



**FCC CFR47 PART 15 SUBPART C**

**Bluetooth**

**CERTIFICATION TEST REPORT**

**FOR**

**WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac**

**MODEL NUMBER : SM-W737N0**

**FCC ID: A3LSMW737N0**

**REPORT NUMBER: 4788556585-E1V1**

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Testing  
Laboratory

**TL-637**

Revision History

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac  
**MODEL NUMBER:** SM-W737N0  
**SERIAL NUMBER:** BBMGR34K500613H (RADIATED);  
BBMGR34K50061VZ (CONDUCTED)  
**DATE TESTED:** JUL 25, 2018 – AUG 16, 2018

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 JUN 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:



SungGil Park  
Suwon Lab Engineer  
UL Korea, Ltd.

Hoonpyo Lee  
Suwon Lab Engineer  
UL Korea, Ltd.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. 558074 D01 15.247 Meas Guidance v05
4. ANSI C63.10-2013.

## 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, 16675, 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	
<input type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

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	3.86 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 WCDMA/LTE Tablet + BT/BLE, DTS/UNII a/b/g/n and ANT+. This test report addresses the DSS (BT) operational mode.

### 5.1. 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	9.478	8.867
		Peak	9.776	9.497
	Enhanced Pi/4-DPSK	Average	6.773	4.757
		Peak	8.936	7.827
	Enhanced 8PSK	Average	6.730	4.710
		Peak	9.403	8.716

### 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antenna, with a maximum gain of -0.5 dBi.

### 5.3. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

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

The fundamental level of the EUT was investigated on the condition of equipped with keyboard configuration also, but stand-alone configuration is more worse. So only below 1GHz and AC line conducted test were performed on the condition of equipped with keyboard configuration.

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 9.5. All radiated and power line conducted tests were performed connected with earphone and charger for evaluation of worst case mode.



## 5.4. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number
Charger	SAMSUNG	EP-TA300	R37K3AD0AC3SE3
Data Cable	SAMSUNG	EP-DW720CWE	N/A
Earphone	SAMSUNG	EO-EG920BW	N/A
keyboard	SAMSUNG	EJ-CW730	N/A

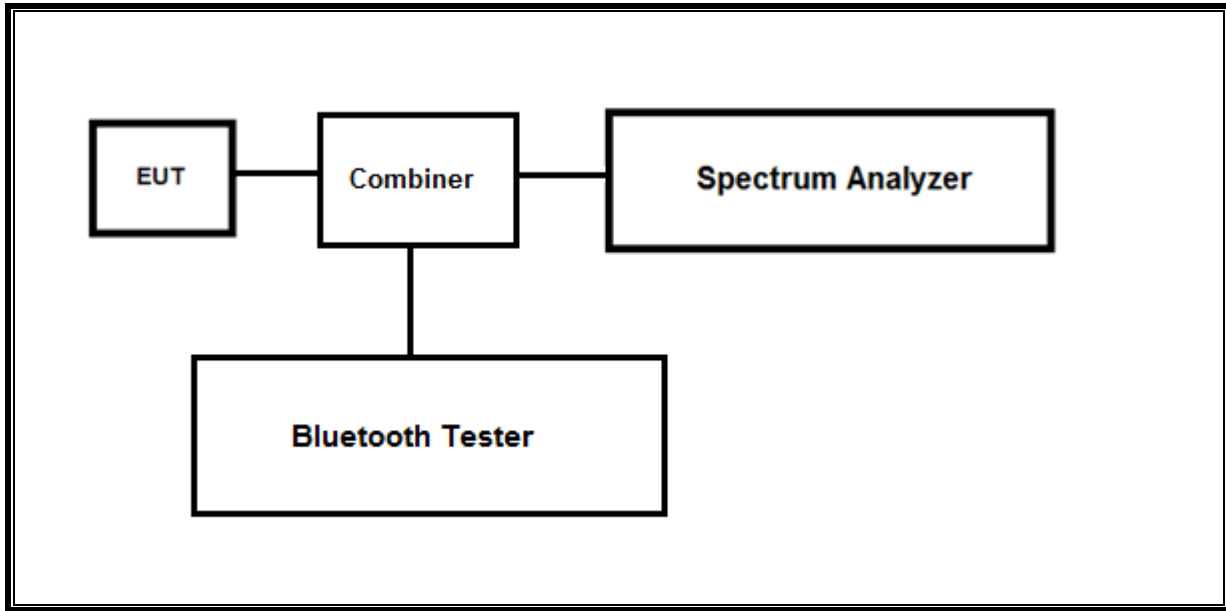
### I/O CABLES

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	2	Mini-Jack	Unshielded	1.2m	N/A

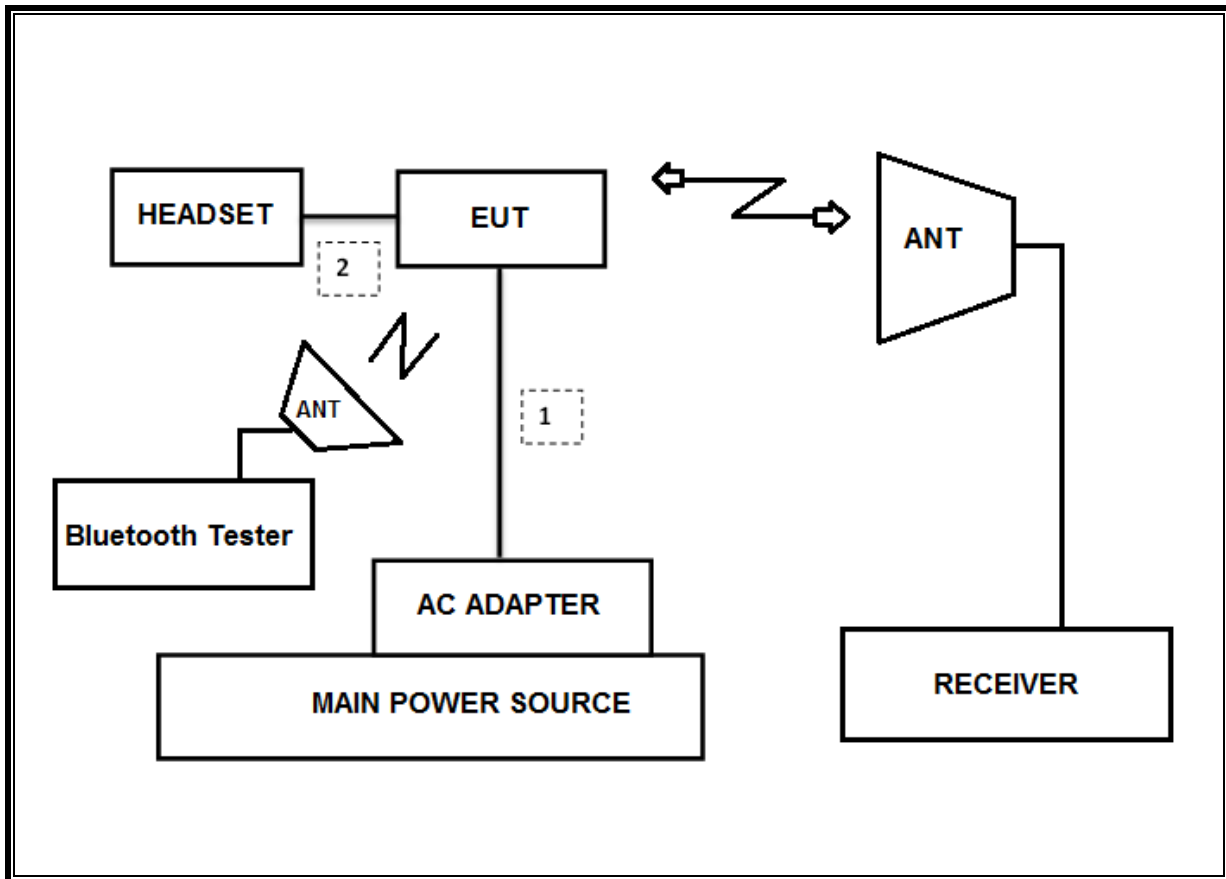
### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.  
 Test software enable BT communications.

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



## 6. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

NUMBER OF HOPPING CHANNELS : ANSI C63.10, Section 7.8.3

AVERAGE TIME OF OCCUPANCY : ANSI C63.10, Section 7.8.4

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

Out-of-band EMISSIONS (Conducted) : ANSI C63.10, Section 7.8.6, 7.8.8

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: ANSI C63.10, Section 6.

Out-of-band EMISSIONS IN RESTRICTED BANDS : ANSI C63.10, Section 6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

## 7. 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	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-31-19	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	09-14-19	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	03-10-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	05-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	05-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	11-29-18	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	11-13-19	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-18	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-10-18	08-06-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-08-18	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-08-18	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-11-18	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-08-18	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18	08-06-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-08-18	08-07-19
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-08-18	08-07-19
Combiner	WEINCHEL	1575	2152	08-08-18	08-08-19
Attenuator	PASTERNAK	PE7087-10	A001	08-08-18	08-08-19
Attenuator	PASTERNAK	PE7087-10	A008	08-08-18	08-08-19
Attenuator	PASTERNAK	PE7087-10	2	08-10-18	08-07-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-08-18	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-08-18	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-09-18	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-07-18	08-06-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-08-18	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-08-18	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-11-18	08-06-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-08-18	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-08-18	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-11-18	08-06-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-08-18	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-08-18	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-11-18	08-06-19
LISN	R&S	ENV-216	101837	08-09-18	08-09-19
UL Software					
Description	Manufacturer	Model	Version		
Radiated software	UL	UL EMC	Ver 9.5		
AC Line Conducted software	UL	UL EMC	Ver 9.5		

## 8. REFERENCE MEASUREMENT RESULTS

### 8.1. ON TIME AND DUTY CYCLE RESULTS

#### LIMITS

None: for reporting purposes only.

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
<b>2400MHz Bands</b>						
BT	2.884	3.750	0.769	76.9%	1.14	0.347



[DH5]

## 8.2. 20 dB AND 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% ~ 5% of the OBW. The VBW is set to  $\geq 3 \times \text{RBW}$ . The sweep time is coupled.

### RESULTS

#### 8.2.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
Low	2402	928.8	829.45
Mid	2441	934.1	829.21
High	2480	923.4	829.03
Worst		934.1	829.45

#### 8.2.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

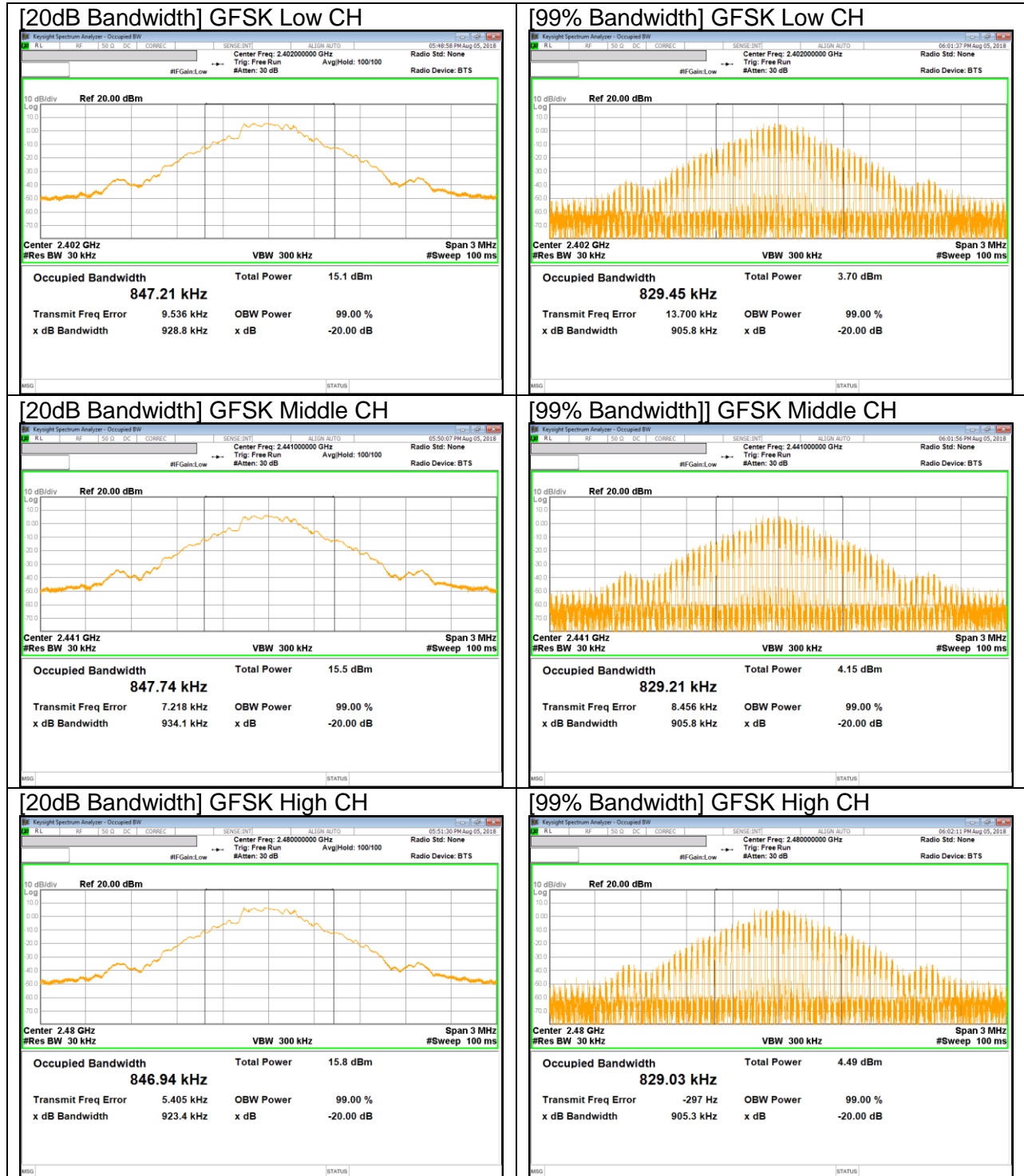
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.296	1.132
Mid	2441	1.297	1.161
High	2480	1.299	1.162
Worst		1.299	1.162

#### 8.2.3. ENHANCED DATA RATE 8PSK MODULATION

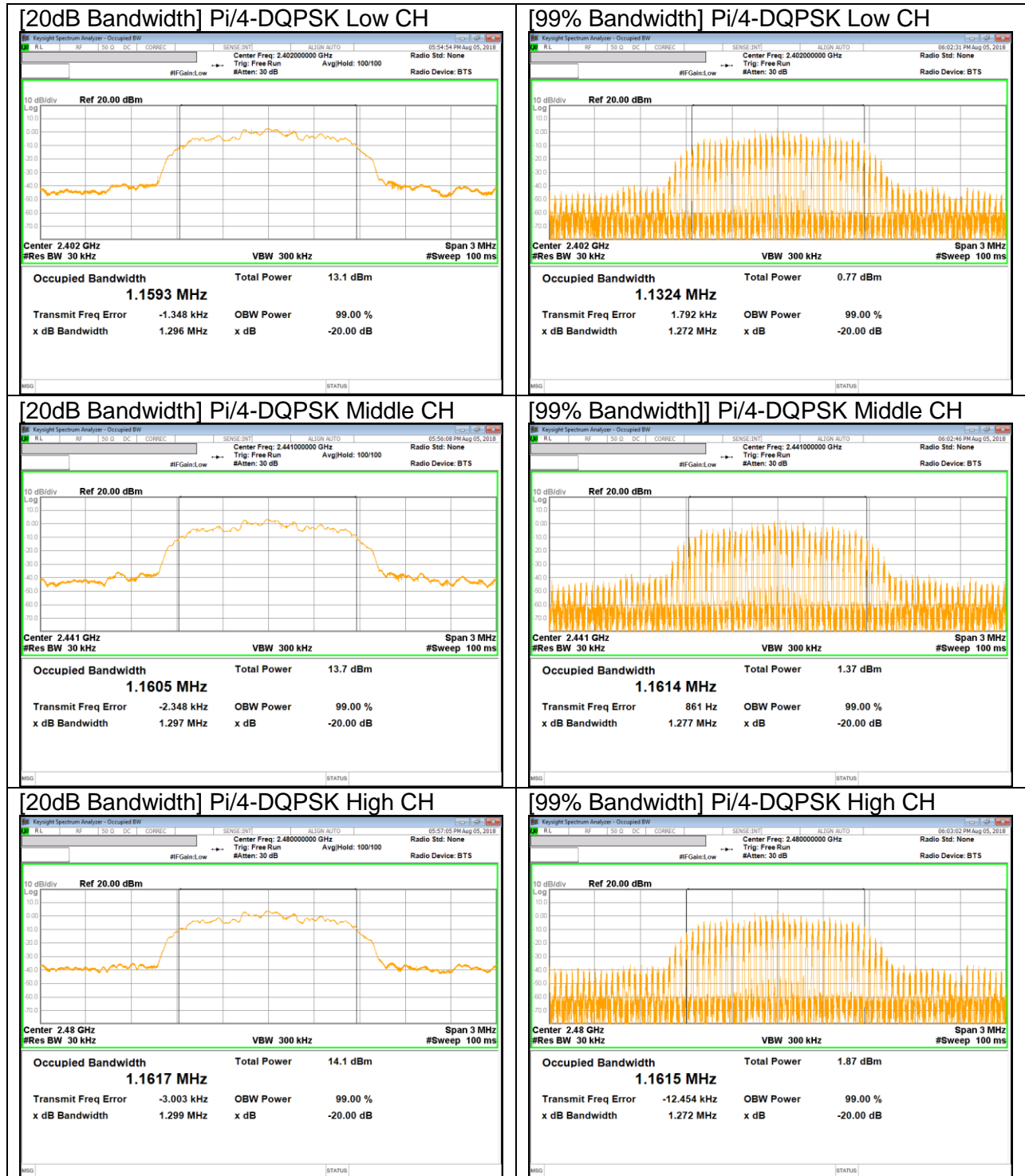
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.263	1.132
Mid	2441	1.266	1.162
High	2480	1.210	1.131
Worst		1.266	1.162

### 8.2.4. 20 dB AND 99% BANDWIDTH PLOTS

#### GFSK BANDWIDTH

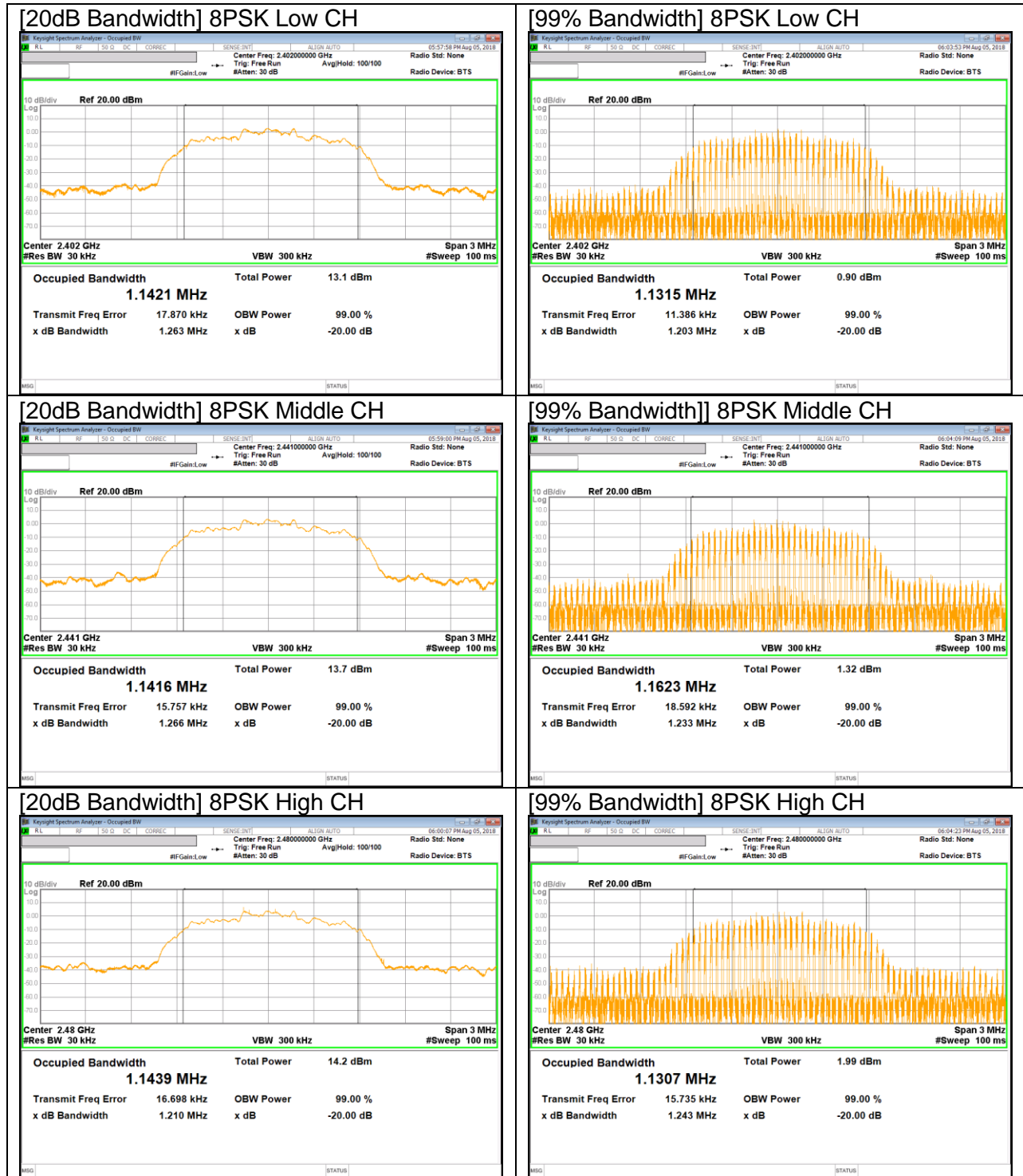


**Pi/4-DQPSK BANDWIDTH**





**8PSK BANDWIDTH**



## 9. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247 (b)(1)	TX conducted output power	<30dBm		Pass
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		Pass
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Pass
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 0.4sec		Pass
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

## 10. ANTENNA PORT TEST RESULTS

### 10.1. 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 JUN 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

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



[GFSK]

[8PSK]

## 10.2. 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

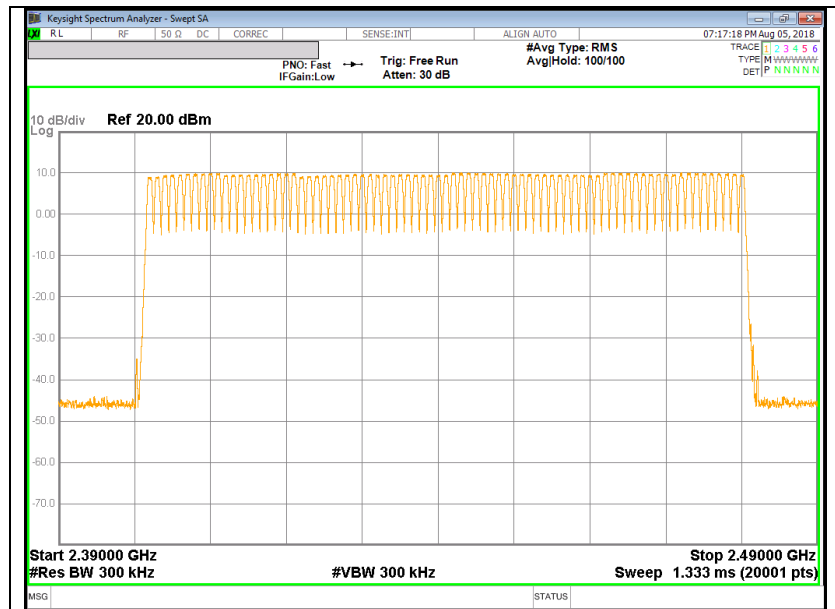
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. The analyzer is set to Max Hold.

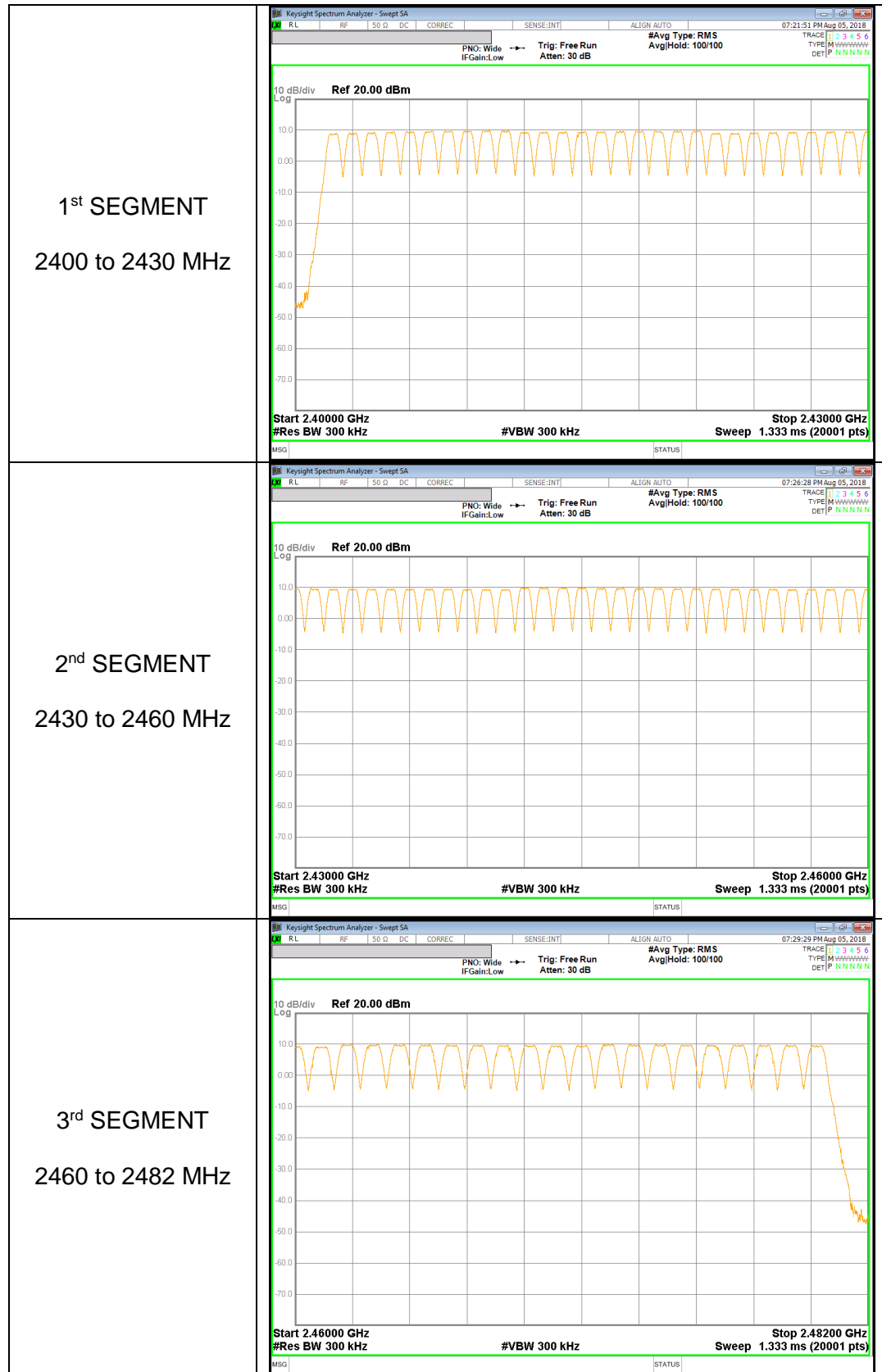
### RESULTS

Normal Mode: 79 Channels observed.

### NUMBER OF HOPPING CHANNELS PLOTS[GFSK]

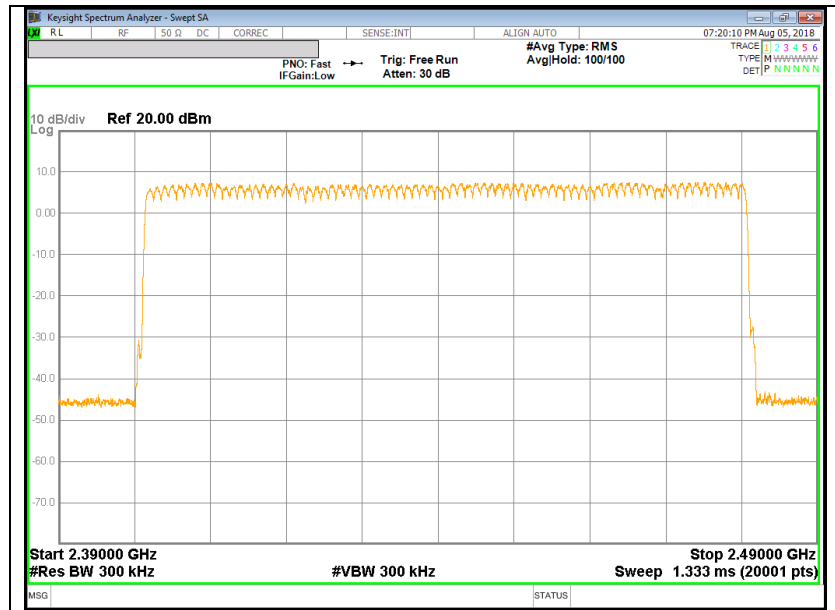
#### NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)

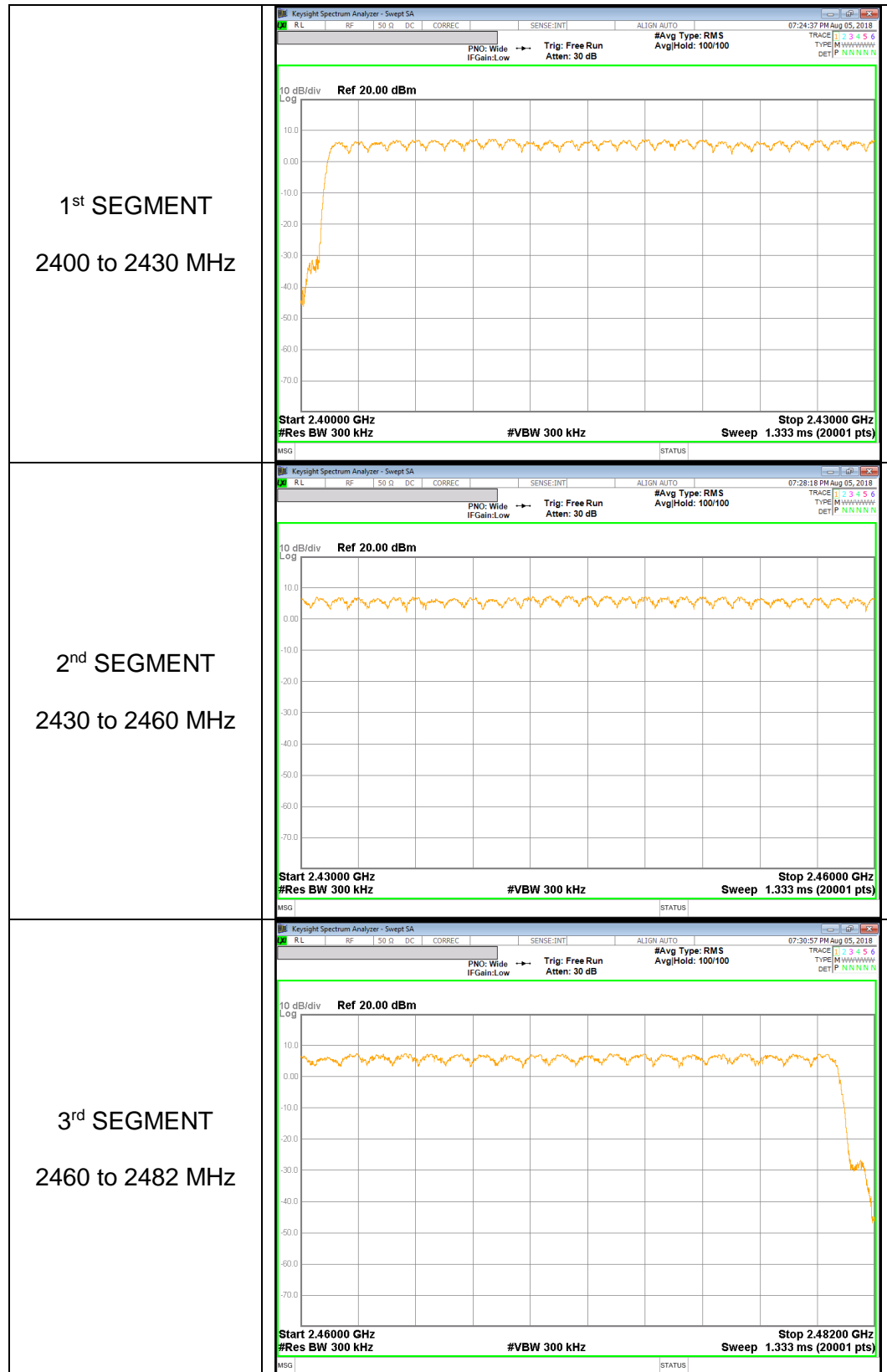




**NUMBER OF HOPPING CHANNELS PLOTS[8PSK]**

**NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)**





### 10.3. 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  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

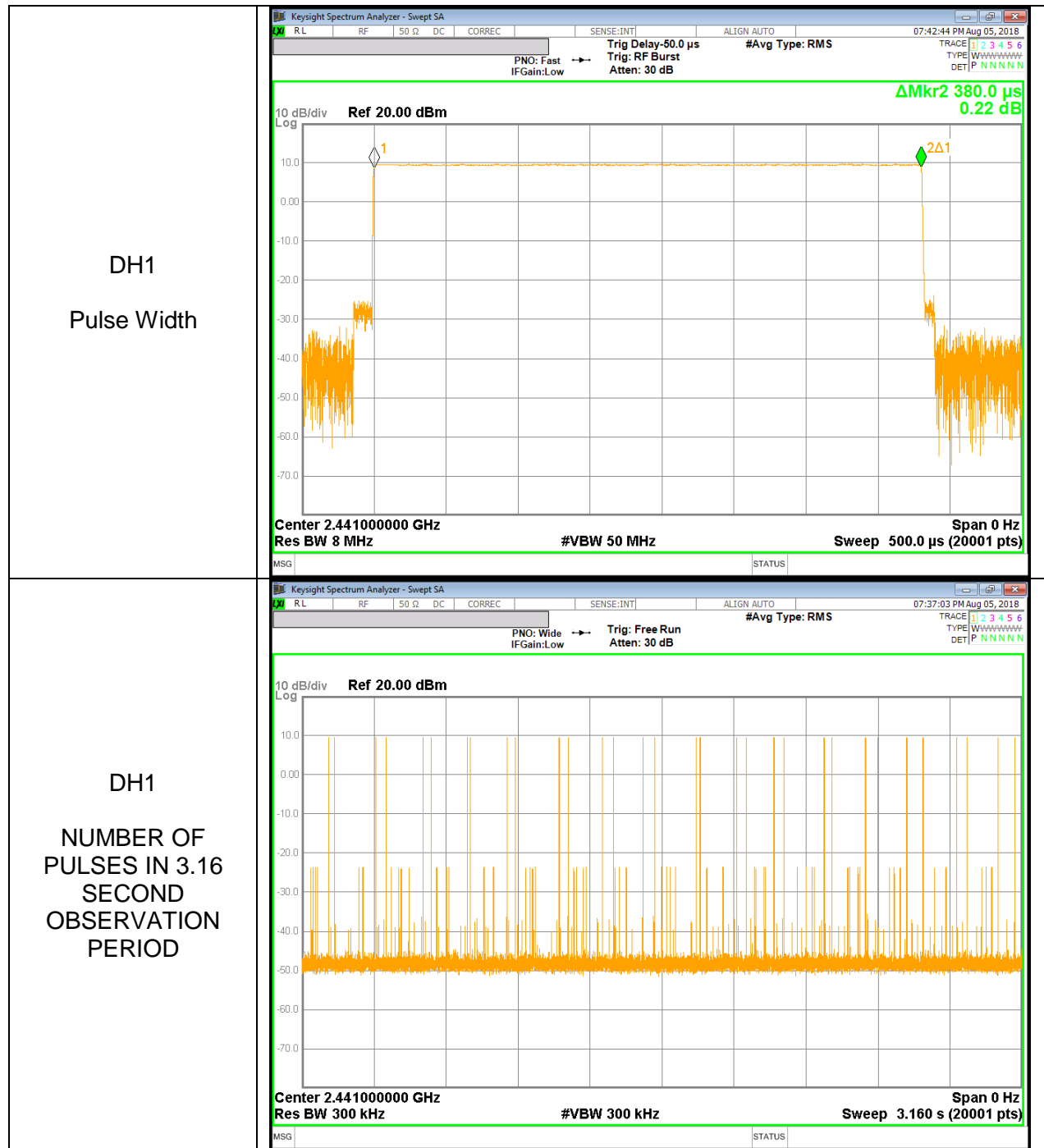
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$ .

#### RESULTS[GFSK]

	Width [msec]	Pulses in 3.16 seconds	of Occupancy [sec]	[sec]	[sec]
GFSK Normal					
DH1	0.380	32	0.121600	0.4	-0.2784
DH3	1.636	16	0.261760	0.4	-0.1382
DH5	2.884	12	0.346080	0.4	-0.0539
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.380	8	0.030400	0.4	-0.3696
DH3	1.636	4	0.065440	0.4	-0.3346
DH5	2.884	3	0.086520	0.4	-0.3135



**DH1**



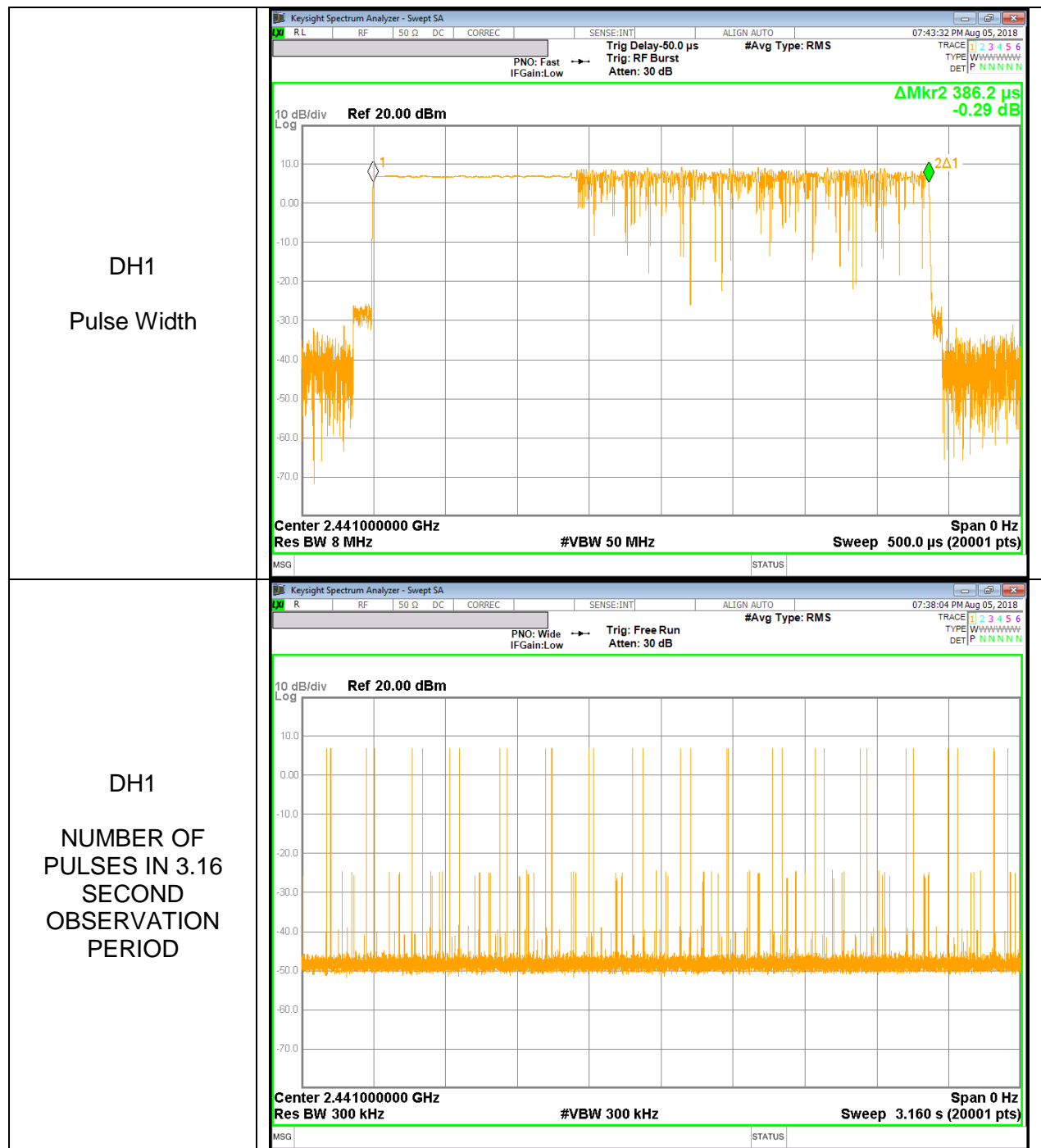




**RESULTS[8PSK]**

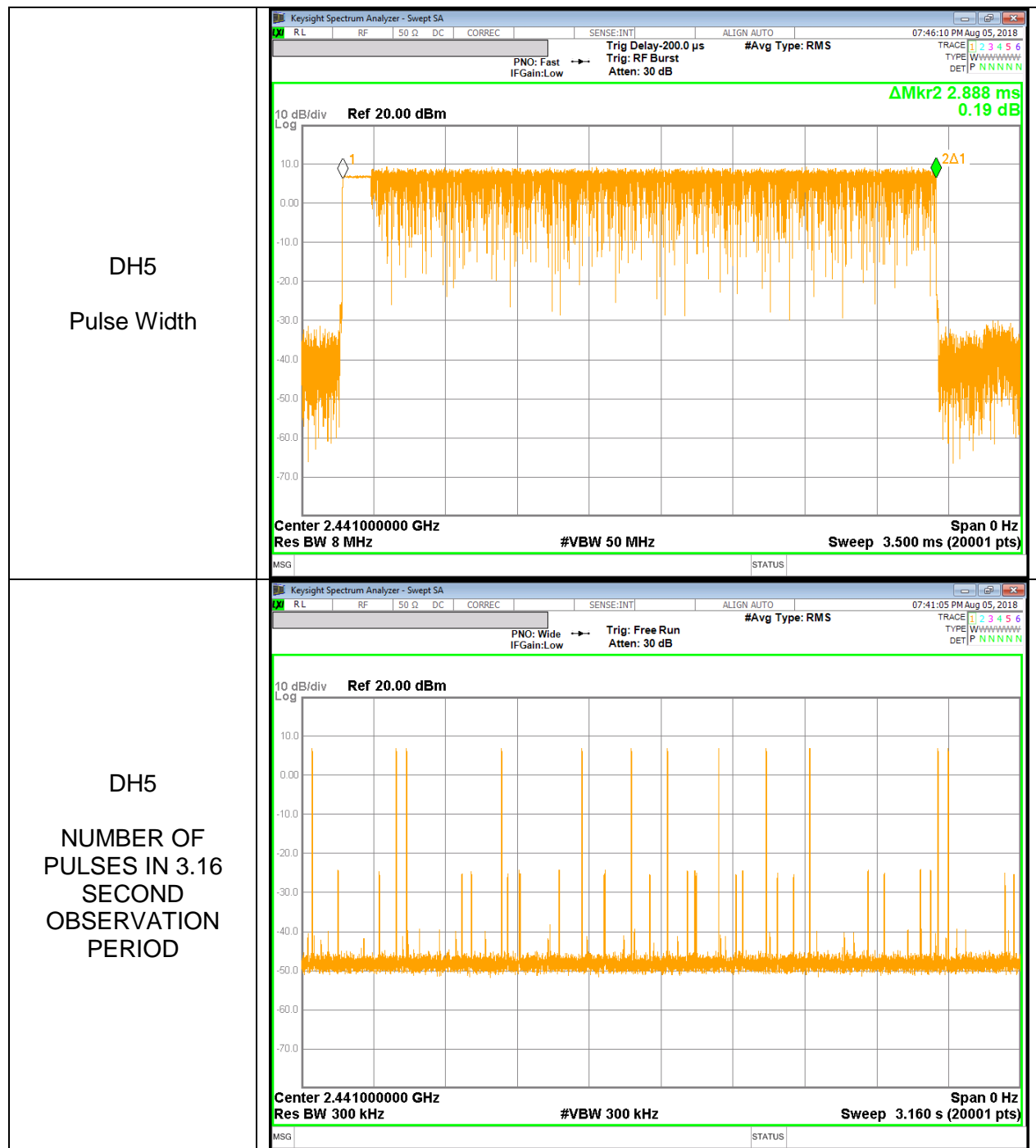
	Width [msec]	Pulses in 3.16 seconds	of Occupancy [sec]	[sec]	[sec]
GFSK Normal					
DH1	0.386	32	0.123552	0.4	-0.2764
DH3	1.637	16	0.261920	0.4	-0.1381
DH5	2.888	12	0.346560	0.4	-0.0534
GFSK AFH					
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.386	8	0.030888	0.4	-0.3691
DH3	1.637	4	0.065480	0.4	-0.3345
DH5	2.888	3	0.086640	0.4	-0.3134

**DH1**





**DH5**



## 10.4. OUTPUT POWER

### LIMIT

§15.247 (b) (1)

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

### TEST PROCEDURE

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

#### 10.4.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	9.190	21	-11.810
Middle	2441	9.557	21	-11.443
High	2480	9.776	21	-11.224
Worst		9.776	21	-11.224

#### 10.4.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.190	21	-12.810
Middle	2441	8.710	21	-12.290
High	2480	8.936	21	-12.064
Worst		8.936	21	-12.064

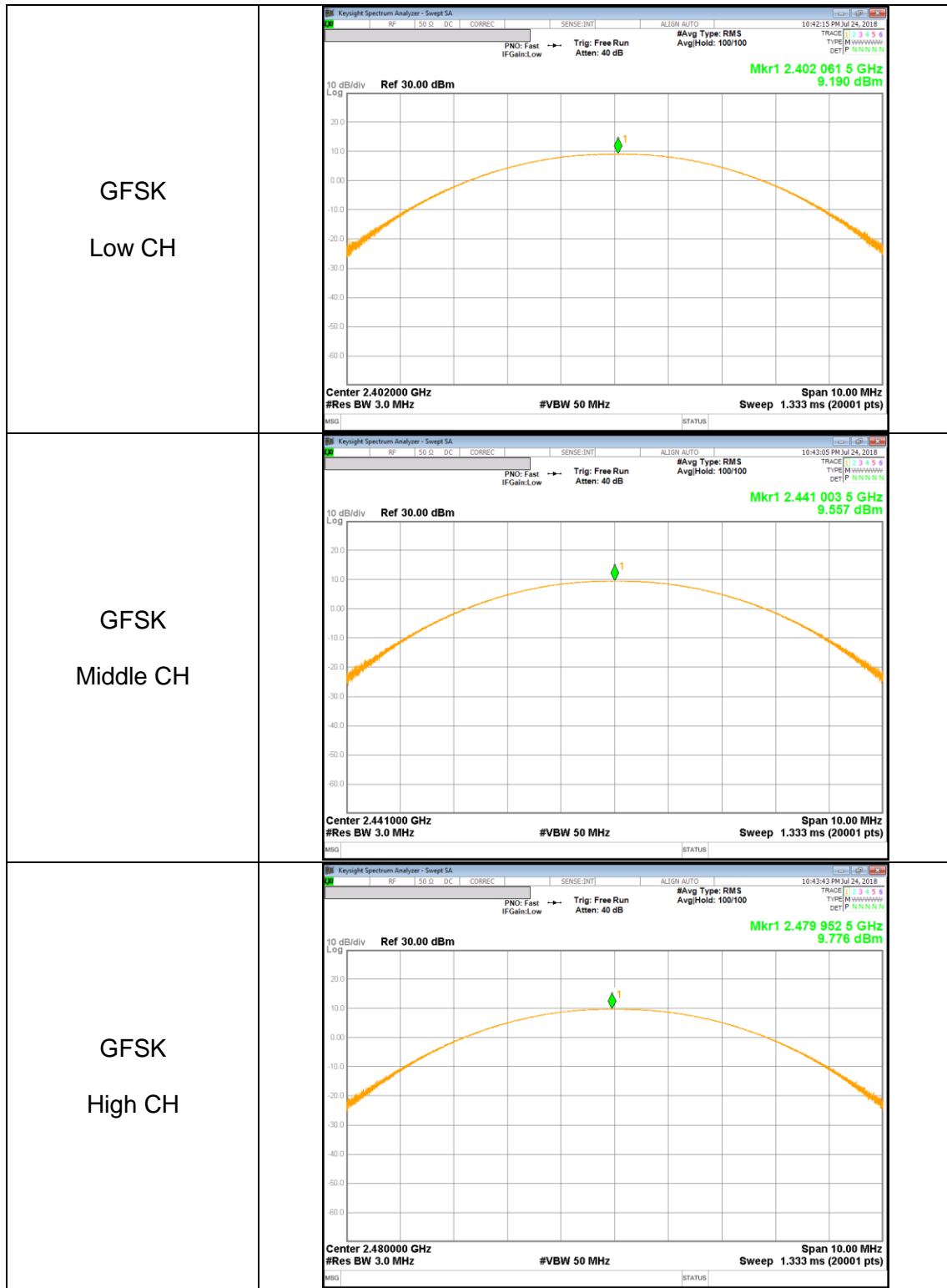
#### 10.4.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.622	21	-12.378
Middle	2441	9.192	21	-11.808
High	2480	9.403	21	-11.597
Worst		9.403	21	-11.597

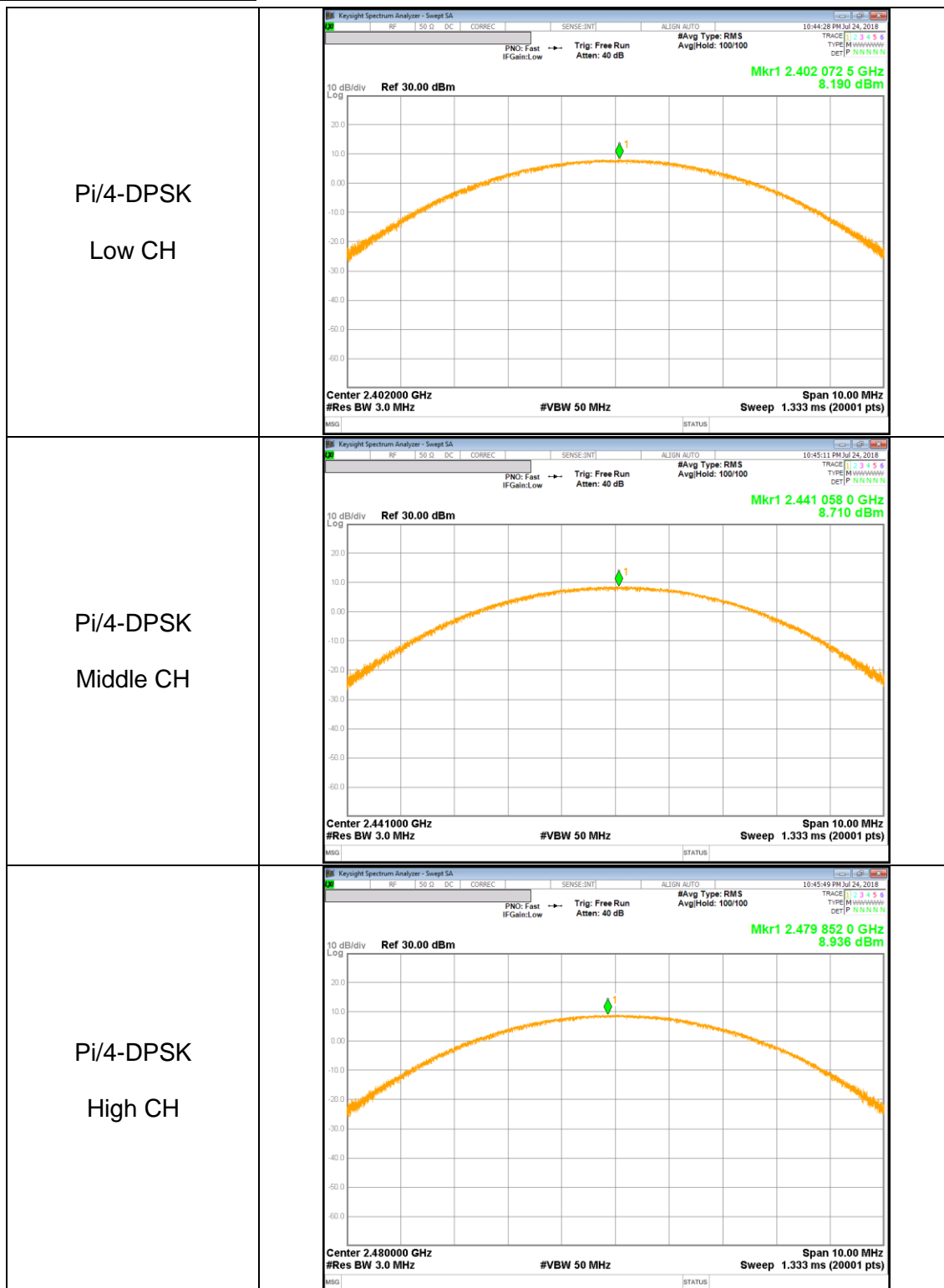


**OUTPUT POWER PLOTS**

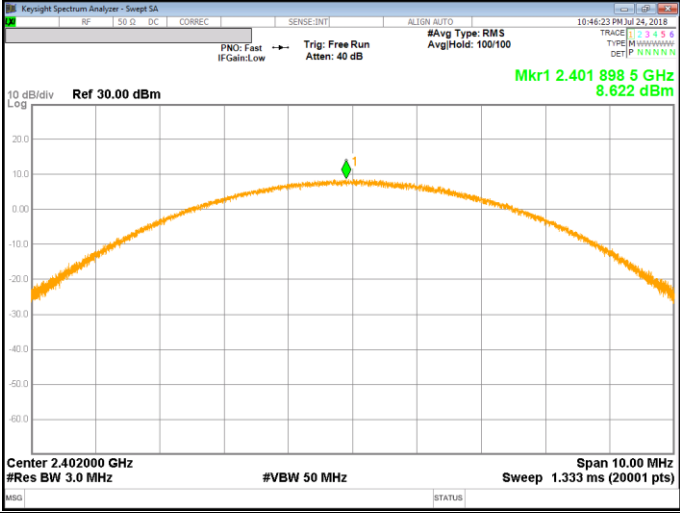
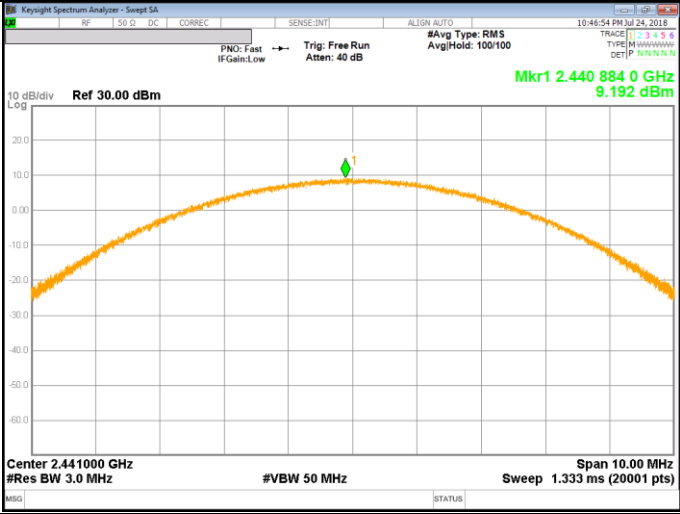
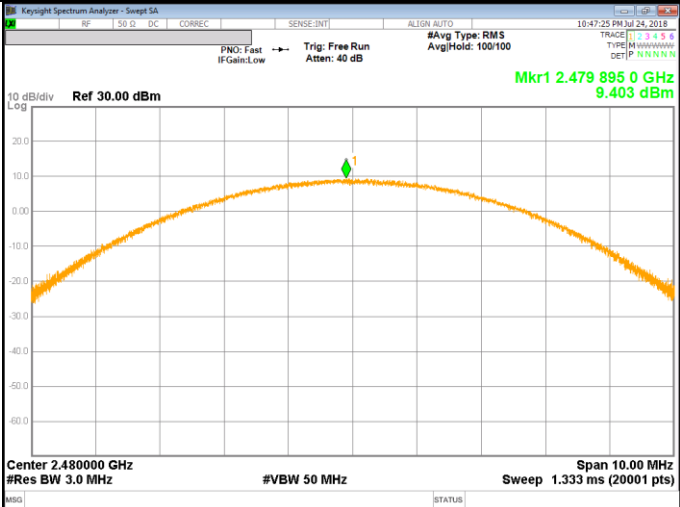
**GFSK OUTPUT POWER**



**Pi/4-DPSK OUTPUT POWER**



**8PSK OUTPUT POWER**

<p>8PSK Low CH</p>	 <p>Key parameters from screenshot:                  Center: 2.402000 GHz                  Res BW: 3.0 MHz                  VBW: 50 MHz                  Span: 10.00 MHz                  Peak Power: 8.622 dBm                  Reference: 30.00 dBm</p>
<p>8PSK Middle CH</p>	 <p>Key parameters from screenshot:                  Center: 2.441000 GHz                  Res BW: 3.0 MHz                  VBW: 50 MHz                  Span: 10.00 MHz                  Peak Power: 9.192 dBm                  Reference: 30.00 dBm</p>
<p>8PSK High CH</p>	 <p>Key parameters from screenshot:                  Center: 2.479000 GHz                  Res BW: 3.0 MHz                  VBW: 50 MHz                  Span: 10.00 MHz                  Peak Power: 9.403 dBm                  Reference: 30.00 dBm</p>

## 10.5. AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

#### 10.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	8.796	7.578
Middle	2441	9.221	8.357
High	2480	9.478	8.868
Worst		9.478	8.868

#### 10.5.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	5.729	3.740
Middle	2441	6.246	4.213
High	2480	6.773	4.756
Worst		6.773	4.756

#### 10.5.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	5.747	3.756
Middle	2441	6.257	4.224
High	2480	6.730	4.709
Worst		6.730	4.709

## **10.6. 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.

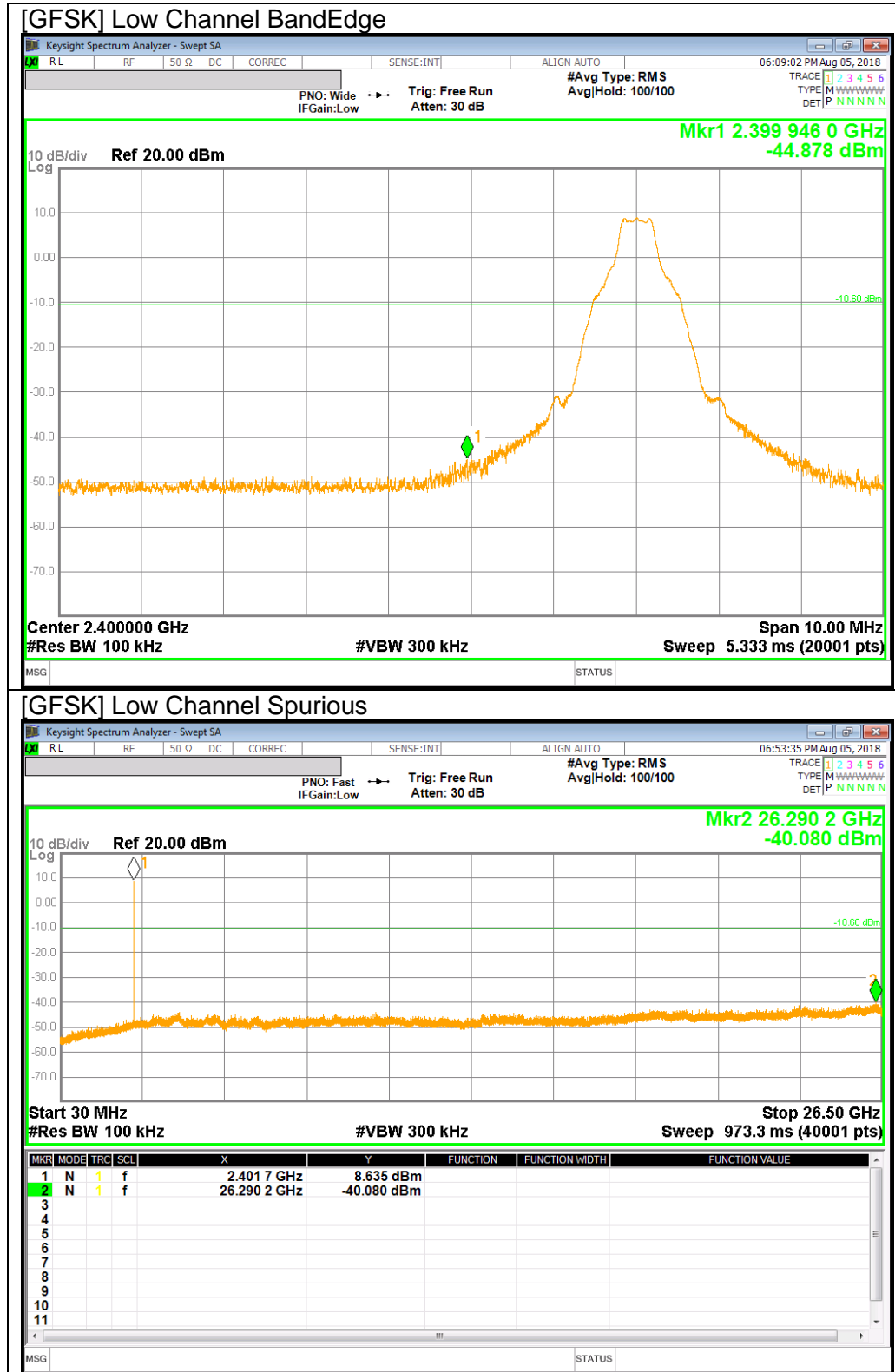
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

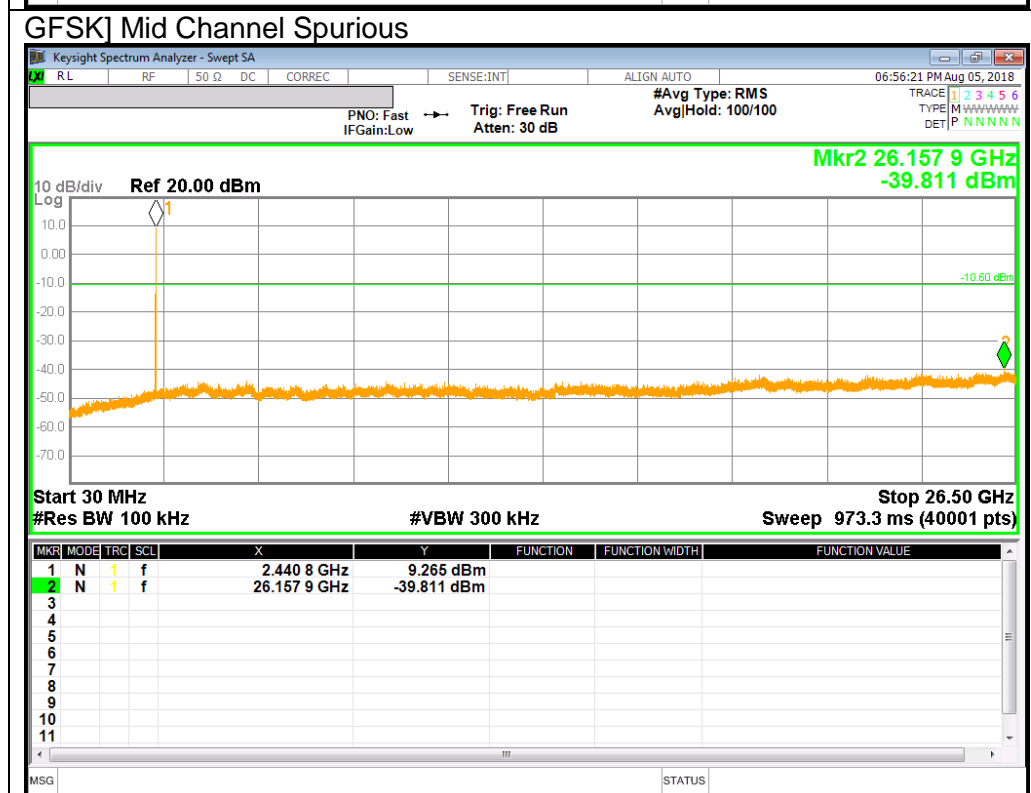
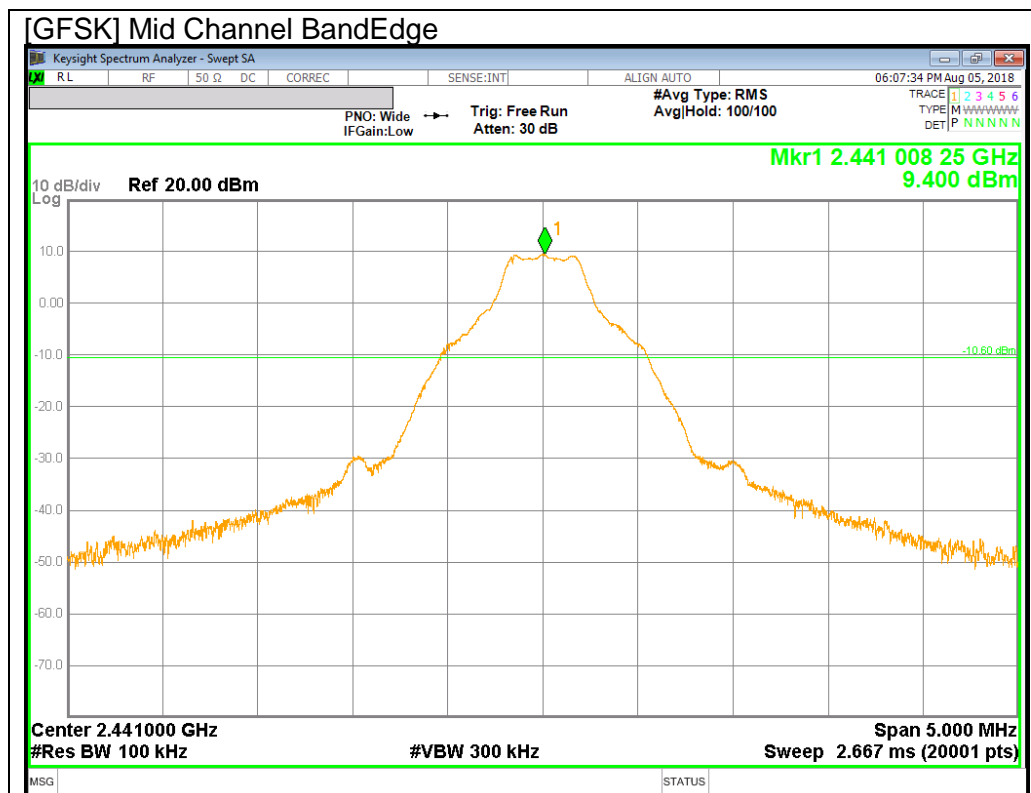
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

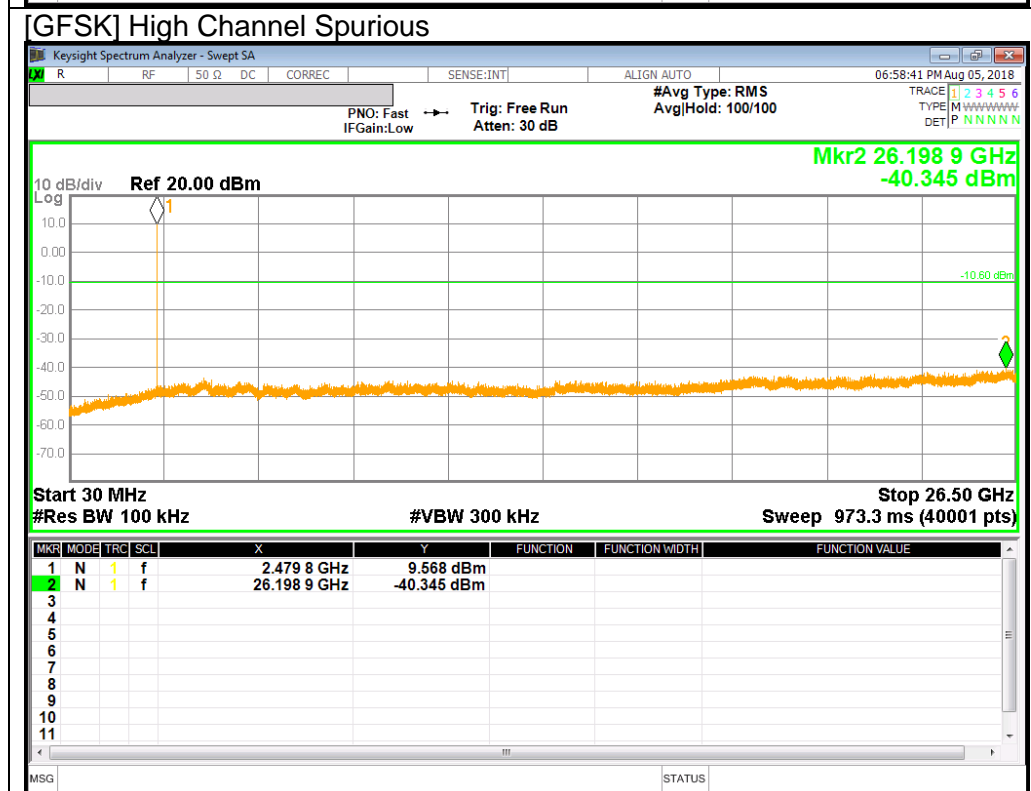
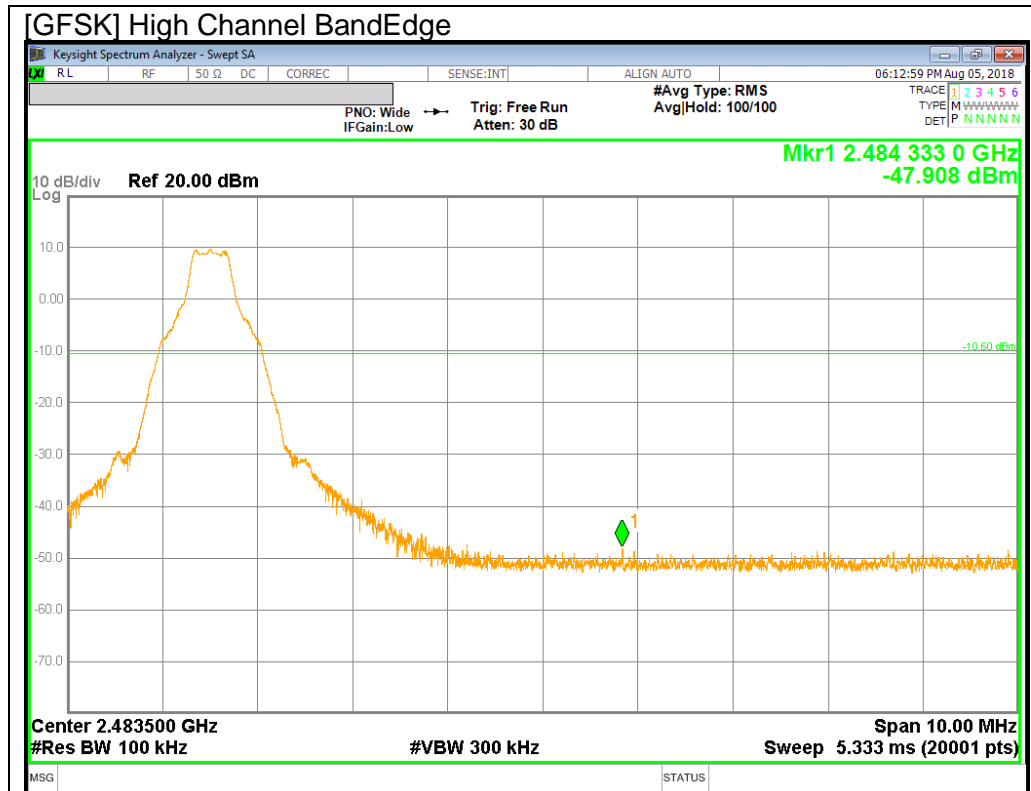
### **RESULTS**

### 10.6.1. BASIC DATA RATE GFSK MODULATION

#### GFSK Mode

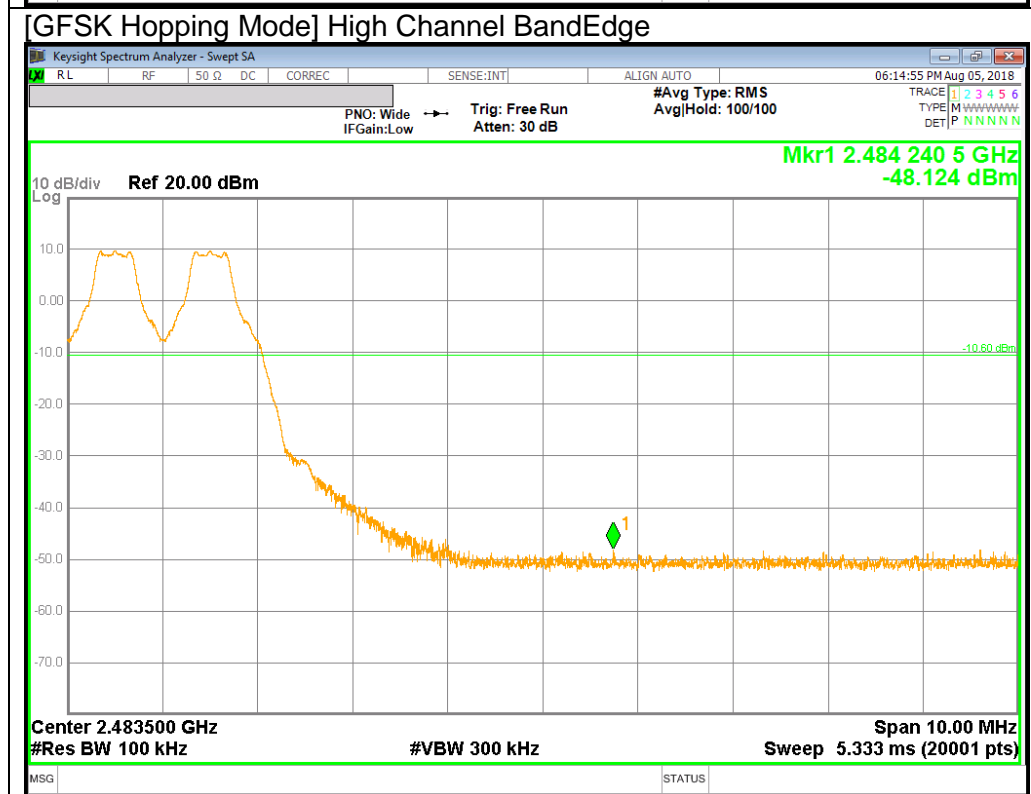
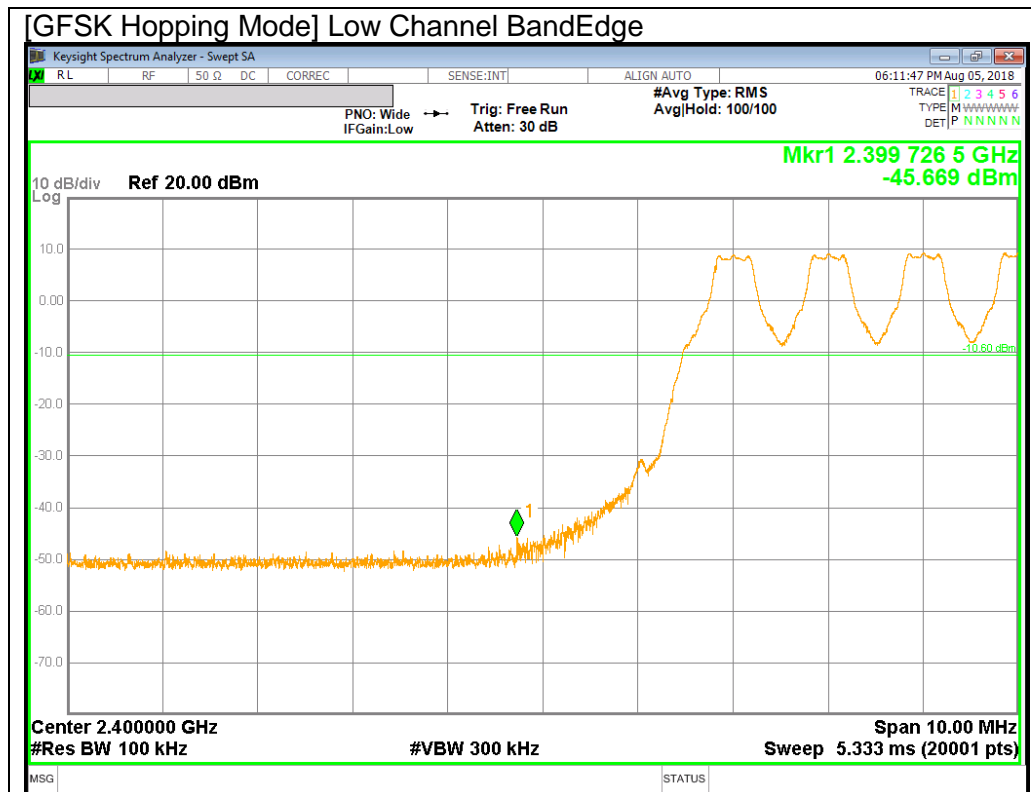




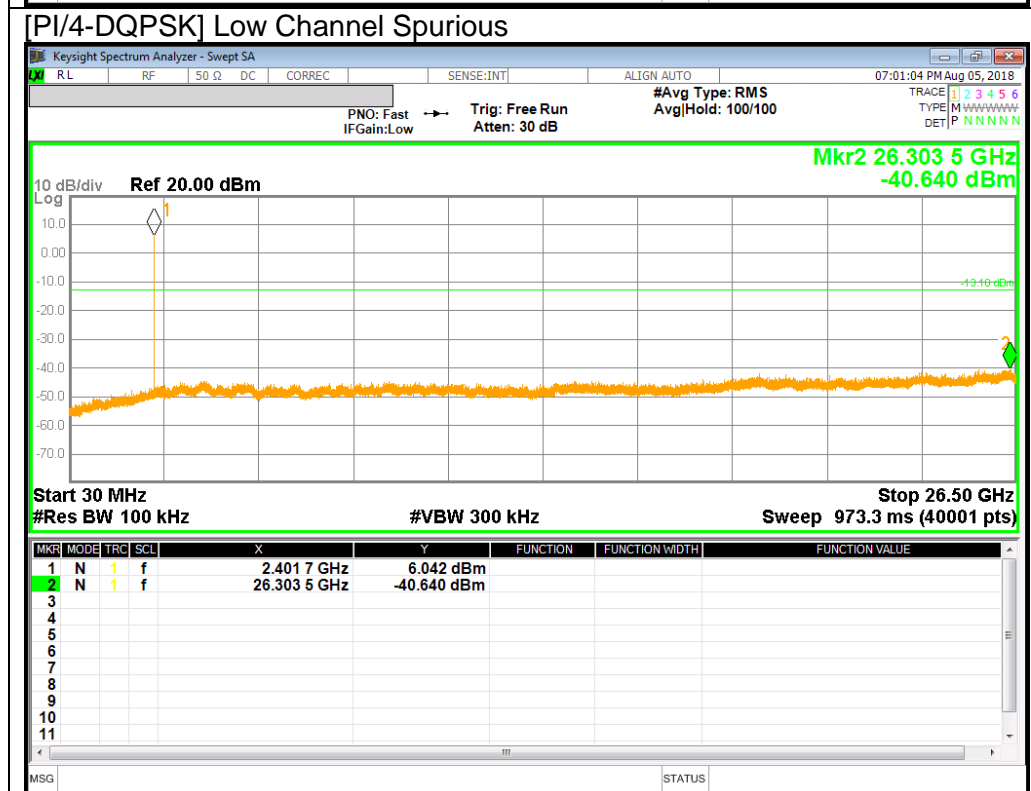
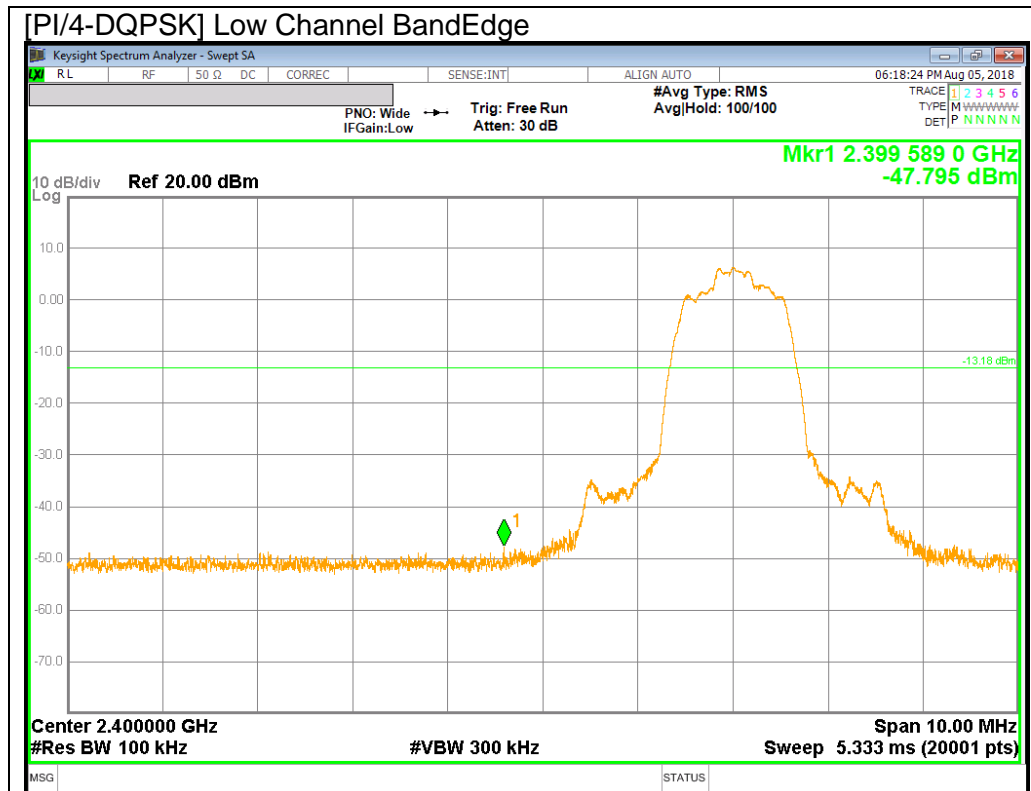


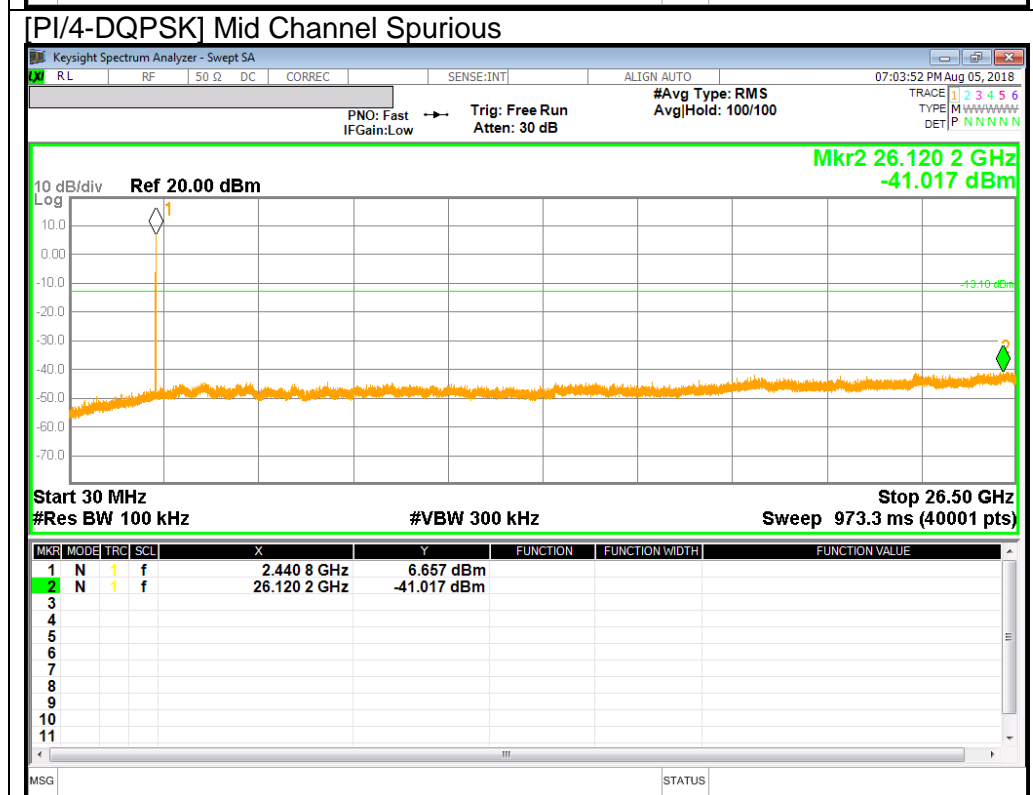
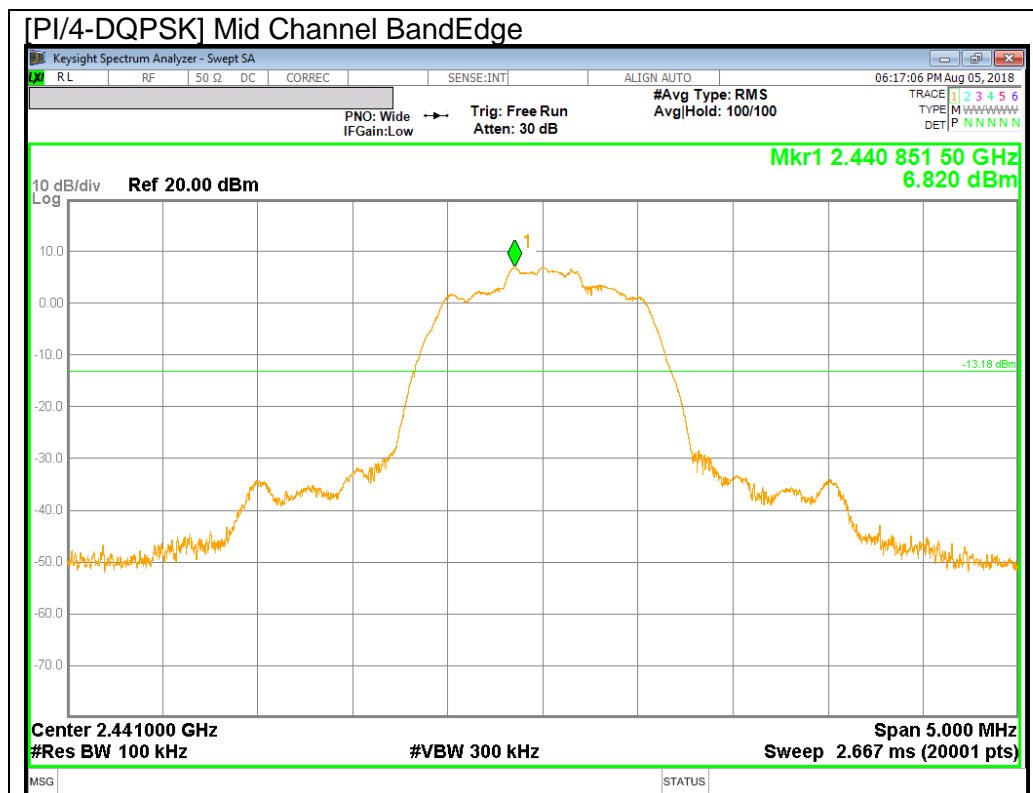


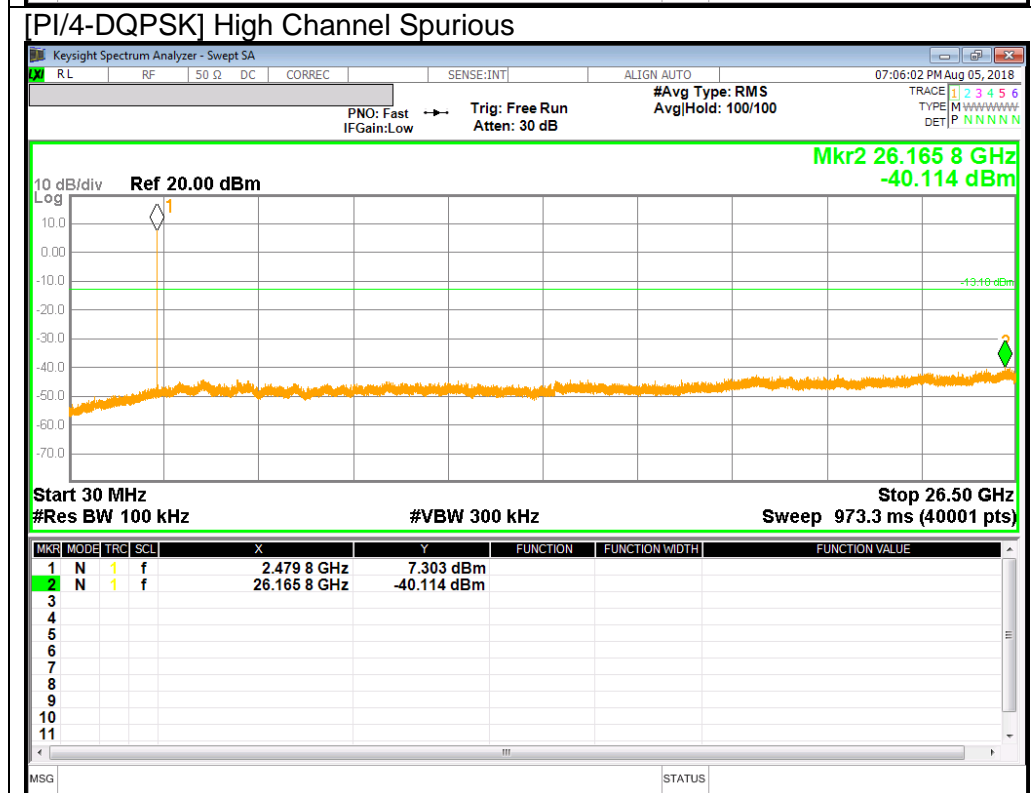
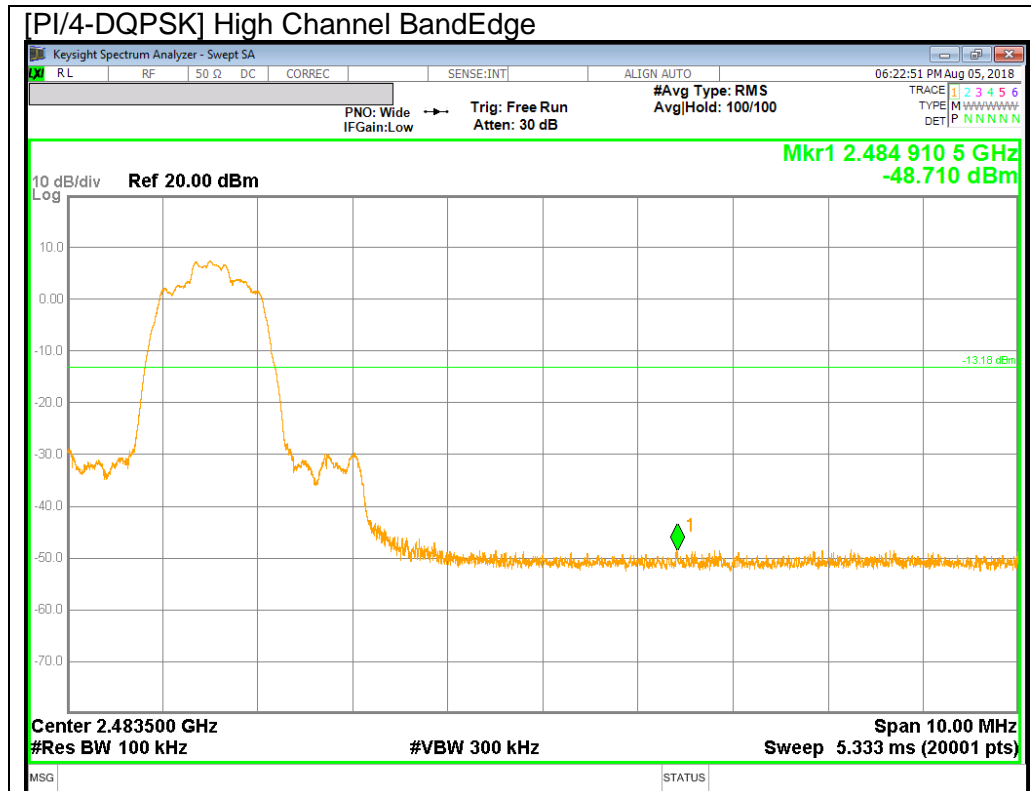
**BandEdge Emission at GFSK Hopping Mode**



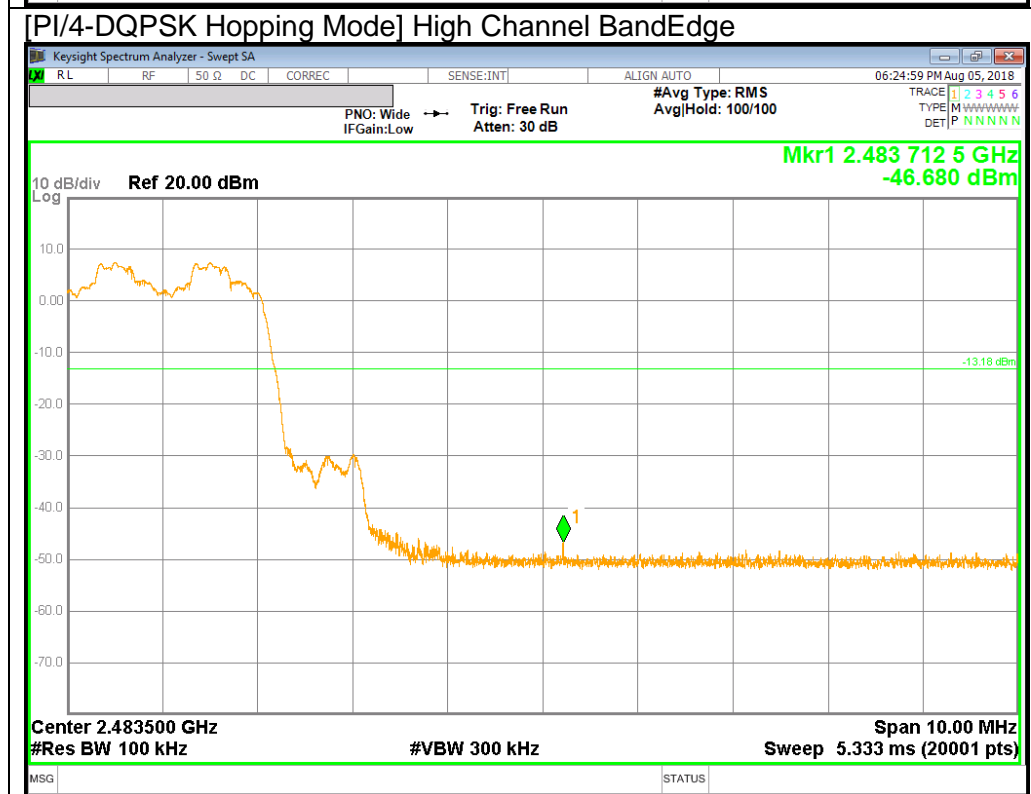
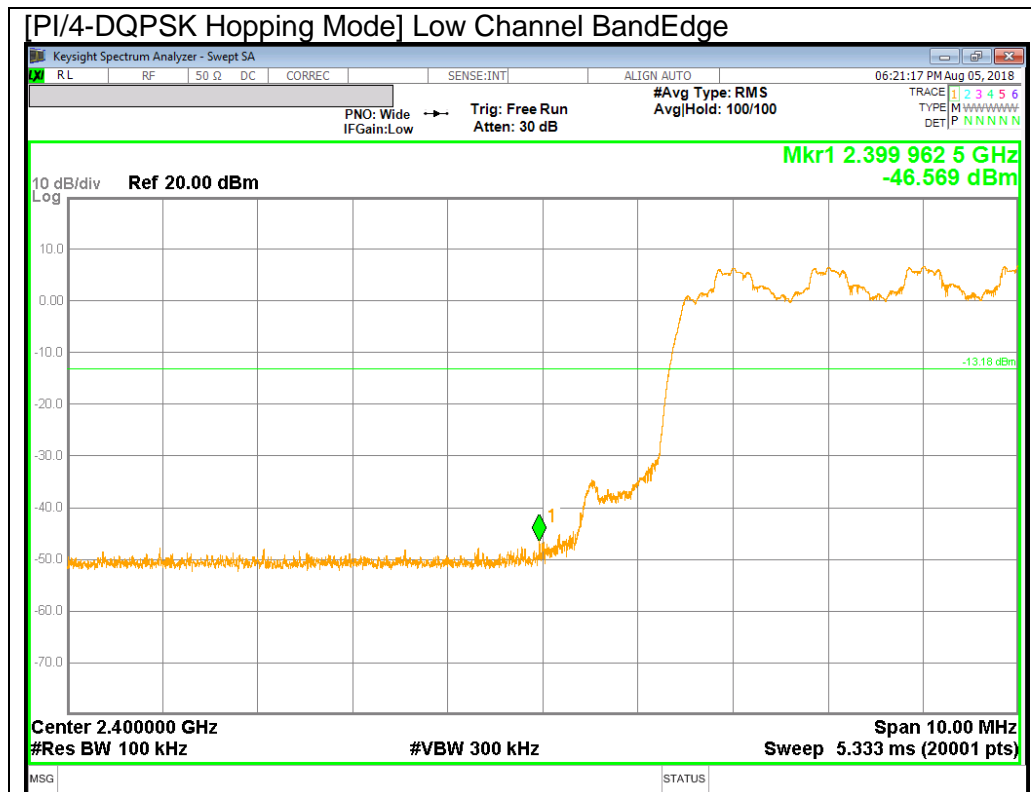
**PI/4-DQPSK Mode**



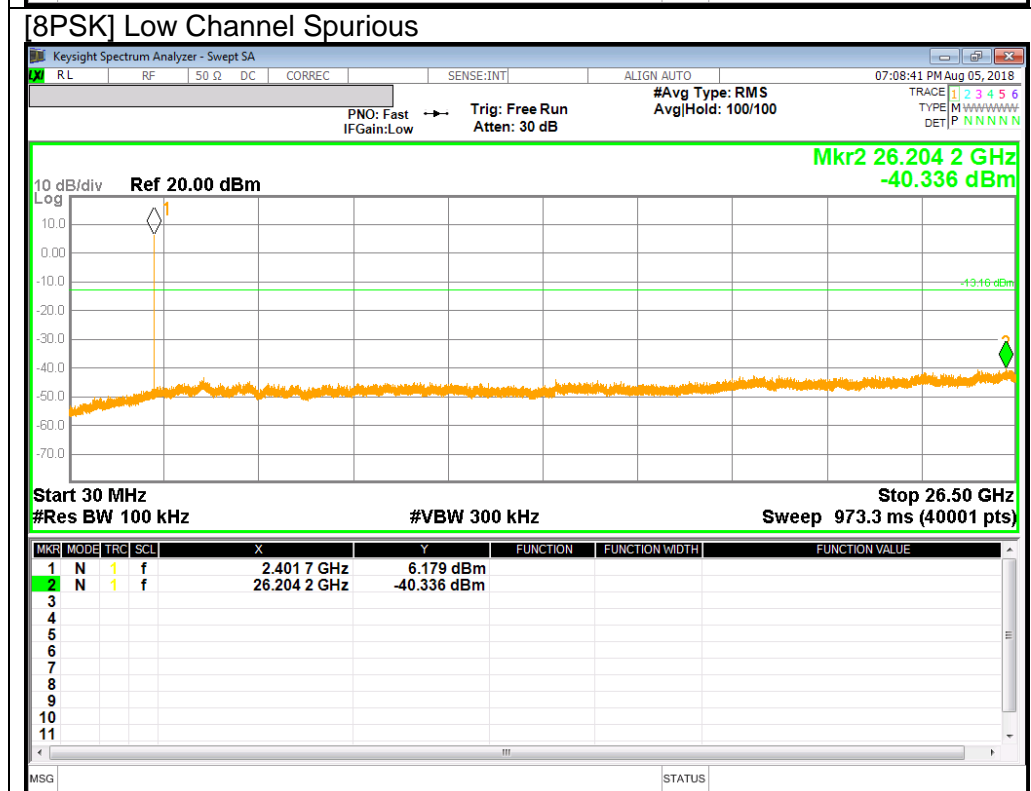
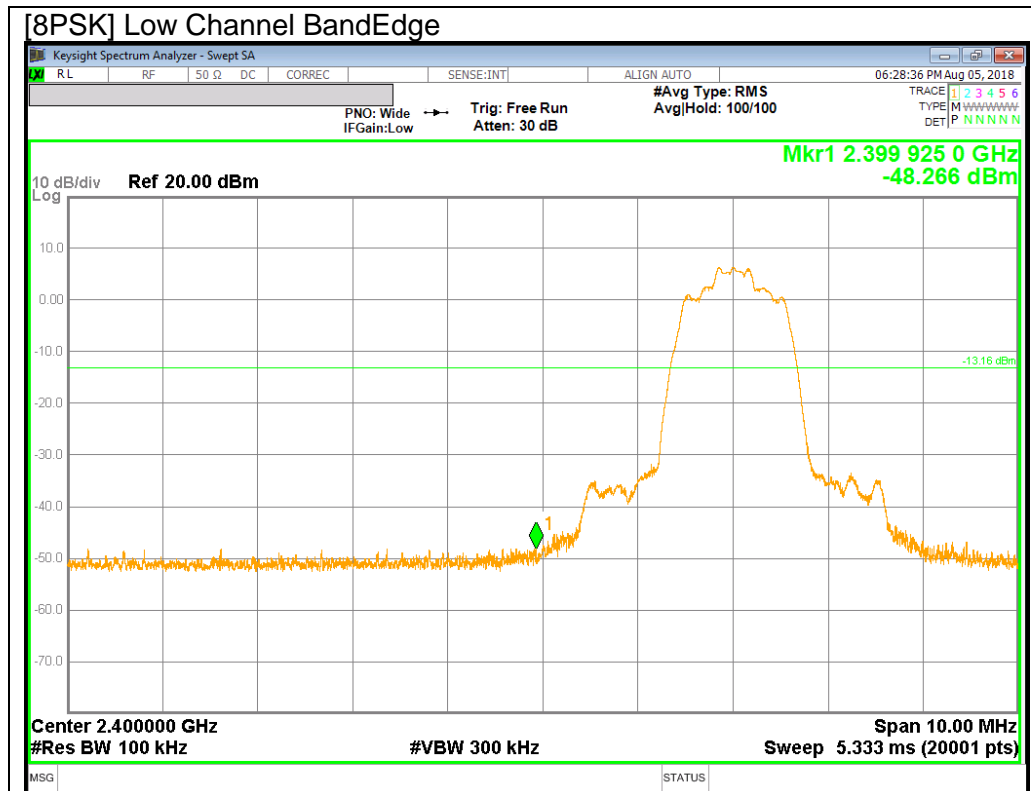


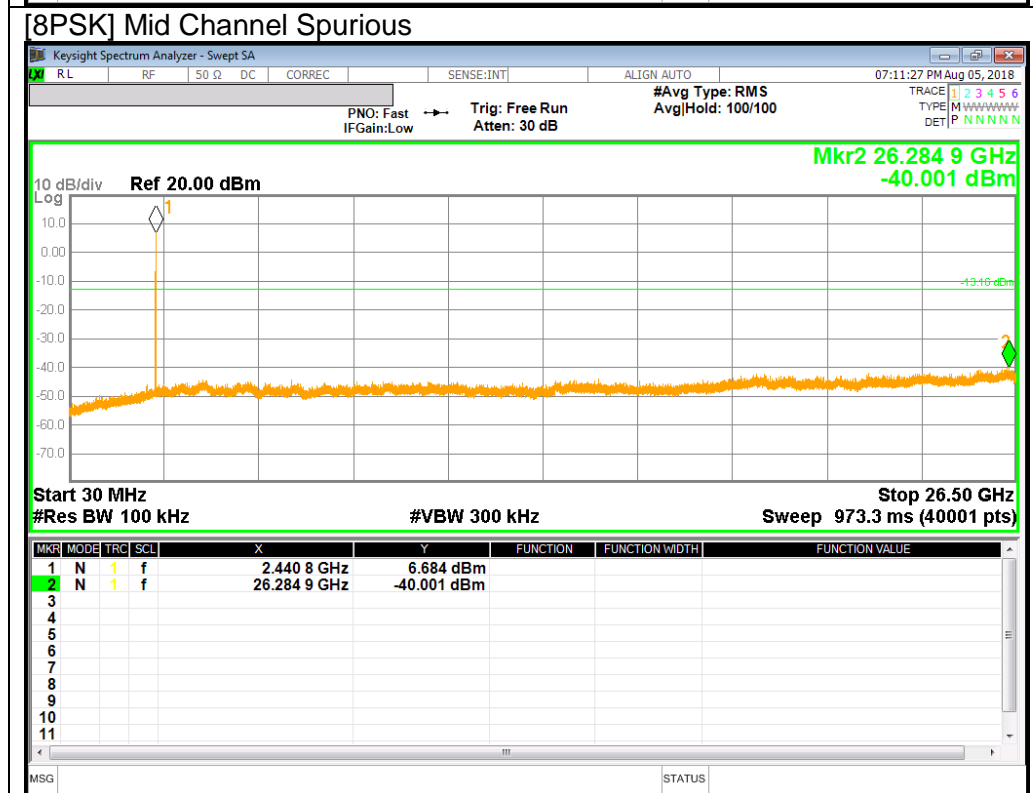
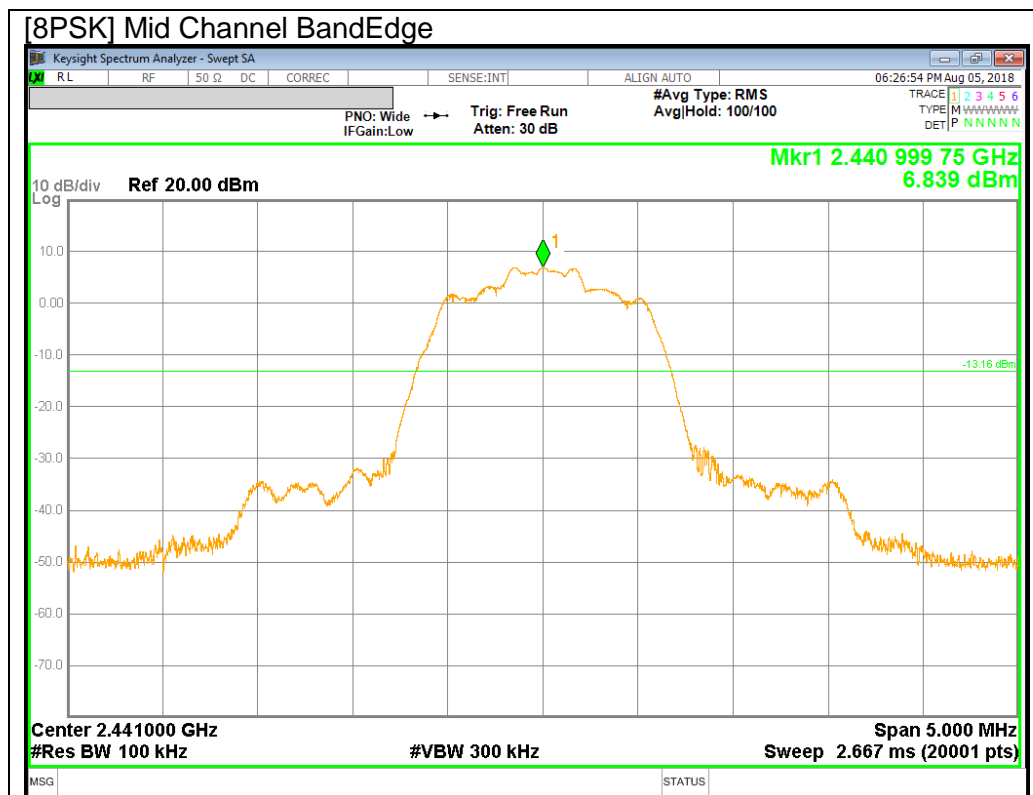


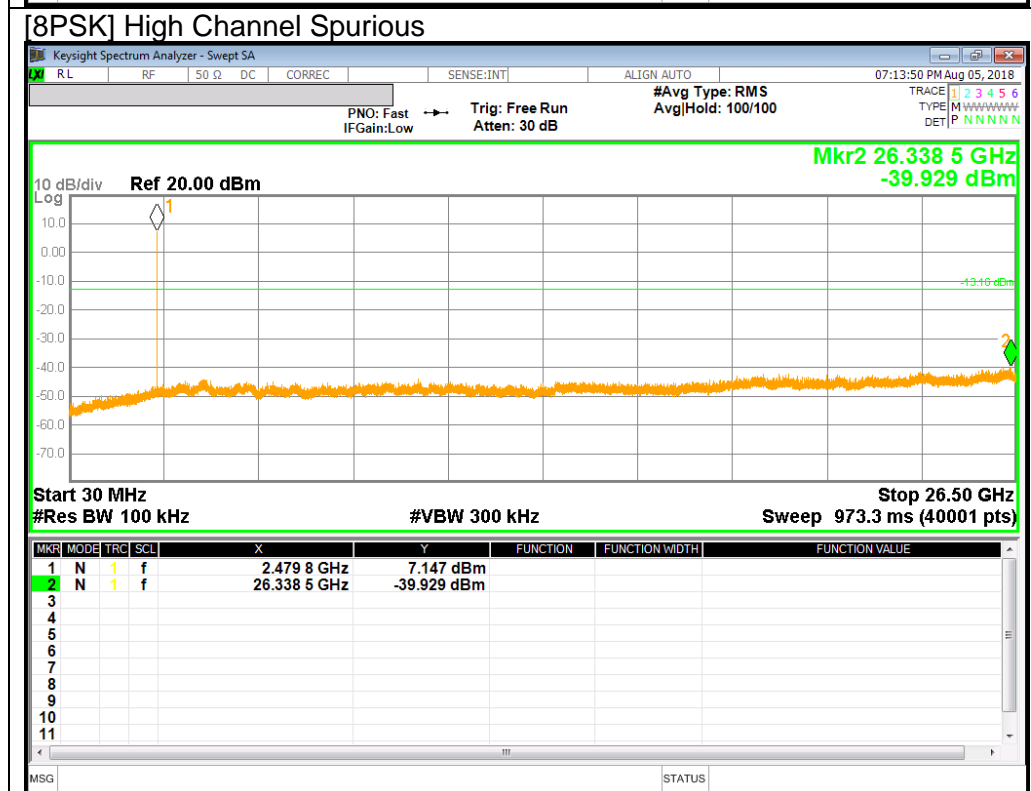
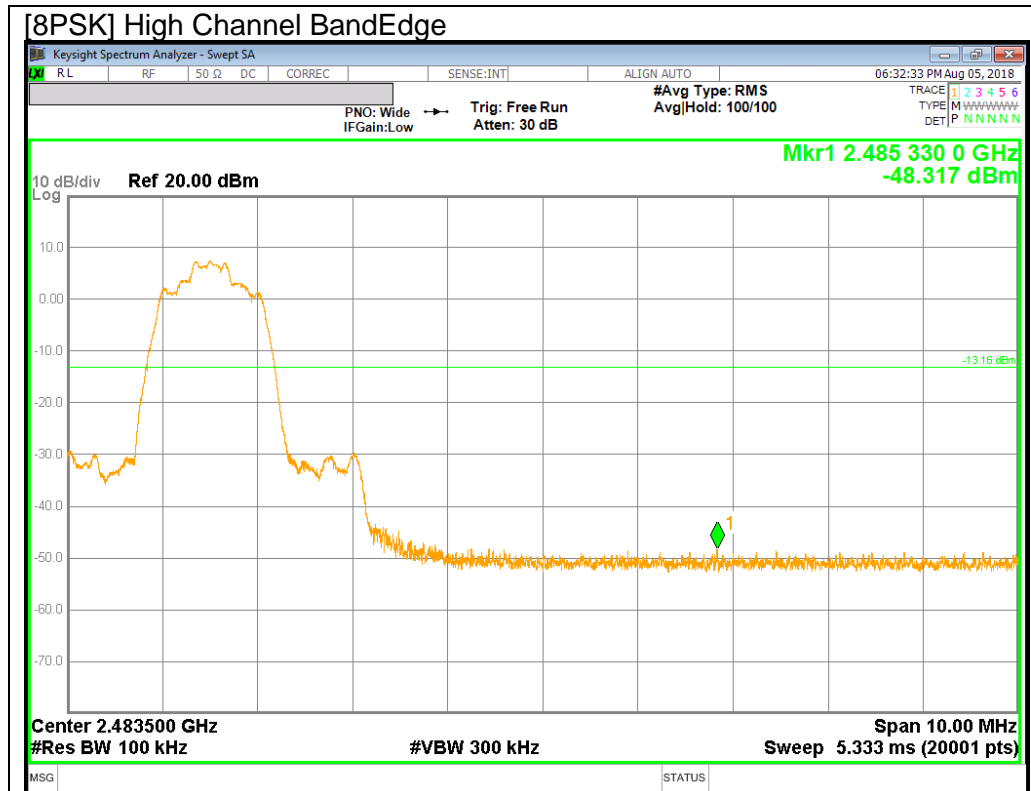
**BandEdge Emission at PI/4-DQPSK Hopping Mode**



**8PSK Mode**

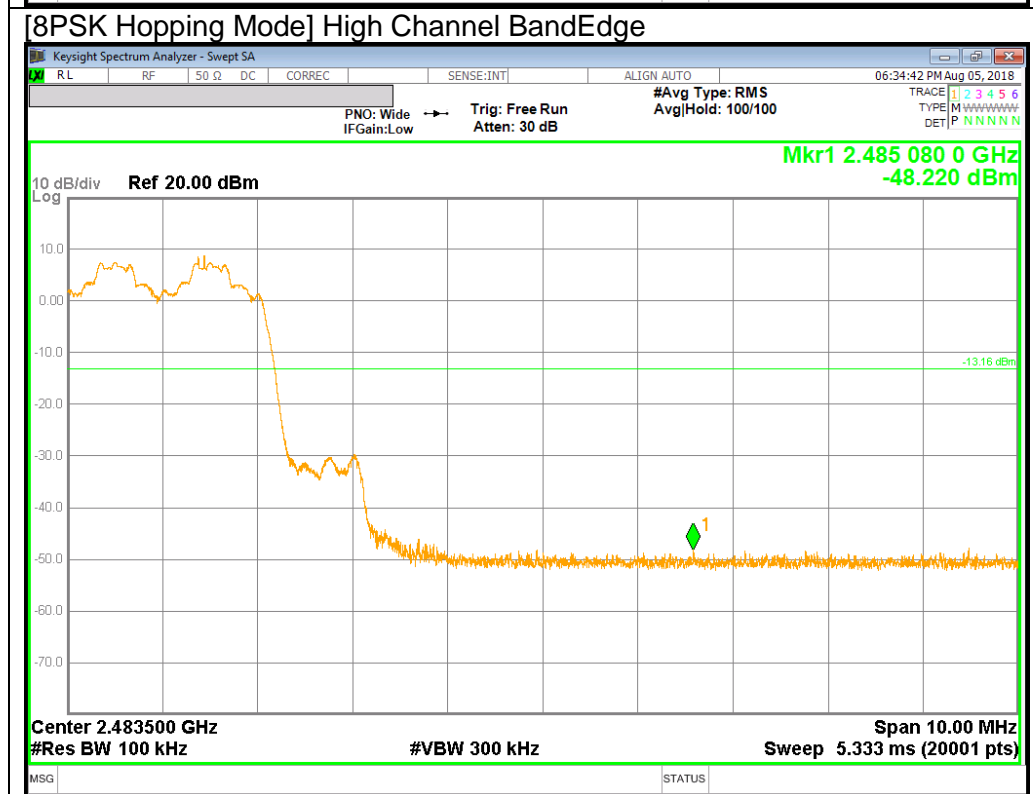
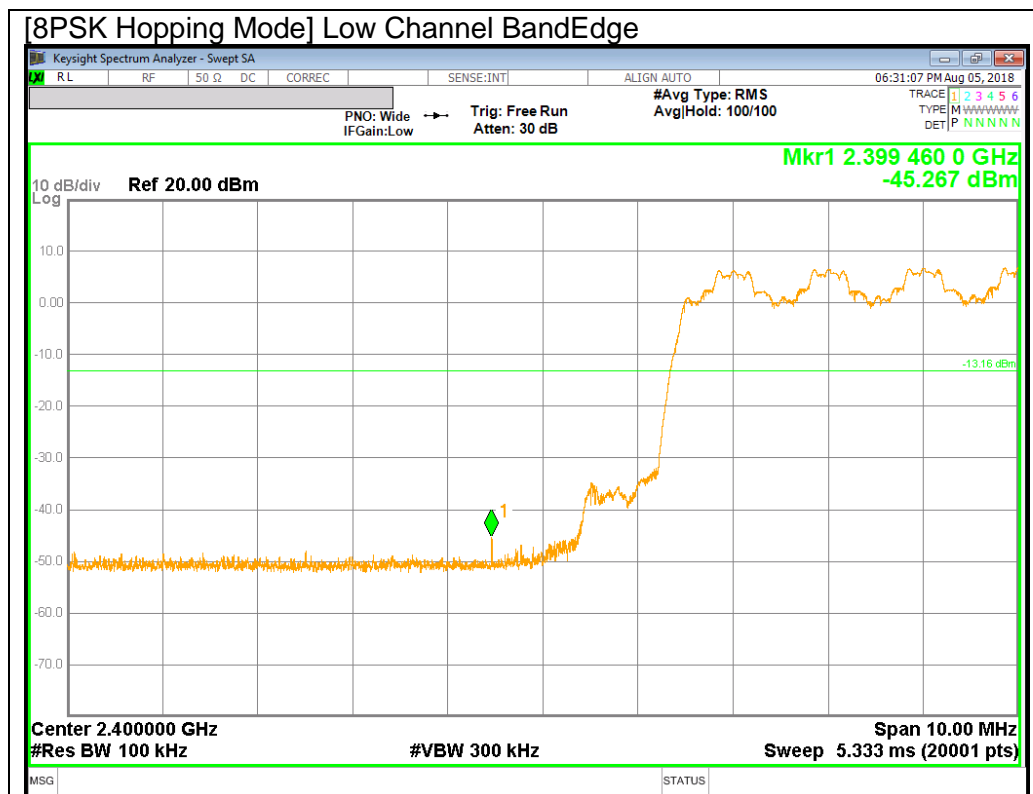








### BandEdge Emission at 8PSK Hopping Mode



## 11. RADIATED TEST RESULTS

### 11.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

## TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements.(Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.)

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1/T (on time) for average measurement.

$$\text{GFSK} = 1/T = 1 / 0.002884\text{S} = 347\text{Hz}.$$

The minimum VBW was 347Hz, but test receiver(ESU40) couldn't set value 347Hz. Due to this reason, testing VBW was set to 500Hz(Worst cases).

The spectrum from 1GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.  
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

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.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).  
Per FCC part 15.31(o), test results were not reported.

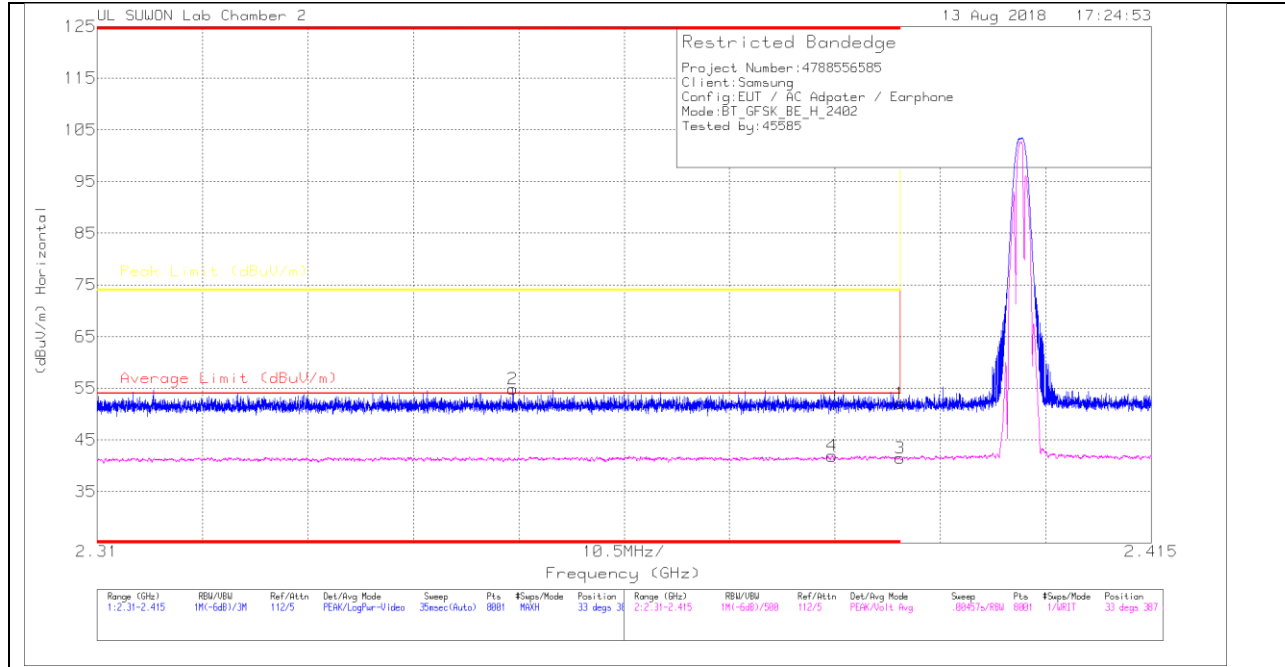
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.  
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

## 11.2. TRANSMITTER ABOVE 1 GHz

### 11.2.1. BASIC DATA RATE GFSK MODULATION

#### RESTRICTED BANDEDGE (LOW CHANNEL)

##### HORIZONTAL PEAK AND AVERAGE PLOT



##### HORIZONTAL DATA

###### Trace Markers

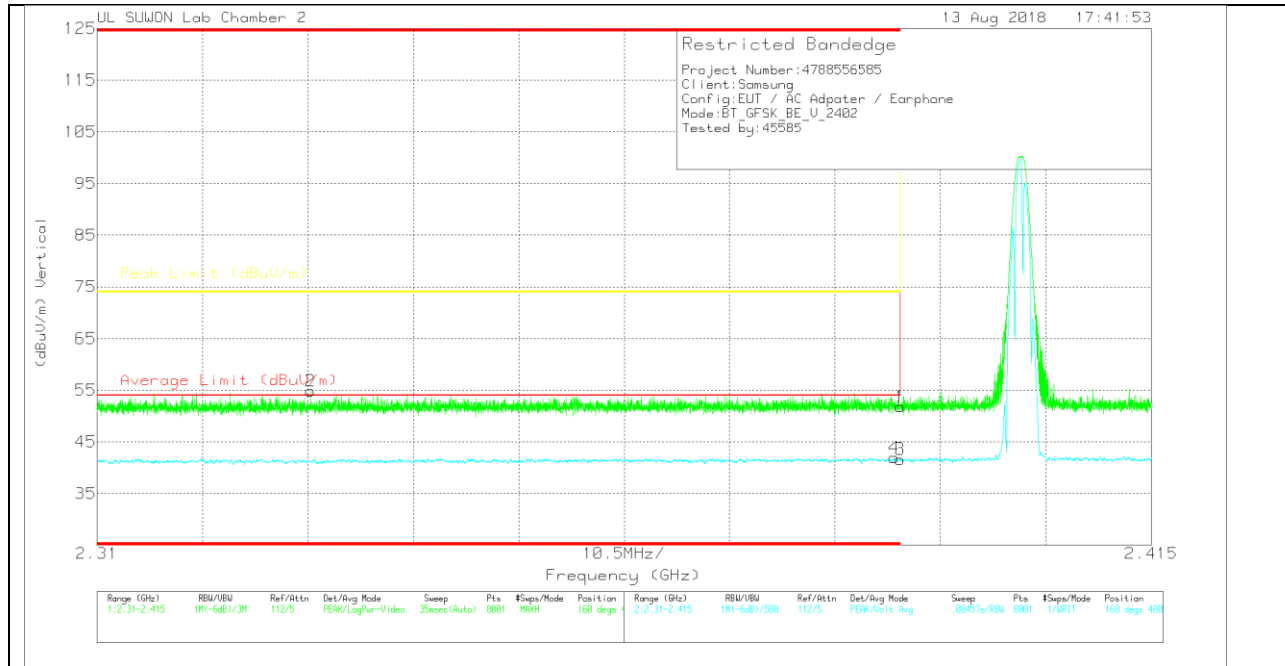
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.26	Pk	31.6	-20.8	52.06	-	-	74	-21.94	33	387	H
2	* 2.351	44.17	Pk	31.6	-20.9	54.87	-	-	74	-19.13	33	387	H
3	* 2.39	30.65	VA1T	31.6	-20.8	41.45	54	-12.55	-	-	33	387	H
4	* 2.383	31.12	VA1T	31.6	-20.8	41.92	54	-12.08	-	-	33	387	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $VB=1/T_{on}$  where:  $T_{on}$  is transmit duration

**VERTICAL PEAK AND AVERAGE PLOT**



**VERTICAL DATA**

**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[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	41.03	Pk	31.6	-20.8	51.83	-	-	74	-22.17	160	400	V
2	* 2.331	44.25	Pk	31.5	-20.9	54.85	-	-	74	-19.15	160	400	V
3	* 2.39	30.84	VA1T	31.6	-20.8	41.64	54	-12.36	-	-	160	400	V
4	* 2.389	31.17	VA1T	31.6	-20.8	41.97	54	-12.03	-	-	160	400	V

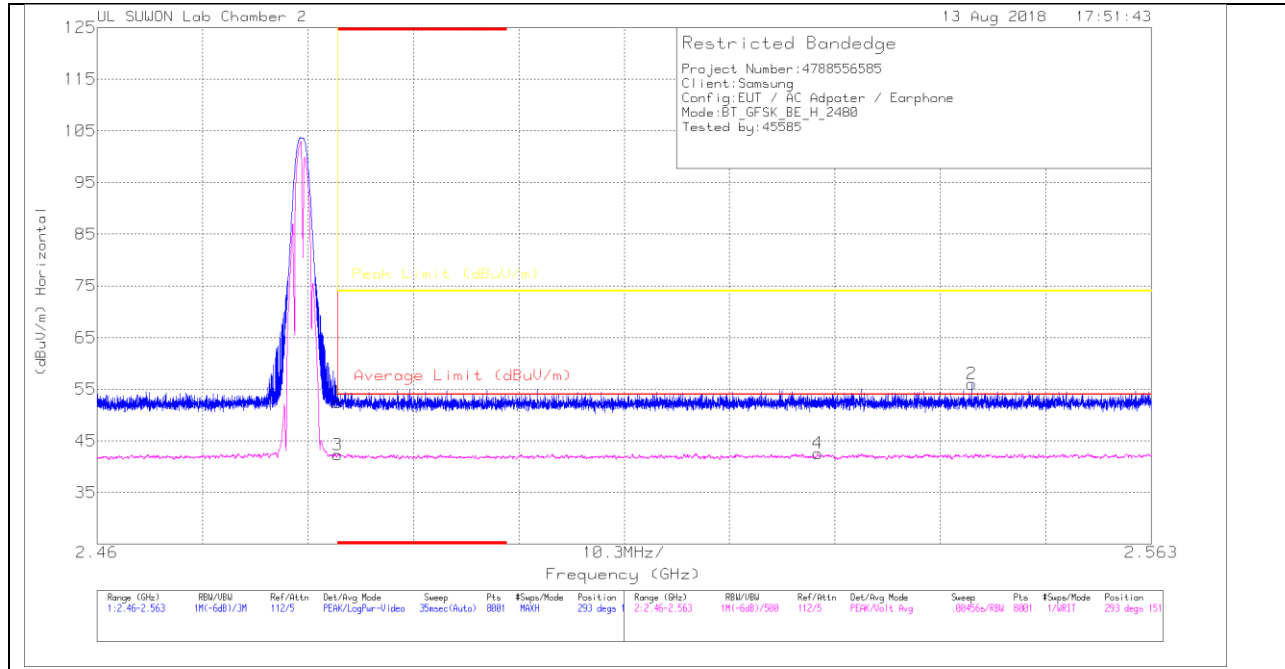
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### AUTHORIZED BANDEDGE (HIGH CHANNEL)

#### HORIZONTAL PEAK AND AVERAGE PLOT



#### HORIZONTAL DATA

##### Trace Markers

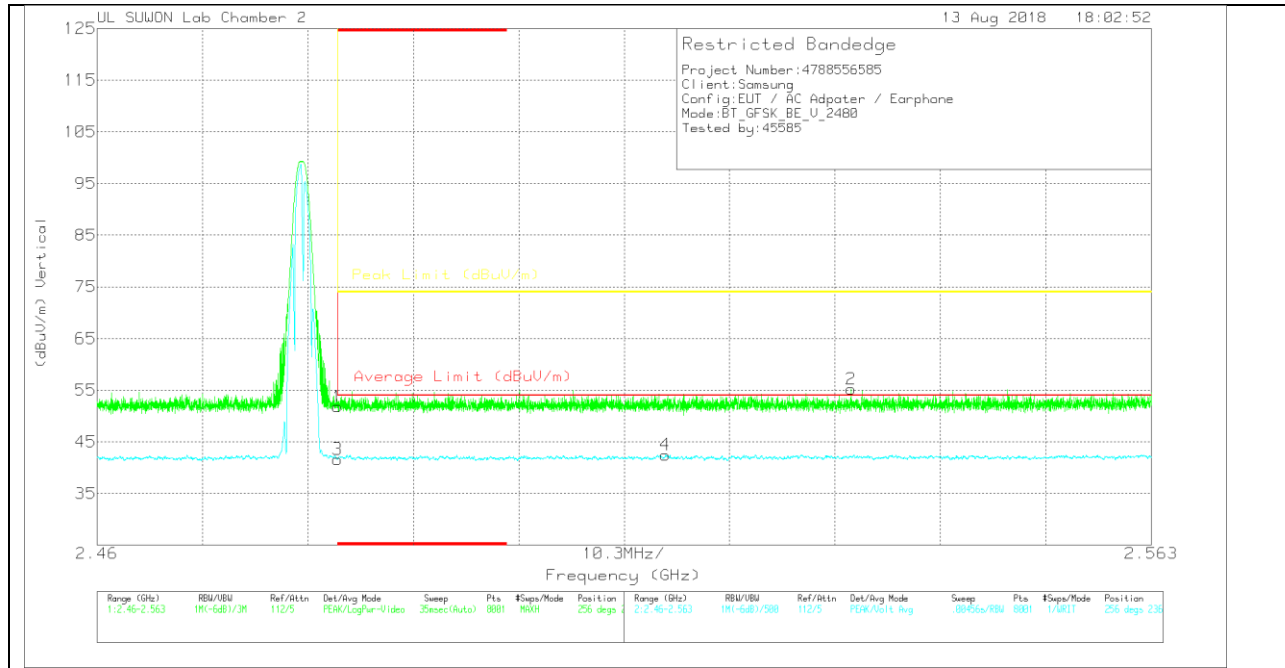
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.16	Pk	31.9	-20.6	52.46	-	-	74	-21.54	293	151	H
2	2.545	44.54	Pk	32	-20.5	56.04	-	-	74	-17.96	293	151	H
3	* 2.484	31.02	VA1T	31.9	-20.6	42.32	54	-11.68	-	-	293	151	H
4	2.53	31.21	VA1T	32	-20.6	42.61	54	-11.39	-	-	293	151	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B=1/T_{on}$  where:  $T_{on}$  is transmit duration

**VERTICAL PEAK AND AVERAGE PLOT**



**VERTICAL DATA**

**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.52	Pk	31.9	-20.6	51.82	-	-	74	-22.18	256	236	V
2	2.534	43.72	Pk	32	-20.5	55.22	-	-	74	-18.78	256	236	V
3	* 2.484	30.32	VA1T	31.9	-20.6	41.62	54	-12.38	-	-	256	236	V
4	2.516	31.1	VA1T	31.9	-20.5	42.5	54	-11.5	-	-	256	236	V

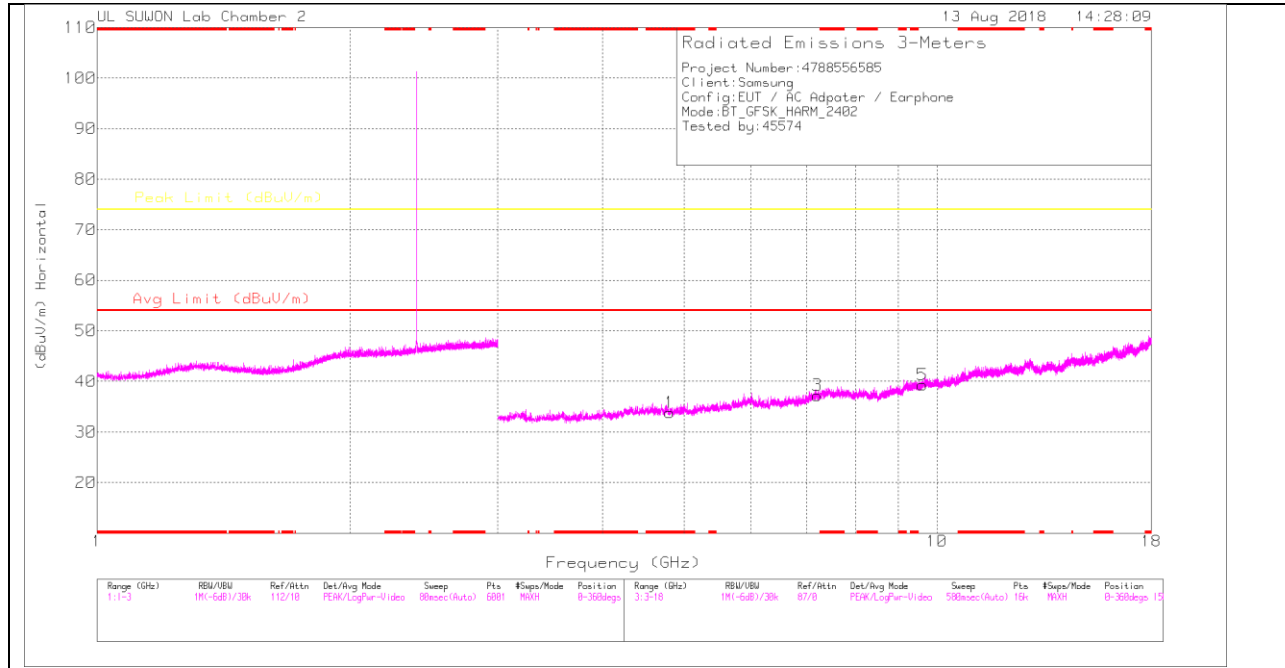
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

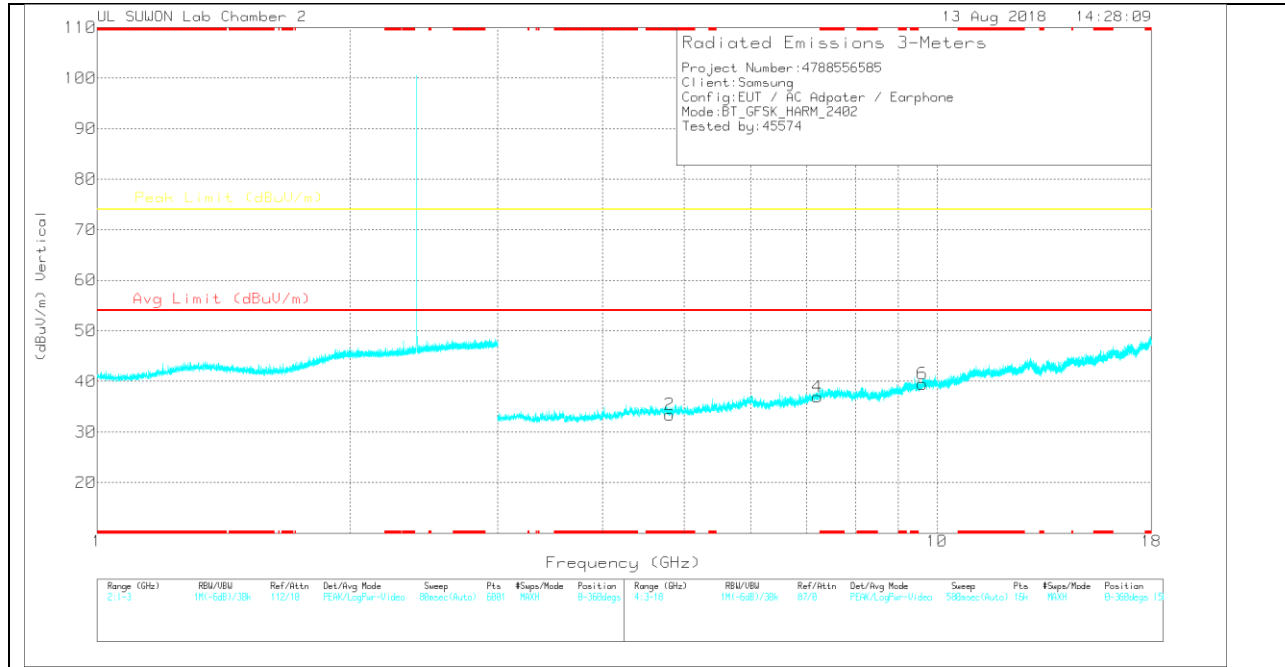
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 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**

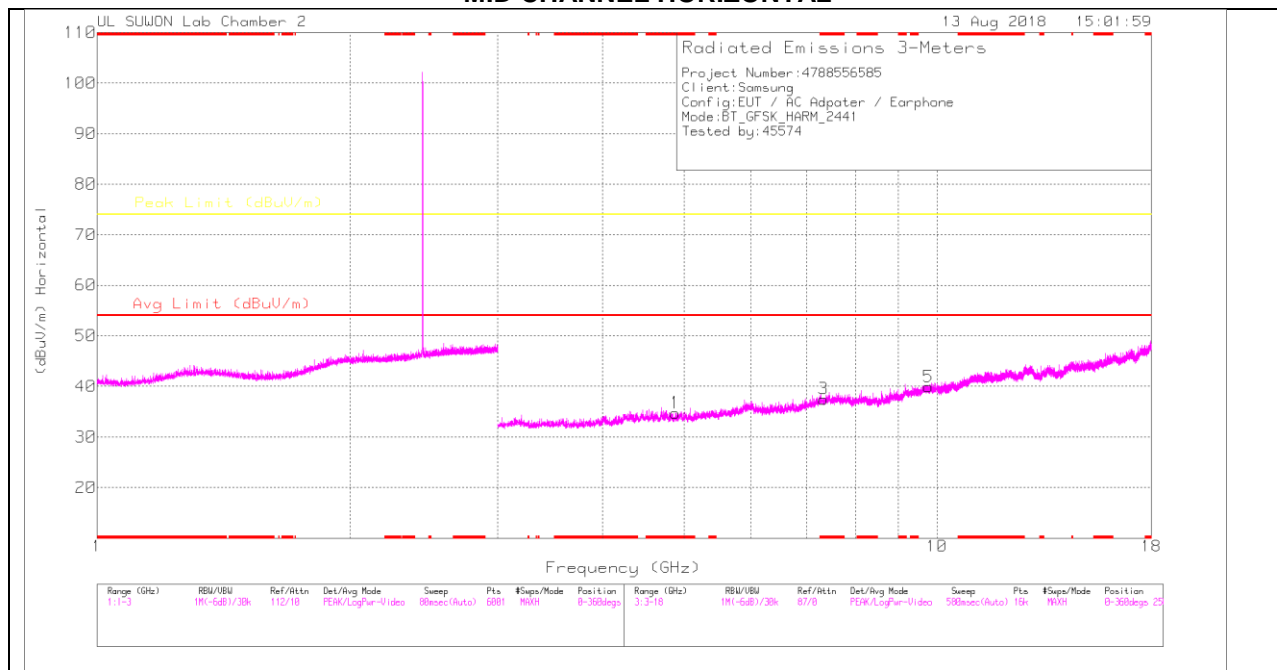
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.805	27.9	PK	34	-28.1	33.8	-	-	74	-40.2	0-360	150	H
3	7.205	26.42	PK	36.1	-25.3	37.22	-	-	74	-36.78	0-360	250	H
5	9.609	24.2	PK	37	-21.9	39.3	-	-	74	-34.7	0-360	250	H
2	* 4.805	27.5	PK	34	-28.1	33.4	-	-	74	-40.6	0-360	250	V
4	7.208	26.14	PK	36.1	-25.3	36.94	-	-	74	-37.06	0-360	150	V
6	9.609	24.41	PK	37	-21.9	39.51	-	-	74	-34.49	0-360	150	V

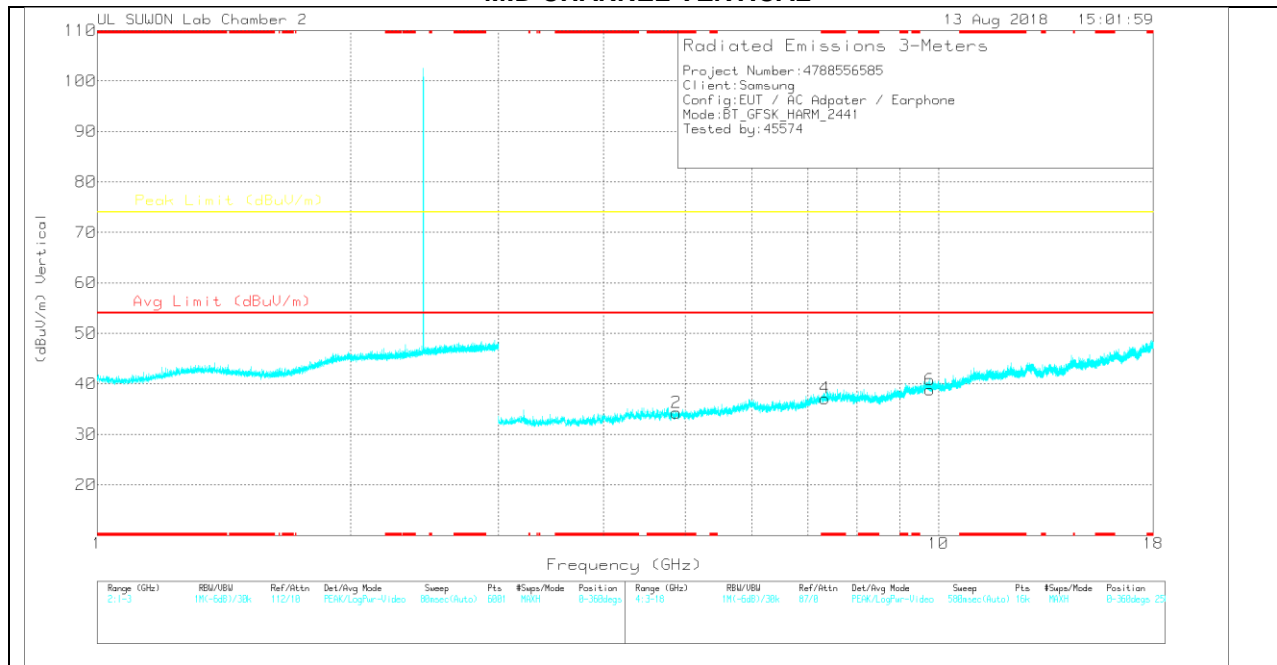
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

**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**

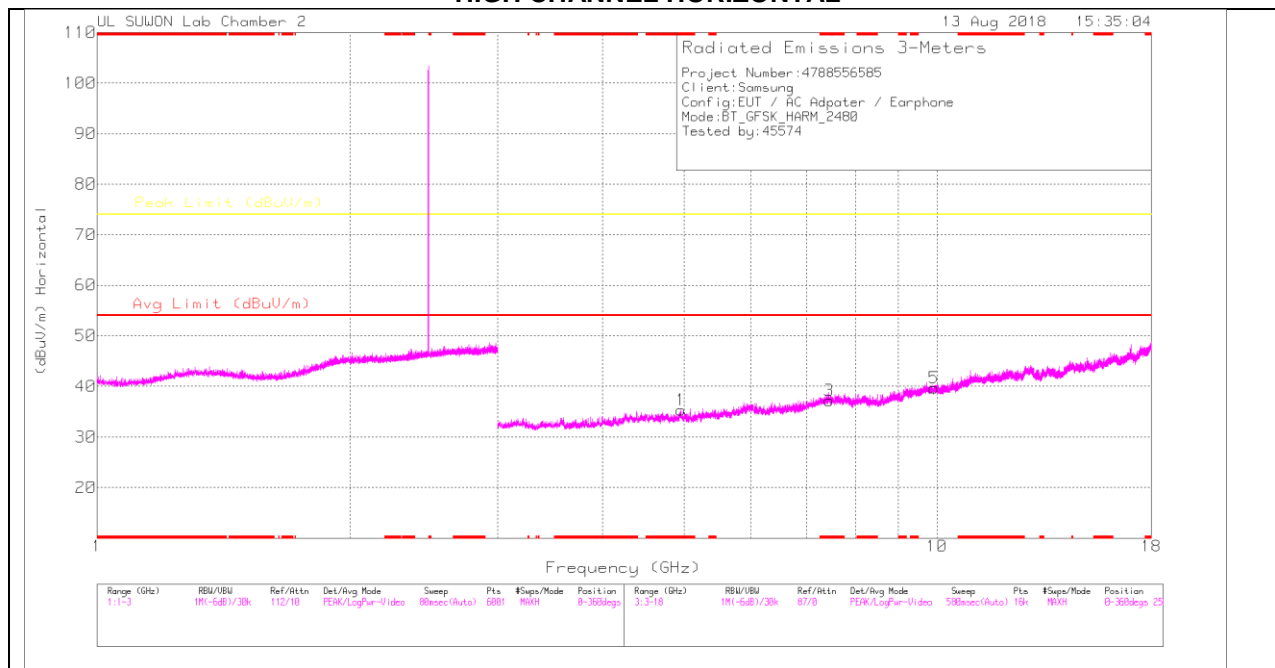
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	28.54	PK	34	-27.8	34.74	-	-	74	-39.26	0-360	150	H
3	* 7.323	26.09	PK	36.2	-24.8	37.49	-	-	74	-36.51	0-360	250	H
5	9.765	24.19	PK	37.2	-21.5	39.89	-	-	74	-34.11	0-360	250	H
2	* 4.883	28.08	PK	34	-27.8	34.28	-	-	74	-39.72	0-360	250	V
4	* 7.323	25.72	PK	36.2	-24.8	37.12	-	-	74	-36.88	0-360	150	V
6	9.765	23.1	PK	37.2	-21.5	38.8	-	-	74	-35.2	0-360	250	V

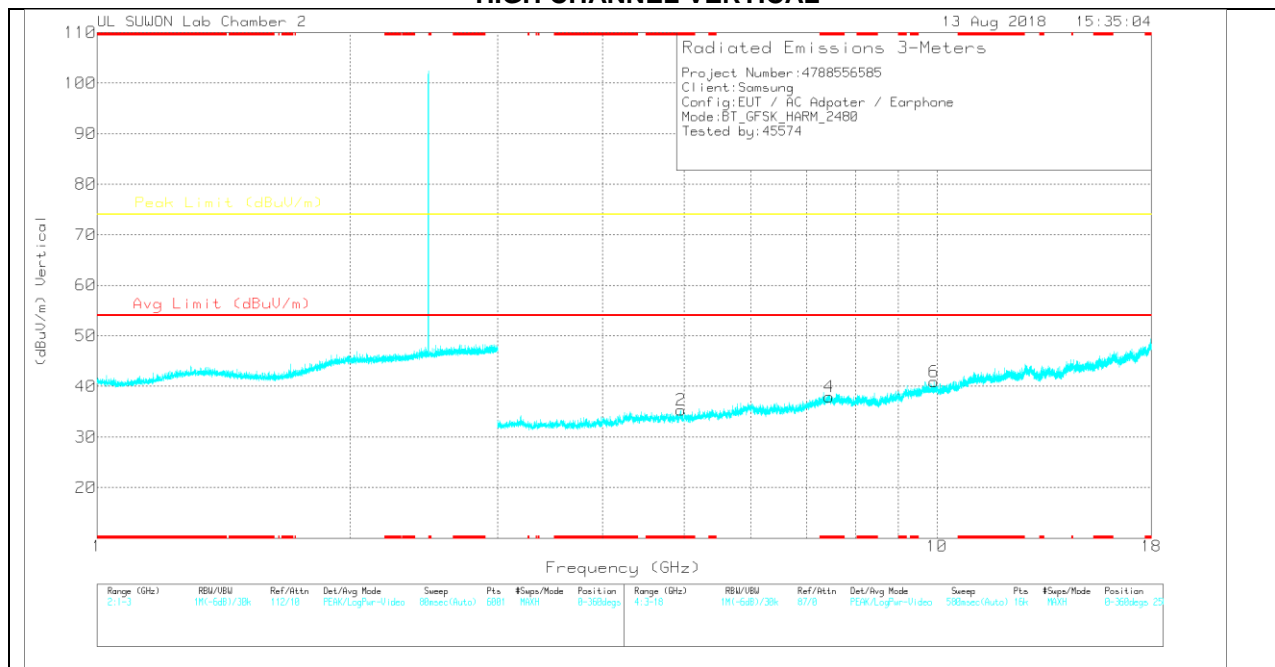
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

### 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

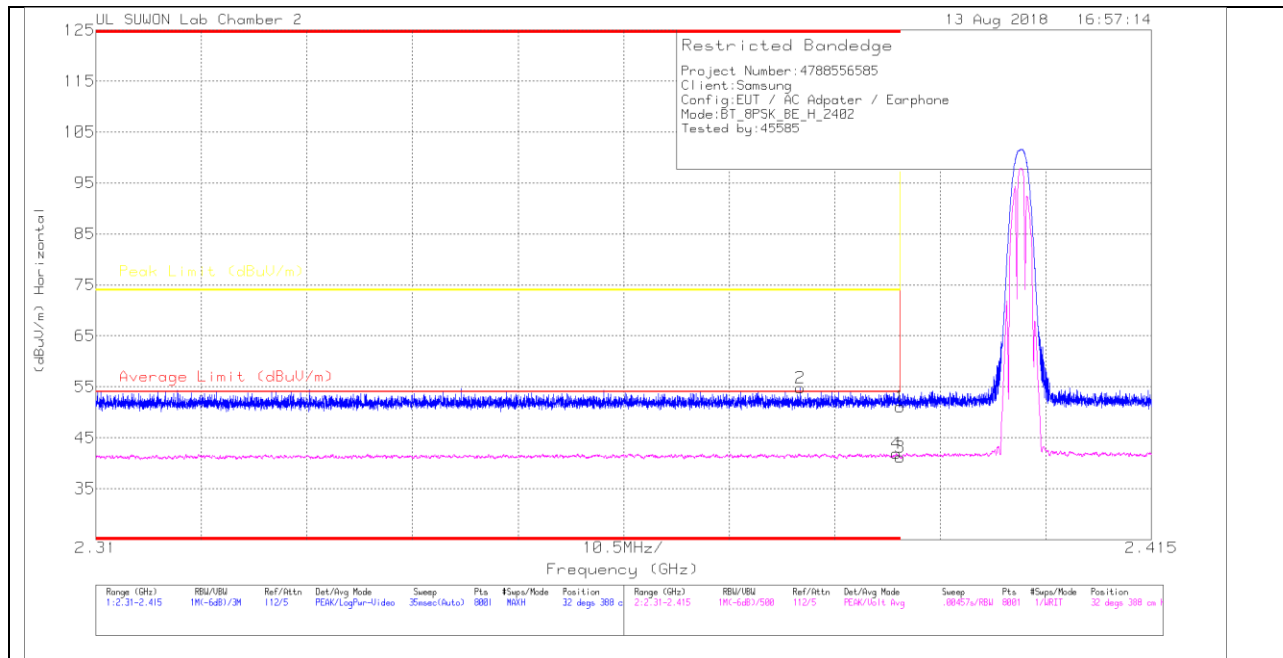
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96	28.3	PK	34.1	-27.1	35.3	-	-	74	-38.7	0-360	250	H
3	* 7.441	25.09	PK	36.2	-24.1	37.19	-	-	74	-36.81	0-360	250	H
5	9.921	23.27	PK	37.4	-21	39.67	-	-	74	-34.33	0-360	250	H
2	* 4.959	28.3	PK	34.1	-27.1	35.3	-	-	74	-38.7	0-360	250	V
4	* 7.441	25.82	PK	36.2	-24.1	37.92	-	-	74	-36.08	0-360	150	V
6	9.922	24.39	PK	37.4	-20.9	40.89	-	-	74	-33.11	0-360	250	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

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

### HORIZONTAL PEAK AND AVERAGE PLOT



### HORIZONTAL DATA

#### Trace Markers

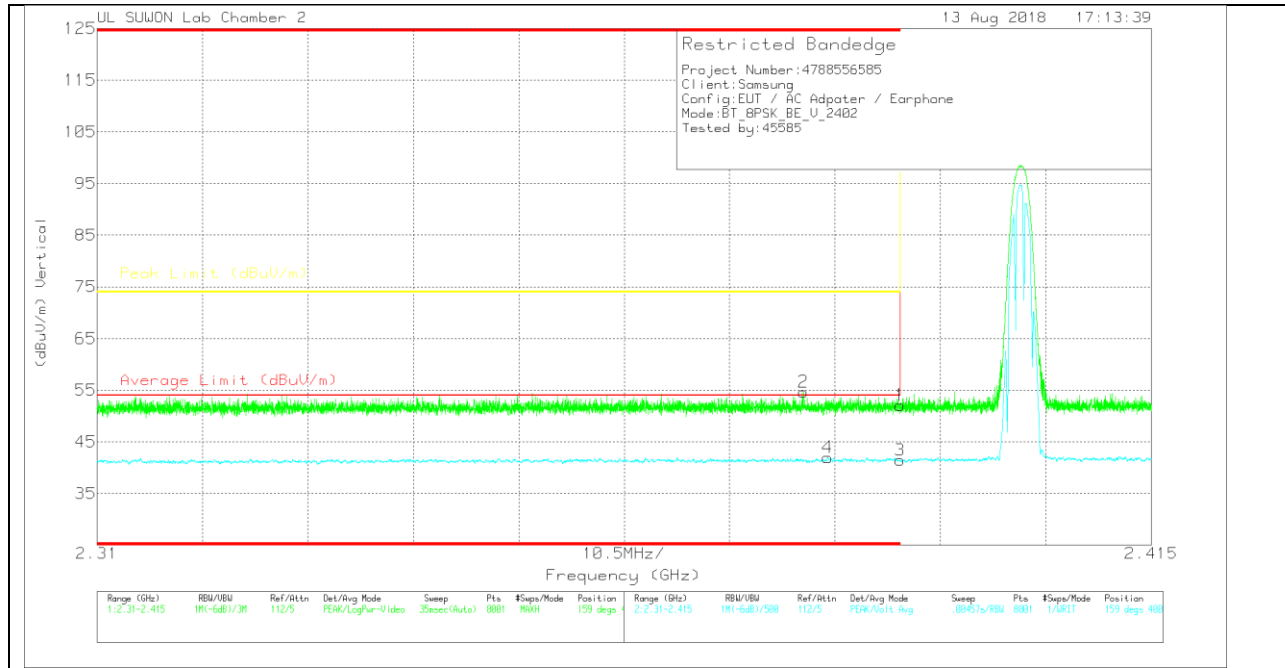
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00205959)	10dB_ATT(dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.34	Pk	31.8	-23.3	50.84	-	-	74	-23.16	55	163	H
2	* 2.351	44.87	Pk	31.7	-23.3	53.27	-	-	74	-20.73	55	163	H
3	* 2.39	30.25	VA1T	31.8	-23.3	38.75	54	-15.25	-	-	55	163	H
4	* 2.389	30.76	VA1T	31.8	-23.3	39.26	54	-14.74	-	-	55	163	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B=1/T_{on}$  where:  $T_{on}$  is transmit duration

**VERTICAL PEAK AND AVERAGE PLOT**



**VERTICAL DATA**

**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[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	41.28	Pk	31.6	-20.8	52.08	-	-	74	-21.92	159	400	V
2	* 2.38	43.85	Pk	31.6	-20.8	54.65	-	-	74	-19.35	159	400	V
3	* 2.39	30.67	VA1T	31.6	-20.8	41.47	54	-12.53	-	-	159	400	V
4	* 2.383	31.19	VA1T	31.6	-20.8	41.99	54	-12.01	-	-	159	400	V

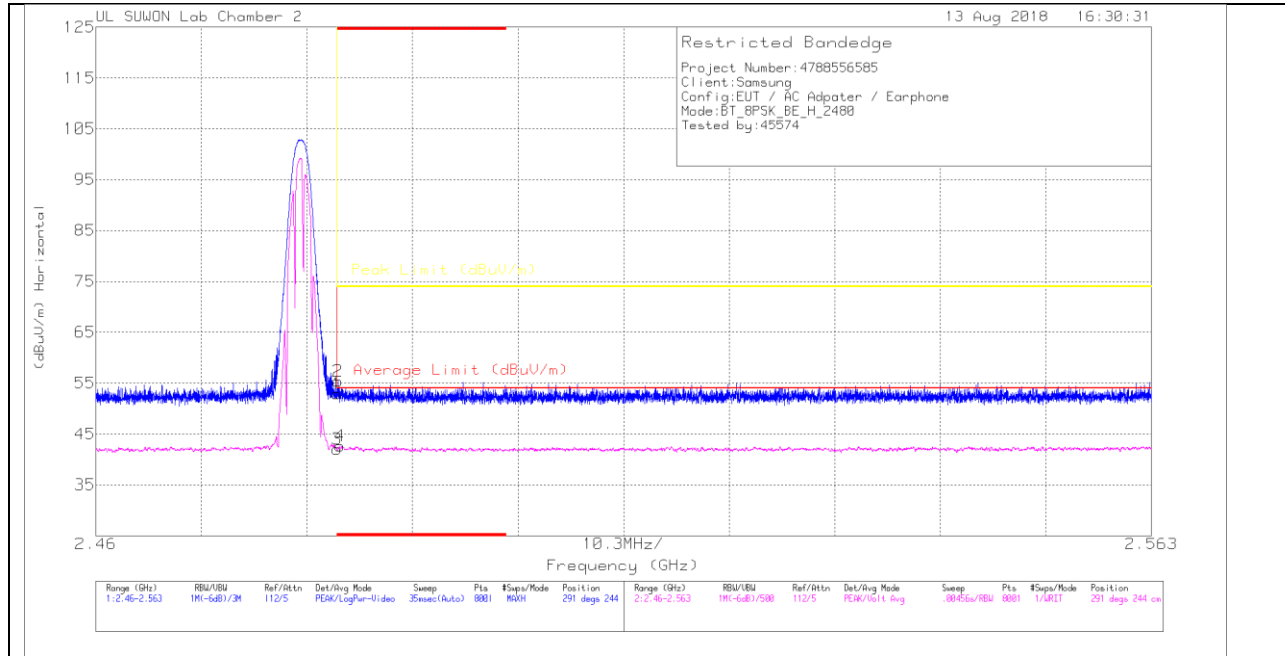
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

**AUTHORIZED BANDEDGE (HIGH CHANNEL)**

**HORIZONTAL PEAK AND AVERAGE PLOT**



**HORIZONTAL DATA**

**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[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	41.68	Pk	31.9	-20.6	52.98	-	-	74	-21.02	291	244	H
2	* 2.484	44.08	Pk	31.9	-20.6	55.38	-	-	74	-18.62	291	244	H
3	* 2.484	30.71	VA1T	31.9	-20.6	42.01	54	-11.99	-	-	291	244	H
4	* 2.484	31.31	VA1T	31.9	-20.6	42.61	54	-11.39	-	-	291	244	H

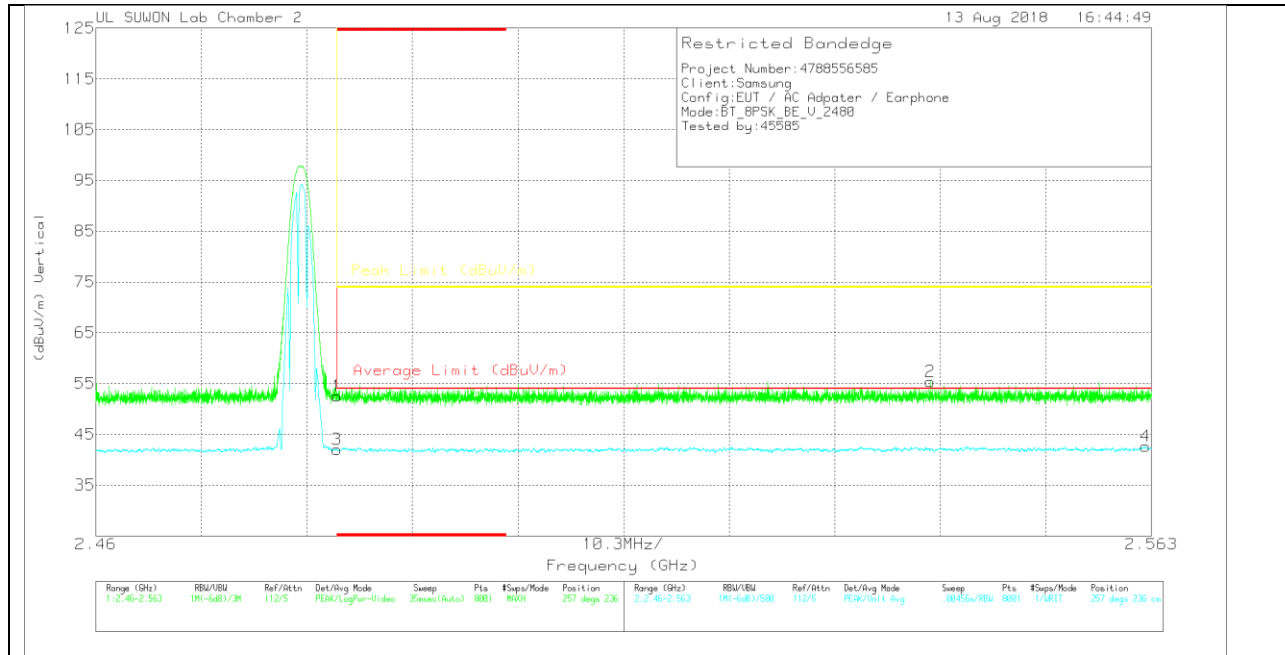
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B=1/T_{on}$  where:  $T_{on}$  is transmit duration



**VERTICAL PEAK AND AVERAGE PLOT**



**VERTICAL DATA**

**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB[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	41.24	Pk	31.9	-20.6	52.54	-	-	74	-21.46	257	236	V
2	2.541	43.89	Pk	32	-20.5	55.39	-	-	74	-18.61	257	236	V
3	* 2.484	30.77	VA1T	31.9	-20.6	42.07	54	-11.93	-	-	257	236	V
4	2.562	30.92	VA1T	32	-20.3	42.62	54	-11.38	-	-	257	236	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B=1/T_{on}$  where:  $T_{on}$  is transmit duration