

TEST REPORT

Applicant Name : Seeed Technology Co., Ltd
Address : 9F, G3 Building, TCL International E City, Zhongshanyuan Road,
Nanshan District, Shenzhen, China
Report Number : SZNS1220114-02178E-07A

Test Standard (s)

Japan item 19 of Article 2 Paragraph 1

Sample Description

Product Type: XIAO nRF52840 Sense
Tested Model: XIAO-nRF52840 Sense
Multiple Product: XIAO nRF52840
Multiple Model: XIAO-nRF52840
Date Received: 2022-01-14
Date of Test: 2022-02-07 to 2022-04-12
Report Date: 2022-04-13

Test Result:	Pass*
--------------	-------

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Ting Lü
Engineer

Approved By:

Candy Li
Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk "★". Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

Tel: +86 755-26503290

Fax: +86 755-26503396

Web: www.atc-lab.com

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
EUT TEST CONFIGURATION.....	4
DESCRIPTION OF TEST CONFIGURATION	4
EUT EXERCISE SOFTWARE	4
TEST VOLTAGE	4
EQUIPMENT MODIFICATIONS	4
SUPPORT EQUIPMENT LIST AND DETAILS	5
CONFIGURATION OF TEST SETUP	5
SUMMARY OF TEST RESULTS	6
TEST EQUIPMENT LIST	7
FREQUENCY ERROR	8
LIMIT	8
TEST PROCEDURE	8
TEST DATA	8
OCCUPIED BANDWIDTH	14
LIMIT	14
TEST PROCEDURE	14
TEST DATA	14
TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY.....	24
LIMIT	24
TEST PROCEDURE	24
TEST DATA	24
ANTENNA OUTPUT POWER AND ANTENNA POWER TOLERANCE	59
LIMIT	59
TEST PROCEDURE	59
TEST DATA	59
RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY	62
LIMIT	62
TEST PROCEDURE	62
MEASUREMENT RESULT	62
INTERFERENCE PREVENTION FUNCTION.....	76
REQUIREMENT	76
TEST PROCEDURE	76
MEASUREMENT RESULT	76
CONSTRUCTION PROTECTION CONFIRMATION	77

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Equipment Name	XIAO nRF52840 Sense	
Tested Model	XIAO-nRF52840 Sense	
Multiple Product	XIAO nRF52840	
Multiple Model	XIAO-nRF52840	
Radio Type	Bluetooth LE 1M, LE 2M	
Bluetooth Technical Parameters	Modulation Type	GFSK
	Frequency Range	2402-2480 MHz
	Maximum Output Power	LE 1M: 6mW LE 2M: 3mW
	Antenna Gain*	2dBi (provided by the applicant)
Nominal Power Supply:	DC 5V From USB Port	
Sample serial number	SZNS1220114-02178E-RF-S1 (XIAO-nRF52840 Sense) SZNS1220114-02178E-RF-S1 (XIAO-nRF52840)	
Sample/EUT Status	Good condition	

Objective

The objective of the manufacturer is to demonstrate compliance with Radio Law of Japan item 19 of Article 2 Paragraph 1, rules and limits for this device including:

- Frequency Error
- Occupied Bandwidth
- Transmitter Spurious Emission and Unwanted Emission Intensity
- Antenna Output Power And Output Power Tolerance
- Receiver Spurious Emission Strength
- Interference Prevention Function
- Construction Protection Confirmation

Test Methodology

All measurements contained in this report were conducted with technical regulations of the Radio Law of Japan.

EUT TEST CONFIGURATION

Description of Test Configuration

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

EUT Exercise Software

“PUTY”* exercise software was used for testing and the power level was default*. The software and power level was provided by the applicant.

Test Voltage

The EUT has a voltage regulator chip: SGM2040-3.3YUDH4G/TR, the output voltage of the chip is 3.3V and the fluctuation of power supply to the RF circuit of EUT is equal to or less than +/- 1%. So exempt extremely high and low supply voltage condition tests, EUT only operated in normal voltage to test all regulations.

Equipment Modifications

No modification was made to the EUT tested.

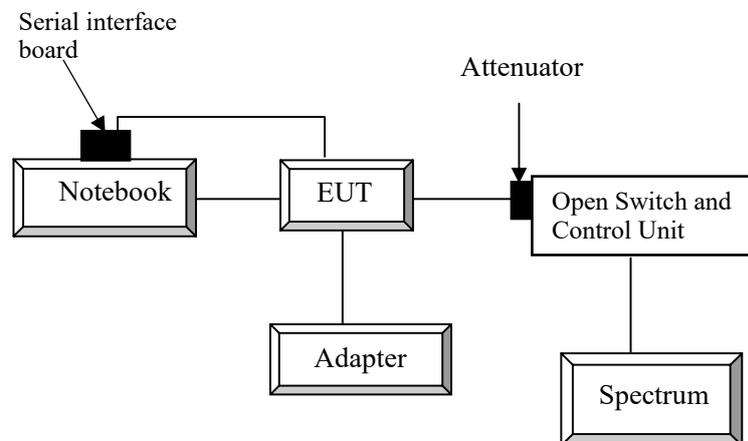
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Apple	Adapter	A1357	Unknown
Lenovo	Notebook	T430	Unknown
Unknown	Serial interface board	Unknown	Unknown

External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Detachable USB Cable	0.75	EUT	Adapter
Unshielded Detachable Data Cable	0.2	EUT	Serial interface board
RF Coaxial Cable	0.4	EUT	Attenuator

Configuration of Test Setup



SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.43 Article 2, Paragraph 1, Item 19 Rules Section	Description of Test	Result
3	Frequency Error	Compliant
4	Occupied Bandwidth	Compliant
5	Transmitter Spurious Emission and Unwanted Emission Intensity	Compliant
6	Antenna Output Power and Output Power Tolerance	Compliant
7	Receiver Spurious Emission and Unwanted Emission Intensity	Compliant
8 & 9	Carrier sense capability	Not Applicable**
10	Transmission Antenna Gain	Not Applicable
11	Transmission Radiation Angle Width	Not Applicable
12	Interference Prevention Function	Compliant
13	Frequency Hopping Dwell Time	Not Applicable*
Note 1	Construction Protection Confirmation	Compliant

Not Applicable* -Testing is only required for FHSS system devices.

Not Applicable**- The OBW of EUT is less than 26 MHz and the EUT is not radio control model aircraft.

Not Applicable - This test item was not required for the output power less than 12.14 dBm (E.I.R.P)

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date	Calibration Authority	Calibration Method
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/13	2022/12/12	CICC	C
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606	2021/12/13	2022/12/12	CICC	C
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2021/12/13	2022/12/12	CCIC	C
Agilent	Signal Generator	N5182A	MY5014 3401	2021/12/13	2022/12/12	CCIC	C
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each Time		/	/

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Note

- A. Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- B. Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No.51 of 1992)
- C. Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)
- D. Calibration conducted by using measuring instruments and other equipment which shall have been given any of calibration, etc. listed above from A to C.

FREQUENCY ERROR

Limit

50ppm or below

Test Procedure

Set the EUT to the measurement frequency without modulation.
Setting of SA is following as:

- Center Frequency: Frequency to measure
- RBW: 1 kHz, VBW: 30 kHz
- Span: 200 kHz
- Sweep time: Auto
- Log scale: 10dB/Div, Data points: 400 points or more
- Reference level: Enough level for maximum dynamic range
- Detection: Positive Peak
- Sweep mode: Single Sweep
- Marker: Spot

Record the peak spot frequency.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2022-02-07 to 2022-04-12.

Test Result: Compliant

Test Mode: Transmitting

For model of XIAO-nRF52840 Sense

Normal Voltage

Frequency (MHz)	Measure frequency (MHz)	Frequency tolerance (ppm)	Limit (ppm)
2402	2402.03792	15.79	< 50
2440	2440.03792	15.54	
2480	2480.03907	15.75	

For model of XIAO-nRF52840

Normal Voltage

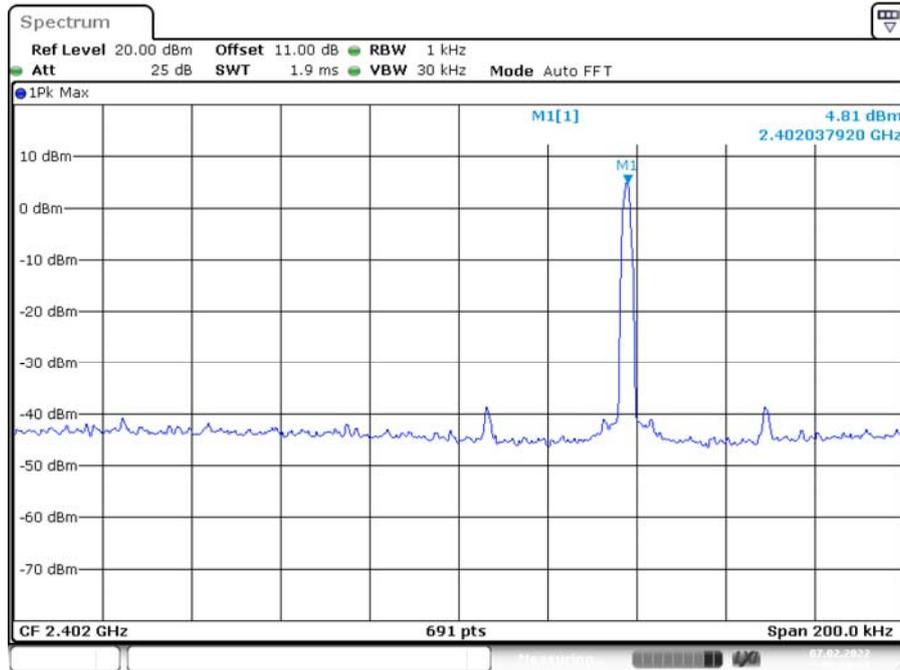
Frequency (MHz)	Measure frequency (MHz)	Frequency tolerance (ppm)	Limit (ppm)
2402	2402.03444	14.33	< 50
2440	2440.03589	14.71	
2480	2480.03589	14.47	

Please refer to the plots as below.

For model XIAO-nRF52840 Sense

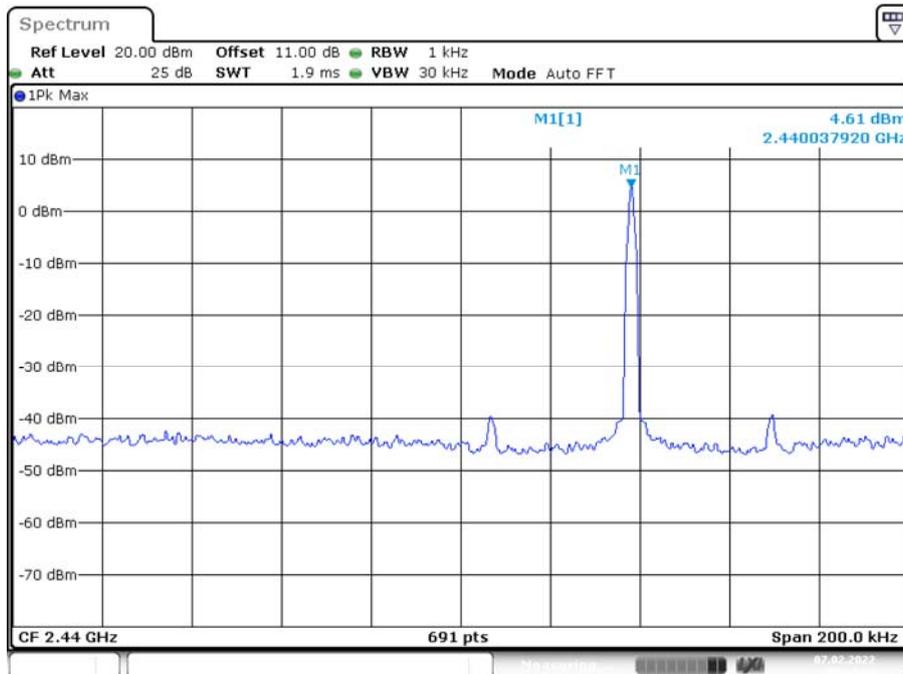
Normal Voltage

Low Channel



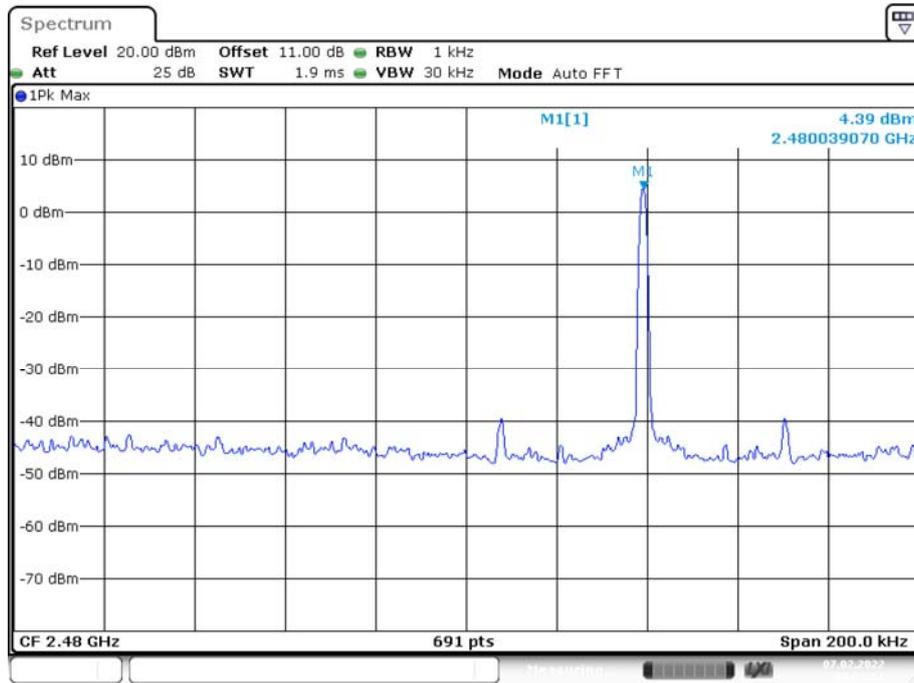
Date: 7.FEB.2022 09:10:47

Middle Channel



Date: 7.FEB.2022 09:14:39

High Channel

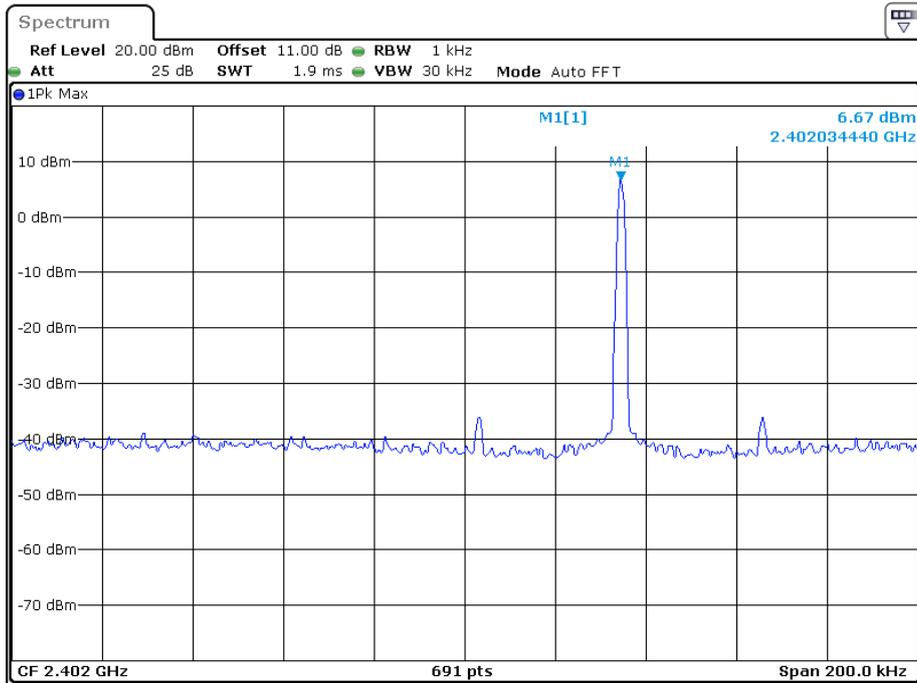


Date: 7.FEB.2022 09:15:51

For model of XIAO-nRF52840

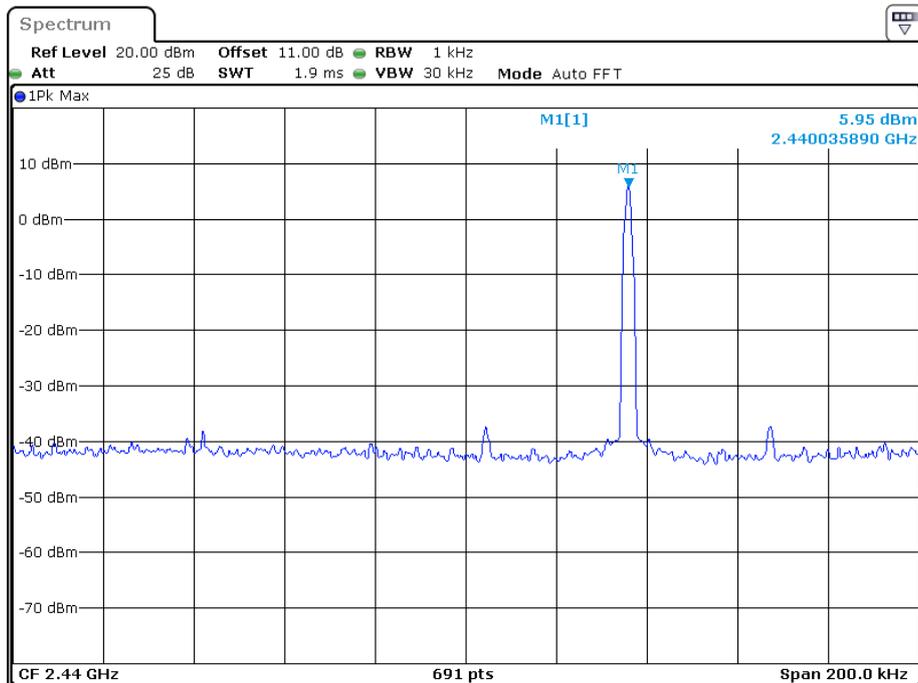
Normal Voltage

Low Channel



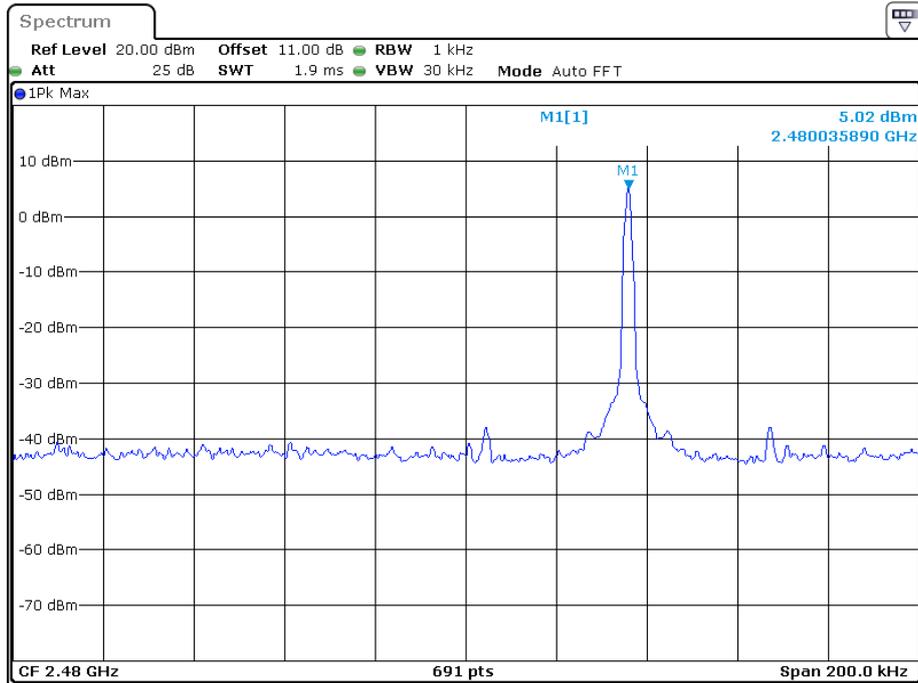
Date: 12.APR.2022 17:20:23

Middle Channel



Date: 12.APR.2022 17:25:20

High Channel



Date: 12.APR.2022 17:26:33

OCCUPIED BANDWIDTH

Limit

- Occupied bandwidth: FH \leq 83.5 MHz; OFDM, DS \leq 26 MHz; Others \leq 26 MHz

Test Procedure

1. Setting of SA is following as:
 - Center Frequency: Frequency to measure
 - RBW: 30 kHz, VBW: 30 kHz
 - Span: 5MHz
 - Sweep time: Auto
 - Log scale: 10dB/Div, Data points: 400 points or more
 - Reference level: Enough level for maximum dynamic range
 - Detection: Positive Peak
 - Sweep mode: Continuous Sweep
 - Marker: Spot
2. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of occupied bandwidth to measure occupied bandwidth.

Test Data

Environmental Conditions

Temperature:	25°C
Relative Humidity:	53%
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2022-02-07 to 2022-04-12.

Test Result: Compliant

Test Mode: Transmitting

For model of XIAO-nRF52840 Sense

Normal Voltage

Modulation mode	Frequency	2402 MHz	2440 MHz	2480 MHz	Limit
GFSK(1M)	Occupied bandwidth (MHz)	1.071	1.085	1.071	≤26MHz
GFSK(2M)	Occupied bandwidth (MHz)	2.077	2.084	2.084	≤26MHz

For model of XIAO-nRF52840

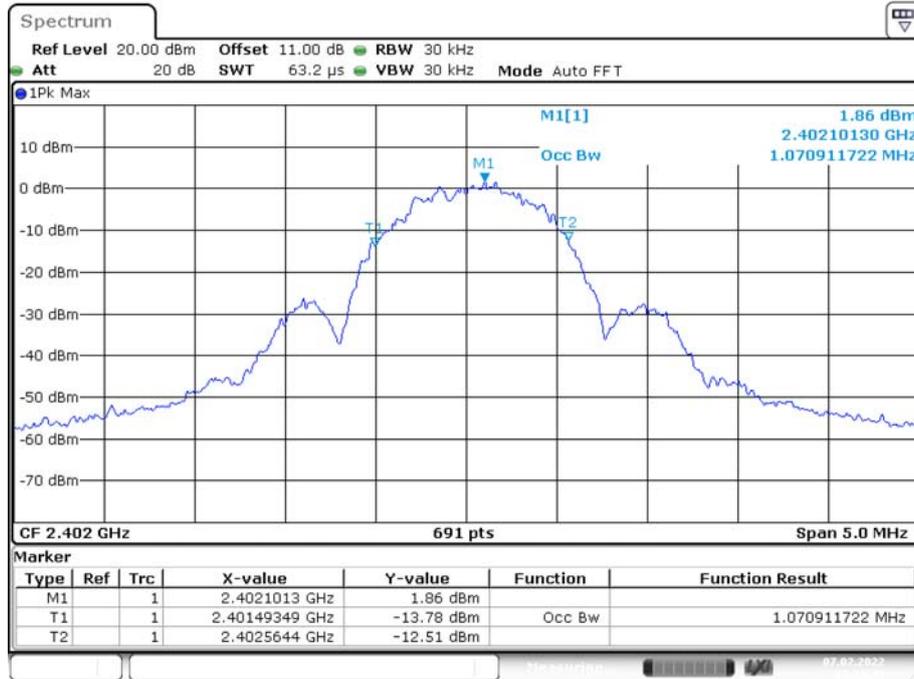
Modulation mode	Frequency	2402 MHz	2440 MHz	2480 MHz	Limit
GFSK(1M)	Occupied bandwidth (MHz)	1.078	1.071	1.071	≤26MHz
GFSK(2M)	Occupied bandwidth (MHz)	2.084	2.106	2.106	≤26MHz

Please refer to the plots for normal voltage test.

For model of XIAO-nRF52840 Sense

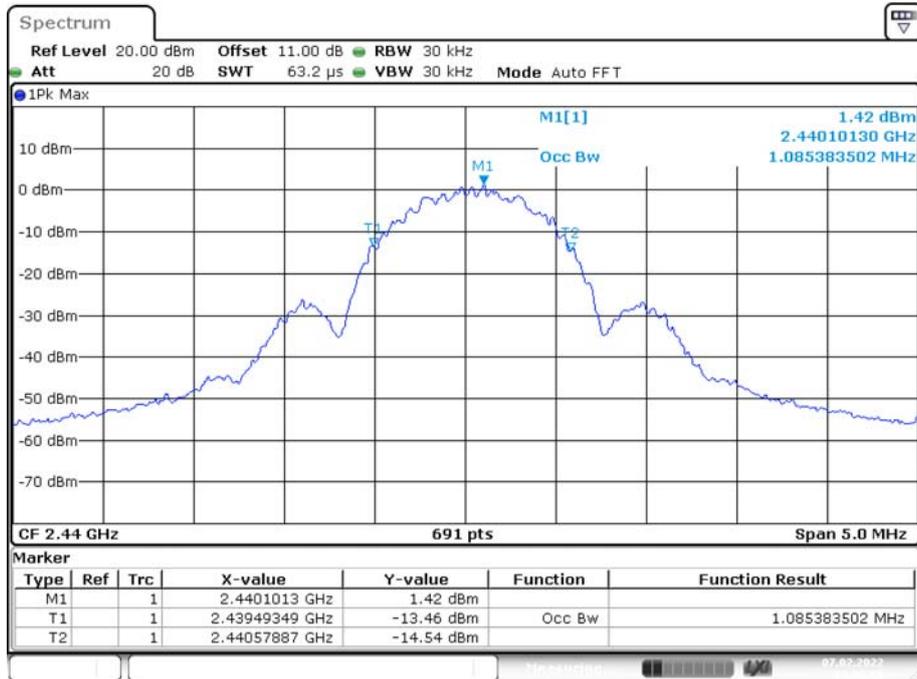
**Normal Voltage
GFSK (1M)
Occupied Bandwidth:**

Low Channel



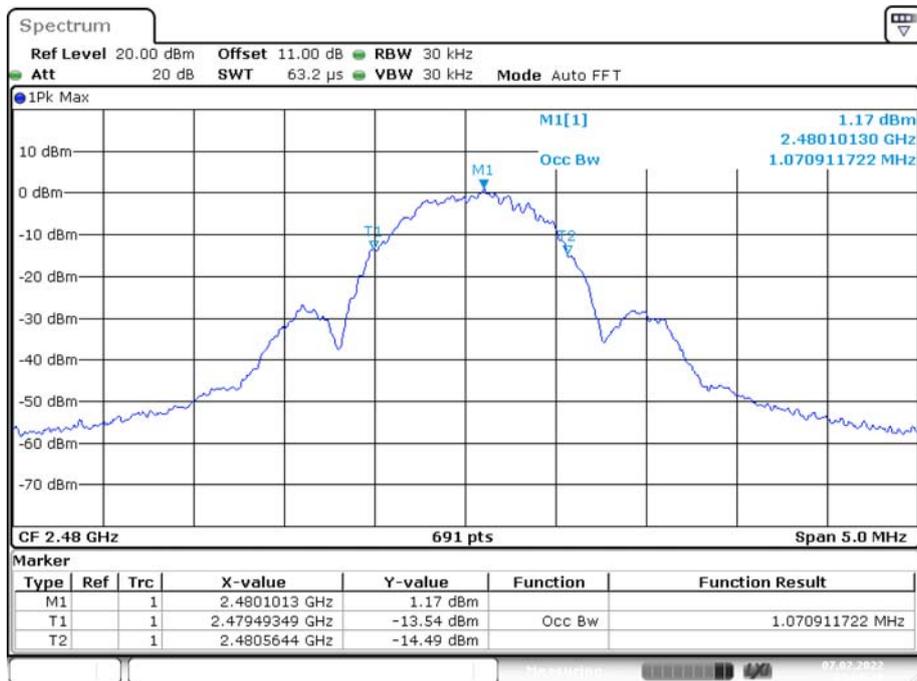
Date: 7.FEB.2022 09:21:30

Middle Channel



Date: 7.FEB.2022 09:33:05

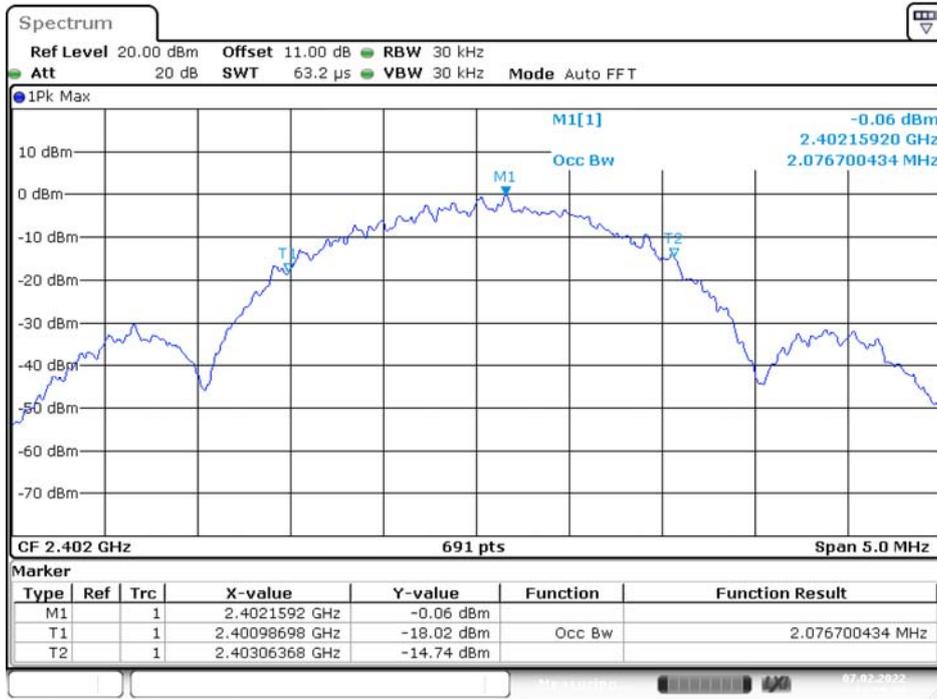
High Channel



Date: 7.FEB.2022 09:38:46

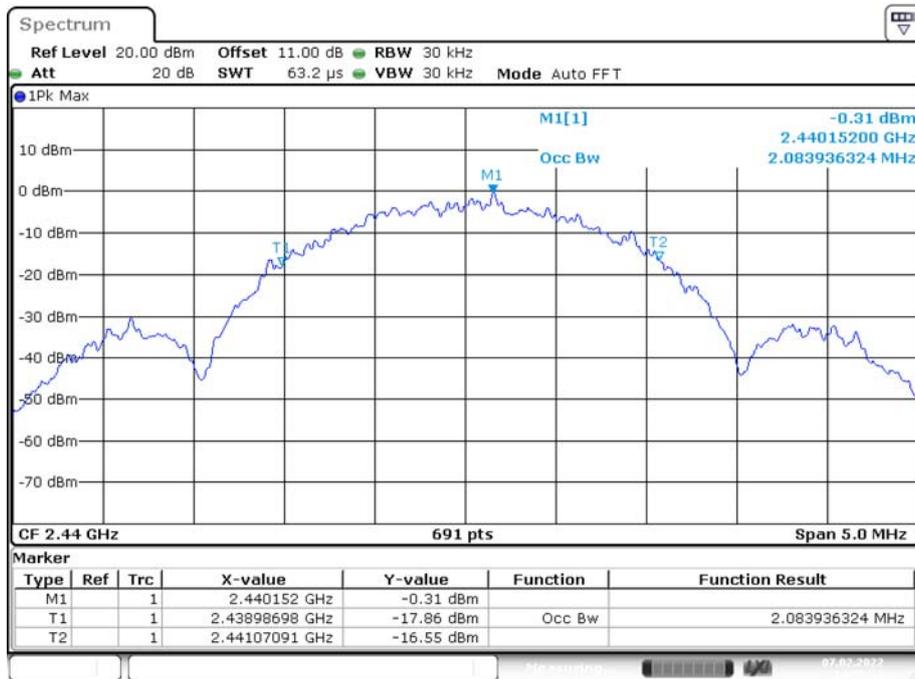
**GFSK (2M)
Occupied Bandwidth:**

Low Channel



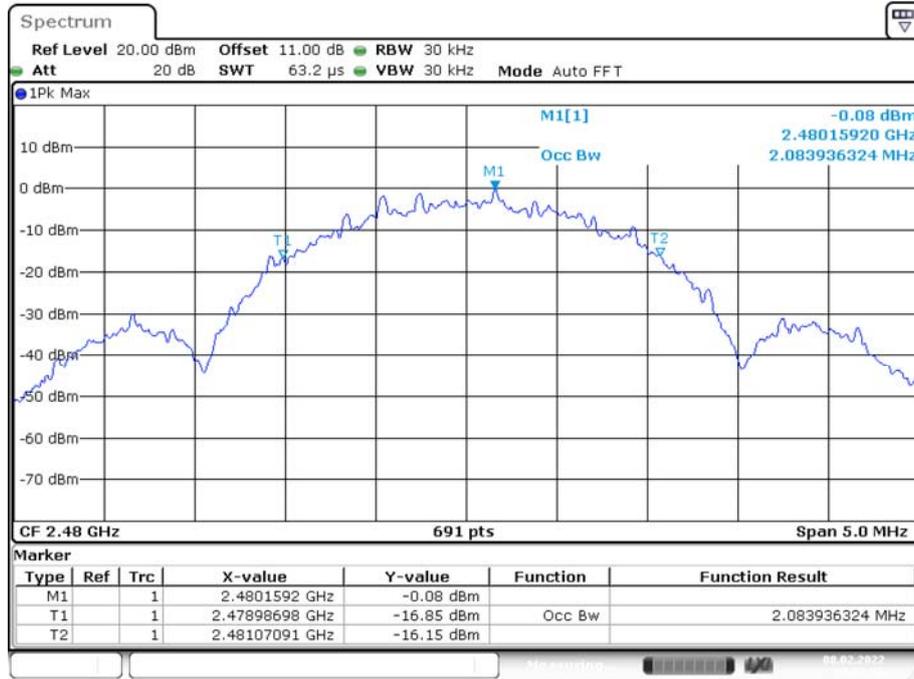
Date: 7.FEB.2022 14:55:52

Middle Channel



Date: 7.FEB.2022 14:55:11

High Channel

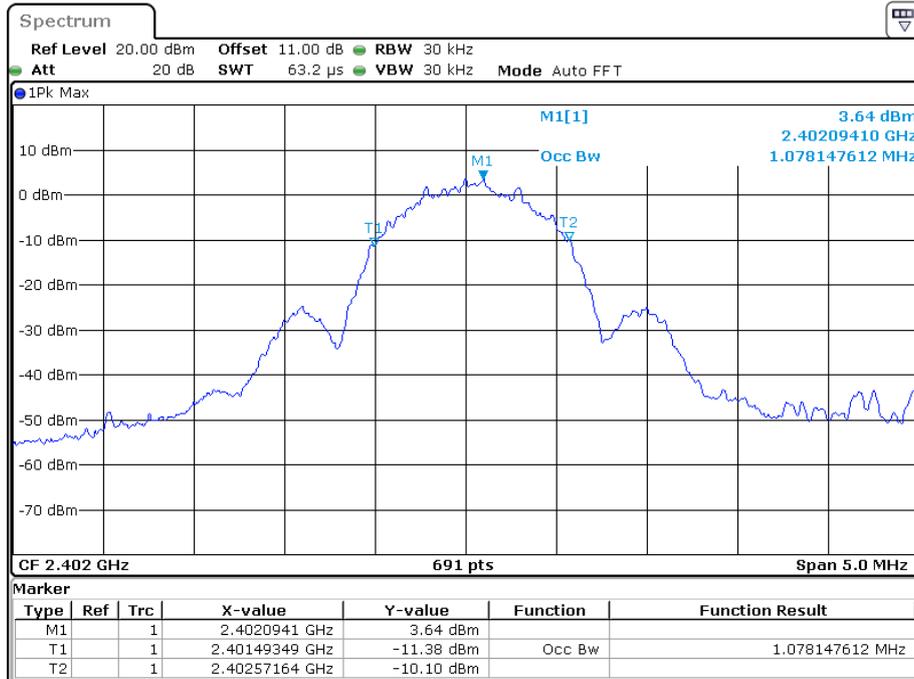


Date: 7.FEB.2022 08:41:15

For model XIAO-nRF52840

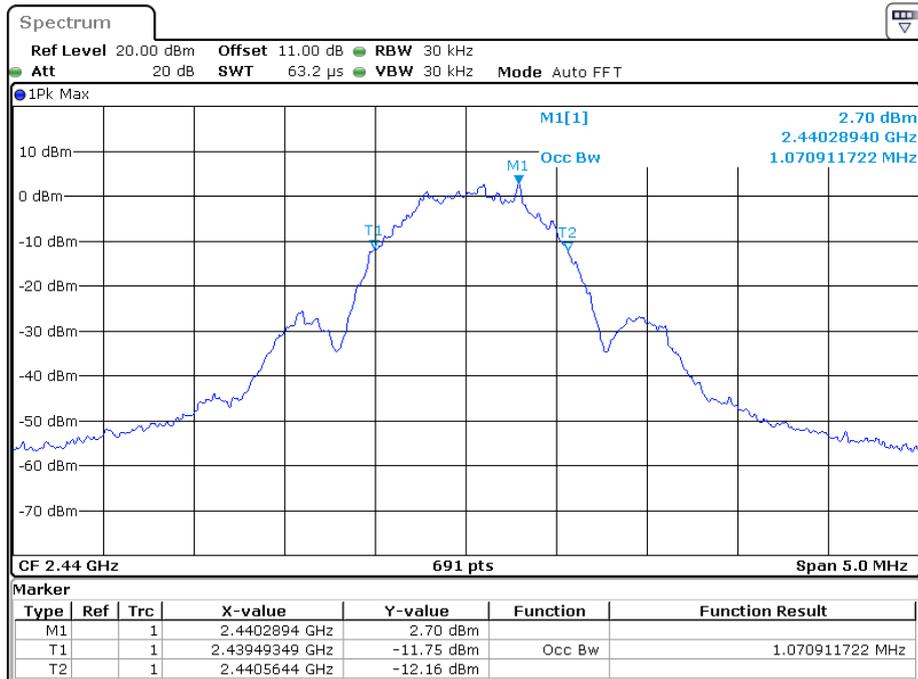
**Normal Voltage
GFSK (1M)
Occupied Bandwidth:**

Low Channel



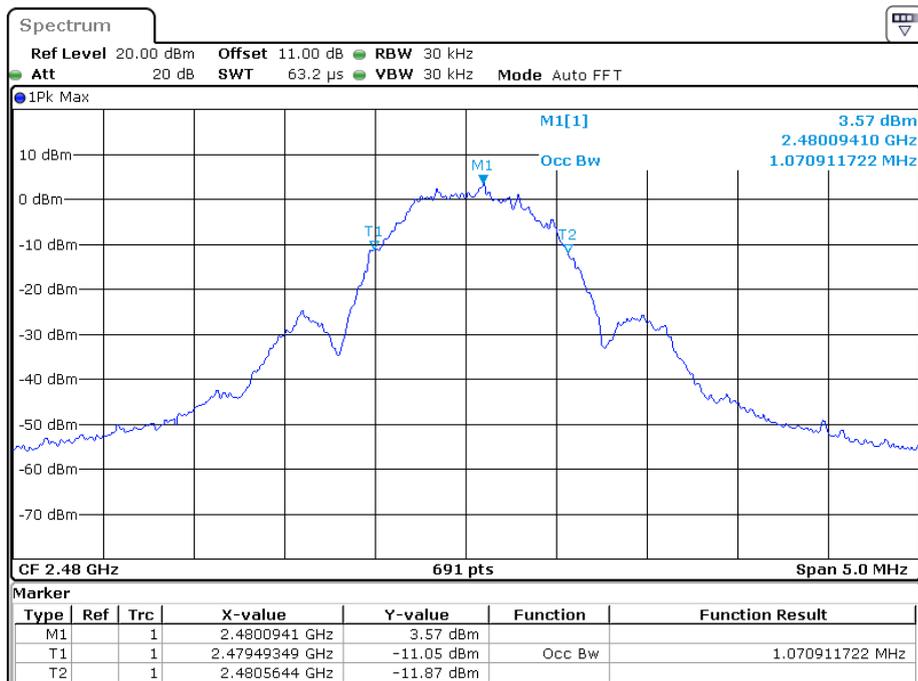
Date: 12.APR.2022 15:37:40

Middle Channel



Date: 12.APR.2022 15:48:47

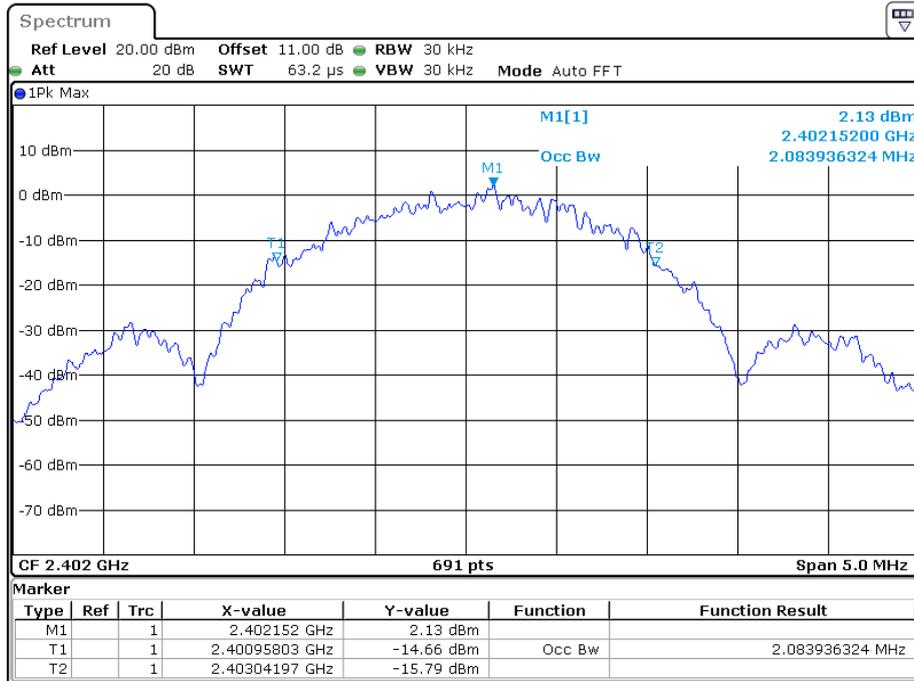
High Channel



Date: 12.APR.2022 15:33:54

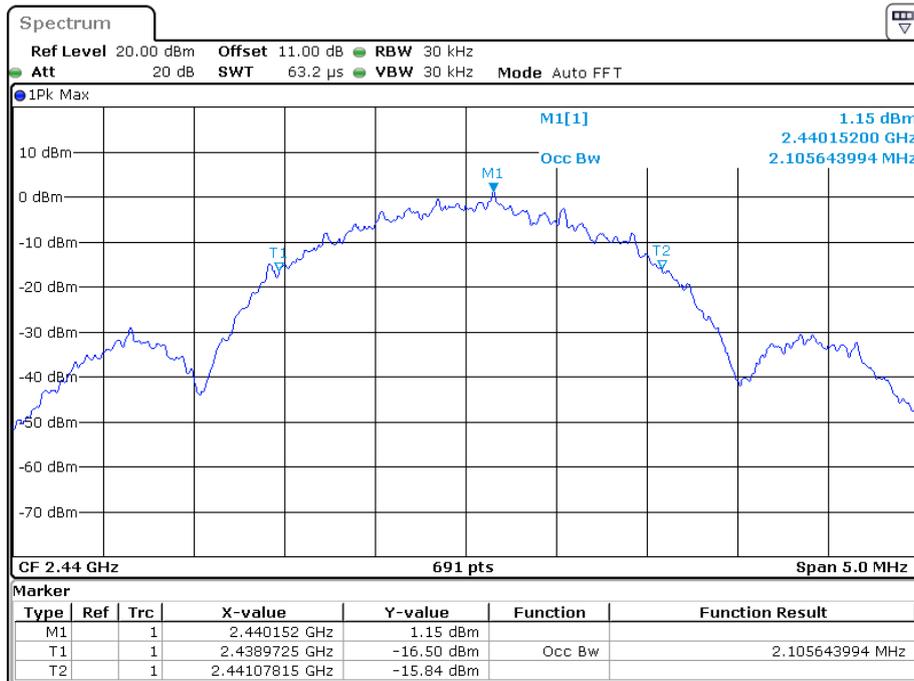
**GFSK (2M)
Occupied Bandwidth:**

Low Channel



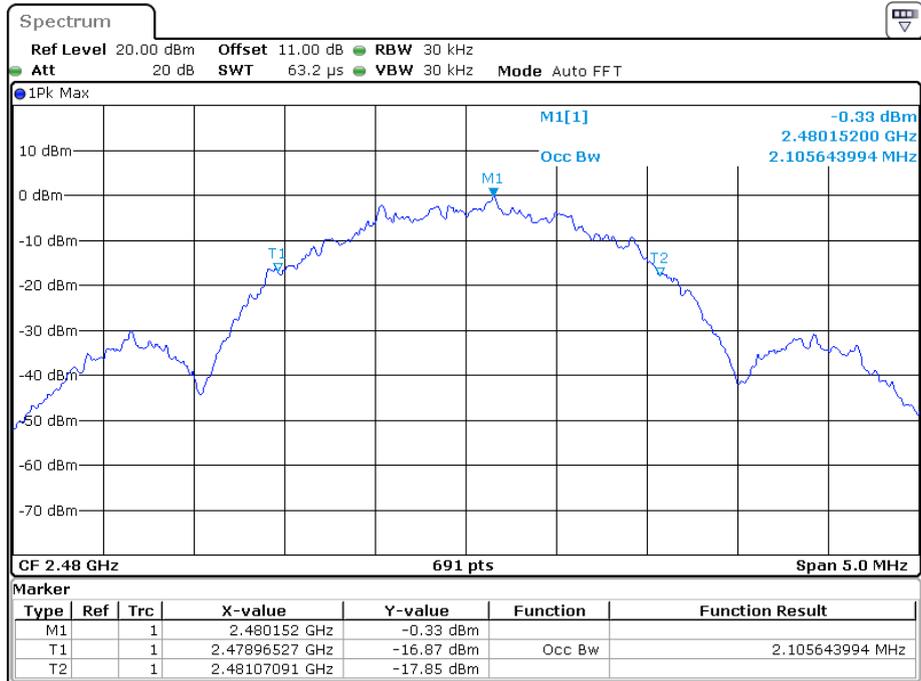
Date: 12.APR.2022 15:50:48

Middle Channel



Date: 12.APR.2022 15:58:44

High Channel



Date: 12.APR.2022 16:00:03

TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY

Limit

- $f < 2387 \text{ MHz}, f > 2496.5 \text{ MHz}: \leq 2.5 \mu\text{W}/\text{MHz}$
- $2387 \text{ MHz} \leq f \leq 2400 \text{ MHz}; 2483.5 \text{ MHz} < f \leq 2496.5 \text{ MHz}: \leq 25 \mu\text{W}/\text{MHz}$

Test Procedure

Conditions of Application Equipment (EUT)

- The modulation state shall be in continuously transmitting mode.

Spectrum Analyzer Conditions

- Span: Measuring Frequency Range
- RBW: 1MHz (frequency range; 1GHz over), 100kHz (frequency range; 30MHz to 1GHz)
- VBW: Same as RBW (1MHz or 100kHz)
- Sweep time: Auto (Minimum time to ensure measurement accuracy.)
- Data points : 400 points or more
- Reference level: Enough level for maximum dynamic range
- Detection: Positive Peak

If the measured value is under the technical standard value, do not need to measure more detail.

Test Data

Environmental Conditions

Temperature:	25°C
Relative Humidity:	53%
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2022-02-07 to 2022-04-12.

Test Result: Compliant

Please refer to the below plots and table.

For model of XIAO-nRF52840 Sense

Normal Voltage

GFSK(1M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band I (dBm/100kHz)	-56.69	-57.32	-56.60	-36
	Band II (dBm/MHz)	-47.28	-35.25	-46.24	-26
	Band III (dBm/MHz)	-30.39	-45.55	-45.92	-16
	Band IV (dBm/MHz)	-46.18	-46.83	-44.14	-16
	Band V (dBm/MHz)	-35.96	-36.83	-38.62	-26

GFSK(2M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band I (dBm/100kHz)	-56.72	-55.46	-56.70	-36
	Band II (dBm/MHz)	-46.21	-47.57	-46.82	-26
	Band III (dBm/MHz)	-17.36	-47.01	-46.38	-16
	Band IV (dBm/MHz)	-45.82	-46.46	-39.47	-16
	Band V (dBm/MHz)	-35.76	-37.39	-38.75	-26

For model of XIAO-nRF52840

Normal Voltage

GFSK(1M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band I (dBm/100kHz)	-55.70	-56.44	-56.17	-36
	Band II (dBm/MHz)	-39.41	-41.88	-42.41	-26
	Band III (dBm/MHz)	-28.48	-44.50	-45.91	-16
	Band IV (dBm/MHz)	-45.66	-45.93	-43.24	-16
	Band V (dBm/MHz)	-31.52	-29.96	-30.33	-26

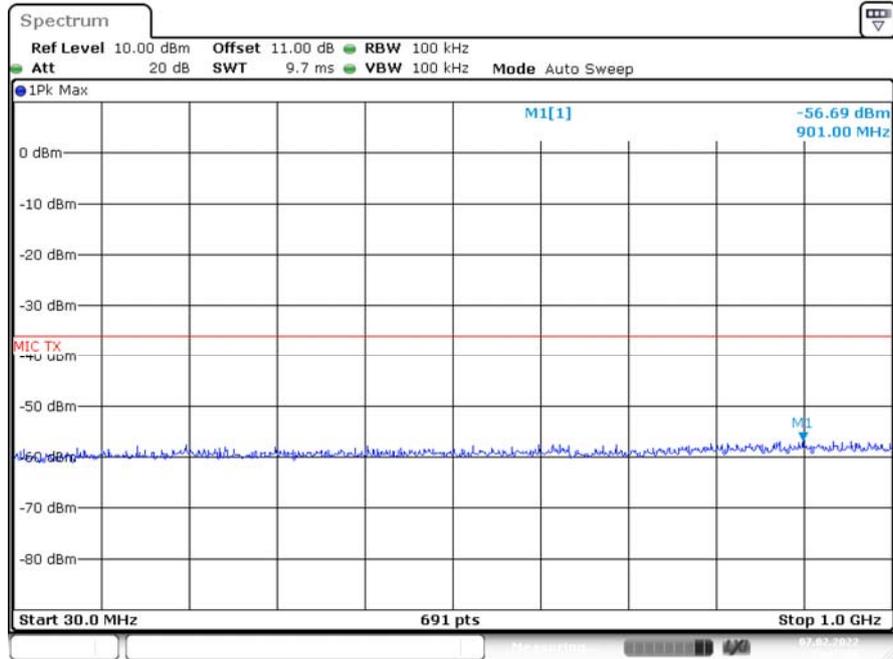
GFSK(2M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band I (dBm/100kHz)	-56.38	-56.45	-56.34	-36
	Band II (dBm/MHz)	-43.11	-43.57	-46.54	-26
	Band III (dBm/MHz)	-30.57	-45.82	-46.91	-16
	Band IV (dBm/MHz)	-45.76	-45.49	-38.85	-16
	Band V (dBm/MHz)	-32.04	-30.26	-30.81	-26

Note:2.5 μ W/MHz = -26dBm/MHz = -36dBm/100kHz25 μ W/MHz = -16dBm/MHz**Band I: 30MHz-1000MHz****Band II: 1000MHz-2387MHz****Band III: 2387MHz-2400MHz****Band IV: 2483.5MHz-2496.5MHz****Band V: 2496.5MHz-12500MHz**

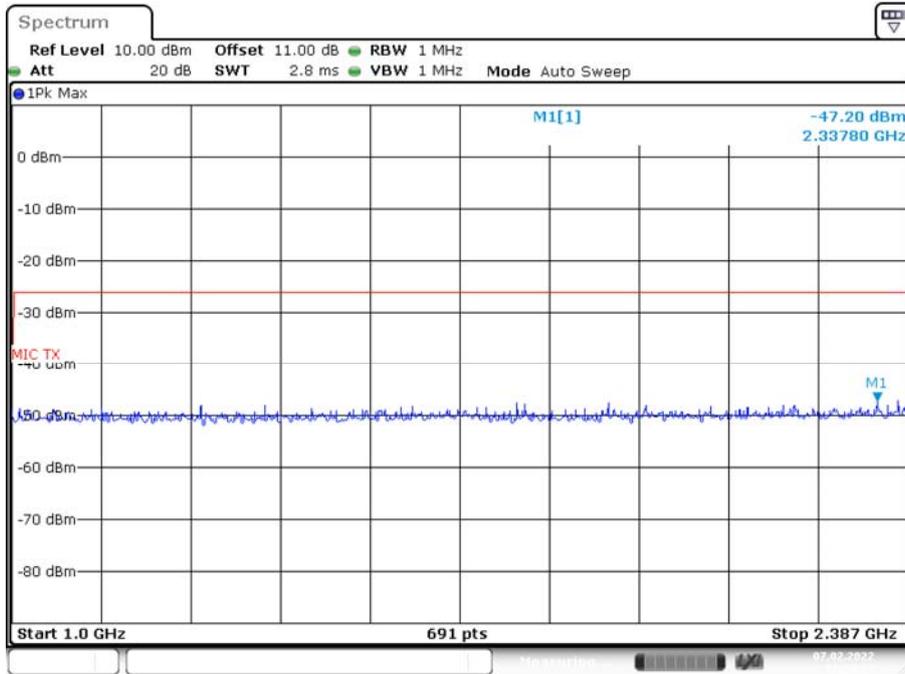
For model of XIAO-nRF52840 Sense

Normal Voltage
GFSK (1M)
Low Channel:

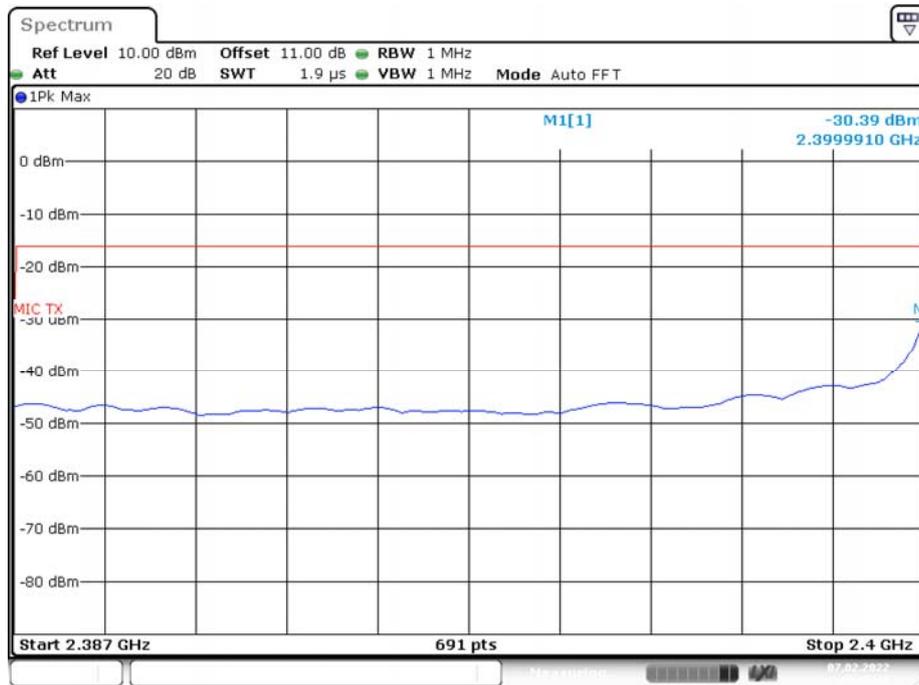
30MHz - 1000MHz



1000MHz - 2387MHz

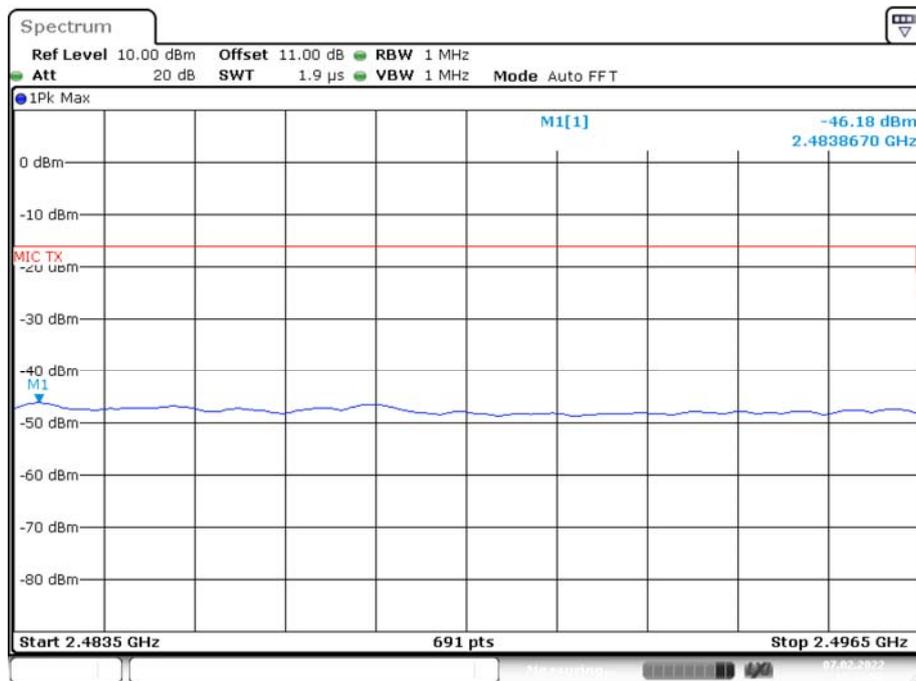


2387MHz - 2400MHz



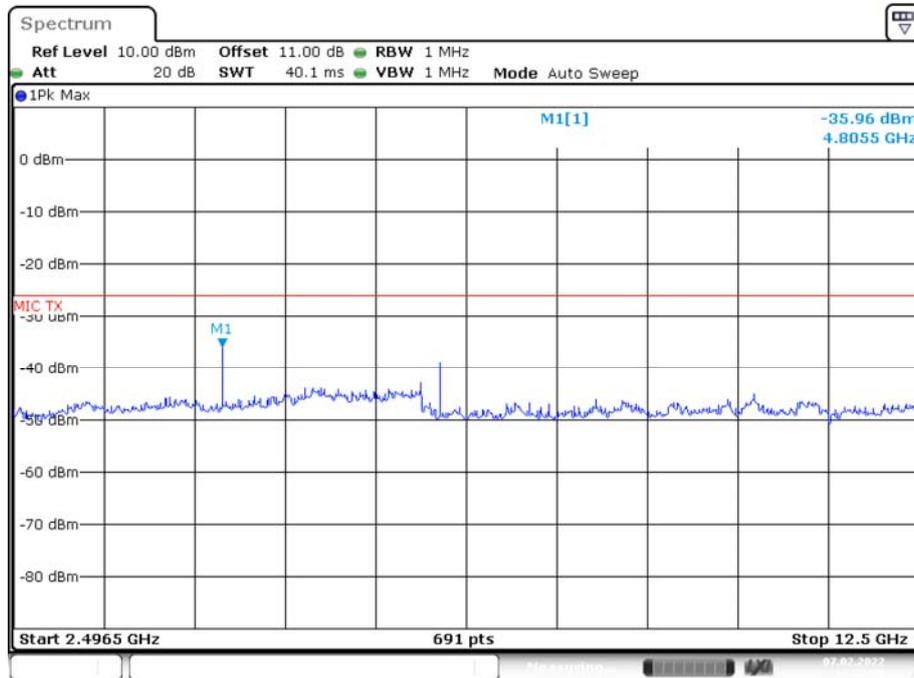
Date: 7.FEB.2022 13:30:50

2483.5MHz - 2496.5MHz



Date: 7.FEB.2022 13:31:57

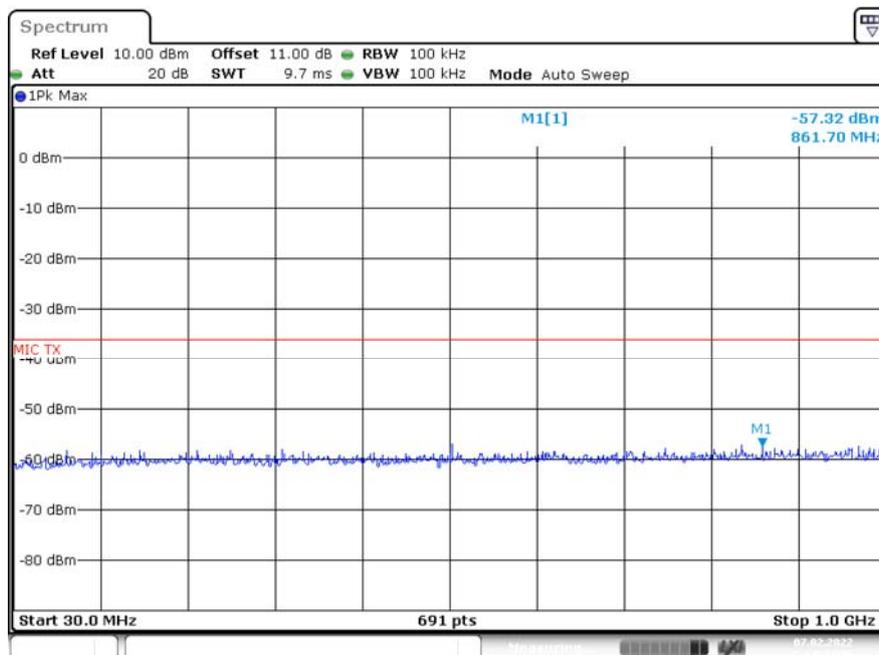
2496.5MHz - 12500MHz



Date: 7.FEB.2022 13:32:59

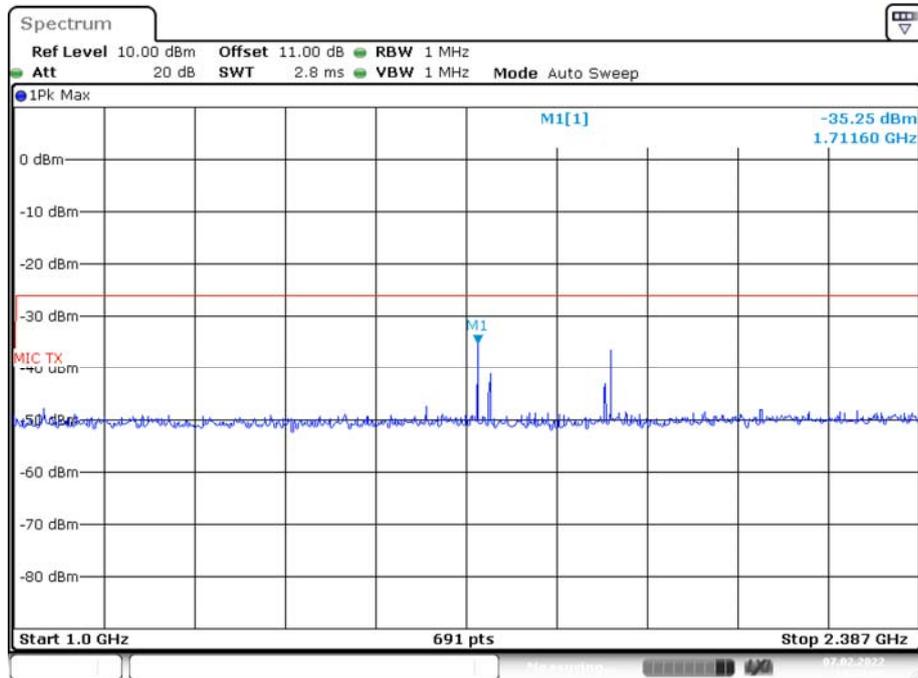
Middle Channel:

30MHz - 1000MHz



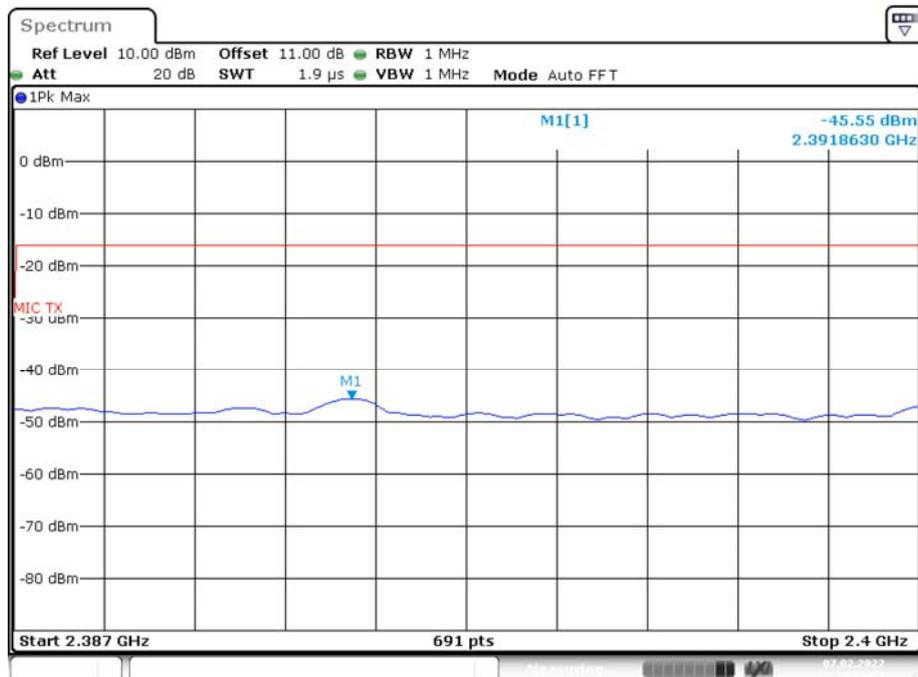
Date: 7.FEB.2022 13:44:47

1000MHz - 2387MHz



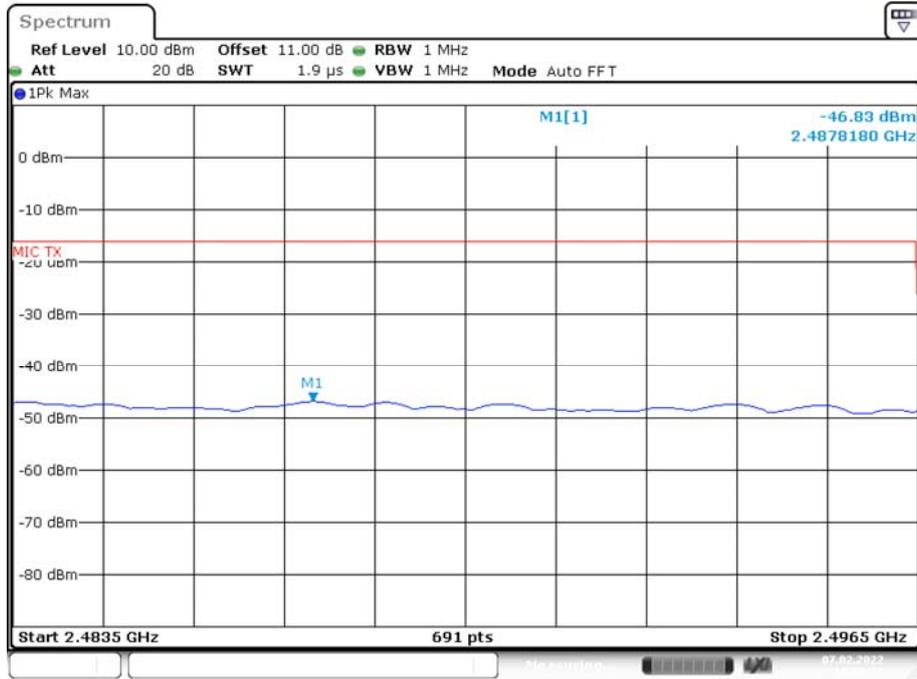
Date: 7.FEB.2022 13:44:06

2387MHz - 2400MHz



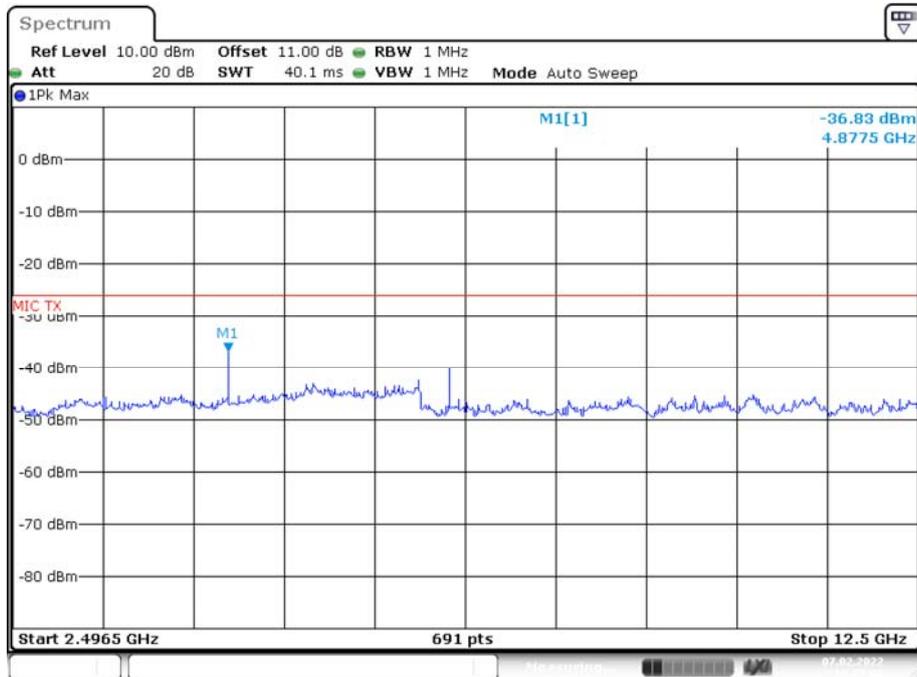
Date: 7.FEB.2022 13:41:53

2483.5MHz - 2496.5MHz



Date: 7.FEB.2022 13:43:18

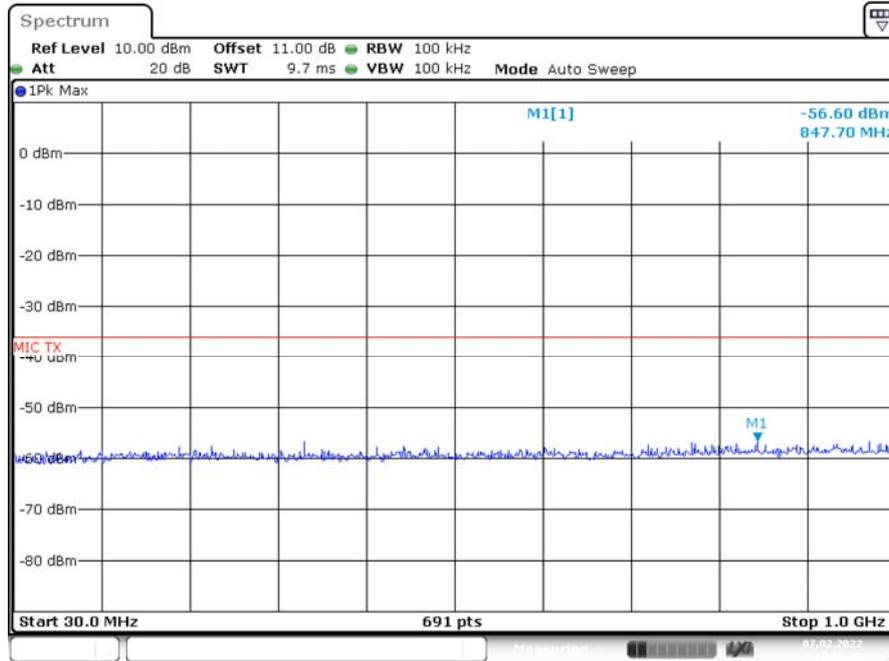
2496.5MHz - 12500MHz



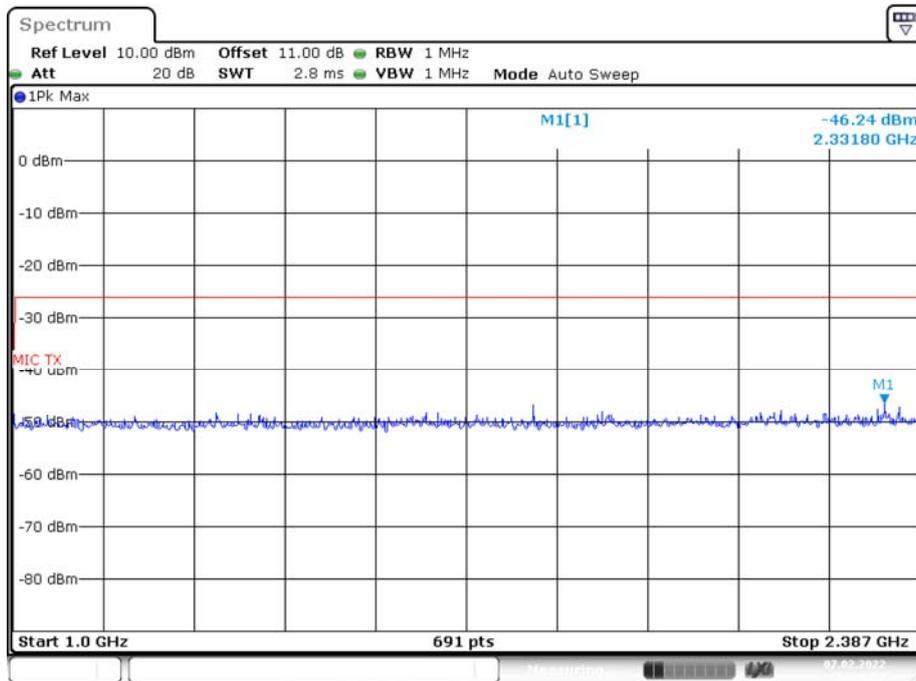
Date: 7.FEB.2022 13:37:07

High Channel:

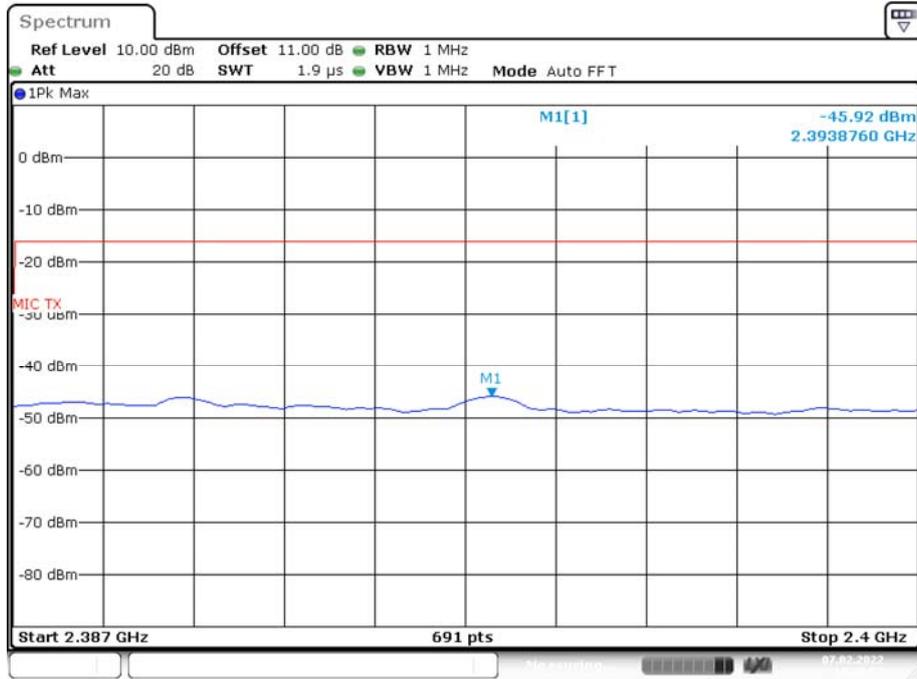
30MHz - 1000MHz



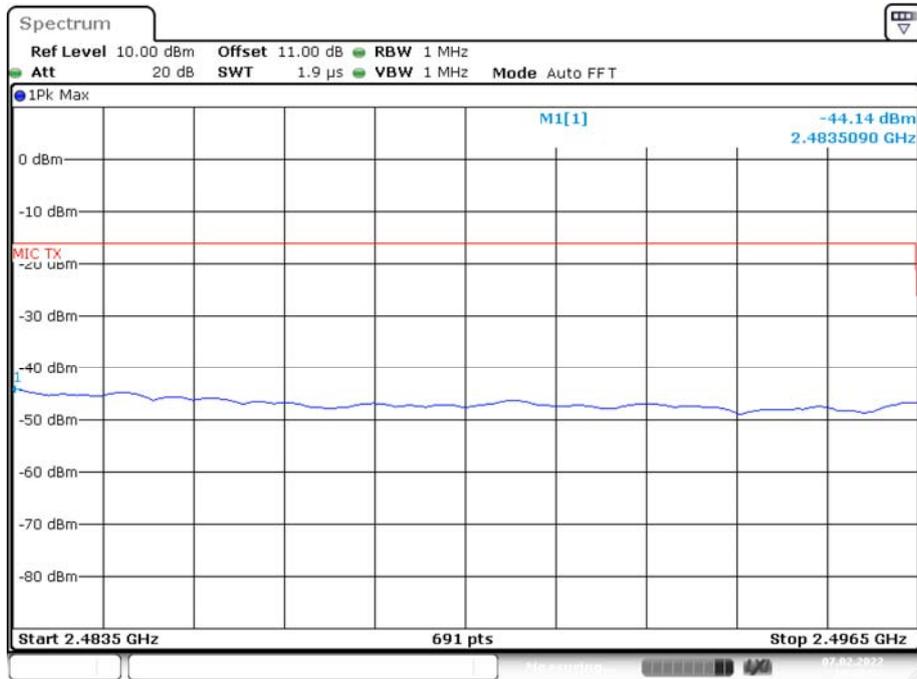
1000MHz - 2387MHz



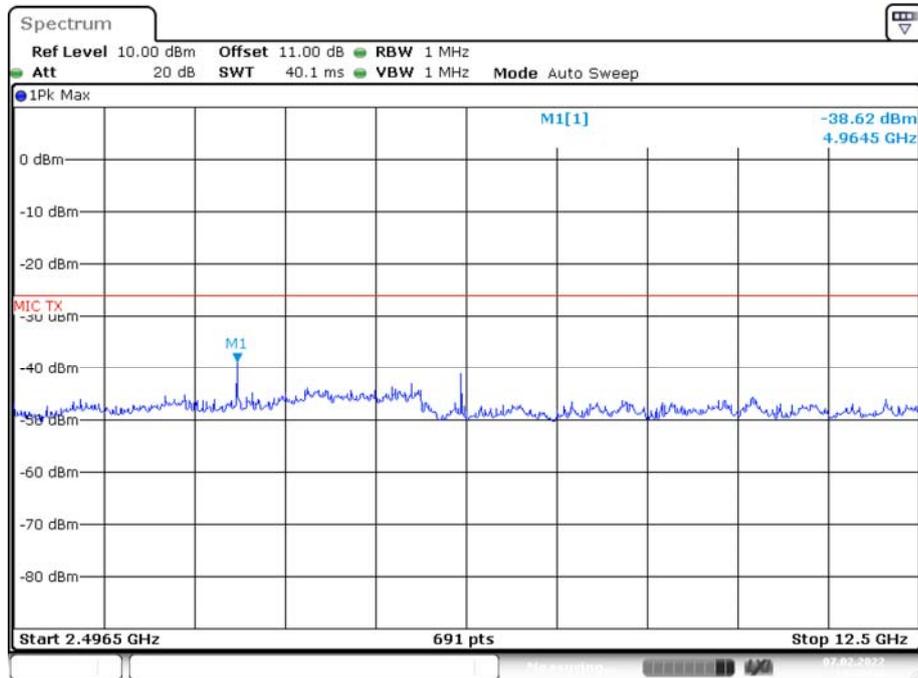
2387MHz - 2400MHz



2483.5MHz - 2496.5MHz



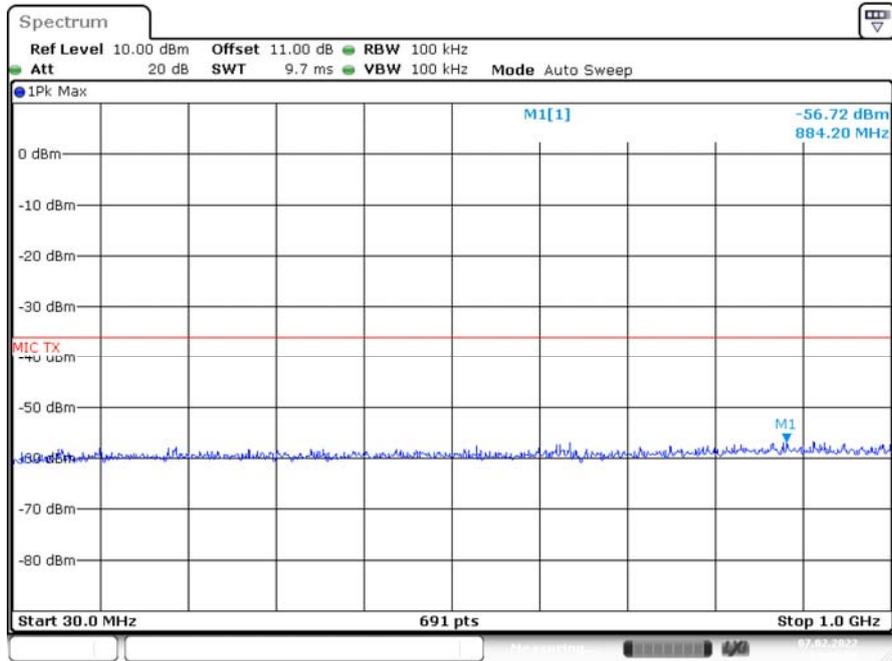
2496.5MHz - 12500MHz



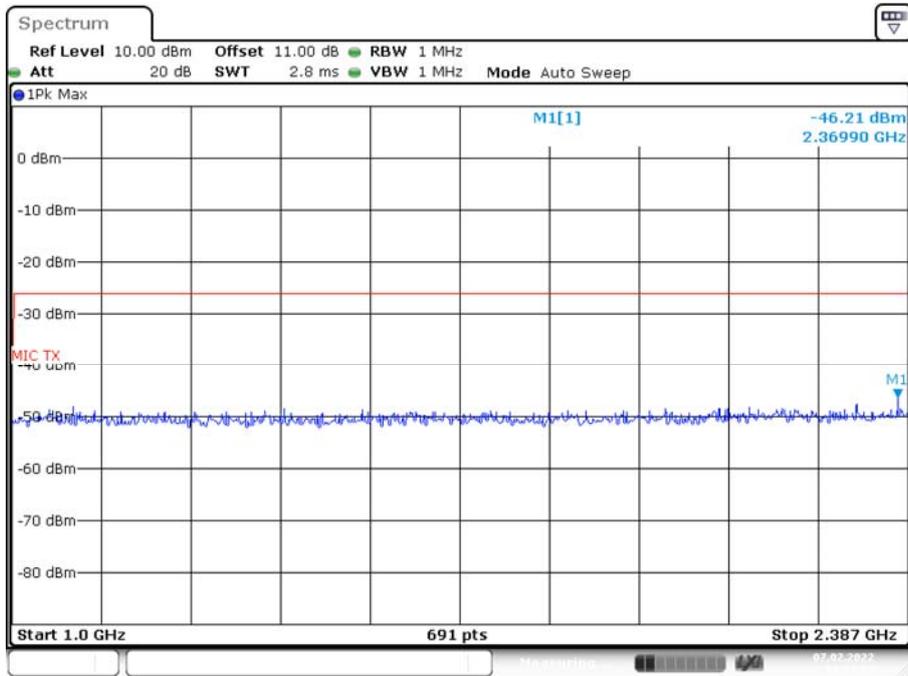
Date: 7.FEB.2022 13:49:34

**GFSK (2M)
Low Channel:**

30MHz - 1000MHz



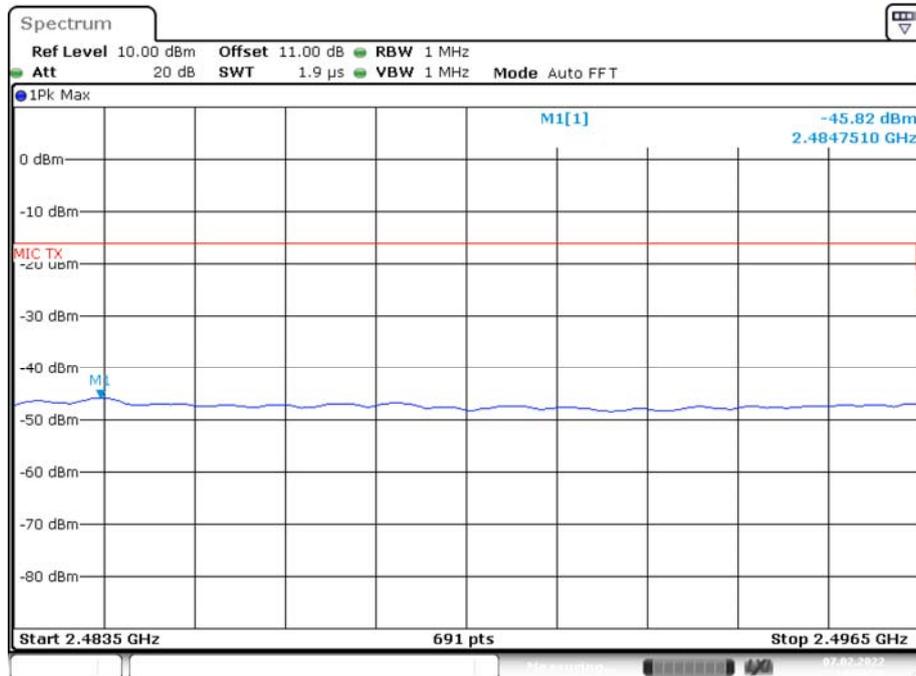
1000MHz - 2387MHz



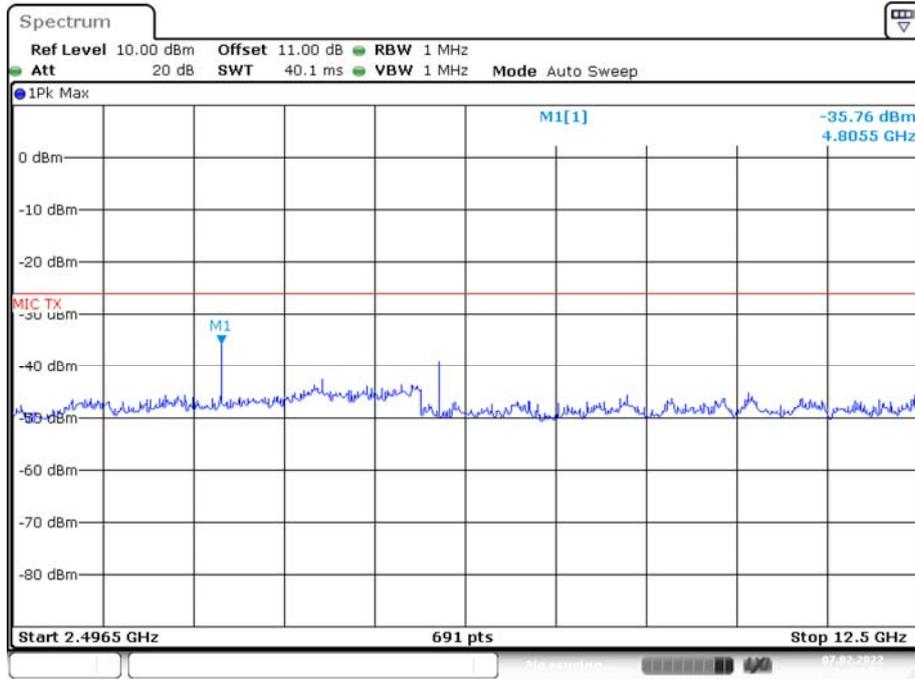
2387MHz - 2400MHz



2483.5MHz - 2496.5MHz



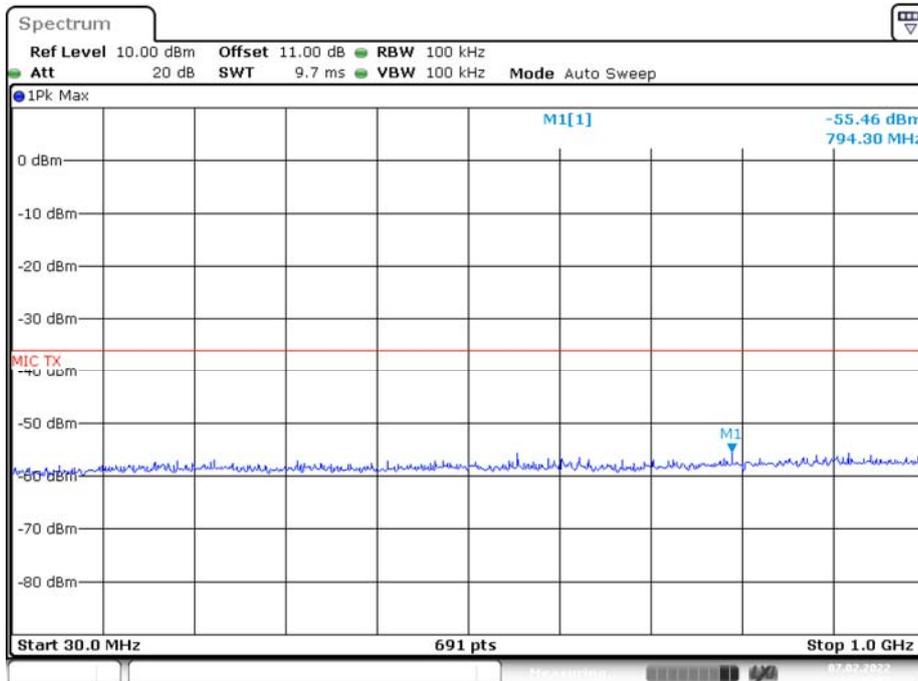
2496.5MHz - 12500MHz



Date: 7.FEB.2022 14:39:51

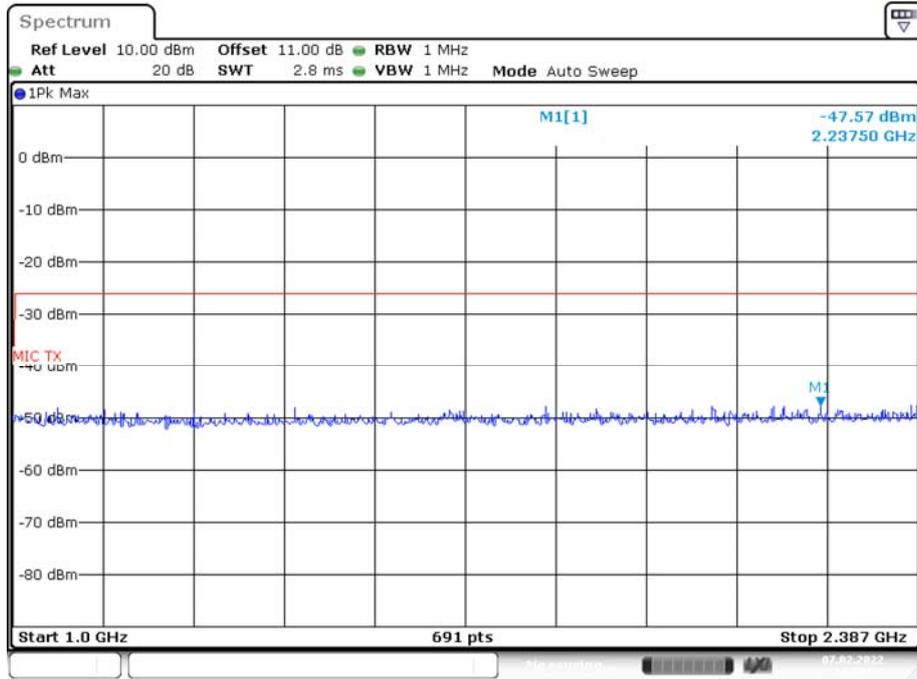
Middle Channel:

30MHz - 1000MHz

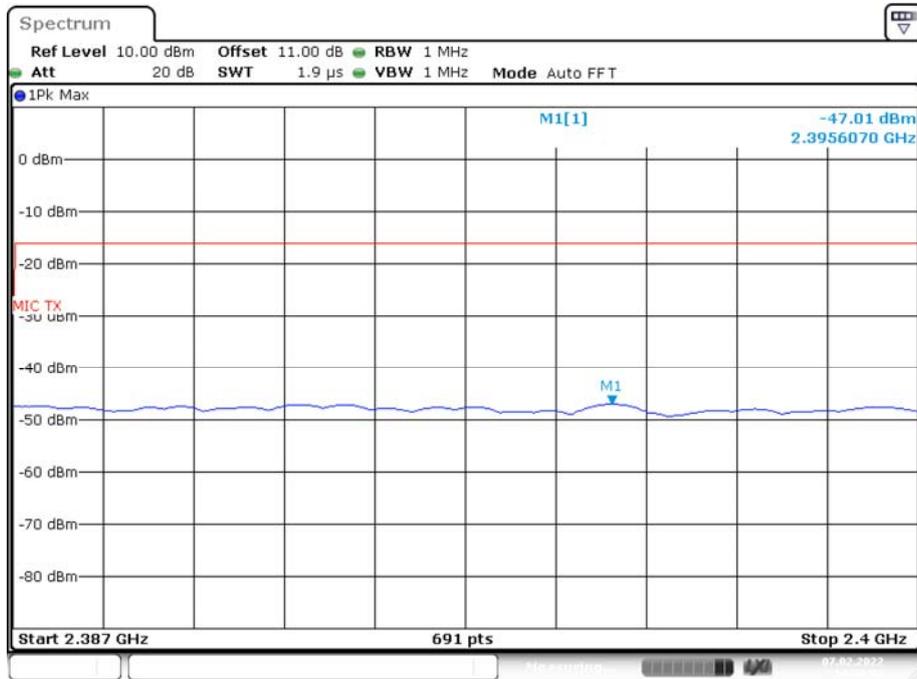


Date: 7.FEB.2022 14:46:05

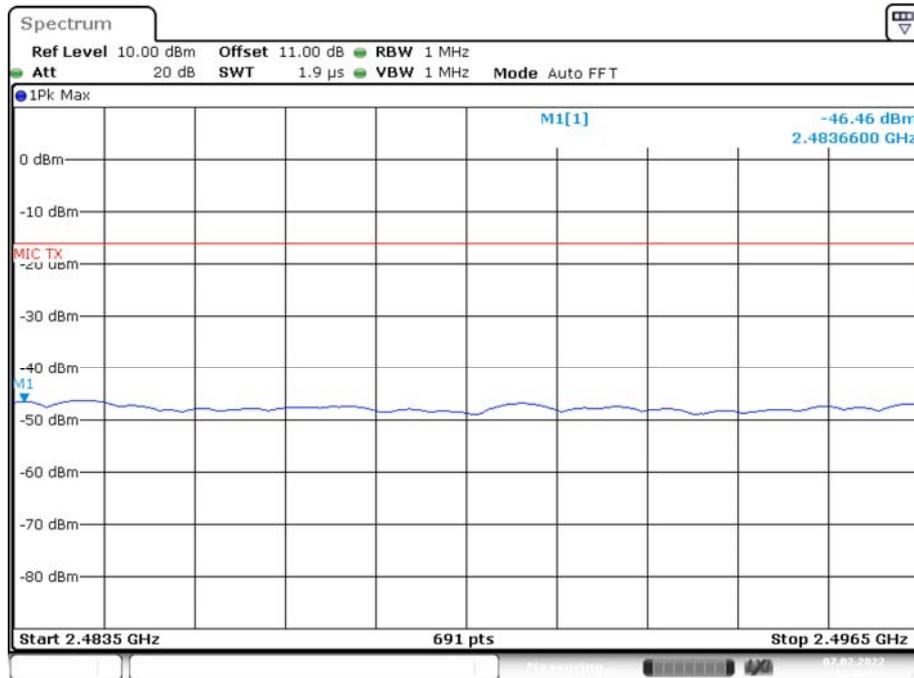
1000MHz - 2387MHz



2387MHz - 2400MHz

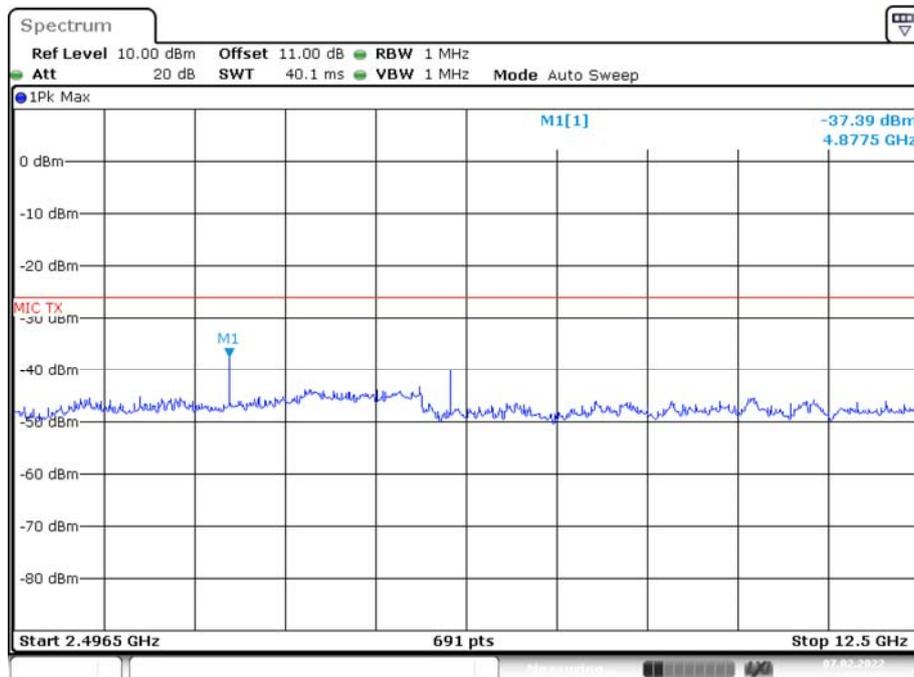


2483.5MHz - 2496.5MHz



Date: 7.FEB.2022 14:42:21

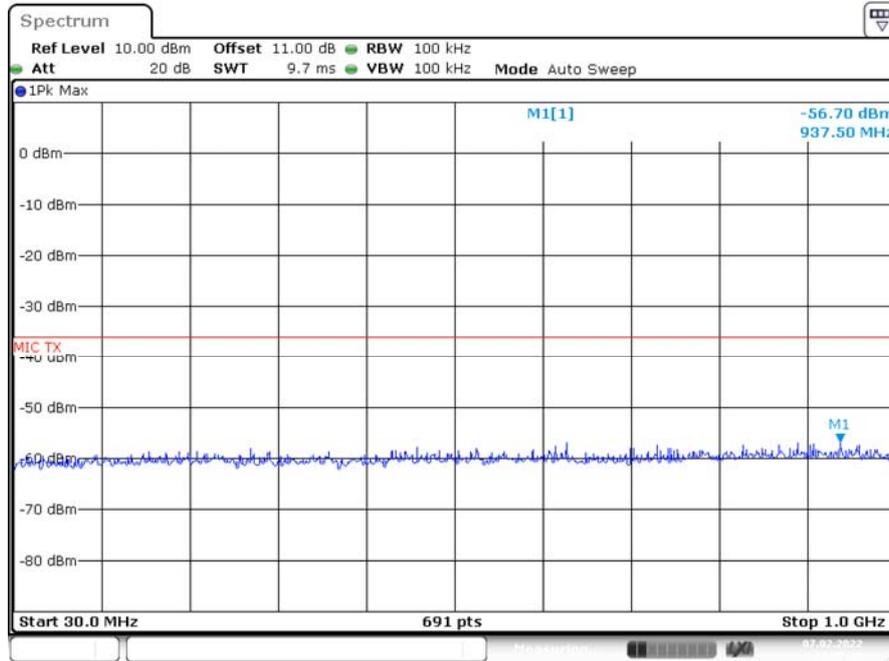
2496.5MHz - 12500MHz



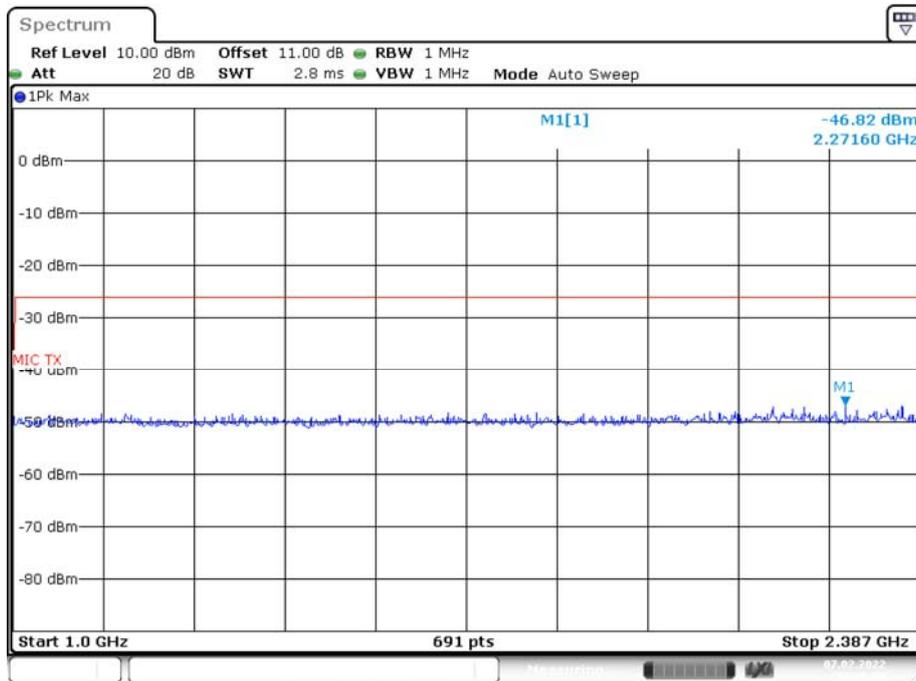
Date: 7.FEB.2022 14:41:44

High Channel:

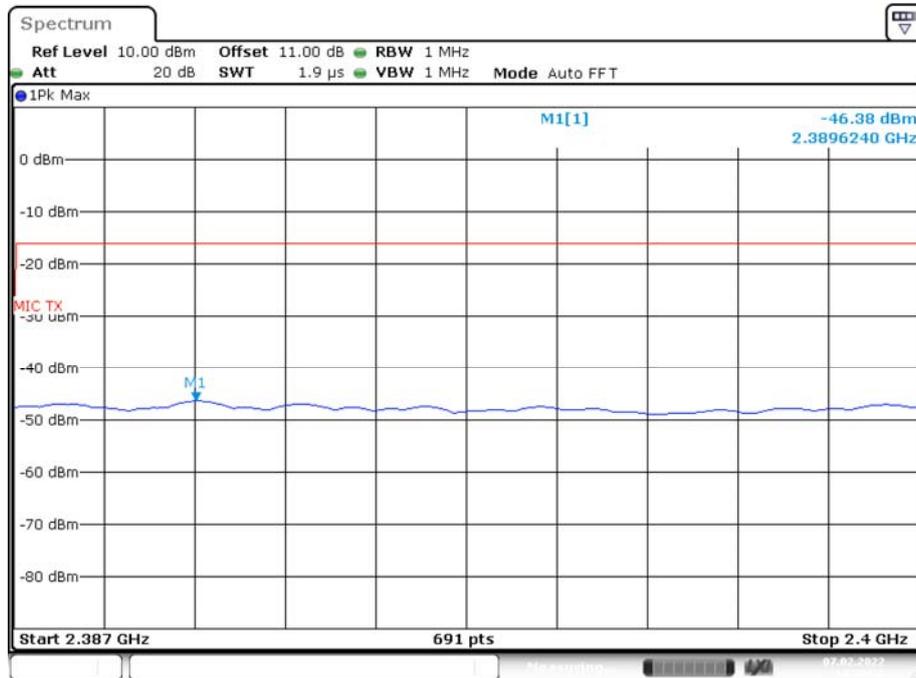
30MHz - 1000MHz



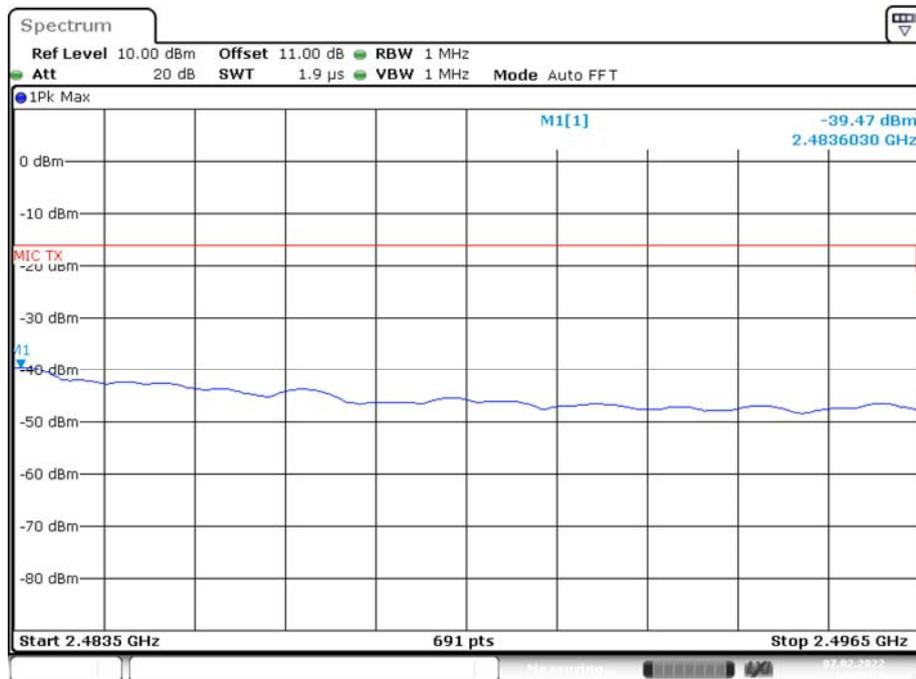
1000MHz - 2387MHz



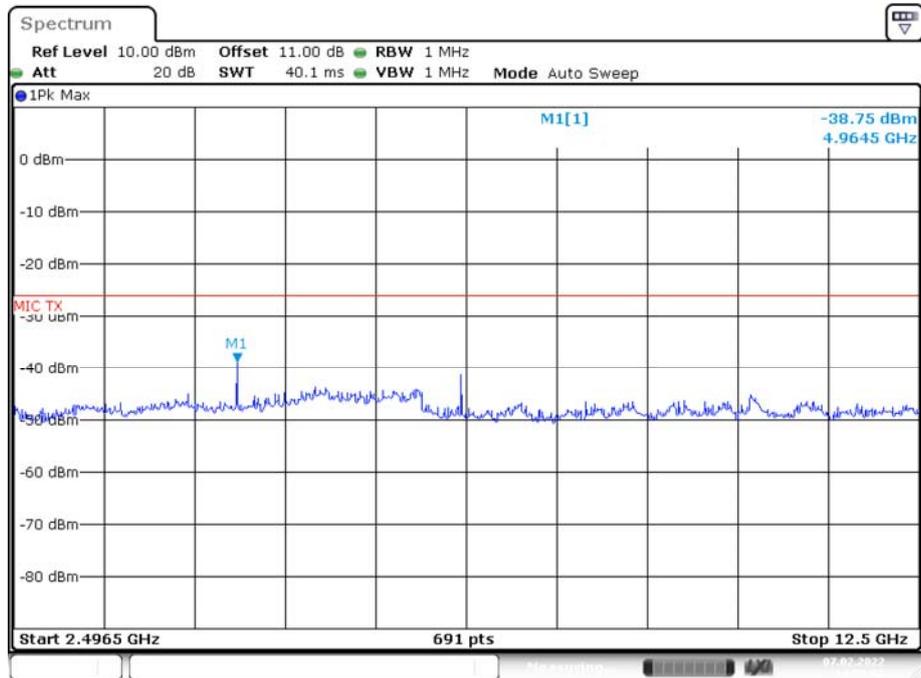
2387MHz - 2400MHz



2483.5MHz - 2496.5MHz



2496.5MHz - 12500MHz

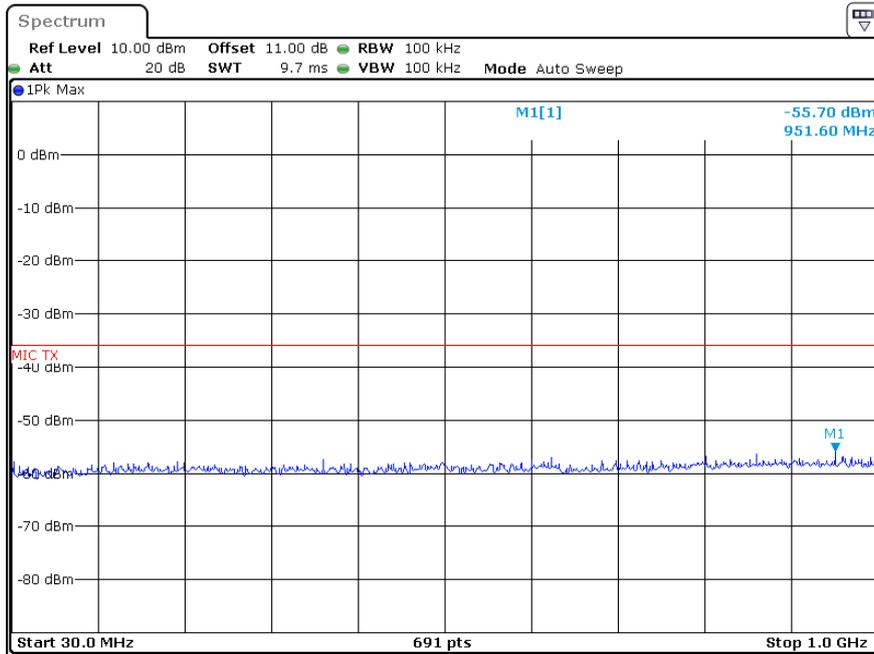


Date: 7.FEB.2022 14:50:07

For model of XIAO-nRF52840

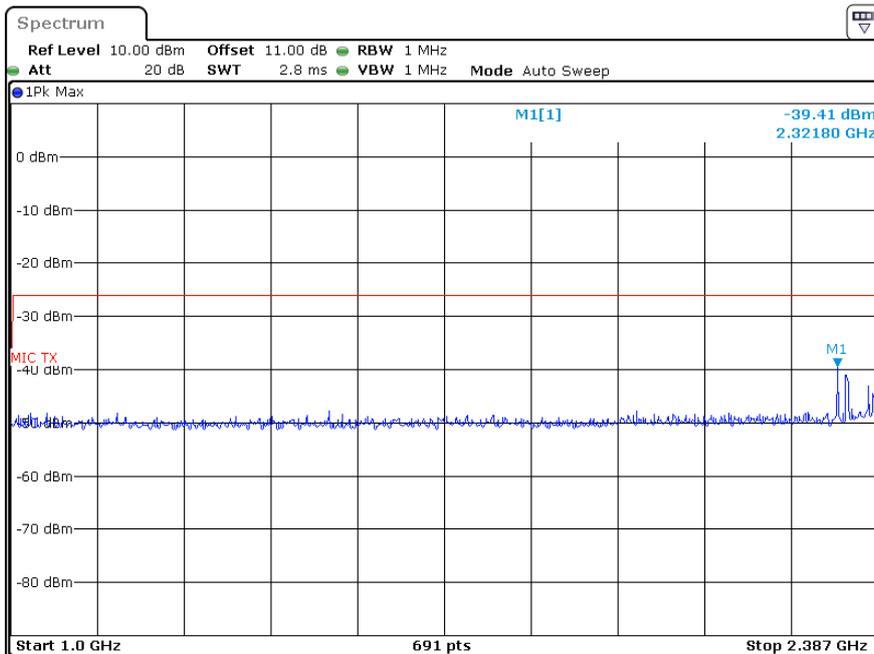
Normal Voltage
GFSK (1M)
Low Channel:

30MHz - 1000MHz



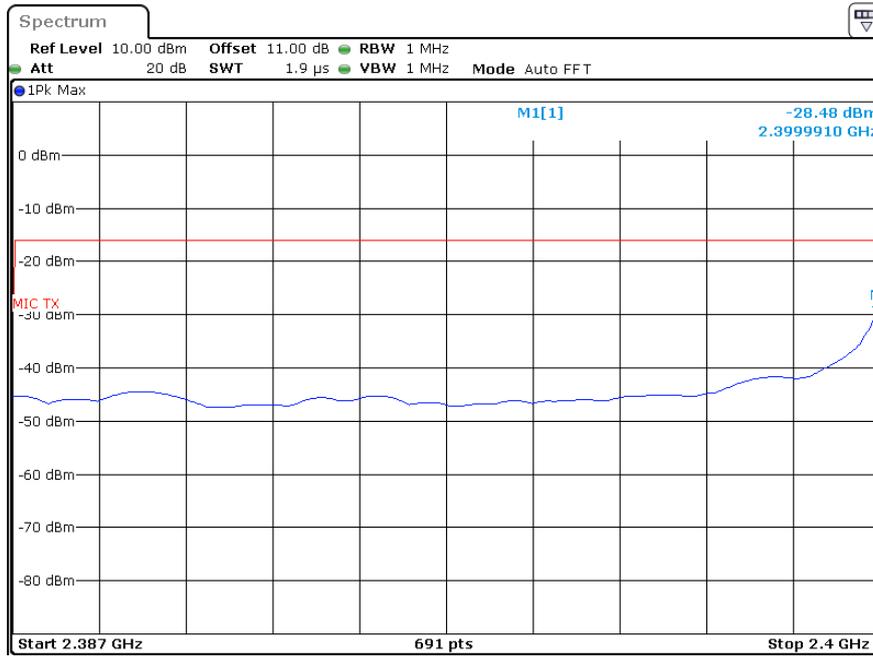
Date: 12.APR.2022 16:04:55

1000MHz - 2387MHz



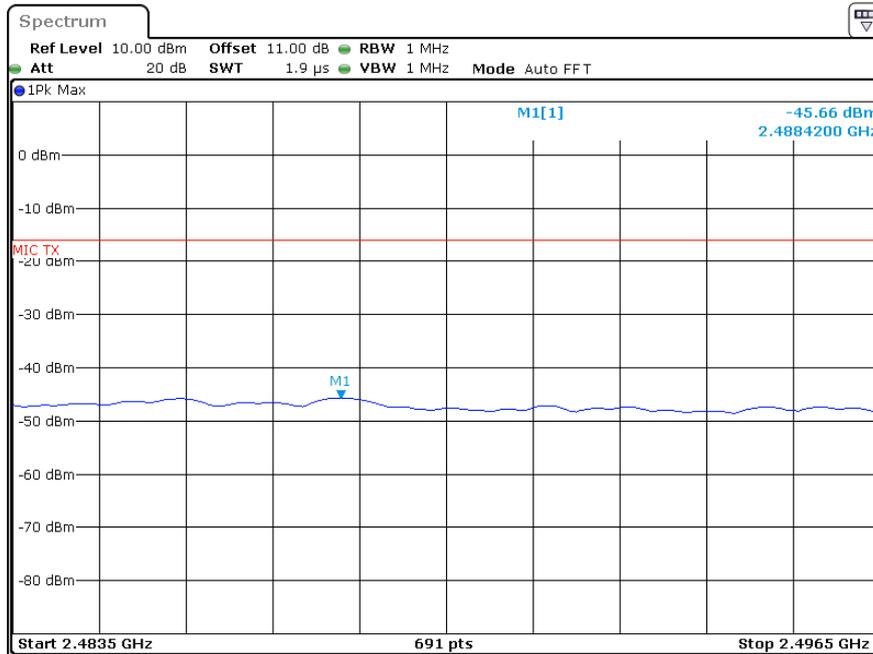
Date: 12.APR.2022 16:07:29

2387MHz - 2400MHz



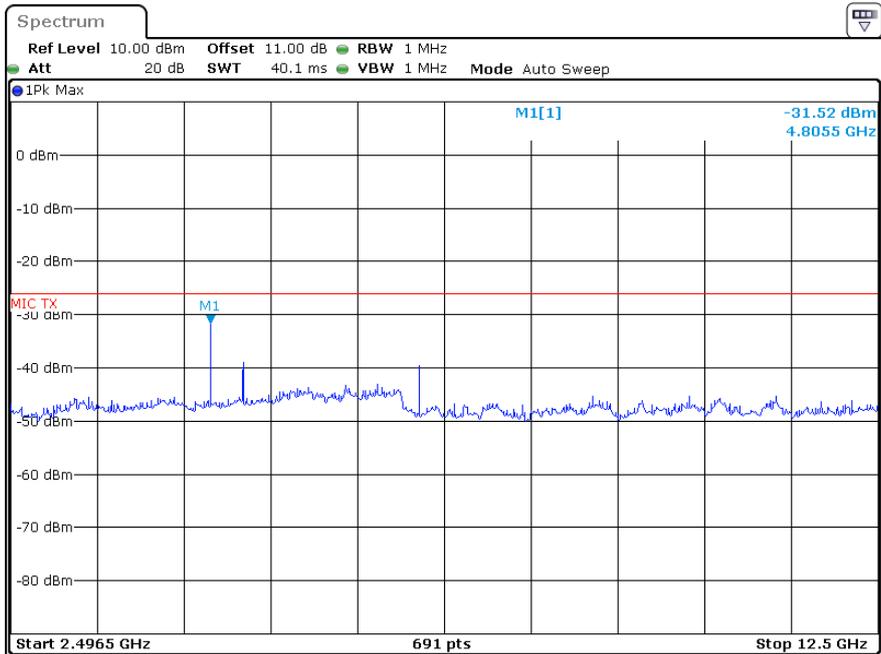
Date: 12.APR.2022 16:08:48

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:09:56

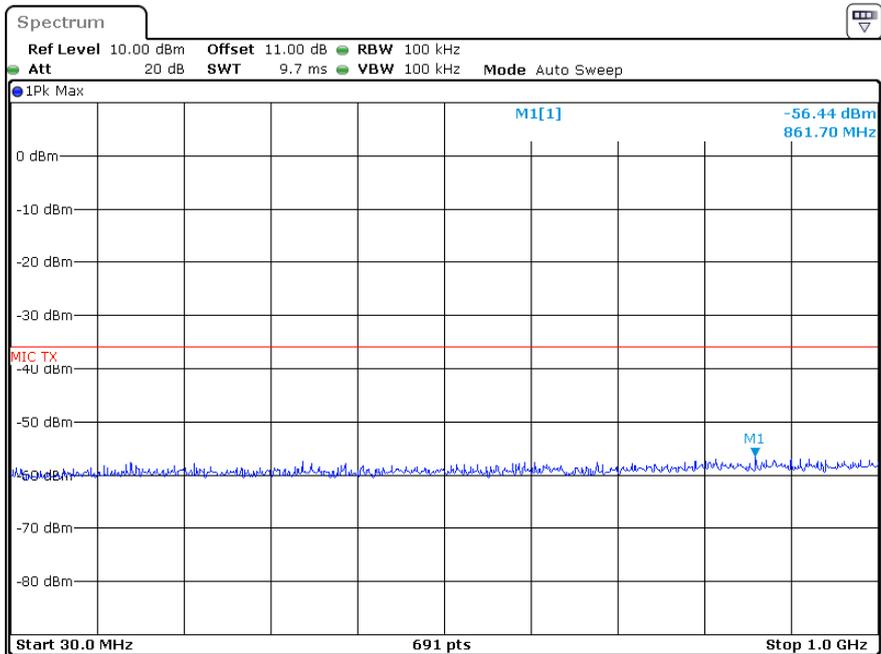
2496.5MHz - 12500MHz



Date: 12.APR.2022 16:11:29

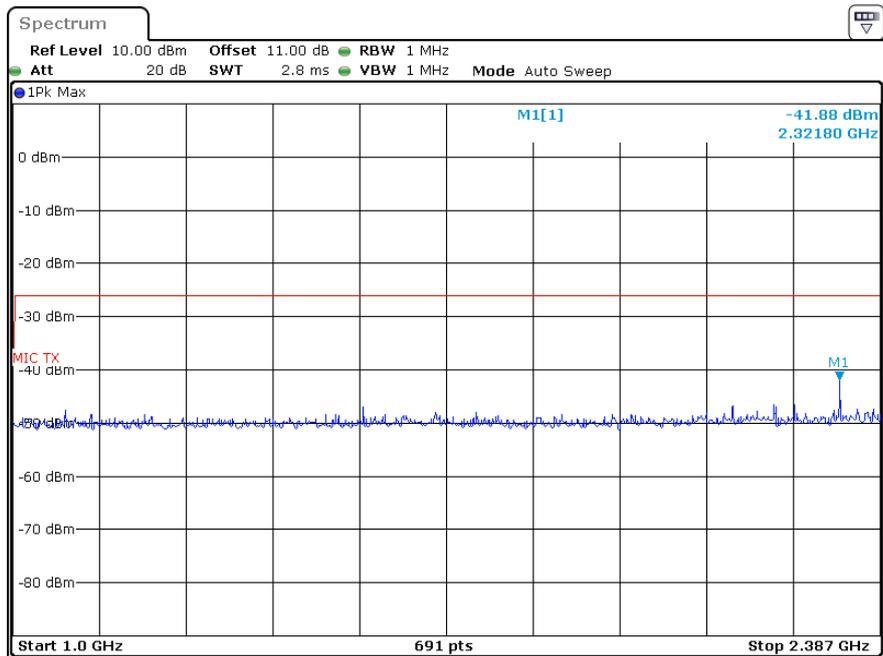
Middle Channel:

30MHz - 1000MHz



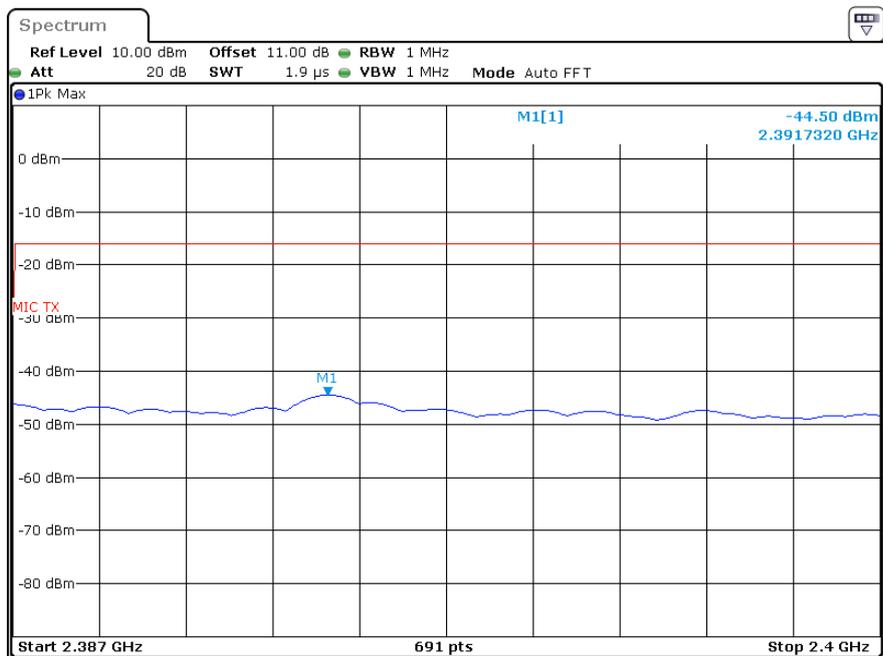
Date: 12.APR.2022 16:16:15

1000MHz - 2387MHz



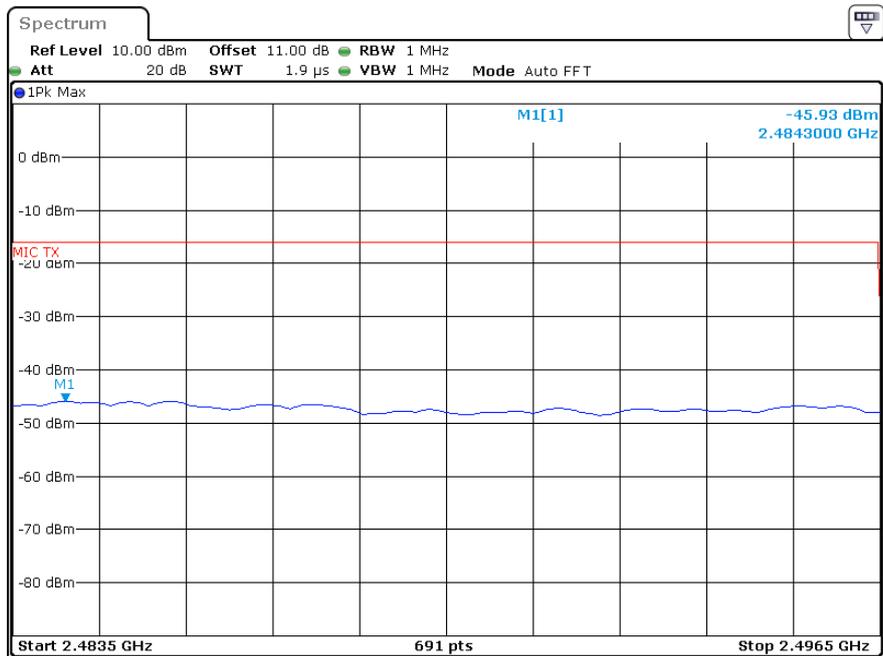
Date: 12.APR.2022 16:17:53

2387MHz - 2400MHz



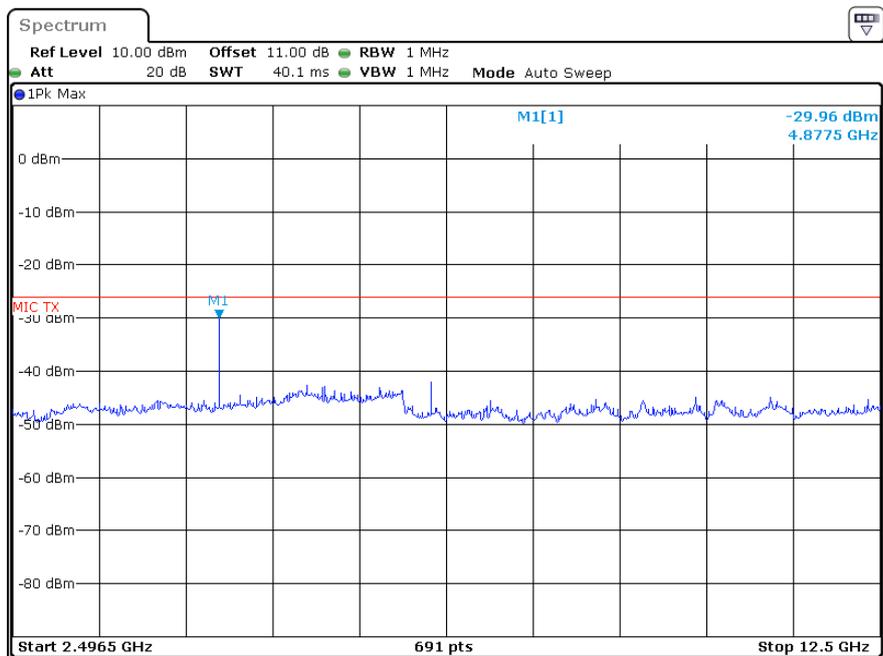
Date: 12.APR.2022 16:18:53

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:20:30

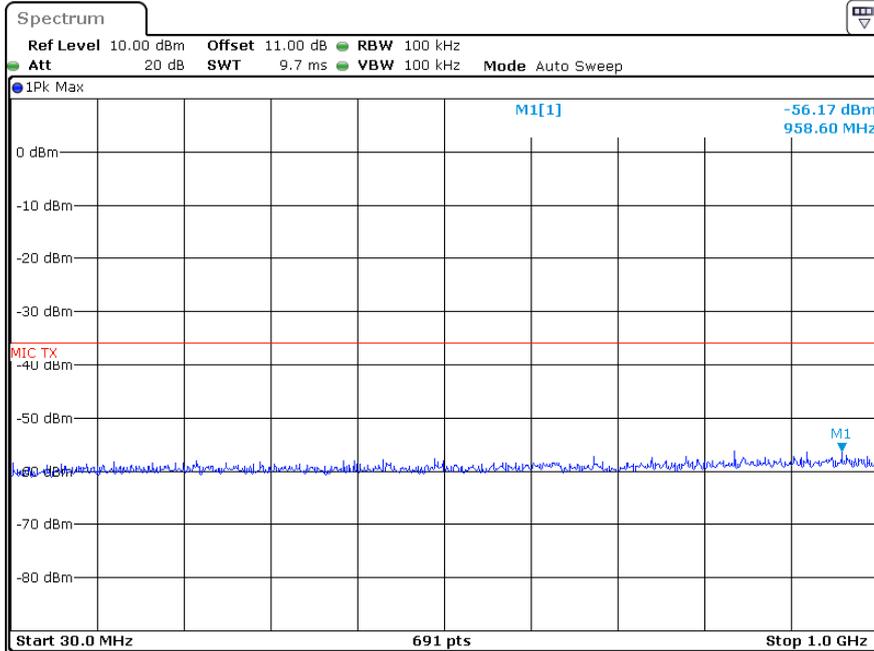
2496.5MHz - 12500MHz



Date: 12.APR.2022 16:21:21

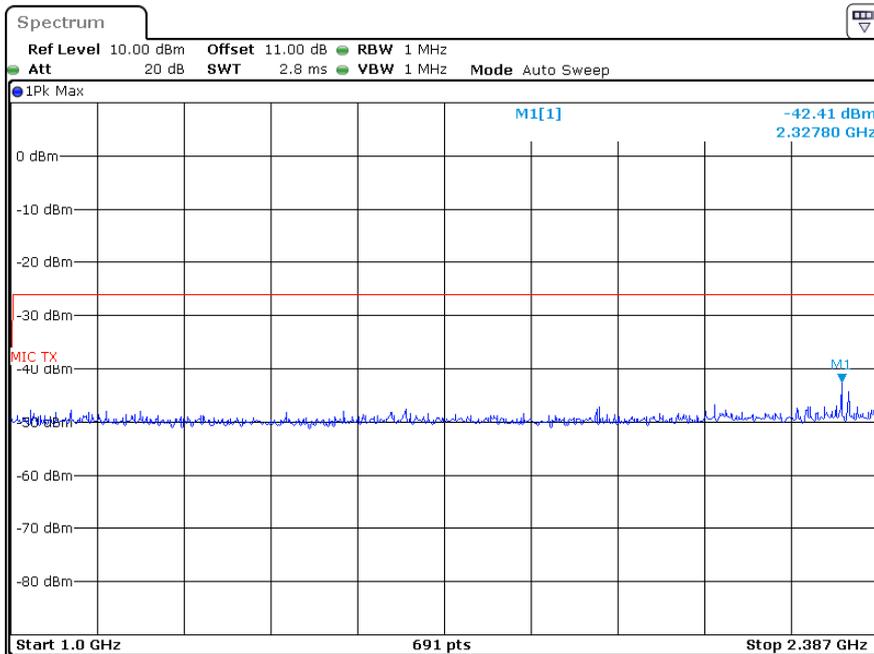
High Channel:

30MHz - 1000MHz



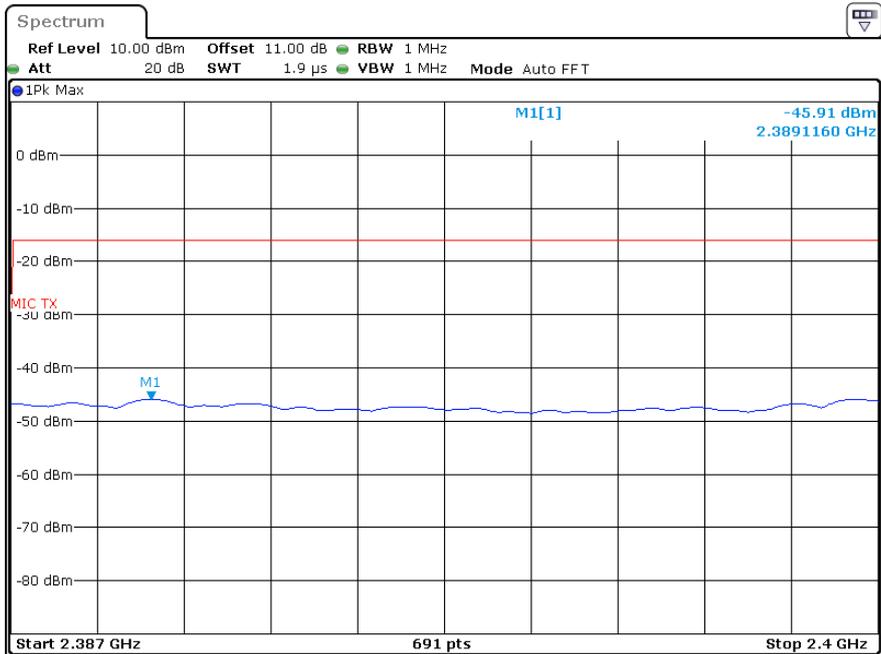
Date: 12.APR.2022 16:22:54

1000MHz - 2387MHz



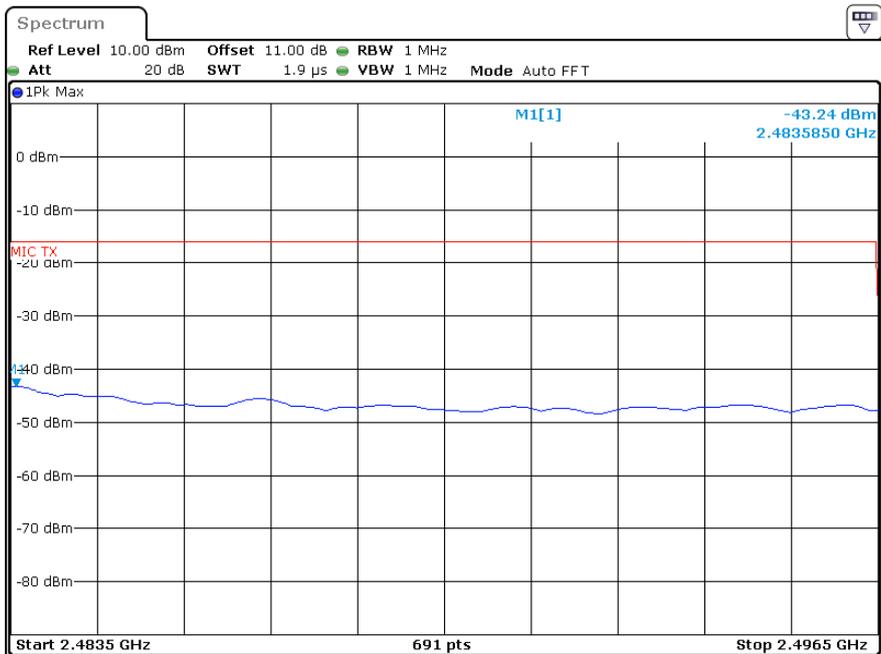
Date: 12.APR.2022 16:24:58

2387MHz - 2400MHz



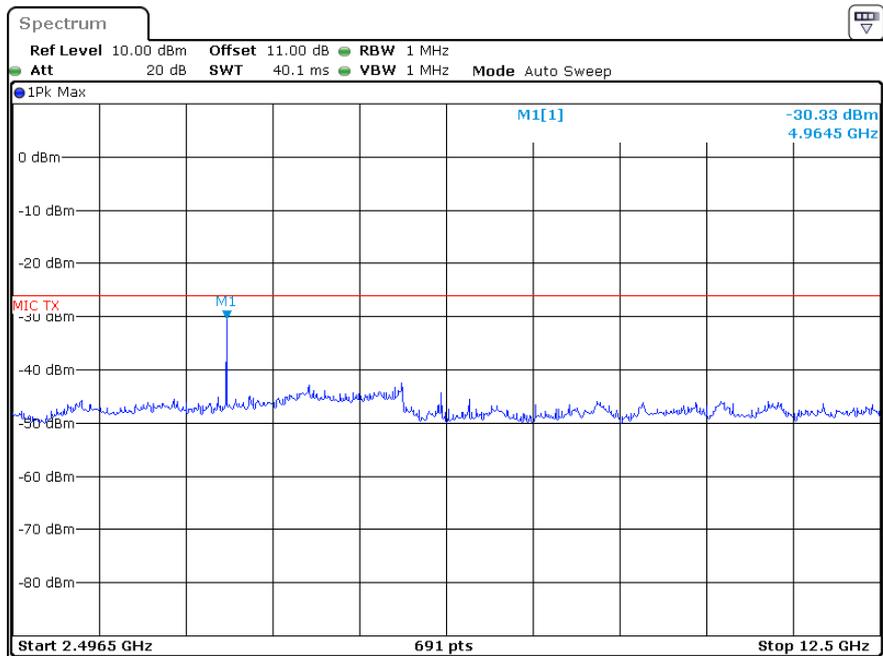
Date: 12.APR.2022 16:26:34

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:27:40

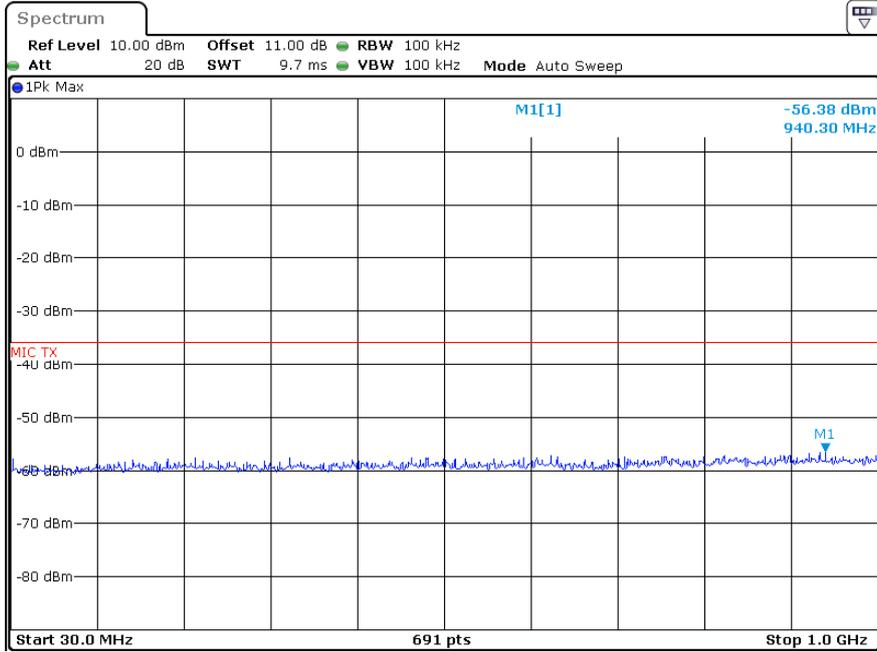
2496.5MHz - 12500MHz



Date: 12.APR.2022 16:29:14

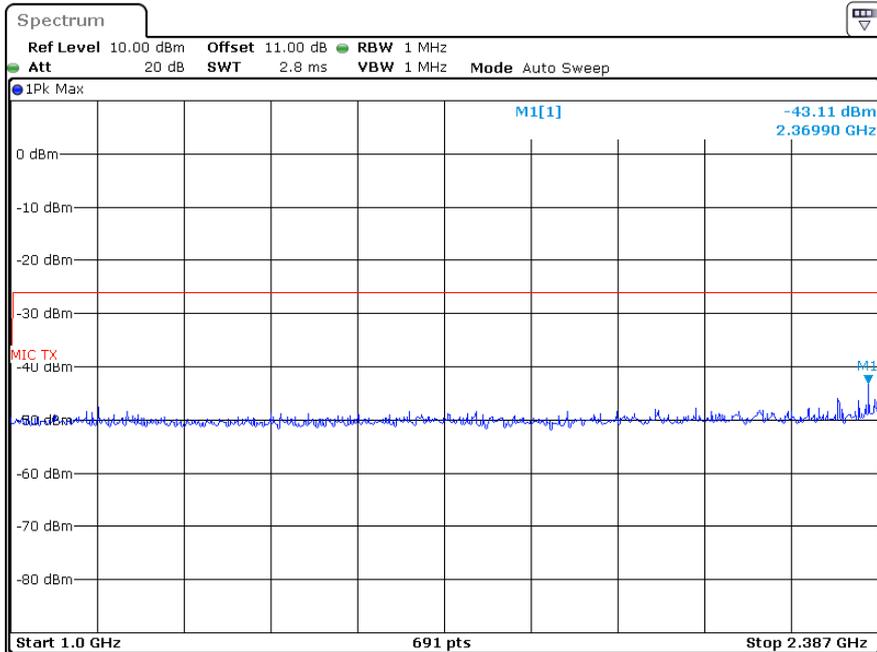
**GFSK (2M)
Low Channel:**

30MHz - 1000MHz



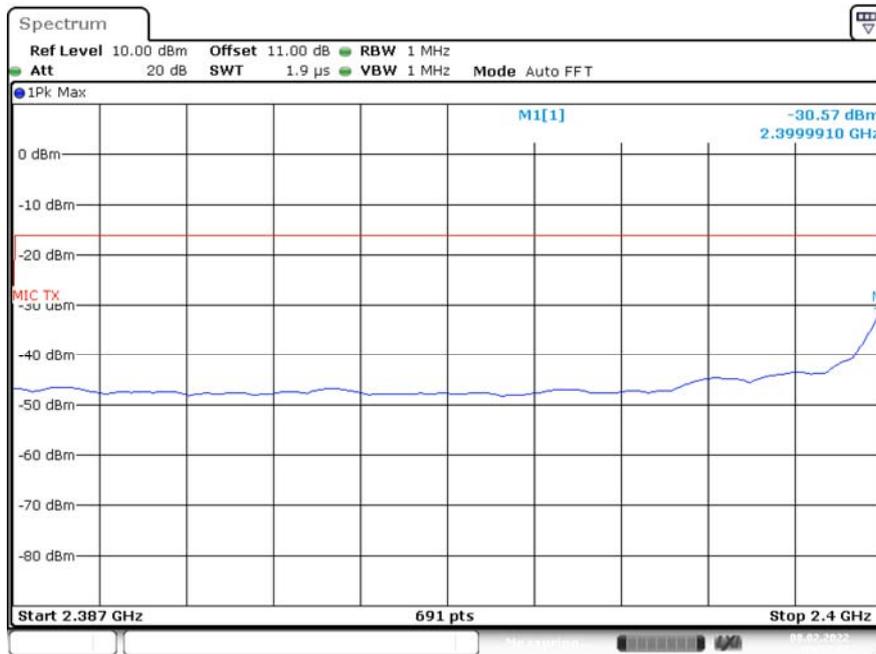
Date: 12.APR.2022 16:33:21

1000MHz - 2387MHz



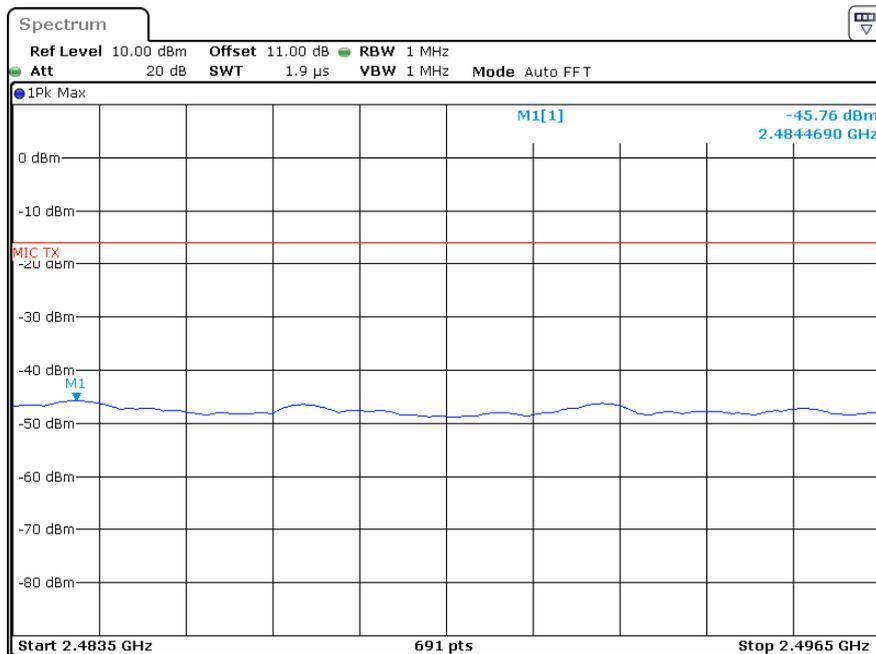
Date: 12.APR.2022 16:35:18

2387MHz - 2400MHz



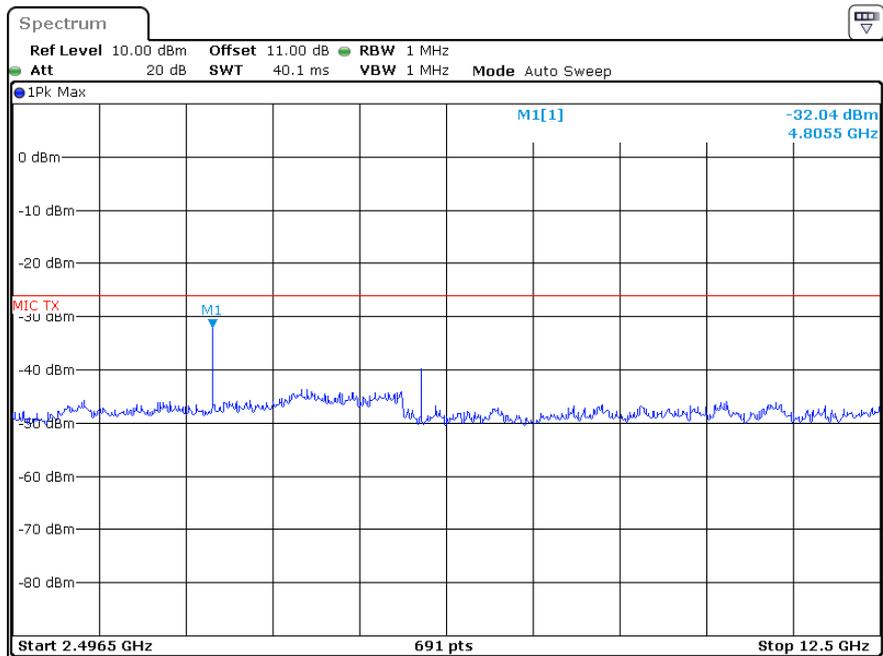
Date: 12.APR.2022 16:37:17

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:38:11

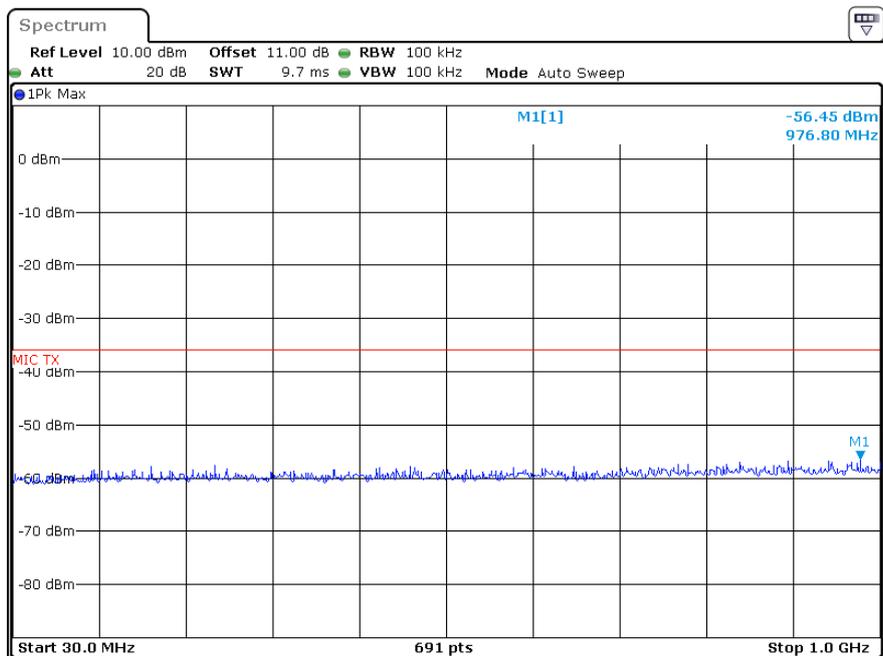
2496.5MHz - 12500MHz



Date: 12.APR.2022 16:39:09

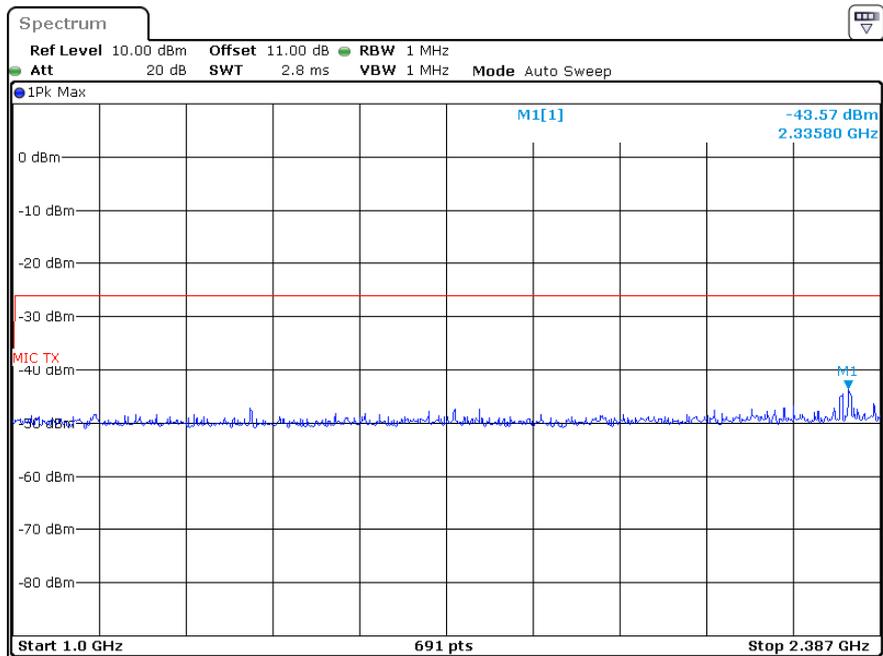
Middle Channel:

30MHz - 1000MHz



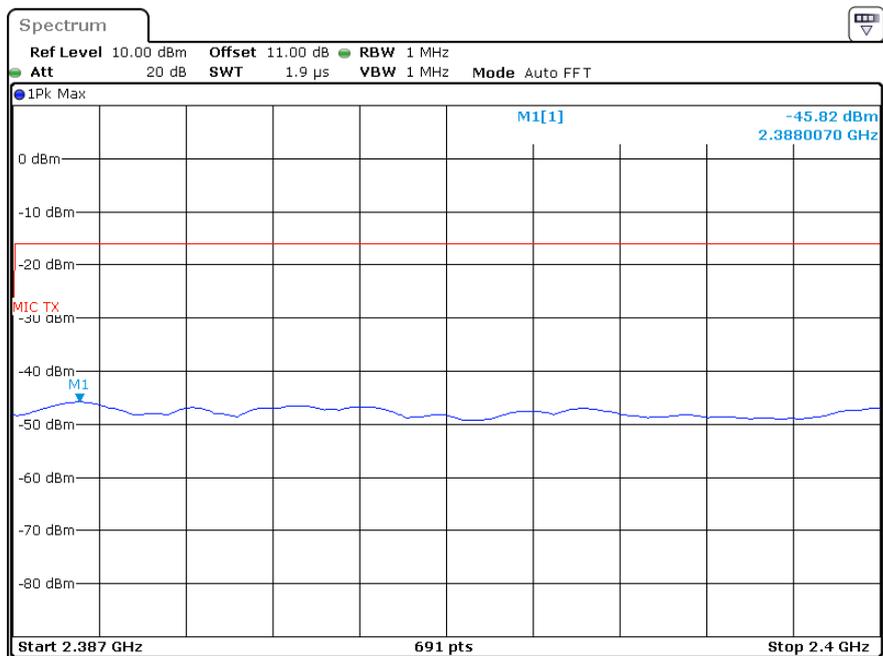
Date: 12.APR.2022 16:44:46

1000MHz - 2387MHz



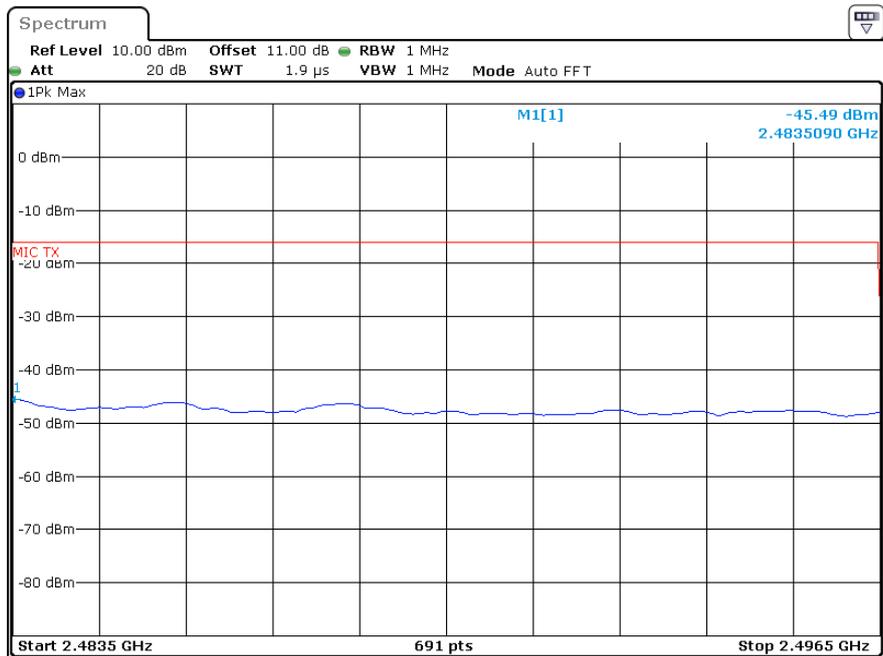
Date: 12.APR.2022 16:43:48

2387MHz - 2400MHz



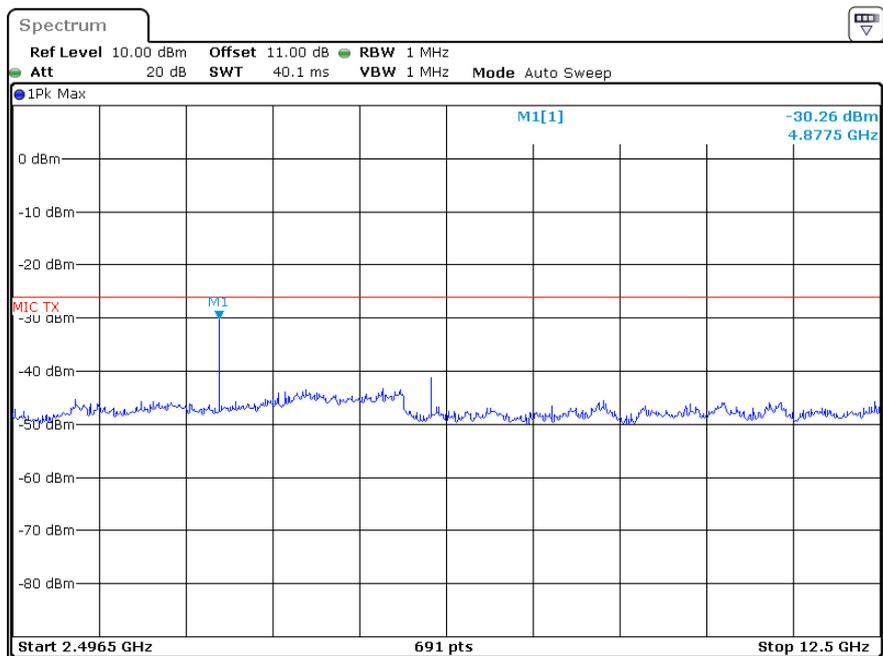
Date: 12.APR.2022 16:42:18

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:41:26

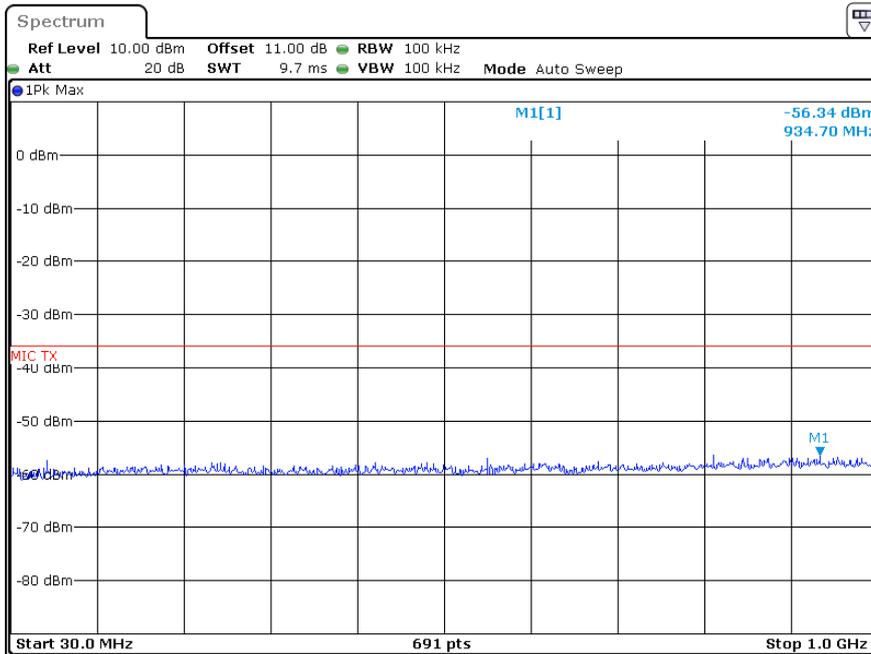
2496.5MHz - 12500MHz



Date: 12.APR.2022 16:40:16

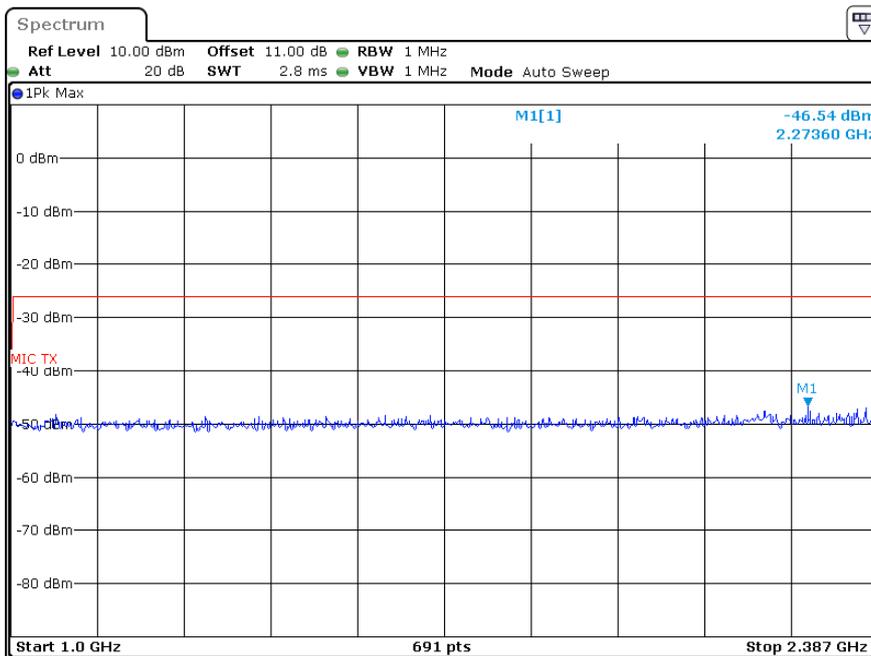
High Channel:

30MHz - 1000MHz



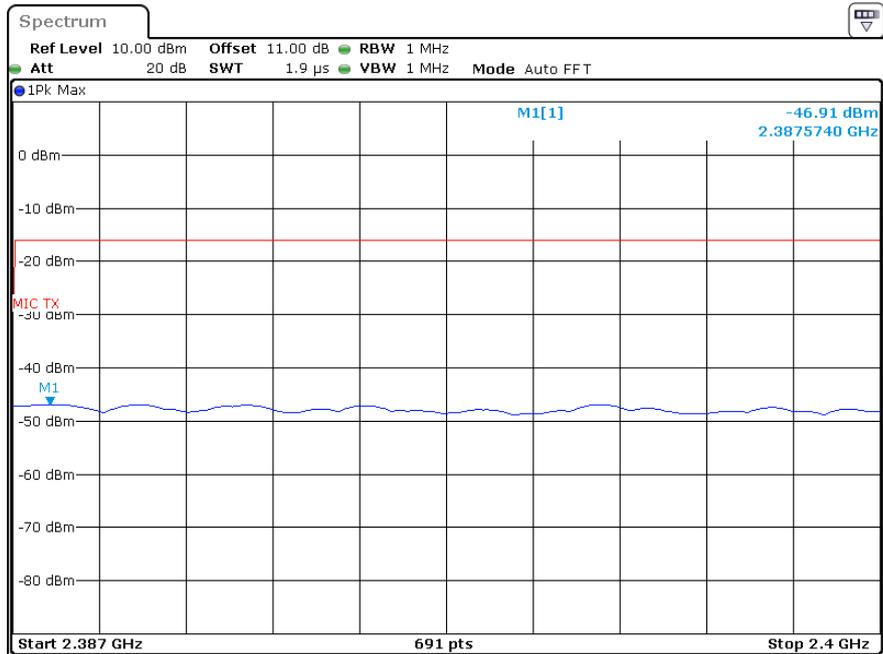
Date: 12.APR.2022 16:46:10

1000MHz - 2387MHz



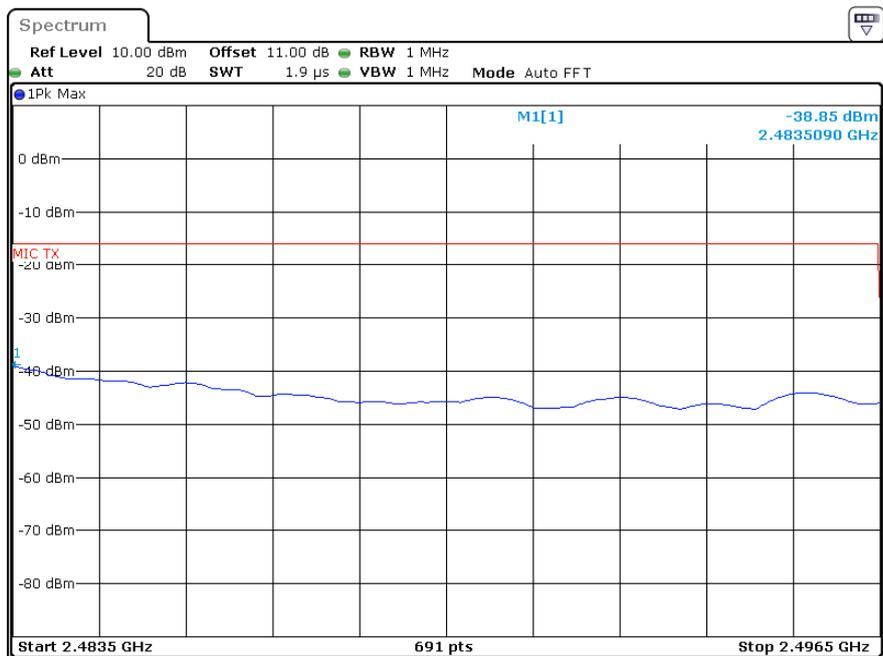
Date: 12.APR.2022 16:47:24

2387MHz - 2400MHz



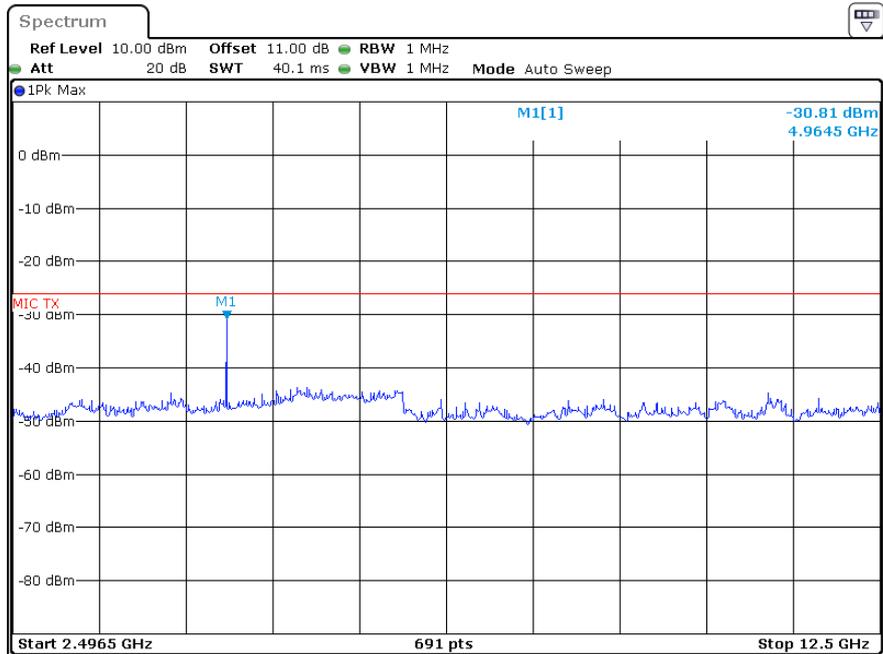
Date: 12.APR.2022 16:48:12

2483.5MHz - 2496.5MHz



Date: 12.APR.2022 16:49:08

2496.5MHz - 12500MHz



Date: 12.APR.2022 16:49:48

ANTENNA OUTPUT POWER AND ANTENNA POWER TOLERANCE

Limit

- ≤ 3 mW /MHz(FHSS from 2402-2480 MHz)
- ≤ 10 mW/MHz (OFDM, DSSS from 2400-2483.5 MHz)
- ≤ 10 mW (other from 2400-2483.5 MHz)

The Output Power Tolerance must be within +20%, -80%.

Test Procedure

Step 1: Measure the total power by Power Meter in a state of hopping mode or non-hopping mode (with Average Sensor)

Step 2: If it's the burst wave, please measure the burst ratio. Then calculate the real total power by burst ratio.

Step 3: Calculate the mean power.

Antenna output power (mW) = Antenna output power Reading (mW) / Burst Ratio

Note: The burst ratio has been calculated to result by power meter, so the equation updated as below:

Antenna output power (mW) = Antenna output power Reading (mW)

Test Data

Environmental Conditions

Temperature:	25°C
Relative Humidity:	53%
ATM Pressure:	101.0 kPa

The testing was performed by Pual Liu from 2022-02-07 to 2022-04-12.

Test Result: Compliant

Test Mode: Transmitting

For model of XIAO-nRF52840 Sense

Normal voltage

GFSK BLE 1M

(Nominal Output power is 6.0mW):

Frequency	Low channel	Middle channel	High channel	Limit
Antenna Output Power Reading(dBm)	8.20	7.83	7.68	
Antenna Output Power (mW)	6.61	6.07	5.86	10
Antenna Output Power Tolerance (%)	10.12	1.12	-2.31	-80 ~ +20
EIRP(dBm)	10.20	9.83	9.68	12.14

GFSK BLE 2M

(Nominal Output power is 3.0mW):

Frequency	Low channel	Middle channel	High channel	Limit
Antenna Output Power Reading(dBm)	4.97	4.54	4.31	
Antenna Output Power (mW)	3.14	2.84	2.70	10
Antenna Output Power Tolerance (%)	4.68	-5.18	-10.08	-80 ~ +20
EIRP(dBm)	6.97	6.54	6.31	12.14

For model of XIAO-nRF52840

GFSK BLE 1M

(Nominal Output power is 6.0mW):

Frequency	Low channel	Middle channel	High channel	Limit
Antenna Output Power Reading(dBm)	8.24	7.40	6.72	
Antenna Output Power (mW)	6.67	5.50	4.70	10
Antenna Output Power Tolerance (%)	11.17	-8.33	-6.00	-80 ~ +20
EIRP(dBm)	10.24	9.40	8.72	12.14

GFSK BLE 2M

(Nominal Output power is 3.0mW):

Frequency	Low channel	Middle channel	High channel	Limit
Antenna Output Power Reading(dBm)	4.48	4.10	3.44	
Antenna Output Power (mW)	2.81	2.57	2.21	10
Antenna Output Power Tolerance (%)	-6.33	-14.33	-26.33	-80 ~ +20
EIRP(dBm)	6.48	6.10	5.44	12.14

Note :

Antenna output power tolerance(%) = (Antenna output power - declared power)/declared power*100

EIRP(dBm)= Antenna Output Power Reading(dBm)+ Antenna gain

Antenna gain is 2dBi.

RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY

Limit

- $\leq 4 \text{ nW}$ ($30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$)
- $\leq 20 \text{ nW}$ ($1 \text{ GHz} \leq f \leq 12.5 \text{ GHz}$)

Test Procedure

Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous receiving mode”.

Spectrum Analyzer Conditions

- Start Frequency: Start Frequency of frequency range to measure (30MHz or 1GHz)
- Stop Frequency: Stop Frequency of frequency range to measure (1GHz or 12.5GHz)
- Span: AUTO (Measurement Range)
- RBW: 100 kHz, VBW: 100 kHz for Frequency < 1 GHz
- RBW: 1MHz, VBW: 1MHz for Frequency > 1 GHz
- Sweep time: AUTO or more
- Sweep mode: Auto Sweep
- Detection: Positive Peak
- Reference Level: Enough level for maximum dynamic range

Measurement Result

Environmental Conditions

Temperature:	25°C
Relative Humidity:	53%
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2022-02-07 to 2022-04-12.

Test Result: Compliant, please see the below tables and plots

Test Mode: Receiving

For model of XIAO-nRF52840 Sense

Normal voltage

GFSK(1M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band VI (dBm)	-66.79	-66.68	-67.03	-54
	Band VI I(dBm)	-63.03	-63.42	-63.39	-47

GFSK(2M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band VI (dBm)	-66.62	-67.08	-66.10	-54
	Band VI I(dBm)	-61.81	-63.53	-63.54	-47

For model of XIAO-nRF52840

Normal voltage

GFSK(1M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band VI (dBm)	-66.05	-66.23	-66.86	-54
	Band VI I(dBm)	-63.98	-62.84	-62.17	-47

GFSK(2M)	Frequency Band	2402MHz	2440MHz	2480MHz	Limit
Raw data	Band VI (dBm)	-66.05	-66.58	-65.68	-54
	Band VI I(dBm)	-64.10	-63.25	-64.13	-47

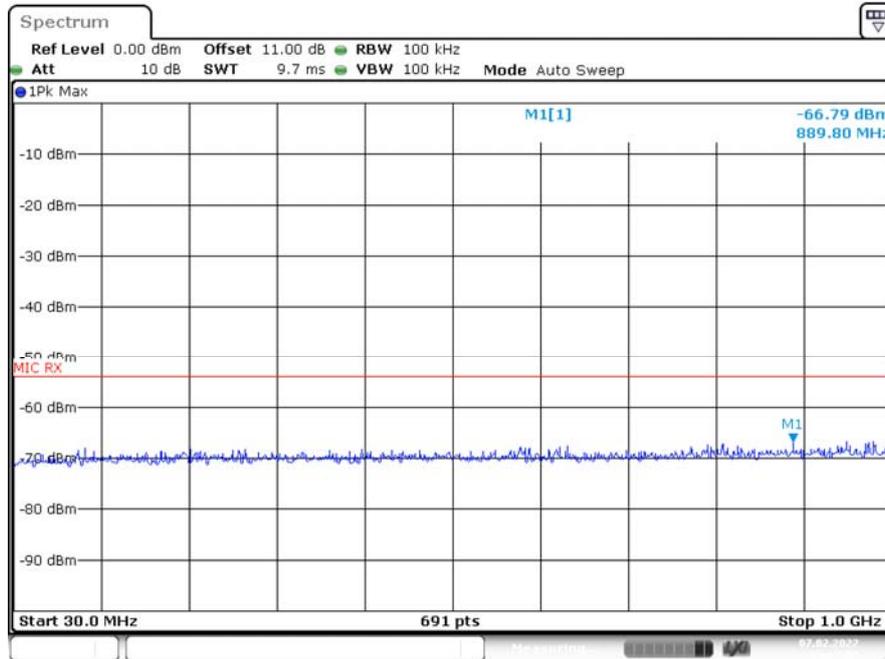
Note: 30 MHz~1000 MHz, Limit is 4 nW = -54 dBm;
1000 MHz~12500 MHz, Limit is 20 nW = -47 dBm;

If searched value is under the technical standard value, do not need to measure more detail.

For model of XIAO-nRF52840 Sense

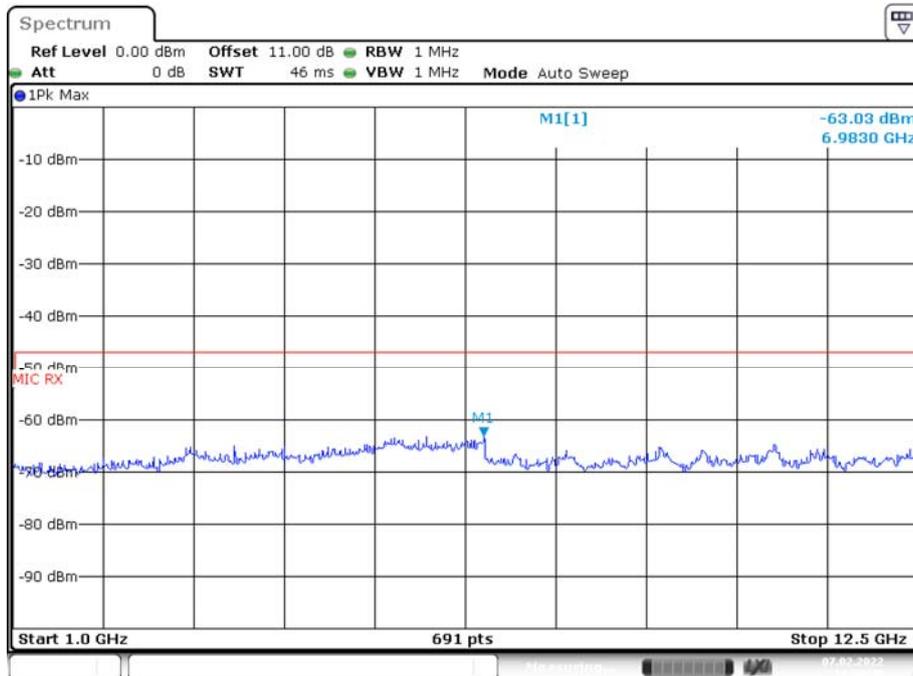
**GFSK (1M)
Low Channel:**

30 MHz~1 GHz



Date: 7.FEB.2022 13:57:08

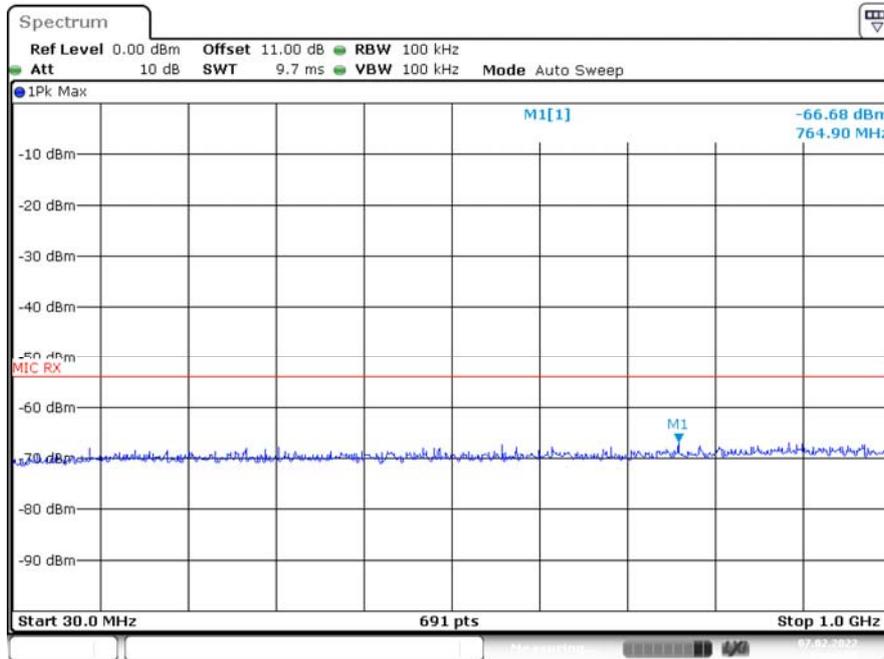
1 GHz~12.5 GHz



Date: 7.FEB.2022 14:08:40

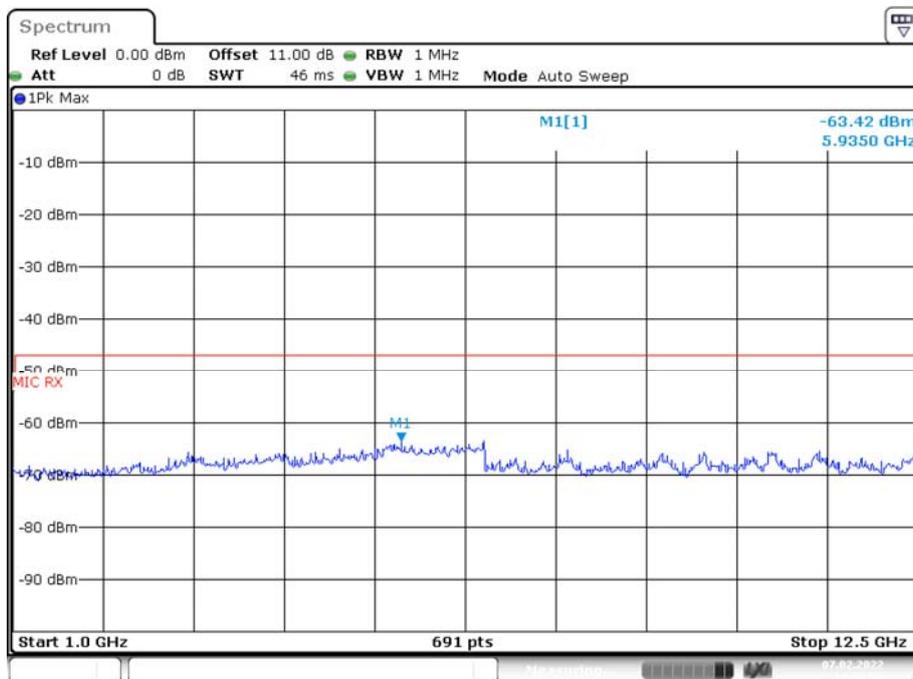
Middle Channel:

30 MHz~1 GHz



Date: 7.FEB.2022 13:58:59

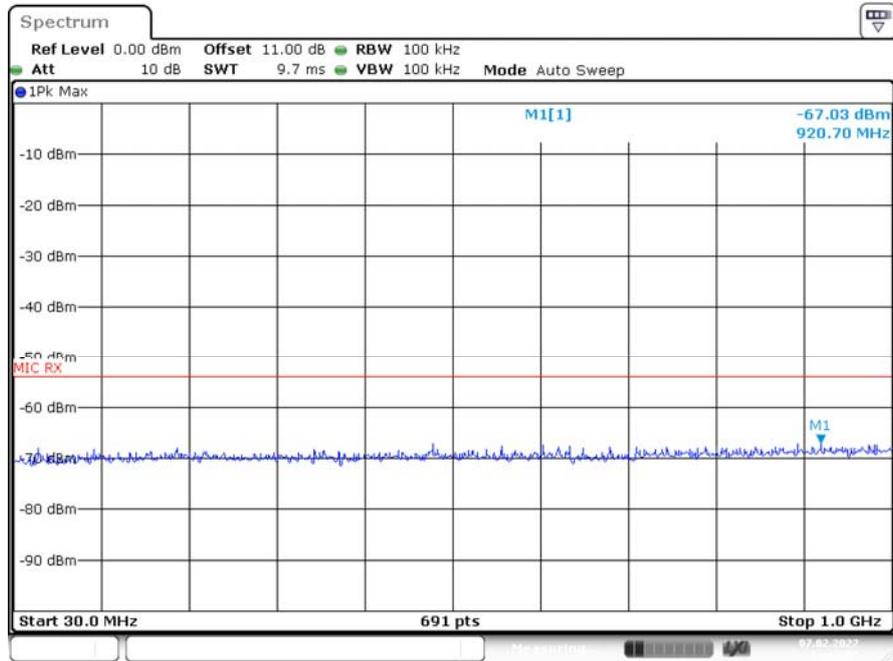
1 GHz~12.5 GHz



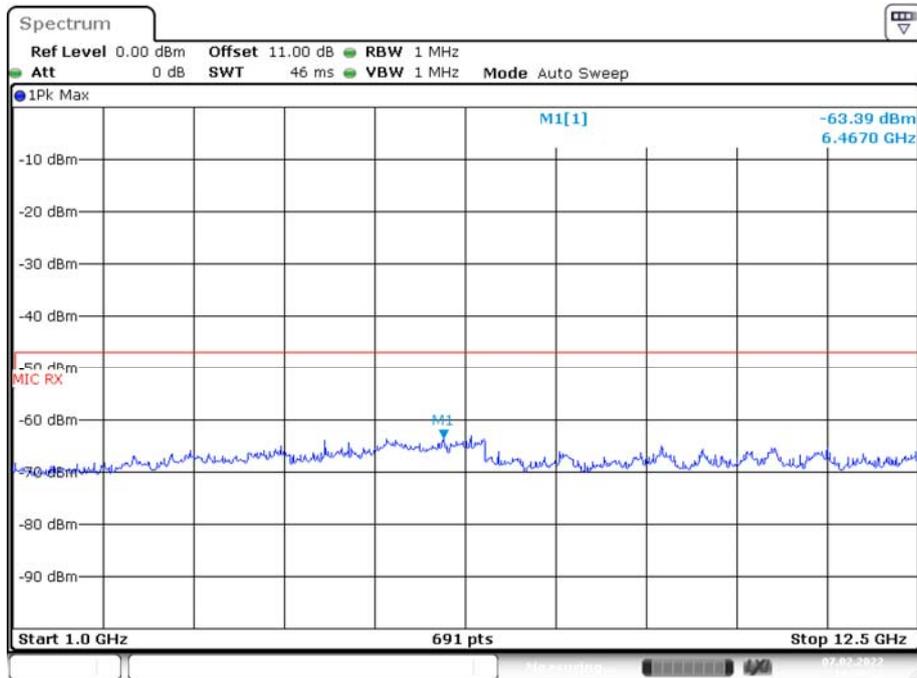
Date: 7.FEB.2022 14:09:51

High Channel:

30 MHz~1 GHz

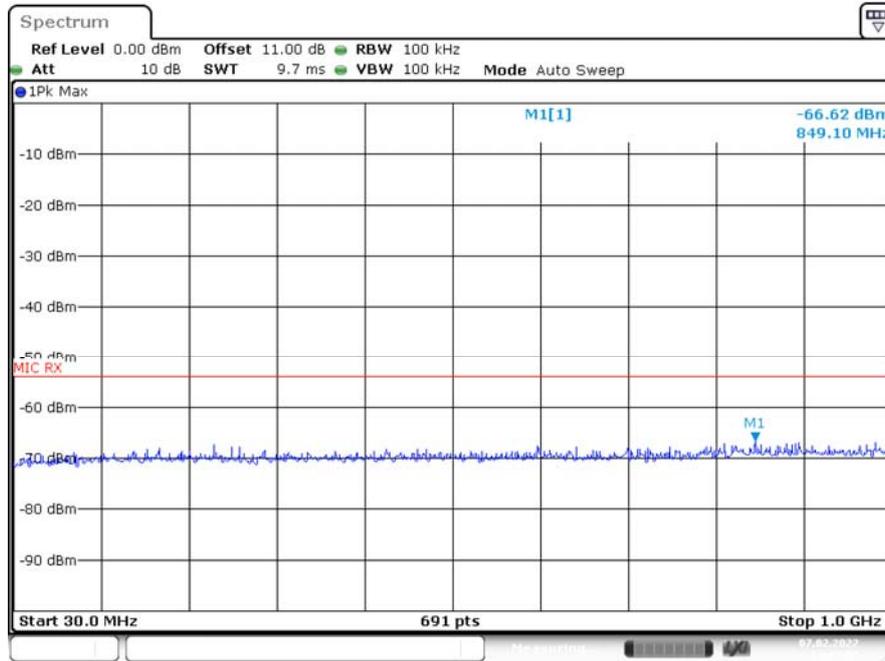


1 GHz~12.5 GHz



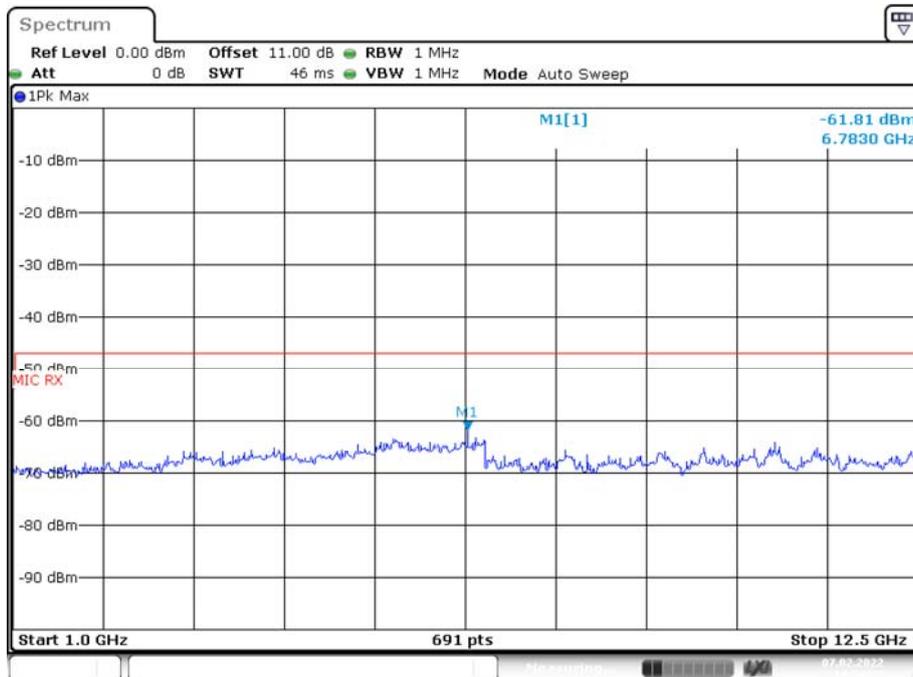
**GFSK (2M)
Low Channel:**

30 MHz~1 GHz



Date: 7.FEB.2022 14:27:28

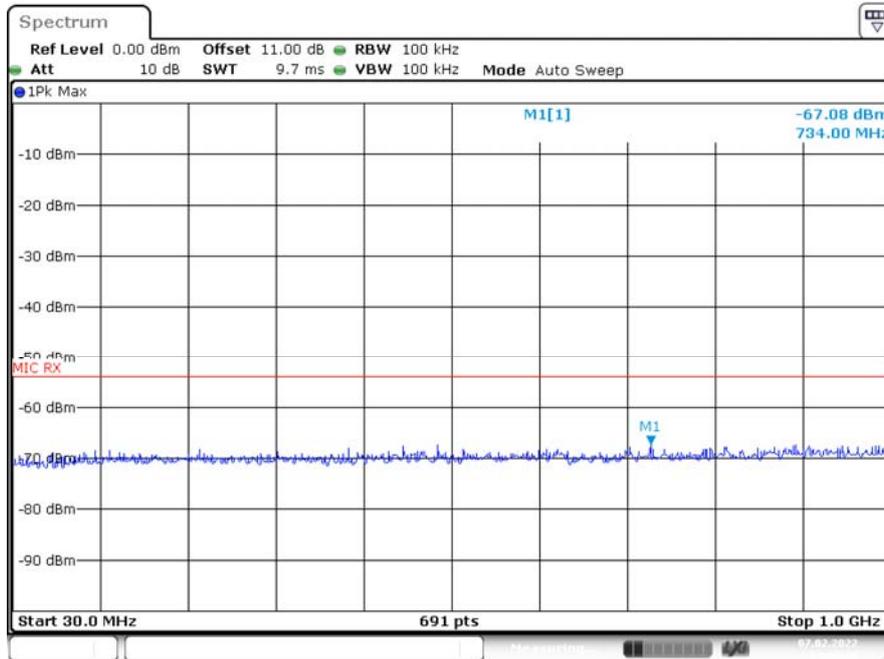
1 GHz~12.5 GHz



Date: 7.FEB.2022 14:24:23

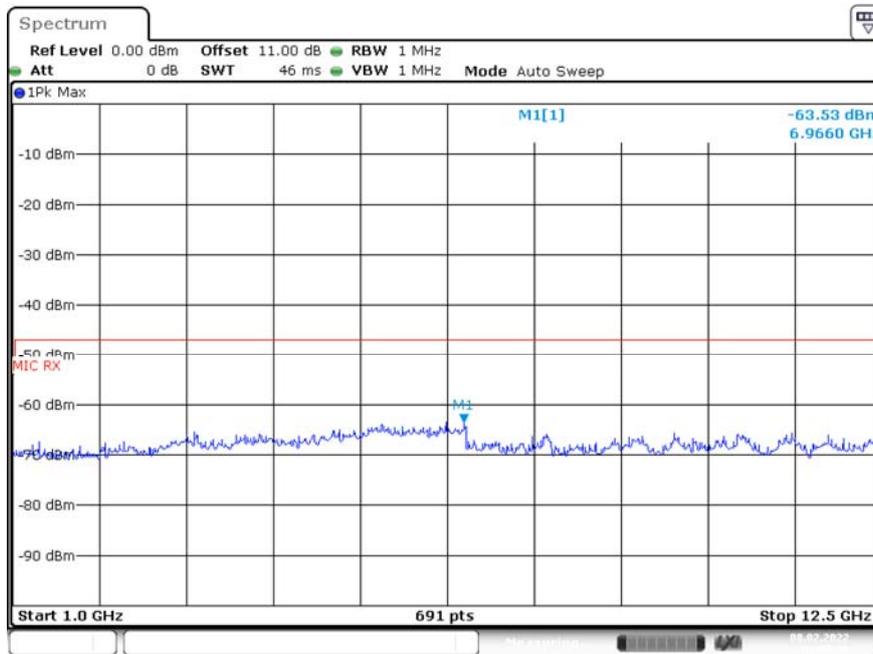
Middle Channel:

30 MHz~1 GHz



Date: 7.FEB.2022 14:30:11

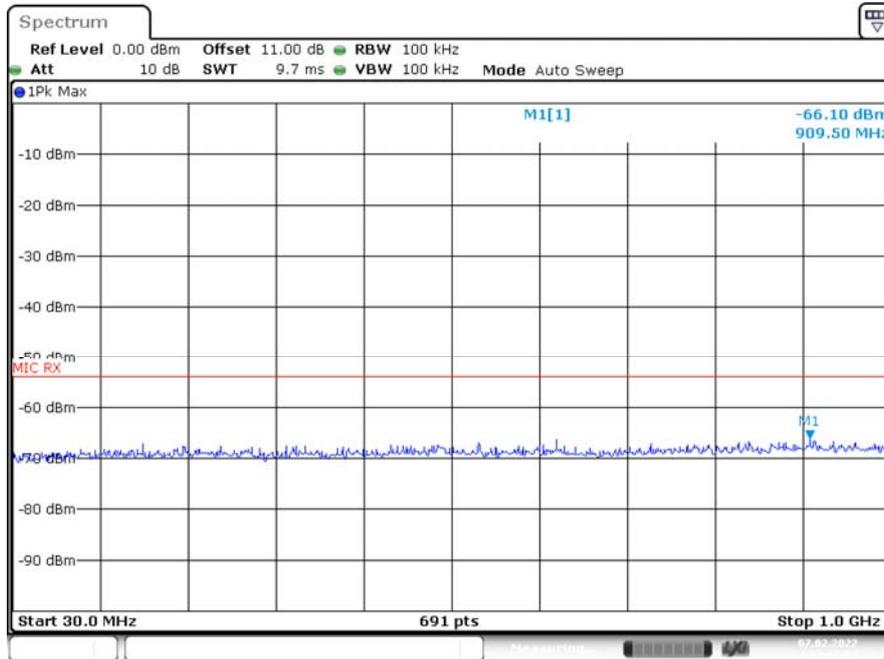
1 GHz~12.5 GHz



Date: 8.FEB.2022 09:48:23

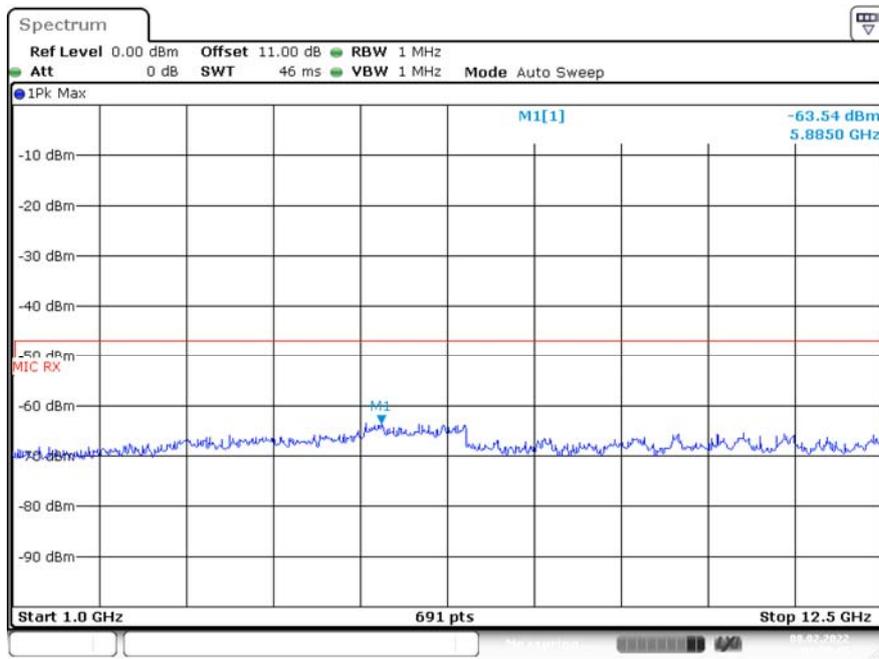
High Channel:

30 MHz~1 GHz



Date: 7.FEB.2022 14:33:34

1 GHz~12.5 GHz

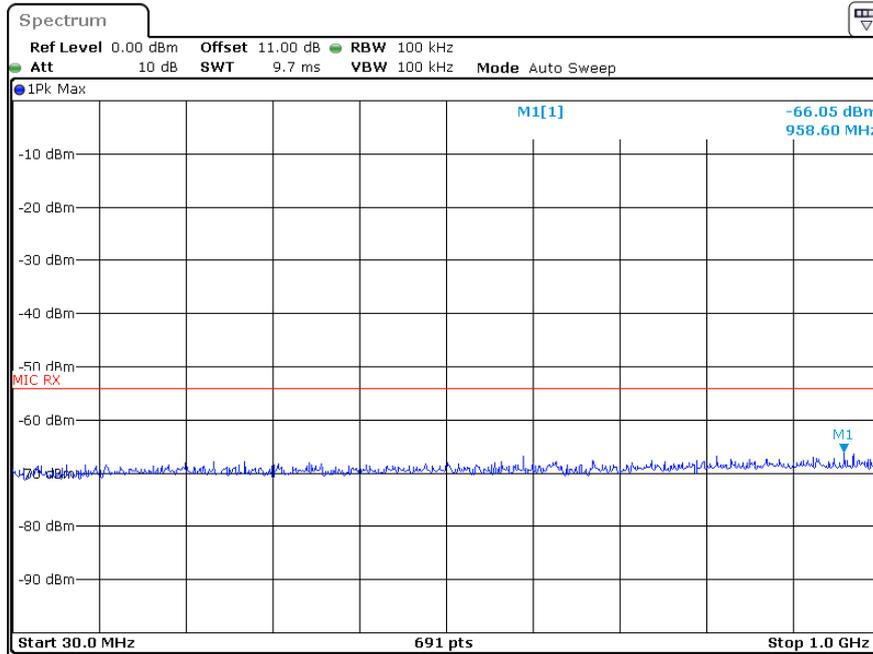


Date: 8.FEB.2022 09:50:47

For model of XIAO-nRF52840

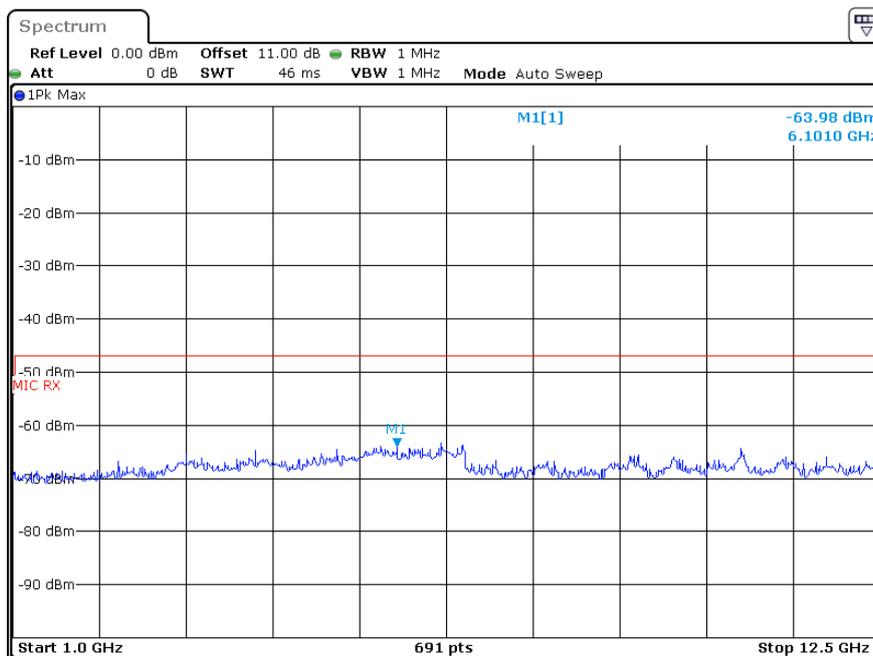
**GFSK (1M)
Low Channel:**

30 MHz~1 GHz



Date: 12.APR.2022 17:03:33

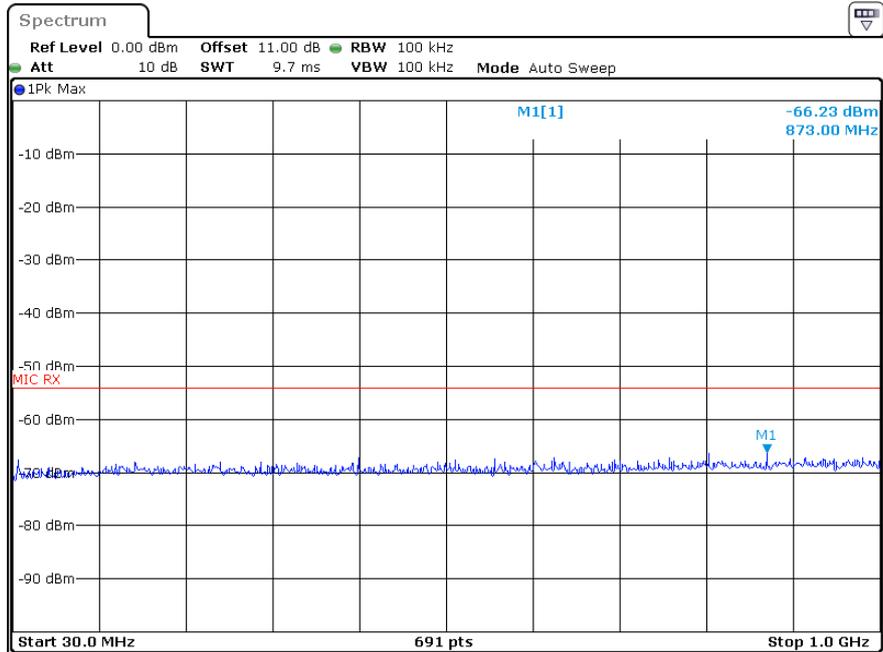
1 GHz~12.5 GHz



Date: 12.APR.2022 17:08:13

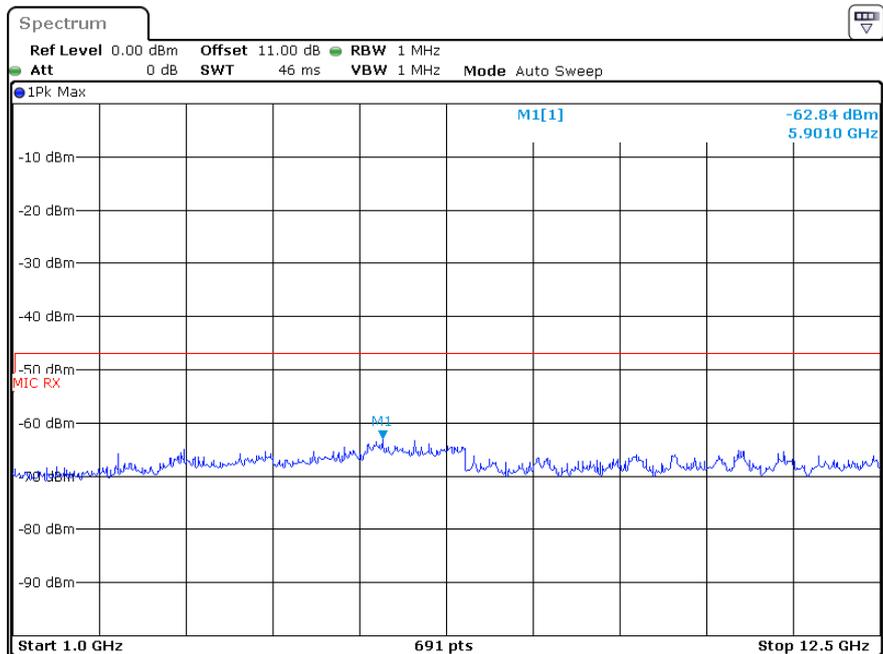
Middle Channel:

30 MHz~1 GHz



Date: 12.APR.2022 17:02:35

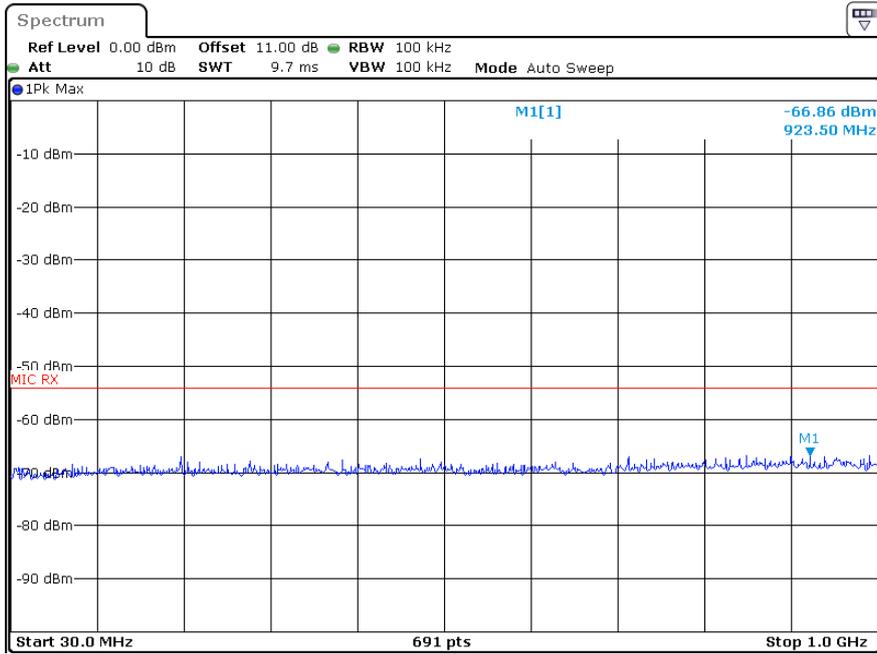
1 GHz~12.5 GHz



Date: 12.APR.2022 17:09:25

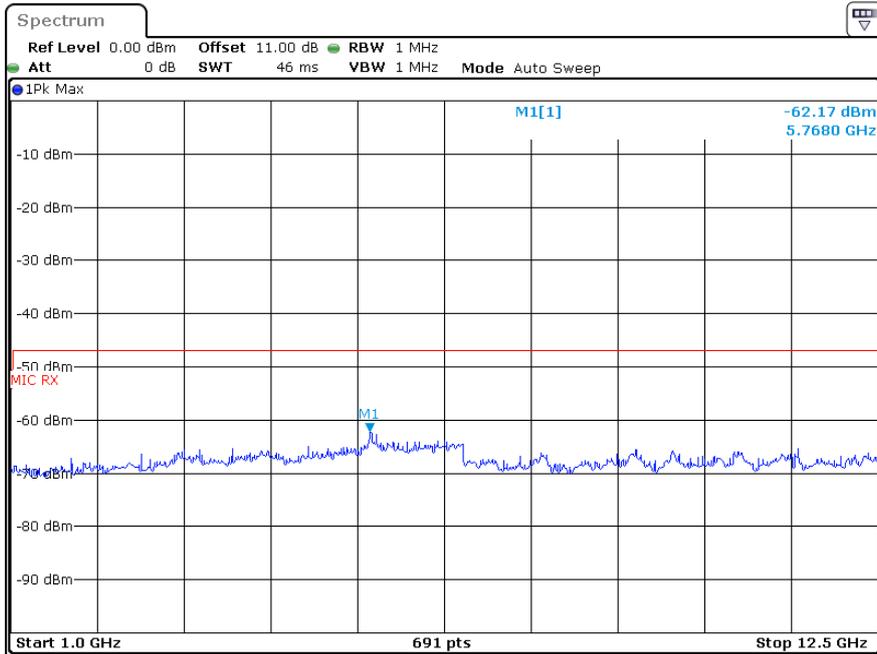
High Channel:

30 MHz~1 GHz



Date: 12.APR.2022 17:03:05

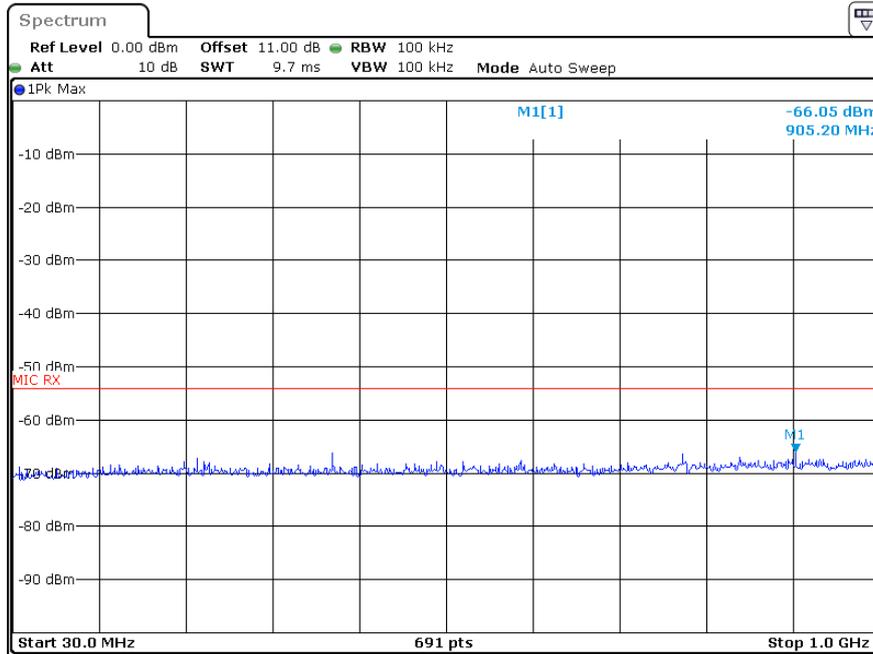
1 GHz~12.5 GHz



Date: 12.APR.2022 17:01:21

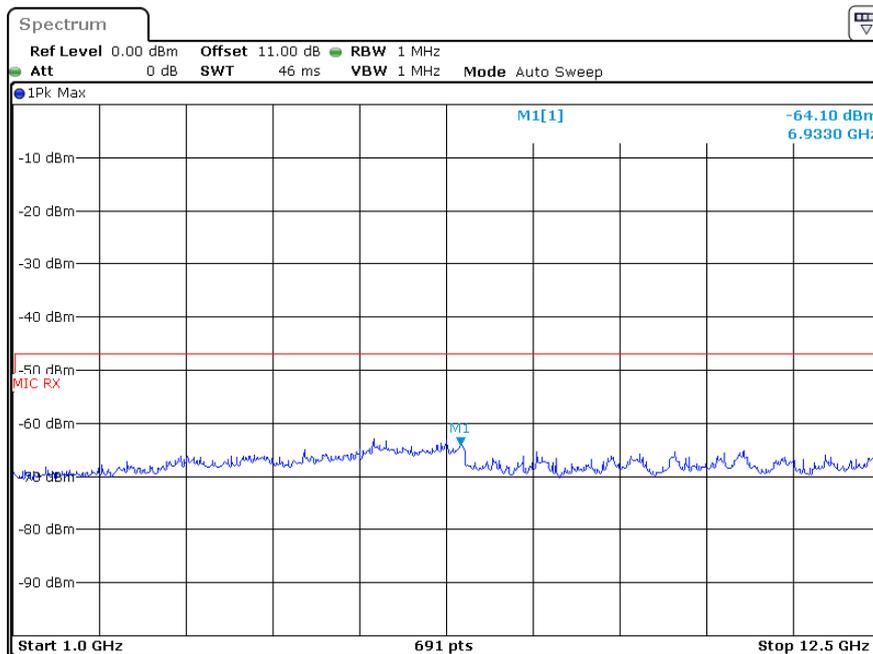
**GFSK (2M)
Low Channel:**

30 MHz~1 GHz



Date: 12.APR.2022 17:12:44

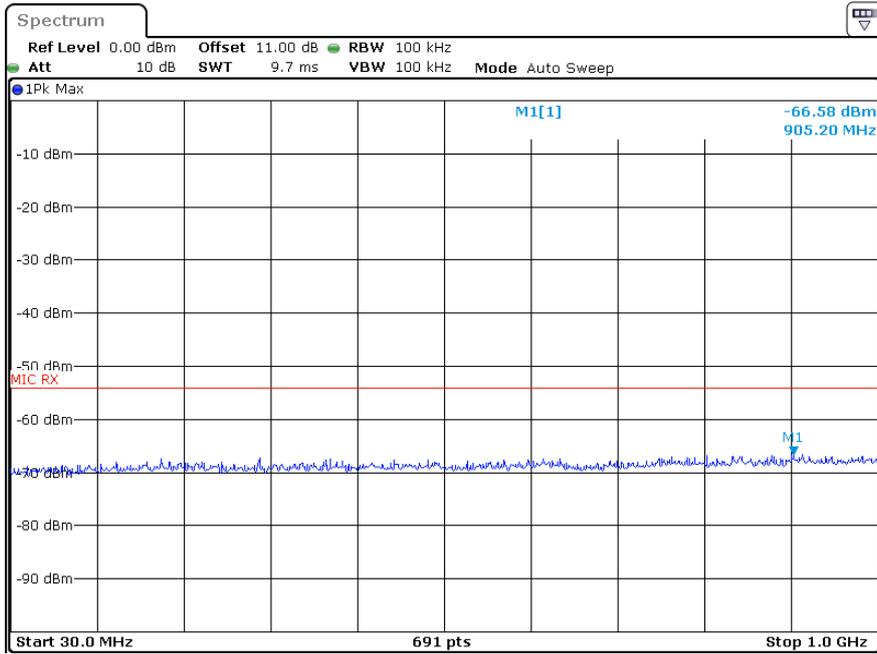
1 GHz~12.5 GHz



Date: 12.APR.2022 17:06:42

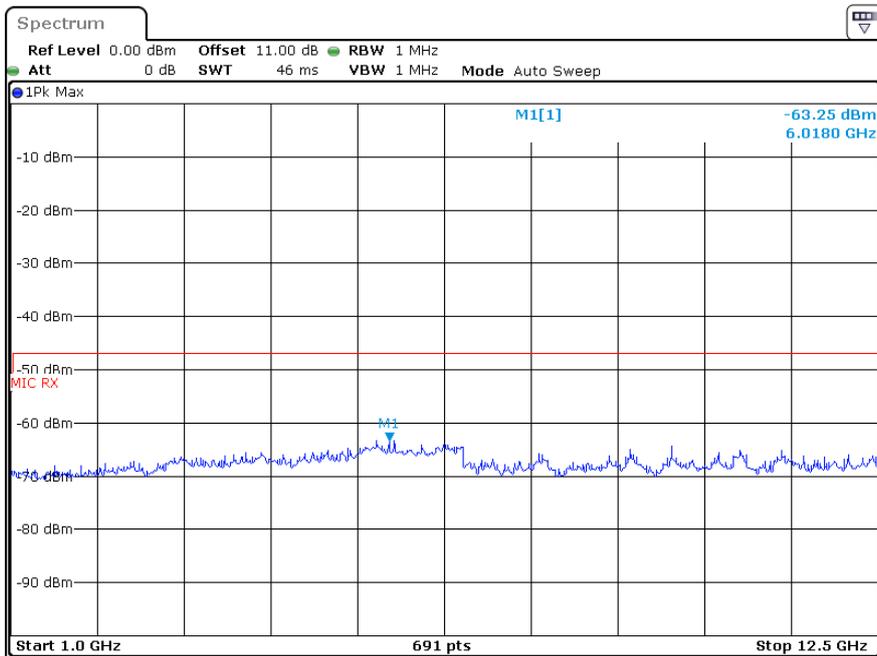
Middle Channel:

30 MHz~1 GHz



Date: 12.APR.2022 17:13:40

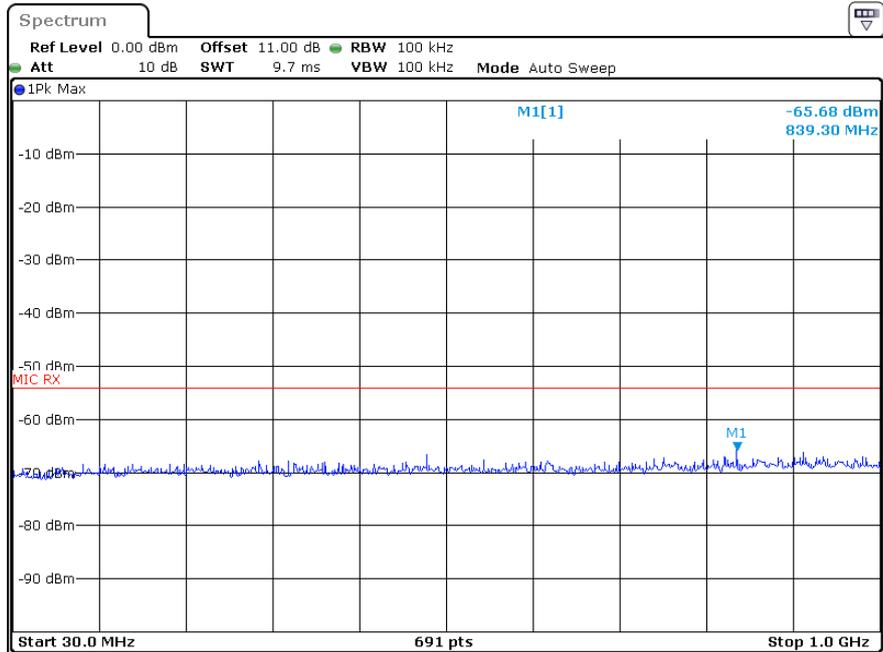
1 GHz~12.5 GHz



Date: 12.APR.2022 17:10:29

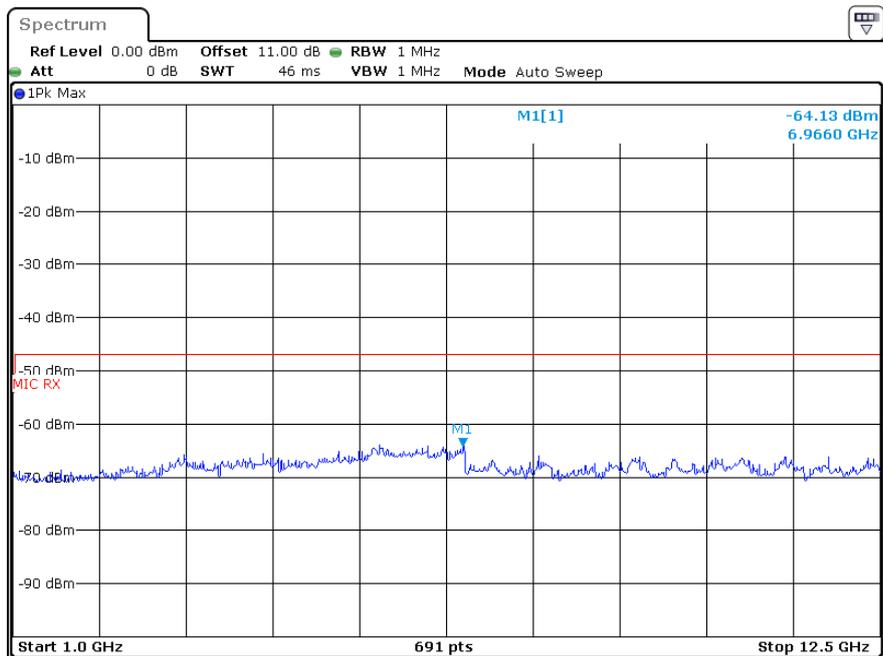
High Channel:

30 MHz~1 GHz



Date: 12.APR.2022 17:12:17

1 GHz~12.5 GHz



Date: 12.APR.2022 17:11:13

INTERFERENCE PREVENTION FUNCTION

Requirement

The EUT shall have the interference prevention capability to transmit or to receive the identification automatically, so that sender and receiver shall exclude other equipment.

Test Procedure

In the case that the EUT has the function of automatically transmitting the identification code:

1. Transmit the predetermined identification codes from EUT
2. Check the transmitted identification codes with the demodulator.

In the case of receiving the identification codes:

1. Transmit the predetermined identification codes from the counterpart.
2. Check if communication is normal
3. Transmit the signal other than predetermined ID codes from the counterpart.
4. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

Measurement Result

Environmental Conditions

Temperature:	25°C
Relative Humidity:	53%
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu on 2022-02-07 to 2022-04-12.

Test Result: Good.

CONSTRUCTION PROTECTION CONFIRMATION

Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

Confirmation Method

The EUT has shielding cover the high-frequency section except for the antenna system, the shielding can't be opened easily. Please refer to the EUT photos.

******END OF REPORT******