



FCC PART 90

TEST REPORT

For

RCA Communications Systems

133 W. Market St. Suite 227 Indianapolis Indiana United States, 46204

FCC ID: XYH-RDR2750U

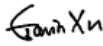
Report Type: Original Report	Product Type: Digital Radio Base Station
Report Number: <u>SZ1210531-20419E-00A</u>	
Report Date: <u>2021-06-23</u>	
Reviewed By: Gavin Xu RF Engineer	
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TABLE OF CONTENTS

GENERAL INFORMATION	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
TECHNICAL SPECIFICATION	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S)	4
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
DECLARATIONS	5
SYSTEM TEST CONFIGURATION	6
DESCRIPTION OF TEST CONFIGURATION.....	6
EQUIPMENT MODIFICATIONS.....	6
EUT EXERCISE SOFTWARE	6
SUPPORT EQUIPMENT LIST AND DETAILS.....	6
SUPPORT CABLE LIST AND DETAILS.....	6
BLOCK DIAGRAM OF TEST SETUP	6
TEST EQUIPMENT LIST	7
ENVIRONMENTAL CONDITIONS	7
SUMMARY OF TEST RESULTS	8
1- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	9
APPLICABLE STANDARD.....	9
CALCULATION FORMULA	9
RESULTS.....	9
2 - RF OUTPUT POWER.....	10
APPLICABLE STANDARD.....	10
TEST PROCEDURE.....	10
TEST DATA.....	10
3 - MODULATION CHARACTERISTIC	13
APPLICABLE STANDARD.....	13
TEST PROCEDURE.....	13
TEST DATA.....	13
4 – OCCUPIED BANDWIDTH & EMISSION MASK.....	16
APPLICABLE STANDARD.....	16
TEST PROCEDURE.....	16
TEST DATA.....	16
5 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	21
APPLICABLE STANDARD.....	21
TEST PROCEDURE.....	21
TEST DATA.....	21
6 - RADIATED SPURIOUS EMISSIONS.....	24
APPLICABLE STANDARD.....	24
TEST PROCEDURE.....	24
TEST DATA.....	24
7 - FREQUENCY STABILITY	28
APPLICABLE STANDARD.....	28
TEST PROCEDURE.....	28
TEST DATA.....	28
8 - TRANSIENT FREQUENCY BEHAVIOR	29

APPLICABLE STANDARD.....	29
TEST PROCEDURE.....	29
TEST DATA.....	30

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:		Digital Radio Base Station
EUT Model:		RDR2750U
Rated Input Voltage:		DC 12V from adapter
Adapter Information	Model:	TGC36-120300-03B
	Input:	AC 100-240V 50/60Hz 0.8A
	Output:	DC 12V 3.0A
Serial Number:		SZ1210531-20419E-S1
EUT Received Date:		2021.06.01
EUT Received Status:		Good

Technical Specification

Operation Frequency Range (MHz):	400-470
Rated RF Output Power (Conducted) (W):	High power level: 5 Low power level: 2
Modulation Type:	FM, 4FSK
Channel Spacing (kHz):	12.5

Objective

This test report is prepared on behalf of *RCA Communications Systems* in accordance with Part 2, and Part 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 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 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.

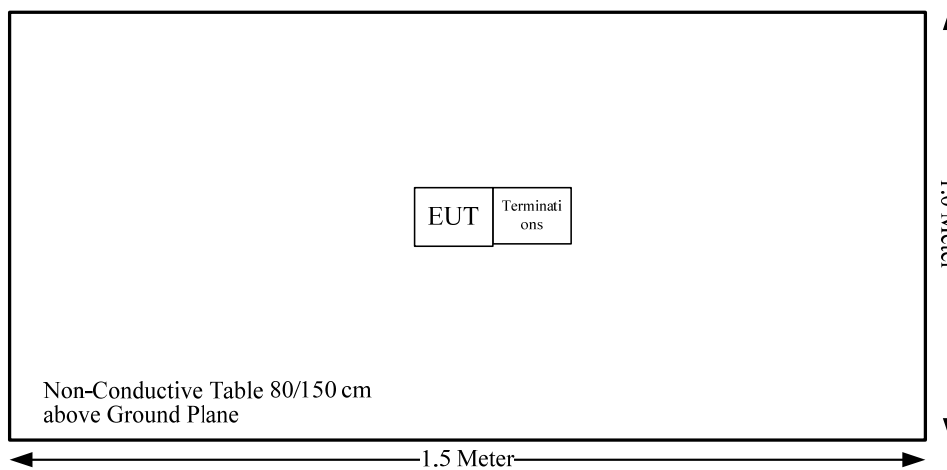
Support Equipment List and Details

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
/	/	/	/	/	/

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					
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2020-09-12	2021-09-12
R&S	Spectrum Analyzer	FSV40	101474	2020-07-07	2021-07-07
R&S	Spectrum Analyzer	FSU 26	200256	2020-07-07	2021-07-07
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:	25.8~27.4℃	28.4 ℃	29.9 ℃
Relative Humidity:	42~49 %	56 %	44 %
ATM Pressure:	100~100.5 kPa	100.2kPa	100kPa
Tester:	Wayne wei	Alex Hu	Lee Li
Test Date:	2021.06.03~2021.06.15	2021.06.18	2021.06.20

SUMMARY OF TEST RESULTS

S/N	FCC Rules	Description of Test	Results
1	§1.1310; §2.1091	Maximum Permissible Exposure (MPE)	Compliance
2	§2.1046; §90.205	RF Output Power	Compliance
3	§2.1047	Modulation Characteristic	Compliance
4	§2.1049; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
5	§2.1051; §90.210	Spurious Emission at Antenna Terminal	Compliance
6	§2.1053; §90.210	Spurious Radiated Emissions	Compliance
7	§2.1055; §90.213	Frequency Stability	Compliance
8	§90.214	Transient Frequency Behavior	Compliance

1- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for Maximum Permissible Exposure (MPE)

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3- 3.0	614	1.63	(100)*	6
3.0 - 30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

f = frequency in MHz;

* = Plane-wave equivalent power density;

Calculation Formula

Prediction of power density at the distance of the applicable MPE limit:

$$S = PG/4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm²);

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

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

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

Results

Frequency (MHz)	Maximum Output Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	Operation Duty Cycle (%)	Evaluation Distance (cm)	Power Density (mW/cm ²)	Power Density Limit (mW/cm ²)
400-470	37	1.8	50	20	0.756	1.33

Result: The device meet FCC MPE at 20 cm distance

Conclusion: Compliance

2 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046, §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

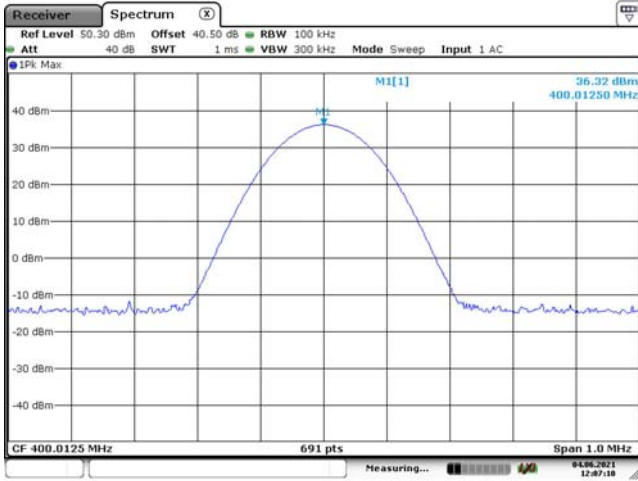
Test Result: Compliance. *Please refer to following table and plots.*

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	400.0125	36.32	32.49	37.78	33.80	FCC
		Middle	453.2125	36.28	32.83	37.78	33.80	Part 90
		High	469.9875	36.08	32.40	37.78	33.80	
	4FSK	Low	400.0125	36.67	33.56	37.78	33.80	FCC
		Middle	453.2125	36.93	33.61	37.78	33.80	Part 90
		High	469.9875	36.08	32.13	37.78	33.80	

*Note: The high rated power level is 5W(37dBm), and low rated power level is 2W(33dBm).
 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.*

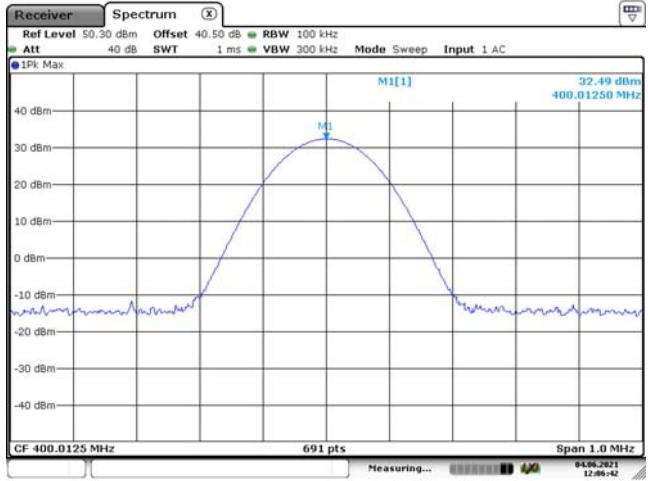
FM, 12.5kHz:

Low Channel, 400.0125 MHz High Power



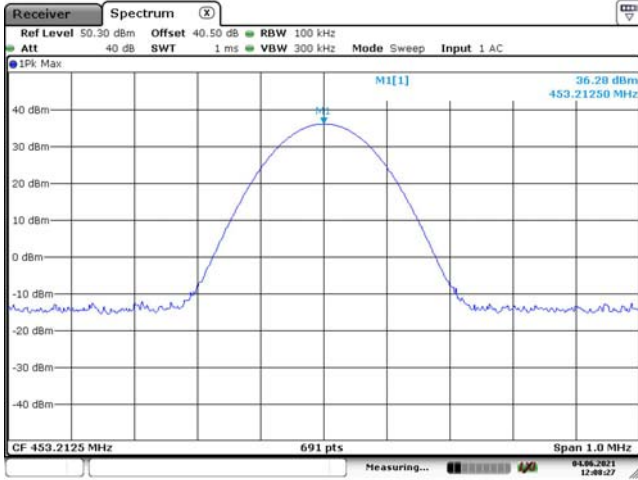
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Low Channel, 400.0125 MHz Low Power



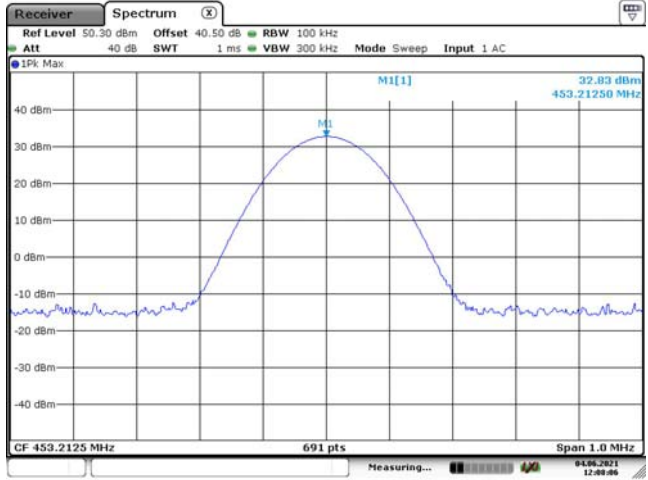
Date: 4 JUN 2021 12:06:42

Part 90, Middle Channel, 453.2125 MHz High Power



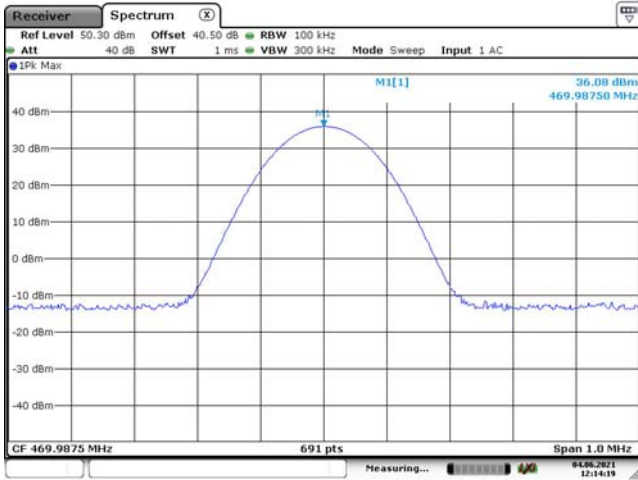
Date: 4 JUN 2021 12:08:27

Part 90, Middle Channel, 453.2125 MHz Low Power



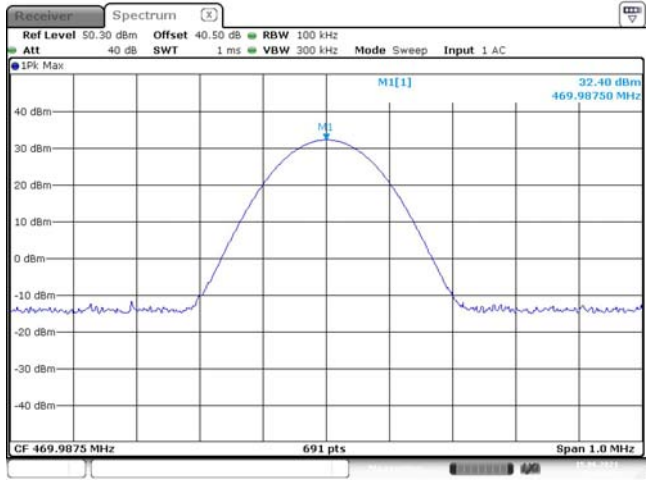
Date: 4 JUN 2021 12:08:07

Part 90, High Channel, 469.9875 MHz High Power



Date: 4 JUN 2021 12:14:20

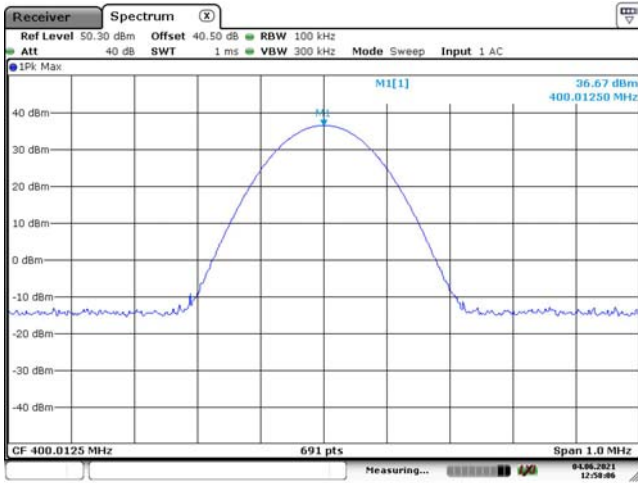
Part 90, High Channel, 469.9875 MHz Low Power



Date: 15 JUN 2021 21:50:21

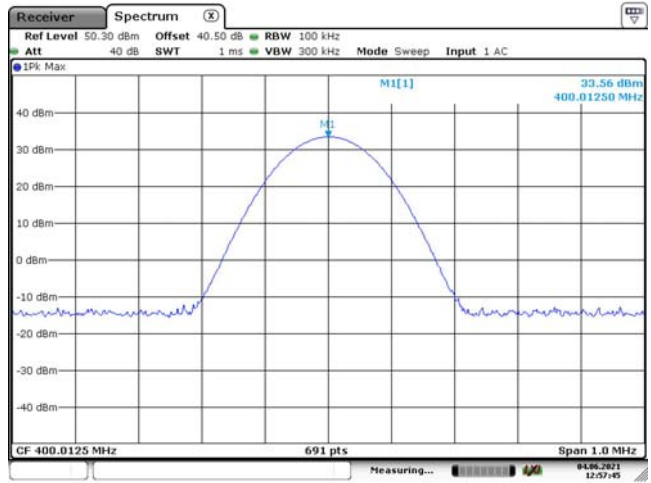
4FSK, 12.5kHz:

Low Channel, 400.0125 MHz High Power



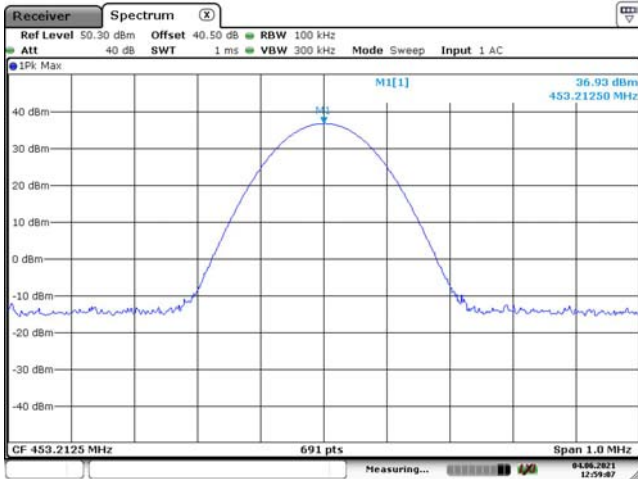
Date: 4 JUN 2021 12:58:07

Low Channel, 400.0125 MHz Low Power



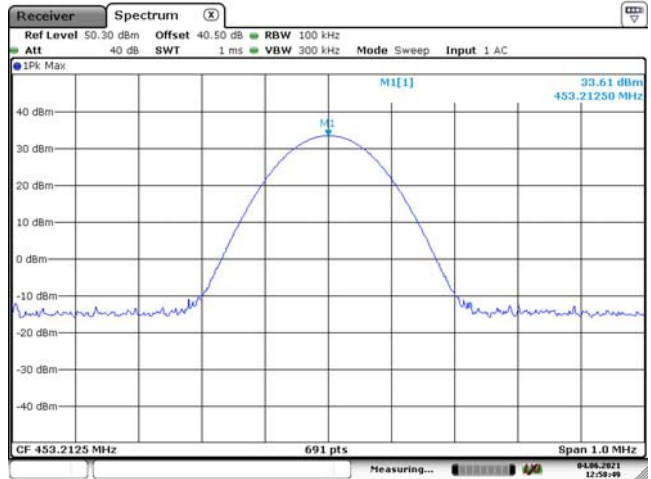
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Part 90, Middle Channel, 453.2125 MHz High Power



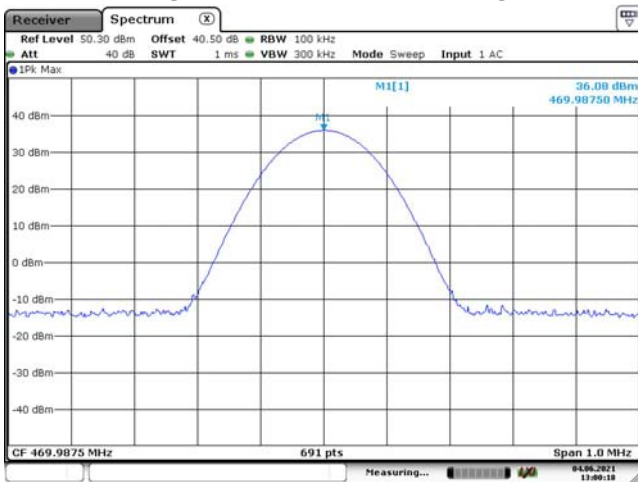
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Part 90, Middle Channel, 453.2125 MHz Low Power



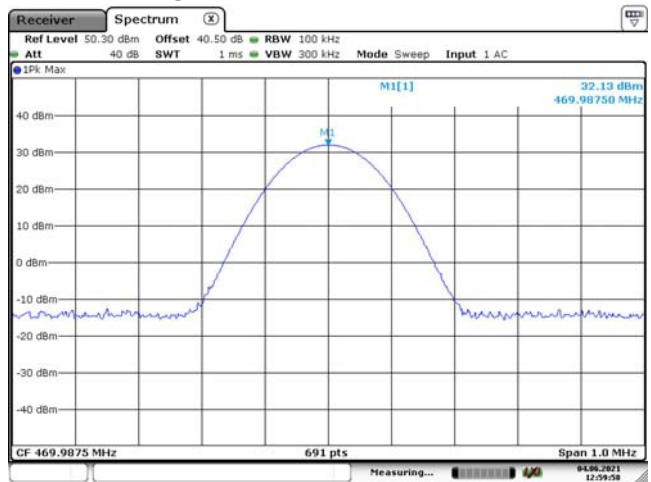
Date: 4 JUN 2021 12:58:49

Part 90, High Channel, 469.9875 MHz High Power



Date: 4 JUN 2021 13:00:19

Part 90, High Channel, 469.9875 MHz Low Power



Date: 4 JUN 2021 12:59:58

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

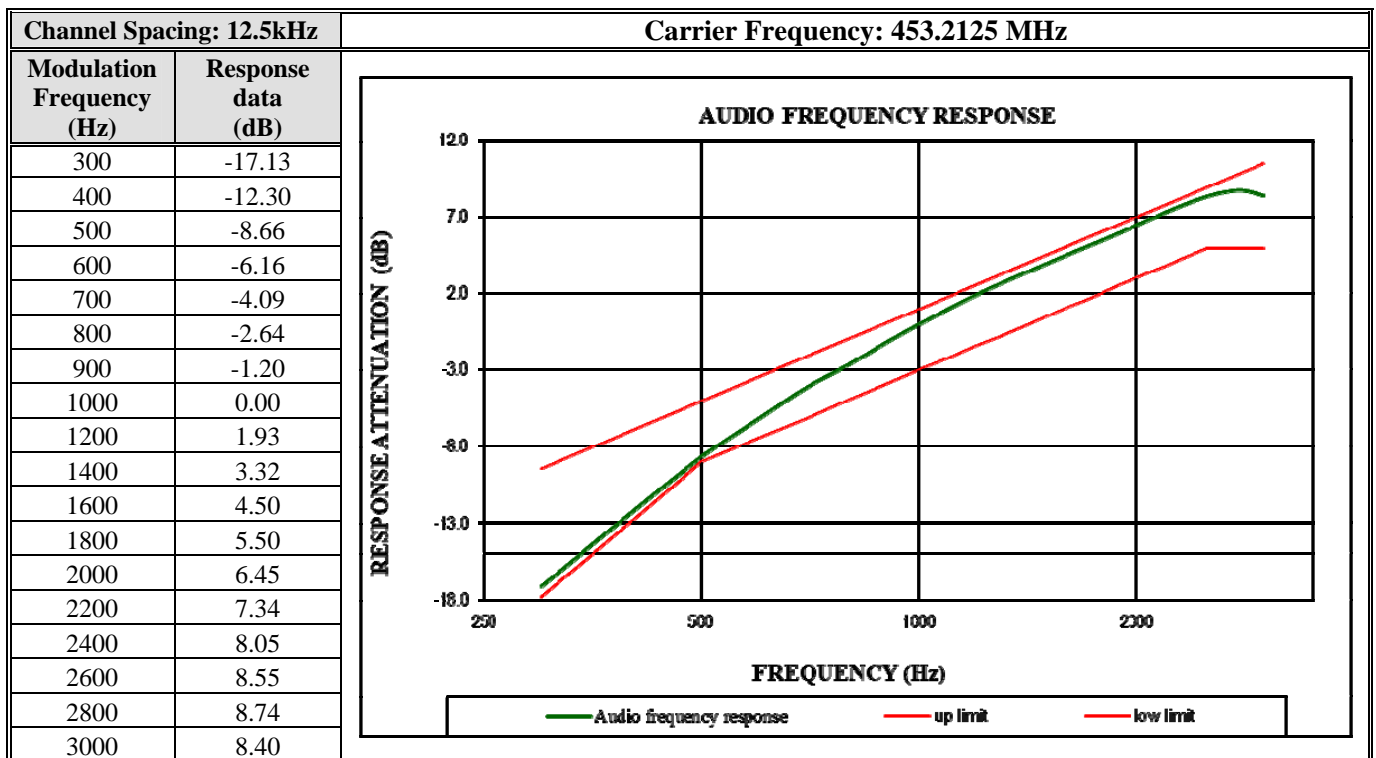
Test Method: TIA-603-E 2.2.3

Test Data

Test Mode: Transmitting

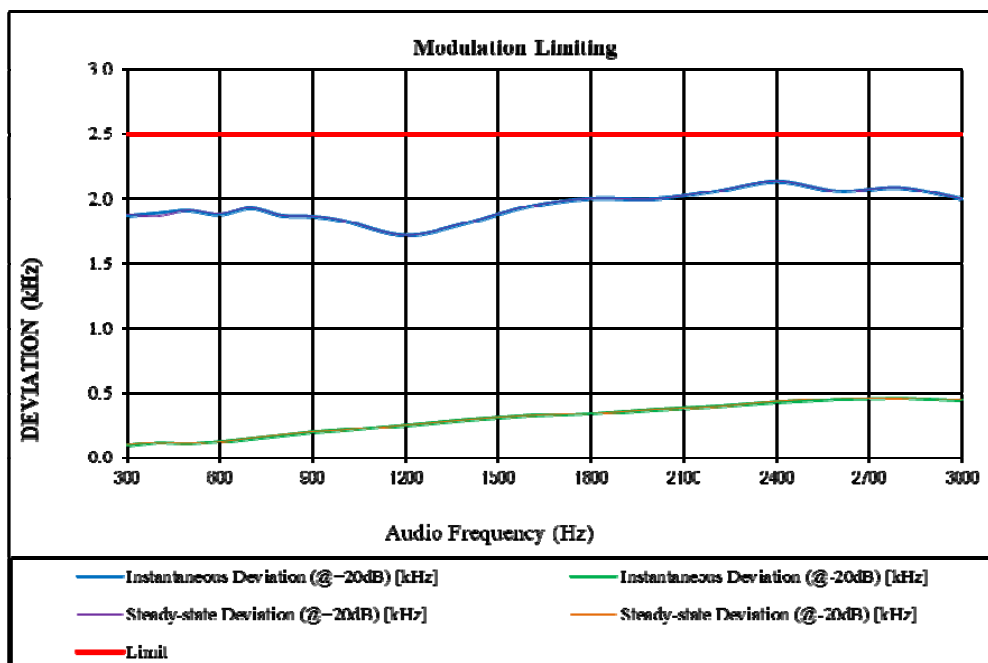
Test Result: Compliance. Please refer to following tables and plots.

Audio Frequency Response – High Power

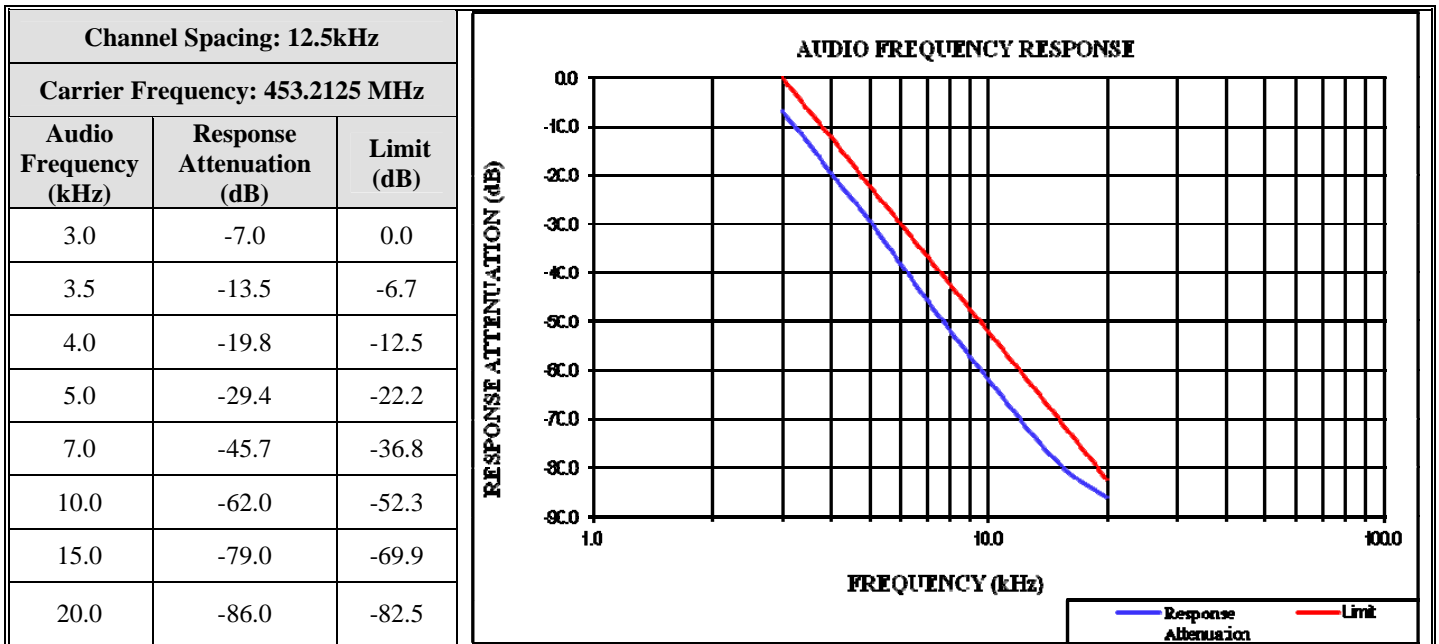


Modulation Limiting – High Power

Audio Frequency (Hz)	Carrier Frequency: 453.2125 MHz				Limit [kHz]
	Instantaneous		Steady-state		
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.870	0.094	1.880	0.099	2.5
400	1.890	0.114	1.870	0.115	2.5
500	1.910	0.107	1.911	0.108	2.5
600	1.880	0.123	1.886	0.125	2.5
700	1.928	0.151	1.929	0.152	2.5
800	1.872	0.177	1.872	0.178	2.5
900	1.864	0.195	1.865	0.199	2.5
1000	1.832	0.212	1.833	0.213	2.5
1200	1.723	0.253	1.722	0.254	2.5
1400	1.815	0.292	1.816	0.293	2.5
1600	1.943	0.323	1.943	0.325	2.5
1800	2.002	0.346	2.002	0.344	2.5
2000	1.999	0.371	1.998	0.375	2.5
2200	2.054	0.395	2.054	0.395	2.5
2400	2.130	0.431	2.130	0.436	2.5
2600	2.057	0.459	2.057	0.459	2.5
2800	2.083	0.463	2.083	0.464	2.5
3000	1.998	0.447	1.998	0.447	2.5



Audio Frequency Low Pass Filter Response – High Power



4 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §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	9.780	10.380	9.913	10.275	FCC part 90
	Middle	453.2125	9.841	10.347	9.841	10.347	
	High	469.9875	9.913	10.275	9.913	10.275	
4FSK 12.5kHz	Low	400.0125	7.308	9.479	7.381	9.624	
	Middle	453.2125	7.670	9.624	7.381	9.986	
	High	469.9875	7.453	9.479	7.381	9.624	

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 Digital Mode (Channel Spacing: 12.5 kHz)

Emission Designator 7K60F1D and 7K60F1E

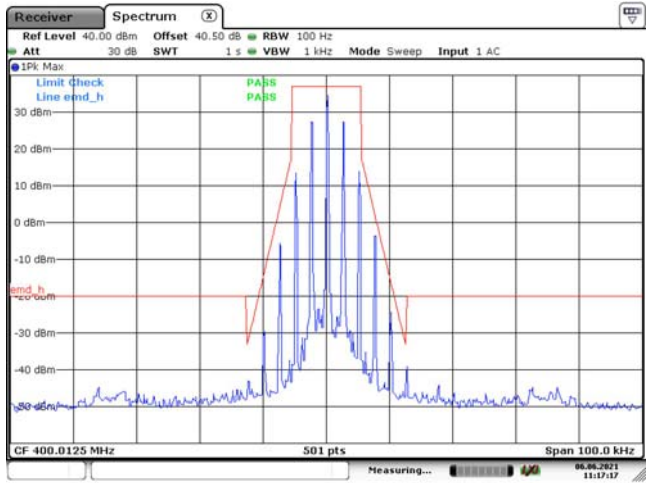
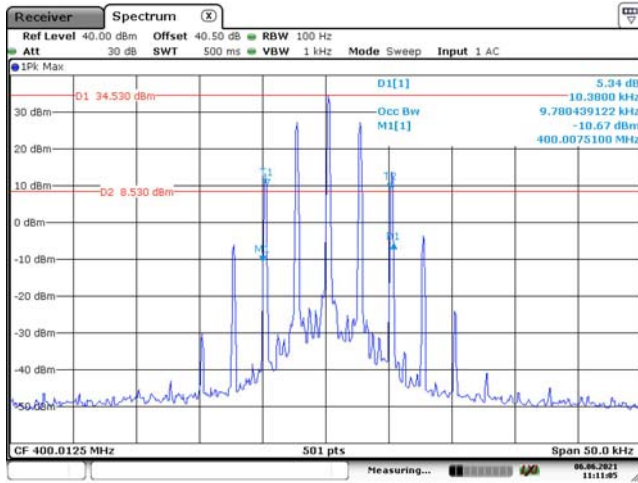
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).

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:

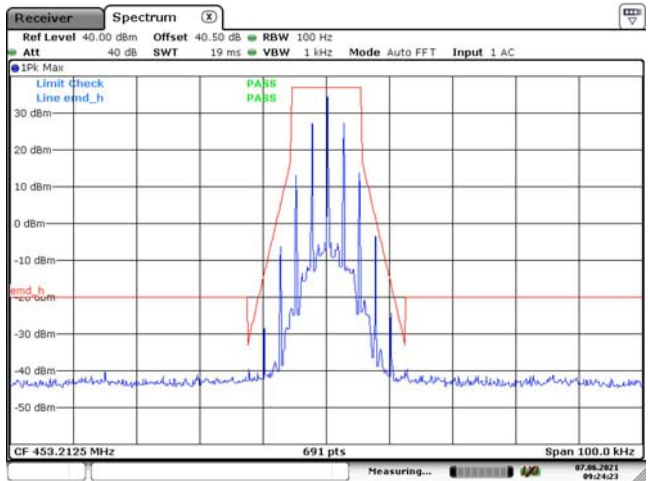
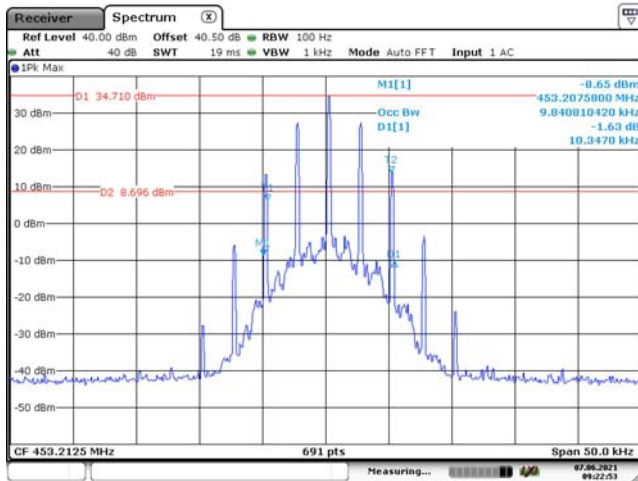
Low Channel



Date: 6 JUN 2021 11:11:05

Date: 6 JUN 2021 11:17:17

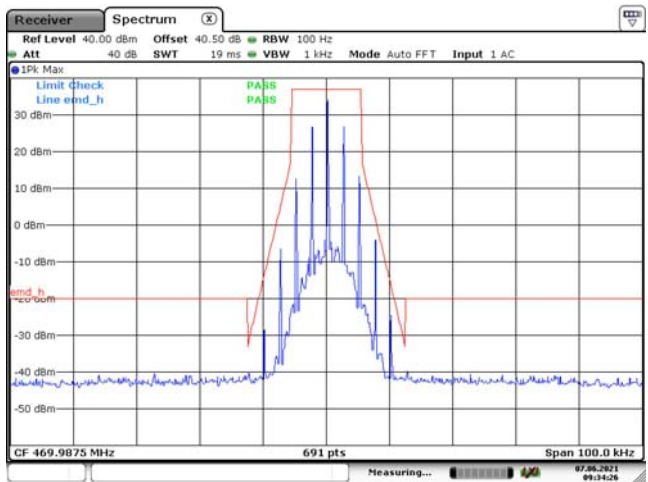
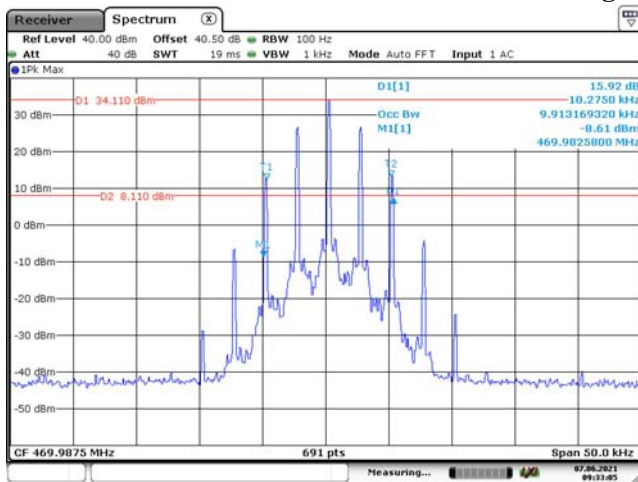
Middle Channel



Date: 7 JUN 2021 09:22:53

Date: 7 JUN 2021 09:24:23

High Channel

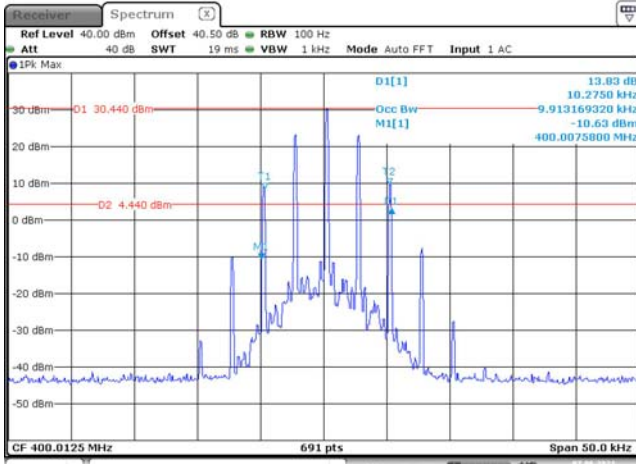


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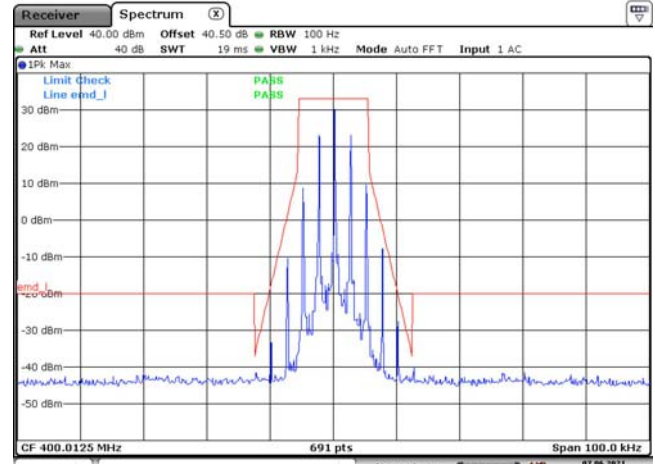
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FM, 12.5kHz Low Power:

Low Channel

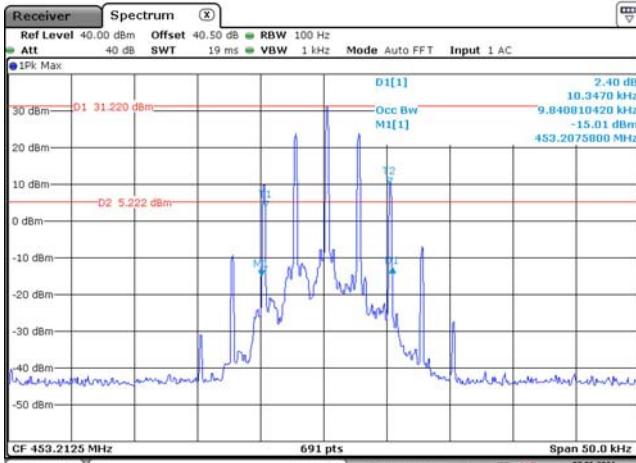


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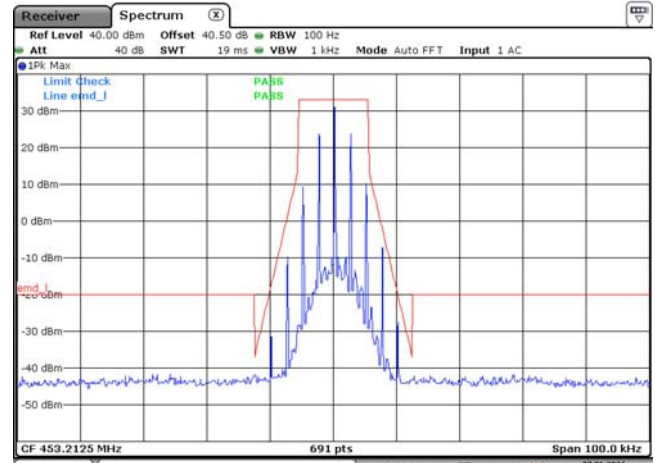


Date: 7 JUN 2021 09:16:20

Middle Channel

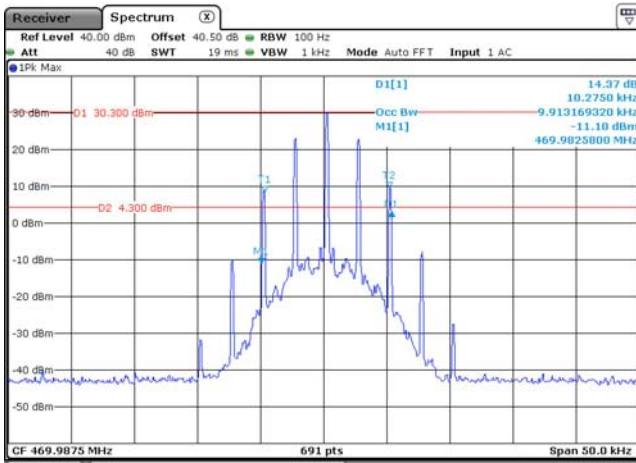


Date: 7 JUN 2021 09:19:33

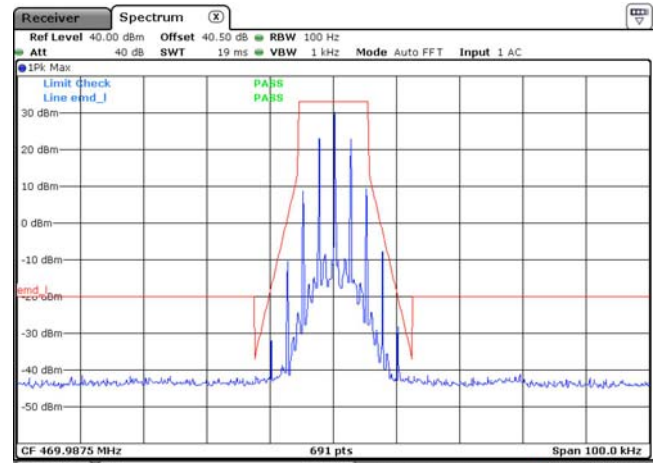


Date: 7 JUN 2021 09:25:30

High Channel



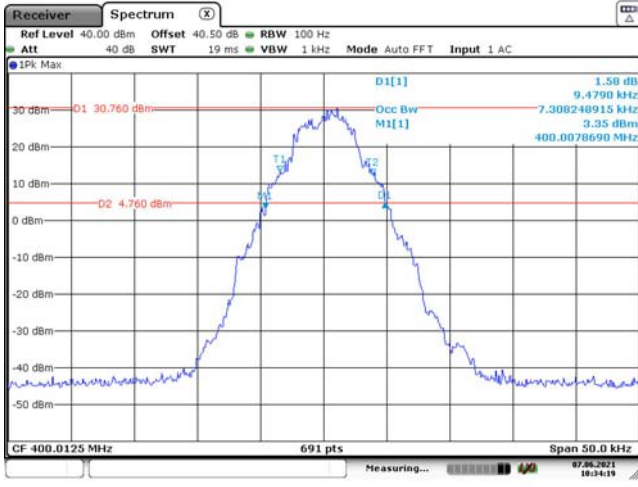
Date: 7 JUN 2021 09:31:52



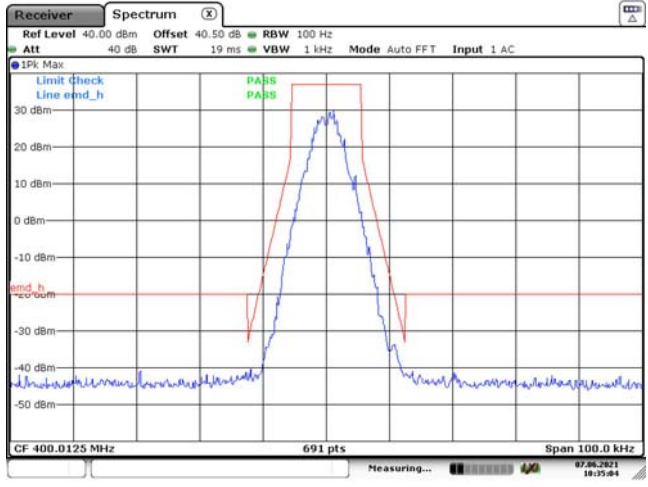
Date: 7 JUN 2021 09:35:56

4FSK, 12.5kHz High Power:

Low Channel

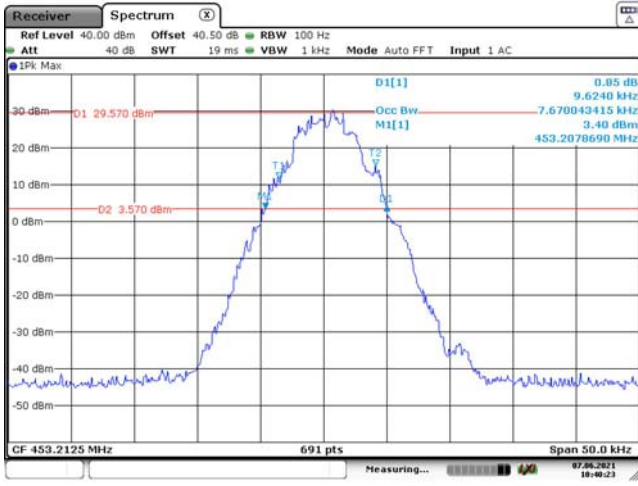


Date: 7 JUN 2021 10:34:20

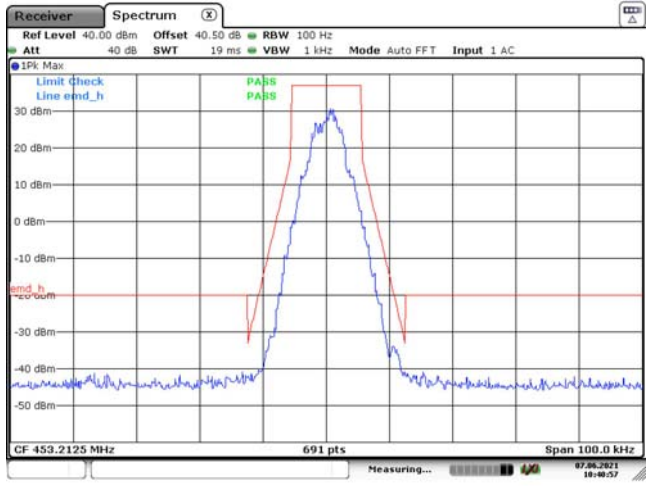


Date: 7 JUN 2021 10:35:05

Middle Channel

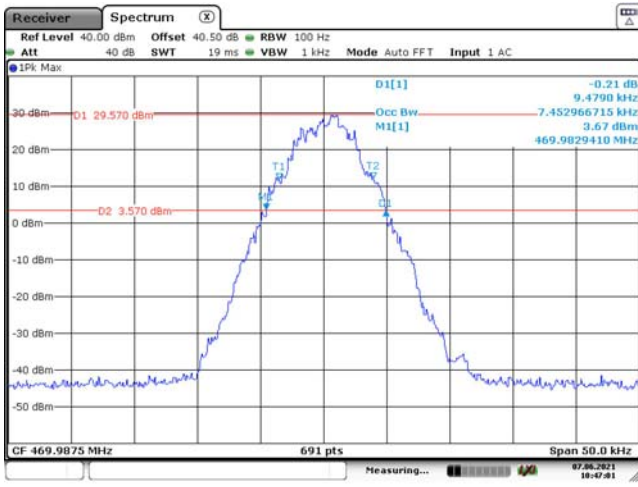


Date: 7 JUN 2021 10:40:24

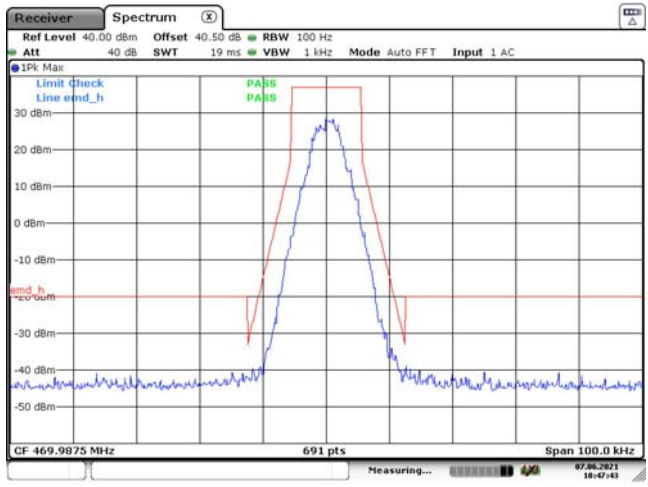


Date: 7 JUN 2021 10:40:58

High Channel



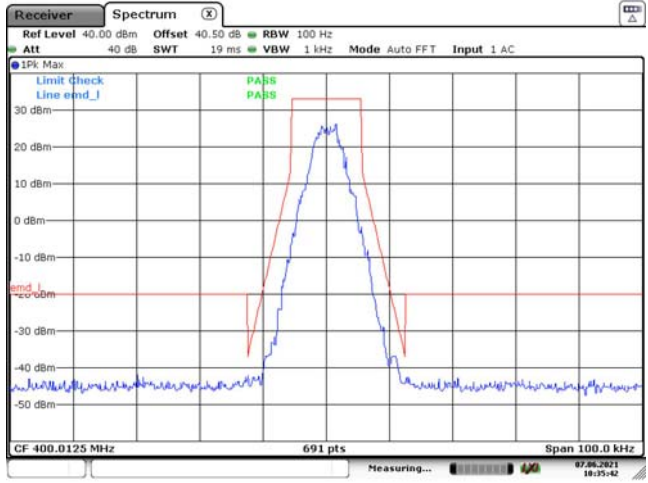
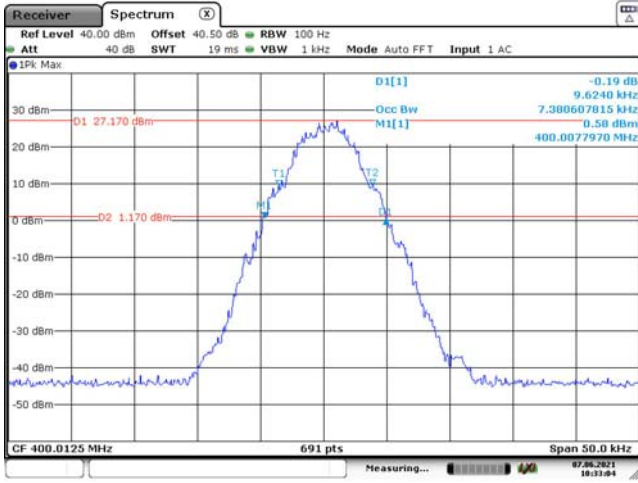
Date: 7 JUN 2021 10:47:02



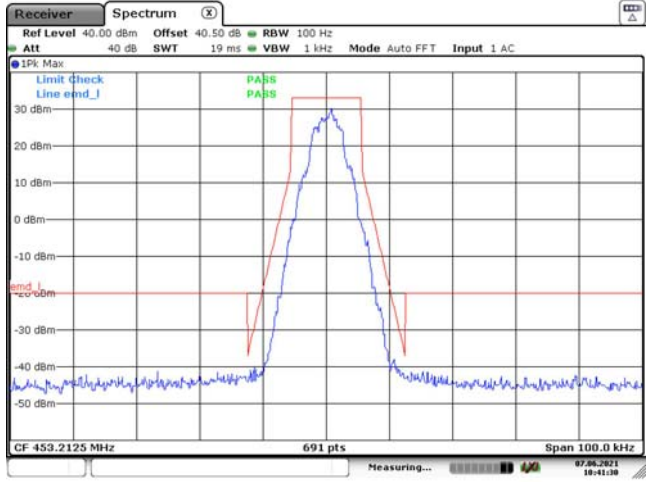
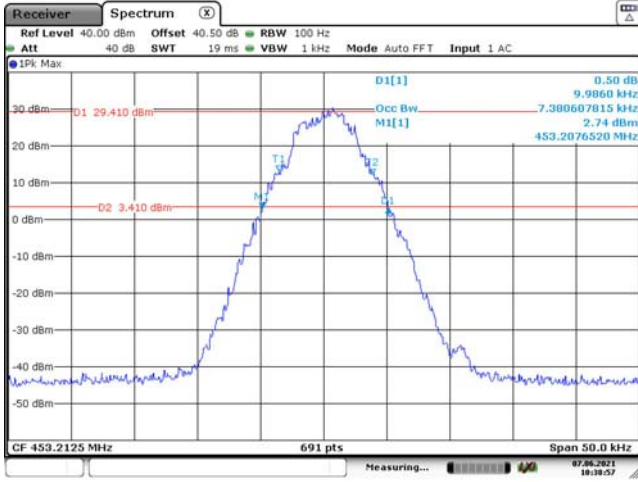
Date: 7 JUN 2021 10:47:44

4FSK, 12.5kHz Low Power:

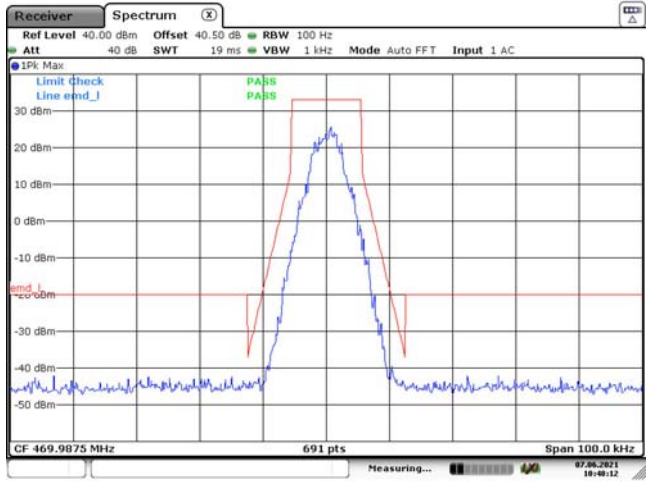
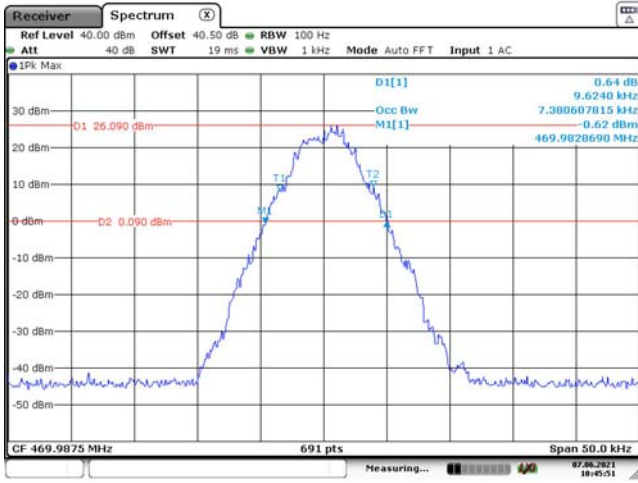
Low Channel



Middle Channel



High Channel



5 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051, §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.

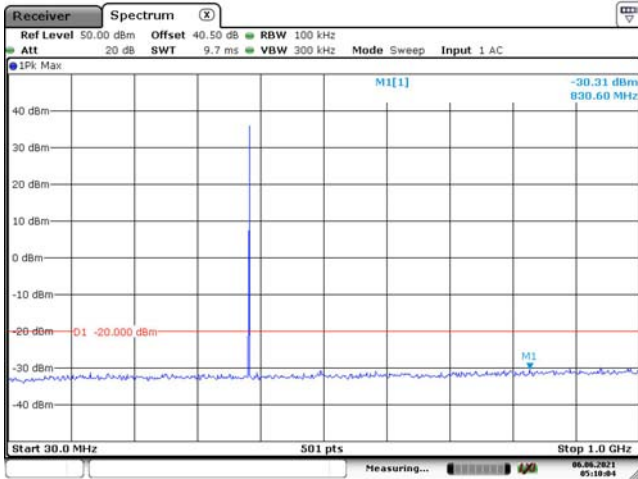
Test Data

Test Mode: Transmitting

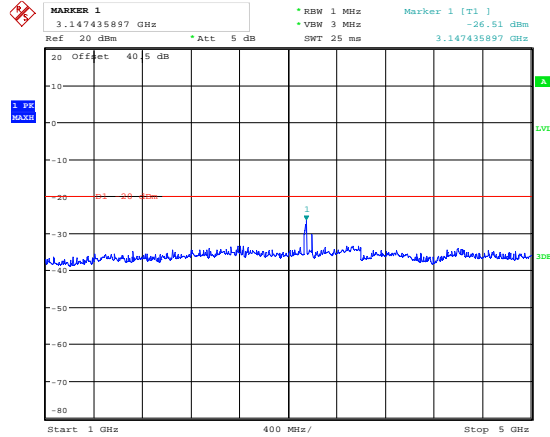
Test Result: Compliance. Please refer to following plots.

FM, 12.5kHz:

Low Channel, 400.0125 MHz

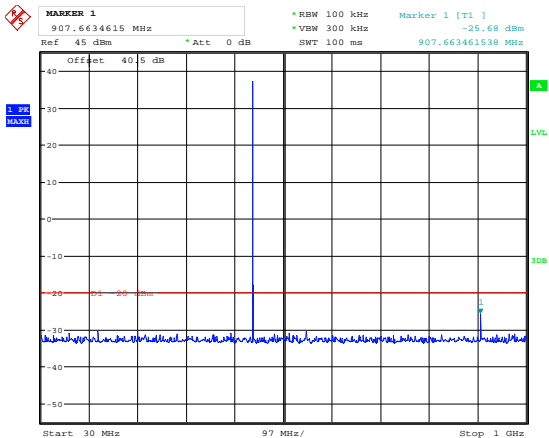


Date: 6.JUN.2021 05:10:04

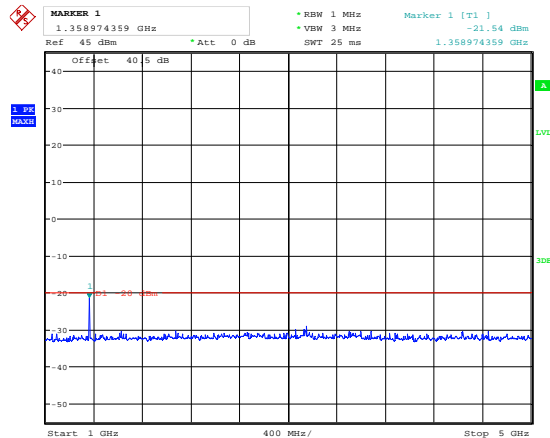


Date: 6.JUN.2021 16:39:48

Middle Channel, 453.2125 MHz

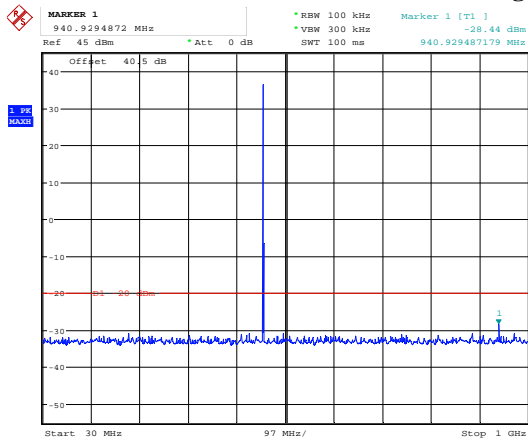


Date: 6.JUN.2021 16:44:42

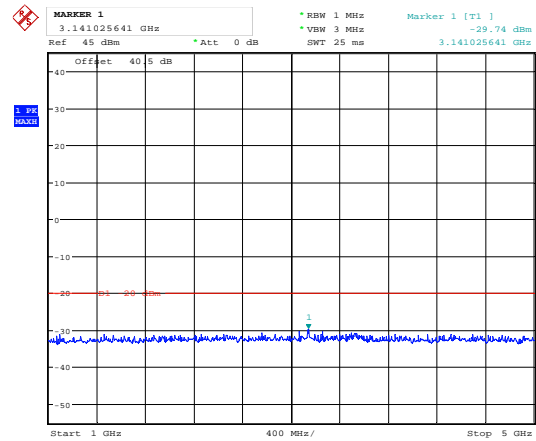


Date: 6.JUN.2021 16:46:03

High Channel, 469.9875 MHz



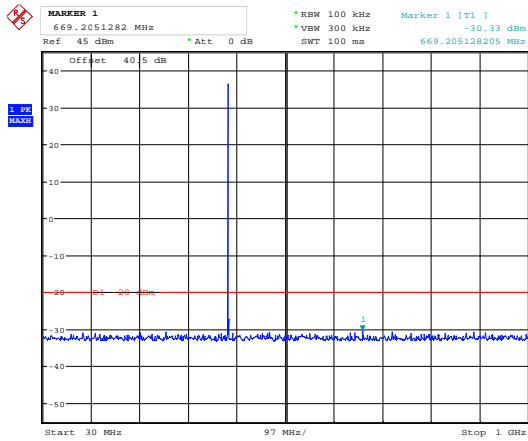
Date: 6.JUN.2021 16:47:38



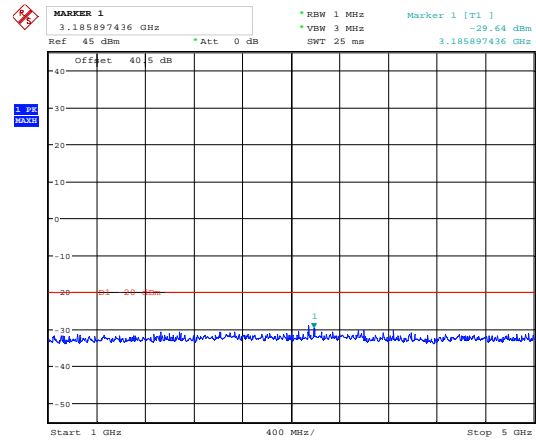
Date: 6.JUN.2021 16:52:32

4FSK, 12.5kHz:

Low Channel, 400.0125 MHz

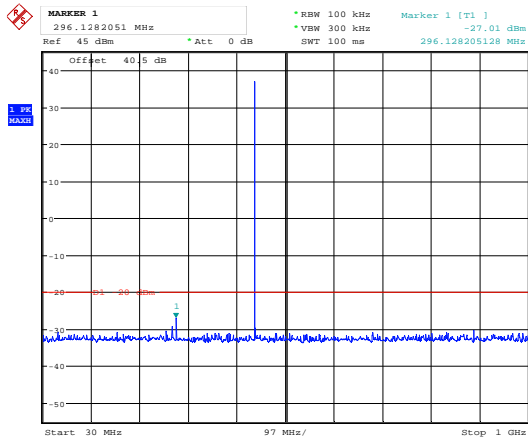


Date: 6.JUN.2021 16:55:50

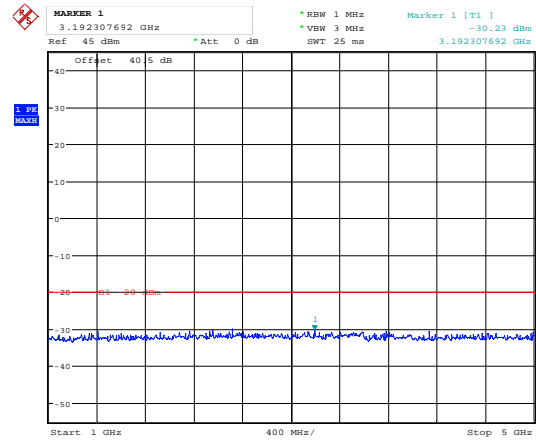


Date: 6.JUN.2021 16:57:01

Middle Channel, 453.2125 MHz

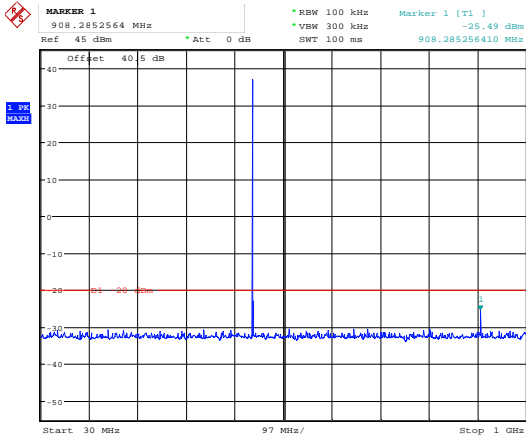


Date: 6.JUN.2021 16:58:34

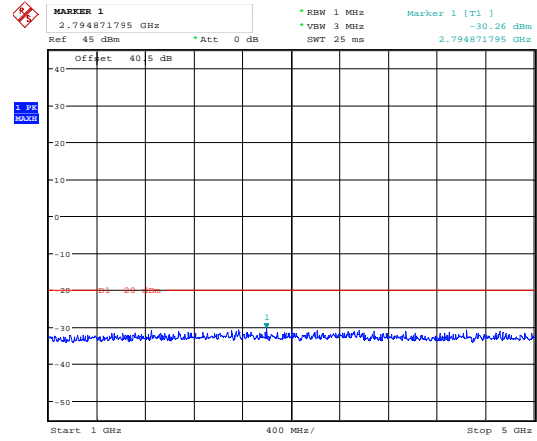


Date: 6.JUN.2021 16:59:53

High Channel, 469.9875 MHz



Date: 6.JUN.2021 17:01:37



Date: 6.JUN.2021 17:02:19

6 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053, §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. *Please refer to following table and plots.*

30MHz - 5GHz:

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	75.33	-23.32	0.00	0.93	-24.25	-20.00	4.25
800.03	V	66.07	-36.34	0.00	0.93	-37.27	-20.00	17.27
1200.04	H	50.19	-52.79	7.30	1.09	-46.58	-20.00	26.58
1200.04	V	51.33	-52.75	7.30	1.09	-46.54	-20.00	26.54
1600.05	H	49.99	-54.65	10.10	0.68	-45.23	-20.00	25.23
1600.05	V	51.80	-53.44	10.10	0.68	-44.02	-20.00	24.02
2000.06	H	47.77	-55.06	12.00	1.13	-44.19	-20.00	24.19
2000.06	V	52.00	-51.23	12.00	1.13	-40.36	-20.00	20.36
2400.08	H	51.90	-50.56	12.30	1.29	-39.55	-20.00	19.55
2400.08	V	51.51	-51.15	12.30	1.29	-40.14	-20.00	20.14
2800.09	H	51.53	-50.19	13.10	1.36	-38.45	-20.00	18.45
2800.09	V	54.89	-47.03	13.10	1.36	-35.29	-20.00	15.29
3200.10	H	44.87	-53.80	13.60	1.57	-41.77	-20.00	21.77
3200.10	V	53.96	-44.77	13.60	1.57	-32.74	-20.00	12.74
3600.11	H	37.70	-61.33	14.10	1.50	-48.73	-20.00	28.73
3600.11	V	42.89	-56.14	14.10	1.50	-43.54	-20.00	23.54
4000.13	H	44.66	-52.81	14.00	1.45	-40.26	-20.00	20.26
4000.13	V	45.09	-52.43	14.00	1.45	-39.88	-20.00	19.88
4FSK, Frequency: 400.0125MHz-12.5 kHz								
800.03	H	75.89	-22.76	0.00	0.93	-23.69	-20.00	3.69
800.03	V	65.50	-36.91	0.00	0.93	-37.84	-20.00	17.84
1200.04	H	50.63	-52.35	7.30	1.09	-46.14	-20.00	26.14
1200.04	V	48.71	-55.37	7.30	1.09	-49.16	-20.00	29.16
1600.05	H	49.44	-55.20	10.10	0.68	-45.78	-20.00	25.78
1600.05	V	49.07	-56.17	10.10	0.68	-46.75	-20.00	26.75
2000.06	H	47.57	-55.26	12.00	1.13	-44.39	-20.00	24.39
2000.06	V	53.89	-49.34	12.00	1.13	-38.47	-20.00	18.47
2400.08	H	52.58	-49.88	12.30	1.29	-38.87	-20.00	18.87
2400.08	V	55.22	-47.44	12.30	1.29	-36.43	-20.00	16.43
2800.09	H	52.24	-49.48	13.10	1.36	-37.74	-20.00	17.74
2800.09	V	55.54	-46.38	13.10	1.36	-34.64	-20.00	14.64
3200.10	H	45.12	-53.55	13.60	1.57	-41.52	-20.00	21.52
3200.10	V	53.63	-45.10	13.60	1.57	-33.07	-20.00	13.07
3600.11	H	38.82	-60.21	14.10	1.50	-47.61	-20.00	27.61
3600.11	V	46.96	-52.07	14.10	1.50	-39.47	-20.00	19.47
4000.13	H	45.72	-51.75	14.00	1.45	-39.20	-20.00	19.20
4000.13	V	46.39	-51.13	14.00	1.45	-38.58	-20.00	18.58

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	74.67	-22.20	0.00	1.03	-23.23	-20.00	3.23
906.43	V	66.72	-32.12	0.00	1.03	-33.15	-20.00	13.15
1359.64	H	55.25	-48.31	8.72	1.20	-40.79	-20.00	20.79
1359.64	V	55.01	-49.27	8.72	1.20	-41.75	-20.00	21.75
1812.85	H	51.63	-52.47	11.19	0.72	-42.00	-20.00	22.00
1812.85	V	54.63	-50.03	11.19	0.72	-39.56	-20.00	19.56
2266.06	H	60.18	-41.87	11.06	1.20	-32.01	-20.00	12.01
2266.06	V	63.71	-38.24	11.06	1.20	-28.38	-20.00	8.38
2719.28	H	54.26	-47.65	13.10	1.27	-35.82	-20.00	15.82
2719.28	V	57.39	-44.63	13.10	1.27	-32.80	-20.00	12.80
3172.49	H	42.84	-56.18	13.49	1.64	-44.33	-20.00	24.33
3172.49	V	45.12	-53.94	13.49	1.64	-42.09	-20.00	22.09
3625.70	H	44.63	-54.13	14.07	1.58	-41.64	-20.00	21.64
3625.70	V	51.47	-47.29	14.07	1.58	-34.80	-20.00	14.80
4078.91	H	55.12	-42.87	13.76	1.36	-30.47	-20.00	10.47
4078.91	V	54.55	-43.56	13.76	1.36	-31.16	-20.00	11.16
4532.13	H	42.63	-54.62	14.13	1.64	-42.13	-20.00	22.13
4532.13	V	47.82	-49.36	14.13	1.64	-36.87	-20.00	16.87
4FSK,Frequency: 453.2125MHz -12.5 kHz								
906.43	H	73.92	-22.95	0.00	1.03	-23.98	-20.00	3.98
906.43	V	65.25	-33.59	0.00	1.03	-34.62	-20.00	14.62
1359.64	H	55.06	-48.50	8.72	1.20	-40.98	-20.00	20.98
1359.64	V	55.14	-49.14	8.72	1.20	-41.62	-20.00	21.62
1812.85	H	50.42	-53.68	11.19	0.72	-43.21	-20.00	23.21
1812.85	V	56.41	-48.25	11.19	0.72	-37.78	-20.00	17.78
2266.06	H	60.47	-41.58	11.06	1.20	-31.72	-20.00	11.72
2266.06	V	64.73	-37.22	11.06	1.20	-27.36	-20.00	7.36
2719.28	H	55.36	-46.55	13.10	1.27	-34.72	-20.00	14.72
2719.28	V	59.63	-42.39	13.10	1.27	-30.56	-20.00	10.56
3172.49	H	41.36	-57.66	13.49	1.64	-45.81	-20.00	25.81
3172.49	V	45.25	-53.81	13.49	1.64	-41.96	-20.00	21.96
3625.70	H	42.96	-55.80	14.07	1.58	-43.31	-20.00	23.31
3625.70	V	48.63	-50.13	14.07	1.58	-37.64	-20.00	17.64
4078.91	H	56.32	-41.67	13.76	1.36	-29.27	-20.00	9.27
4078.91	V	56.36	-41.75	13.76	1.36	-29.35	-20.00	9.35
4532.13	H	42.36	-54.89	14.13	1.64	-42.40	-20.00	22.40
4532.13	V	49.15	-48.03	14.13	1.64	-35.54	-20.00	15.54

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	64.83	-30.65	0.00	0.93	-31.58	-20.00	11.58
939.98	V	59.42	-37.78	0.00	0.93	-38.71	-20.00	18.71
1409.96	H	56.25	-47.29	9.05	1.21	-39.45	-20.00	19.45
1409.96	V	57.20	-46.89	9.05	1.21	-39.05	-20.00	19.05
1879.95	H	44.68	-58.43	11.66	0.95	-47.72	-20.00	27.72
1879.95	V	48.51	-54.96	11.66	0.95	-44.25	-20.00	24.25
2349.94	H	61.28	-41.02	11.75	1.26	-30.53	-20.00	10.53
2349.94	V	64.34	-38.01	11.75	1.26	-27.52	-20.00	7.52
2819.93	H	57.65	-43.87	13.26	1.36	-31.97	-20.00	11.97
2819.93	V	59.32	-42.42	13.26	1.36	-30.52	-20.00	10.52
3289.91	H	42.62	-57.08	13.60	1.59	-45.07	-20.00	25.07
3289.91	V	46.36	-53.35	13.60	1.59	-41.34	-20.00	21.34
3759.90	H	43.89	-53.75	13.76	1.63	-41.62	-20.00	21.62
3759.90	V	45.45	-52.05	13.76	1.63	-39.92	-20.00	19.92
4229.89	H	52.49	-45.18	13.97	1.35	-32.56	-20.00	12.56
4229.89	V	54.31	-43.35	13.97	1.35	-30.73	-20.00	10.73
4699.88	H	40.26	-56.97	14.40	1.67	-44.24	-20.00	24.24
4699.88	V	45.04	-52.28	14.40	1.67	-39.55	-20.00	19.55
4FSK,Frequency: 469.9875MHz -12.5 kHz								
939.98	H	64.72	-30.76	0.00	0.93	-31.69	-20.00	11.69
939.98	V	59.60	-37.60	0.00	0.93	-38.53	-20.00	18.53
1409.96	H	55.24	-48.30	9.05	1.21	-40.46	-20.00	20.46
1409.96	V	56.19	-47.90	9.05	1.21	-40.06	-20.00	20.06
1879.95	H	43.67	-59.44	11.66	0.95	-48.73	-20.00	28.73
1879.95	V	47.53	-55.94	11.66	0.95	-45.23	-20.00	25.23
2349.94	H	60.27	-42.03	11.75	1.26	-31.54	-20.00	11.54
2349.94	V	63.33	-39.02	11.75	1.26	-28.53	-20.00	8.53
2819.93	H	56.64	-44.88	13.26	1.36	-32.98	-20.00	12.98
2819.93	V	58.31	-43.43	13.26	1.36	-31.53	-20.00	11.53
3289.91	H	41.66	-58.04	13.60	1.59	-46.03	-20.00	26.03
3289.91	V	45.35	-54.36	13.60	1.59	-42.35	-20.00	22.35
3759.90	H	42.88	-54.76	13.76	1.63	-42.63	-20.00	22.63
3759.90	V	44.44	-53.06	13.76	1.63	-40.93	-20.00	20.93
4229.89	H	51.48	-46.19	13.97	1.35	-33.57	-20.00	13.57
4229.89	V	53.36	-44.30	13.97	1.35	-31.68	-20.00	11.68
4699.88	H	39.25	-57.98	14.40	1.67	-45.25	-20.00	25.25
4699.88	V	44.03	-53.29	14.40	1.67	-40.56	-20.00	20.56

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,§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 table and plots.*

FM,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ±1.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	12	453.2126000	0.22
-20		453.2127000	0.44
-10		453.2128000	0.66
0		453.2129000	0.88
10		453.2127000	0.44
20		453.2126600	0.35
30		453.2125000	0.00
40		453.2128000	0.66
50		453.2126000	0.22
20		10	453.2124000
20	14	453.2126000	0.22

4FSK, 12.5kHz, Reference Frequency: 453.2125MHz, Limit: ±1.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	12	453.2127000	0.44
-20		453.2126000	0.22
-10		453.2126000	0.22
0		453.2128000	0.66
10		453.2129000	0.88
20		453.2128000	0.66
30		453.2127000	0.44
40		453.2127000	0.44
50		453.2129000	0.88
20		10	453.2127000
20	14	453.2126000	0.22

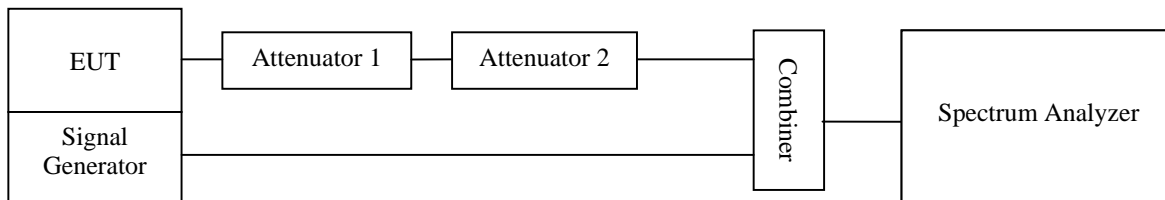
8 - TRANSIENT FREQUENCY BEHAVIOR

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 ± 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 ± 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 .



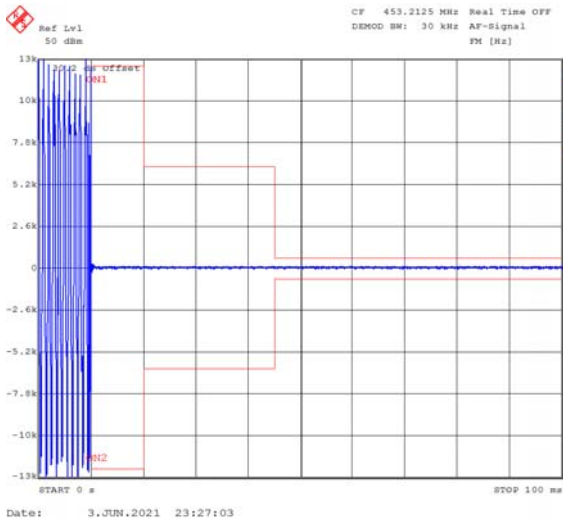
Test Data

Test Mode: Transmitting

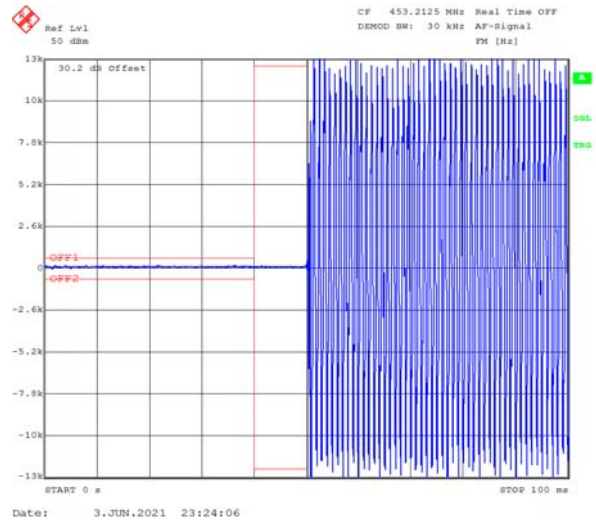
Test Result: Compliance. Please refer to following table and plots.

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 *******