CERTIFICATION TEST REPORT

Report Number. : 13018973-E1V3

Applicant	:	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2275, A2297, A2298
FCC ID	:	BCG-E3500A
IC	:	579C-E3500A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue:
March 25, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2/10/2020	Initial Issue	Tony Li
V2	3/19/2020	Addressed TCB Questions for Section 5.4, 8.5, 8.12	Tony Li
V3	3/25/2020	Add Test methods on multiple antennas	Chin Pang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A

EUT DESCRIPTION: SMARTPHONE

MODEL: A2275, A2297, A2298

SERIAL NUMBER: FFMZV04ZPM63, FFMZW0B3PM63

DATE TESTED: AUGUST 29, 2019 –JANUARY 02, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

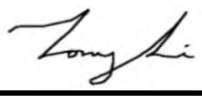
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

Chin Pang
Senior Engineer
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



Tony Li
Test Engineer
Consumer Technology Division
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 662911, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd.
☒ Chamber A (IC:2324B-1)	☒ Chamber D (IC:22541-1)	☐ Chamber I (IC: 2324A-5)
☒ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)	☐ Chamber J (IC: 2324A-6)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)	☐ Chamber K (IC: 2324A-1)
	☐ Chamber G (IC:22541-4)	☐ Chamber L (IC: 2324A-3)
	☐ Chamber H (IC:22541-5)	☐ Chamber M (IC: 2324A-2)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

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4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U_{LAB}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

EUT is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also not user accessible.

5.2. DIFFERENCE IN MODEL NUMBER

Model A2275, A2297 and A2298 is electrically identical to Model A2275. Three model numbers are allocated for marketing and logistic purposes only. A2275 was used to perform all final tests.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Antenna	Config	Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
UAT 1	High Power	2402 - 2480	Basic GFSK	19.24	83.95
		2402 - 2480	DQPSK	18.18	65.77
		2402 - 2480	Enhanced 8PSK	18.41	69.34
	Low Power	2402 - 2480	Basic GFSK	12.72	18.71
		2402 - 2480	DQPSK	11.24	13.30
		2402 - 2480	Enhanced 8PSK	11.30	13.49
LAT 3	High Power	2402 - 2480	Basic GFSK	20.13	103.04
		2402 - 2480	DQPSK	18.24	66.68
		2402 - 2480	Enhanced 8PSK	18.44	69.82
	Low Power	2402 - 2480	Basic GFSK	12.70	18.62
		2402 - 2480	DQPSK	11.45	13.96
		2402 - 2480	Enhanced 8PSK	11.50	14.13
BF, UAT 1 + LAT3	High Power	2402 - 2480	Basic GFSK TxBF	20.20	104.71
		2402 - 2480	DQPSK TxBF	19.70	93.33
		2402 - 2480	Enhanced 8PSK TxBF	19.96	99.08
	Low Power	2402 - 2480	Basic GFSK TxBF	17.71	59.02
		2402 - 2480	DQPSK TxBF	13.22	20.99
		2402 - 2480	Enhanced 8PSK TxBF	13.42	21.98

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on these modes to showing compliance. For average power data please refer to section 8.7.

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5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range (GHz)	UAT 1 (dBi)	LAT 3 (dBi)
2.4	-2.5	-1.3

5.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was BT FW Version: 17.1.210.2193.

5.6. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in three orthogonal orientations X, Y and Z on UAT 1 and LAT 3, it was determined that X (Flatbed) was the worst-case orientation for UAT 1 and 2TX Beamforming and Y (Landscape) orientation for LAT 3.

Radiated band edge, harmonic, and spurious emissions from 1GHz to 18GHz were performed with the EUT was set to transmit at highest power on Low/Middle/High channels.

Radiated emissions below 30MHz, below 1GHz, 18-26GHz and power line conducted emissions were performed with the EUT transmits at the channel with the highest output power as worst-case scenario

For below 1GHz tests EUT was connected to AC power adapter as the worst case; and for above 1GHz, the worst-case configuration reported was tested with EUT only. For AC line conducted emission, test was investigated with AC power adapter and with laptop.

For simultaneous transmission of multiple channels in the 2.4GHz BT and 5GHz bands, No noticeable emission was found.

GFSK, DQPSK, 8PSK average power are all investigated, The GFSK & 8PSK power are the worst case. For average power data please refer to section 8.7.

Worst-case data rates as provided by the client were:

GFSK mode: DH5
8PSK mode: 3-DH5
Beamforming : GFSK, DH5, 8PSK, 3-DH5

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Apple	A1398	C02PM012G3QD	QDS-BRCM1069
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
EUT AC Adapter	Apple	A1385	D29325SM03XDHLHC9	NA

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (BELOW 1GHz AND AC POWER LINE TEST WITH ADAPTER AND LAPTOP)

I/O Cable List						
Cable No	**Port**	**# of identical**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	2	N/A
2	USB	1	USB	Un-shielded	1	N/A

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

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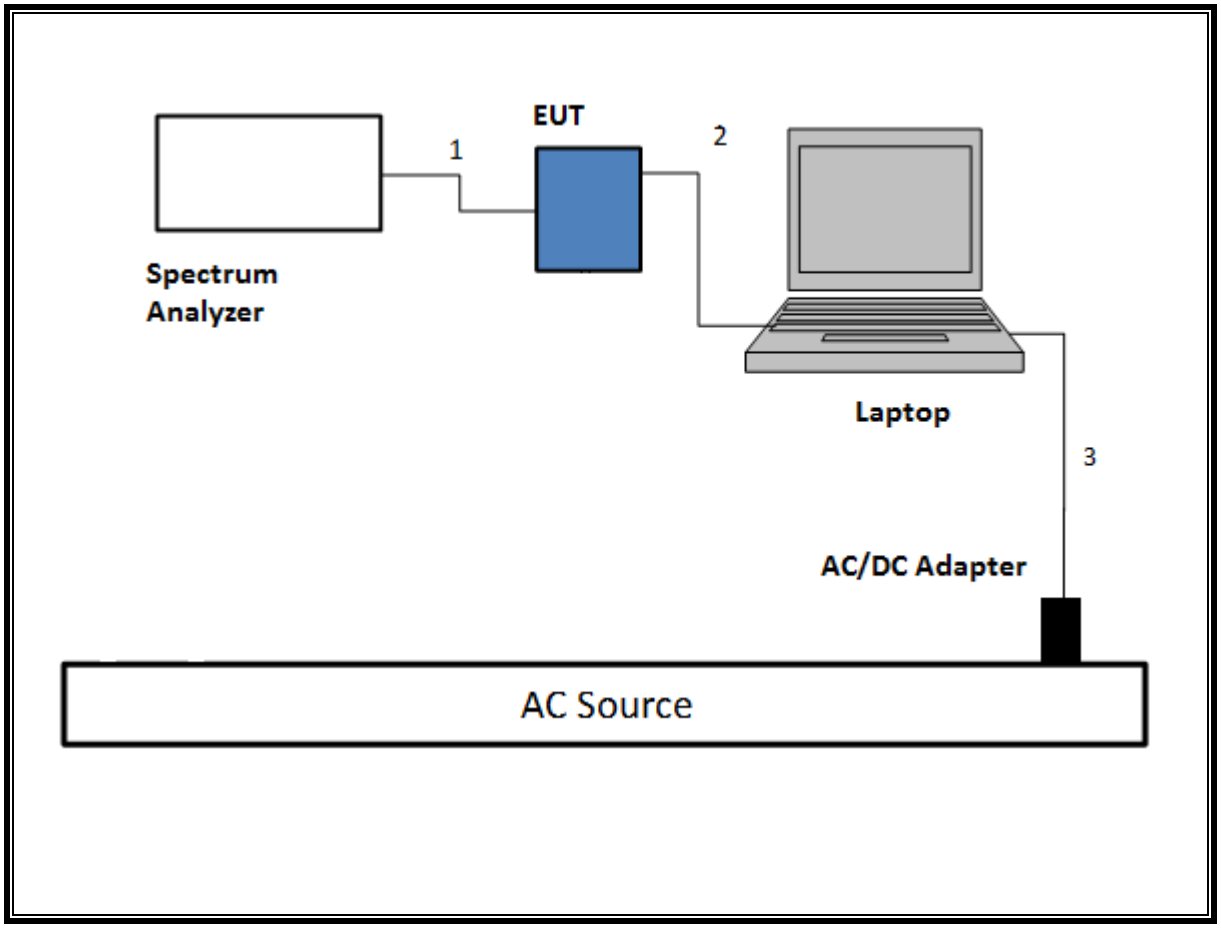
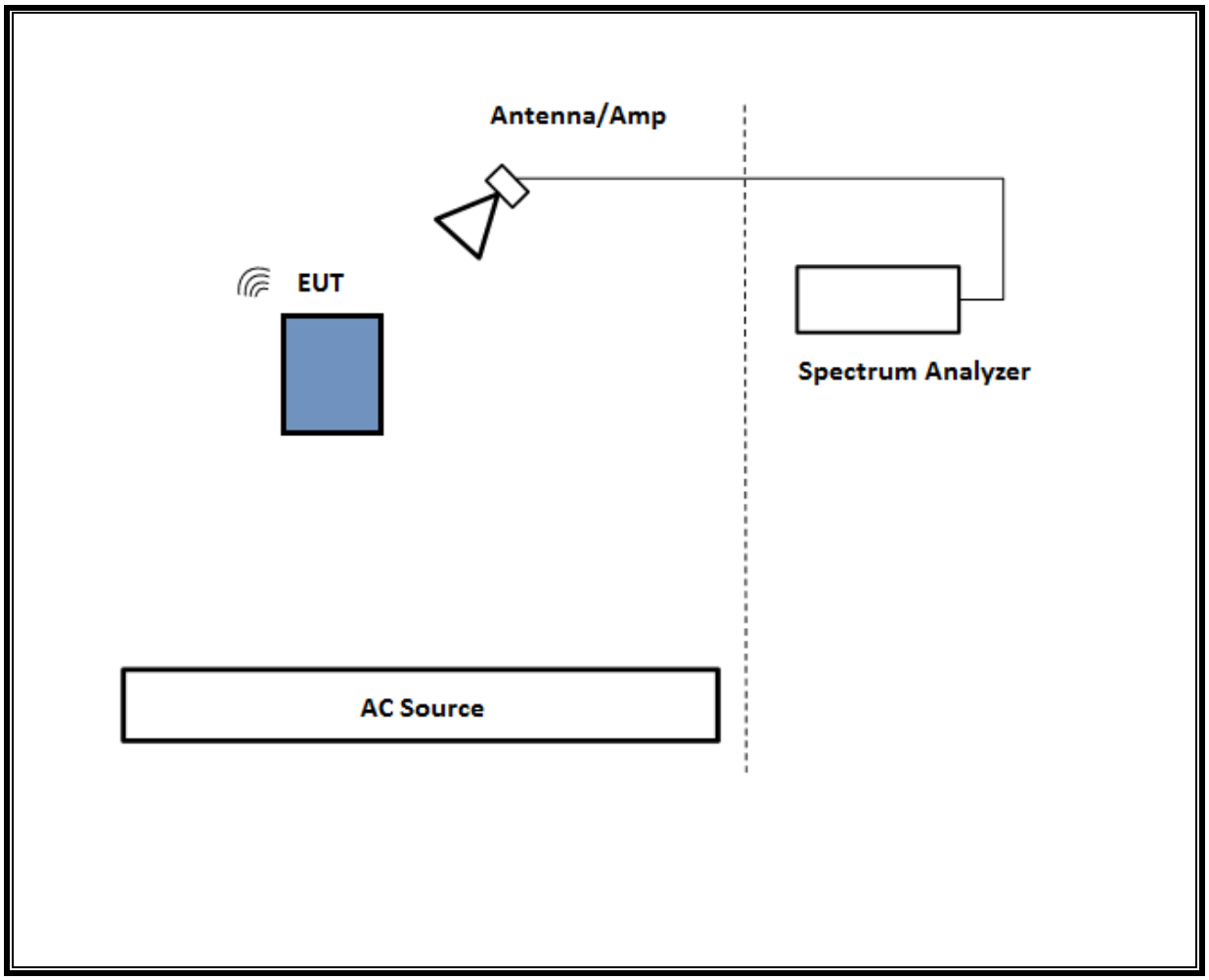
SETUP DIAGRAM FOR CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS Above 1 GHz



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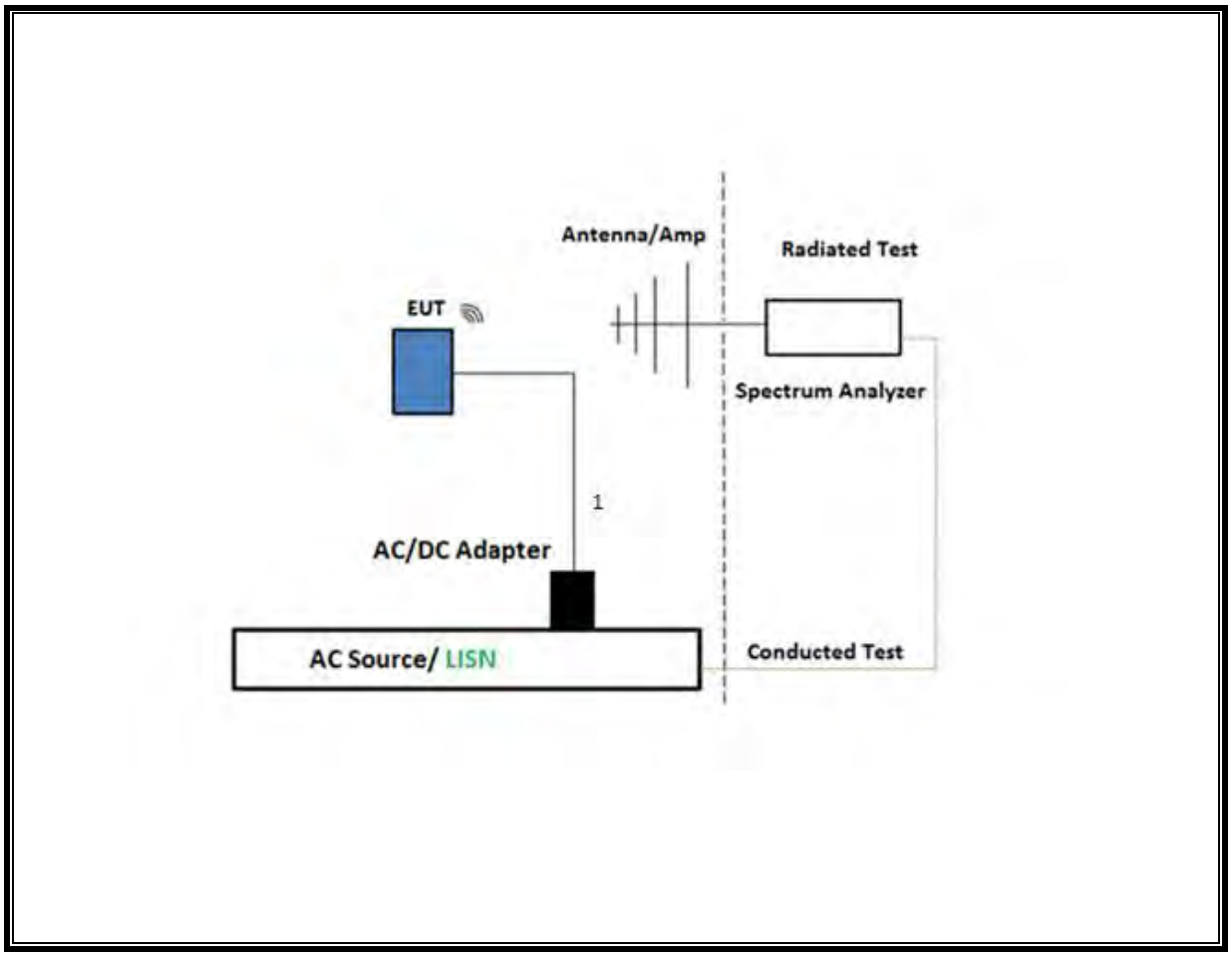
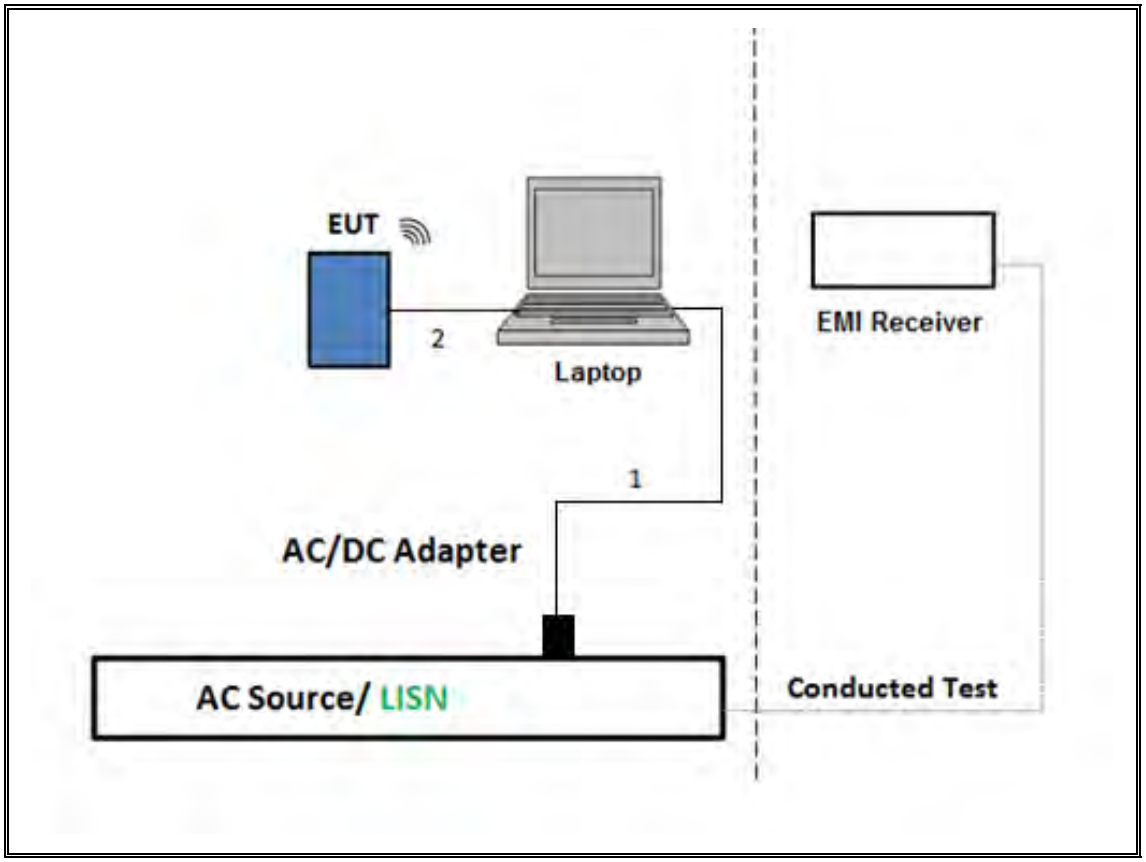
SETUP DIAGRAM FOR Below 1GHz and AC LINE CONDUCTED TEST



TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION



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6. TEST AND MEASUREMENT EQUIPMENT

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

Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T346	05/14/2020	05/14/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T931	05/11/2020	05/11/2019
Amplifier, 1 to 18GHz	Amplical	AMPO.1G18-47-20	172121	07/15/2020	07/15/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T345	04/20/2020	04/20/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	05/24/2020	05/24/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T119	03/22/2020	03/22/2019
Amplifier, 1 to 18GHz	AMPLICAL	AMP1G18-35	138301	08/03/2020	08/03/2019
Antenna, Double Ridge Guide Horn Antenna 700MHz to 18GHz	A.H. SYSTEMS, INC.	SAS-571	PRE0194893	05/16/2021	05/16/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T931	05/11/2020	05/11/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T712	02/26/2020	02/26/2019
6/Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T740	07/31/2020	07/31/2019
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	T407	05/11/2020	05/11/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	06/06/2020	06/06/2019
*Power Meter, P-series single channel	Keysight	N1911A	T1268	01/31/2020	01/31/2019
Power Sensor	Keysight	N1921A	T1224	02/22/2020	02/22/2019
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T447	08/13/2020	08/13/2019
Pre-Amp 18-26GHz	Agilent Technology	8449B	T404	03/23/2020	03/23/2019
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	06/06/2020	06/06/2019
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2020	01/23/2019
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T905	01/24/2020	01/24/2019
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T459	01/24/2020	01/24/2019

AC Line Conducted					
*EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	02/14/2020	02/14/2019
*Power Cable, Line Conducted Emissions	UL	PG1	T861	10/19/2019	10/19/2018
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	01/24/2020	01/24/2019
UL AUTOMATION SOFTWARE					
Radiated Software	UL	UL EMC	Ver 9.5, September 7, 2016		
Conducted Software	UL	UL EMC	Ver 10.2, September 19, 2019		
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		

*Testing was completed before equipment calibration date

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7. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2013 Section 7.8.8

Conducted Band-Edge: ANSI C63.10-2013 Section 6.10.4

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4 & 13

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3, 6.5 & 13

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3, 6.6 & 13

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5 & 13

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
Bluetooth GFSK	50.00	50.00	1.000	100.0%	0.00	0.010
Bluetooth 8PSK	50.00	50.00	1.000	100.0%	0.00	0.010
Bluetooth GFSK TxBF	50.00	50.00	1.000	100.0%	0.00	0.010
Bluetooth 8PSK TxBF	50.00	50.00	1.000	100.0%	0.00	0.010

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DUTY CYCLE PLOTS

BLUETOOTH GFSK

BLUETOOTH 8PSK

BLUETOOTH TxBF GFSK

BLUETOOTH TxBF 8PSK

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 ≥ 3xRBW. The sweep time is coupled.

RESULTS

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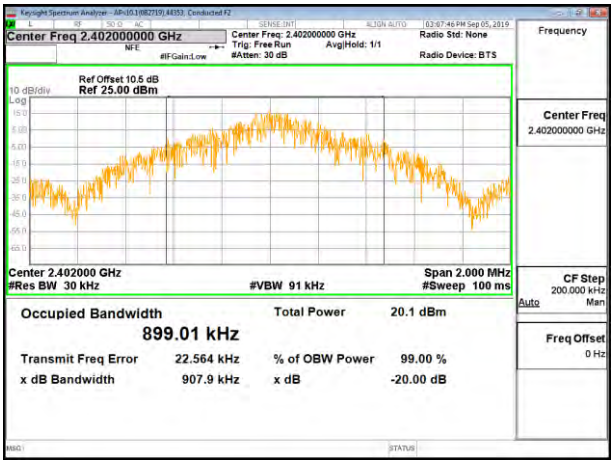
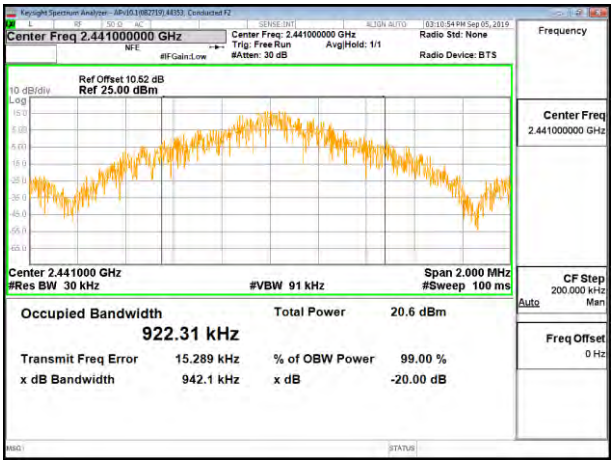
8.2.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

UAT 1

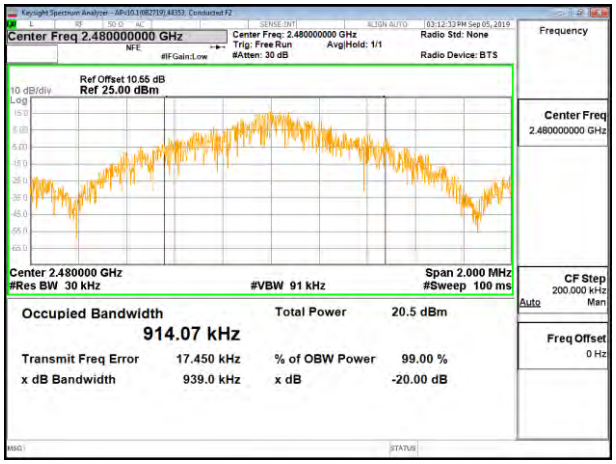
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.908	0.899
Mid	2441	0.942	0.922
High	2480	0.939	0.914



LOW CHANNEL



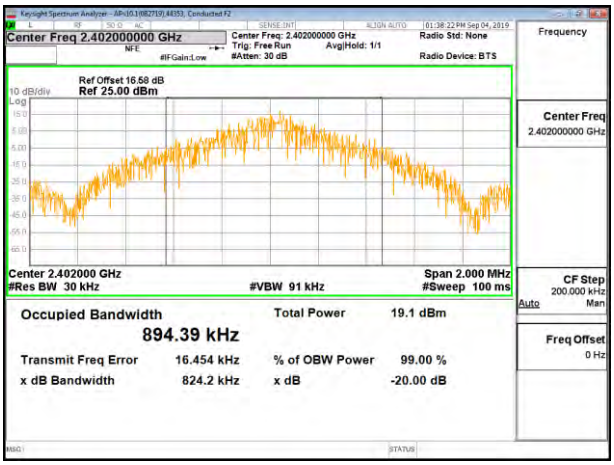
MID CHANNEL



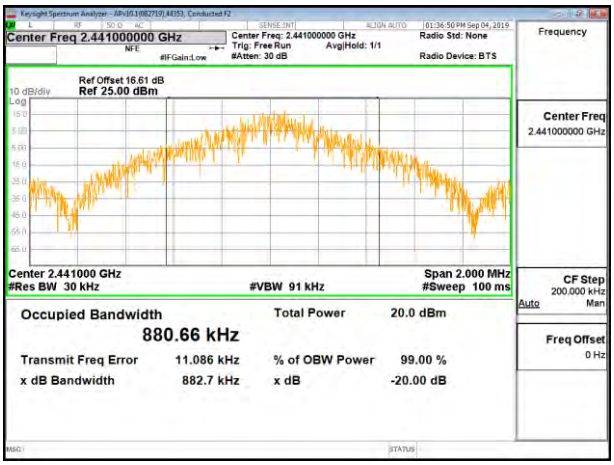
HIGH CHANNEL

LAT 3

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.824	0.894
Mid	2441	0.883	0.881
High	2480	0.861	0.870



LOW CHANNEL



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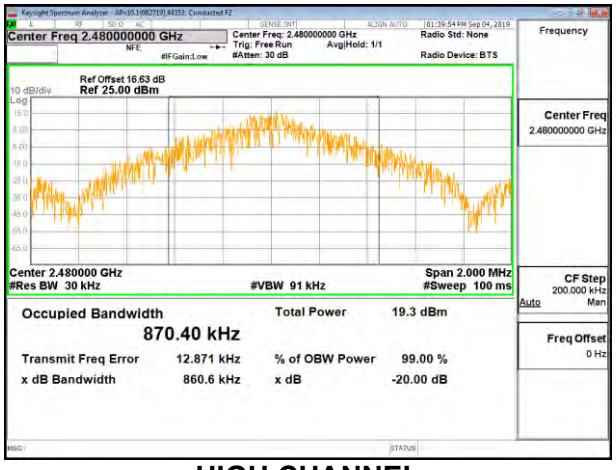
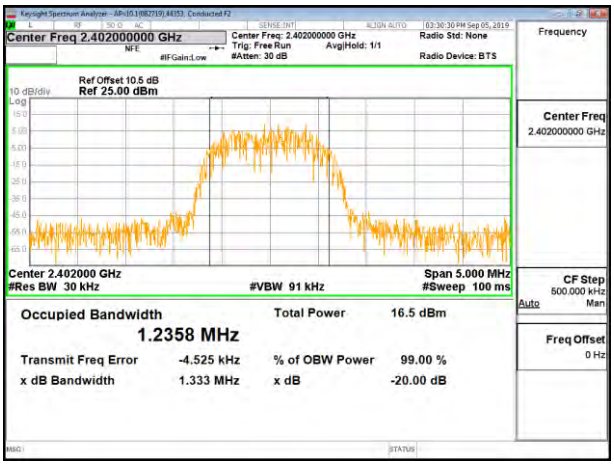


HIGH CHANNEL

8.2.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

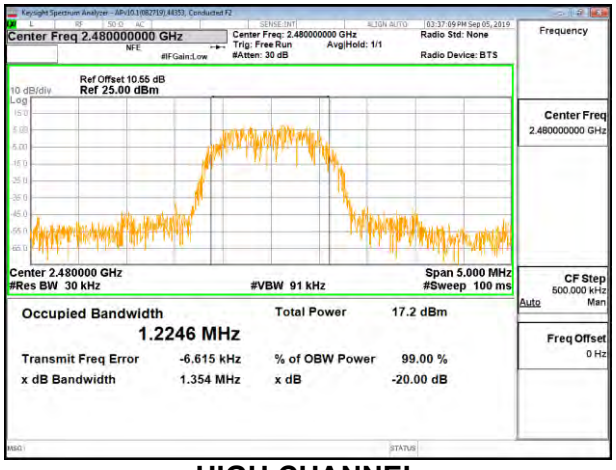
UAT 1

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.333	1.236
Mid	2441	1.329	1.220
High	2480	1.354	1.225



LOW CHANNEL

MID CHANNEL



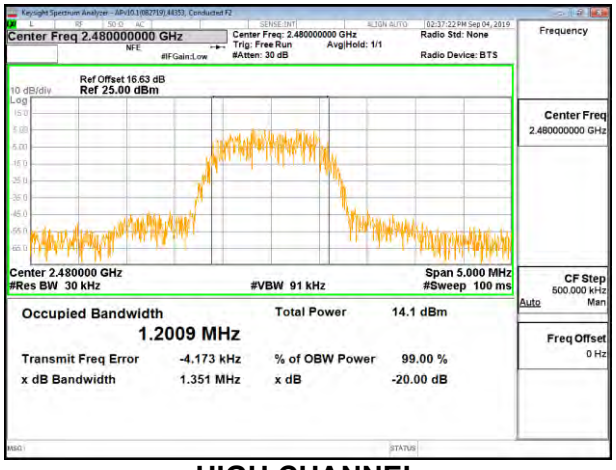
HIGH CHANNEL

LAT 3

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.347	1.223
Mid	2441	1.350	1.237
High	2480	1.351	1.201

LOW CHANNEL

MID CHANNEL

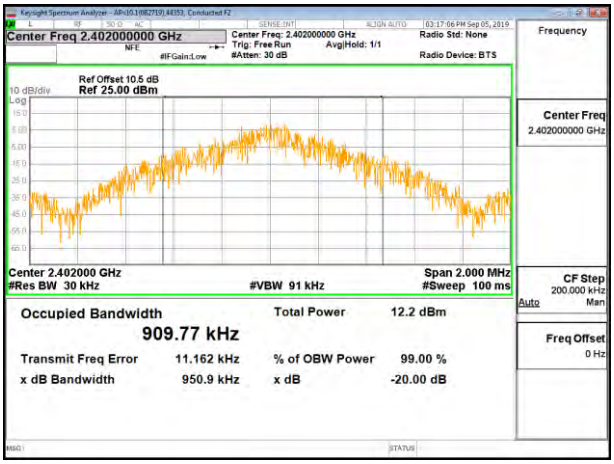


HIGH CHANNEL

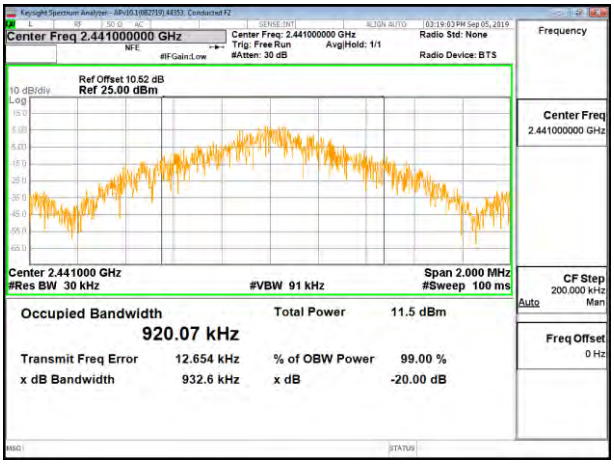
8.2.3. LOW POWER BASIC DATA RATE GFSK MODULATION

UAT 1

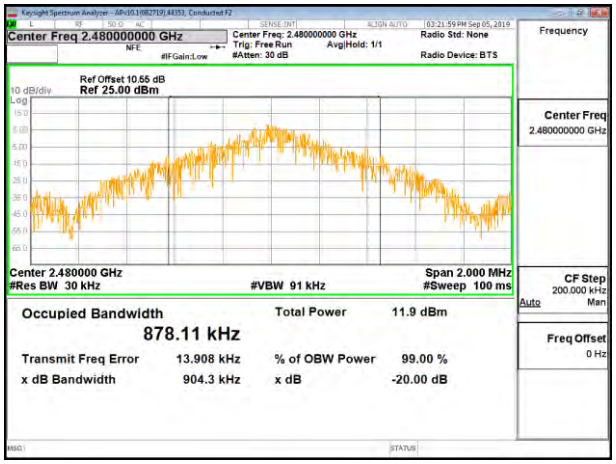
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.951	0.910
Mid	2441	0.933	0.920
High	2480	0.904	0.878



LOW CHANNEL



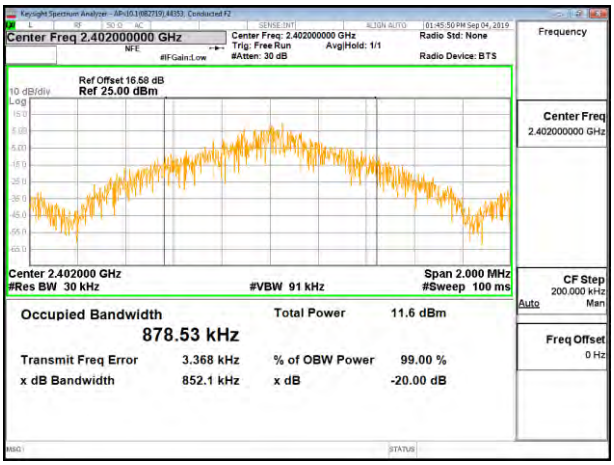
MID CHANNEL



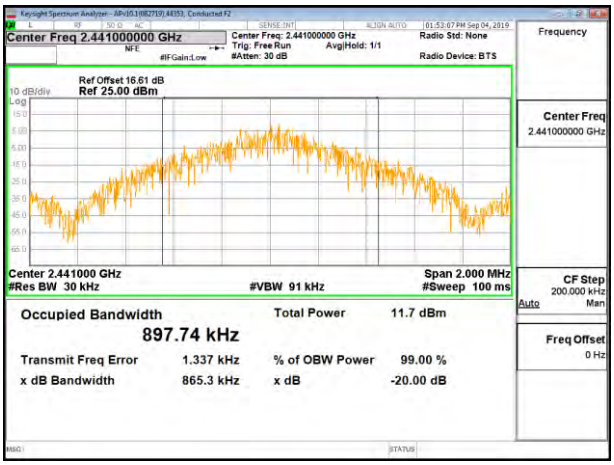
HIGH CHANNEL

LAT 3

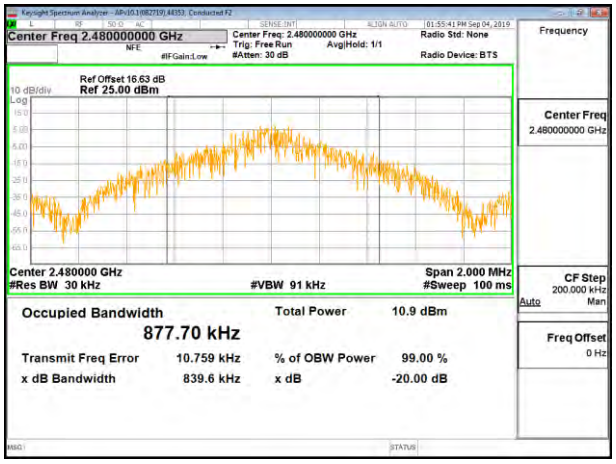
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.852	0.879
Mid	2441	0.865	0.898
High	2480	0.840	0.878



LOW CHANNEL



MID CHANNEL



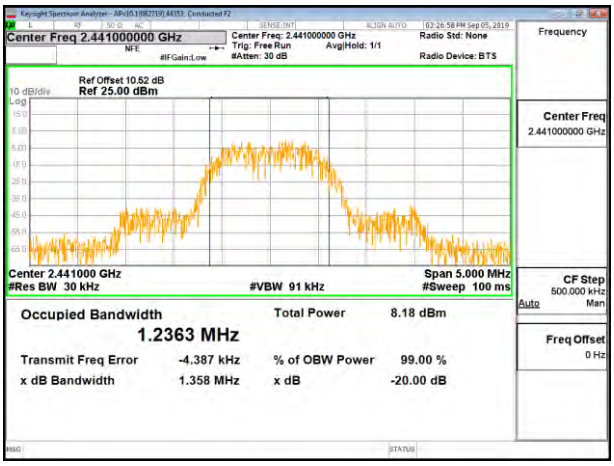
HIGH CHANNEL

8.2.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

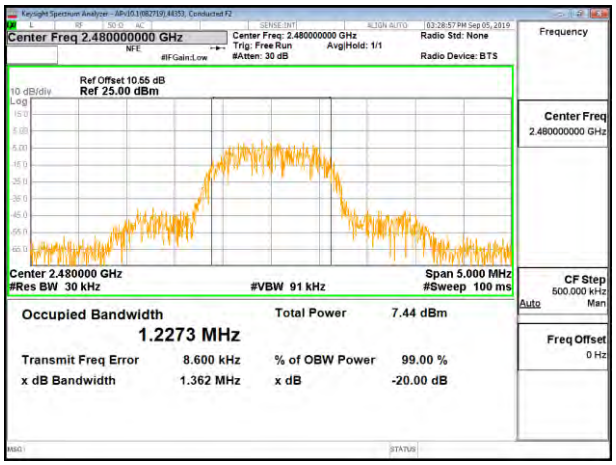
UAT 1

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.382	1.253
Mid	2441	1.358	1.236
High	2480	1.362	1.227

LOW CHANNEL



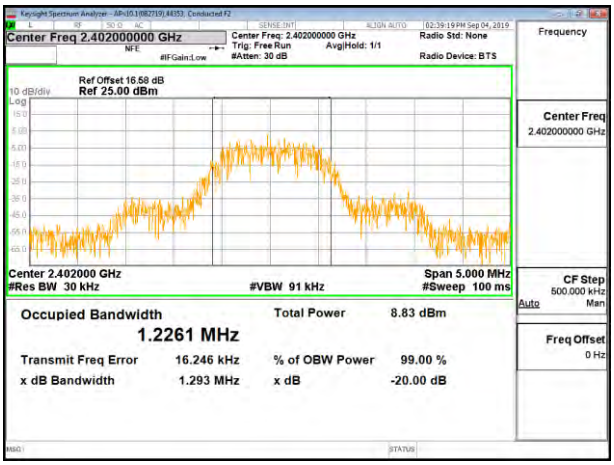
MID CHANNEL



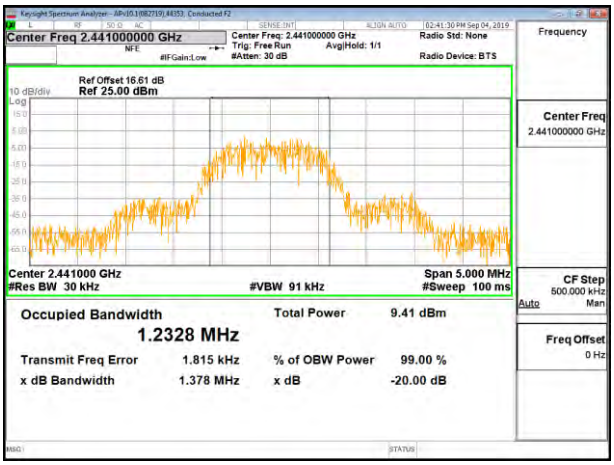
HIGH CHANNEL

LAT 3

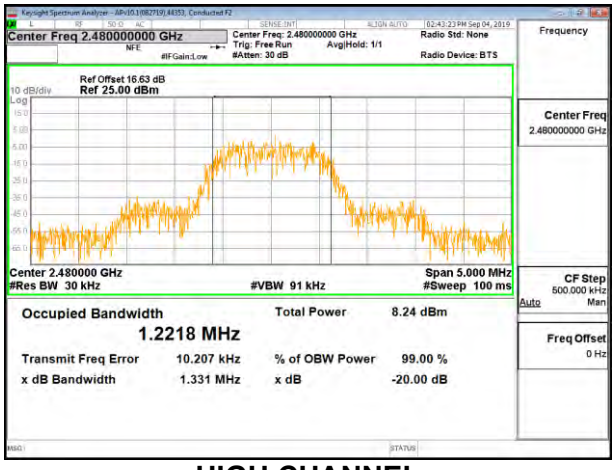
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.293	1.226
Mid	2441	1.378	1.233
High	2480	1.331	1.222



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

RSS-247 (5.1) (b)

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

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

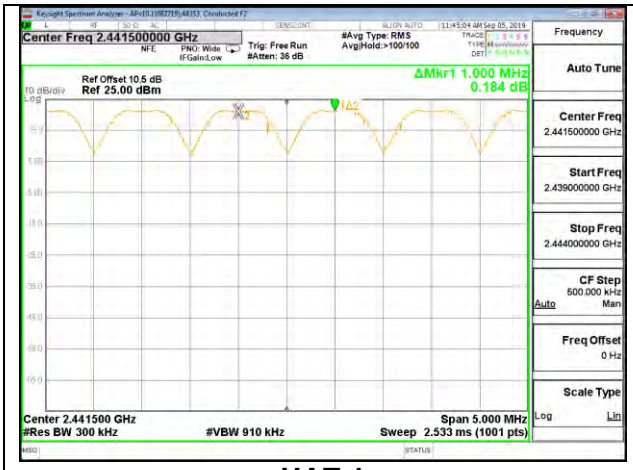
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to VBW >= 3xRBW. The sweep time is coupled.

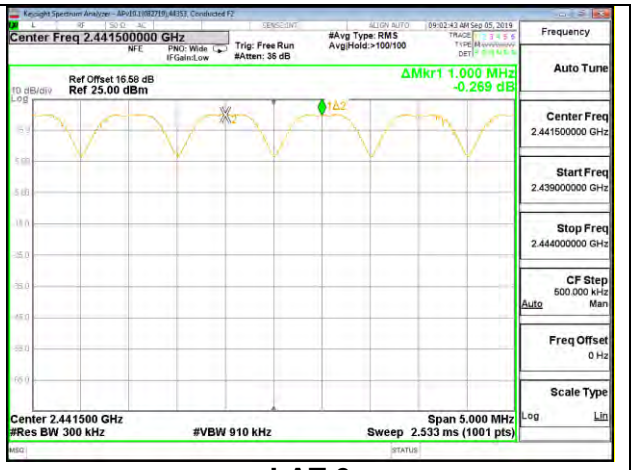
RESULTS

8.3.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

HOPPING FREQUENCY SEPARATION

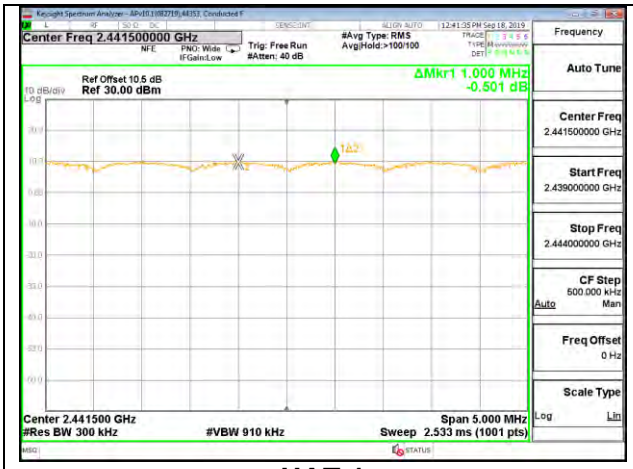


UAT 1

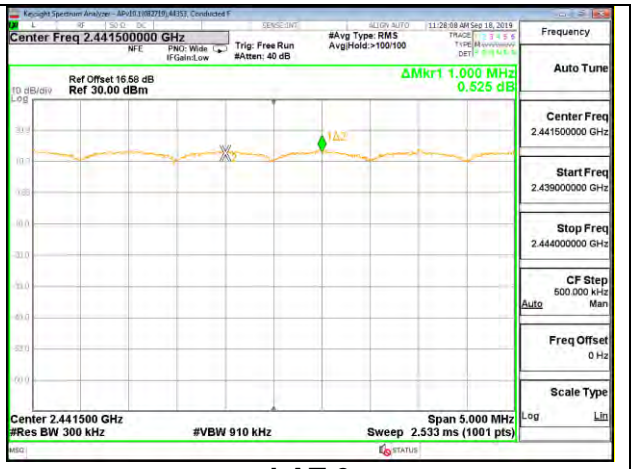


LAT 3

8.3.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION



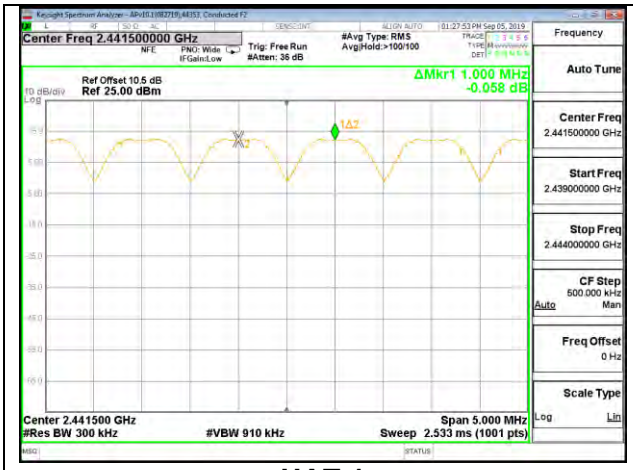
UAT 1



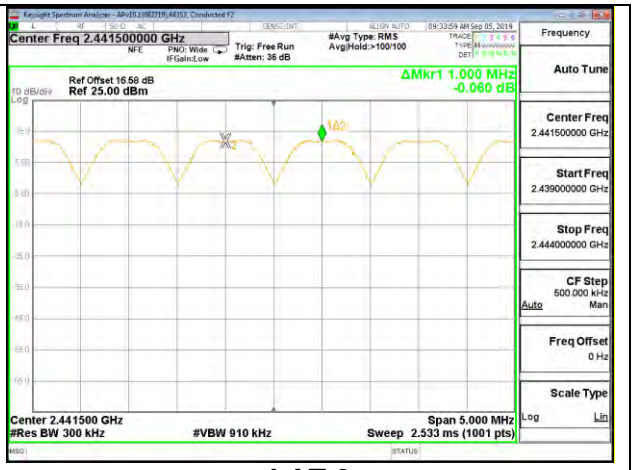
LAT 3

8.3.3. LOW POWER BASIC DATA RATE GFSK MODULATION

HOPPING FREQUENCY SEPARATION



UAT 1



LAT 3

8.3.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

HOPPING FREQUENCY SEPARATION

UAT 1

LAT 3

8.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

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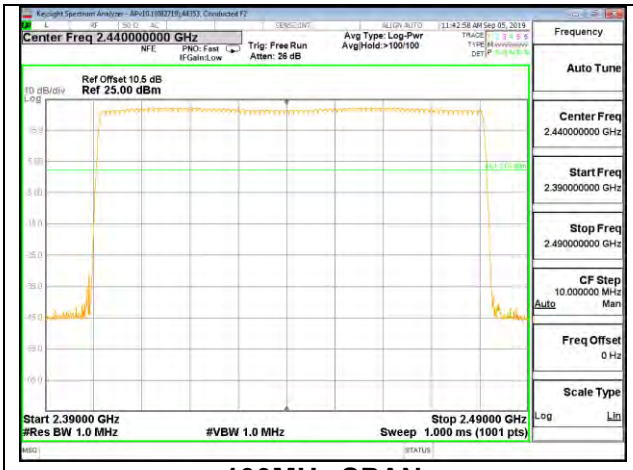
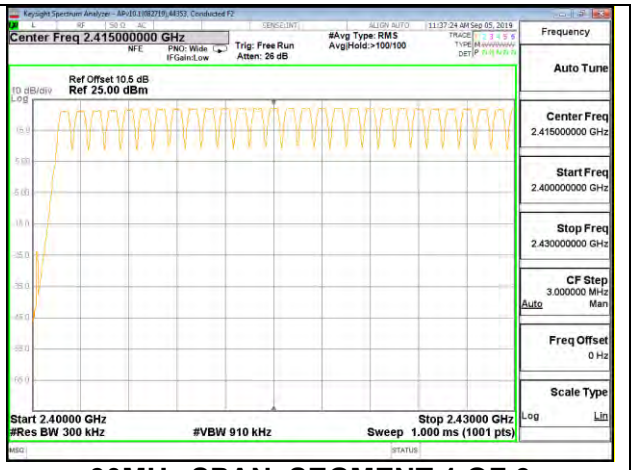
8.4.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

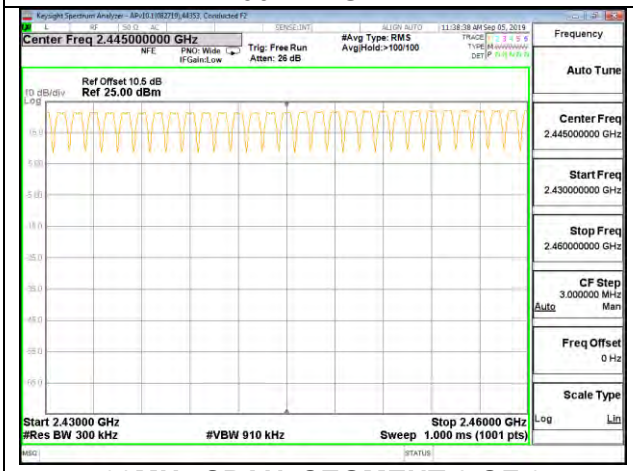
UAT 1



100MHz SPAN



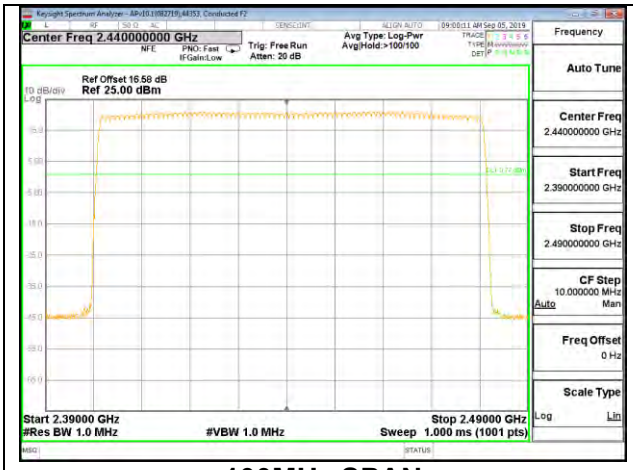
30MHz SPAN, SEGMENT 1 OF 3



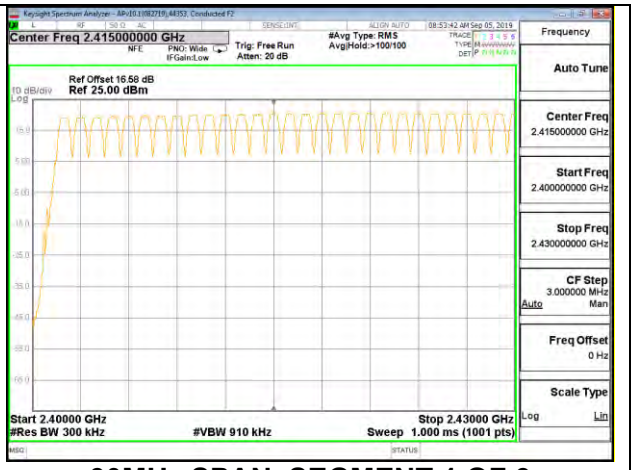
30MHz SPAN, SEGMENT 2 OF 3

30MHz SPAN, SEGMENT 3 OF 3

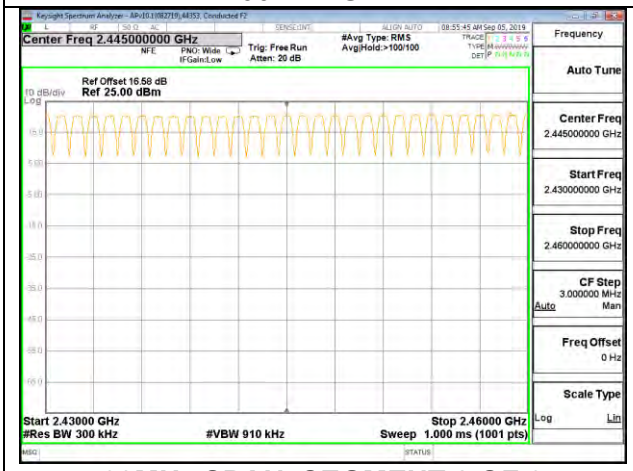
LAT 3



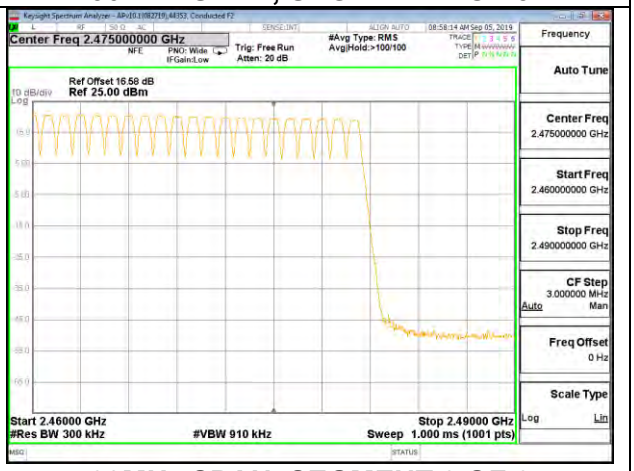
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



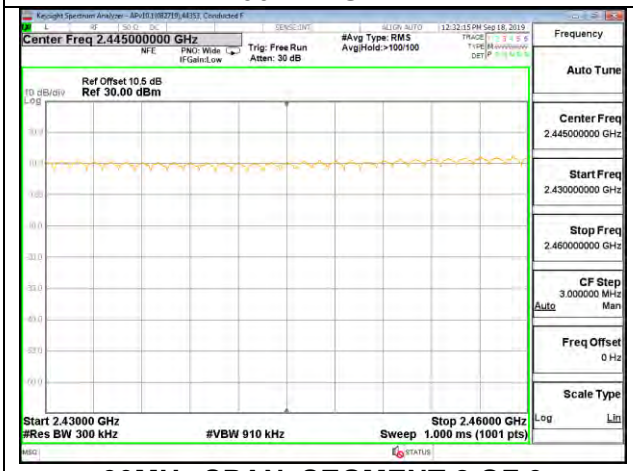
30MHz SPAN, SEGMENT 3 OF 3

8.4.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

100MHz SPAN

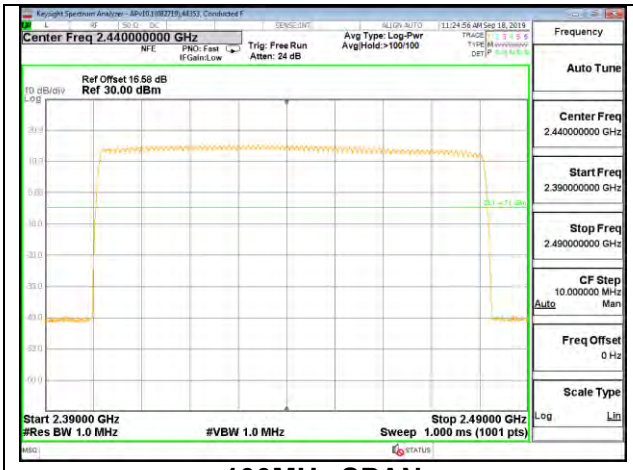
30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3

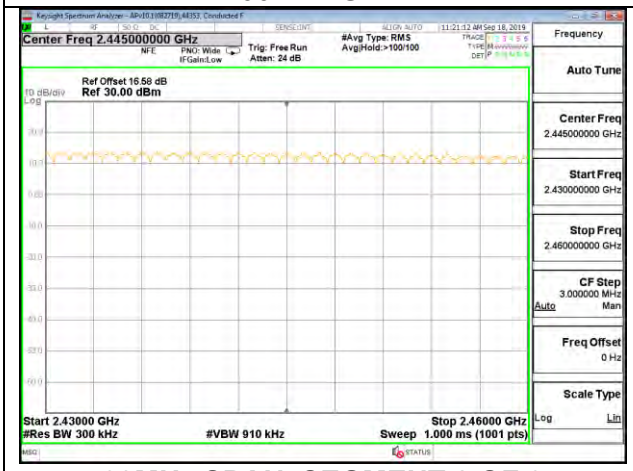
30MHz SPAN, SEGMENT 3 OF 3

LAT 3



100MHz SPAN

30MHz SPAN, SEGMENT 1 OF 3

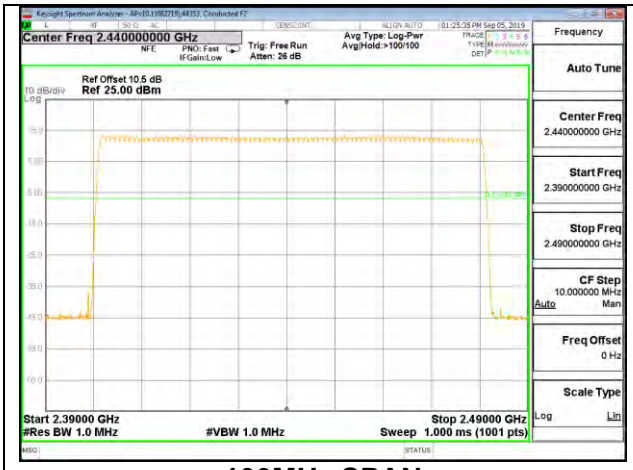


30MHz SPAN, SEGMENT 2 OF 3

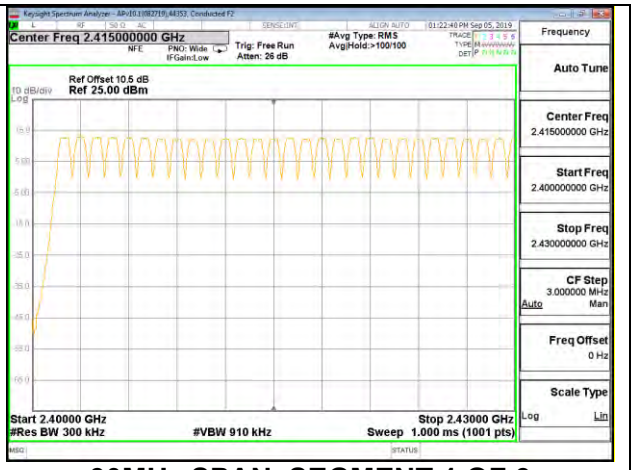
30MHz SPAN, SEGMENT 3 OF 3

8.4.3. LOW POWER BASIC DATA RATE GFSK MODULATION

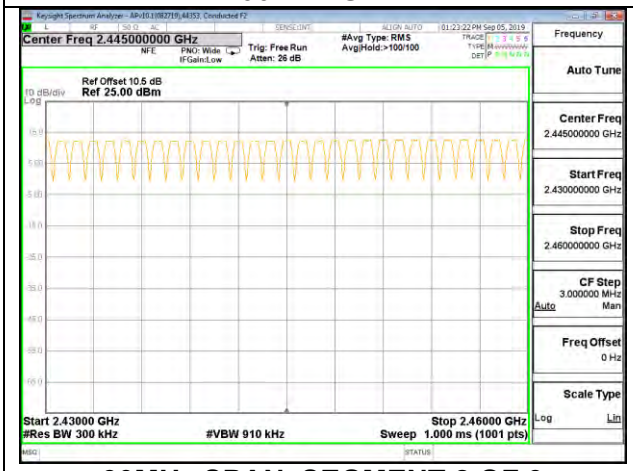
UAT 1



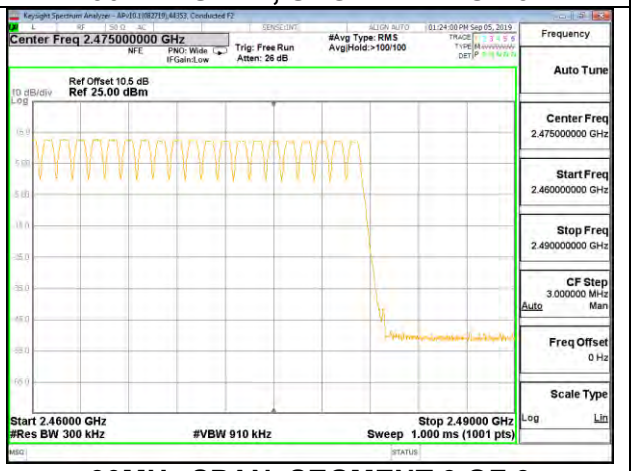
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

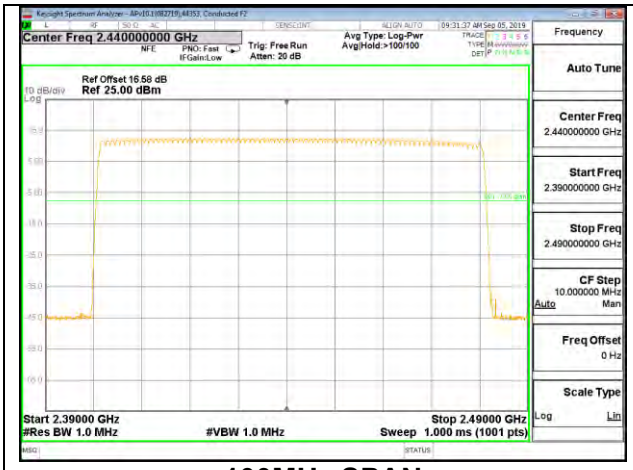


30MHz SPAN, SEGMENT 2 OF 3

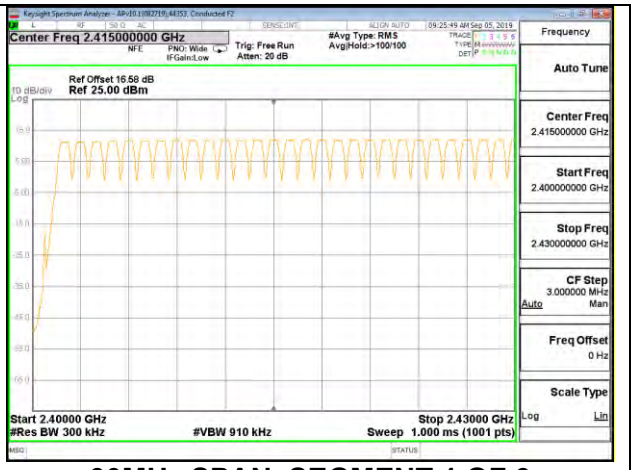


30MHz SPAN, SEGMENT 3 OF 3

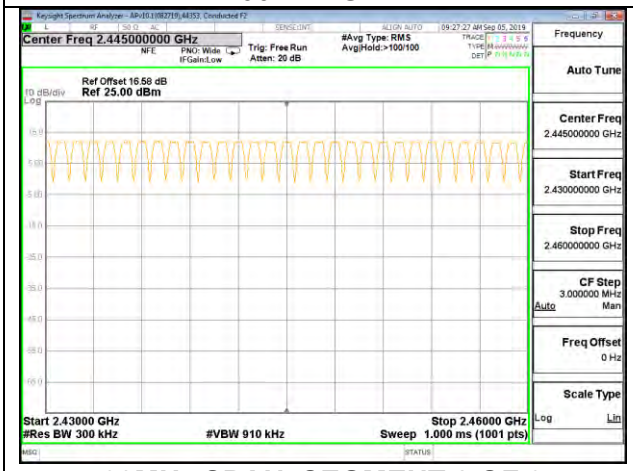
LAT 3



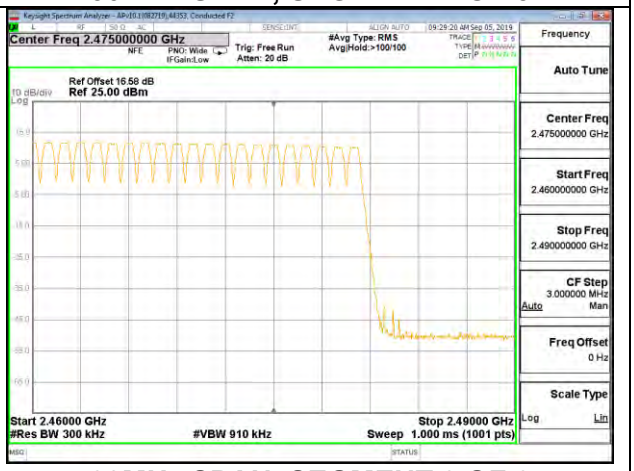
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



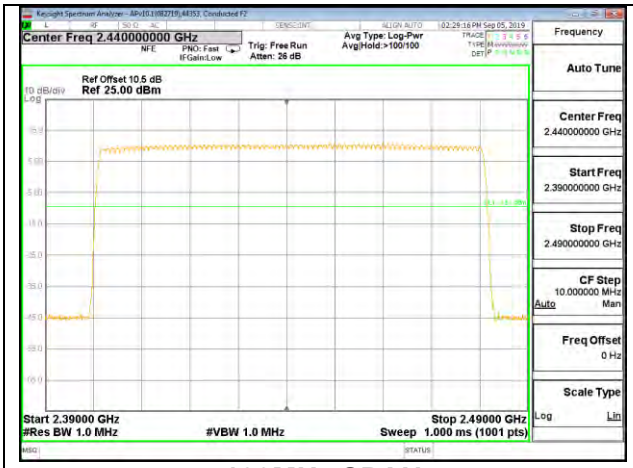
30MHz SPAN, SEGMENT 2 OF 3



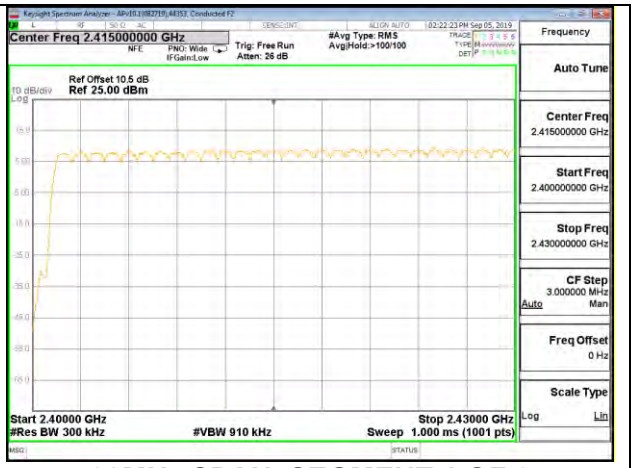
30MHz SPAN, SEGMENT 3 OF 3

8.4.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

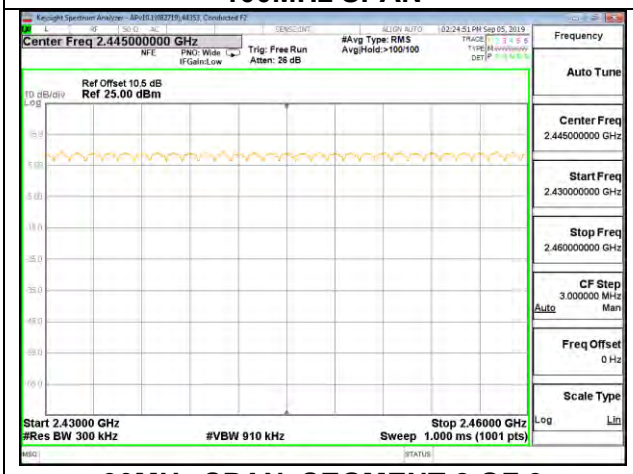
UAT 1



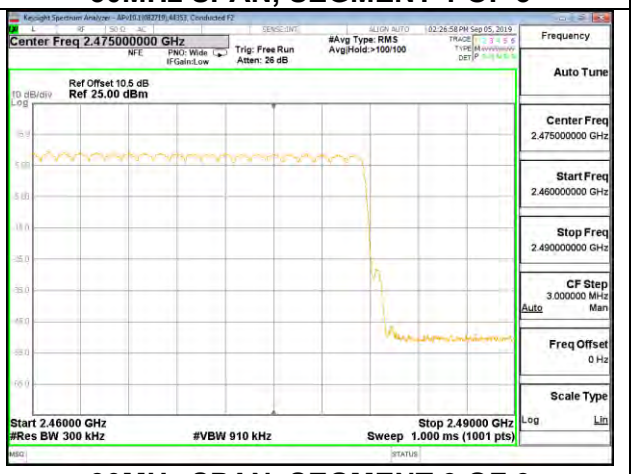
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

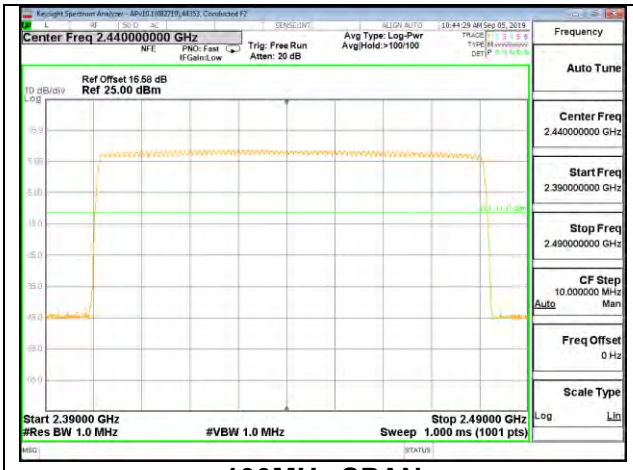


30MHz SPAN, SEGMENT 2 OF 3



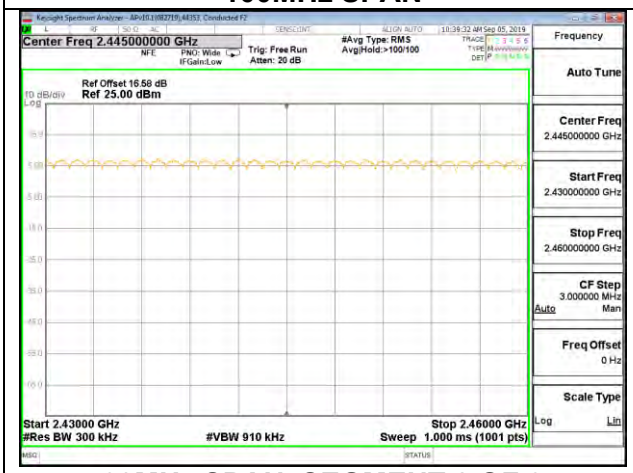
30MHz SPAN, SEGMENT 3 OF 3

LAT 3



100MHz SPAN

30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3

30MHz SPAN, SEGMENT 3 OF 3

8.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

TEST PROCEDURE

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

The average time of occupancy in the specified 3.16 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

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8.5.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

UAT 1

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	32	0.122	0.4	-0.278
DH3	1.636	16	0.262	0.4	-0.138
DH5	2.884	11	0.317	0.4	-0.083
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	8	0.030	0.4	-0.370
DH3	1.636	4	0.065	0.4	-0.335
DH5	2.884	2.75	0.079	0.4	-0.321

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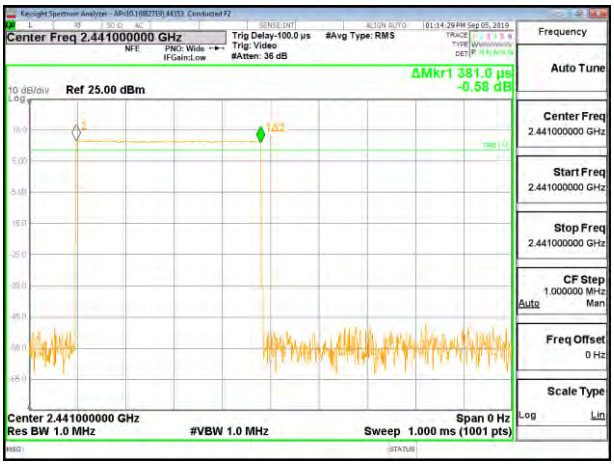
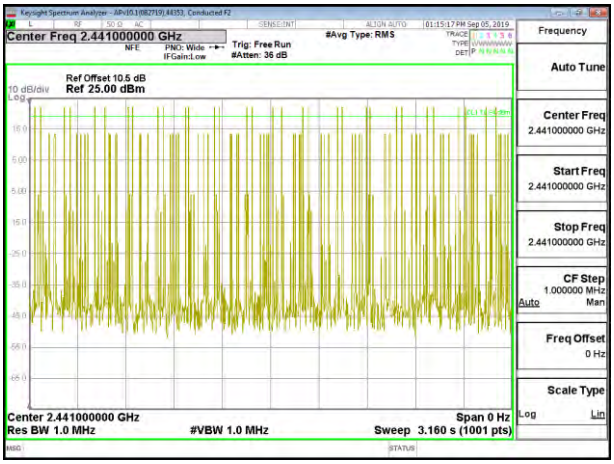


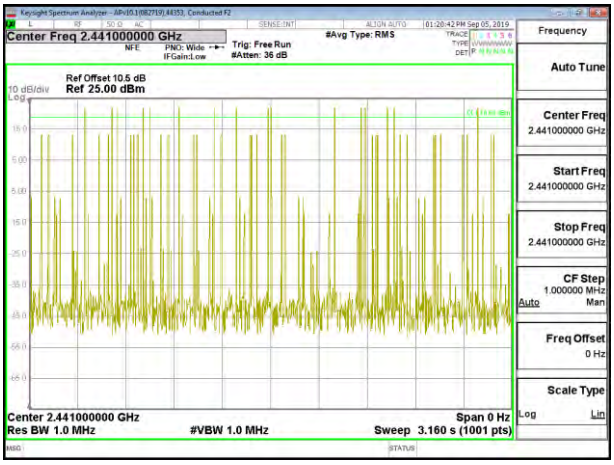
PULSE WIDTH – DH1

PULSE WIDTH – DH3

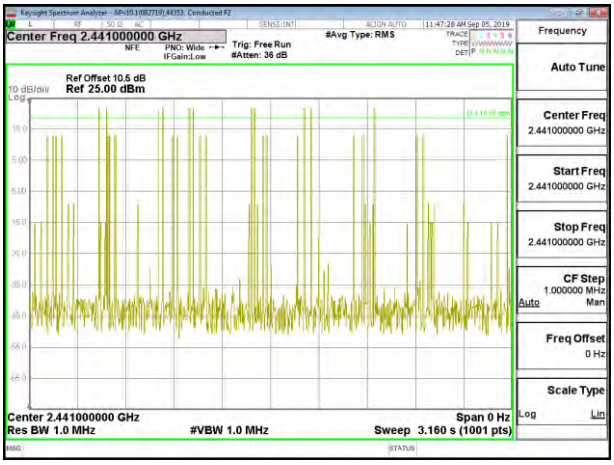
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

LAT 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	31	0.118	0.4	-0.282
DH3	1.638	15	0.246	0.4	-0.154
DH5	2.888	10	0.289	0.4	-0.111
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	7.75	0.030	0.4	-0.370
DH3	1.638	3.75	0.061	0.4	-0.339
DH5	2.888	2.5	0.072	0.4	-0.328

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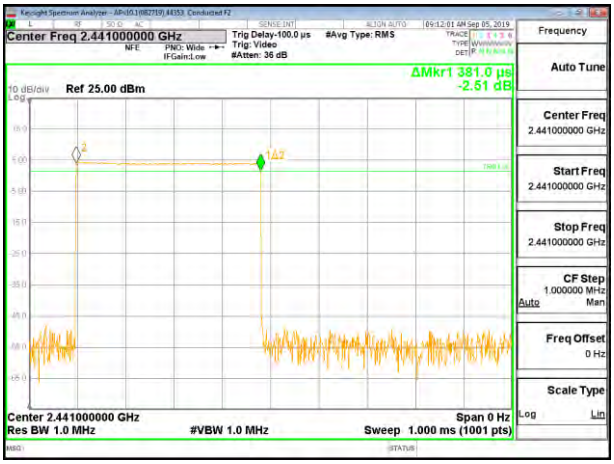
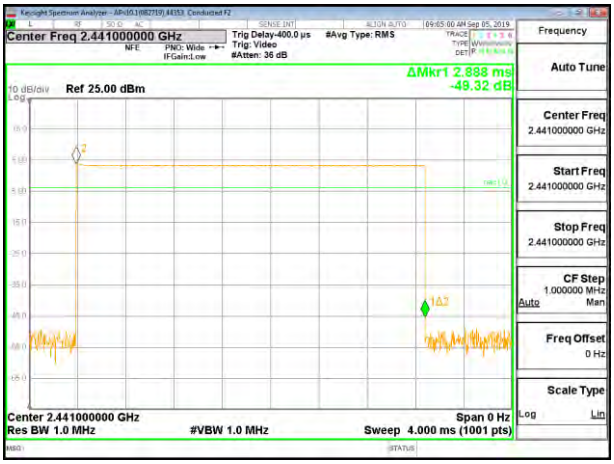
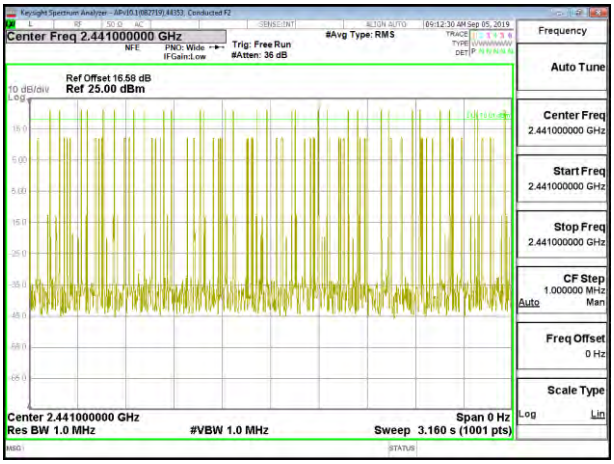


PULSE WIDTH – DH1

PULSE WIDTH – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

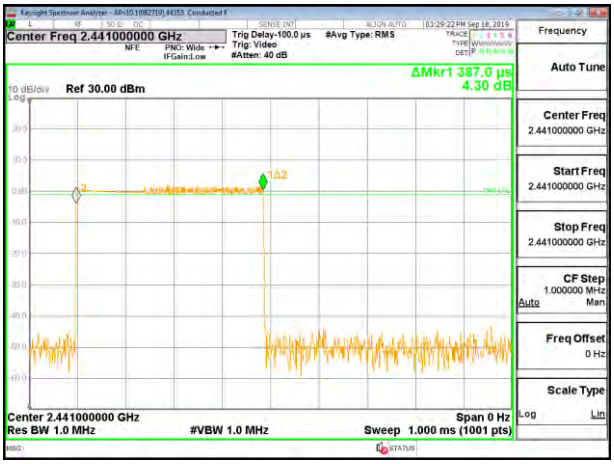
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

8.5.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

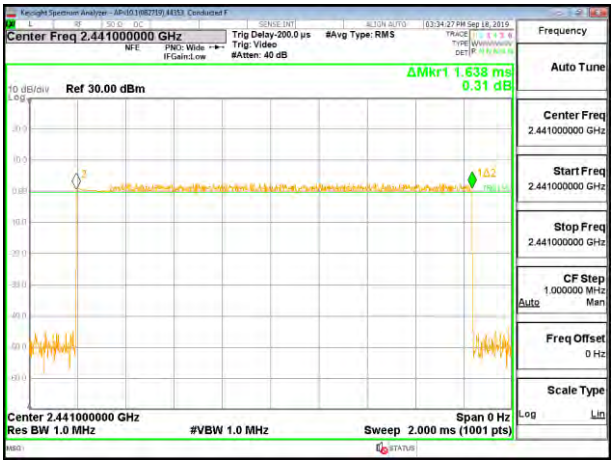
UAT 1

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	32	0.124	0.4	-0.276
3DH3	1.638	16	0.262	0.4	-0.138
3DH5	2.892	11	0.318	0.4	-0.082

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



PULSE WIDTH – 3DH1



PULSE WIDTH – 3DH3

PULSE WIDTH – 3DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

LAT 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	32	0.124	0.4	-0.276
3DH3	1.638	15	0.246	0.4	-0.154
3DH5	2.892	12	0.347	0.4	-0.053

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

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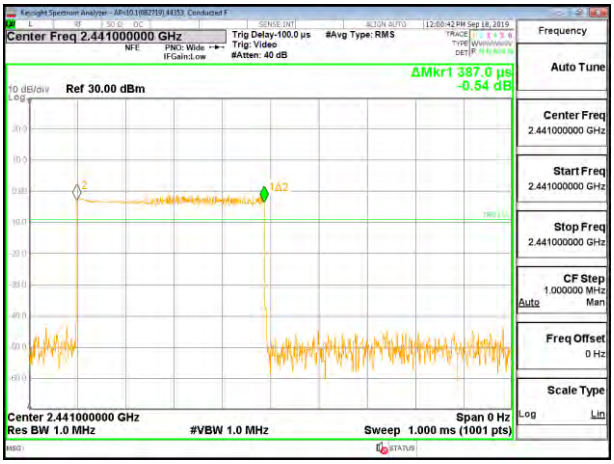
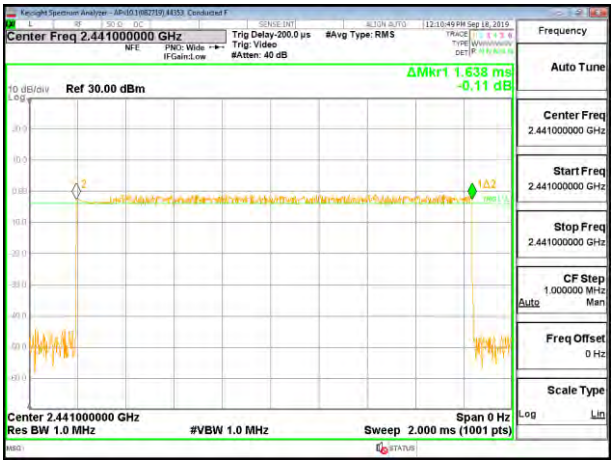
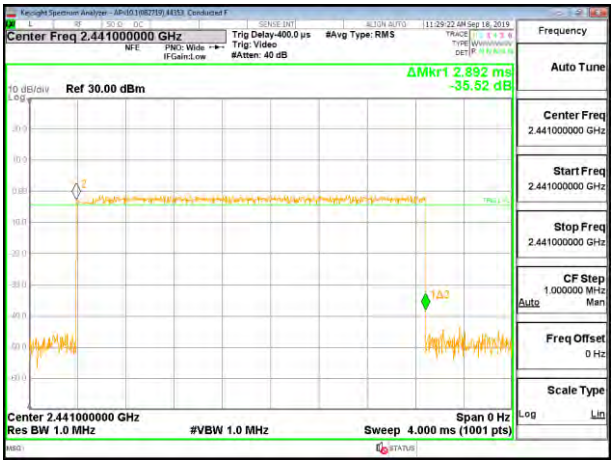


PULSE WIDTH – 3DH1



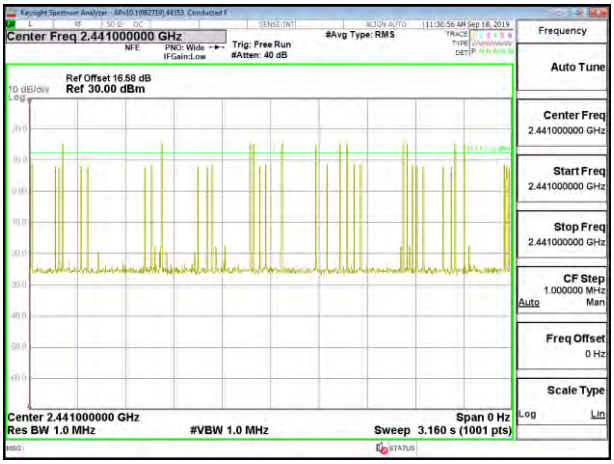
PULSE WIDTH – 3DH3



PULSE WIDTH – 3DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3

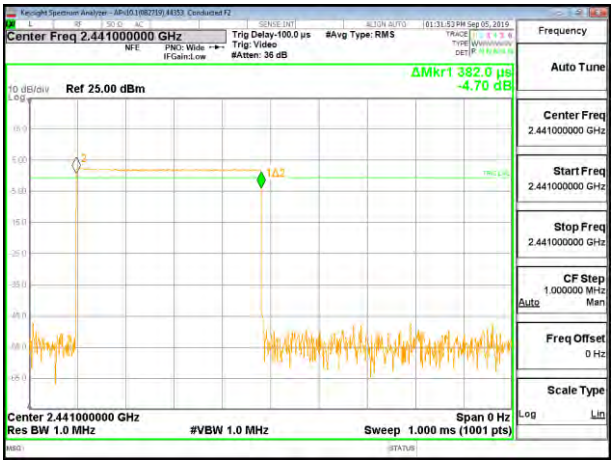


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

8.5.3. LOW POWER BASIC DATA RATE GFSK MODULATION

UAT 1

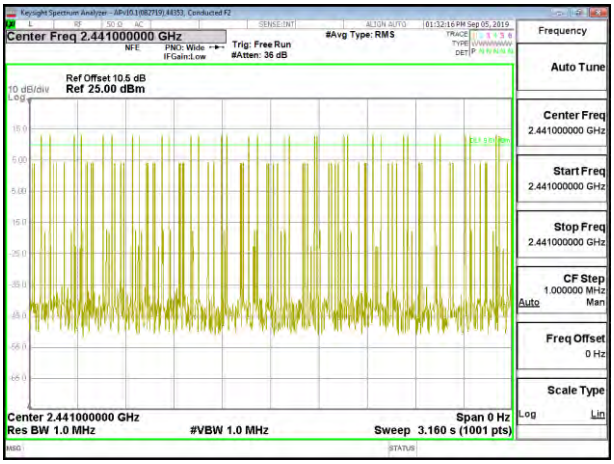
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.382	32	0.122	0.4	-0.278
DH3	1.636	15	0.245	0.4	-0.155
DH5	2.884	9	0.260	0.4	-0.140
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.382	8	0.031	0.4	-0.369
DH3	1.636	3.75	0.061	0.4	-0.339
DH5	2.884	2.25	0.065	0.4	-0.335



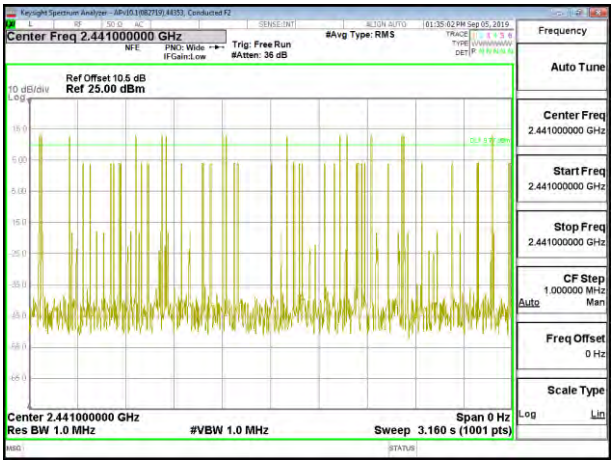
PULSE WIDTH – DH1

PULSE WIDTH – DH3

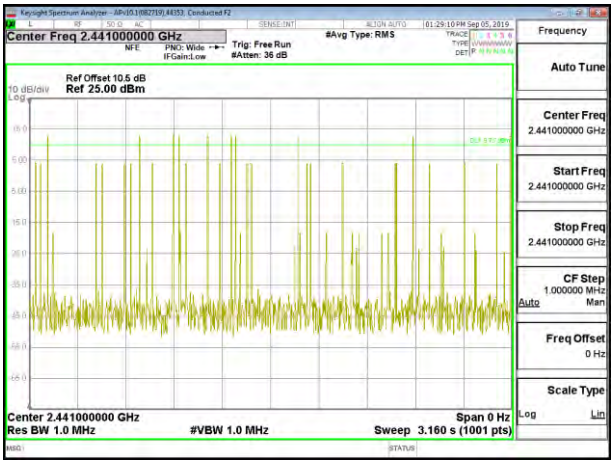
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

LAT 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	31	0.118	0.4	-0.282
DH3	1.638	15	0.246	0.4	-0.154
DH5	2.884	10	0.288	0.4	-0.112
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	7.75	0.030	0.4	-0.370
DH3	1.638	3.75	0.061	0.4	-0.339
DH5	2.884	2.5	0.072	0.4	-0.328

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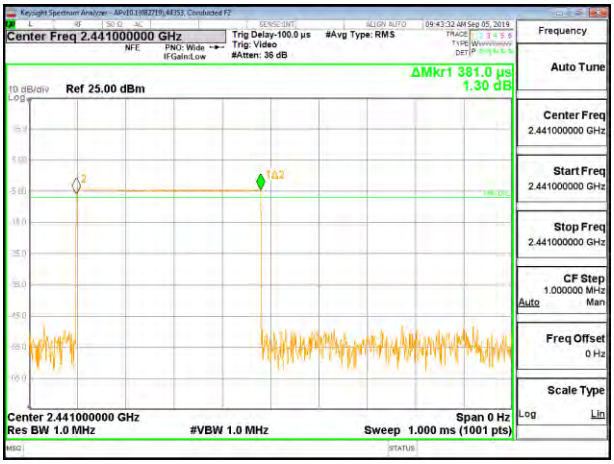
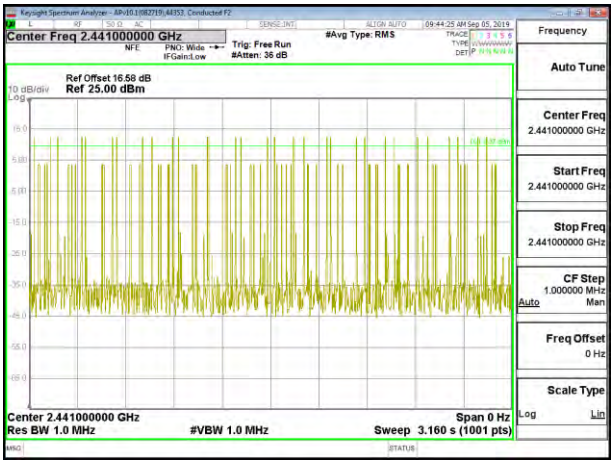


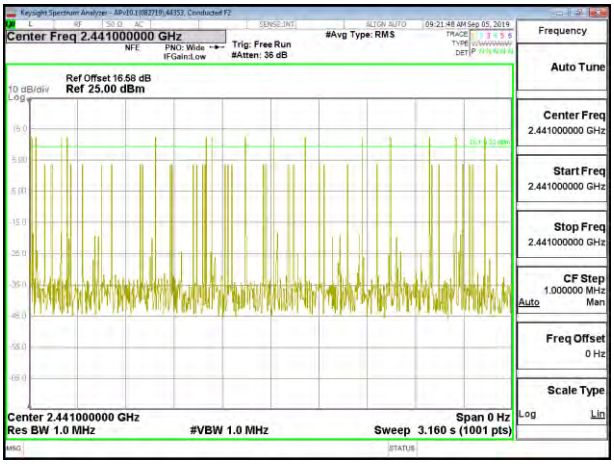
PULSE WIDTH – DH1

PULSE WIDTH – DH3

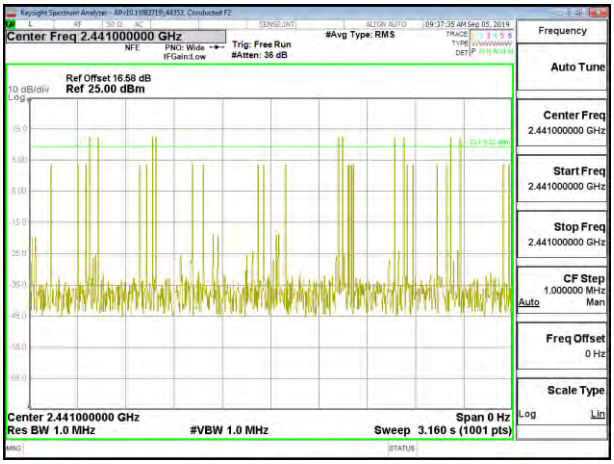
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

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8.5.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	32	0.124	0.4	-0.276
3DH3	1.638	16	0.262	0.4	-0.138
3DH5	2.888	10	0.289	0.4	-0.111

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

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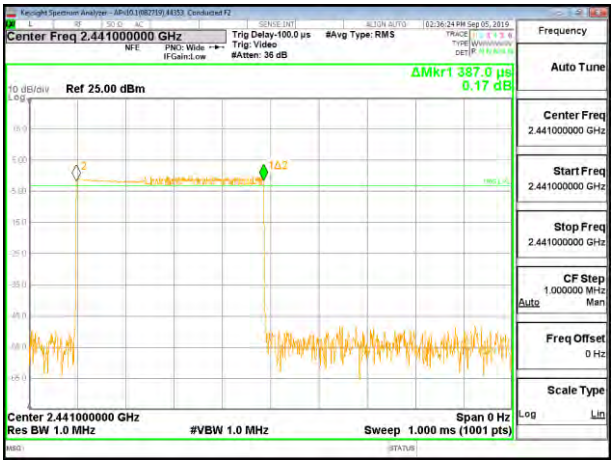
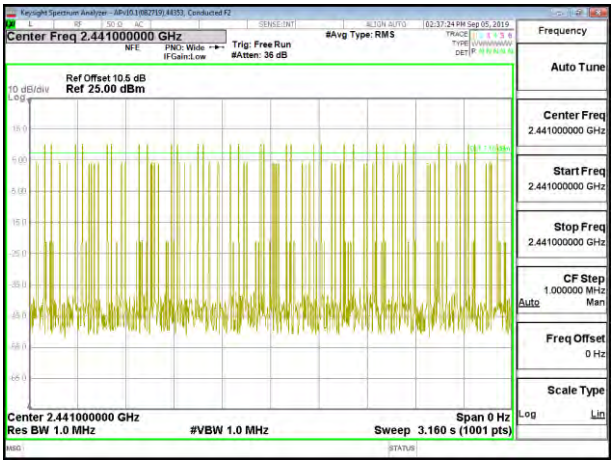


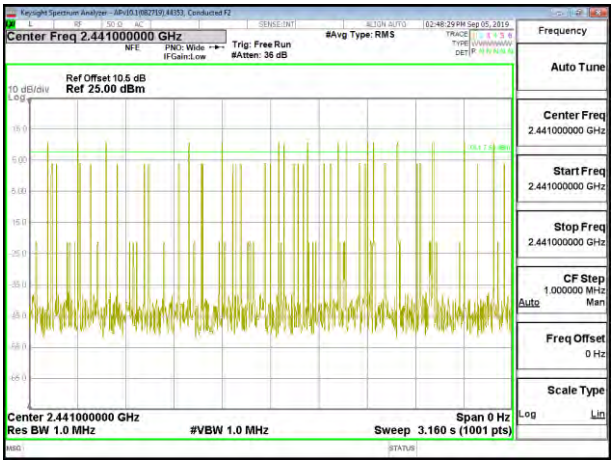
PULSE WIDTH – 3DH1

PULSE WIDTH – 3DH3

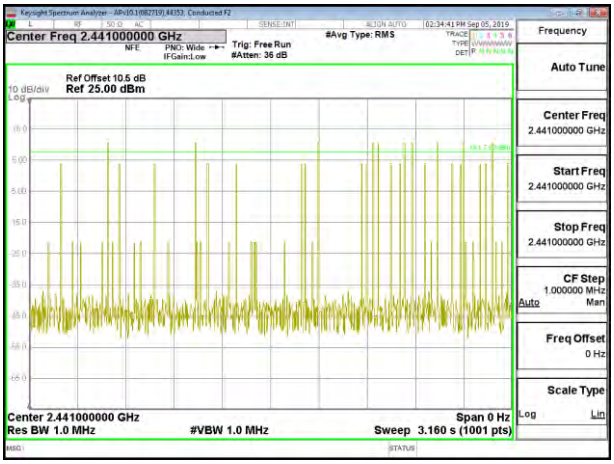
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

LAT 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.388	32	0.124	0.4	-0.276
3DH3	1.638	14	0.229	0.4	-0.171
3DH5	2.888	11	0.318	0.4	-0.082

Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

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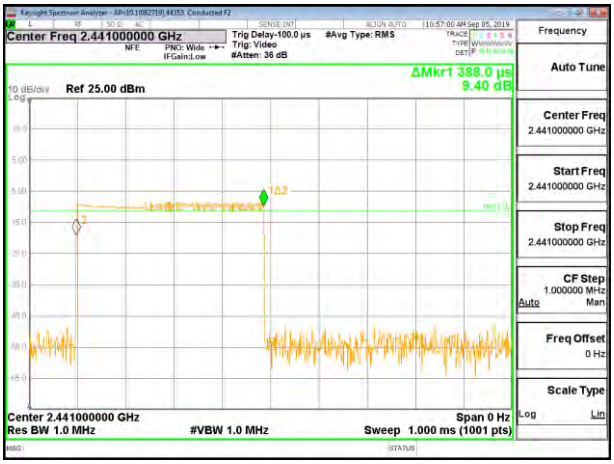
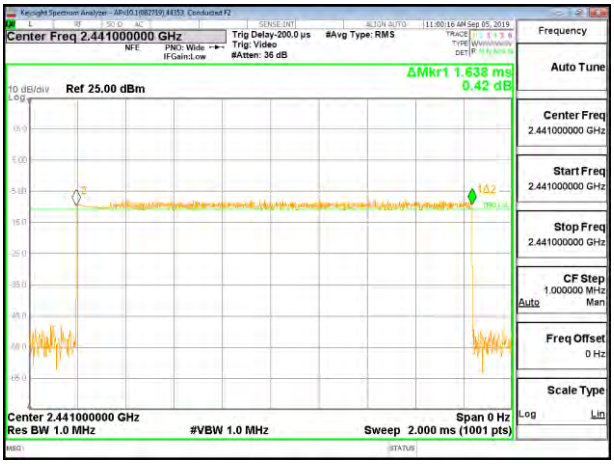
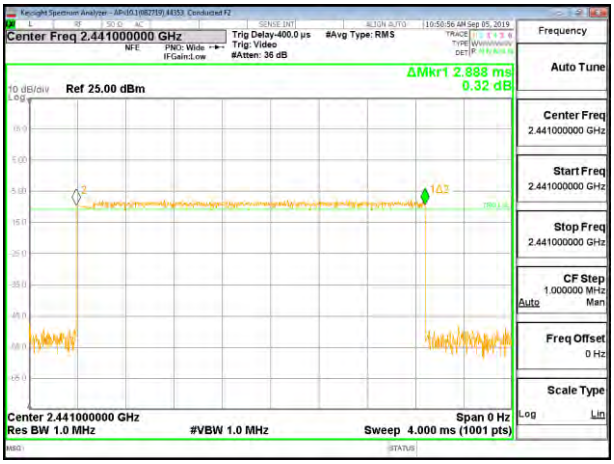


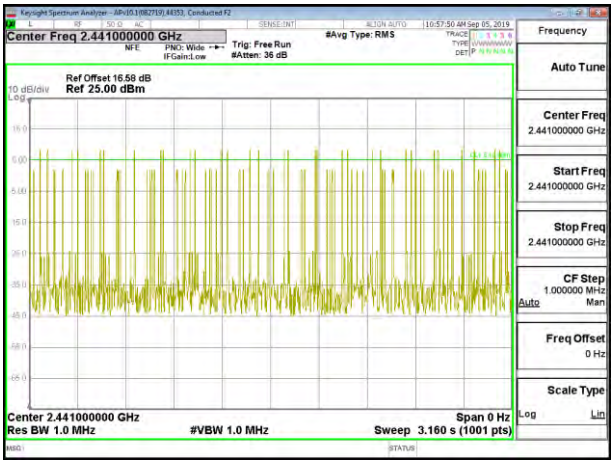
PULSE WIDTH – 3DH1



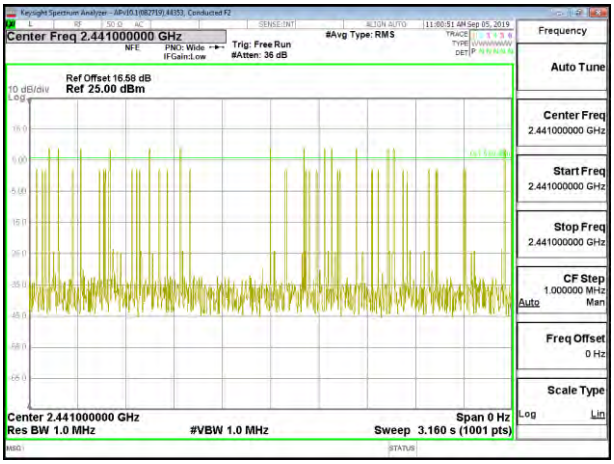
PULSE WIDTH – 3DH3



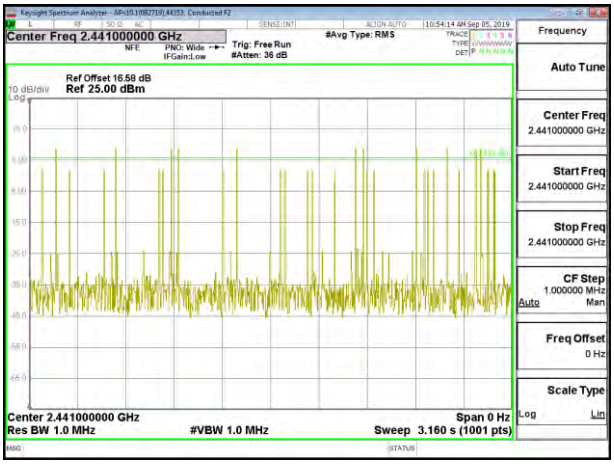
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

8.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

DIRECTIONAL ANTENNA GAIN

For 1 TX:
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

For 2 TX:

Tx chains are correlated for power due to the device supporting Beamforming documented in section 8.13. The directional gains are as follows:

Band (GHz)	UAT 1 Antenna Gain (dBi)	LAT 3 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.4	-2.50	-1.30	-1.86	1.13

RESULTS

8.6.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

UAT 1

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	19.24	21	-1.76
Middle	2441	19.15	21	-1.85
High	2480	19.19	21	-1.81

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	20.09	21	-0.91
Middle	2441	20.13	21	-0.87
High	2480	20.03	21	-0.97

8.6.2. HIGH POWER ENHANCED DATA RATE QPSK MODULATION

UAT 1

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	18.10	21	-2.9
Middle	2441	18.18	21	-2.82
High	2480	18.17	21	-2.83

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	18.24	21	-2.76
Middle	2441	18.18	21	-2.82
High	2480	18.16	21	-2.84

8.6.3. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	18.32	21	-2.68
Middle	2441	18.41	21	-2.59
High	2480	18.40	21	-2.6

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	18.44	21	-2.56
Middle	2441	18.32	21	-2.68
High	2480	18.31	21	-2.69

8.6.4. LOW POWER BASIC DATA RATE GFSK MODULATION

UAT 1

Tested By:	44353
Date:	1/20/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.60	21	-8.4
Middle	2441	12.72	21	-8.28
High	2480	12.70	21	-8.3

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.70	21	-8.3
Middle	2441	12.59	21	-8.41
High	2480	12.57	21	-8.43

8.6.5. LOW POWER ENHANCED DATA RATE QPSK MODULATION

UAT 1

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.23	21	-9.77
Middle	2441	11.24	21	-9.76
High	2480	11.24	21	-9.76

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.31	21	-9.69
Middle	2441	11.40	21	-9.6
High	2480	11.45	21	-9.55

8.6.6. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.28	21	-9.72
Middle	2441	11.30	21	-9.7
High	2480	11.27	21	-9.73

LAT 3

Tested By:	44353
Date:	1/2/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.37	21	-9.63
Middle	2441	11.44	21	-9.56
High	2480	11.50	21	-9.5

8.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

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8.7.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	18.96
Middle	2441	18.84
High	2480	18.91

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	19.78
Middle	2441	19.83
High	2480	19.75

8.7.2. HIGH POWER ENHANCED DATA RATE QPSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	15.51
Middle	2441	15.62
High	2480	15.69

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	15.52
Middle	2441	15.61
High	2480	15.67

8.7.3. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	15.84
Middle	2441	15.97
High	2480	15.96

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	15.98
Middle	2441	15.89
High	2480	15.82

8.7.4. LOW POWER BASIC DATA RATE GFSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	12.34
Middle	2441	12.47
High	2480	12.42

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	12.43
Middle	2441	12.33
High	2480	12.28

8.7.5. LOW POWER ENHANCED DATA RATE QPSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.55
Middle	2441	8.57
High	2480	8.54

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.61
Middle	2441	8.69
High	2480	8.60

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8.7.6. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.76
Middle	2441	8.79
High	2480	8.76

LAT 3

Tested By:	44353
Date	1/2/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.84
Middle	2441	8.95
High	2480	8.98

8.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

Limit = -20 dBc

TEST PROCEDURE

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

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

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

RESULTS

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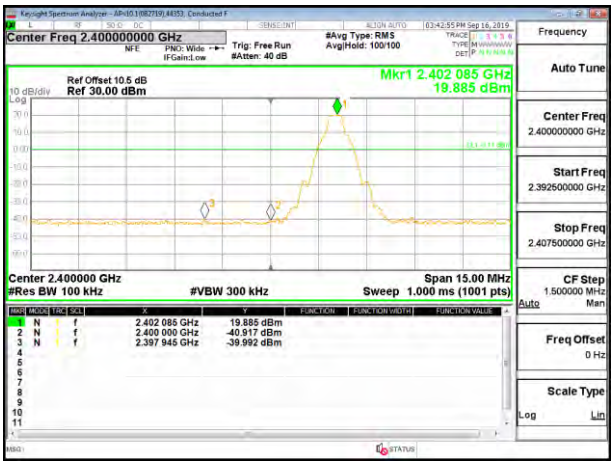
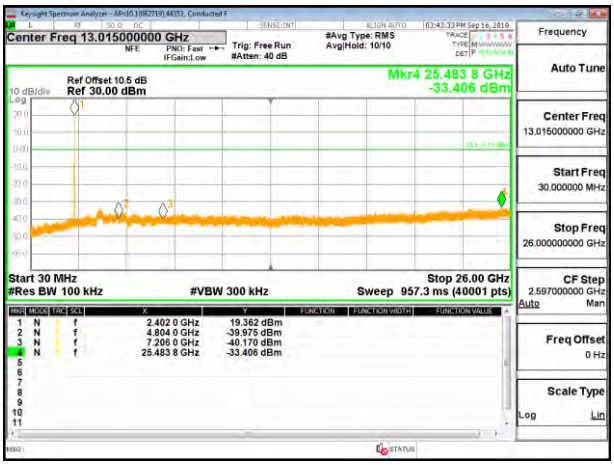
8.8.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

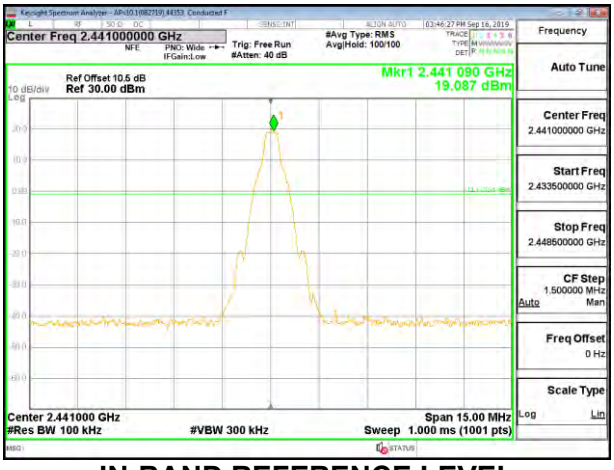
UAT 1 SPURIOUS EMISSIONS, NON-HOPPING



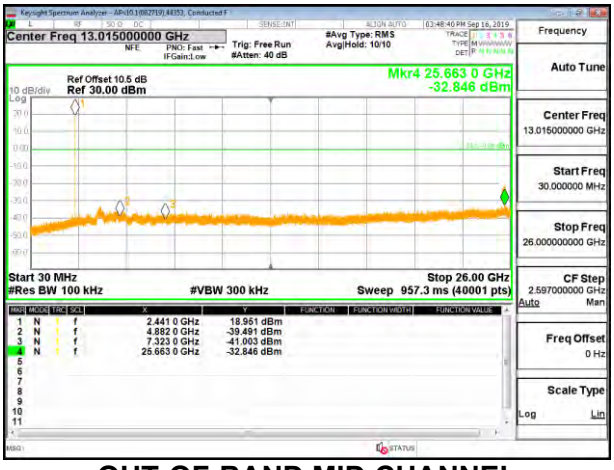
LOW CHANNEL BANDEDGE



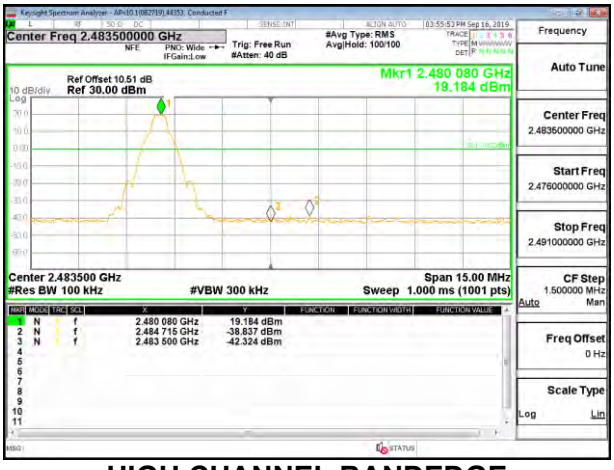
OUT-OF-BAND LOW CHANNEL



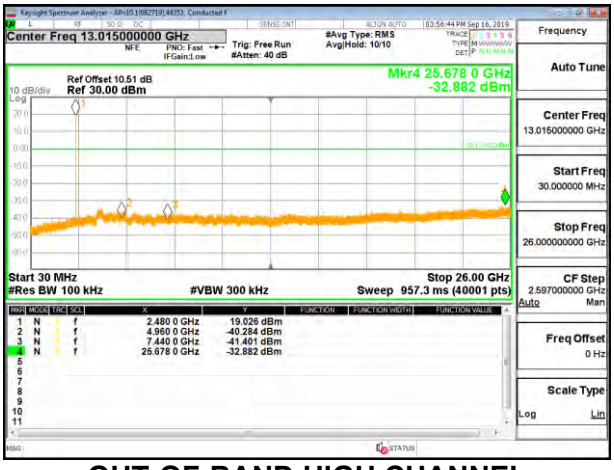
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

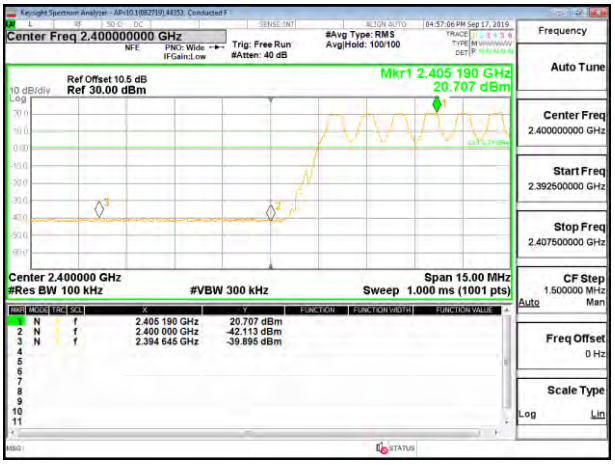


HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

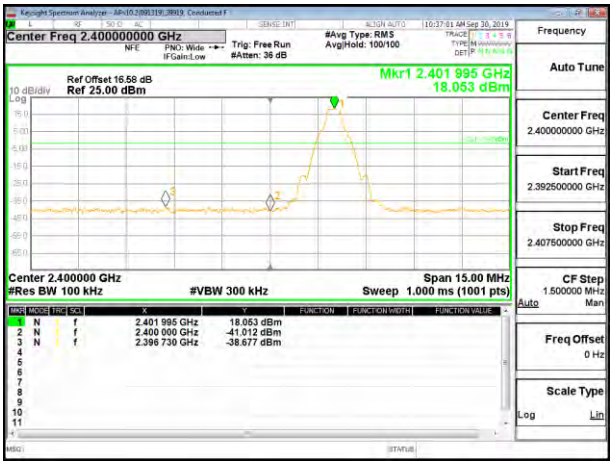
UAT 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE

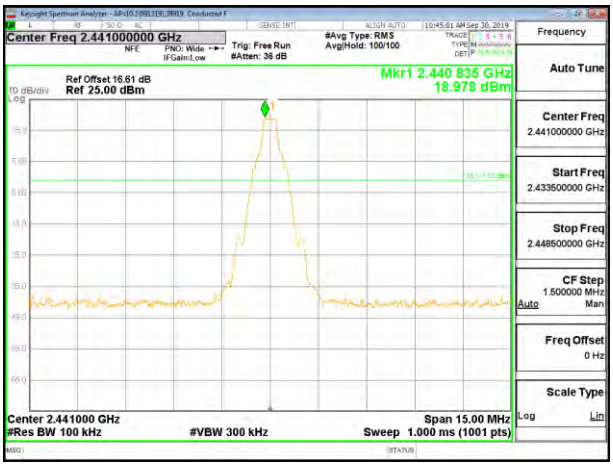
HIGH BANDEDGE

LAT 3 SPURIOUS EMISSIONS, NON-HOPPING

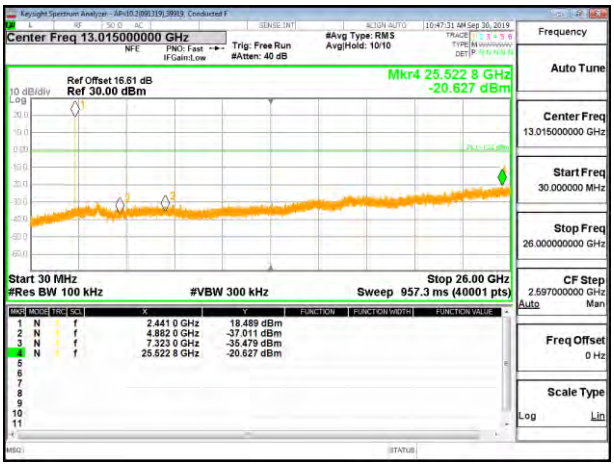


LOW CHANNEL BANDEDGE

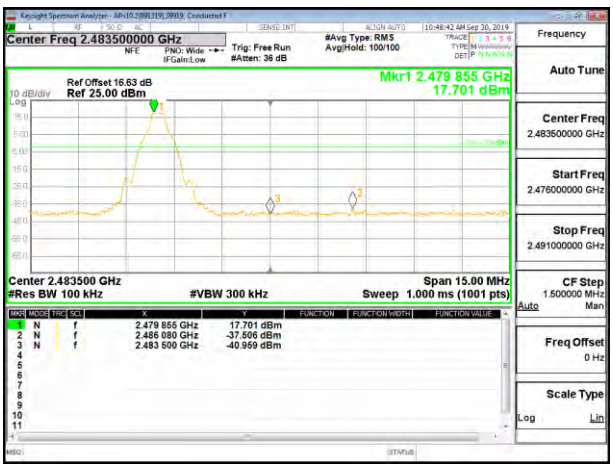
OUT-OF-BAND LOW CHANNEL



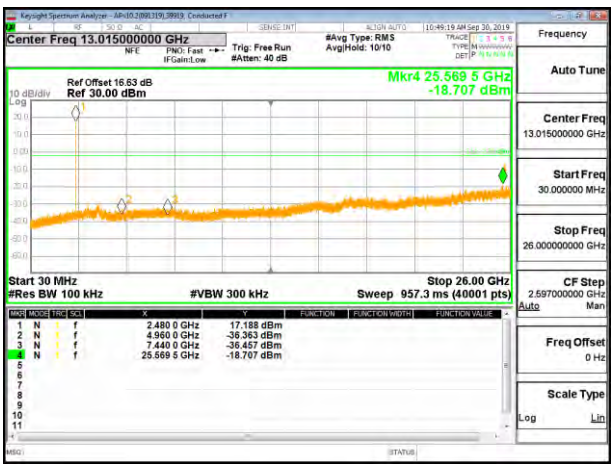
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

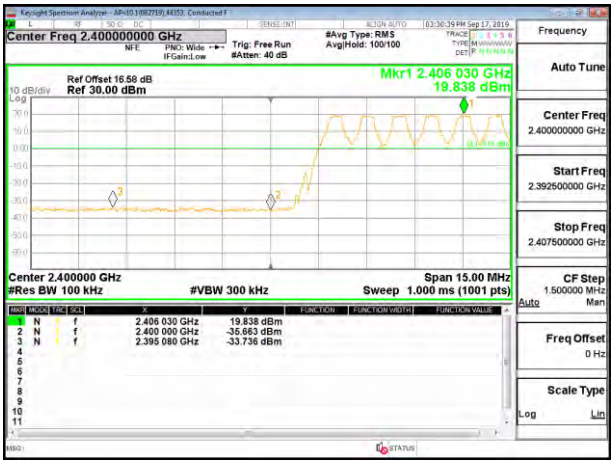


HIGH CHANNEL BANDEDGE

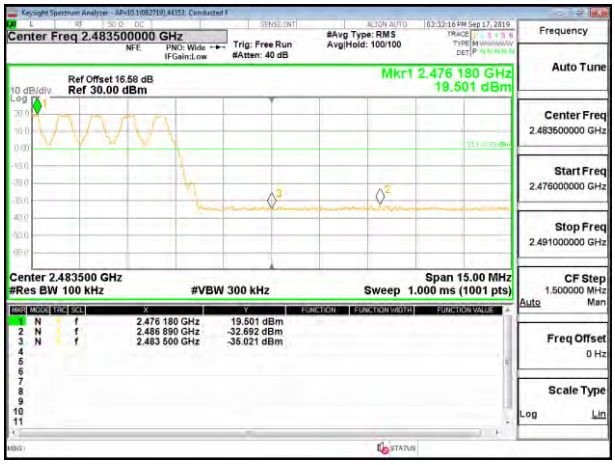


OUT-OF-BAND HIGH CHANNEL

LAT 3 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



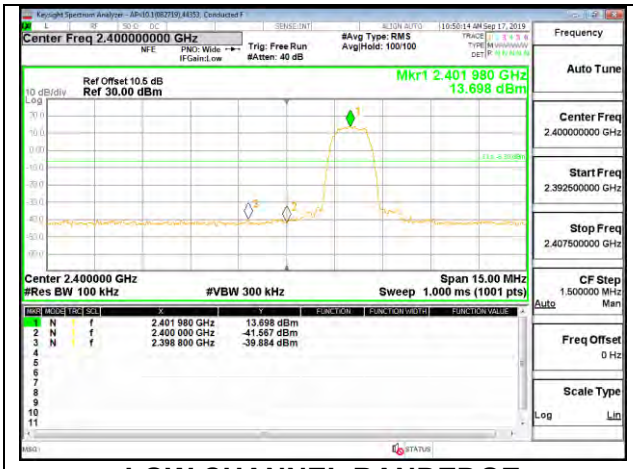
LOW BANDEDGE



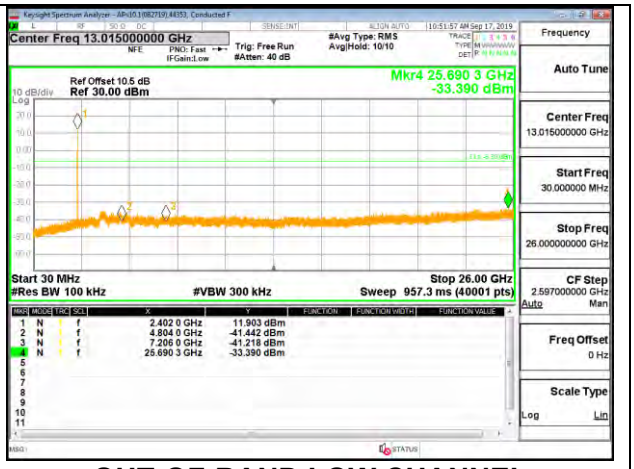
HIGH BANDEDGE

8.8.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

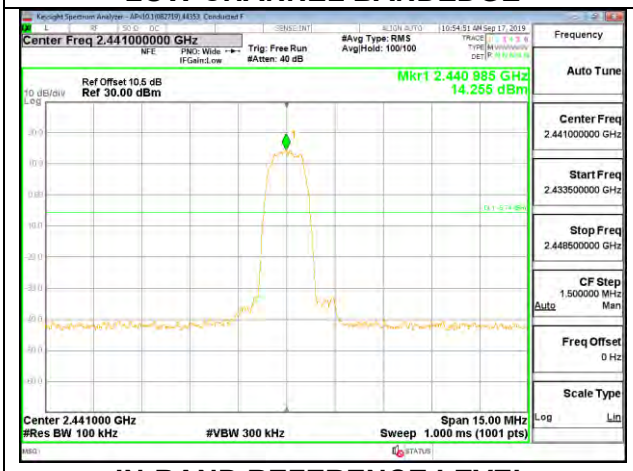
UAT 1 SPURIOUS EMISSIONS, NON-HOPPING



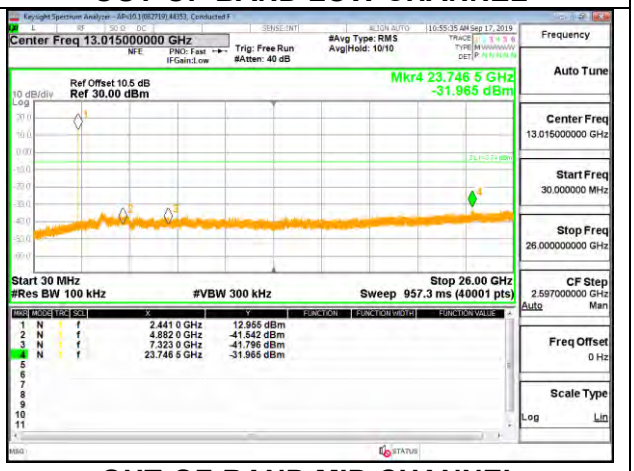
LOW CHANNEL BANDEDGE



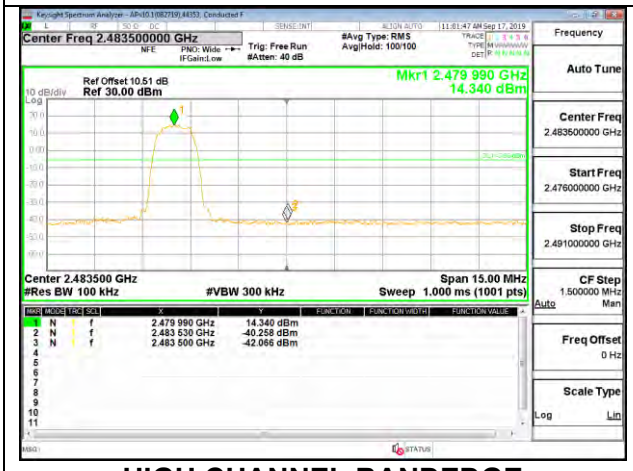
OUT-OF-BAND LOW CHANNEL



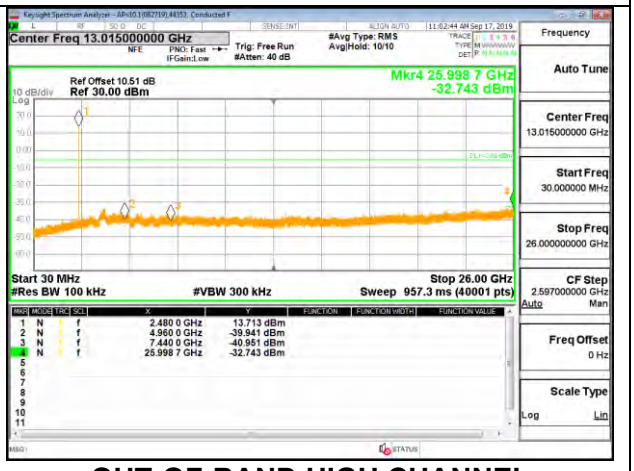
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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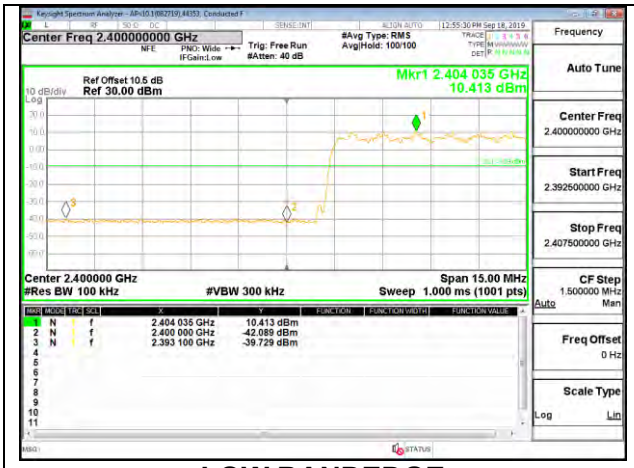
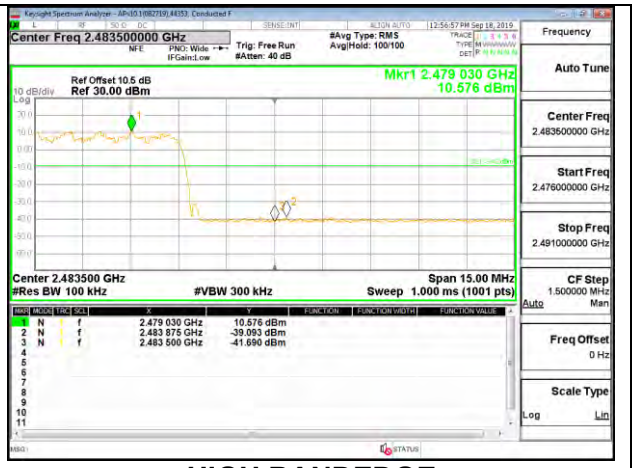
UAT 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

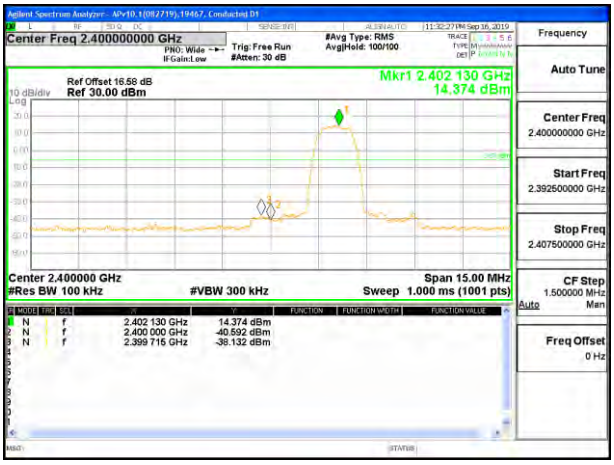


LOW BANDEDGE

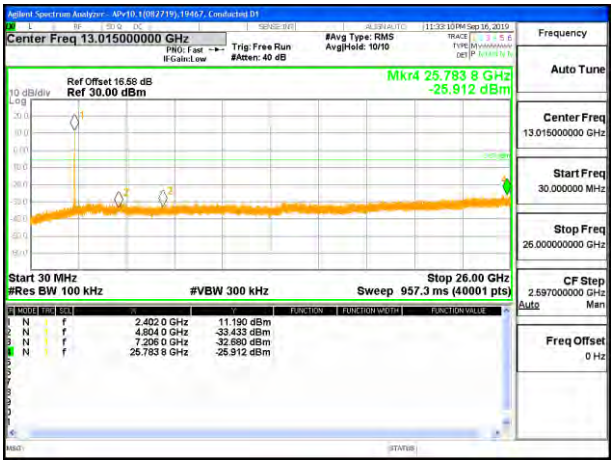


HIGH BANDEDGE

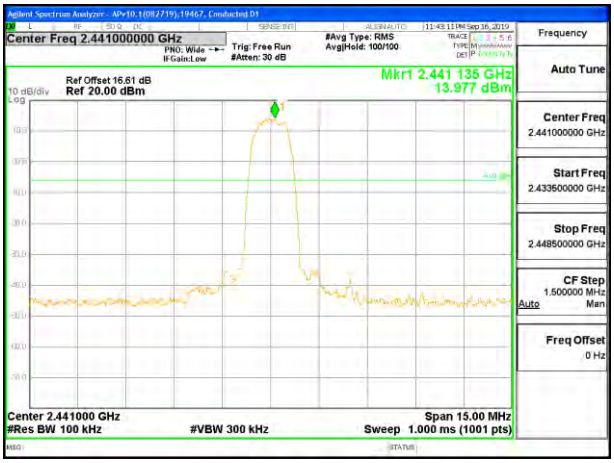
LAT 3 SPURIOUS EMISSIONS, NON-HOPPING



LOW CHANNEL BANDEDGE

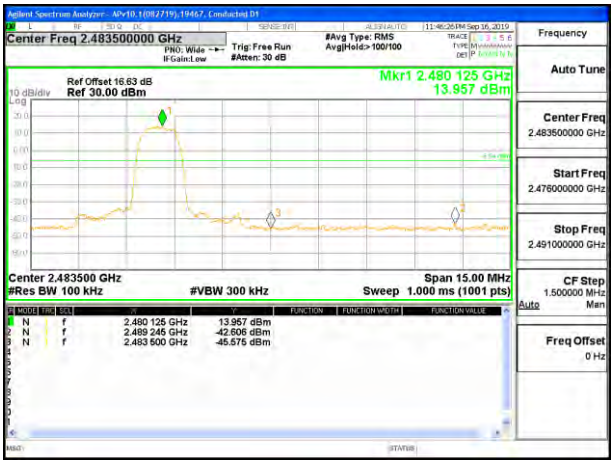


OUT-OF-BAND LOW CHANNEL

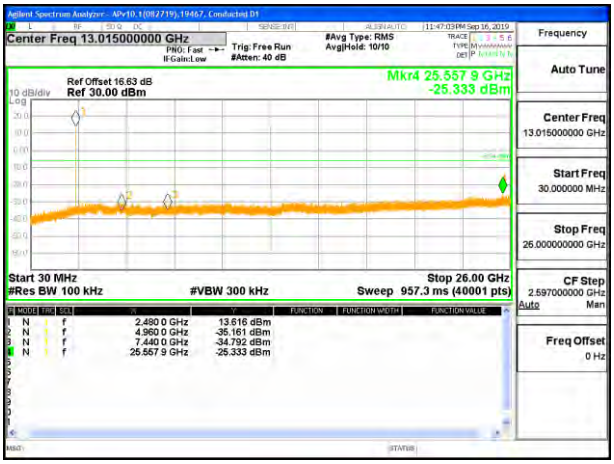


IN-BAND REFERENCE LEVEL

OUT-OF-BAND MID CHANNEL

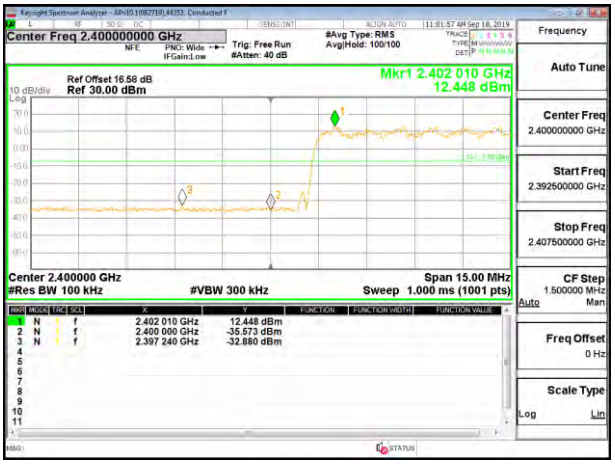


HIGH CHANNEL BANDEDGE

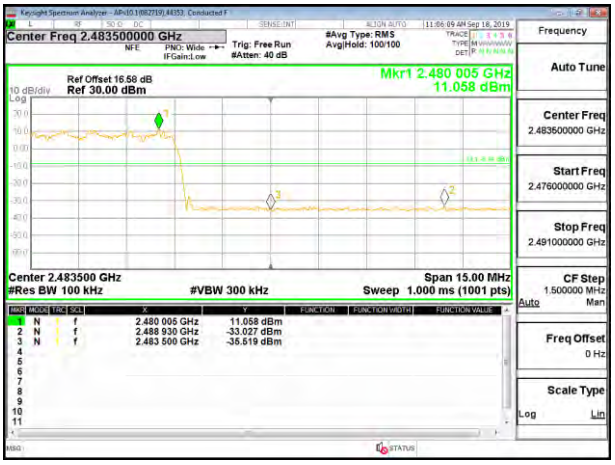


OUT-OF-BAND HIGH CHANNEL

LAT 3 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



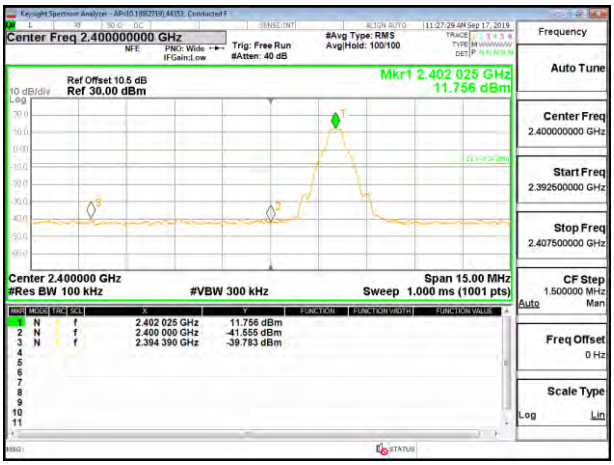
LOW BANDEDGE



HIGH BANDEDGE

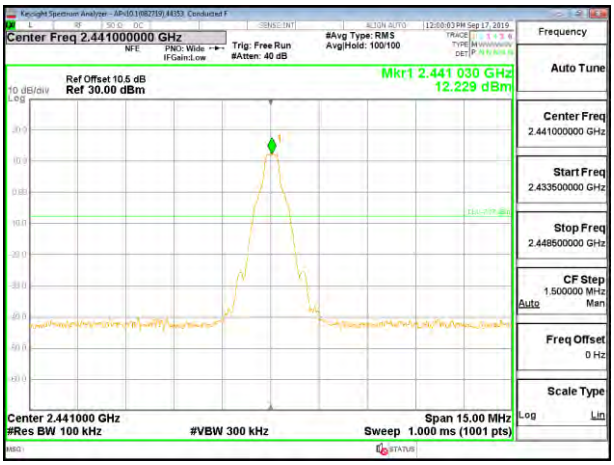
8.8.3. LOW POWER BASIC DATA RATE GFSK MODULATION

UAT 1 SPURIOUS EMISSIONS, NON-HOPPING

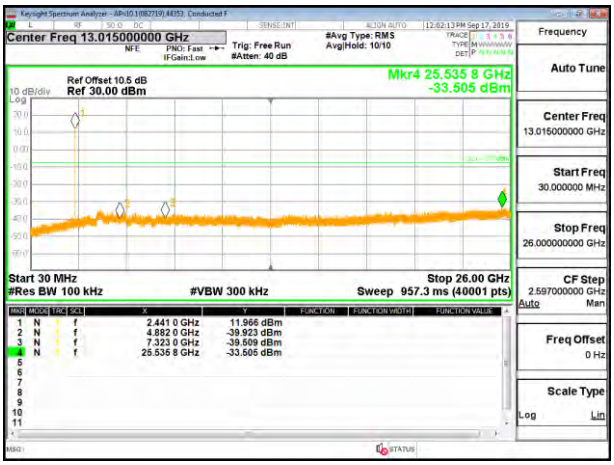


LOW CHANNEL BANDEDGE

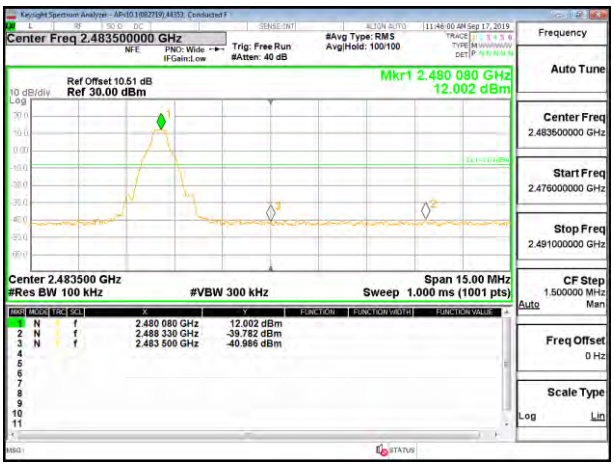
OUT-OF-BAND LOW CHANNEL



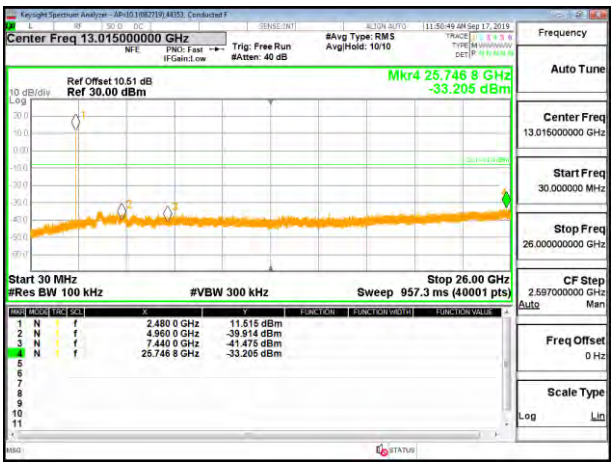
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

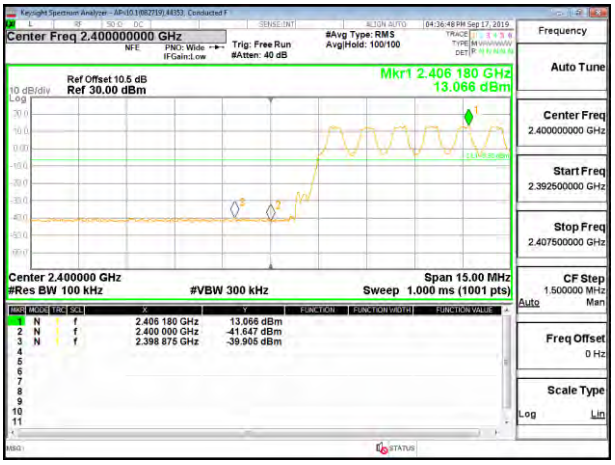


HIGH CHANNEL BANDEDGE

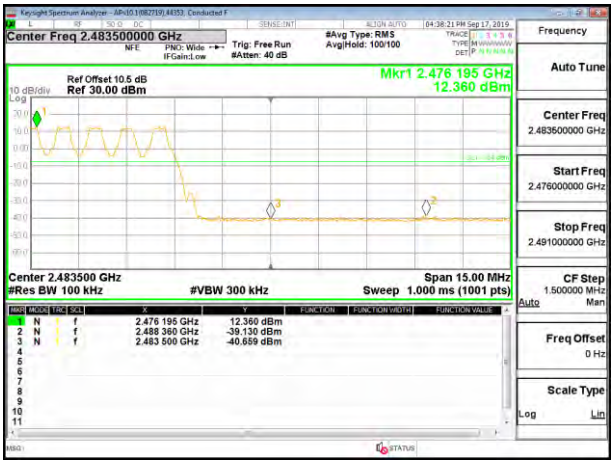


OUT-OF-BAND HIGH CHANNEL

UAT 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

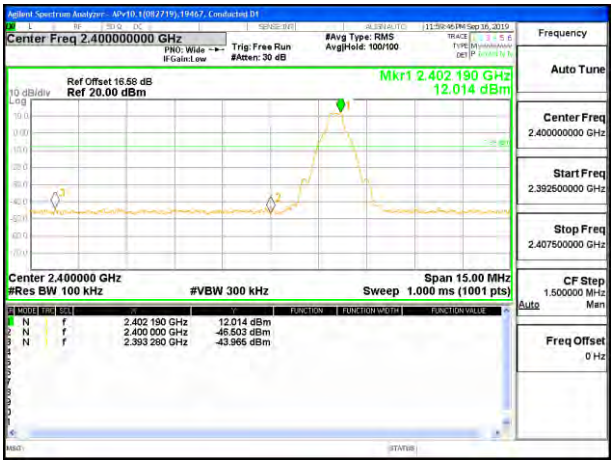


LOW BANDEDGE



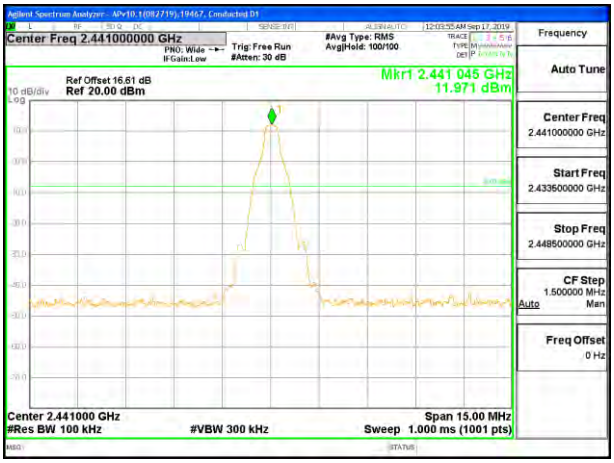
HIGH BANDEDGE

LAT 3 SPURIOUS EMISSIONS, NON-HOPPING



LOW CHANNEL BANDEDGE

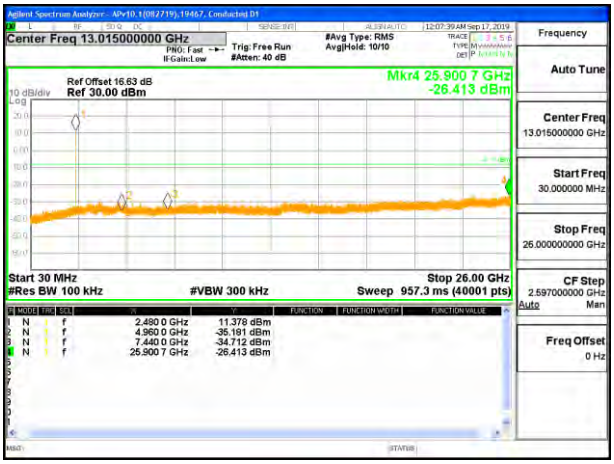
OUT-OF-BAND LOW CHANNEL



IN-BAND REFERENCE LEVEL

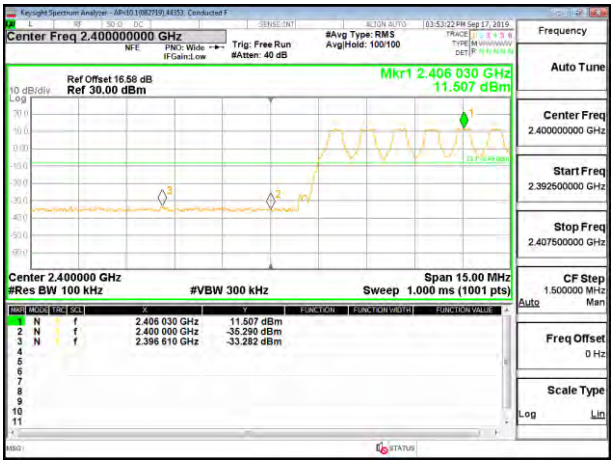
OUT-OF-BAND MID CHANNEL

HIGH CHANNEL BANDEDGE

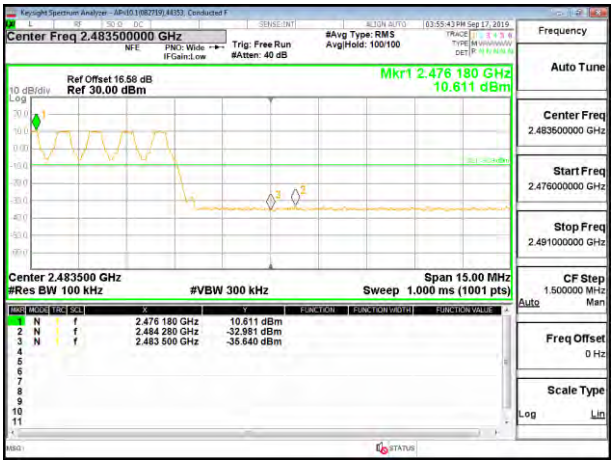


OUT-OF-BAND HIGH CHANNEL

LAT 3 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



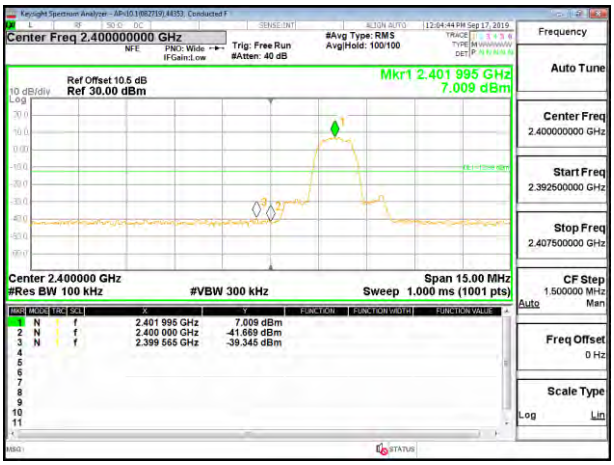
LOW BANDEDGE



HIGH BANDEDGE

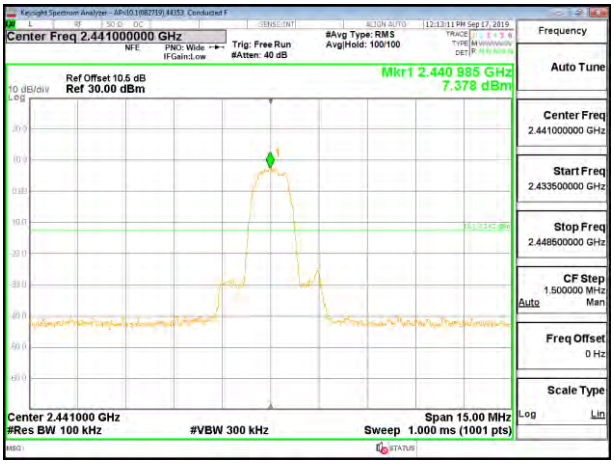
8.8.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

UAT 1 SPURIOUS EMISSIONS, NON-HOPPING



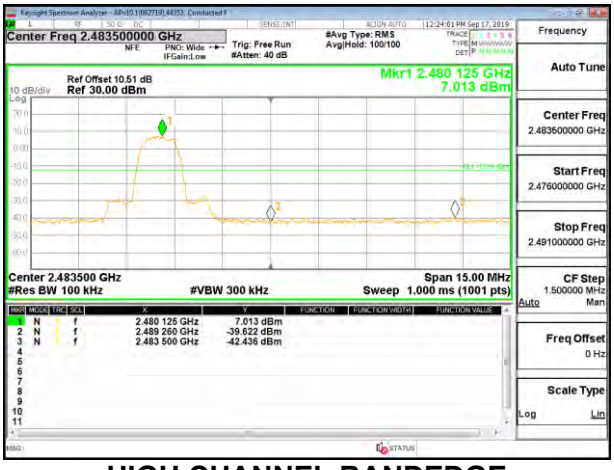
LOW CHANNEL BANDEDGE

OUT-OF-BAND LOW CHANNEL

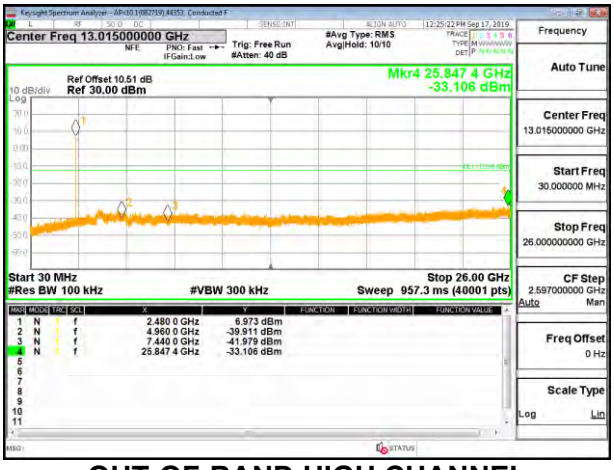


IN-BAND REFERENCE LEVEL

OUT-OF-BAND MID CHANNEL

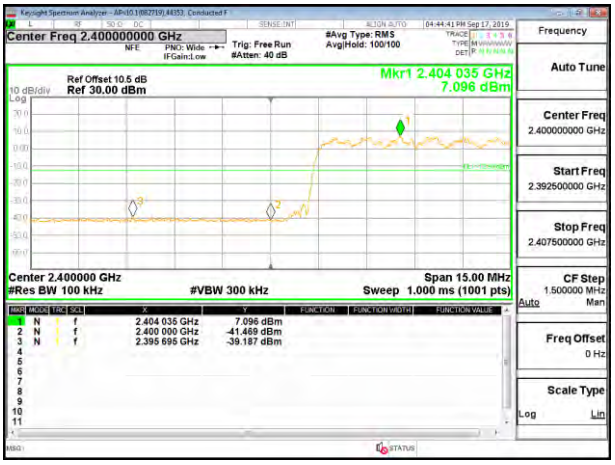


HIGH CHANNEL BANDEDGE

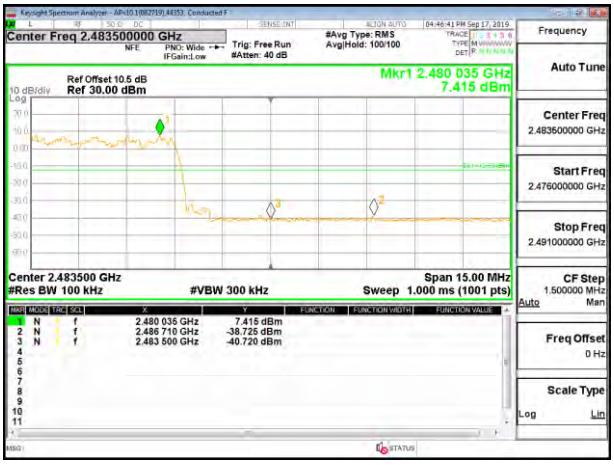


OUT-OF-BAND HIGH CHANNEL

UAT 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

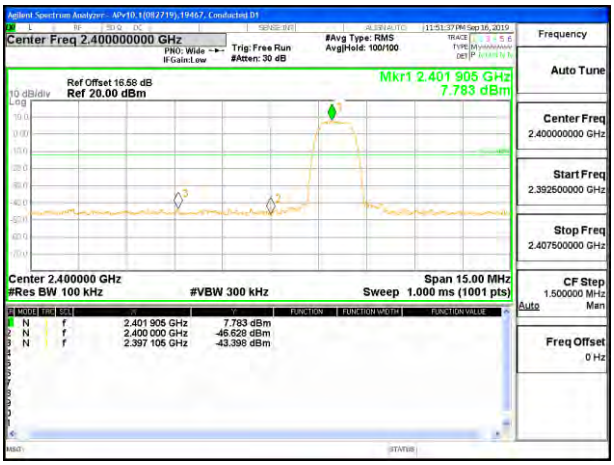


LOW BANDEDGE

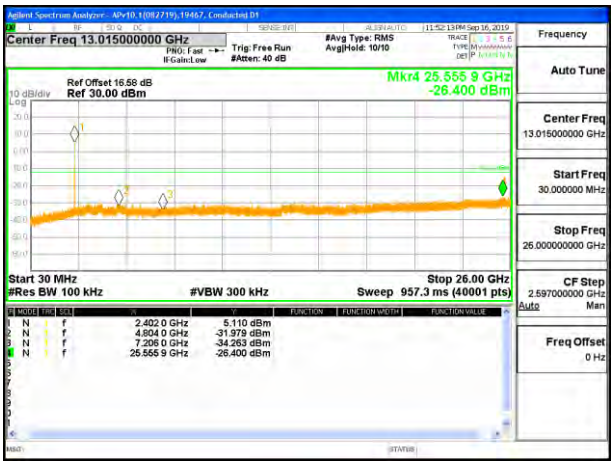


HIGH BANDEDGE

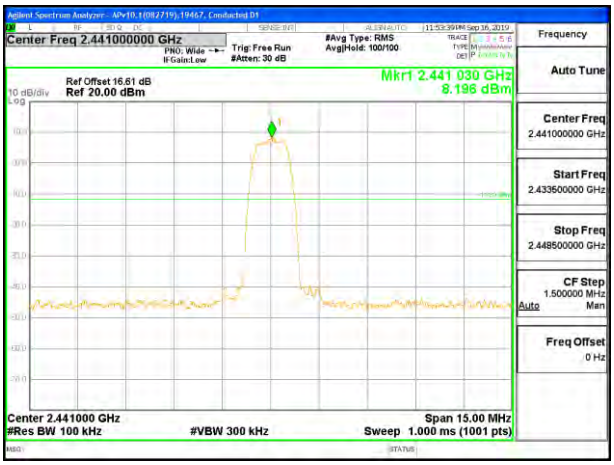
LAT 3 SPURIOUS EMISSIONS, NON-HOPPING



LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL



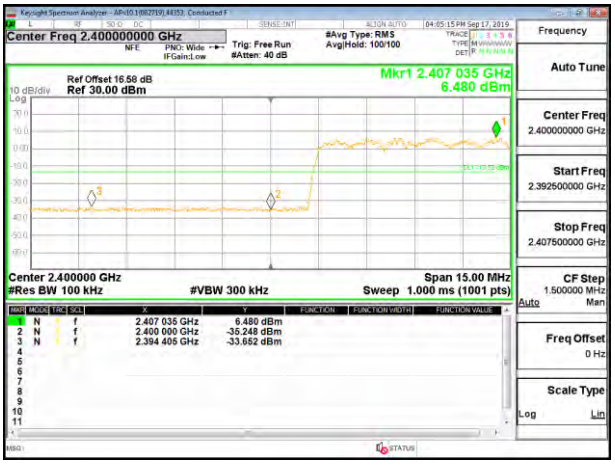
IN-BAND REFERENCE LEVEL

OUT-OF-BAND MID CHANNEL

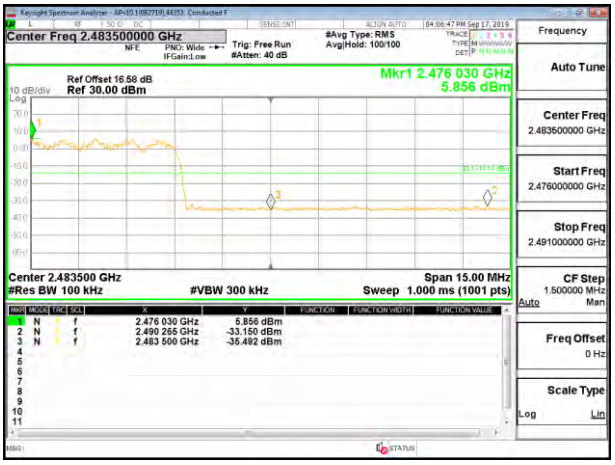
HIGH CHANNEL BANDEDGE

OUT-OF-BAND HIGH CHANNEL

LAT 3 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

8.9. BEAMFORMING, 99% AND 20dB BANDWIDTH

8.9.1. HIGH POWER BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth UAT 1 (MHz)	20dB Bandwidth LAT 3 (MHz)	99% Bandwidth UAT 1 (MHz)	99% Bandwidth LAT 3 (MHz)
Low	2402	0.951	0.807	0.918	0.879
Mid	2441	0.939	0.859	0.922	0.902
High	2480	0.938	0.893	0.919	0.894

Note: Test procedures and setting on beamforming mode are same as BT basic and EDR mode

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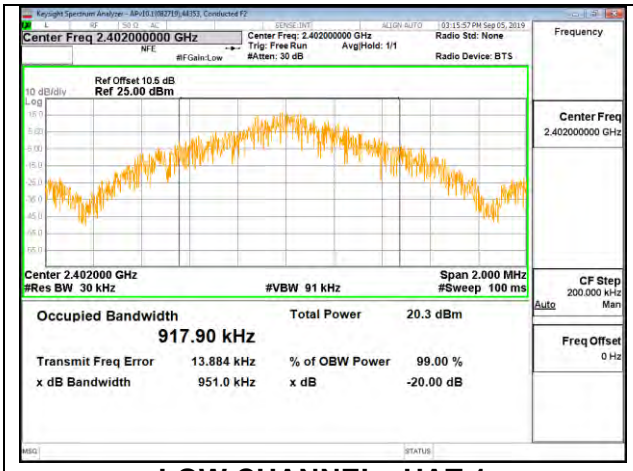
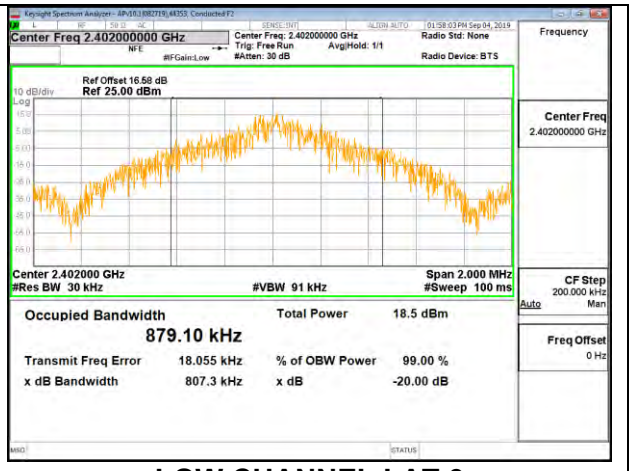
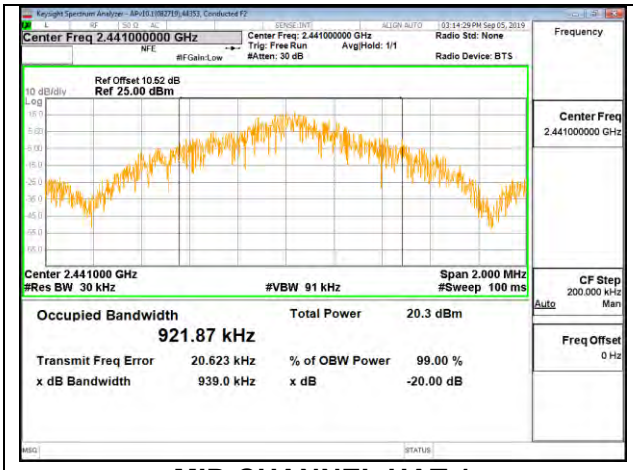


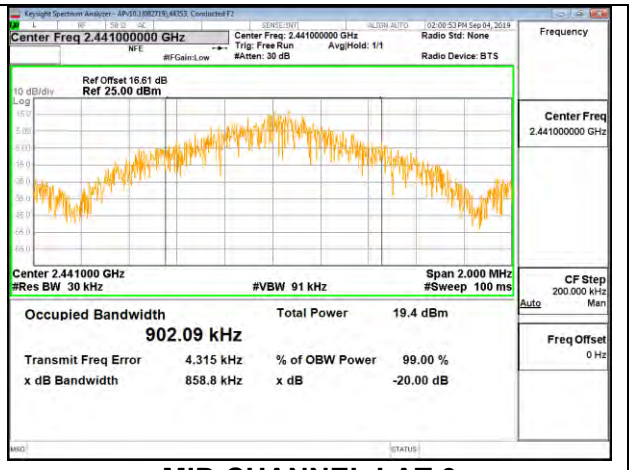
LOW CHANNEL , UAT 1



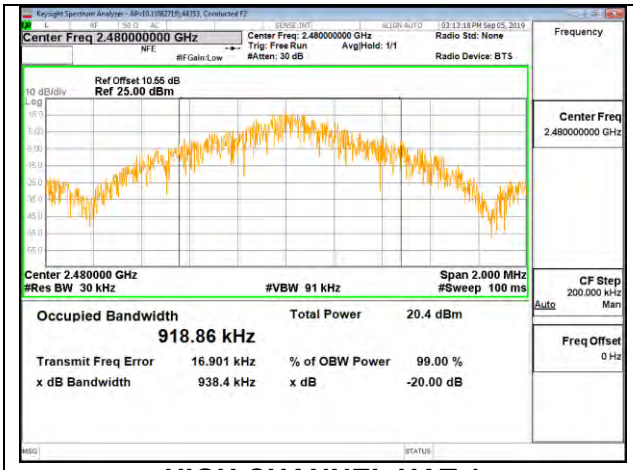
LOW CHANNEL LAT 3



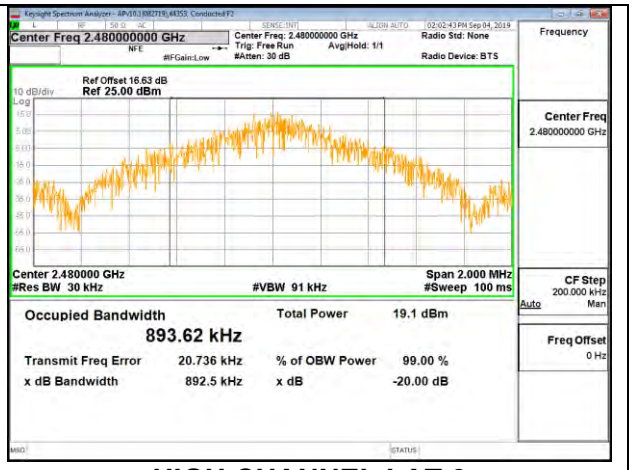
MID CHANNEL UAT 1



MID CHANNEL LAT 3



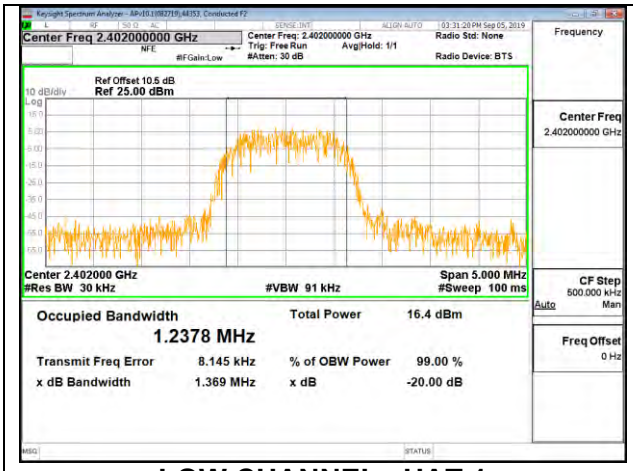
HIGH CHANNEL UAT 1



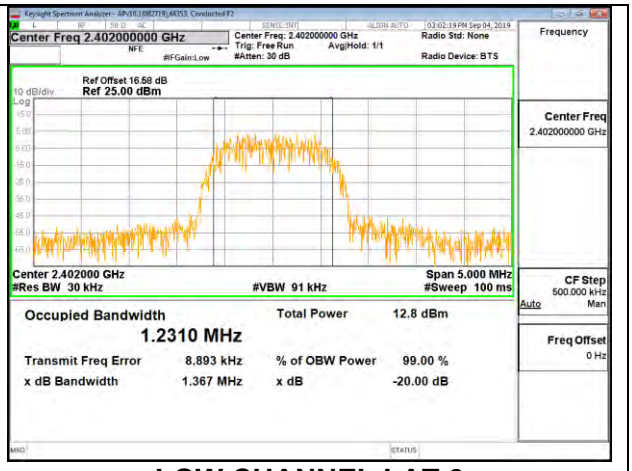
HIGH CHANNEL LAT 3

8.9.2. HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth UAT 1 (MHz)	20dB Bandwidth LAT 3 (MHz)	99% Bandwidth UAT 1 (MHz)	99% Bandwidth LAT 3 (MHz)
Low	2402	1.369	1.367	1.238	1.231
Mid	2441	1.350	1.331	1.230	1.215
High	2480	1.343	1.317	1.224	1.228



LOW CHANNEL , UAT 1

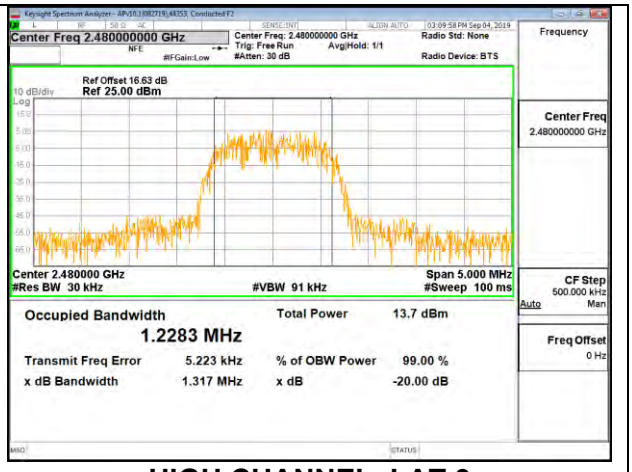


LOW CHANNEL LAT 3

MID CHANNEL UAT 1

MID CHANNEL LAT 3

HIGH CHANNEL UAT 1



HIGH CHANNEL LAT 3

8.9.3. LOW POWER BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth UAT 1 (MHz)	20dB Bandwidth LAT 3 (MHz)	99% Bandwidth UAT 1 (MHz)	99% Bandwidth LAT 3 (MHz)
Low	2402	0.938	0.881	0.915	0.876
Mid	2441	0.951	0.903	0.925	0.881
High	2480	0.942	0.997	0.916	0.892

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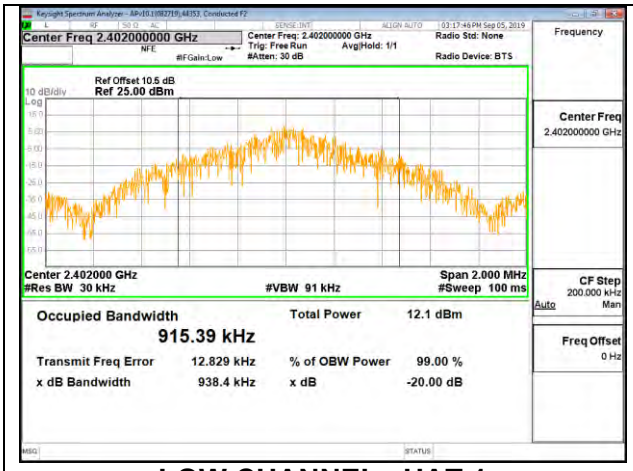
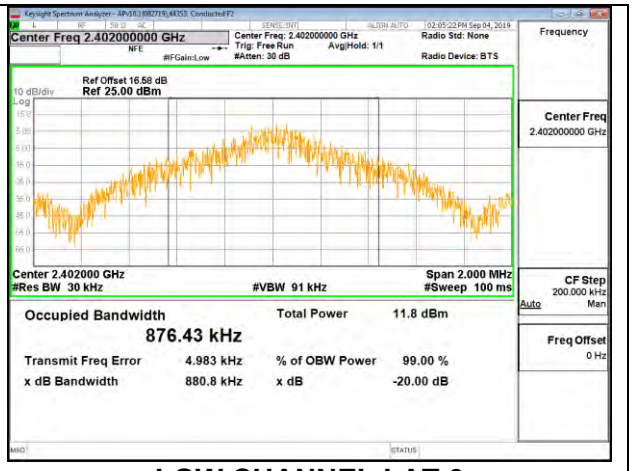
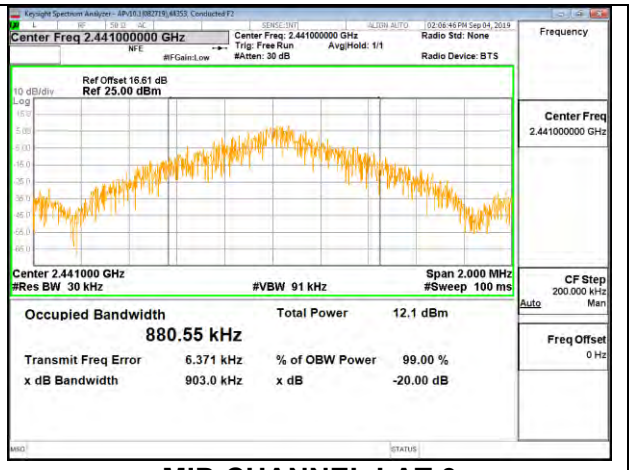


LOW CHANNEL , UAT 1

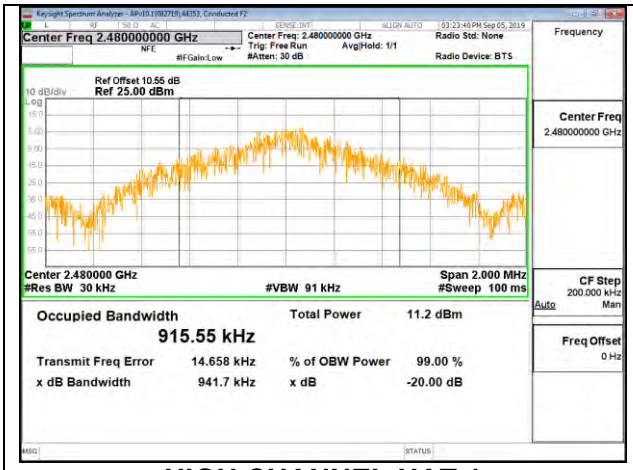


LOW CHANNEL LAT 3

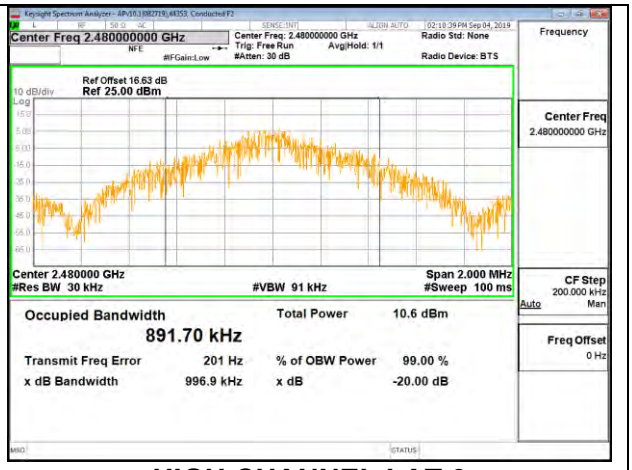
MID CHANNEL UAT 1



MID CHANNEL LAT 3



HIGH CHANNEL UAT 1



HIGH CHANNEL LAT 3

8.9.4. LOW POWER ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth UAT 1 (MHz)	20dB Bandwidth LAT 3 (MHz)	99% Bandwidth UAT 1 (MHz)	99% Bandwidth LAT 3 (MHz)
Low	2402	1.361	1.318	1.227	1.232
Mid	2441	1.348	1.340	1.231	1.233
High	2480	1.369	1.368	1.240	1.237