



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, and ANT+

MODEL NUMBER: SM-A7000

FCC ID: A3LSMA7000

REPORT NUMBER: 14I19355-E2

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Issue			
Rev.	Date	Revisions	Revised By
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1 ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, & ANT+

MODEL: SM-A7000

SERIAL NUMBER: c899c6eb (RADIATED); c89fc6f6 (CONDUCTED)

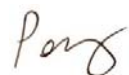
DATE TESTED: NOVEMBER 7-13, 2014

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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LAB ENGINEER
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2 TEST METHODOLOGY

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

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

4 CALIBRATION AND UNCERTAINTY

4.1 MEASURING INSTRUMENT CALIBRATION

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

4.2 SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3 MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 26000 MHz	4.94 dB

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

5 EQUIPMENT UNDER TEST

5.1 DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, 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	11.01	12.62
2402 - 2480	Enhanced 8PSK	11.19	13.15

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

5.3 DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.32dBi.

5.4 WORST-CASE CONFIGURATION AND MODE

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

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

5.5 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	SAMSUNG	EP-TA50CBC	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

I/O CABLES

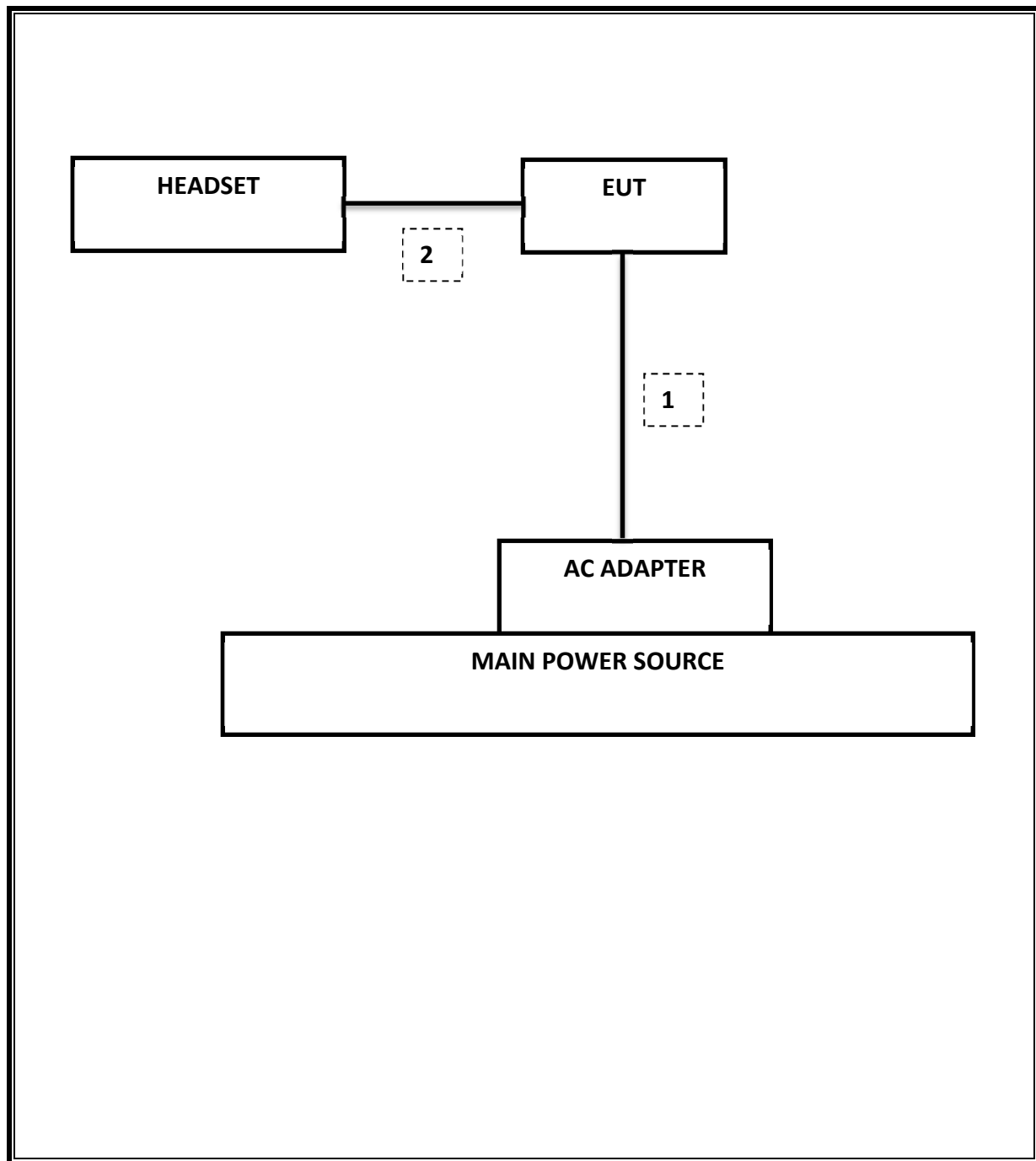
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.

EUT was set in the Hidden menu mode to enable BT communications.

SETUP DIAGRAM FOR TESTS



6 TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	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	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/15
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14

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	1.311MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-46.60dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	11.19dBm
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	Radiated	Pass	0.288sec
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10		Pass	45.26dBuV(PK)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	41.25dBuV/m

8 ANTENNA PORT TEST RESULTS

8.1 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to $\geq$ RBW. The sweep time is coupled.

RESULTS

8.1.1 BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	921	892
Middle	2441	924	878
High	2480	872	902
Worst		924	902

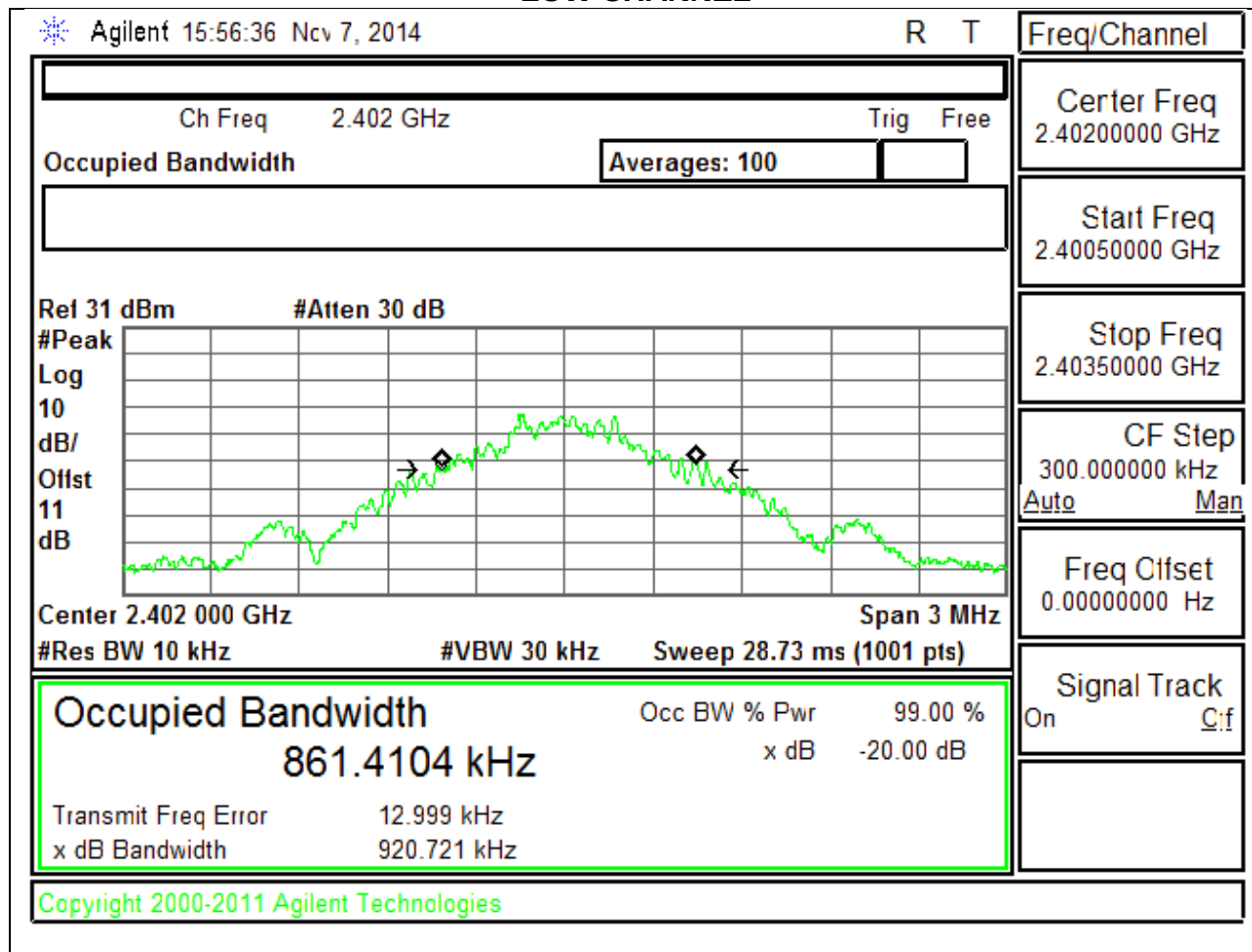
8.1.2 ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.205	1.135
Middle	2441	1.311	1.192
High	2480	1.265	1.188
Worst		1.311	

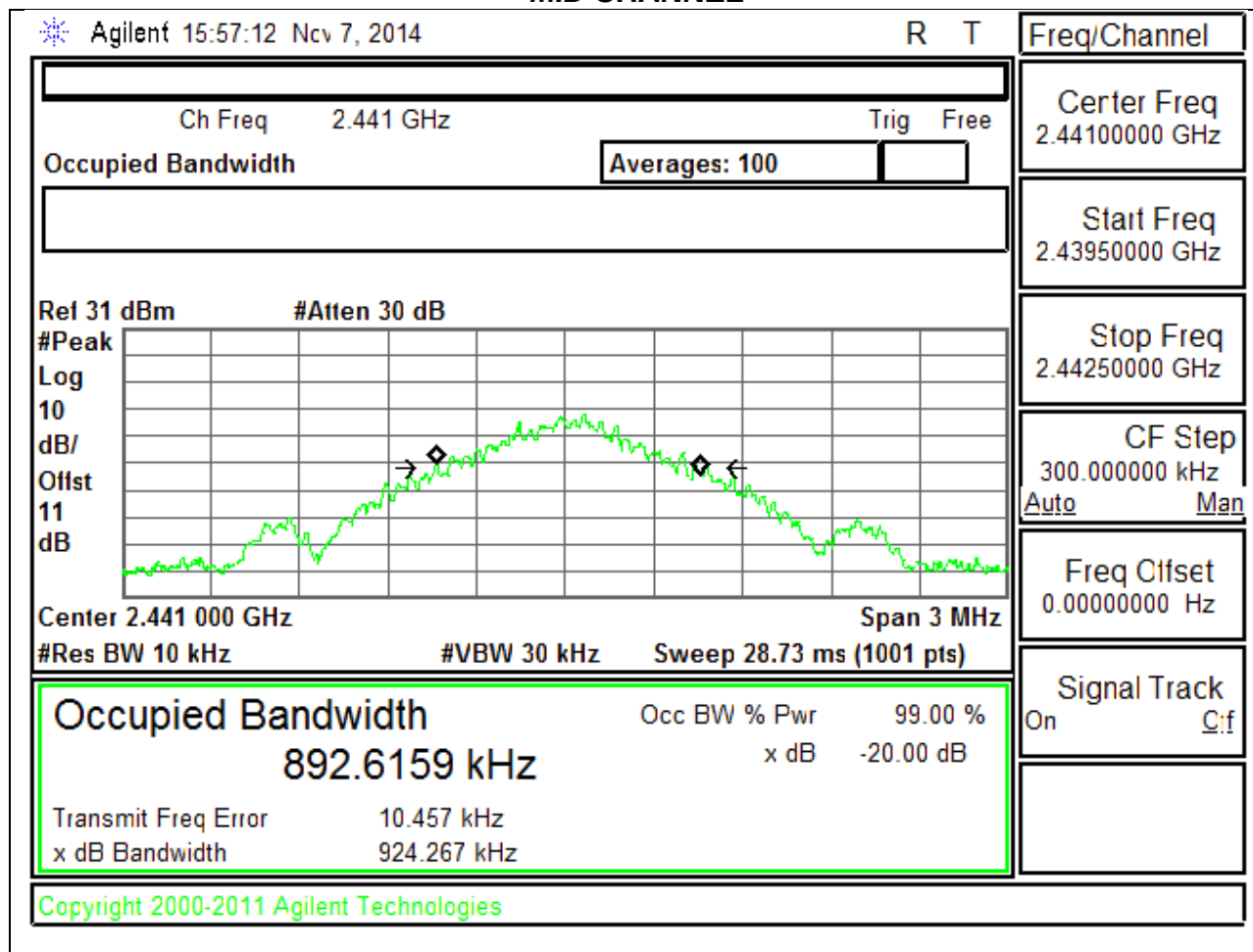
8.1.3 20 dB AND 99% BANDWIDTH PLOTS

GFSK 20 dB BANDWIDTH

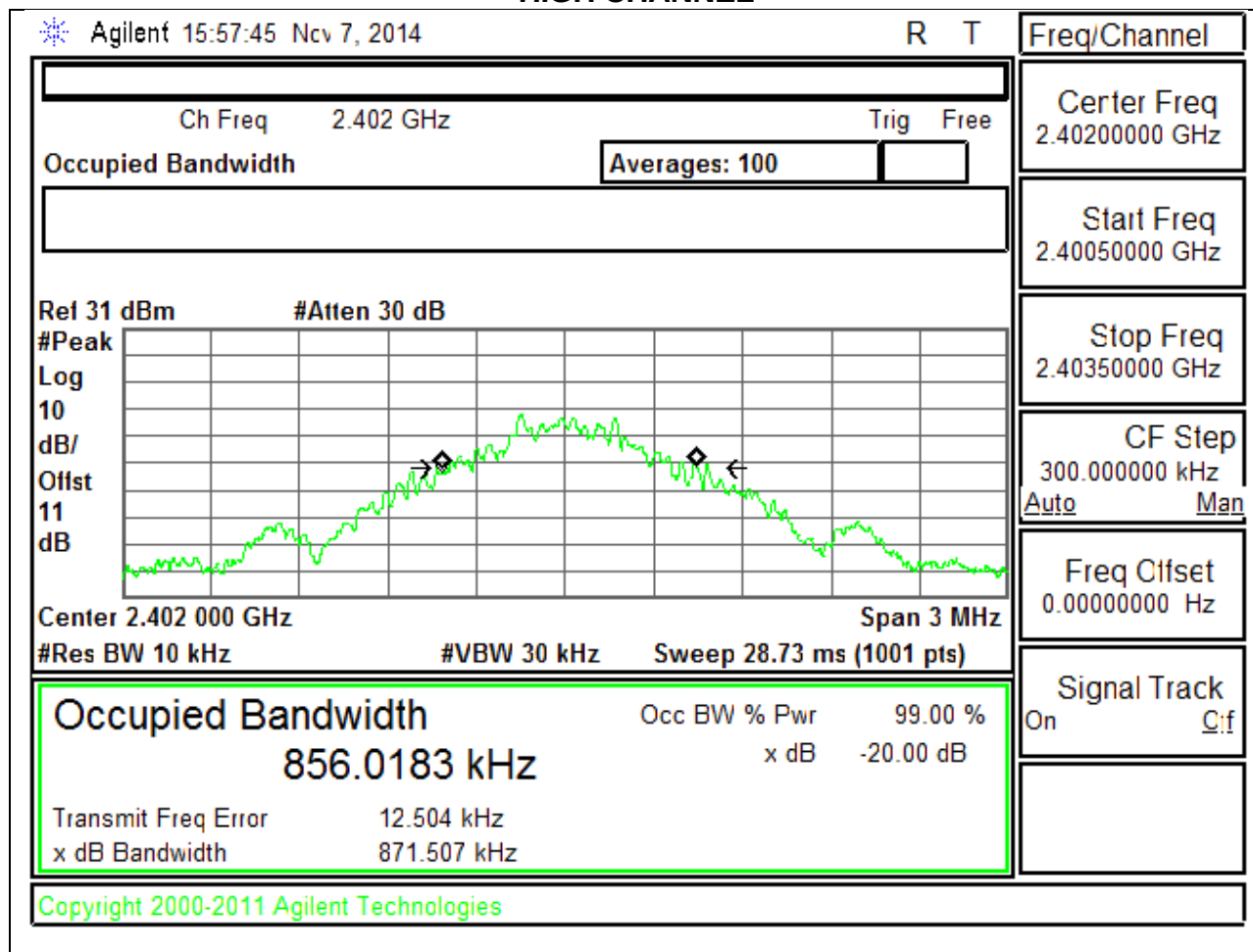
LOW CHANNEL



MID CHANNEL

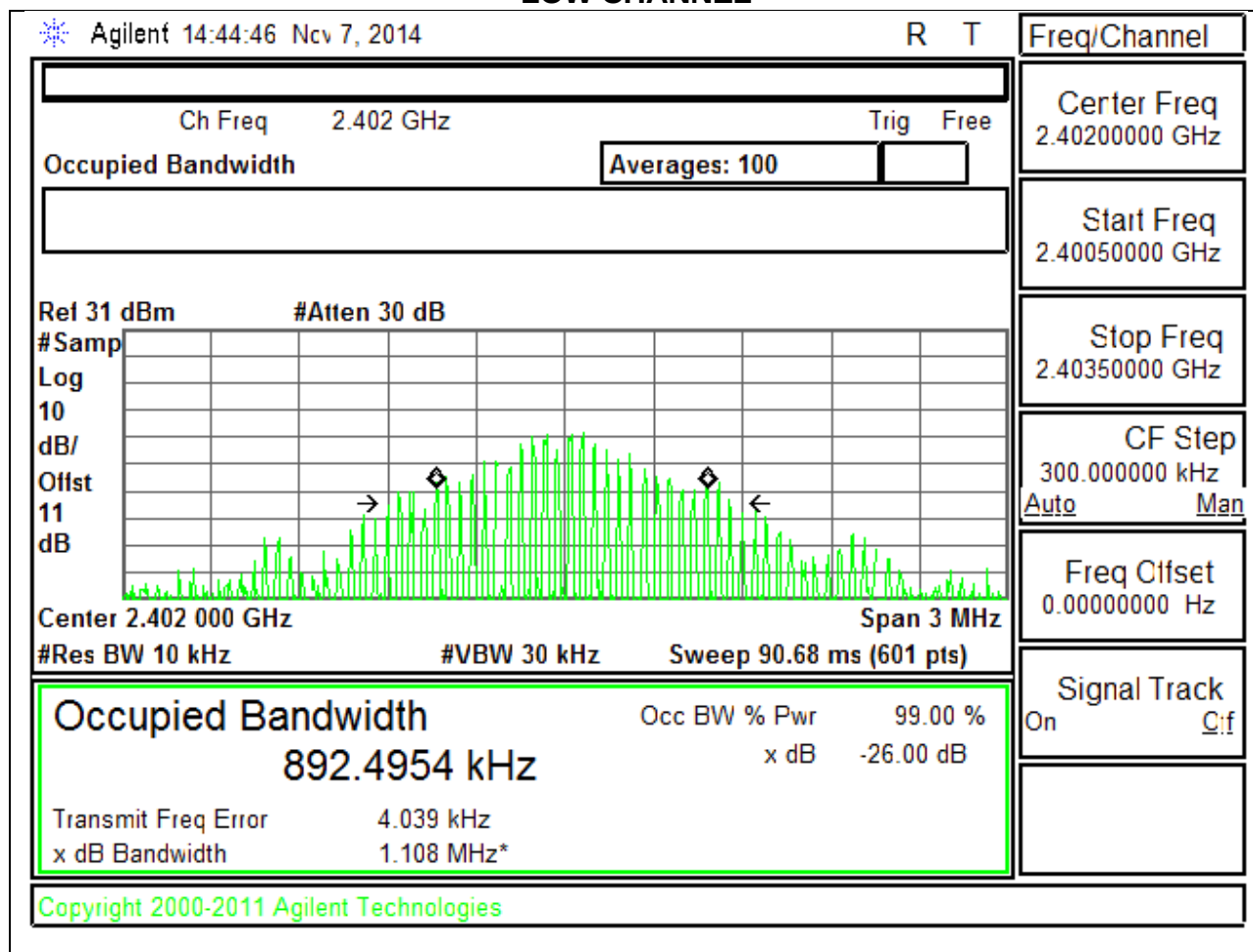


HIGH CHANNEL

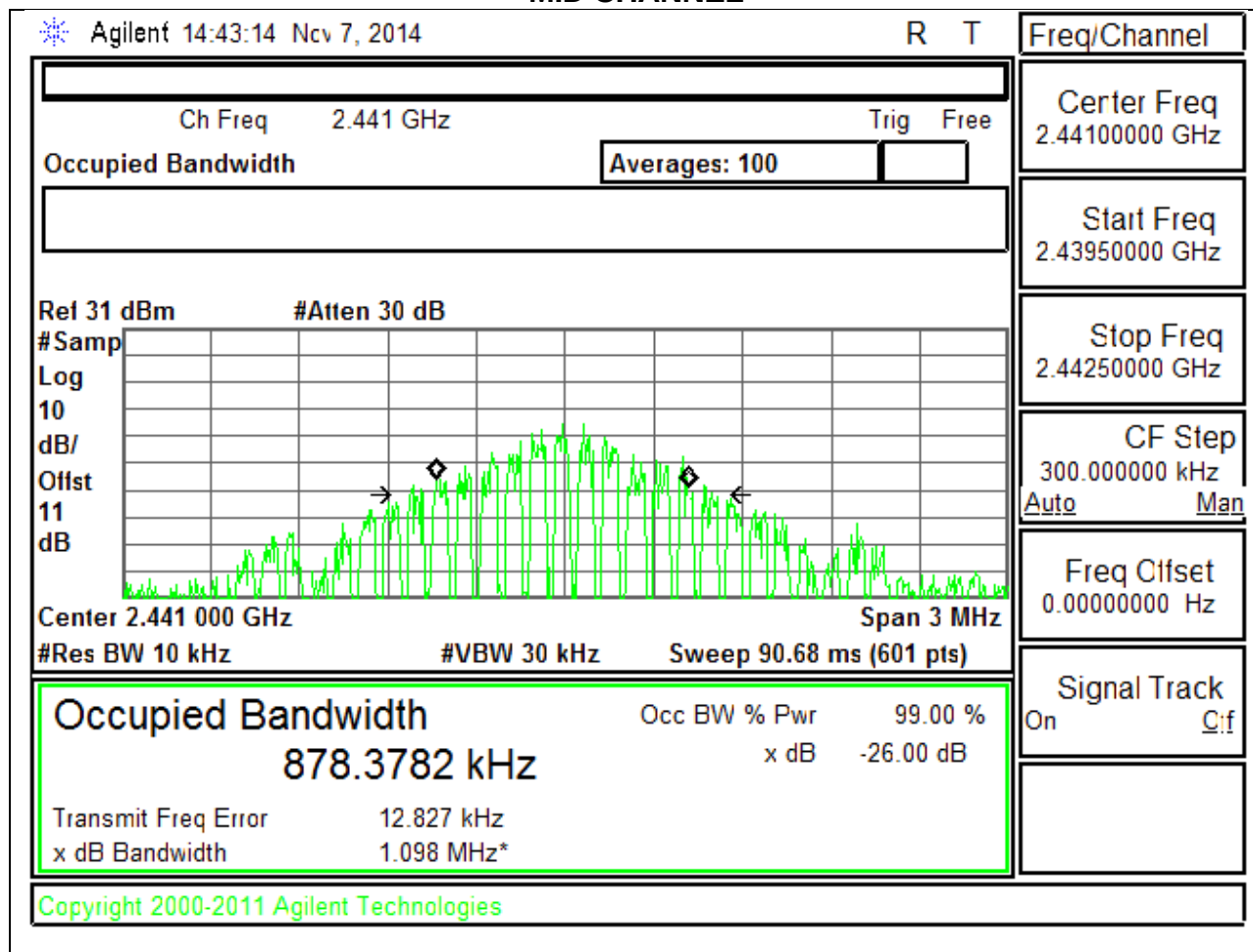


GFSK 99% BANDWIDTH

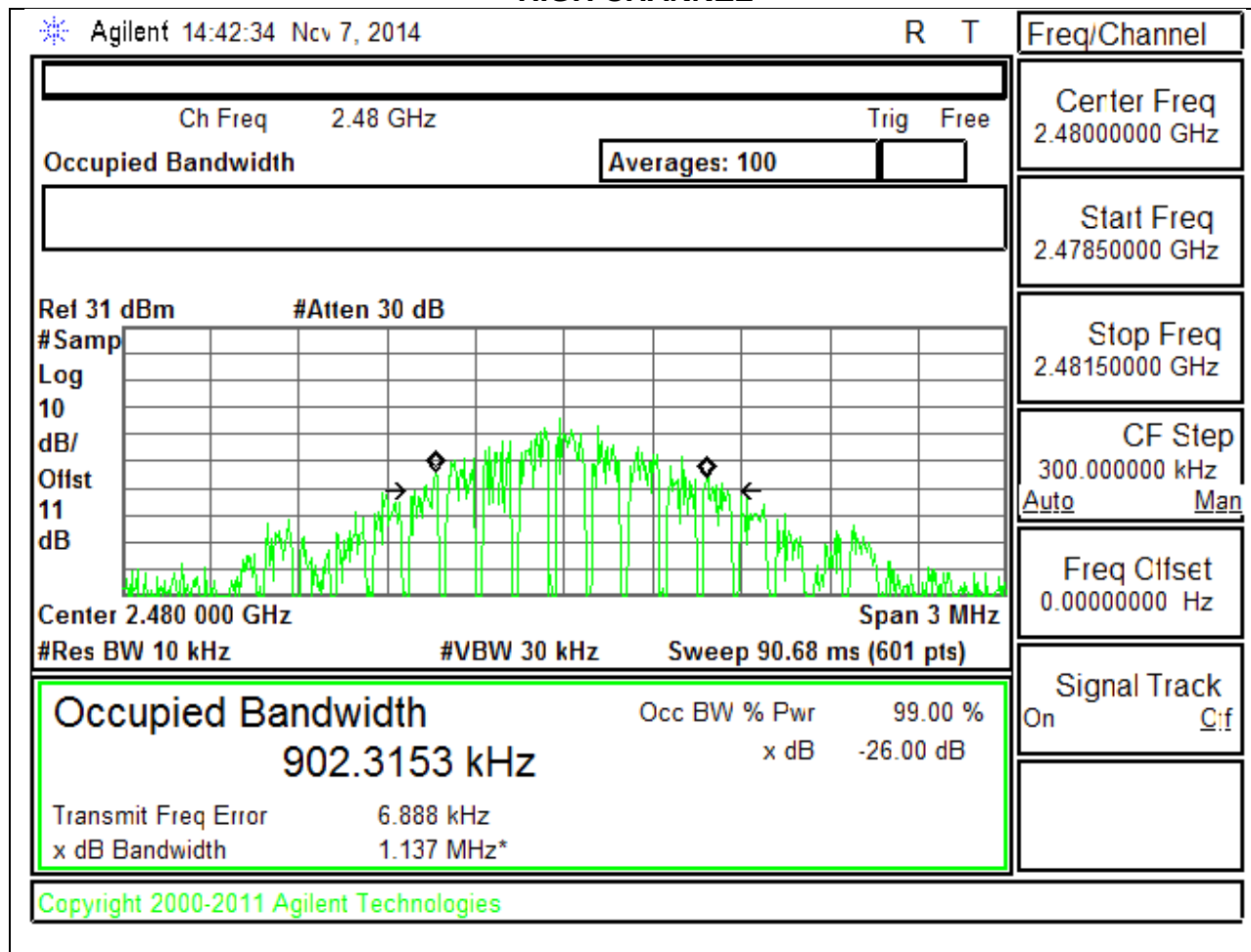
LOW CHANNEL



MID CHANNEL

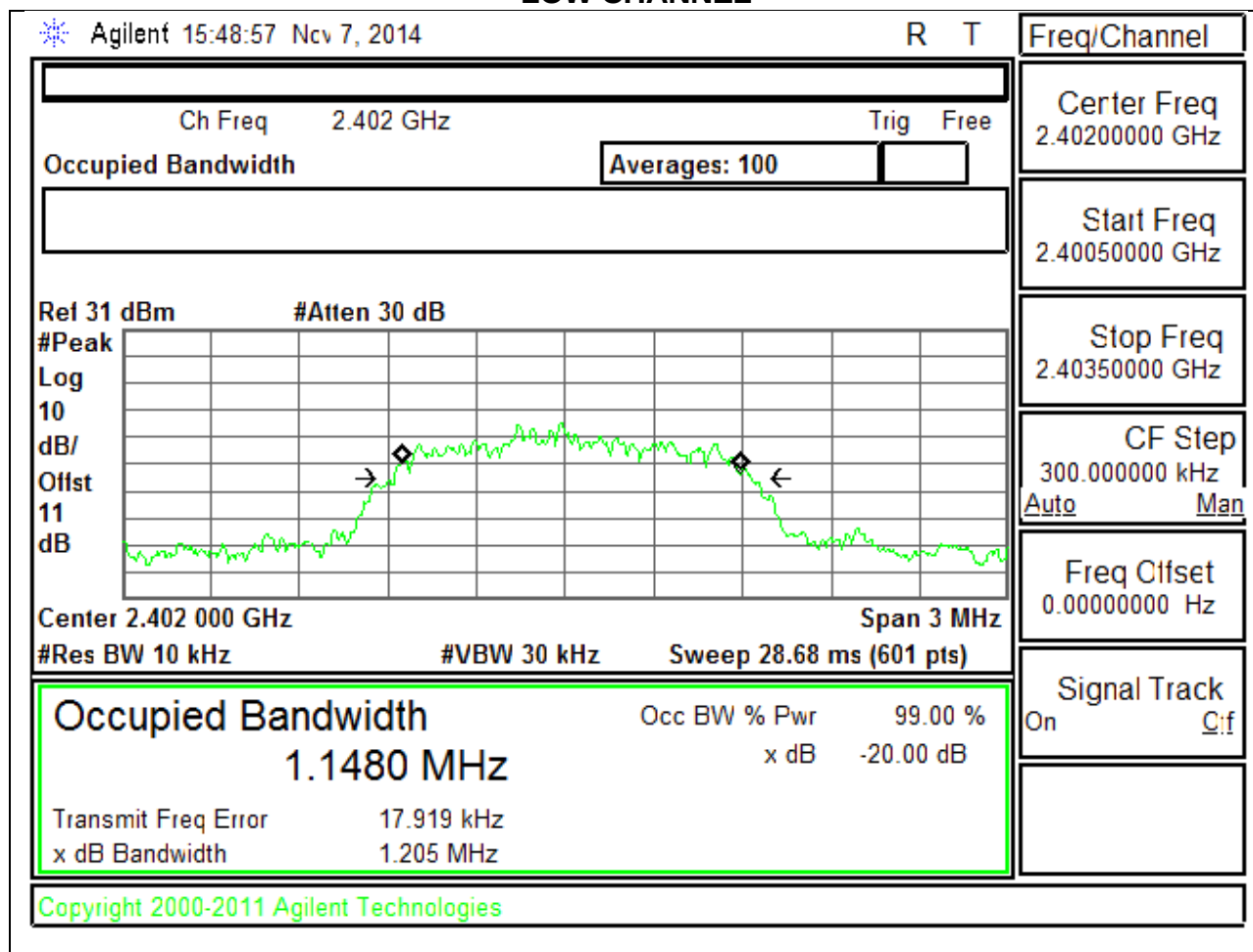


HIGH CHANNEL

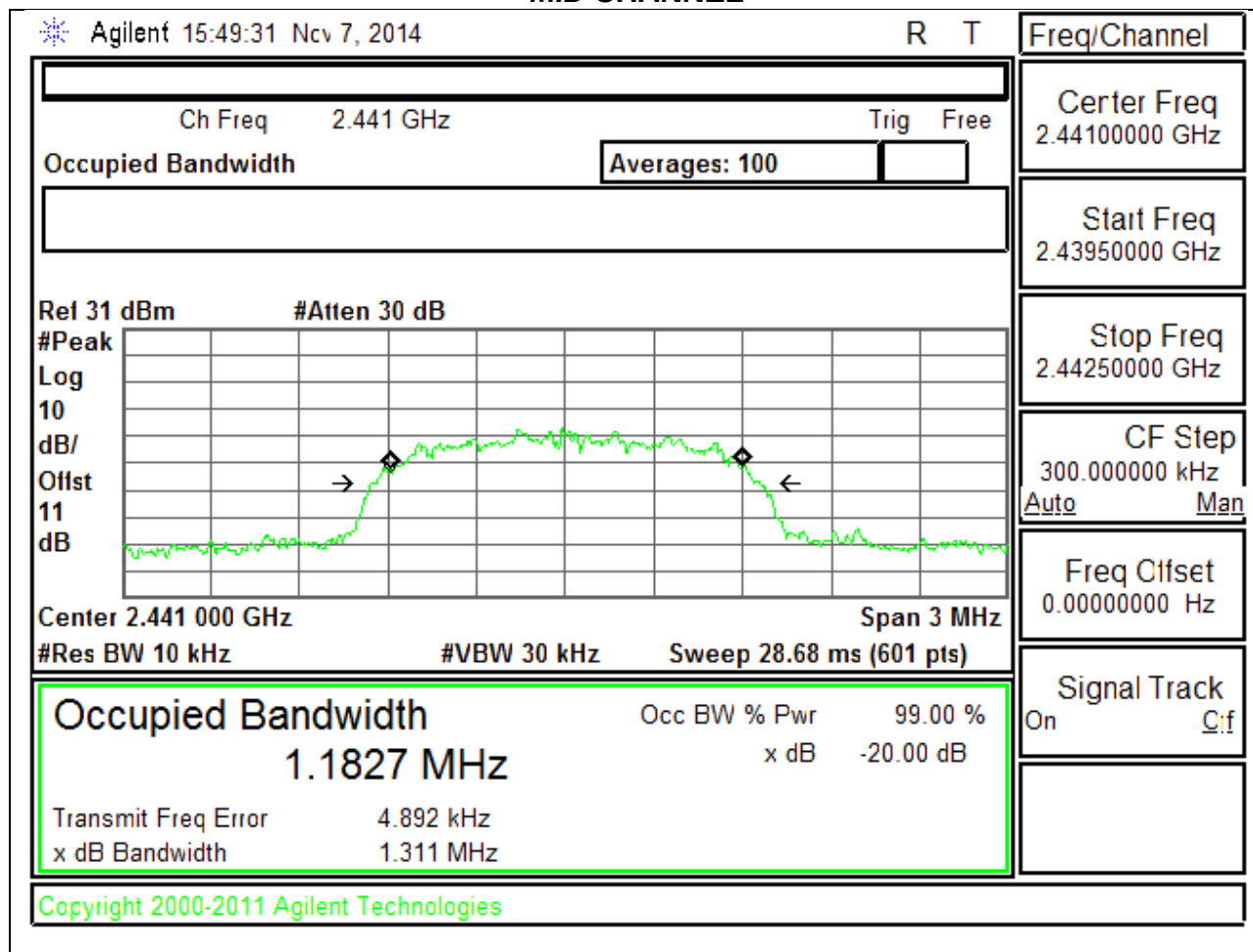


8PSK 20 dB BANDWIDTH

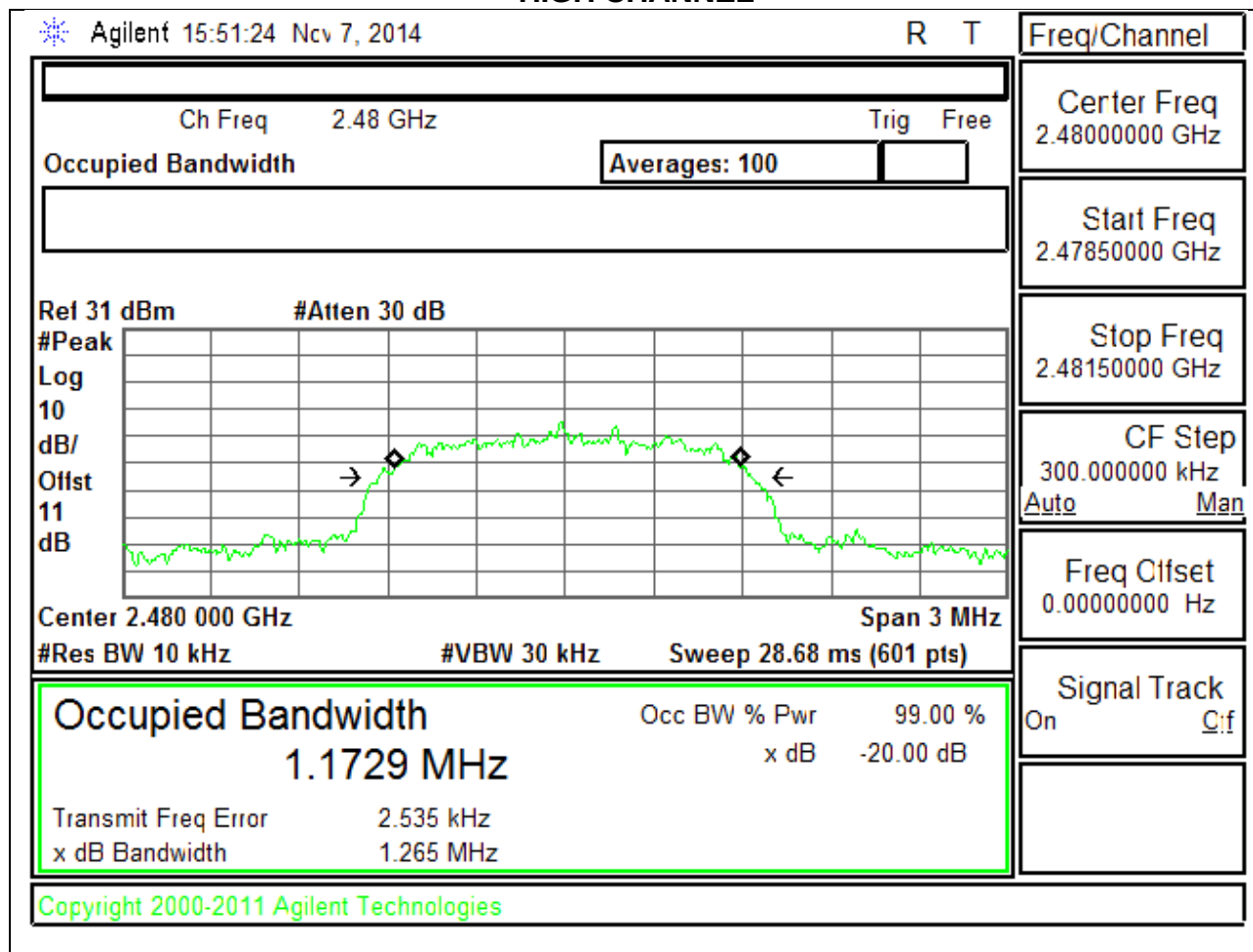
LOW CHANNEL



MID CHANNEL

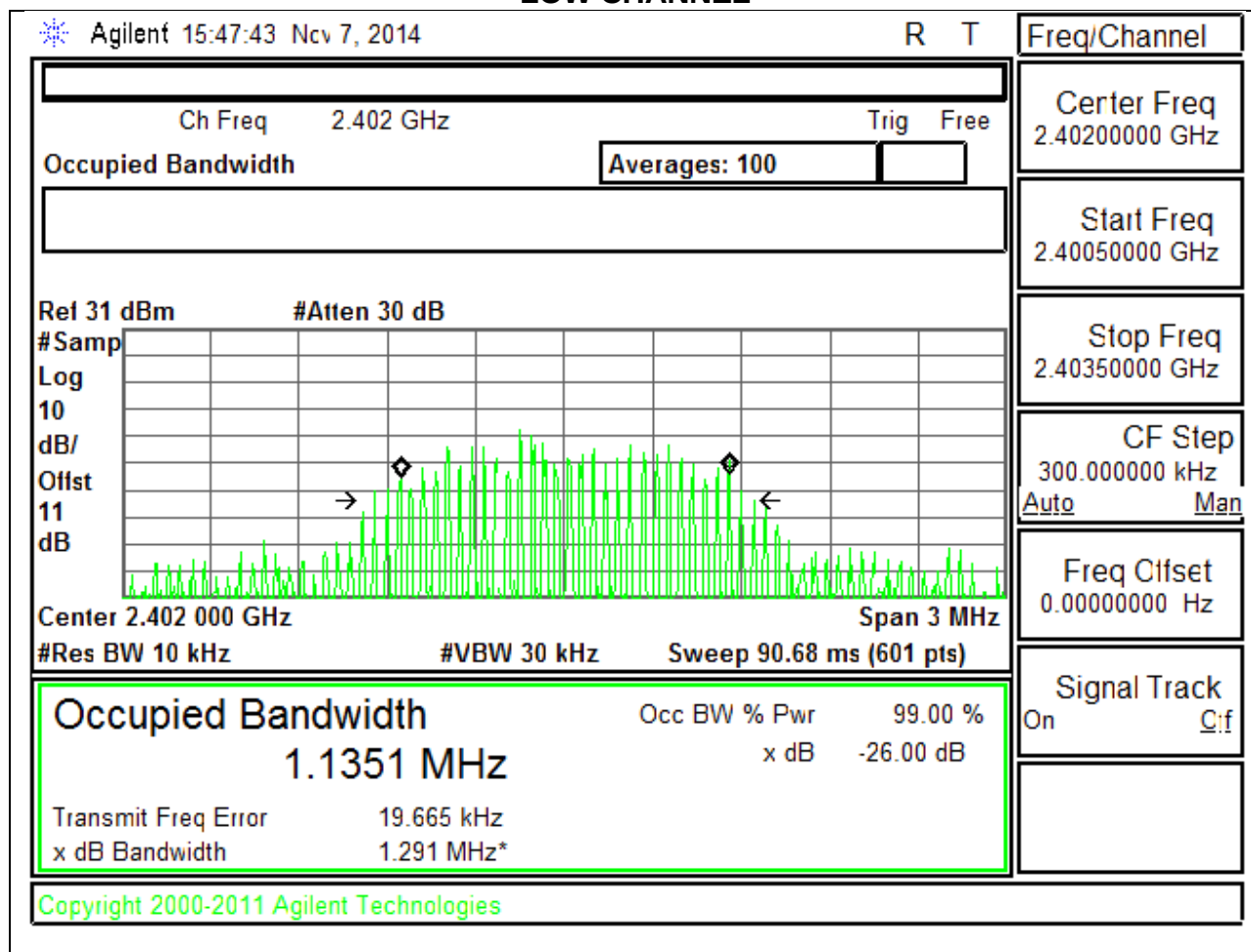


HIGH CHANNEL

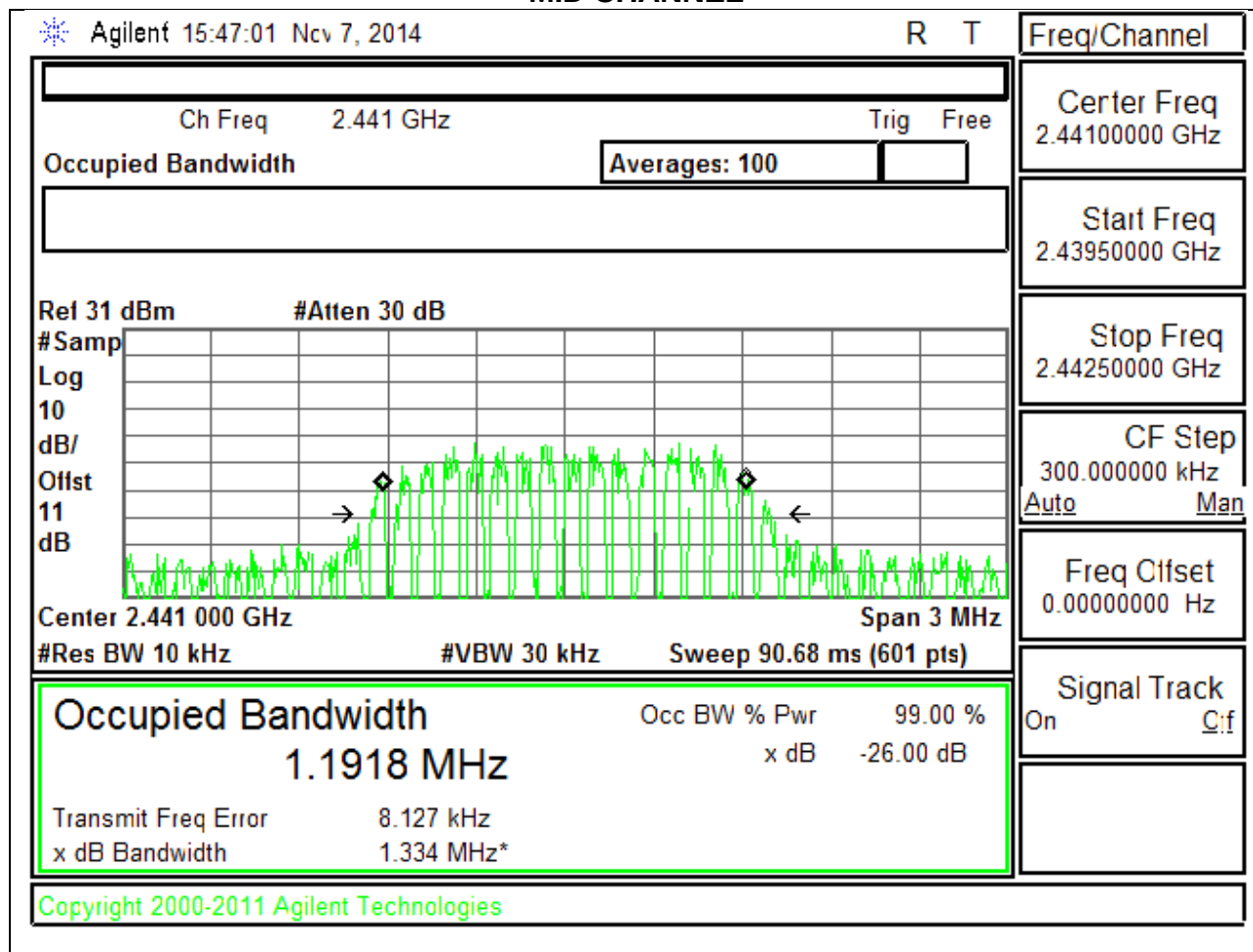


8PSK 99% BANDWIDTH

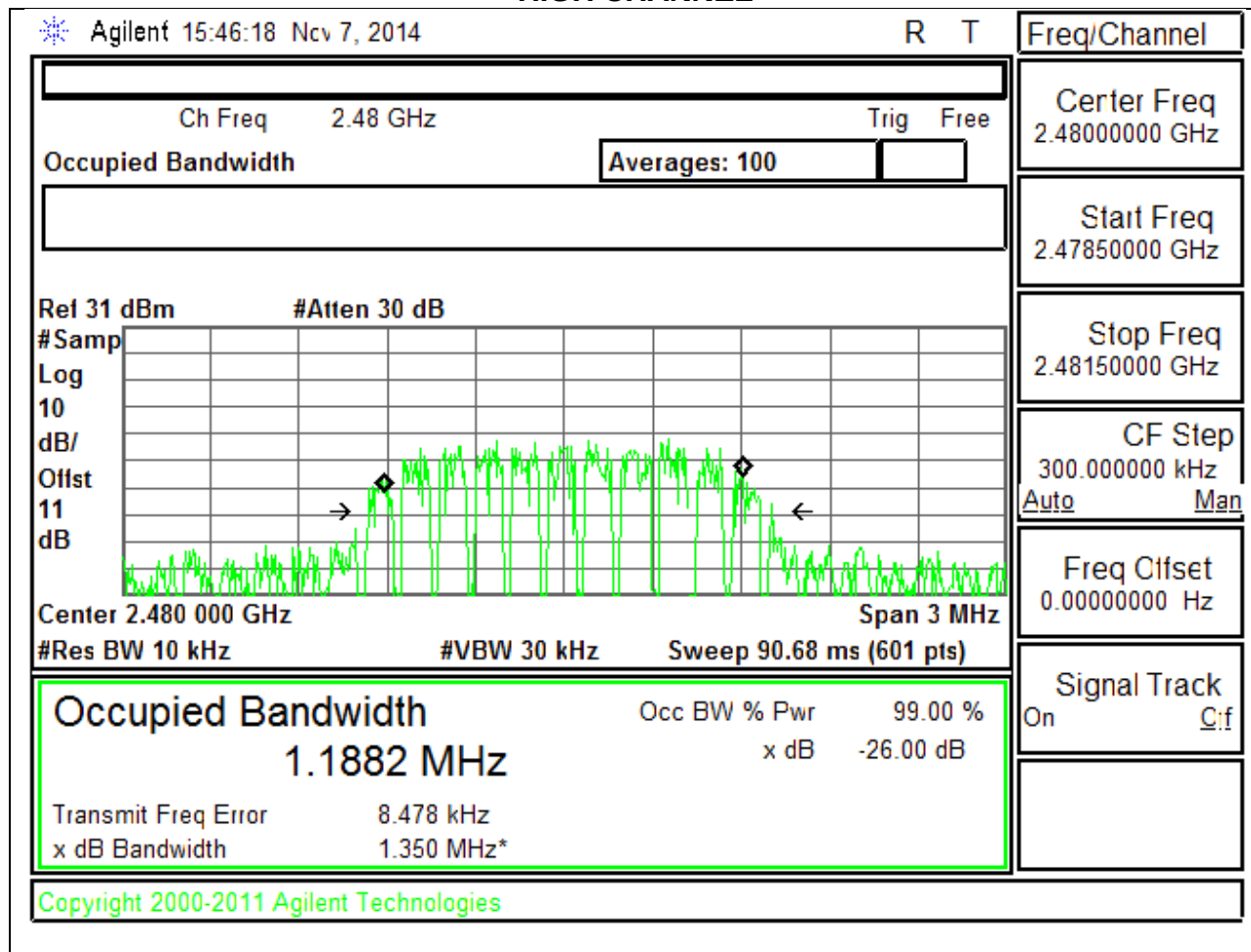
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



8.2 HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

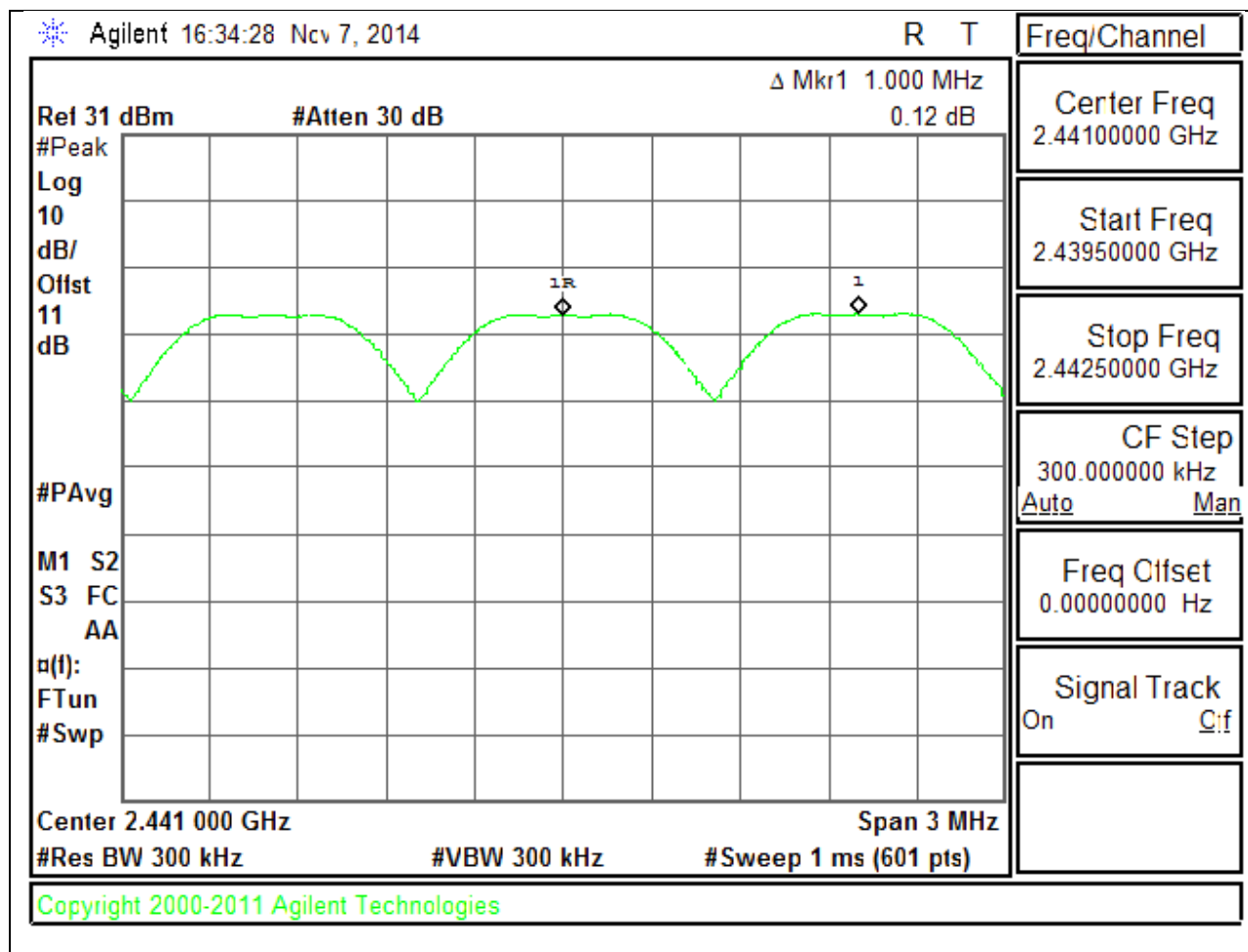
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION PLOT



8.3 NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

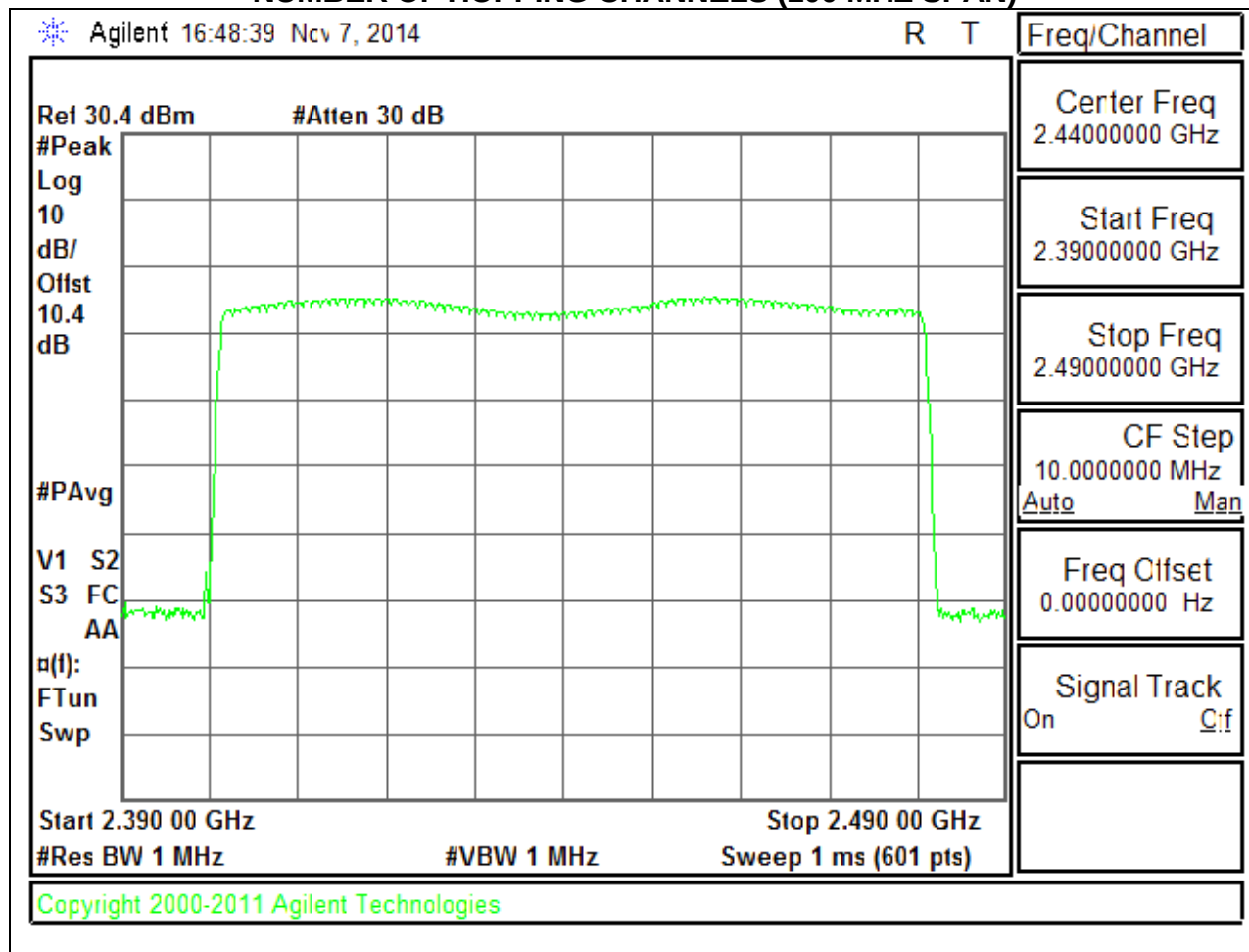
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

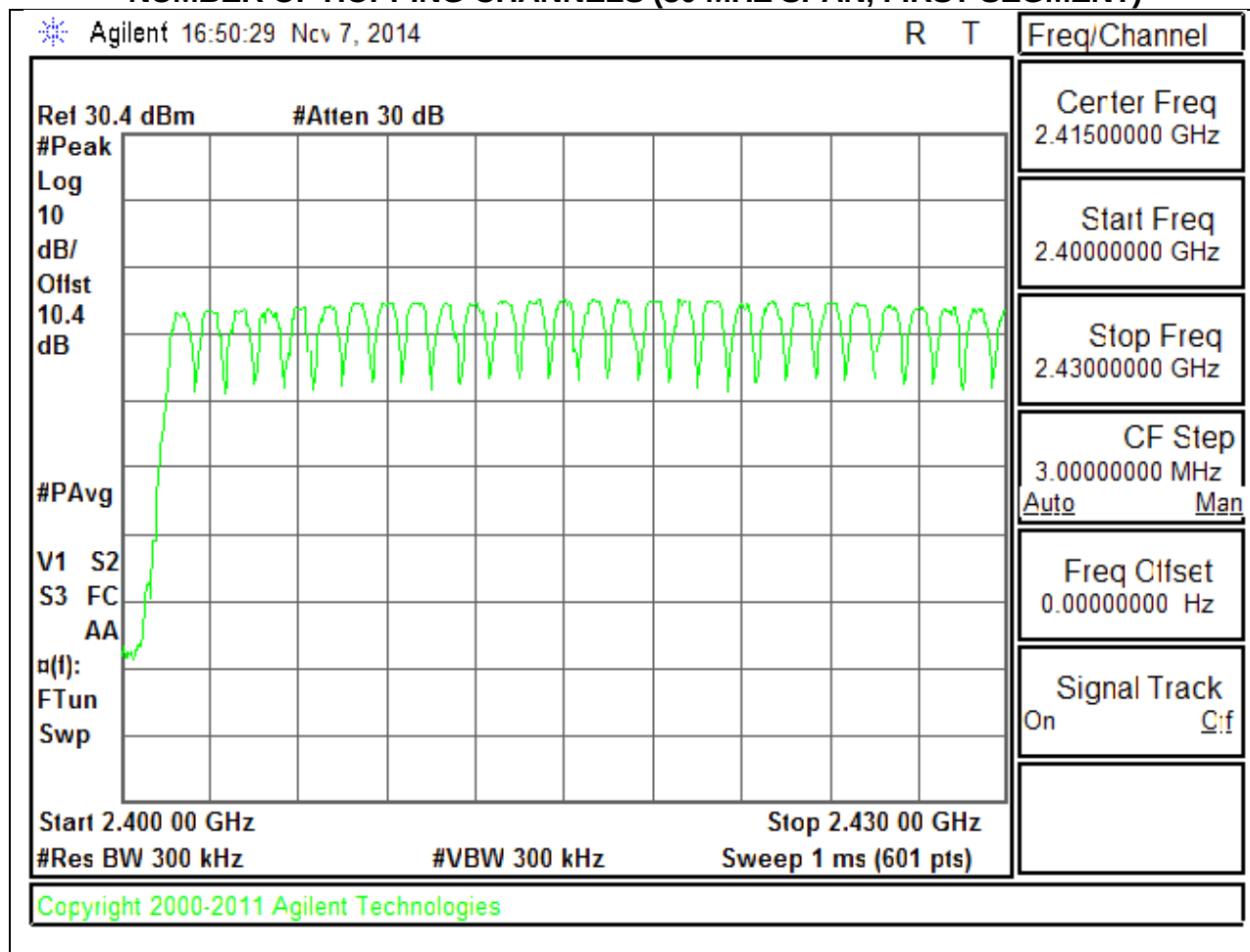
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS PLOTS

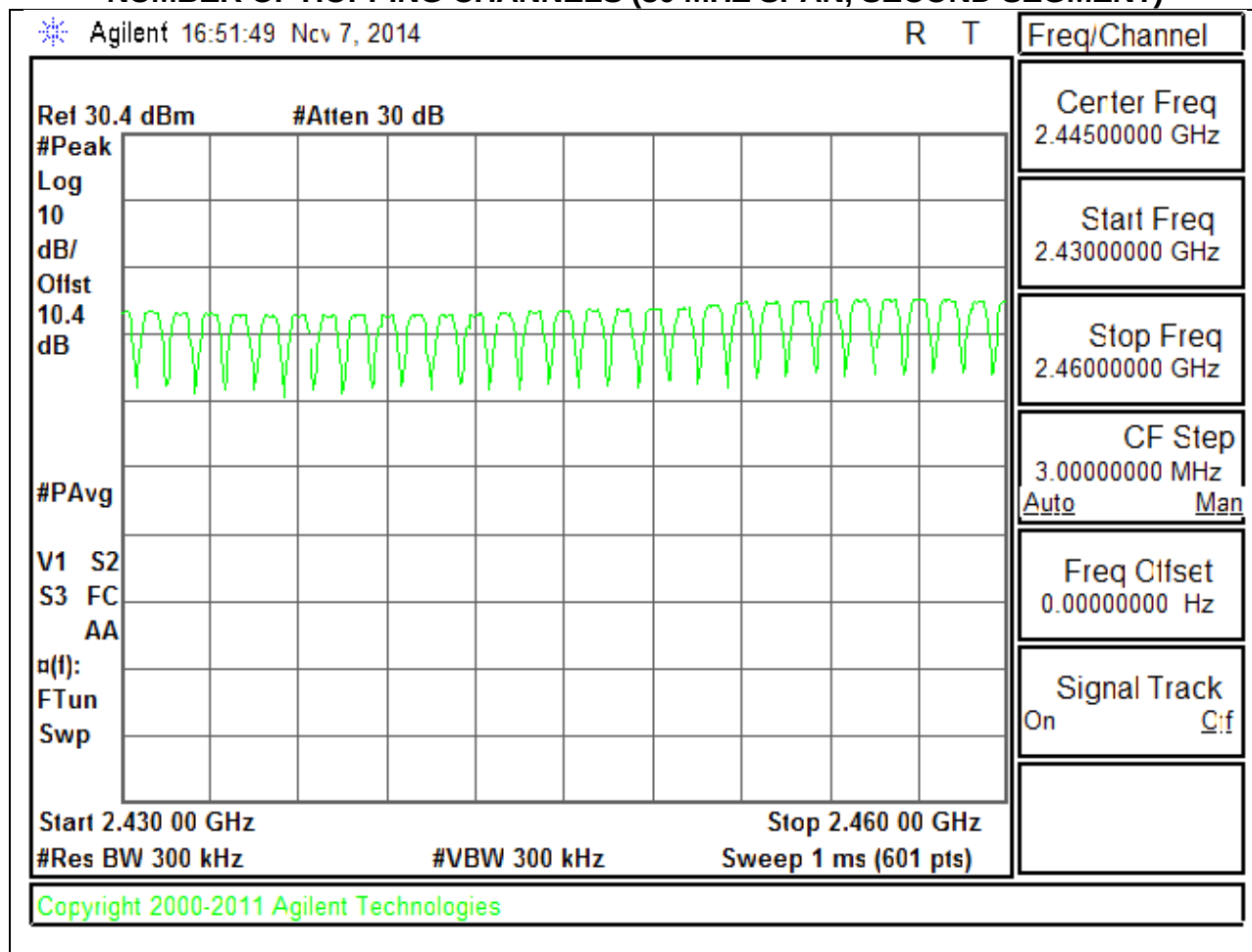
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



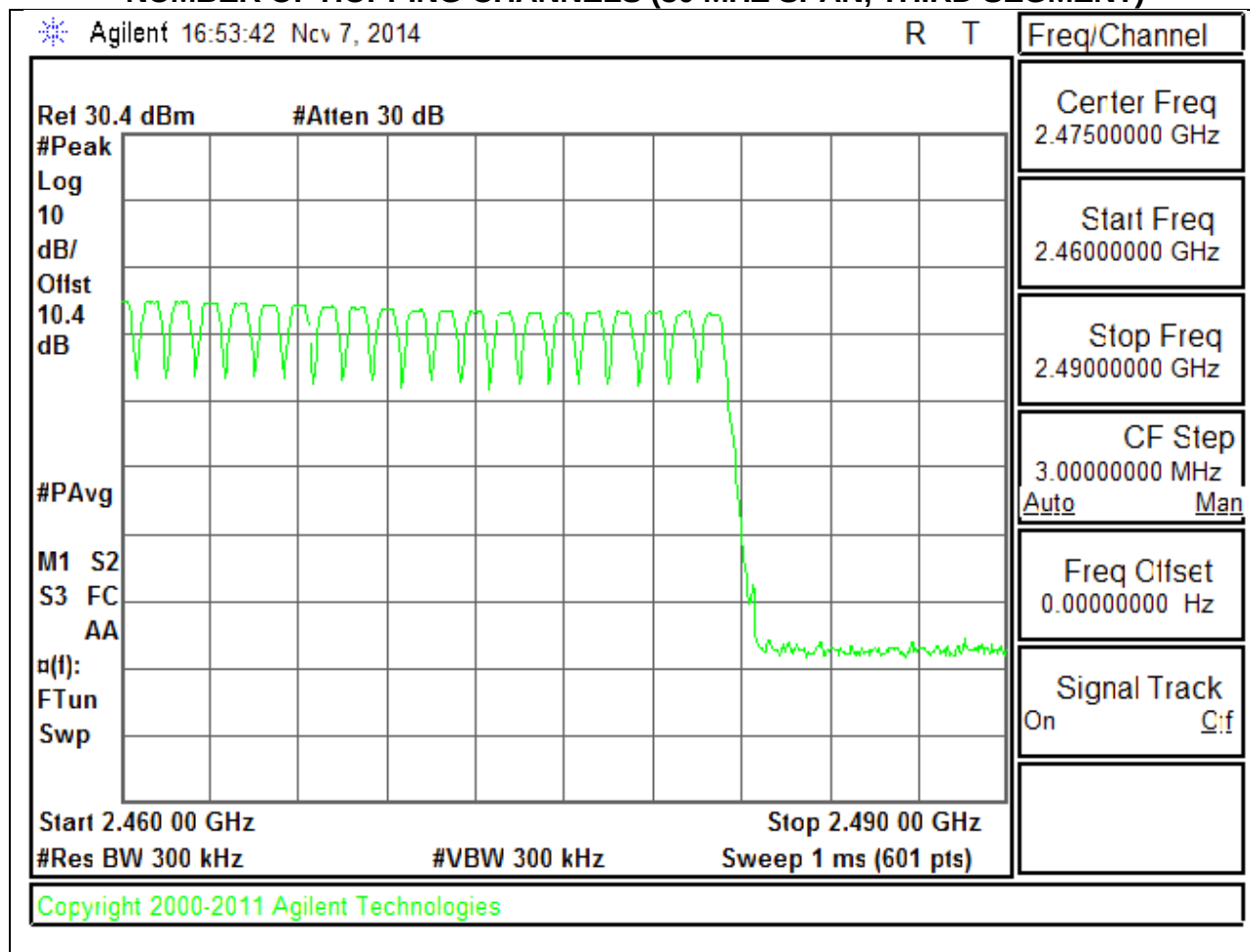
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.4 AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

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

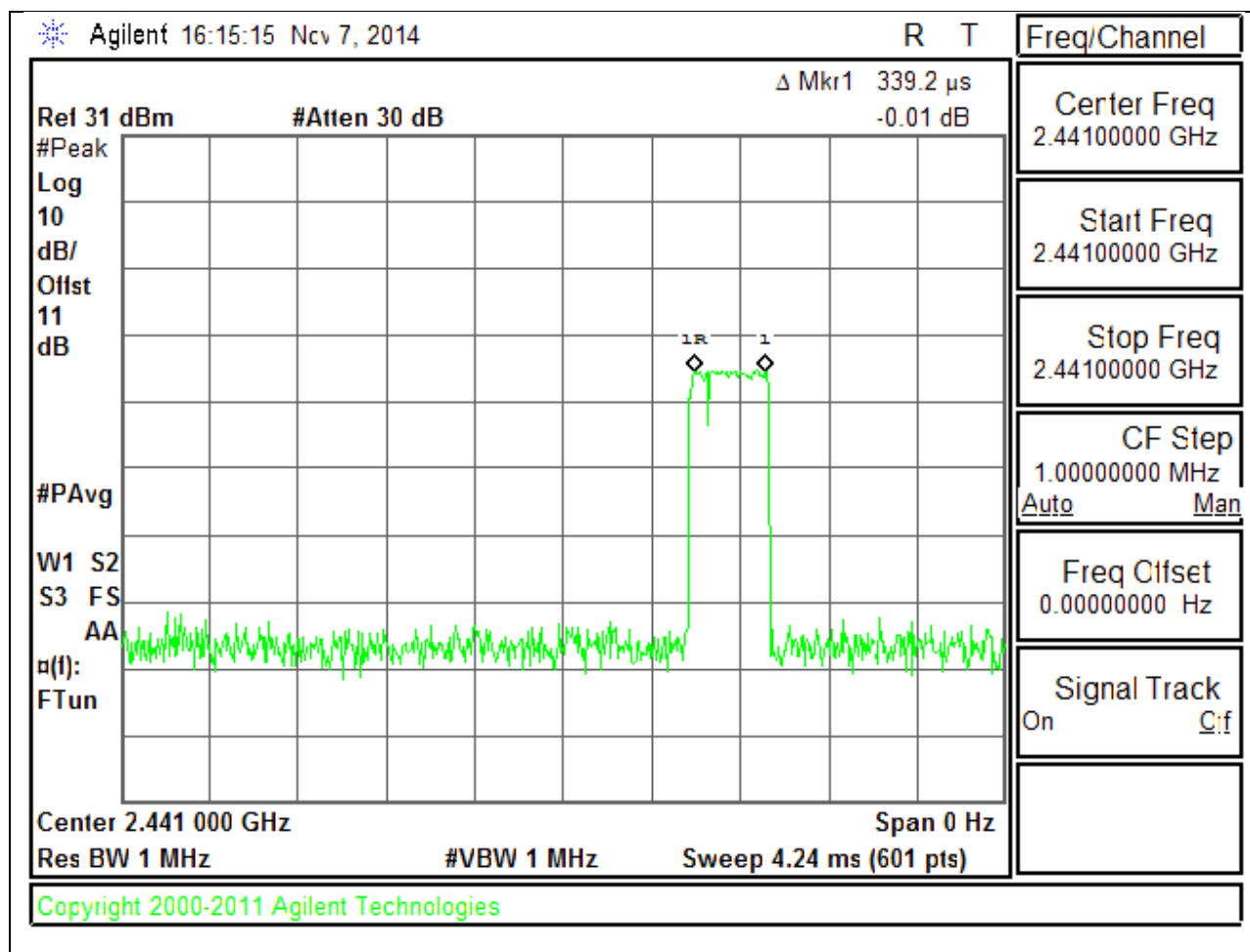
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

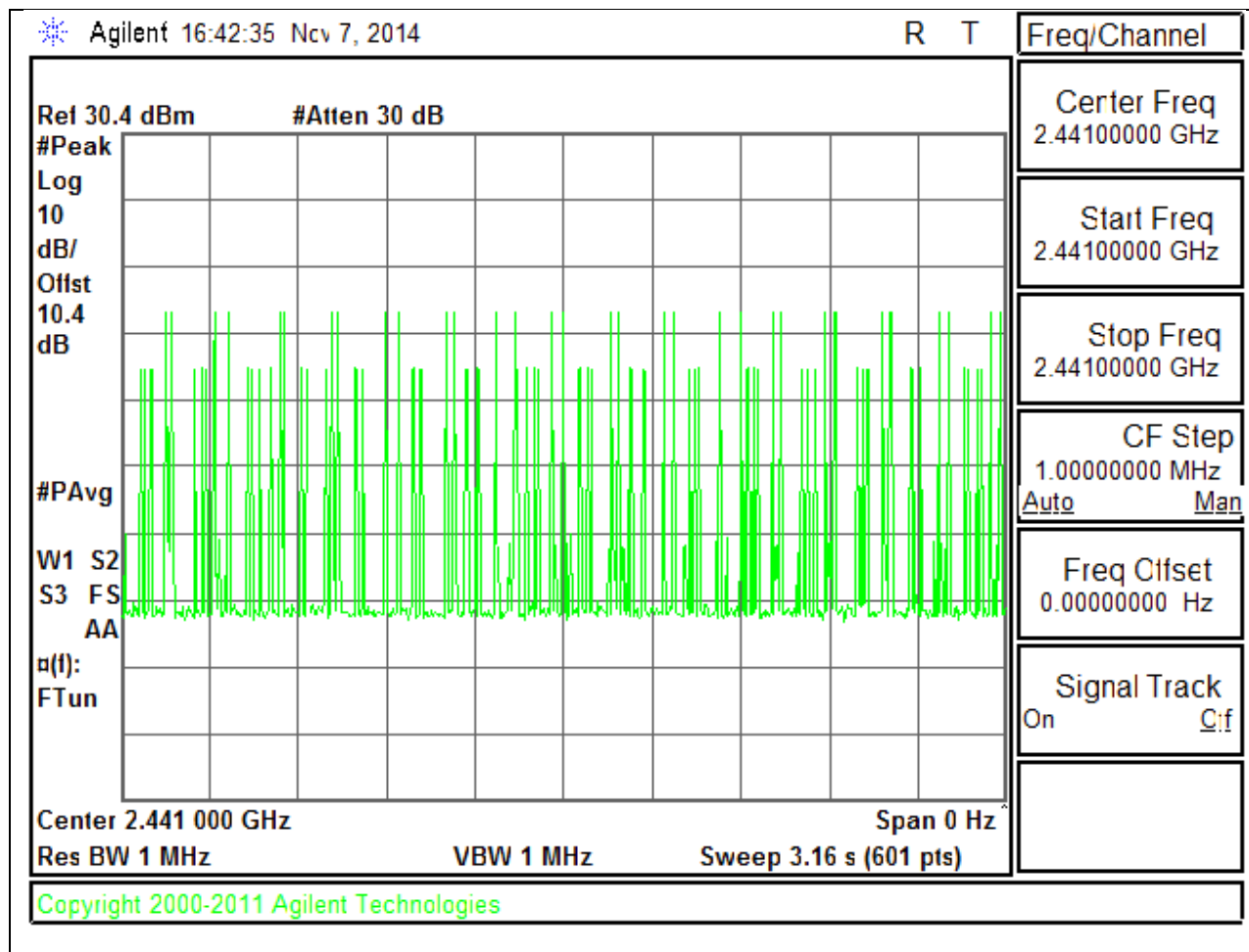
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.339	32	0.109	0.4	-0.29146
DH3	1.593	14	0.223	0.4	-0.17698
DH5	2.884	10	0.288	0.4	-0.1116
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	0.339	8	0.027	0.4	-0.37286
DH3	1.593	3.5	0.056	0.4	-0.34425
DH5	2.884	2.5	0.072	0.4	-0.3279

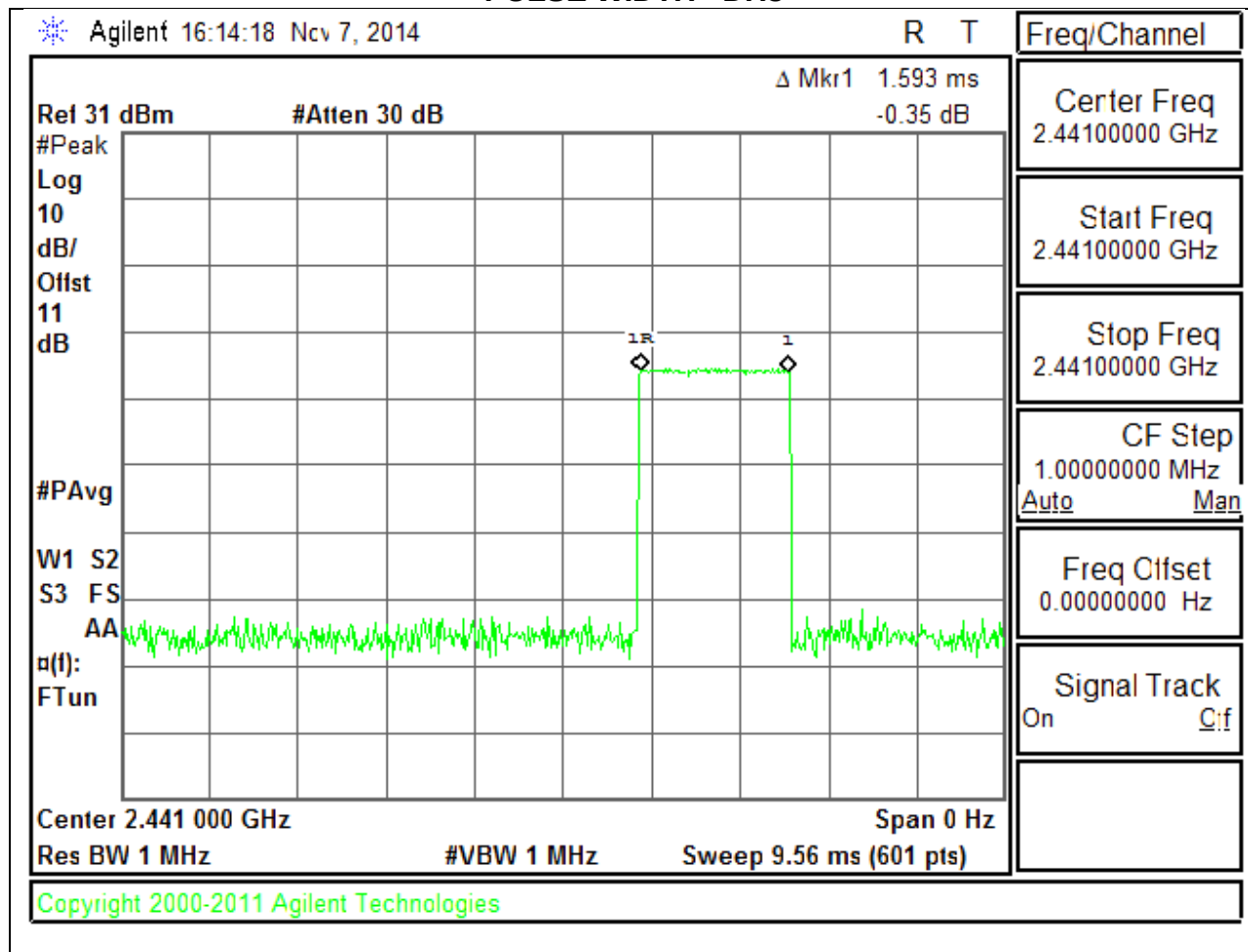
PULSE WIDTH - DH1



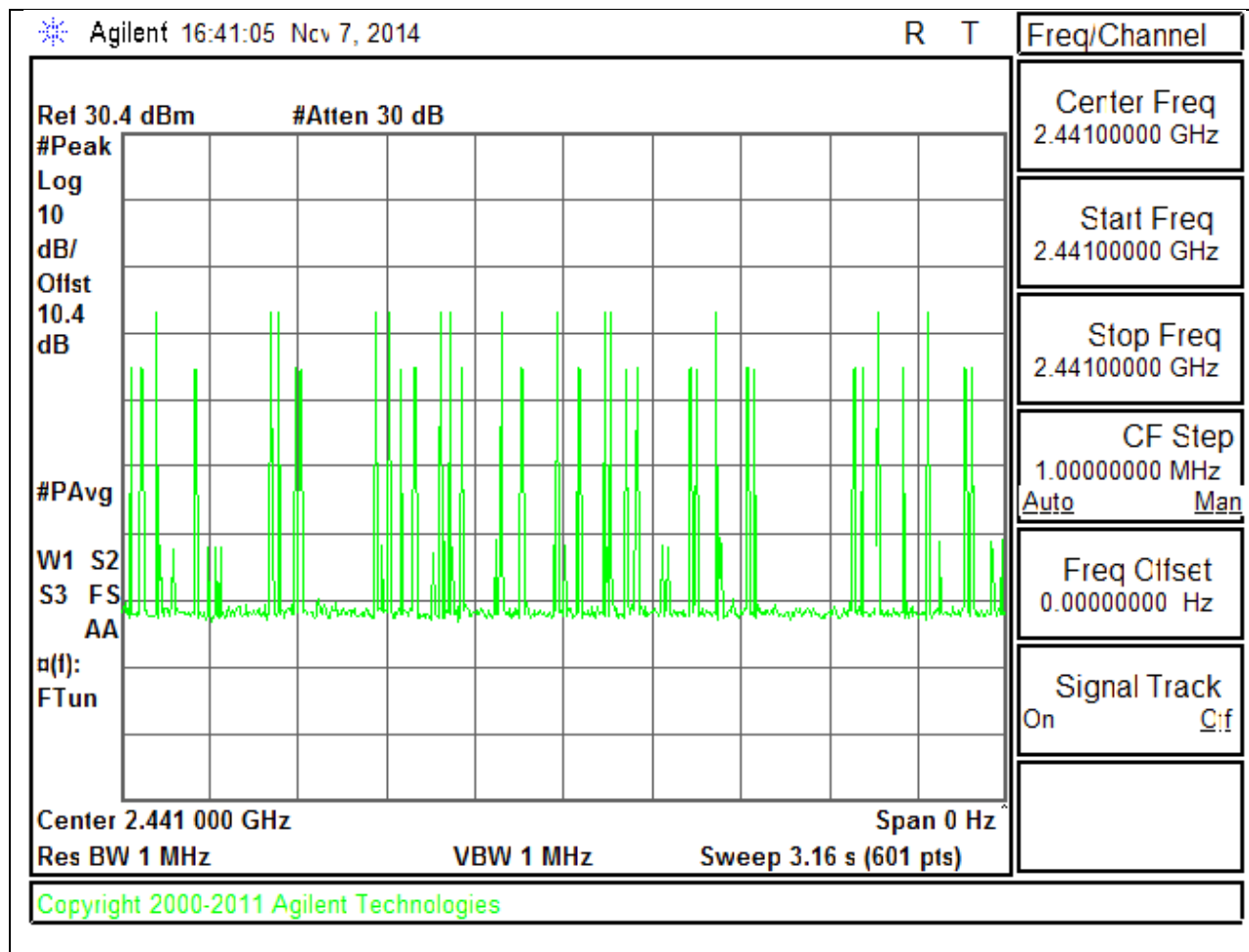
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



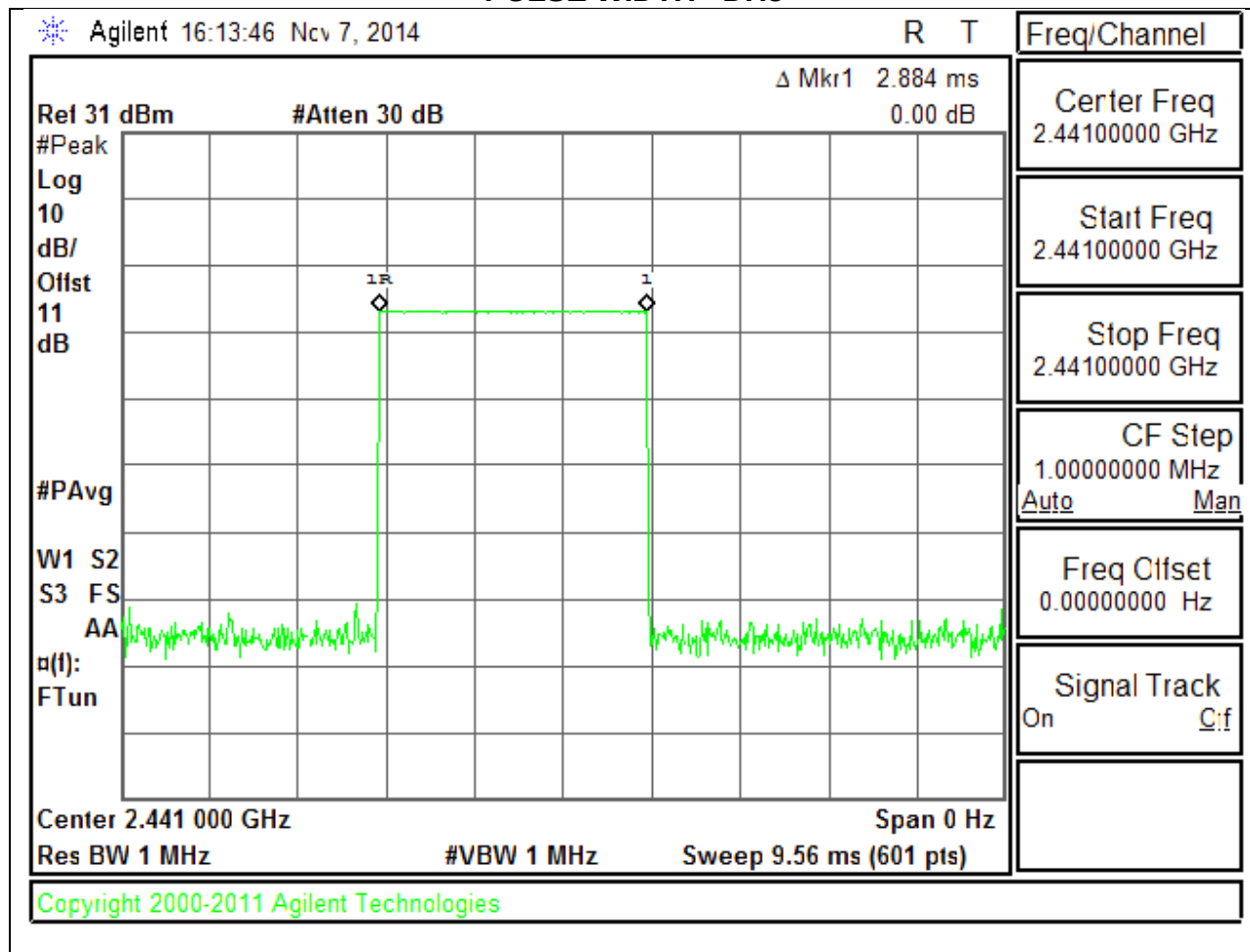
PULSE WIDTH - DH3



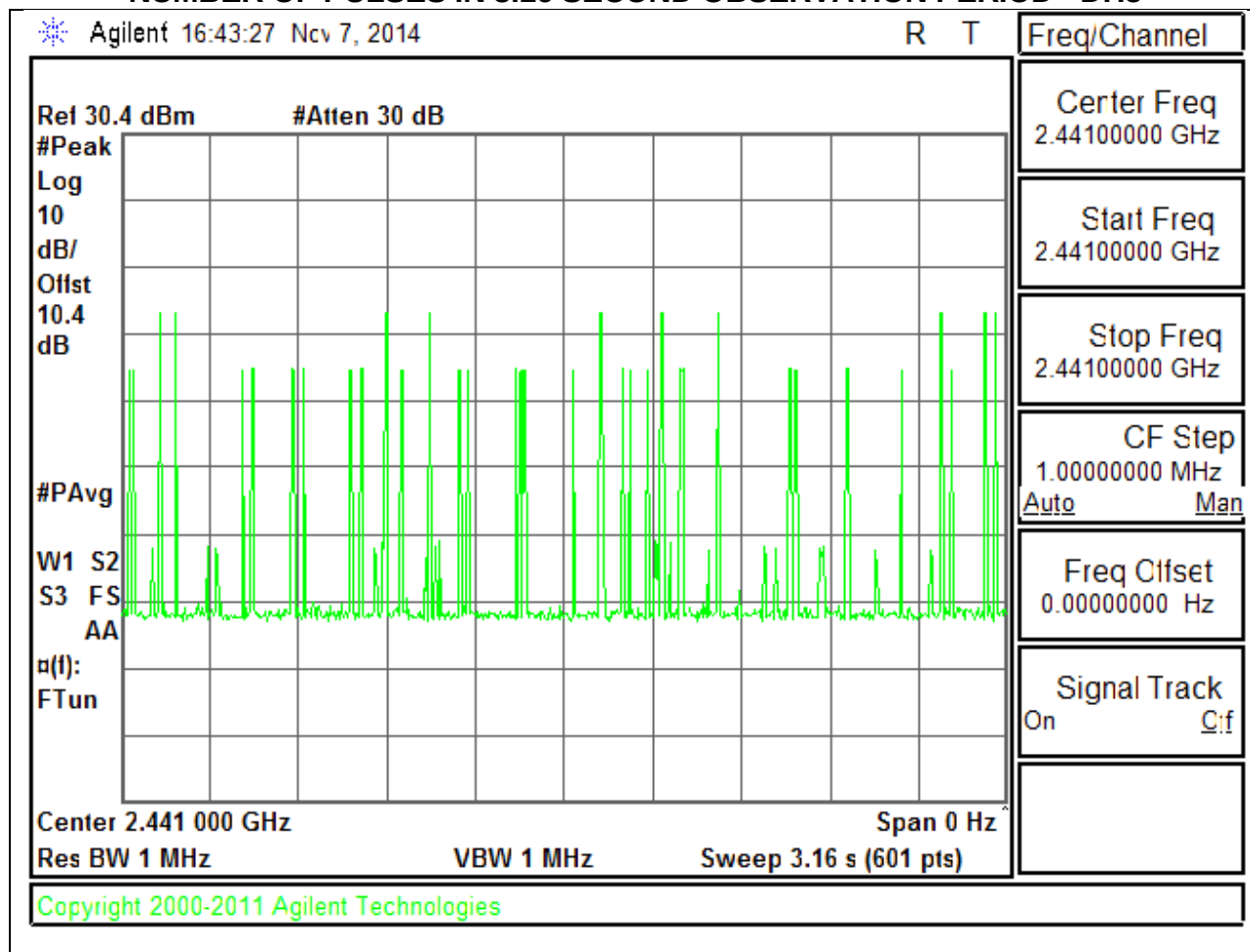
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



PULSE WIDTH - DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



8.5 OUTPUT POWER

8.5.1.1 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

BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.436	21	-10.564
Middle	2441	11.012	21	-9.988
High	2480	10.17	21	-10.83
Worst		11.012		-9.988

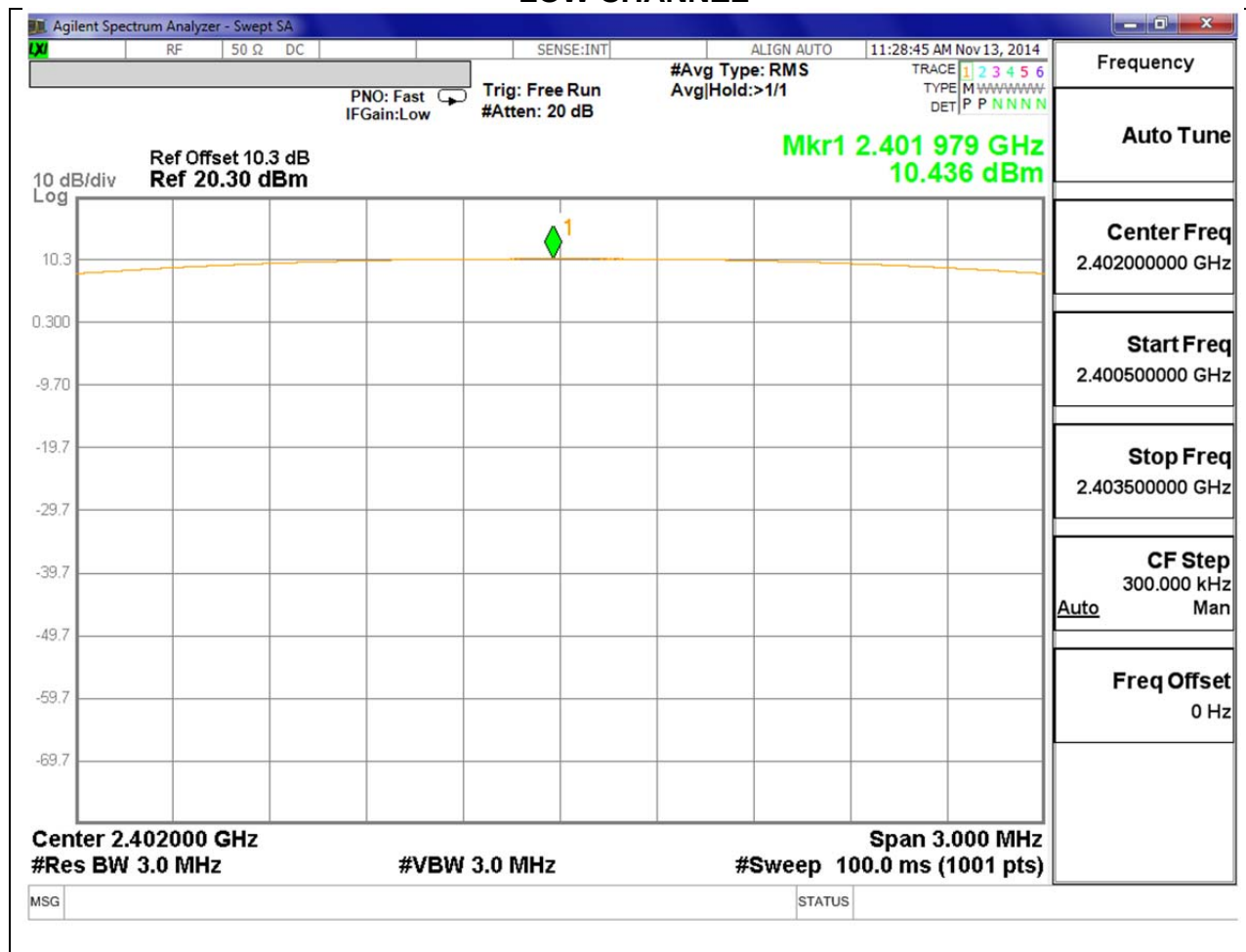
ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.837	21	-10.163
Middle	2441	11.188	21	-9.812
High	2480	10.609	21	-10.391
Worst		11.188		-9.812

OUTPUT POWER PLOTS

GFSK OUTPUT POWER

LOW CHANNEL



Agilent Spectrum Analyzer - Swept SA

RF 50 Ω DC SENSE:INT ALIGN AUTO 11:25:09 AM Nov 13, 2014

PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB #Avg Type: RMS AvgHold:>1/1

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P P N N N N

Ref Offset 10.3 dB
Ref 20.30 dBm

**Mkr1 2.440 997 GHz
11.012 dBm**

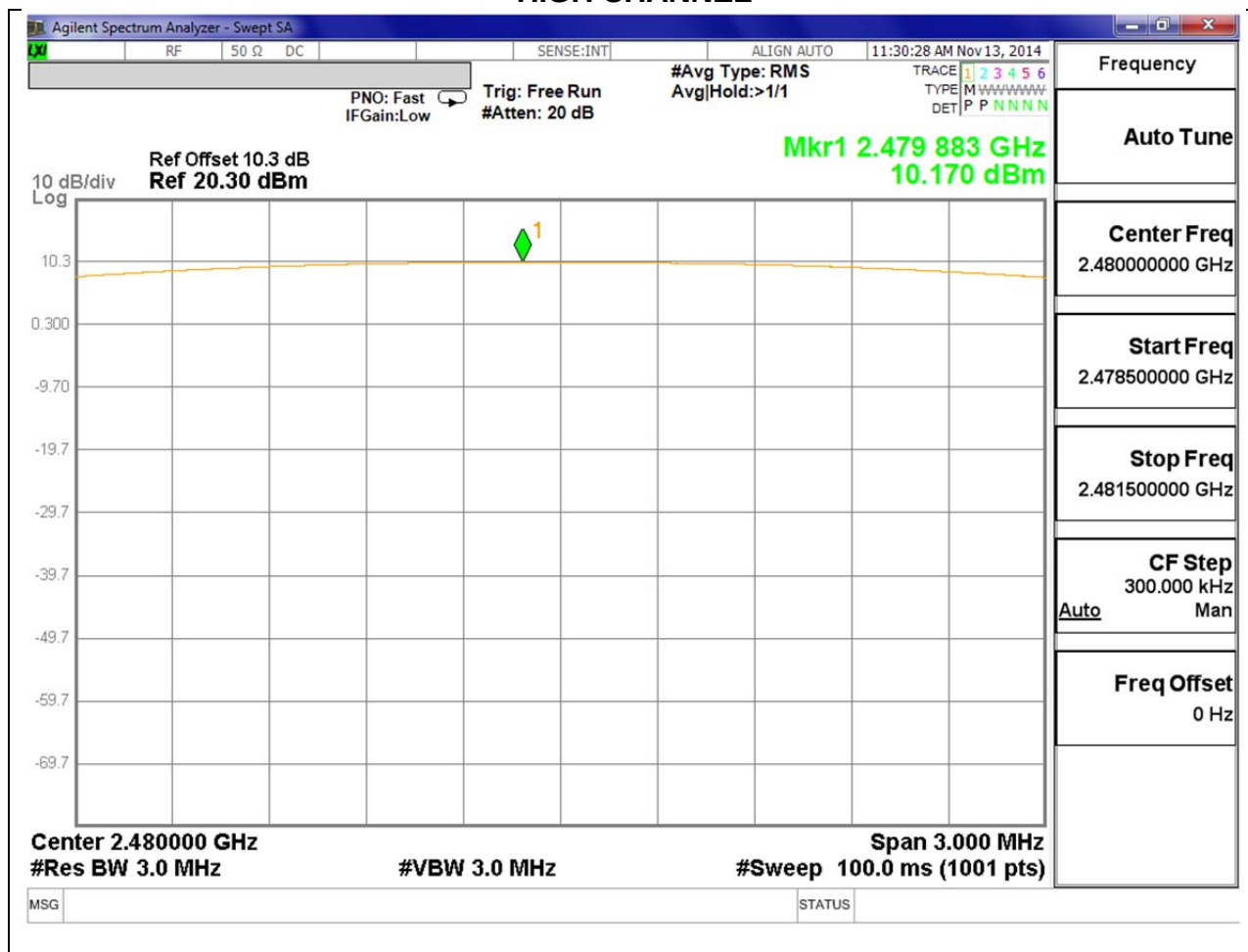
10 dB/div
Log

Center 2.441000 GHz
#Res BW 3.0 MHz #VBW 3.0 MHz Span 3.000 MHz
#Sweep 100.0 ms (1001 pts)

MSG STATUS

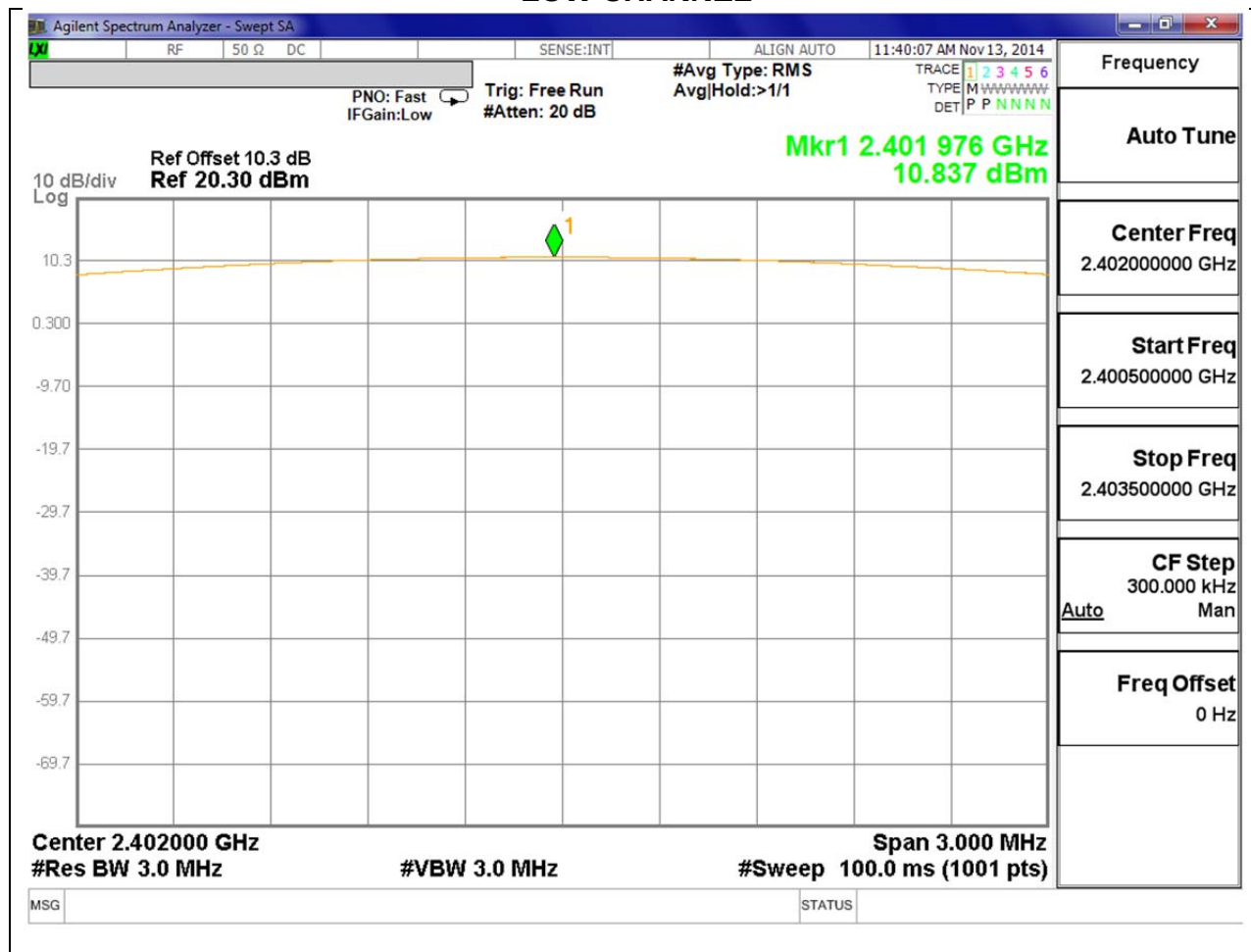
File Explorer...
Page Setup...
Print...
Restore Down
Minimize
Exit

HIGH CHANNEL



8PSK OUTPUT POWER

LOW CHANNEL



Agilent Spectrum Analyzer - Swept SA

RF 50 Ω DC SENSE:INT ALIGN AUTO 11:38:53 AM Nov 13, 2014

PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB #Avg Type: RMS AvgHold:>1/1

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P P N N N N N

Ref Offset 10.3 dB
Ref 20.30 dBm

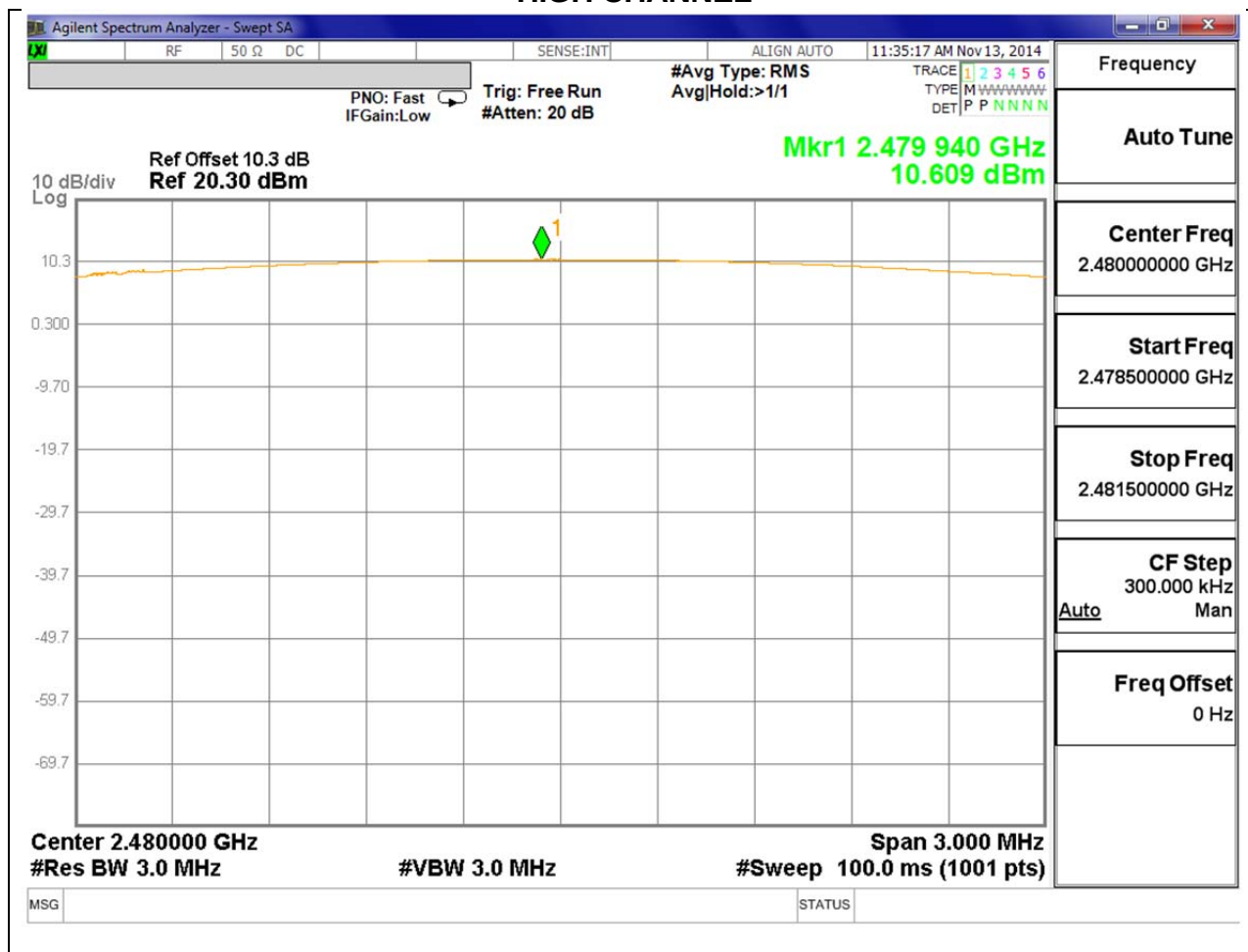
Mkr1 2.440 607 GHz
11.188 dBm

10 dB/div Log

Center 2.441000 GHz
#Res BW 3.0 MHz #VBW 3.0 MHz Span 3.000 MHz
#Sweep 100.0 ms (1001 pts)

MSG STATUS

HIGH CHANNEL



8.6 AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

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.

1.1.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	10.4
Middle	2441	10.3
High	2480	10
Worst		10.4

1.1.1. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.1
Middle	2441	8.1
High	2480	7.8
Worst		8.1

8.7 CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

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

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

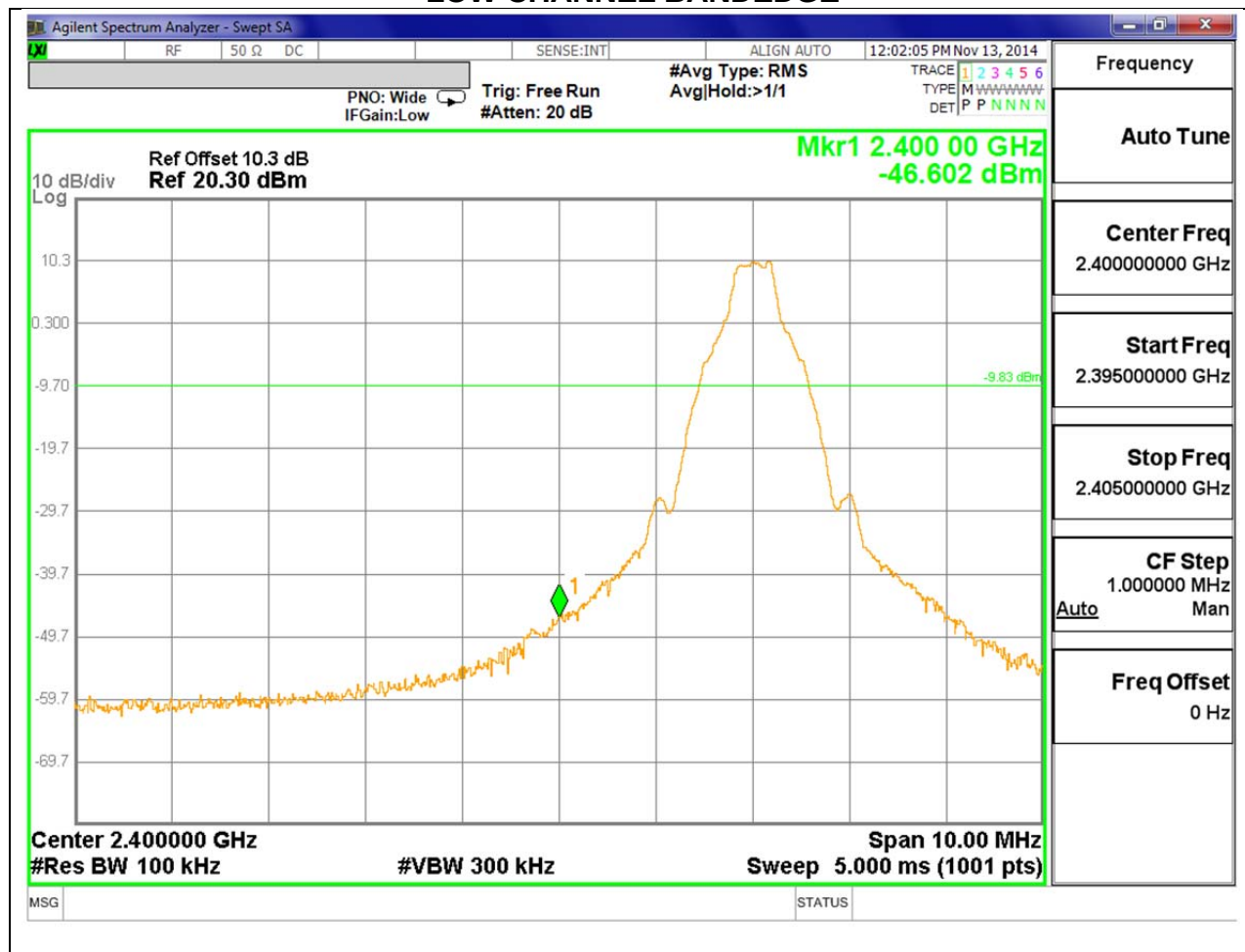
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

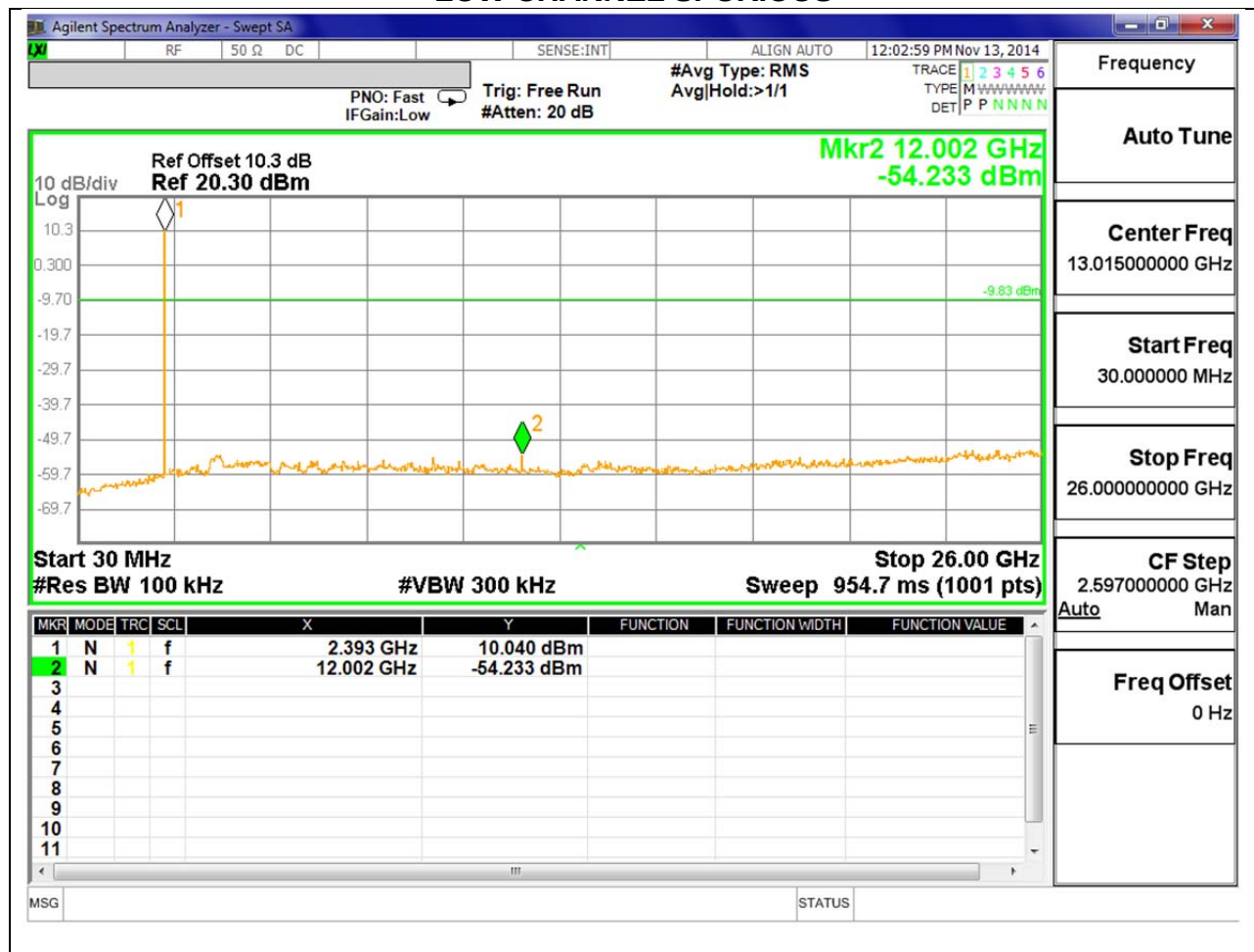
RESULTS

8.7.1 BASIC DATA RATE GFSK MODULATION

8.7.1.1 SPURIOUS EMISSIONS, LOW CHANNEL

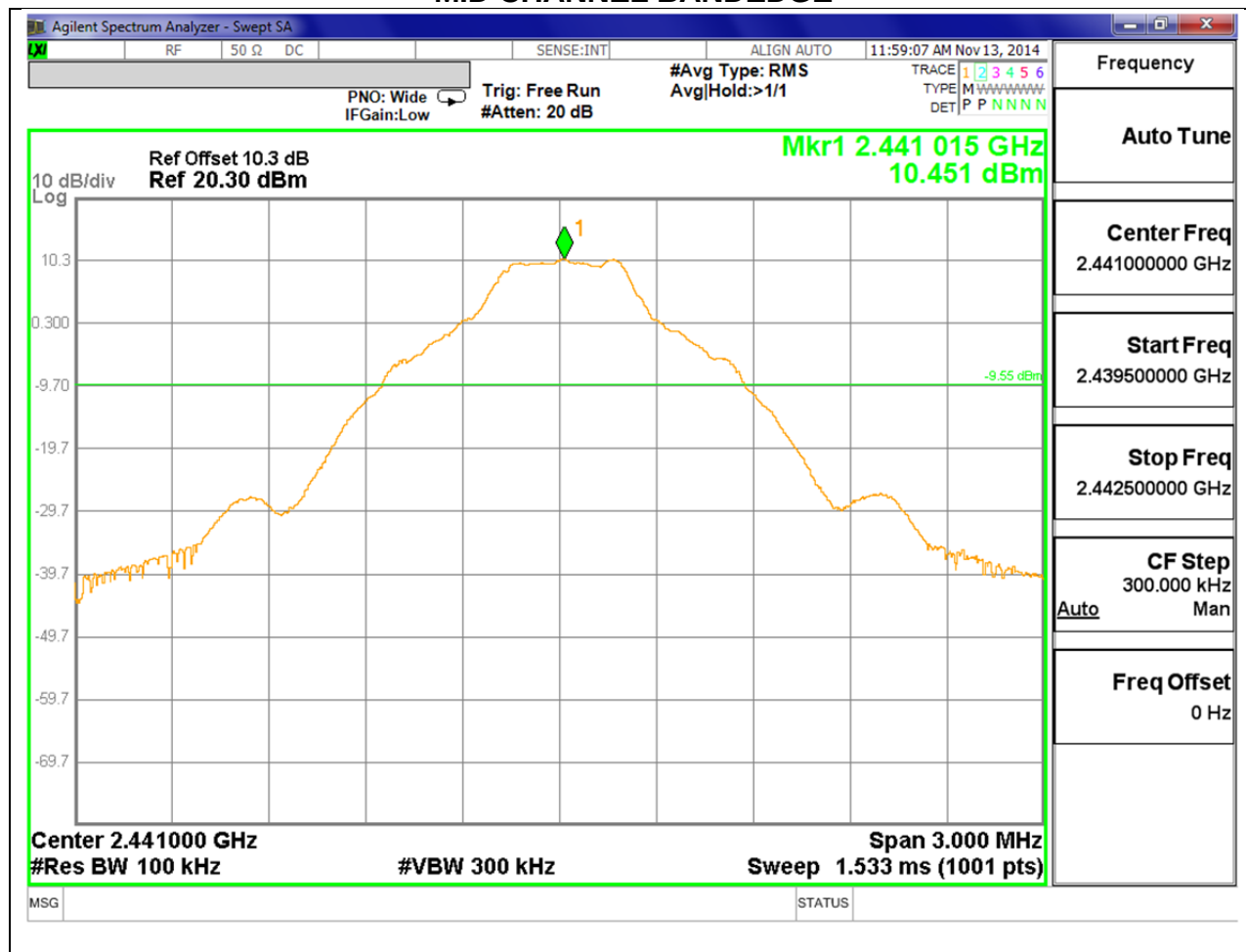
LOW CHANNEL BANDEDGE





SPURIOUS EMISSIONS, MID CHANNEL

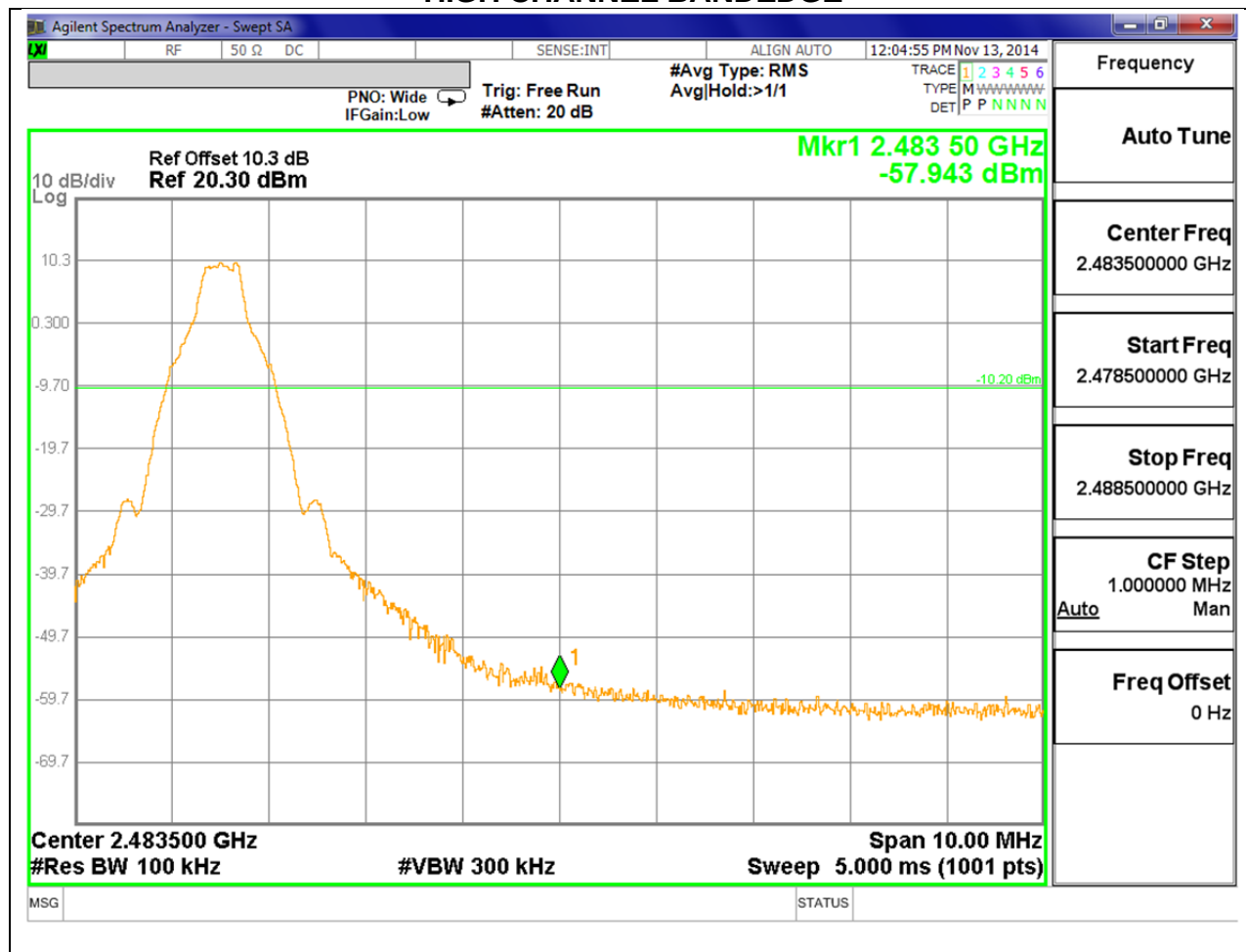
MID CHANNEL BANDEDGE

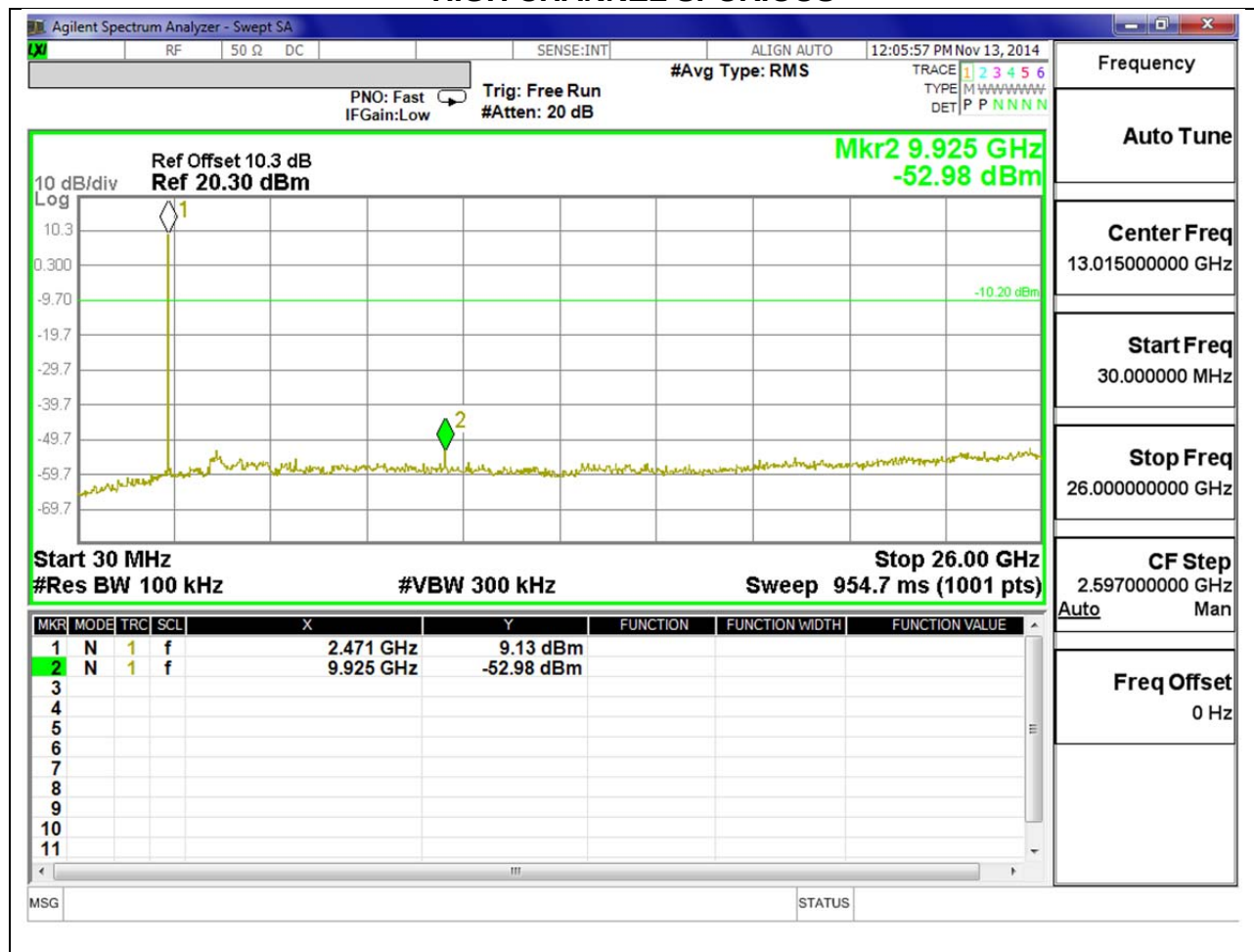


[illegible]

SPURIOUS EMISSIONS, HIGH CHANNEL

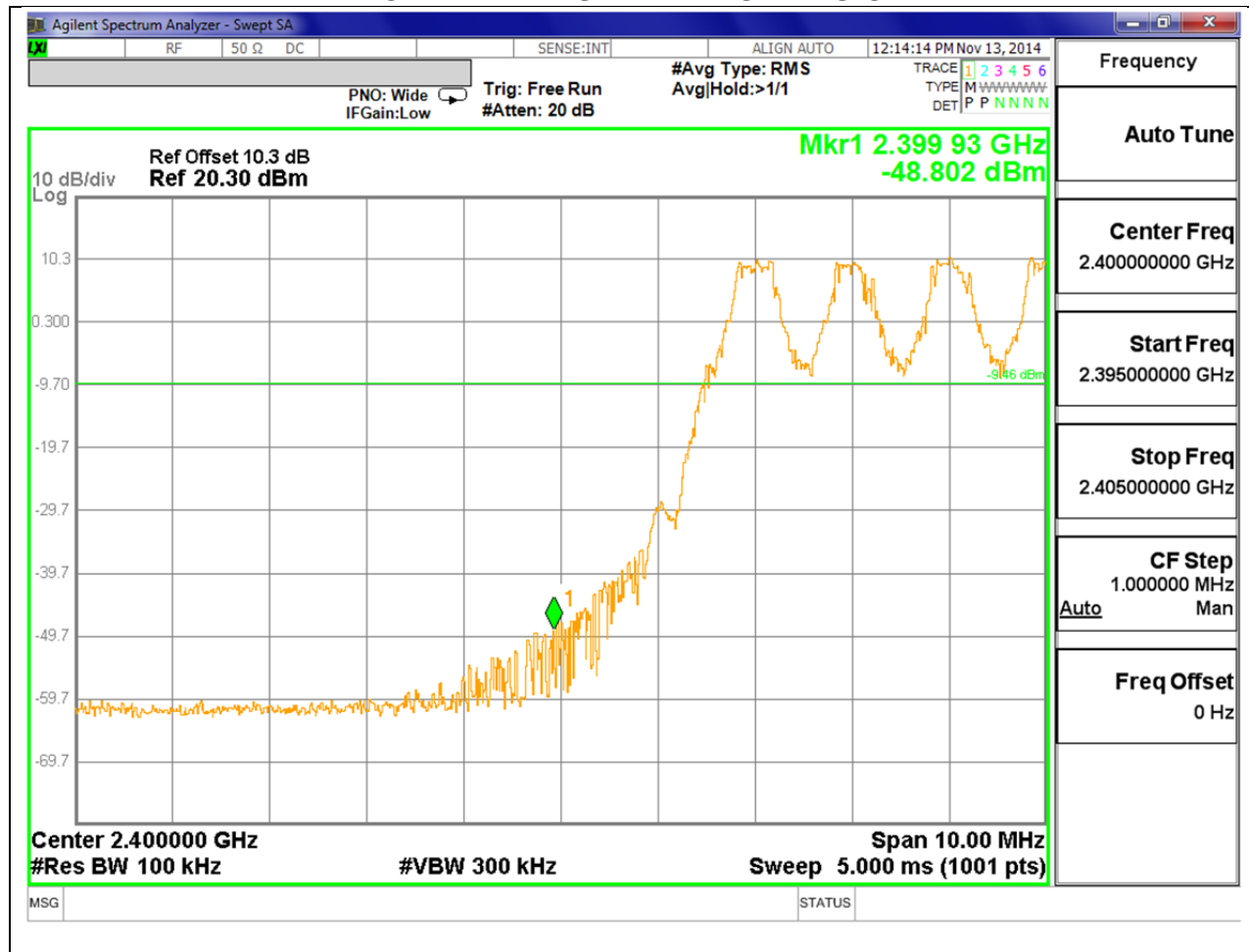
HIGH CHANNEL BANDEDGE



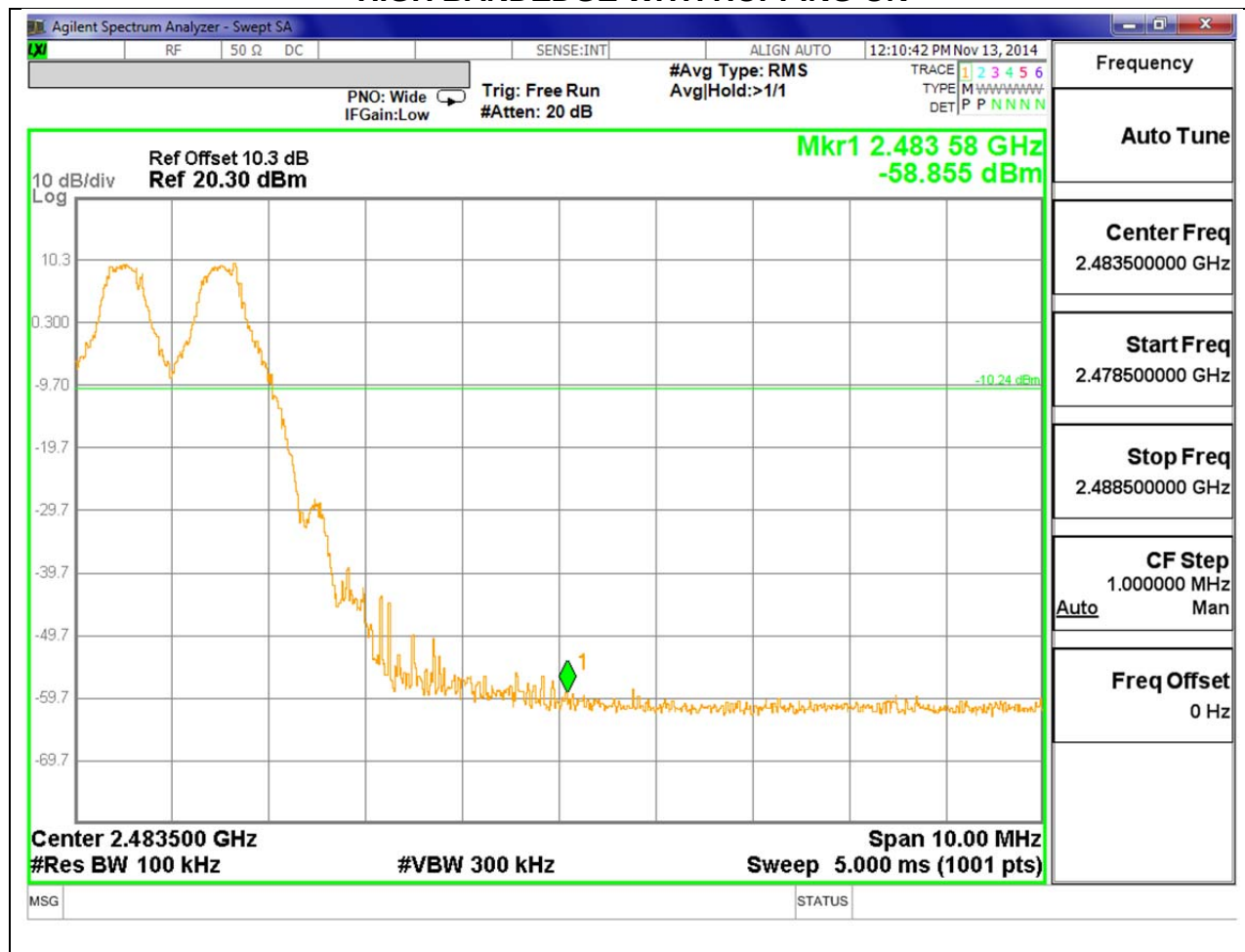


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



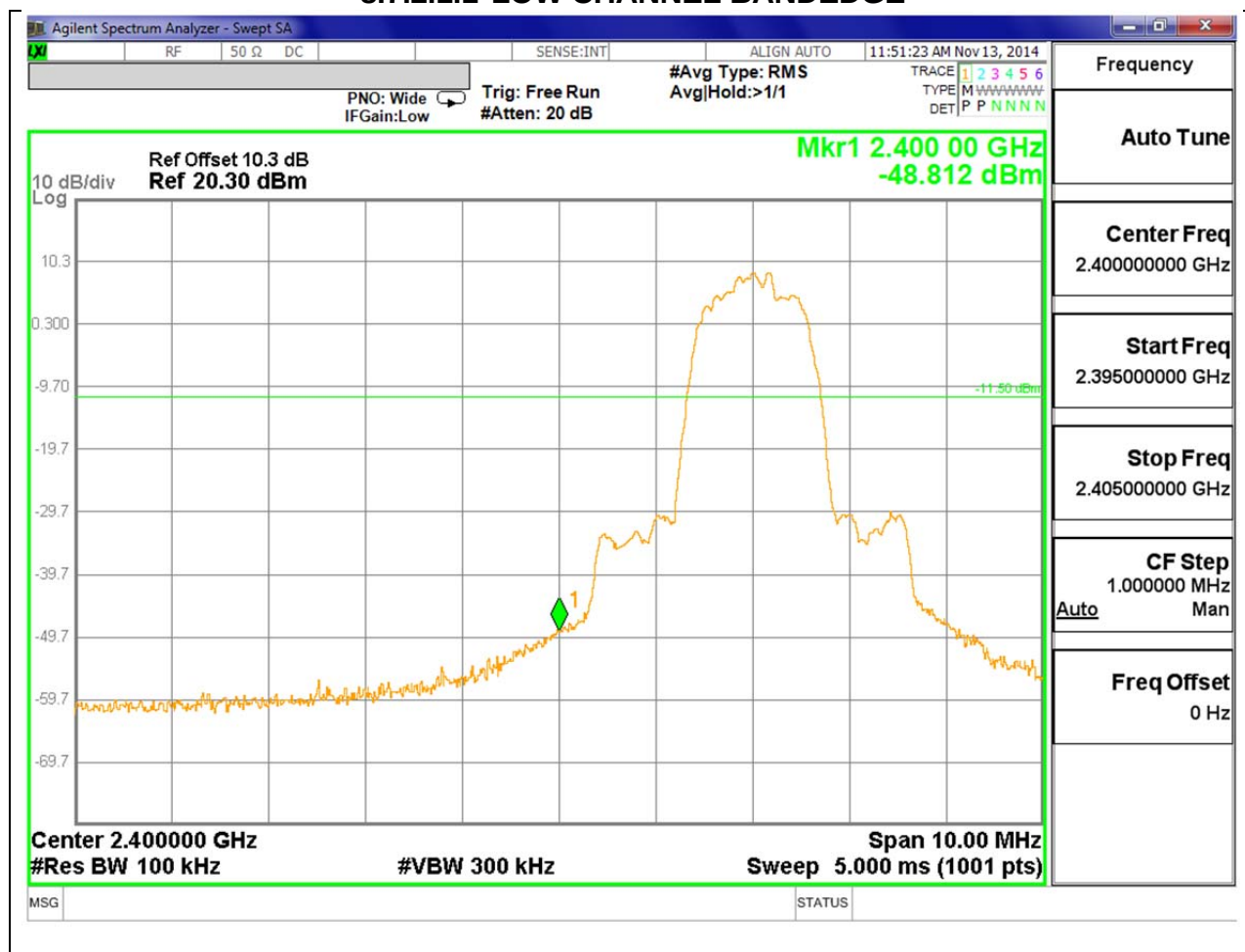
HIGH BANDEGE WITH HOPPING ON

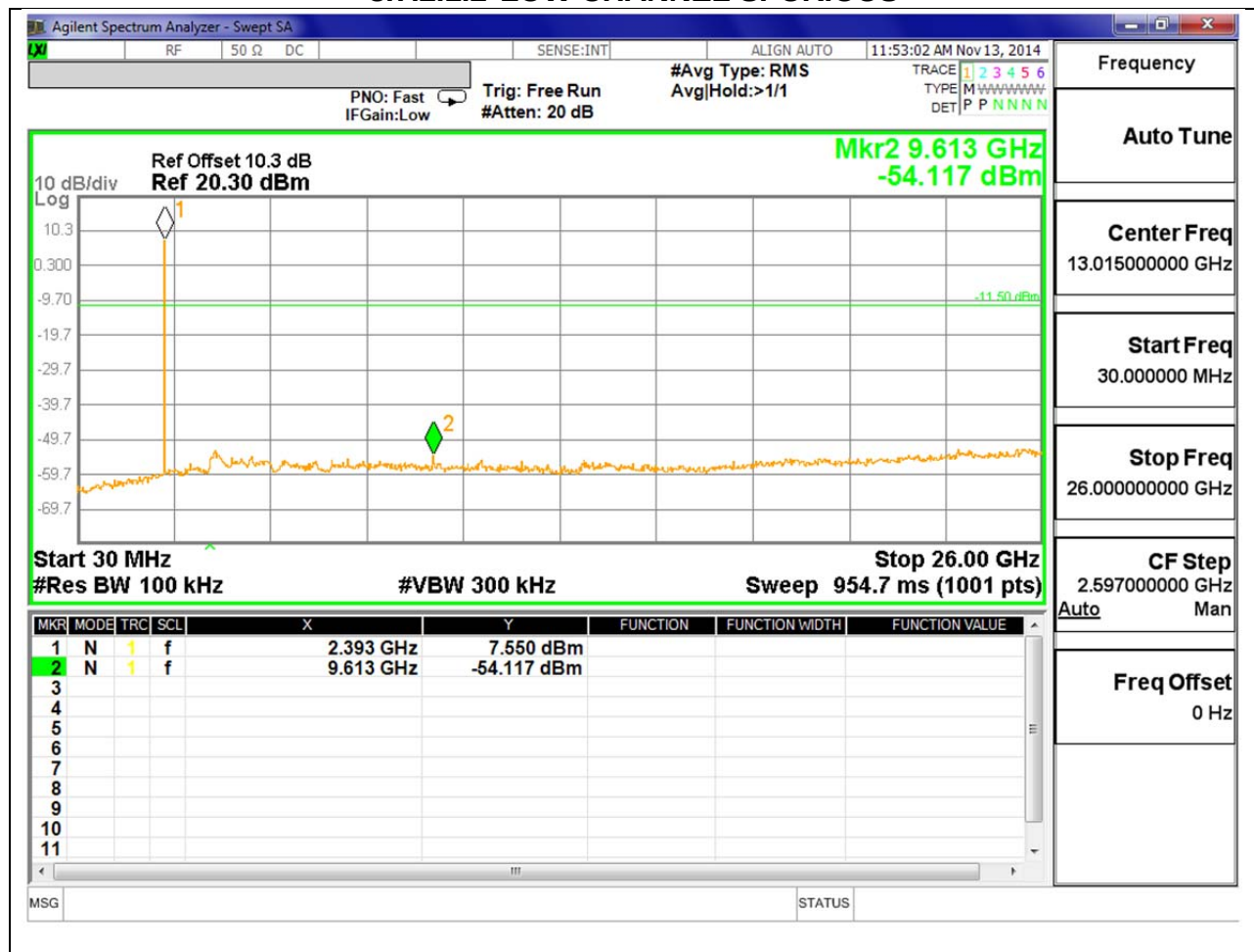


8.7.2 ENHANCED DATA RATE 8PSK MODULATION

8.7.2.1 SPURIOUS EMISSIONS, LOW CHANNEL

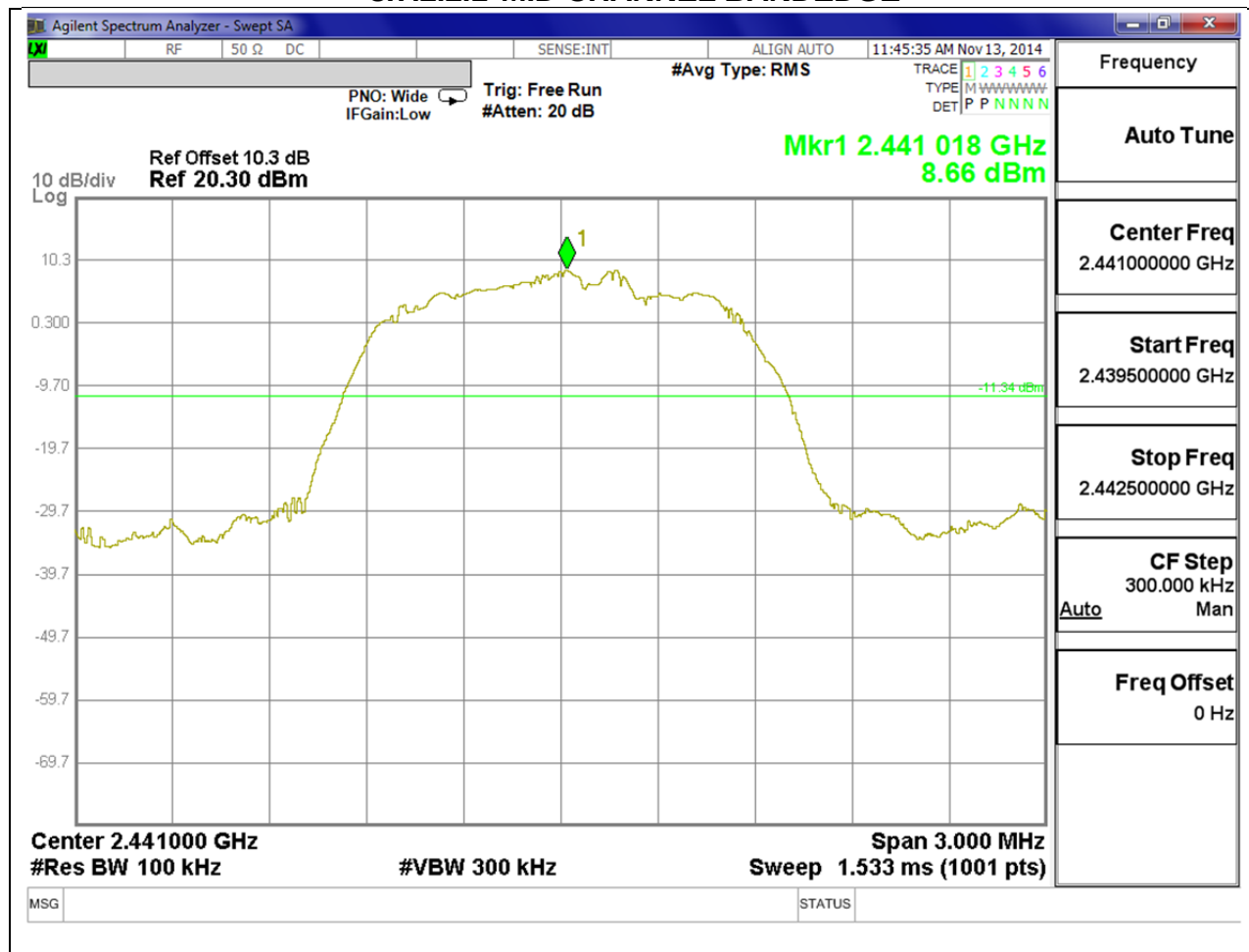
8.7.2.1.1 LOW CHANNEL BANDEDGE





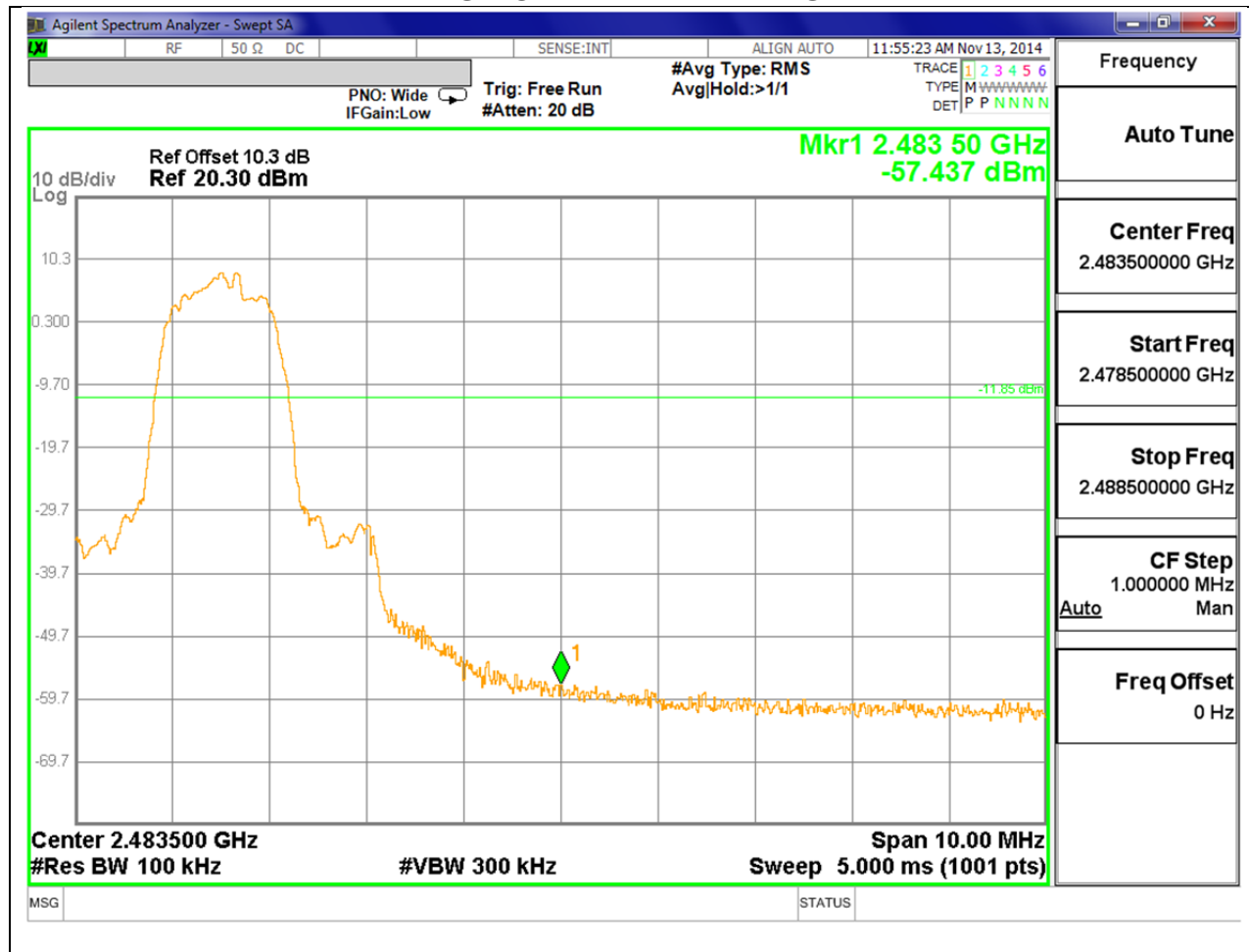
8.7.2.2 SPURIOUS EMISSIONS, MID CHANNEL

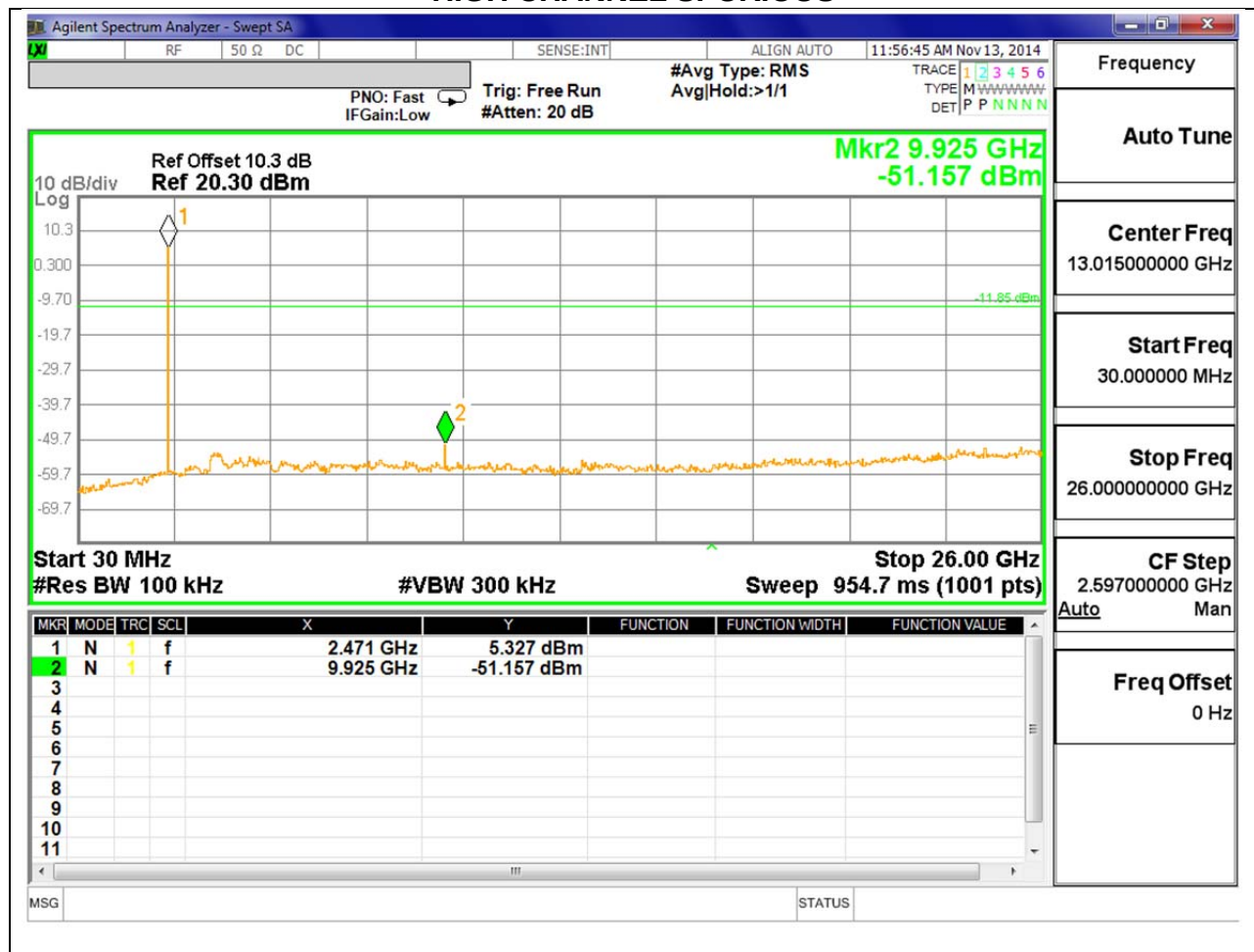
8.7.2.2.1 MID CHANNEL BANDEDGE



SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE





Agilent Spectrum Analyzer - Swept SA

RF 50 Ω DC SENSE:INT ALIGN AUTO 12:19:24 PM Nov 13, 2014

PNO: Wide IFGain:Low Trig: Free Run #Atten: 20 dB #Avg Type: RMS Avg|Hold:>1/1

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P P N N N N N

Ref Offset 10.3 dB
Ref 20.30 dBm

Mkr1 2.484 10 GHz
-58.113 dBm

10 dB/div
Log

Center 2.483500 GHz
#Res BW 100 kHz #VBW 300 kHz Span 10.00 MHz
Sweep 5.000 ms (1001 pts)

MSG STATUS

Frequency

Auto Tune

Center Freq
2.483500000 GHz

Start Freq
2.478500000 GHz

Stop Freq
2.488500000 GHz

CF Step
1.000000 MHz
Man

Auto

Freq Offset
0 Hz

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.

$GFSK = 1/T = 1 / 0.0028S = 360Hz$.

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

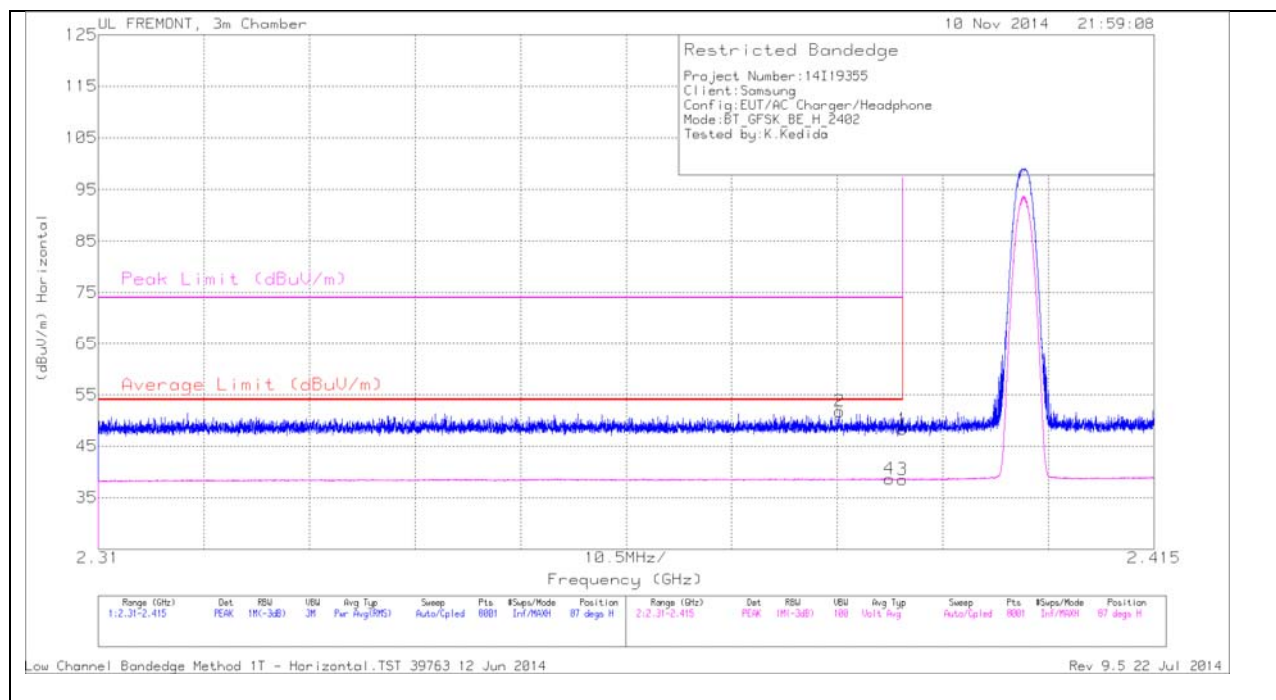
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

9.2 TRANSMITTER ABOVE 1 GHz

9.2.1 BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



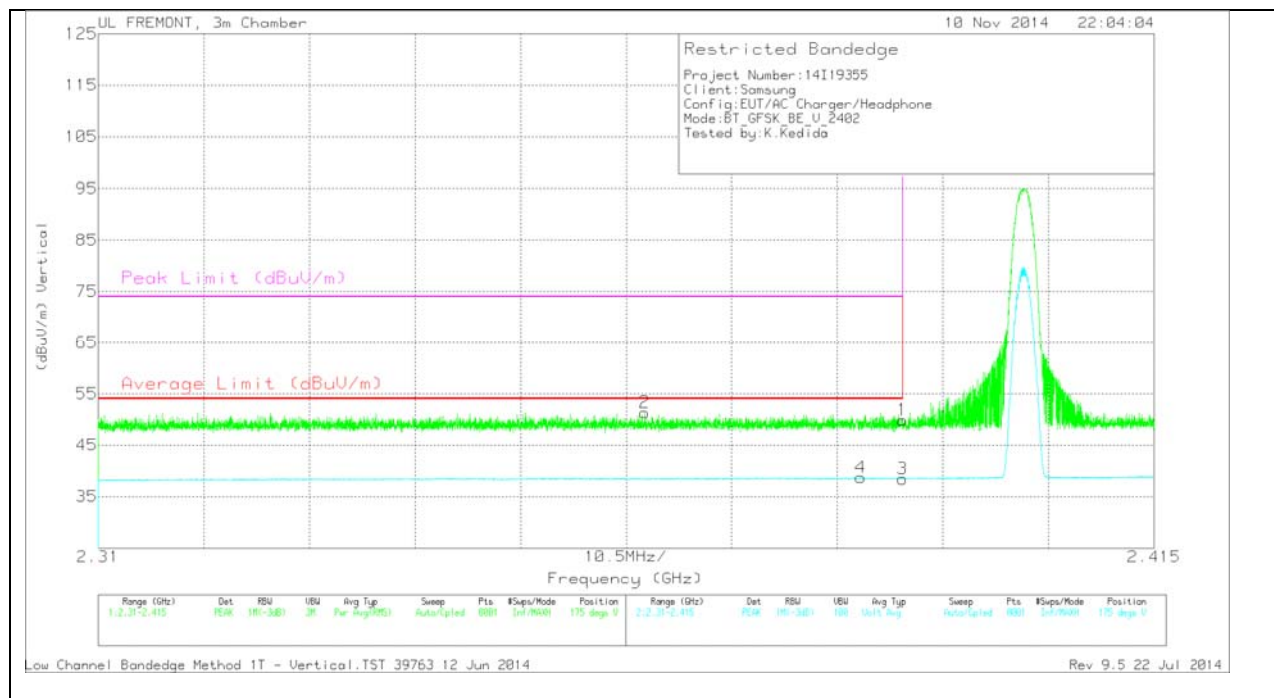
HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.384	42.75	PK	32.1	-23.1	51.75	-	-	74	-22.25	87	194	H
4	2.389	29.65	VB1T	32.1	-23.1	38.65	54	-15.35	-	-	87	194	H
1	2.39	39.27	PK	32.1	-23.1	48.27	-	-	74	-25.73	87	194	H
3	2.39	29.51	VB1T	32.1	-23.1	38.51	54	-15.49	-	-	87	194	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

VERTICAL PEAK AND AVERAGE PLOT

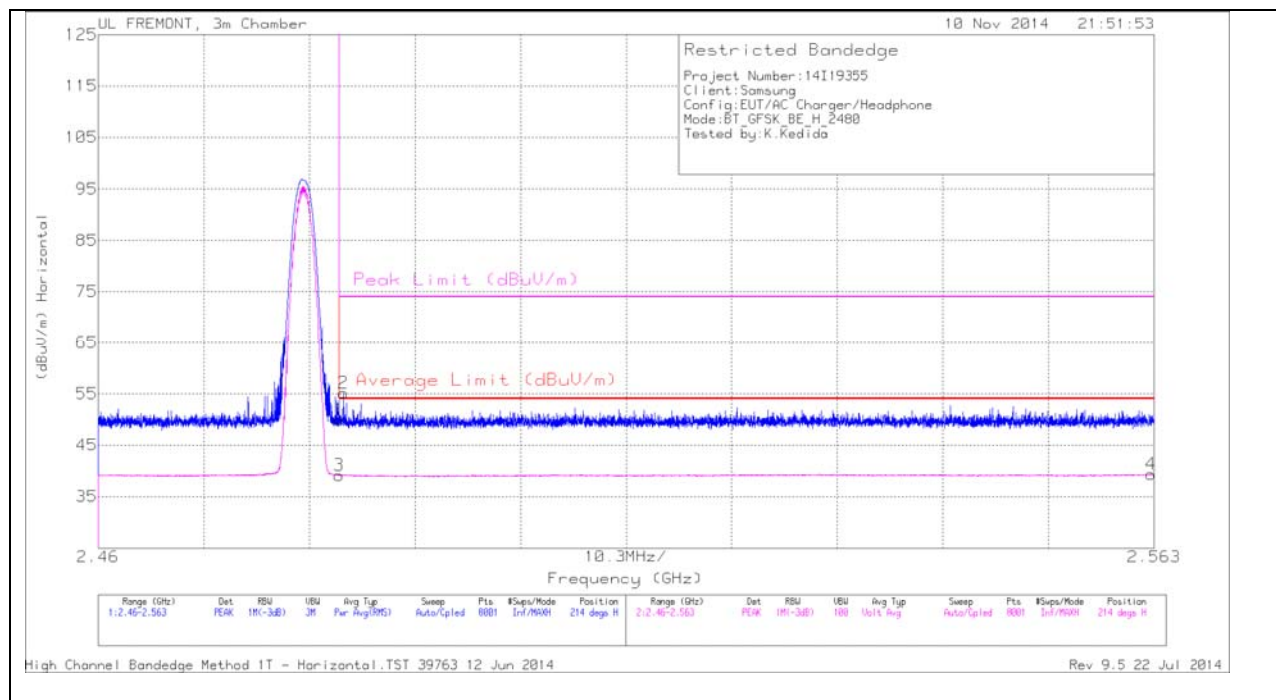


VERTICAL DATA

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	42.45	PK	32	-23.1	51.35	-	-	74	-22.65	175	176	V
4	2.386	29.7	VB1T	32.1	-23.1	38.7	54	-15.3	-	-	175	176	V
1	2.39	40.87	PK	32.1	-23.1	49.87	-	-	74	-24.13	175	176	V
3	2.39	29.44	VB1T	32.1	-23.1	38.44	54	-15.56	-	-	175	176	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



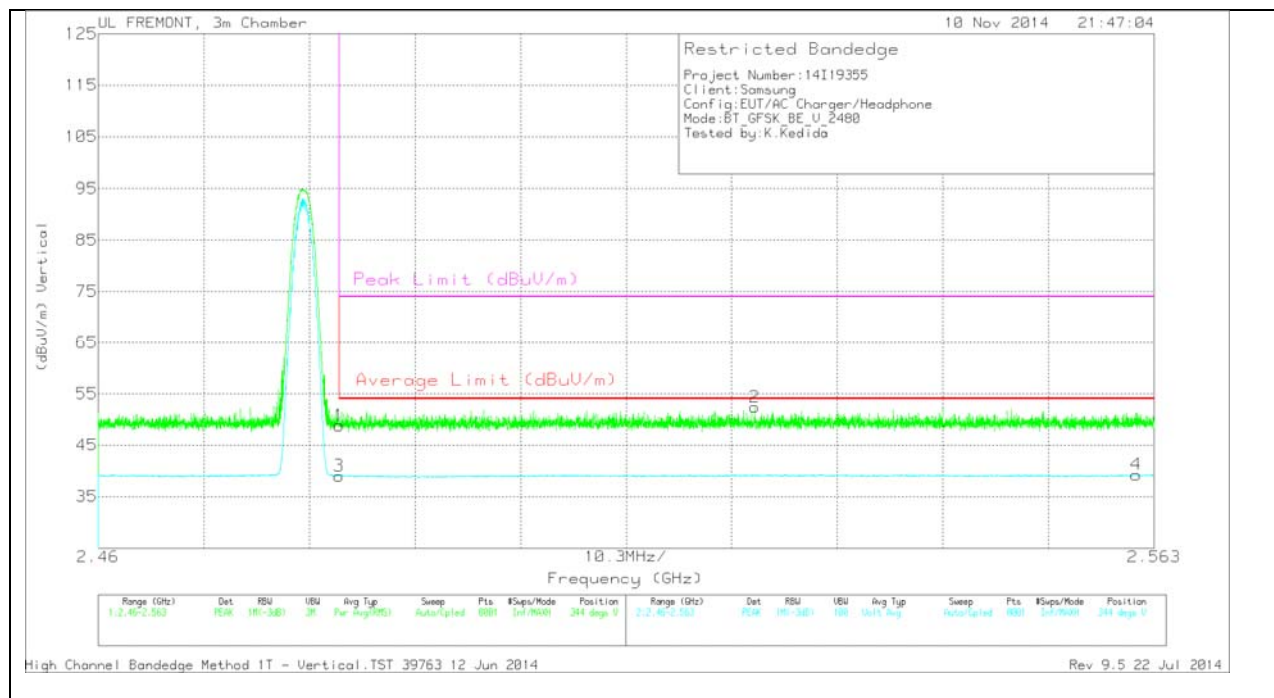
HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	40.47	PK	32.3	-22.8	49.97	-	-	74	-24.03	214	122	H
2	2.484	45.64	PK	32.3	-22.8	55.14	-	-	74	-18.86	214	122	H
3	2.484	29.63	VB1T	32.3	-22.8	39.13	54	-14.87	-	-	214	122	H
4	2.563	29.65	VB1T	32.4	-22.7	39.35	54	-14.65	-	-	214	122	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

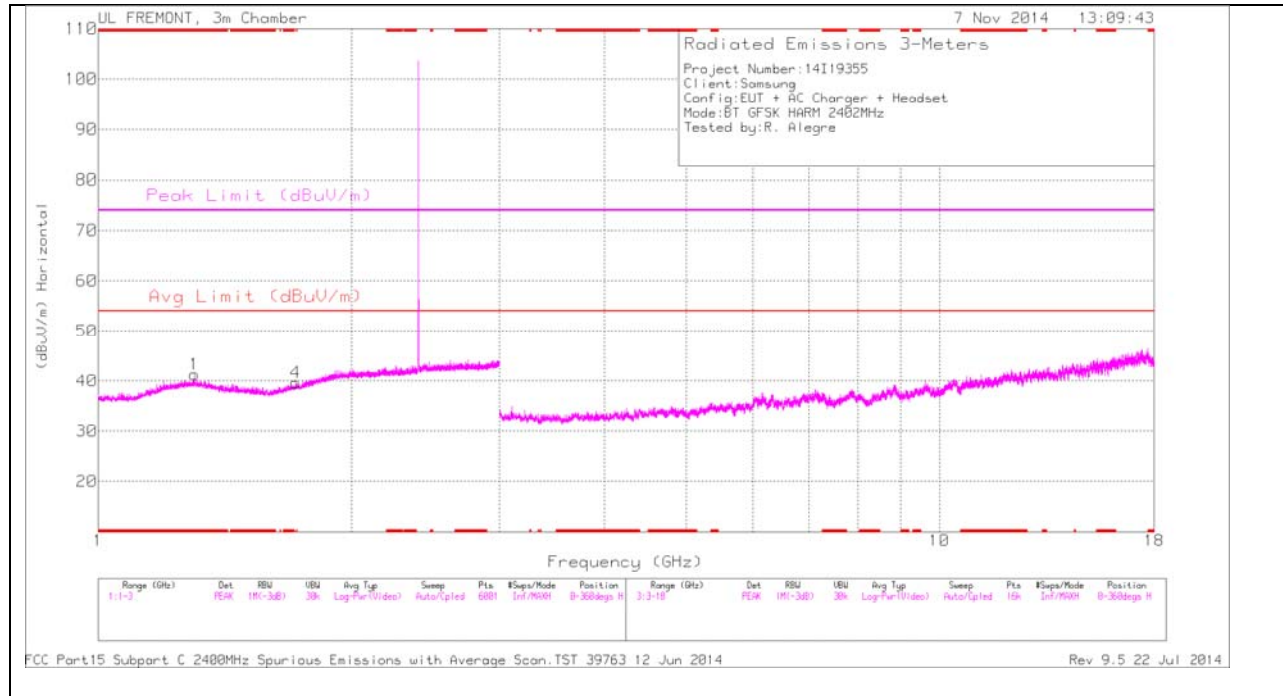
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	39.31	PK	32.3	-22.8	48.81	-	-	74	-25.19	344	397	V
3	2.484	29.5	VB1T	32.3	-22.8	39	54	-15	-	-	344	397	V
2	2.524	42.67	PK	32.4	-22.7	52.37	-	-	74	-21.63	344	397	V
4	2.561	29.57	VB1T	32.4	-22.7	39.27	54	-14.73	-	-	344	397	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

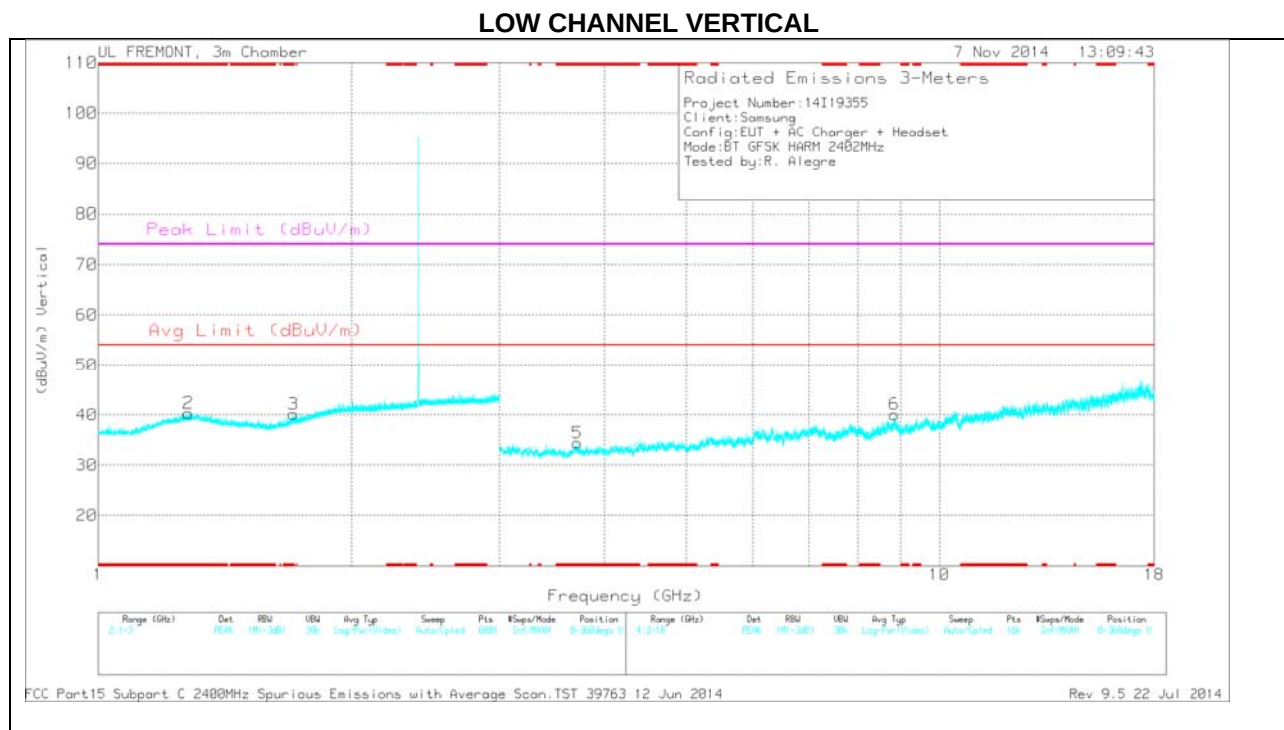
PK - Peak detector

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.



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

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.302	34.86	PK	30.2	-23.8	41.26	-	-	74	-32.74	0-360	200	H
2	* 1.281	34.13	PK	30	-23.8	40.33	-	-	74	-33.67	0-360	100	V
3	* 1.707	34.33	PK	29.1	-23.3	40.13	-	-	74	-33.87	0-360	200	V
5	* 3.713	32.08	PK	33.2	-30.9	34.38	-	-	74	-39.62	0-360	200	V
4	1.717	33.81	PK	29.2	-23.4	39.61	-	-	-	-	0-360	100	H
6	8.846	30.59	PK	36	-26.5	40.09	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

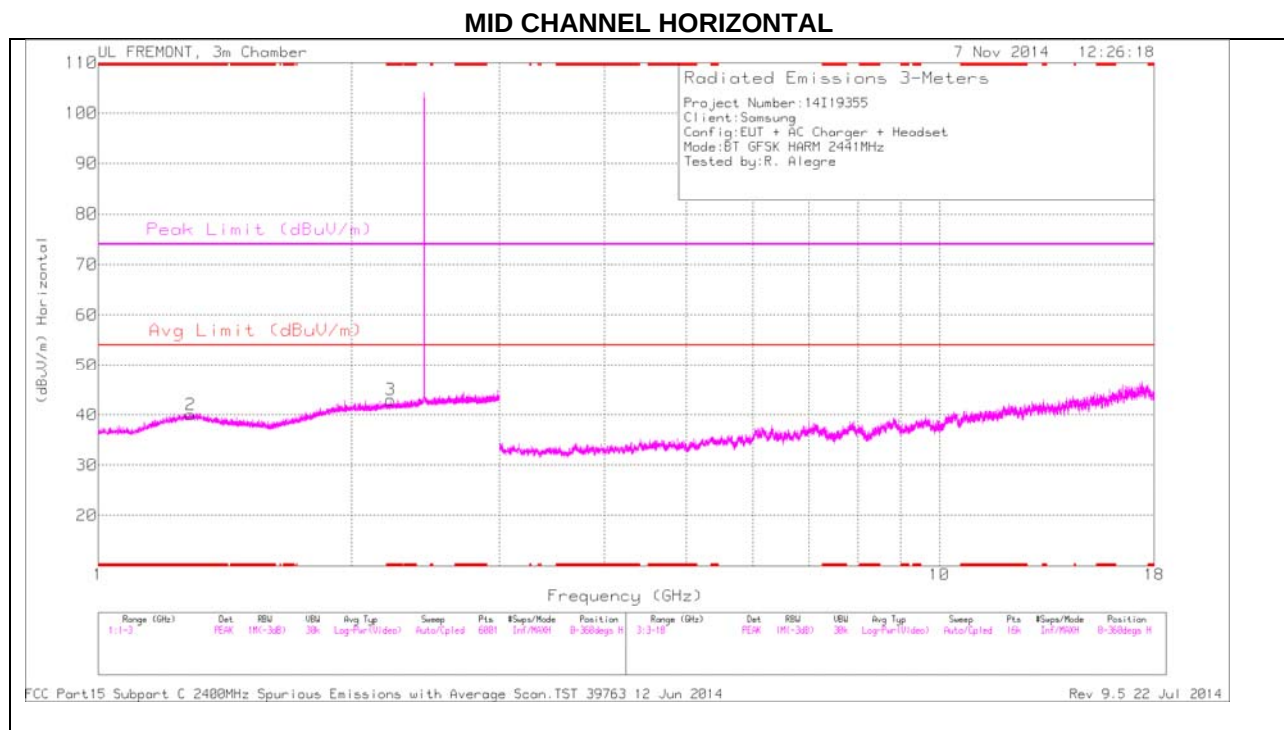
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
8.847	38.11	PK3	36	-26.5	47.61	-	-	-	-	0	100	V
8.847	25	VB1T	36	-26.5	34.5	-	-	-	-	0	100	V

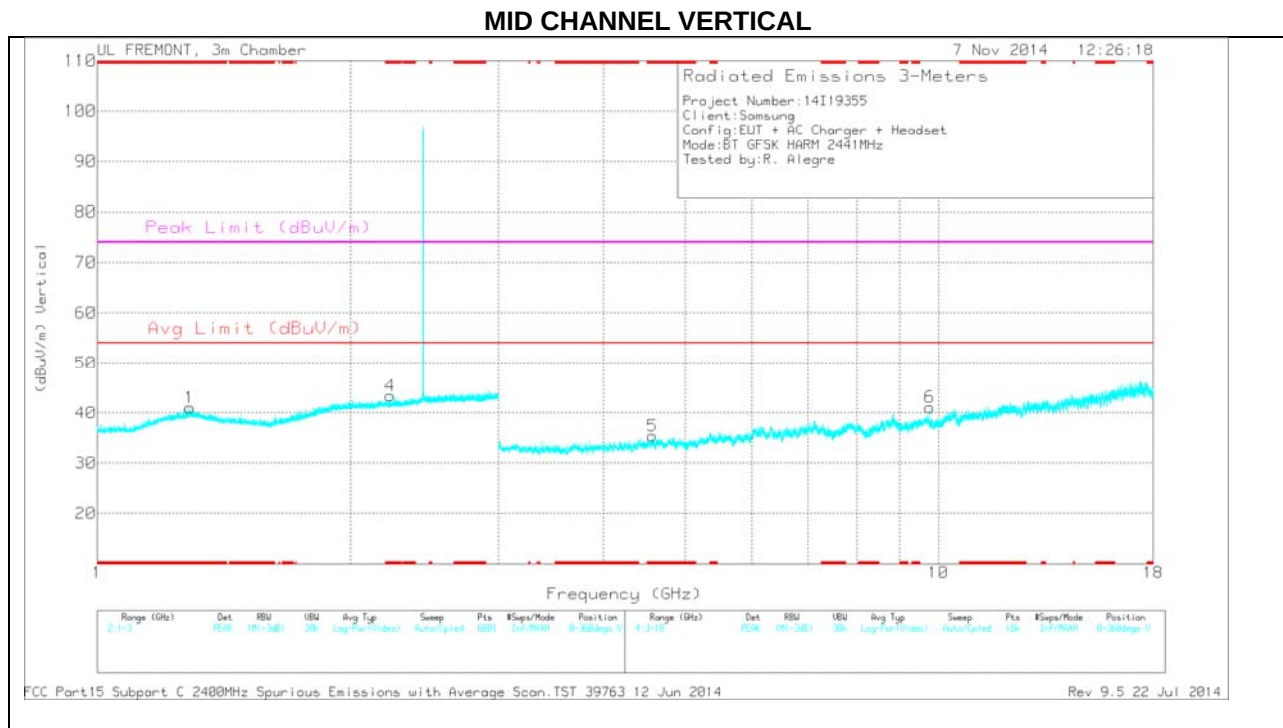
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

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



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



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

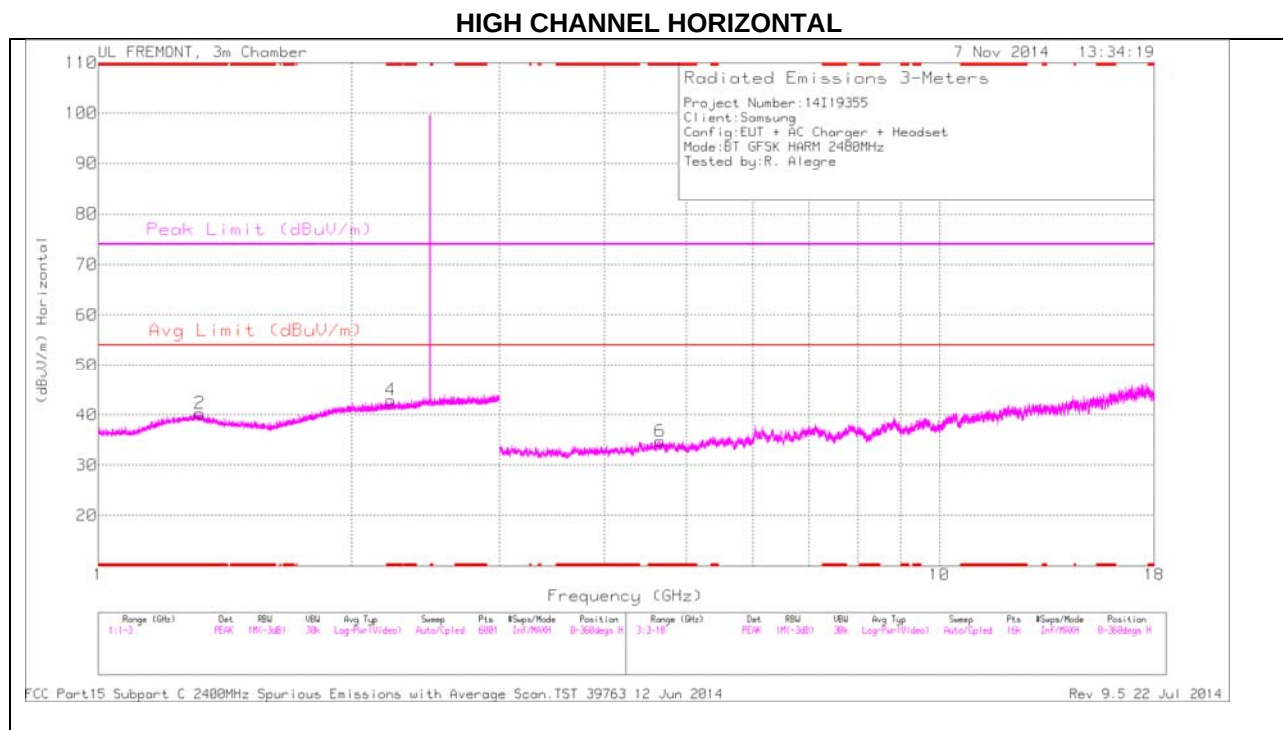
MID CHANNEL DATA

TRACE MARKERS

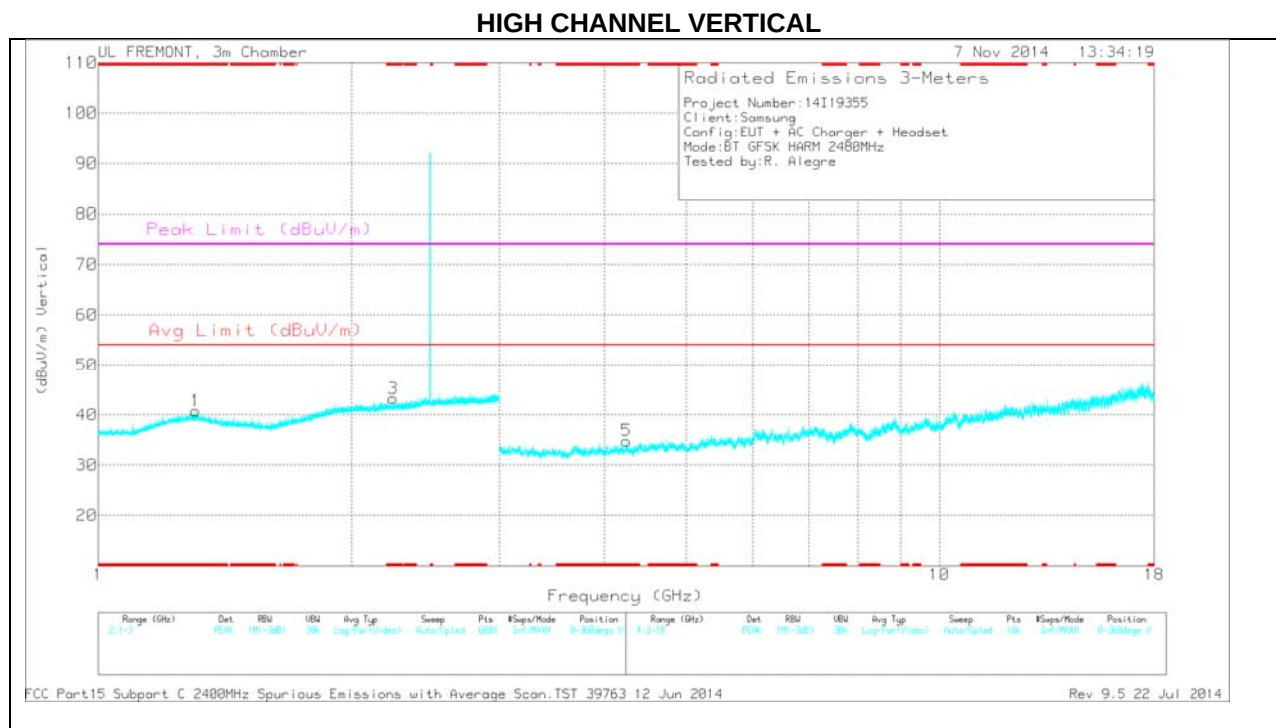
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 1.289	33.62	PK	30.1	-23.7	40.02	-	-	74	-33.98	0-360	100	H
3	* 2.226	34.27	PK	31.7	-23	42.97	-	-	74	-31.03	0-360	100	H
1	* 1.289	34.6	PK	30.1	-23.7	41	-	-	74	-33	0-360	100	V
4	* 2.229	34.7	PK	31.7	-23	43.4	-	-	74	-30.6	0-360	200	V
5	* 4.575	32.3	PK	34	-30.9	35.4	-	-	74	-38.6	0-360	200	V
6	9.764	30.21	PK	36.9	-26	41.11	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector



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



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

HIGH CHANNEL DATA

TRACE MARKERS

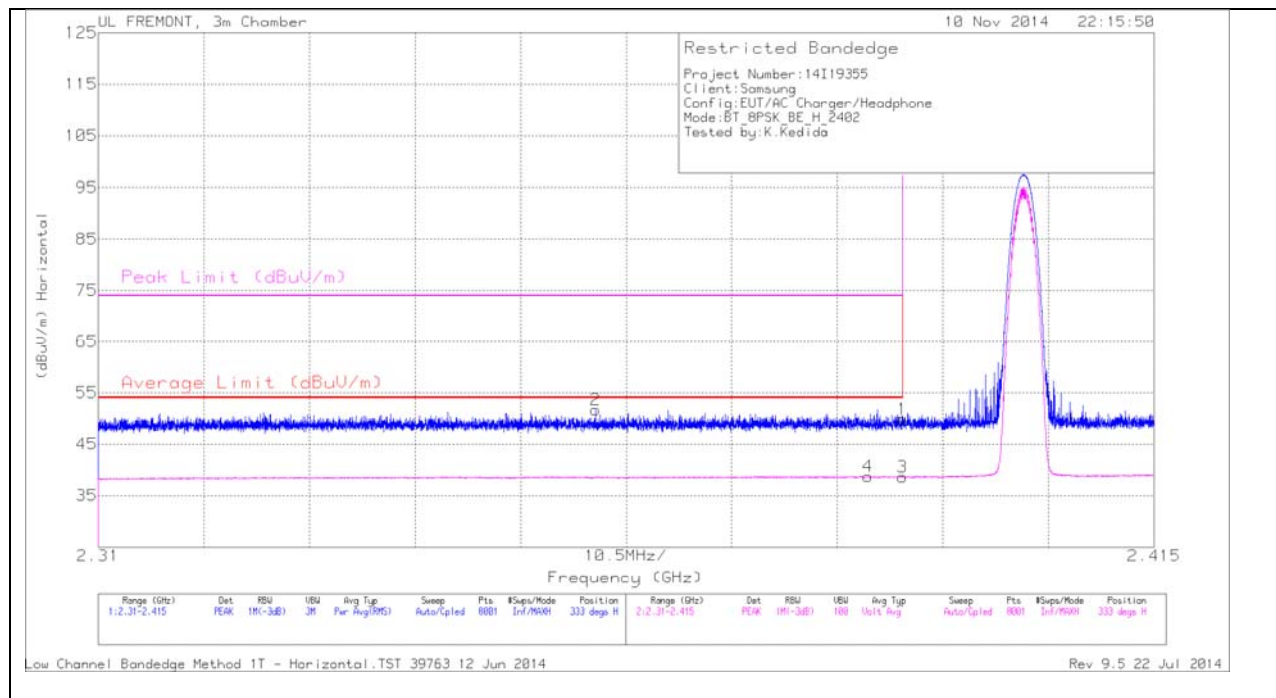
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 1.321	34.13	PK	30	-23.8	40.33	-	-	74	-33.67	0-360	200	H
4	* 2.228	34.22	PK	31.7	-23	42.92	-	-	74	-31.08	0-360	200	H
1	* 1.306	34.39	PK	30.2	-23.8	40.79	-	-	74	-33.21	0-360	200	V
3	* 2.243	34.54	PK	31.7	-23	43.24	-	-	74	-30.76	0-360	100	V
6	* 4.656	31.49	PK	34.1	-30.8	34.79	-	-	74	-39.21	0-360	100	H
5	* 4.249	32.64	PK	33.5	-31.3	34.84	-	-	74	-39.16	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

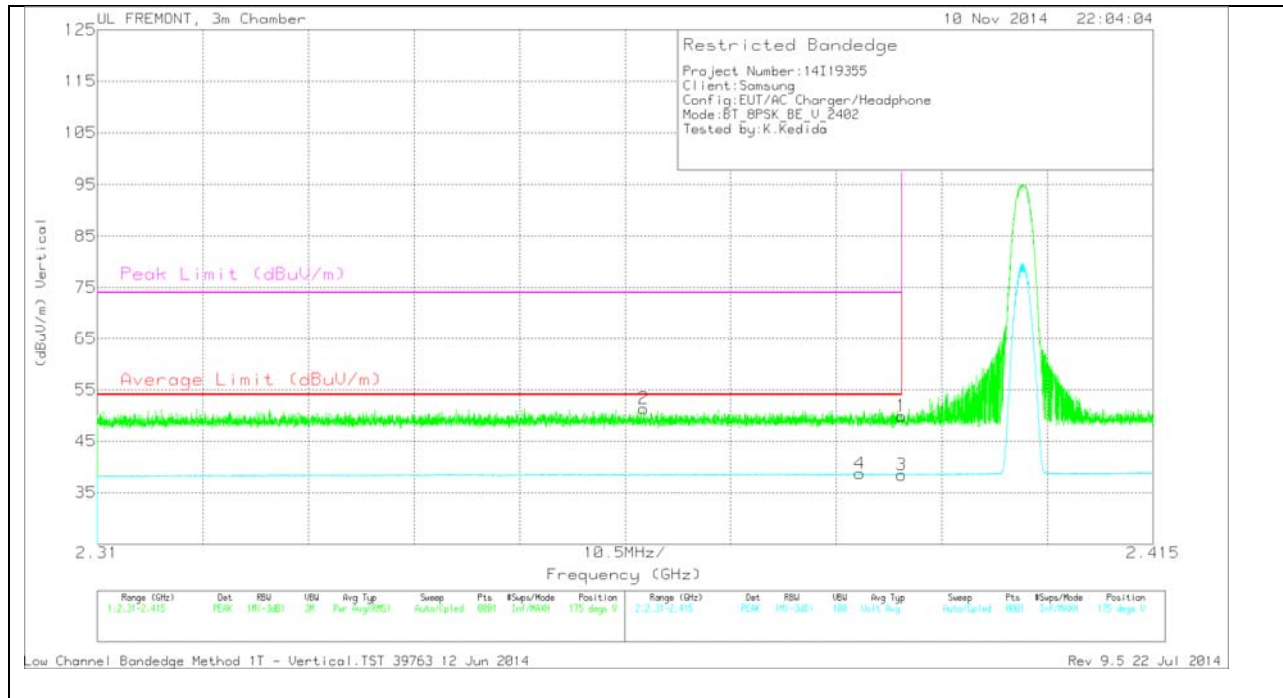
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/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	2.359	42.77	PK	32	-23.1	51.67	-	-	74	-22.33	333	112	H
4	2.387	29.71	VB1T	32.1	-23.1	38.71	54	-15.29	-	-	333	112	H
1	2.39	40.84	PK	32.1	-23.1	49.84	-	-	74	-24.16	333	112	H
3	2.39	29.57	VB1T	32.1	-23.1	38.57	54	-15.43	-	-	333	112	H

VERTICAL PEAK AND AVERAGE PLOT

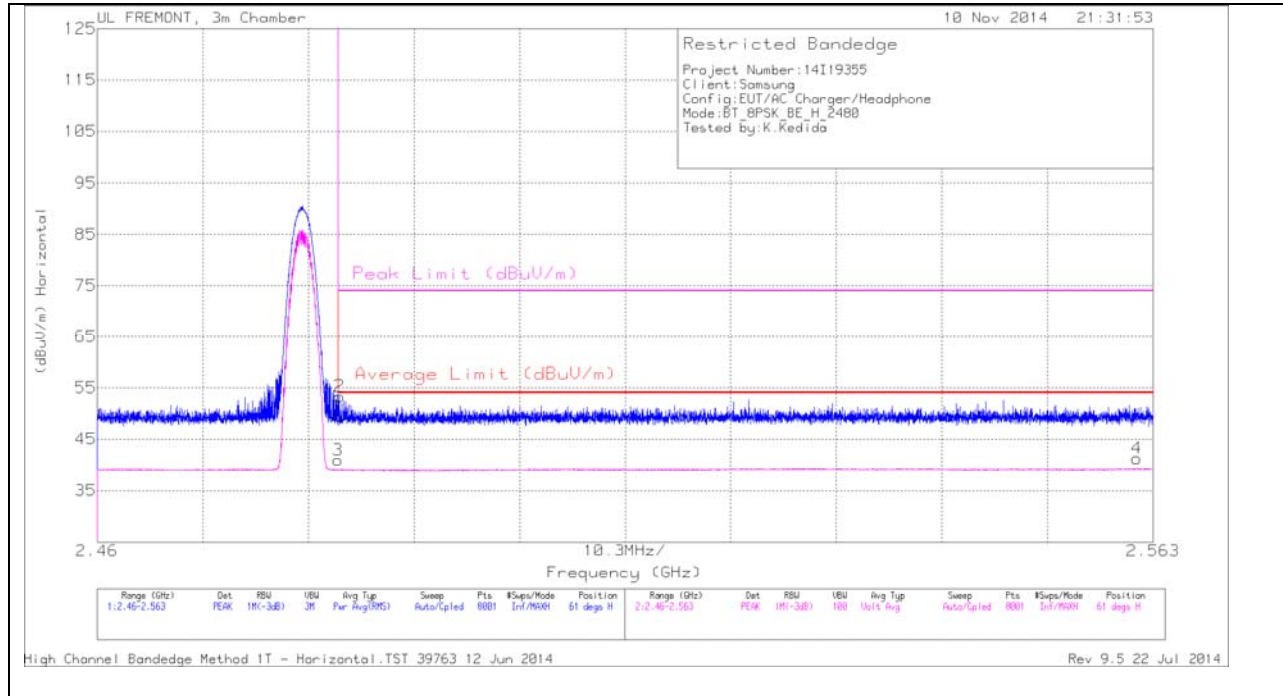


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filt/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	42.45	PK	32	-23.1	51.35	-	-	74	-22.65	175	176	V
4	2.386	29.7	VB1T	32.1	-23.1	38.7	54	-15.3	-	-	175	176	V
1	2.39	40.87	PK	32.1	-23.1	49.87	-	-	74	-24.13	175	176	V
3	2.39	29.44	VB1T	32.1	-23.1	38.44	54	-15.56	-	-	175	176	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

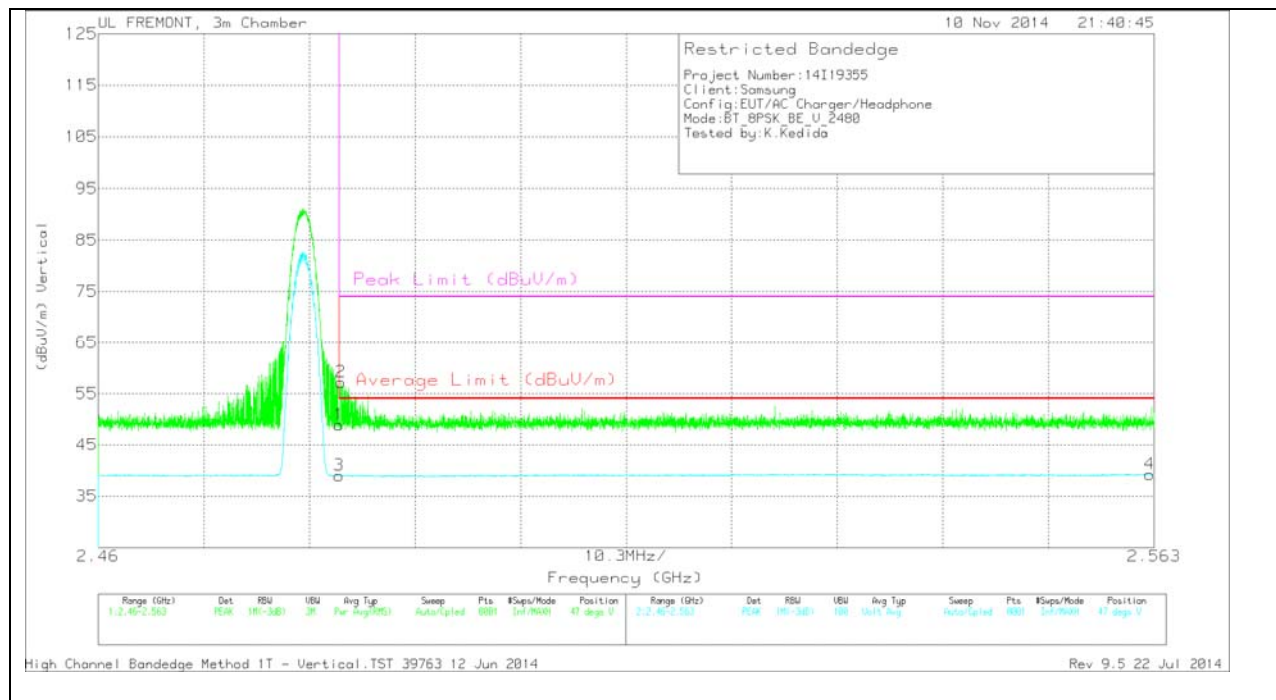
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/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	40.03	PK	32.3	-22.8	49.53	-	-	74	-24.47	61	214	H
2	2.484	43.79	PK	32.3	-22.8	53.29	-	-	74	-20.71	61	214	H
3	2.484	31.39	VB1T	32.3	-22.8	40.89	54	-13.11	-	-	61	214	H
4	2.561	31.55	VB1T	32.4	-22.7	41.25	54	-12.75	-	-	61	214	H

VERTICAL PEAK AND AVERAGE PLOT

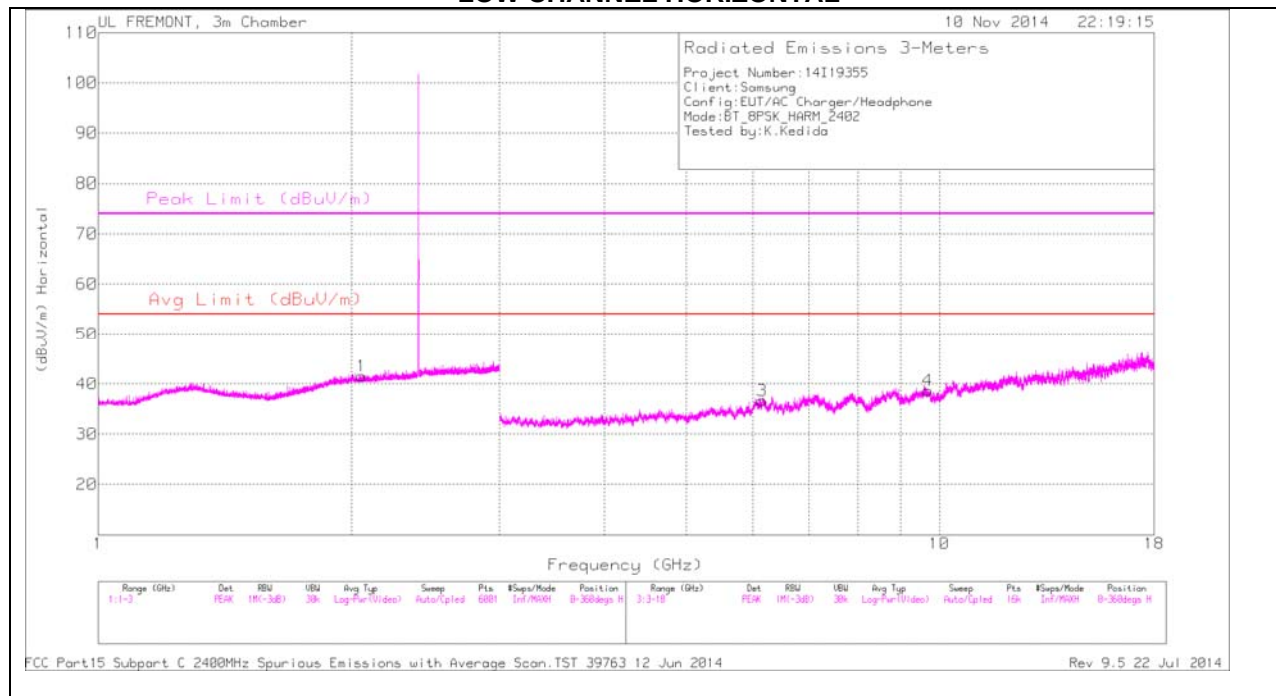


VERTICAL DATA

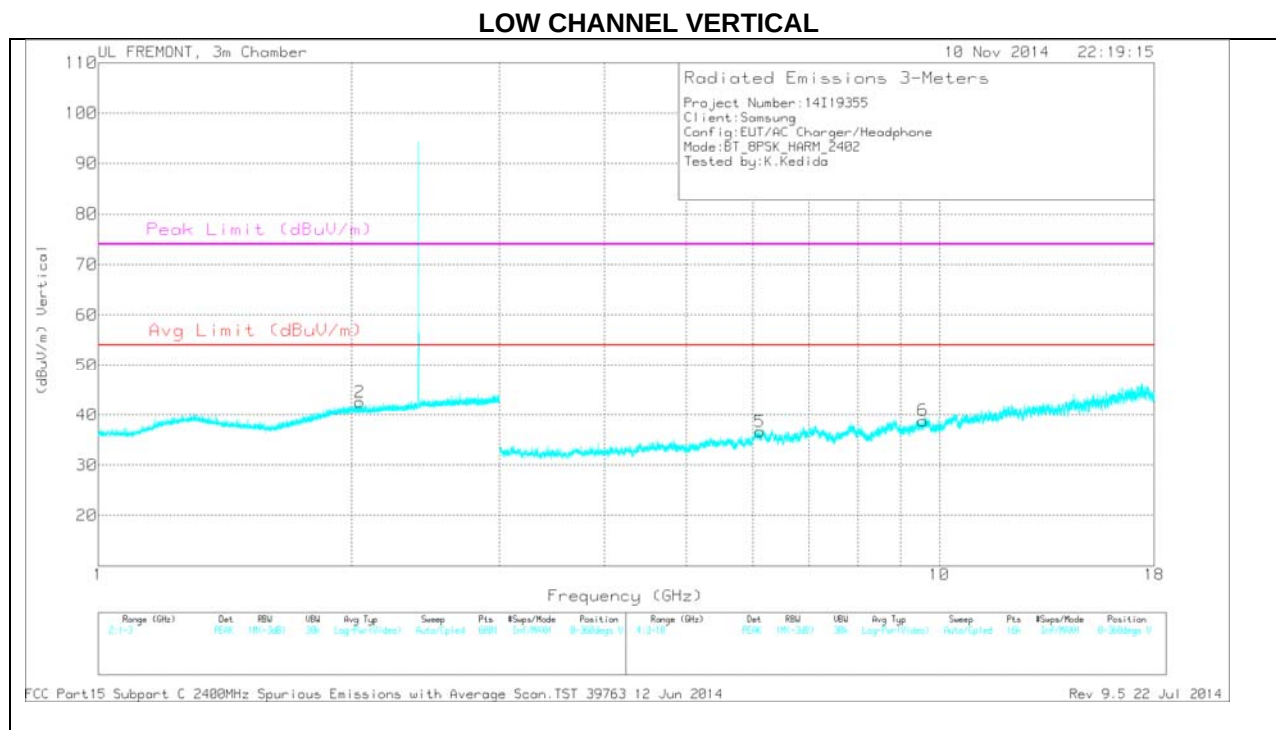
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	39.4	PK	32.3	-22.8	48.9	-	-	74	-25.1	47	184	V
2	2.484	47.73	PK	32.3	-22.8	57.23	-	-	74	-16.77	47	184	V
3	2.484	29.53	VB1T	32.3	-22.8	39.03	54	-14.97	-	-	47	184	V
4	2.563	29.57	VB1T	32.4	-22.7	39.27	54	-14.73	-	-	47	184	V

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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



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

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.047	34.1	PK	31.6	-23.2	42.5	-	-	-	-	0-360	200	V
1	2.058	33.11	PK	31.6	-23.2	41.51	-	-	-	-	0-360	200	H
5	6.116	30.43	PK	35.3	-29.1	36.63	-	-	-	-	0-360	200	V
3	6.154	30.95	PK	35.3	-29.6	36.65	-	-	-	-	0-360	100	H
6	9.562	28.44	PK	36.7	-26.3	38.84	-	-	-	-	0-360	200	V
4	9.691	27.44	PK	36.8	-25.6	38.64	-	-	-	-	0-360	100	H

PK - Peak detector

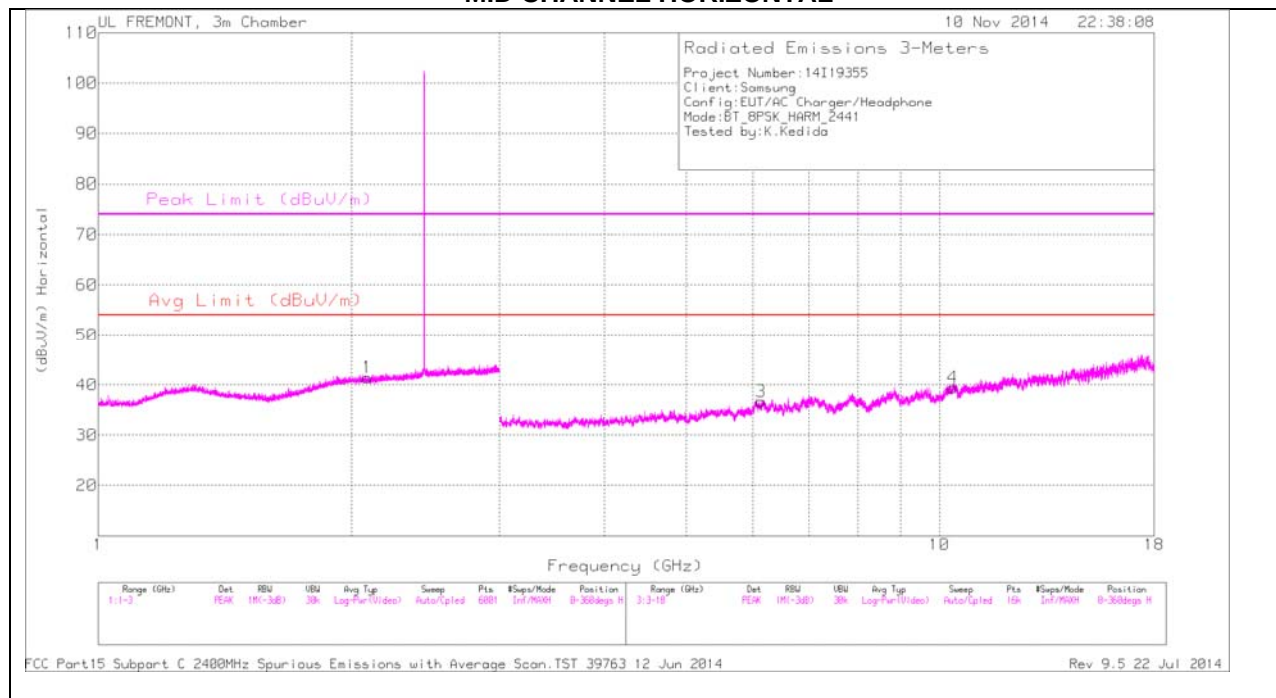
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.998	29.55	VB1T	31.6	-23.2	37.95	-	-	-	-	76	358	V
2.022	42.75	PK3	31.6	-23.2	51.15	-	-	-	-	76	358	V

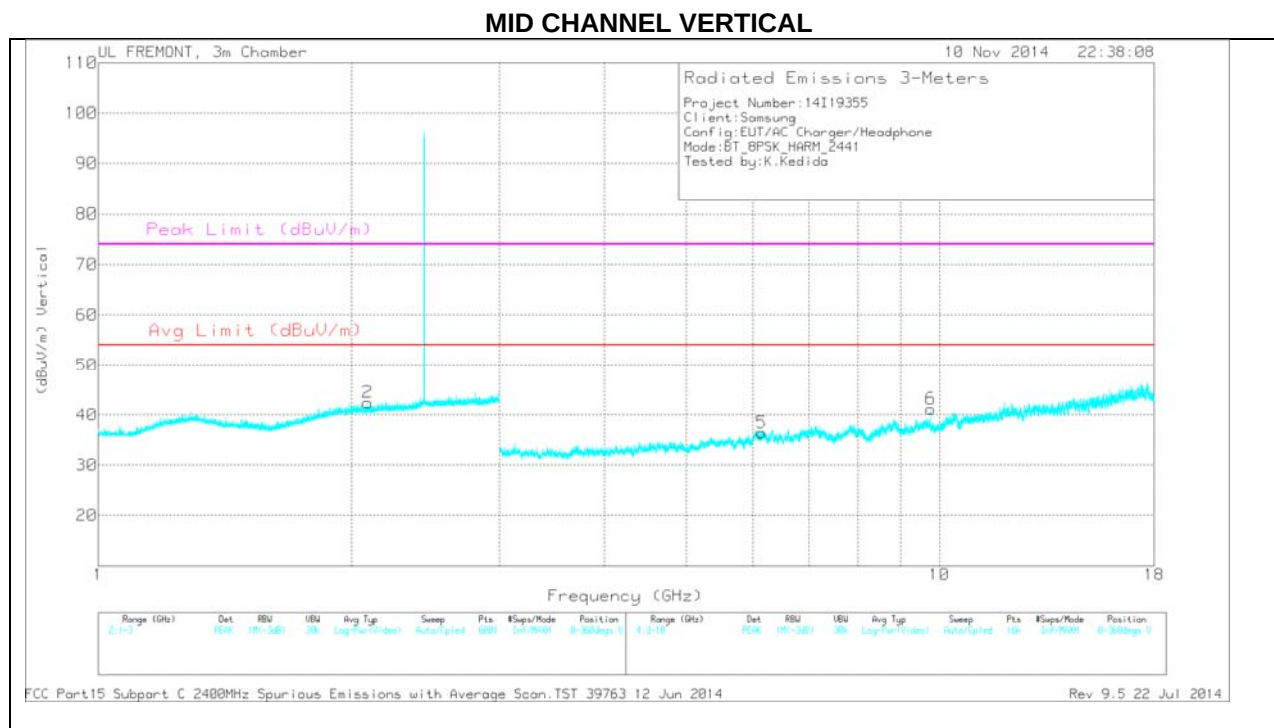
PK3 - FHSS Method: Maximum Peak

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

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 DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.089	33.05	PK	31.5	-23.1	41.45	-	-	-	-	0-360	200	H
2	2.091	33.96	PK	31.5	-23	42.46	-	-	-	-	0-360	200	V
3	6.138	30.77	PK	35.3	-29.4	36.67	-	-	-	-	0-360	200	H
5	6.147	30.84	PK	35.3	-29.7	36.44	-	-	-	-	0-360	100	V
6	9.764	30.3	PK	36.9	-26	41.2	-	-	-	-	0-360	100	V
4	10.368	27.84	PK	37.3	-25.7	39.44	-	-	-	-	0-360	100	H

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6.138	39.54	PK3	35.3	-29.4	45.44	-	-	-	-	3	200	H
6.138	26.4	VB1T	35.3	-29.4	32.3	-	-	-	-	3	200	H

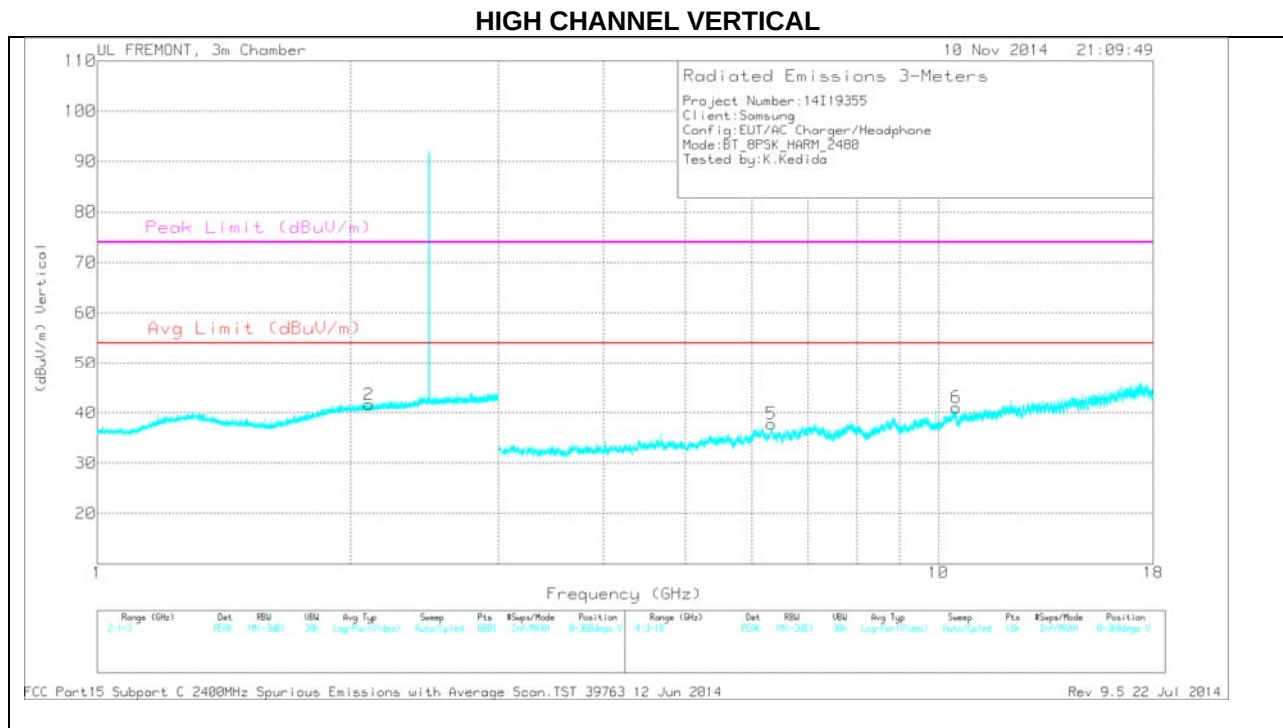
PK3 - FHSS Method: Maximum Peak

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

HIGH CHANNEL HORIZONTAL



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



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

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.099	32.69	PK	31.5	-23	41.19	-	-	-	-	0-360	100	H
2	2.103	33.13	PK	31.5	-23	41.63	-	-	-	-	0-360	100	V
3	6.126	30.21	PK	35.3	-29.1	36.41	-	-	-	-	0-360	200	H
5	6.328	31.4	PK	35.4	-29	37.8	-	-	-	-	0-360	200	V
4	8.848	29.9	PK	36	-26.6	39.3	-	-	-	-	0-360	100	H
6	10.495	29.17	PK	37.5	-25.6	41.07	-	-	-	-	0-360	200	V

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6.126	39.36	PK3	35.3	-29.1	45.56	-	-	-	-	360	200	H
6.128	26.46	VB1T	35.3	-29.2	32.56	-	-	-	-	360	200	H

PK3 - FHSS Method: Maximum Peak

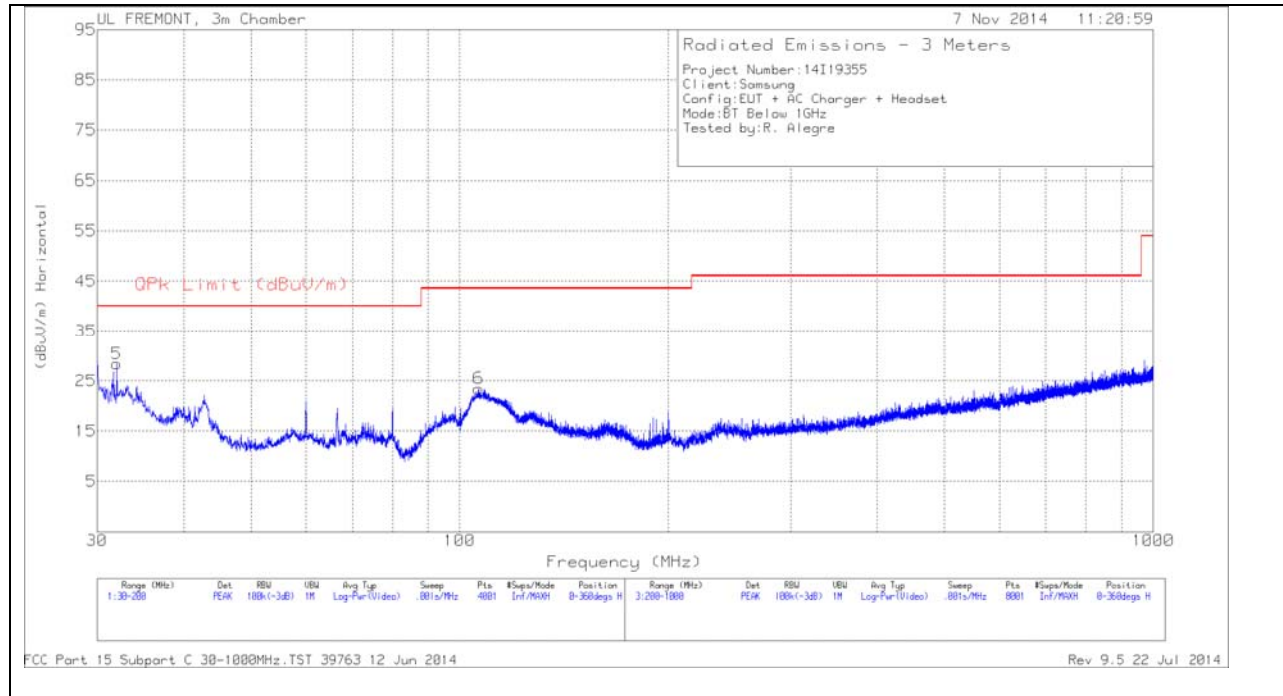
VB10Hz - FHSS Method: 10Hz Video Bandwidth

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

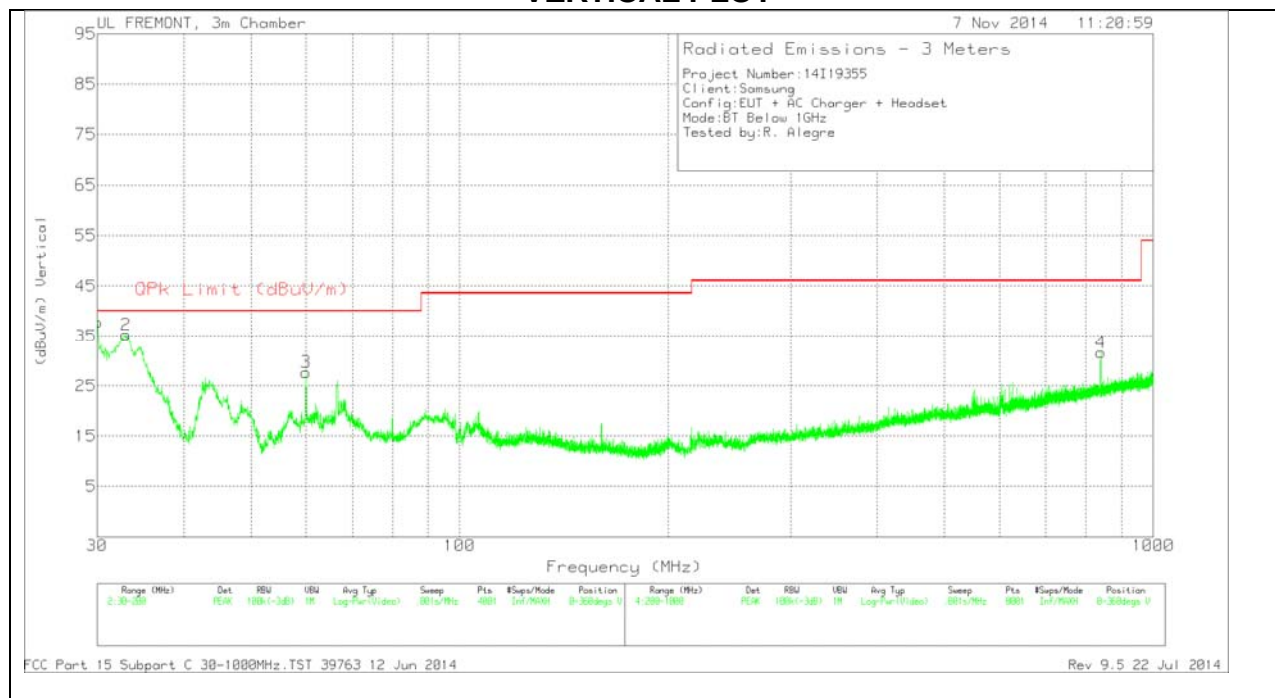
9.3 WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 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	44.28	PK	21	-27.5	37.78	40	-2.22	0-360	100	V
5	32.04	36.47	PK	19.4	-27.5	28.37	40	-11.63	0-360	300	H
2	33.0175	43.87	PK	18.9	-27.5	35.27	40	-4.73	0-360	100	V
3	60.005	47.69	PK	7.1	-27.1	27.69	40	-12.31	0-360	100	V
6	106.5	38.56	PK	11.6	-26.7	23.46	43.52	-20.06	0-360	400	H
4	840.5	34.37	PK	21.7	-24.4	31.67	46.02	-14.35	0-360	100	V

PK - Peak detector

10 AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

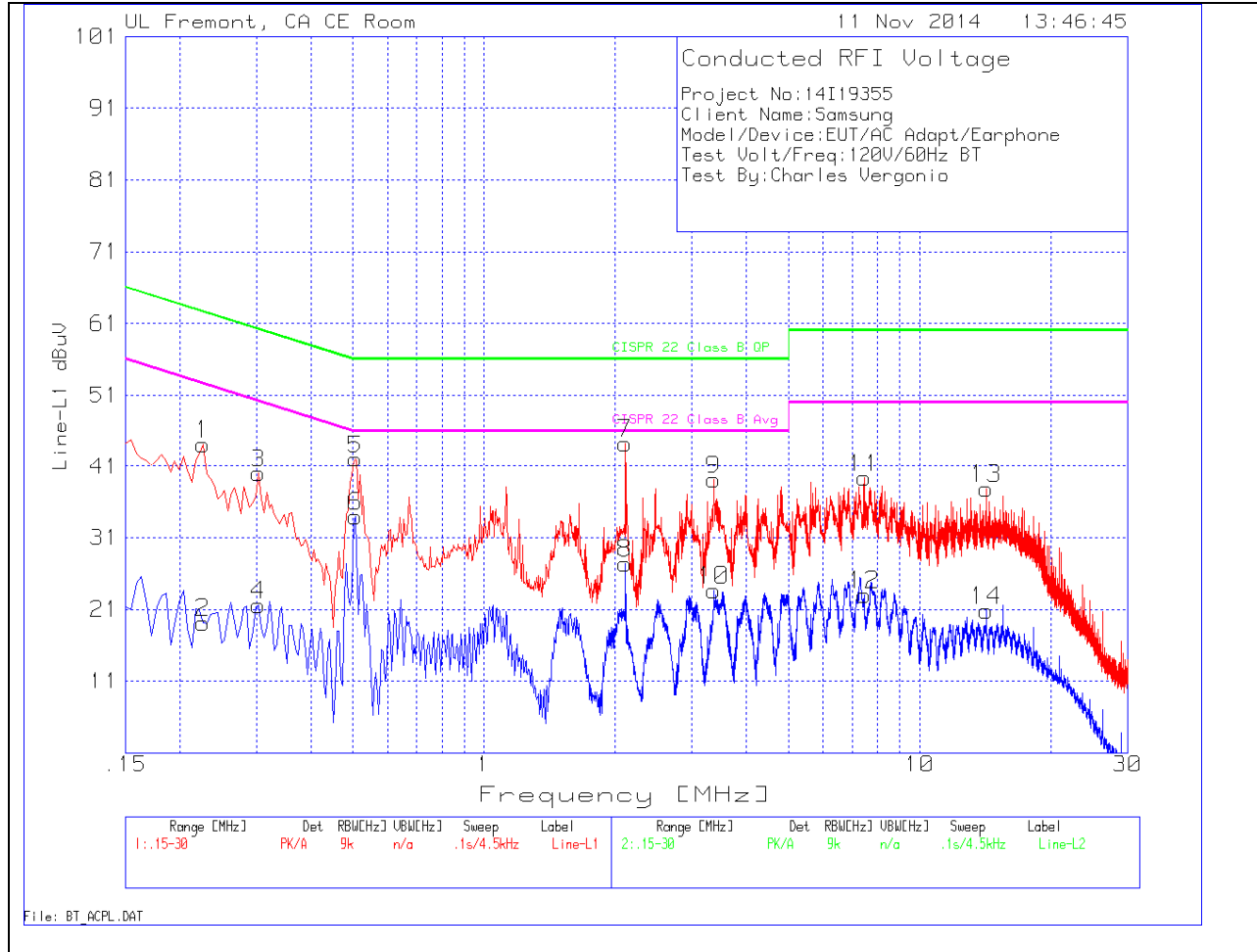
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT

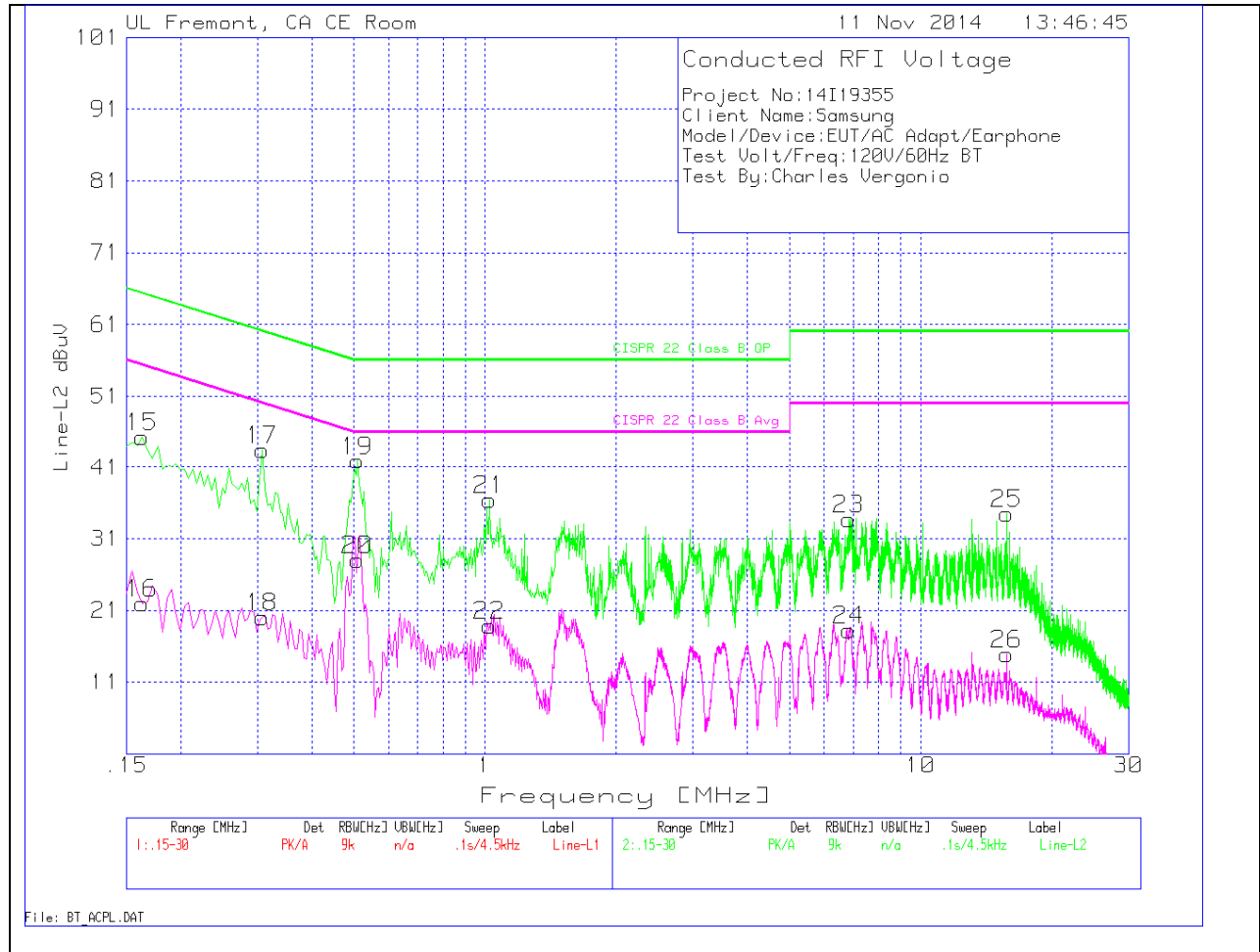


LINE 1 RESULTS

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	.2265	43.29	PK	.8	0	44.09	62.6	-18.51	-	-
2	.2265	18.29	Av	.8	0	19.09	-	-	52.6	-33.51
3	.303	39.39	PK	.6	0	39.99	60.2	-20.21	-	-
4	.303	20.98	Av	.6	0	21.58	-	-	50.2	-28.62
5	.5055	41.72	PK	.3	0	42.02	56	-13.98	-	-
6	.5055	33.68	Av	.3	0	33.98	-	-	46	-12.02
7	2.112	44.02	PK	.2	.1	44.32	56	-11.68	-	-
8	2.112	27.1	Av	.2	.1	27.4	-	-	46	-18.6
9	3.3675	38.79	PK	.2	.1	39.09	56	-16.91	-	-
10	3.3675	23.3	Av	.2	.1	23.6	-	-	46	-22.4
11	7.467	39.13	PK	.2	.1	39.43	60	-20.57	-	-
12	7.467	22.68	Av	.2	.1	22.98	-	-	50	-27.02
13	14.226	37.45	PK	.2	.2	37.85	60	-22.15	-	-
14	14.226	20.36	Av	.2	.2	20.76	-	-	50	-29.24

LINE 2 PLOT



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)
15	.1635	43.96	PK	1.3	0	45.26	65.3	-20.04	-	-
16	.1635	20.7	Av	1.3	0	22	-	-	55.3	-33.3
17	.3075	42.91	PK	.6	0	43.51	60	-16.49	-	-
18	.3075	19.42	Av	.6	0	20.02	-	-	50	-29.98
19	.51	41.57	PK	.4	0	41.97	56	-14.03	-	-
20	.51	27.59	Av	.4	0	27.99	-	-	46	-18.01
21	1.023	36.1	PK	.3	0	36.4	56	-19.6	-	-
22	1.023	18.53	Av	.3	0	18.83	-	-	46	-27.17
23	6.846	33.42	PK	.2	.1	33.72	60	-26.28	-	-
24	6.846	17.94	Av	.2	.1	18.24	-	-	50	-31.76
25	15.747	34.03	PK	.3	.2	34.53	60	-25.47	-	-
26	15.747	14.36	Av	.3	.2	14.86	-	-	50	-35.14