



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC

MODEL NUMBER : SM-N9208

FCC ID: A3LSMN9208

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Revision History

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY.....	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. WORST-CASE CONFIGURATION AND MODE.....	7
5.5. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. SUMMARY TABLE	11
8. ANTENNA PORT TEST RESULTS.....	12
8.1. 20 dB AND 99% BANDWIDTH	12
8.1.1. BASIC DATA RATE GFSK MODULATION.....	12
8.1.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION.....	12
8.1.3. ENHANCED DATA RATE 8PSK MODULATION	12
8.1.4. 20 dB AND 99% BANDWIDTH PLOTS.....	13
8.2. HOPPING FREQUENCY SEPARATION	16
8.3. NUMBER OF HOPPING CHANNELS.....	18
8.4. AVERAGE TIME OF OCCUPANCY.....	21
8.5. OUTPUT POWER.....	25
8.5.1. BASIC DATA RATE GFSK MODULATION.....	25
8.5.2. ENHANCED DATA RATE PI/4-DPSK MODULATION	25
8.5.3. ENHANCED DATA RATE 8PSK MODULATION	25
8.5.4. OUTPUT POWER PLOTS.....	26
8.6. AVERAGE POWER.....	29
8.6.1. BASIC DATA RATE GFSK MODULATION.....	29
8.6.2. DATA RATE PI/4-DQPSK MODULATION	29
8.6.3. ENHANCED DATA RATE 8PSK MODULATION	29
8.7. CONDUCTED SPURIOUS EMISSIONS.....	30
8.7.1. BASIC DATA RATE GFSK MODULATION.....	31

9. RADIATED TEST RESULTS.....	37
9.1. LIMITS AND PROCEDURE	37
9.2. TRANSMITTER ABOVE 1 GHz	38
9.2.1. BASIC DATA RATE GFSK MODULATION.....	38
9.2.2. ENHANCED DATA RATE 8PSK MODULATION	48
9.3. WORST-CASE BELOW 1 GHz.....	58
10. AC POWER LINE CONDUCTED EMISSIONS	60
11. SETUP PHOTOS	63

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC
MODEL NUMBER: SM-N9208
SERIAL NUMBER: R38G50YGR2N (RADIATED); R38G50YGMJH (CONDUCTED)
DATE TESTED: JUN 21 - JUL 11, 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
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CY Choi
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, 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/LTE Phone+BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC.
This test report addresses the DSS (BT) operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2402 - 2480	Basic GFSK	Average	9.67	9.27
		Peak	9.89	9.75
	Enhanced Pi/4-DPSK	Average	5.72	3.73
		Peak	8.21	6.62
	Enhanced 8PSK	Average	5.83	3.83
		Peak	8.61	7.26

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

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.48 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA20CBC	R37FCPc00R1DK3	N/A
Data Cable	SAMSUNG	EP-DG925UWE	N/A	N/A
Earphone	SAMSUNG	EO-EG920LW	N/A	N/A

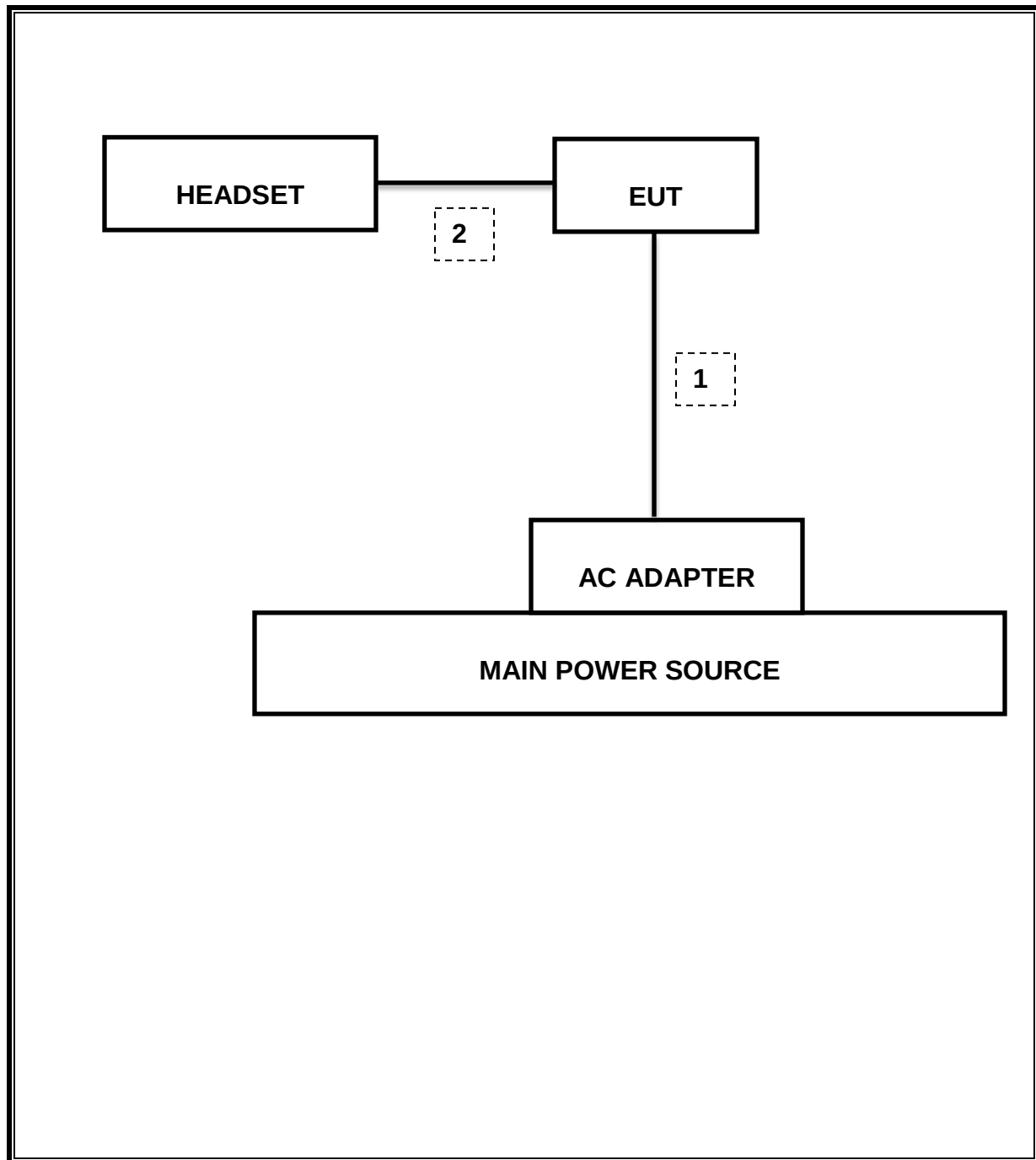
I/O CABLES

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
LISN	R&S	ENV-216	101836	04-09-16
LISN	R&S	ENV-216	101837	04-09-16

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass	1.207 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-48.70 dBm
15.247 (b)(1)	TX conducted output power	<21dBm		Pass	9.89 dBm (Peak)
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	41.87 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	34.03 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	1.052	0.927
Mid	2441	1.053	0.934
High	2480	1.052	0.933
Worst		1.053	0.934

8.1.2. ENHANCED DATA RATE $\pi/4$ -DQPSK MODULATION

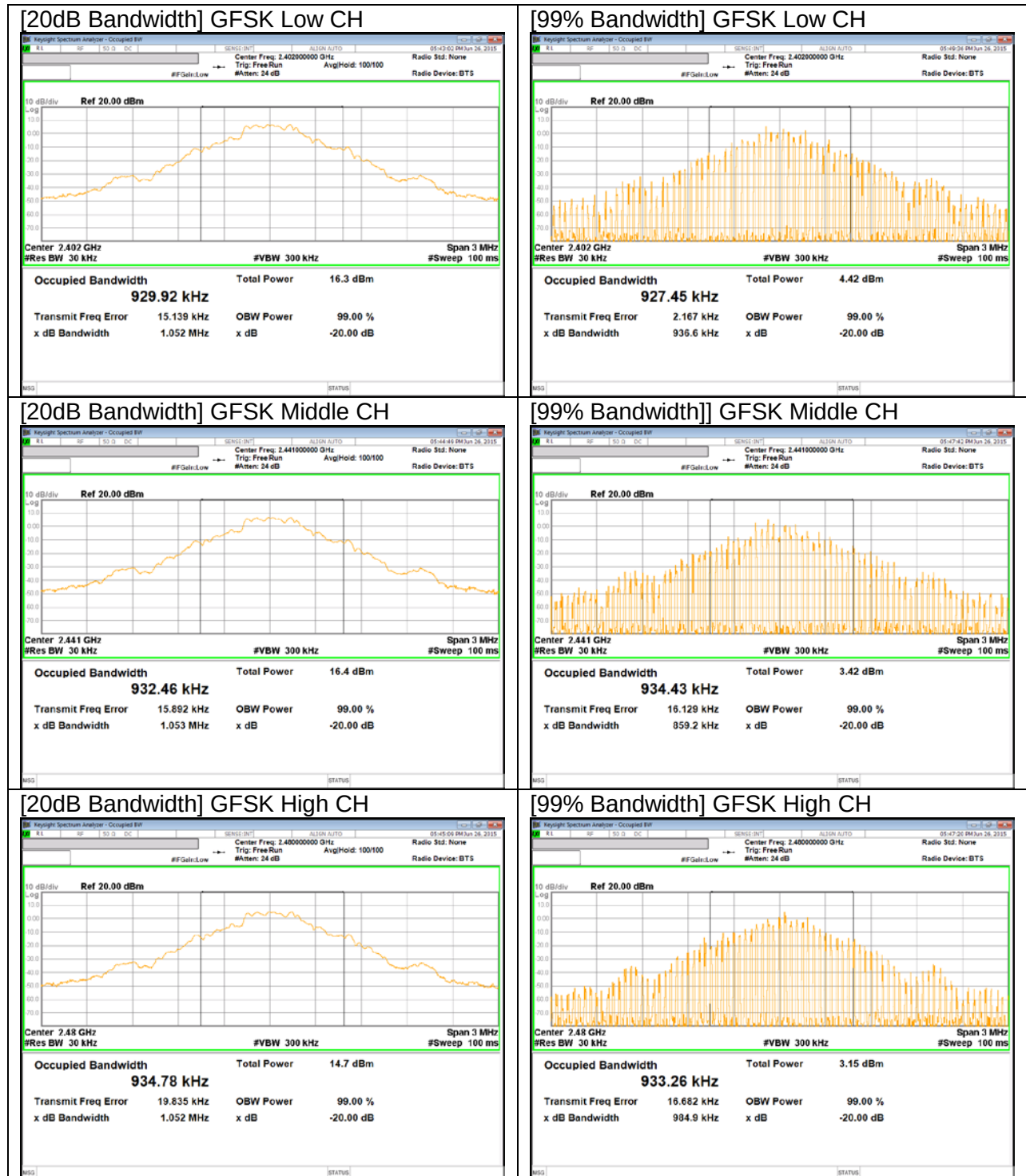
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.358	1.202
Mid	2441	1.355	1.167
High	2480	1.301	1.168
Worst		1.358	1.202

8.1.3. ENHANCED DATA RATE 8PSK MODULATION

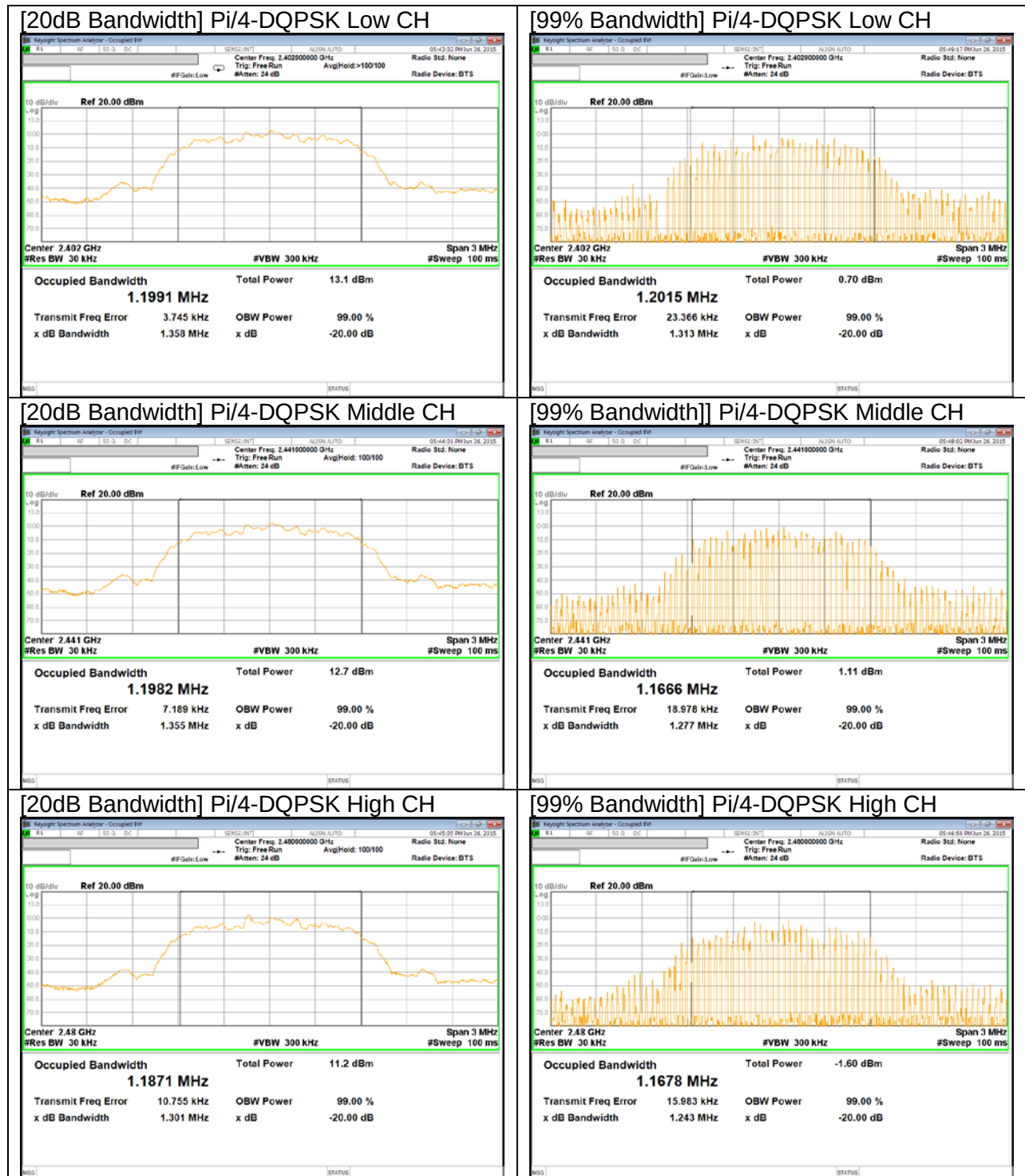
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.320	1.200
Mid	2441	1.318	1.199
High	2480	1.318	1.165
Worst		1.320	1.200

8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

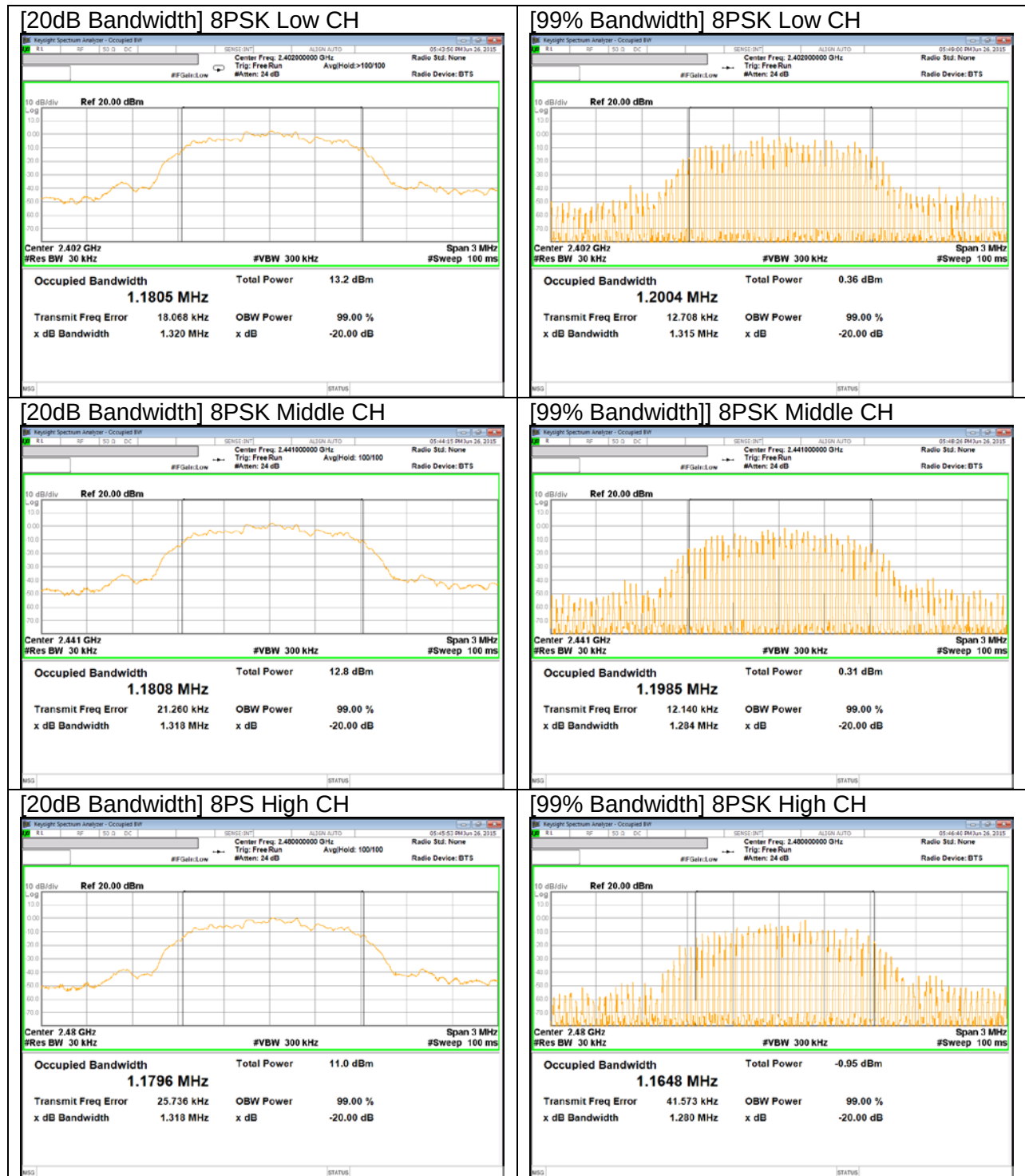
GFSK BANDWIDTH



Pi/4-DQPSK BANDWIDTH



8PSK BANDWIDTH



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.

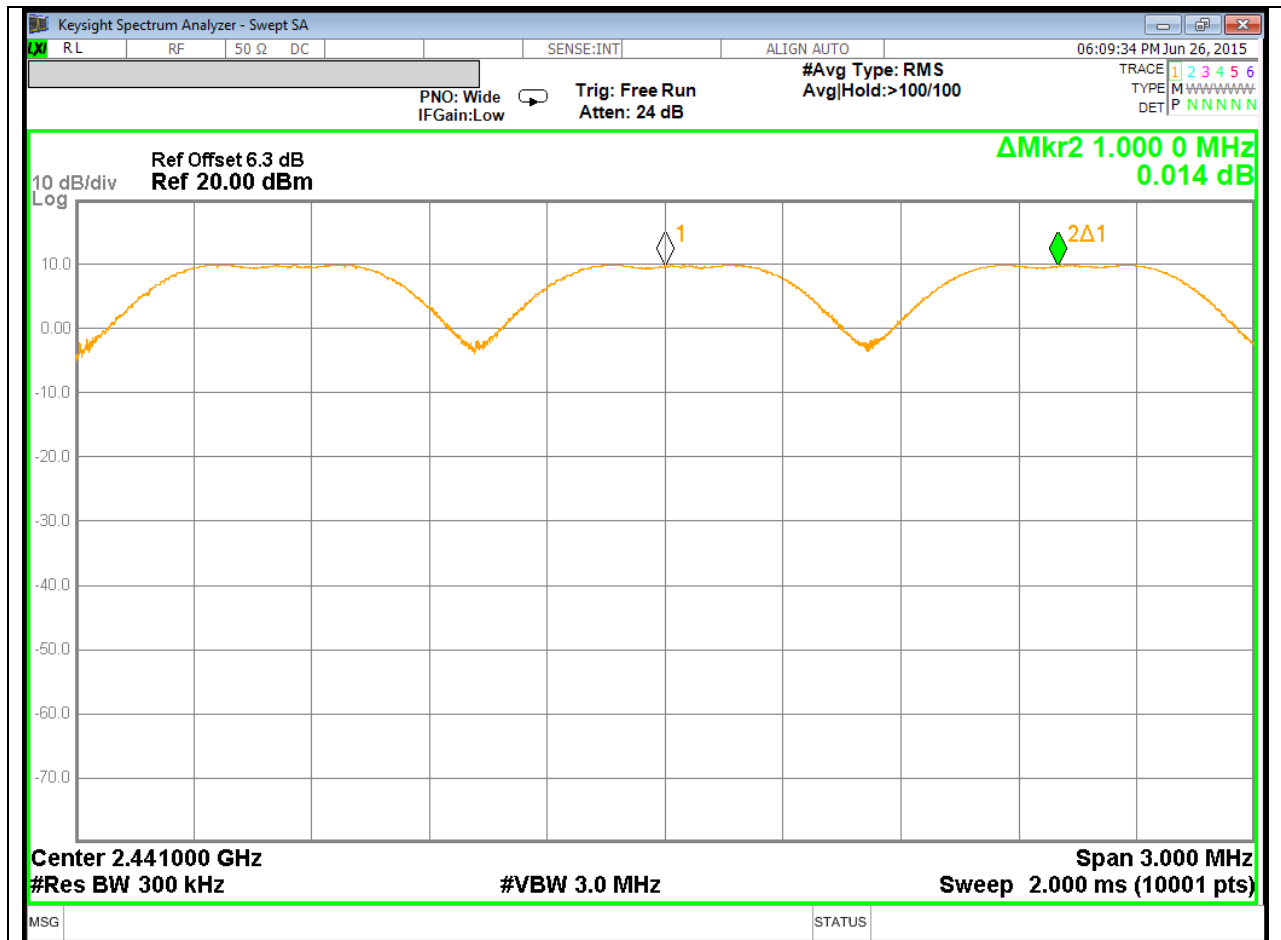
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

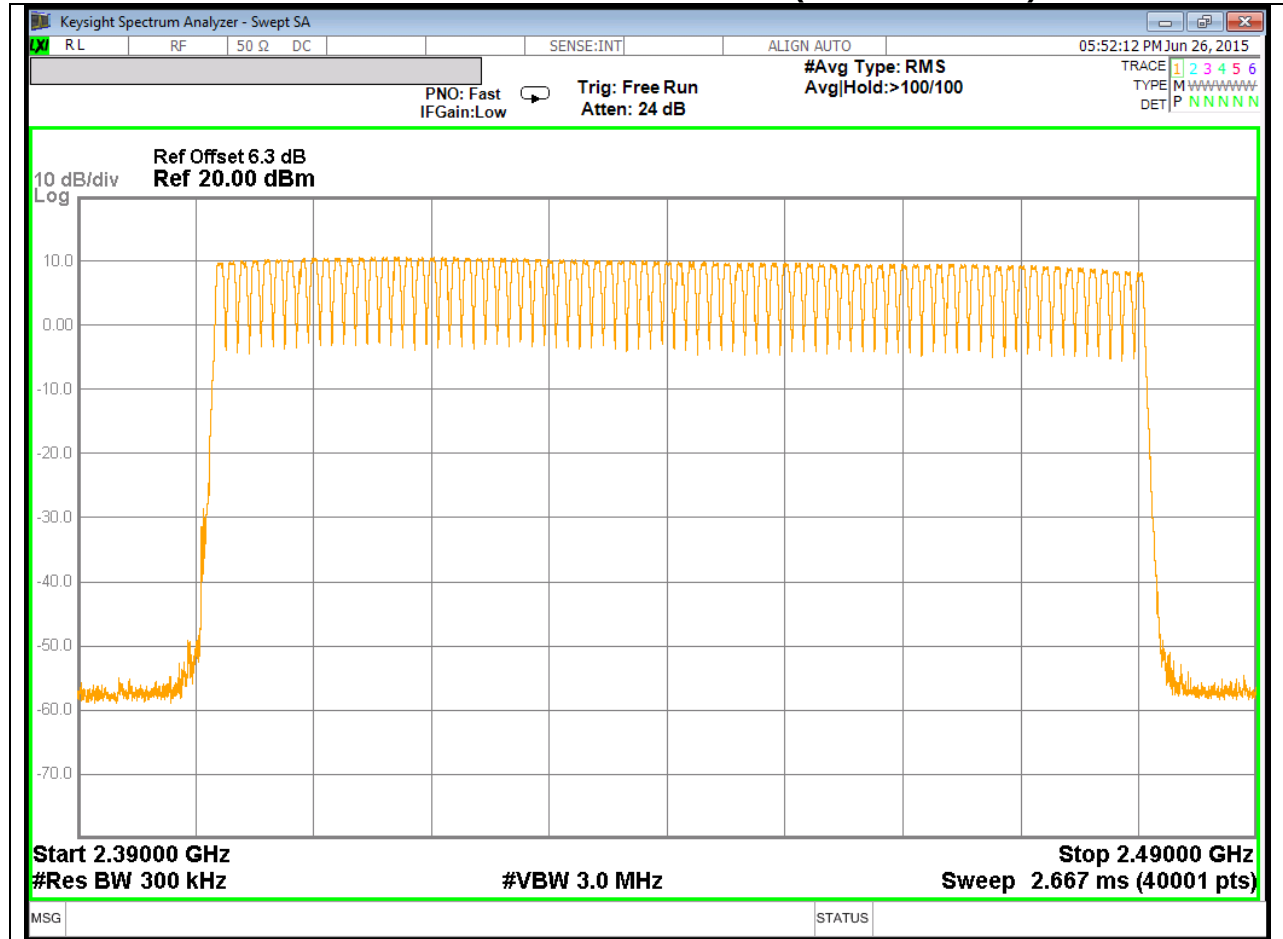
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

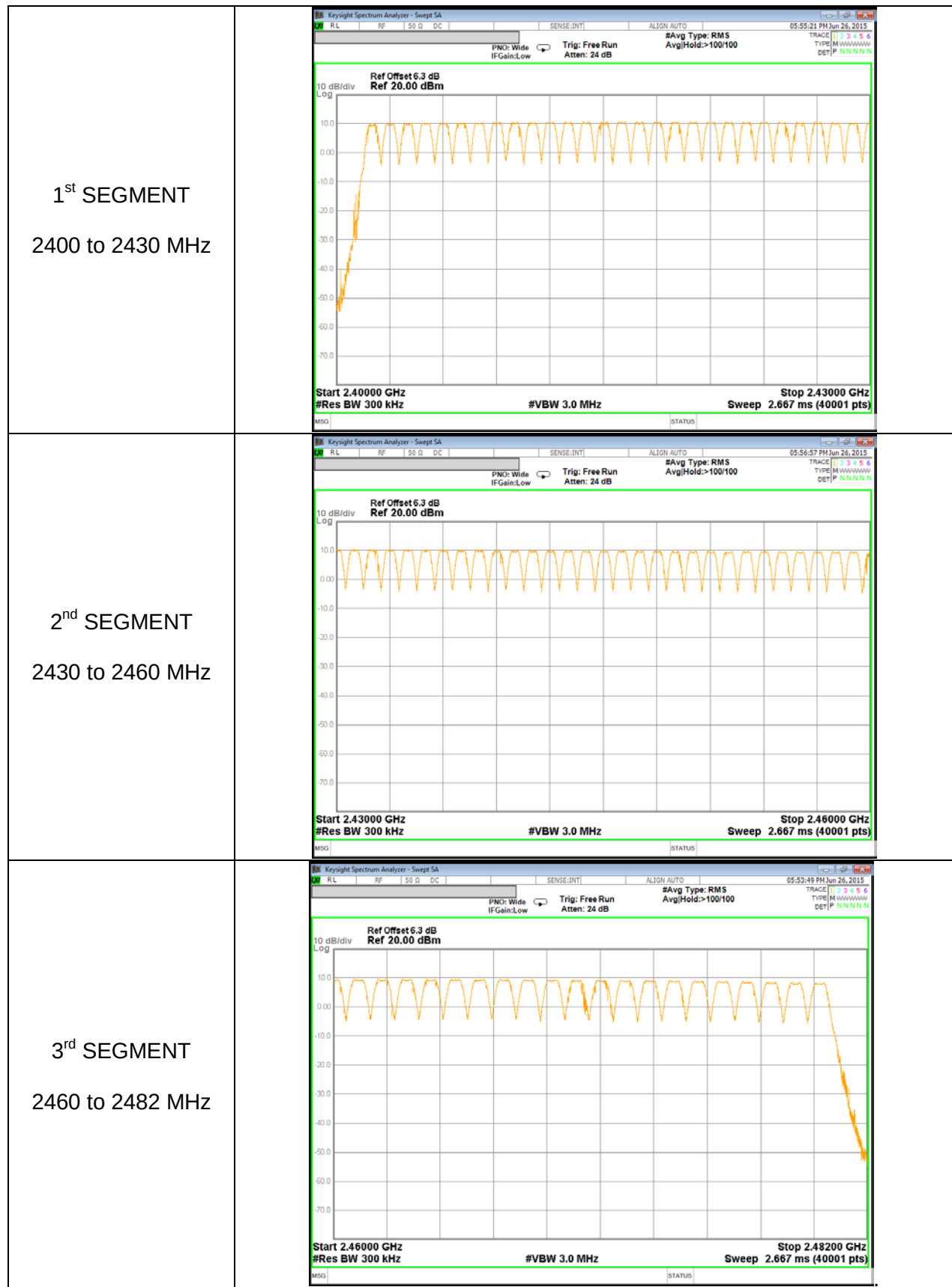
RESULTS

Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)





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.

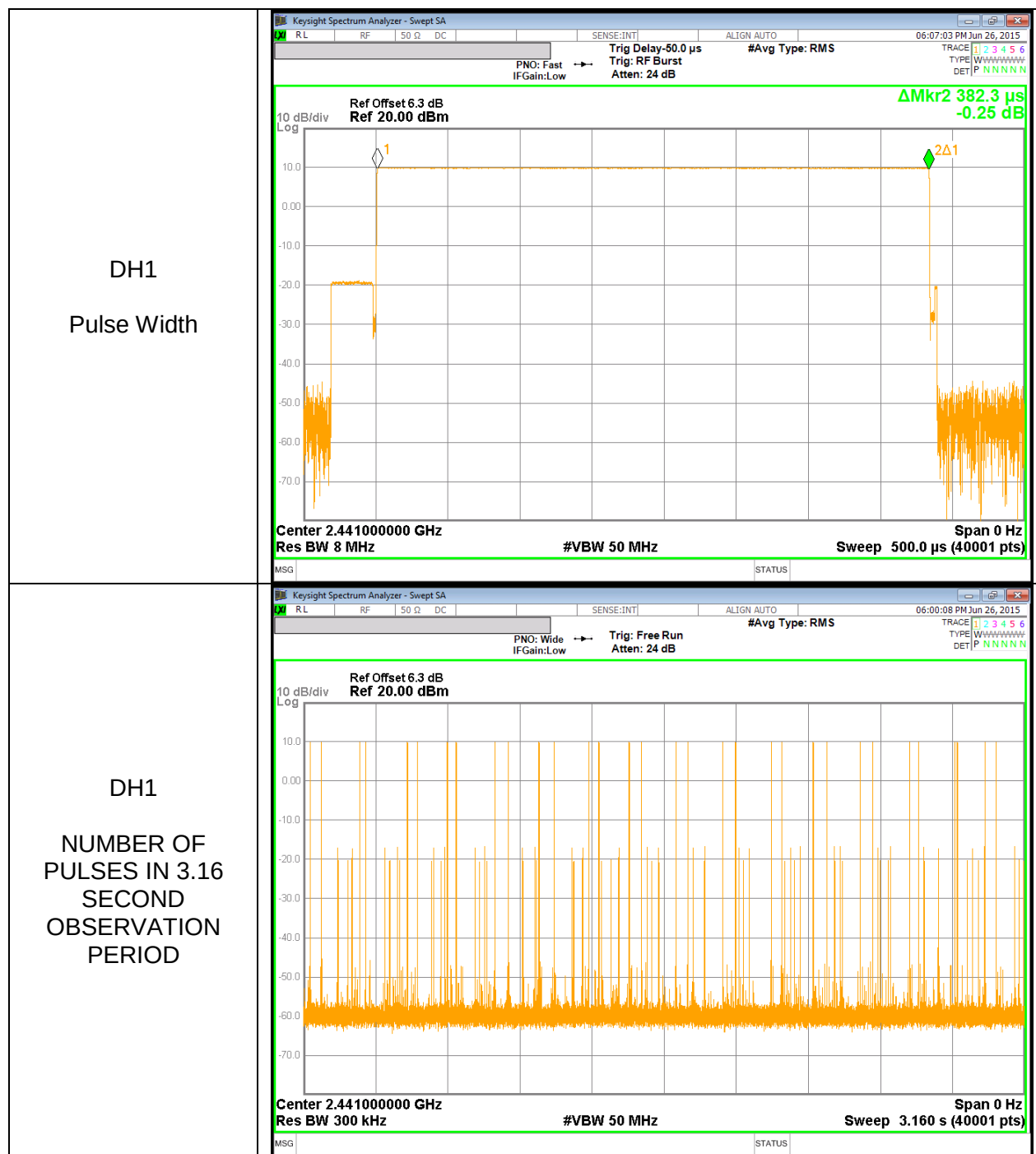
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

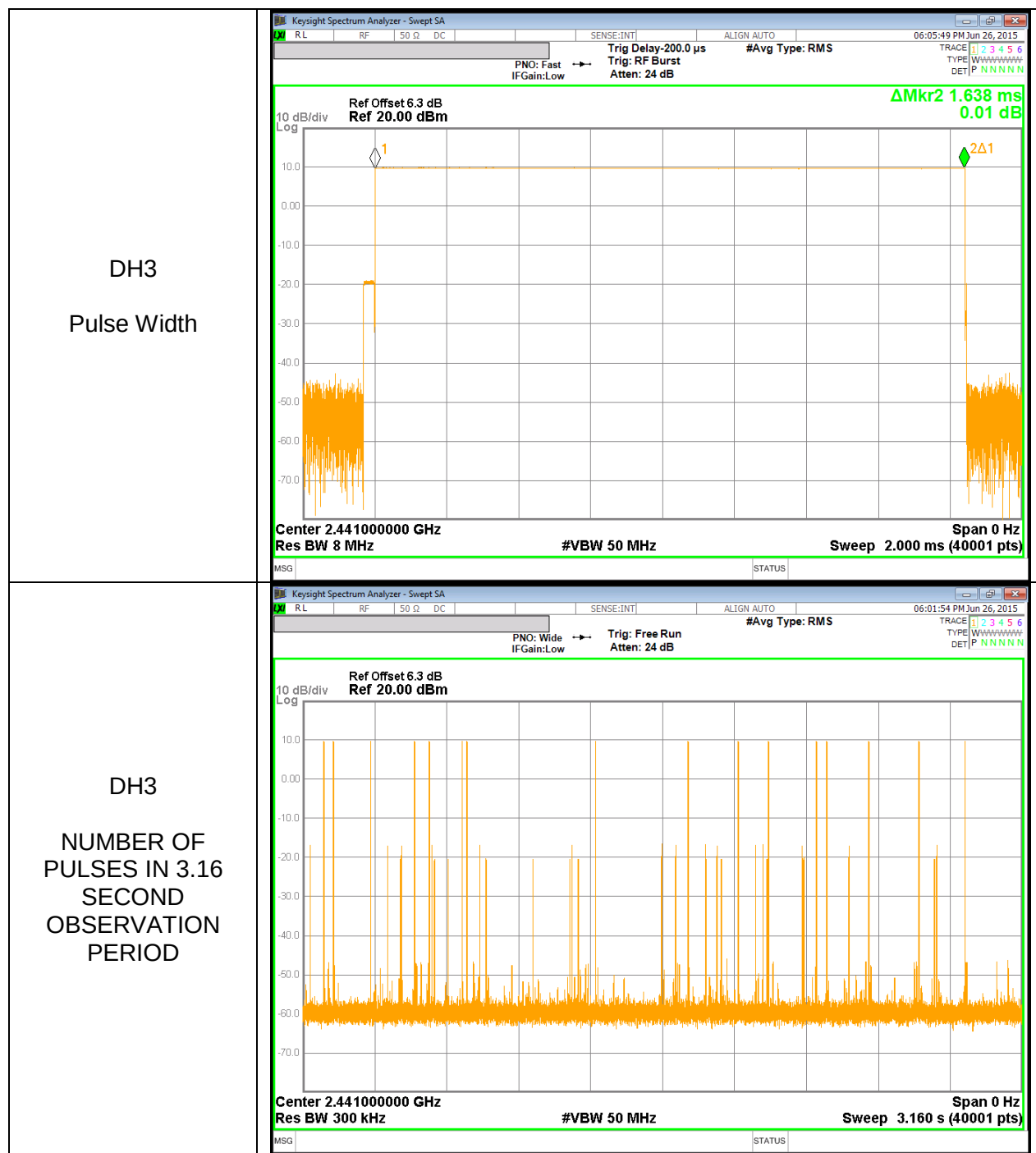
RESULTS

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.382	32	0.122336	0.4	-0.2777
DH3	1.638	16	0.262080	0.4	-0.1379
DH5	2.886	12	0.346320	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					
DH1	0.382	8	0.030584	0.4	-0.36942
DH3	1.638	4	0.065520	0.4	-0.33448
DH5	2.886	3	0.086580	0.4	-0.31342

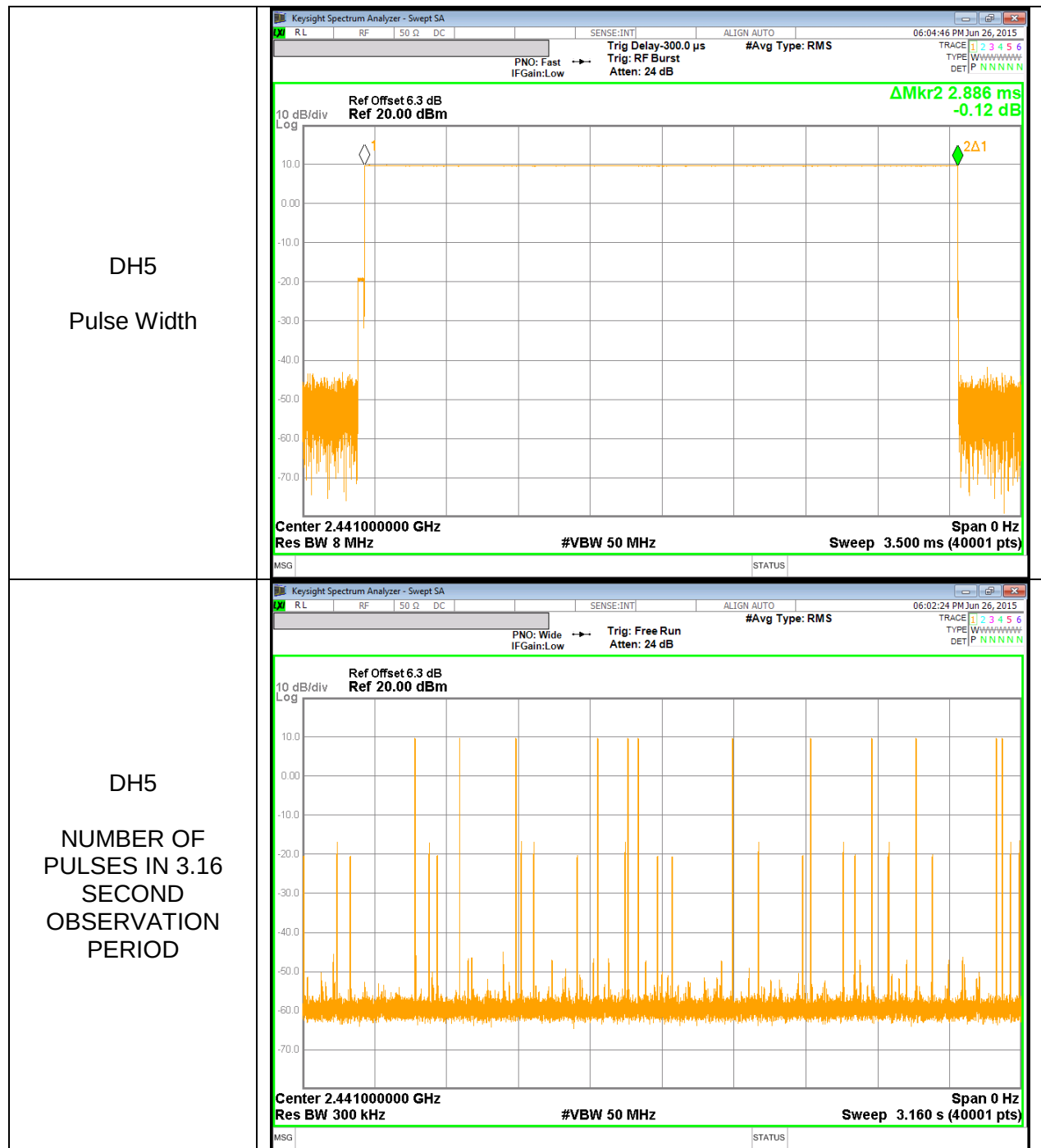
DH1



DH3



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	9.888	21	-11.112
Middle	2441	9.870	21	-11.13
High	2480	8.331	21	-12.669
Worst		9.888	21	-11.112

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

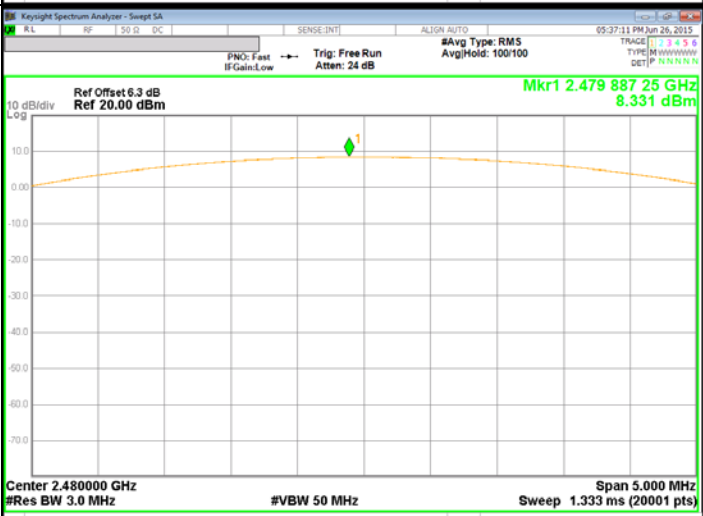
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.206	21	-12.794
Middle	2441	7.842	21	-13.158
High	2480	6.044	21	-14.956
Worst		8.206	21	-12.794

8.5.3. ENHANCED DATA RATE 8PSK MODULATION

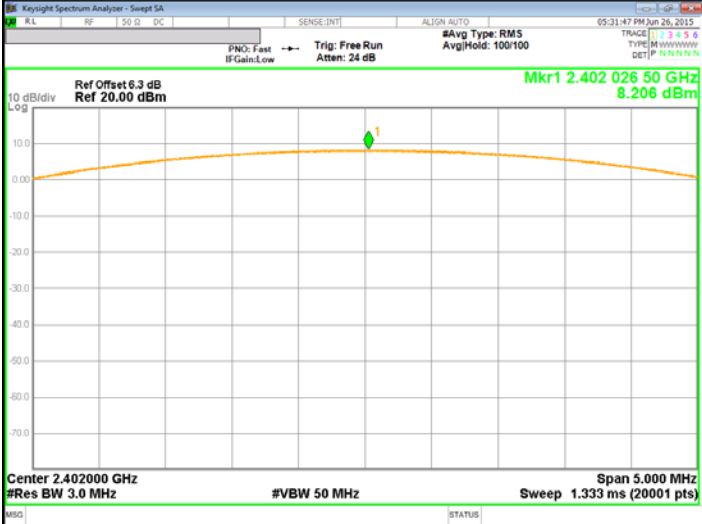
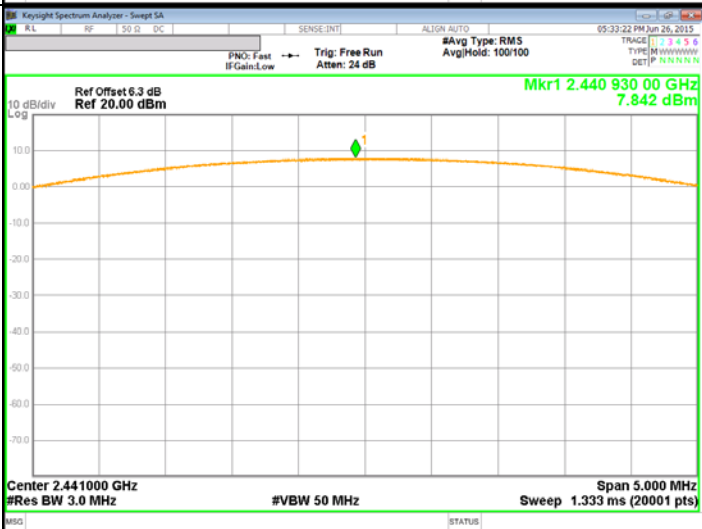
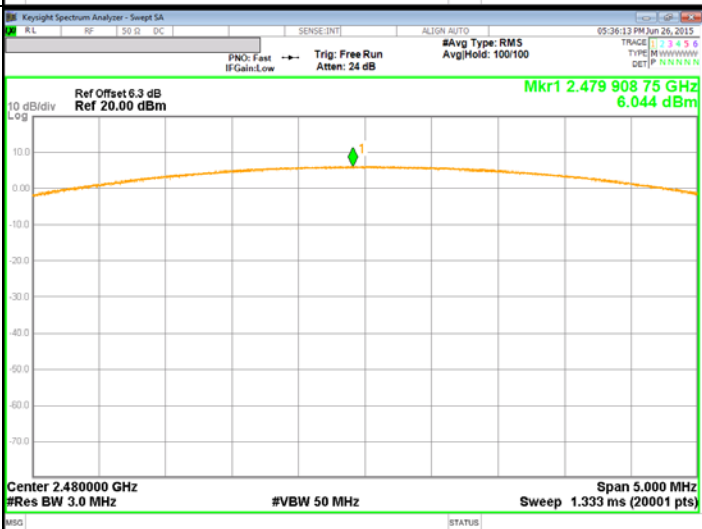
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.609	21	-12.391
Middle	2441	8.287	21	-12.713
High	2480	6.473	21	-14.527
Worst		8.609	21	-12.391

8.5.4. OUTPUT POWER PLOTS

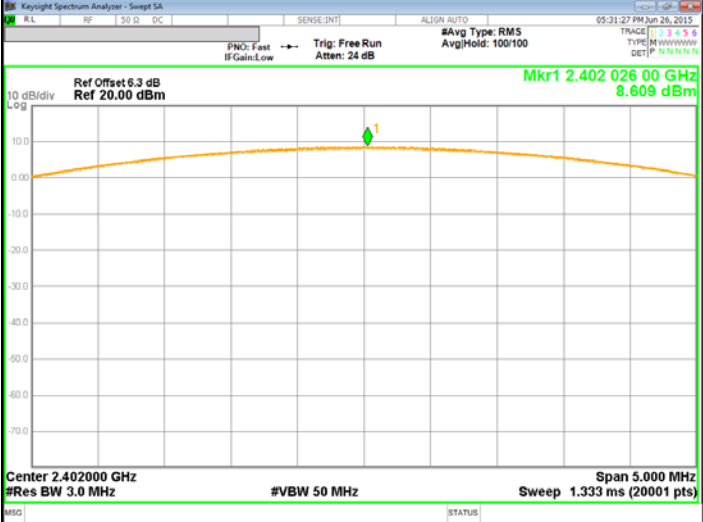
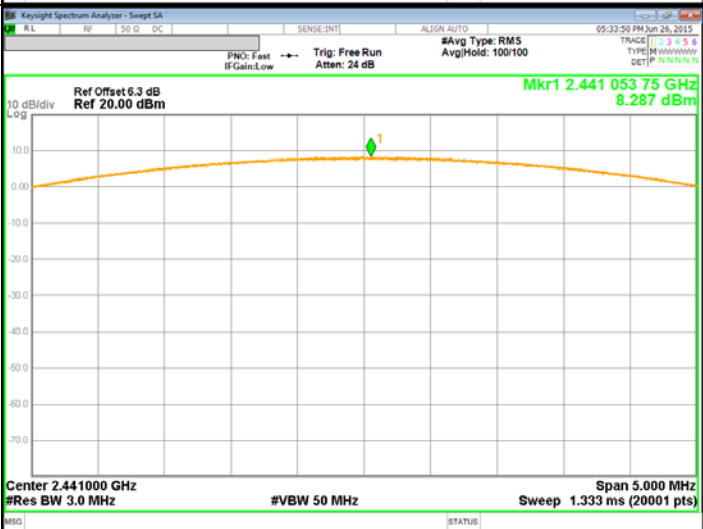
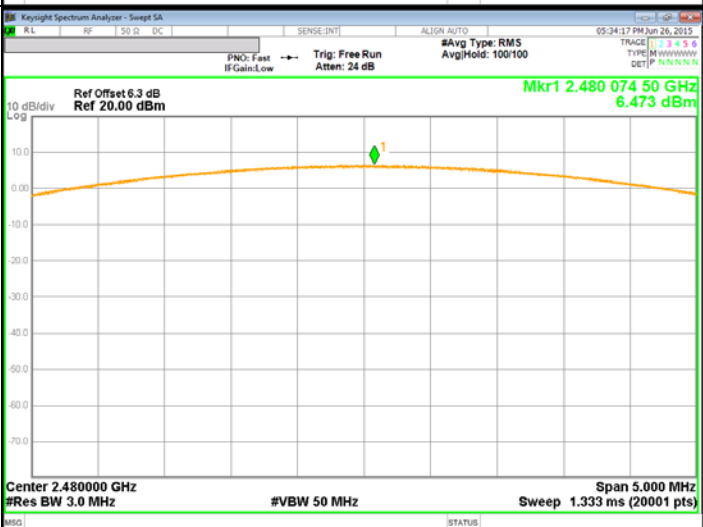
GFSK OUTPUT POWER

GFSK Low CH	 KeySight Spectrum Analyzer - Swept SA RL RF 50 Ω DC SENSE:INT ALIGN: AUTO 09:32:05 PM Jun 26, 2015 PNO: Fast Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.402 214 00 GHz 9.888 dBm 10 dB/div Log Center 2.402000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS
GFSK Middle CH	 KeySight Spectrum Analyzer - Swept SA RL RF 50 Ω DC SENSE:INT ALIGN: AUTO 09:32:53 PM Jun 26, 2015 PNO: Fast Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.440 871 00 GHz 9.870 dBm 10 dB/div Log Center 2.441000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS
GFSK High CH	 KeySight Spectrum Analyzer - Swept SA RL RF 50 Ω DC SENSE:INT ALIGN: AUTO 09:37:11 PM Jun 26, 2015 PNO: Fast Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.479 887 25 GHz 8.331 dBm 10 dB/div Log Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS

Pi/4-DPSK OUTPUT POWER

Pi/4-DPSK Low CH	 Key: Keysight Spectrum Analyzer - Sweep SA PNO: Fast IF Gain: Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.402 026 50 GHz 8.206 dBm Center 2.402000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS
Pi/4-DPSK Middle CH	 Key: Keysight Spectrum Analyzer - Sweep SA PNO: Fast IF Gain: Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.440 930 00 GHz 7.842 dBm Center 2.441000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS
Pi/4-DPSK High CH	 Key: Keysight Spectrum Analyzer - Sweep SA PNO: Fast IF Gain: Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.479 908 75 GHz 6.044 dBm Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts) MSG STATUS

8PSK OUTPUT POWER

8PSK Low CH	
8PSK Middle CH	
8PSK High CH	

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]	AV power [dBm]	AV power [mW]
Low	2402	9.66	9.25
Middle	2441	9.67	9.27
High	2480	8.08	6.43

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	5.72	3.73
Middle	2441	5.34	3.42
High	2480	3.50	2.24

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	5.83	3.83
Middle	2441	5.42	3.48
High	2480	3.59	2.28

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.

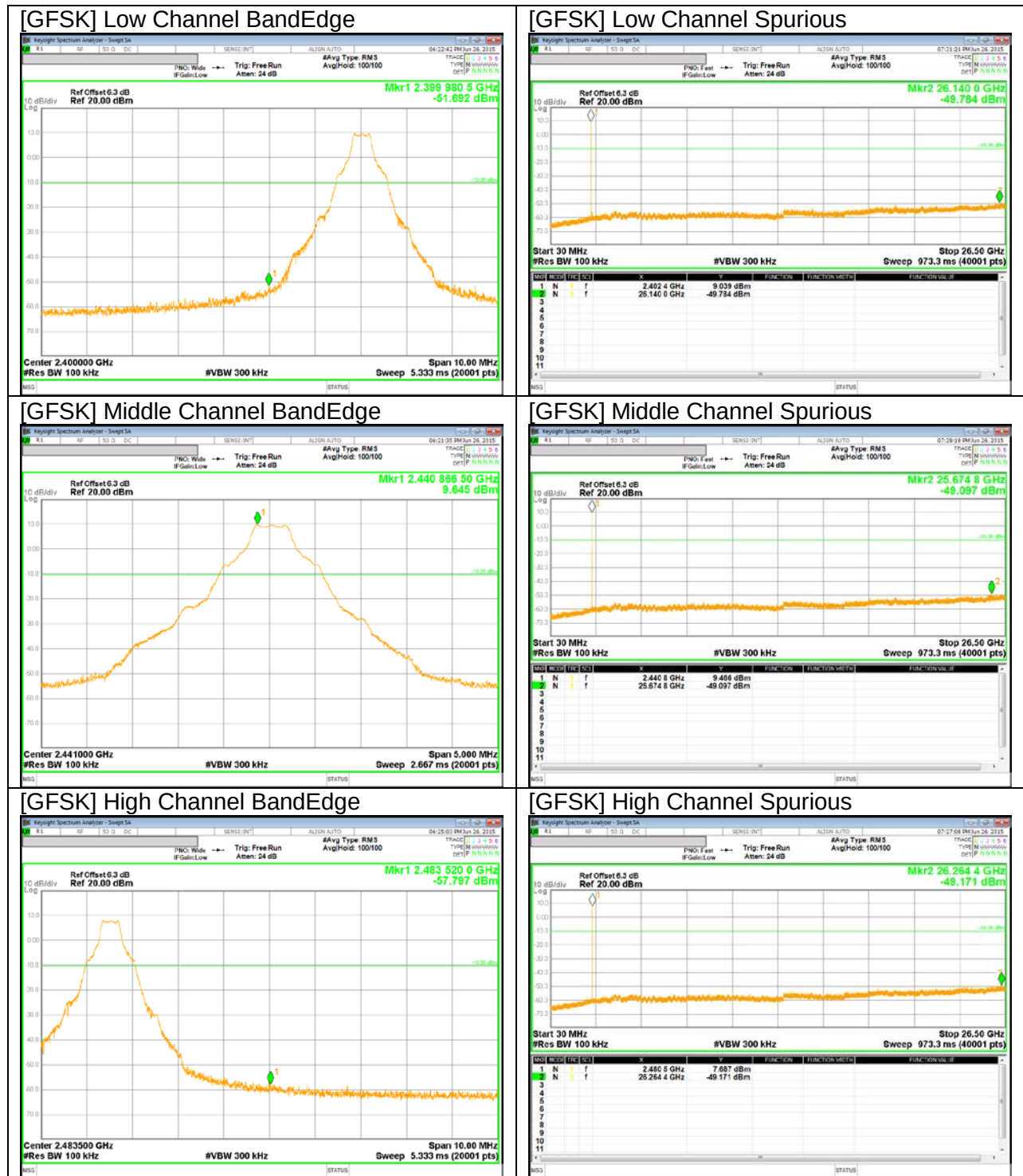
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

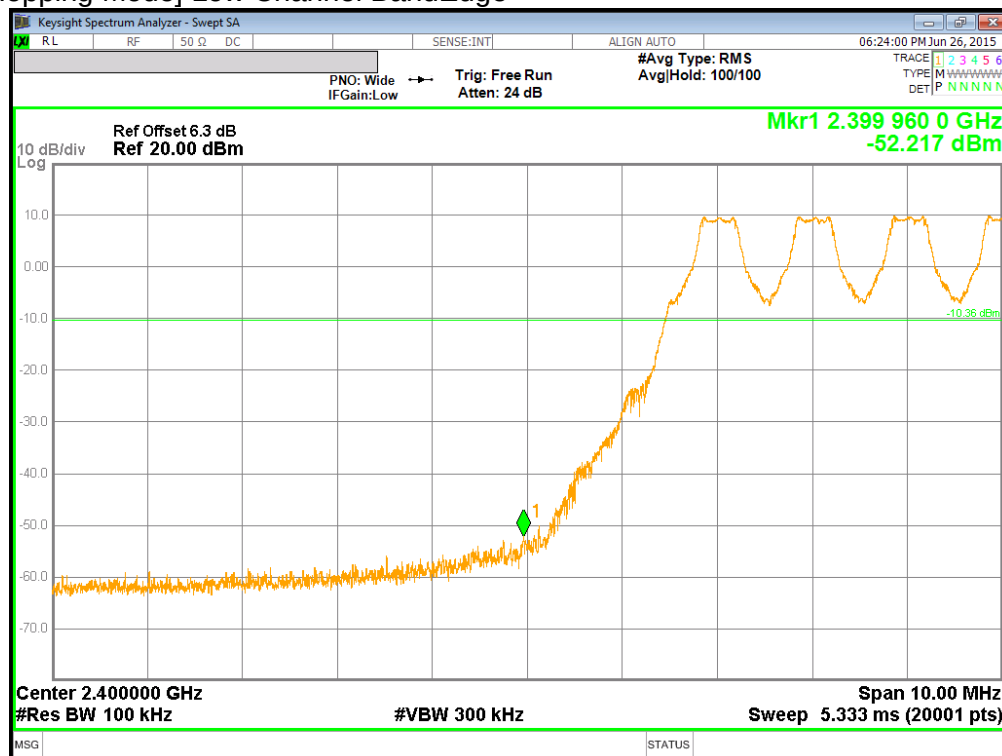
8.7.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

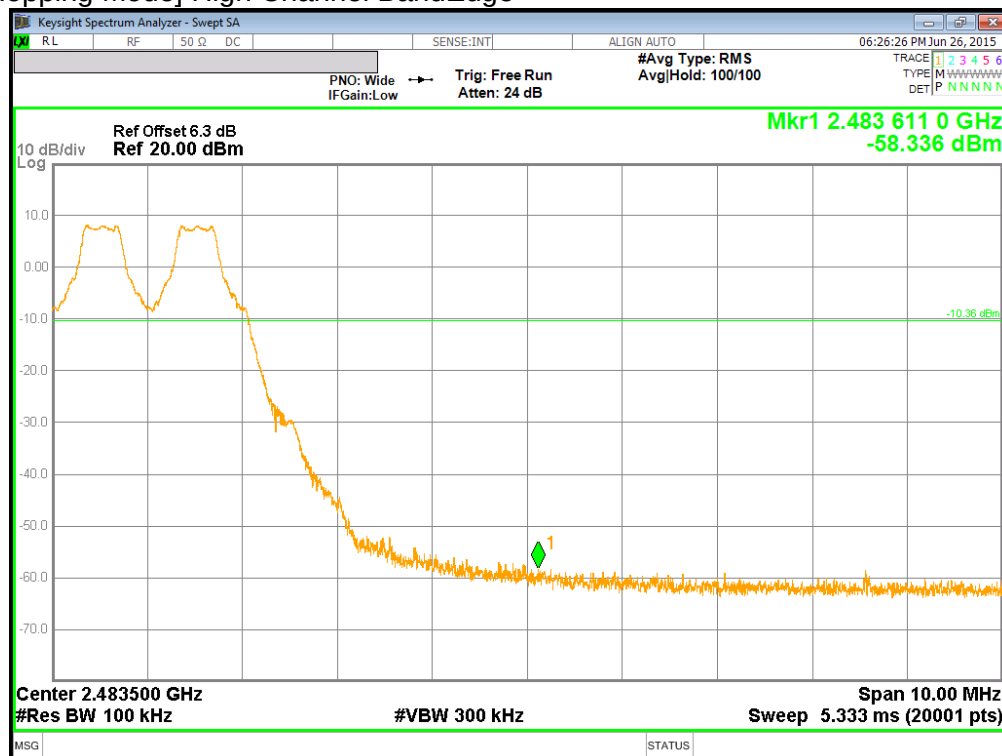


BandEdge Emission at GFSK Hopping Mode

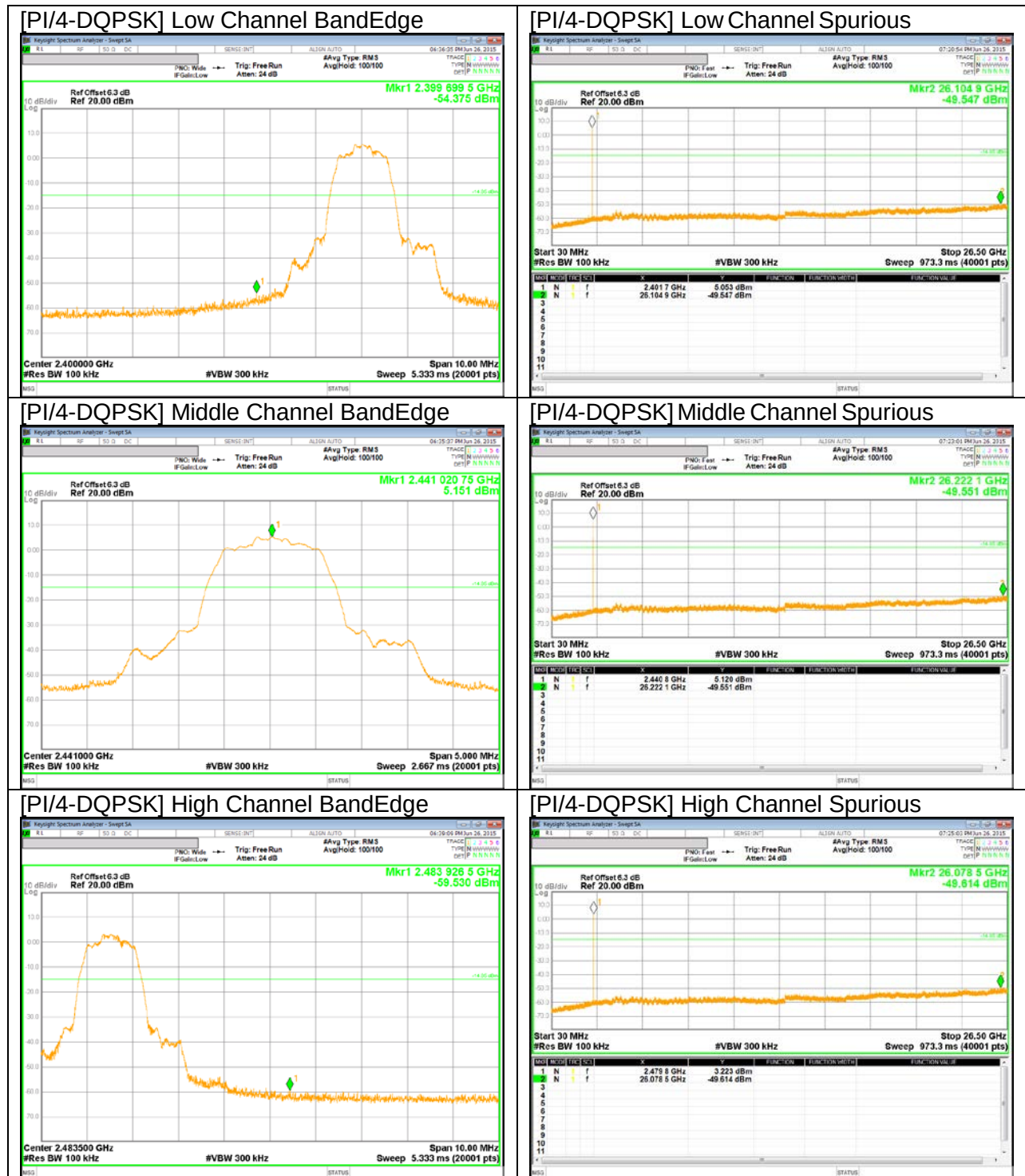
[GFSK Hopping Mode] Low Channel BandEdge



[GFSK Hopping Mode] High Channel BandEdge

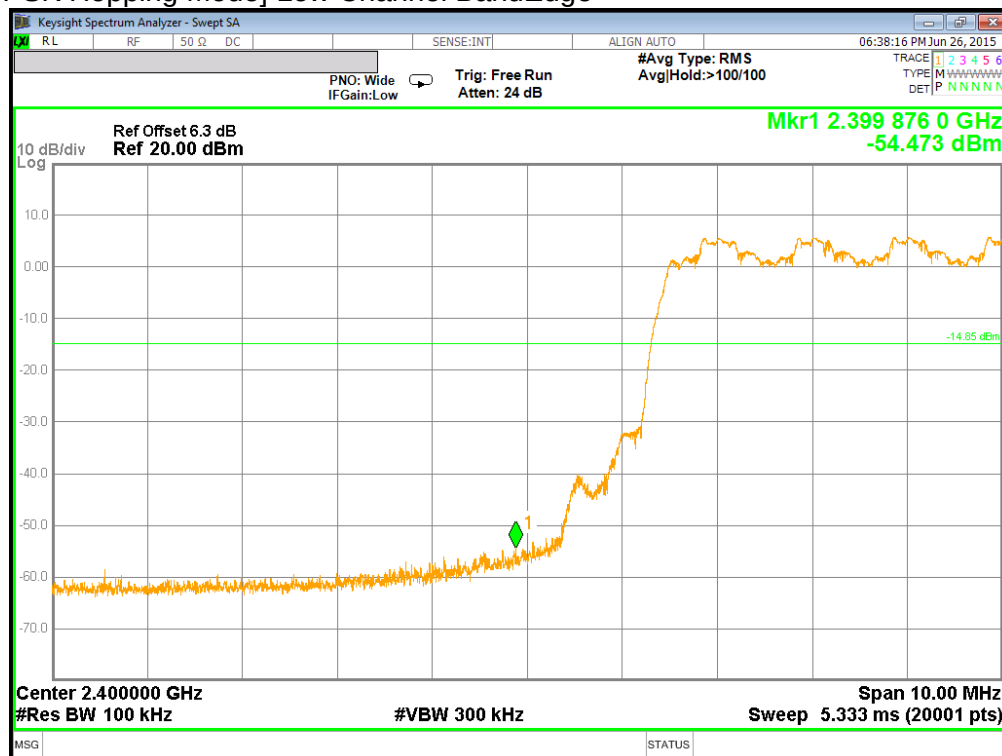


PI/4-DQPSK Mode

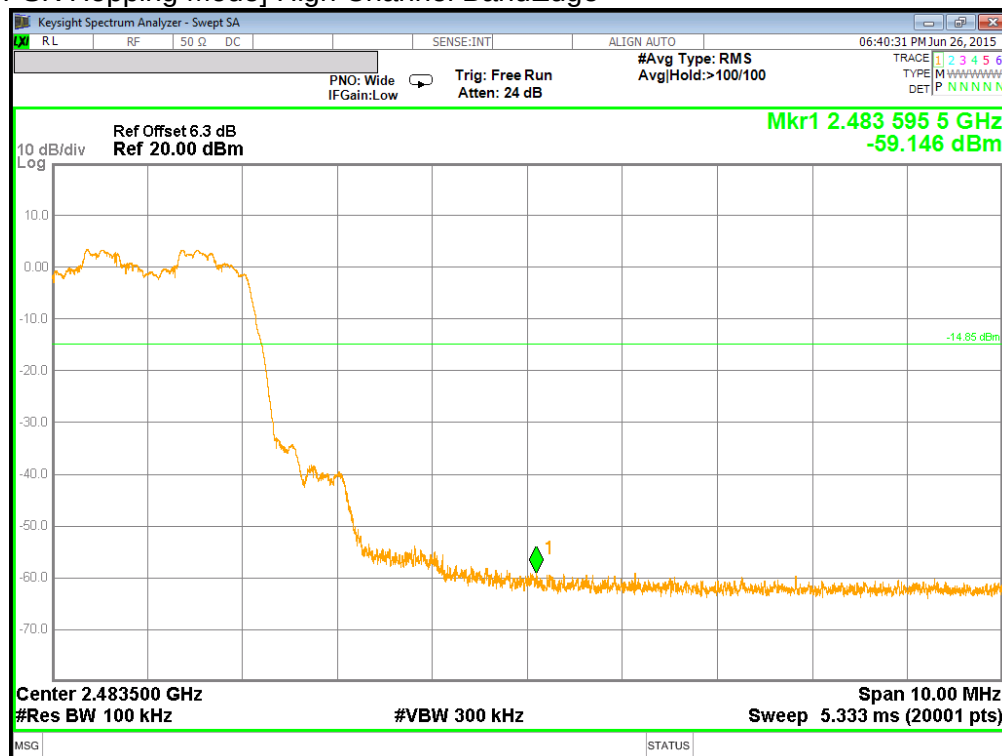


BandEdge Emission at PI/4-DQPSK Hopping Mode

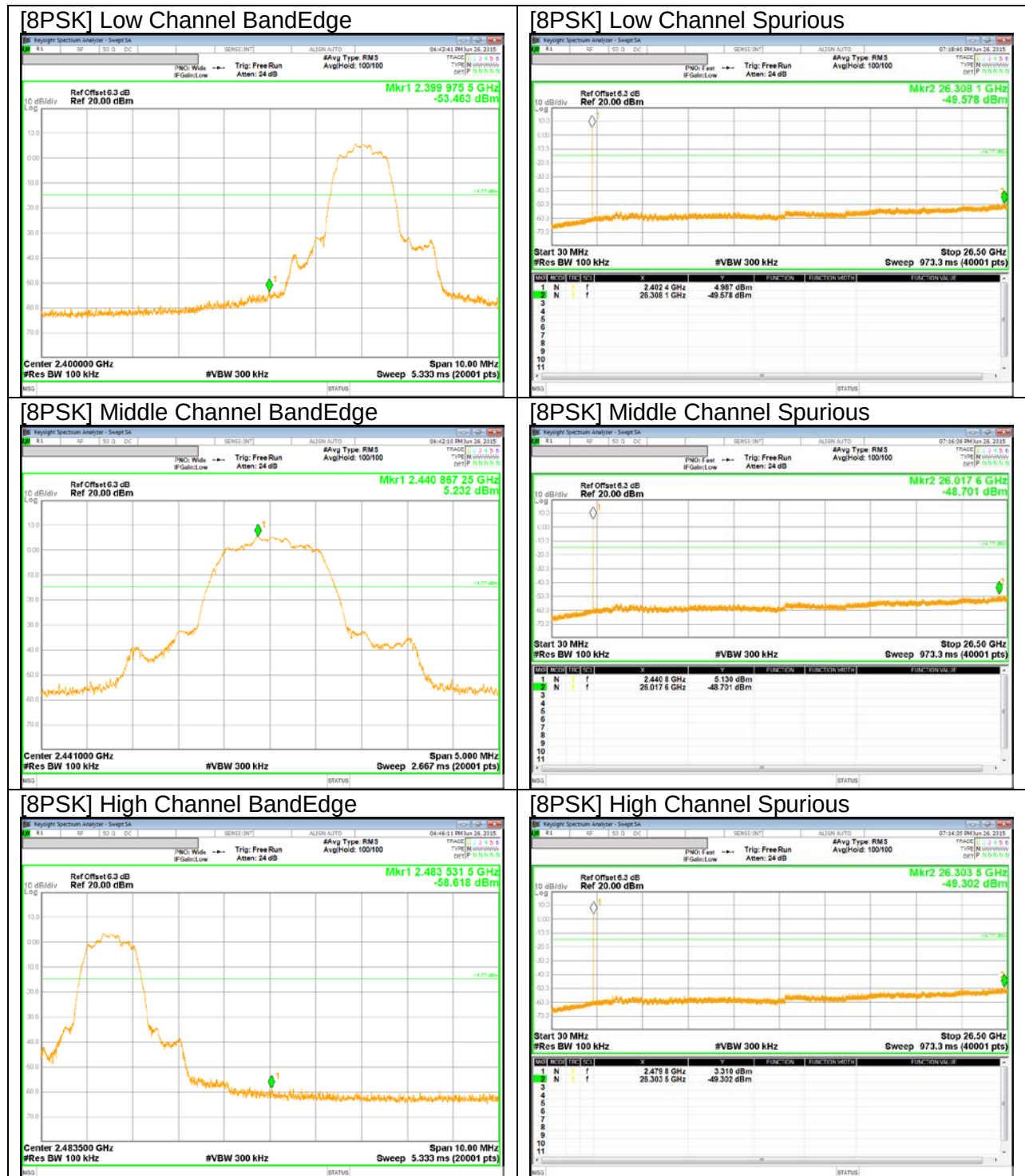
[PI/4-DQPSK Hopping Mode] Low Channel BandEdge



[PI/4-DQPSK Hopping Mode] High Channel BandEdge

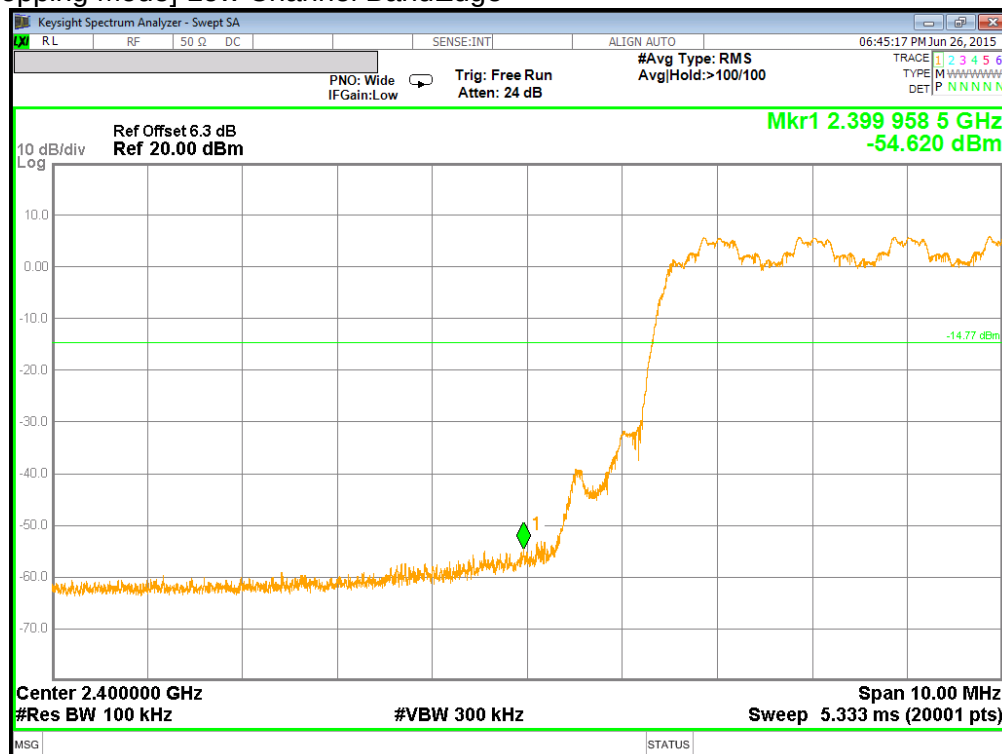


8PSK Mode

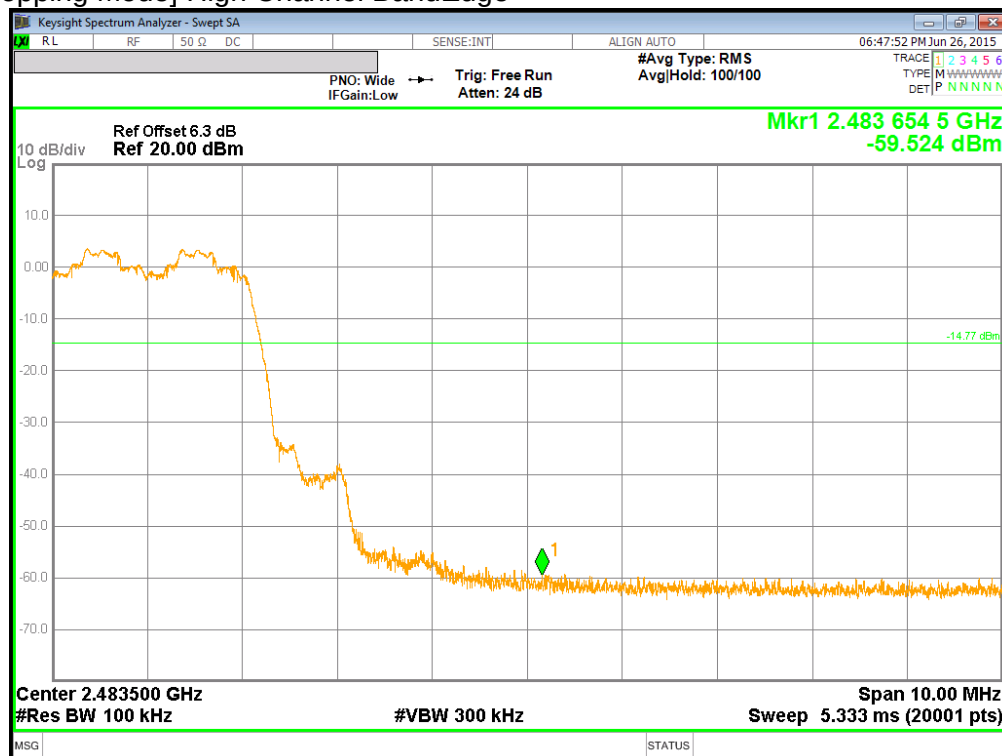


BandEdge Emission at 8PSK Hopping Mode

[8PSK Hopping Mode] Low Channel BandEdge



[8PSK Hopping Mode] High Channel BandEdge



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 C63.10. 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.

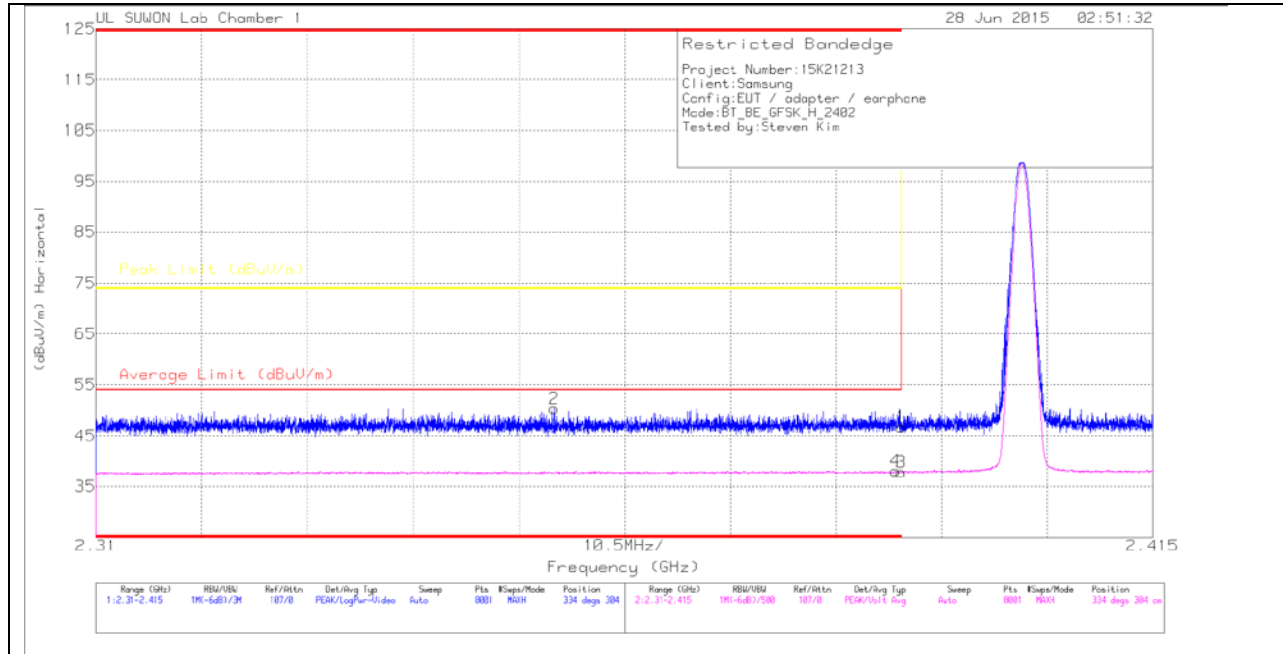
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

TRACE MARKERS

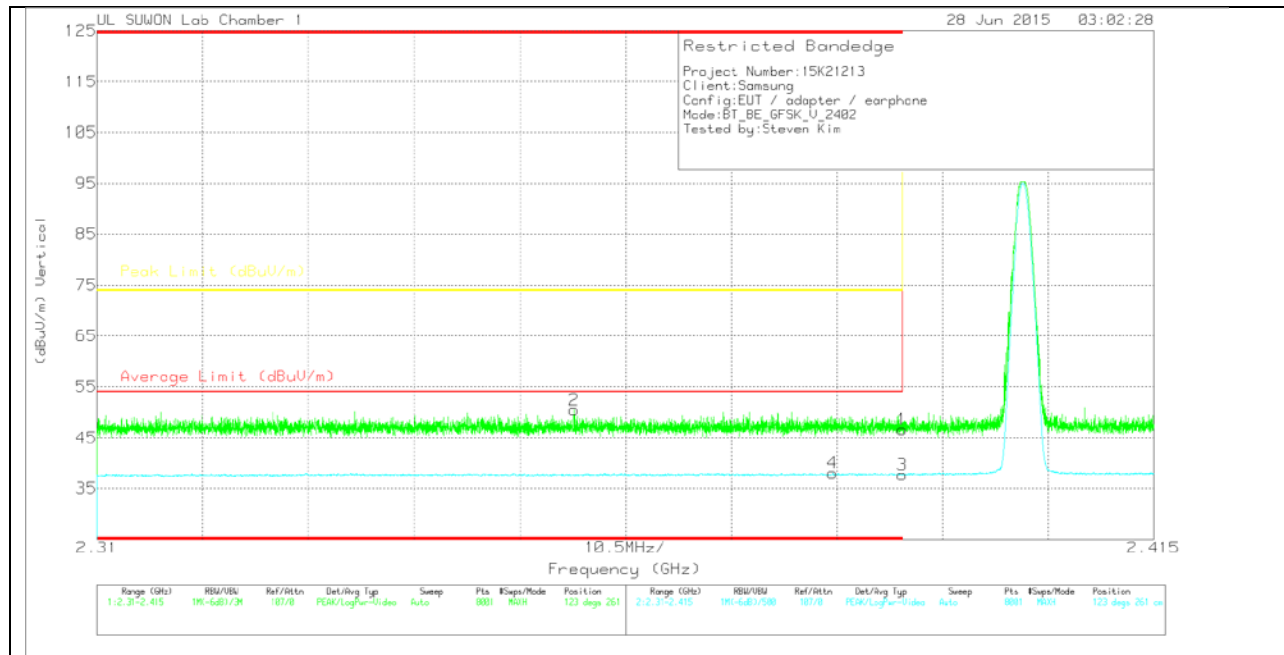
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.76	Pk	31.8	-22.8	46.76	-	-	74	-27.24	334	304	H
2	* 2.356	41.39	Pk	31.7	-22.8	50.29	-	-	74	-23.71	334	304	H
3	* 2.39	28.81	VB1T	31.8	-22.8	37.81	54	-16.19	-	-	334	304	H
4	* 2.389	29.05	VB1T	31.8	-22.8	38.05	54	-15.95	-	-	334	304	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

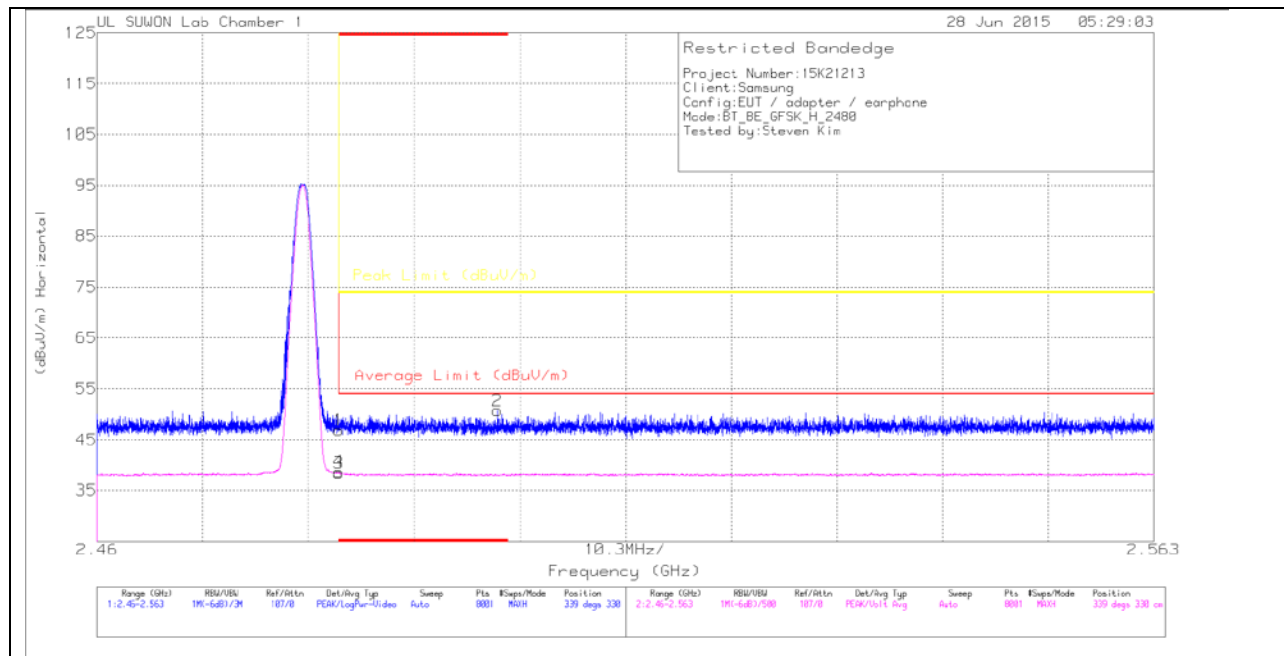
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.61	Pk	31.8	-22.8	46.61	-	-	74	-27.39	123	261	V
2	* 2.357	41.56	Pk	31.7	-22.8	50.46	-	-	74	-23.54	123	261	V
3	* 2.39	28.72	VB1T	31.8	-22.8	37.72	54	-16.28	-	-	123	261	V
4	* 2.383	29.05	VB1T	31.8	-22.8	38.05	54	-15.95	-	-	123	261	V

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

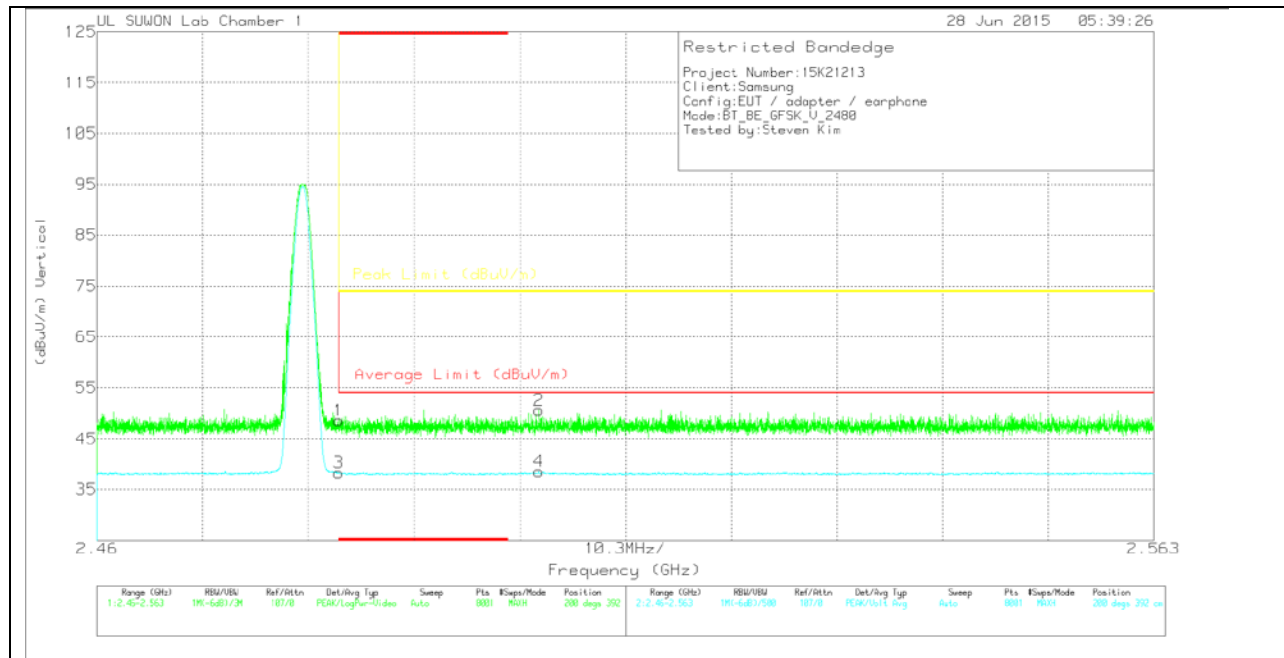
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.48	Pk	32	-22.6	46.88	-	-	74	-27.12	339	330	H
2	* 2.499	41.3	Pk	32	-22.6	50.7	-	-	74	-23.3	339	330	H
3	* 2.484	29.08	VB1T	32	-22.6	38.48	54	-15.52	-	-	339	330	H
4	* 2.484	29.25	VB1T	32	-22.6	38.65	54	-15.35	-	-	339	330	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	3117(0016 8717)_150 619	Path_2_10 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	39.16	Pk	32	-22.6	48.56	-	-	74	-25.44	200	392	V
2	2.503	41.17	Pk	32	-22.6	50.57	-	-	74	-23.43	200	392	V
3	* 2.484	28.96	VB1T	32	-22.6	38.36	54	-15.64	-	-	200	392	V
4	2.503	29.15	VB1T	32	-22.6	38.55	54	-15.45	-	-	200	392	V

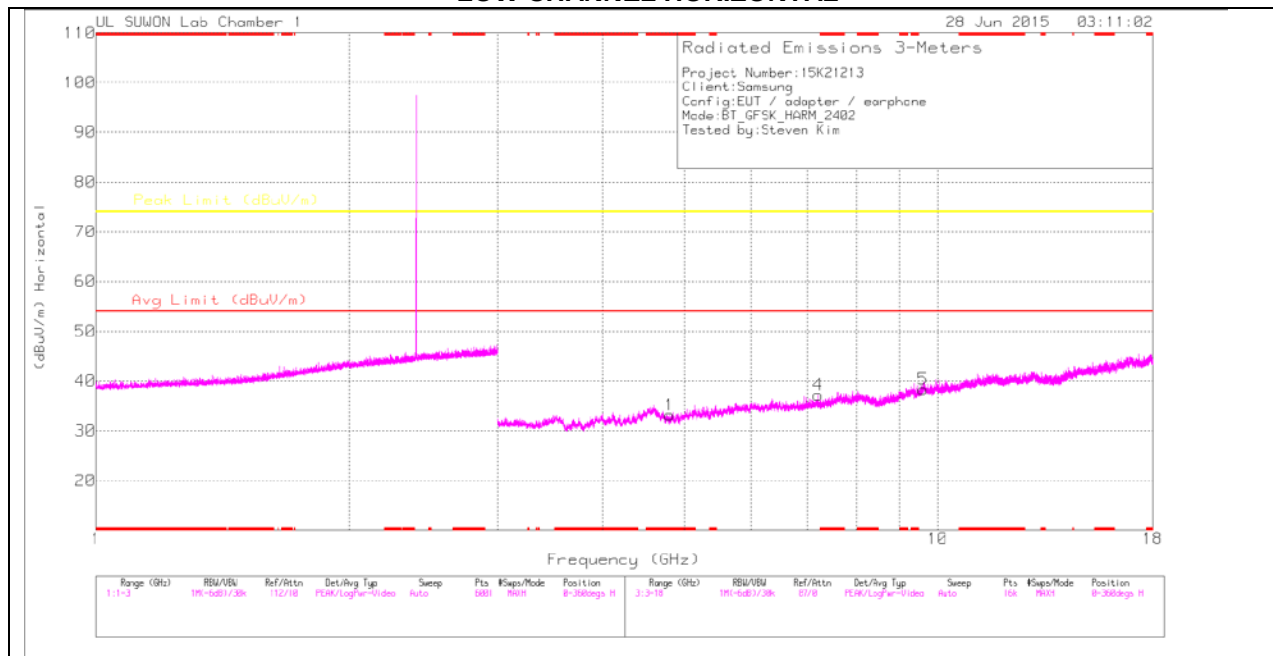
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

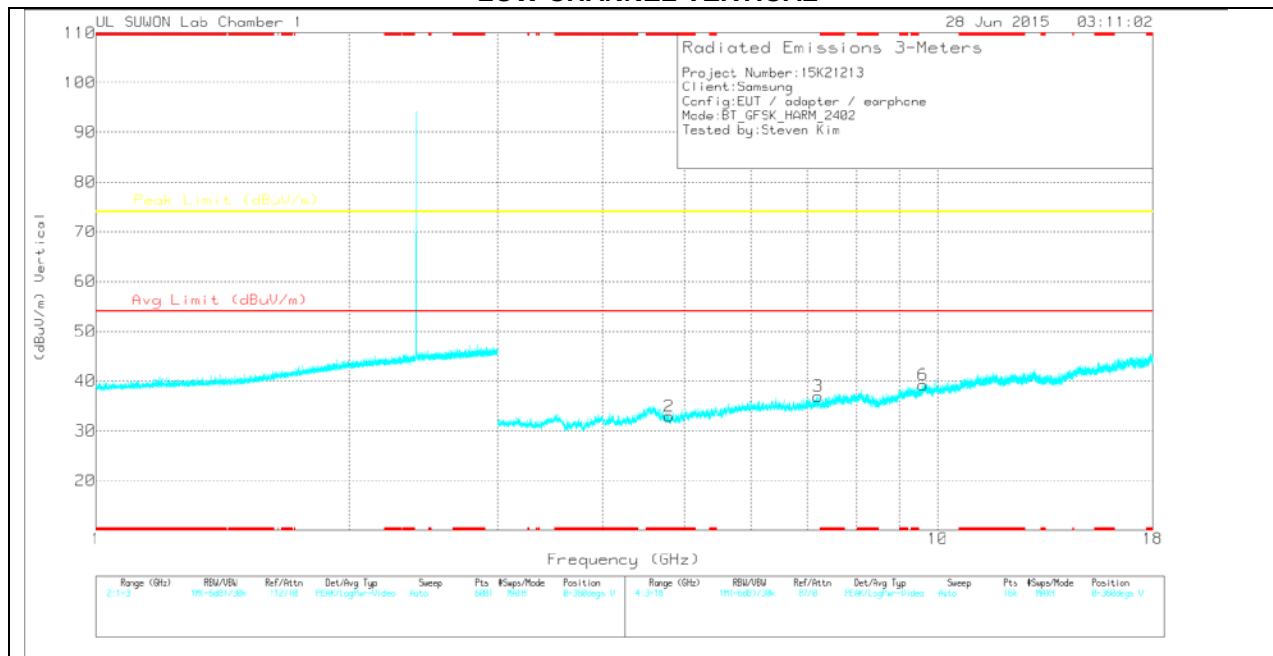
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

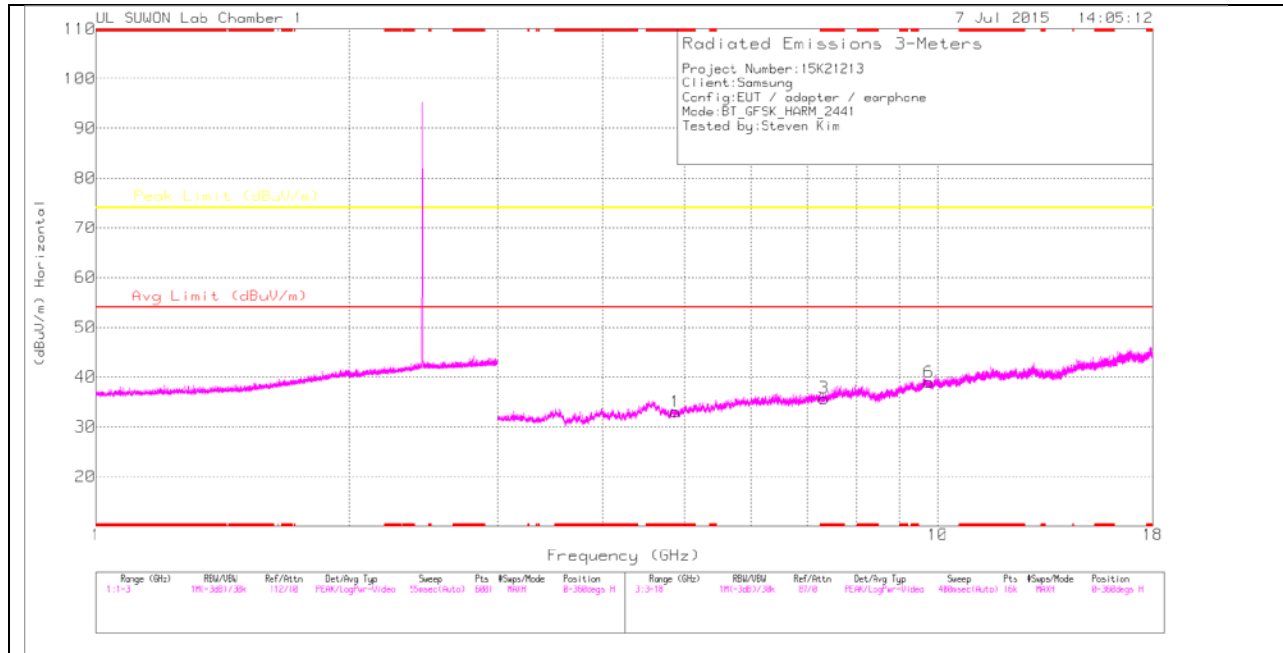
TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717) 150 619	Path_3_3 GHP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	28.97	PK	34	-29.8	33.17	-	-	74	-40.83	0-360	100	H
4	7.205	26.94	PK	35.7	-25.4	37.24	-	-	-	-	0-360	200	H
5	9.609	22.35	PK	37	-21	38.35	-	-	-	-	0-360	100	H
2	* 4.799	28.83	PK	34	-29.9	32.93	-	-	74	-41.07	0-360	100	V
3	7.205	26.64	PK	35.7	-25.4	36.94	-	-	-	-	0-360	100	V
6	9.608	23.25	PK	37	-21	39.25	-	-	-	-	0-360	100	V

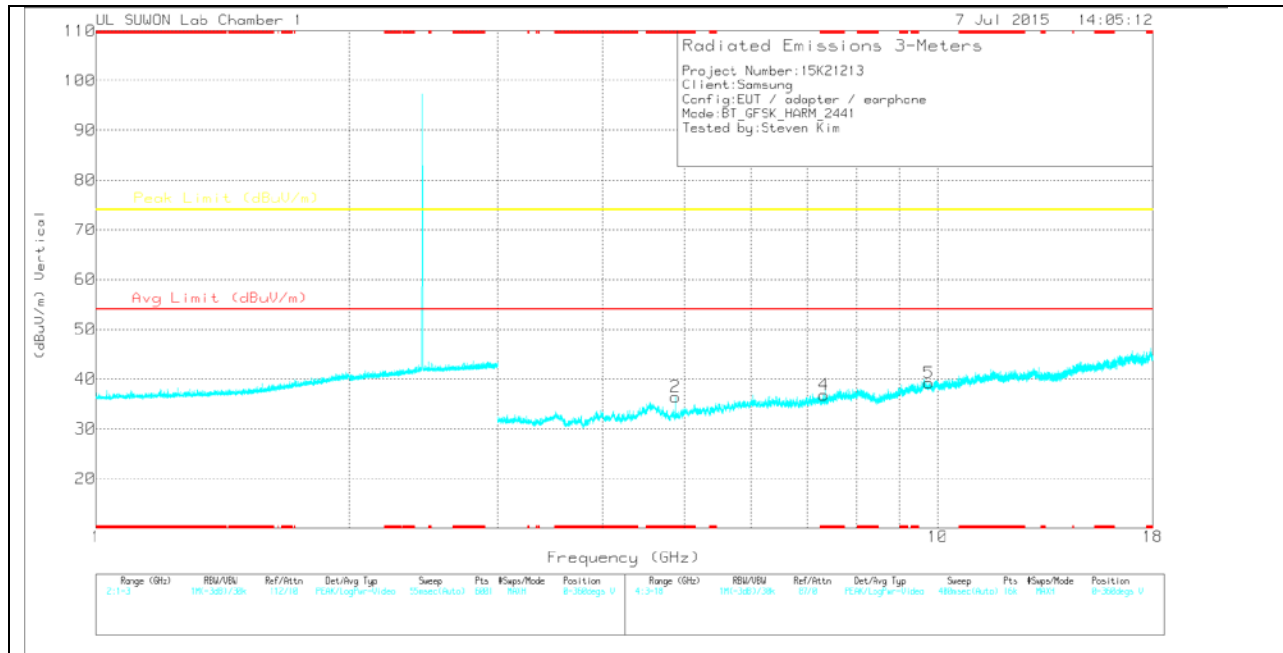
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

MID CHANNEL HORIZONTAL



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	3117(00168 717)_15061 9	Path_3_3 GHP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	28.17	PK	34	-29.1	33.07	-	-	74	-40.93	0-360	100	H
3	* 7.323	25.55	PK	35.8	-25.6	35.75	-	-	74	-38.25	0-360	200	H
6	9.76	23.78	PK	37.2	-22	38.98	-	-	74	-35.02	0-360	100	H
2	* 4.881	31.58	PK	34	-29.1	36.48	-	-	74	-37.52	0-360	100	V
4	* 7.323	26.66	PK	35.8	-25.6	36.86	-	-	74	-37.14	0-360	200	V
5	9.753	24.02	PK	37.2	-22	39.22	-	-	74	-34.78	0-360	100	V

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

PK – Peak detector

Radiated Emissions

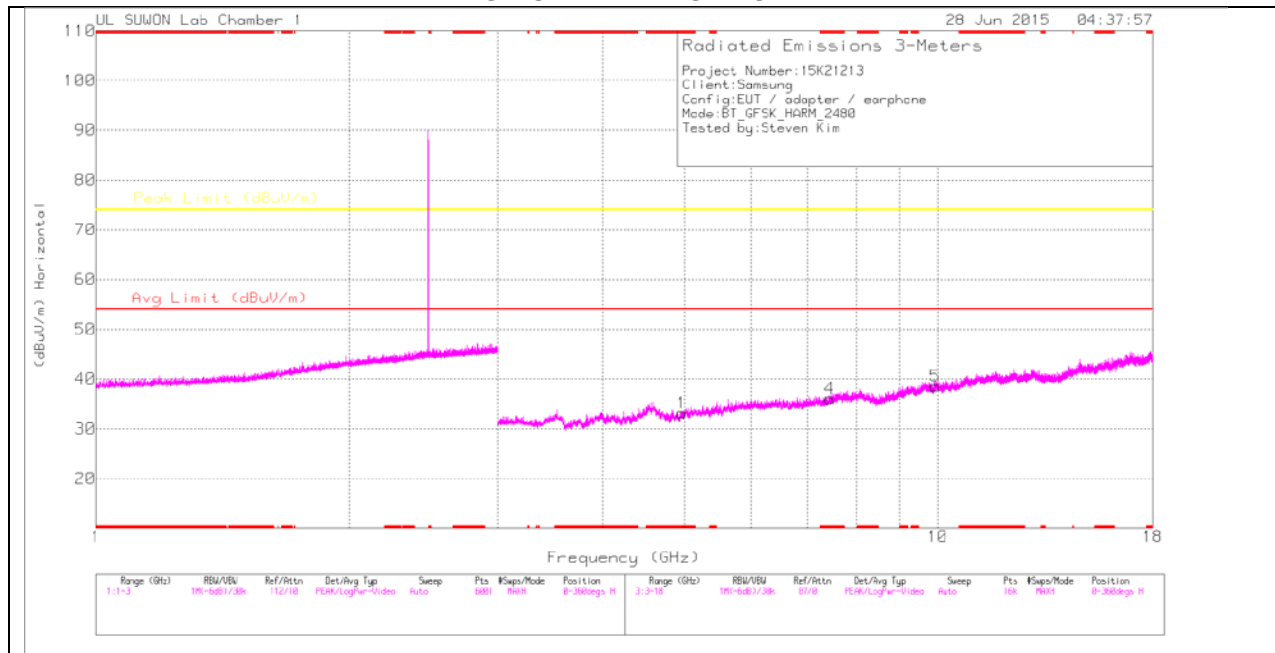
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.882	36.38	PK3	34	-29.1	41.28	-	-	74	-32.72	182	325	V
* 4.882	29.13	VB1T	34	-29.1	34.03	54	-19.97	-	-	182	325	V

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

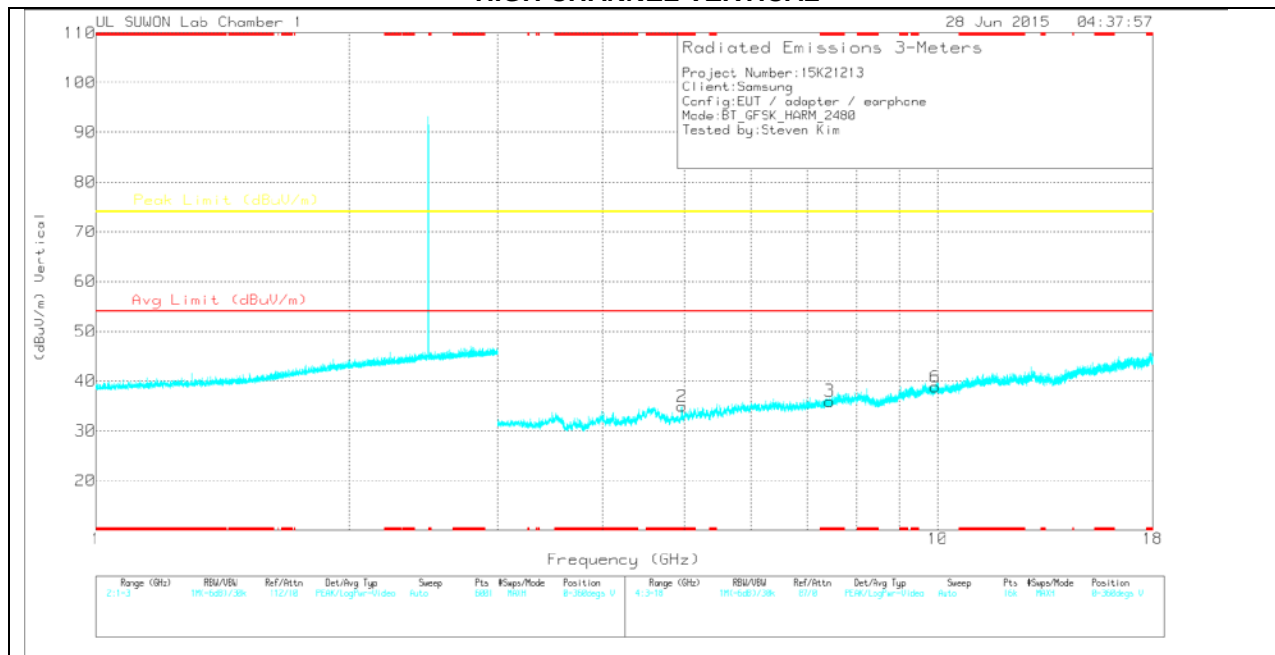
PK3 - FHSS Method: Maximum Peak

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

HIGH CHANNEL HORIZONTAL



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.

HIGH CHANNEL DATA

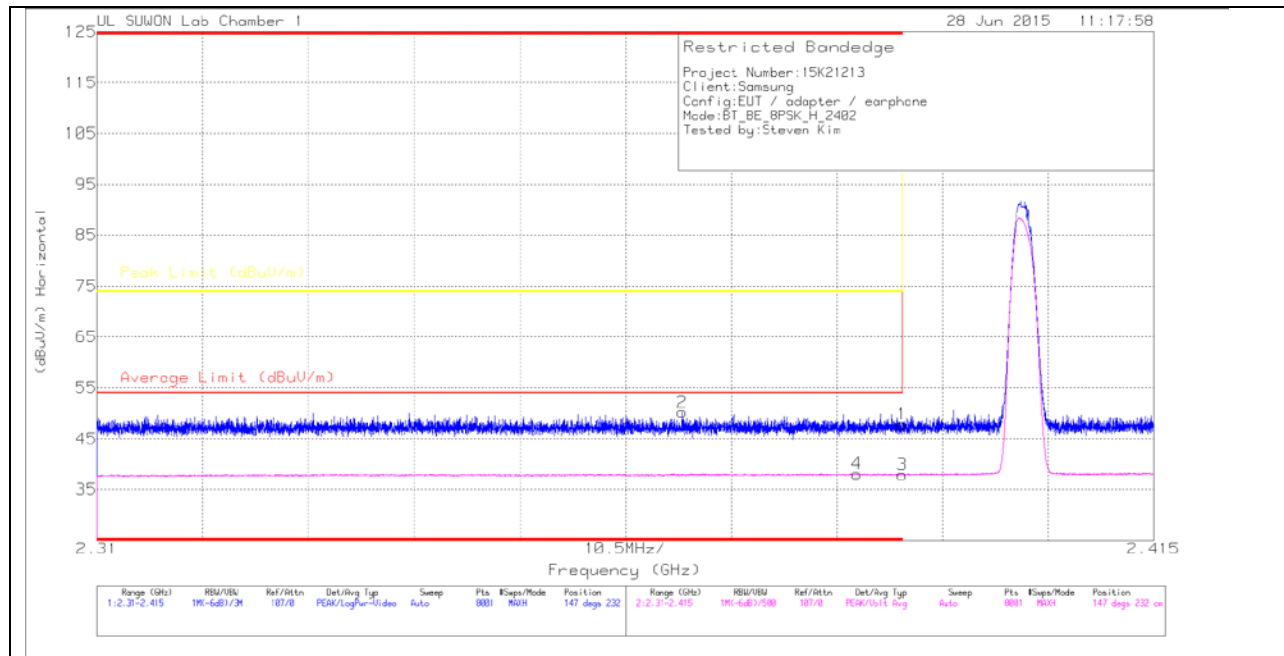
TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	Path_3_3 GHP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.963	28.04	PK	34	-28.9	33.14	-	-	74	-40.86	0-360	100	H
4	* 7.438	25.03	PK	35.8	-24.8	36.03	-	-	74	-37.97	0-360	100	H
5	9.921	21.6	PK	37.4	-20.4	38.6	-	-	-	-	0-360	200	H
2	* 4.96	29.8	PK	34	-28.9	34.9	-	-	74	-39.1	0-360	100	V
3	* 7.439	25	PK	35.8	-24.8	36	-	-	74	-38	0-360	100	V
6	9.921	21.87	PK	37.4	-20.4	38.87	-	-	-	-	0-360	200	V

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

PK – Peak detector

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



HORIZONTAL DATA

TRACE MARKERS

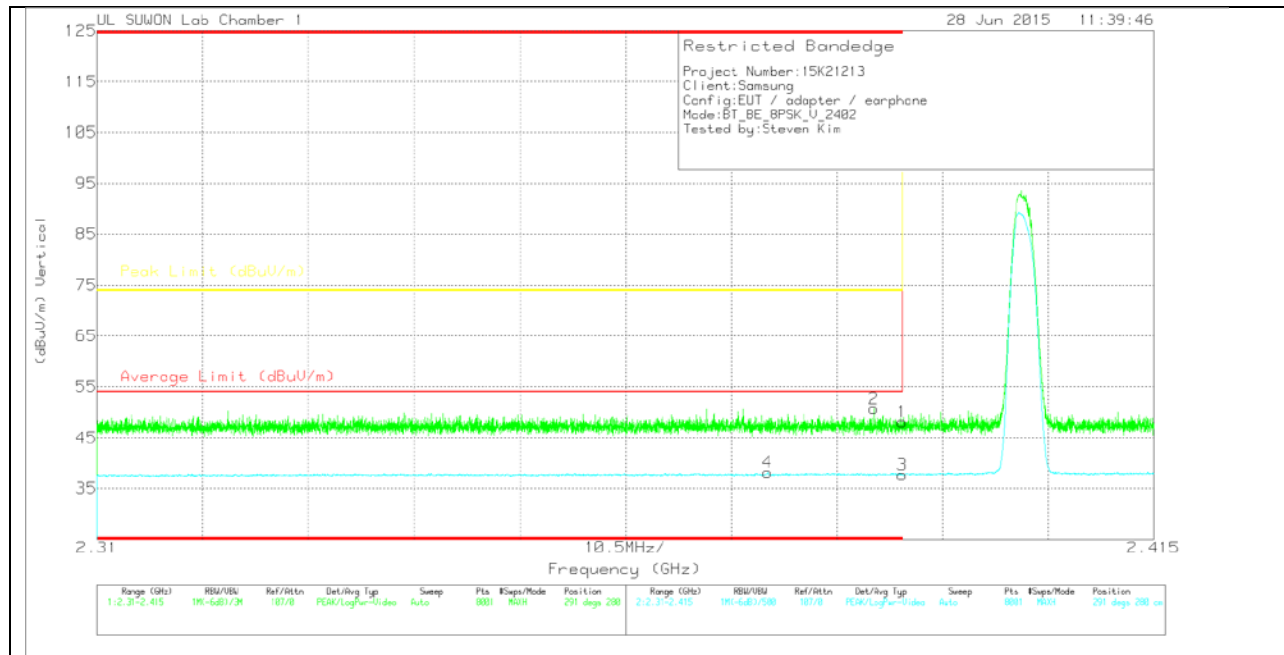
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/0016 8717_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.89	Pk		-22.8	47.89	-	-	74	-26.11	147	232	H
2	* 2.368	41.15	Pk		-22.8	50.15	-	-	74	-23.85	147	232	H
3	* 2.39	28.96	VB1T		-22.8	37.96	54	-16.04	-	-	147	232	H
4	* 2.386	29.14	VB1T		-22.8	38.14	54	-15.86	-	-	147	232	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	3117(0016 8717)_150 619	Path_2_10 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	39.11	Pk	31.8	-22.8	48.11	-	-	74	-25.89	291	280	V
2	* 2.387	41.72	Pk	31.8	-22.8	50.72	-	-	74	-23.28	291	280	V
3	* 2.39	28.74	VB1T	31.8	-22.8	37.74	54	-16.26	-	-	291	280	V
4	* 2.377	29.22	VB1T	31.8	-22.8	38.22	54	-15.78	-	-	291	280	V

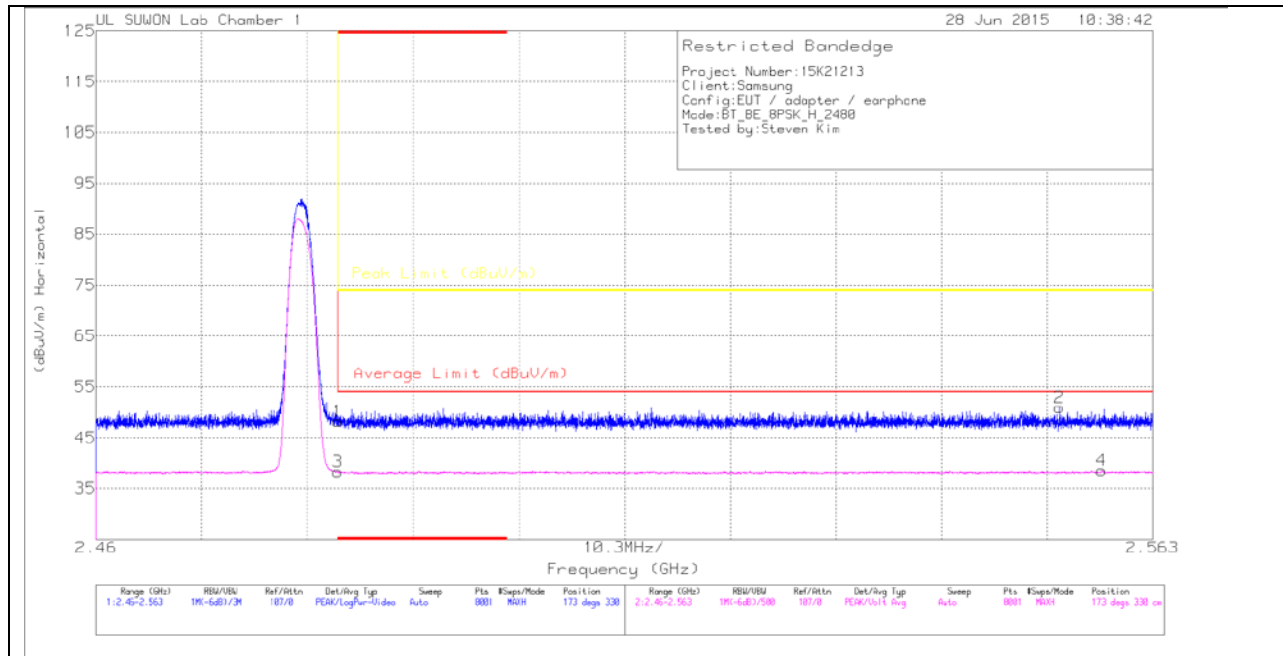
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

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

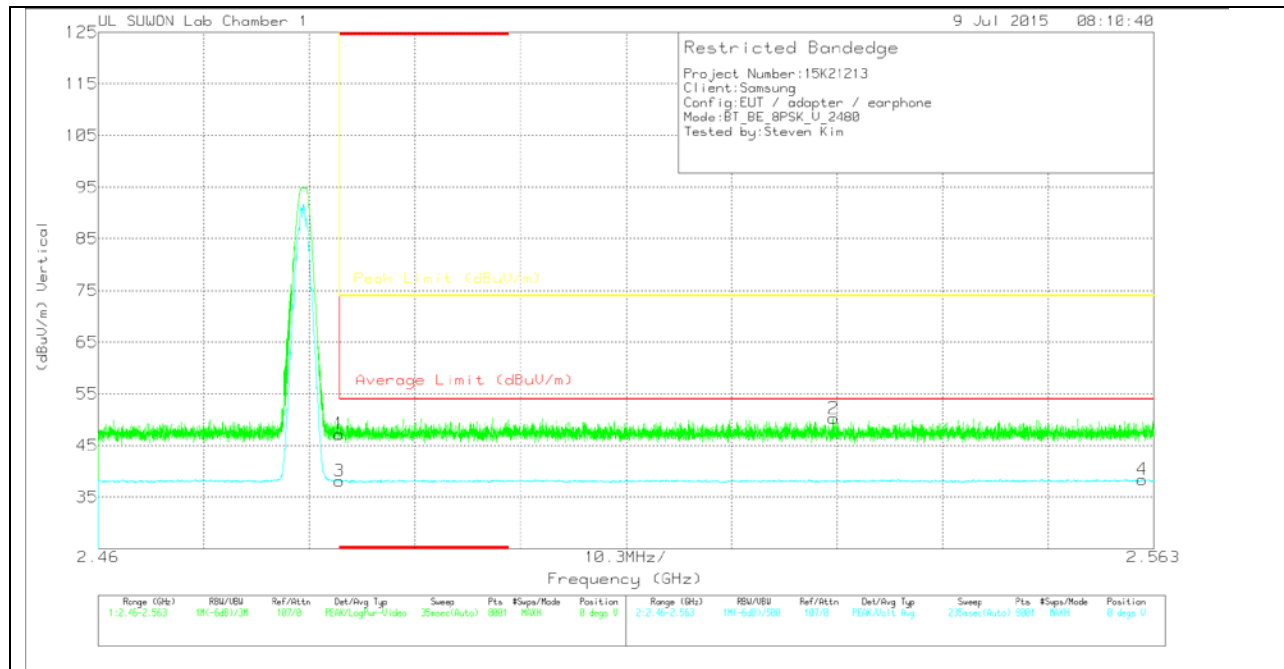
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.86	Pk	32	-22.6	48.26	-	-	74	-25.74	173	330	H
2	2.554	41.56	Pk	32	-22.6	50.96	-	-	74	-23.04	173	330	H
3	* 2.484	28.96	VB1T	32	-22.6	38.36	54	-15.64	-	-	173	330	H
4	2.558	29.13	VB1T	32	-22.6	38.53	54	-15.47	-	-	173	330	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	3117(0016 8717)_150 619	Path_2_10 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	37.83	Pk	32	-22.6	47.23	-	-	74	-26.77	0	328	V
2	2.532	40.87	Pk	32	-22.6	50.27	-	-	74	-23.73	0	328	V
3	* 2.484	28.8	VB1T	32	-22.6	38.2	54	-15.8	-	-	0	328	V
4	2.562	29.06	VB1T	32	-22.6	38.46	54	-15.54	-	-	0	328	V

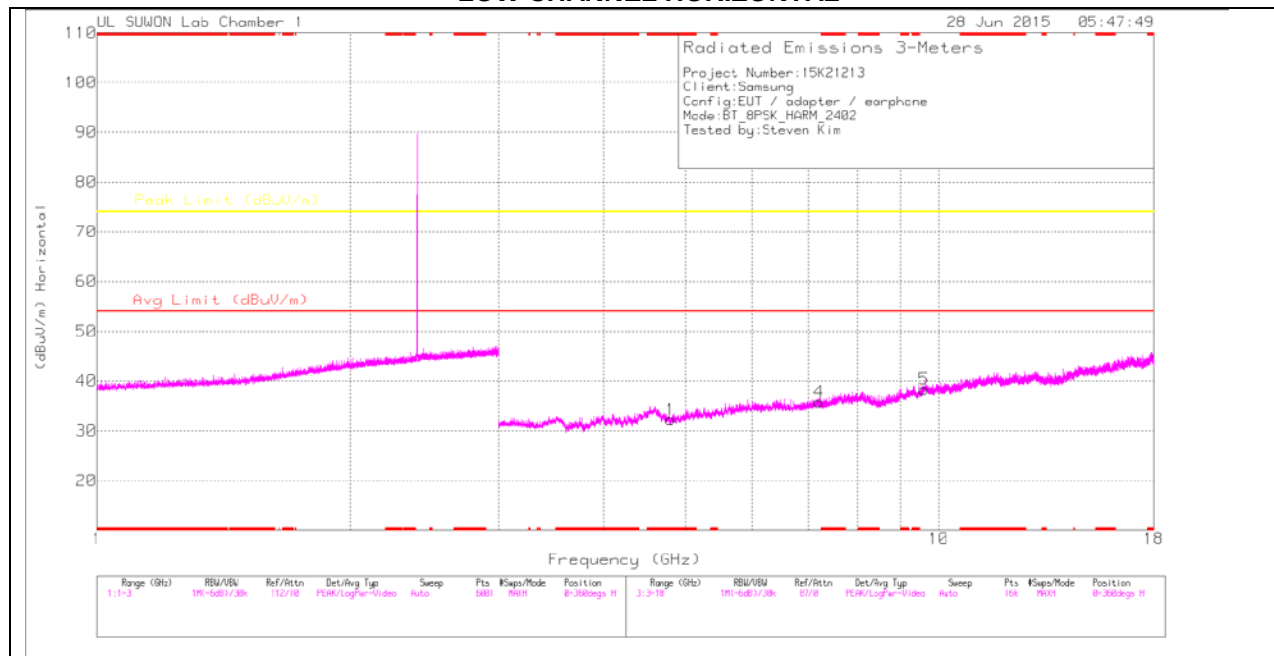
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

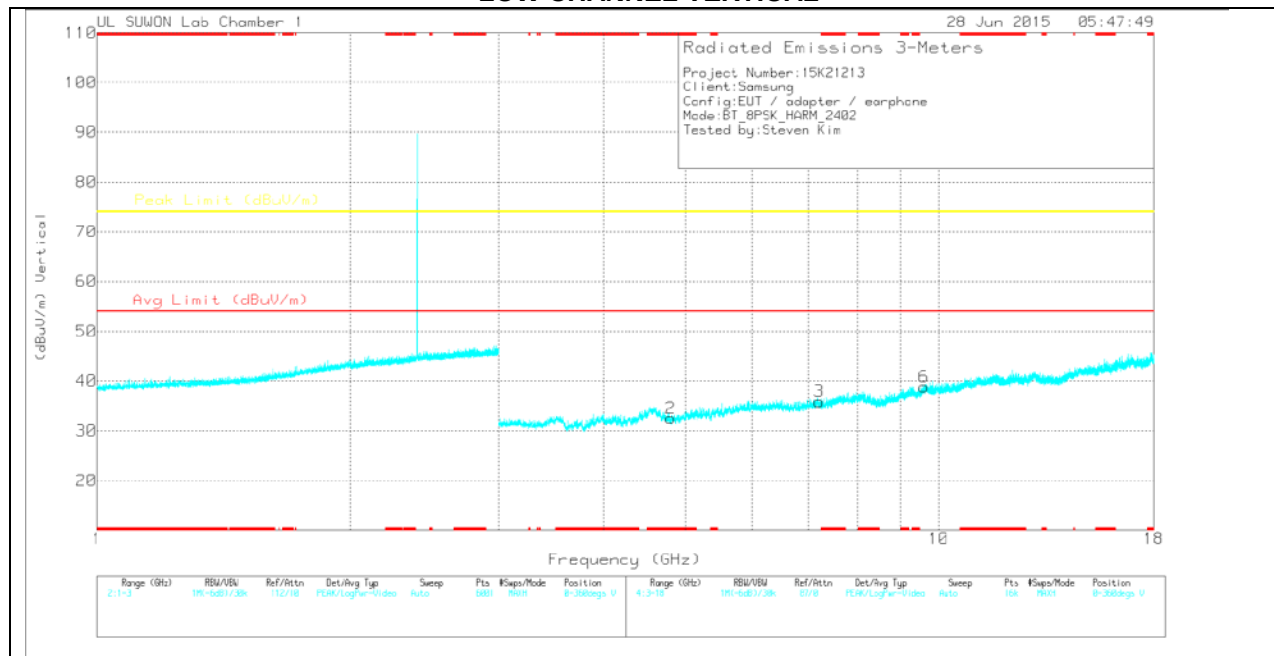
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

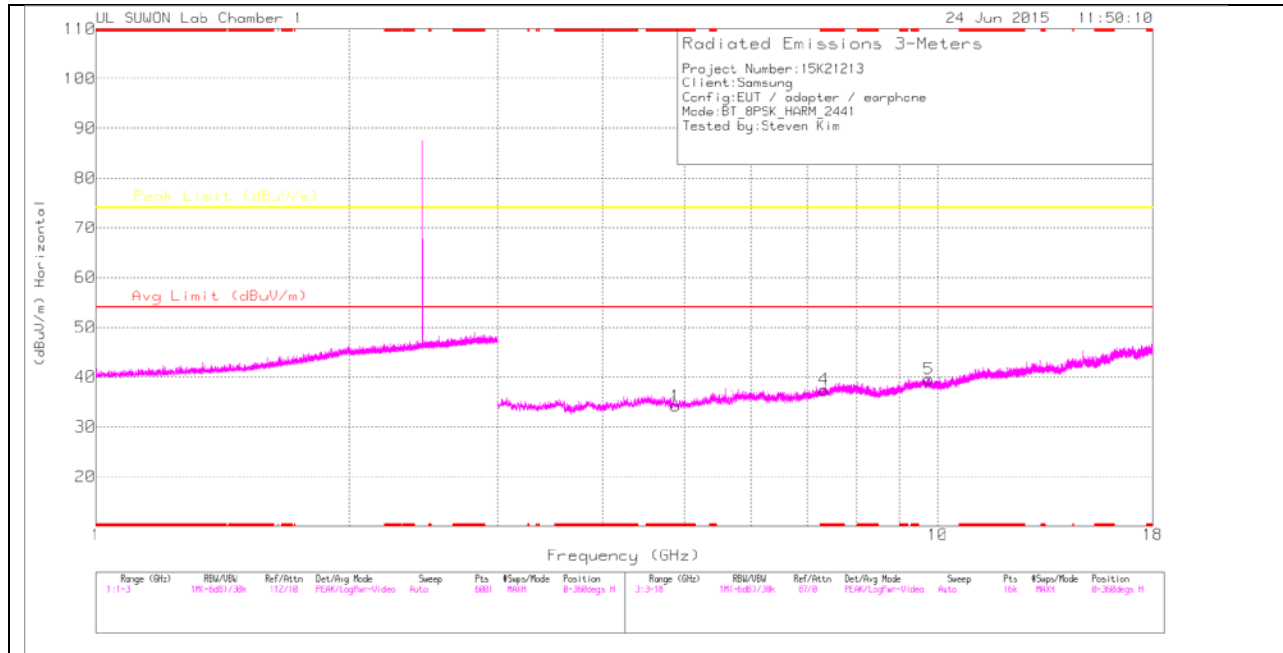
TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	Path_3_3 GHP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.805	28.02	PK	34	-29.8	32.22	-	-	74	-41.78	0-360	200	H
4	7.208	25.54	PK	35.7	-25.4	35.84	-	-	-	-	0-360	200	H
5	9.607	22.35	PK	37	-21	38.35	-	-	-	-	0-360	200	H
2	* 4.804	28.28	PK	34	-29.8	32.48	-	-	74	-41.52	0-360	100	V
3	7.205	25.58	PK	35.7	-25.4	35.88	-	-	-	-	0-360	100	V
6	9.61	22.82	PK	37	-21	38.82	-	-	-	-	0-360	200	V

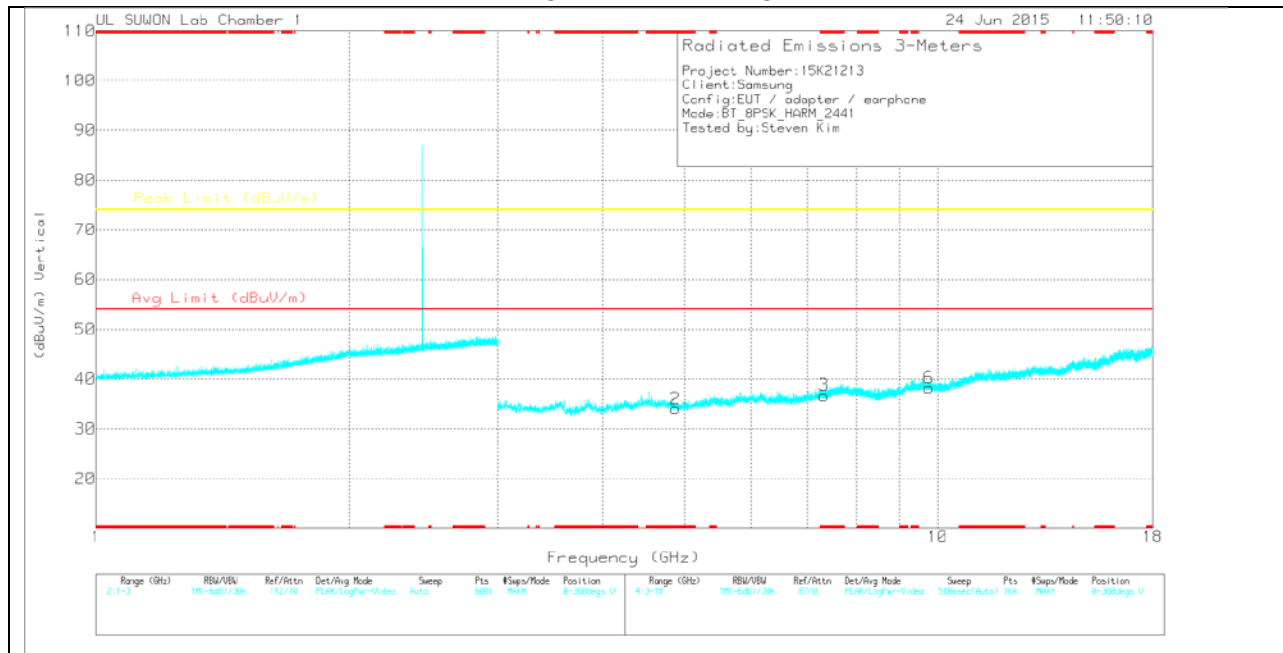
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

MID CHANNEL HORIZONTAL



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

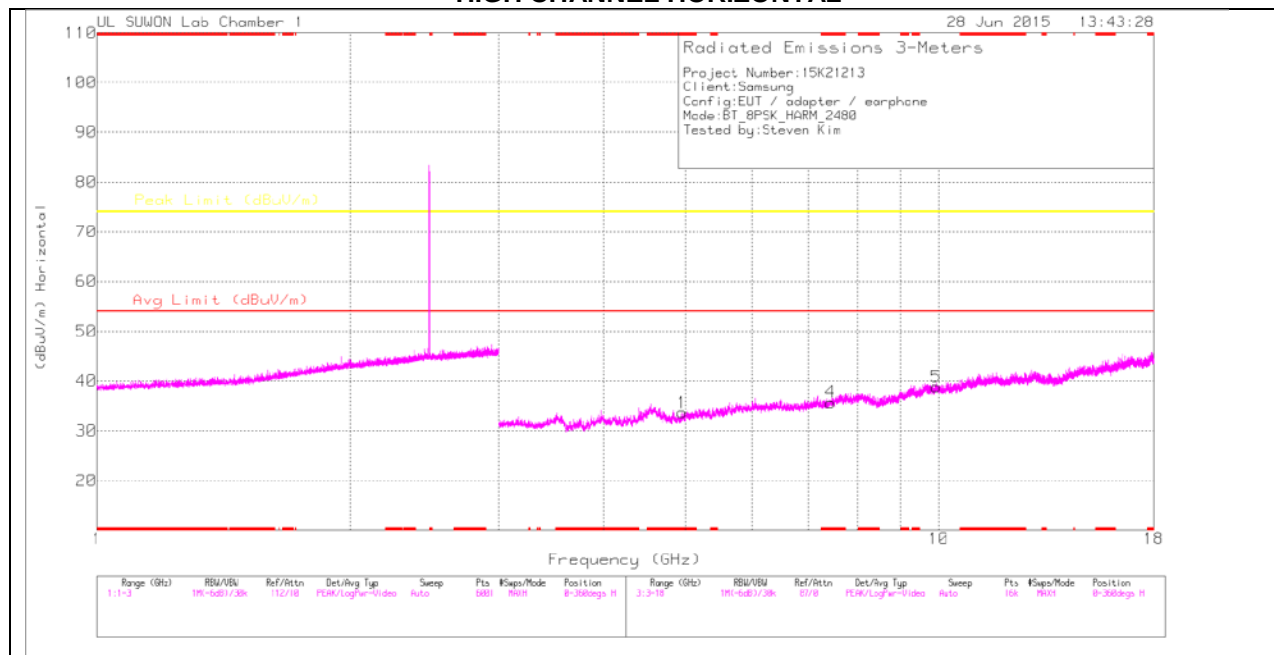
TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.882	25.46	PK	33.9	-25.2	34.16	-	-	74	-39.84	0-360	200	H
4	* 7.323	24	PK	35.9	-22.5	37.4	-	-	74	-36.6	0-360	200	H
5	9.764	21.93	PK	37	-19.3	39.63	-	-	-	-	0-360	200	H
2	* 4.882	25.37	PK	33.9	-25.2	34.07	-	-	74	-39.93	0-360	200	V
3	* 7.323	23.36	PK	35.9	-22.5	36.76	-	-	74	-37.24	0-360	200	V
6	9.765	20.5	PK	37	-19.3	38.2	-	-	-	-	0-360	200	V

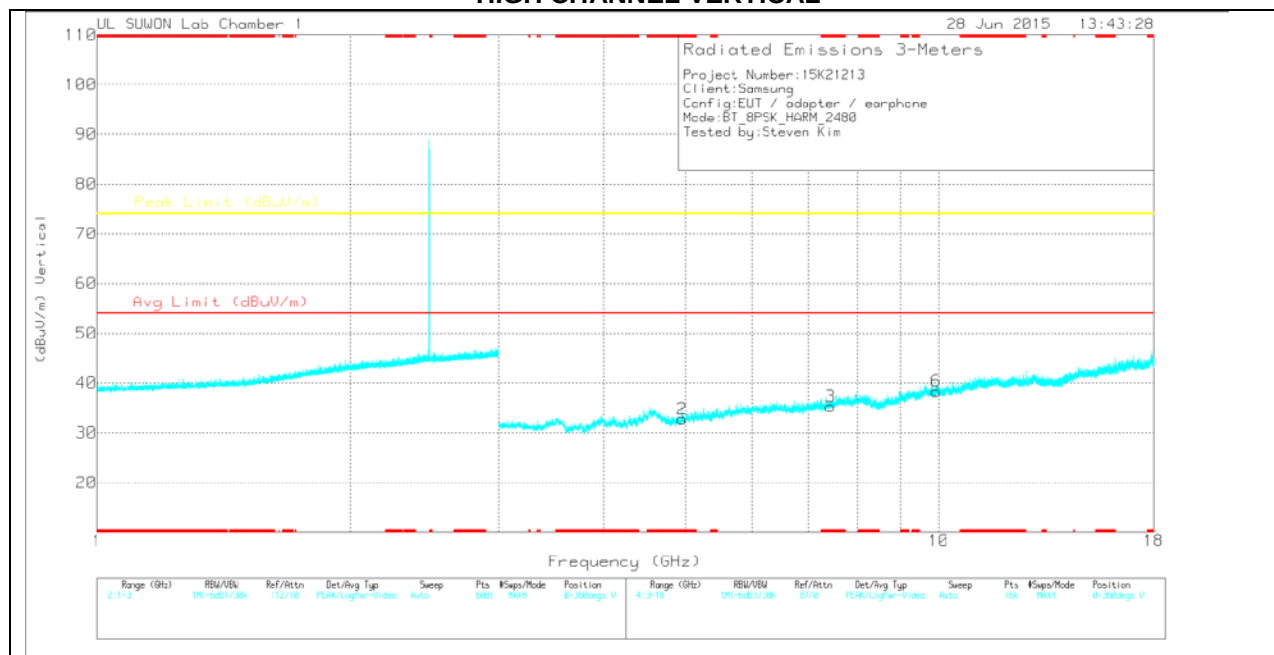
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

HIGH CHANNEL HORIZONTAL



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.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	Path_3_3 GHP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.959	28.54	PK	34	-28.9	33.64	-	-	74	-40.36	0-360	200	H
4	* 7.44	24.75	PK	35.8	-24.8	35.75	-	-	74	-38.25	0-360	100	H
5	9.92	21.87	PK	37.4	-20.4	38.87	-	-	-	-	0-360	200	H
2	* 4.959	27.66	PK	34	-28.9	32.76	-	-	74	-41.24	0-360	100	V
3	* 7.441	24.31	PK	35.8	-24.8	35.31	-	-	74	-38.69	0-360	100	V
6	9.92	21.33	PK	37.4	-20.4	38.33	-	-	-	-	0-360	100	V

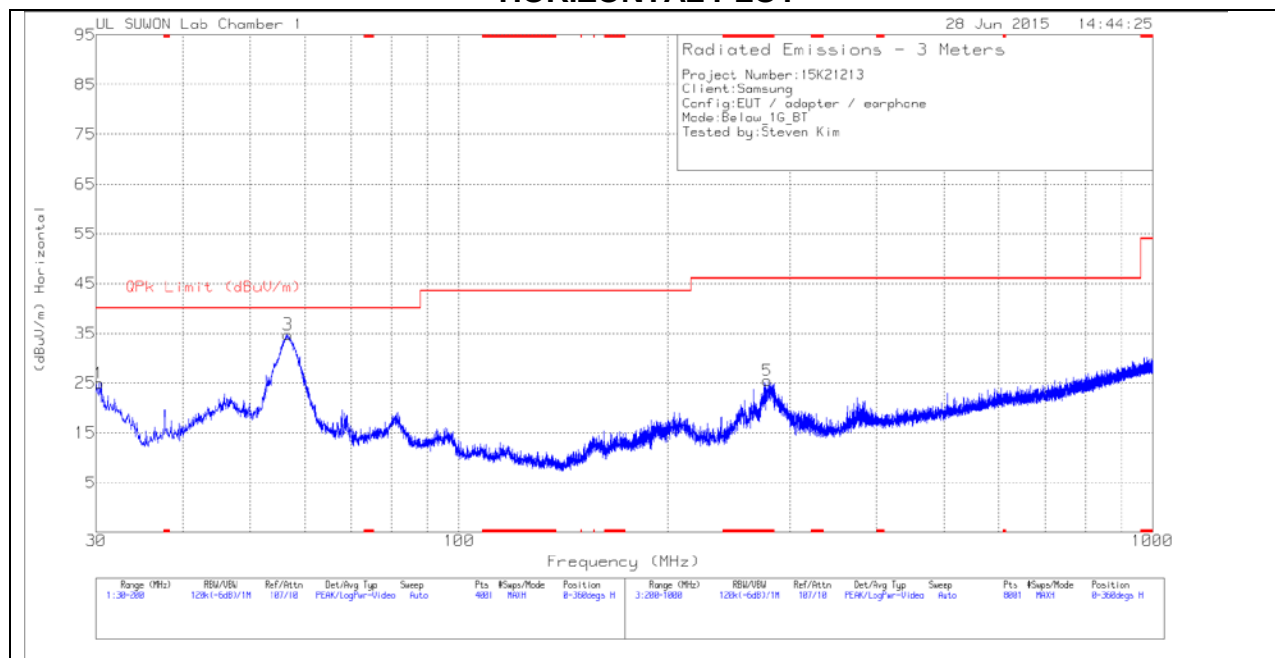
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

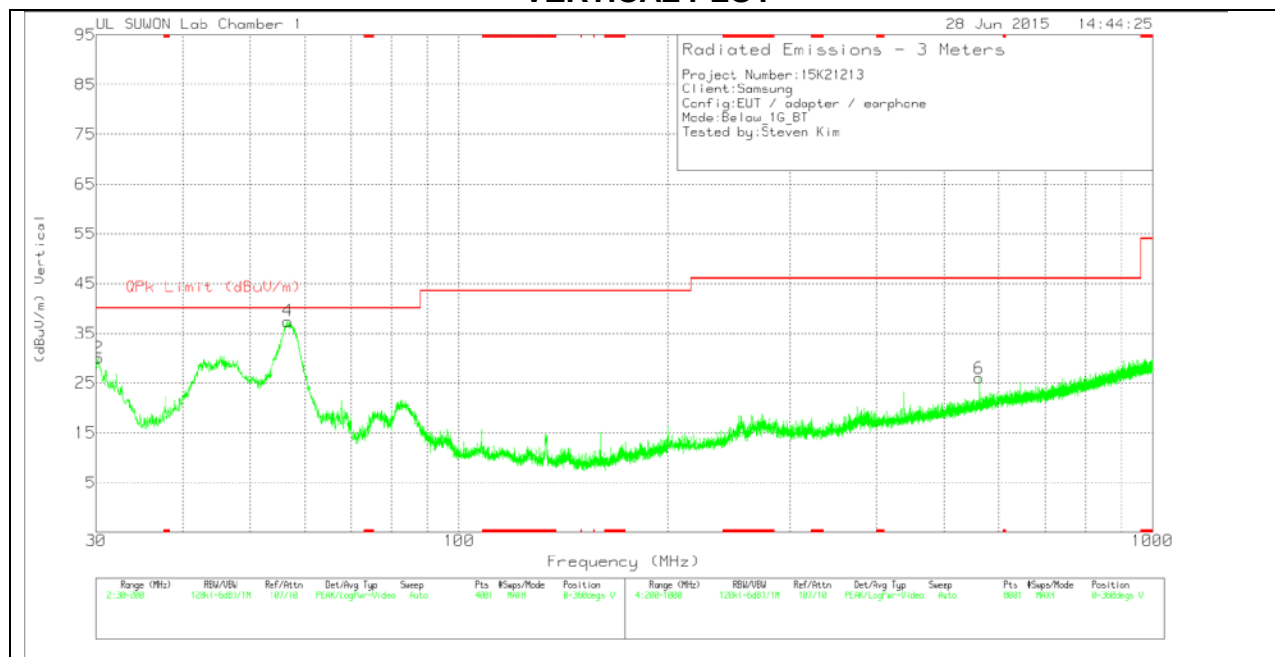
9.3. WORST-CASE BELOW 1 GHz

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	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.2975	45.19	Pk	10.3	-30.5	24.99	40	-15.01	0-360	200	H
3	56.69	51.68	Pk	13.1	-30	34.78	40	-5.22	0-360	400	H
2	30.255	50.24	Pk	10.3	-30.5	30.04	40	-9.96	0-360	100	V
4	56.6475	54.34	Pk	13.1	-30	37.44	40	-2.56	0-360	200	V
5	* 278.5	40.2	Pk	12.9	-27.6	25.5	46.02	-20.52	0-360	100	H
6	562.6	33.57	Pk	18.4	-26	25.97	46.02	-20.05	0-360	100	V

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

Pk - Peak detector

Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163-750	Bi-Log	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
56.5425	53.45	Qp	13.1	-30	36.55	40	-3.45	6	210	V

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

Qp - Quasi-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 C63.10.

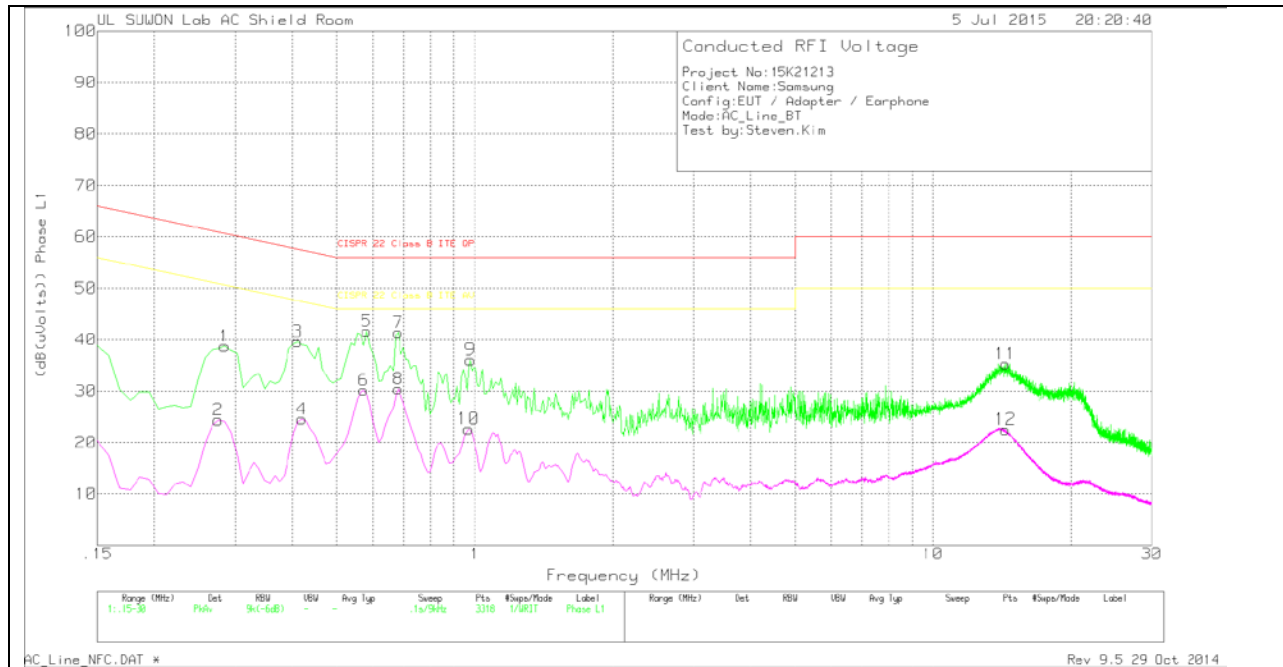
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

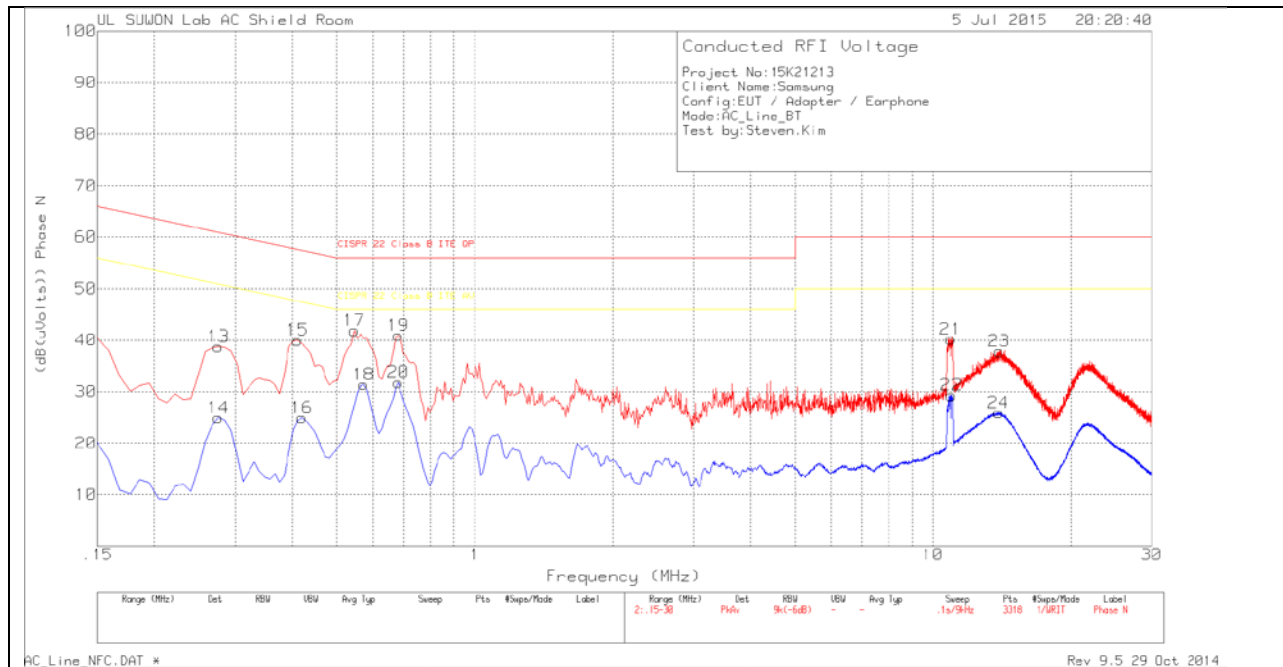
Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex- cord_L1	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
1	.285	28.91	Pk	9.8	0	38.71	60.67	-21.96	-	-
2	.276	14.58	Av	9.8	0	24.38	-	-	50.94	-26.56
3	.411	29.54	Pk	10.1	0	39.64	57.63	-17.99	-	-
4	.42	14.45	Av	10.1	0	24.55	-	-	47.45	-22.9
5	.582	31.54	Pk	10.1	0	41.64	56	-14.36	-	-
6	.573	20.1	Av	10.1	0	30.2	-	-	46	-15.8
7	.681	31.28	Pk	10.1	0	41.38	56	-14.62	-	-
8	.681	20.29	Av	10.1	0	30.39	-	-	46	-15.61
9	.978	26.2	Pk	9.9	0	36.1	56	-19.9	-	-
10	.969	12.75	Av	9.9	0	22.65	-	-	46	-23.35
11	14.379	25	Pk	10.1	.2	35.3	60	-24.7	-	-
12	14.388	12.22	Av	10.1	.2	22.52	-	-	50	-27.48

Pk - Peak detector

Av - Average detection

LINE 2 PLOT



LINE 2 RESULTS

Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex-cord_N	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
13	.276	28.96	Pk	9.8	0	38.76	60.94	-22.18	-	-
14	.276	15.1	Av	9.8	0	24.9	-	-	50.94	-26.04
15	.411	29.9	Pk	10.1	0	40	57.63	-17.63	-	-
16	.42	14.82	Av	10.1	0	24.92	-	-	47.45	-22.53
17	.546	31.77	Pk	10.1	0	41.87	56	-14.13	-	-
18	.573	21.28	Av	10.1	0	31.38	-	-	46	-14.62
19	.681	30.91	Pk	10	0	40.91	56	-15.09	-	-
20	.681	21.8	Av	10	0	31.8	-	-	46	-14.2
21	10.932	29.88	Pk	10.1	.2	40.18	60	-19.82	-	-
22	10.977	18.98	Av	10.1	.2	29.28	-	-	50	-20.72
23	13.938	27.33	Pk	10.3	.2	37.83	60	-22.17	-	-
24	13.911	15.49	Av	10.2	.2	25.89	-	-	50	-24.11

Pk - Peak detector

Av - Average detection