FCC CFR47 PART 15 SUBPART C

Bluetooth

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n and NFC

MODEL NUMBER : SM-A205YN

FCC ID: A3LSMA205YN

REPORT NUMBER: 4788931341-E4V1

ISSUE DATE: APR 04, 2019

Prepared for
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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	04/04/19	Initial issue	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n and NFC
MODEL NUMBER:	SM-A205YN
SERIAL NUMBER:	R38M10DYWWJ (CONDUCTED, Original) R38M10DYWJA, R38M10DYX2A (RADIATED, Original); R38M305XVNL (RADIATED, Spot check)
DATE TESTED:	FEB 19, 2019 – FEB 27, 2019 (Original); MAR 27, 2019 – APR 04, 2019 (Spot check)

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
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA205GN DSS Bluetooth(FCC CFR 47 Part 15C). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMA205YN shares the same enclosure and circuit board as FCC ID: A3LSMA205GN. The Bluetooth antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA205GN remains representative of FCC ID: A3LSMA205YN. The test data of FCC ID: A3LSMA205GN being submitted for this application to cover Bluetooth features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated spurious and band edge emissions)

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A205GN Results	SM-A205YN Results		
					FCC ID : A3LSMA205GN	FCC ID : A3LSMA205YN		
DSS BT (2.4GHz)	Band Edge	8PSK	2480 MHz	54 dBuV/m	41.69 dBuV/m	41.57 dBuV/m	-0.12 dB	
	RSE	8PSK	2480 MHz	54 dBuV/m	51.57 dBuV/m	49.23 dBuV/m	-2.34 dB	

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.

Output power verification was performed for the spot check model, all conducted power test results were in the tune up tolerance range. Also deviation for maximum output power result is within upper 0.5dB range.

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1.4. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Tittle / Section
PCE	A3LSMA205GN	Grant	4788869685-E1	Test	FCC Report WWAN / GSM,WCDMA, LTE B5/B41
DTS	A3LSMA205GN	Grant	4788869685-E2	Test	FCC Report DTS WLAN / All sections
			4788869685-E3	Test	FCC Report BLE All sections
DSS	A3LSMA205GN	Grant	4788869685-E4	Test	FCC Report BT / All sections
DXX	A3LSMA205GN	Grant	4788869685-E5	Test	FCC Report NFC/ All sections

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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. KDB 558074 D01 15.247 Meas Guidance v05r01
4. KDB 484596 D01 Referencing Test Data v01
5. 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
☒ Chamber 1
☒ Chamber 2
☐ Chamber 3

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	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%.

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5. EQUIPMENT UNDER TEST

5.1.DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n and NFC.
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	9.176	8.272
		Peak	9.870	9.705
	Enhanced Pi/4-DPSK	Average	7.772	5.987
		Peak	10.105	10.245
	Enhanced 8PSK	Average	7.796	6.020
		Peak	10.879	12.243

5.2.DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antenna, with a maximum gain of -0.53 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 Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

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.

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5.4.DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37M1560CV1SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

I/O CABLE

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.1m	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.

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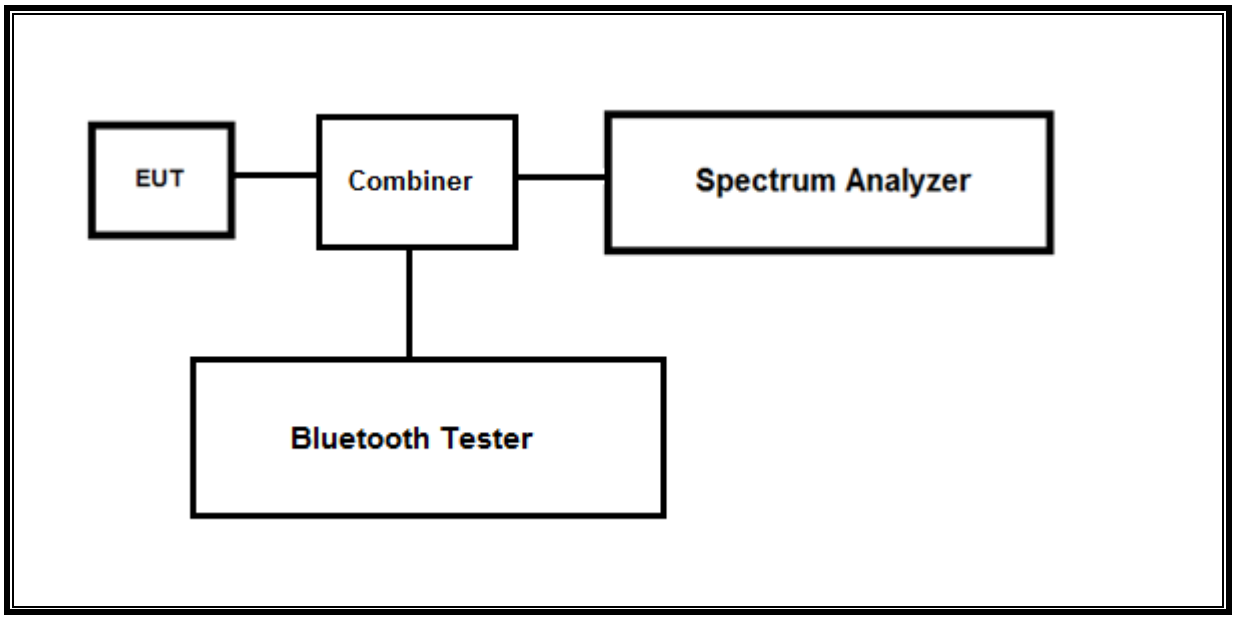
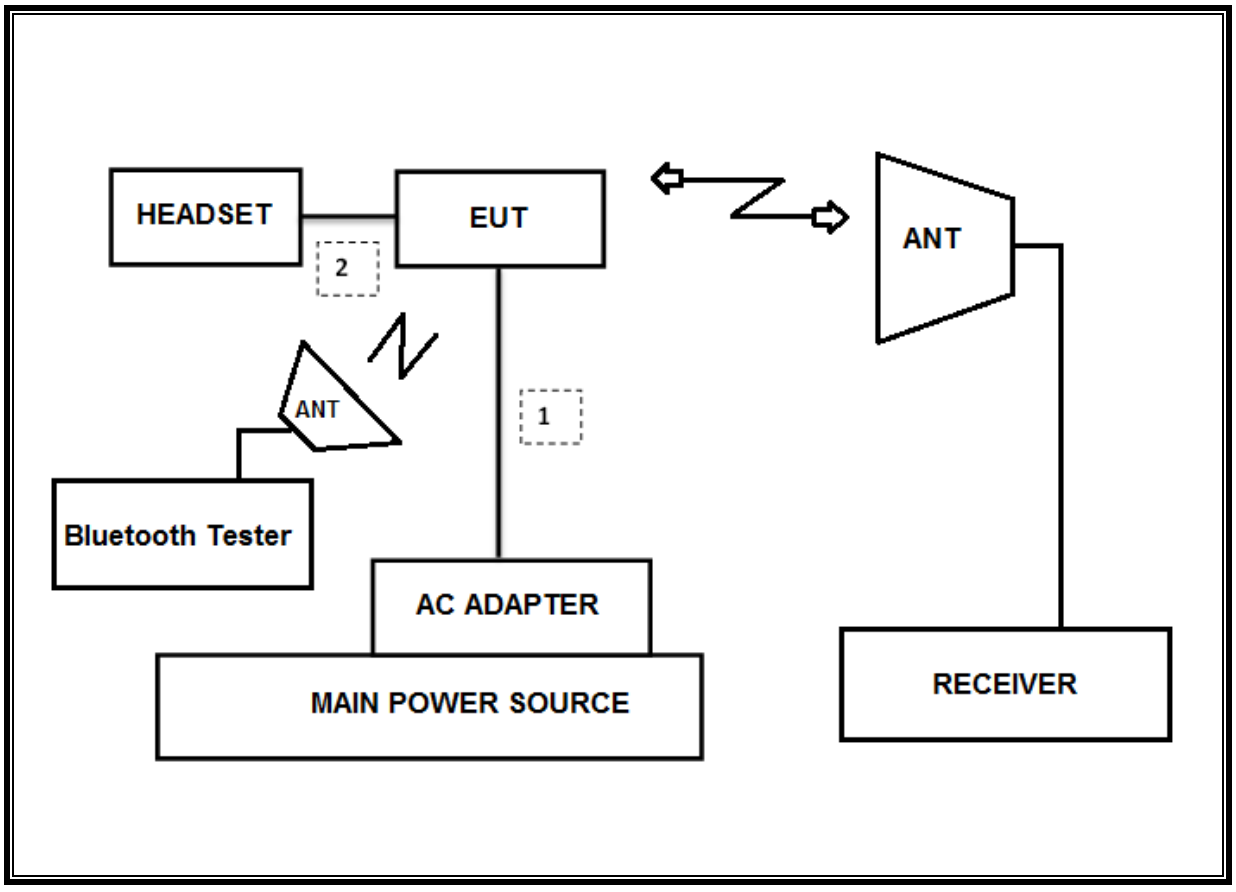
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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.

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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**	**New Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Combiner	WEINSCHEL	1575	2150	08-08-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-07-19
Attenuator	PASTERNACK	PE7087-10	A001	08-08-19
Attenuator	PASTERNACK	PE7087-10	A008	08-08-19
Attenuator	PASTERNACK	PE7004-10	2	08-07-19
Attenuator	PASTERNACK	PE7087-10	A009	08-08-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-06-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-19
LISN	R&S	ENV-216	101837	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	

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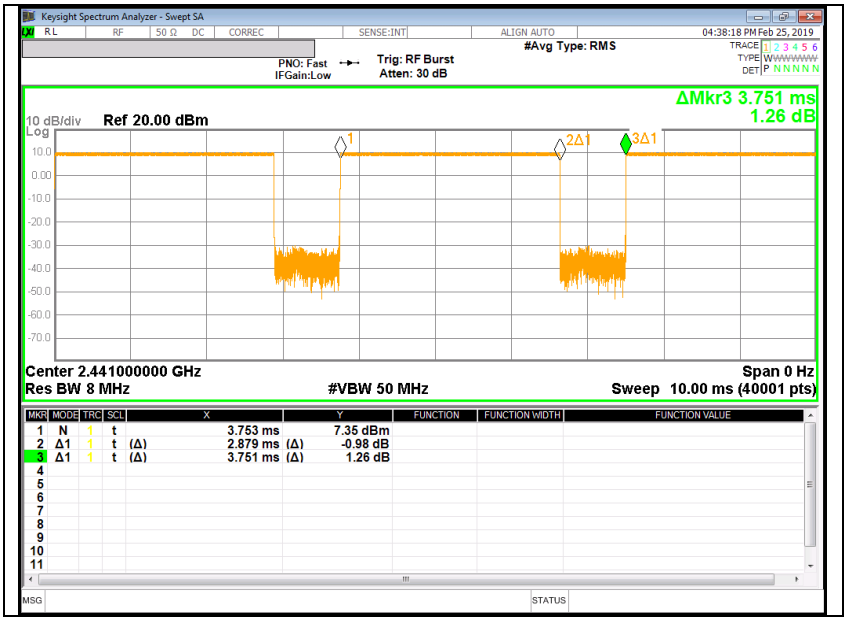
8. REFERENCE MEASUREMENT RESULTS

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]
2400MHz Bands						
BT	2.879	3.751	0.768	76.8%	1.15	0.347



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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% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

8.2.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [kHz]
Low	2402	1.041	937.97
Mid	2441	1.038	903.92
High	2480	1.044	936.42
Worst		1.044	937.97

8.2.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.339	1.167
Mid	2441	1.345	1.166
High	2480	1.349	1.199
Worst		1.349	1.199

8.2.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.301	1.194
Mid	2441	1.273	1.167
High	2480	1.282	1.196
Worst		1.301	1.196

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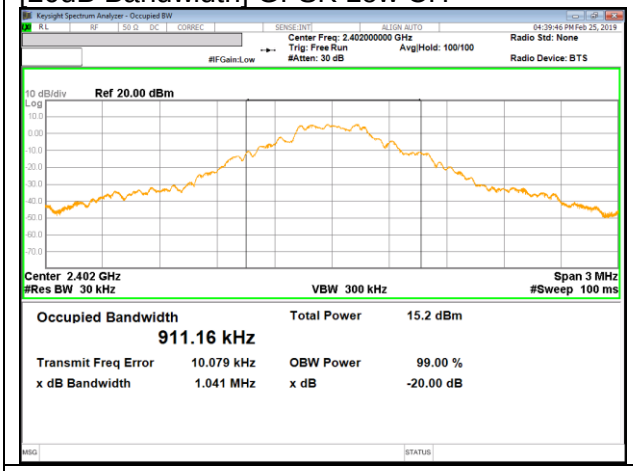
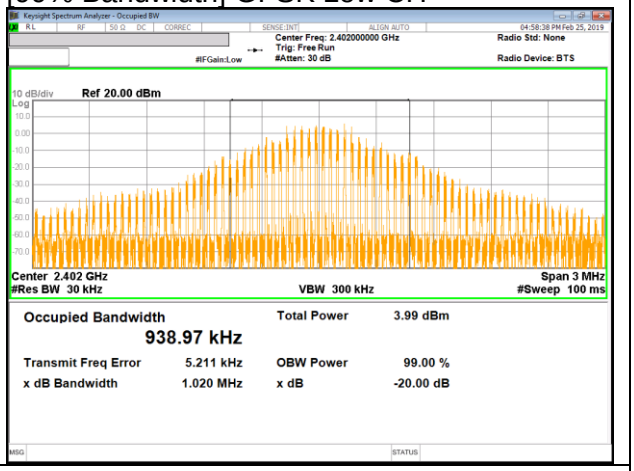
8.2.4. 20 dB AND 99% BANDWIDTH PLOTS

GFSK BANDWIDTH

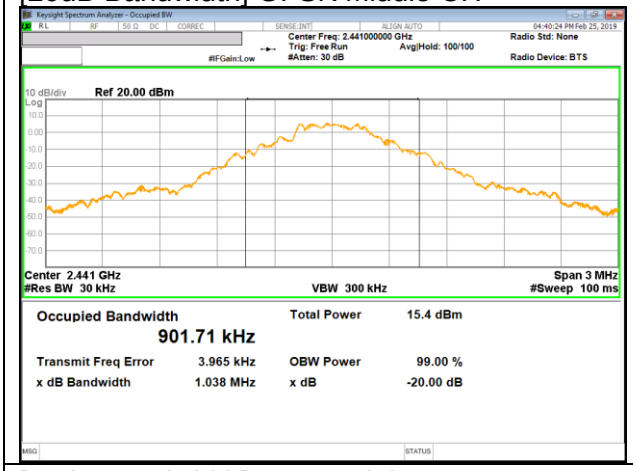
[20dB Bandwidth] GFSK Low CH



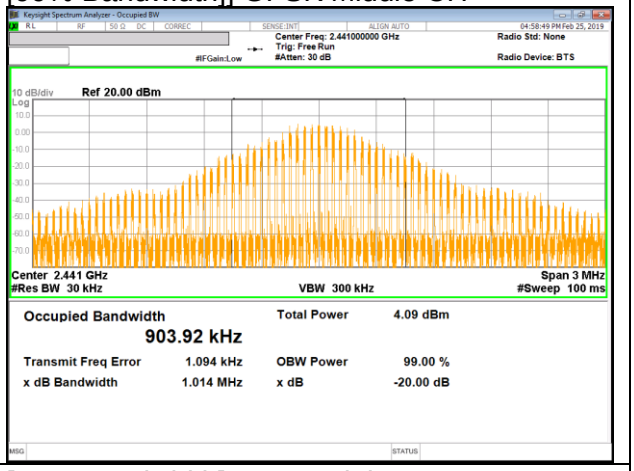
[99% Bandwidth] GFSK Low CH



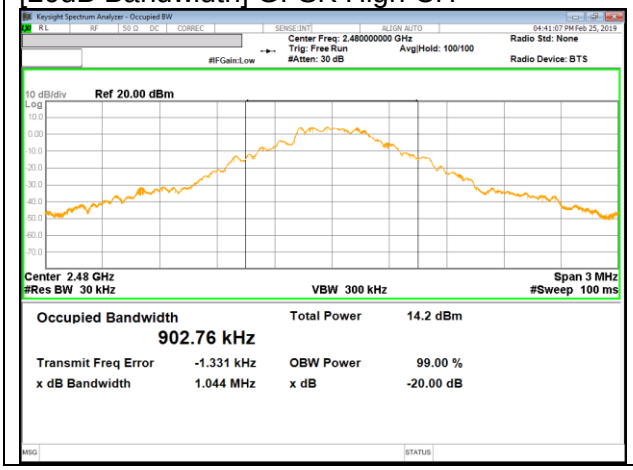
[20dB Bandwidth] GFSK Middle CH



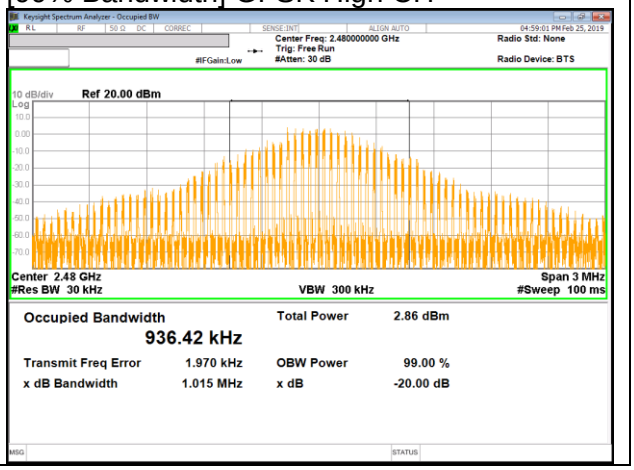
[99% Bandwidth]] GFSK Middle CH



[20dB Bandwidth] GFSK High CH



[99% Bandwidth] GFSK High CH



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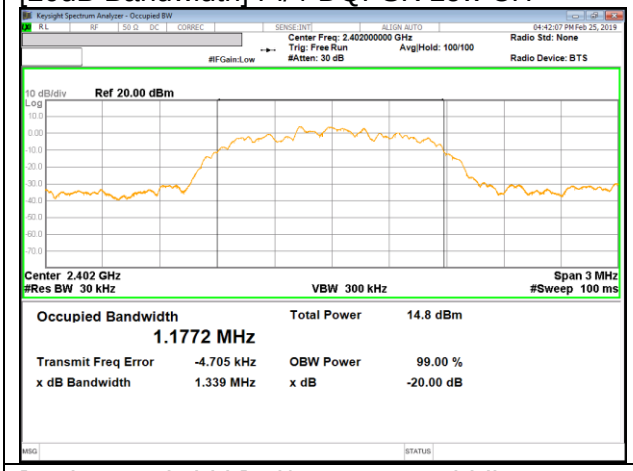
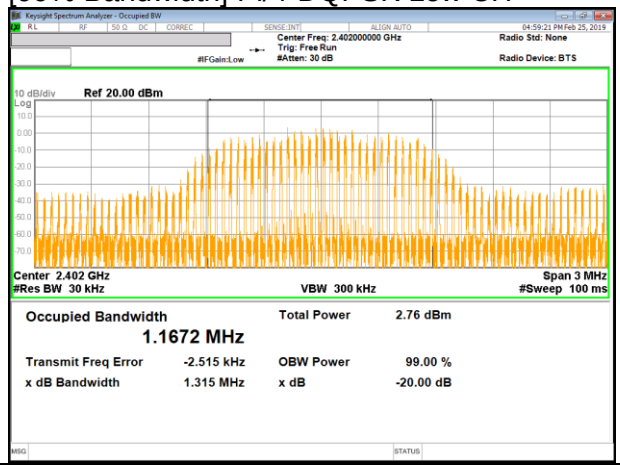
Pi/4-DQPSK BANDWIDTH

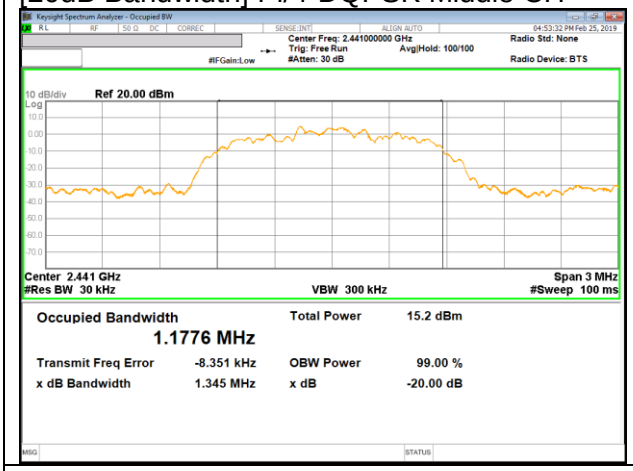
[20dB Bandwidth] Pi/4-DQPSK Low CH



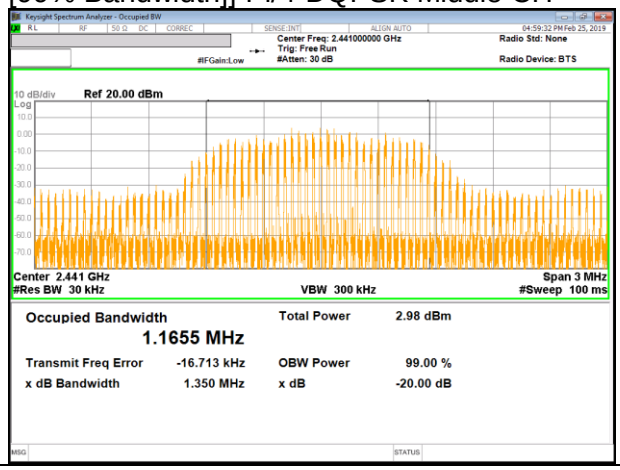
[99% Bandwidth] Pi/4-DQPSK Low CH



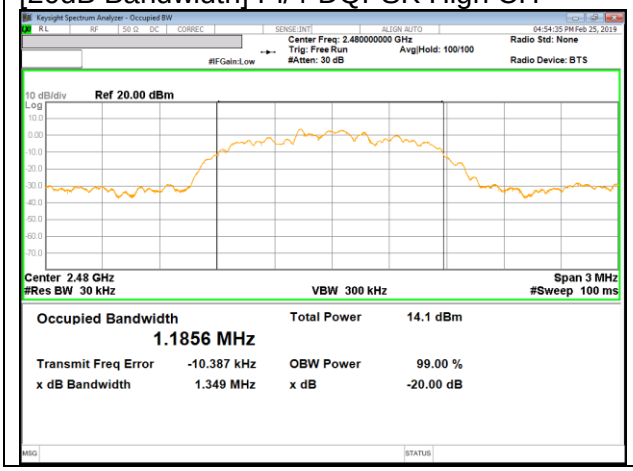
[20dB Bandwidth] Pi/4-DQPSK Middle CH



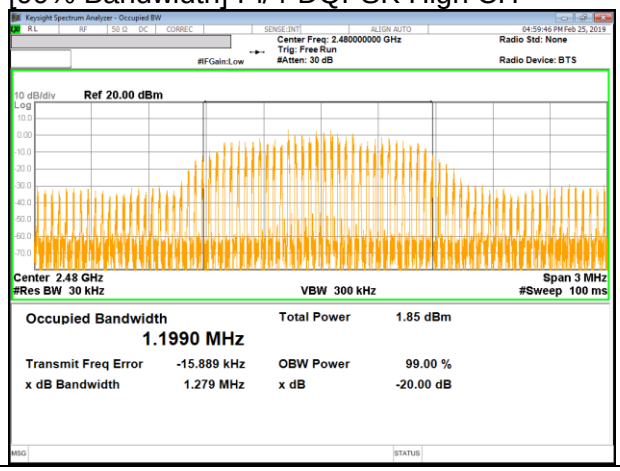
[99% Bandwidth]] Pi/4-DQPSK Middle CH



[20dB Bandwidth] Pi/4-DQPSK High CH



[99% Bandwidth] Pi/4-DQPSK High CH



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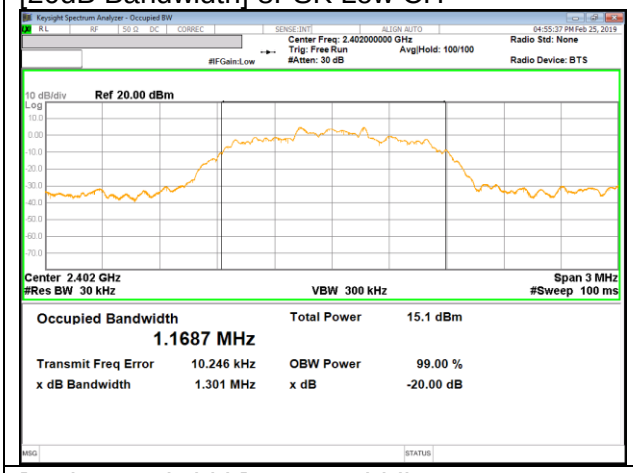
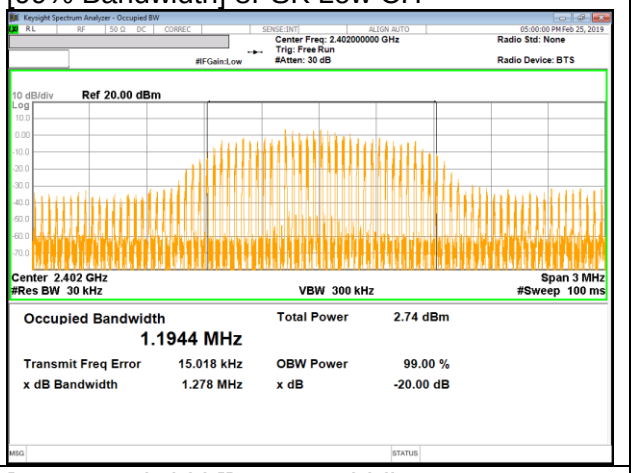
8PSK BANDWIDTH

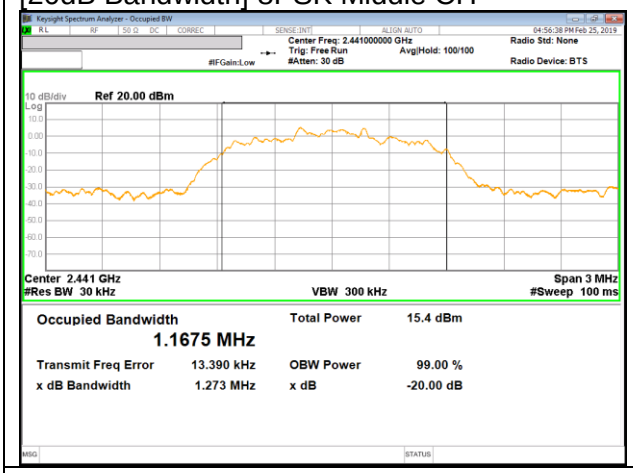
[20dB Bandwidth] 8PSK Low CH



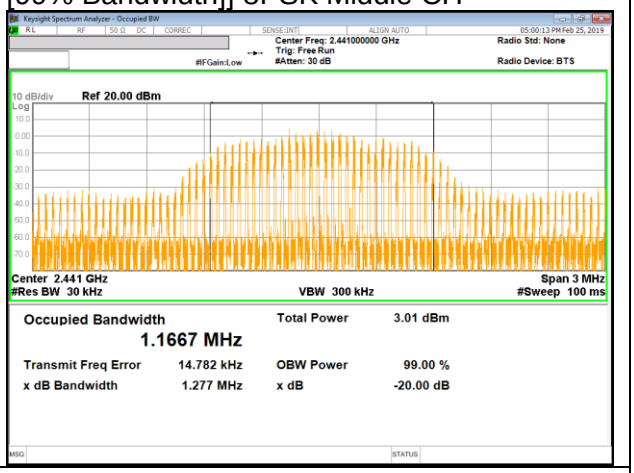
[99% Bandwidth] 8PSK Low CH



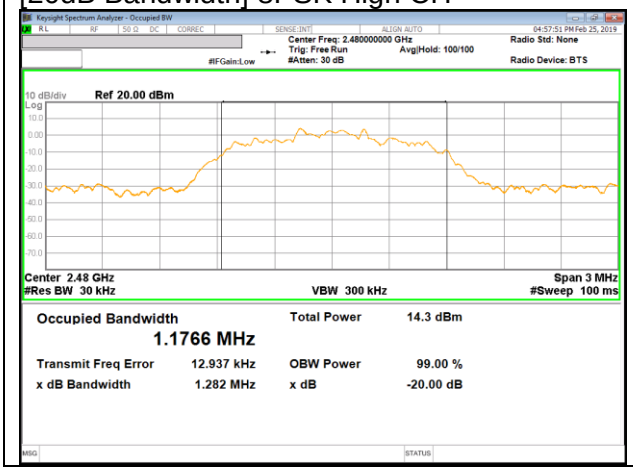
[20dB Bandwidth] 8PSK Middle CH



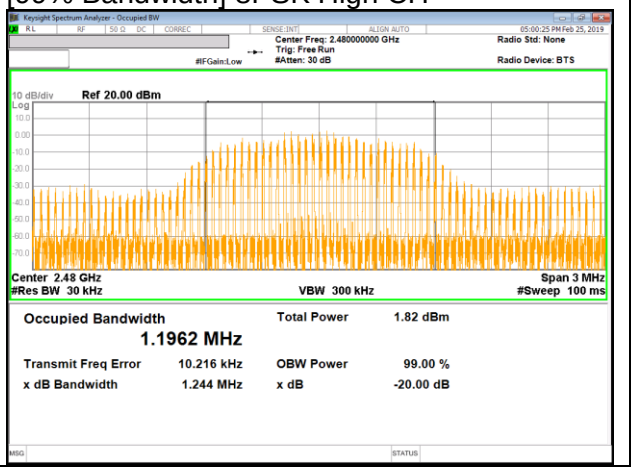
[99% Bandwidth]] 8PSK Middle CH



[20dB Bandwidth] 8PSK High CH



[99% Bandwidth] 8PSK High CH



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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	Conducted	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

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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 hoping channel, whichever is greater.

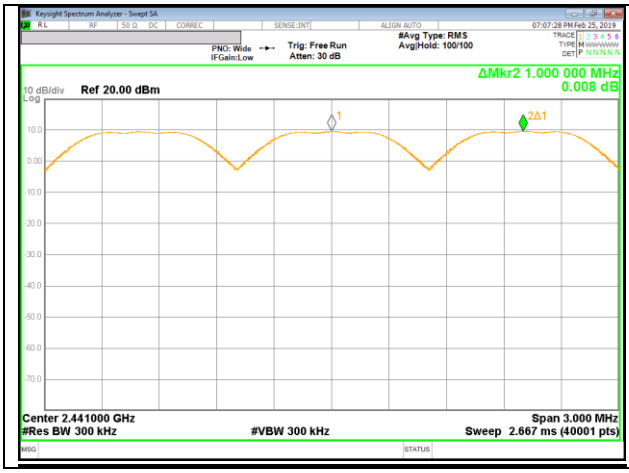
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band JUN have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

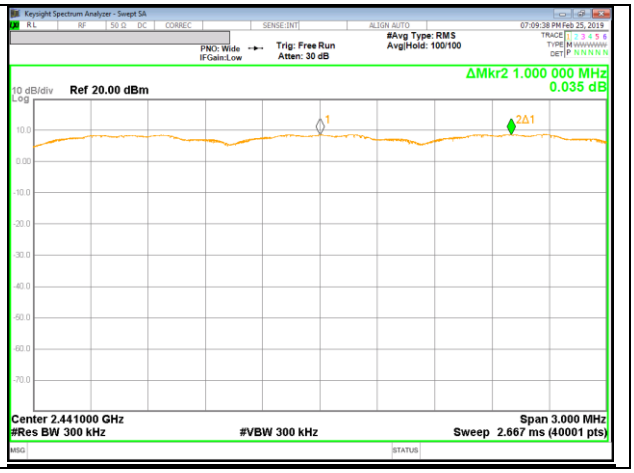
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION PLOT



[GFSK]



[8PSK]

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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.

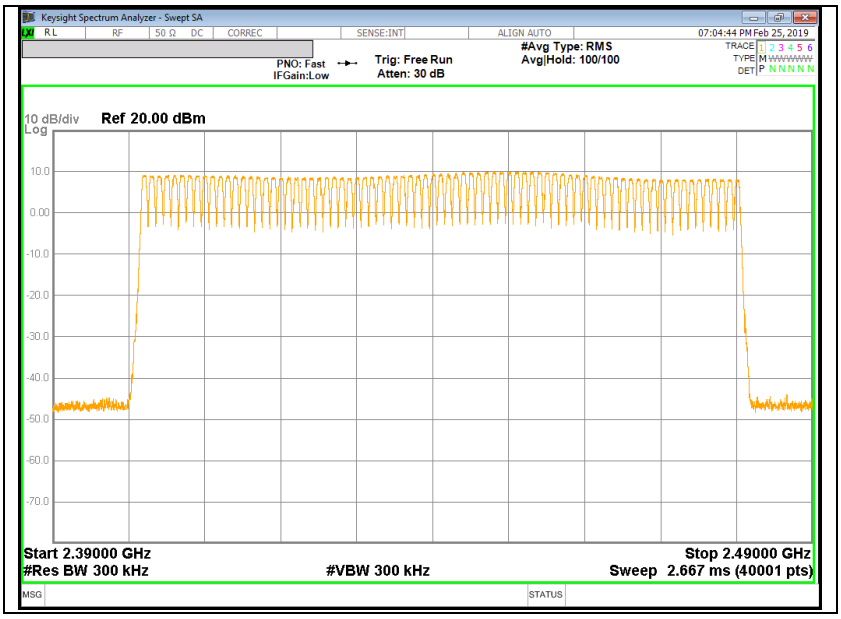
TEST PROCEDURE

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 a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



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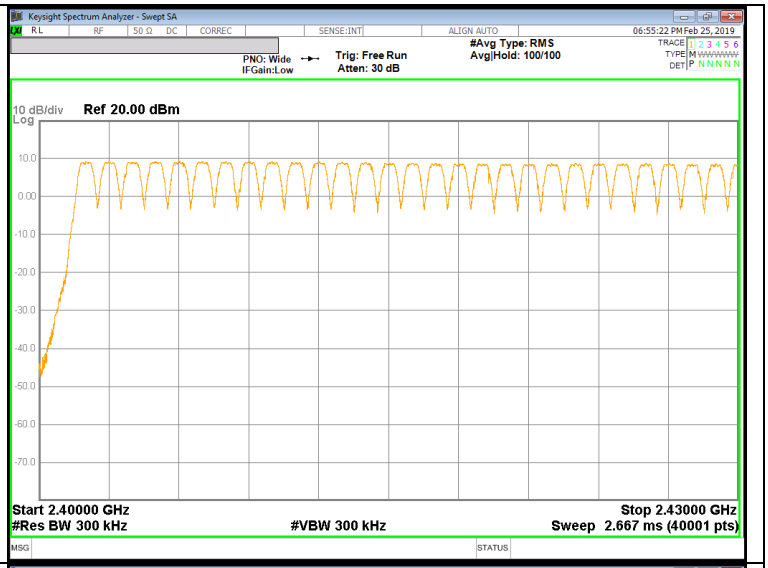
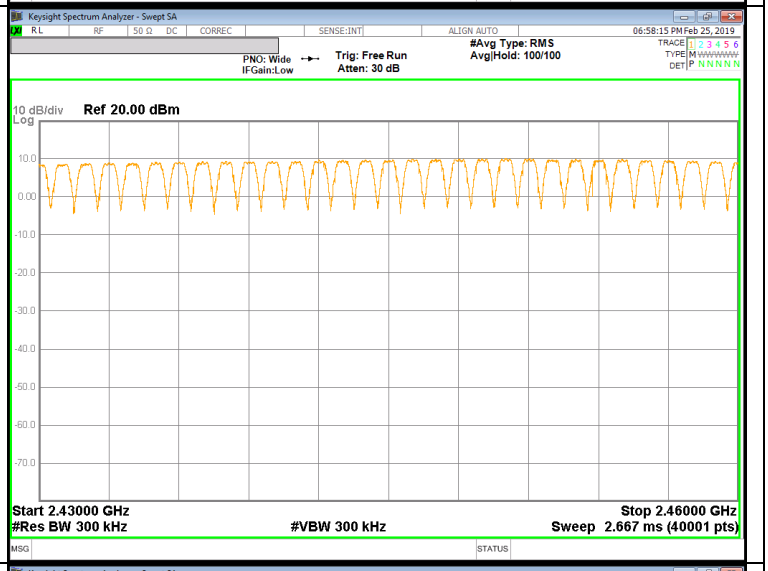
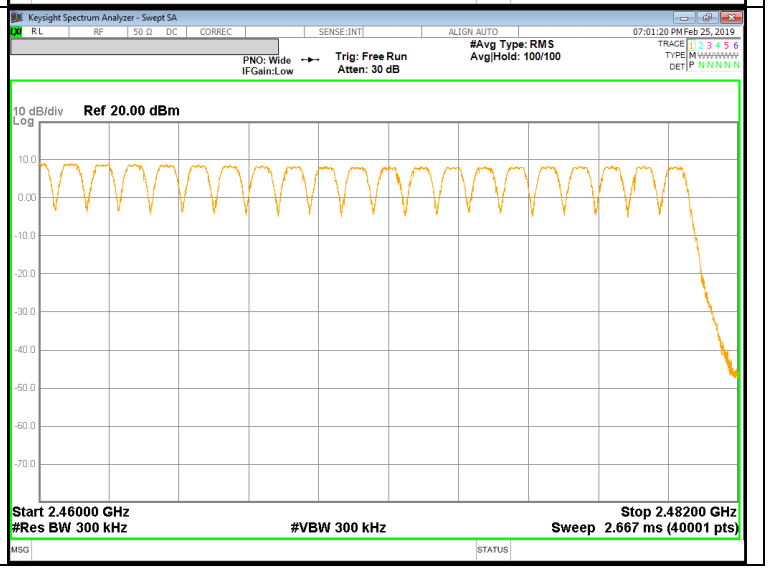
1st SEGMENT 2400 to 2430 MHz	
2nd SEGMENT 2430 to 2460 MHz	
3rd SEGMENT 2460 to 2482 MHz	

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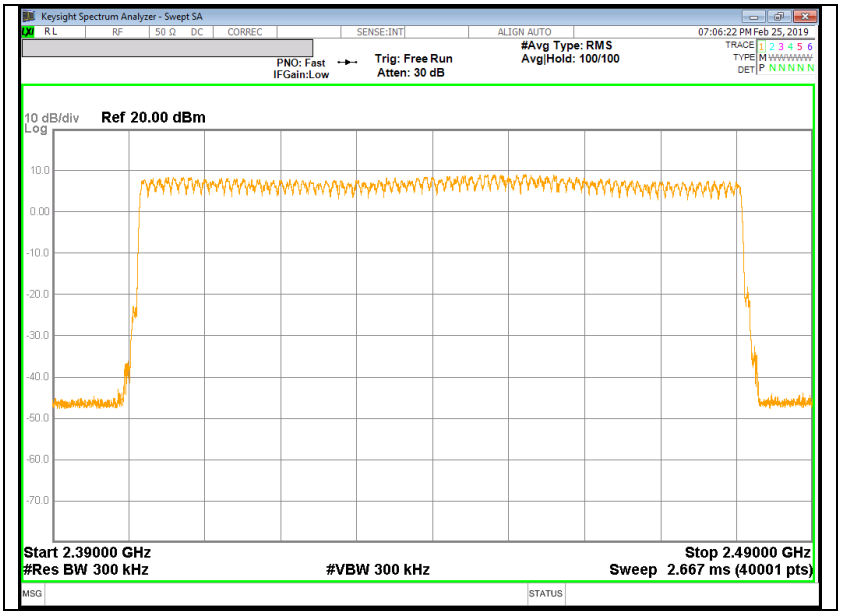
NUMBER OF HOPPING CHANNELS PLOTS[8PSK]

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



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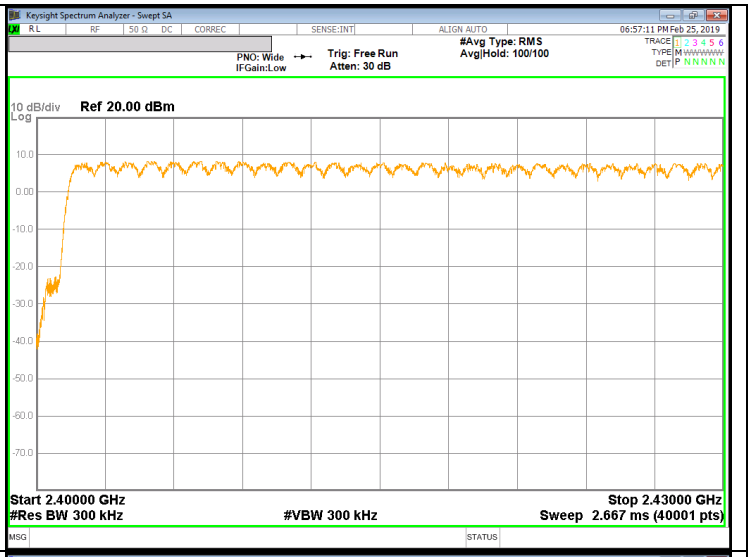
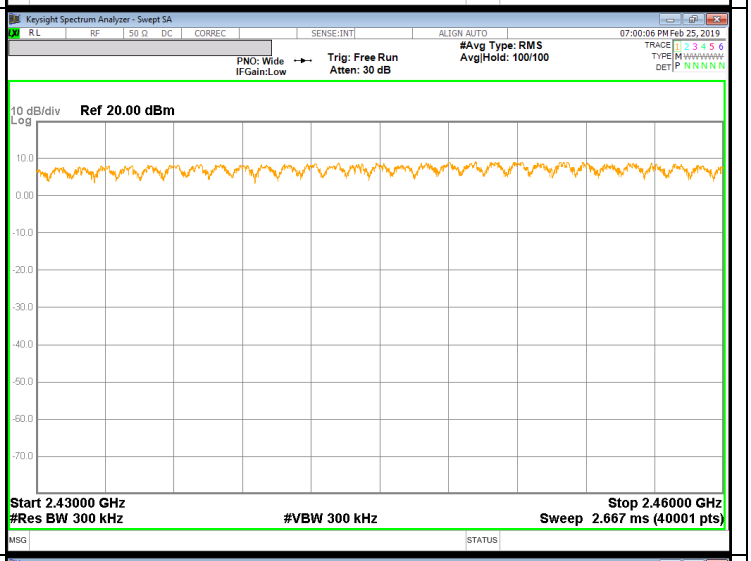
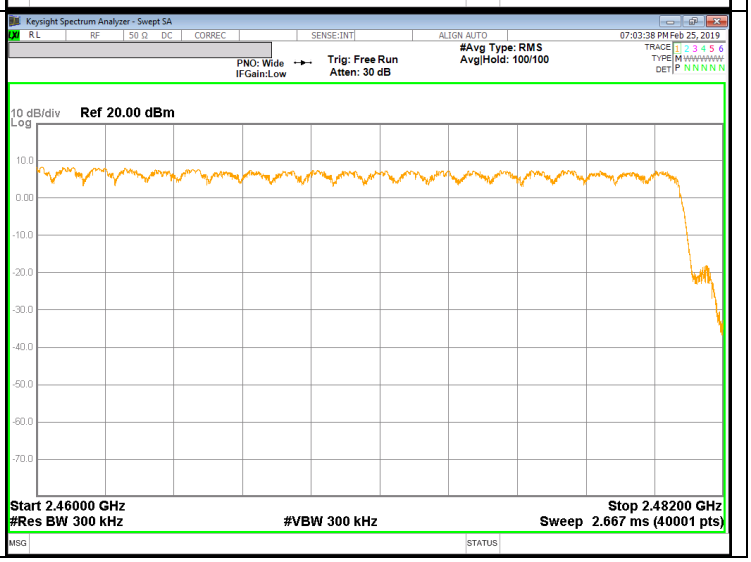
1st SEGMENT 2400 to 2430 MHz	
2nd SEGMENT 2430 to 2460 MHz	
3rd SEGMENT 2460 to 2482 MHz	

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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 * (# of pulses in 3.16 s) * pulse width.

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

RESULTS[GFSK]

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.374	32	0.119584	0.4	-0.2804
DH3	1.630	16	0.260800	0.4	-0.1392
DH5	2.876	12	0.345120	0.4	-0.0549
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.374	8	0.029896	0.4	-0.3701
DH3	1.630	4	0.065200	0.4	-0.3348
DH5	2.876	3	0.086280	0.4	-0.3137

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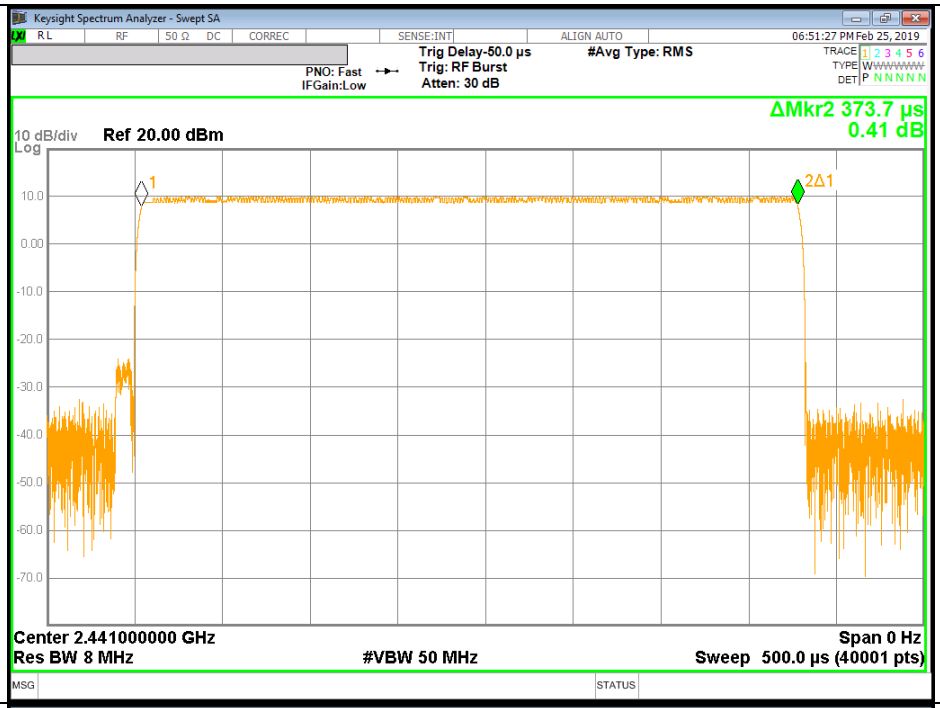
DH1

DH1 Pulse Width	
DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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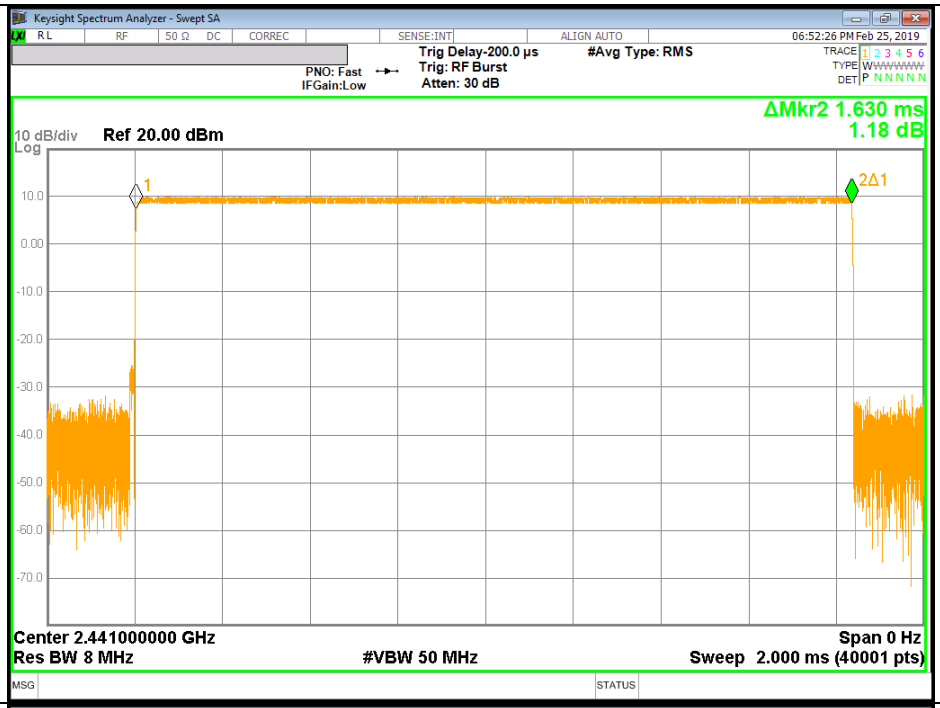
DH3

DH3 Pulse Width	
DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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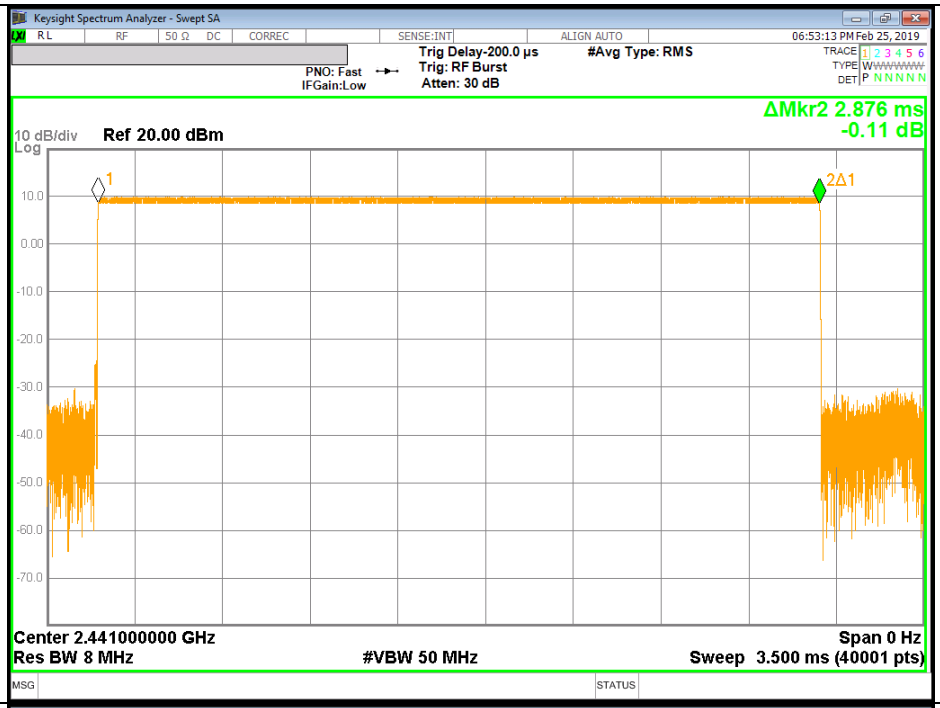
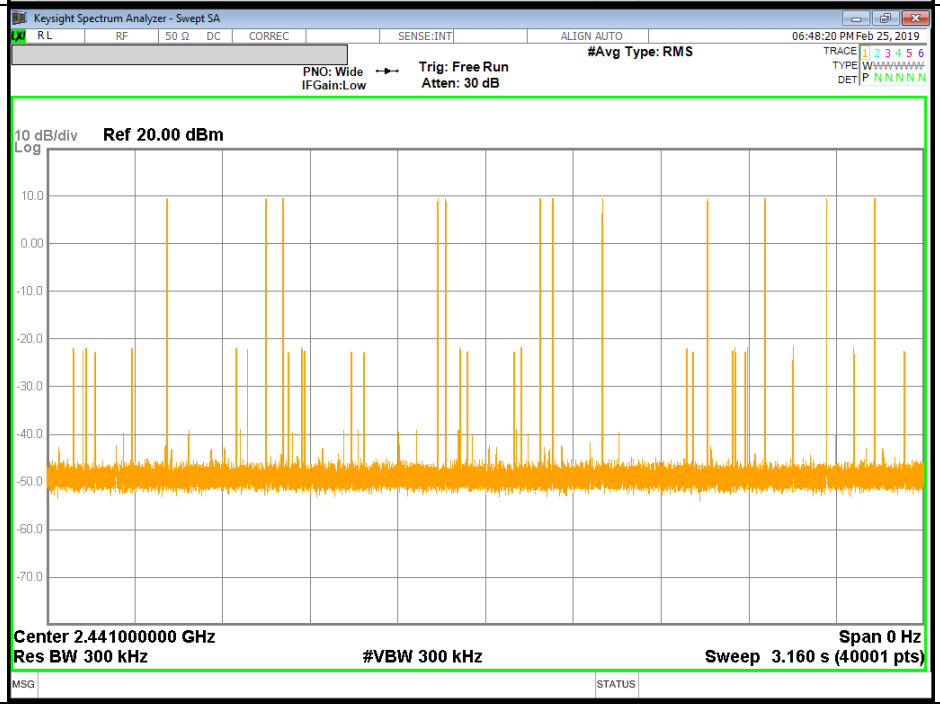
DH5

DH5 Pulse Width	
DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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RESULTS[8PSK]

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.385	32	0.123328	0.4	-0.2767
DH3	1.635	16	0.261600	0.4	-0.1384
DH5	2.885	12	0.346200	0.4	-0.0538
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.385	8	0.030832	0.4	-0.3692
DH3	1.635	4	0.065400	0.4	-0.3346
DH5	2.885	3	0.086550	0.4	-0.3135

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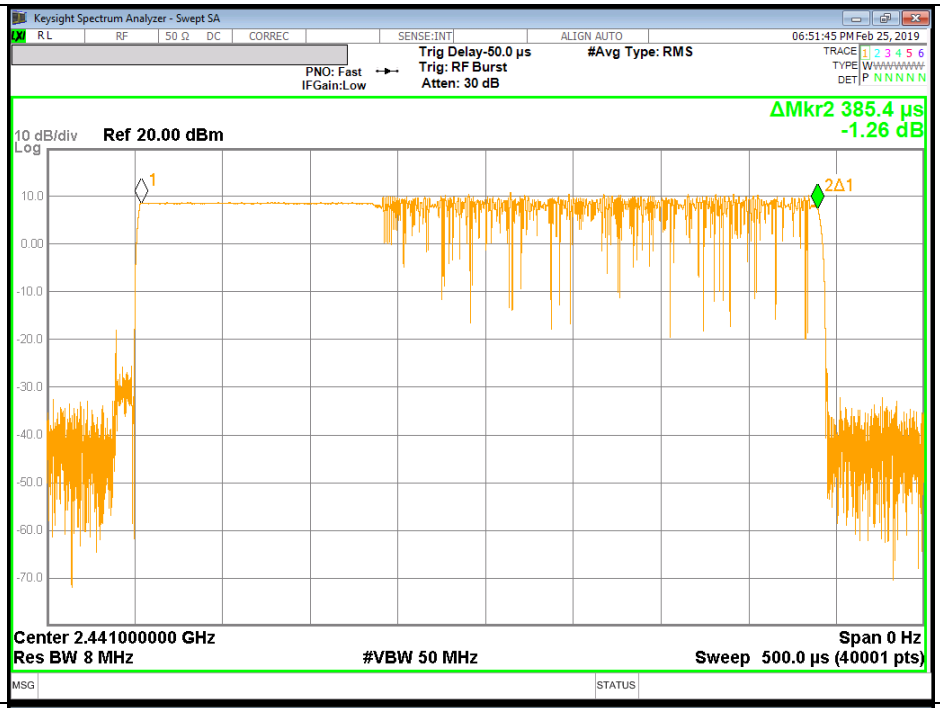
DH1

DH1 Pulse Width	
DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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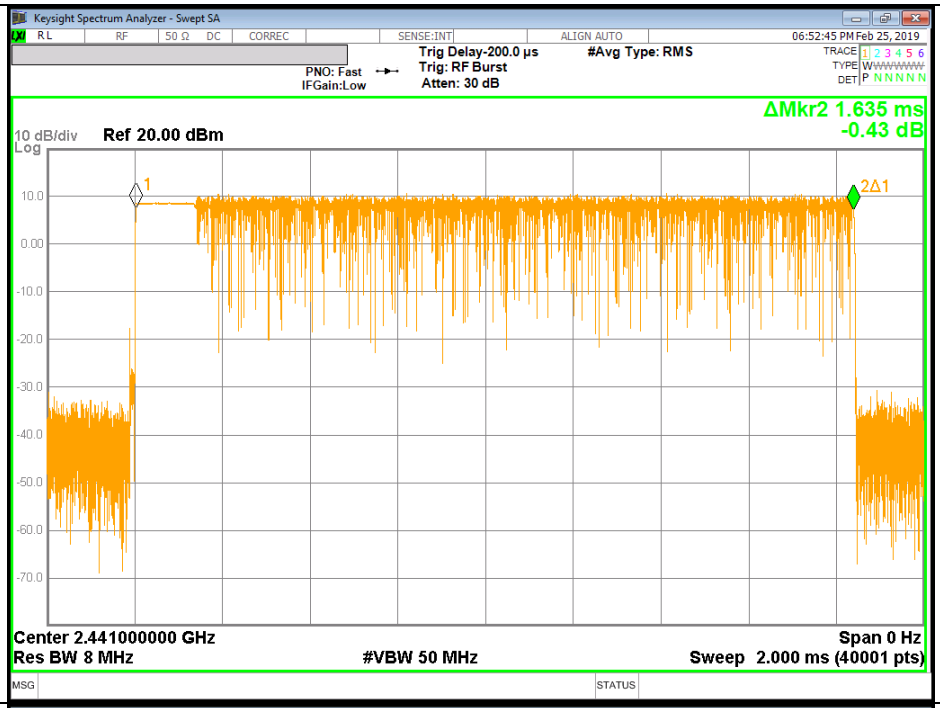
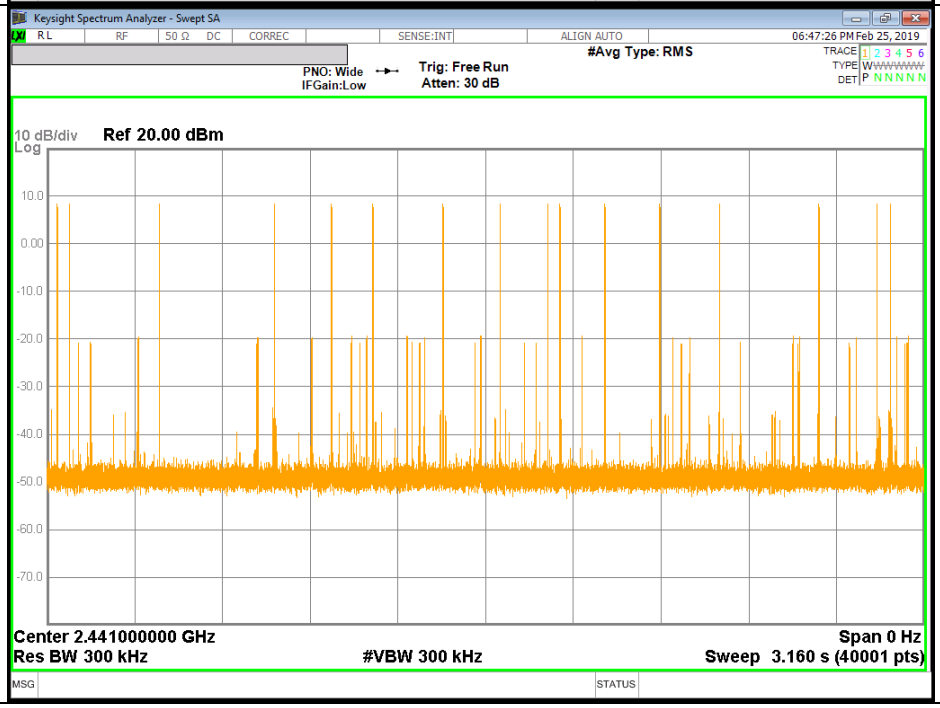
DH3

DH3 Pulse Width	
DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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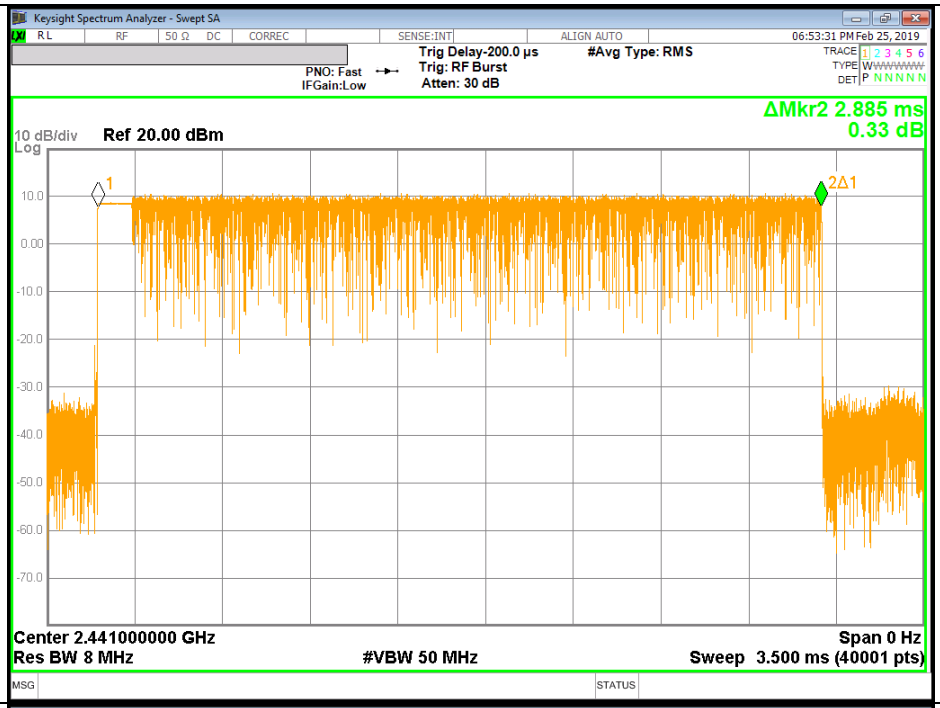
DH5

DH5 Pulse Width	
DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD	

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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	9.564	21	-11.436
Middle	2441	9.870	21	-11.13
High	2480	8.427	21	-12.573
Worst		9.870	21	-11.13

10.4.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	9.838	21	-11.162
Middle	2441	10.105	21	-10.895
High	2480	8.618	21	-12.382
Worst		10.105	21	-10.895

10.4.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	10.558	21	-10.442
Middle	2441	10.879	21	-10.121
High	2480	9.333	21	-11.667
Worst		10.879	21	-10.121

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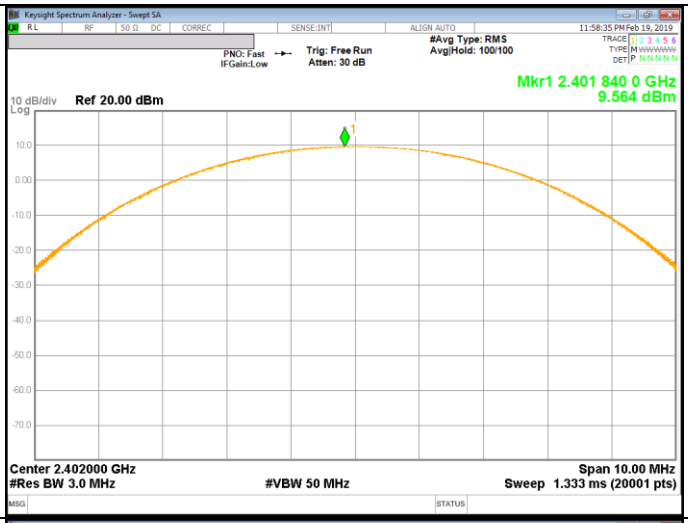
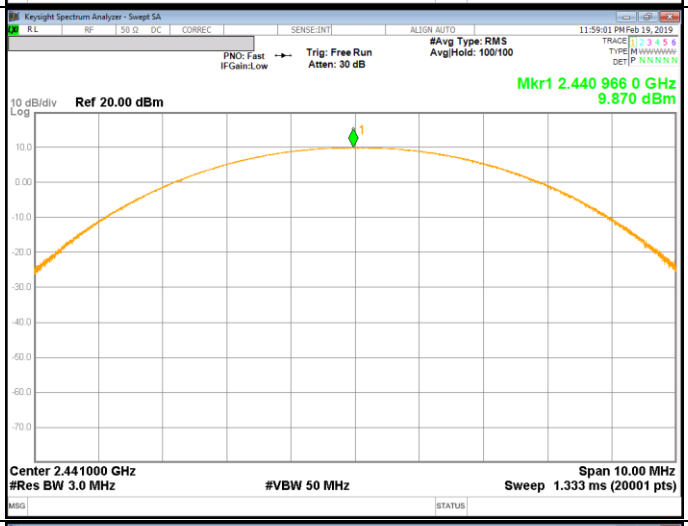
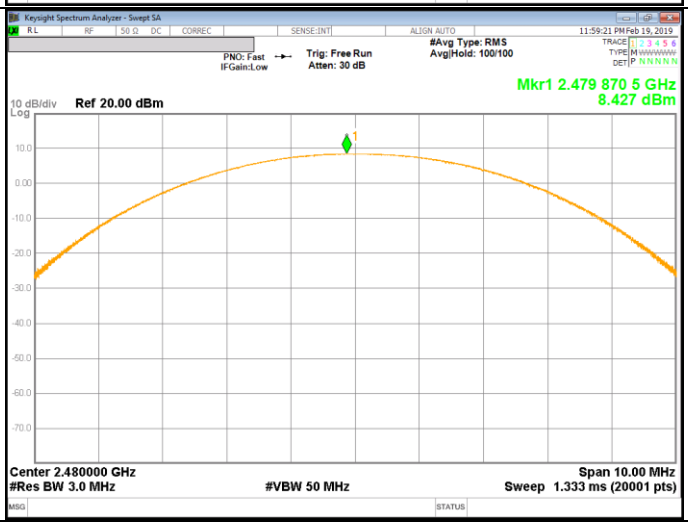
10.4.4. OUTPUT POWER PLOTS

GFSK OUTPUT POWER

GFSK Low CH	
GFSK Middle CH	
GFSK High CH	

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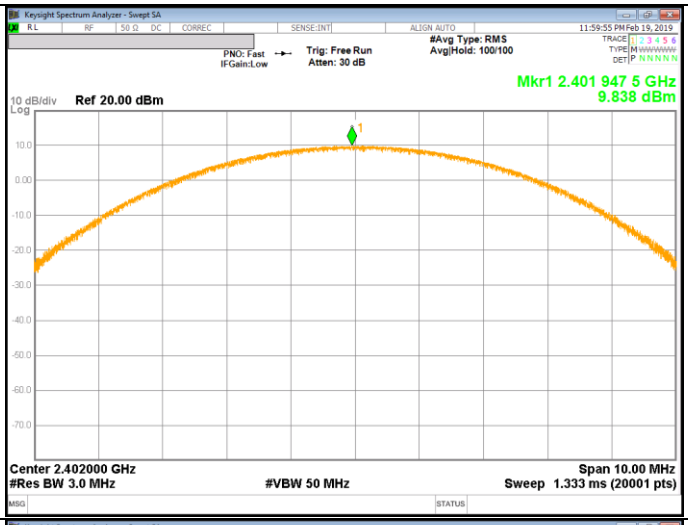
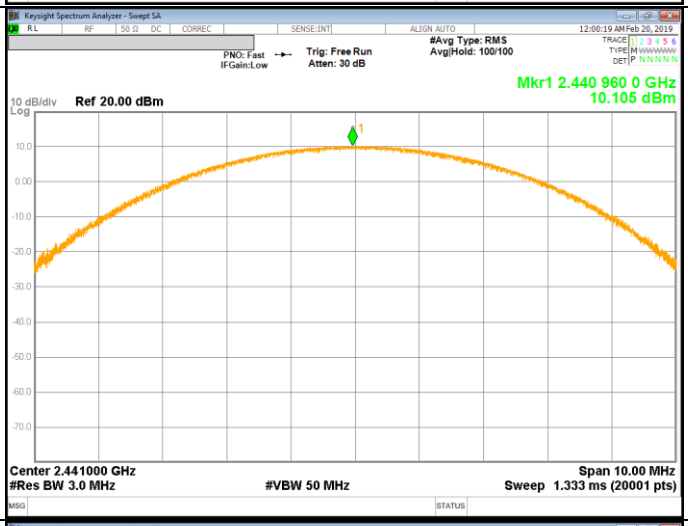
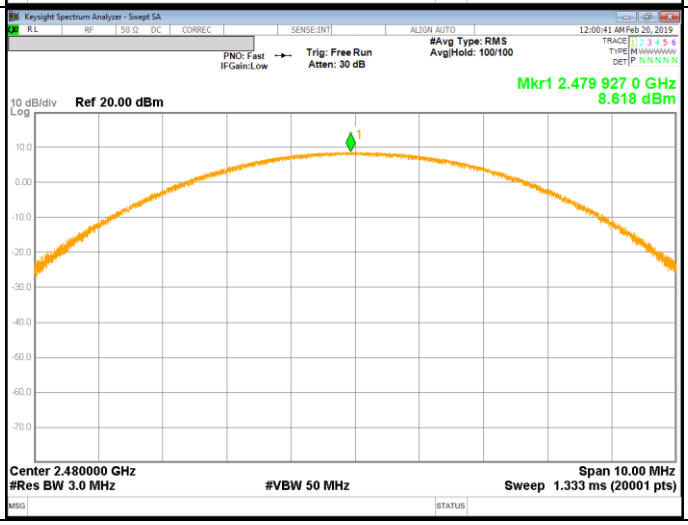
Pi/4-DPSK OUTPUT POWER

Pi/4-DPSK Low CH	
Pi/4-DPSK Middle CH	
Pi/4-DPSK High CH	

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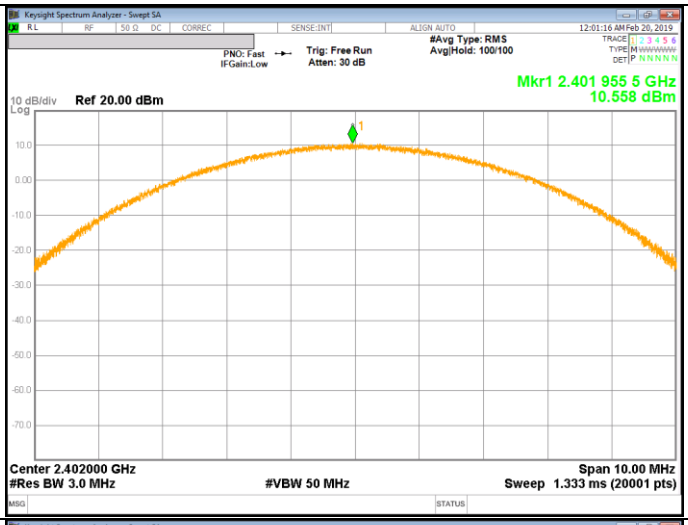
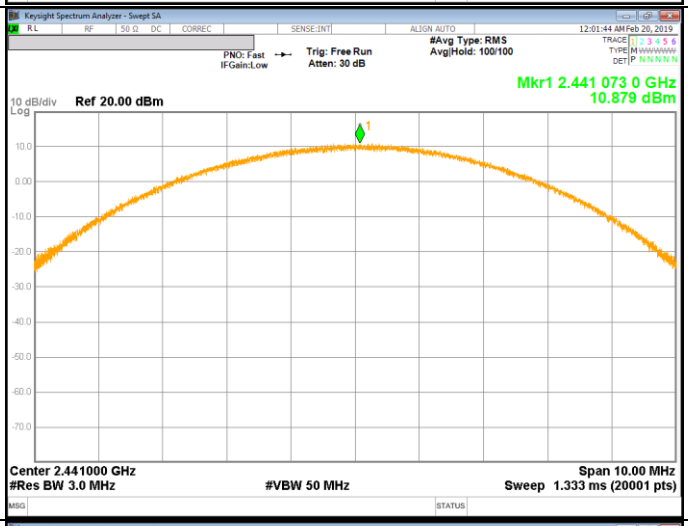
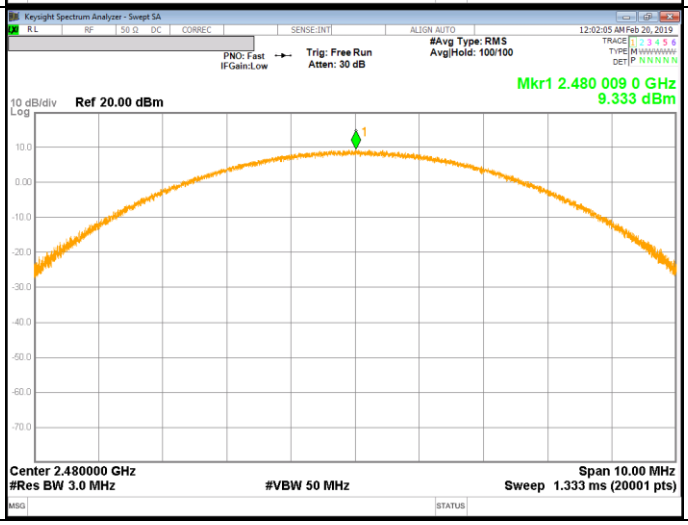
8PSK OUTPUT POWER

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

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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	8.868	7.71
Middle	2441	9.176	8.27
High	2480	7.773	5.99

10.5.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	7.425	5.53
Middle	2441	7.772	5.99
High	2480	6.462	4.43

10.5.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	7.453	5.56
Middle	2441	7.796	6.02
High	2480	6.488	4.45

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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

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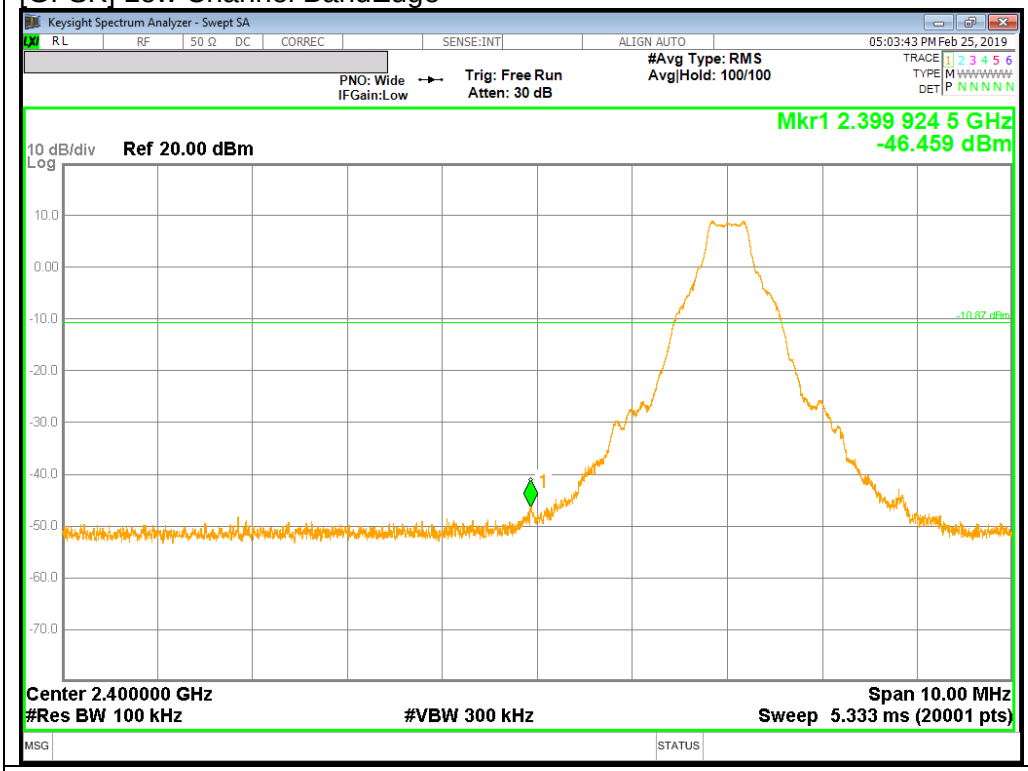
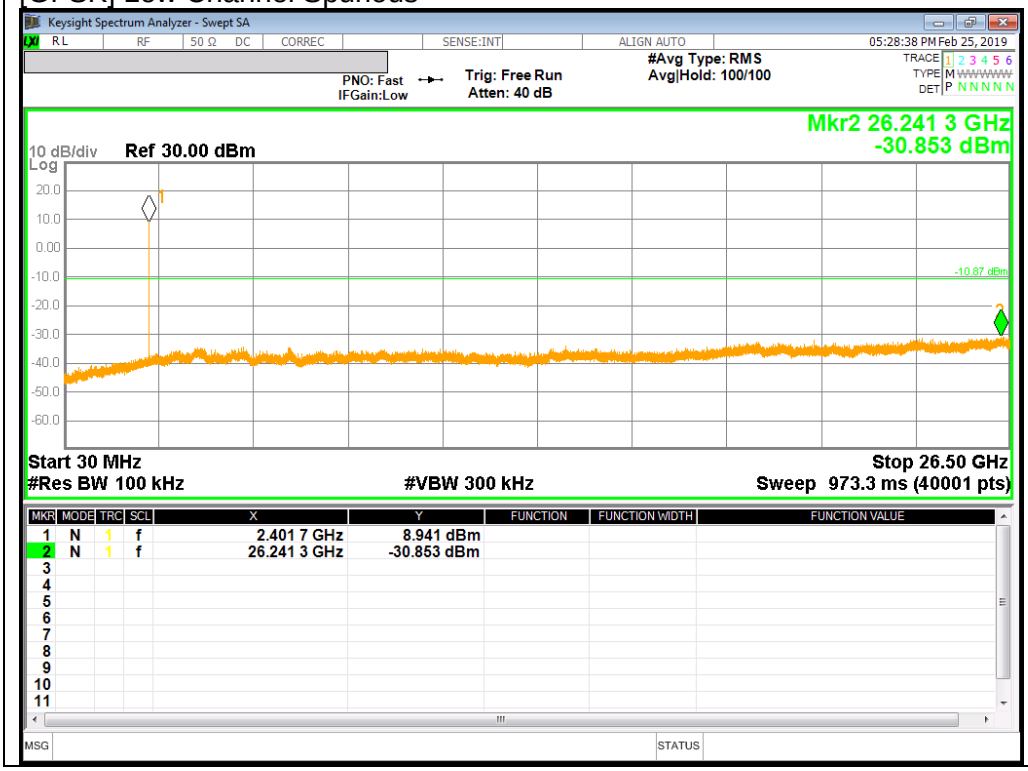
10.6.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

[GFSK] Low Channel BandEdge



[GFSK] Low Channel Spurious



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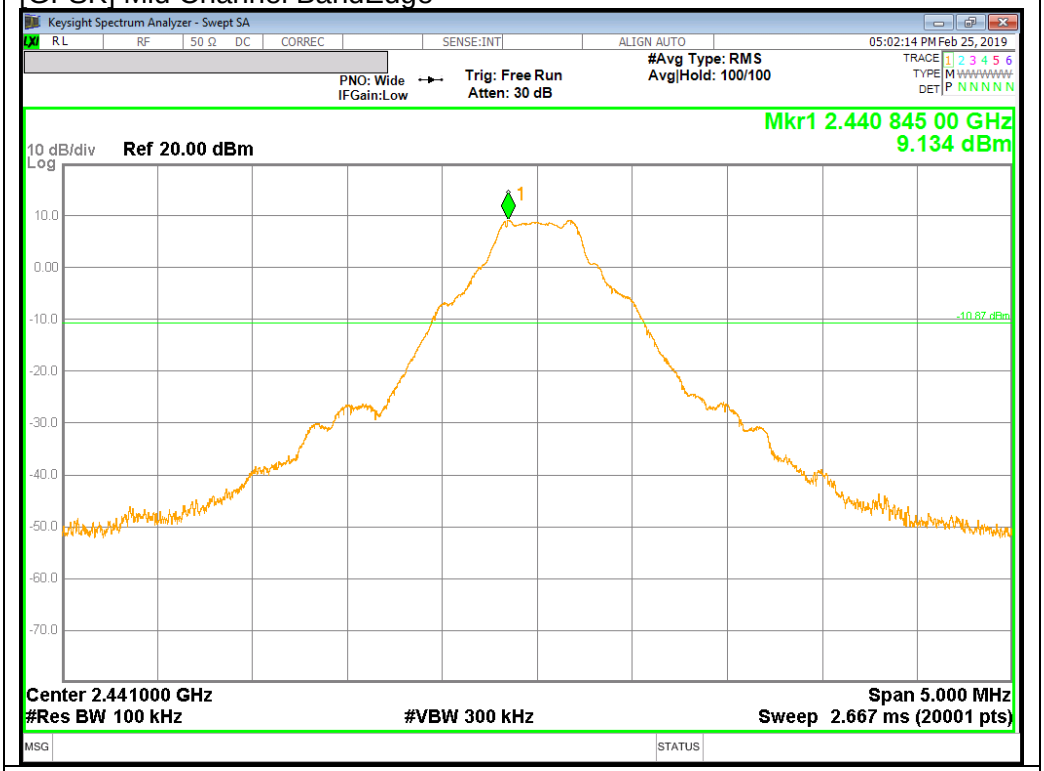
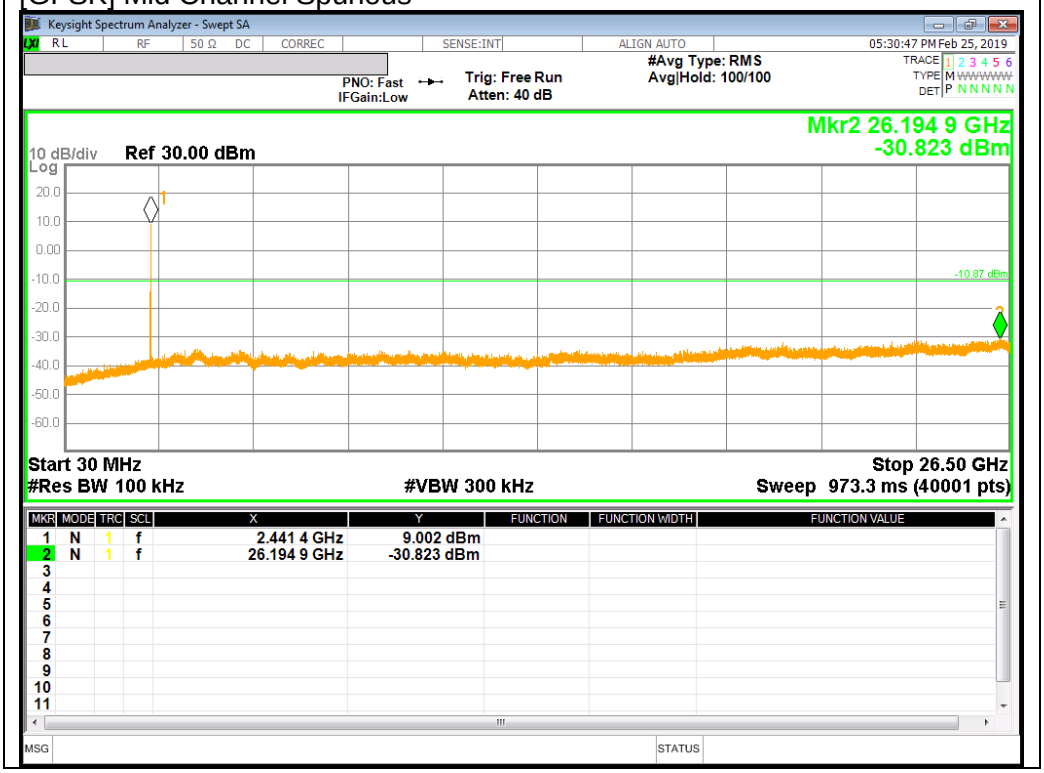
[GFSK] Mid Channel BandEdge



[GFSK] Mid Channel Spurious



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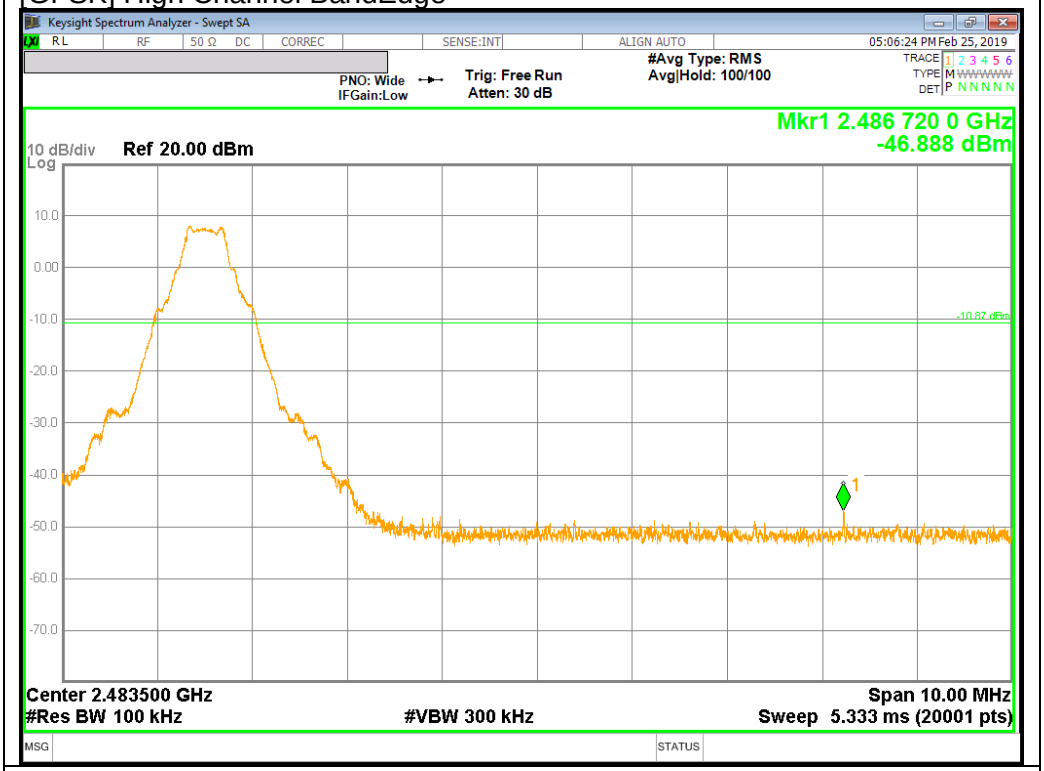
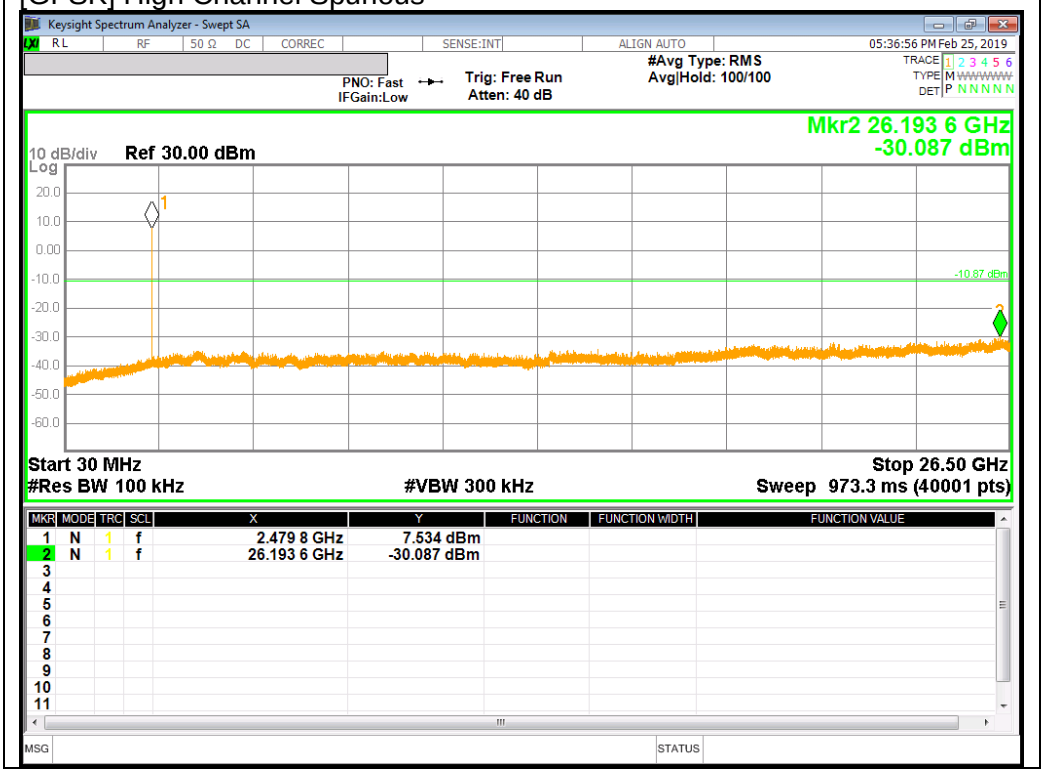
[GFSK] High Channel BandEdge



[GFSK] High Channel Spurious



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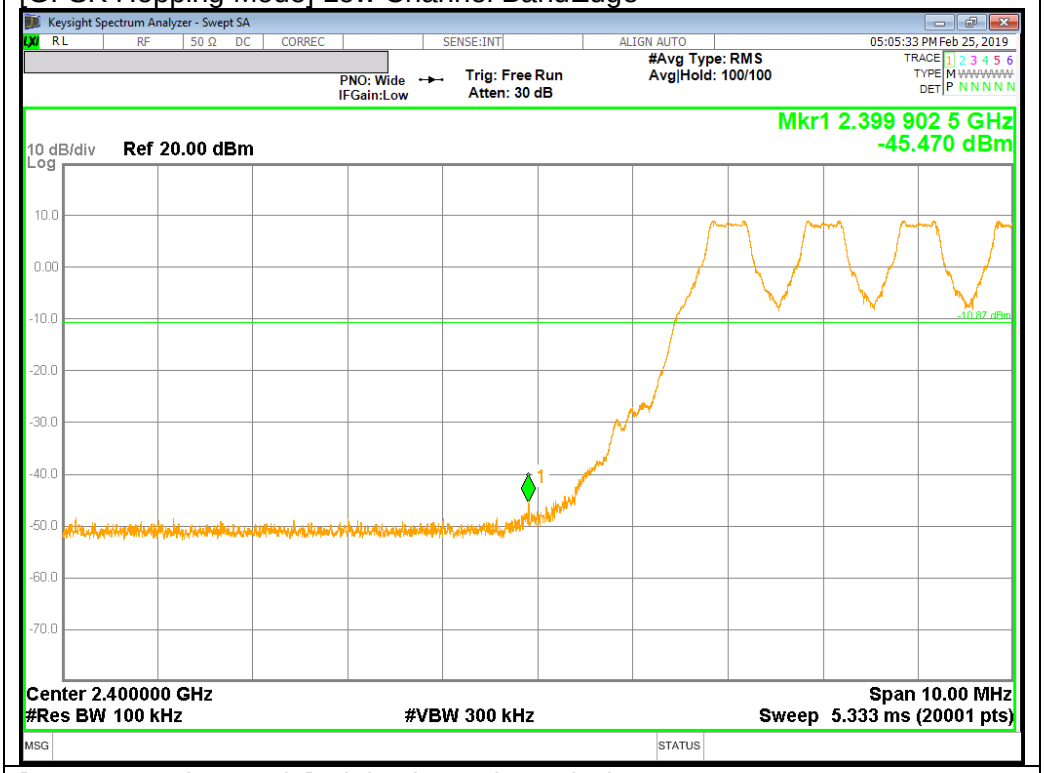
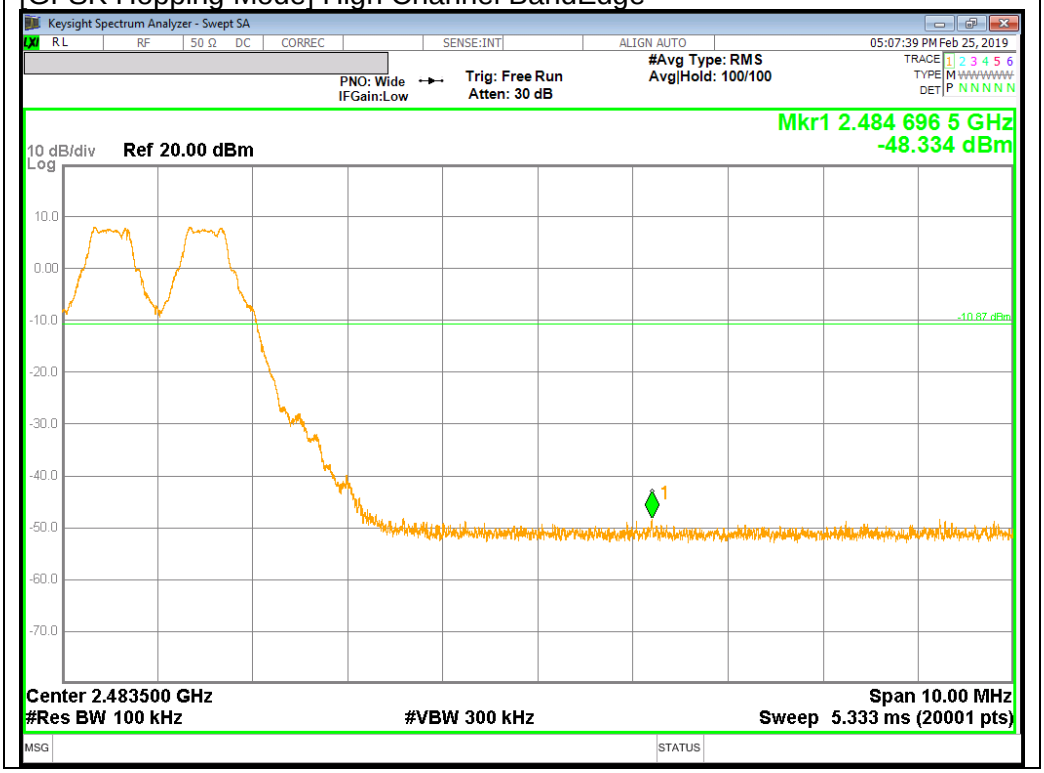
BandEdge Emission at GFSK Hopping Mode

[GFSK Hopping Mode] Low Channel BandEdge



[GFSK Hopping Mode] High Channel BandEdge



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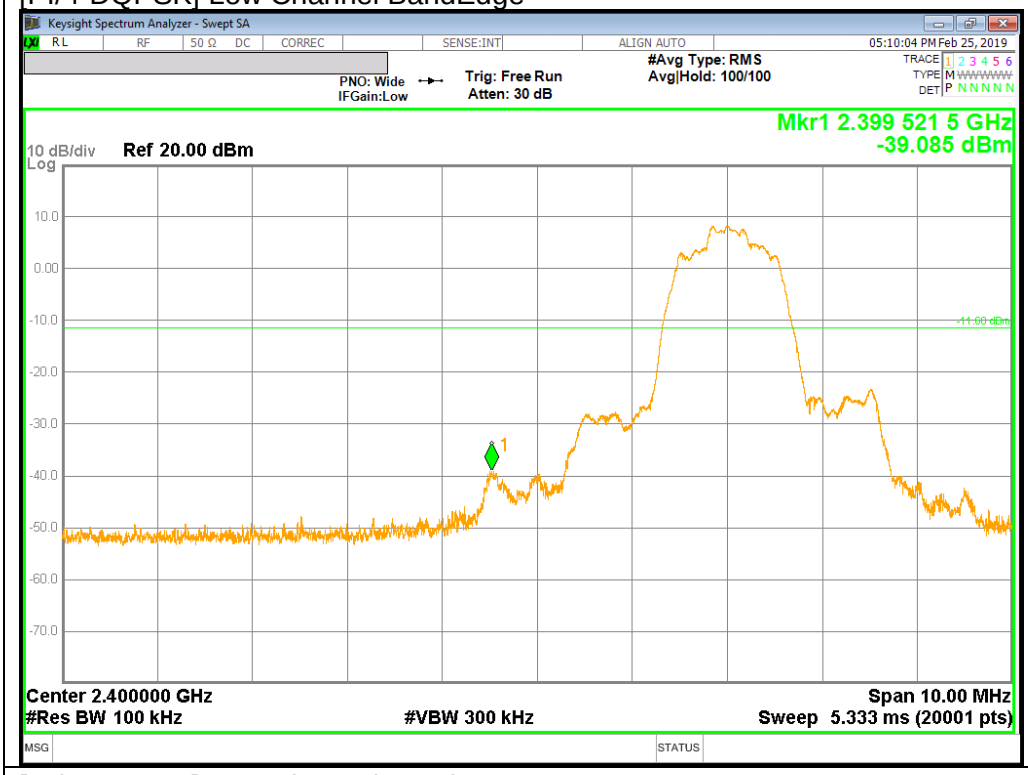
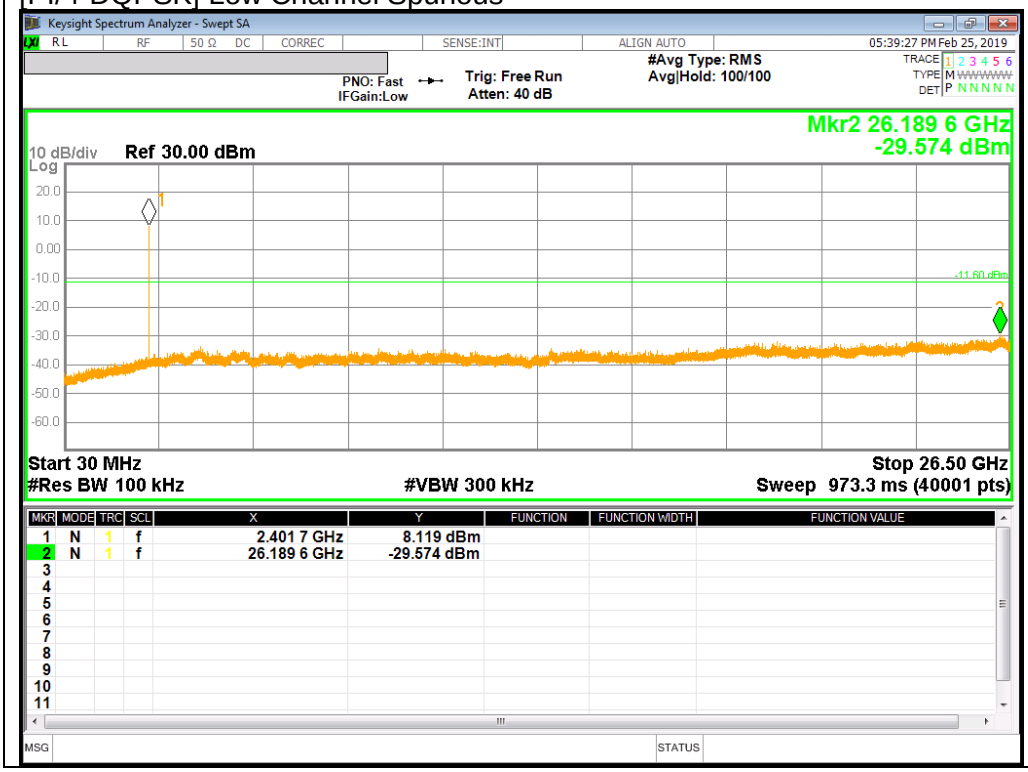
10.6.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

PI/4-DQPSK Mode

[PI/4-DQPSK] Low Channel BandEdge



[PI/4-DQPSK] Low Channel Spurious



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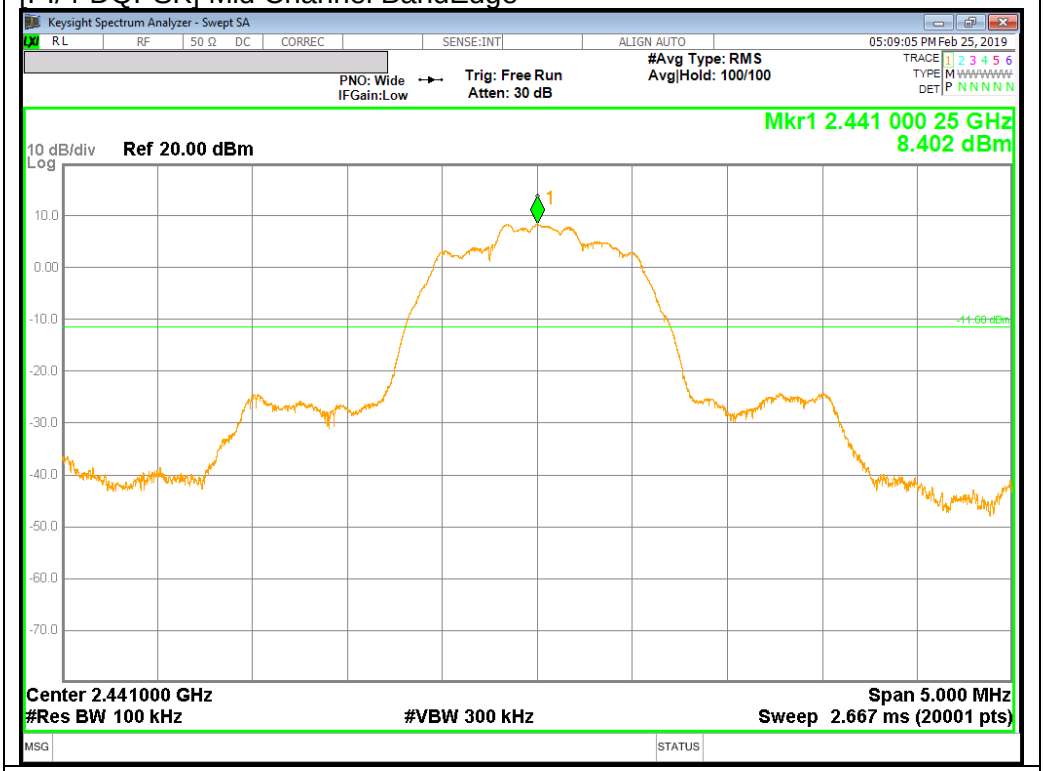
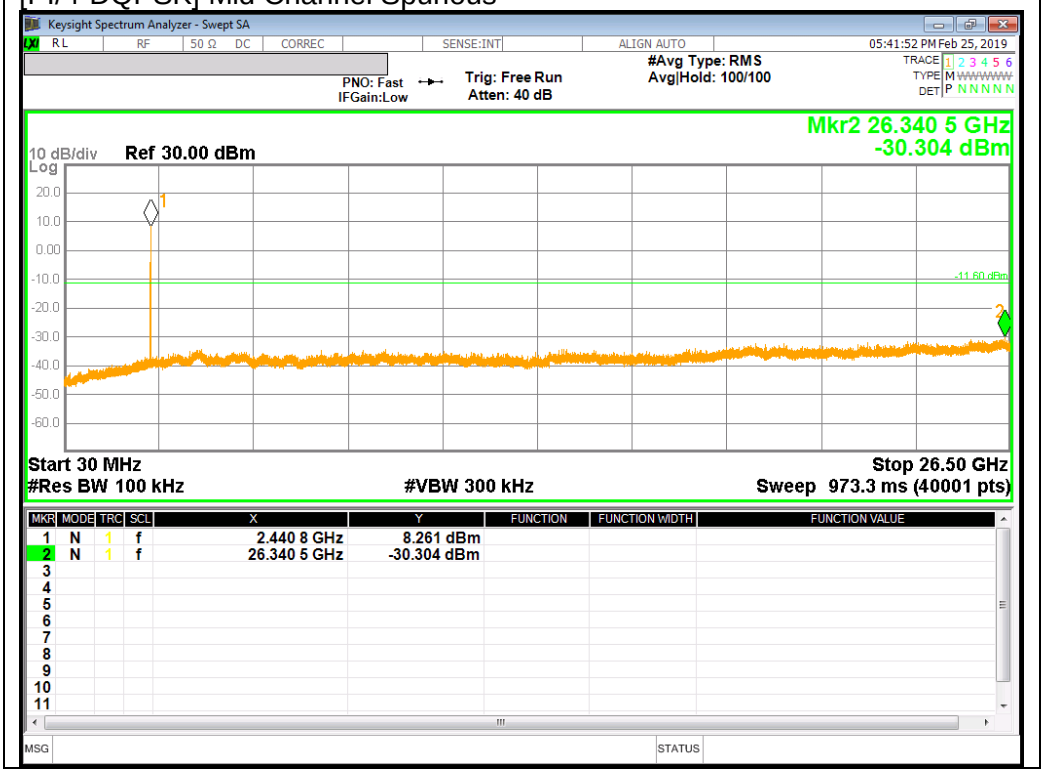
[PI/4-DQPSK] Mid Channel BandEdge



[PI/4-DQPSK] Mid Channel Spurious



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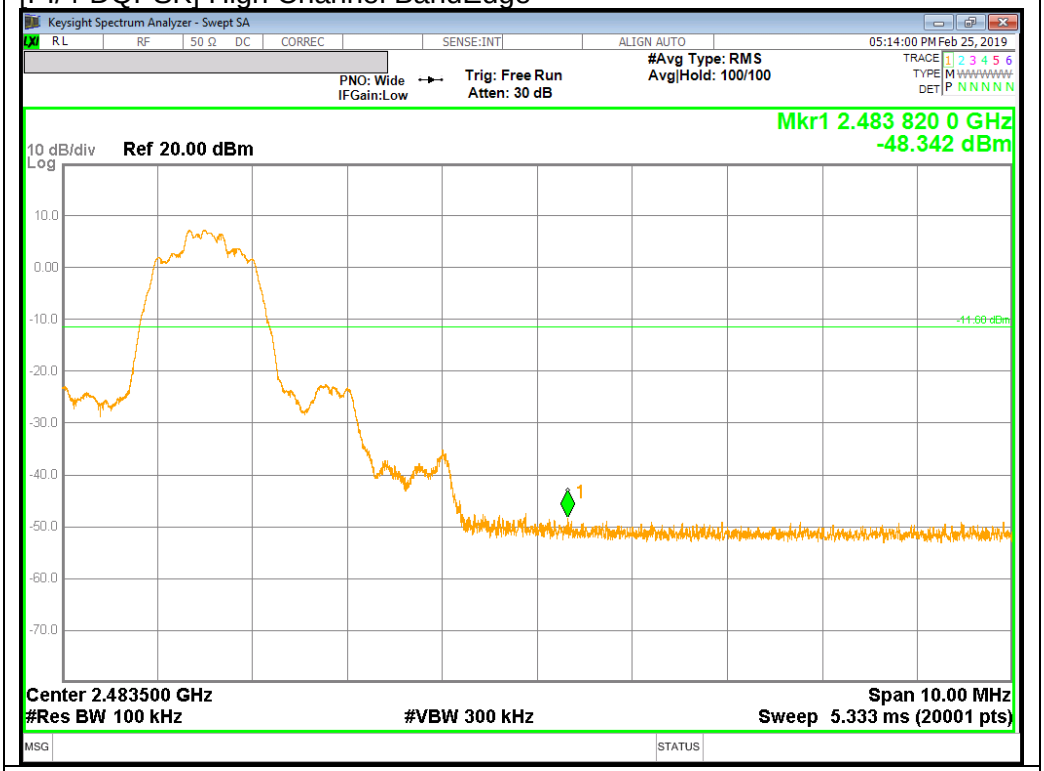
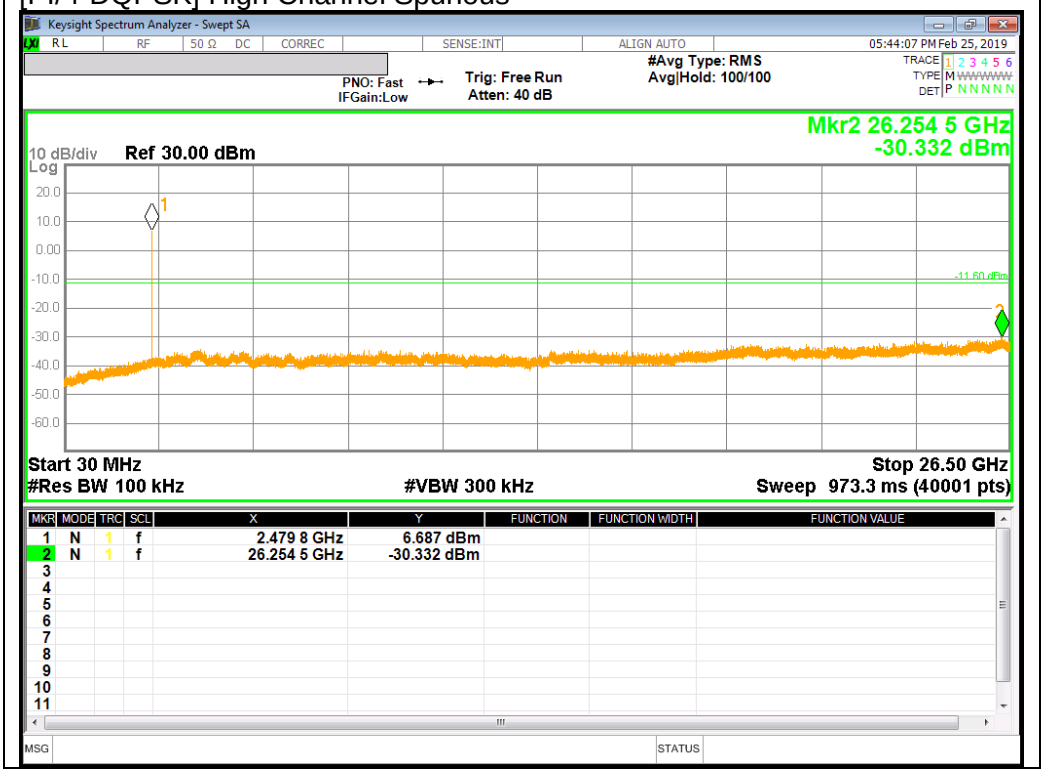
[PI/4-DQPSK] High Channel BandEdge



[PI/4-DQPSK] High Channel Spurious



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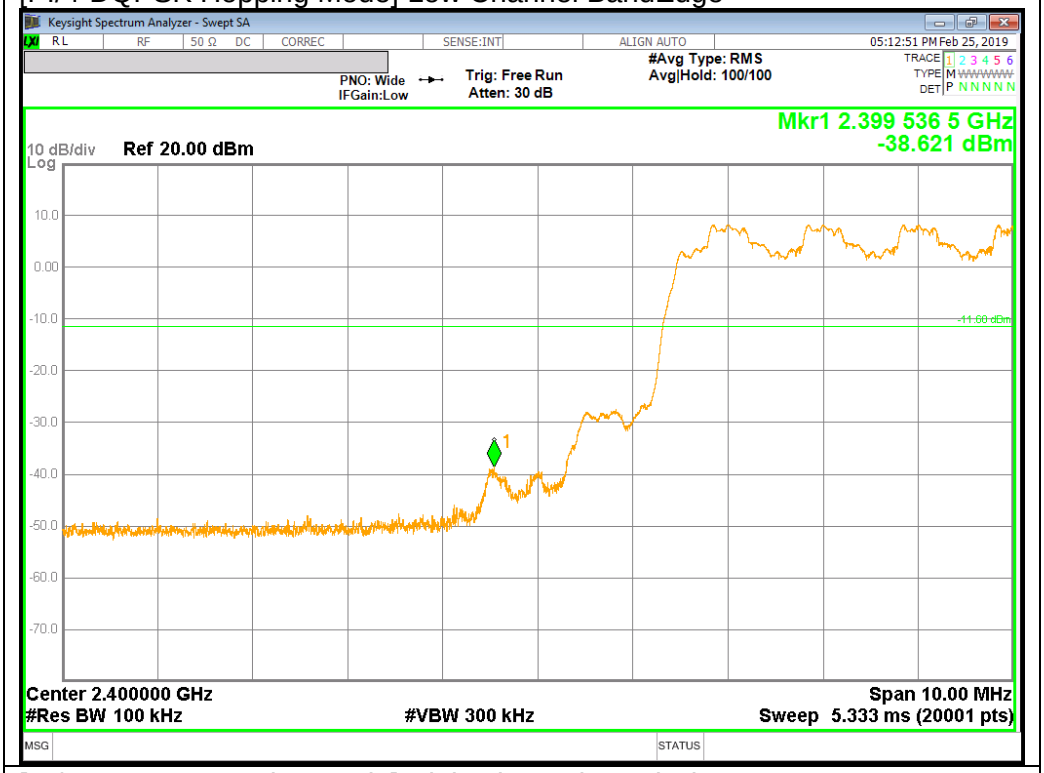
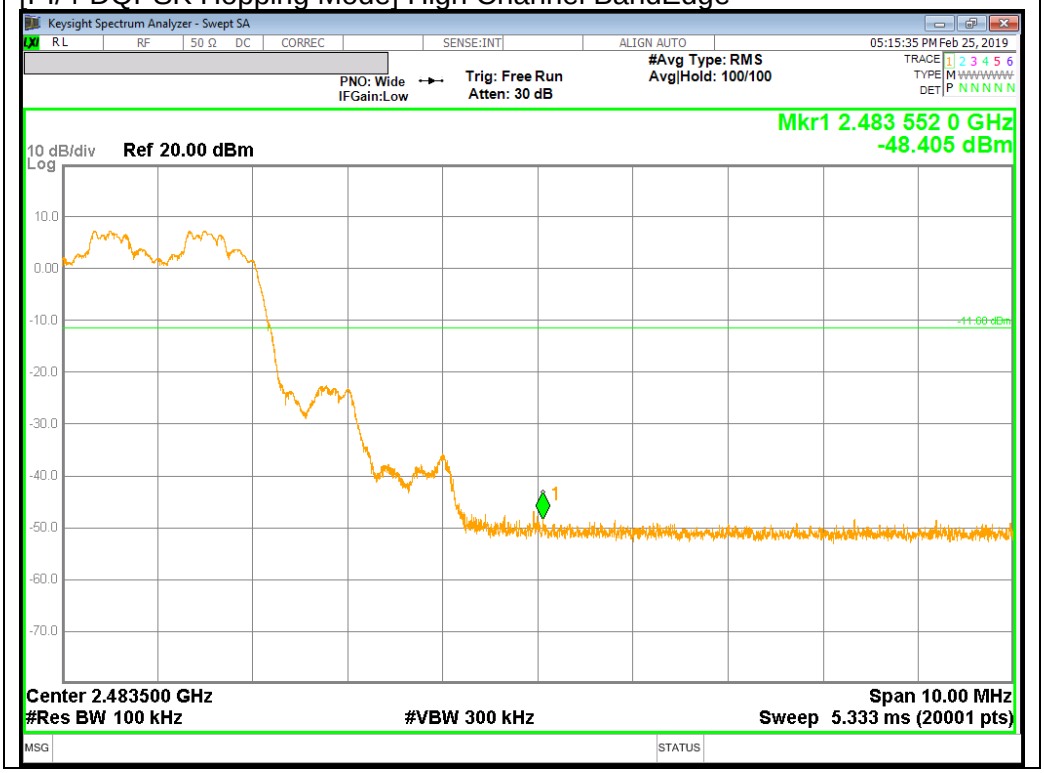
BandEdge Emission at PI/4-DQPSK Hopping Mode

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



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



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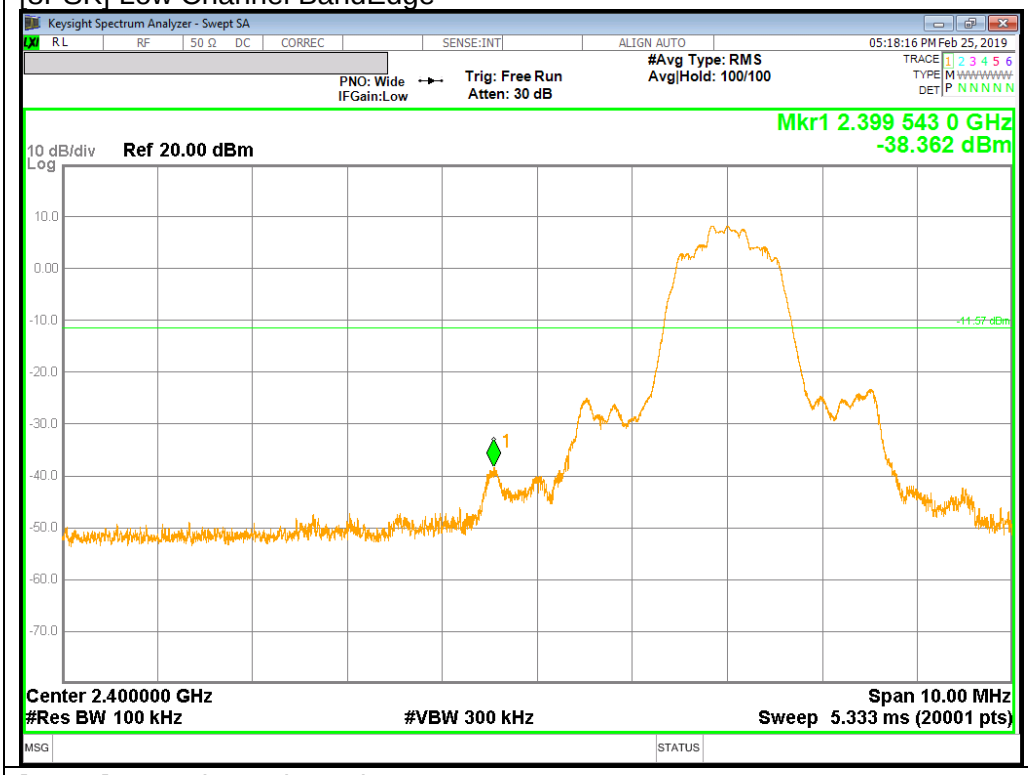
10.6.3. ENHANCED DATA RATE 8PSK MODULATION

8PSK Mode

[8PSK] Low Channel BandEdge



[8PSK] Low Channel Spurious

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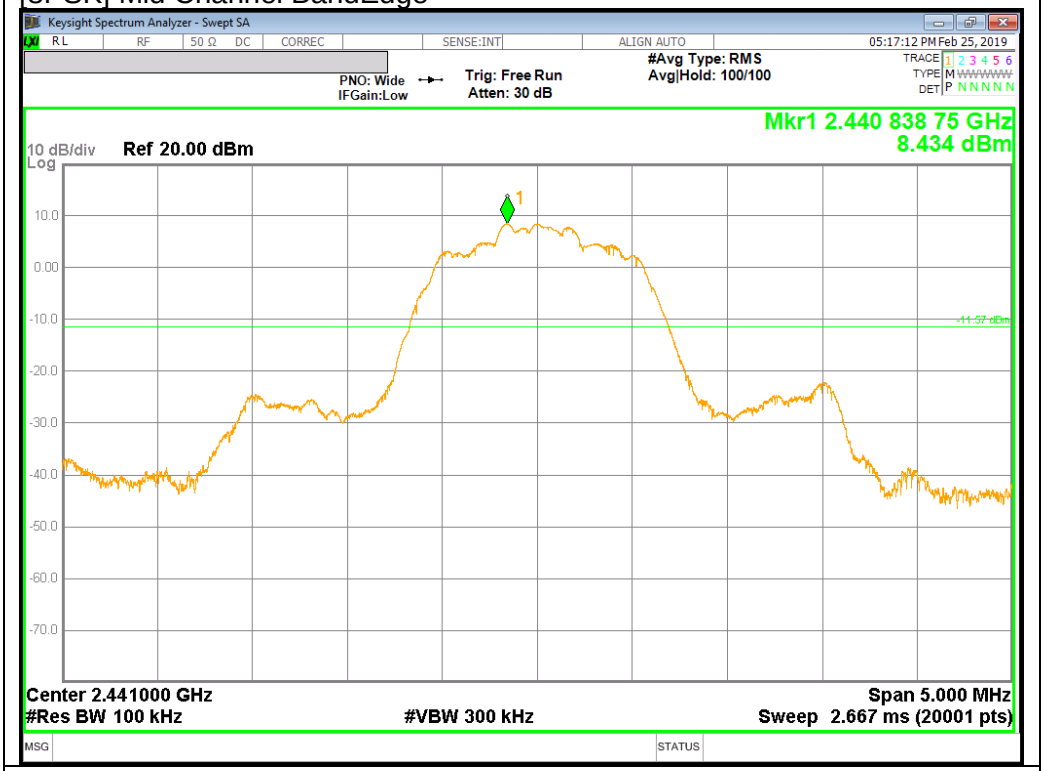
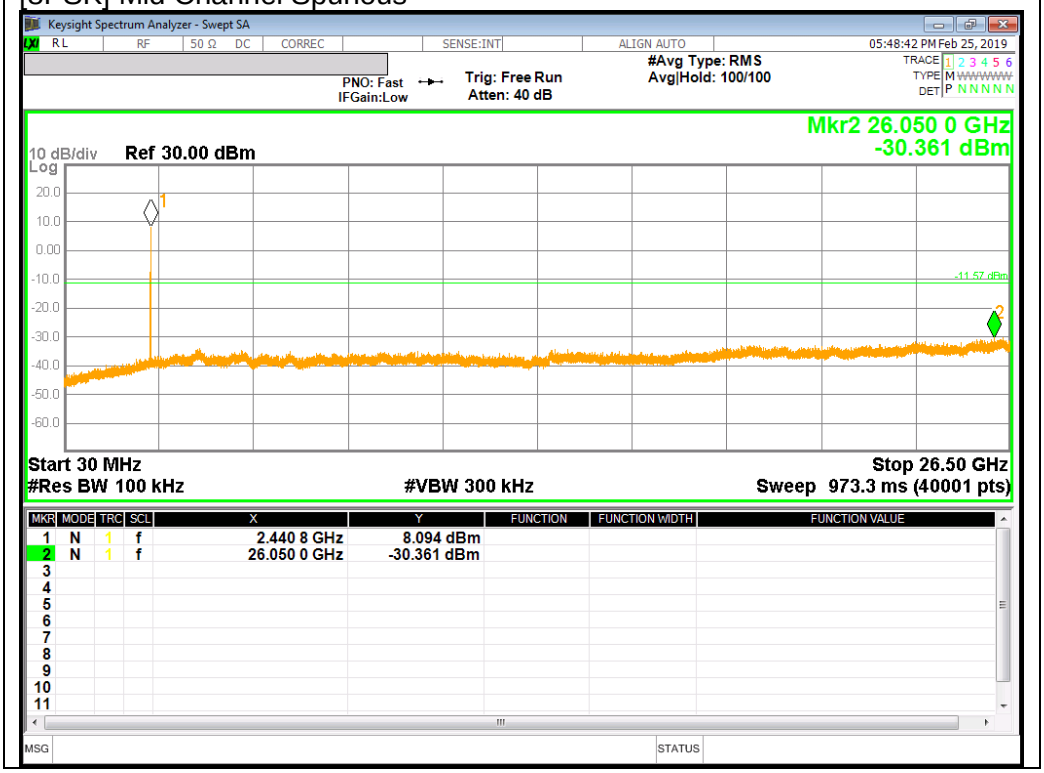
[8PSK] Mid Channel BandEdge



[8PSK] Mid Channel Spurious



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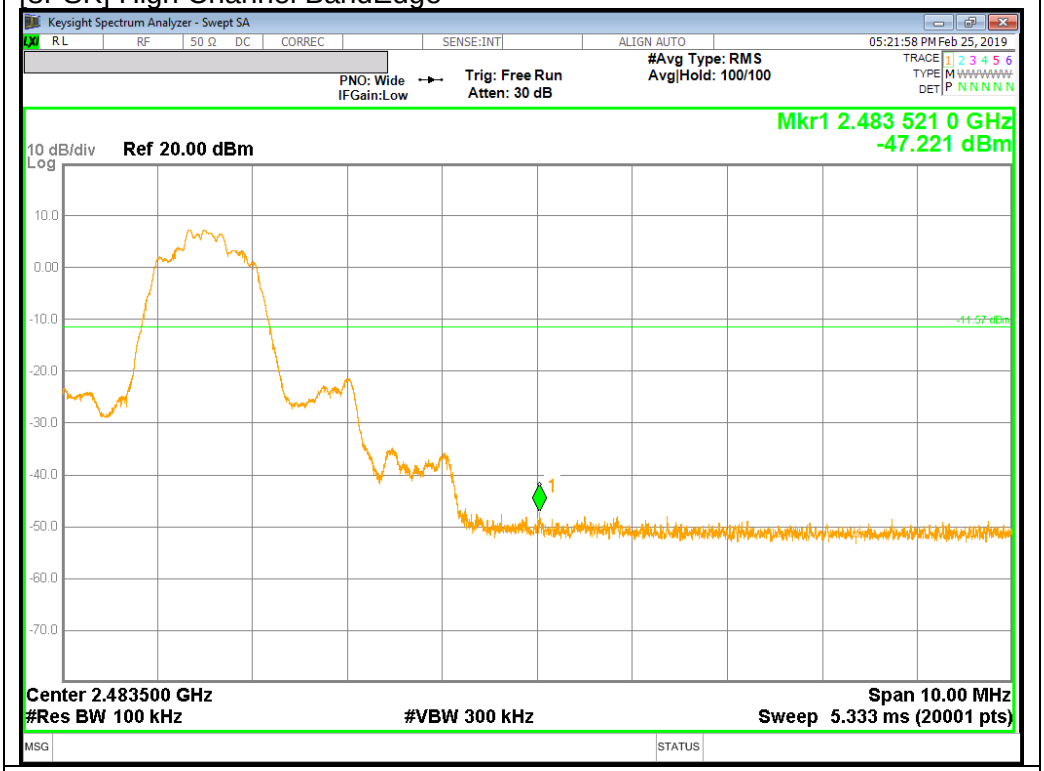
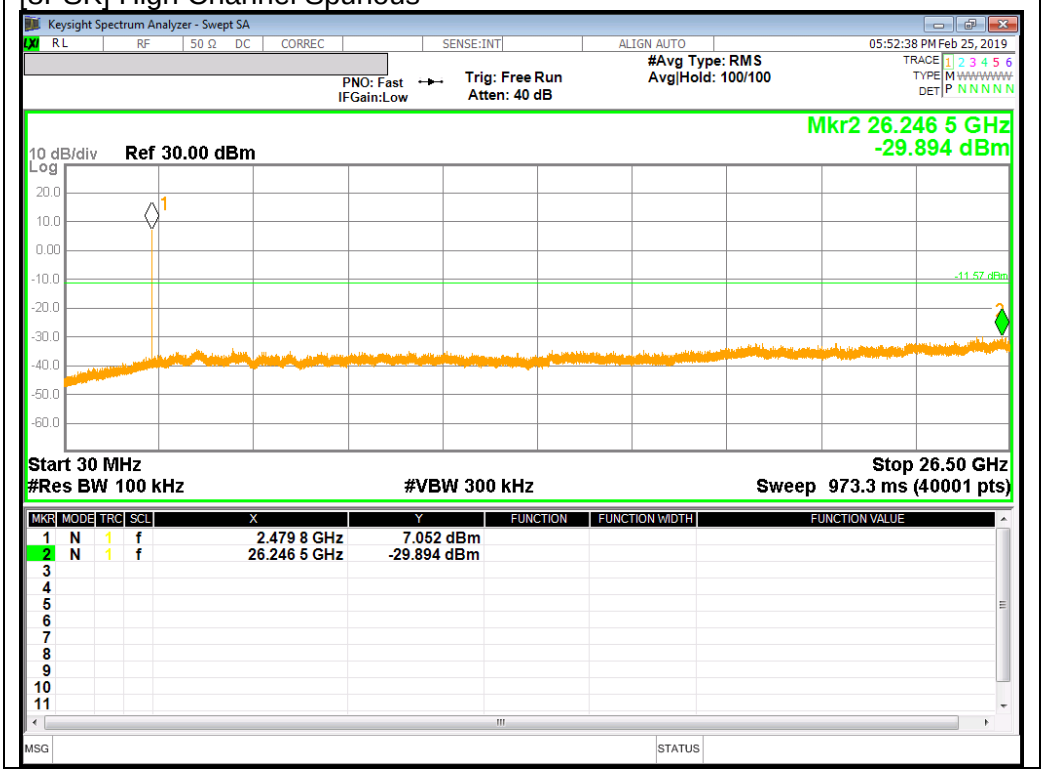
[8PSK] High Channel BandEdge



[8PSK] High Channel Spurious



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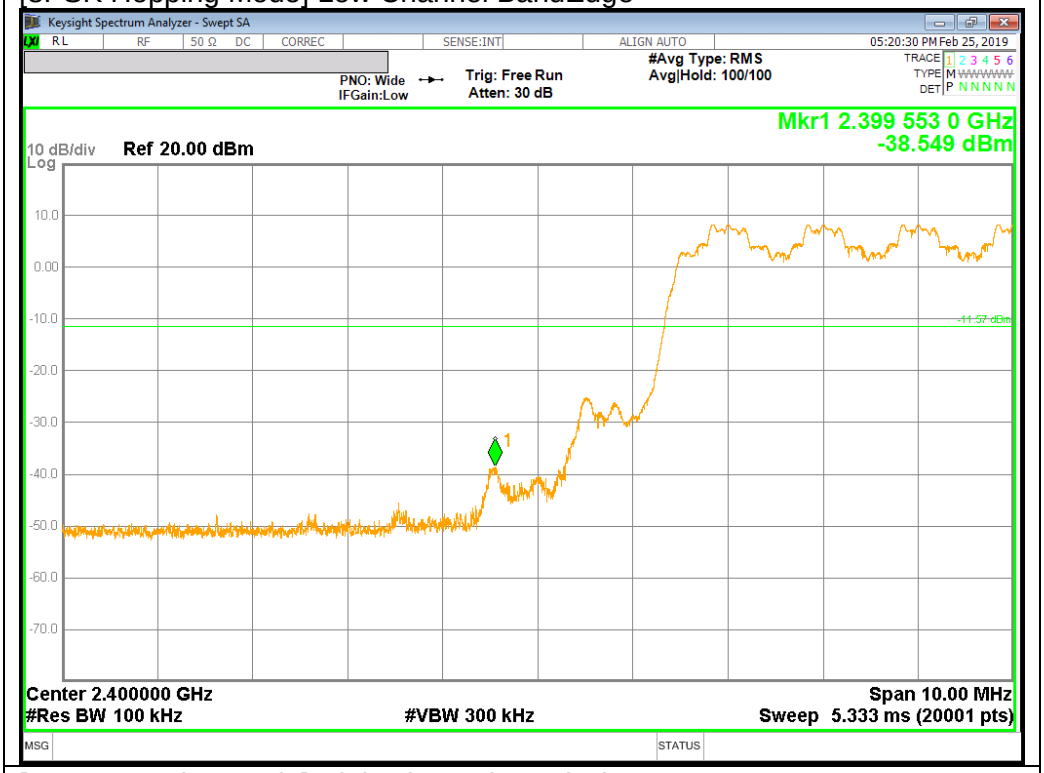
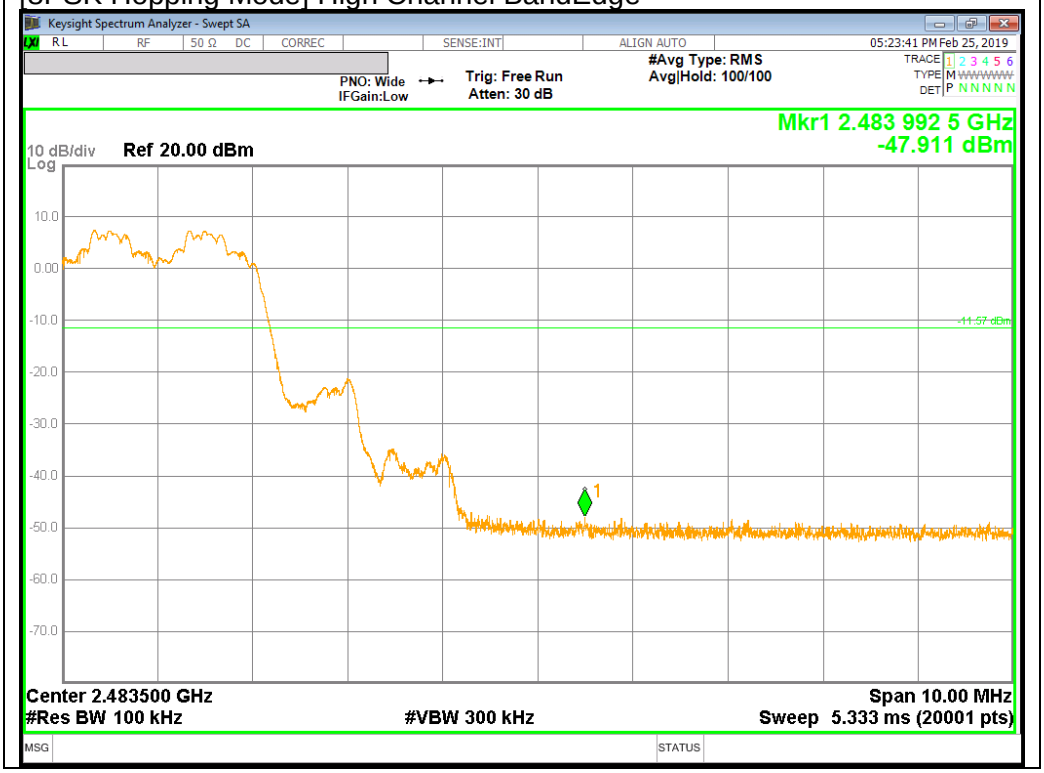
BandEdge Emission at 8PSK Hopping Mode

[8PSK Hopping Mode] Low Channel BandEdge



[8PSK Hopping Mode] High Channel BandEdge



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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.

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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.

GFSK = 1/T = 1 / 0.002879S = 347Hz.

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 field 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.

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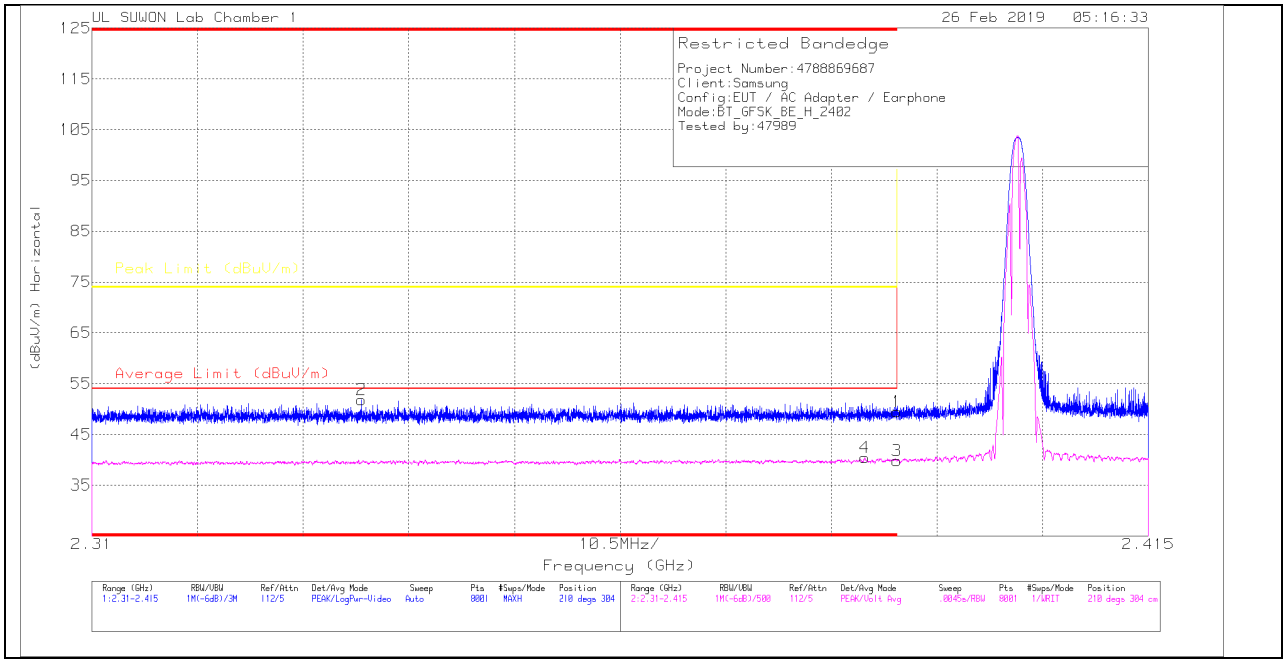
11.1. TRANSMITTER ABOVE 1 GHz

11.1.1. 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_00168717	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	43.24	Pk	31.7	-25.5	49.44	-	-	74	-24.56	210	304	H
2	* 2.337	46.03	Pk	31.5	-25.7	51.83	-	-	74	-22.17	210	304	H
3	* 2.39	32.43	VA1T	31.7	-25.5	38.63	54	-15.37	-	-	210	304	H
4	* 2.387	33.11	VA1T	31.7	-25.5	39.31	54	-14.69	-	-	210	304	H

* - 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

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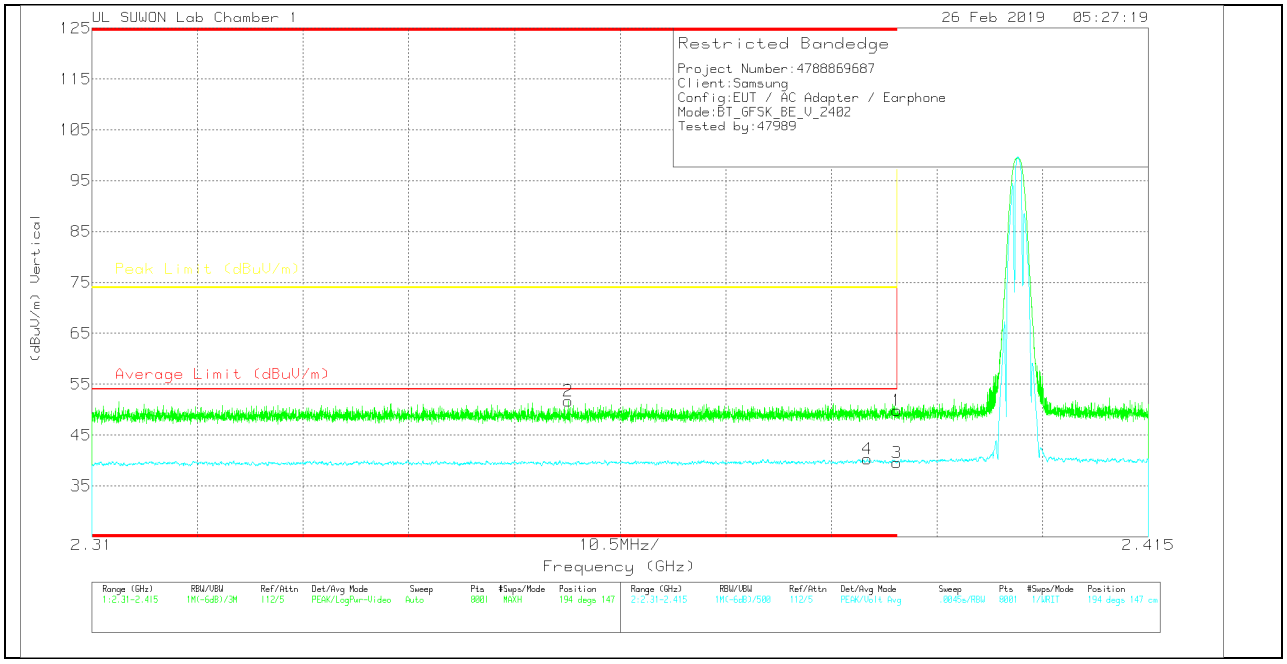
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	43.67	Pk	31.7	-25.5	49.87	-	-	74	-24.13	194	147	V
2	* 2.357	45.78	Pk	31.6	-25.7	51.68	-	-	74	-22.32	194	147	V
3	* 2.39	32.2	VA1T	31.7	-25.5	38.4	54	-15.6	-	-	194	147	V
4	* 2.387	32.91	VA1T	31.7	-25.5	39.11	54	-14.89	-	-	194	147	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

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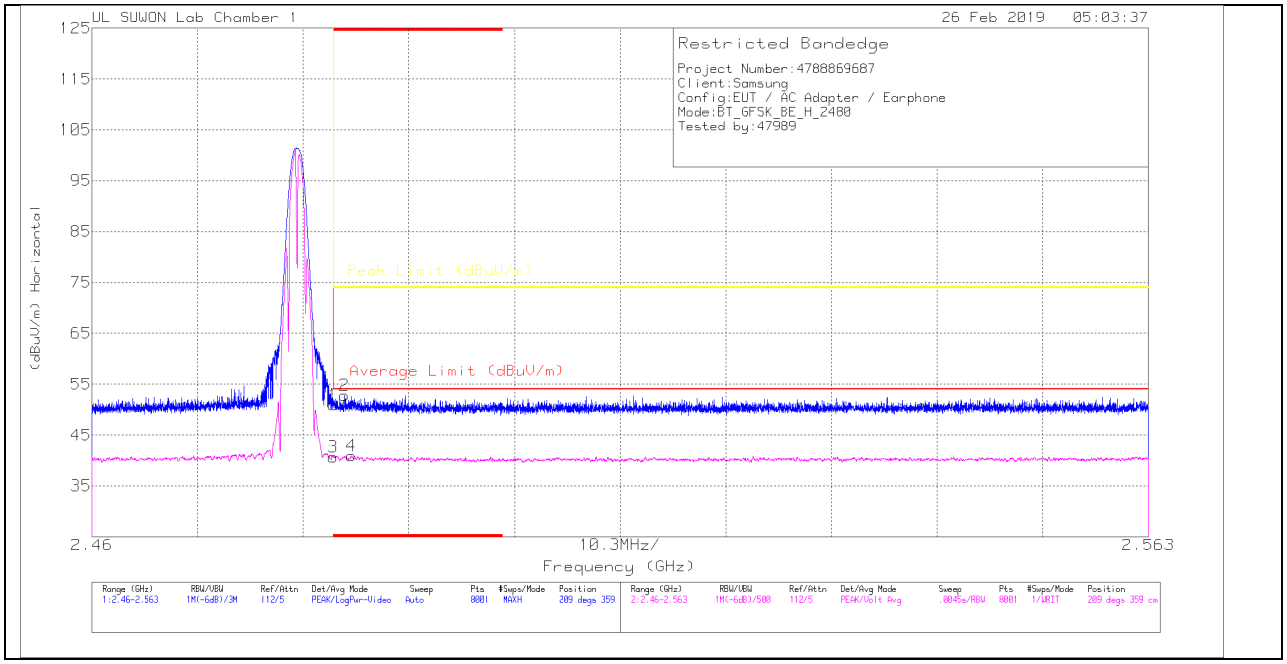
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	44.39	Pk	31.9	-25.3	50.99	-	-	74	-23.01	209	359	H
2	* 2.485	46.17	Pk	31.9	-25.3	52.77	-	-	74	-21.23	209	359	H
3	* 2.484	32.92	VA1T	31.9	-25.3	39.52	54	-14.48	-	-	209	359	H
4	* 2.485	33.19	VA1T	31.9	-25.3	39.79	54	-14.21	-	-	209	359	H

* - 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

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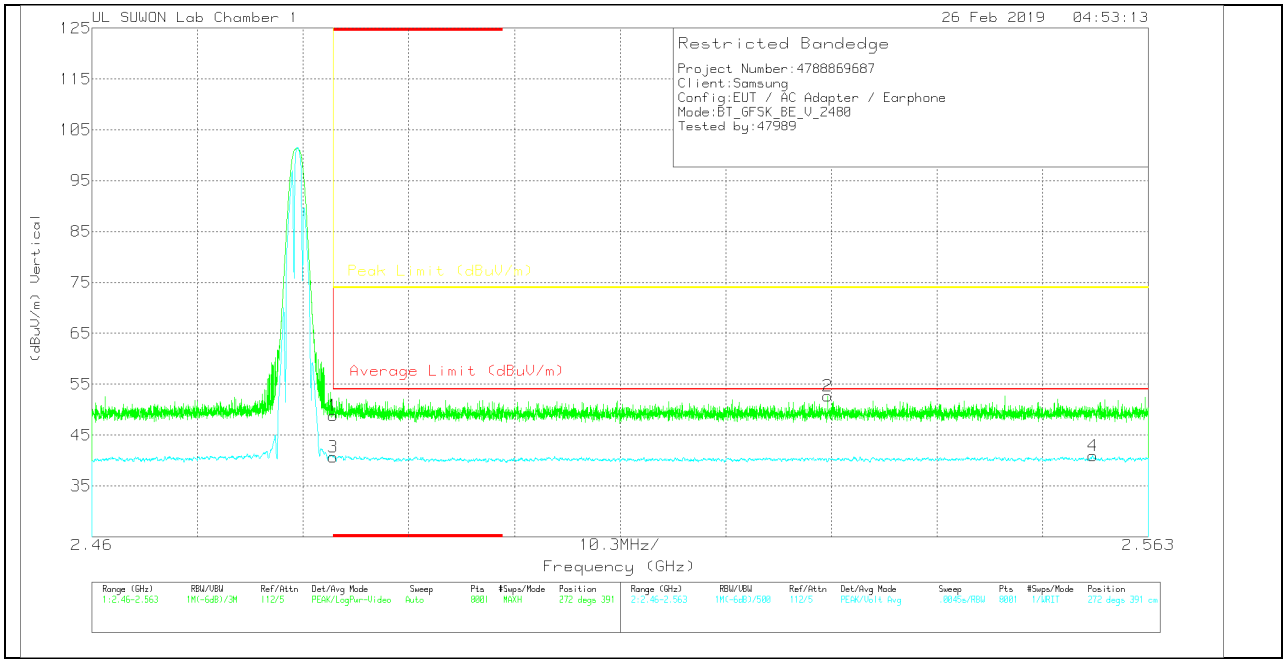
VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	42.28	Pk	31.9	-25.3	48.88	-	-	74	-25.12	272	391	V
2	2.532	45.8	Pk	32	-25.1	52.7	-	-	74	-21.3	272	391	V
3	* 2.484	32.93	VA1T	31.9	-25.3	39.53	54	-14.47	-	-	272	391	V
4	2.558	32.88	VA1T	32	-25.1	39.78	54	-14.22	-	-	272	391	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

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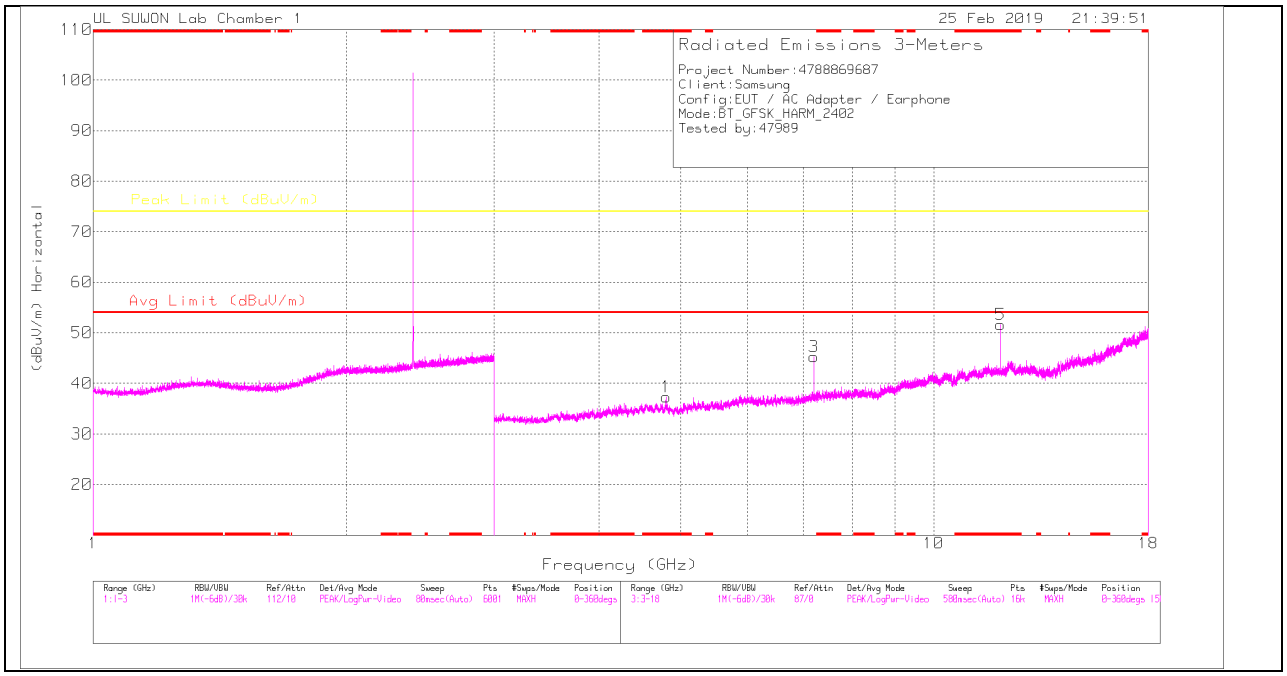
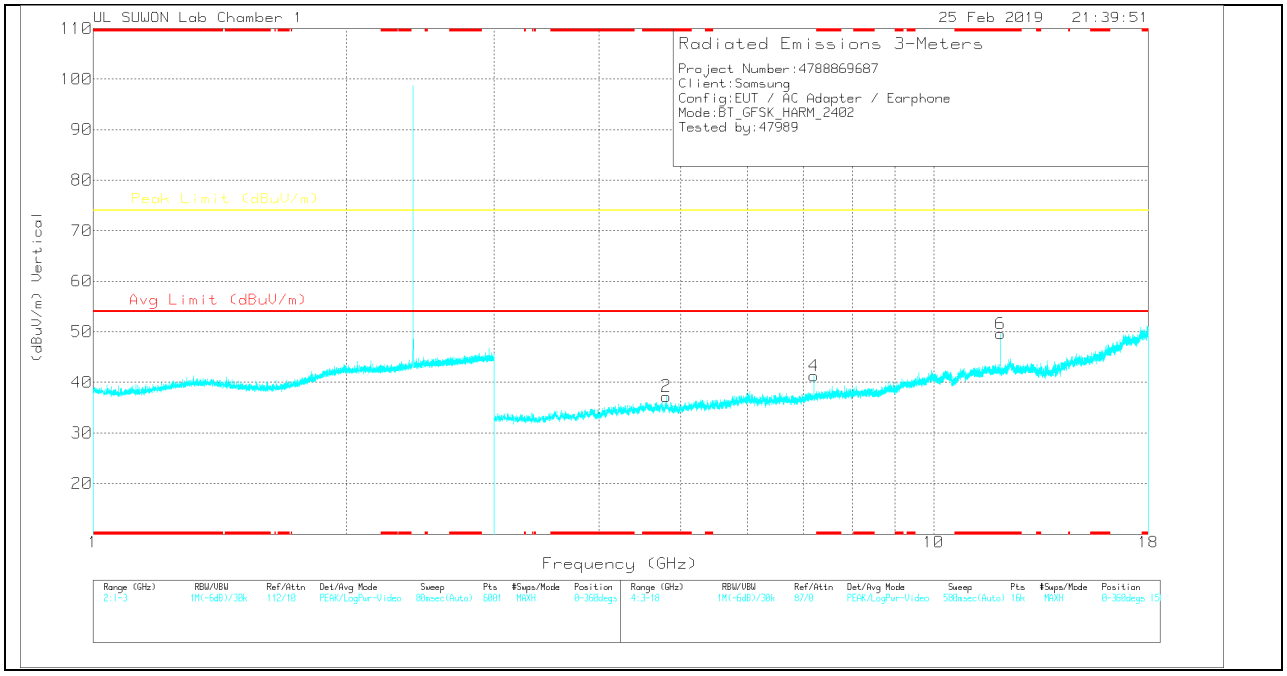
HARMONICS AND SPURIOUS EMISSIONS

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.

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.804	34.52	PK	34.2	-31.4	0	37.32	-	-	74	-36.68	0-360	250	H
3	7.206	37.36	PK	35.8	-27.9	0	45.26	-	-	74	-28.74	0-360	150	H
5	* 12.011	34.81	PK	39	-22.2	0	51.61	-	-	74	-22.39	0-360	250	H
2	* 4.804	34.43	PK	34.2	-31.4	0	37.23	-	-	74	-36.77	0-360	250	V
4	7.205	33.4	PK	35.8	-27.9	0	41.3	-	-	74	-32.7	0-360	250	V
6	* 12.009	32.83	PK	39	-22.2	0	49.63	-	-	74	-24.37	0-360	250	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	42.3	PKFH	34.2	-31.4	0	45.1	-	-	74	-28.9	136	261	H
* 4.804	32.85	VA1T	34.2	-31.4	1.15	36.8	54	-17.2	-	-	136	261	H
* 4.809	40.5	PKFH	34.2	-31.4	0	43.3	-	-	74	-30.7	196	210	V
* 4.804	31.48	VA1T	34.2	-31.4	1.15	35.43	54	-18.57	-	-	196	210	V
7.207	43.54	PKFH	35.8	-27.9	0	51.44	-	-	74	-22.56	167	108	H
7.206	39.06	PKFH	35.8	-27.9	0	46.96	-	-	74	-27.04	130	114	V
* 12.01	39.82	PKFH	39	-22.2	0	56.62	-	-	74	-17.38	275	100	H
* 12.01	31.1	VA1T	39	-22.2	1.15	49.05	54	-4.95	-	-	275	100	H
* 12.01	42.19	PKFH	39	-22.2	0	58.99	-	-	74	-15.01	175	111	V
* 12.01	33.58	VA1T	39	-22.2	1.15	51.53	54	-2.47	-	-	175	111	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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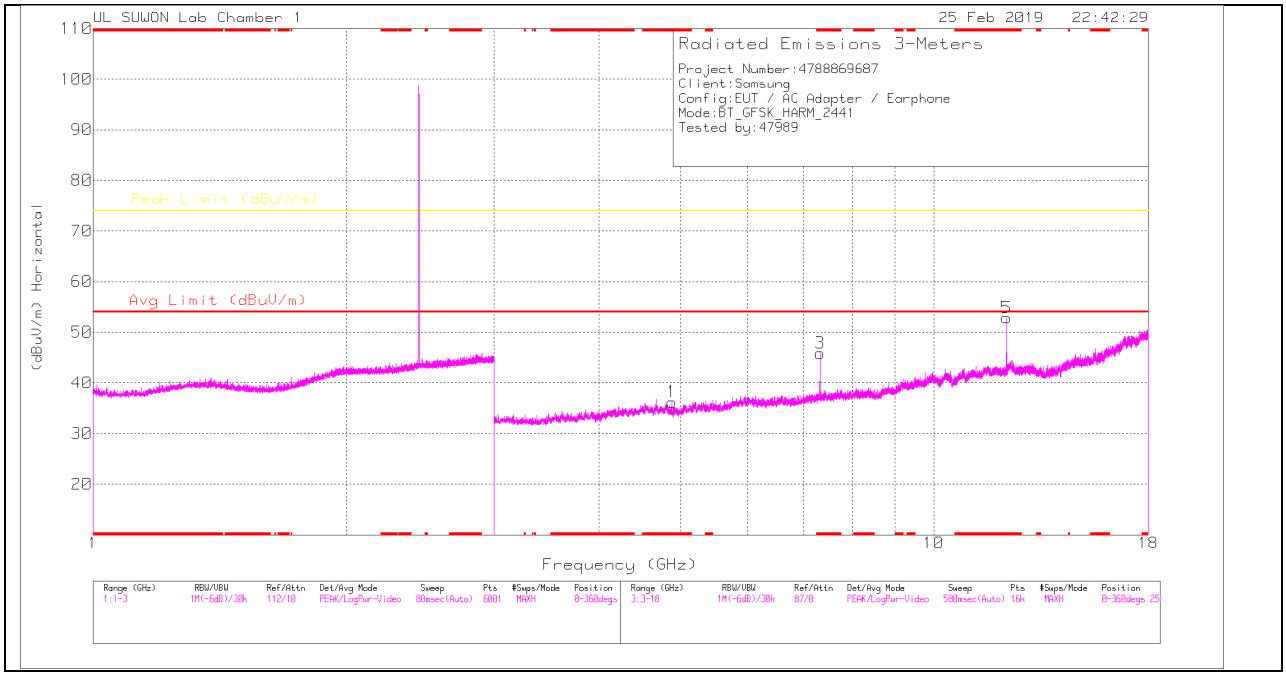
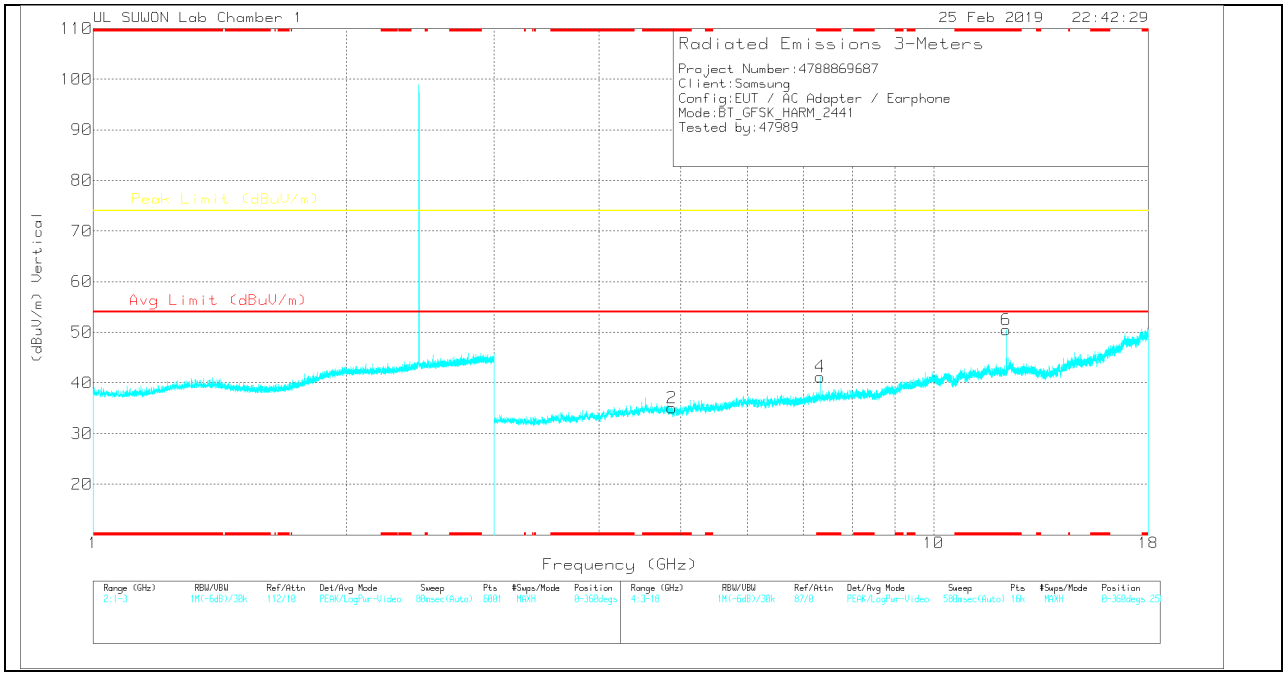
MID CHANNEL HORIZONTAL



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.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.881	33.55	PK	34.2	-31.5	0	36.25	-	-	74	-37.75	0-360	150	H
3	* 7.323	37.34	PK	35.8	-27.3	0	45.84	-	-	74	-28.16	0-360	250	H
5	* 12.206	36.27	PK	39	-22.4	0	52.87	-	-	74	-21.13	0-360	250	H
2	* 4.881	32.34	PK	34.2	-31.5	0	35.04	-	-	74	-38.96	0-360	250	V
4	* 7.323	32.7	PK	35.8	-27.3	0	41.2	-	-	74	-32.8	0-360	150	V
6	* 12.205	33.9	PK	39	-22.4	0	50.5	-	-	74	-23.5	0-360	250	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.323	43.79	PKFH	35.8	-27.3	0	52.29	-	-	74	-21.71	167	105	H
* 7.323	37.6	VA1T	35.8	-27.3	1.15	47.25	54	-6.75	-	-	167	105	H
* 7.323	38.39	PKFH	35.8	-27.3	0	46.89	-	-	74	-27.11	112	388	V
* 7.323	29.52	VA1T	35.8	-27.3	1.15	39.17	54	-14.83	-	-	112	388	V
* 12.205	42.77	PKFH	39	-22.4	0	59.37	-	-	74	-14.63	167	272	H
* 12.205	34.25	VA1T	39	-22.4	1.15	52	54	-2	-	-	167	272	H
* 12.205	43.02	PKFH	39	-22.4	0	59.62	-	-	74	-14.38	128	100	V
* 12.205	35.08	VA1T	39	-22.4	1.15	52.83	54	-1.17	-	-	128	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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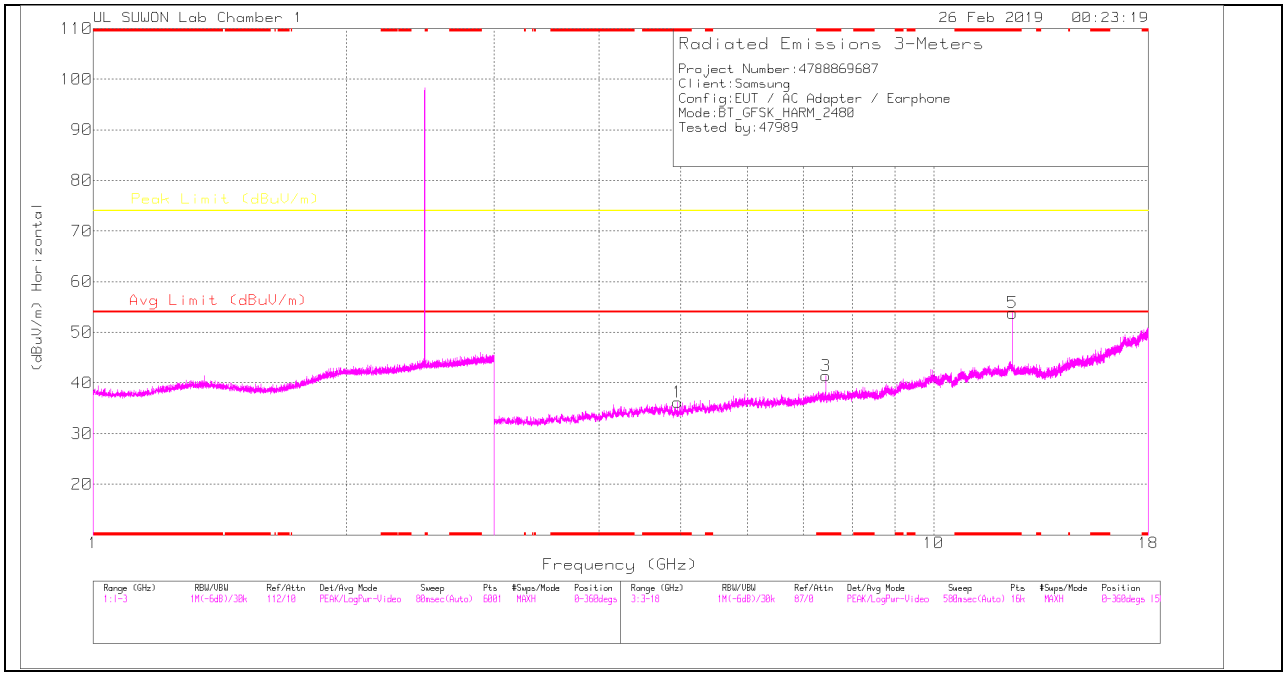
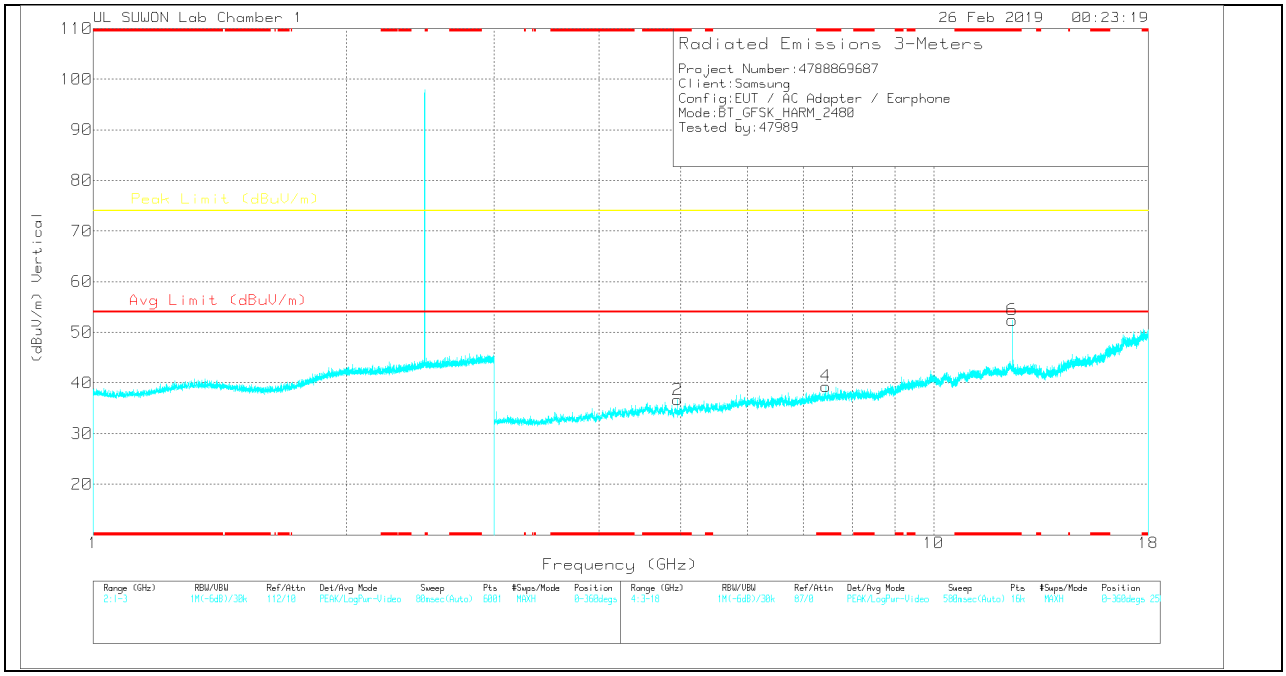
HIGH CHANNEL HORIZONTAL



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.

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.96	33.38	PK	34.2	-31.4	0	36.18	-	-	74	-37.82	0-360	250	H
3	* 7.441	32.59	PK	35.8	-27	0	41.39	-	-	74	-32.61	0-360	150	H
5	* 12.401	36.01	PK	38.8	-21	0	53.81	-	-	74	-20.19	0-360	250	H
2	* 4.959	33.86	PK	34.2	-31.4	0	36.66	-	-	74	-37.34	0-360	150	V
4	* 7.44	30.56	PK	35.8	-27	0	39.36	-	-	74	-34.64	0-360	250	V
6	* 12.4	34.53	PK	38.9	-21	0	52.43	-	-	74	-21.57	0-360	250	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	40.39	PKFH	34.2	-31.4	0	43.19	-	-	74	-30.81	127	121	H
* 4.96	31.69	VA1T	34.2	-31.4	1.15	35.64	54	-18.36	-	-	127	121	H
* 4.96	40.88	PKFH	34.2	-31.4	0	43.68	-	-	74	-30.32	186	120	V
* 4.96	31.46	VA1T	34.2	-31.4	1.15	35.41	54	-18.59	-	-	186	120	V
* 7.437	36.27	PKFH	35.8	-27	0	45.07	-	-	74	-28.93	6	152	H
* 7.446	24.92	VA1T	35.8	-27.1	1.15	34.77	54	-19.23	-	-	6	152	H
* 7.439	37.03	PKFH	35.8	-27	0	45.83	-	-	74	-28.17	116	359	V
* 7.44	27.06	VA1T	35.8	-27	1.15	37.01	54	-16.99	-	-	116	359	V
* 12.4	42.44	PKFH	38.9	-21	0	60.34	-	-	74	-13.66	176	100	H
* 12.4	34.28	VA1T	38.8	-21	1.15	53.23	54	-.77	-	-	176	100	H
* 12.401	43.22	PKFH	38.8	-21	0	61.02	-	-	74	-12.98	130	105	V
* 12.4	34.73	VA1T	38.8	-21	1.15	53.68	54	-.32	-	-	130	105	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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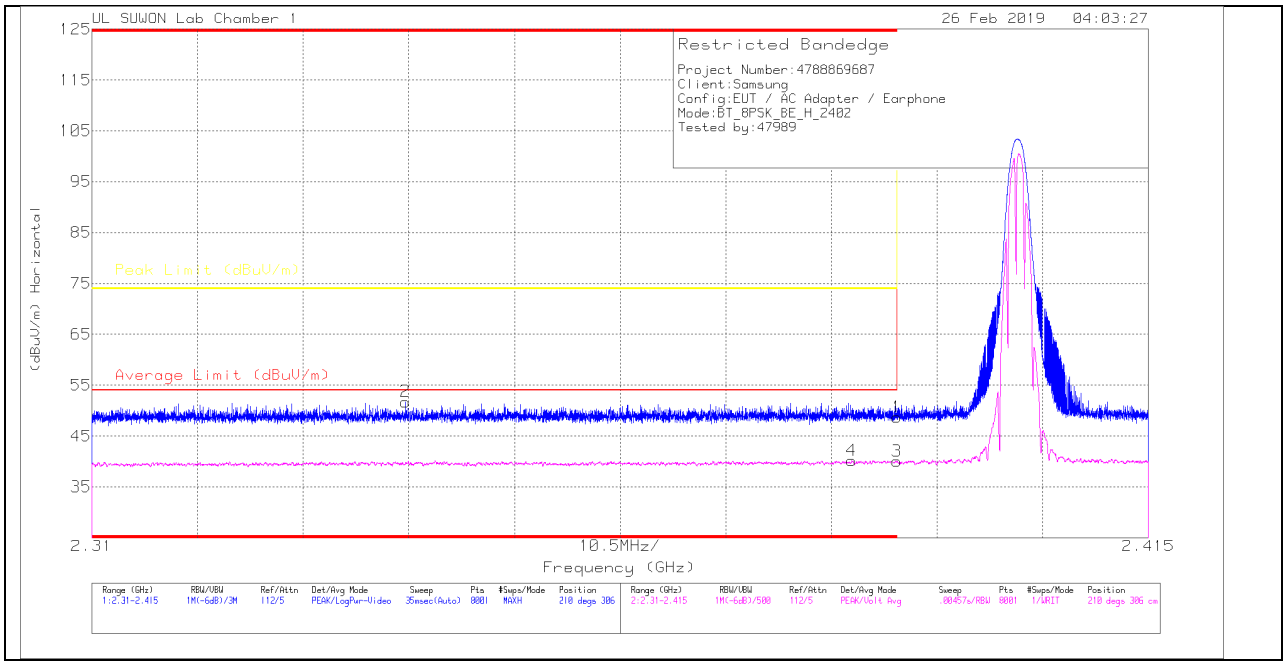
11.1.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB[dB]	DC Corr (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	42.51	Pk	31.7	-25.5	0	48.71	-	-	74	-25.29	210	306	H
2	* 2.341	45.95	Pk	31.5	-25.7	0	51.75	-	-	74	-22.25	210	306	H
3	* 2.39	32.69	VA1T	31.7	-25.5	1.15	40.04	54	-13.96	-	-	210	306	H
4	* 2.386	32.84	VA1T	31.7	-25.5	1.15	40.19	54	-13.81	-	-	210	306	H

* - 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

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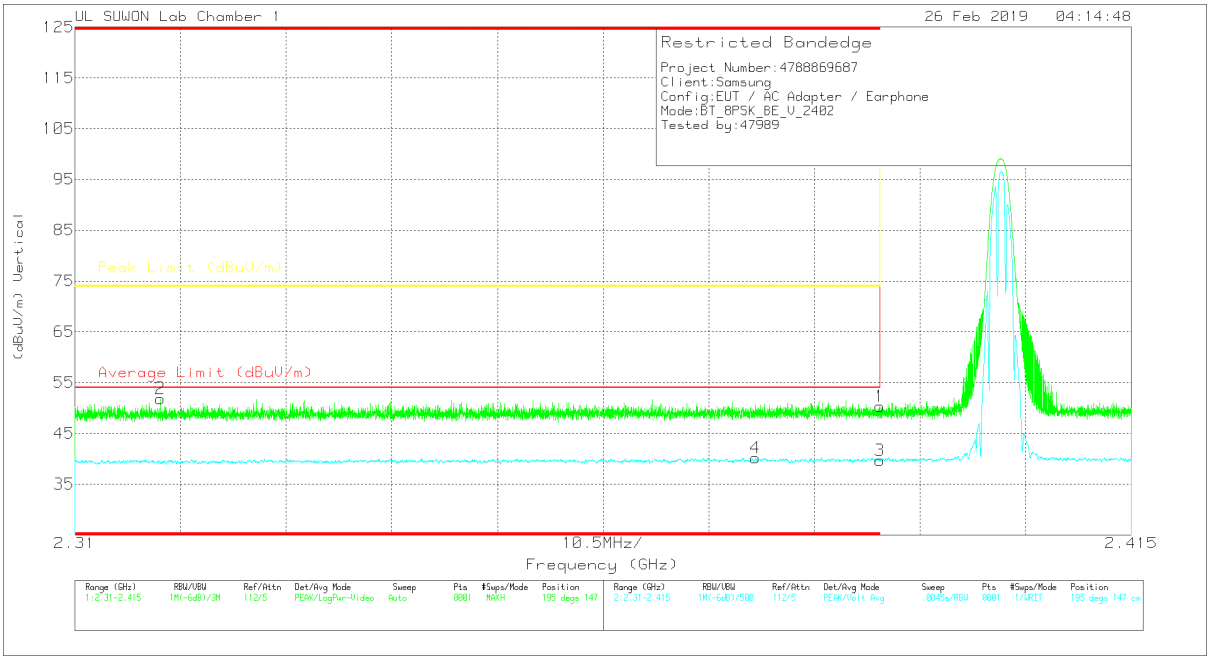
VERTICAL PEAK AND AVERAGE PLOT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	44.08	Pk	31.7	-25.5	50.28	-	-	74	-23.72	195	147	V
2	* 2.318	46.07	Pk	31.5	-25.7	51.87	-	-	74	-22.13	195	147	V
3	* 2.39	32.29	VA1T	31.7	-25.5	38.49	54	-15.51	-	-	195	147	V
4	* 2.378	33.06	VA1T	31.6	-25.6	39.06	54	-14.94	-	-	195	147	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

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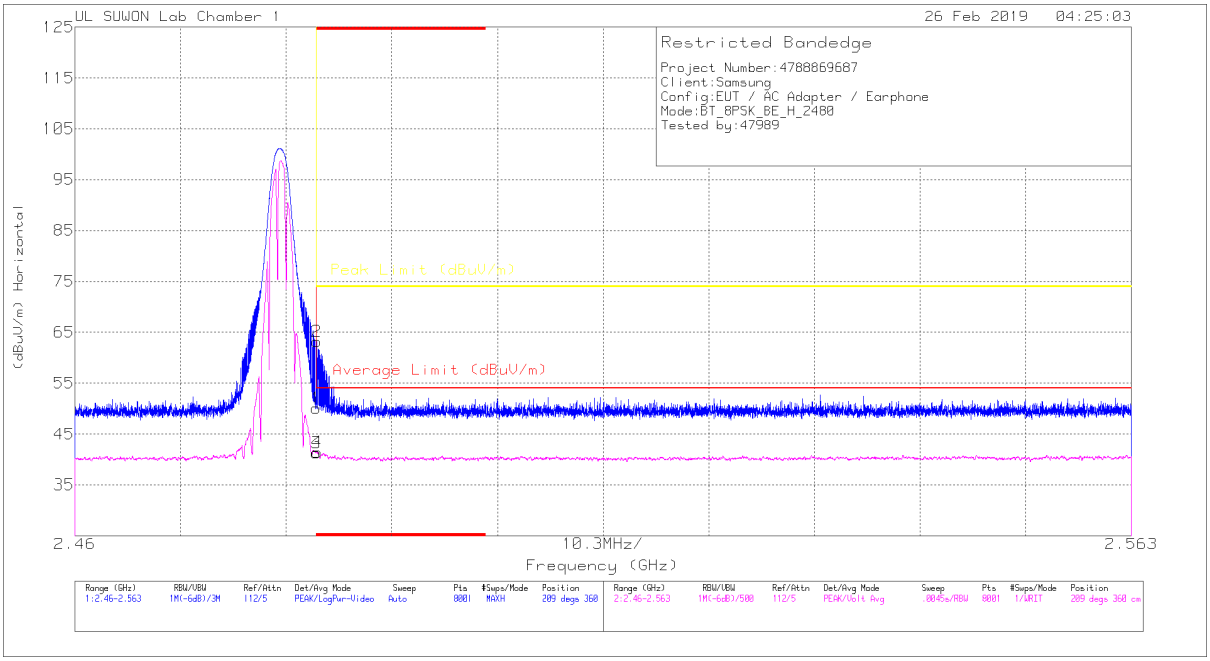
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	43.46	Pk	31.9	-25.3	50.06	-	-	74	-23.94	209	360	H
2	* 2.484	56.58	Pk	31.9	-25.3	63.18	-	-	74	-10.82	209	360	H
3	* 2.484	33.55	VA1T	31.9	-25.3	40.15	54	-13.85	-	-	209	360	H
4	* 2.484	33.71	VA1T	31.9	-25.3	40.31	54	-13.69	-	-	209	360	H

* - 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

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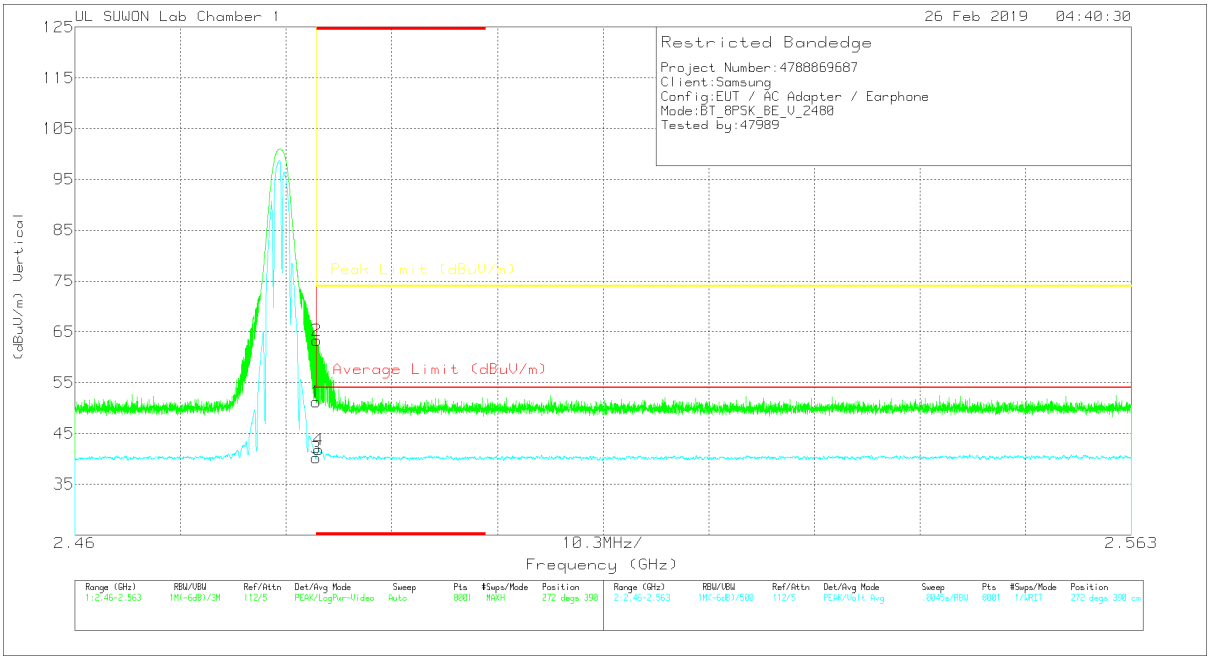
VERTICAL PEAK AND AVERAGE PLOT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	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	44.62	Pk	31.9	-25.3	51.22	-	-	74	-22.78	272	390	V
2	* 2.484	56.69	Pk	31.9	-25.3	63.29	-	-	74	-10.71	272	390	V
3	* 2.484	32.49	VA1T	31.9	-25.3	39.09	54	-14.91	-	-	272	390	V
4	* 2.484	34.04	VA1T	31.9	-25.3	40.64	54	-13.36	-	-	272	390	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

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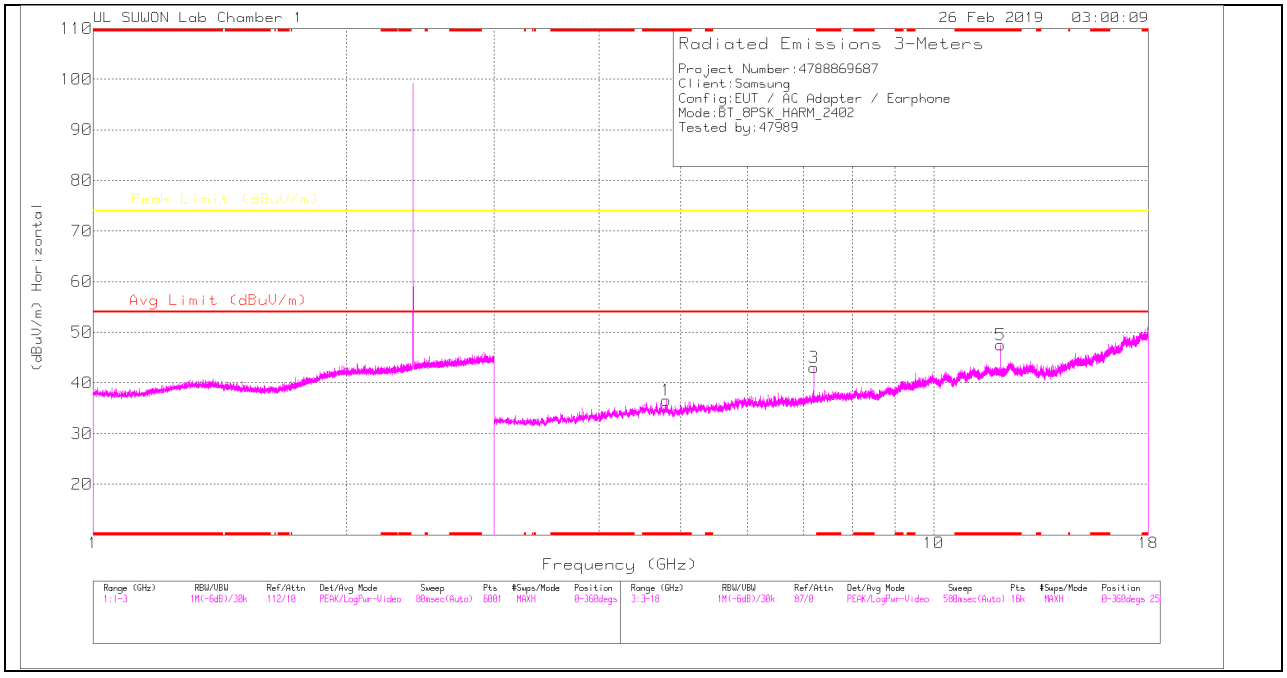
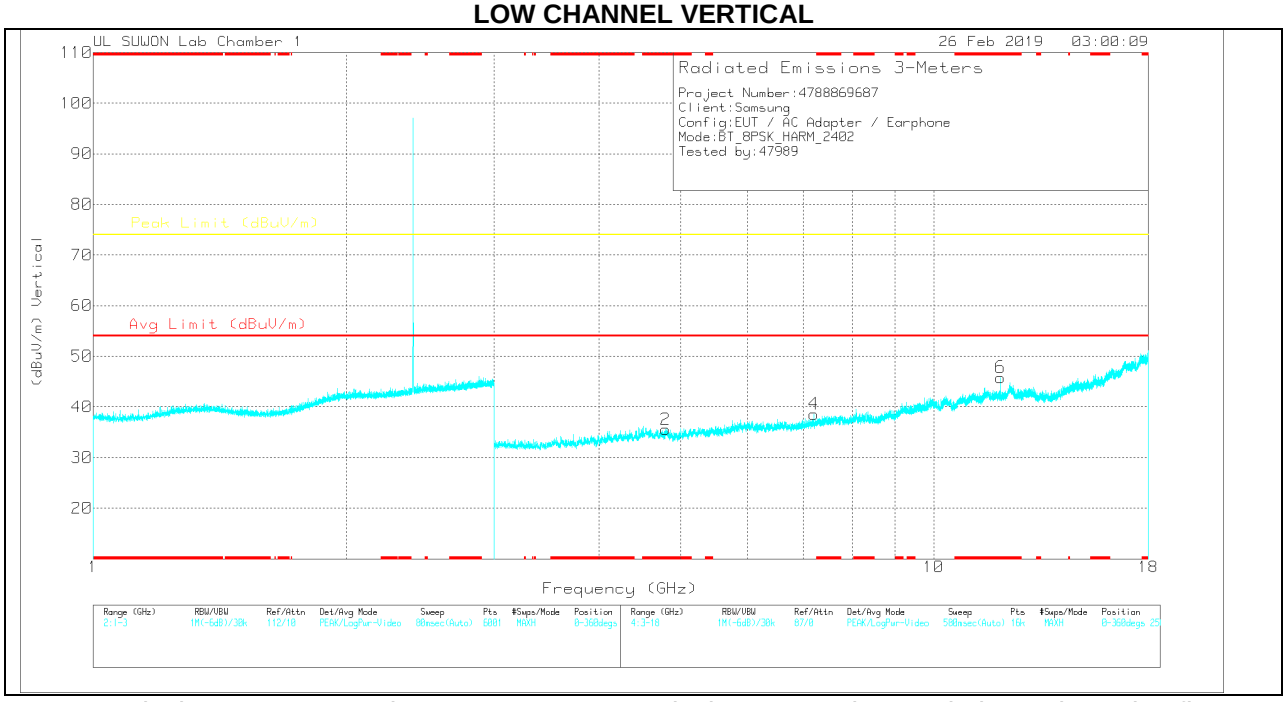
HARMONICS AND SPURIOUS EMISSIONS

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.

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.804	33.73	PK	34.2	-31.4	0	36.53	-	-	74	-37.47	0-360	250	H
3	7.206	35.1	PK	35.8	-27.9	0	43	-	-	74	-31	0-360	150	H
5	* 12.01	30.72	PK	39	-22.2	0	47.52	-	-	74	-26.48	0-360	250	H
2	* 4.801	32.74	PK	34.2	-31.4	0	35.54	-	-	74	-38.46	0-360	150	V
4	7.205	30.7	PK	35.8	-27.9	0	38.6	-	-	74	-35.4	0-360	150	V
6	* 12.011	29.01	PK	39	-22.2	0	45.81	-	-	74	-28.19	0-360	150	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7.206	42.43	PKFH	35.8	-27.9	0	50.33	-	-	74	-23.67	169	127	H
7.206	39.29	PKFH	35.8	-27.9	0	47.19	-	-	74	-26.81	145	294	V
* 12.011	39.91	PKFH	39	-22.2	0	56.71	-	-	74	-17.29	275	108	H
* 12.01	27.91	VA1T	39	-22.2	1.15	45.86	54	-8.14	-	-	275	108	H
* 12.01	41.23	PKFH	39	-22.2	0	58.03	-	-	74	-15.97	172	125	V
* 12.01	29.44	VA1T	39	-22.2	1.15	47.39	54	-6.61	-	-	172	125	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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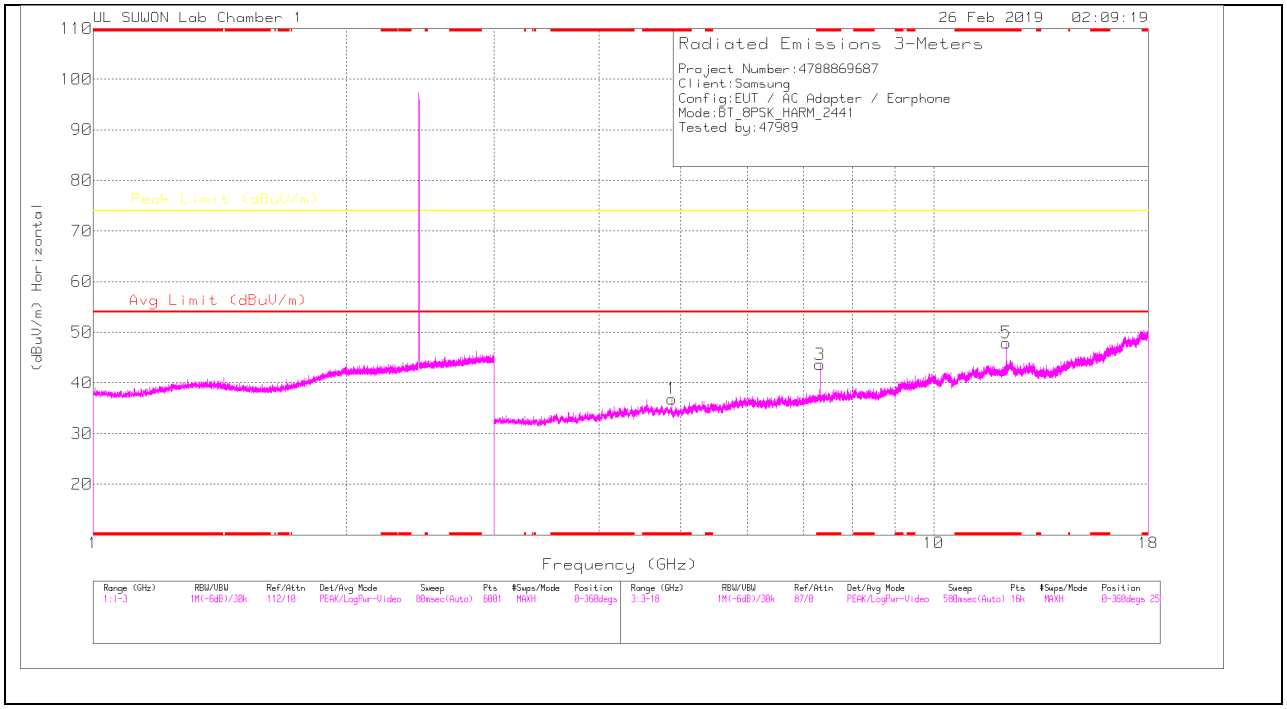
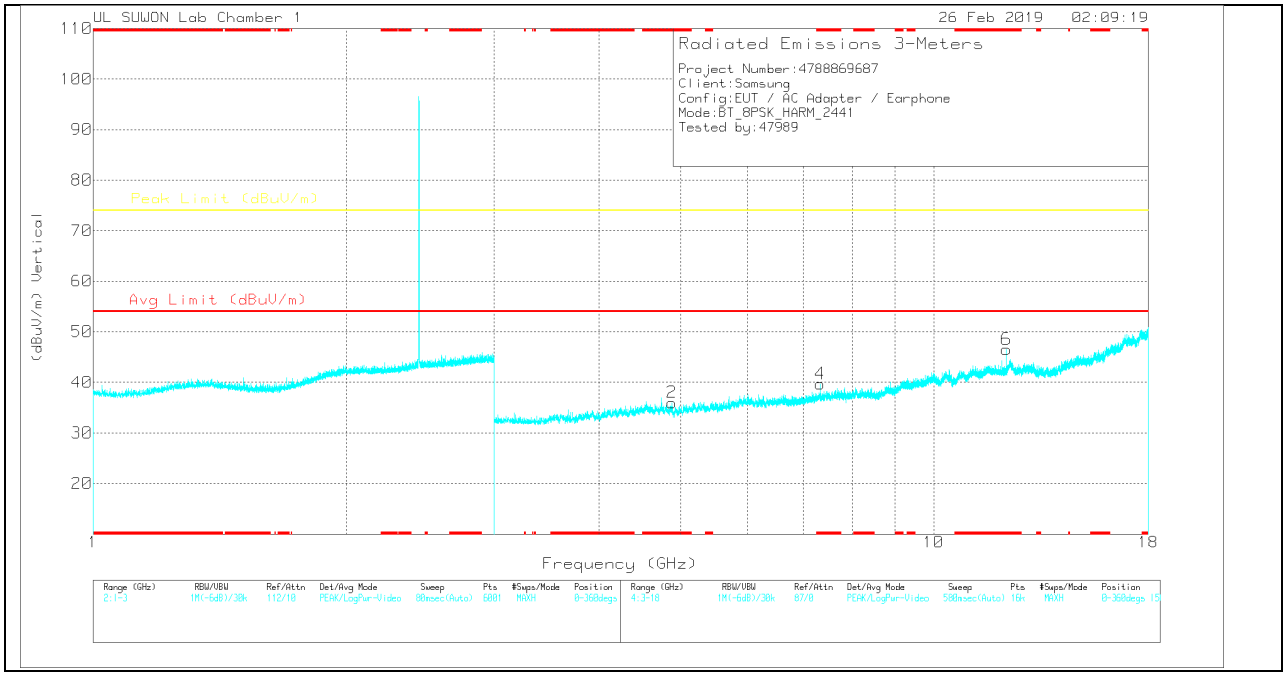
MID CHANNEL HORIZONTAL



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.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.881	34.17	PK	34.2	-31.5	0	36.87	-	-	74	-37.13	0-360	250	H
3	* 7.323	35.14	PK	35.8	-27.3	0	43.64	-	-	74	-30.36	0-360	150	H
5	* 12.205	31.33	PK	39	-22.4	0	47.93	-	-	74	-26.07	0-360	250	H
2	* 4.881	33.3	PK	34.2	-31.5	0	36	-	-	74	-38	0-360	150	V
4	* 7.323	31.19	PK	35.8	-27.3	0	39.69	-	-	74	-34.31	0-360	150	V
6	* 12.206	29.93	PK	39	-22.4	0	46.53	-	-	74	-27.47	0-360	250	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.324	42.35	PKFH	35.8	-27.3	0	50.85	-	-	74	-23.15	165	121	H
* 7.323	34.6	VA1T	35.8	-27.3	1.15	44.25	54	-9.75	-	-	165	121	H
* 7.323	40.7	PKFH	35.8	-27.3	0	49.2	-	-	74	-24.8	131	117	V
* 7.323	29.19	VA1T	35.8	-27.3	1.15	38.84	54	-15.16	-	-	131	117	V
* 12.205	41.65	PKFH	39	-22.4	0	58.25	-	-	74	-15.75	177	263	H
* 12.205	29.71	VA1T	39	-22.4	1.15	47.46	54	-6.54	-	-	177	263	H
* 12.205	41.22	PKFH	39	-22.4	0	57.82	-	-	74	-16.18	129	115	V
* 12.205	29.89	VA1T	39	-22.4	1.15	47.64	54	-6.36	-	-	129	115	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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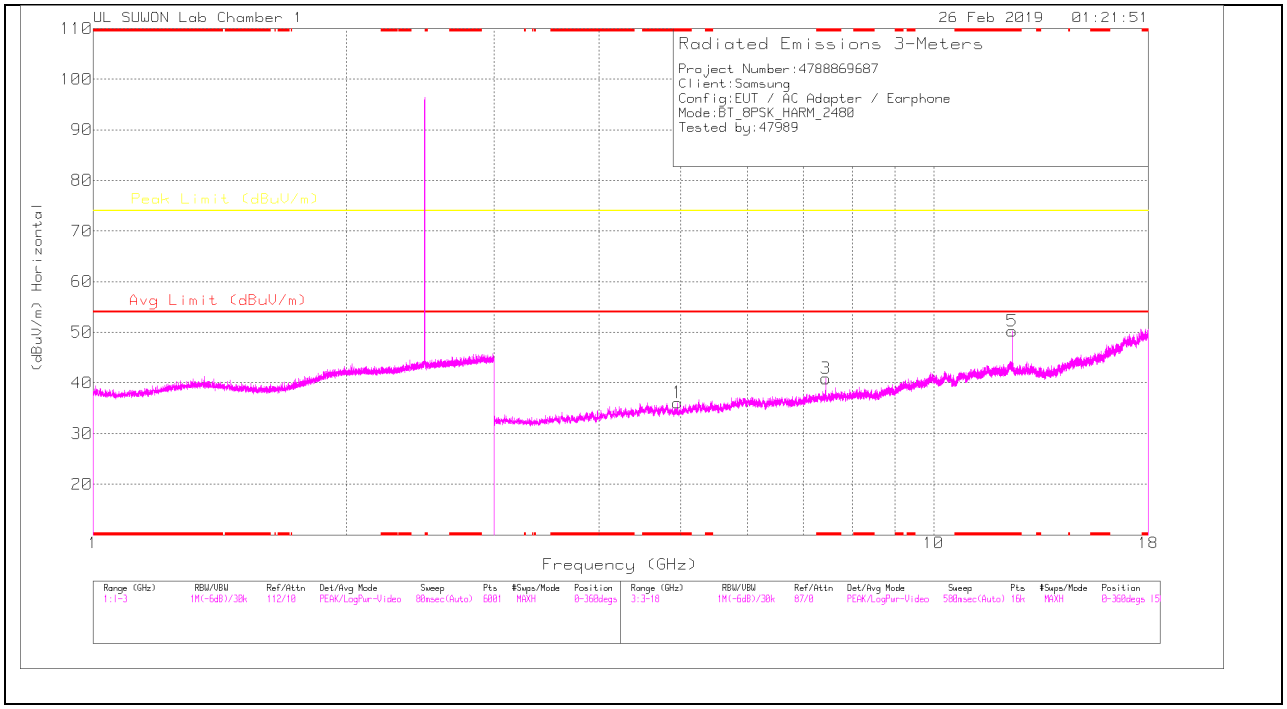
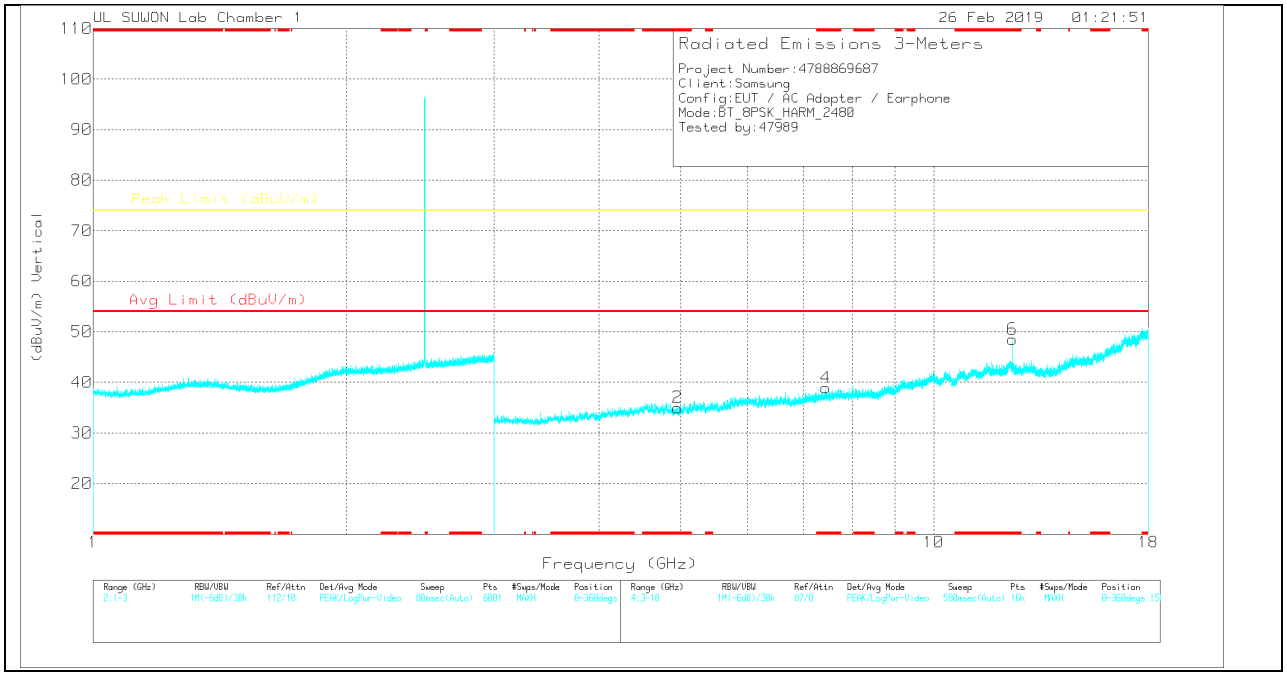
HIGH CHANNEL HORIZONTAL



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.

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	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	* 4.956	33.31	PK	34.2	-31.4	0	36.11	-	-	74	-37.89	0-360	250	H
3	* 7.441	32.08	PK	35.8	-27	0	40.88	-	-	74	-33.12	0-360	150	H
5	* 12.4	32.33	PK	38.9	-21	0	50.23	-	-	74	-23.77	0-360	250	H
2	* 4.96	32.2	PK	34.2	-31.4	0	35	-	-	74	-39	0-360	250	V
4	* 7.441	30.1	PK	35.8	-27	0	38.9	-	-	74	-35.1	0-360	250	V
6	* 12.401	30.73	PK	38.8	-21	0	48.53	-	-	74	-25.47	0-360	150	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.44	39.98	PKFH	35.8	-27	0	48.78	-	-	74	-25.22	165	119	H
* 7.44	30.97	VA1T	35.8	-27	1.15	40.92	54	-13.08	-	-	165	119	H
* 7.441	36.89	PKFH	35.8	-27	0	45.69	-	-	74	-28.31	253	357	V
* 7.44	25.59	VA1T	35.8	-27	1.15	35.54	54	-18.46	-	-	253	357	V
* 12.4	41.71	PKFH	38.9	-21	0	59.61	-	-	74	-14.39	180	100	H
* 12.4	31.09	VA1T	38.9	-21	1.15	50.14	54	-3.86	-	-	180	100	H
* 12.4	41.35	PKFH	38.9	-21	0	59.25	-	-	74	-14.75	129	123	V
* 12.4	30.71	VA1T	38.9	-21	1.15	49.76	54	-4.24	-	-	129	123	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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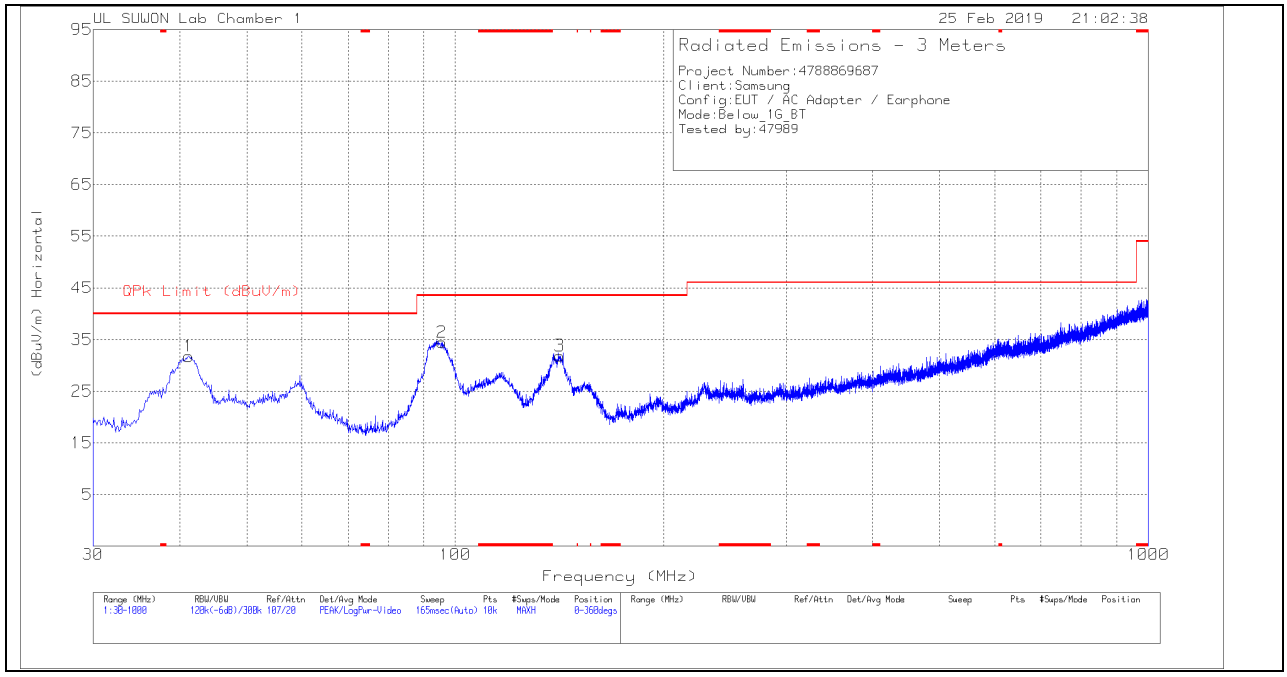
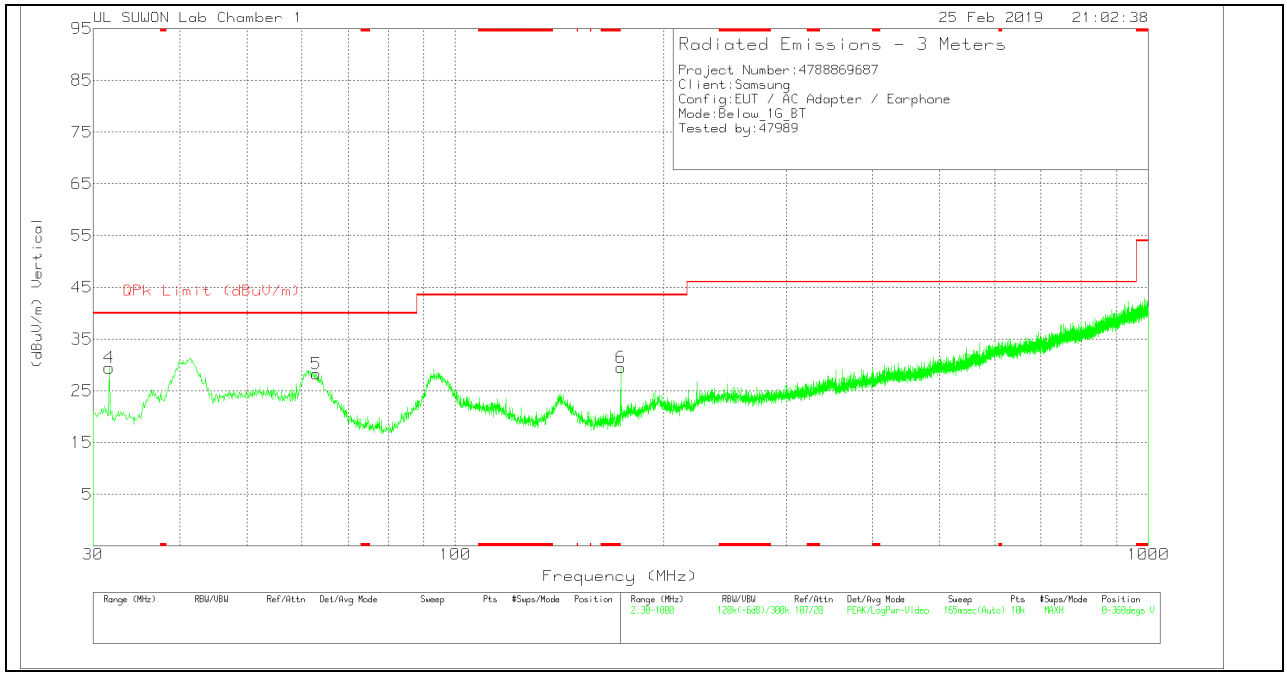
11.2. WORST-CASE BELOW 1 GHz

GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



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BELOW 1 GHz TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	41.252	43.46	Pk	19	-30.7	0	31.76	40	-8.24	0-360	400	H
2	95.572	46.75	Pk	17.4	-29.7	0	34.45	43.52	-9.07	0-360	300	H
3	141.453	46.95	Pk	14.1	-29.2	0	31.85	43.52	-11.67	0-360	200	H
4	31.649	44.64	Pk	15.7	-30.9	0	29.44	40	-10.56	0-360	100	V
5	62.98	40.68	Pk	17.9	-30.3	0	28.28	40	-11.72	0-360	100	V
6	173.269	43.26	Pk	15	-28.8	0	29.46	43.52	-14.06	0-360	100	V

Pk - Peak detector

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12. 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.

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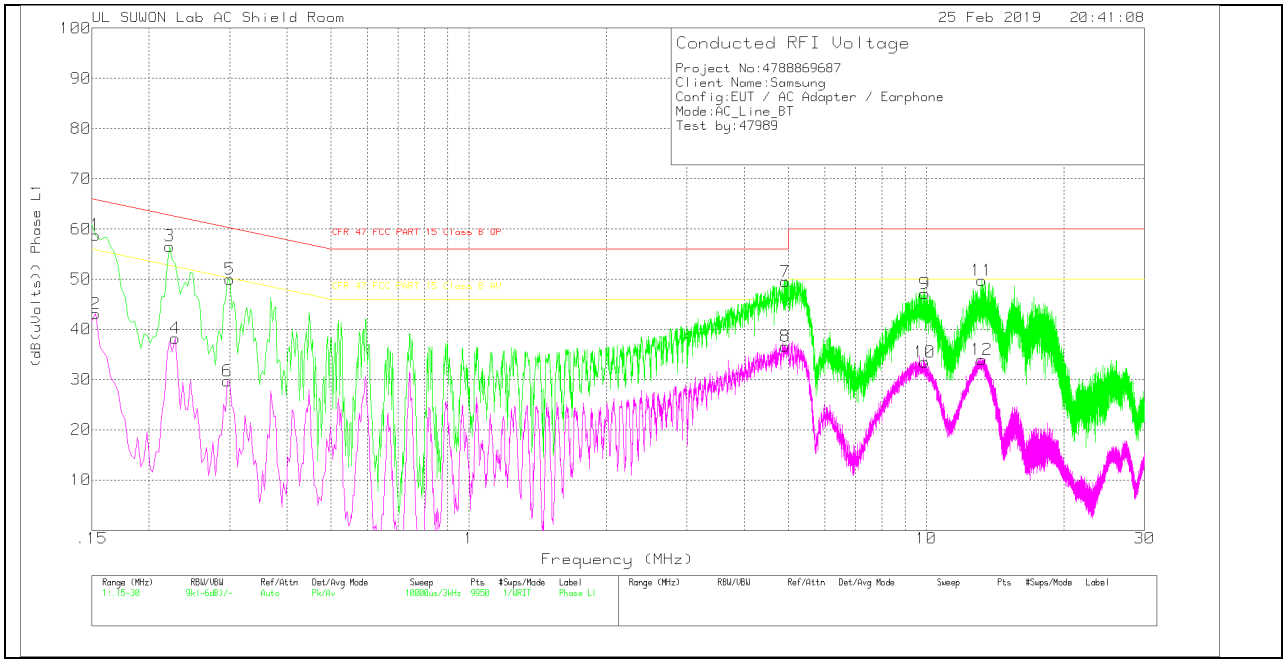
RESULTS

WORST EMISSIONS

LINE 1 PLOT



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LINE 1 RESULTS

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836_With ex-cord_L1	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.153	48.91	Pk	9.8	.1	58.81	65.84	-7.03	-	-
2	.153	33.18	Av	9.8	.1	43.08	-	-	55.84	-12.76
3	.222	46.56	Pk	9.8	.2	56.56	62.74	-6.18	-	-
4	.228	28.24	Av	9.8	.2	38.24	-	-	52.52	-14.28
5	.3	39.95	Pk	9.8	.2	49.95	60.24	-10.29	-	-
6	.297	19.78	Av	9.8	.2	29.78	-	-	50.33	-20.55
7	4.926	39.43	Pk	9.8	.3	49.53	56	-6.47	-	-
8	4.926	26.45	Av	9.8	.3	36.55	-	-	46	-9.45
9	9.933	36.76	Pk	10	.4	47.16	60	-12.84	-	-
10	9.912	23.08	Av	10	.4	33.48	-	-	50	-16.52
11	13.206	39.23	Pk	10.1	.4	49.73	60	-10.27	-	-
12	13.215	23.44	Av	10.1	.4	33.94	-	-	50	-16.06

Pk - Peak detector
Av - Average detection

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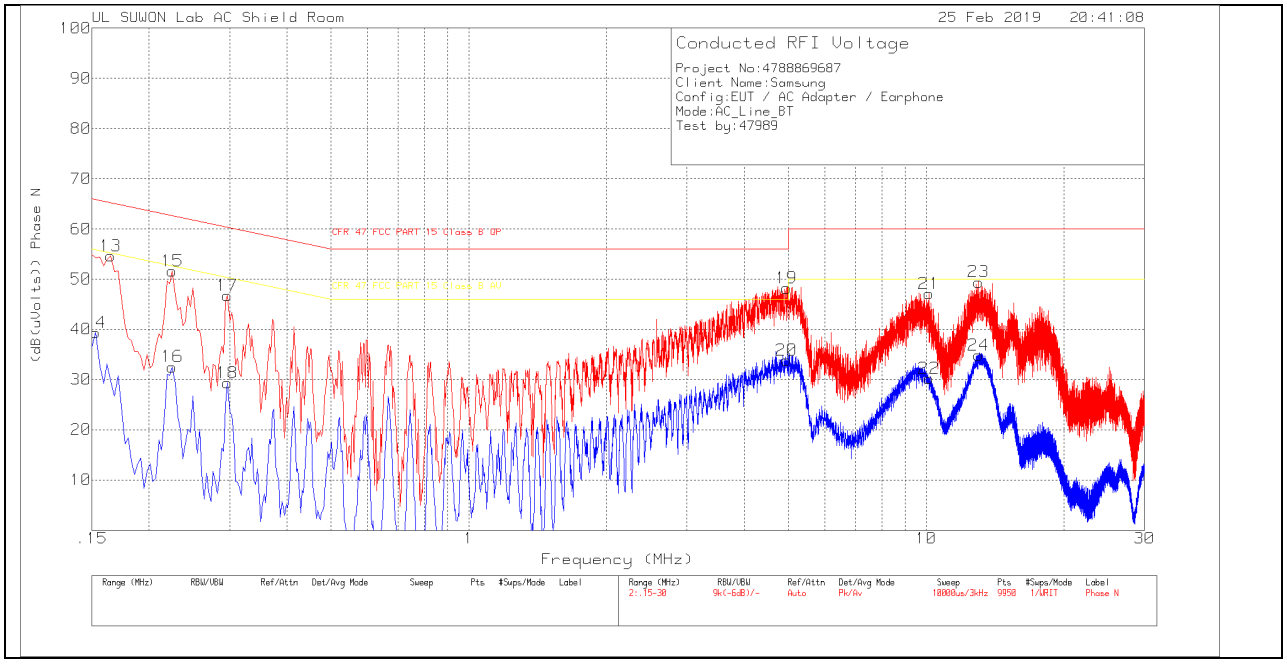
LINE 2 PLOT



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LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836_With ex-cord_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.165	44.55	Pk	10	.1	54.65	65.21	-10.56	-	-
14	.153	29.44	Av	9.8	.1	39.34	-	-	55.84	-16.5
15	.225	41.63	Pk	9.8	.2	51.63	62.63	-11	-	-
16	.225	22.54	Av	9.8	.2	32.54	-	-	52.63	-20.09
17	.297	36.89	Pk	9.7	.2	46.79	60.33	-13.54	-	-
18	.297	19.5	Av	9.7	.2	29.4	-	-	50.33	-20.93
19	4.956	38.08	Pk	9.8	.3	48.18	56	-7.82	-	-
20	4.95	23.8	Av	9.8	.3	33.9	-	-	46	-12.1
21	10.149	36.68	Pk	10	.4	47.08	60	-12.92	-	-
22	10.125	19.78	Av	10	.4	30.18	-	-	50	-19.82
23	13.008	38.83	Pk	10.2	.4	49.43	60	-10.57	-	-
24	13.014	24.24	Av	10.2	.4	34.84	-	-	50	-15.16

Pk - Peak detector
Av - Average detection

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