

TEST REPORT

Applicant Name : Shenzhen Ysair Technology Co., LTD
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Report Number : RA221110-53086E-RF-00B
FCC ID: 2A3OORB89

Test Standard (s)

FCC PART 95

Sample Description

Product Type: Two Way Radio
Model No.: RB89
Multiple Model(s) No.: N/A
Trade Mark: RETEVIS
Date Received: 2022/11/10
Report Date: 2023/02/09

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Nick Fang
EMC Engineer

Approved By:



Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk "★". Customer model name, addresses, names, trademarks etc. are not considered data.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA221110-53086E-RF-00B	Original Report	2023/02/09

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

Frequency Range	462MHz Main channels: 462.5500-462.7250MHz 462MHz Interstitial channels: 462.5625-462.7125MHz 467MHz Main channels: 467.5500-467.7250MHz 467MHz Interstitial channels: 467.5625-467.7125MHz
Maximum Output Power (ERP)	462MHz Main channels: 35.72dBm 462MHz Interstitial channels: 36.32dBm 467MHz Main channels: 36.42dBm 467MHz Interstitial channels: 26.78dBm
Modulation Technique	FM
Antenna Specification*	2.0dBi(It is provided by the applicant)
Voltage Range	DC 7.4V from battery or DC 8.4V from charger
Sample serial number	1PRY-3 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This report is in accordance with Part 2 and Part 95, Subpart A & Subpart E of the Federal Communication Commissions rules.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with Part 95 Subpart A, Subpart E of the Federal Communication Commissions rules with TIA-603-E 2016, Land Mobile FM or PM-Communications Equipment-Measurement and Performance Standards, and ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		0.082×10^{-7}
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Temperature		1 °C
Humidity		6%
Supply voltages		0.4%

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

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

Description of Channel List

462MHz main channels

Channel No.	Channel Frequency (MHz)	Channel No.	Channel Frequency (MHz)
1	462.5500	2	462.5750
3	462.6000	4	462.6250
5	462.6500	6	462.6750
7	462.7000	8	462.7250

462MHz interstitial channels

Channel No.	Channel Frequency (MHz)	Channel No.	Channel Frequency (MHz)
1	462.5625	2	462.5875
3	462.6125	4	462.6375
5	462.6625	6	462.6875
7	462.7125	/	/

467MHz main channels

Channel No.	Channel Frequency (MHz)	Channel No.	Channel Frequency (MHz)
1	467.5500	2	467.5750
3	467.6000	4	467.6250
5	467.6500	6	467.6750
7	467.7000	8	467.7250

Note: The EUT transmit on these 467MHz main channels only when communicating through a repeater station or making brief test transmissions in accordance with § 95.319(c), and which testing is compliant to this report and will do not cause interference to the communications of other stations.

467MHz interstitial channels

Channel No.	Channel Frequency (MHz)	Channel No.	Channel Frequency (MHz)
1	467.5625	2	467.5875
3	467.6125	4	467.6375
5	467.6625	6	467.6875
7	467.7125	/	/

Equipment Modifications

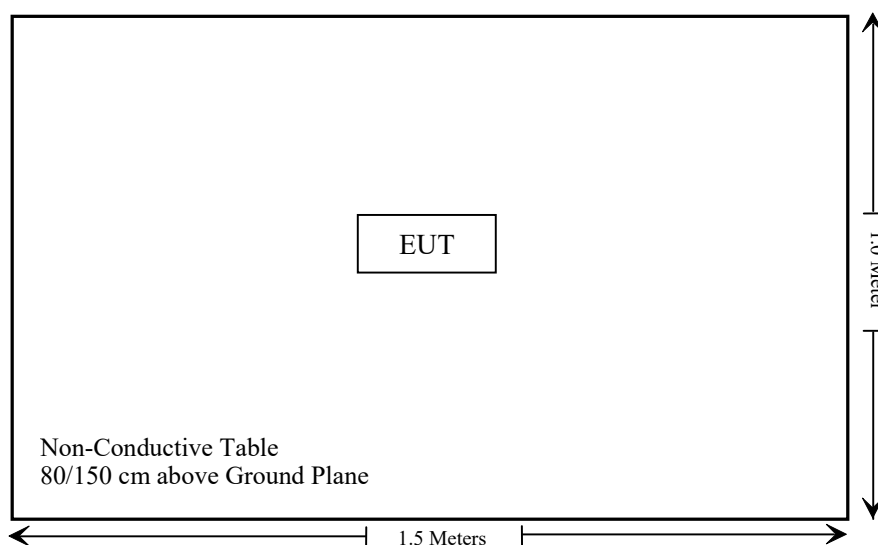
No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1093	RF Exposure	Compliant
§95.1787	GMRS additional requirements	Not Applicable
§2.1046, §95.1767	RF Output Power	Compliant
§2.1047, §95.1775	Modulation Characteristic	Compliant
§2.1049, §95.1773, §95.1779	Authorized Bandwidth & Emission Mask	Compliant
§2.1051, §95.1779	Spurious Emission at Antenna Terminal	Compliant
§2.1053, §95.1779	Spurious Radiated Emissions	Compliant
§2.1055(d), §95.1765	Frequency Stability	Compliant

Not Applicable: The product has not digital data transmissions function.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2020/01/05	2023/01/04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Unknown	RFCoaxialCable	No.16	N200	2022/11/25	2023/11/24
Agilent	Signal Generator	N5183A	MY5104075 5	2022/11/25	2023/11/24
CD	High Pass Filter	HPM-1.2/18G-60	110	2022/11/25	2023/11/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
SPECTRUM ANALYZER	Rohde & Schwarz	FSU26	200982	2022/07/04	2023/07/03
HP Agilent	RF Communication test set	8920B	3325U00859	2022/09/02	2023/09/01
Aeroflex/Weinschel	30dB Attenuator (Input 250W/Output 50W)	58-30-33	PS467	2022/11/25	2023/11/24
Mini-Circuits	Power Splitter	DC-18000MHz	SF10944151S	2022/11/25	2023/11/24
REALE	Temp. & Humid. Chamber	RHP-800BT	R20170318310	2022/11/23	2023/11/22
UNI-T	DC Power Supply	UTP8305M	Unknown	NCR	NCR
Fluke	Multi Meter	45	7664009	2022/12/14	2023/12/13
Unknown	RF Cable	Unknown	Unknown	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

§2.1093.

Test Result

Compliance, please refer to the SAR report: CR221153040-20.

FCC §2.1046 & §95.1767 - RF OUTPUT POWER

Applicable Standard

Per FCC §2.1046, and §95.1767, This section contains transmitting power limits for GMRS stations. The maximum transmitting power depends on which channels are being used and the type of station.

(a) 462/467 MHz main channels. The limits in this paragraph apply to stations transmitting on any of the 462 MHz main channels or any of the 467 MHz main channels. Each GMRS transmitter type must be capable of operating within the allowable power range. GMRS licensees are responsible for ensuring that their GMRS stations operate in compliance with these limits.

(1) The transmitter output power of mobile, repeater and base stations must not exceed 50 Watts.

(2) The transmitter output power of fixed stations must not exceed 15 Watts.

(b) 462 MHz interstitial channels. The effective radiated power (ERP) of mobile, hand-held portable and base stations transmitting on the 462 MHz interstitial channels must not exceed 5 Watts.

(c) 467 MHz interstitial channels. The effective radiated power (ERP) of hand-held portable units transmitting on the 467 MHz interstitial channels must not exceed 0.5 Watt. Each GMRS transmitter type capable of transmitting on these channels must be designed such that the ERP does not exceed 0.5 Watt.

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.

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 emissions were measured by the substitution.

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	63 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-12-05

Test Mode: Transmitting

Test Result: Compliance.

Please refer to the following tables and plots.

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
462.6375 MHz								
462.6375	10.52	51	1.7	H	9.1	19.62	37	-17.38
462.6375	31.32	200	2	V	5	36.32	37	-0.68
467.6375 MHz								
467.6375	8.72	115	1.4	H	8.3	17.02	27	-9.98
467.6375	21.38	127	1.8	V	5.4	26.78	27	-0.22
462.6000 MHz								
462.6000	5.82	73	1.5	H	9.1	14.92	47	-32.08
462.6000	30.72	264	1.9	V	5	35.72	47	-11.28
467.6000 MHz								
467.6000	7.02	108	1.2	H	8.3	15.32	47	-31.68
467.6000	31.02	245	2.1	V	5.4	36.42	47	-10.58

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: Substituted Level - Cable loss+ Antenna Gain

Margin = Absolute Level - Limit

FCC §2.1047 & §95.1775 - MODULATION CHARACTERISTIC

Applicable Standard

Per FCC §2.1047 and §95.1775: Each GMRS transmitter type must be designed to satisfy the modulation requirements in this section. Operation of GMRS stations must also be in compliance with these requirements.

(a) Main channels. The peak frequency deviation for emissions to be transmitted on the main channels must not exceed ± 5 kHz.

(b) 462 MHz interstitial channels. The peak frequency deviation for emissions to be transmitted on the 462 MHz interstitial channels must not exceed ± 5 kHz.

(c) 467 MHz interstitial channels. The peak frequency deviation for emissions to be transmitted on the 467 MHz interstitial channels must not exceed ± 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

(d) Overmodulation. Each GMRS transmitter type, except for a mobile station transmitter type with a transmitter power output of 2.5 W or less, must automatically prevent a higher than normal audio level from causing overmodulation.

(e) Audio filter. Each GMRS transmitter type must include audio frequency low pass filtering, unless it complies with the applicable paragraphs of §95.1779 (without filtering).

(1) The filter must be between the modulation limiter and the modulated stage of the transmitter.

(2) At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least $60 \log(f/3)$ dB more than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB more than the attenuation at 1 kHz.

Test Procedure

Test Method: TIA/EIA-603-E 2016

Test Data

Environmental Conditions

Temperature:	25.4 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Jesse on 2023-01-10.

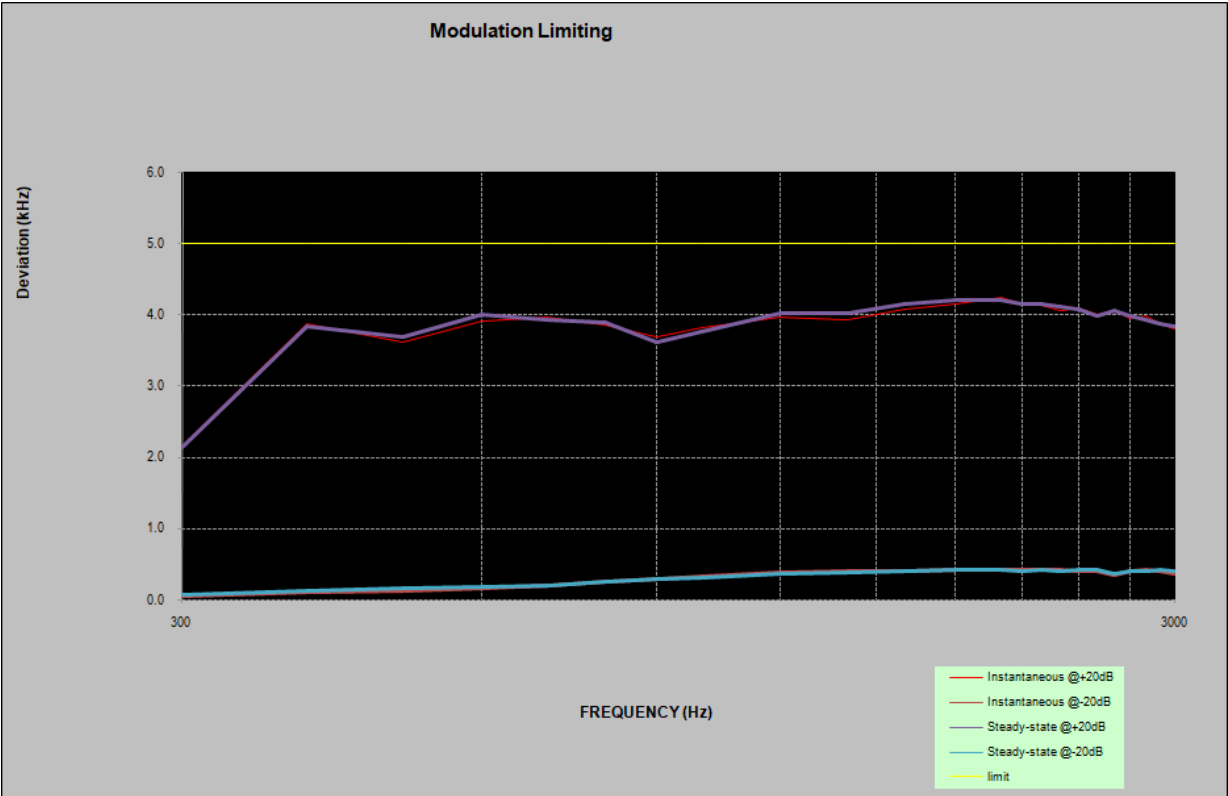
Please refer to the following tables and plots.

Test Mode: Transmitting

MODULATION LIMITING

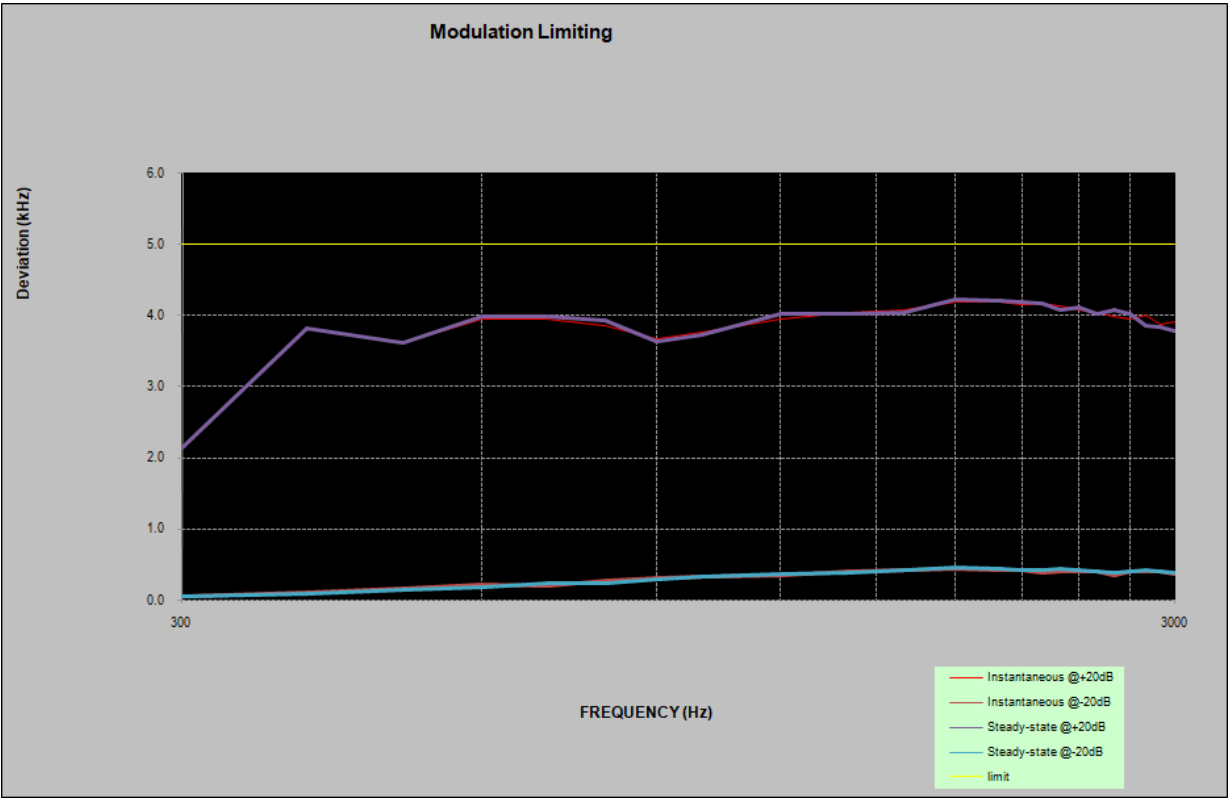
Carrier Frequency: 462.6000MHz

Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.150	0.042	2.127	0.068	5.000
400	3.872	0.093	3.834	0.125	5.000
500	3.605	0.127	3.685	0.156	5.000
600	3.912	0.166	3.988	0.180	5.000
700	3.964	0.203	3.929	0.202	5.000
800	3.846	0.249	3.895	0.248	5.000
900	3.680	0.281	3.607	0.277	5.000
1000	3.805	0.315	3.763	0.313	5.000
1200	3.955	0.375	4.020	0.354	5.000
1400	3.921	0.388	4.010	0.374	5.000
1600	4.078	0.403	4.152	0.405	5.000
1800	4.151	0.415	4.202	0.409	5.000
2000	4.242	0.409	4.201	0.418	5.000
2100	4.138	0.415	4.144	0.400	5.000
2200	4.135	0.420	4.149	0.409	5.000
2300	4.057	0.408	4.100	0.390	5.000
2400	4.098	0.401	4.077	0.408	5.000
2500	4.002	0.390	3.983	0.413	5.000
2600	4.045	0.350	4.058	0.360	5.000
2700	3.937	0.403	3.977	0.400	5.000
2800	3.971	0.424	3.920	0.403	5.000
2900	3.860	0.399	3.864	0.414	5.000
3000	3.787	0.368	3.822	0.389	5.000



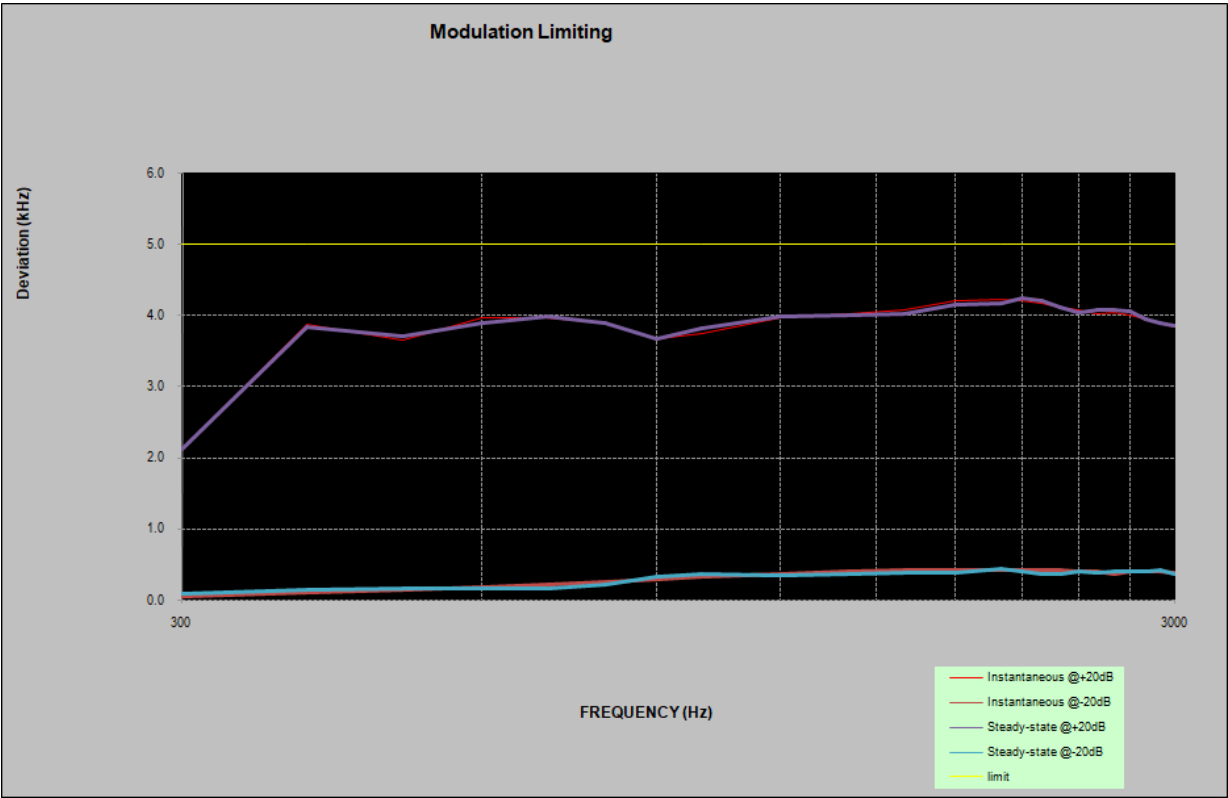
Carrier Frequency: 467.6000MHz

Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.159	0.049	2.128	0.055	5.000
400	3.806	0.102	3.806	0.092	5.000
500	3.604	0.152	3.611	0.147	5.000
600	3.944	0.205	3.970	0.175	5.000
700	3.941	0.186	3.977	0.224	5.000
800	3.844	0.262	3.928	0.230	5.000
900	3.661	0.305	3.628	0.288	5.000
1000	3.755	0.326	3.724	0.315	5.000
1200	3.944	0.349	4.018	0.362	5.000
1400	4.025	0.401	4.013	0.384	5.000
1600	4.070	0.423	4.037	0.412	5.000
1800	4.184	0.430	4.213	0.448	5.000
2000	4.176	0.424	4.200	0.430	5.000
2100	4.149	0.417	4.176	0.418	5.000
2200	4.165	0.387	4.158	0.420	5.000
2300	4.123	0.392	4.064	0.430	5.000
2400	4.068	0.396	4.115	0.417	5.000
2500	4.041	0.403	4.023	0.396	5.000
2600	3.987	0.340	4.069	0.377	5.000
2700	3.942	0.405	4.022	0.398	5.000
2800	4.001	0.400	3.856	0.409	5.000
2900	3.866	0.398	3.834	0.392	5.000
3000	3.897	0.365	3.782	0.385	5.000



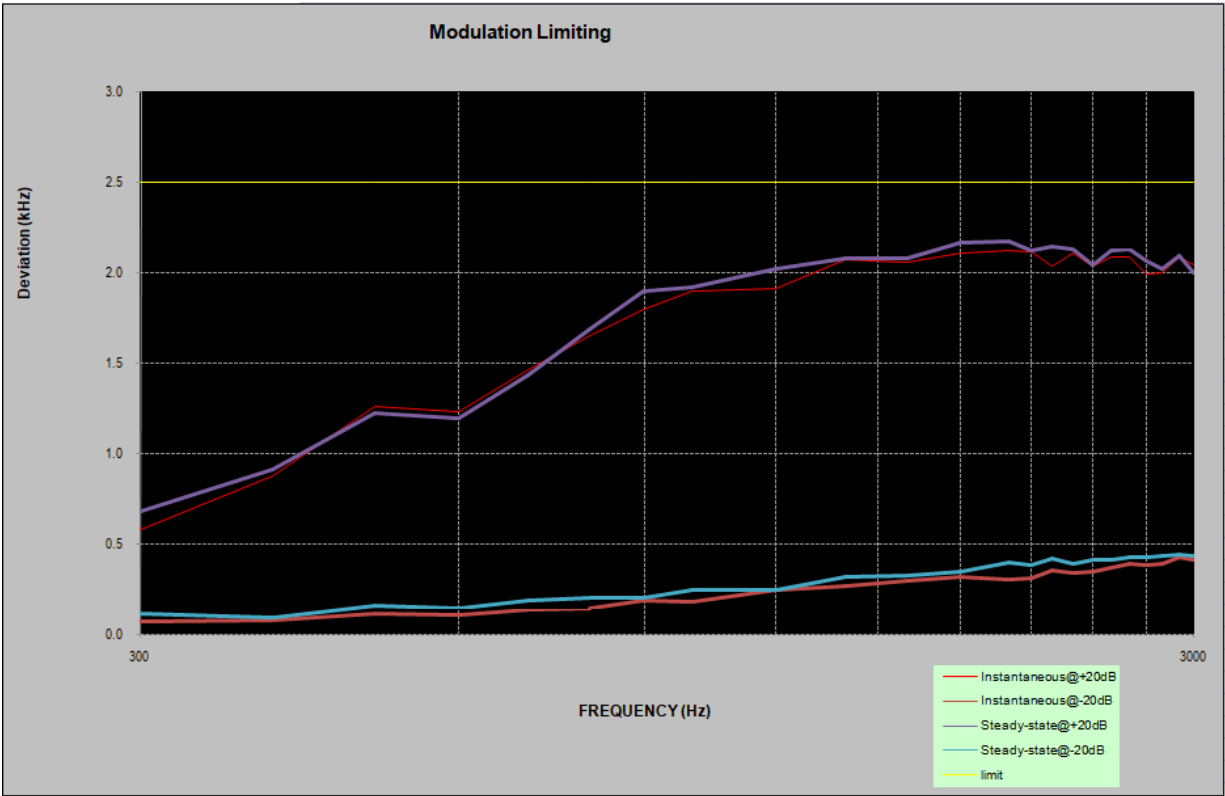
Carrier Frequency: 462.6375MHz

Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.122	0.045	2.119	0.085	5.000
400	3.864	0.104	3.835	0.139	5.000
500	3.645	0.146	3.697	0.155	5.000
600	3.958	0.178	3.886	0.162	5.000
700	3.957	0.213	3.973	0.164	5.000
800	3.886	0.252	3.877	0.212	5.000
900	3.666	0.291	3.662	0.325	5.000
1000	3.747	0.316	3.819	0.352	5.000
1200	3.960	0.365	3.974	0.347	5.000
1400	4.010	0.399	4.000	0.358	5.000
1600	4.068	0.412	4.007	0.383	5.000
1800	4.196	0.418	4.143	0.380	5.000
2000	4.223	0.416	4.172	0.440	5.000
2100	4.206	0.413	4.244	0.397	5.000
2200	4.158	0.411	4.208	0.360	5.000
2300	4.105	0.410	4.115	0.368	5.000
2400	4.075	0.406	4.031	0.394	5.000
2500	4.014	0.405	4.076	0.383	5.000
2600	4.029	0.359	4.074	0.391	5.000
2700	3.996	0.395	4.046	0.402	5.000
2800	3.937	0.398	3.943	0.405	5.000
2900	3.889	0.392	3.883	0.413	5.000
3000	3.823	0.378	3.848	0.361	5.000



Carrier Frequency: 467.6375MHz

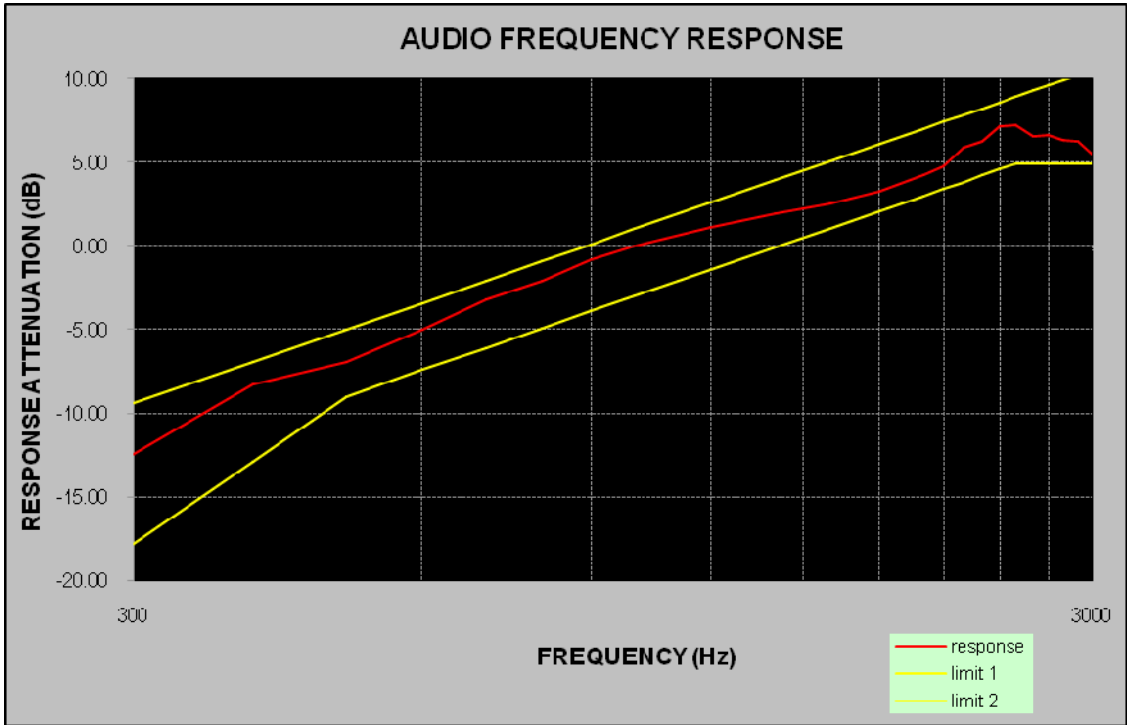
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	0.575	0.069	0.679	0.111	2.500
400	0.875	0.079	0.909	0.091	2.500
500	1.259	0.111	1.221	0.153	2.500
600	1.231	0.106	1.191	0.142	2.500
700	1.459	0.131	1.428	0.188	2.500
800	1.651	0.140	1.684	0.199	2.500
900	1.792	0.183	1.892	0.196	2.500
1000	1.898	0.175	1.917	0.242	2.500
1200	1.910	0.240	2.019	0.241	2.500
1400	2.069	0.262	2.077	0.315	2.500
1600	2.054	0.297	2.077	0.323	2.500
1800	2.108	0.316	2.163	0.342	2.500
2000	2.120	0.303	2.172	0.398	2.500
2100	2.109	0.308	2.118	0.384	2.500
2200	2.034	0.350	2.144	0.417	2.500
2300	2.103	0.335	2.125	0.389	2.500
2400	2.029	0.345	2.039	0.413	2.500
2500	2.082	0.367	2.123	0.407	2.500
2600	2.086	0.386	2.129	0.421	2.500
2700	1.991	0.378	2.062	0.425	2.500
2800	1.997	0.389	2.019	0.429	2.500
2900	2.082	0.424	2.087	0.440	2.500
3000	2.043	0.413	1.999	0.430	2.500



Audio Frequency Response

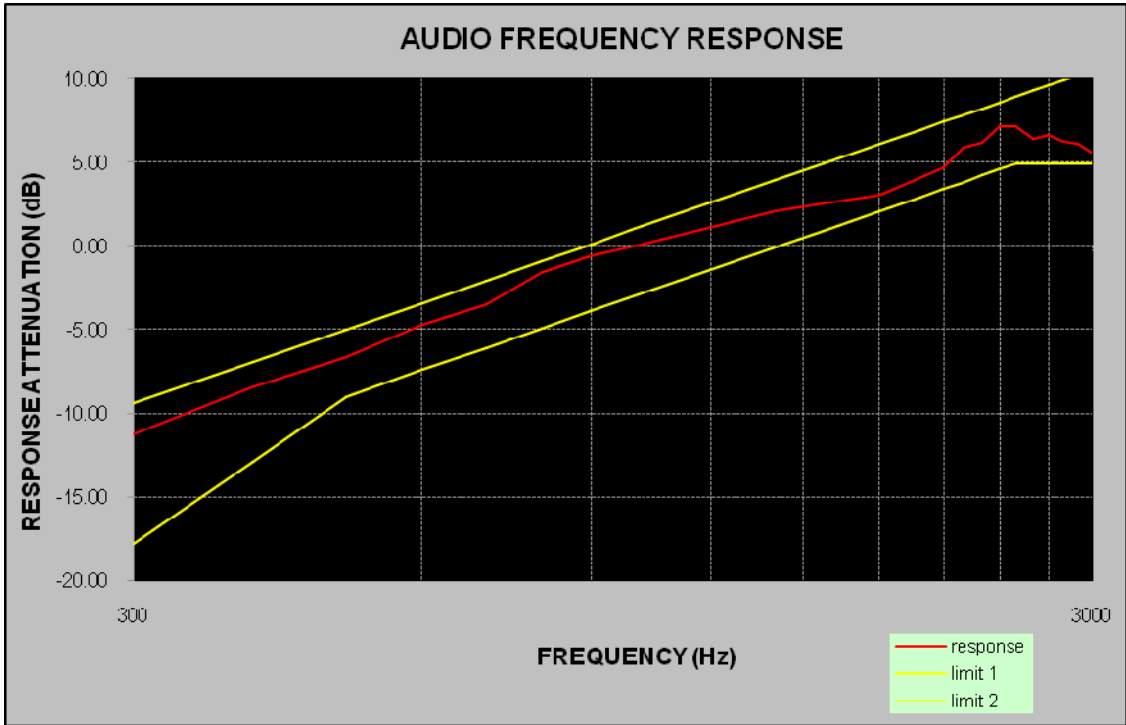
Carrier Frequency: 462.6000MHz

Audio Frequency (Hz)	Response (dB)
300	-12.47
400	-8.27
500	-6.97
600	-5.01
700	-3.22
800	-2.09
900	-0.86
1000	0.00
1200	1.14
1400	1.94
1600	2.54
1800	3.28
2000	4.22
2100	4.75
2200	5.89
2300	6.25
2400	7.15
2500	7.22
2600	6.55
2700	6.62
2800	6.30
2900	6.29
3000	5.53



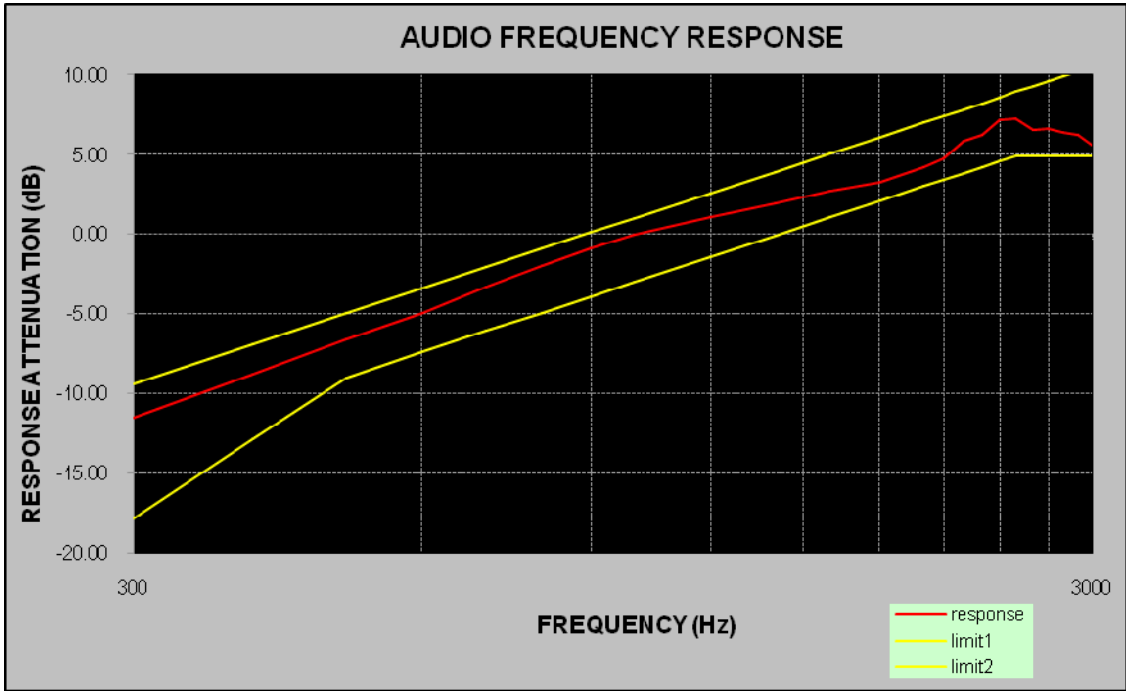
Carrier Frequency: 467.6000MHz

Audio Frequency (Hz)	Response (dB)
300	-11.24
400	-8.45
500	-6.67
600	-4.73
700	-3.53
800	-1.60
900	-0.63
1000	0.00
1200	1.08
1400	2.05
1600	2.57
1800	3.03
2000	4.19
2100	4.67
2200	5.88
2300	6.20
2400	7.14
2500	7.17
2600	6.41
2700	6.61
2800	6.23
2900	6.13
3000	5.61



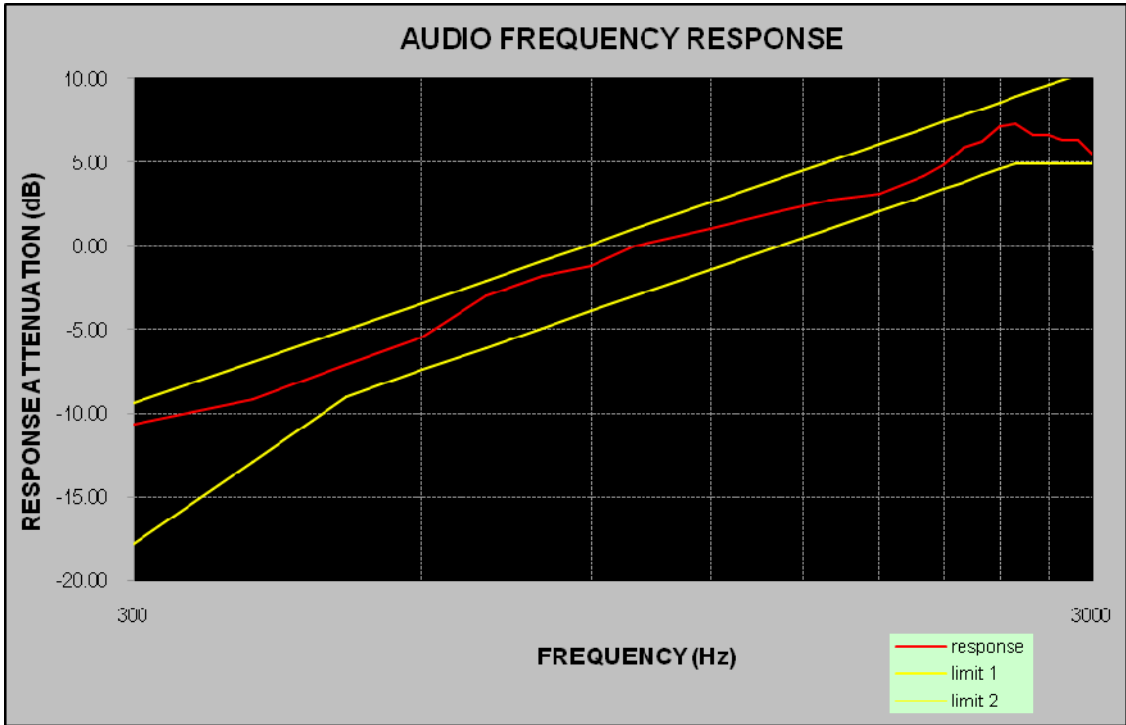
Carrier Frequency: 462.6375MHz

Audio Frequency (Hz)	Response (dB)
300	-11.57
400	-8.78
500	-6.63
600	-4.94
700	-3.30
800	-1.98
900	-0.88
1000	0.00
1200	1.06
1400	1.91
1600	2.70
1800	3.23
2000	4.19
2100	4.71
2200	5.86
2300	6.23
2400	7.17
2500	7.22
2600	6.56
2700	6.63
2800	6.34
2900	6.24
3000	5.61



Carrier Frequency: 467.6375MHz

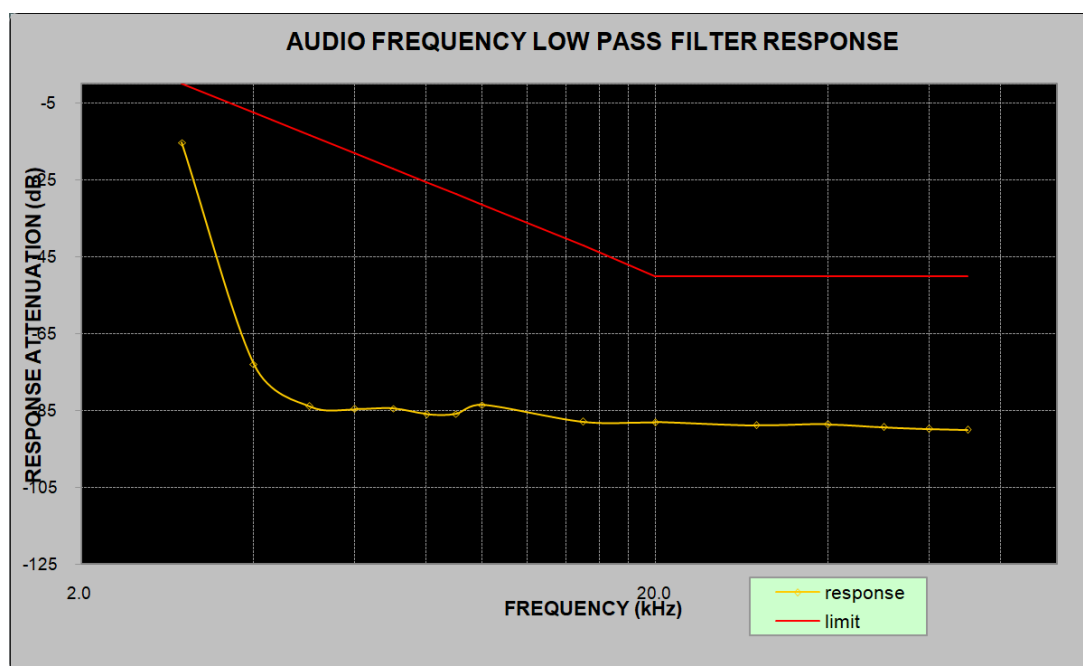
Audio Frequency (Hz)	Response (dB)
300	-10.63
400	-9.17
500	-7.05
600	-5.48
700	-3.00
800	-1.79
900	-1.17
1000	0.00
1200	1.05
1400	1.99
1600	2.72
1800	3.13
2000	4.16
2100	4.84
2200	5.88
2300	6.28
2400	7.17
2500	7.27
2600	6.62
2700	6.62
2800	6.29
2900	6.35
3000	5.50



Audio frequency lows pass filter response

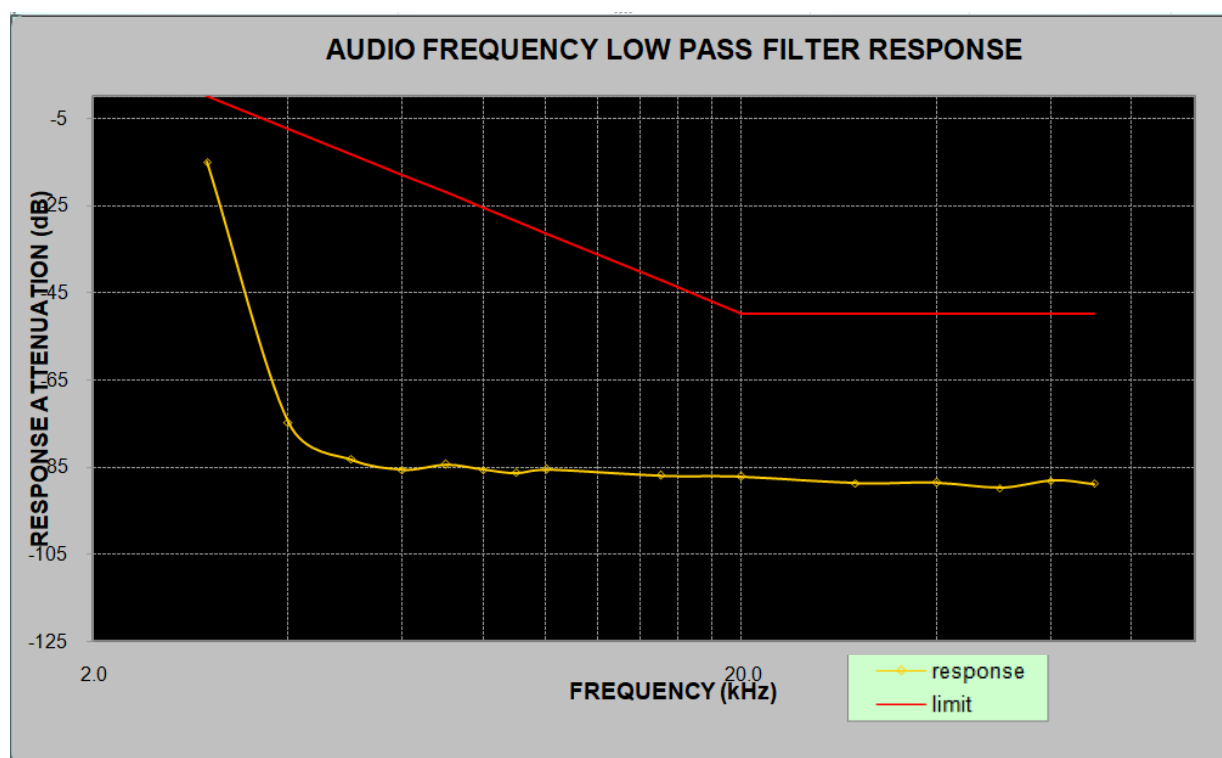
Carrier Frequency: 462.6000MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
1.0	0.0	/
3.0	-15.5	0.0
4.0	-73.2	-7.5
5.0	-84.0	-13.3
6.0	-84.9	-18.1
7.0	-84.5	-22.1
8.0	-86.0	-25.6
9.0	-85.9	-28.6
10.0	-83.8	-31.4
15.0	-88.0	-41.9
20.0	-88.2	-50.0
30.0	-89.0	-50.0
40.0	-88.7	-50.0
50.0	-89.5	-50.0
60.0	-89.8	-50.0
70.0	-88.2	-50.0



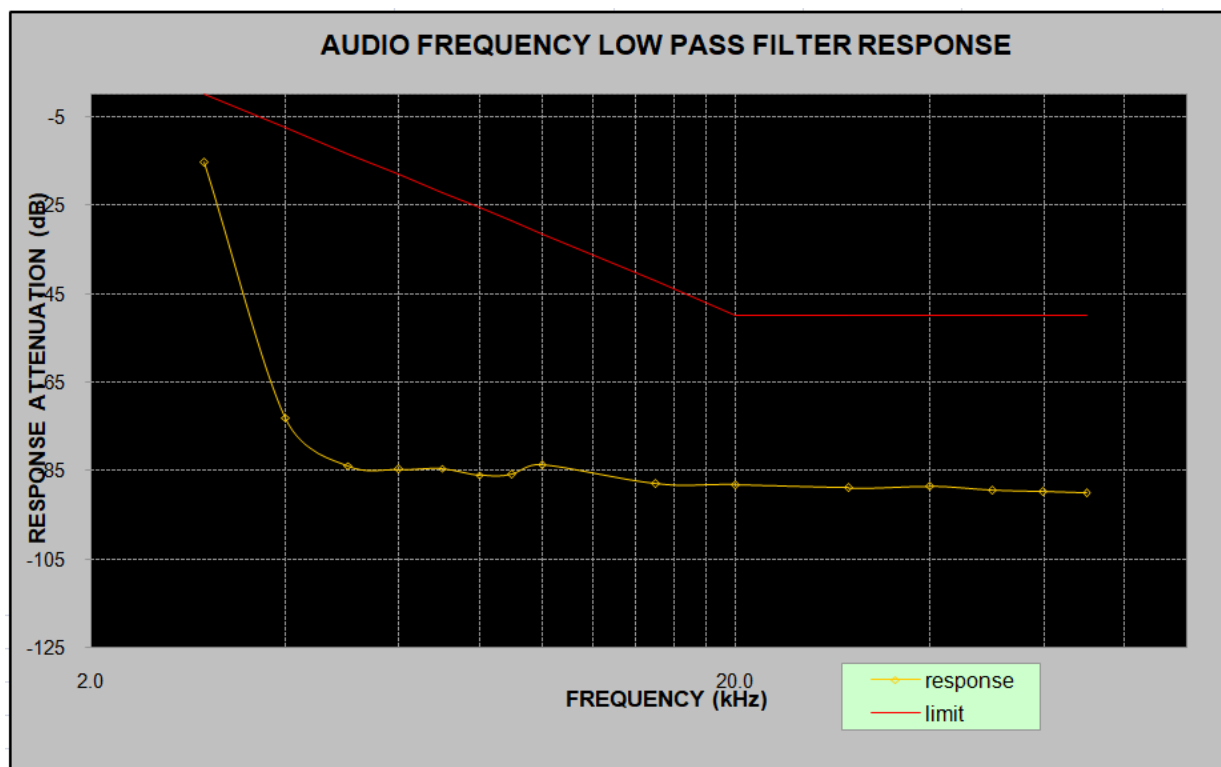
Carrier Frequency: 467.6000MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
1.0	0.0	/
3.0	-15.1	0.0
4.0	-74.8	-7.5
5.0	-83.4	-13.3
6.0	-85.8	-18.1
7.0	-84.5	-22.1
8.0	-85.5	-25.6
9.0	-86.3	-28.6
10.0	-85.4	-31.4
15.0	-86.9	-41.9
20.0	-87.3	-50.0
30.0	-88.7	-50.0
40.0	-88.5	-50.0
50.0	-89.8	-50.0
60.0	-88.3	-50.0
70.0	-88.7	-50.0



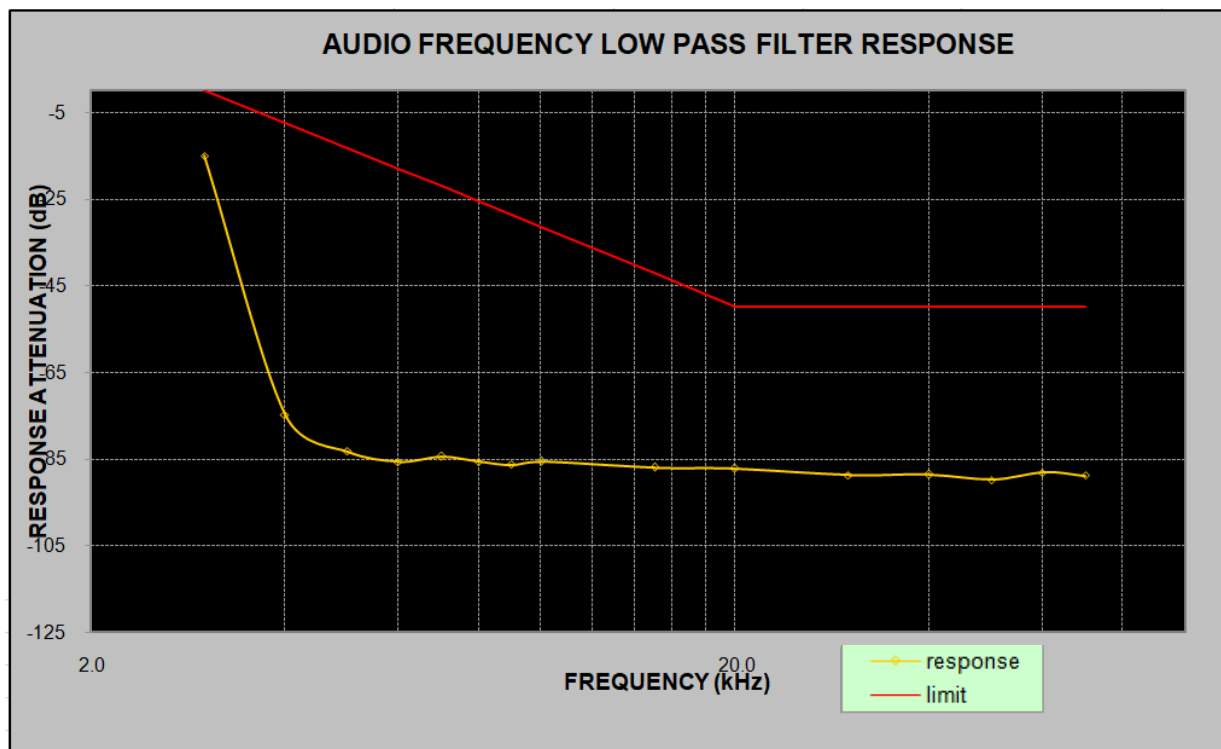
Carrier Frequency: 462.6375MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
1.0	0.0	/
3.0	-15.2	0.0
4.0	-73.0	-7.5
5.0	-83.8	-13.3
6.0	-84.7	-18.1
7.0	-84.4	-22.1
8.0	-86.0	-25.6
9.0	-85.9	-28.6
10.0	-83.6	-31.4
15.0	-87.9	-41.9
20.0	-88.1	-50.0
30.0	-88.9	-50.0
40.0	-88.6	-50.0
50.0	-89.4	-50.0
60.0	-89.7	-50.0
70.0	-90.0	-50.0



Carrier Frequency: 467.6375MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
1.0	0.0	/
3.0	-15.0	0.0
4.0	-74.8	-7.5
5.0	-83.2	-13.3
6.0	-85.6	-18.1
7.0	-84.4	-22.1
8.0	-85.7	-25.6
9.0	-86.3	-28.6
10.0	-85.6	-31.4
15.0	-87.0	-41.9
20.0	-87.2	-50.0
30.0	-88.7	-50.0
40.0	-88.6	-50.0
50.0	-89.8	-50.0
60.0	-88.1	-50.0
70.0	-88.8	-50.0



FCC §2.1049 & §95.1773&§95.1779(a)(c) - AUTHORIZED BANDWIDTH AND EMISSION MASK

Applicable Standard

According to §95.1773. Each GMRS transmitter type must be designed such that the occupied bandwidth does not exceed the authorized bandwidth for the channels used. Operation of GMRS stations must also be in compliance with these requirements.

(a) Main channels. The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz main channels (see §95.1763(a)) or any of the 467 MHz main channels (see §95.1763(c)).

(b) Interstitial channels. The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz interstitial channels (see §95.1763(b)) and is 12.5 kHz for GMRS transmitters operating on any of the 467 MHz interstitial channels (see §95.1763(d)).

(c) Digital data transmissions. Digital data transmissions are limited to the 462 MHz main channels and interstitial channels in the 462 MHz and 467 MHz bands.

According to §95.1779. Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(a) Emission masks. Emission masks applicable to transmitting equipment in the GMRS are defined by the requirements in the following table. The numbers in the attenuation requirements column refer to rule paragraph numbers under paragraph (b) of this section.

Emission types filter	Attenuation requirements
A1D, A3E, F1D, G1D, F2D, F3E, G3E with audio filter	(1), (2), (7)
A1D, A3E, F1D, G1D, F3E, G3E without audio filter	(3), (4), (7)
H1D, J1D, R1D, H3E, J3E, R2E	(5), (6), (7)

(1) Filtering noted for GMRS transmitters refers to the requirement in §95.1775(e).

(2) Unwanted emission power may be measured as either mean power or peak envelope power, provided that the transmitter output power is measured the same way.

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

(2) 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

(7) $43 + 10 \log (P)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (b)(5) of this section is measured with a reference bandwidth of at least 30 kHz.

Test Procedure

TIA-603-E 2016, section 2.2.11

Test Data

Environmental Conditions

Temperature:	25.4 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Jesse from 2023-01-10 to 2023-02-09.

Test Mode: Transmitting

Item	Frequency (MHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)
GMRS	462.6000	14.744	20
	462.6375	14.744	20
	467.6000	14.744	20
	467.6375	5.16	12.5

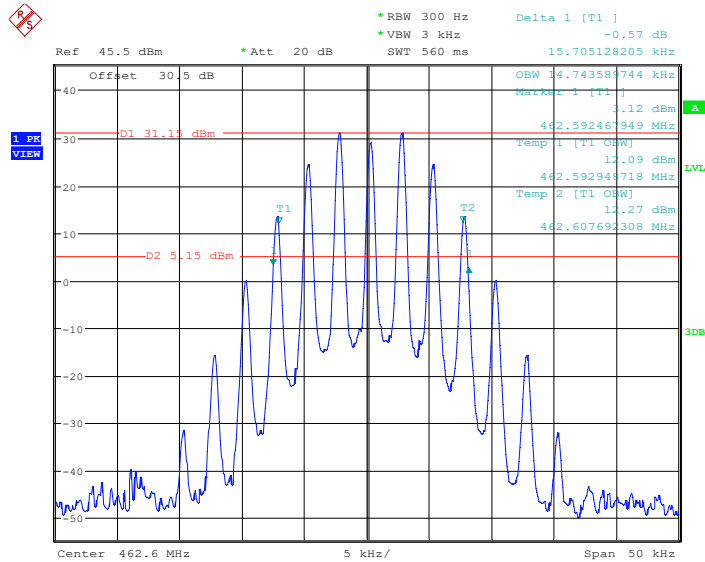
Emission Designator Per CFR 47 §2.201& §2.202&, $B_n = 2M + 2D$:

Emission Designator 11K0F3E In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation. $BW = 2(M+D) = 2*(3.0 \text{ kHz} + 2.5 \text{ kHz}) = 11 \text{ kHz} \rightarrow 11K0$

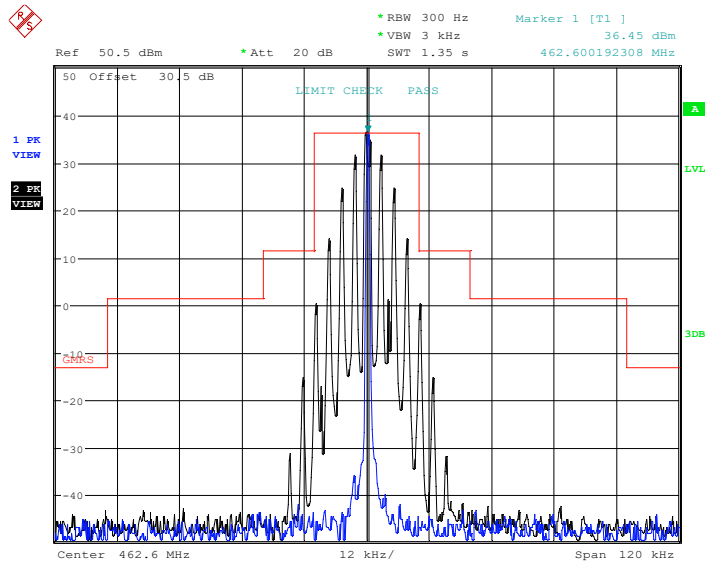
F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.

Emission Designator 16K0F3E In this case, the maximum modulating frequency is 3.0kHz with a 5.0 kHz deviation. $BW = 2(M+D) = 2*(3.0\text{kHz} + 5.0 \text{ kHz}) = 16 \text{ kHz} \rightarrow 16K0$

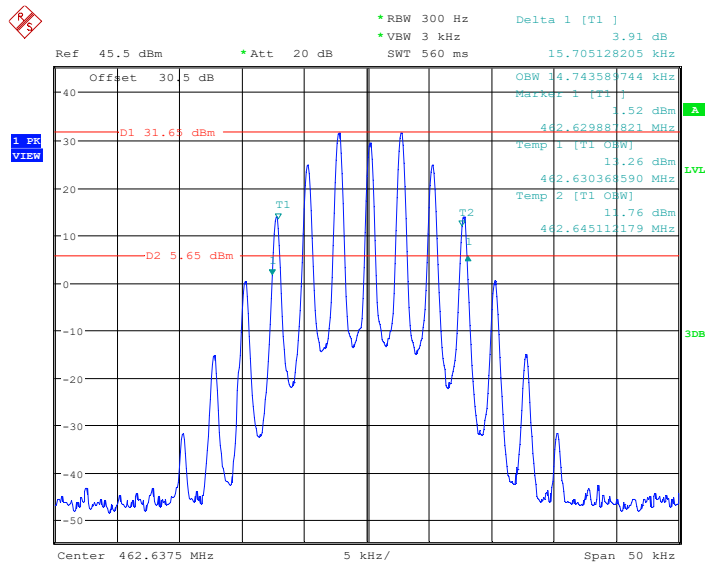
F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

OBW, 462.6000MHz

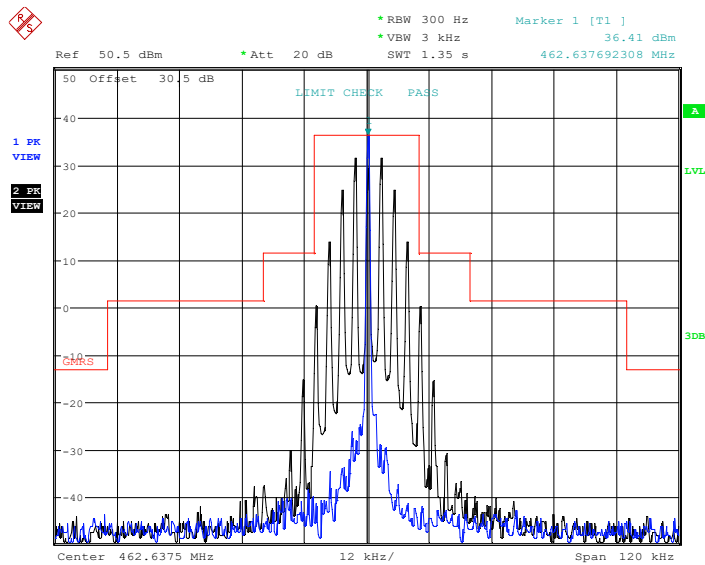
Date: 9.FEB.2023 16:41:44

Emission Mask, 462.6000MHz

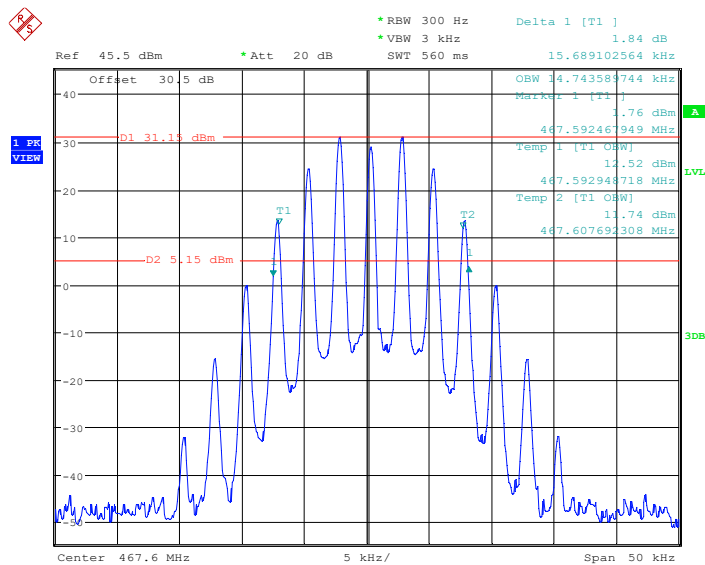
Date: 9.FEB.2023 16:24:08

OBW, 462.6375MHz

Date: 9.FEB.2023 16:39:34

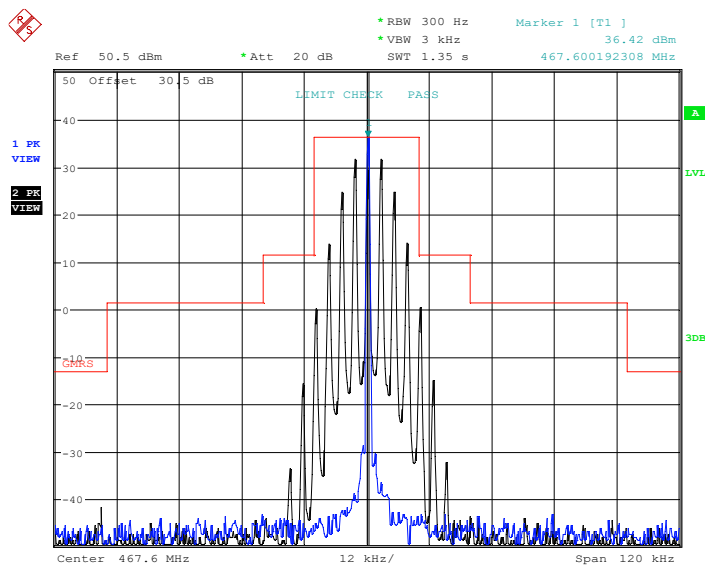
Emission Mask, 462.6375MHz

Date: 9.FEB.2023 16:35:56

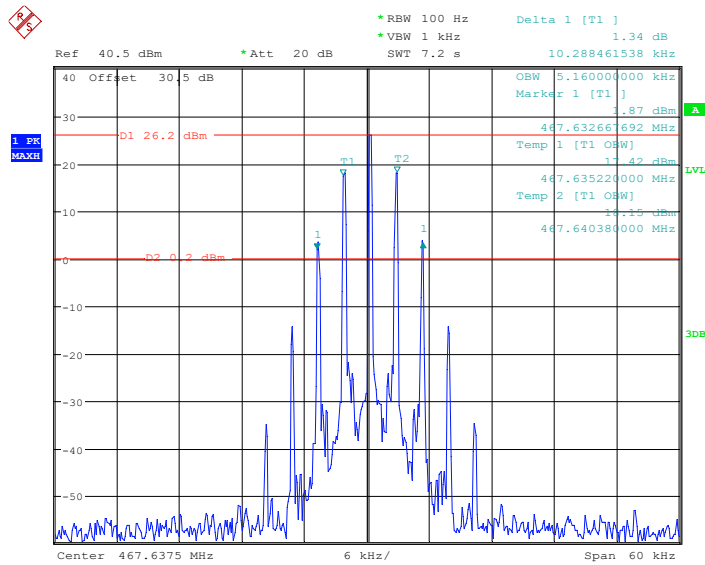
OBW, 467.6000MHz

Date: 9.FEB.2023 16:42:42

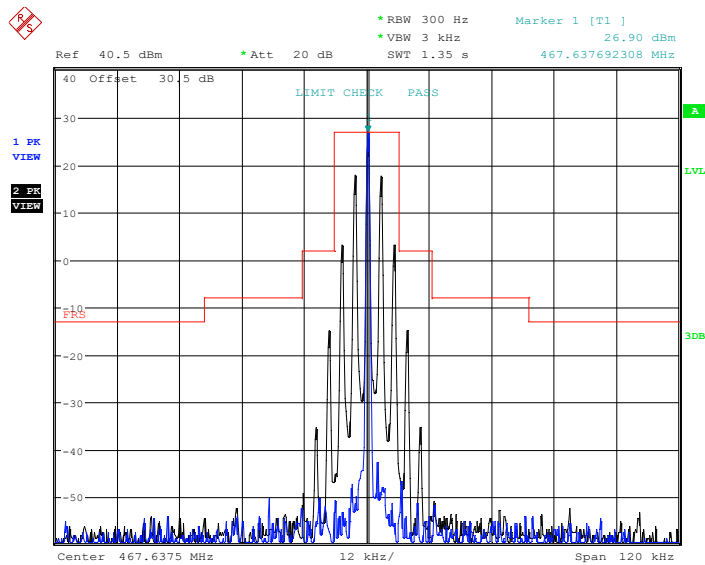
Emission Mask, 467.6000MHz



Date: 9.FEB.2023 16:27:19

OBW, 467.6375MHz

Date: 10.JAN.2023 14:51:49

Emission Mask, 467.6375_12.5K

Date: 9.FEB.2023 16:30:51

FCC §2.1053 & §95.1779- RADIATED SPURIOUS EMISSION

Applicable Standard

FCC §2.1053 and §95.1779. Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

(2) 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

(7) $43 + 10 \log(P)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (b)(5) of this section is measured with a reference bandwidth of at least 30 kHz.

(d) Measurement conditions. The requirements in this section apply to each GMRS transmitter type both with and without the connection of permitted attachments, such as an external speaker, microphone, power cord and/or antenna.

Test Procedure

The transmitter was placed on a nonconducting 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 tenth harmonic of the fundamental frequency was investigated.

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

Spurious emissions in dB = $10 \lg(\text{TXpwr in Watts}/0.001)$ - the absolute level

Spurious attenuation limit in dB = $43 + 10 \lg(\text{power out in Watts})$

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	63 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-12-05

Test Mode: Transmitting (worst case)

Note: Pre-scan in the X, Y and Z axes of orientation, the worst case Y-axis of orientation was recorded.

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
462.6375 MHz								
925.28	-36.43	157	2.1	H	9.3	-27.13	-13	-14.13
925.28	-37.53	302	1.6	V	11.5	-26.03	-13	-13.03
1387.91	-39.2	74	1.2	H	6	-33.2	-13	-20.20
1387.91	-29.6	357	2	V	5.8	-23.8	-13	-10.80
1850.55	-33.8	305	2.1	H	4.4	-29.4	-13	-16.40
1850.55	-31.1	49	1.9	V	3.6	-27.5	-13	-14.50
2313.19	-32.4	144	2.1	H	7.2	-25.2	-13	-12.20
2313.19	-37.3	66	1.8	V	6.7	-30.6	-13	-17.60
2775.83	-33.8	271	1.7	H	6.7	-27.1	-13	-14.10
2775.83	-35.9	305	1.1	V	6.3	-29.6	-13	-16.60
3238.46	-30.4	243	1.2	H	7	-23.4	-13	-10.40
3238.46	-28.5	220	2	V	6.3	-22.2	-13	-9.20
3701.10	-40.2	94	1.1	H	8.1	-32.1	-13	-19.10
3701.10	-45.1	119	1.9	V	7.6	-37.5	-13	-24.50
4163.74	-46.5	41	1.6	H	9.4	-37.1	-13	-24.10
4163.74	-46	116	1.2	V	8.5	-37.5	-13	-24.50
4626.38	-33.8	142	1.8	H	10.5	-23.3	-13	-10.30
4626.38	-27.2	214	1.9	V	10.1	-17.1	-13	-4.10
467.6375 MHz								
935.28	-42.33	171	1.6	H	9.3	-33.03	-13	-20.03
935.28	-36.43	30	2.2	V	11.5	-24.93	-13	-11.93
1402.91	-39.8	24	1.4	H	5.9	-33.9	-13	-20.90
1402.91	-29.5	292	2.1	V	5.8	-23.7	-13	-10.70
1870.55	-36.4	352	1.2	H	4.2	-32.2	-13	-19.20
1870.55	-38.5	46	1.5	V	3.4	-35.1	-13	-22.10
2338.19	-39.1	341	1.1	H	7.3	-31.8	-13	-18.80
2338.19	-35.5	255	1.3	V	6.5	-29	-13	-16.00
2805.83	-36.3	66	1.7	H	6.8	-29.5	-13	-16.50
2805.83	-32.4	212	1.8	V	6.7	-25.7	-13	-12.70
3273.46	-32.4	76	1.9	H	6.7	-25.7	-13	-12.70
3273.46	-27	252	1.3	V	5.9	-21.1	-13	-8.10
3741.10	-43.4	7	1.1	H	8.8	-34.6	-13	-21.60
3741.10	-40.5	314	1.7	V	7.9	-32.6	-13	-19.60
4208.74	-43.2	288	1.6	H	9.4	-33.8	-13	-20.80
4208.74	-41.1	160	2	V	9	-32.1	-13	-19.10
4676.38	-33.8	232	2.1	H	10.7	-23.1	-13	-10.10
4676.38	-25.3	148	1.7	V	10.1	-15.2	-13	-2.20

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
462.6000 MHz								
925.20	-43.66	244	1.5	H	9.3	-34.36	-13	-21.36
925.20	-36.98	118	1.6	V	11.5	-25.48	-13	-12.48
1387.80	-37.6	35	1.9	H	6	-31.6	-13	-18.60
1387.80	-28.7	222	2	V	5.8	-22.9	-13	-9.90
1850.40	-33.6	328	2.2	H	4.4	-29.2	-13	-16.20
1850.40	-30.6	326	1.5	V	3.6	-27	-13	-14.00
2313.00	-32.7	5	2	H	7.2	-25.5	-13	-12.50
2313.00	-36.6	342	2	V	6.7	-29.9	-13	-16.90
2775.60	-32.7	23	2	H	6.7	-26	-13	-13.00
2775.60	-37.6	358	1.5	V	6.3	-31.3	-13	-18.30
3238.20	-31	91	1	H	7	-24	-13	-11.00
3238.20	-27.8	77	1.6	V	6.3	-21.5	-13	-8.50
3700.80	-40	217	1.5	H	8.1	-31.9	-13	-18.90
3700.80	-44.5	297	2	V	7.6	-36.9	-13	-23.90
4163.40	-45.3	284	1.3	H	9.4	-35.9	-13	-22.90
4163.40	-47.1	2	2	V	8.5	-38.6	-13	-25.60
4626	-33	62	1.2	H	10.5	-22.5	-13	-9.50
4626	-27.5	100	1.5	V	10.1	-17.4	-13	-4.40
467.6000 MHz								
935.20	-42.45	223	1.1	H	9.3	-33.15	-13	-20.15
935.20	-35.87	86	1.9	V	11.5	-24.37	-13	-11.37
1402.80	-40.4	138	1.1	H	5.9	-34.5	-13	-21.50
1402.80	-29.9	301	2.2	V	5.8	-24.1	-13	-11.10
1870.40	-37.4	56	2.1	H	4.2	-33.2	-13	-20.20
1870.40	-36.6	231	1.2	V	3.4	-33.2	-13	-20.20
2338.00	-40	71	1.4	H	7.3	-32.7	-13	-19.70
2338.00	-35.6	216	1.3	V	6.5	-29.1	-13	-16.10
2805.60	-36.6	297	1.7	H	6.8	-29.8	-13	-16.80
2805.60	-31.6	132	2	V	6.7	-24.9	-13	-11.90
3273.20	-32.4	258	1.5	H	6.7	-25.7	-13	-12.70
3273.20	-27.6	89	1.8	V	5.9	-21.7	-13	-8.70
3740.80	-43.5	172	1.8	H	8.8	-34.7	-13	-21.70
3740.80	-40.4	229	1.5	V	7.9	-32.5	-13	-19.50
4208.40	-44	17	1.1	H	9.4	-34.6	-13	-21.60
4208.40	-43	250	2.1	V	9	-34	-13	-21.00
4676	-33.8	201	2	H	10.7	-23.1	-13	-10.10
4676	-27.3	28	2	V	10.1	-17.2	-13	-4.20

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: Substituted Level - Cable loss+ Antenna Gain

Margin = Absolute Level - Limit

FCC§2.1055 (d) & §95.1765 - FREQUENCY STABILITY

Applicable Standard

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from -30 °C to +50 °C, and according to FCC 2.1055(d) (2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.1765, Each GMRS transmitter type must be designed to comply with the frequency accuracy requirements in this section under normal operating conditions. Operators of GMRS stations must also ensure compliance with these requirements.

(a) The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth greater than 12.5 kHz must remain within 5 parts-per-million (ppm) of the channel center frequencies listed in §95.1763 under normal operating conditions.

(b) The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth of 12.5 kHz or less must remain within 2.5 ppm of the channel center frequencies listed in §95.1763 under normal operating conditions.

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 Frequency Counter.

Frequency Stability vs. Voltage (item 1 or item 2 will be chosen according to different condition) :

☒1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

☐2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

The output frequency was recorded for each voltage.

Test Data

Environmental Conditions

Temperature:	25.4 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Jesse on 2023-01-10.

Test Mode: Transmitting

Reference Frequency:462.6000MHz, Limit: 5ppm			
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	462.600113	0.244
40	7.4	462.600382	0.826
30	7.4	462.600247	0.534
20	7.4	462.600339	0.733
10	7.4	462.600241	0.521
0	7.4	462.600106	0.229
-10	7.4	462.600458	0.990
-20	7.4	462.600432	0.934
-30	7.4	462.600184	0.398
Frequency Stability versus Input Voltage			
20	7.0	462.600279	0.603
20	8.4	462.600138	0.298

Reference Frequency:462.6375MHz, Limit: 5ppm			
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	462.637666	0.359
40	7.4	462.637842	0.739
30	7.4	462.637744	0.527
20	7.4	462.637634	0.290
10	7.4	462.637820	0.692
0	7.4	462.637721	0.478
-10	7.4	462.637743	0.525
-20	7.4	462.637636	0.294
-30	7.4	462.637754	0.549
Frequency Stability versus Input Voltage			
20	7.0	462.637837	0.728
20	8.4	462.637778	0.601

Reference Frequency:467.6000MHz, Limit: 5ppm			
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	467.600211	0.451
40	7.4	467.600105	0.225
30	7.4	467.600330	0.706
20	7.4	467.600295	0.631
10	7.4	467.600188	0.402
0	7.4	467.600090	0.192
-10	7.4	467.600381	0.815
-20	7.4	467.600372	0.796
-30	7.4	467.600237	0.507
Frequency Stability versus Input Voltage			
20	7.0	467.600302	0.646
20	8.4	467.600354	0.757

Reference Frequency:467.6375MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.4	467.637735	0.503
40	7.4	467.637678	0.381
30	7.4	467.637878	0.808
20	7.4	467.637865	0.781
10	7.4	467.637880	0.813
0	7.4	467.637872	0.795
-10	7.4	467.637690	0.406
-20	7.4	467.637702	0.432
-30	7.4	467.637627	0.272
Frequency Stability versus Input Voltage			
20	7.0	467.637675	0.374
20	8.4	467.637613	0.242

Note: the extreme voltage was provided by applicant.

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