

CERTIFICATION TEST REPORT

Report Number. : 4790976523-E9V2

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

Model : SM-S921U, SM-S921U1

FCC ID : A3LSMS921U

EUT Description : GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax,
NFC and WPT

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

Date Of Issue:

2023-10-30

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2023-10-27	Initial issue	Dexter(Hyunsik) Yun
V2	2023-10-30	Updated to address TCB's question	Dexter(Hyunsik) Yun

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT

MODEL: SM-S921U, SM-S921U1

SERIAL NUMBER: R3CW90BXLKA, R3CW90BXLGJ (CONDUCTED);
R3CW90BXLCD, R3CW90BXLFV (RADIATED);

DATE TESTED: 2023-10-05 ~ 2023-10-30

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
47 CFR 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:



Seokhwan Hong
Suwon Lab Engineer
UL KOREA LTD.

Tested By:



Dexter(Hyunsik) Yun
Suwon Lab Engineer
UL KOREA LTD.

2. TEST METHODOLOGY

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

1. FCC 47 CFR Part 2.
2. FCC 47 CFR Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. KDB 662911 D01 v02r01
5. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

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

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

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:

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

$$\begin{aligned} \text{AC Corrected Reading (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Extension Cord} \\ &\text{Loss (dB)} + \text{Cable Loss (dB)} \\ 44.72 \text{ dBuV} &= 34.72 \text{ dBuV} + 9.9 \text{ dB} + 0.1 \text{ dB} \end{aligned}$$

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	2.80 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.92 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.06 dB
Radiated Disturbance, 18 GHz to 40 GHz	6.02 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 115:2021.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT. This test report addresses the DSS(Bluetooth) operational mode.

Representative model	Difference	Derivative model
		SM-S921U1
SM-S921U	Hardware	Same
	Software	The UI has changed according to Service Provider

The model SM-S921U was used for final testing and is representative of the test results in this report.

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	Peak	20.080	101.859
		Average	19.657	92.406
	Enhanced Pi/4-DPSK	Peak	19.450	88.105
		Average	16.289	42.550
	Enhanced 8PSK	Peak	19.470	88.512
		Average	16.570	45.394

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 a internal antenna, with a maximum gain of:

Frequency Band[MHz]	ANT1 Gain [dBi]	ANT2 Gain [dBi]	Correlated Chains Directional Gain[dBi]
DTS 2400 – 2483.5	-2.44	-3.89	-0.12

Directional gain for the MIMO operations is determined using KDB 662911 D01 Multiple Transmitter Output section F (2)(d)(1) for *Unequal antenna gains, with equal transmit powers*. The gain is calculated using the formula for correlated transmissions across the two transmit antennas.

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi.

Sample calculation for this device with $N_{ANT} = 2$

Directional gain = $10 \log[(10^{-3.5/20} + 10^{-7.1/20})^2 / 2] = -2.1$ dBi

“BT/WIFI #1_2.4GHz” and “BT/WIFI #2_2.4GHz (SUB6_Ant J)” as indicated in antenna specification are written as ANT1 and ANT2 in this report.

5.4. WORST-CASE CONFIGURATION AND MODE

Both Bluetooth Diversity mode and DUAL mode have been investigated and confirmed.

The fundamentals of the EUT were investigated in three orthogonal orientations X, Y and Z. It was determined that below table's orientation was the worst-case orientation.

ANT1	ANT2	DUAL
X	X	X

For conducted power test, both Diversity and DUAL mode were verified and reported. In DUAL mode, except power test, no noticeable data was found. Tests was performed on Diversity mode.

Diversity mode test was performed on SISO and DUAL iPA mode.

Radiated and power line conducted tests were performed with EUT connected to AC power adapter as the worst-case configuration. Radiated harmonics spurious 1~18 GHz Low/Mid/High channels, 18-26GHz were performed with the EUT set at the Diversity and DUAL 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.

For Radiated band-edge and spurious test, tests were performed on Diversity mode and DUAL mode.

All radiated and power line conducted tests were performed attached with travel adapter for the worst-case condition mode.

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	R37MC7MHS27DK3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02111A	N/A

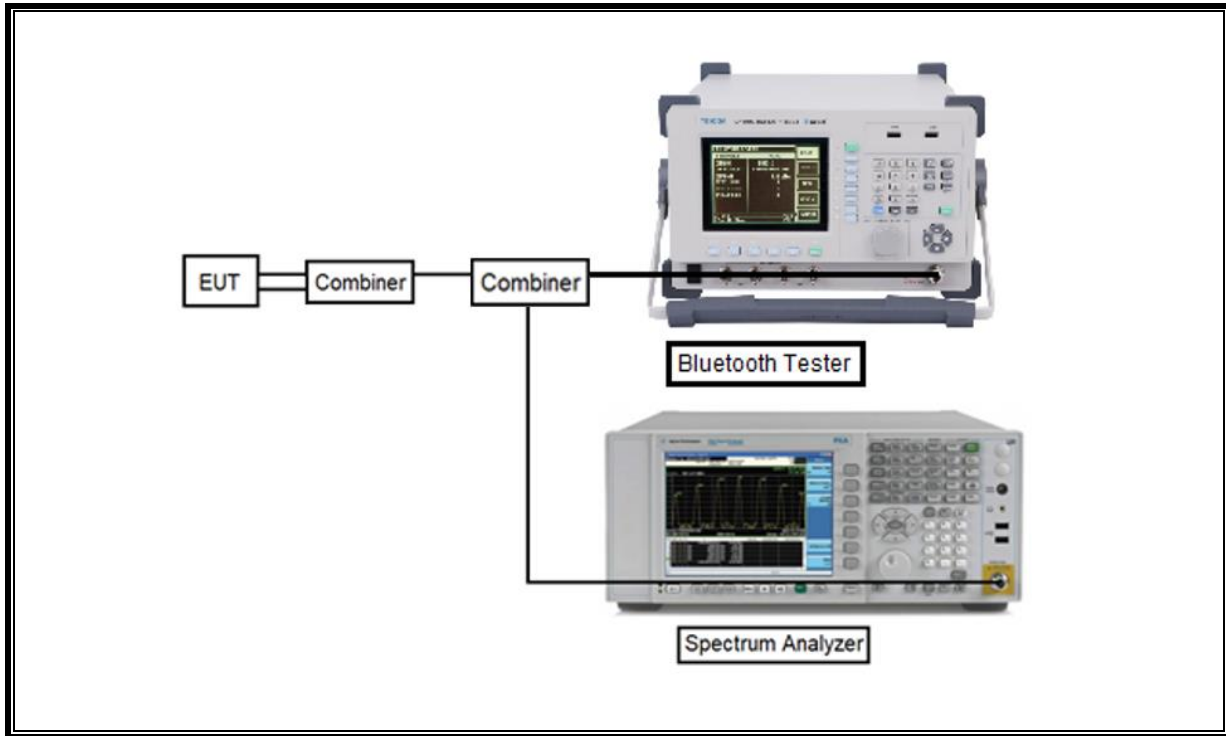
I/O CABLE

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	1.0 m	N/A

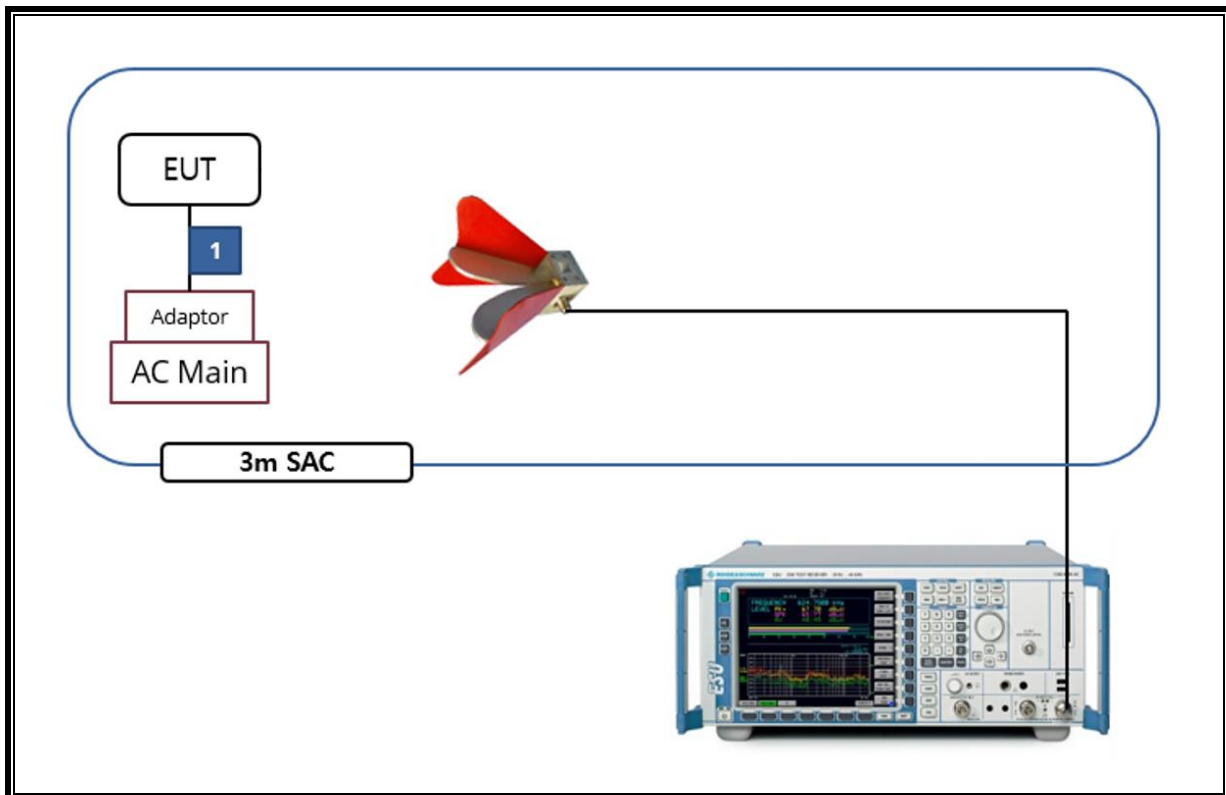
TEST SETUP

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	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2024-08-15
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2025-09-06
Antenna, Horn, 18 GHz	ETS	3117	00168724	2024-08-04
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02
Preamplifier	ETS	3115-PA	00167475	2024-07-25
Preamplifier	ETS	3116C-PA	00168841	2024-07-25
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	2024-07-24
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2024-07-25
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2024-07-24
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY60070693	2024-01-09
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9040B	MY60080268	2024-01-09
Average Power Sensor	Agilent / HP	U2000	MY54270007	2024-07-23
Average Power Sensor	Agilent / HP	U2000	MY54260010	2024-07-24
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	2024-07-24
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2024-01-09
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2024-01-09
Attenuator	PASTERNAK	PE7087-10	A009	2024-07-24
Attenuator	PASTERNAK	PE7087-10	A001	2024-07-23
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2024-07-23
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2024-07-24
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2024-07-23
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2024-07-23
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2024-07-23
LISN	R&S	ENV-216	101836	2024-07-23
Termination	WEINSCHEL	M1406A	T09	2024-07-23
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	-20 dBc	Conducted	Complies
15.247 (b)(1)	TX conducted output power	< 21 dBm		Complies
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		Complies
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Complies
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 8 dBm		Complies
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	Complies
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Complies

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

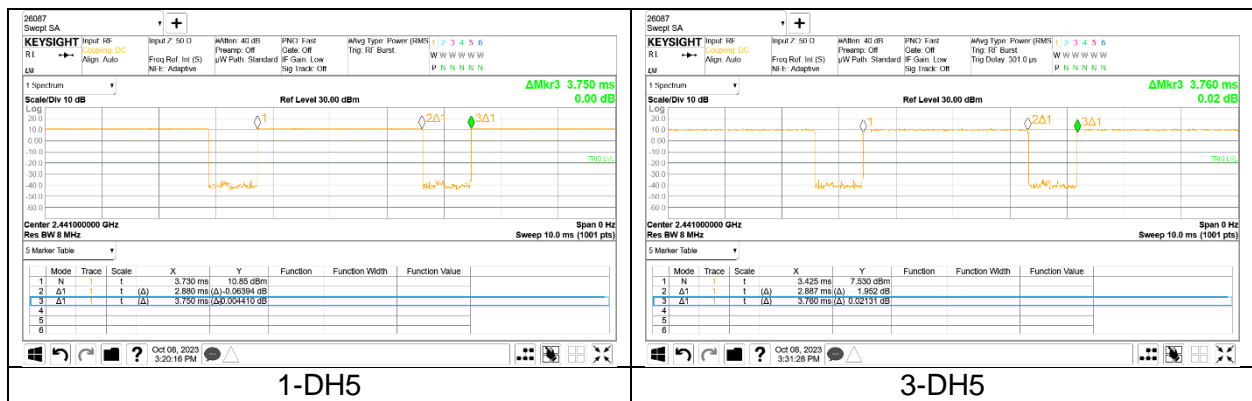
LIMITS

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 [%]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Band				
BDR	2.880	3.750	76.80	0.35
EDR	2.887	3.760	76.78	0.35

9.2. 20 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. The sweep time is coupled.

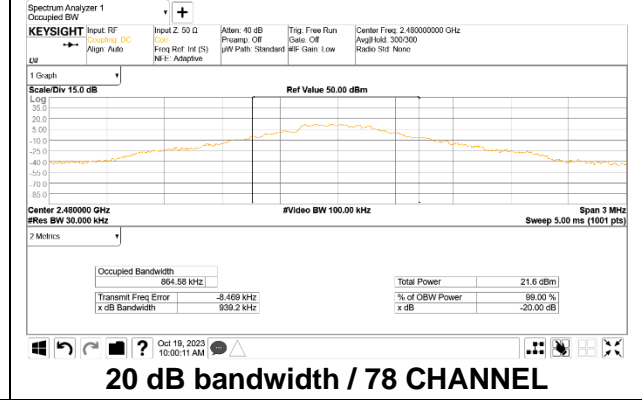
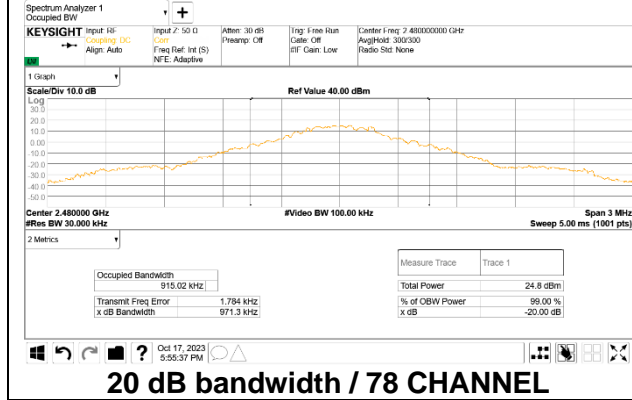
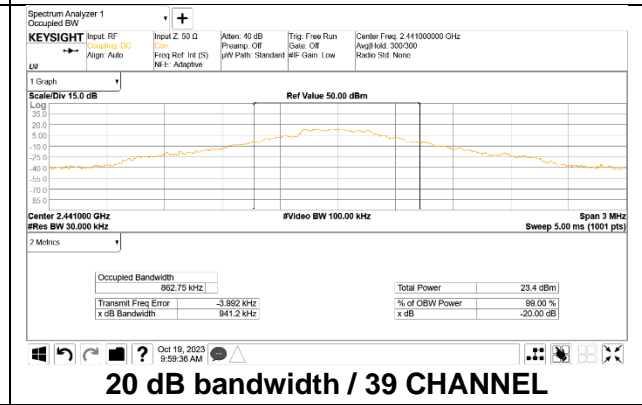
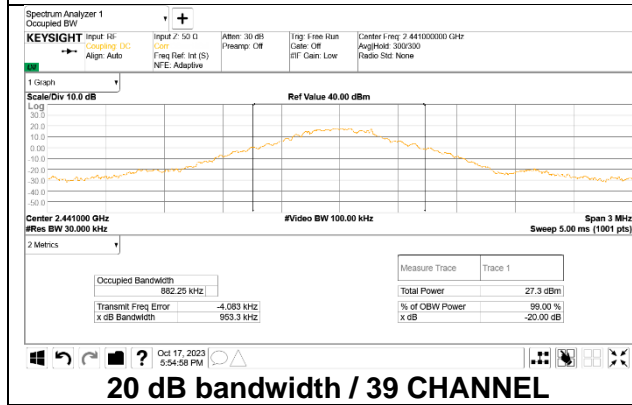
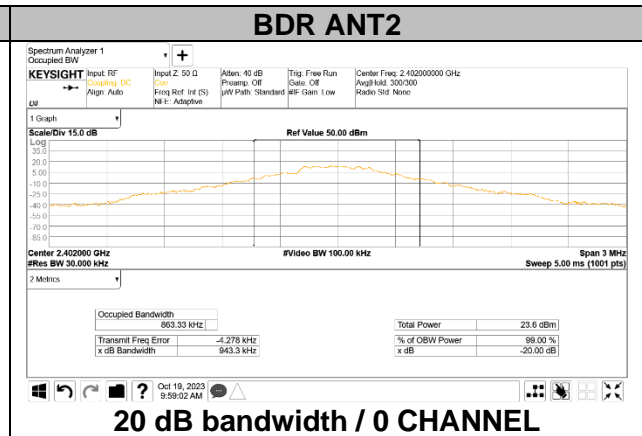
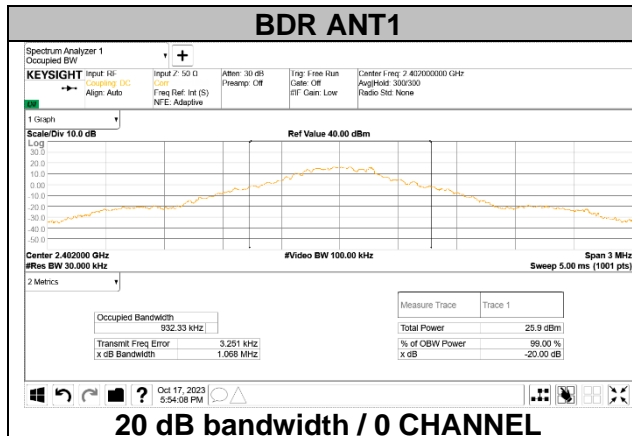
RESULTS

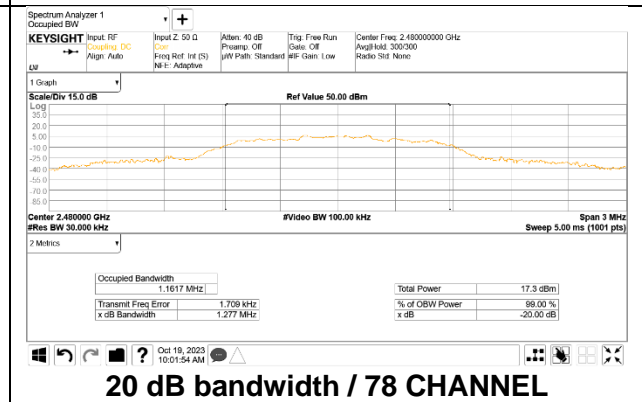
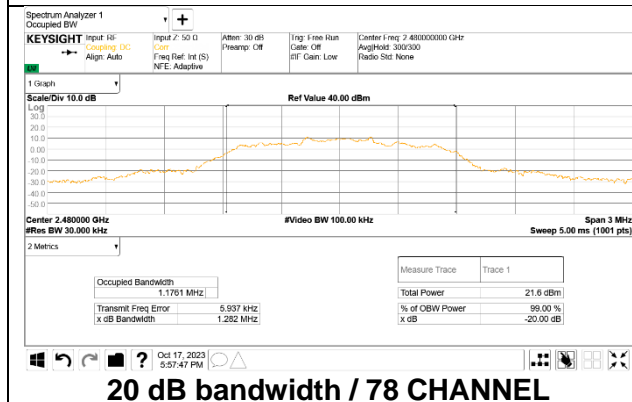
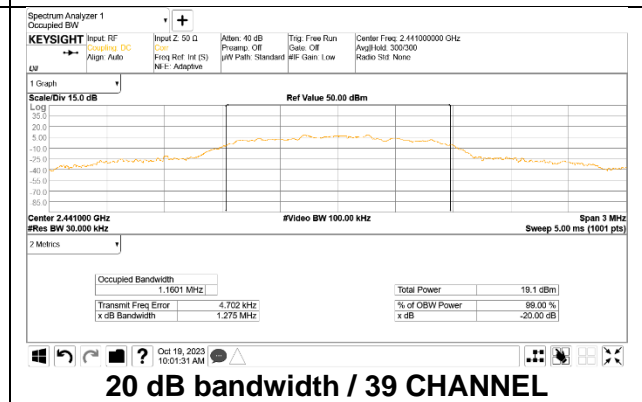
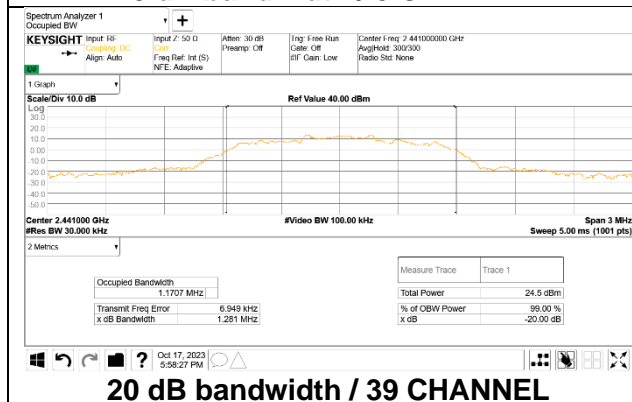
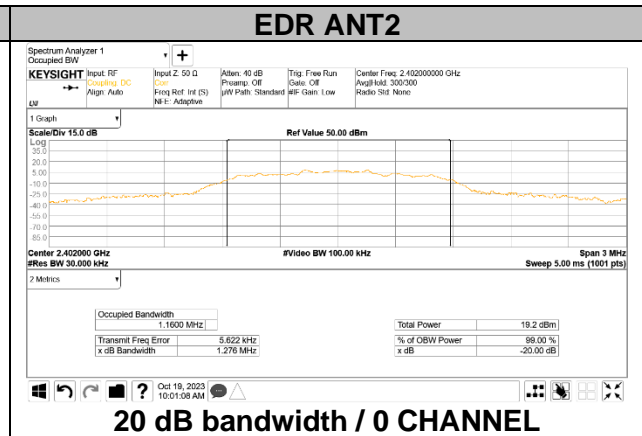
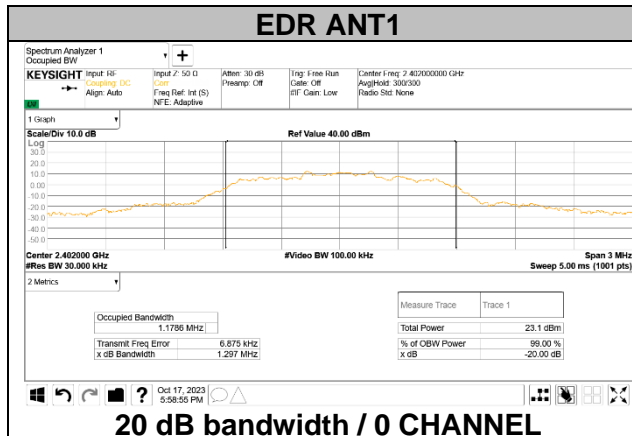
9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Antenna	Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
ANT1	0	2 402	1 068.0
	39	2 441	953.3
	78	2 480	971.3
ANT2	0	2 402	943.3
	39	2 441	941.2
	78	2 480	939.2
Worst			1 068.0

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel		Frequency [MHz]	20 dB Bandwidth [kHz]
ANT1	0	2 402	1 297.0
	39	2 441	1 281.0
	78	2 480	1 282.0
ANT2	0	2 402	1 276.0
	39	2 441	1 275.0
	78	2 480	1 277.0
Worst			1 297.0





9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

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

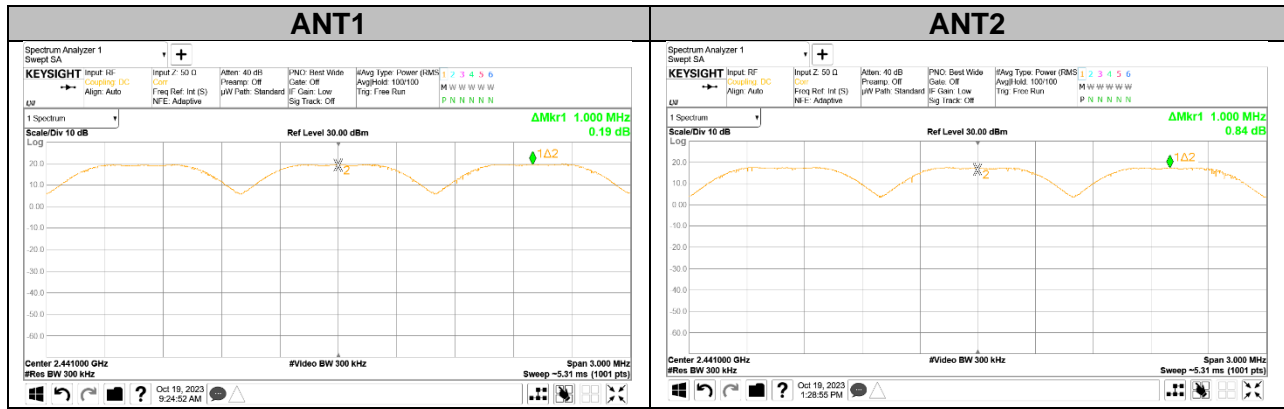
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

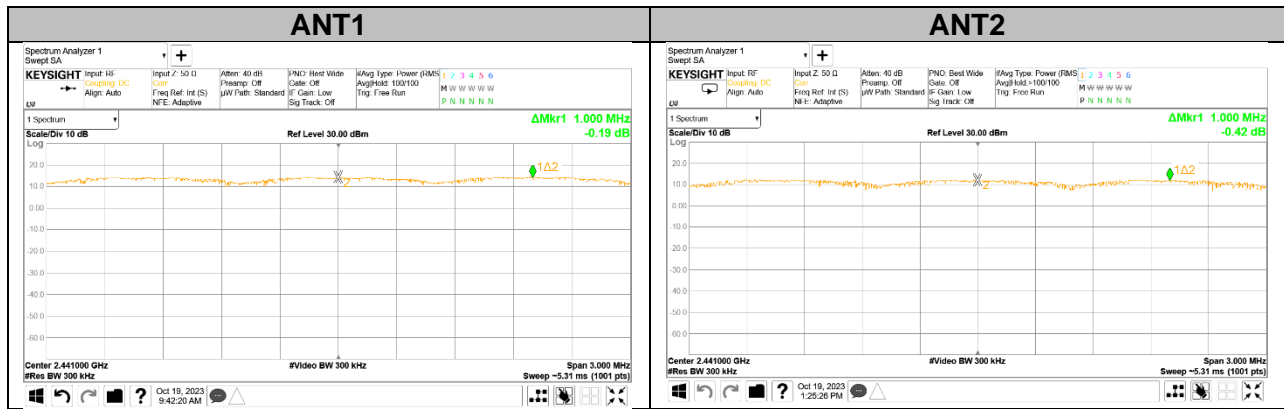
The transmitter output is connected to a spectrum analyzer. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. The VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

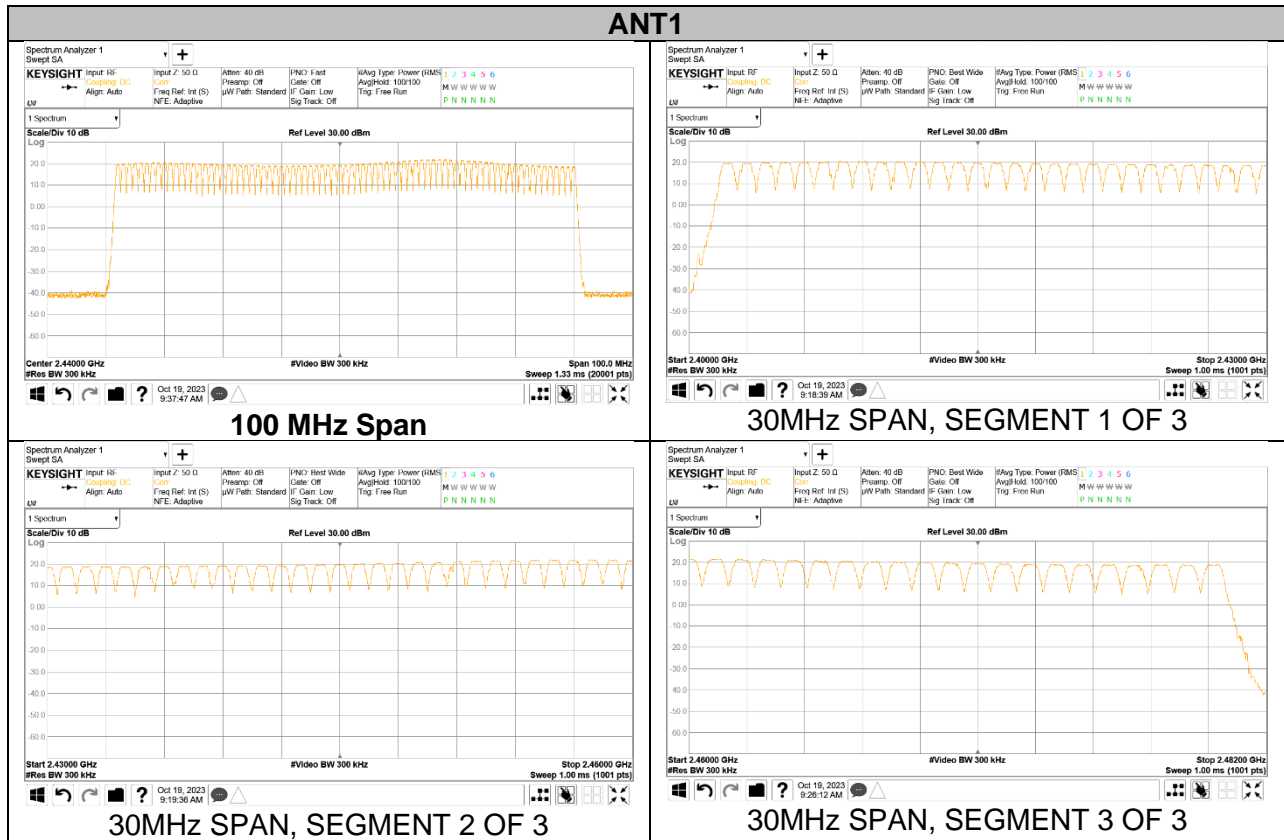
TEST PROCEDURE

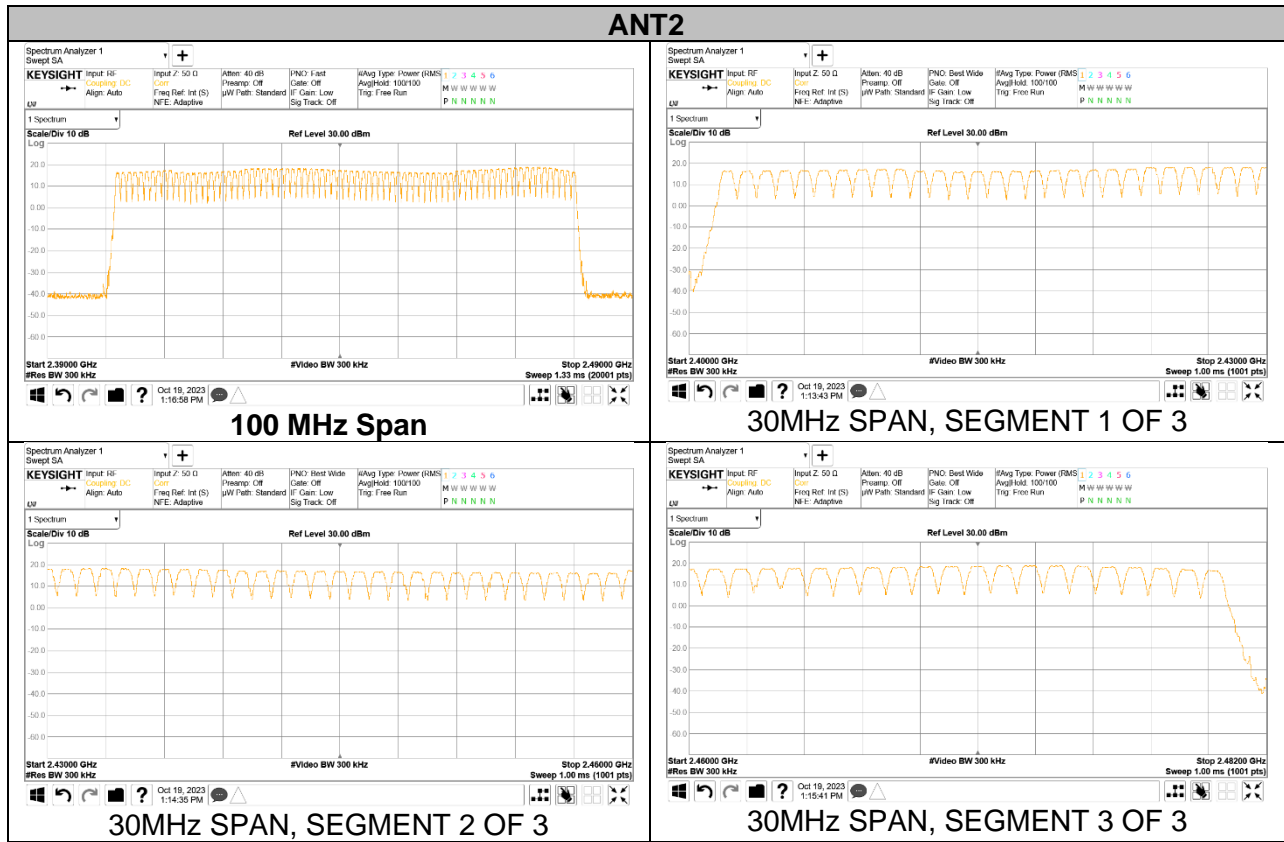
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever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

RESULTS

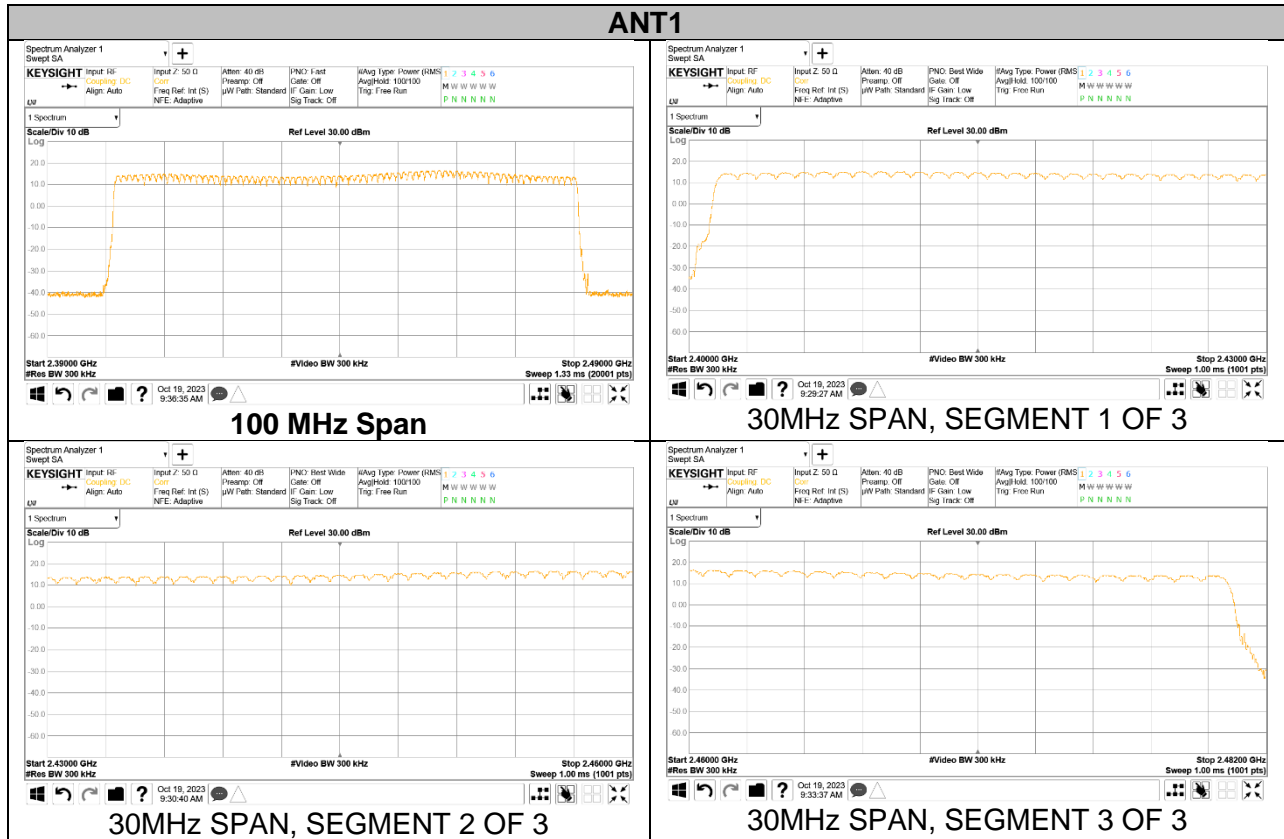
Normal Mode: All Channels Observed

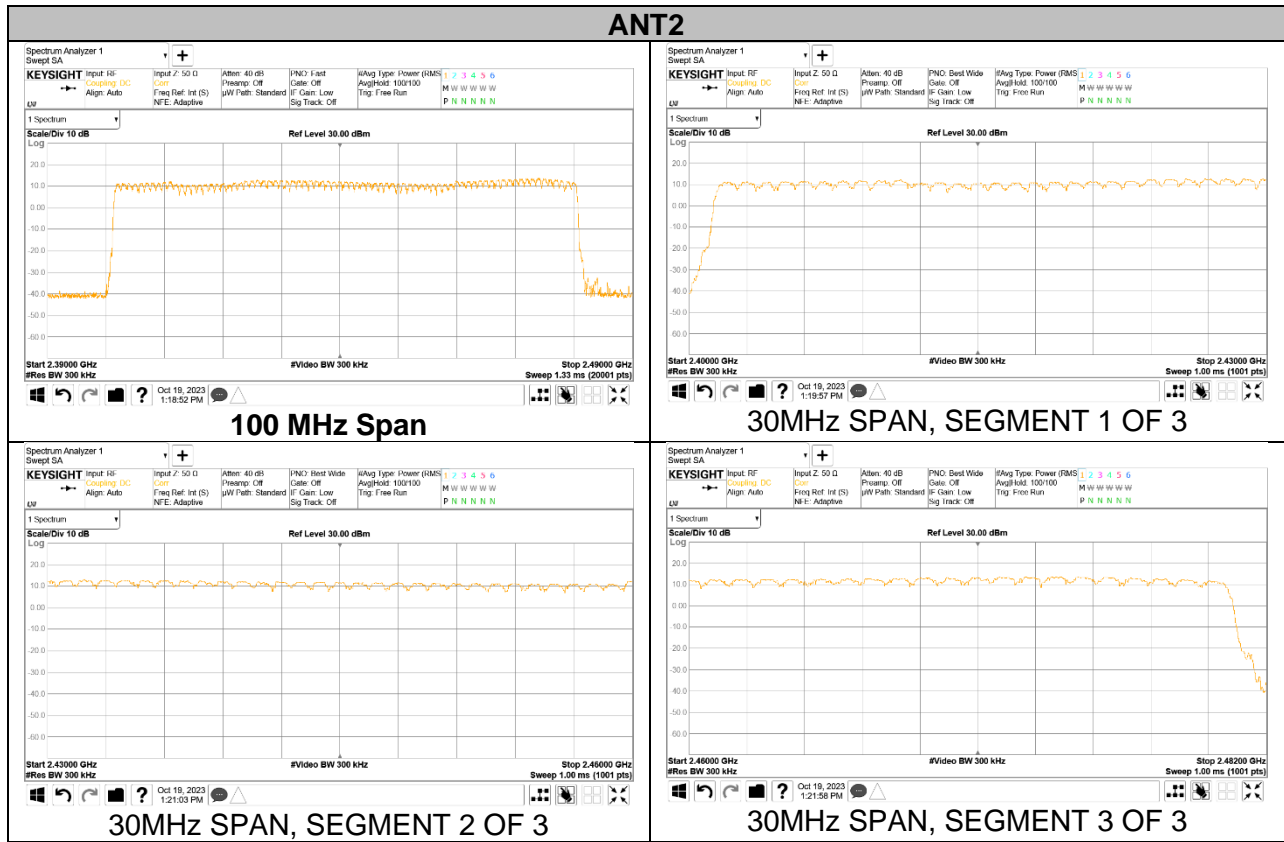
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION





9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION





9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

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

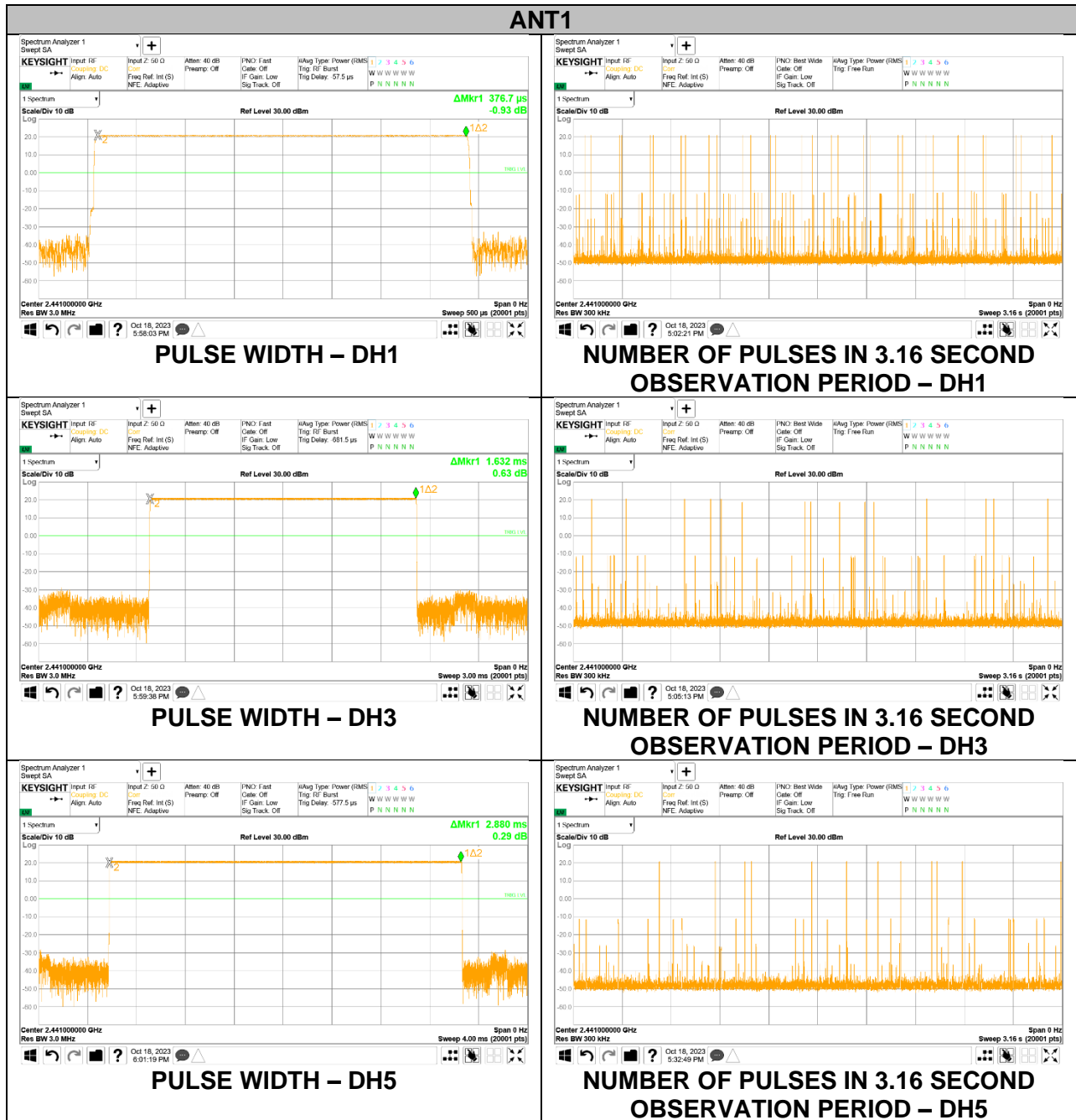
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

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

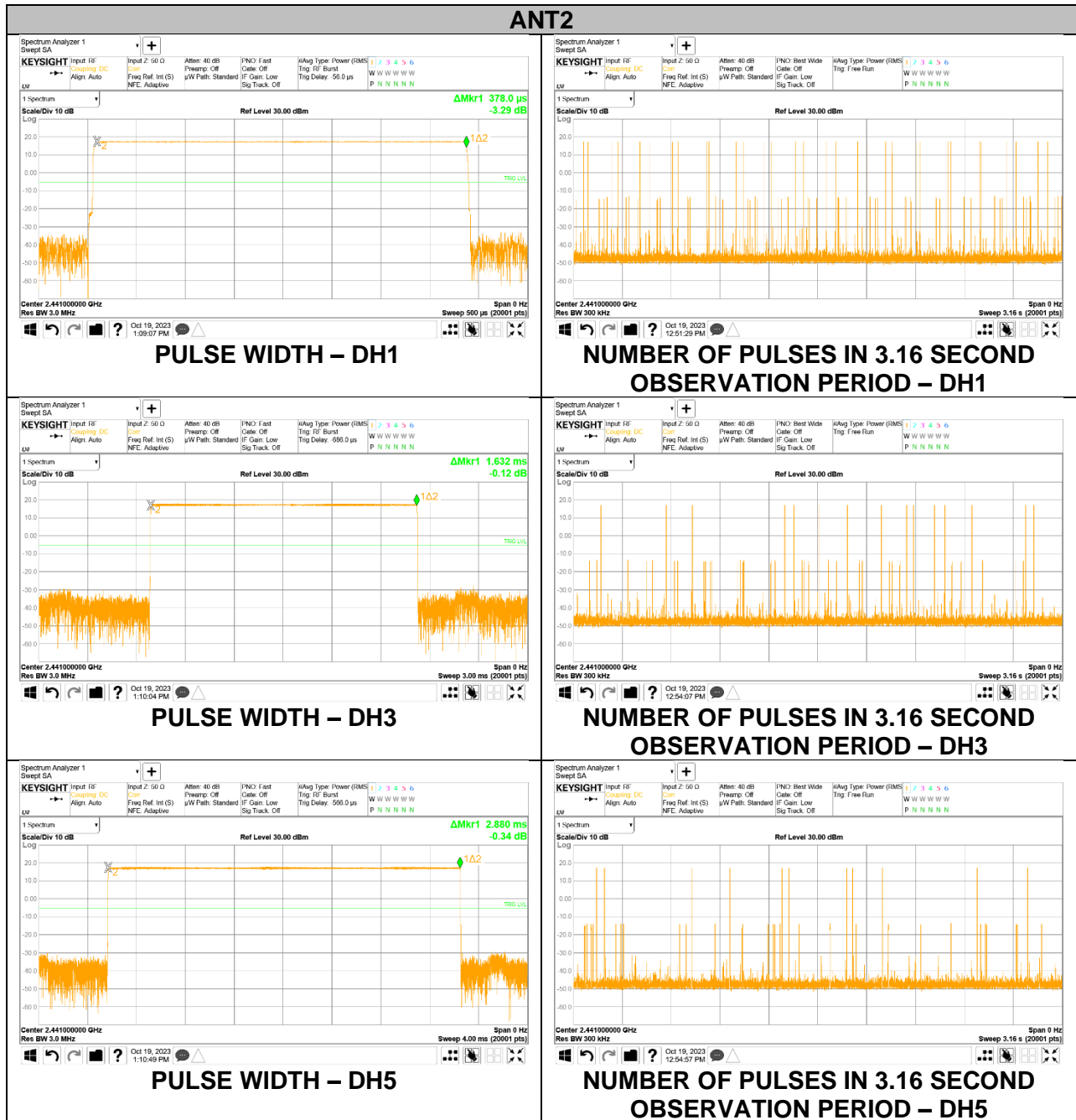
RESULTS

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 Normal ANT1					
DH1	0.377	32	0.121	0.4	-0.279
DH3	1.632	15	0.245	0.4	-0.155
DH5	2.880	11	0.317	0.4	-0.083
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH ANT1					
DH1	0.377	8	0.030	0.4	-0.370
DH3	1.632	4	0.065	0.4	-0.335
DH5	2.880	3	0.086	0.4	-0.314

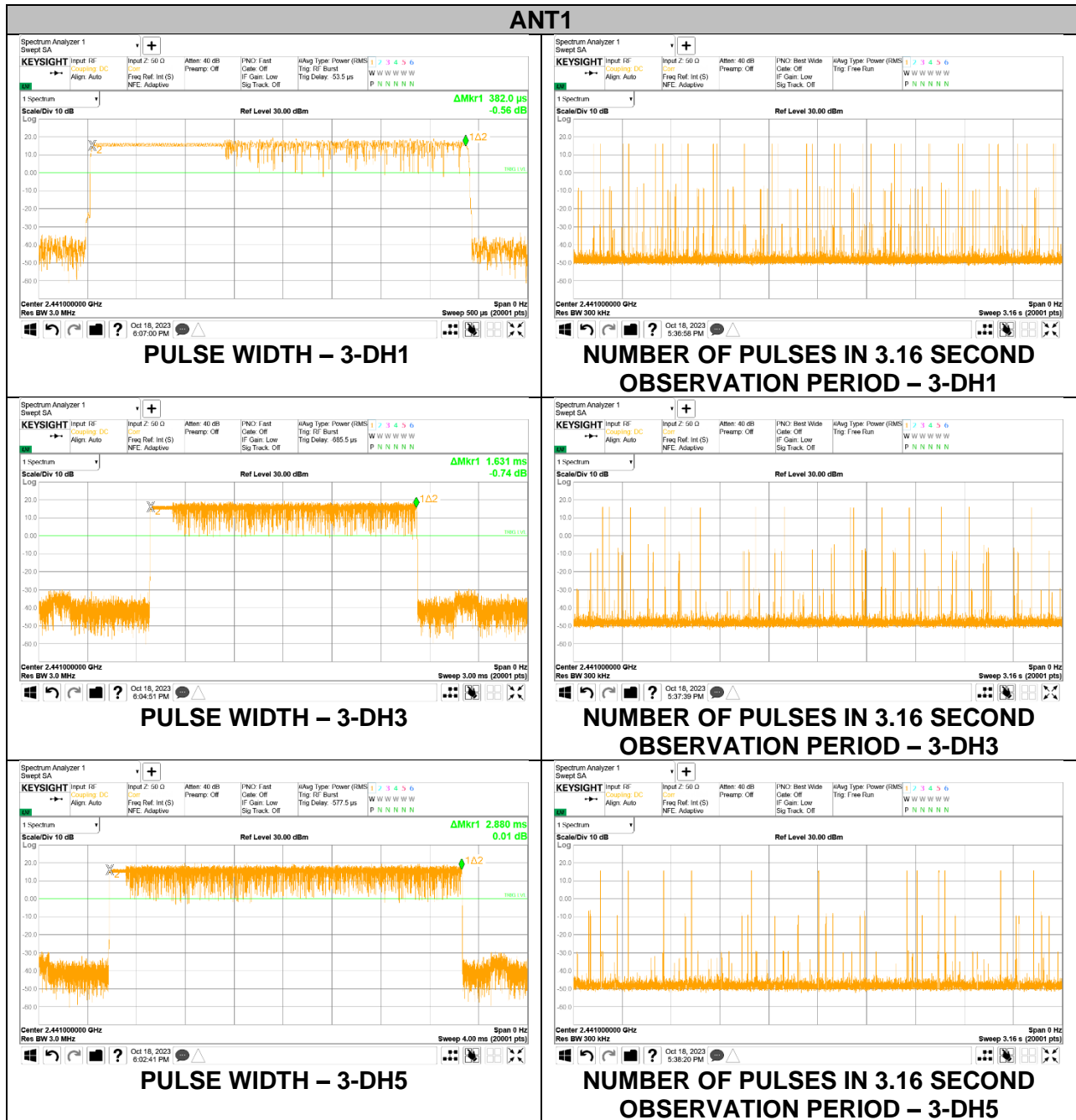


DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal ANT2					
DH1	0.378	32	0.121	0.4	-0.279
DH3	1.632	15	0.245	0.4	-0.155
DH5	2.880	11	0.317	0.4	-0.083
GFSK AFH ANT2					
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH ANT2					
DH1	0.378	8	0.030	0.4	-0.370
DH3	1.632	4	0.065	0.4	-0.335
DH5	2.880	3	0.086	0.4	-0.314

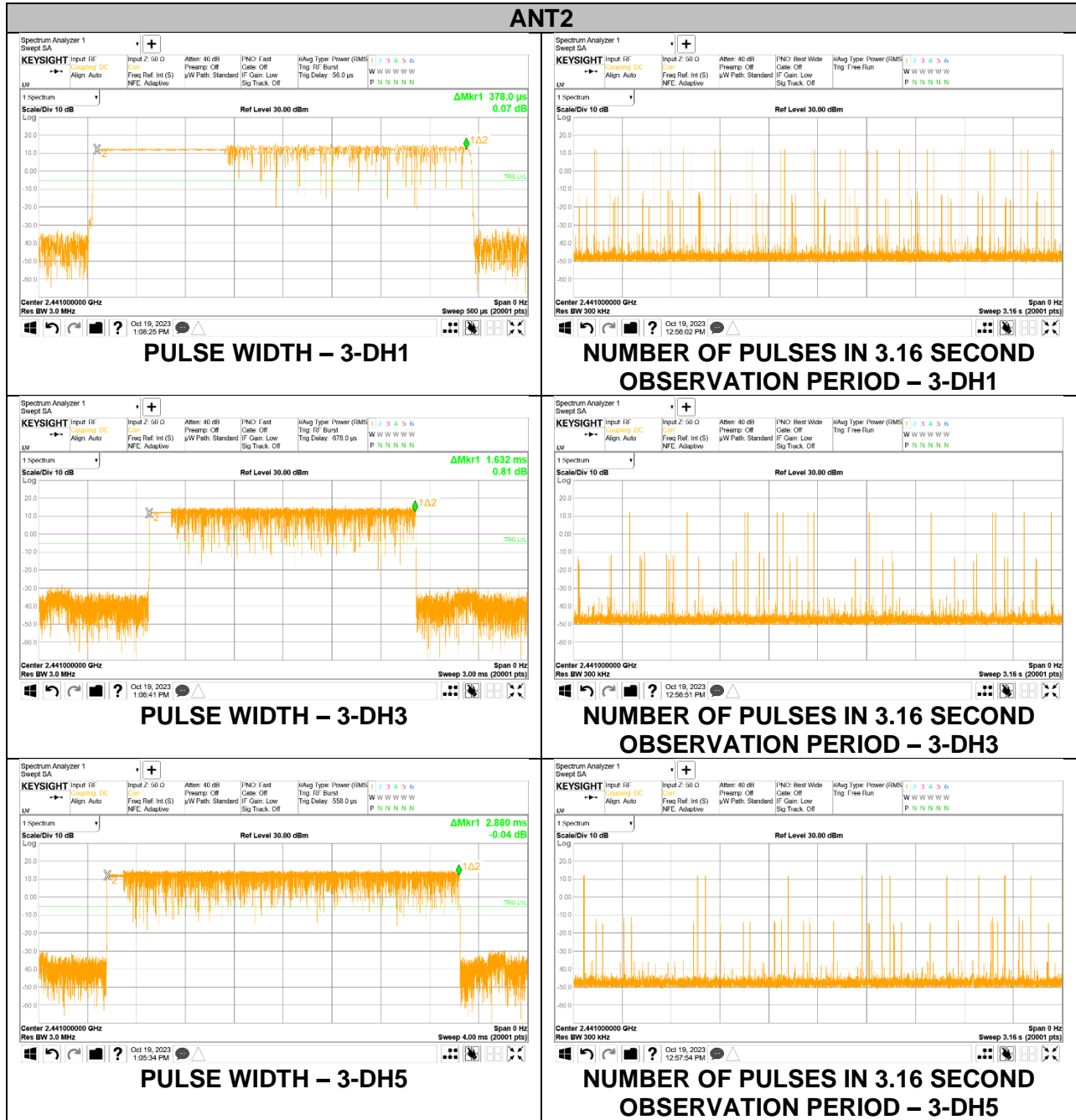


9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Normal ANT1					
DH1	0.382	32	0.122	0.4	-0.278
DH3	1.631	15	0.245	0.4	-0.155
DH5	2.880	12	0.346	0.4	-0.054
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK AFH ANT1					
DH1	0.382	8	0.031	0.4	-0.369
DH3	1.631	4	0.065	0.4	-0.335
DH5	2.880	3	0.086	0.4	-0.314



DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Normal ANT2					
DH1	0.378	32	0.121	0.4	-0.279
DH3	1.632	15	0.245	0.4	-0.155
DH5	2.880	11	0.317	0.4	-0.083
8PSK AFH ANT2					
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK AFH ANT2					
DH1	0.378	8	0.030	0.4	-0.370
DH3	1.632	4	0.065	0.4	-0.335
DH5	2.880	3	0.086	0.4	-0.314



9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

The correlated maximum antenna gain + Beamforming 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

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
ANT1	0	2 402	19.85	21.00	-1.15	
	39	2 441	20.08		-0.92	
	78	2 480	18.21		-2.79	
ANT2	0	2 402	16.68		-4.32	
	39	2 441	17.66		-3.34	
	78	2 480	15.25		-5.75	
Worst			20.08			-0.92

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
ANT1	0	2 402	19.09	21.00	-1.91	
	39	2 441	19.45		-1.55	
	78	2 480	17.61		-3.39	
ANT2	0	2 402	16.31		-4.69	
	39	2 441	16.14		-4.86	
	78	2 480	14.20		-6.80	
Worst			19.45			-1.55

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
ANT1	0	2 402	18.46	21.00	-2.54	
	39	2 441	19.47		-1.53	
	78	2 480	17.77		-3.23	
ANT2	0	2 402	15.72		-5.28	
	39	2 441	16.81		-4.19	
	78	2 480	14.17		-6.83	
Worst			19.47			-1.53

9.6.4. BASIC DATA RATE GFSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
DUAL ANT1	0	2 402	13.90	21.00		
	39	2 441	13.45			
	78	2 480	13.59			
DUAL ANT2	0	2 402	12.42			
	39	2 441	13.87			
	78	2 480	12.09			
DUAL ANT1+2	0	2 402	16.23			-4.77
	39	2 441	16.68			-4.32
	78	2 480	15.91			-5.09
Worst			16.68			-4.32

9.6.1. ENHANCED DATA RATE Pi/4-DPSK MODULATION(DUAL)

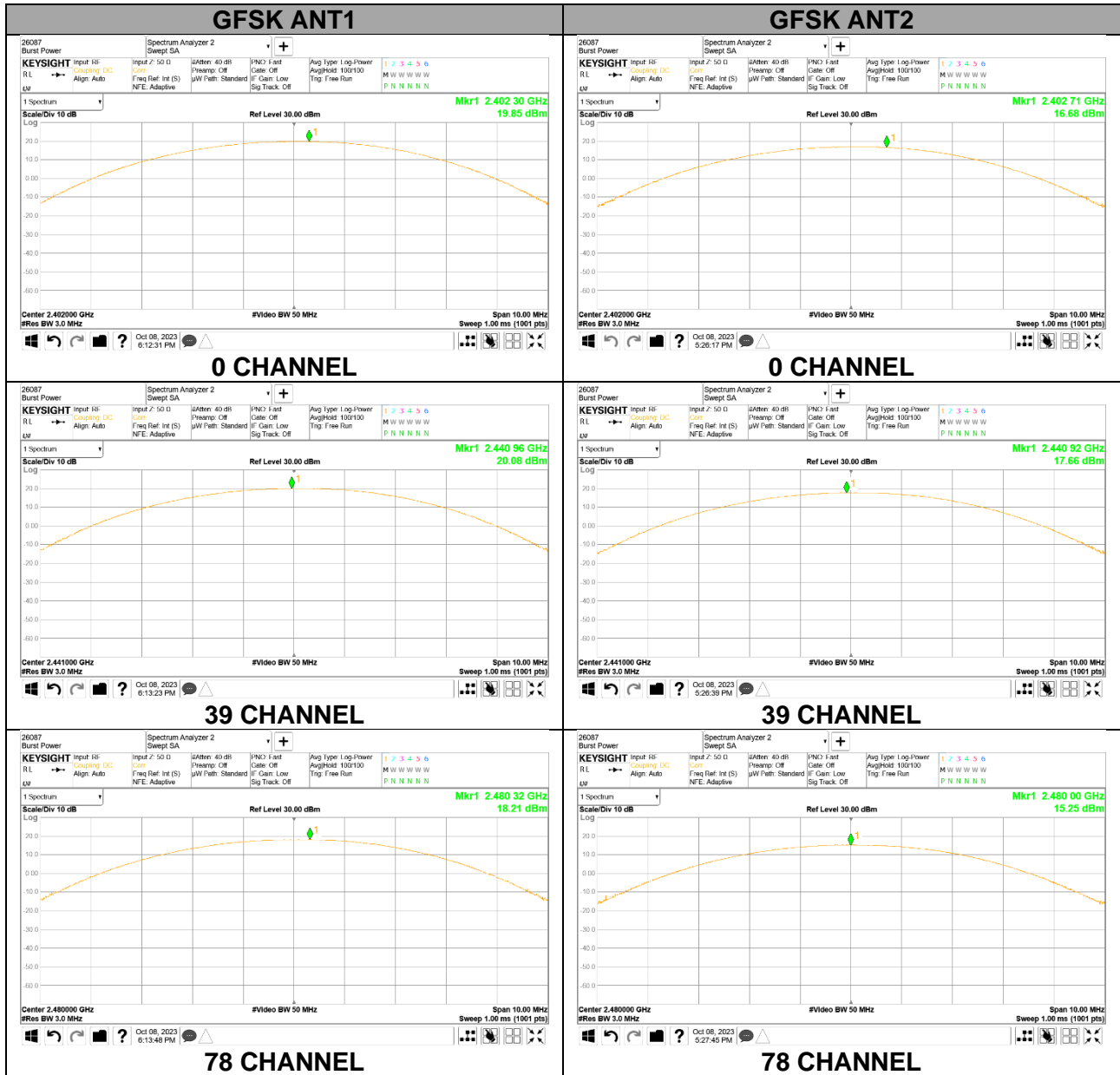
Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
DUAL ANT1	0	2 402	12.02	21.00		
	39	2 441	12.33			
	78	2 480	11.06			
DUAL ANT2	0	2 402	9.67			
	39	2 441	10.56			
	78	2 480	9.08			
DUAL ANT1+2	0	2 402	14.01			-6.99
	39	2 441	14.54			-6.46
	78	2 480	13.19			-7.81
Worst			14.54			-6.46

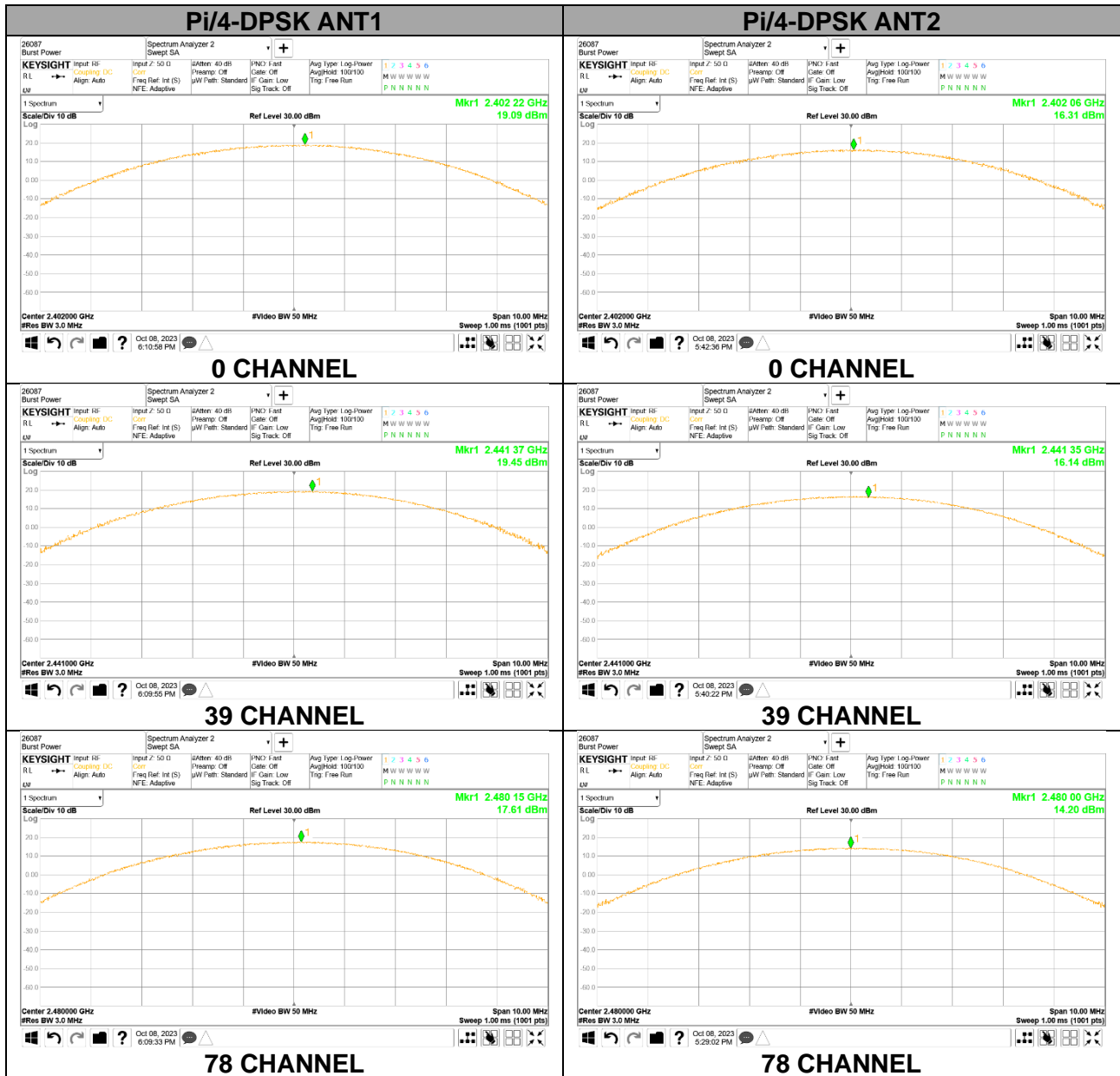
9.6.2. ENHANCED DATA RATE 8PSK MODULATION(DUAL)

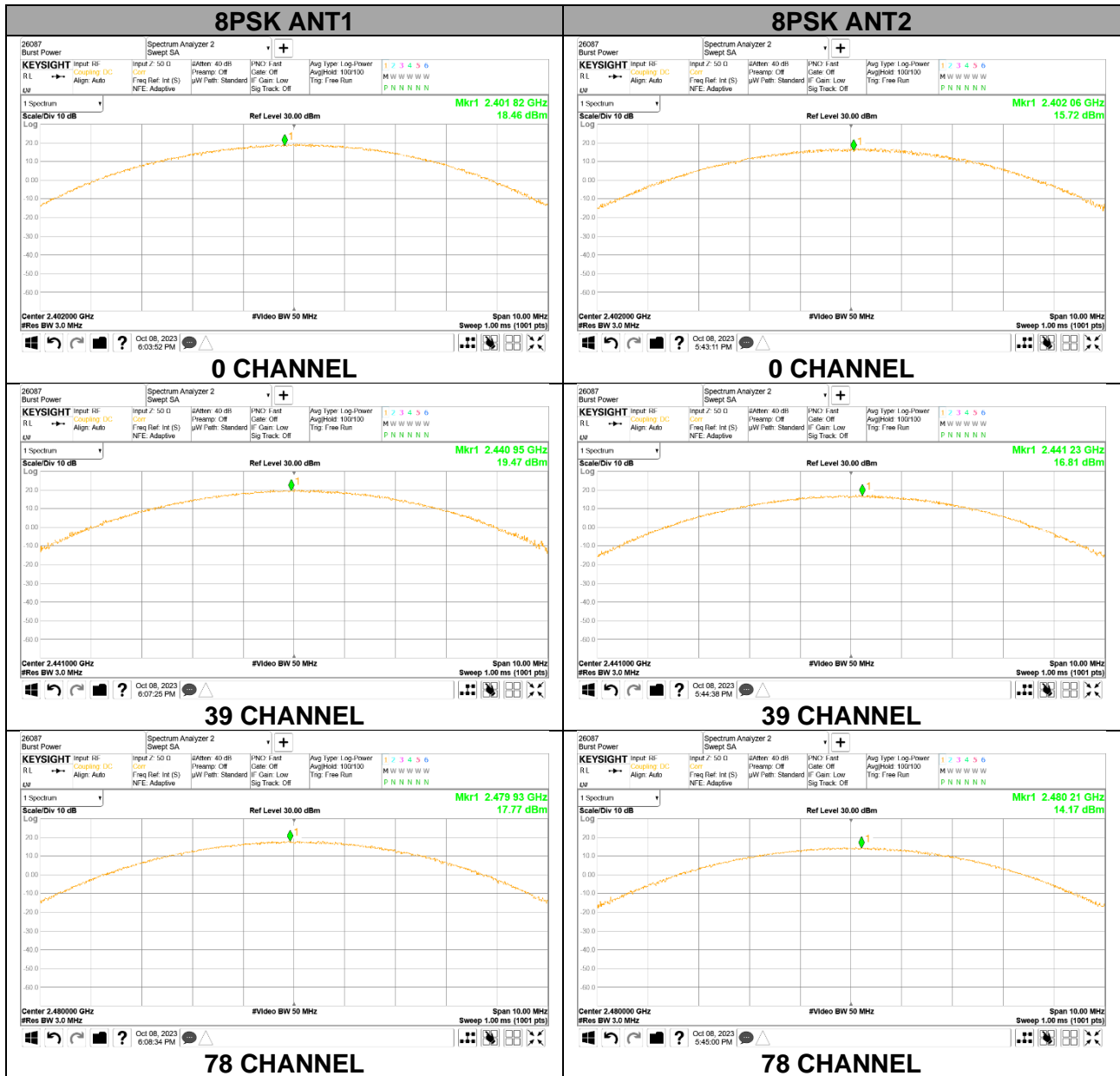
Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]	
DUAL ANT1	0	2 402	12.29	21.00		
	39	2 441	12.58			
	78	2 480	12.10			
DUAL ANT2	0	2 402	9.88			
	39	2 441	11.04			
	78	2 480	9.43			
DUAL ANT1+2	0	2 402	14.26			-6.74
	39	2 441	14.89			-6.11
	78	2 480	13.98			-7.02
Worst			14.89			-6.11

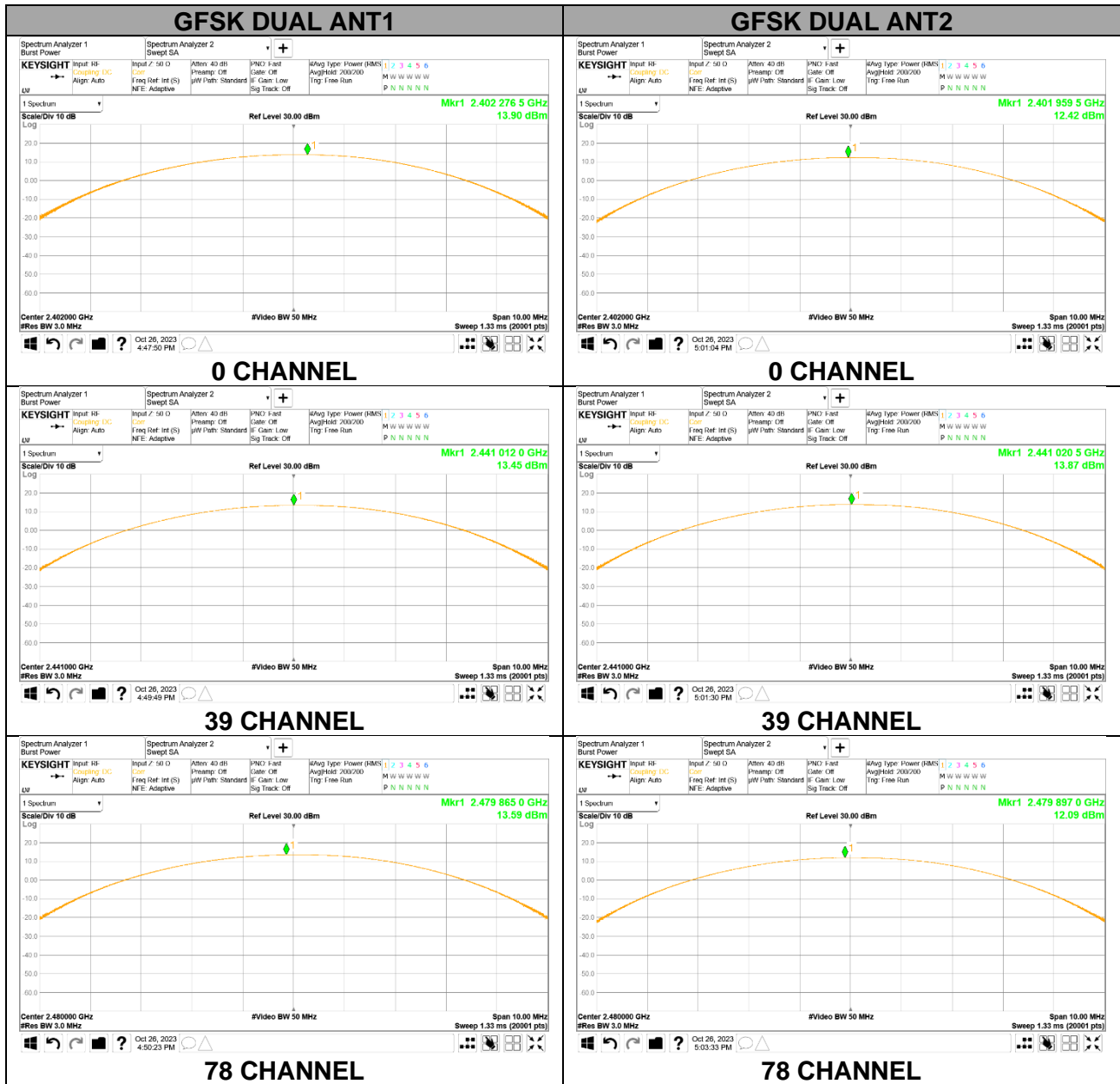
9.6.3. OUTPUT POWER PLOTS

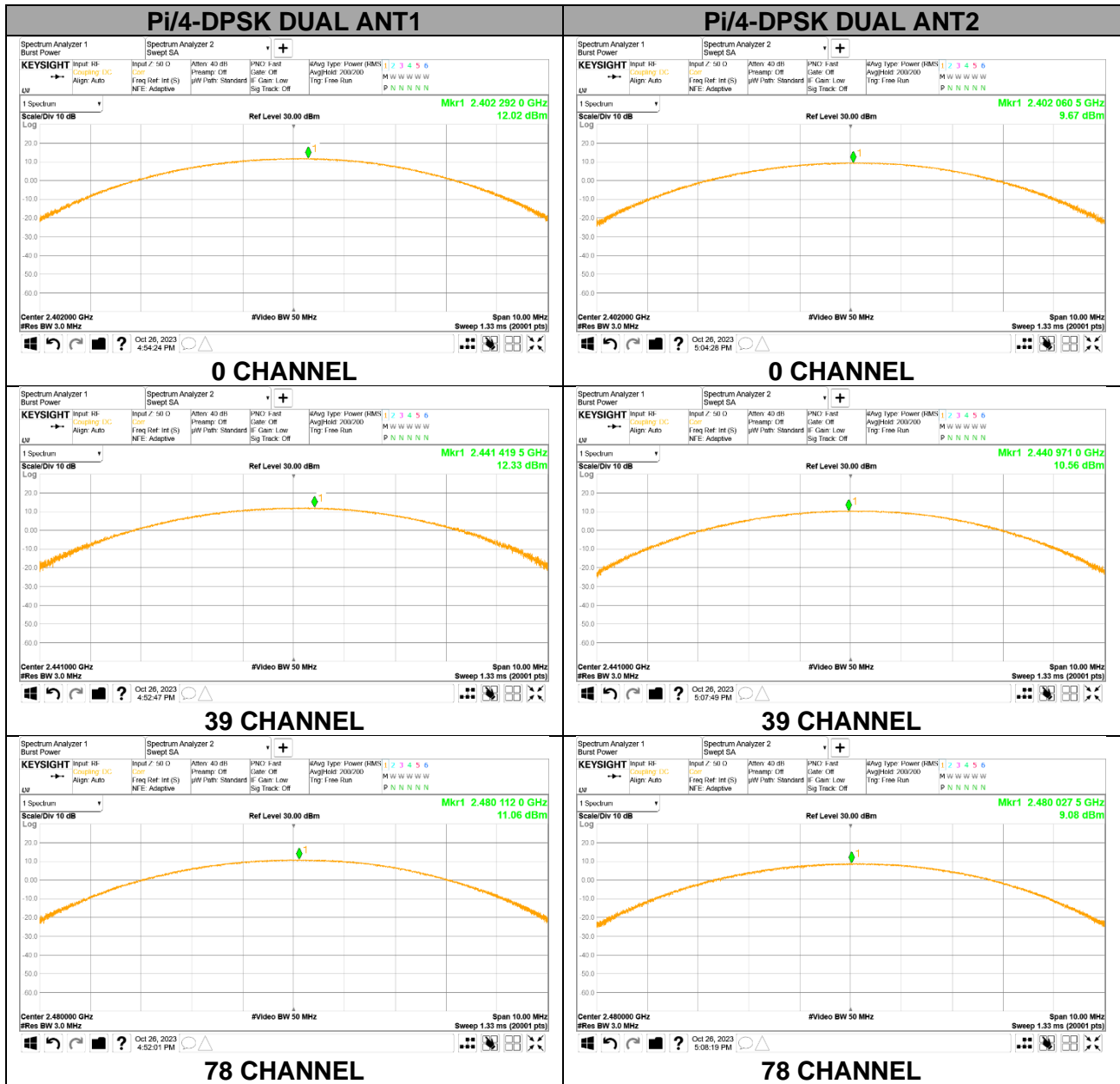
PEAK OUTPUT POWER

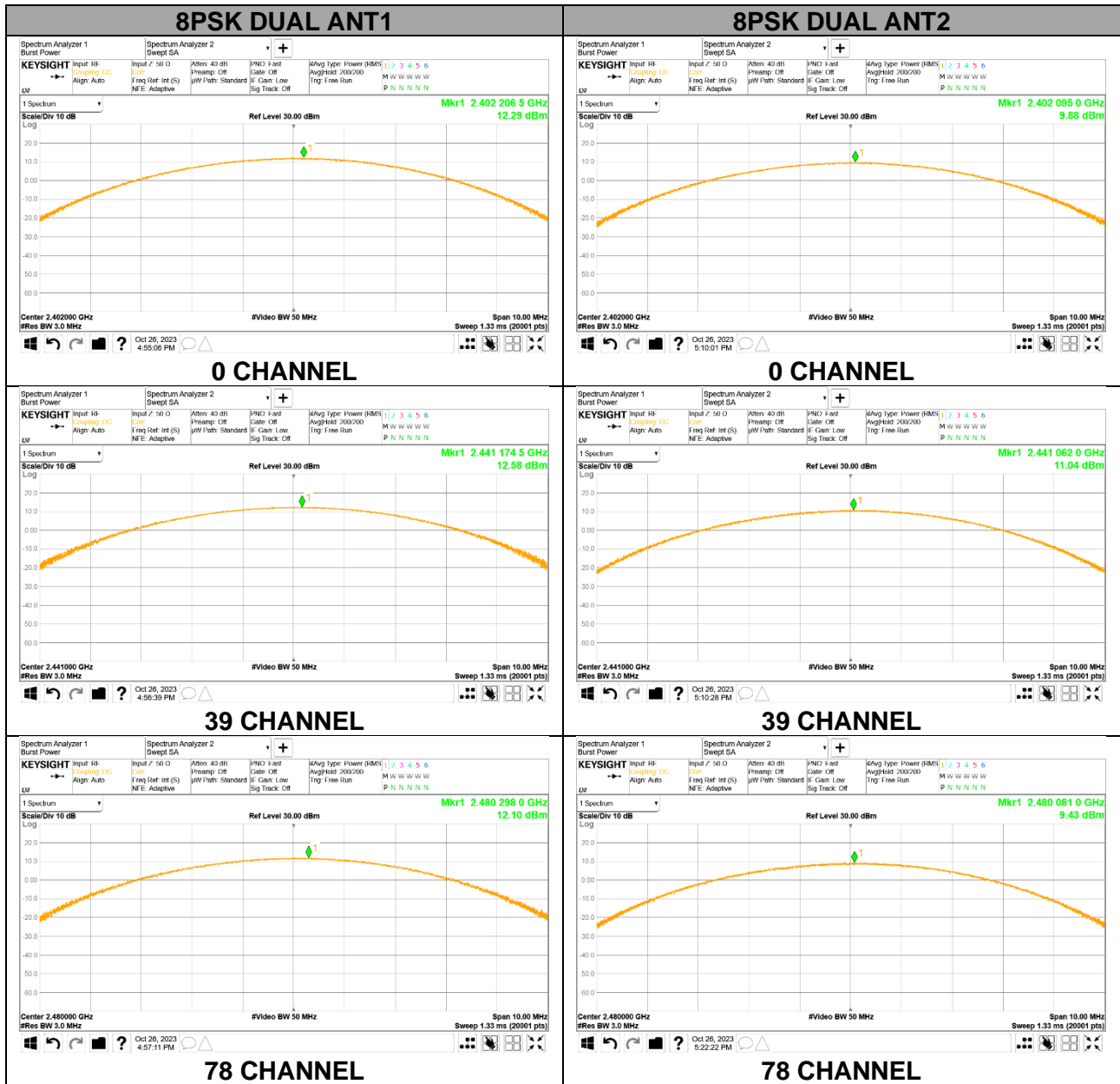












9.7. AVERAGE POWER

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

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
ANT1	0	2 402	19.300	85.114
	39	2 441	19.657	92.406
	78	2 480	17.747	59.525
ANT2	0	2 402	16.650	46.238
	39	2 441	17.346	54.275
	78	2 480	14.772	30.005

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
ANT1	0	2 402	15.952	39.373
	39	2 441	16.289	42.550
	78	2 480	14.590	28.774
ANT2	0	2 402	13.170	20.749
	39	2 441	13.645	23.147
	78	2 480	11.405	13.820

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
ANT1	0	2 402	15.929	39.165
	39	2 441	16.570	45.394
	78	2 480	14.568	28.629
ANT2	0	2 402	13.176	20.778
	39	2 441	13.675	23.308
	78	2 480	11.392	13.778

9.7.4. BASIC DATA RATE GFSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]	
DUAL ANT1	0	2 402	13.631		
	39	2 441	13.174		
	78	2 480	13.330		
DUAL ANT2	0	2 402	12.354		
	39	2 441	13.633		
	78	2 480	12.116		
DUAL ANT1+2	0	2 402	16.050		40.268
	39	2 441	16.420		43.852
	78	2 480	15.776		37.806

9.7.5. ENHANCED DATA RATE PI/4-DQPSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]	
DUAL ANT1	0	2 402	10.144		
	39	2 441	10.737		
	78	2 480	9.004		
DUAL ANT2	0	2 402	7.682		
	39	2 441	8.208		
	78	2 480	6.412		
DUAL ANT1+2	0	2 402	12.096		16.201
	39	2 441	12.664		18.469
	78	2 480	10.909		12.327

9.7.6. ENHANCED DATA RATE 8PSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]	
DUAL ANT1	0	2 402	9.886		
	39	2 441	10.769		
	78	2 480	8.721		
DUAL ANT2	0	2 402	7.527		
	39	2 441	8.295		
	78	2 480	6.436		
DUAL ANT1+2	0	2 402	11.875		15.399
	39	2 441	12.716		18.690
	78	2 480	10.737		11.850

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.

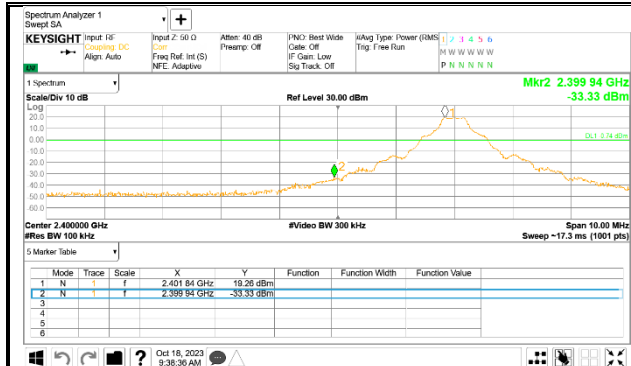
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

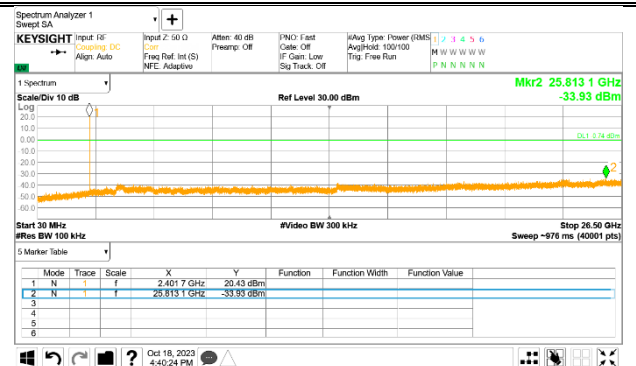
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

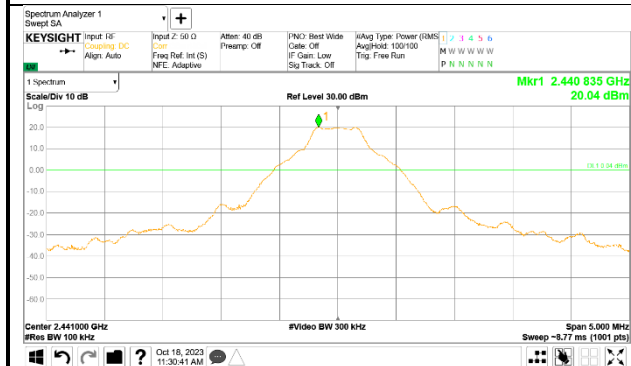
SPURIOUS EMISSIONS, NON-HOPPING – ANT1



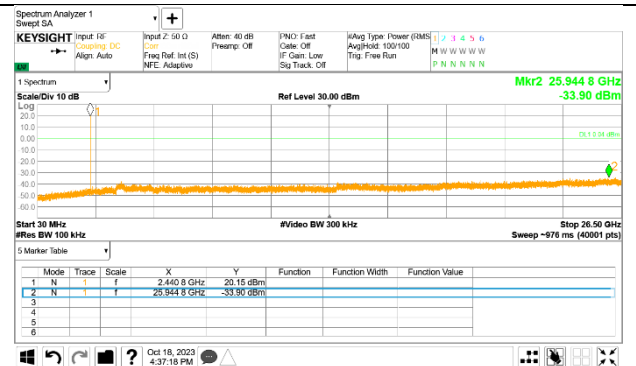
0 CHANNEL BANDEDGE



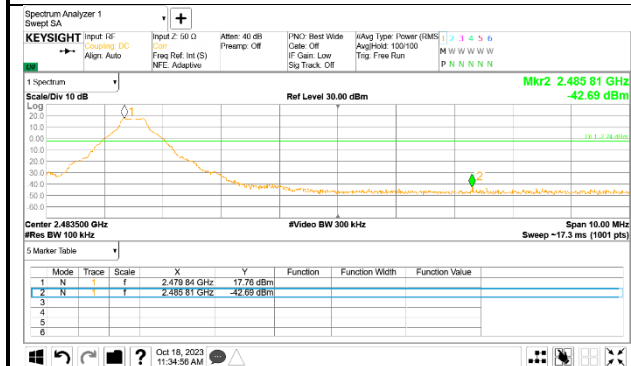
OUT-OF-BAND 0 CHANNEL



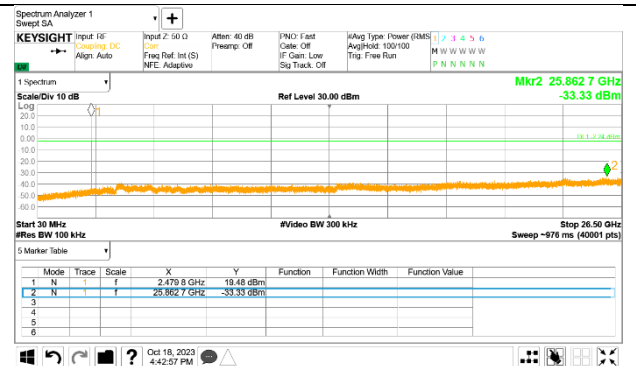
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

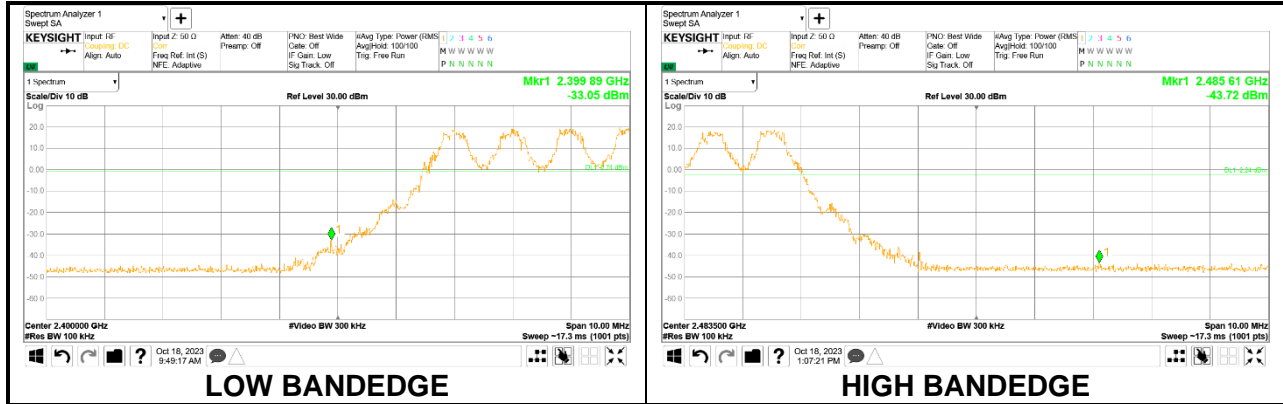


78 CHANNEL BANDEDGE

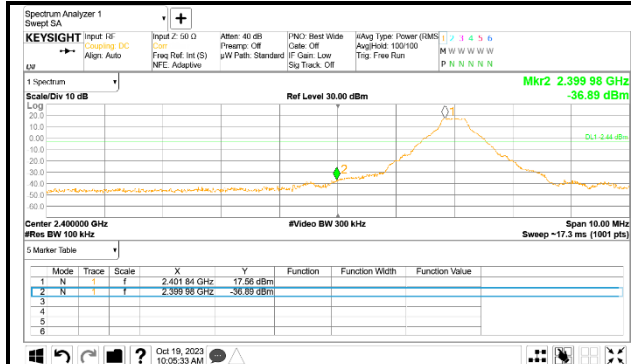


OUT-OF-BAND 78 CHANNEL

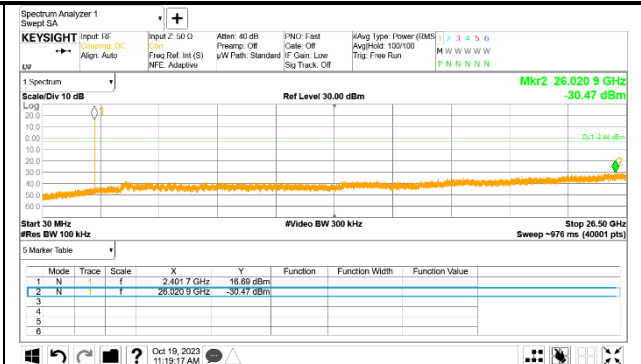
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON – ANT1



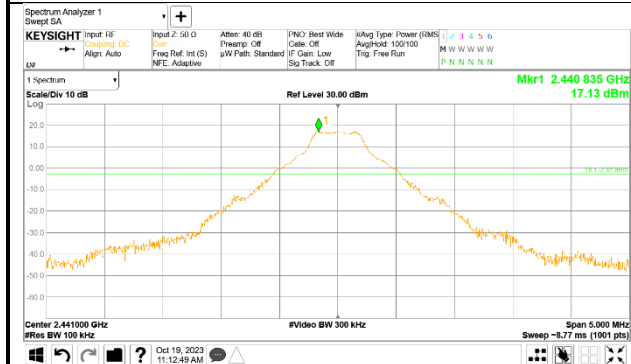
SPURIOUS EMISSIONS, NON-HOPPING – ANT2



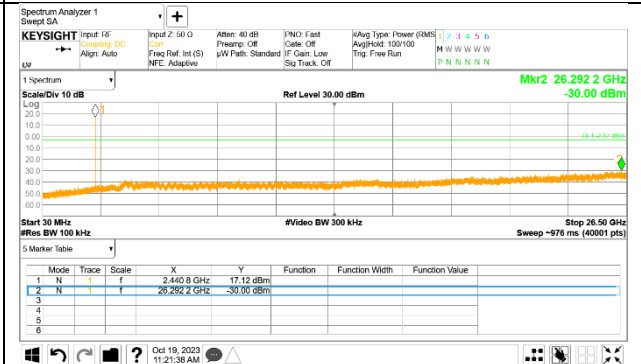
0 CHANNEL BANDEDGE



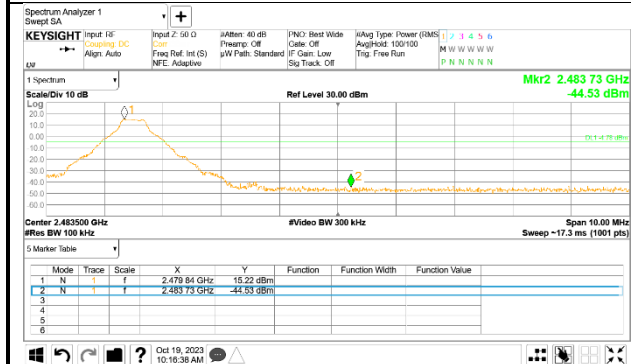
OUT-OF-BAND 0 CHANNEL



IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL



78 CHANNEL BANDEDGE



OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON – ANT2

