

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 1 of 53

Applicant : Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address of Applicant : Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province

Product Name : Real-time Fluorescence Quantitative PCR Instrument
Brand Name : anitoa
Model No. : MQ4164,MQ4041,MQ4042,MQ4043,MQ4044,MQ4081
MQ4082,MQ4083,MQ4084,MQ4161,MQ4162,MQ4163
Sample No. : H22020028-01#01

FCC ID : 2A7M7MQ4

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2022-05-20
Date of Test : 2022-05-21 ~ 2022-07-15
Date of Issue : 2022-07-15

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product.

Prepared by:



(Erik Yang)

Reviewed by:



(Jennifer Zhou)

Approved by:



(Authorized signatory: Guoyou Chi)

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 2 of 53

Contents

1	GENERAL INFORMATION	3
1.1	TESTING LABORATORY	3
1.2	DETAILS OF APPLICATION	3
1.3	DETAILS OF EUT	3
1.4	TEST METHODOLOGY	4
1.5	TEST SUMMARY	4
2	TEST CONDITION	5
2.1	ENVIRONMENTAL CONDITIONS	5
2.2	EQUIPMENT LIST	5
2.3	MEASUREMENT UNCERTAINTY	6
3	TEST SET-UP AND OPERATION MODES	7
3.1	DETAILS OF TEST MODE	7
3.2	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	7
3.3	SUPPORT SOFTWARE	7
3.4	TEST SETUP DIAGRAM	8
4	TEST RESULTS	10
4.1	TRANSMITTER REQUIREMENT & TEST SUITES	10
4.1.1	<i>Antenna Requirement</i>	10
4.1.2	<i>Maximum Conducted Output Power</i>	11
4.1.3	<i>20dB Bandwidth and 99% Bandwidth</i>	17
4.1.4	<i>Conducted Spurious Emission & Authorized-band band-edge</i>	21
4.1.5	<i>Radiated Spurious Emission</i>	38
4.1.6	<i>Band Edge (Restricted-band band-edge)</i>	39
4.1.7	<i>Hopping Frequency Separation</i>	40
4.1.8	<i>Number of Hopping Frequency</i>	42
4.1.9	<i>Time of Occupancy</i>	44
4.2	MAINS EMISSIONS	48
4.2.1	<i>Conducted Emission on AC Mains</i>	48
5	APPENDIXES	51
5.1	PHOTOGRAPHS OF THE SAMPLE	51
5.2	SET-UP FOR CONDUCTED EMISSIONS	52
5.3	SET-UP FOR CONDUCTED RF TEST AT ANTENNA PORT	52
5.4	SET-UP FOR SPURIOUS EMISSIONS BELOW 1GHZ	53
5.5	SET-UP FOR SPURIOUS EMISSIONS ABOVE 1GHZ	53

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 3 of 53

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province
Contact Person	Xu.Bai
Telephone	13616528058
Email	xu.bai@artobio.cn
Manufacturer Company Name	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province
Factory Company Name	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province

1.3 Details of EUT

Product Name	Real-time Fluorescence Quantitative PCR Instrument
Brand Name	anitoa
Test Model No.	MQ4164
Series Model No.	MQ4041,MQ4042,MQ4043,MQ4044,MQ4081,MQ4082,MQ4083,MQ4084,MQ4161,MQ4162,MQ4163
Difference Description	All the models are identical with the same schematics, PCB layout, structure, size and components, the difference are only quantities in fluorescence channel and check holes.
FCC ID	2A7M7MQ4
Mode of Operation	Bluetooth BR/EDR
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	79 (at intervals of 1 MHz)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Antenna Type	Internal Antenna
Antenna Gain	2dBi
Test Voltage	AC 120V 60Hz by Switching adapter (Model: GST160A15)
Extreme Voltage	Low Voltage: AC 100V by Switching adapter (Model: GST160A15)

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 4 of 53

	High Voltage: AC 240V by Switching adapter (Model: GST160A15)
Hardware version	MQ_05_V10.3
Software version	V1.7.2.2
RF power setting in TEST SW	Engineer Mode

1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
KDB Publication 558074 D01 v05r02	Part 15.247 Meas Guidance
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.5 Test Summary

Test Item	FCC Rules	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	PASS
Maximum Conducted Output Power	FCC Part 15.247(b)(1)	PASS
20dB Bandwidth and 99% Bandwidth	FCC Part 15.247(a)(1)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	PASS
Radiated Spurious Emission	FCC Part 15.247(d), 15.205, 15.209	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	PASS
Hopping Frequency Separation	FCC Part 15.247(a)(1)	PASS
Number of Hopping Frequency	FCC Part 15.247(a)(1)(iii)	PASS
Time of Occupancy	FCC Part 15.247(a)(1)(iii)	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	PASS

Note(s):

$\pi/4$ -DQPSK is the EDR 2M rate mode, 8-DPSK is the EDR 3M rate mode. The consistency of test results in $\pi/4$ -DQPSK and 8-DPSK is very high. So we chose 8-DPSK as a typical representative to appear on the report. Another we will show all the modes on the RF output power test item.

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 5 of 53

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-17	2022-08-16
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-10	2022-06-09
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-06-10	2022-06-09
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-13	2022-08-12
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08	2023-06-07
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08	2023-06-07
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-06-12	2022-06-11
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2022-11-22
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-09	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-06-09	2023-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A	N/A

Note(s): Updated calibration dates for some equipment

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2022-06-09	2023-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2022-06-09	2023-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2022-06-09	2023-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2022-06-09	2023-06-08

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 6 of 53

Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2022-06-09	2023-06-08
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2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3.42 dB
	> 1GHz	± 4.20 dB
Conducted Emission on AC Mains	9 kHz to 30 MHz	± 1.71 dB

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 7 of 53

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software (Engineer Mode) was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel (CH0)	2402MHz
The middle channel (CH39)	2441MHz
The Highest channel (CH78)	2480MHz

The basic operation modes are:

- A. On
 - 1. BR/EDR mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - iv. Hopping mode
 - b. Receiving
 - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Switching Adapter	N/A	GST160A15	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	Engineer Mode

TEST REPORT

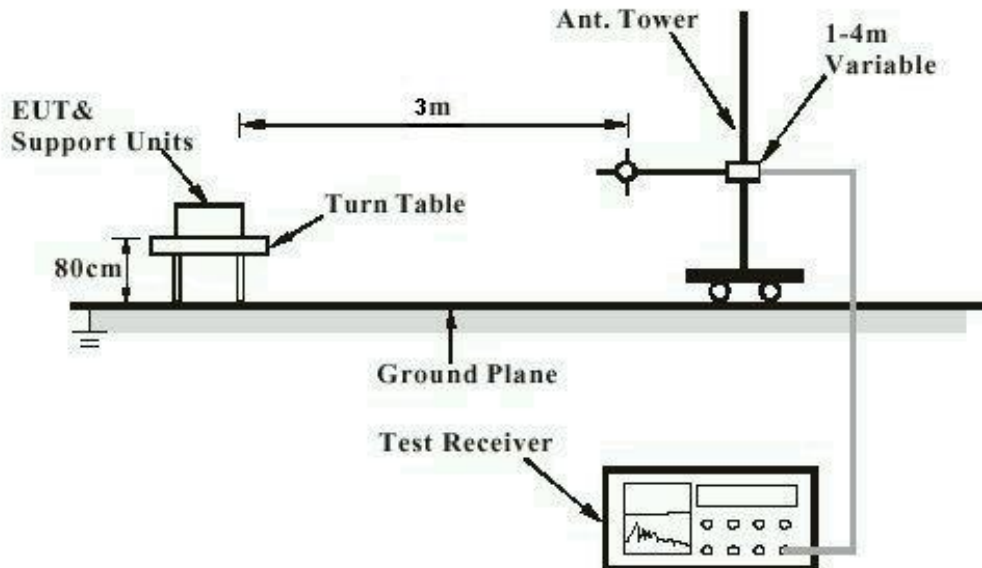
Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 8 of 53

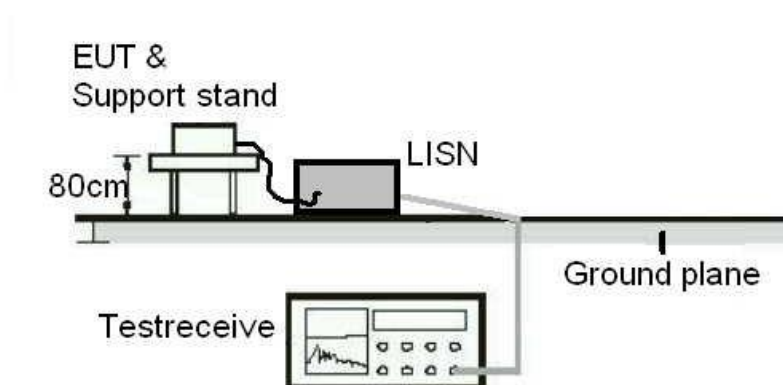
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



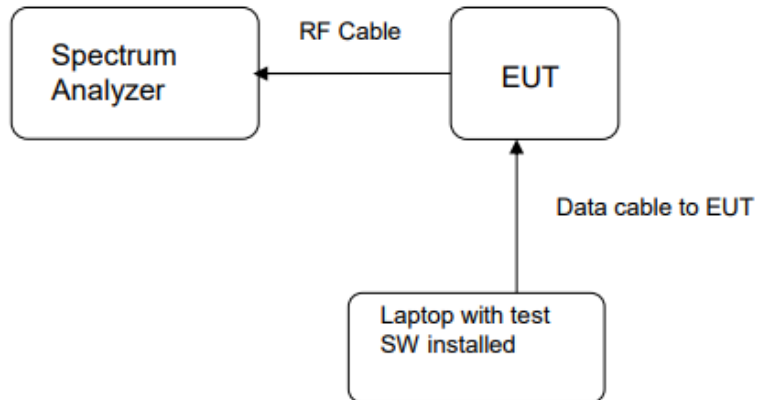
TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 9 of 53

Diagram of Measurement Equipment Configuration for Transmitter Measurement



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 10 of 53

4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard	: FCC Part 15.247(b)(4), Part 15.203
Requirement	: The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 11 of 53

4.1.2 Maximum Conducted Output Power

RESULT:

PASS

Test standard : FCC Part 15.247(b)(1)
Requirement : ANSI C63.10-2013
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 24.8°C
Relative humidity : 52%

Table 1: Maximum Conducted Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
GFSK	2402	10.68	11.69	≤ 1
	2441	9.32	8.55	
	2480	11.04	12.71	
$\pi/4$ -DQPSK	2402	10.56	11.38	≤ 0.125
	2441	9.13	8.18	
	2480	10.89	12.27	
8-DPSK	2402	10.49	11.19	≤ 0.125
	2441	9.04	8.02	
	2480	10.79	11.99	

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 12 of 53

Figure 1: Maximum Conducted Output Power, 2402MHz, GFSK

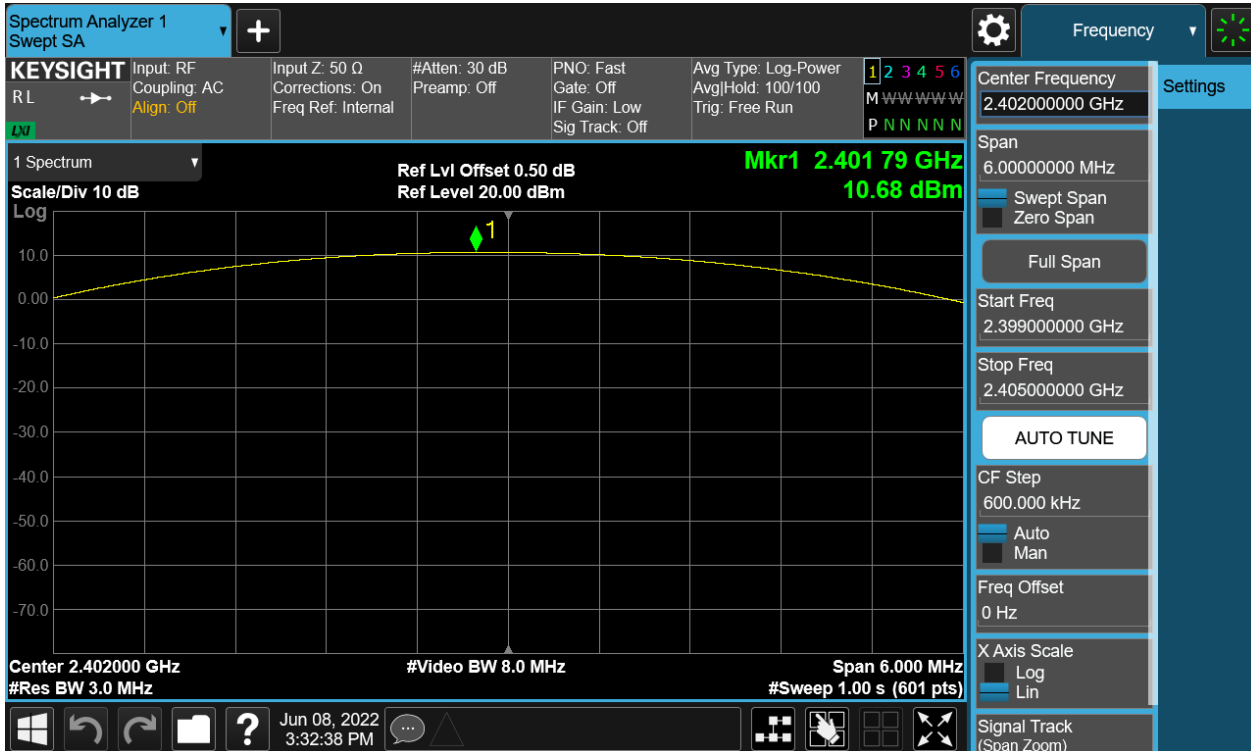
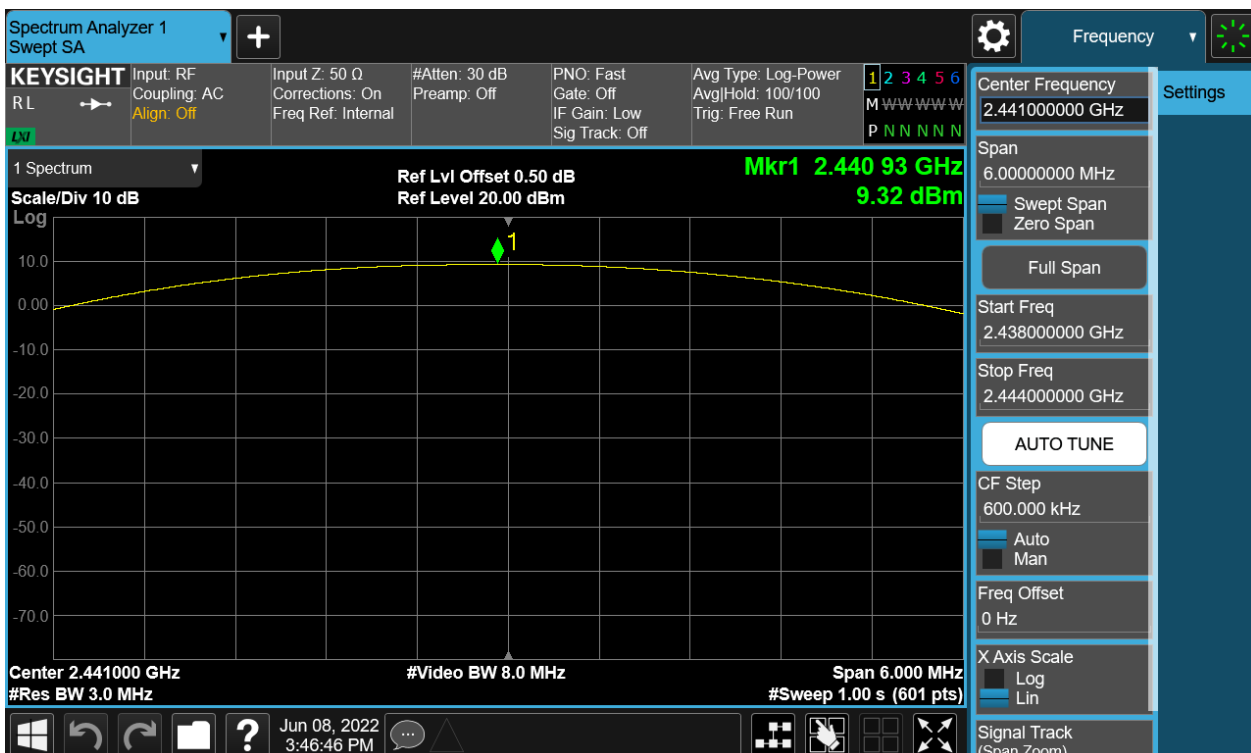


Figure 2: Maximum Conducted Output Power, 2441MHz, GFSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 13 of 53

Figure 3: Maximum Conducted Output Power, 2480MHz, GFSK

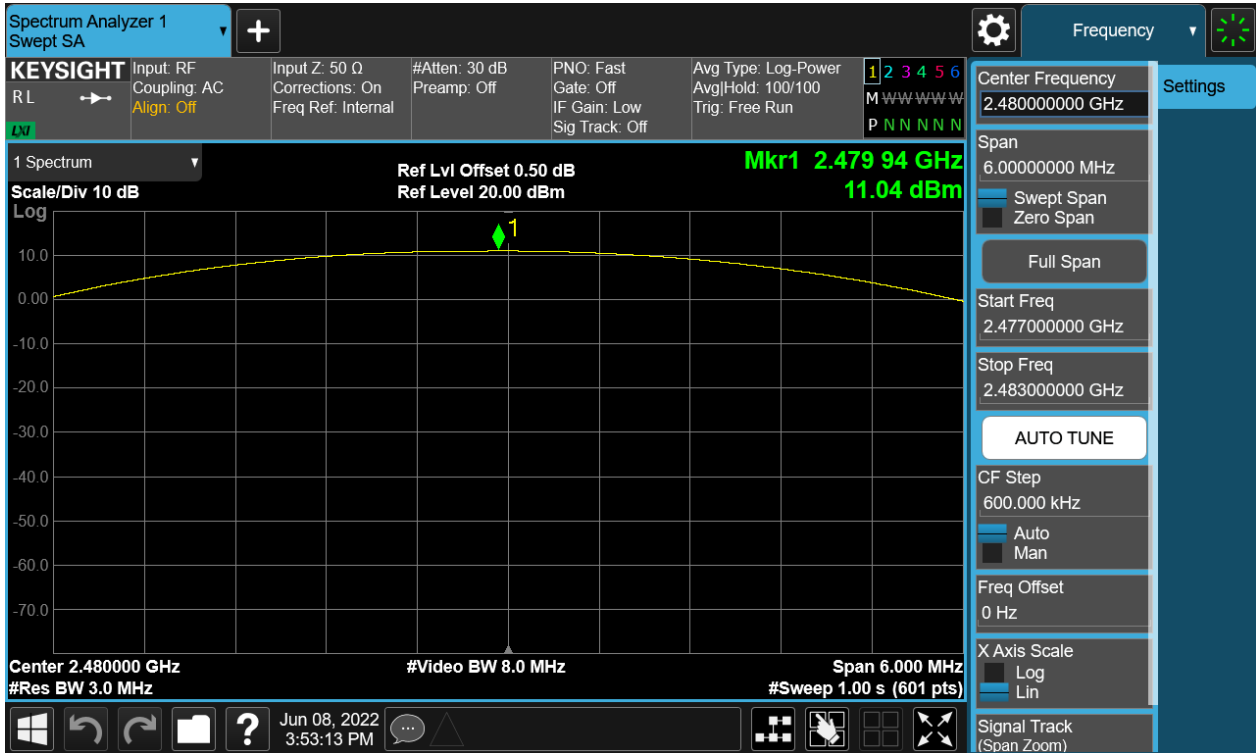
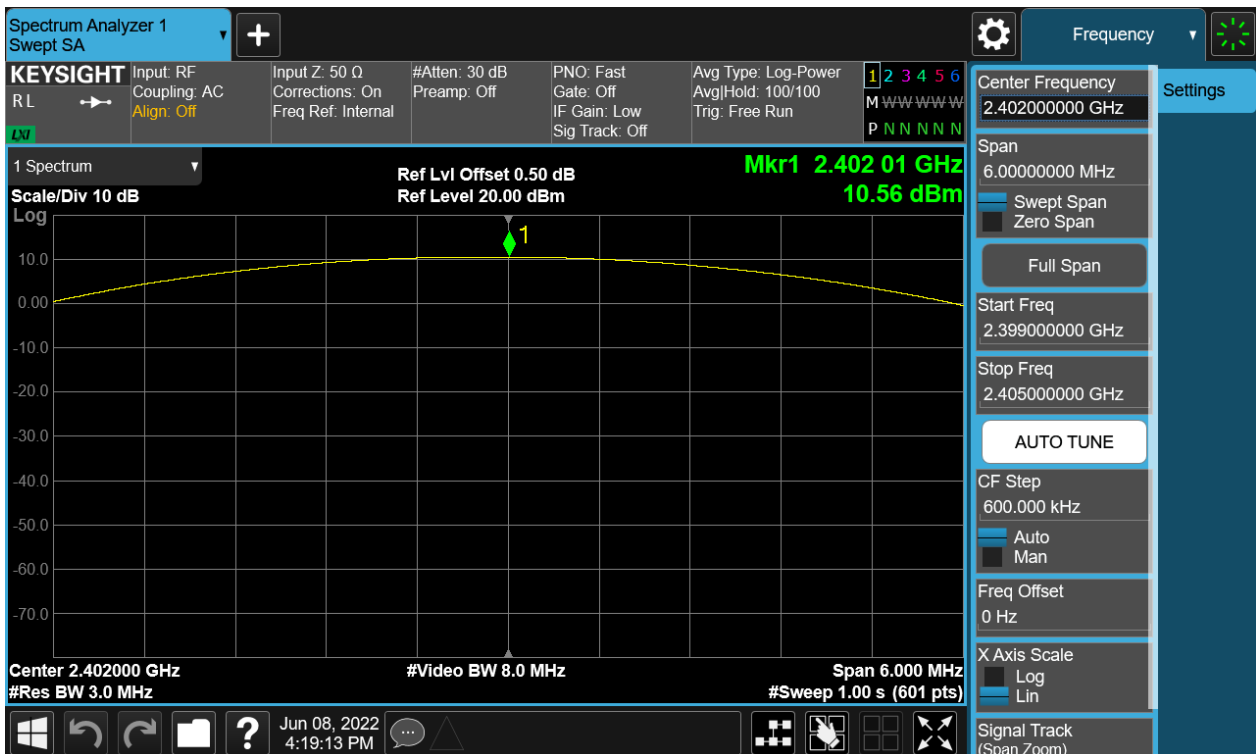


Figure 4: Maximum Conducted Output Power, 2402MHz, $\pi/4$ -DQPSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 14 of 53

Figure 5: Maximum Conducted Output Power, 2441MHz, $\pi/4$ -DQPSK

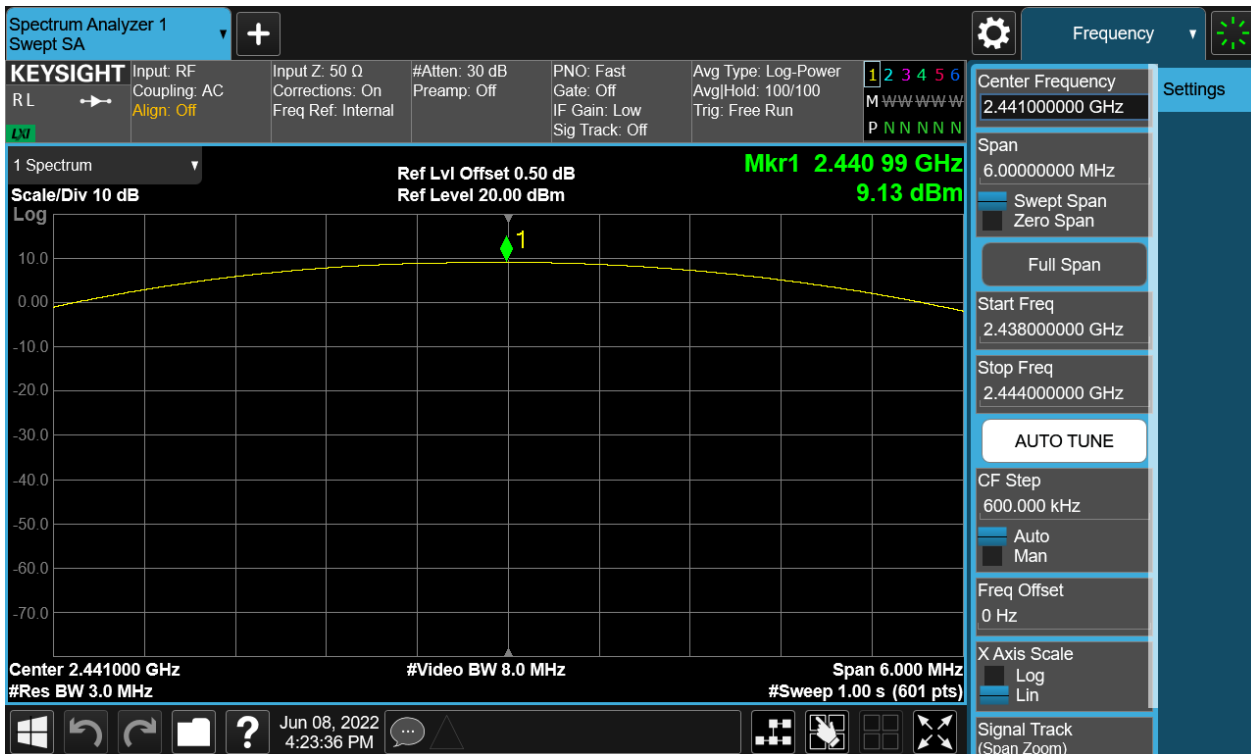
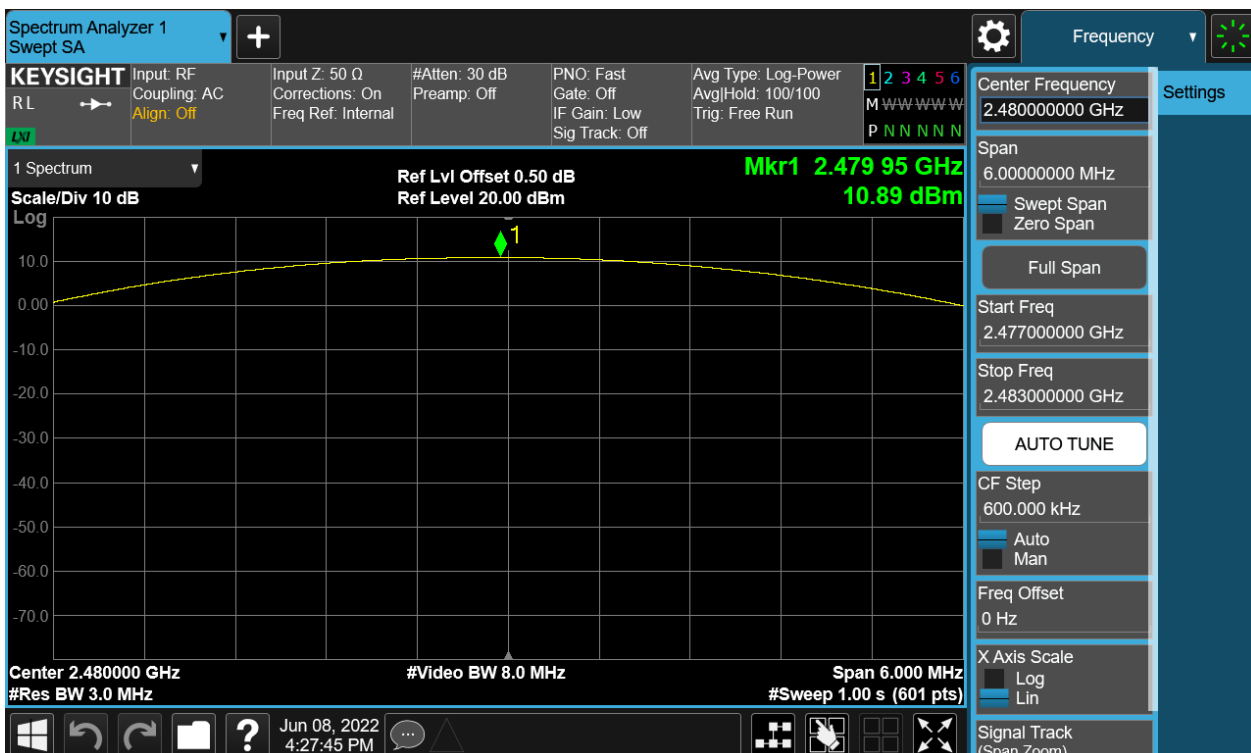


Figure 6: Maximum Conducted Output Power, 2480MHz, $\pi/4$ -DQPSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 15 of 53

Figure 7: Maximum Conducted Output Power, 2402MHz, 8-DPSK

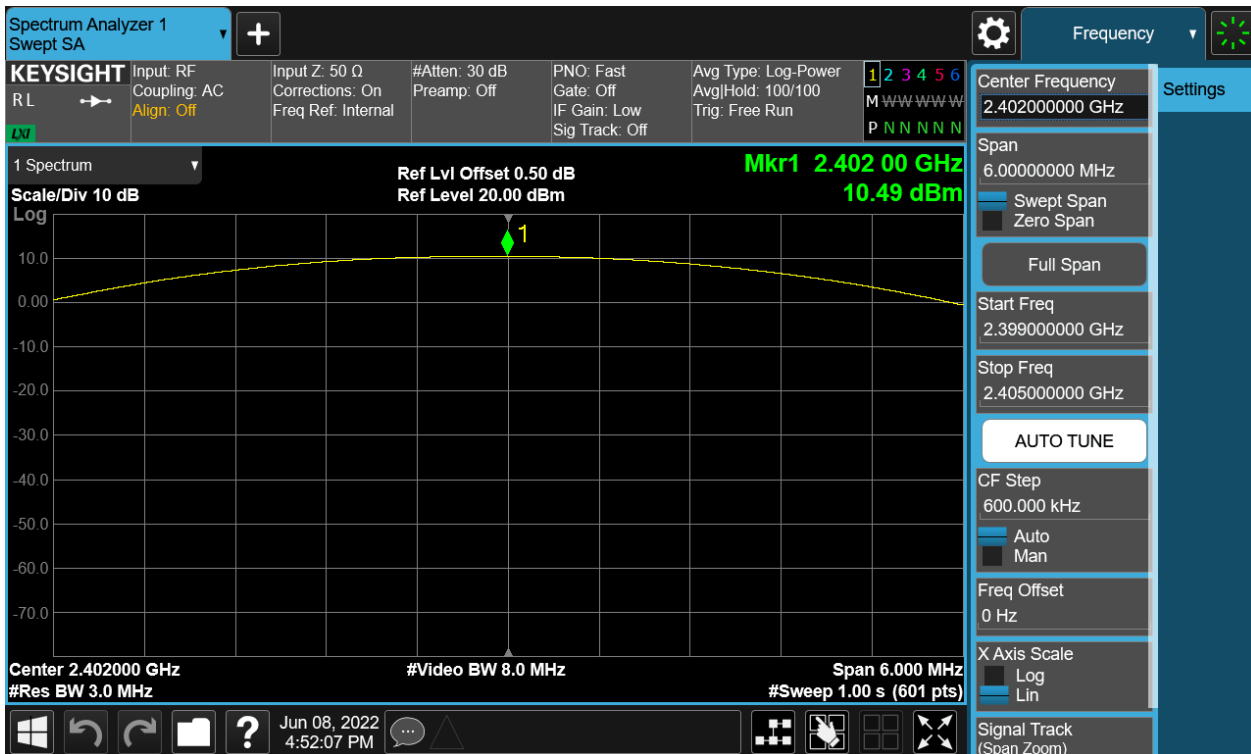
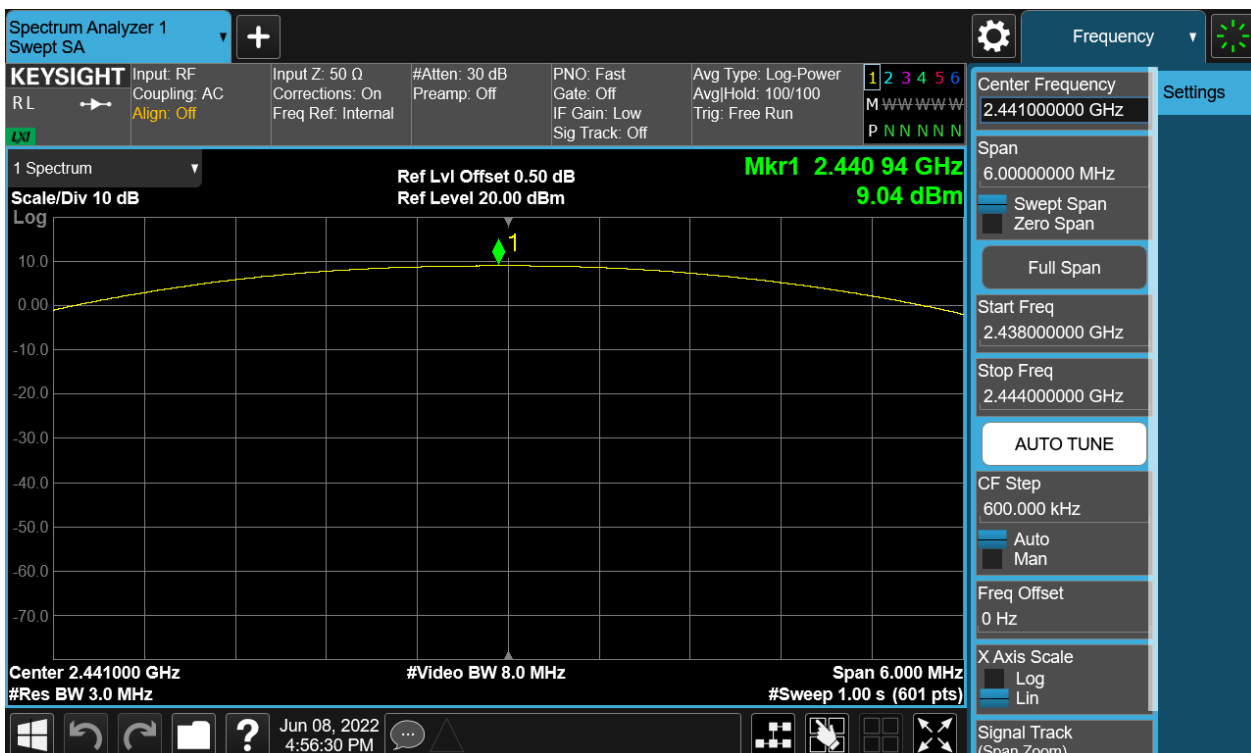


Figure 8: Maximum Conducted Output Power, 2441MHz, 8-DPSK



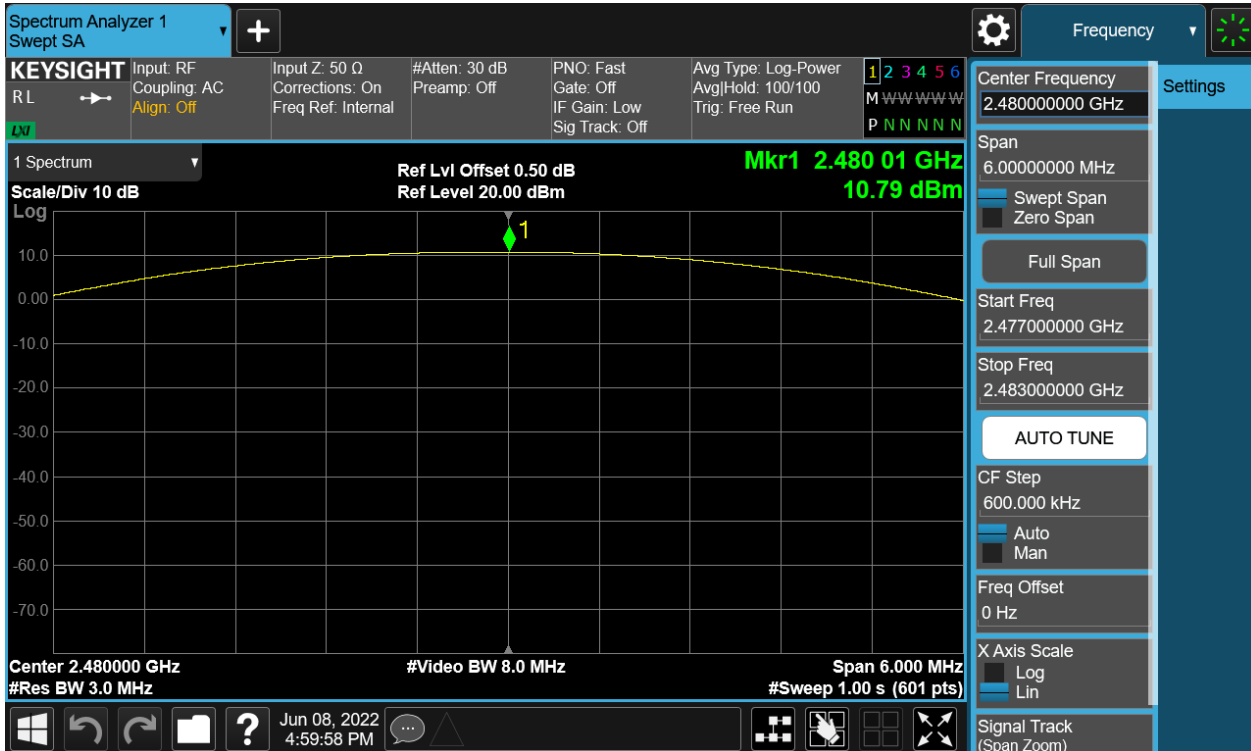
TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 16 of 53

Figure 9: Maximum Conducted Output Power, 2480MHz, 8-DPSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 17 of 53

4.1.3 20dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)
Requirement : ANSI C63.10-2013
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 24.8°C
Relative humidity : 52%

Table 2: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
GFSK	2402	1.045	0.932
	2441	1.032	0.905
	2480	1.036	0.946
8-DPSK	2402	1.325	1.222
	2441	1.302	1.198
	2480	1.318	1.216

TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 18 of 53

Figure 10: 20dB Bandwidth and 99% Bandwidth, 2402MHz, GFSK



Figure 11: 20dB Bandwidth and 99% Bandwidth, 2441MHz, GFSK



TEST REPORT

Report No.: SHH22020028-01CE

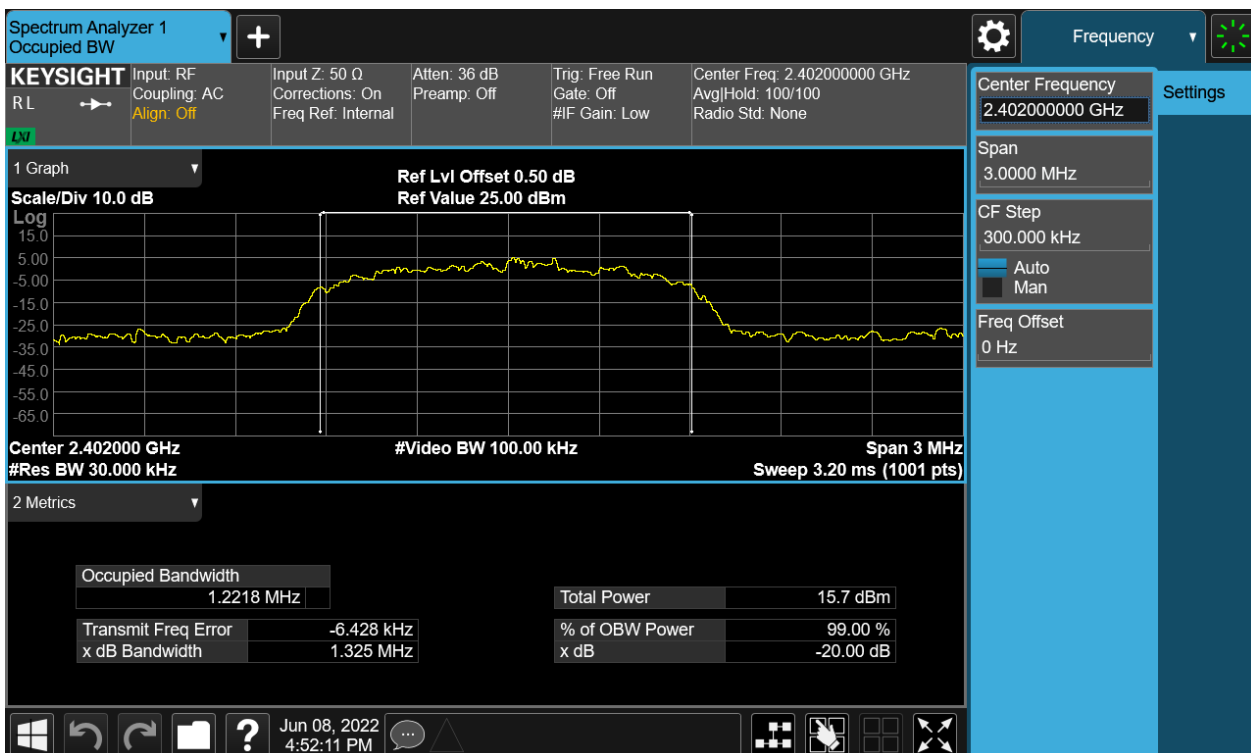
Date: 2022-07-15

Page 19 of 53

Figure 12: 20dB Bandwidth and 99% Bandwidth, 2480MHz, GFSK



Figure 13: 20dB Bandwidth and 99% Bandwidth, 2402MHz, 8-DPSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 20 of 53

Figure 14: 20dB Bandwidth and 99% Bandwidth, 2441MHz, 8-DPSK

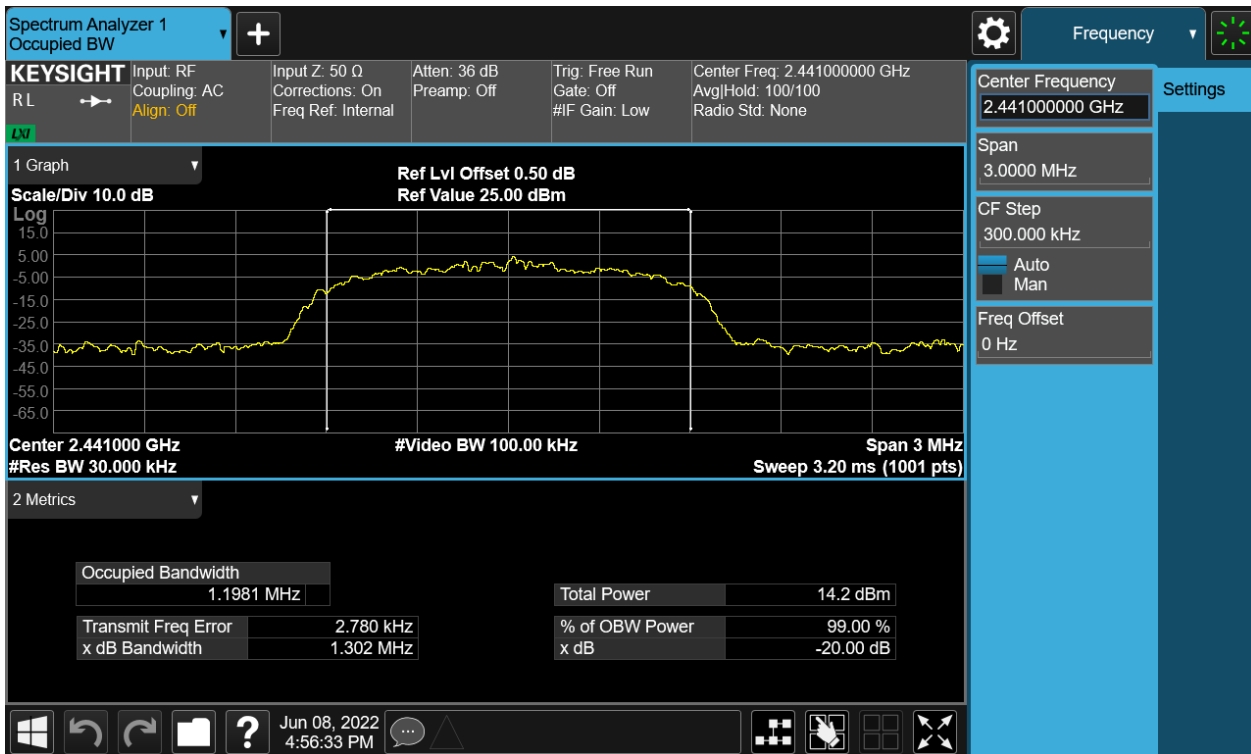
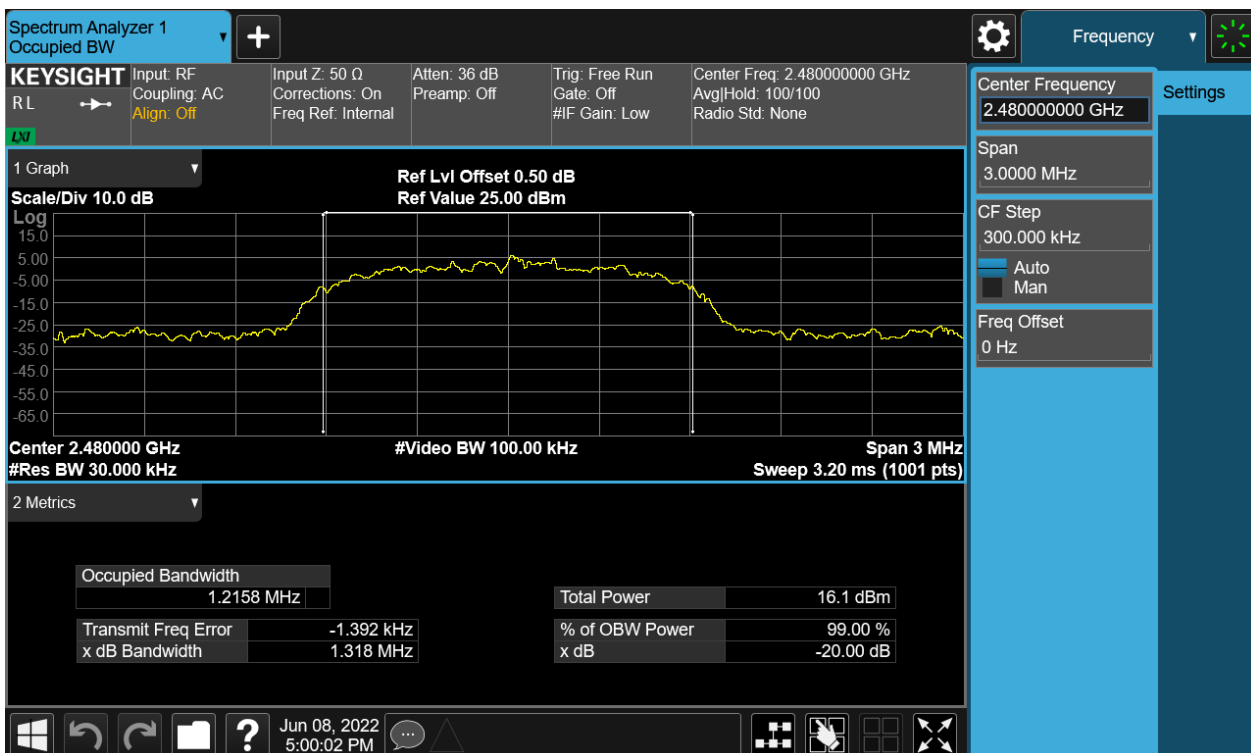


Figure 15: 20dB Bandwidth and 99% Bandwidth, 2480MHz, 8-DPSK



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 21 of 53

4.1.4 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

Test standard : FCC Part 15.247(d)

Requirement : ANSI C63.10-2013

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band
Edge

Operation Mode : A.1.a

Ambient temperature : 24.8°C

Relative humidity : 52%

For details refer to following test plot.

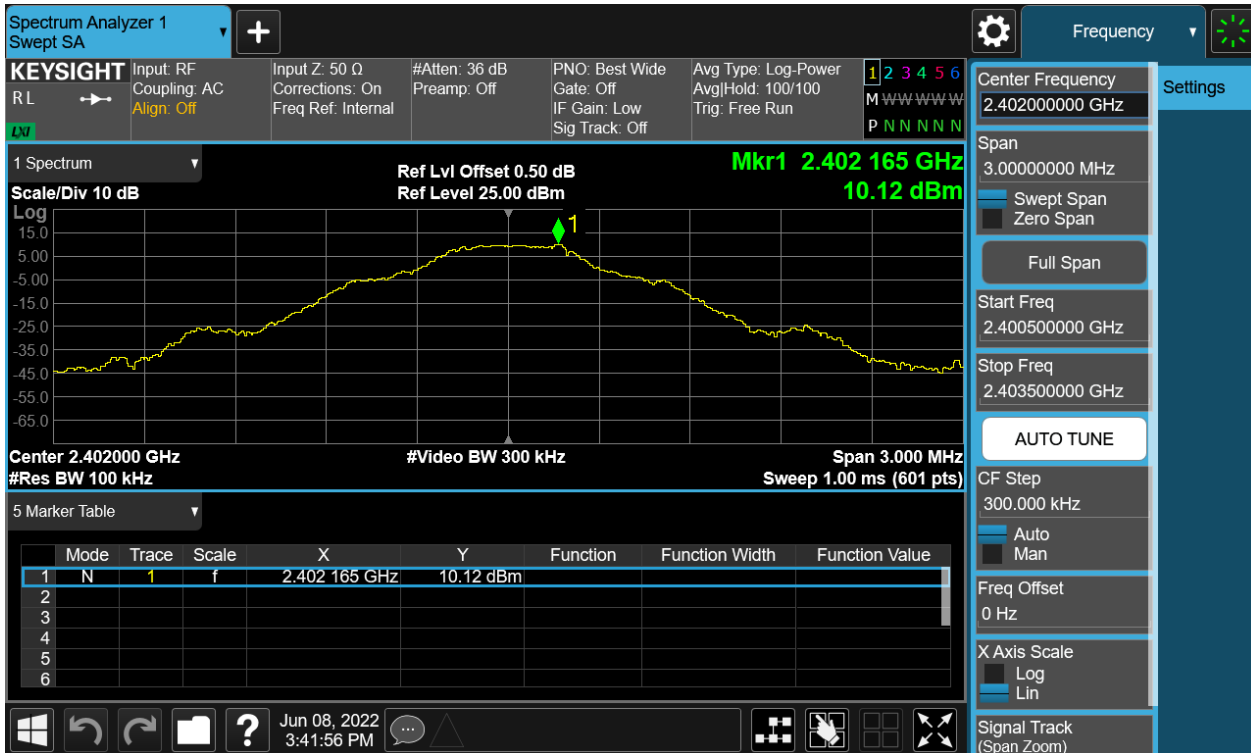
TEST REPORT

Report No.: SHH22020028-01CE

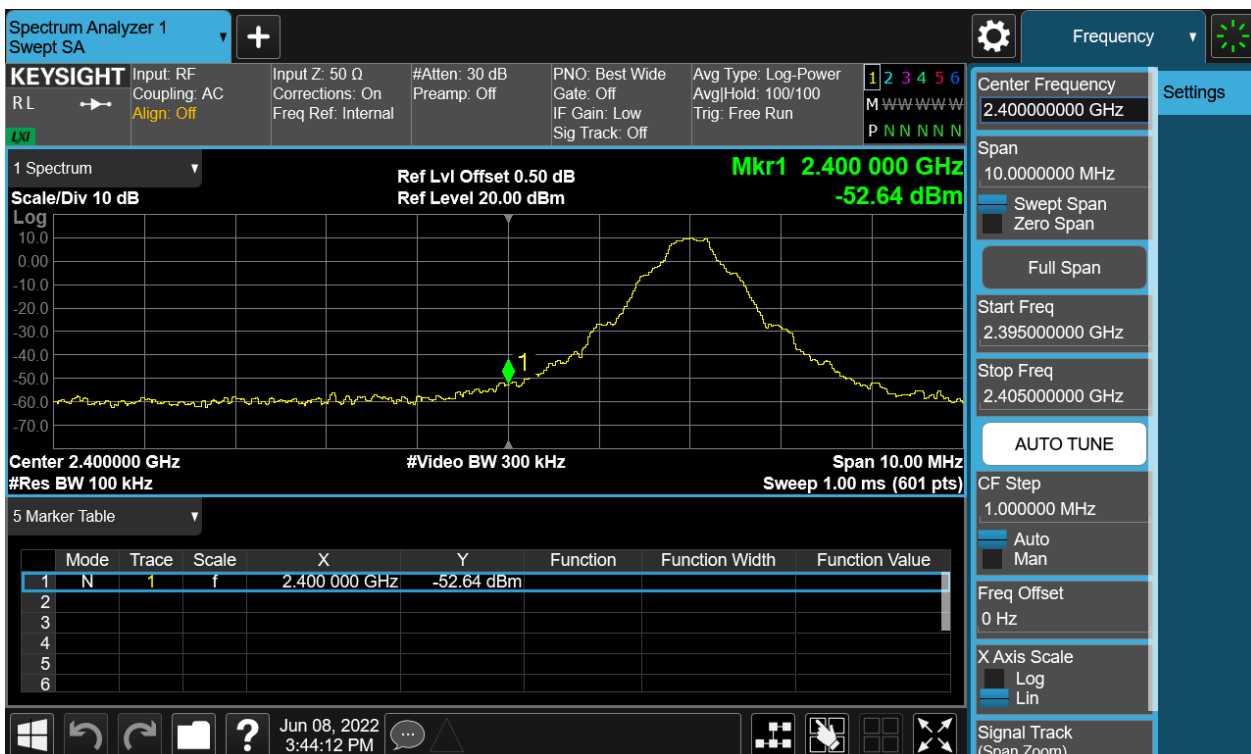
Date: 2022-07-15

Page 22 of 53

Figure 16: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, GFSK Carrier Level



Band Edge



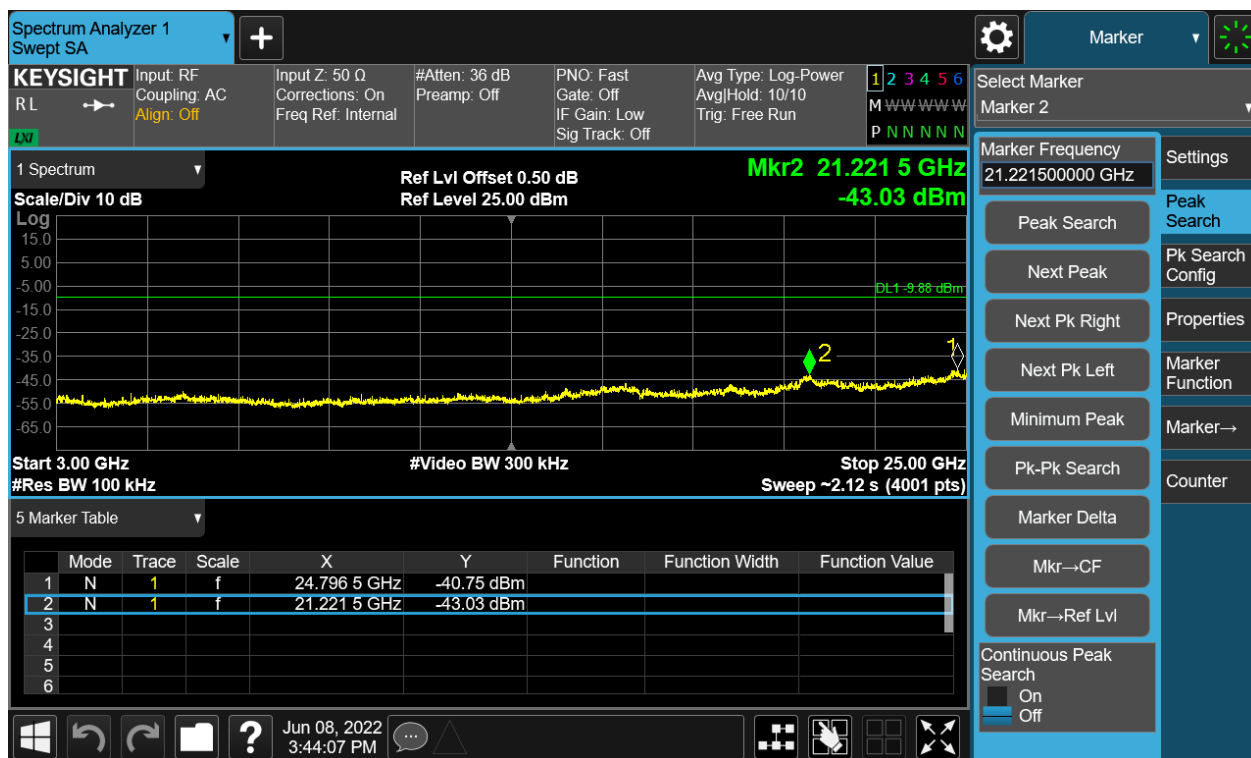
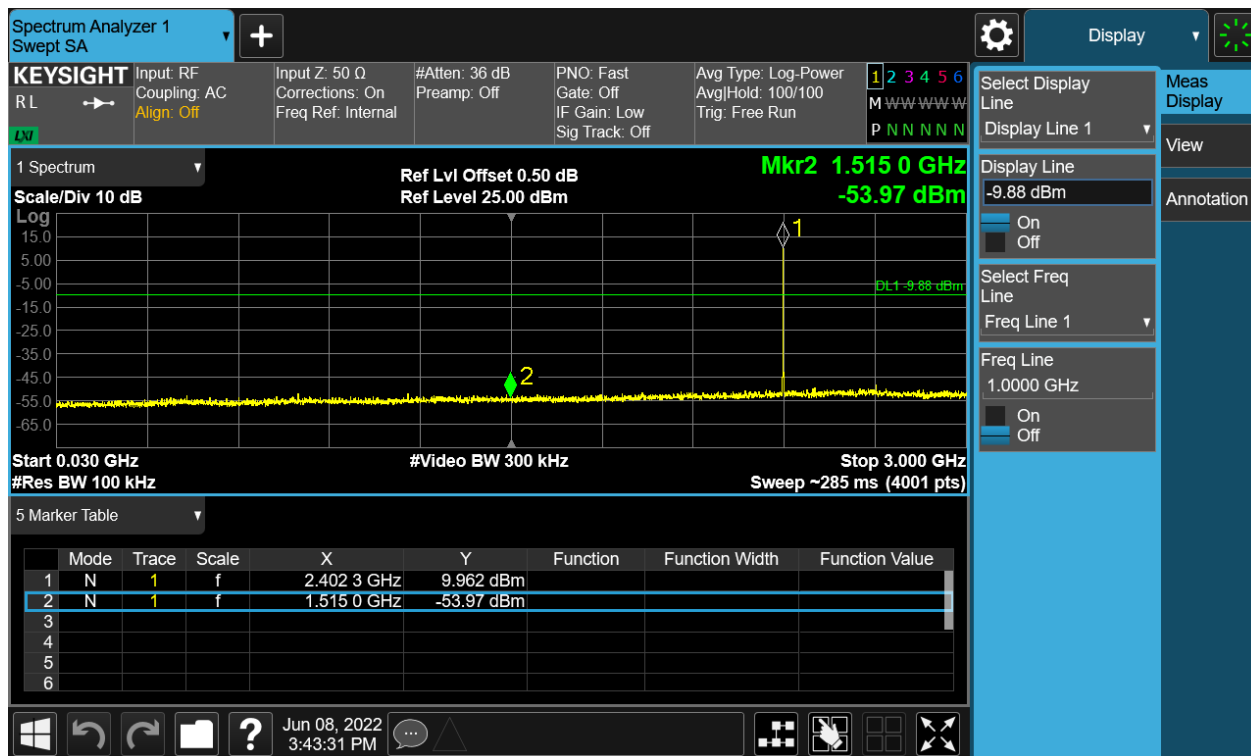
TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 23 of 53

Conducted spurious emissions 30MHz-25GHz



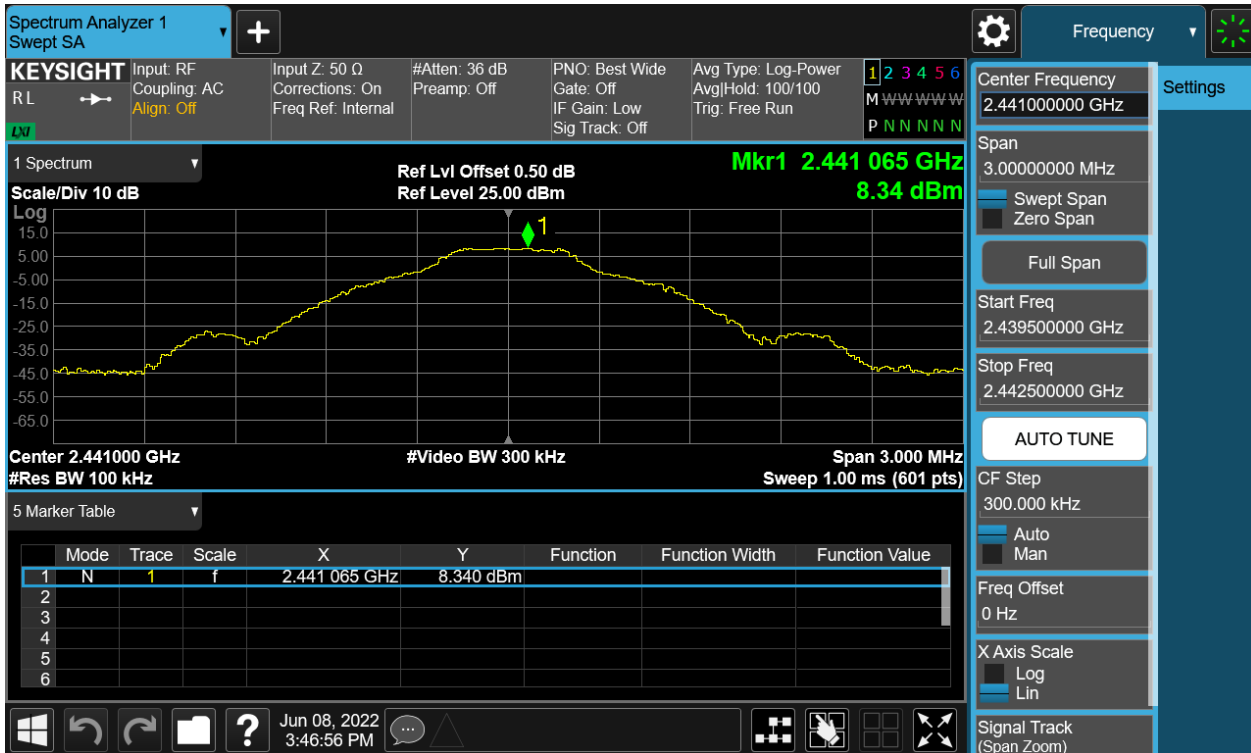
TEST REPORT

Report No.: SHH22020028-01CE

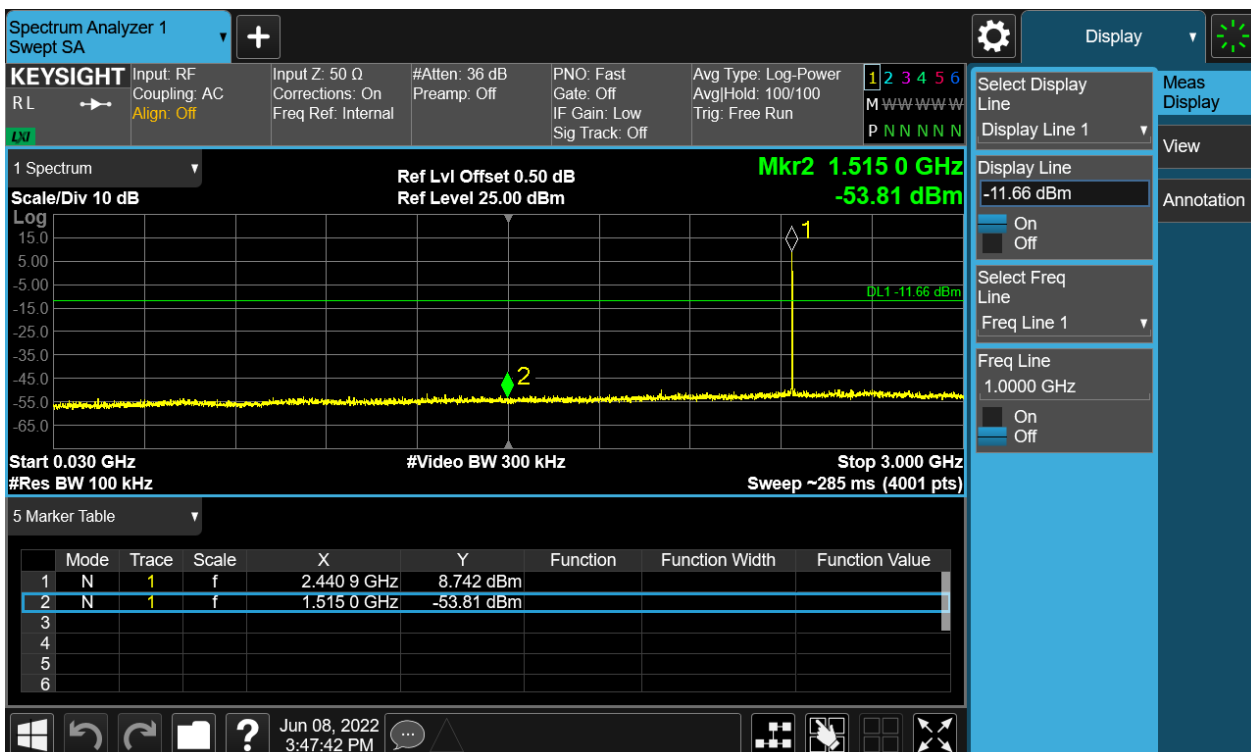
Date: 2022-07-15

Page 24 of 53

Figure 17: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, GFSK Carrier Level



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 25 of 53

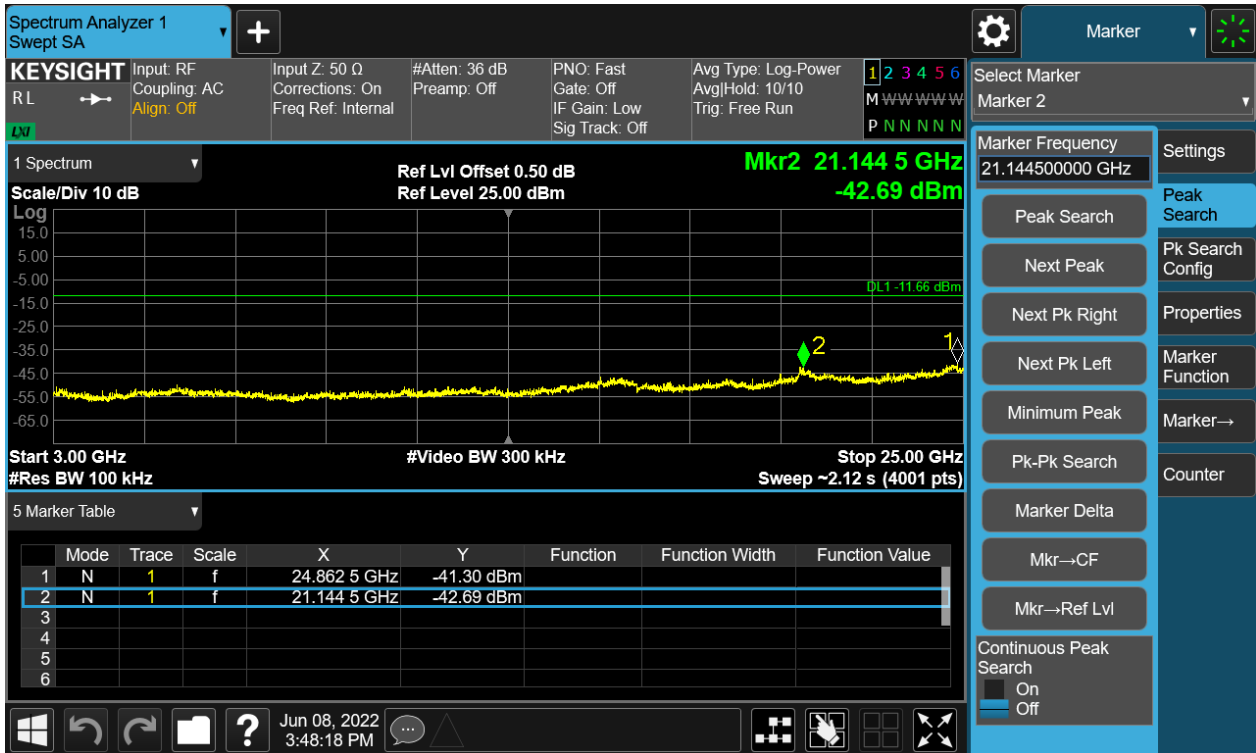
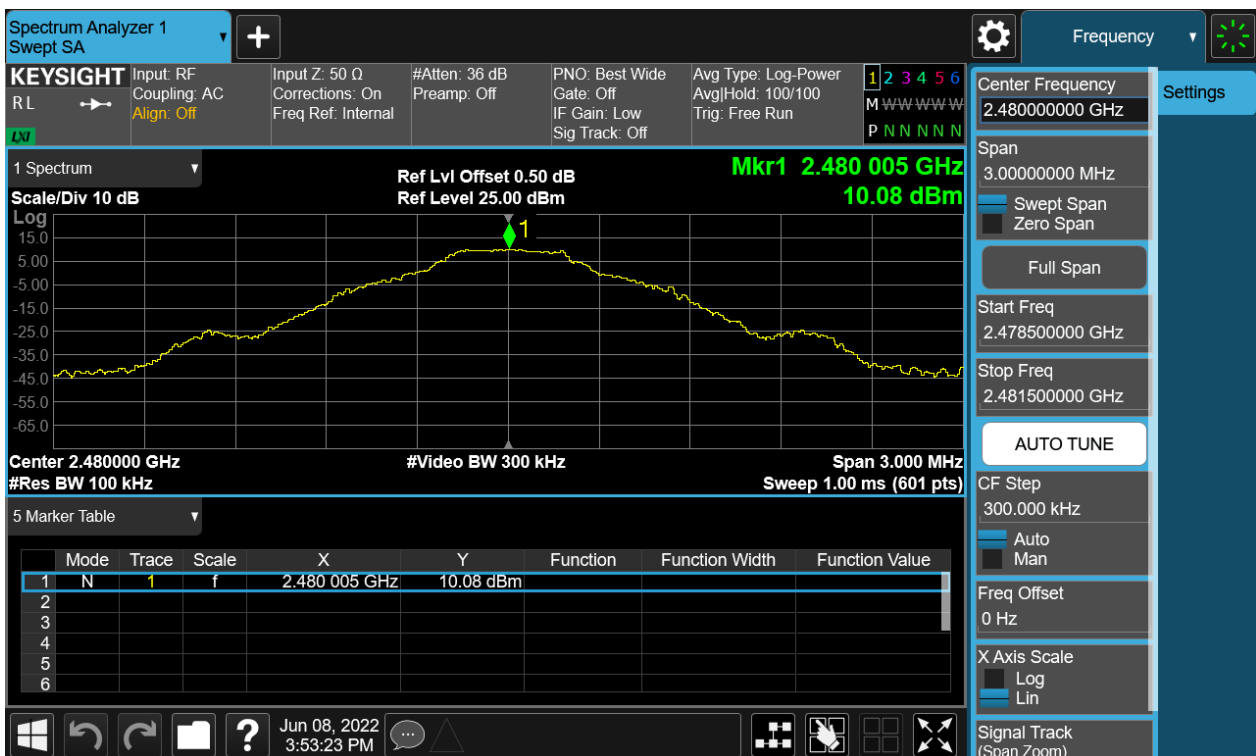


Figure 18: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, GFSK Carrier Level



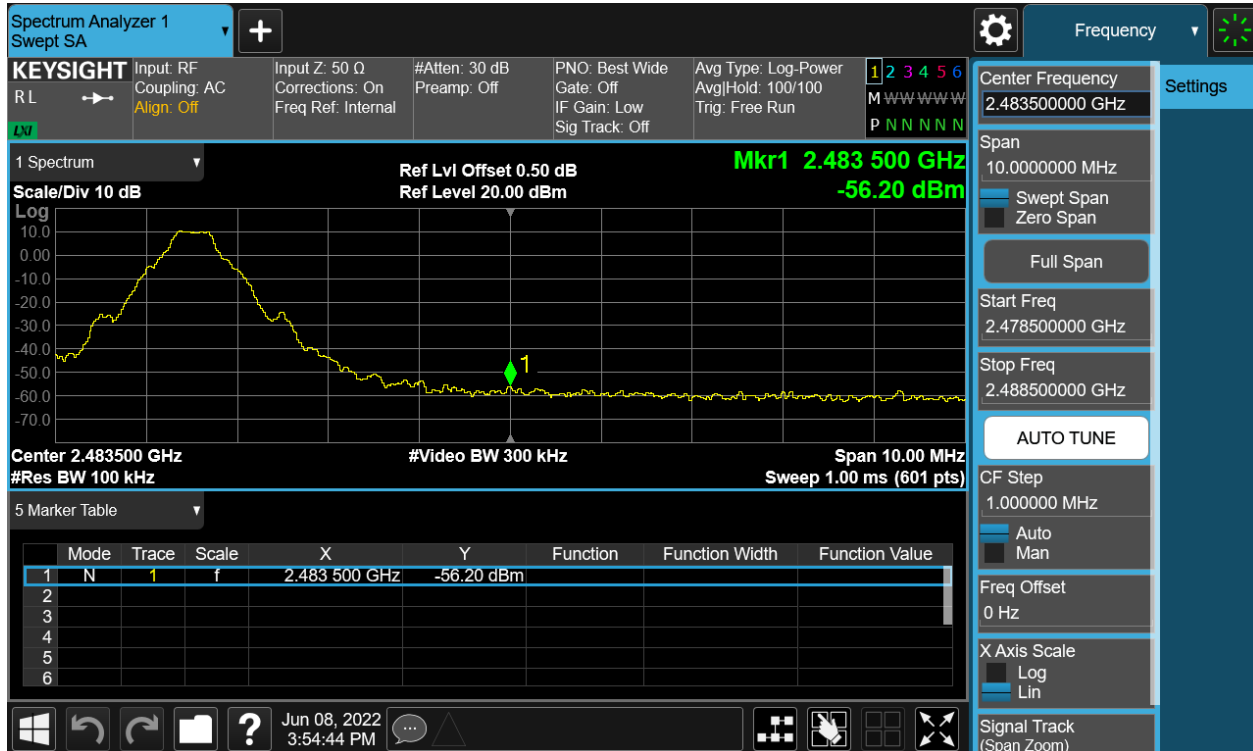
TEST REPORT

Report No.: SHH22020028-01CE

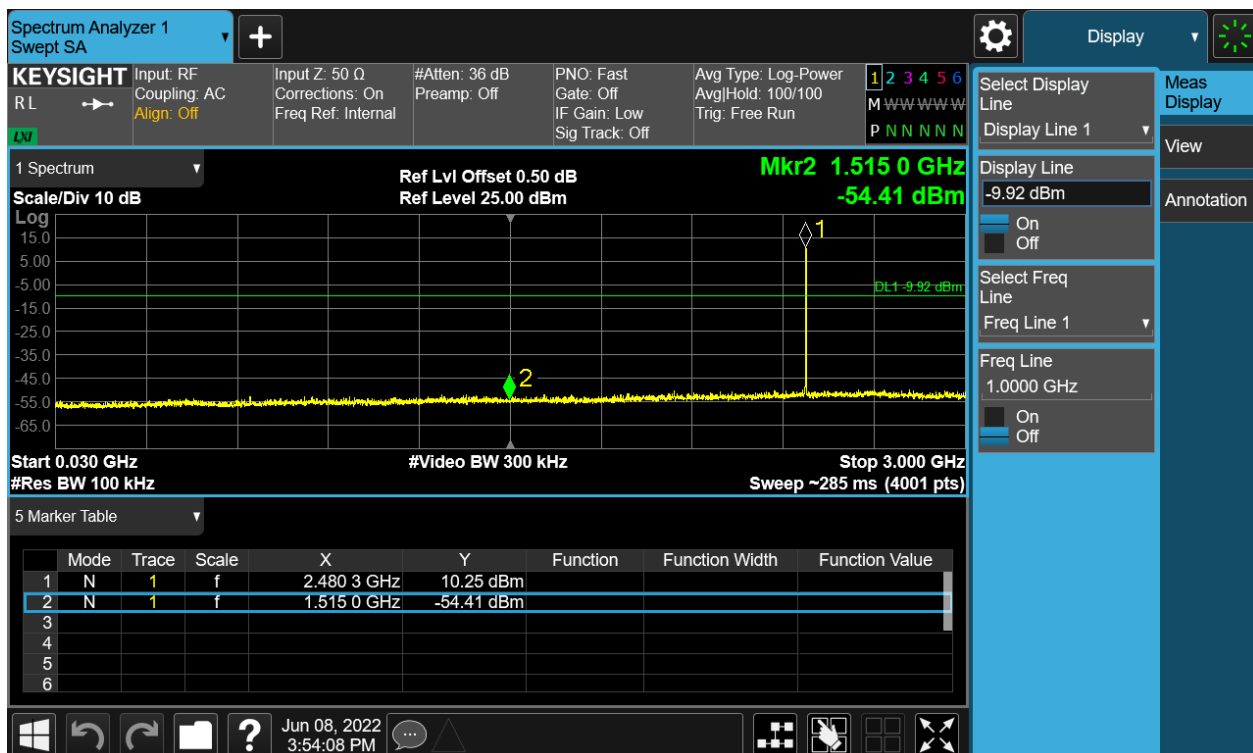
Date: 2022-07-15

Page 26 of 53

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 27 of 53

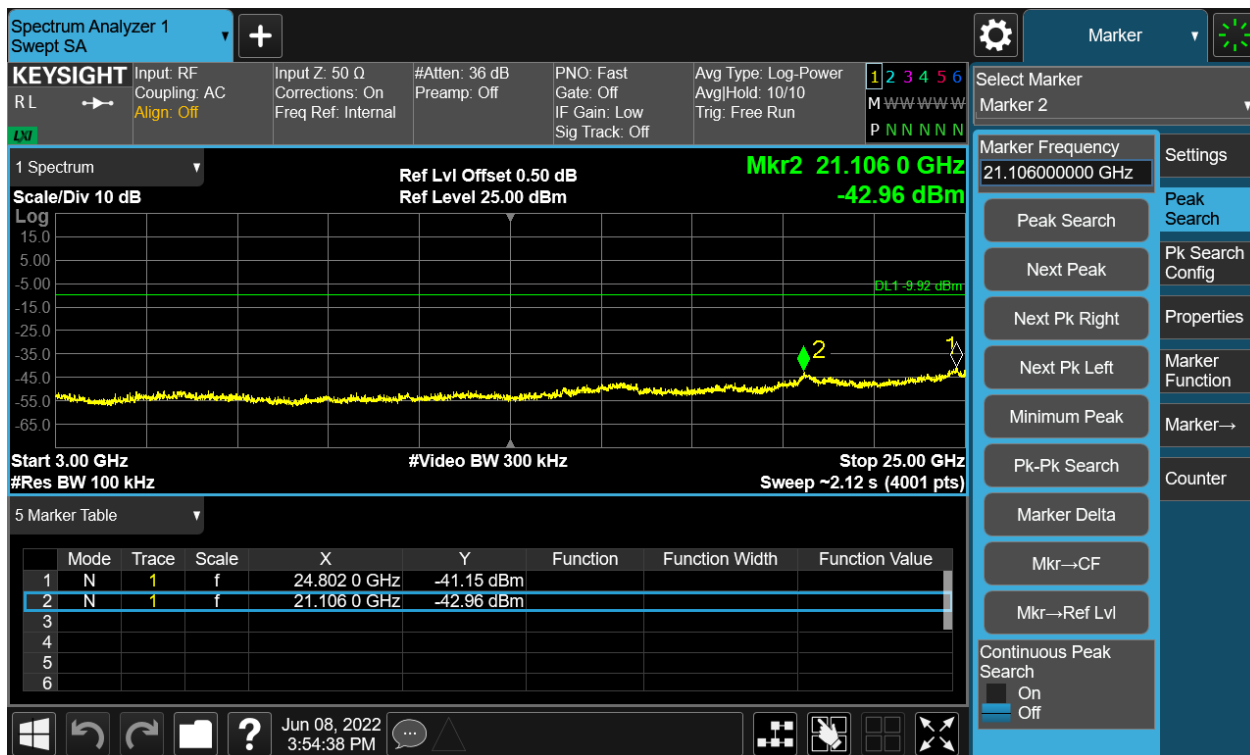
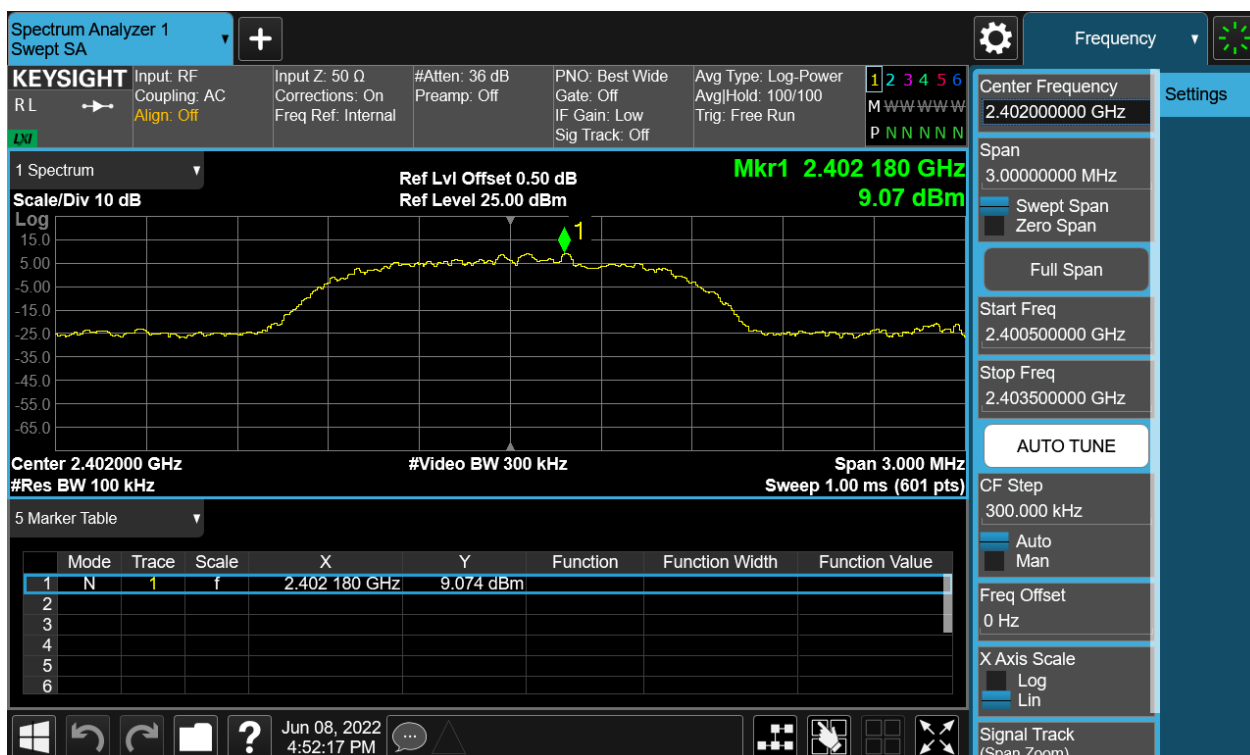


Figure 19: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



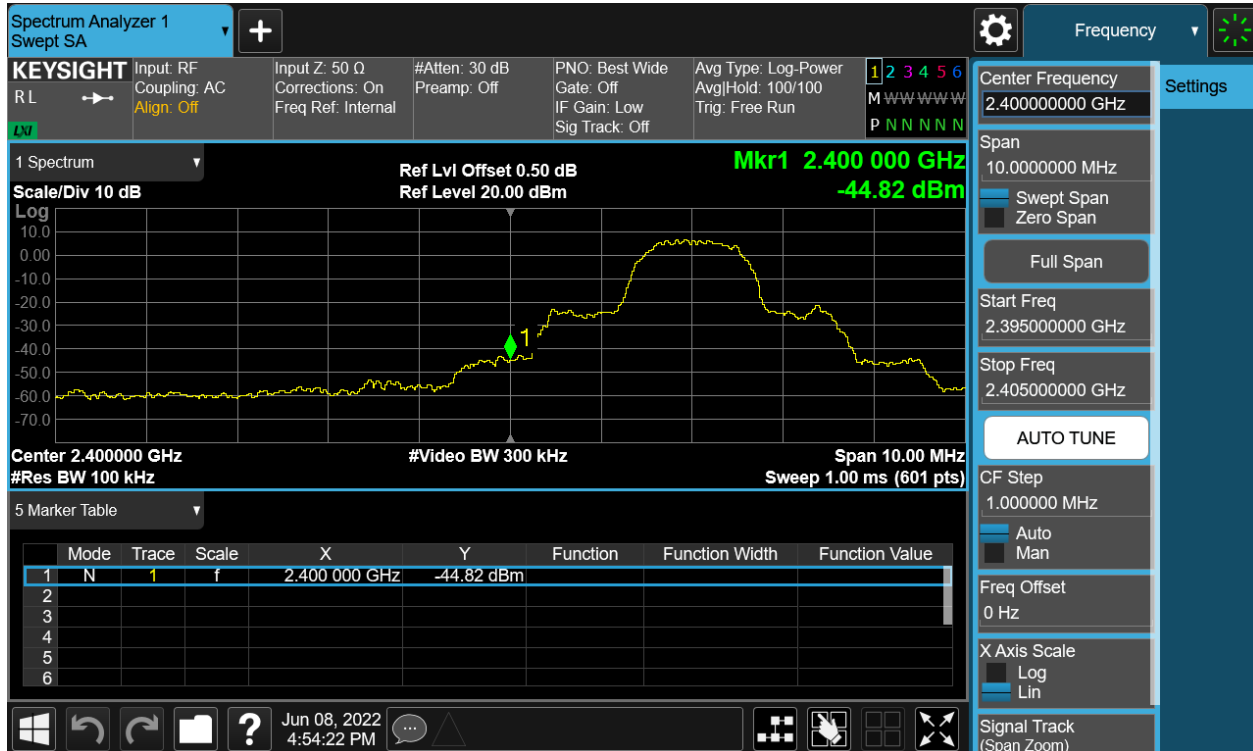
TEST REPORT

Report No.: SHH22020028-01CE

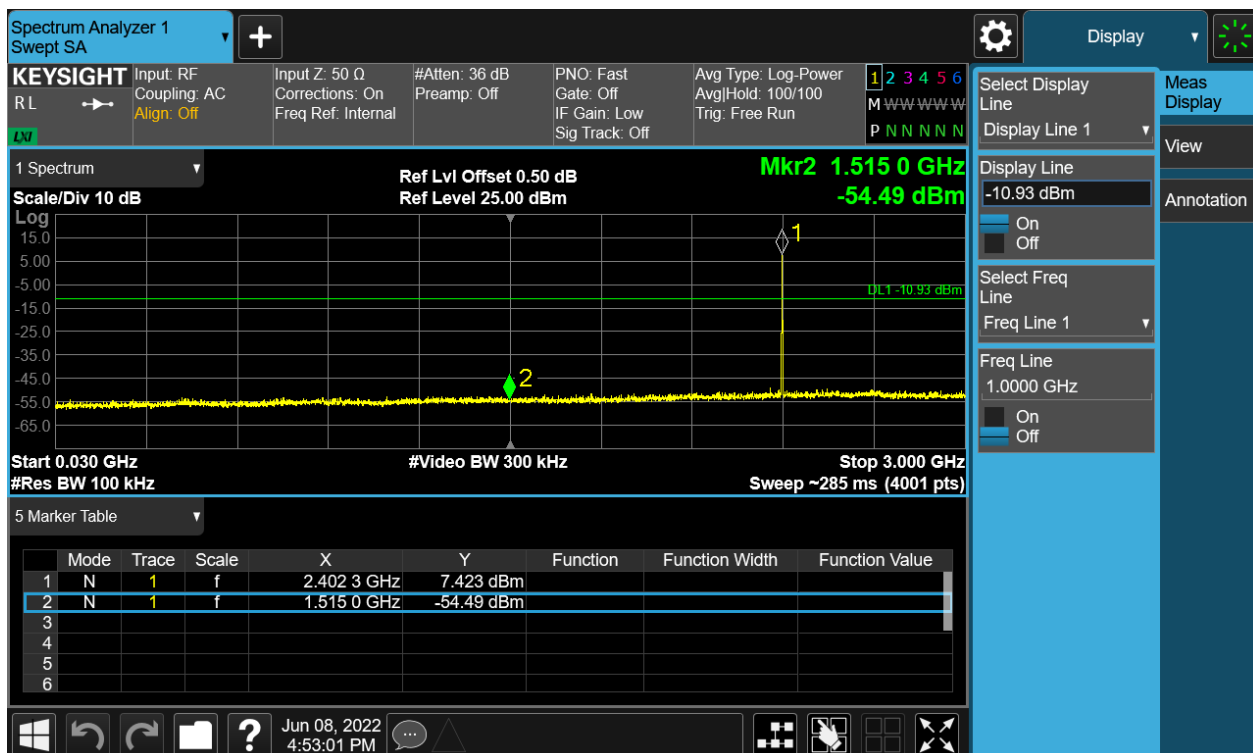
Date: 2022-07-15

Page 28 of 53

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 29 of 53

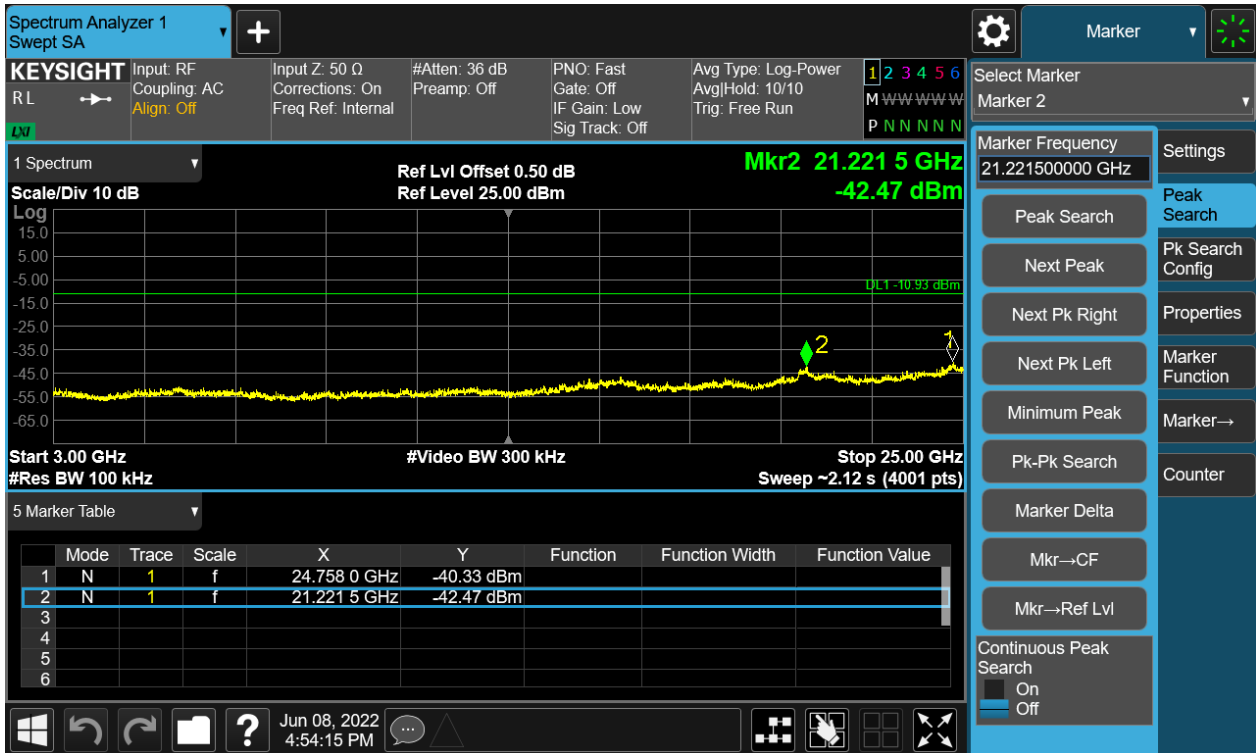
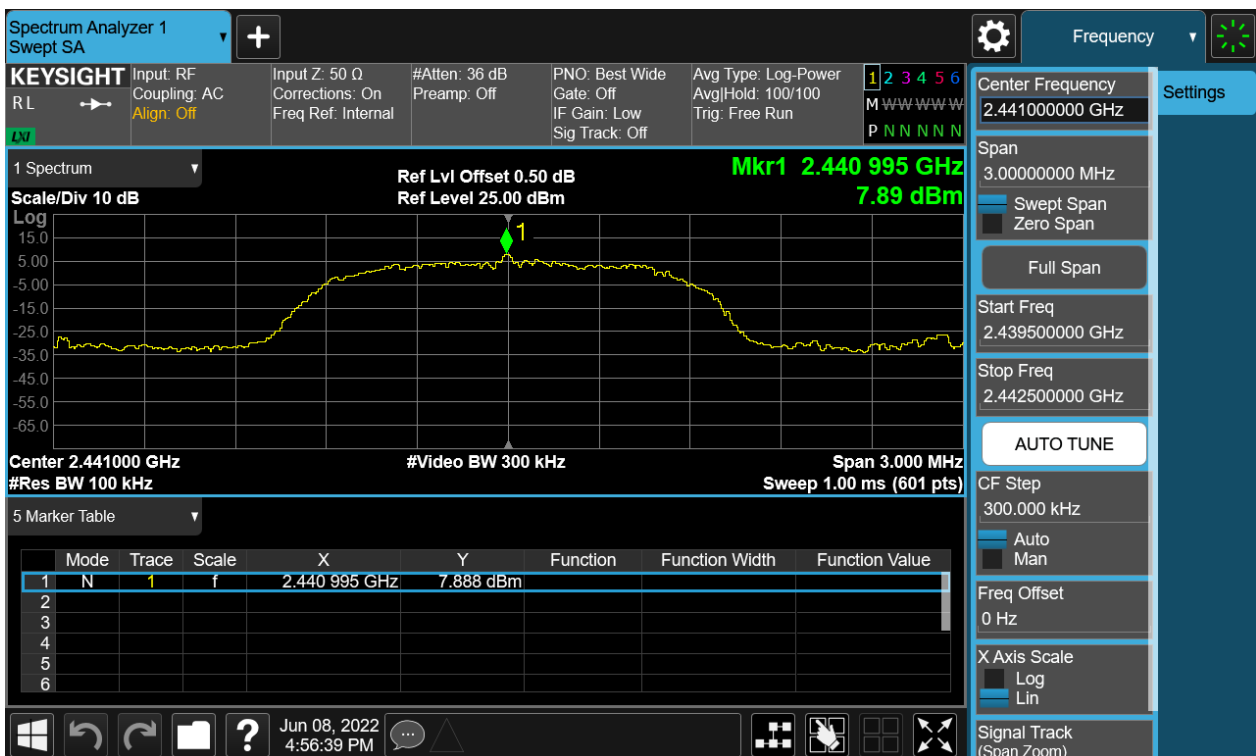


Figure 20: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



TEST REPORT

Report No.: SHH22020028-01CE

Date: 2022-07-15

Page 30 of 53

Conducted spurious emissions 30MHz-25GHz

