



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM Tablet + Bluetooth, DTS b/g/n

MODEL NUMBER : SM-T561

FCC ID: A3LSMT561

REPORT NUMBER: 15K20424-E3

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Prepared for

**SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 443-742, KOREA**

Prepared by

**UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 443-823, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433**



Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM Tablet + Bluetooth and DTS b/g/n
MODEL NUMBER: SM-T561
SERIAL NUMBER: R32G301WP2N (RADIATED); R32G301WPDV (CONDUCTED)
DATE TESTED: MARCH 11 - APRIL 20, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

Tested By:



Ji Ho Choi
Suwon Lab Manager
UL Korea, Ltd.

CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

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 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-823, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
☒	Chamber 1
☐	Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA Tablet + Bluetooth and DTS b/g/n.
This test report addresses the DSS (BT) operational mode.

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	9.70	9.32
2402 - 2480	Enhanced Pi/4-DPSK	7.65	5.83
2402 - 2480	Enhanced 8PSK	7.64	5.80

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

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -0.19 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.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA12EWE	N/A	N/A
Data Cable	SAMSUNG	ECB-DU68WC	N/A	N/A
Earphone	SAMSUNG	GH59-11129H	N/A	N/A

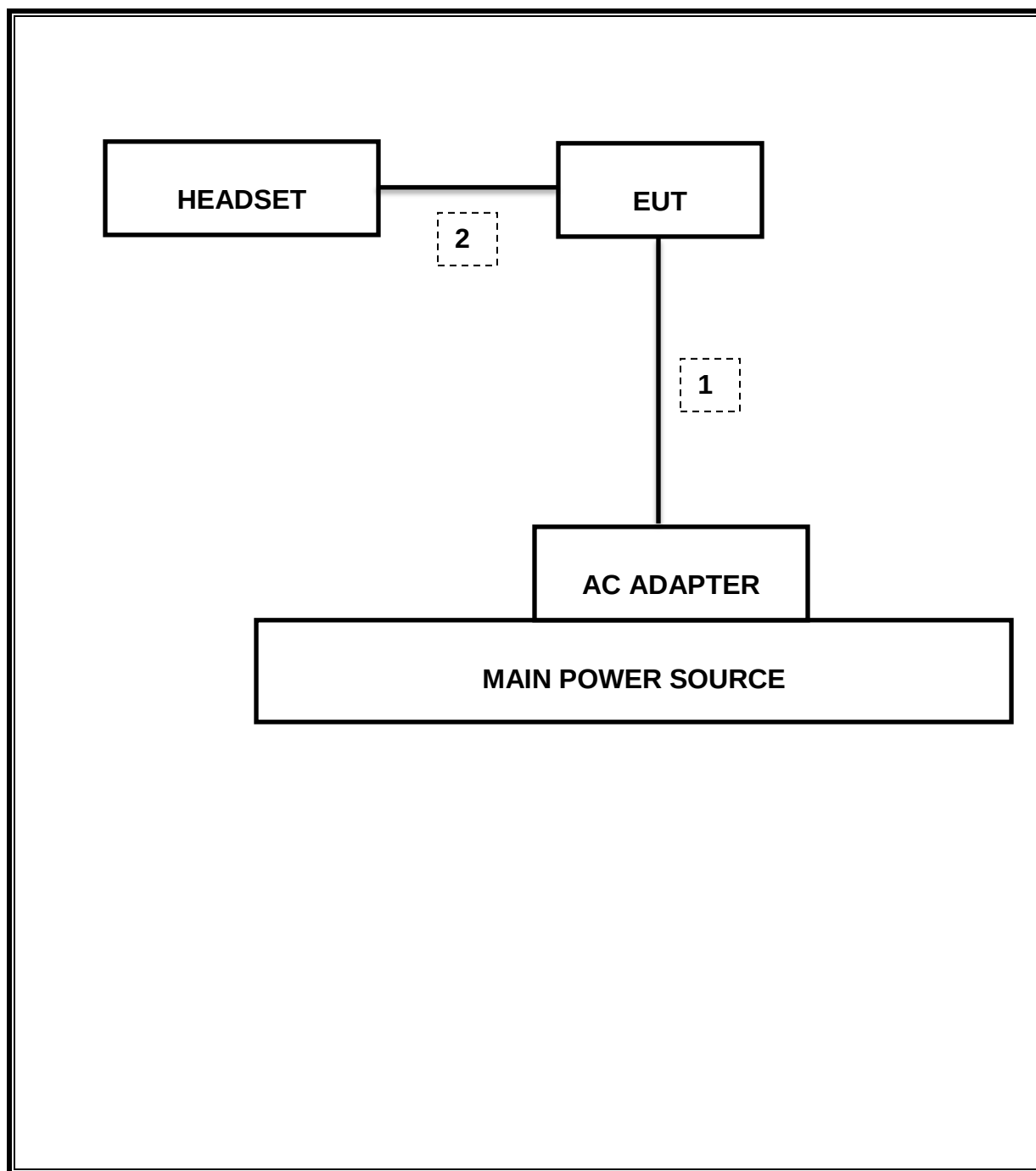
I/O CABLES

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	0.8m	N/A
2	Audio	1	Mini-Jack	Unshielded	1.0m	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	950	11-17-15
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-15
Antenna, Horn, 40 GHz	ETS	3116C	00166255	09-23-15
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	09-29-15
Preamplifier, 1000 MHz	Sonoma	310N	341282	11-17-15
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	11-18-15
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	09-23-15
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	11-17-15
Average Power Sensor	R&S	NRZ-Z91	102681	11-17-15
Average Power Sensor	Agilent / HP	U2000	MY54270007	09-23-15
EMI Test Receive, 40 GHz	R&S	ESU40	100439	11-17-15
EMI Test Receive, 3 GHz	R&S	ESR3	101832	11-17-15
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	11-17-15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	11-17-15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	11-17-15

7. SUMMARY TABLE

The FCC ID: A3LSMT561 shares the same enclosure and circuit board as FCC ID: A3LSMT561Y. The BT circuitry and layout, including antennas, are almost identical between the two units. The BT antennas and surrounding circuitry are the same between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMT561 remains representative of FCC ID: A3LSMT561Y, test data for FCC ID: A3LSMT561Y is being submitted for this application to cover BT features.

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass	1.205 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-43.571 dBm
15.247 (b)(1)	TX conducted output power	<21dBm		Pass	9.078 dBm (AV)
15.247 (a)(1)	Hopping frequency separation	> 25KHz		Pass	1 MHz
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 0.4sec		Pass	0.346 sec
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	41.97 dBuV (PK)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	35.56 dBuV/m (AV)

8. ANTENNA PORT TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

8.1.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.006	0.907
Mid	2440	1.026	0.931
High	2480	1.024	0.930
Worst		1.026	0.931

8.1.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.287	1.200
Mid	2440	1.257	1.197
High	2480	1.251	1.196
Worst		1.287	1.200

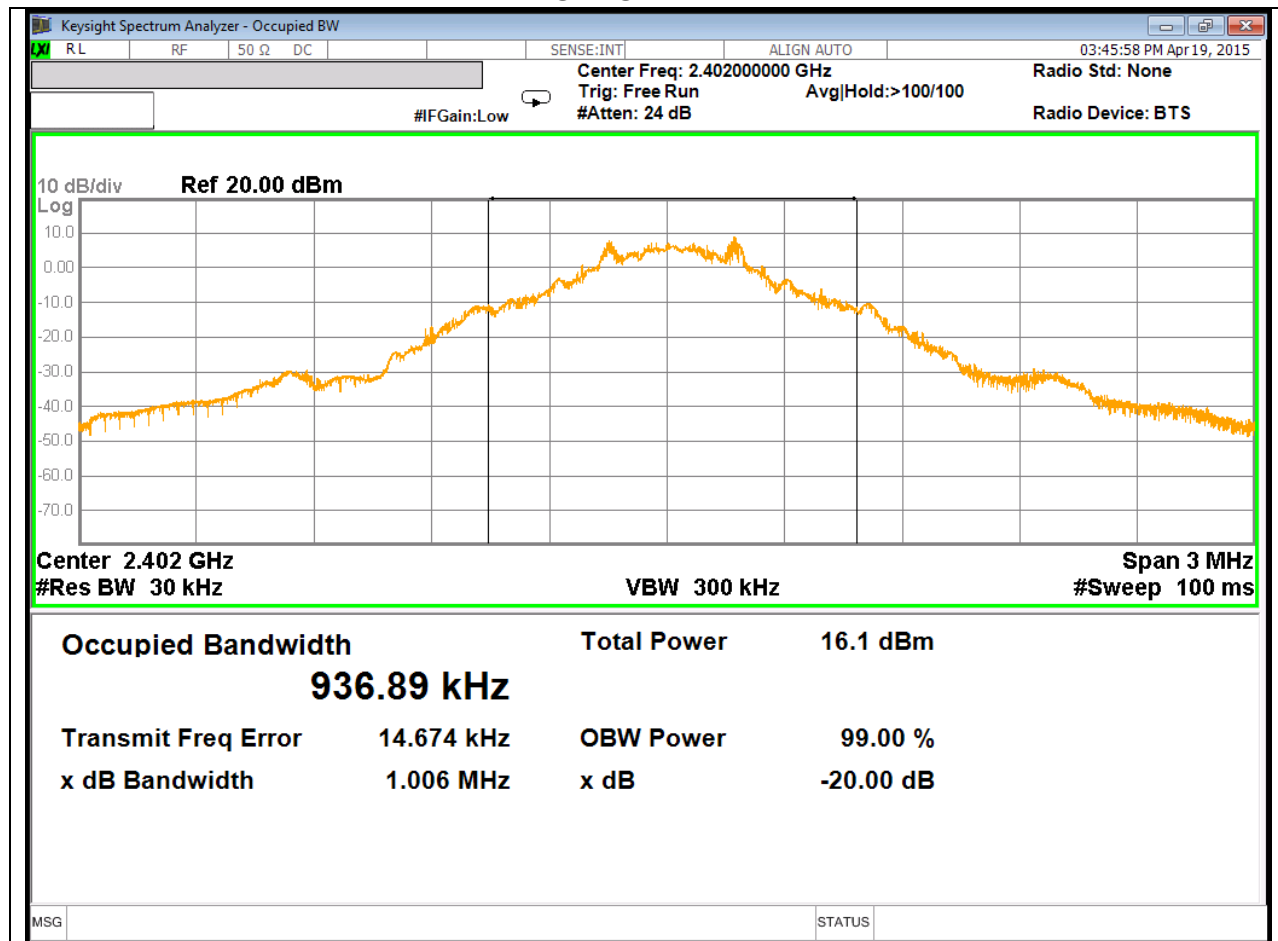
8.1.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.298	1.201
Mid	2440	1.317	1.201
High	2480	1.316	1.205
Worst		1.317	1.205

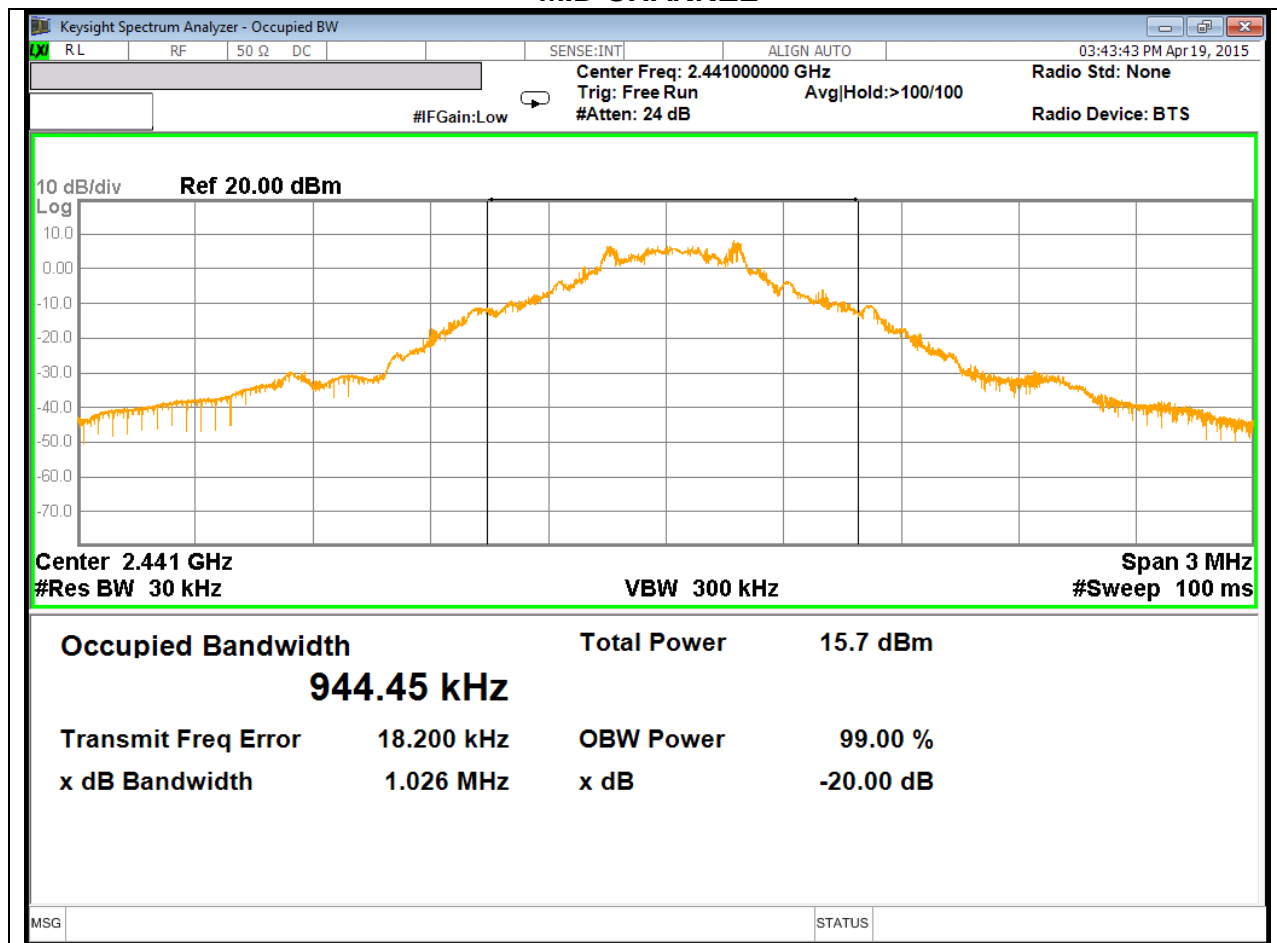
8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

GFSK 20 dB BANDWIDTH

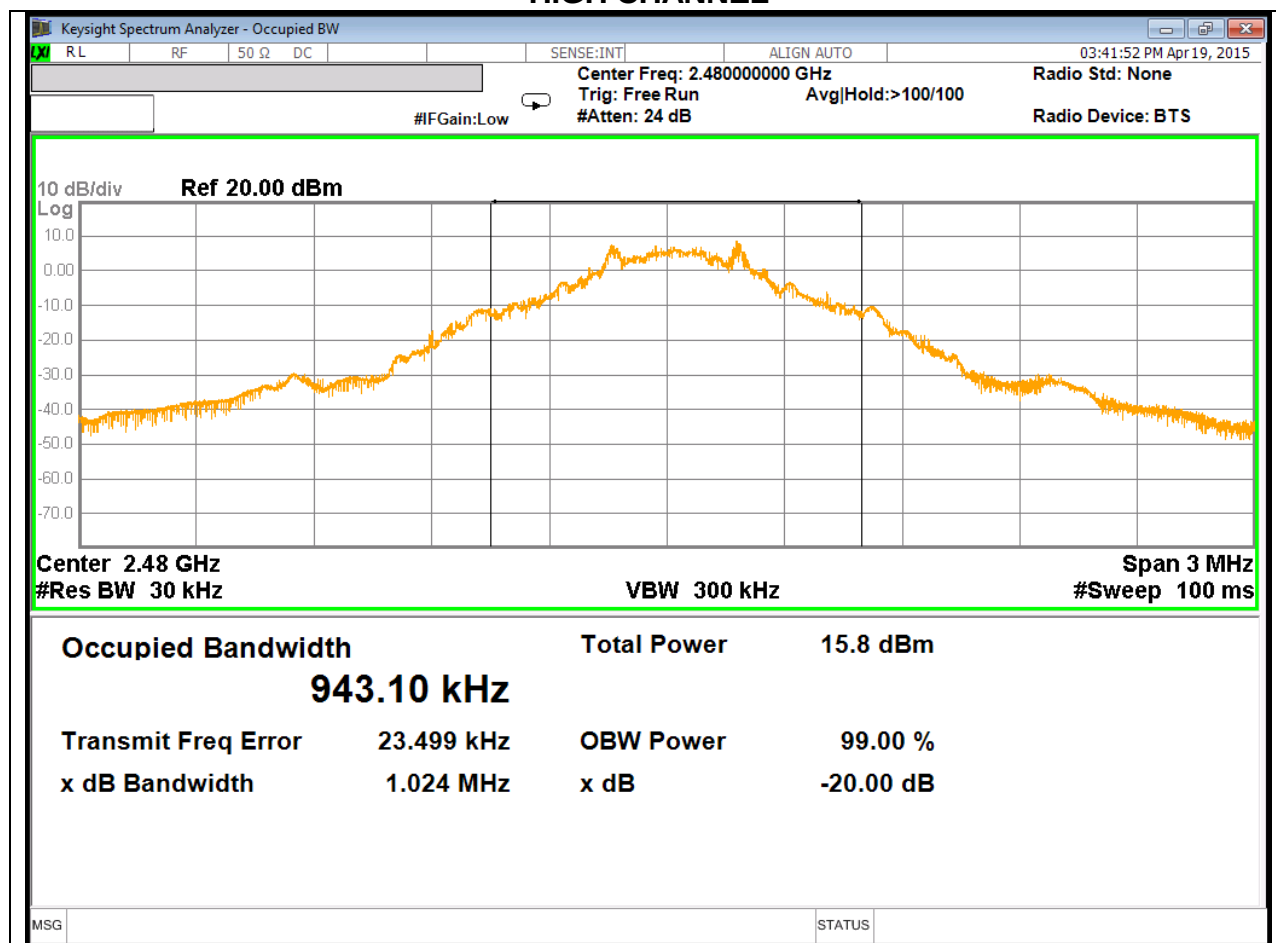
LOW CHANNEL



MID CHANNEL

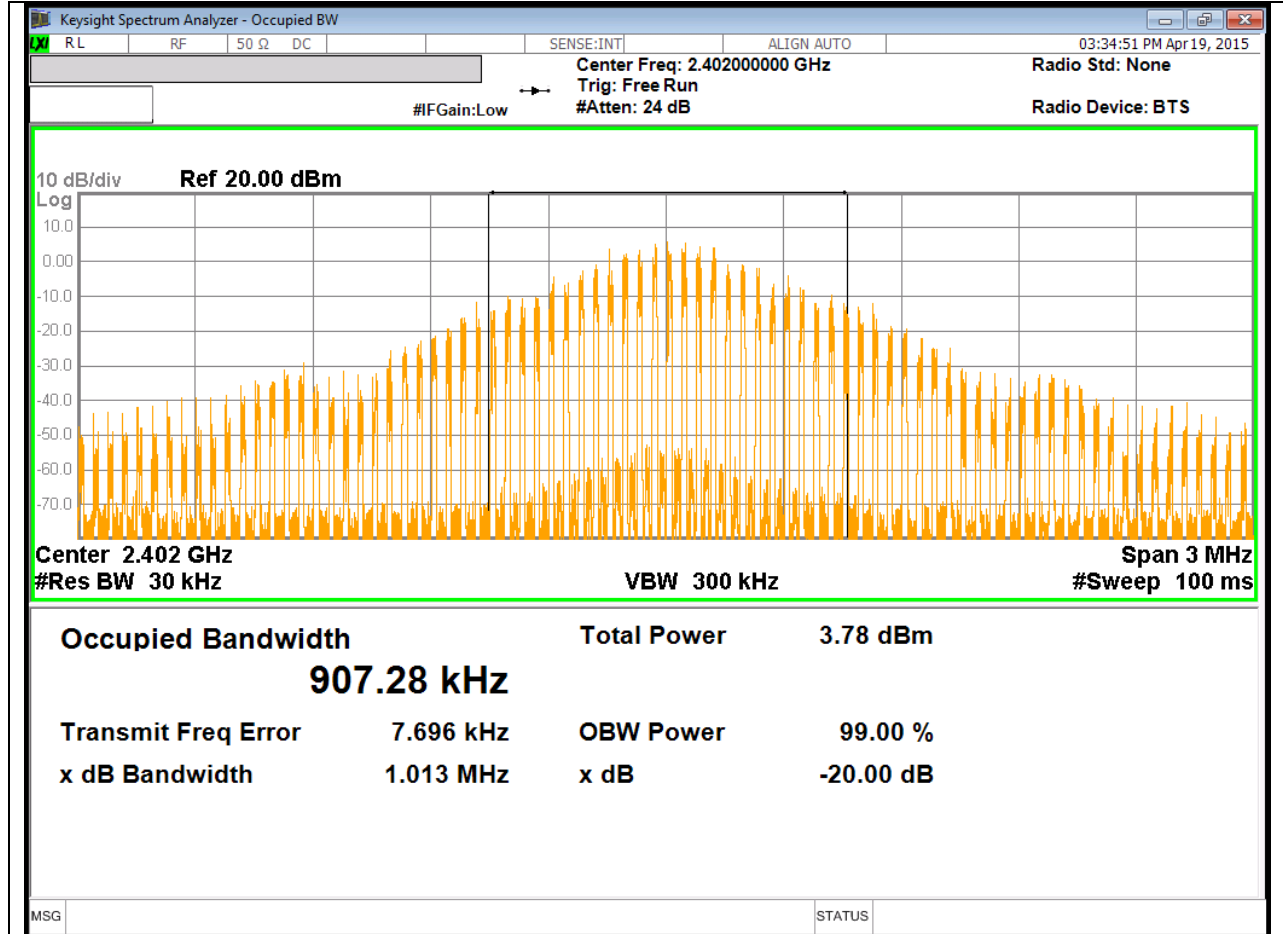


HIGH CHANNEL

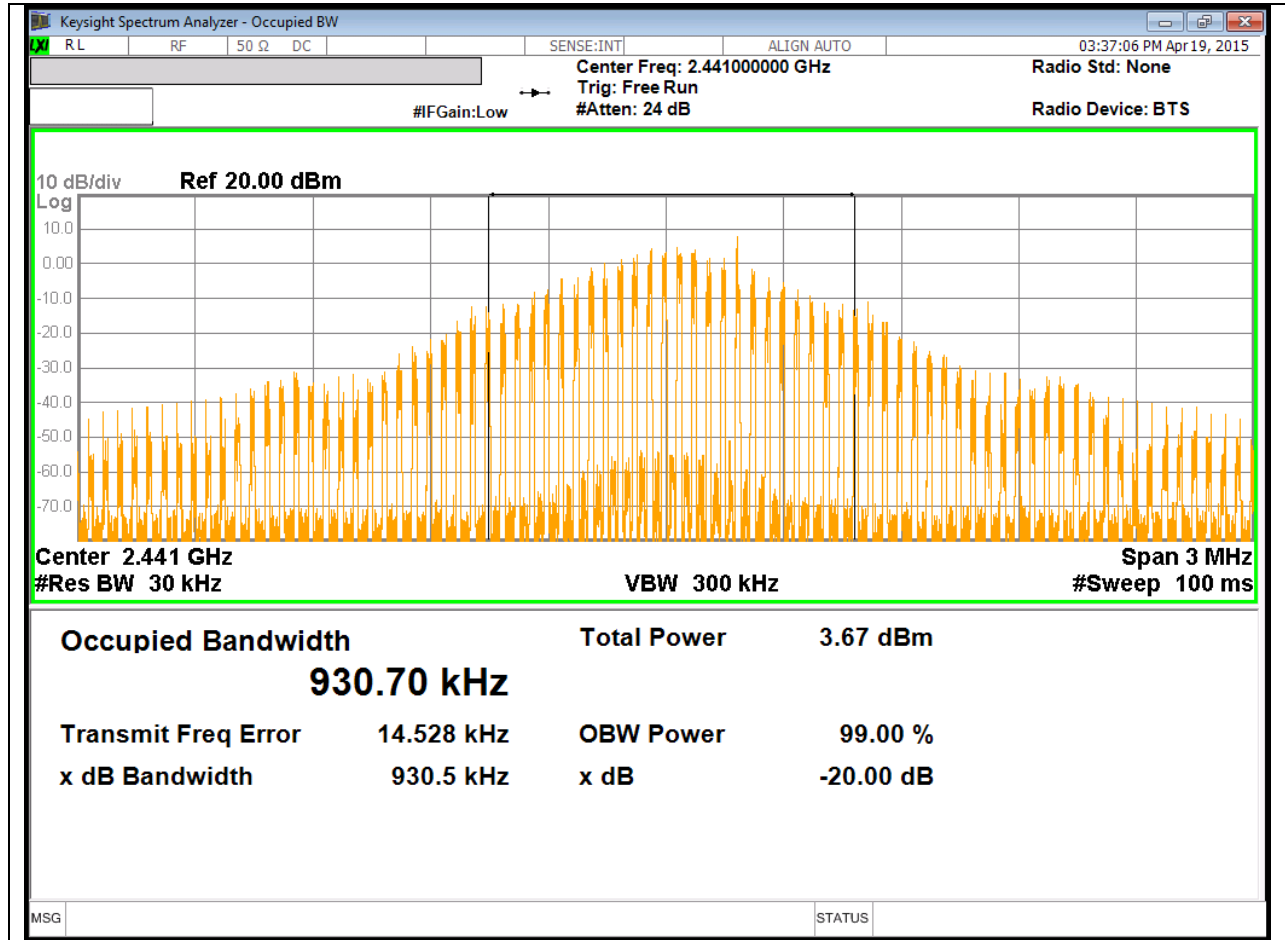


GFSK 99% BANDWIDTH

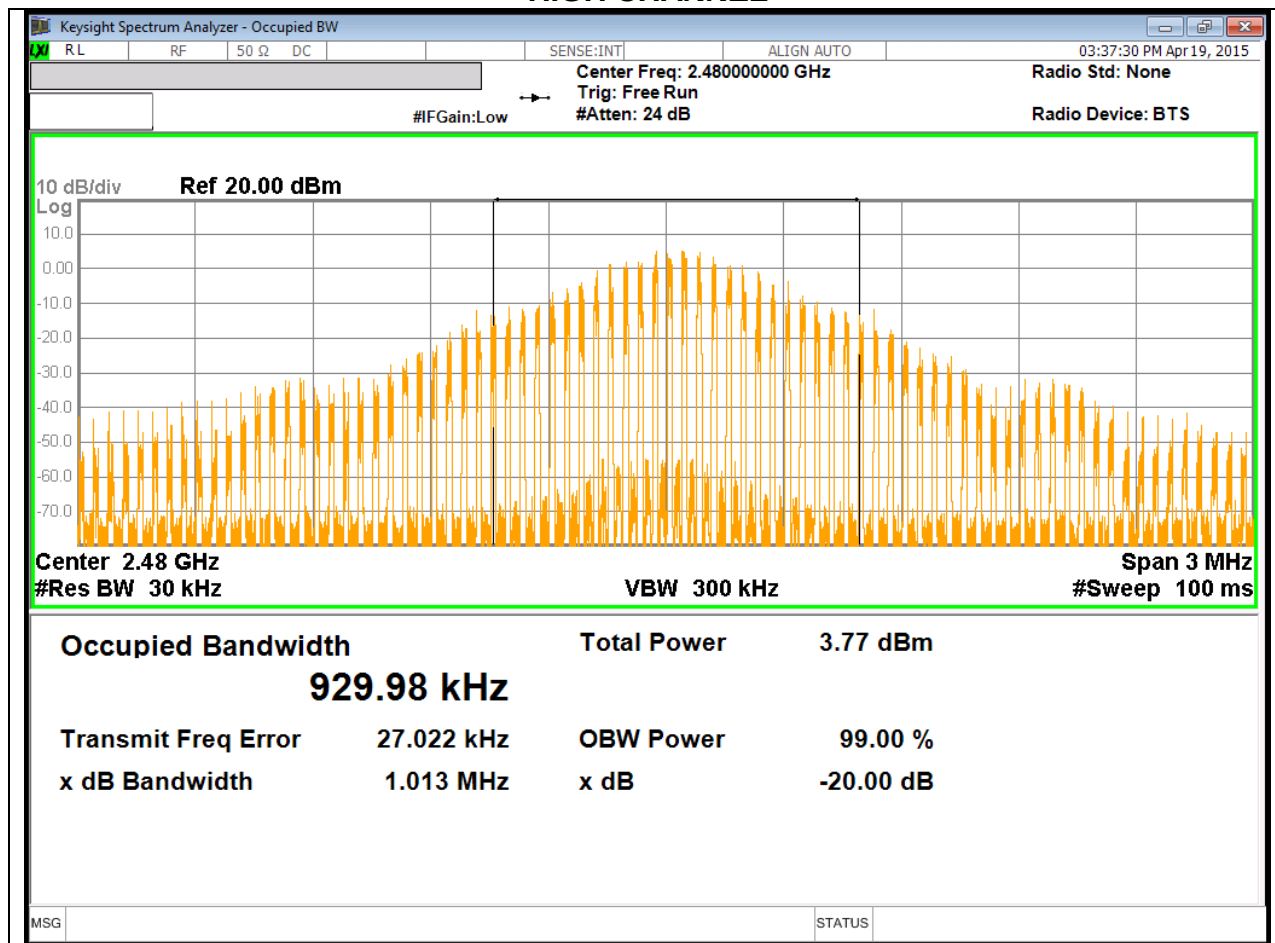
LOW CHANNEL



MID CHANNEL

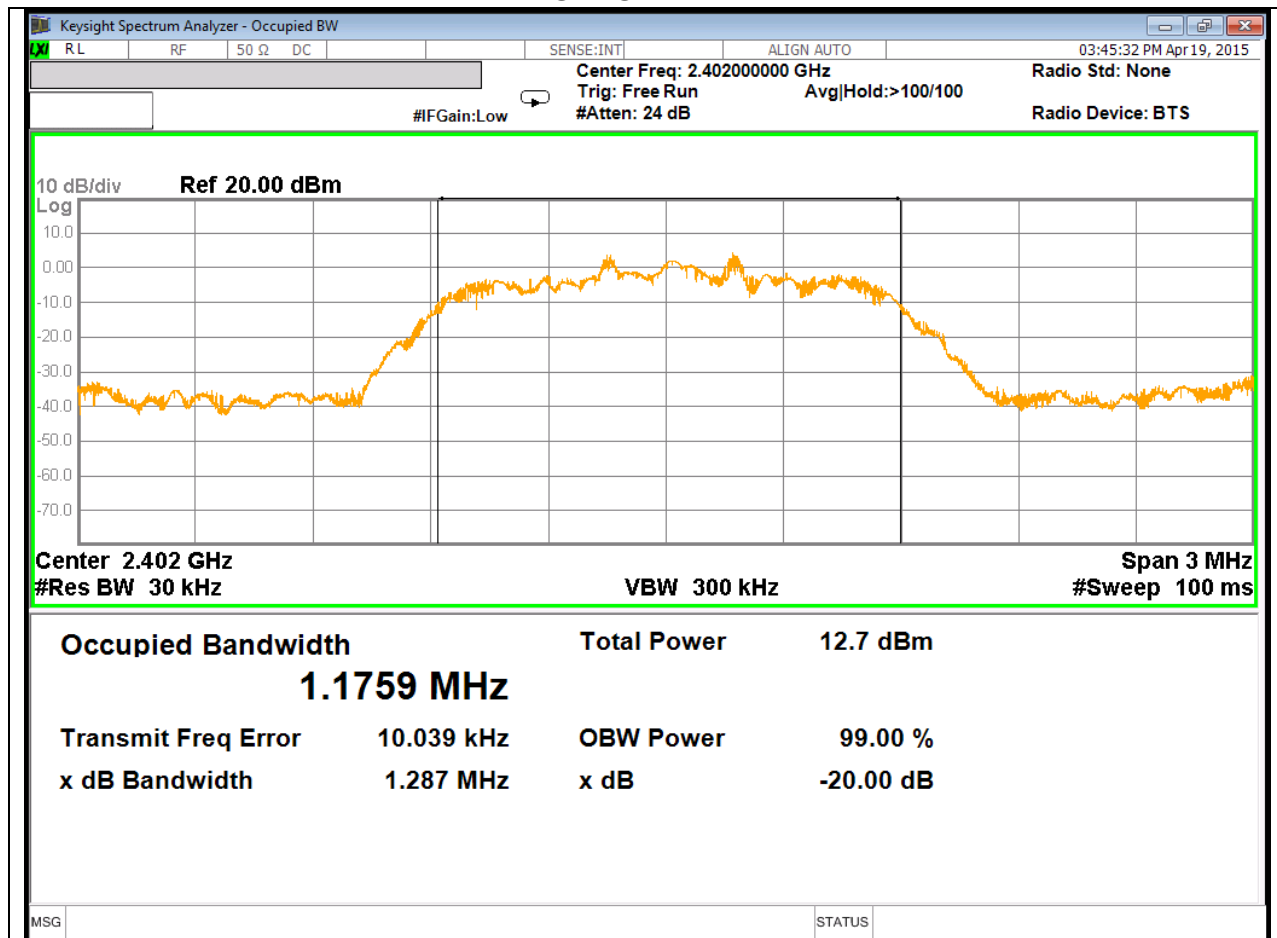


HIGH CHANNEL

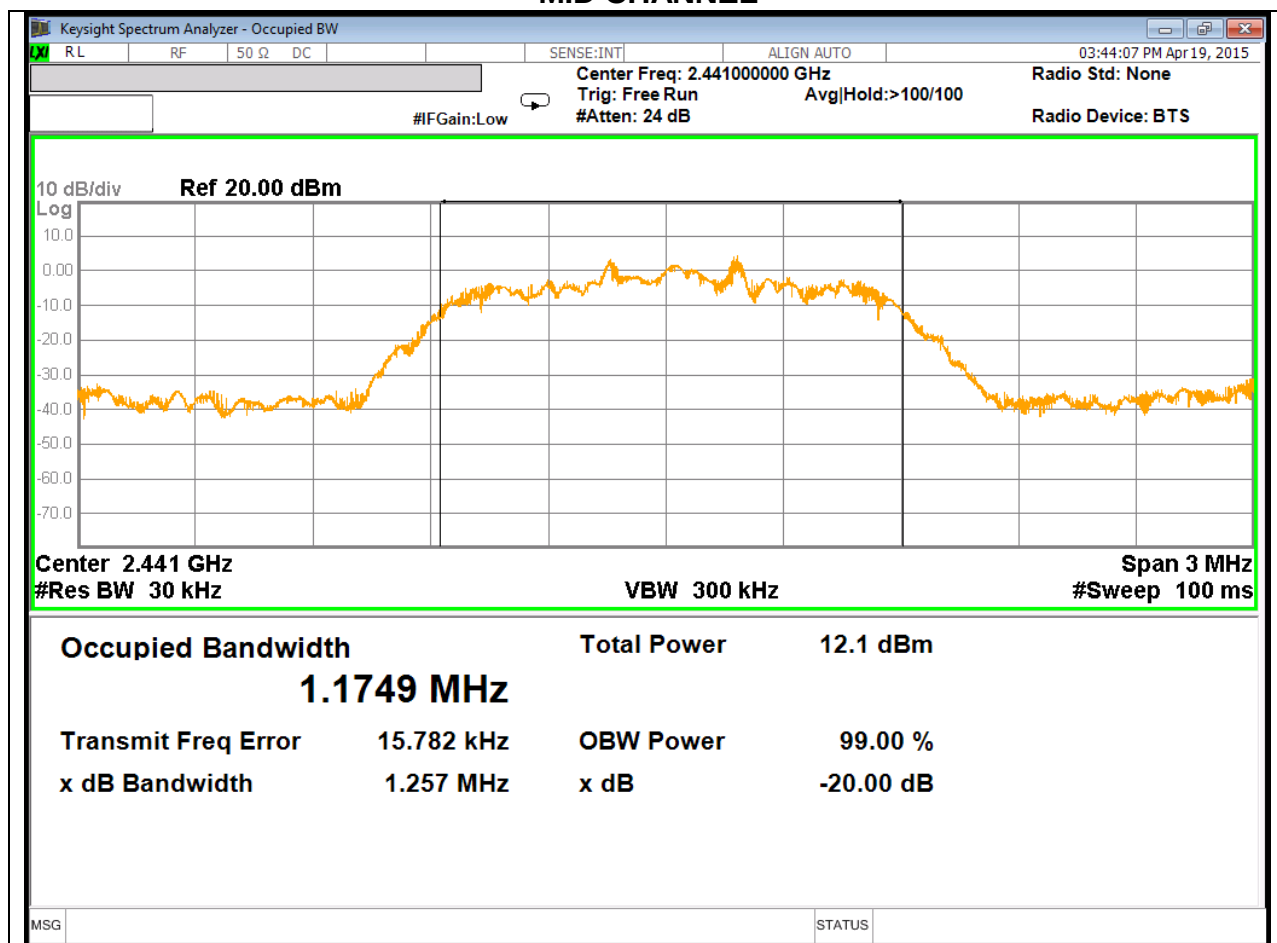


Pi/4-DQPSK 20 dB BANDWIDTH

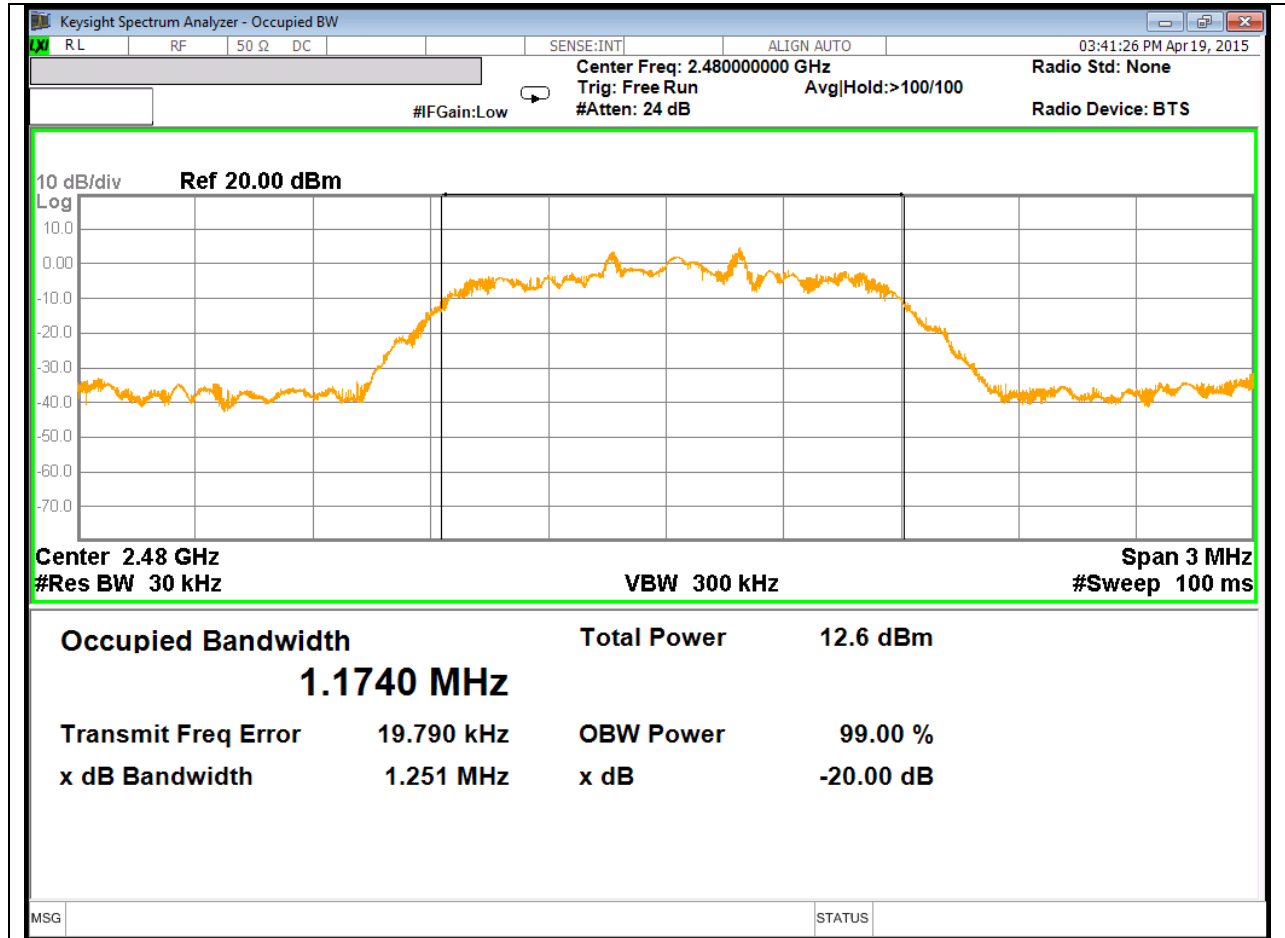
LOW CHANNEL



MID CHANNEL

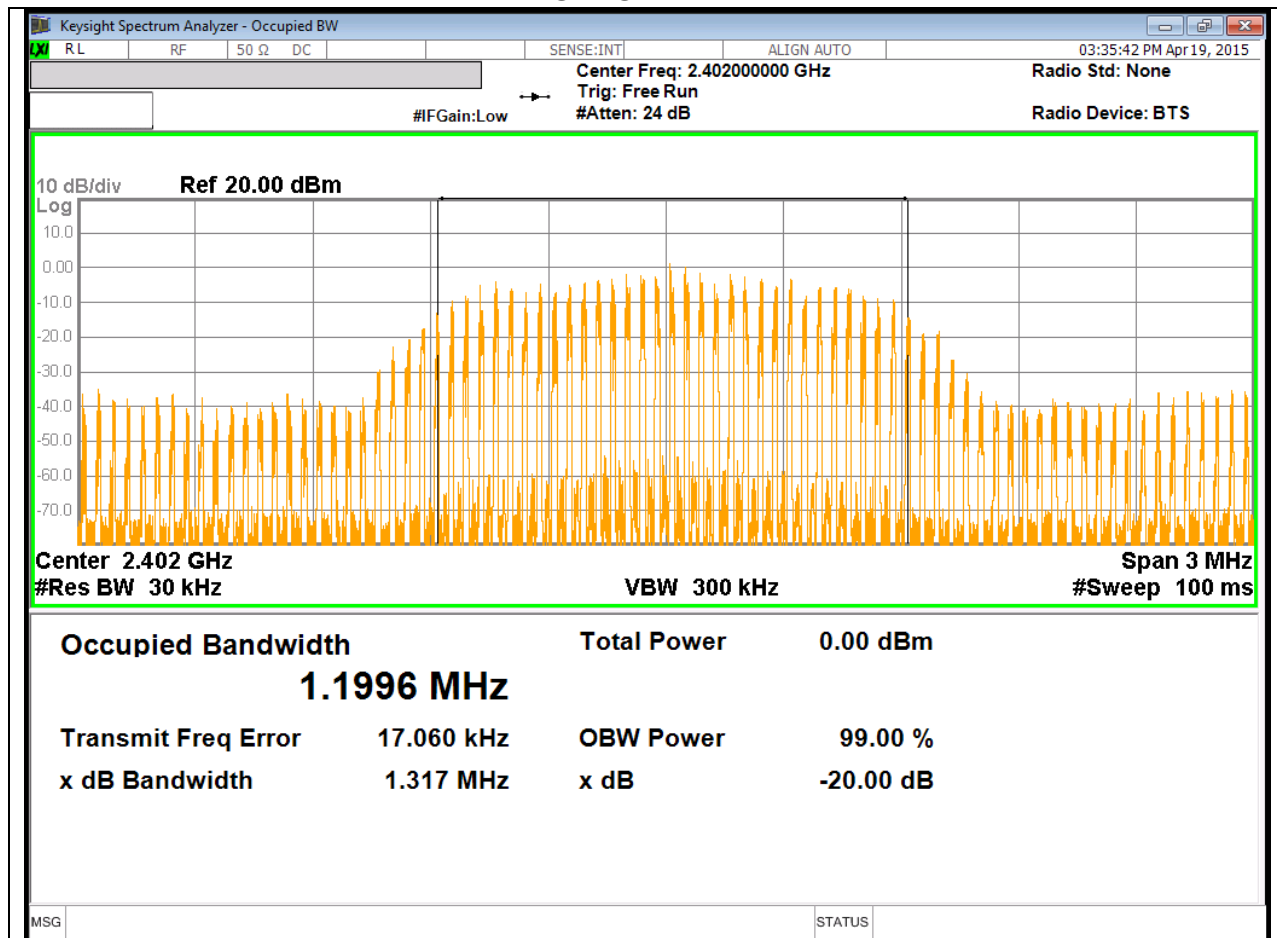


HIGH CHANNEL

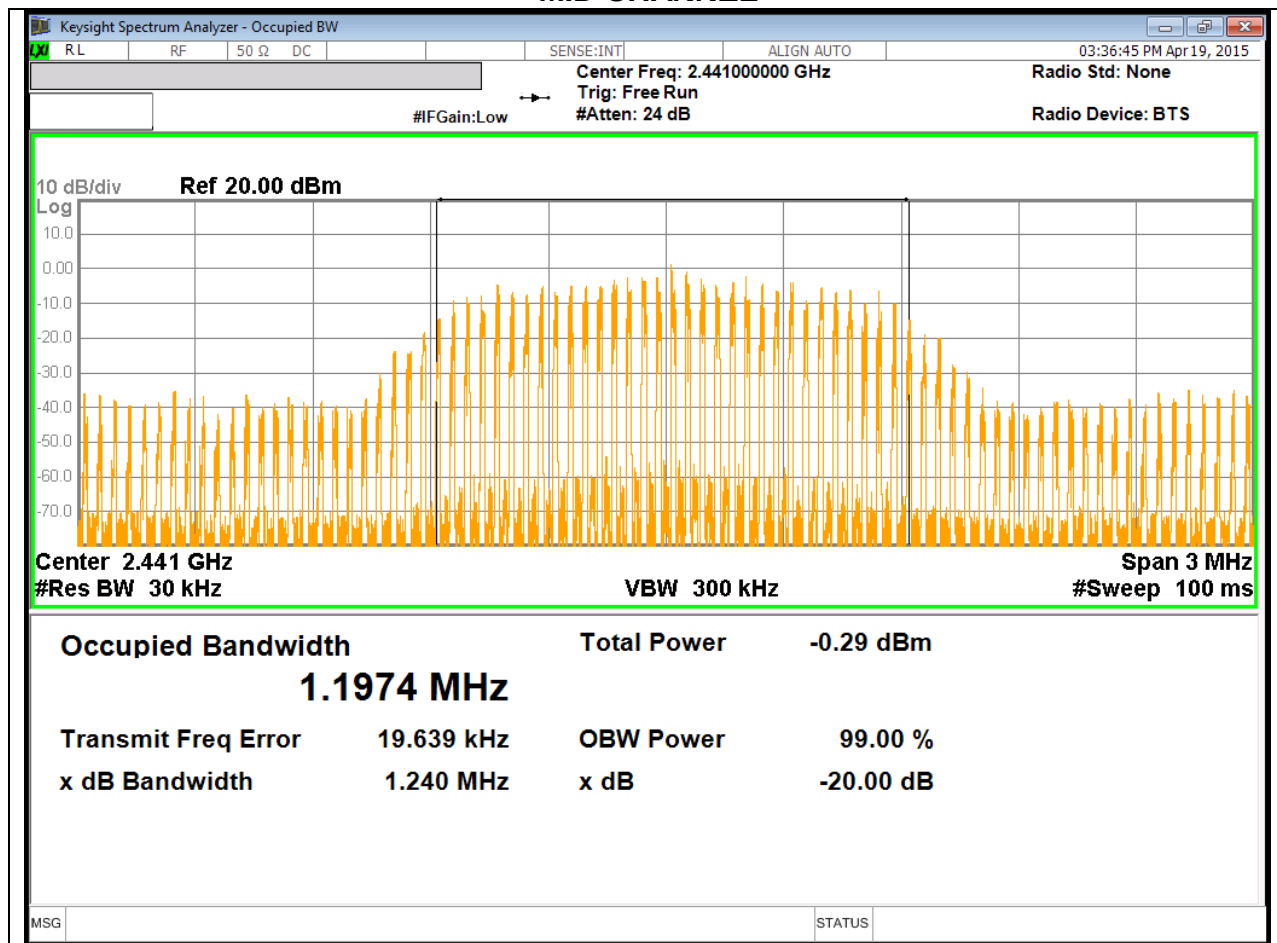


Pi/4-DQPSK 99% BANDWIDTH

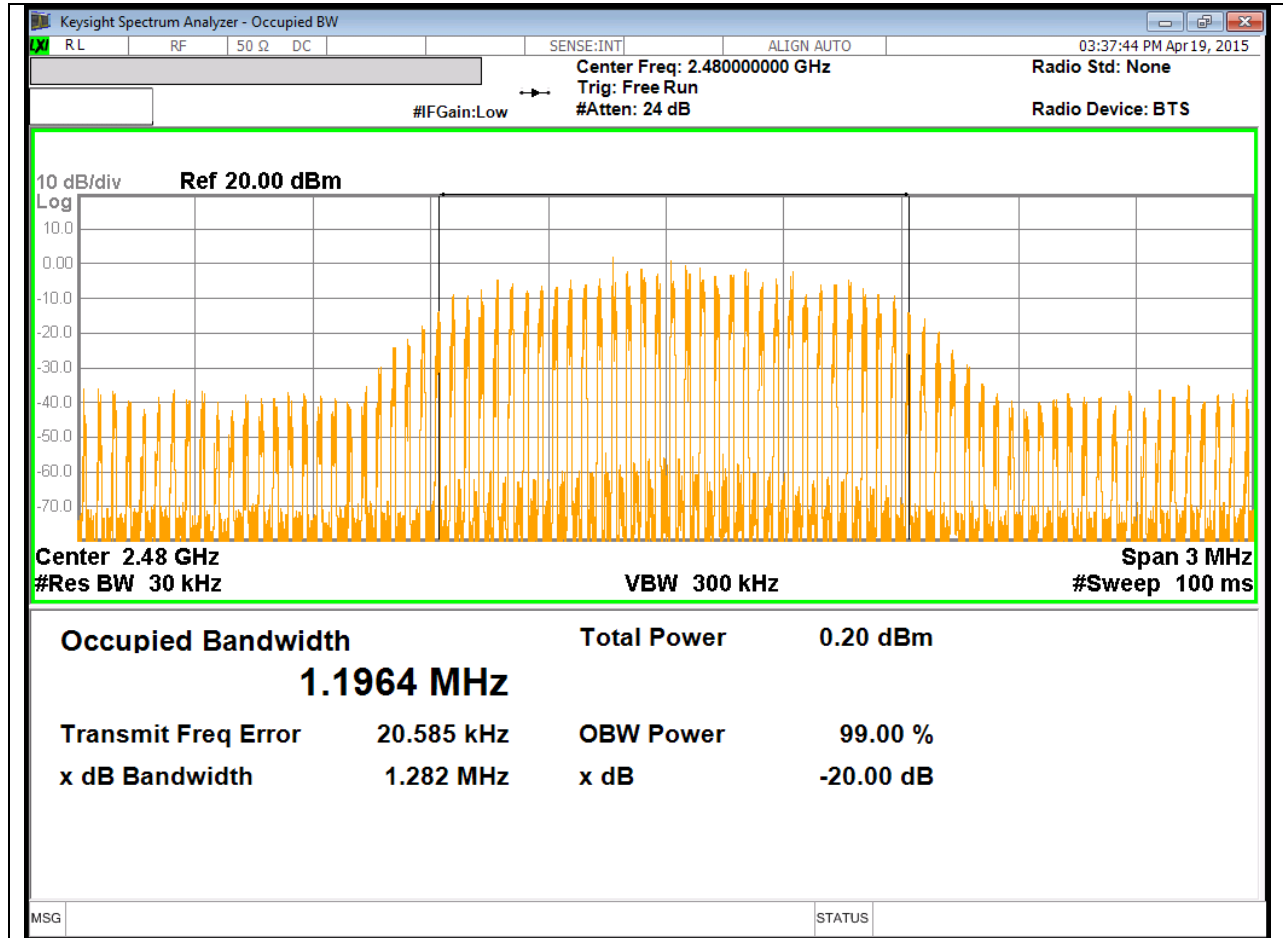
LOW CHANNEL



MID CHANNEL

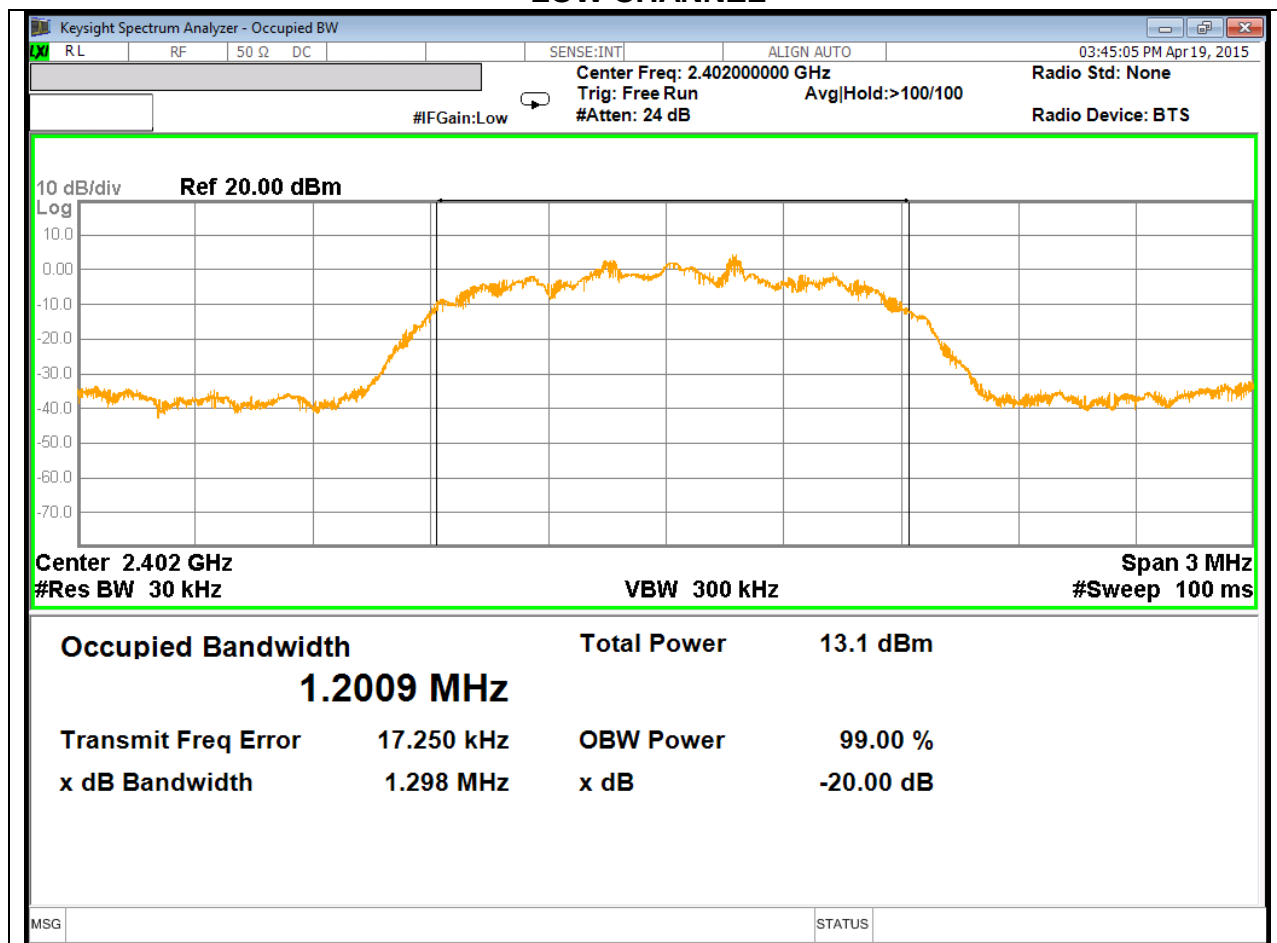


HIGH CHANNEL

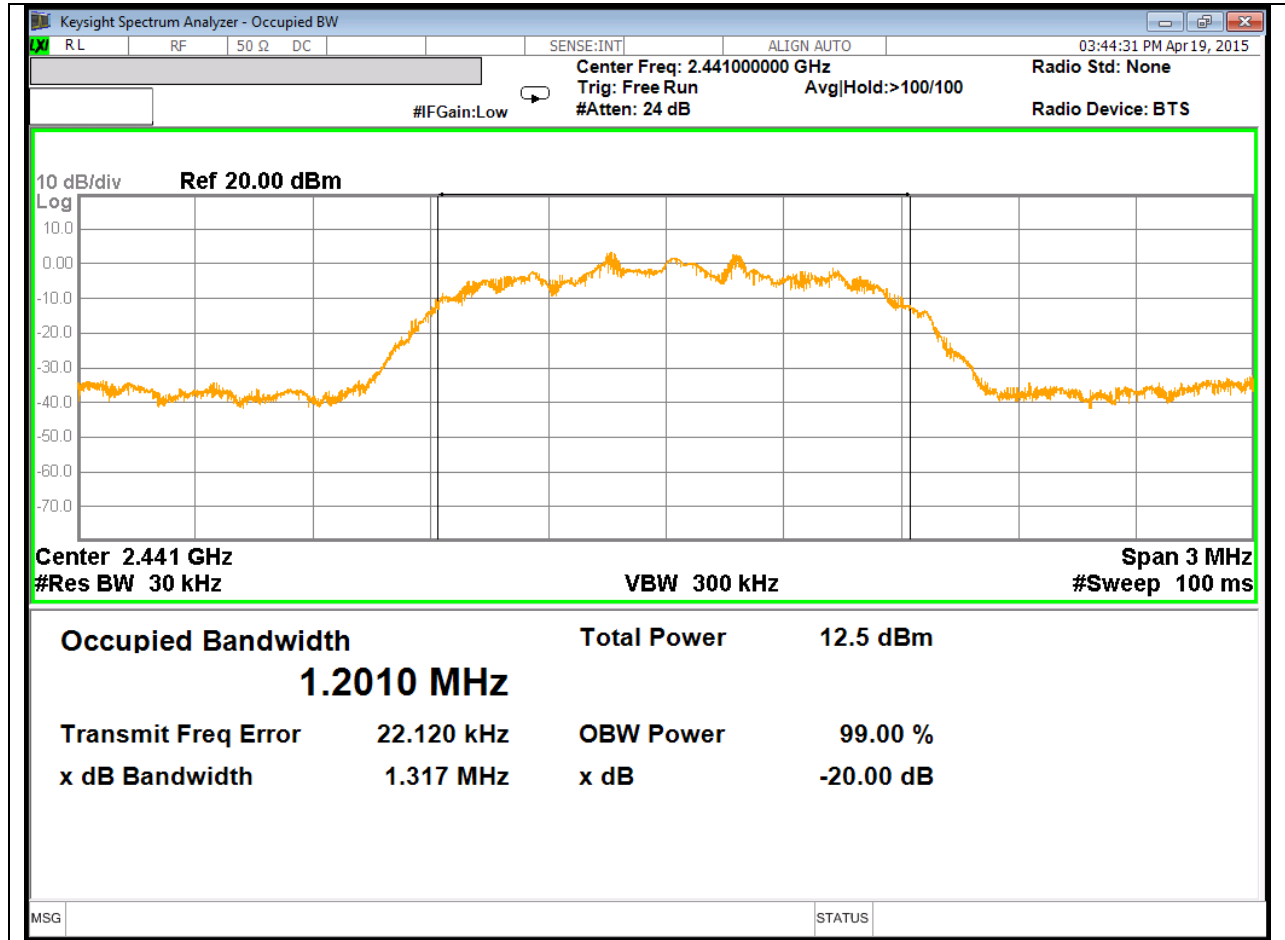


8PSK 20 dB BANDWIDTH

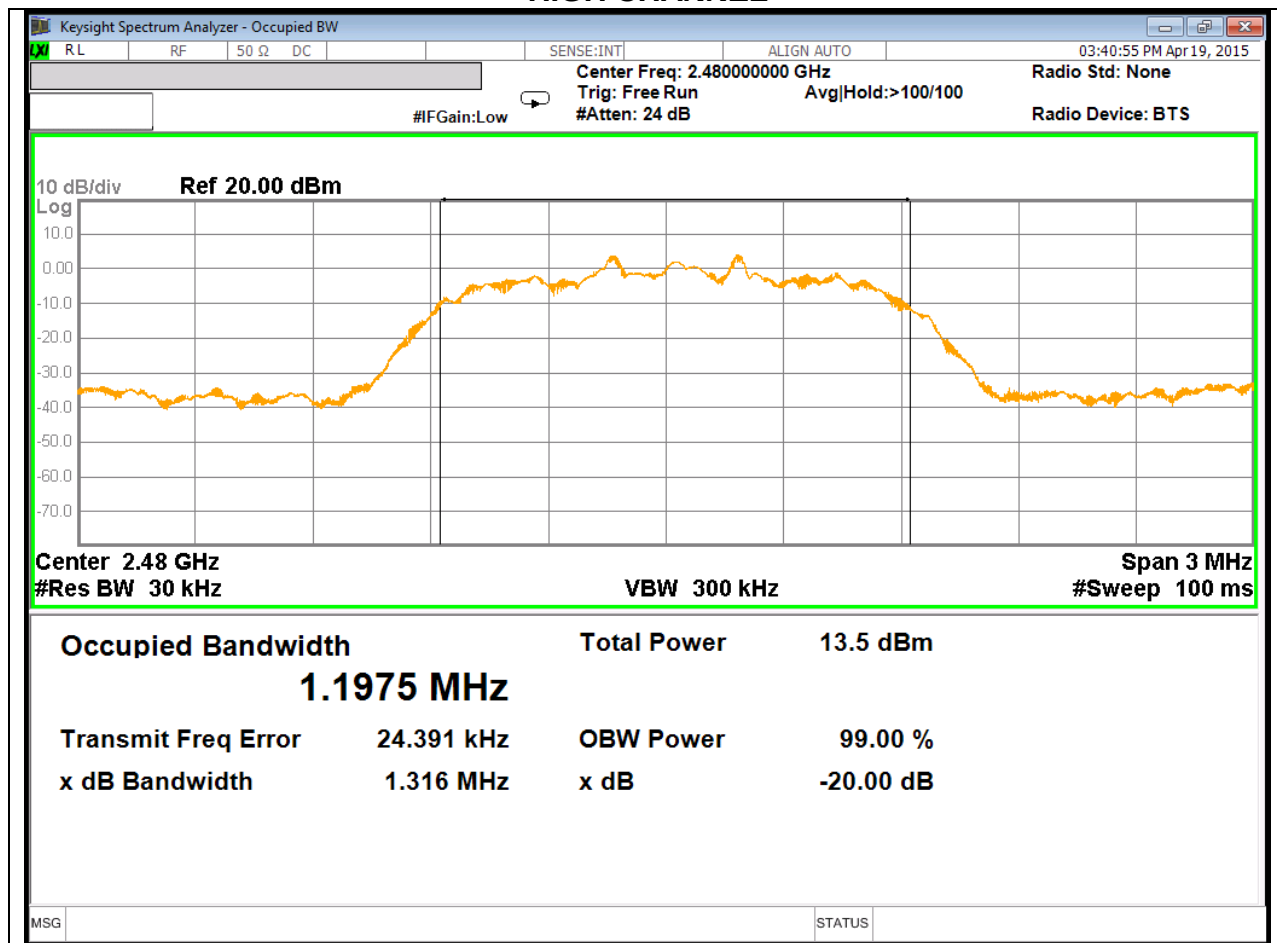
LOW CHANNEL



MID CHANNEL

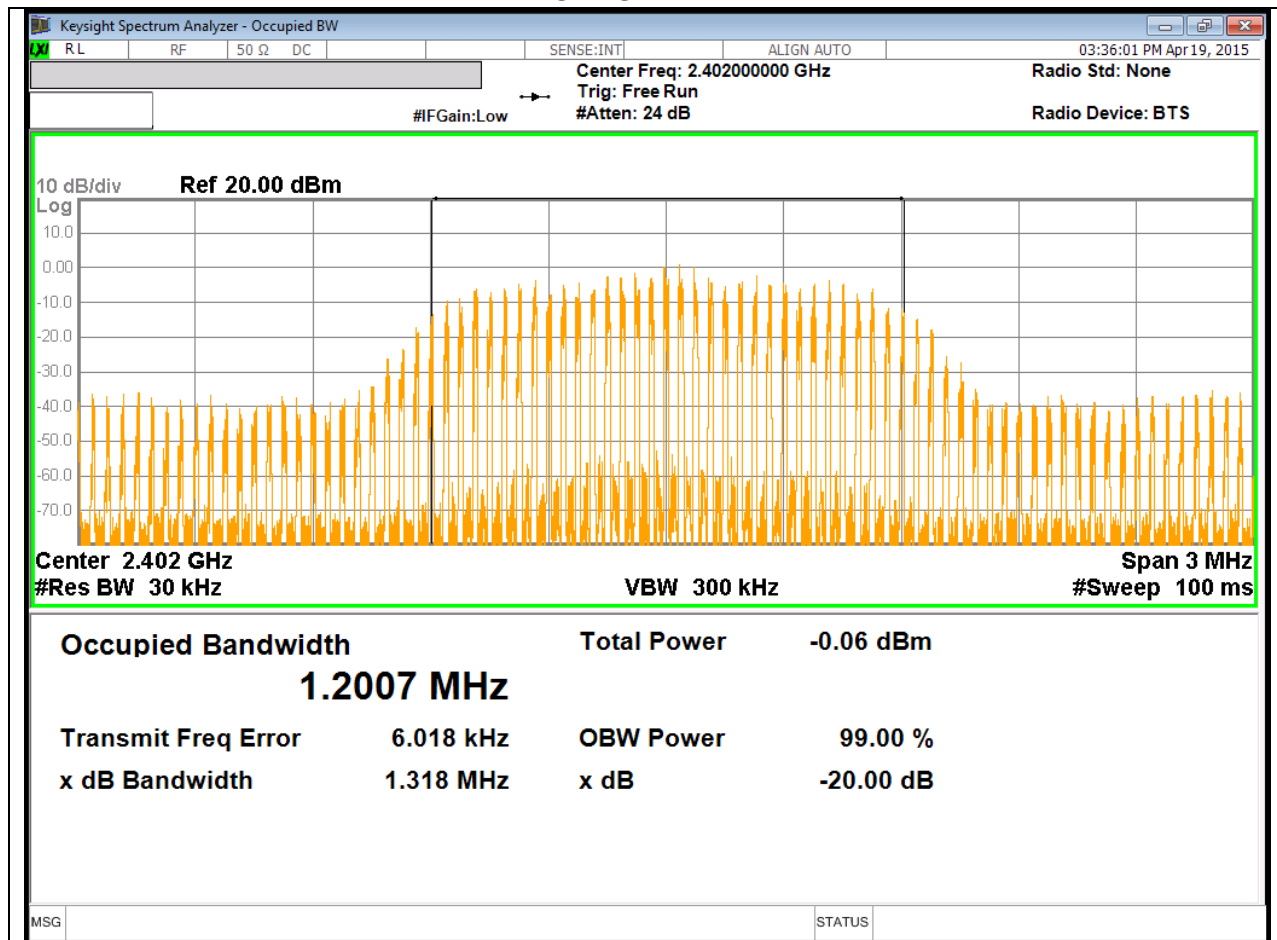


HIGH CHANNEL

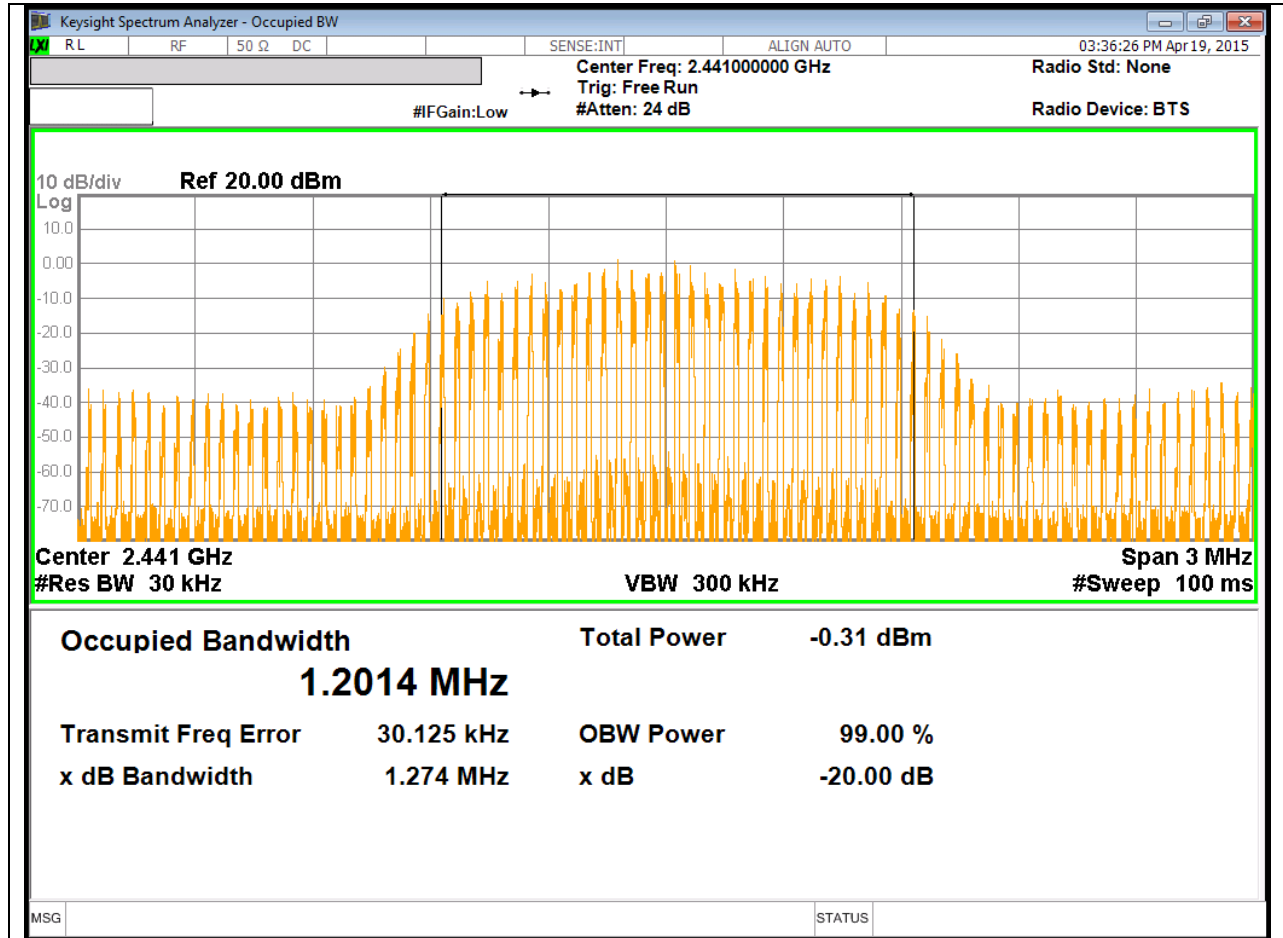


8PSK 99% BANDWIDTH

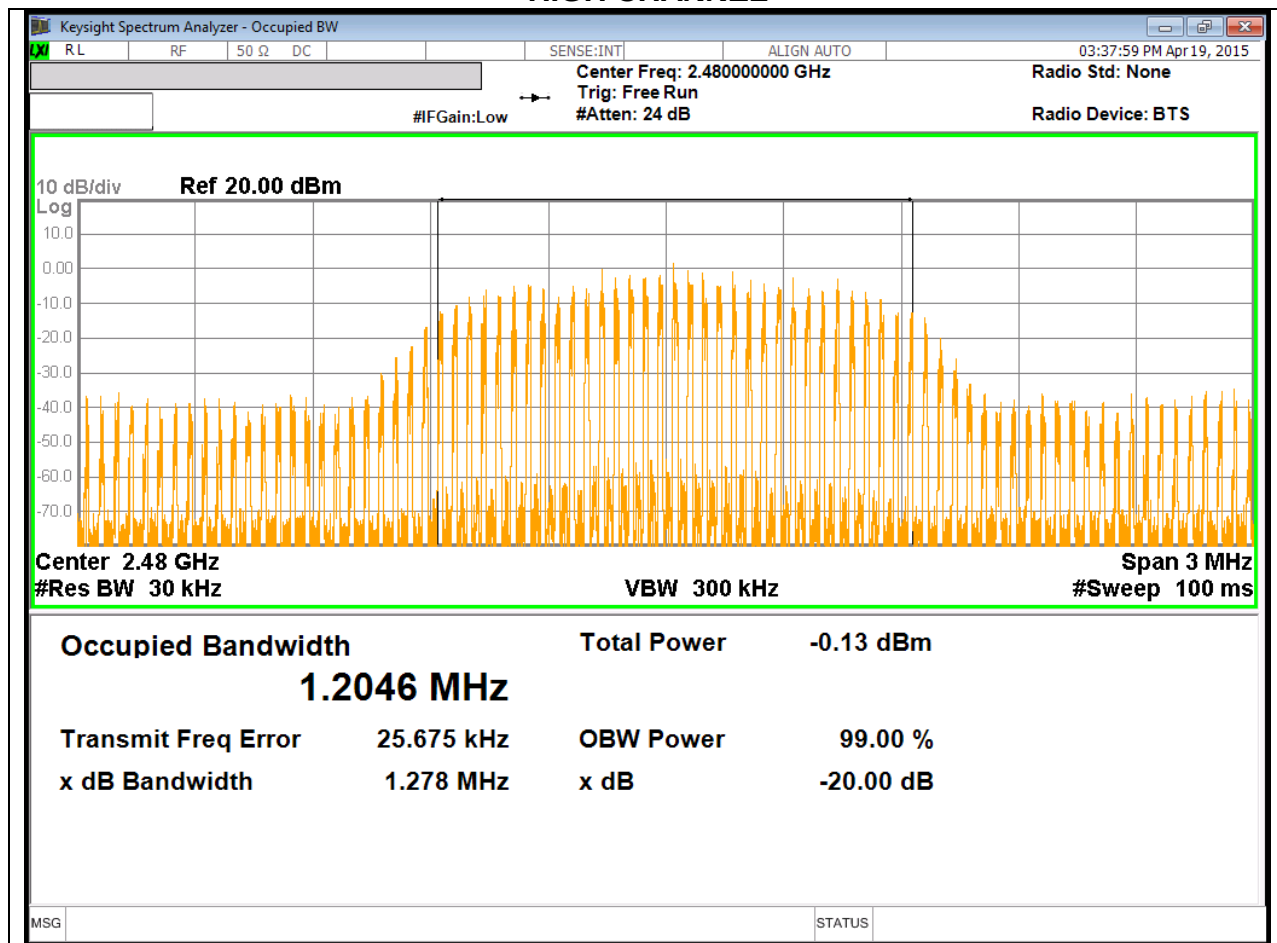
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

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

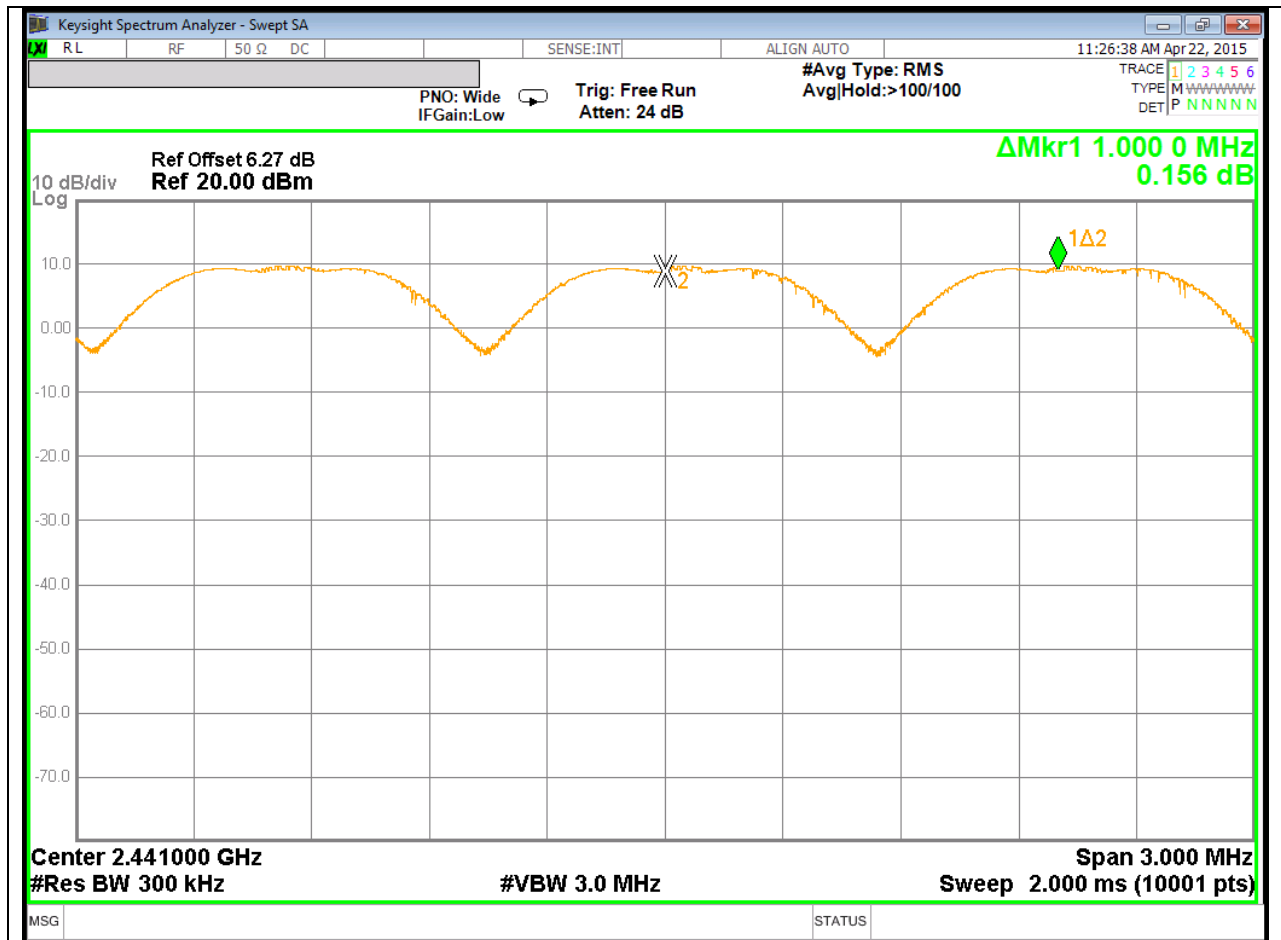
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION PLOT



8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

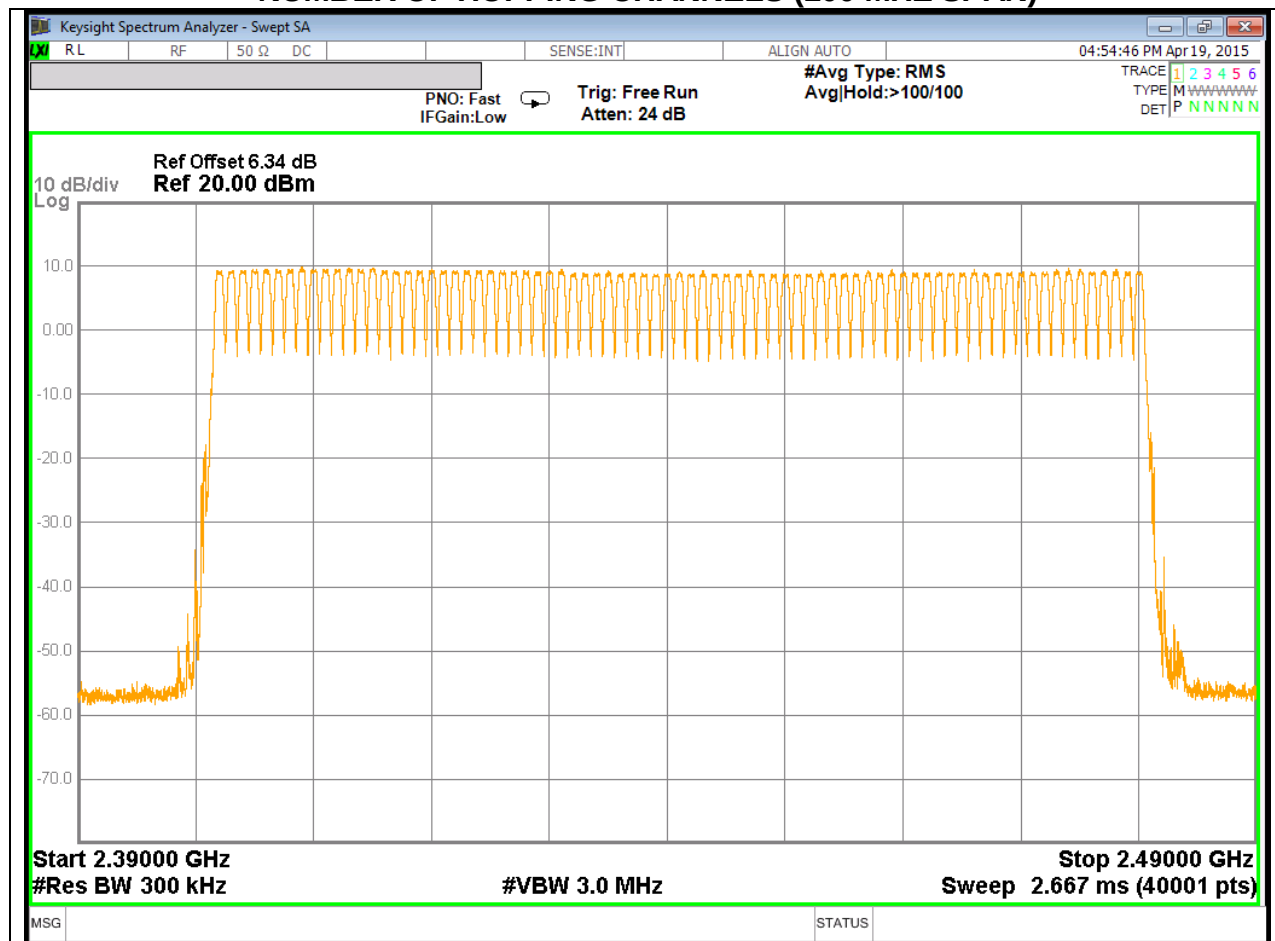
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

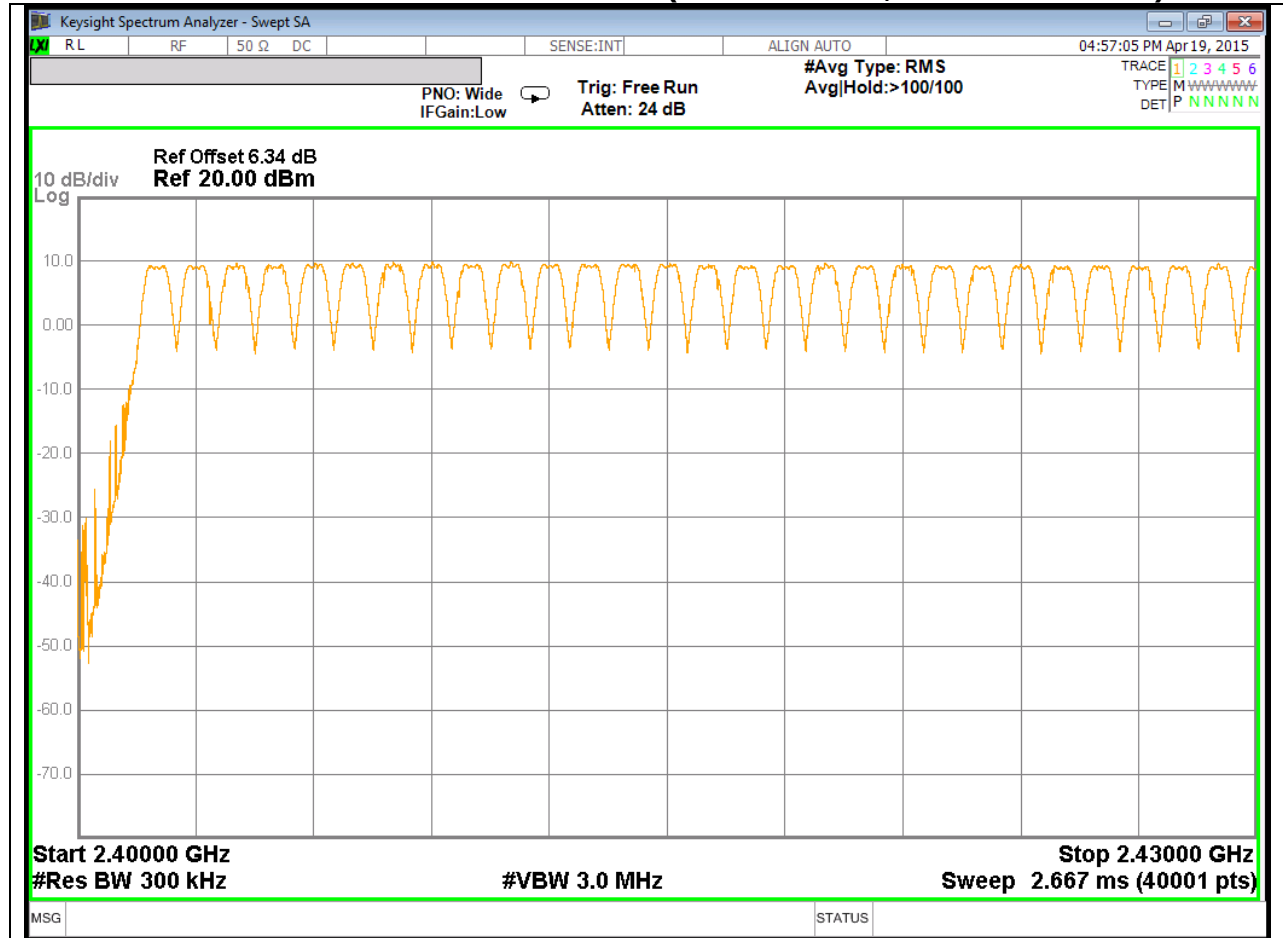
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS PLOTS

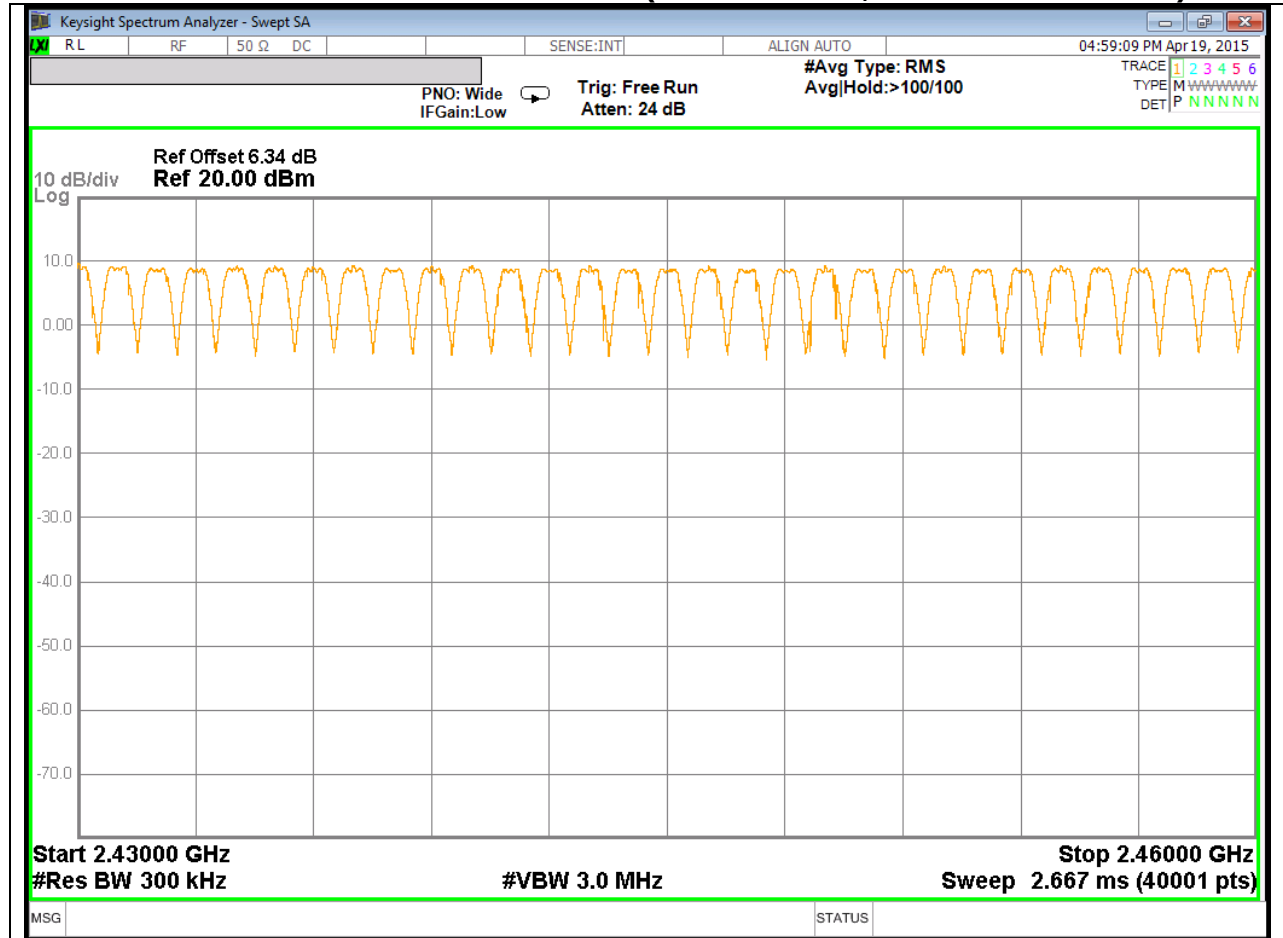
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



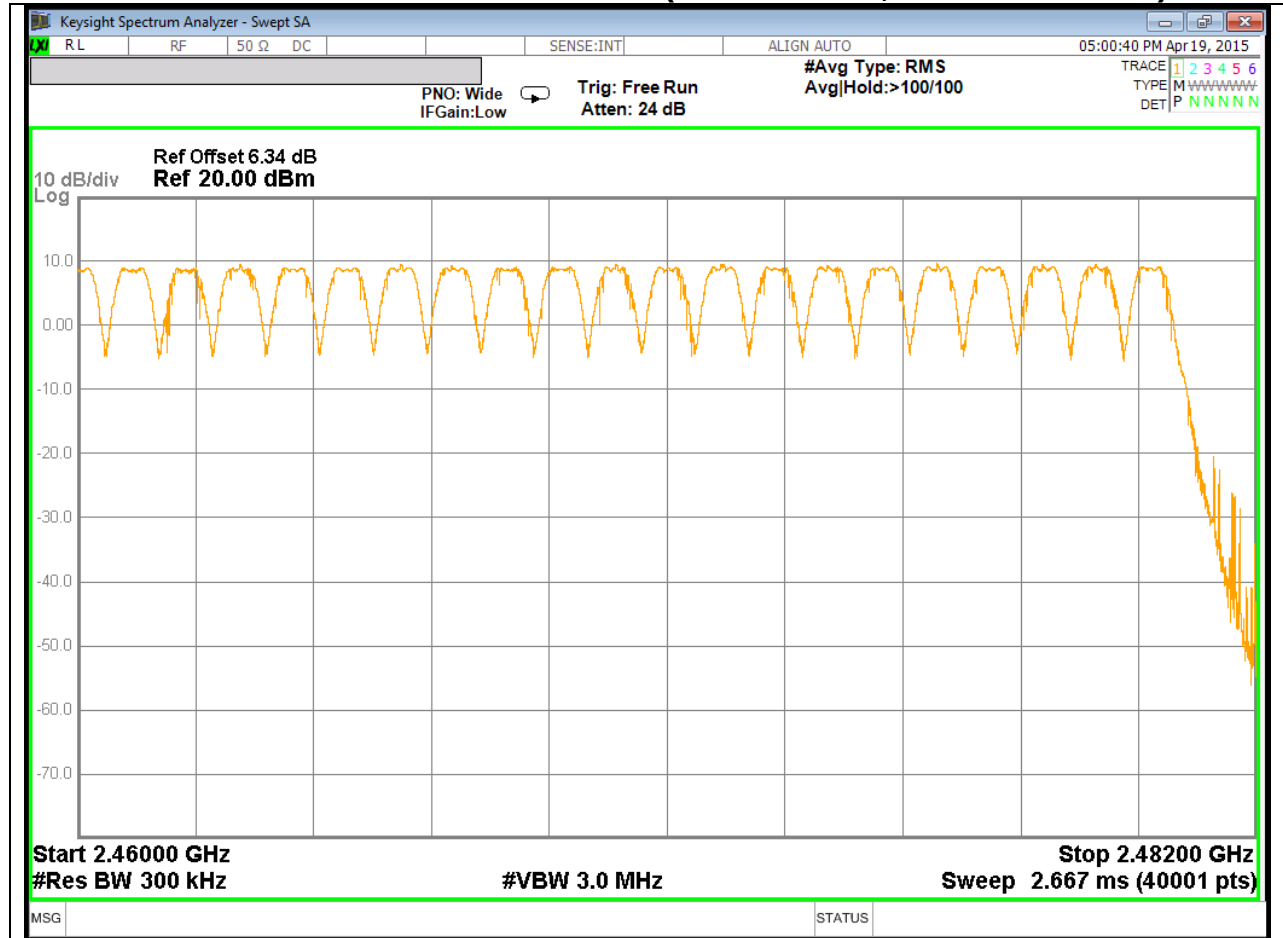
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



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



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



8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

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

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

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

RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.382	32	0.122368	0.4	-0.2776
DH3	1.638	16	0.26208	0.4	-0.1379
DH5	2.886	12	0.34632	0.4	-0.0537
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	0.382	8	0.030592	0.4	-0.3694
DH3	1.638	4	0.06552	0.4	-0.3345
DH5	2.886	3	0.08658	0.4	-0.3134

PULSE WIDTH - DH1



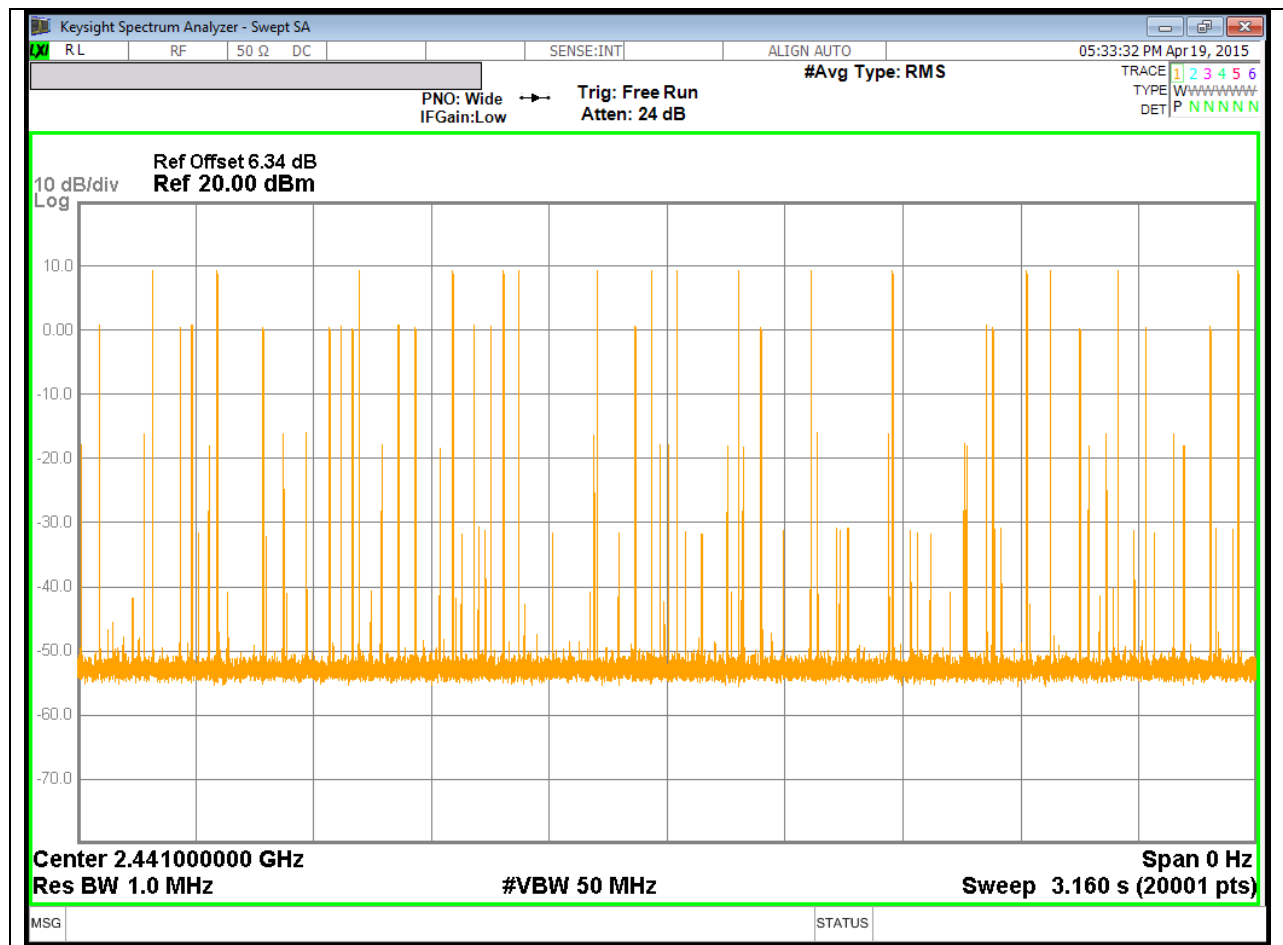
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



PULSE WIDTH - DH3



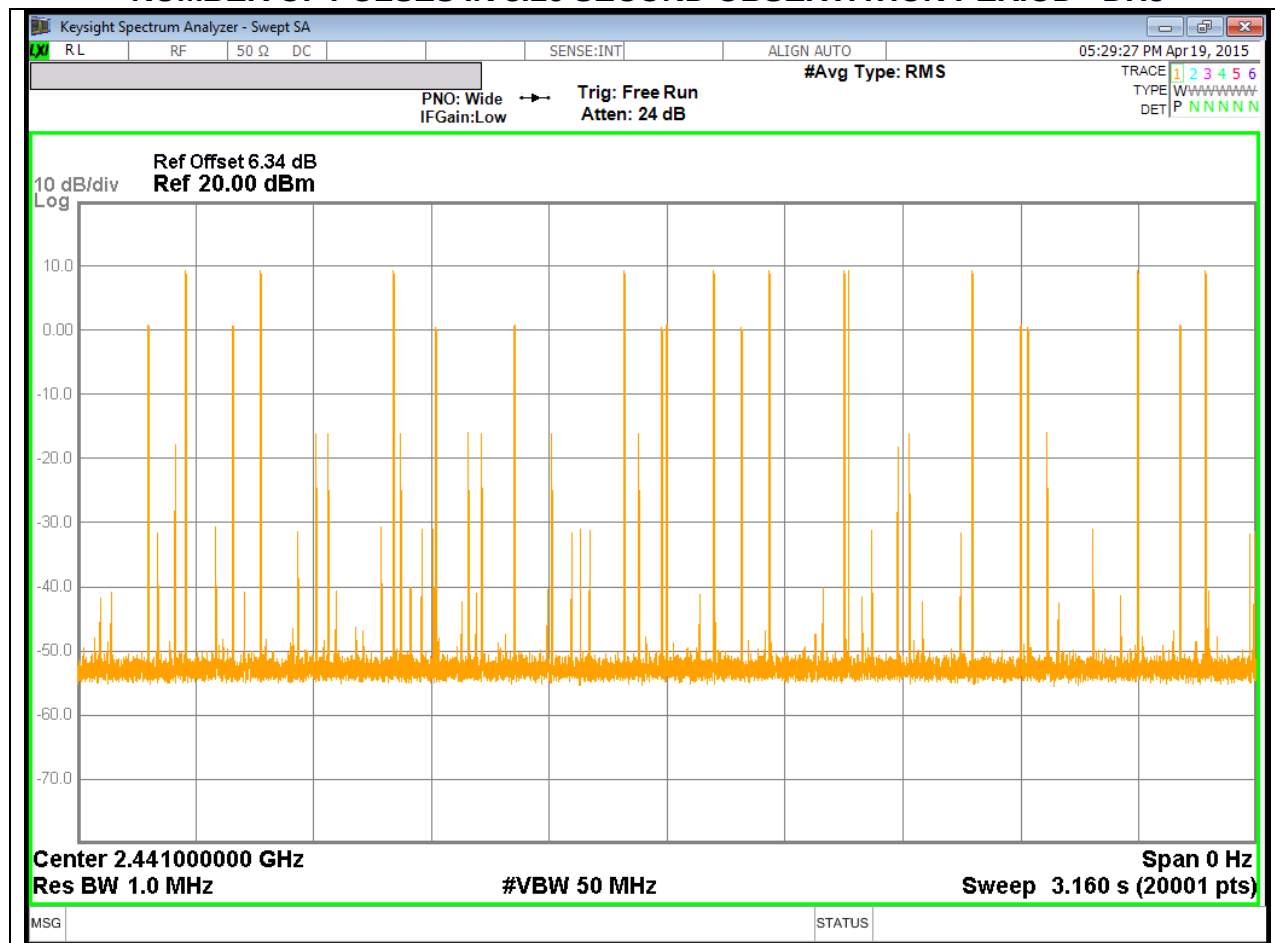
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



PULSE WIDTH - DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

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

TEST PROCEDURE

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

RESULTS

8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.696	21	-11.304
Middle	2441	9.323	21	-11.677
High	2480	9.694	21	-11.306
Worst		9.696		-11.304

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.654	21	-13.346
Middle	2441	6.930	21	-14.07
High	2480	7.066	21	-13.934
Worst		7.654		-13.346

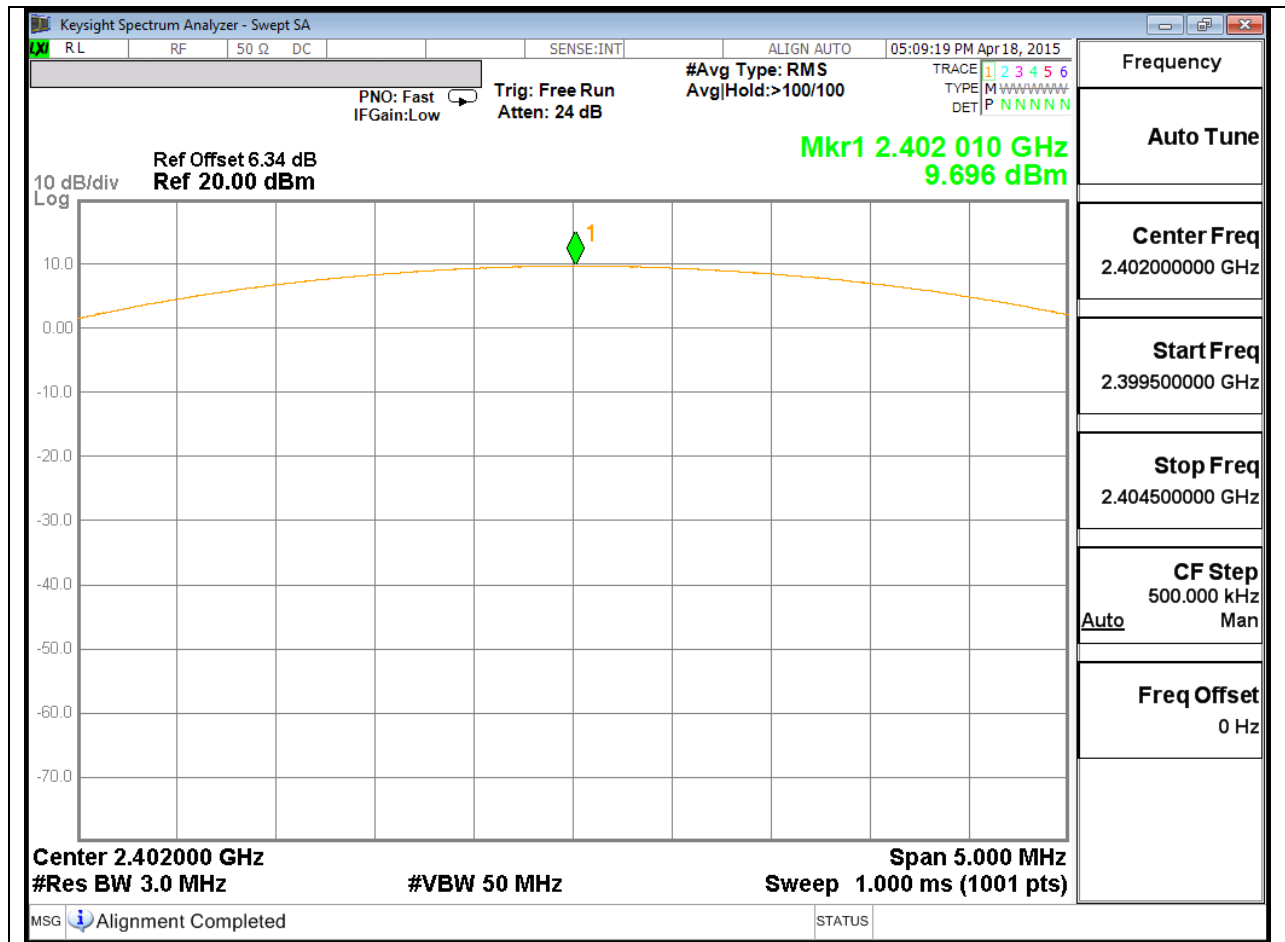
8.5.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.638	21	-13.362
Middle	2441	6.922	21	-14.078
High	2480	7.076	21	-13.924
Worst		7.638		-13.362

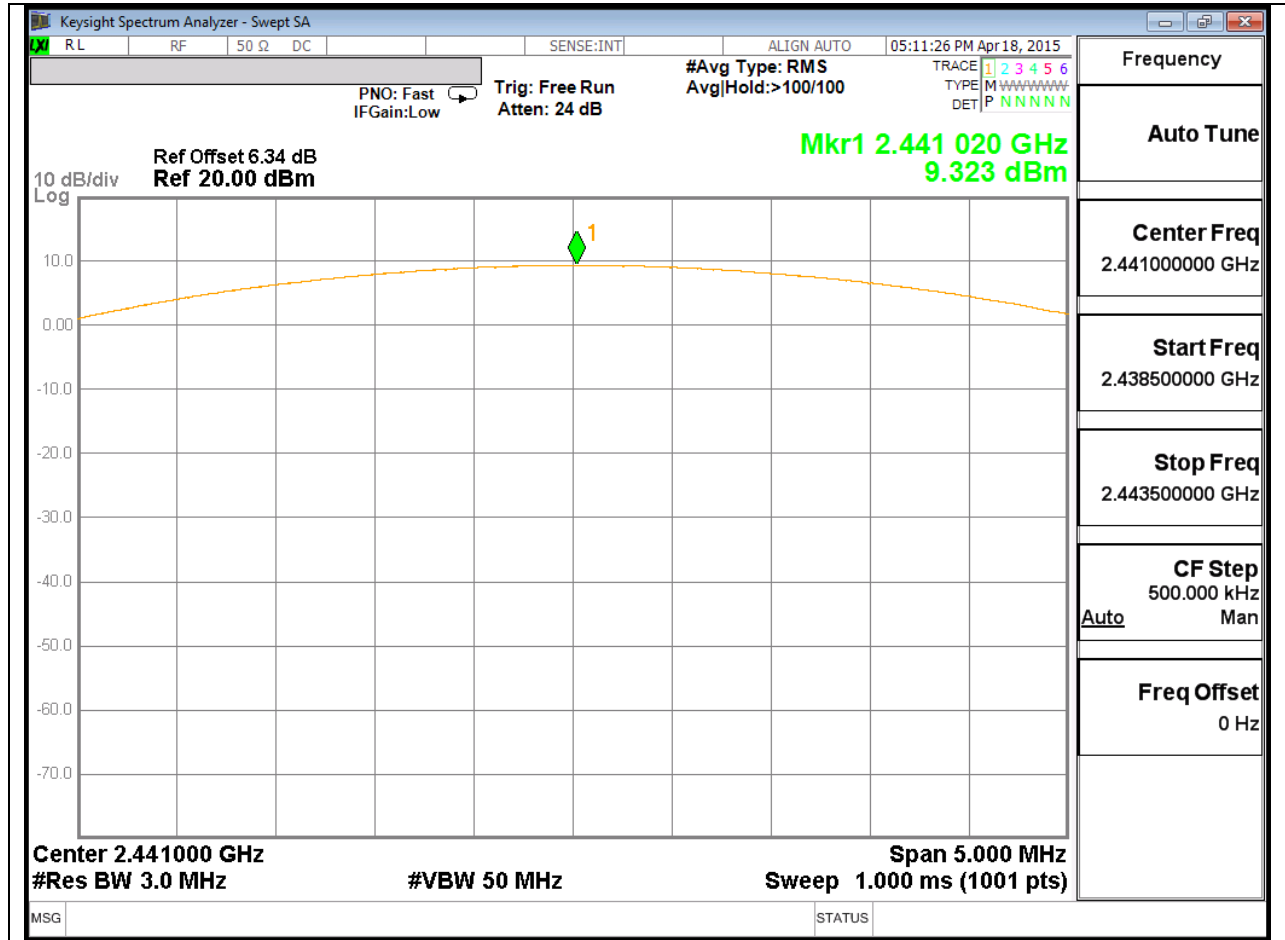
8.5.4. OUTPUT POWER PLOTS

GFSK OUTPUT POWER

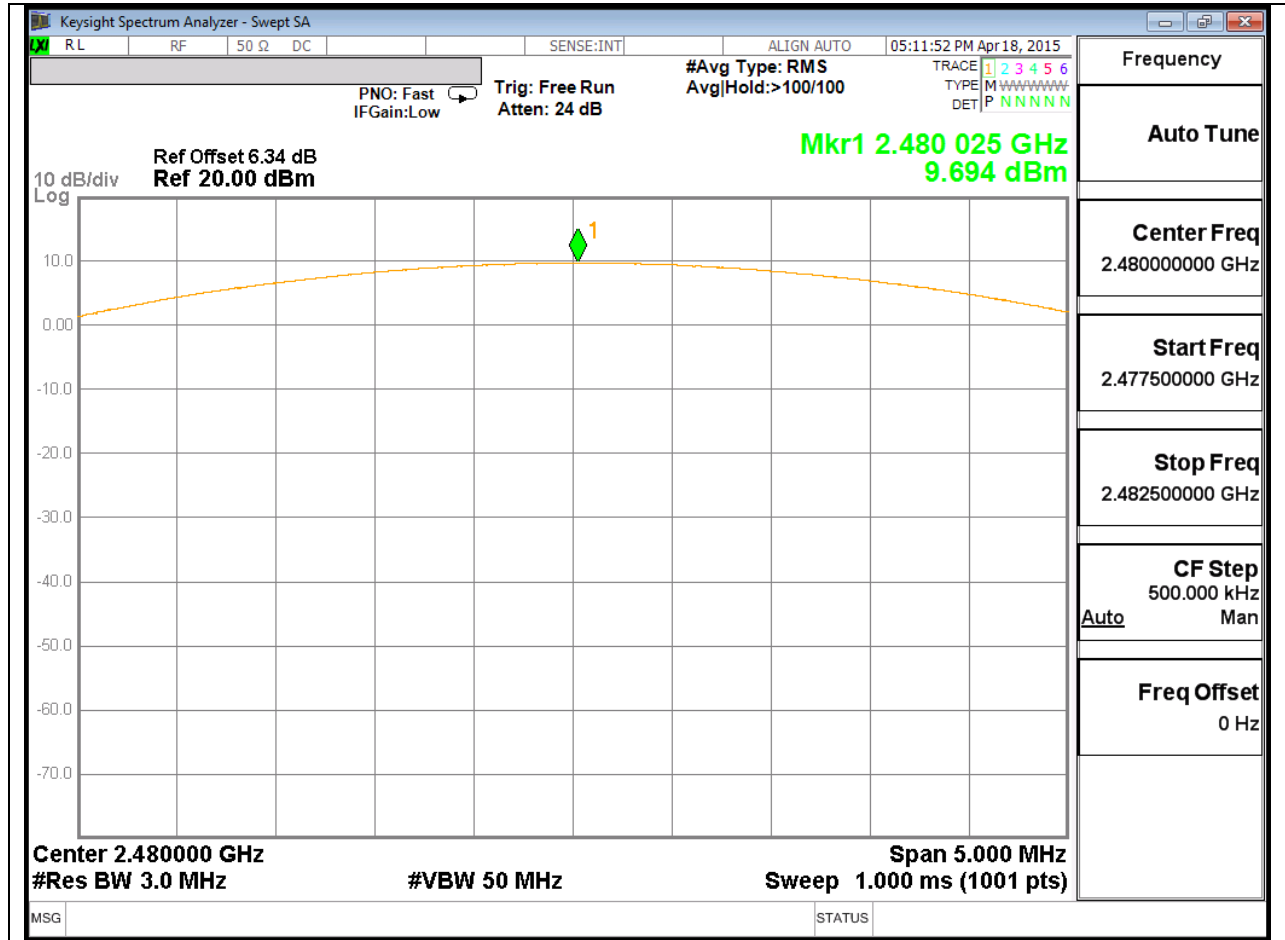
LOW CHANNEL



MID CHANNEL

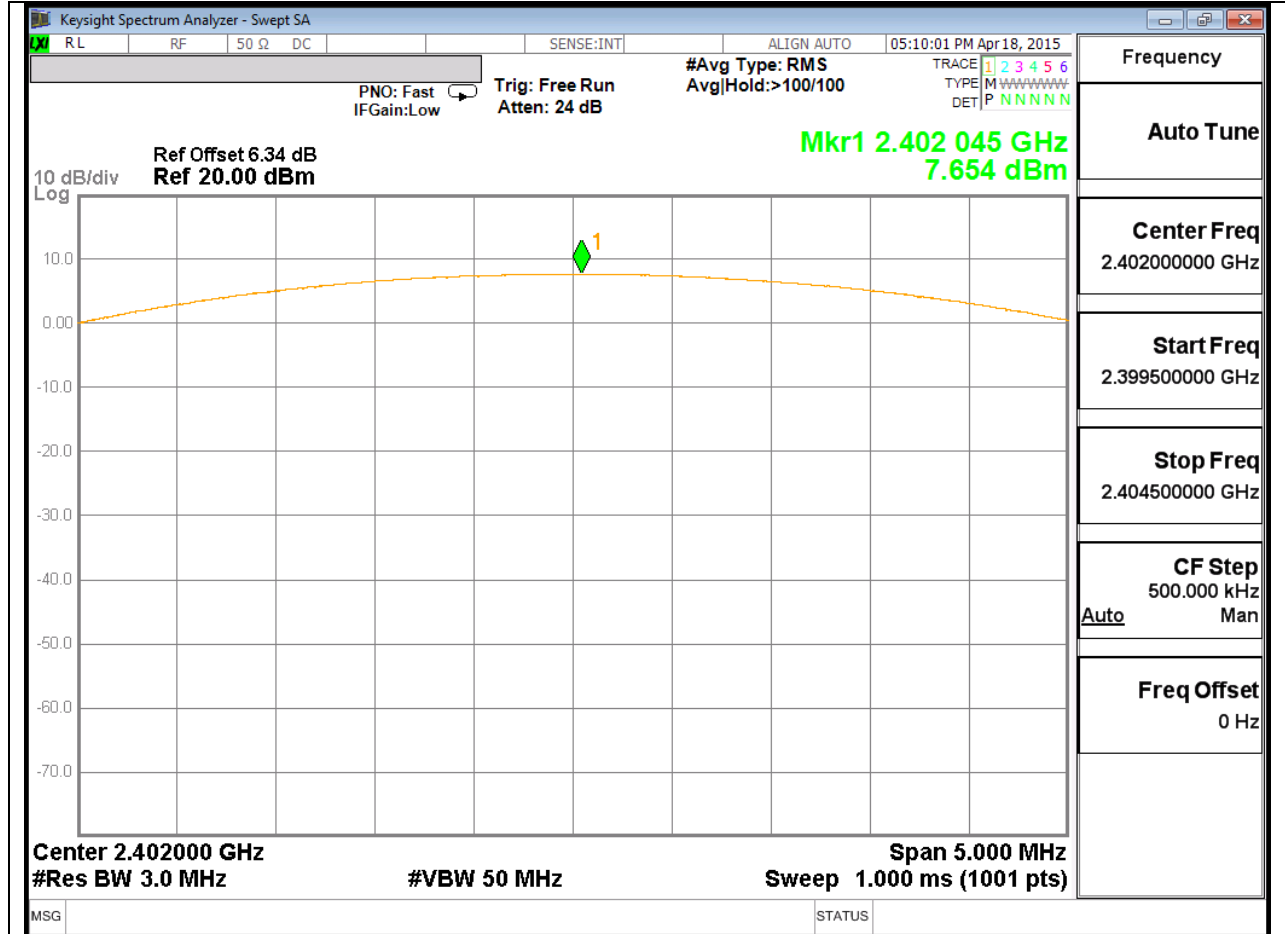


HIGH CHANNEL

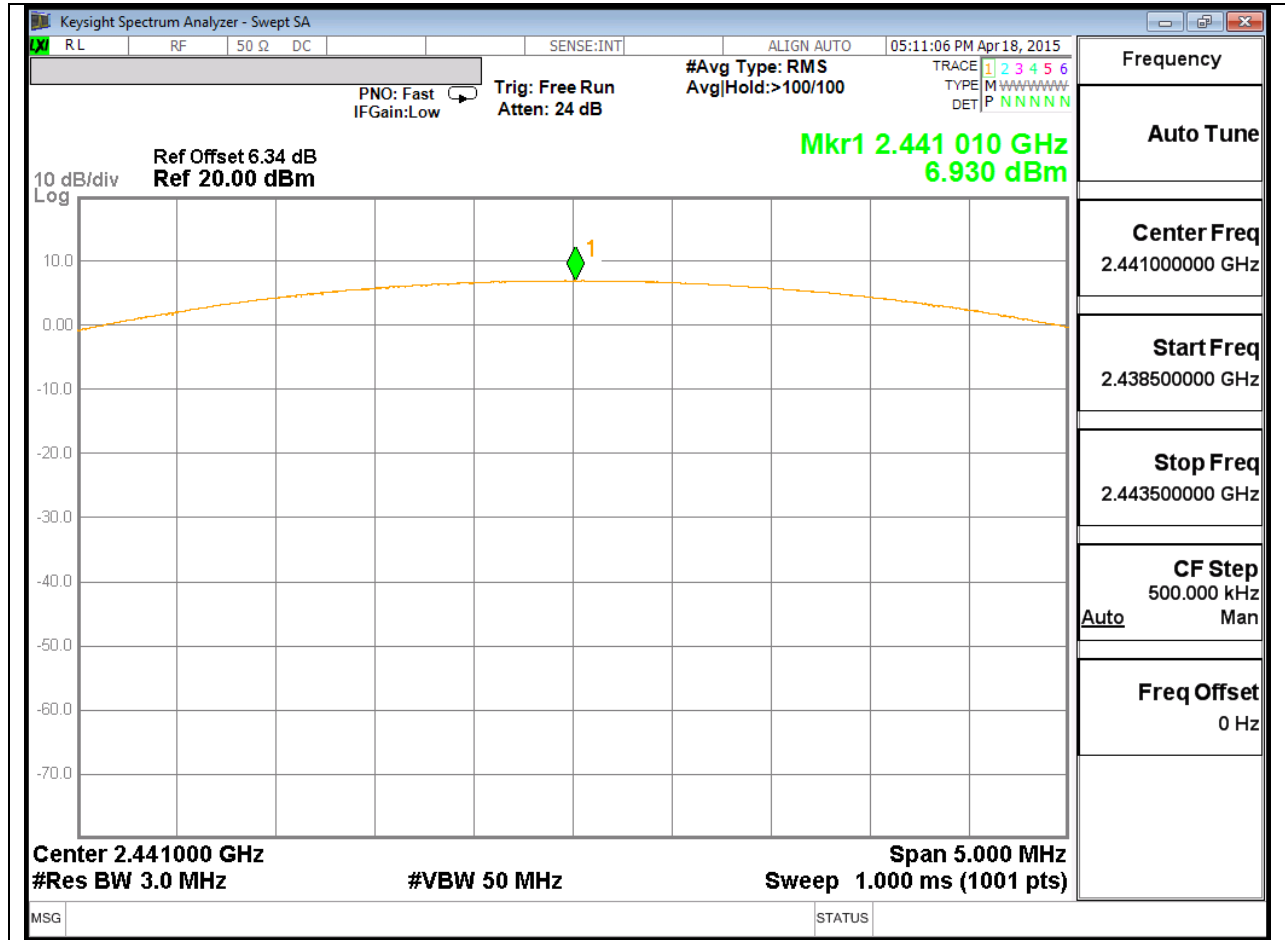


Pi/4-DPSK OUTPUT POWER

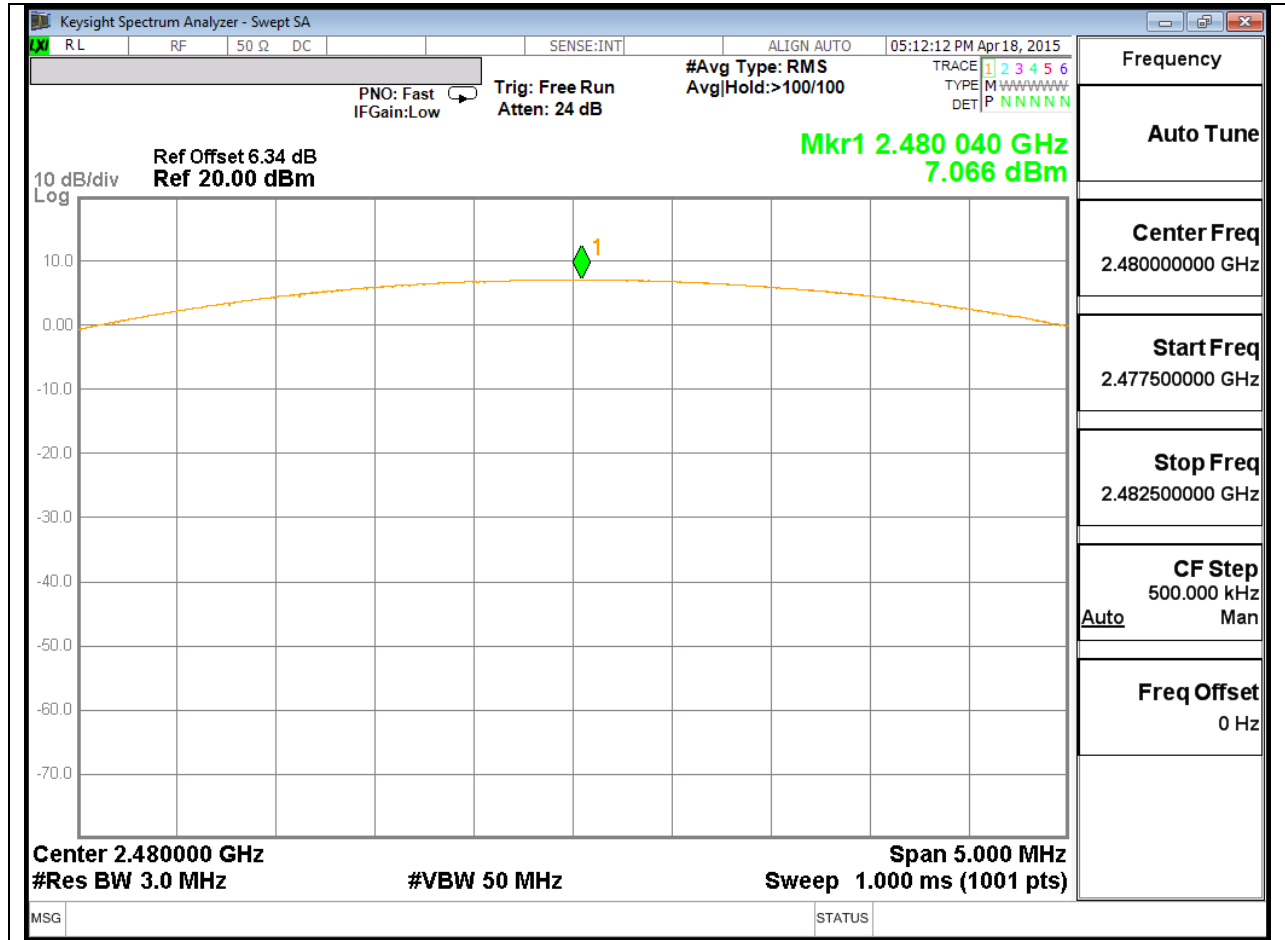
LOW CHANNEL



MID CHANNEL

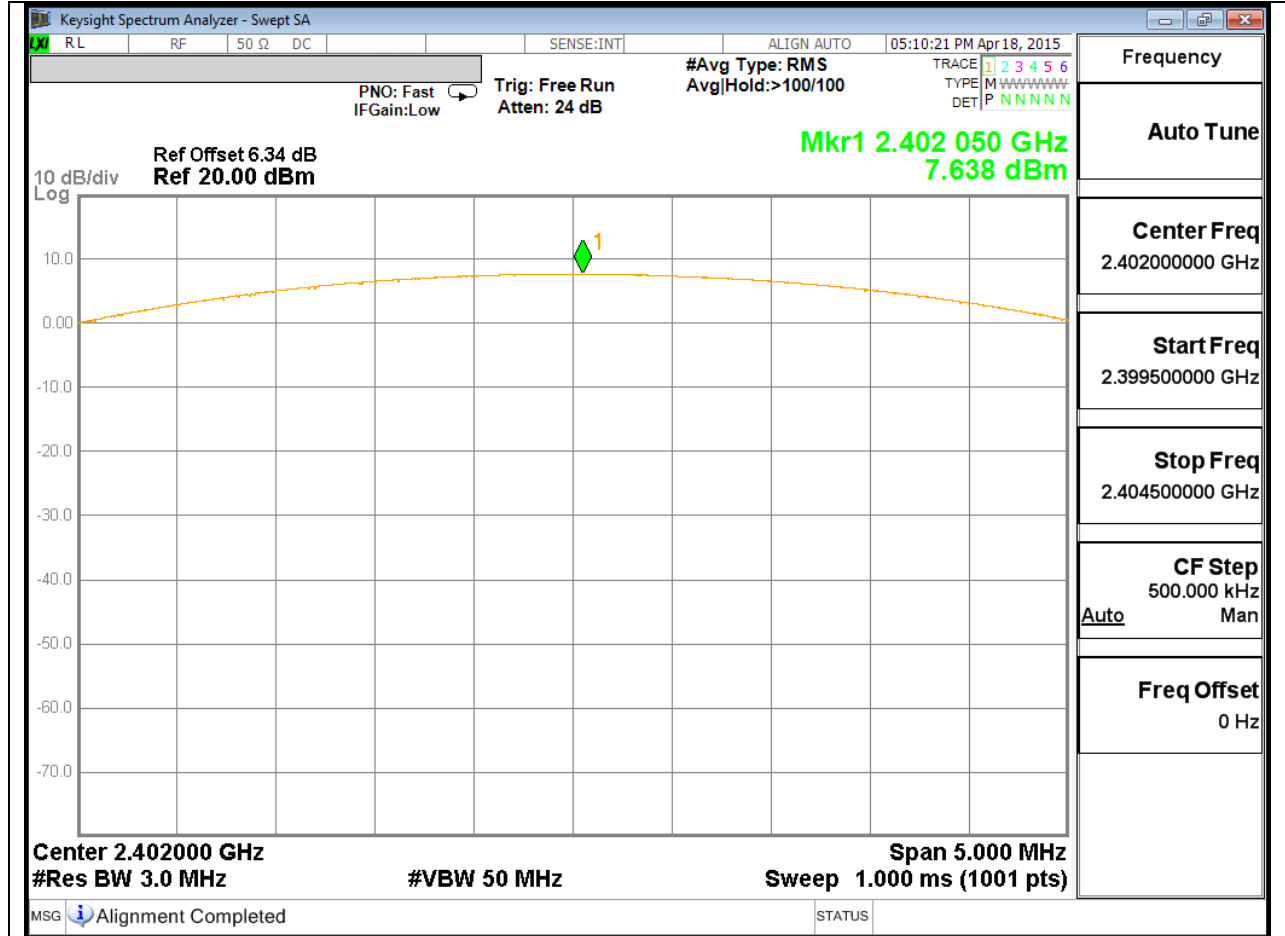


HIGH CHANNEL



8PSK OUTPUT POWER

LOW CHANNEL



Keysight Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 05:10:47 PM Apr 18, 2015

PNO: Fast IFGain:Low Trig: Free Run Atten: 24 dB

#Avg Type: RMS AvgHold:>100/100

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

Ref Offset 6.34 dB
Ref 20.00 dBm

Mkr1 2.441 065 GHz
6.922 dBm

10 dB/div
Log

Center 2.441000 GHz
#Res BW 3.0 MHz
#VBW 50 MHz
Sweep 1.000 ms (1001 pts)
Span 5.000 MHz

Frequency

Auto Tune

Center Freq
2.441000000 GHz

Start Freq
2.438500000 GHz

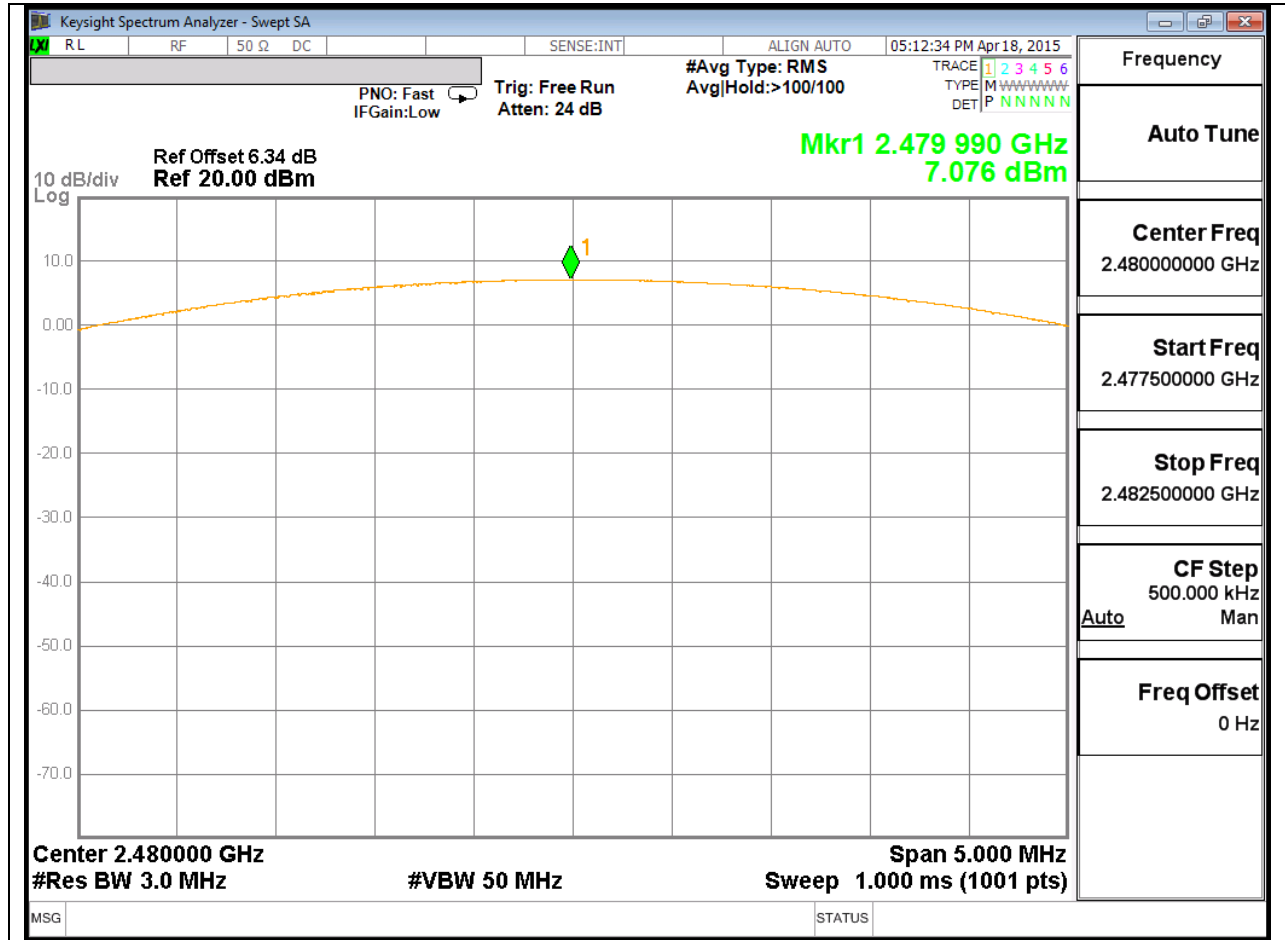
Stop Freq
2.443500000 GHz

CF Step
500.000 kHz
Auto Man

Freq Offset
0 Hz

MSG STATUS

HIGH CHANNEL



8.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.1 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	9.078
Middle	2441	8.625
High	2480	8.906
Worst		9.078

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.225
Middle	2441	4.633
High	2480	4.819
Worst		5.225

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.375
Middle	2441	4.748
High	2480	4.918
Worst		5.375

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

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

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

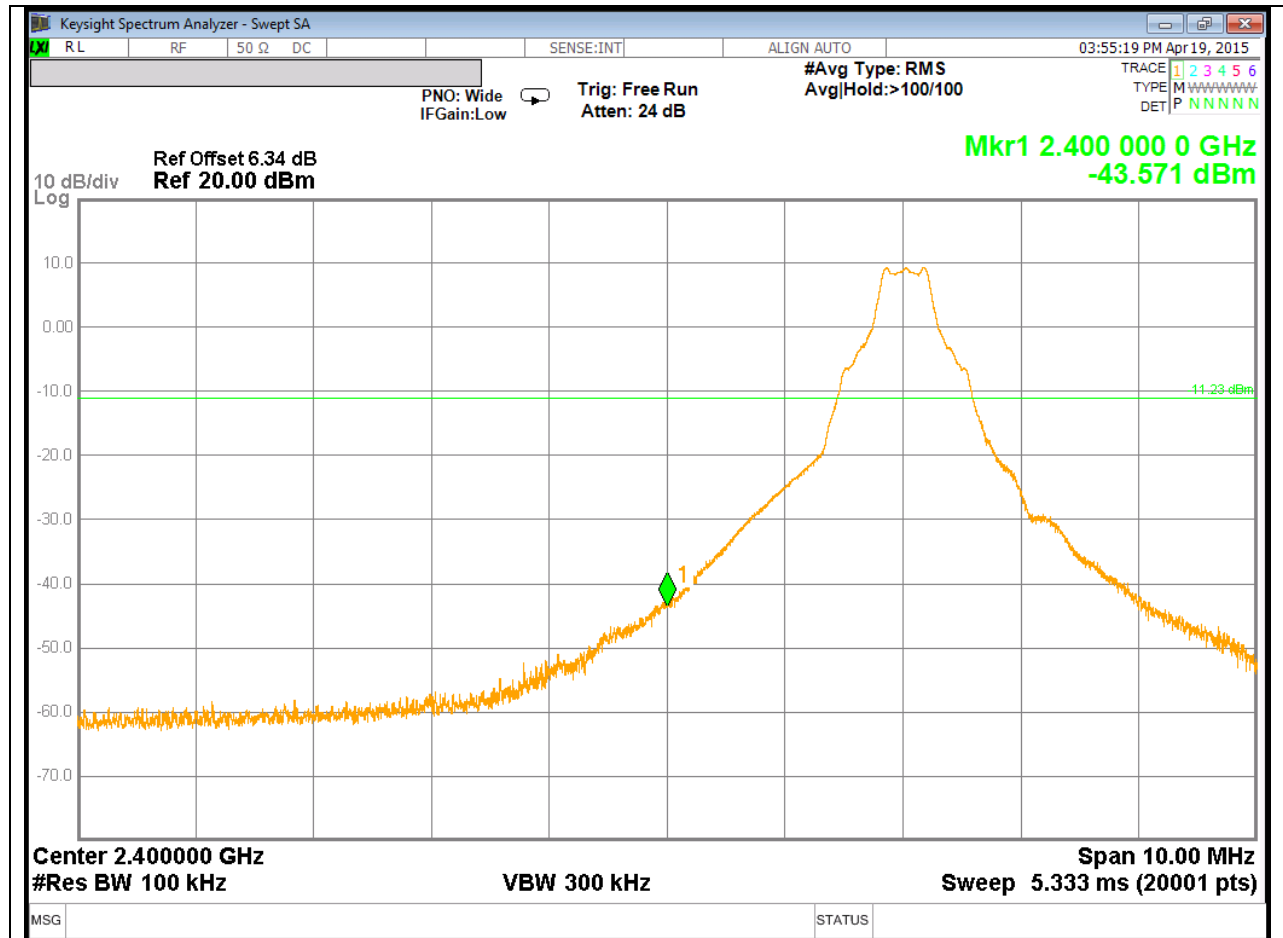
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

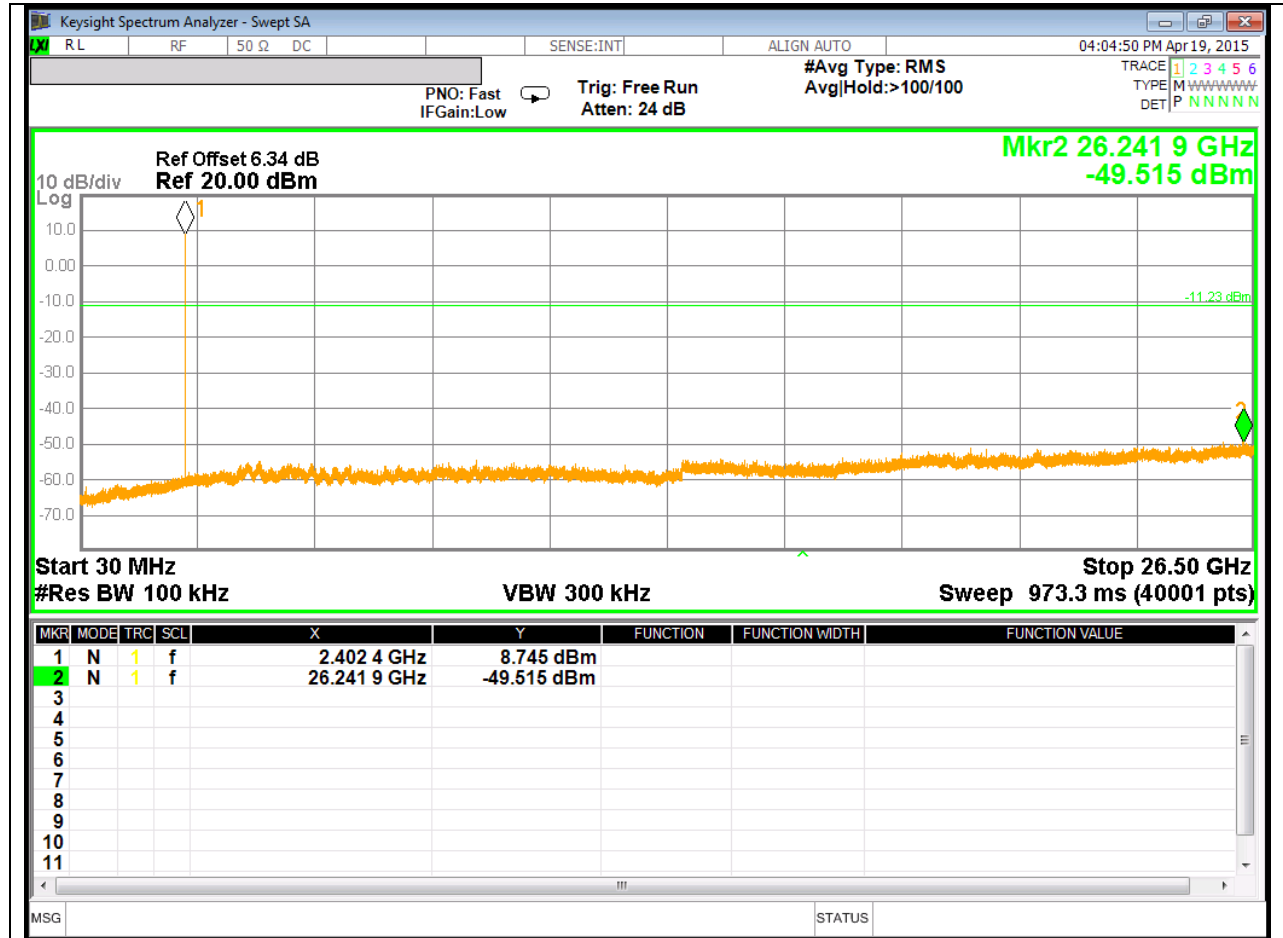
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

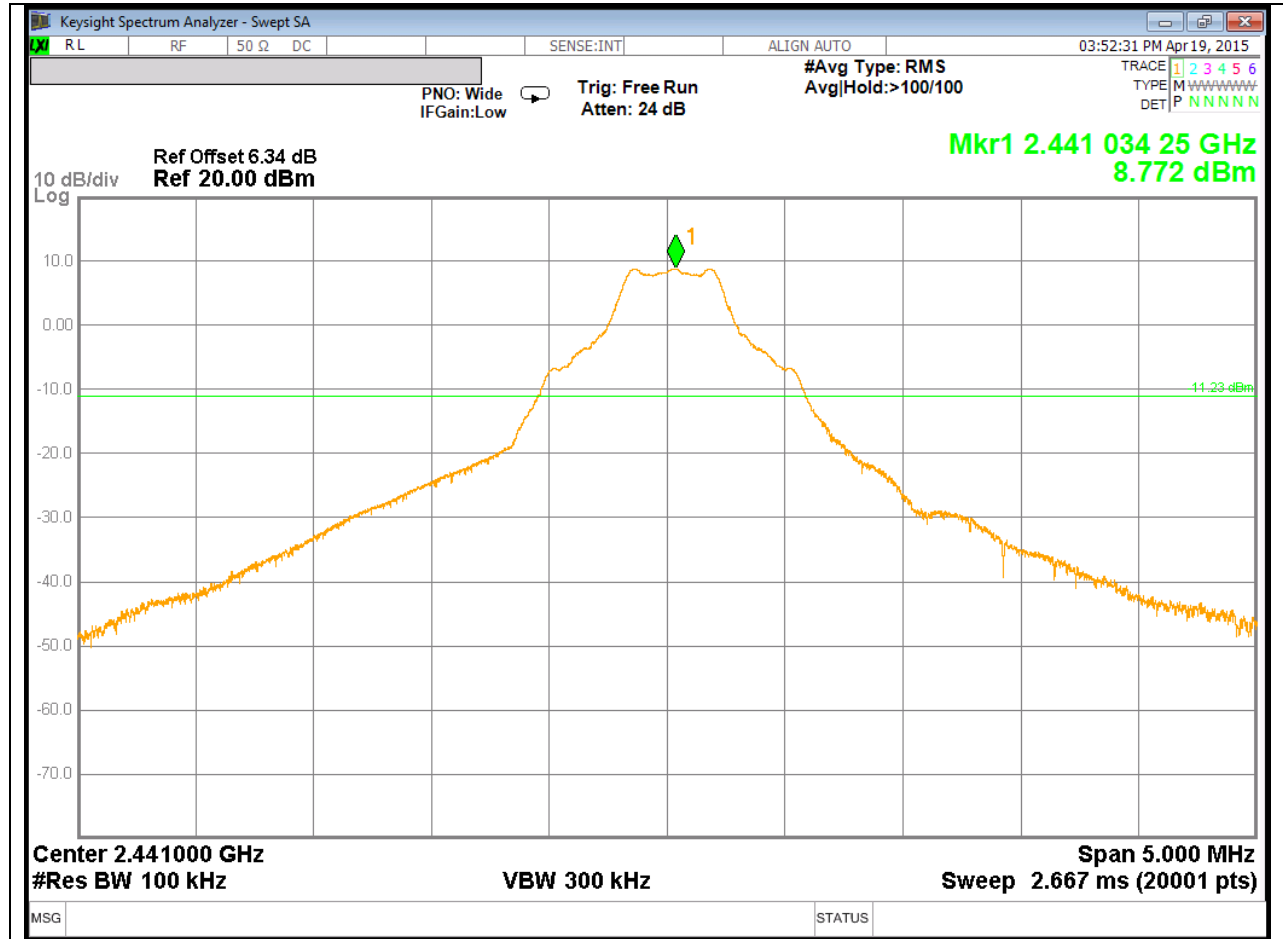


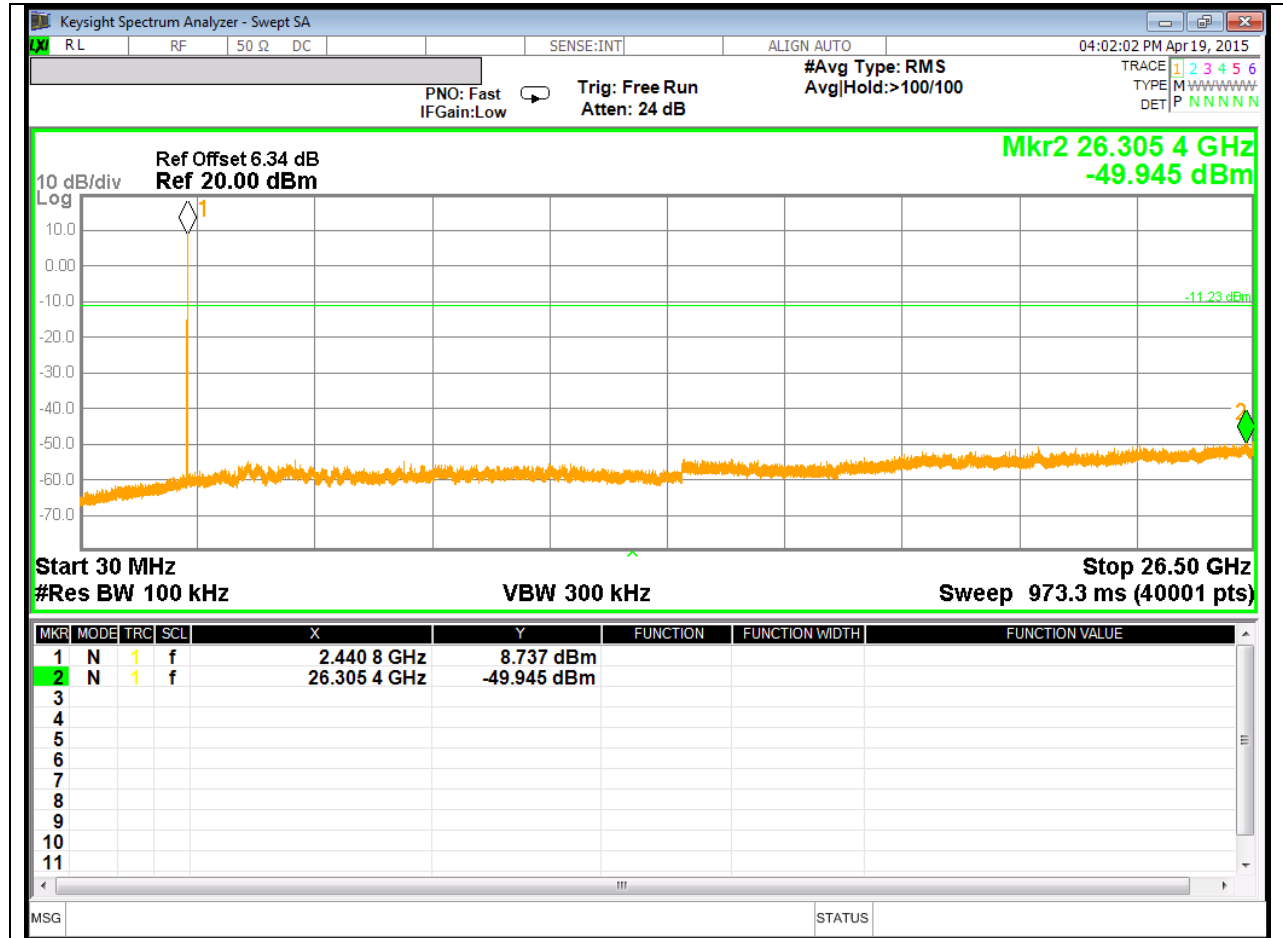
LOW CHANNEL SPURIOUS



SPURIOUS EMISSIONS, MID CHANNEL

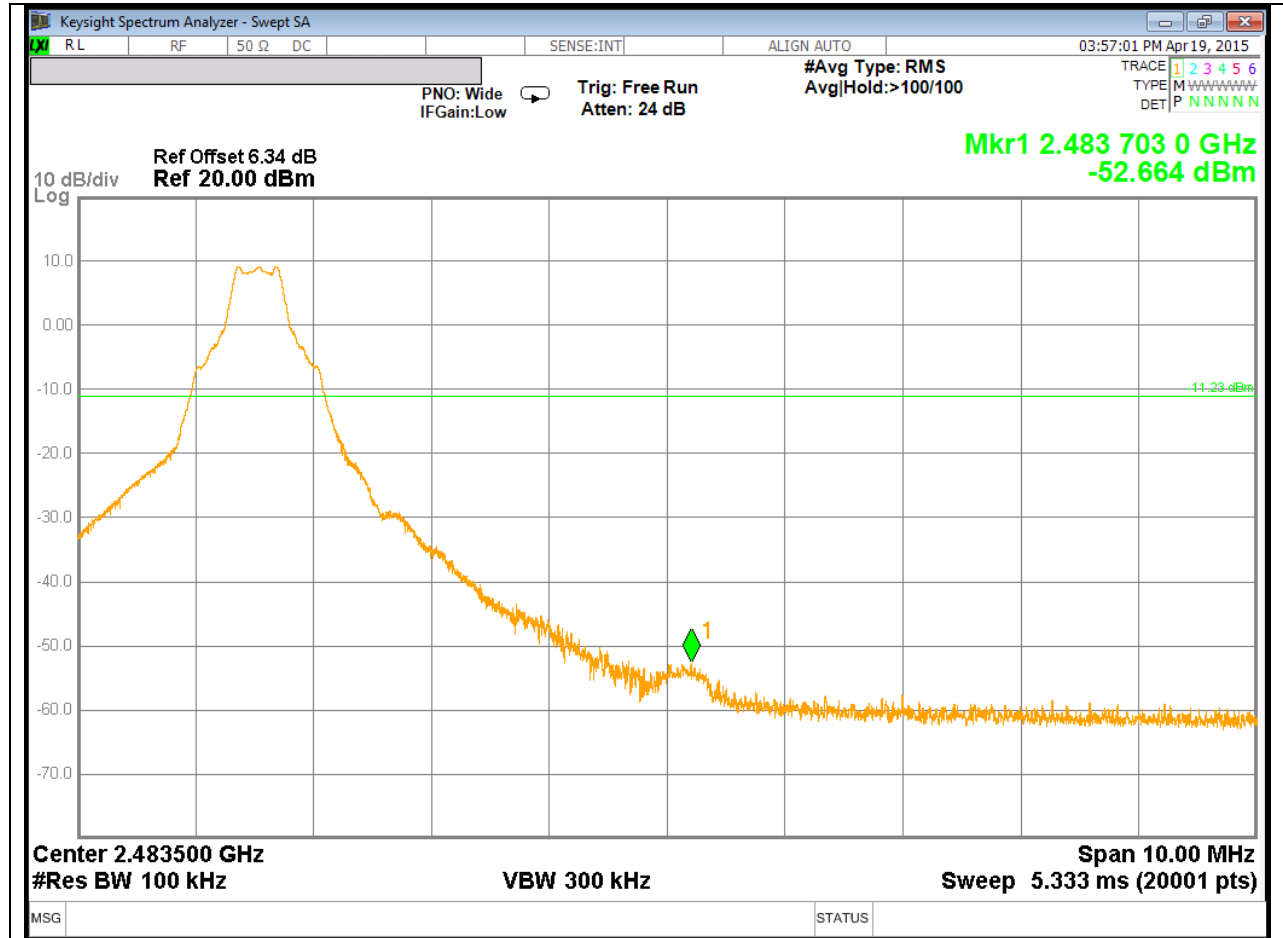
MID CHANNEL BANDEDGE

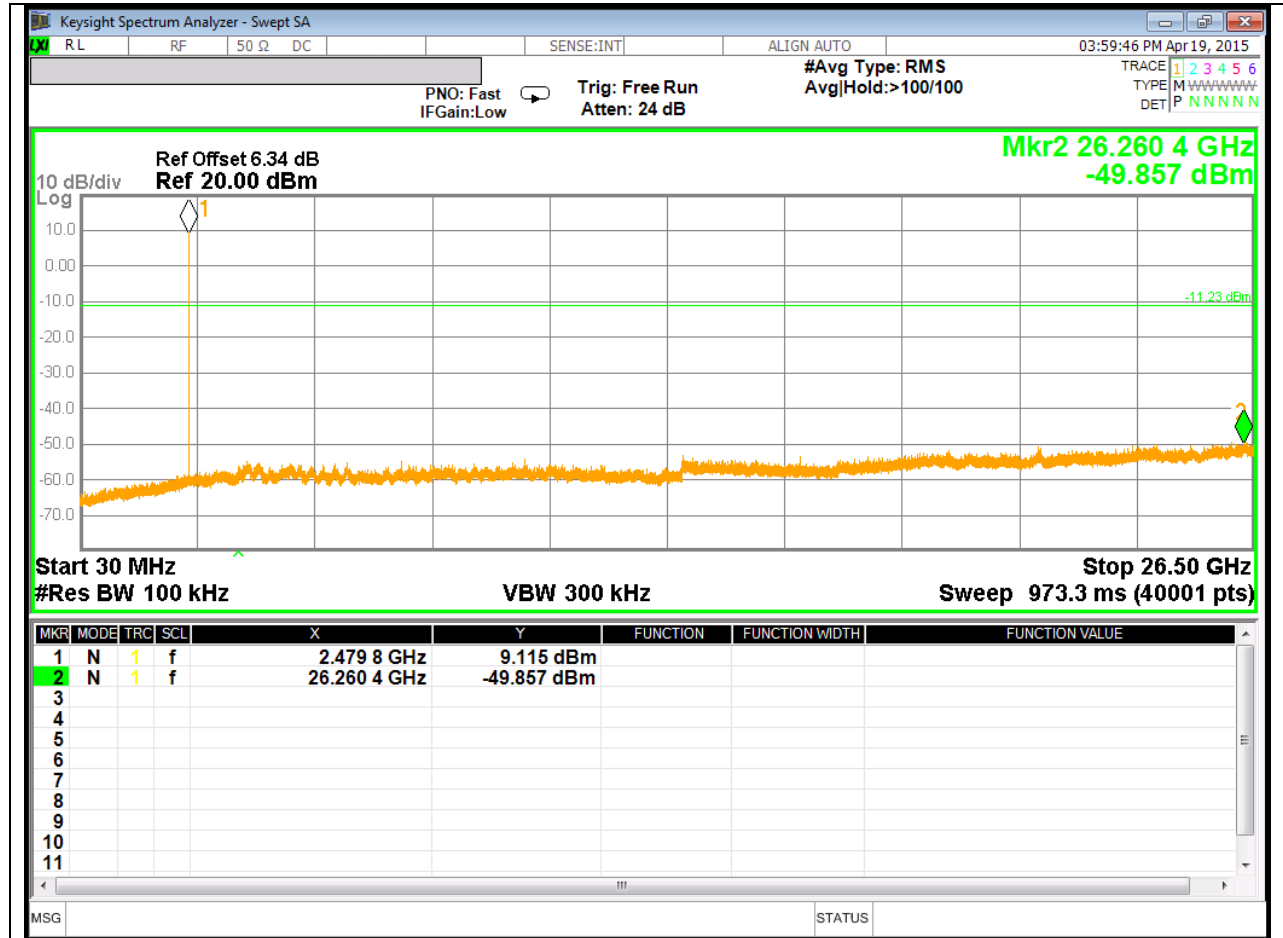




SPURIOUS EMISSIONS, HIGH CHANNEL

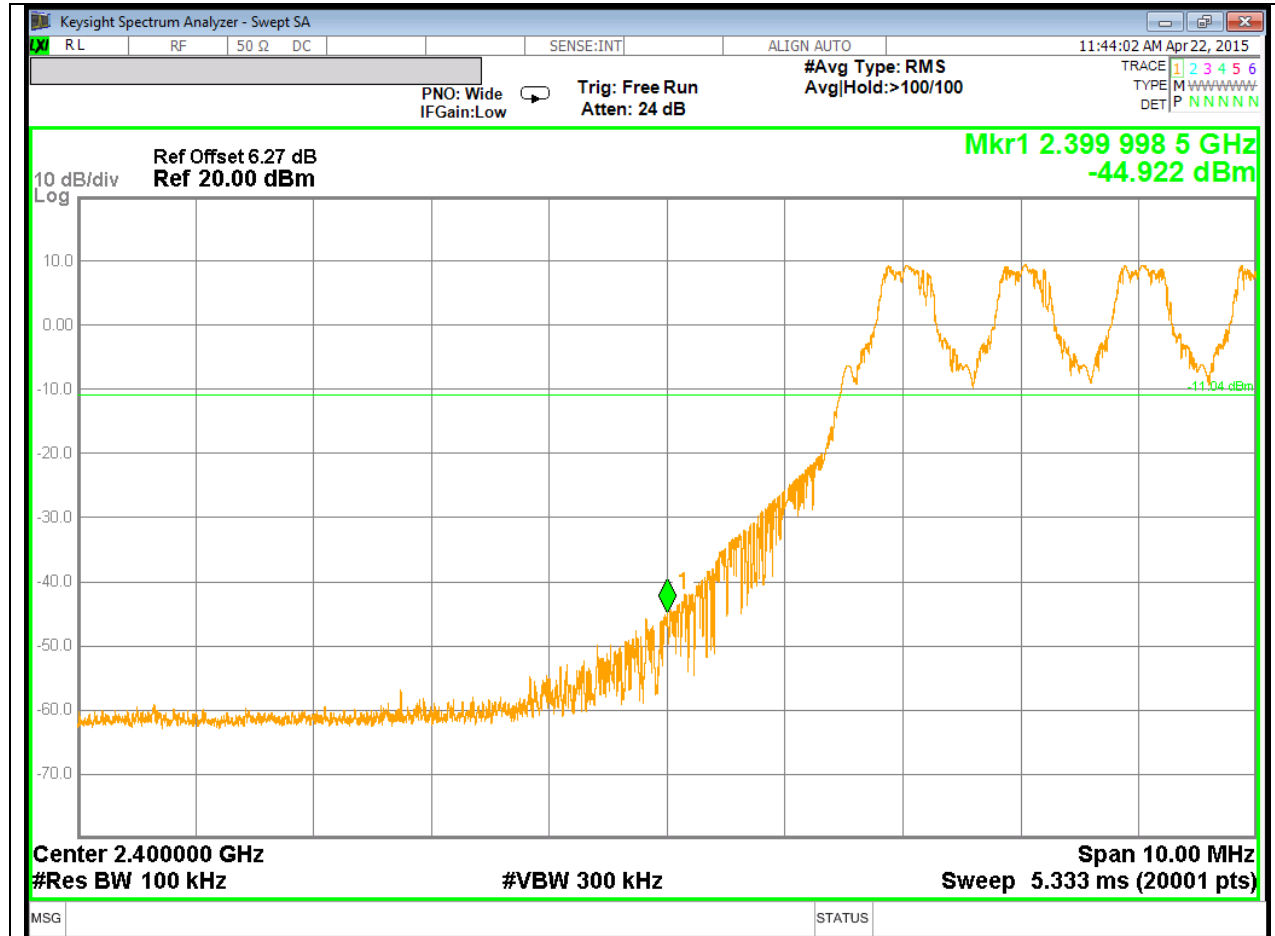
HIGH CHANNEL BANDEDGE





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

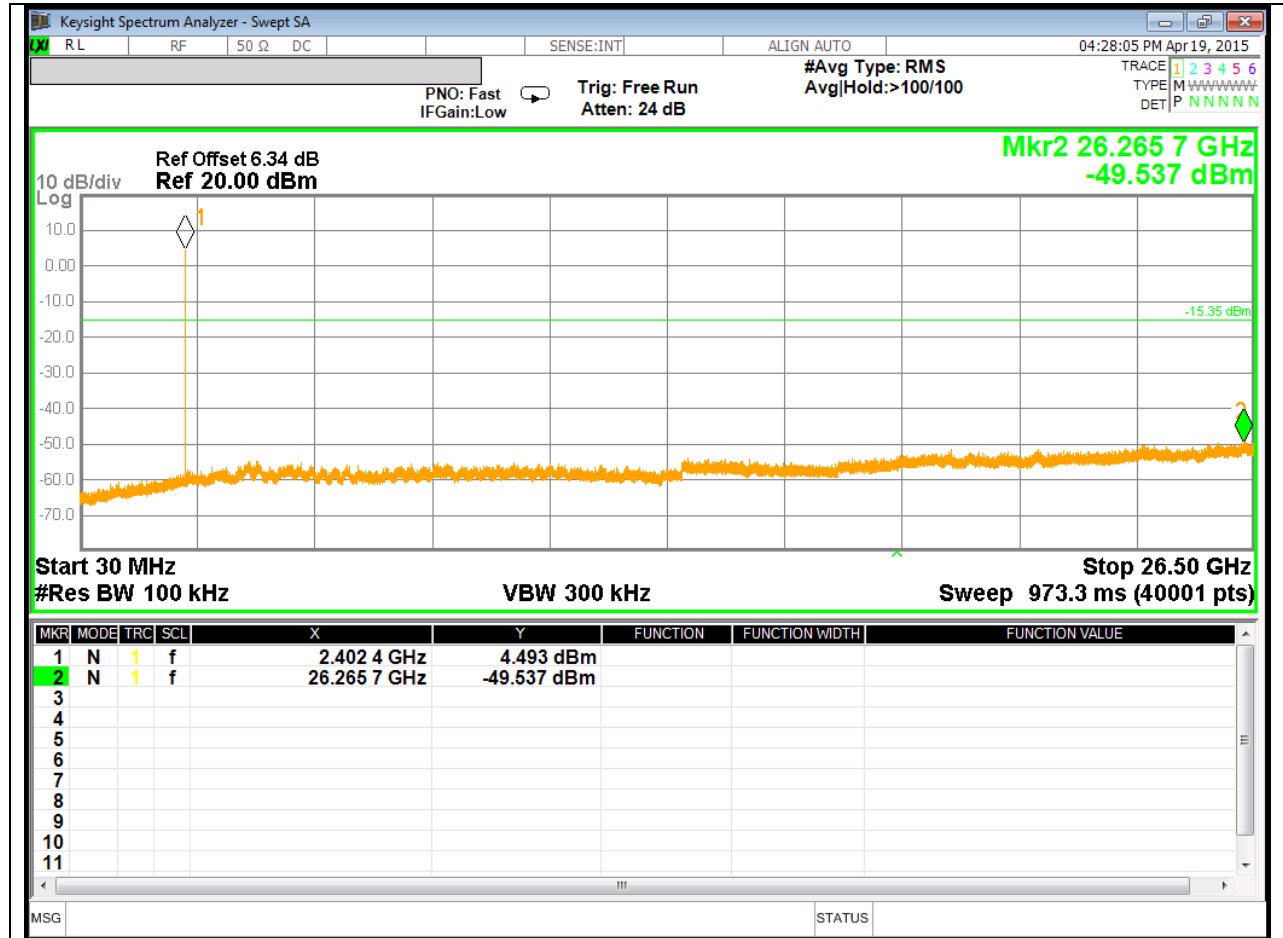
LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON

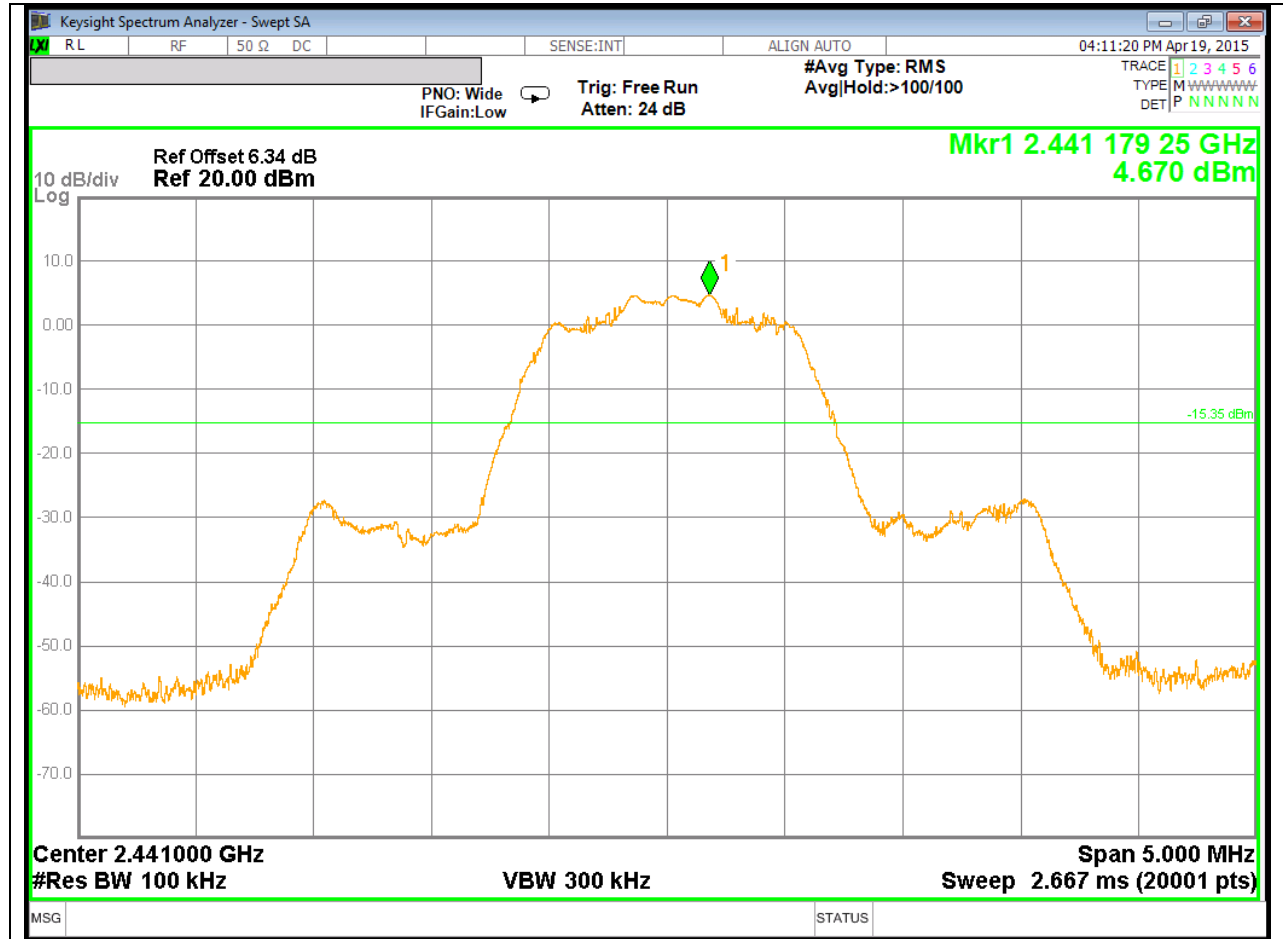


LOW CHANNEL SPURIOUS

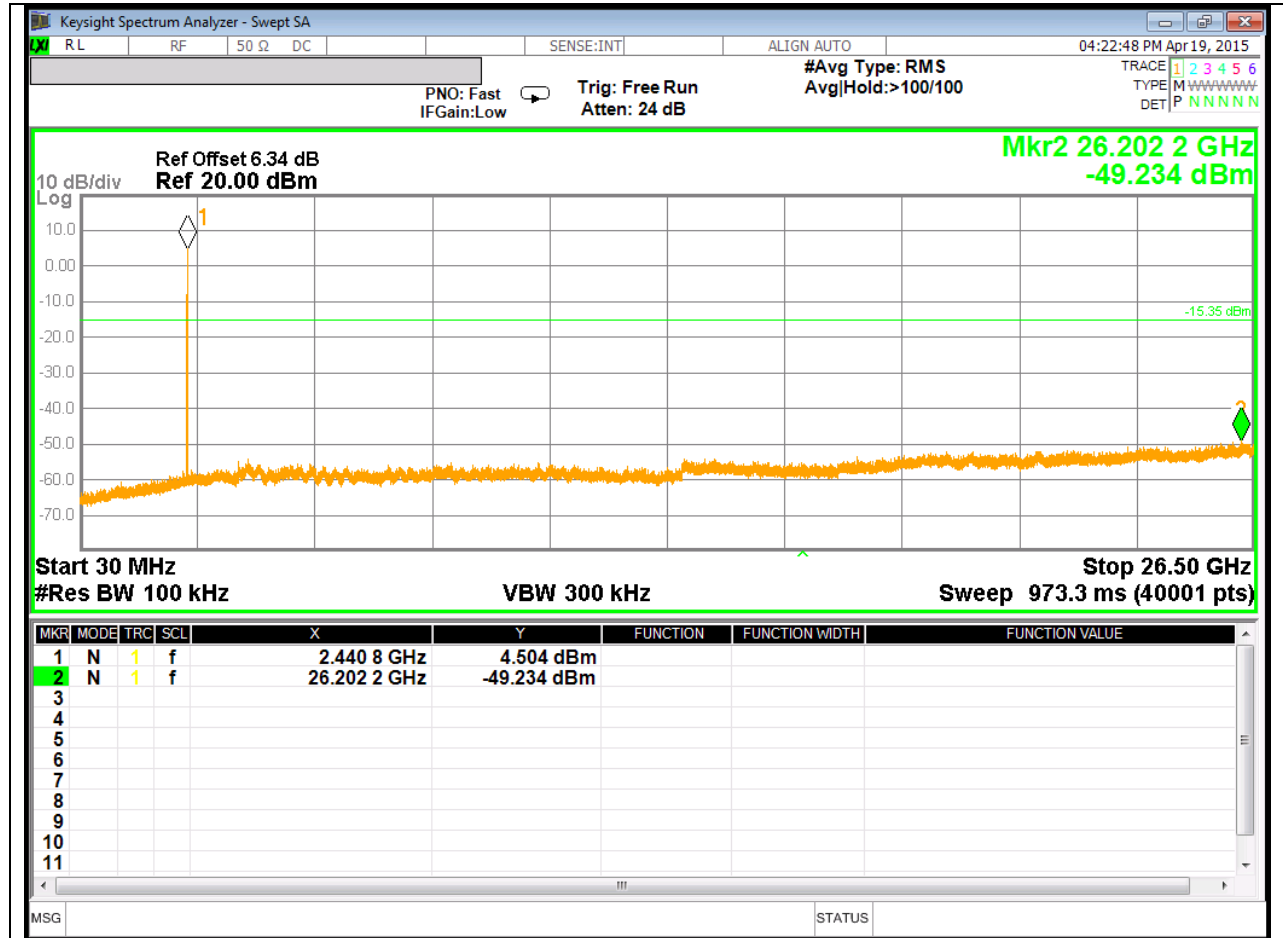


SPURIOUS EMISSIONS, MID CHANNEL

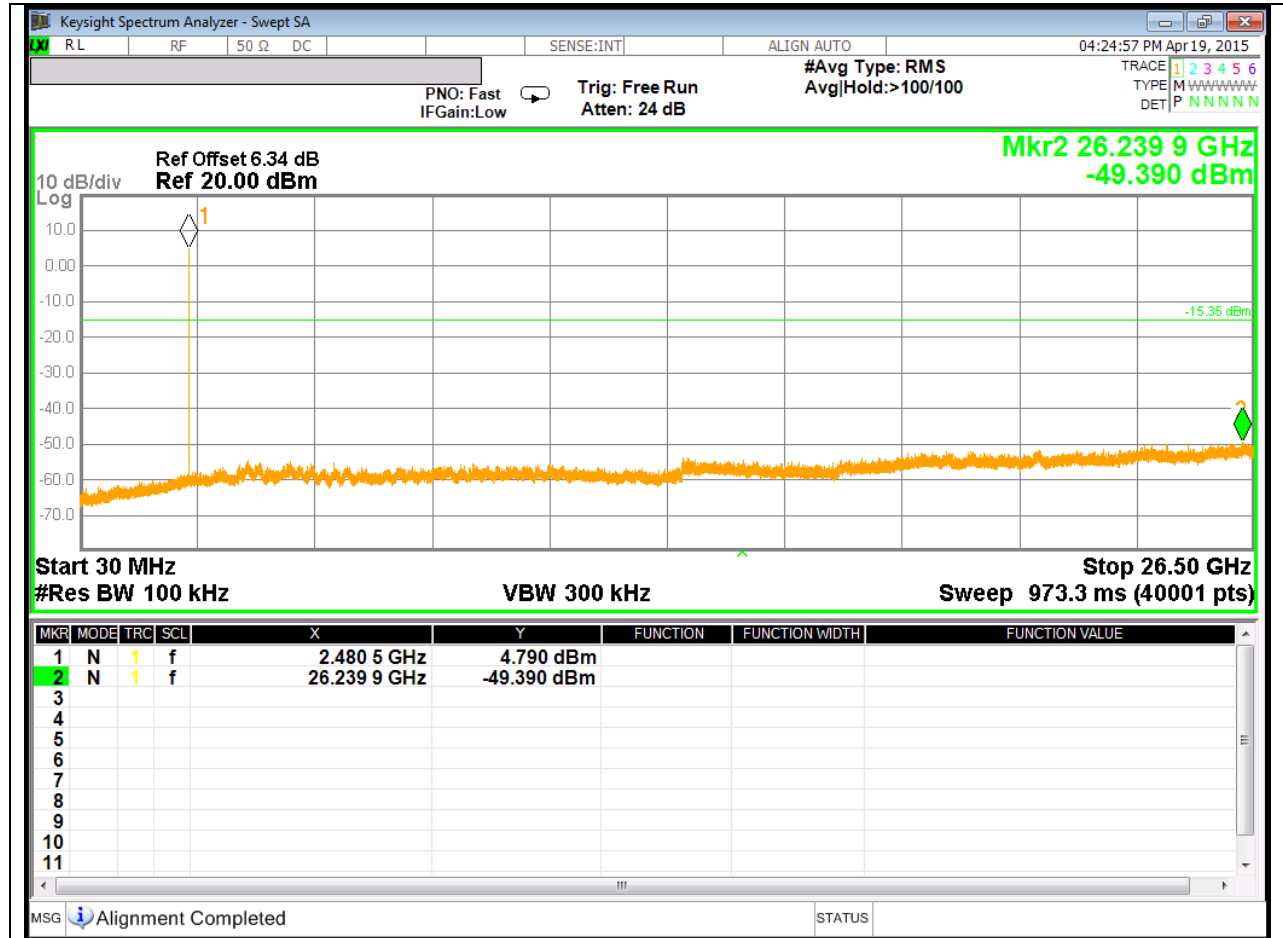
MID CHANNEL BANDEDGE



MID CHANNEL SPURIOUS

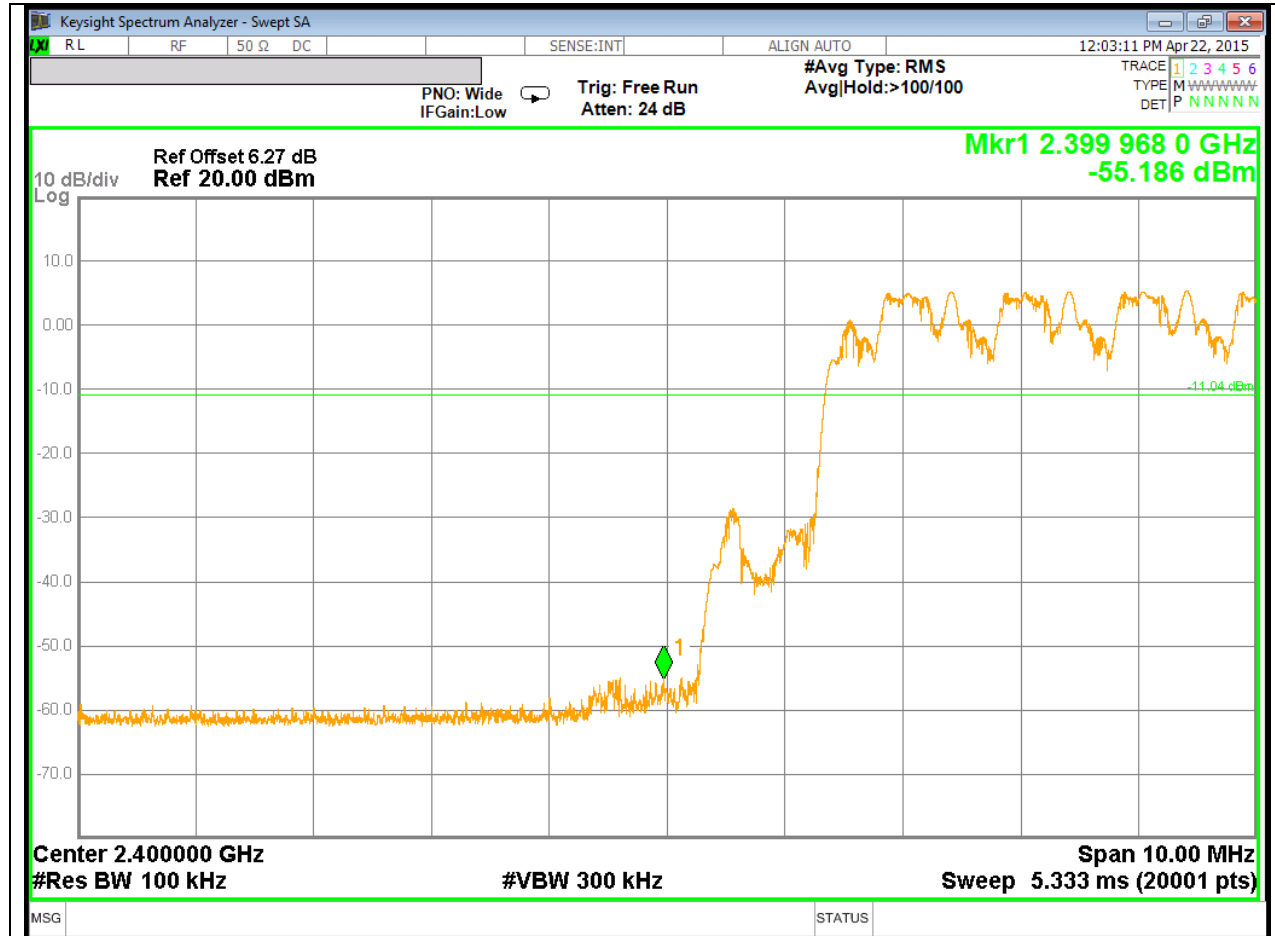


HIGH CHANNEL SPURIOUS



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



SPURIOUS EMISSIONS, LOW CHANNEL

Keysight Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 04:42:36 PM Apr 19, 2015

PNO: Wide IFGain:Low Trig: Free Run Atten: 24 dB #Avg Type: RMS Avg|Hold:>100/100

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

Ref Offset 6.34 dB Ref 20.00 dB

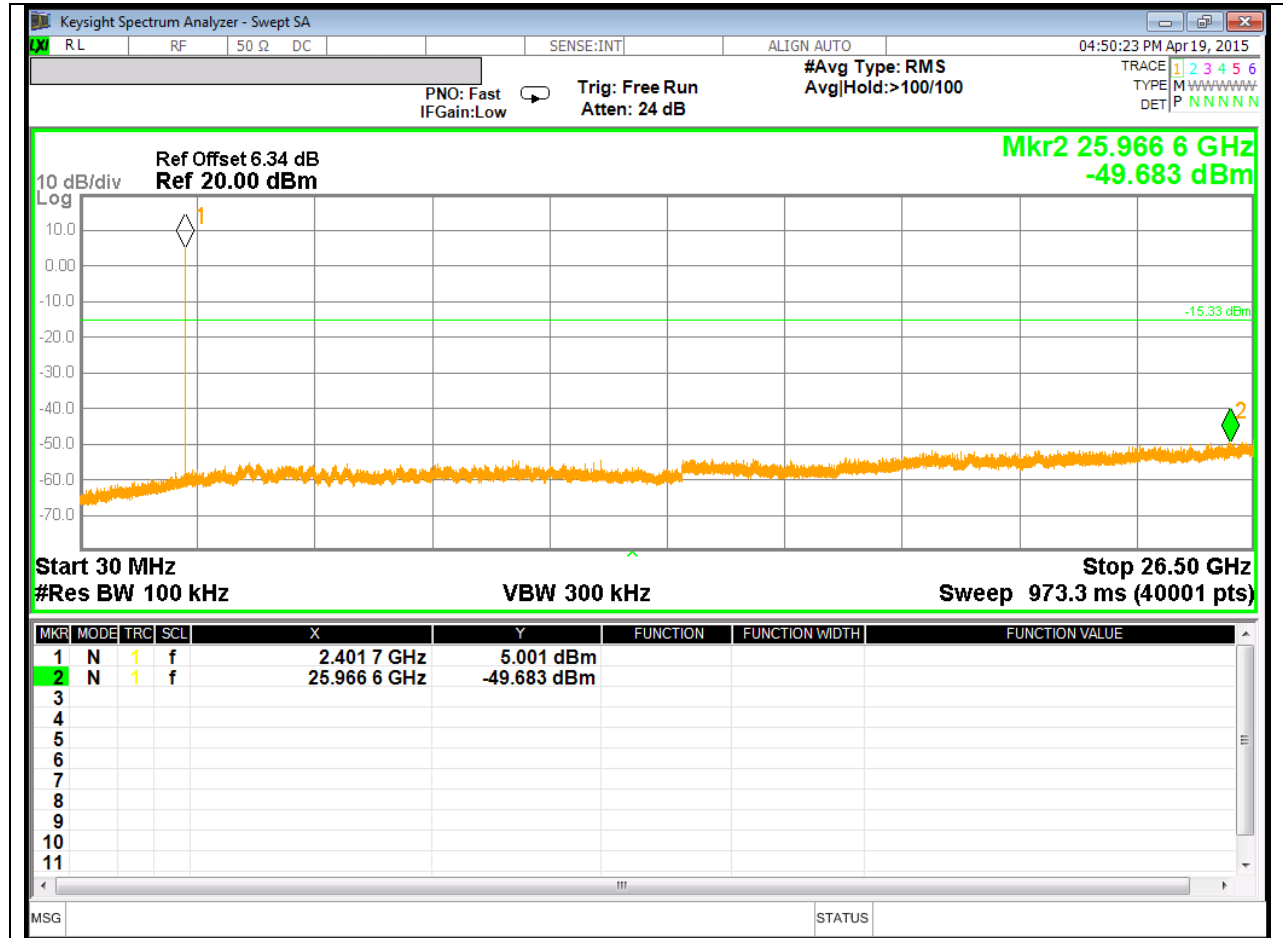
Mkr1 2.399 521 5 GHz -50.295 dBm

10 dB/div Log

Center 2.400000 GHz Span 10.00 MHz
#Res BW 100 kHz VBW 300 kHz Sweep 5.333 ms (20001 pts)

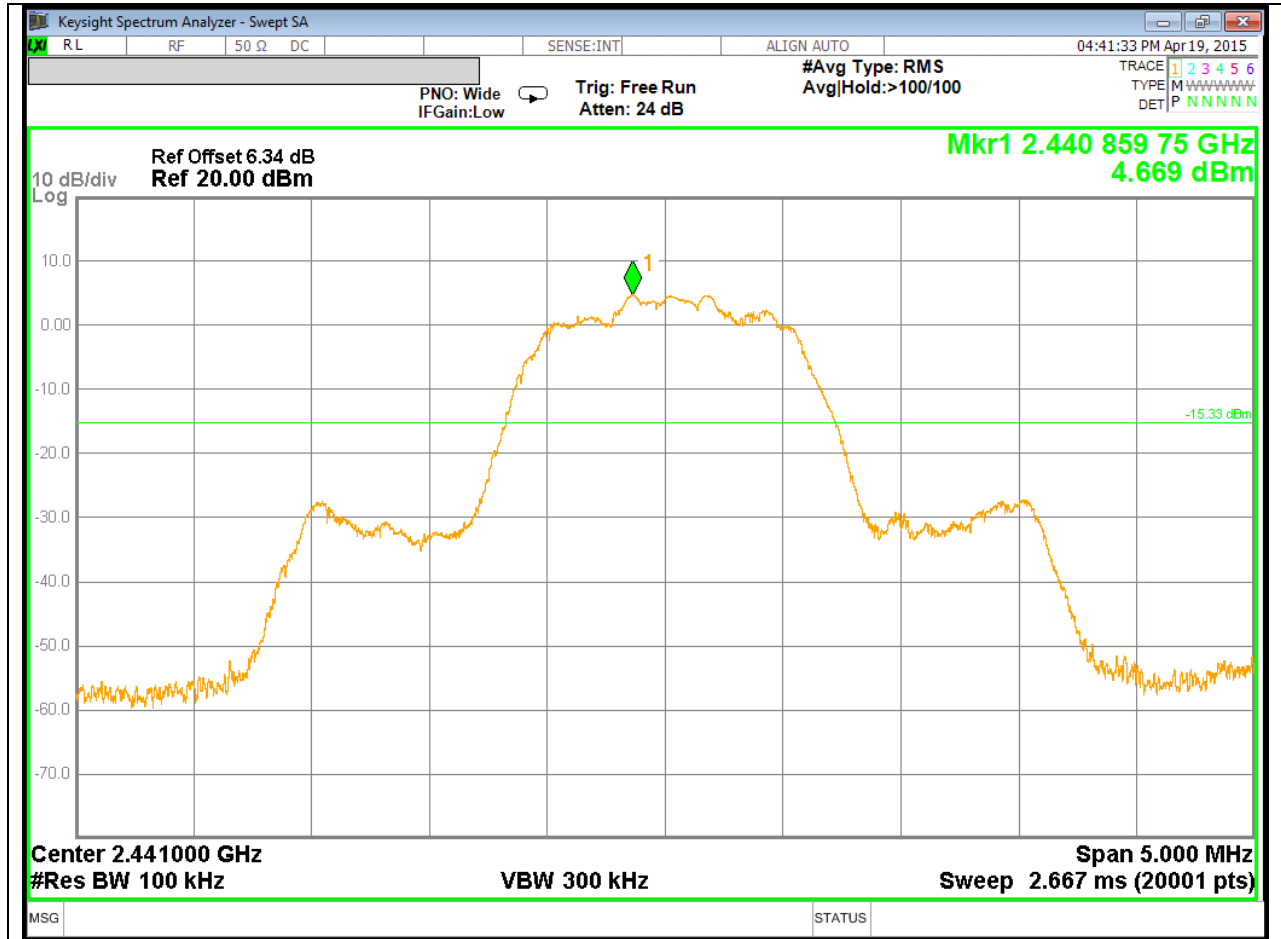
MSG STATUS

LOW CHANNEL SPURIOUS

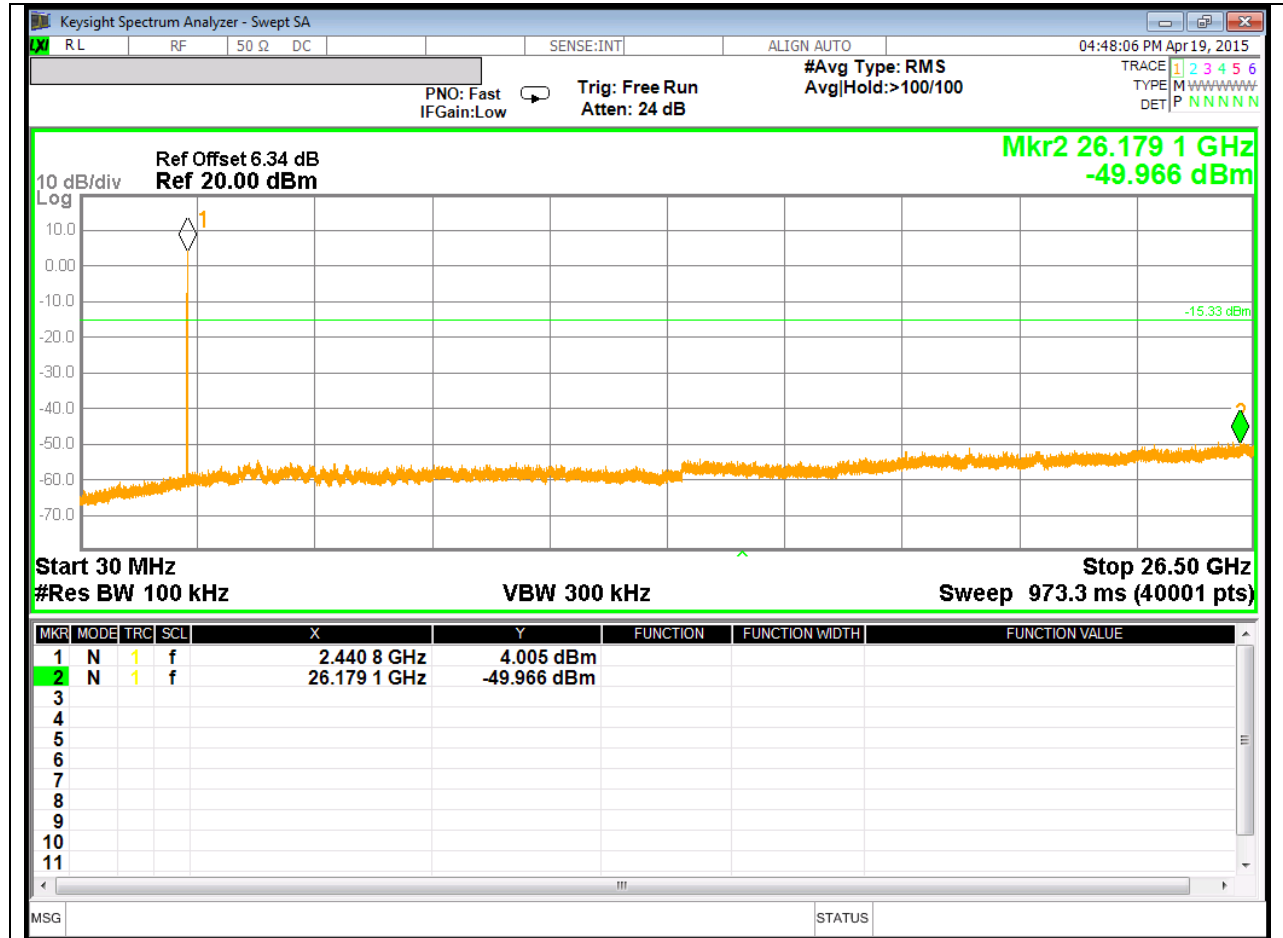


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL BANDEDGE

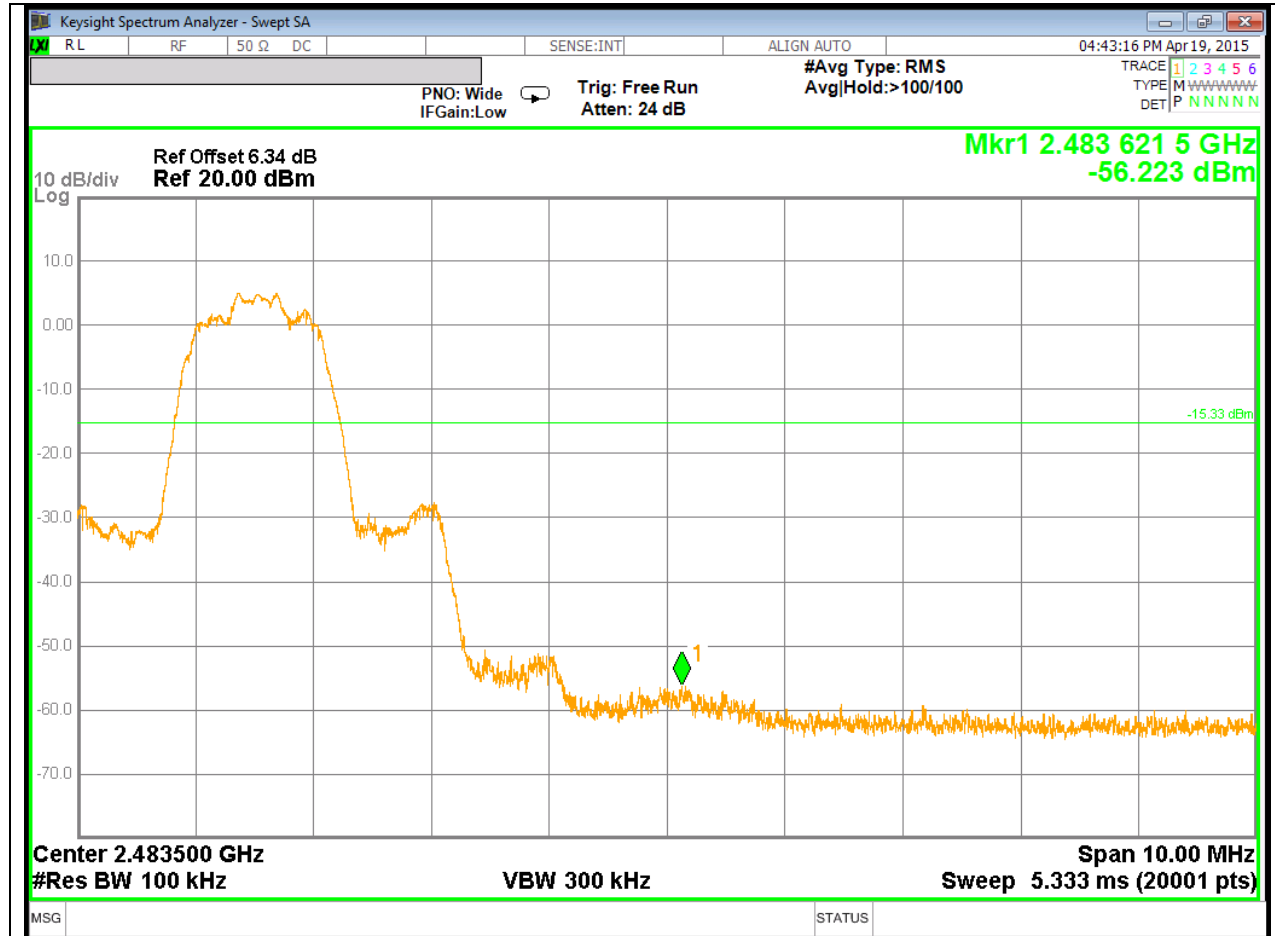


MID CHANNEL SPURIOUS

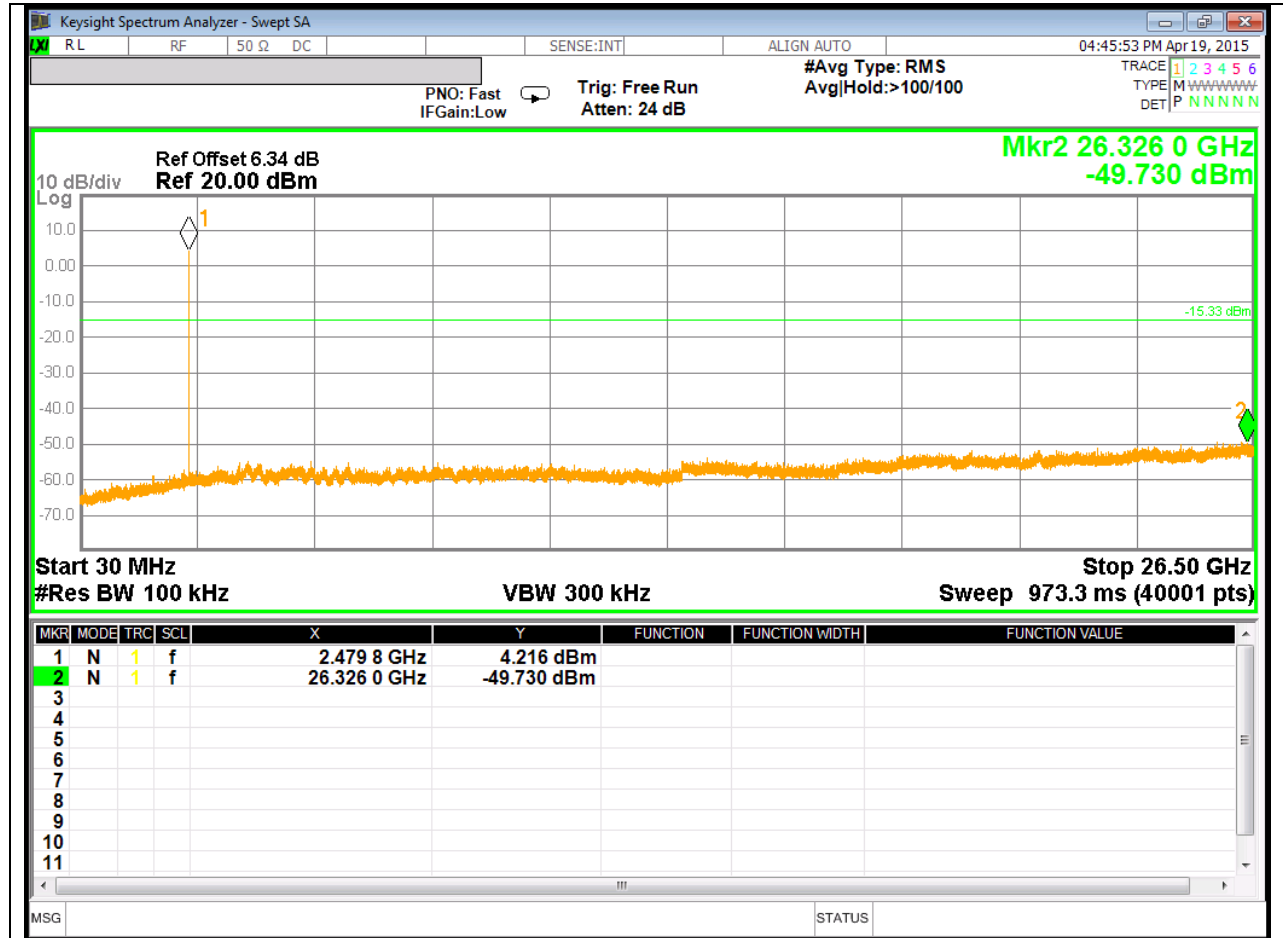


SPURIOUS EMISSIONS, HIGH CHANNEL

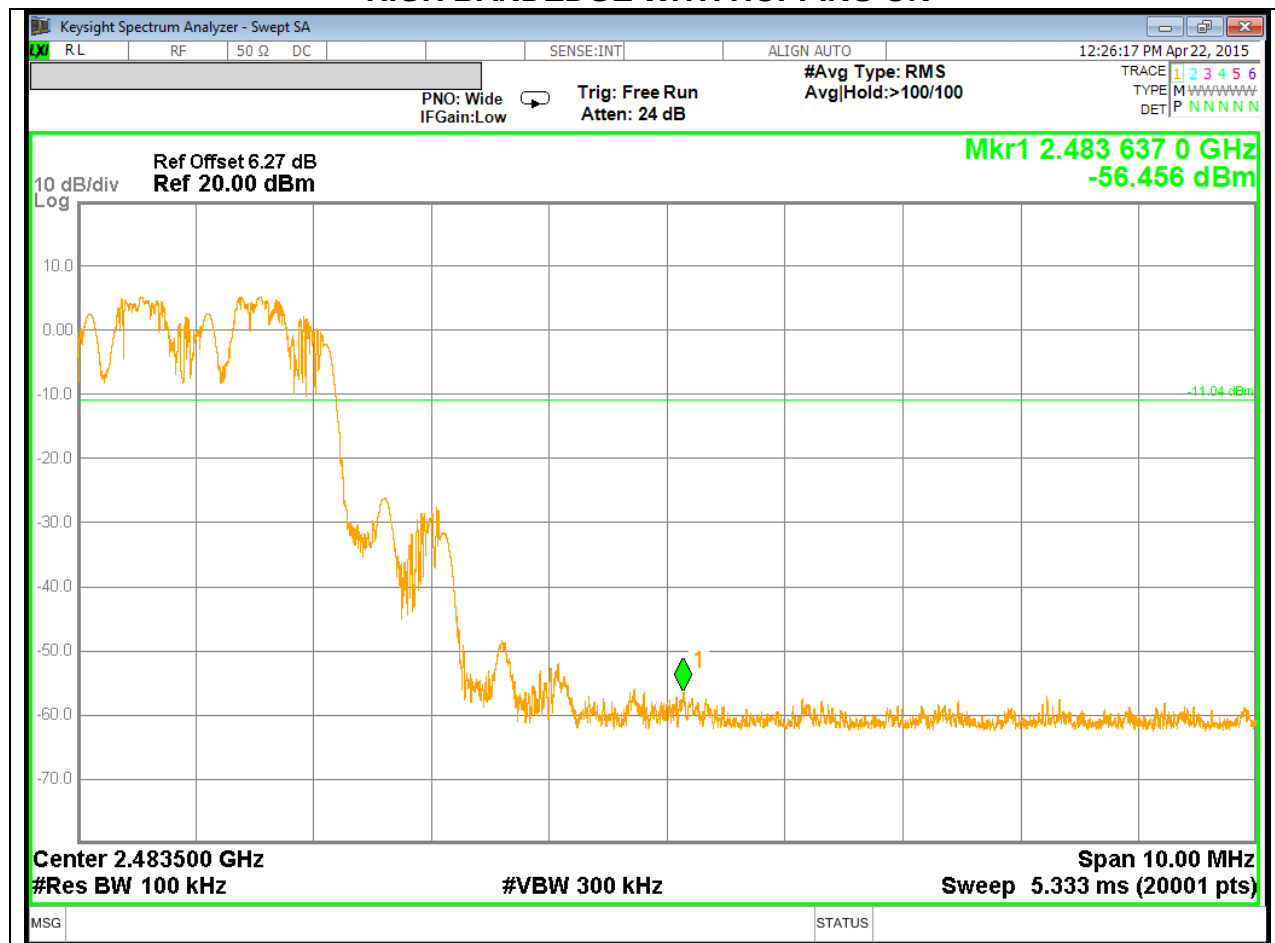
HIGH CHANNEL BANDEDGE



HIGH CHANNEL SPURIOUS



HIGH BANDEDGE WITH HOPPING ON



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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

TEST PROCEDURE

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

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

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement.

$$GFSK = 1/T = 1 / 0.0029S = 350Hz.$$

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.

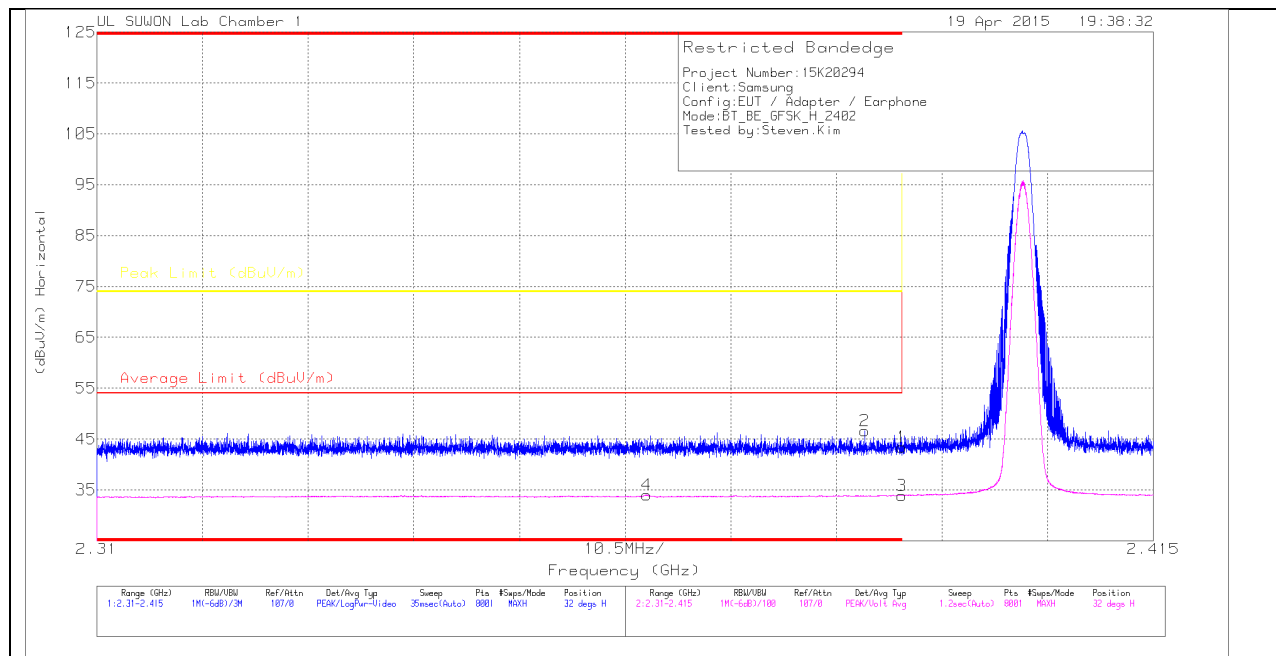
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

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

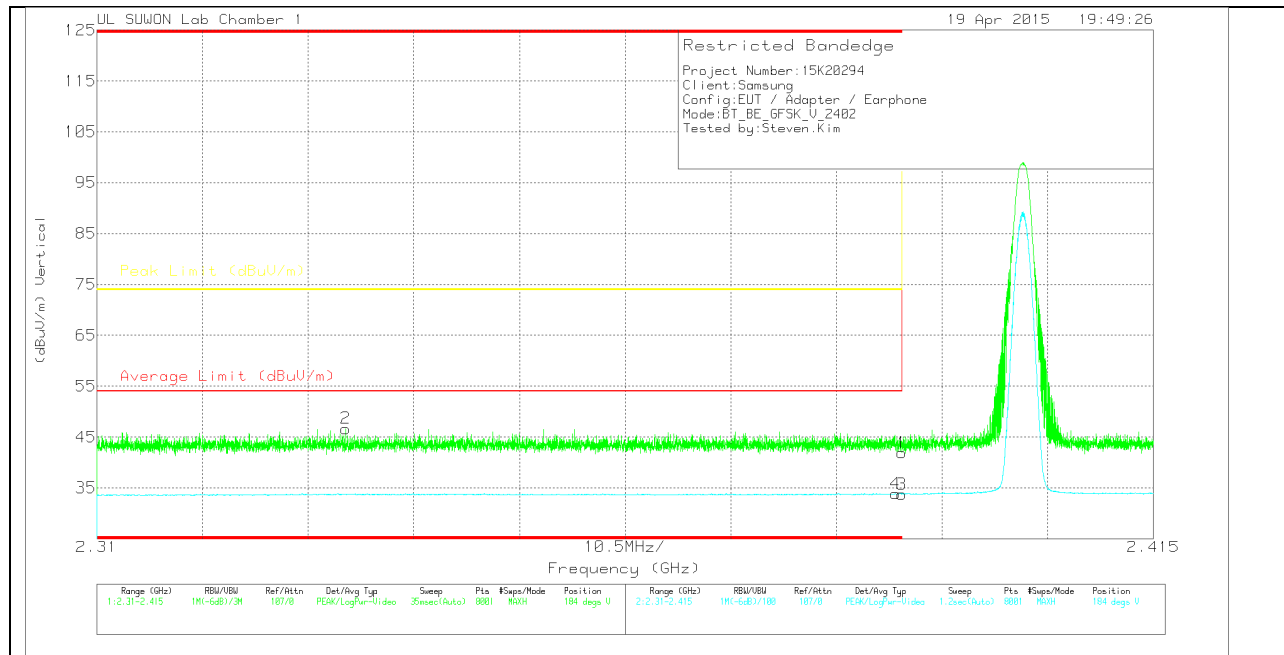
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3115D Factor	Path_2_10dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.32	Pk	27.9	-22.8	43.42	-	-	74	-30.58	32	103	H
2	* 2.386	41.55	Pk	27.9	-22.8	46.65	-	-	74	-27.35	32	103	H
3	* 2.39	28.8	VB1T	27.9	-22.8	33.9	54	-20.1	-	-	32	103	H
4	* 2.365	28.99	VB1T	27.8	-22.8	33.99	54	-20.01	-	-	32	103	H

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

Pk - Peak detector

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

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3115D Factor	Path_2_10dB	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	36.79	Pk	27.9	-22.8	41.89	-	-	74	-32.11	184	383	V
2	* 2.335	41.78	Pk	27.8	-22.9	46.68	-	-	74	-27.32	184	383	V
3	* 2.39	28.69	VB1T	27.9	-22.8	33.79	54	-20.21	-	-	184	383	V
4	* 2.389	28.82	VB1T	27.9	-22.8	33.92	54	-20.08	-	-	184	383	V

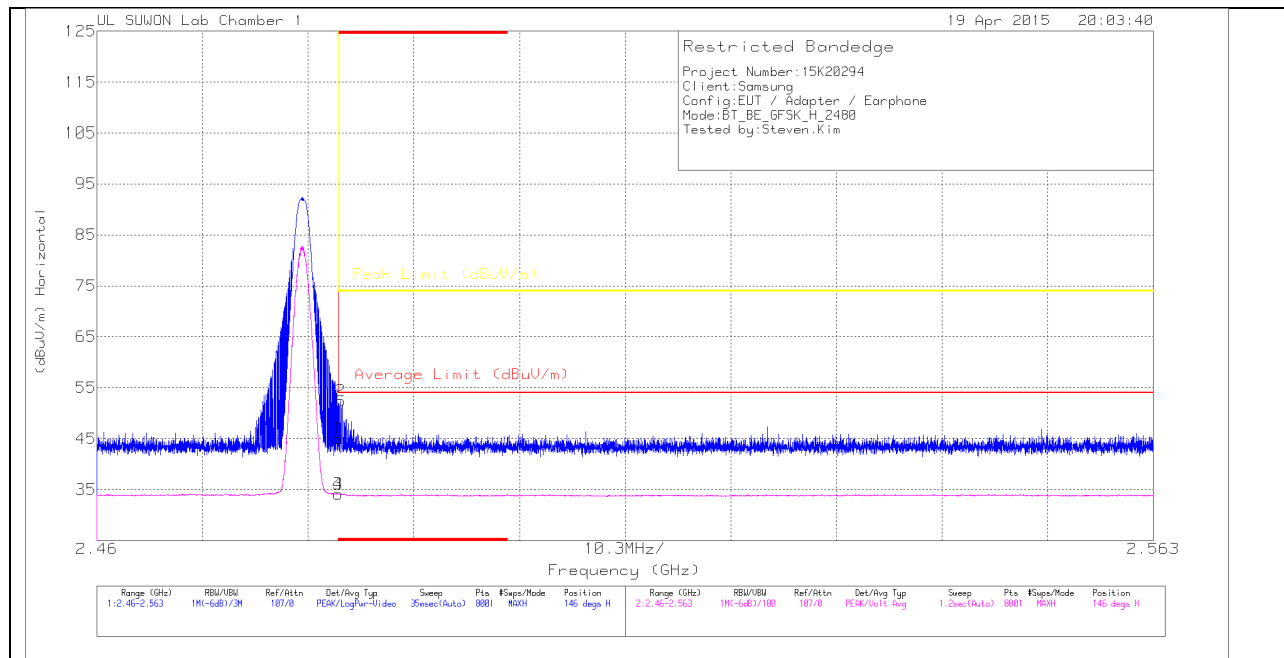
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

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

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

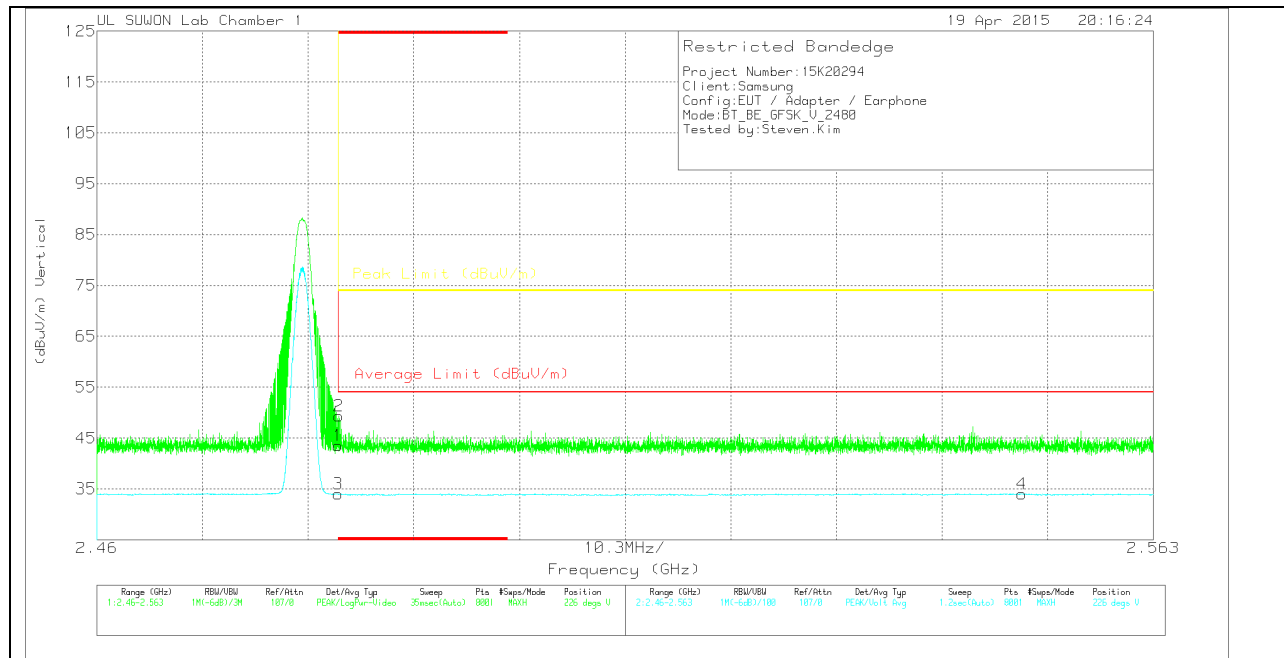
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3115D Factor	Path_2_10dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.69	Pk	27.9	-22.6	44.99	-	-	74	-29.01	146	156	H
2	* 2.484	47.11	Pk	27.9	-22.6	52.41	-	-	74	-21.59	146	156	H
3	* 2.484	28.86	VB1T	27.9	-22.6	34.16	54	-19.84	-	-	146	156	H
4	* 2.484	28.87	VB1T	27.9	-22.6	34.17	54	-19.83	-	-	146	156	H

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

Pk - Peak detector

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

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

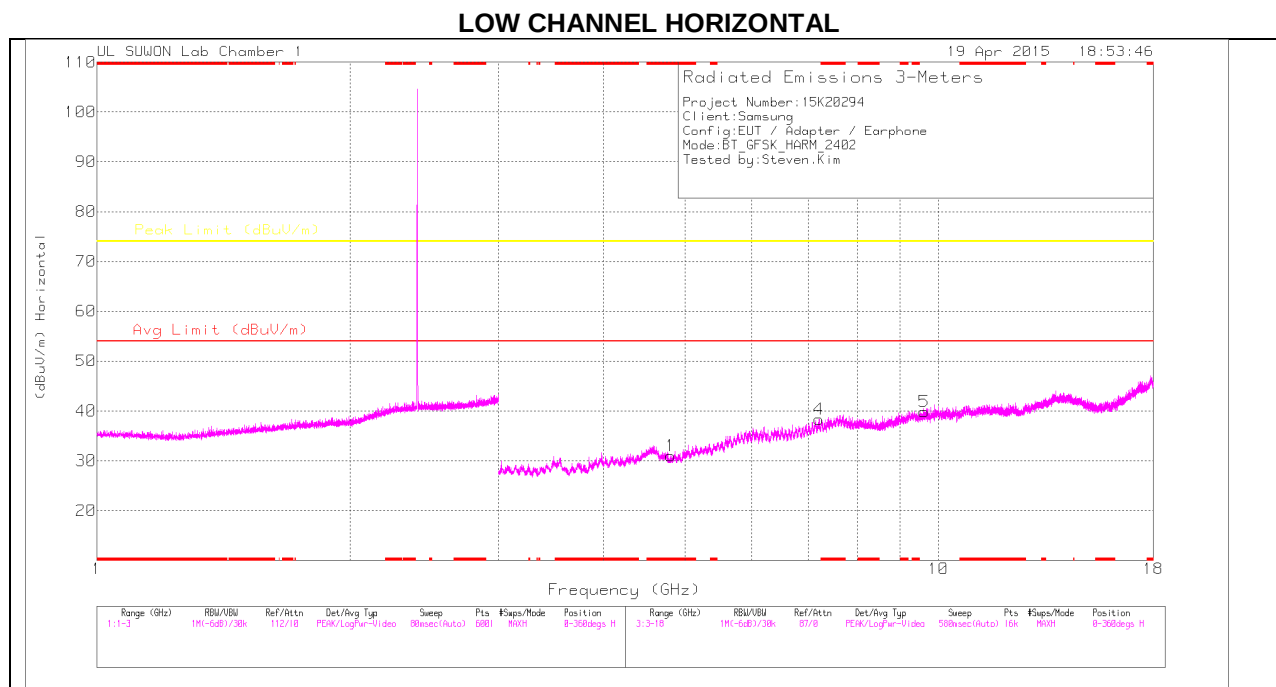
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_2_10dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.28	Pk	27.9	-22.6	43.58	-	-	74	-30.42	226	353	V
2	* 2.484	44.09	Pk	27.9	-22.6	49.39	-	-	74	-24.61	226	353	V
3	* 2.484	28.67	VB1T	27.9	-22.6	33.97	54	-20.03	-	-	226	353	V
4	2.55	28.73	VB1T	27.9	-22.6	34.03	54	-19.97	-	-	226	353	V

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

Pk - Peak detector

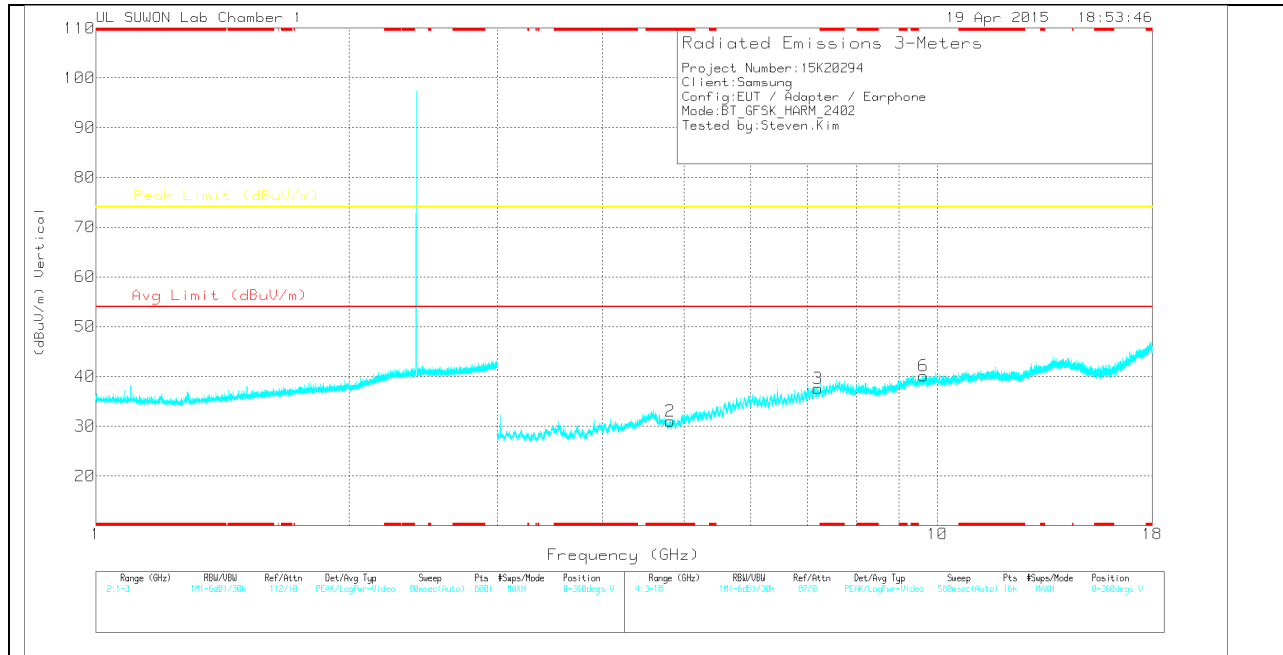
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HARMONICS AND SPURIOUS EMISSIONS



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

LOW CHANNEL 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.

LOW CHANNEL DATA

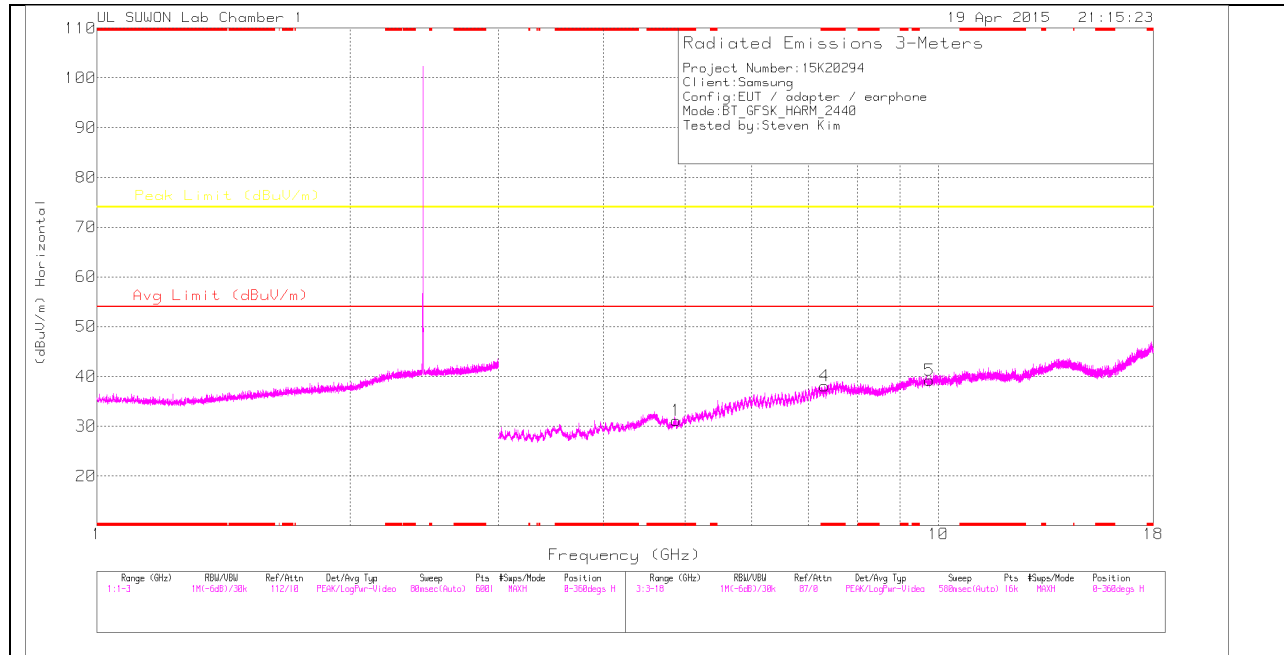
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.808	28.93	PK	31.9	-29.8	0	31.03	-	-	74	-42.97	0-360	200	H
4	7.204	26.74	PK	37	-25.4	0	38.34	-	-	-	-	0-360	200	H
5	9.616	23.13	PK	37.7	-21	0	39.83	-	-	-	-	0-360	200	H
2	* 4.811	28.8	PK	31.9	-29.7	0	31	-	-	74	-43	0-360	100	V
3	7.203	26.11	PK	36.9	-25.4	0	37.61	-	-	-	-	0-360	200	V
6	9.617	23.32	PK	37.7	-20.9	0	40.12	-	-	-	-	0-360	200	V

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

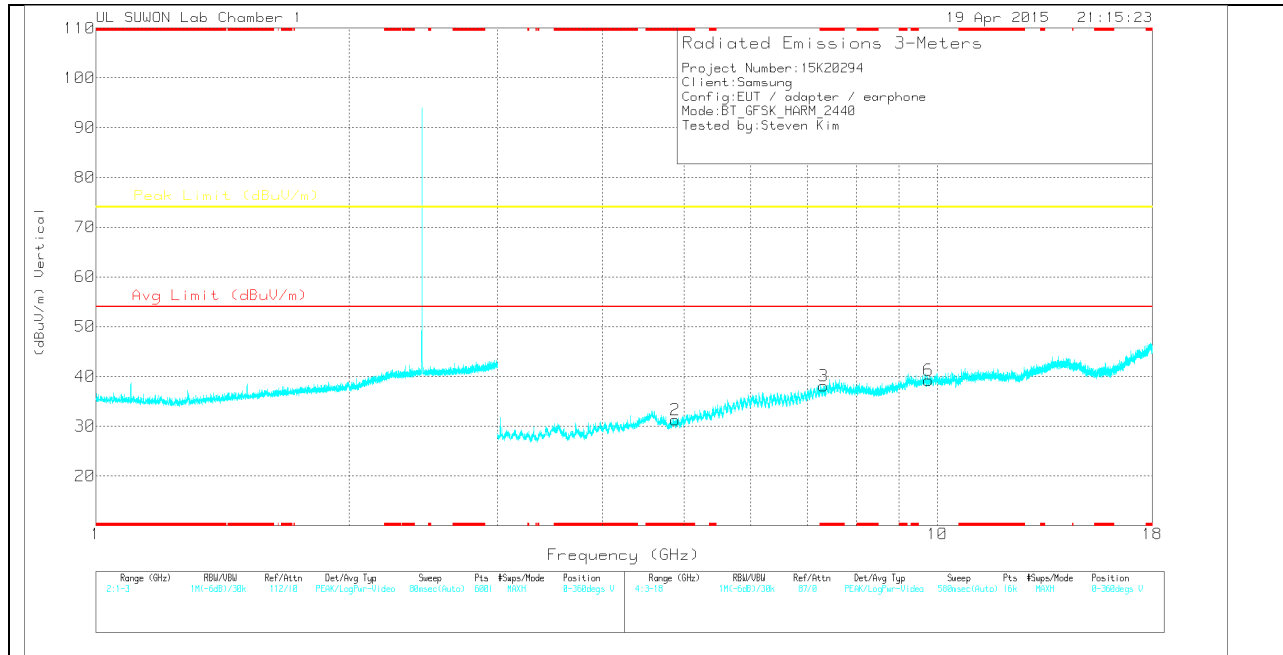
PK – Peak Detector

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.

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.

MID CHANNEL DATA

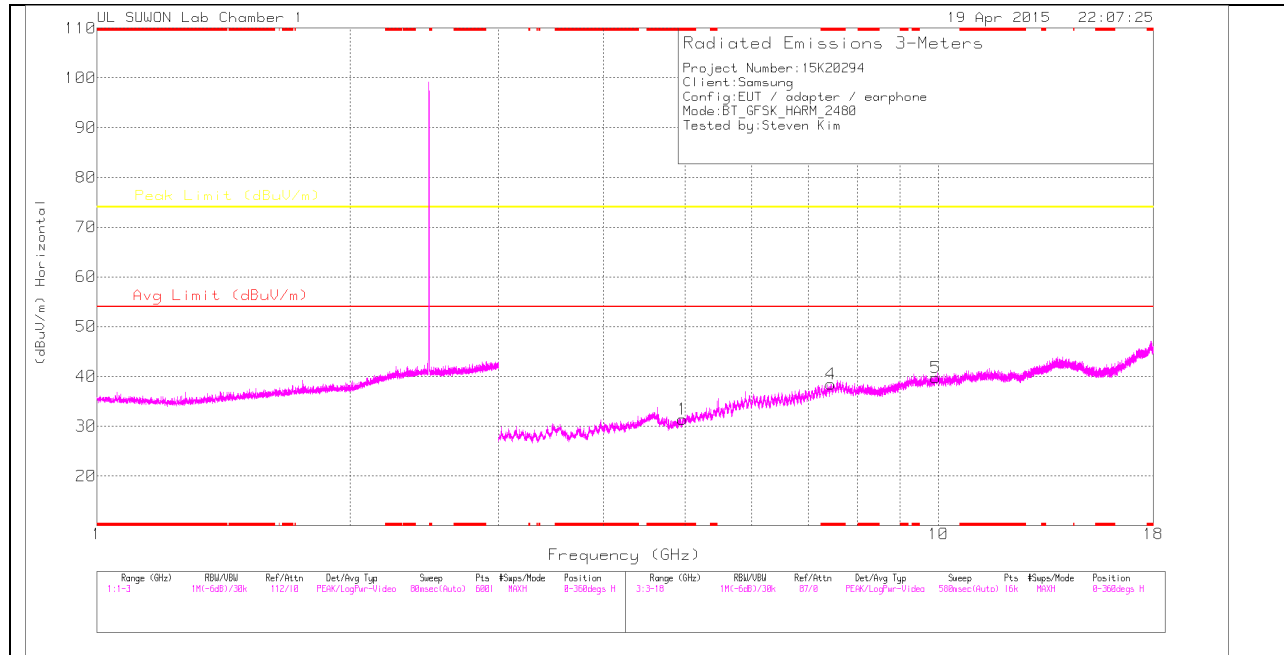
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.876	28.29	PK	32	-29.2	0	31.09	-	-	74	-42.91	0-360	200	H
4	* 7.325	26.45	PK	37.2	-25.6	0	38.05	-	-	74	-35.95	0-360	200	H
5	9.762	23.62	PK	37.6	-22	0	39.22	-	-	-	-	0-360	200	H
2	* 4.876	28.48	PK	32	-29.2	0	31.28	-	-	74	-42.72	0-360	100	V
3	* 7.322	26.54	PK	37.2	-25.6	0	38.14	-	-	74	-35.86	0-360	200	V
6	9.758	23.61	PK	37.6	-22	0	39.21	-	-	-	-	0-360	200	V

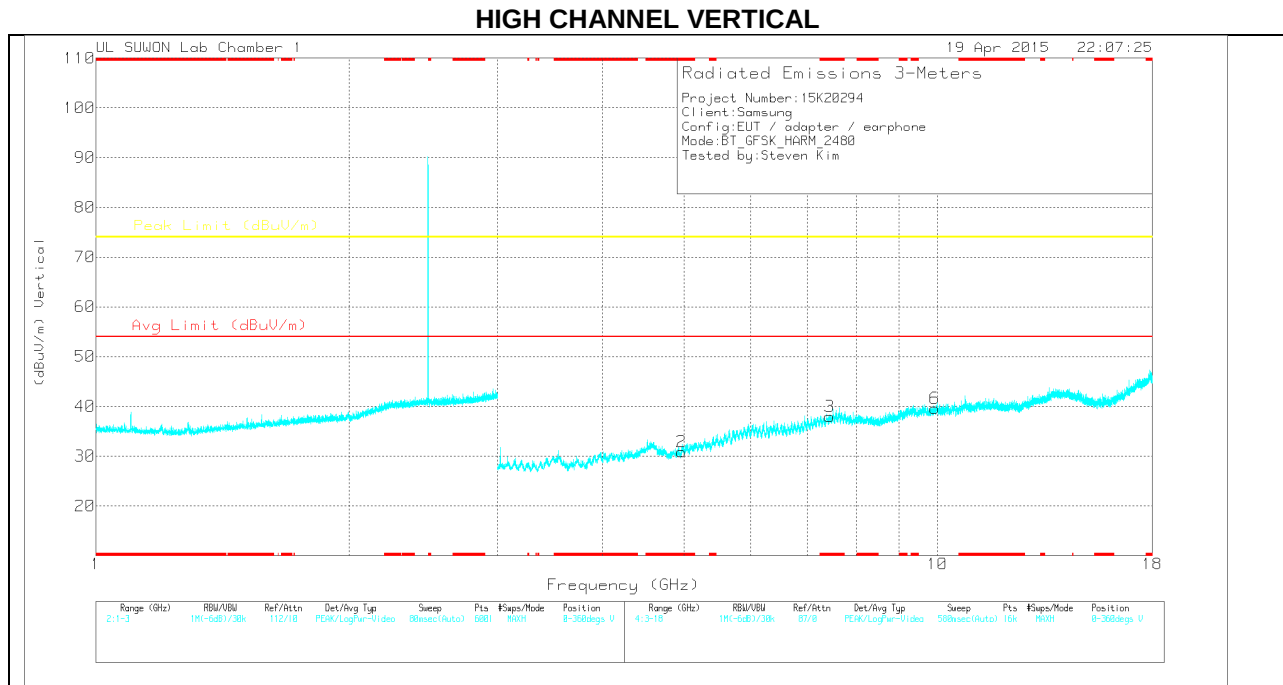
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

HIGH CHANNEL HORIZONTAL



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



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

HIGH CHANNEL DATA

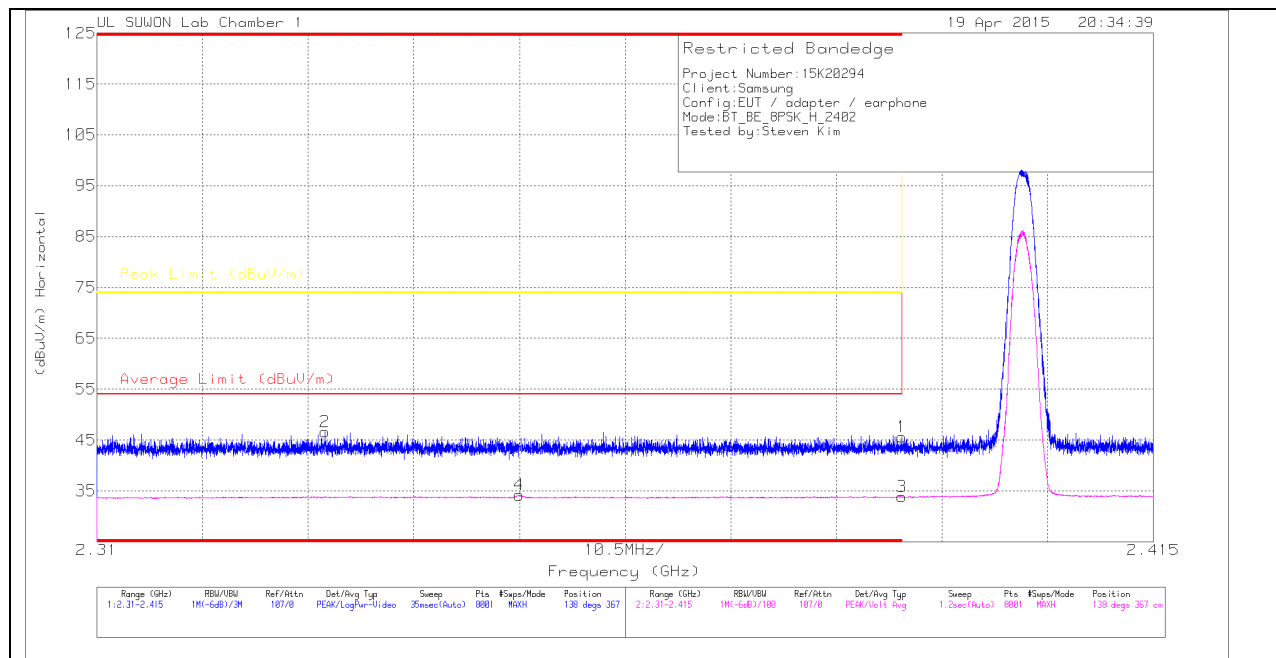
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.961	28.19	PK	32.1	-28.9	0	31.39	-	-	74	-42.61	0-360	200	H
4	* 7.447	25.95	PK	37.3	-24.8	0	38.45	-	-	74	-35.55	0-360	200	H
5	9.923	22.24	PK	37.9	-20.4	0	39.74	-	-	-	-	0-360	100	H
2	* 4.962	27.7	PK	32.1	-28.9	0	30.9	-	-	74	-43.1	0-360	100	V
3	* 7.443	25.44	PK	37.3	-24.8	0	37.94	-	-	74	-36.06	0-360	200	V
6	9.922	22.11	PK	37.9	-20.4	0	39.61	-	-	-	-	0-360	100	V

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

PK – Peak Detector

9.2.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)



HORIZONTAL DATA

Trace Markers

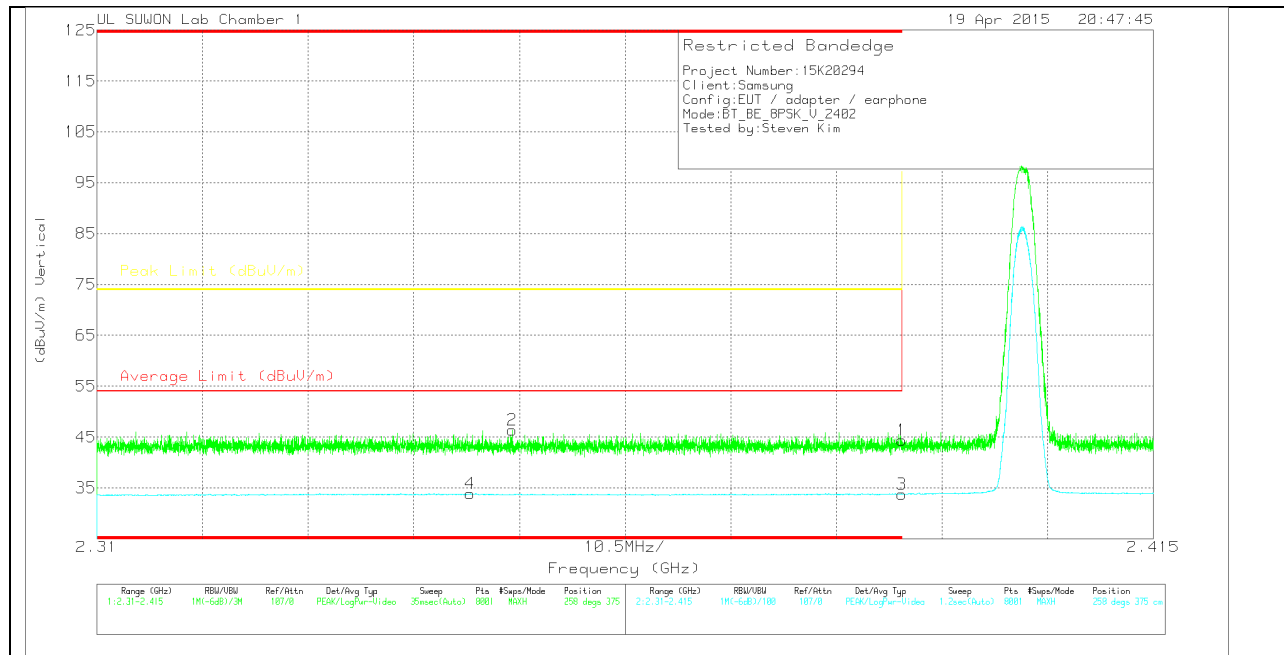
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_2_10dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.51	Pk	27.9	-22.8	45.61	-	-	74	-28.39	138	367	H
2	* 2.333	41.72	Pk	27.8	-22.9	46.62	-	-	74	-27.38	138	367	H
3	* 2.39	28.74	VB1T	27.9	-22.8	33.84	54	-20.16	-	-	138	367	H
4	* 2.352	29.29	VB1T	27.8	-22.9	34.19	54	-19.81	-	-	138	367	H

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

Pk - Peak detector

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

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_2_10dB	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	39.31	Pk	27.9	-22.8	44.41	-	-	74	-29.59	258	375	V
2	* 2.351	41.47	Pk	27.8	-22.9	46.37	-	-	74	-27.63	258	375	V
3	* 2.39	28.69	VB1T	27.9	-22.8	33.79	54	-20.21	-	-	258	375	V
4	* 2.347	28.99	VB1T	27.8	-22.9	33.89	54	-20.11	-	-	258	375	V

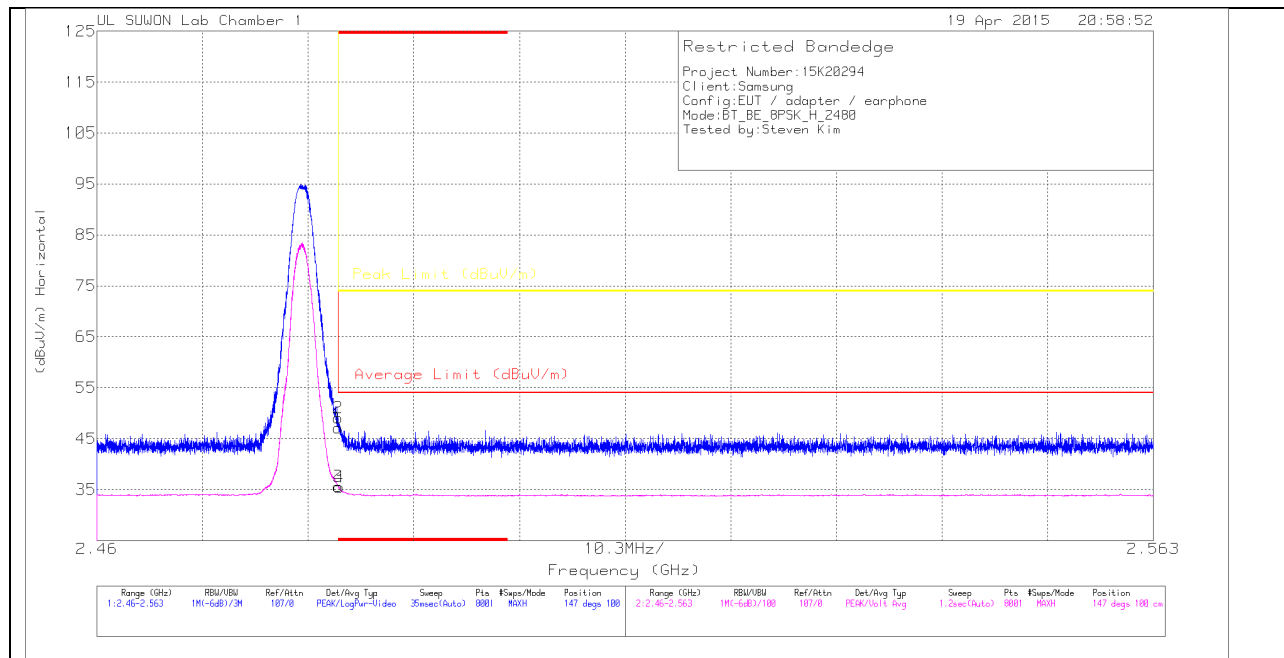
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

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

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

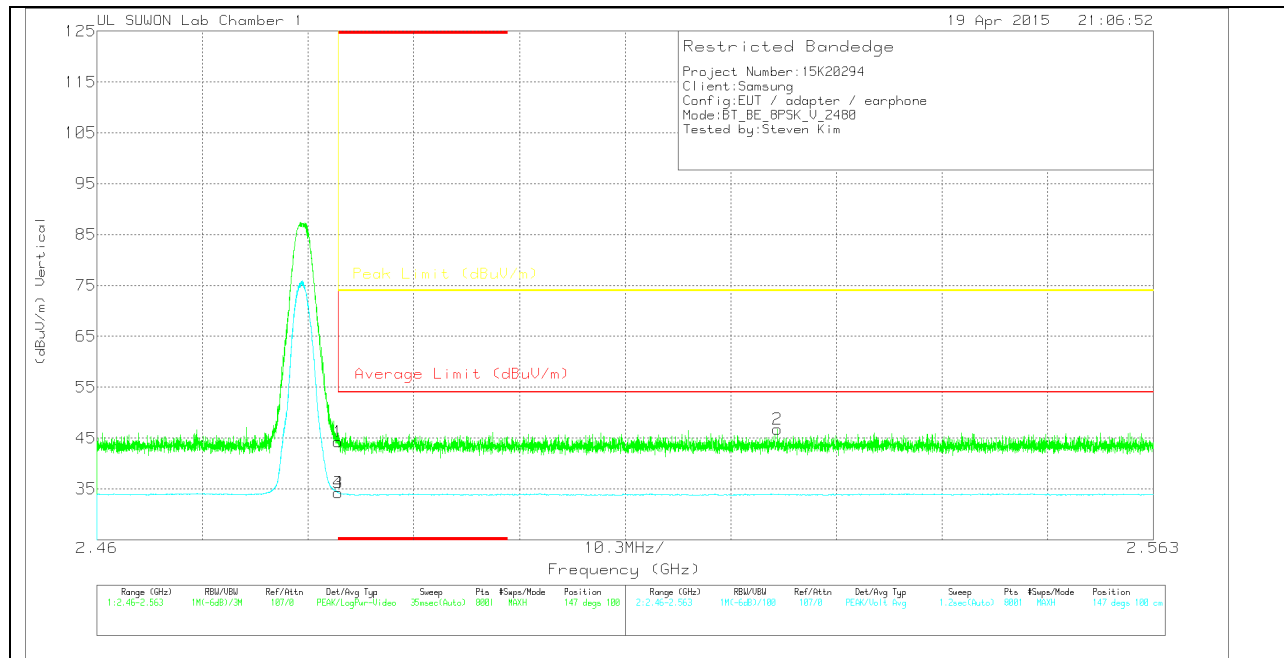
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3115D Factor	Path_2_10dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.78	Pk	27.9	-22.6	47.08	-	-	74	-26.92	147	100	H
2	* 2.484	43.76	Pk	27.9	-22.6	49.06	-	-	74	-24.94	147	100	H
3	* 2.484	30.26	VB1T	27.9	-22.6	35.56	54	-18.44	-	-	147	100	H
4	* 2.484	30.14	VB1T	27.9	-22.6	35.44	54	-18.56	-	-	147	100	H

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

Pk - Peak detector

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

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_2_10dB	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	38.92	Pk	27.9	-22.6	44.22	-	-	74	-29.78	147	100	V
2	2.526	41.47	Pk	27.9	-22.6	46.77	-	-	74	-27.23	147	100	V
3	* 2.484	28.97	VB1T	27.9	-22.6	34.27	54	-19.73	-	-	147	100	V
4	* 2.484	28.99	VB1T	27.9	-22.6	34.29	54	-19.71	-	-	147	100	V

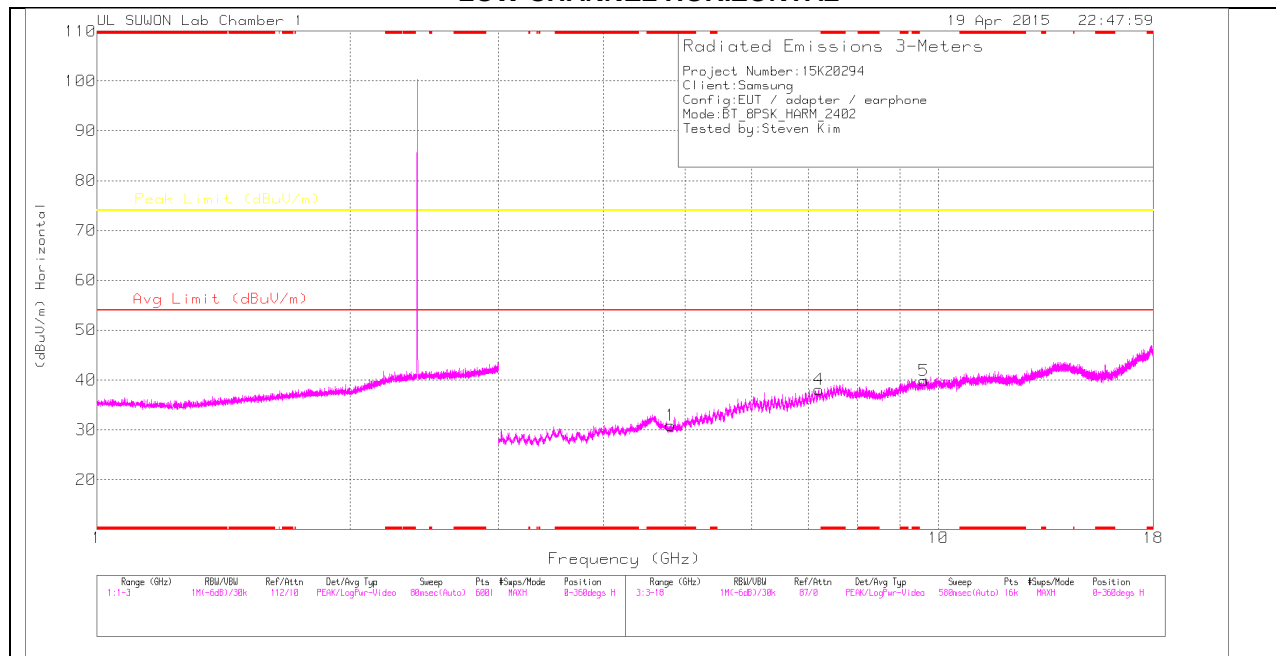
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

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

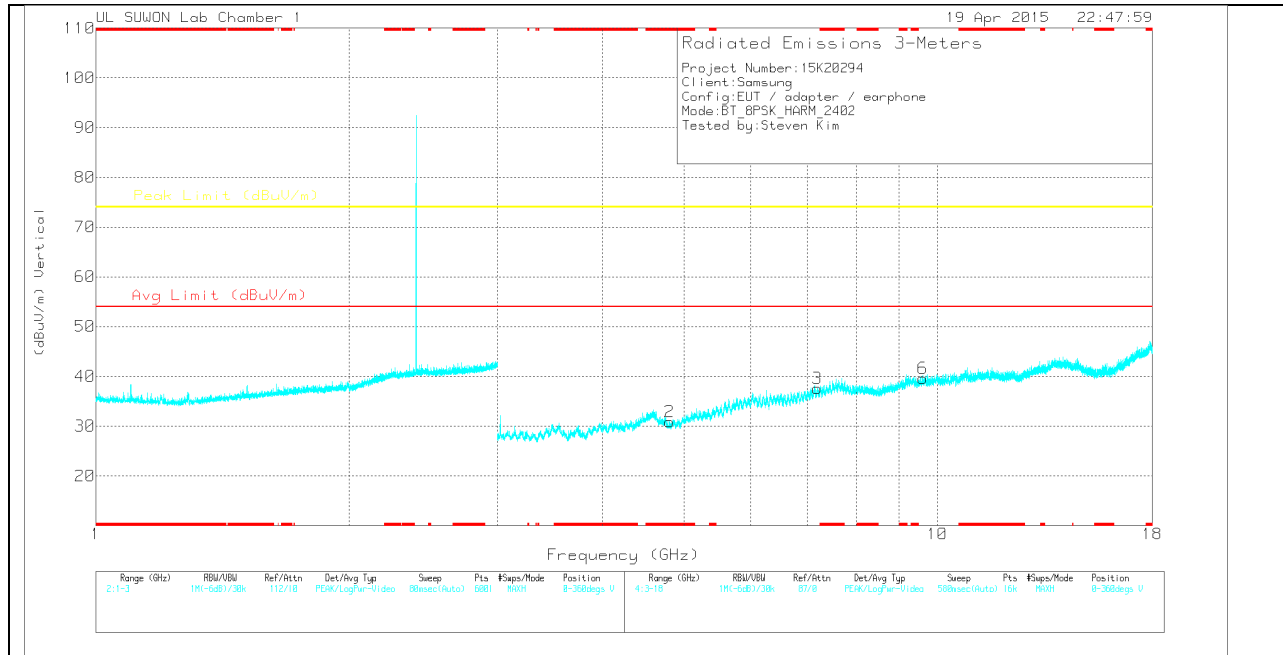
HARMONICS AND SPURIOUS EMISSIONS

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.

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.

LOW CHANNEL DATA

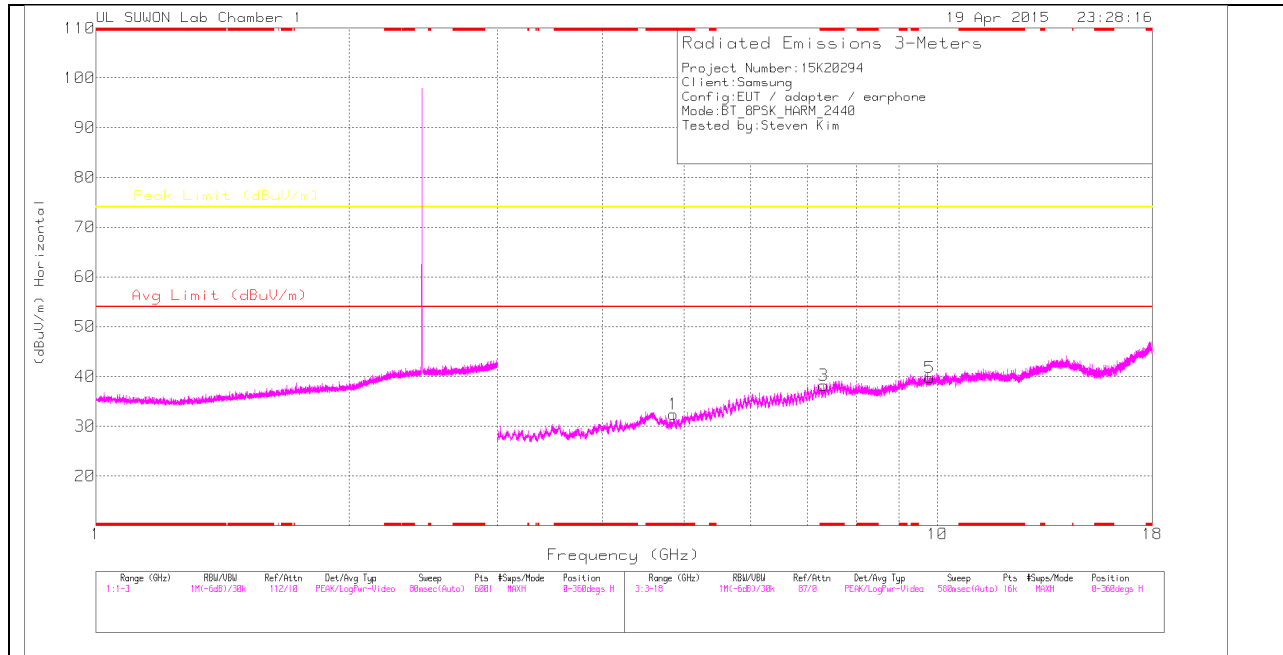
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803	28.74	PK	31.9	-29.8	0	30.84	-	-	74	-43.16	0-360	200	H
4	7.203	26.64	PK	36.9	-25.4	0	38.14	-	-	-	-	0-360	200	H
5	9.612	23.15	PK	37.7	-21	0	39.85	-	-	-	-	0-360	100	H
2	* 4.802	28.78	PK	31.9	-29.8	0	30.88	-	-	74	-43.12	0-360	200	V
3	7.2	26.11	PK	36.9	-25.4	0	37.61	-	-	-	-	0-360	200	V
6	9.61	22.87	PK	37.7	-21	0	39.57	-	-	-	-	0-360	200	V

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

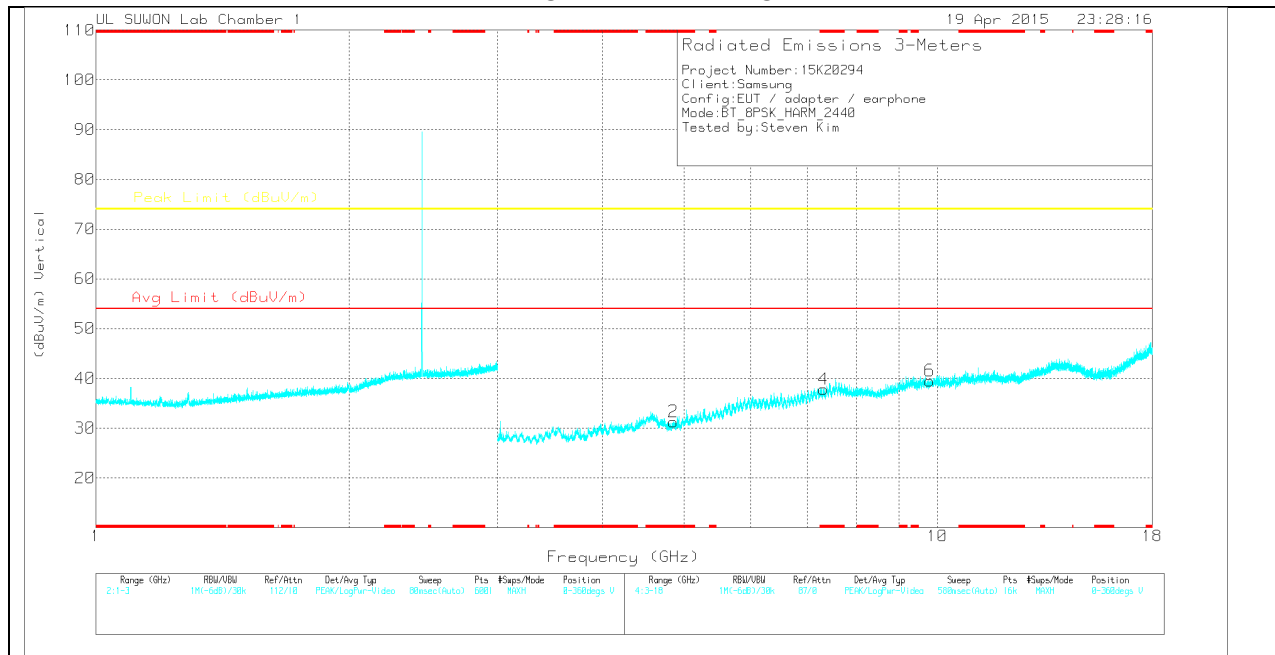
PK – Peak Detector

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.

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.

MID CHANNEL DATA

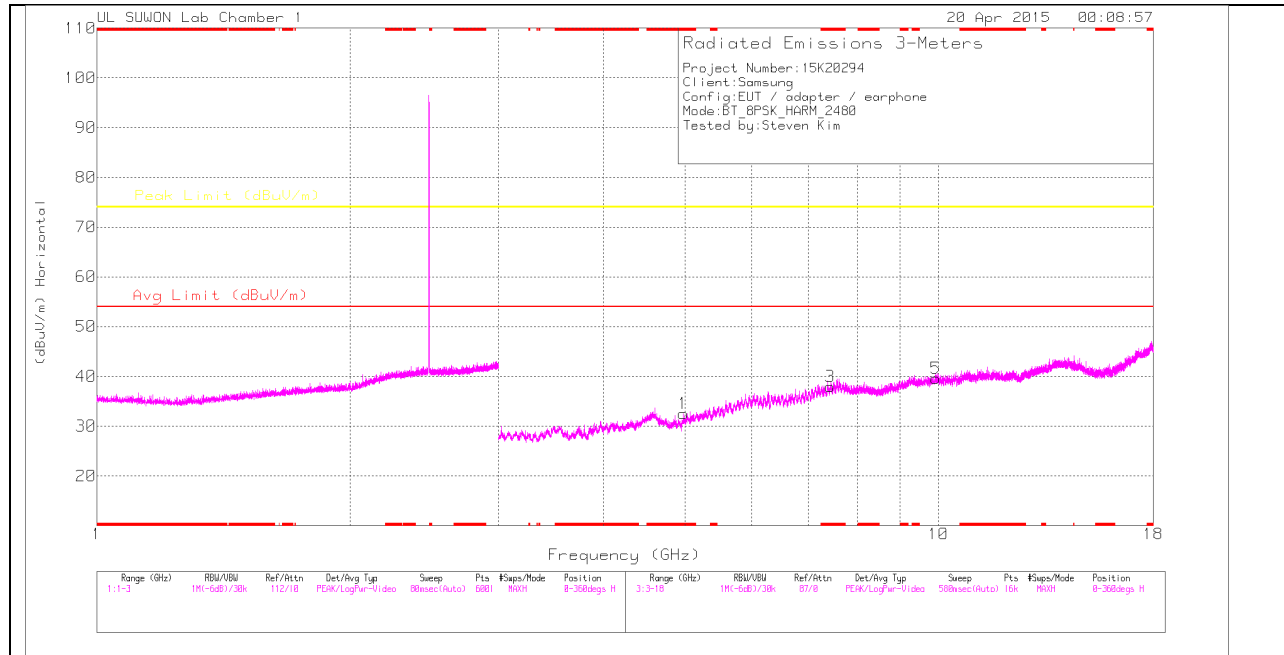
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	31150 Factor	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.857	29.54	PK	32	-29.2	0	32.34	-	-	74	-41.66	0-360	100	H
3	* 7.321	26.72	PK	37.1	-25.6	0	38.22	-	-	74	-35.78	0-360	100	H
5	9.797	24.34	PK	37.7	-22.3	0	39.74	-	-	-	-	0-360	100	H
2	* 4.851	28.52	PK	32	-29.2	0	31.32	-	-	74	-42.68	0-360	100	V
4	* 7.322	26.25	PK	37.2	-25.6	0	37.85	-	-	74	-36.15	0-360	200	V
6	9.786	24.04	PK	37.7	-22.2	0	39.54	-	-	-	-	0-360	200	V

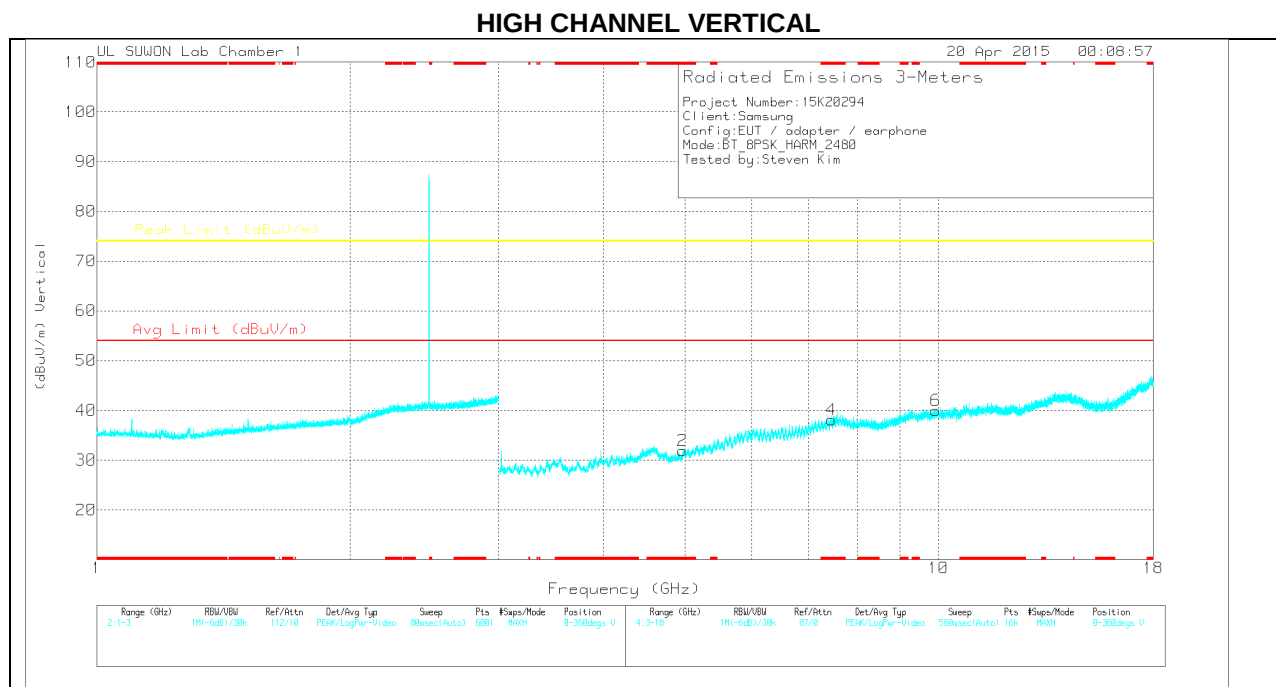
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

HIGH CHANNEL HORIZONTAL



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



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

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3115D Factor	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.977	28.97	PK	32.2	-28.7	32.47	-	-	74	-41.53	0-360	100	H
3	* 7.441	25.5	PK	37.3	-24.8	38	-	-	74	-36	0-360	100	H
5	9.928	22.14	PK	37.9	-20.4	39.64	-	-	-	-	0-360	100	H
2	* 4.967	28.65	PK	32.1	-28.8	31.95	-	-	74	-42.05	0-360	100	V
4	* 7.458	25.53	PK	37.3	-24.8	38.03	-	-	74	-35.97	0-360	200	V
6	9.932	22.41	PK	37.9	-20.3	40.01	-	-	-	-	0-360	200	V

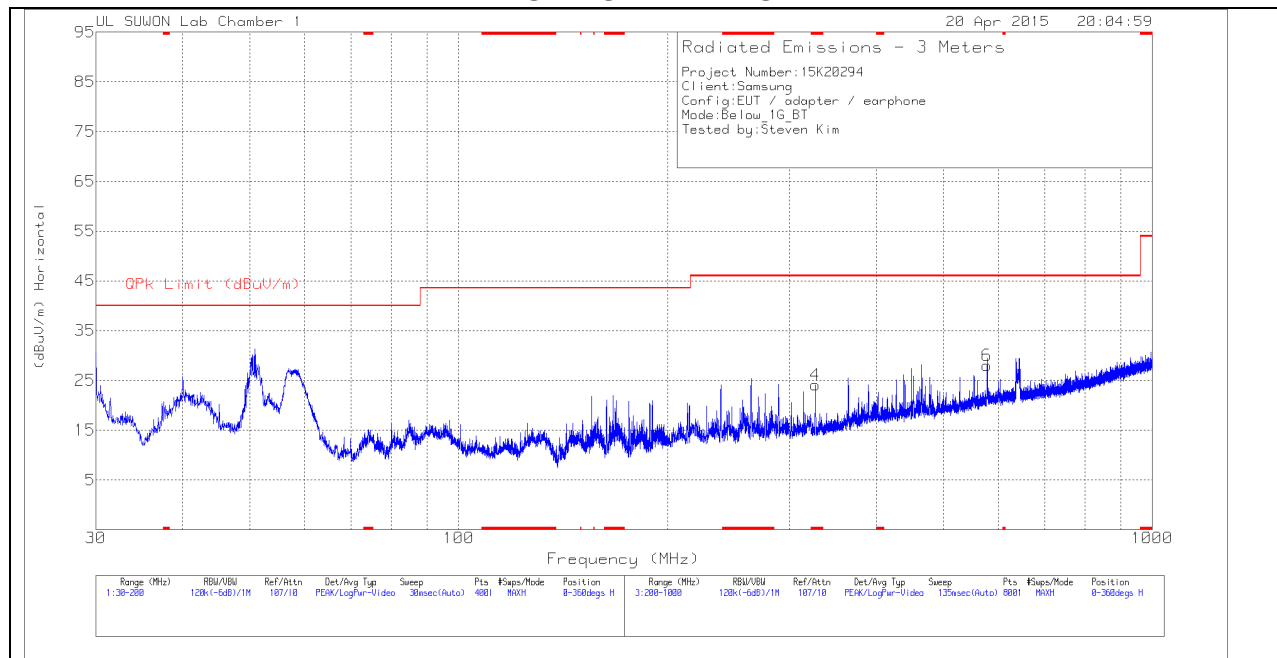
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

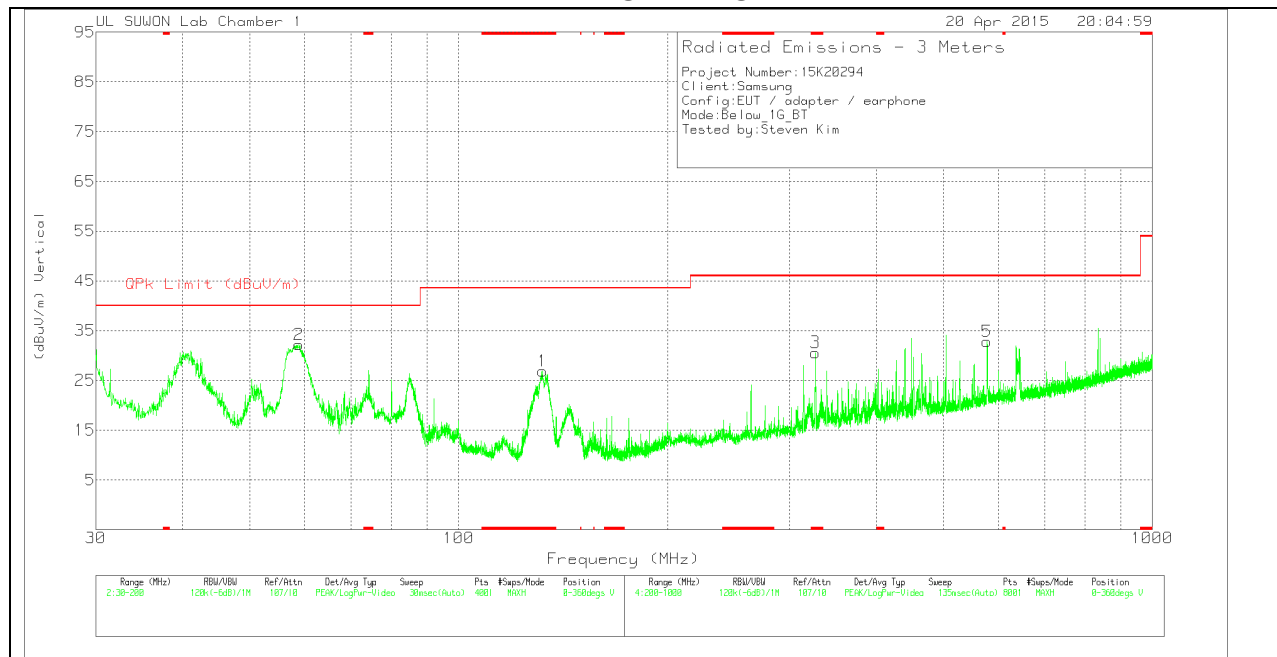
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



BELOW 1 GHz TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163-750	Bi-Log	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 132.2125	47.09	Pk	8.7	-28.9	0	26.89	43.52	-16.63	0-360	100	V
2	58.8575	49.3	Pk	12.8	-29.9	0	32.2	40	-7.8	0-360	100	V
4	* 326.8	37.37	Pk	13.9	-27.2	0	24.07	46.02	-21.95	0-360	200	H
6	577.9	35.25	Pk	18.7	-25.9	0	28.05	46.02	-17.97	0-360	200	H
3	* 326.8	43.91	Pk	13.9	-27.2	0	30.61	46.02	-15.41	0-360	200	V
5	577.9	40.03	Pk	18.7	-25.9	0	32.83	46.02	-13.19	0-360	100	V

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

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

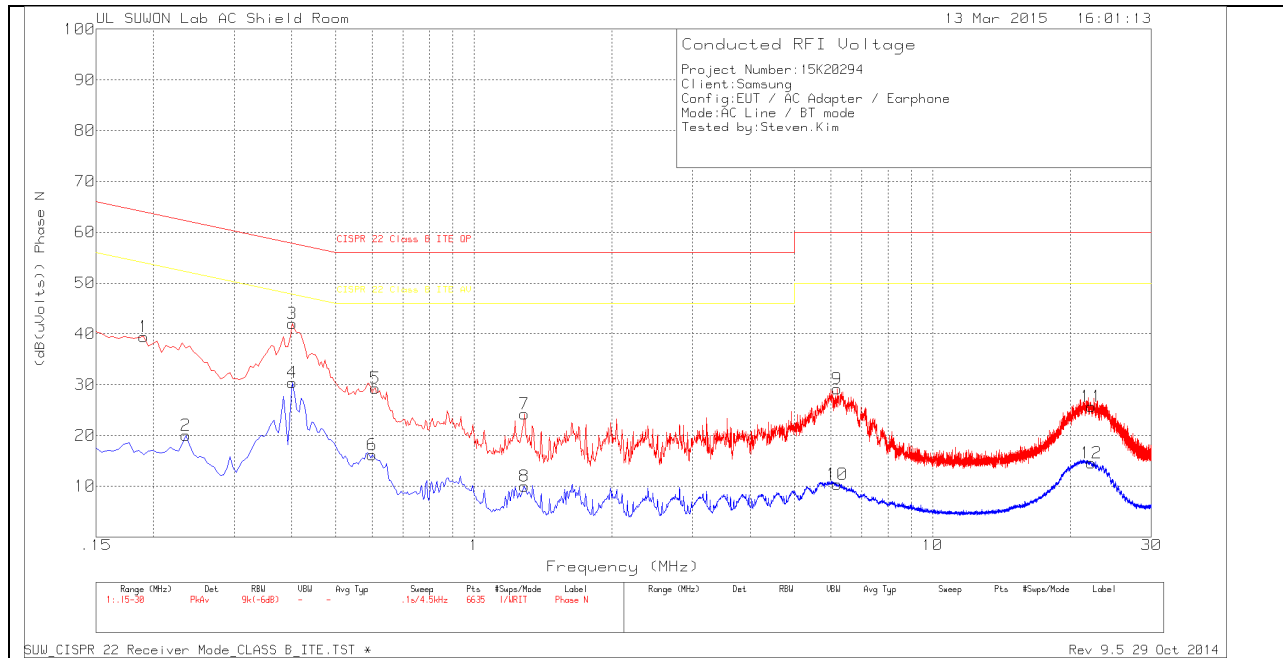
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

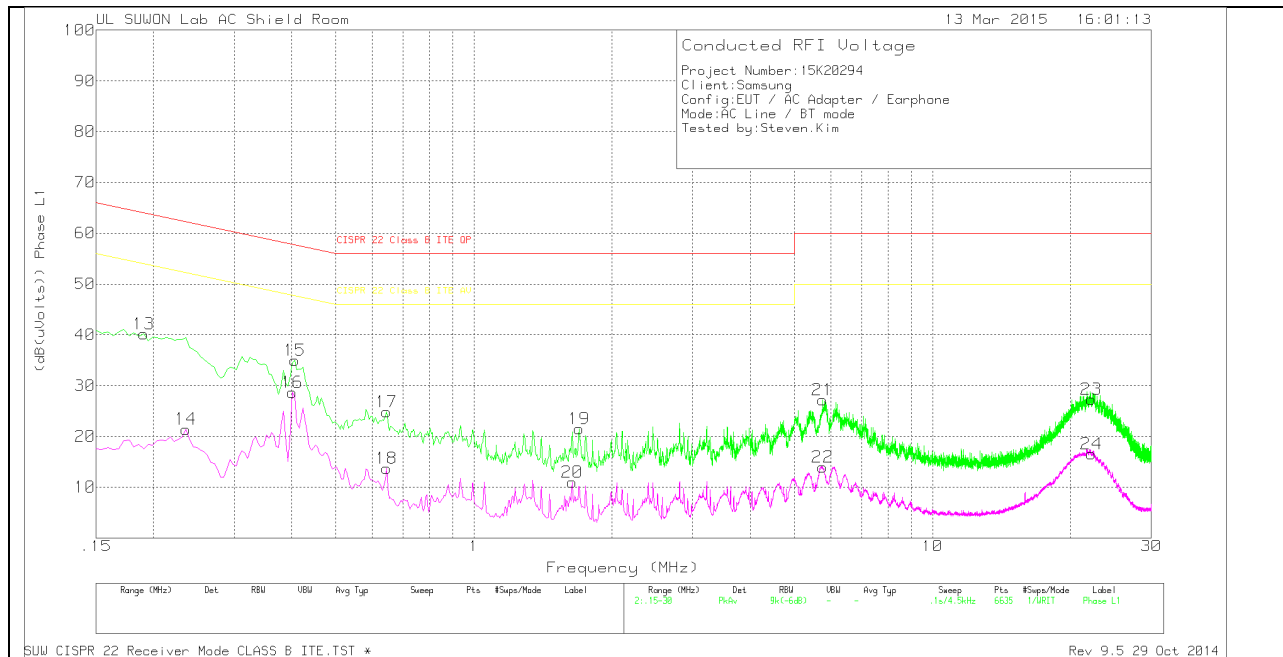
Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_N	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
1	.1905	29.48	Pk	10	0	39.48	64.01	-24.53	-	-
2	.2355	10.11	Av	9.9	0	20.01	-	-	52.25	-32.24
3	.402	31.97	Pk	10	0	41.97	57.81	-15.84	-	-
4	.402	20.43	Av	10	0	30.43	-	-	47.81	-17.38
5	.609	19.19	Pk	10.1	0	29.29	56	-26.71	-	-
6	.6	6.02	Av	10.1	0	16.12	-	-	46	-29.88
7	1.2885	14.36	Pk	9.8	.1	24.26	56	-31.74	-	-
8	1.2885	.04	Av	9.8	.1	9.94	-	-	46	-36.06
9	6.198	19.31	Pk	9.7	.1	29.11	60	-30.89	-	-
10	6.2025	.58	Av	9.7	.1	10.38	-	-	50	-39.62
11	22.218	15.72	Pk	9.8	.2	25.72	60	-34.28	-	-
12	22.2045	4.53	Av	9.8	.2	14.53	-	-	50	-35.47

Pk - Peak detector

Av - Average detection

LINE 2 PLOT



LINE 2 RESULTS

Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_L 1	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
13	.1905	30.48	Pk	9.7	0	40.18	64.01	-23.83	-	-
14	.2355	11.73	Av	9.7	0	21.43	-	-	52.25	-30.82
15	.4065	25.08	Pk	9.9	0	34.98	57.72	-22.74	-	-
16	.402	18.78	Av	9.9	0	28.68	-	-	47.81	-19.13
17	.645	14.96	Pk	9.9	0	24.86	56	-31.14	-	-
18	.645	3.84	Av	9.9	0	13.74	-	-	46	-32.26
19	1.698	11.98	Pk	9.4	.1	21.48	56	-34.52	-	-
20	1.6395	1.45	Av	9.4	.1	10.95	-	-	46	-35.05
21	5.7615	17.67	Pk	9.4	.1	27.17	60	-32.83	-	-
22	5.7615	4.47	Av	9.4	.1	13.97	-	-	50	-36.03
23	22.2225	17.71	Pk	9.4	.2	27.31	60	-32.69	-	-
24	22.227	6.95	Av	9.4	.2	16.55	-	-	50	-33.45

Pk - Peak detector

Av - Average detection