



# TEST REPORT

No. I21N02075-BT

for

**TCL Communication Ltd**  
**LTE/UMTS/GSM Smartphone**

**Model Name: 4165F**

with

**Hardware Version: Proto**

**Software Version: V1.0**

**FCC ID: 2ACCJB156**

**Issued Date: 2021-07-05**

**Designation Number: CN1210**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

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## 1. Summary of Test Report

### 1.1. Test Items

Description	LTE/UMTS/GSM Smartphone
Model Name	4165F
Applicant's name	TCL Communication Ltd
Manufacturer's Name	TCL Communication Ltd

### 1.2. Test Standards

FCC Part15-2019; ANSI C63.10-2013

### 1.3. Test Result

**Pass**

Please refer to "5.2.Test Results"

### 1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road,  
Futian District, Shenzhen, Guangdong, P. R. China

### 1.5. Project data

Testing Start Date:	2021-05-31
Testing End Date:	2021-06-22

### 1.6. Signature

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**Lin Zechuang**  
**(Prepared this test report)**

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**Tang Weisheng**  
**(Reviewed this test report)**

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**Zhang Bojun**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: TCL Communication Ltd  
Address: 5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong  
Contact Person: Gong Zhizhou  
E-Mail: zhizhou.gong@tcl.com  
Telephone: 0086-755-36611722  
Fax: /

### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd  
Address: 5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong  
Contact Person: Gong Zhizhou  
E-Mail: zhizhou.gong@tcl.com  
Telephone: 0086-755-36611722  
Fax: /



### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

Description	LTE/UMTS/GSM Smartphone
Model Name	4165F
Frequency Band	2400MHz~2483.5MHz
Type of Modulation	GFSK/ $\pi$ /4 DQPSK/8DPSK
Number of Channels	79
Antenna Type	Integrated
Antenna Gain	-1.3dBi
Power Supply	3.85V DC by Battery
FCC ID	2ACCJB156
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

#### **3.2. Internal Identification of EUT used during the test**

<b>EUT ID*</b>	<b>IMEI</b>	<b>HW Version</b>	<b>SW Version</b>	<b>Receive Date</b>
UT04aa	355246690000096	Proto	V1.0	2021-05-27
UT01aa	355246690000161	Proto	V1.0	2021-05-26
UT02aa	355246690000153	Proto	V1.0	2021-05-26

\*EUT ID: is used to identify the test sample in the lab internally.

UT04aa is used for conduction test, UT01aa is used for radiation test, and UT02aa is used for AC Power line Conducted Emission test.

#### **3.3. Internal Identification of AE used during the test**

<b>AE ID*</b>	<b>Description</b>	<b>AE ID*</b>
AE1	Battery	/
AE2	Charger	/
AE3	USB Cable	/
AE4	Headset	/

##### AE1

Model	TLp029D7
Manufacturer	BYD
Capacity	3000mAh
Nominal Voltage	3.85V

##### AE2

Model	UC11US/CBA0058AGAC5
Manufacturer	PUAN
Specification	/

##### AE3



Model CDA3122005C8  
Manufacturer PUAN  
AE4  
Model CCB0046A10C1  
Manufacturer DALIN

\*AE ID: is used to identify the test sample in the lab internally. AE2: just for testing.

**3.4. General Description**

The Equipment under Test (EUT) is a model of LTE/UMTS/GSM Smartphone with integrated antenna and battery.

It consists of normal options: Lithium Battery, Charger, USB Cable and Headset.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

According to the customer's description, 4165F is a variant of 4065F.

The only difference between them is:

<b>Model</b>	<b>4065F</b>	<b>4165F</b>
Brand Name	Alcatel	TCL

Except listings above, the others are all the same. This difference does not affect the following test cases. All results were from the initial model. The initial model report number is I21N01673-BT.



## **4. Reference Documents**

### **4.1. Documents supplied by applicant**

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

### **4.2. Reference Documents for testing**

The following documents listed in this section are referred for testing.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz	2019
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013



## 5. Test Results

### 5.1. Testing Environment

Normal Temperature: 15~35°C

Relative Humidity: 20~75%

### 5.2. Test Results

No	Test cases	Sub-clause of Part 15C	Verdict
0	Antenna Requirement	15.203	<b>P</b>
1	Maximum Peak Output Power	15.247 (b)	<b>P</b>
2	Band Edges Compliance	15.247 (d)	<b>P</b>
3	Conducted Spurious Emission	15.247 (d)	<b>P</b>
4	Radiated Spurious Emission	15.247,15.205,15.209	<b>P</b>
5	Occupied 20dB bandwidth	15.247(a)	/
6	Time of Occupancy(Dwell Time)	15.247(a)	<b>P</b>
7	Number of Hopping Channel	15.247(a)	<b>P</b>
8	Carrier Frequency Separation	15.247(a)	<b>P</b>
9	AC Power line Conducted Emission	15.107,15.207	<b>P</b>

See **ANNEX A** for details.

### 5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2.



## 6. Test Equipments Utilized

### Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2021-12-30	1 year
2	Power Sensor	U2021XA	MY55430013	Agilent	2022-01-13	1 year
3	Data Acquisition	U2531A	TW55443507	Agilent	/	/
4	RF Control Unit	JS0806-2	21C8060398	Tonscend	2022-05-09	1 year
6	Wireless Connective Tester	CMW270	100540	Rohde & Schwarz	2022-03-14	1 year
5	Test Receiver	ESCI	100702	Rohde & Schwarz	2022-01-13	100702
6	LISN	ENV216	102067	Rohde & Schwarz	2021-07-16	1 year

### Radiated test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Loop Antenna	HLA6120	35779	TESEQ	2022-04-25	3 years
2	BiLog Antenna	3142E	00224831	ETS-Lindgren	2024-05-24	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2022-04-02	3 years
4	Horn Antenna	QSH-SL-18-26-S-20	17013	Q-par	2023-01-06	3 years
5	Horn Antenna	QSH-SL-8-26-40-K-20	17014	Q-par	2023-01-06	3 years
5	Test Receiver	ESR7	101676	Rohde & Schwarz	2021-11-25	1 year
6	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2022-01-13	1 year
7	Chamber	FACT3-2.0	1285	ETS-Lindgren	2021-07-19	2 years

### Test software

No.	Equipment	Manufacturer	Version
1	RF Test System	Tonscend	JS1120-3
2	EMC32	Rohde & Schwarz	10.50.40

EUT is engineering software provided by the customer to control the transmitting signal. The EUT was programmed to be in continuously transmitting mode.

### Anechoic chamber

Fully anechoic chamber by ETS-Lindgren

## 7. Laboratory Environment

### Semi-anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3 m distance, from 30 to 1000 MHz

### Shielded room

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-1000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω

### Fully-anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

## 8. Measurement Uncertainty

Test Name	Uncertainty ( $k=2$ )	
1. Maximum Peak Output Power	1.32dB	
2. Band Edges Compliance	1.92dB	
3. Transmitter Spurious Emission - Conducted	30MHz $\leq$ f<1GHz	1.41dB
	1GHz $\leq$ f<7GHz	1.92dB
	7GHz $\leq$ f<13GHz	2.31dB
	13GHz $\leq$ f $\leq$ 26GHz	2.61dB
4.. Transmitter Spurious Emission - Radiated	9kHz $\leq$ f<30MHz	1.74dB
	30MHz $\leq$ f<1GHz	4.84dB
	1GHz $\leq$ f<18GHz	4.68dB
	18GHz $\leq$ f $\leq$ 40GHz	3.76dB
5. 20dB Bandwidth	66Hz	
6. Time of Occupancy (Dwell Time) & Number of Hopping Channels	0.58ms	
7. Carrier Frequency Separation	66Hz	
8. AC Power line Conducted Emission	150kHz $\leq$ f $\leq$ 30MHz	3.00dB

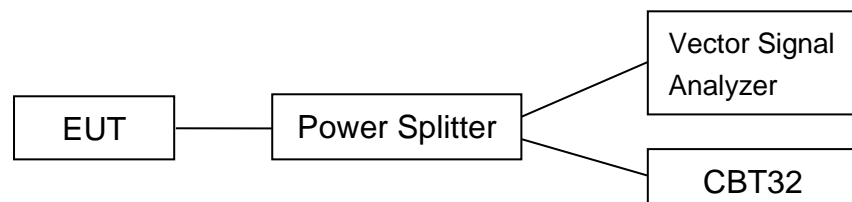
## ANNEX A: Detailed Test Results

### Test Configuration

The measurement is made according to ANSI C63.10.

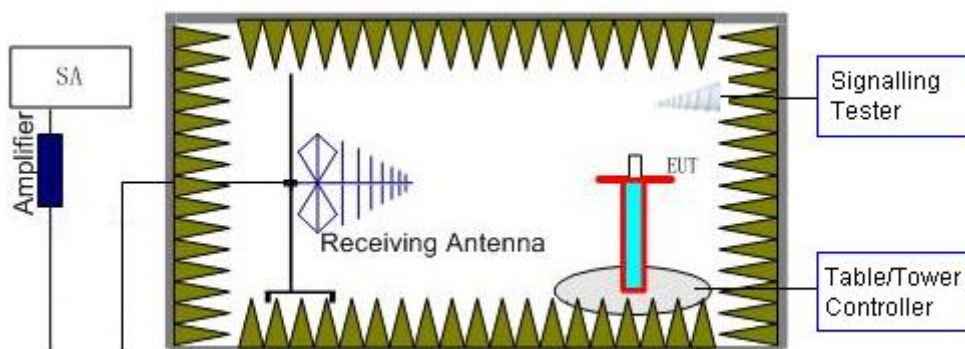
#### 1) Conducted Measurements

1. Connect the EUT to the test system correctly.
2. Set the EUT to the required work mode.
3. Set the EUT to the required channel.
4. Set the EUT hopping mode (hopping on or hopping off).
5. Set the spectrum analyzer to start measurement.
6. Record the values.



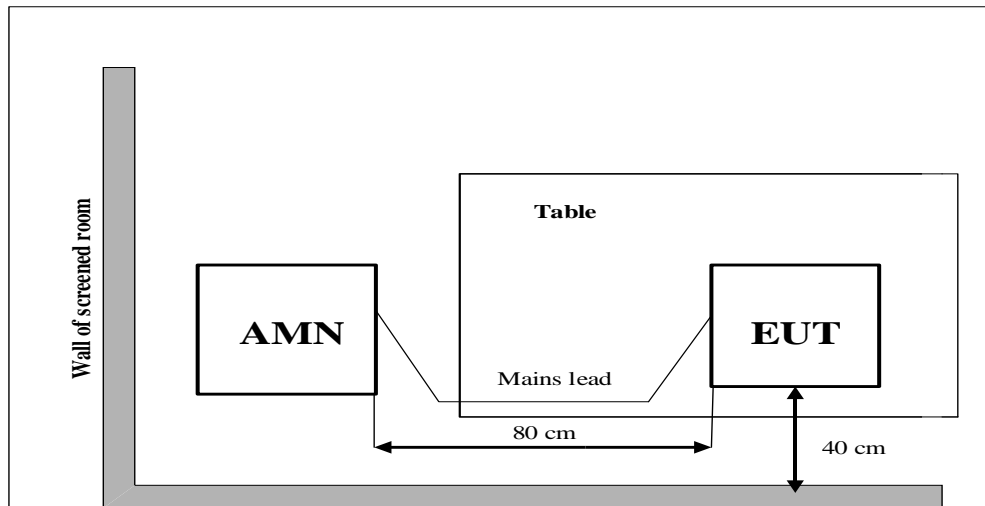
#### 2) Radiated Measurements

**Test setup:** EUT was placed on a 1.5 meter high non-conductive table at a 3 meter test distance from the receive antenna. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the receiving antenna polarization.



### 3) AC Power line Conducted Emission Measurement

The EUT is working as Bluetooth terminal. A communication link of Bluetooth is set up with a System Simulator (SS). The EUT is commanded to operate at maximum transmitting power.





**A.0 Antenna requirement**

**Measurement Limit:**

<b>Standard</b>	<b>Requirement</b>
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

**Conclusion: The Directional gains of antenna used for transmitting is -1.3dBi.  
The RF transmitter uses an integrate antenna without connector.**



### A.1 Maximum Peak Output Power

**Method of Measurement: See ANSI C63.10-clause 7.8.5.**

A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

**Measurement Limit:**

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

**Measurement Results:**

Mode	RF output power (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	5.33	6.04	4.49
$\pi/4$ DQPSK	5.99	5.96	4.87
8DPSK	6.19	6.17	5.11

**Conclusion: Pass**



## A.2 Band Edges Compliance

### Measurement Limit:

Standard	Limit (dBm)
FCC 47 CFR Part 15.247 (d)	> 20

### Measurement Result:

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	ON	Fig.1	P
	78	ON	Fig.2	P
$\pi/4$ DQPSK	0	ON	Fig.3	P
	78	ON	Fig.4	P
8DPSK	0	ON	Fig.5	P
	78	ON	Fig.6	P

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	OFF	Fig.7	P
	78	OFF	Fig.8	P
$\pi/4$ DQPSK	0	OFF	Fig.9	P
	78	OFF	Fig.10	P
8DPSK	0	OFF	Fig.11	P
	78	OFF	Fig.12	P

See below for test graphs.

**Conclusion: Pass**



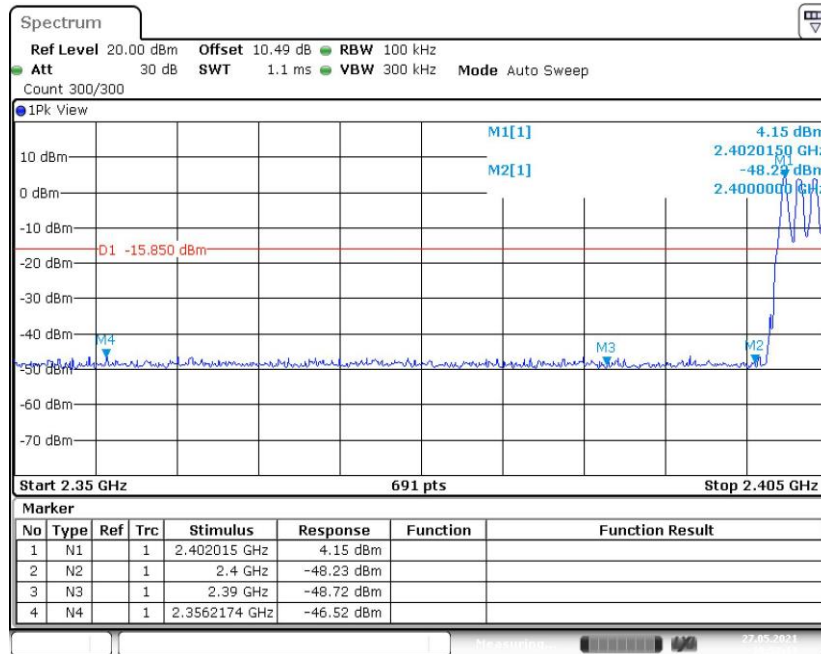


Fig. 1 Band Edges (GFSK, CH0, Hopping ON)

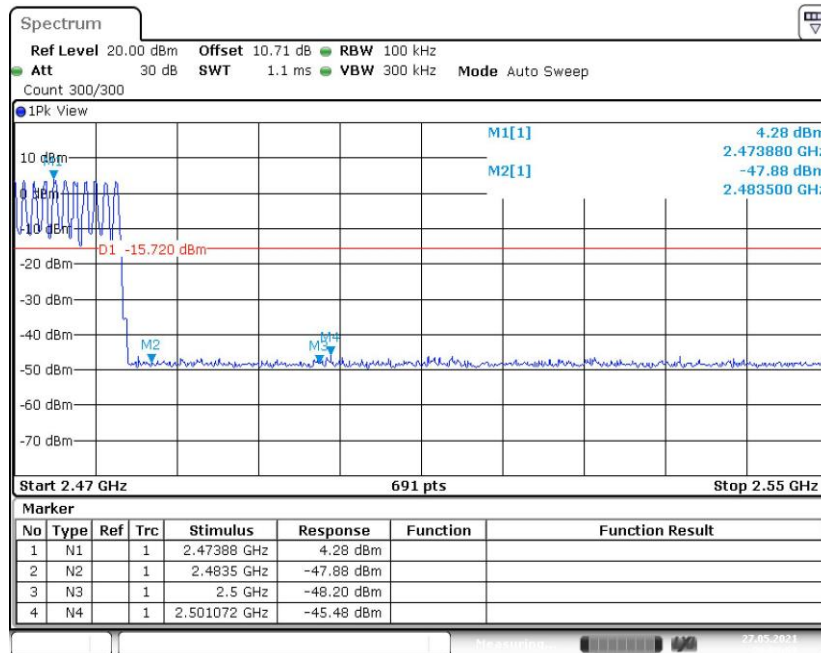


Fig. 2 Band Edges (GFSK, CH78, Hopping ON)

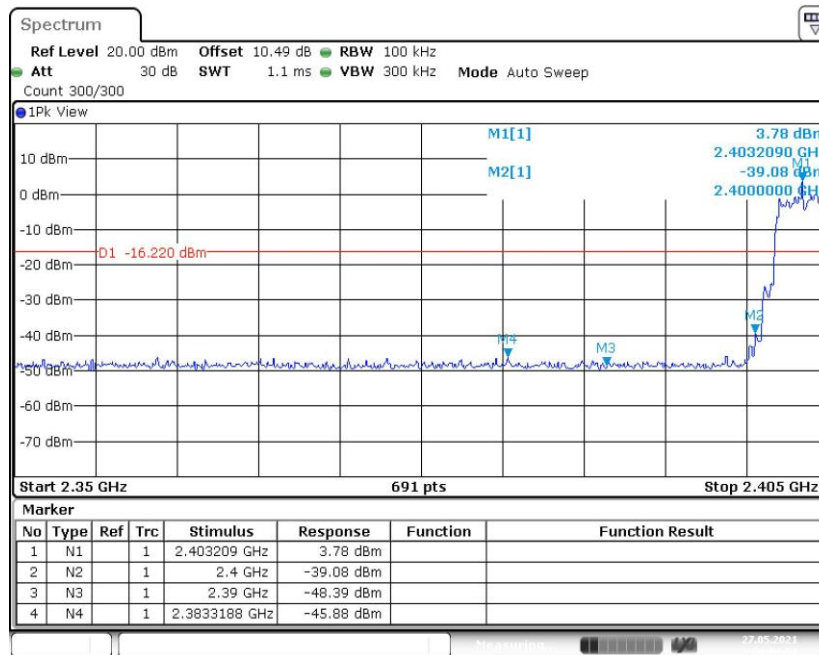


Fig. 3 Band Edges ( $\pi/4$  DQPSK, CH0, Hopping ON)

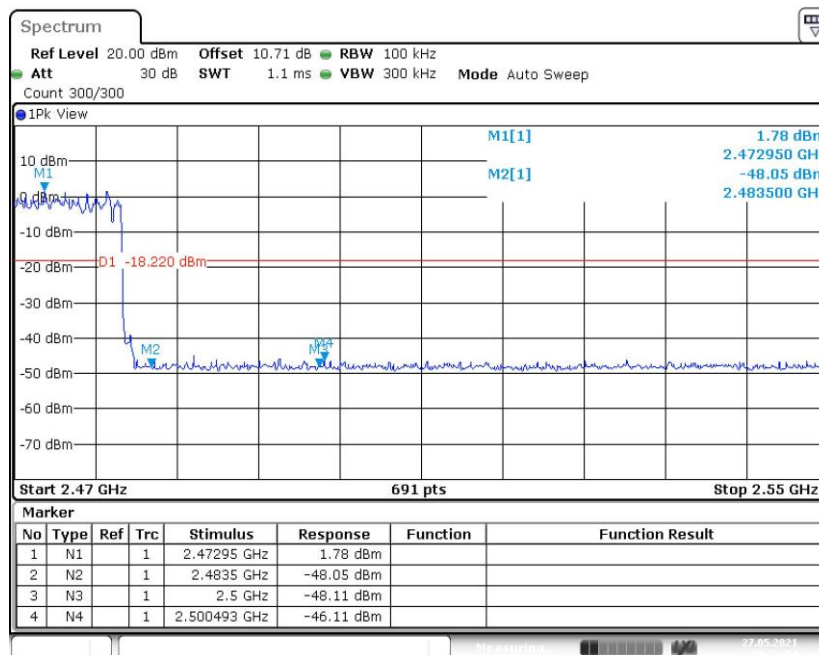


Fig. 4 Band Edges ( $\pi/4$  DQPSK, CH78, Hopping ON)

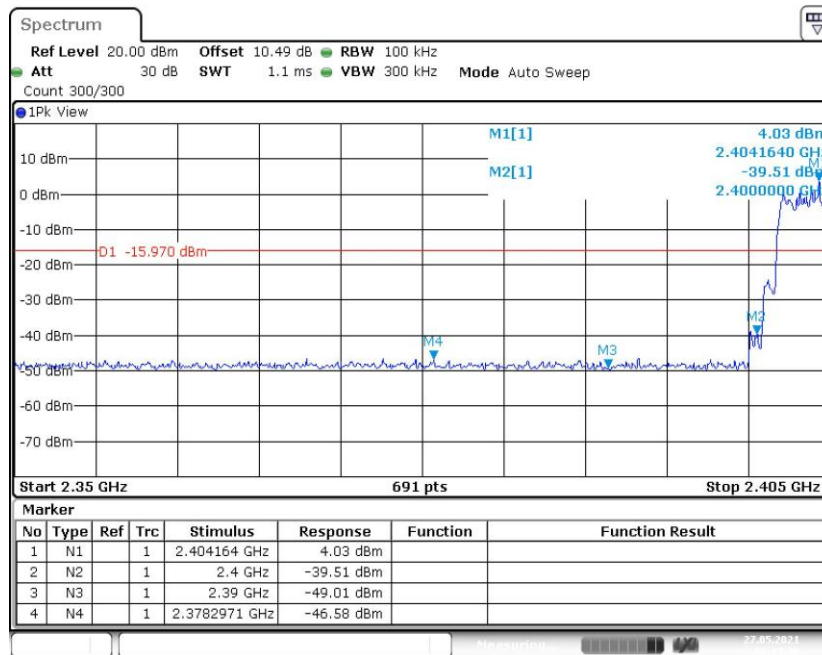


Fig. 5 Band Edges (8DPSK, CH0, Hopping ON)

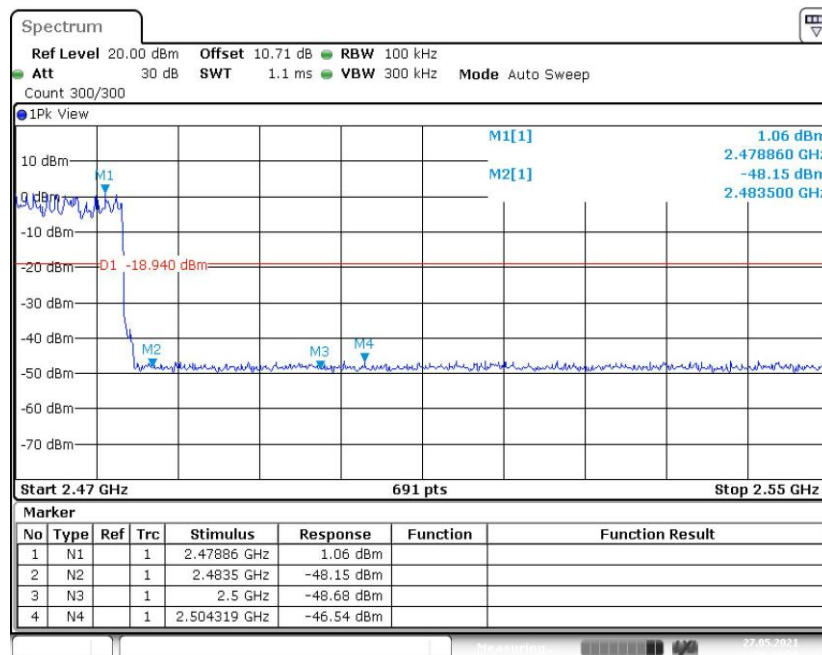


Fig. 6 Band Edges (8DPSK, CH78, Hopping ON)

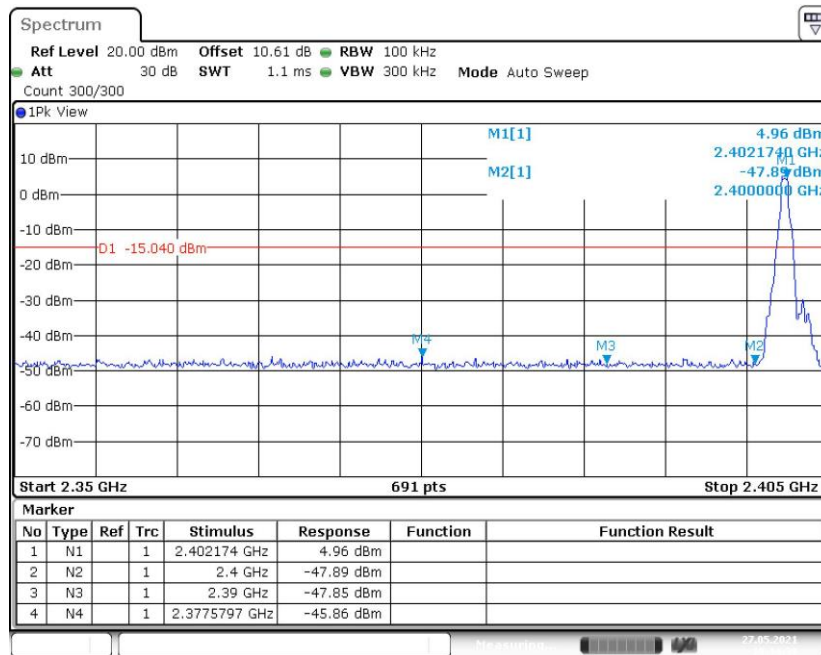


Fig. 7 Band Edges (GFSK, CH0, Hopping OFF)

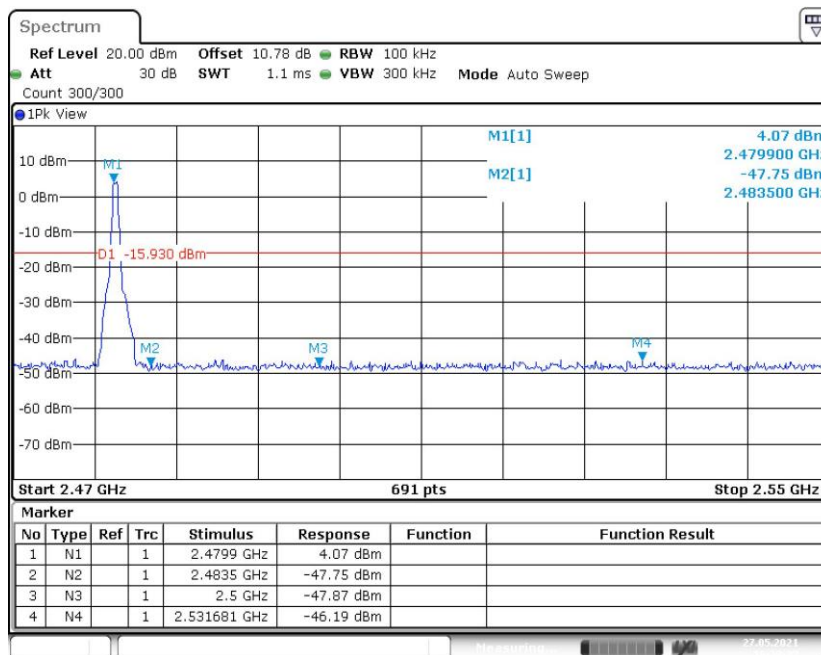


Fig. 8 Band Edges (GFSK, CH78, Hopping OFF)

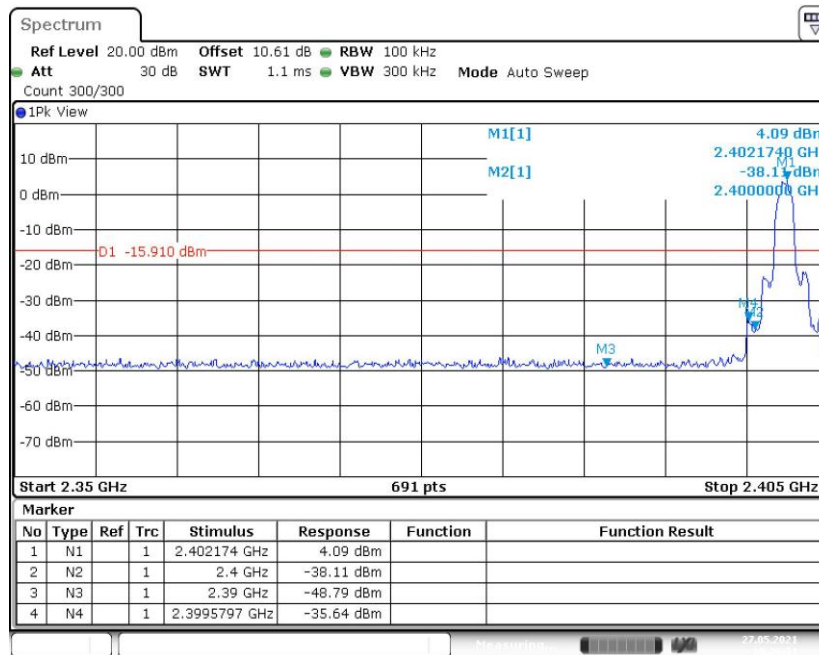


Fig. 9 Band Edges ( $\pi/4$  DQPSK, CH0, Hopping OFF)

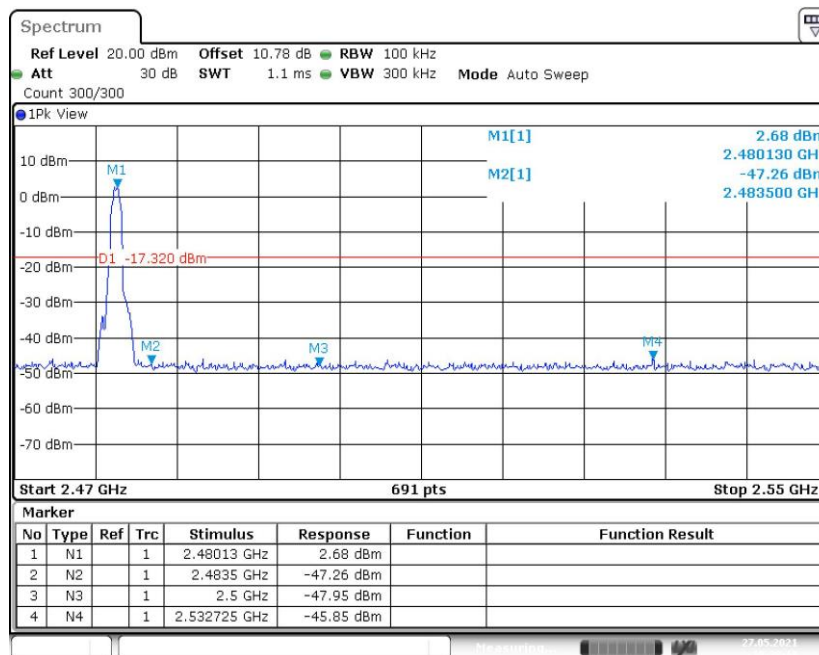


Fig. 10 Band Edges ( $\pi/4$  DQPSK, CH78, Hopping OFF)

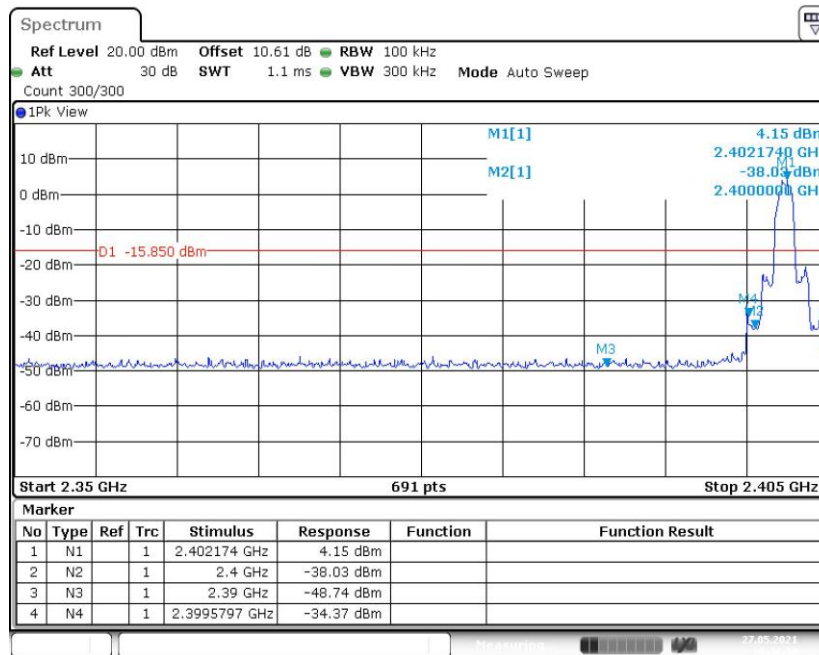


Fig. 11 Band Edges (8DPSK, CH0, Hopping OFF)

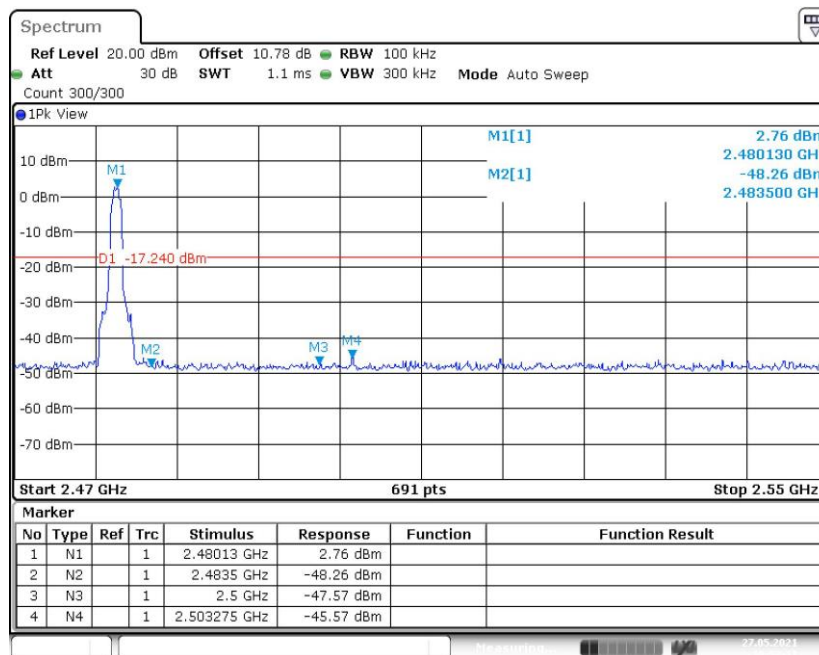


Fig. 12 Band Edges (8DPSK, CH78, Hopping OFF)



### A.3 Conducted Emission

**Measurement Limit:**

Standard	Limit (dBm)
FCC 47 CFR Part 15.247 (d)	20dBm below peak output power in 100 kHz bandwidth

**Measurement Results:**

MODE	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.402 GHz	Fig.13	P
		30MHz -1GHz	Fig.14	P
		1GHz-26.5GHz	Fig.15	P
	39	2.441 GHz	Fig.16	P
		30MHz -1GHz	Fig.17	P
		1GHz-26.5GHz	Fig.18	P
	78	2.480 GHz	Fig.19	P
		30MHz -1GHz	Fig.20	P
		1GHz-26.5GHz	Fig.21	P
$\pi/4$ DQPSK	0	2.402 GHz	Fig.22	P
		30MHz -1GHz	Fig.23	P
		1GHz-26.5GHz	Fig.24	P
	39	2.441 GHz	Fig.25	P
		30MHz -1GHz	Fig.26	P
		1GHz-26.5GHz	Fig.27	P
	78	2.480 GHz	Fig.28	P
		30MHz -1GHz	Fig.29	P
		1GHz-26.5GHz	Fig.30	P
8DPSK	0	2.402 GHz	Fig.31	P
		30MHz -1GHz	Fig.32	P
		1GHz-26.5GHz	Fig.33	P
	39	2.441 GHz	Fig.34	P
		30MHz -1GHz	Fig.35	P
		1GHz-26.5GHz	Fig.36	P
	78	2.480 GHz	Fig.37	P
		30MHz -1GHz	Fig.38	P
		1GHz-26.5GHz	Fig.39	P

See below for test graphs.

**Conclusion: Pass**

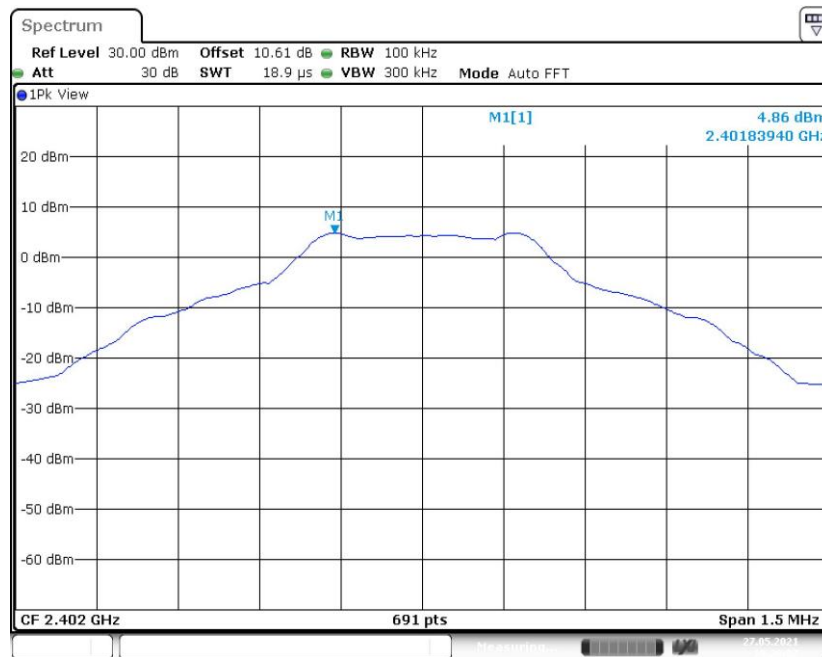


Fig. 13 Conducted Spurious Emission (GFSK, CH0, 2.402GHz)

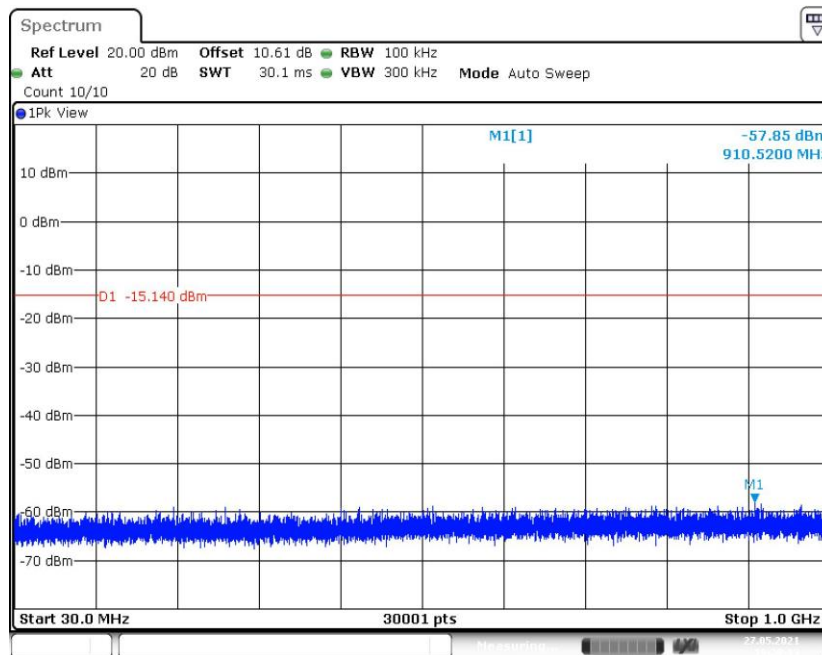


Fig. 14 Conducted Spurious Emission (GFSK, CH0, 30MHz -1GHz)



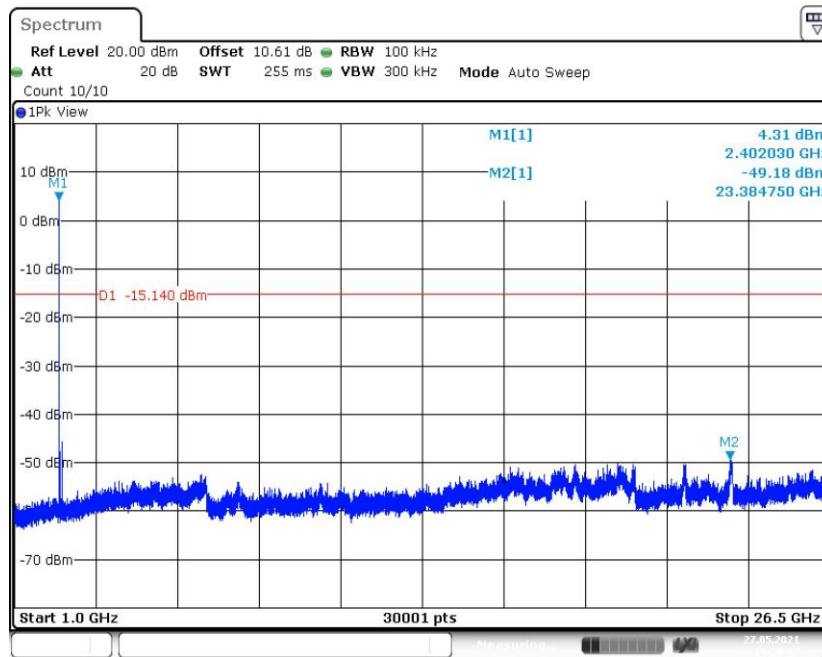


Fig. 15 Conducted Spurious Emission (GFSK, CH0, 1GHz-26.5GHz)

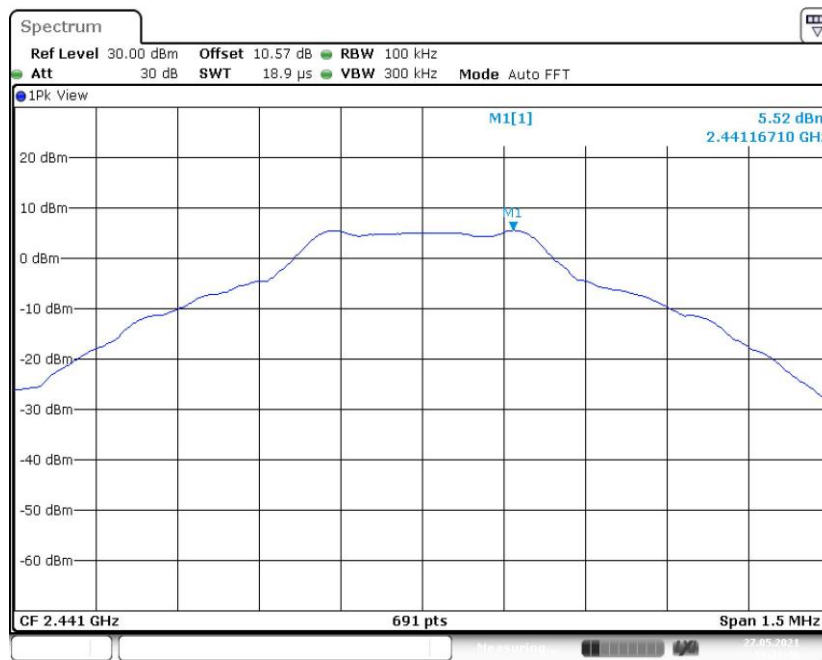


Fig. 16 Conducted Spurious Emission (GFSK, CH39, 2.441GHz)

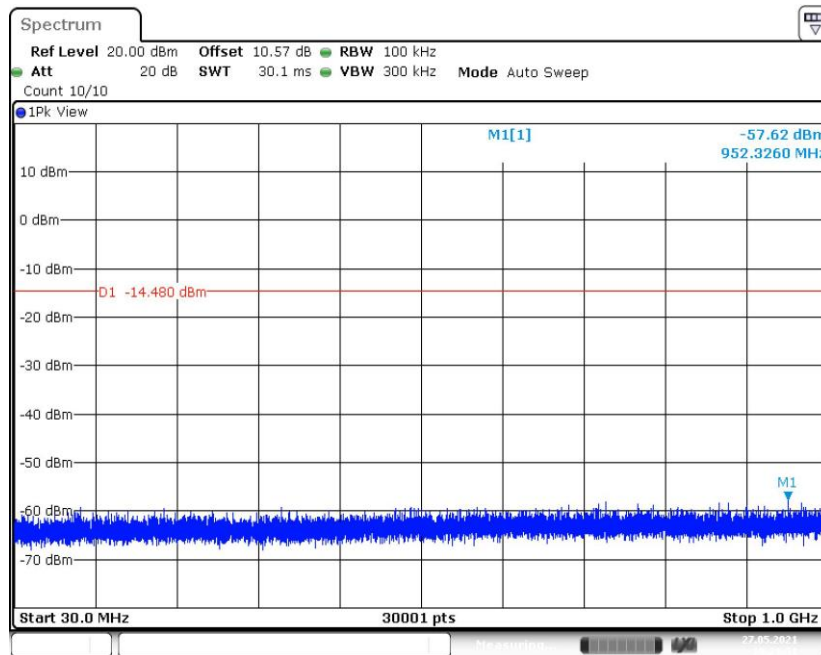


Fig. 17 Conducted Spurious Emission (GFSK, CH39, 30MHz -1GHz)

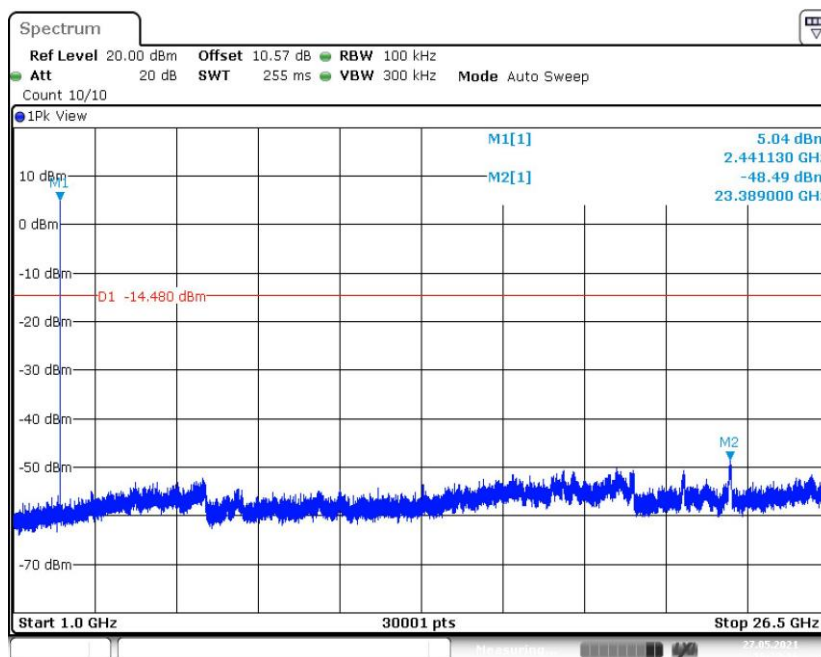


Fig. 18 Conducted Spurious Emission (GFSK, CH39, 1GHz-26.5GHz)

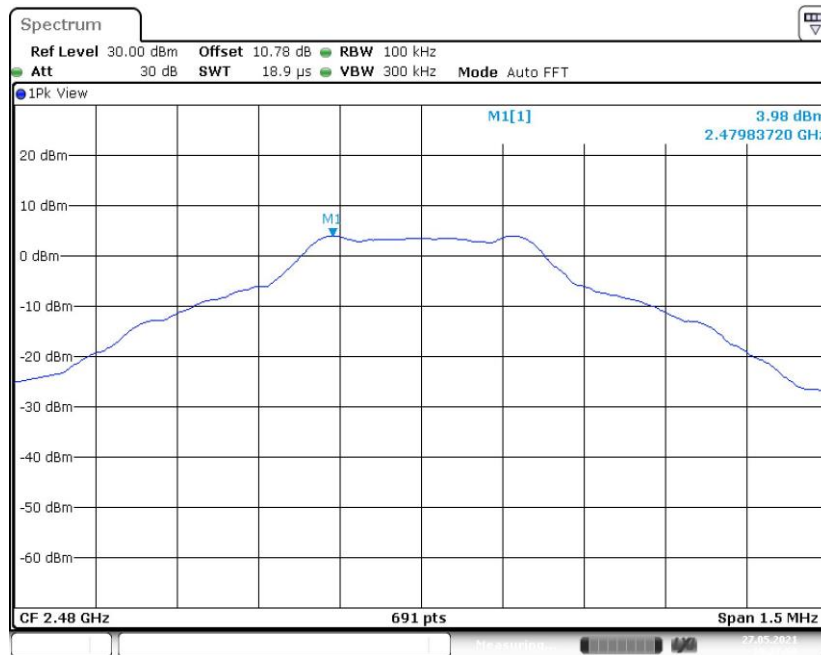


Fig. 19 Conducted Spurious Emission (GFSK, CH78, 2.480GHz)

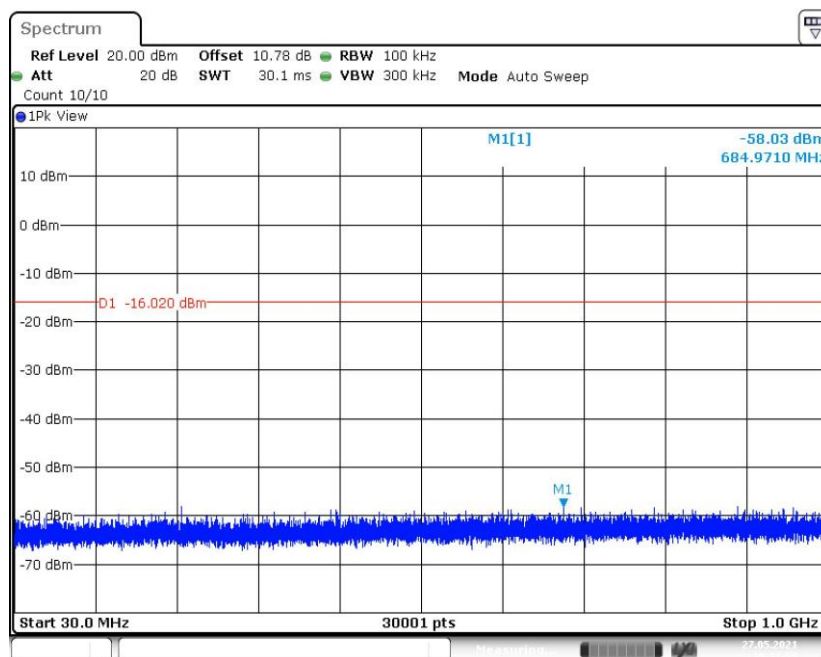


Fig. 20 Conducted Spurious Emission (GFSK, CH78, 30MHz -1GHz)

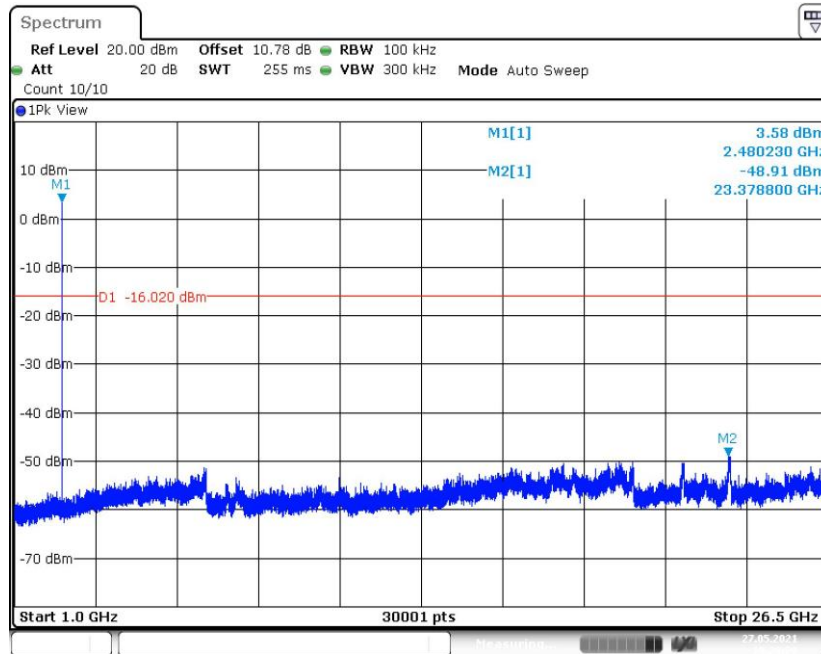


Fig. 21 Conducted Spurious Emission (GFSK, CH78, 1GHz-26.5GHz)

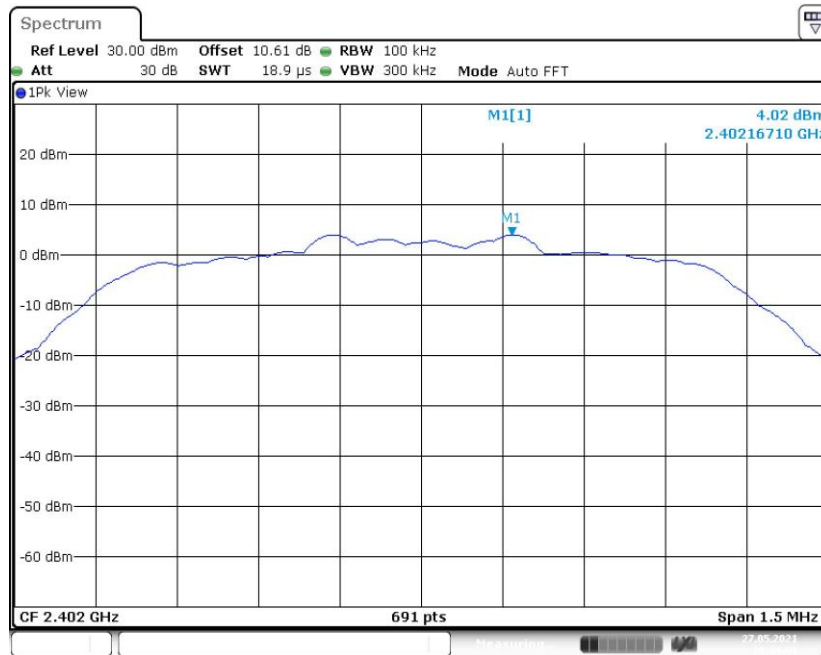


Fig. 22 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH0, 2.402GHz)

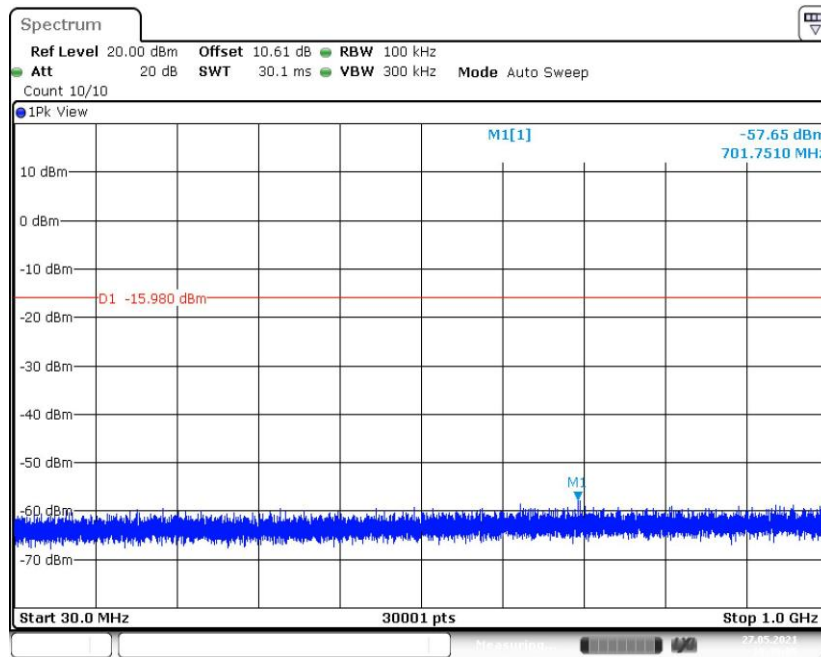


Fig. 23 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH0, 30MHz -1GHz)

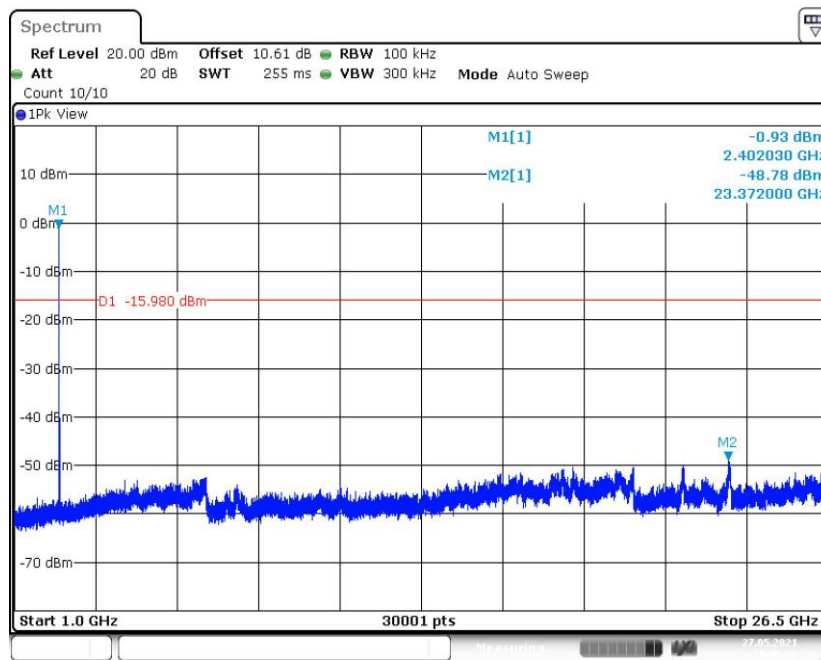


Fig. 24 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH0, 1GHz-26.5GHz)

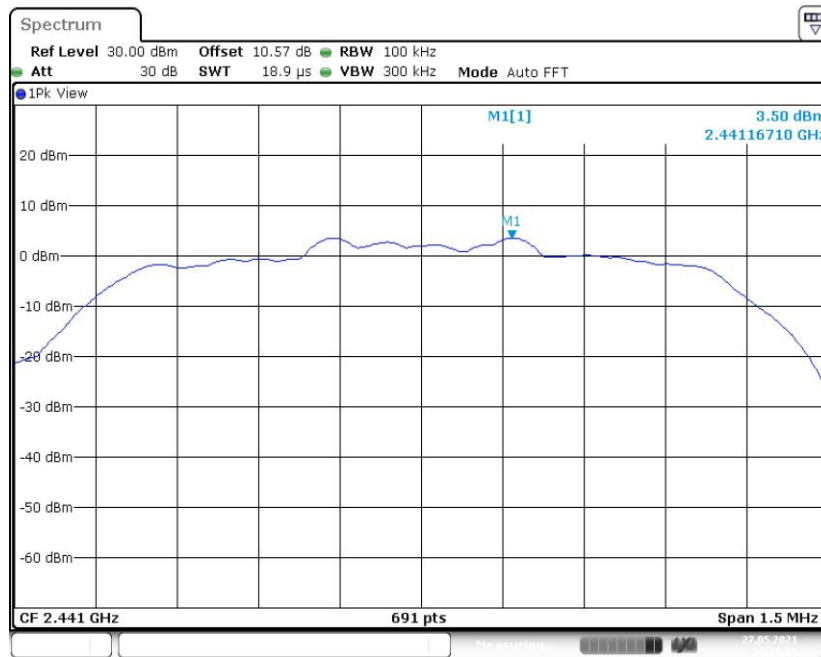


Fig. 25 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH39, 2.441GHz)

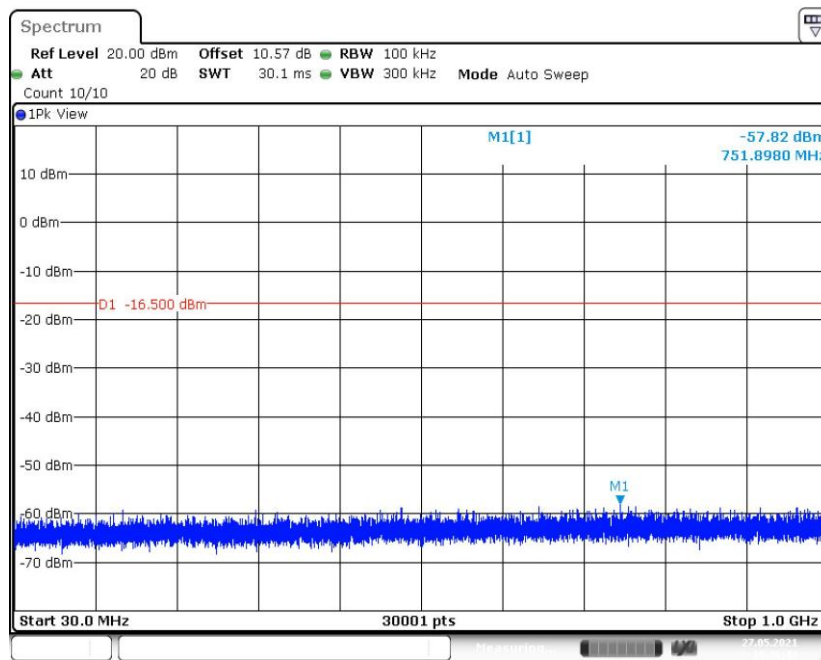


Fig. 26 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH39, 30MHz -1GHz)

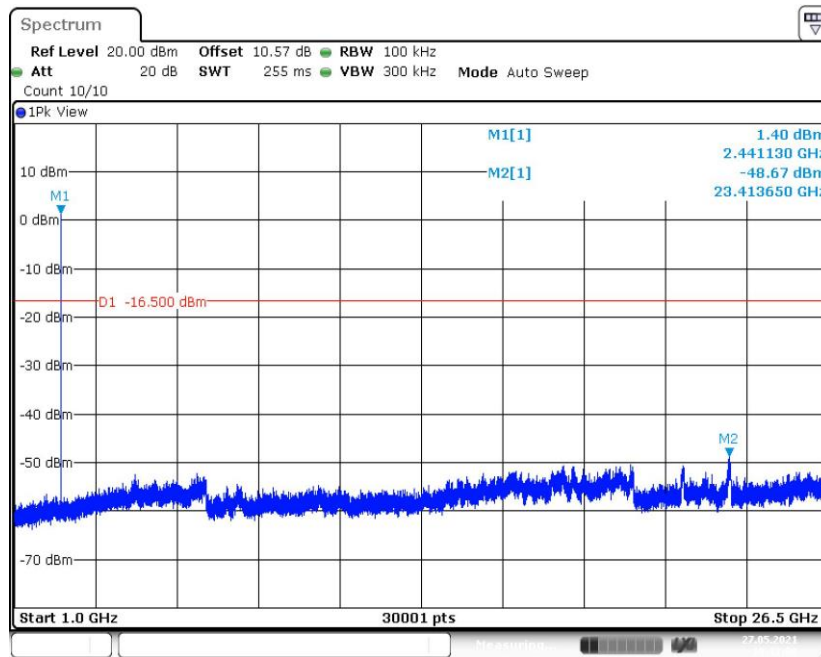


Fig. 27 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH39, 1GHz-26.5GHz)

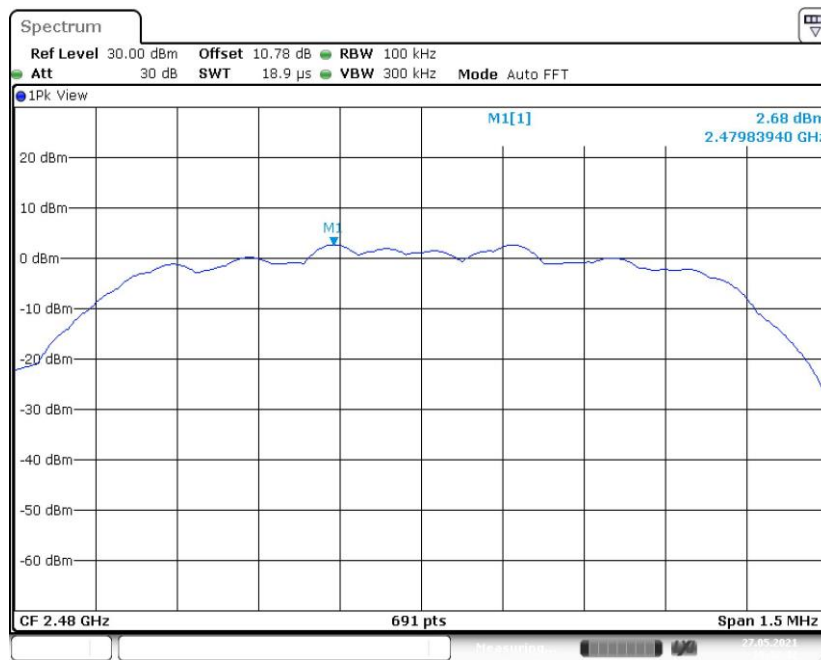


Fig. 28 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH78, 2.480GHz)

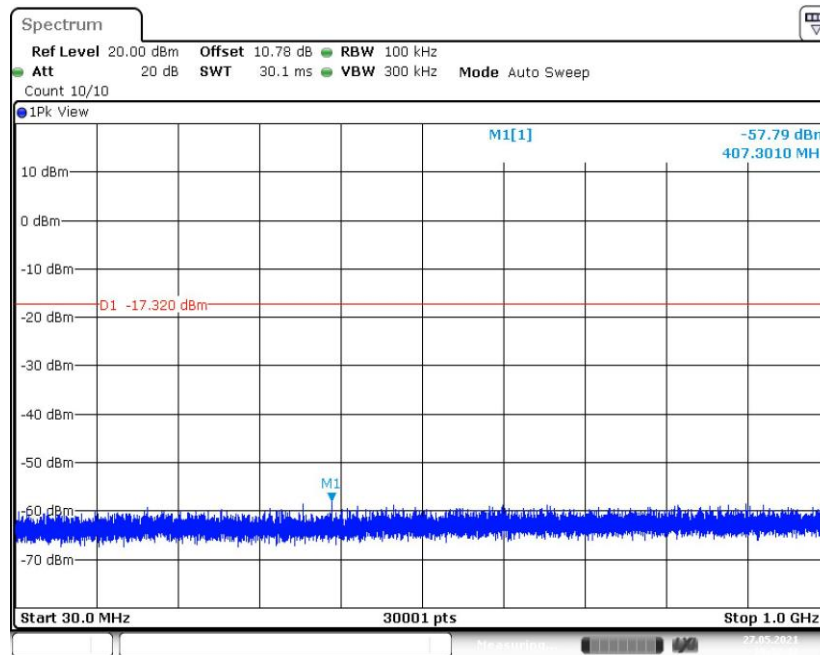


Fig. 29 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH78, 30MHz -1GHz)

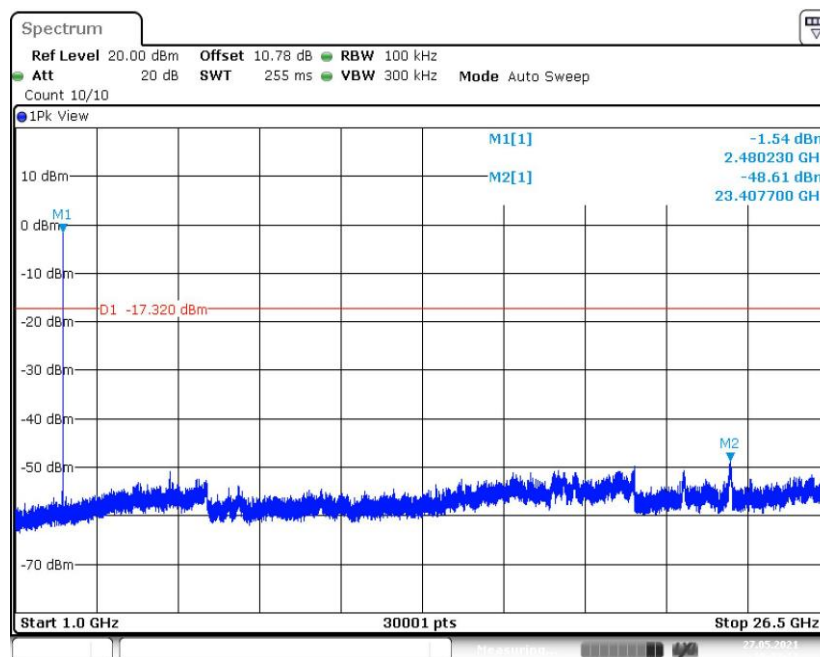


Fig. 30 Conducted Spurious Emission ( $\pi/4$  DQPSK, CH78, 1GHz-26.5GHz)



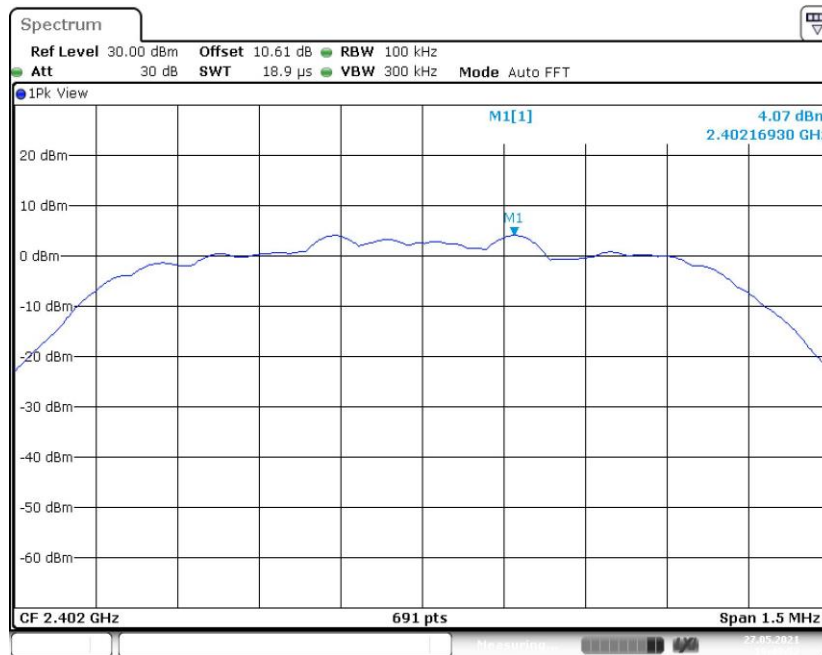


Fig. 31 Conducted Spurious Emission (8DPSK, CH0, 2.402GHz)

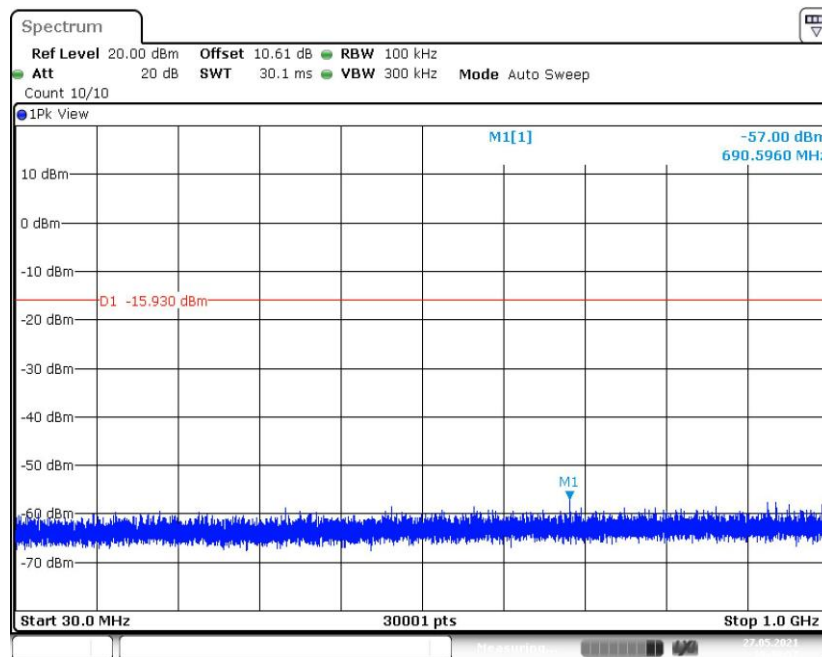


Fig. 32 Conducted Spurious Emission (8DPSK, CH0, 30MHz -1GHz)

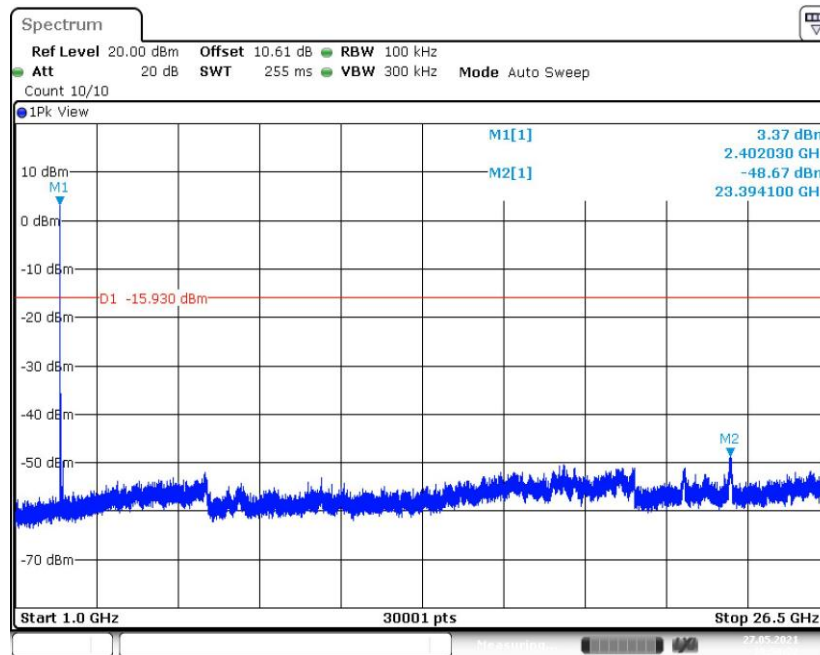


Fig. 33 Conducted Spurious Emission (8DPSK, CH0, 1GHz-26.5GHz)

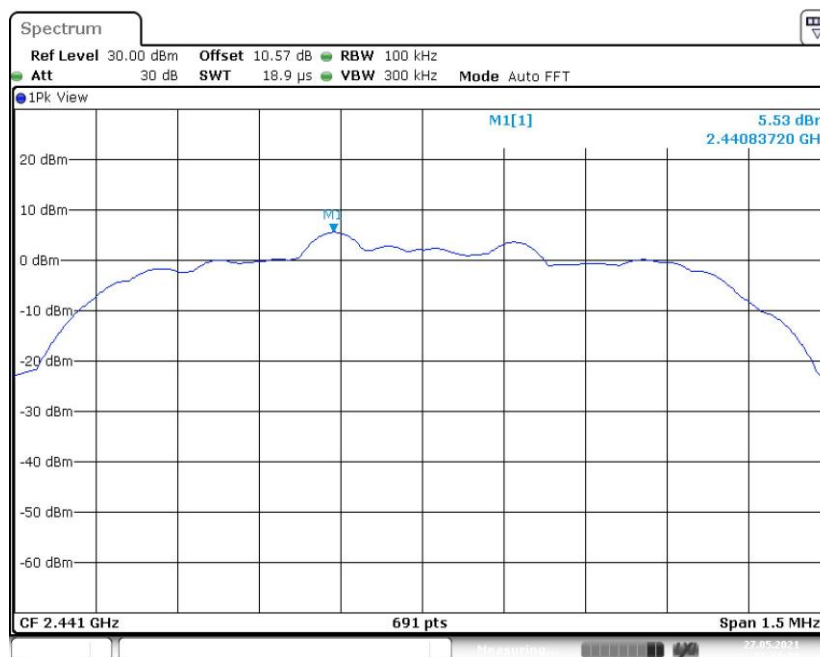


Fig. 34 Conducted Spurious Emission (8DPSK, CH39, 2.441GHz)

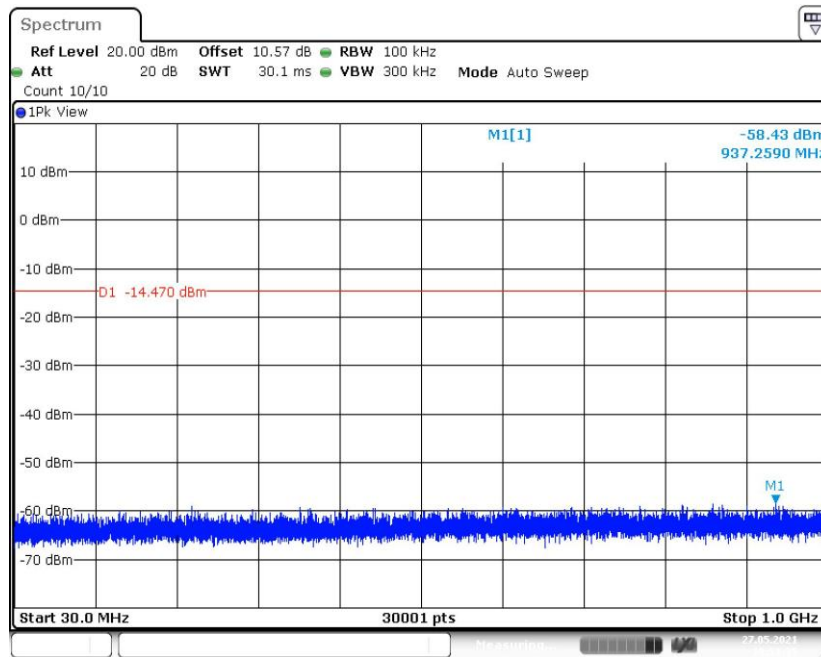


Fig. 35 Conducted Spurious Emission (8DPSK, CH39, 30MHz -1GHz)

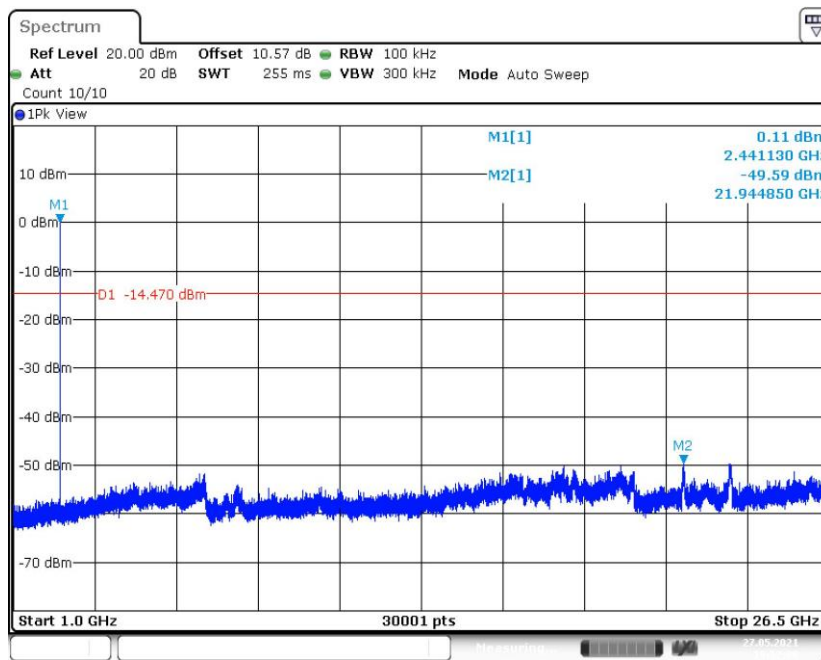


Fig. 36 Conducted Spurious Emission (8DPSK, CH39, 1GHz-26.5GHz)

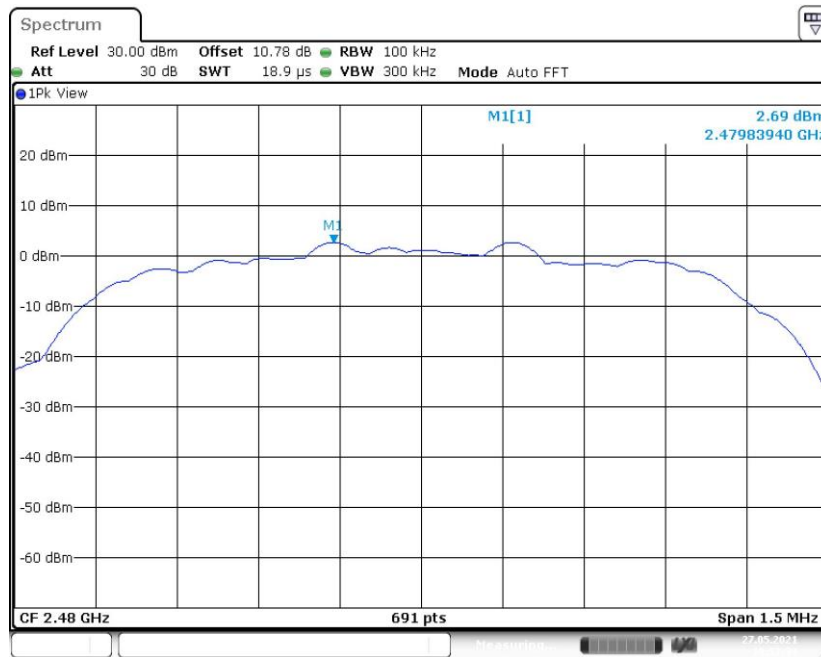


Fig. 37 Conducted Spurious Emission (8DPSK, CH78, 2.480GHz)

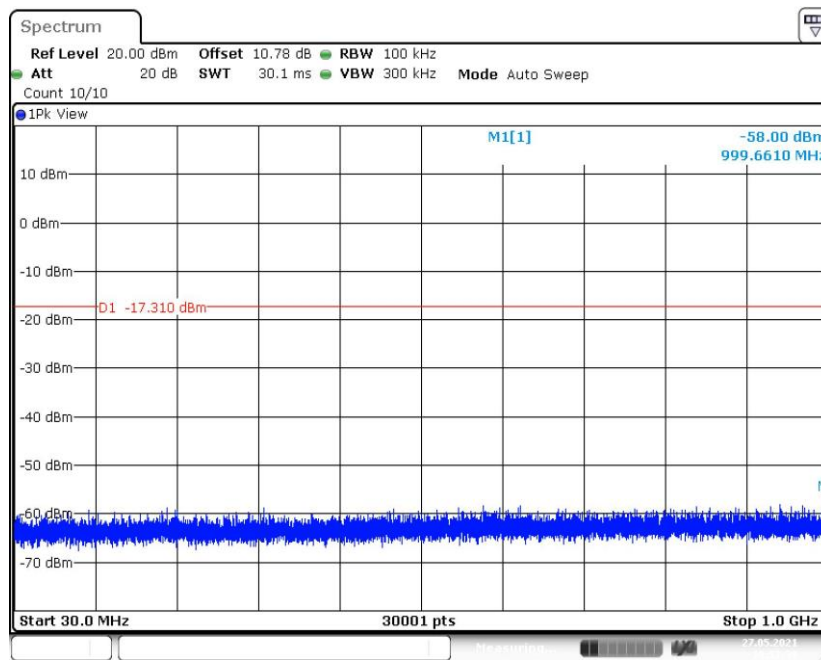


Fig. 38 Conducted Spurious Emission (8DPSK, CH78, 30MHz -1GHz)

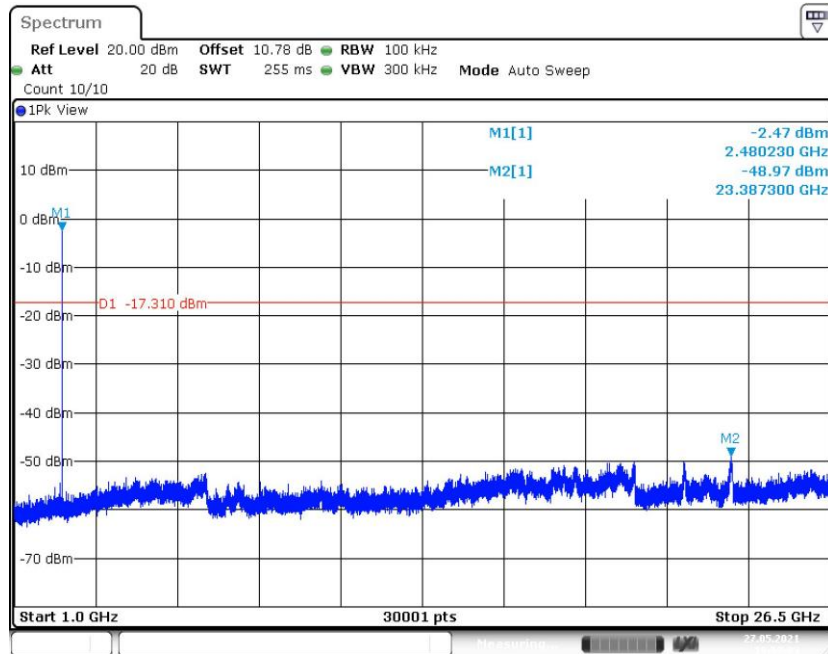


Fig. 39 Conducted Spurious Emission (8DPSK, CH78, 1GHz-26.5GHz)

#### A.4 Radiated Emission

##### Measurement Limit:

Standard	Limit (dBm)
FCC 47 CFR Part 15.247, 15.205, 15.209	20dBm below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

##### Limit in restricted band:

Frequency of emission (MHz)	Field strength( $\mu$ V/m)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

##### Test Condition:

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

**Note:** According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.



**Measurement Results:**

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	1 GHz ~18 GHz	Fig.40	P
	39	1 GHz ~18 GHz	Fig.41	P
	78	1 GHz ~18 GHz	Fig.42	P
	Restricted Band(CH0)	2.38 GHz ~ 2.45 GHz	Fig.43	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.44	P
π/4 DQPSK	0	1 GHz ~18 GHz	Fig.45	P
	39	1 GHz ~18 GHz	Fig.46	P
	78	1 GHz ~18 GHz	Fig.47	P
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.48	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.49	P
8DPSK	0	1 GHz ~18 GHz	Fig.50	P
	39	1 GHz ~18 GHz	Fig.51	P
	78	1 GHz ~18 GHz	Fig.52	P
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.53	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.54	P
/	All channels	9 kHz ~30 MHz	Fig.55	P
		30 MHz ~1 GHz	Fig.56	P
		18 GHz ~26.5 GHz	Fig.57	P

**Worst Case Result**

**GFSK CH39 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5971.800000	48.40	74.00	25.60	V	4.8
7638.857143	46.19	74.00	27.81	H	5.7
9495.857143	46.06	74.00	27.94	H	7.0
12600.428572	48.84	74.00	25.16	H	11.3
14842.714286	48.85	74.00	25.15	H	13.0
17943.000000	53.76	74.00	20.24	H	19.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5971.800000	36.36	54.00	17.64	V	4.8
7638.857143	36.81	54.00	17.19	H	5.7
9495.857143	36.52	54.00	17.48	H	7.0
12600.428572	38.72	54.00	15.28	H	11.3
14842.714286	41.01	54.00	12.99	H	13.0
17943.000000	45.21	54.00	8.79	H	19.0



**π/4 DQPSK CH0 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
4826.700000	47.79	74.00	26.21	V	3.9
8856.857143	45.95	74.00	28.05	H	6.5
12383.142857	46.12	74.00	27.88	V	11.3
14827.285714	48.19	74.00	25.81	V	12.9
16594.285714	51.61	74.00	22.39	V	16.9
17917.285714	53.43	74.00	20.57	V	18.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
4826.700000	39.58	54.00	14.42	V	3.9
8856.857143	35.46	54.00	18.54	H	6.5
12383.142857	37.88	54.00	16.12	V	11.3
14827.285714	39.86	54.00	14.14	V	12.9
16594.285714	42.89	54.00	11.11	V	16.9
17917.285714	43.46	54.00	10.54	V	18.9

**8DPSK CH0 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5973.600000	48.15	74.00	25.85	H	4.8
8235.000000	47.17	74.00	26.83	H	5.9
10401.000000	48.59	74.00	25.41	H	9.1
12242.142857	48.11	74.00	25.89	H	10.9
14849.571429	50.75	74.00	25.25	H	13.0
16934.142857	51.62	74.00	22.38	H	18.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5973.600000	36.34	54.00	17.66	H	4.8
8235.000000	37.37	54.00	16.63	H	5.9
10401.000000	37.22	54.00	16.78	H	9.1
12242.142857	38.89	54.00	15.11	H	10.9
14849.571429	40.08	54.00	13.92	H	13.0
16934.142857	42.81	54.00	11.19	H	18.2

**Note:**

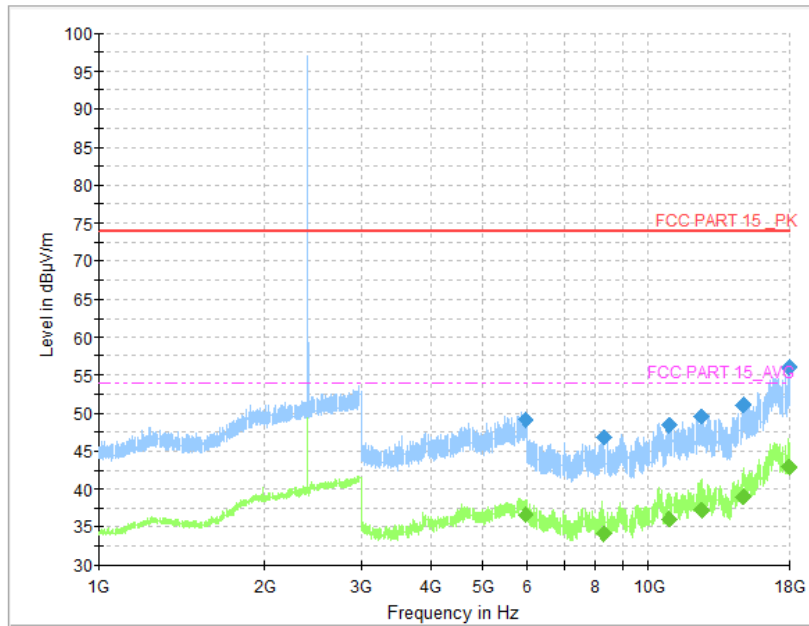
A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and Antenna Factor, the gain of the preamplifier, the cable loss.  $P_{Mea}$  is the field strength recorded from the instrument. The measurement results are obtained as described below:

Result=  $P_{Mea}$  +Cable Loss +Antenna Factor-Gain of the preamplifier.

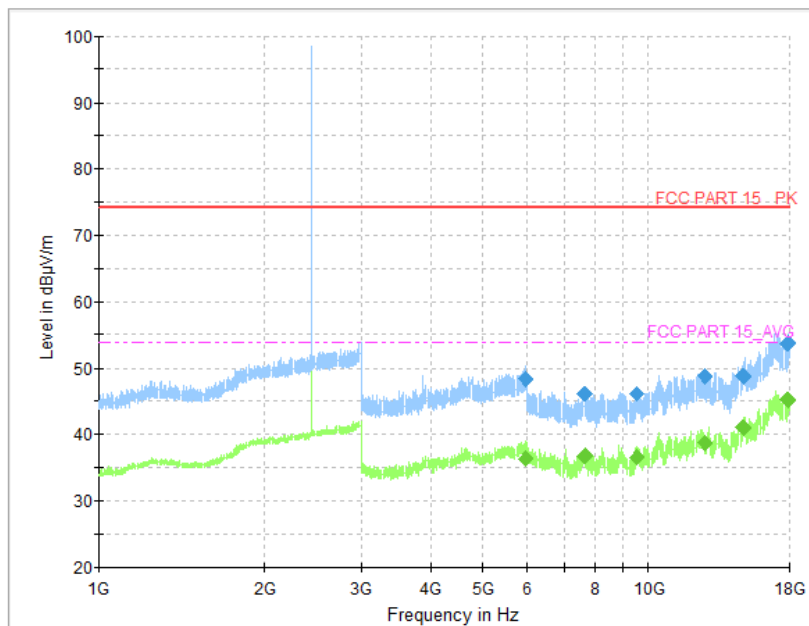
**See below for test graphs.**

**Conclusion: Pass**





**Fig. 40 Radiated Spurious Emission (GFSK, CH0, 1 GHz ~18 GHz)**



**Fig. 41 Radiated Spurious Emission (GFSK, CH39, 1 GHz ~18 GHz)**

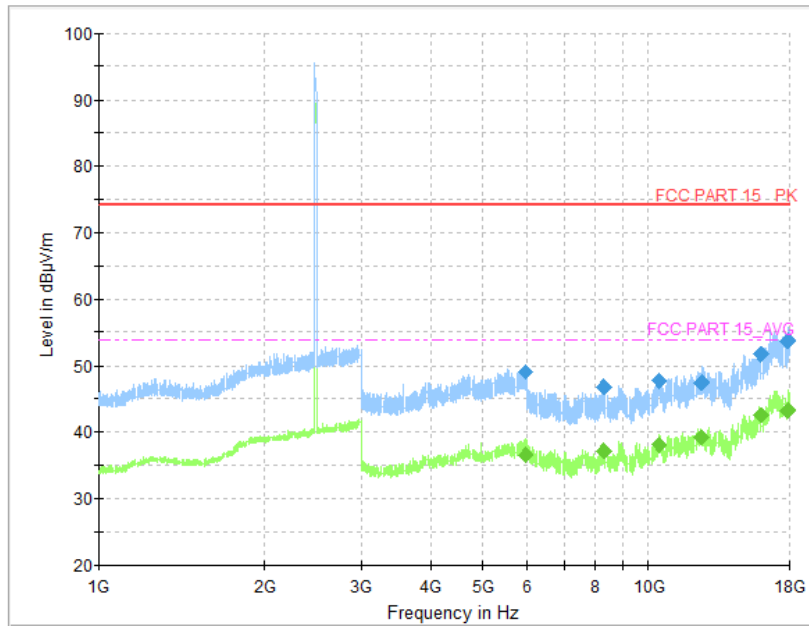


Fig. 42 Radiated Spurious Emission (GFSK, CH78, 1 GHz ~18 GHz)

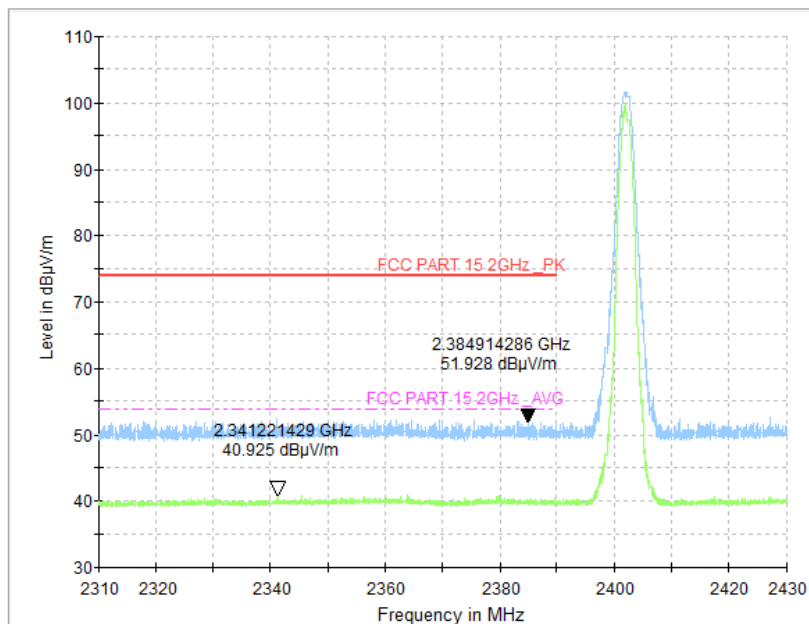


Fig. 43 Radiated Band Edges (GFSK, CH0, 2380GHz~2450GHz)

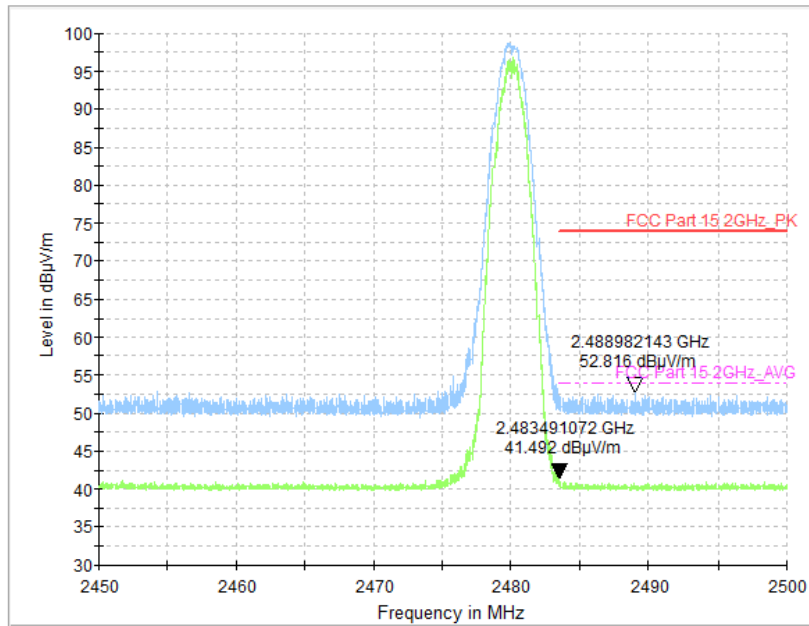


Fig. 44 Radiated Band Edges (GFSK, CH78, 2450GHz~2500GHz)

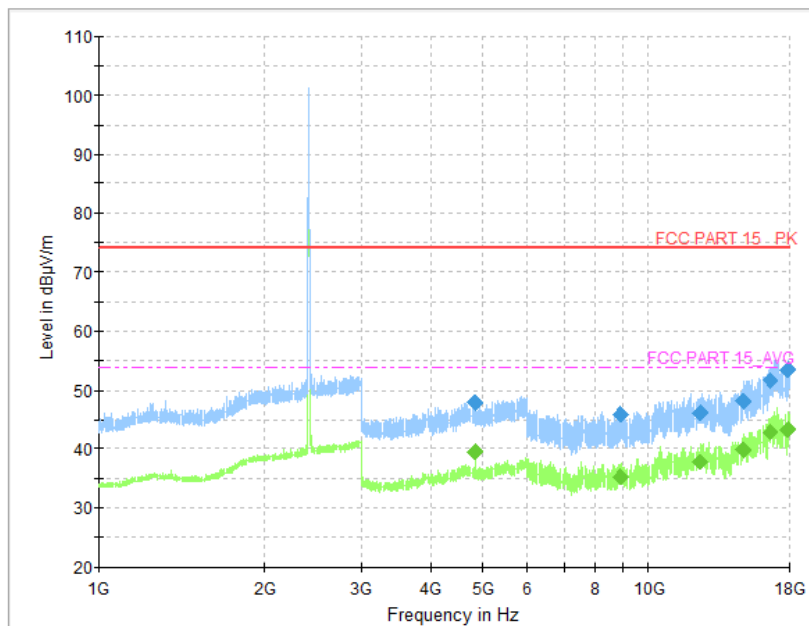


Fig. 45 Radiated Spurious Emission ( $\pi/4$  DQPSK, CH0, 1 GHz ~18 GHz)

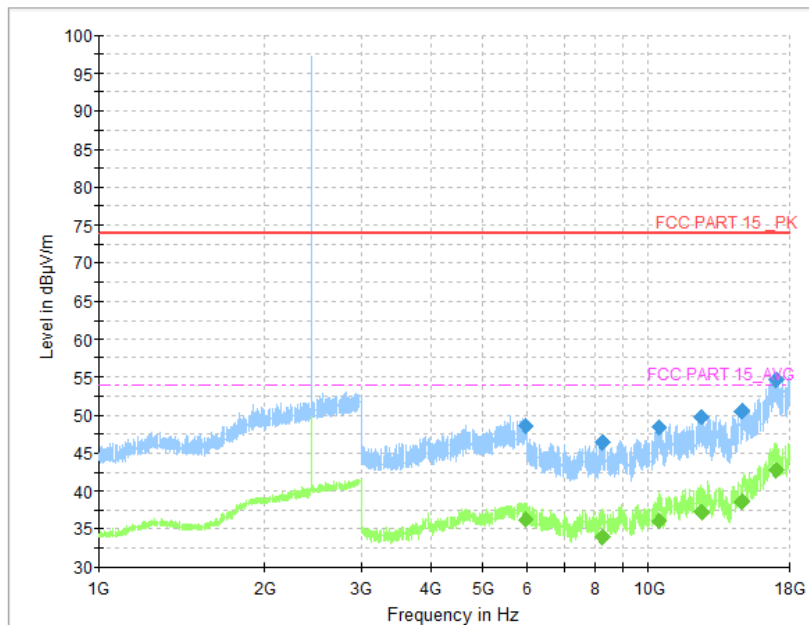


Fig. 46 Radiated Spurious Emission ( $\pi/4$  DQPSK, CH39, 1 GHz ~18 GHz)

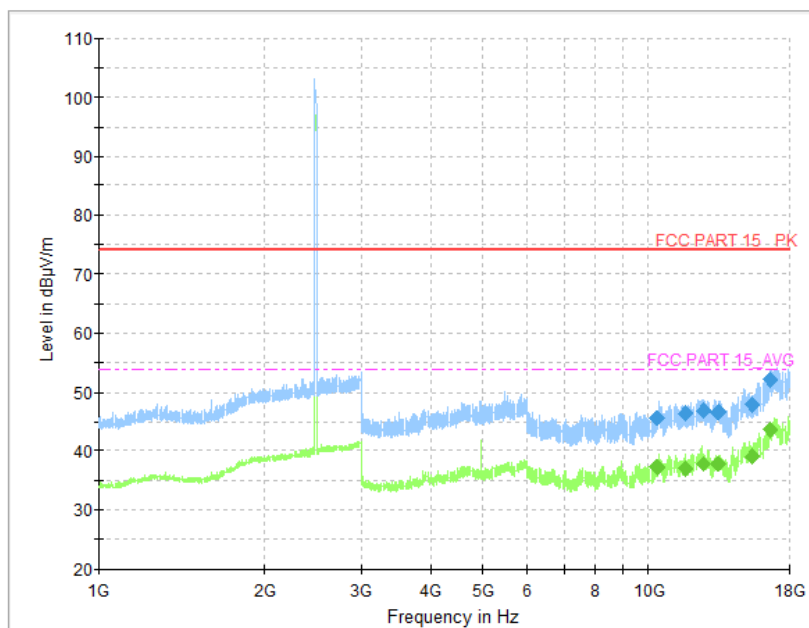


Fig. 47 Radiated Spurious Emission ( $\pi/4$  DQPSK, CH78, 1 GHz ~18 GHz)

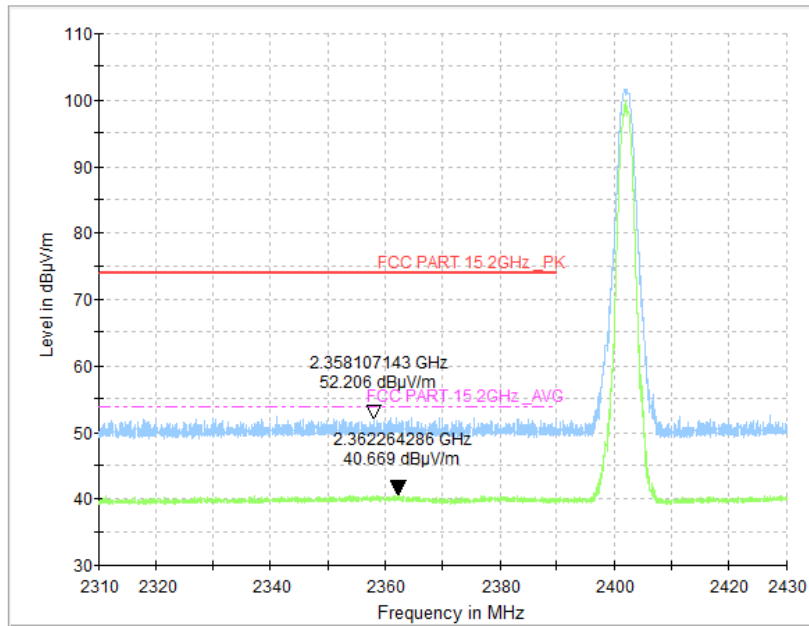


Fig. 48 Radiated Band Edges ( $\pi/4$  DQPSK, CH0, 2380GHz~2450GHz)

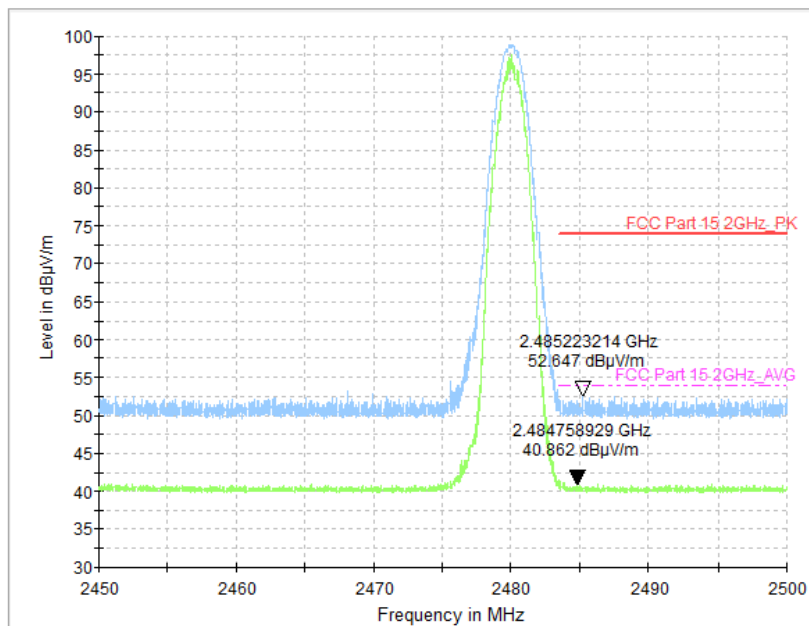
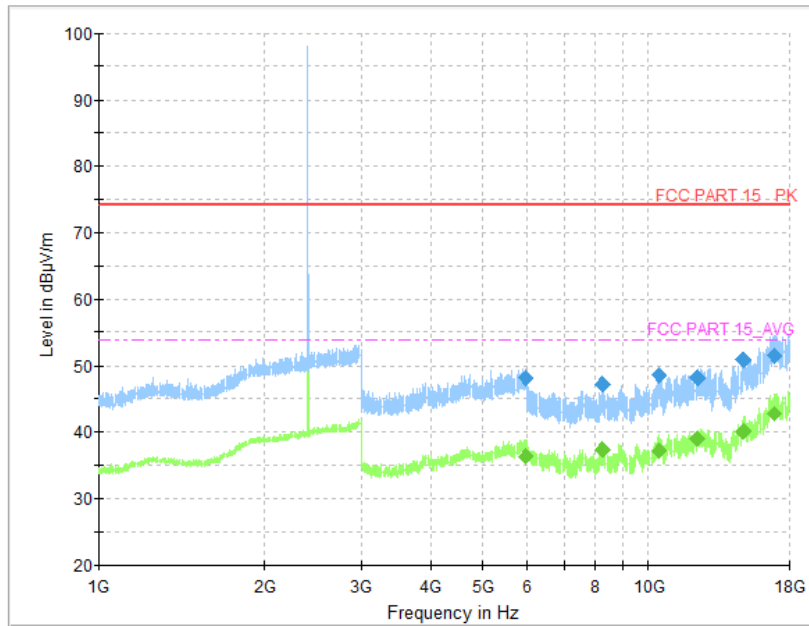
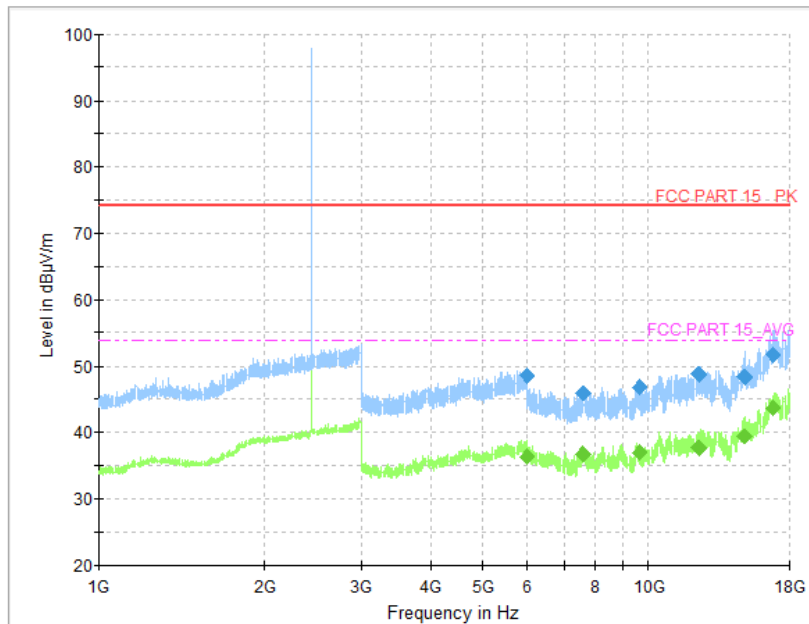


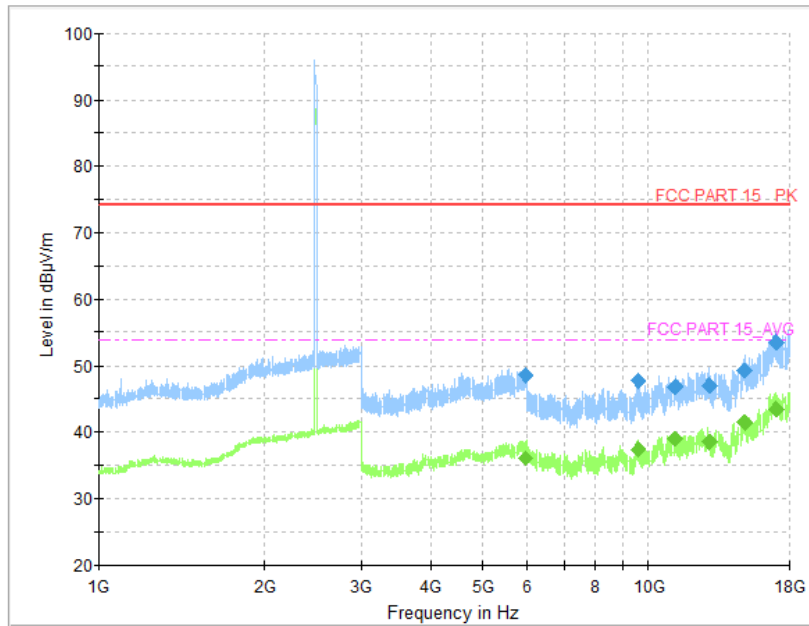
Fig. 49 Radiated Band Edges ( $\pi/4$  DQPSK, CH78, 2450GHz~2500GHz)



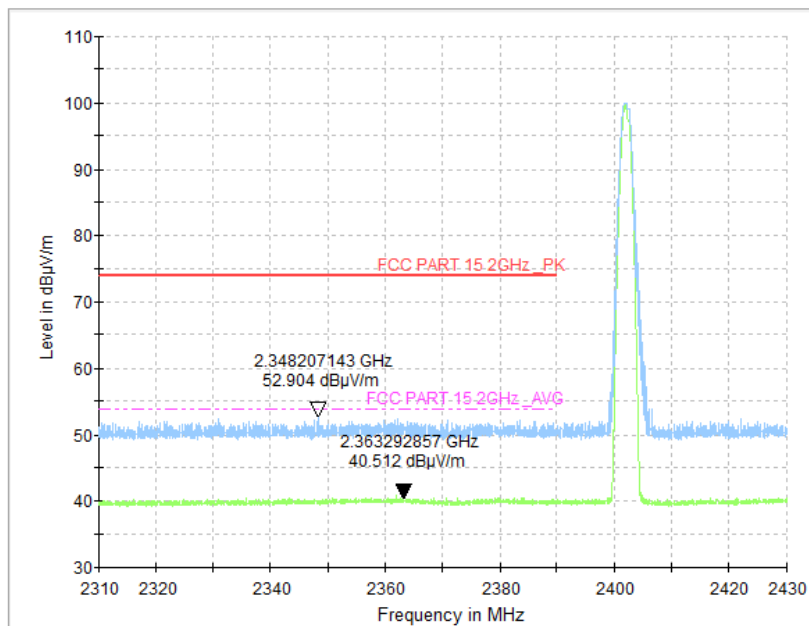
**Fig. 50 Radiated Spurious Emission (8DPSK, CH0, 1 GHz ~18 GHz)**



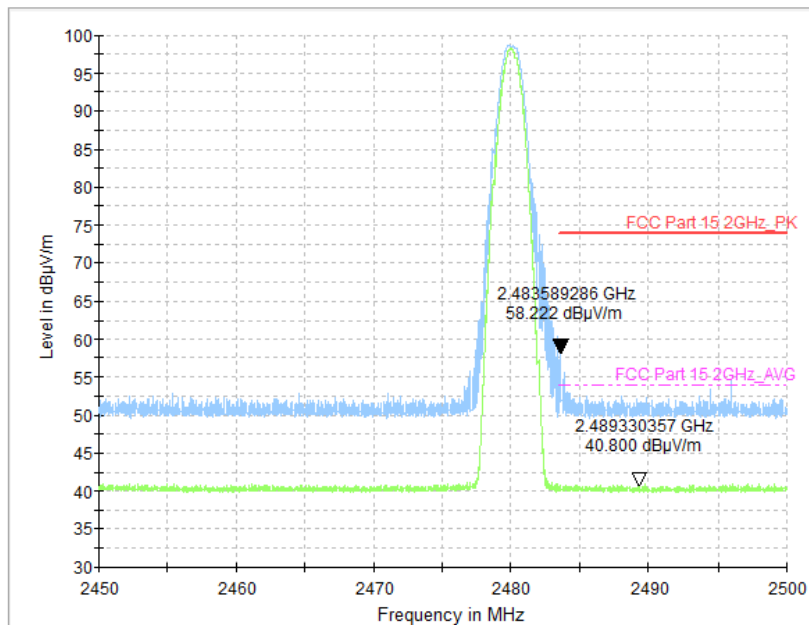
**Fig. 51 Radiated Spurious Emission (8DPSK, CH39, 1 GHz ~18 GHz)**



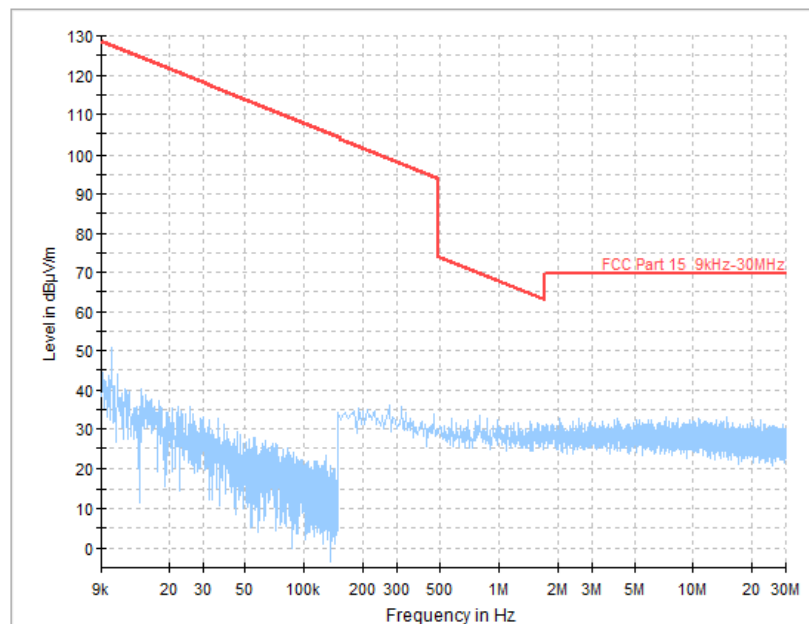
**Fig. 52 Radiated Spurious Emission (8DPSK, CH78, 1 GHz ~18 GHz)**



**Fig. 53 Radiated Band Edges (8DPSK, CH0, 2380GHz~2450GHz)**

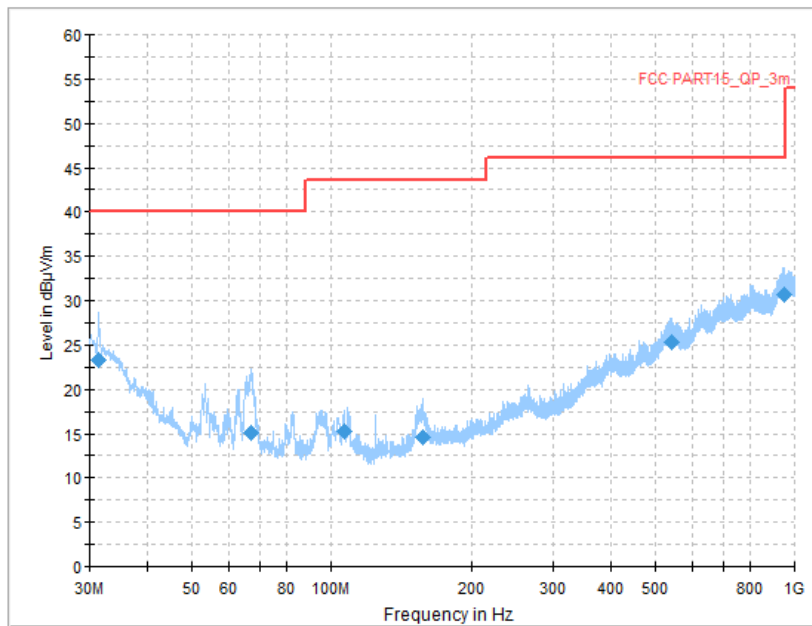


**Fig. 54 Radiated Band Edges (8DPSK, CH78, 2450GHz~2500GHz)**

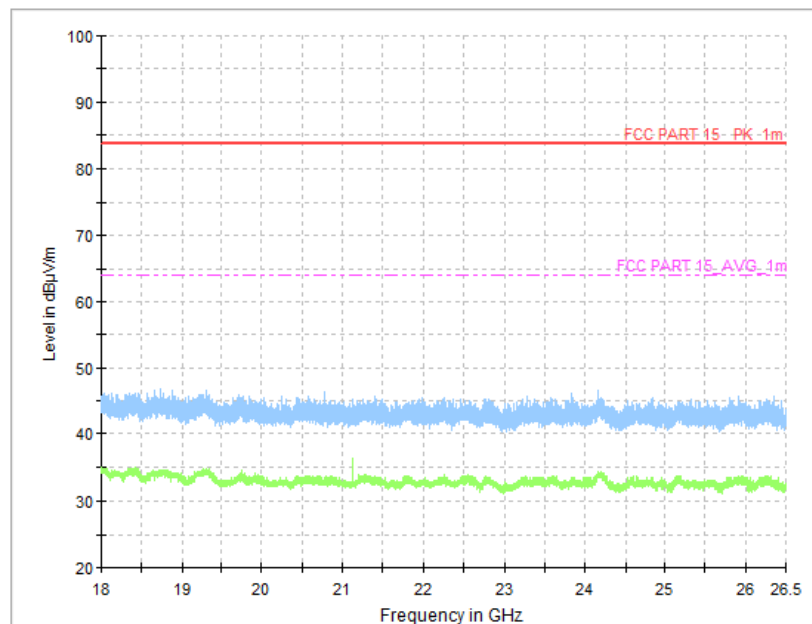


**Fig. 55 Radiated Spurious Emission (All Channels, 9 kHz ~30 MHz)**





**Fig. 56 Radiated Spurious Emission (All Channels, 30 MHz ~1 GHz)**



**Fig. 57 Radiated Spurious Emission (All Channels, 18 GHz ~26.5 GHz)**

### A.5 20dB Bandwidth

**Measurement Limit:**

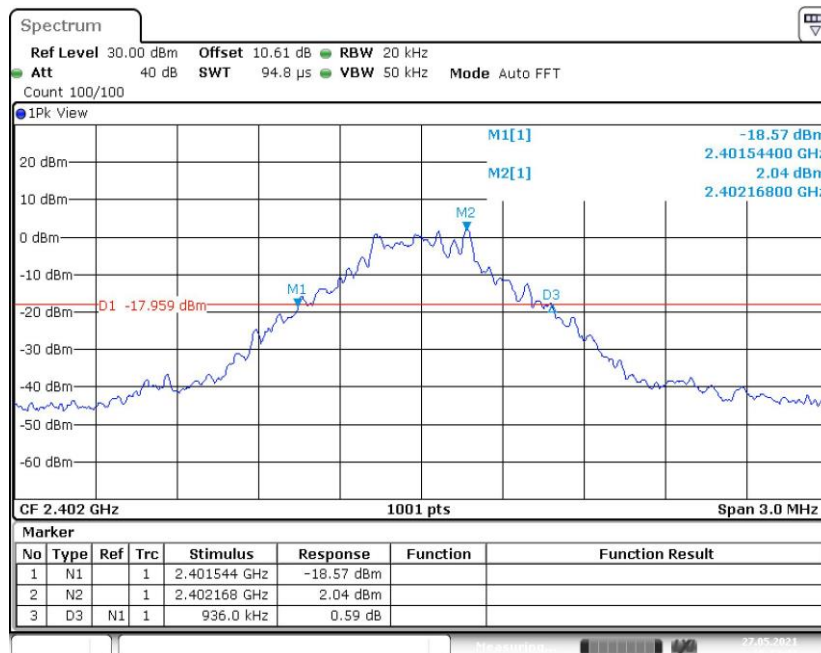
Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	/

**Measurement Result:**

Mode	Channel	20dB Bandwidth ( kHz)		Conclusion
		Fig.	Value	
GFSK	0	Fig.58	936.00	/
	39	Fig.59	936.00	
	78	Fig.60	972.00	
$\pi/4$ DQPSK	0	Fig.61	1287.00	/
	39	Fig.62	1266.00	
	78	Fig.63	1296.00	
8DPSK	0	Fig.64	1290.00	/
	39	Fig.65	1278.00	
	78	Fig.66	1275.00	

See below for test graphs.

**Conclusion: PASS**



**Fig. 58 20dB Bandwidth (GFSK, CH0)**

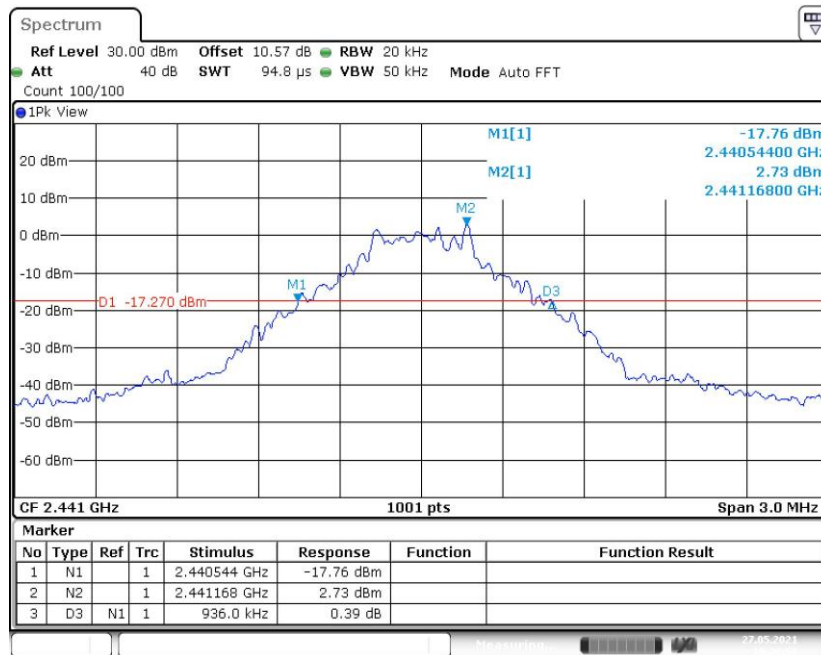


Fig. 59 20dB Bandwidth (GFSK, CH39)

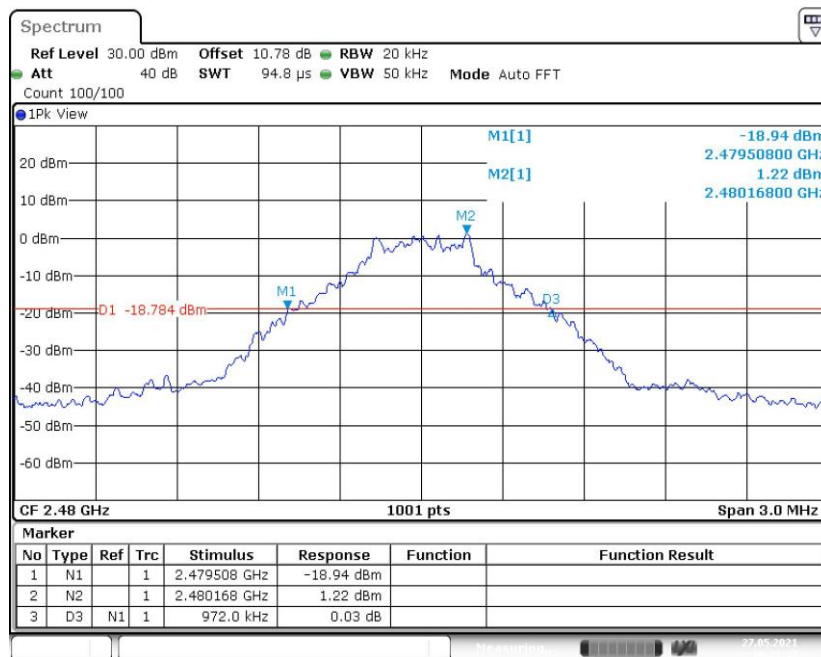


Fig. 60 20dB Bandwidth (GFSK, CH78)

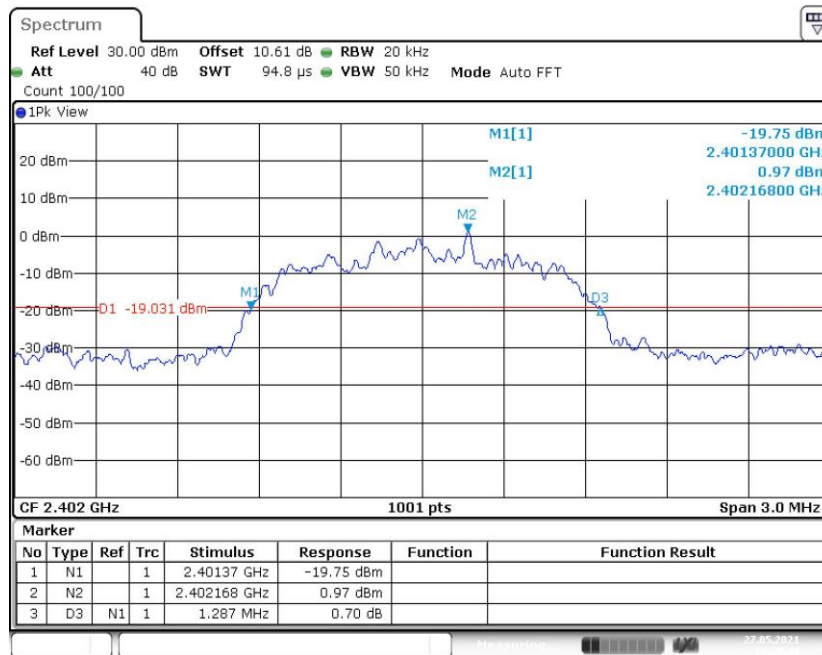


Fig. 61 20dB Bandwidth ( $\pi/4$  DQPSK, CH0)

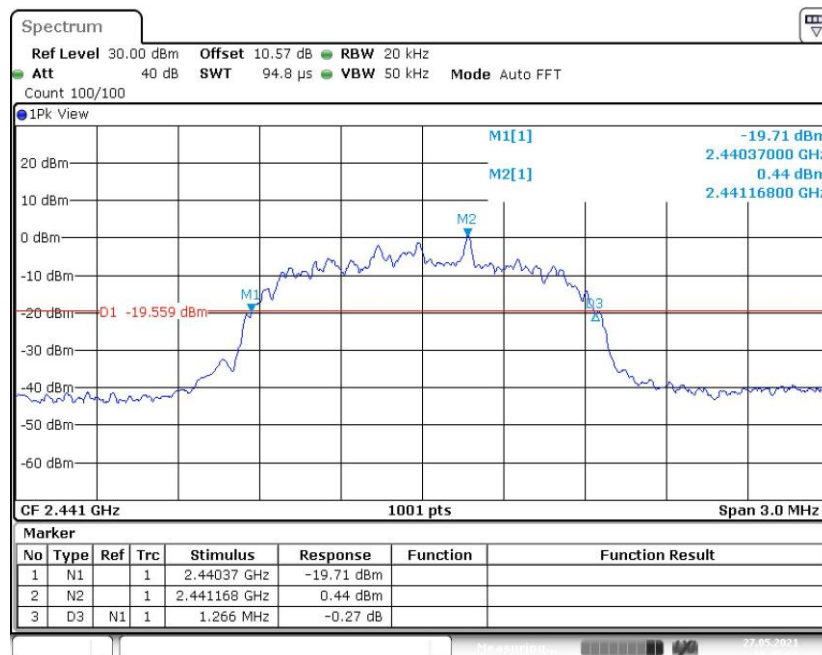


Fig. 62 20dB Bandwidth ( $\pi/4$  DQPSK, CH39)

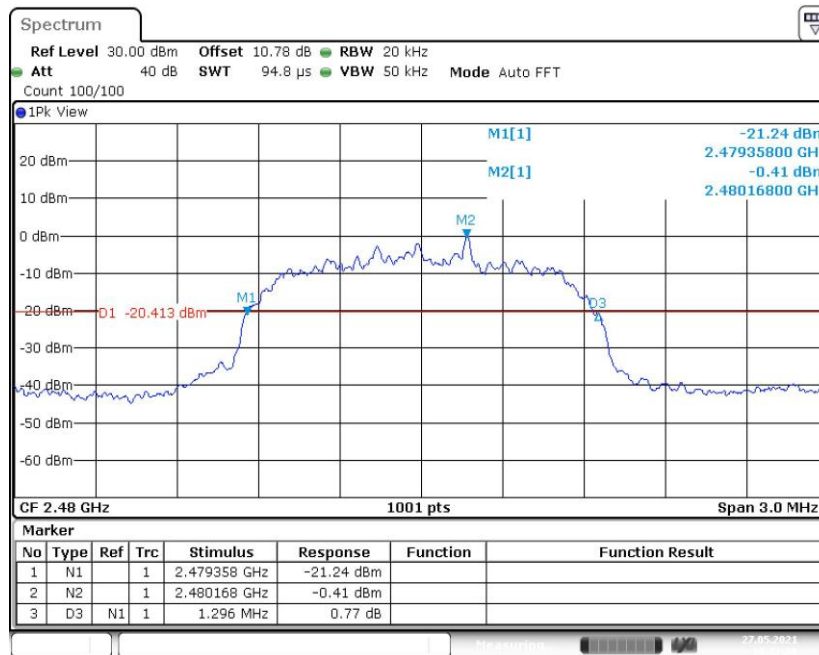


Fig. 63 20dB Bandwidth ( $\pi/4$  DQPSK, CH78)

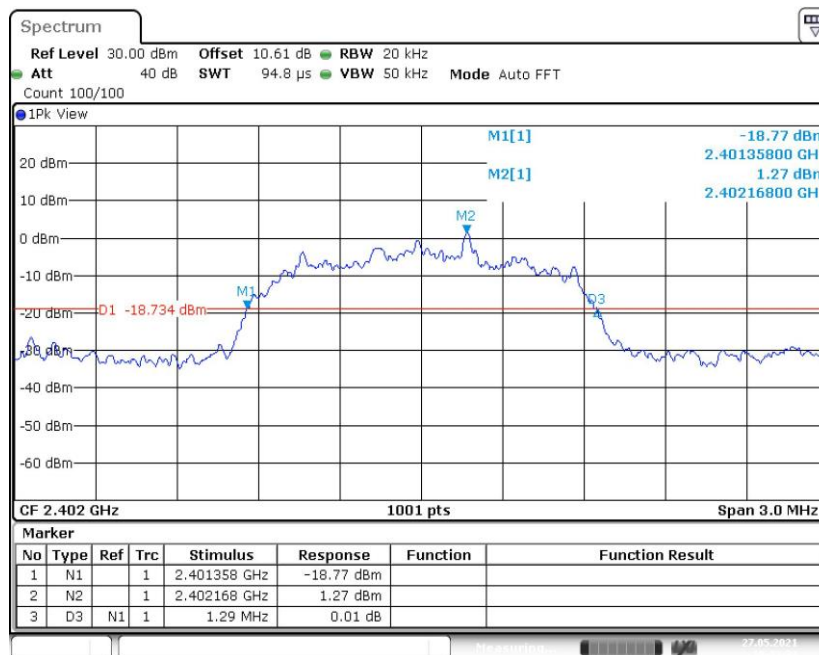


Fig. 64 20dB Bandwidth (8DPSK, CH0)

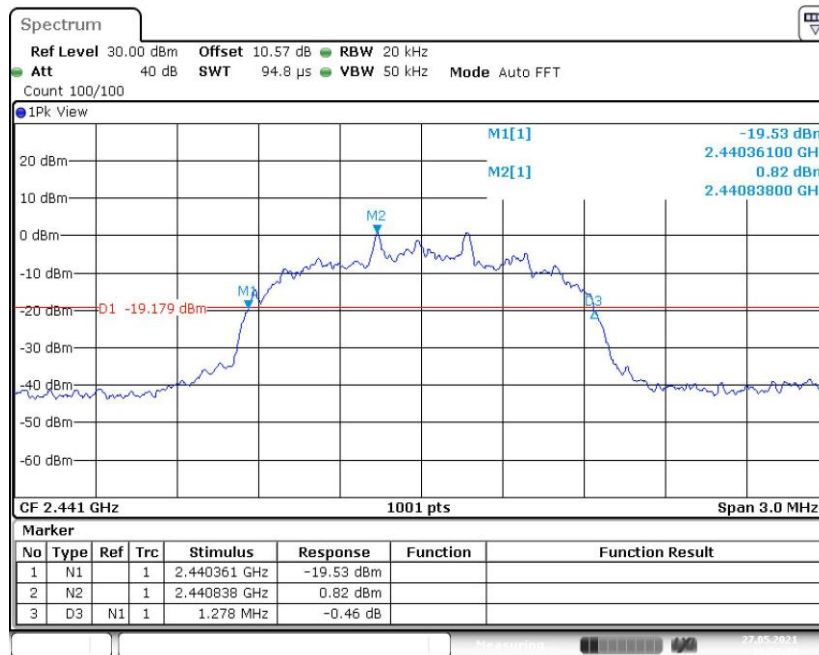


Fig. 65 20dB Bandwidth (8DPSK, CH39)

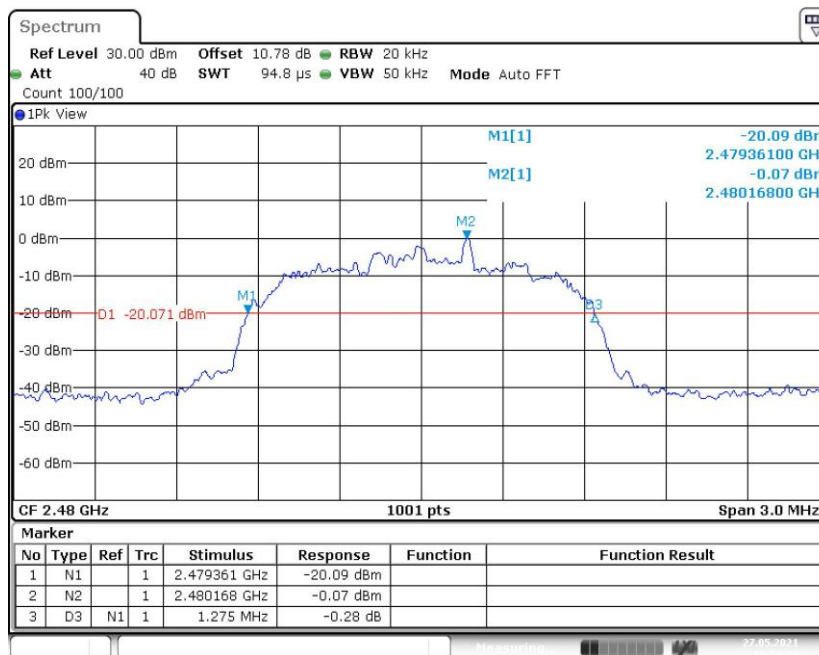


Fig. 66 20dB Bandwidth (8DPSK, CH78)



### A.6 Time of Occupancy (Dwell Time)

**Measurement Limit:**

Standard	Limit (ms)
FCC 47 CFR Part 15.247(a)	< 400

**Measurement Results:**

Mode	Channel	Packet	BurstWidth (ms)		TotalHops (Num)		Result (ms)	Conclusion
GFSK	39	DH5	Fig.67	2.89	Fig.68	100	289.00	<b>P</b>
$\pi/4$ DQPSK	39	2-DH5	Fig.69	2.86	Fig.70	90	258.00	<b>P</b>
8DPSK	39	3-DH5	Fig.71	2.86	Fig.72	100	286.00	<b>P</b>

See below for test graphs.

**Conclusion: Pass**

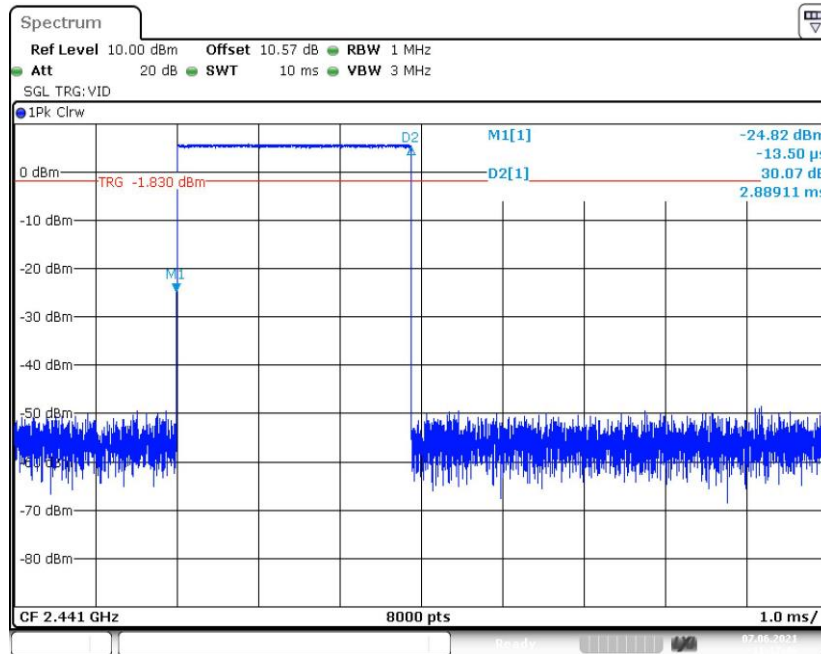


Fig. 67 BurstWidth (Dwell Time) (GFSK, CH39)

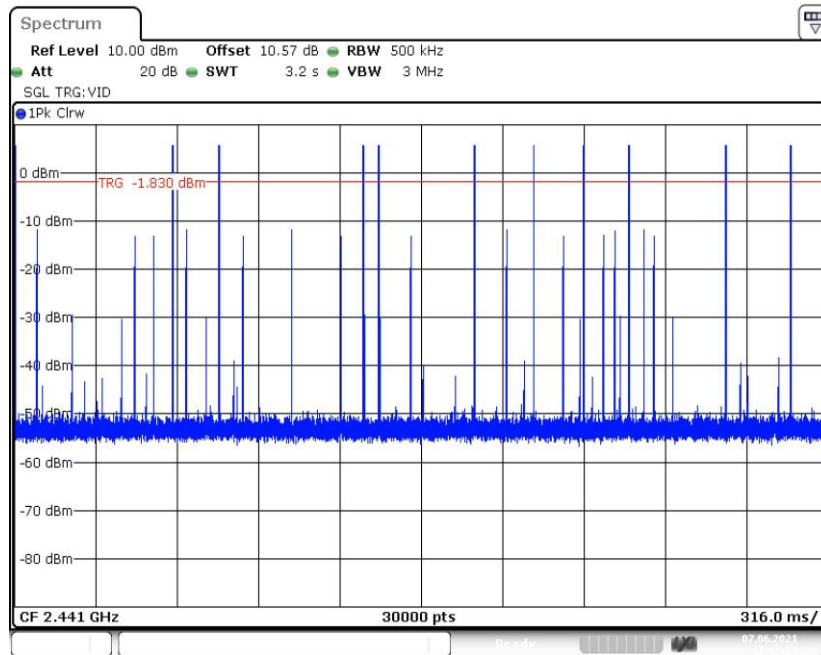


Fig. 68 Number of Burst in Observation Period (Dwell Time) (GFSK, CH39)



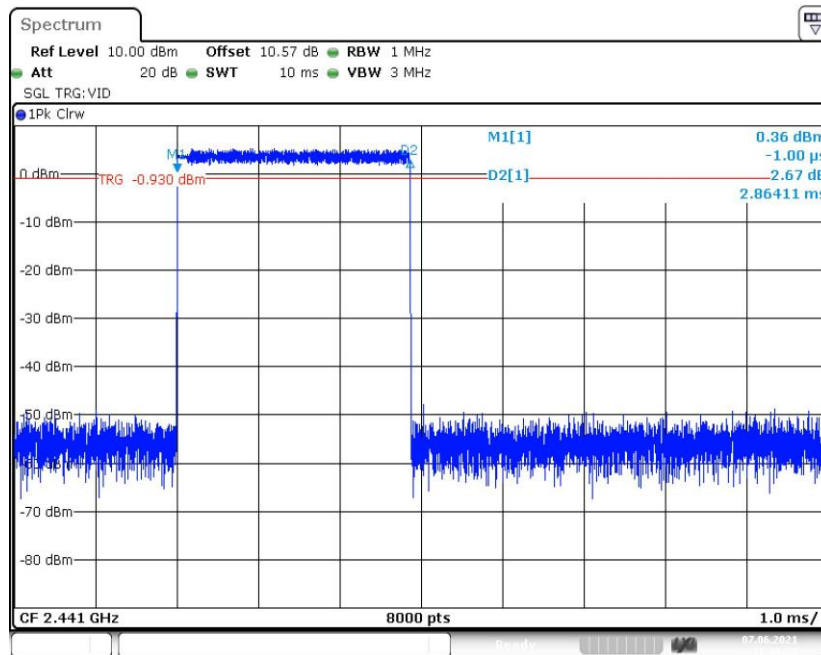


Fig. 69 BurstWidth (Dwell Time) ( $\pi/4$  DQPSK, CH39)

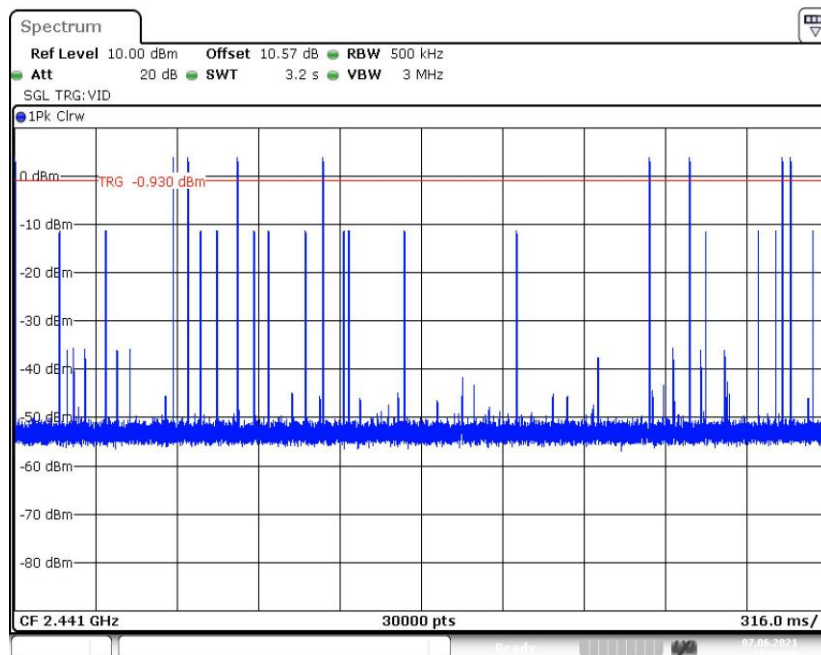


Fig. 70 Number of Burst in Observation Period (Dwell Time) ( $\pi/4$  DQPSK, CH39)