FCC 47 CFR PART 15 SUBPART C

INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

SMART WATCH with 2.4 DTS b/g/n + BT and BLE

MODEL NUMBER: LG-W110, W110, LGW110

FCC ID: ZNFW110
IC ID: 2703C-W110

REPORT NUMBER: 14U18426-E1 REVISION A

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC**.**

EUT DESCRIPTION: SMART WATCH with 2.4 DTS b/g/n + BT and BLE

MODEL: LG-W110, W110, LGW110

SERIAL NUMBER: 1B5WH

DATE TESTED: JULY 29 – AUGUST 4, 2014

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

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 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://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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a SMART WATCH with 2.4 DTS b/g/n + BT and BLE.

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	10.21	10.50
2402 - 2480	Enhanced 8PSK	7.64	5.81

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 a metal antenna, with a maximum gain of -1.9 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, and 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	LG	MCS-02WR	DB390078751	N/A
Cradle	LG	SDT-330	N/A	N/A

I/O CABLES

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

TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.
EUT was set in the Hidden menu mode to enable BT communications.

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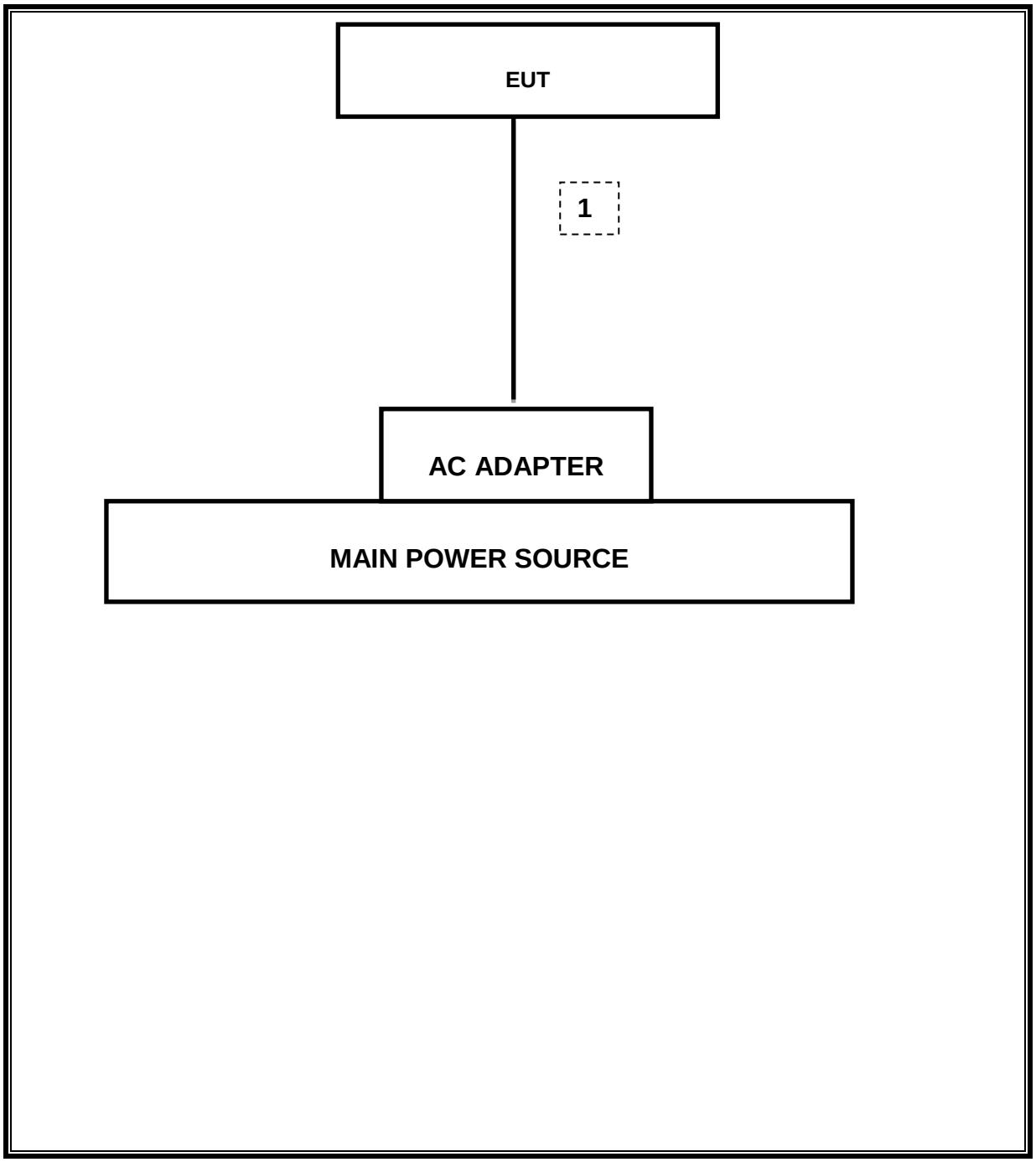
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	04/21/15
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

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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	1.235MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-30.29dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	10.21dBm
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	41.07dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	43.68dBuV/m

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8. ANTENNA PORT TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

8.1.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.929	0.879
Middle	2441	0.928	0.936
High	2480	0.929	0.995
Worst		0.929	0.995

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.343	1.223
Middle	2441	1.342	1.235
High	2480	1.343	1.226
Worst		1.343	1.235

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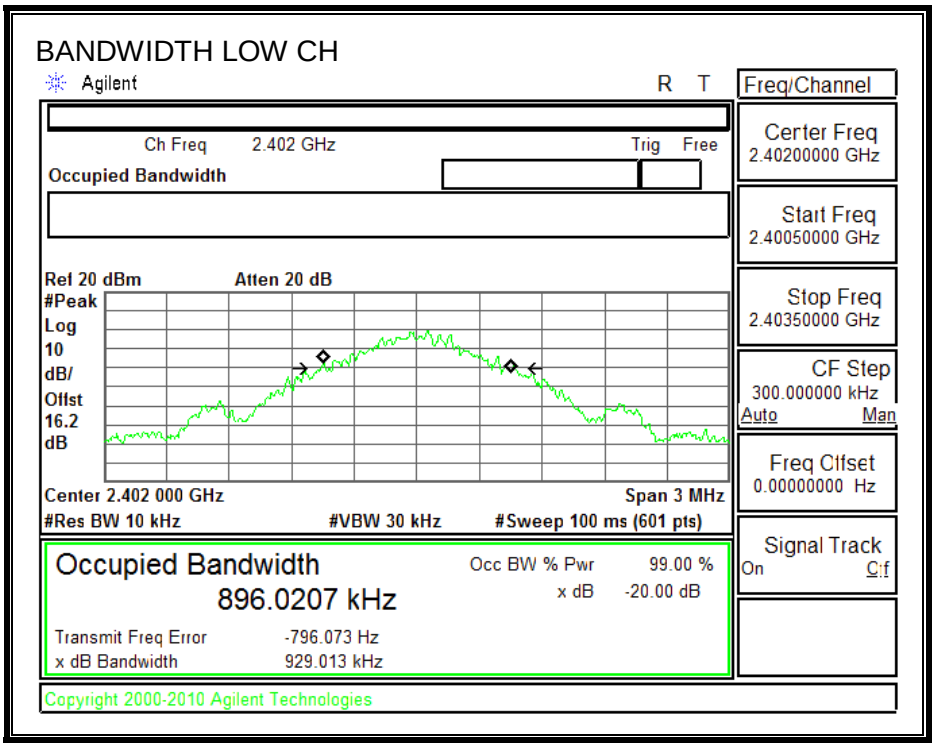
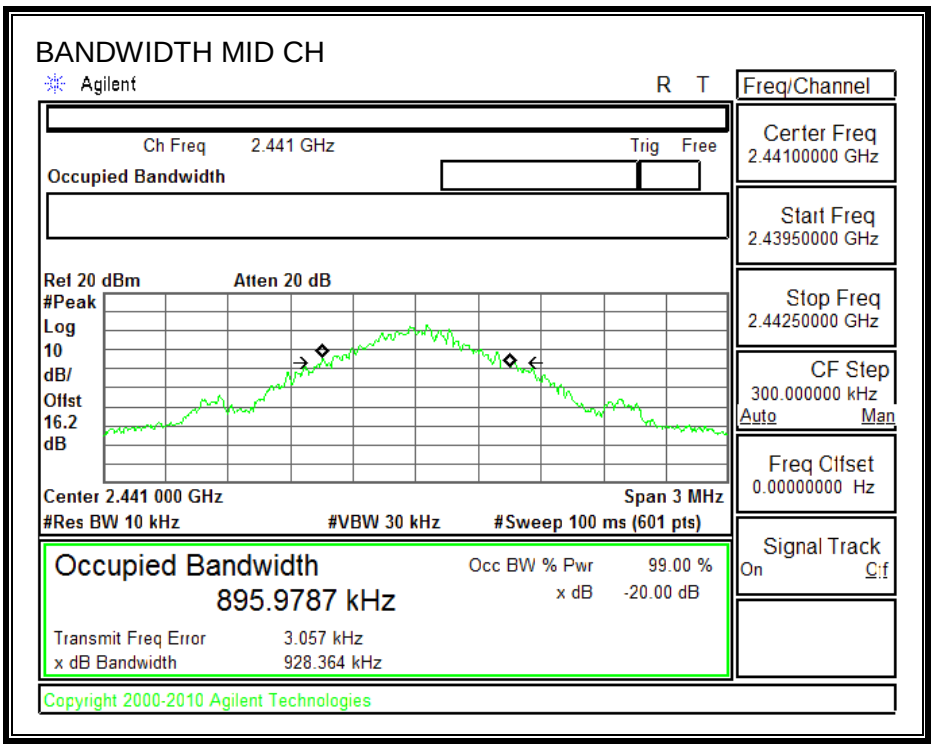
GFSK 20 dB BANDWIDTH





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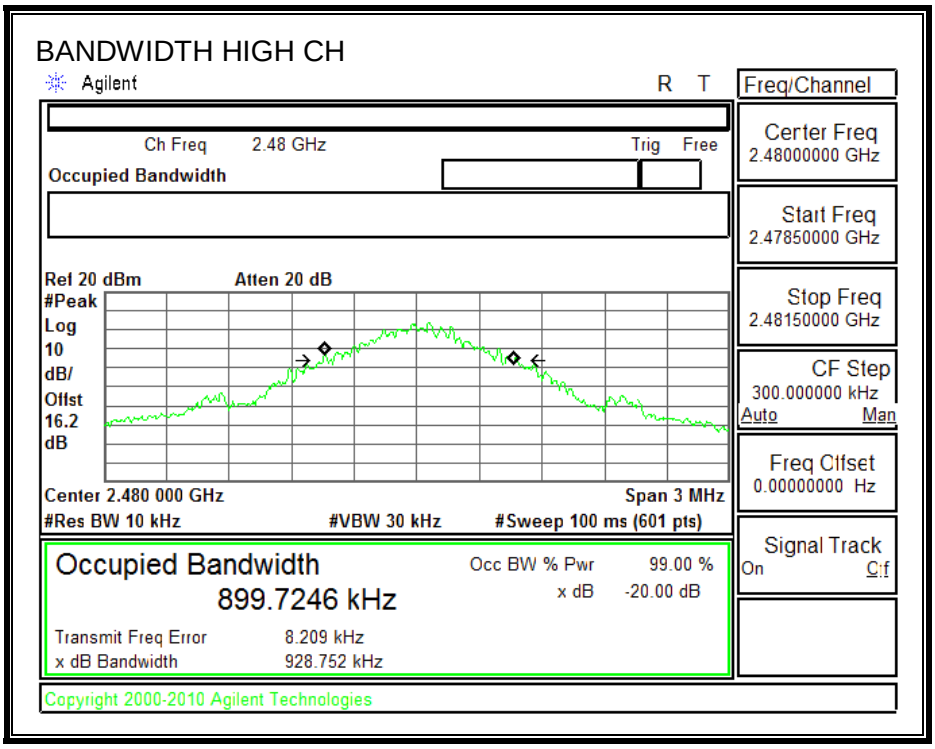

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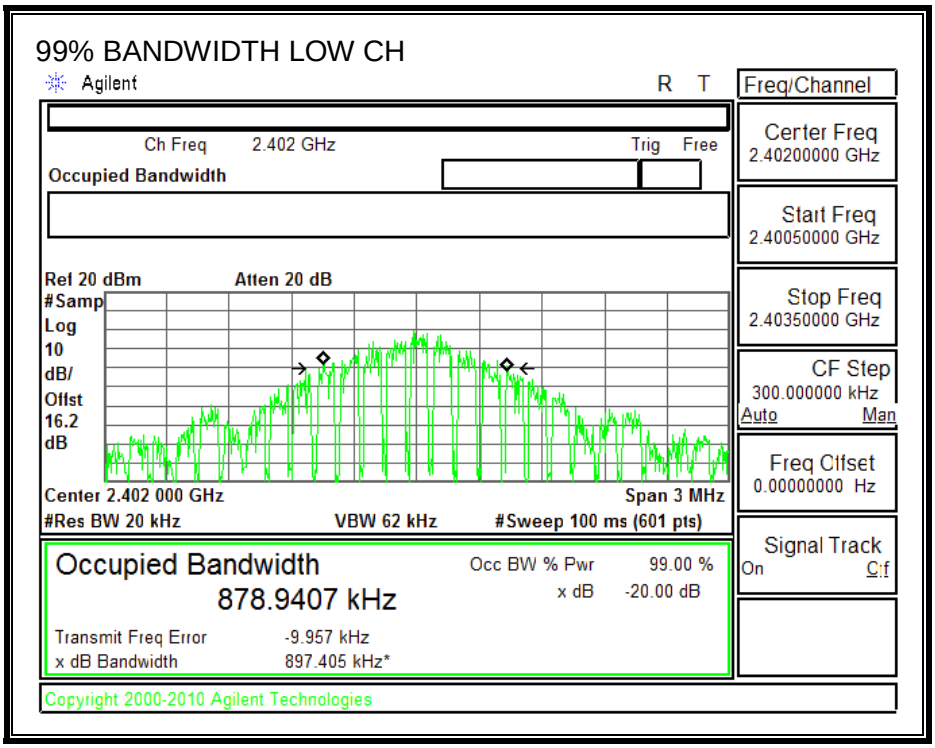
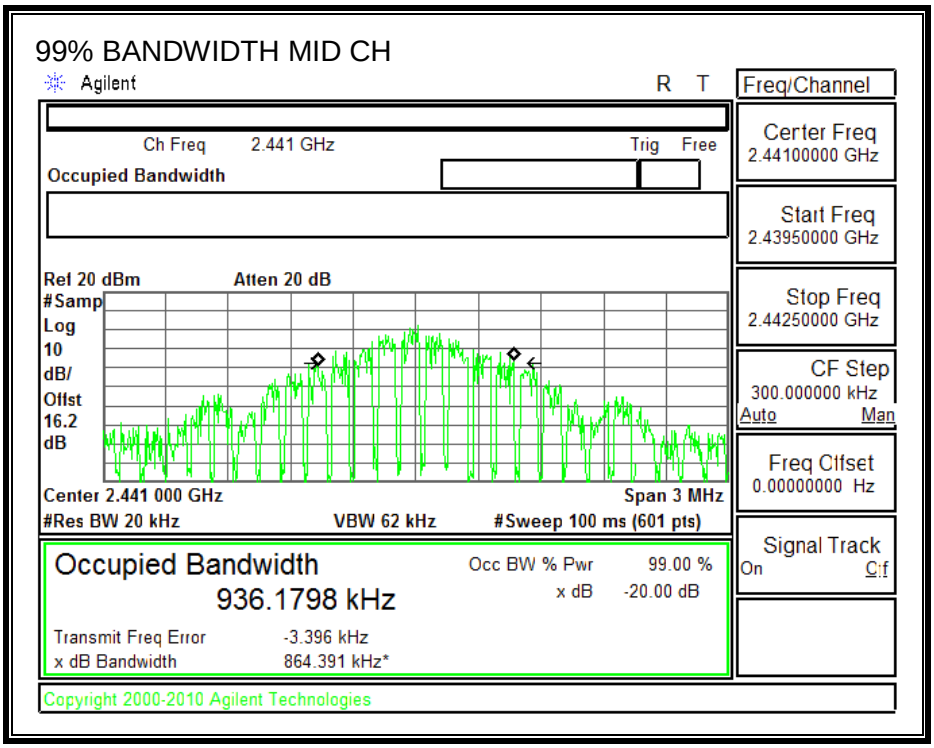
GFSK 99% BANDWIDTH





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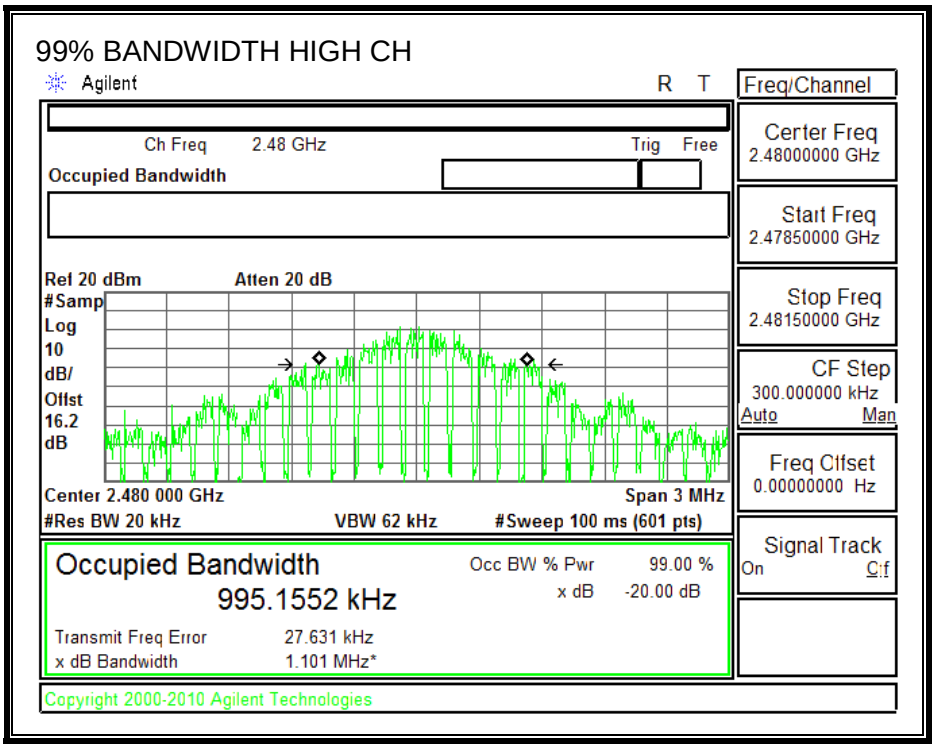

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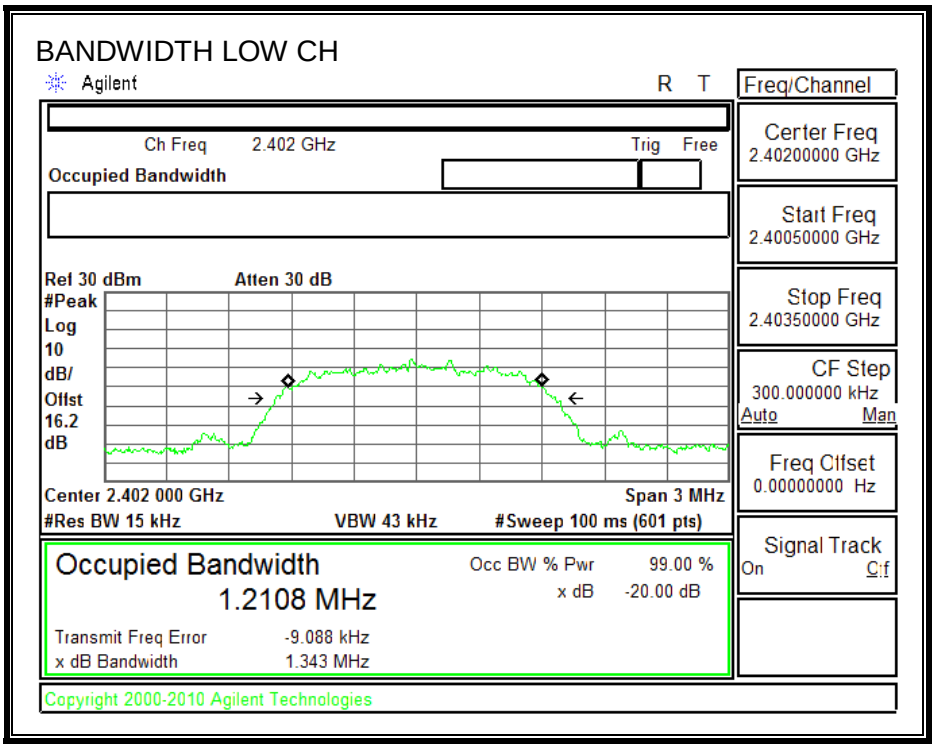
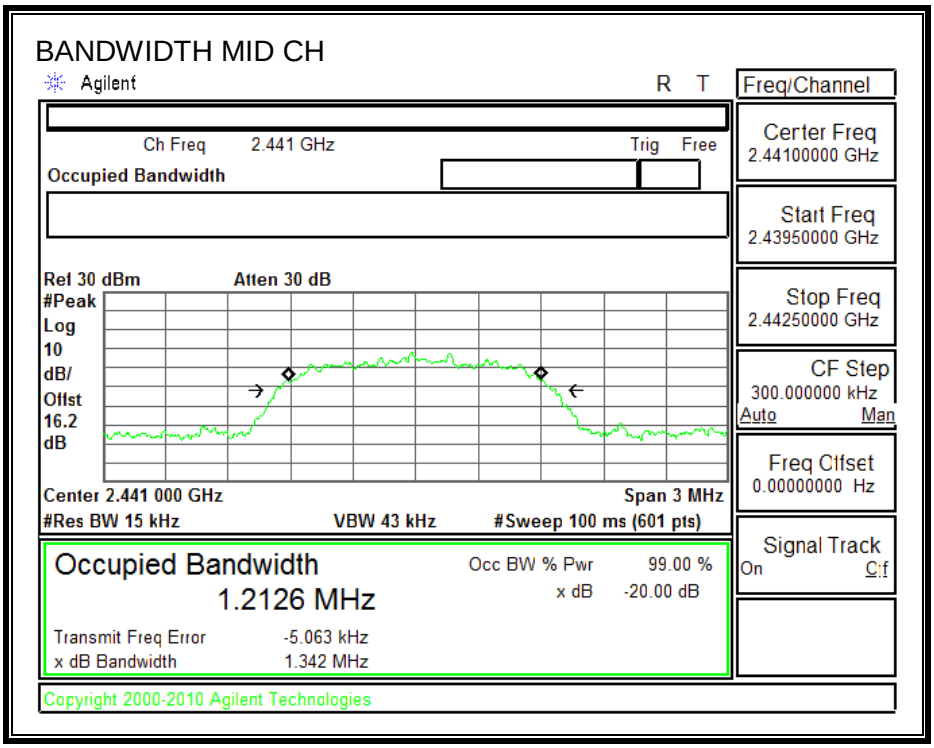
8PSK 20 dB BANDWIDTH





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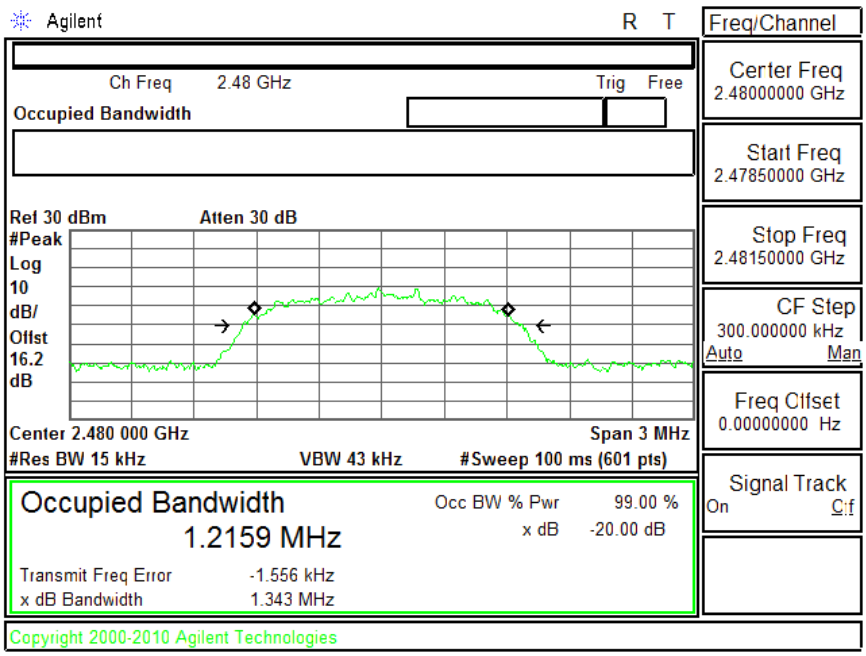
BANDWIDTH HIGH CH



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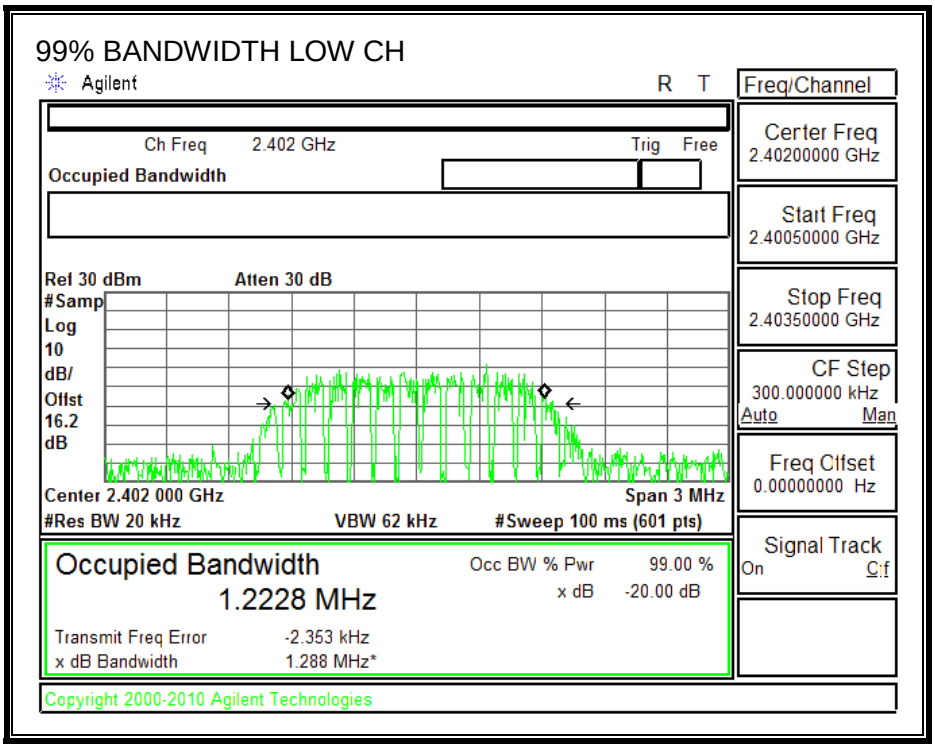
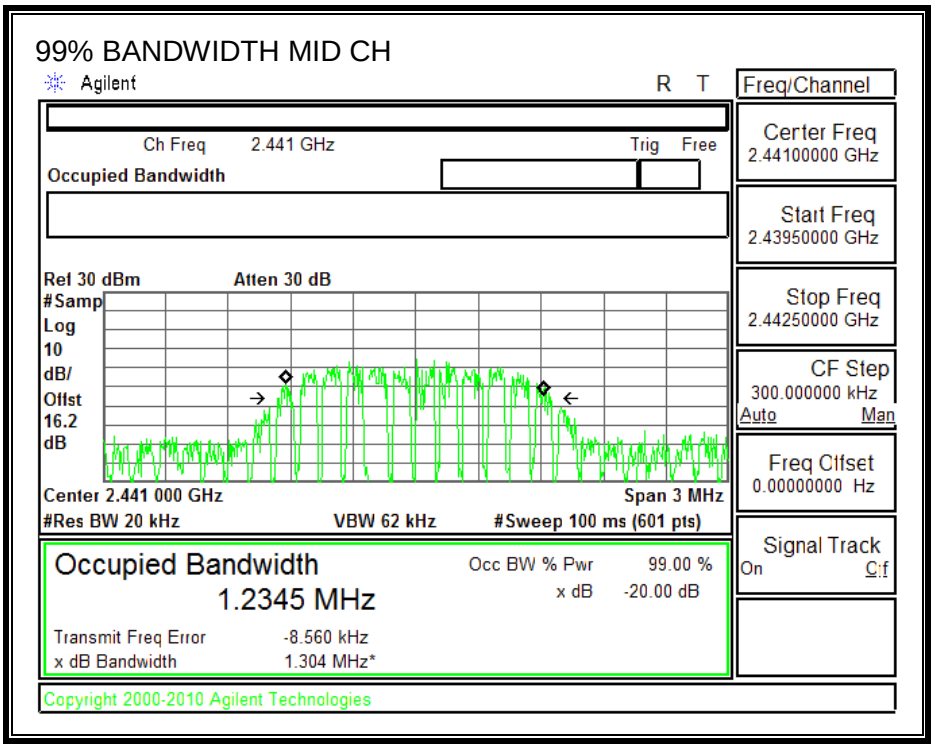
8PSK 99% BANDWIDTH





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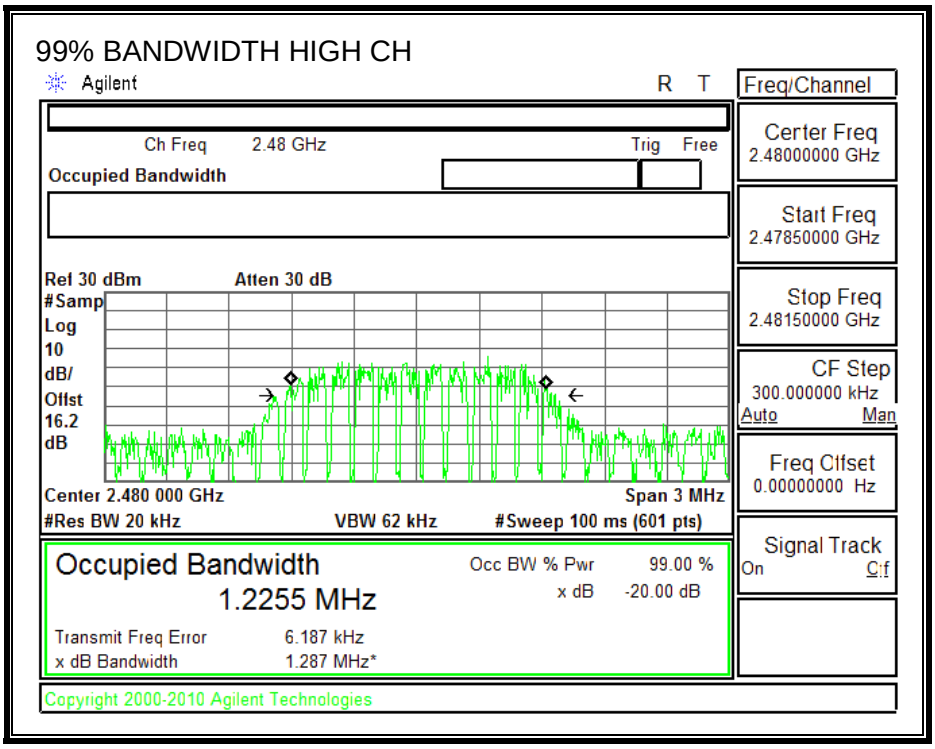

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8.2. HOPPING FREQUENCY SEPARATION

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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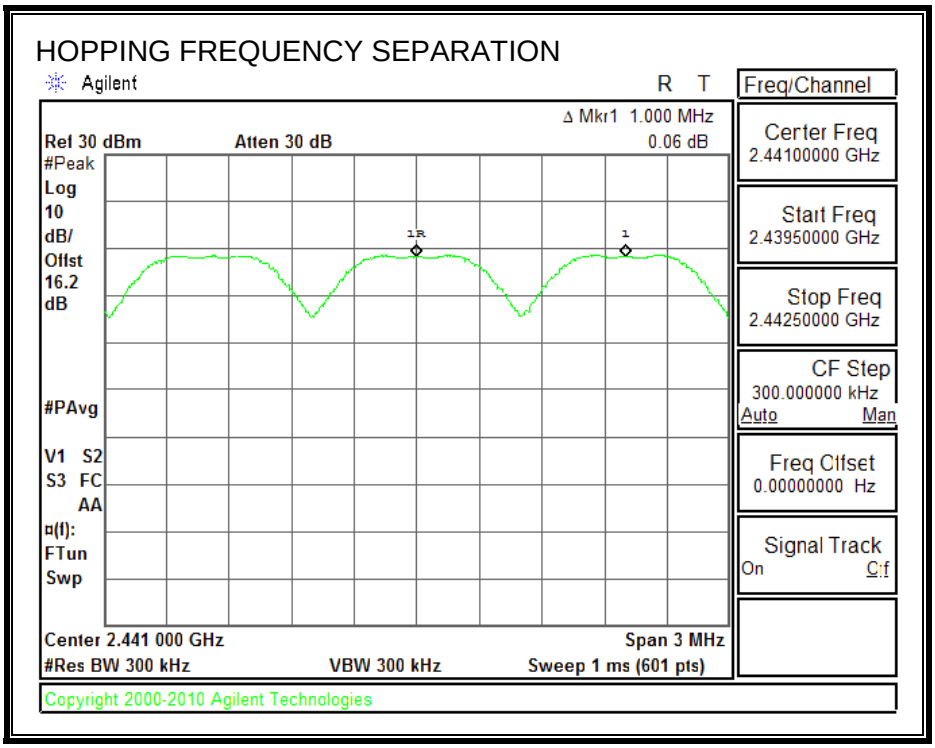
HOPPING FREQUENCY SEPARATION PLOT



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8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

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

RESULTS

Normal Mode: 79 Channels observed.

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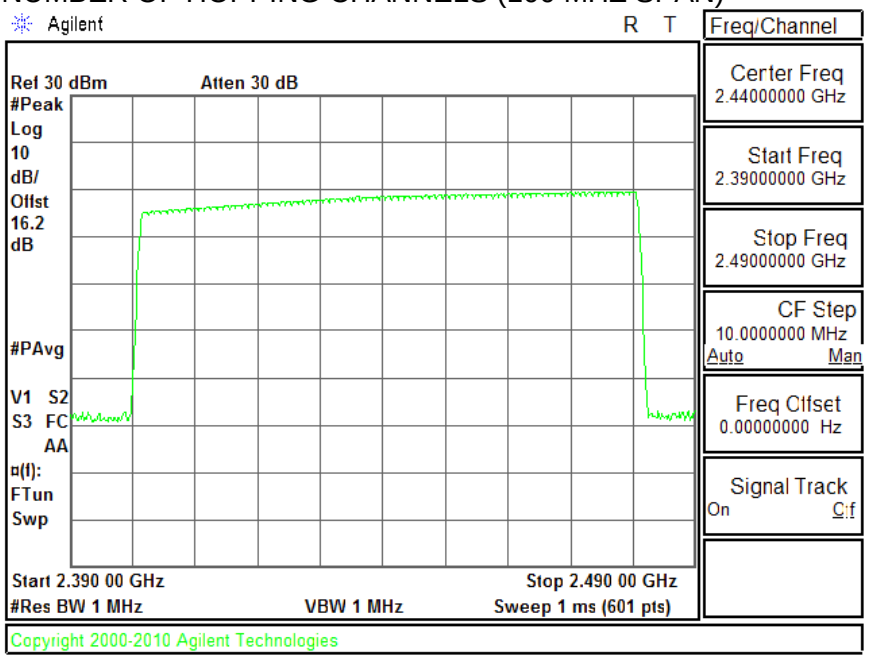
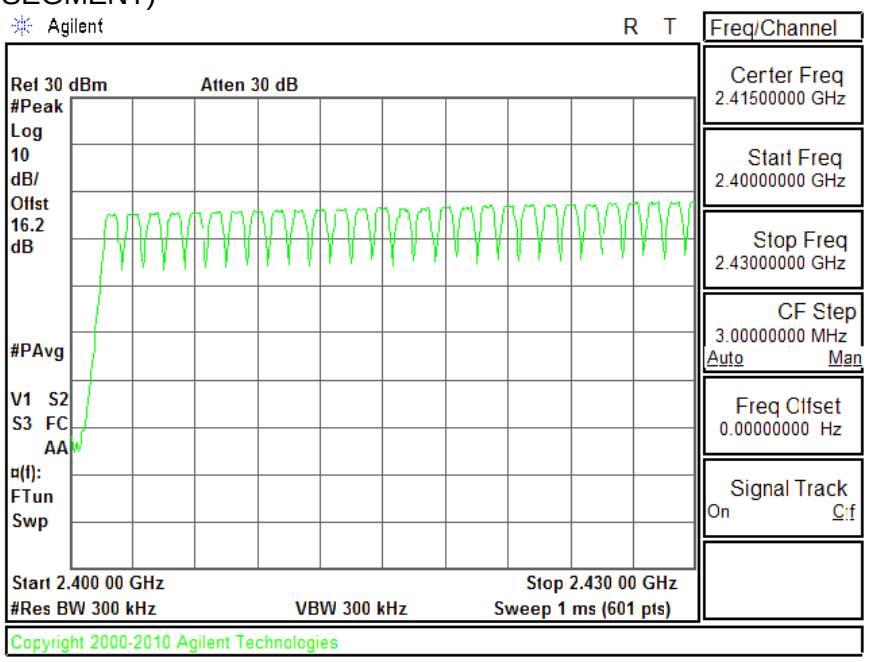
NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



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



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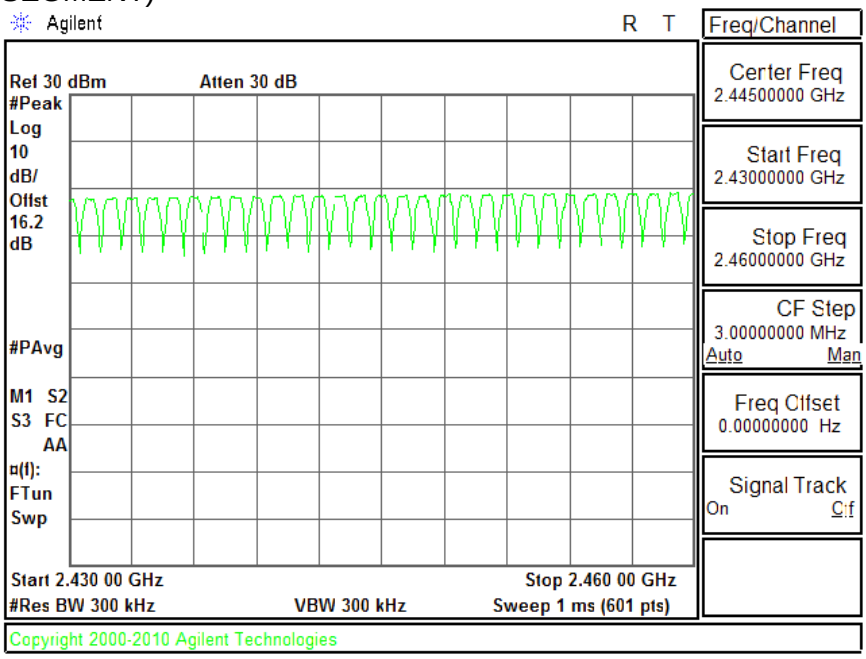
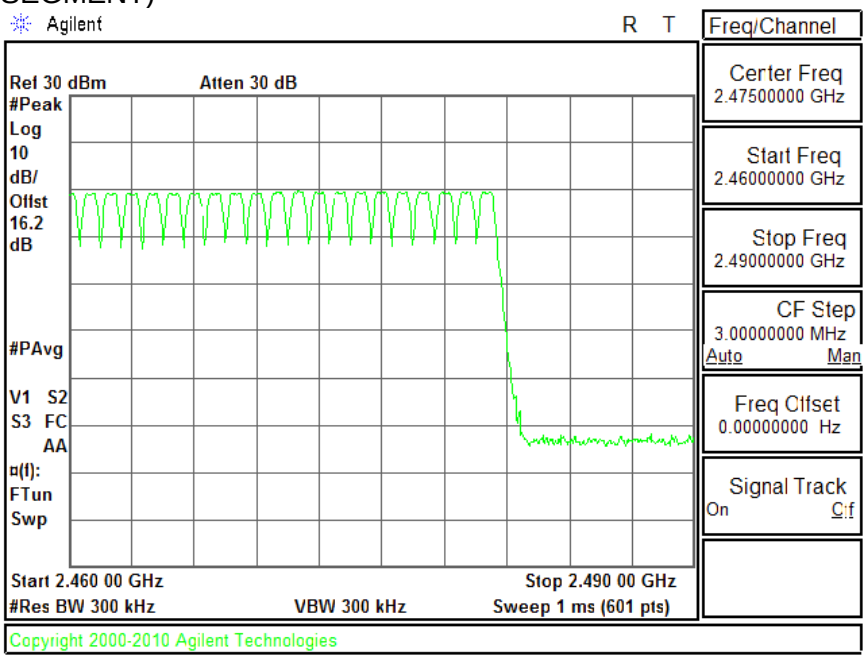
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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	0.383	30	0.115	0.4	-0.285
DH3	1.600	18	0.288	0.4	-0.112
DH5	2.880	5	0.144	0.4	-0.256
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	0.383	8	0.031	0.4	-0.369
DH3	1.6	4	0.064	0.4	-0.336
DH5	2.88	4	0.115	0.4	-0.285

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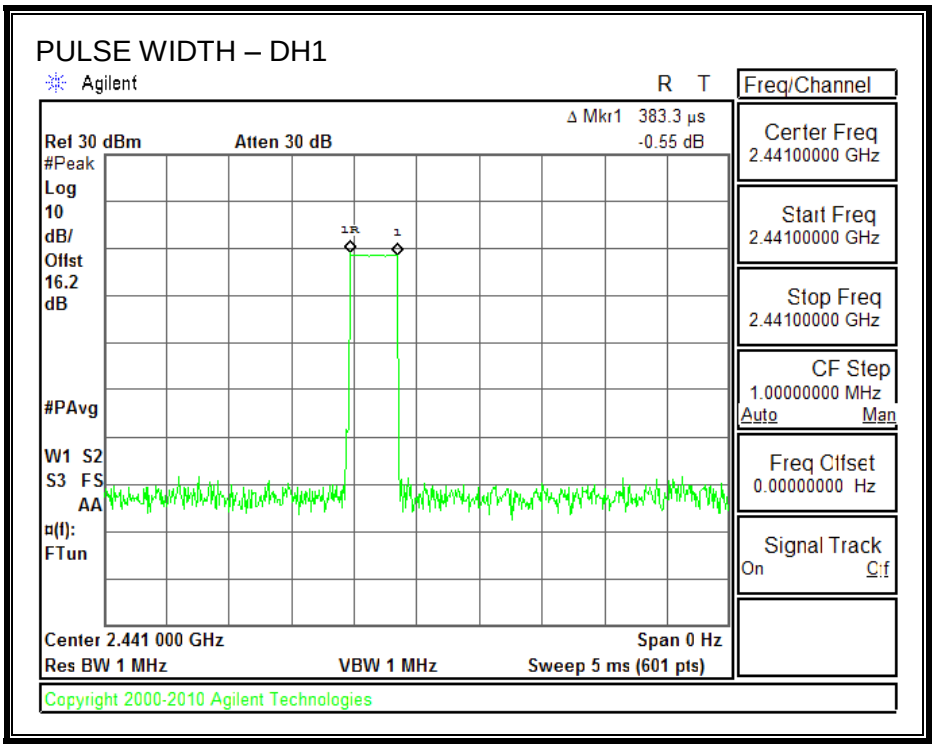
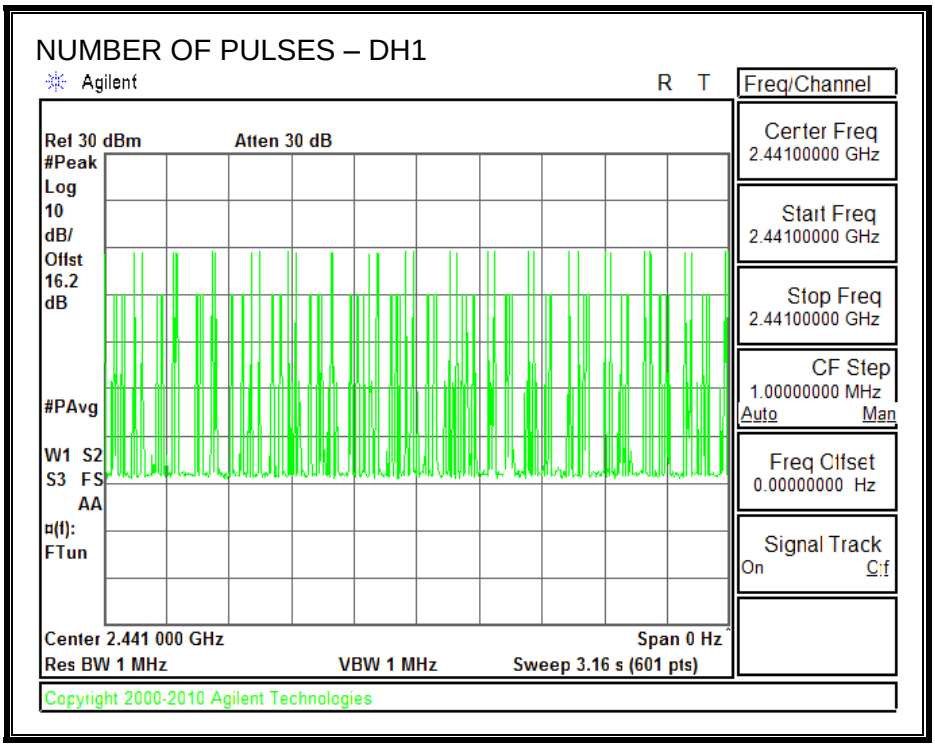
PULSE WIDTH - DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



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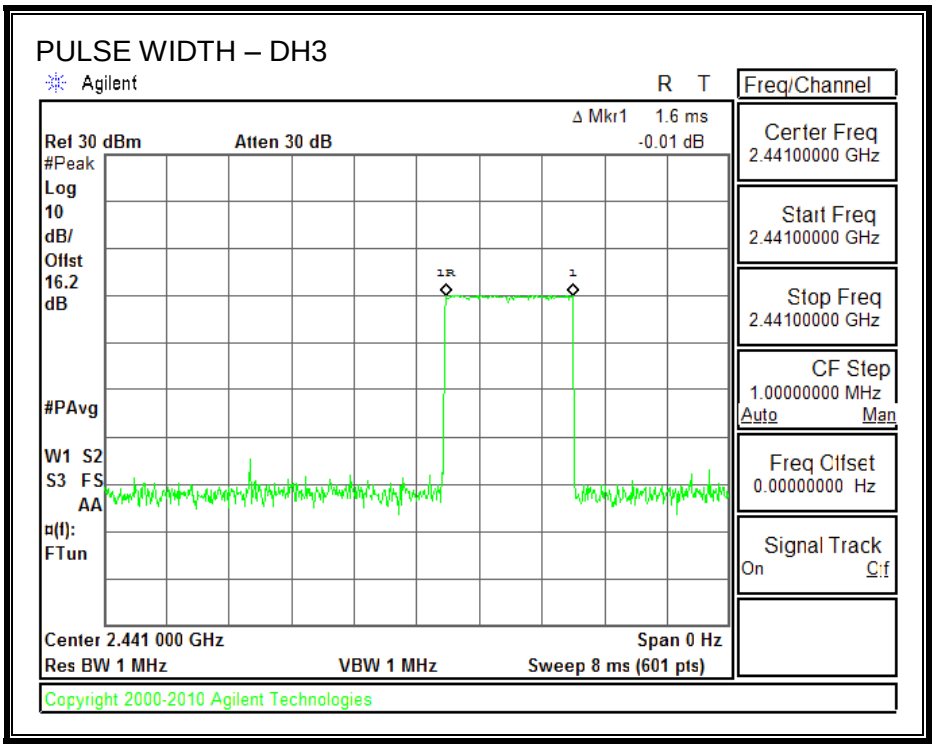
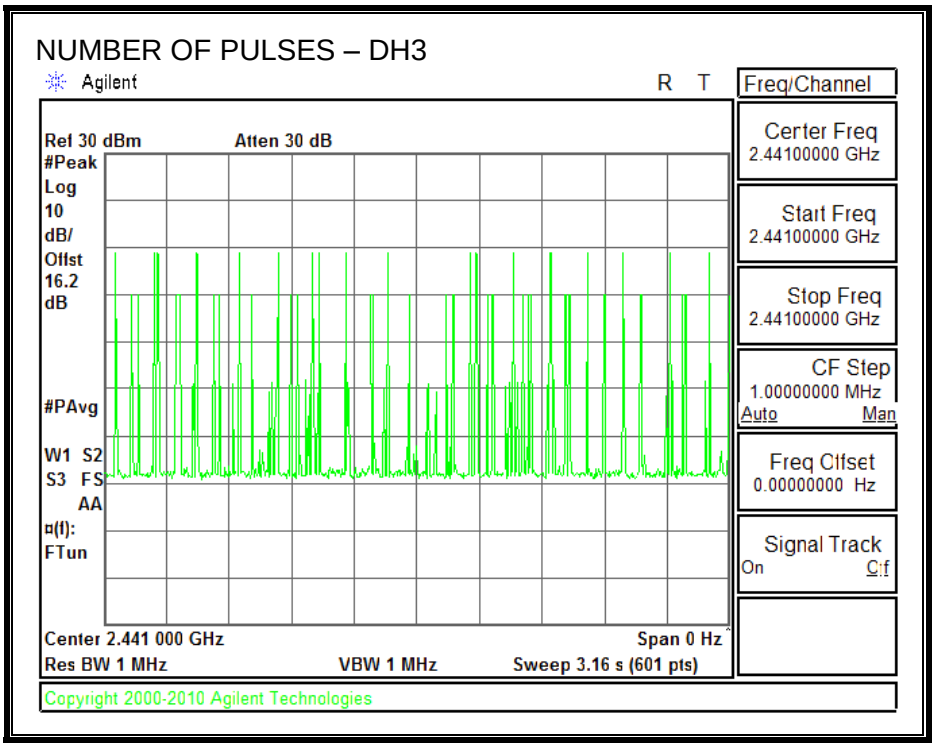
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



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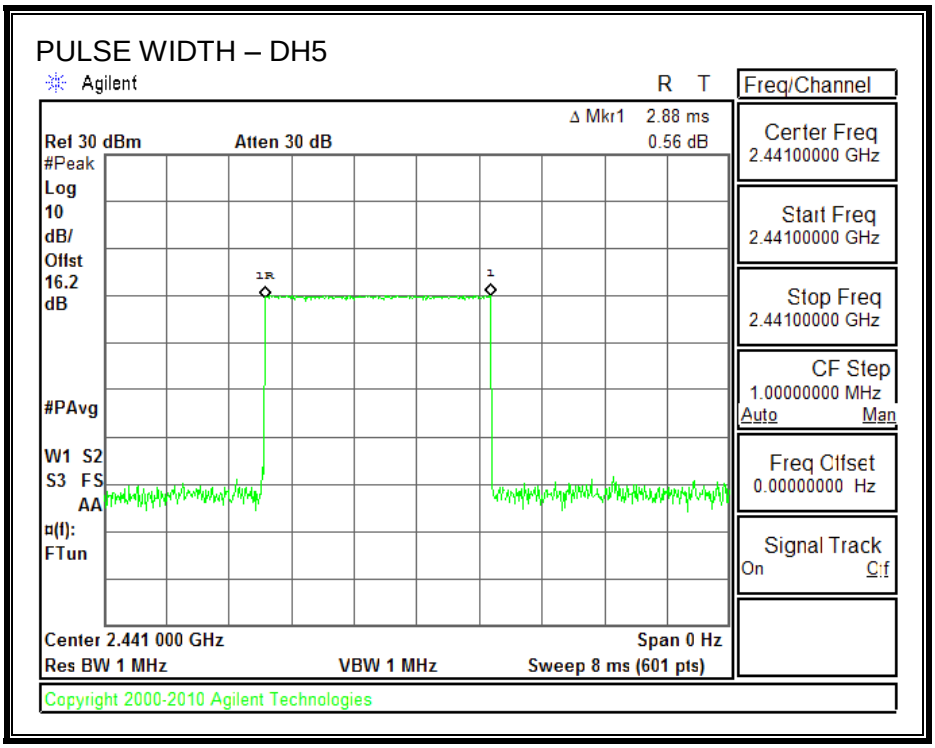
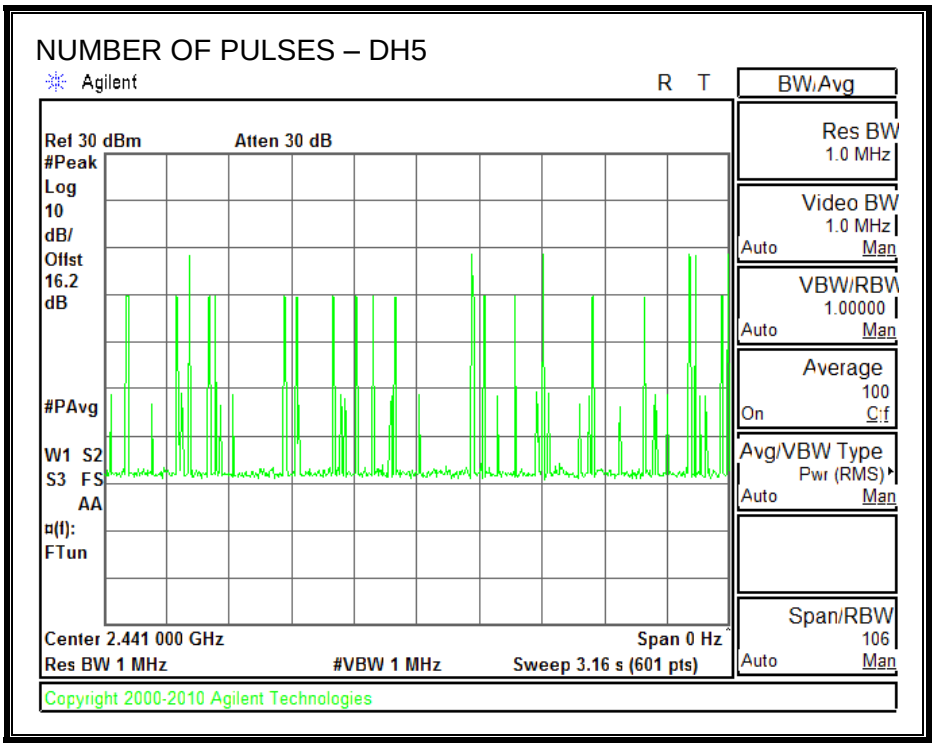
PULSE WIDTH – DH5



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	9.99	21	-11.01
Middle	2441	10.21	21	-10.79
High	2480	9.83	21	-11.17
Worst		10.21		-10.79

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.64	21	-13.36
Middle	2441	7.60	21	-13.40
High	2480	7.09	21	-13.91
Worst		7.64		-13.36

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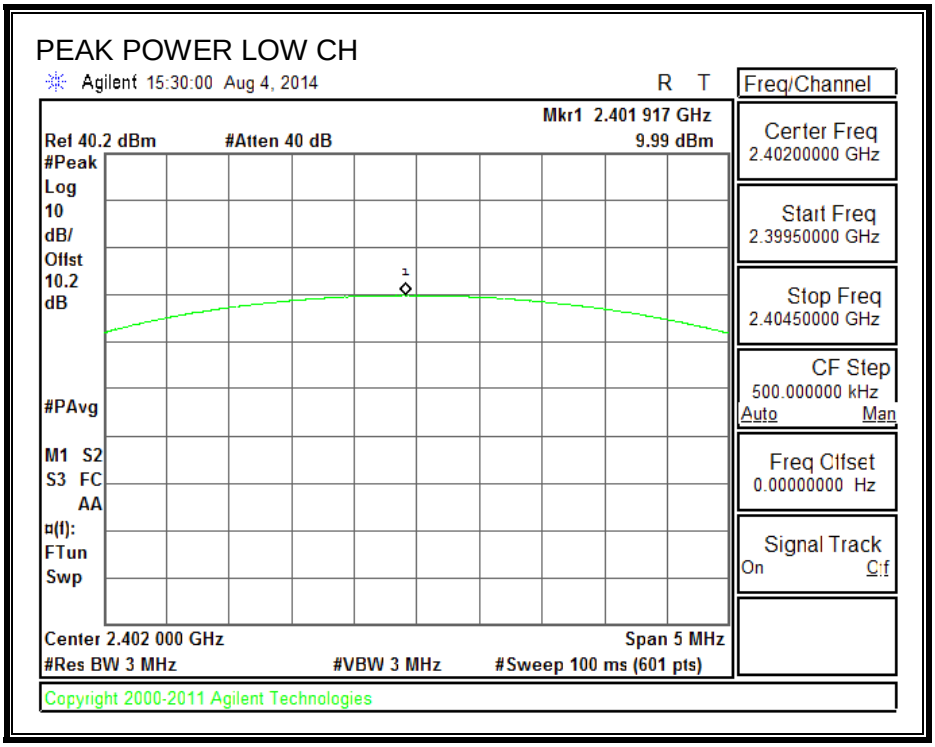
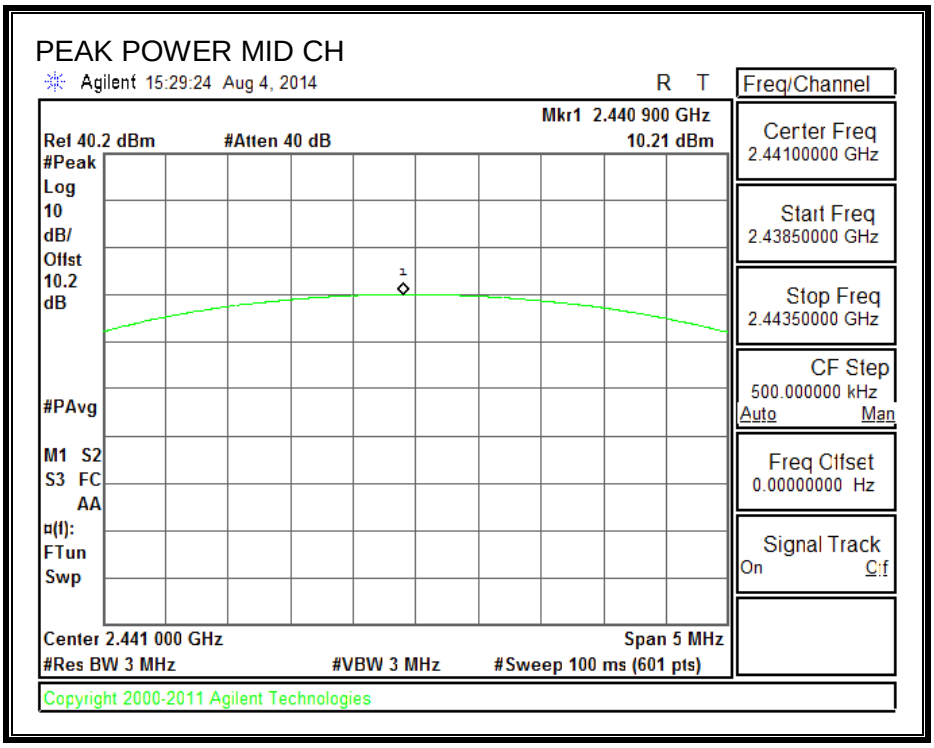
GFSK OUTPUT POWER





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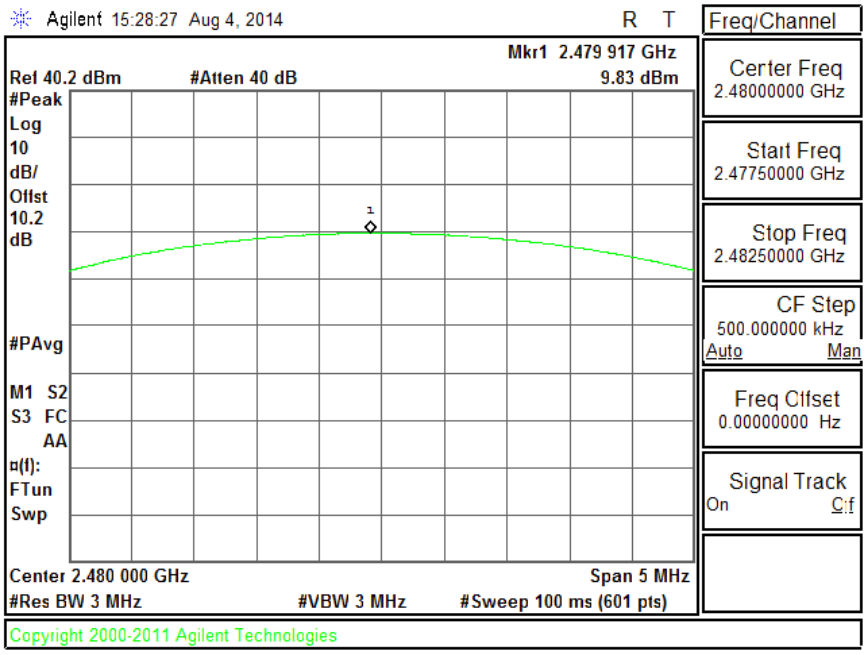
PEAK POWER HIGH CH



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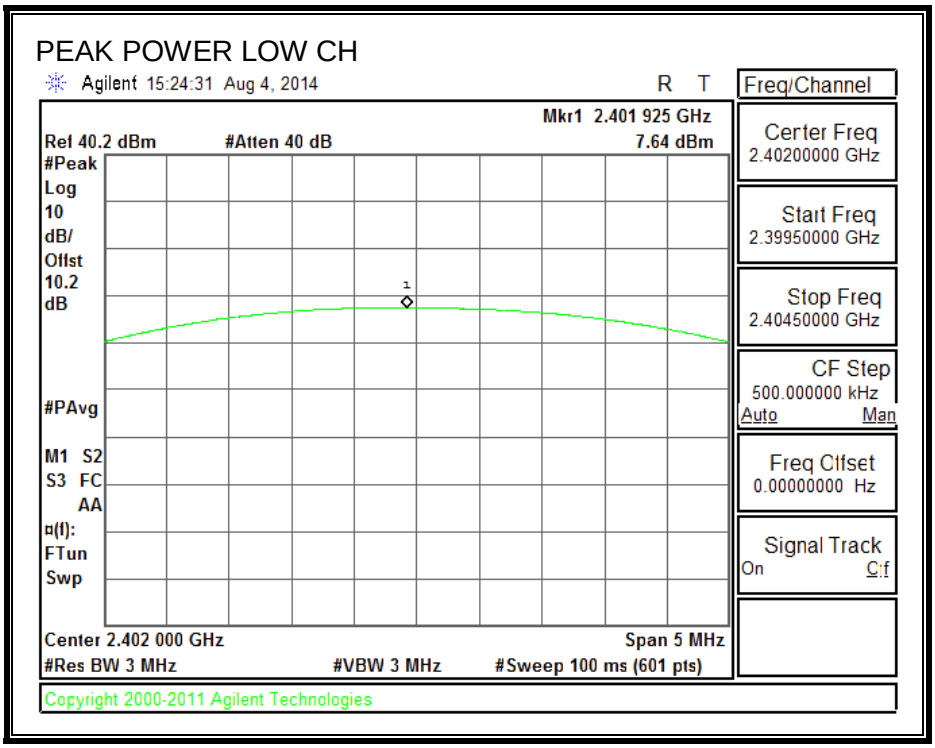
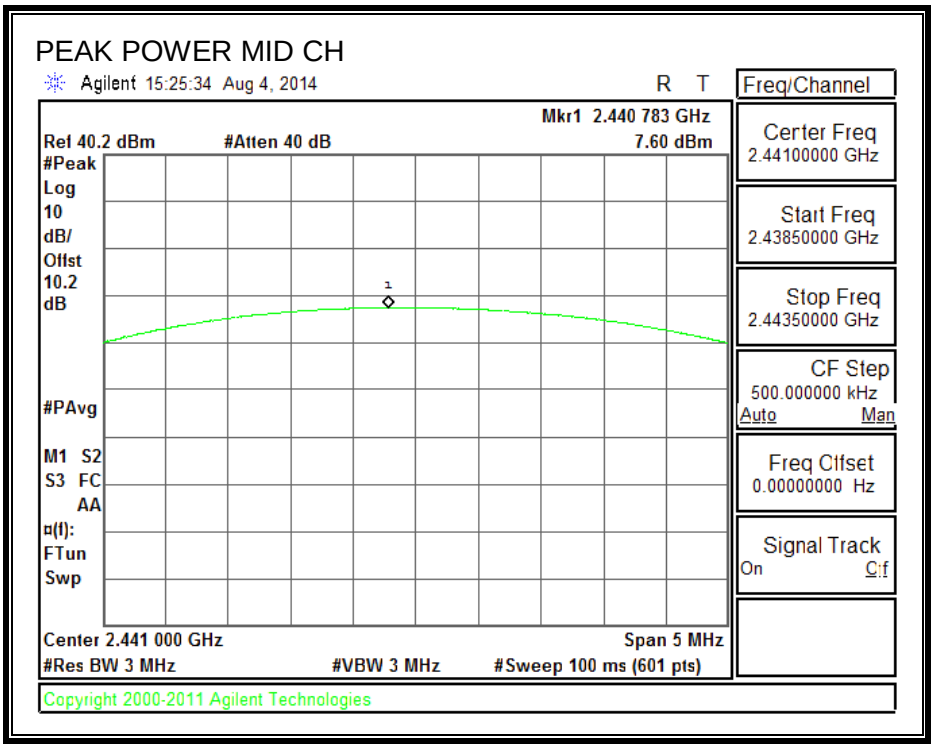
8PSK OUTPUT POWER





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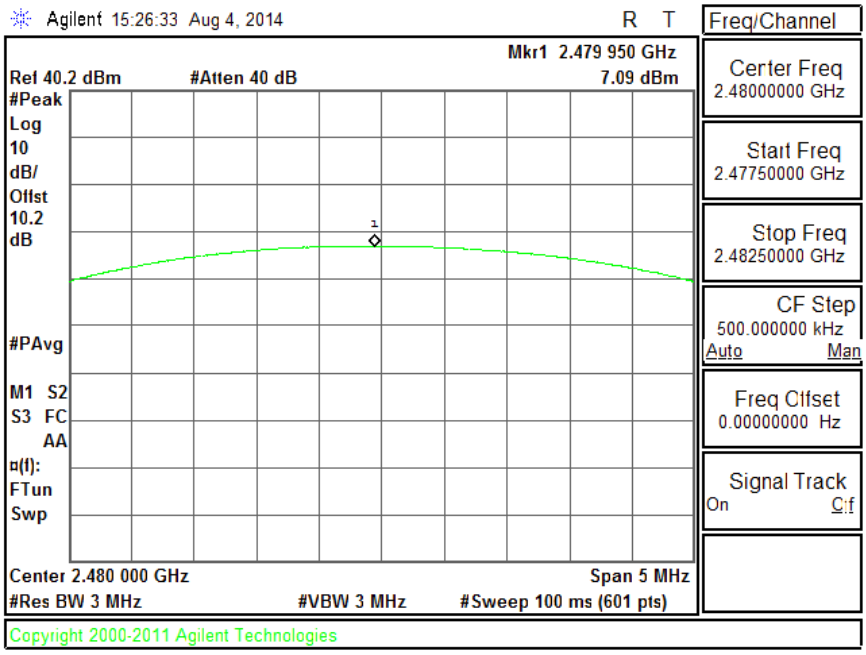
PEAK POWER HIGH CH



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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	9.1
Middle	2441	9.4
High	2480	9.1
Worst		9.4

8.6.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.9
Middle	2441	6.0
High	2480	5.5
Worst		6.0

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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

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

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

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

RESULTS

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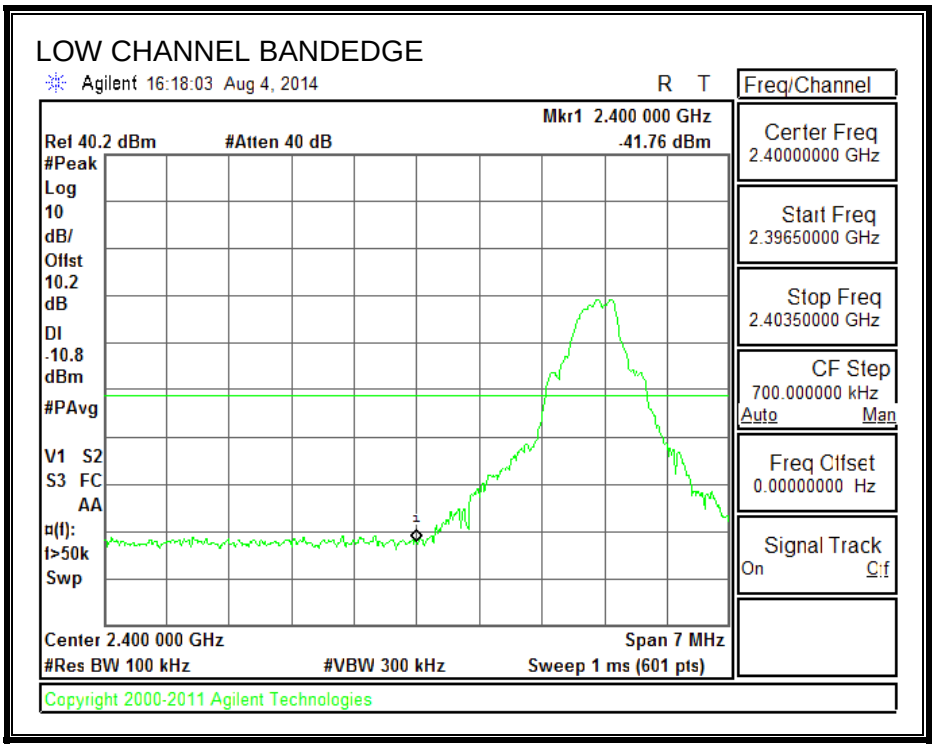
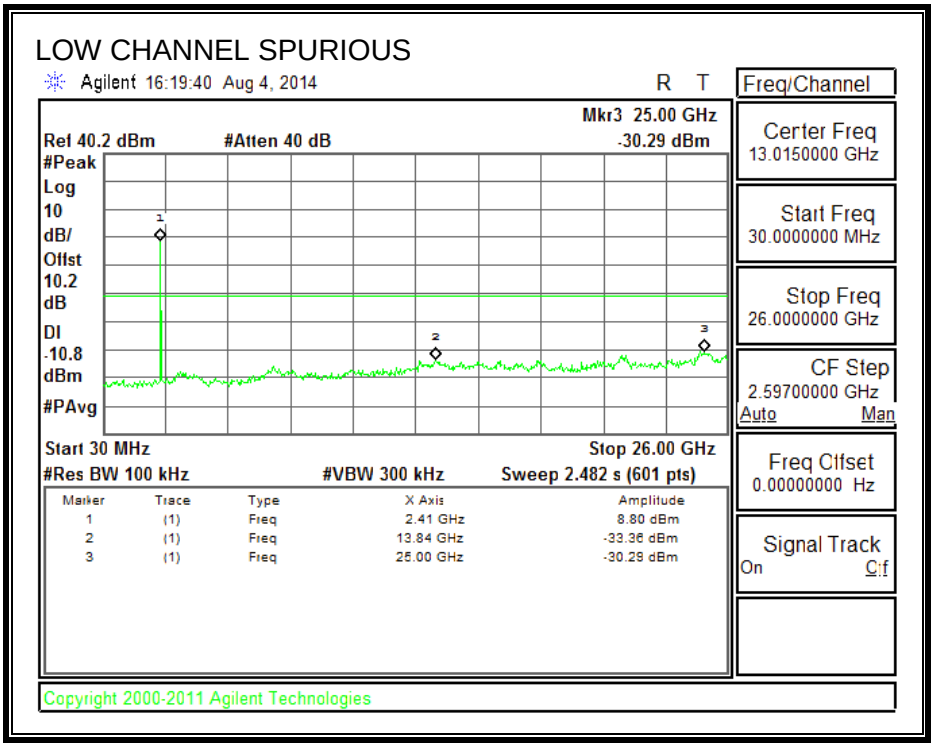
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL





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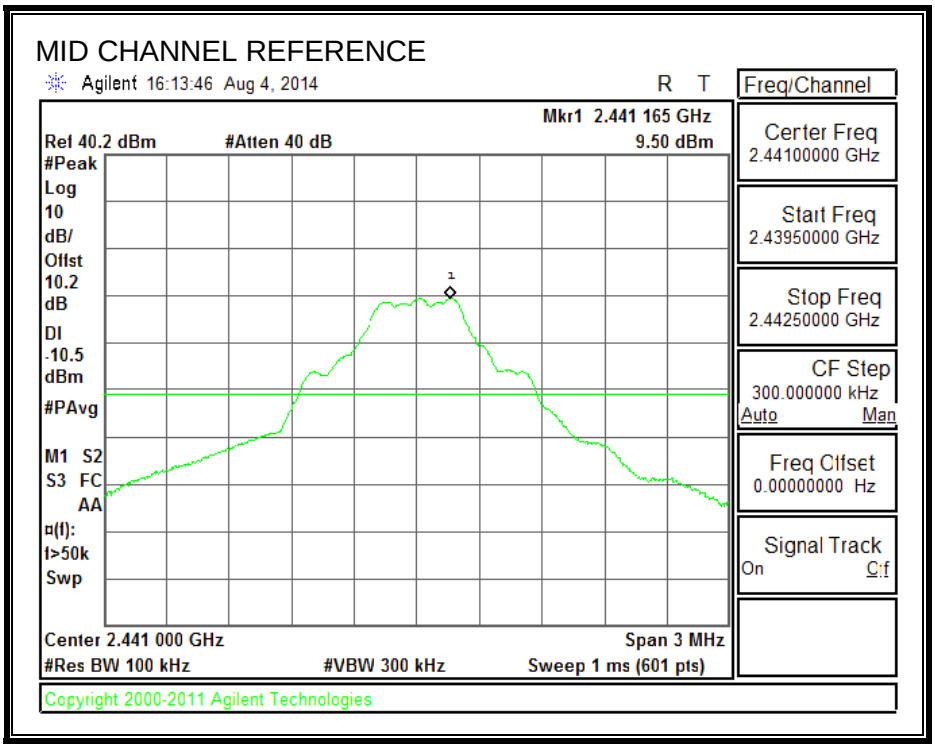
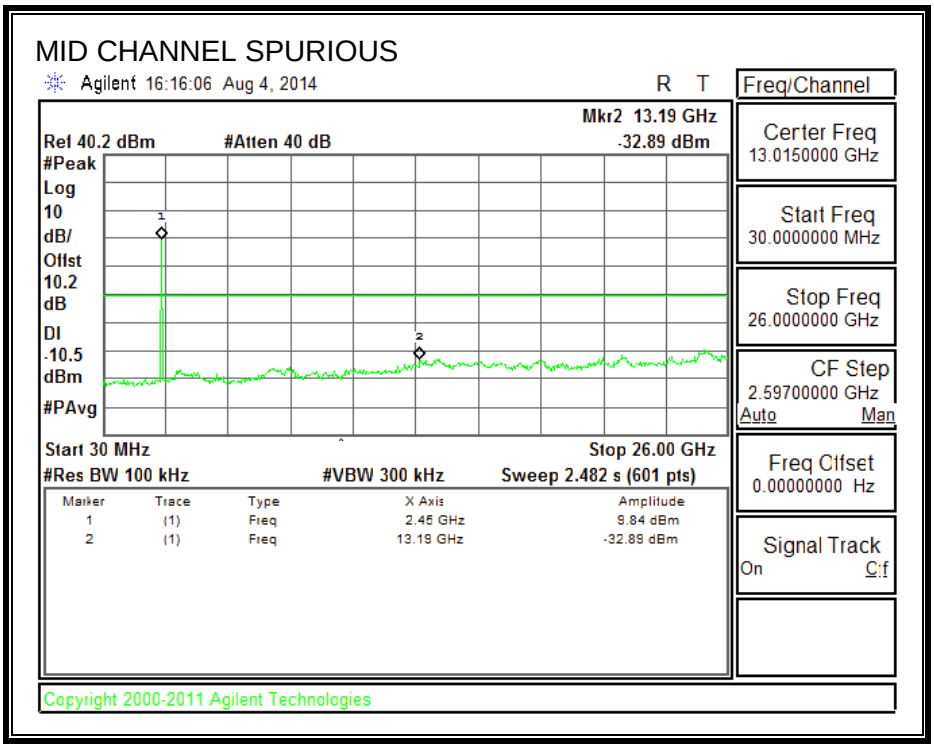
SPURIOUS EMISSIONS, MID CHANNEL





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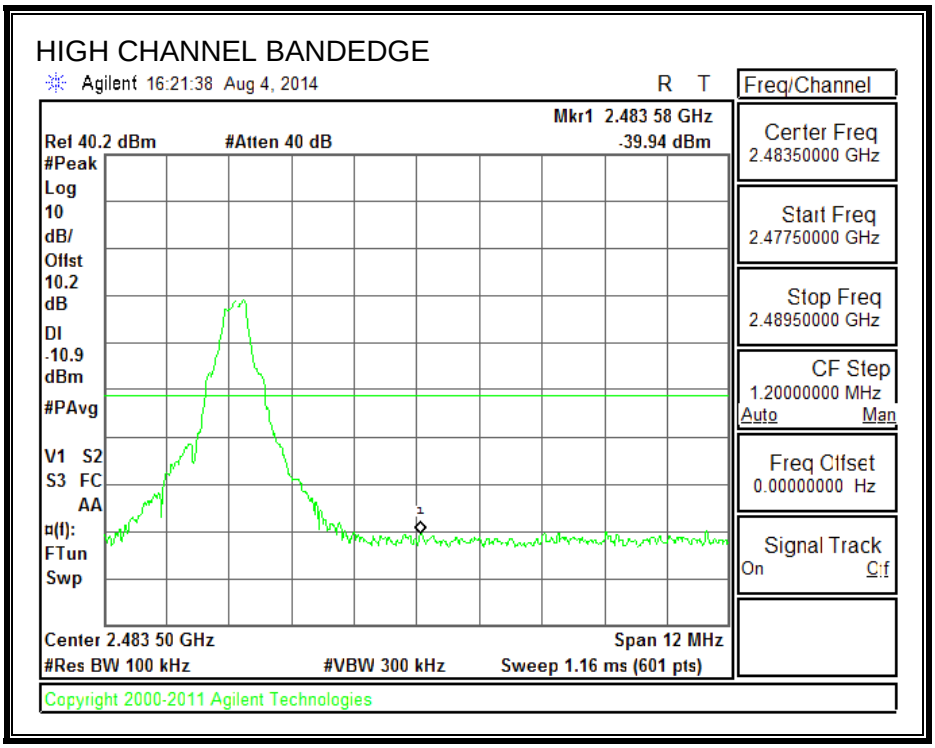
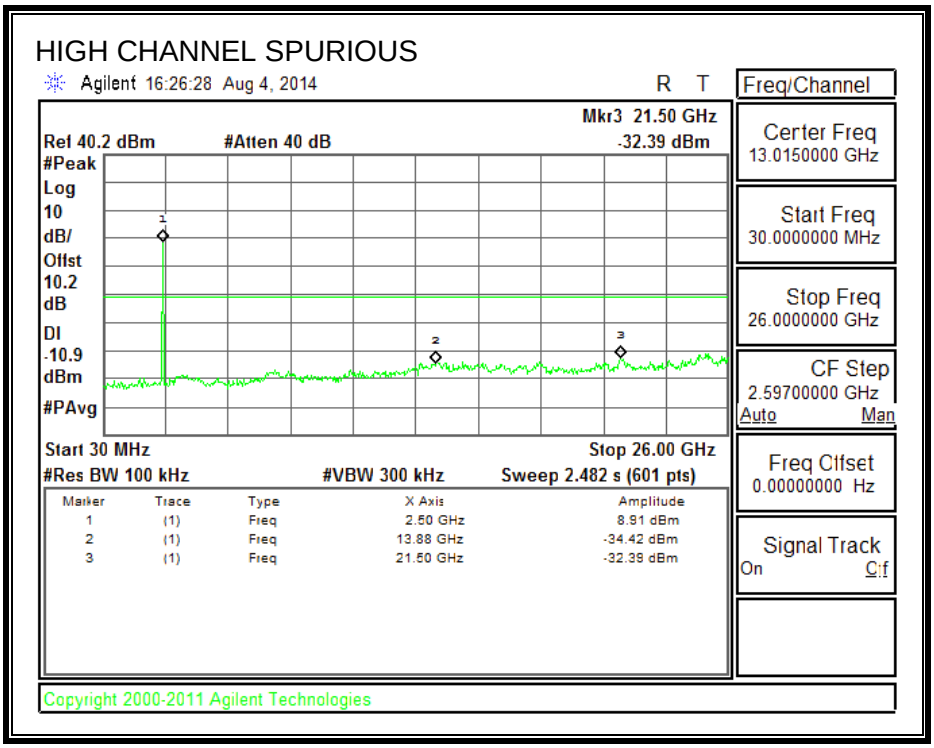
SPURIOUS EMISSIONS, HIGH CHANNEL





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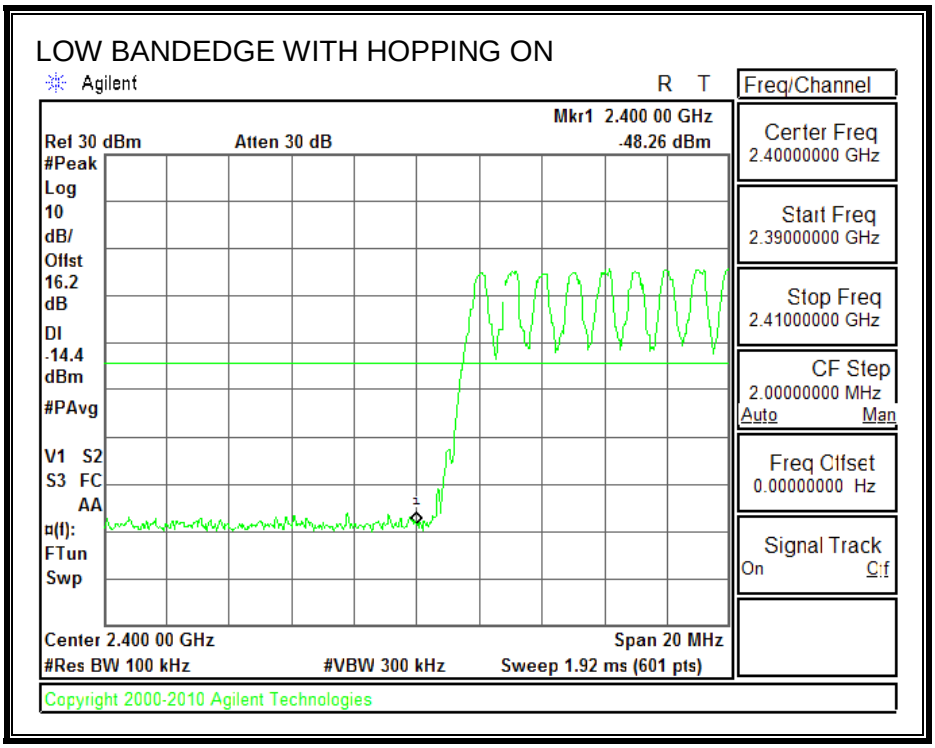
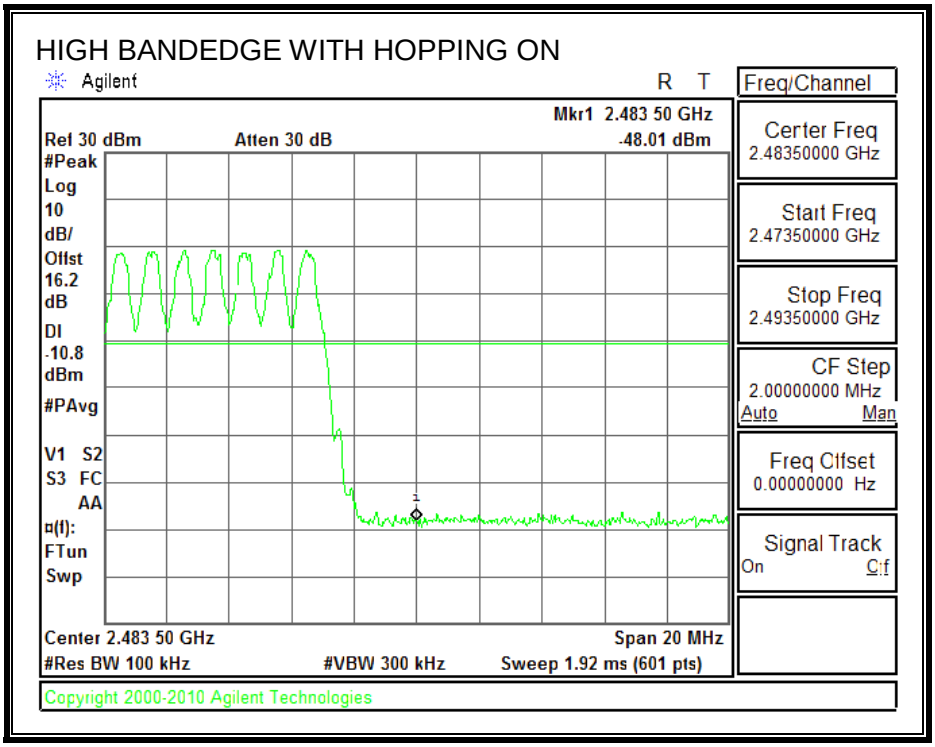
SPURIOUS BANDEDGE EMISSIONS WITH GFSK HOPPING ON





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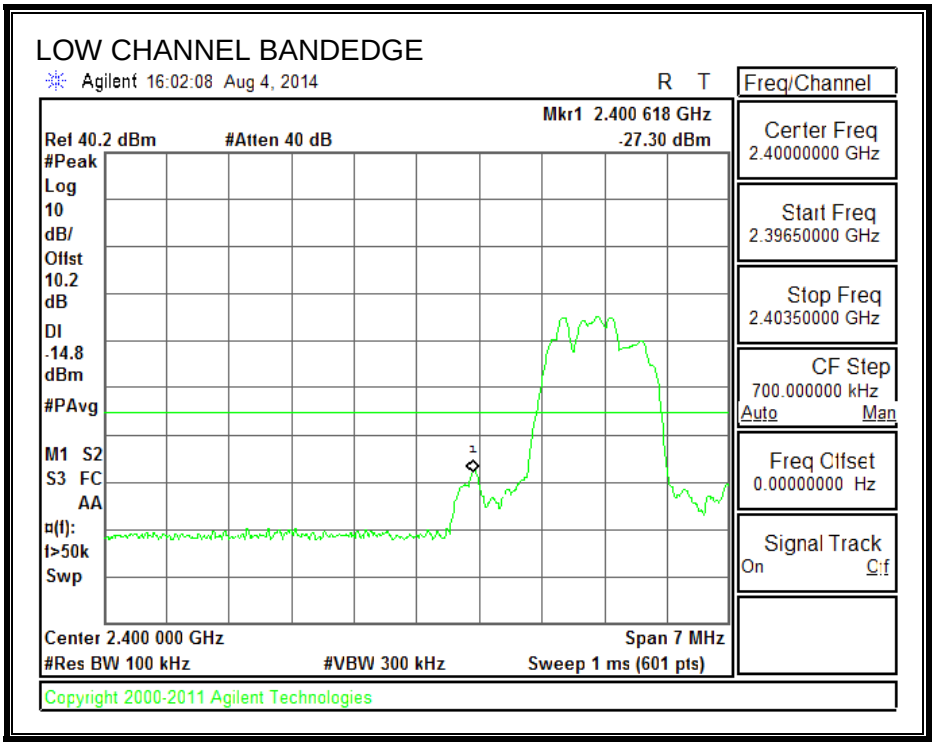
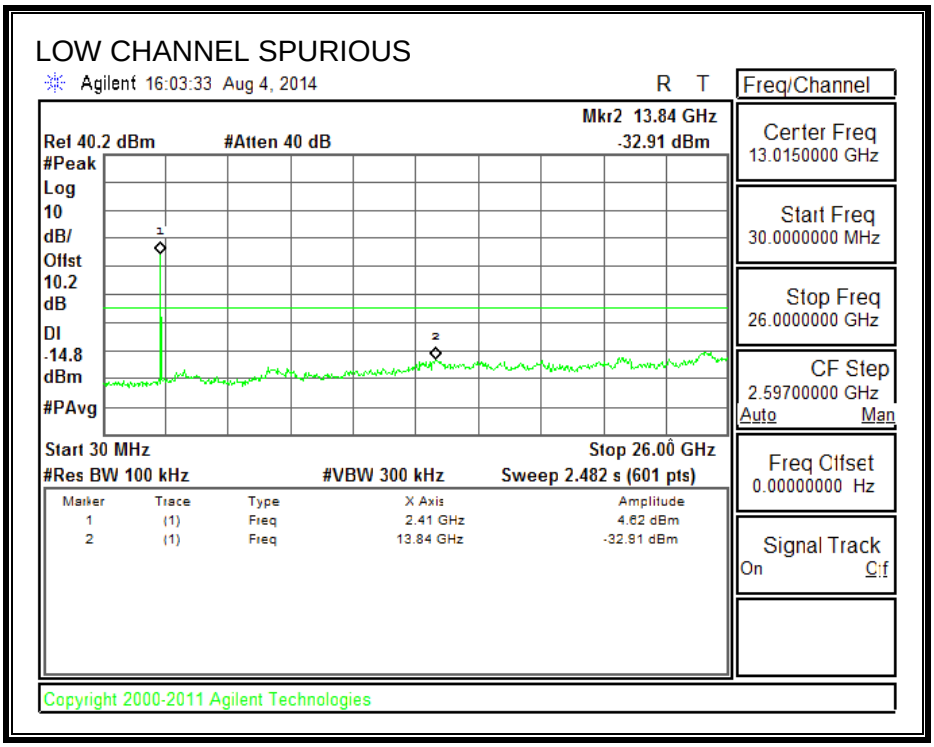
8.7.1. ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL





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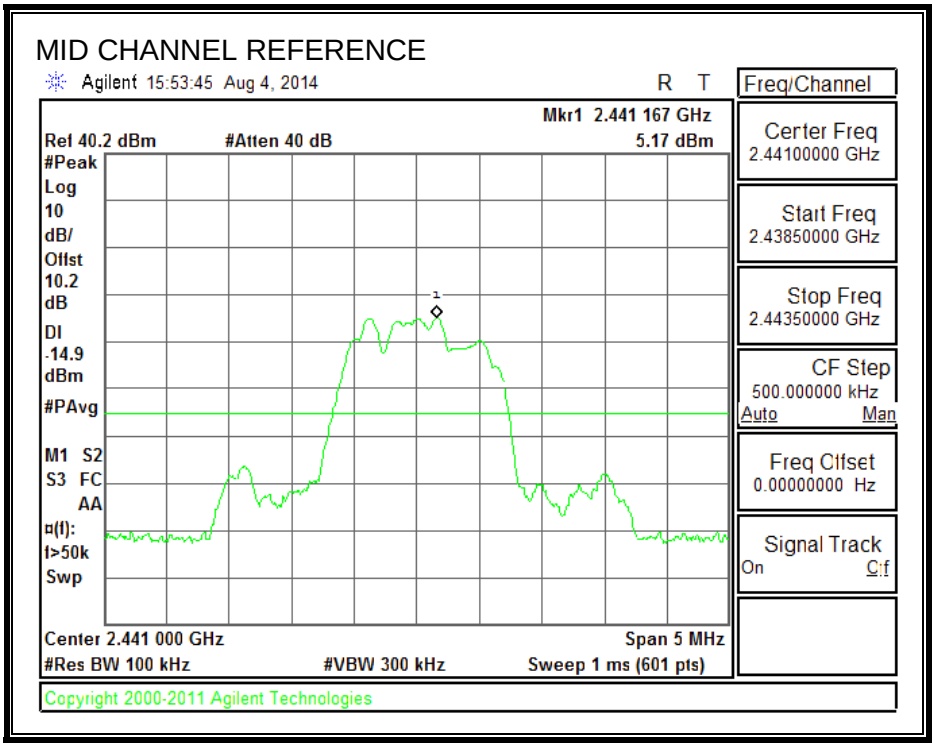
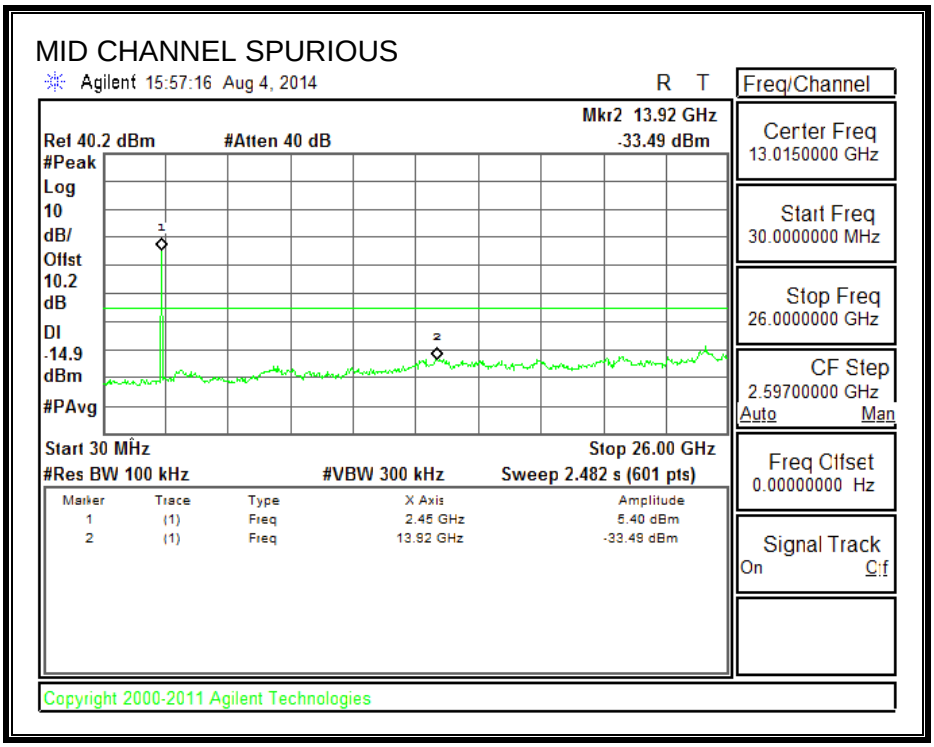
SPURIOUS EMISSIONS, MID CHANNEL





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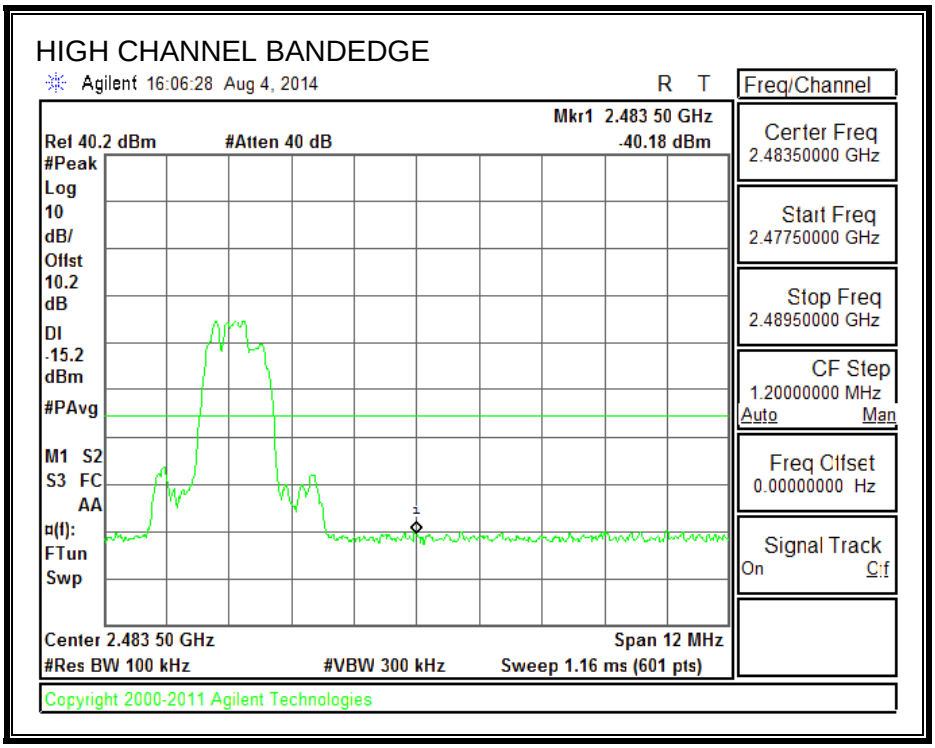
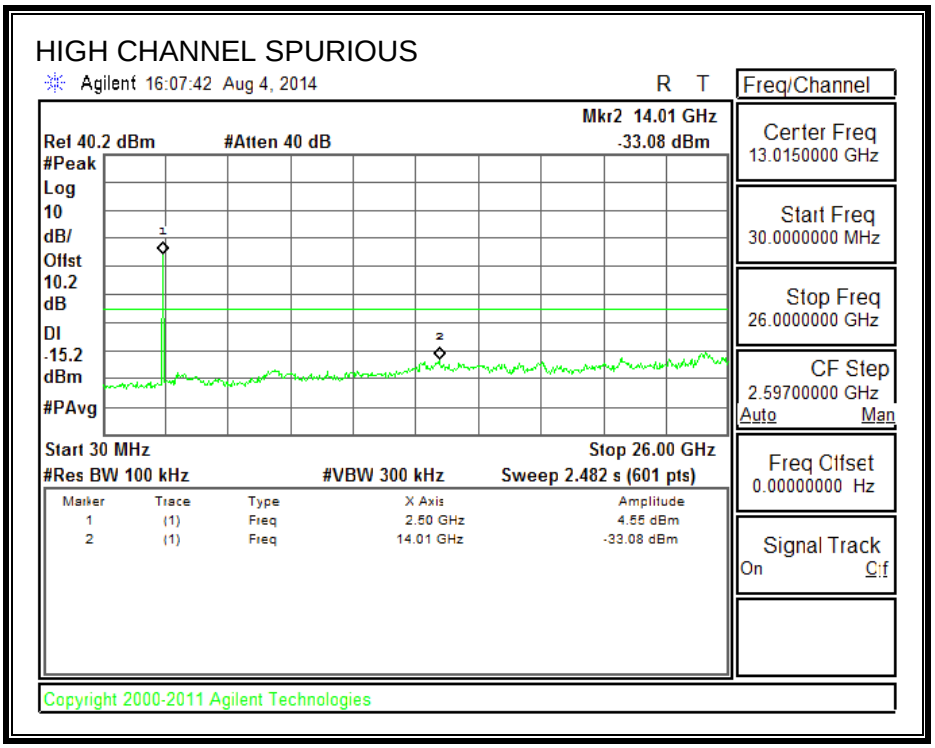
SPURIOUS EMISSIONS, HIGH CHANNEL





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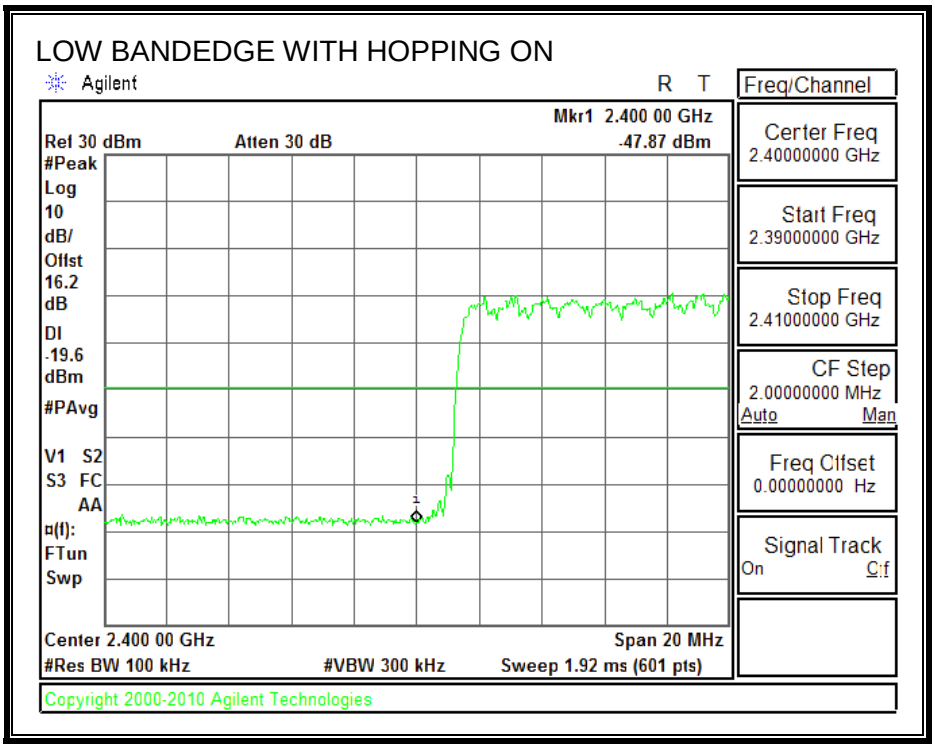
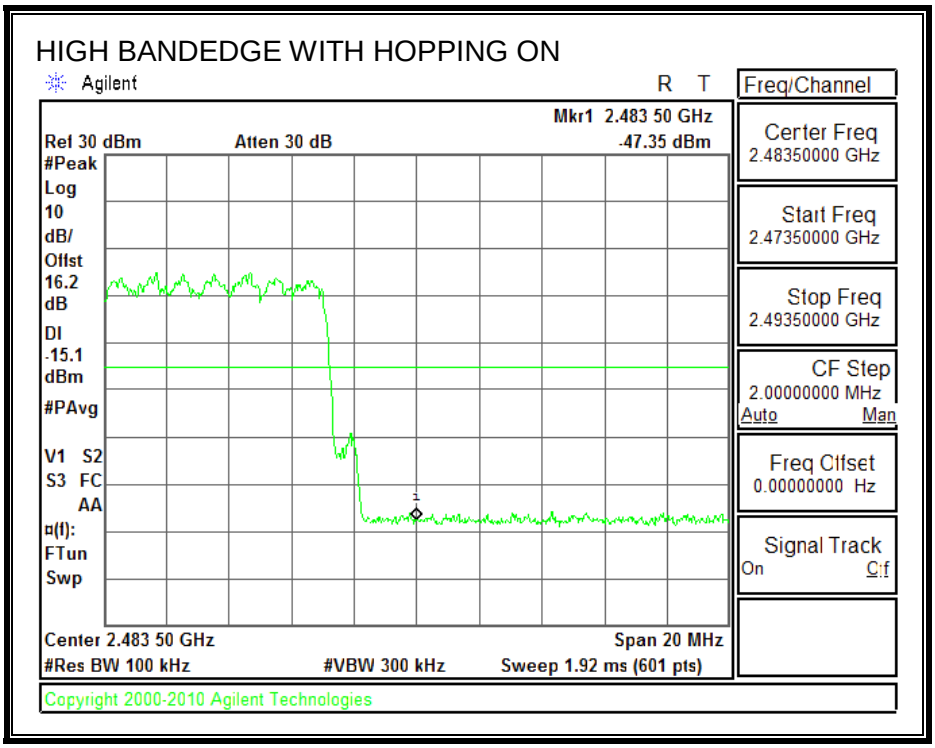
SPURIOUS BANDEDGE EMISSIONS WITH 8SK HOPPING ON





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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 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 / 0.0029S = 350Hz.

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

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

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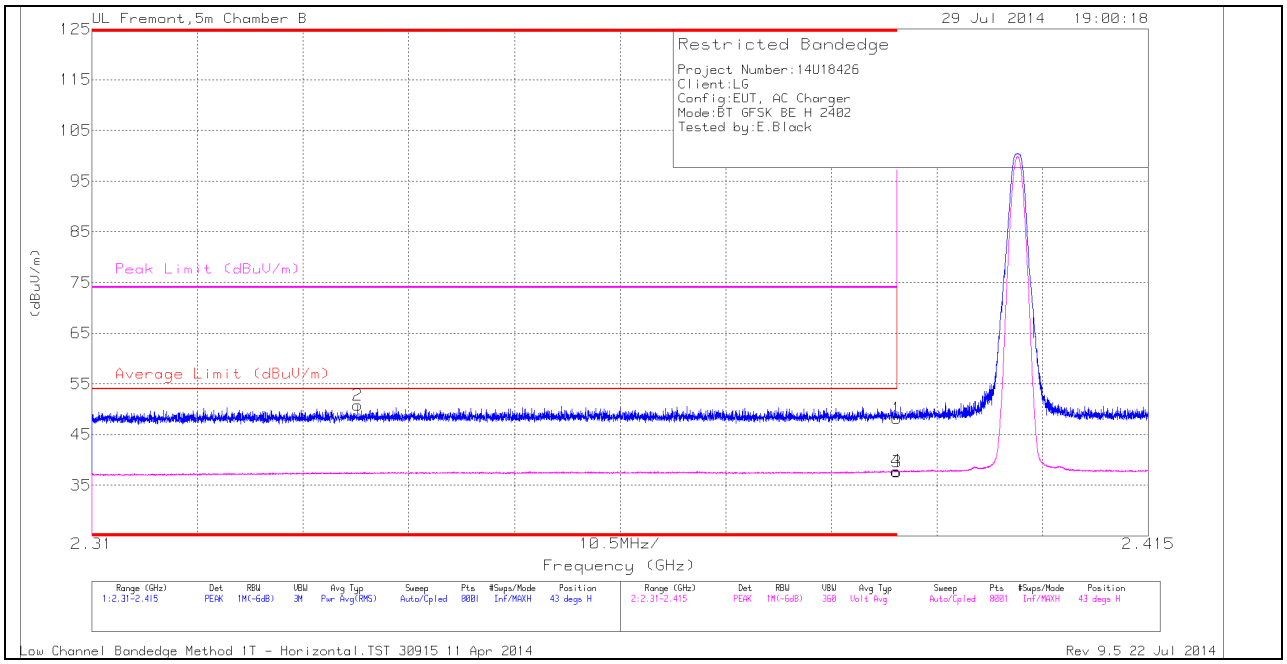
9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.92	PK	32.1	-22.8	48.22	-	-	74	-25.78	43	275	H
2	* 2.336	41.87	PK	31.8	-22.9	50.77	-	-	74	-23.23	43	275	H
3	* 2.39	28.34	VB1T	32.1	-22.8	37.64	54	-16.36	-	-	43	275	H
4	* 2.39	28.51	VB1T	32.1	-22.8	37.81	54	-16.19	-	-	43	275	H

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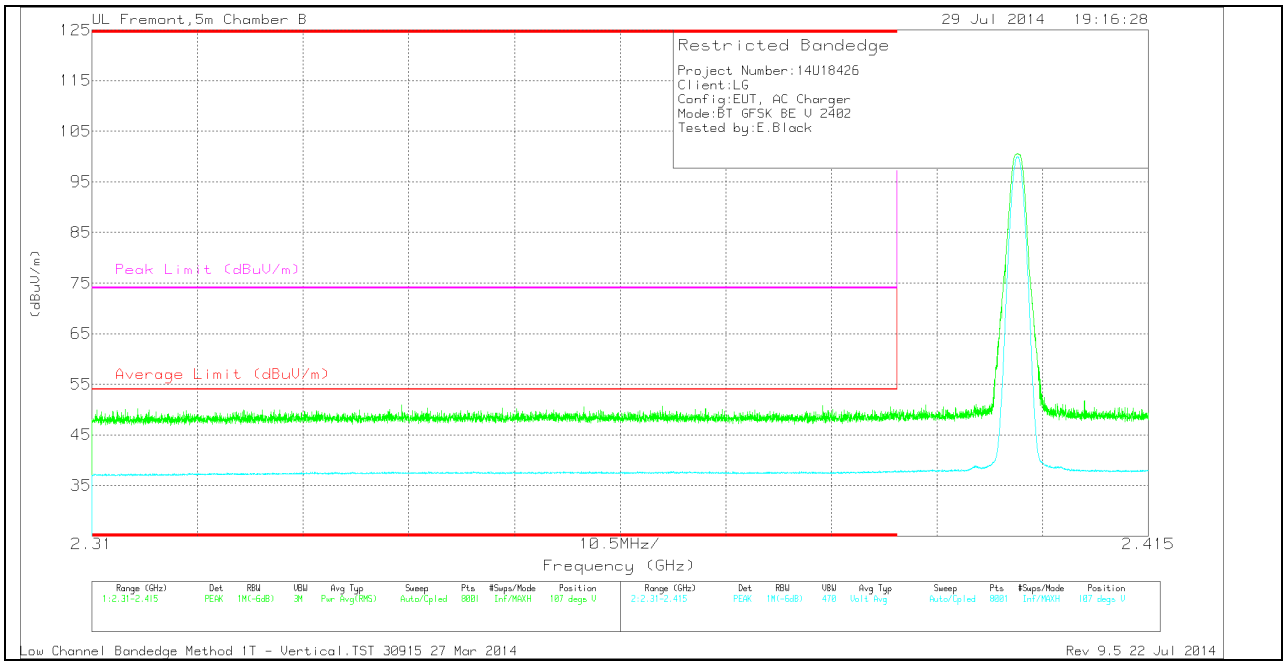
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.46	PK	32.1	-22.8	48.76	-	-	74	-25.24	107	331	V
2	* 2.341	42.05	PK	31.8	-22.9	50.95	-	-	74	-23.05	107	331	V
3	* 2.39	28.38	VB1T	32.1	-22.8	37.68	54	-16.32	-	-	107	331	V
4	* 2.39	28.64	VB1T	32.1	-22.8	37.94	54	-16.06	-	-	107	331	V

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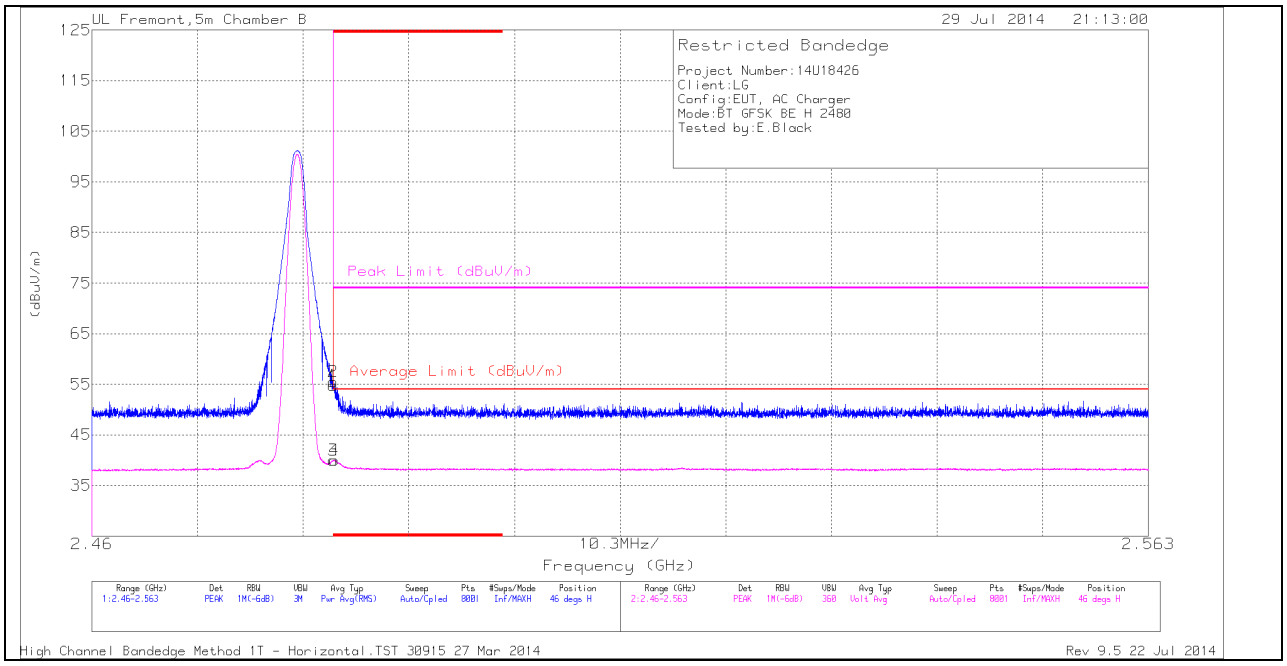
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.01	PK	32.4	-22.7	54.71	-	-	74	-19.29	46	315	H
2	* 2.484	45.76	PK	32.4	-22.7	55.46	-	-	74	-18.54	46	315	H
3	* 2.484	30.25	VB1T	32.4	-22.7	39.95	54	-14.05	-	-	46	315	H
4	* 2.484	30.31	VB1T	32.4	-22.7	40.01	54	-13.99	-	-	46	315	H

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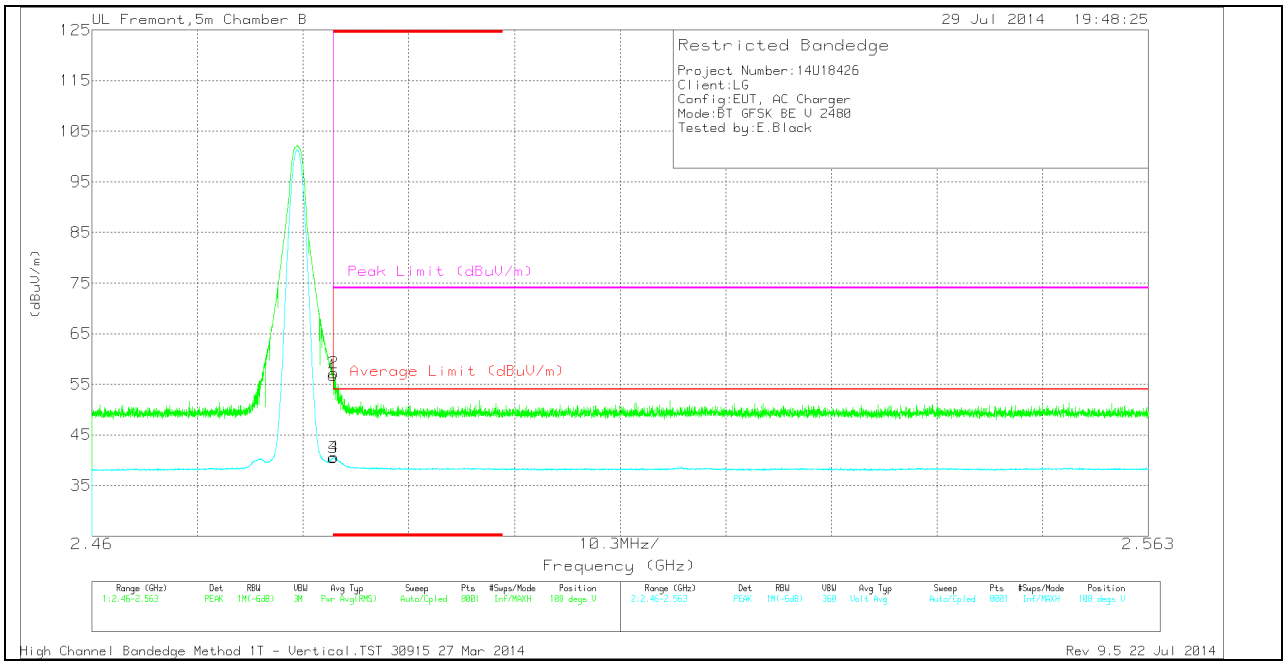
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.04	PK	32.4	-22.7	56.74	-	-	74	-17.26	108	313	V
2	* 2.484	47.56	PK	32.4	-22.7	57.26	-	-	74	-16.74	108	313	V
3	* 2.484	30.75	VB1T	32.4	-22.7	40.45	54	-13.55	-	-	108	313	V
4	* 2.484	30.91	VB1T	32.4	-22.7	40.61	54	-13.39	-	-	108	313	V

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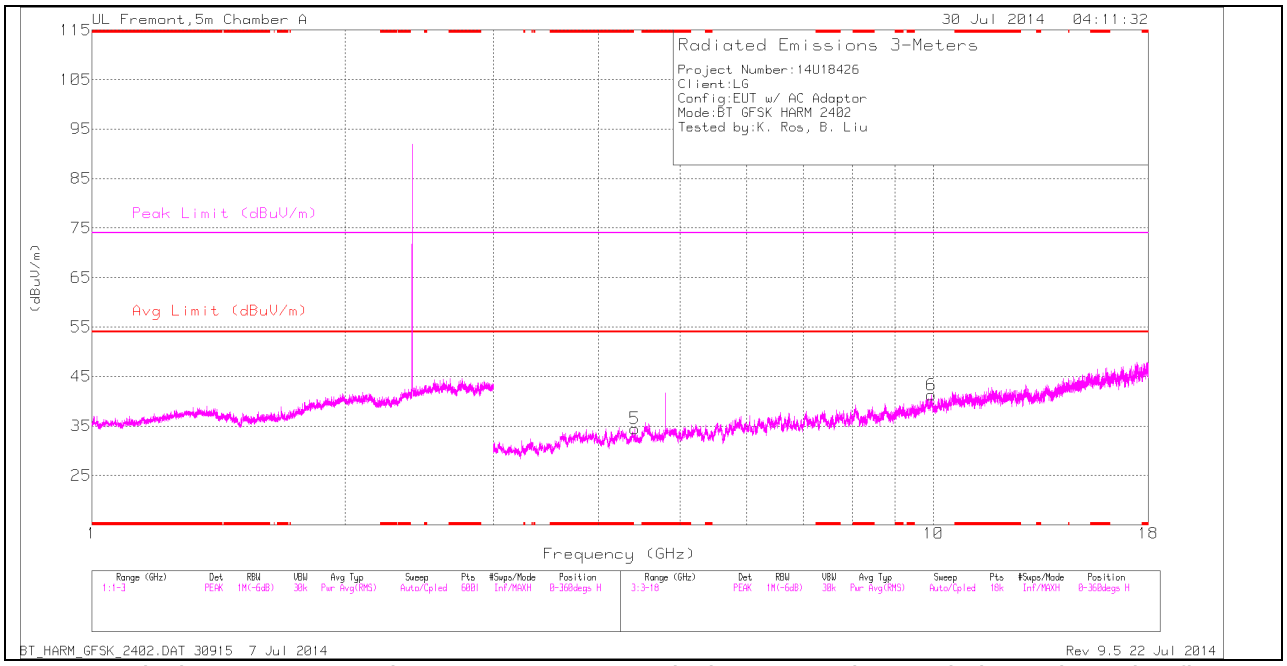
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

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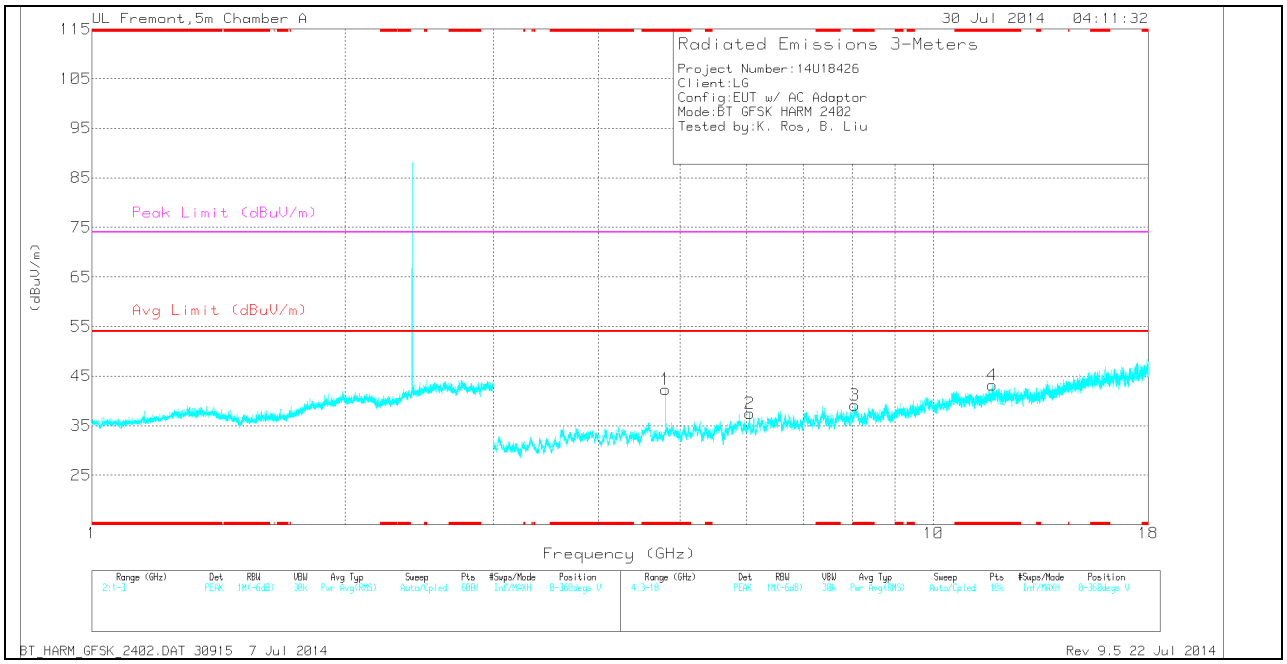
LOW CHANNEL VERTICAL



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

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (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	* 4.804	38.36	PK	34	-30	42.36	-	-	74	-31.64	0-360	201	V
3	* 8.068	27.77	PK	35.5	-24.1	39.17	-	-	74	-34.83	0-360	100	V
4	* 11.74	25.96	PK	38.7	-21.5	43.16	-	-	74	-30.84	0-360	201	V
5	4.416	31.19	PK	33.9	-30.6	34.49	-	-	-	-	0-360	201	H
2	6.045	30.28	PK	35.3	-28.1	37.48	-	-	-	-	0-360	201	V
6	9.95	26.79	PK	37.1	-22.6	41.29	-	-	-	-	0-360	201	H

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.803	38.46	PK3	34	-30.1	42.36	-	-	74	-31.64	60	178	V
* 4.805	25.98	VB1T	34	-30	29.98	54	-24.02	-	-	60	178	V
* 8.068	35.06	PK3	35.5	-24.1	46.46	-	-	74	-27.54	60	100	V
* 11.738	32.44	PK3	38.7	-21.5	49.64	-	-	74	-24.36	60	202	V
4.417	38.03	PK3	33.9	-30.6	41.33	-	-	-	-	60	202	H
6.045	37.59	PK3	35.3	-28.1	44.79	-	-	-	-	60	202	V
9.948	33.38	PK3	37.1	-22.6	47.88	-	-	-	-	60	202	H

* - 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

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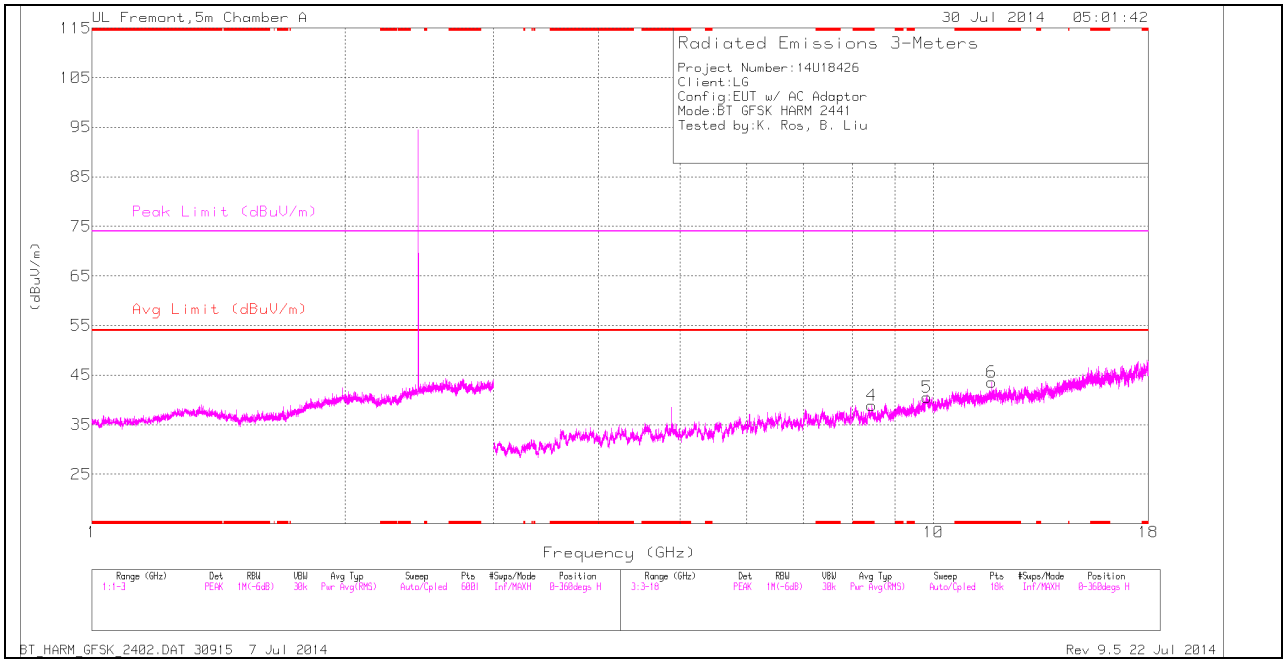
MID CHANNEL HORIZONTAL



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

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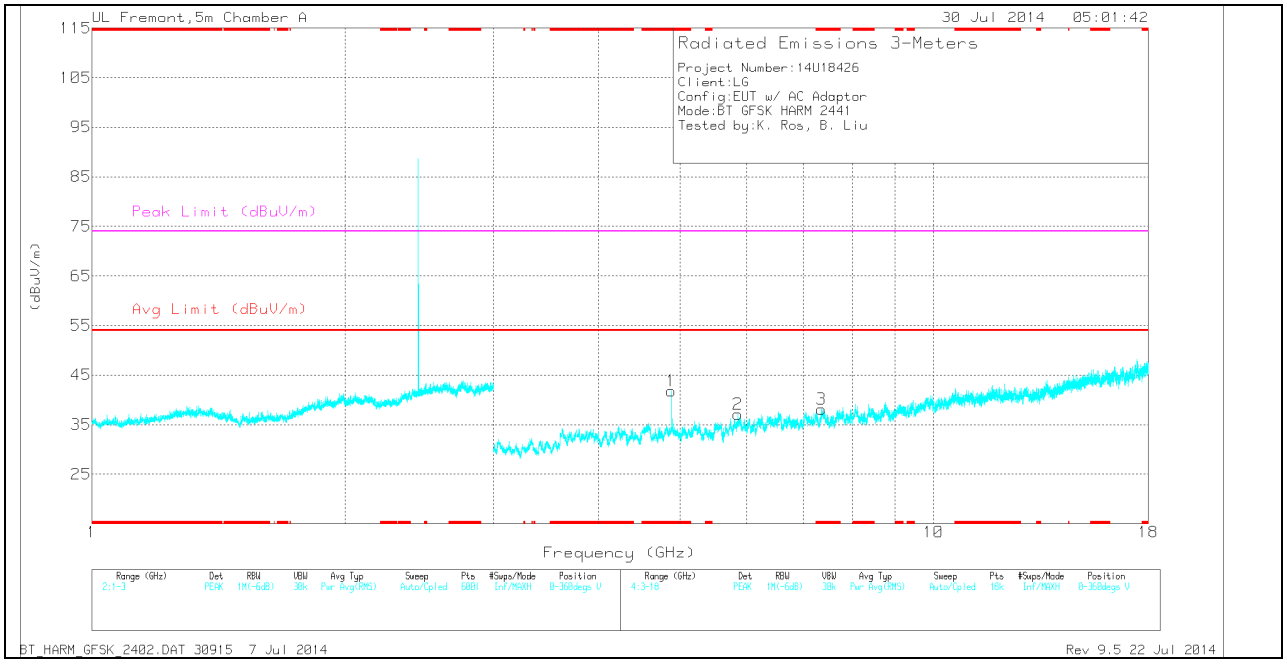
MID CHANNEL VERTICAL



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

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MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 8.447	27.61	PK	35.7	-24.4	38.91	-	-	74	-35.09	0-360	100	H
6	* 11.733	26.21	PK	38.7	-21.3	43.61	-	-	74	-30.39	0-360	201	H
1	* 4.882	36.2	PK	34	-28.4	41.8	-	-	74	-32.2	0-360	201	V
3	* 7.355	28.5	PK	35.3	-25.7	38.1	-	-	74	-35.9	0-360	100	V
2	5.857	29.49	PK	34.9	-27.3	37.09	-	-	-	-	0-360	201	V
5	9.83	26.14	PK	37	-22.6	40.54	-	-	-	-	0-360	201	H

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (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
* 8.449	35.49	PK3	35.7	-24.4	46.79	-	-	74	-27.21	218	100	H
* 11.734	32.72	PK3	38.7	-21.4	50.02	-	-	74	-23.98	218	202	H
* 4.882	40.5	PK3	34	-28.3	46.2	-	-	74	-27.8	218	310	V
* 4.882	34.7	VB1T	34	-28.3	40.4	54	-13.6	-	-	218	310	V
* 7.353	35.32	PK3	35.3	-25.8	44.82	-	-	74	-29.18	218	100	V
5.857	36.38	PK3	34.9	-27.3	43.98	-	-	-	-	218	200	V
9.832	34.09	PK3	37	-22.7	48.39	-	-	-	-	218	202	H

* - 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

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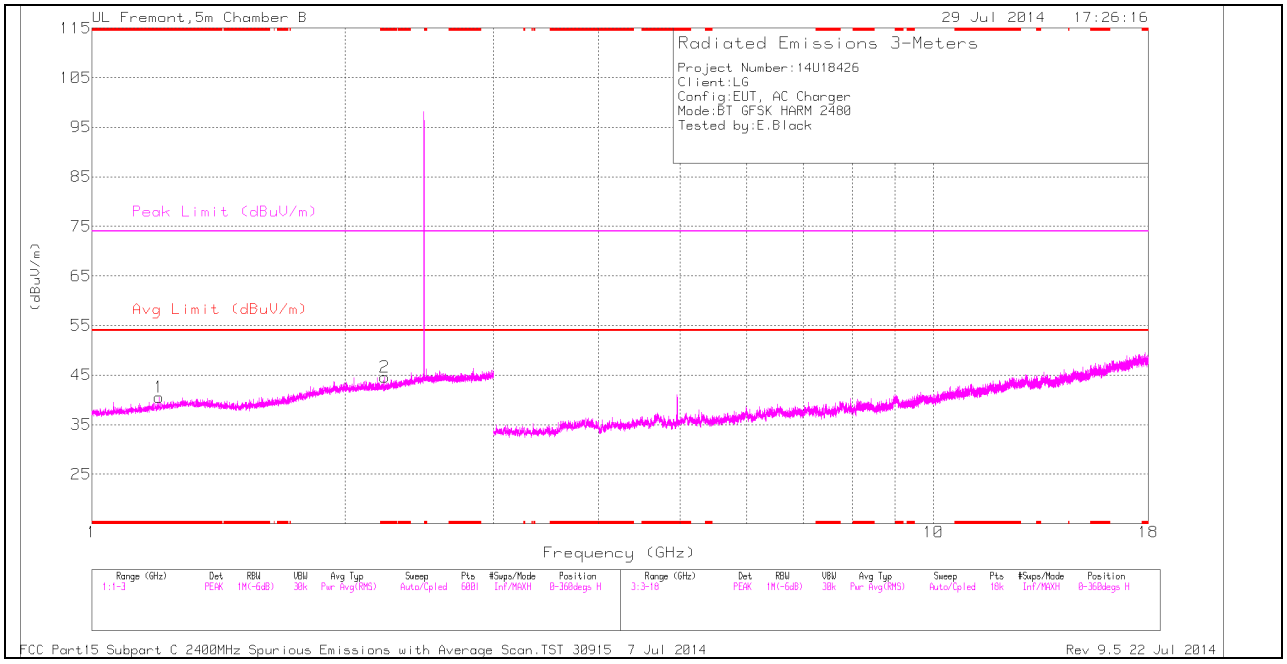
HIGH CHANNEL HORIZONTAL



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

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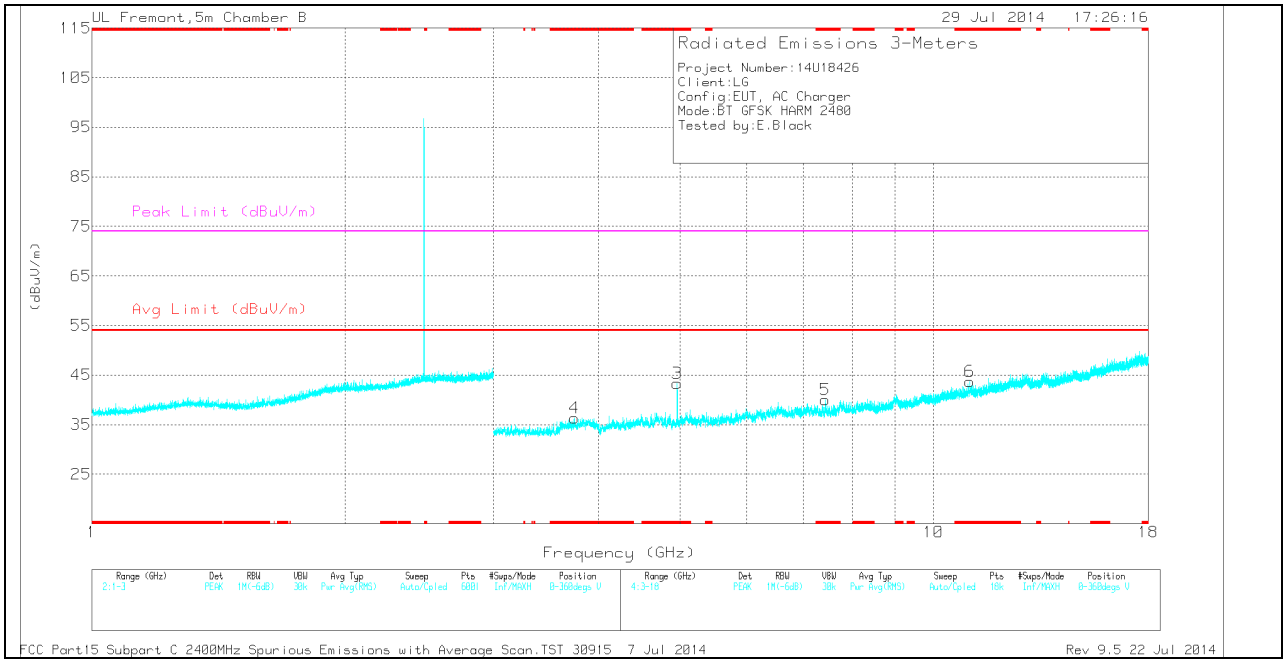
HIGH CHANNEL VERTICAL



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

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HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.202	36.9	PK	28.2	-24.6	40.5	-	-	74	-33.5	0-360	200	H
2	* 2.228	36.42	PK	31.4	-23.2	44.62	-	-	74	-29.38	0-360	99	H
3	* 4.96	39.48	PK	34.2	-30.4	43.28	-	-	74	-30.72	0-360	199	V
4	* 3.742	34.37	PK	33.5	-31.5	36.37	-	-	74	-37.63	0-360	101	V
5	* 7.44	30.73	PK	35.6	-26.3	40.03	-	-	74	-33.97	0-360	199	V
6	* 11.04	27.85	PK	37.8	-22	43.65	-	-	74	-30.35	0-360	101	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	45.59	PK3	34.2	-30.4	49.39	-	-	74	-24.61	265	302	V
* 4.96	39.88	VB1T	34.2	-30.4	43.68	54	-10.32	-	-	265	302	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

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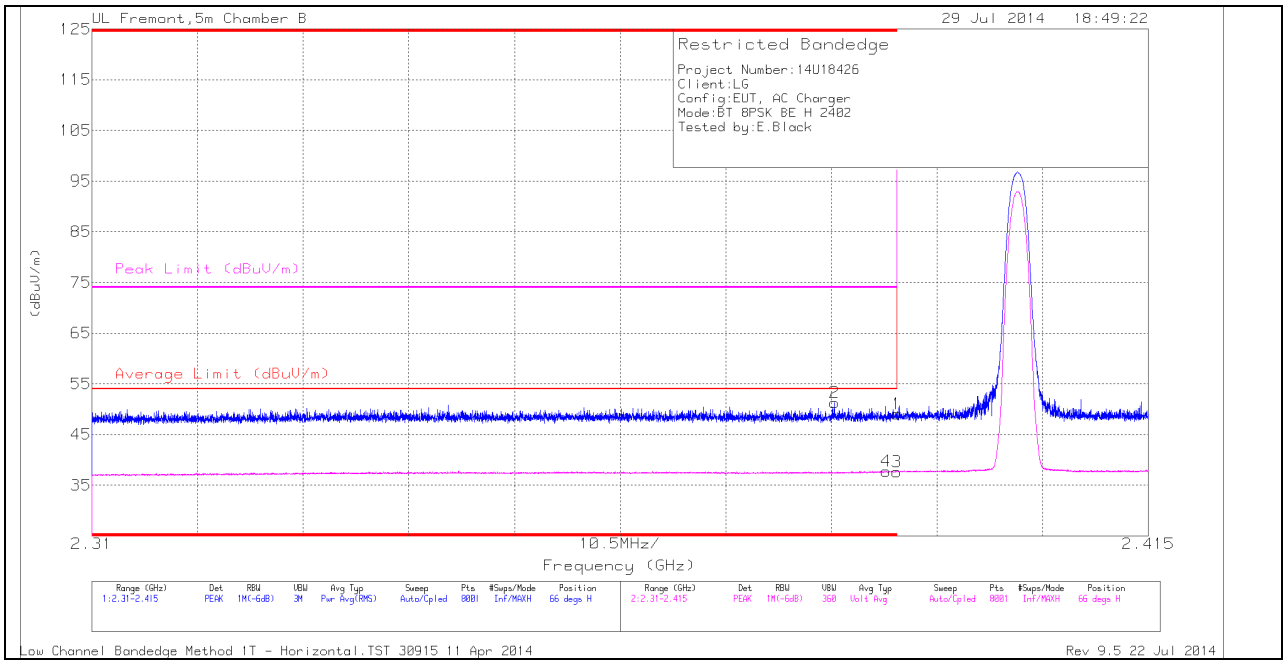
9.2.1. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.76	PK	32.1	-22.8	49.06	-	-	74	-24.94	66	274	H
2	* 2.384	42.12	PK	32.1	-22.9	51.32	-	-	74	-22.68	66	274	H
3	* 2.39	28.29	VB1T	32.1	-22.8	37.59	54	-16.41	-	-	66	274	H
4	* 2.389	28.47	VB1T	32.1	-22.8	37.77	54	-16.23	-	-	66	274	H

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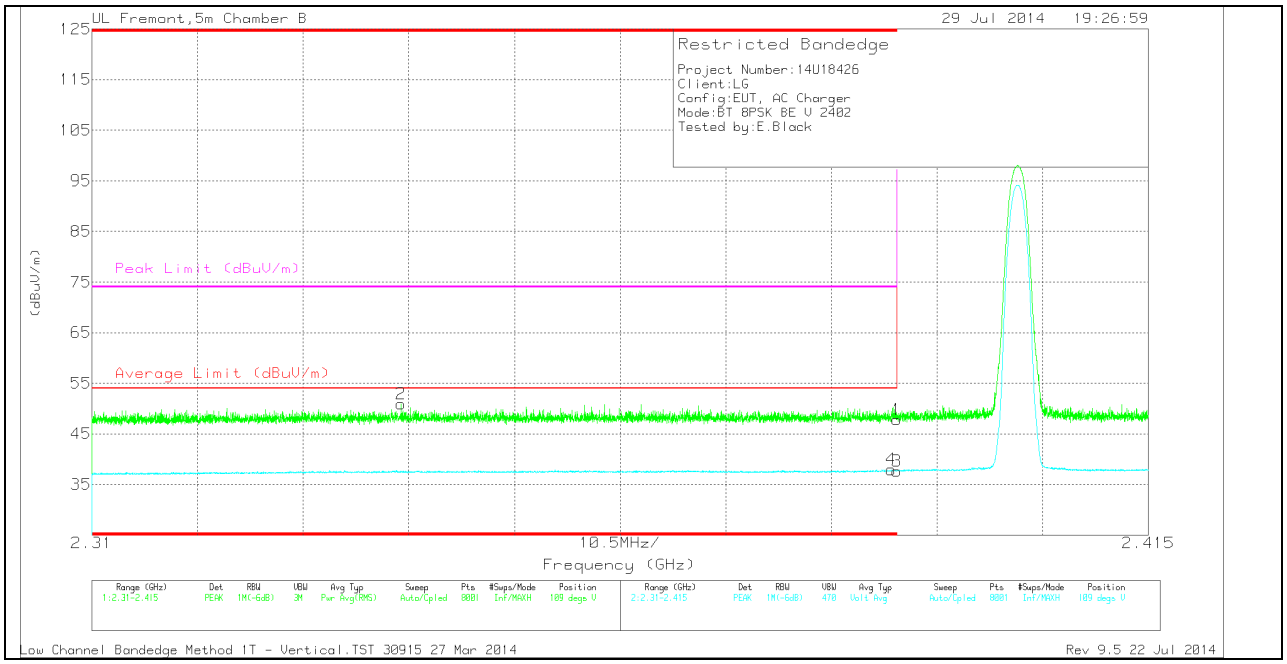
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.52	PK	32.1	-22.8	47.82	-	-	74	-26.18	109	331	V
2	* 2.341	41.96	PK	31.8	-22.9	50.86	-	-	74	-23.14	109	331	V
3	* 2.39	28.34	VB1T	32.1	-22.8	37.64	54	-16.36	-	-	109	331	V
4	* 2.389	28.64	VB1T	32.1	-22.8	37.94	54	-16.06	-	-	109	331	V

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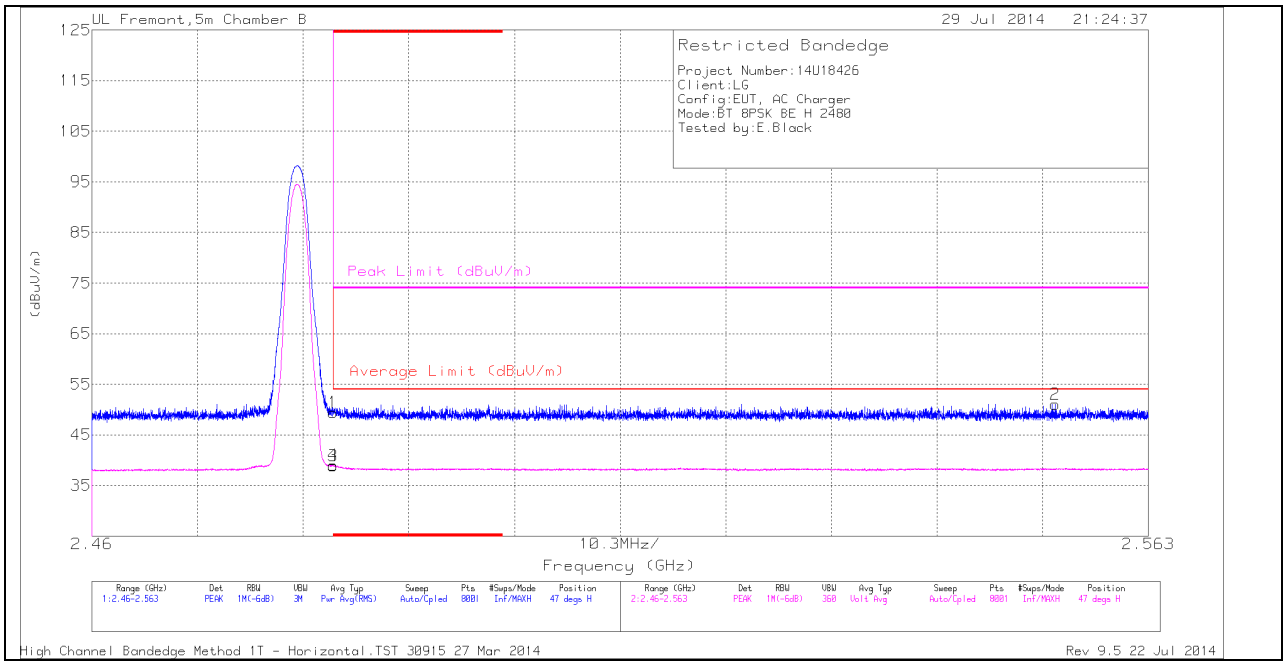
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.71	PK	32.4	-22.7	49.41	-	-	74	-24.59	47	316	H
3	* 2.484	29.16	VB1T	32.4	-22.7	38.86	54	-15.14	-	-	47	316	H
4	* 2.484	29.3	VB1T	32.4	-22.7	39	54	-15	-	-	47	316	H
2	2.554	41.14	PK	32.5	-22.6	51.04	-	-	74	-22.96	47	316	H

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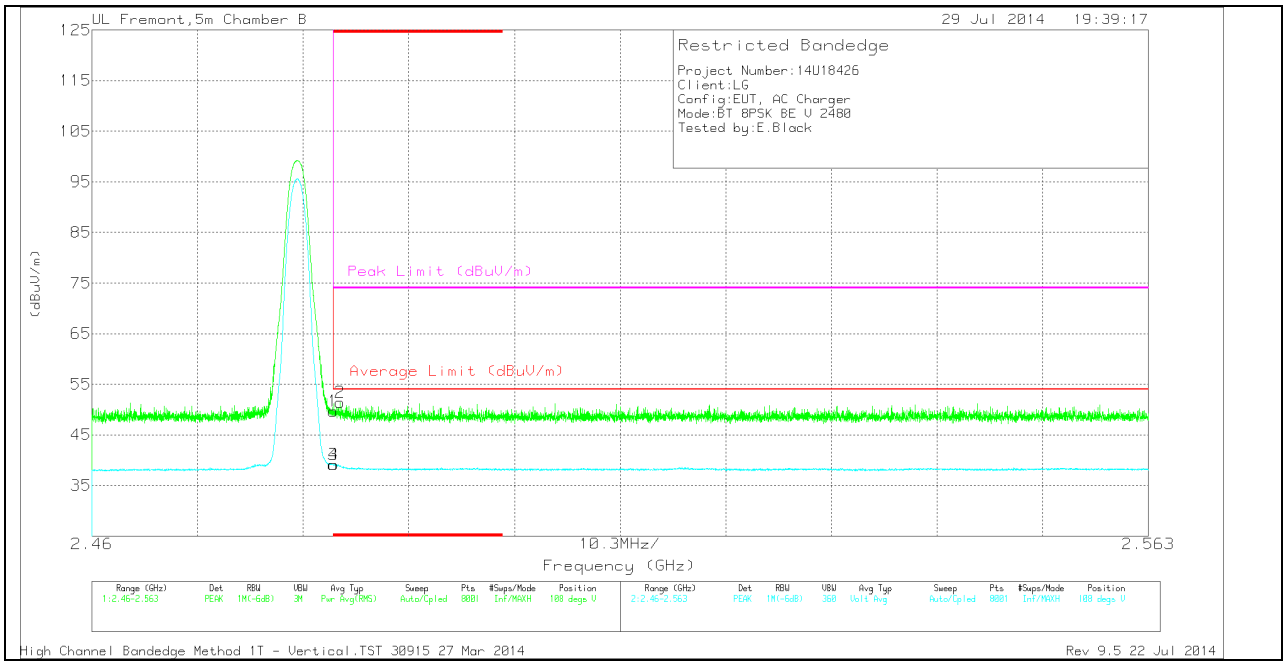
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.92	PK	32.4	-22.7	49.62	-	-	74	-24.38	108	314	V
2	* 2.484	41.71	PK	32.4	-22.7	51.41	-	-	74	-22.59	108	314	V
3	* 2.484	29.4	VB1T	32.4	-22.7	39.1	54	-14.9	-	-	108	314	V
4	* 2.484	29.46	VB1T	32.4	-22.7	39.16	54	-14.84	-	-	108	314	V

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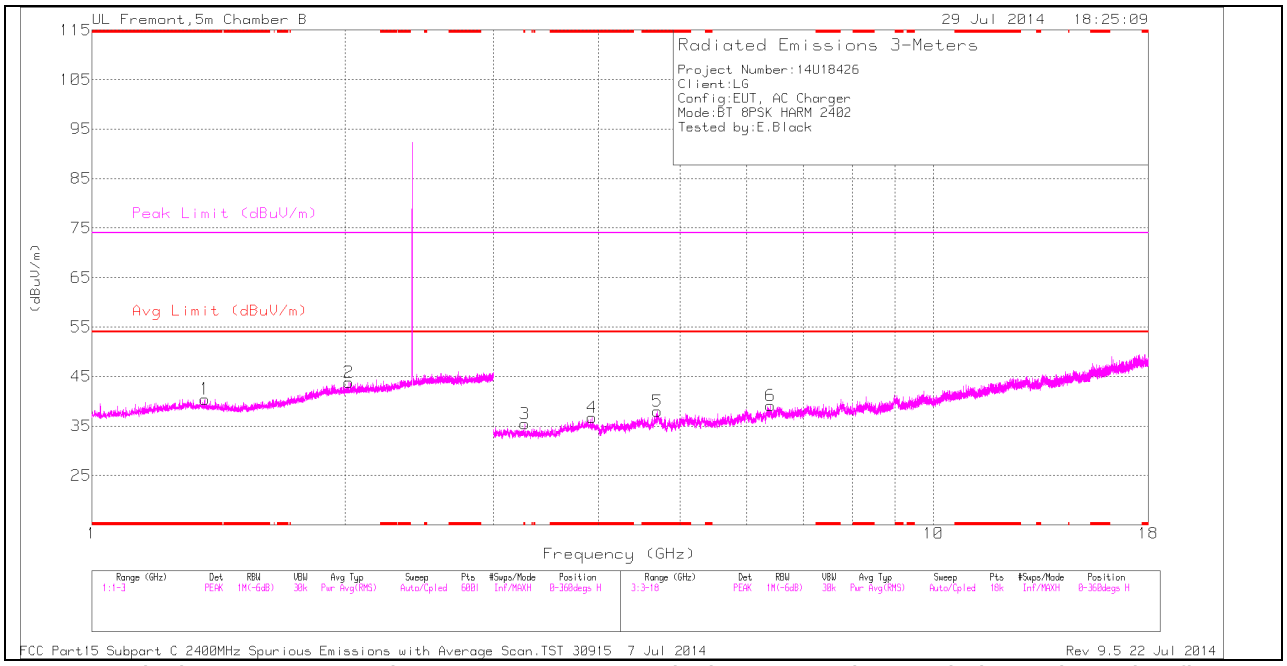
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

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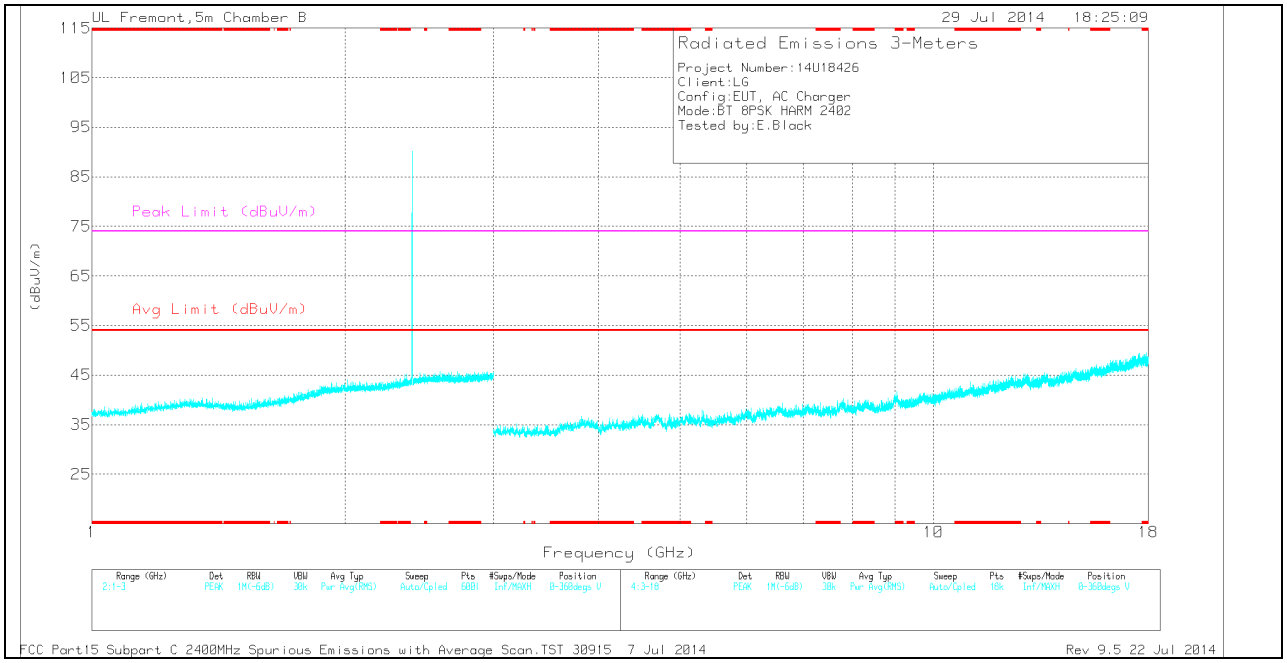
LOW CHANNEL VERTICAL



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

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LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.361	36.26	PK	28.6	-24.4	40.46	-	-	74	-33.54	0-360	100	H
4	* 3.927	33.44	PK	33.7	-30.4	36.74	-	-	74	-37.26	0-360	199	H
5	* 4.697	33.46	PK	34.2	-29.7	37.96	-	-	74	-36.04	0-360	199	H
2	2.02	36.08	PK	31.3	-23.5	43.88	-	-	-	-	0-360	100	H
3	3.267	33.82	PK	32.8	-31.2	35.42	-	-	-	-	0-360	101	H
6	6.406	32.53	PK	35.6	-29	39.13	-	-	-	-	0-360	101	H

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

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 7 Jul 2014
Rev 9.5 22 Jul 2014

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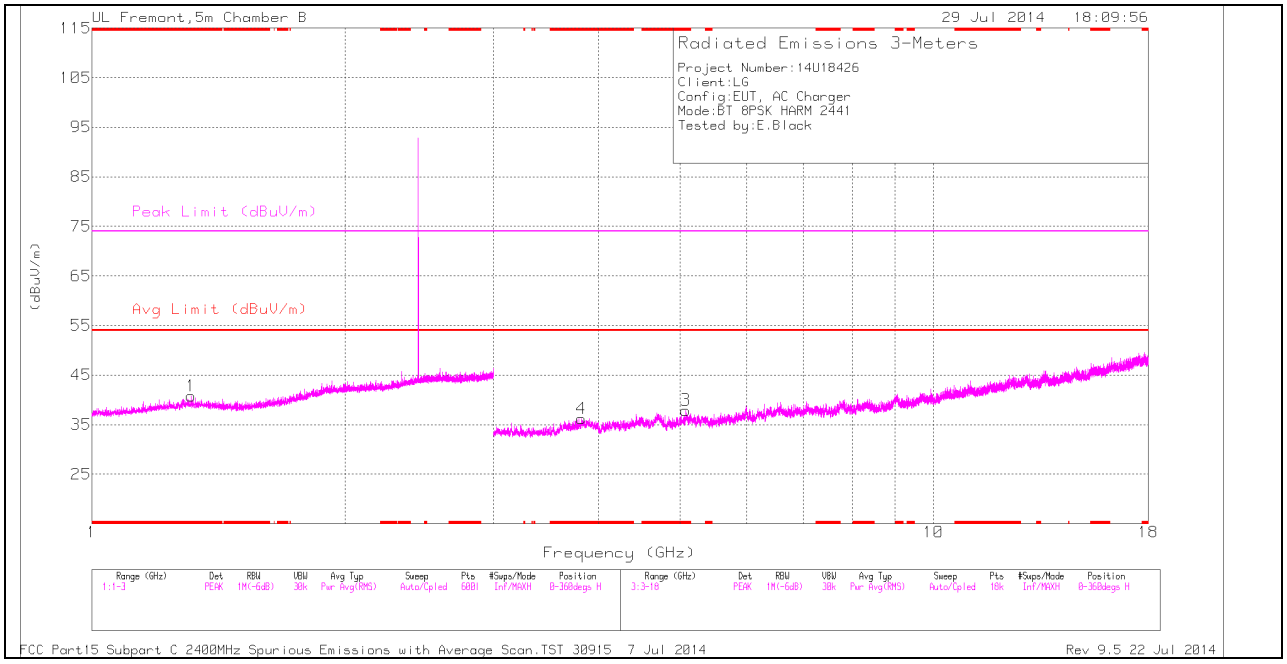
MID CHANNEL HORIZONTAL



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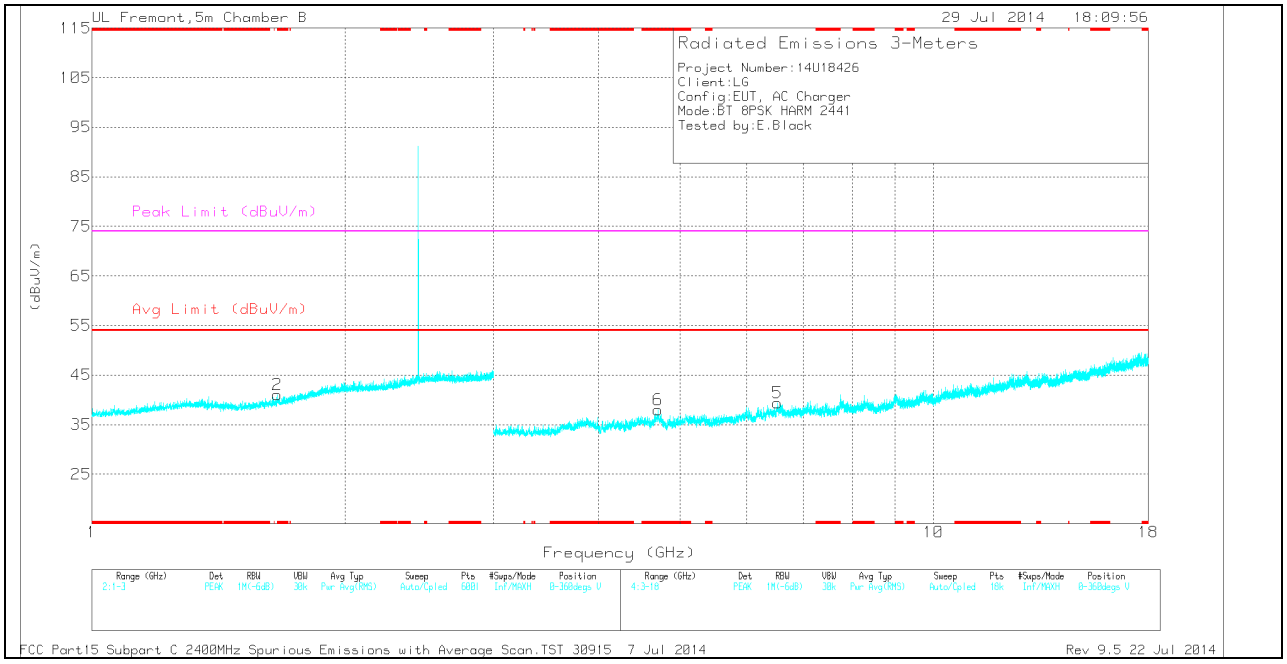
MID CHANNEL VERTICAL



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

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MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.311	36.44	PK	28.8	-24.5	40.74	-	-	74	-33.26	0-360	200	H
3	* 5.08	32.32	PK	34.2	-28.6	37.92	-	-	74	-36.08	0-360	101	H
4	* 3.817	33.11	PK	33.7	-30.6	36.21	-	-	74	-37.79	0-360	200	H
6	* 4.707	33.26	PK	34.2	-29.5	37.96	-	-	74	-36.04	0-360	101	V
2	1.659	35.89	PK	28.8	-23.7	40.99	-	-	-	-	0-360	200	V
5	6.527	31.61	PK	35.7	-27.9	39.41	-	-	-	-	0-360	101	V

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

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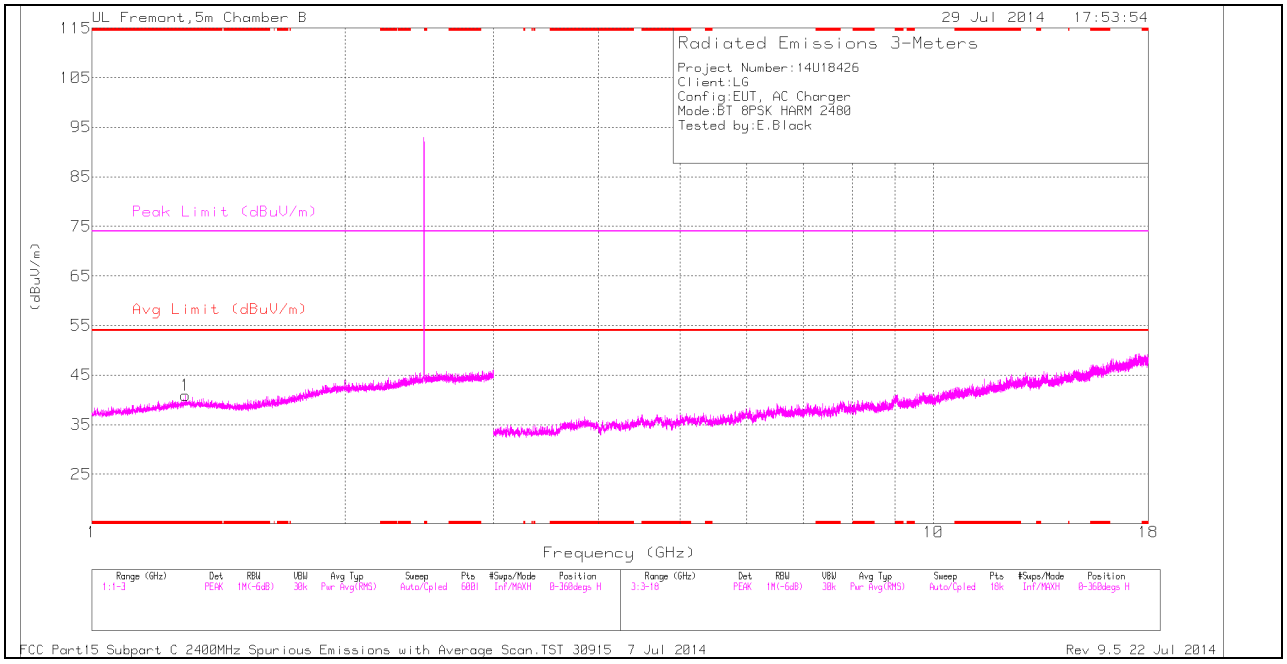
HIGH CHANNEL HORIZONTAL



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

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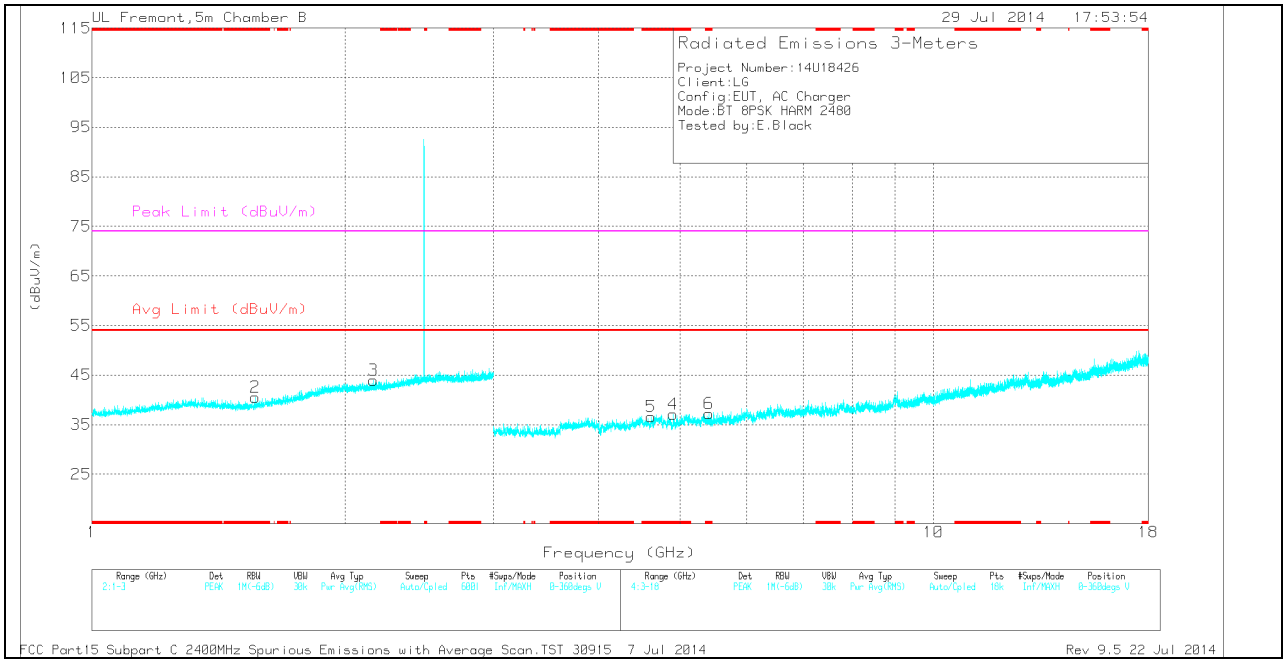
HIGH CHANNEL VERTICAL



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

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HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.292	36.64	PK	28.8	-24.5	40.94	-	-	74	-33.06	0-360	101	H
2	* 1.563	36.37	PK	28.3	-24.1	40.57	-	-	74	-33.43	0-360	101	V
4	* 4.903	33.67	PK	34.2	-30.8	37.07	-	-	74	-36.93	0-360	101	V
5	* 4.616	33.3	PK	34.2	-30.9	36.6	-	-	74	-37.4	0-360	200	V
6	* 5.407	31.93	PK	34.5	-29.2	37.23	-	-	74	-36.77	0-360	101	V
3	2.162	35.88	PK	31.3	-23.2	43.98	-	-	-	-	0-360	200	V

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

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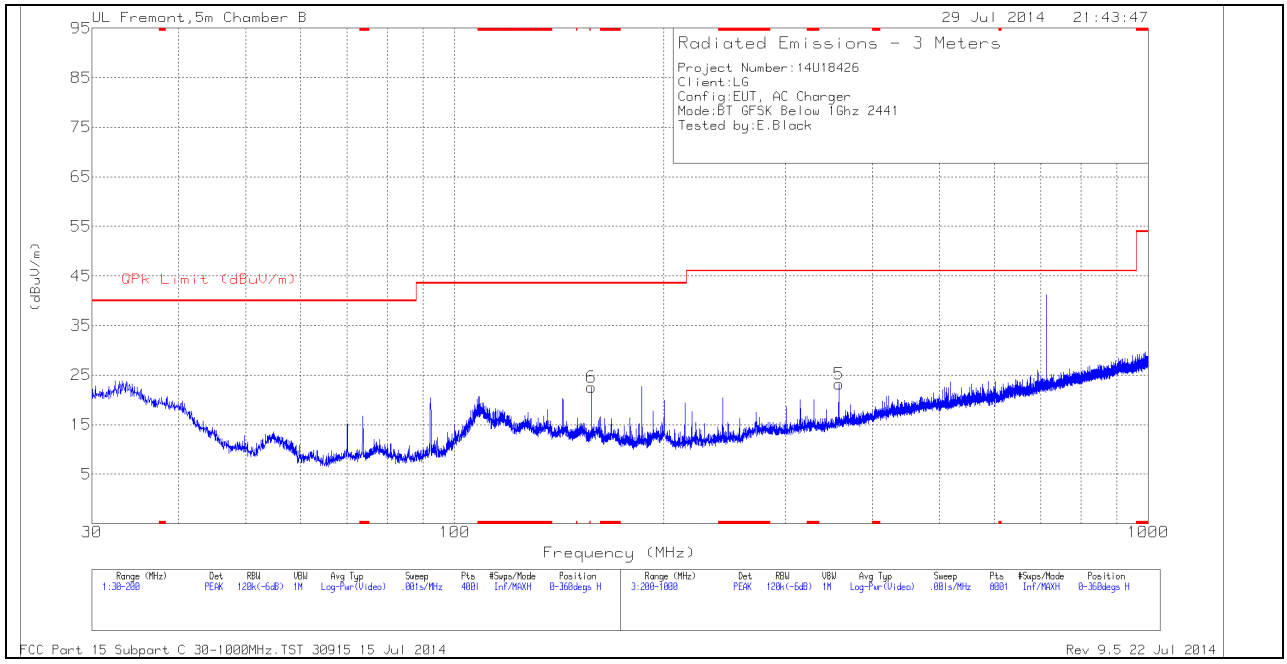
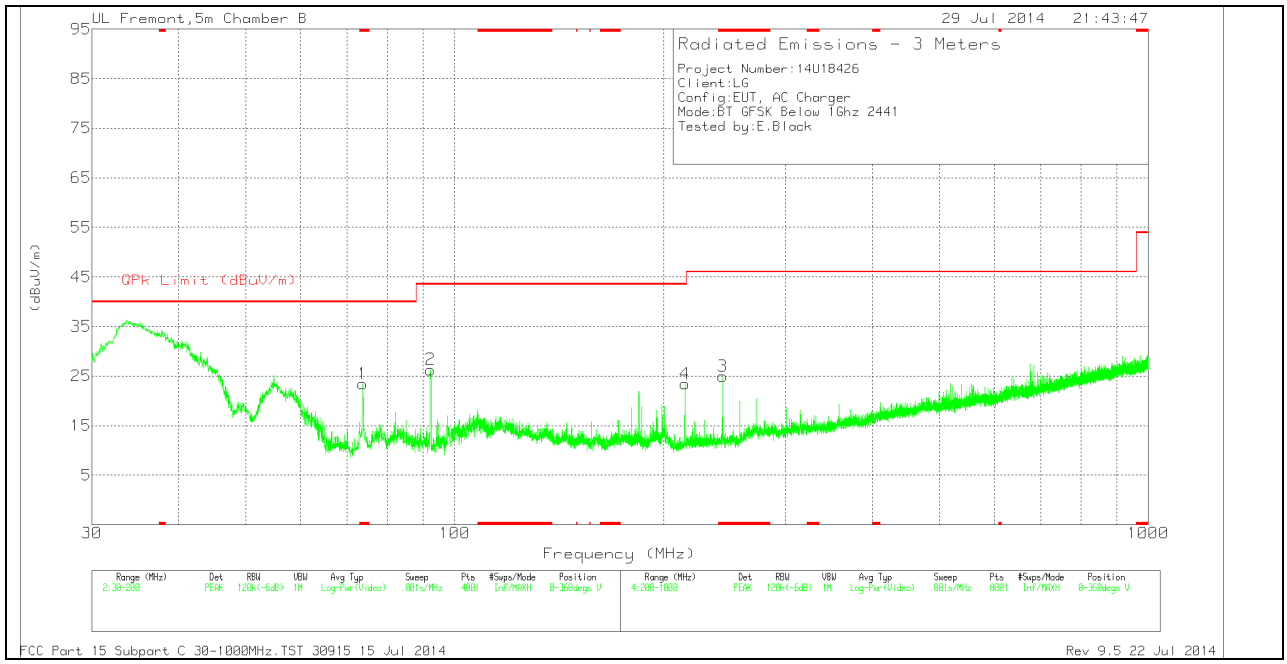
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



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BELOW 1 GHz TABLE

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
1	* 73.7325	43.62	PK	8.1	-28.3	23.42	40	-16.58	0-360	101	V
3	* 243.4	39.62	PK	11.7	-26.4	24.92	46.02	-21.1	0-360	200	V
2	92.2625	46.2	PK	8.2	-28.1	26.3	43.52	-17.22	0-360	101	V
6	157.5	37.7	PK	12.2	-27.4	22.5	43.52	-21.02	0-360	200	H
4	214.8	39.68	PK	10.6	-26.8	23.48	43.52	-20.04	0-360	200	V
5	357.9	34.36	PK	14.6	-25.8	23.16	46.02	-22.86	0-360	200	H

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

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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

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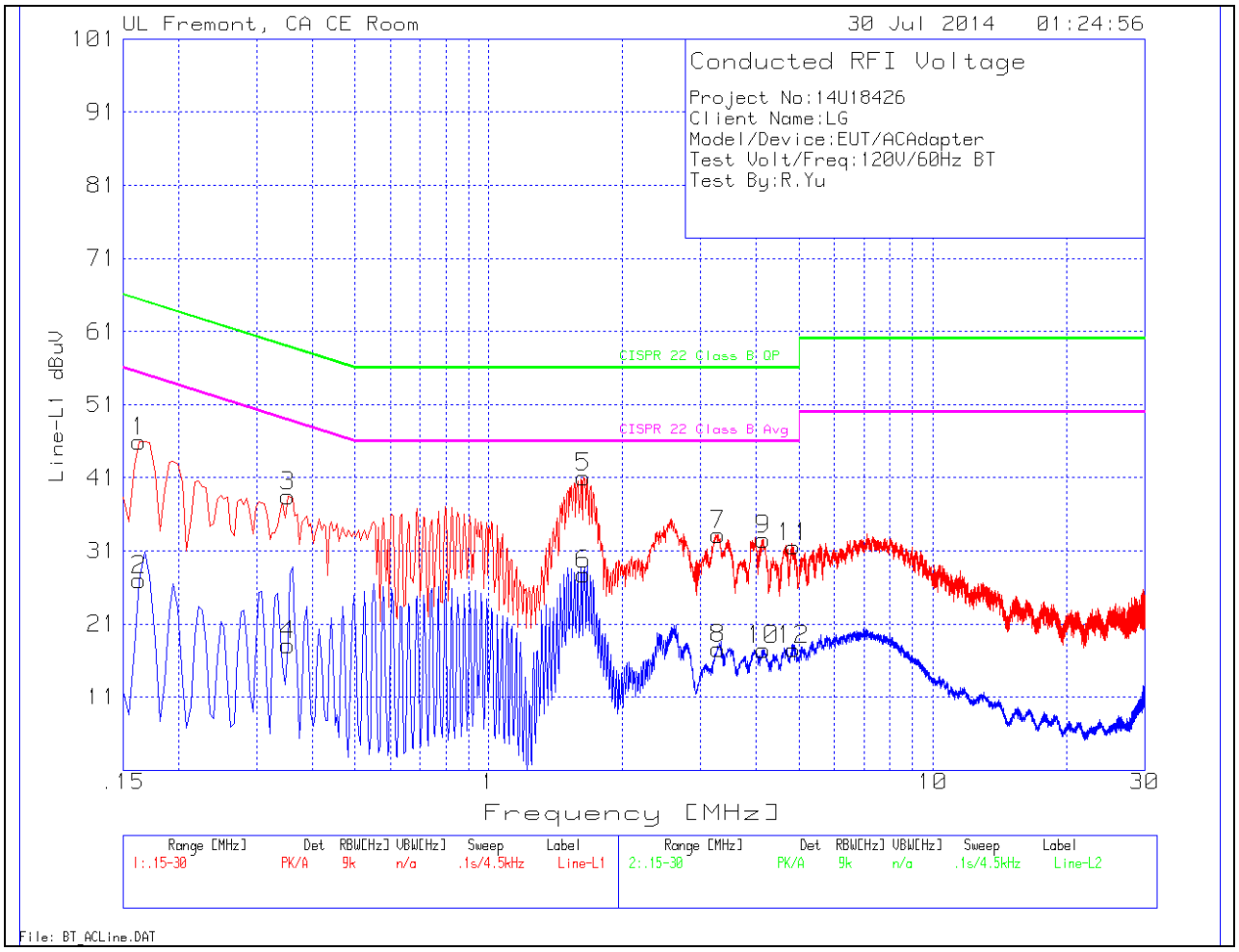
6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Line-L1 .15 - 30MHz

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	.1635	44.74	PK	1.2	0	45.94	65.3	-19.36	-	-
2	.1635	25.75	Av	1.2	0	26.95	-	-	55.3	-28.35
3	.3525	37.94	PK	.5	0	38.44	58.9	-20.46	-	-
4	.3525	17.56	Av	.5	0	18.06	-	-	48.9	-30.84
5	1.635	40.77	PK	.2	.1	41.07	56	-14.93	-	-
6	1.635	27.51	Av	.2	.1	27.81	-	-	46	-18.19
7	3.282	32.87	PK	.2	.1	33.17	56	-22.83	-	-
8	3.282	17.34	Av	.2	.1	17.64	-	-	46	-28.36
9	4.146	32.19	PK	.2	.1	32.49	56	-23.51	-	-
10	4.146	17.14	Av	.2	.1	17.44	-	-	46	-28.56
11	4.8525	31.27	PK	.2	.1	31.57	56	-24.43	-	-
12	4.8525	17.22	Av	.2	.1	17.52	-	-	46	-28.48

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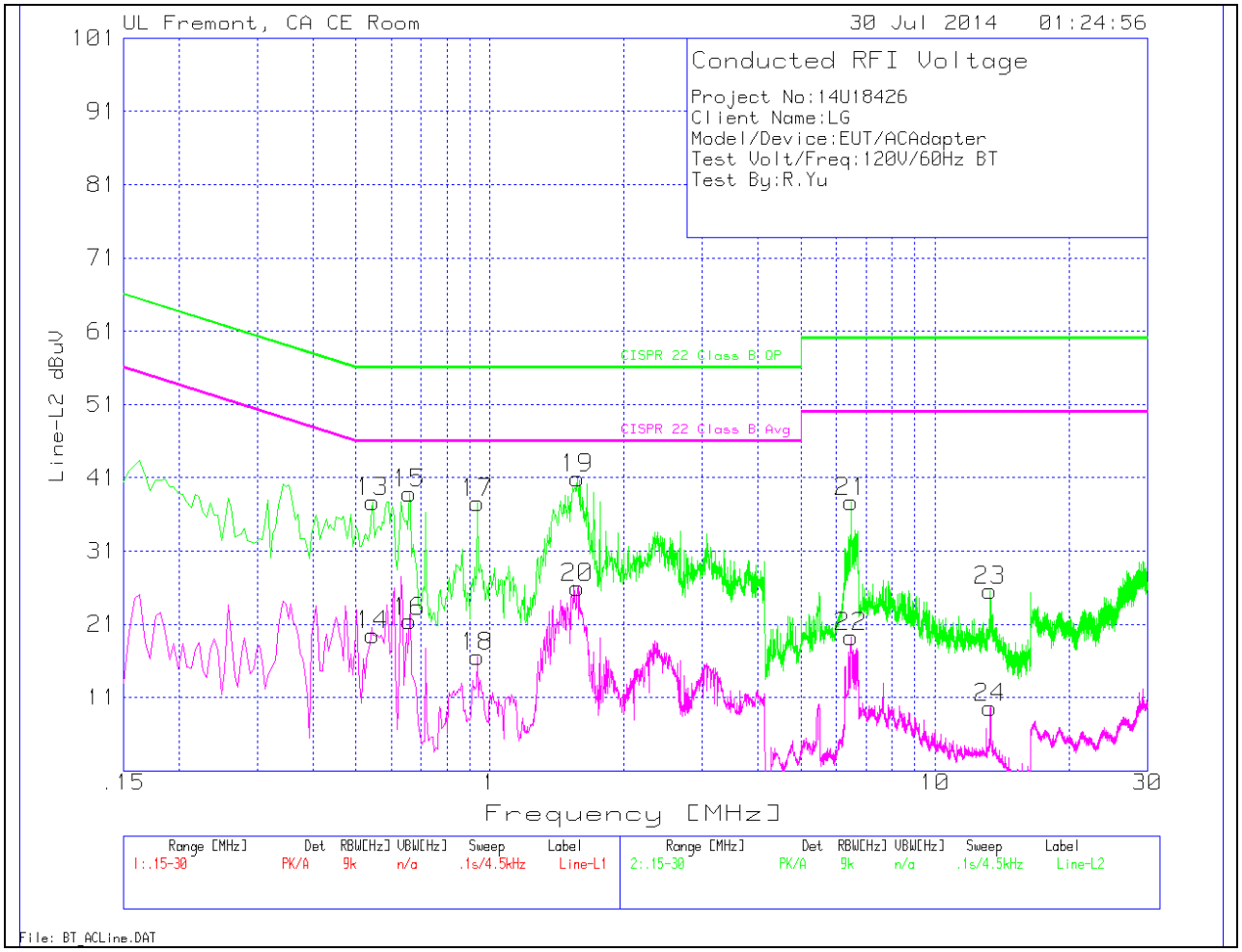
LINE 2 PLOT



LINE 2 RESULTS

Line-L2 .15 - 30MHz

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)
13	.546	37.39	PK	.3	0	37.69	56	-18.31	-	-
14	.546	19.22	Av	.3	0	19.52	-	-	46	-26.48
15	.6585	38.55	PK	.3	0	38.85	56	-17.15	-	-
16	.6585	21.09	Av	.3	0	21.39	-	-	46	-24.61
17	.9375	37.28	PK	.3	0	37.58	56	-18.42	-	-
18	.9375	16.24	Av	.3	0	16.54	-	-	46	-29.46
19	1.572	40.67	PK	.2	.1	40.97	56	-15.03	-	-
20	1.572	25.62	Av	.2	.1	25.92	-	-	46	-20.08
21	6.4725	37.45	PK	.2	.1	37.75	60	-22.25	-	-
22	6.4725	18.98	Av	.2	.1	19.28	-	-	50	-30.72
23	13.308	25.07	PK	.3	.2	25.57	60	-34.43	-	-
24	13.308	9.13	Av	.3	.2	9.63	-	-	50	-40.37

PK - Peak detector
Av - average detection

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