



RSS-119, ISSUE 12 MAY 2015  
RSS-GEN, ISSUE 5 MARCH 2019  
TEST REPORT

For

**Tersus GNSS Inc.**

Rm 203, Building 2, No. 666 Zhangheng Road, Zhangjiang Hi-tech Park Pudong Shanghai, P.R.C  
Shanghai 201200 China

**IC: 25725-OSCAR**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Surveying GNSS Receiver
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<b>Report Number:</b>	RSHA191209001-08C
<b>Report Date:</b>	2021-04-09
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Applicant:	Tersus GNSS Inc.
Tested Model:	Oscar Ultimate
Series Model	Oscar Advanced, Oscar Basic
Product Type:	Surveying GNSS Receiver
Power Supply:	DC 9V~28V from external power supply and DC 7.4V from battery
RF Function:	UHF
Operating Band/Frequency:	410-430 MHz, 450-470 MHz
Modulation Mode:	4FSK
Channel Separation:	12.5 kHz
*Maximum Antenna Gain:	5.5 dBi
Rated Power:	H: 2.0W, L: 0.5W

*Note 1: The maximum antenna gain was declared by the manufacturer.*

*Note 2: The difference between tested model and series model was explained in the attached declaration letter.*

*All measurement and test data in this report was gathered from production sample serial number: RSHA191209001-1 (Assigned by BACL, Kunshan). The EUT was received on 2019-12-09.*

### Objective

This type approval report is prepared on behalf of *Tersus GNSS Inc.* in accordance with RSS-119, Issue 12, May 2015 and RSS-GEN, Issue 5, MARCH 2019 of the Innovation, Science and Economic Development Canada.

### Related Submittal(s)/Grant(s)

RSS-247 submissions with IC: 25725-OSCAR.

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with the ISED RSS-119, Issue 12, May 2015.

Applicable standard: ISED RSS- 119, Issue 12, May 2015-Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz and ANSI C63.26-2015,American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

**Measurement Uncertainty**

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a typical fashion (as normally used by a typical user)

### EUT Exercise Software

No software was used during the test.

### Support Equipment List and Details

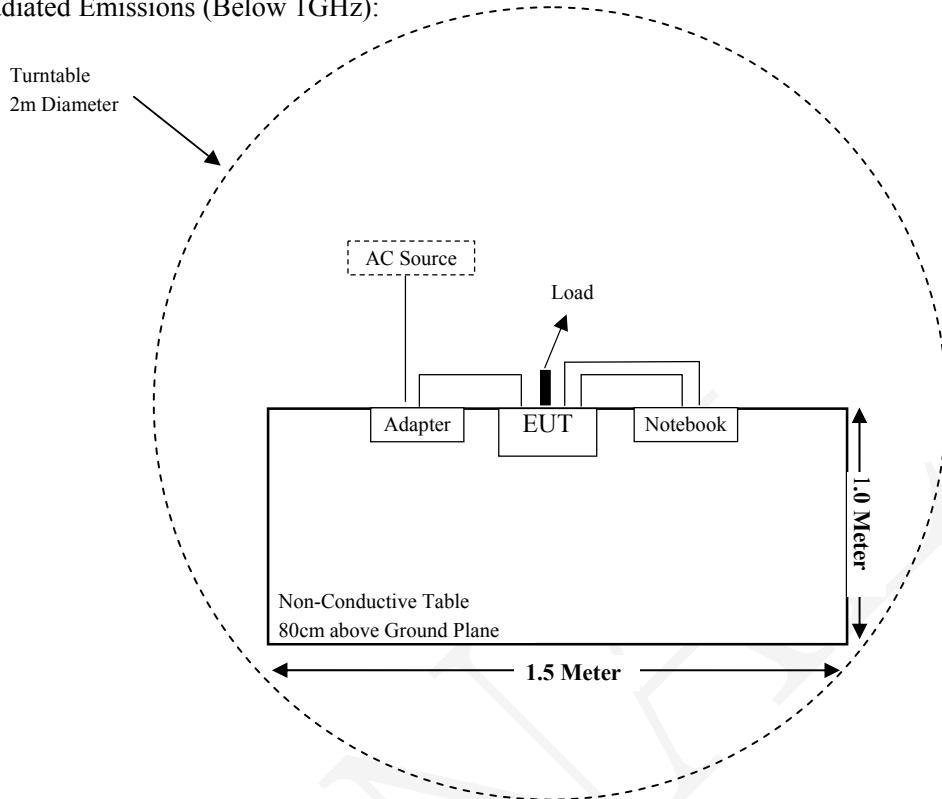
Manufacturer	Description	Model	Serial Number
DELL	Notebook	E6410	3094742521
SHENZHENTIANYIN ELECTRONICS CO.,LTD	Adapter	TPA-46B050100UVU	Unknow
Unknow	Load	Unknow	Unknow
Unknow	Socket	Unknow	Unknow

### External I/O Cable

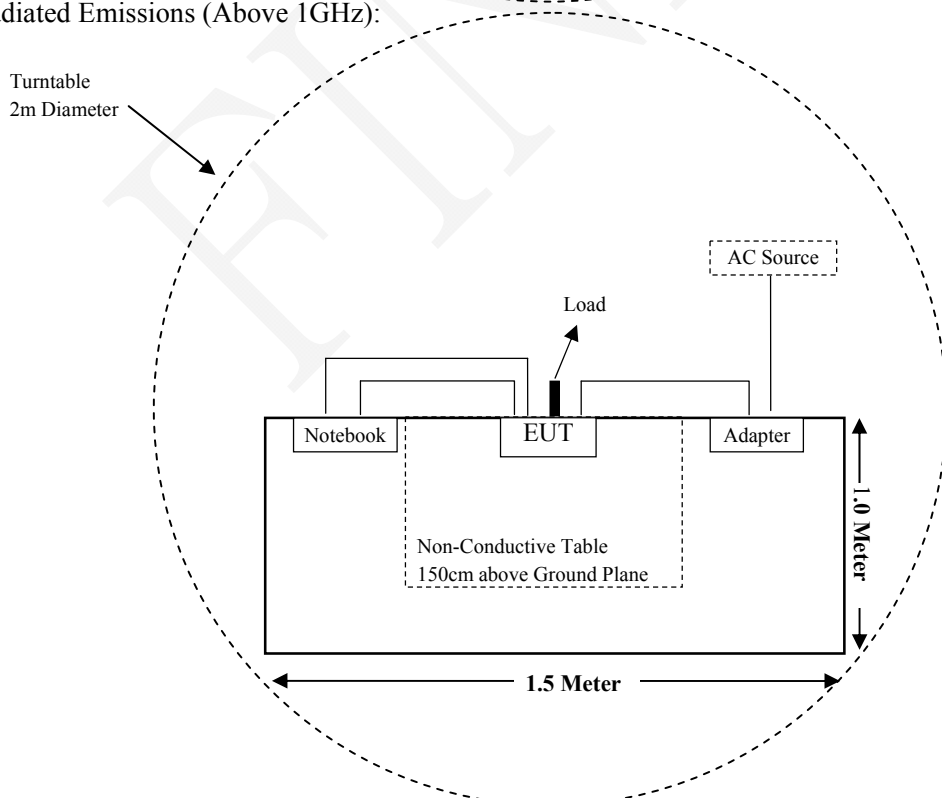
Cable Description	Length (m)	From Port	To
Data Cable	1.5	EUT	Notebook
Data Cable	1.0	EUT	Notebook
Power Cable	1.5	EUT	Adapter
Power Cable	1.0	Adapter	AC Source

### Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



**SUMMARY OF TEST RESULTS**

<b>RSS-119&amp;RSS Gen Rules</b>	<b>Description of Test</b>	<b>Result</b>
RSS-102	RF Exposure Evaluation	Compliant
RSS-119 § 5.1	Interface Impedance	Compliant
RSS-119 § 5.2	Type of Modulation	Compliant
RSS-119 § 5.3	Transmitter Frequency stability	Compliant
RSS-119 § 5.4	Transmitter Output power	Compliant
RSS-119 § 5.5	Occupied Bandwidth	Compliant
RSS-119 § 5.8	Transmitter Unwanted Emission (Radiated)	Compliant
RSS-119 § 5.8	Transmitter Unwanted Emission (Conducted)	Compliant
RSS-119 § 5.9	Transient Frequency Behavior	Compliant
RSS-119 § 5.11; RSS-Gen §7	Receiver Spurious Emissions	Not Applicable

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 1#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-12-14	2020-12-13
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-12-26	2020-12-25
Sunol Sciences	Bilog antenna	JB3	A060217	2020-11-28	2023-11-27
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3115	6229	2020-01-07	2023-01-06
A.H.Systems, inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-12-12	2020-12-11
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14
<b>RF Conducted Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2019-12-14	2020-12-13
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2020-12-14	2021-12-13
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048/027	2020-11-27	2021-11-26
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2020-07-28	2021-07-27
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
Narda	Attenuator	30dB	030	2020-08-15	2021-08-14
Tersus GNSS Inc.	RF Cable	Tersus GNSS Inc. C01	C01	Each Time	/

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).



## RSS-102 §RF EXPOSURE EVALUATION

According to RSS-102 Clause 4:

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada’s RF exposure guideline, Safety Code 6

**Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>23</sup>	170	180	-	Instantaneous <sup>*</sup>
0.1-10	-	1.6/ <i>f</i>	-	6 <sup>**</sup>
1.29-10	193/ <i>f</i> <sup>0.5</sup>	-	-	6 <sup>**</sup>
10-20	61.4	0.163	-10	6
20-48	129.8/ <i>f</i> <sup>0.25</sup>	0.3444/ <i>f</i> <sup>0.25</sup>	44.72/ <i>f</i> <sup>0.5</sup>	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 <i>f</i> <sup>0.25</sup>	0.04138 <i>f</i> <sup>0.25</sup>	0.6455 <i>f</i> <sup>0.5</sup>	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.354 <i>f</i> <sup>0.5</sup>	9.40 × 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	3.33 × 10 <sup>-4</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>

**Note:** *f* is frequency in MHz.  
<sup>\*</sup> Based on nerve stimulation (NS).  
<sup>\*\*</sup> Based on specific absorption rate (SAR).

S = PG/4 π R<sup>2</sup> = power density (in appropriate units, e.g. W/m<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., W);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., m);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Test Result**

RF exposure evaluation at 30 cm distance:

**Based on Uncontrolled Environment:**

Mode	Frequency Range (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune-up EIRP		Power Density (W/m <sup>2</sup> )	RF Exp. Limit (W/m <sup>2</sup> )	Ratio
				(dBm)	(W)			
802.11b	2412-2462	20.0	1.0	21.00	0.126	0.1113	5.3660	0.0207
802.11g	2412-2462	21.5	1.0	22.50	0.178	0.1572	5.3660	<b>0.0293</b>
802.11n-HT20	2412-2462	18.5	1.0	19.50	0.089	0.0788	5.3660	0.0147
802.11n-HT40	2422-2452	15.5	1.0	16.50	0.045	0.0395	5.3812	0.0073
BLE	2402-2480	10.0	1.0	11.00	0.013	0.0111	5.3508	0.0021
BT	2402-2480	12.5	1.0	13.50	0.022	0.0198	5.3508	0.0037
WCDMA Band II	1850-1910	24.0	1.0	25.00	0.316	0.2796	4.4763	0.0625
WCDMA Band V	824-849	24.0	1.0	25.00	0.316	0.2796	2.5756	<b>0.1086</b>
LTE Band 2	1850-1910	23.5	1.0	24.50	0.282	0.2492	4.4763	0.0557
LTE Band 4	1710-1755	23.5	1.0	24.50	0.282	0.2492	4.2419	0.0587
LTE Band 5	824-849	23.0	1.0	24.00	0.251	0.2221	2.5756	0.0862
LTE Band 12	699-716	23.0	1.0	24.00	0.251	0.2221	2.3017	0.0965
LTE Band 13	777-787	23.0	1.0	24.00	0.251	0.2221	2.4743	0.0898
LTE Band 17	704-716	23.0	1.0	24.00	0.251	0.2221	2.3130	0.0960

**UHF:(Based on Controlled Environment)**

Mode	Channel Spacing	Frequency Range (MHz)	Tune-up Conducted Power(dBm)	Antenna Gain (dBi)	Tune-up EIRP		Power Density (W/m <sup>2</sup> )	RF Exp. Limit (W/m <sup>2</sup> )	Ratio
					(dBm)	(W)			
UHF	12.5 kHz	410~430	34.00	5.5	39.50	8.913	7.8794	13.07	0.6029
		450~470	33.50	5.5	39.00	7.943	7.0225	13.69	0.5130

**Note:**

1. The tune-up output power was declared by the Manufacturer.
2. The LTE/3G module IC: 5131A-LE910NAV2(Grant: 07/05/2016).
3. 2.4G Wi-Fi/BT/BLE, WCDMA and UHF can transmit simultaneously; the worst condition is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0293 + 0.1086 + 0.6029 = 0.7408 < 1.0$$

Conclusion: The device meets RF exposure limits at 30 cm distance.

## **RSS-119 §5.1 - INTERFACE IMPEDANCE**

### **Applicable Standard**

According to According to RSS-119, Issue 12 §5.1, the preferred impedance is 600 ohms resistive for audio frequencies, and 50 ohms for radio frequencies. This product has complied with this requirement

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## RSS-119 §5.3-TRANSMITTER FREQUENCY STABILITY

### Applicable Standard

According to RSS-119, Issue 12 §5.3

### Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The power leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

### Test Data

#### Environmental Conditions

Temperature:	24.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2020-12-07.

Channel Spacing: 12.5 kHz

Reference Frequency: 410.0125MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	410.0118	-0.18	2.5
-20		410.0119	-0.14	
-10		410.012	-0.12	
0		410.0122	-0.08	
10		410.0123	-0.04	
20		410.0126	0.01	
30		410.0128	0.06	
40		410.013	0.12	
50		410.0132	0.17	
20		6.3	410.0131	
20	8.4	410.0129	0.09	

Reference Frequency: 420.0125MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	420.0111	-0.33	2.5
-20		420.0116	-0.20	
-10		420.0122	-0.08	
0		420.0122	-0.06	
10		420.0126	0.01	
20		420.0128	0.07	
30		420.0131	0.14	
40		420.0134	0.21	
50		420.0137	0.27	
20		6.3	420.0128	
20	8.4	420.0123	-0.04	

Reference Frequency: 429.9875MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	429.9861	-0.32	2.5
-20		429.9864	-0.25	
-10		429.9868	-0.17	
0		429.9871	-0.10	
10		429.9874	-0.03	
20		429.9879	0.09	
30		429.9882	0.15	
40		429.9884	0.22	
50		429.9888	0.29	
20		6.3	429.9877	
20	8.4	429.9875	0.01	

Reference Frequency: 450.0125MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	450.0116	-0.19	2.5
-20		450.0117	-0.17	
-10		450.012	-0.12	
0		450.0123	-0.04	
10		450.0127	0.05	
20		450.0129	0.10	
30		450.0131	0.12	
40		450.0133	0.18	
50		450.0135	0.22	
20		6.3	450.013	
20	8.4	450.0129	0.08	

Reference Frequency: 460.0125MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	460.0116	-0.20	2.5
-20		460.0118	-0.15	
-10		460.012	-0.12	
0		460.0122	-0.06	
10		460.0124	-0.02	
20		460.0126	0.03	
30		460.0129	0.08	
40		460.013	0.10	
50		460.0133	0.17	
20		6.3	460.0129	
20	8.4	460.0126	0.03	

Reference Frequency: 469.9875MHz				
Temperature (°C)	Voltage (V <sub>DC</sub> )	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	7.4	469.9863	-0.25	2.5
-20		469.9866	-0.19	
-10		469.9869	-0.12	
0		469.9872	-0.07	
10		469.9874	-0.03	
20		469.9876	0.02	
30		469.988	0.11	
40		469.9883	0.17	
50		469.9886	0.23	
20		6.3	469.9882	
20	8.4	469.988	0.11	

## RSS-119 §5.4- TRANSMITTER OUTPUT POWER

### Applicable Standard

According to RSS-119, Issue 12 §5.4

The output power shall be within  $\pm 1.0\text{dB}$  of the manufacturer's rated power.

### Test Procedure

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

### Test Data

#### Environmental Conditions

Temperature:	24.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2020-01-02.

**Test Result:** Compliant.

Modulation Mode	Channel Spacing	fc (MHz)	Conducted Output Power (W)	
			High	Low
4FSK	12.5 kHz	410.0125	1.91	0.39
		420.0125	2.17	0.51
		429.9875	2.33	0.59
	12.5 kHz	450.0125	2.04	0.60
		460.0125	2.14	0.47
		469.9875	2.14	0.40

Note: The manufacturer's rated power are 2.0W and 0.5W.



**RSS-119 § 5.5& § 5.8-OCCUPIED BANDWIDTH &EMISSION MASK**

**Applicable Standard**

According to RSS-119, Issue 12 § 5.5& § 5.8

**Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	23.5 °C
<b>Relative Humidity:</b>	49 %
<b>ATM Pressure:</b>	101.5 kPa

The testing was performed by Chao Gao on 2021-04-09.

**Test Result:** Compliant.

Test Mode: Transmitting

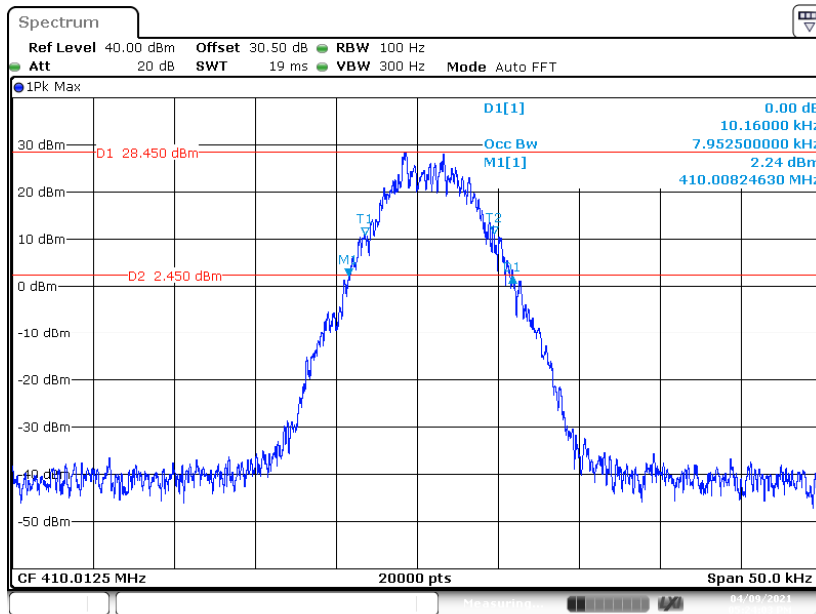
Please refer to the emission mask here in after table and plots:

Modulation Mode	Channel Spacing (kHz)	fc (MHz)	Power level	99% Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Authorized Bandwidth (kHz)
4FSK	12.5 kHz	410.0125	High	7.95	10.16	11.25
			Low	7.97	10.06	11.25
		420.0125	High	7.93	10.16	11.25
			Low	7.92	10.13	11.25
		429.9857	High	7.86	10.01	11.25
			Low	7.95	10.15	11.25

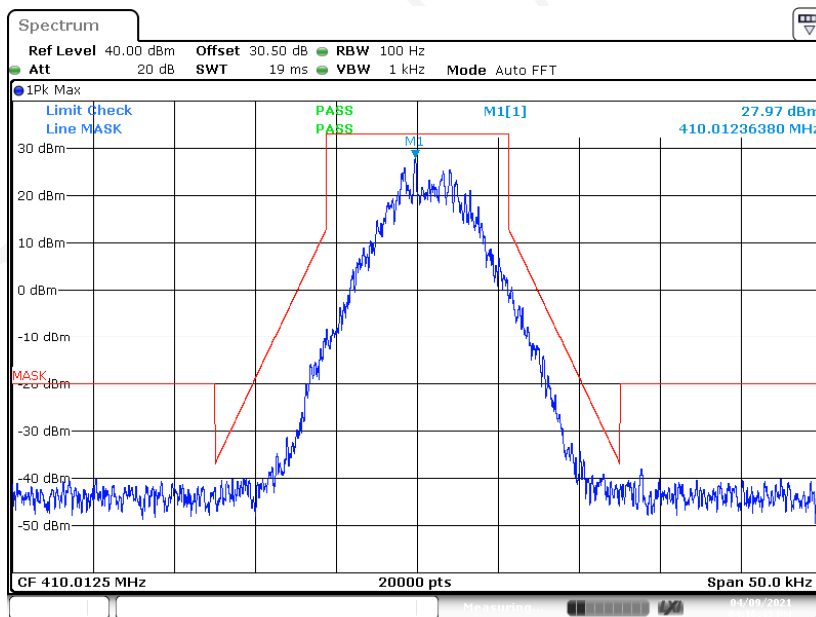
**Note:**

- The occupied bandwidth shall not exceed the authorized bandwidth
  - Emission Designator is base on calculation instead of measurement
- For Digital Mode (Channel Spacing: 12.5 kHz)  
 Emission Designator 7K60F1D and 7K60F1E, the Emission Designator is base on calculation instead of measurement  
 The 99% energy rule was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz.  
 F1D and F1E portion of the designator indicates digital information.  
 Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

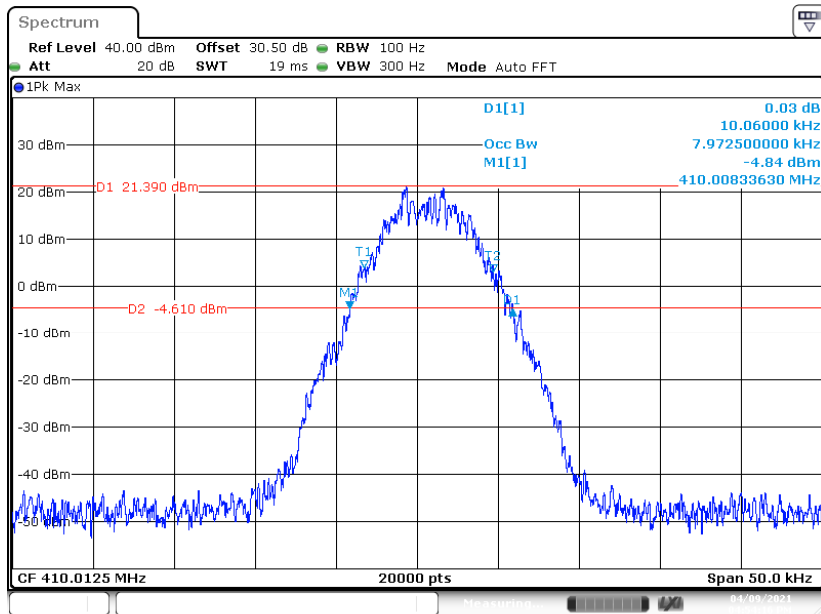
### Occupied Bandwidth-410.0125 MHz (4FSK 12.5kHz), High Power



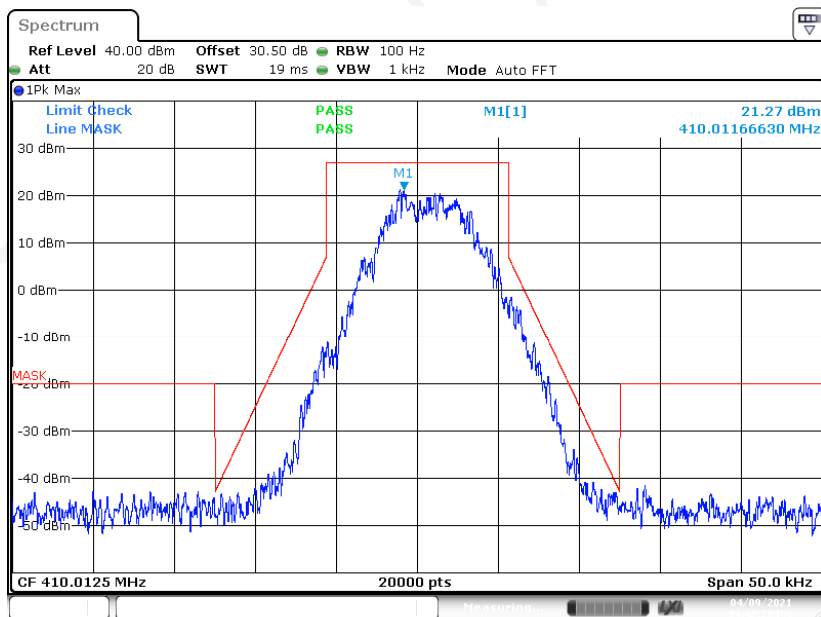
### Emission Mask-Type D



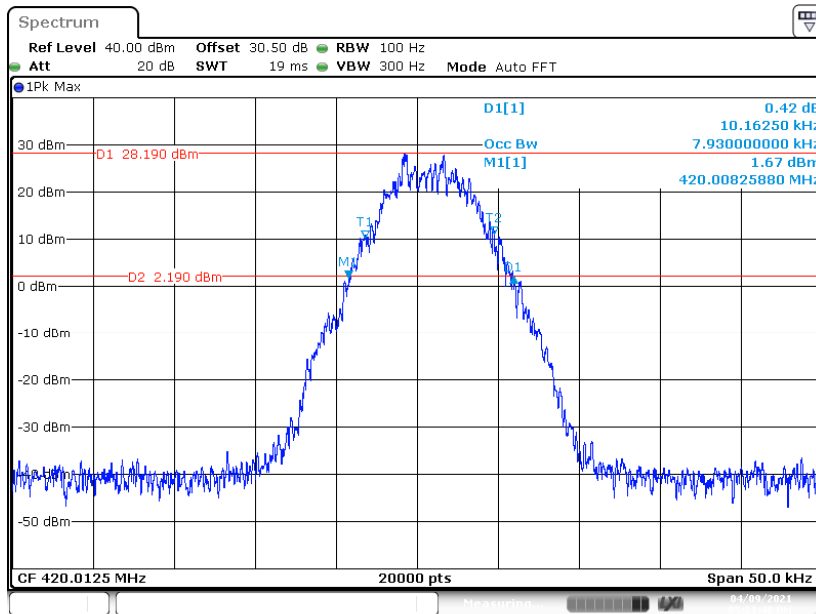
### Occupied Bandwidth-410.0125 MHz (4FSK 12.5kHz), Low Power



### Emission Mask-Type D

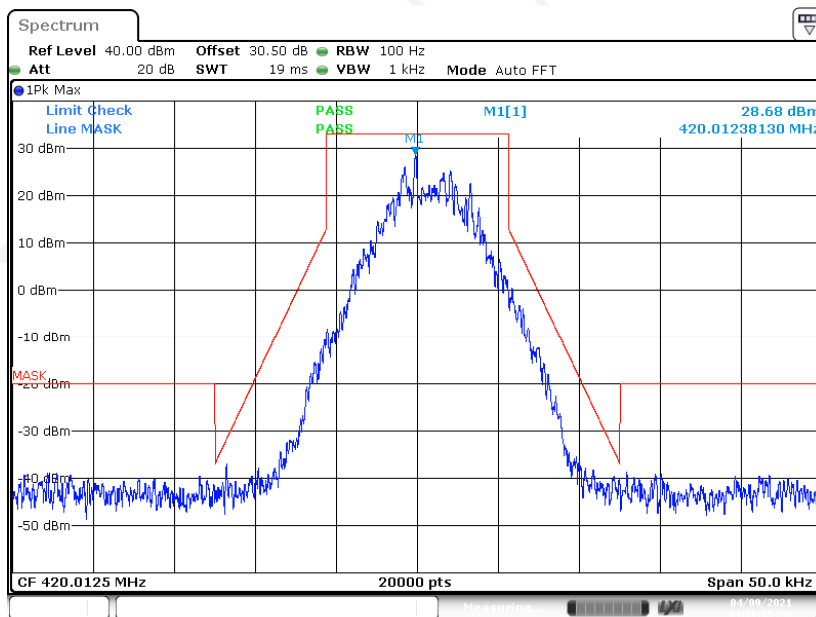


### Occupied Bandwidth-420.0125 MHz (4FSK 12.5kHz), High Power



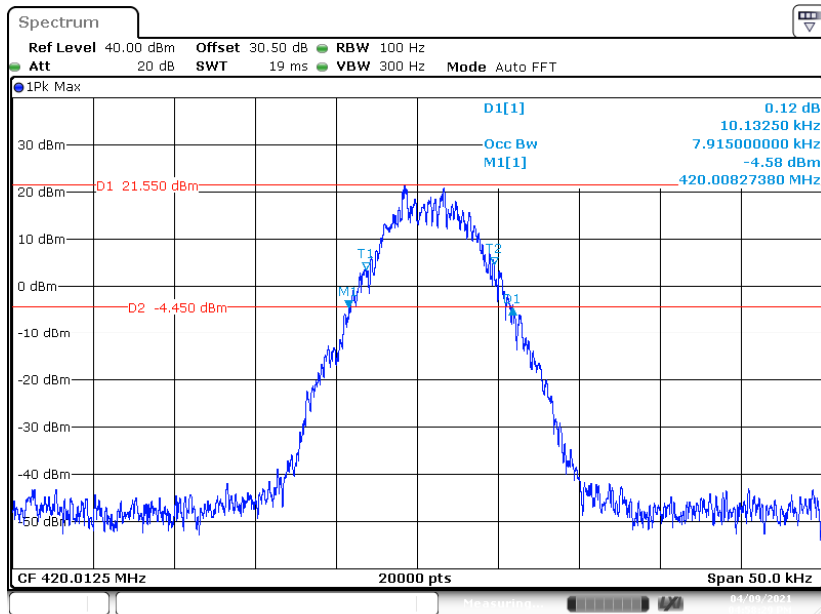
Date: 9.APR.2021 17:21:49

### Emission Mask-Type D



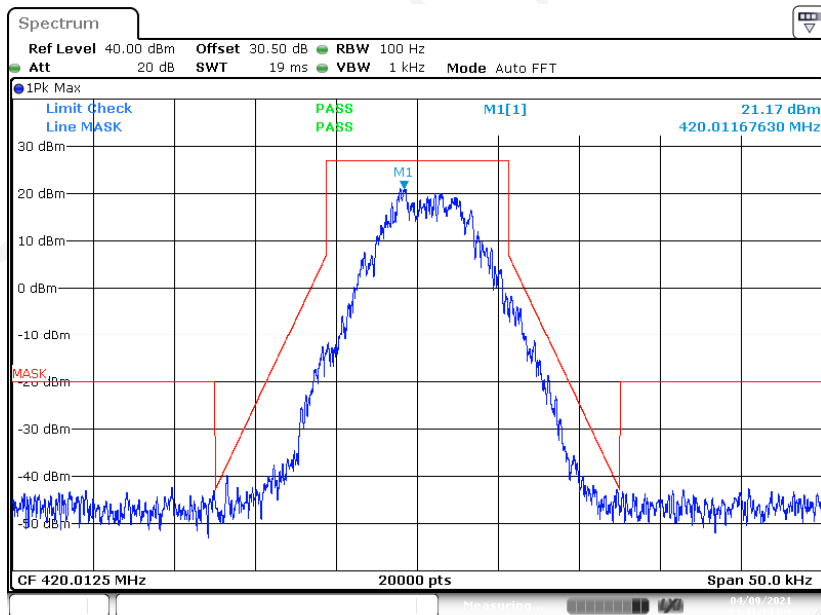
Date: 9.APR.2021 16:18:15

### Occupied Bandwidth-420.0125 MHz (4FSK 12.5kHz), Low Power



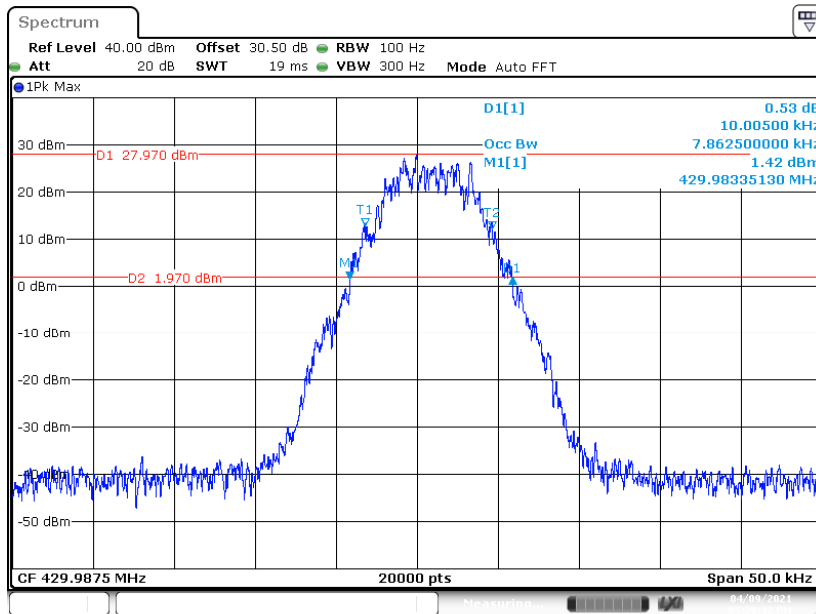
Date: 9.APR.2021 16:58:30

### Emission Mask-Type D



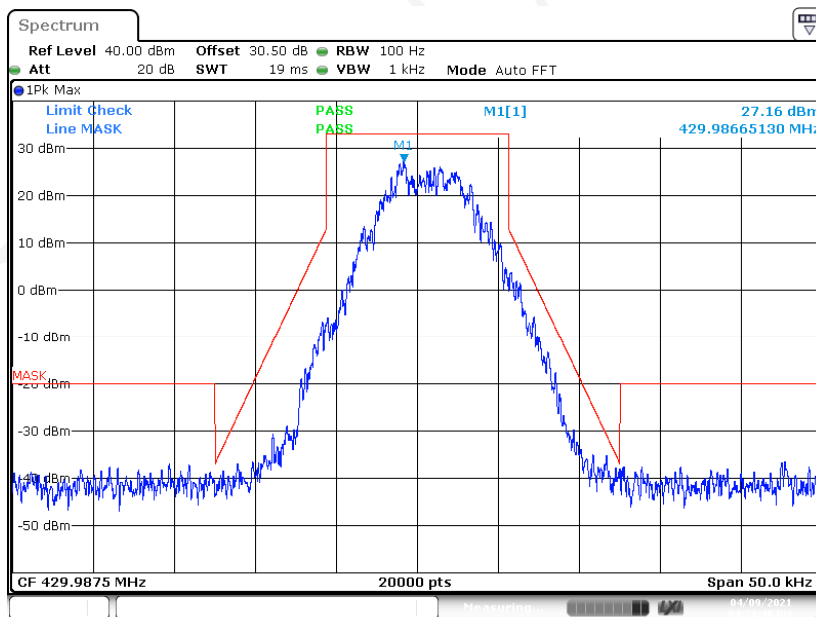
Date: 9.APR.2021 16:41:14

### Occupied Bandwidth-429.9875 MHz (4FSK 12.5kHz), High Power



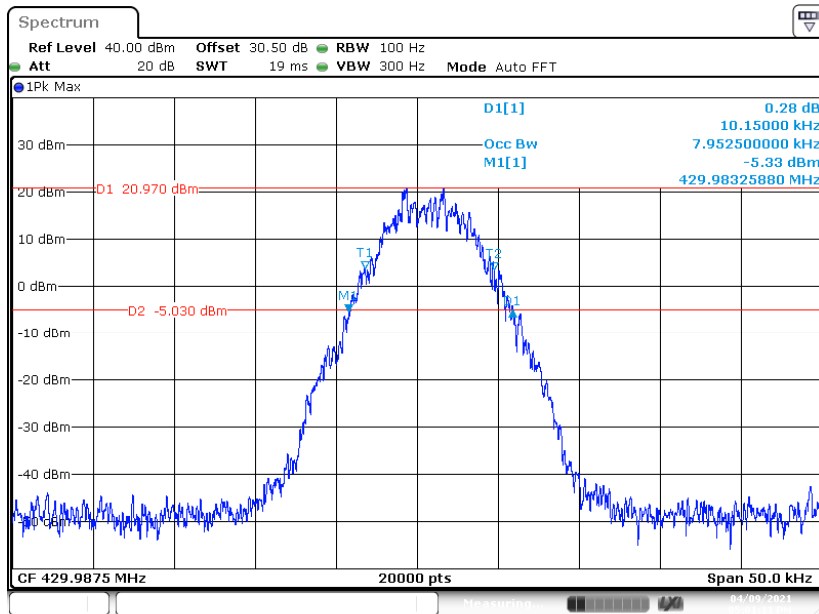
Date: 9.APR.2021 17:20:12

### Emission Mask-Type D



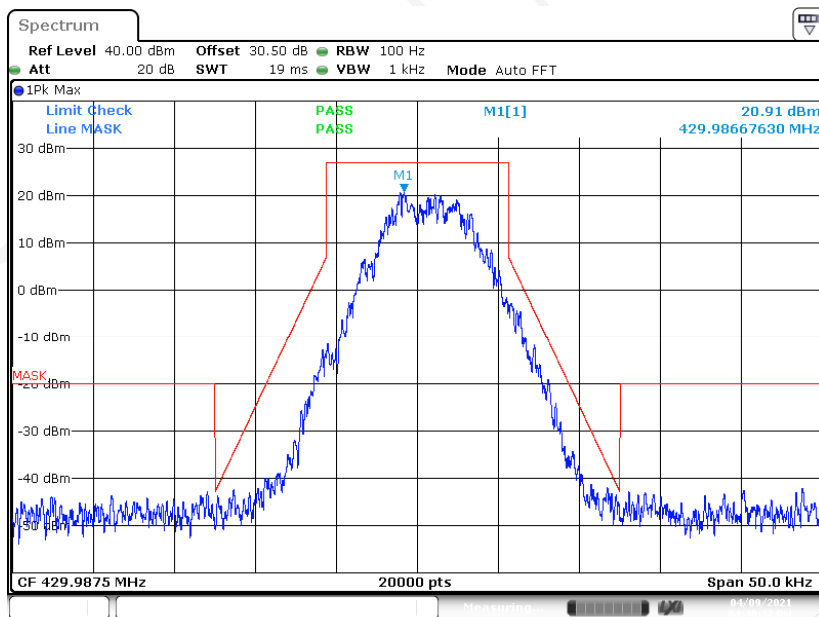
Date: 9.APR.2021 16:21:46

### Occupied Bandwidth-429.9875 MHz (4FSK 12.5kHz), Low Power



Date: 9.APR.2021 17:01:12

### Emission Mask-Type D



Date: 9.APR.2021 16:40:37

Modulation Mode	Channel Spacing (kHz)	fc (MHz)	Power level	99% Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Authorized Bandwidth (kHz)
4FSK	12.5 kHz	450.0125	High	7.94	10.16	11.25
			Low	7.92	10.15	11.25
		460.0125	High	7.92	10.14	11.25
			Low	7.94	10.17	11.25
		469.9857	High	7.82	9.93	11.25
			Low	7.87	9.98	11.25

**Note:**

1. The occupied bandwidth shall not exceed the authorized bandwidth

2. Emission Designator is based on calculation instead of measurement

For Digital Mode (Channel Spacing: 12.5 kHz)

Emission Designator 7K60F1D and 7K60F1E, the Emission Designator is based on calculation instead of measurement

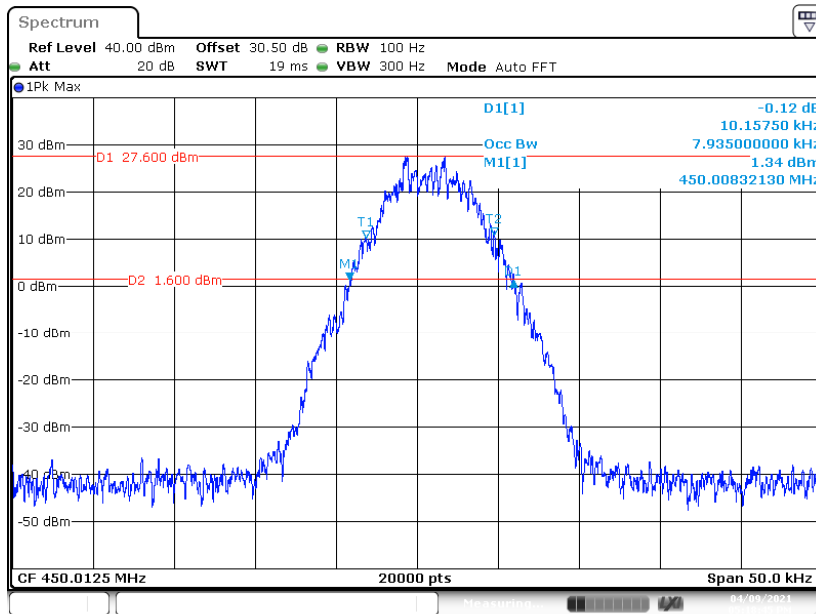
The 99% energy rule was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz.

F1D and F1E portion of the designator indicates digital information.

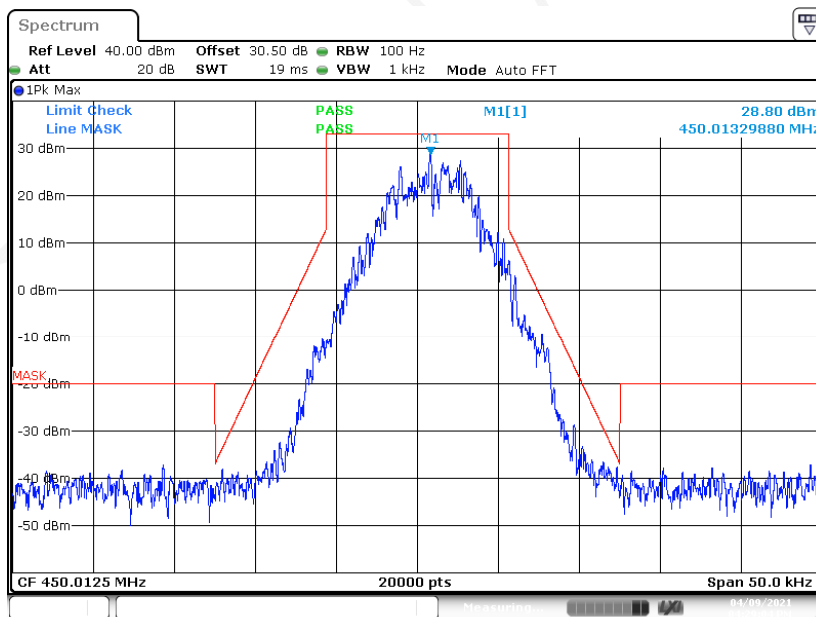
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.



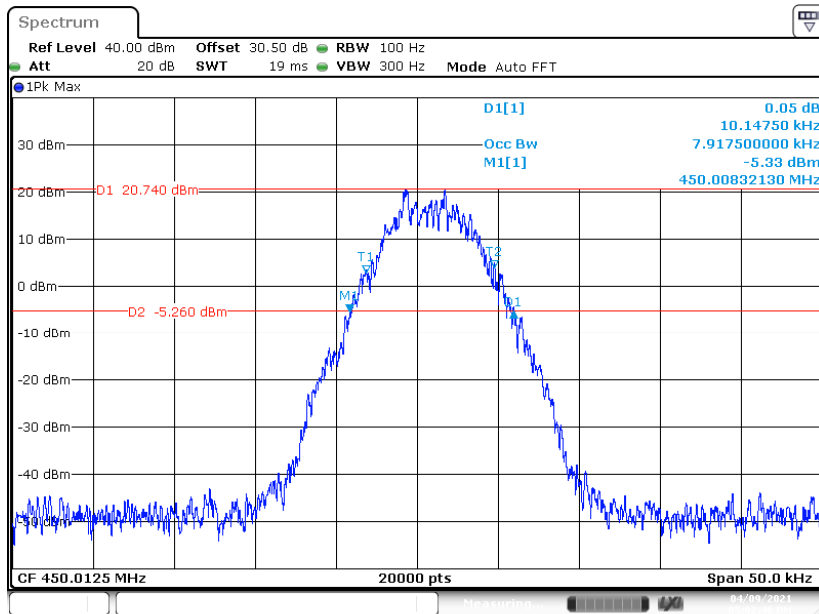
### Occupied Bandwidth-450.0125 MHz (4FSK 12.5kHz), High Power



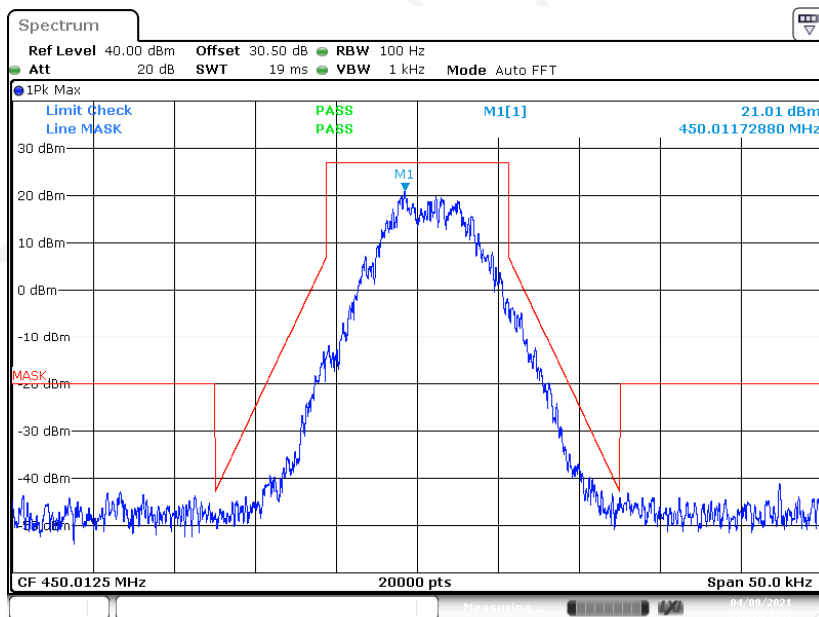
### Emission Mask-Type D



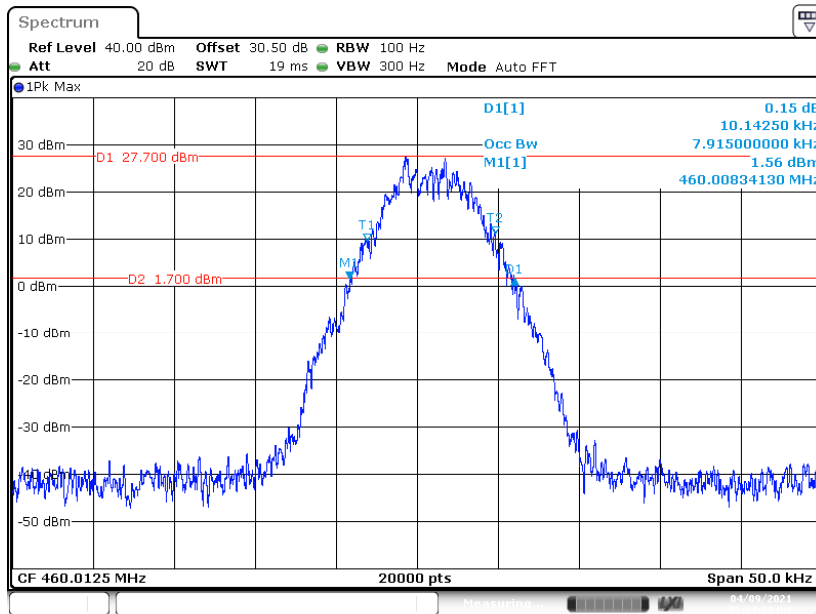
### Occupied Bandwidth-450.0125 MHz (4FSK 12.5kHz), Low Power



### Emission Mask-Type D

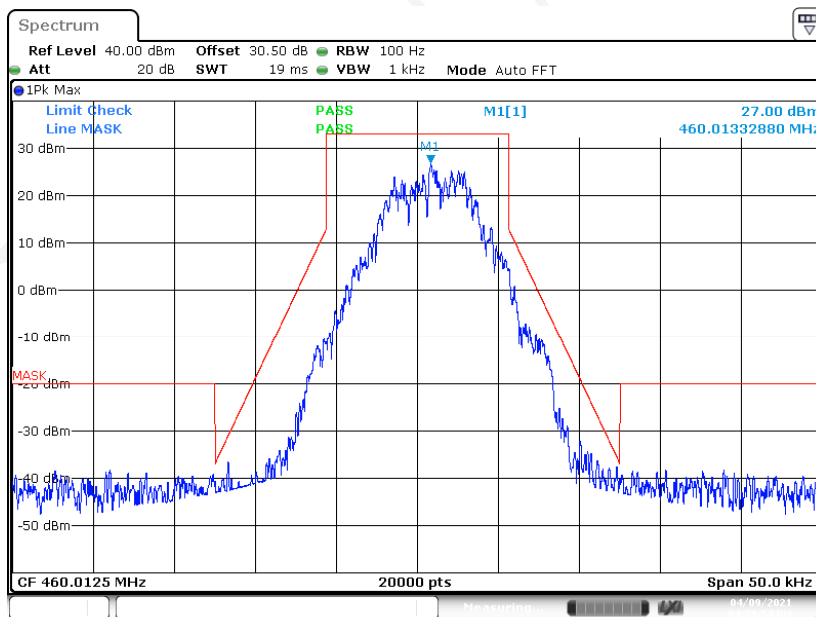


### Occupied Bandwidth-460.0125 MHz (4FSK 12.5kHz), High Power



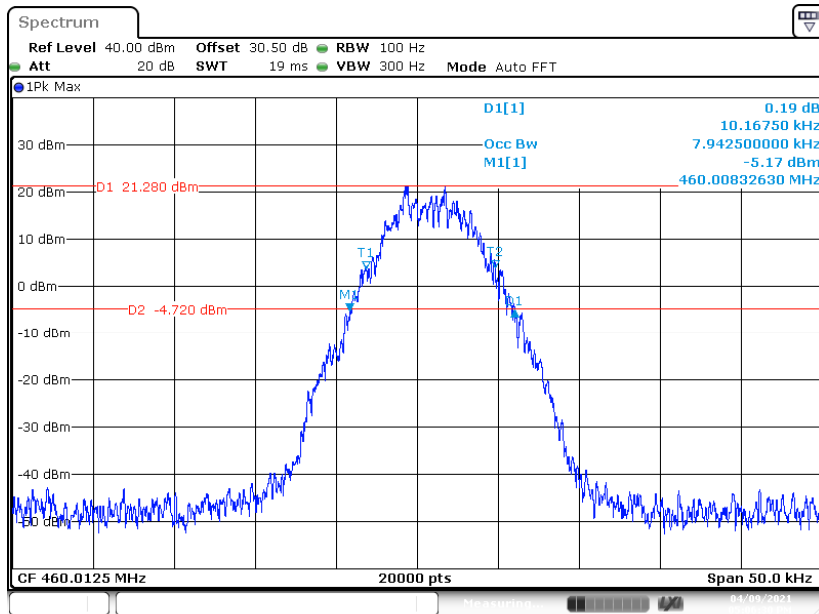
Date: 9.APR.2021 17:14:53

### Emission Mask-Type D



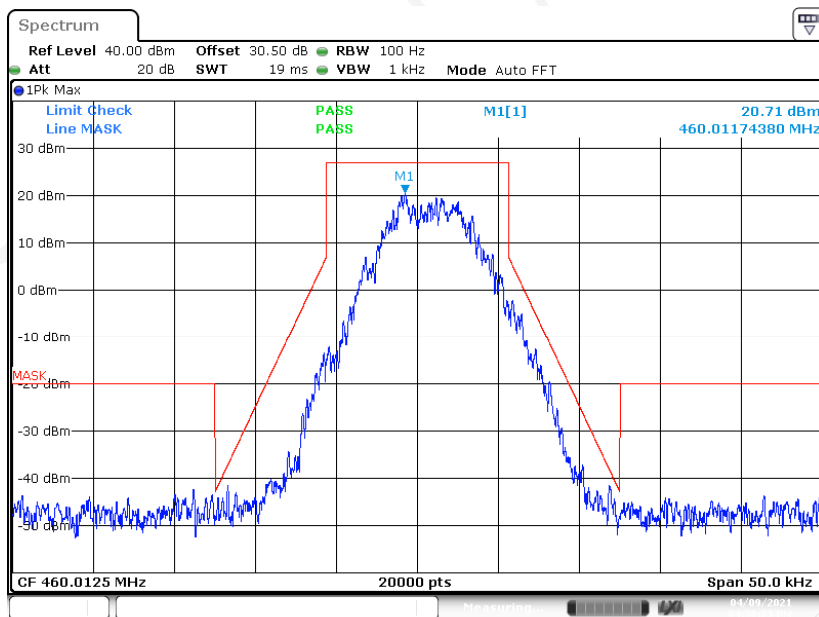
Date: 9.APR.2021 16:29:54

### Occupied Bandwidth-460.0125 MHz (4FSK 12.5kHz), Low Power



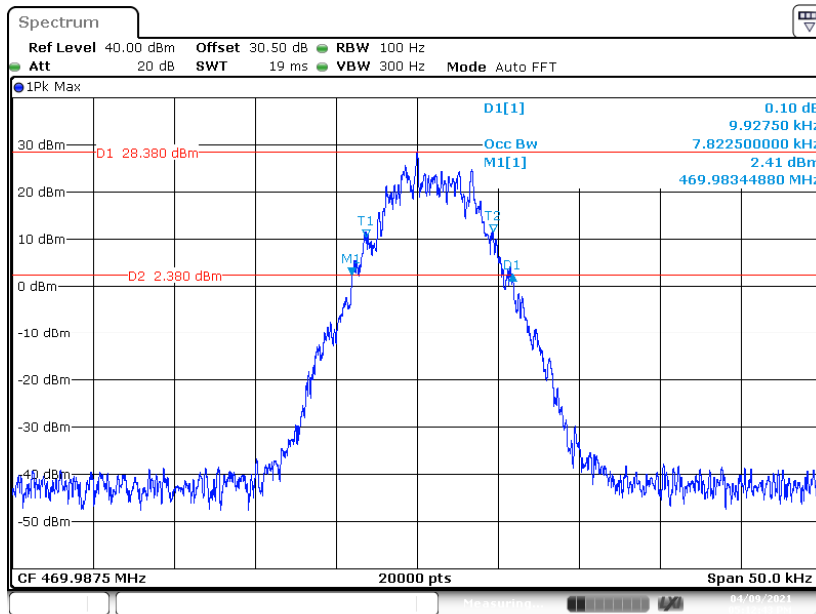
Date: 9.APR.2021 17:06:30

### Emission Mask-Type D



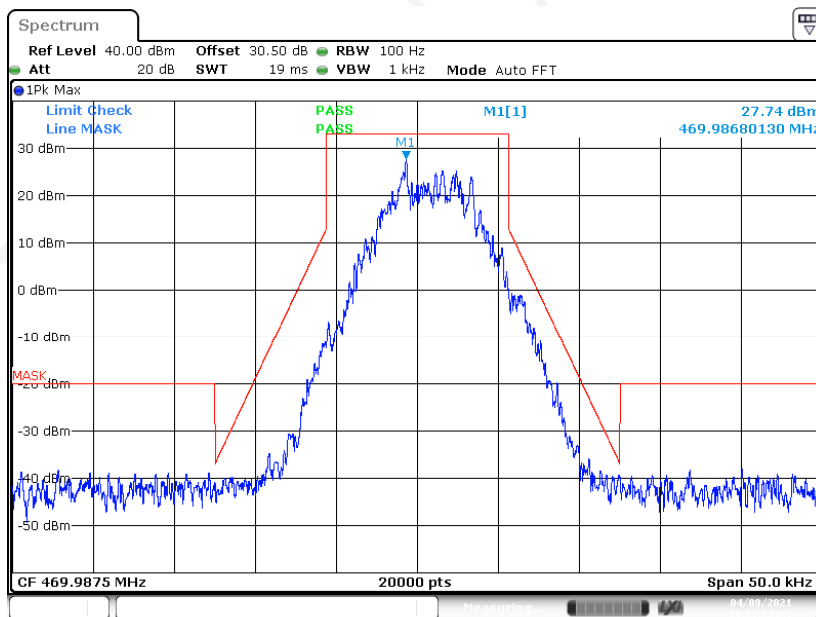
Date: 9.APR.2021 16:38:24

### Occupied Bandwidth-469.9875 MHz (4FSK 12.5kHz), High Power



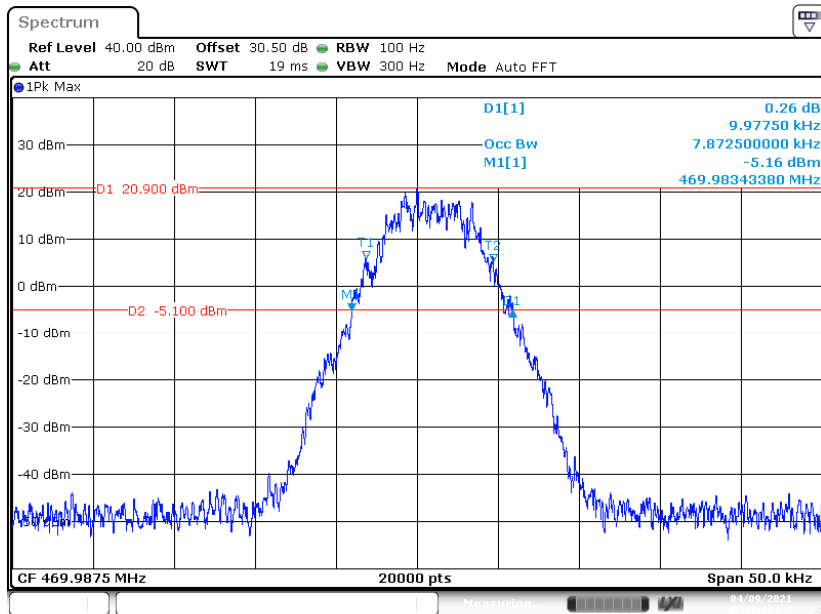
Date: 9.APR.2021 17:12:43

### Emission Mask-Type D



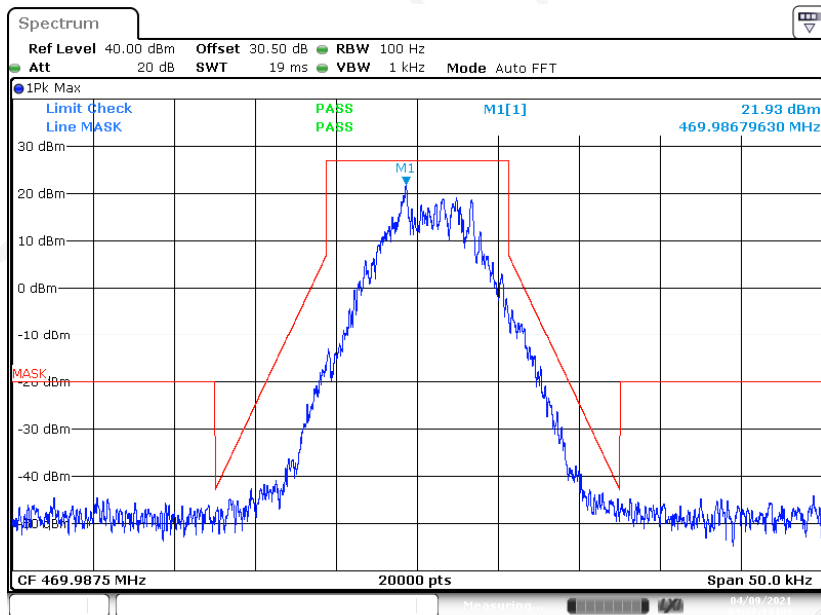
Date: 9.APR.2021 16:33:51

### Occupied Bandwidth-469.9875 MHz (4FSK 12.5kHz), Low Power



Date: 9.APR.2021 17:10:27

### Emission Mask-Type D



Date: 9.APR.2021 16:37:15

## **RSS-119 §5.8- TRANSMITTER UNWANTED EMISSIONS (RADIATED)**

### **Applicable Standard**

According to RSS-119, Issue 12 § 5.8

### **Test Procedure**

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	24.2 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.3 kPa

*The testing was performed by Chao Gao on 2020-12-07.*

**Test Result:** Compliant.

*Test Mode: Transmitting in high power level(worst case)*

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	RSS-119	
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)		Limit (dBm)	Margin (dB)
410.0125 MHz										
820.025	38.45	27	150	H	-57.93	0.62	-1.19	-59.74	-20	39.74
820.025	37.72	254	150	V	-60.65	0.62	-1.19	-62.46	-20	42.46
1533.45	67.08	53	150	H	-47.06	0.83	8.25	-39.64	-20	19.64
1533.45	66.21	261	150	V	-47.93	0.83	8.25	-40.51	-20	20.51
420.0125 MHz										
840.025	38.98	327	150	H	-55.57	0.63	-1.13	-57.33	-20	37.33
840.025	37.66	152	150	V	-60.66	0.63	-1.13	-62.42	-20	42.42
1533.45	67.35	232	150	H	-46.79	0.83	8.25	-39.37	-20	19.37
1533.45	65.77	173	150	V	-48.37	0.83	8.25	-40.95	-20	20.95
429.9875 MHz										
859.975	39.13	317	150	H	-55.25	0.63	-1.07	-56.95	-20	36.95
859.975	38.27	318	150	V	-59.46	0.63	-1.07	-61.16	-20	41.16
1533.45	66.8	177	150	H	-47.34	0.83	8.25	-39.92	-20	19.92
1533.45	65.69	187	150	V	-48.45	0.83	8.25	-41.03	-20	21.03
450.0125 MHz										
900.025	39.87	336	150	H	-57.52	0.63	-0.95	-59.1	-20	39.1
900.025	37.24	139	150	V	-58.26	0.63	-0.95	-59.84	-20	39.84
1533.45	67.3	320	150	H	-46.84	0.83	8.25	-39.42	-20	19.42
1533.45	66.01	245	150	V	-48.13	0.83	8.25	-40.71	-20	20.71
460.0125 MHz										
920.025	40.03	3	150	H	-57.57	0.63	-1.03	-59.23	-20	39.23
920.025	37.57	32	150	V	-57.29	0.63	-1.03	-58.95	-20	38.95
1533.45	68.43	359	150	H	-45.71	0.83	8.25	-38.29	-20	18.29
1533.45	65.99	216	150	V	-48.15	0.83	8.25	-40.73	-20	20.73
469.9875 MHz										
939.975	39.95	91	150	H	-57.86	0.64	-1.11	-59.61	-20	39.61
939.975	37.14	249	150	V	-57.09	0.64	-1.11	-58.84	-20	38.84
1533.45	67.39	81	150	H	-46.75	0.83	8.25	-39.33	-20	19.33
1533.45	65.04	28	150	V	-49.1	0.83	8.25	-41.68	-20	21.68



**RSS-119 §5.8-TRANSMITTER UNWANTED EMISSIONS (CONDUCTED)****Applicable Standard**

According to RSS-119, Issue 12 §5.8

**Test Procedure**

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

**Test Data****Environmental Conditions**

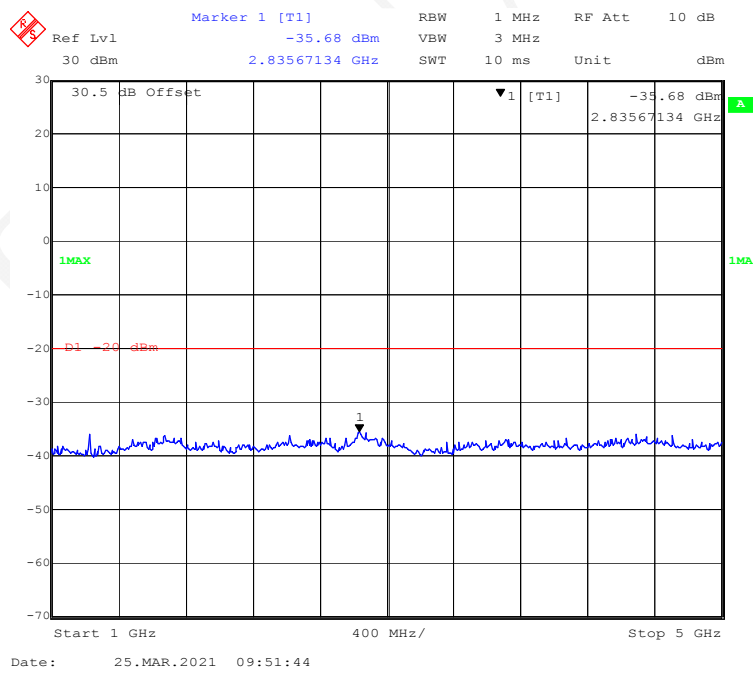
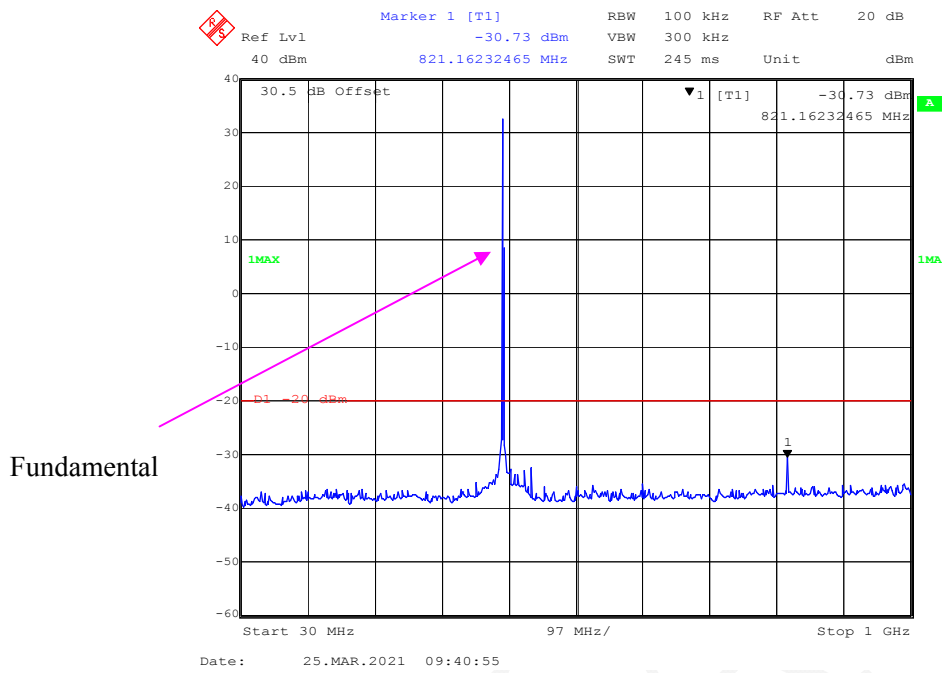
<b>Temperature:</b>	24.1 °C
<b>Relative Humidity:</b>	48%
<b>ATM Pressure:</b>	101.3 kPa

*The testing was performed by Chao Gao on 2020-03-25.*

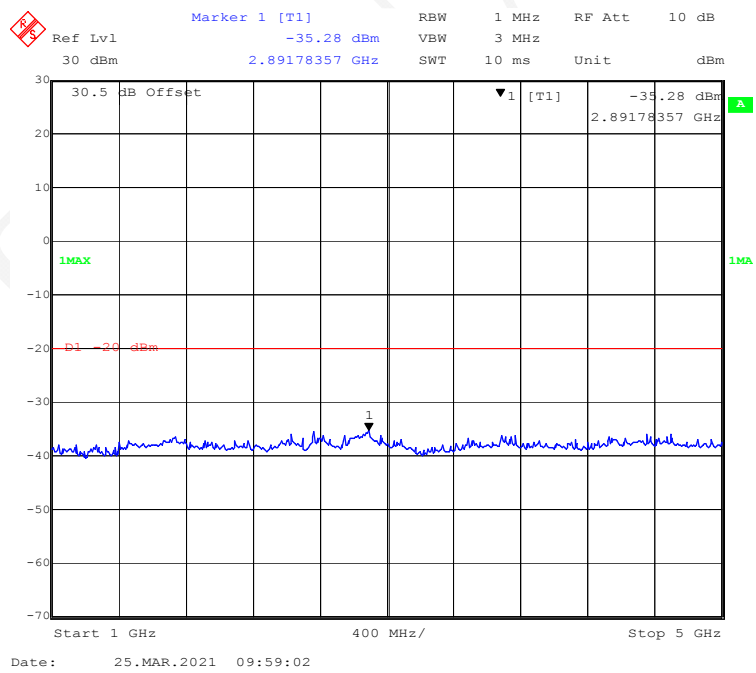
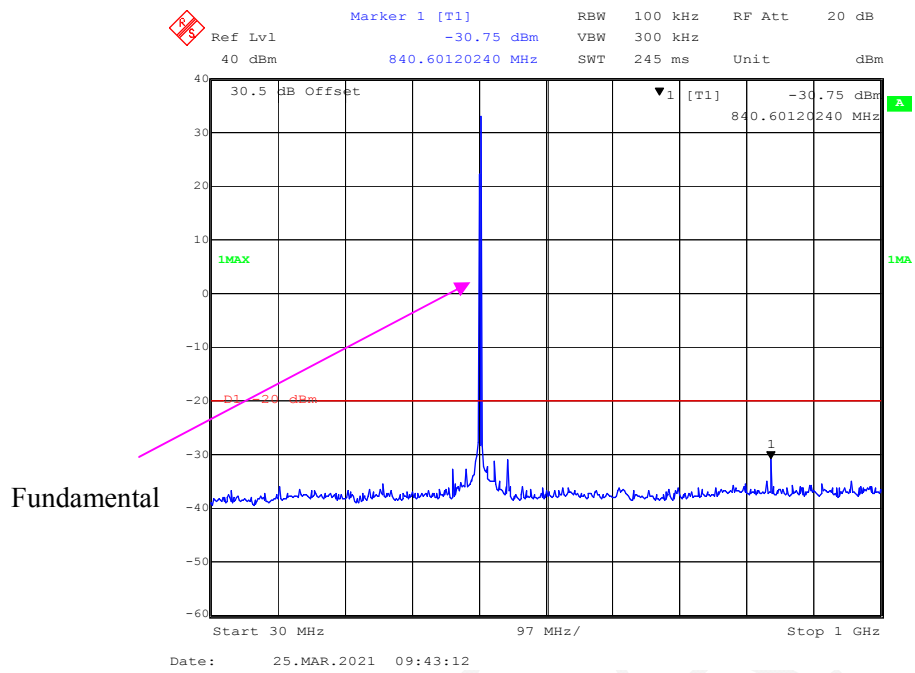
**Test Result:** Compliant.

*Test Mode: Transmitting*

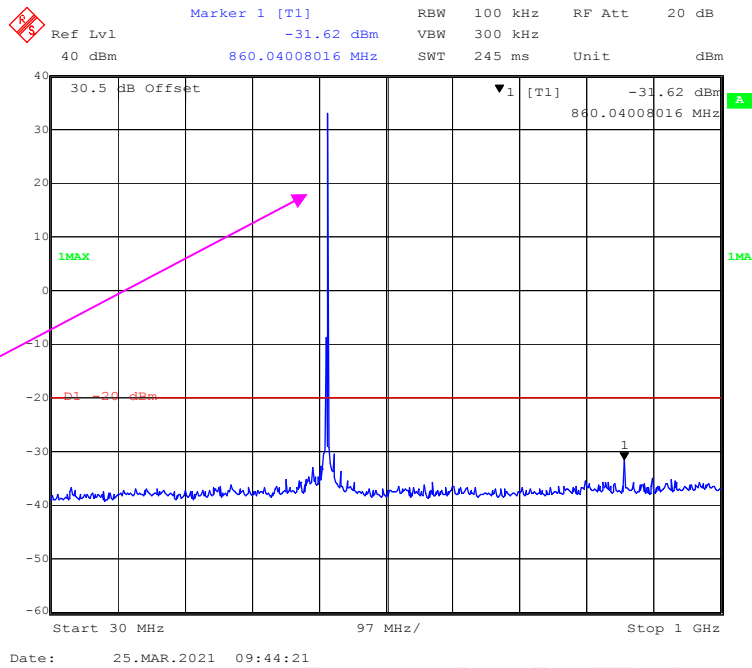
### 410.0125 MHz - 4FSK 12.5 kHz, High Power



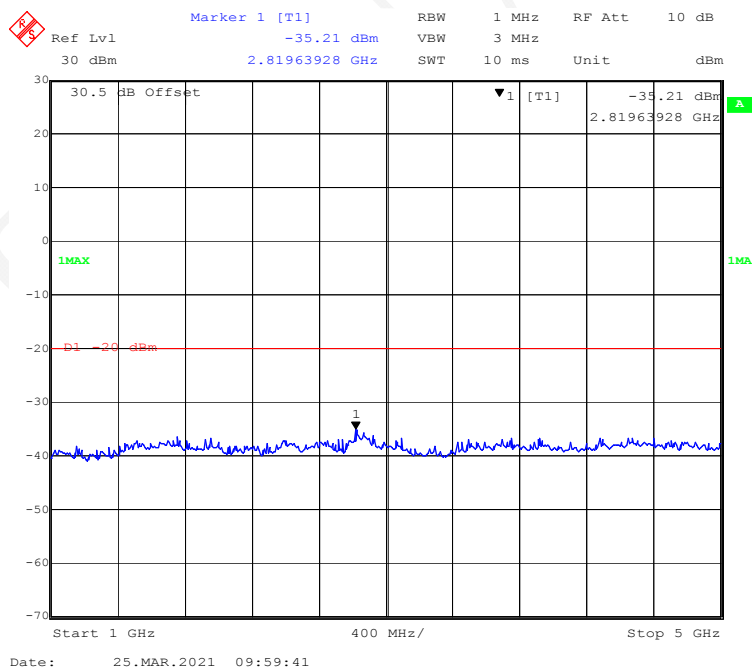
### 420.0125 MHz - 4FSK 12.5 kHz, High Power



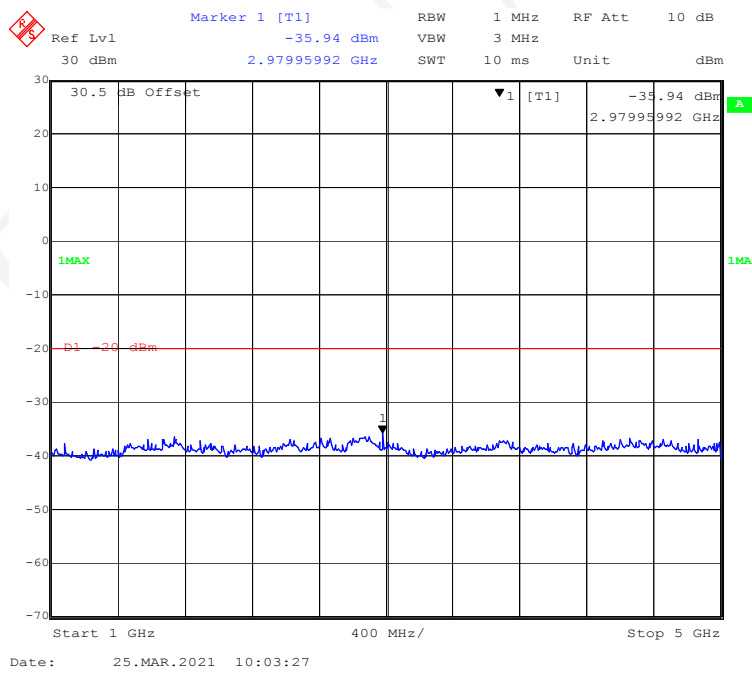
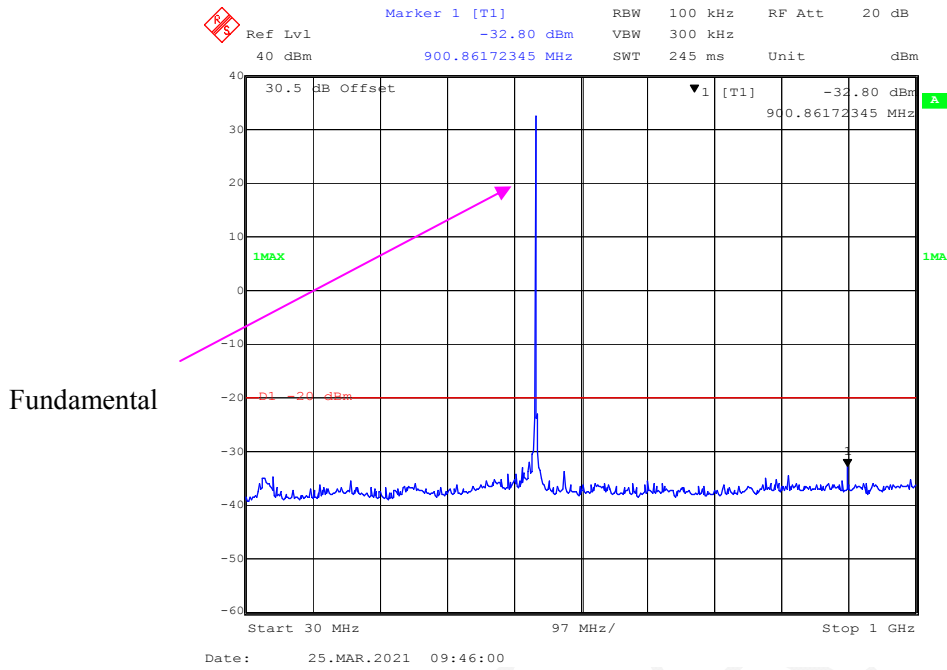
### 429.9875 MHz - 4FSK 12.5 kHz, High Power



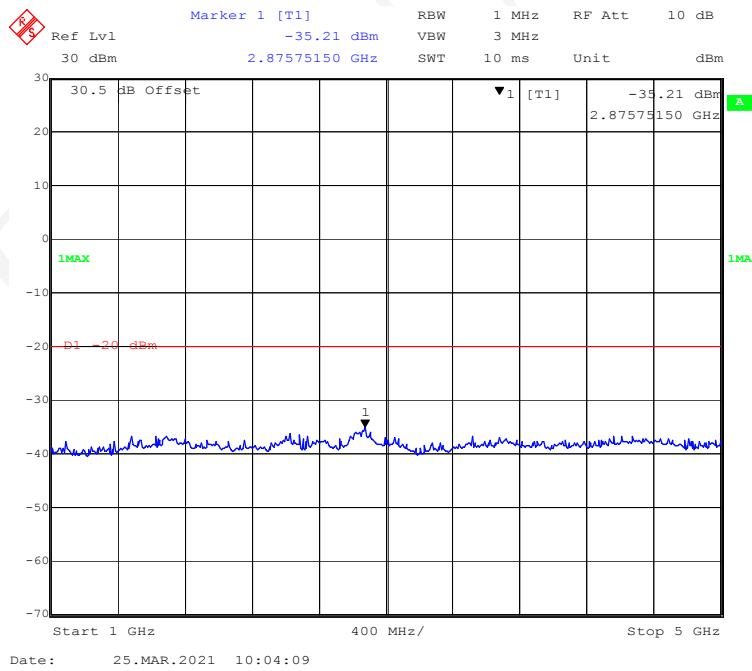
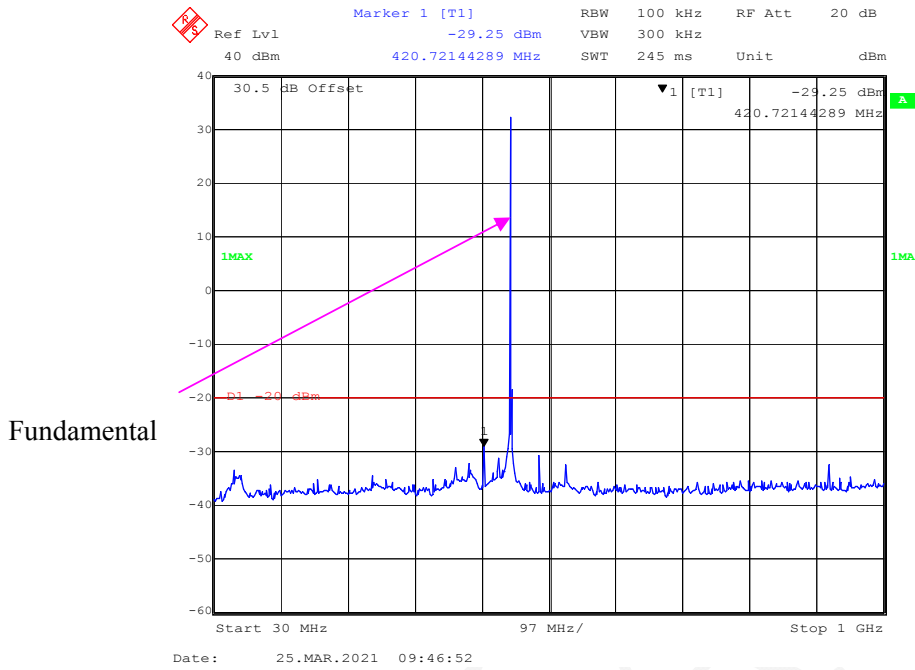
Fundamental



**450.0125 MHz - 4FSK 12.5 kHz, High Power**

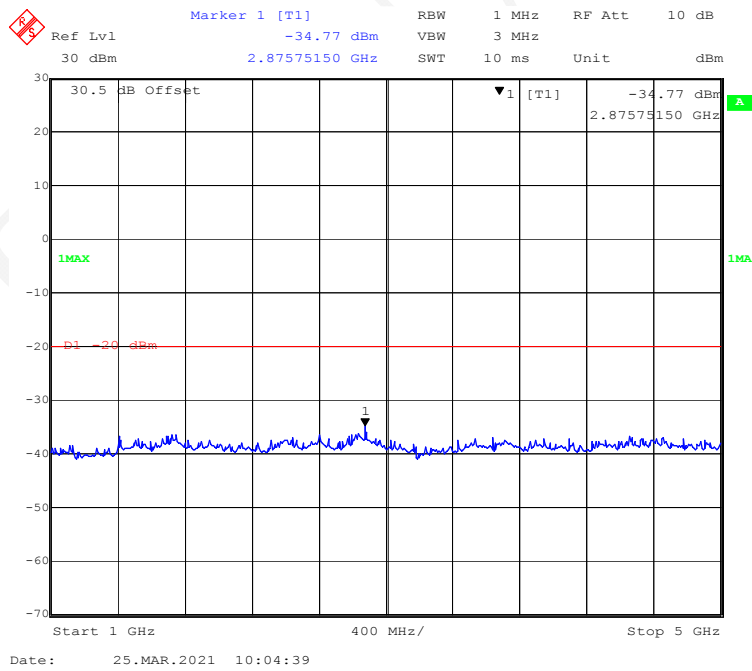
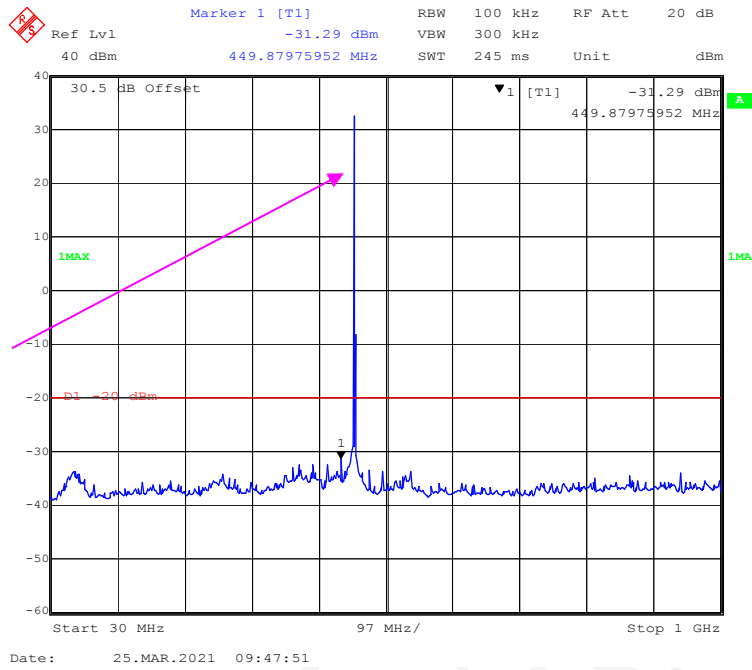


### 460.0125 MHz - 4FSK 12.5 kHz, High Power

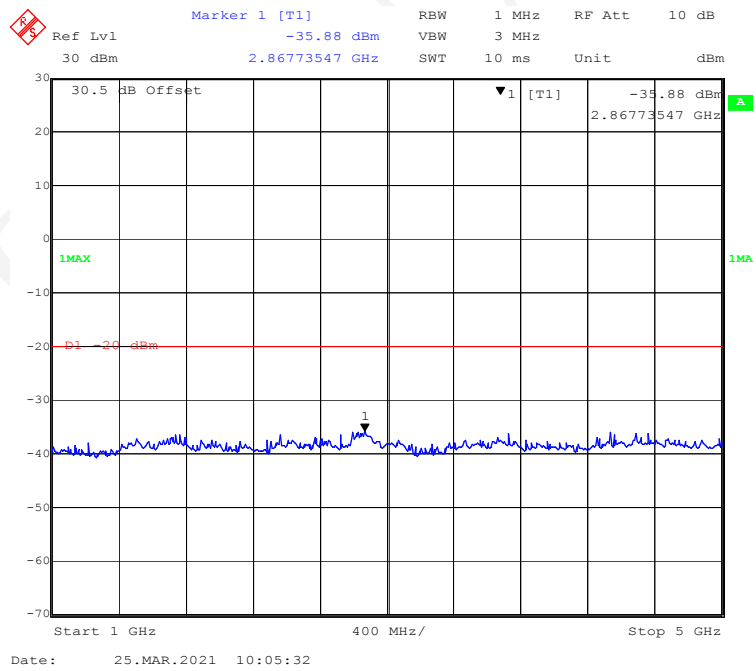
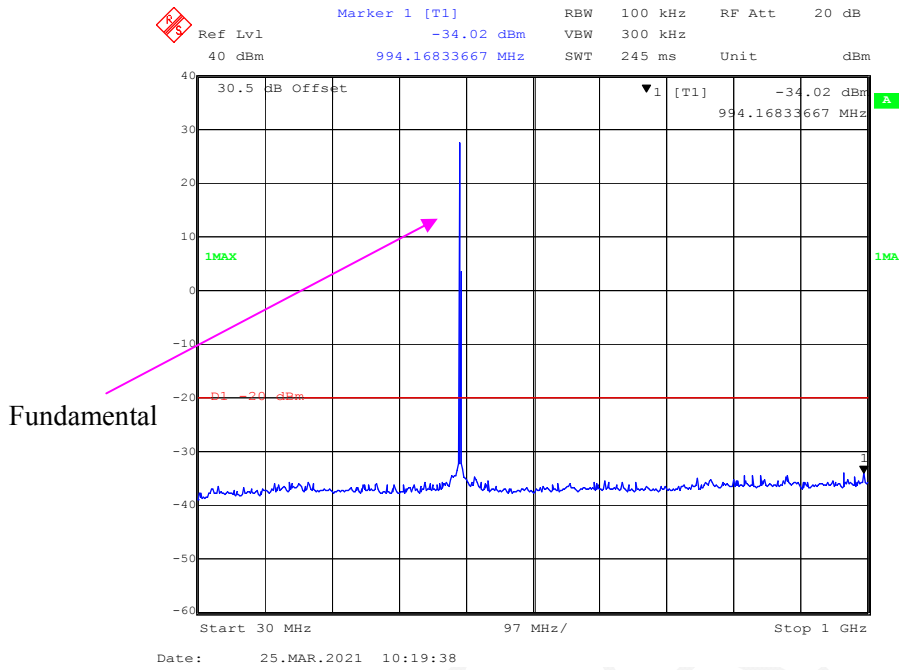


### 469.9875 MHz - 4FSK 12.5 kHz, High Power

Fundamental

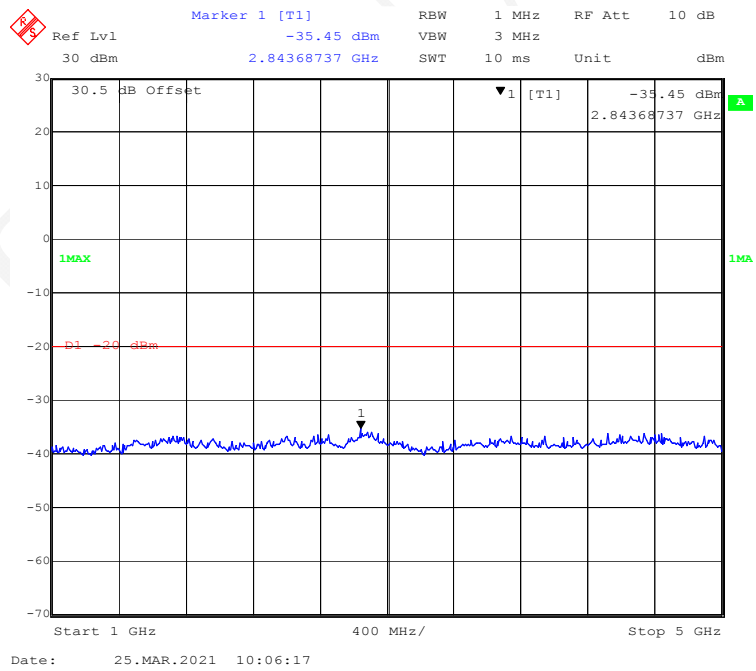
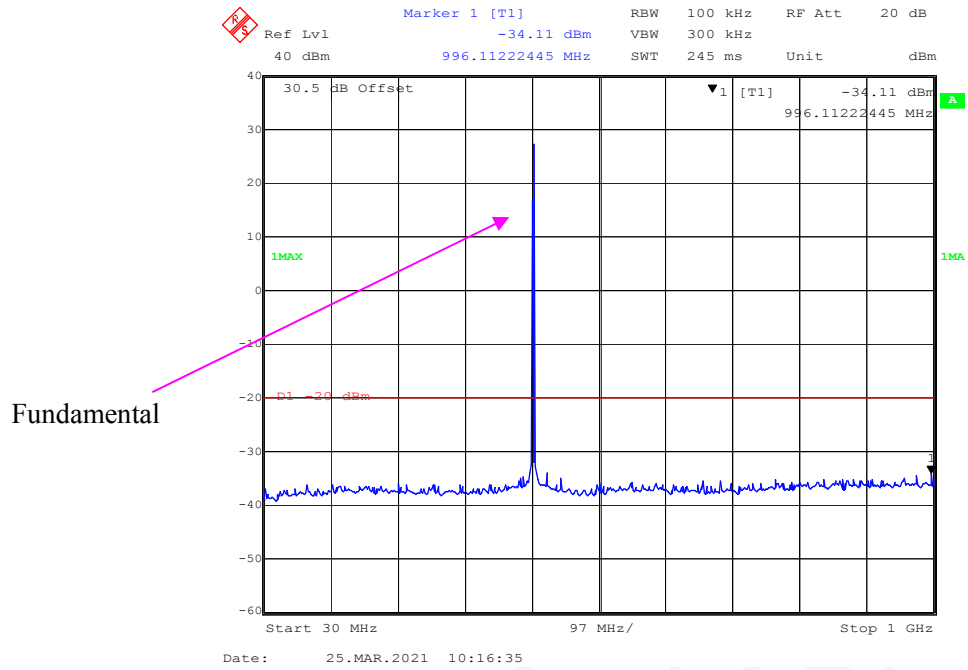


### 410.0125 MHz - 4FSK 12.5 kHz, Low Power

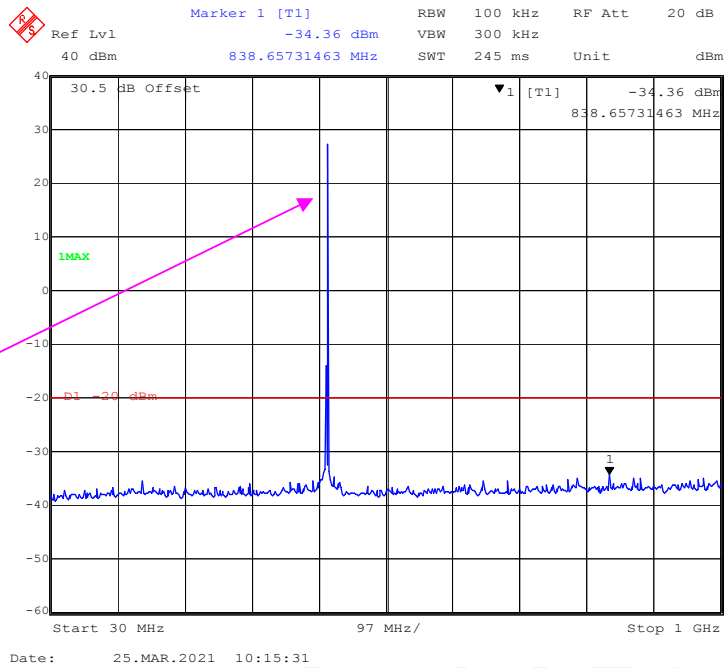




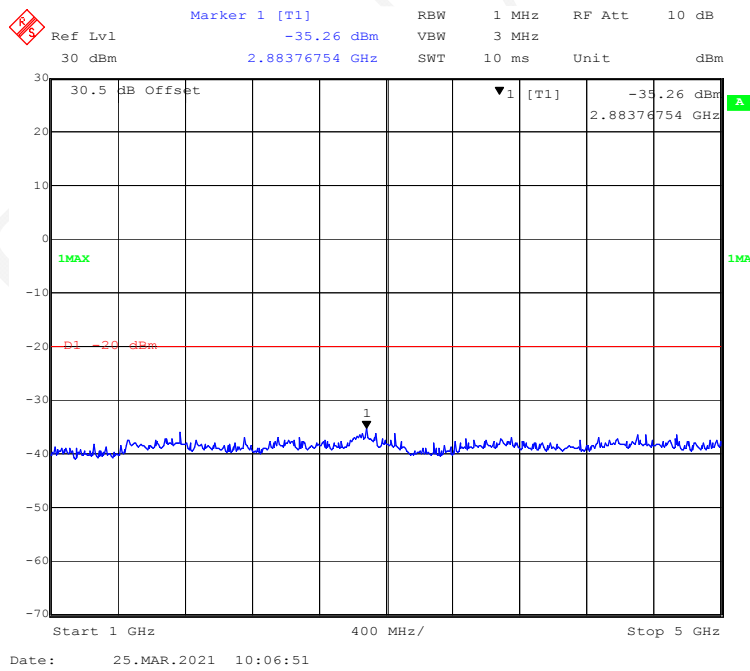
### 420.0125 MHz - 4FSK 12.5 kHz, Low Power



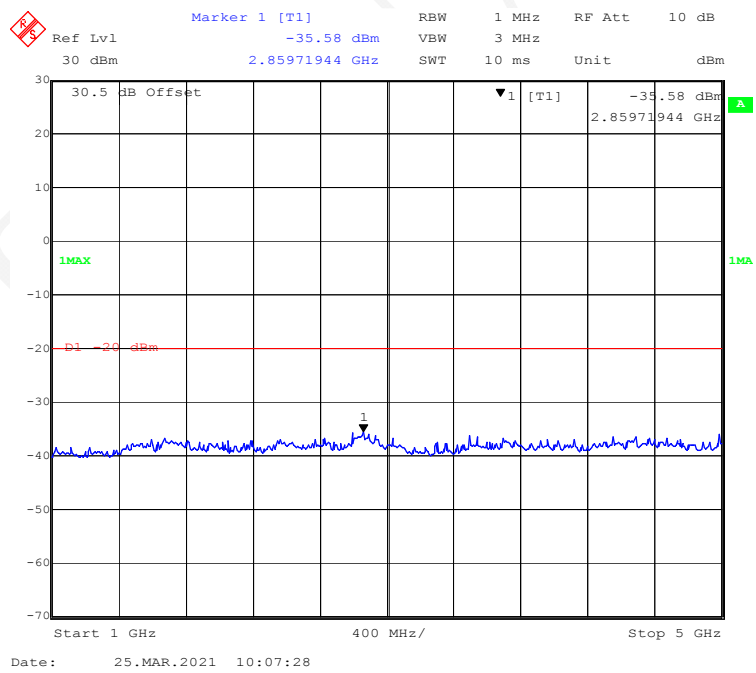
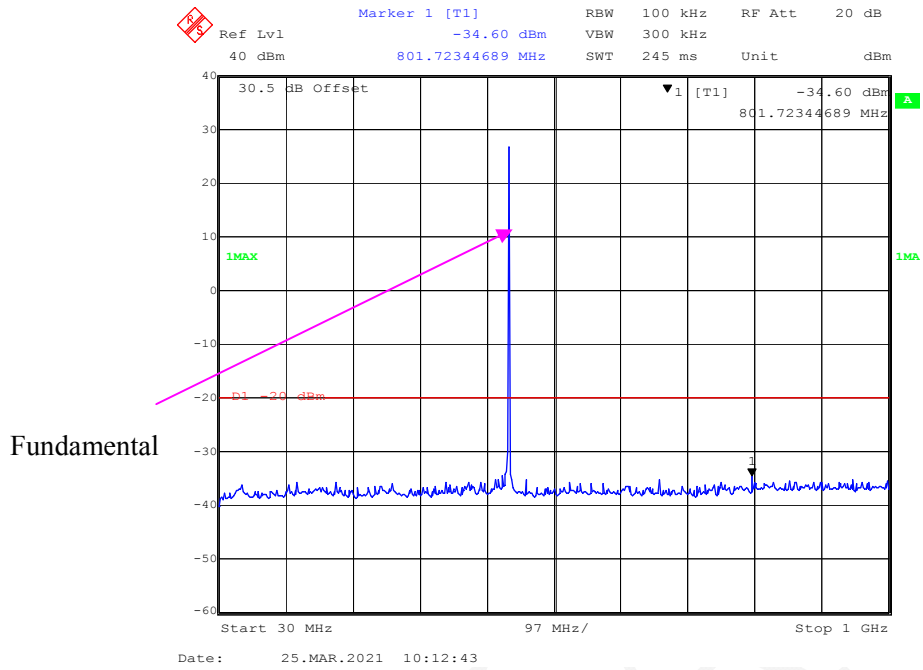
### 429.9875 MHz - 4FSK 12.5 kHz, Low Power



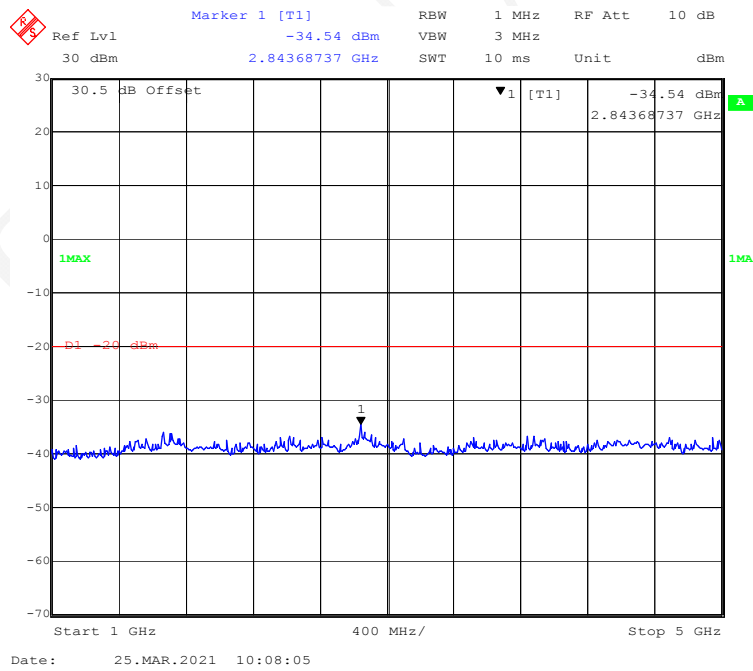
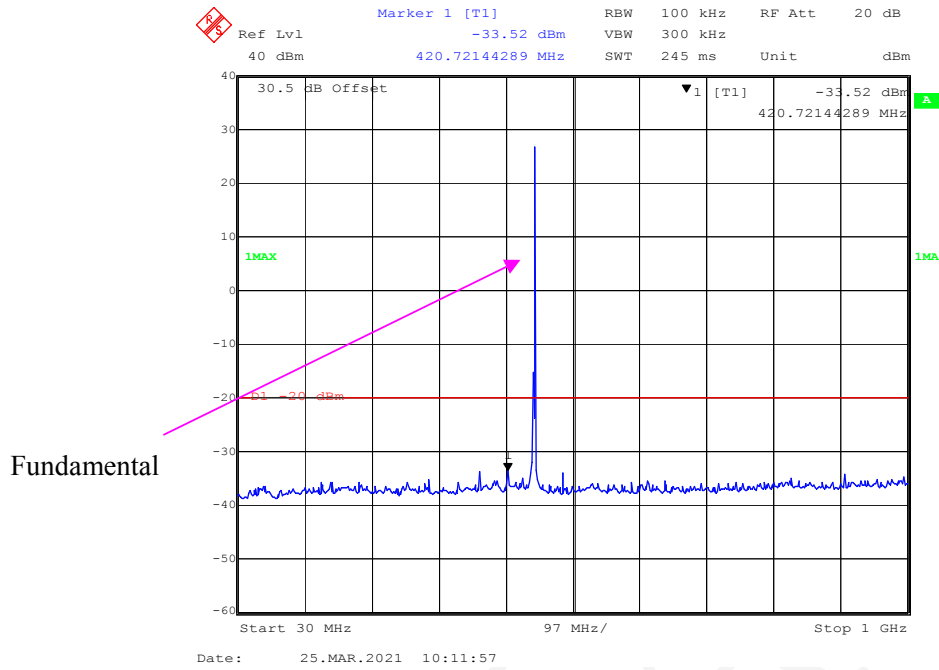
Fundamental



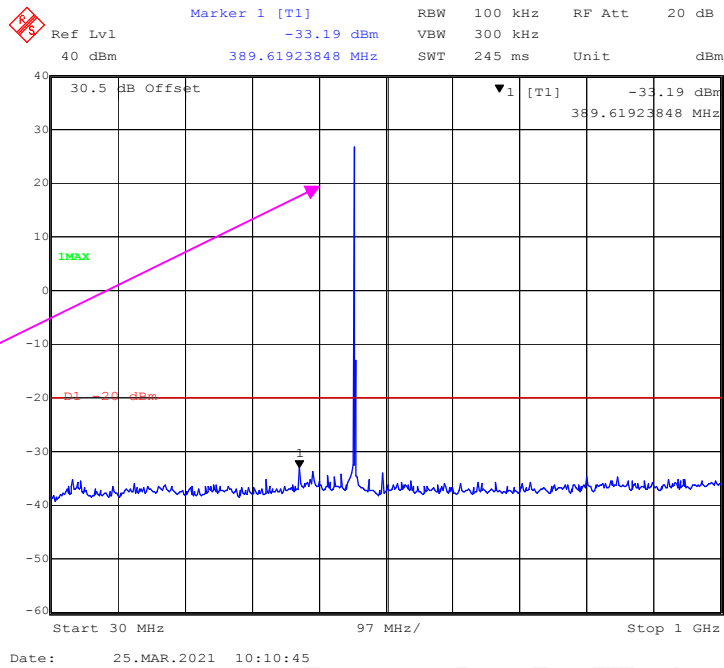
### 450.0125 MHz - 4FSK 12.5 kHz, Low Power



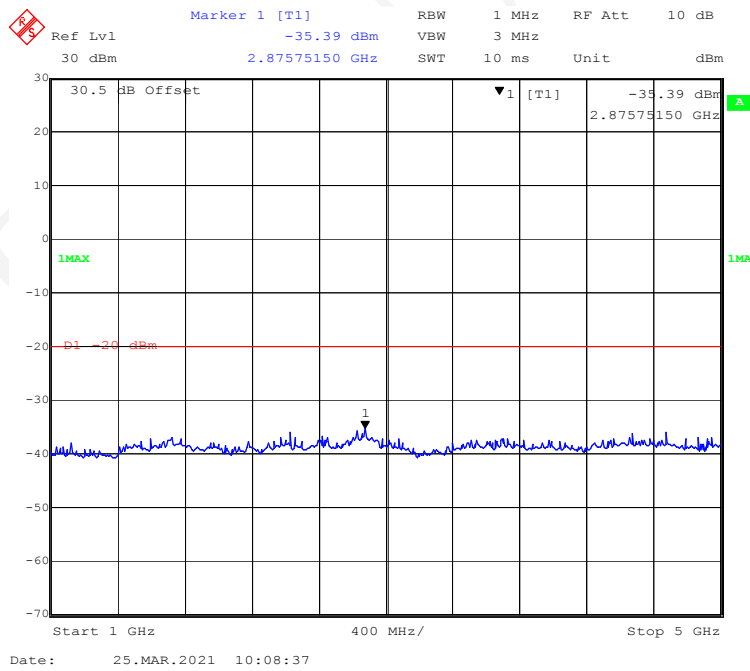
### 460.0125 MHz - 4FSK 12.5 kHz, Low Power



### 469.9875 MHz - 4FSK 12.5 kHz, Low Power



Fundamental



## RSS-119 §5.9 - TRANSIENT FREQUENCY BEHAVIOR

### Applicable Standard

According to RSS-119, Issue 12§5.9

### Test Data

#### Environmental Conditions

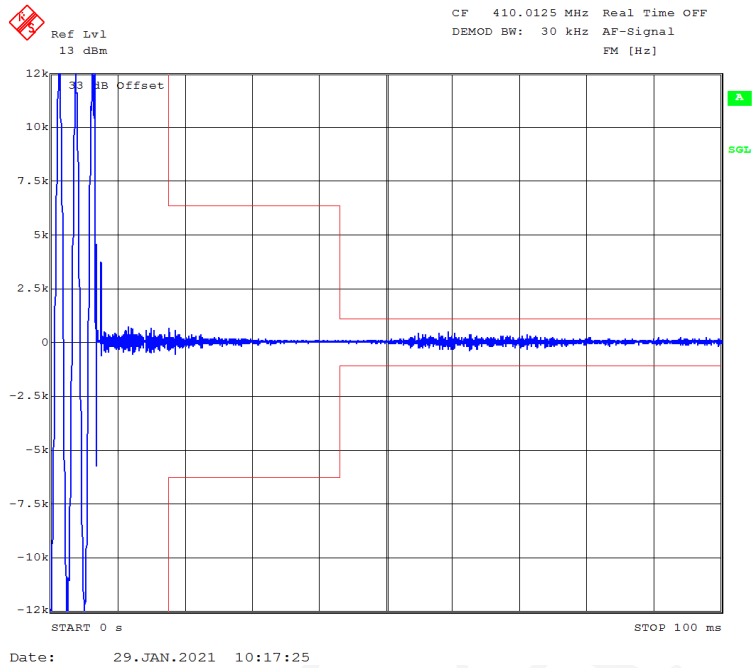
<b>Temperature:</b>	23.2 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.5 kPa

*The testing was performed by Chao Gao on 2021-01-29*

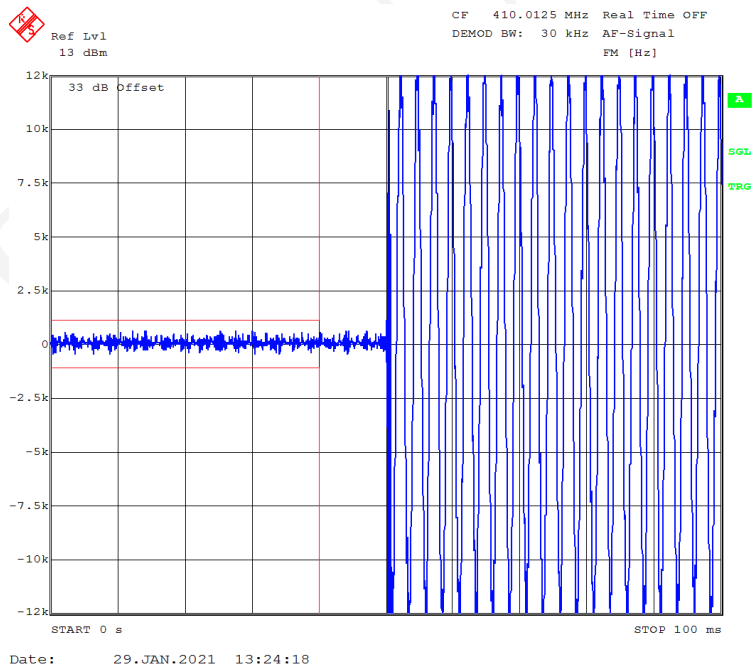
**Test Result:** Compliant.

Modulation Mode	Channel Spacing	Transient Period (ms)	Transient Frequency	Result
4FSK	12.5 kHz	<10(t <sub>1</sub> )	±12.5 kHz	Pass
		<25(t <sub>2</sub> )	±6.25 kHz	Pass
		<10(t <sub>3</sub> )	±12.5 kHz	Pass

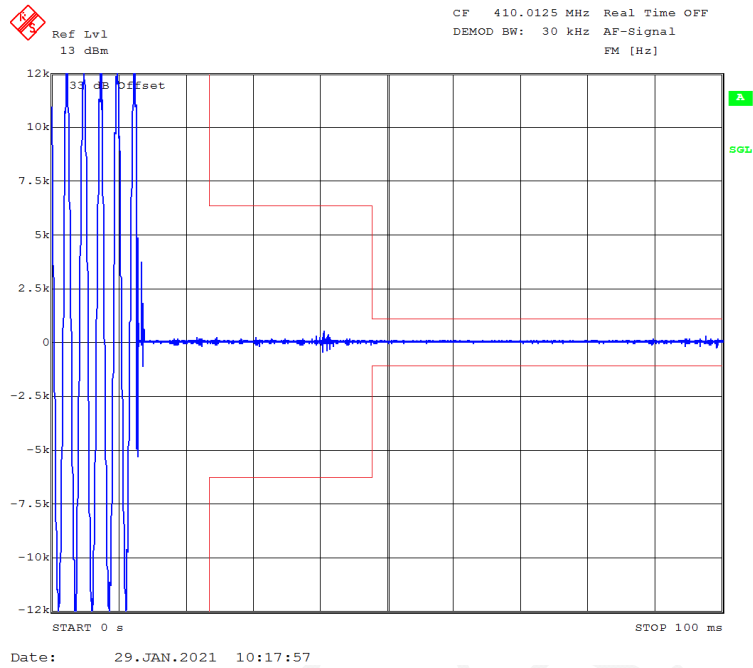
### Turn on - 4FSK, 410.0125 MHz, High Power



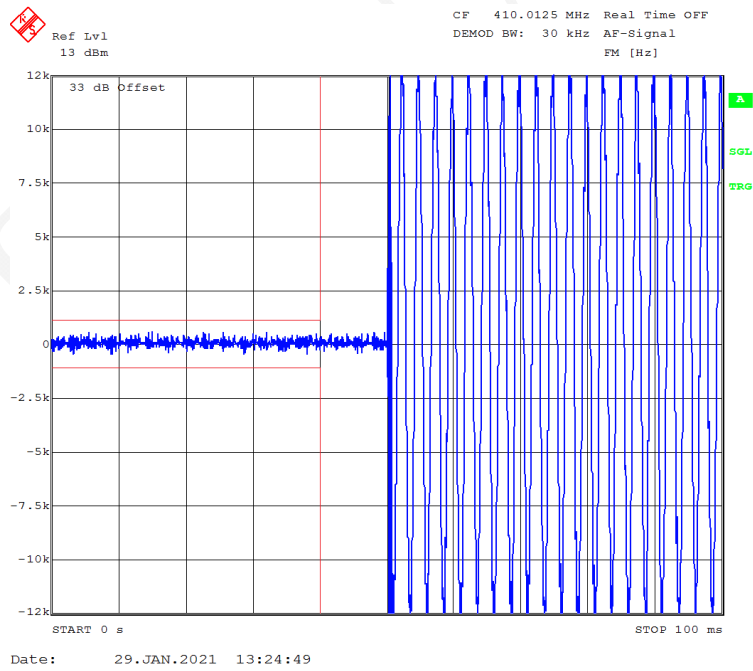
### Turn off - 4FSK, 410.0125 MHz, High Power



### Turn on - 4FSK, 410.0125 MHz, Low Power

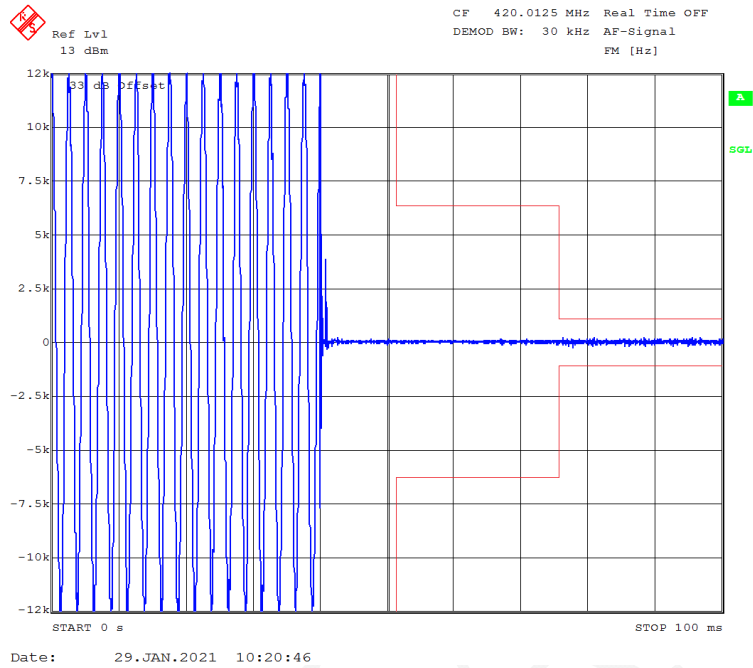


### Turn off - 4FSK, 410.0125 MHz, Low Power

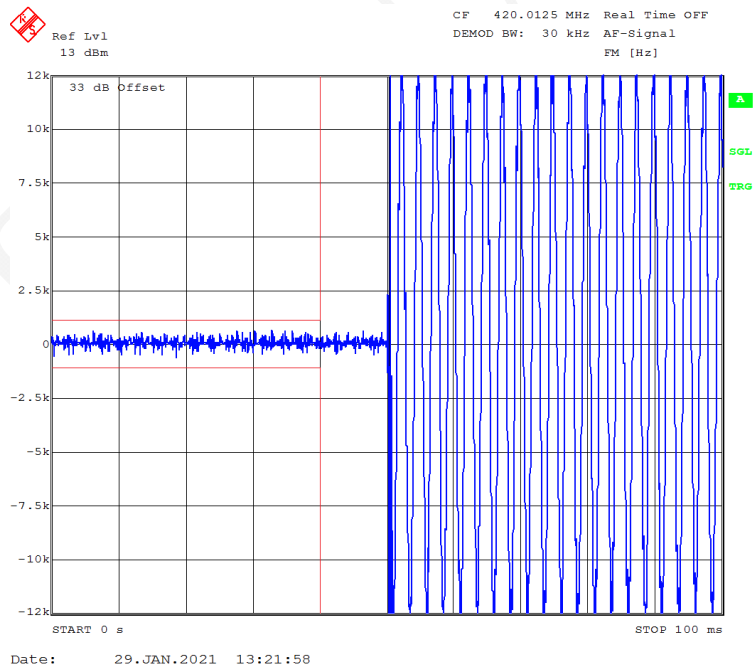




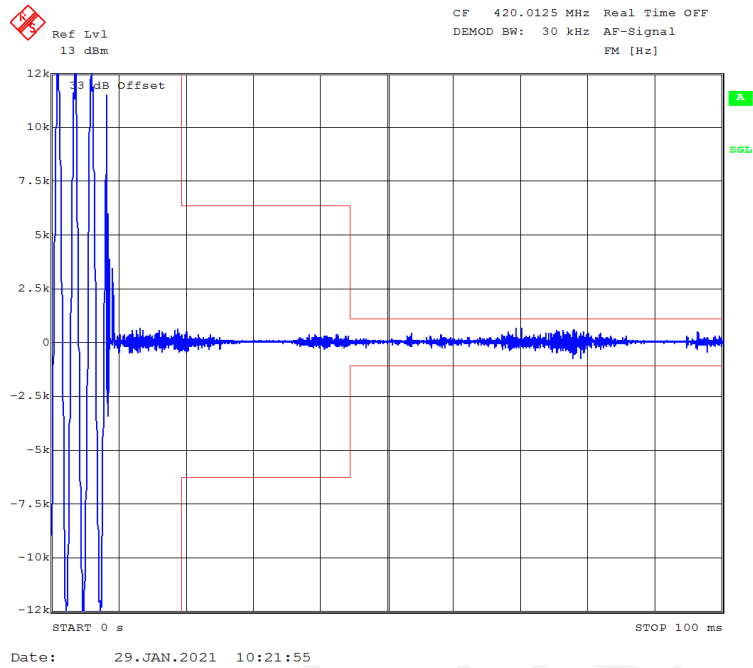
### Turn on - 4FSK, 420.0125 MHz, High Power



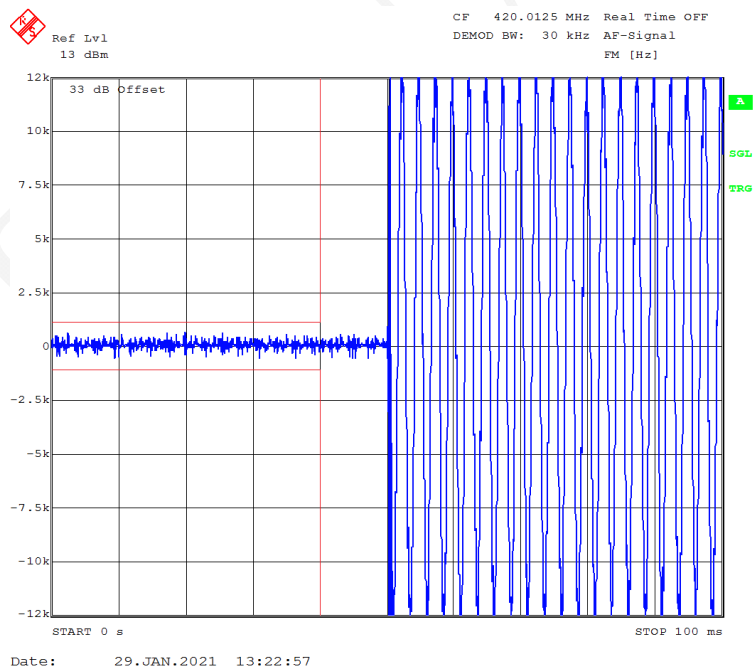
### Turn off - 4FSK, 420.0125 MHz, High Power



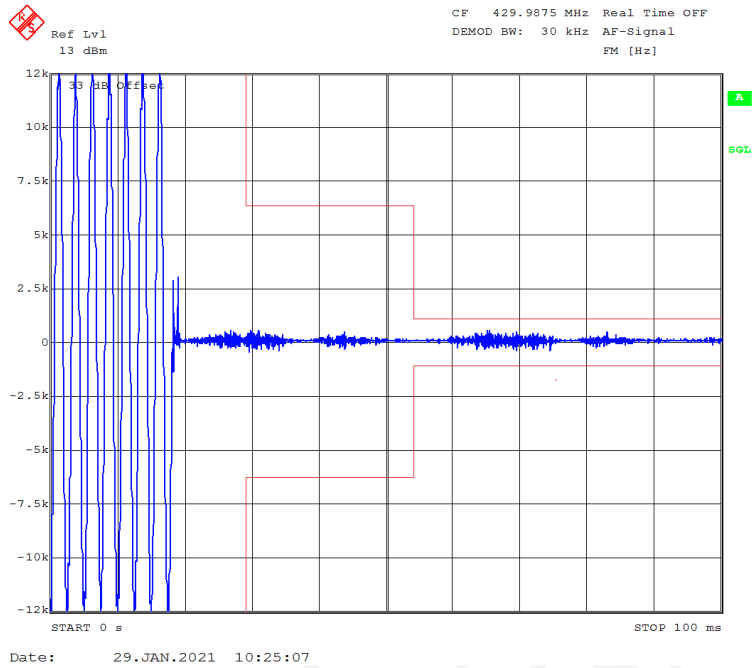
### Turn on - 4FSK, 420.0125 MHz, Low Power



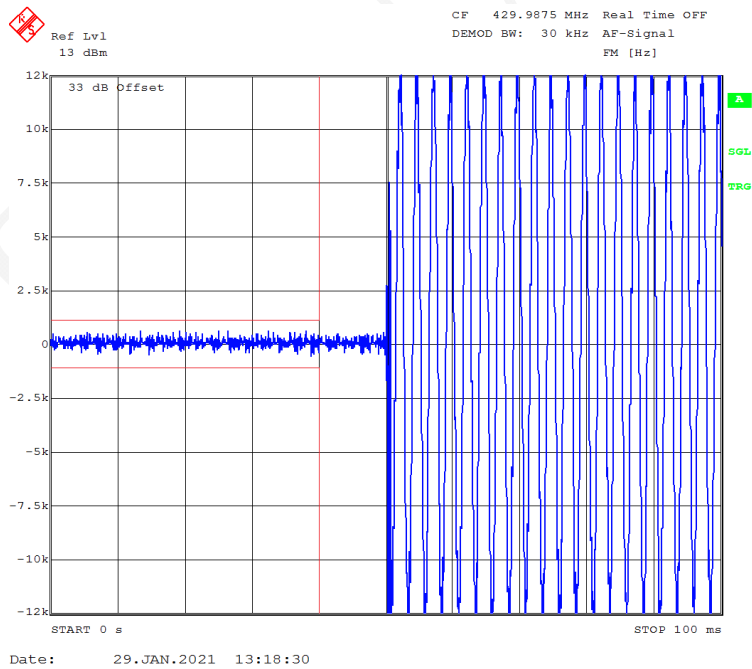
### Turn off - 4FSK, 420.0125 MHz, Low Power



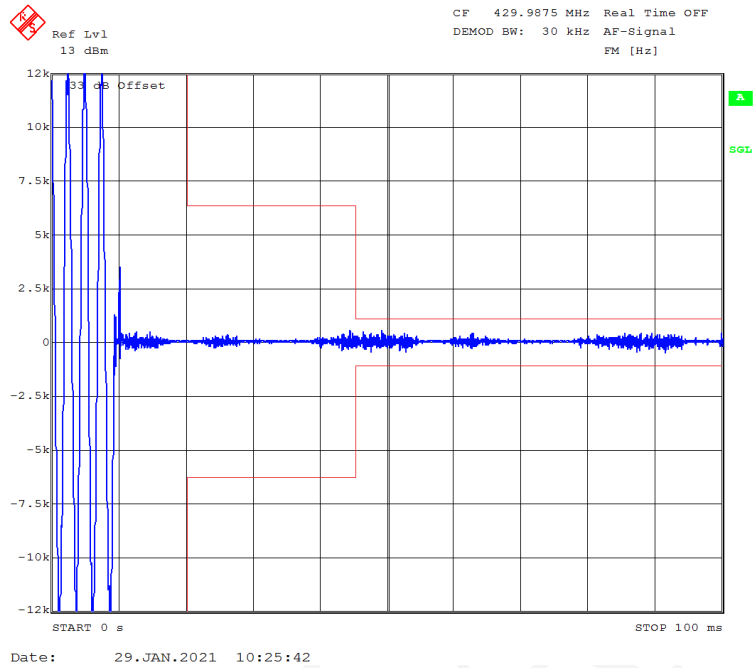
### Turn on - 4FSK, 429.9875 MHz, High Power



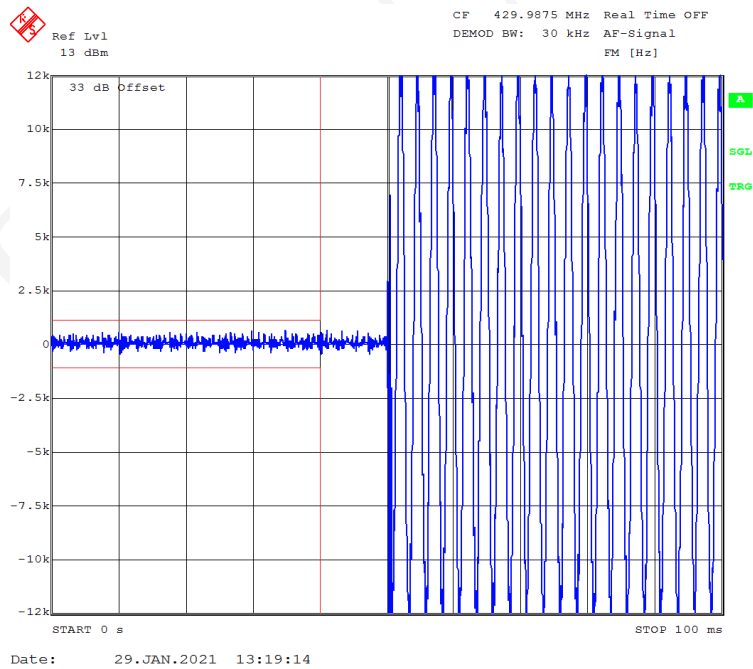
### Turn off - 4FSK, 429.9875 MHz, High Power



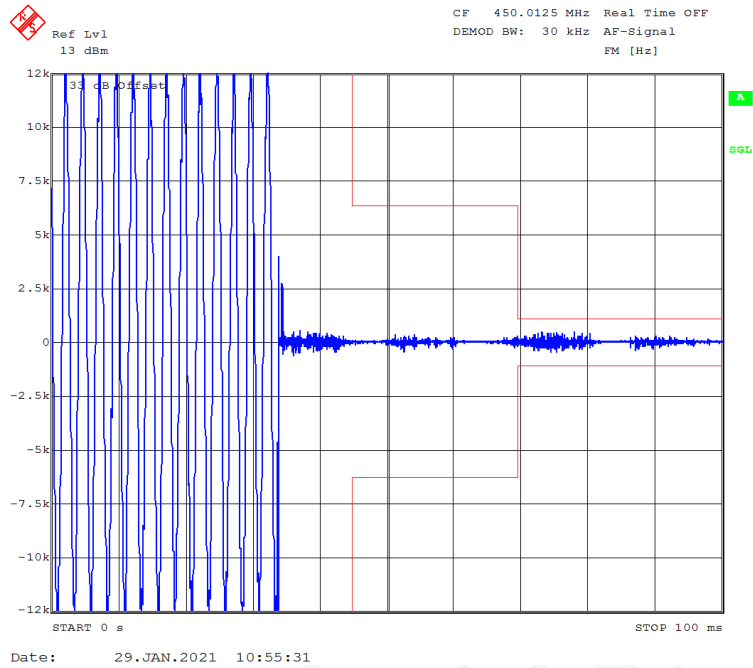
### Turn on - 4FSK, 429.9875 MHz, Low Power



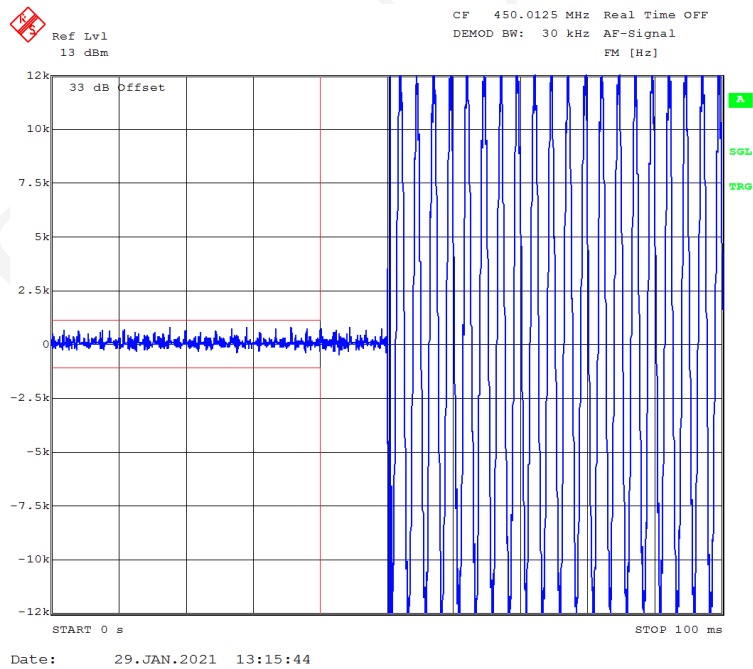
### Turn off - 4FSK, 429.9875 MHz, Low Power



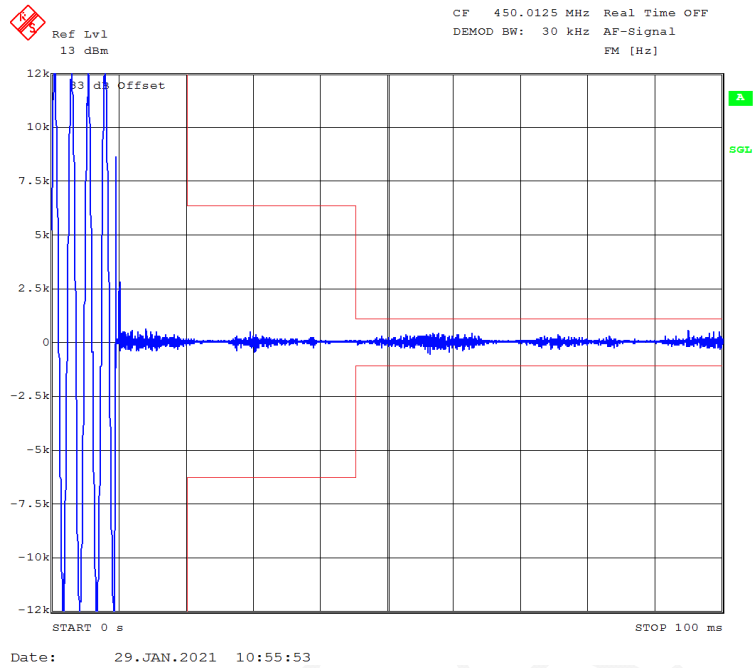
### Turn on - 4FSK, 450.0125 MHz, High Power



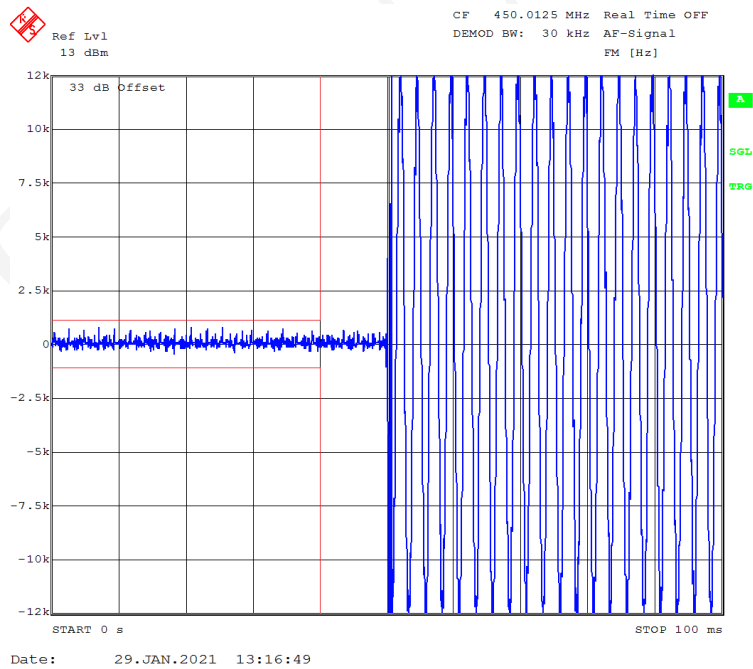
### Turn off - 4FSK, 450.0125 MHz, High Power



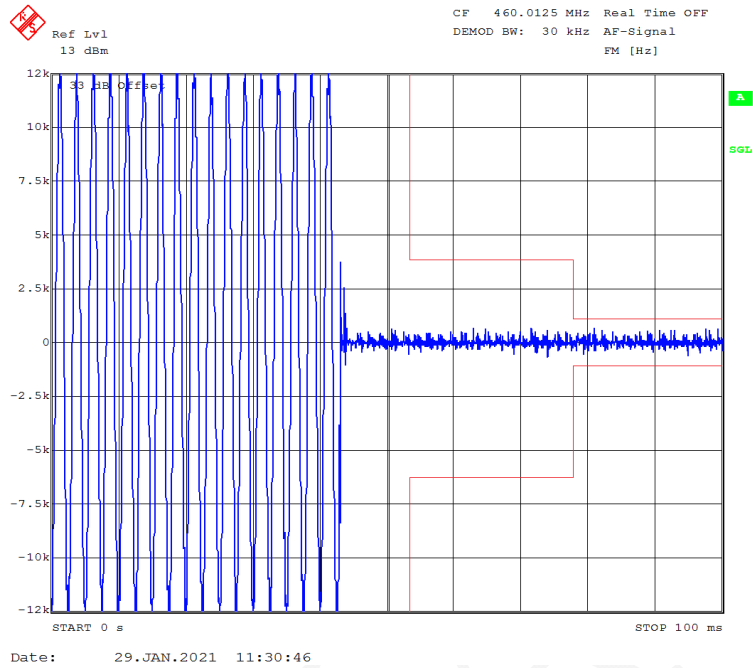
### Turn on - 4FSK, 450.0125 MHz, Low Power



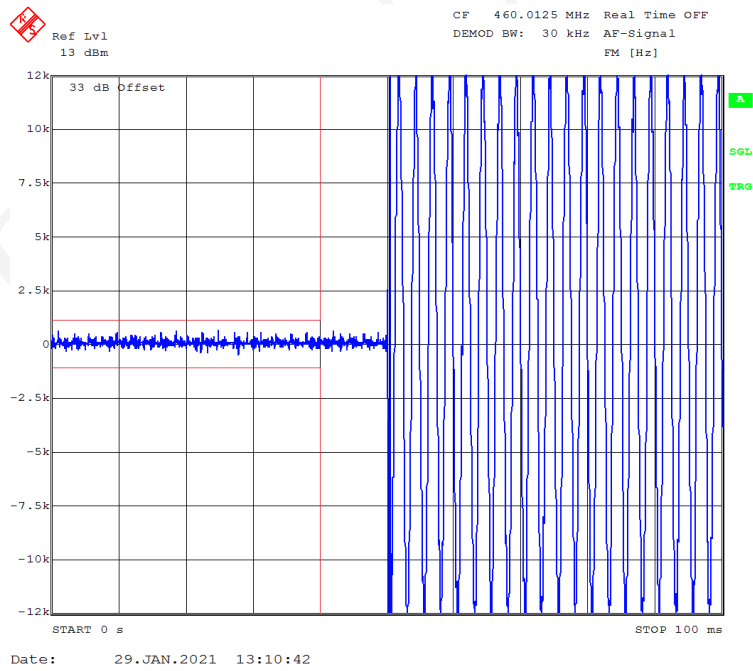
### Turn off - 4FSK, 450.0125 MHz, Low Power



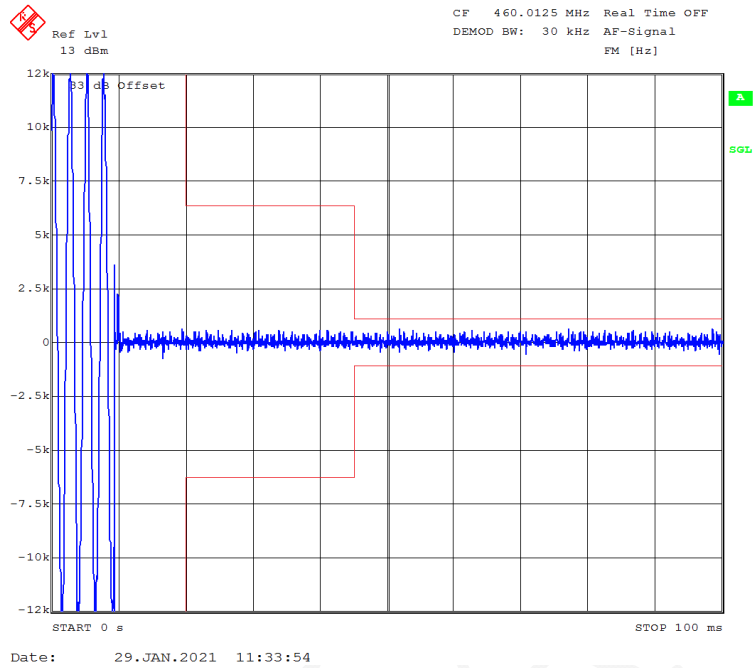
### Turn on - 4FSK, 460.0125 MHz, High Power



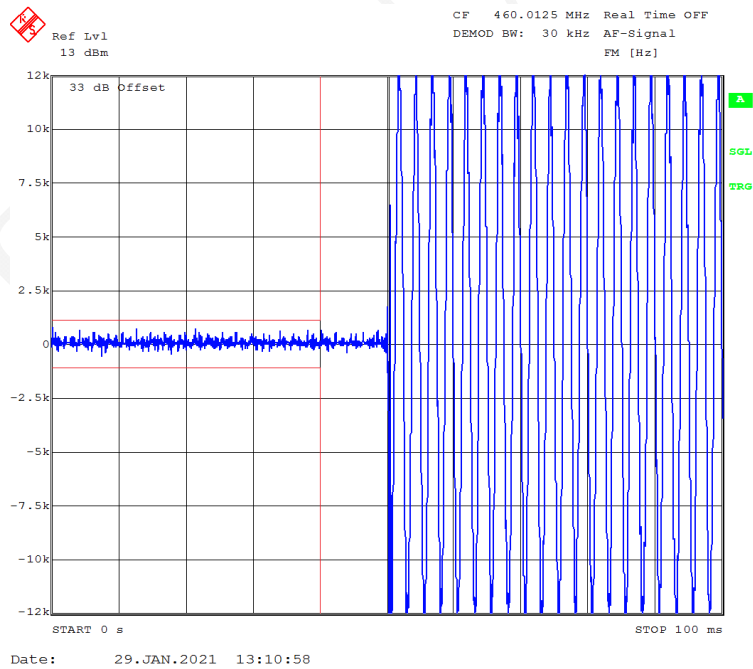
### Turn off - 4FSK, 460.0125 MHz, High Power



### Turn on - 4FSK, 460.0125 MHz, Low Power

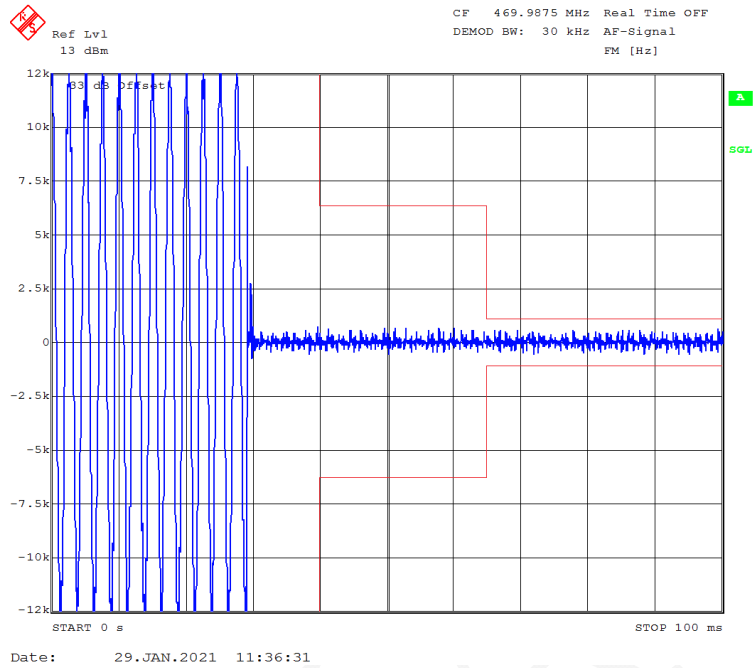


### Turn off - 4FSK, 460.0125 MHz, Low Power

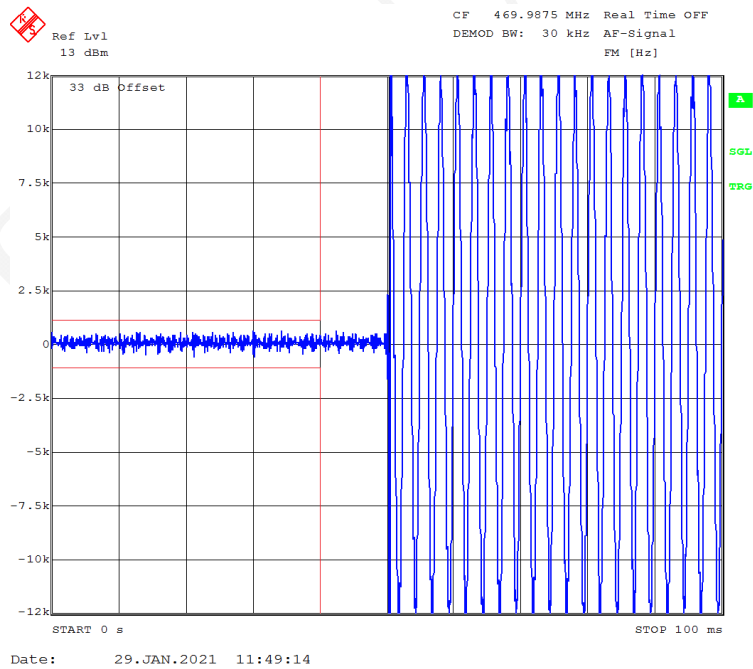




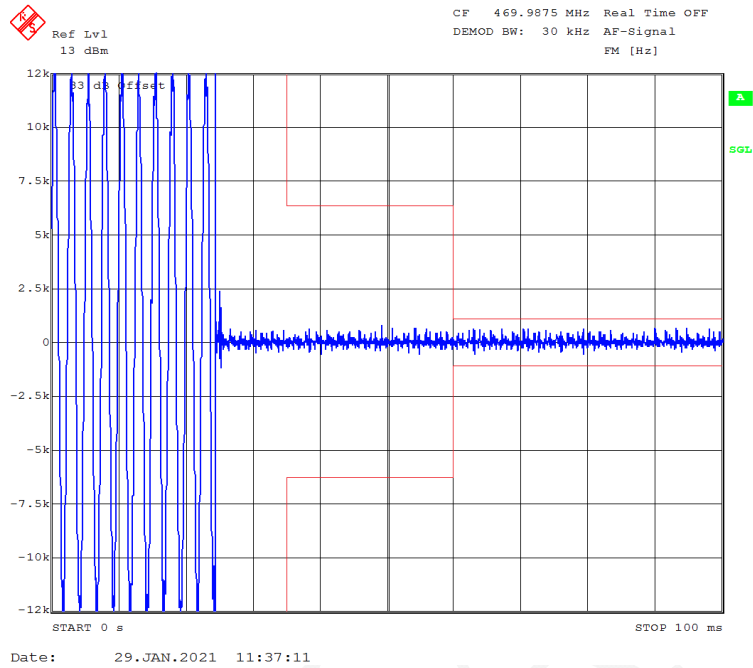
### Turn on - 4FSK, 469.9875 MHz, High Power



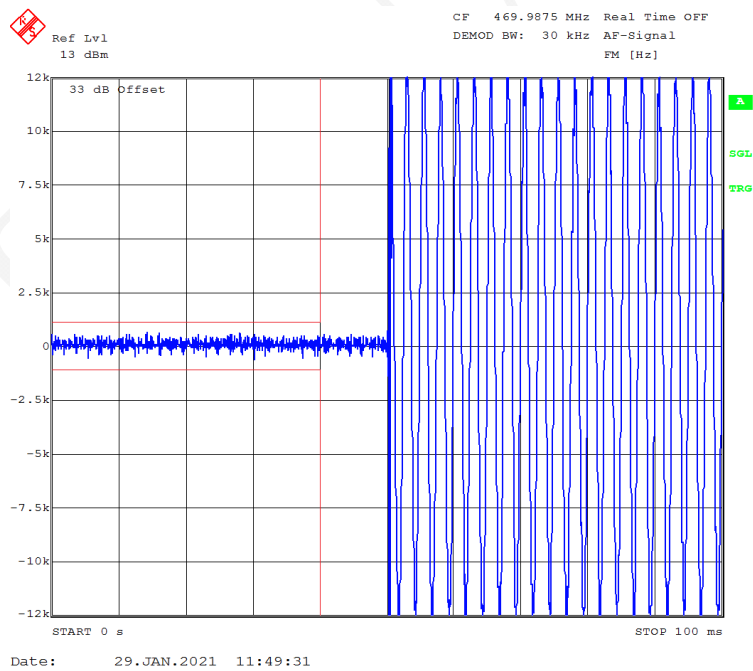
### Turn off - 4FSK, 469.9875 MHz, High Power



### Turn on - 4FSK, 469.9875 MHz, Low Power



### Turn off - 4FSK, 469.9875 MHz, Low Power



### Declarations

1: BACL 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.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

6: 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.

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