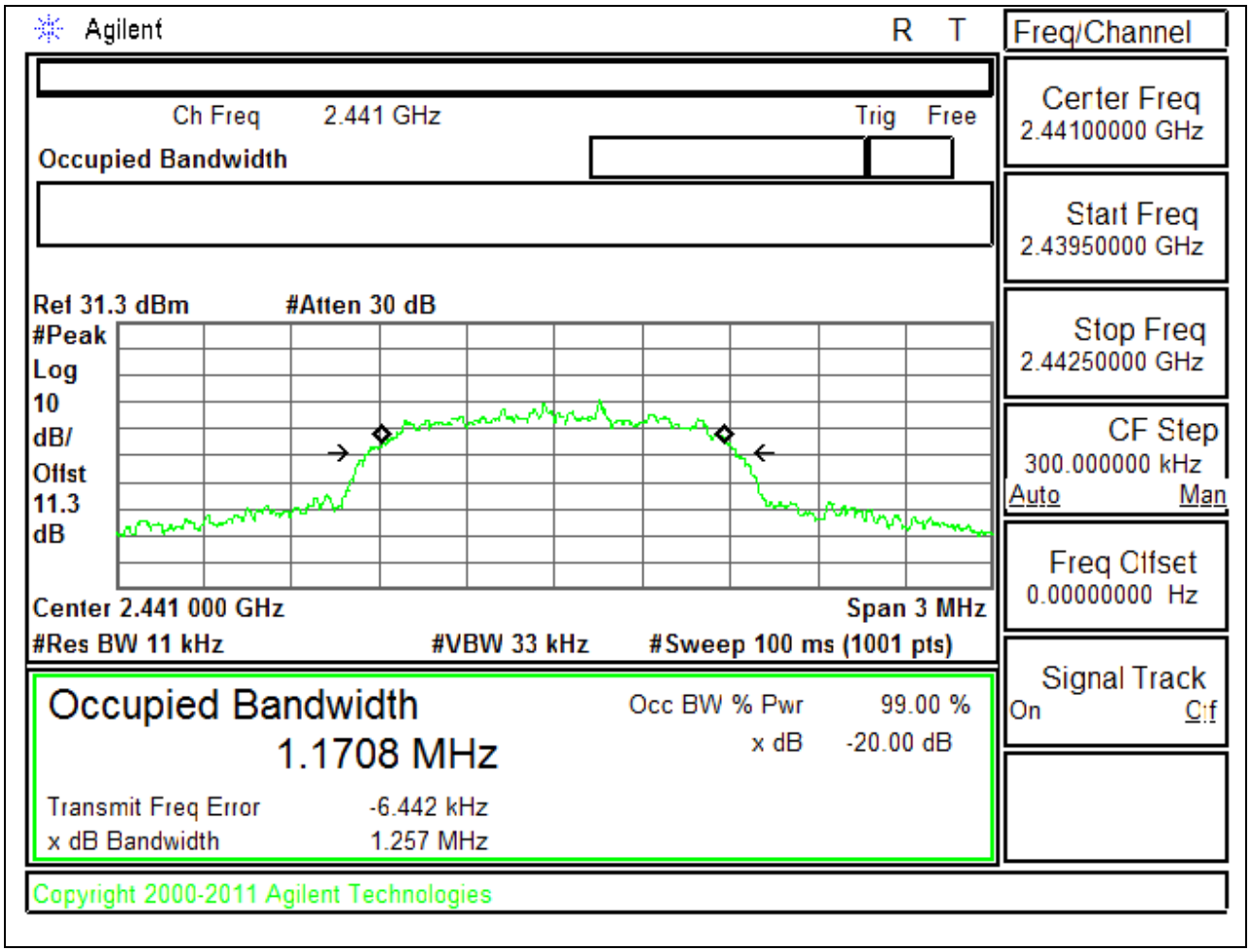
MID CHANNEL



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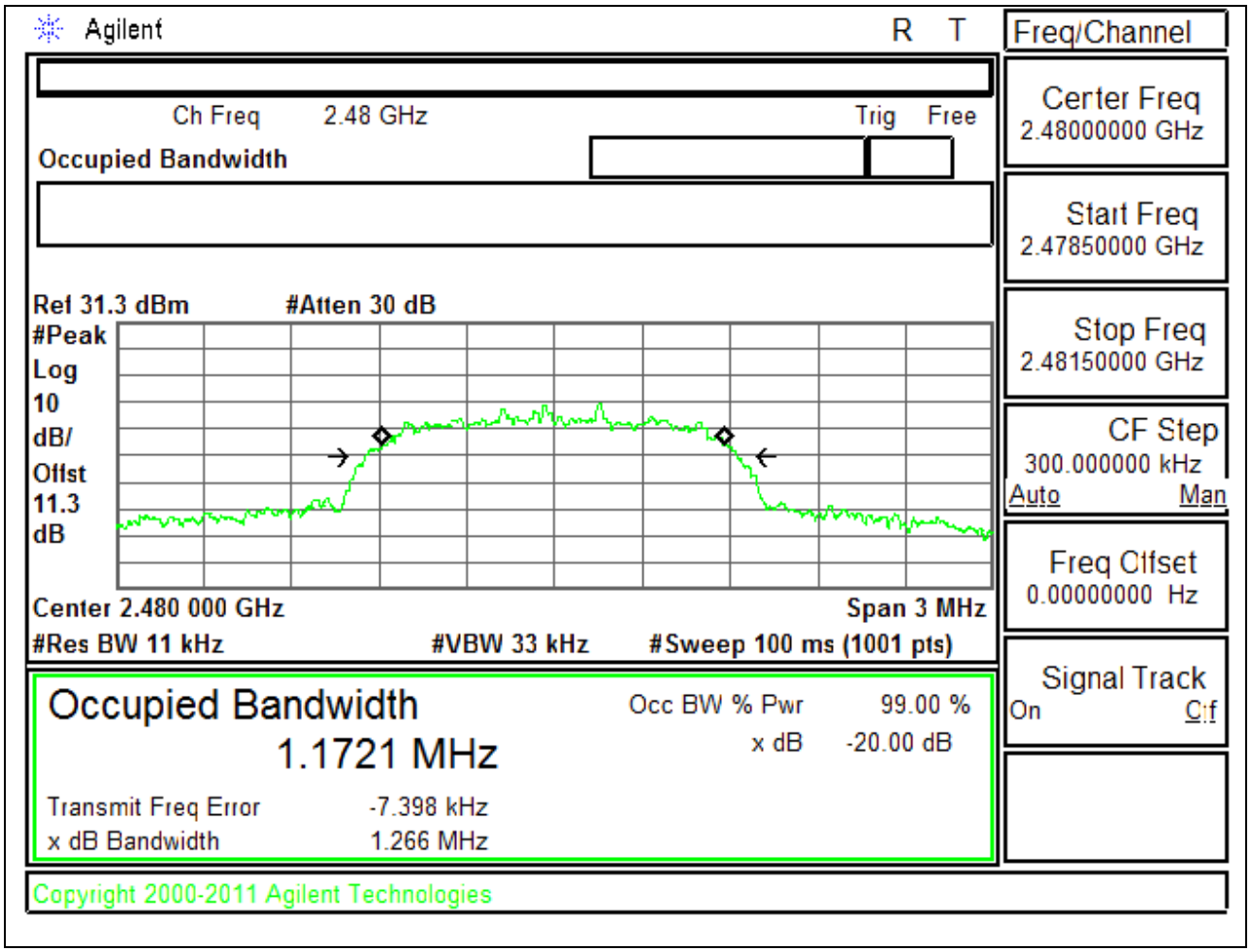
HIGH CHANNEL



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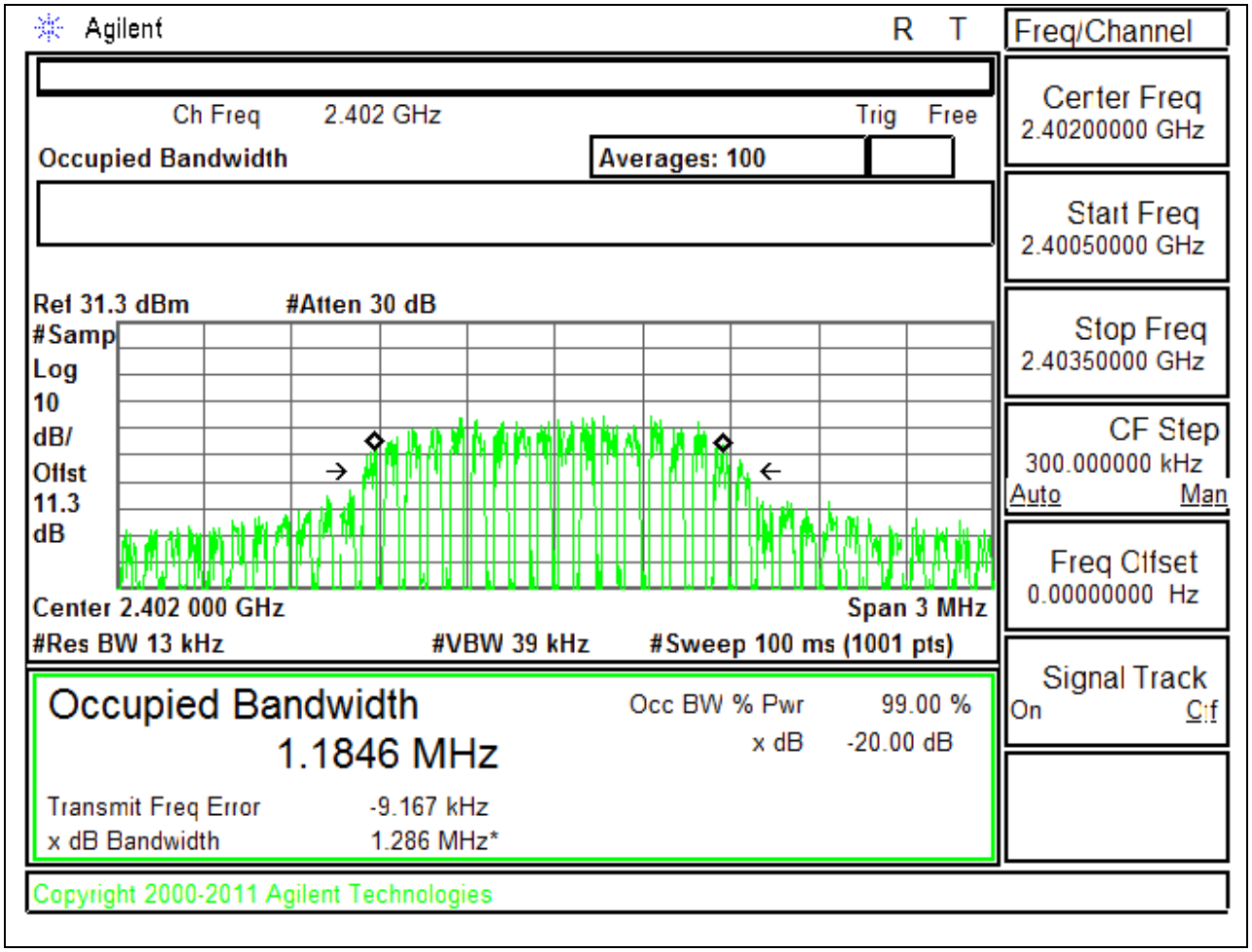
8PSK 99% BANDWIDTH

LOW CHANNEL



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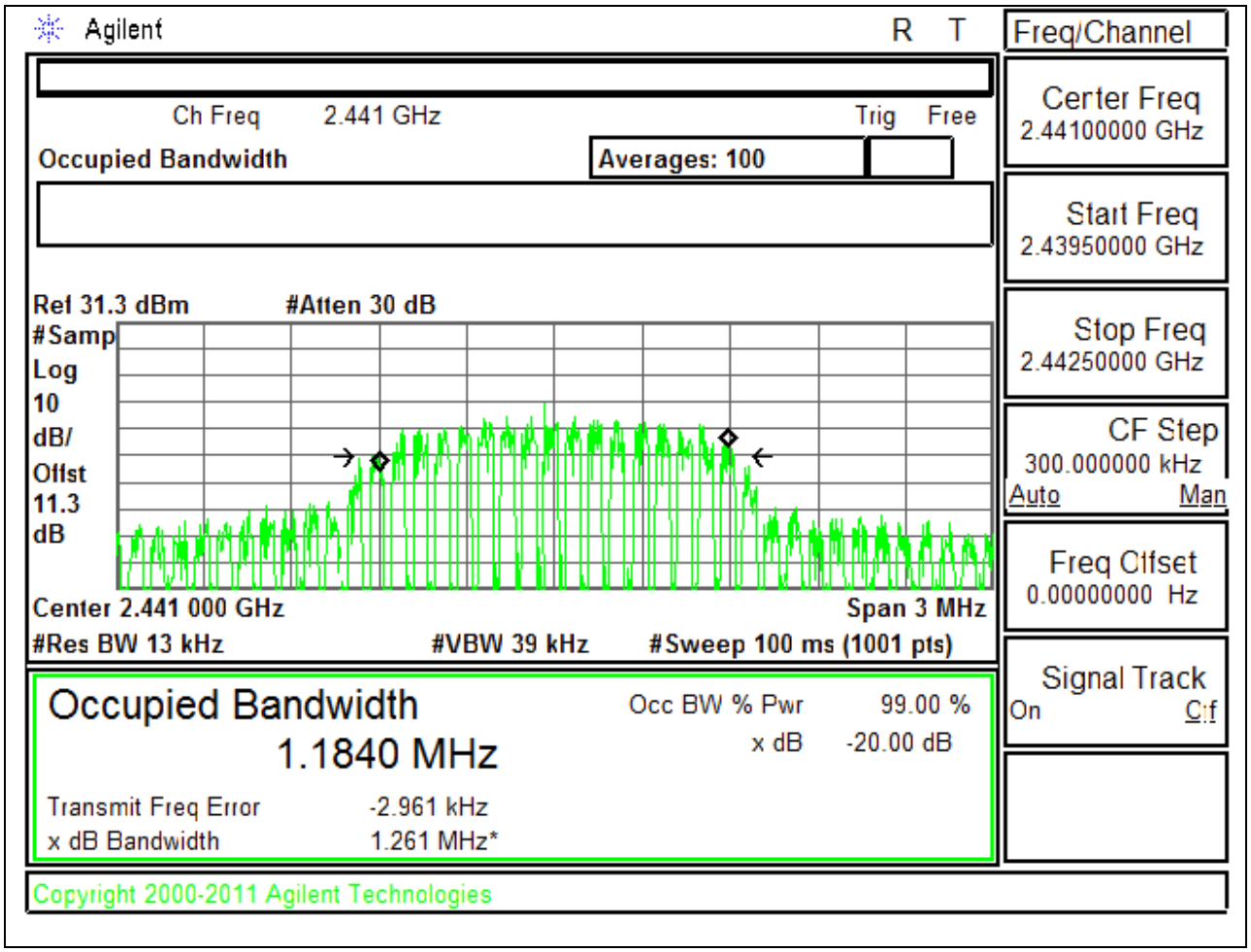
MID CHANNEL



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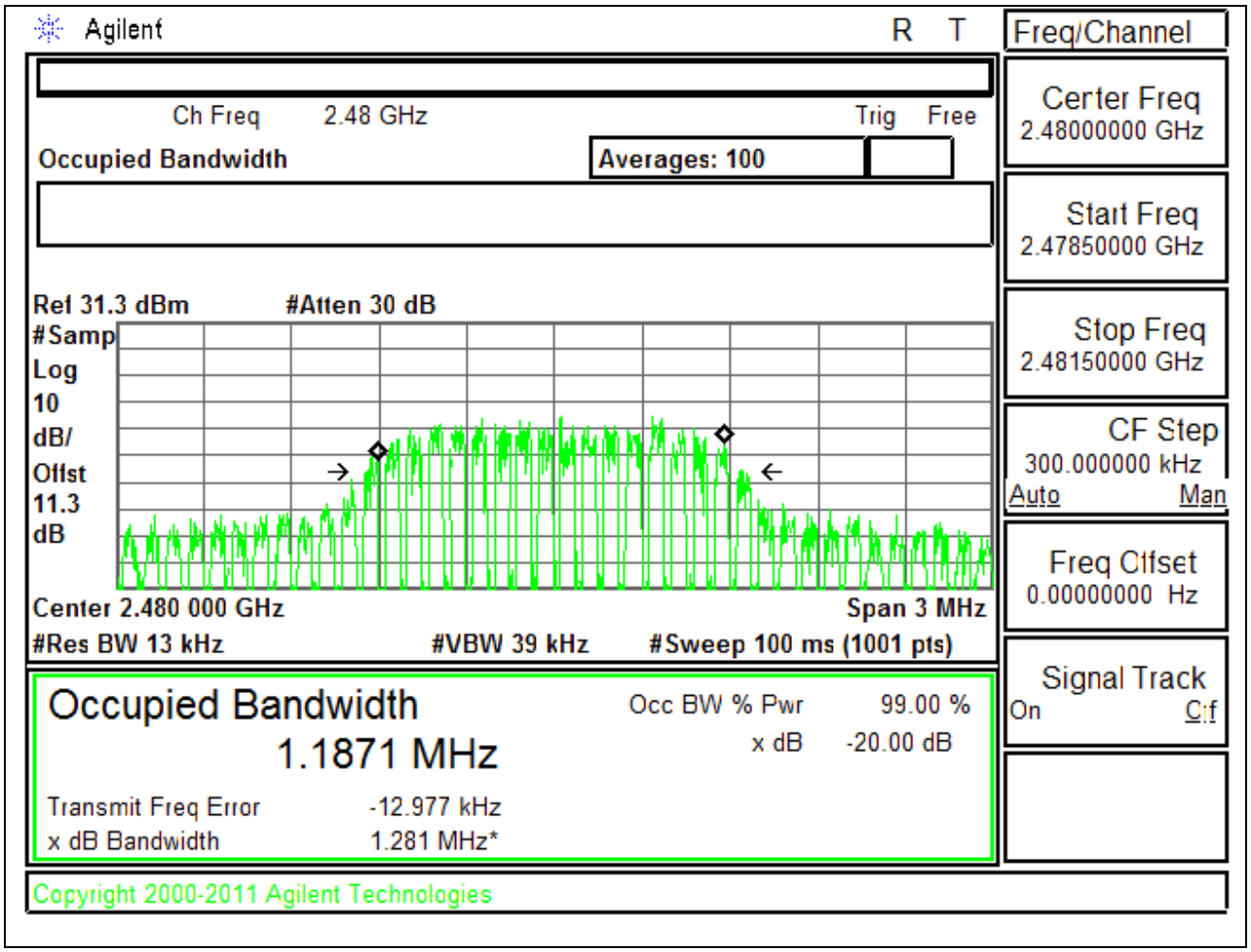
HIGH CHANNEL



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8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

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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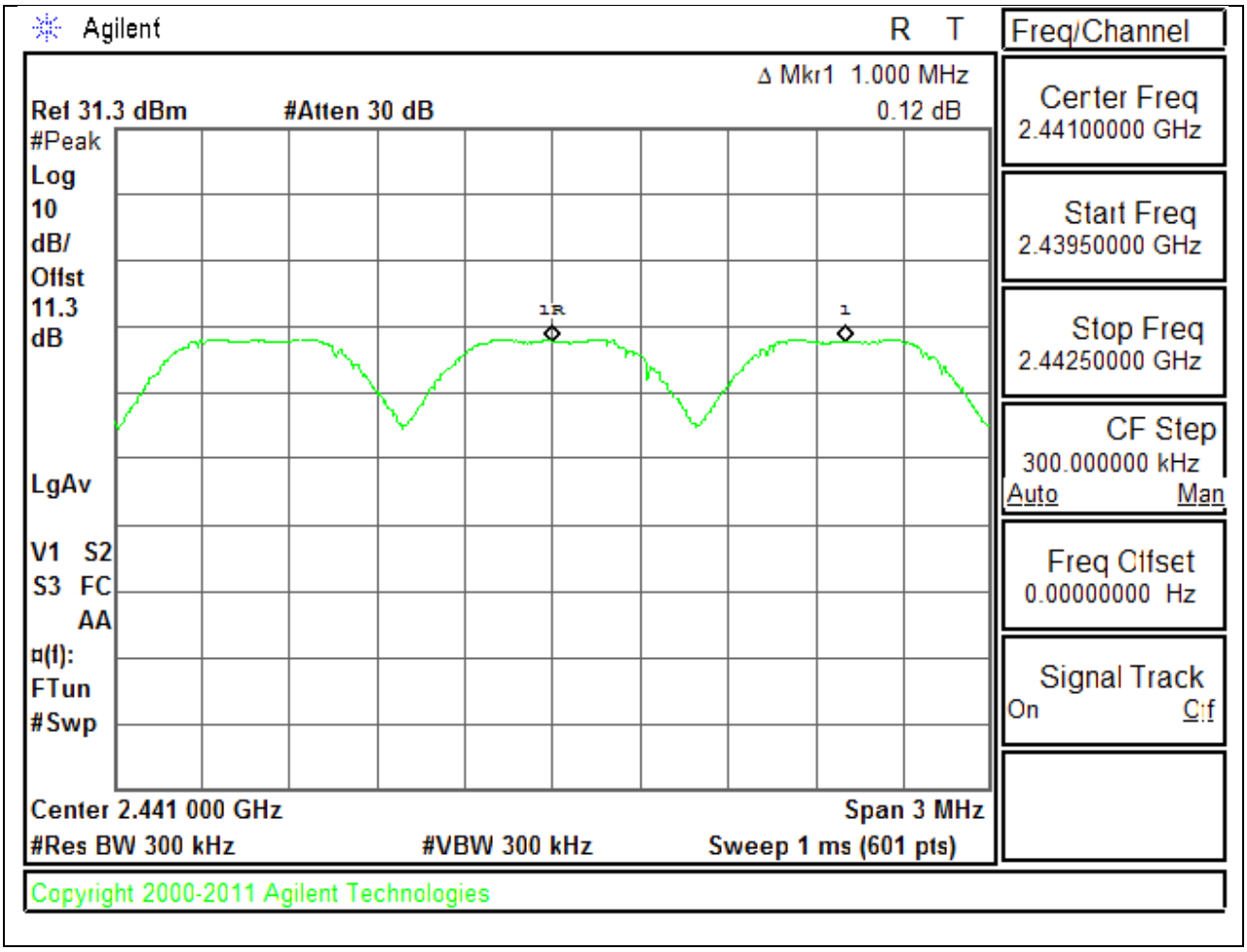
HOPPING FREQUENCY SEPARATION PLOT



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8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

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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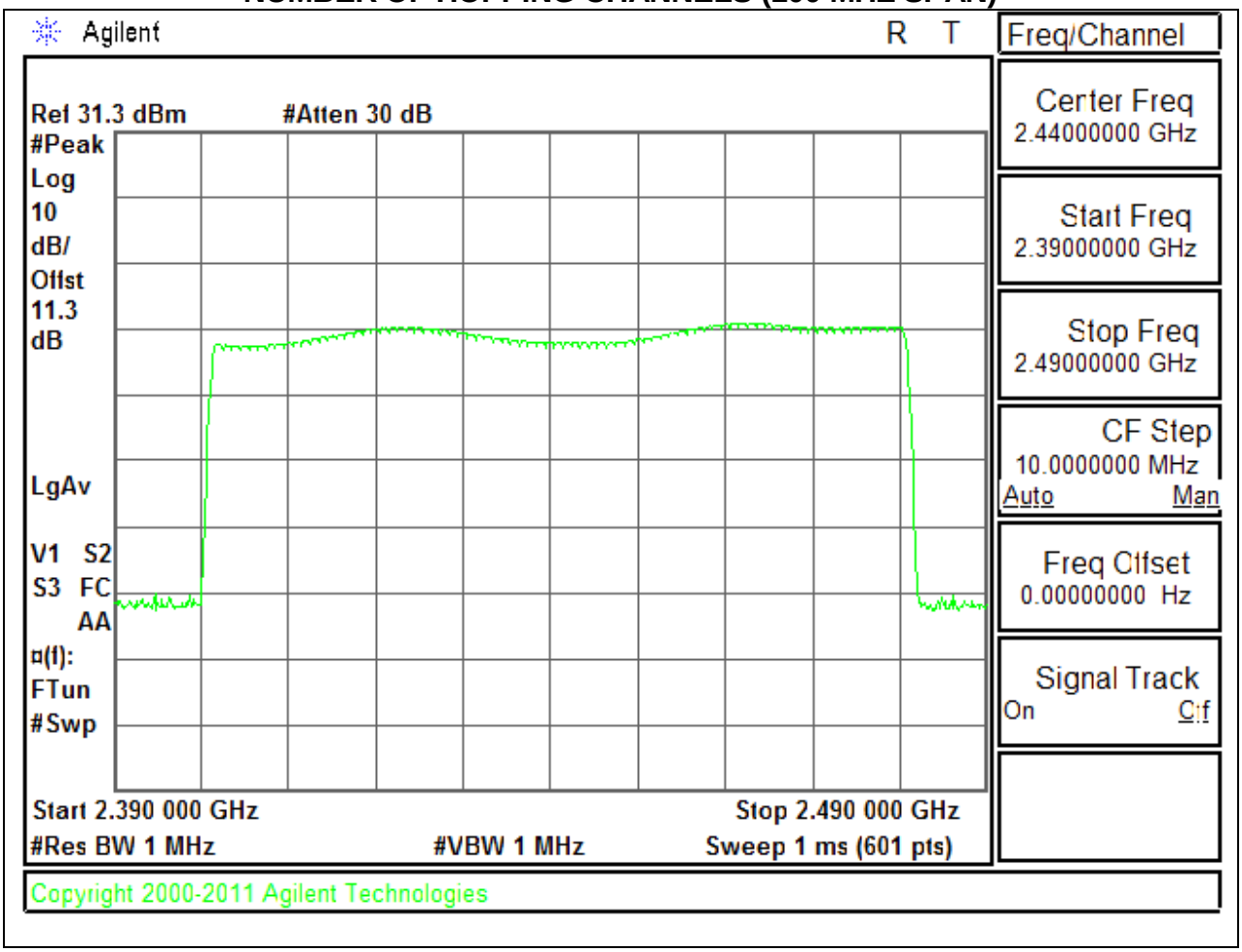
NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



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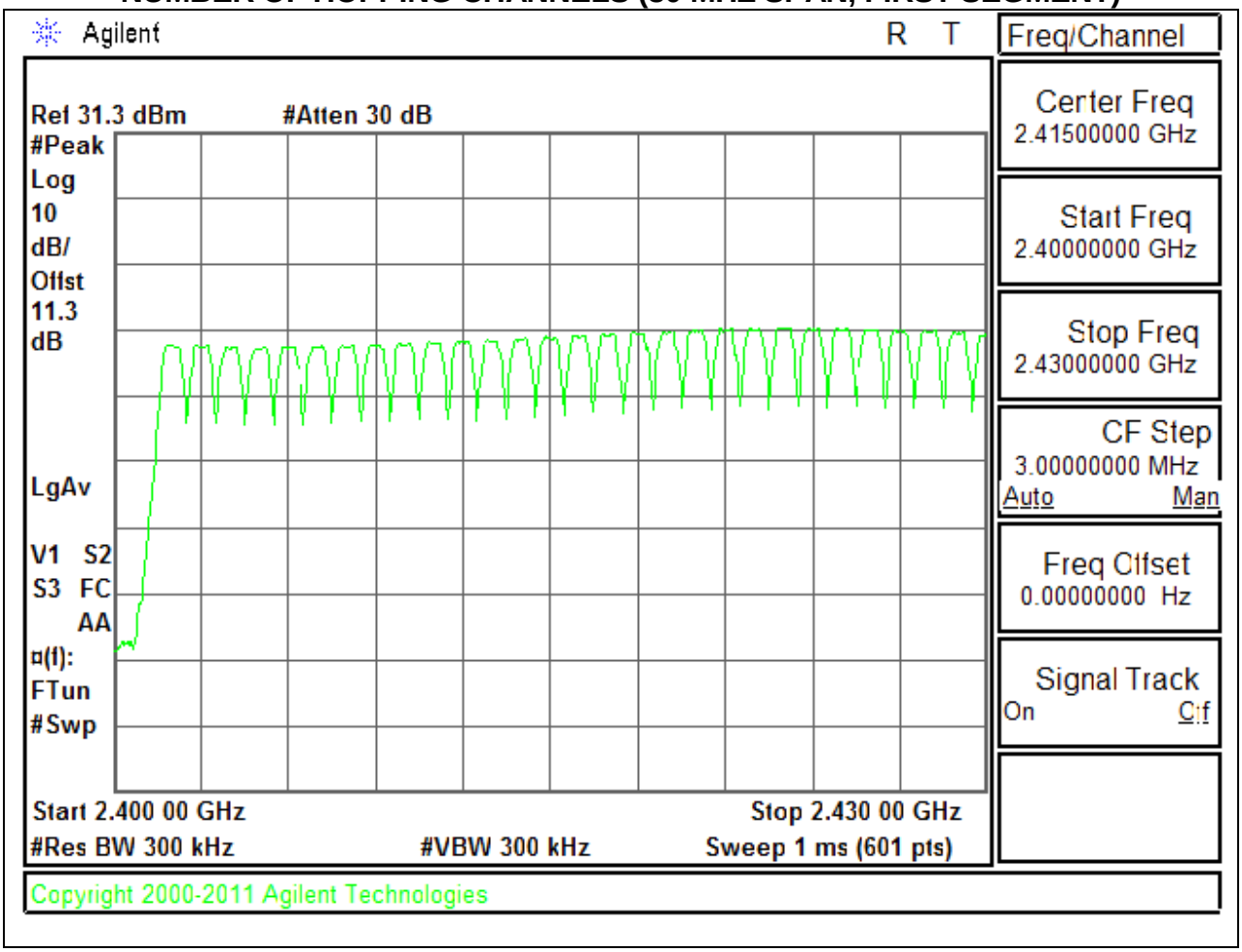
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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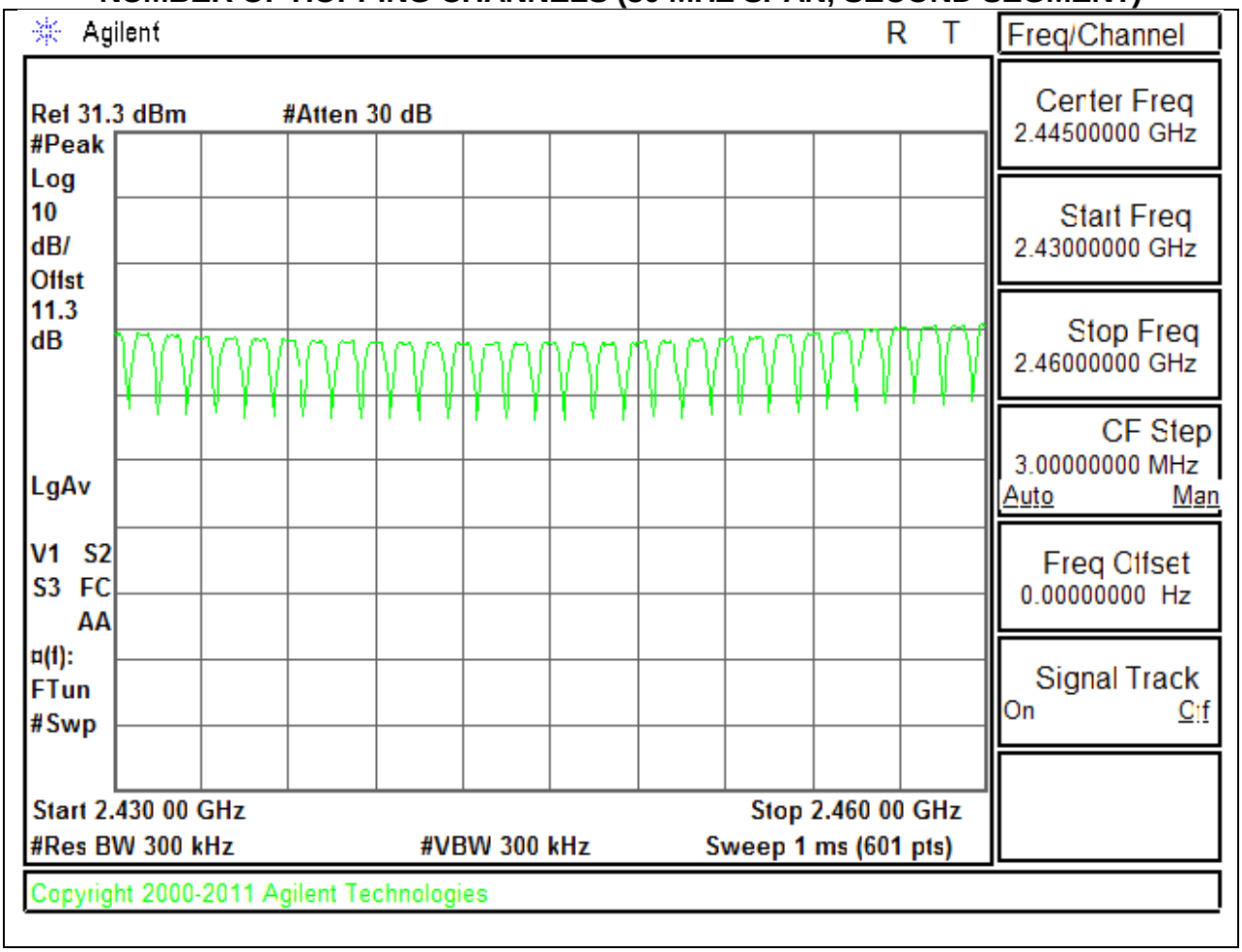
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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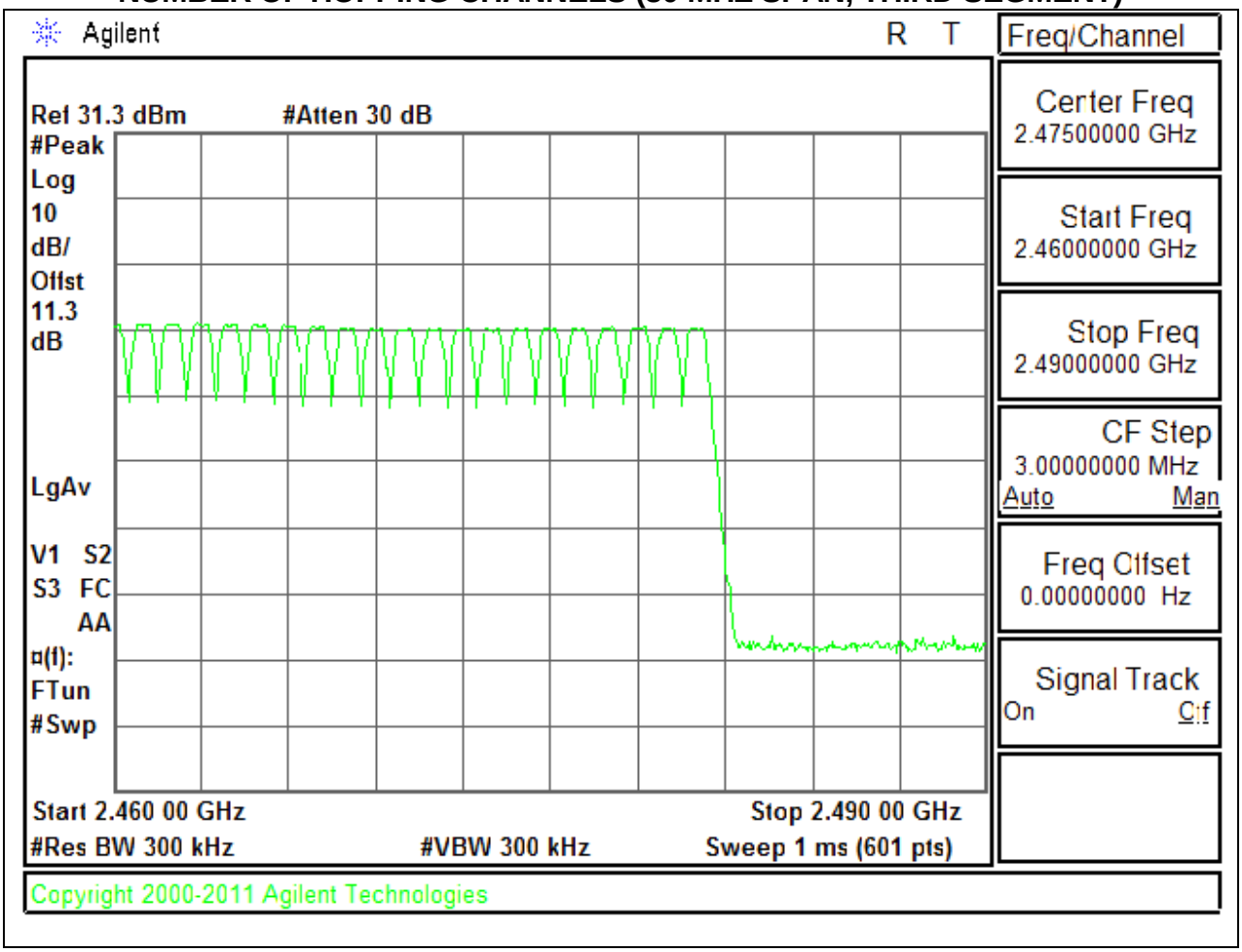
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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	0.3733	32	0.119456	0.4	-0.28054
DH3	1.622	17	0.27574	0.4	-0.12426
DH5	2.858	10	0.2858	0.4	-0.1142
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	0.3733	8	0.029864	0.4	-0.37014
DH3	1.622	4.25	0.068935	0.4	-0.33107
DH5	2.858	2.5	0.07145	0.4	-0.32855

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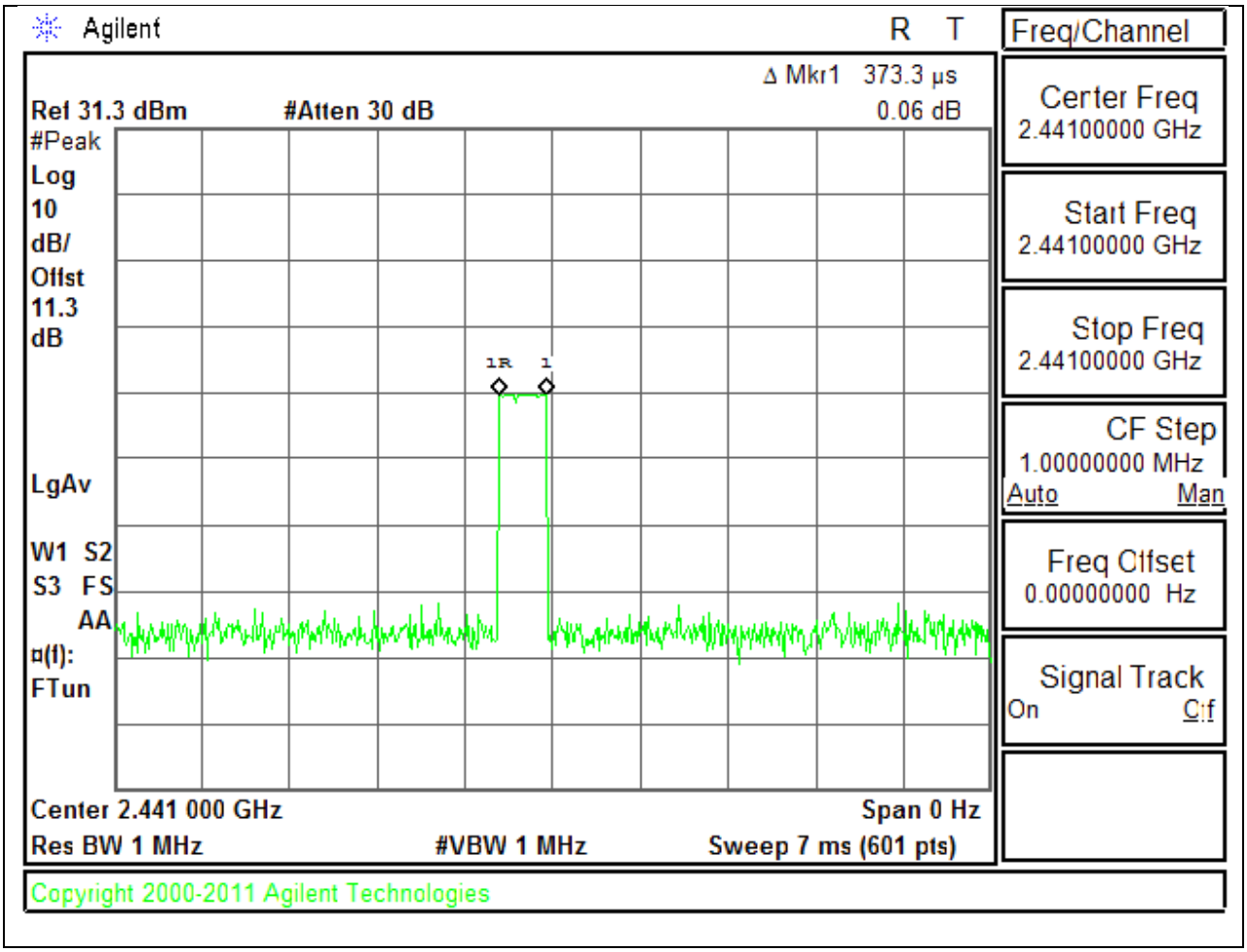
PULSE WIDTH - DH1



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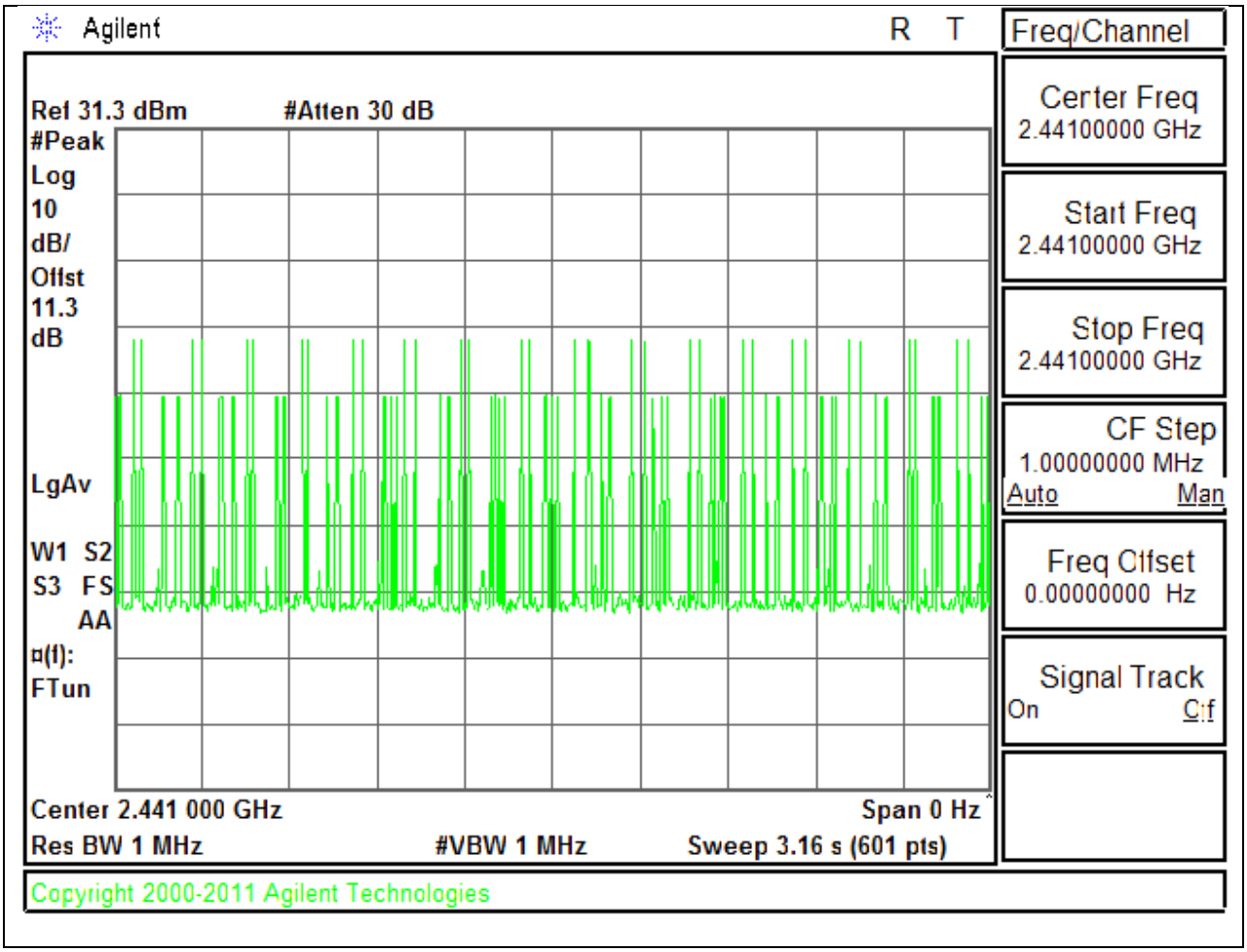
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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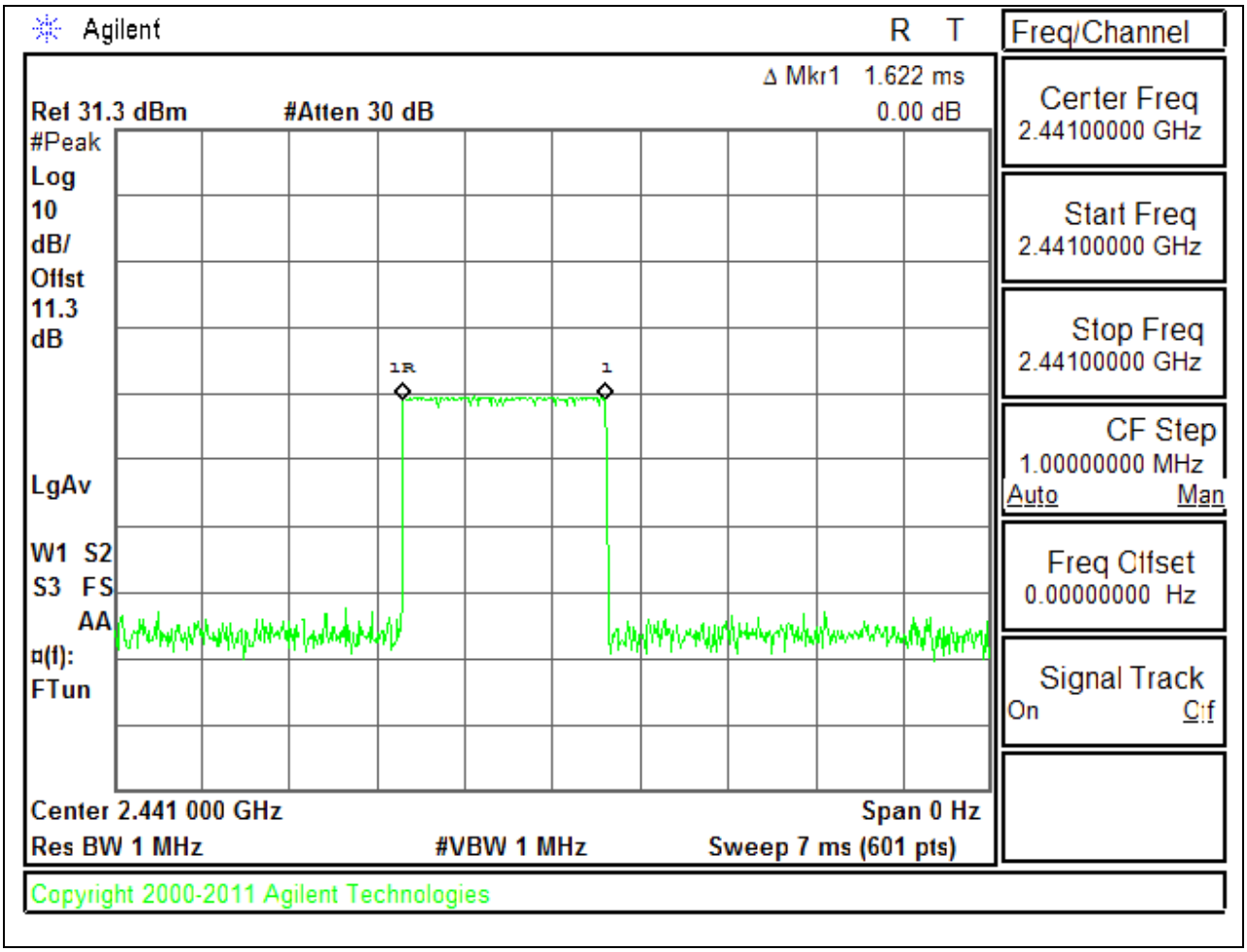
PULSE WIDTH - DH3



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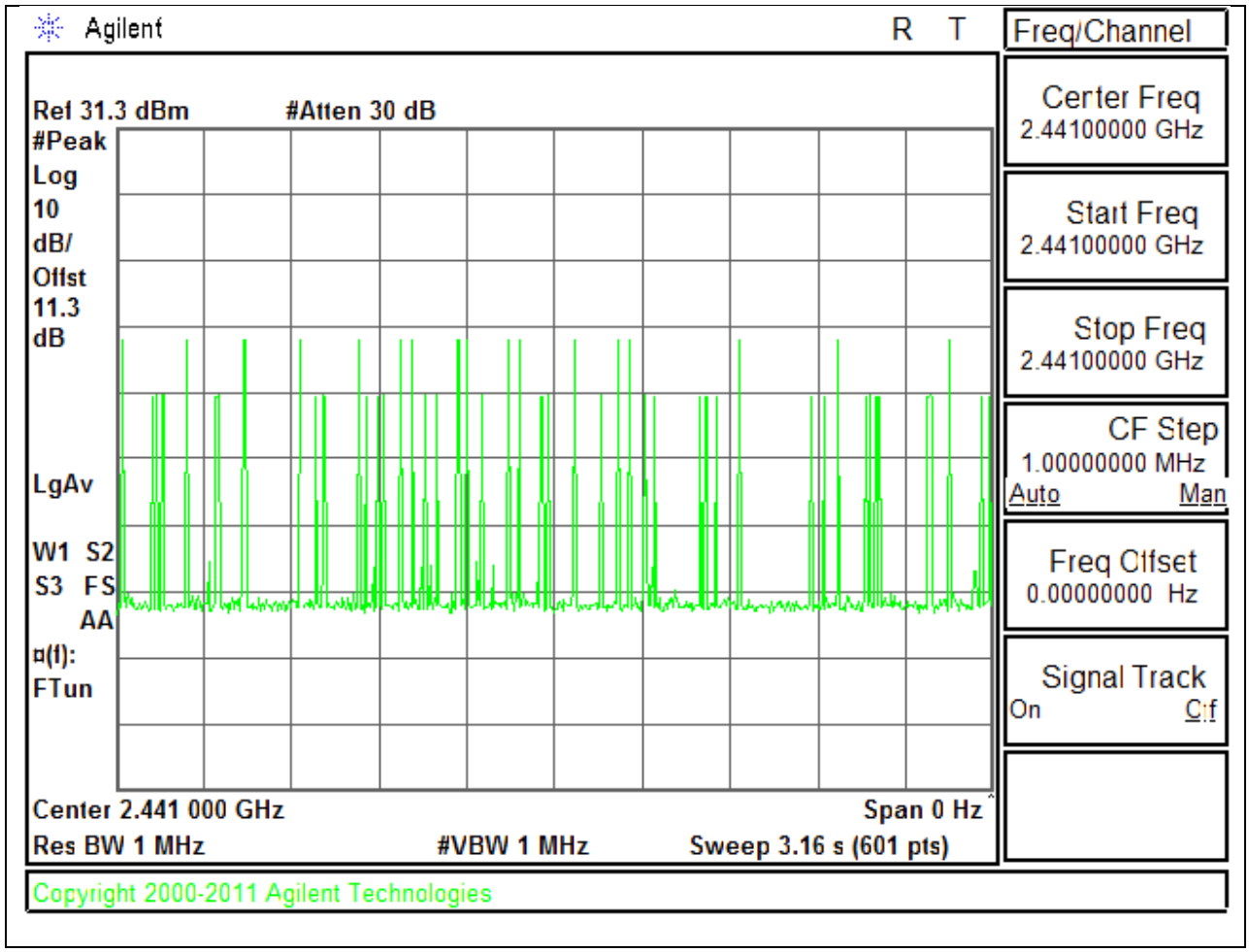
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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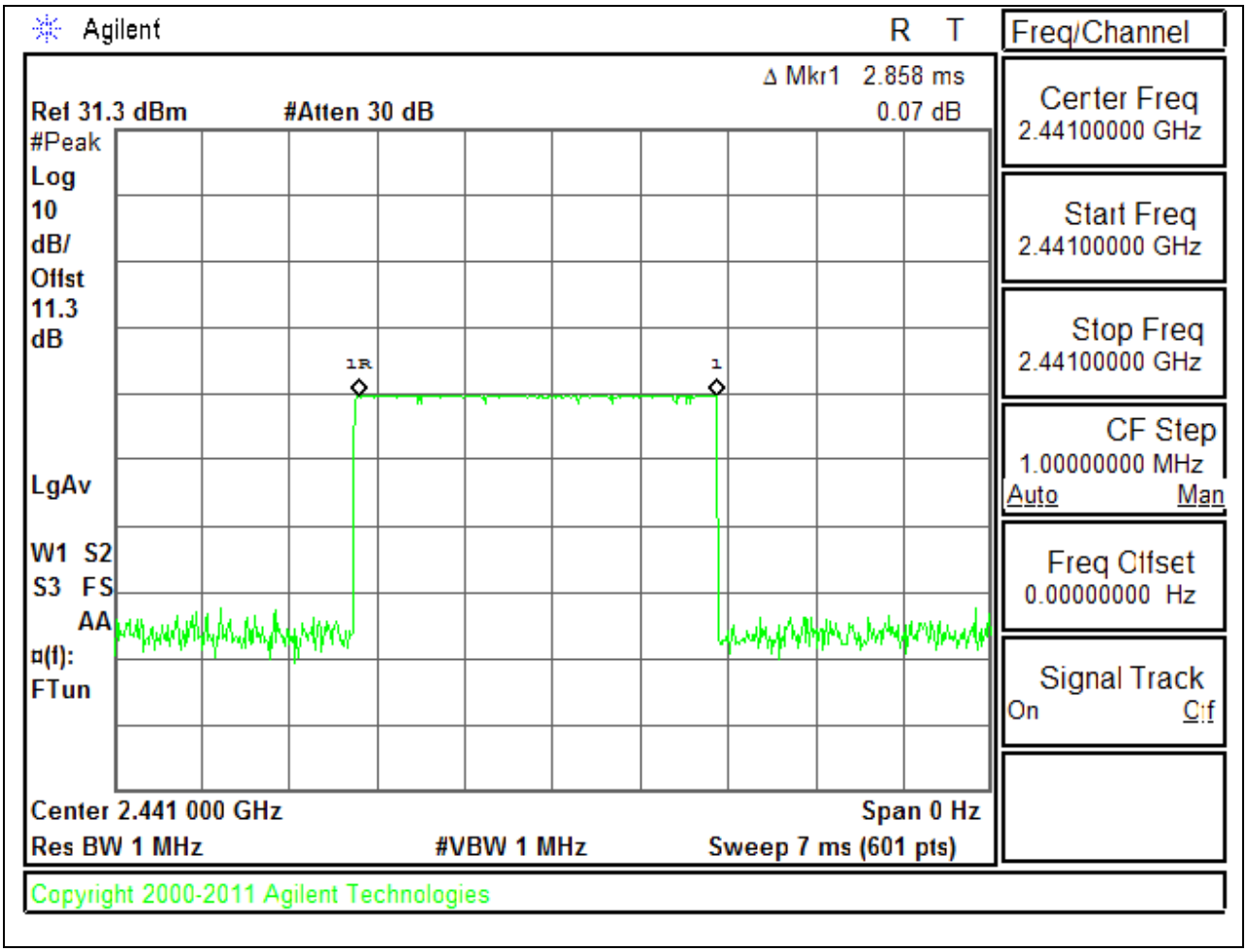
PULSE WIDTH - DH5



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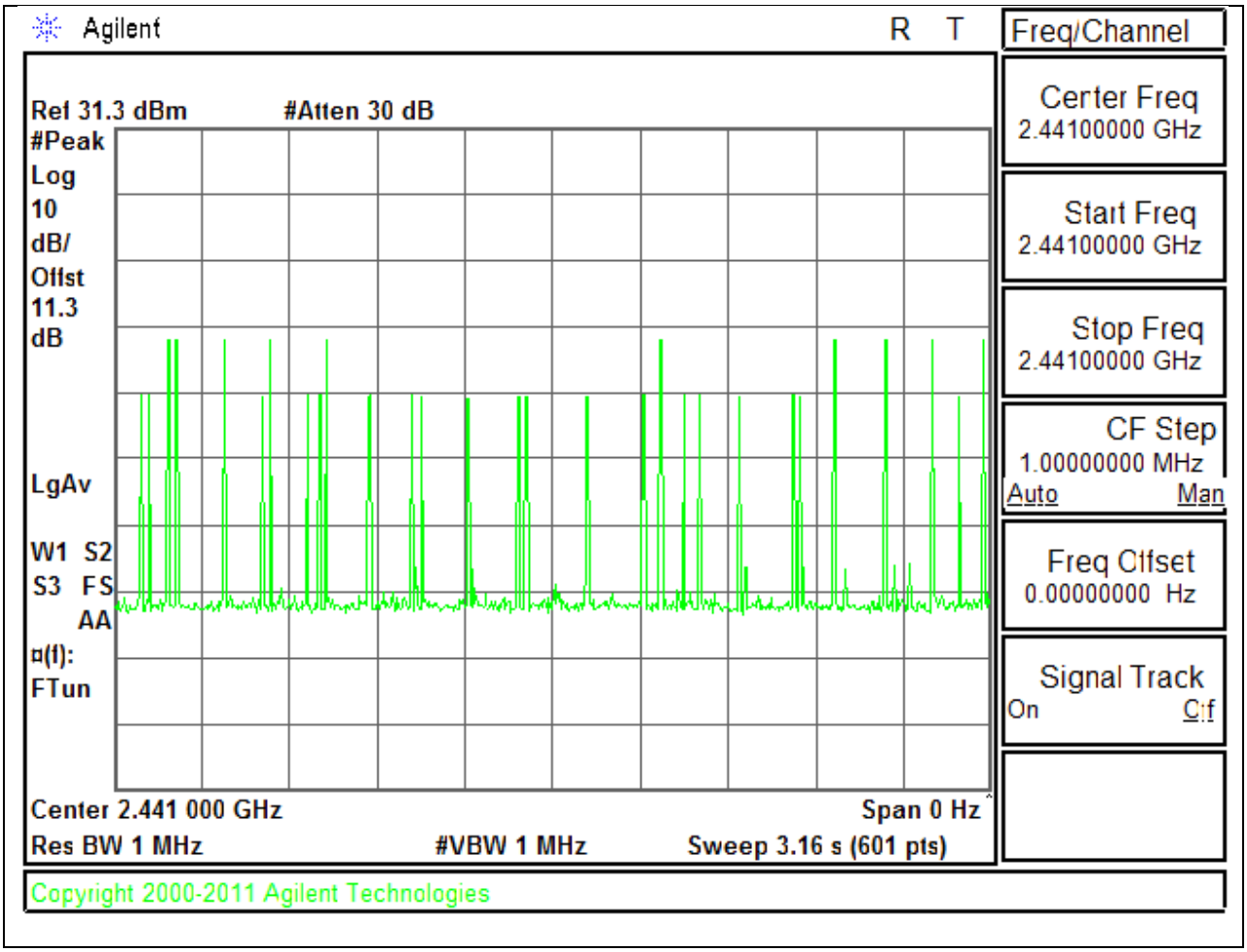
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

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	6.04	21	-14.96
Middle	2441	6.72	21	-14.28
High	2480	5.28	21	-15.72
Worst		6.72		-14.28

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.71	21	-15.29
Middle	2441	6.31	21	-14.69
High	2480	5.09	21	-15.91
Worst		6.31		-14.69

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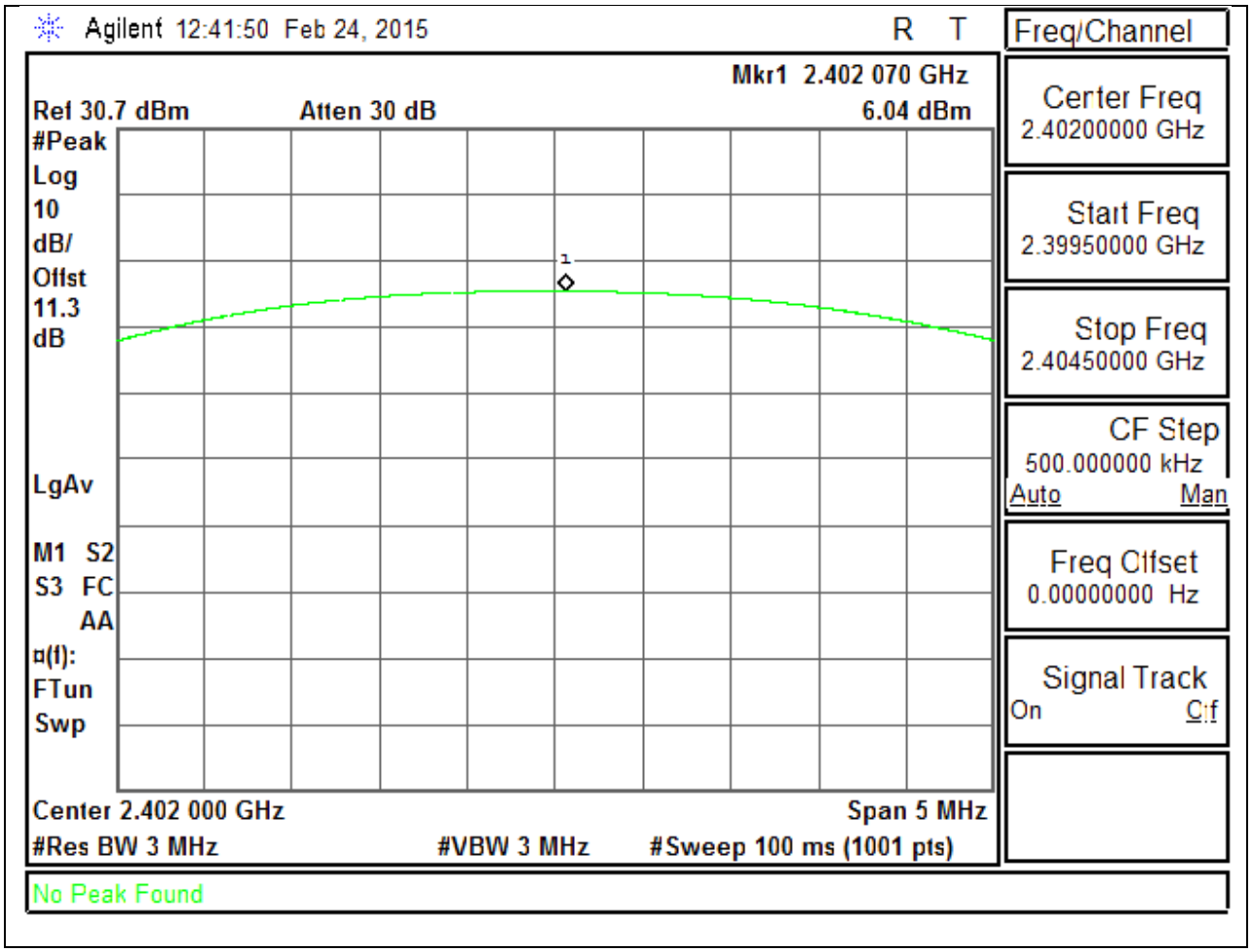
8.5.3. OUTPUT POWER PLOTS

GFSK OUTPUT POWER

LOW CHANNEL



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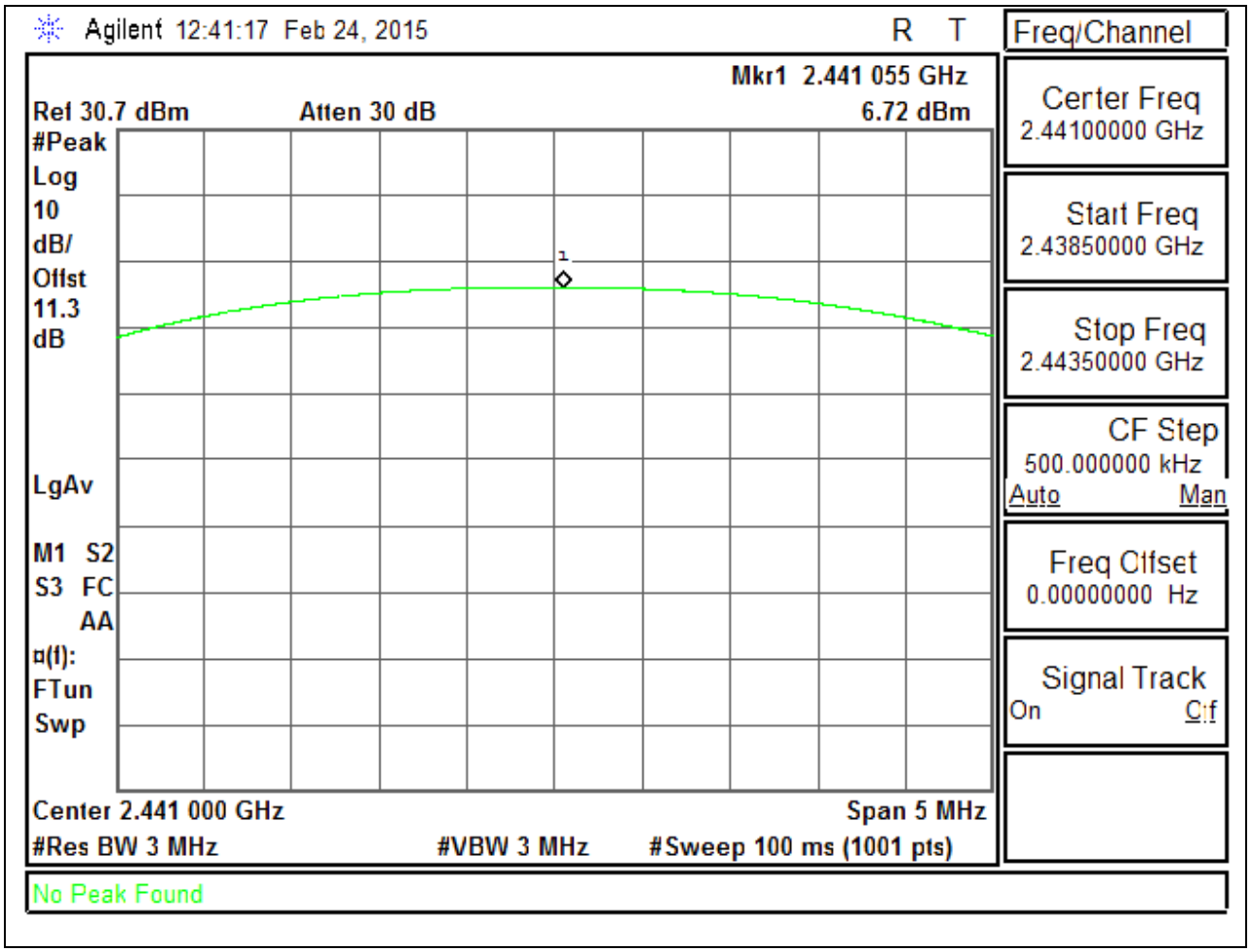
MID CHANNEL



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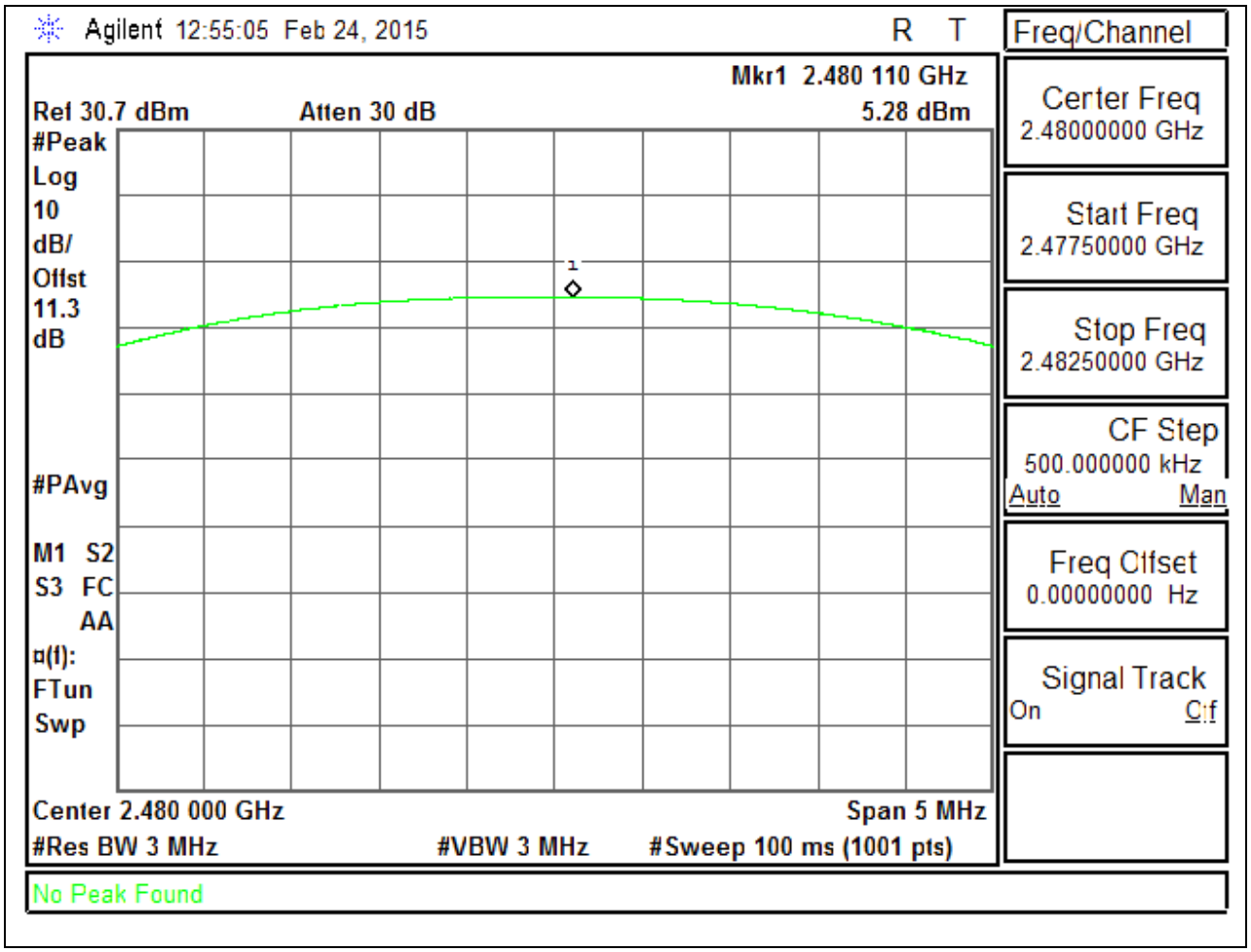
HIGH CHANNEL



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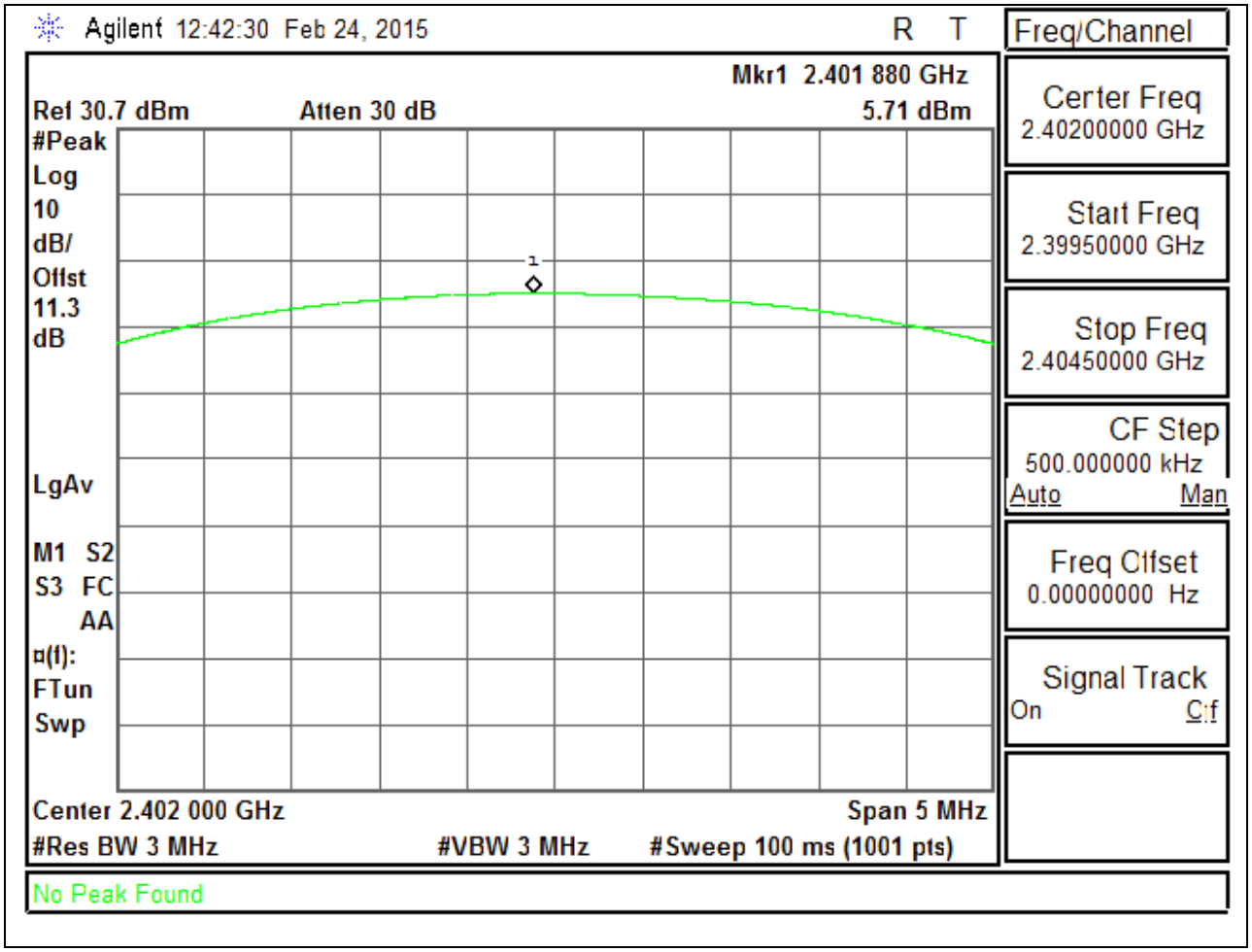
8PSK OUTPUT POWER

LOW CHANNEL



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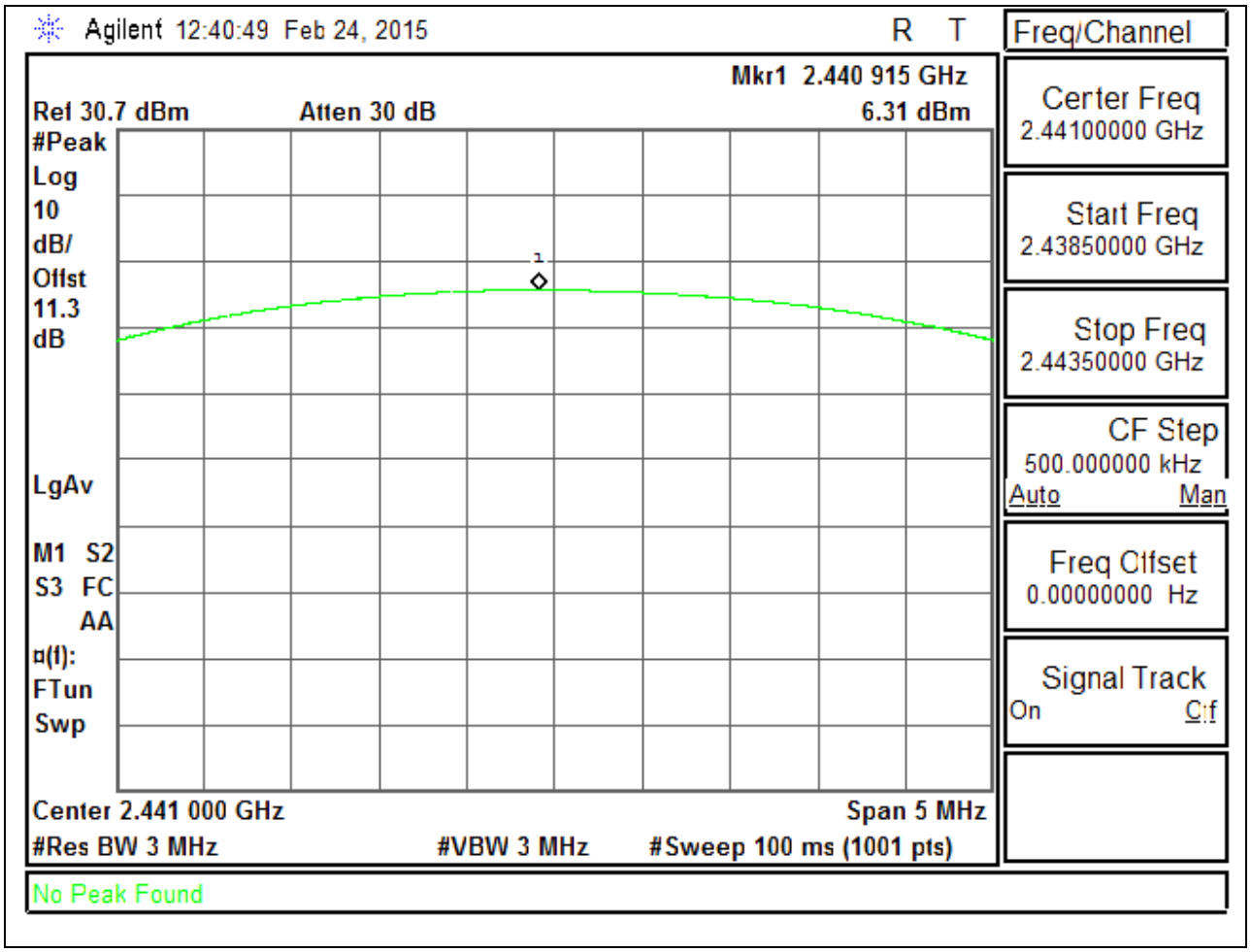
MID CHANNEL



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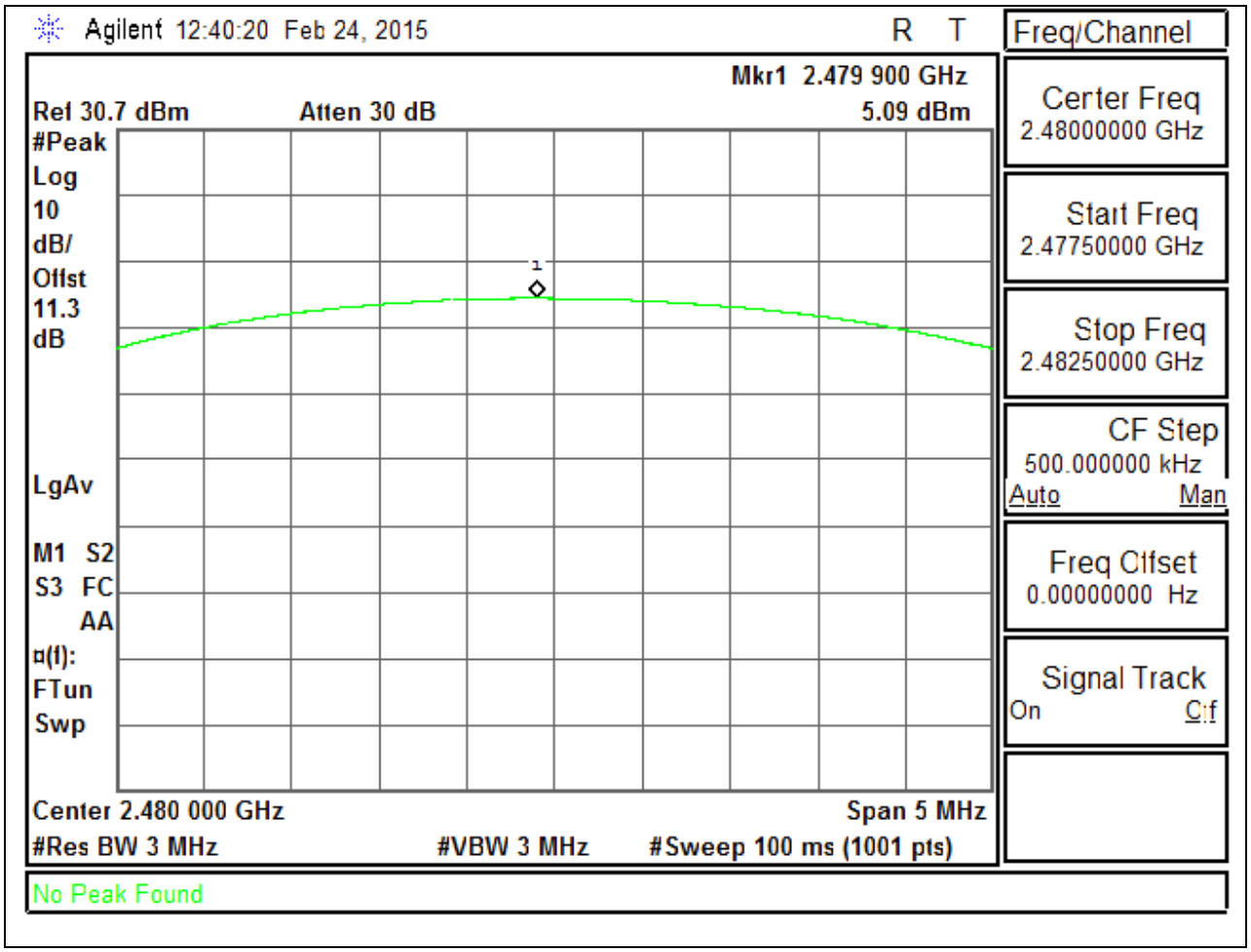
HIGH CHANNEL



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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.

8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6
Middle	2441	6.3
High	2480	5.2
Worst		6.3

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8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.90
Middle	2441	3.40
High	2480	2.40
Worst		3.40

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.9
Middle	2441	3.4
High	2480	2.5
Worst		3.4

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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

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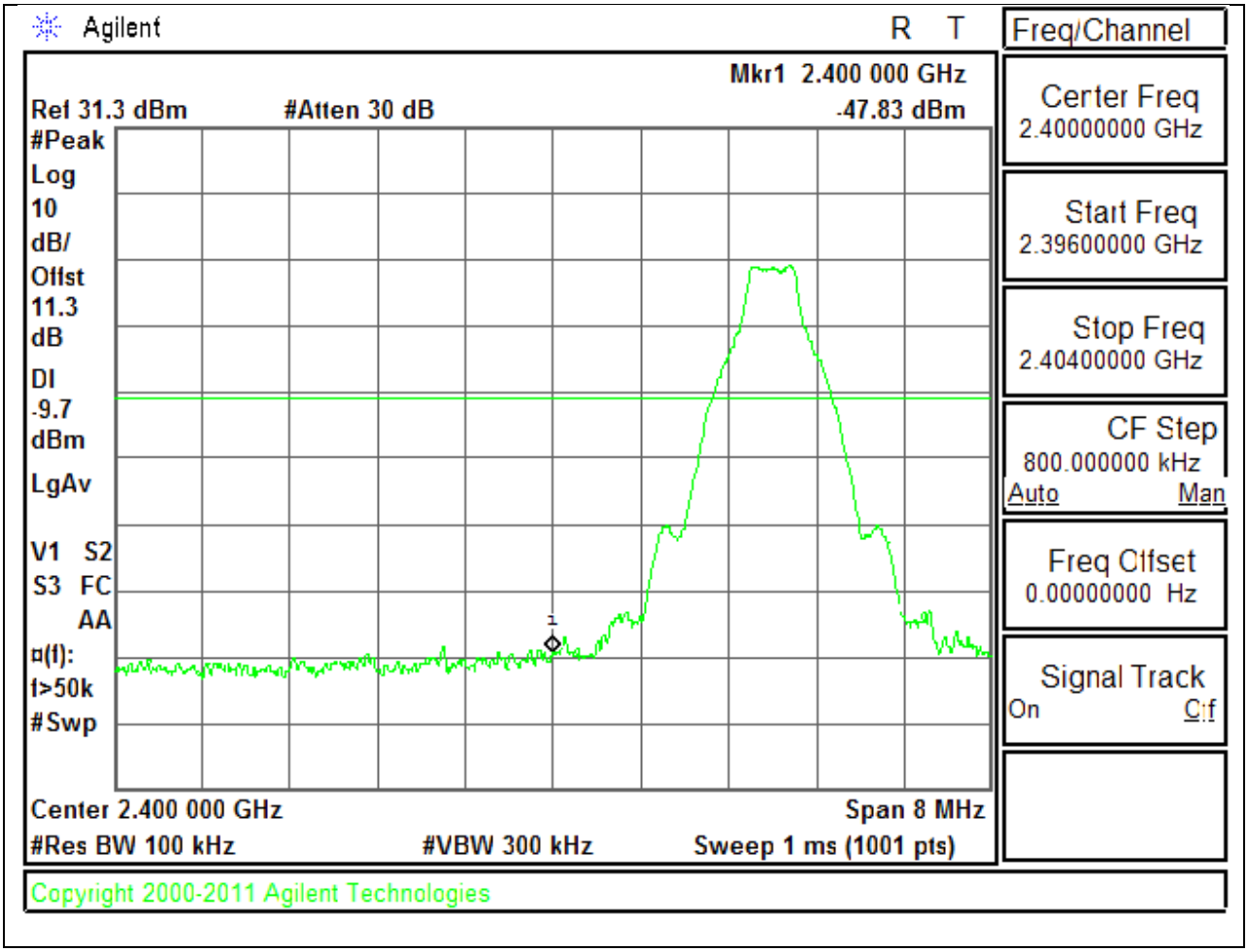
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



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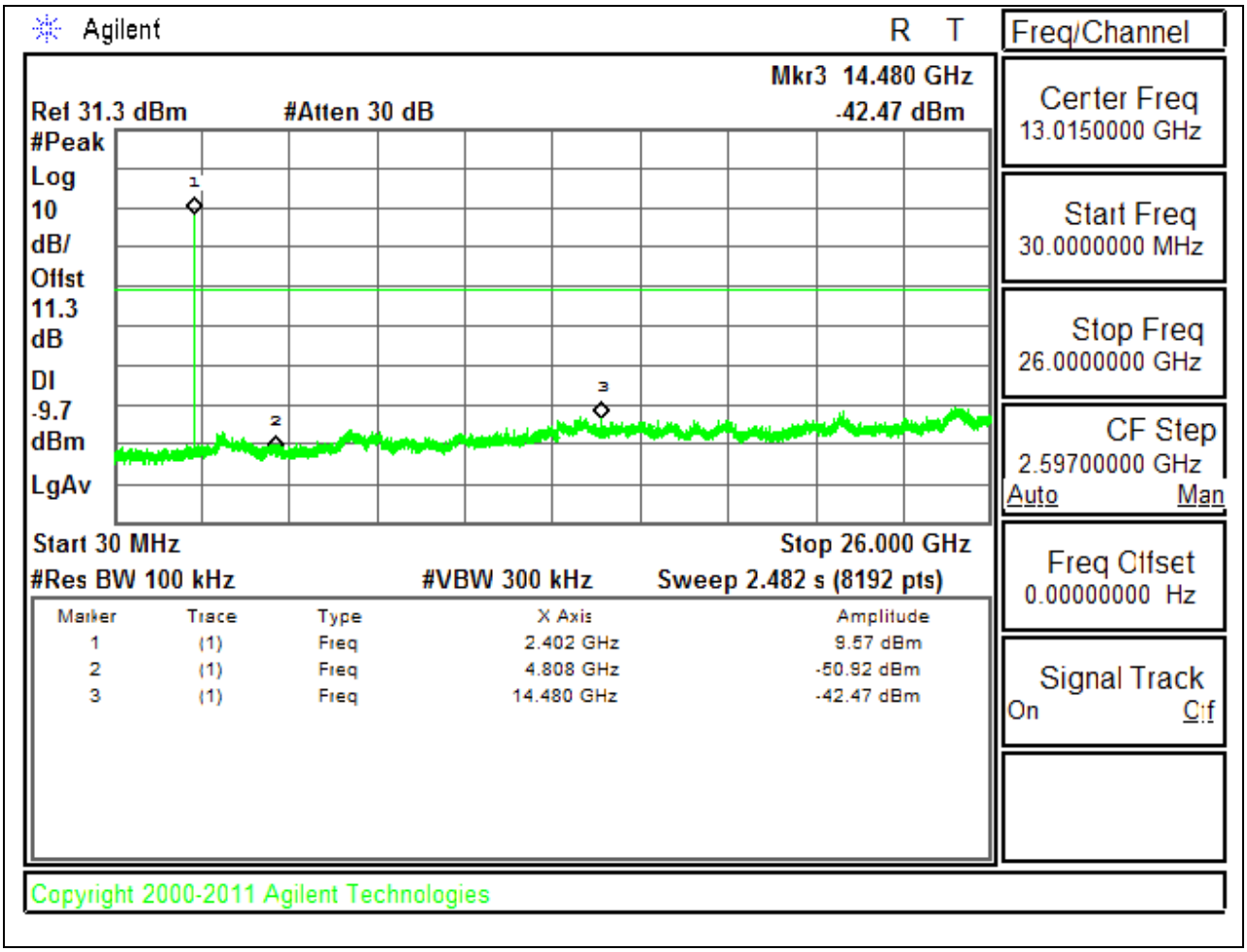
LOW CHANNEL SPURIOUS



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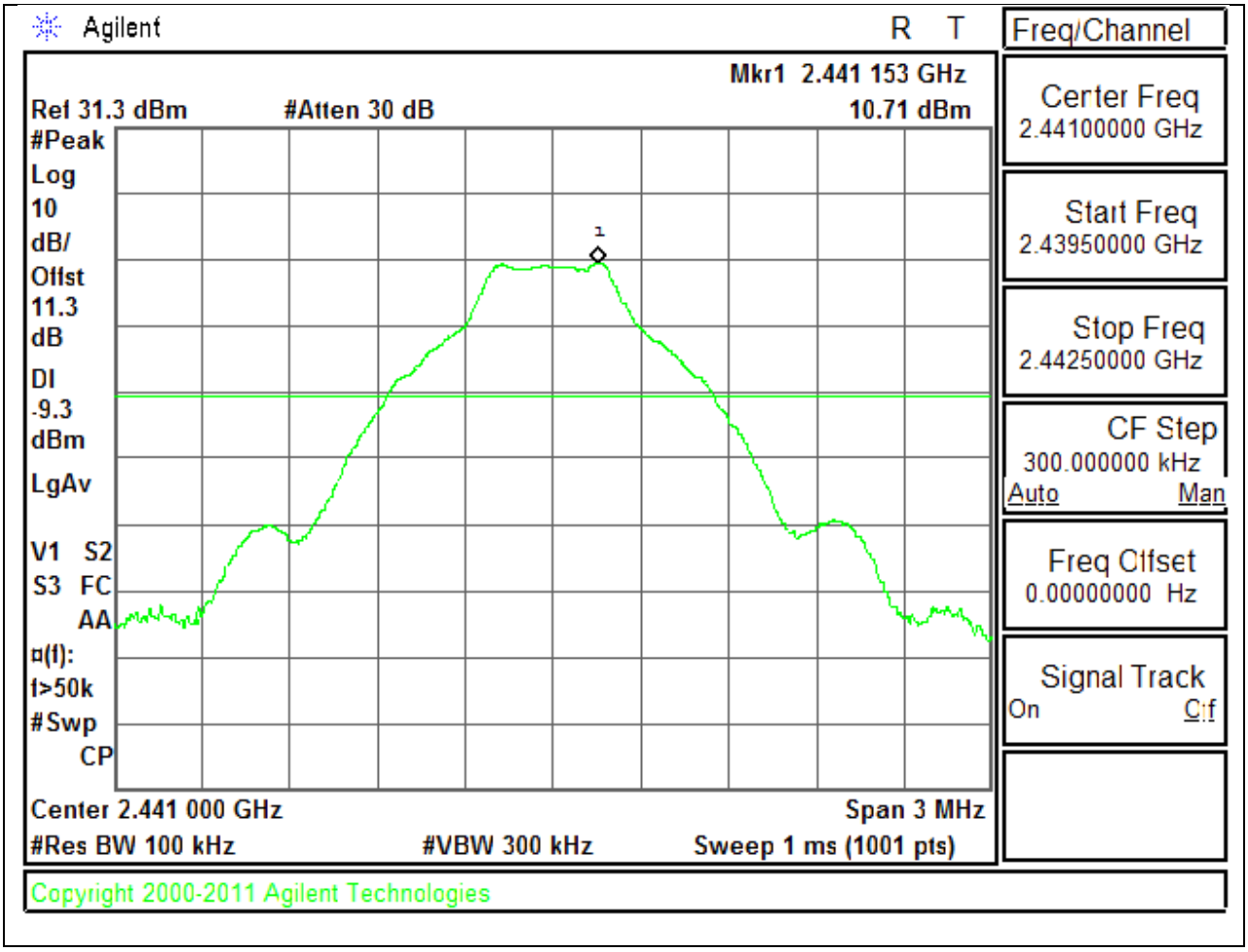
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



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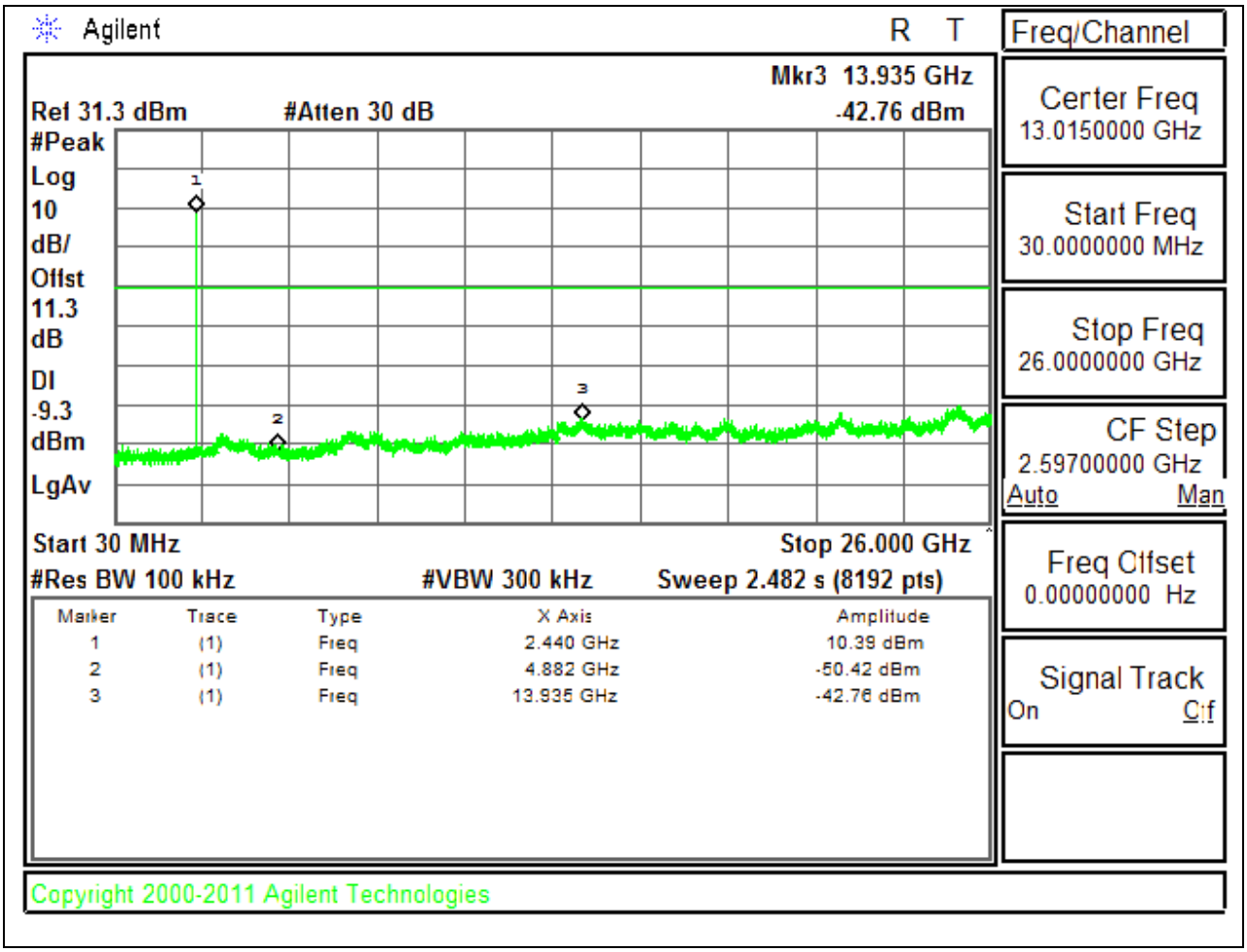
MID CHANNEL SPURIOUS



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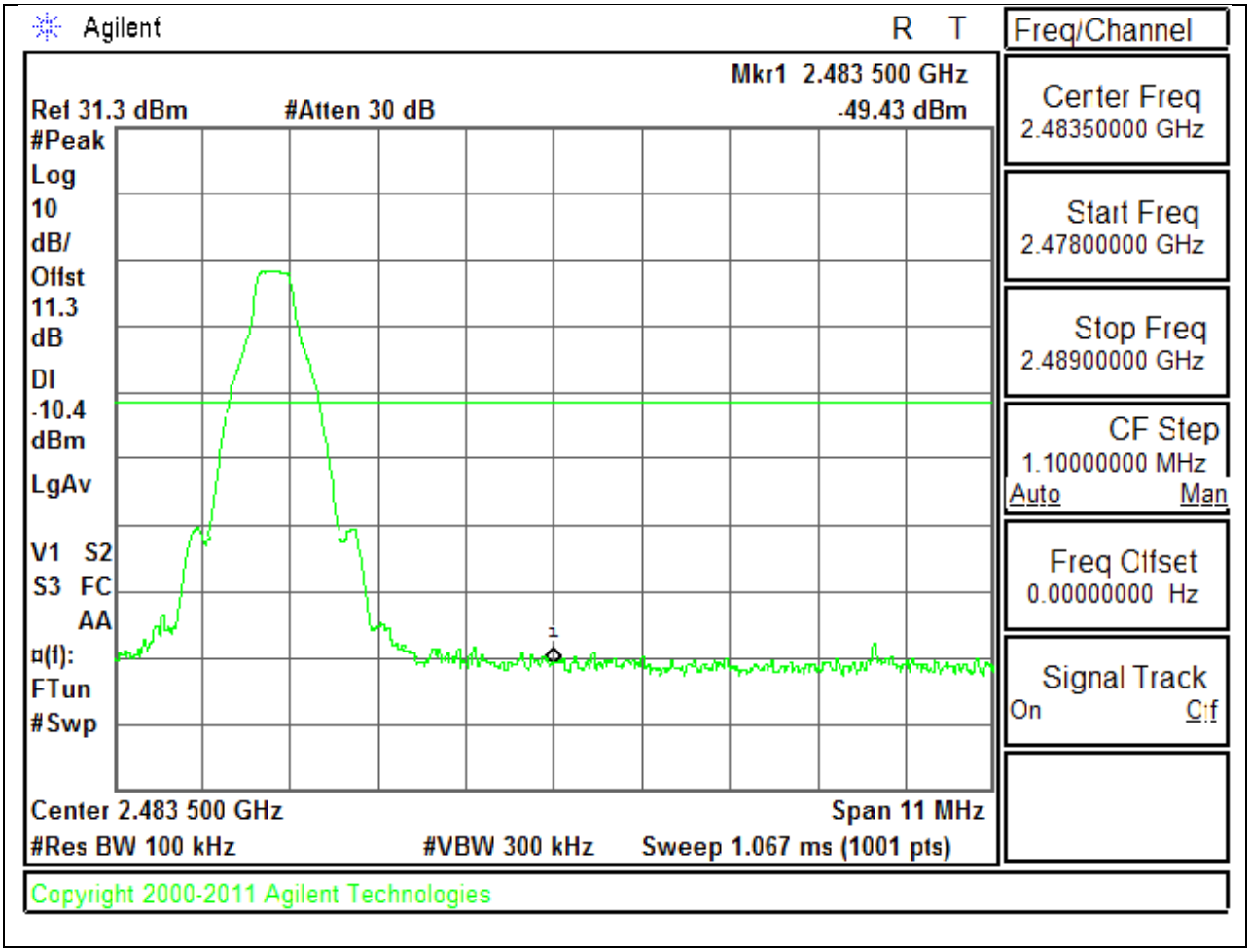
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



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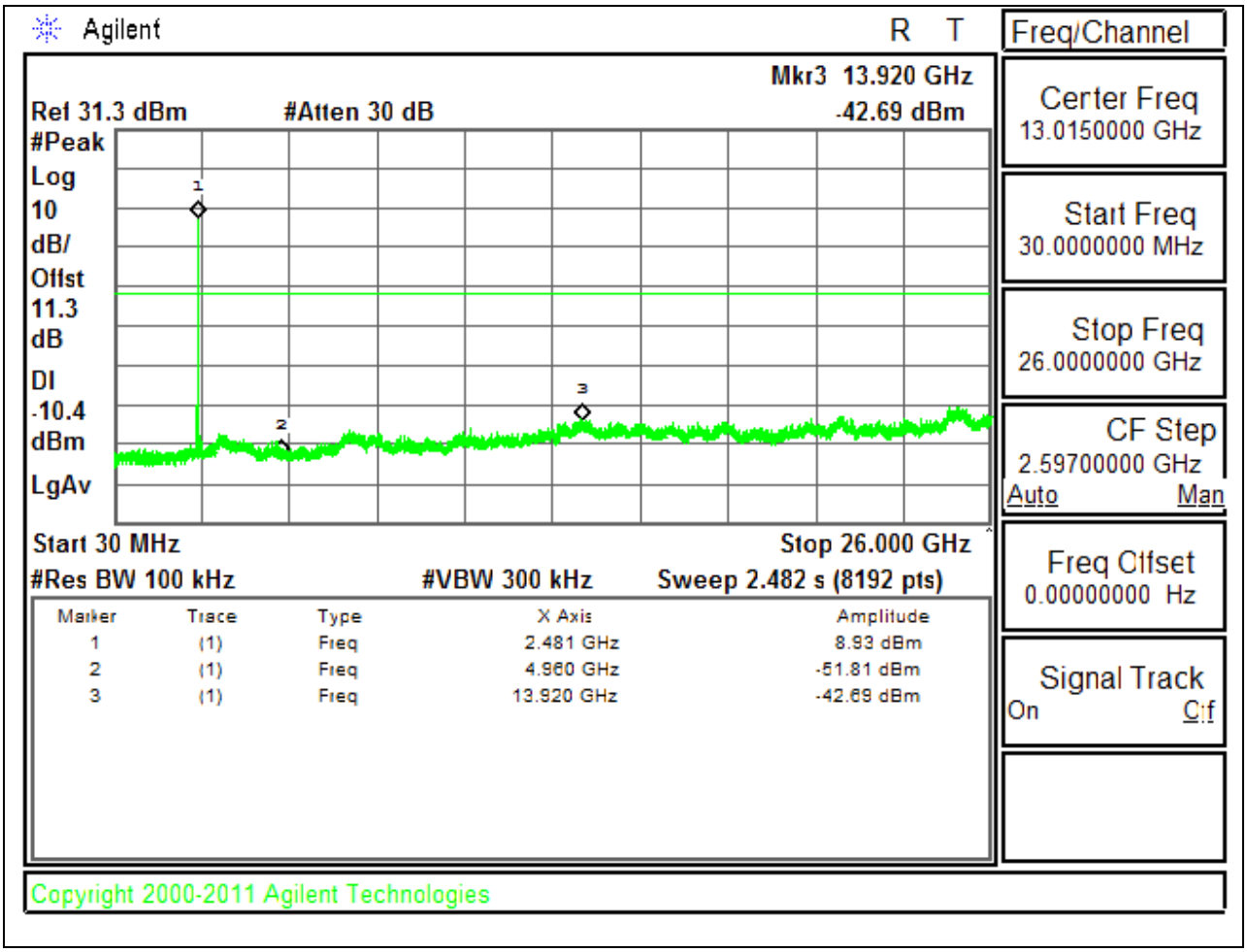
HIGH CHANNEL SPURIOUS



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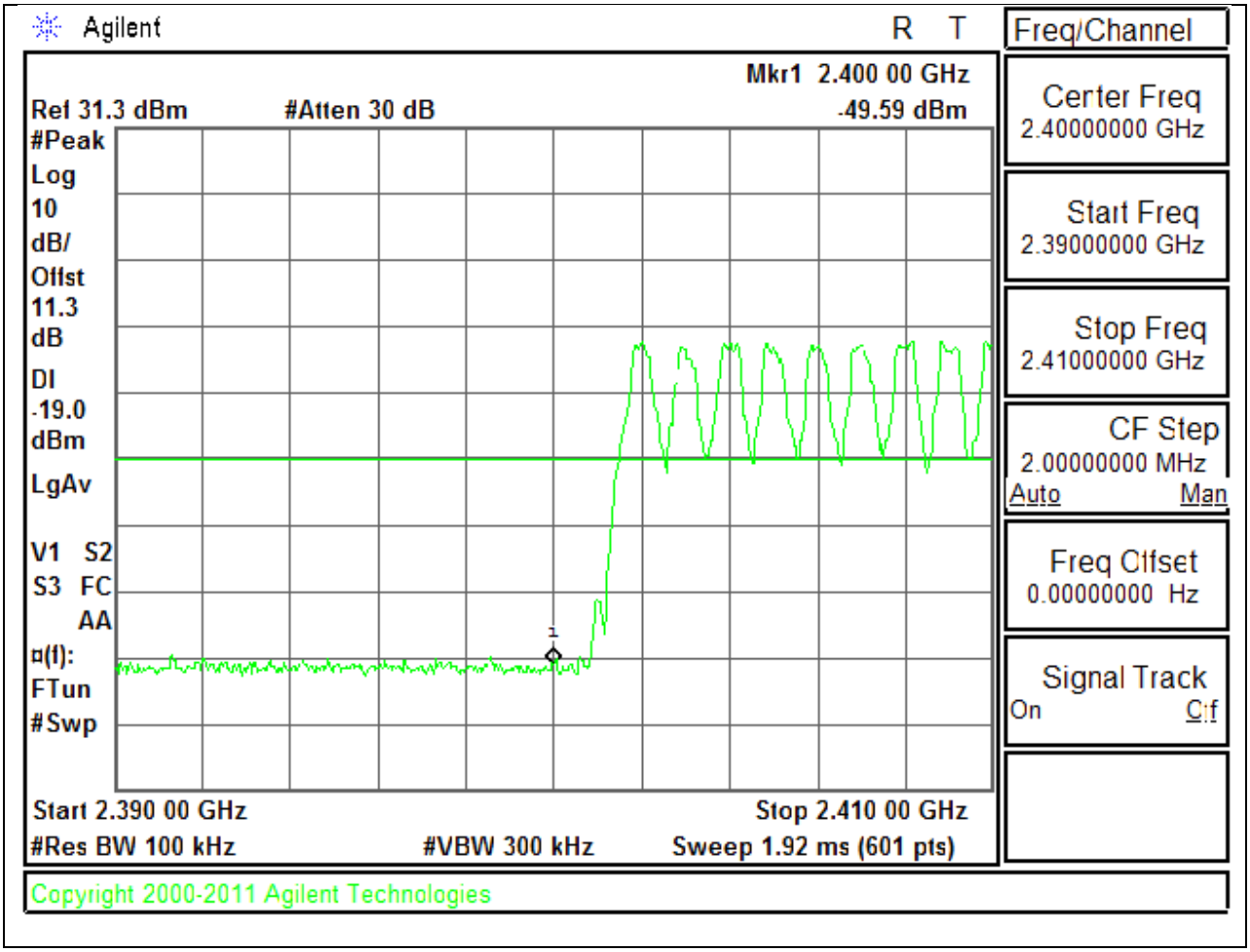
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



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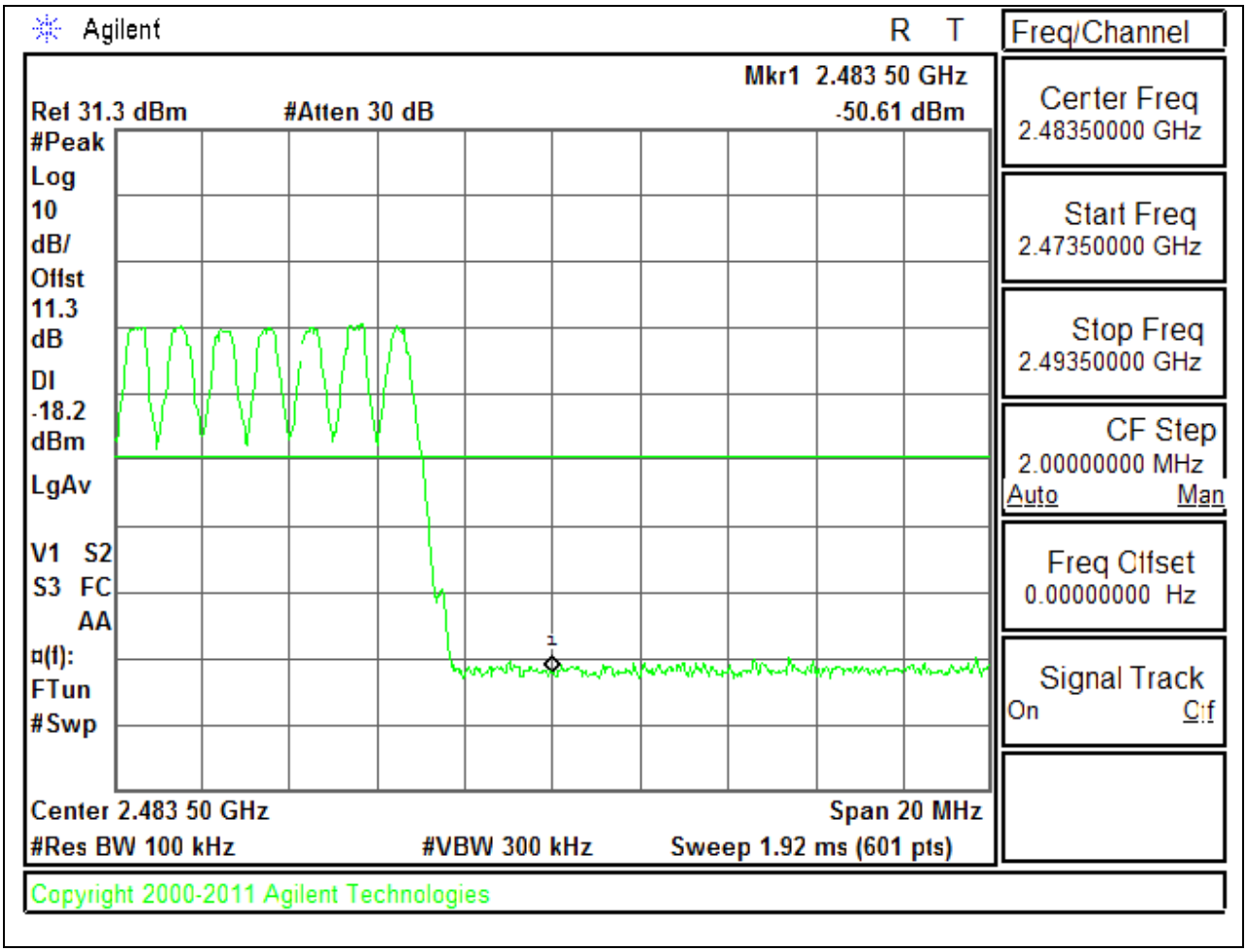
HIGH BANDEDGE WITH HOPPING ON



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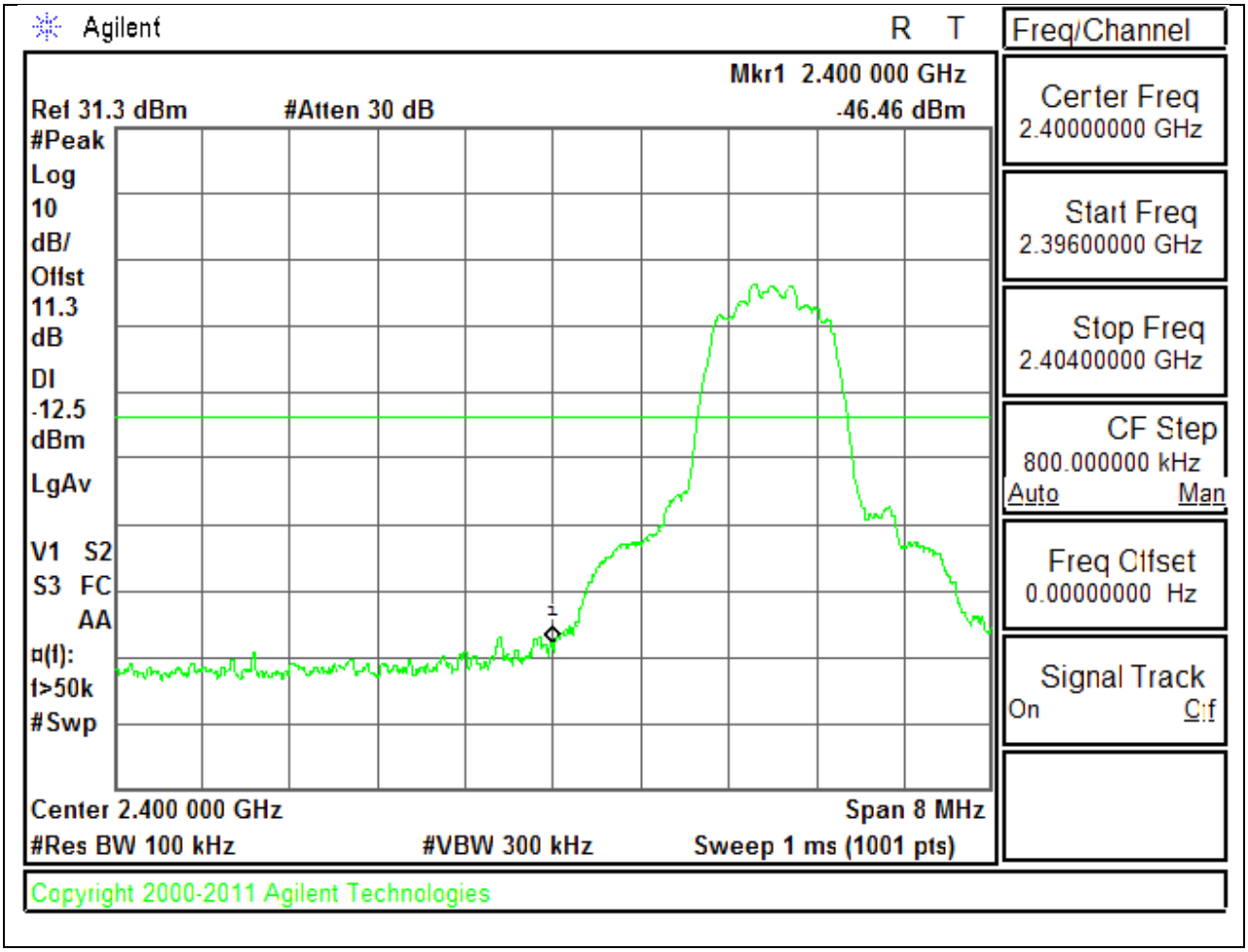
ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



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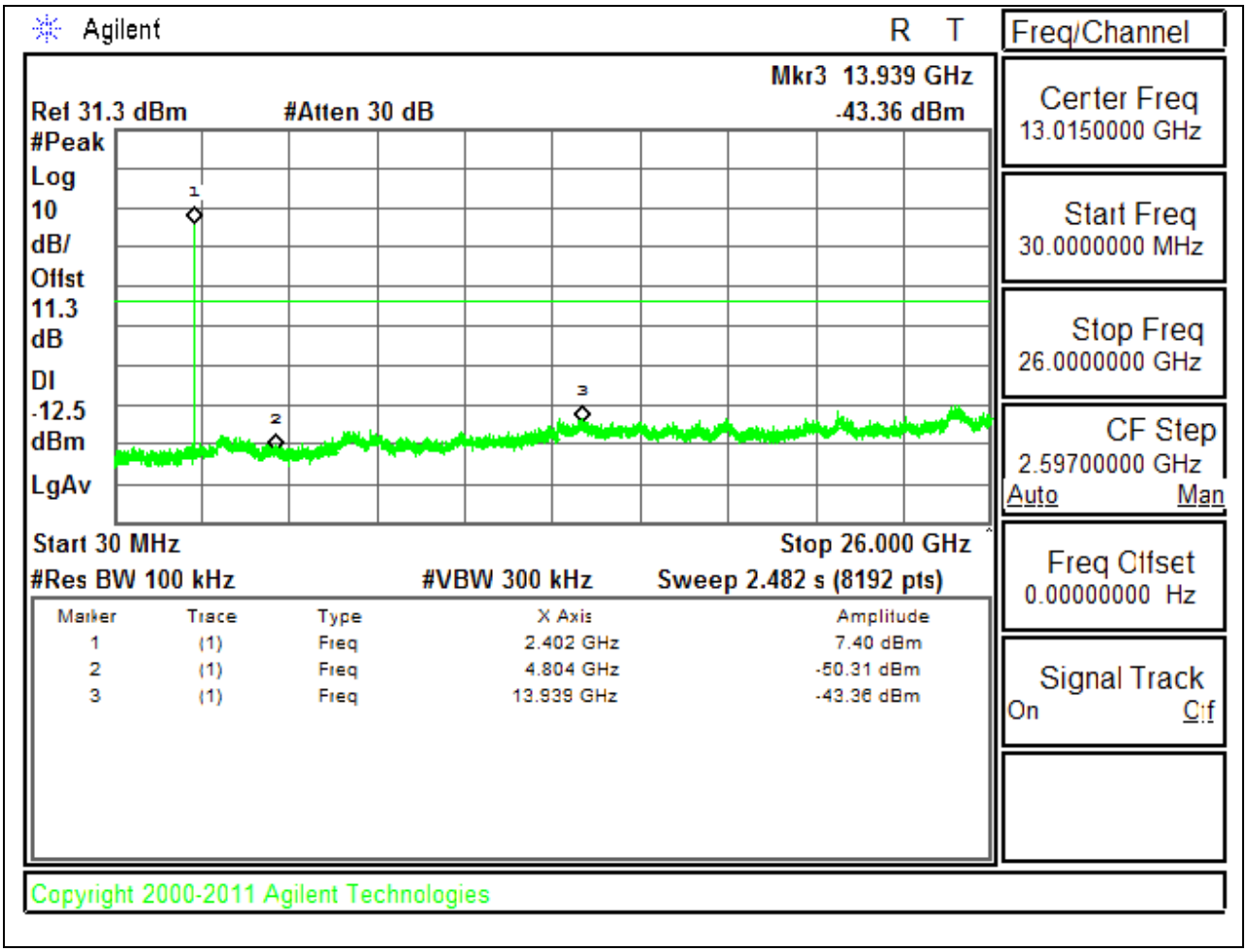
LOW CHANNEL SPURIOUS



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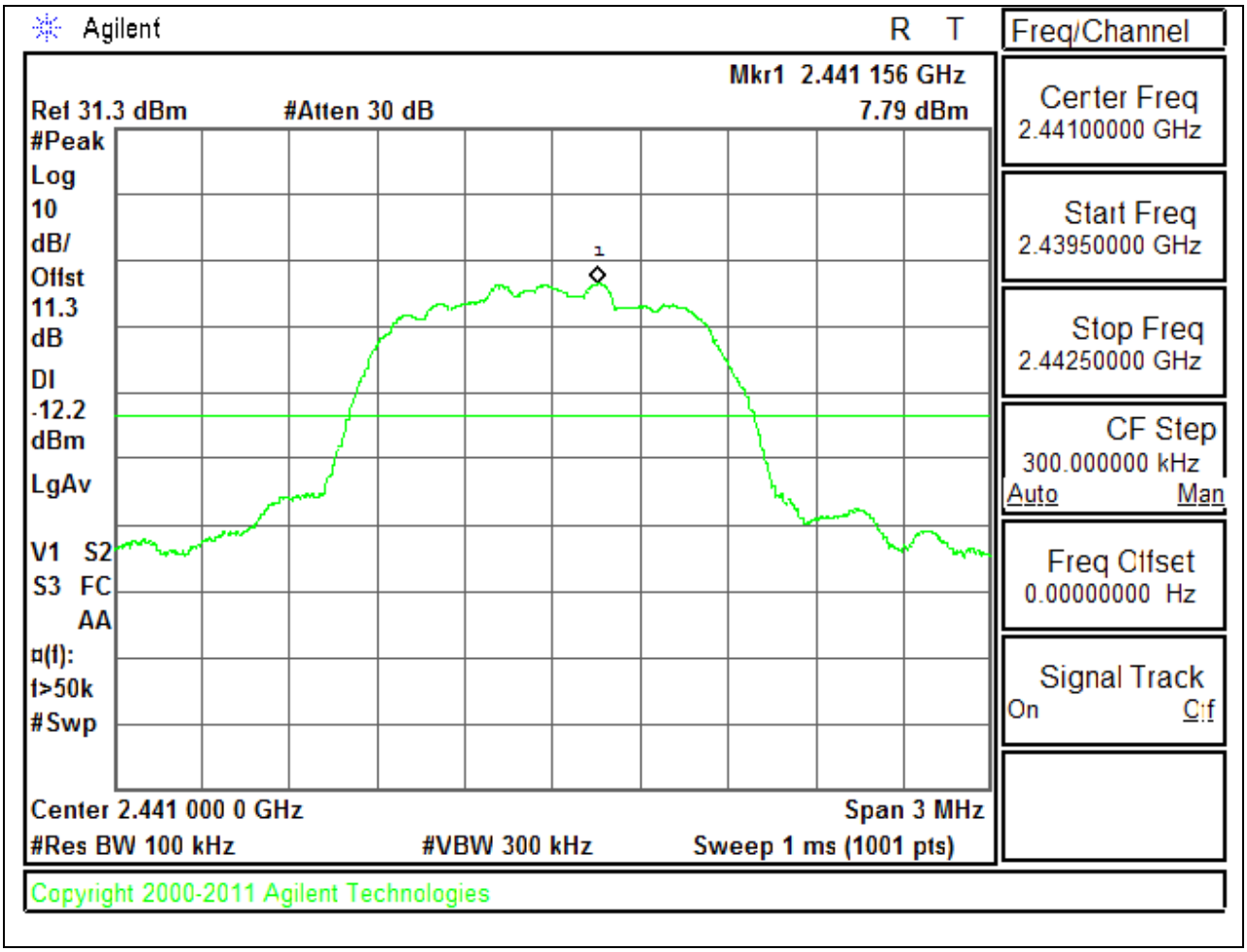
SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE



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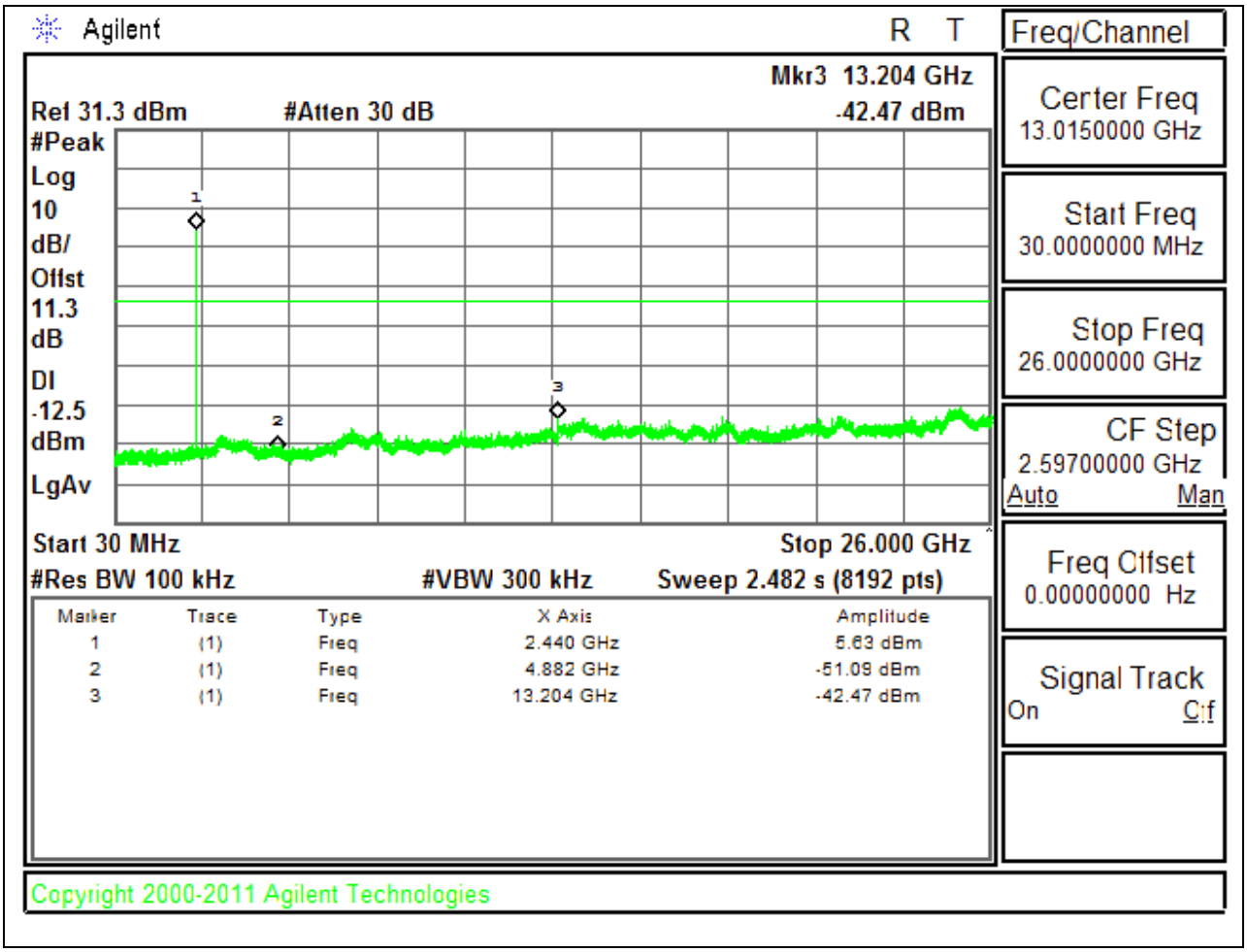
MID CHANNEL SPURIOUS



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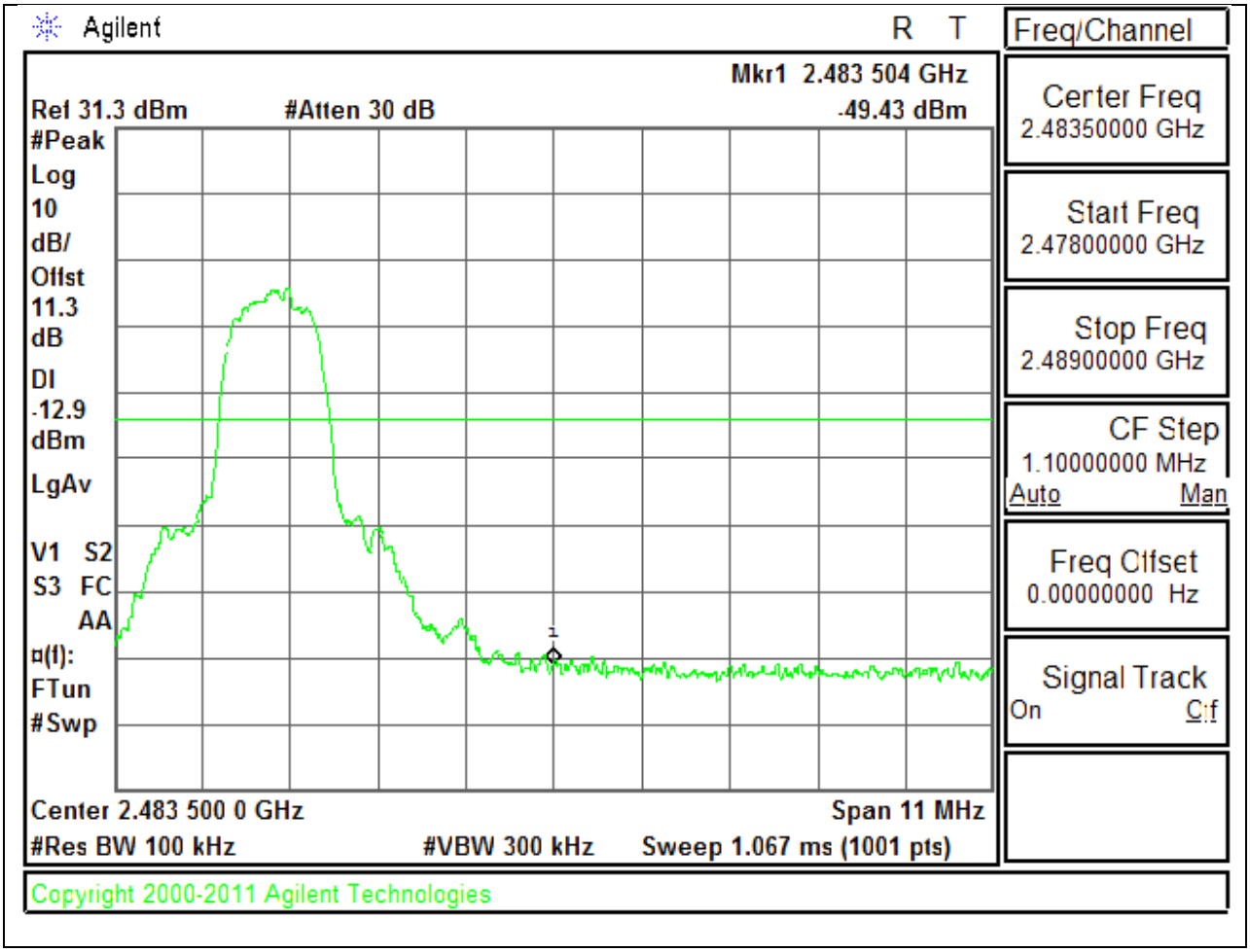
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



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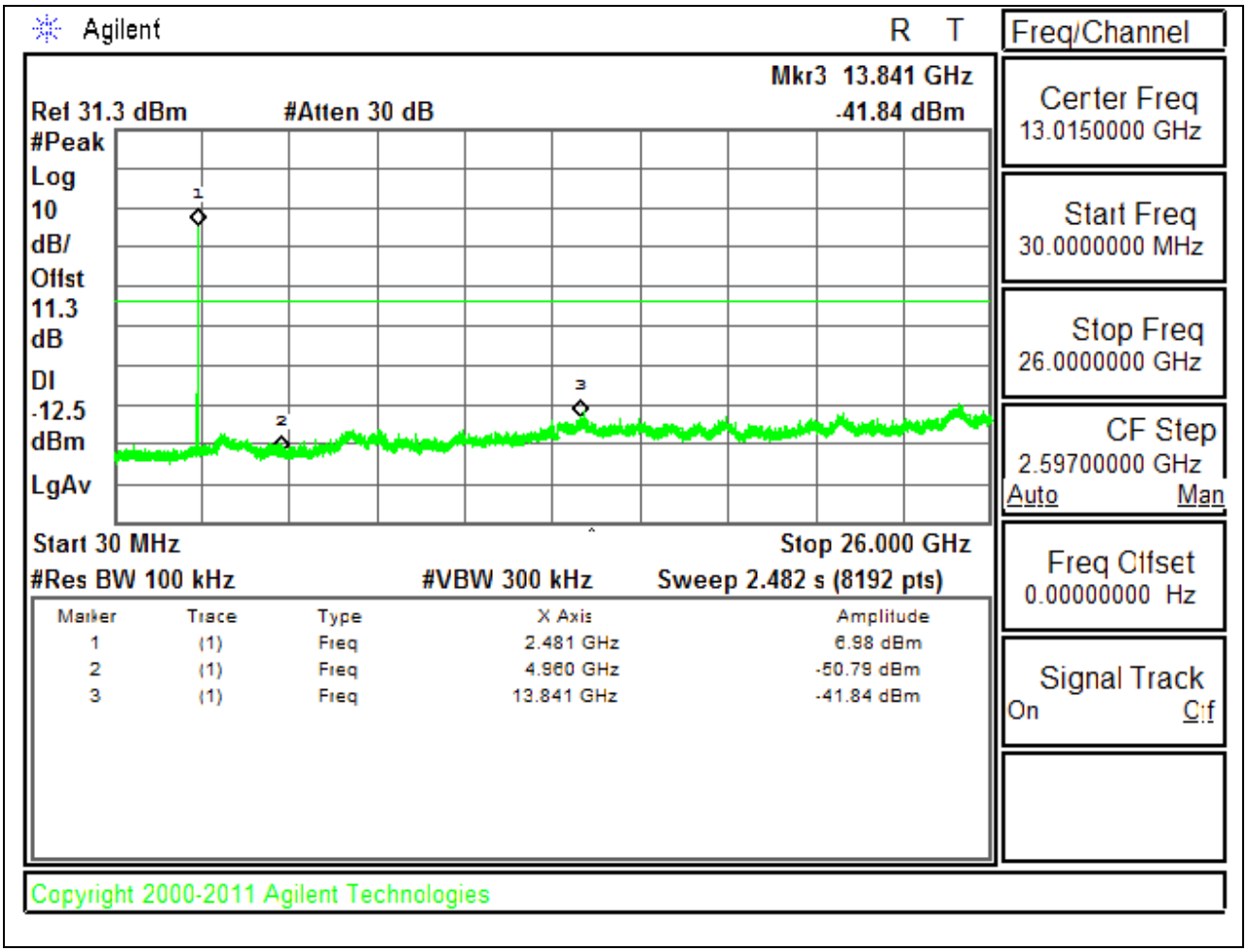
HIGH CHANNEL SPURIOUS



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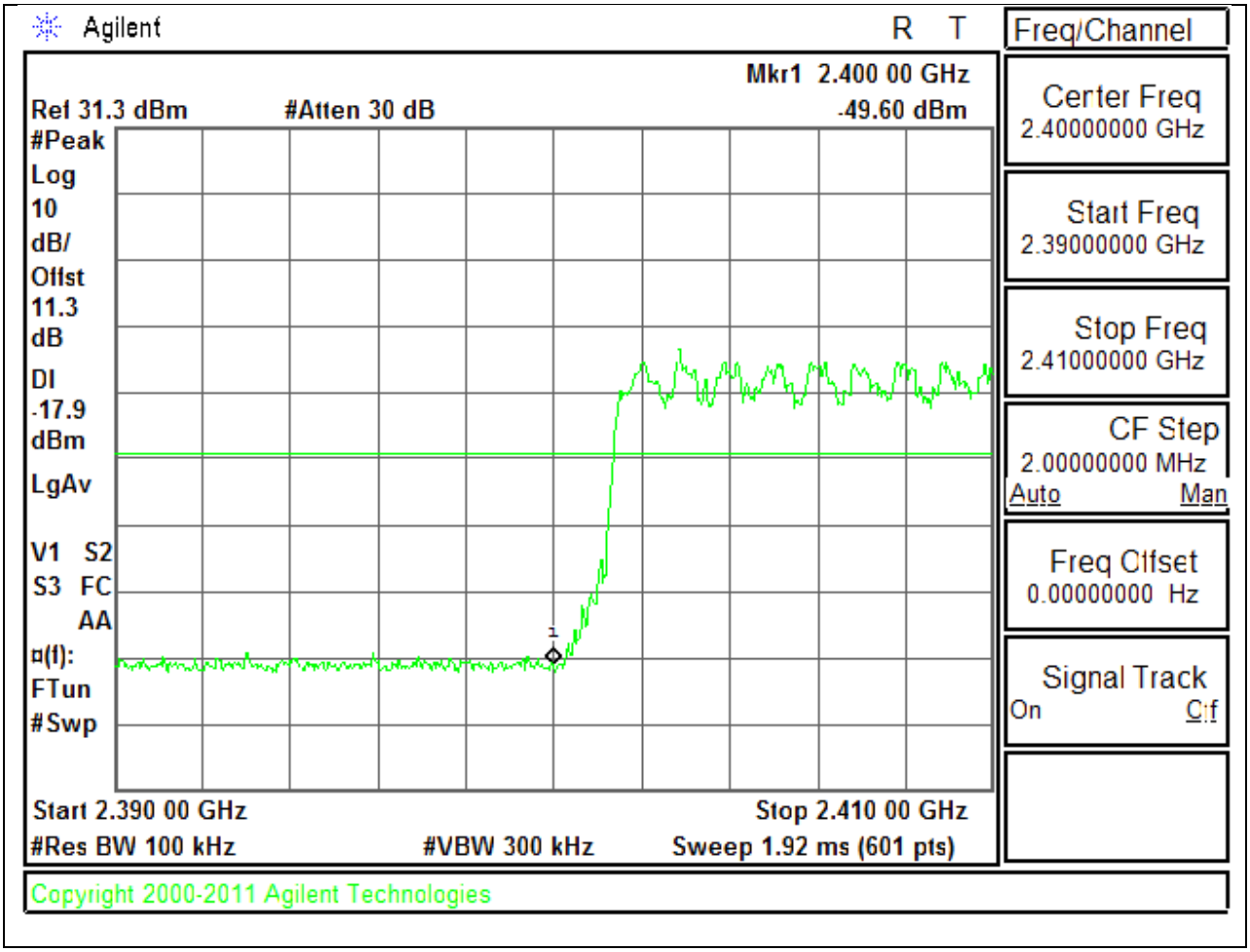
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



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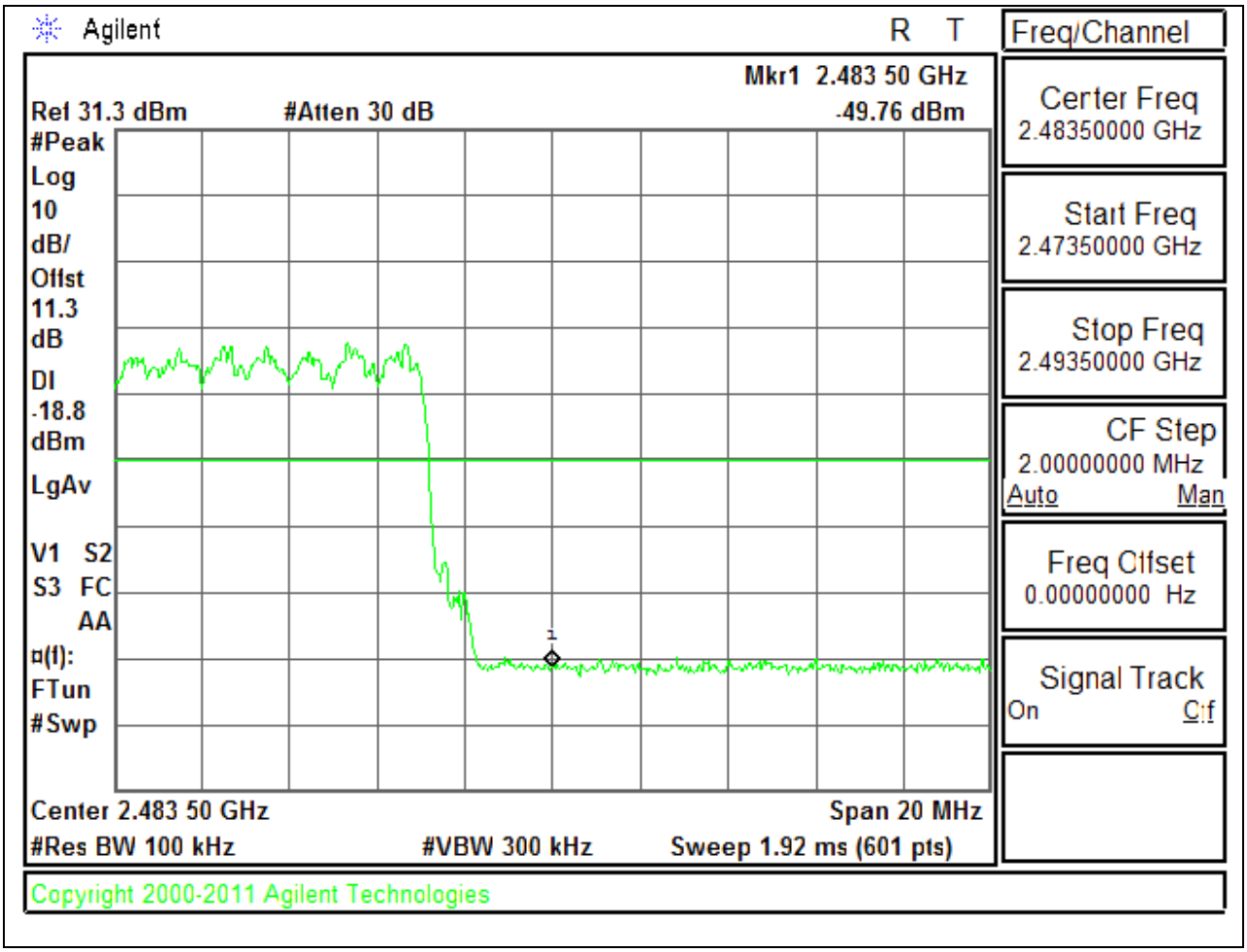
HIGH BANDEDGE WITH HOPPING ON



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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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.

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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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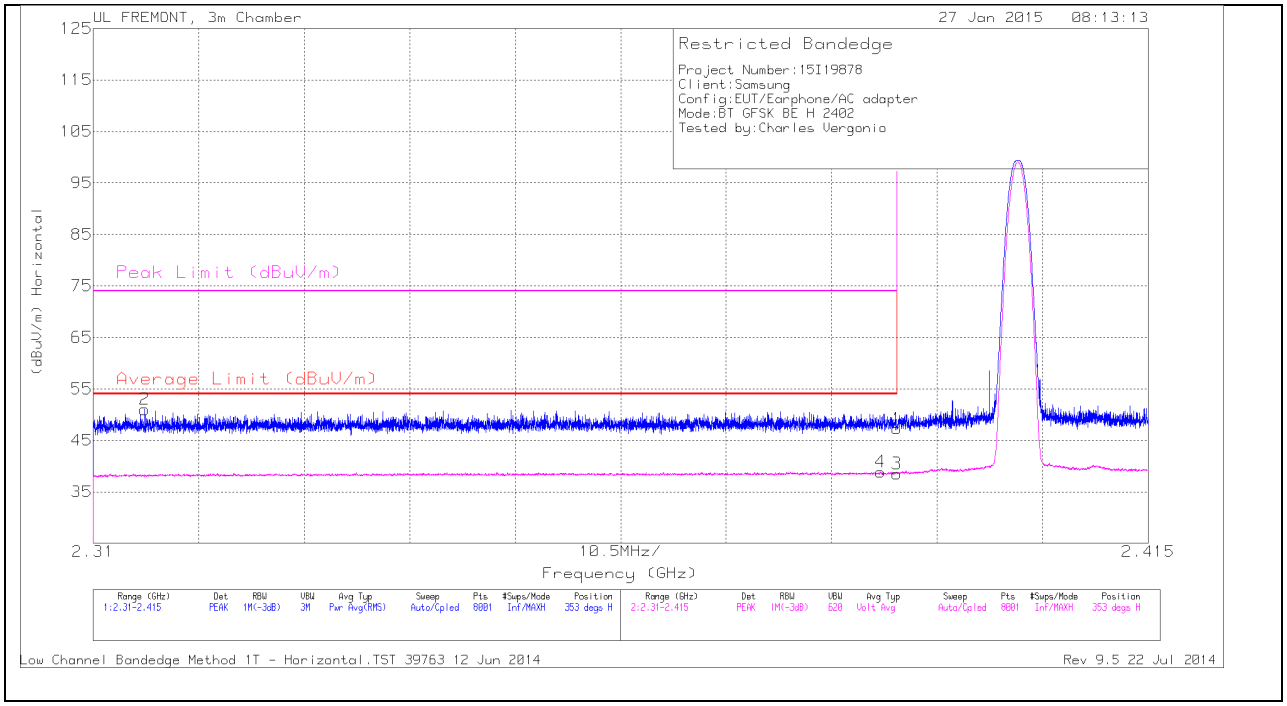
9.2. TRANSMITTER ABOVE 1 GHz

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	2.315	42.41	PK	31.7	-23.1	51.01	-	-	74	-22.99	353	119	H
4	2.388	29.97	VB1T	32	-23.1	38.87	54	-15.13	-	-	353	119	H
1	2.39	38.38	PK	32	-23.1	47.28	-	-	74	-26.72	353	119	H
3	2.39	29.61	VB1T	32	-23.1	38.51	54	-15.49	-	-	353	119	H

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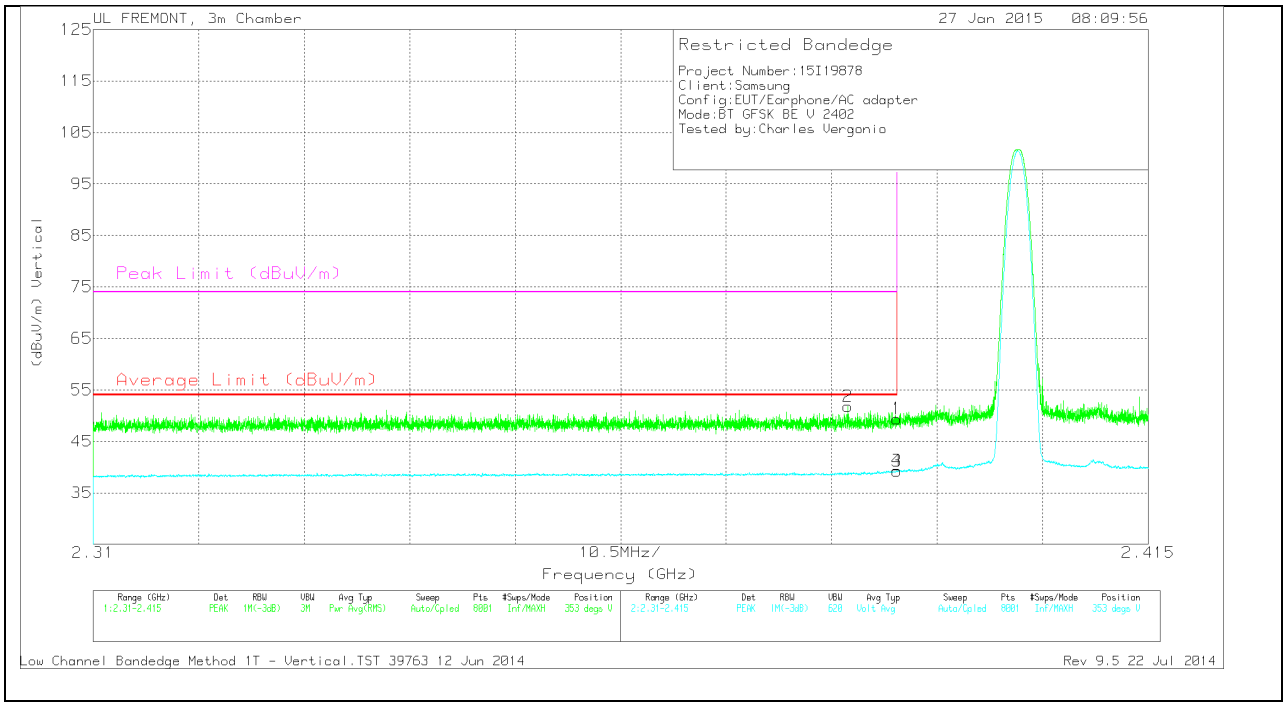
VERTICAL PEAK AND AVERAGE PLOT



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	2.385	42.88	PK	32	-23.1	51.78	-	-	74	-22.22	353	299	V
1	2.39	40.49	PK	32	-23.1	49.39	-	-	74	-24.61	353	299	V
3	2.39	30.33	VB1T	32	-23.1	39.23	54	-14.77	-	-	353	299	V
4	2.39	30.38	VB1T	32	-23.1	39.28	54	-14.72	-	-	353	299	V

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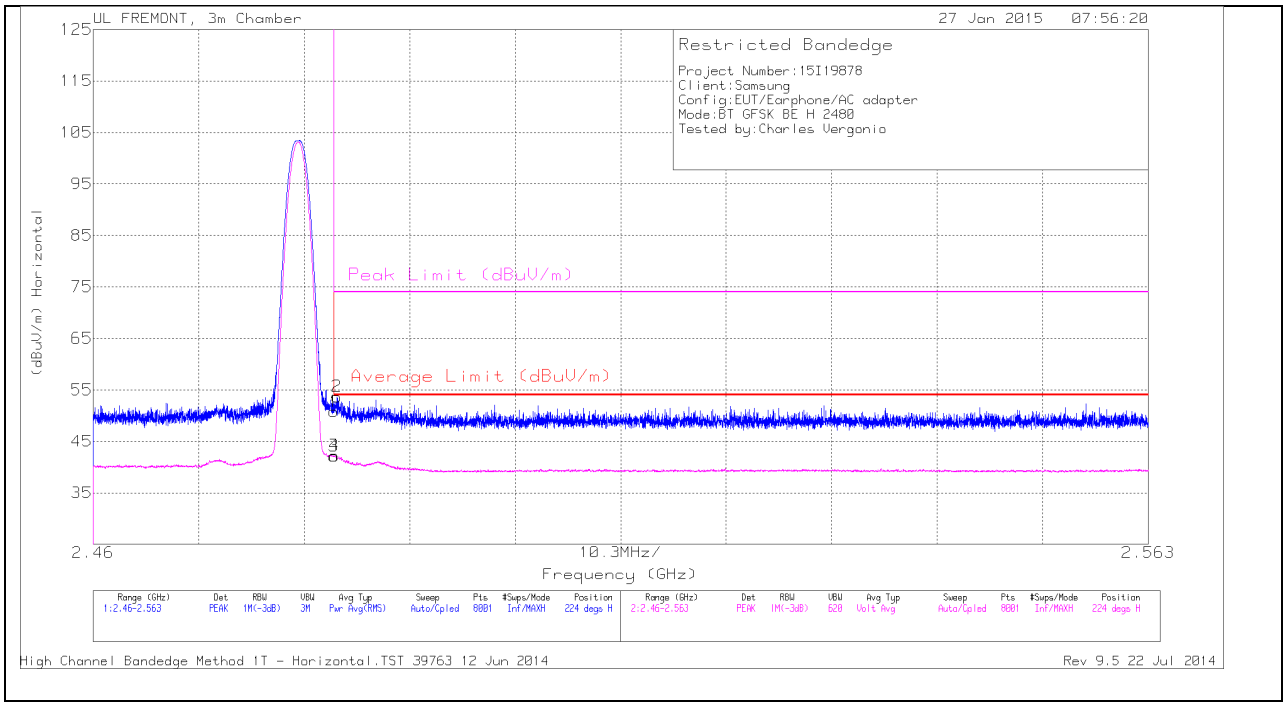
AUTHORIZED BANDEDGE (HIGH CHANNEL)

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	41.29	PK	32.3	-22.8	50.79	-	-	74	-23.21	224	102	H
2	2.484	44.19	PK	32.3	-22.8	53.69	-	-	74	-20.31	224	102	H
3	2.484	32.66	VB1T	32.3	-22.8	42.16	54	-11.84	-	-	224	102	H
4	2.484	32.71	VB1T	32.3	-22.8	42.21	54	-11.79	-	-	224	102	H

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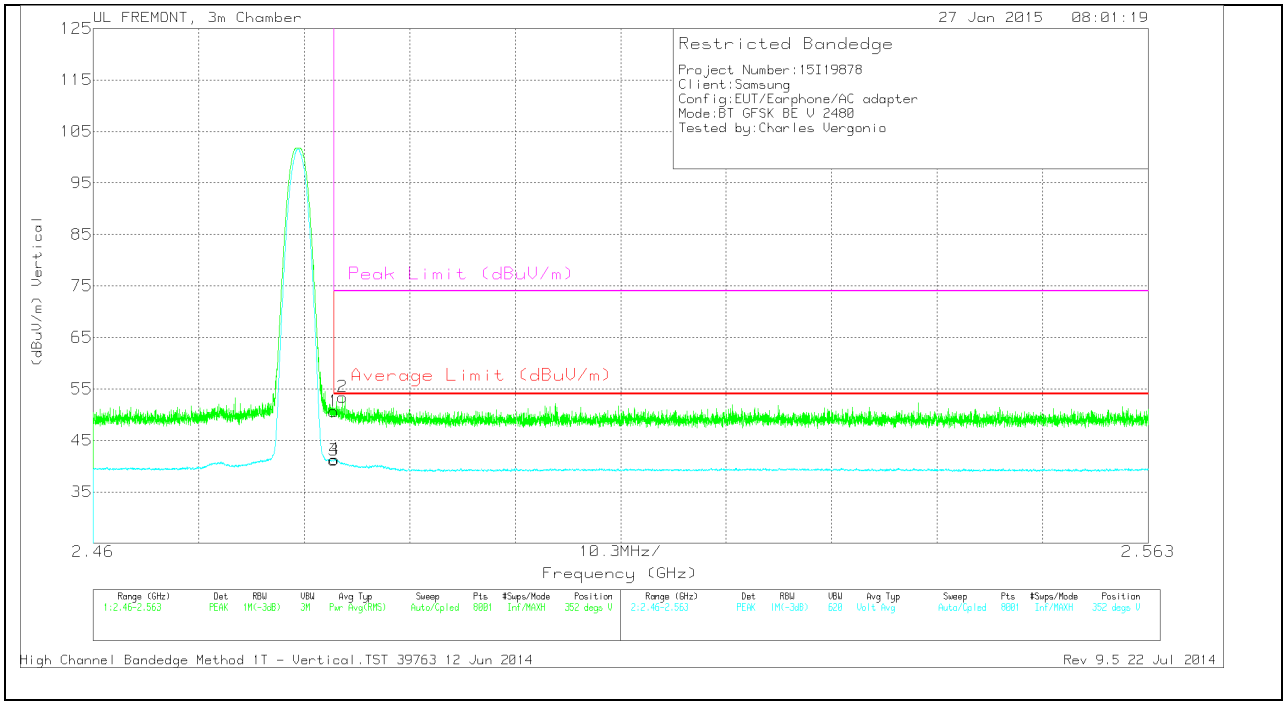
VERTICAL PEAK AND AVERAGE PLOT



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	41.14	PK	32.3	-22.8	50.64	-	-	74	-23.36	352	105	V
2	2.484	43.94	PK	32.3	-22.8	53.44	-	-	74	-20.56	352	105	V
3	2.484	31.63	VB1T	32.3	-22.8	41.13	54	-12.87	-	-	352	105	V
4	2.484	31.82	VB1T	32.3	-22.8	41.32	54	-12.68	-	-	352	105	V

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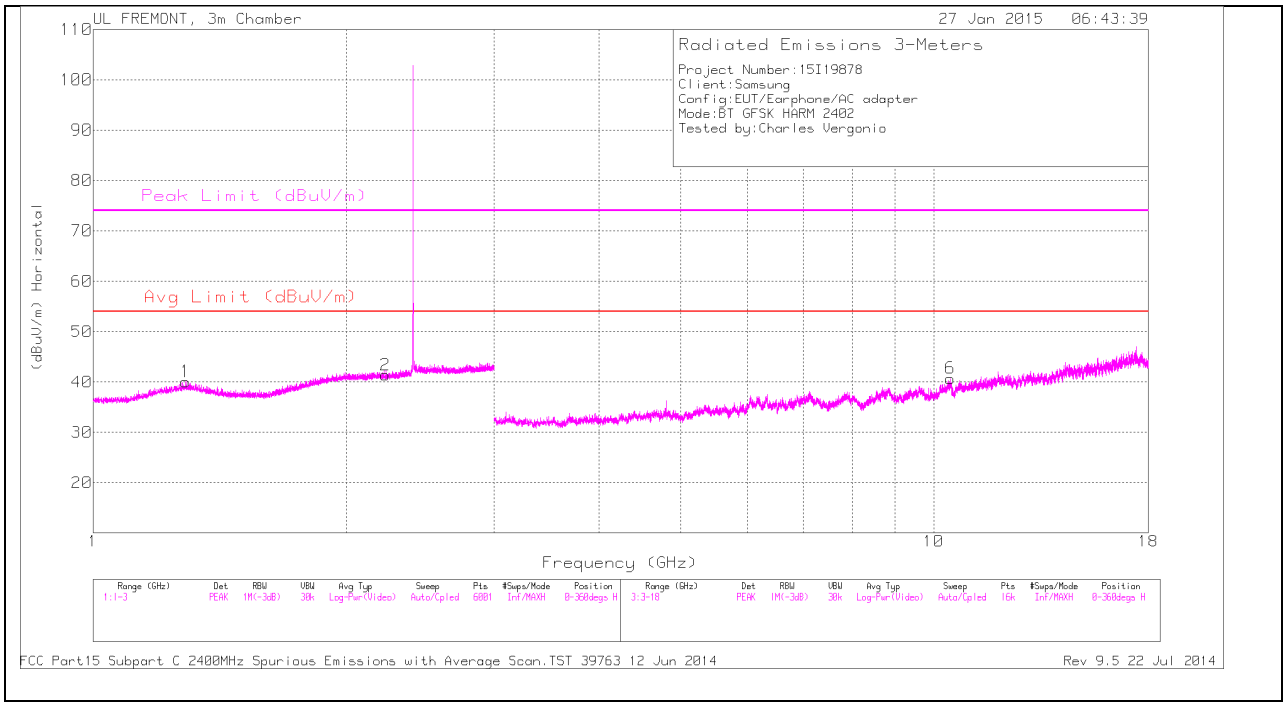
HARMONICS AND SPURIOUS EMISSIONS

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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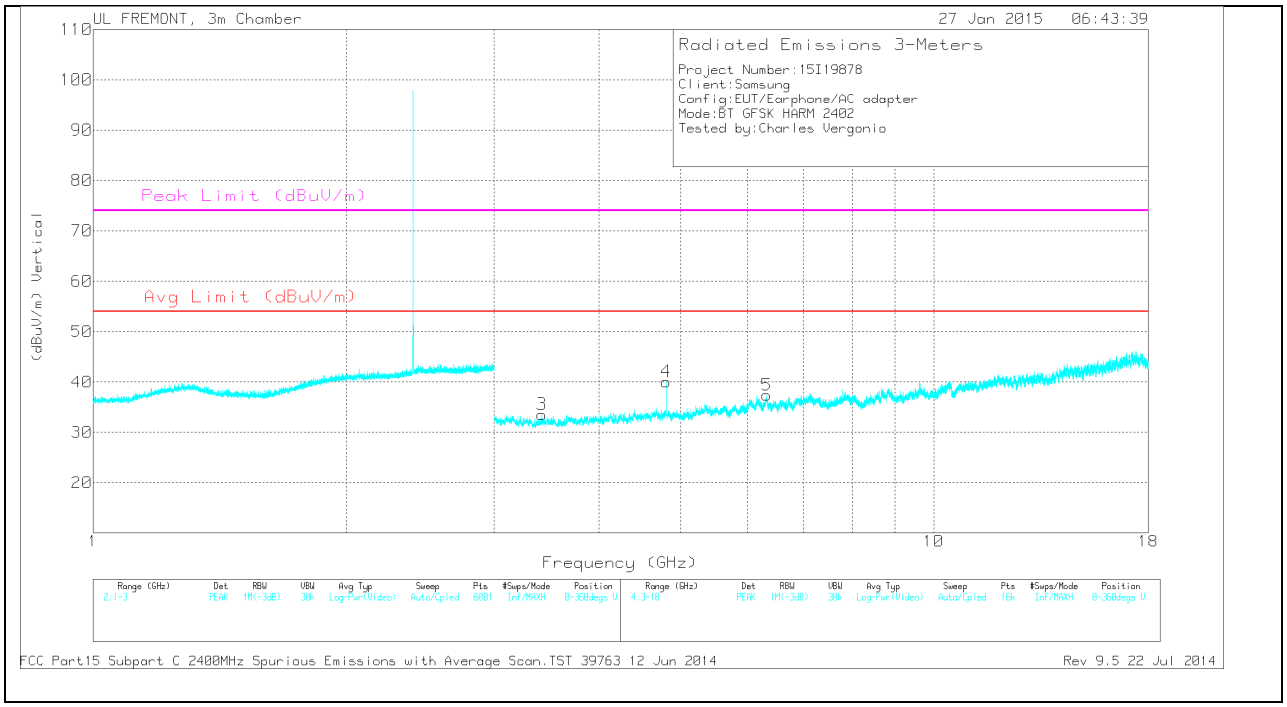
LOW CHANNEL VERTICAL



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 T119 (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	1.289	33.95	PK	29.8	-23.7	40.05	-	-	74	-33.95	0-360	100	H
2	2.226	32.9	PK	31.5	-23	41.4	-	-	74	-32.6	0-360	200	H
3	3.417	32.57	PK	32.7	-31.7	33.57	-	-	-	-	0-360	100	V
4	4.804	36.38	PK	34	-30.3	40.08	-	-	74	-33.92	0-360	100	V
5	6.334	31.1	PK	35.4	-29.1	37.4	-	-	-	-	0-360	100	V
6	10.466	28.31	PK	37.4	-25	40.71	-	-	-	-	0-360	100	H

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.804	42	PK3	34	-30.3	45.7	-	-	74	-28.3	0	100	V
4.804	32.41	VB1T	34	-30.3	36.11	54	-17.89	-	-	0	100	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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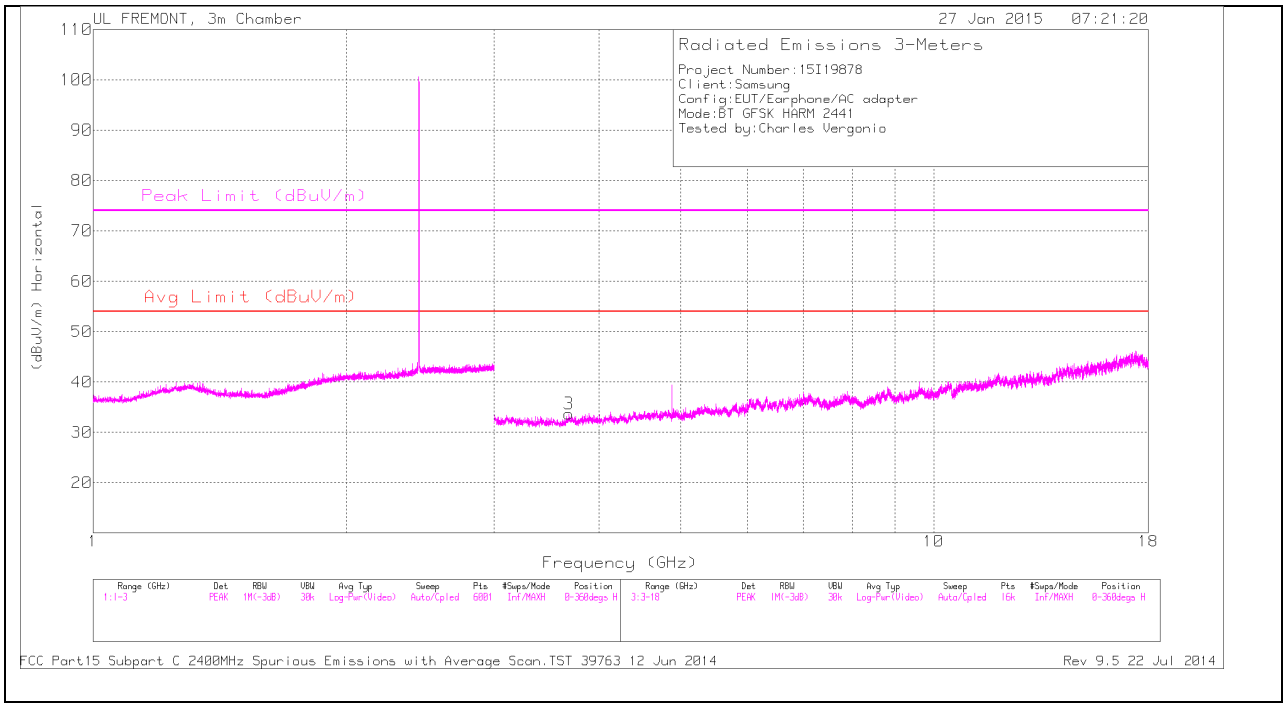
MID CHANNEL HORIZONTAL



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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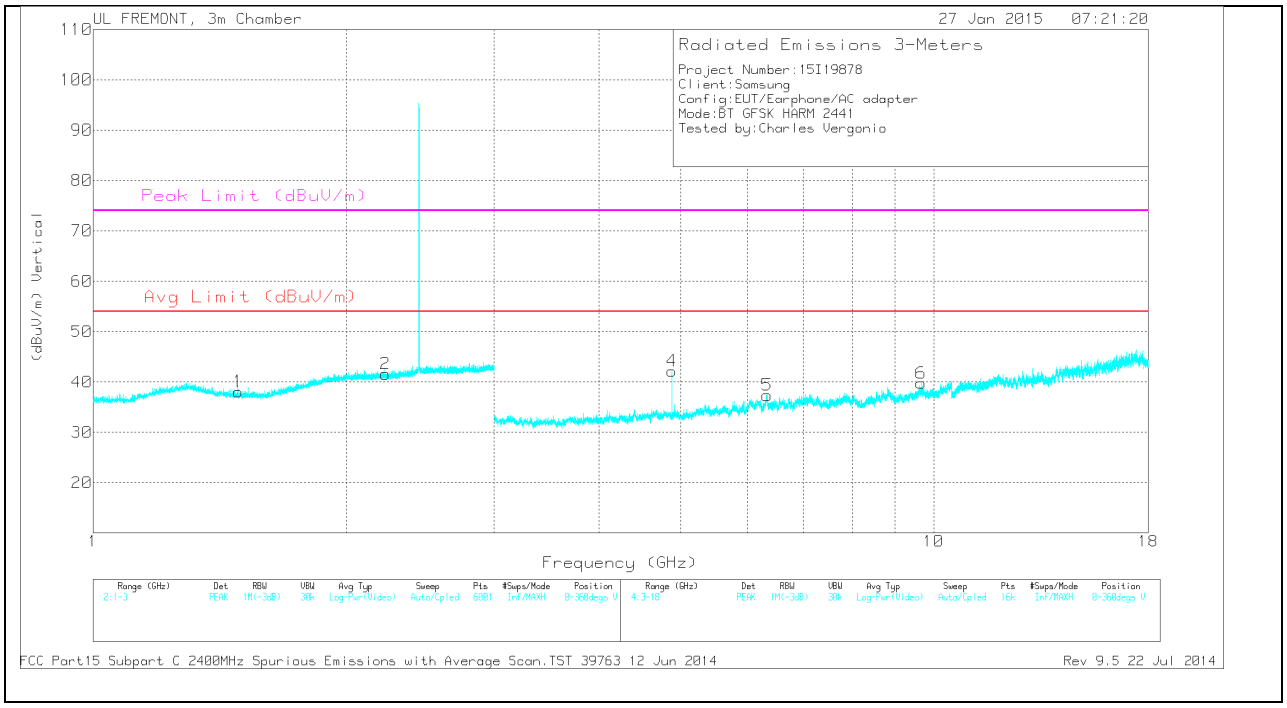
MID CHANNEL VERTICAL



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 T119 (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	1.489	33.57	PK	28.1	-23.6	38.07	-	-	74	-35.93	0-360	100	V
2	2.227	33	PK	31.5	-22.9	41.6	-	-	74	-32.4	0-360	200	V
3	3.683	31.38	PK	33	-30.7	33.68	-	-	74	-40.32	0-360	200	H
4	4.882	38.27	PK	34	-30.1	42.17	-	-	74	-31.83	0-360	200	V
5	6.336	31.06	PK	35.4	-29.1	37.36	-	-	-	-	0-360	100	V
6	9.661	28.36	PK	36.8	-25.4	39.76	-	-	-	-	0-360	200	V

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.882	43.75	PK3	34	-30.1	47.65	-	-	74	-26.35	0	200	V
4.882	36.64	VB1T	34	-30.1	40.54	54	-13.46	-	-	0	200	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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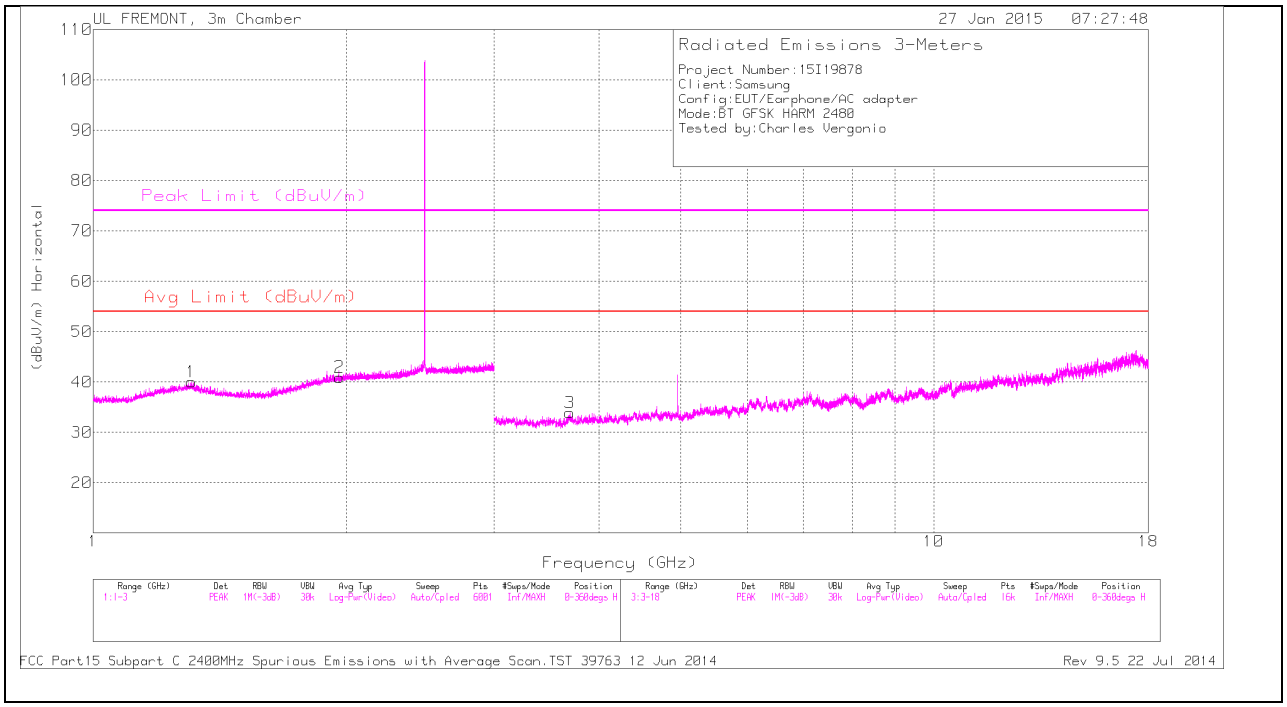
HIGH CHANNEL HORIZONTAL



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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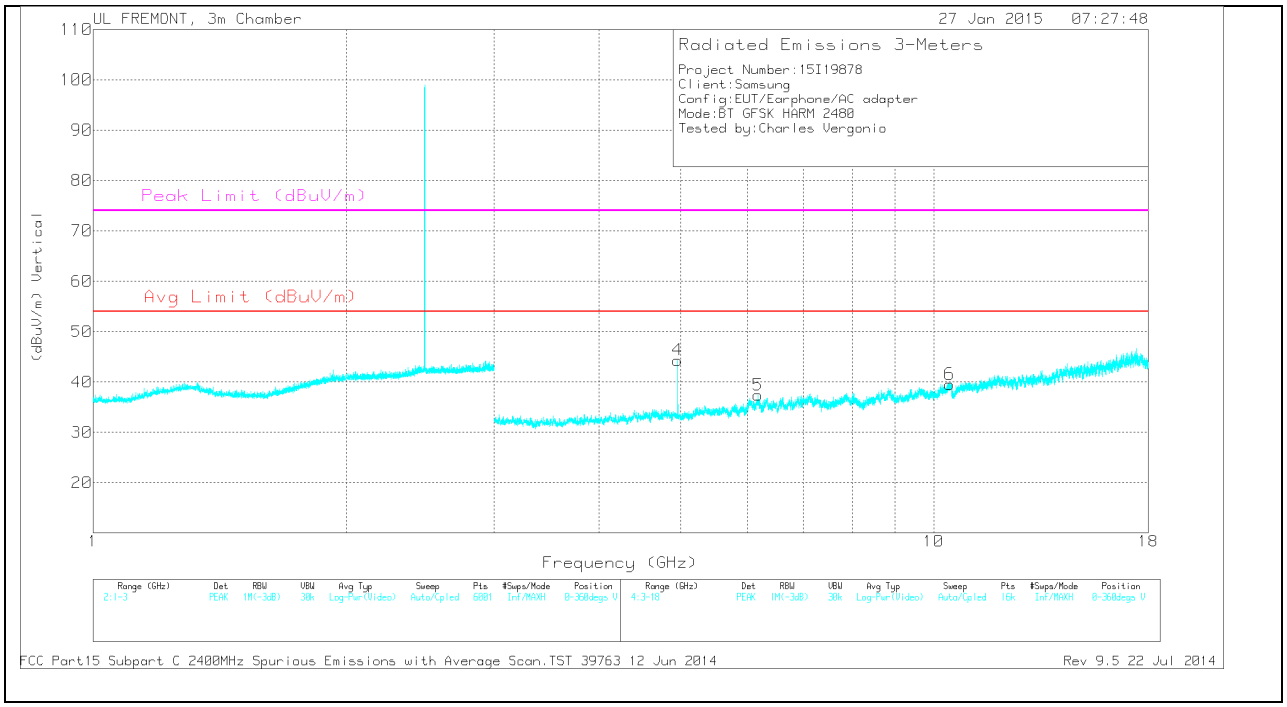
HIGH CHANNEL VERTICAL



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 T119 (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	1.309	34	PK	29.8	-23.8	40	-	-	74	-34	0-360	100	H
2	1.964	32.72	PK	31.4	-23.2	40.92	-	-	-	-	0-360	200	H
3	3.691	31.68	PK	33	-30.8	33.88	-	-	74	-40.12	0-360	100	H
4	4.96	41.33	PK	34	-31	44.33	-	-	74	-29.67	0-360	200	V
5	6.179	32.19	PK	35.3	-30.1	37.39	-	-	-	-	0-360	200	V
6	10.451	27.57	PK	37.4	-25.4	39.57	-	-	-	-	0-360	200	V

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.96	42.63	PK3	34	-31	45.63	-	-	74	-28.37	0	200	V
4.96	33	VB1T	34	-31	36	54	-18	-	-	0	200	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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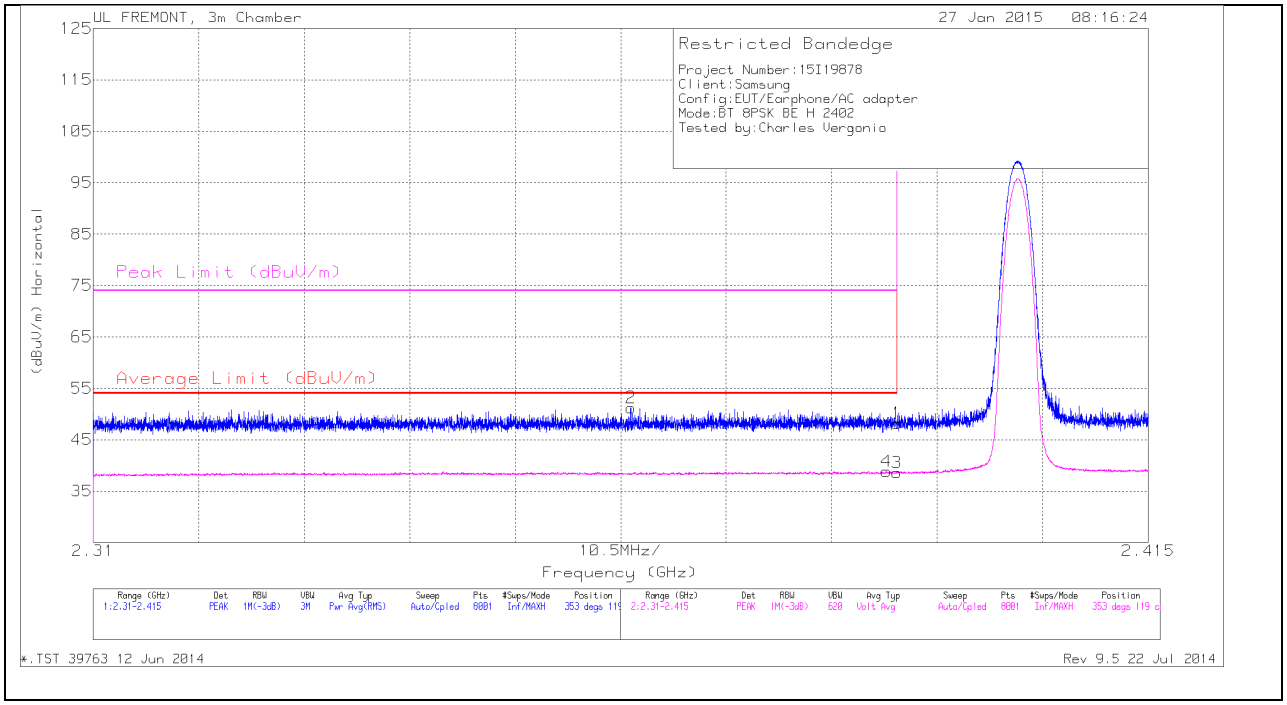
9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

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	2.364	42.4	PK	31.9	-23.1	51.2	-	-	74	-22.8	353	119	H
4	2.389	29.92	VB1T	32	-23.1	38.82	54	-15.18	-	-	353	119	H
1	2.39	39.26	PK	32	-23.1	48.16	-	-	74	-25.84	353	119	H
3	2.39	29.69	VB1T	32	-23.1	38.59	54	-15.41	-	-	353	119	H

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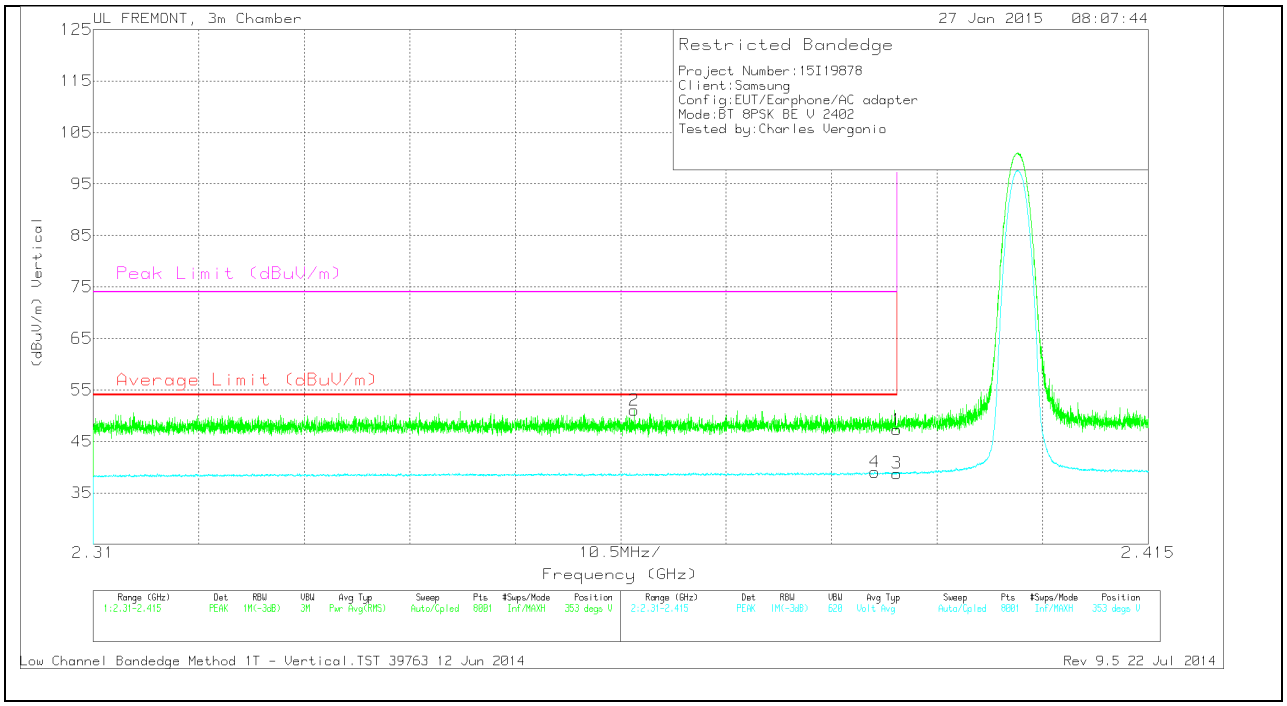
VERTICAL PEAK AND AVERAGE PLOT



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	2.364	42.27	PK	31.9	-23.1	51.07	-	-	74	-22.93	353	299	V
4	2.388	30.15	VB1T	32	-23.1	39.05	54	-14.95	-	-	353	299	V
1	2.39	38.37	PK	32	-23.1	47.27	-	-	74	-26.73	353	299	V
3	2.39	29.88	VB1T	32	-23.1	38.78	54	-15.22	-	-	353	299	V

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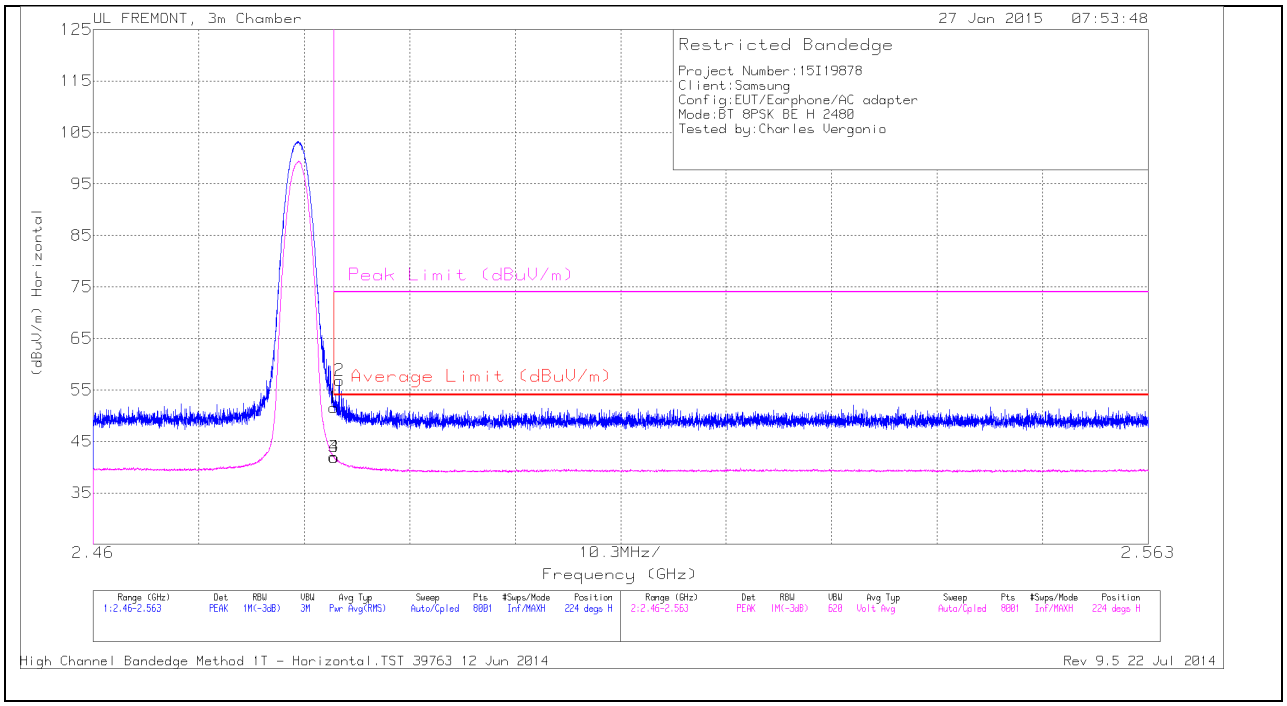
AUTHORIZED BANDEDGE (HIGH CHANNEL)

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	42.08	PK	32.3	-22.8	51.58	-	-	74	-22.42	224	102	H
2	2.484	47.35	PK	32.3	-22.8	56.85	-	-	74	-17.15	224	102	H
3	2.484	32.48	VB1T	32.3	-22.8	41.98	54	-12.02	-	-	224	102	H
4	2.484	32.46	VB1T	32.3	-22.8	41.96	54	-12.04	-	-	224	102	H

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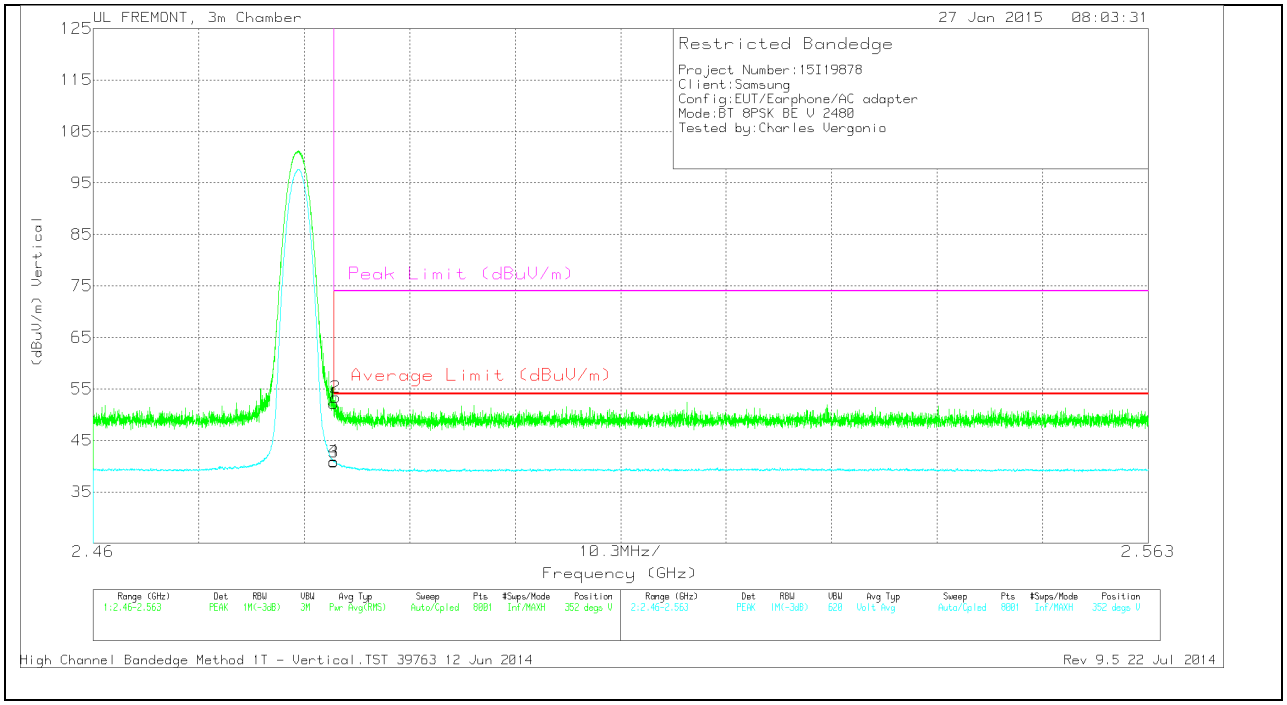
VERTICAL PEAK AND AVERAGE PLOT



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	42.63	PK	32.3	-22.8	52.13	-	-	74	-21.87	352	105	V
2	2.484	43.88	PK	32.3	-22.8	53.38	-	-	74	-20.62	352	105	V
3	2.484	31.28	VB1T	32.3	-22.8	40.78	54	-13.22	-	-	352	105	V
4	2.484	31.48	VB1T	32.3	-22.8	40.98	54	-13.02	-	-	352	105	V

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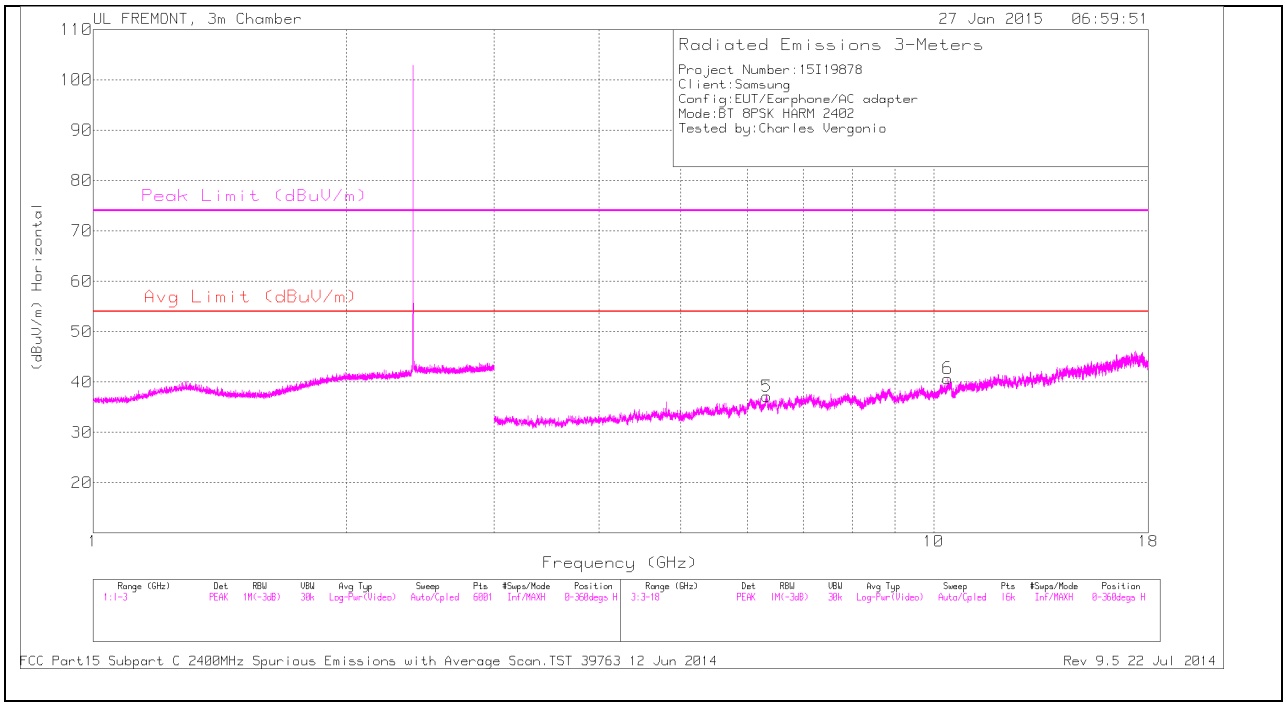
HARMONICS AND SPURIOUS EMISSIONS

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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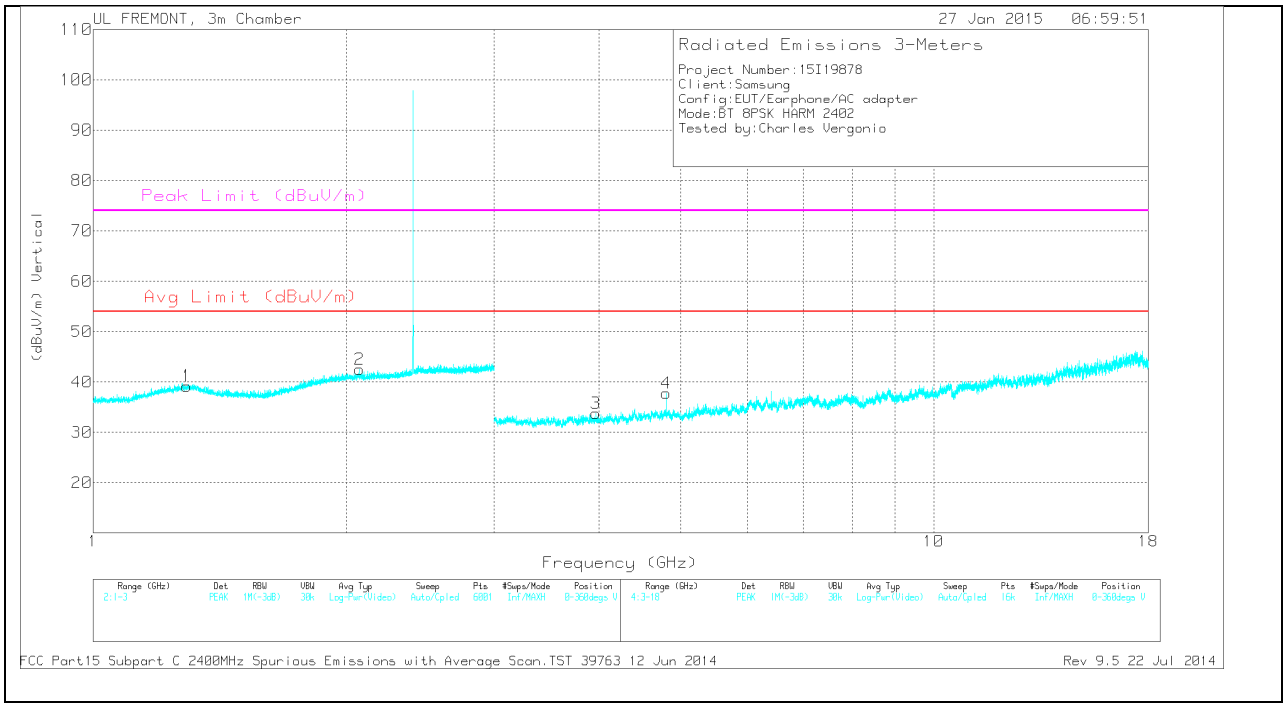
LOW CHANNEL VERTICAL



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 T119 (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	1.293	33.17	PK	29.8	-23.8	39.17	-	-	74	-34.83	0-360	200	V
2	2.075	34.12	PK	31.5	-23.1	42.52	-	-	-	-	0-360	200	V
3	3.965	31.57	PK	33.2	-31	33.77	-	-	74	-40.23	0-360	100	V
4	4.804	34.07	PK	34	-30.3	37.77	-	-	74	-36.23	0-360	100	V
5	6.332	30.83	PK	35.4	-29.1	37.13	-	-	-	-	0-360	100	H
6	10.389	29.19	PK	37.2	-25.7	40.69	-	-	-	-	0-360	200	H

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.804	41.58	PK3	34	-30.3	45.28	-	-	74	-28.72	0	100	V
4.804	30.54	VB1T	34	-30.3	34.24	54	-19.76	-	-	0	100	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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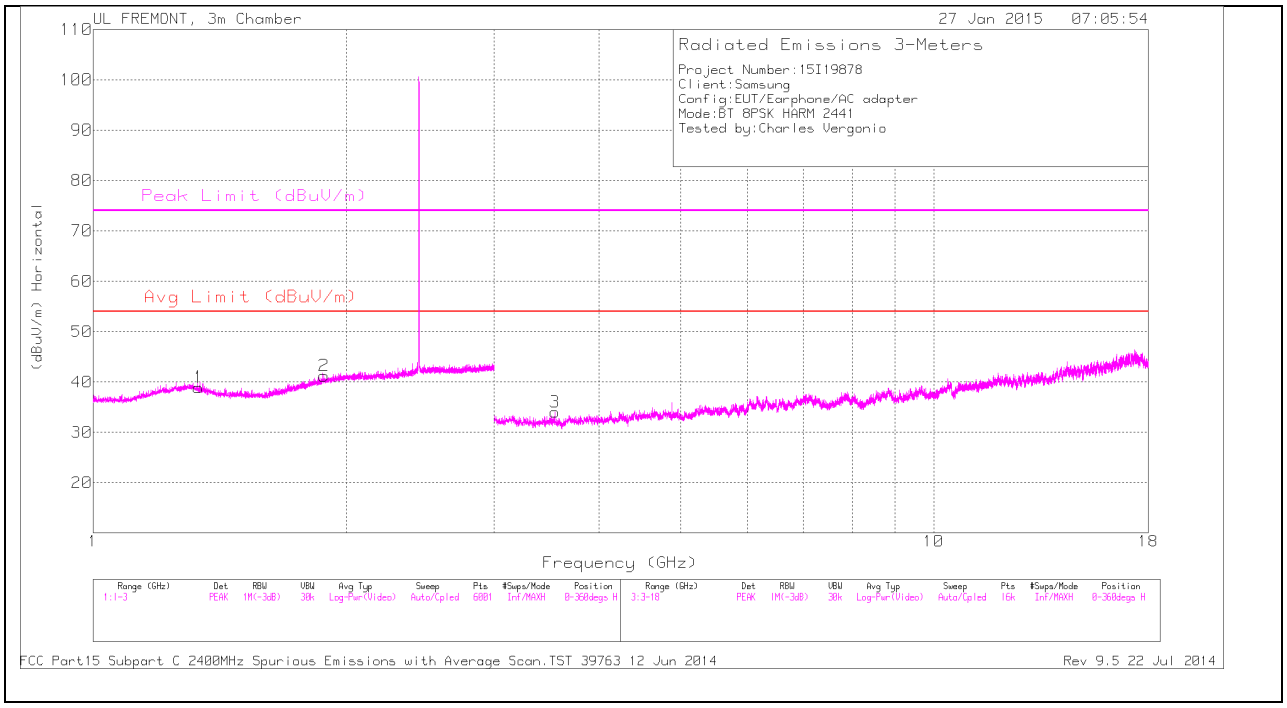
MID CHANNEL HORIZONTAL



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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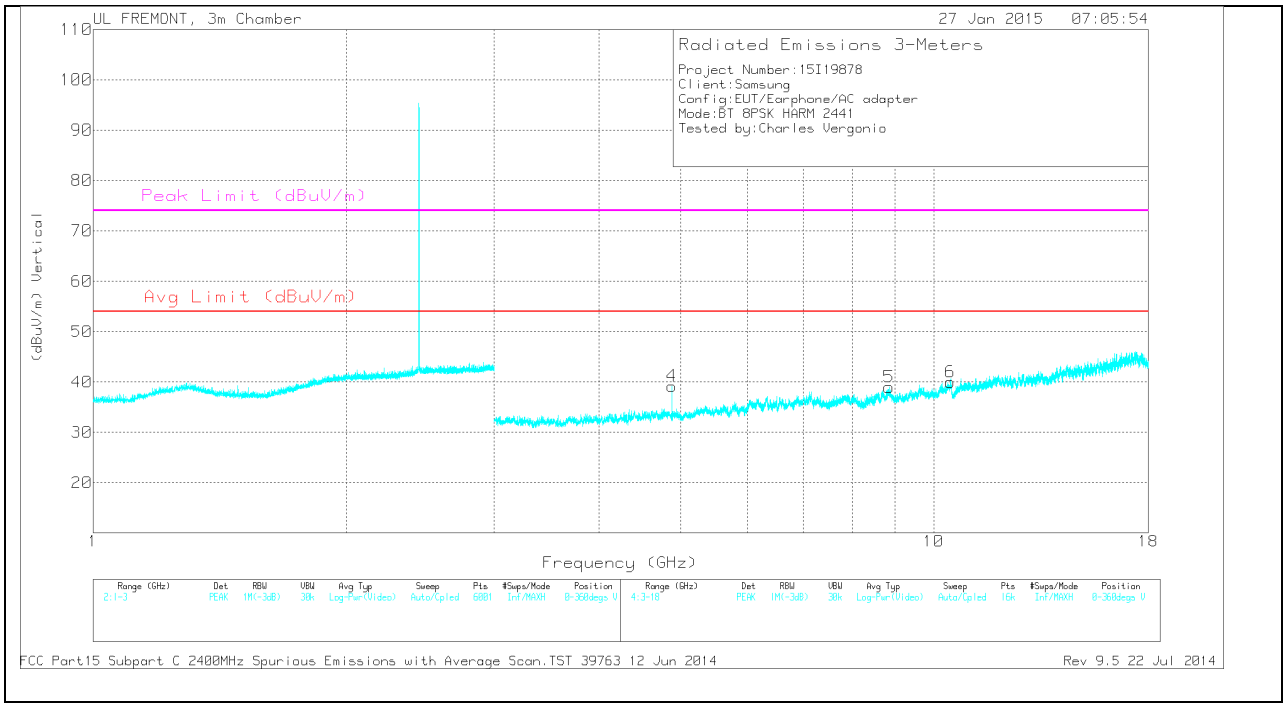
MID CHANNEL VERTICAL



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 T119 (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	1.335	33.22	PK	29.4	-23.7	38.92	-	-	74	-35.08	0-360	200	H
2	1.883	33.64	PK	30.9	-23.3	41.24	-	-	-	-	0-360	100	H
3	3.546	32.52	PK	32.8	-31.3	34.02	-	-	74	-39.98	0-360	200	H
4	4.882	35.29	PK	34	-30.1	39.19	-	-	74	-34.81	0-360	100	V
5	8.848	29.68	PK	35.9	-26.6	38.98	-	-	-	-	0-360	200	V
6	10.46	27.79	PK	37.4	-25.2	39.99	-	-	-	-	0-360	100	V

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.882	41.94	PK3	34	-30.1	45.84	-	-	74	-28.16	0	100	V
4.882	31.6	VB1T	34	-30.1	35.5	54	-18.5	-	-	0	100	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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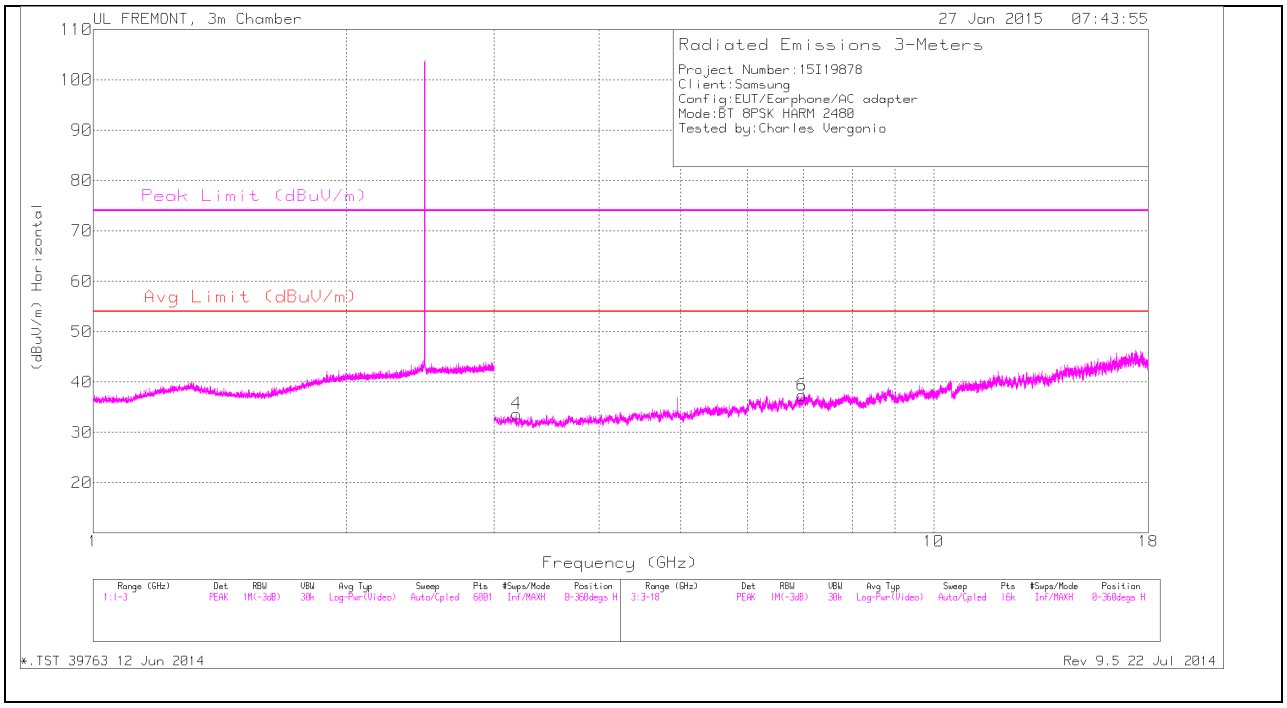
HIGH CHANNEL HORIZONTAL



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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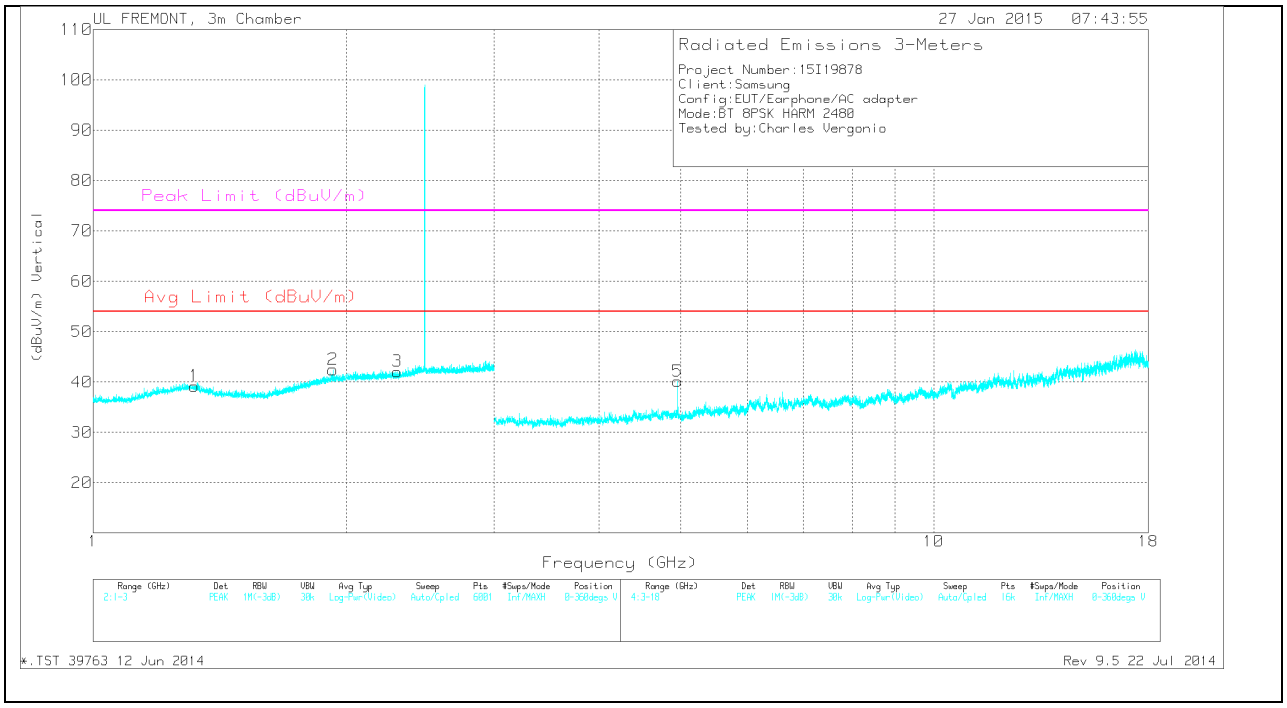
HIGH CHANNEL VERTICAL



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 T119 (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	1.319	33.4	PK	29.6	-23.8	39.2	-	-	74	-34.8	0-360	100	V
2	1.929	34.57	PK	31.2	-23.3	42.47	-	-	-	-	0-360	200	V
3	2.301	33.59	PK	31.6	-23.1	42.09	-	-	-	-	0-360	200	V
4	3.19	32.31	PK	32.6	-31.2	33.71	-	-	-	-	0-360	100	H
5	4.96	37.12	PK	34	-31	40.12	-	-	74	-33.88	0-360	200	V
6	6.97	31.15	PK	35.6	-29.4	37.35	-	-	-	-	0-360	100	H

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
4.96	42.23	PK3	34	-31	45.23	-	-	74	-28.77	0	200	V
4.96	31.15	VB1T	34	-31	34.15	54	-19.85	-	-	0	200	V

PK3 - FHSS Method: Maximum Peak

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

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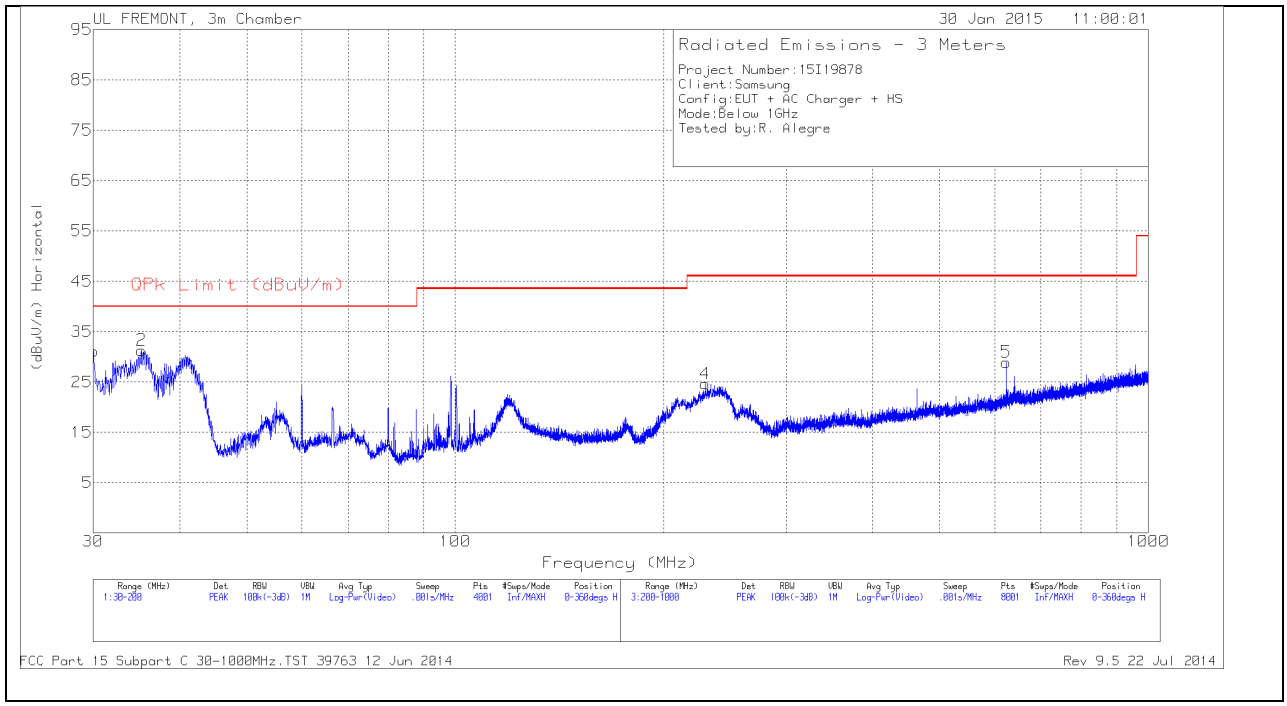
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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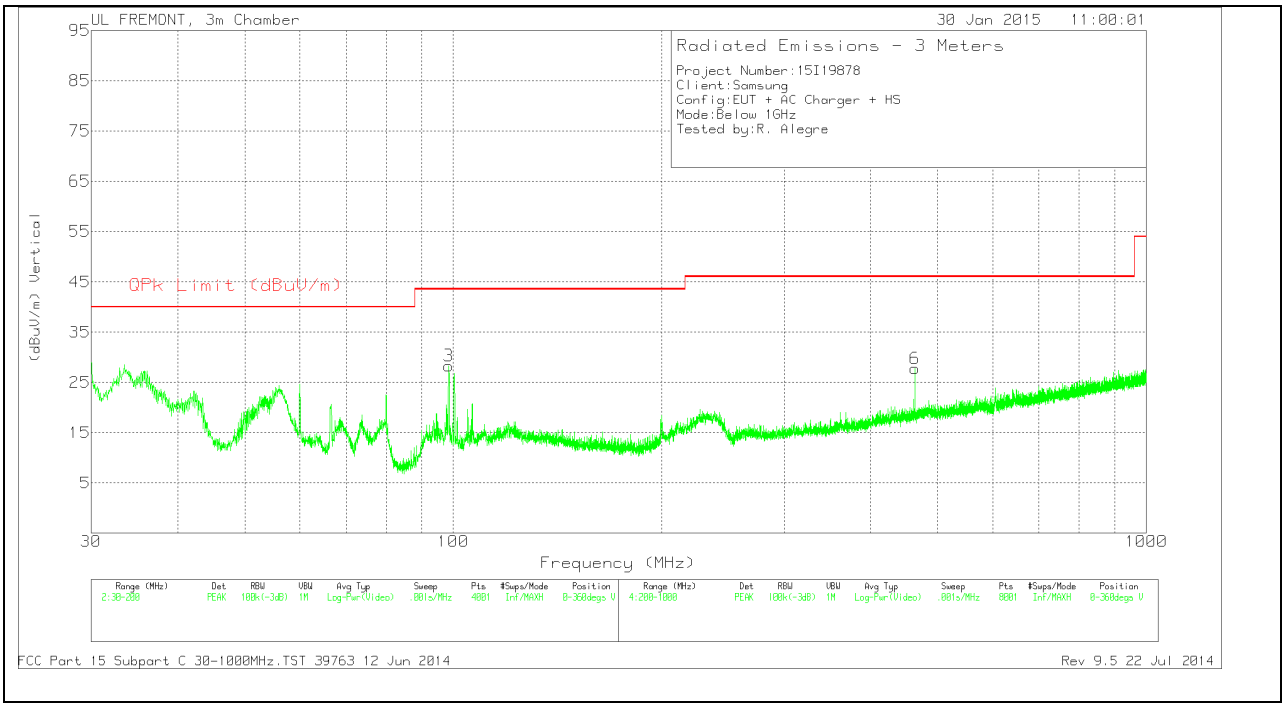
VERTICAL PLOT



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BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.0425	37.7	PK	21	-27.5	31.2	40	-8.8	0-360	300	H
2	35.2275	41.69	PK	17.1	-27.5	31.29	40	-8.71	0-360	400	H
3	98.4675	45.59	PK	9.5	-26.8	28.29	43.52	-15.23	0-360	100	V
4	229.4	39.05	PK	11.1	-25.5	24.65	46.02	-21.37	0-360	100	H
6	463.7	36.47	PK	17.1	-25.8	27.77	46.02	-18.25	0-360	100	V
5	624	35.34	PK	19.2	-25.6	28.94	46.02	-17.08	0-360	300	H

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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

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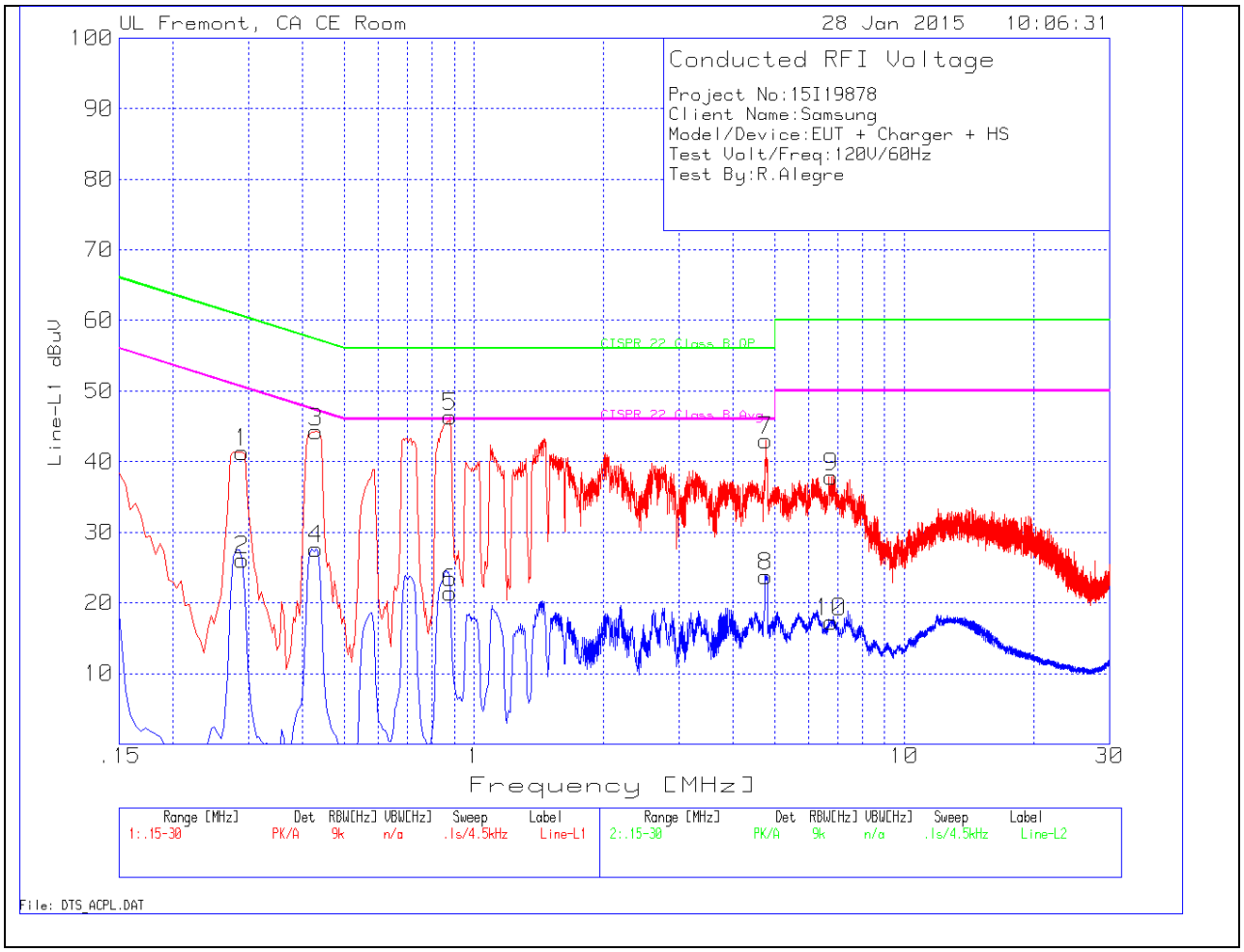
6 WORST EMISSIONS

LINE 1 PLOT



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LINE 1 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.2895	40.75	PK	.6	0	41.35	60.5	-19.15	-	-
2	.2895	25.45	Av	.6	0	26.05	-	-	50.5	-24.45
3	.429	43.84	PK	.4	0	44.24	57.3	-13.06	-	-
4	.429	27.24	Av	.4	0	27.64	-	-	47.3	-19.66
5	.879	46.04	PK	.3	0	46.34	56	-9.66	-	-
6	.879	21.12	Av	.3	0	21.42	-	-	46	-24.58
7	4.7715	42.72	PK	.2	.1	43.02	56	-12.98	-	-
8	4.7715	23.49	Av	.2	.1	23.79	-	-	46	-22.21
9	6.7605	37.5	PK	.2	.1	37.8	60	-22.2	-	-
10	6.7605	16.96	Av	.2	.1	17.26	-	-	50	-32.74

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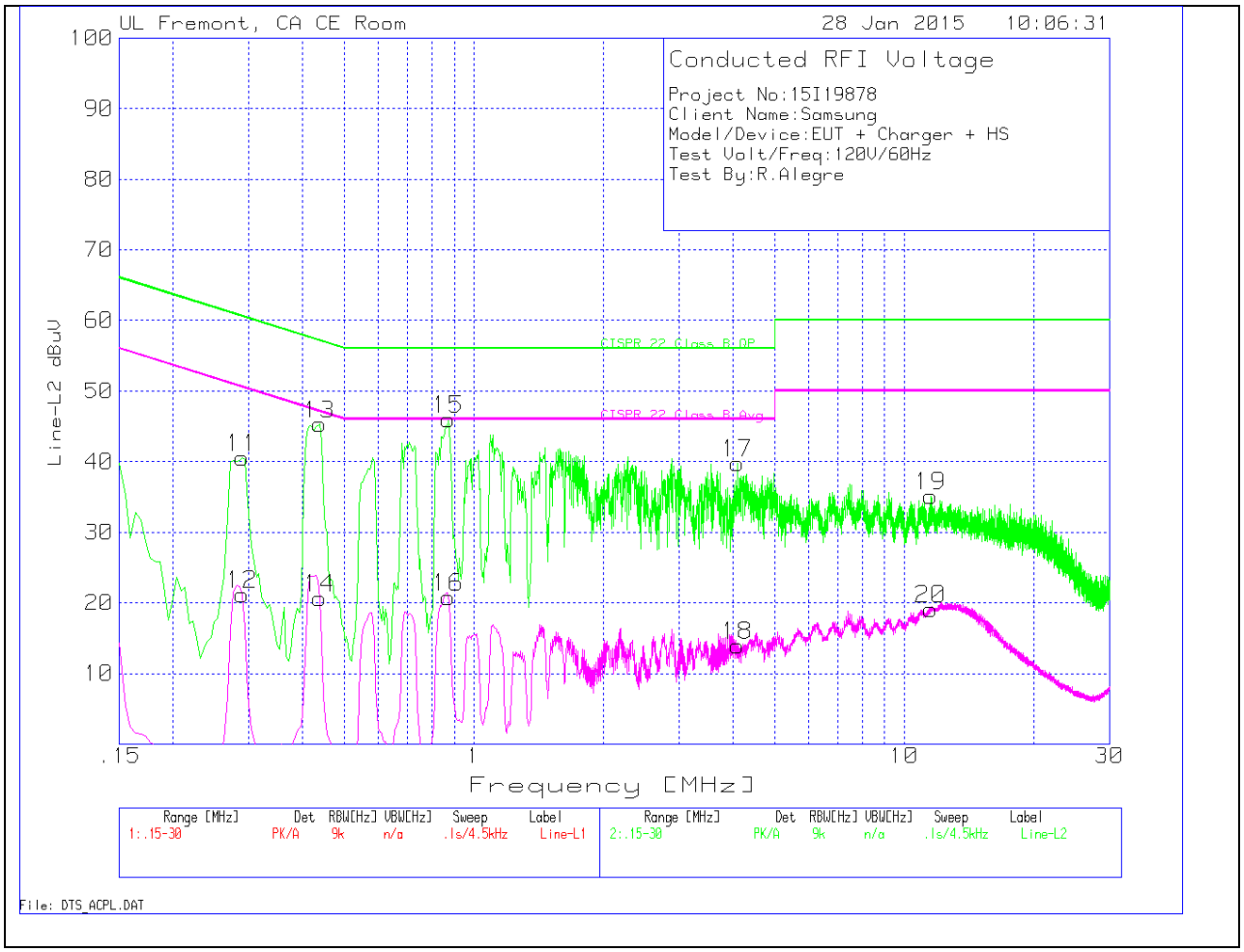
LINE 2 PLOT



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LINE 2 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
11	.2895	39.91	PK	.6	0	40.51	60.5	-19.99	-	-
12	.2895	20.59	Av	.6	0	21.19	-	-	50.5	-29.31
13	.438	44.88	PK	.4	0	45.28	57.1	-11.82	-	-
14	.438	20.24	Av	.4	0	20.64	-	-	47.1	-26.46
15	.87	45.74	PK	.3	0	46.04	56	-9.96	-	-
16	.87	20.54	Av	.3	0	20.84	-	-	46	-25.16
17	4.0965	39.48	PK	.2	.1	39.78	56	-16.22	-	-
18	4.0965	13.7	Av	.2	.1	14	-	-	46	-32
19	11.535	34.76	PK	.2	.2	35.16	60	-24.84	-	-
20	11.535	18.71	Av	.2	.2	19.11	-	-	50	-30.89

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