



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 22, AND PART 90

TEST REPORT

For

RCA Communications Systems

133 W. Market St.Suite 227 Indianapolis IN 46204 United States

FCC ID: XYH-RDR42X0U

Report Type: Original Report	Product Type: Digital Two-Way Radio
Report Number: RDG200729008-00A	
Report Date: 2020-09-09	
Reviewed By:	Ivan Cao Assistant manager 
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Digital Two-Way Radio
EUT Model:		RDR4280U
Multiple Models:		RDR4220U, RDR4250U
Rated Antenna Output power:		4W(High), 1W(Low)
Modulation Type:		FM, 4FSK
Channel Spacing:		12.5 kHz/25kHz
Frequency Range:		400-512 MHz
Adapter Information	Model:	MR-1201000US
	Input:	AC 100-240V 50/60Hz 0.3A
	Output:	DC 12V 1A
Rated Input Voltage:		DC 7.4V from Battery or DC 12V from charger base
Serial Number:		RDG200729008 - RF -S1
EUT Received Date:		2020.08.01
EUT Received Status:		Good

Note: The series product, models RDR4220U, RDR4250U and RDR4280U are electrically identical, The difference between them please refer to the declaration letter for details. Per FCC part 15B emission test, the worst is RDR4280U, this model was performed full test for this report.

Objective

This test report is prepared on behalf of **RCA Communications Systems** in accordance with Part 2, part 22, and Part 90 of the Federal Communication Commission rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID:XYH-RDR42X0U
FCC Part 15C DTS submissions with FCC ID:XYH-RDR42X0U

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 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.69 Pulongcun, Puxinhu Industry Area, Tangxia, 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 “ $\triangle$ ”. Customer model name, addresses, names, trademarks etc. are not considered data.

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

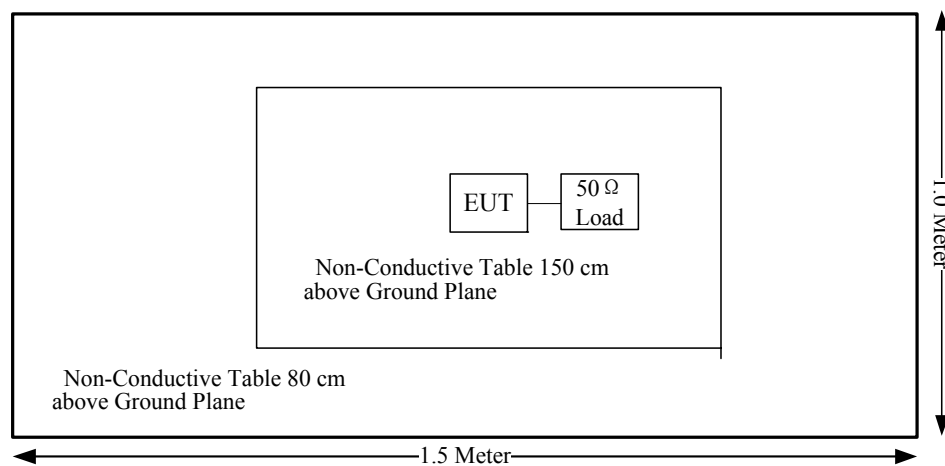
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
WEINSCHTEL Corp	Load	50oml	50oml Load
ITE	Adapter	MR-1201000US	MR-1201000US

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1310 and §2.1093	RF Exposure	Compliance
§2.1046; § 22.727; §90.205	RF Output Power	Compliance
§2.1047;§90.207	Modulation Characteristic	Compliance
§2.1049;§22.357;§ 22.731; §90.209; §90.210	Occupied Bandwidth	Compliance
§2.1051; §22.861; §90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053;§22.861; §90.210	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355;§90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated emissions below 1GHz					
R&S	EMI Test Receiver	ESCI	100035	2019-08-03	2020-08-03
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2019-09-24	2020-09-24
Sonoma	Amplifier	310N	185914	2019-10-13	2020-10-13
Agilent	Signal Generator	E8247C	MY43321350	2019-12-10	2020-12-10
Ouli	Band Rejector Filter	400-470M	087	2020-01-23	2021-01-23
Radiated emissions above 1GHz					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2020-07-07	2021-07-07
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2020-06-27	2021-06-27
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2019-09-05	2020-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2020-06-27	2021-06-27
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-09-12	2020-09-12
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41005011	Each time	N/A
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41005012	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	OE01203218	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN749	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05201	2020-05-09	2021-05-09
ESPEC	Constant temperature and humidity Tester	ESX-4CA	018 463	2020-03-26	2021-03-26
Ouli	Band Rejector Filter	400-470M	087	2020-01-23	2021-01-23
UNI-T	Multimeter	UT39A	M130199938	2019-07-23	2021-07-23

*** 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).

FCC §1.1310 & §2.1093 - RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RDG200729008-20A.

FCC §2.1046 & § 22.727 & §90.205- RF OUTPUT POWER**Applicable Standard**

FCC §2.1046, § 22.727, 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:

RBW	VBW
100 kHz	300 kHz

Test Data**Environmental Conditions**

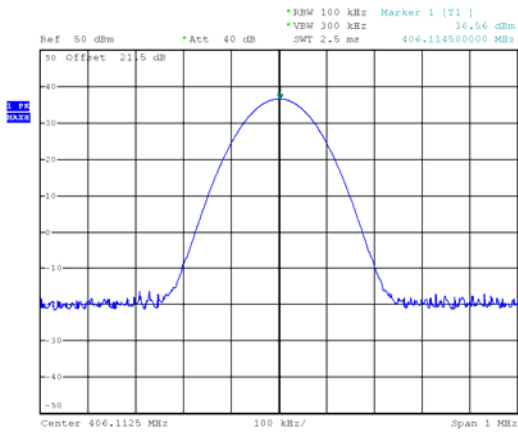
Temperature:	26.9~27.8°C
Relative Humidity:	63~69 %
ATM Pressure:	100~100.8 kPa
Tester:	James Chen
Test Date:	2020-08-31~2020-09-02

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

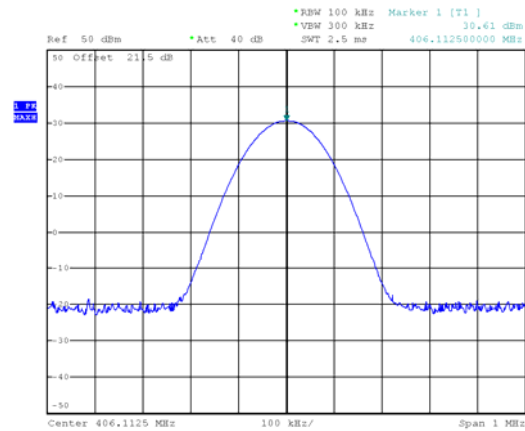
Channel Separation	Test Modulation	Test Channel	Test Frequency (MHz)	Conducted Output Power (dBm)		Limit (dBm)		Note
				High Power Level	Low Power Level	High Power Level	Low Power Level	
12.5kHz	FM	Additional	400.0125	36.42	30.52	36.81	30.79	For federal
		Low	406.1125	36.56	30.61	36.81	30.79	FCC part 90
		Middle	453.2125	35.82	30.03	36.81	30.79	
		High	511.9875	36.36	30.57	36.81	30.79	
		Additional	454.0125	36.68	30.77	36.81	30.79	FCC part 22
	4FSK	Additional	400.0125	35.80	30.09	36.81	30.79	For federal
		Low	406.1125	36.06	30.33	36.81	30.79	FCC part 90
		Middle	453.2125	36.14	30.42	36.81	30.79	
		High	511.9875	35.92	30.39	36.81	30.79	
		Additional	454.0125	36.04	30.43	36.81	30.79	FCC part 22
25kHz	FM	Additional	454.0125	35.92	30.07	36.81	30.79	FCC part 22

Note: The high rated power level is 4W(36dBm), and low rated power level is 1 W(30dBm).

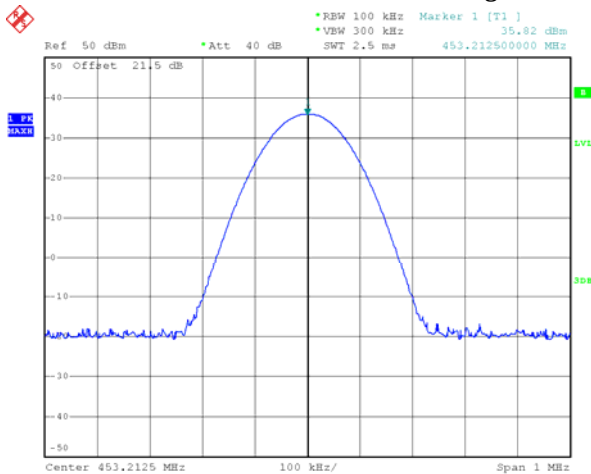
The output power shall not exceed by more than 20 percent the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

FM, 12.5kHz:**Part 90, Low Channel, 406.1125 MHz High Power**

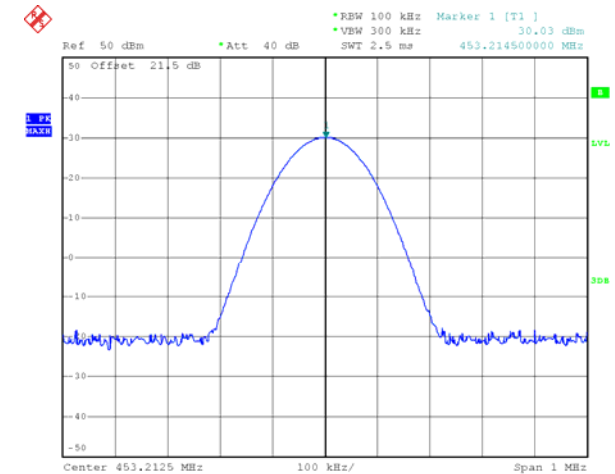
Date: 31.AUG.2020 21:05:39

Part 90, Low Channel, 406.1125 MHz Low Power

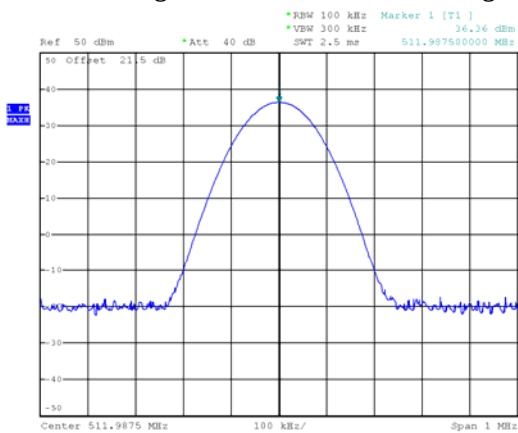
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Part 90, Middle Channel, 453.2125 MHz High Power

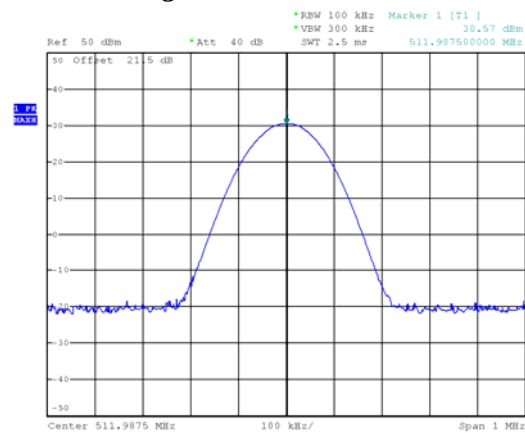
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Part 90, Middle Channel, 453.2125 MHz Low Power

Date: 2.SEP.2020 14:15:56

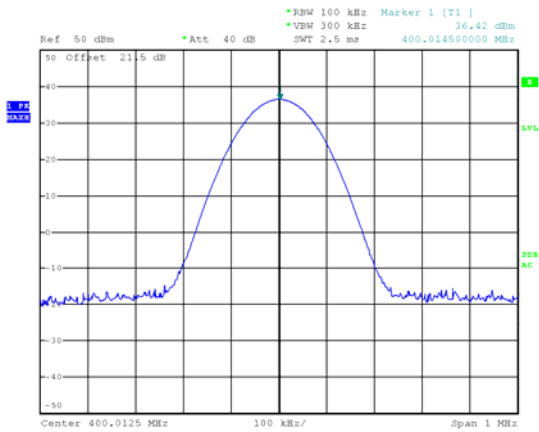
Part 90, High Channel, 511.9875 MHz High Power

Date: 31.AUG.2020 21:11:14

Part 90, High Channel, 511.9875 MHz Low Power

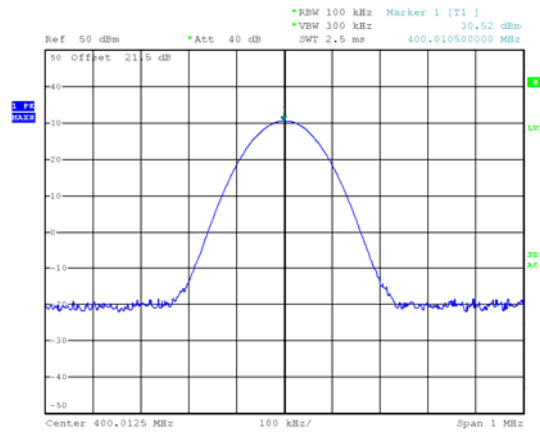
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Additional, For federal, 400.0125 MHz High Power



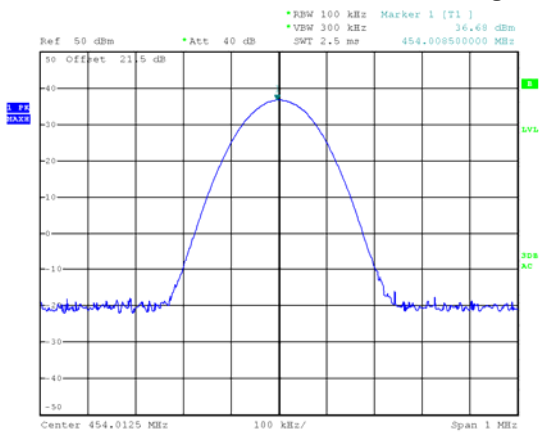
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Additional, For federal, 400.0125 MHz Low Power



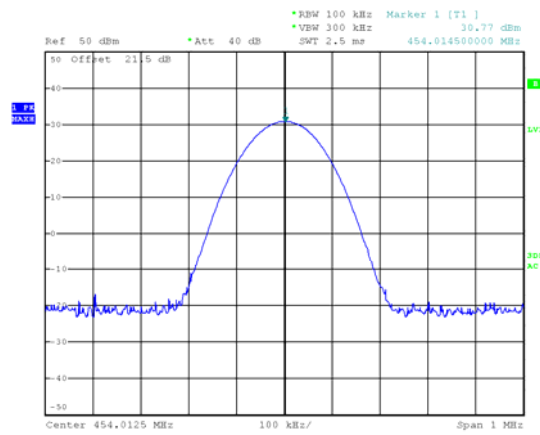
Date: 31.AUG.2020 21:03:53

Additional, For Part 22, 454.0125 MHz High Power



Date: 31.AUG.2020 21:13:45

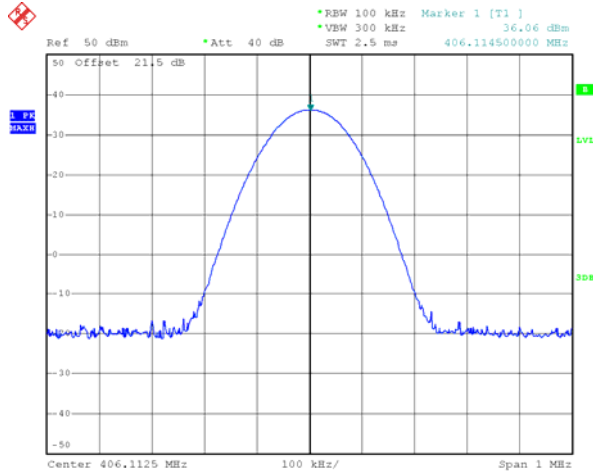
Additional, For Part 22, 454.0125 MHz Low Power



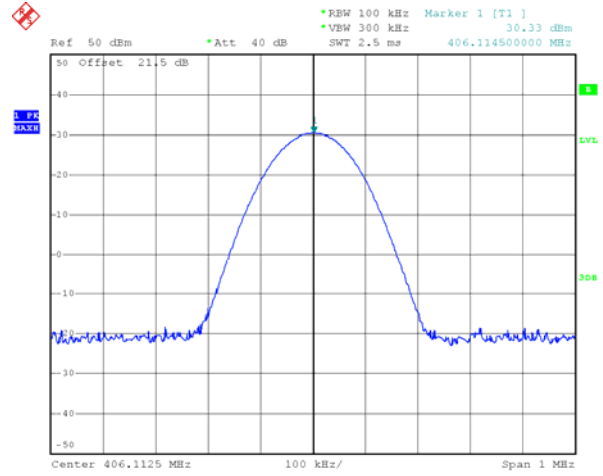
Date: 31.AUG.2020 21:14:08

4FSK, 12.5kHz:

Part 90, Low Channel, 406.1125 MHz High Power

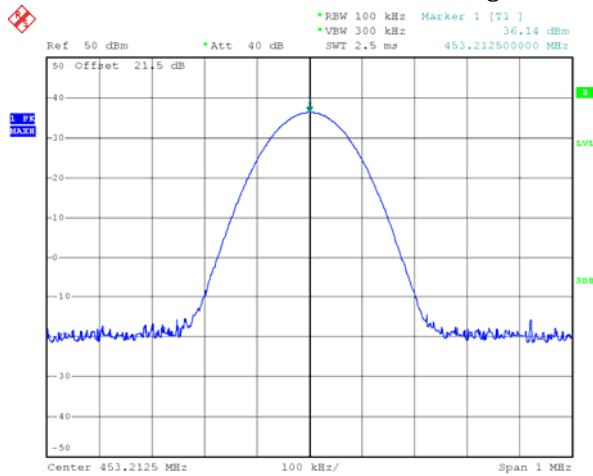


Part 90, Low Channel, 406.1125 MHz Low Power



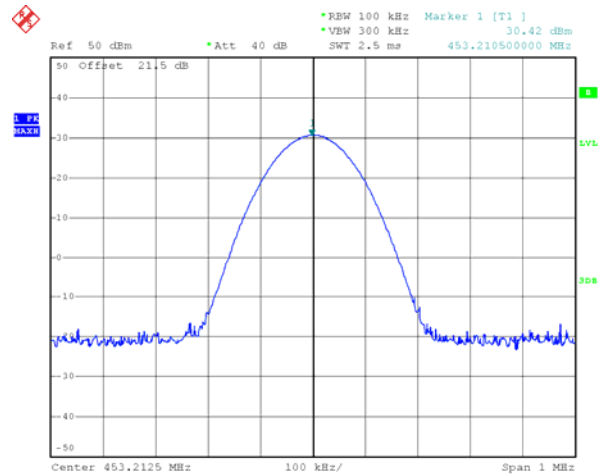
Date: 2.SEP.2020 14:25:05

Part 90, Middle Channel, 453.2125 MHz High Power



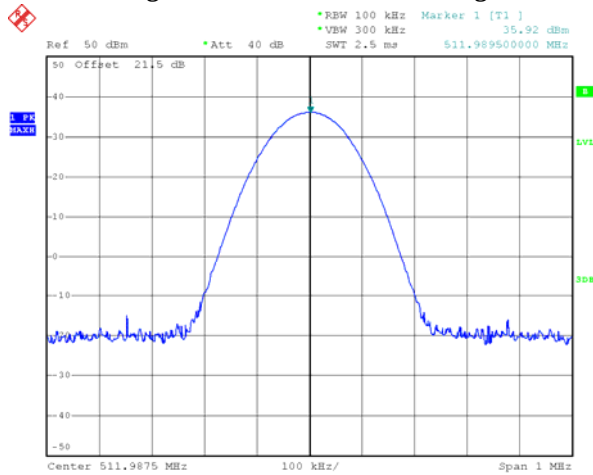
Date: 2.SEP.2020 14:25:28

Part 90, Middle Channel, 453.2125 MHz Low Power



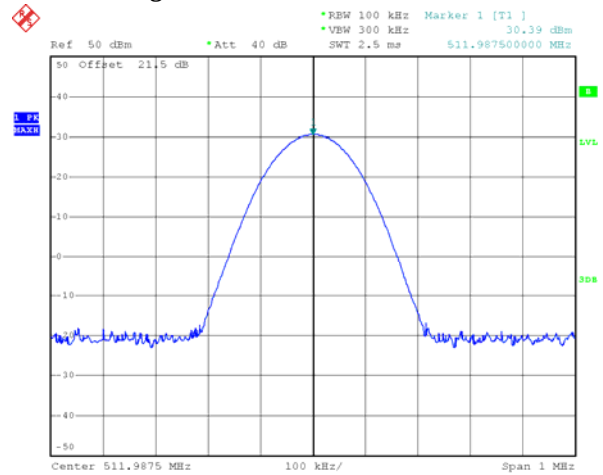
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Part 90, High Channel, 511.9875 MHz High Power



Date: 2.SEP.2020 14:22:27

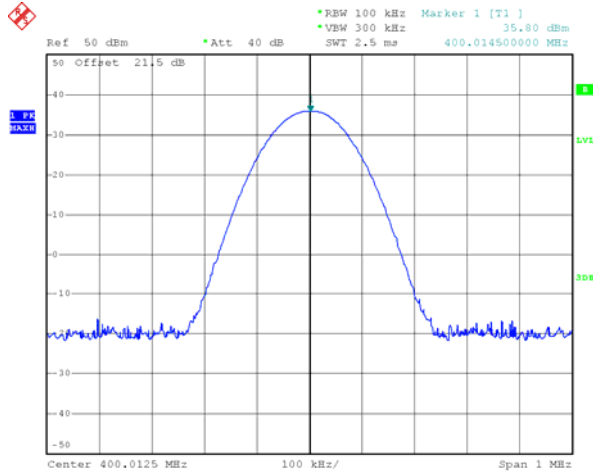
Part 90, High Channel, 511.9875 MHz Low Power



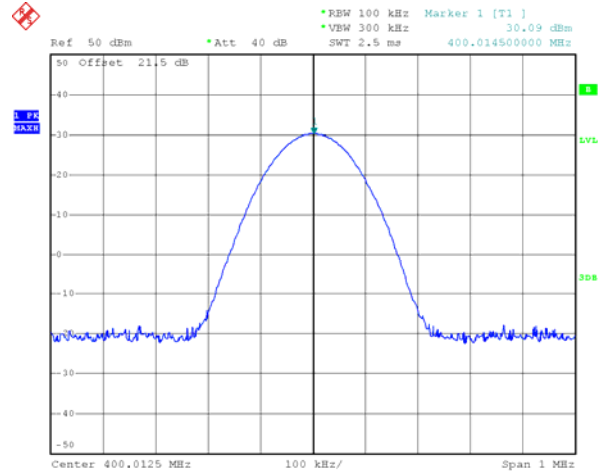
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Date: 2.SEP.2020 14:21:23

Additional, For federal, 400.0125 MHz High Power

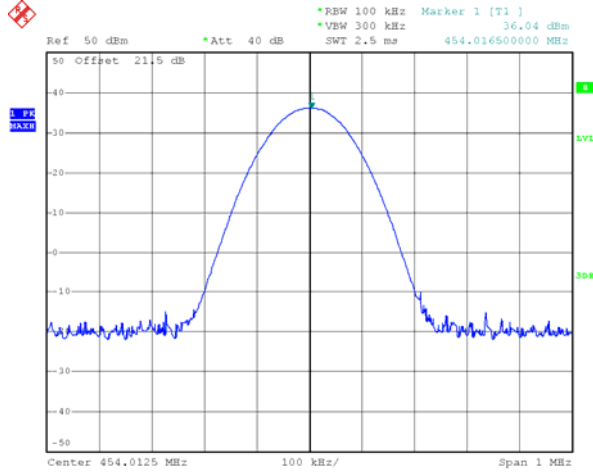


Additional, For federal, 400.0125 MHz Low Power



Date: 2.SEP.2020 14:23:19

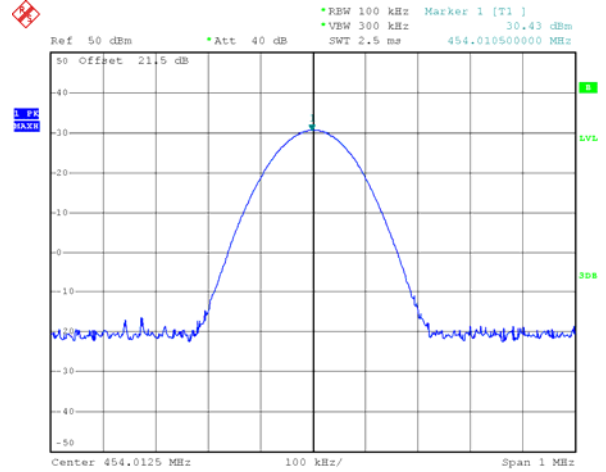
Additional, For Part 22, 454.0125 MHz High Power



Date: 2.SEP.2020 14:19:42

Date: 2.SEP.2020 14:23:43

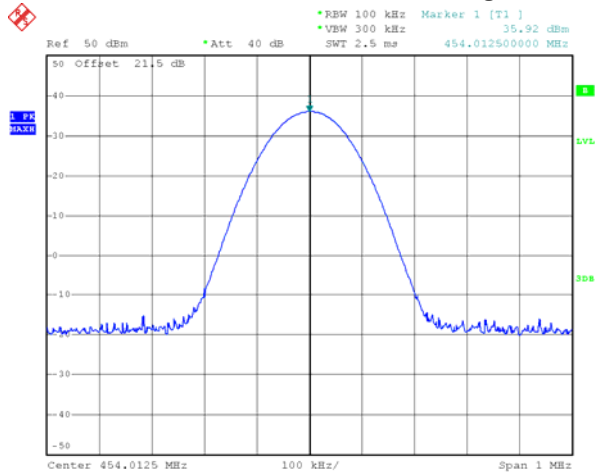
Additional, For Part 22, 454.0125 MHz Low Power



Date: 2.SEP.2020 14:20:06

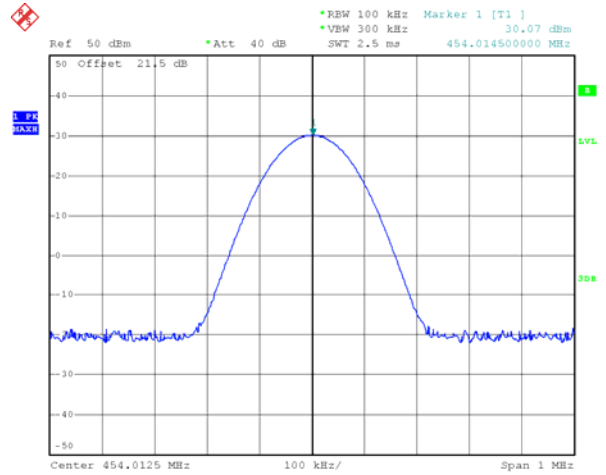
FM, 25kHz:

Additional, For Part 22, 454.0125 MHz High Power



Date: 2.SEP.2020 14:17:04

Additional, For Part 22, 454.0125 MHz Low Power



Date: 2.SEP.2020 14:17:25

FCC §2.1047 - 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/EIA-603 2.2.3

Test Data**Environmental Conditions**

Temperature:	27.8°C
Relative Humidity:	69 %
ATM Pressure:	100.8 kPa
Tester:	James Chen
Test Date:	2020-08-31

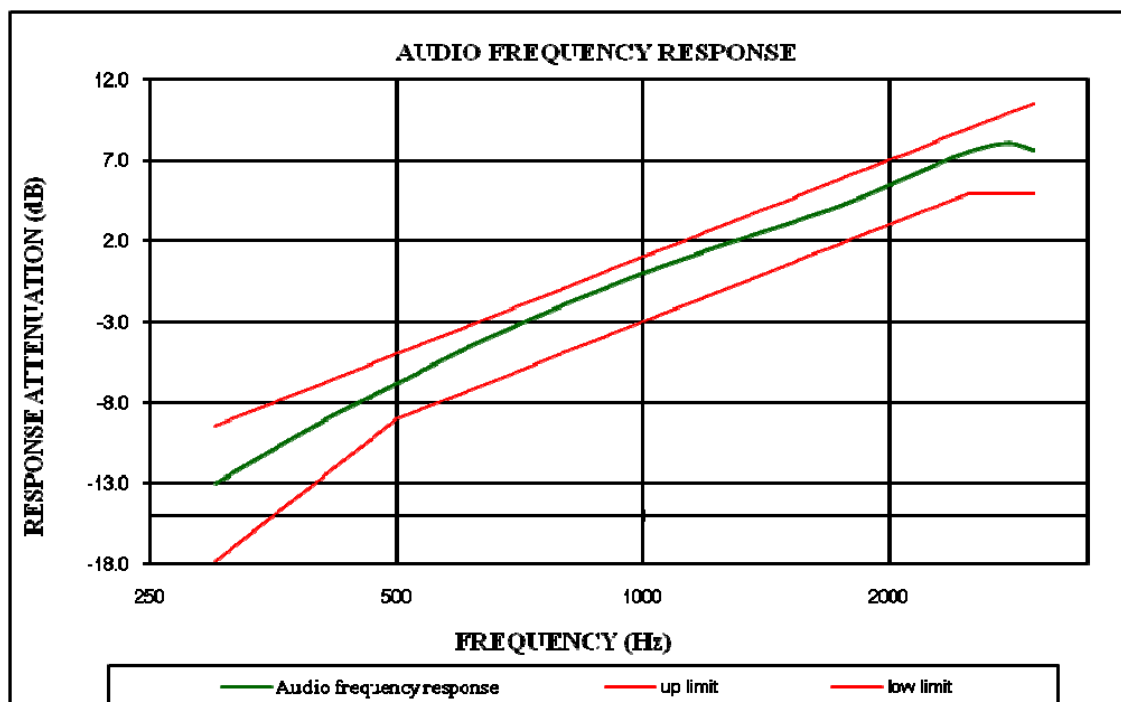
*Test Mode: Transmitting***Result:** Compliance.

12.5 kHz:

Audio Frequency Response – High Power

Carrier Frequency: 453.2125 MHz

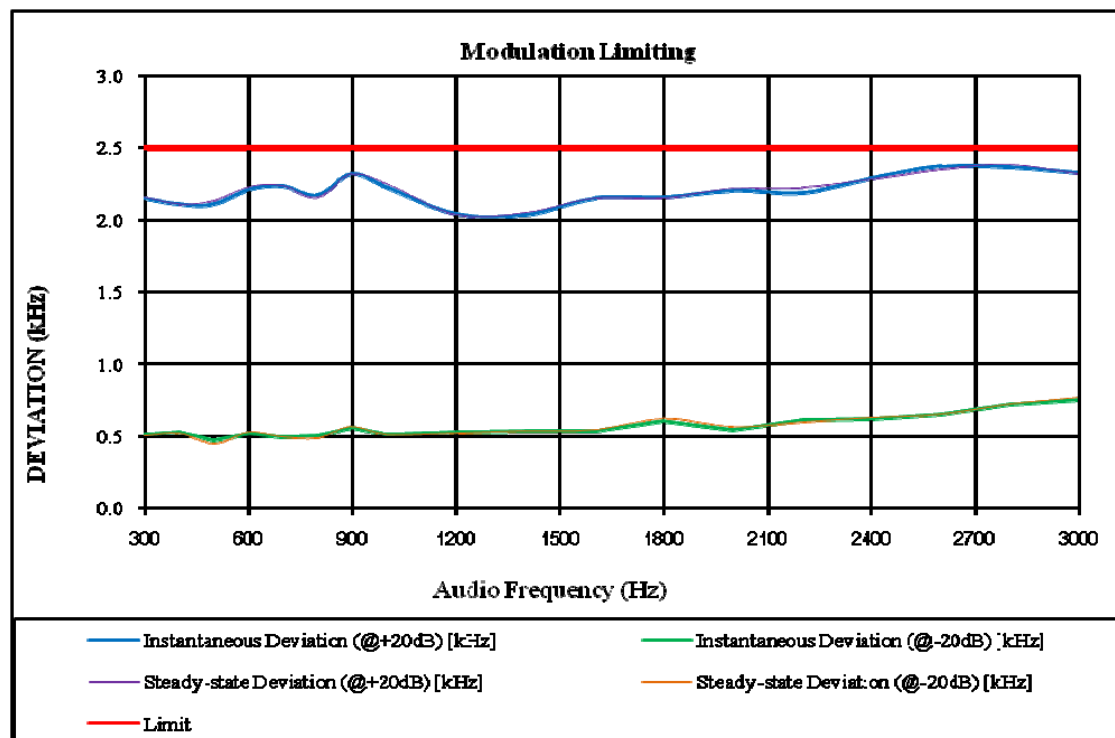
Modulation Frequency (Hz)	Response data (dB)
300	-12.99
400	-9.34
500	-6.84
600	-4.80
700	-3.24
800	-1.98
900	-0.92
1000	0.00
1200	1.44
1400	2.53
1600	3.51
1800	4.47
2000	5.42
2200	6.35
2400	7.19
2600	7.80
2800	8.05
3000	7.67



MODULATION LIMITING – High Power

Carrier Frequency: 453.2125 MHz

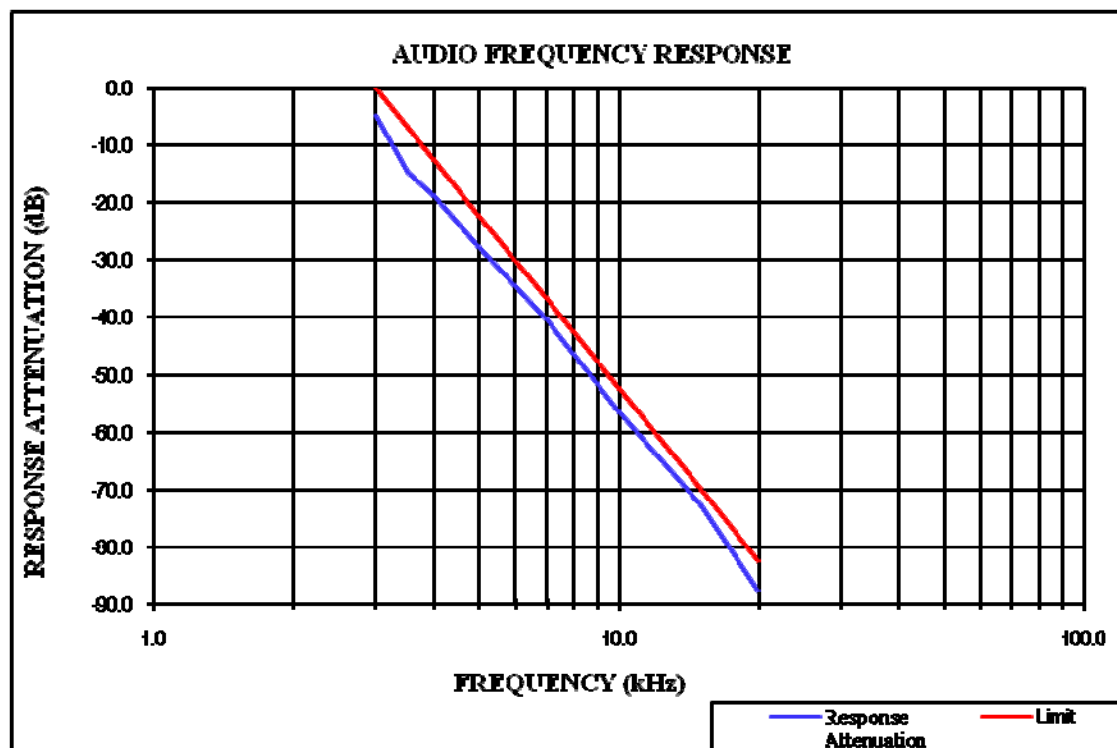
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	2.149	0.508	2.155	0.505	2.5
400	2.107	0.529	2.107	0.519	2.5
500	2.107	0.471	2.137	0.453	2.5
600	2.210	0.520	2.228	0.527	2.5
700	2.235	0.499	2.235	0.497	2.5
800	2.171	0.502	2.155	0.490	2.5
900	2.316	0.559	2.316	0.566	2.5
1000	2.223	0.508	2.247	0.508	2.5
1200	2.040	0.524	2.035	0.521	2.5
1400	2.035	0.533	2.047	0.535	2.5
1600	2.152	0.538	2.149	0.544	2.5
1800	2.156	0.608	2.150	0.624	2.5
2000	2.204	0.543	2.216	0.563	2.5
2200	2.188	0.609	2.223	0.597	2.5
2400	2.291	0.618	2.281	0.630	2.5
2600	2.371	0.649	2.347	0.649	2.5
2800	2.369	0.724	2.384	0.724	2.5
3000	2.325	0.755	2.322	0.771	2.5



Audio Frequency Low Pass Filter Response – High Power

Carrier Frequency: 453.2125 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-4.7	0.0
3.5	-14.5	-6.7
4.0	-18.6	-12.5
5.0	-27.5	-22.2
7.0	-40.5	-36.8
10.0	-56.5	-52.3
15.0	-72.8	-69.9
20.0	-87.8	-82.5

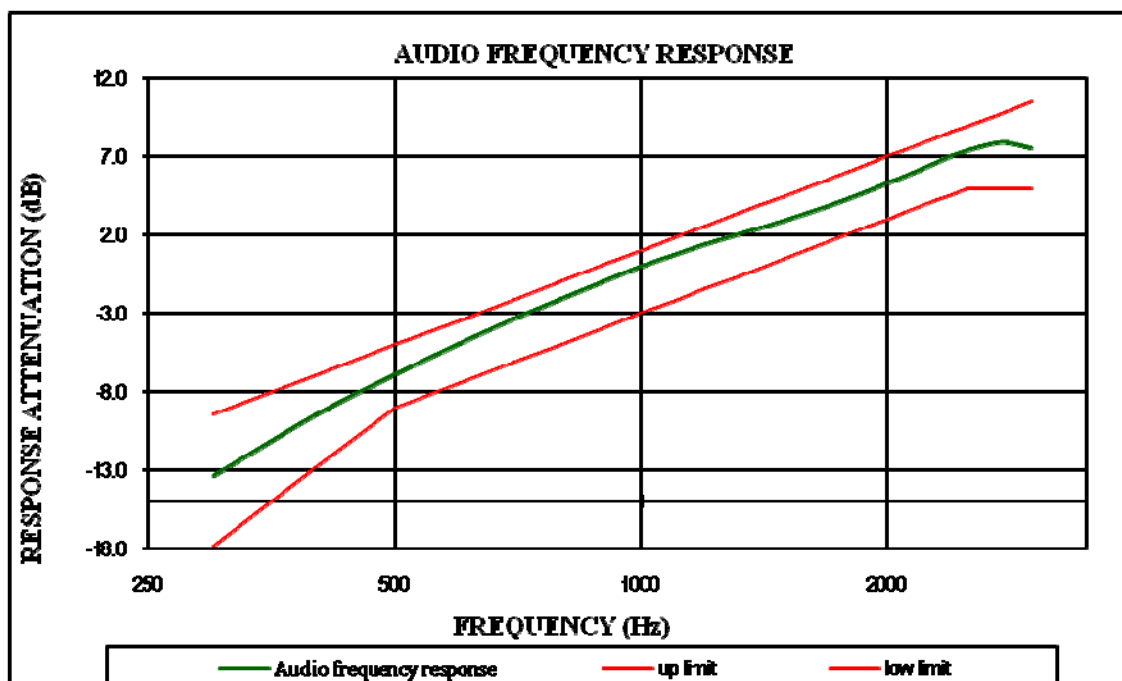


25 kHz:

Audio Frequency Response – High Power

Carrier Frequency: 454.0125 MHz

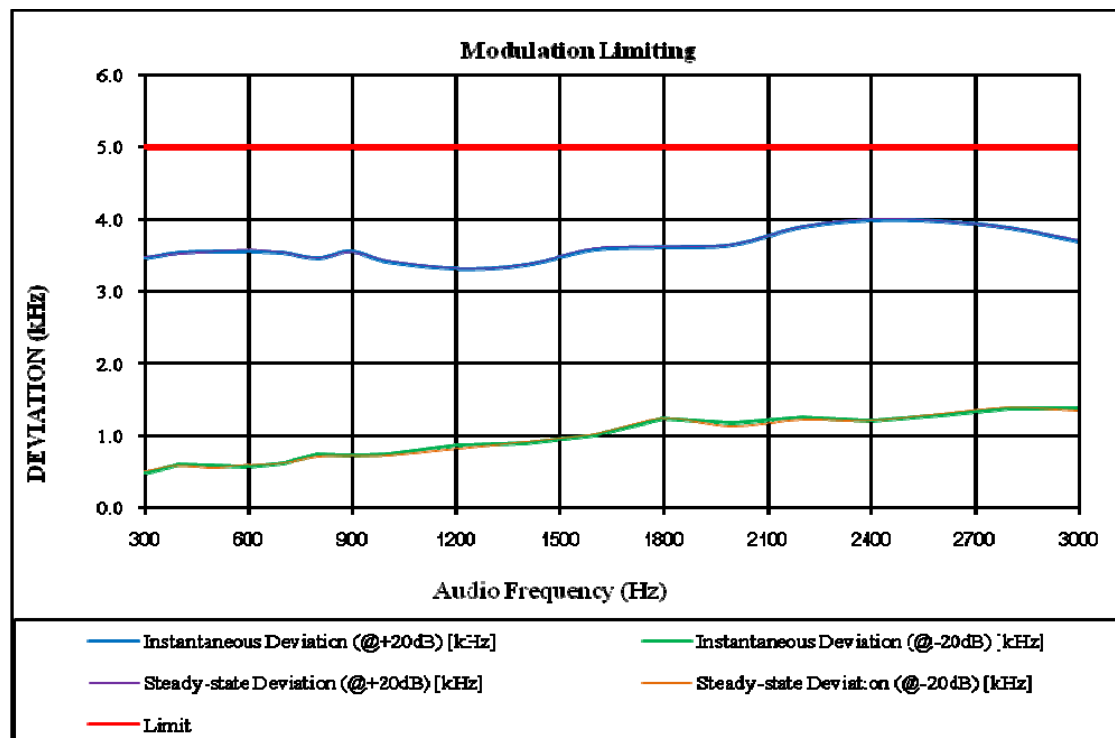
Modulation Frequency (Hz)	Response data (dB)
300	-13.36
400	-9.49
500	-6.88
600	-4.92
700	-3.34
800	-2.05
900	-0.96
1000	0.00
1200	1.41
1400	2.46
1600	3.44
1800	4.35
2000	5.28
2200	6.21
2400	7.07
2600	7.65
2800	7.89
3000	7.53



MODULATION LIMITING – High Power

Carrier Frequency: 454.0125 MHz

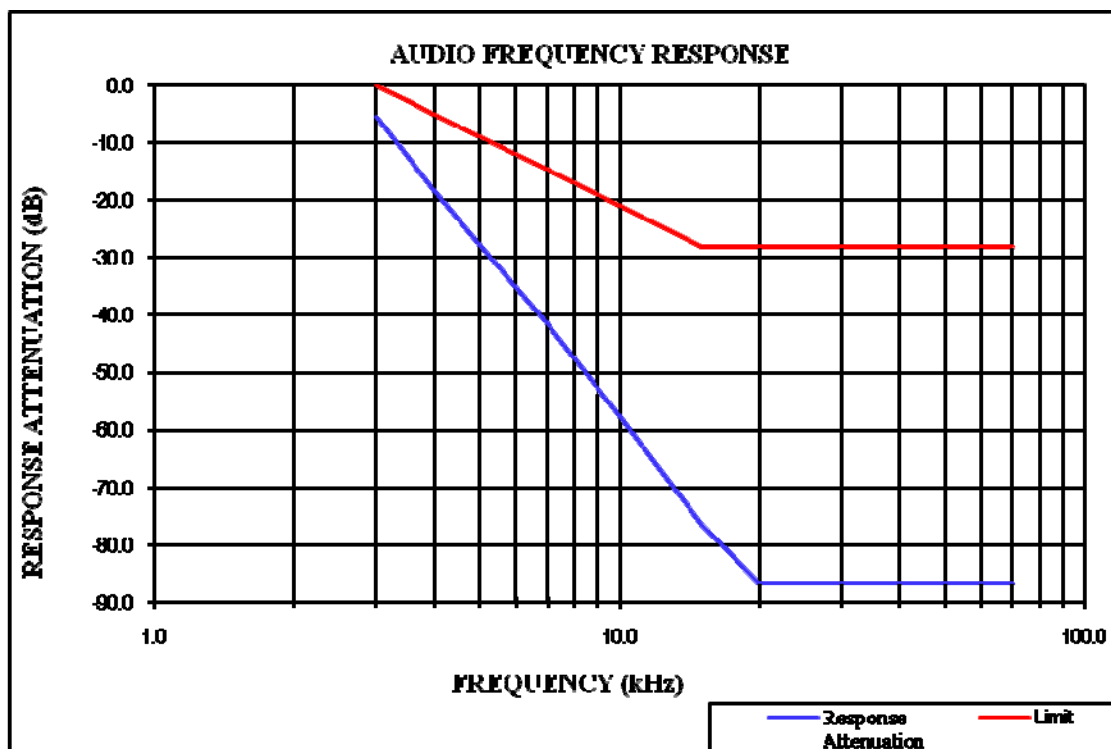
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	3.455	0.473	3.470	0.505	5
400	3.536	0.598	3.521	0.588	5
500	3.552	0.582	3.552	0.554	5
600	3.549	0.581	3.584	0.599	5
700	3.532	0.625	3.531	0.615	5
800	3.464	0.743	3.464	0.715	5
900	3.555	0.731	3.540	0.725	5
1000	3.416	0.739	3.431	0.731	5
1200	3.315	0.867	3.315	0.822	5
1400	3.367	0.906	3.361	0.911	5
1600	3.577	1.015	3.602	1.017	5
1800	3.617	1.235	3.617	1.243	5
2000	3.651	1.171	3.643	1.139	5
2200	3.891	1.261	3.891	1.229	5
2400	3.991	1.212	4.003	1.214	5
2600	3.978	1.293	3.978	1.309	5
2800	3.883	1.381	3.880	1.397	5
3000	3.686	1.383	3.711	1.348	5



Audio Frequency Low Pass Filter Response – High Power

Carrier Frequency: 454.0125 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-5.5	0.0
3.5	-12.5	-2.7
4.0	-18.2	-5.0
5.0	-27.9	-8.9
7.0	-41.6	-14.7
10.0	-57.5	-20.9
15.0	-76.5	-28.0
20.0	-86.8	-28.0
30.0	-86.7	-28.0
50.0	-86.6	-28.0
70.0	-86.8	-28.0



FCC §2.1049 & §22.357 & § 22.731 & §90.209 & §90.210 – OCCUPIED BANDWIDTH&EMISSION MASK

Applicable Standard

FCC §2.1049, §22.357, § 22.731, §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 shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.

Test Data**Environmental Conditions**

Temperature:	27.8°C
Relative Humidity:	69 %
ATM Pressure:	100.8 kPa
Tester:	James Chen
Test Date:	2020-08-31

Test Mode: Transmitting

Result: Compliance.

Channel Separation	Test Modulation	Test Frequency (MHz)	High Power Level		Low Power Level		Note
			99% Occupied Bandwidth (MHz)	26dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	26dB Emission Bandwidth (MHz)	
12.5kHz	FM	406.1125	5.200	10.400	5.200	10.400	FCC part 90
		453.2125	9.856	10.369	9.856	10.369	
		511.9875	9.900	10.400	9.900	10.400	
	4FSK	406.1125	7.200	9.100	6.900	9.500	
		453.2125	7.372	9.295	6.971	8.253	
		511.9875	7.200	9.600	7.000	8.300	
12.5kHz	FM	454.0125	9.900	10.300	9.800	10.400	FCC part 22
25kHz	FM	454.0125	10.600	15.800	10.600	15.800	
12.5kHz	4FSK	454.0125	7.100	9.900	7.000	8.600	

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

$$BW = 2M + 2D$$

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

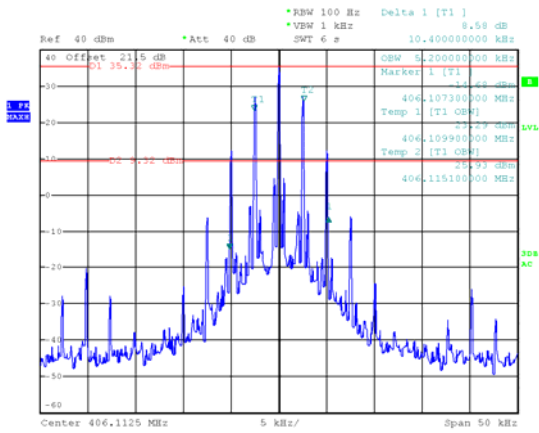
The 99% energy rule was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz.

F1D and F1E portion of the designator indicates digital information.

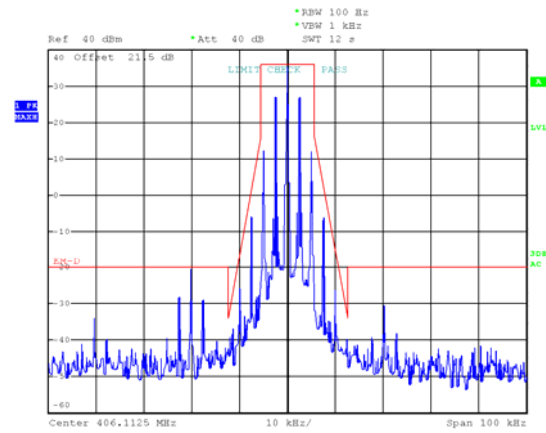
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

FCC part 90, FM, 12.5kHz High Power:

Low Channel, 406.1125 MHz

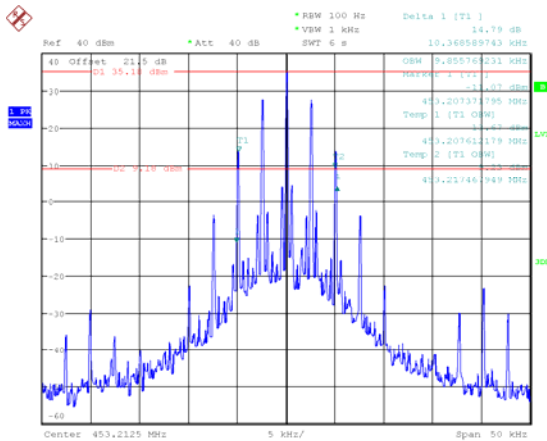


Date: 31.AUG.2020 19:29:19

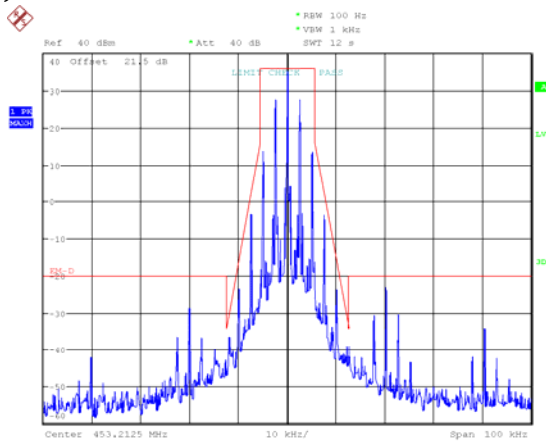


Date: 31.AUG.2020 19:38:47

Middle Channel, 453.2125 MHz

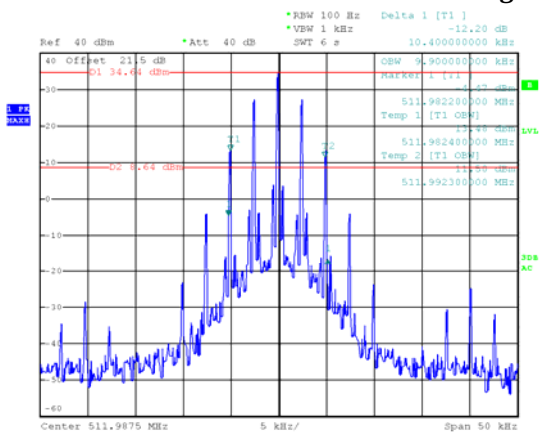


Date: 29.AUG.2020 00:38:01

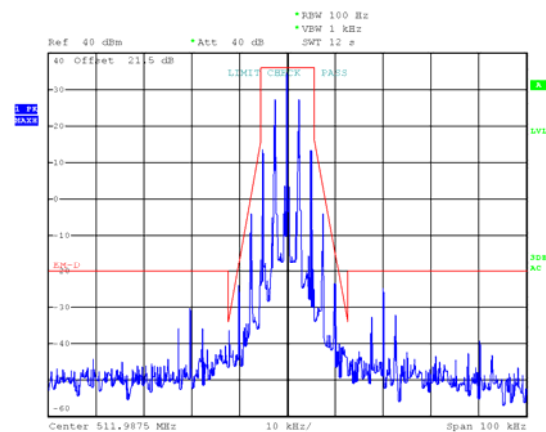


Date: 29.AUG.2020 00:33:09

High Channel, 511.9875 MHz



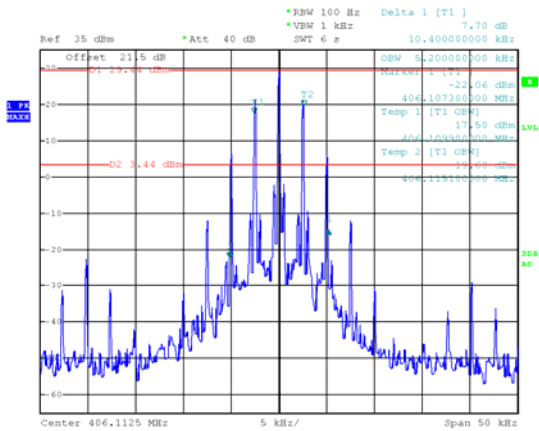
Date: 31.AUG.2020 18:55:22



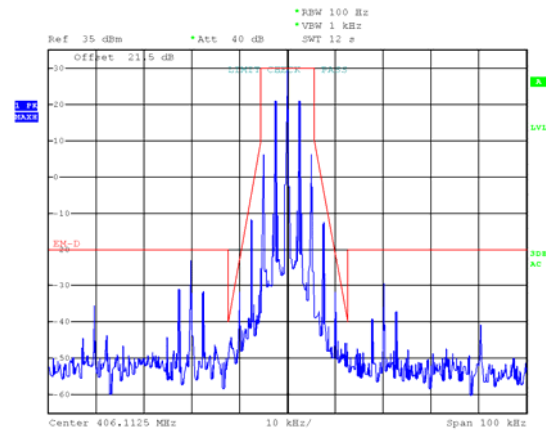
Date: 31.AUG.2020 18:56:46

FM,12.5kHz, Low Power:

Low Channel, 406.1125 MHz

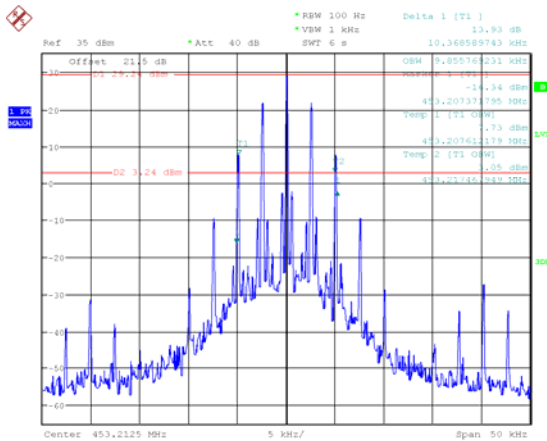


Date: 31.AUG.2020 19:30:20

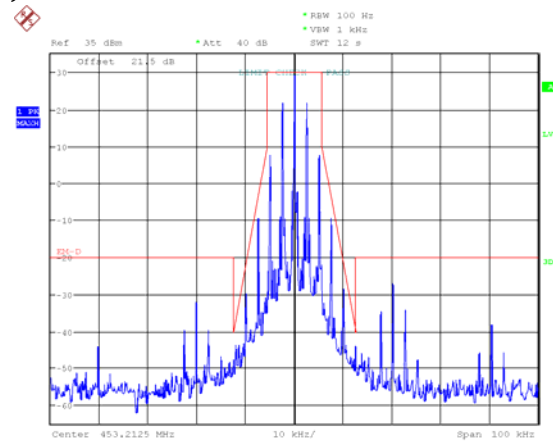


Date: 31.AUG.2020 19:39:37

Middle Channel, 453.2125 MHz

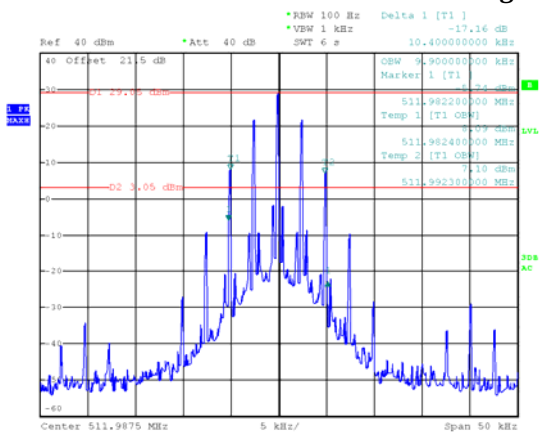


Date: 29.AUG.2020 00:31:03

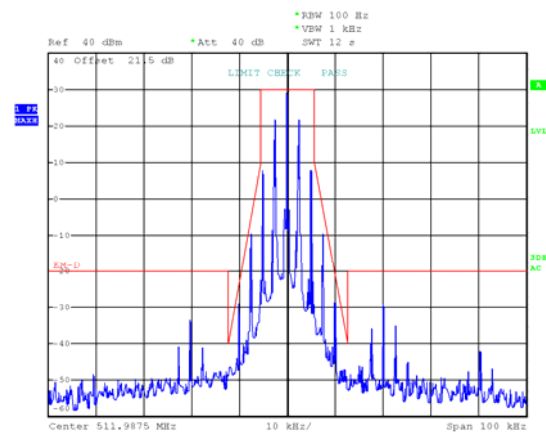


Date: 29.AUG.2020 00:32:10

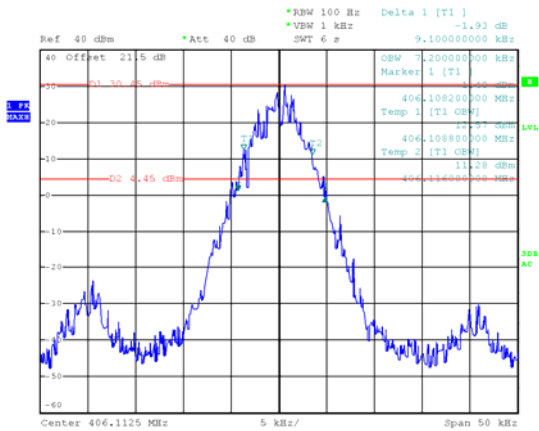
High Channel, 511.9875 MHz



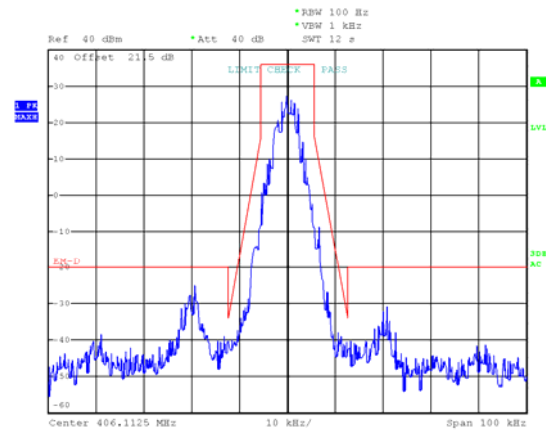
Date: 31.AUG.2020 18:59:06



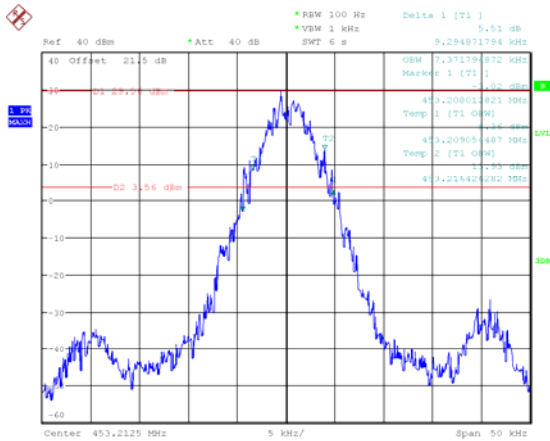
Date: 31.AUG.2020 18:57:58

4FSK, 12.5kHz High Power:**Low Channel, 406.1125 MHz**

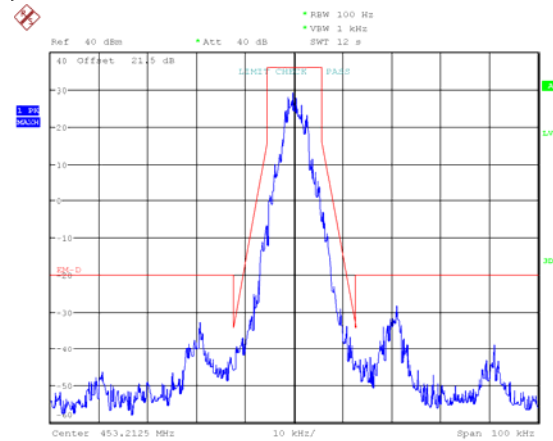
Date: 31.AUG.2020 19:32:46



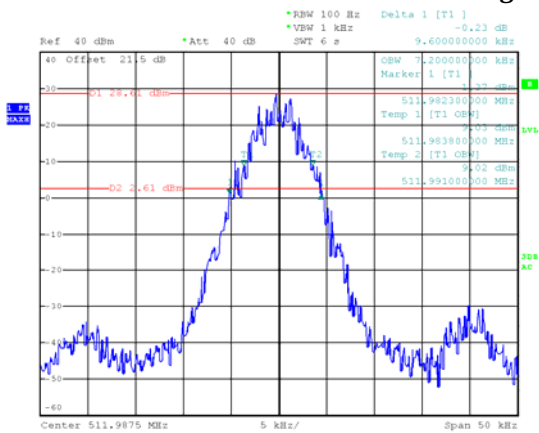
Date: 31.AUG.2020 19:37:28

Middle Channel, 453.2125 MHz

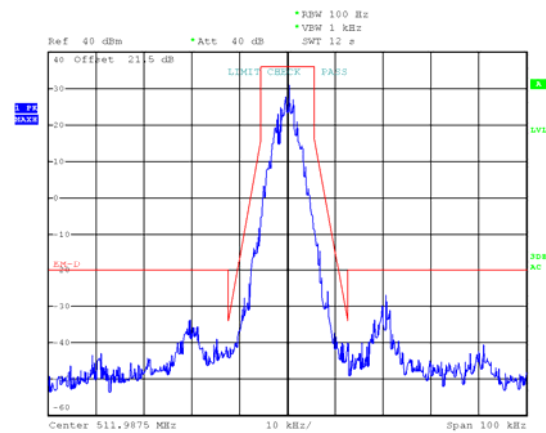
Date: 29.AUG.2020 00:38:40



Date: 29.AUG.2020 00:43:03

High Channel, 511.9875 MHz

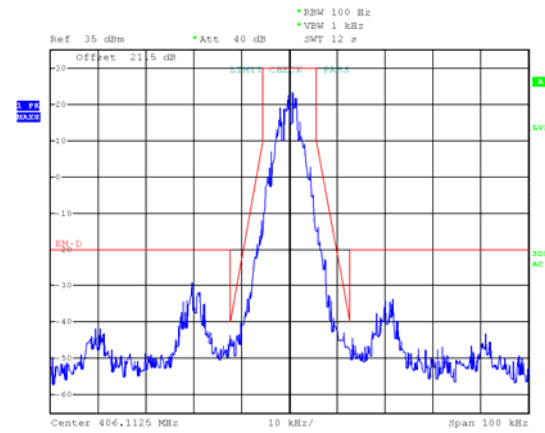
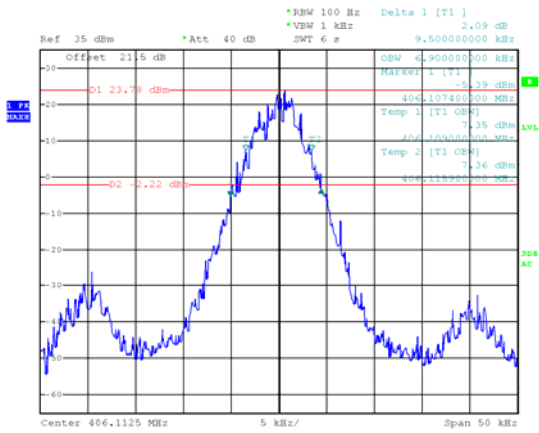
Date: 31.AUG.2020 19:02:32



Date: 31.AUG.2020 19:04:12

4FSK,12.5kHz, Low Power:

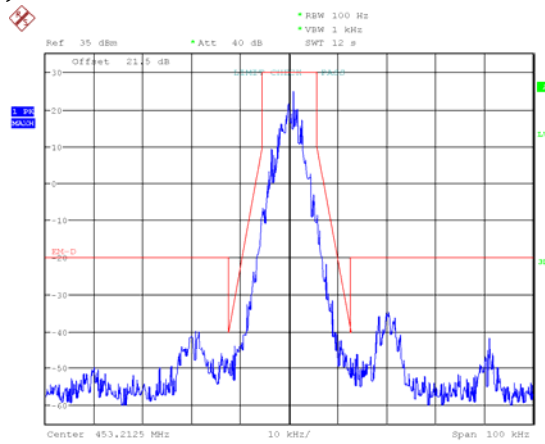
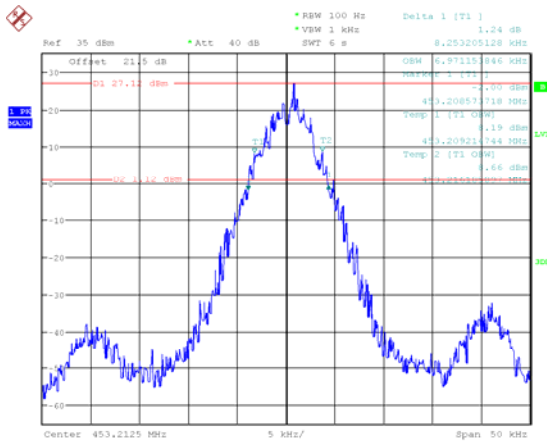
Low Channel, 406.1125 MHz



Date: 31.AUG.2020 19:34:30

Date: 31.AUG.2020 19:36:18

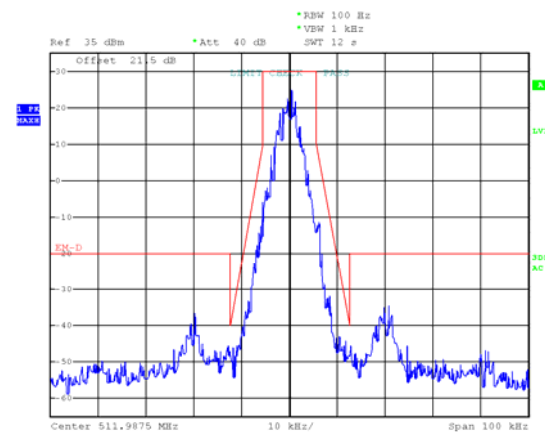
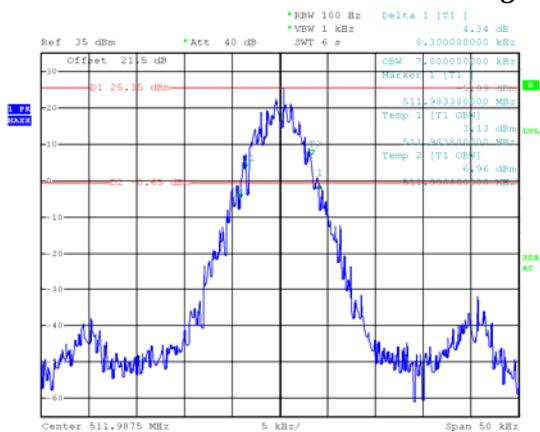
Middle Channel, 453.2125 MHz



Date: 29.AUG.2020 00:41:31

Date: 29.AUG.2020 00:44:22

High Channel, 511.9875 MHz

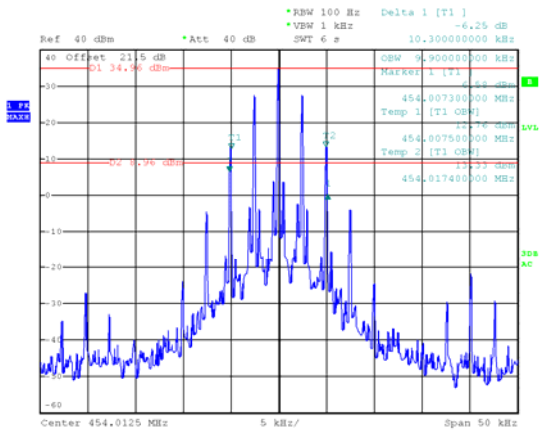


Date: 31.AUG.2020 19:10:50

Date: 31.AUG.2020 19:05:54

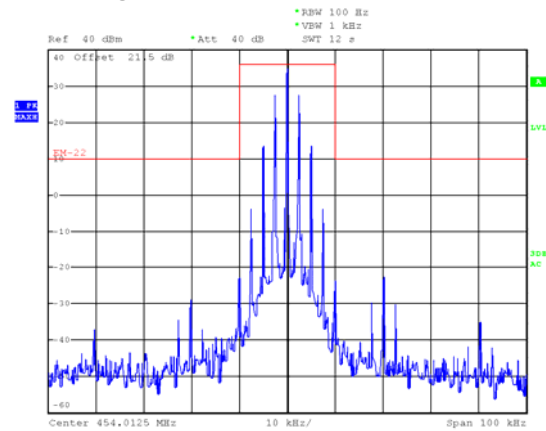
Part 22:

FM, 12.5kHz, 454.0125 MHz, High Power

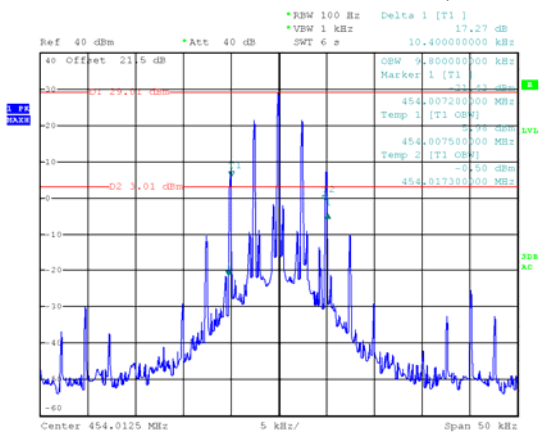


Date: 31.AUG.2020 19:42:40

Date: 31.AUG.2020 20:54:20

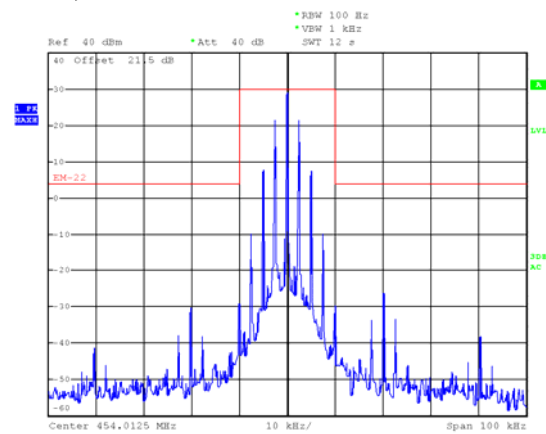


FM, 12.5kHz, 454.0125 MHz, Low Power

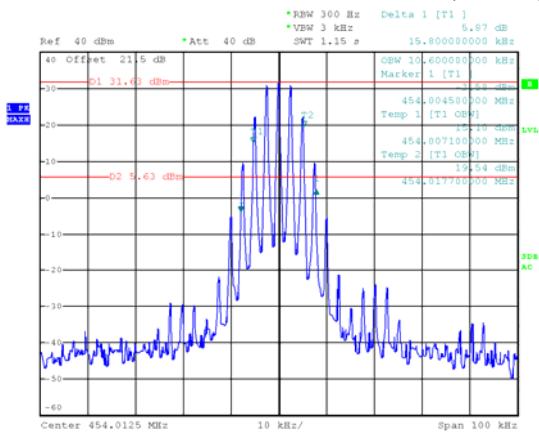


Date: 31.AUG.2020 19:45:32

Date: 31.AUG.2020 20:55:17

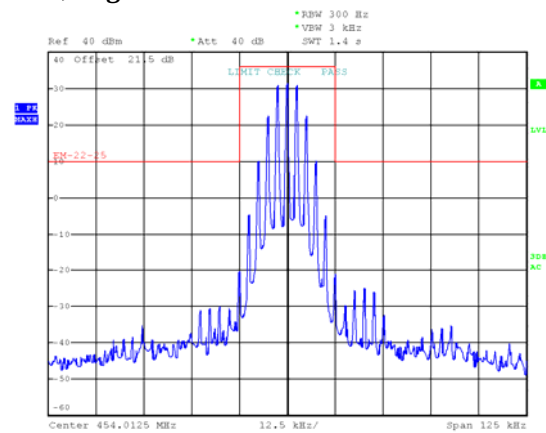


FM, 25kHz, 454.0125 MHz, High Power



Date: 31.AUG.2020 19:56:27

Date: 31.AUG.2020 20:59:26



FCC §2.1051 & §22.861& §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051, §22.861, 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 100 kHz 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**Environmental Conditions**

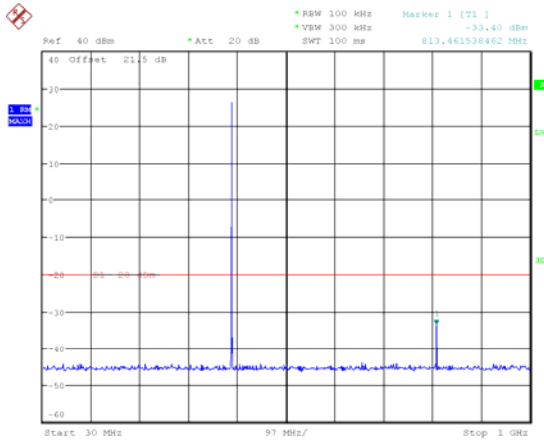
Temperature:	27.8°C
Relative Humidity:	69 %
ATM Pressure:	100.8 kPa
Tester:	James Chen
Test Date:	2020-08-31

Test Mode: Transmitting

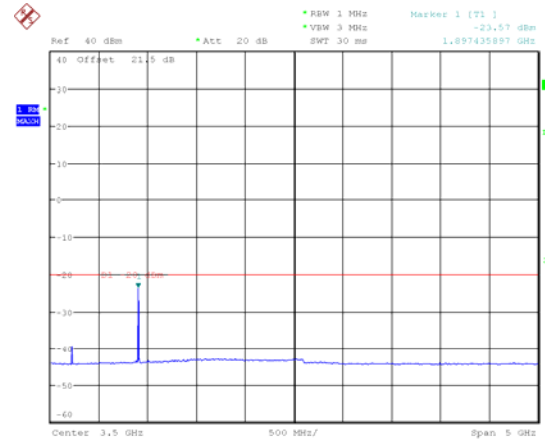
Test Result: Compliance, test performed at high power level with Band Rejector Filter, please refer to the following plots.

FCC part 90, FM, 12.5kHz:

Low Channel, 406.1125 MHz

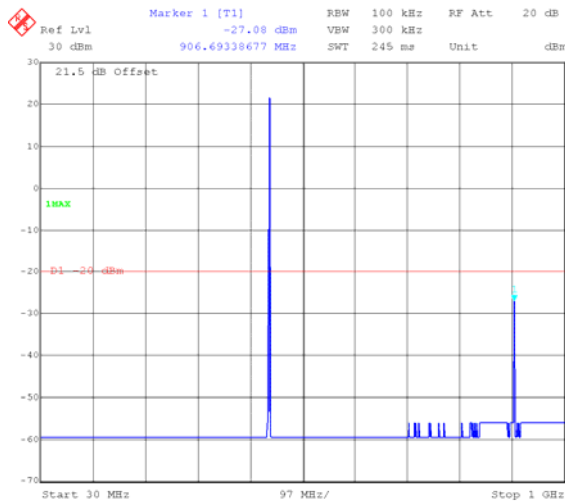


Date: 31.AUG.2020 21:42:04



Date: 31.AUG.2020 21:41:42

Middle Channel, 453.2125 MHz

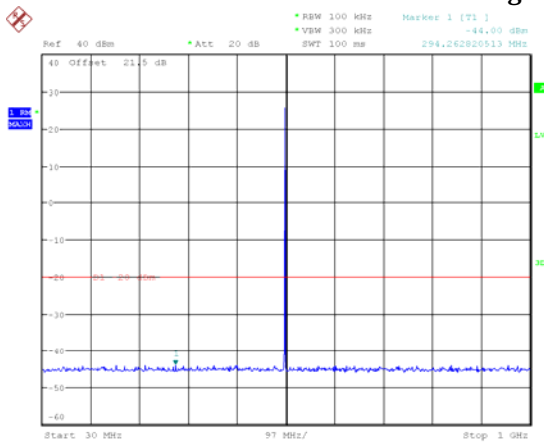


Date: 15.SEP.2020 19:33:05

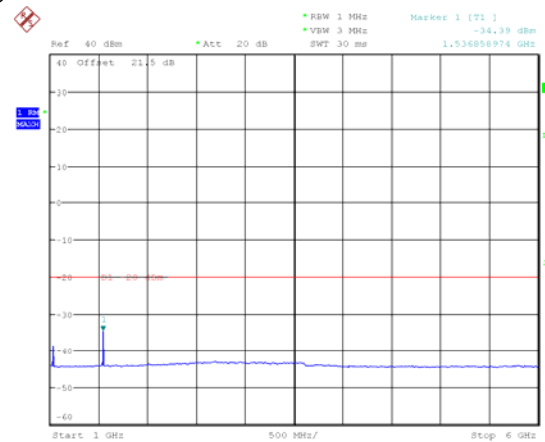


Date: 15.SEP.2020 19:34:01

High Channel, 511.9875 MHz



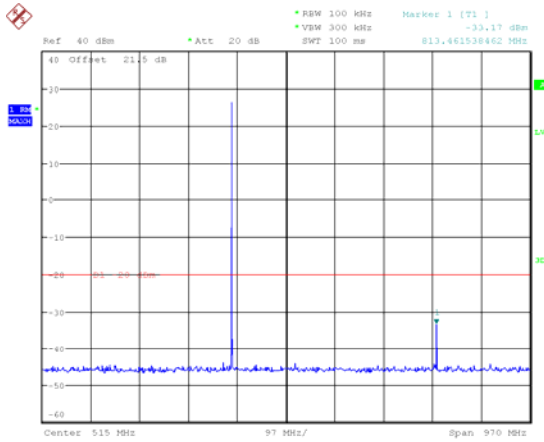
Date: 31.AUG.2020 21:46:21



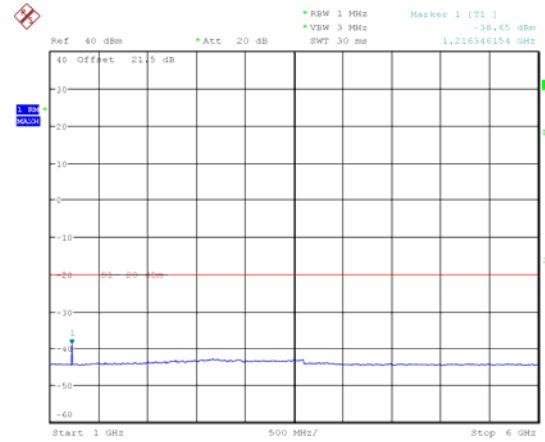
Date: 31.AUG.2020 21:46:38

4FSK, 12.5kHz:

Low Channel, 406.1125 MHz

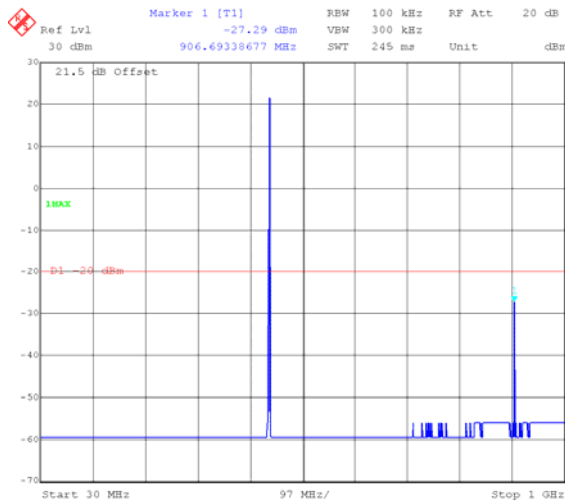


Date: 31.AUG.2020 21:44:31



Date: 31.AUG.2020 21:44:53

Middle Channel, 453.2125 MHz

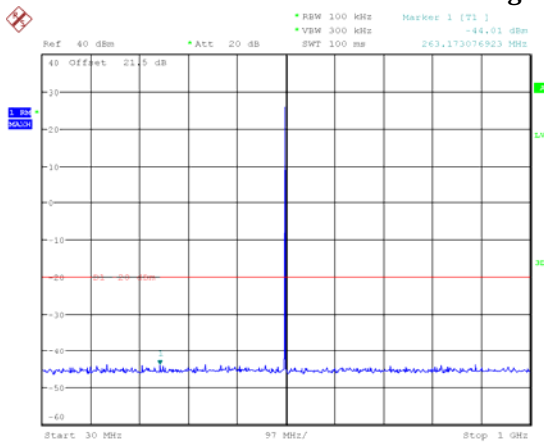


Date: 15.SEP.2020 19:31:55

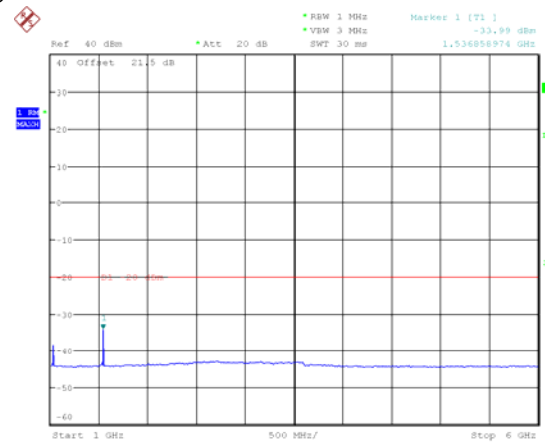


Date: 15.SEP.2020 19:34:23

High Channel, 511.9875 MHz



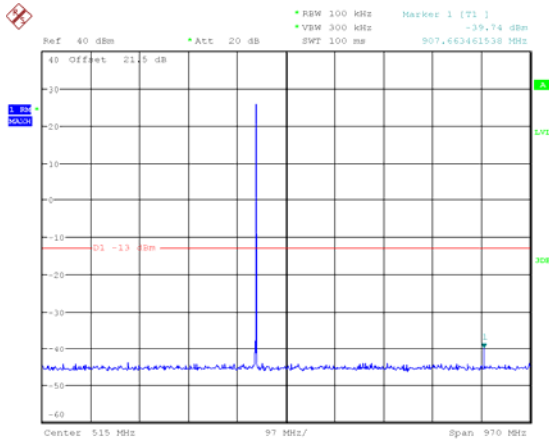
Date: 31.AUG.2020 21:47:15



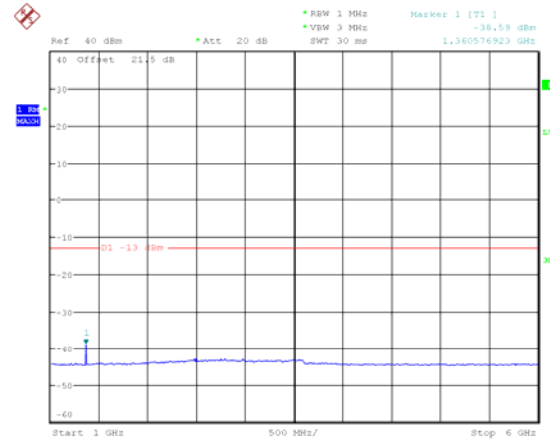
Date: 31.AUG.2020 21:47:49

Part 22:

FM,12.5kHz, 454.0125 MHz

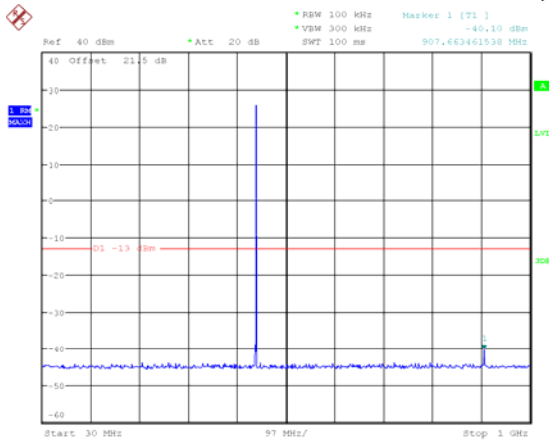


Date: 31.AUG.2020 21:50:49

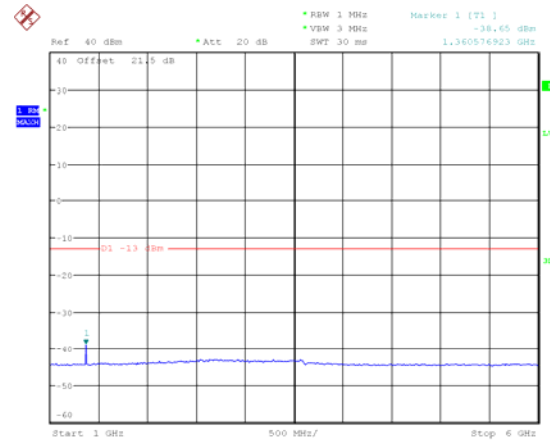


Date: 31.AUG.2020 21:51:04

FM,25kHz, 454.0125 MHz

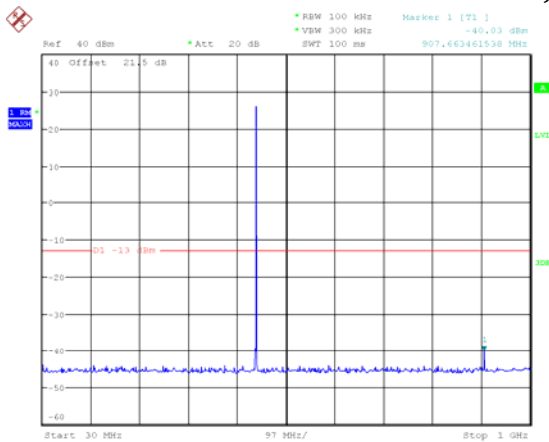


Date: 31.AUG.2020 21:54:59

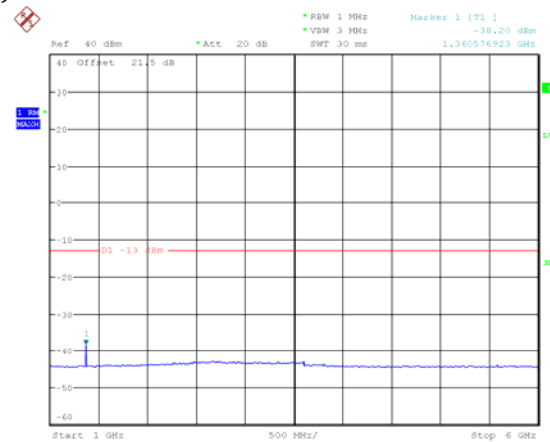


Date: 31.AUG.2020 21:55:17

4FSK,12.5kHz, 454.0125 MHz



Date: 31.AUG.2020 21:51:40



Date: 31.AUG.2020 21:51:57

FCC §2.1053; §22.861; §90.210 - RADIATED SPURIOUS EMISSIONS**Applicable Standard**

FCC §2.1053, §90.210, §22.861

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.

Test Data**Environmental Conditions**

Test Item:	Radiated Spurious Emissions Below 1GHz	Radiated Spurious Emissions Above 1GHz
Temperature:	28.1 °C	29 °C
Relative Humidity:	42%	60%
ATM Pressure:	100.2kPa	100.2kPa
Tester:	Asa Chen	Jia
Test Date:	2020-08-07	2020-08-07

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: 406.1125MHz-12.5 kHz, High Power								
812.23	H	68.48	-29.69	0.00	0.49	-30.18	-20.00	10.18
812.23	V	64.46	-30.64	0.00	0.49	-31.13	-20.00	11.13
1218.34	H	38.70	-64.43	7.48	1.11	-58.06	-20.00	38.06
1218.34	V	43.12	-61.07	7.48	1.11	-54.70	-20.00	34.70
1624.45	H	45.87	-58.54	10.27	0.70	-48.97	-20.00	28.97
1624.45	V	57.76	-47.25	10.27	0.70	-37.68	-20.00	17.68
2030.56	H	38.07	-64.52	11.82	1.12	-53.82	-20.00	33.82
2030.56	V	38.01	-64.86	11.82	1.12	-54.16	-20.00	34.16
2436.68	H	53.22	-49.40	12.59	1.27	-38.08	-20.00	18.08
2436.68	V	50.53	-52.22	12.59	1.27	-40.90	-20.00	20.90
2842.79	H	62.59	-38.70	13.44	1.36	-26.62	-20.00	6.62
2842.79	V	54.34	-47.19	13.44	1.36	-35.11	-20.00	15.11
3248.90	H	60.51	-38.72	13.60	1.58	-26.70	-20.00	6.70
3248.90	V	54.75	-44.51	13.60	1.58	-32.49	-20.00	12.49
3655.01	H	41.37	-57.09	14.04	1.68	-44.73	-20.00	24.73
3655.01	V	40.82	-57.63	14.04	1.68	-45.27	-20.00	25.27
4061.13	H	47.90	-49.97	13.82	1.38	-37.53	-20.00	17.53
4061.13	V	45.45	-52.53	13.82	1.38	-40.09	-20.00	20.09
4FSK,Frequency: 406.1125MHz-12.5 kHz, High Power								
812.23	H	69.47	-28.70	0.00	0.49	-29.19	-20.00	9.19
812.23	V	64.32	-30.78	0.00	0.49	-31.27	-20.00	11.27
1218.34	H	38.80	-64.33	7.48	1.11	-57.96	-20.00	37.96
1218.34	V	43.09	-61.10	7.48	1.11	-54.73	-20.00	34.73
1624.45	H	47.18	-57.23	10.27	0.70	-47.66	-20.00	27.66
1624.45	V	57.31	-47.70	10.27	0.70	-38.13	-20.00	18.13
2030.56	H	45.21	-57.38	11.82	1.12	-46.68	-20.00	26.68
2030.56	V	54.40	-48.47	11.82	1.12	-37.77	-20.00	17.77
2436.68	H	59.12	-43.50	12.59	1.27	-32.18	-20.00	12.18
2436.68	V	61.93	-40.82	12.59	1.27	-29.50	-20.00	9.50
2842.79	H	57.27	-44.02	13.44	1.36	-31.94	-20.00	11.94
2842.79	V	63.88	-37.65	13.44	1.36	-25.57	-20.00	5.57
3248.90	H	57.02	-42.21	13.60	1.58	-30.19	-20.00	10.19
3248.90	V	61.59	-37.67	13.60	1.58	-25.65	-20.00	5.65
3655.01	H	41.47	-56.99	14.04	1.68	-44.63	-20.00	24.63
3655.01	V	42.90	-55.55	14.04	1.68	-43.19	-20.00	23.19
4061.13	H	51.37	-46.50	13.82	1.38	-34.06	-20.00	14.06
4061.13	V	49.90	-48.08	13.82	1.38	-35.64	-20.00	15.64

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, High Power								
906.43	H	65.88	-29.49	0.00	0.51	-30.00	-20.00	10.00
906.43	V	60.80	-31.24	0.00	0.51	-31.75	-20.00	11.75
1359.64	H	44.14	-59.42	8.72	1.20	-51.90	-20.00	31.90
1359.64	V	53.14	-51.14	8.72	1.20	-43.62	-20.00	23.62
1812.85	H	45.06	-59.04	11.19	0.72	-48.57	-20.00	28.57
1812.85	V	51.58	-53.08	11.19	0.72	-42.61	-20.00	22.61
2266.06	H	51.51	-50.54	11.06	1.20	-40.68	-20.00	20.68
2266.06	V	48.77	-53.18	11.06	1.20	-43.32	-20.00	23.32
2719.28	H	55.13	-46.78	13.10	1.27	-34.95	-20.00	14.95
2719.28	V	50.02	-52.00	13.10	1.27	-40.17	-20.00	20.17
3172.49	H	55.47	-43.55	13.49	1.64	-31.70	-20.00	11.70
3172.49	V	53.93	-45.13	13.49	1.64	-33.28	-20.00	13.28
3625.70	H	44.98	-53.78	14.07	1.58	-41.29	-20.00	21.29
3625.70	V	41.18	-57.58	14.07	1.58	-45.09	-20.00	25.09
4078.91	H	42.19	-55.80	13.76	1.36	-43.40	-20.00	23.40
4078.91	V	43.13	-54.98	13.76	1.36	-42.58	-20.00	22.58
4532.13	H	56.49	-40.76	14.13	1.64	-28.27	-20.00	8.27
4532.13	V	53.94	-43.24	14.13	1.64	-30.75	-20.00	10.75
4FSK,Frequency: 453.2125MHz-12.5 kHz, High Power								
906.43	H	61.24	-34.13	0.00	0.51	-34.64	-20.00	14.64
906.43	V	57.90	-34.14	0.00	0.51	-34.65	-20.00	14.65
1359.64	H	41.20	-62.36	8.72	1.20	-54.84	-20.00	34.84
1359.64	V	53.44	-50.84	8.72	1.20	-43.32	-20.00	23.32
1812.85	H	52.97	-51.13	11.19	0.72	-40.66	-20.00	20.66
1812.85	V	56.74	-47.92	11.19	0.72	-37.45	-20.00	17.45
2266.06	H	58.04	-44.01	11.06	1.20	-34.15	-20.00	14.15
2266.06	V	59.41	-42.54	11.06	1.20	-32.68	-20.00	12.68
2719.28	H	54.55	-47.36	13.10	1.27	-35.53	-20.00	15.53
2719.28	V	62.19	-39.83	13.10	1.27	-28.00	-20.00	8.00
3172.49	H	65.87	-33.15	13.49	1.64	-21.30	-20.00	1.30
3172.49	V	61.49	-37.57	13.49	1.64	-25.72	-20.00	5.72
3625.70	H	45.08	-53.68	14.07	1.58	-41.19	-20.00	21.19
3625.70	V	42.58	-56.18	14.07	1.58	-43.69	-20.00	23.69
4078.91	H	57.13	-40.86	13.76	1.36	-28.46	-20.00	8.46
4078.91	V	58.16	-39.95	13.76	1.36	-27.55	-20.00	7.55
4532.13	H	54.99	-42.26	14.13	1.64	-29.77	-20.00	9.77
4532.13	V	49.71	-47.47	14.13	1.64	-34.98	-20.00	14.98

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: 511.9875MHz-12.5 kHz, High Power								
685.72	H	41.40	-59.72	0.00	0.38	-60.10	-20.00	40.10
363.56	V	36.77	-68.40	0.00	0.35	-68.75	-20.00	48.75
1023.98	H	41.25	-62.57	7.78	0.81	-55.60	-20.00	35.60
1023.98	V	45.32	-59.06	7.78	0.81	-52.09	-20.00	32.09
1535.96	H	48.72	-56.05	9.72	1.11	-47.44	-20.00	27.44
1535.96	V	56.12	-48.93	9.72	1.11	-40.32	-20.00	20.32
2047.95	H	57.87	-44.59	11.71	1.12	-34.00	-20.00	14.00
2047.95	V	61.99	-40.68	11.71	1.12	-30.09	-20.00	10.09
2559.94	H	53.16	-49.81	13.16	1.28	-37.93	-20.00	17.93
2559.94	V	56.00	-47.15	13.16	1.28	-35.27	-20.00	15.27
3071.93	H	60.13	-39.70	13.42	1.74	-28.02	-20.00	8.02
3071.93	V	61.65	-38.24	13.42	1.74	-26.56	-20.00	6.56
3583.91	H	45.61	-53.42	14.05	1.52	-40.89	-20.00	20.89
3583.91	V	45.51	-53.52	14.05	1.52	-40.99	-20.00	20.99
4095.90	H	62.13	-35.97	13.71	1.34	-23.60	-20.00	3.60
4095.90	V	54.00	-44.24	13.71	1.34	-31.87	-20.00	11.87
4607.89	H	58.00	-39.08	14.22	1.84	-26.70	-20.00	6.70
4607.89	V	54.01	-43.17	14.22	1.84	-30.79	-20.00	10.79
4FSK,Frequency: 511.9875MHz-12.5 kHz, High Power								
689.60	H	35.56	-65.50	0.00	0.38	-65.88	-20.00	45.88
363.68	V	37.79	-67.38	0.00	0.35	-67.73	-20.00	47.73
1023.98	H	43.45	-60.37	7.78	0.81	-53.40	-20.00	33.40
1023.98	V	47.76	-56.62	7.78	0.81	-49.65	-20.00	29.65
1535.96	H	49.14	-55.63	9.72	1.11	-47.02	-20.00	27.02
1535.96	V	56.82	-48.23	9.72	1.11	-39.62	-20.00	19.62
2047.95	H	56.21	-46.25	11.71	1.12	-35.66	-20.00	15.66
2047.95	V	64.09	-38.58	11.71	1.12	-27.99	-20.00	7.99
2559.94	H	64.40	-38.57	13.16	1.28	-26.69	-20.00	6.69
2559.94	V	68.30	-34.85	13.16	1.28	-22.97	-20.00	2.97
3071.93	H	62.92	-36.91	13.42	1.74	-25.23	-20.00	5.23
3071.93	V	64.73	-35.16	13.42	1.74	-23.48	-20.00	3.48
3583.91	H	45.80	-53.23	14.05	1.52	-40.70	-20.00	20.70
3583.91	V	46.26	-52.77	14.05	1.52	-40.24	-20.00	20.24
4095.90	H	61.38	-36.72	13.71	1.34	-24.35	-20.00	4.35
4095.90	V	59.27	-38.97	13.71	1.34	-26.60	-20.00	6.60
4607.89	H	60.60	-36.48	14.22	1.84	-24.10	-20.00	4.10
4607.89	V	54.73	-42.45	14.22	1.84	-30.07	-20.00	10.07

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, High Power								
908.03	H	61.79	-33.53	0.00	0.51	-34.04	-13.00	21.04
908.03	V	60.54	-31.45	0.00	0.51	-31.96	-13.00	18.96
1362.04	H	44.38	-59.17	8.73	1.20	-51.64	-13.00	38.64
1362.04	V	50.28	-53.98	8.73	1.20	-46.45	-13.00	33.45
1816.05	H	50.59	-53.46	11.21	0.73	-42.98	-13.00	29.98
1816.05	V	56.19	-48.42	11.21	0.73	-37.94	-13.00	24.94
2270.06	H	46.59	-55.47	11.08	1.20	-45.59	-13.00	32.59
2270.06	V	54.26	-47.70	11.08	1.20	-37.82	-13.00	24.82
2724.08	H	56.66	-45.23	13.10	1.28	-33.41	-13.00	20.41
2724.08	V	62.25	-39.77	13.10	1.28	-27.95	-13.00	14.95
3178.09	H	55.91	-43.04	13.51	1.63	-31.16	-13.00	18.16
3178.09	V	55.07	-43.92	13.51	1.63	-32.04	-13.00	19.04
3632.10	H	46.26	-52.44	14.07	1.61	-39.98	-13.00	26.98
3632.10	V	43.62	-55.07	14.07	1.61	-42.61	-13.00	29.61
4086.11	H	60.33	-37.71	13.74	1.36	-25.33	-13.00	12.33
4086.11	V	54.30	-43.87	13.74	1.36	-31.49	-13.00	18.49
4540.13	H	55.40	-41.83	14.14	1.66	-29.35	-13.00	16.35
4540.13	V	52.02	-45.16	14.14	1.66	-32.68	-13.00	19.68
FM, Frequency: 454.0125MHz-25 kHz, High Power								
908.03	H	62.87	-32.45	0.00	0.51	-32.96	-13.00	19.96
908.03	V	63.40	-28.59	0.00	0.51	-29.10	-13.00	16.1
1362.04	H	43.56	-59.99	8.73	1.20	-52.46	-13.00	39.46
1362.04	V	48.11	-56.15	8.73	1.20	-48.62	-13.00	35.62
1816.05	H	50.52	-53.53	11.21	0.73	-43.05	-13.00	30.05
1816.05	V	57.01	-47.60	11.21	0.73	-37.12	-13.00	24.12
2270.06	H	48.91	-53.15	11.08	1.20	-43.27	-13.00	30.27
2270.06	V	52.22	-49.74	11.08	1.20	-39.86	-13.00	26.86
2724.08	H	56.83	-45.06	13.10	1.28	-33.24	-13.00	20.24
2724.08	V	61.12	-40.90	13.10	1.28	-29.08	-13.00	16.08
3178.09	H	55.04	-43.91	13.51	1.63	-32.03	-13.00	19.03
3178.09	V	54.23	-44.76	13.51	1.63	-32.88	-13.00	19.88
3632.10	H	44.30	-54.40	14.07	1.61	-41.94	-13.00	28.94
3632.10	V	43.79	-54.90	14.07	1.61	-42.44	-13.00	29.44
4086.11	H	60.56	-37.48	13.74	1.36	-25.10	-13.00	12.1
4086.11	V	54.92	-43.25	13.74	1.36	-30.87	-13.00	17.87
4540.13	H	57.12	-40.11	14.14	1.66	-27.63	-13.00	14.63
4540.13	V	51.44	-45.74	14.14	1.66	-33.26	-13.00	20.26

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, High Power								
908.03	H	61.15	-34.17	0.00	0.51	-34.68	-13.00	21.68
908.03	V	62.78	-29.21	0.00	0.51	-29.72	-13.00	16.72
1362.04	H	44.32	-59.23	8.73	1.20	-51.70	-13.00	38.7
1362.04	V	49.52	-54.74	8.73	1.20	-47.21	-13.00	34.21
1816.05	H	51.24	-52.81	11.21	0.73	-42.33	-13.00	29.33
1816.05	V	58.97	-45.64	11.21	0.73	-35.16	-13.00	22.16
2270.06	H	49.87	-52.19	11.08	1.20	-42.31	-13.00	29.31
2270.06	V	53.62	-48.34	11.08	1.20	-38.46	-13.00	25.46
2724.08	H	57.36	-44.53	13.10	1.28	-32.71	-13.00	19.71
2724.08	V	63.58	-38.44	13.10	1.28	-26.62	-13.00	13.62
3178.09	H	57.16	-41.79	13.51	1.63	-29.91	-13.00	16.91
3178.09	V	54.16	-44.83	13.51	1.63	-32.95	-13.00	19.95
3632.10	H	45.68	-53.02	14.07	1.61	-40.56	-13.00	27.56
3632.10	V	44.32	-54.37	14.07	1.61	-41.91	-13.00	28.91
4086.11	H	44.17	-53.87	13.74	1.36	-41.49	-13.00	28.49
4086.11	V	45.00	-53.17	13.74	1.36	-40.79	-13.00	27.79
4540.13	H	56.39	-40.84	14.14	1.66	-28.36	-13.00	15.36
4540.13	V	54.11	-43.07	14.14	1.66	-30.59	-13.00	17.59

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

FCC §2.1055 & § 22.355 & §90.213- FREQUENCY STABILITY**Applicable Standard**

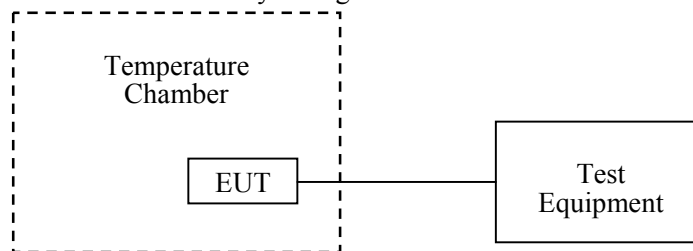
FCC §2.1055, § 22.355, §90.213

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 communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The 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 communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

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

Temperature:	26.9°C
Relative Humidity:	63 %
ATM Pressure:	100 kPa
Tester:	James Chen
Test Date:	2020-09-01

Test Mode: Transmitting(the worst is high power level)

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	7.4	453.2130406	1.19
-20	7.4	453.2124760	-0.05
-10	7.4	453.2126406	0.31
0	7.4	453.2124360	-0.14
10	7.4	453.2124750	-0.06
20	7.4	453.2124600	-0.09
30	7.4	453.2124680	-0.07
40	7.4	453.2124550	-0.10
50	7.4	453.2129006	0.88
20	6.2	453.2124280	-0.16
20	8.4	453.2128406	0.75

4FSK,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.4	453.2126806	0.40
-20	7.4	453.2124760	-0.05
-10	7.4	453.2124600	-0.09
0	7.4	453.2128206	0.71
10	7.4	453.2124750	-0.06
20	7.4	453.2128006	0.66
30	7.4	453.2124680	-0.07
40	7.4	453.2124550	-0.10
50	7.4	453.2130406	1.19
20	6.2	453.2124280	-0.16
20	8.4	453.2128006	0.66

FCC Part 22:

FM, 12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.4	454.0129203	0.93
-20	7.4	454.0125603	0.13
-10	7.4	454.0123850	-0.25
0	7.4	454.0124500	-0.11
10	7.4	454.0124200	-0.18
20	7.4	454.0124200	-0.18
30	7.4	454.0124240	-0.17
40	7.4	454.0128503	0.77
50	7.4	454.0124110	-0.20
20	6.2	454.0124230	-0.17
20	8.4	454.0126503	0.33

4FSK, 12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.4	454.0126103	0.24
-20	7.4	454.0124020	-0.22
-10	7.4	454.0123850	-0.25
0	7.4	454.0124500	-0.11
10	7.4	454.0124200	-0.18
20	7.4	454.0126503	0.33
30	7.4	454.0124240	-0.17
40	7.4	454.0123003	-0.44
50	7.4	454.0124110	-0.20
20	6.2	454.0124230	-0.17
20	8.4	454.0124403	-0.13

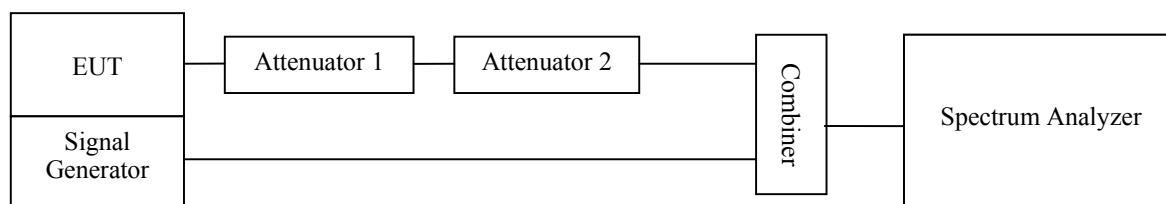
FM, 25kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	7.4	454.0126703	0.38
-20	7.4	454.0125603	0.13
-10	7.4	454.0125503	0.11
0	7.4	454.0126503	0.33
10	7.4	454.0125903	0.20
20	7.4	454.0125902	0.20
30	7.4	454.0127703	0.60
40	7.4	454.0123003	-0.44
50	7.4	454.0130503	1.21
20	6.2	454.0122003	-0.66
20	8.4	454.0126803	0.40

FCC §90.214 - 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**Environmental Conditions**

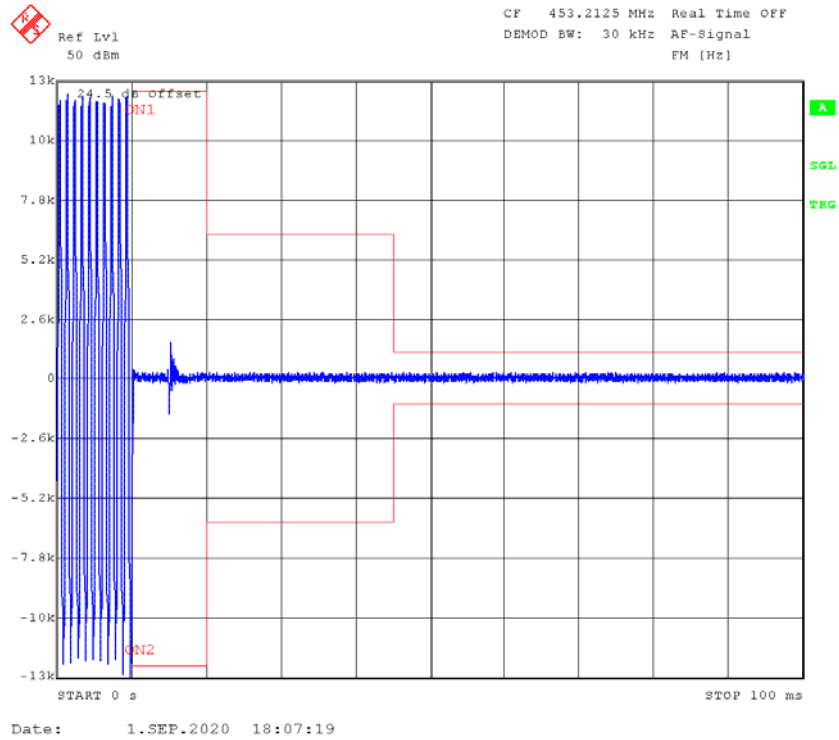
Temperature:	26.9°C
Relative Humidity:	63 %
ATM Pressure:	100 kPa
Tester:	James Chen
Test Date:	2020-09-01

Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	<5(t ₁)	±12.5 kHz	Pass
	<20(t ₂)	±6.25 kHz	
	<5(t ₃)	±12.5 kHz	

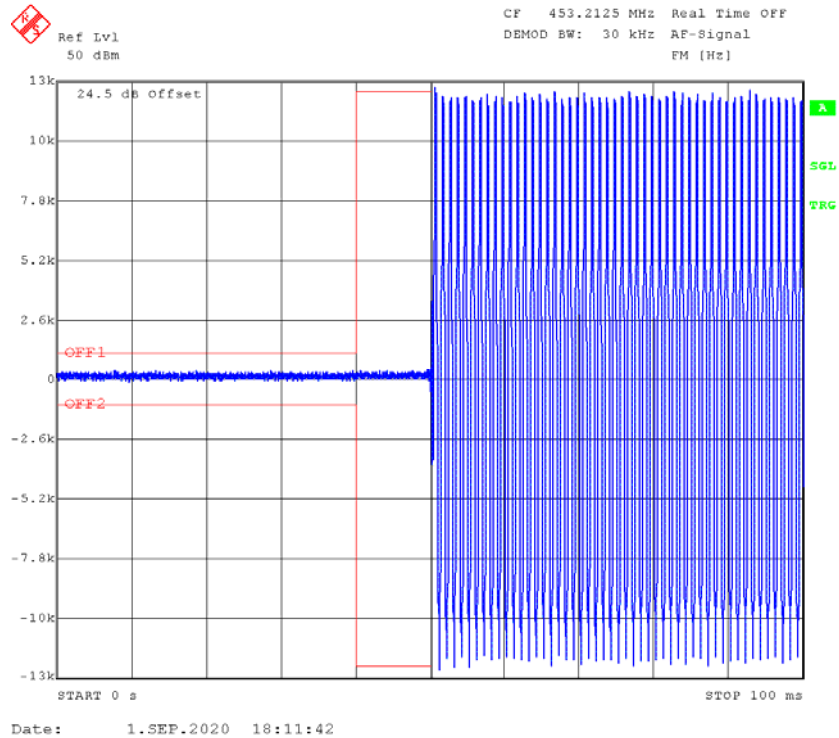
Please refer to the following plots.

High Power

Turn on



Turn off



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