



CERTIFICATION TEST REPORT

Report Number. : 4789497384-E5V2

Applicant : SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Model : SM-F916B

FCC ID : A3LSMF916B

EUT Description : GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax,
UWB, WPT and NFC

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:

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Prepared by:

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	07/22/20	Initial issue	Jihyeon Park
V2	07/28/20	Updated to address TCB's question	Jihyeon Park

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC

MODEL NUMBER: SM-F916B

SERIAL NUMBER: R3CN60FSTTL (CONDUCTED)
R3CN60FSWRM (RADIATED);

DATE TESTED: JUL 08, 2020 – JUL 18, 2020;

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

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Jihyeon Park
Suwon Lab Technician
UL Korea, Ltd.

2. TEST METHODOLOGY

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

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

4.4. 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	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 dB

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC. This test report addresses the BT(DSS) operational mode.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 - 2 480	Basic GFSK	Average	18.819	76.190
		Peak	19.128	81.810
	Enhanced Pi/4-DPSK	Average	17.067	50.900
		Peak	19.370	86.500
	Enhanced 8PSK	Average	17.068	50.910
		Peak	19.735	94.080

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.
 Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes an internal antennas, with Antenna 1's maximum gain of -3.60 dBi and Antenna 2's maximum gain of -4.31 dBi

"WIFI ANT1" and "WIFI ANT2" as indicated in antenna specification are written as Antenna 1 and Antenna 2 in this report.

5.4. WORST-CASE CONFIGURATION AND MODE

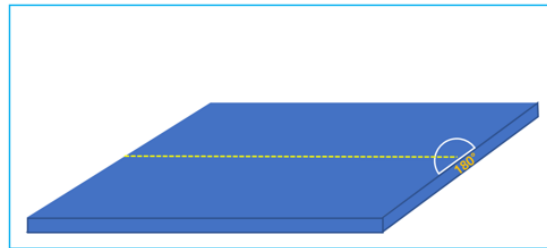
Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

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

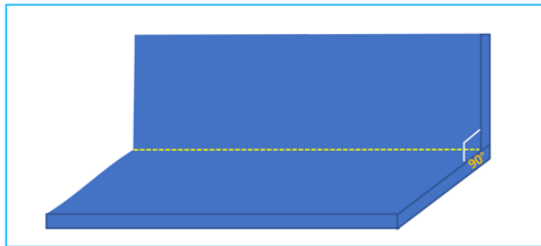
- i. Worst Case condition

ANT 1		ANT 2	
Axis	Foldable	Axis	Foldable
Y	Open	Y	Open

- ii. Foldable condition



Open



Half-folded



Full-folded

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.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37N47V0G92HM3	N/A
Data Cable	SAMSUNG	EP-DG980	N/A	N/A

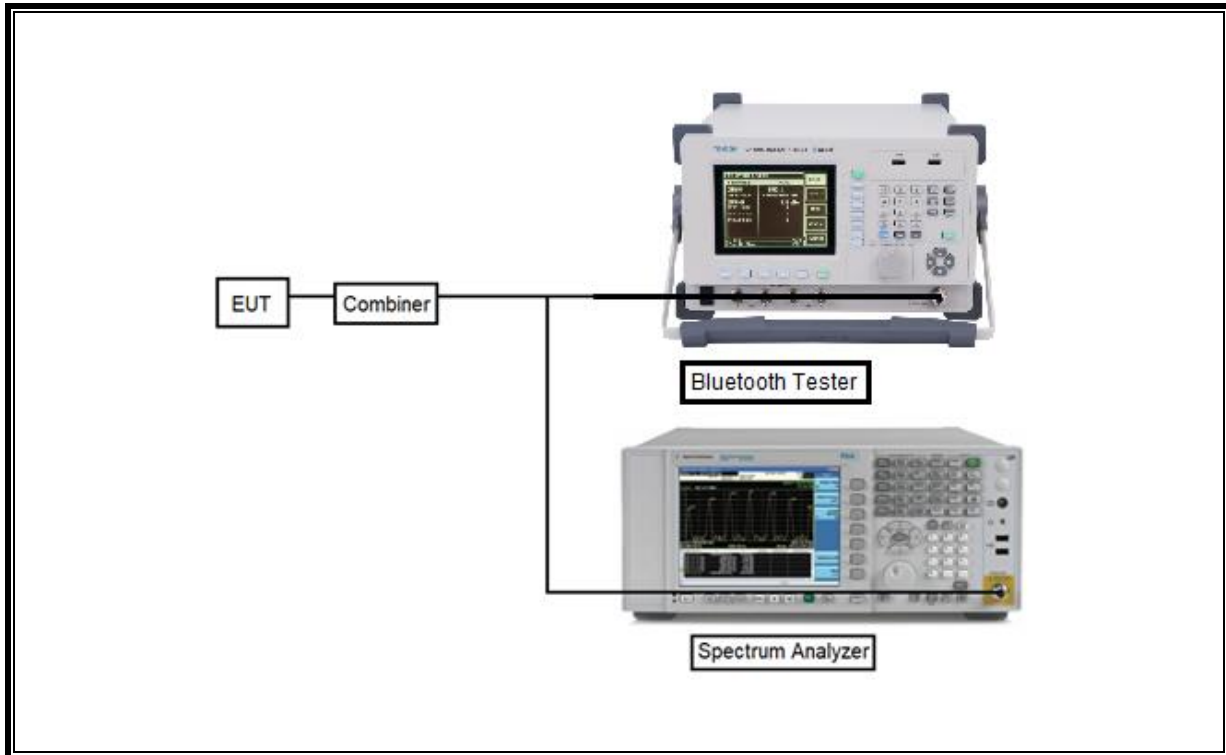
I/O CABLE

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

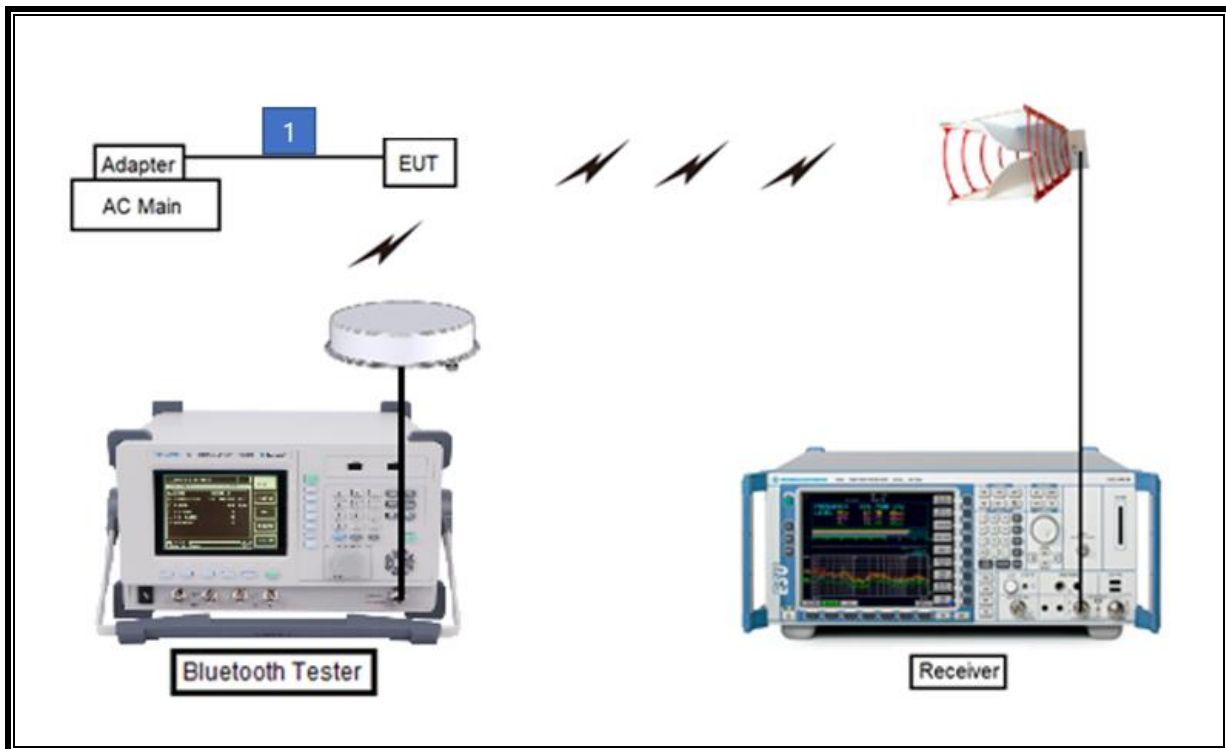
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. 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	Next Cal. Date
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	10-02-21
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	00168845	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-08-20
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-05-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-06-20
Spectrum Analyzer, 44 GHz	Keysight	N9030B	MY57143717	01-20-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-09-20
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-07-20
Power Splitter	MINI-CIRCUITS	WA1534	UL001	02-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20
Attenuator	PASTERNAK	PE7087-10	2	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-05-20
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-20
LISN	R&S	ENV-216	101837	08-09-20
Termination	WEINSCHEL	M1406A	T01	08-08-20
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. TEST RESULTS SUMMARY

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	<21dBm		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

8. 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.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

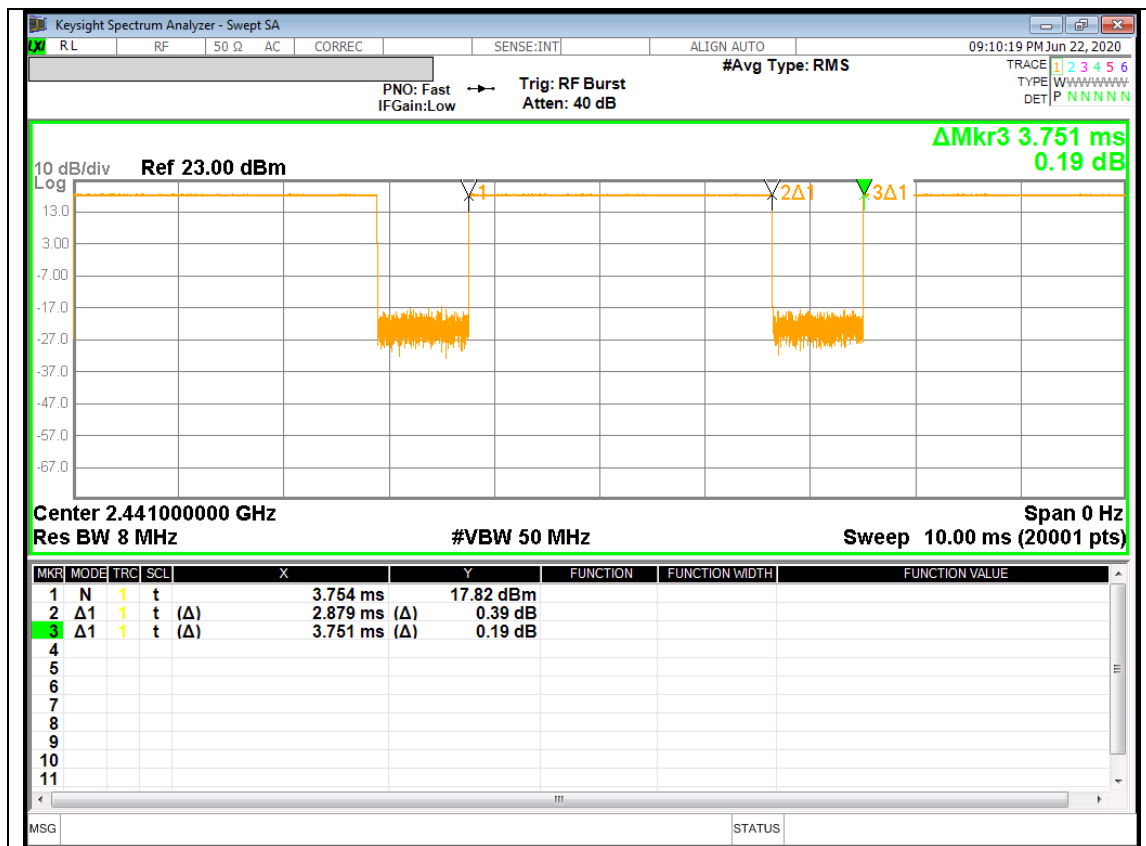
None; for reporting purposes only.

PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Band					
Bluetooth	2.879	3.751	91.02	1.12	0.345



9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

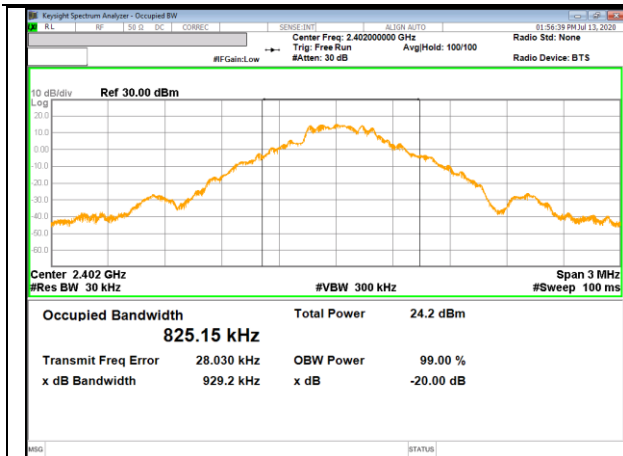
TEST PROCEDURE

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

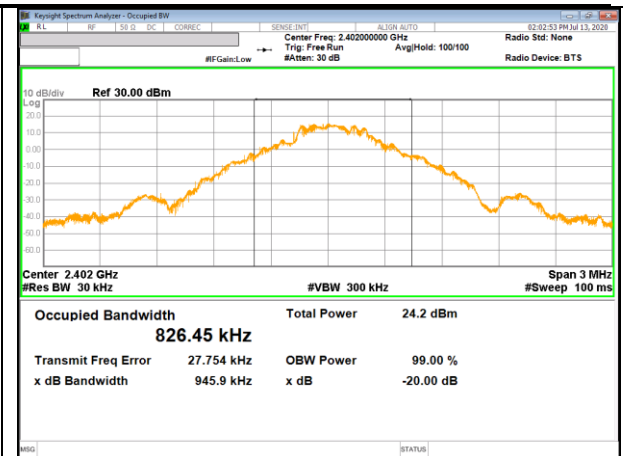
RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

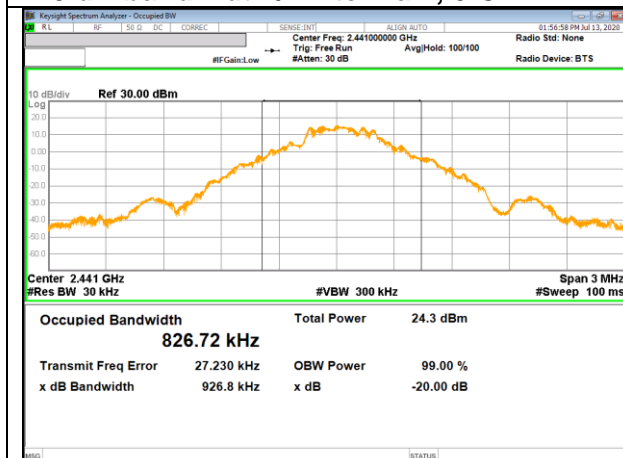
Chain	Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
Antenna 1	0	2 402	929.2	825.7
	39	2 441	926.8	825.4
	78	2 480	925.2	824.5
Antenna 2	0	2 402	945.9	825.1
	39	2 441	927.4	824.2
	78	2 480	927.0	825.3
Worst			945.9	825.7



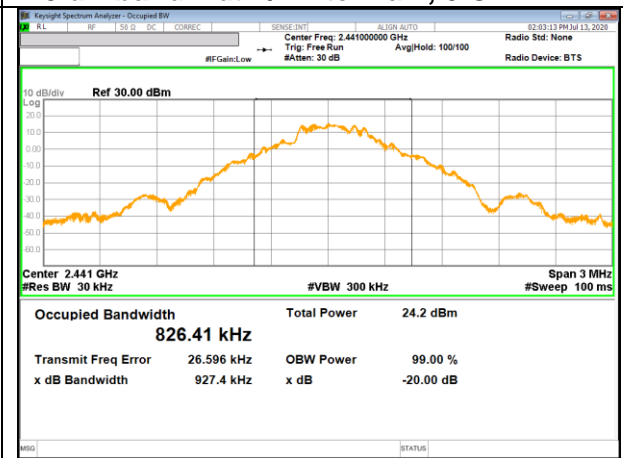
20 dB bandwidth / Antenna 1, 0 CHANNEL



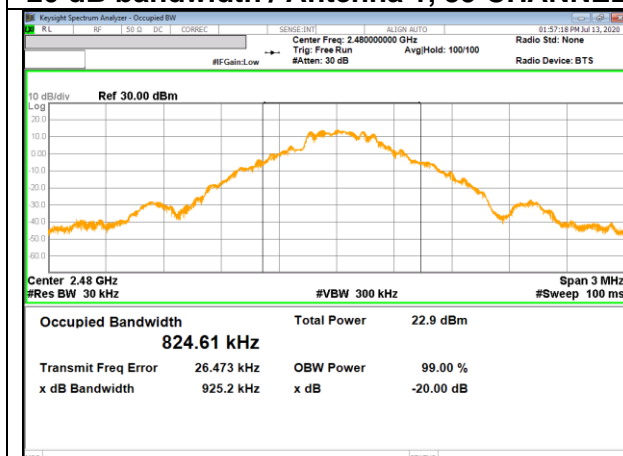
20 dB bandwidth / Antenna 2, 0 CHANNEL



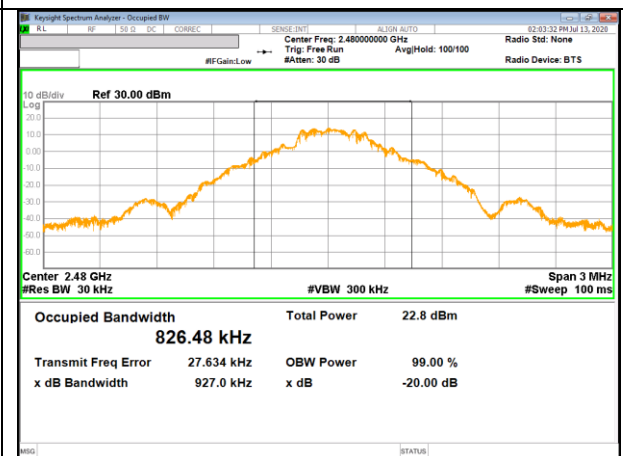
20 dB bandwidth / Antenna 1, 39 CHANNEL



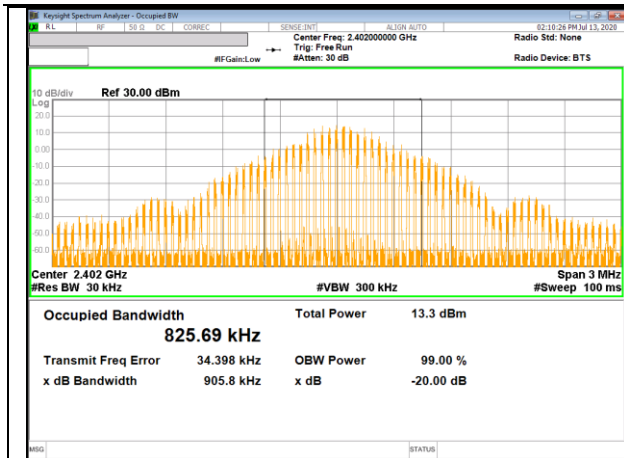
20 dB bandwidth / Antenna 2, 39 CHANNEL



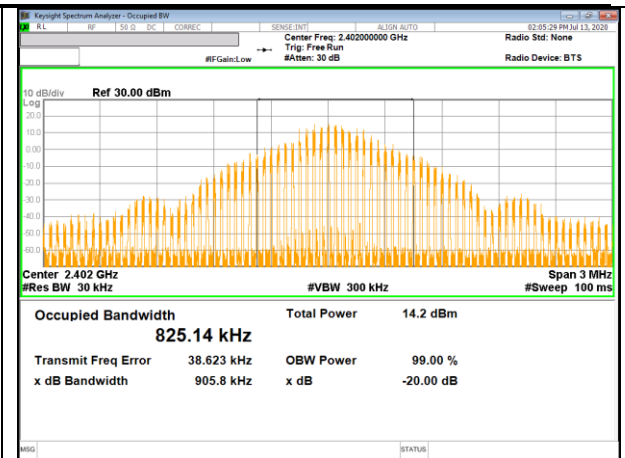
20 dB bandwidth / Antenna 1, 78 CHANNEL



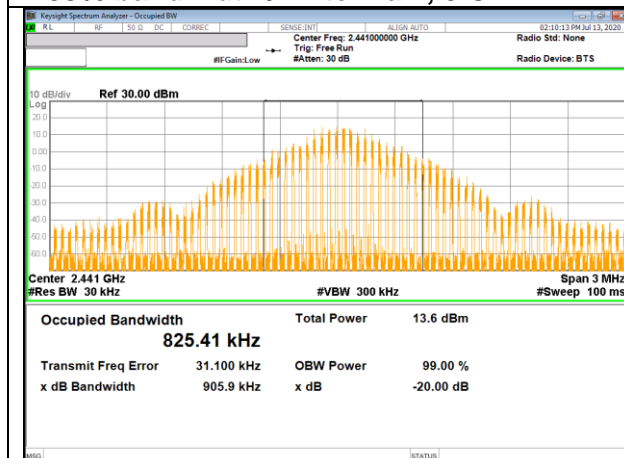
20 dB bandwidth / Antenna 2, 78 CHANNEL



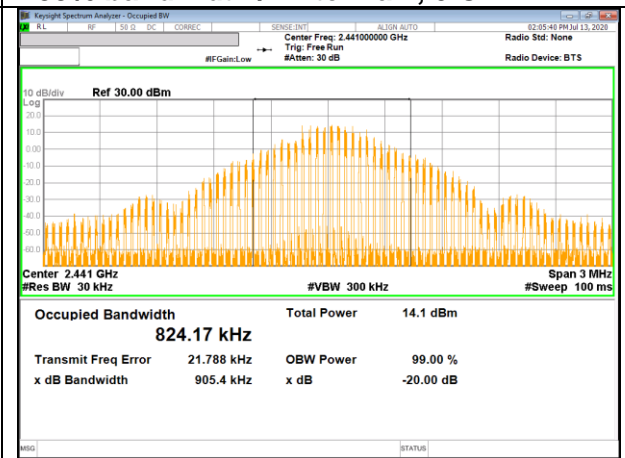
99% bandwidth / Antenna 1, 0 CHANNEL



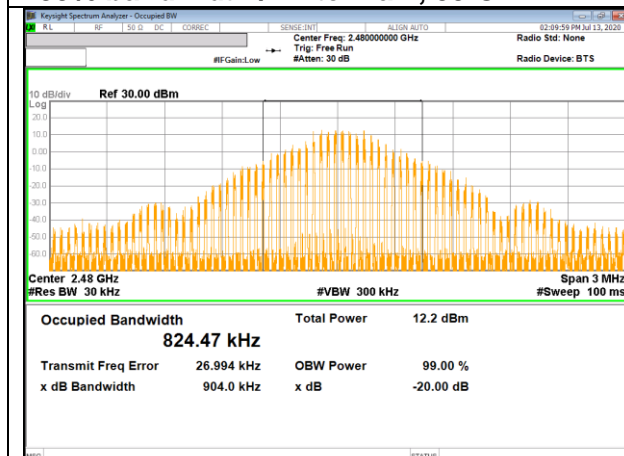
99% bandwidth / Antenna 2, 0 CHANNEL



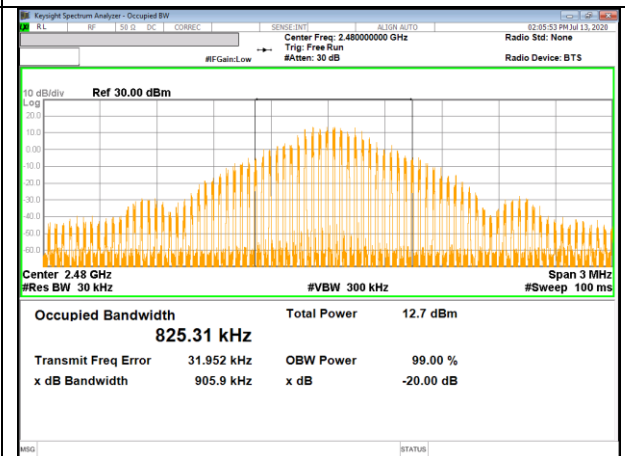
99% bandwidth / Antenna 1, 39 CHANNEL



99% bandwidth / Antenna 2, 39 CHANNEL



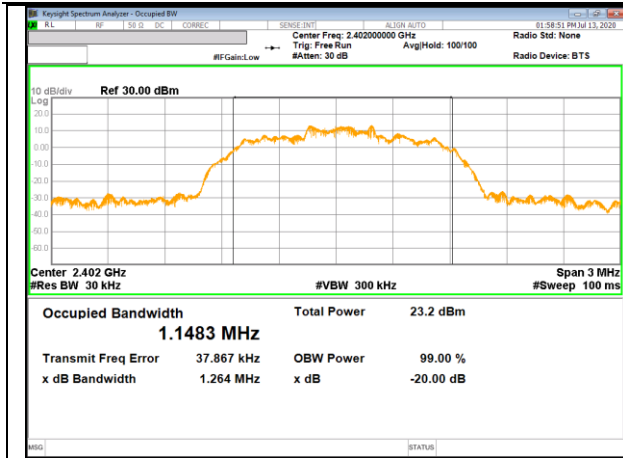
99% bandwidth / Antenna 1, 78 CHANNEL



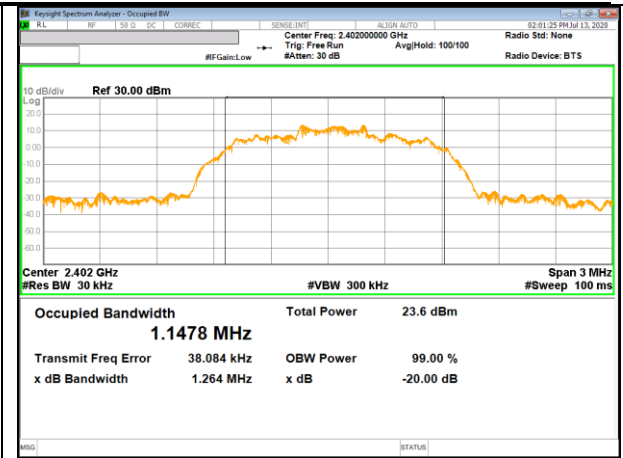
99% bandwidth / Antenna 2, 78 CHANNEL

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

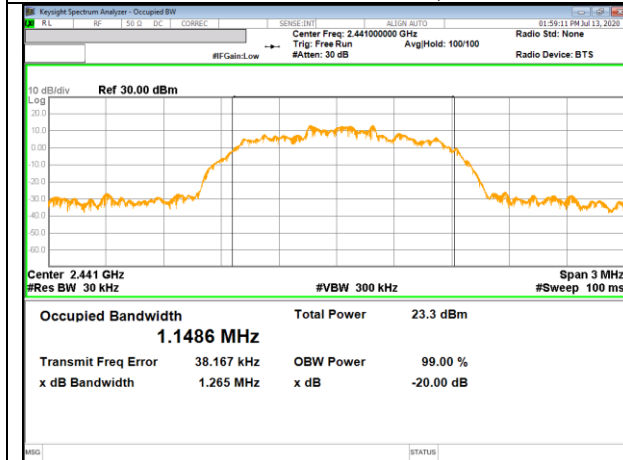
Chain	Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
Antenna 1	0	2 402	1264.0	1162.6
	39	2 441	1265.0	1162.1
	78	2 480	1265.0	1160.5
Antenna 2	0	2 402	1264.0	1134.2
	39	2 441	1266.0	1161.5
	78	2 480	1267.0	1162.6
Worst			1267.0	1162.6



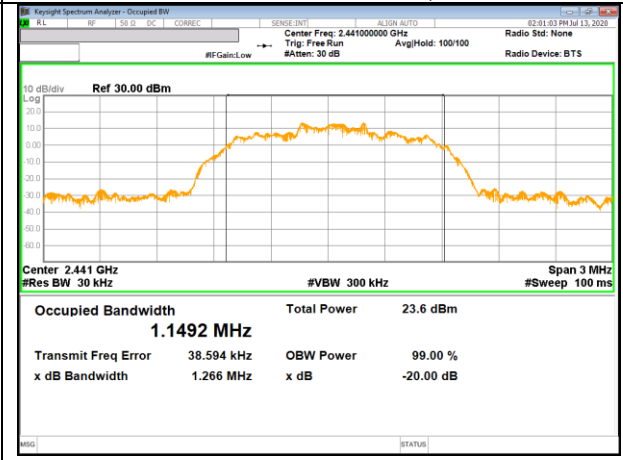
20 dB bandwidth / Antenna 1, 0 CHANNEL



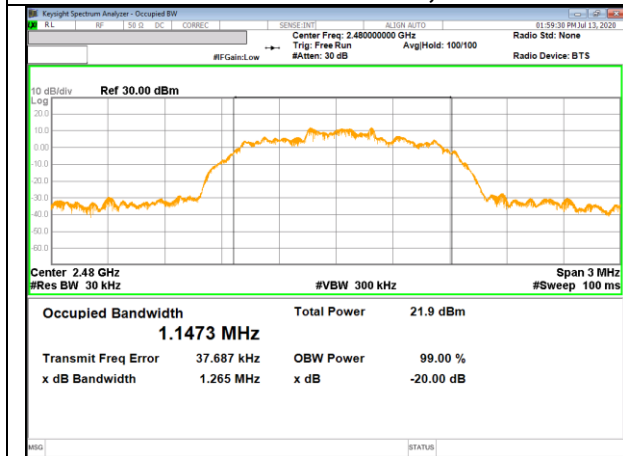
20 dB bandwidth / Antenna 2, 0 CHANNEL



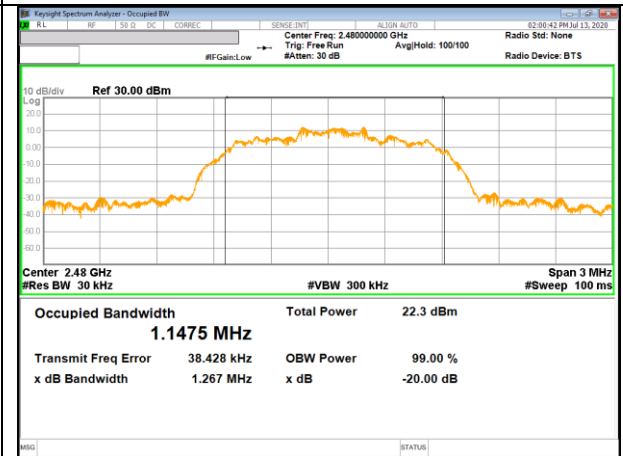
20 dB bandwidth / Antenna 1, 39 CHANNEL



20 dB bandwidth / Antenna 2, 39 CHANNEL



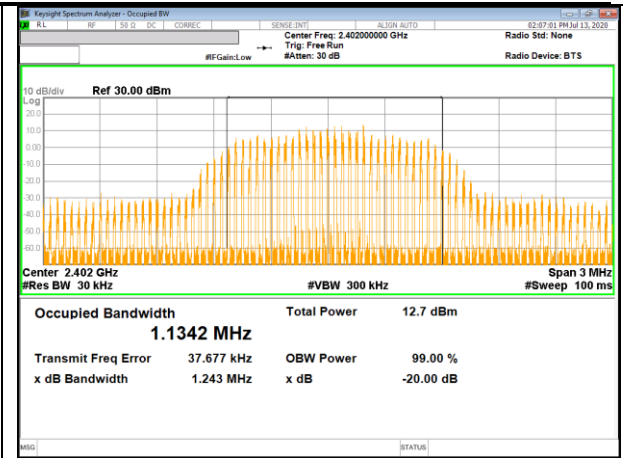
20 dB bandwidth / Antenna 1, 78 CHANNEL



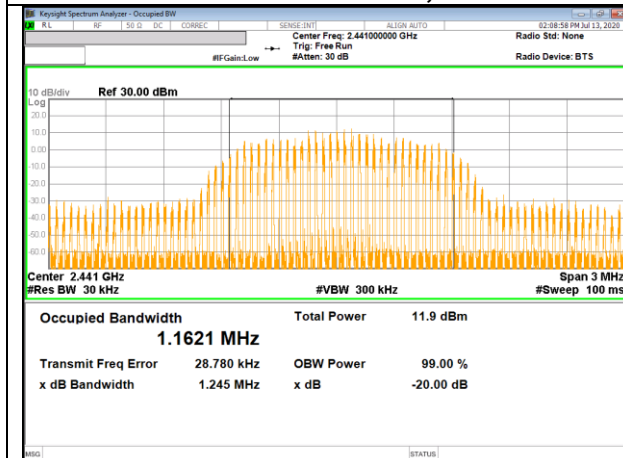
20 dB bandwidth / Antenna 2, 78 CHANNEL



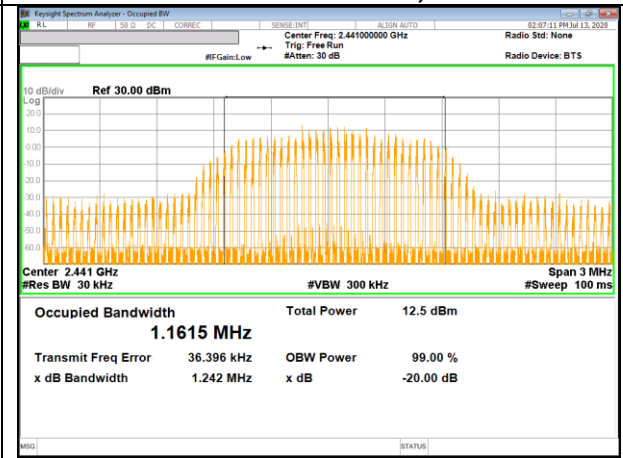
99% bandwidth / Antenna 1, 0 CHANNEL



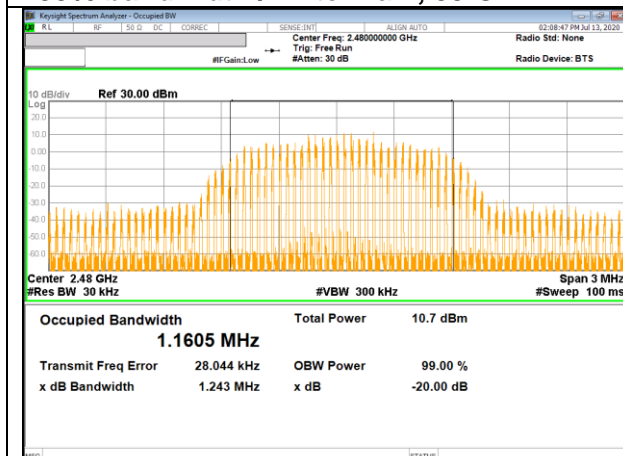
99% bandwidth / Antenna 2, 0 CHANNEL



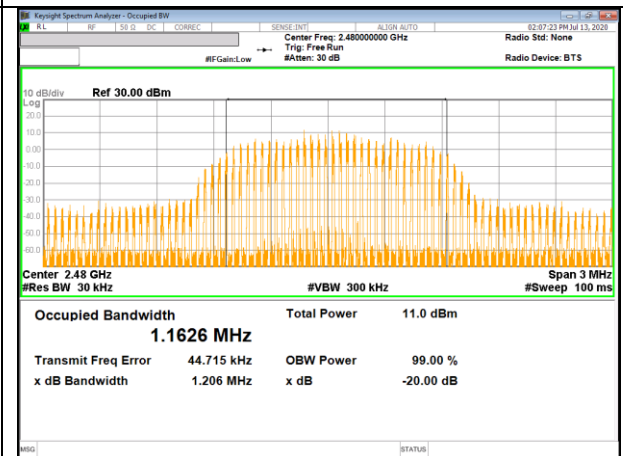
99% bandwidth / Antenna 1, 39 CHANNEL



99% bandwidth / Antenna 2, 39 CHANNEL



99% bandwidth / Antenna 1, 78 CHANNEL



99% bandwidth / Antenna 2, 78 CHANNEL

9.3. 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 hopping channel, whichever is greater.

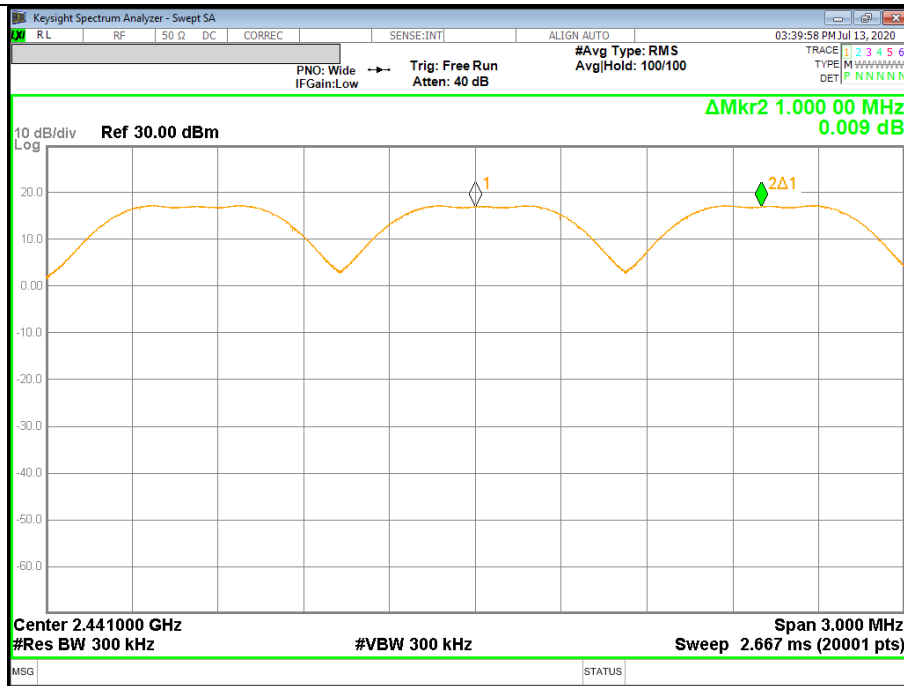
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

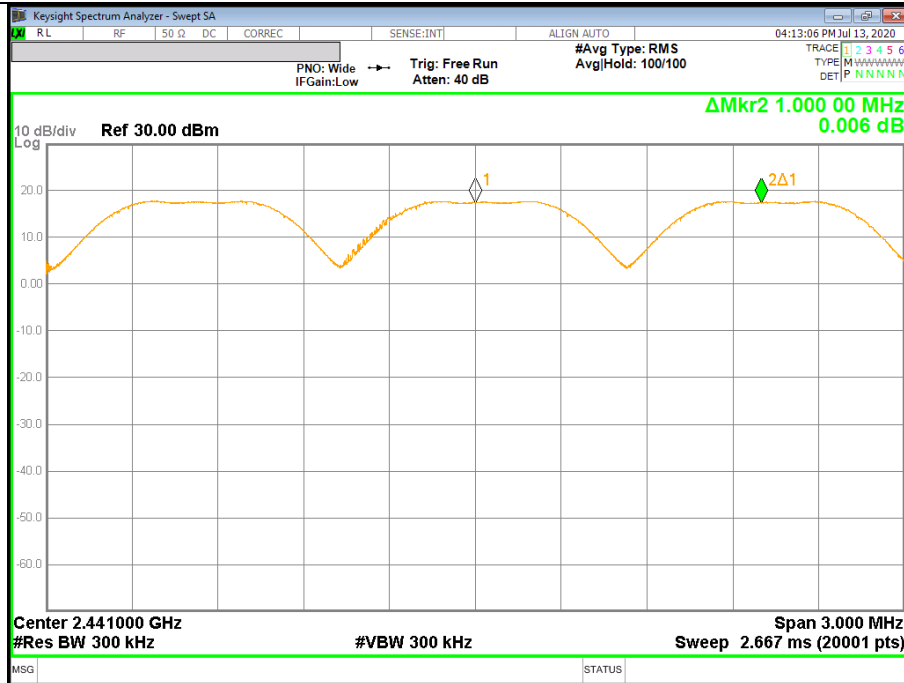
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

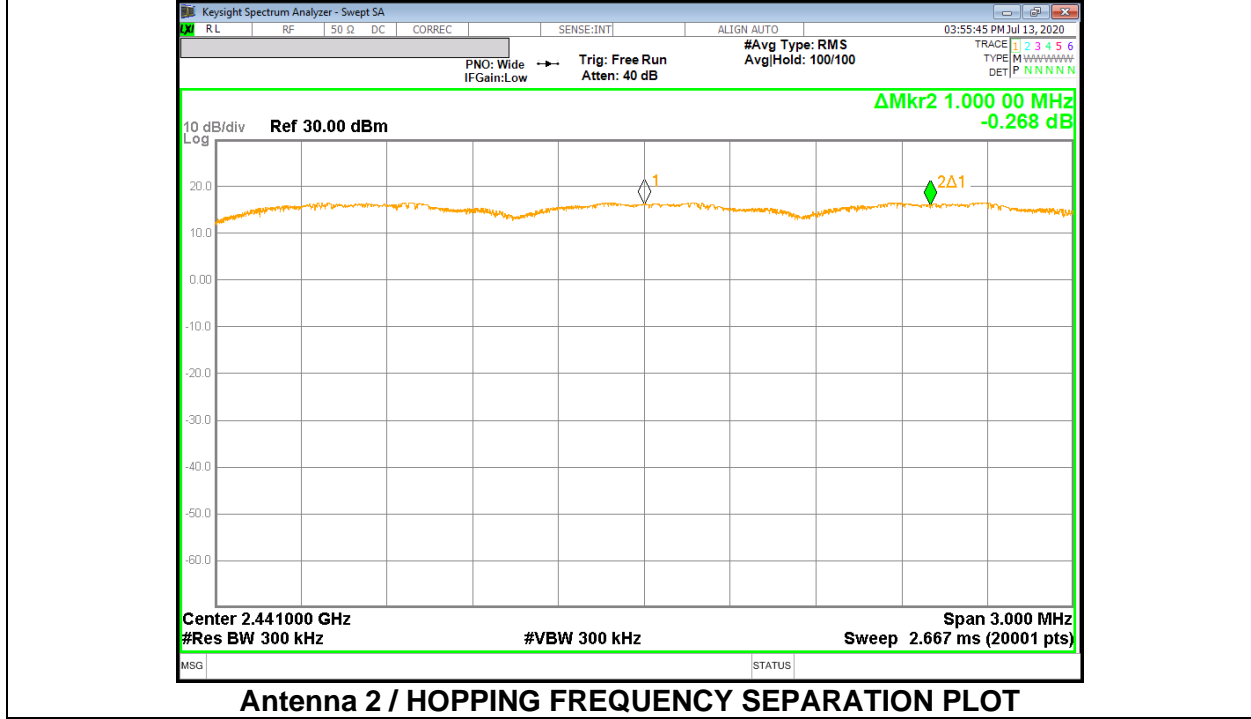
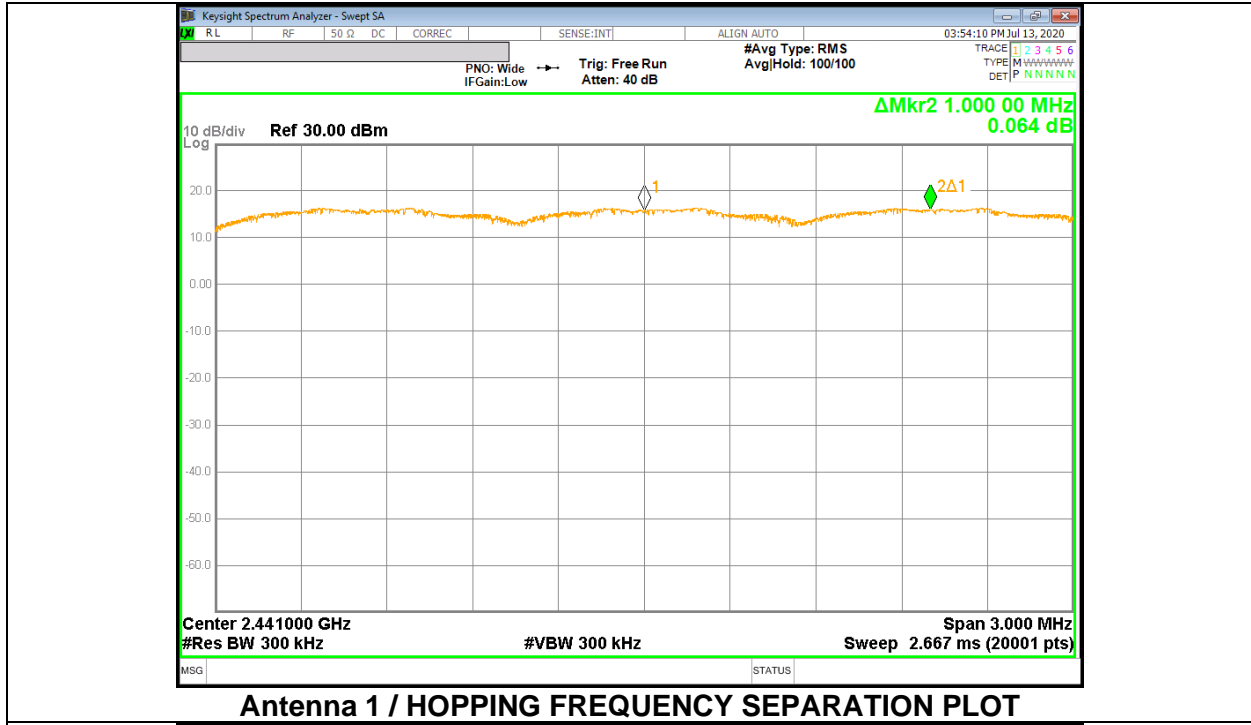


Antenna 1 / HOPPING FREQUENCY SEPARATION PLOT



Antenna 2 / HOPPING FREQUENCY SEPARATION PLOT

9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



9.4. 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.

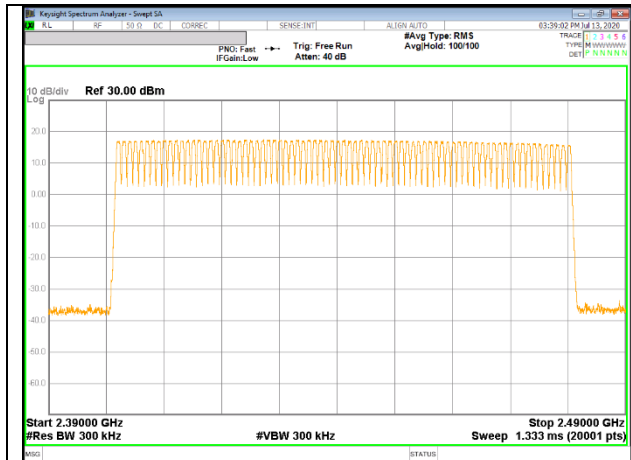
TEST PROCEDURE

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.

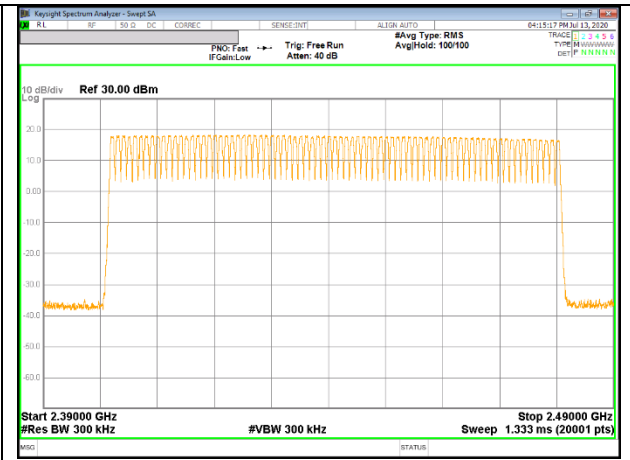
RESULTS

Normal Mode: All Channels Observed

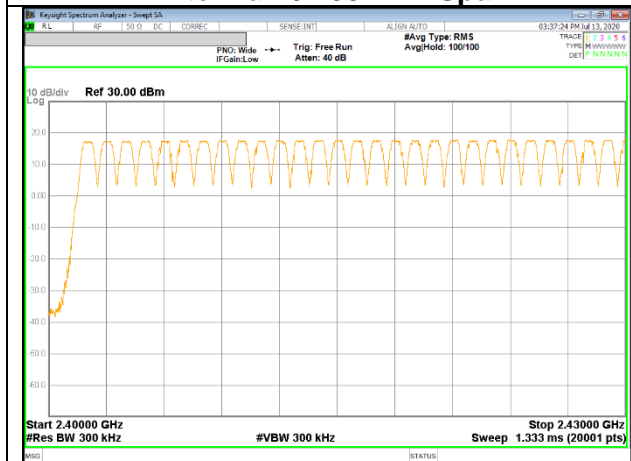
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



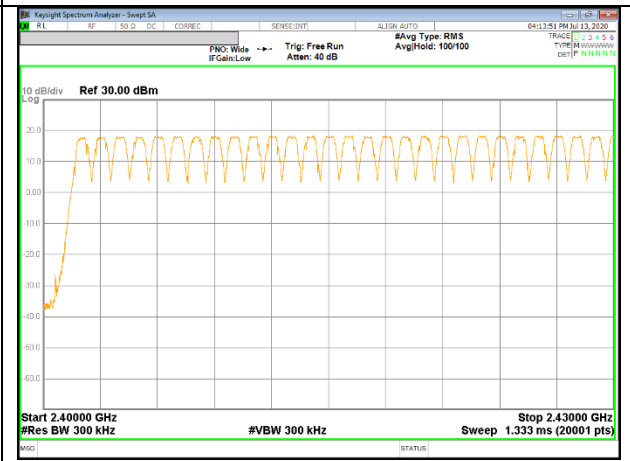
Antenna 1 / 100 MHz Span



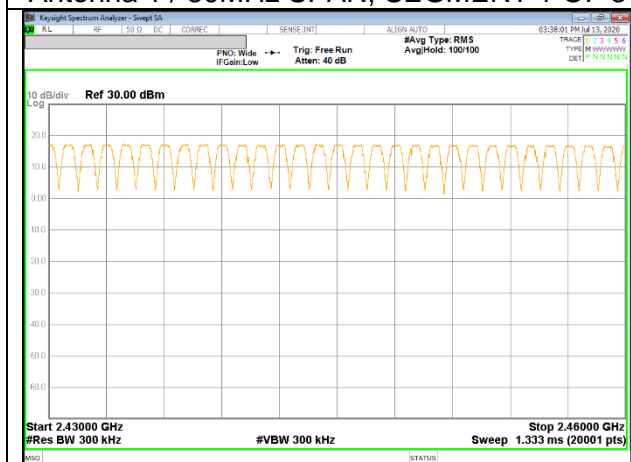
Antenna 2 / 100 MHz Span



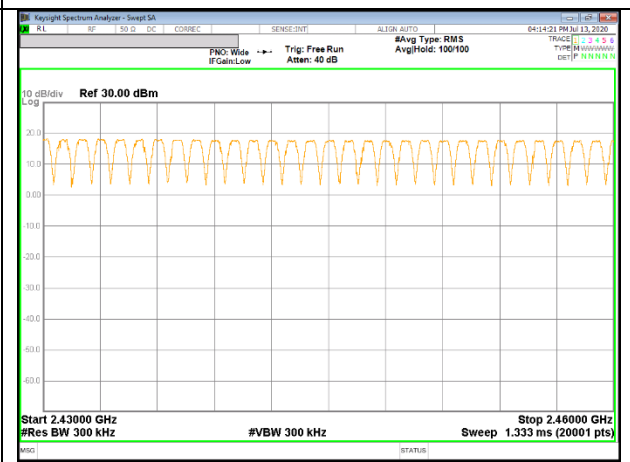
Antenna 1 / 30MHz SPAN, SEGMENT 1 OF 3



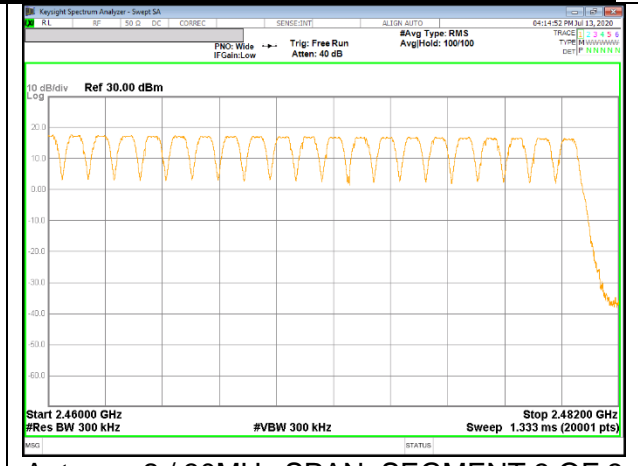
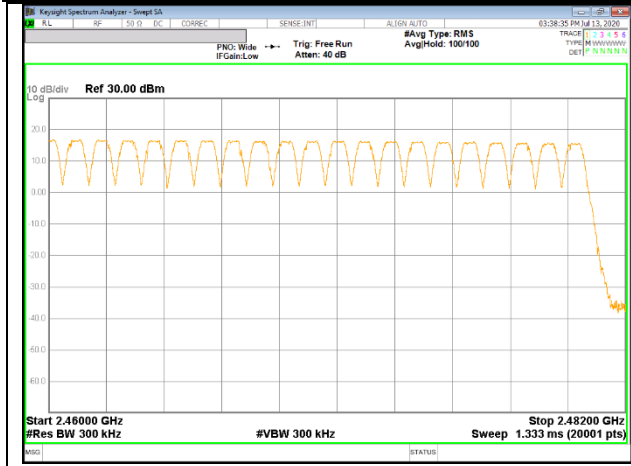
Antenna 2 / 30MHz SPAN, SEGMENT 1 OF 3



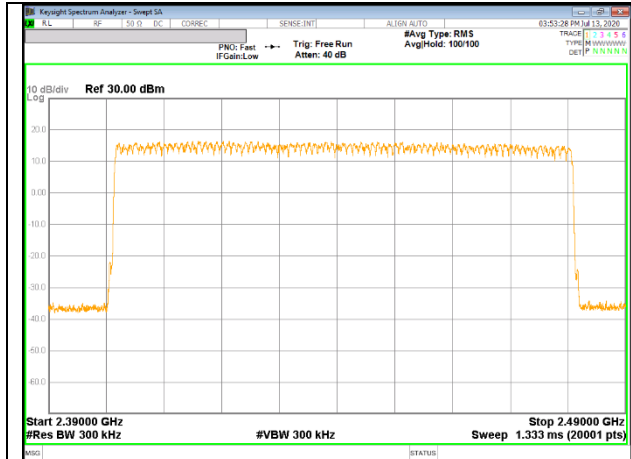
Antenna 1 / 30MHz SPAN, SEGMENT 2 OF 3



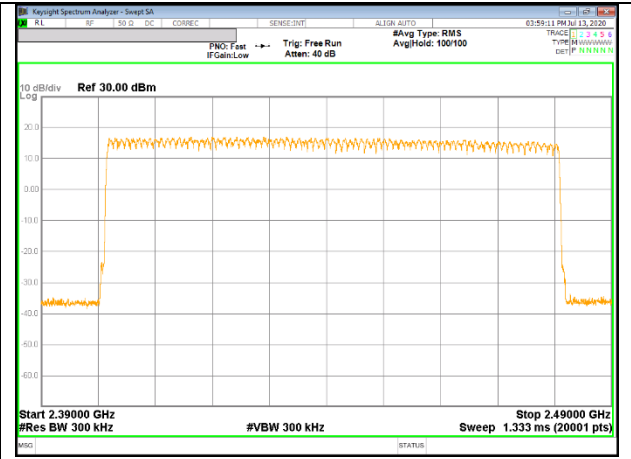
Antenna 2 / 30MHz SPAN, SEGMENT 2 OF 3



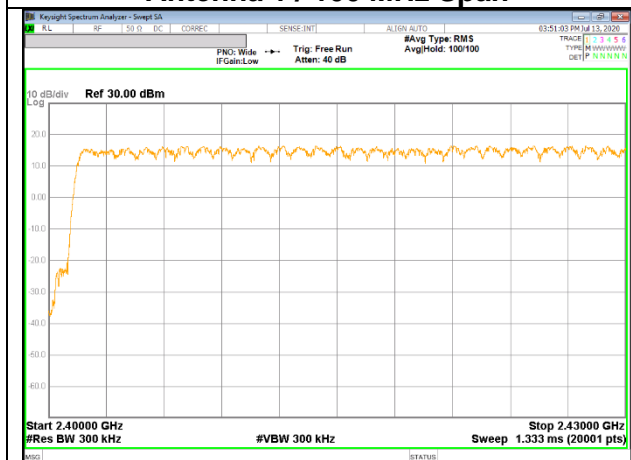
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



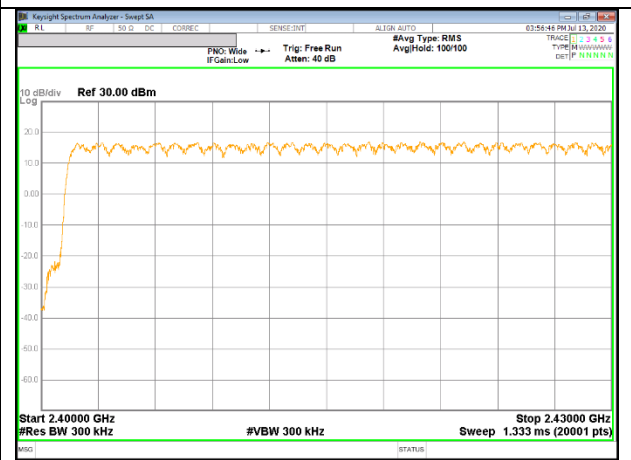
Antenna 1 / 100 MHz Span



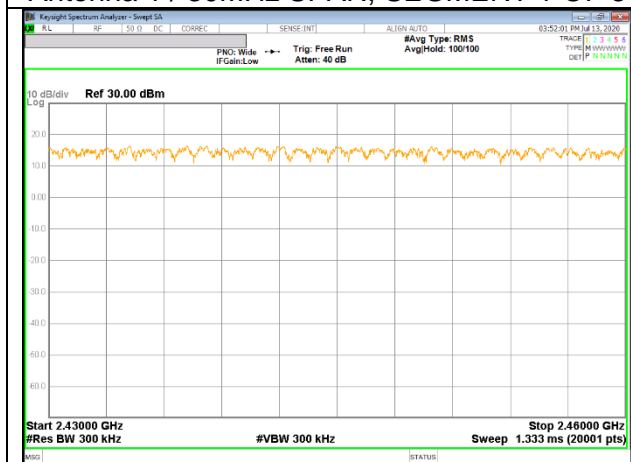
Antenna 2 / 100 MHz Span



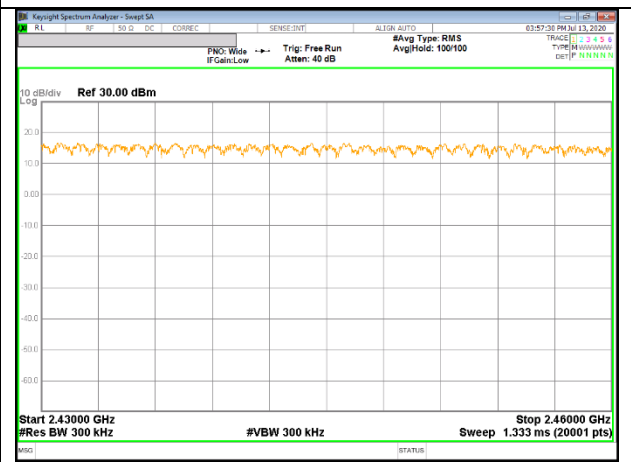
Antenna 1 / 30MHz SPAN, SEGMENT 1 OF 3



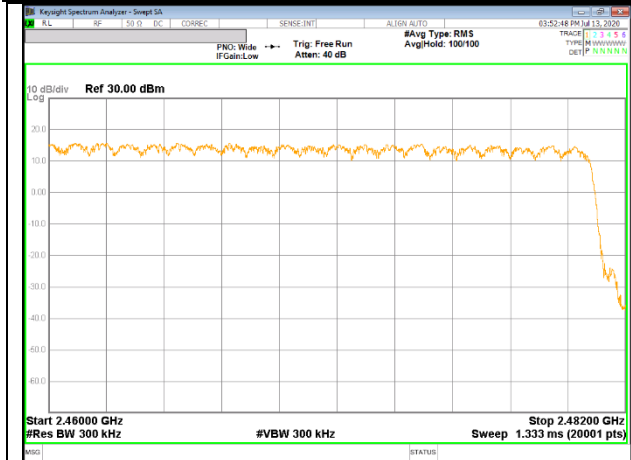
Antenna 2 / 30MHz SPAN, SEGMENT 1 OF 3



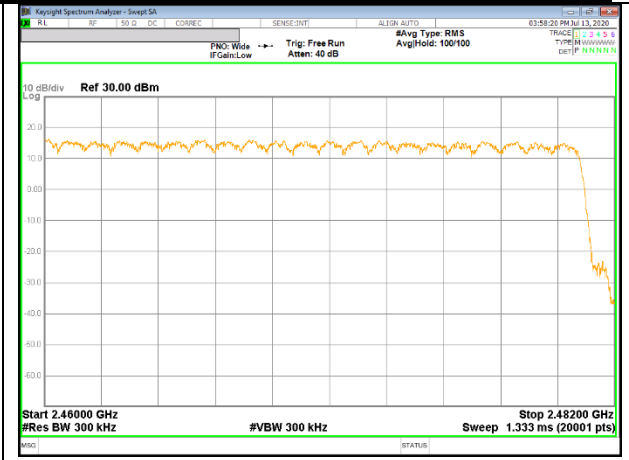
Antenna 1 / 30MHz SPAN, SEGMENT 2 OF 3



Antenna 2 / 30MHz SPAN, SEGMENT 2 OF 3



Antenna 1 / 30MHz SPAN, SEGMENT 3 OF 3



Antenna 2 / 30MHz SPAN, SEGMENT 3 OF 3

9.5. 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 $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

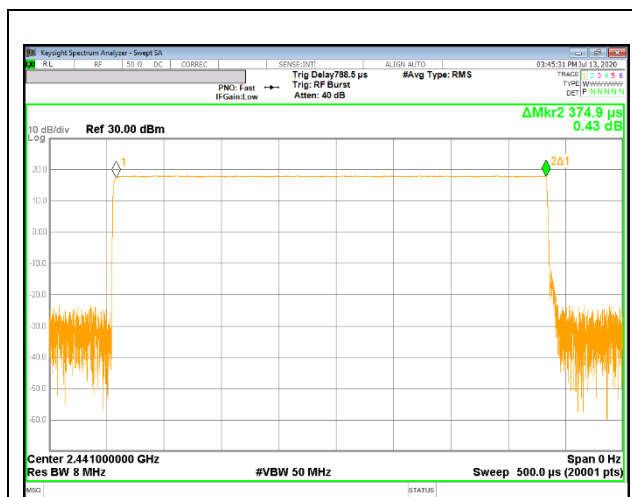
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$.

RESULTS

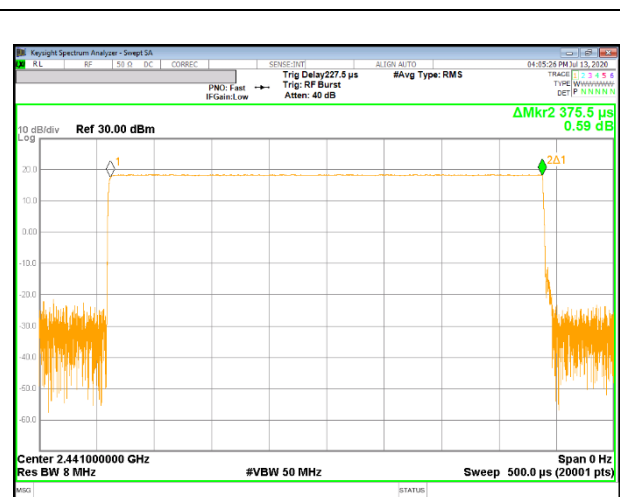
9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Antenna 1 Normal					
DH1	0.375	32	0.119968	0.4	-0.2800
DH3	1.630	16	0.260800	0.4	-0.1392
DH5	2.876	12	0.345120	0.4	-0.0549
GFSK Antenna 1 AFH					
DH1	0.375	8	0.029992	0.4	-0.3700
DH3	1.630	4	0.065200	0.4	-0.3348
DH5	2.876	3	0.086280	0.4	-0.3137

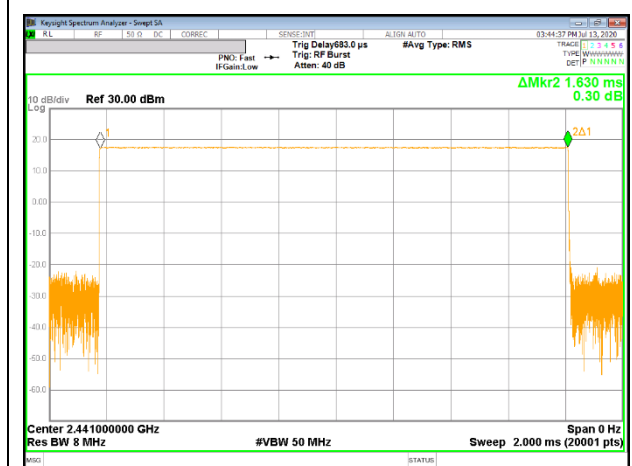
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Antenna 2 Normal					
DH1	0.376	32	0.120160	0.4	-0.2798
DH3	1.629	16	0.260640	0.4	-0.1394
DH5	2.877	12	0.345240	0.4	-0.0548
GFSK Antenna 2 AFH					
DH1	0.376	8	0.030040	0.4	-0.3700
DH3	1.629	4	0.065160	0.4	-0.3348
DH5	2.877	3	0.086310	0.4	-0.3137



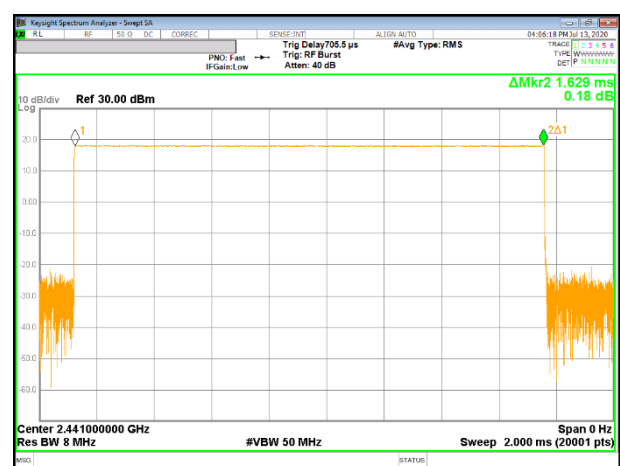
Antenna 1 / PULSE WIDTH – DH1



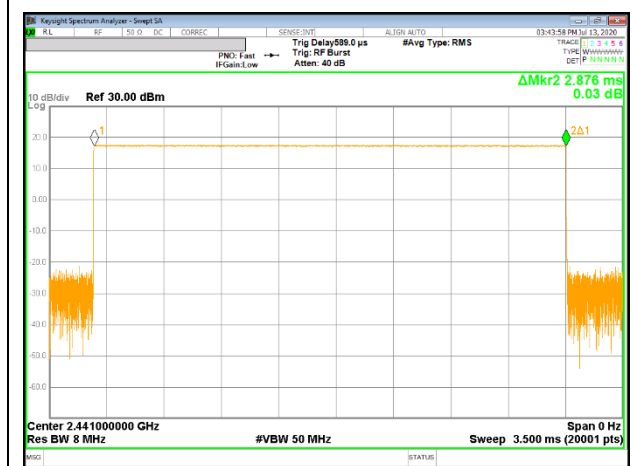
Antenna 2 / PULSE WIDTH – DH1



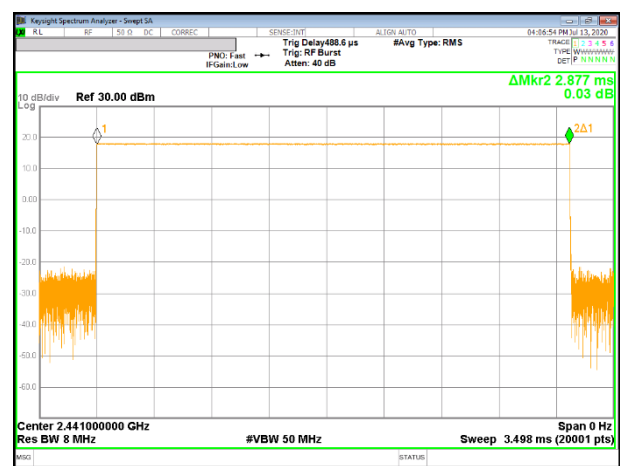
Antenna 1 / PULSE WIDTH – DH3



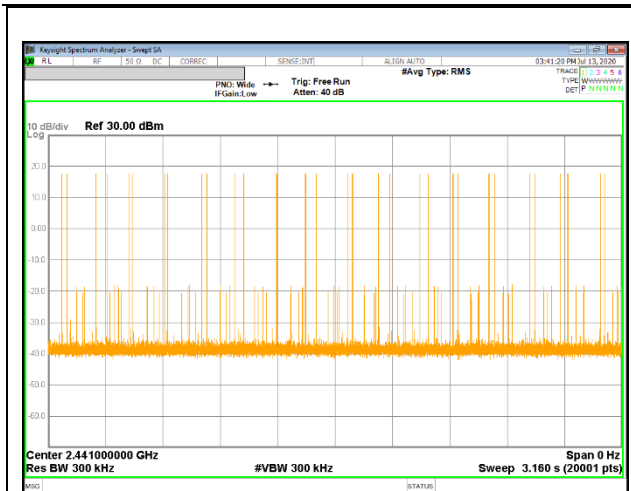
Antenna 2 / PULSE WIDTH – DH3



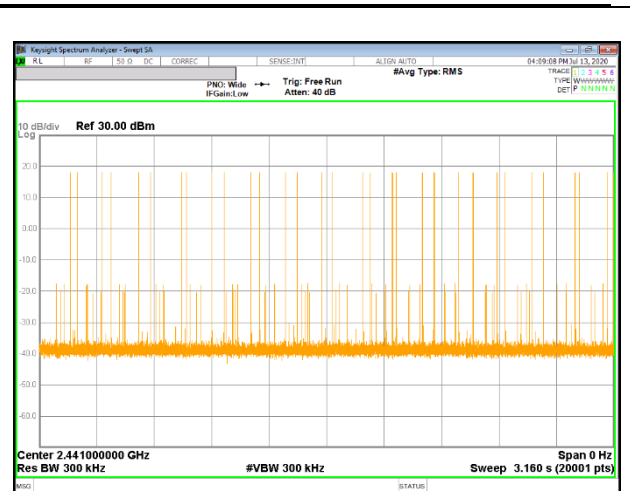
Antenna 1 / PULSE WIDTH – DH5



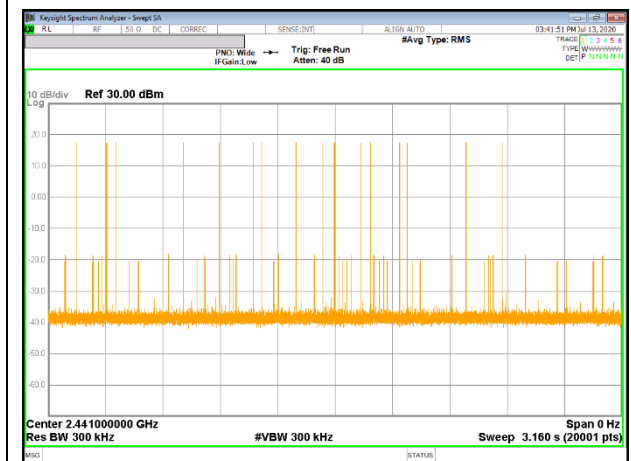
Antenna 2 / PULSE WIDTH – DH5



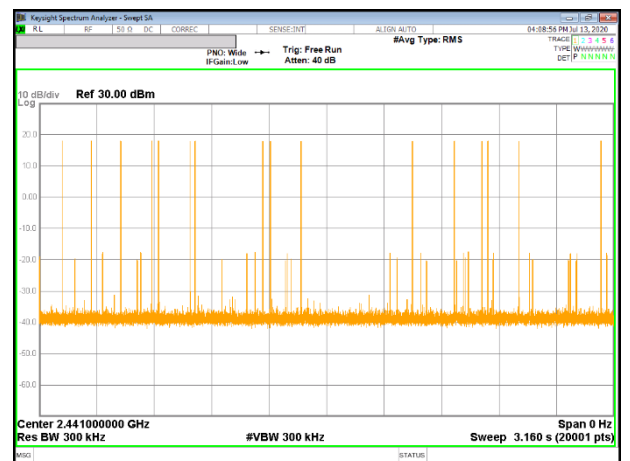
Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



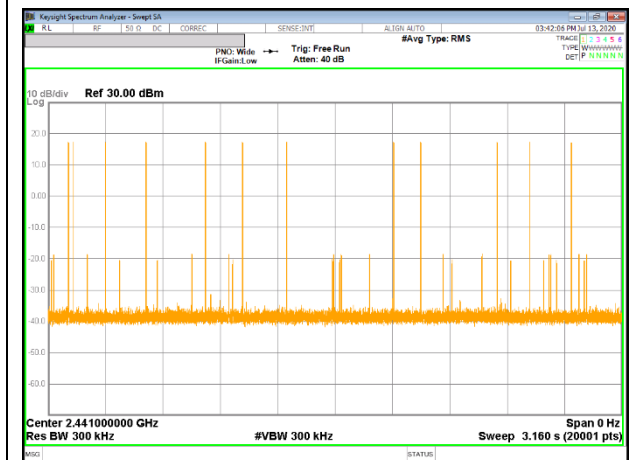
Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



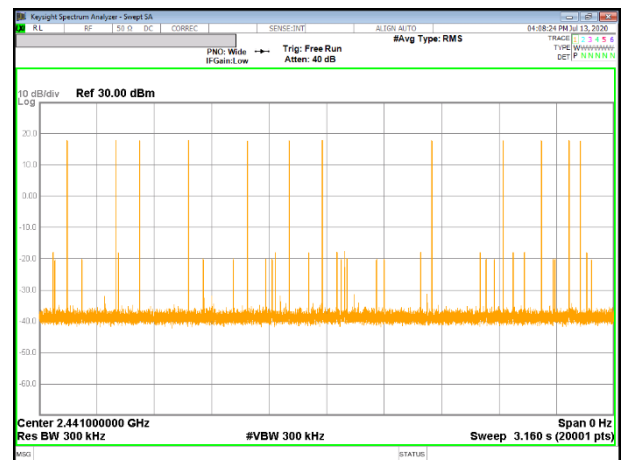
Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

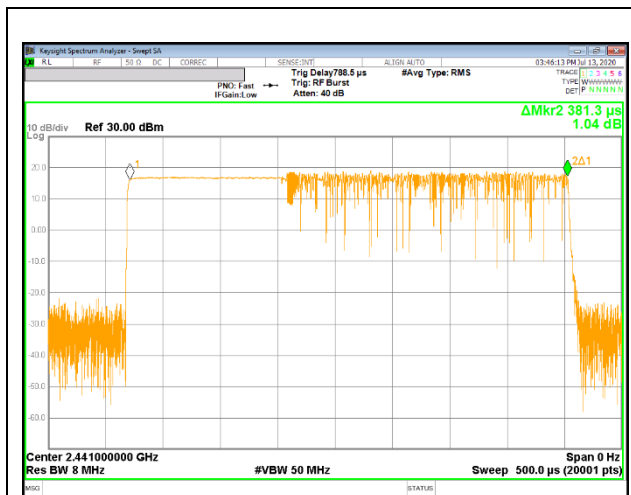


Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

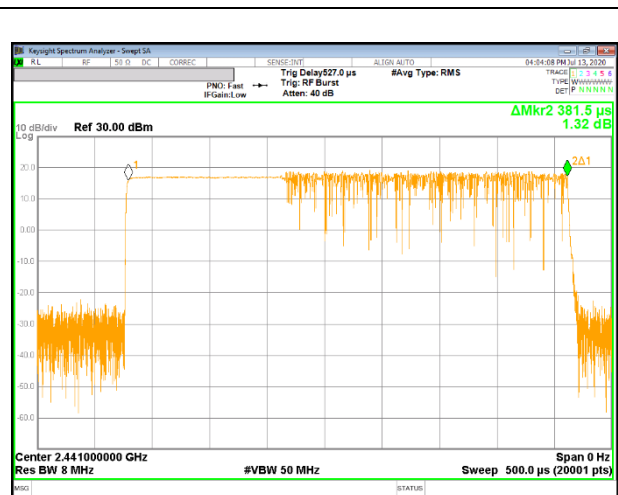
9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Antenna 1 Normal					
DH1	0.381	32	0.122016	0.4	-0.2780
DH3	1.630	16	0.260800	0.4	-0.1392
DH5	2.881	12	0.345720	0.4	-0.0543
8PSK Antenna 1 AFH					
DH1	0.381	8	0.030504	0.4	-0.369496
DH3	1.630	4	0.065200	0.4	-0.3348
DH5	2.881	3	0.086430	0.4	-0.31357

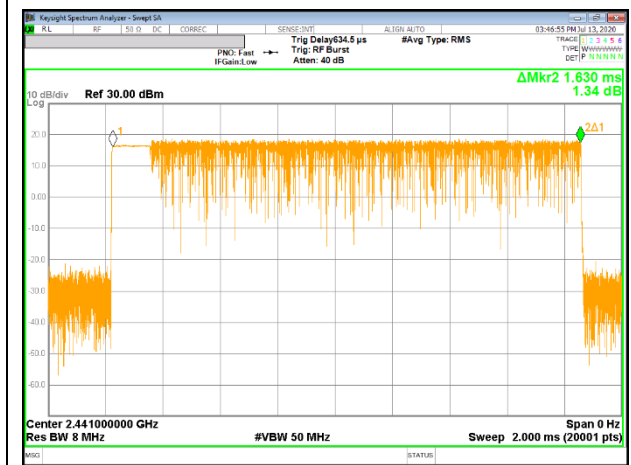
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Antenna 2 Normal					
DH1	0.382	32	0.122080	0.4	-0.2779
DH3	1.627	16	0.260320	0.4	-0.1397
DH5	2.880	12	0.345600	0.4	-0.0544
8PSK Antenna 2 AFH					
DH1	0.382	8	0.030520	0.4	-0.36948
DH3	1.627	4	0.065080	0.4	-0.33492
DH5	2.880	3	0.086400	0.4	-0.3136



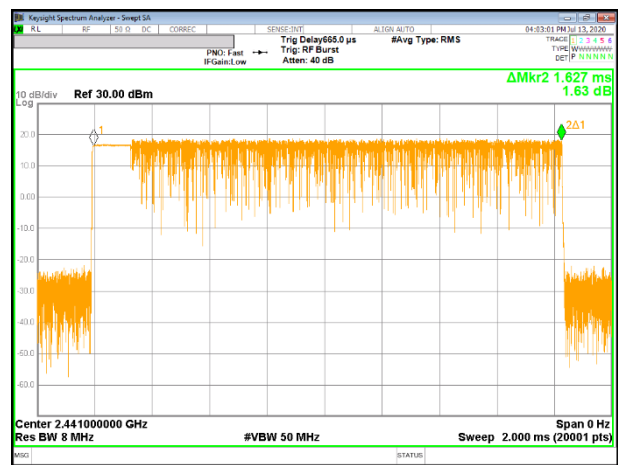
Antenna 1 / PULSE WIDTH - 3-DH1



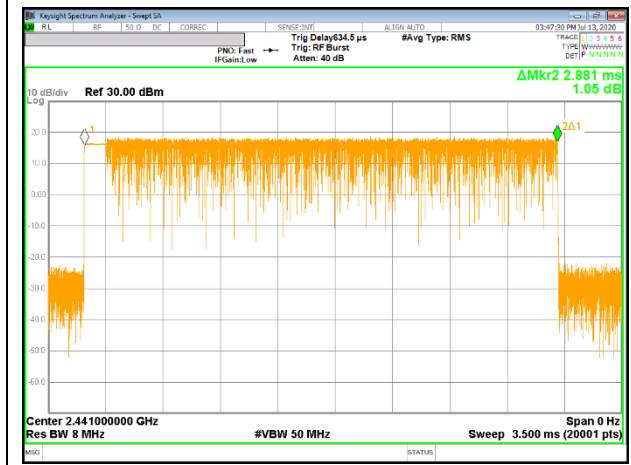
Antenna 2 / PULSE WIDTH - 3-DH1



Antenna 1 / PULSE WIDTH - 3-DH3



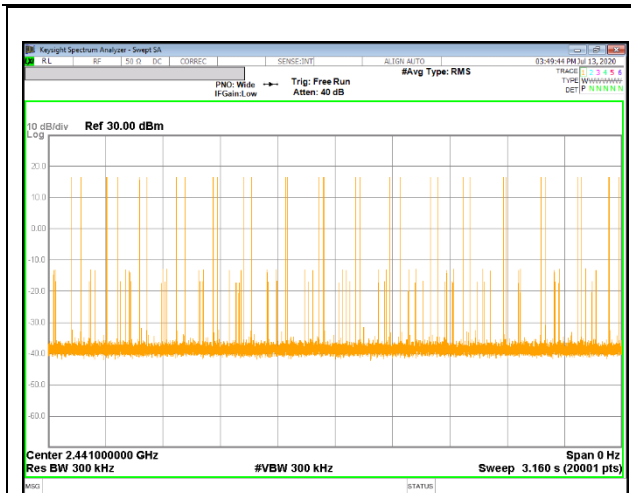
Antenna 2 / PULSE WIDTH - 3-DH3



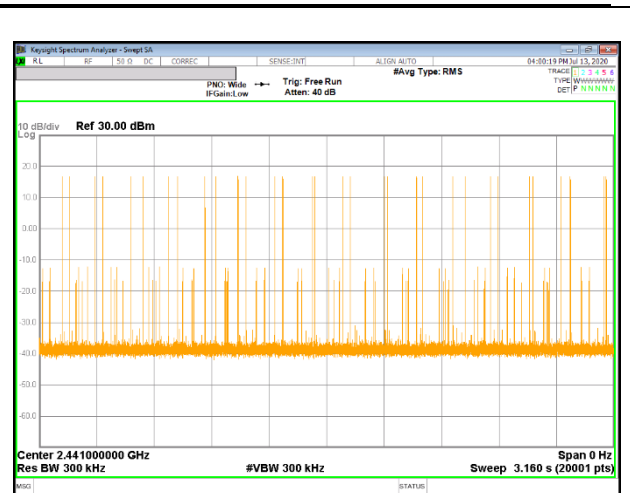
Antenna 1 / PULSE WIDTH - 3-DH5



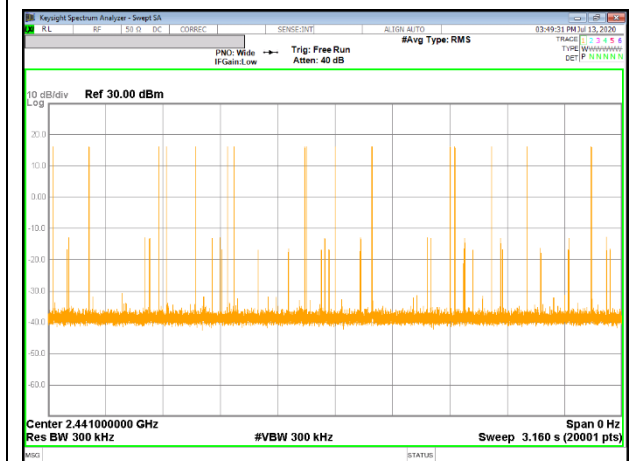
Antenna 2 / PULSE WIDTH - 3-DH5



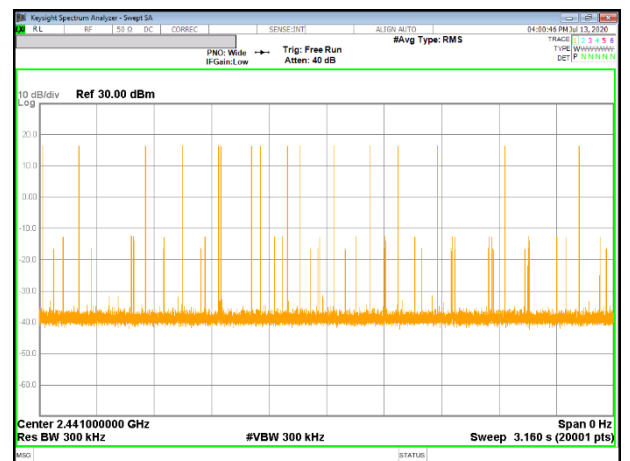
Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH1



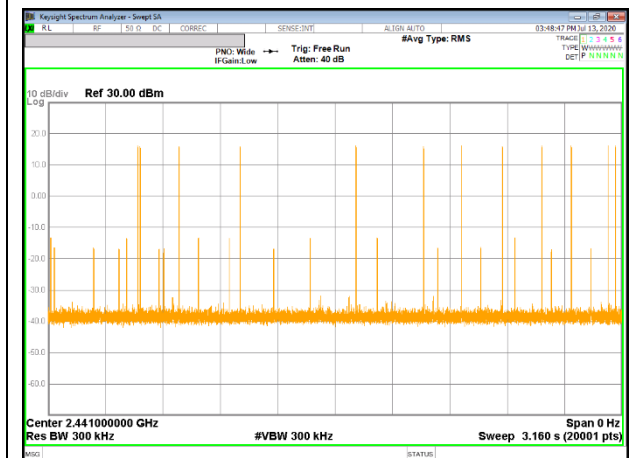
Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH1



Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH3



Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH3



Antenna 1 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH5



Antenna 2 / NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH5

9.6. OUTPUT POWER

LIMITS

§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

9.6.1. BASIC DATA RATE GFSK MODULATION

Chain	Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
Antenna 1	0	2 402	18.833	21.000	-2.167
	39	2 441	19.128	21.000	-1.872
	78	2 480	17.805	21.000	-3.195
Antenna 2	0	2 402	18.738	21.000	-2.262
	39	2 441	18.693	21.000	-2.307
	78	2 480	17.470	21.000	-3.530
Worst			19.128	21.000	-1.872

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

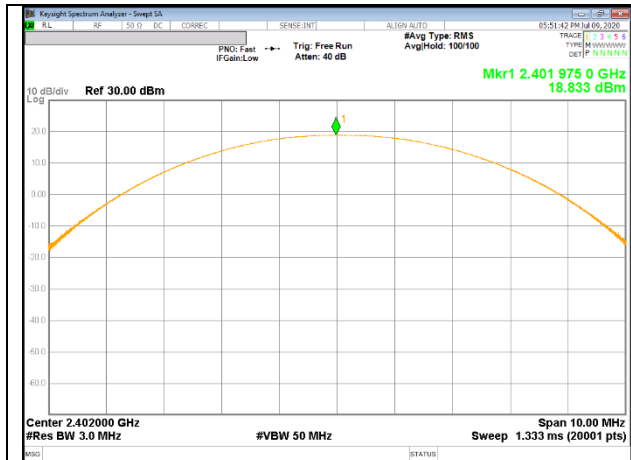
Chain	Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
Antenna 1	0	2 402	19.067	21.000	-1.933
	39	2 441	19.370	21.000	-1.630
	78	2 480	18.058	21.000	-2.942
Antenna 2	0	2 402	18.990	21.000	-2.010
	39	2 441	18.932	21.000	-2.068
	78	2 480	17.752	21.000	-3.248
Worst			19.370	21.000	-1.63

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

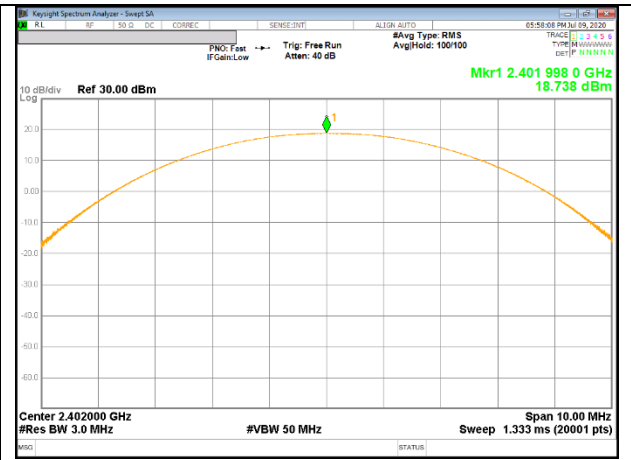
Chain	Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
Antenna 1	0	2 402	19.482	21.000	-1.518
	39	2 441	19.735	21.000	-1.265
	78	2 480	18.478	21.000	-2.522
Antenna 2	0	2 402	19.339	21.000	-1.661
	39	2 441	19.261	21.000	-1.739
	78	2 480	18.209	21.000	-2.791
Worst			19.735	21.000	-1.265

9.6.4. OUTPUT POWER PLOTS

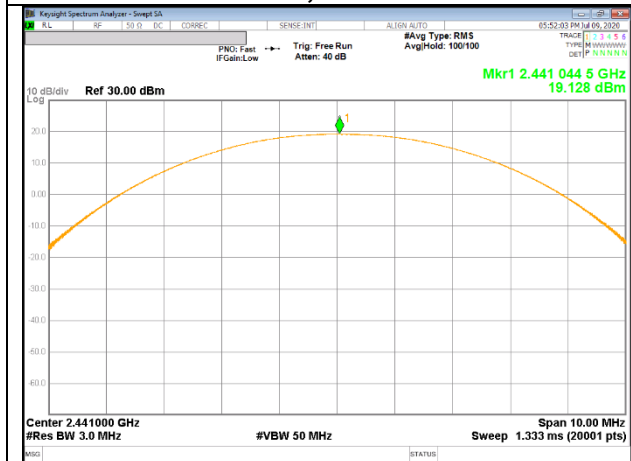
GFSK OUTPUT POWER



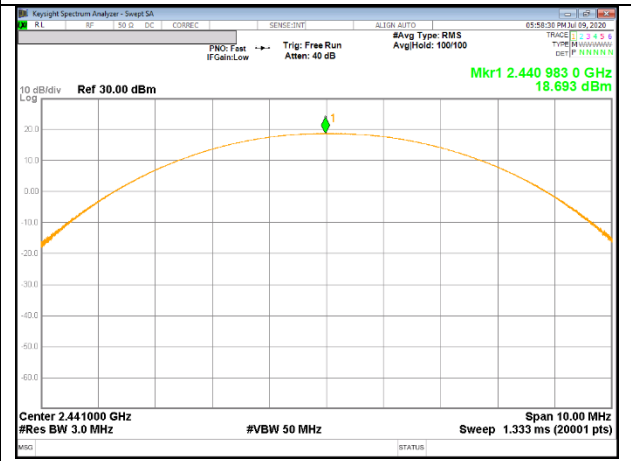
Antenna 1, 0 CHANNEL



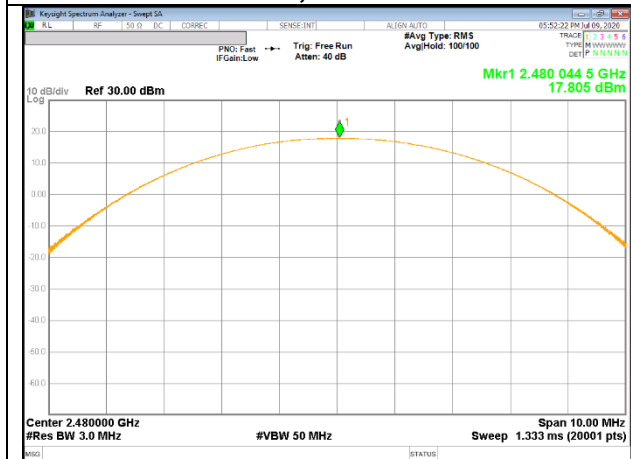
Antenna 2, 0 CHANNEL



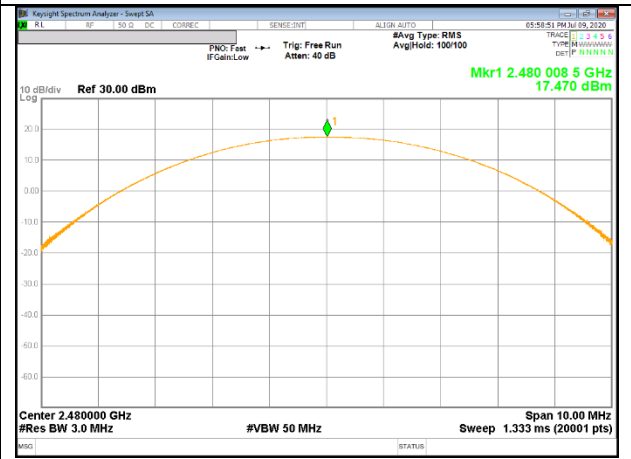
Antenna 1, 39 CHANNEL



Antenna 2, 39 CHANNEL

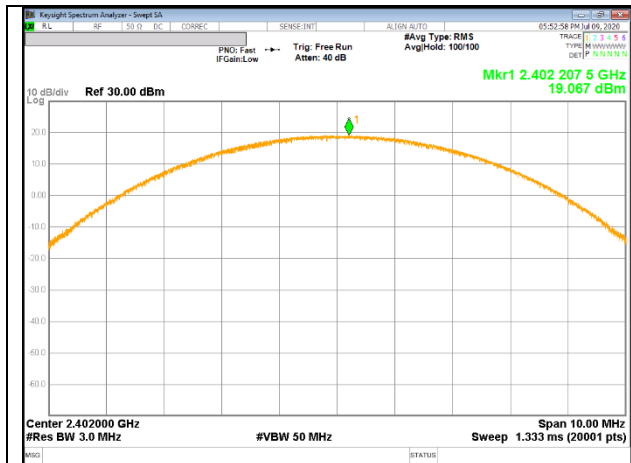


Antenna 1, 78 CHANNEL

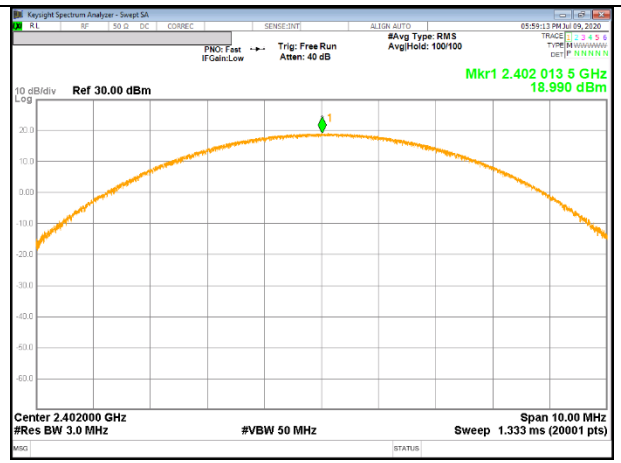


Antenna 2, 78 CHANNEL

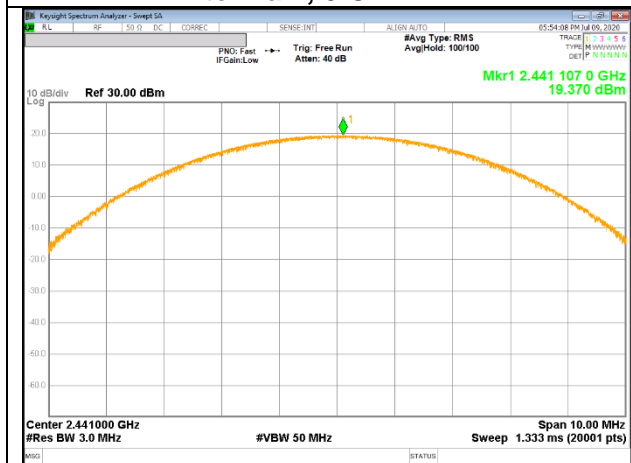
Pi/4-DPSK OUTPUT POWER



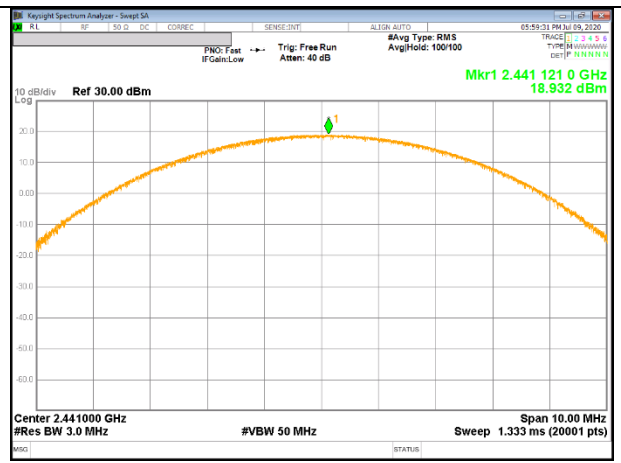
Antenna 1, 0 CHANNEL



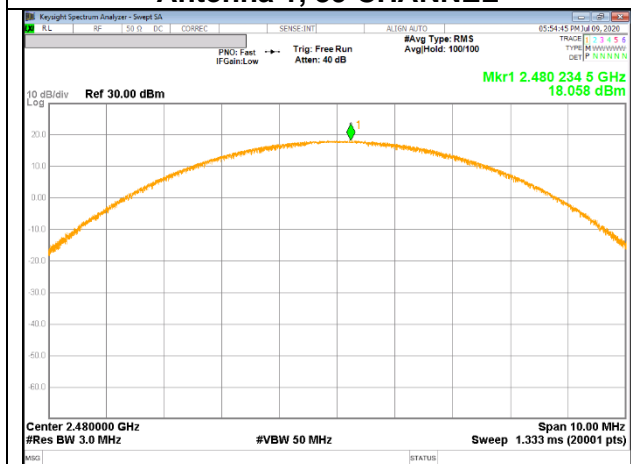
Antenna 2, 0 CHANNEL



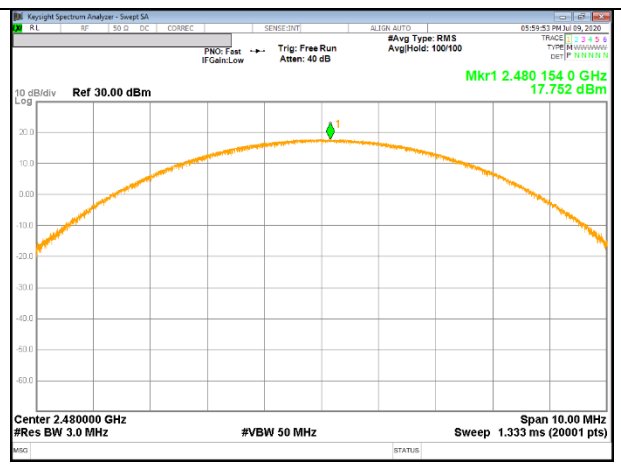
Antenna 1, 39 CHANNEL



Antenna 2, 39 CHANNEL

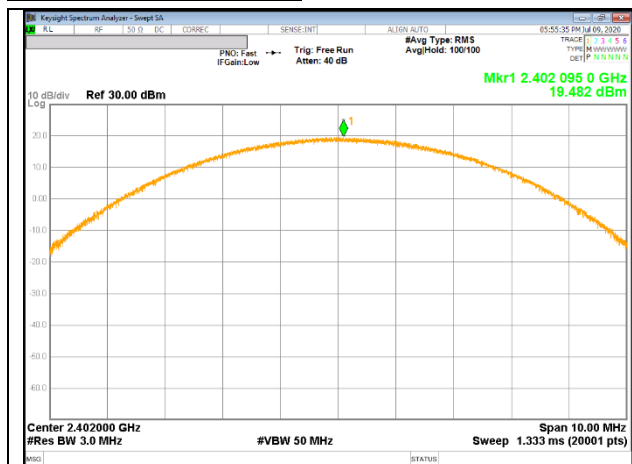


Antenna 1, 78 CHANNEL

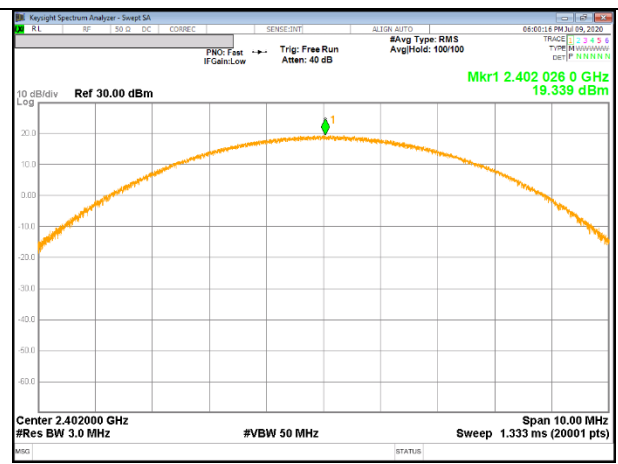


Antenna 2, 78 CHANNEL

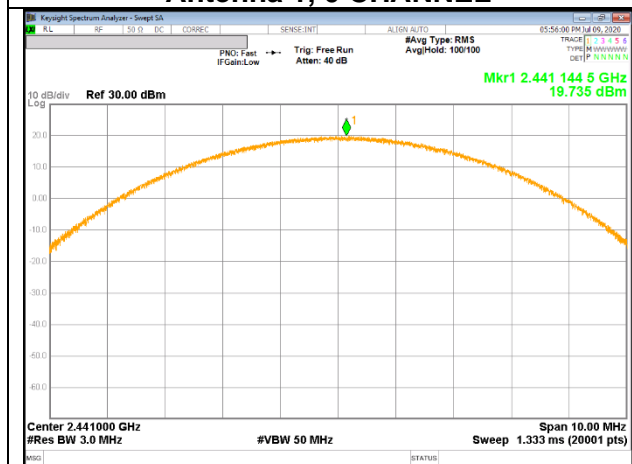
8PSK OUTPUT POWER



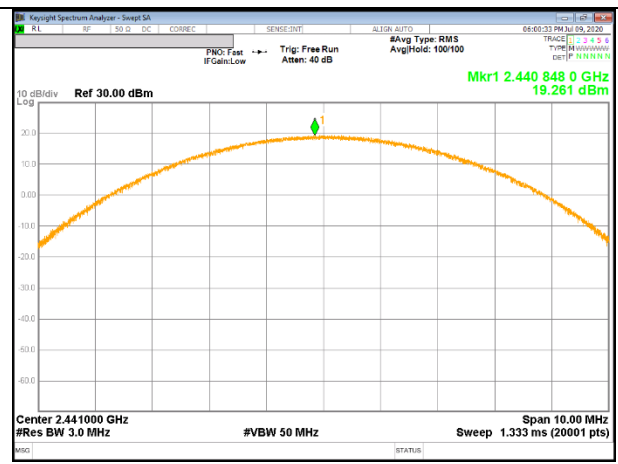
Antenna 1, 0 CHANNEL



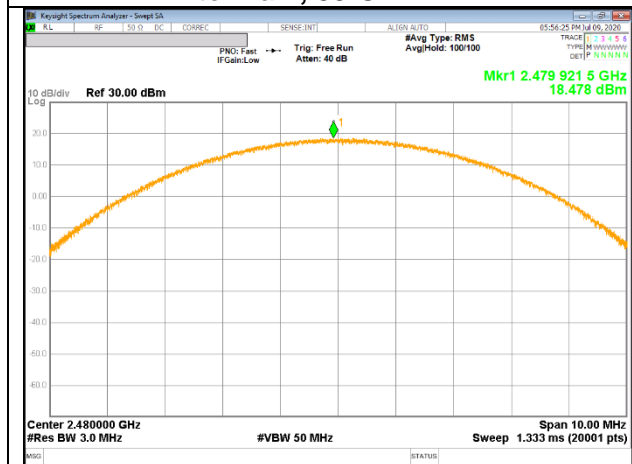
Antenna 2, 0 CHANNEL



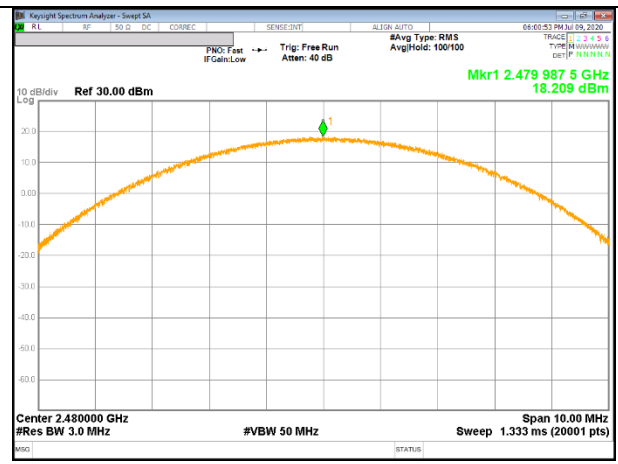
Antenna 1, 39 CHANNEL



Antenna 2, 39 CHANNEL



Antenna 1, 78 CHANNEL



Antenna 2, 78 CHANNEL

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.
 The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

9.7.1. BASIC DATA RATE GFSK MODULATION

Chain	Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Antenna 1	0	2 402	18.532	71.318
	39	2 441	18.819	76.190
	78	2 480	17.486	56.053
Antenna 2	0	2 402	18.437	69.775
	39	2 441	18.375	68.786
	78	2 480	17.156	51.952

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Chain	Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Antenna 1	0	2 402	16.731	47.109
	39	2 441	17.067	50.898
	78	2 480	15.696	37.119
Antenna 2	0	2 402	16.678	46.537
	39	2 441	16.639	46.121
	78	2 480	15.360	34.356

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Chain	Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Antenna 1	0	2 402	16.744	47.250
	39	2 441	17.068	50.910
	78	2 480	15.701	37.162
Antenna 2	0	2 402	16.702	46.795
	39	2 441	16.659	46.334
	78	2 480	15.376	34.483

9.8. 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.

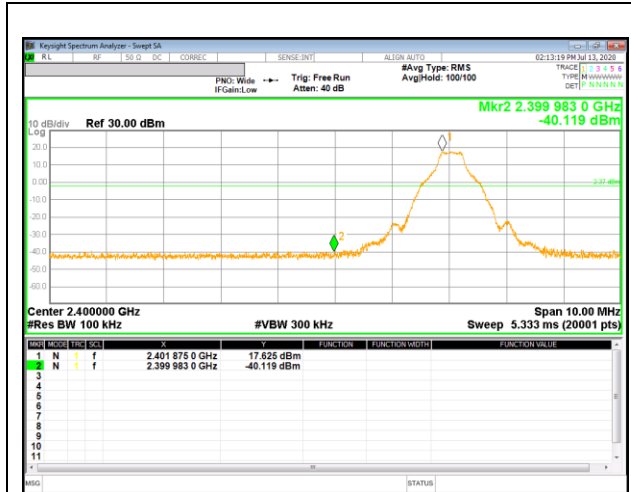
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

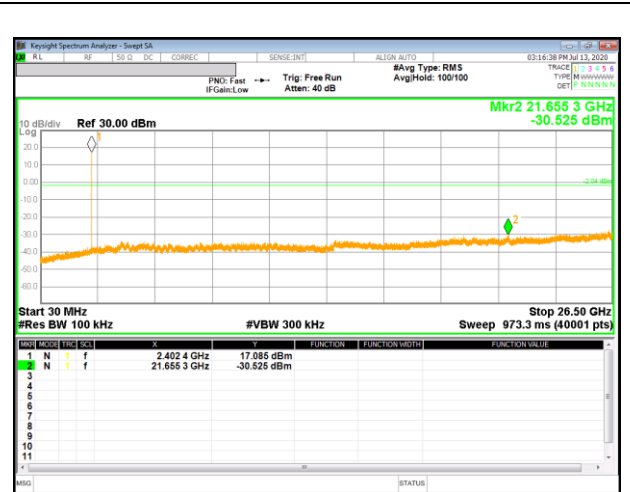
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

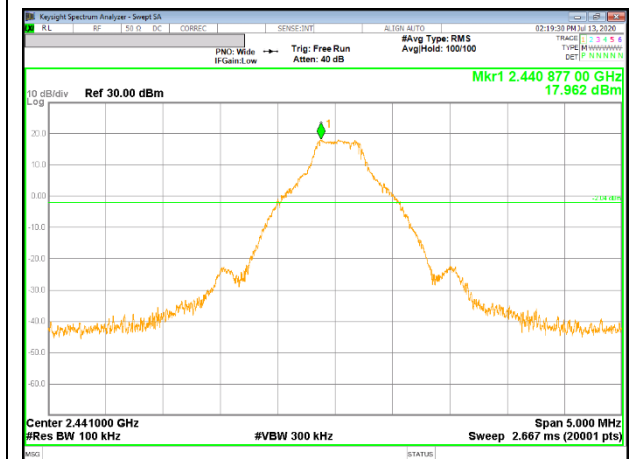
SPURIOUS EMISSIONS, NON-HOPPING(Antenna 1)



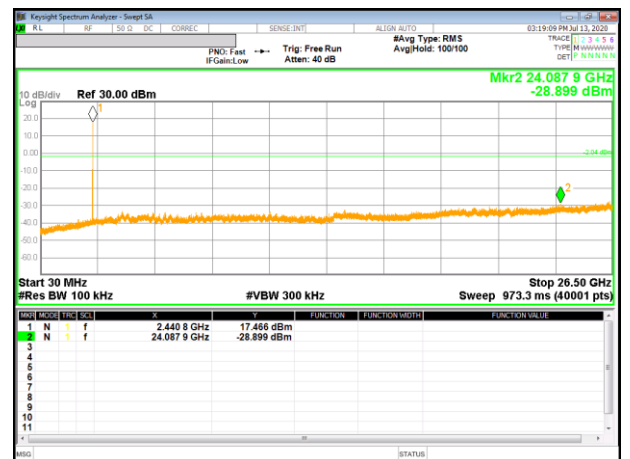
0 CHANNEL BANDEDGE



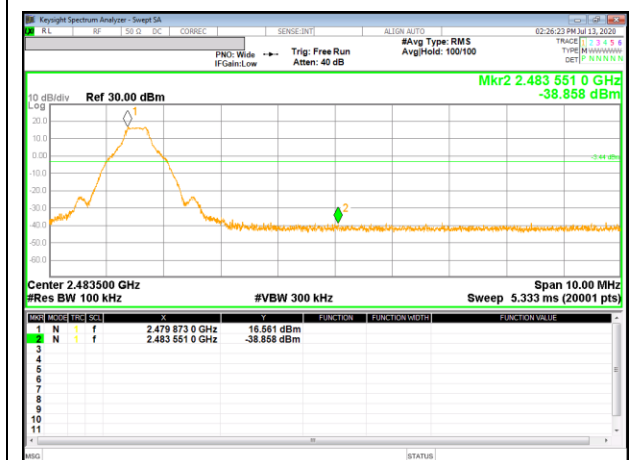
OUT-OF-BAND 0 CHANNEL



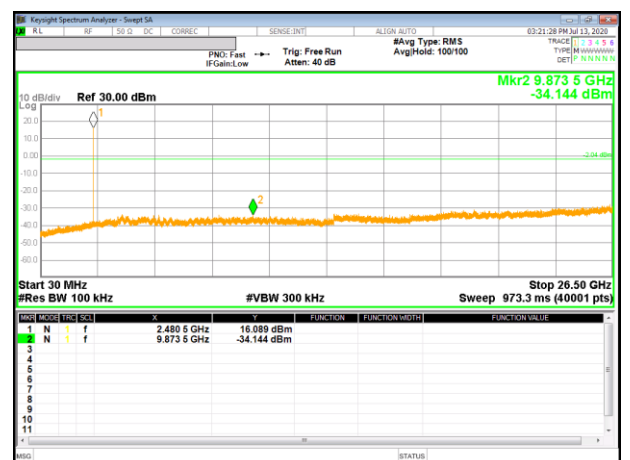
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL



78 CHANNEL BANDEDGE



OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

