



CERTIFICATION TEST REPORT

Report Number. : 4790390048-FR1V1

Applicant : Cresyn Co., Ltd.
5 Gangnam-daero 107-gil, Seocho-gu, Seoul, Korea

Model : TW0060

FCC ID : V2R-TW0060
IC : 10488A-TW0060

EUT Description : True Wireless Earphones

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 Issue 2
INDUSTRY CANADA RSS-GEN Issue 5

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ACCREDITED

Testing Laboratory

TL-637

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Cresyn Co., Ltd.
EUT DESCRIPTION: True Wireless Earphones
MODEL: TW0060
SERIAL NUMBER: Proto type
DATE TESTED: 2022-05-02 ~ 2022-07-07

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
INDUSTRY CANADA RSS-247 Issue 2	Complies
INDUSTRY CANADA RSS-GEN Issue 5	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.

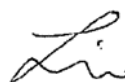
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration 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:



Anthony Kim
Senior Laboratory Engineer
UL Korea, Ltd.

Tested By:



Jaejin Lee
Laboratory Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

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.
5. IC RSS-GEN Issue 5.
6. IC RSS-247 Issue 2.

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 type="checkbox"/>	Chamber 2
<input checked="" type="checkbox"/>	Chamber 3

Used ISED Test Site Reg.(company number): 2324L
CAB Identifier: KR0161

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:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.87 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.58 dB

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

4.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT are Bluetooth Earphones.
 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:

- Left

Frequency range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2402 ~ 2480	Basic GFSK	Peak	10.610	11.51
		Average	10.446	11.08
	Enhanced Pi/4-DQPSK	Peak	10.610	11.51
		Average	8.724	7.45
	Enhanced 8DPSK	Peak	10.720	11.80
		Average	8.808	7.60

- Right

Frequency range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2402 ~ 2480	Basic GFSK	Peak	11.400	13.80
		Average	11.261	13.37
	Enhanced Pi/4-DQPSK	Peak	11.390	13.77
		Average	9.213	8.34
	Enhanced 8DPSK	Peak	11.510	14.16
		Average	9.303	8.52

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.**

Left earphone,
The radio utilizes an internal antennas, with maximum gain of -2.07 dBi.

Right earphone,
The radio utilizes an internal antennas, with maximum gain of -1.75 dBi.

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.

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

GFSK, Pi/4-DQPSK, 8DPSK average Power are all investigated, The GFSK & 8DPSK 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
Notebook	SAMSUNG	NT550EBZ	0YM791HN300026T	N/A
Adaptor (for Notebook)	LITE-ON TECHNOLOGY CHANGZHOU CO., LTD	PA-1400-96	AA-PA2N40S	N/A
Test Jig Board	CRESYN	N/A	N/A	N/A

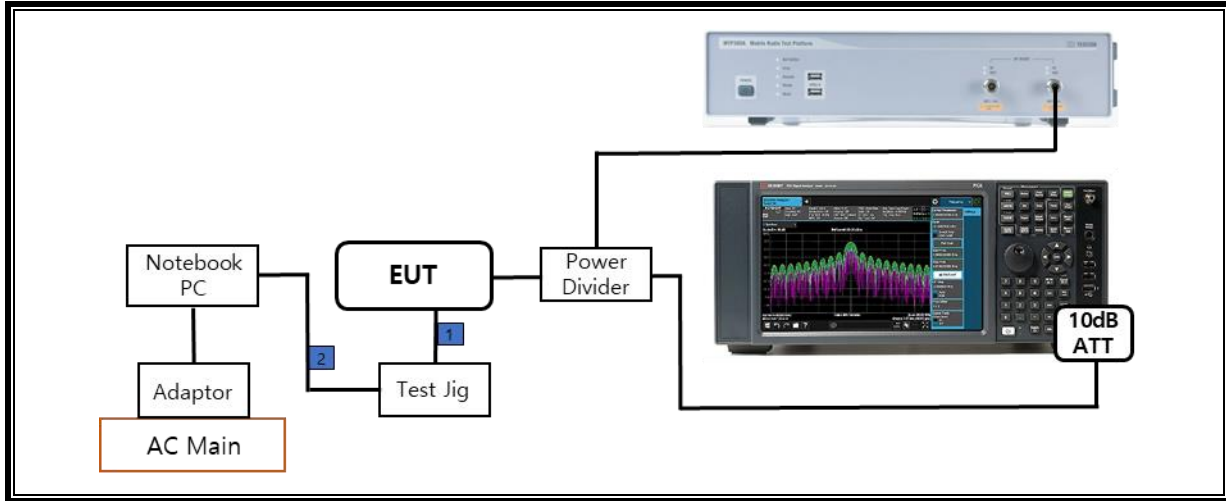
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power & Data	2	4 Pin to USB C	Unshielded	0.25 m	N/A
2	DC Power & Data	1	USB A to C	Shielded	1.8 m	N/A

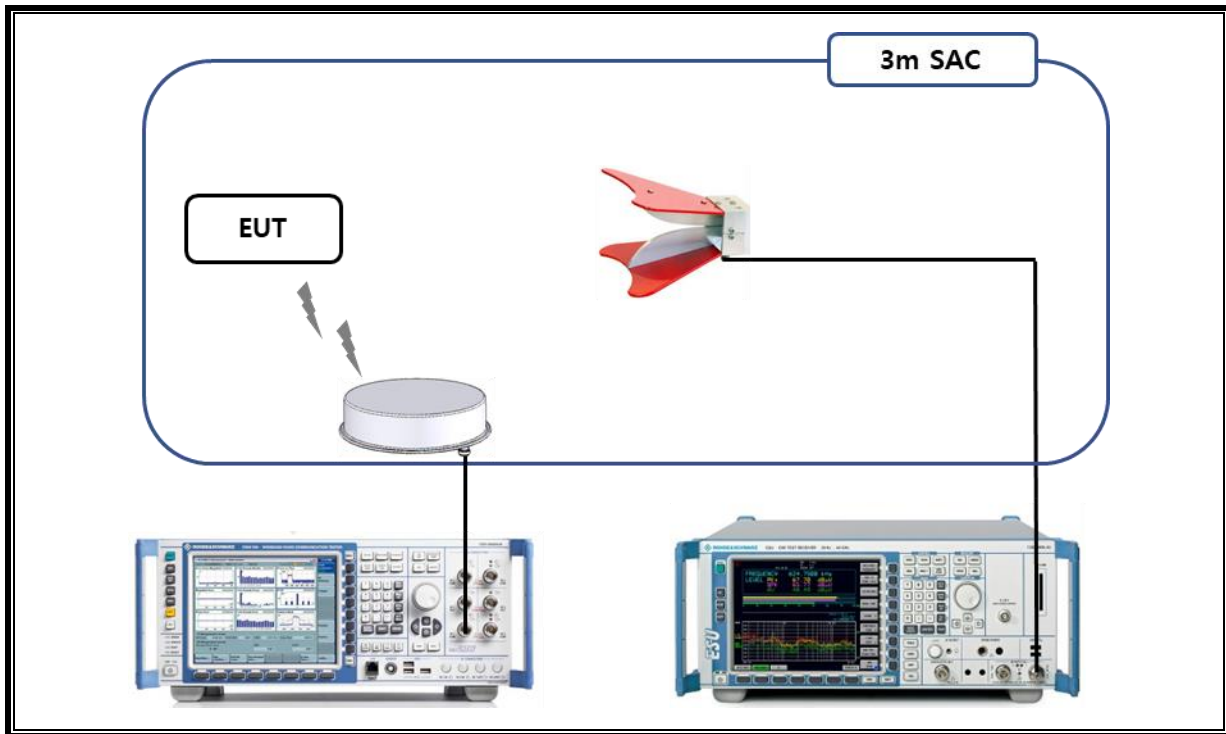
TEST SETUP

The EUT is a unit with test jig board during the tests.
 It was controlled by entering the test mode using a Notebook and Bluetooth call simulator.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. MEASUREMENT METHOD

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

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

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

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

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

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

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

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

7. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022-08-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022-08-13
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022-07-27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022-08-15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022-07-27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022-08-15
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2022-08-04
Preamplifier	ETS	3116C-PA	00168841	2022-08-04
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022-08-02
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY57143652	2023-01-11
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY57143717	2023-04-15
Power Sensor	R&S	NRP-Z91	102681	2022-08-04
Bluetooth Tester	TESCOM	MTP300A	MTP300A010266	2022-08-06
Power Divider	WEINSCHEL	1580	SQ373	2022-08-04
10dB ATTENUATOR	MINI-CIRCUITS	BW-K10-2W44+	2117	2022-10-22
Attenuator	PASTERNAK	PE7087-10	A001	2022-08-03
Attenuator	PASTERNAK	PE7087-10	A008	2022-08-03
Attenuator	PASTERNAK	PE7004-10	2	2022-08-02
Attenuator	PASTERNAK	PE7087-10	A009	2022-08-03
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022-08-02
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	019	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	020	2022-08-02
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	

8. TEST RESULTS SUMMARY

FCC Part Section	IC Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247 (d)	RSS-247(5.5)	Band Edge / Conducted Spurious Emission	-20dBc	Conducted	PASS
15.247 (b)(1)	RSS-247, (5.4)(b)	TX conducted output power	<21dBm		PASS
15.247 (a)(1)	RSS-247, (5.1)(b)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		PASS
15.247 (a)(1)(iii)	RSS-247, (5.1)(d)	Number of Hopping channels	More than 15 non-overlapping channels		PASS
15.247 (a)(1)(iii)	RSS-247, (5.1)(d)	Avg Time of Occupancy	< 0.4sec		PASS
15.205, 15.209	RSS-GEN (8.9), (8.10)	Radiated Spurious Emission	< 54dBuV/m	Radiated	PASS
15.207 (a)	RSS-GEN (8.8)	AC Power Line Conducted Emission	Section 11	Power Line Conducted	N/P

Note. The AC power line test was not performed because the EUT does not operate Bluetooth mode while charging.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

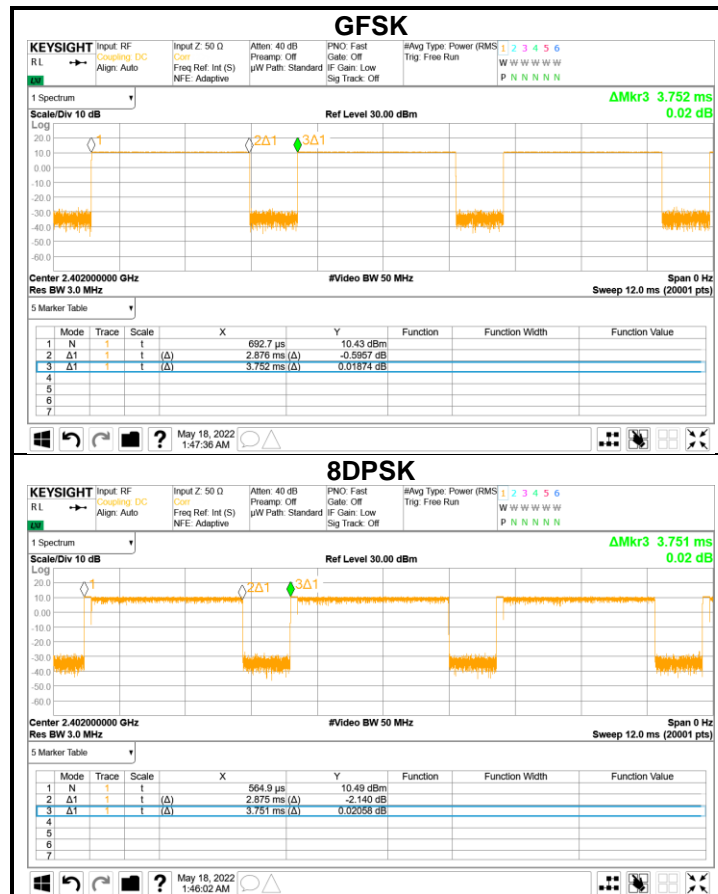
PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

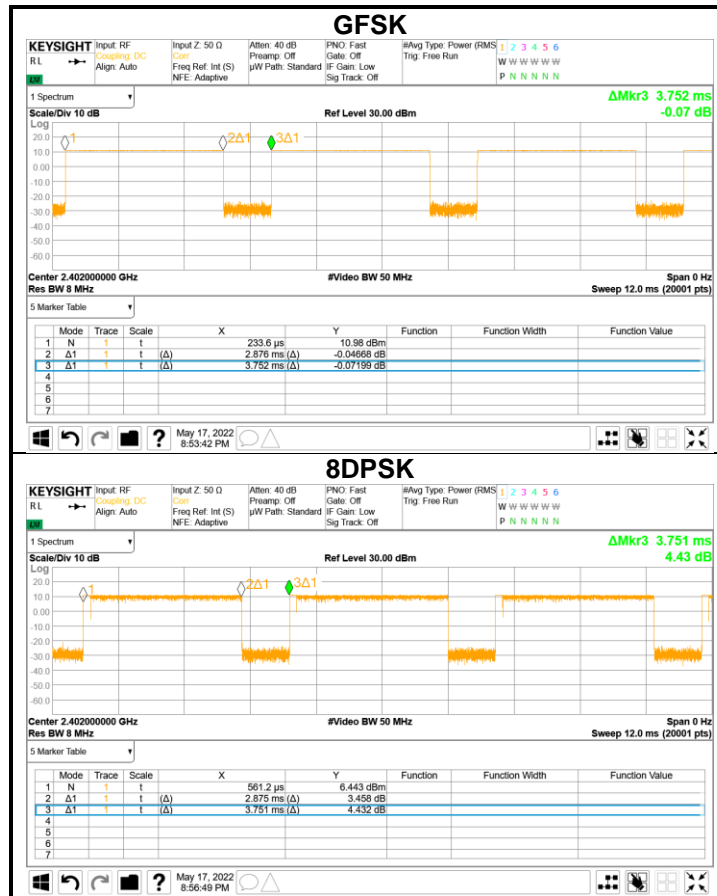
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Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Bands					
GFSK	2.876	3.752	76.65	1.15	0.348
8DPSK	2.875	3.751	76.65	1.16	0.348



- Right

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum CBW [kHz]
2 400 ~ 2 483.5 MHz Bands					
GFSK	2.876	3.752	76.65	1.15	0.348
8DPSK	2.875	3.751	76.65	1.16	0.348



9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

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

- Left

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	0.952	0.892
Mid	2441	0.949	0.893
High	2480	0.968	0.900
Worst		0.968	0.900

9.2.2. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.279	1.166
Mid	2441	1.271	1.181
High	2480	1.290	1.174
Worst		1.290	1.181

- Right

9.2.3. BLUETOOTH BASIC DATA RATE GFSK MODULATION

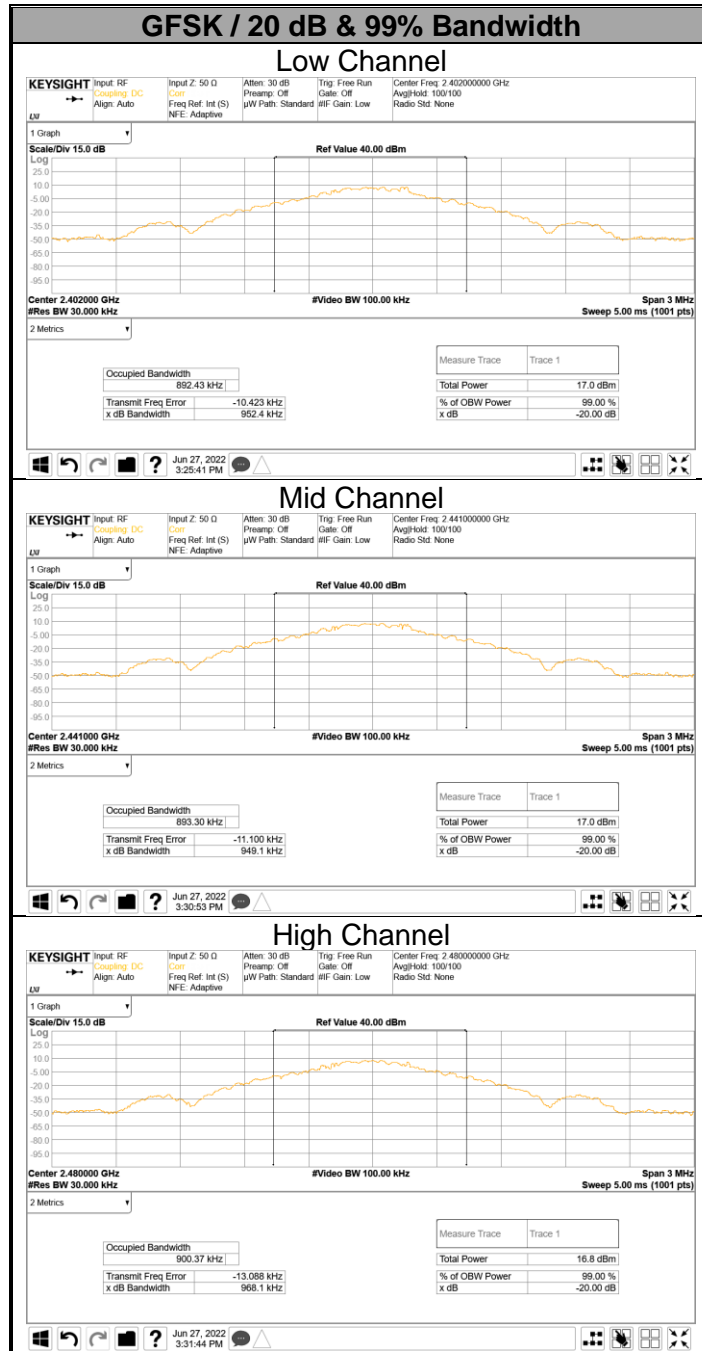
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	0.956	0.888
Mid	2441	0.957	0.904
High	2480	0.956	0.896
Worst		0.957	0.904

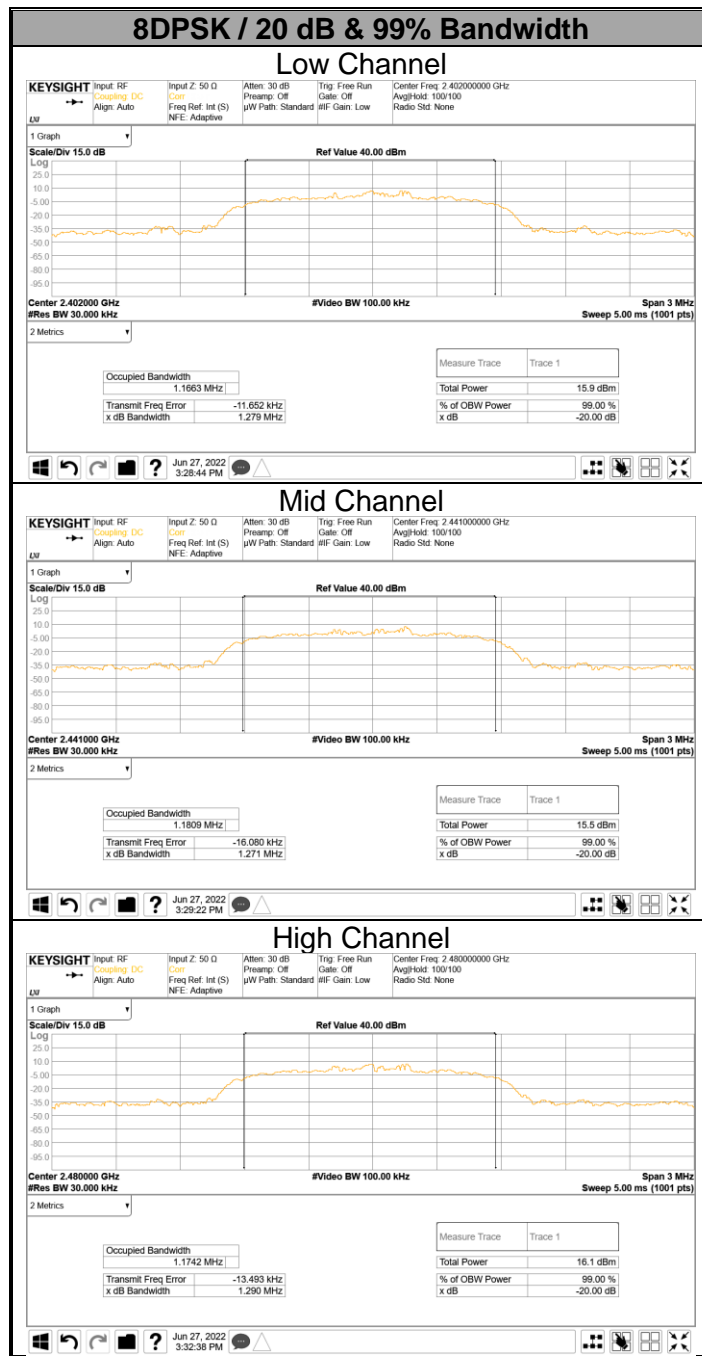
9.2.4. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.235	1.172
Mid	2441	1.287	1.179
High	2480	1.282	1.178
Worst		1.287	1.179

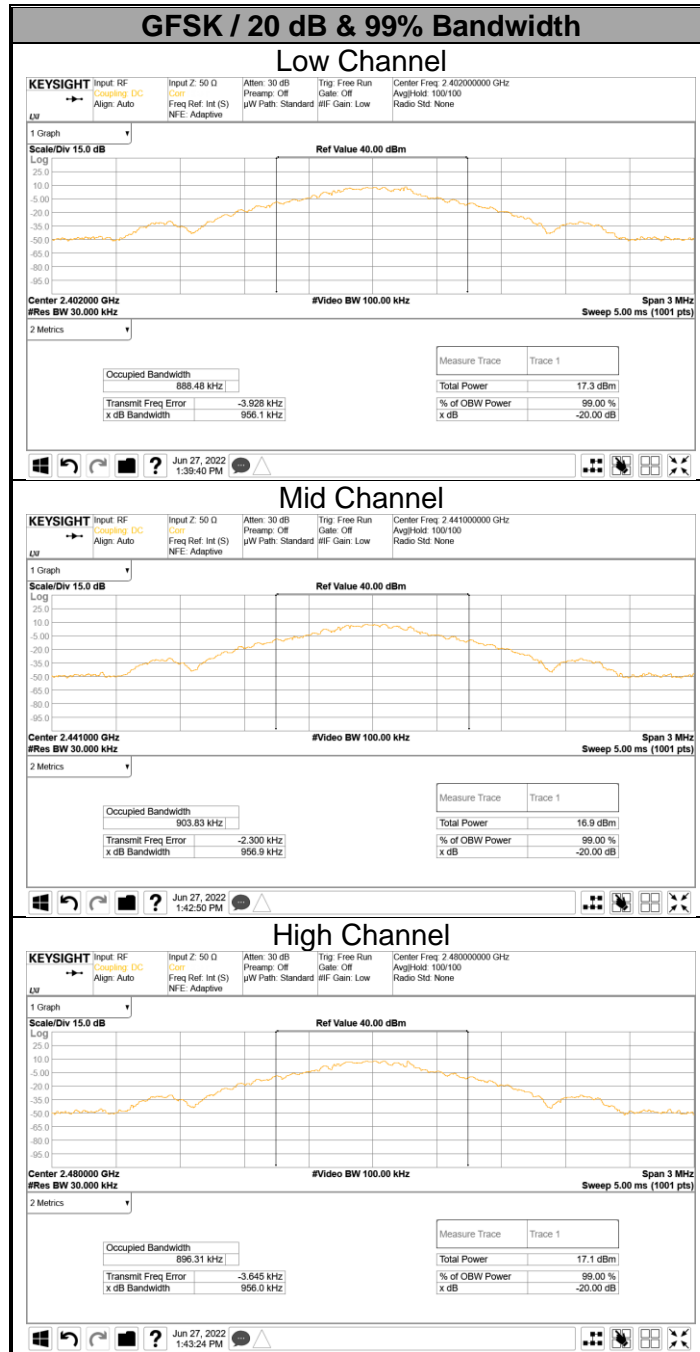
20 dB AND 99% BANDWIDTH PLOTS

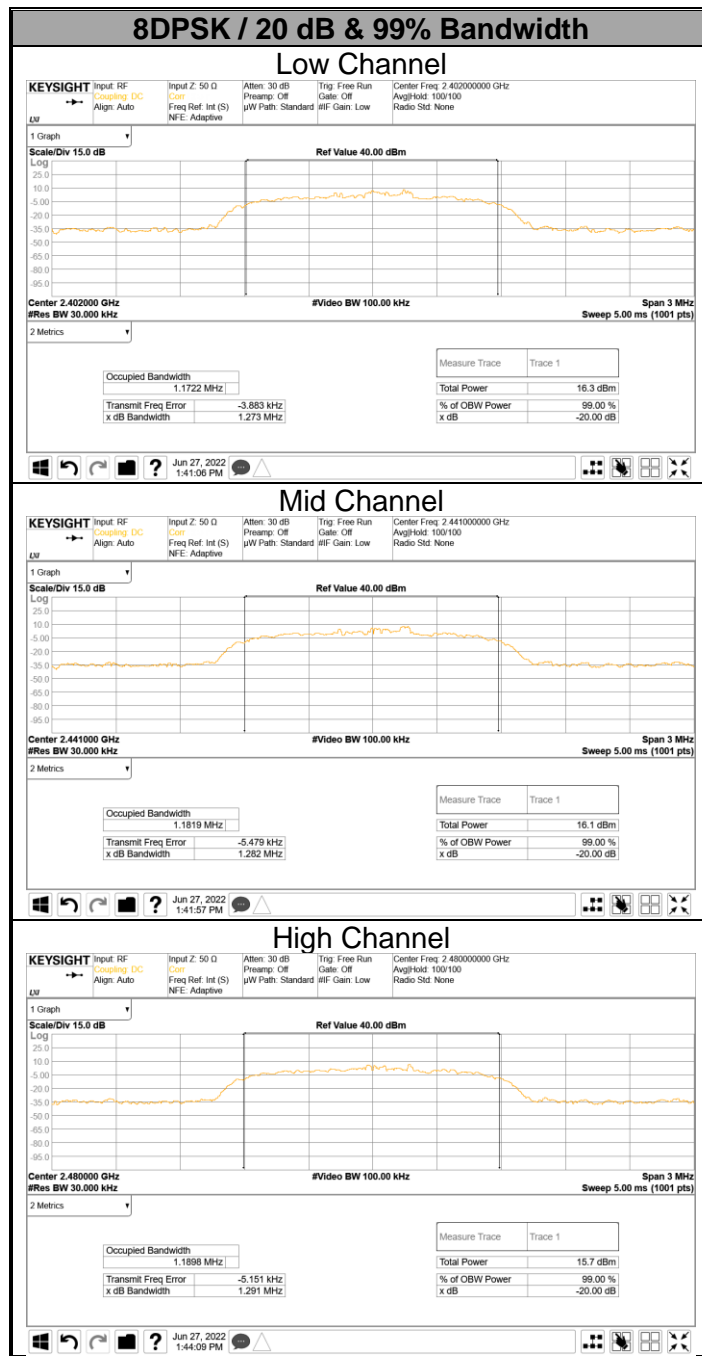
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- Right





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

Span = wide enough to capture the peaks of two adjacent channels

RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

VBW \geq RBW

Sweep = Auto

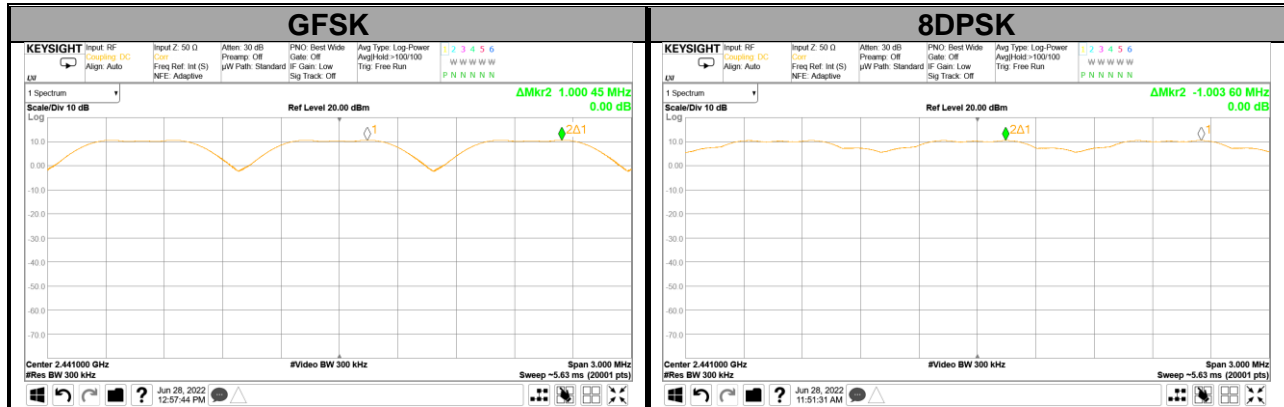
Detector function = Peak

Trace = Max hold

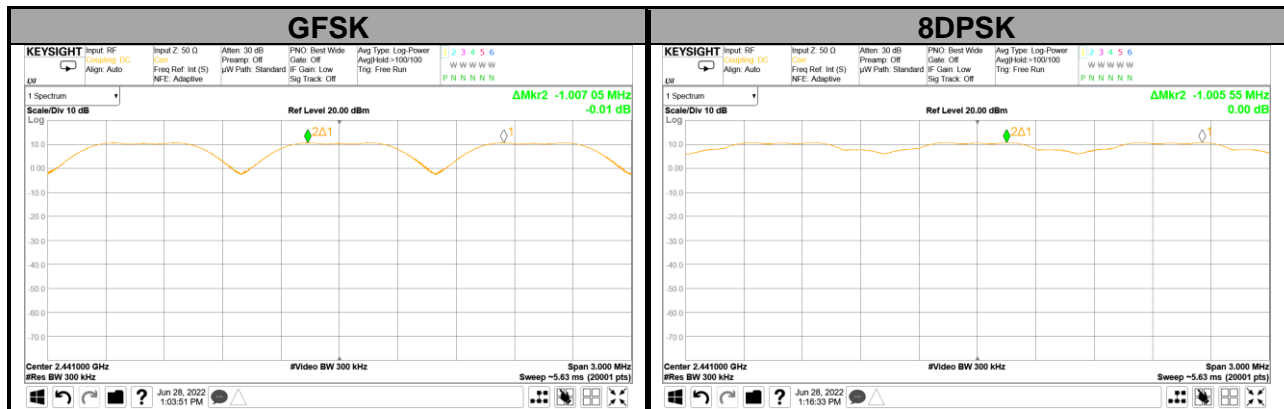
RESULTS

HOPPING FREQUENCY SEPARATION PLOT

- **Left**



- **Right**



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

RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

VBW \geq RBW

Sweep = Auto

Detector function = Peak

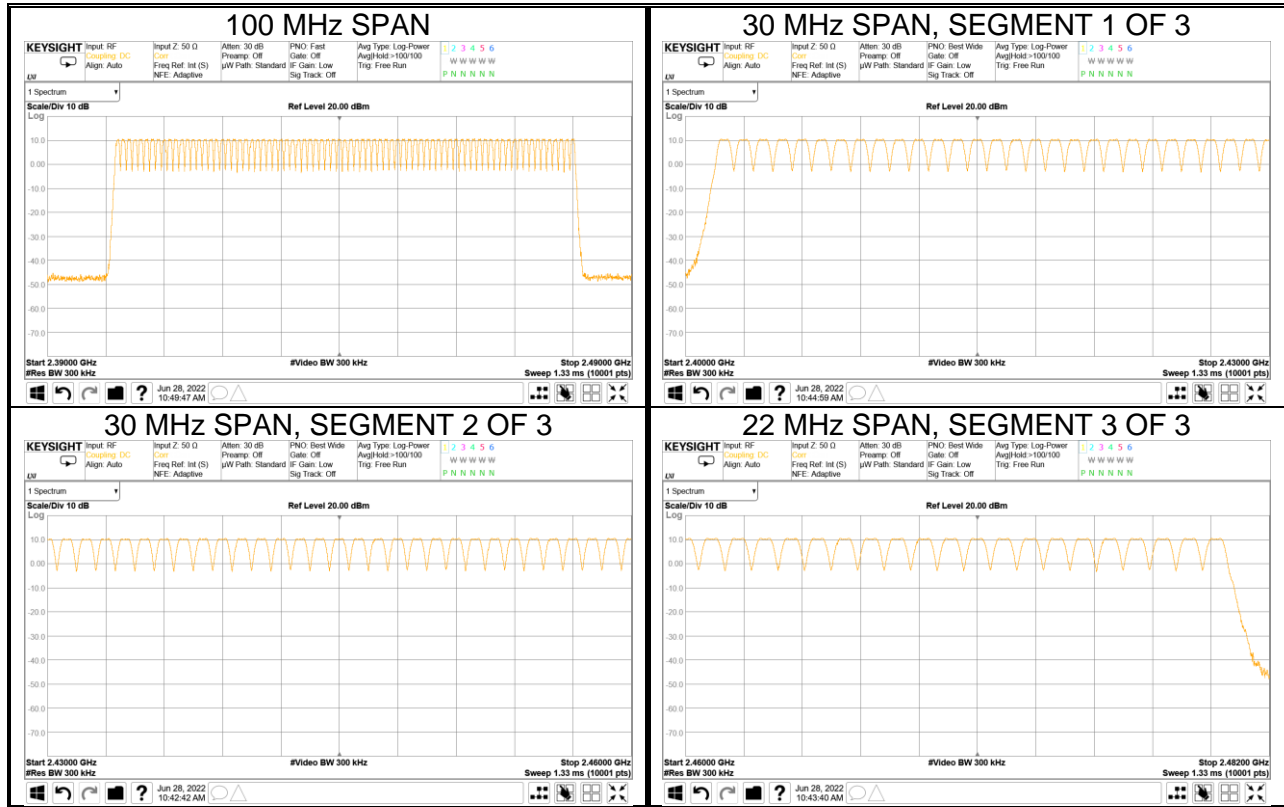
Trace = Max hold

RESULTS

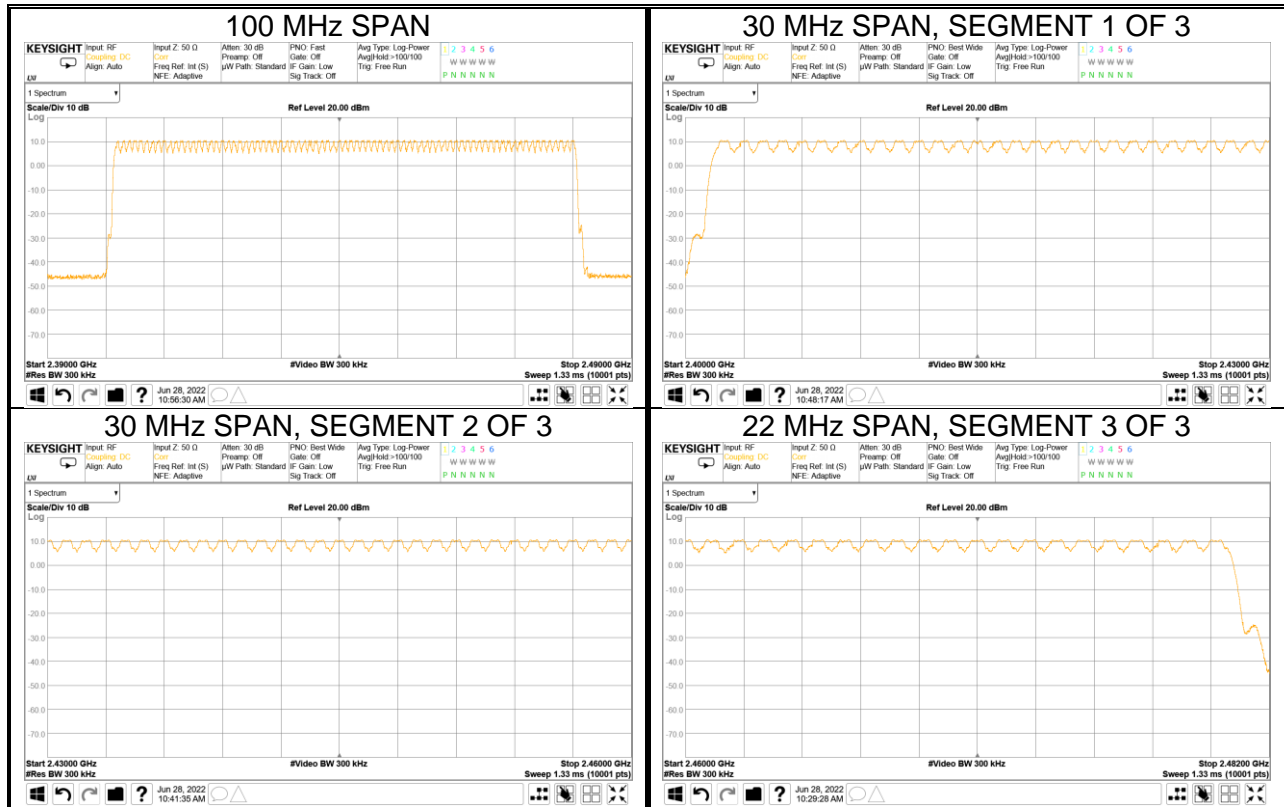
Normal Mode: 79 Channels Observed

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9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

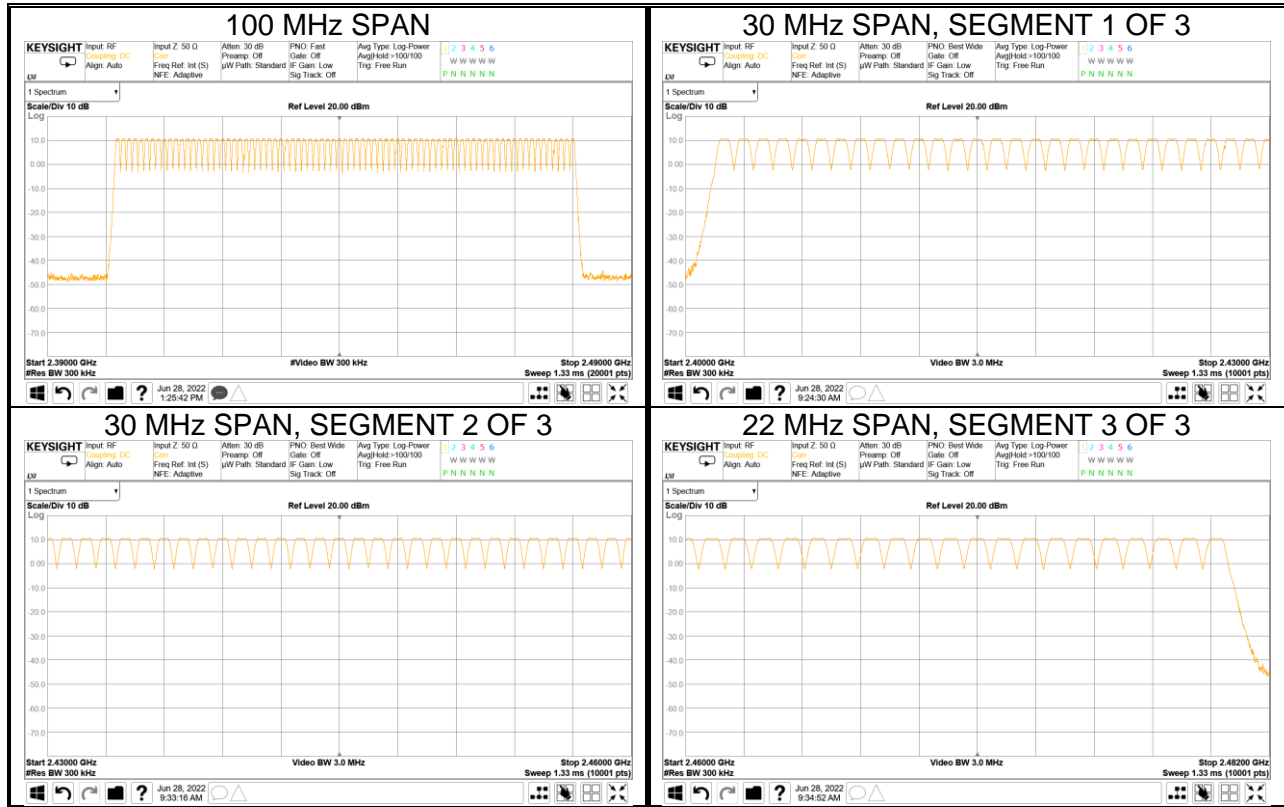


9.4.2. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

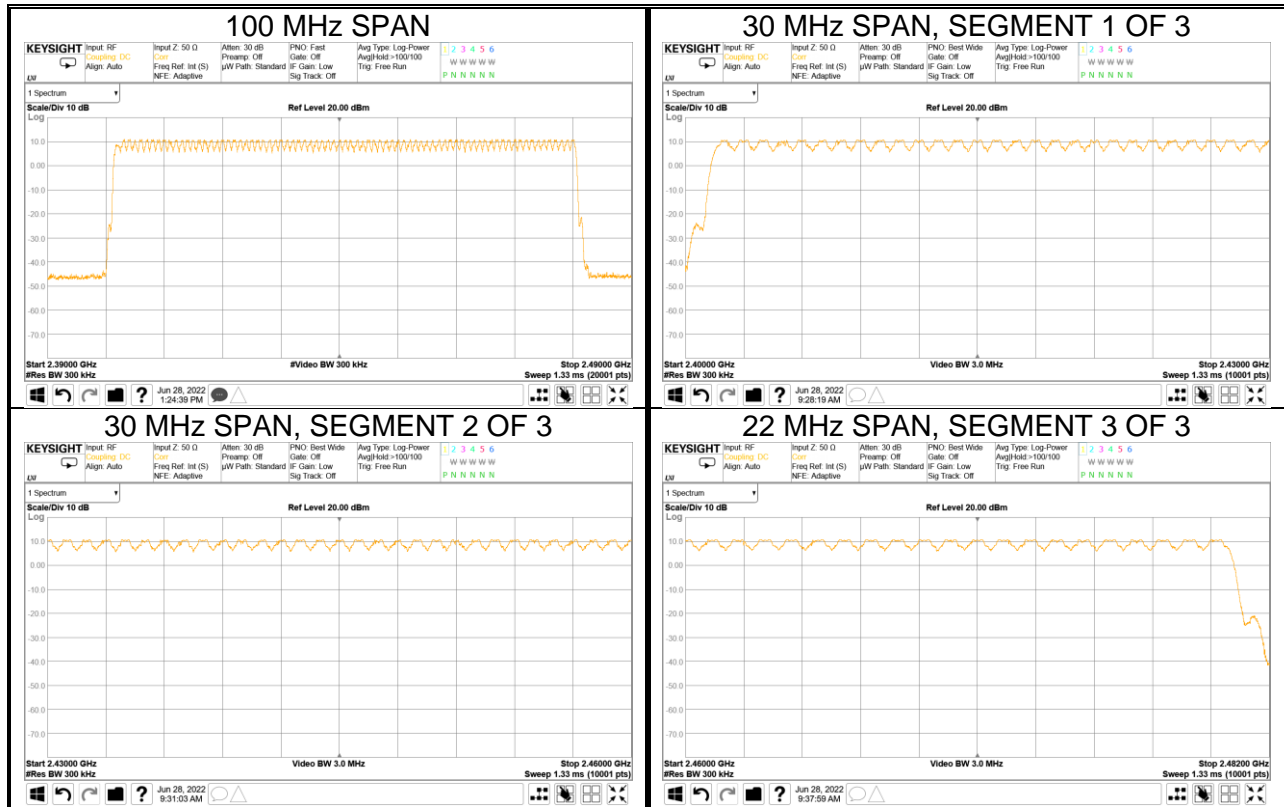


- Right

9.4.3. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.4.4. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION



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

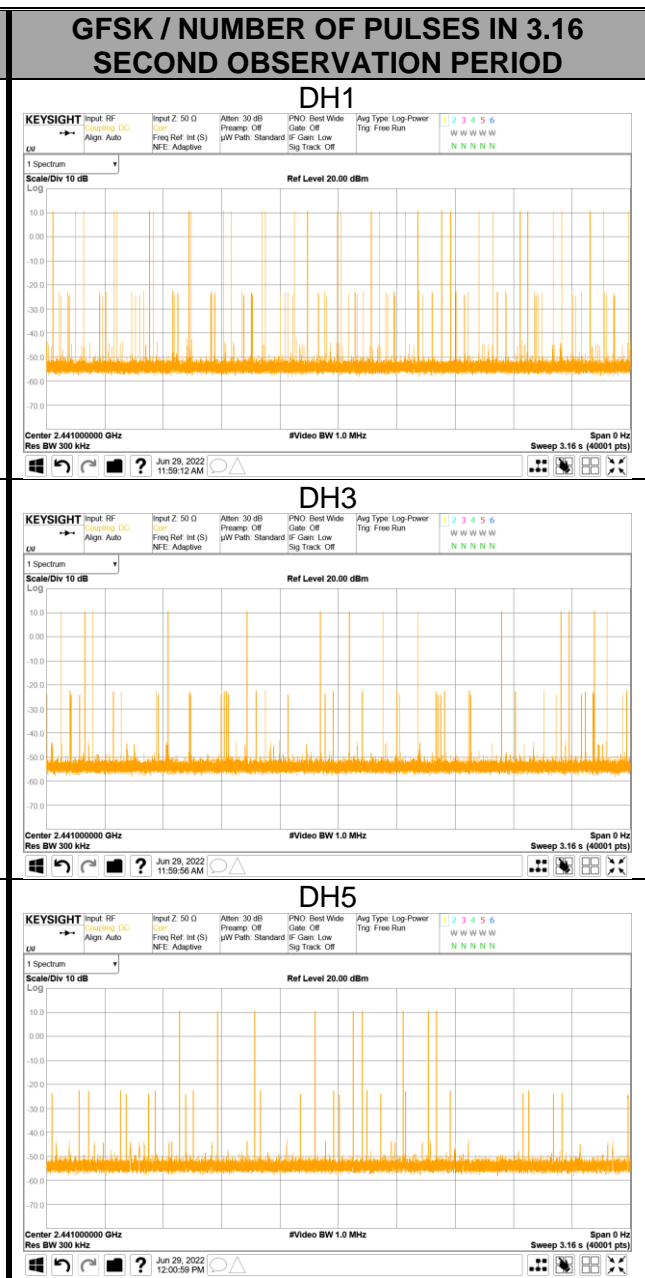
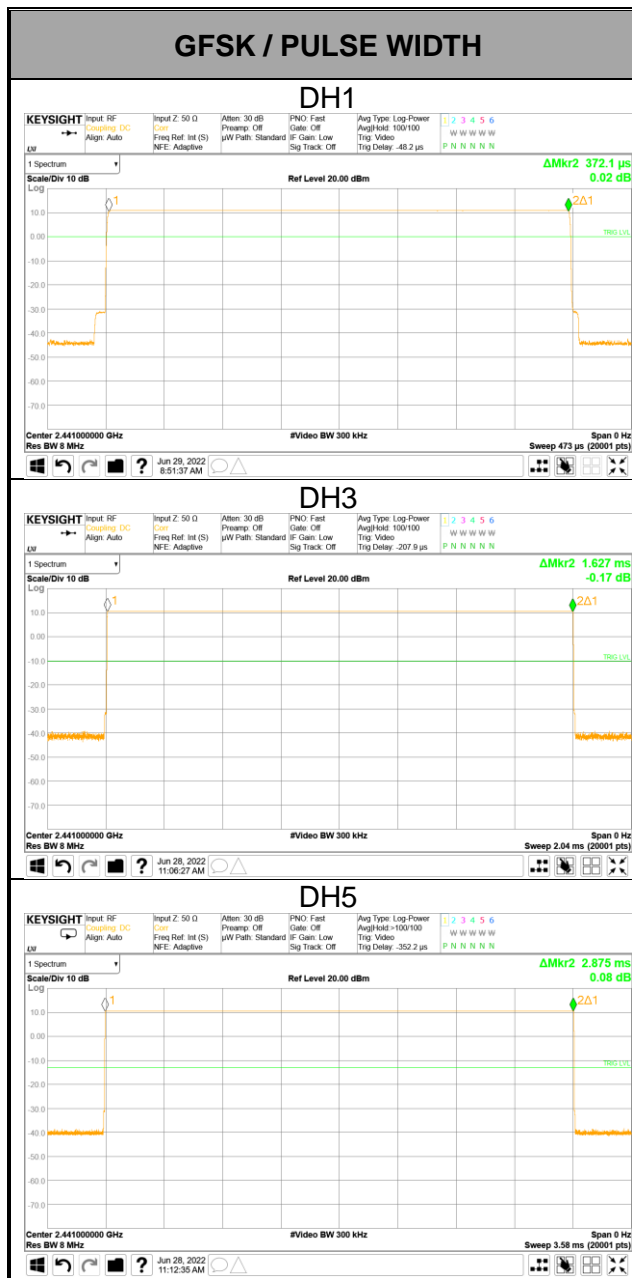
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$.

RESULTS

- Left

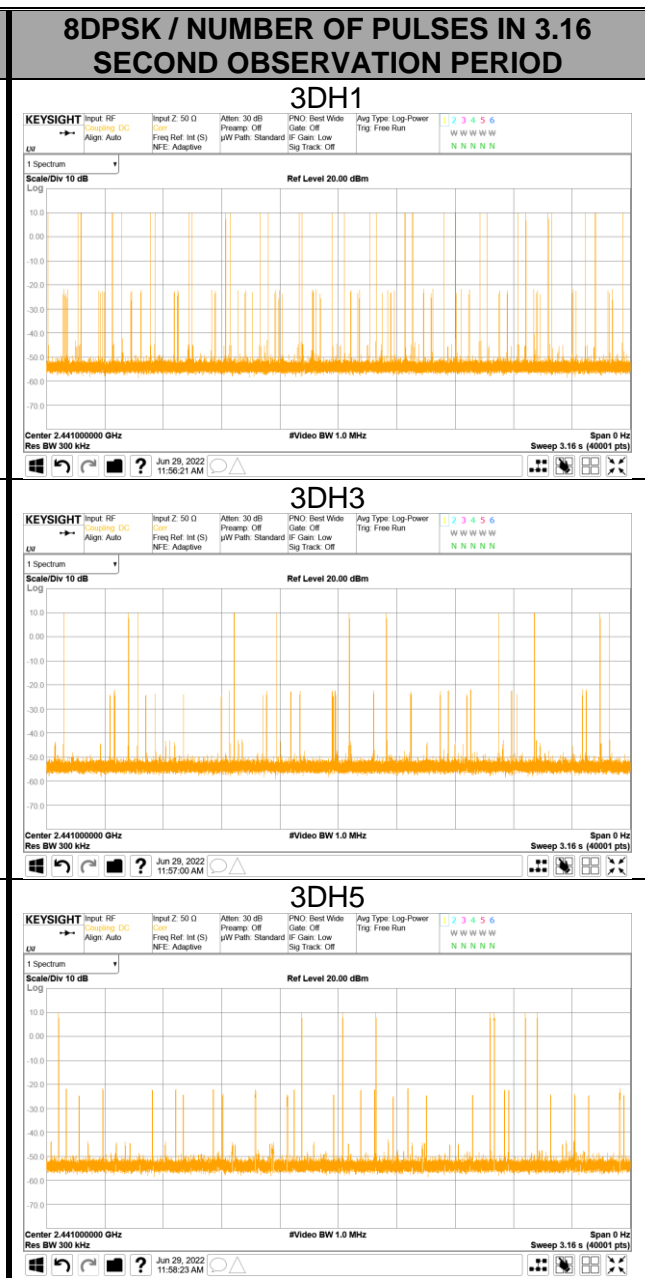
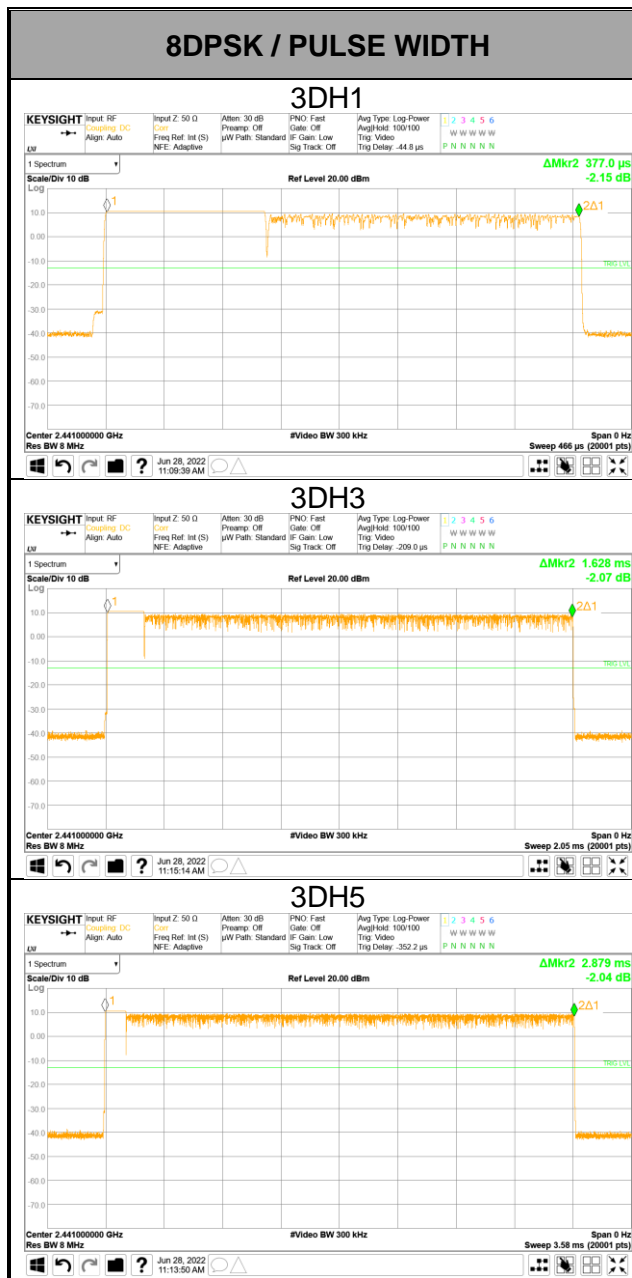
9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.372	32	0.119	0.4	-0.281
DH3	1.627	14	0.228	0.4	-0.172
DH5	2.875	9	0.259	0.4	-0.141
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.373	30	0.112	0.4	-0.288
DH3	1.627	11	0.179	0.4	-0.221
DH5	2.875	9	0.259	0.4	-0.141



9.5.2. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

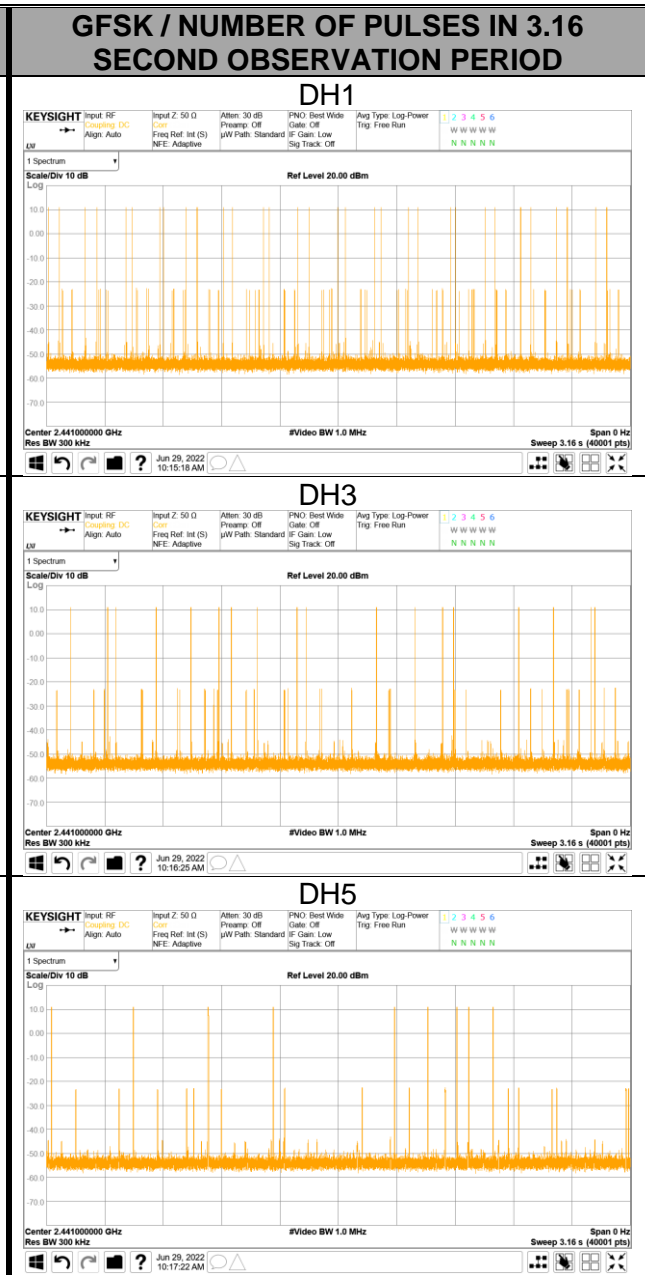
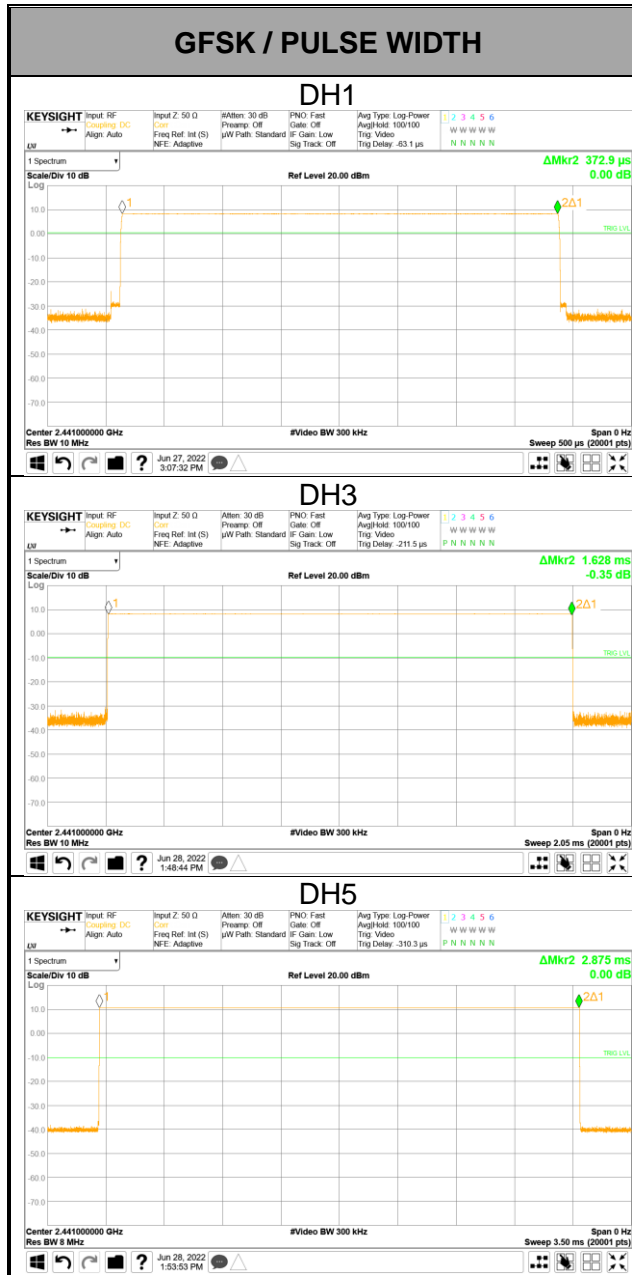
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8DPSK Normal					
3-DH1	0.377	32	0.121	0.4	-0.279
3-DH3	1.628	11	0.179	0.4	-0.221
3-DH5	2.879	8	0.230	0.4	-0.170
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8DPSK AFH					
3-DH1	0.377	30	0.113	0.4	-0.287
3-DH3	1.628	11	0.179	0.4	-0.221
3-DH5	2.879	7	0.202	0.4	-0.198



- Right

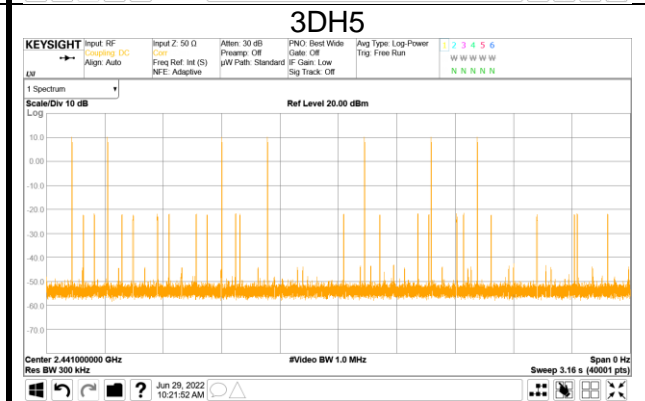
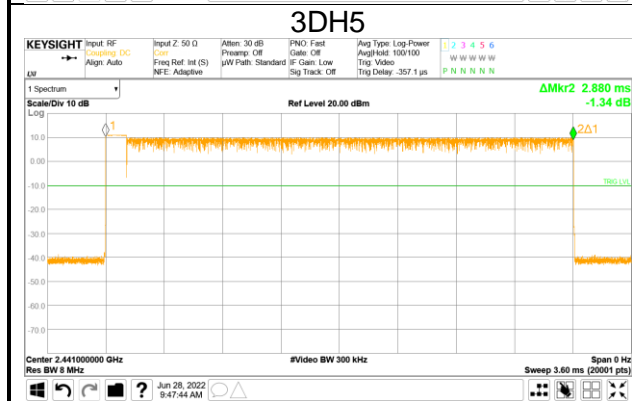
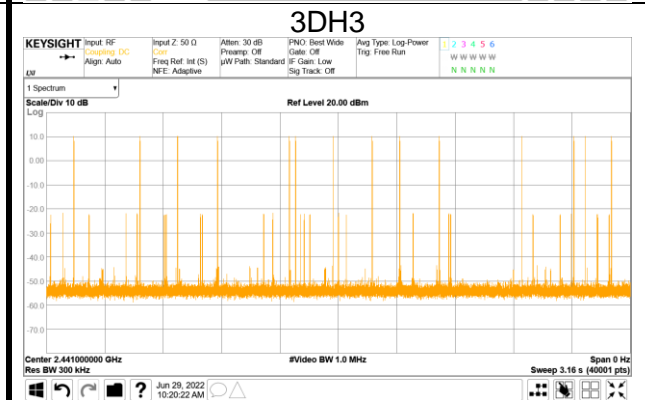
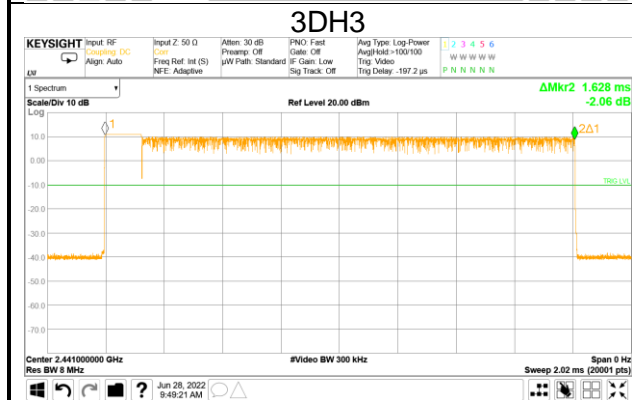
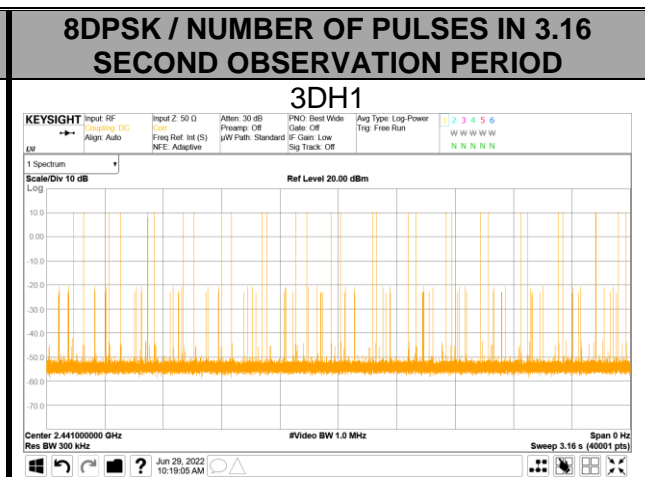
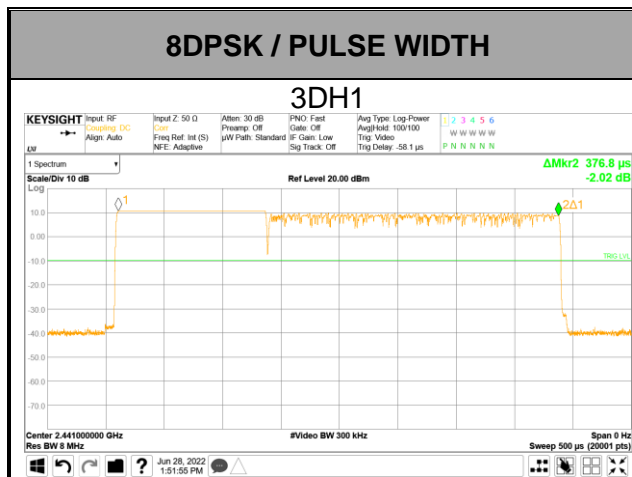
9.5.3. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.373	32	0.119	0.4	-0.281
DH3	1.628	18	0.293	0.4	-0.107
DH5	2.875	9	0.259	0.4	-0.141
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.373	30	0.112	0.4	-0.288
DH3	1.628	12	0.195	0.4	-0.205
DH5	2.875	8	0.230	0.4	-0.170



9.5.4. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8DPSK Normal					
3-DH1	0.377	31	0.117	0.4	-0.283
3-DH3	1.628	14	0.228	0.4	-0.172
3-DH5	2.88	7	0.202	0.4	-0.198
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8DPSK AFH					
3-DH1	0.377	28	0.106	0.4	-0.294
3-DH3	1.628	13	0.212	0.4	-0.188
3-DH5	2.88	10	0.288	0.4	-0.112



9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

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

RSS-247 (5.4) (b)

The maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels.

TEST PROCEDURE

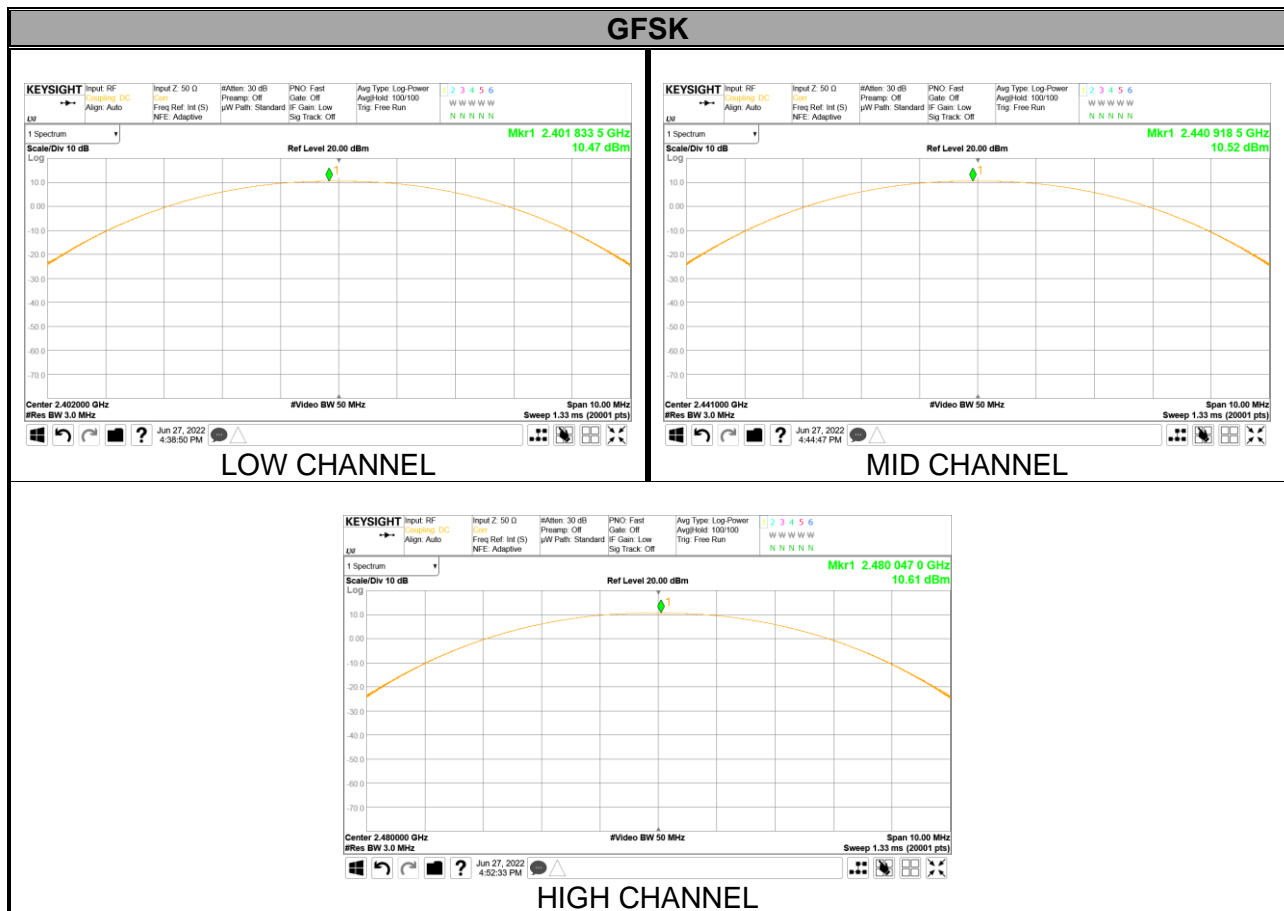
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

- Left

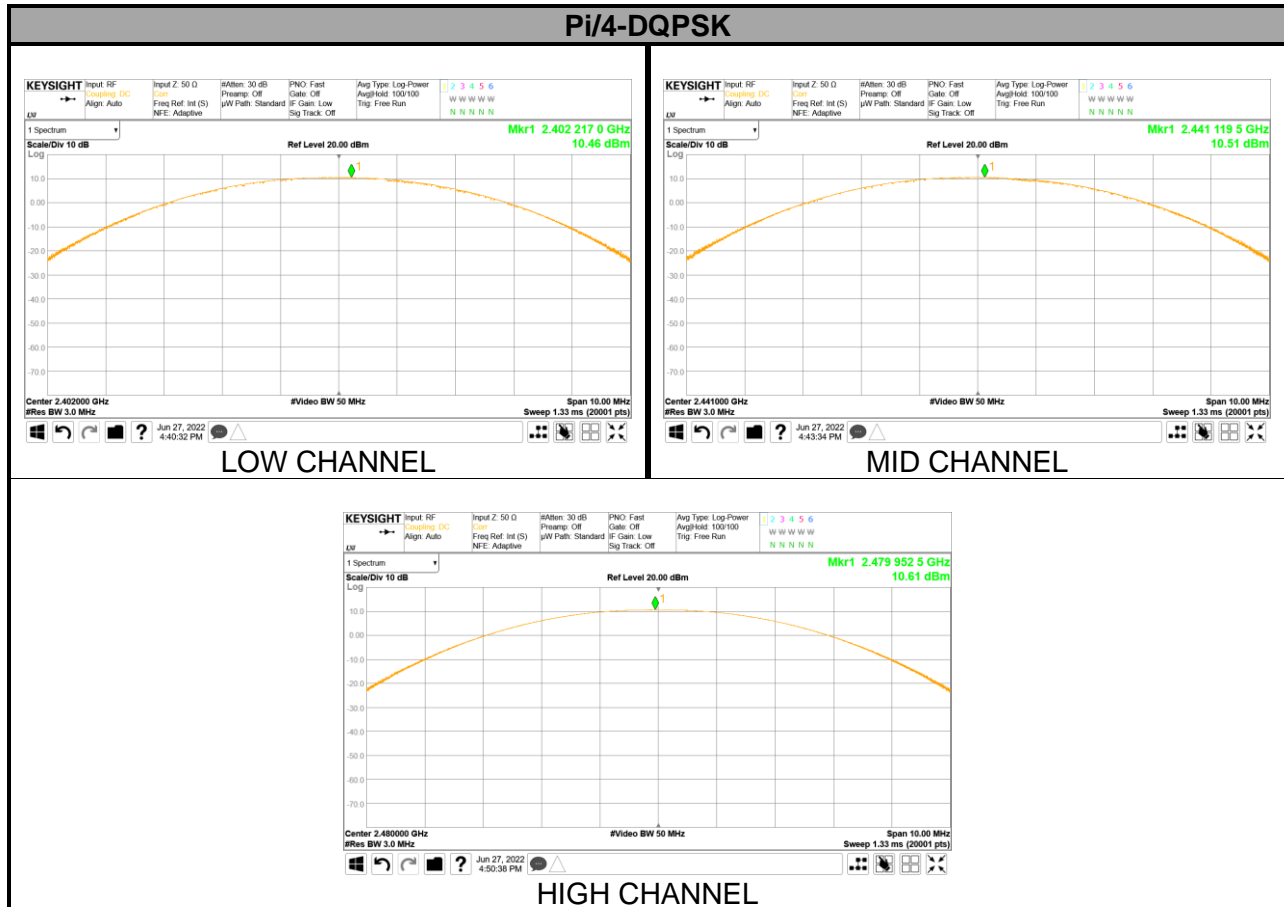
9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	10.470	21.000	-10.530
Mid	2441	10.520		-10.480
High	2480	10.610		-10.390
Worst		10.610		-10.390



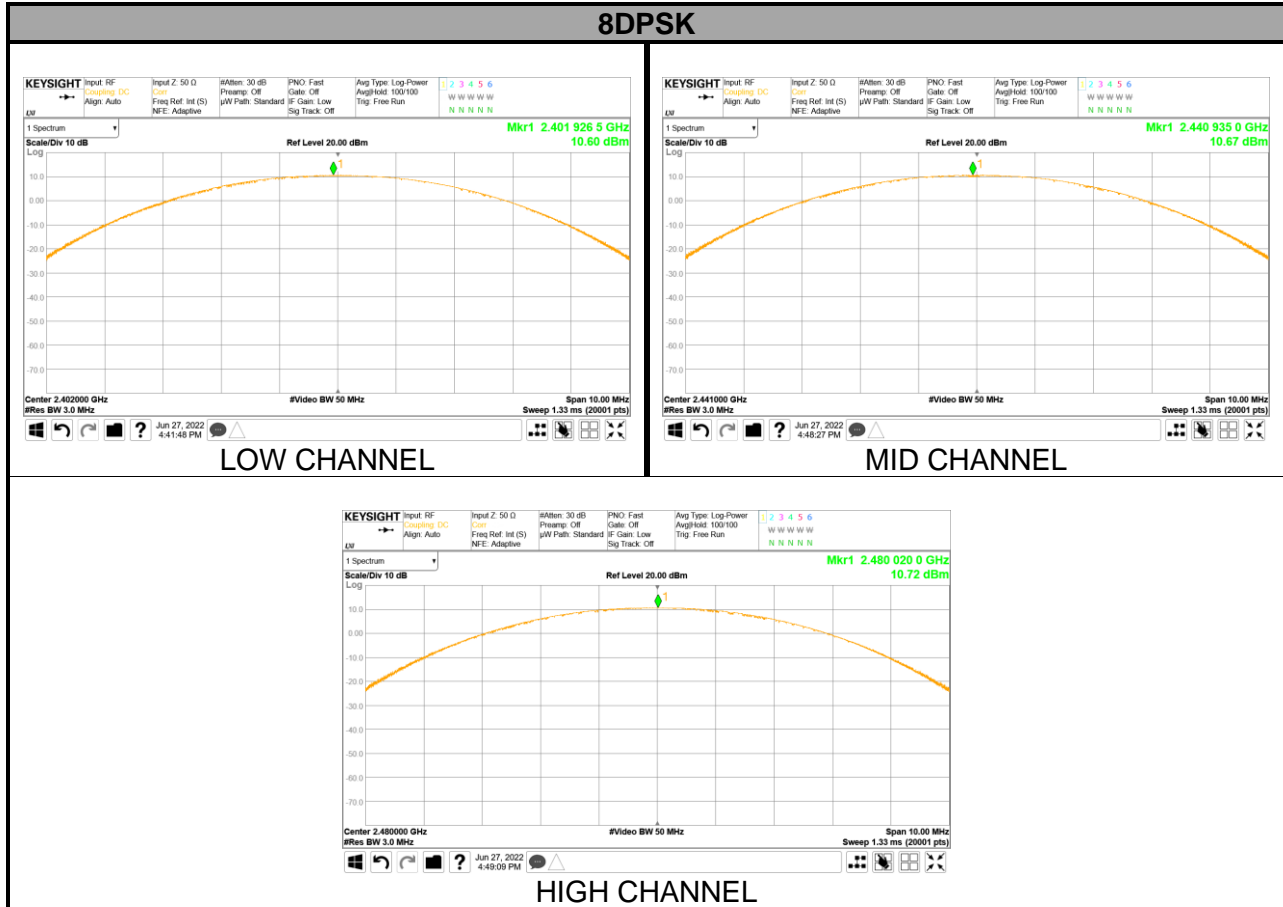
9.6.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	10.460	21.000	-10.540
Mid	2441	10.510		-10.490
High	2480	10.610		-10.390
Worst		10.610		-10.390



9.6.3. ENHANCED DATA RATE 8DPSK MODULATION

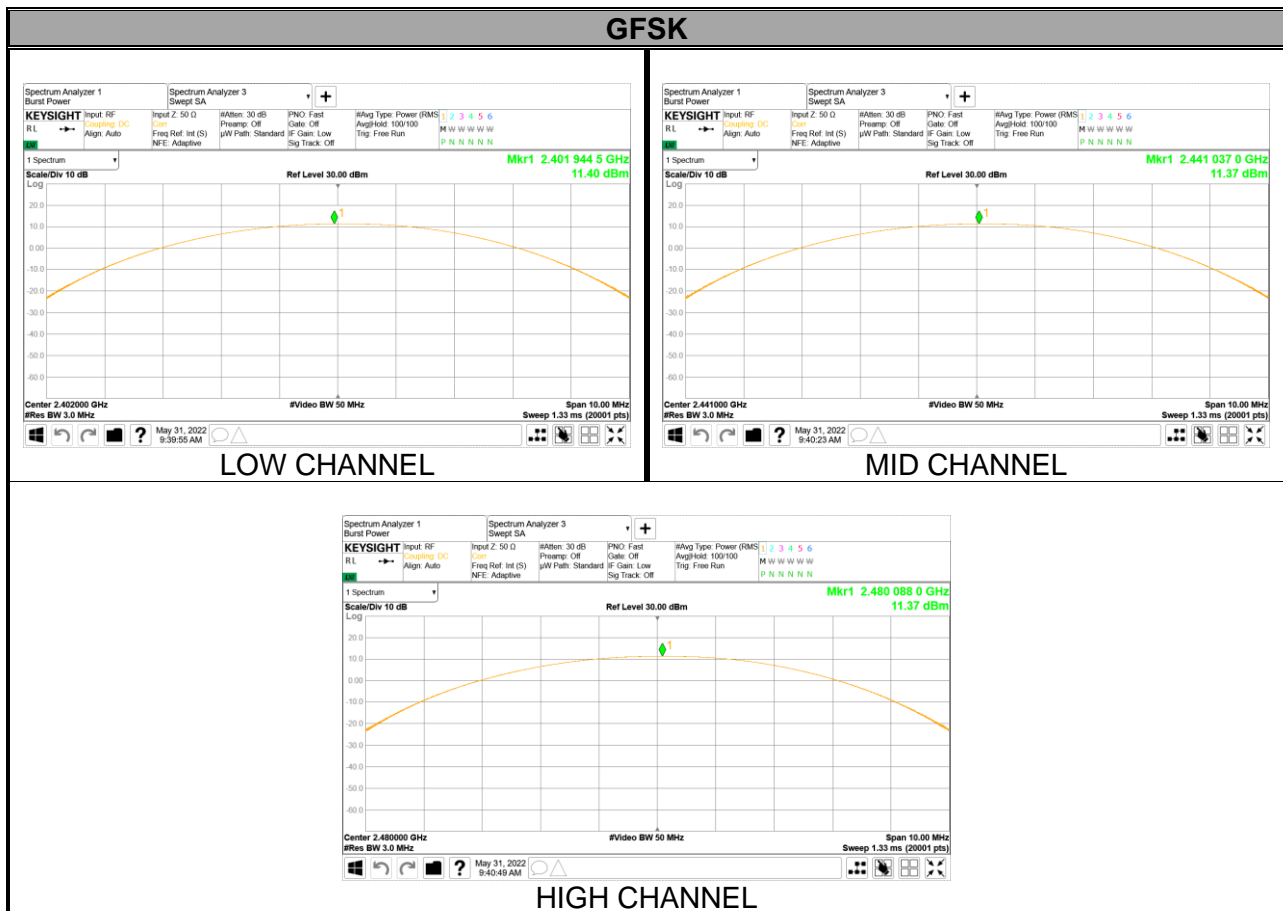
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	10.600	21.000	-10.400
Mid	2441	10.670		-10.330
High	2480	10.720		-10.280
Worst		10.720		-10.280



- Right

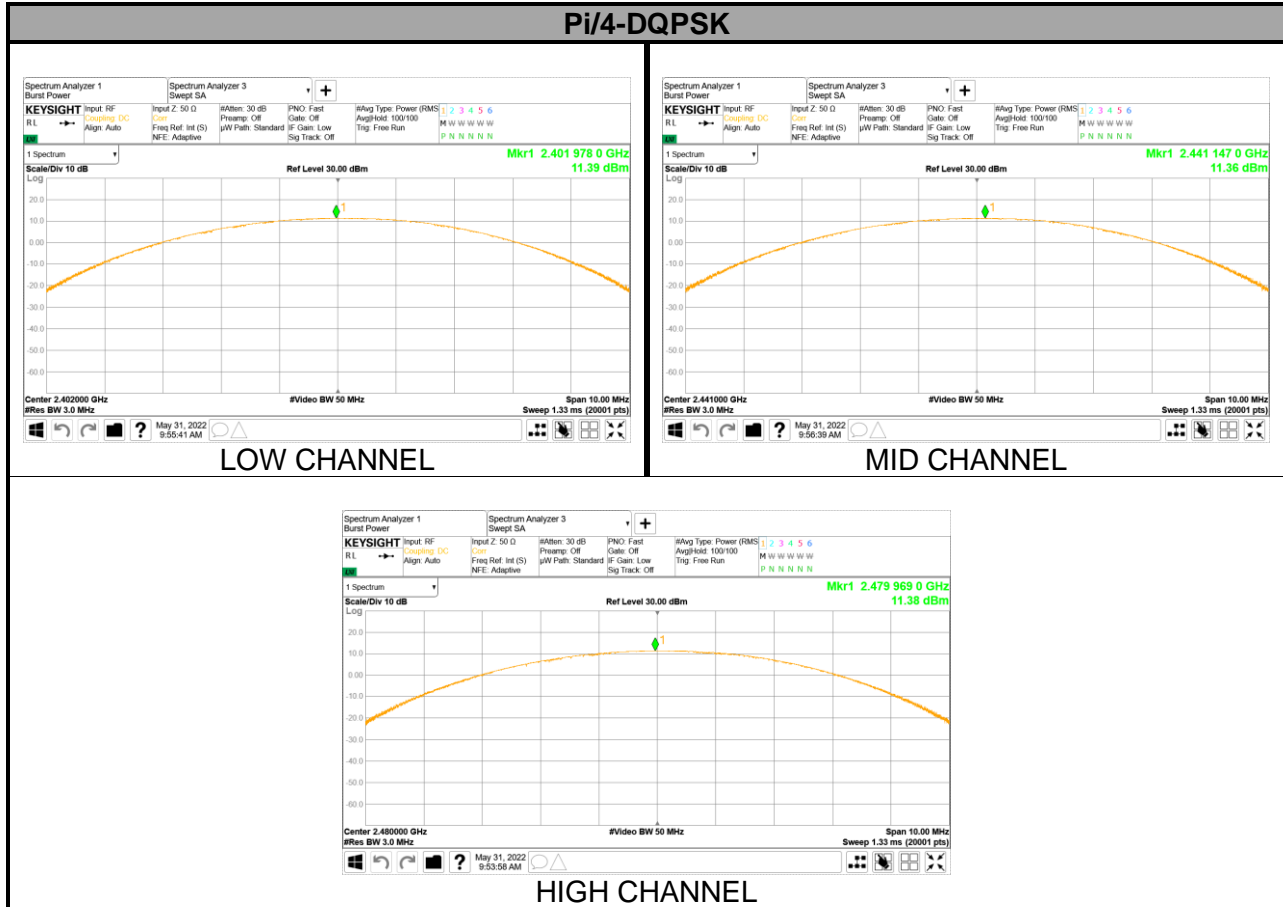
9.6.4. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.400	21.000	-9.600
Mid	2441	11.370		-9.630
High	2480	11.370		-9.630
Worst		11.400		-9.600



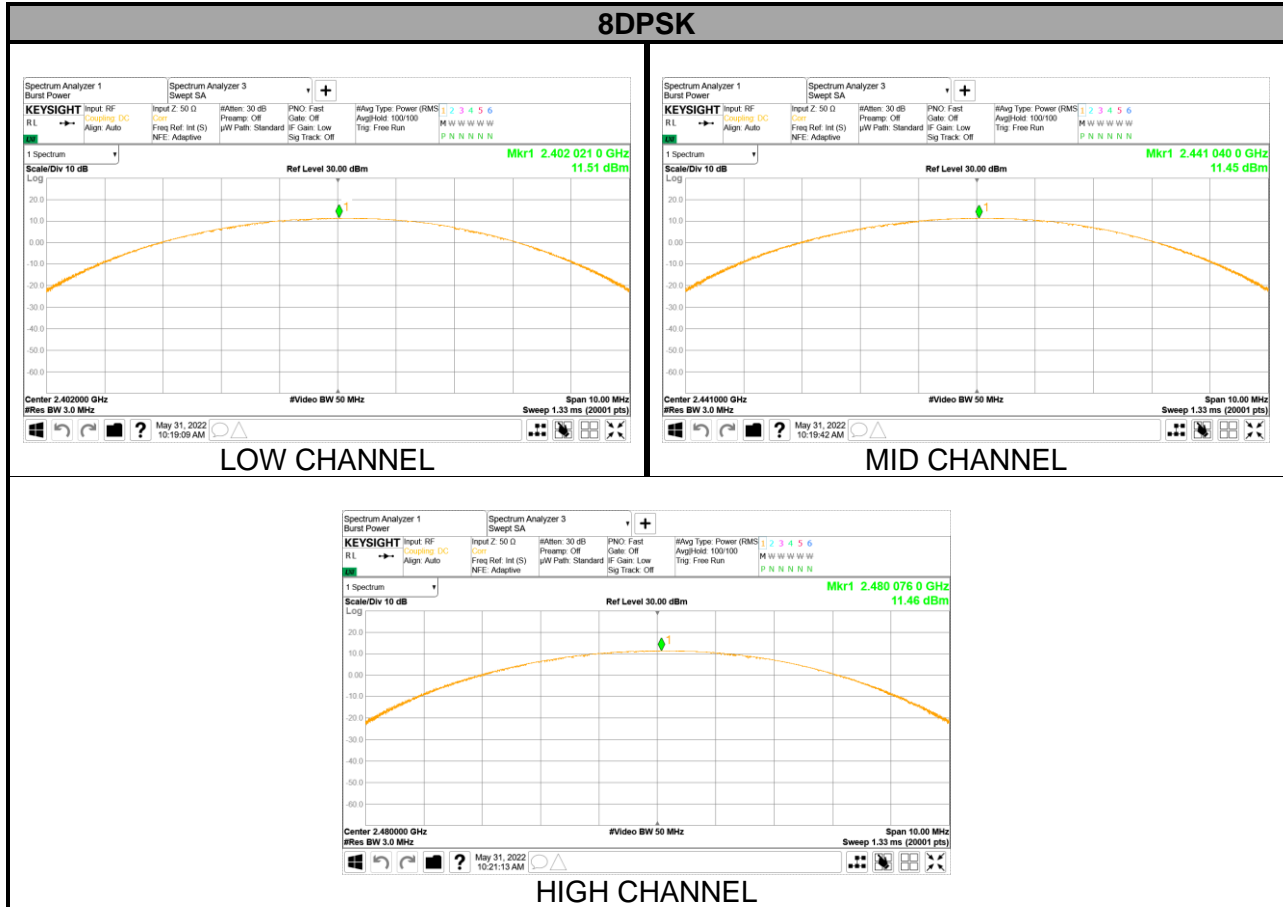
9.6.5. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.390	21.000	-9.610
Mid	2441	11.360		-9.640
High	2480	11.380		-9.620
Worst		11.390		-9.610



9.6.6. ENHANCED DATA RATE 8DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.510	21.000	-9.490
Mid	2441	11.450		-9.550
High	2480	11.460		-9.540
Worst		11.510		-9.490



9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

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

RESULTS

- Left

9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	10.417	11.01
Mid	2441	10.357	10.86
High	2480	10.446	11.08

9.7.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	8.584	7.22
Mid	2441	8.623	7.28
High	2480	8.724	7.45

9.7.3. ENHANCED DATA RATE 8DPSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	8.657	7.34
Mid	2441	8.703	7.42
High	2480	8.808	7.60

- Right

9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	11.261	13.37
Mid	2441	11.232	13.28
High	2480	11.246	13.32

9.7.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	9.129	8.18
Mid	2441	9.170	8.26
High	2480	9.213	8.34

9.7.3. ENHANCED DATA RATE 8DPSK MODULATION

Channel	Frequency [MHz]	Av Power [dBm]	Av Power [mW]
Low	2402	9.223	8.36
Mid	2441	9.261	8.43
High	2480	9.303	8.52

9.8. 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.

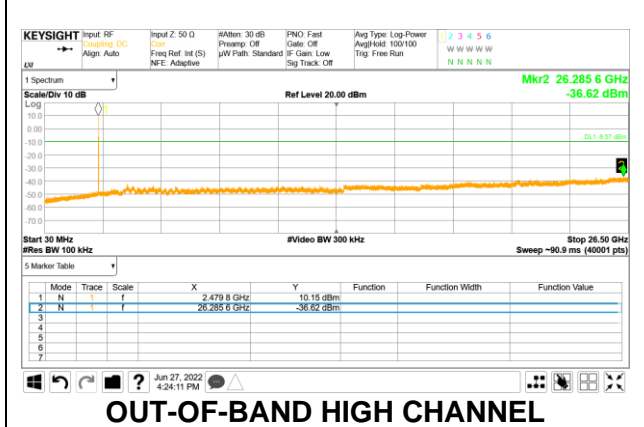
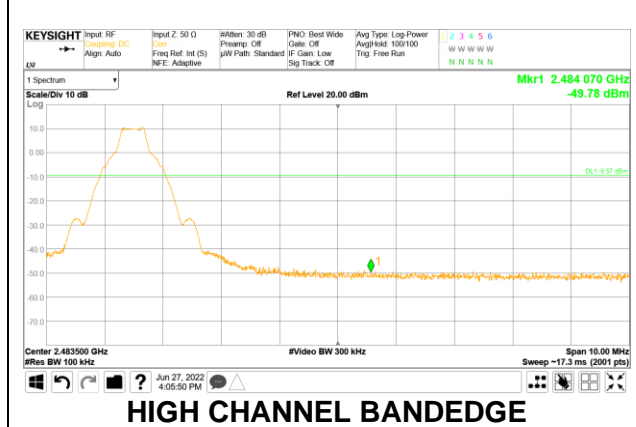
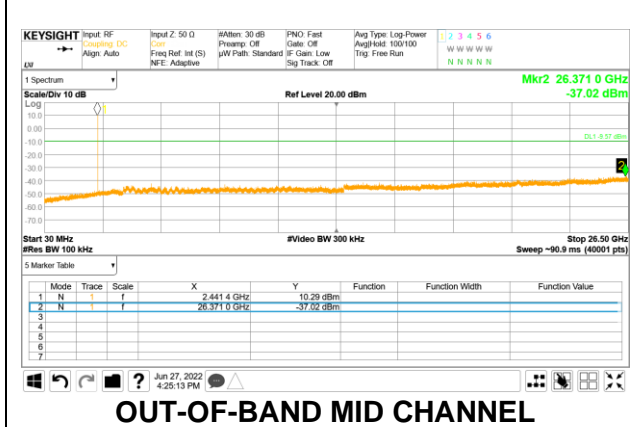
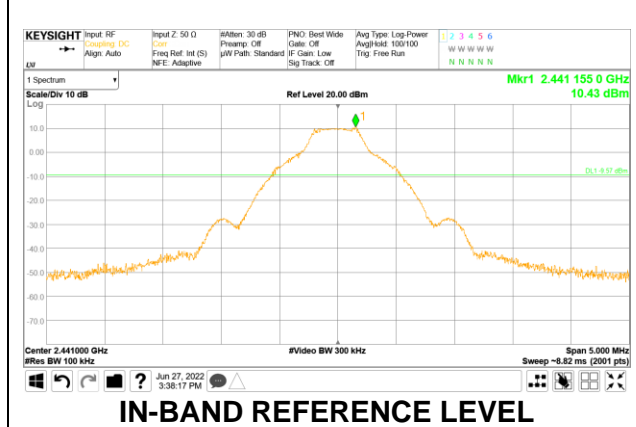
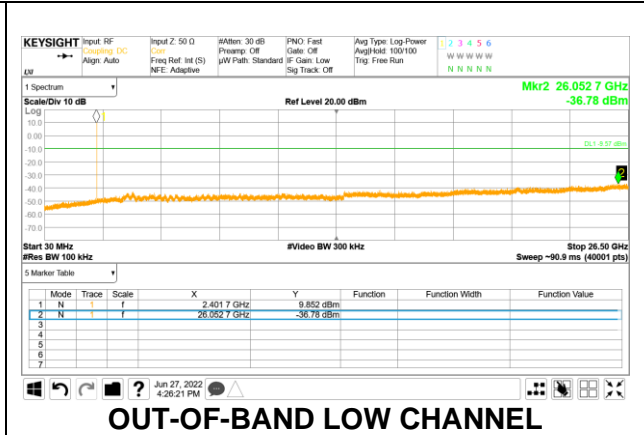
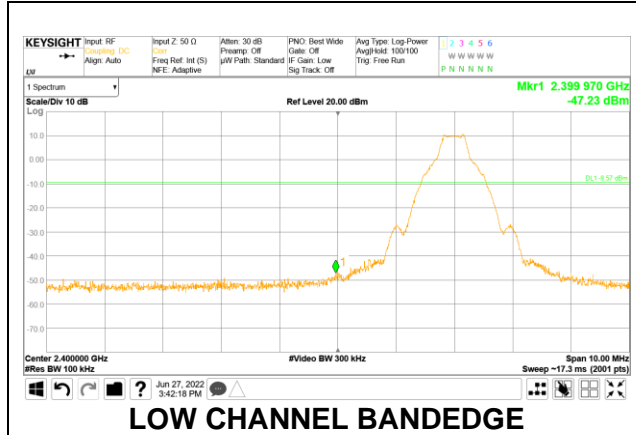
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

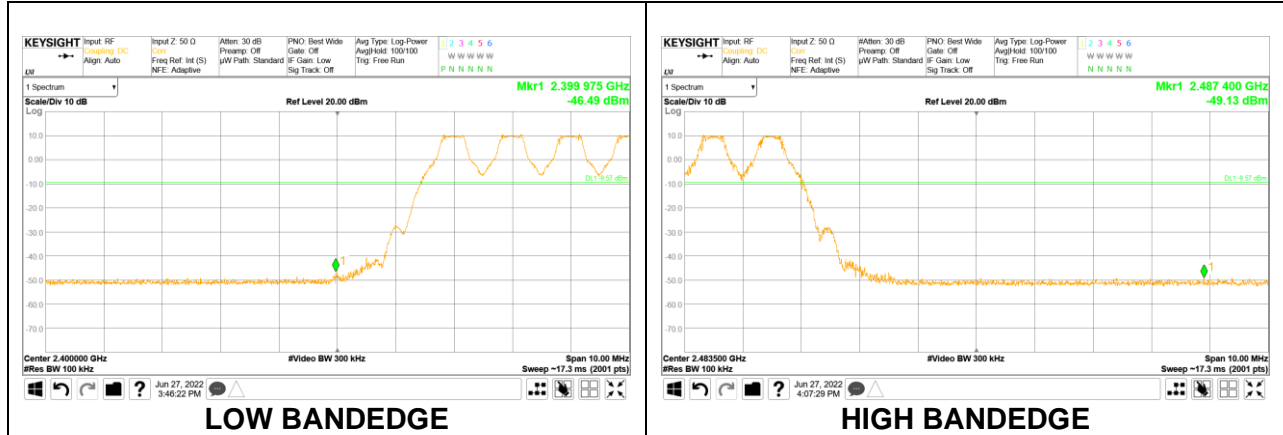
- Left

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING

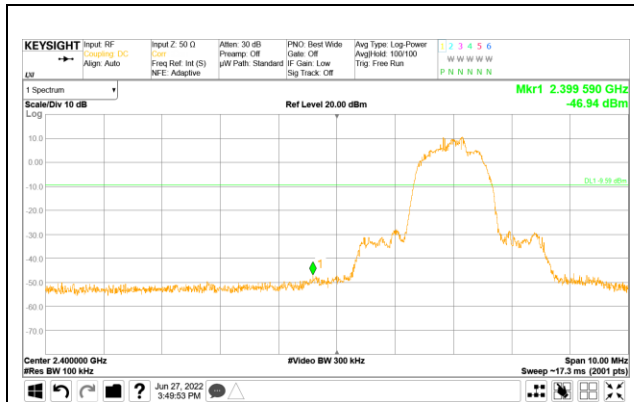


SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON

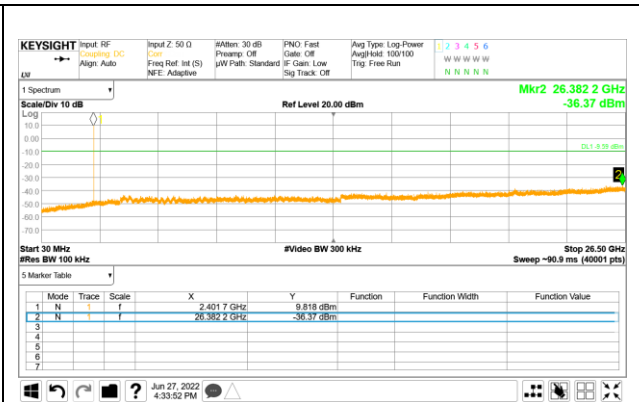


9.8.2. BLUETOOTH ENHANCED DATA RATE 8DPSK MODULATION

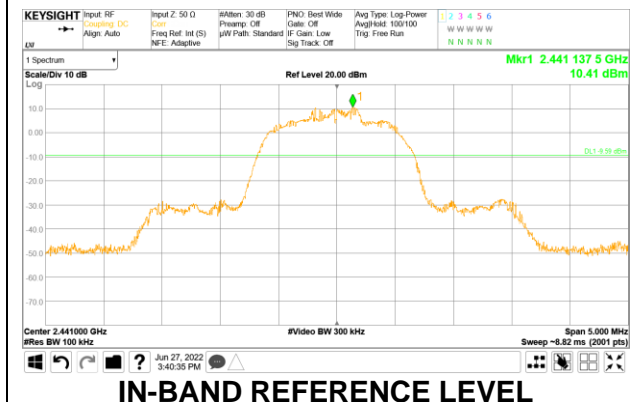
SPURIOUS EMISSIONS, NON-HOPPING



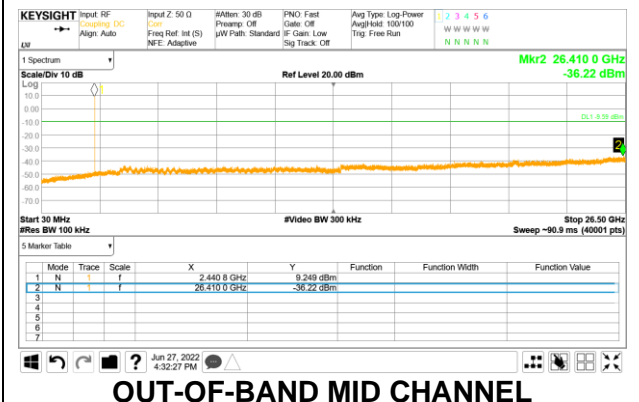
LOW CHANNEL BANDEDGE



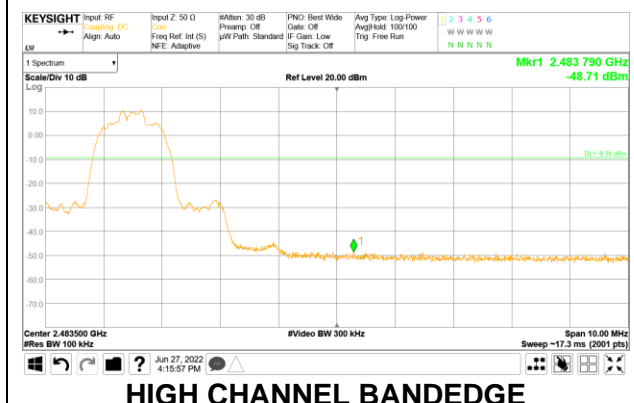
OUT-OF-BAND LOW CHANNEL



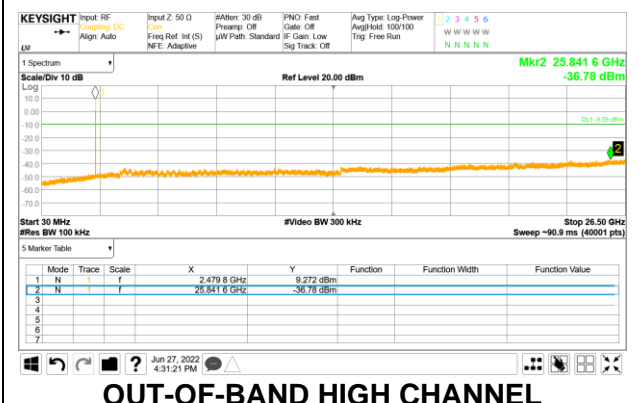
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL