



# FCC PART 22, 74, 80 and 90

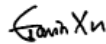
## TEST REPORT

For

### Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, 518057  
China

**FCC ID:YAMPD48XUVS**

<b>Report Type:</b> Original Report	<b>Product Type:</b> DIGITAL PORTABLE RADIO
<b>Report Number:</b>	RDG210330013-00A
<b>Report Date:</b>	2021-06-28
<b>Reviewed By:</b>	Gavin Xu RF Engineer 
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## GENERAL INFORMATION

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

<b>Product Name:</b>		DIGITAL PORTABLE RADIO
<b>Test Model:</b>		PD482 Uv
<b>Multiple Models:</b>		PD485 Uv, PD486 Uv, PD488 Uv
<b>Model Difference:</b>		Refer to the DOS letter
<b>Rated Input Voltage:</b>		DC 7.2V from battery or DC 12V charging from adapter
<b>Adapter Information</b>	<b>Model:</b>	HKA01212010-XQ
	<b>Input:</b>	AC 100-240V 50/60Hz 0.5A
	<b>Output:</b>	DC 12.0V 1.0A 12.0W
<b>Serial Number:</b>		RDG210330013-RF-S1
<b>EUT Received Date:</b>		2021.03.31
<b>EUT Received Status:</b>		Good

### Technical Specification

<b>Operation Frequency Range (MHz):</b>	350-470
<b>Rated RF Output Power (Conducted) (W):</b>	High power level: 4 Low power level: 1
<b>Modulation Type:</b>	FM, 4FSK
<b>Channel Spacing (kHz):</b>	12.5/25

### Objective

This test report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, and Part 22, 74, 80 and 90 of the Federal Communication Commissions rules.

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

FCC Part 15C DSS submissions with FCC ID: YAMPD48XUVS  
FCC Part 15C DTS submissions with FCC ID: YAMPD48XUVS

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with:

the Code of federal Regulations Title 47, Part 2, Part 22, Part 74, Part 80 and Part 90

ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

TIA-603-E-2016, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30MHz ~ 1GHz: 5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%

*Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1<sup>st</sup> Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

## Declarations

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 a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

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

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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a test mode which has been done in the factory.

### Equipment Modifications

No modification was made to the EUT.

### EUT Exercise Software

No software was tested in test.

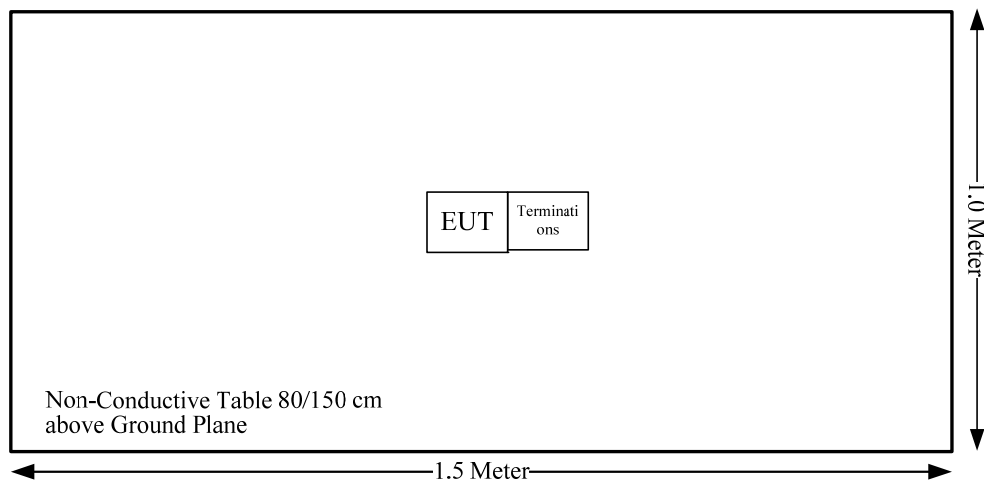
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Wenschel	Termination	1440	MD477

### Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

### Block Diagram of Test Setup



## Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated emissions below 1GHz</b>					
Sunol Sciences	Antenna	JB3	A060611-2	2020-08-25	2023-08-25
R&S	EMI Test Receiver	ESCI	100224	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2020-09-24	2021-09-24
Sonoma	Amplifier	310N	185914	2020-10-13	2021-10-13
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
<b>Radiated emissions above 1GHz</b>					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Agilent	Spectrum Analyzer	E4440A	SG43360054	2020-07-07	2021-07-07
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2020-09-05	2021-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2020-09-05	2021-09-05
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2020-09-05	2021-09-05
Agilent	Signal Generator	E8247C	MY43321350	2020-12-09	2021-12-08
<b>RF Conducted Test</b>					
R&S	EMI Test Receiver	ESR3	102453	2020-09-12	2021-09-12
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2020-09-12	2021-09-12
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41005012	2020-09-05	2021-09-05
E-Microwave	Blocking Control	EMDCB-00036	0E01201047	2021-05-06	2022-05-06
E-Microwave	Coaxial Attenuators	EMCA40-200SN-6	0E01201046	2020-09-06	2021-09-06
HP	RF Communications Test Set	8920A	3438A05201	2020-07-07	2021-07-07
ESPEC	Constant temperature and humidity Tester	ESX-4CA	018 463	2021-03-10	2022-03-09
UNI-T	Multimeter	UT39A	M130199938	2020-07-01	2021-07-01
Pro instrument	DC Power Supply	pps3300	3300012	N/A	N/A

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

## Environmental Conditions

Test Item:	RF Conducted	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	24.2~27.7°C	27.4 °C	26.2°C
Relative Humidity:	46~56 %	54 %	50 %
ATM Pressure:	100~100.6 kPa	101.2 kPa	100.4kPa
Tester:	Levi Shi	King Wang	Alex Hu
Test Date:	2021.05.28~2021.06.28	2021.06.07	2021.06.07

**SUMMARY OF TEST RESULTS**

S/N	FCC Rules	Description of Test	Results
1	§1.1310 and §2.1093	RF Exposure	Compliance*
2	§2.1046; § 22.727; §80.215; §74.461; §90.205	RF Output Power	Compliance
3	§2.1047	Modulation Characteristic	Compliance
4	§2.1049; §22.357; § 22.731; §74.462; §80.205; §80.207 §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
5	§2.1051; §22.861; §74.462; §80.211; §90.210	Spurious Emission at Antenna Terminal	Compliance
6	§2.1053; §22.861; §74.462; §80.211; §90.210	Spurious Radiated Emissions	Compliance
7	§2.1055; § 22.355; §74.464; §80.209; §90.213	Frequency Stability	Compliance
8	§90.214	Transient Frequency Behavior	Compliance

Note:

Compliance\*: Please refer to the SAR report: RDG210330013-20A.

## 2 - RF OUTPUT POWER

### Applicable Standard

FCC §2.1046, § 22.727, §74.461, §80.215 and §90.205

### 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

Test Mode: Transmitting

**Test Result: Compliance.** *Please refer to following table and plots.*

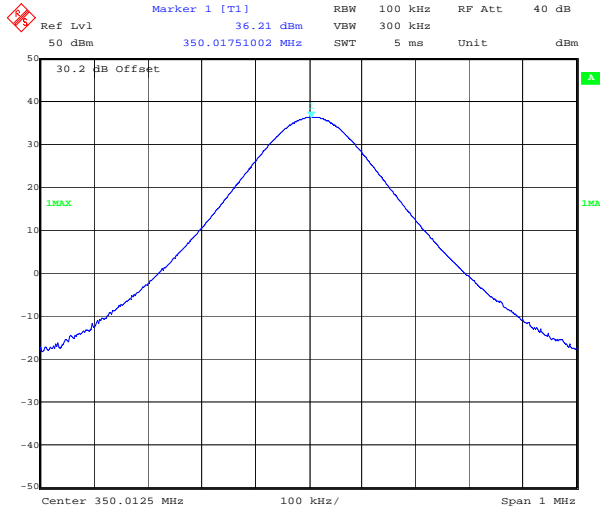
Channel Separation	Test Modulation	Test Channel	Test Frequency (MHz)	Conducted Output Power (dBm)		Limit (dBm)		Note
				High Power Level	Low Power Level	High Power Level	Low Power Level	
12.5kHz	FM	Low	350.0125	36.21	30.01	36.81	30.79	FCC
		Middle	453.2125	35.36	29.53	36.81	30.79	Part 90
		High	469.9875	35.18	29.08	36.81	30.79	
		Additional	454.0125	35.42	29.49	36.81	30.79	
		Additional	455.0125	35.38	29.44	36.81	30.79	Part 74
	4FSK	Low	350.0125	35.57	29.73	36.81	30.79	FCC
		Middle	453.2125	35.43	29.60	36.81	30.79	Part 90
		High	469.9875	35.17	29.11	36.81	30.79	
		Additional	454.0125	35.40	29.52	36.81	30.79	
		Additional	455.0125	35.36	29.45	36.81	30.79	Part 74
25kHz	FM	Additional	454.0125	35.42	29.52	36.81	30.79	Part 22
		Additional	455.0125	35.38	29.44	36.81	30.79	Part 74
		Additional	459.9875	35.23	29.17	36.81	30.79	Part 80

*Note: The high rated power level is 4W(36dBm), and low rated power level is 1W(30dBm). The output power shall not exceed by more than 20 percent the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.*

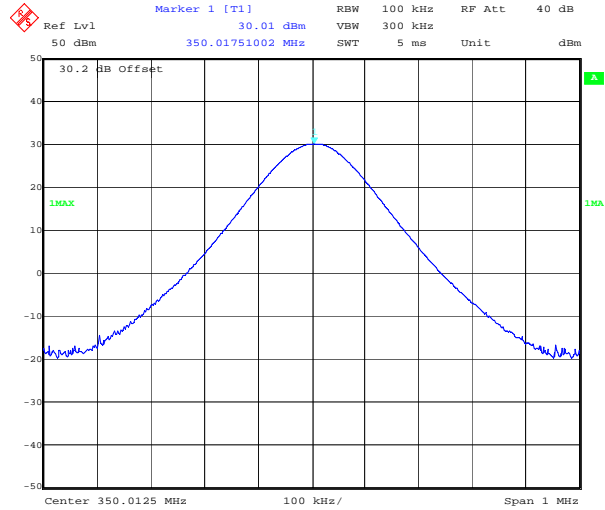


FM, 12.5kHz:

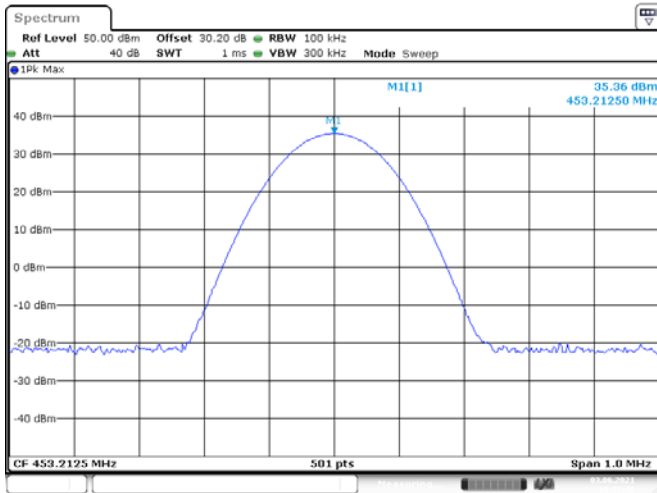
Low Channel, 350.0125 MHz High Power



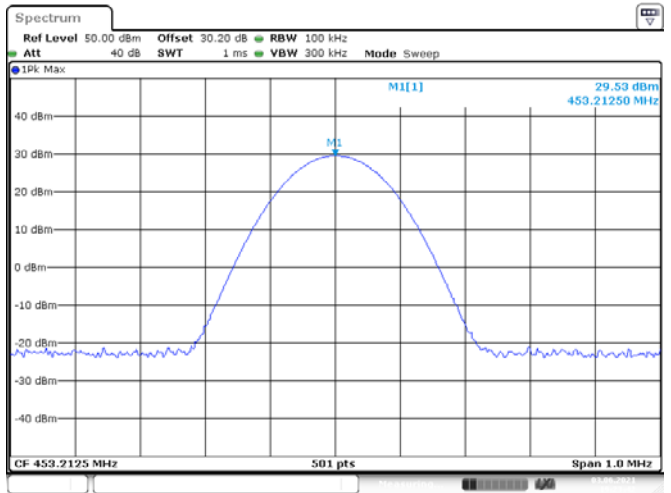
Low Channel, 350.0125 MHz Low Power



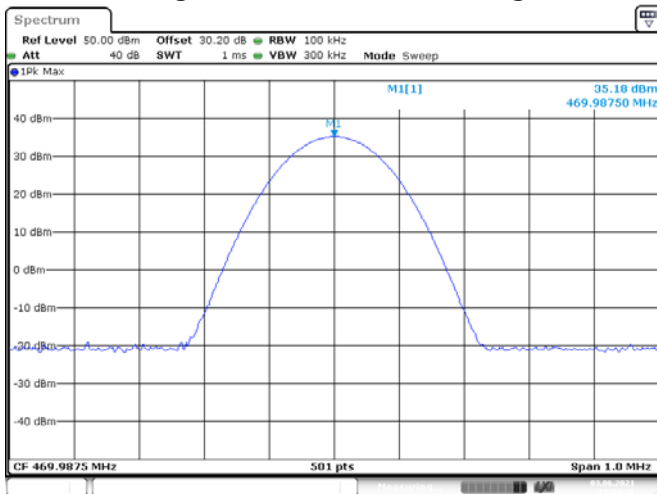
Part 90, Middle Channel, 453.2125 MHz High Power



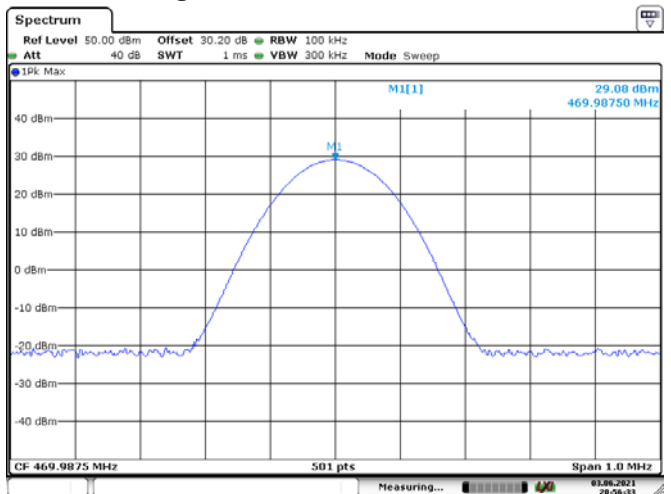
Part 90, Middle Channel, 453.2125 MHz Low Power



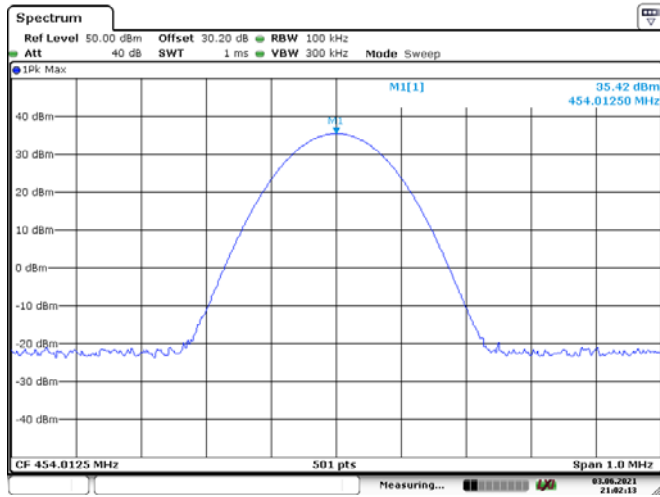
Part 90, High Channel, 469.9875MHz High Power



Part 90, High Channel, 469.9875 MHz Low Power

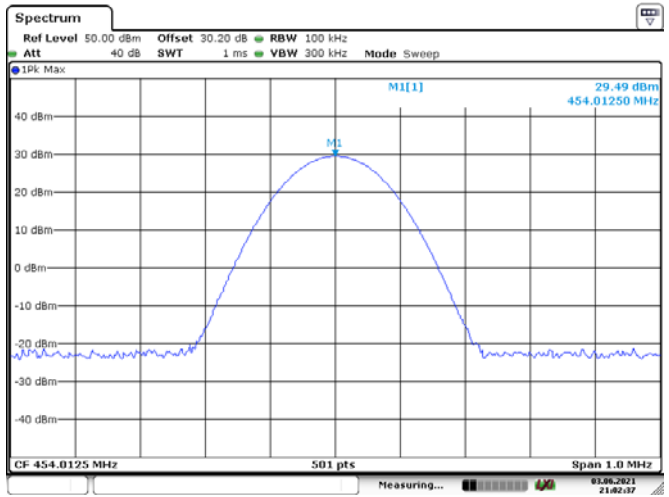


**Additional, For Part 22, 454.0125 MHz High Power**



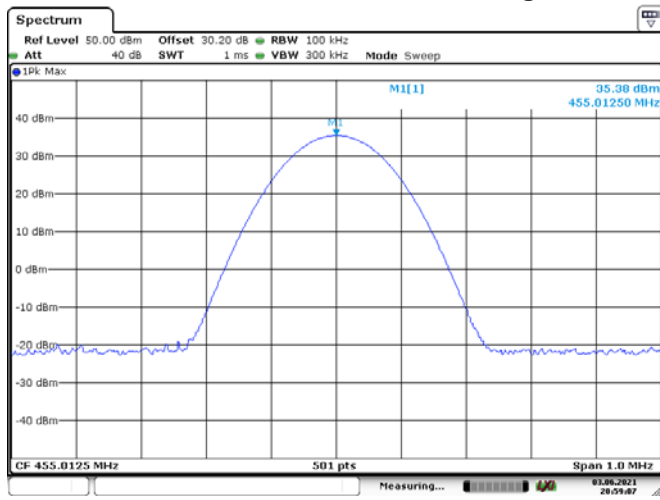
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**Additional, For Part 22, 454.0125 MHz Low Power**



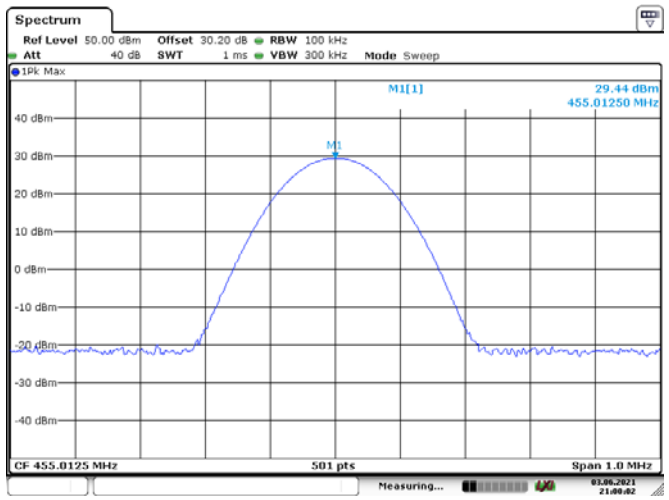
Date: 3.JUN.2021 21:02:37

**Additional, For Part 74, 455.0125 MHz High Power**



Date: 3.JUN.2021 20:59:07

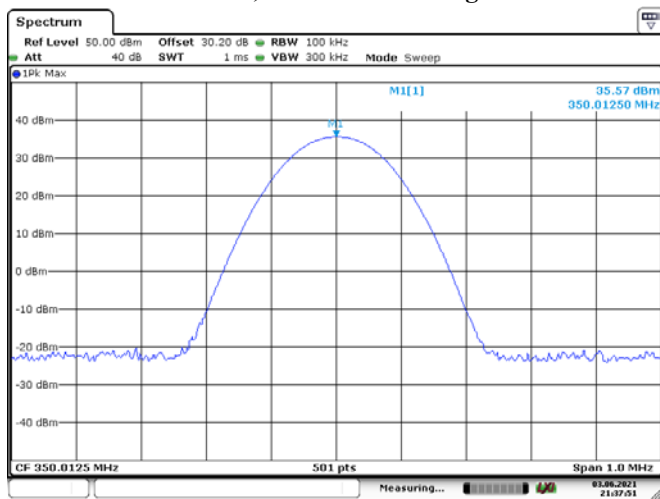
**Additional, For Part 74, 455.0125 MHz Low Power**



Date: 3.JUN.2021 21:00:03

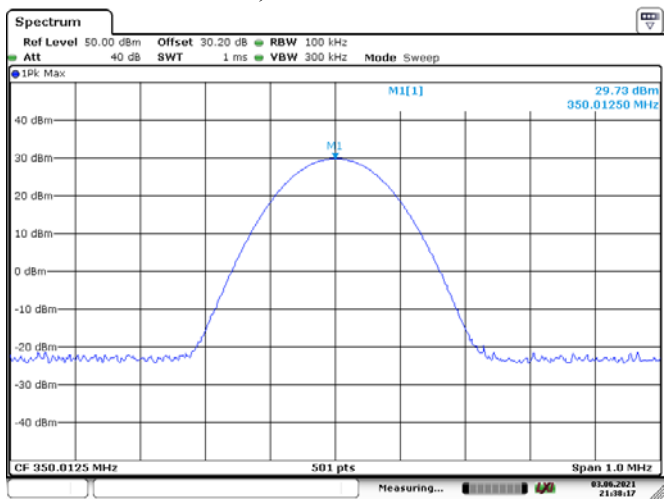
**4FSK, 12.5kHz:**

**Low Channel, 350.0125 MHz High Power**



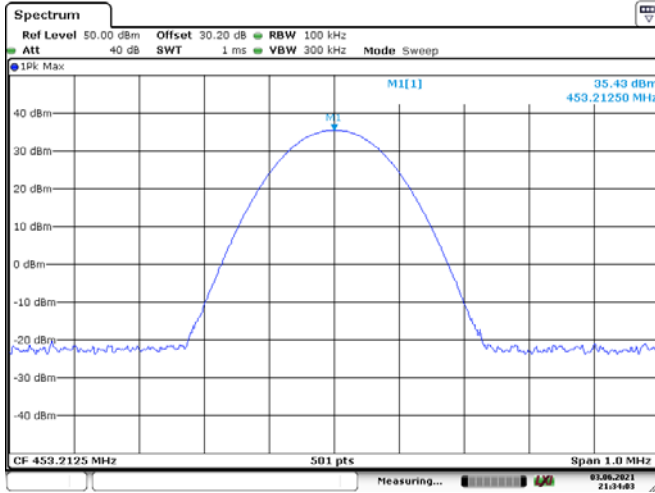
Date: 3.JUN.2021 21:37:51

**Low Channel, 350.0125 MHz Low Power**



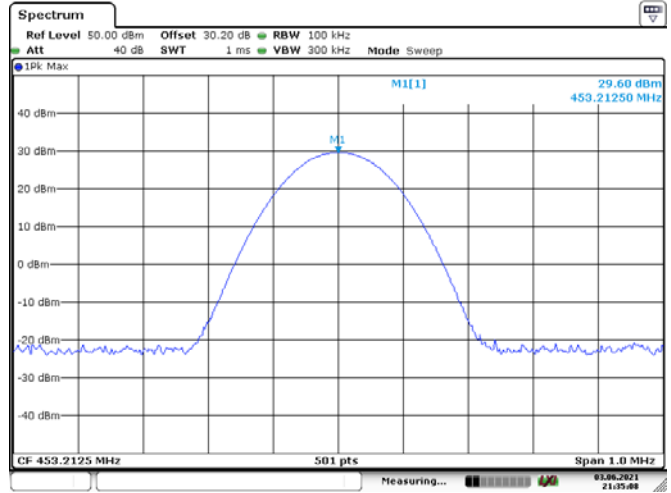
Date: 3.JUN.2021 21:38:18

Part 90, Middle Channel, 453.2125 MHz High Power



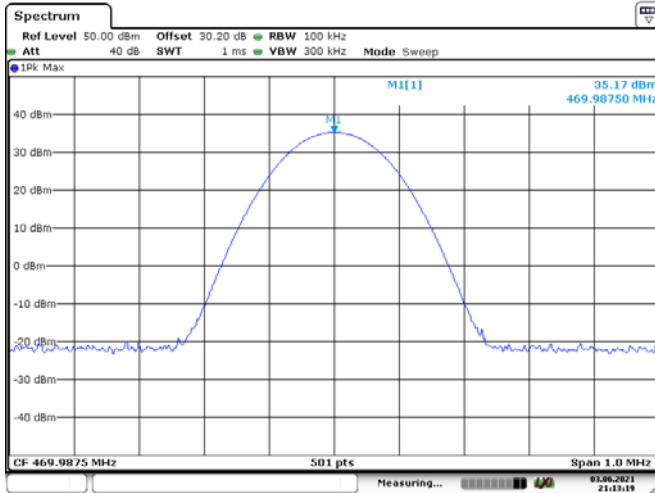
Date: 3 JUN 2021 21:34:04

Part 90, Middle Channel, 453.2125 MHz Low Power



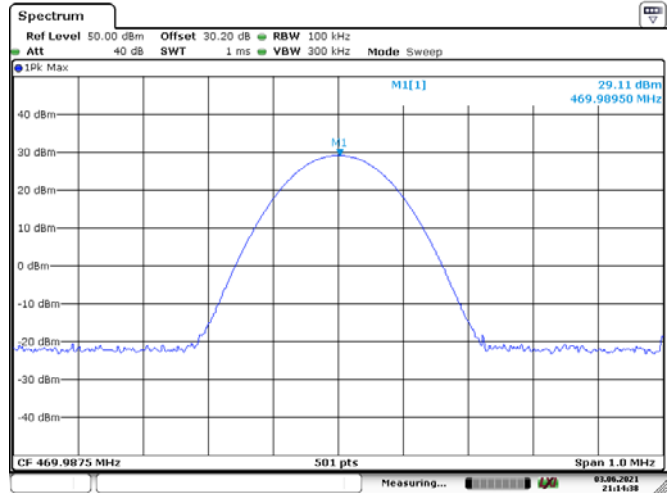
Date: 3 JUN 2021 21:35:08

Part 90, High Channel, 469.9875 MHz High Power



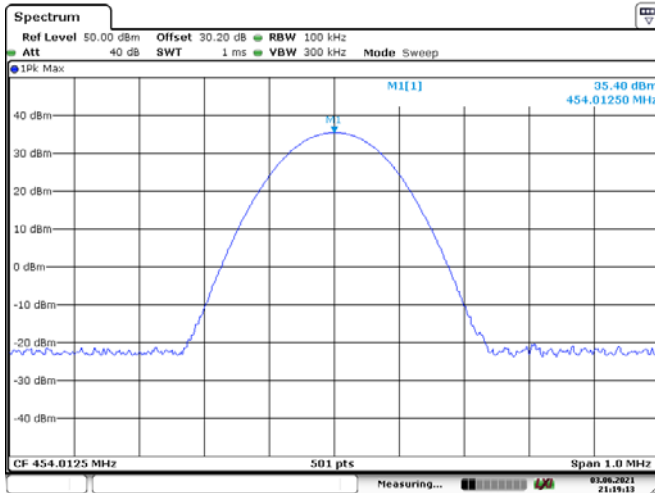
Date: 3 JUN 2021 21:13:19

Part 90, High Channel, 469.9875 MHz Low Power



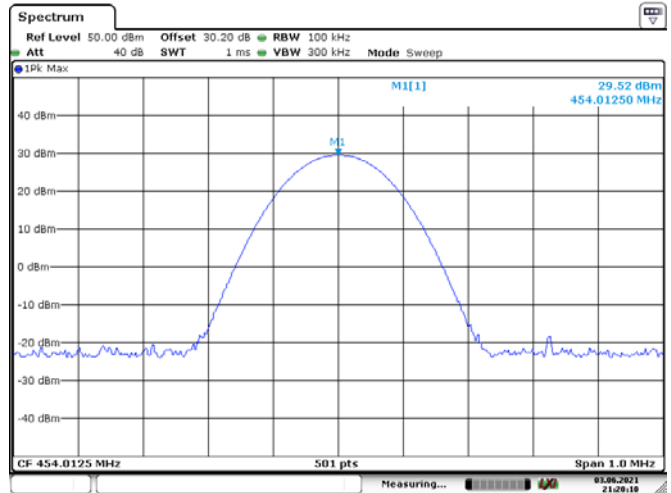
Date: 3 JUN 2021 21:14:38

Additional, For Part 22, 454.0125 MHz High Power



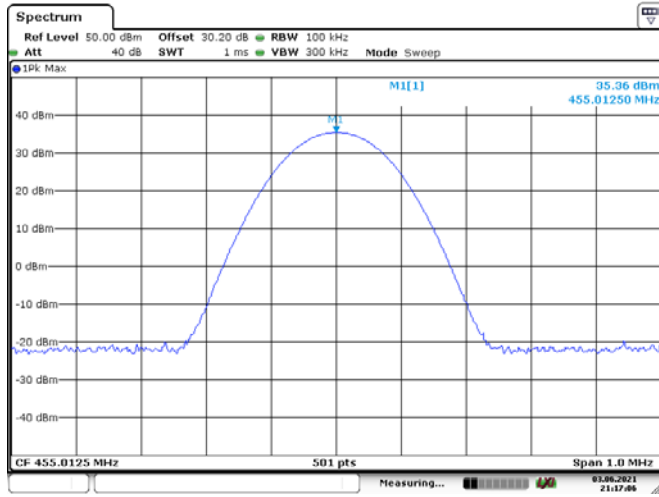
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Additional, For Part 22, 454.0125 MHz Low Power



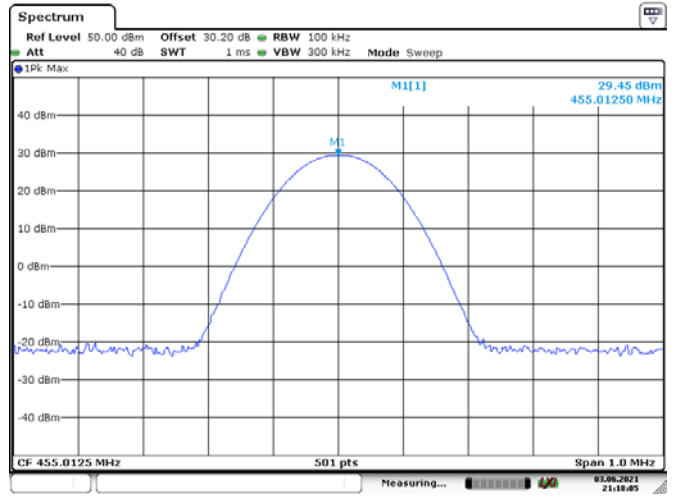
Date: 3 JUN 2021 21:20:11

**Additional, For Part 74, 455.0125 MHz High Power**



Date: 3 JUN. 2021 21:17:06

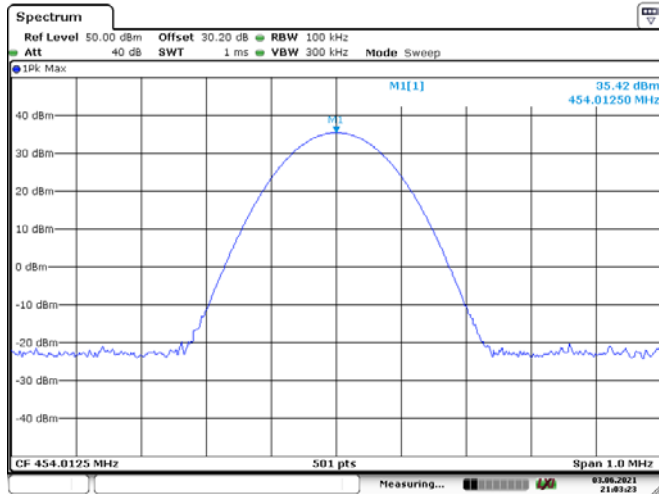
**Additional, For Part 74, 455.0125 MHz Low Power**



Date: 3 JUN. 2021 21:18:06

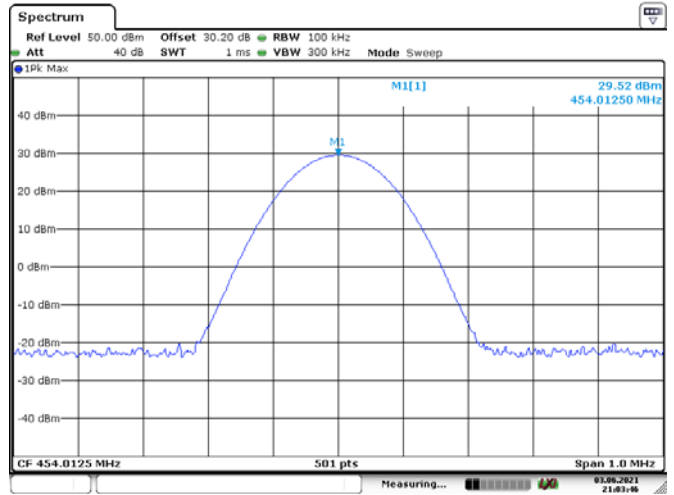
**FM, 25kHz:**

**Additional Channel, Part 22, 454.0125 MHz High Power**



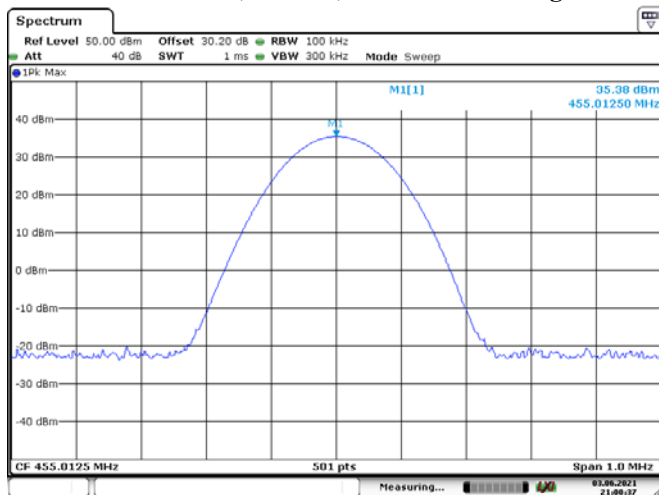
Date: 3 JUN. 2021 21:03:23

**Additional Channel, Part 22, 454.0125 MHz Low Power**



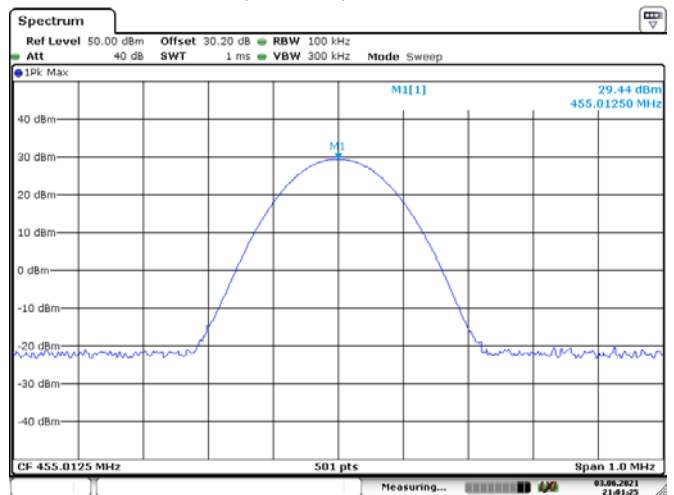
Date: 3 JUN. 2021 21:03:47

**Additional Channel, Part 74, 455.0125 MHz High Power**



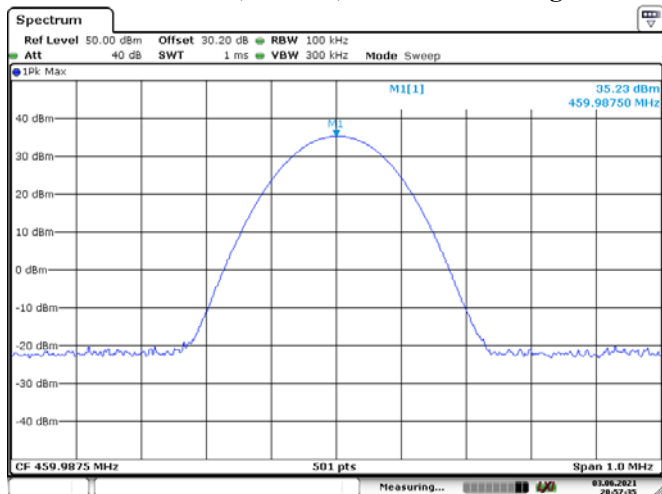
Date: 3 JUN. 2021 21:00:37

**Additional Channel, Part 74, 455.0125 MHz Low Power**



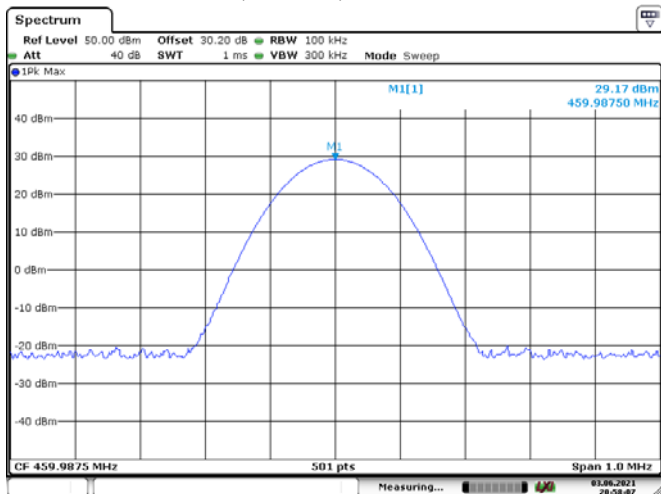
Date: 3 JUN. 2021 21:01:25

### Additional Channel, Part 80, 459.9875 MHz High Power



Date: 3.JUN.2021 20:57:36

### Additional Channel, Part 80, 459.9875 MHz Low Power



Date: 3.JUN.2021 20:58:08

### **3 - MODULATION CHARACTERISTIC**

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#### **Applicable Standard**

FCC §2.1047

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

#### **Test Procedure**

Test Method: TIA-603-E 2.2.3

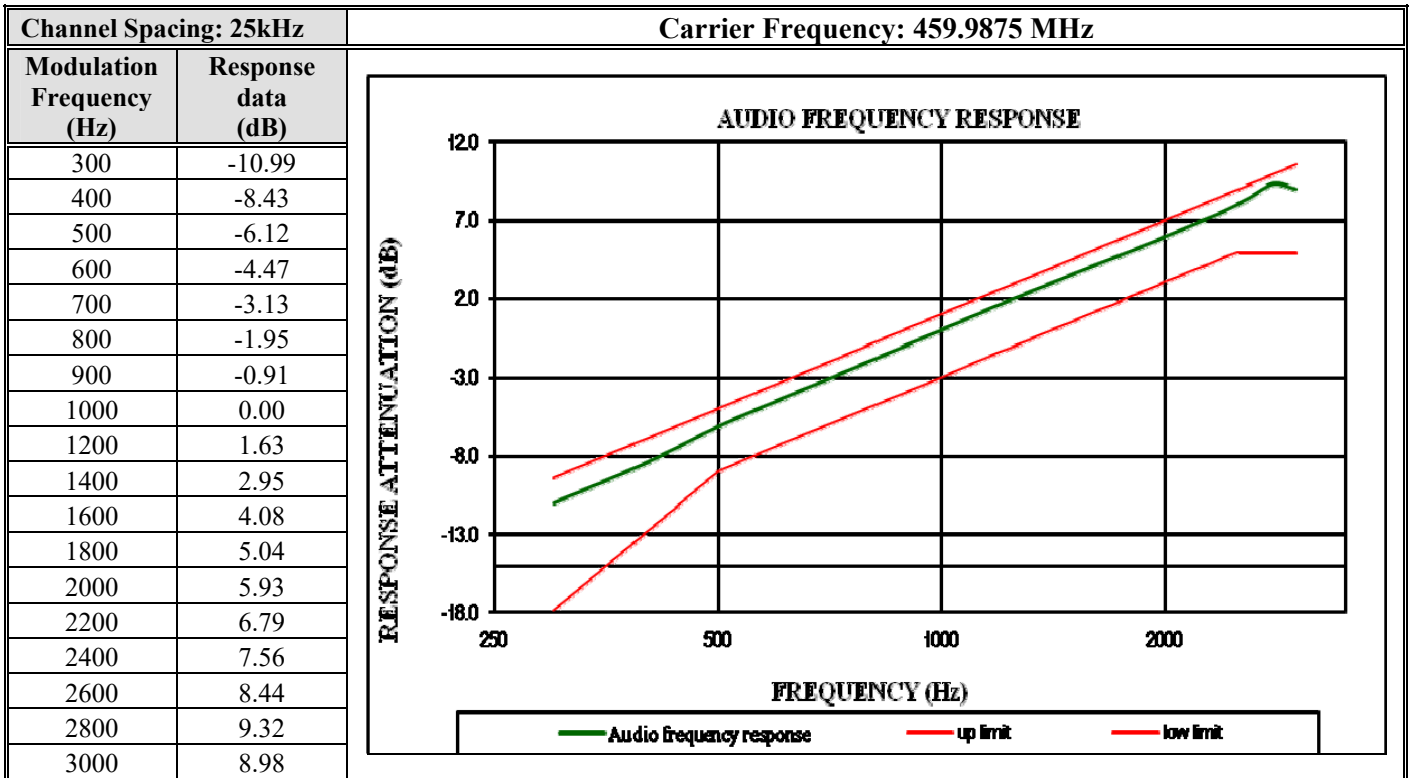
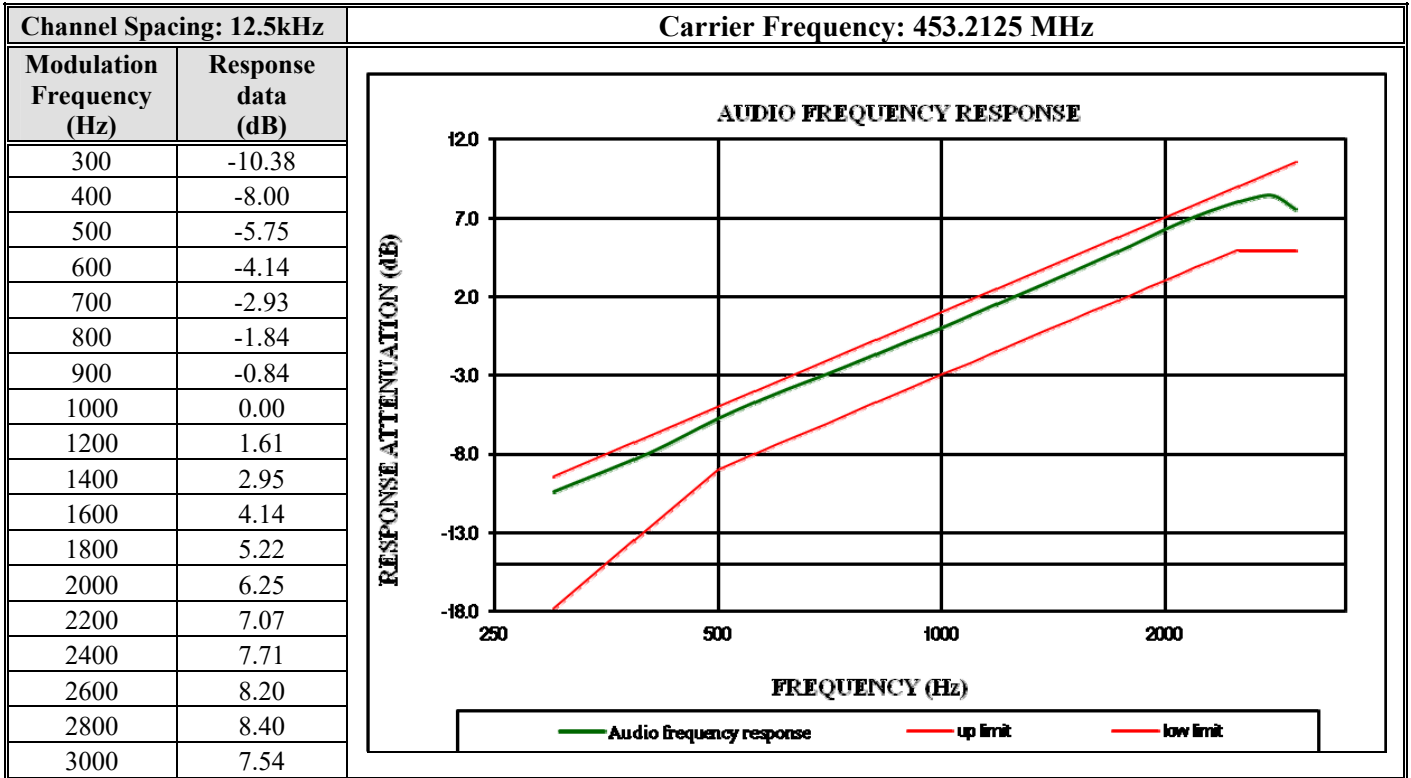
#### **Test Data**

Test Mode: Transmitting

**Test Result: Compliance.**

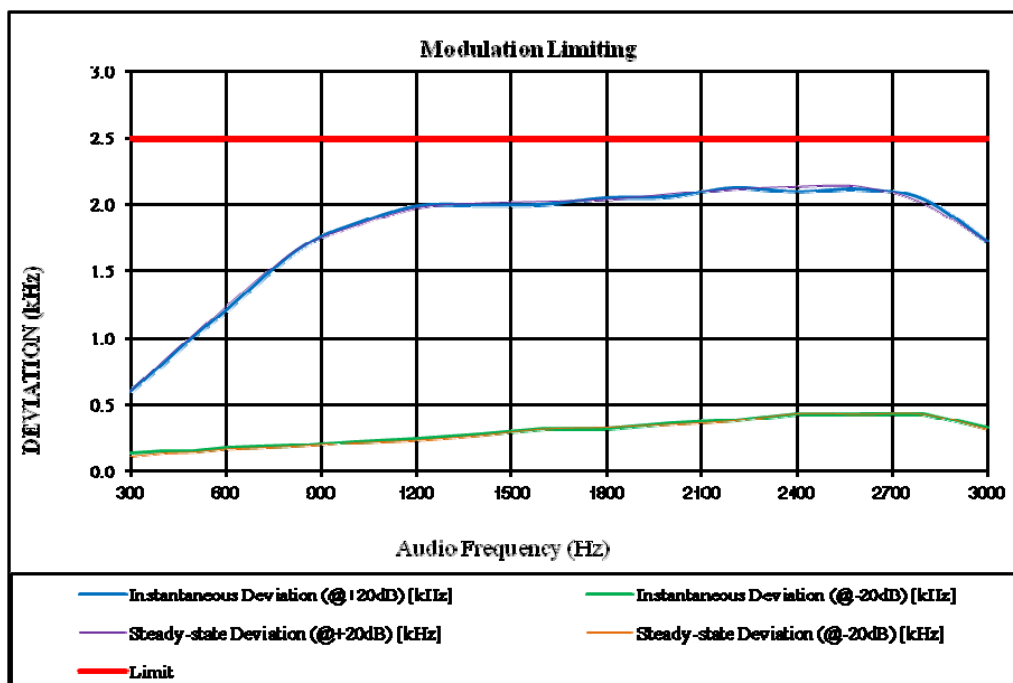
*Please refer to the following tables and plots.*

**Audio Frequency Response – High Power**



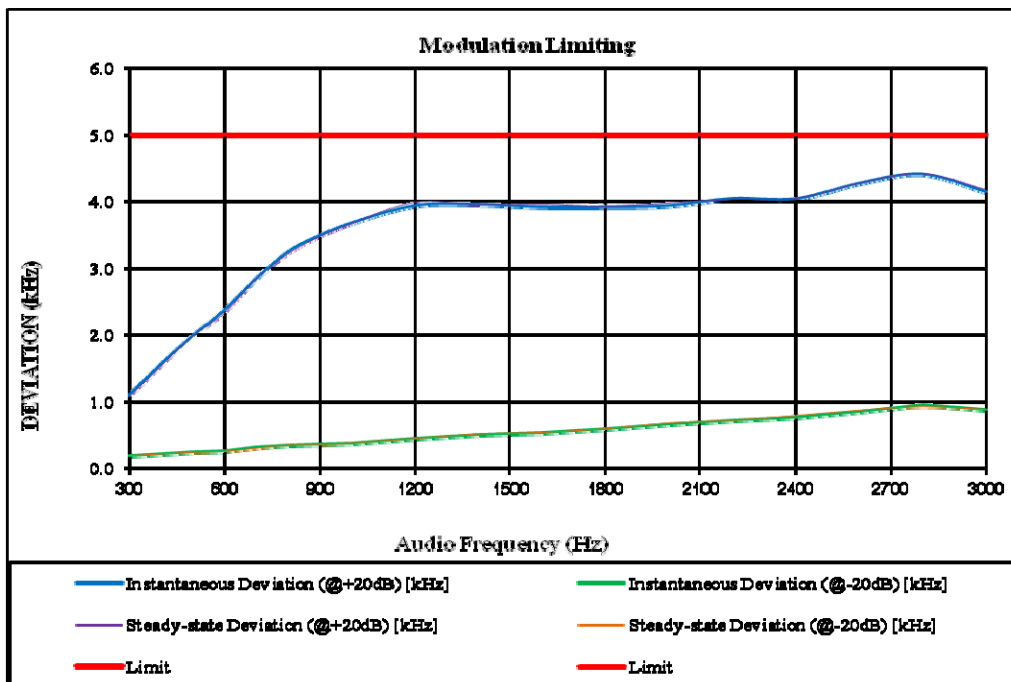
**Modulation Limiting – High Power**

Channel Spacing: 12.5kHz		Carrier Frequency: 453.2125 MHz			
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	0.602	0.134	0.597	0.112	2.5
400	0.806	0.148	0.821	0.136	2.5
500	1.015	0.146	1.024	0.143	2.5
600	1.209	0.178	1.234	0.165	2.5
700	1.414	0.180	1.436	0.173	2.5
800	1.618	0.191	1.625	0.184	2.5
900	1.760	0.205	1.752	0.196	2.5
1000	1.850	0.220	1.834	0.215	2.5
1200	1.990	0.243	1.976	0.234	2.5
1400	2.000	0.277	2.012	0.268	2.5
1600	2.003	0.321	2.024	0.314	2.5
1800	2.050	0.320	2.038	0.326	2.5
2000	2.060	0.359	2.079	0.347	2.5
2200	2.130	0.386	2.120	0.374	2.5
2400	2.100	0.430	2.140	0.429	2.5
2600	2.120	0.432	2.140	0.426	2.5
2800	2.040	0.435	2.010	0.425	2.5
3000	1.730	0.325	1.725	0.314	2.5



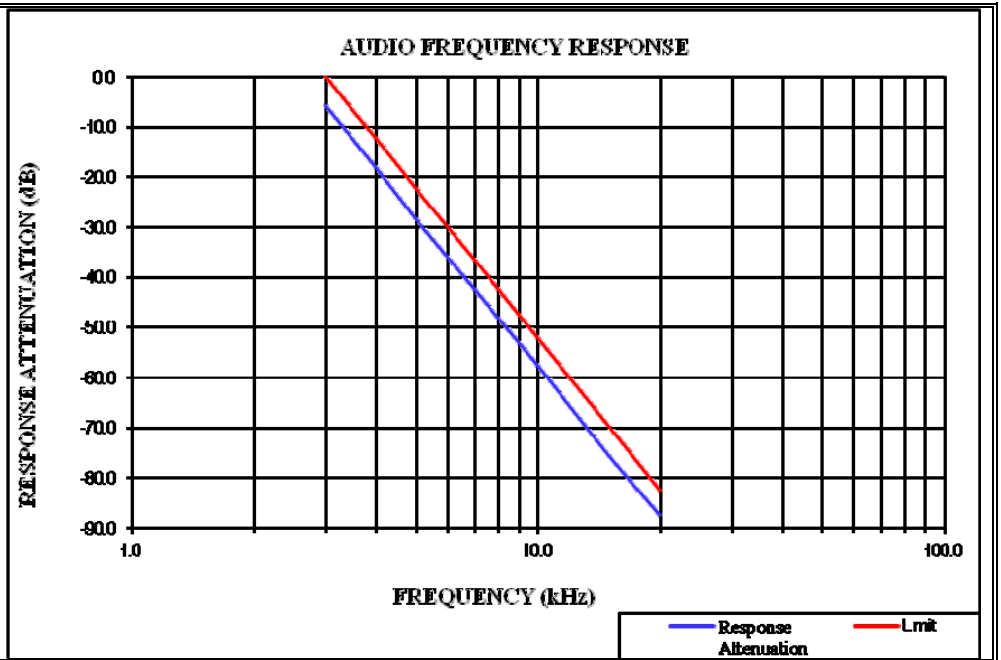


Channel Spacing: 25kHz		Carrier Frequency: 459.9875 MHz			
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.087	0.192	1.065	0.188	5
400	1.564	0.220	1.537	0.212	5
500	1.980	0.240	1.976	0.238	5
600	2.375	0.260	2.326	0.251	5
700	2.839	0.310	2.827	0.296	5
800	3.250	0.350	3.210	0.345	5
900	3.490	0.356	3.460	0.352	5
1000	3.680	0.380	3.660	0.376	5
1200	3.940	0.450	3.980	0.442	5
1400	3.960	0.506	3.940	0.512	5
1600	3.920	0.528	3.950	0.534	5
1800	3.920	0.596	3.920	0.587	5
2000	3.940	0.657	3.970	0.677	5
2200	4.047	0.723	4.023	0.715	5
2400	4.043	0.764	4.035	0.784	5
2600	4.276	0.853	4.261	0.864	5
2800	4.414	0.945	4.408	0.915	5
3000	4.150	0.874	4.170	0.876	5

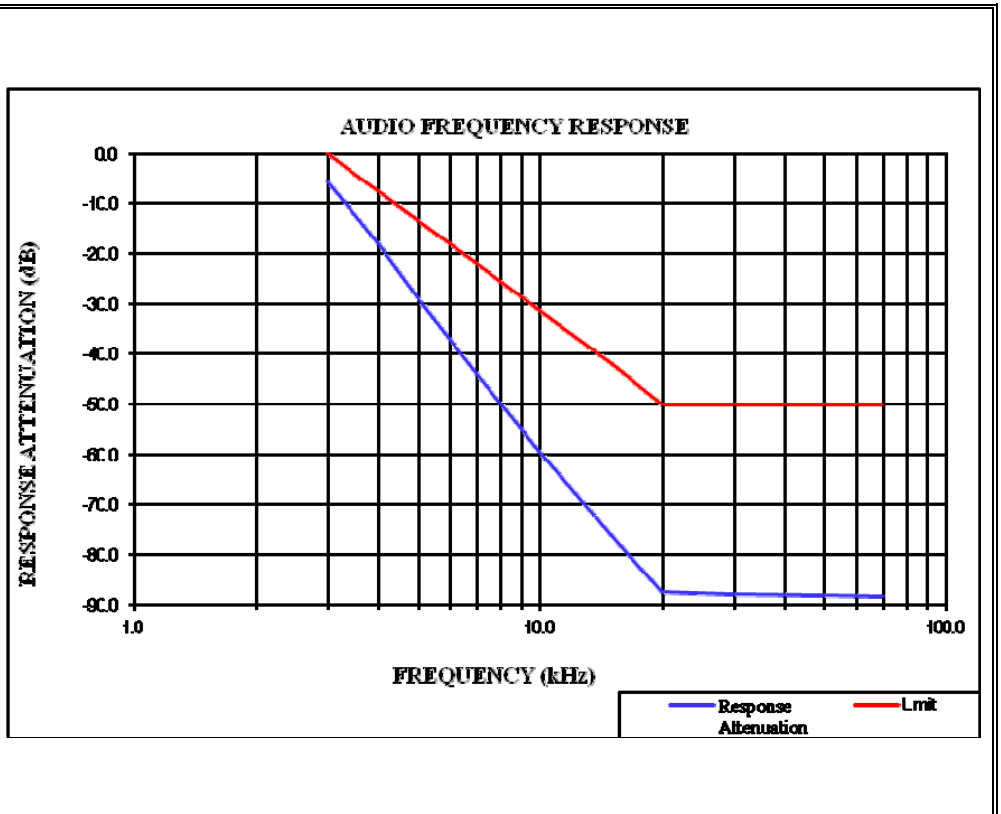


**Audio Frequency Low Pass Filter Response – High Power**

Channel Spacing: 12.5kHz		
Carrier Frequency: 453.2125 MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-5.8	0.0
3.5	-12.5	-6.7
4.0	-18.4	-12.5
5.0	-28.3	-22.2
7.0	-42.6	-36.8
10.0	-57.8	-52.3
15.0	-75.8	-69.9
20.0	-87.6	-82.5



Channel Spacing: 25kHz		
Carrier Frequency: 459.9875 MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-5.6	0.0
3.5	-12.3	-4.0
4.0	-18.2	-7.5
5.0	-28.9	-13.3
7.0	-44.2	-22.1
10.0	-59.7	-31.4
15.0	-76.4	-41.9
20.0	-87.6	-50.0
30.0	-87.9	-50.0
50.0	-88.1	-50.0
70.0	-88.4	-50.0



## 4 – OCCUPIED BANDWIDTH & EMISSION MASK

### Applicable Standard

FCC §2.1049, §22.357, § 22.731, §74.462, §80.205, §80.207, §90.209 and §90.210

### Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 100 Hz or 300 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

### Test Data

Test Mode: Transmitting

**Test Result: Compliance.** Please refer to following table and plots.

Test Mode	Test Channel	Test Frequency (MHz)	High Power Level		Low Power Level		Note
			99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)	
FM 12.5kHz	Low	350.0125	7.525	10.275	7.525	10.275	FCC
	Middle	453.2125	9.986	10.275	9.986	10.275	Part 90
	High	469.9875	9.986	10.265	9.986	10.275	
	Additional	454.0125	9.986	10.275	9.986	10.275	Part 22
	Additional	455.0125	9.986	10.275	9.913	10.275	Part 74
4FSK 12.5kHz	Low	350.0125	6.512	8.828	7.091	9.407	FCC
	Additional	453.2125	7.815	9.768	7.742	10.130	Part 90
	Middle	469.9875	8.249	9.913	8.032	10.637	
	High	454.0125	7.525	9.986	7.598	10.420	Part 22
	Additional	455.0125	7.670	9.986	7.742	9.407	Part 74
FM 25kHz	Additional	454.0125	14.761	15.630	14.761	15.770	Part 22
	Additional	455.0125	14.761	15.710	14.761	15.710	Part 74
	Additional	459.9875	14.906	15.770	14.906	15.770	Part 80

Note: Emission bandwidth was based on calculation method instead of measurement.

Emission Designator: Per CFR 47 §2.201& §2.202, BW = 2M + 2D

#### For FM Mode (Channel Spacing: 12.5 kHz)

Emission Designator: 11K0F3E

In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.

$$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 2.5 \text{ kHz}) = 11 \text{ kHz} = 11K0$$

F3E portion of the designator represents an FM voice transmission

Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.

#### For FM Mode (Channel Spacing: 25 kHz)

Emission Designator: 16K0F3E

In this case, the maximum modulating frequency is 3.0 kHz with a 5.0 kHz deviation.

$$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 5.0 \text{ kHz}) = 16 \text{ kHz} = 16K0$$

F3E portion of the designator represents an FM voice transmission

Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

#### For Digital Mode (Channel Spacing: 12.5 kHz)

Emission Designator: 7K60F1D and 7K60F1E

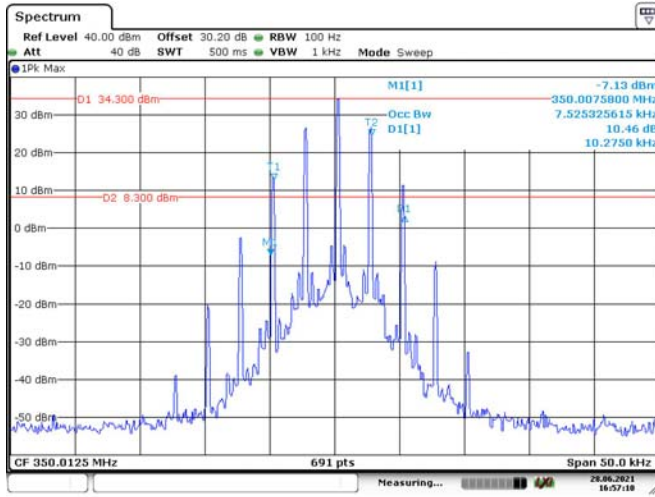
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).

F1D and F1E portion of the designator indicates digital information.

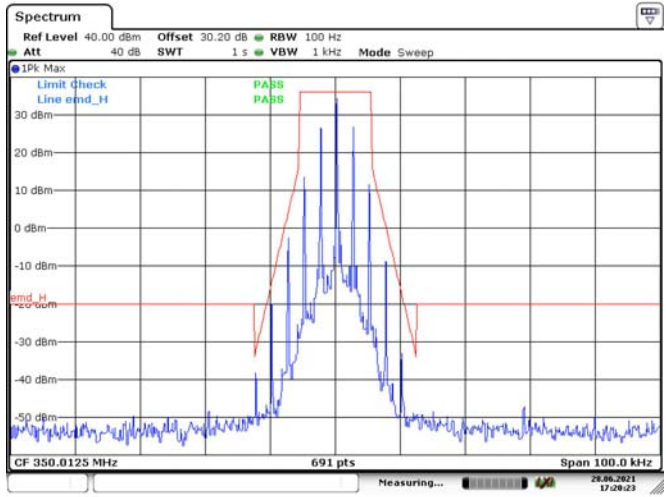
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

FM, 12.5kHz High Power:

Low Channel

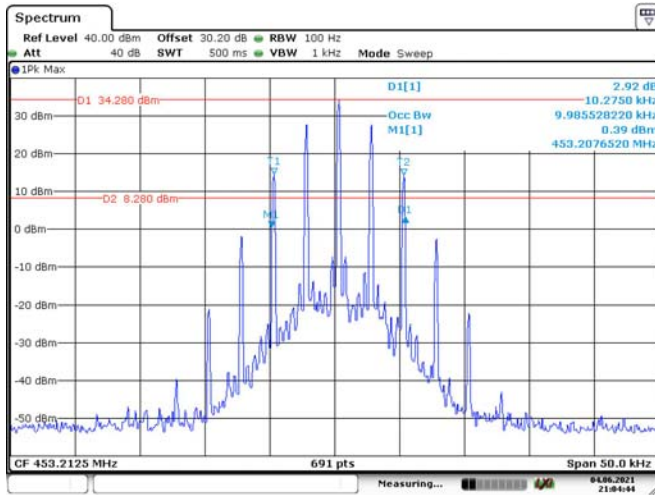


Date: 28 JUN 2021 16:57:10

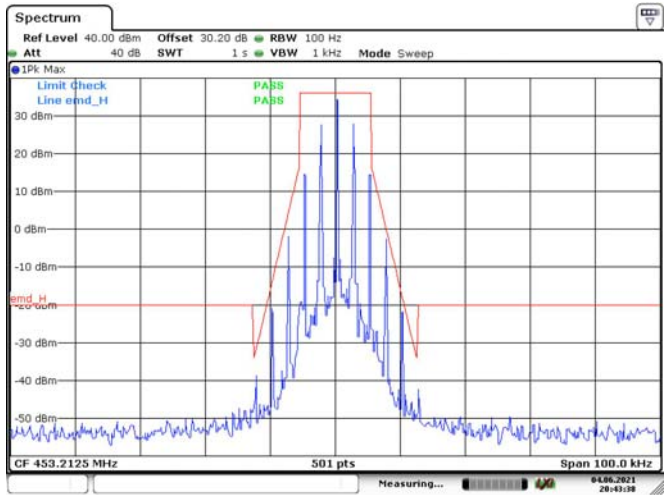


Date: 28 JUN 2021 17:20:23

Middle Channel

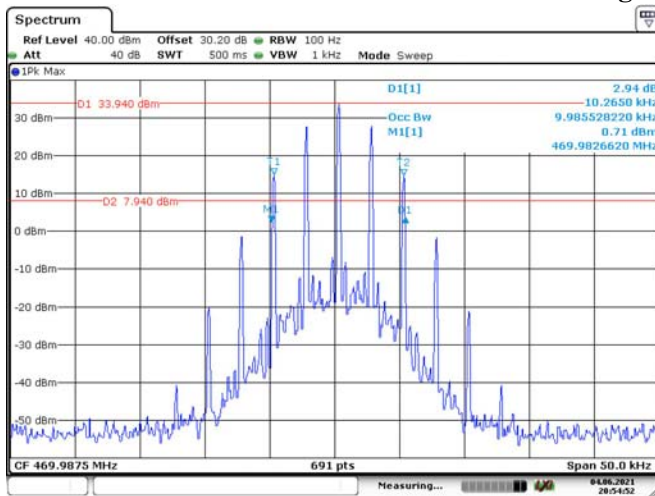


Date: 4 JUN 2021 21:04:45

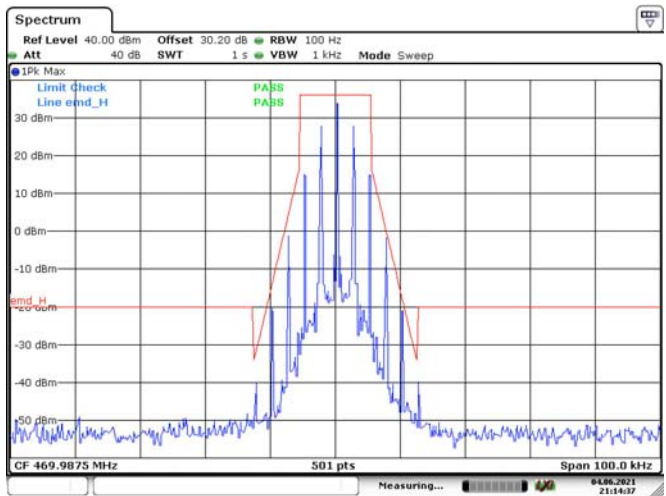


Date: 4 JUN 2021 20:43:38

High Channel

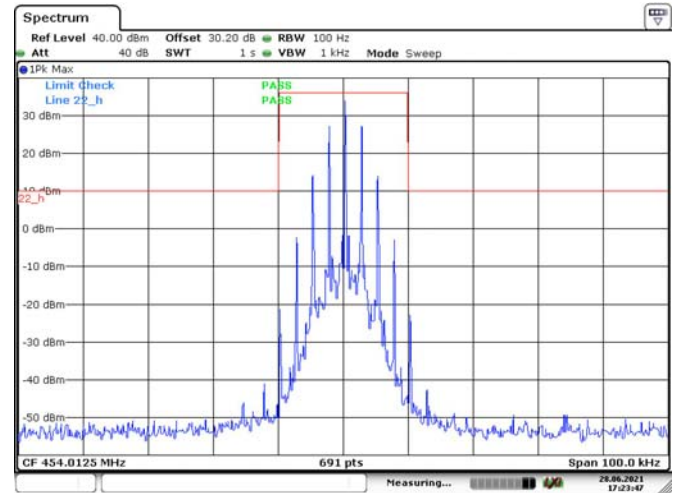
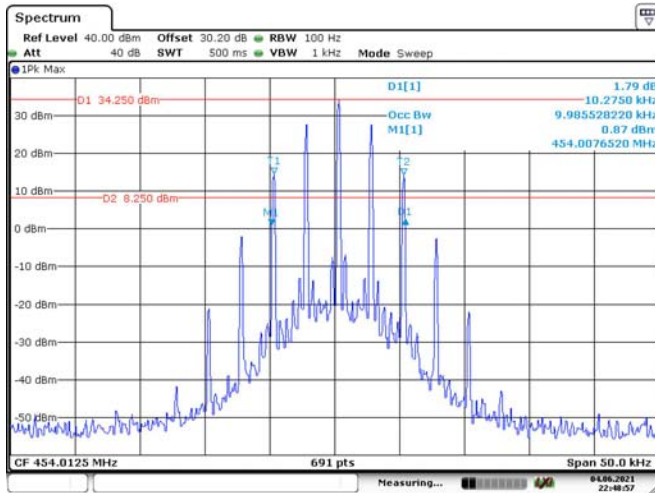


Date: 4 JUN 2021 20:54:52

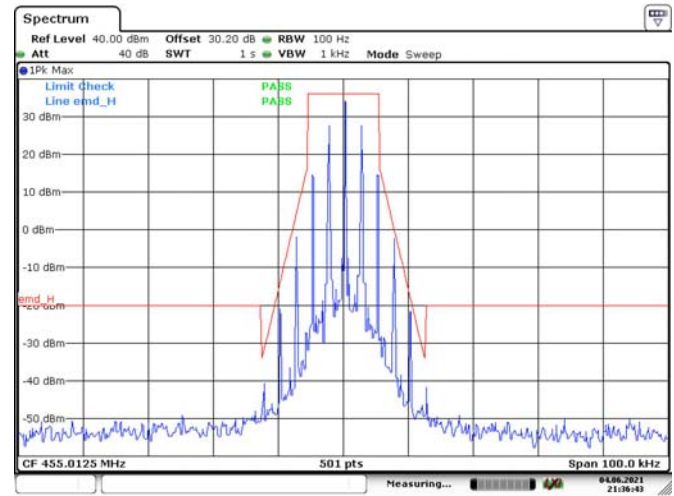
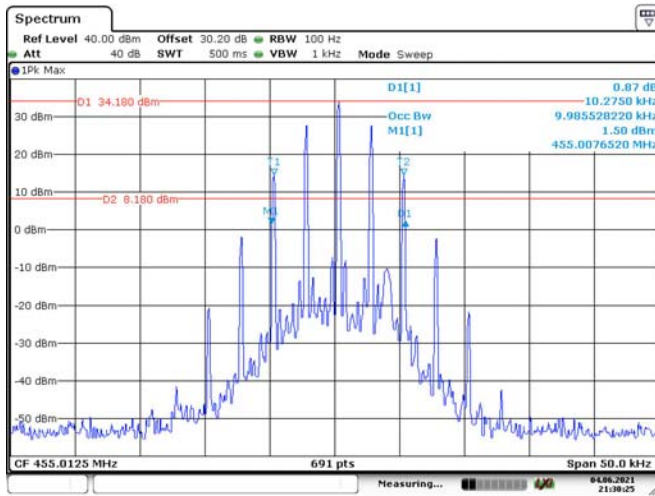


Date: 4 JUN 2021 21:14:37

### Additional Channel Part 22, 454.0125 MHz

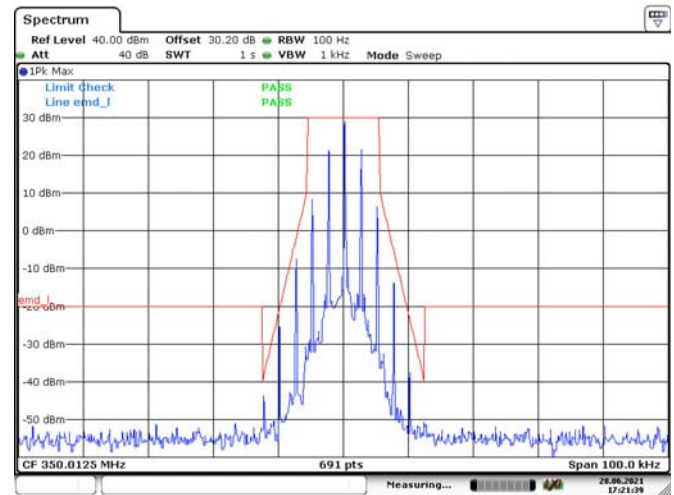
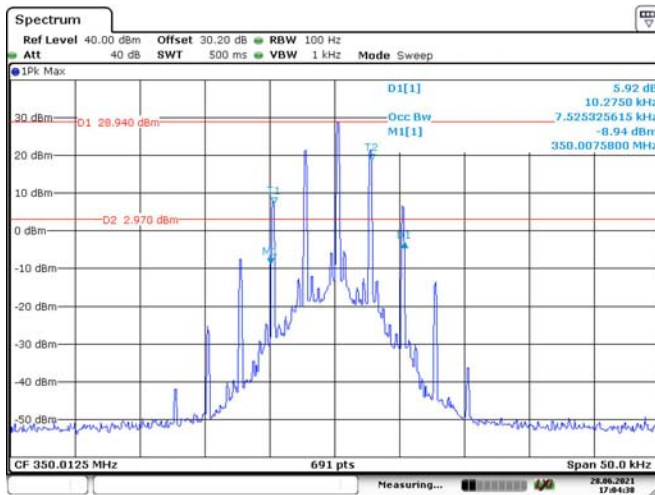


### Additional Channel Part 74, 455.0125 MHz



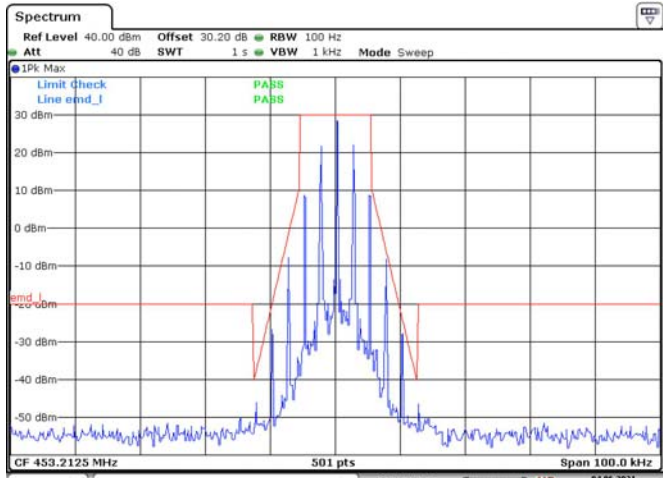
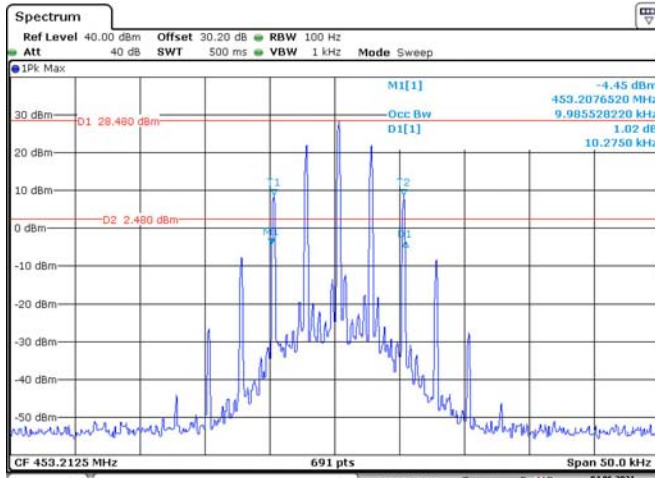
### FM, 12.5kHz Low Power:

### Low Channel

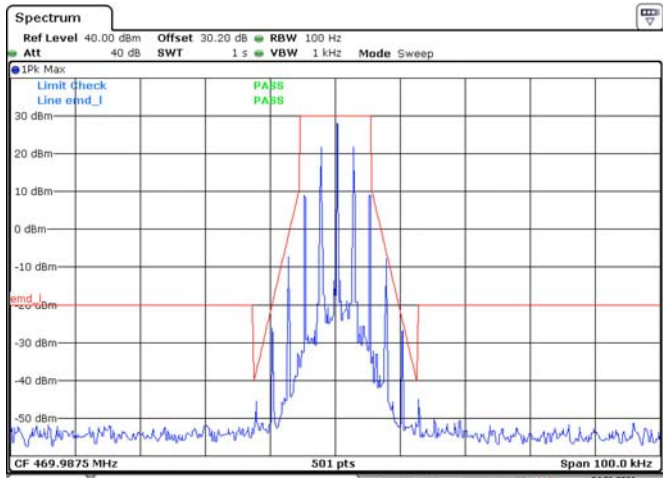
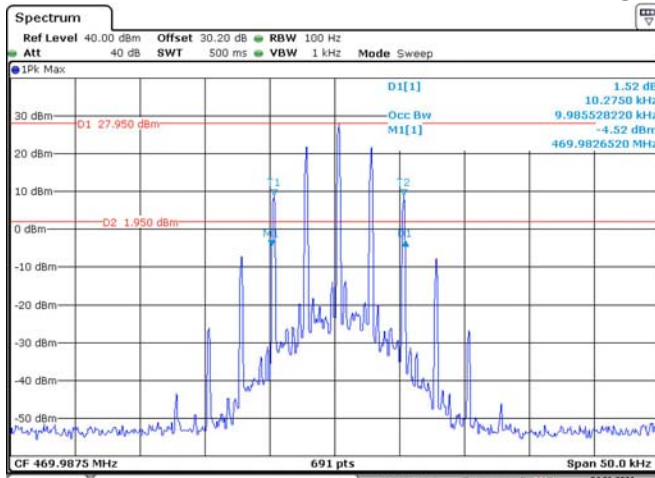




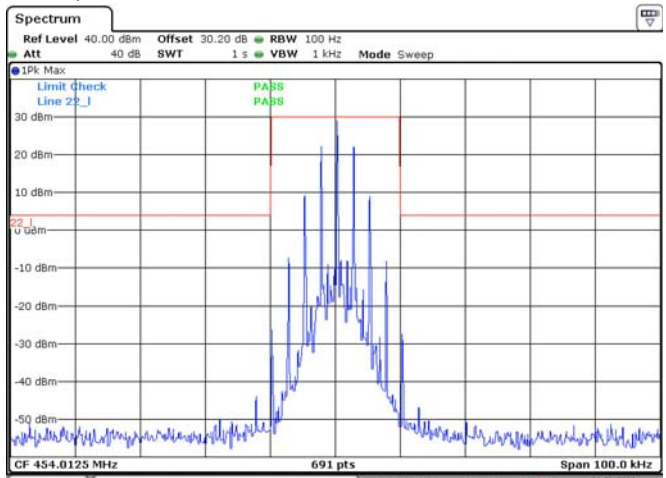
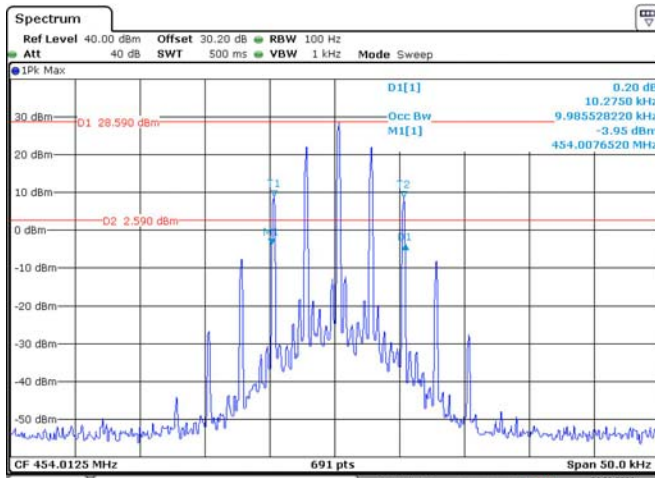
### Middle Channel



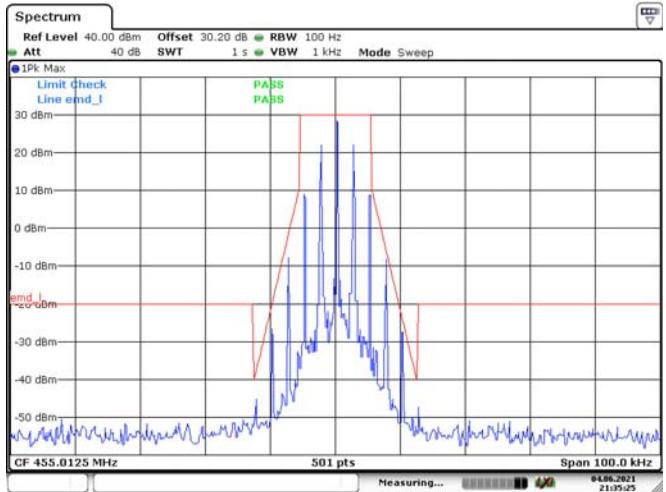
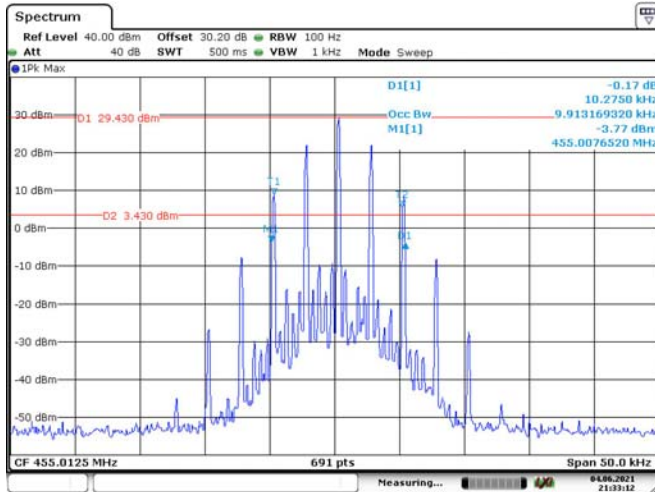
### High Channel



### Additional Channel Part 22, 454.0125 MHz

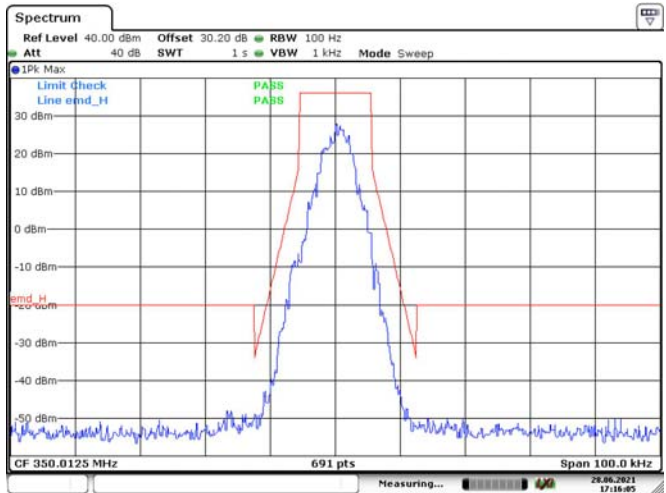
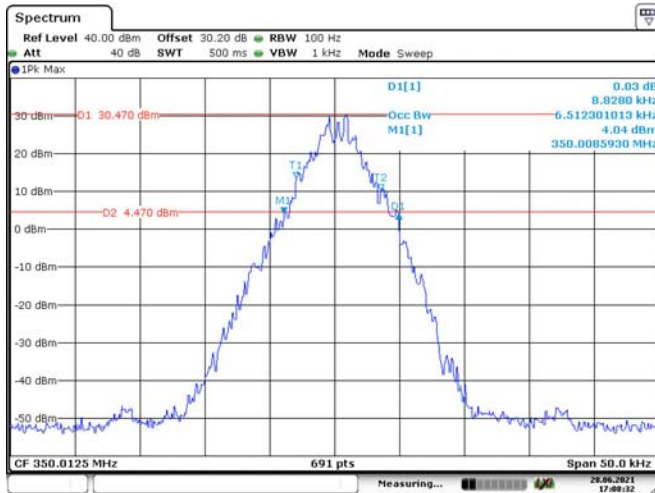


**Additional Channel Part 74, 455.0125 MHz**

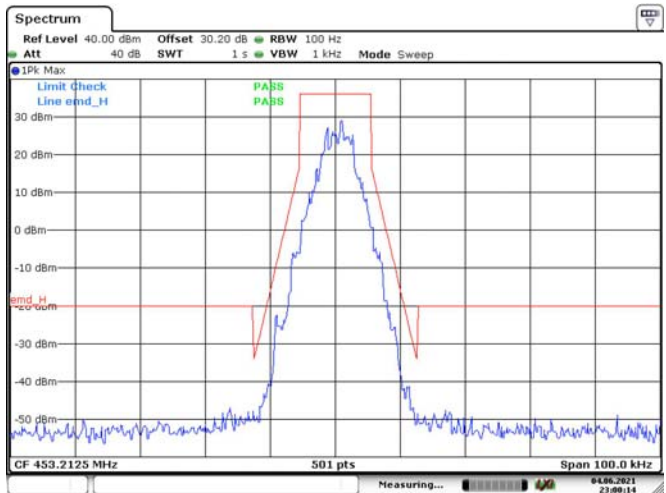
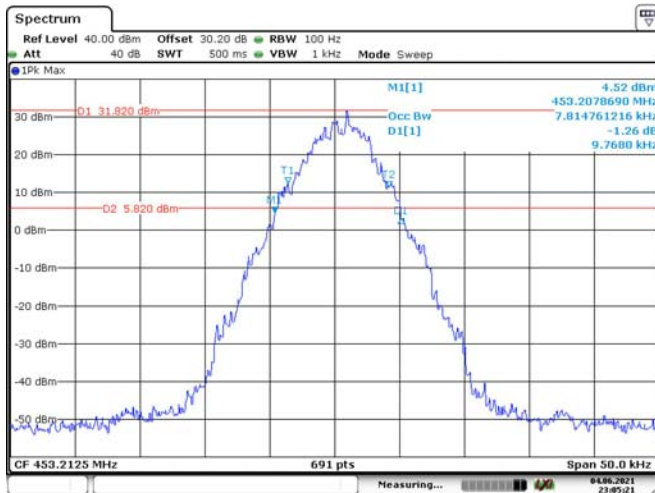


**4FSK, 12.5kHz High Power:**

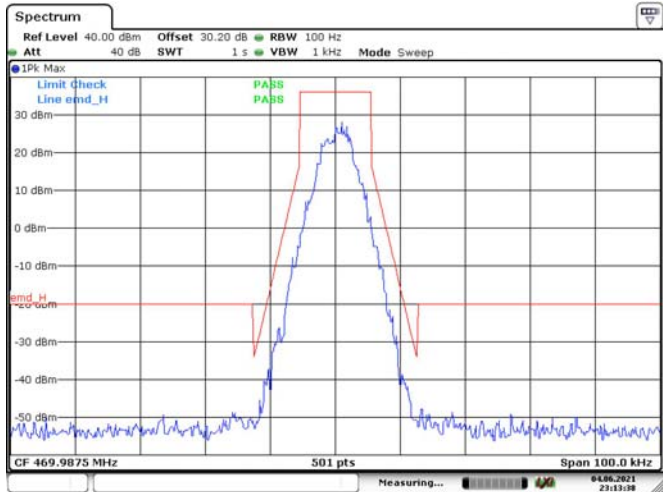
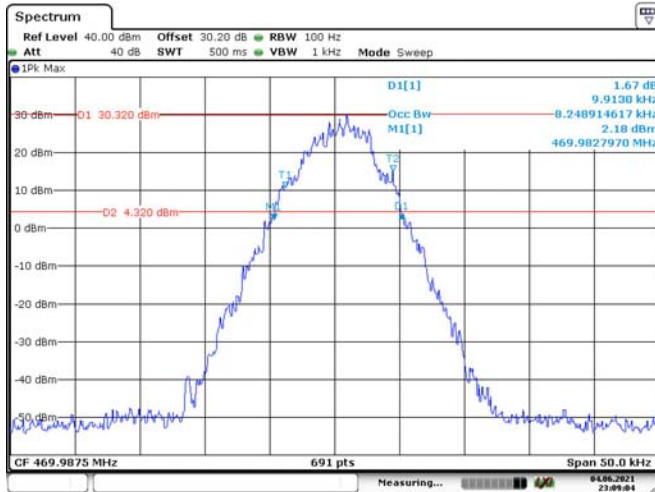
**Low Channel**



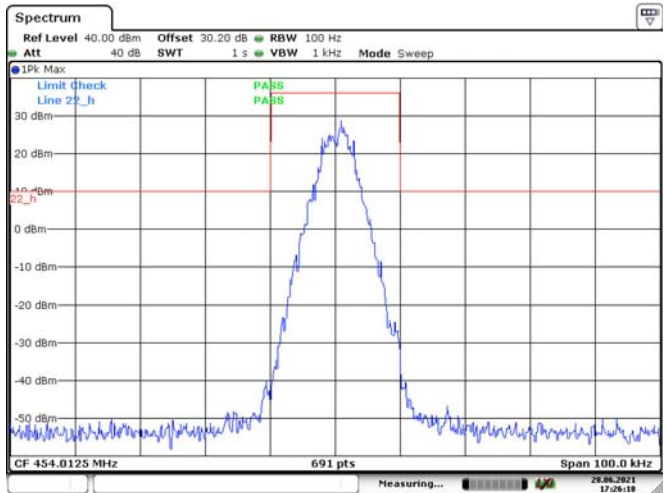
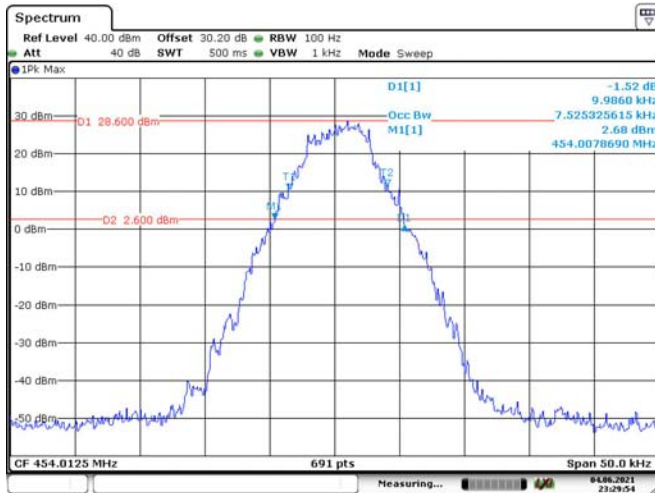
**Middle Channel**



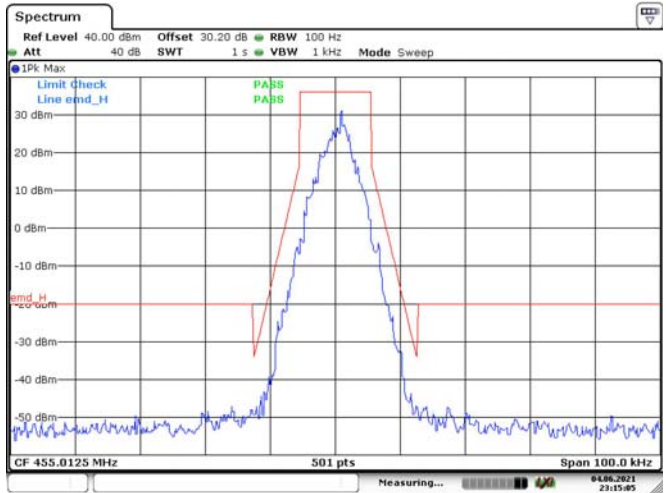
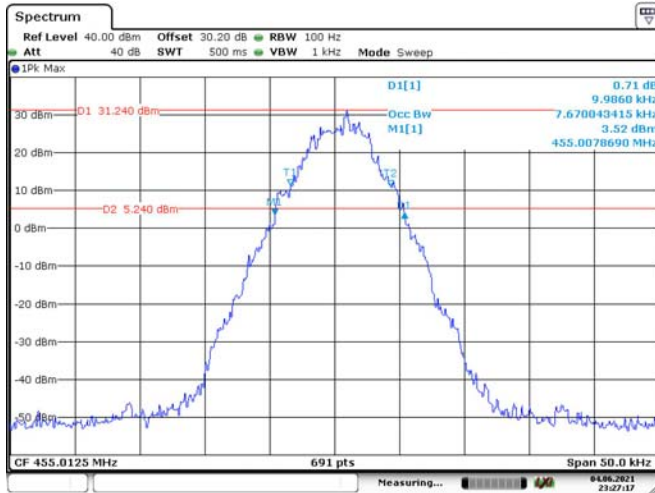
### High Channel



### Additional Channel Part 22, 454.0125 MHz



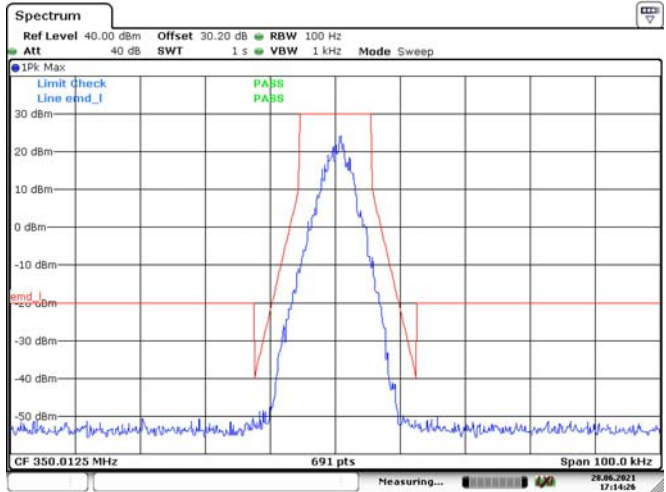
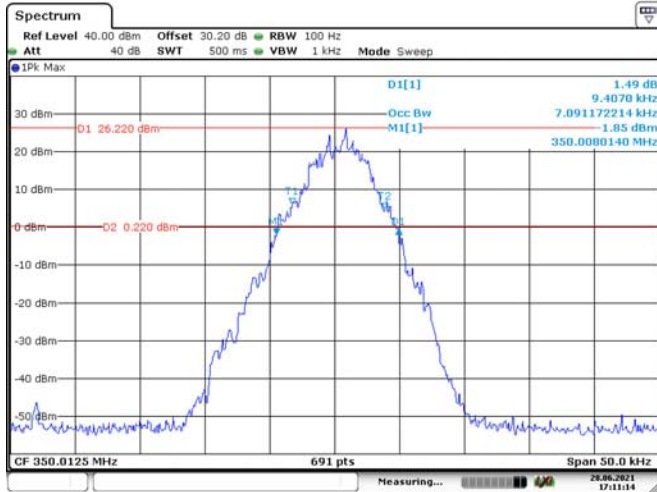
### Additional Channel Part 74, 455.0125 MHz



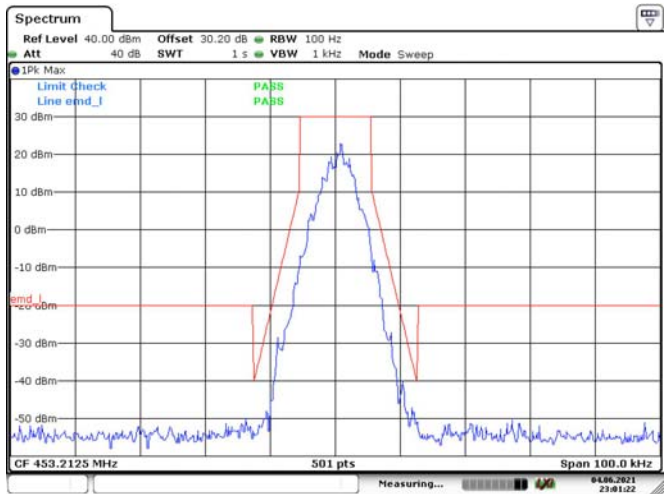
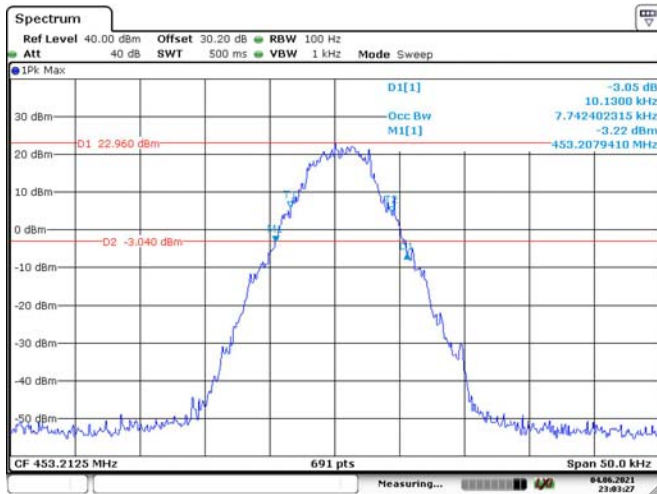


4FSK, 12.5kHz Low Power:

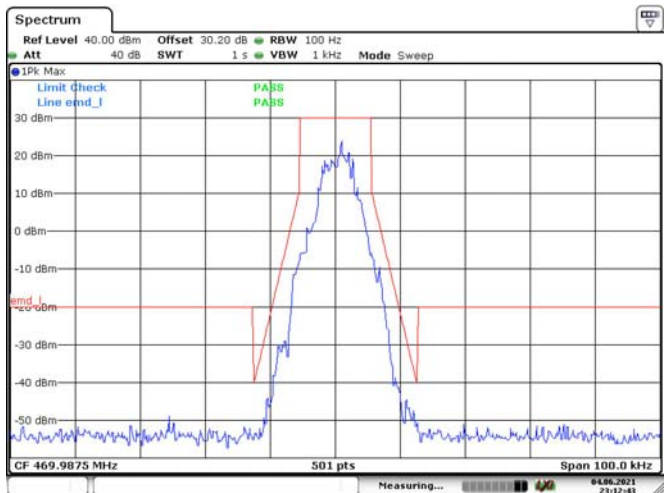
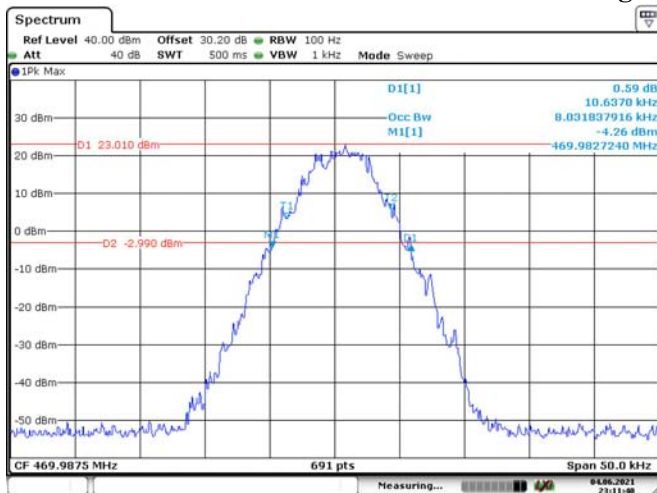
Low Channel



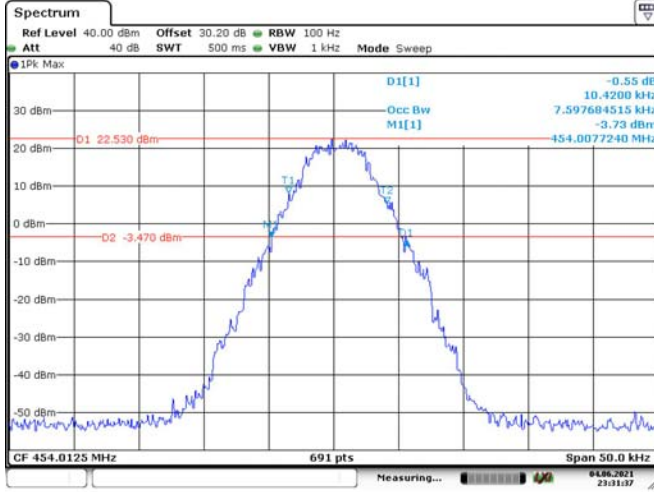
Middle Channel



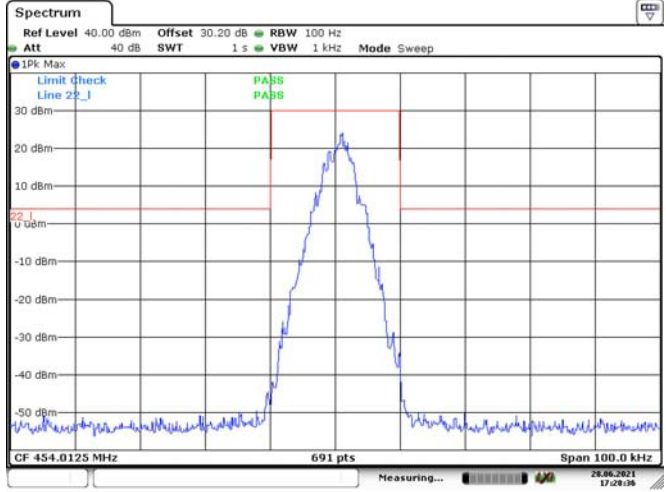
High Channel



### Additional Channel Part 22, 454.0125 MHz

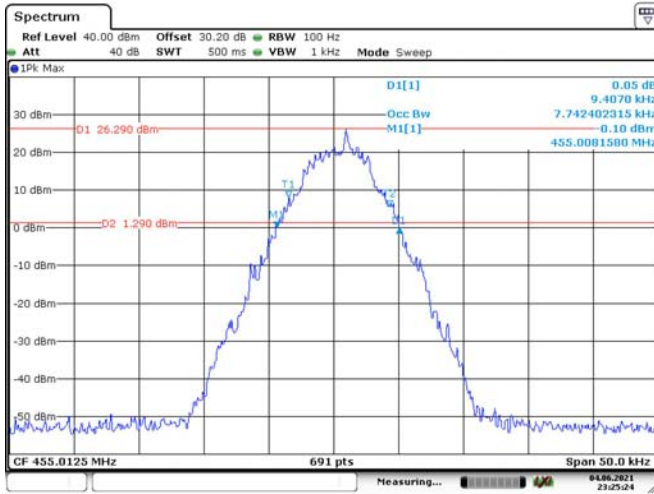


Date: 4 JUN 2021 23:31:37

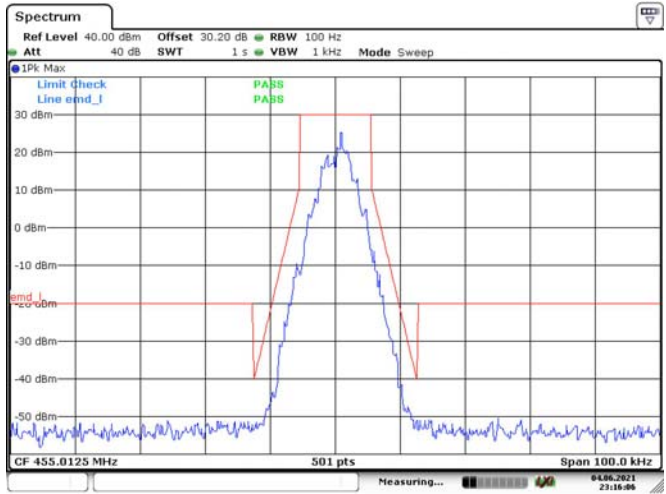


Date: 28 JUN 2021 17:28:36

### Additional Channel Part 74, 455.0125 MHz



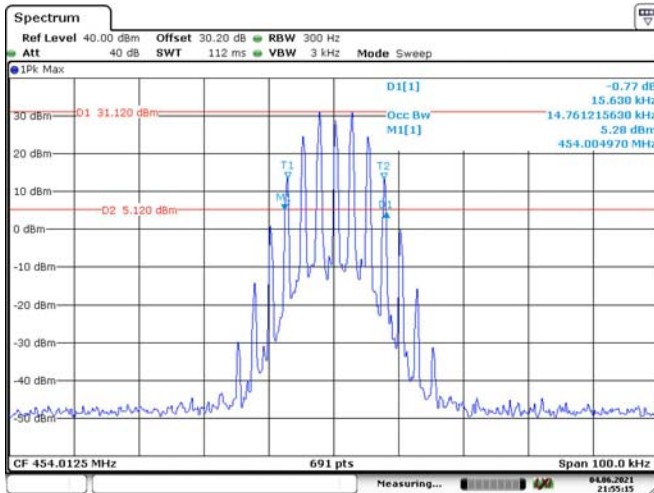
Date: 4 JUN 2021 23:25:24



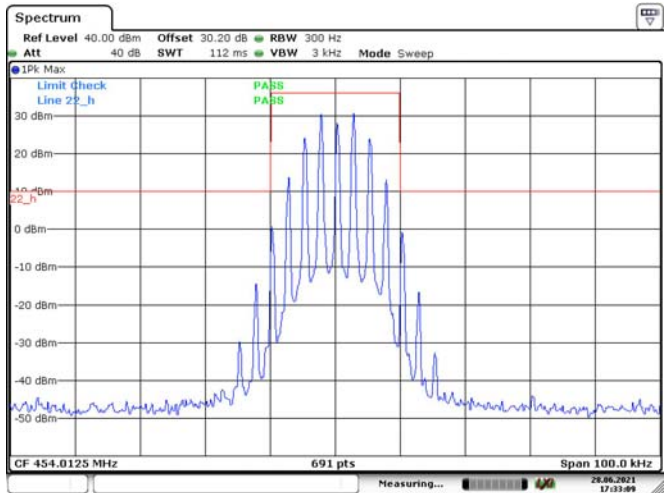
Date: 4 JUN 2021 23:16:07

### FM, 25 kHz, High Power:

### Additional Channel Part 22, 454.0125 MHz

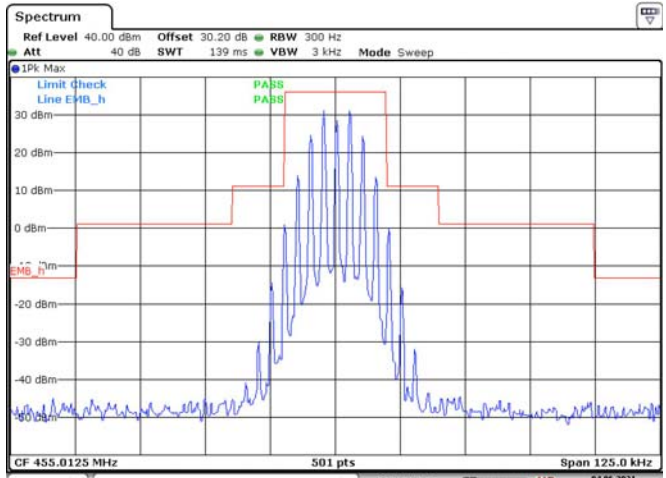
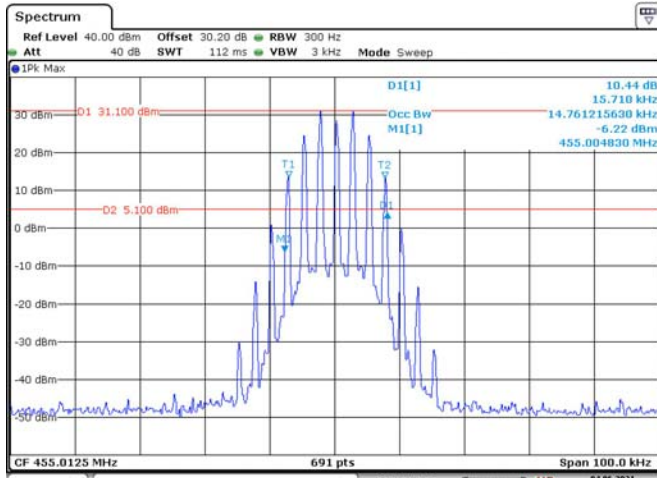


Date: 4 JUN 2021 21:55:15

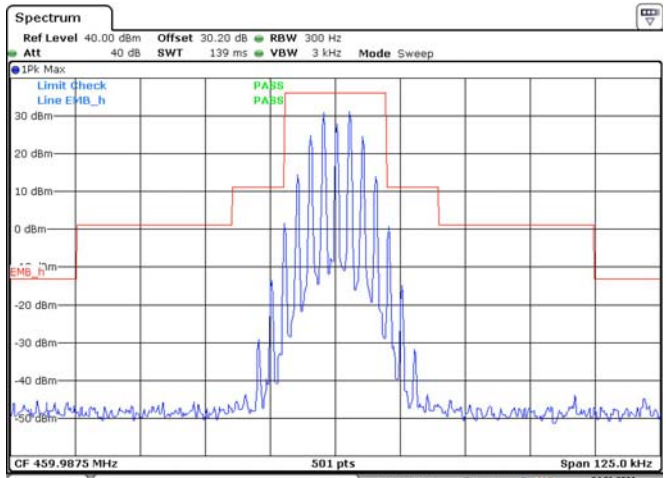
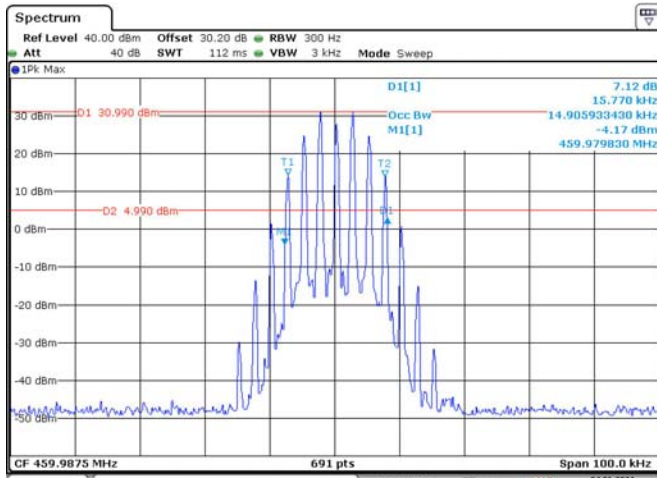


Date: 28 JUN 2021 17:33:09

**Additional Channel Part 74, 455.0125 MHz**

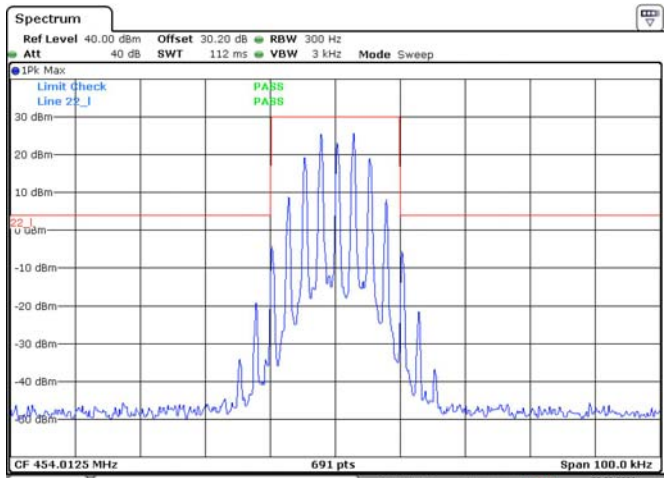
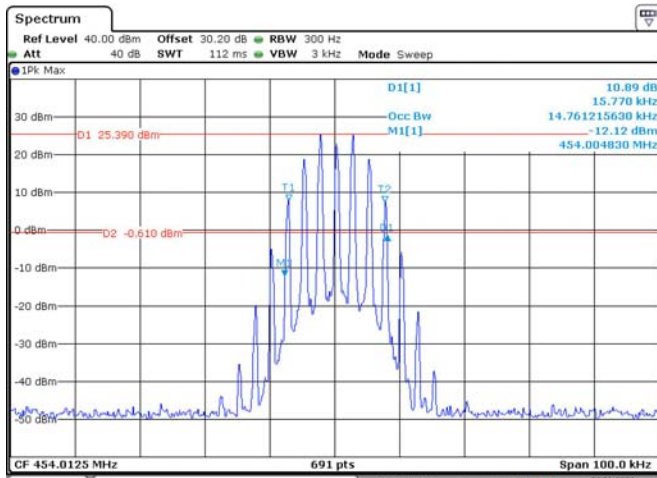


**Additional Channel Part 80, 459.9875 MHz**

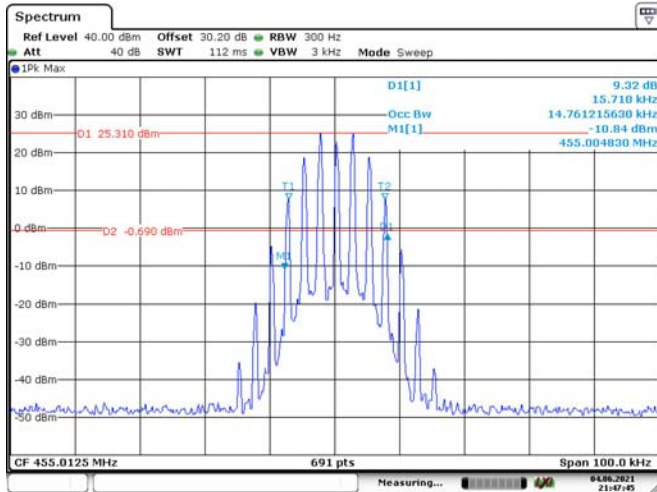


**FM, 25 kHz, Low Power:**

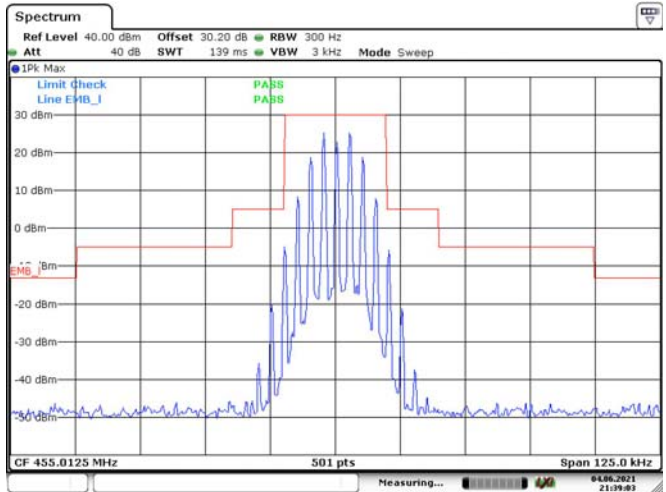
**Additional Channel Part 22, 454.0125 MHz**



### Additional Channel Part 74, 455.0125 MHz

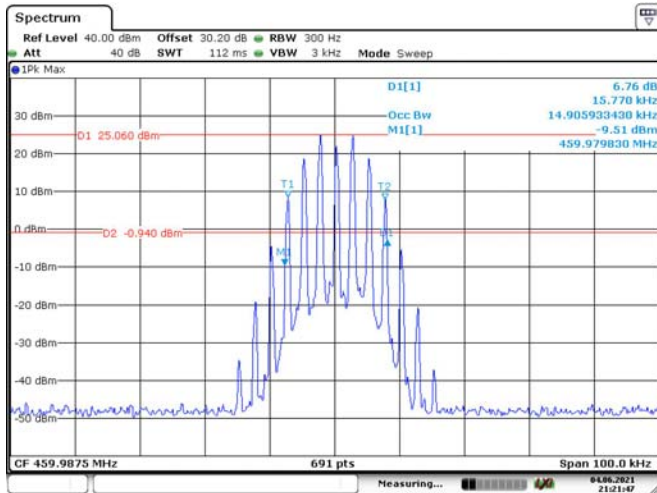


Date: 4.JUN.2021 21:47:45

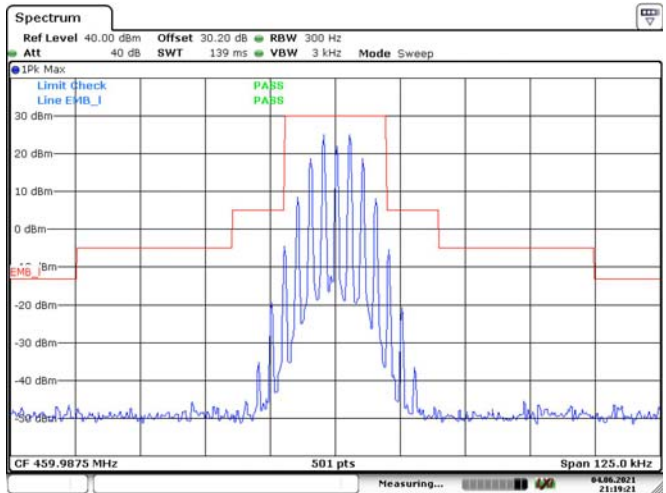


Date: 4.JUN.2021 21:19:04

### Additional Channel Part 80, 459.9875 MHz



Date: 4.JUN.2021 21:21:47



Date: 4.JUN.2021 21:19:21



# 5 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## Applicable Standard

FCC §2.1051, §22.861, §74.462, §80.211, and §90.210

## Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

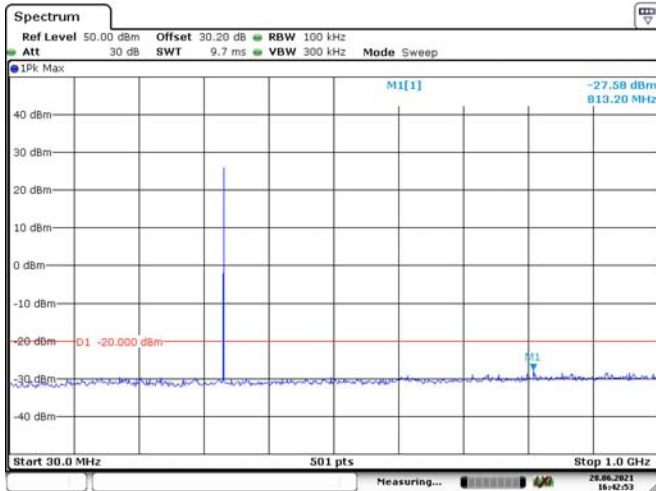
## Test Data

Test Mode: Transmitting

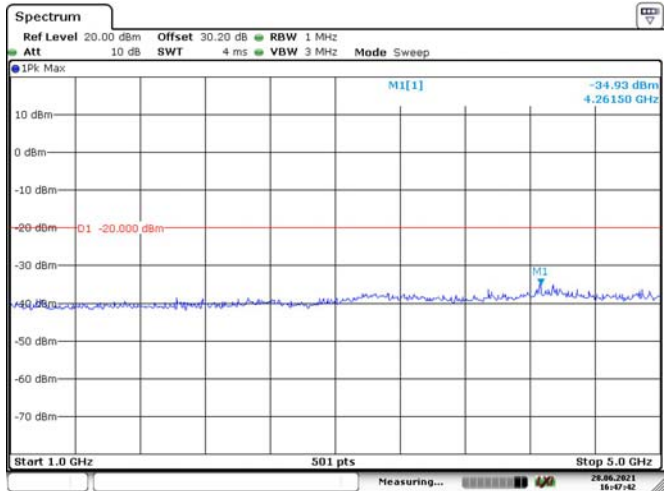
Test Result: Compliance. Please refer to following plots.

### FM, 12.5kHz:

Low Channel, 350.0125 MHz

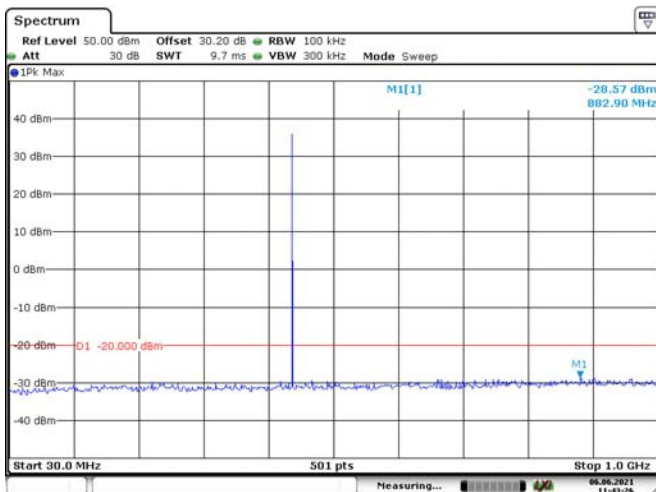


Date: 28 JUN 2021 16:42:53

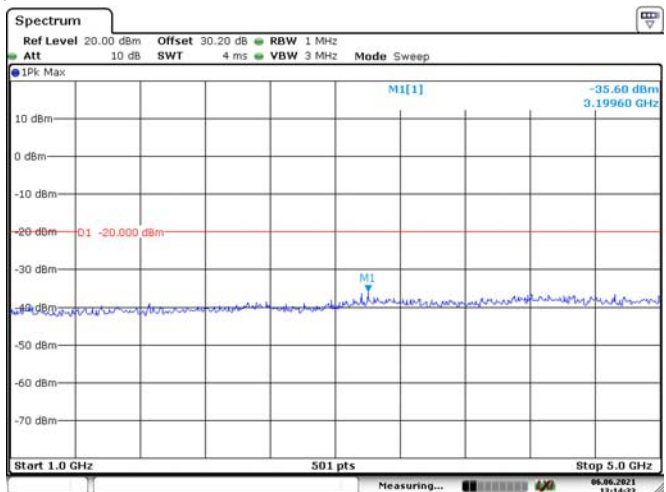


Date: 28 JUN 2021 16:47:42

Middle Channel, 453.2125 MHz

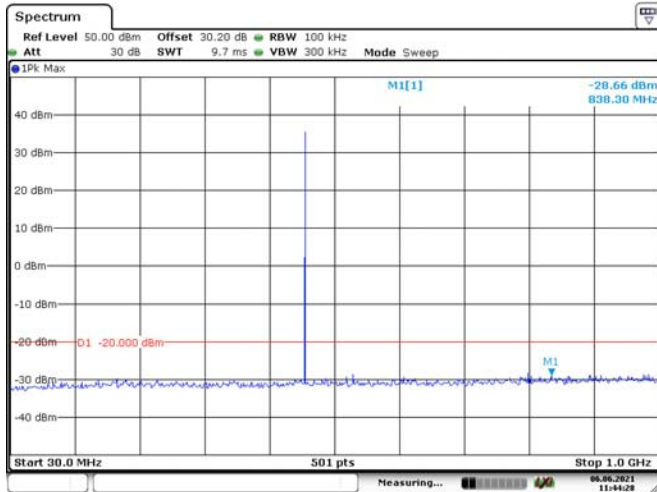


Date: 6 JUN 2021 11:43:26

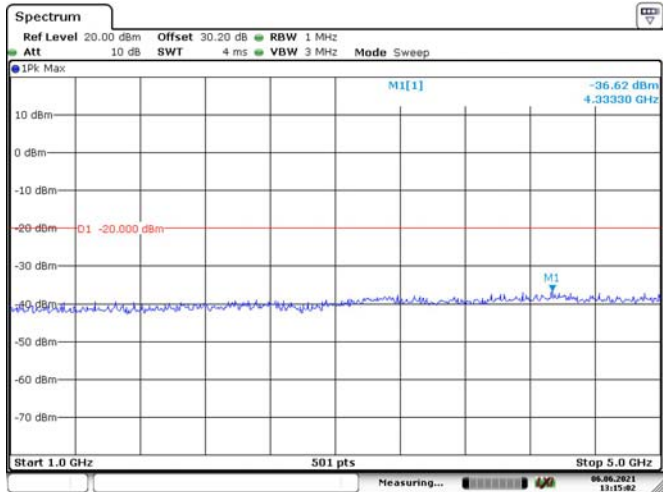


Date: 6 JUN 2021 13:14:33

### High Channel, 469.9875 MHz



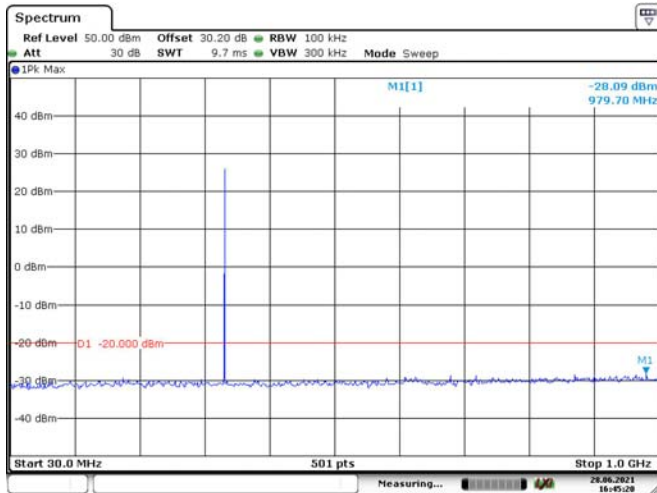
Date: 6 JUN 2021 11:44:28



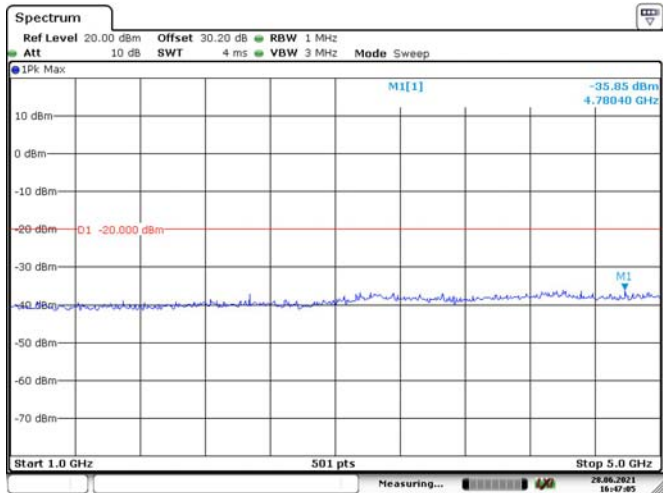
Date: 6 JUN 2021 13:15:03

### 4FSK, 12.5kHz:

### Low Channel, 350.0125 MHz

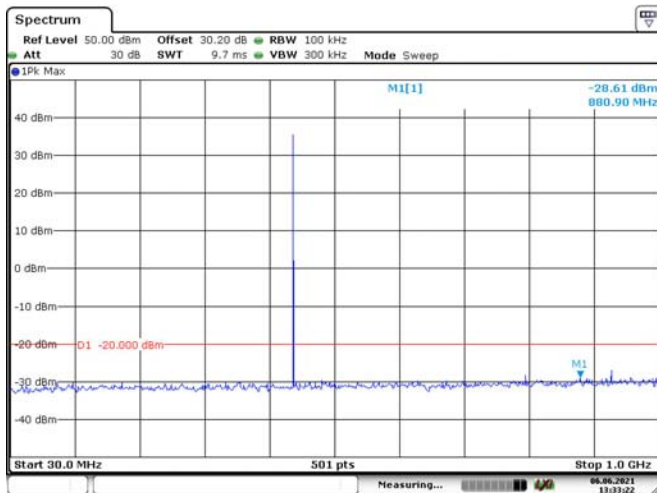


Date: 28 JUN 2021 16:45:20

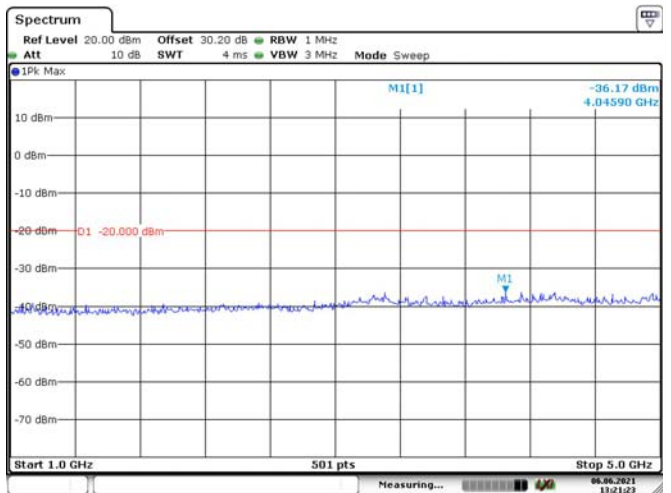


Date: 28 JUN 2021 16:47:05

### Middle Channel, 453.2125 MHz

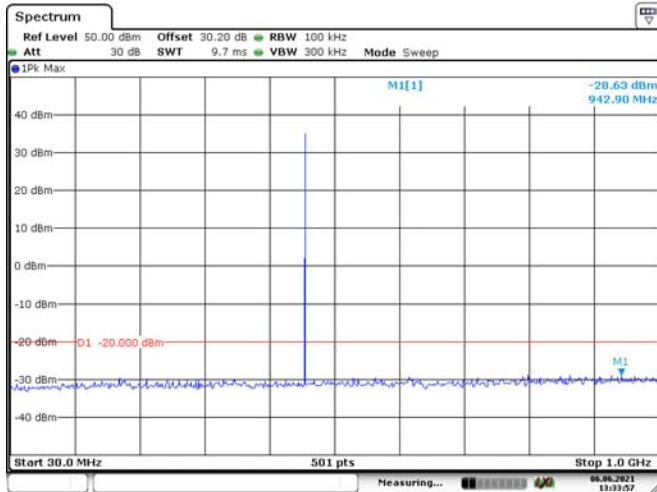


Date: 6 JUN 2021 13:33:23

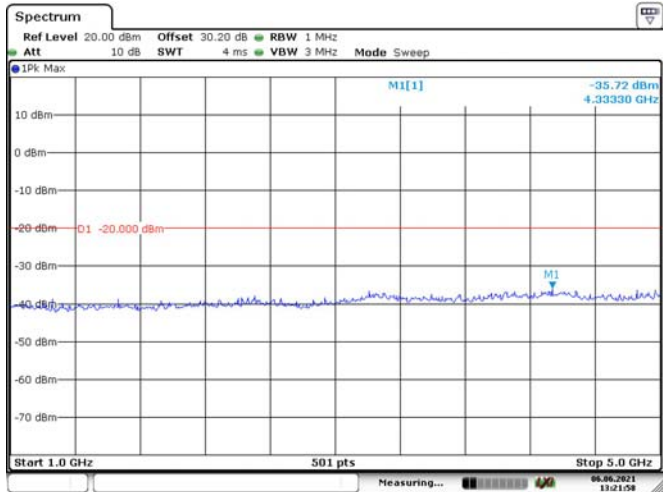


Date: 6 JUN 2021 13:21:24

### High Channel, 469.9875 MHz



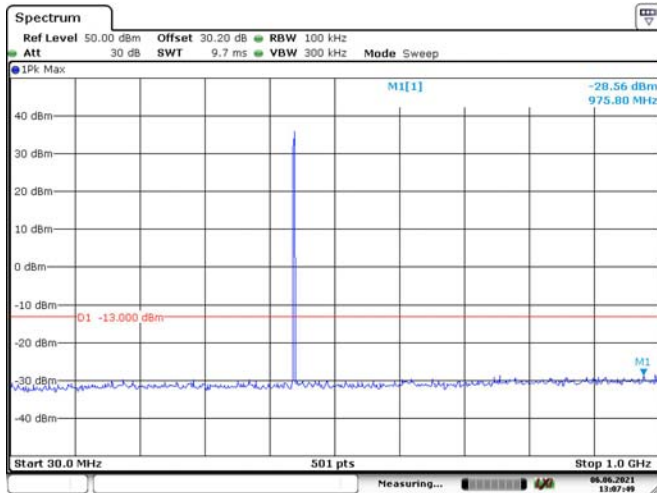
Date: 6 JUN 2021 13:33:58



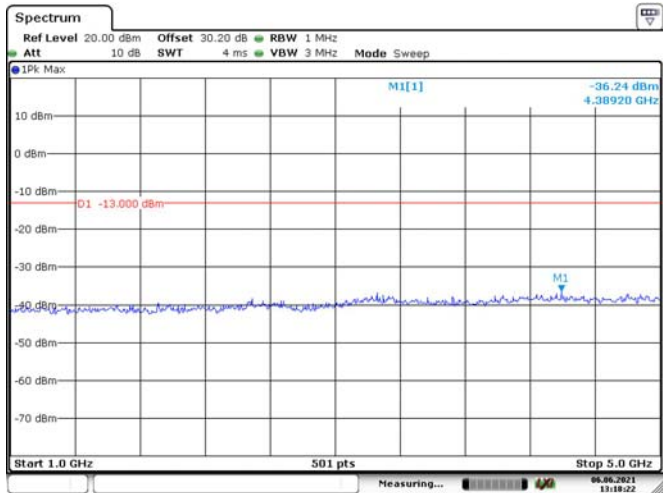
Date: 6 JUN 2021 13:21:58

### Part 22:

### FM, 12.5kHz, 454.0125 MHz

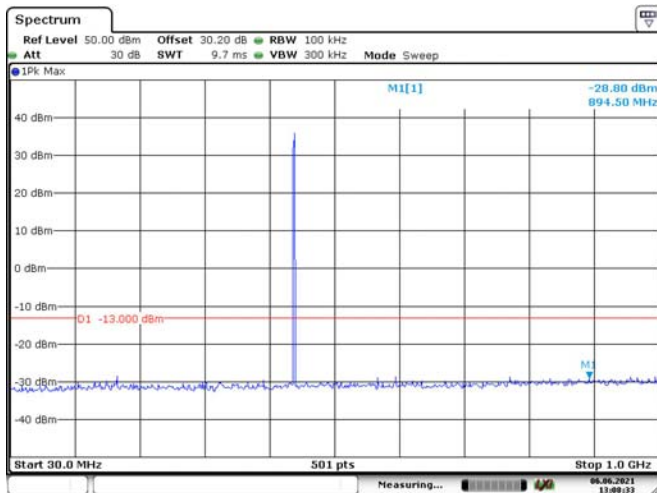


Date: 6 JUN 2021 13:07:49

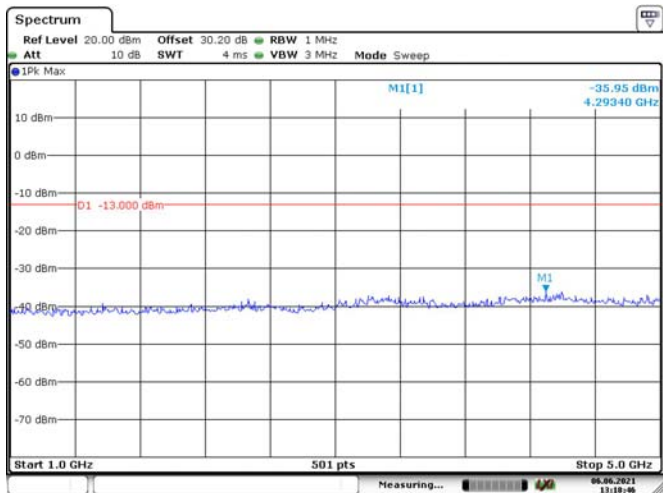


Date: 6 JUN 2021 13:18:23

### FM, 25kHz, 454.0125 MHz

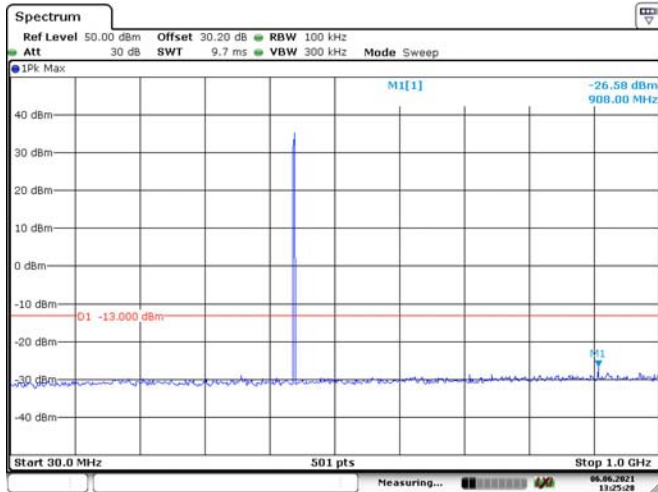


Date: 6 JUN 2021 13:08:34

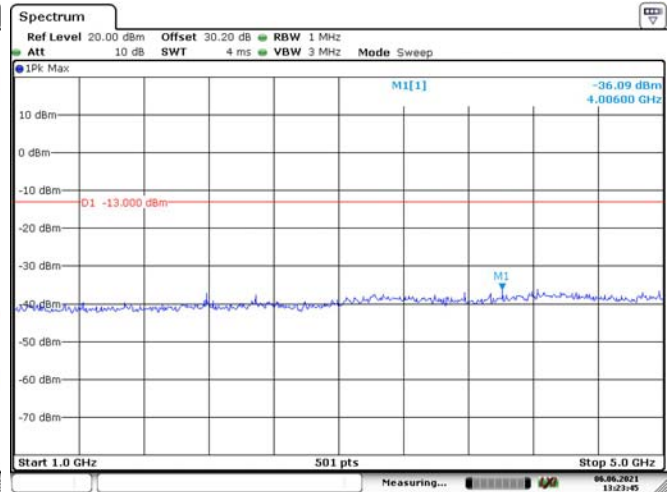


Date: 6 JUN 2021 13:18:47

4FSK,12.5kHz, 454.0125 MHz



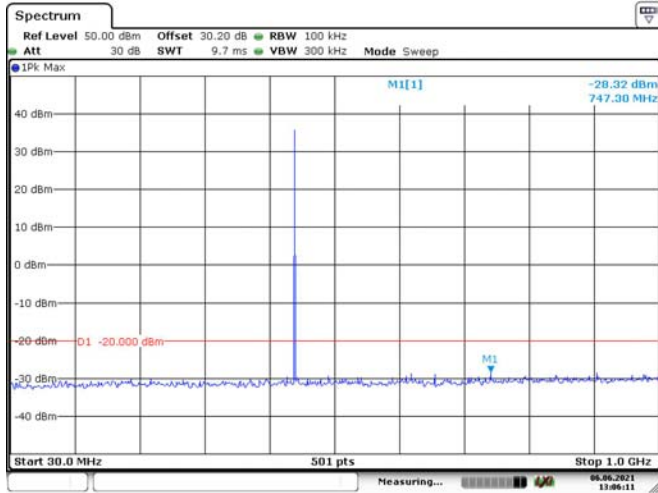
Date: 6 JUN 2021 13:25:29



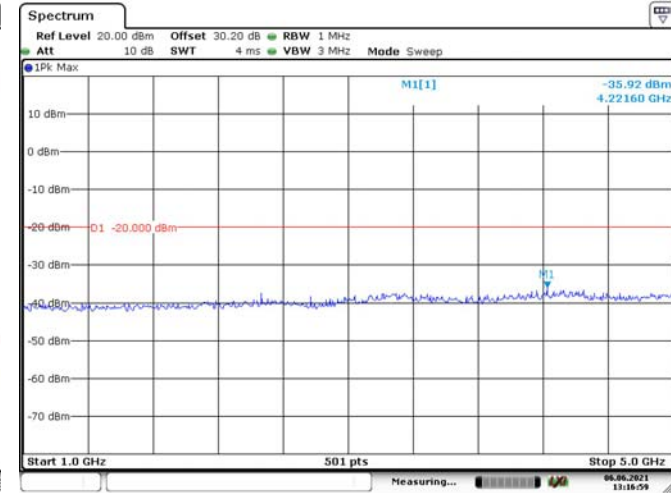
Date: 6 JUN 2021 13:23:45

Part 74:

FM,12.5kHz, 455.0125 MHz

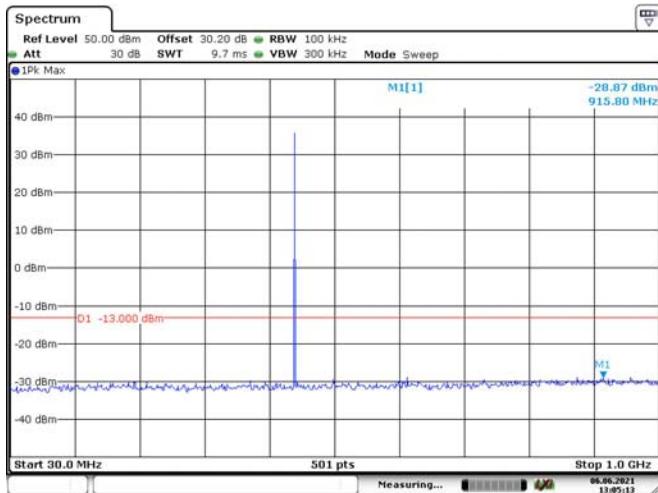


Date: 6 JUN 2021 13:06:11

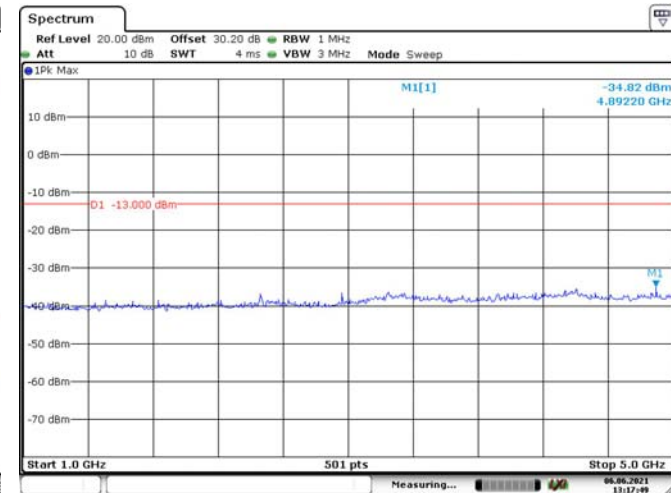


Date: 6 JUN 2021 13:16:59

FM,25kHz, 455.0125 MHz



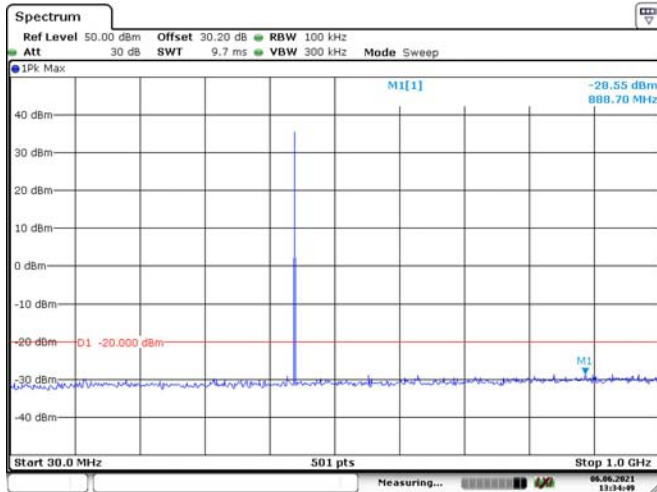
Date: 6 JUN 2021 13:05:14



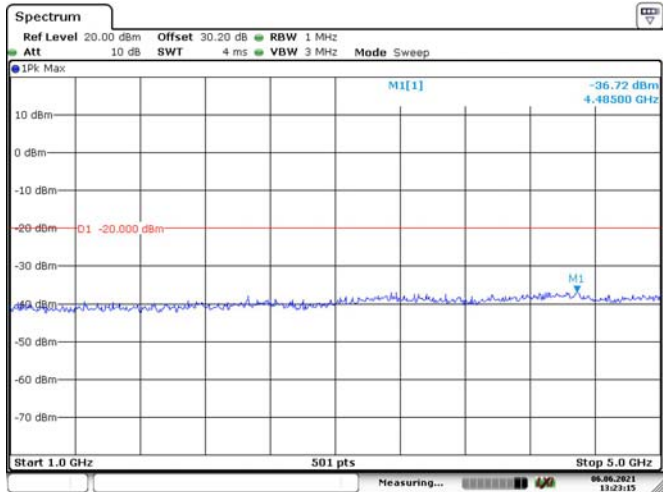
Date: 6 JUN 2021 13:17:50



### 4FSK, 12.5kHz, 455.0125 MHz



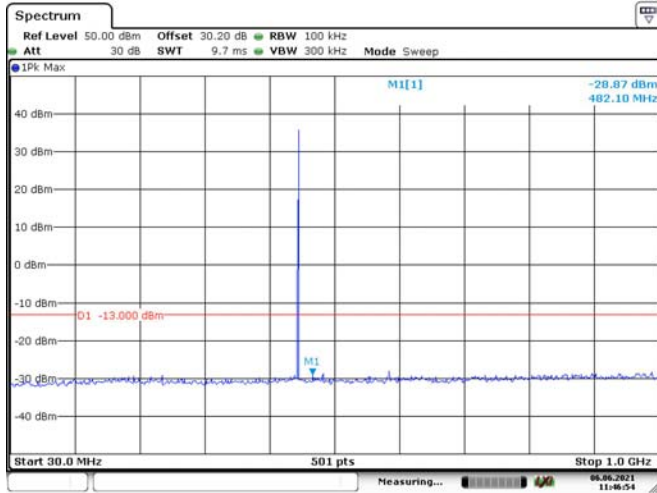
Date: 6, JUN, 2021 13:34:49



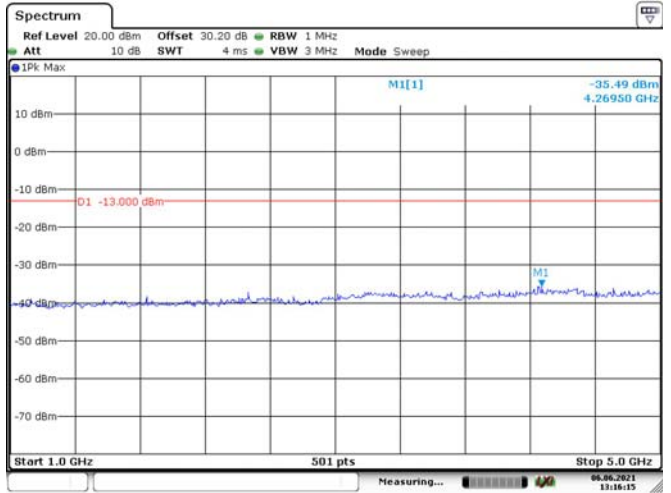
Date: 6, JUN, 2021 13:23:16

### Part 80:

### FM, 25kHz, 459.9875 MHz



Date: 6, JUN, 2021 11:46:54



Date: 6, JUN, 2021 13:16:16

## 6 - RADIATED SPURIOUS EMISSIONS

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### Applicable Standard

FCC §2.1053, §22.861, §74.462, §80.211 and §90.210

### Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

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 test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth 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.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001)-the absolute level

### Test Data

Test Mode: Transmitting

**Test Result: Compliance.**

Test performed at high power level with Band Rejector Filter, *please refer to the following table.*

**30MHz - 5GHz:**

**Part 90**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 350.0125MHz-12.5 kHz								
700.03	H	38.87	-62.03	0.00	0.38	-62.41	-20.00	42.41
700.03	V	39.87	-57.66	0.00	0.38	-58.04	-20.00	38.04
1050.04	H	41.20	-60.83	8.11	0.80	-53.52	-20.00	33.52
1050.04	V	42.64	-60.04	8.11	0.80	-52.73	-20.00	32.73
1400.05	H	52.10	-52.36	9.58	1.23	-44.01	-20.00	24.01
1400.05	V	48.60	-55.95	9.58	1.23	-47.60	-20.00	27.60
1750.06	H	54.50	-50.45	10.75	1.24	-40.94	-20.00	20.94
1750.06	V	52.80	-52.09	10.75	1.24	-42.58	-20.00	22.58
2100.08	H	52.60	-51.93	11.64	1.15	-41.44	-20.00	21.44
2100.08	V	58.80	-45.97	11.64	1.15	-35.48	-20.00	15.48
2450.09	H	51.87	-51.89	12.13	1.23	-40.99	-20.00	20.99
2450.09	V	45.97	-59.06	12.13	1.23	-48.16	-20.00	28.16
2800.10	H	43.99	-59.14	12.32	1.40	-48.22	-20.00	28.22
2800.10	V	38.64	-64.99	12.32	1.40	-54.07	-20.00	34.07
3150.11	H	41.23	-61.29	12.34	1.53	-50.48	-20.00	30.48
3150.11	V	37.89	-64.10	12.34	1.53	-53.29	-20.00	33.29
3500.13	H	36.99	-64.92	12.20	1.61	-54.33	-20.00	34.33
3500.13	V	38.70	-61.71	12.20	1.61	-51.12	-20.00	31.12
4FSK, Frequency: 350.0125MHz-12.5 kHz								
700.03	H	43.40	-57.50	0.00	0.38	-57.88	-20.00	37.88
700.03	V	46.87	-50.66	0.00	0.38	-51.04	-20.00	31.04
1050.04	H	40.20	-61.83	8.11	0.80	-54.52	-20.00	34.52
1050.04	V	42.80	-59.88	8.11	0.80	-52.57	-20.00	32.57
1400.05	H	53.40	-51.06	9.58	1.23	-42.71	-20.00	22.71
1400.05	V	49.87	-54.68	9.58	1.23	-46.33	-20.00	26.33
1750.06	H	55.80	-49.15	10.75	1.24	-39.64	-20.00	19.64
1750.06	V	53.50	-51.39	10.75	1.24	-41.88	-20.00	21.88
2100.08	H	54.10	-50.43	11.64	1.15	-39.94	-20.00	19.94
2100.08	V	49.87	-54.90	11.64	1.15	-44.41	-20.00	24.41
2450.09	H	53.10	-50.66	12.13	1.23	-39.76	-20.00	19.76
2450.09	V	47.10	-57.93	12.13	1.23	-47.03	-20.00	27.03
2800.10	H	44.50	-58.63	12.32	1.40	-47.71	-20.00	27.71
2800.10	V	39.70	-63.93	12.32	1.40	-53.01	-20.00	33.01
3150.11	H	42.12	-60.40	12.34	1.53	-49.59	-20.00	29.59
3150.11	V	37.88	-64.11	12.34	1.53	-53.30	-20.00	33.30
3500.13	H	37.10	-64.81	12.20	1.61	-54.22	-20.00	34.22
3500.13	V	36.87	-63.54	12.20	1.61	-52.95	-20.00	32.95

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 453.2125MHz-12.5 kHz								
906.43	H	39.14	-56.23	0.00	0.51	-56.74	-20.00	36.74
906.43	V	41.34	-50.70	0.00	0.51	-51.21	-20.00	31.21
1359.64	H	42.24	-61.94	9.41	1.18	-53.71	-20.00	33.71
1359.64	V	38.96	-65.38	9.41	1.18	-57.15	-20.00	37.15
1812.85	H	61.38	-43.52	10.94	1.21	-33.79	-20.00	13.79
1812.85	V	54.84	-50.00	10.94	1.21	-40.27	-20.00	20.27
2266.06	H	54.39	-49.77	11.87	1.19	-39.09	-20.00	19.09
2266.06	V	52.64	-52.25	11.87	1.19	-41.57	-20.00	21.57
2719.28	H	52.32	-50.95	12.29	1.35	-40.01	-20.00	20.01
2719.28	V	49.64	-54.38	12.29	1.35	-43.44	-20.00	23.44
3172.49	H	46.92	-55.56	12.33	1.54	-44.77	-20.00	24.77
3172.49	V	39.00	-62.89	12.33	1.54	-52.10	-20.00	32.10
3625.70	H	40.26	-61.26	12.23	1.57	-50.60	-20.00	30.60
3625.70	V	36.90	-63.70	12.23	1.57	-53.04	-20.00	33.04
4078.91	H	35.25	-64.92	12.47	1.46	-53.91	-20.00	33.91
4078.91	V	35.78	-65.13	12.47	1.46	-54.12	-20.00	34.12
4532.13	H	35.67	-63.37	13.37	1.53	-51.53	-20.00	31.53
4532.13	V	35.34	-64.01	13.37	1.53	-52.17	-20.00	32.17
4FSK, Frequency: 453.2125MHz-12.5 kHz								
906.43	H	37.72	-57.65	0.00	0.51	-58.16	-20.00	38.16
906.43	V	39.73	-52.31	0.00	0.51	-52.82	-20.00	32.82
1359.64	H	42.33	-61.85	9.41	1.18	-53.62	-20.00	33.62
1359.64	V	39.16	-65.18	9.41	1.18	-56.95	-20.00	36.95
1812.85	H	61.55	-43.35	10.94	1.21	-33.62	-20.00	13.62
1812.85	V	54.77	-50.07	10.94	1.21	-40.34	-20.00	20.34
2266.06	H	54.42	-49.74	11.87	1.19	-39.06	-20.00	19.06
2266.06	V	52.63	-52.26	11.87	1.19	-41.58	-20.00	21.58
2719.28	H	52.41	-50.86	12.29	1.35	-39.92	-20.00	19.92
2719.28	V	49.58	-54.44	12.29	1.35	-43.50	-20.00	23.50
3172.49	H	46.87	-55.61	12.33	1.54	-44.82	-20.00	24.82
3172.49	V	39.32	-62.57	12.33	1.54	-51.78	-20.00	31.78
3625.70	H	40.41	-61.11	12.23	1.57	-50.45	-20.00	30.45
3625.70	V	36.96	-63.64	12.23	1.57	-52.98	-20.00	32.98
4078.91	H	35.36	-64.81	12.47	1.46	-53.80	-20.00	33.80
4078.91	V	35.68	-65.23	12.47	1.46	-54.22	-20.00	34.22
4532.13	H	35.71	-63.33	13.37	1.53	-51.49	-20.00	31.49
4532.13	V	35.65	-63.70	13.37	1.53	-51.86	-20.00	31.86

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 469.9875MHz-12.5 kHz								
939.98	H	38.64	-55.54	0.00	0.51	-56.05	-20.00	36.05
939.98	V	38.62	-52.45	0.00	0.51	-52.96	-20.00	32.96
1409.96	H	43.55	-60.98	9.62	1.24	-52.60	-20.00	32.60
1409.96	V	40.36	-64.25	9.62	1.24	-55.87	-20.00	35.87
1879.95	H	46.73	-58.12	11.14	1.18	-48.16	-20.00	28.16
1879.95	V	52.36	-52.43	11.14	1.18	-42.47	-20.00	22.47
2349.94	H	43.39	-60.59	11.99	1.21	-49.81	-20.00	29.81
2349.94	V	44.57	-60.39	11.99	1.21	-49.61	-20.00	29.61
2819.93	H	54.33	-48.76	12.33	1.41	-37.84	-20.00	17.84
2819.93	V	48.45	-55.08	12.33	1.41	-44.16	-20.00	24.16
3289.91	H	43.28	-59.00	12.28	1.56	-48.28	-20.00	28.28
3289.91	V	40.39	-60.97	12.28	1.56	-50.25	-20.00	30.25
3759.90	H	39.24	-61.86	12.25	1.53	-51.14	-20.00	31.14
3759.90	V	36.78	-64.03	12.25	1.53	-53.31	-20.00	33.31
4229.89	H	36.25	-63.55	12.81	1.49	-52.23	-20.00	32.23
4229.89	V	36.71	-63.70	12.81	1.49	-52.38	-20.00	32.38
4699.88	H	36.38	-62.08	13.24	1.50	-50.34	-20.00	30.34
4699.88	V	36.57	-61.97	13.24	1.50	-50.23	-20.00	30.23
4FSK, Frequency: 469.9875MHz-12.5 kHz								
939.98	H	39.17	-55.01	0.00	0.51	-55.52	-20.00	35.52
939.98	V	39.47	-51.60	0.00	0.51	-52.11	-20.00	32.11
1409.96	H	43.63	-60.90	9.62	1.24	-52.52	-20.00	32.52
1409.96	V	40.13	-64.48	9.62	1.24	-56.10	-20.00	36.10
1879.95	H	46.70	-58.15	11.14	1.18	-48.19	-20.00	28.19
1879.95	V	52.28	-52.51	11.14	1.18	-42.55	-20.00	22.55
2349.94	H	43.24	-60.74	11.99	1.21	-49.96	-20.00	29.96
2349.94	V	44.42	-60.54	11.99	1.21	-49.76	-20.00	29.76
2819.93	H	54.25	-48.84	12.33	1.41	-37.92	-20.00	17.92
2819.93	V	48.56	-54.97	12.33	1.41	-44.05	-20.00	24.05
3289.91	H	43.17	-59.11	12.28	1.56	-48.39	-20.00	28.39
3289.91	V	40.27	-61.09	12.28	1.56	-50.37	-20.00	30.37
3759.90	H	39.15	-61.95	12.25	1.53	-51.23	-20.00	31.23
3759.90	V	36.68	-64.13	12.25	1.53	-53.41	-20.00	33.41
4229.89	H	36.08	-63.72	12.81	1.49	-52.40	-20.00	32.40
4229.89	V	36.69	-63.72	12.81	1.49	-52.40	-20.00	32.40
4699.88	H	36.21	-62.25	13.24	1.50	-50.51	-20.00	30.51
4699.88	V	36.32	-62.22	13.24	1.50	-50.48	-20.00	30.48

**Part 80**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 459.9875MHz-25 kHz								
919.98	H	38.48	-56.41	0.00	0.51	-56.92	-13.00	43.92
919.98	V	38.67	-52.98	0.00	0.51	-53.49	-13.00	40.49
1379.96	H	42.79	-61.53	9.50	1.20	-53.23	-13.00	40.23
1379.96	V	39.24	-65.21	9.50	1.20	-56.91	-13.00	43.91
1839.95	H	52.39	-52.49	11.02	1.20	-42.67	-13.00	29.67
1839.95	V	55.66	-49.16	11.02	1.20	-39.34	-13.00	26.34
2299.94	H	49.26	-54.83	11.92	1.20	-44.11	-13.00	31.11
2299.94	V	49.41	-55.51	11.92	1.20	-44.79	-13.00	31.79
2759.93	H	54.65	-48.55	12.30	1.38	-37.63	-13.00	24.63
2759.93	V	48.41	-55.41	12.30	1.38	-44.49	-13.00	31.49
3219.91	H	45.53	-56.87	12.31	1.55	-46.11	-13.00	33.11
3219.91	V	39.84	-61.84	12.31	1.55	-51.08	-13.00	38.08
3679.90	H	40.68	-60.67	12.24	1.55	-49.98	-13.00	36.98
3679.90	V	38.12	-62.56	12.24	1.55	-51.87	-13.00	38.87
4139.89	H	36.38	-63.64	12.61	1.48	-52.51	-13.00	39.51
4139.89	V	35.54	-65.17	12.61	1.48	-54.04	-13.00	41.04
4599.88	H	35.24	-63.56	13.32	1.52	-51.76	-13.00	38.76
4599.88	V	35.86	-63.16	13.32	1.52	-51.36	-13.00	38.36

**Part 74**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 455.0125MHz-12.5 kHz								
910.03	H	38.97	-56.28	0.00	0.51	-56.79	-20.00	36.79
910.03	V	40.18	-51.75	0.00	0.51	-52.26	-20.00	32.26
1365.04	H	42.19	-62.03	9.43	1.19	-53.79	-20.00	33.79
1365.04	V	39.75	-64.62	9.43	1.19	-56.38	-20.00	36.38
1820.05	H	58.06	-46.84	10.96	1.21	-37.09	-20.00	17.09
1820.05	V	52.68	-52.15	10.96	1.21	-42.40	-20.00	22.40
2275.06	H	56.16	-47.98	11.89	1.19	-37.28	-20.00	17.28
2275.06	V	49.10	-55.80	11.89	1.19	-45.10	-20.00	25.10
2730.08	H	54.44	-48.81	12.29	1.36	-37.88	-20.00	17.88
2730.08	V	48.20	-55.77	12.29	1.36	-44.84	-20.00	24.84
3185.09	H	46.80	-55.66	12.33	1.54	-44.87	-20.00	24.87
3185.09	V	39.41	-62.42	12.33	1.54	-51.63	-20.00	31.63
3640.10	H	40.85	-60.63	12.23	1.57	-49.97	-20.00	29.97
3640.10	V	37.71	-62.91	12.23	1.57	-52.25	-20.00	32.25
4095.11	H	36.99	-63.14	12.51	1.47	-52.10	-20.00	32.10
4095.11	V	35.95	-64.90	12.51	1.47	-53.86	-20.00	33.86
4550.13	H	36.35	-62.63	13.36	1.53	-50.80	-20.00	30.80
4550.13	V	36.44	-62.83	13.36	1.53	-51.00	-20.00	31.00
FM, Frequency: 455.0125MHz-25 kHz								
910.03	H	38.86	-56.39	0.00	0.51	-56.90	-13.00	43.90
910.03	V	39.06	-52.87	0.00	0.51	-53.38	-13.00	40.38
1365.04	H	42.24	-61.98	9.43	1.19	-53.74	-13.00	40.74
1365.04	V	39.86	-64.51	9.43	1.19	-56.27	-13.00	43.27
1820.05	H	58.12	-46.78	10.96	1.21	-37.03	-13.00	24.03
1820.05	V	52.66	-52.17	10.96	1.21	-42.42	-13.00	29.42
2275.06	H	56.23	-47.91	11.89	1.19	-37.21	-13.00	24.21
2275.06	V	49.19	-55.71	11.89	1.19	-45.01	-13.00	32.01
2730.08	H	54.55	-48.70	12.29	1.36	-37.77	-13.00	24.77
2730.08	V	48.27	-55.70	12.29	1.36	-44.77	-13.00	31.77
3185.09	H	46.75	-55.71	12.33	1.54	-44.92	-13.00	31.92
3185.09	V	40.12	-61.71	12.33	1.54	-50.92	-13.00	37.92
3640.10	H	40.65	-60.83	12.23	1.57	-50.17	-13.00	37.17
3640.10	V	37.73	-62.89	12.23	1.57	-52.23	-13.00	39.23
4095.11	H	36.96	-63.17	12.51	1.47	-52.13	-13.00	39.13
4095.11	V	35.93	-64.92	12.51	1.47	-53.88	-13.00	40.88
4550.13	H	36.47	-62.51	13.36	1.53	-50.68	-13.00	37.68
4550.13	V	36.48	-62.79	13.36	1.53	-50.96	-13.00	37.96

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
4FSK, Frequency: 455.0125MHz-12.5 kHz								
910.03	H	38.86	-56.39	0.00	0.51	-56.90	-20.00	36.90
910.03	V	39.06	-52.87	0.00	0.51	-53.38	-20.00	33.38
1365.04	H	42.33	-61.89	9.43	1.19	-53.65	-20.00	33.65
1365.04	V	39.76	-64.61	9.43	1.19	-56.37	-20.00	36.37
1820.05	H	58.23	-46.67	10.96	1.21	-36.92	-20.00	16.92
1820.05	V	52.57	-52.26	10.96	1.21	-42.51	-20.00	22.51
2275.06	H	56.36	-47.78	11.89	1.19	-37.08	-20.00	17.08
2275.06	V	49.31	-55.59	11.89	1.19	-44.89	-20.00	24.89
2730.08	H	54.45	-48.80	12.29	1.36	-37.87	-20.00	17.87
2730.08	V	48.33	-55.64	12.29	1.36	-44.71	-20.00	24.71
3185.09	H	46.87	-55.59	12.33	1.54	-44.80	-20.00	24.80
3185.09	V	40.16	-61.67	12.33	1.54	-50.88	-20.00	30.88
3640.10	H	40.55	-60.93	12.23	1.57	-50.27	-20.00	30.27
3640.10	V	37.86	-62.76	12.23	1.57	-52.10	-20.00	32.10
4095.11	H	36.91	-63.22	12.51	1.47	-52.18	-20.00	32.18
4095.11	V	36.05	-64.80	12.51	1.47	-53.76	-20.00	33.76
4550.13	H	36.59	-62.39	13.36	1.53	-50.56	-20.00	30.56
4550.13	V	36.46	-62.81	13.36	1.53	-50.98	-20.00	30.98



**Part 22**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 454.0125MHz-12.5 kHz								
908.03	H	38.97	-56.35	0.00	0.51	-56.86	-13.00	43.86
908.03	V	40.18	-51.81	0.00	0.51	-52.32	-13.00	39.32
1362.04	H	42.41	-61.79	9.42	1.18	-53.55	-13.00	40.55
1362.04	V	39.72	-64.63	9.42	1.18	-56.39	-13.00	43.39
1816.05	H	58.15	-46.75	10.95	1.21	-37.01	-13.00	24.01
1816.05	V	52.53	-52.31	10.95	1.21	-42.57	-13.00	29.57
2270.06	H	56.37	-47.79	11.88	1.19	-37.10	-13.00	24.10
2270.06	V	49.34	-55.56	11.88	1.19	-44.87	-13.00	31.87
2724.08	H	54.46	-48.80	12.29	1.36	-37.87	-13.00	24.87
2724.08	V	48.38	-55.61	12.29	1.36	-44.68	-13.00	31.68
3178.09	H	46.85	-55.62	12.33	1.54	-44.83	-13.00	31.83
3178.09	V	40.17	-61.70	12.33	1.54	-50.91	-13.00	37.91
3632.10	H	40.57	-60.93	12.23	1.57	-50.27	-13.00	37.27
3632.10	V	37.81	-62.80	12.23	1.57	-52.14	-13.00	39.14
4086.11	H	36.72	-63.43	12.49	1.47	-52.41	-13.00	39.41
4086.11	V	36.24	-64.64	12.49	1.47	-53.62	-13.00	40.62
4540.13	H	36.46	-62.55	13.37	1.53	-50.71	-13.00	37.71
4540.13	V	36.58	-62.73	13.37	1.53	-50.89	-13.00	37.89
FM, Frequency: 454.0125MHz-25 kHz								
908.03	H	38.86	-56.46	0.00	0.51	-56.97	-13.00	43.97
908.03	V	39.06	-52.93	0.00	0.51	-53.44	-13.00	40.44
1362.04	H	42.33	-61.87	9.42	1.18	-53.63	-13.00	40.63
1362.04	V	39.75	-64.60	9.42	1.18	-56.36	-13.00	43.36
1816.05	H	58.23	-46.67	10.95	1.21	-36.93	-13.00	23.93
1816.05	V	52.52	-52.32	10.95	1.21	-42.58	-13.00	29.58
2270.06	H	56.36	-47.80	11.88	1.19	-37.11	-13.00	24.11
2270.06	V	49.38	-55.52	11.88	1.19	-44.83	-13.00	31.83
2724.08	H	54.32	-48.94	12.29	1.36	-38.01	-13.00	25.01
2724.08	V	48.53	-55.46	12.29	1.36	-44.53	-13.00	31.53
3178.09	H	46.77	-55.70	12.33	1.54	-44.91	-13.00	31.91
3178.09	V	40.25	-61.62	12.33	1.54	-50.83	-13.00	37.83
3632.10	H	40.53	-60.97	12.23	1.57	-50.31	-13.00	37.31
3632.10	V	37.65	-62.96	12.23	1.57	-52.30	-13.00	39.30
4086.11	H	36.64	-63.51	12.49	1.47	-52.49	-13.00	39.49
4086.11	V	36.33	-64.55	12.49	1.47	-53.53	-13.00	40.53
4540.13	H	36.80	-62.21	13.37	1.53	-50.37	-13.00	37.37
4540.13	V	36.63	-62.68	13.37	1.53	-50.84	-13.00	37.84

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
4FSK, Frequency: 454.0125MHz-12.5 kHz								
908.03	H	38.86	-56.46	0.00	0.51	-56.97	-13.00	43.97
908.03	V	39.06	-52.93	0.00	0.51	-53.44	-13.00	40.44
1362.04	H	42.25	-61.95	9.42	1.18	-53.71	-13.00	40.71
1362.04	V	39.64	-64.71	9.42	1.18	-56.47	-13.00	43.47
1816.05	H	58.16	-46.74	10.95	1.21	-37.00	-13.00	24.00
1816.05	V	52.63	-52.21	10.95	1.21	-42.47	-13.00	29.47
2270.06	H	56.44	-47.72	11.88	1.19	-37.03	-13.00	24.03
2270.06	V	49.27	-55.63	11.88	1.19	-44.94	-13.00	31.94
2724.08	H	54.48	-48.78	12.29	1.36	-37.85	-13.00	24.85
2724.08	V	48.39	-55.60	12.29	1.36	-44.67	-13.00	31.67
3178.09	H	46.81	-55.66	12.33	1.54	-44.87	-13.00	31.87
3178.09	V	40.47	-61.40	12.33	1.54	-50.61	-13.00	37.61
3632.10	H	40.39	-61.11	12.23	1.57	-50.45	-13.00	37.45
3632.10	V	37.63	-62.98	12.23	1.57	-52.32	-13.00	39.32
4086.11	H	36.82	-63.33	12.49	1.47	-52.31	-13.00	39.31
4086.11	V	36.55	-64.33	12.49	1.47	-53.31	-13.00	40.31
4540.13	H	36.68	-62.33	13.37	1.53	-50.49	-13.00	37.49
4540.13	V	36.74	-62.57	13.37	1.53	-50.73	-13.00	37.73

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Note 2:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit - Absolute Level

## 7 - FREQUENCY STABILITY

### Applicable Standard

FCC §2.1055, § 22.355, §74.464, §80.209 and §90.213

### Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external 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 DC 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.

### Test Data

Test Mode: Transmitting

**Test Result: Compliance.** *Please refer to following tables.*

FCC Part 90:

FM,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ±2.5 ppm			
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.2	453.2125365	0.08
-20		453.2125919	0.20
-10		453.2124928	-0.02
0		453.2125726	0.16
10		453.2128376	0.74
20		453.2127790	0.62
30		453.2127043	0.45
40		453.2125579	0.13
50		453.2126699	0.37
20		8.4	453.2125621
20	6.4	453.2126232	0.27

4FSK, 12.5kHz, Reference Frequency: 453.2125MHz, Limit: ±2.5 ppm			
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.2	453.2124892	-0.02
-20		453.2127616	0.58
-10		453.2126520	0.34
0		453.2125880	0.19
10		453.2126637	0.36
20		453.2127500	0.55
30		453.2126085	0.24
40		453.2127437	0.54
50		453.2126841	0.41
20		8.4	453.2126468
20	6.4	453.2127835	0.63

FCC Part 80:

<b>FM,25kHz, Reference Frequency: 459.9875MHz,Limit: ±5.0 ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	459.987580	0.17
-20		459.987678	0.39
-10		459.987762	0.57
0		459.987515	0.03
10		459.987551	0.11
20		459.987740	0.52
30		459.987631	0.28
40		459.987651	0.33
50		459.987785	0.62
20		8.4	459.987510
20	6.4	459.987457	-0.09

FCC Part 74:

<b>FM, 12.5kHz, Reference Frequency: 455.0125 MHz, Limit: ±5.0 ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	455.0125485	0.11
-20		455.0128381	0.74
-10		455.0125535	0.12
0		455.0124780	-0.05
10		455.0125255	0.06
20		455.0127790	0.61
30		455.0127231	0.49
40		455.0126106	0.24
50		455.0126465	0.32
20		8.4	455.0128388
20	6.4	455.0126499	0.33

<b>4FSK, 12.5kHz, Reference Frequency: 455.0125 MHz, Limit: ±5.0 ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	455.0128270	0.72
-20		455.0125866	0.19
-10		455.0125897	0.20
0		455.0125424	0.09
10		455.0125889	0.20
20		455.0127950	0.65
30		455.0124997	0.00
40		455.0124917	-0.02
50		455.0128113	0.68
20		8.4	455.0125672
20	6.4	455.0126719	0.38

<b>FM, 25kHz, Reference Frequency: 455.0125 MHz, Limit: ±5.0 ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	455.0125795	0.17
-20		455.0126791	0.39
-10		455.0127600	0.57
0		455.0125791	0.17
10		455.0124919	-0.02
20		455.0127790	0.61
30		455.0127224	0.49
40		455.0125462	0.10
50		455.0125773	0.17
20		8.4	455.0126695
20	6.4	455.0126826	0.40

FCC Part 22:

<b>FM, 12.5kHz, Reference Frequency: 454.0125MHz, Limit: ±5.0ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	454.0125831	0.18
-20		454.0127385	0.53
-10		454.0125883	0.19
0		454.0127233	0.49
10		454.0124596	-0.09
20		454.0127790	0.61
30		454.0126219	0.27
40		454.0124771	-0.05
50		454.0128289	0.72
20		8.4	454.0125668
20	6.4	454.0126372	0.30

<b>4FSK,12.5kHz, Reference Frequency: 454.0125MHz, Limit: ±5.0ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	454.0125083	0.02
-20		454.0124828	-0.04
-10		454.0128114	0.69
0		454.0125224	0.05
10		454.0126299	0.29
20		454.0127450	0.54
30		454.0127675	0.59
40		454.0126778	0.39
50		454.0128196	0.70
20		8.4	454.0128033
20	6.4	454.0125426	0.09

<b>FM, 25kHz, Reference Frequency: 454.0125MHz, Limit: ±5.0 ppm</b>			
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
-30	7.2	454.0127864	0.63
-20		454.0125795	0.18
-10		454.0125236	0.05
0		454.0128262	0.72
10		454.0125489	0.11
20		454.0127790	0.61
30		454.0128226	0.71
40		454.0126843	0.41
50		454.0127225	0.49
20		8.4	454.0127220
20	6.4	454.0127893	0.64

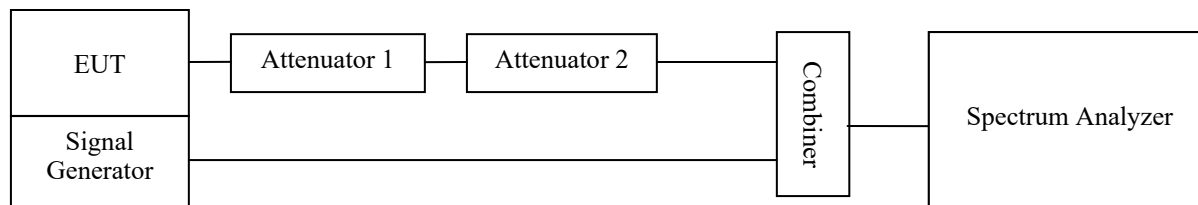
## 8 - TRANSIENT FREQUENCY BEHAVIOR

### Applicable Standard

Regulations: FCC §90.214

### Test Procedure

- a) Connect the EUT and test equipment as shown on the following block diagram.
- b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- c) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at  $\pm 12.5$  kHz deviation and set its output level to -100dBm.
- d) Turn on the transmitter.
- e) Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as  $P_0$ .
- f) Turn off the transmitter.
- g) Adjust the RF level of the signal generator to provide RF power equal to  $P_0$ . This signal generator RF level shall be maintained throughout the rest of the measurement.
- h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- i) Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at  $\pm 4$  divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- j) Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be  $t_{on}$ . The trace should be maintained within the allowed divisions during the period  $t_1$  and  $t_2$ .
- k) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period  $t_3$ .





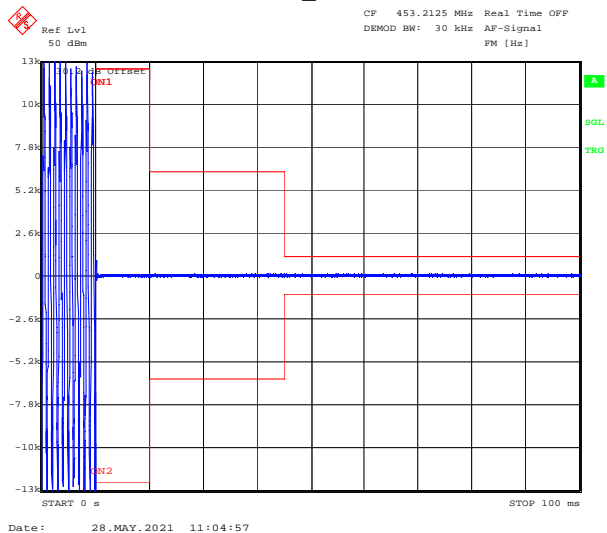
**Test Data**

Test Mode: Transmitting

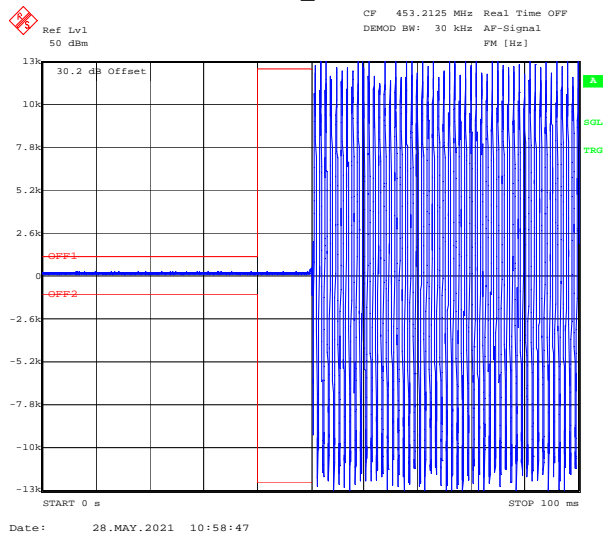
**Test Result: Compliance.** Please refer to the following table and plots.

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

453.2125\_Turn On



453.2125\_Turn Off



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