

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:YAM-BD30XU1S

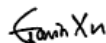
Report Type: Original Report	Product Type: DIGITAL PORTABLE RADIO
Report Number: RDG210409042-00A	
Report Date: 2021-05-27	
Reviewed By:	Gavin Xu RF Engineer 
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		DIGITAL PORTABLE RADIO
Test Model:		BD305 U(1)
Multiple Models:		BD300 U(1), BD302 U(1), BD306 U(1), BD308 U(1)
Model Difference:		Refer to the DOS letter
Adapter Information	Manufacturer:	SHENZHEN HUNTKEY ELECTRIC CO., LTD.
	Model:	HKA00505010-XA
	Input:	AC 100-240V~50/60Hz, 0.2A
	Output:	DC 5.0V 1.0A
Rated Input Voltage:		DC 3.8V from Battery or DC 5V charging from Adapter or Base Charger
Serial Number:		RDG210409042-RF-S1
EUT Received Date:		2021.04.10
EUT Received Status:		Good

Technical Specification

Operation Frequency Range (MHz):	400-470
Rated RF Output Power (Conducted) (W):	High power level: 2 Low power level: 1
Modulation Type:	FM, 4FSK
Channel Spacing (kHz):	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)

No related submittal(s)/grant(s).

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	$\pm 5\%$
RF output power, conducted	$\pm 0.61\text{dB}$
Unwanted Emissions, radiated	30MHz ~ 1GHz: 5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	$\pm 1.5\text{dB}$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
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 1st 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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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.

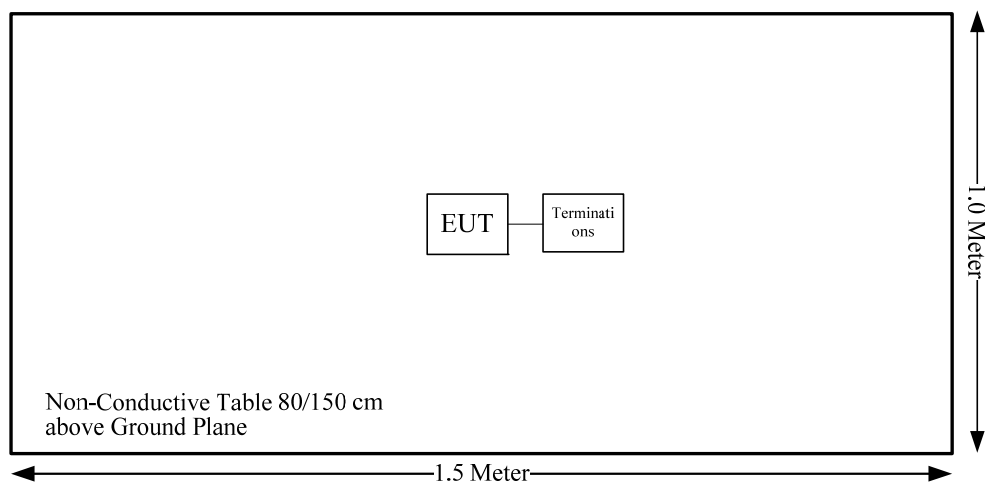
Support Equipment List and Details

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
Coaxial Cable	Yes	No	0.2	EUT	Termination

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated emissions below 1GHz					
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
Radiated emissions above 1GHz					
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
RF Conducted Test					
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	41005011	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	OE01201046	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
Ouli	Band Rejector Filter	400-470M	087	2021-01-23	2022-01-23

* **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:	24.2~24.5℃	25.4 ℃	26.2 ℃
Relative Humidity:	59~60 %	52 %	53 %
ATM Pressure:	100.3~100.5 kPa	101.2kPa	101.3kPa
Tester:	Levi Shi	Asa Chen	Lee Li
Test Date:	2021.5.13~2021.05.25	2021.04.29	2021.05.01

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: RDG210409042-20A.

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

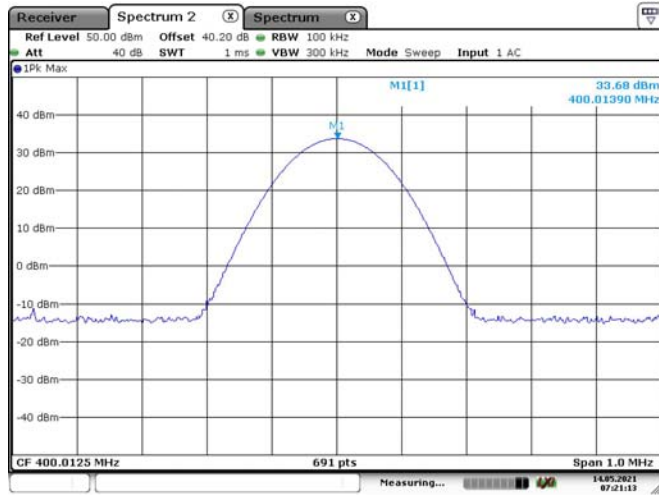
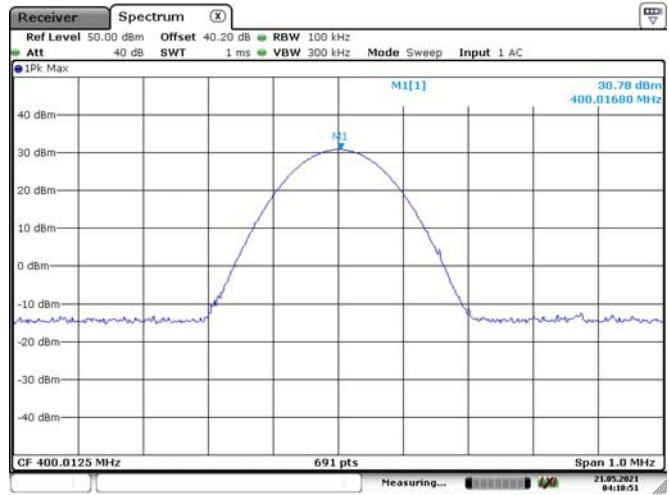
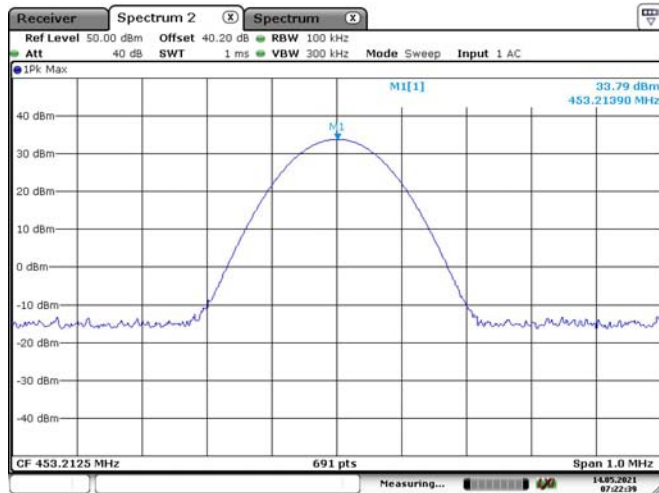
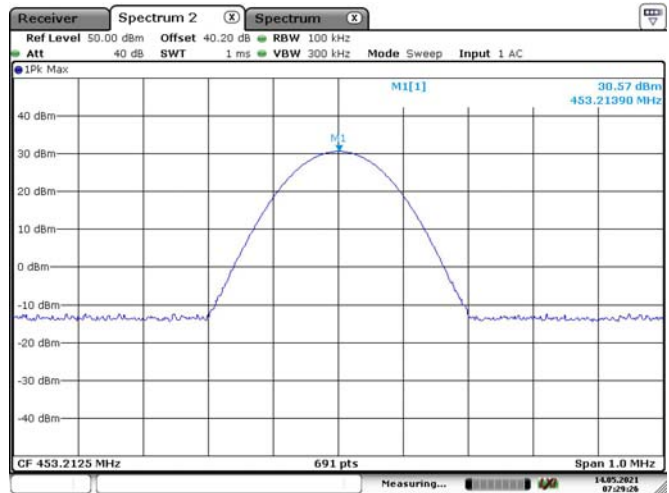
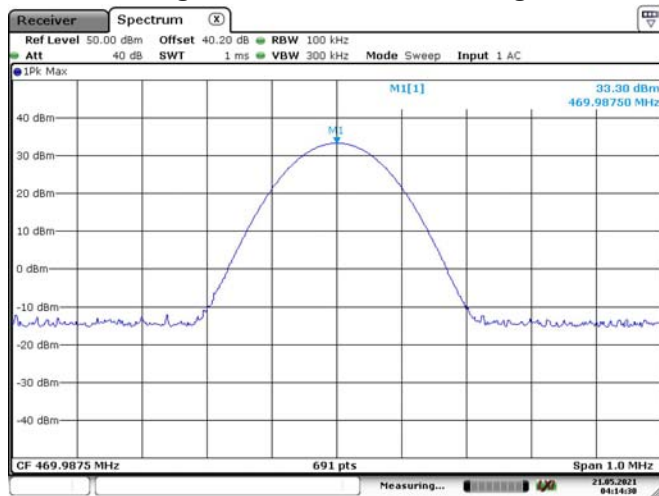
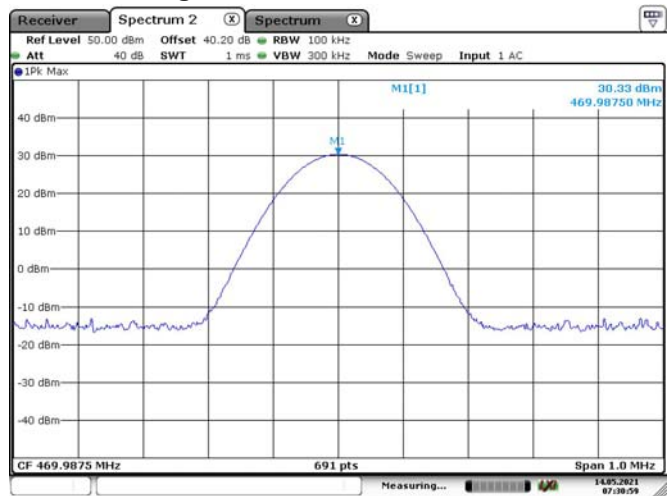
Test Mode: Transmitting

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

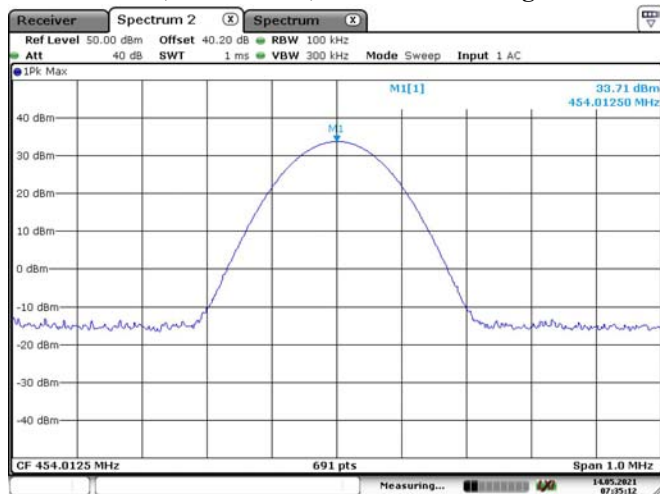
Channel Separation	Test Modulation	Test Channel	Test Frequency (MHz)	Conducted Output Power (dBm)		Limit (dBm)		Note
				High Power Level	Low Power Level	High Power Level	Low Power Level	
12.5kHz	FM	Low	400.0125	33.68	30.78	33.80	30.79	FCC
		Middle	453.2125	33.79	30.57	33.80	30.79	Part 90
		High	469.9875	33.30	30.33	33.80	30.79	
		Additional	454.0125	33.71	30.45	33.80	30.79	Part 22
		Additional	455.0125	33.77	30.37	33.80	30.79	Part 74
	4FSK	Low	400.0125	33.50	30.08	33.80	30.79	FCC
		Middle	453.2125	33.60	30.68	33.80	30.79	Part 90
		High	469.9875	33.37	30.45	33.80	30.79	
		Additional	454.0125	33.61	30.42	33.80	30.79	Part 22
		Additional	455.0125	33.65	30.64	33.80	30.79	Part 74
25kHz	FM	Additional	454.0125	33.62	30.71	33.80	30.79	Part 22
		Additional	455.0125	33.75	30.60	33.80	30.79	Part 74
		Additional	459.9875	32.96	29.39	33.80	30.79	Part 80

Note: The high rated power level is 2W(33.01dBm), 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.

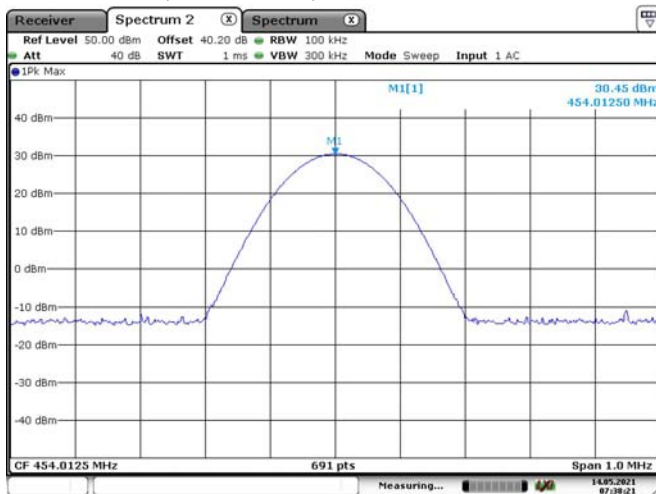
FM, 12.5kHz:**Low Channel, 400.0125 MHz High Power****Low Channel, 400.0125 MHz Low Power****Part 90, Middle Channel, 453.2125 MHz High Power****Part 90, Middle Channel, 453.2125 MHz Low Power****Part 90, High Channel, 469.9875 MHz High Power****Part 90, High Channel, 469.9875 MHz Low Power**

Additional, For Part 22, 454.0125 MHz High Power



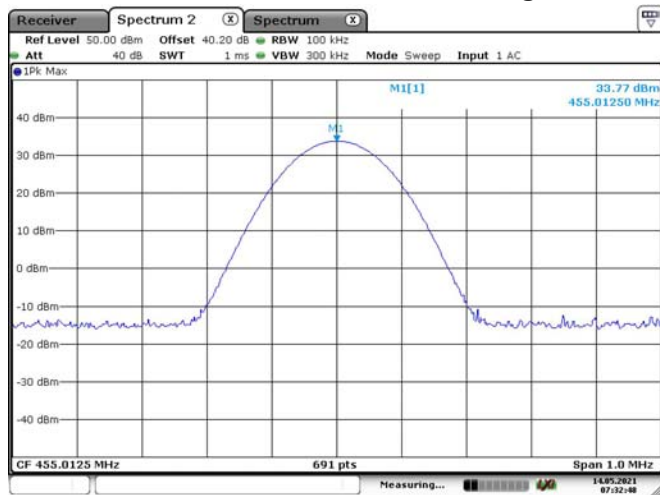
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Additional, For Part 22, 454.0125 MHz Low Power



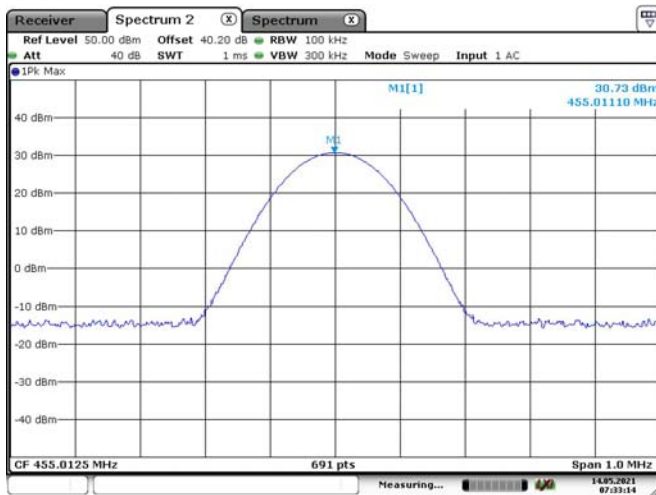
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Additional, For Part 74, 455.0125 MHz High Power

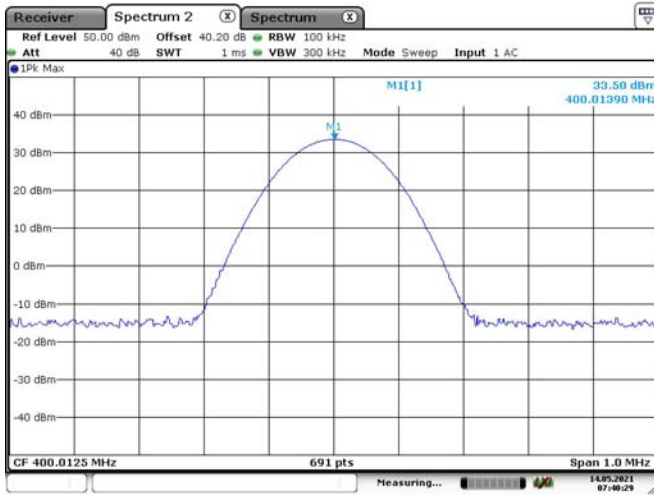


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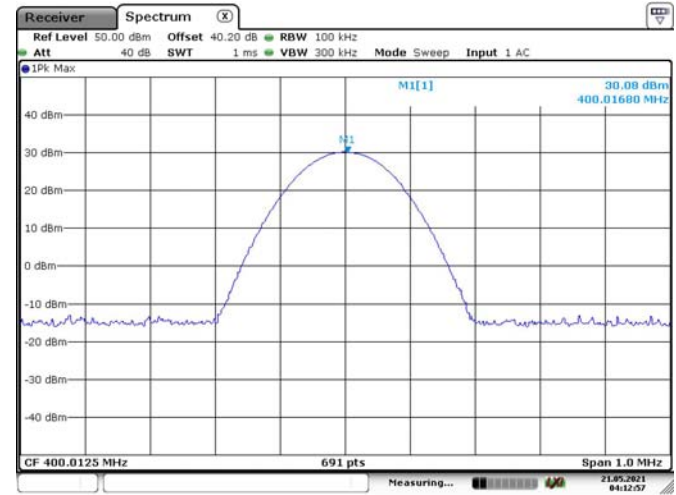
Additional, For Part 22, 455.0125 MHz Low Power



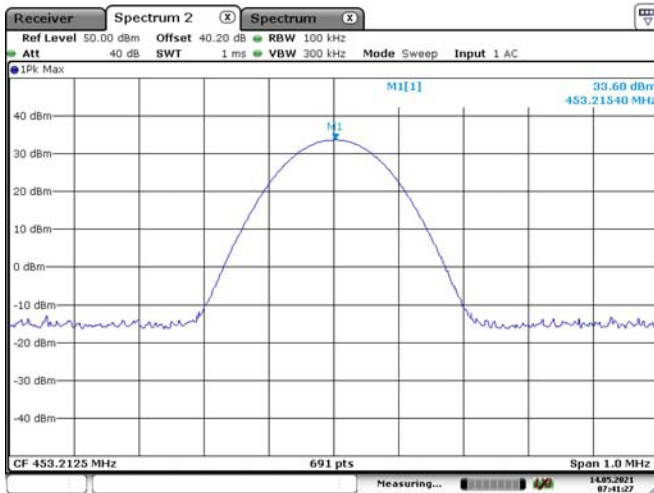
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4FSK, 12.5kHz:**Low Channel, 400.0125 MHz High Power**

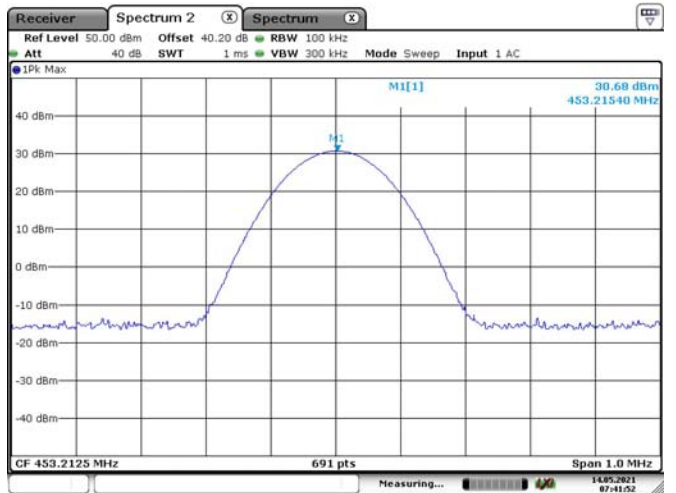
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Low Channel, 400.0125 MHz Low Power

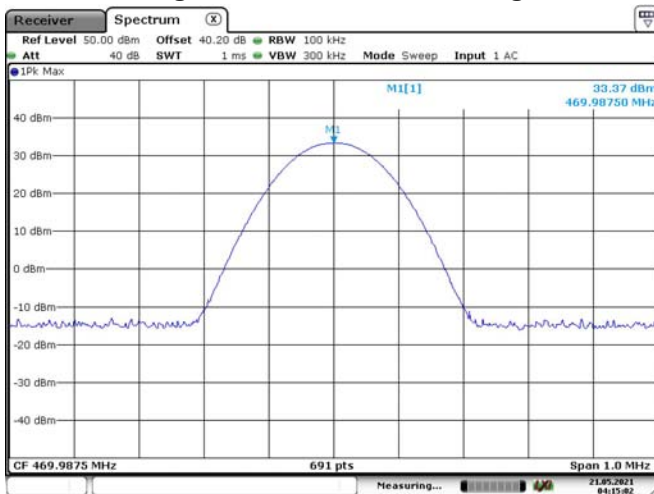
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Part 90, Middle Channel, 453.2125 MHz High Power

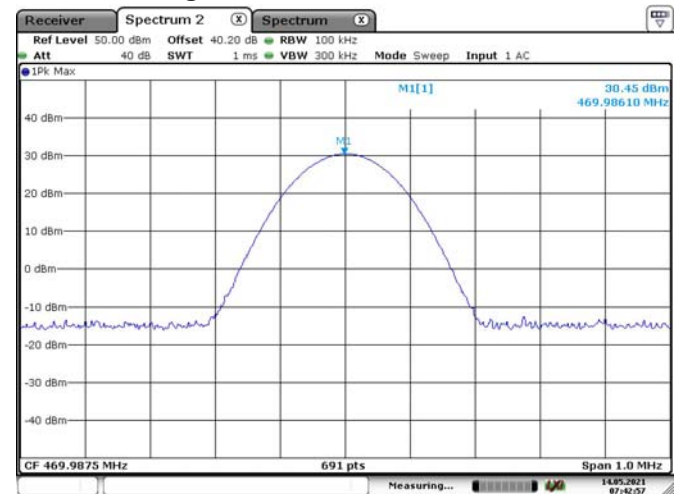
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Part 90, Middle Channel, 453.2125 MHz Low Power

Date: 14.MAY.2021 07:41:53

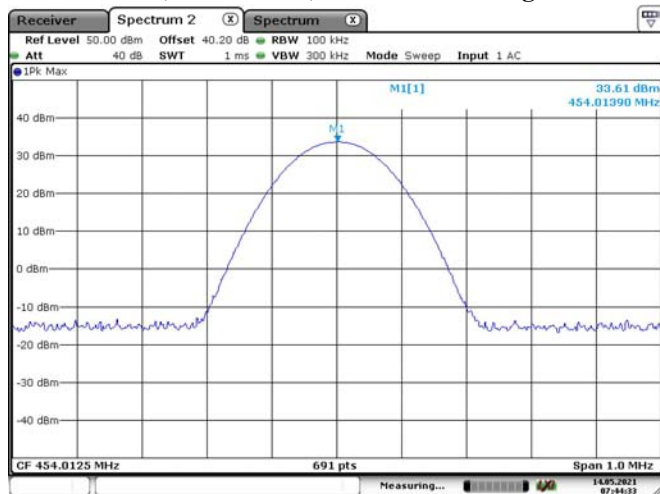
Part 90, High Channel, 469.9875 MHz High Power

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Part 90, High Channel, 469.9875 MHz Low Power

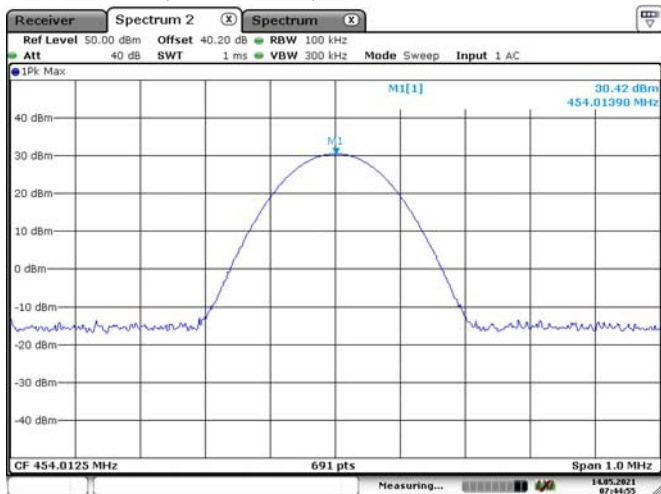
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Additional, For Part 22, 454.0125 MHz High Power



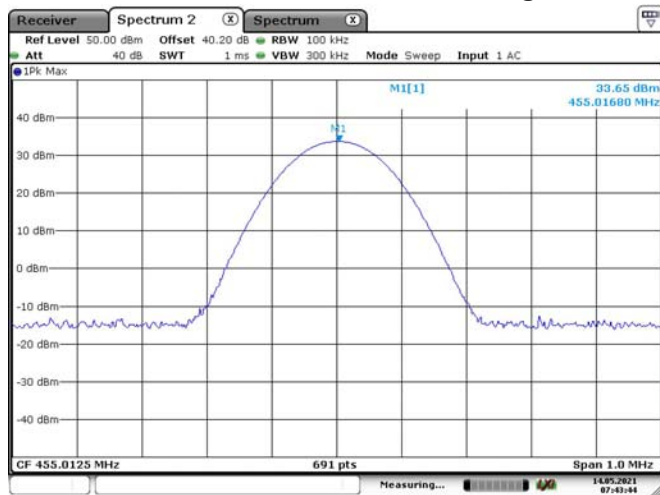
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Additional, For Part 22, 454.0125 MHz Low Power



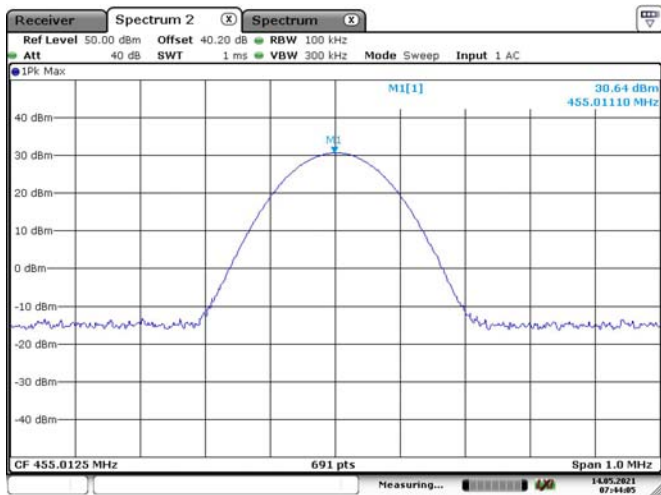
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Additional, For Part 74, 455.0125 MHz High Power

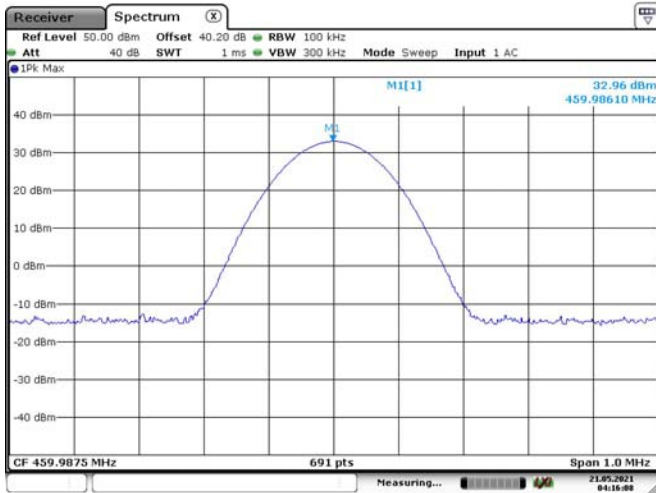


Date: 14.MAY.2021 07:43:44

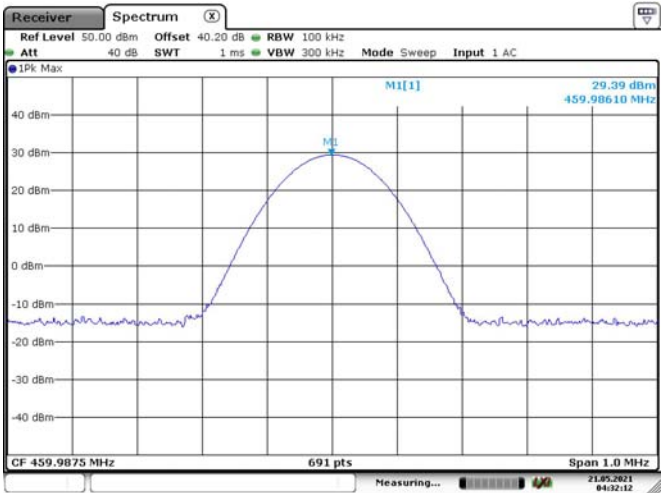
Additional, For Part 22, 455.0125 MHz Low Power



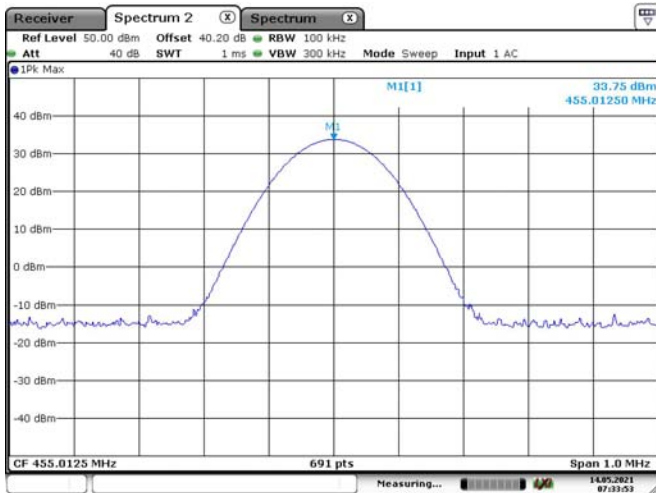
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FM, 25kHz:**Additional Channel, Part 80, 459.9875 MHz High Power**

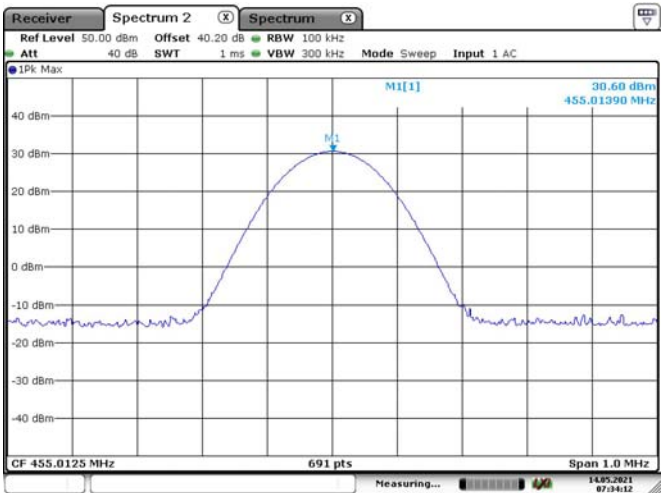
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Additional Channel, Part 80, 459.9875 MHz Low Power

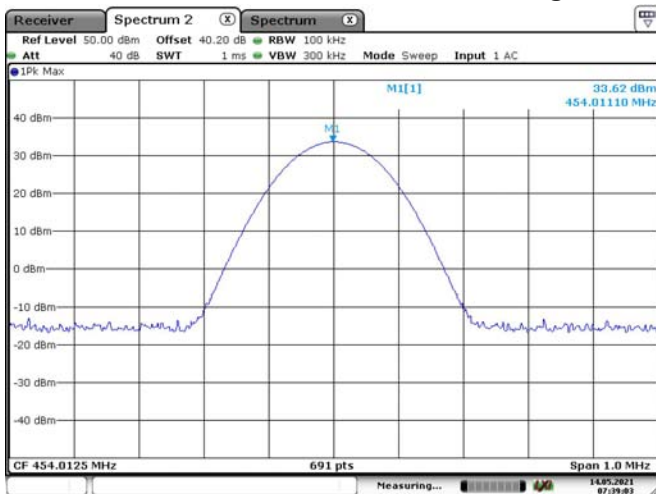
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Additional Channel, Part 74, 455.0125 MHz High Power

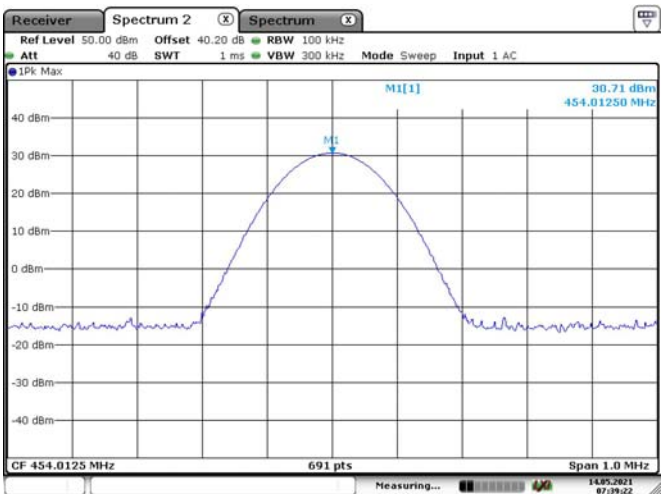
Date: 14.MAY.2021 07:33:53

Additional Channel, Part 74, 455.0125 MHz Low Power

Date: 14.MAY.2021 07:34:12

Additional Channel, Part 22, 454.0125 MHz High Power

Date: 14.MAY.2021 07:39:04

Additional Channel, Part 22, 454.0125 MHz Low Power

Date: 14.MAY.2021 07:39:22

3 - MODULATION CHARACTERISTIC

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

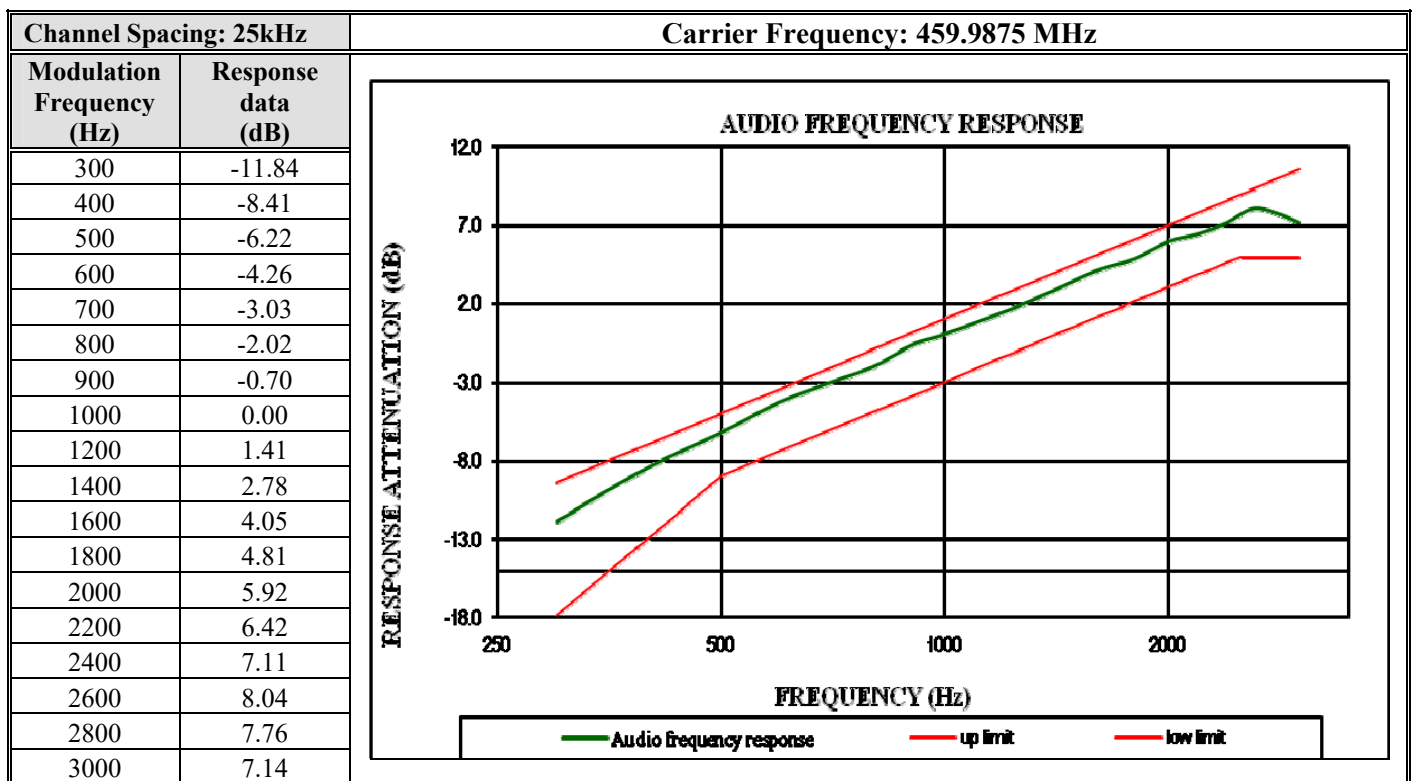
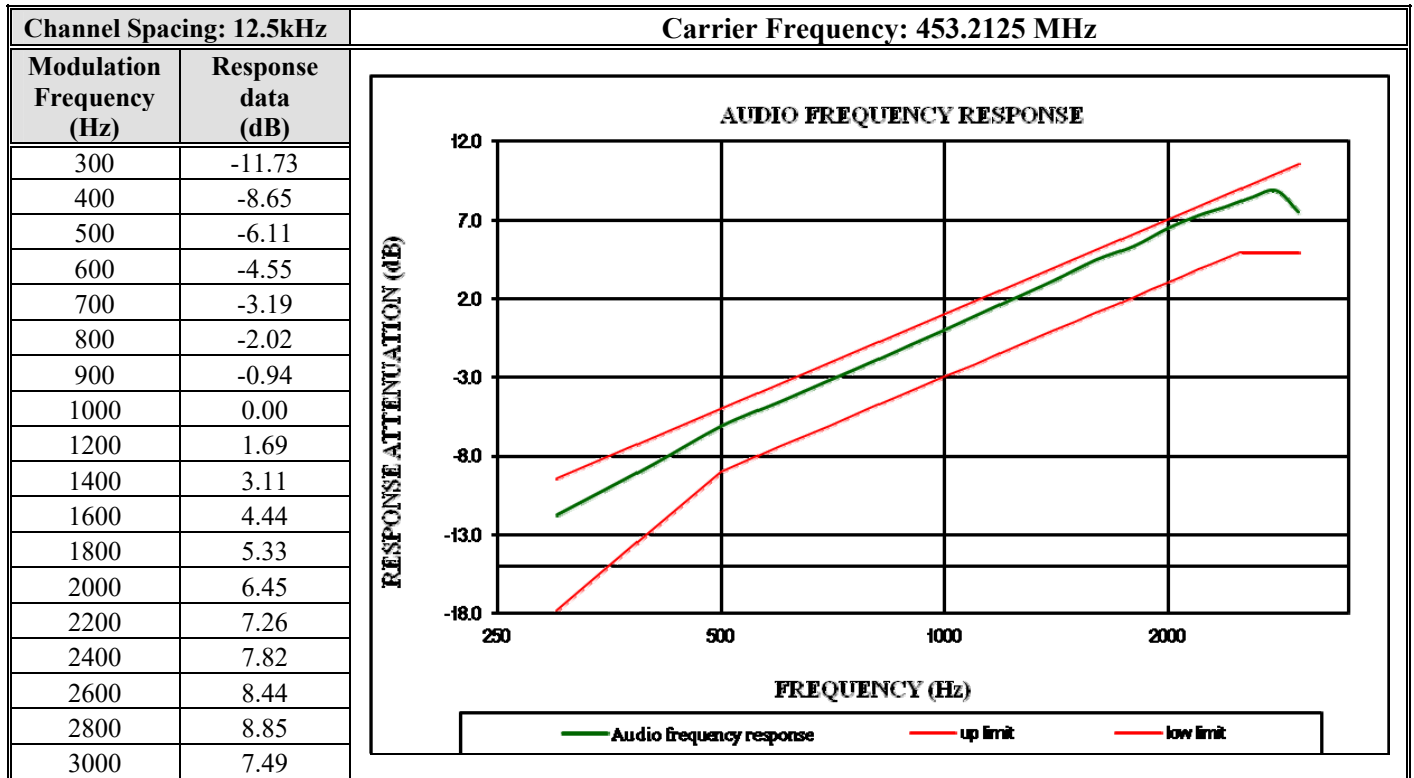
Test Data

Test Mode: Transmitting

Test Result: Compliance.

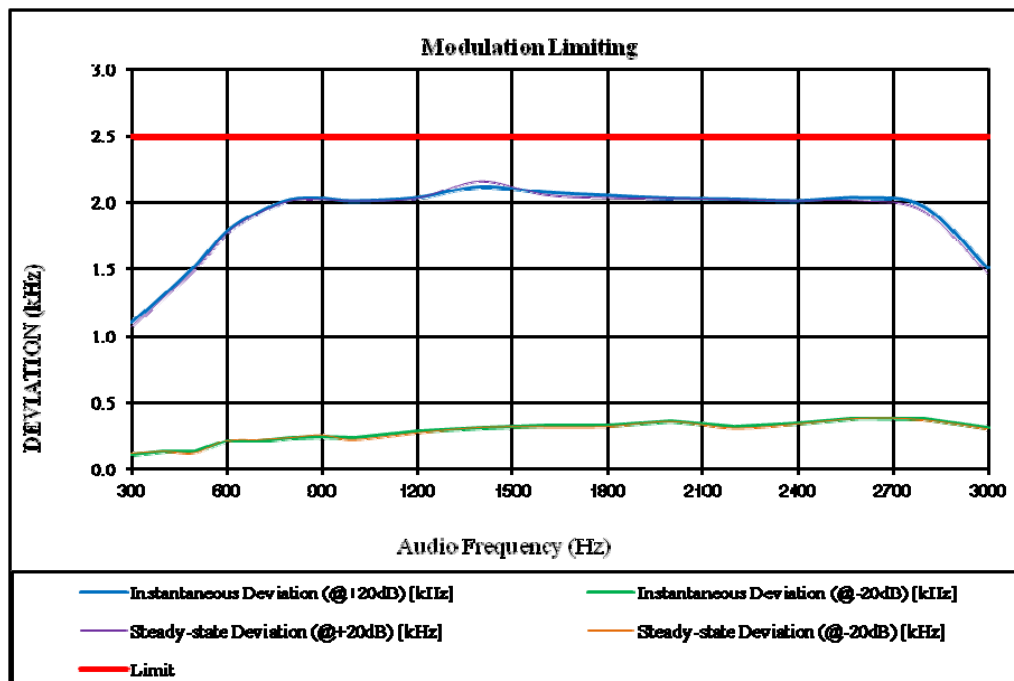
Please refer to the following tables and plots.

Audio Frequency Response – High Power

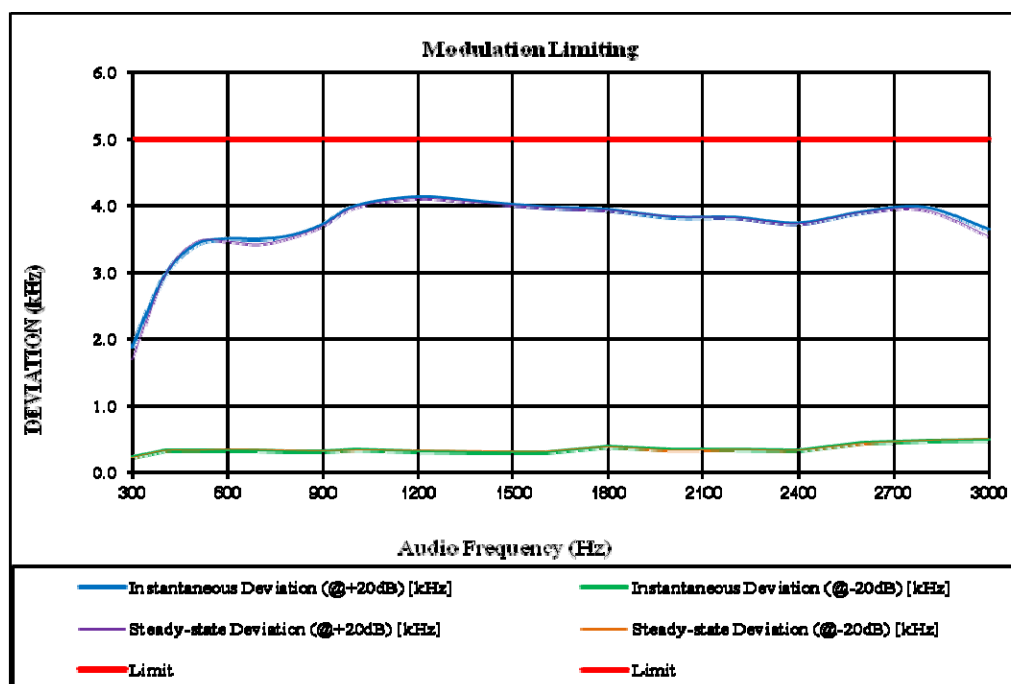


Modulation Limiting – High Power

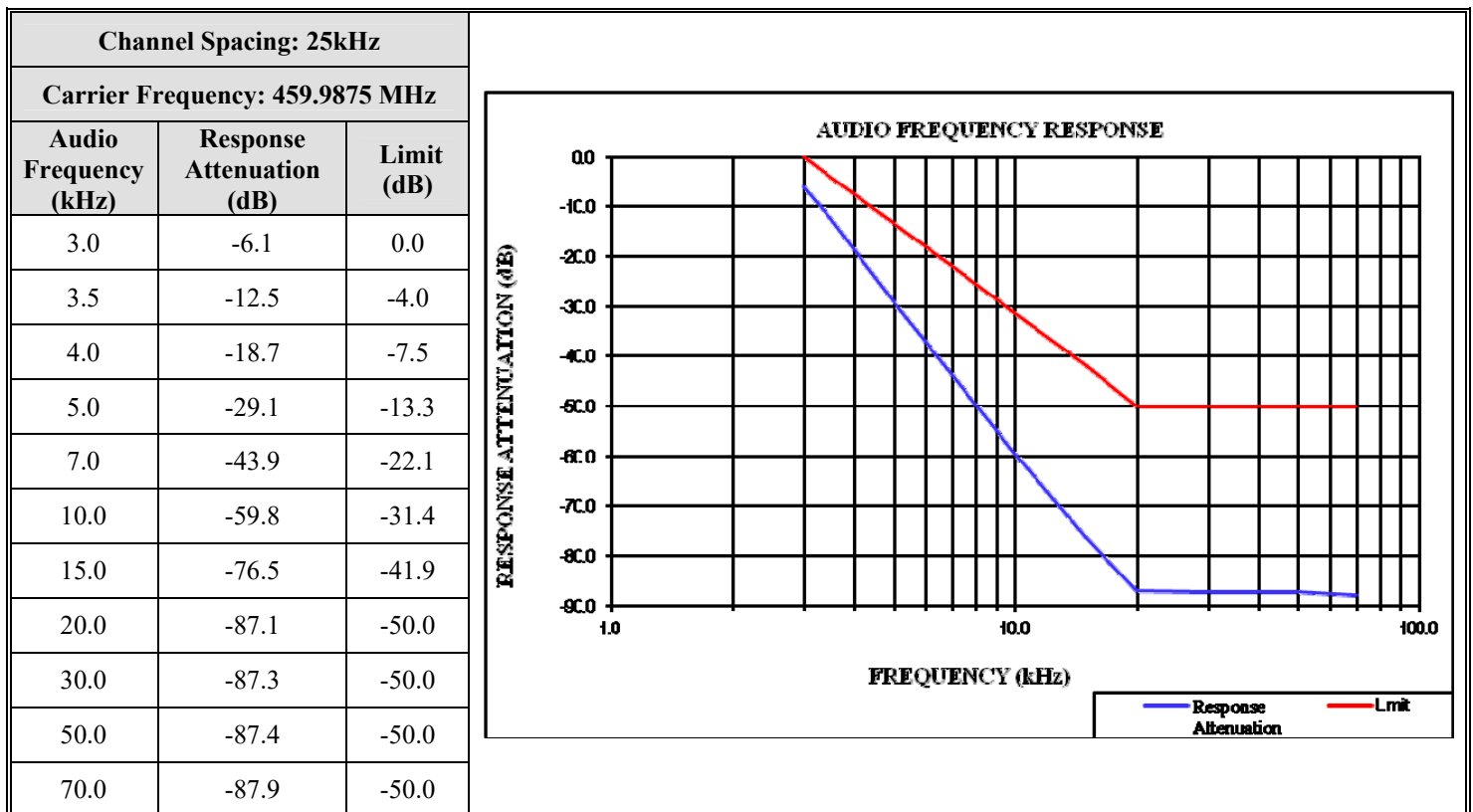
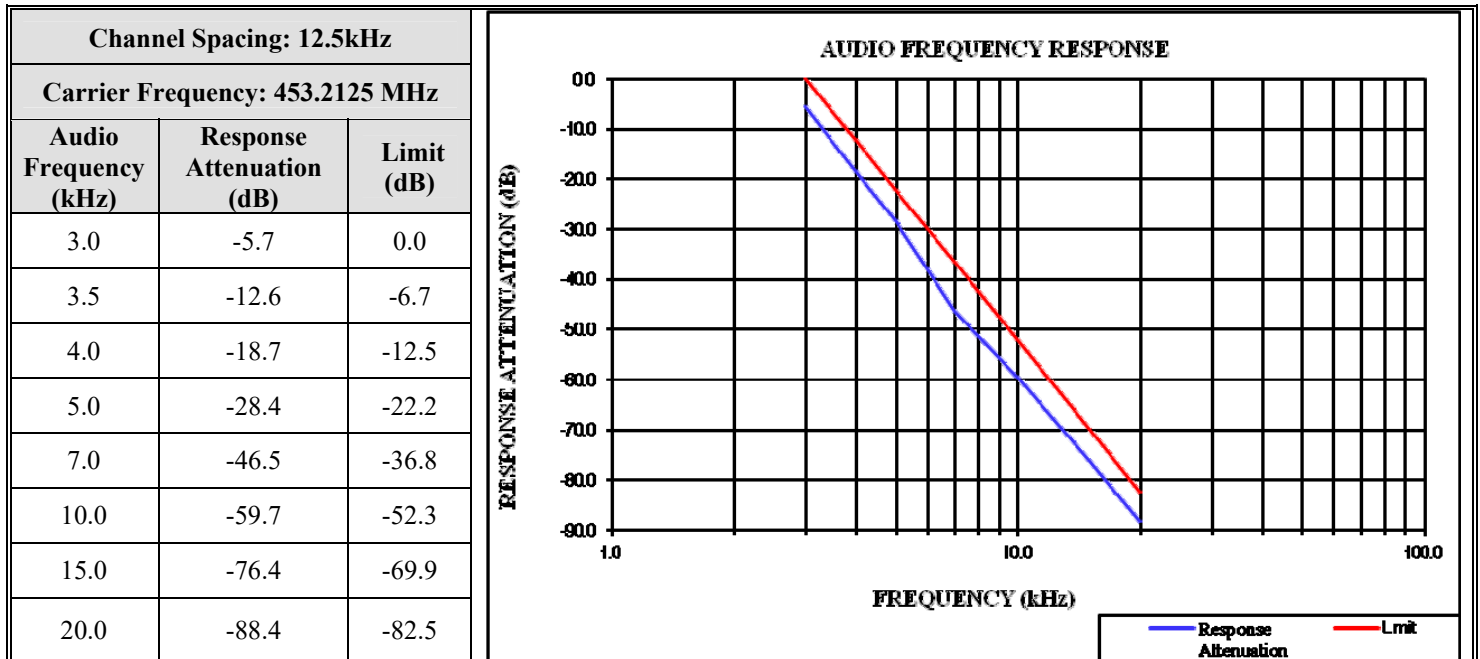
Channel Spacing: 12.5kHz		Carrier Frequency: 453.2125 MHz			
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.097	0.112	1.068	0.120	2.5
400	1.303	0.134	1.285	0.135	2.5
500	1.520	0.136	1.496	0.125	2.5
600	1.783	0.212	1.768	0.216	2.5
700	1.926	0.214	1.916	0.224	2.5
800	2.020	0.235	2.010	0.238	2.5
900	2.030	0.245	2.020	0.257	2.5
1000	2.012	0.236	2.010	0.225	2.5
1200	2.036	0.286	2.028	0.272	2.5
1400	2.120	0.312	2.160	0.311	2.5
1600	2.076	0.323	2.058	0.315	2.5
1800	2.052	0.325	2.034	0.317	2.5
2000	2.031	0.362	2.027	0.352	2.5
2200	2.024	0.318	2.018	0.306	2.5
2400	2.012	0.345	2.010	0.335	2.5
2600	2.034	0.386	2.010	0.375	2.5
2800	1.967	0.375	1.934	0.364	2.5
3000	1.508	0.312	1.468	0.300	2.5



Channel Spacing: 12.5kHz		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	1.870	0.224	1.680	0.214	5
400	2.940	0.336	2.930	0.321	5
500	3.410	0.332	3.450	0.325	5
600	3.500	0.334	3.460	0.342	5
700	3.495	0.337	3.420	0.335	5
800	3.550	0.321	3.520	0.326	5
900	3.710	0.312	3.690	0.318	5
1000	3.986	0.338	3.968	0.328	5
1200	4.128	0.321	4.105	0.326	5
1400	4.052	0.308	4.037	0.317	5
1600	3.975	0.304	3.968	0.312	5
1800	3.936	0.384	3.928	0.374	5
2000	3.826	0.346	3.834	0.325	5
2200	3.821	0.340	3.814	0.338	5
2400	3.734	0.335	3.725	0.328	5
2600	3.902	0.442	3.896	0.425	5
2800	3.968	0.471	3.935	0.469	5
3000	3.640	0.483	3.540	0.497	5



Audio Frequency Low Pass Filter Response – High Power



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	400.0125	5.282	10.203	8.032	10.275	FCC
	Middle	453.2125	5.282	10.275	7.670	10.275	Part 90
	High	469.9875	10.275	5.355	5.282	10.275	
	Additional	454.0125	7.525	10.275	7.598	10.275	Part 22
	Additional	455.0125	7.525	10.203	7.598	10.203	Part 74
4FSK 12.5kHz	Low	400.0125	7.453	9.696	7.236	9.550	FCC
	Middle	453.2125	7.670	9.696	7.308	9.624	Part 90
	High	469.9875	7.381	9.407	7.453	7.453	
	Additional	454.0125	7.525	9.334	7.453	9.768	Part 22
	Additional	455.0125	7.598	9.407	7.308	9.479	Part 74
FM 25kHz	Additional	454.0125	10.709	15.630	10.709	15.630	Part 22
	Additional	455.0125	10.709	15.770	10.709	15.630	Part 74
	Additional	459.9875	10.709	15.630	10.709	15.630	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

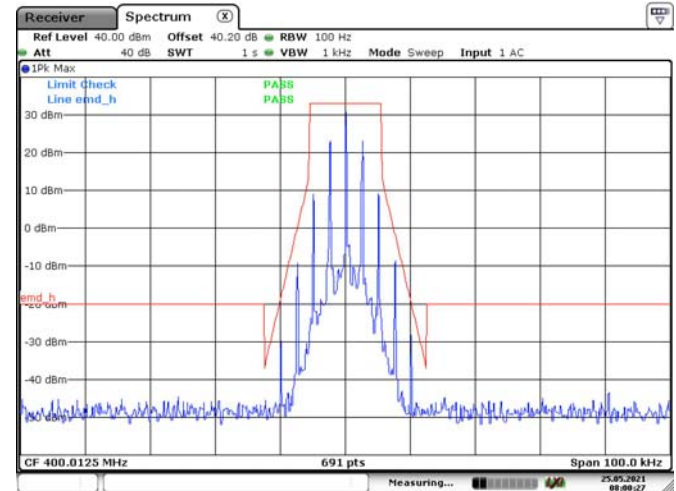
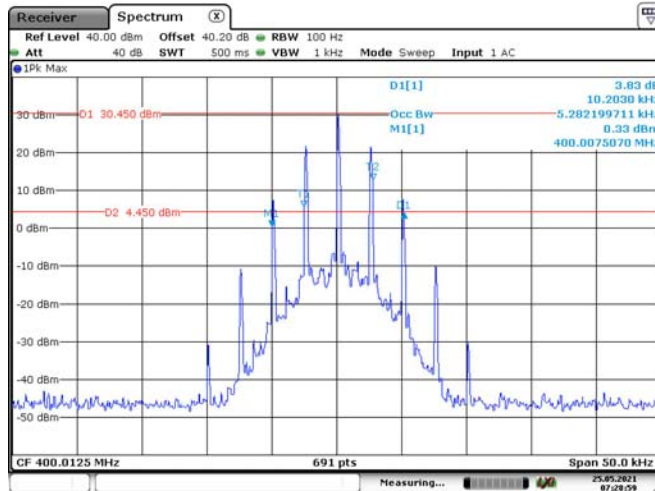
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).

F1D and F1E portion of the designator indicates digital information.

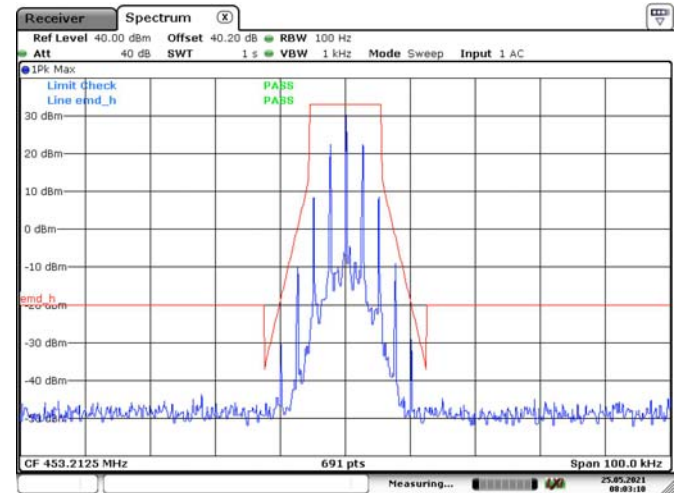
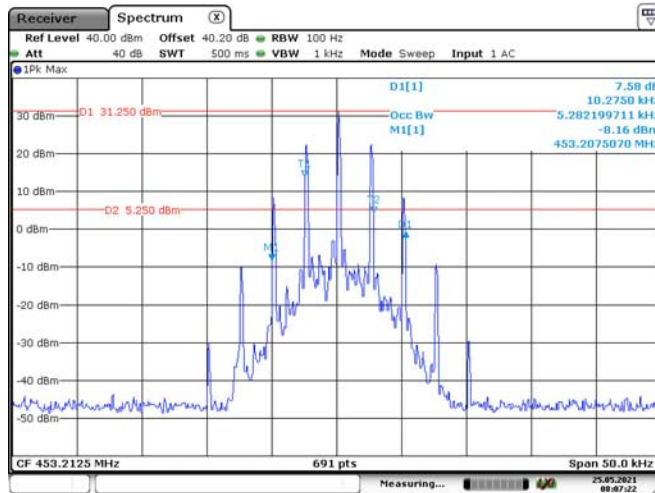
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

FM, 12.5kHz High Power:

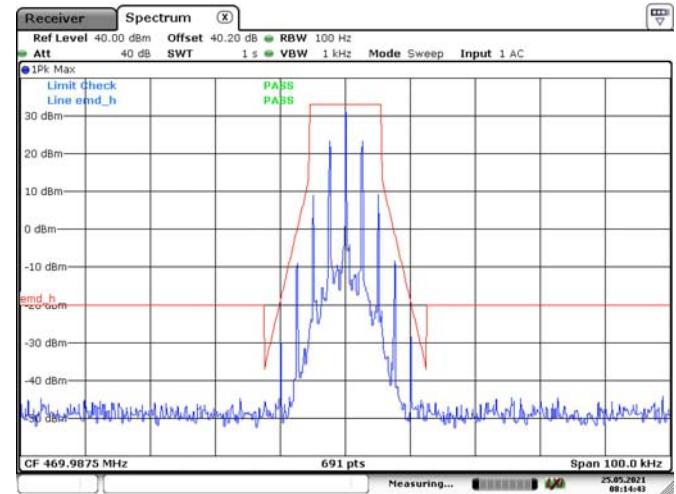
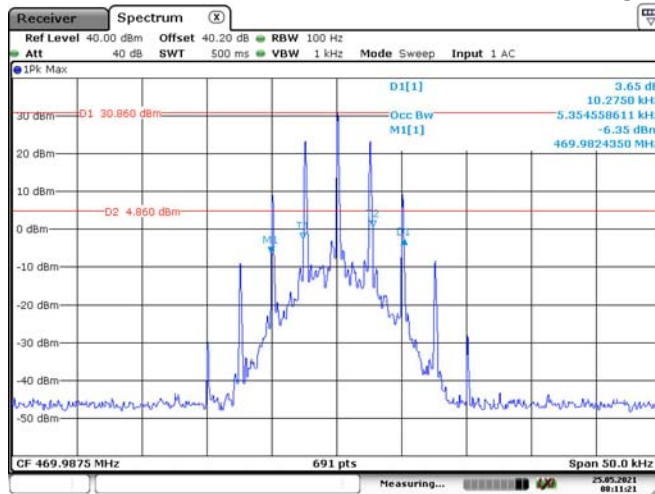
Low Channel



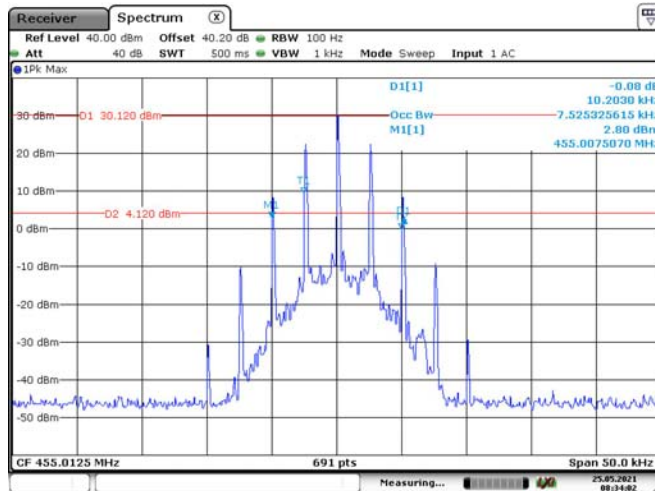
Middle Channel



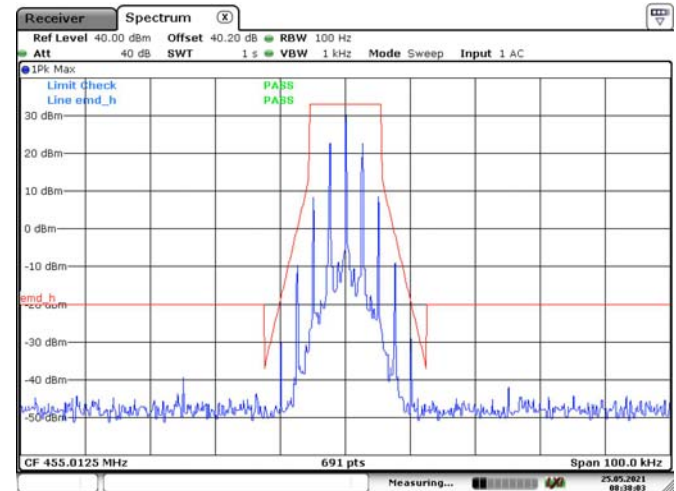
High Channel



Additional Channel Part 74, 455.0125 MHz

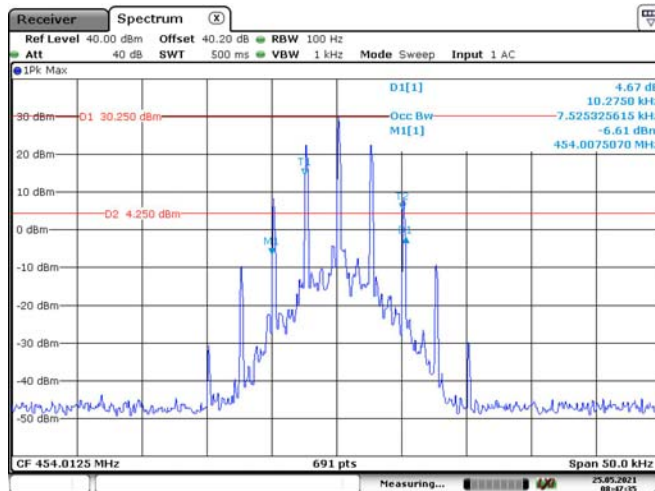


Date: 25.MAY.2021 08:34:02

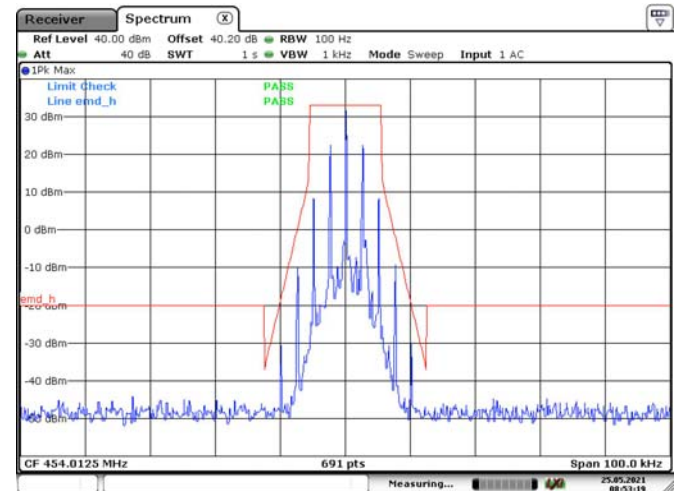


Date: 25.MAY.2021 08:38:03

Additional Channel Part 22, 454.0125 MHz



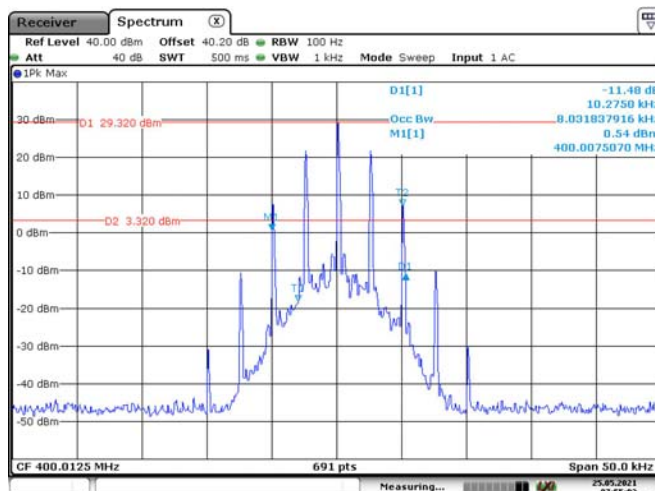
Date: 25.MAY.2021 08:47:35



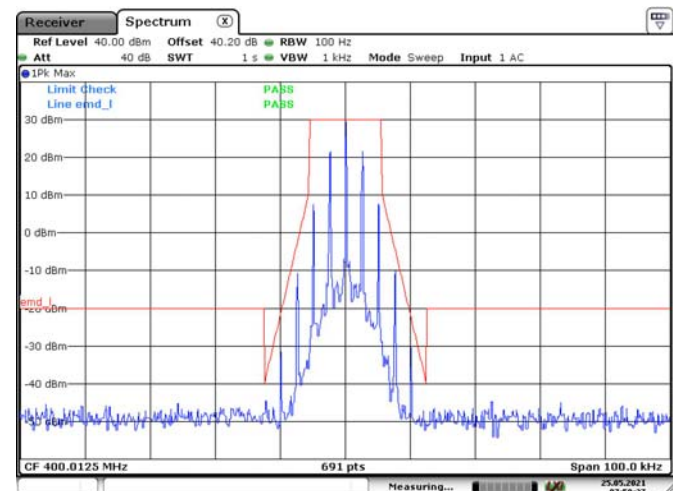
Date: 25.MAY.2021 08:53:19

FM, 12.5kHz Low Power:

Low Channel

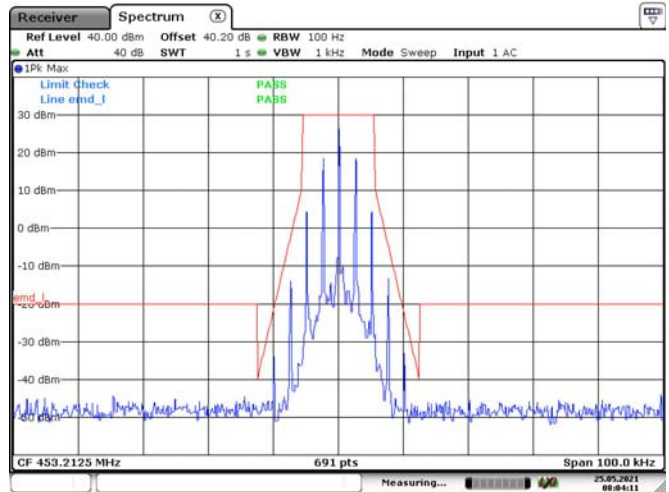
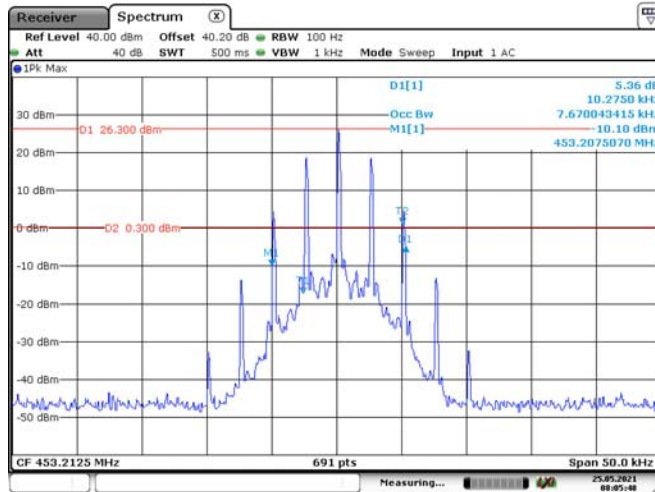


Date: 25.MAY.2021 07:55:03

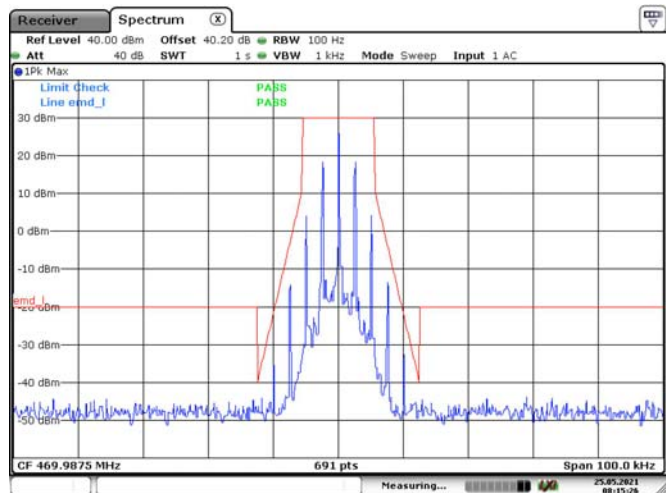
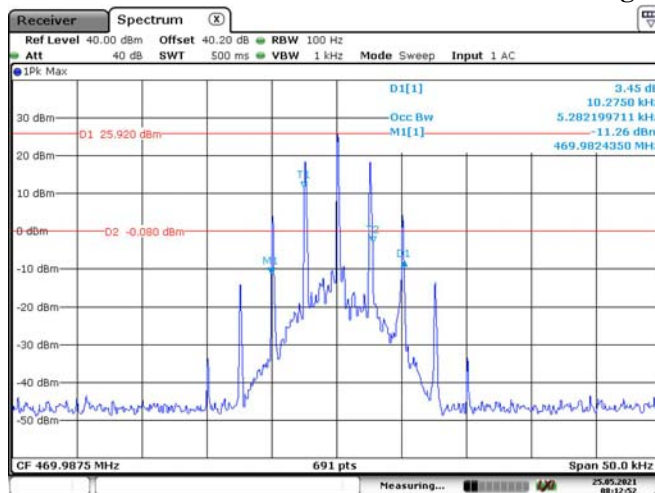


Date: 25.MAY.2021 07:59:27

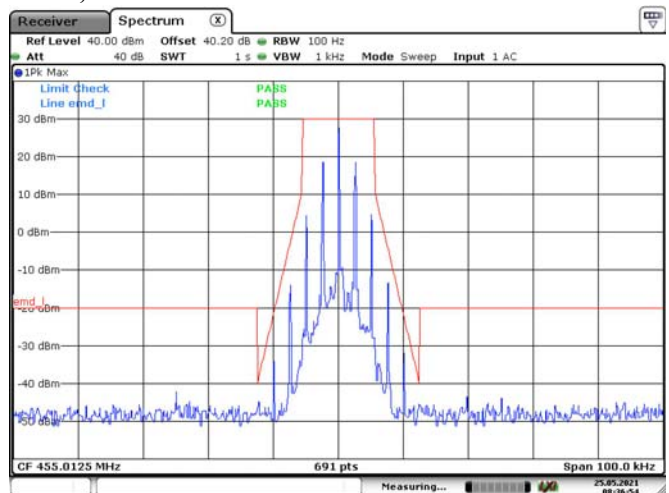
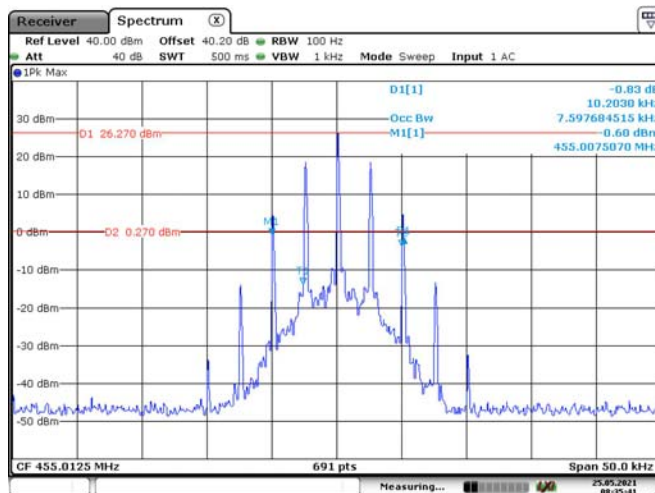
Middle Channel



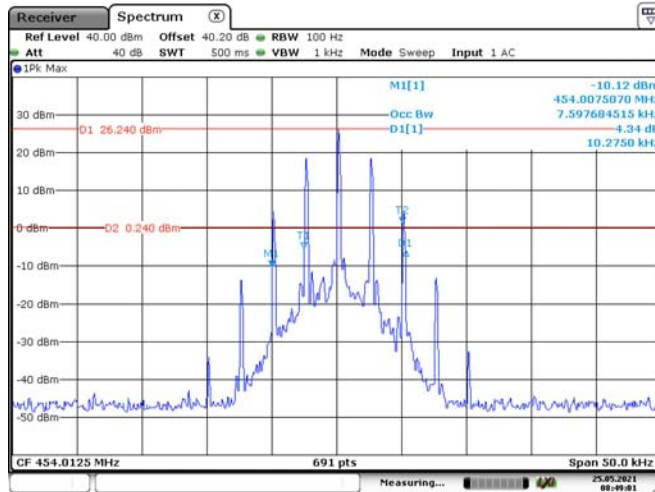
High Channel



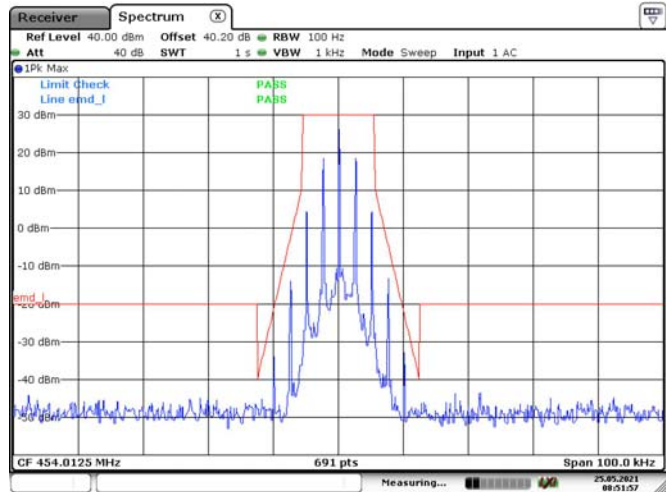
Additional Channel Part 74, 455.0125 MHz



Additional Channel Part 22, 454.0125 MHz



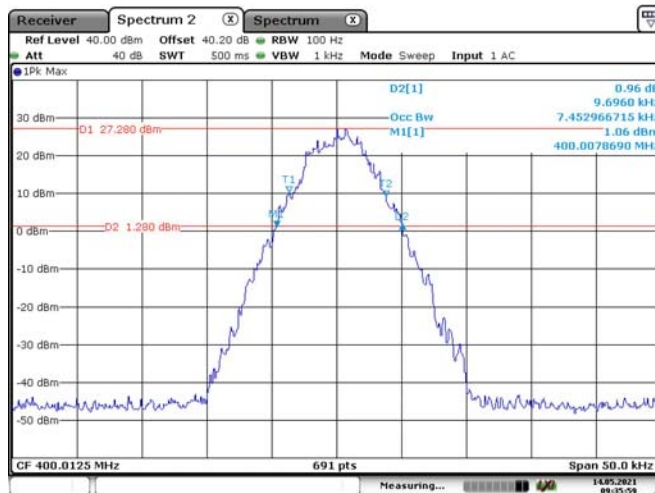
Date: 25.MAY.2021 08:49:01



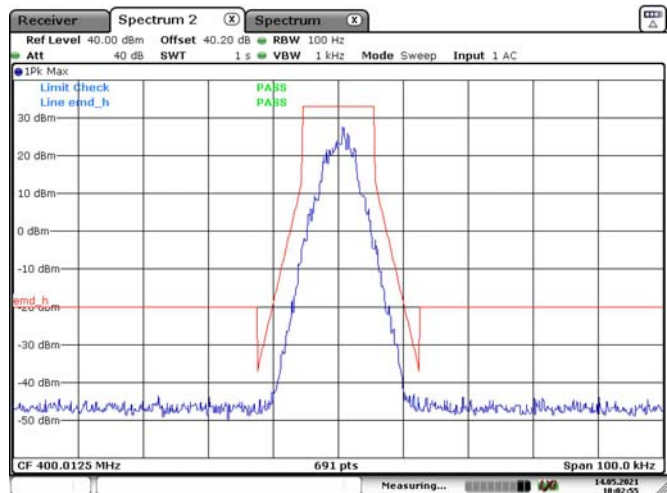
Date: 25.MAY.2021 08:51:58

4FSK, 12.5kHz High Power:

Low Channel

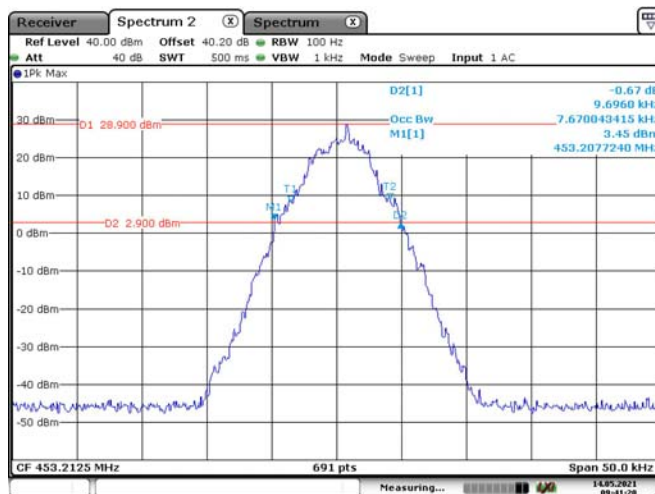


Date: 14.MAY.2021 09:36:00

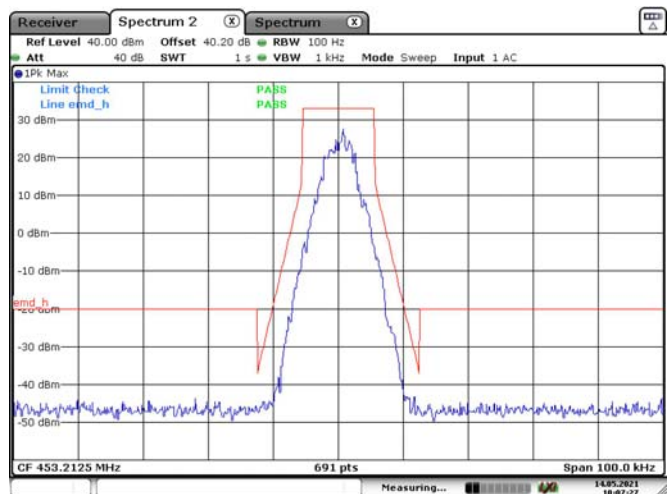


Date: 14.MAY.2021 10:02:56

Middle Channel

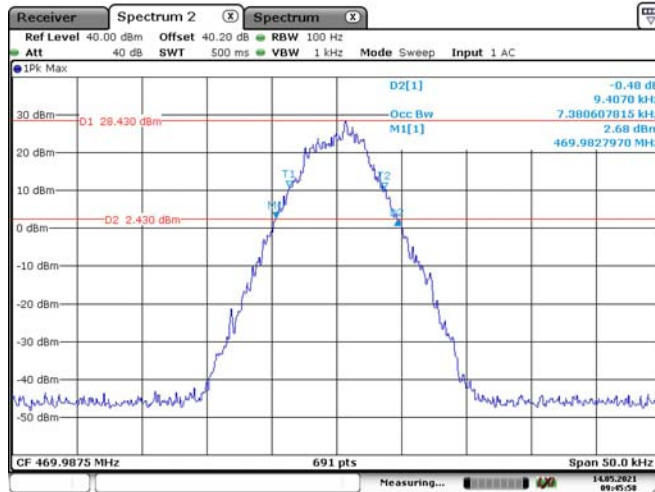


Date: 14.MAY.2021 09:41:20

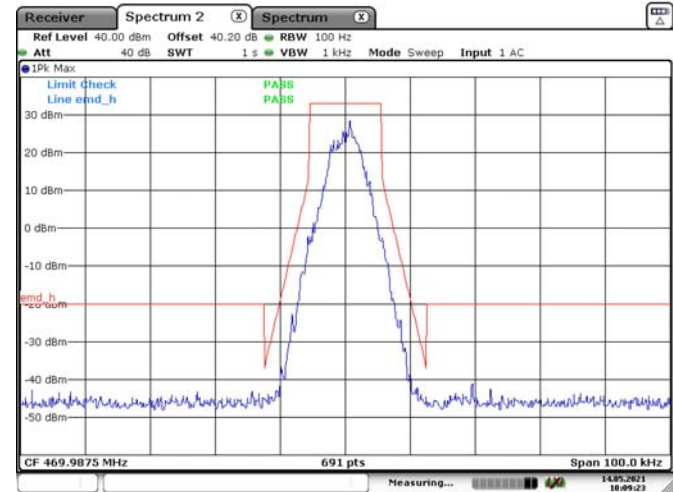


Date: 14.MAY.2021 10:07:27

High Channel

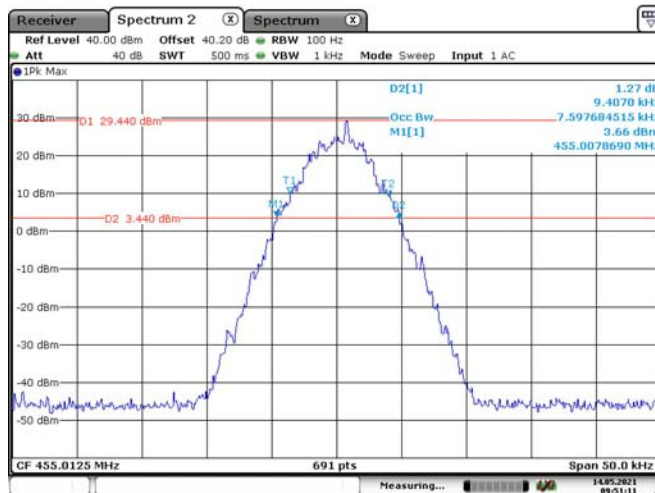


Date: 14.MAY.2021 09:45:58

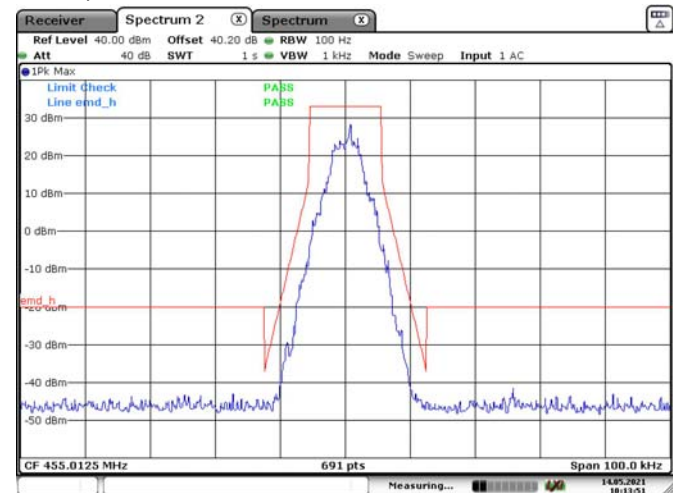


Date: 14.MAY.2021 10:09:24

Additional Channel Part 74, 455.0125 MHz

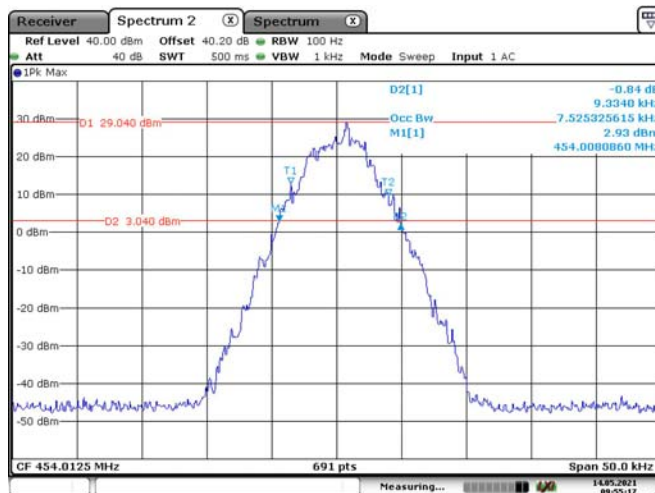


Date: 14.MAY.2021 09:51:11

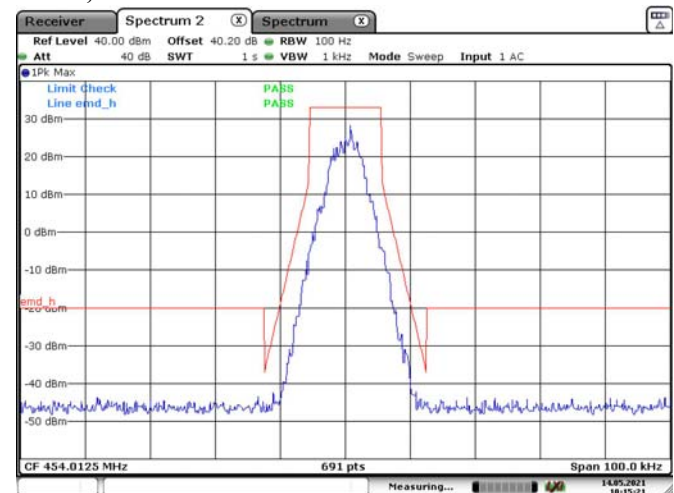


Date: 14.MAY.2021 10:13:52

Additional Channel Part 22, 454.0125 MHz



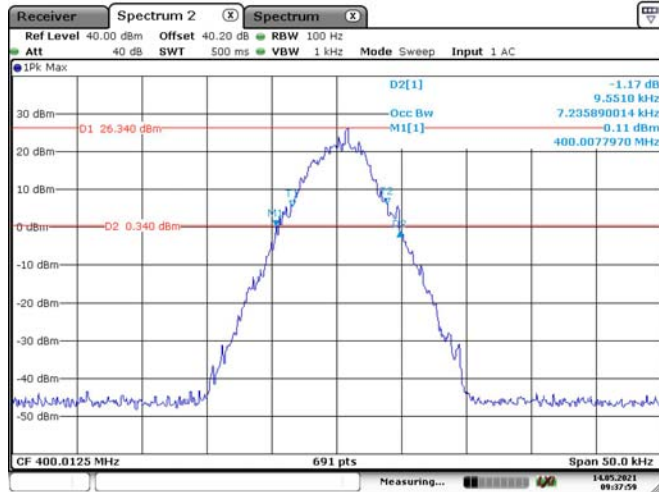
Date: 14.MAY.2021 09:55:17



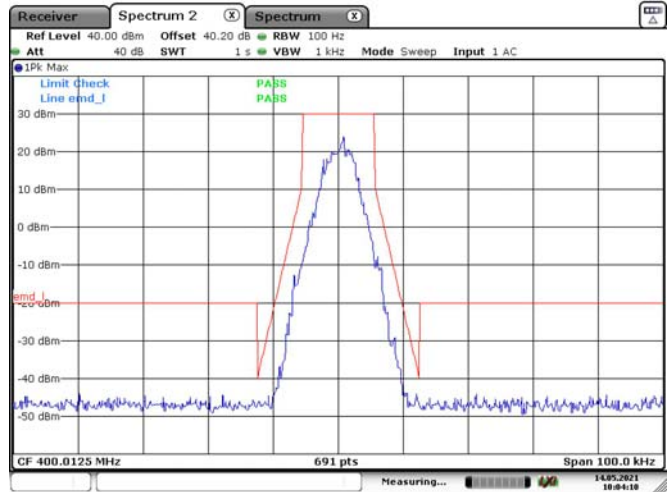
Date: 14.MAY.2021 10:15:21

4FSK, 12.5kHz Low Power:

Low Channel

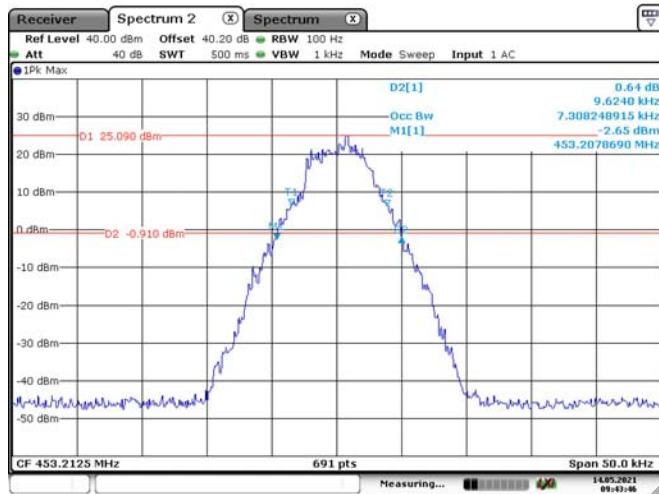


Date: 14.MAY.2021 09:38:00

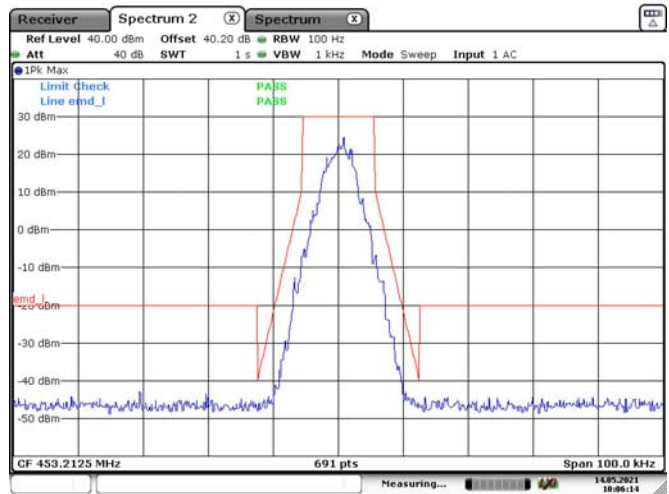


Date: 14.MAY.2021 10:04:11

Middle Channel

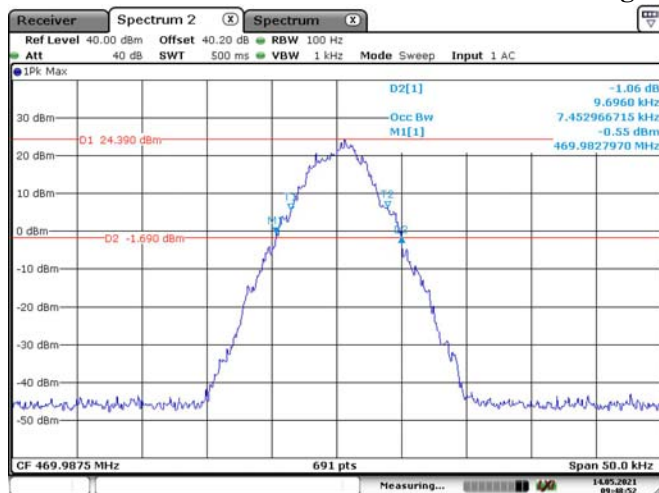


Date: 14.MAY.2021 09:43:46

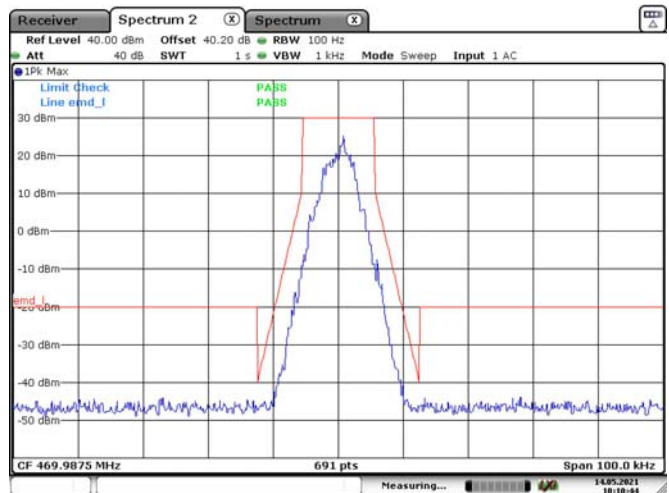


Date: 14.MAY.2021 10:06:15

High Channel



Date: 14.MAY.2021 09:48:53



Date: 14.MAY.2021 10:10:45

The screenshot displays a spectrum analyzer interface with the following details:

- Top Panel:**
 - Receiver:** Active.
 - Spectrum 2:** Active.
 - Spectrum 1:** Inactive (marked with an 'x').
- Measurement Parameters:**
 - Ref Level:** 40.00 dBm
 - Offset:** 40.20 dB
 - RBW:** 100 Hz
 - Att:** 40 dB
 - SWT:** 500 ms
 - VBW:** 1 kHz
 - Mode:** Sweep
 - Input:** 1 AC
- Plot Area:**
 - Y-axis:** Power in dBm, ranging from -50 to 30.
 - X-axis:** Frequency in MHz, ranging from 455.0125 to 455.0175.
 - Signal:** A blue trace showing a peak at 25.490 dBm.
 - Reference Lines:**
 - D2[1]:** 1.67 dBm, 9.4790 kHz
 - Occ BW:** 7.308248915 kHz
 - M1[1]:** -2.02 dBm, 455.0079410 MHz
- Bottom Panel:**
 - CF:** 455.0125 MHz
 - Span:** 50.0 kHz
 - 691 pts:** Number of points in the span.
 - Measuring...** Status indicator.
 - 14.952621:** A numerical value, possibly a measurement result.

The screenshot shows the 'Spectrum 2' window of a software-defined radio application. The main display is a frequency spectrum plot. The y-axis is labeled 'dBm' and ranges from -50 to 30. The x-axis is labeled 'kHz' and ranges from 455.0125 to 14.072621. A blue line represents the measured signal, showing a prominent peak at 691 kHz. A red line represents the 'Limit' or 'Mask' curve, which is a triangular shape centered on the peak. A green line represents the 'Pass' level, which is a horizontal line at approximately -10 dBm. The status bar at the bottom indicates 'Measuring...' and a signal-to-noise ratio of 40 dB.

The screenshot displays a spectrum analyzer interface with the following details:

- Top Bar:**
 - Receiver:** Includes buttons for 'Ref Level', 'Att', 'SWT', and '500 ms'.
 - Spectrum 2:** Includes buttons for 'Offset', 'RBW', and '1 kHz'.
 - Spectrum:** Includes buttons for 'Mode', 'Sweep', and 'Input 1 AC'.
- Parameters:**
 - Ref Level: 40.00 dBm
 - Offset: 40.20 dB
 - RBW: 100 Hz
 - Att: 40 dB
 - SWT: 500 ms
 - VBW: 1 kHz
 - Mode: Sweep
 - Input: 1 AC
- Plot Area:**
 - Y-axis:** Power in dBm, ranging from -50 to 30.
 - X-axis:** Frequency in MHz, ranging from 454.0125 to 454.007910.
 - Signal:** A blue trace showing a peak at 24.910 dBm.
 - Annotations:**
 - D2[1]:** 1.47 dB, 9.7680 kHz, 7.452966715 kHz, -2.02 dBm, 454.007910 MHz.
 - Occ Bw:** 1.47 dB.
 - M1[1]:** -2.02 dBm.
 - D2:** -1.090 dBm.
- Bottom Bar:**
 - CF 454.0125 MHz
 - 691 pts
 - Span 50.0 kHz
 - Measuring... (Progress bar)
 - 1445:26:21

Receiver Spectrum 2 Spectrum

Ref Level 40.00 dBm Offset 40.20 dB RBW 100 Hz

Att 40 dB SWT 1 s VBW 1 kHz Mode Sweep Input 1 AC

1Pk Max

Limit Check
Line emd_f

PASS
PASS

30 dBm

20 dBm

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

CF 454.0125 MHz 691 pts Span 100.0 kHz

Measuring...

14.05.2021 14:05

Receiver Spectrum

Ref Level 40.00 dBm Offset 40.20 dB RBW 300 Hz
 Att 40 dB SWT 112 ms VBW 3 kHz Mode Sweep Input 1 AC

1Pk Max

D1[1] -0.10 dB
 15.630 kHz
 Occ Bw 10.709117221 kHz
 M1[1] -0.42 dBm
 459.979800 MHz

D1 26.750 dBm
 D2 0.750 dBm

CF 459.9875 MHz 691 pts Span 100.0 kHz

Measuring...

The screenshot shows a spectrum analyzer interface. At the top, there are tabs for 'Receiver' and 'Spectrum'. The 'Spectrum' tab is active. Below the tabs, there are several parameters: 'Ref Level' (40.00 dBm), 'Offset' (40.20 dB), 'RBW' (300 Hz), 'Att' (40 dB), 'SWT' (139 ms), 'VBW' (3 kHz), 'Mode' (Sweep), and 'Input' (1 AC). The main display area shows a frequency spectrum plot. The x-axis represents frequency, with labels for 'CF 459.9875 MHz' and 'Span 125.0 kHz'. The y-axis represents power in dBm, ranging from -50 dBm to 30 dBm. A red line represents the 'Limit check' (labeled 'Limit check Line emb_h'). A blue trace represents the signal, showing a peak around 691 MHz. The peak is labeled 'PASS' in green text. The signal is also labeled 'emb_h' in red text. The bottom status bar shows 'Measuring...' and a progress bar.

Page 26 of 48

Receiver Spectrum [X]

Ref Level 40.00 dBm Offset 40.20 dB RBW 300 Hz

Att 40 dB SWT 112 ms VBW 3 kHz Mode Sweep Input 1 AC

1Pk Max

30 dBm

20 dBm

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

D1[1] 7.30 dBm

Occ Bw 15.770 kHz

10.709117221 kHz

M1[1] -9.35 dBm

455.004690 MHz

D1 26.540 dBm

D2 0.540 dBm

M1

M2

M3

M4

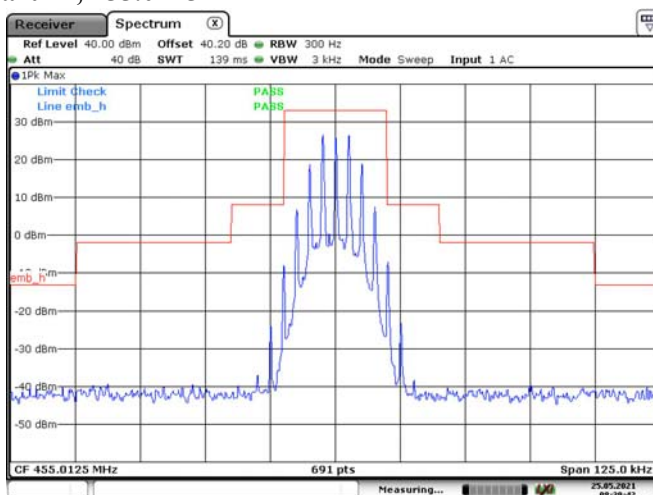
CF 455.0125 MHz

691 pts

Span 100.0 kHz

Measuring... 25.852621

Date: 25.MAY.2021 08:43:46



Date: 25.MAY.2021 08:39:42

Receiver Spectrum

Ref Level 40.00 dBm Offset 40.20 dB RBW 300 Hz

Att 40 dB SWT 112 ms VBW 3 kHz Mode Sweep Input 1 AC

1Pk Max

30 dBm

20 dBm

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

D1 26.400 dBm

D2 0.400 dBm

D1[1] 1.00 dB

Occ BW 15.630 kHz

M1[1] 10.709117221 kHz

1.51 dBm

454.004830 MHz

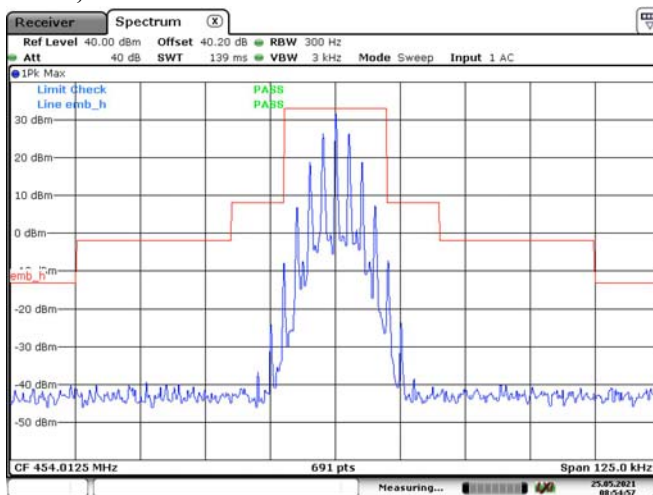
CF 454.0125 MHz

691 pts

Span 100.0 kHz

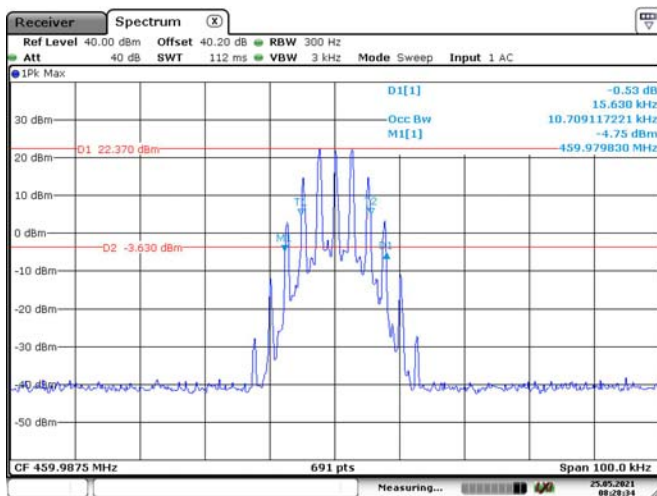
Measuring...

Date: 25.MAY.2021 09:04:22

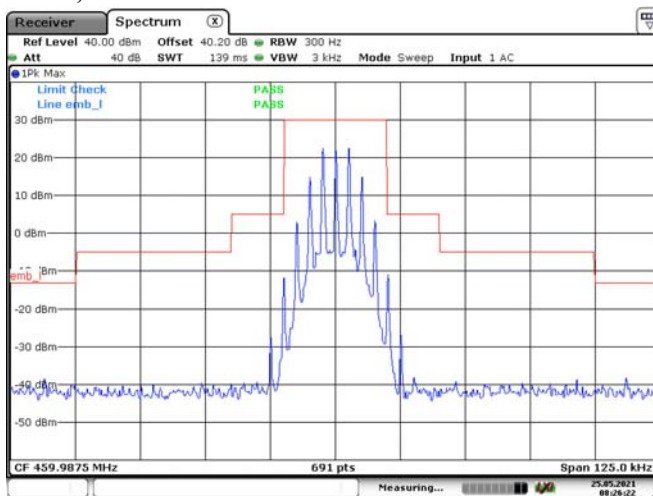


Date: 25.MAY.2021 08:54:58

Additional Channel Part 80, 459.9875 MHz

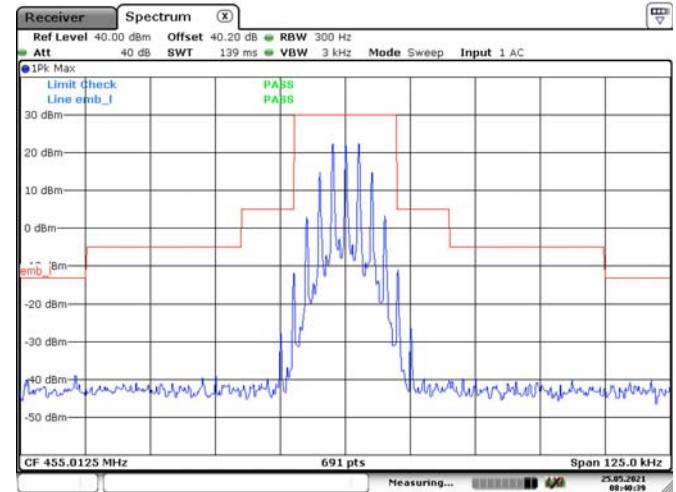
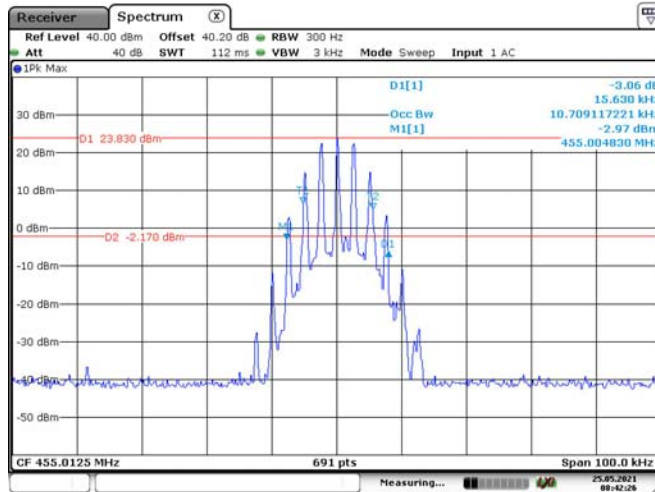


Date: 25.MAY.2021 08:28:34

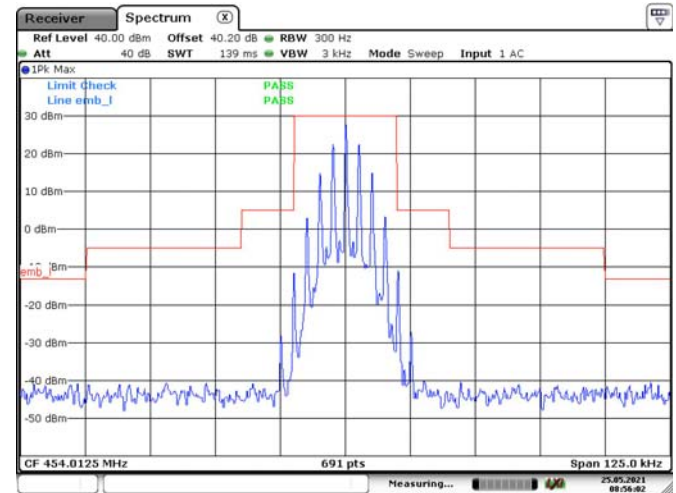
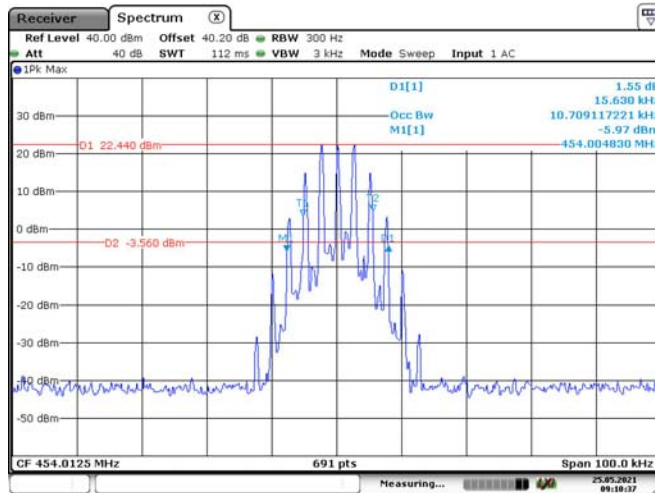


Date: 25.MAY.2021 08:26:22

Additional Channel Part 74, 455.0125 MHz



Additional Channel Part 22, 454.0125 MHz



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 10th harmonic.

Test Data

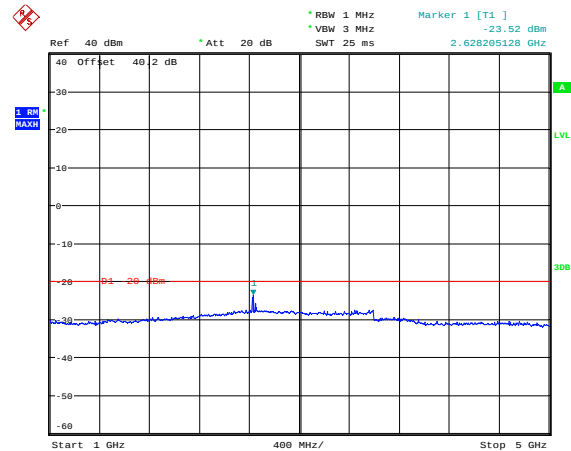
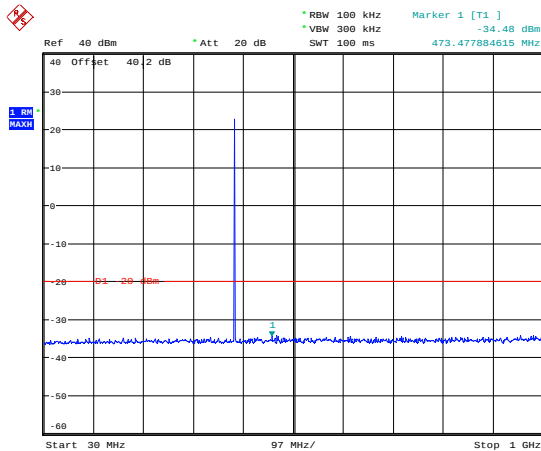
Test Mode: Transmitting

Test Result: Compliance.

Test performed at high power level with Band reject filter, *please refer to the following plots.*

FM, 12.5kHz:

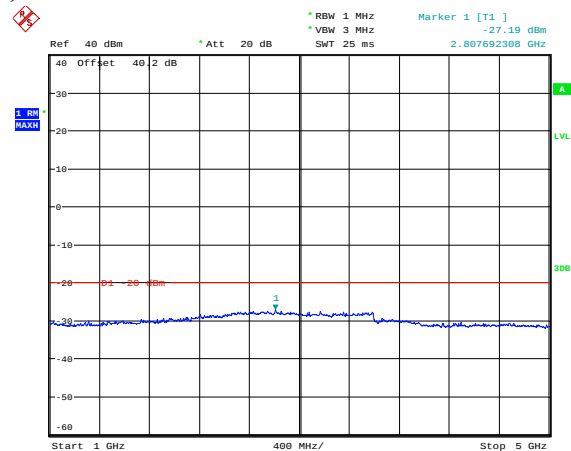
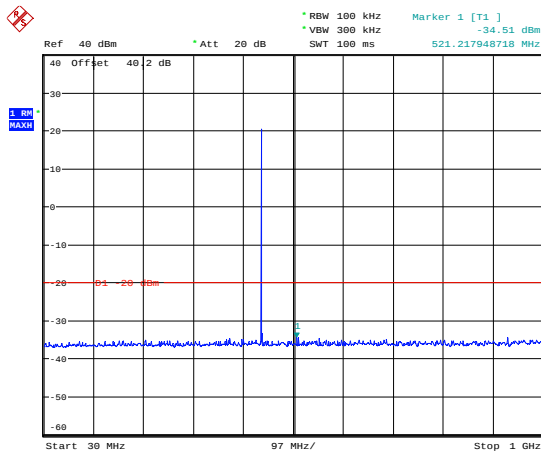
Low Channel, 400.0125 MHz



Date: 13.MAY.2021 17:37:29

Date: 13.MAY.2021 17:38:30

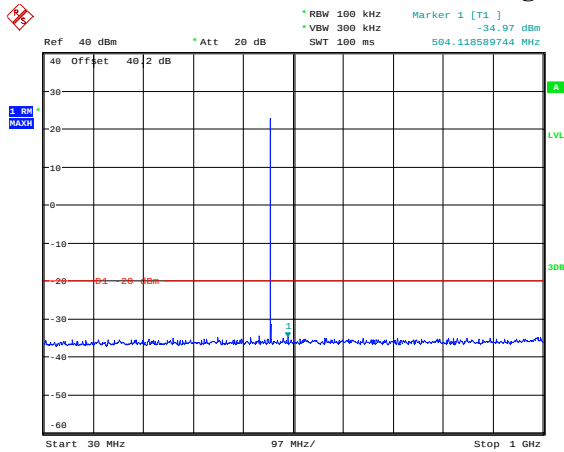
Middle Channel, 453.2125 MHz



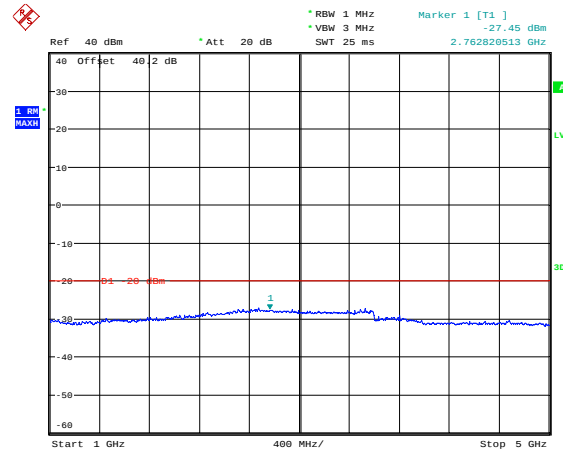
Date: 13.MAY.2021 17:40:58

Date: 13.MAY.2021 17:40:10

High Channel, 469.9875 MHz



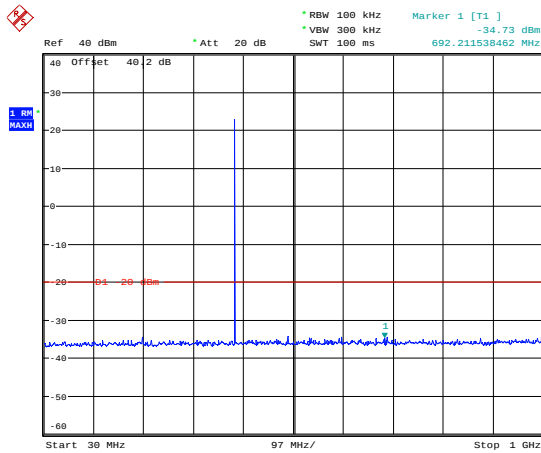
Date: 13.MAY.2021 17:41:52



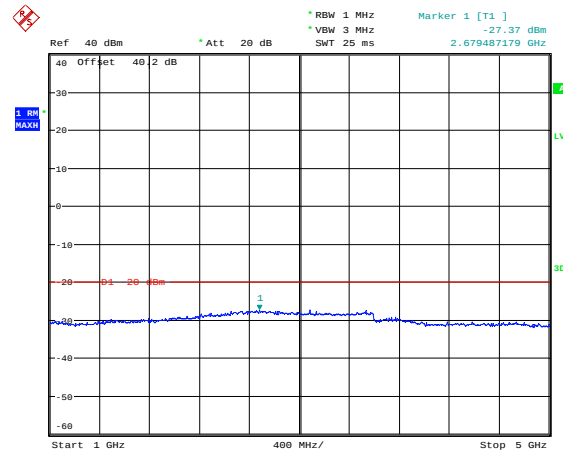
Date: 13.MAY.2021 17:42:34

4FSK, 12.5kHz:

Low Channel, 400.0125 MHz

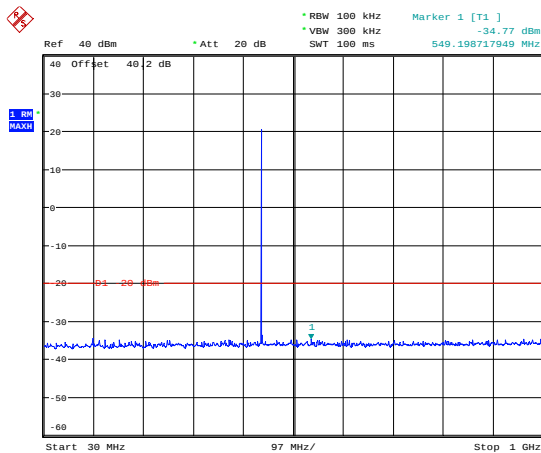


Date: 13.MAY.2021 18:04:09

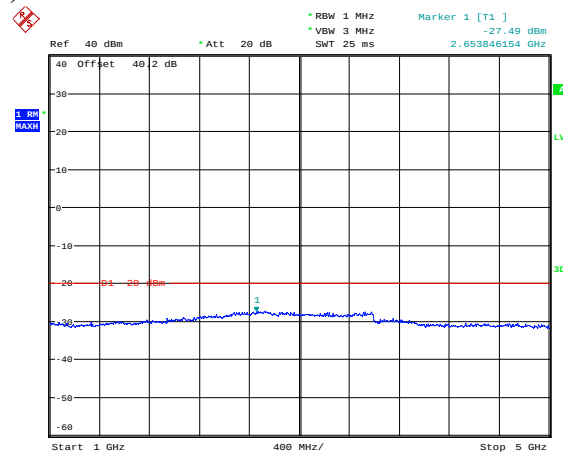


Date: 13.MAY.2021 18:04:44

Middle Channel, 453.2125 MHz

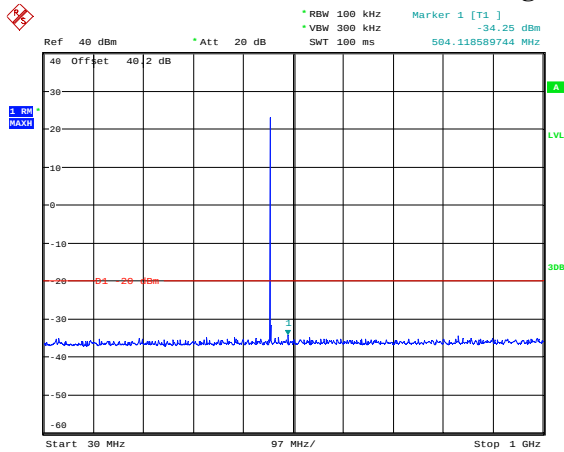


Date: 13.MAY.2021 18:06:13

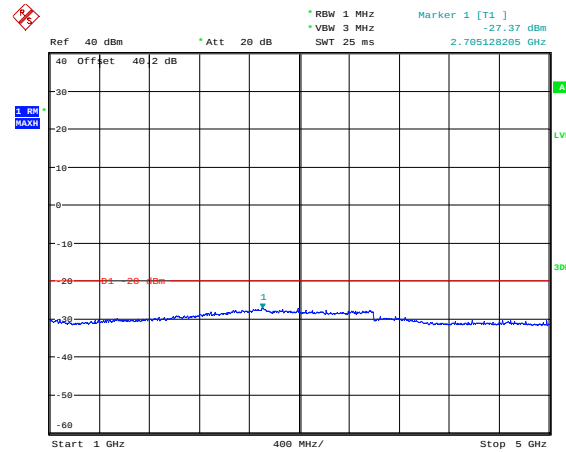


Date: 13.MAY.2021 18:05:21

High Channel, 469.9875 MHz



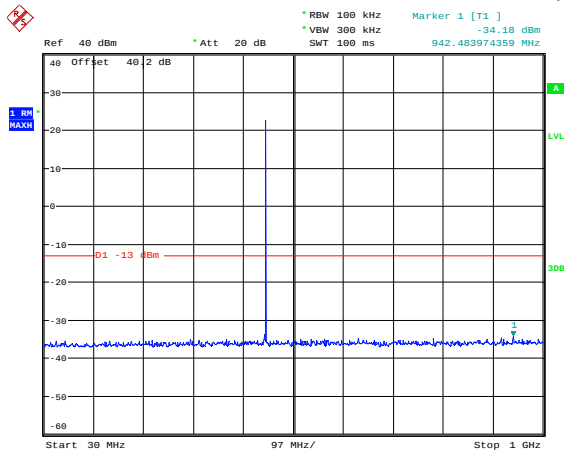
Date: 13.MAY.2021 18:07:05



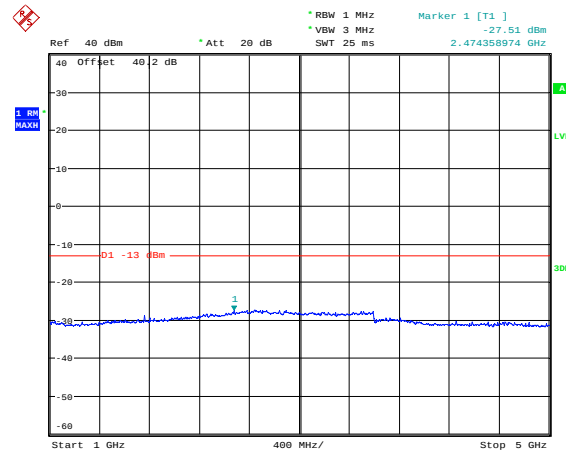
Date: 13.MAY.2021 18:08:14

Part 80:

FM,25kHz, 459.9875 MHz



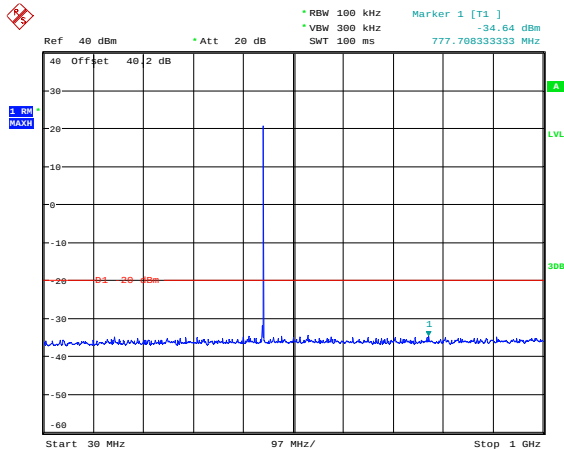
Date: 13.MAY.2021 17:44:28



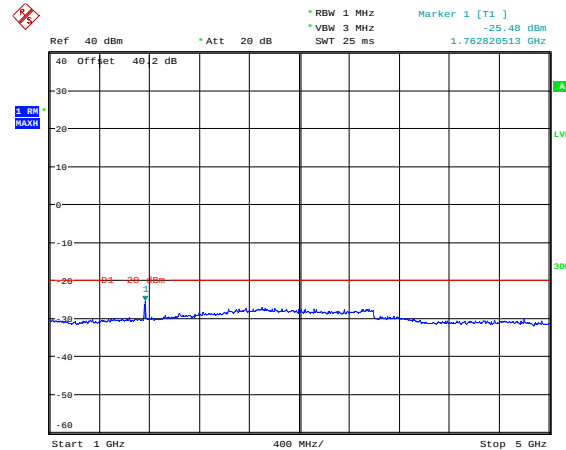
Date: 13.MAY.2021 17:43:50

Part 74:

FM,12.5kHz, 455.0125 MHz

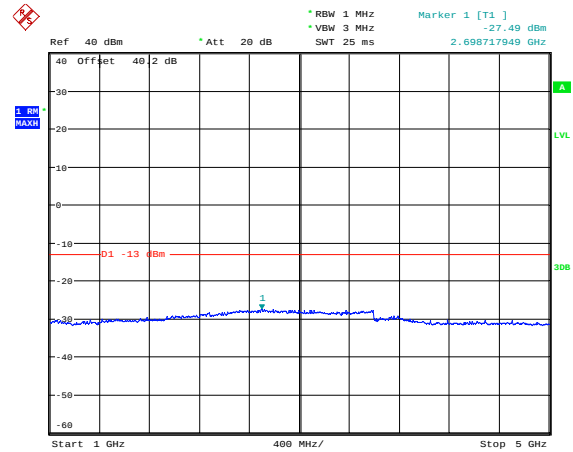
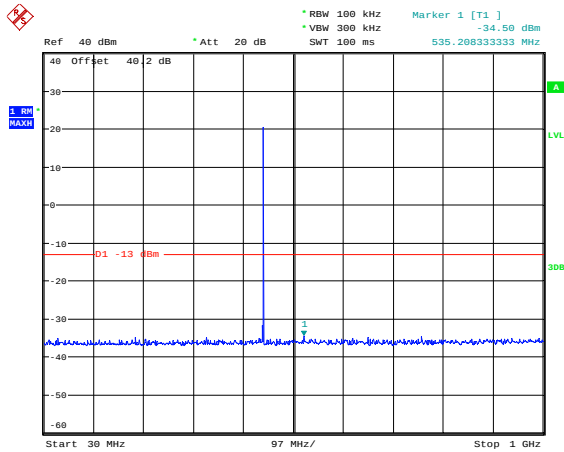


Date: 13.MAY.2021 17:45:29



Date: 13.MAY.2021 17:46:19

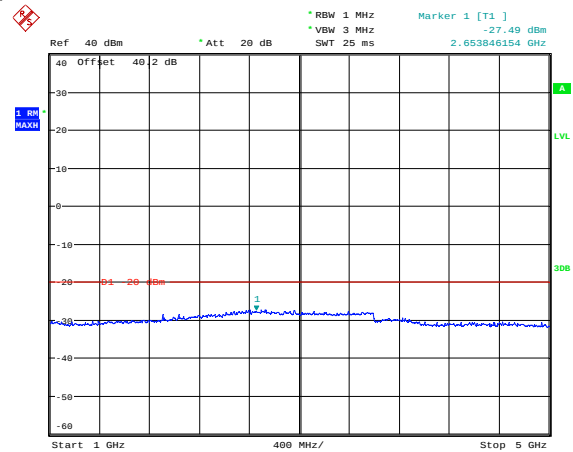
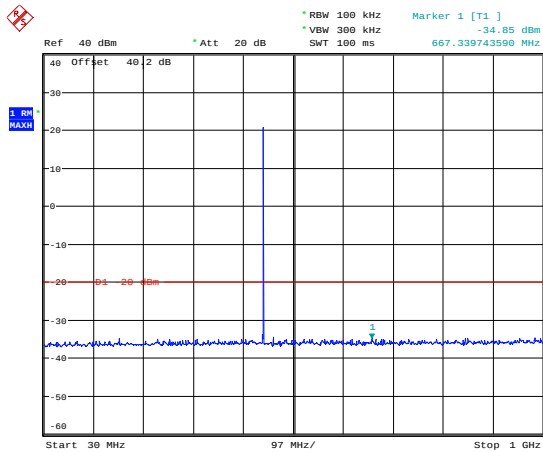
FM,25kHz, 455.0125 MHz



Date: 13.MAY.2021 18:15:47

Date: 13.MAY.2021 18:16:21

4FSK,12.5kHz, 455.0125 MHz

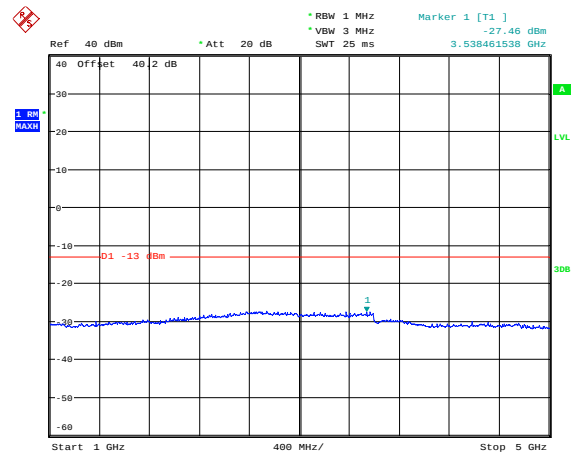
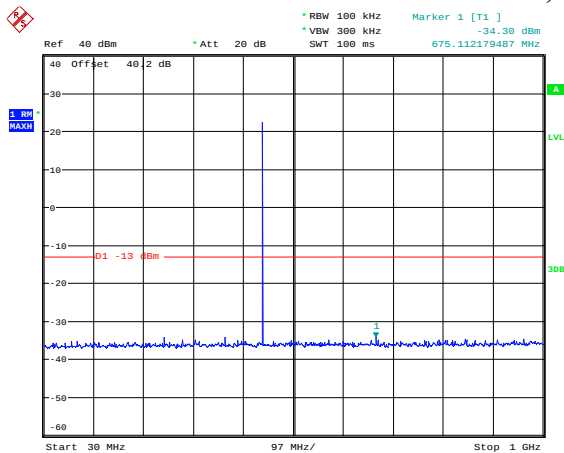


Date: 13.MAY.2021 18:14:40

Date: 13.MAY.2021 18:13:56

Part 22:

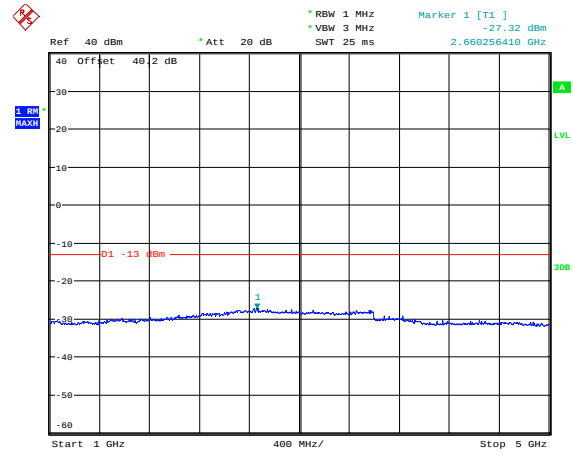
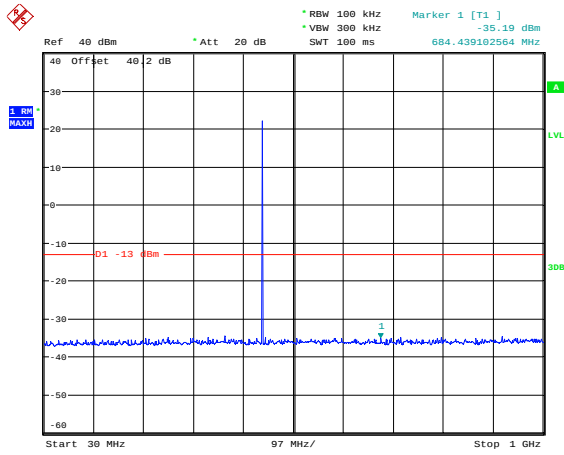
FM,12.5kHz, 454.0125 MHz



Date: 13.MAY.2021 17:48:39

Date: 13.MAY.2021 17:49:35

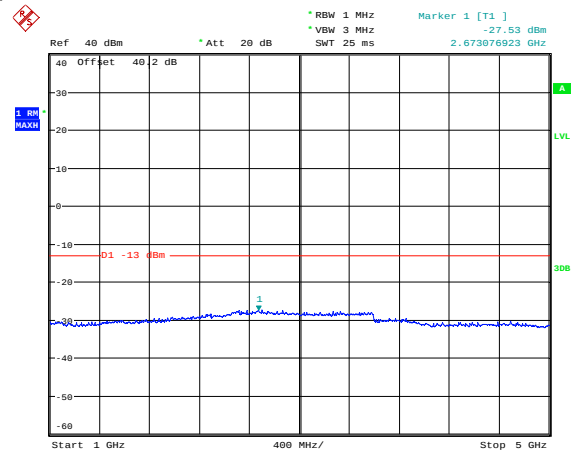
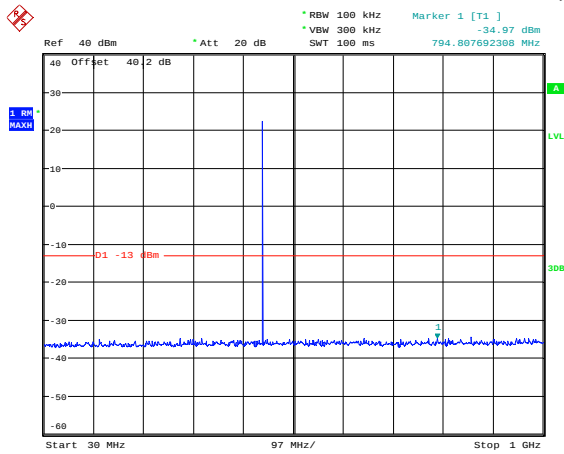
FM,25kHz, 454.0125 MHz



Date: 13.MAY.2021 17:50:48

Date: 13.MAY.2021 17:49:59

4FSK,12.5kHz, 454.0125 MHz



Date: 13.MAY.2021 18:10:48

Date: 13.MAY.2021 18:11:21

6 - RADIATED SPURIOUS EMISSIONS

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: 400.0125MHz-12.5 kHz								
800.03	H	44.25	-54.28	0.00	0.49	-54.77	-20.00	34.77
800.03	V	43.21	-52.29	0.00	0.49	-52.78	-20.00	32.78
1200.04	H	37.61	-65.37	7.30	1.09	-59.16	-20.00	39.16
1200.04	V	36.70	-67.38	7.30	1.09	-61.17	-20.00	41.17
1600.05	H	39.56	-65.08	10.10	0.68	-55.66	-20.00	35.66
1600.05	V	38.03	-67.21	10.10	0.68	-57.79	-20.00	37.79
2000.06	H	37.03	-65.80	12.00	1.13	-54.93	-20.00	34.93
2000.06	V	37.33	-65.90	12.00	1.13	-55.03	-20.00	35.03
2400.08	H	35.36	-67.10	12.30	1.29	-56.09	-20.00	36.09
2400.08	V	35.83	-66.83	12.30	1.29	-55.82	-20.00	35.82
2800.09	H	36.87	-64.85	13.10	1.36	-53.11	-20.00	33.11
2800.09	V	36.70	-65.22	13.10	1.36	-53.48	-20.00	33.48
3200.10	H	37.63	-61.04	13.60	1.57	-49.01	-20.00	29.01
3200.10	V	37.08	-61.65	13.60	1.57	-49.62	-20.00	29.62
3600.11	H	36.25	-62.78	14.10	1.50	-50.18	-20.00	30.18
3600.11	V	36.07	-62.96	14.10	1.50	-50.36	-20.00	30.36
4000.13	H	36.25	-61.22	14.00	1.45	-48.67	-20.00	28.67
4000.13	V	37.05	-60.47	14.00	1.45	-47.92	-20.00	27.92
4FSK,Frequency: 400.0125MHz-12.5 kHz								
800.03	H	44.19	-54.34	0.00	0.49	-54.83	-20.00	34.83
800.03	V	44.17	-51.33	0.00	0.49	-51.82	-20.00	31.82
1200.04	H	37.92	-65.06	7.30	1.09	-58.85	-20.00	38.85
1200.04	V	36.99	-67.09	7.30	1.09	-60.88	-20.00	40.88
1600.05	H	37.85	-66.79	10.10	0.68	-57.37	-20.00	37.37
1600.05	V	36.32	-68.92	10.10	0.68	-59.50	-20.00	39.50
2000.06	H	37.34	-65.49	12.00	1.13	-54.62	-20.00	34.62
2000.06	V	37.62	-65.61	12.00	1.13	-54.74	-20.00	34.74
2400.08	H	35.65	-66.81	12.30	1.29	-55.80	-20.00	35.80
2400.08	V	36.12	-66.54	12.30	1.29	-55.53	-20.00	35.53
2800.09	H	37.16	-64.56	13.10	1.36	-52.82	-20.00	32.82
2800.09	V	36.99	-64.93	13.10	1.36	-53.19	-20.00	33.19
3200.10	H	37.92	-60.75	13.60	1.57	-48.72	-20.00	28.72
3200.10	V	37.39	-61.34	13.60	1.57	-49.31	-20.00	29.31
3600.11	H	36.54	-62.49	14.10	1.50	-49.89	-20.00	29.89
3600.11	V	36.38	-62.65	14.10	1.50	-50.05	-20.00	30.05
4000.13	H	36.54	-60.93	14.00	1.45	-48.38	-20.00	28.38
4000.13	V	37.34	-60.18	14.00	1.45	-47.63	-20.00	27.63

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	35.60	-59.77	0.00	0.51	-60.28	-20.00	40.28
906.43	V	38.52	-53.52	0.00	0.51	-54.03	-20.00	34.03
1359.64	H	44.76	-58.80	8.72	1.20	-51.28	-20.00	31.28
1359.64	V	39.13	-65.15	8.72	1.20	-57.63	-20.00	37.63
1812.85	H	39.49	-64.61	11.19	0.72	-54.14	-20.00	34.14
1812.85	V	37.66	-67.00	11.19	0.72	-56.53	-20.00	36.53
2266.06	H	37.56	-64.49	11.06	1.20	-54.63	-20.00	34.63
2266.06	V	36.08	-65.87	11.06	1.20	-56.01	-20.00	36.01
2719.28	H	40.12	-61.79	13.10	1.27	-49.96	-20.00	29.96
2719.28	V	36.94	-65.08	13.10	1.27	-53.25	-20.00	33.25
3172.49	H	37.15	-61.87	13.49	1.64	-50.02	-20.00	30.02
3172.49	V	37.52	-61.54	13.49	1.64	-49.69	-20.00	29.69
3625.70	H	37.28	-61.48	14.07	1.58	-48.99	-20.00	28.99
3625.70	V	36.58	-62.18	14.07	1.58	-49.69	-20.00	29.69
4078.91	H	36.53	-61.46	13.76	1.36	-49.06	-20.00	29.06
4078.91	V	36.91	-61.20	13.76	1.36	-48.80	-20.00	28.80
4532.13	H	37.69	-59.56	14.13	1.64	-47.07	-20.00	27.07
4532.13	V	37.19	-59.99	14.13	1.64	-47.50	-20.00	27.50
4FSK,Frequency: 453.2125MHz -12.5 kHz								
906.43	H	35.80	-59.57	0.00	0.51	-60.08	-20.00	40.08
906.43	V	39.80	-52.24	0.00	0.51	-52.75	-20.00	32.75
1359.64	H	38.12	-65.44	8.72	1.20	-57.92	-20.00	37.92
1359.64	V	45.58	-58.70	8.72	1.20	-51.18	-20.00	31.18
1812.85	H	36.36	-67.74	11.19	0.72	-57.27	-20.00	37.27
1812.85	V	36.78	-67.88	11.19	0.72	-57.41	-20.00	37.41
2266.06	H	37.12	-64.93	11.06	1.20	-55.07	-20.00	35.07
2266.06	V	37.25	-64.70	11.06	1.20	-54.84	-20.00	34.84
2719.28	H	36.78	-65.13	13.10	1.27	-53.30	-20.00	33.30
2719.28	V	36.95	-65.07	13.10	1.27	-53.24	-20.00	33.24
3172.49	H	36.99	-62.03	13.49	1.64	-50.18	-20.00	30.18
3172.49	V	37.36	-61.70	13.49	1.64	-49.85	-20.00	29.85
3625.70	H	37.12	-61.64	14.07	1.58	-49.15	-20.00	29.15
3625.70	V	36.42	-62.34	14.07	1.58	-49.85	-20.00	29.85
4078.91	H	36.37	-61.62	13.76	1.36	-49.22	-20.00	29.22
4078.91	V	36.75	-61.36	13.76	1.36	-48.96	-20.00	28.96
4532.13	H	37.53	-59.72	14.13	1.64	-47.23	-20.00	27.23
4532.13	V	37.03	-60.15	14.13	1.64	-47.66	-20.00	27.66

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	44.44	-49.74	0.00	0.51	-50.25	-20.00	30.25
939.98	V	43.29	-47.78	0.00	0.51	-48.29	-20.00	28.29
1409.96	H	36.23	-67.31	9.05	1.21	-59.47	-20.00	39.47
1409.96	V	42.30	-61.79	9.05	1.21	-53.95	-20.00	33.95
1879.95	H	37.69	-65.42	11.66	0.95	-54.71	-20.00	34.71
1879.95	V	36.16	-67.31	11.66	0.95	-56.60	-20.00	36.60
2349.94	H	37.19	-65.11	11.75	1.26	-54.62	-20.00	34.62
2349.94	V	37.45	-64.90	11.75	1.26	-54.41	-20.00	34.41
2819.93	H	35.49	-66.03	13.26	1.36	-54.13	-20.00	34.13
2819.93	V	35.96	-65.78	13.26	1.36	-53.88	-20.00	33.88
3289.91	H	37.25	-62.45	13.60	1.59	-50.44	-20.00	30.44
3289.91	V	36.83	-62.88	13.60	1.59	-50.87	-20.00	30.87
3759.90	H	37.76	-59.88	13.76	1.63	-47.75	-20.00	27.75
3759.90	V	37.21	-60.29	13.76	1.63	-48.16	-20.00	28.16
4229.89	H	36.38	-61.29	13.97	1.35	-48.67	-20.00	28.67
4229.89	V	36.23	-61.43	13.97	1.35	-48.81	-20.00	28.81
4699.88	H	36.38	-60.85	14.40	1.67	-48.12	-20.00	28.12
4699.88	V	37.18	-60.14	14.40	1.67	-47.41	-20.00	27.41
4FSK,Frequency: 469.9875MHz -12.5 kHz								
939.98	H	42.50	-51.68	0.00	0.51	-52.19	-20.00	32.19
939.98	V	46.44	-44.63	0.00	0.51	-45.14	-20.00	25.14
1409.96	H	39.01	-64.53	9.05	1.21	-56.69	-20.00	36.69
1409.96	V	43.10	-60.99	9.05	1.21	-53.15	-20.00	33.15
1879.95	H	40.47	-62.64	11.66	0.95	-51.93	-20.00	31.93
1879.95	V	38.94	-64.53	11.66	0.95	-53.82	-20.00	33.82
2349.94	H	39.97	-62.33	11.75	1.26	-51.84	-20.00	31.84
2349.94	V	40.23	-62.12	11.75	1.26	-51.63	-20.00	31.63
2819.93	H	38.27	-63.25	13.26	1.36	-51.35	-20.00	31.35
2819.93	V	38.74	-63.00	13.26	1.36	-51.10	-20.00	31.10
3289.91	H	40.03	-59.67	13.60	1.59	-47.66	-20.00	27.66
3289.91	V	39.61	-60.10	13.60	1.59	-48.09	-20.00	28.09
3759.90	H	39.54	-58.10	13.76	1.63	-45.97	-20.00	25.97
3759.90	V	38.99	-58.51	13.76	1.63	-46.38	-20.00	26.38
4229.89	H	38.16	-59.51	13.97	1.35	-46.89	-20.00	26.89
4229.89	V	38.01	-59.65	13.97	1.35	-47.03	-20.00	27.03
4699.88	H	38.16	-59.07	14.40	1.67	-46.34	-20.00	26.34
4699.88	V	38.96	-58.36	14.40	1.67	-45.63	-20.00	25.63

Part 80

Part 66

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	35.68	-59.21	0.00	0.51	-59.72	-13.00	46.72
919.98	V	36.54	-55.11	0.00	0.51	-55.62	-13.00	42.62
1379.96	H	37.29	-66.18	8.86	1.20	-58.52	-13.00	45.52
1379.96	V	38.78	-65.35	8.86	1.20	-57.69	-13.00	44.69
1839.95	H	37.30	-66.40	11.38	0.82	-55.84	-13.00	42.84
1839.95	V	40.69	-63.49	11.38	0.82	-52.93	-13.00	39.93
2299.94	H	36.27	-65.88	11.20	1.23	-55.91	-13.00	42.91
2299.94	V	37.30	-64.75	11.20	1.23	-54.78	-13.00	41.78
2759.93	H	37.56	-64.25	13.10	1.32	-52.47	-13.00	39.47
2759.93	V	35.60	-66.37	13.10	1.32	-54.59	-13.00	41.59
3219.91	H	36.07	-62.83	13.60	1.57	-50.80	-13.00	37.80
3219.91	V	37.36	-61.59	13.60	1.57	-49.56	-13.00	36.56
3679.90	H	36.94	-61.26	14.02	1.76	-49.00	-13.00	36.00
3679.90	V	37.87	-60.31	14.02	1.76	-48.05	-13.00	35.05
4139.89	H	37.32	-60.62	13.82	1.45	-48.25	-13.00	35.25
4139.89	V	36.49	-61.52	13.82	1.45	-49.15	-13.00	36.15
4599.88	H	36.34	-60.73	14.20	1.85	-48.38	-13.00	35.38
4599.88	V	36.49	-60.68	14.20	1.85	-48.33	-13.00	35.33

Part 74

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	34.85	-60.40	0.00	0.51	-60.91	-20.00	40.91
910.03	V	37.98	-53.95	0.00	0.51	-54.46	-20.00	34.46
1365.04	H	36.78	-66.75	8.76	1.20	-59.19	-20.00	39.19
1365.04	V	38.89	-65.35	8.76	1.20	-57.79	-20.00	37.79
1820.05	H	37.88	-66.12	11.24	0.75	-55.63	-20.00	35.63
1820.05	V	36.35	-68.19	11.24	0.75	-57.70	-20.00	37.70
2275.06	H	37.38	-64.70	11.10	1.21	-54.81	-20.00	34.81
2275.06	V	37.64	-64.34	11.10	1.21	-54.45	-20.00	34.45
2730.08	H	35.68	-66.20	13.10	1.28	-54.38	-20.00	34.38
2730.08	V	36.15	-65.86	13.10	1.28	-54.04	-20.00	34.04
3185.09	H	37.64	-61.22	13.54	1.61	-49.29	-20.00	29.29
3185.09	V	37.25	-61.66	13.54	1.61	-49.73	-20.00	29.73
3640.10	H	37.95	-60.66	14.06	1.63	-48.23	-20.00	28.23
3640.10	V	37.40	-61.20	14.06	1.63	-48.77	-20.00	28.77
4095.11	H	36.57	-61.53	13.71	1.35	-49.17	-20.00	29.17
4095.11	V	36.42	-61.81	13.71	1.35	-49.45	-20.00	29.45
4550.13	H	36.57	-60.63	14.15	1.70	-48.18	-20.00	28.18
4550.13	V	37.37	-59.80	14.15	1.70	-47.35	-20.00	27.35
FM, Frequency: 455.0125MHz-25 kHz								
910.03	H	35.21	-60.04	0.00	0.51	-60.55	-13.00	47.55
910.03	V	38.24	-53.69	0.00	0.51	-54.20	-13.00	41.20
1365.04	H	36.49	-67.04	8.76	1.20	-59.48	-13.00	46.48
1365.04	V	39.03	-65.21	8.76	1.20	-57.65	-13.00	44.65
1820.05	H	38.07	-65.93	11.24	0.75	-55.44	-13.00	42.44
1820.05	V	36.54	-68.00	11.24	0.75	-57.51	-13.00	44.51
2275.06	H	37.57	-64.51	11.10	1.21	-54.62	-13.00	41.62
2275.06	V	37.83	-64.15	11.10	1.21	-54.26	-13.00	41.26
2730.08	H	35.87	-66.01	13.10	1.28	-54.19	-13.00	41.19
2730.08	V	36.34	-65.67	13.10	1.28	-53.85	-13.00	40.85
3185.09	H	37.83	-61.03	13.54	1.61	-49.10	-13.00	36.10
3185.09	V	37.44	-61.47	13.54	1.61	-49.54	-13.00	36.54
3640.10	H	38.14	-60.47	14.06	1.63	-48.04	-13.00	35.04
3640.10	V	37.59	-61.01	14.06	1.63	-48.58	-13.00	35.58
4095.11	H	36.76	-61.34	13.71	1.35	-48.98	-13.00	35.98
4095.11	V	36.61	-61.62	13.71	1.35	-49.26	-13.00	36.26
4550.13	H	36.76	-60.44	14.15	1.70	-47.99	-13.00	34.99
4550.13	V	37.56	-59.61	14.15	1.70	-47.16	-13.00	34.16

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	35.40	-59.85	0.00	0.51	-60.36	-20.00	40.36
910.03	V	37.85	-54.08	0.00	0.51	-54.59	-20.00	34.59
1365.04	H	36.75	-66.78	8.76	1.20	-59.22	-20.00	39.22
1365.04	V	38.29	-65.95	8.76	1.20	-58.39	-20.00	38.39
1820.05	H	38.33	-65.67	11.24	0.75	-55.18	-20.00	35.18
1820.05	V	36.86	-67.68	11.24	0.75	-57.19	-20.00	37.19
2275.06	H	37.83	-64.25	11.10	1.21	-54.36	-20.00	34.36
2275.06	V	38.09	-63.89	11.10	1.21	-54.00	-20.00	34.00
2730.08	H	36.13	-65.75	13.10	1.28	-53.93	-20.00	33.93
2730.08	V	36.62	-65.39	13.10	1.28	-53.57	-20.00	33.57
3185.09	H	38.09	-60.77	13.54	1.61	-48.84	-20.00	28.84
3185.09	V	37.70	-61.21	13.54	1.61	-49.28	-20.00	29.28
3640.10	H	38.43	-60.18	14.06	1.63	-47.75	-20.00	27.75
3640.10	V	37.85	-60.75	14.06	1.63	-48.32	-20.00	28.32
4095.11	H	37.02	-61.08	13.71	1.35	-48.72	-20.00	28.72
4095.11	V	36.87	-61.36	13.71	1.35	-49.00	-20.00	29.00
4550.13	H	37.02	-60.18	14.15	1.70	-47.73	-20.00	27.73
4550.13	V	37.86	-59.31	14.15	1.70	-46.86	-20.00	26.86

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	35.47	-59.85	0.00	0.51	-60.36	-13.00	47.36
908.03	V	38.52	-53.47	0.00	0.51	-53.98	-13.00	40.98
1362.04	H	36.64	-66.91	8.73	1.20	-59.38	-13.00	46.38
1362.04	V	38.18	-66.08	8.73	1.20	-58.55	-13.00	45.55
1816.05	H	38.28	-65.77	11.21	0.73	-55.29	-13.00	42.29
1816.05	V	36.75	-67.86	11.21	0.73	-57.38	-13.00	44.38
2270.06	H	37.79	-64.27	11.08	1.20	-54.39	-13.00	41.39
2270.06	V	37.98	-63.98	11.08	1.20	-54.10	-13.00	41.10
2724.08	H	36.02	-65.87	13.10	1.28	-54.05	-13.00	41.05
2724.08	V	36.51	-65.51	13.10	1.28	-53.69	-13.00	40.69
3178.09	H	37.98	-60.97	13.51	1.63	-49.09	-13.00	36.09
3178.09	V	37.59	-61.40	13.51	1.63	-49.52	-13.00	36.52
3632.10	H	38.32	-60.38	14.07	1.61	-47.92	-13.00	34.92
3632.10	V	37.74	-60.95	14.07	1.61	-48.49	-13.00	35.49
4086.11	H	36.93	-61.11	13.74	1.36	-48.73	-13.00	35.73
4086.11	V	36.76	-61.41	13.74	1.36	-49.03	-13.00	36.03
4540.13	H	36.96	-60.27	14.14	1.66	-47.79	-13.00	34.79
4540.13	V	37.75	-59.43	14.14	1.66	-46.95	-13.00	33.95
FM, Frequency: 454.0125MHz-25 kHz								
908.03	H	35.24	-60.08	0.00	0.51	-60.59	-13.00	47.59
908.03	V	37.85	-54.14	0.00	0.51	-54.65	-13.00	41.65
1362.04	H	36.82	-66.73	8.73	1.20	-59.20	-13.00	46.20
1362.04	V	37.36	-66.90	8.73	1.20	-59.37	-13.00	46.37
1816.05	H	37.46	-66.59	11.21	0.73	-56.11	-13.00	43.11
1816.05	V	36.93	-67.68	11.21	0.73	-57.20	-13.00	44.20
2270.06	H	37.97	-64.09	11.08	1.20	-54.21	-13.00	41.21
2270.06	V	38.16	-63.80	11.08	1.20	-53.92	-13.00	40.92
2724.08	H	36.26	-65.63	13.10	1.28	-53.81	-13.00	40.81
2724.08	V	36.69	-65.33	13.10	1.28	-53.51	-13.00	40.51
3178.09	H	38.16	-60.79	13.51	1.63	-48.91	-13.00	35.91
3178.09	V	37.77	-61.22	13.51	1.63	-49.34	-13.00	36.34
3632.10	H	38.53	-60.17	14.07	1.61	-47.71	-13.00	34.71
3632.10	V	37.92	-60.77	14.07	1.61	-48.31	-13.00	35.31
4086.11	H	37.11	-60.93	13.74	1.36	-48.55	-13.00	35.55
4086.11	V	36.94	-61.23	13.74	1.36	-48.85	-13.00	35.85
4540.13	H	37.14	-60.09	14.14	1.66	-47.61	-13.00	34.61
4540.13	V	37.93	-59.25	14.14	1.66	-46.77	-13.00	33.77

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: 454.0125MHz-12.5 kHz								
908.03	H	35.63	-59.69	0.00	0.51	-60.20	-13.00	47.20
908.03	V	39.05	-52.94	0.00	0.51	-53.45	-13.00	40.45
1362.04	H	37.58	-65.97	8.73	1.20	-58.44	-13.00	45.44
1362.04	V	38.22	-66.04	8.73	1.20	-58.51	-13.00	45.51
1816.05	H	37.62	-66.43	11.21	0.73	-55.95	-13.00	42.95
1816.05	V	37.09	-67.52	11.21	0.73	-57.04	-13.00	44.04
2270.06	H	38.13	-63.93	11.08	1.20	-54.05	-13.00	41.05
2270.06	V	38.32	-63.64	11.08	1.20	-53.76	-13.00	40.76
2724.08	H	36.49	-65.40	13.10	1.28	-53.58	-13.00	40.58
2724.08	V	36.85	-65.17	13.10	1.28	-53.35	-13.00	40.35
3178.09	H	38.32	-60.63	13.51	1.63	-48.75	-13.00	35.75
3178.09	V	37.93	-61.06	13.51	1.63	-49.18	-13.00	36.18
3632.10	H	38.69	-60.01	14.07	1.61	-47.55	-13.00	34.55
3632.10	V	38.01	-60.68	14.07	1.61	-48.22	-13.00	35.22
4086.11	H	37.27	-60.77	13.74	1.36	-48.39	-13.00	35.39
4086.11	V	37.13	-61.04	13.74	1.36	-48.66	-13.00	35.66
4540.13	H	37.36	-59.87	14.14	1.66	-47.39	-13.00	34.39
4540.13	V	38.09	-59.09	14.14	1.66	-46.61	-13.00	33.61

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 the following Tables.*

FCC Part 90:

FM,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ±2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	453.2127625	0.58
-20		453.2127333	0.51
-10		453.2127458	0.54
0		453.2126876	0.41
10		453.2126919	0.42
20		453.2126450	0.32
30		453.2126788	0.39
40		453.2126716	0.38
50		453.2127837	0.63
20	3.25	453.2125334	0.07
20	4.35	453.2126581	0.35

4FSK, 12.5kHz, Reference Frequency: 453.2125MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	453.2125214	0.05
-20		453.2125024	0.01
-10		453.2127024	0.45
0		453.2126067	0.24
10		453.2127741	0.60
20		453.2126450	0.32
30		453.2125008	0.00
40		453.2126937	0.43
50		453.2127929	0.65
20	3.25	453.2127069	0.46
20	4.35	453.2125682	0.15

FCC Part 80:

FM, 25kHz, Reference Frequency: 459.9875MHz, Limit: ± 5.0 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	459.987611	0.24
-20		459.987545	0.10
-10		459.987596	0.21
0		459.987743	0.53
10		459.987784	0.62
20		459.987587	0.19
30		459.987551	0.11
40		459.987508	0.02
50		459.987730	0.50
20	3.25	459.987561	0.13
20	4.35	459.987644	0.31

FCC Part 74:

FM, 12.5kHz, Reference Frequency: 455.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	455.0127895	0.64
-20		455.0127459	0.54
-10		455.0126262	0.28
0		455.0127718	0.60
10		455.0126478	0.32
20		455.0125870	0.19
30		455.0126595	0.35
40		455.0127774	0.61
50		455.0125972	0.21
20	3.25	455.0127269	0.50
20	4.35	455.0126290	0.28

4FSK, 12.5kHz, Reference Frequency: 455.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	455.0126834	0.40
-20		455.0125847	0.19
-10		455.0126992	0.44
0		455.0127099	0.46
10		455.0125047	0.01
20		455.0125000	0.00
30		455.0126612	0.35
40		455.0127508	0.55
50		455.0126654	0.36
20	3.25	455.0126807	0.40
20	4.35	455.0125525	0.12

FM, 25kHz, Reference Frequency: 455.0125 MHz, Limit: ± 5.0 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	455.0127963	0.65
-20		455.0126191	0.26
-10		455.0127495	0.55
0		455.0126841	0.40
10		455.0126175	0.26
20		455.0125870	0.19
30		455.0126743	0.38
40		455.0125813	0.18
50		455.0126281	0.28
20	3.25	455.0126784	0.39
20	4.35	455.0127253	0.50

FCC Part 22:

FM, 12.5kHz, Reference Frequency: 454.0125MHz, Limit: ± 5.0 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	454.0127901	0.64
-20		454.0126686	0.37
-10		454.0127548	0.56
0		454.0126391	0.31
10		454.0125888	0.20
20		454.0126160	0.26
30		454.0126040	0.23
40		454.0126413	0.31
50		454.0126629	0.36
20	3.25	454.0125330	0.07
20	4.35	454.0125415	0.09

4FSK, 12.5kHz, Reference Frequency: 454.0125MHz, Limit: ± 5.0 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	454.0125515	0.11
-20		454.0127190	0.48
-10		454.0127685	0.59
0		454.0126054	0.23
10		454.0126136	0.25
20		454.0126445	0.32
30		454.0126760	0.39
40		454.0126997	0.44
50		454.0125340	0.07
20	3.25	454.0125200	0.04
20	4.35	454.0127921	0.64

FM, 25kHz, Reference Frequency: 454.0125MHz, Limit: ± 5.0 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	3.80	454.0126720	0.38
-20		454.0125234	0.05
-10		454.0125654	0.14
0		454.0127497	0.55
10		454.0125531	0.12
20		454.0126160	0.26
30		454.0127468	0.54
40		454.0125864	0.19
50		454.0125118	0.03
20	3.25	454.0125673	0.15
20	4.35	454.0126721	0.38

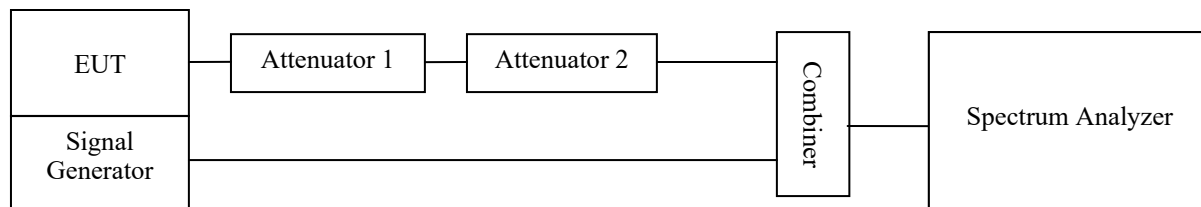
8 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214

Test Procedure

- Connect the EUT and test equipment as shown on the following block diagram.
- Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 12.5 kHz deviation and set its output level to -100dBm.
- Turn on the transmitter.
- 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 .
- Turn off the transmitter.
- 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.
- Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ± 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.
- 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 .
- 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 .

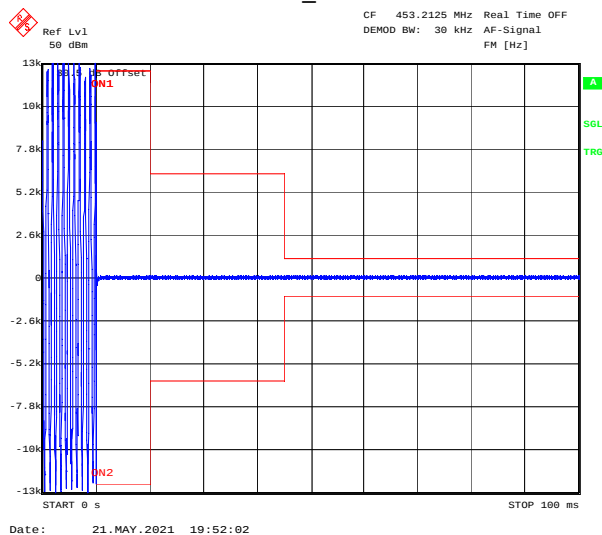
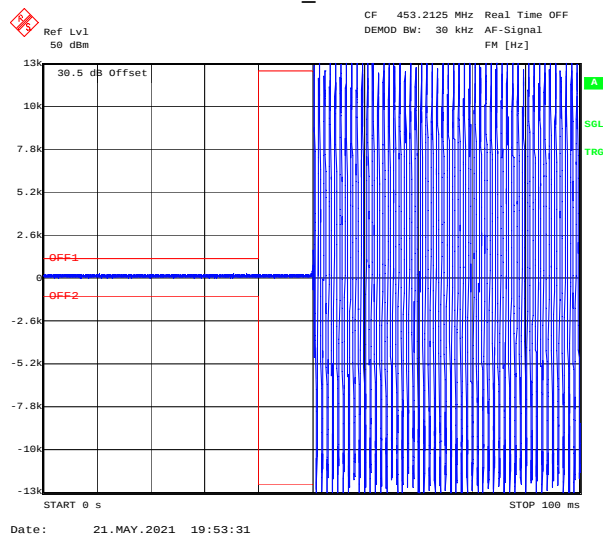


Test Data

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	$<10(t_1)$	± 12.5 kHz	Pass
	$<25(t_2)$	± 6.25 kHz	
	$<10(t_3)$	± 12.5 kHz	

453.2125_Turn On**453.2125_Turn Off********* END OF REPORT *******