FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n

MODEL NUMBER: SM-G350M

FCC ID: A3LSMG350M

REPORT NUMBER: 14I17079-2 REV A

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2/10/14	Initial Issue	P. Kim
A	2/17/14	Updated standard version; Updated radiated harmonic plots	P. Kim

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6

4.2. SAMPLE CALCULATION 6

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. WORST-CASE CONFIGURATION AND MODE 7

5.5. DESCRIPTION OF TEST SETUP 8

6. TEST AND MEASUREMENT EQUIPMENT 10

7. SUMMARY TABLE 11

8. ANTENNA PORT TEST RESULTS 12

8.1. 20 dB AND 99% BANDWIDTH 12

8.1.1. BASIC DATA RATE GFSK MODULATION 12

8.1.1. ENHANCED DATA RATE 8PSK MODULATION 12

8.2. HOPPING FREQUENCY SEPARATION 21

8.3. NUMBER OF HOPPING CHANNELS 23

8.4. AVERAGE TIME OF OCCUPANCY 26

8.5. OUTPUT POWER 30

8.5.1. BASIC DATA RATE GFSK MODULATION 30

8.5.2. ENHANCED DATA RATE 8PSK MODULATION 30

8.6. AVERAGE POWER 35

8.6.1. BASIC DATA RATE GFSK MODULATION 35

8.6.2. ENHANCED DATA RATE 8PSK MODULATION 35

8.7. CONDUCTED SPURIOUS EMISSIONS 36

8.7.1. BASIC DATA RATE GFSK MODULATION 37

8.7.1. ENHANCED DATA RATE 8PSK MODULATION 41

9. RADIATED TEST RESULTS 45

9.1. LIMITS AND PROCEDURE 45

9.2. TRANSMITTER ABOVE 1 GHz 46

9.2.1. BASIC DATA RATE GFSK MODULATION 46

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9.2.2. ENHANCED DATA RATE 8PSK MODULATION 60

9.3. WORST-CASE BELOW 1 GHz 74

10. AC POWER LINE CONDUCTED EMISSIONS 77

11. SETUP PHOTOS 81

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

EUT DESCRIPTION: GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n

MODEL: SM-G350M

SERIAL NUMBER: FL-053-D (Conducted), FL-053-B, FL-053-C, FL-053-A (Radiated)

DATE TESTED: February 7 - 10, 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.

Approved & Released For
UL Verification Services Inc. By:

PHILIP KIM
WiSE PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

CHARLES VERGONIO
WiSE LAB TECHNICIAN
UL Verification Services Inc.

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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 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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 1000 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

GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	10.23	10.54
2402 - 2480	Enhanced 8PSK	10.43	11.04

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 2.29 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

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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	ECB-DU4AWE	N/A	N/A
Earphone	Samsung	SM-350M	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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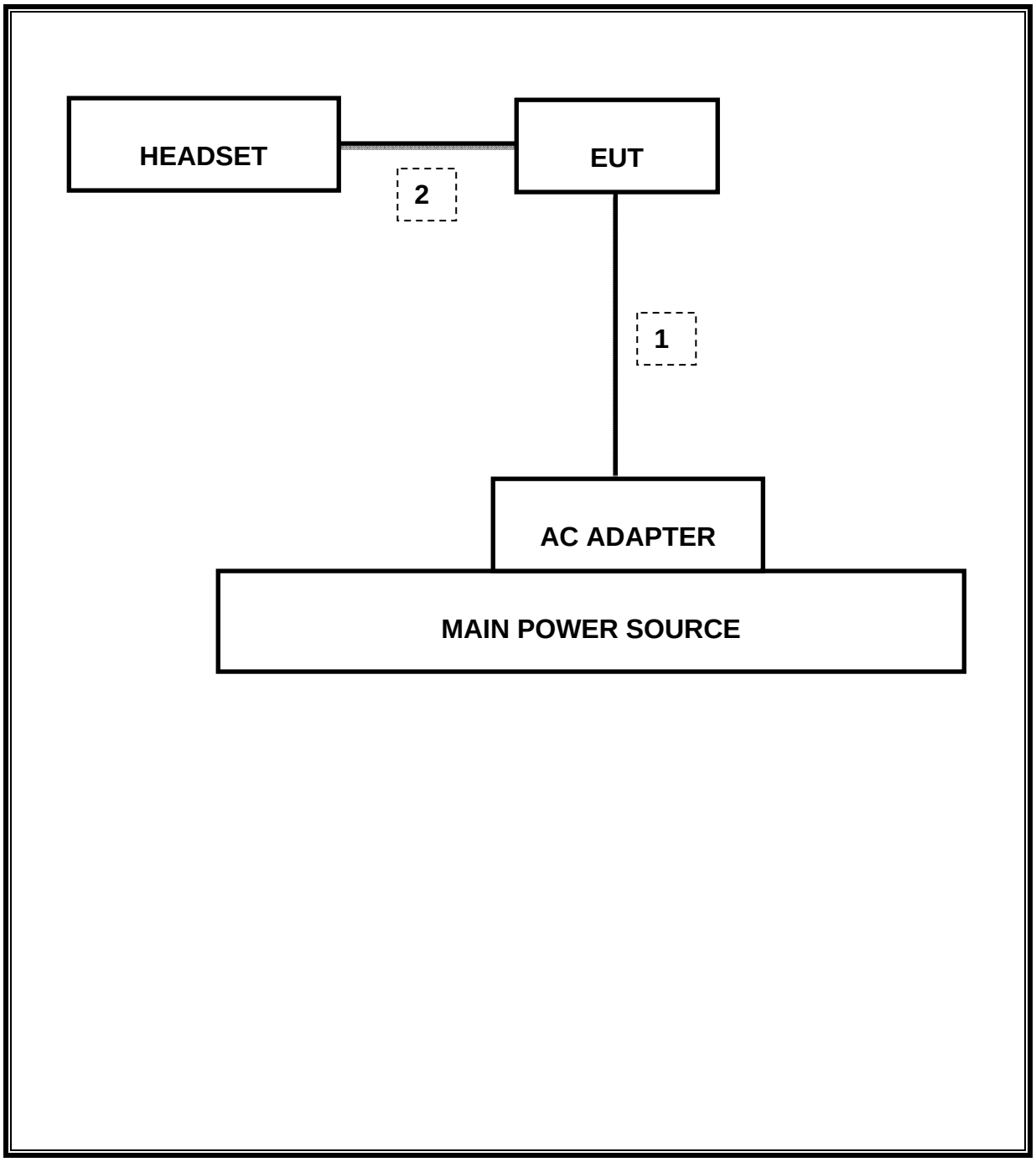
SETUP DIAGRAM FOR TESTS



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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 Date**	**Cal Due**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	03/23/13	02/13/14
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/13	10/25/14
Antenna, Horn, 25.5 GHz	ARA	MWH-1826/B	C00980	11/14/13	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/14	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/13	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/13	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	07/12/13	07/12/14
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/13	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/13	12/13/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/14	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/2013	12/13/2014
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/2013	12/13/2014

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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	1.212MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-45.94dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	10.43dBm
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	0.288sec
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	49.25dBuV/m
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	45.58dBuV/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 (KHz)	99% Bandwidth (KHz)
Low	2402	955.8	905.14
Middle	2441	956.6	904.02
High	2480	958.4	897.42
Worst		958.4	905.14

8.1.1. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.293	1.156
Middle	2441	1.291	1.173
High	2480	1.292	1.212
Worst		1.293	1.212

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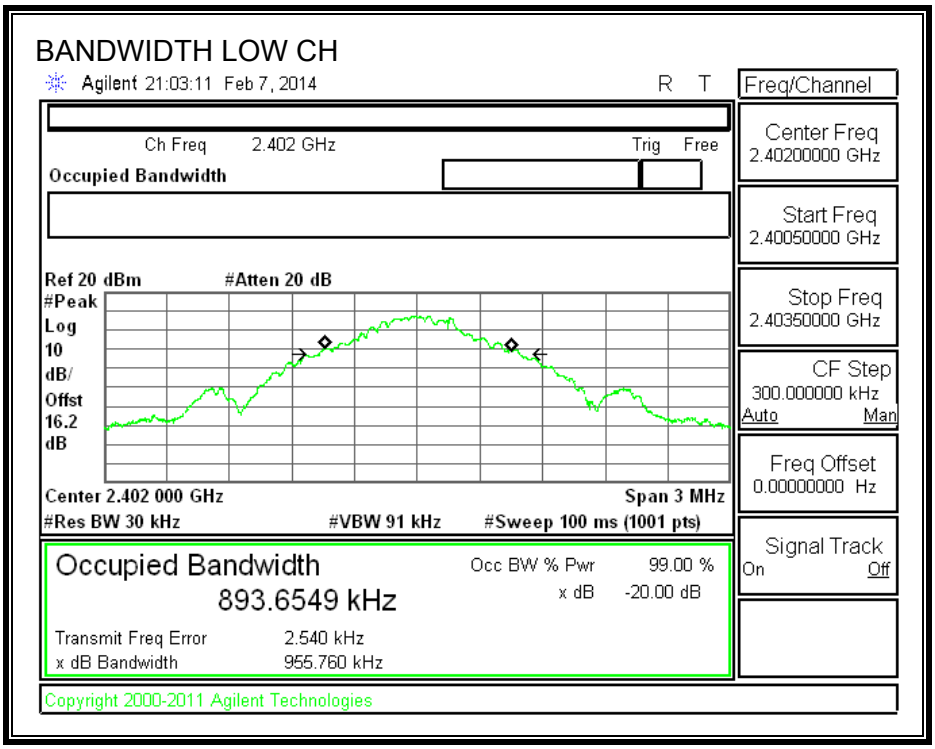
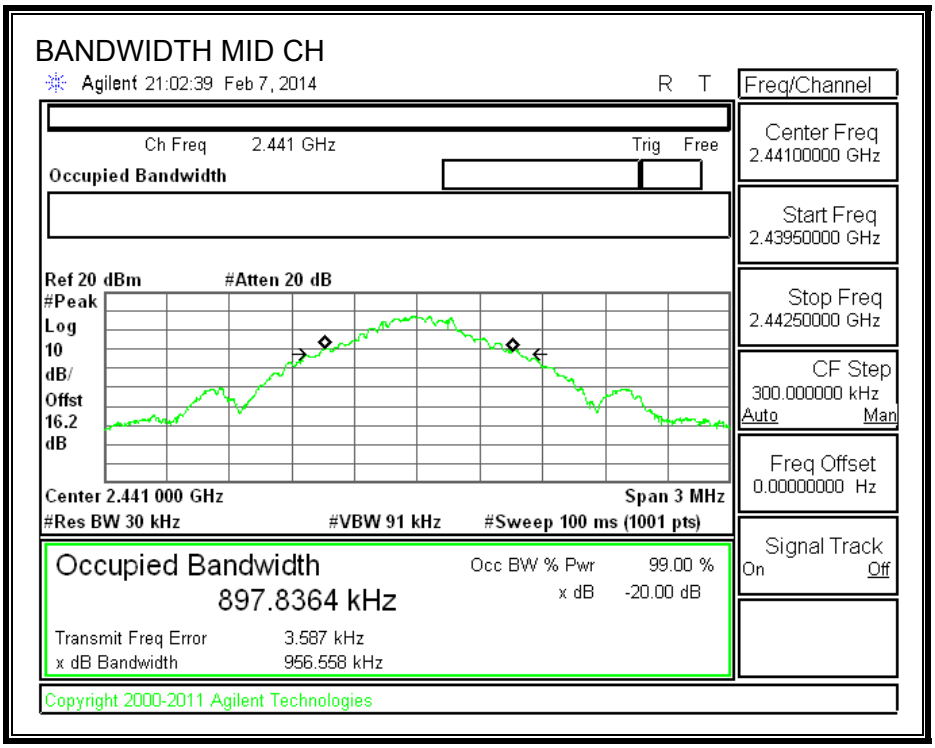
GFSK 20 dB BANDWIDTH





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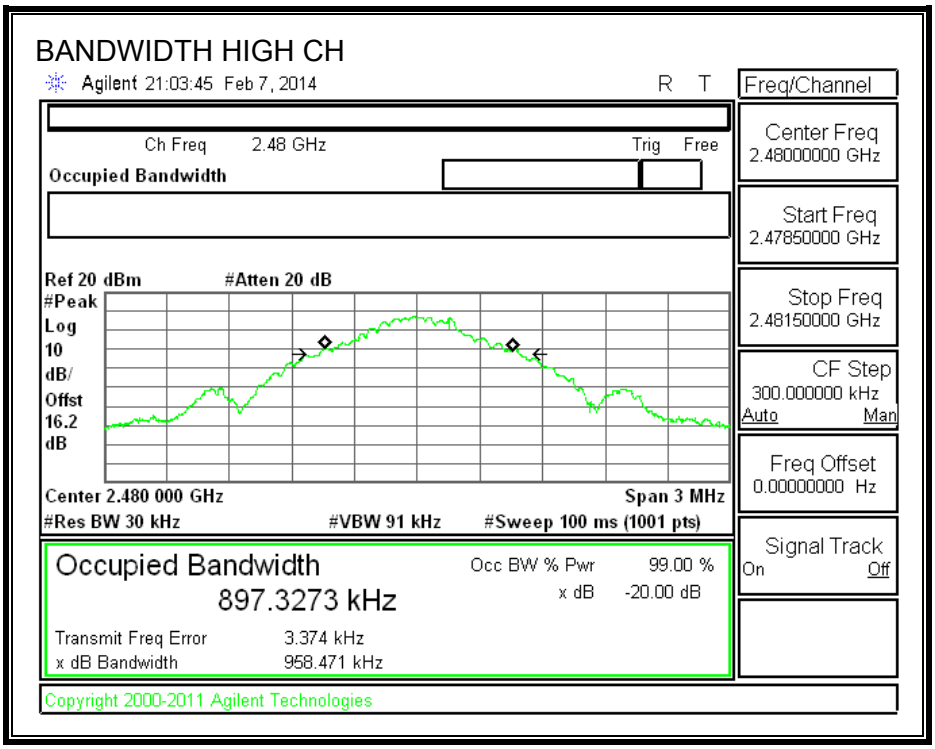

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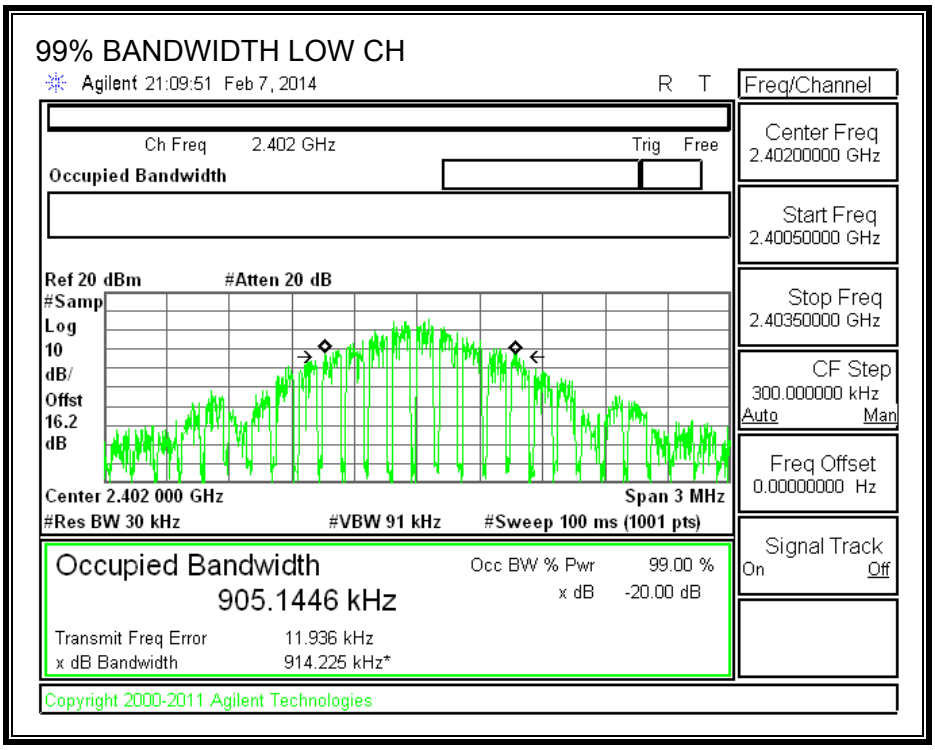
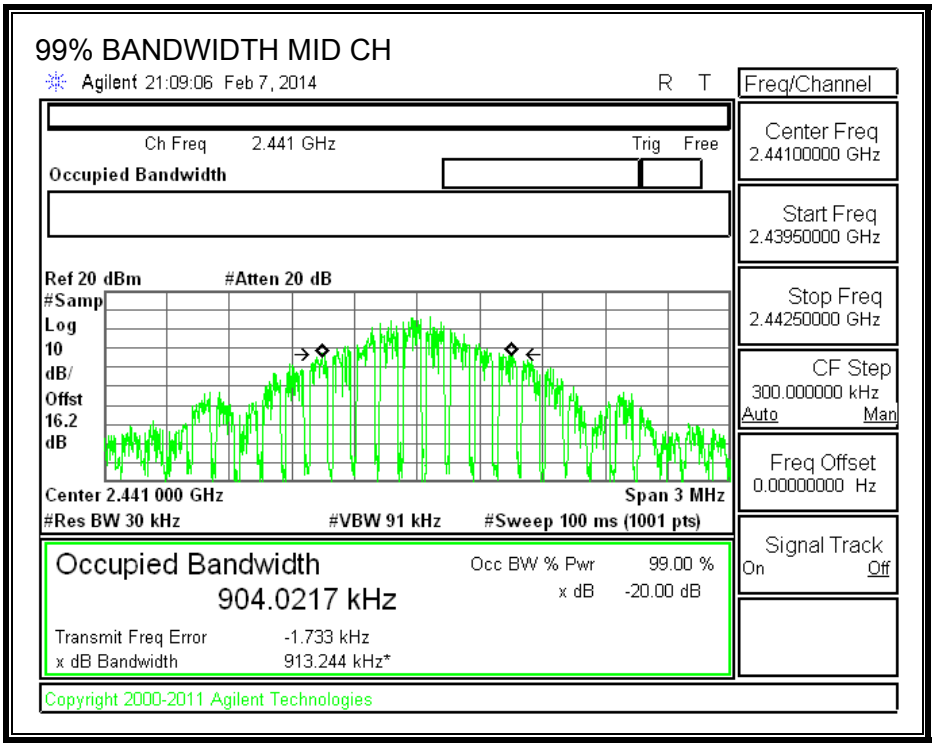
GFSK 99% BANDWIDTH





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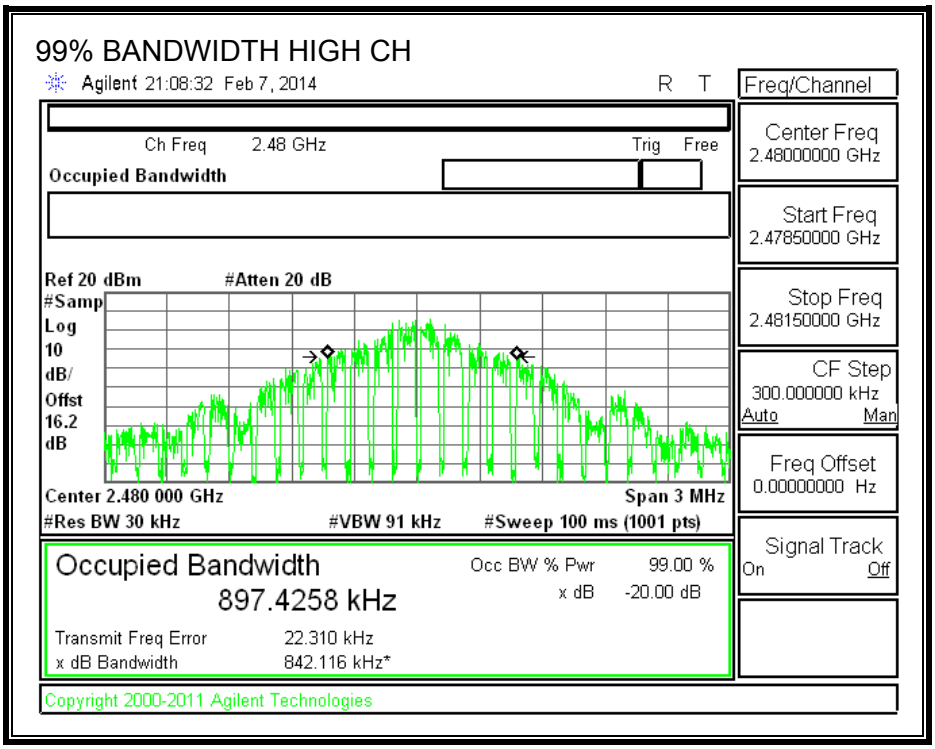

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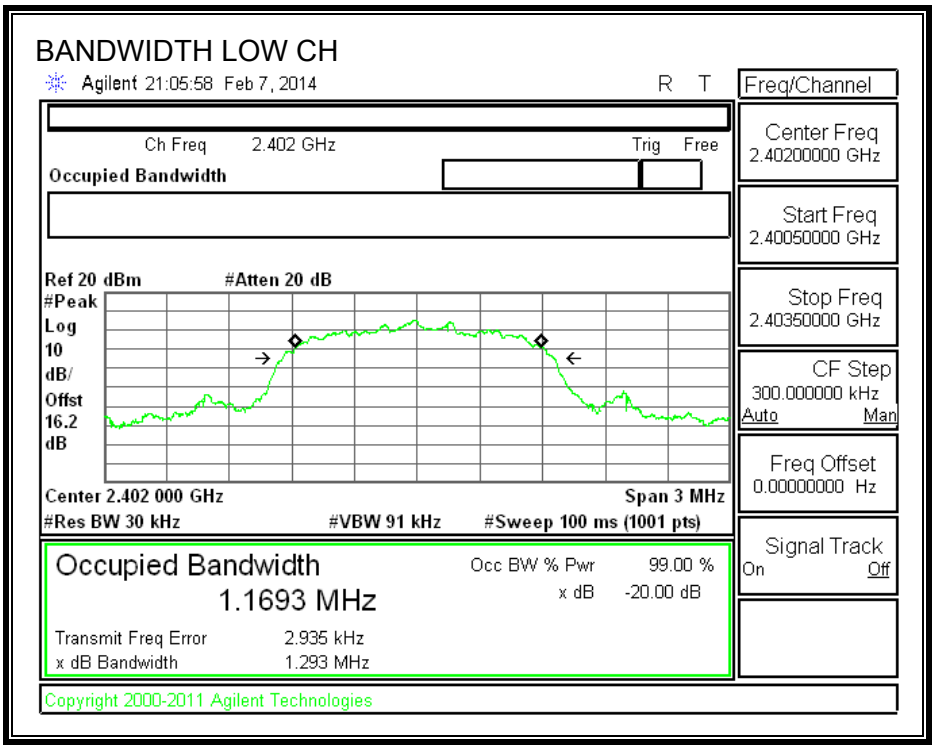
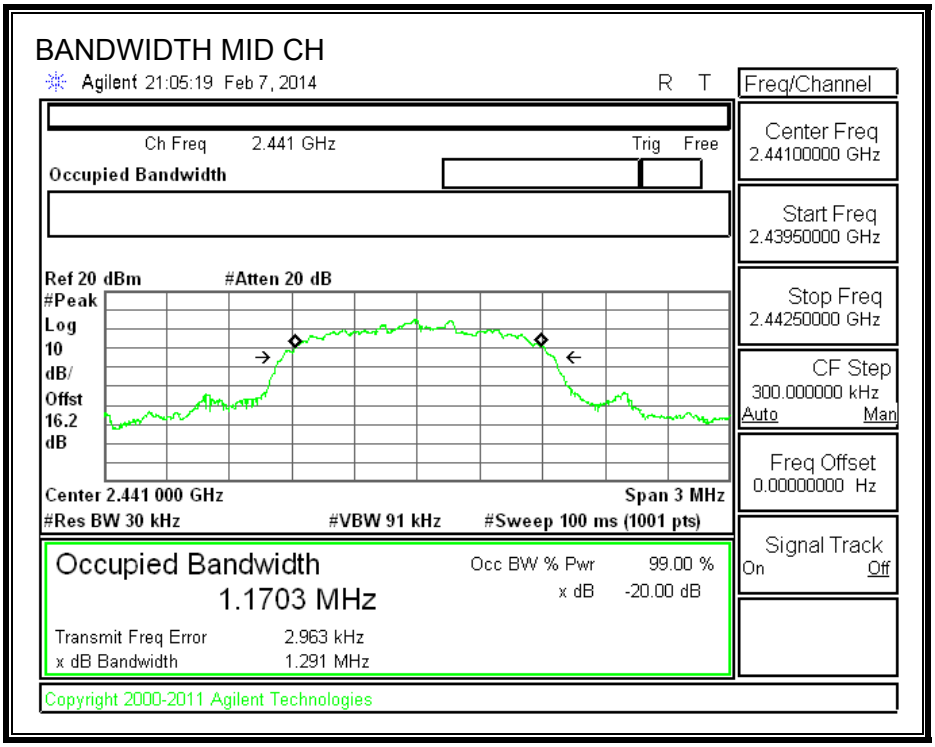
8PSK 20 dB BANDWIDTH





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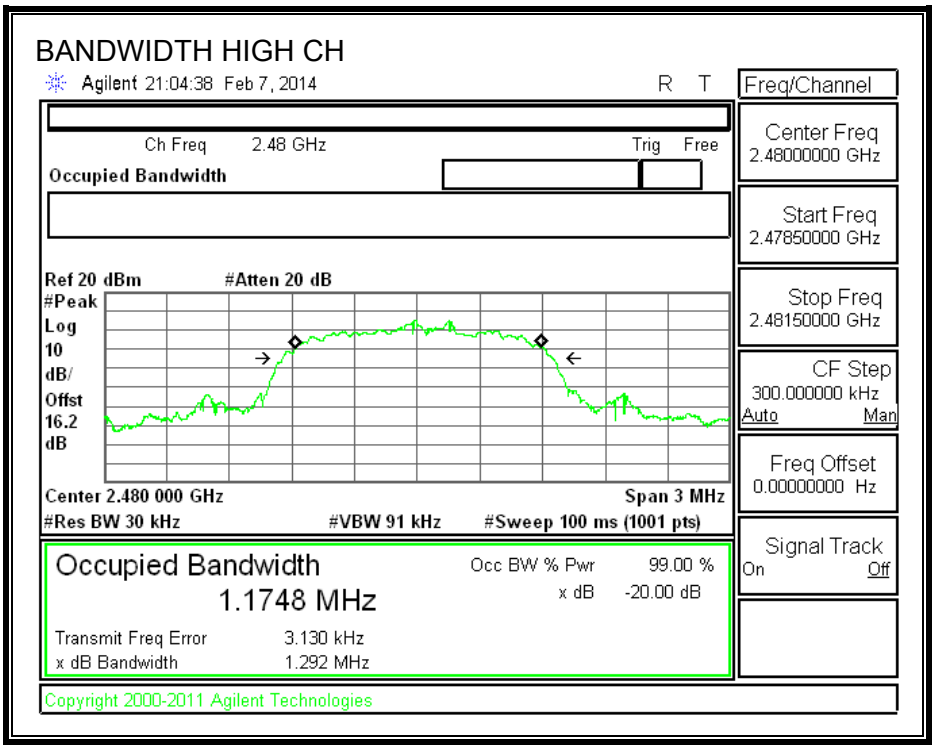

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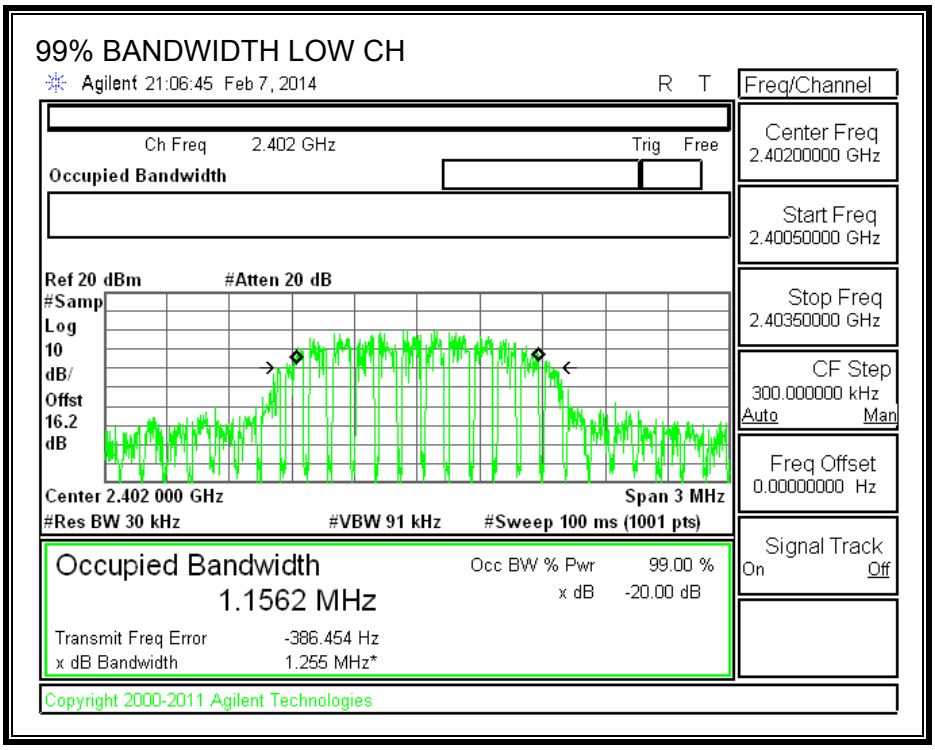
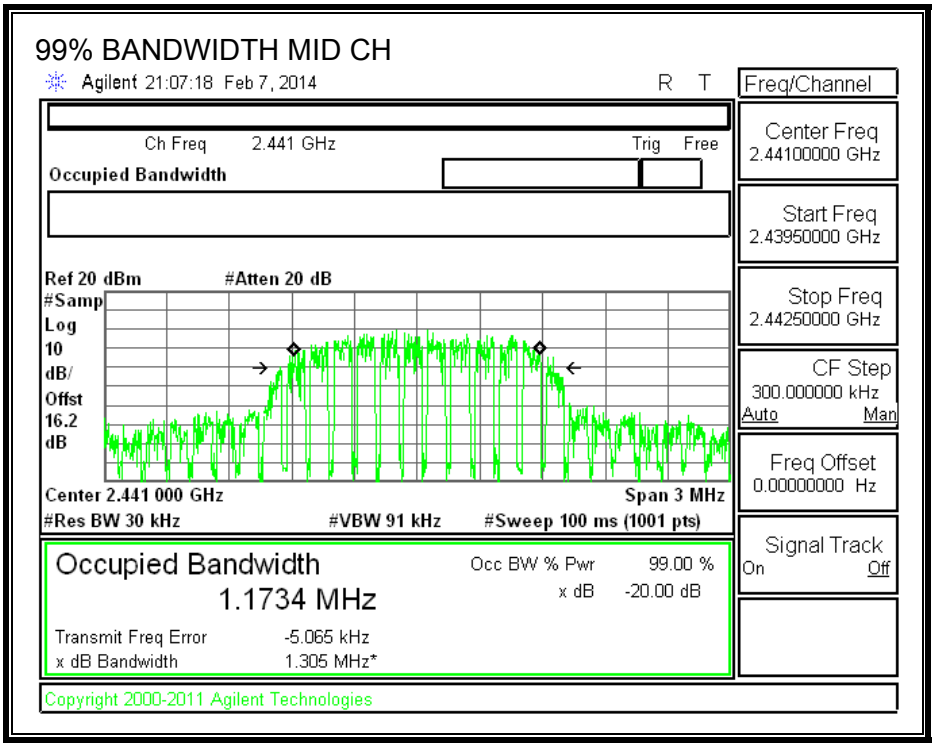
8PSK 99% BANDWIDTH





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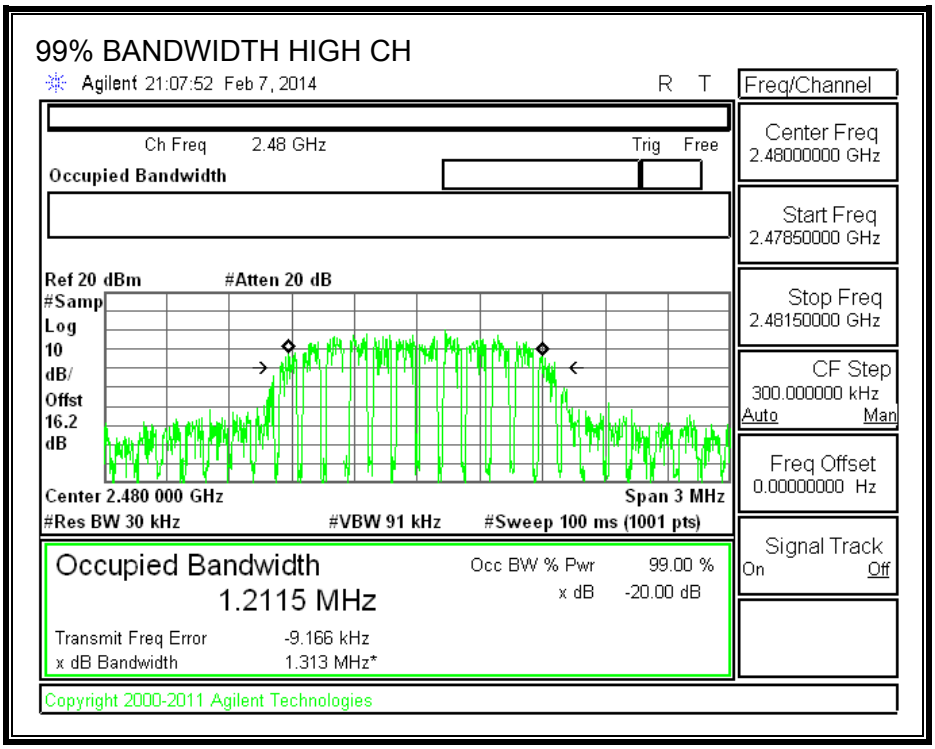

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8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

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

TEST PROCEDURE

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

RESULTS

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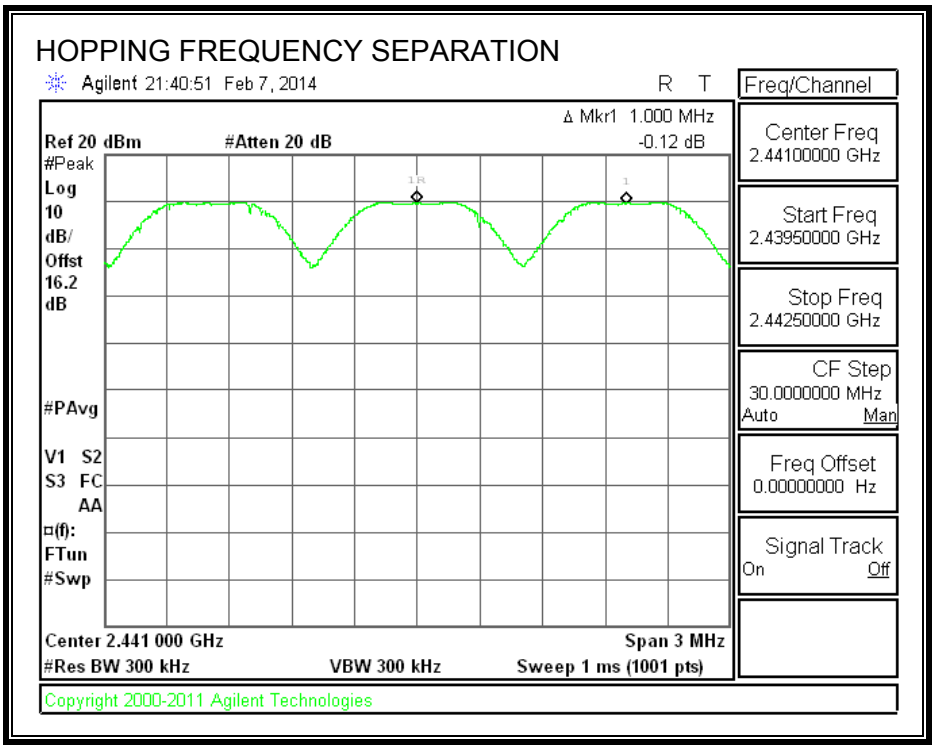
HOPPING FREQUENCY SEPARATION



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8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

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

RESULTS

Normal Mode: 79 Channels observed.

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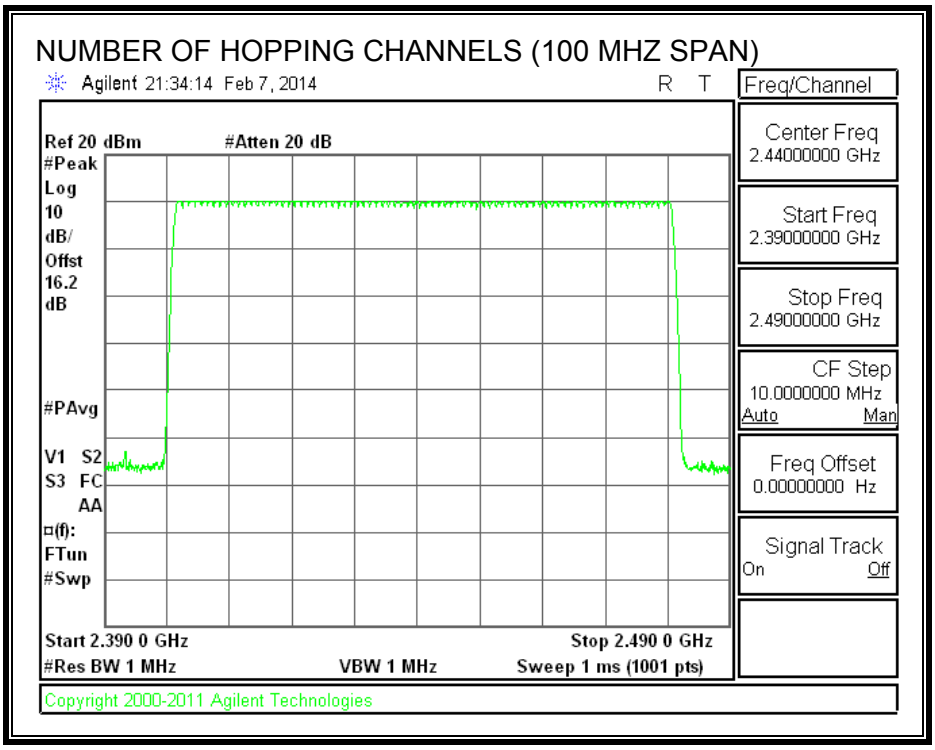
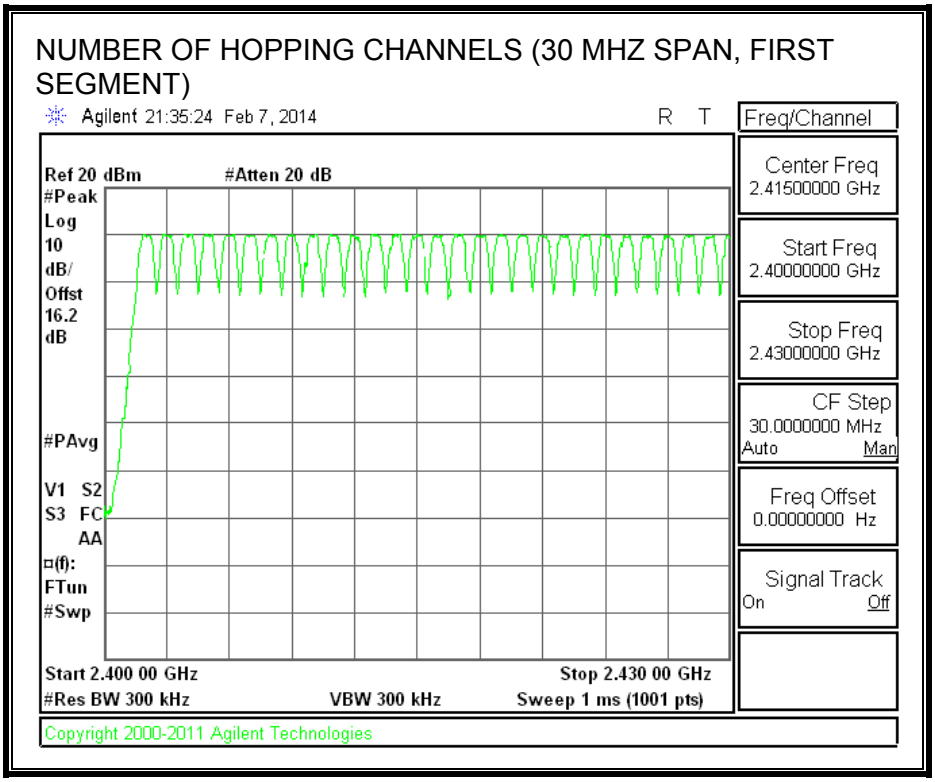
NUMBER OF HOPPING CHANNELS





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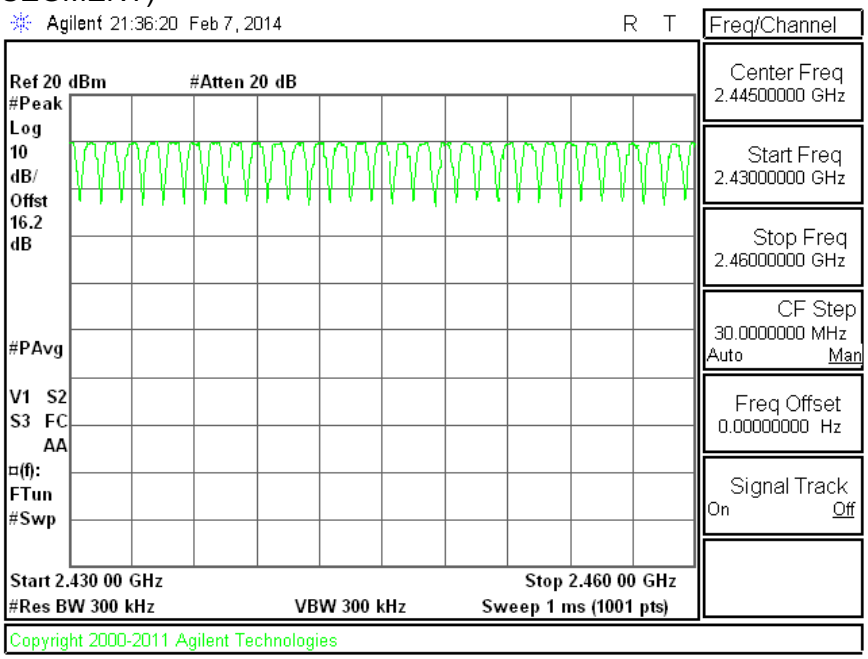
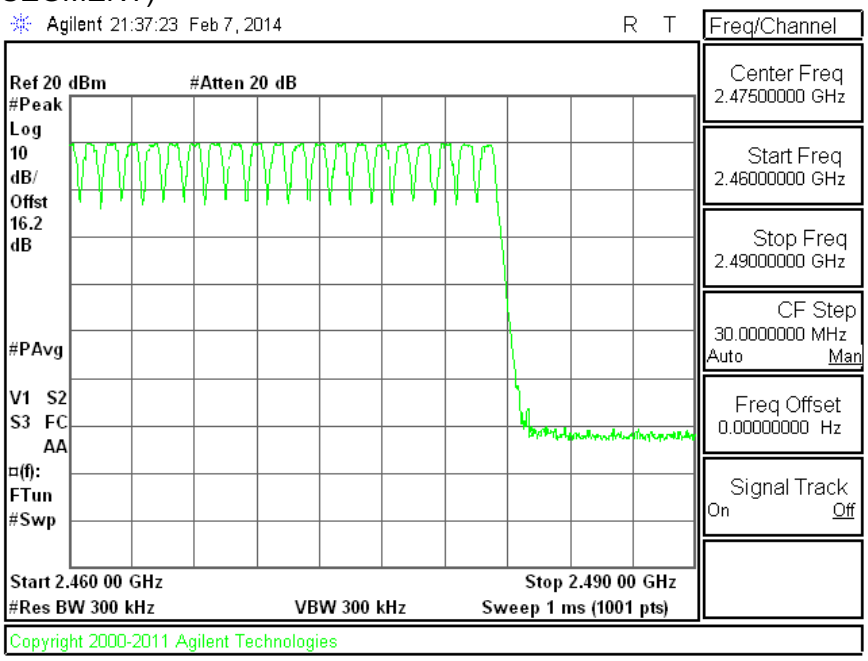
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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



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8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

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

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

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

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	0.379	32	0.121	0.4	-0.279
DH3	1.635	17	0.278	0.4	-0.122
DH5	2.88	10	0.288	0.4	-0.112
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	0.379	8	0.030	0.4	-0.370
DH3	1.635	5	0.082	0.4	-0.318
DH5	2.88	3	0.086	0.4	-0.314

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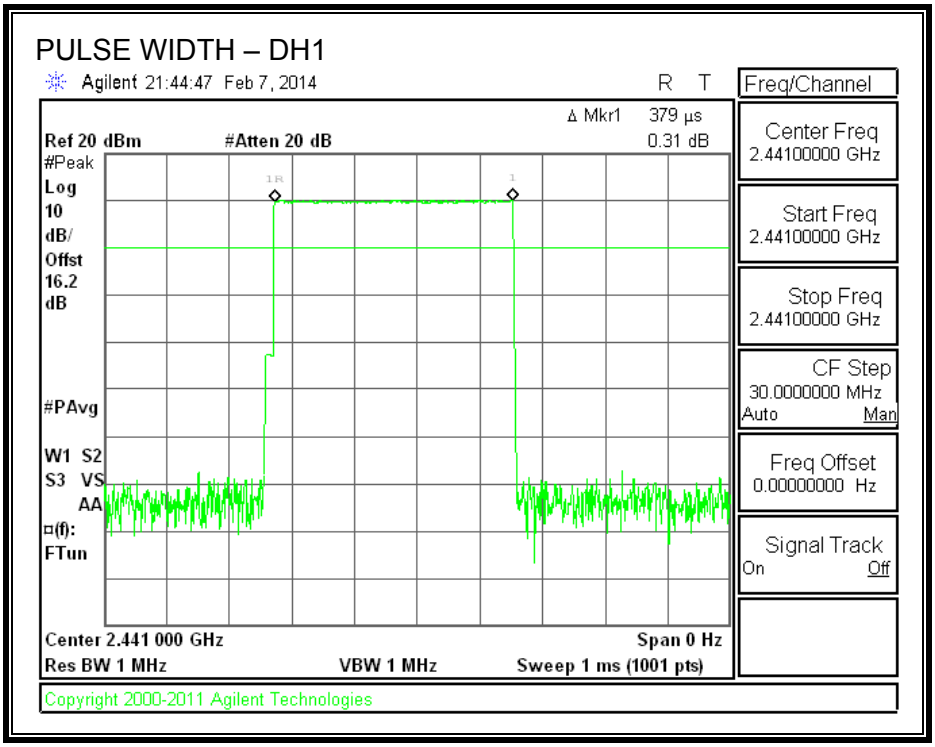
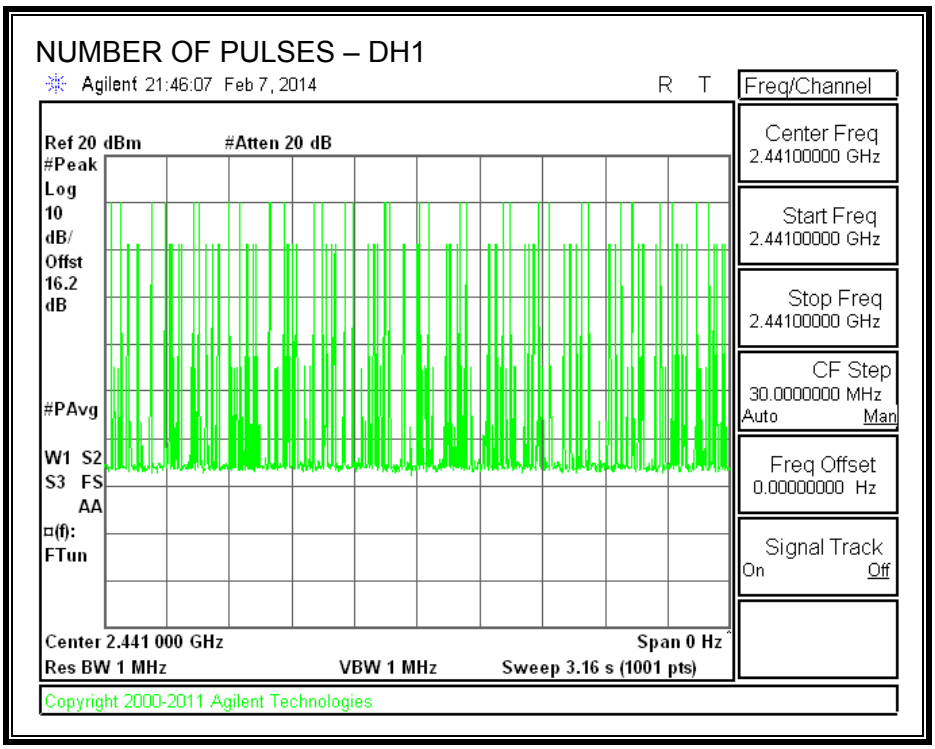
PULSE WIDTH - DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



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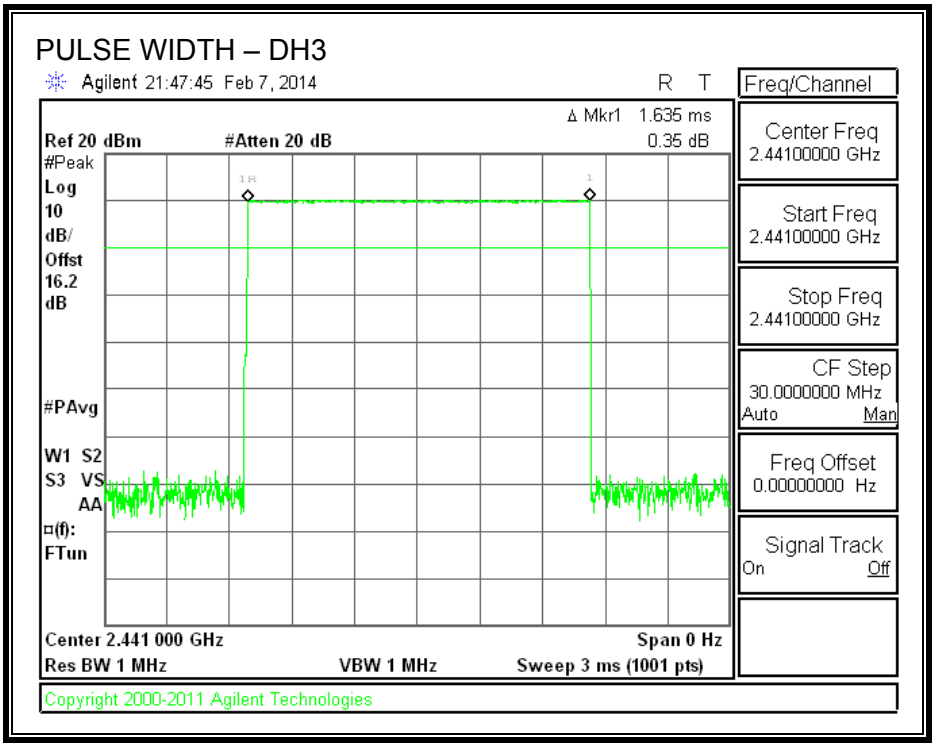
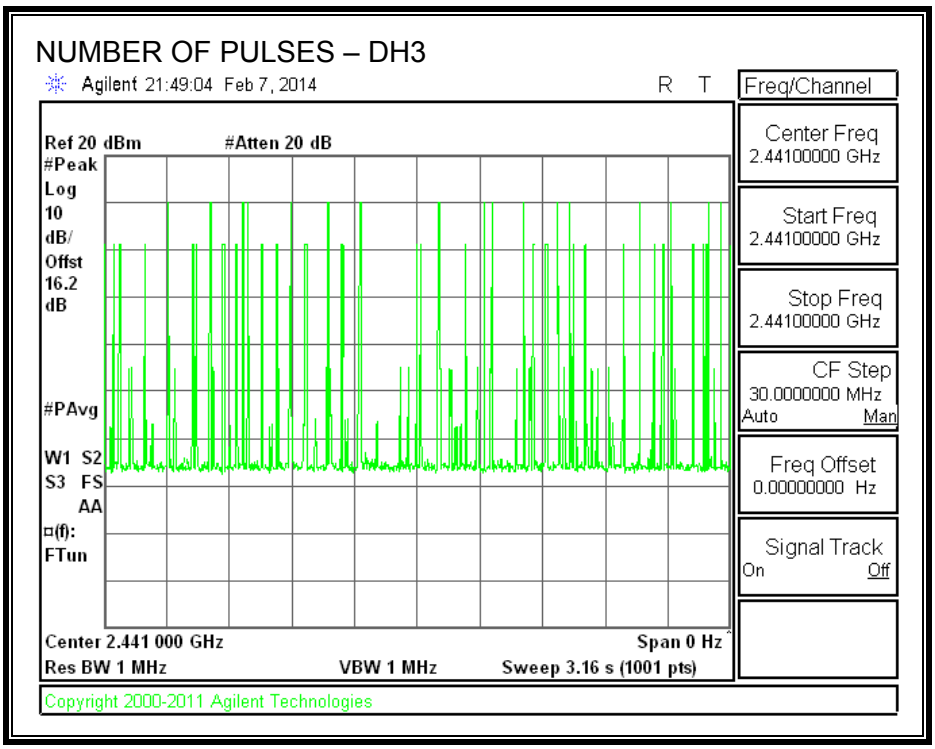
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



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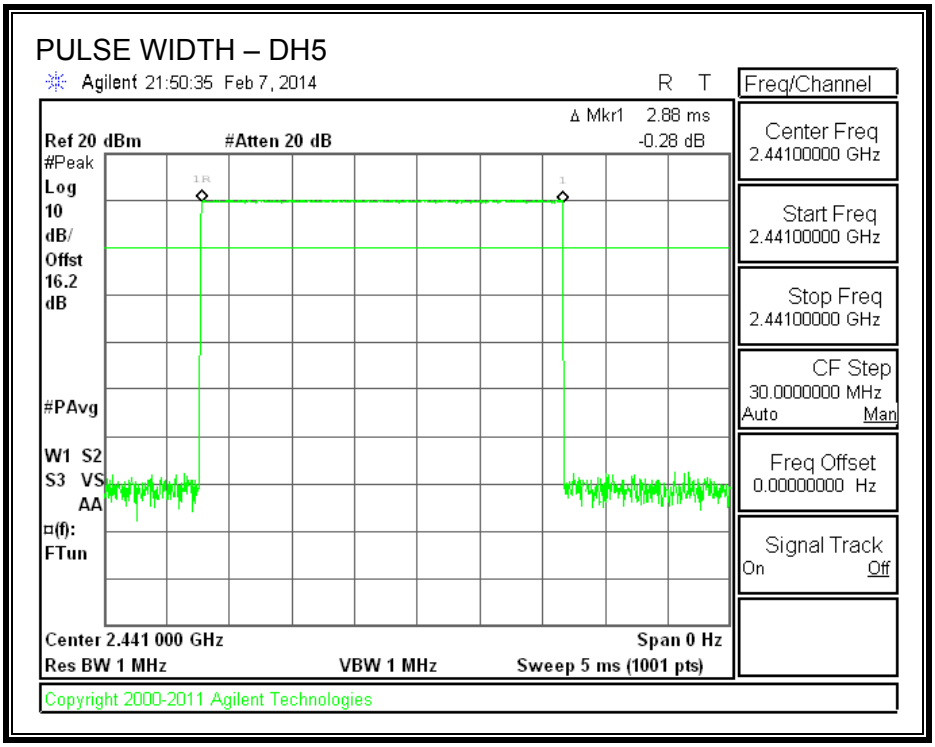
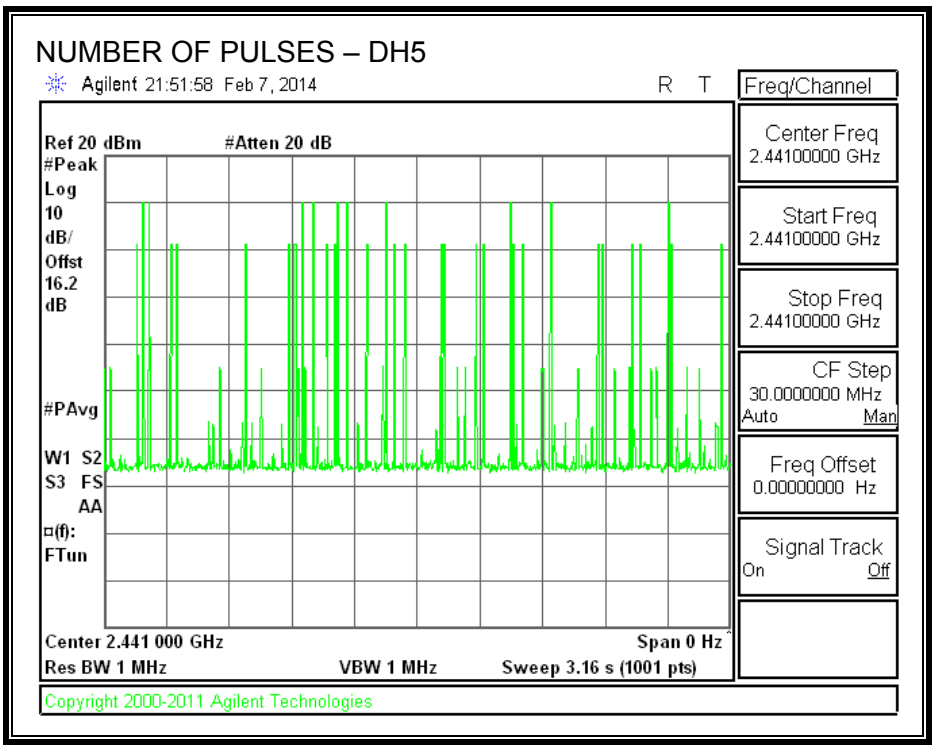
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



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8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.23	21	-10.77
Middle	2441	10.09	21	-10.91
High	2480	10.04	21	-10.96
Worst		10.23		-10.77

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.43	21	-10.57
Middle	2441	10.29	21	-10.71
High	2480	10.25	21	-10.75
Worst		10.43		-10.57

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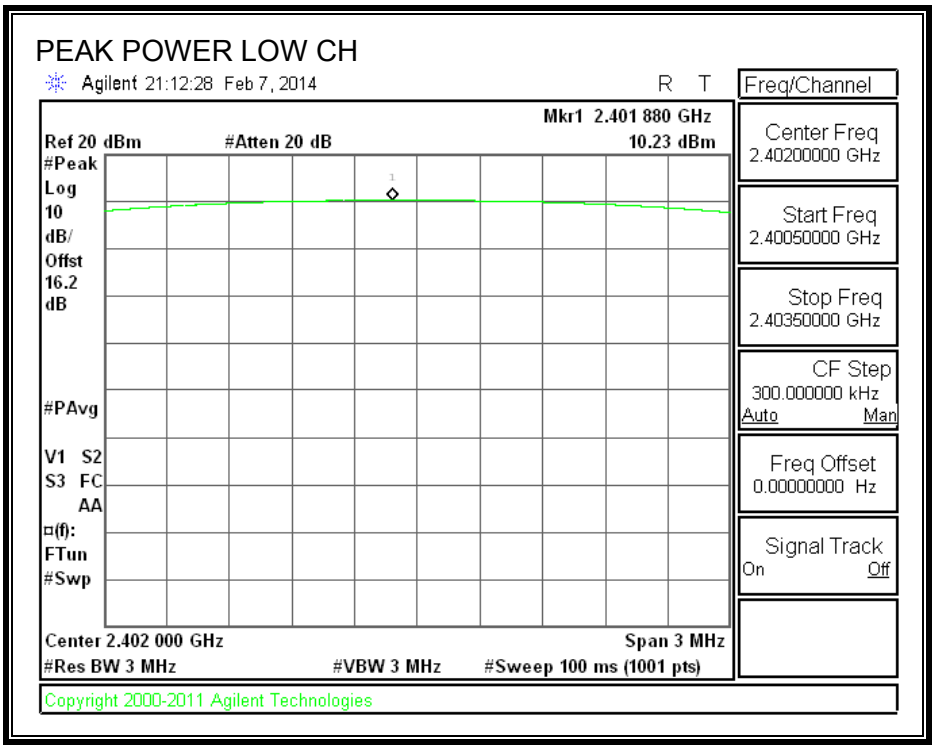
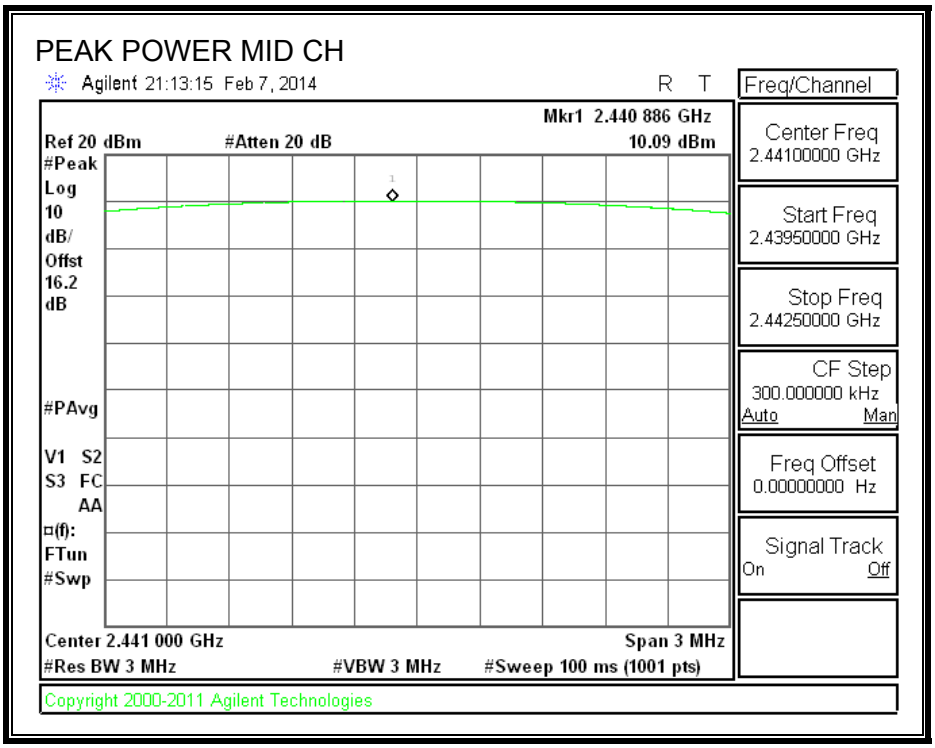
GFSK OUTPUT POWER





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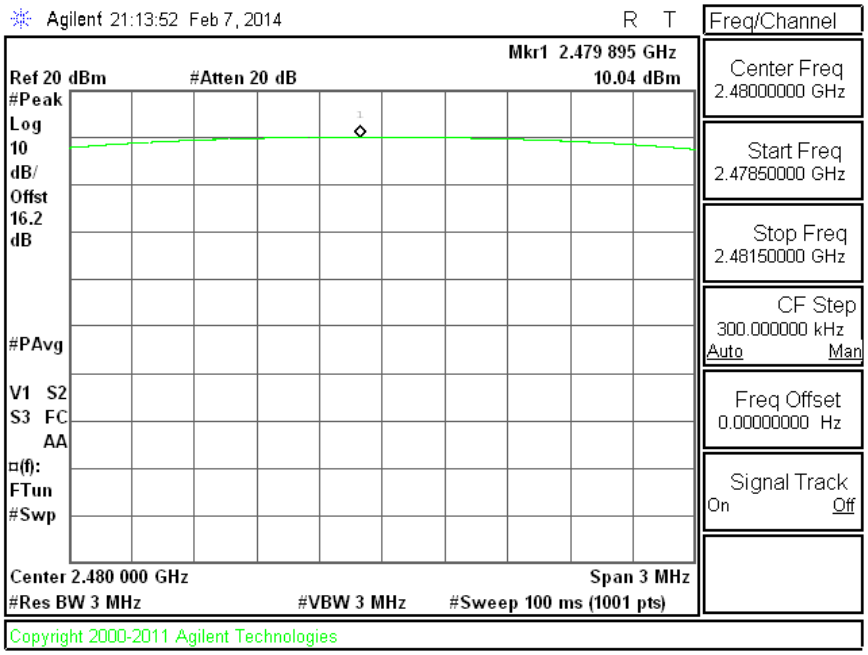
PEAK POWER HIGH CH



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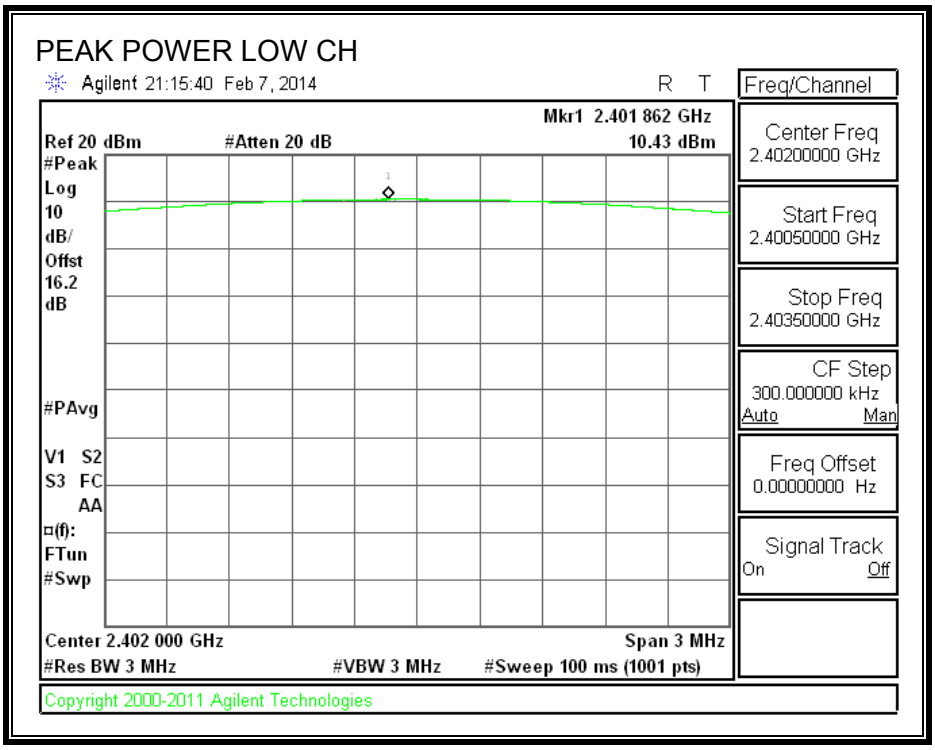
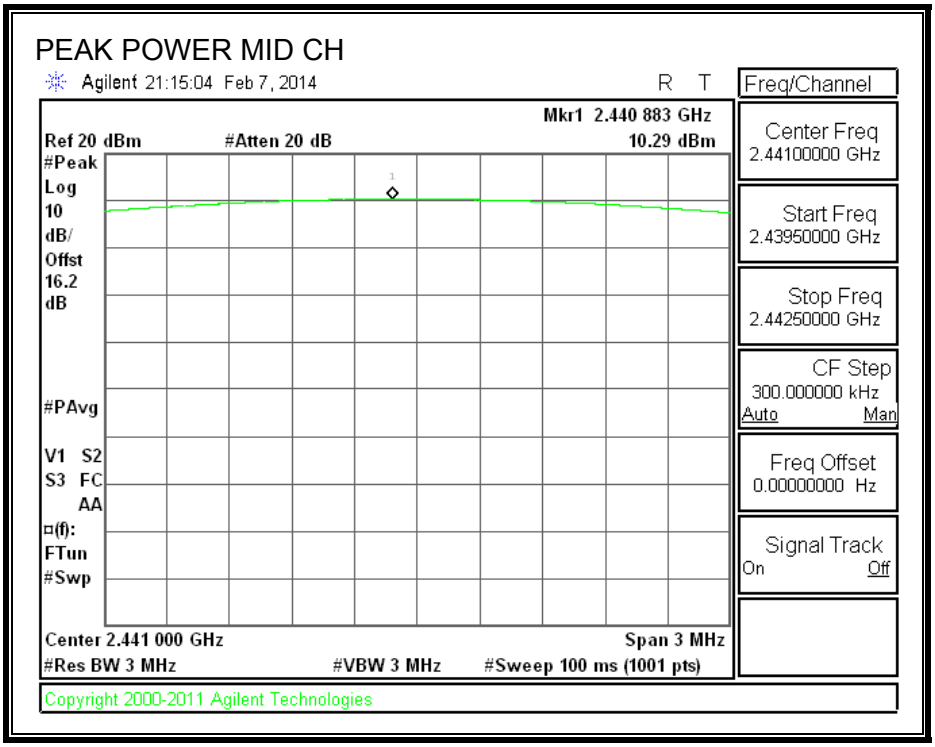
8PSK OUTPUT POWER





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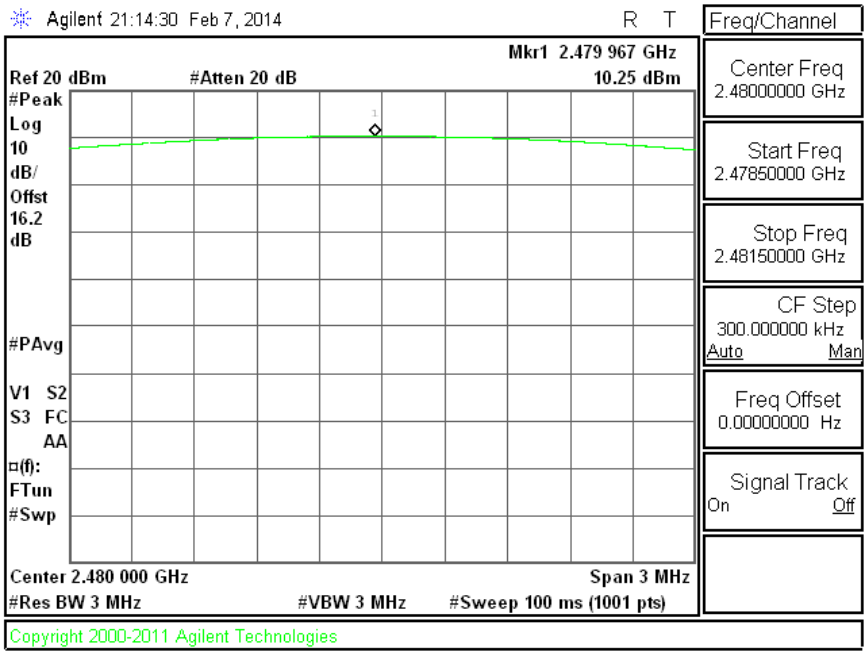
PEAK POWER HIGH CH



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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	10.10
Middle	2441	9.90
High	2480	9.70
Worst		10.10

8.6.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.60
Middle	2441	7.60
High	2480	7.30
Worst		7.60

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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

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

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

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

RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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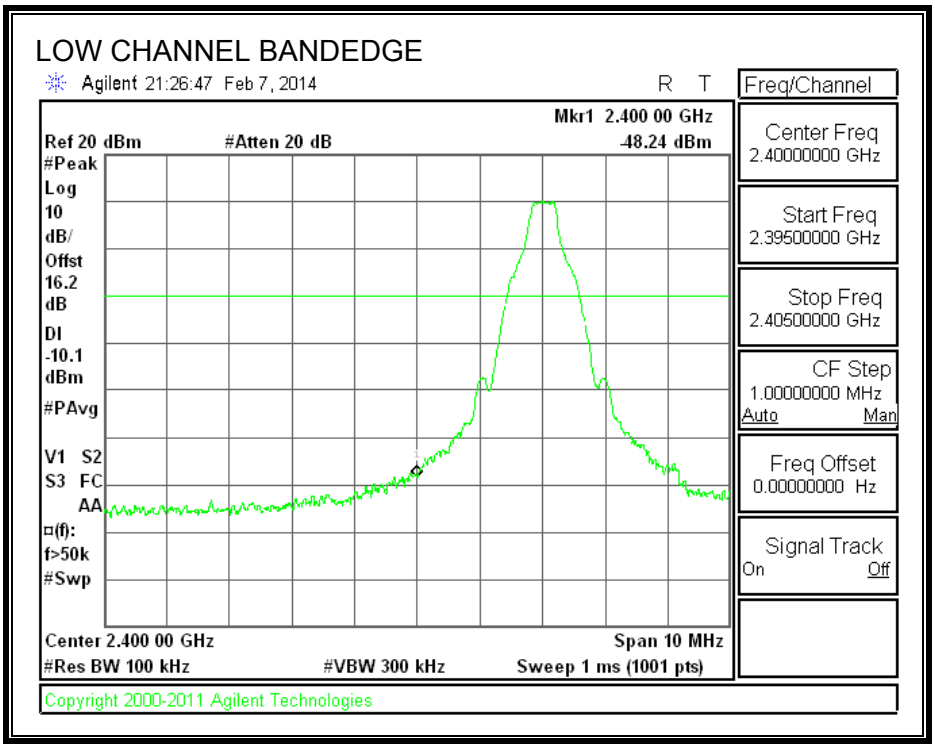
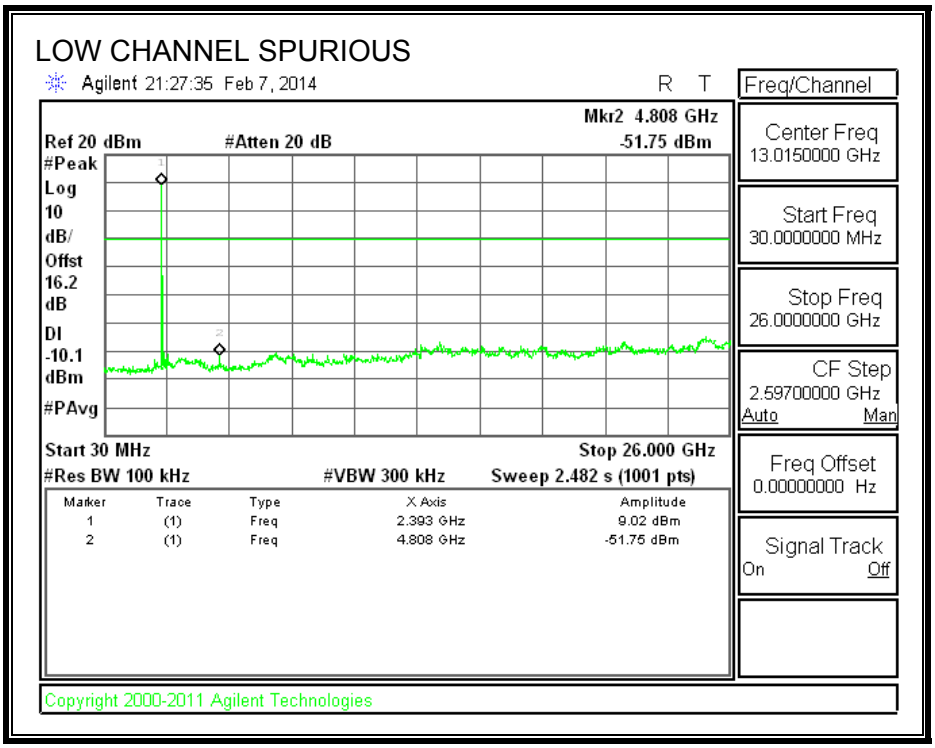
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL





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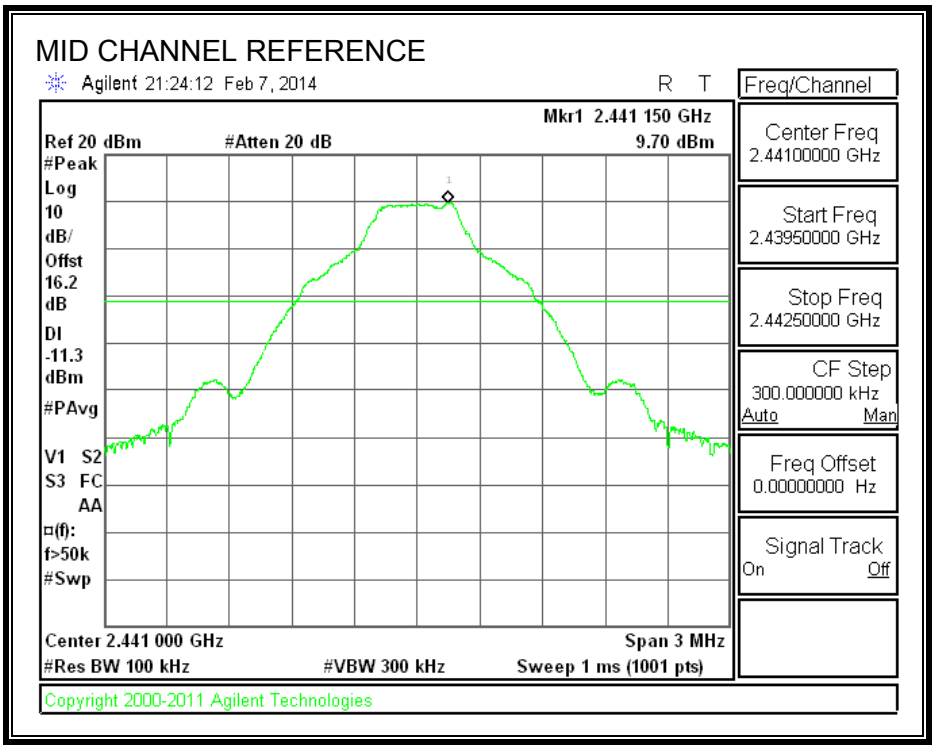
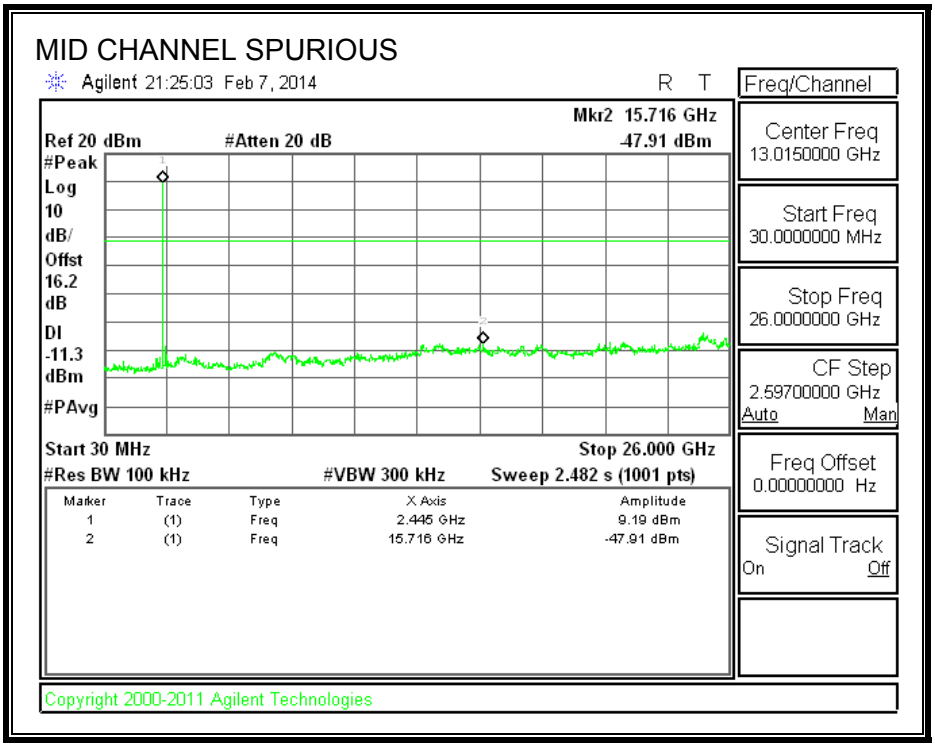
SPURIOUS EMISSIONS, MID CHANNEL





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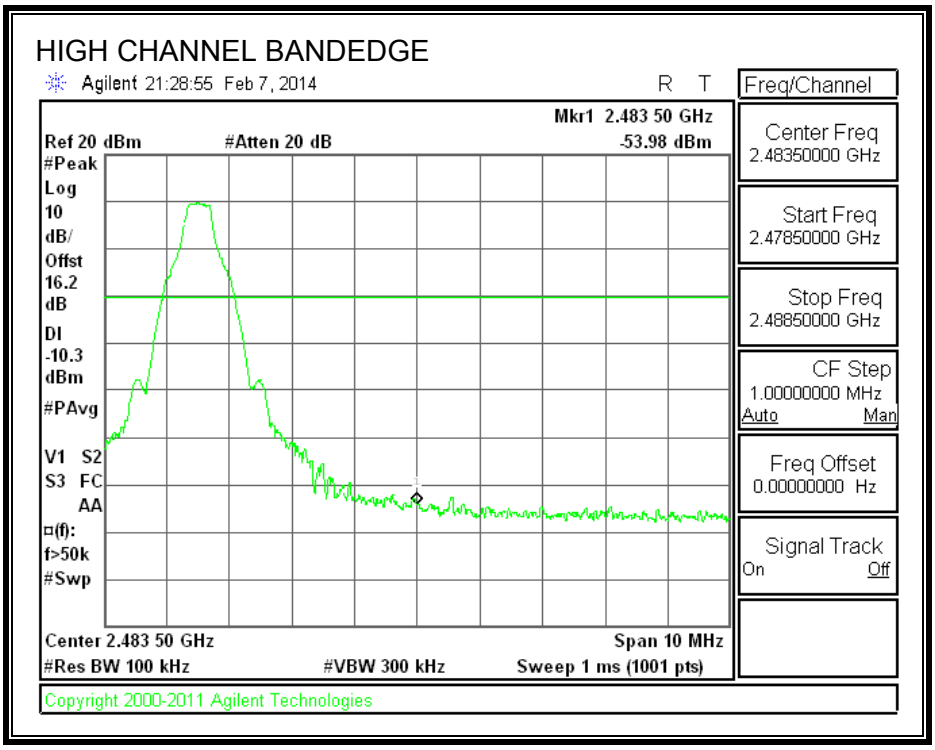
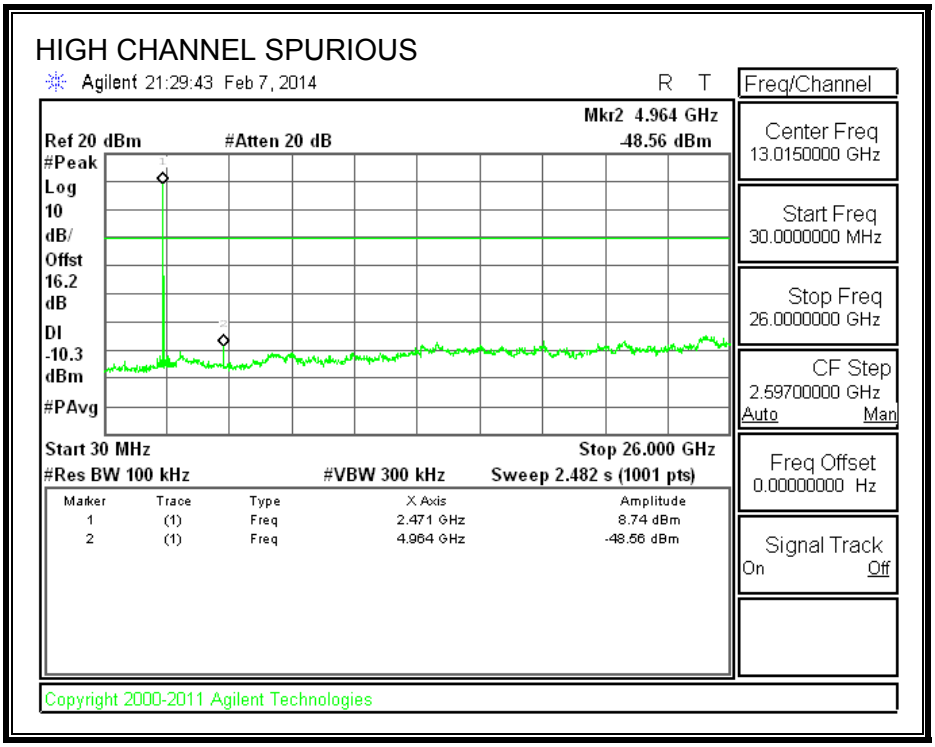
SPURIOUS EMISSIONS, HIGH CHANNEL





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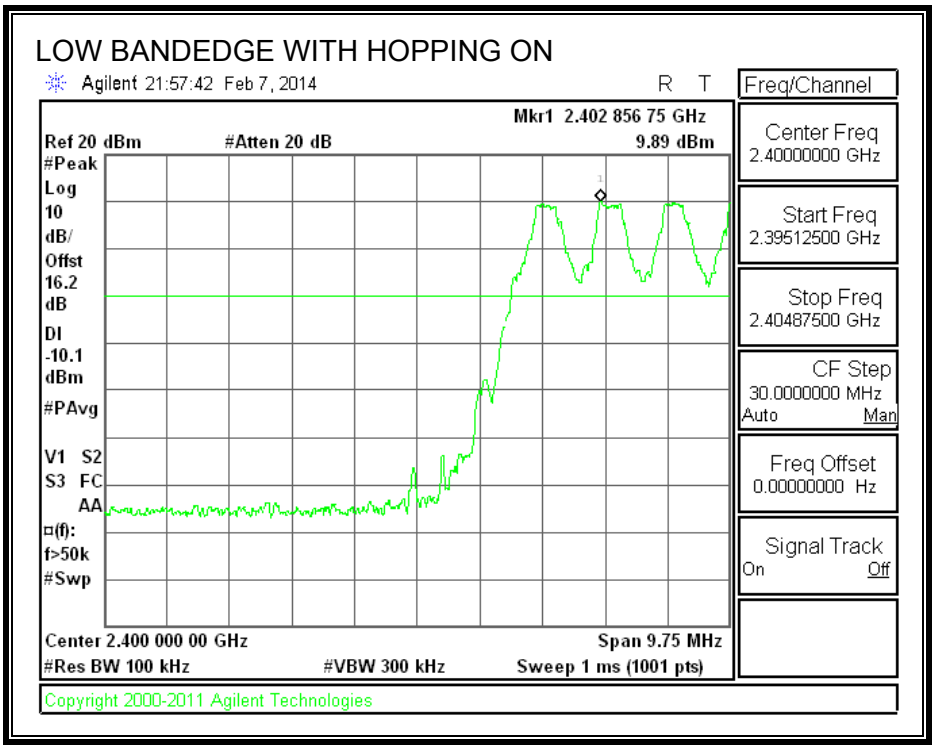
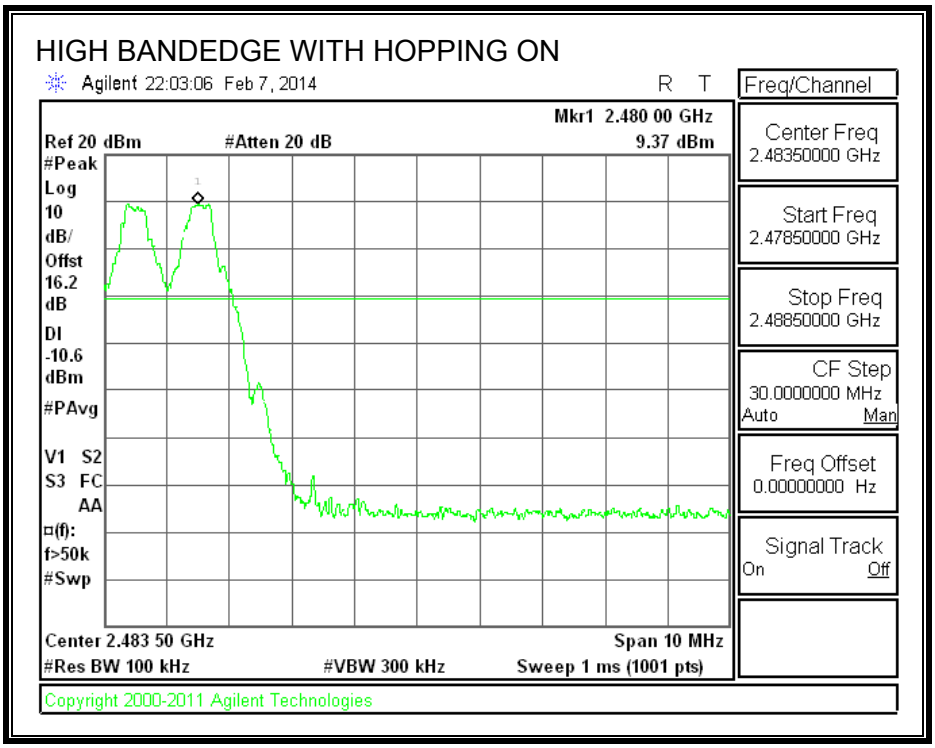
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





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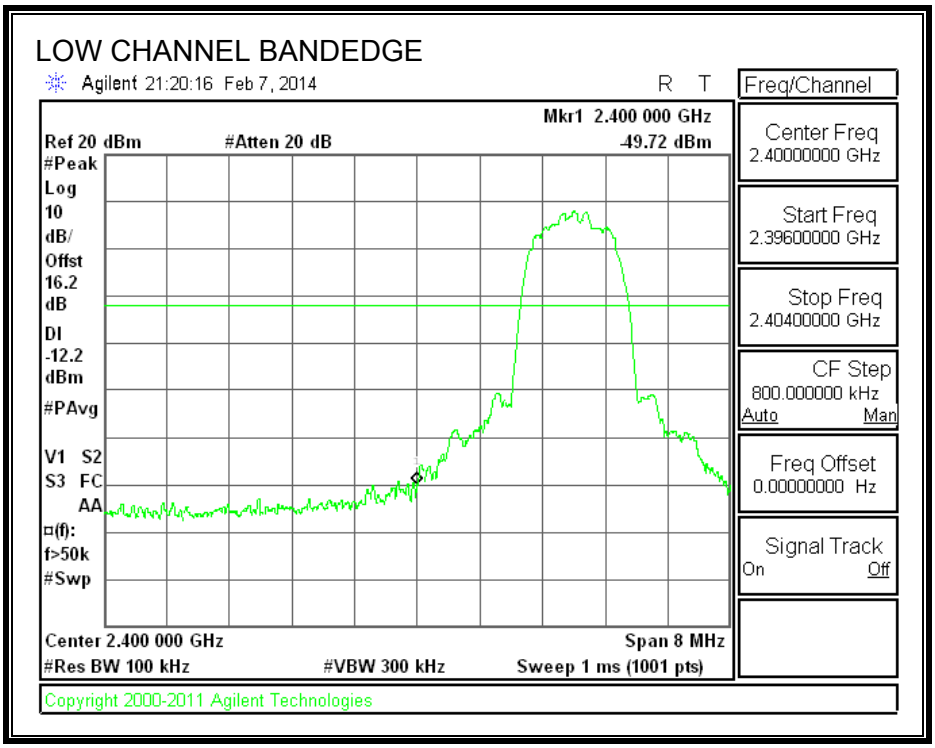
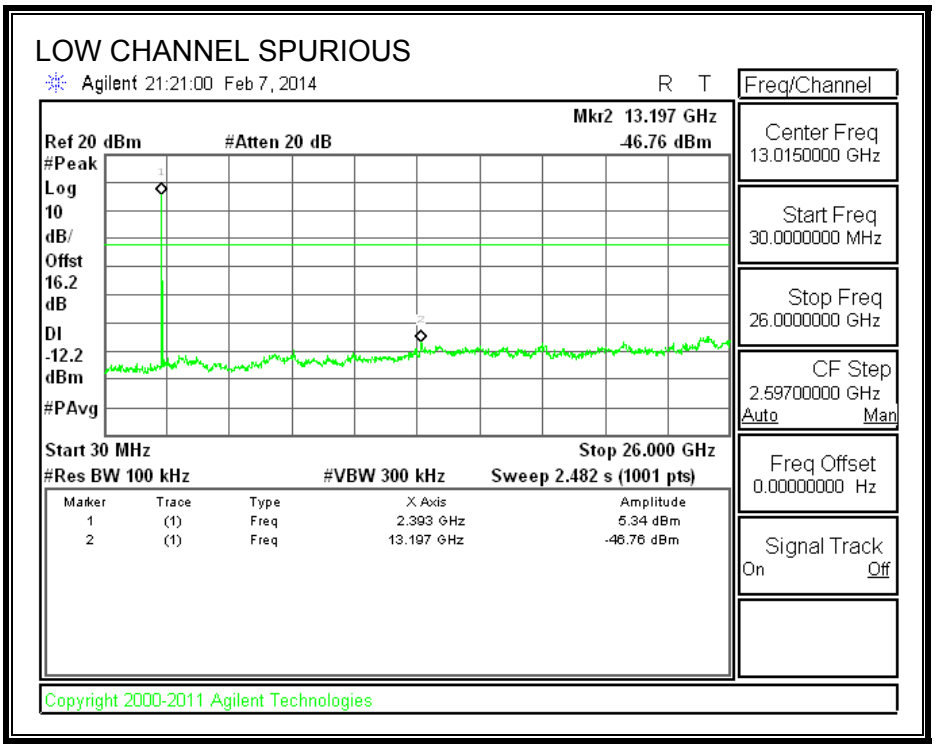
8.7.1. ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL





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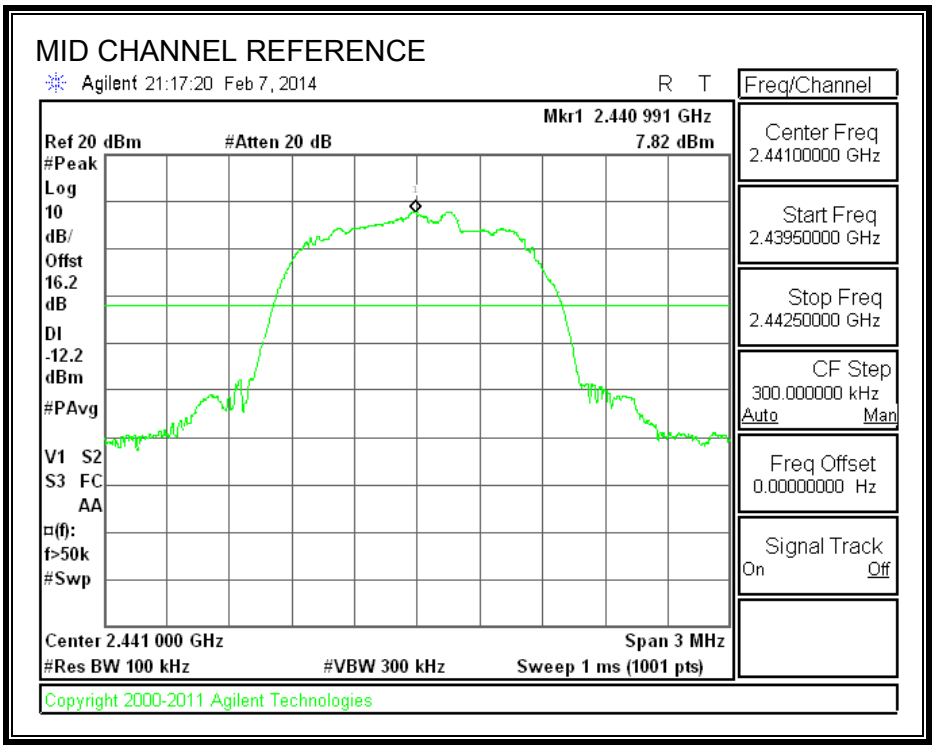
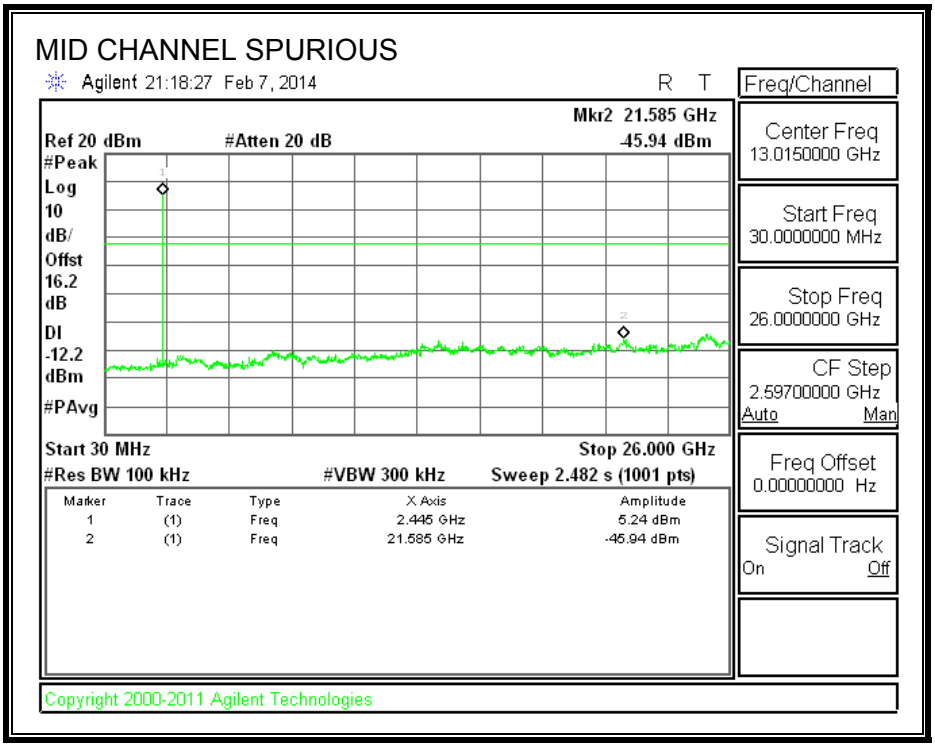
SPURIOUS EMISSIONS, MID CHANNEL





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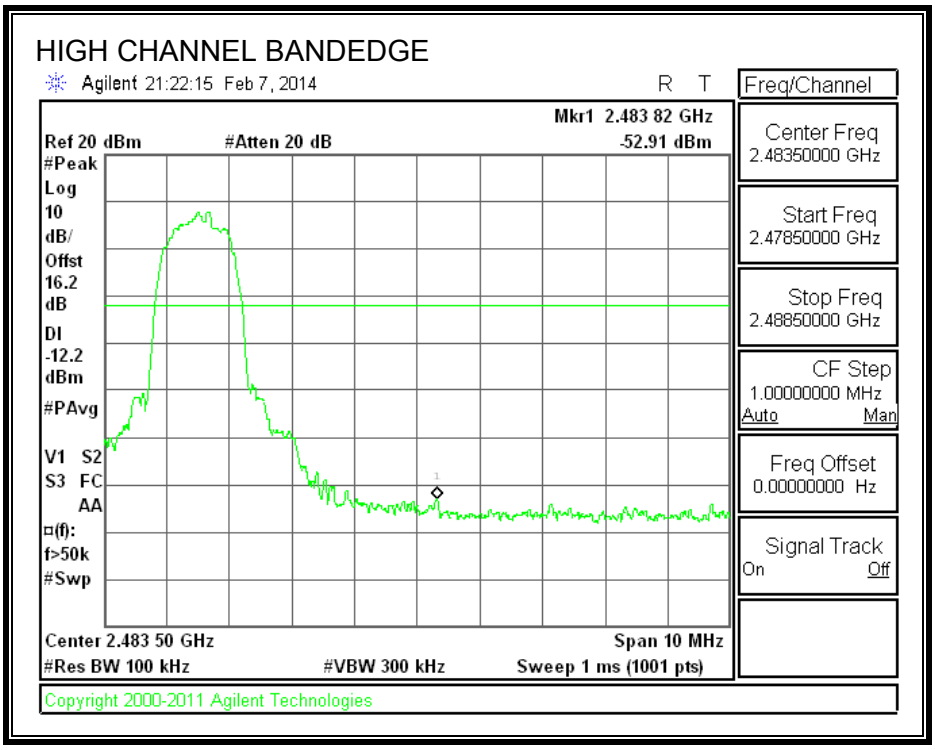
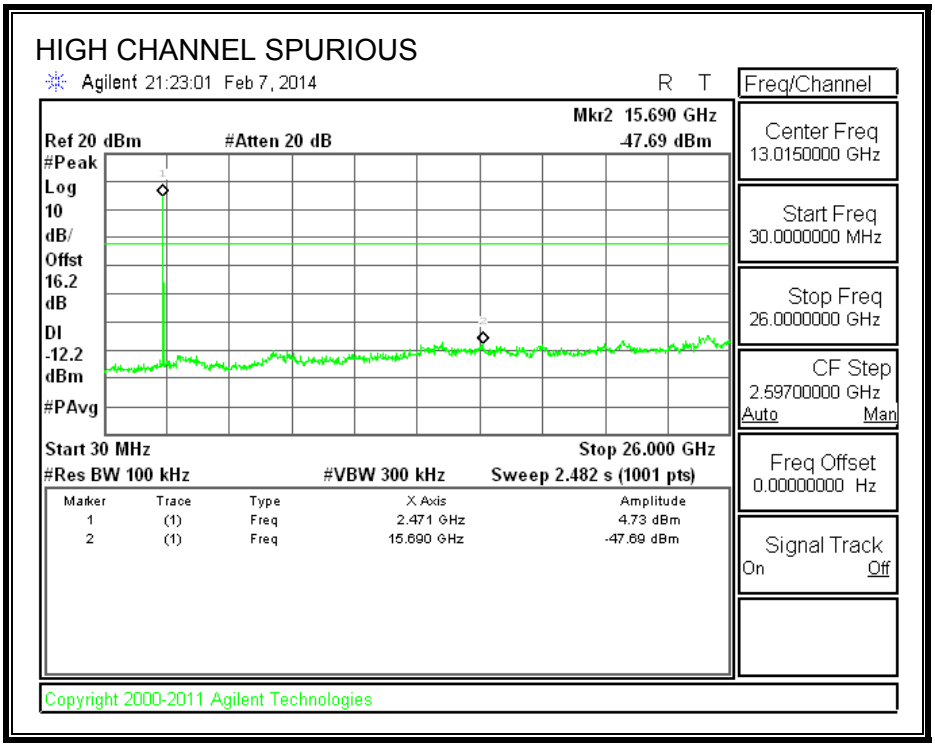
SPURIOUS EMISSIONS, HIGH CHANNEL





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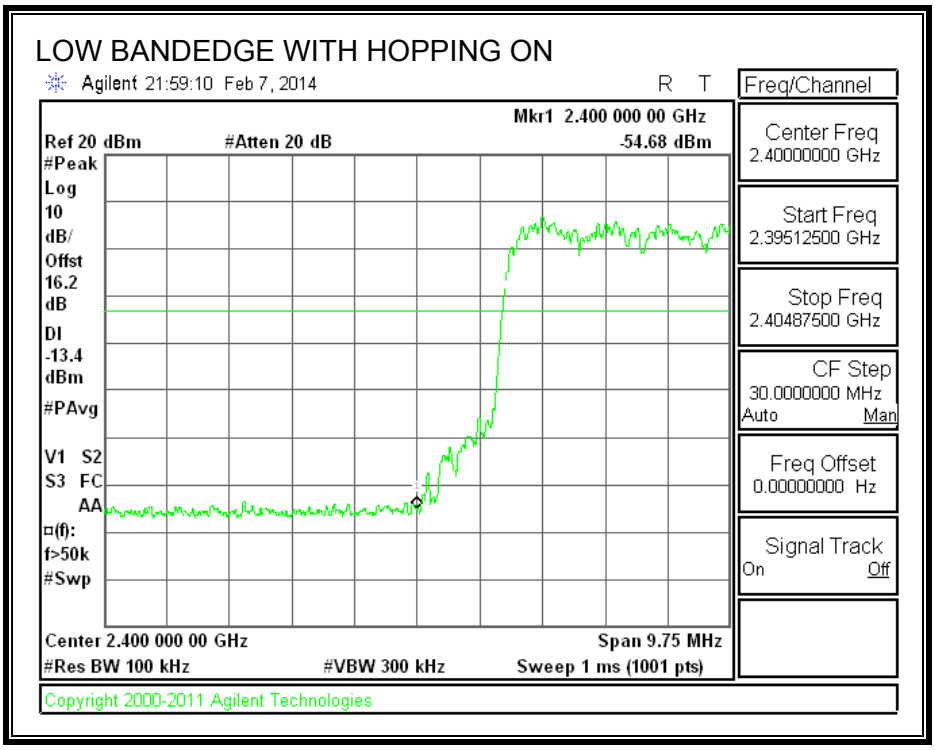
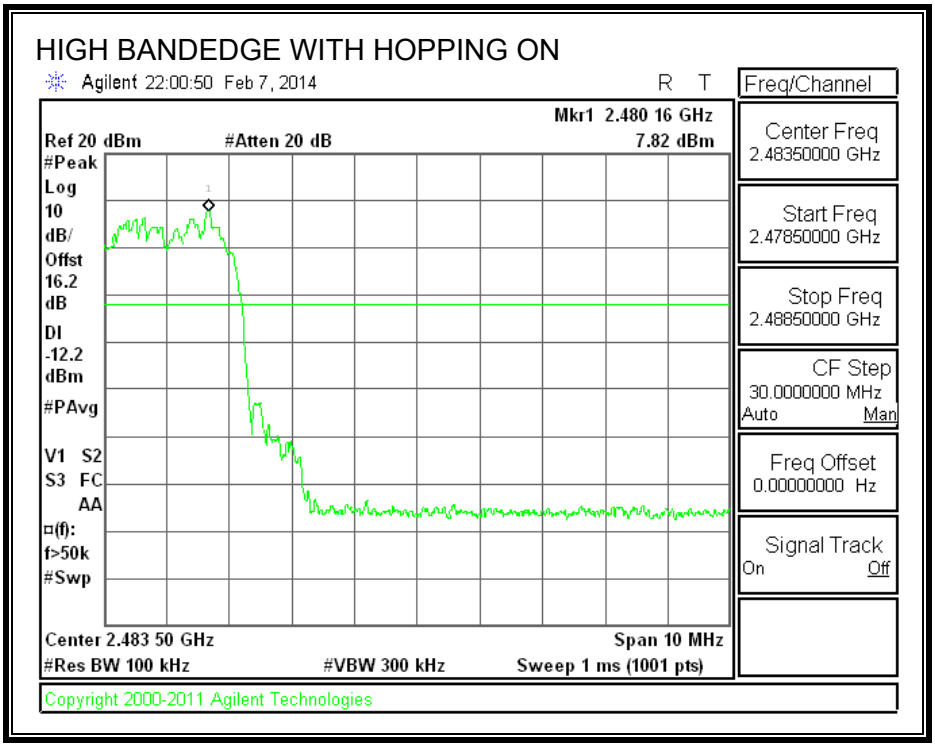
SPURIOUS BANDEDGE EMISSIONS WITH 8PSK HOPPING ON





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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

For 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 / 2.881ms = 360Hz.

The spectrum from 1GHz 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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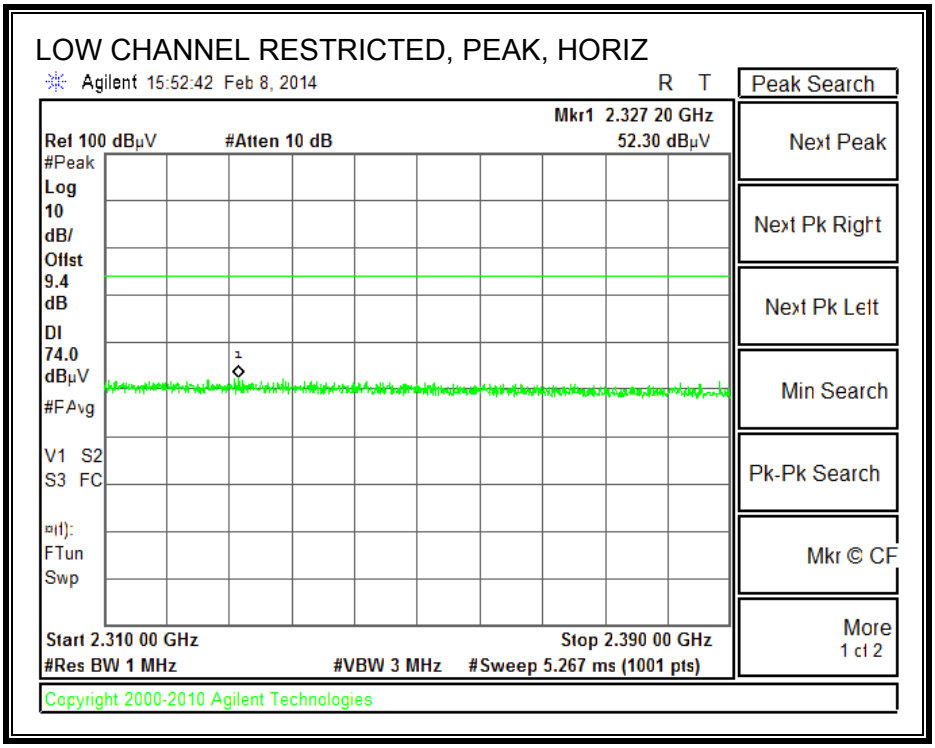
9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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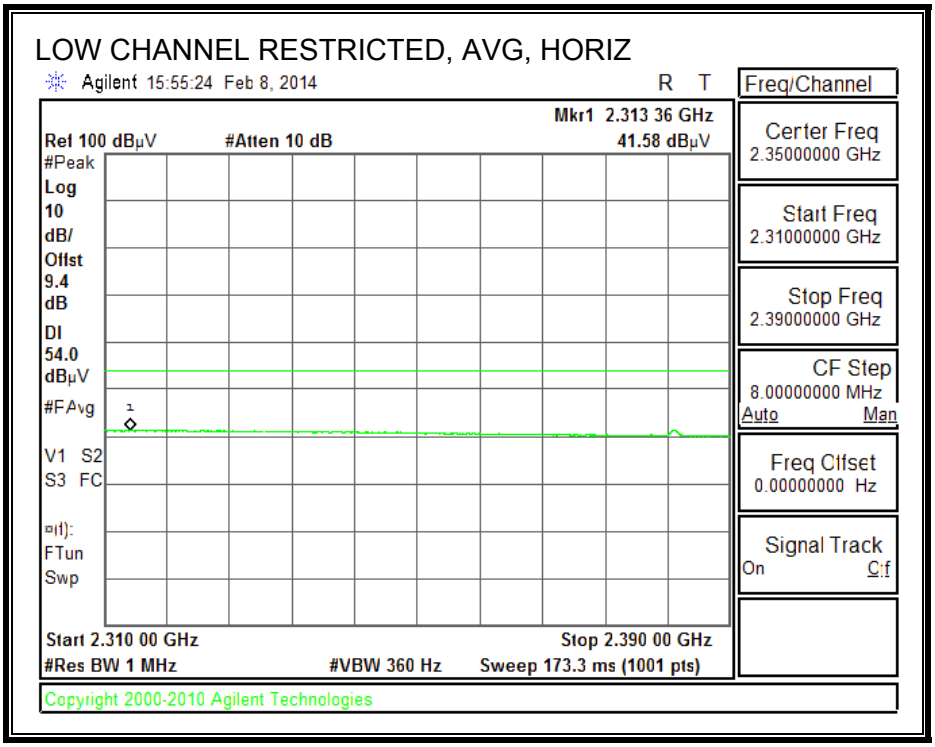
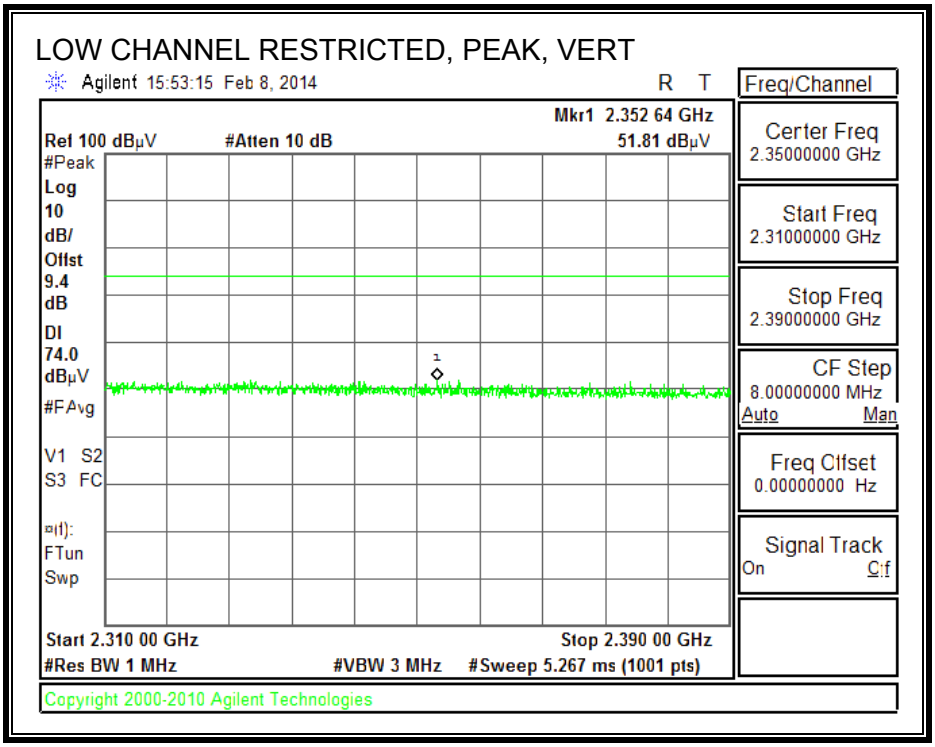


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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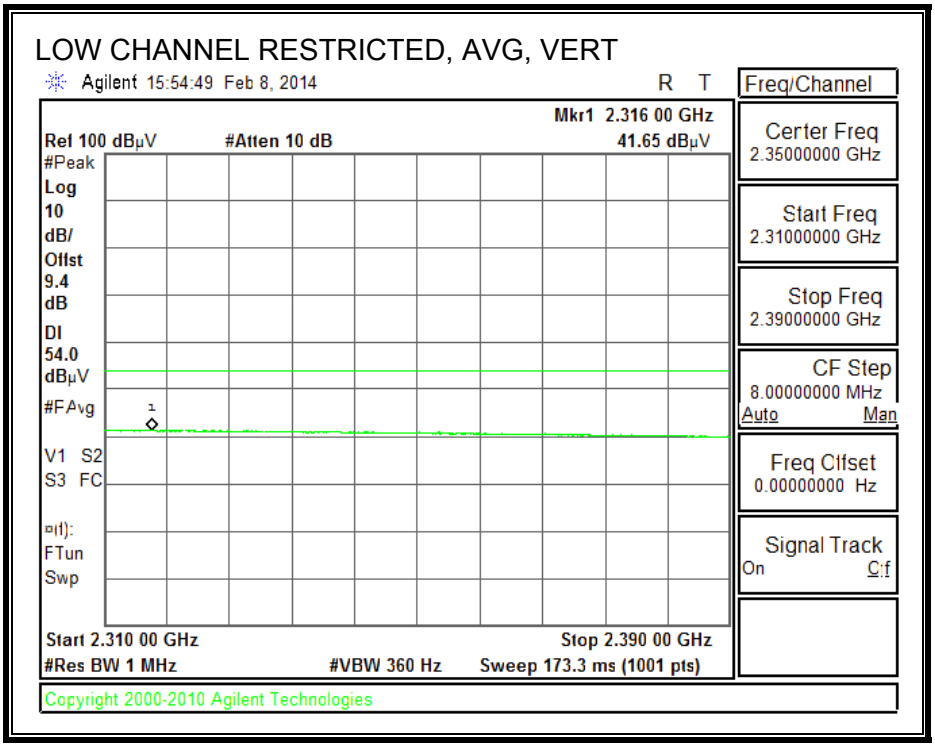
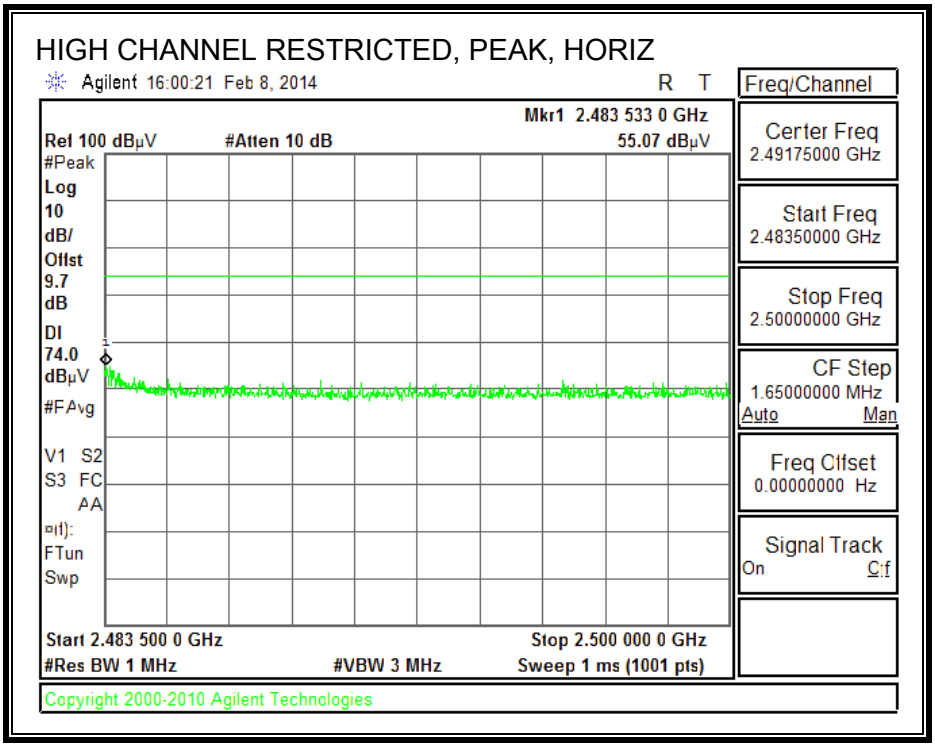


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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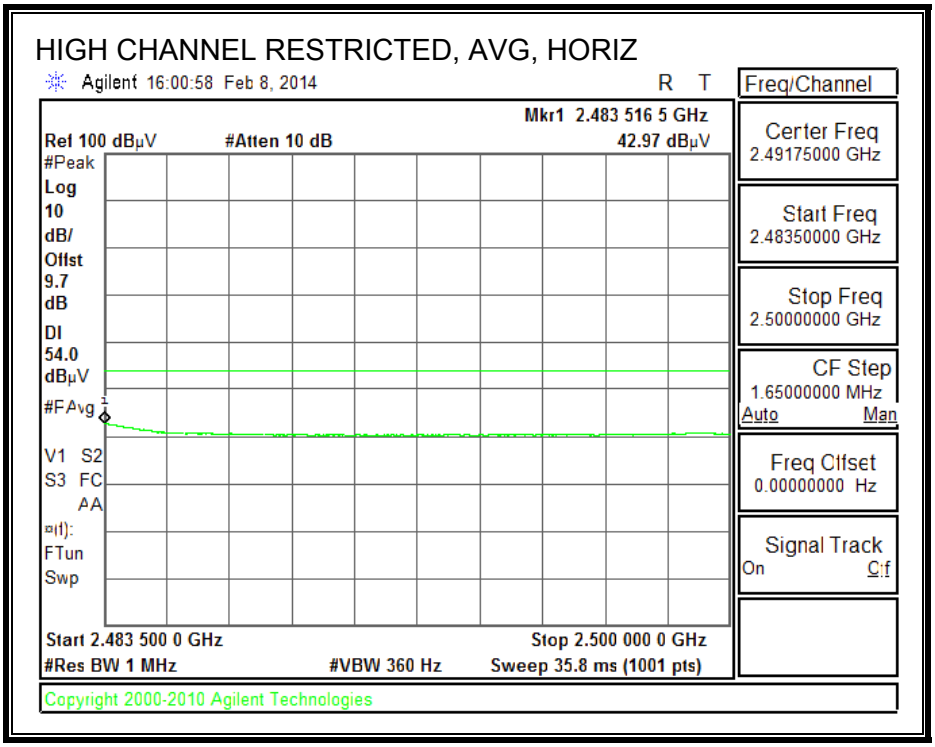
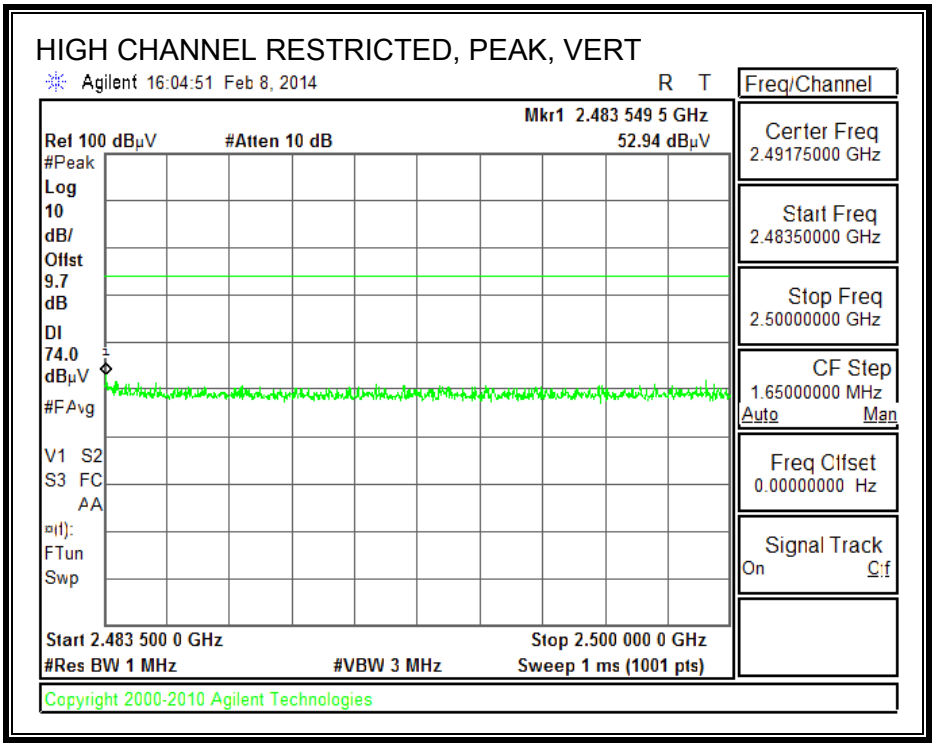


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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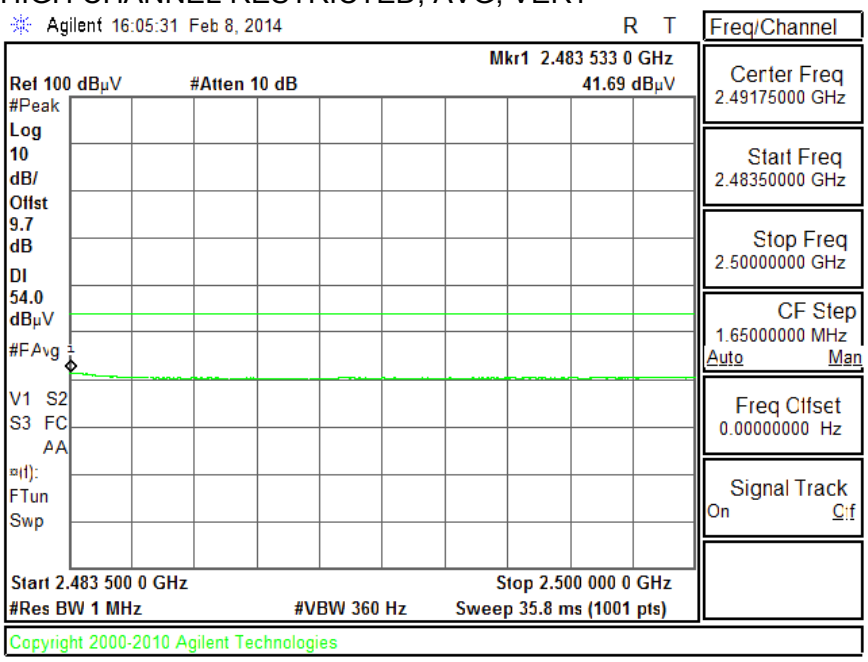
HIGH CHANNEL RESTRICTED, AVG, VERT



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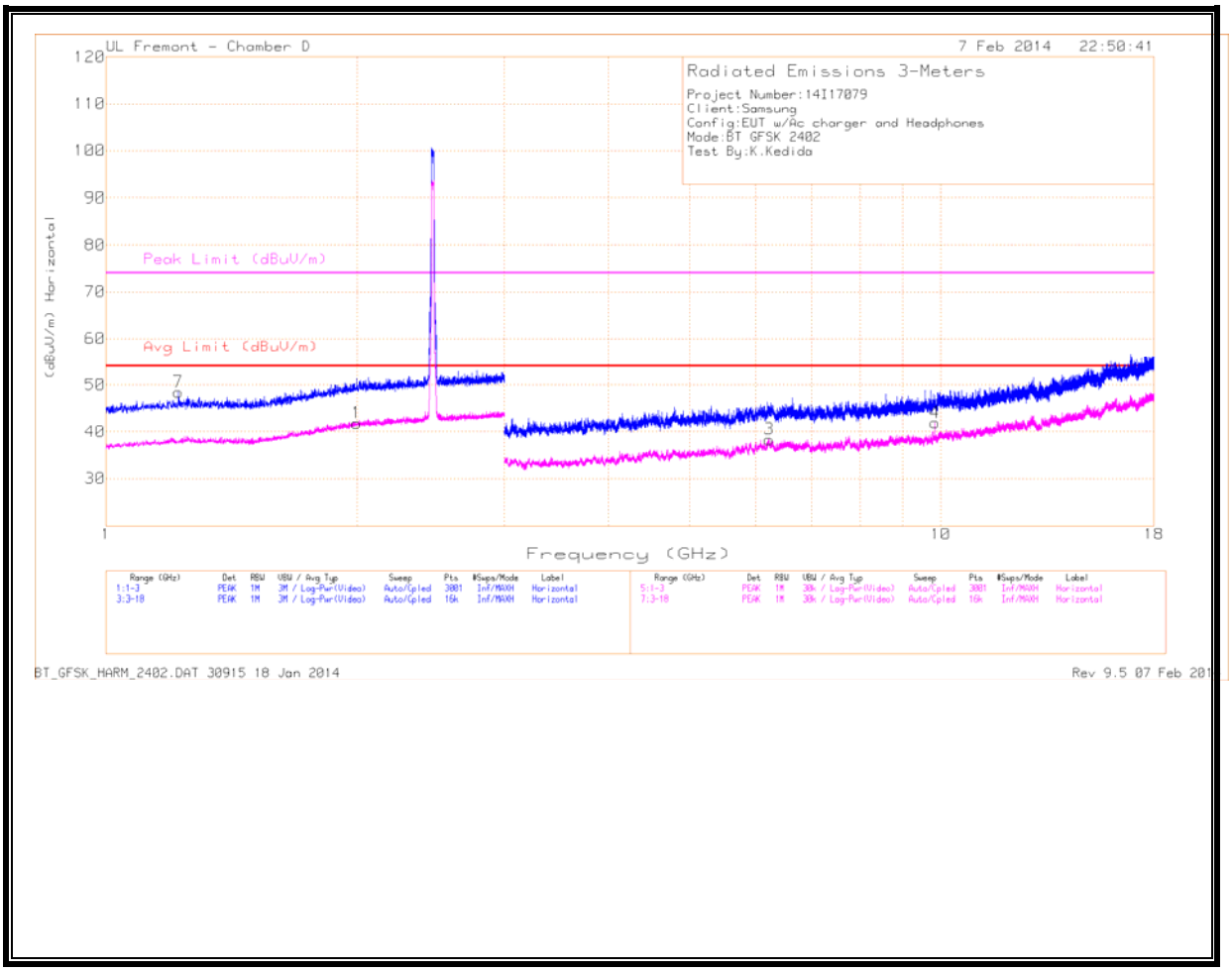
HARMONICS AND SPURIOUS EMISSIONS

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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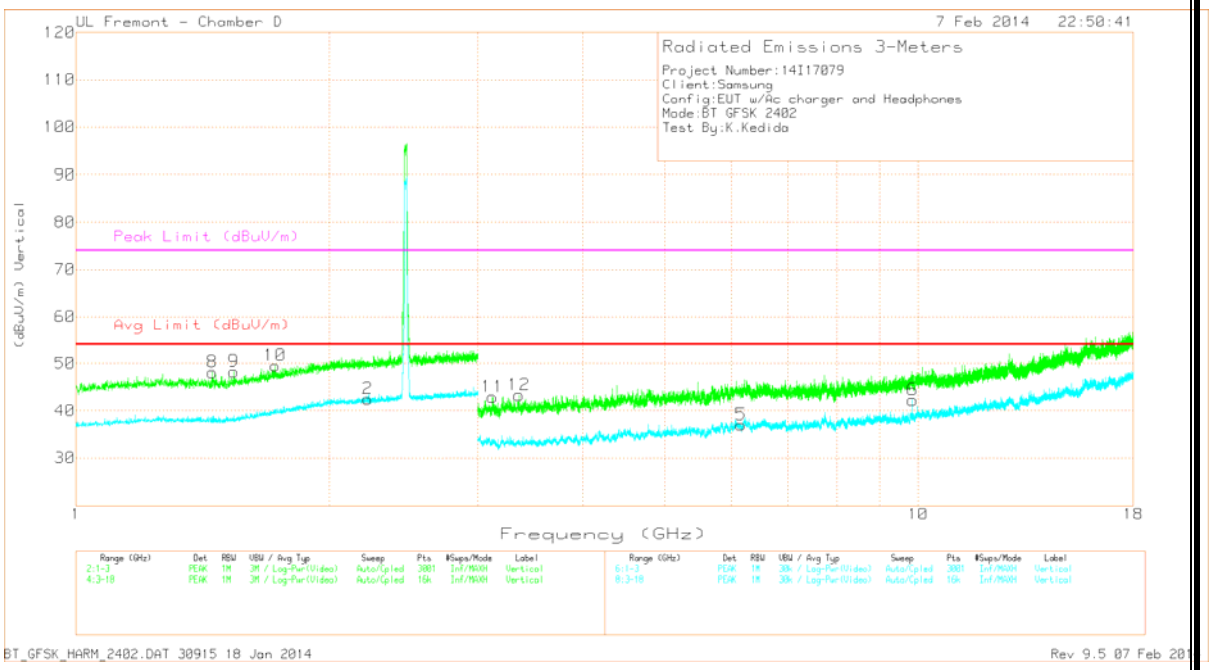
VERTICAL



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

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	* 1.221	44.61	PK	28.5	-24.7	48.41	-	-	74	-25.59	0-360	201	H
8	* 1.452	44.11	PK	28.3	-24.3	48.11	-	-	74	-25.89	0-360	99	V
9	* 1.54	43.83	PK	28.5	-24.1	48.23	-	-	74	-25.77	0-360	202	V
2	* 2.221	33.47	Avg	32.1	-23.1	42.47	54	-11.53	-	-	0-360	99	V
10	1.724	43.32	PK	29.9	-23.7	49.52	-	-	74	-24.48	0-360	202	V
1	1.996	33.51	Avg	31.8	-23.5	41.81	54	-12.19	-	-	0-360	201	H
11	3.123	41.2	PK	33.2	-31.5	42.9	-	-	74	-31.1	0-360	202	V
12	3.358	41.39	PK	33.3	-31.4	43.29	-	-	74	-30.71	0-360	99	V
5	6.16	29.8	Avg	36	-28.8	37	54	-17	-	-	0-360	202	V
3	6.229	30.25	Avg	36	-27.9	38.35	54	-15.65	-	-	0-360	99	H
4	9.847	28.39	Avg	37.6	-24.1	41.89	54	-12.11	-	-	0-360	202	H
6	9.848	28.76	Avg	37.6	-24.1	42.26	54	-11.74	-	-	0-360	99	V

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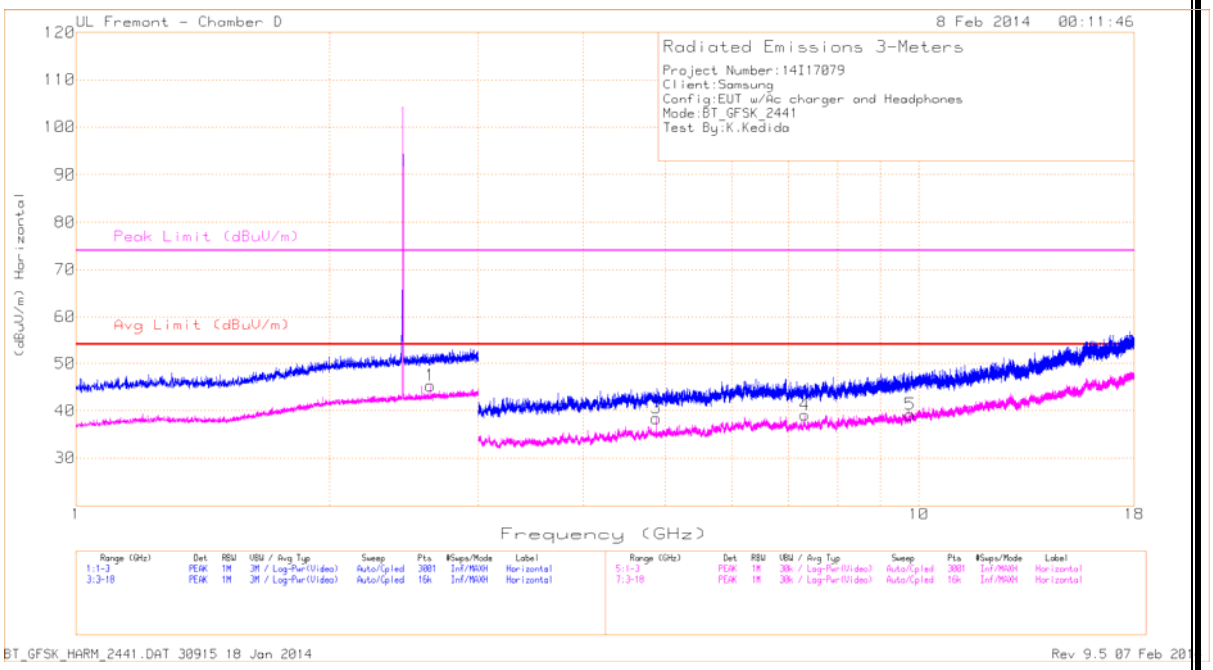
MID CHANNEL
HORIZONTAL



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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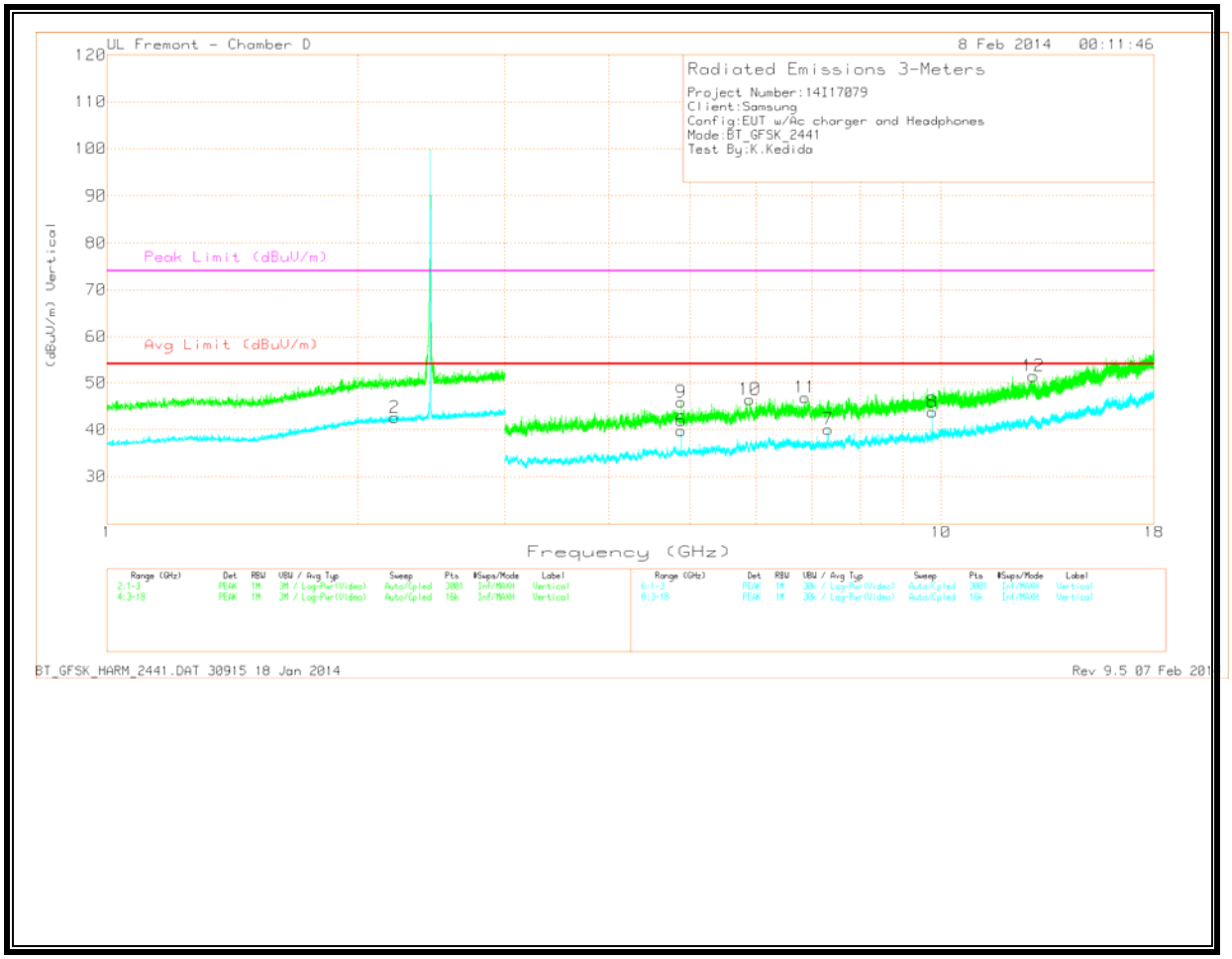
VERTICAL



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

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* 4.881	41.87	PK	34.6	-30.6	45.87	-	-	74	-28.13	0-360	202	V
2	* 2.212	33.66	Avg	32.1	-23.2	42.56	54	-11.44	-	-	0-360	99	V
3	* 4.882	34.39	Avg	34.6	-30.6	38.39	54	-15.61	-	-	0-360	99	H
4	* 7.323	31	Avg	35.9	-27.8	39.1	54	-14.9	-	-	0-360	201	H
6	* 4.882	35.78	Avg	34.6	-30.6	39.78	54	-14.22	-	-	0-360	99	V
7	* 7.323	31.99	Avg	35.9	-27.8	40.09	54	-13.91	-	-	0-360	202	V
1	2.633	35.29	Avg	32.7	-22.7	45.29	54	-8.71	-	-	0-360	99	H
10	5.896	39.64	PK	35.6	-28.8	46.44	-	-	74	-27.56	0-360	202	V
11	6.871	38.46	PK	35.8	-27.4	46.86	-	-	74	-27.14	0-360	202	V
5	9.764	25.88	Avg	37.5	-24.2	39.18	54	-14.82	-	-	0-360	201	H
8	9.764	30.46	Avg	37.5	-24.2	43.76	54	-10.24	-	-	0-360	202	V
12	12.905	33.33	PK	39.2	-21.1	51.43	-	-	74	-22.57	0-360	99	V

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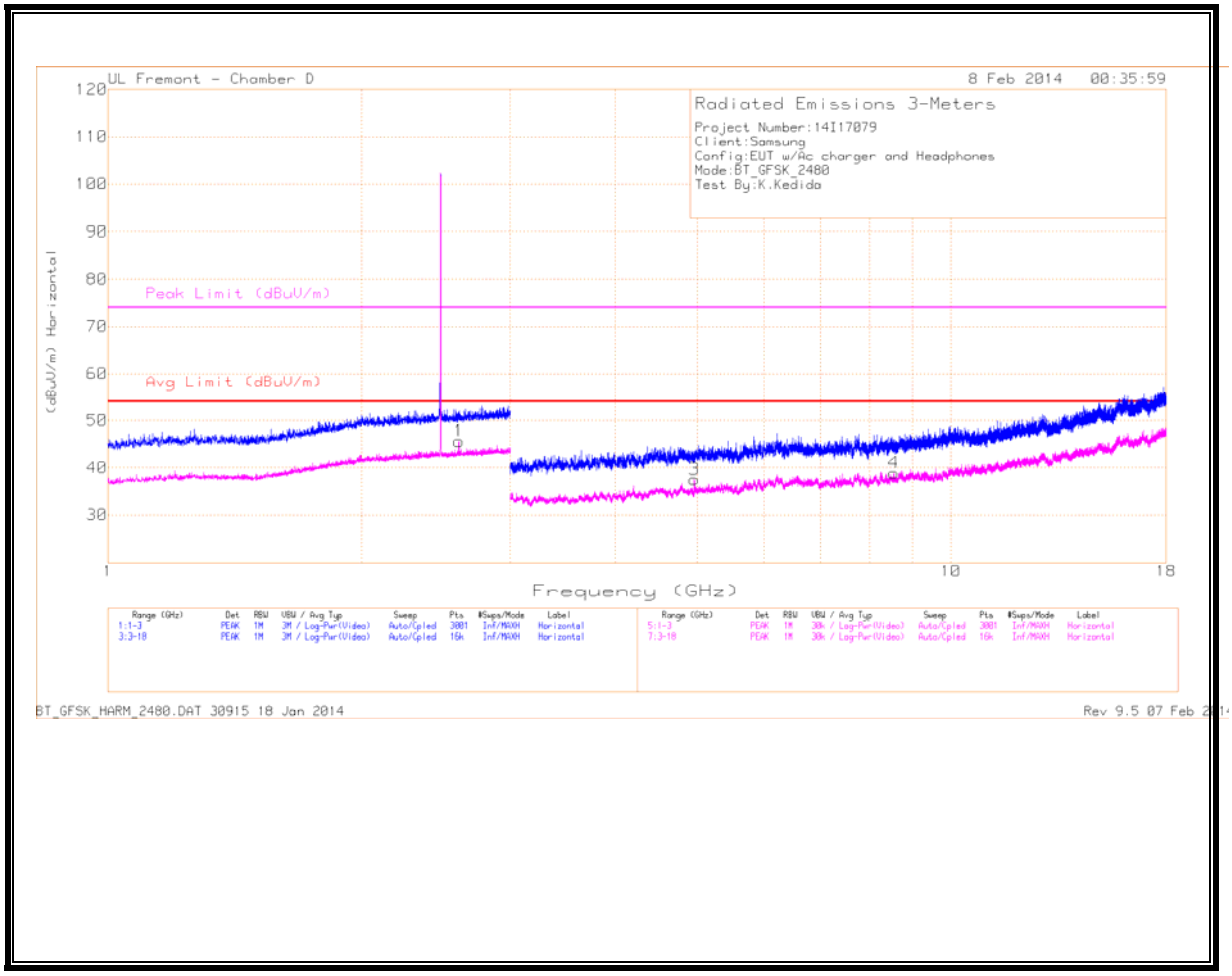
HIGH CHANNEL
HORIZONTAL



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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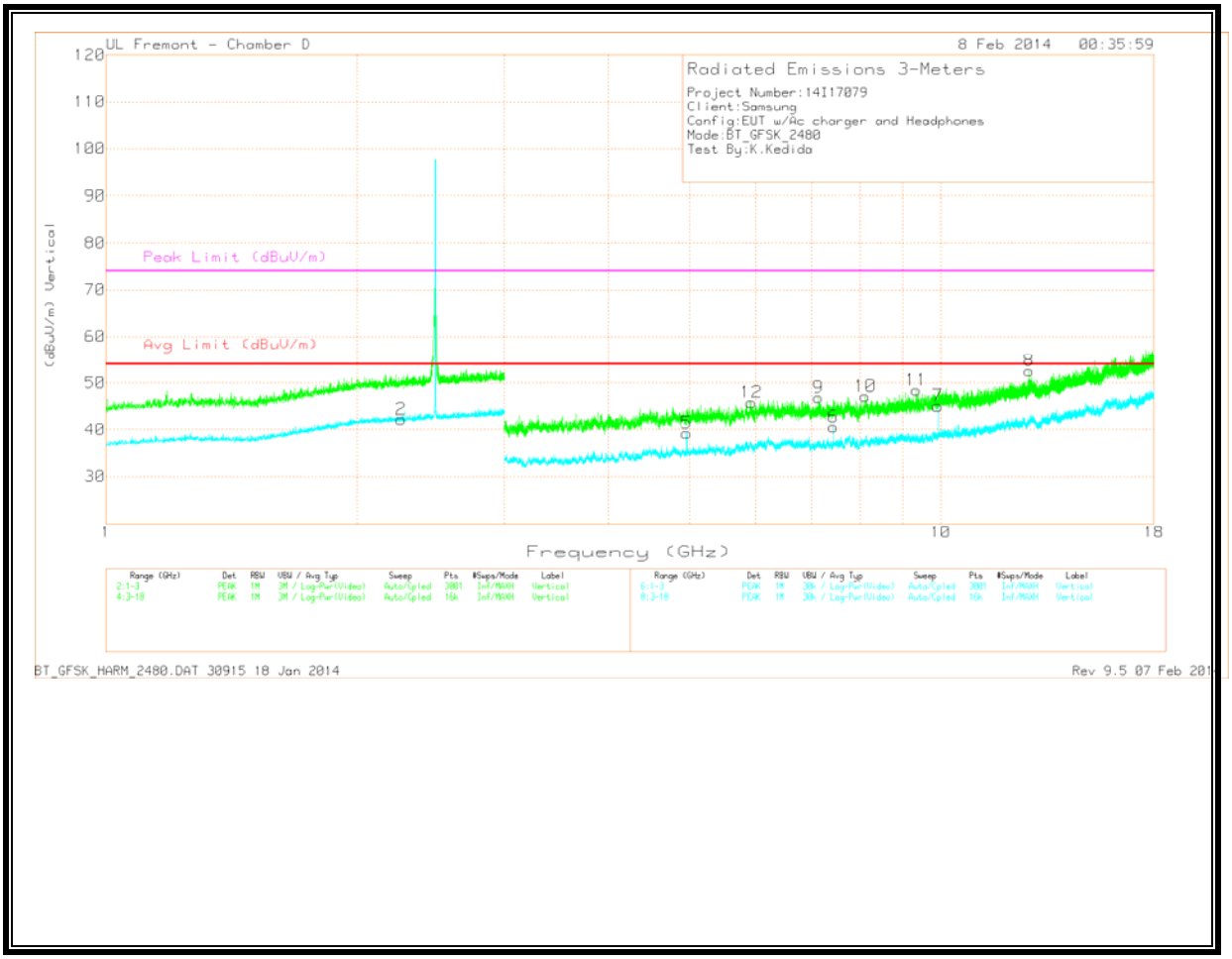
VERTICAL



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

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10	* 8.118	37.51	PK	36.1	-26.5	47.11	-	-	74	-26.89	0-360	99	V
11	* 9.347	35.8	PK	37	-24.4	48.4	-	-	74	-25.6	0-360	202	V
2	* 2.257	33.19	Avg	32.1	-23.1	42.19	54	-11.81	-	-	0-360	202	V
3	* 4.959	33.11	Avg	34.6	-30.2	37.51	54	-16.49	-	-	0-360	201	H
5	* 4.96	34.85	Avg	34.6	-30.2	39.25	54	-14.75	-	-	0-360	202	V
6	* 7.44	31.36	Avg	36	-26.8	40.56	54	-13.44	-	-	0-360	99	V
1	2.608	35.58	Avg	32.6	-22.6	45.58	54	-8.42	-	-	0-360	202	H
12	5.93	38.61	PK	35.7	-28.5	45.81	-	-	74	-28.19	0-360	202	V
9	7.137	38.3	PK	35.8	-27.3	46.8	-	-	74	-27.2	0-360	202	V
4	8.555	29.3	Avg	36.2	-26.6	38.9	54	-15.1	-	-	0-360	99	H
7	9.919	31.36	Avg	37.7	-24	45.06	54	-8.94	-	-	0-360	202	V
8	12.763	35.78	PK	39.2	-22.4	52.58	-	-	74	-21.42	0-360	202	V

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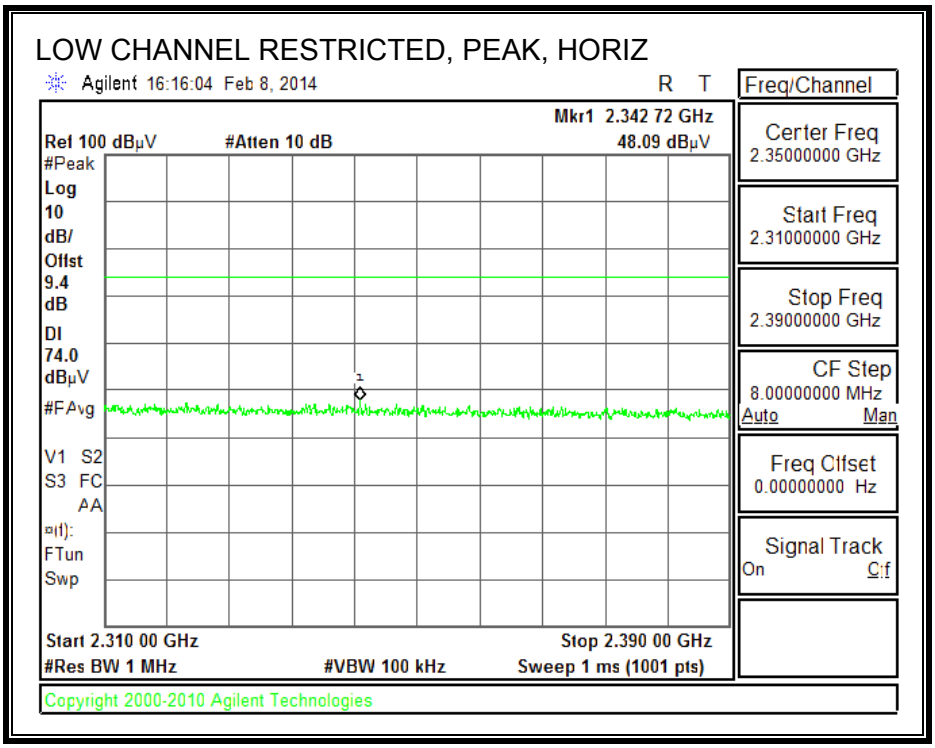
9.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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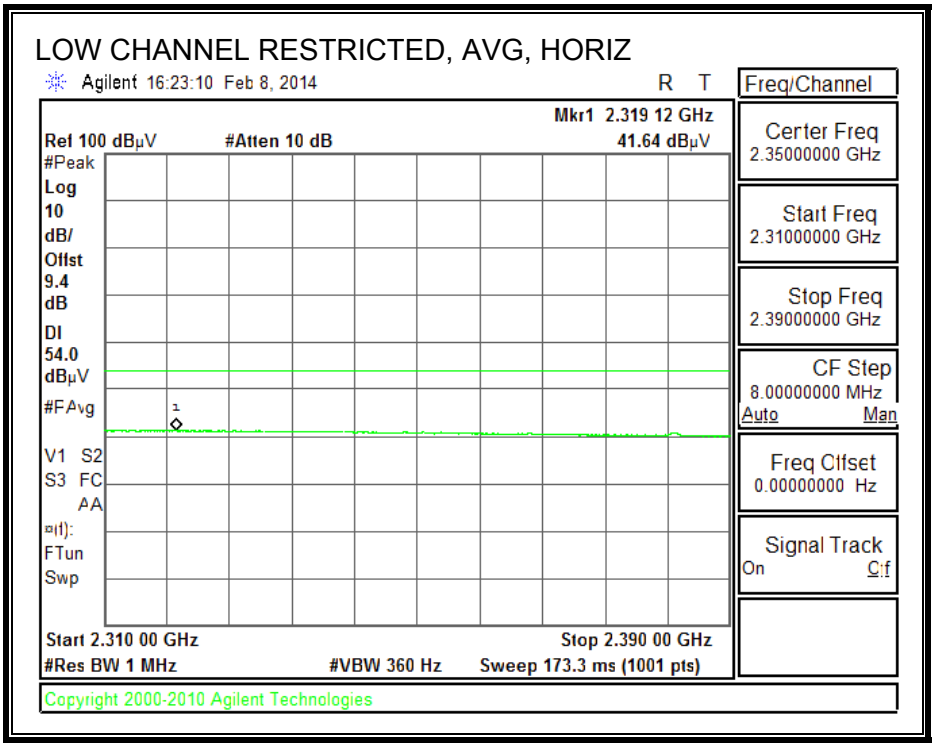
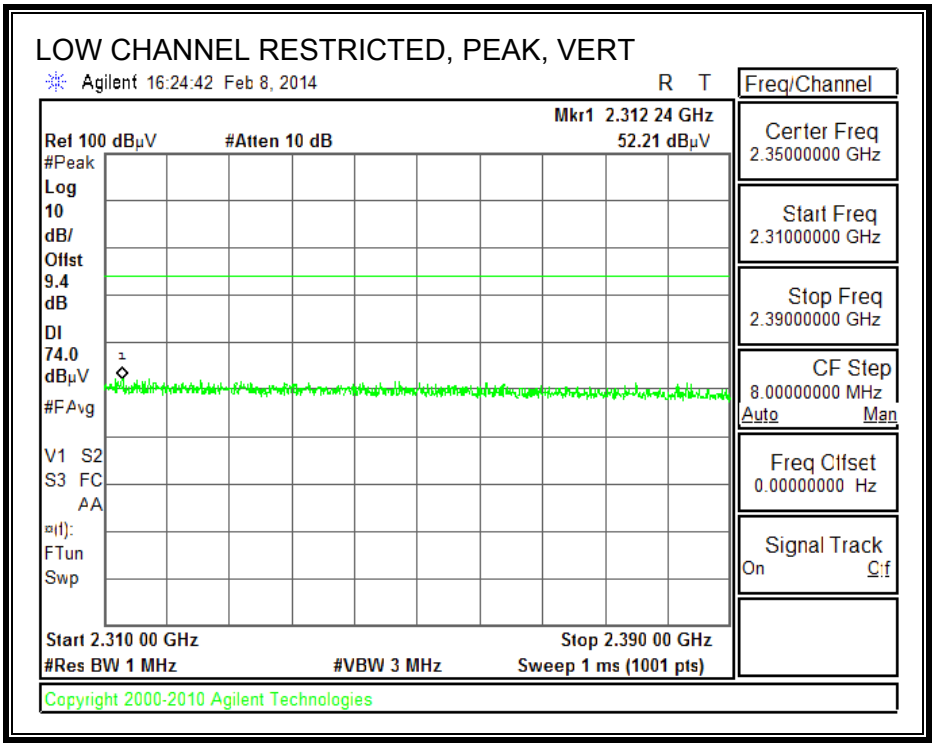


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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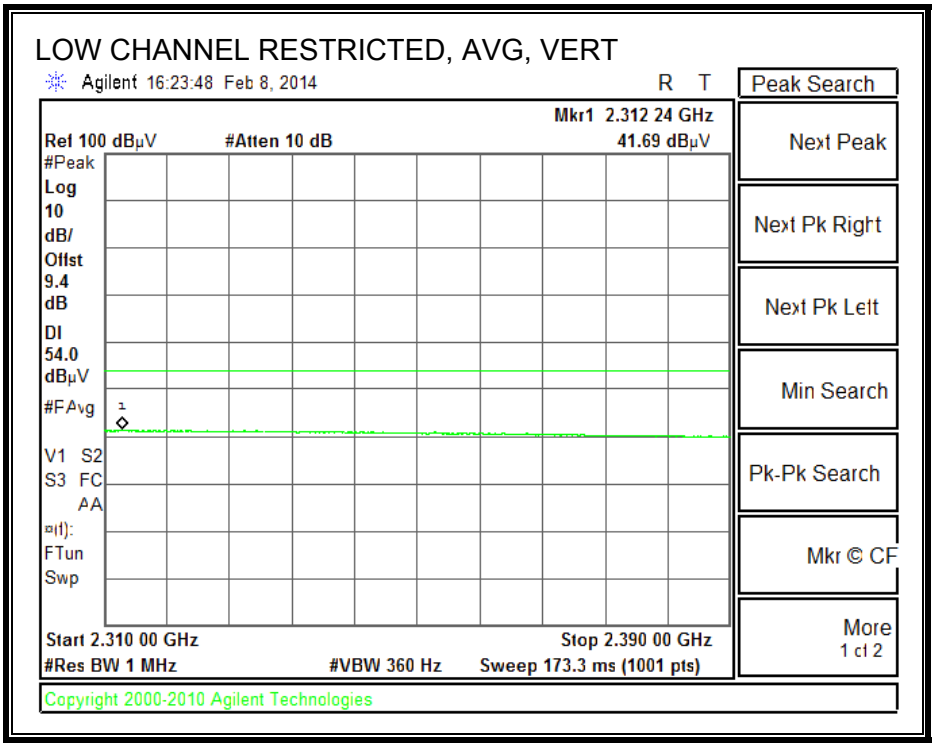
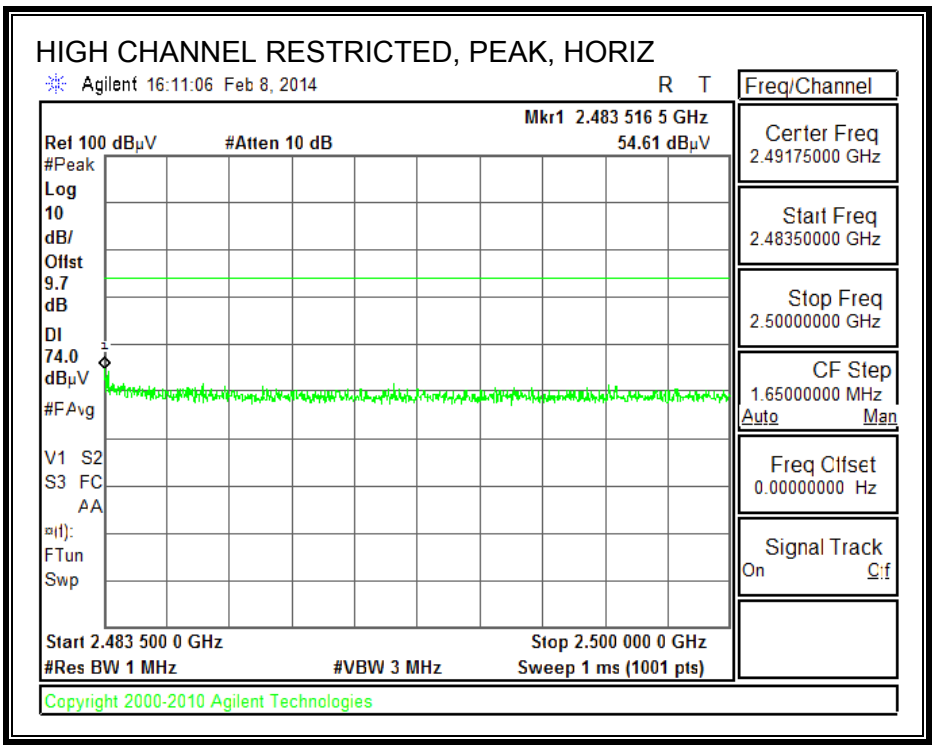


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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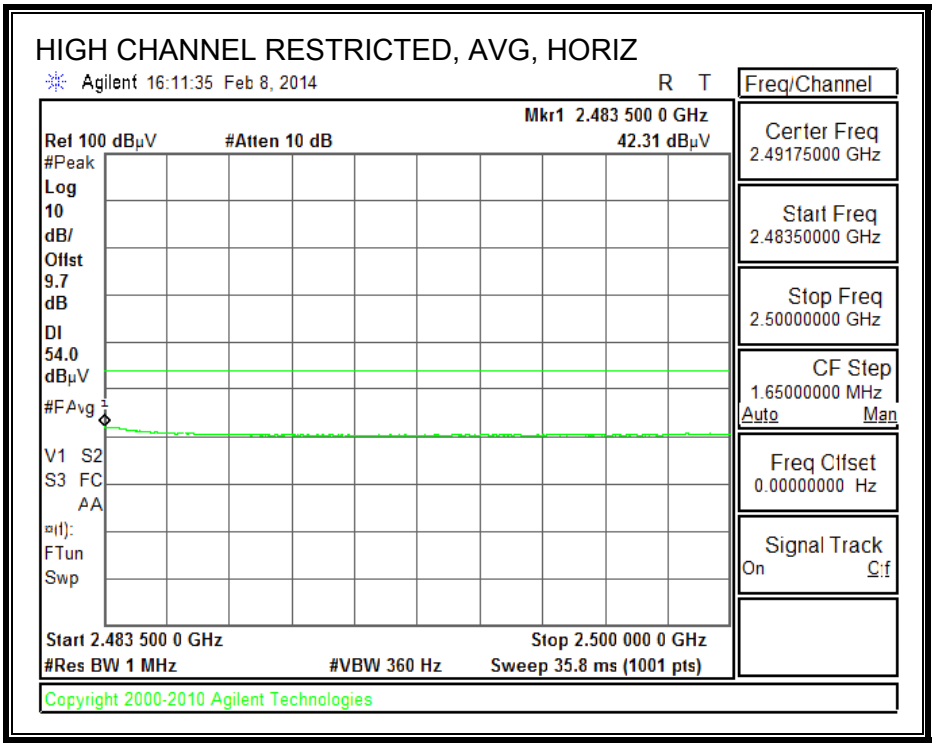
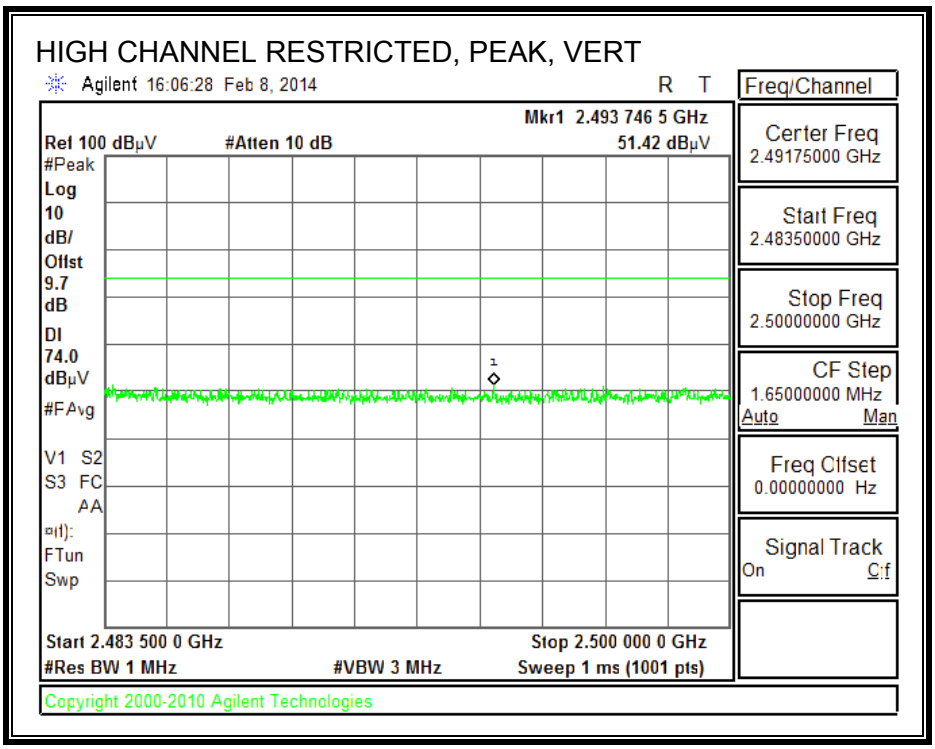


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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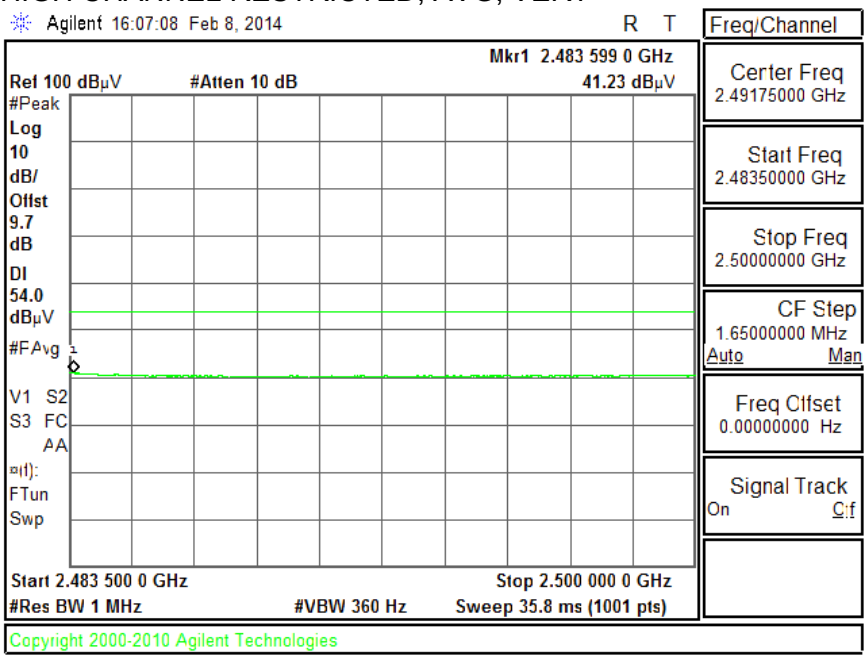
HIGH CHANNEL RESTRICTED, AVG, VERT



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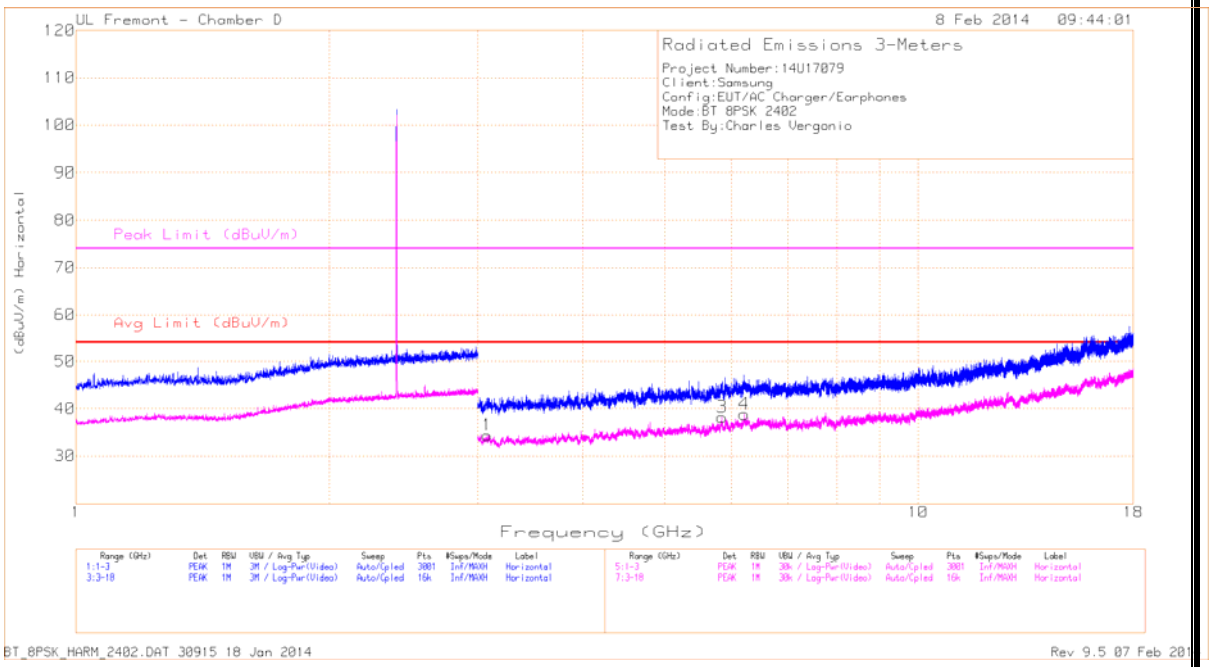
HARMONICS AND SPURIOUS EMISSIONS

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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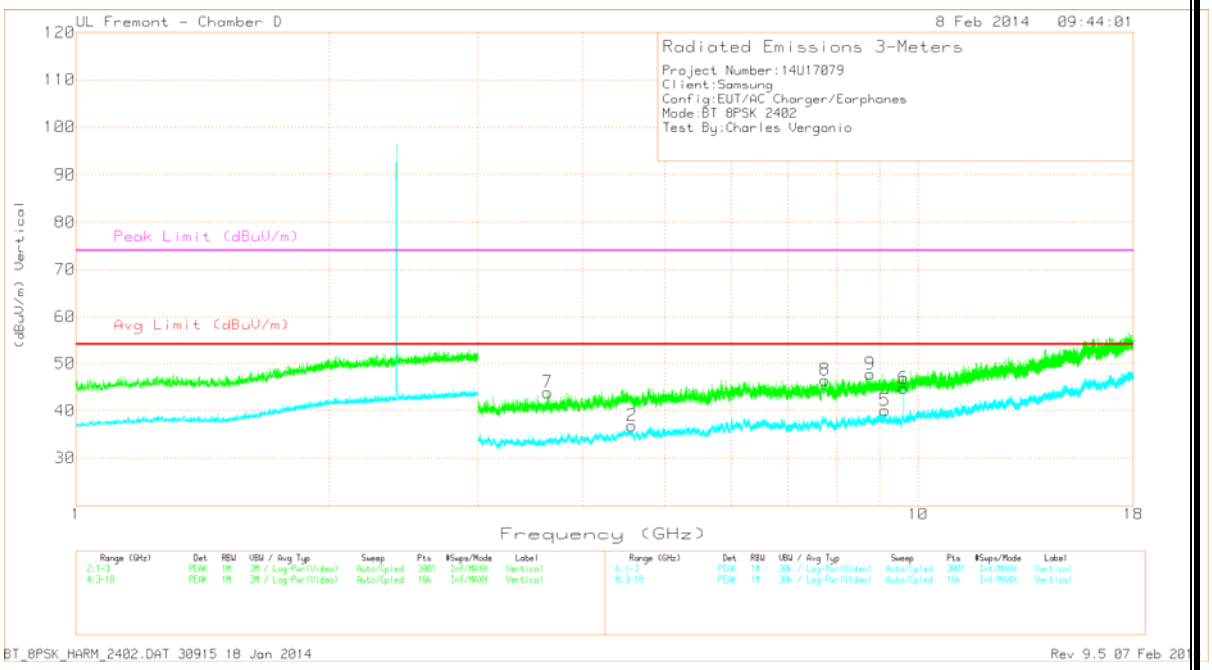
VERTICAL



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

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	* 3.632	41.46	PK	33.5	-31.1	43.86	-	-	74	-30.14	0-360	202	V
8	* 7.748	36.24	PK	36.2	-26	46.44	-	-	74	-27.56	0-360	99	V
2	* 4.57	32.91	Avg	34.6	-30.7	36.81	54	-17.19	-	-	0-360	202	V
5	* 9.132	28.02	Avg	36.9	-24.9	40.02	54	-13.98	-	-	0-360	202	V
1	3.078	32.87	Avg	33.2	-31.7	34.37	54	-19.63	-	-	0-360	99	H
3	5.849	31.88	Avg	35.5	-29.2	38.18	54	-15.82	-	-	0-360	99	H
4	6.215	30.62	Avg	36	-27.8	38.82	54	-15.18	-	-	0-360	99	H
9	8.77	37.15	PK	36.4	-25.8	47.75	-	-	74	-26.25	0-360	202	V
6	9.607	31.49	Avg	37.3	-24.1	44.69	54	-9.31	-	-	0-360	202	V

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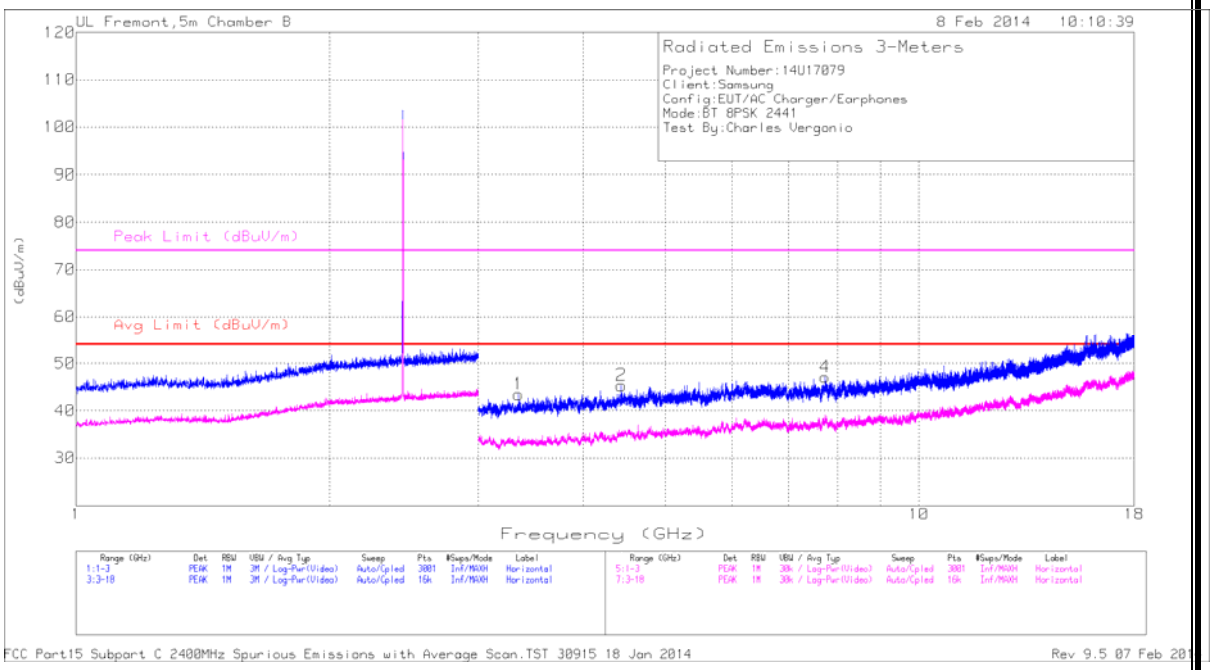
MID CHANNEL
HORIZONTAL



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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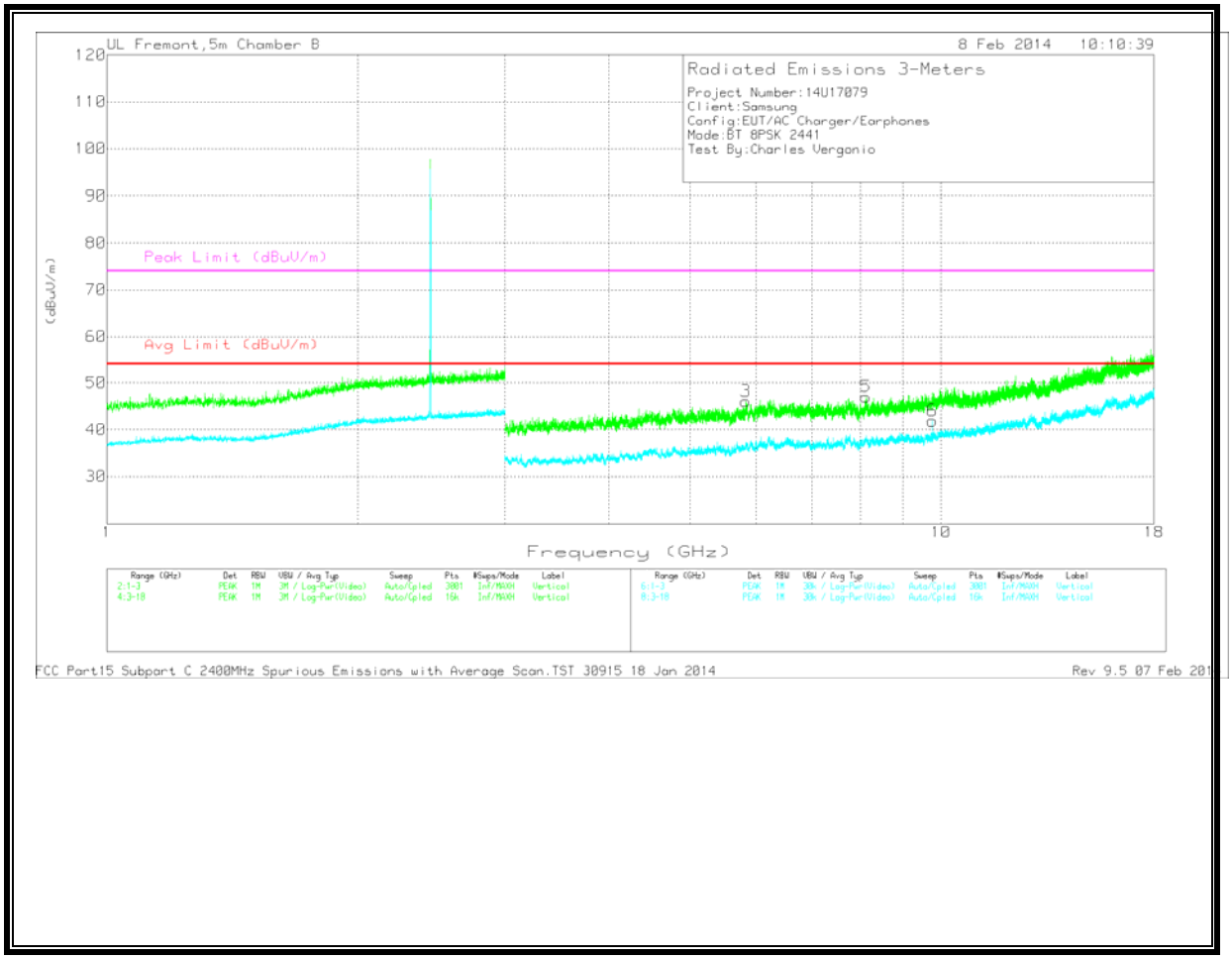
VERTICAL



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

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.35	41.54	PK	33.3	-31.4	43.44	-	-	74	-30.56	0-360	202	H
4	* 7.735	36.86	PK	36.2	-26	47.06	-	-	74	-26.94	0-360	99	H
5	* 8.128	37.21	PK	36.1	-26.3	47.01	-	-	74	-26.99	0-360	203	V
2	4.435	40.03	PK	34.4	-29.1	45.33	-	-	74	-28.67	0-360	202	H
3	5.833	39.84	PK	35.4	-29.2	46.04	-	-	74	-27.96	0-360	99	V
6	9.764	28.57	Avg	37.5	-24.2	41.87	54	-12.13	-	-	0-360	99	V

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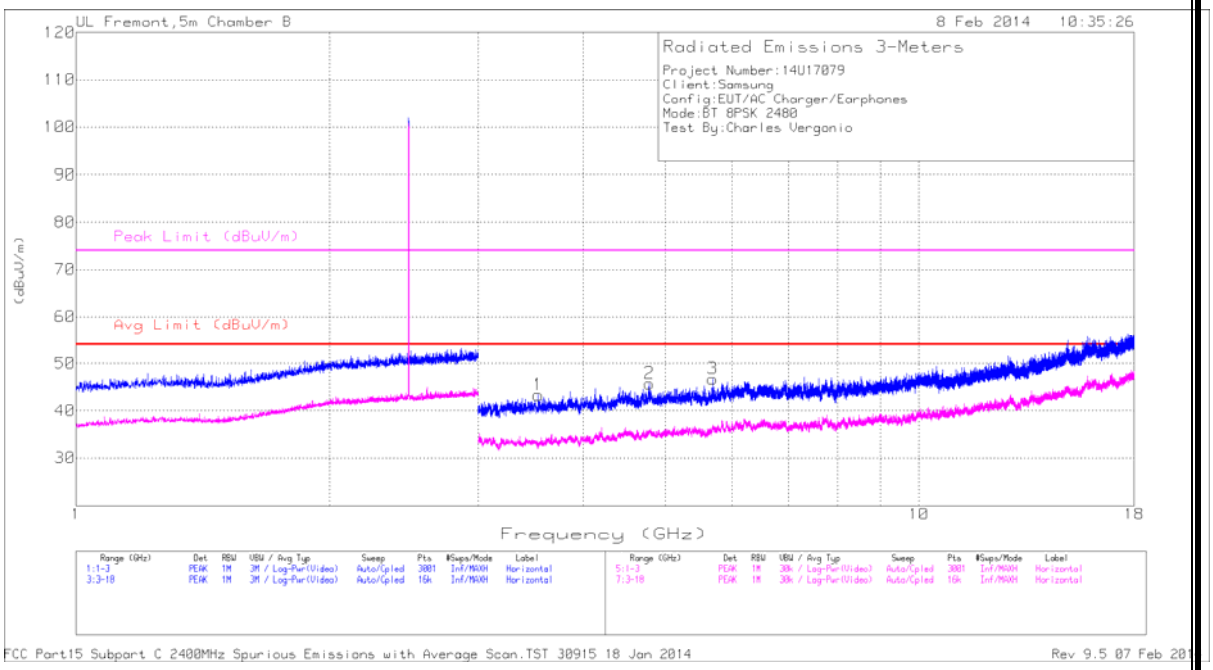
HIGH CHANNEL
HORIZONTAL



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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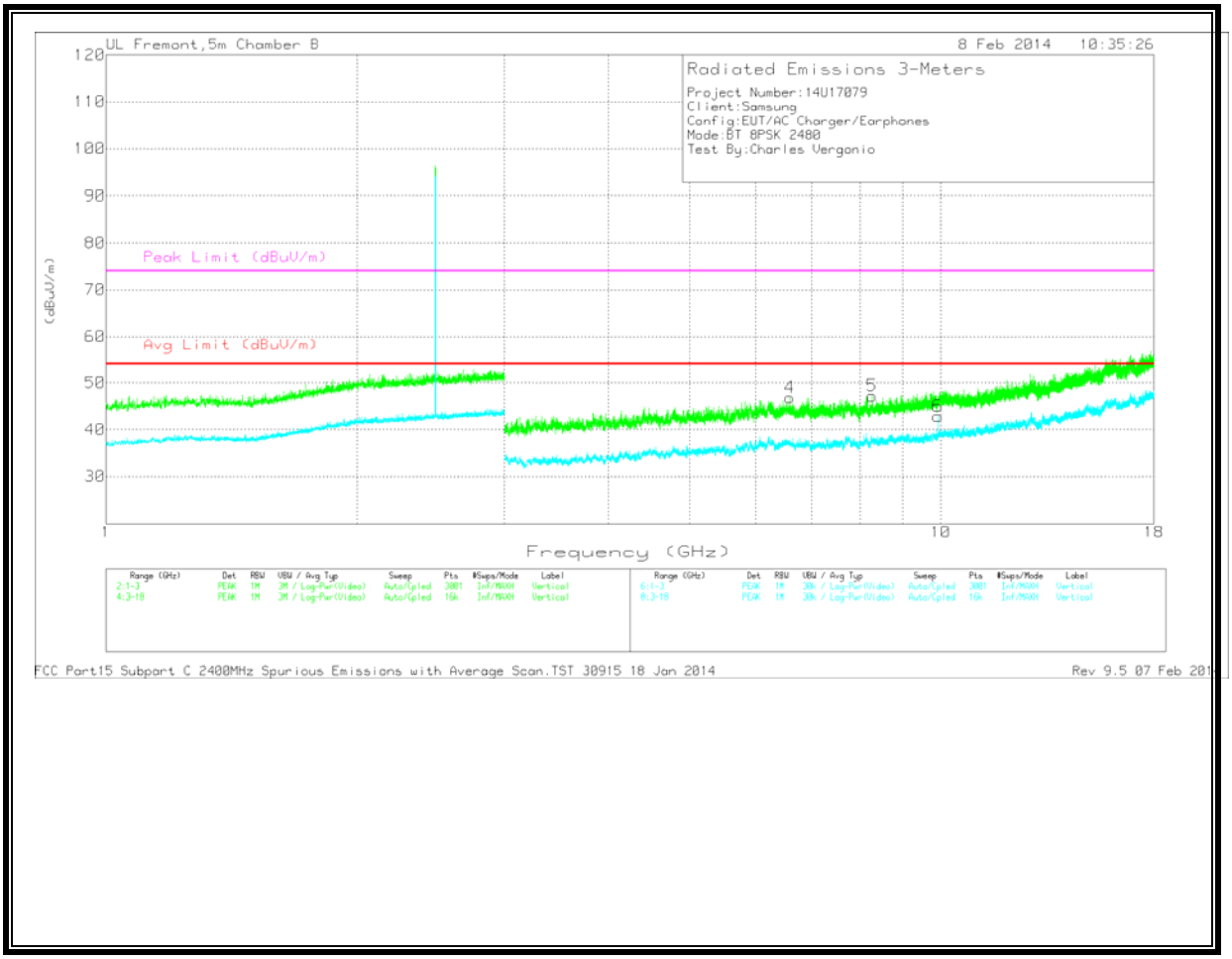
VERTICAL



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

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.534	41.52	PK	33.3	-31.5	43.32	-	-	74	-30.68	0-360	202	H
2	* 4.787	39.92	PK	34.7	-28.9	45.72	-	-	74	-28.28	0-360	99	H
5	* 8.274	37.76	PK	36.1	-26.7	47.16	-	-	74	-26.84	0-360	202	V
3	5.692	40.52	PK	35.1	-28.9	46.72	-	-	74	-27.28	0-360	202	H
4	6.592	38.5	PK	35.9	-27.6	46.8	-	-	74	-27.2	0-360	202	V
6	9.919	29.12	Avg	37.7	-24	42.82	54	-11.18	-	-	0-360	202	V

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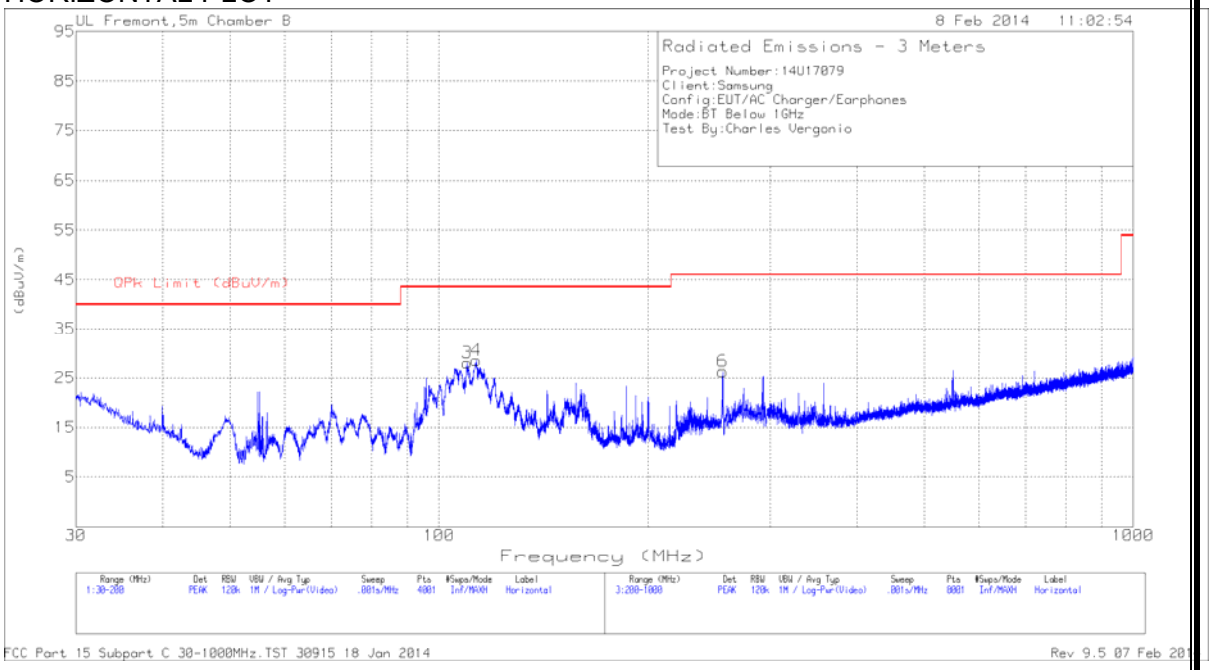
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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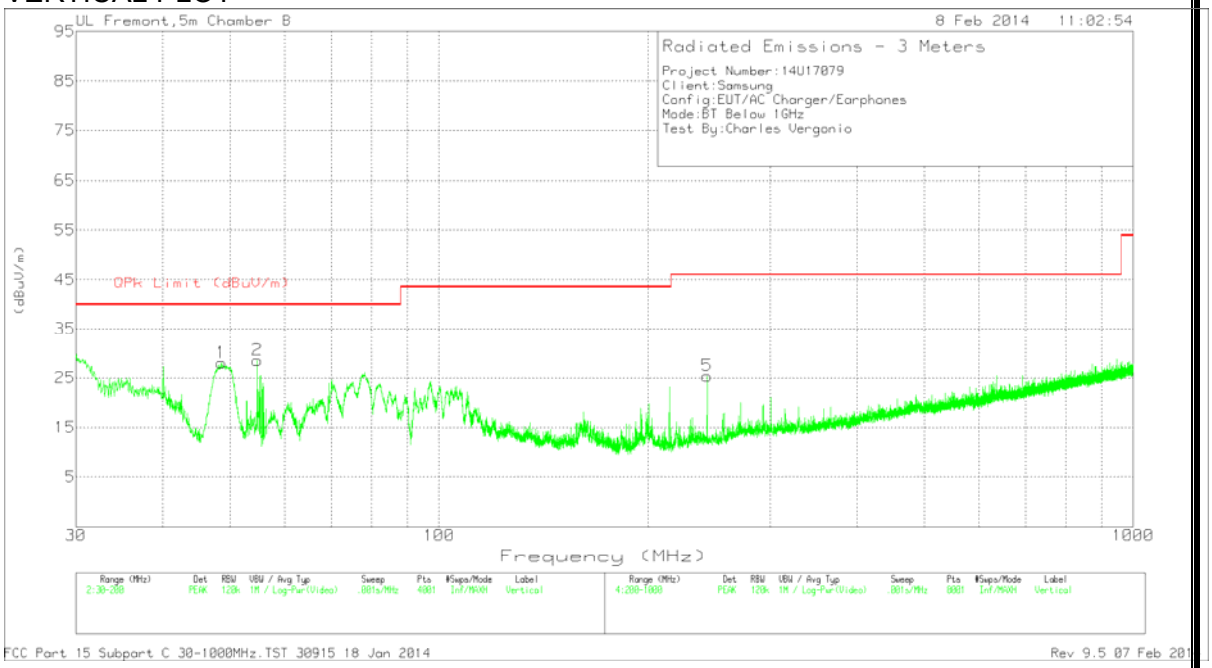
VERTICAL PLOT



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DATA
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 109.7725	43.54	PK	12.5	-28	28.04	43.52	-15.48	0-360	300	H
4	* 113.1725	43.31	PK	13.1	-27.9	28.51	43.52	-15.01	0-360	300	H
6	* 256.3	40.9	PK	11.7	-26.3	26.3	46.02	-19.72	0-360	101	H
5	* 243.4	40.28	PK	11.6	-26.5	25.38	46.02	- 20.64	0-360	200	V
1	48.615	48.39	PK	8.2	-28.6	27.99	40	- 12.01	0-360	101	V
2	54.735	50.37	PK	6.8	-28.6	28.57	40	- 11.43	0-360	101	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
FCC Part 15 Subpart C 30-1000MHz.TST 30915 18 Jan 2014
Rev 9.5 07 Feb 2014

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dB(uVolts)	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
1	.3975	48.85	PK	.4	0	49.25	57.9	-8.65	-	-
2	.3975	38.7	Av	.4	0	39.1	-	-	47.9	-8.8
3	6.2385	42.98	PK	.2	.1	43.28	60	-16.72	-	-
4	6.2385	26.73	Av	.2	.1	27.03	-	-	50	-22.97
5	13.794	39.36	PK	.2	.2	39.76	60	-20.24	-	-
6	13.794	21.67	Av	.2	.2	22.07	-	-	50	-27.93
7	22.3125	26.54	PK	.3	.2	27.04	60	-32.96	-	-
8	22.3125	9.46	Av	.3	.2	9.96	-	-	50	-40.04

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
9	.3975	47.24	PK	.4	0	47.64	57.9	-10.26	-	-
10	.3975	34.62	Av	.4	0	35.02	-	-	47.9	-12.88
11	6.2295	39.32	PK	.2	.1	39.62	60	-20.38	-	-
12	6.2295	22.84	Av	.2	.1	23.14	-	-	50	-26.86
13	13.596	37.65	PK	.3	.2	38.15	60	-21.85	-	-
14	13.596	19.82	Av	.3	.2	20.32	-	-	50	-29.68
15	22.137	40.19	PK	.3	.2	40.69	60	-19.31	-	-
16	22.137	20.5	Av	.3	.2	21	-	-	50	-29

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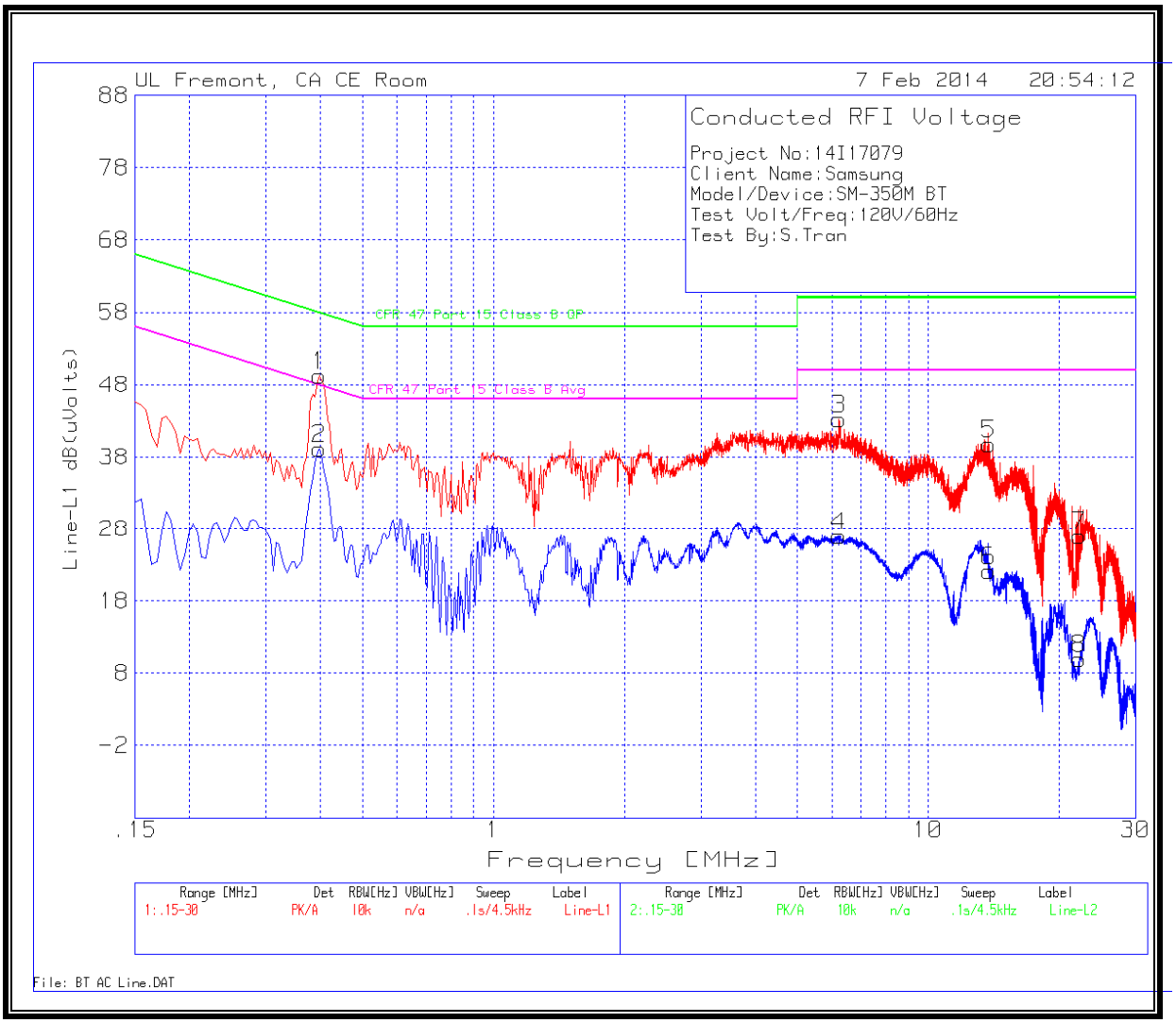
LINE 1 RESULTS



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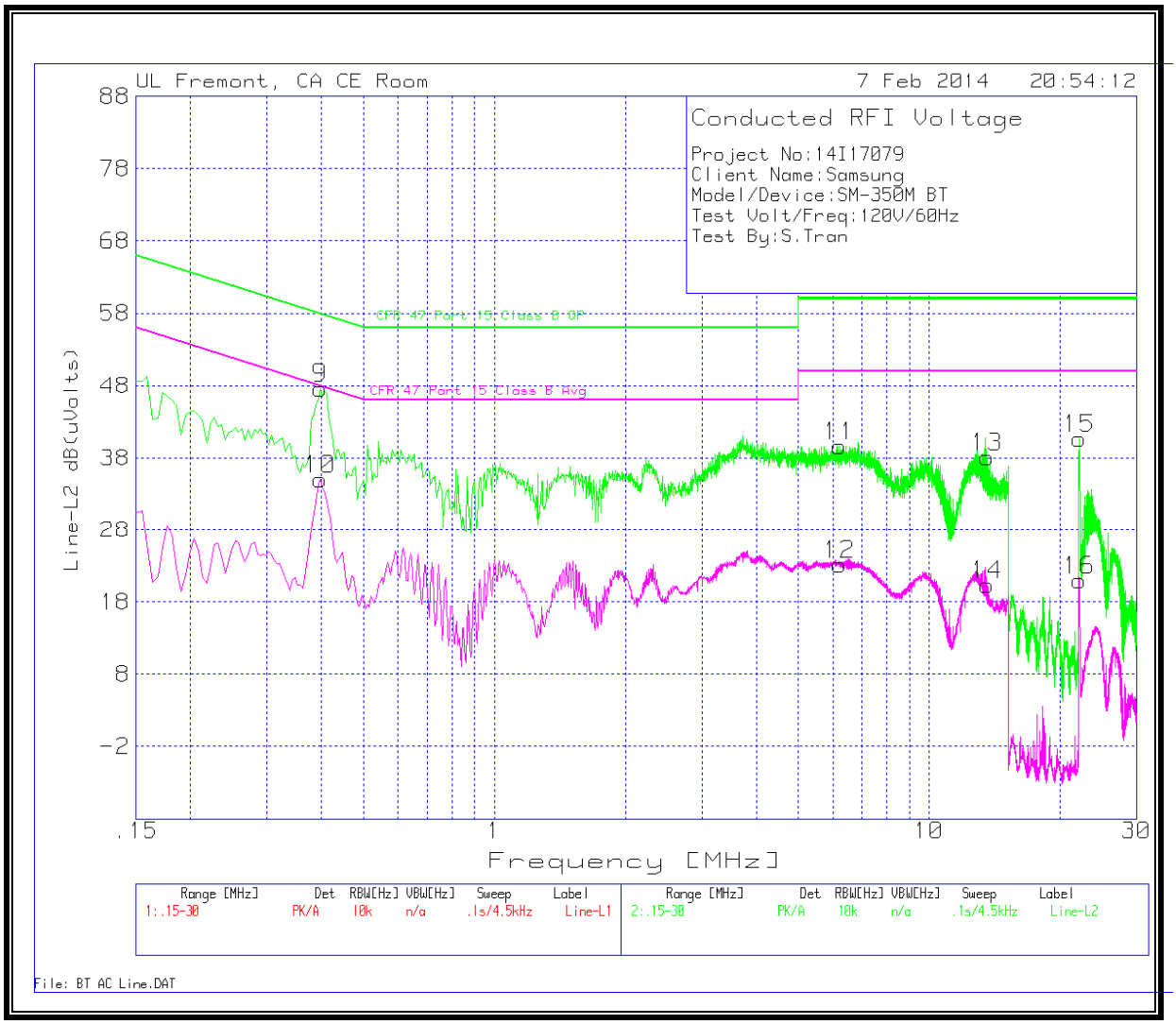
LINE 2 RESULTS



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