HCT CO.,LTD

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FCC REPORT

FCC Certification

Applicant Name:
JVC KENWOOD Corporation

Address:
1-16-2, Hakusan, Midori-ku, Yokohama-shi,
Kanagawa 226-8525 Japan

Date of Issue:
October 13, 2016

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-R-1609-F034-2

HCT FRN: 0005866421

FCC ID:	**K44478600**
APPLICANT:	**JVC KENWOOD Corporation**

FCC Model(s):	TK-3230DX-K
EUT Type:	UHF FM TRANSCEIVER
FCC Rule Part(s):	Part 90 and Part 2

The measurements shown in this report were made in accordance with the procedures specified inCFR47 section§2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
: Seul Ki Lee
Test engineer of RF Team

Approved by
: Jong Seok Lee
Manager of RF Team

Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1609-F034	September 30, 2016	- First Approval Report
HCT-R-1609-F034-1	October 11, 2016	- Add the Adjacent Channel Power(ACP) in Section 8.7
HCT-R-1609-F034-2	October 13, 2016	- Revised the Adjacent Channel Power(ACP) data in Section 8.7(positive dBc➔negative dBc)

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	JVC KENWOOD Corporation
Address:	1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa 226-8525 Japan
FCC ID:	K44478600
EUT Type:	UHF FM TRANSCEIVER
FCC Model(s):	TK-3230DX-K
Date(s) of Tests:	August 22, 2016 ~ September 30, 2016
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

2. EUT DESCRIPTION

EUT Type	UHF FM TRANSCEIVER
FCC Model Name	TK-3230DX-K
Power Supply	DC 3.8 V
Output Power	1.5W (Power output continuously variable to 0.5 W)
Battery type	Li-ion Battery (KNB-46L)
Channel Bandwidth	12.5 kHz / 25 kHz
Operating Temperature	-30 ℃~ +60 □
Modulation	16K0F3E (25 kHz bandwidth) 11K0F3E (12.5 kHz bandwidth)
Frequency Range	450 MHz ~ 470 MHz
Test Frequency	450.05 MHz, 460.05 MHz, 469.95 MHz

3. TEST METHODOLOGY

TIA-603-D dated June 24, 2010 entitled “Land Mobile FM or PM Communications Equipment Measurement and Performance Standards” were used in the measurement.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the FCC Rules Part 2 and Part 90.

3.3 GENERAL TEST PROCEDURES

Radiated Emissions

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-D-2010 Clause 2.2.17.The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a positive peak detector.

A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

Where: $P_d$is the dipole equivalent power and $P_g$is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting is programmed.

3.5 Type of Emission

16K0F3E	(Analogue)
11K0F3E	(Analogue)

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA**.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	6.07

7. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
Carrier Output Power	§90.205(i) §2.1046(a)	Varies	CONDUCTED	PASS
Unwanted Emissions	§2.1051			PASS
99% Bandwidth	NA	NA		PASS
Carrier Frequency Stability	§90.213(a), §2.1055	Channel Spacing : 12.5 kHz = 2.5 ppm Channel Spacing : 25 kHz = 5 ppm		PASS
Audio Frequency Response	§2.1047(a)	Varies		PASS
Audio Low Pass Filter	§2.1047(a)			PASS
Modulation Limiting	§2.1047(b)			PASS
Transient Frequency Behavior	§90.214	Varies		PASS
Emission Mask	§90.210, §2.1049(c)(1)	Varies		PASS
ACP	§90.221	Varies		PASS
Field Strength of Spurious Radiation	§2.1053	Varies	RADIATED	PASS
Necessary Bandwidth	§2.202(g)	-	-	-

8. TEST RESULT

8.1 Carrier Output Power

▣ Definition

The conducted carrier power output rating for a transmitter is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

▣ TEST CONFIGURATION

▣ TEST PROCEDURE

According to 2.2.1 in TIA-603-D Standard.

a) Connect the equipment as illustrated.
b) Measure the transmitter output power during the defined duty cycle(see 1.3.2).
Correct for all losses in the RF path.
c) The value recorded in step b) is the conducted carrier output power rating.

▣ TEST RESULTS

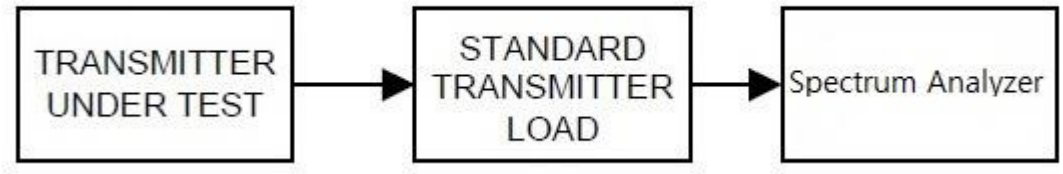
Mode	Type of Emission	Channel Spacing	Freq.(MHz)	Carrier Output Power			
				Low		High	
				dBm	W	dBm	W
Digital	11K0F3E	12.5 kHz	450.05	26.196	0.416	31.552	1.430
			460.05	26.056	0.403	31.196	1.317
			469.95	26.201	0.417	31.052	1.274
	16K0F3E	25.0 kHz	450.05	26.170	0.414	31.502	1.413
			460.05	25.943	0.393	31.292	1.346
			469.95	26.146	0.412	30.995	1.257

8.2 Carrier Frequency Stability

▣ Definition

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to 2.2.2 in TIA-603-D Standard.

a) Connect the equipment as illustrated.

b) Operate the equipment in standby conditions for 15 minutes before proceeding.

c) Record the carrier frequency of the transmitter as MCF_{MHz}

d) Calculate the ppm frequency error by the following:

ppm error = ((MCF_{MHz}/ ACF_{MHz})-1)*10^6

where

MCF_{MHz} is the Measured Carrier Frequency in MHz

$ACF_{MHz}$is the Assigned Carrier Frequency in MHz

e) The value recorded in step d) is the carrier frequency stability.

*Note:In order to simplify the report, attached data were only the worst case frequency stability.

▣ TEST RESULTS - 11K0F3E

(1) Frequency Stability (Temperature Variation)

450.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	450.050353691	0.785893
-20	450.050270251	0.600491
-10	450.050261245	0.580480
0	450.050240510	0.534407
10	450.050152670	0.339229
20	450.050068639	0.152514
30	450.050051418	0.114250
40	450.049975120	-0.055283
50	450.049957196	-0.095109

460.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	460.050367283	0.798355
-20	460.050351627	0.764323
-10	460.050304854	0.662654
0	460.050251274	0.546188
10	460.050189629	0.412192
20	460.050092850	0.201825
30	460.050048527	0.105482
40	460.050010954	0.023810
50	460.049955265	-0.097239

469.95 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	469.950378737	0.805909
-20	469.950322845	0.686977
-10	469.950220385	0.468954
0	469.950133852	0.284822
10	469.950112627	0.239657
20	469.950096957	0.206313
30	469.950052860	0.112480
40	469.950046845	0.099681
50	469.949954434	-0.096959

450.05 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	450.050364484	0.809874
-20	450.050329512	0.732168
-10	450.050301753	0.670488
0	450.050243055	0.540062
10	450.050182561	0.405646
20	450.050095108	0.211328
30	450.050056895	0.126419
40	450.050006327	0.014058
50	450.049942704	-0.127310

460.05 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	460.050374896	0.814903
-20	460.050320958	0.697659
-10	460.050237625	0.516520
0	460.050195634	0.425245
10	460.050138526	0.301111
20	460.050079177	0.172105
30	460.050050082	0.108862
40	460.050026748	0.058142
50	460.049939407	-0.131710

469.95 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	469.950382515	0.813948
-20	469.950338966	0.721280
-10	469.950256660	0.546143
0	469.950182914	0.389220
10	469.950126734	0.269675
20	469.950074273	0.158045
30	469.950052318	0.111327
40	469.949961857	-0.081164
50	469.949935818	-0.136572

(2) Frequency Stability (Voltage Variation)

450.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	450.050082696	0.183748
25	100	3.80	450.050077171	0.171471
25	115	4.37	450.050062855	0.139663

460.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	460.050104298	0.226711
25	100	3.80	460.050092207	0.200427
25	115	4.37	460.050079771	0.173397

469.95 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	469.950109790	0.233621
25	100	3.80	469.950097650	0.207789
25	115	4.37	469.950085030	0.180934

450.05 MHz (Low Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	450.050104763	0.232781
25	100	3.80	450.050087139	0.193621
25	115	4.37	450.050077372	0.171919

460.05 MHz (Low Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	460.050090848	0.197474
25	100	3.80	460.050076475	0.166231
25	115	4.37	460.050064974	0.141233

469.95 MHz (Low Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	469.950086160	0.183338
25	100	3.80	469.950072801	0.154912
25	115	4.37	469.950060504	0.128745

▣ TEST RESULTS - 16K0F3E

(1) Frequency Stability (Temperature Variation)

450.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	450.050276418	0.614194
-20	450.050262158	0.582509
-10	450.050257649	0.572490
0	450.050230154	0.511397
10	450.050209257	0.464964
20	450.050130348	0.289631
30	450.050084512	0.187784
40	450.049985210	-0.032863
50	450.049949133	-0.113025

460.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	460.050329341	0.715881
-20	460.050321267	0.698331
-10	460.050305164	0.663328
0	460.050264891	0.575787
10	460.050194562	0.422915
20	460.050124520	0.270666
30	460.050051327	0.111568
40	460.050002584	0.005617
50	460.049950881	-0.106769

469.95 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	469.950355452	0.756361
-20	469.950318245	0.677189
-10	469.950216847	0.461426
0	469.950156270	0.332525
10	469.950131258	0.279302
20	469.950117711	0.250475
30	469.950084510	0.179828
40	469.950002674	0.005690
50	469.949952292	-0.101517

450.05 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	450.050366801	0.815023
-20	450.050351547	0.781129
-10	450.050302589	0.672345
0	450.050196247	0.436056
10	450.050152548	0.338958
20	450.050088880	0.197488
30	450.050051647	0.114758
40	450.050005148	0.011439
50	450.049950188	-0.110681

460.05 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	460.050374411	0.813848
-20	460.050325489	0.707508
-10	460.050304826	0.662593
0	460.050259456	0.563973
10	460.050142670	0.310118
20	460.050077017	0.167411
30	460.050051128	0.111136
40	460.050001642	0.003569
50	460.049944481	-0.120680

469.95 MHz (Low Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	469.950376111	0.800321
-20	469.950320157	0.681258
-10	469.950212847	0.452914
0	469.950142684	0.303615
10	469.950130751	0.278223
20	469.950071482	0.152105
30	469.950002284	0.004860
40	469.949951428	-0.103356
50	469.949939760	-0.128184

(2)Frequency Stability (Voltage Variation)

450.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	450.050140402	0.311970
25	100	3.80	450.050128982	0.286595
25	115	4.37	450.050118398	0.263076

460.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	460.050135704	0.294976
25	100	3.80	460.050123629	0.268729
25	115	4.37	460.050111715	0.242833

469.95 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	469.950129745	0.276082
25	100	3.80	469.950115935	0.246696
25	115	4.37	469.950103350	0.219917

450.05 MHz (Low Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	450.050099850	0.221864
25	100	3.80	450.050083915	0.186456
25	115	4.37	450.050072667	0.161464

460.05 MHz (Low Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	460.050089072	0.193614
25	100	3.80	460.050074340	0.161591
25	115	4.37	460.050062749	0.136395

469.95 MHz (Low Power)

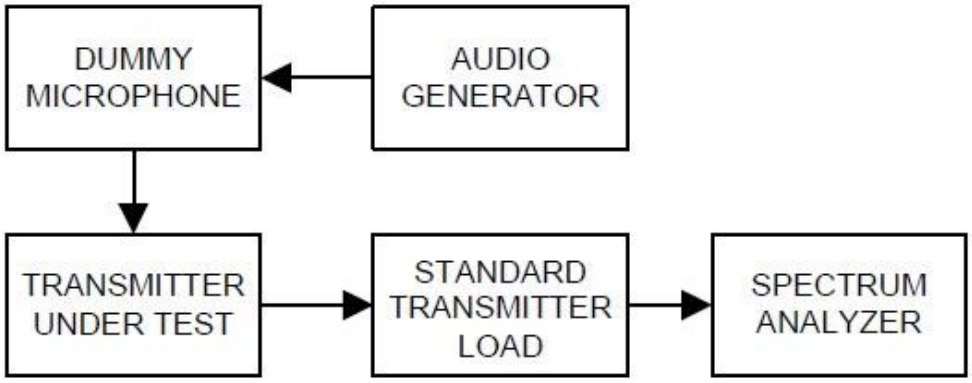
Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25	85	3.23	469.950084684	0.180198
25	100	3.80	469.950070508	0.150033
25	115	4.37	469.950058212	0.123868

8.3 Occupied Bandwidth

▣ Definition

The transmitter sideband spectrum denotes the sideband power produced at a discrete frequency separation from the carrier up to the test bandwidth (see TIA-603-D Section 1.3.4.4) due to all sources of unwanted noise within the transmitter in a modulated condition.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to TIA-603-D Section 2.2.11.2

a) For EUT supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for +/- 2.5 kHz deviation (or 50 % modulation). (FM modulation).

b) With level constant, the signal level was increased 16 dB..

c) For EUT supporting digital modulation, the digital modulation mode was operated to its maximum extent.

d) Adjust the spectrum analyzer for the following setting:

1) RBW : 100Hz (Non modulation and Authorized Band 6 kHz),
100Hz (Non modulation and Authorized Band 11.25 kHz),
300Hz (Non modulation and Authorized Band 20 kHz).

2) VBW : Video Bandwidth at least 10 times the resolution bandwidth.

4) Sweep Speed : Sweep Speed slow enough to maintain measurement calibration.

5) Sampling Time : 10 times

6) Detector Mode = Positive Peak.

e) The occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown onthe test results.

▣LIMIT

Frequency Band (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
450 – 470	12.5	11.25
	25	20

▣ TEST RESULTS

Conducted 99% Bandwidth Measurements for 11K0F3E

11K0F3E		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel Spacing		
450.05	12.5 kHz	9.883	High Power
460.05		9.845	
469.95		9.782	
450.05	12.5 kHz	9.880	Low Power
460.05		9.843	
469.95		9.856	

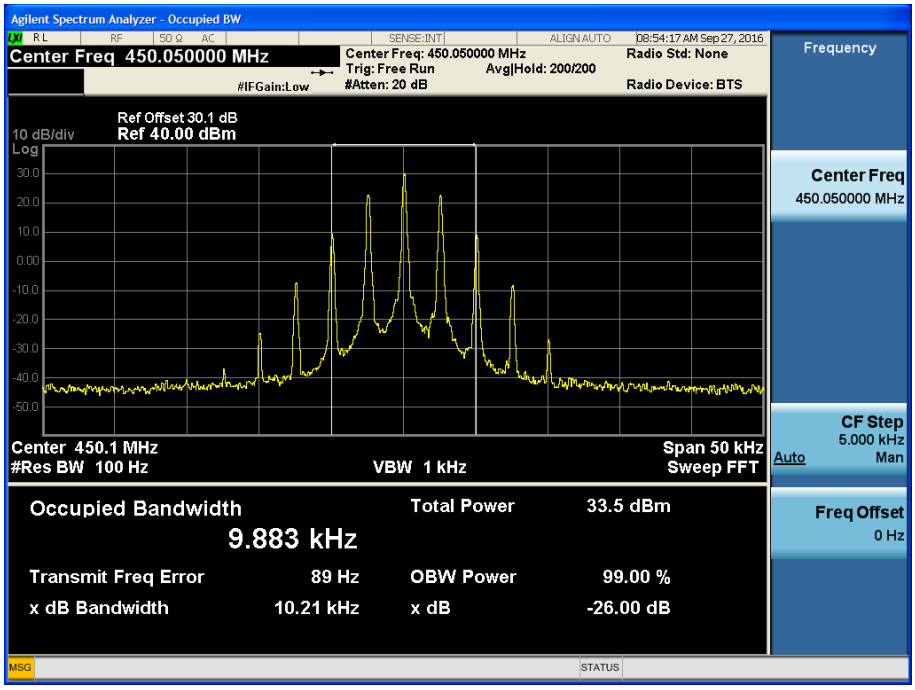
Conducted 99% Bandwidth Measurements for 16K0F3E

16K0F3E		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel Spacing		
450.05	25 kHz	14.659	High Power
460.05		14.564	
469.95		14.541	
450.05	25 kHz	14.770	Low Power
460.05		14.609	
469.95		14.617	

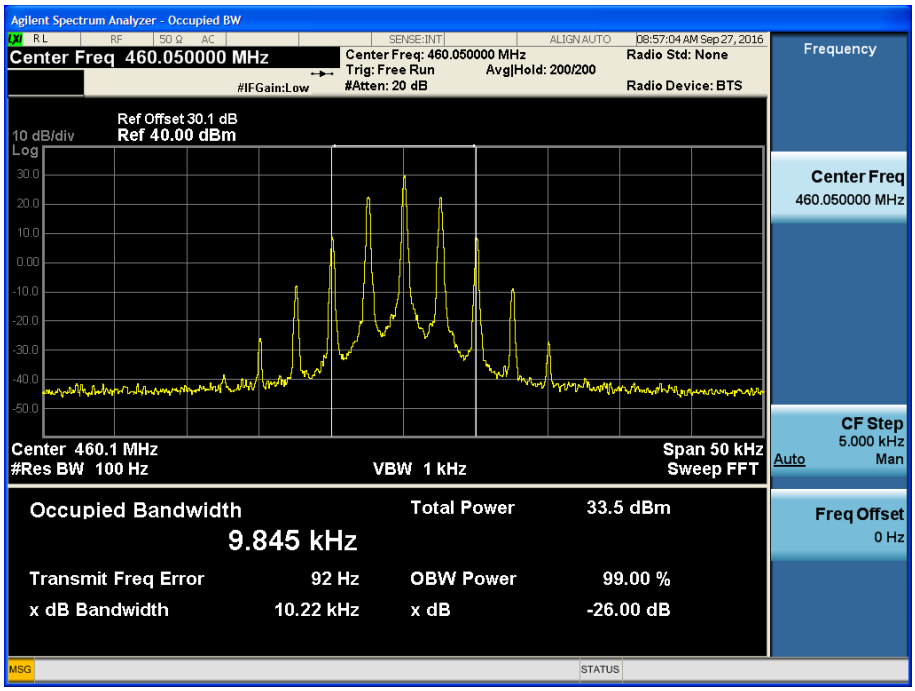
▣ TEST RESULTS

11K0F3E

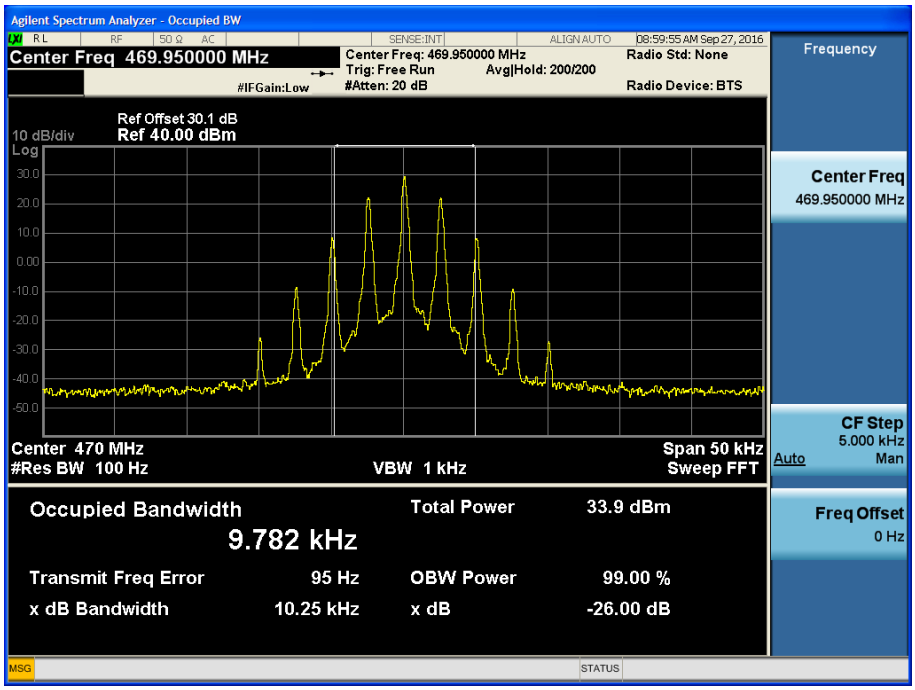
HIGH POWER_11K0F3E _450.05 MHz_Low



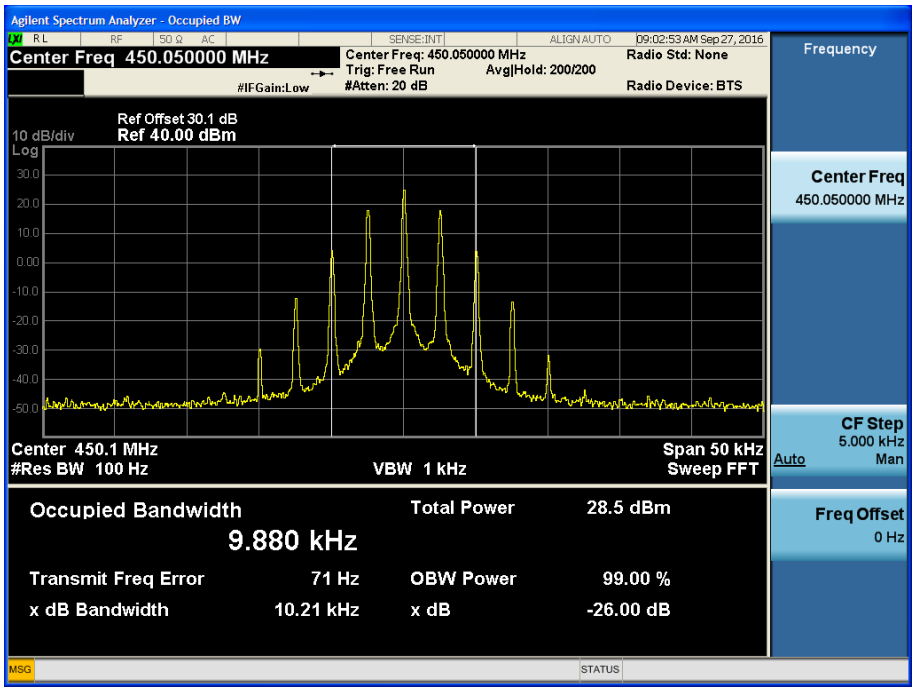
HIGH POWER_11K0F3E _460.05 MHz_Middle



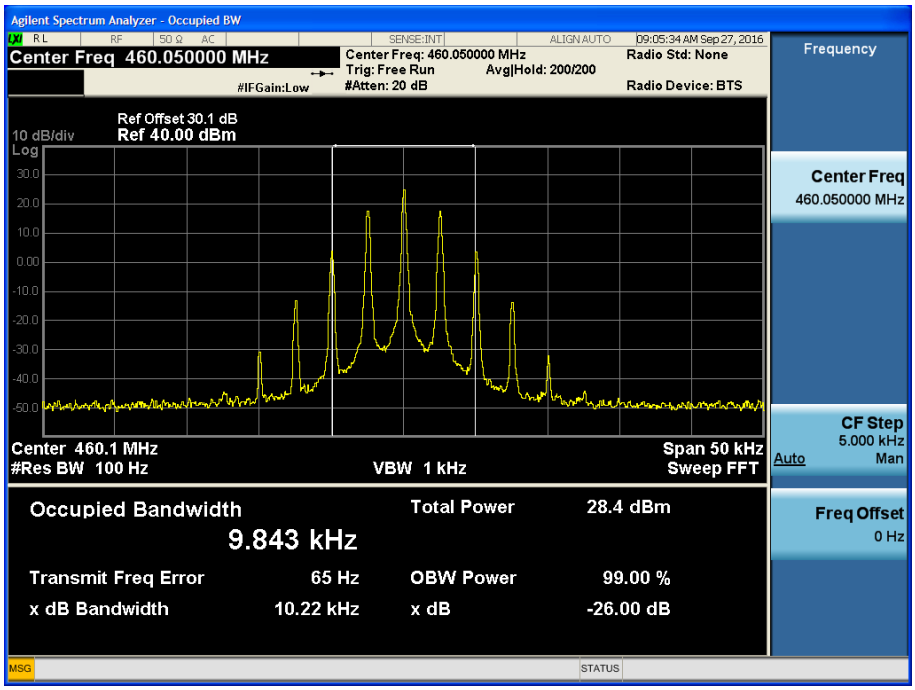
HIGH POWER_11K0F3E _469.95 MHz_High



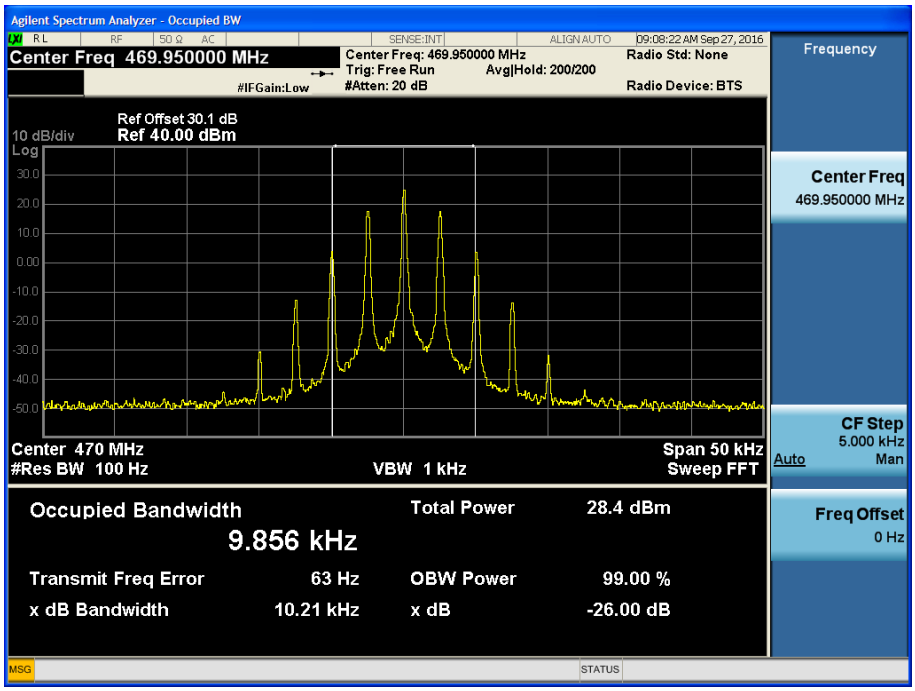
LOW POWER_11K0F3E _450.05 MHz_Low



LOW POWER_11K0F3E _460.05 MHz_Middle

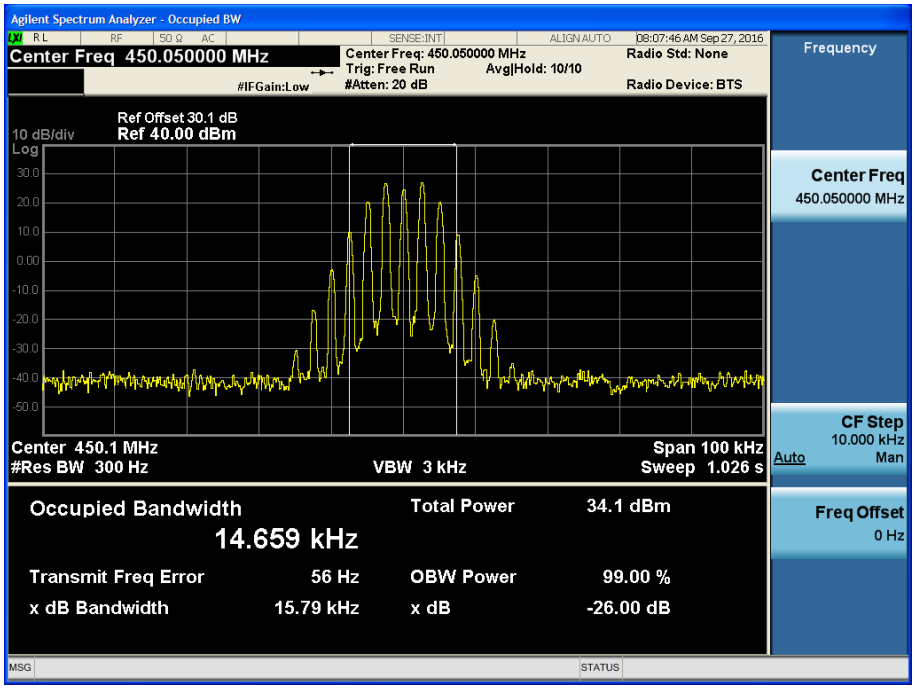


LOW POWER_11K0F3E _469.95 MHz_High

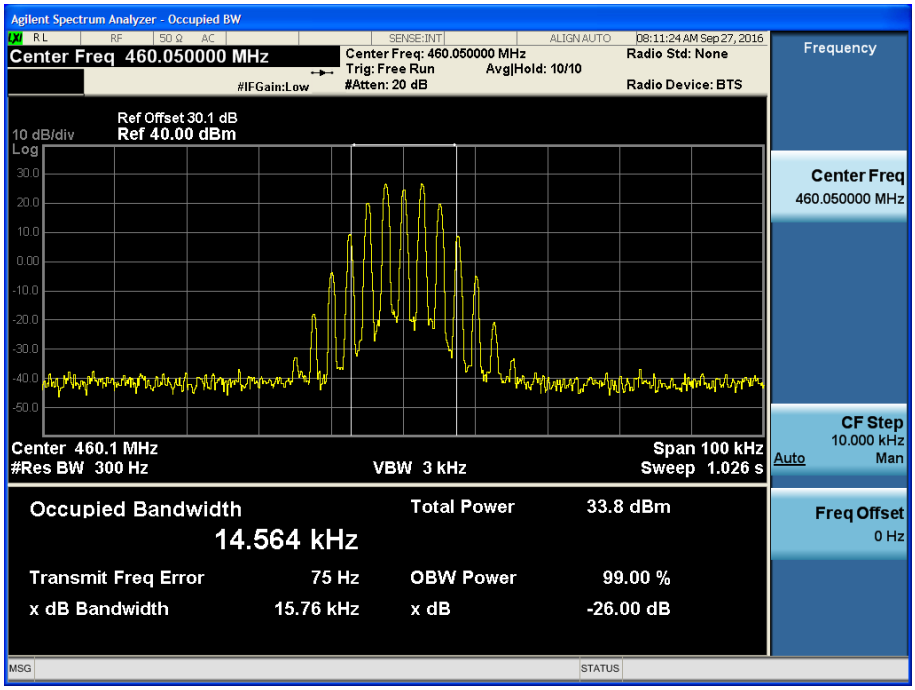


16K0F3E

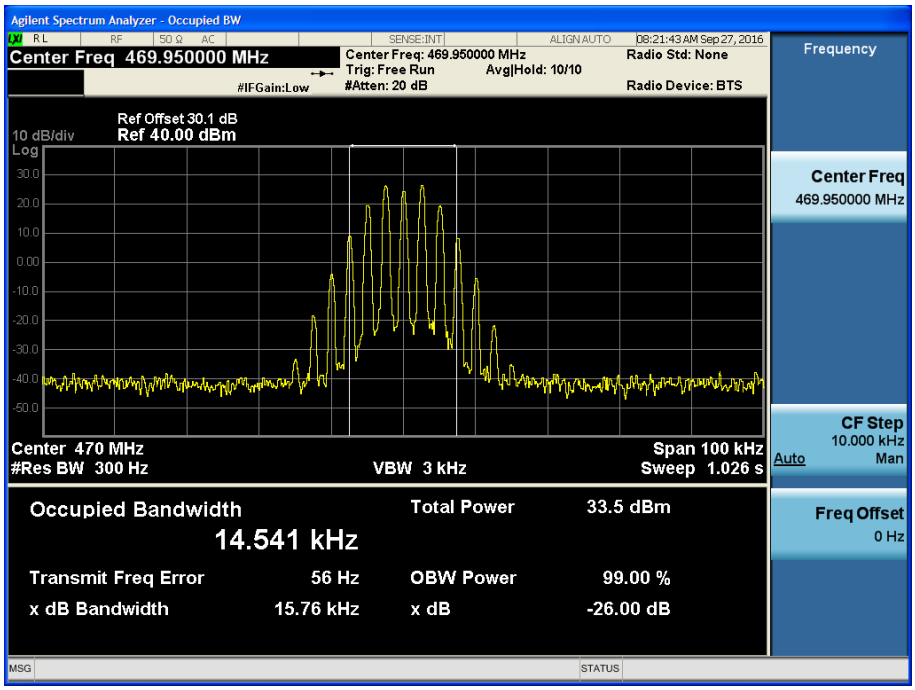
HIGH POWER_16K0F3E _450.05 MHz_Low



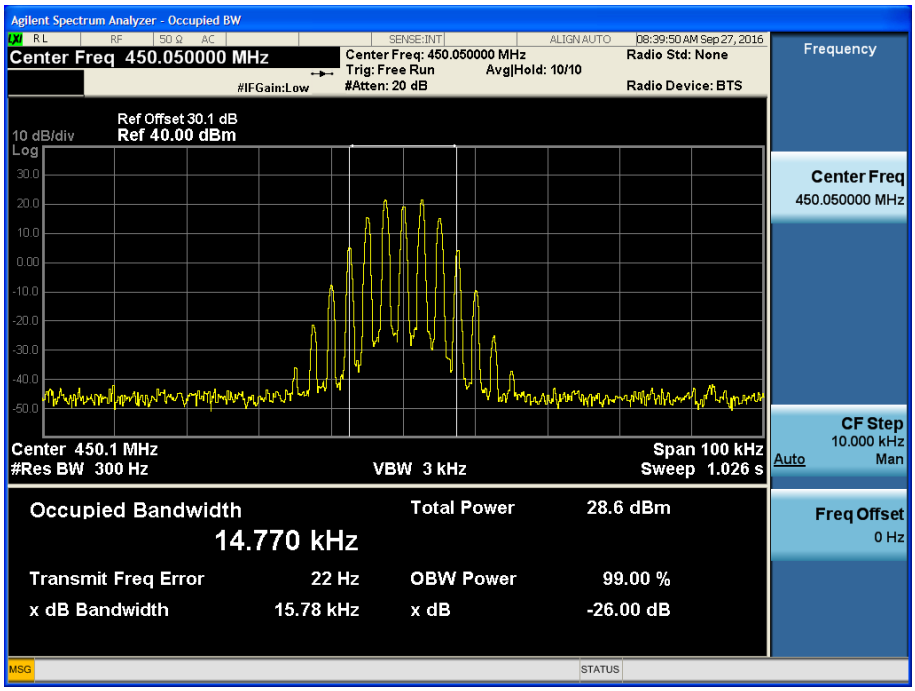
HIGH POWER_16K0F3E _460.05 MHz_Middle



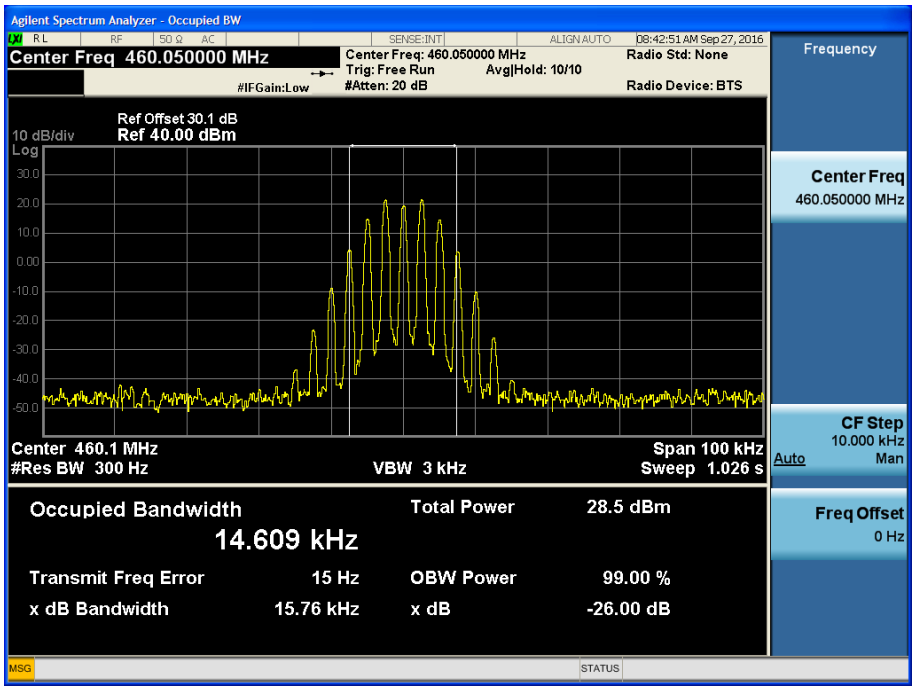
HIGH POWER_16K0F3E _469.95 MHz_High



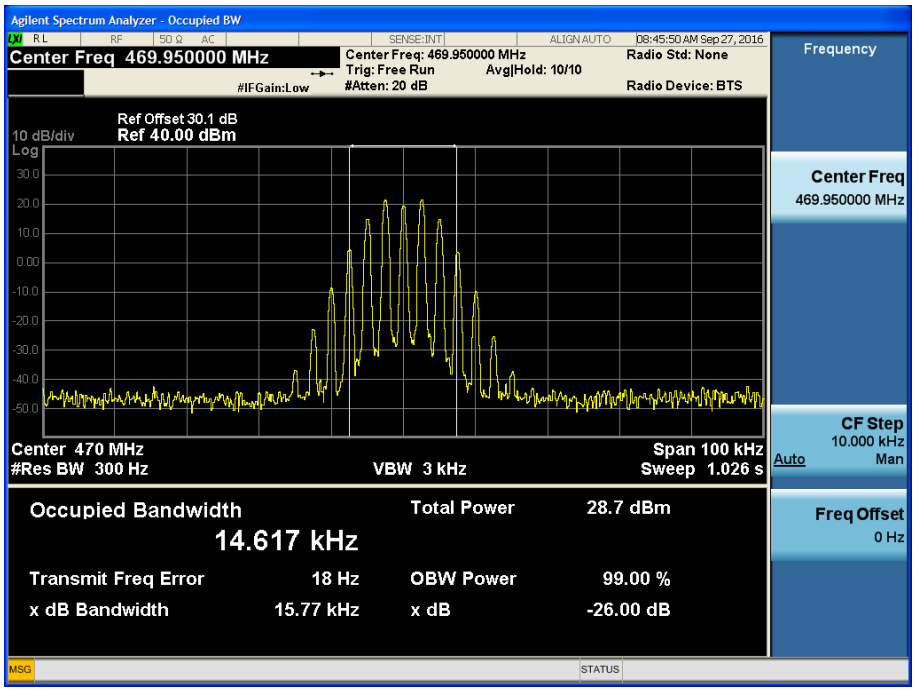
LOW POWER_16K0F3E _450.05 MHz_Low



LOW POWER_16K0F3E _460.05 MHz_Middle



LOW POWER_16K0F3E _469.95 MHz_High

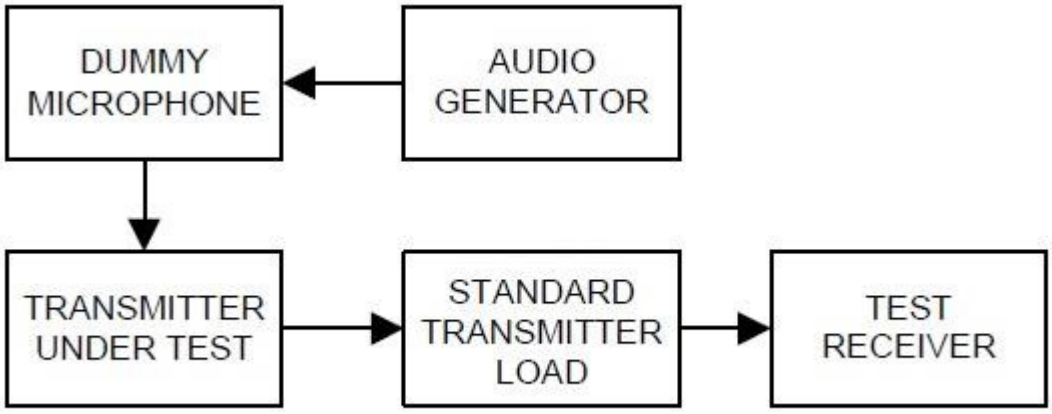


8.4 Modulation Limiting

▣ Definition

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to 2.2.3 in TIA-603-D Standard.

a) Connect the equipment as illustrated.

b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.

c) Set the test receiver to measure peak positive deviation.
Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz.
Turn the de-emphasis function off.

d) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level obtain 60% of full rated system deviation.

e) Increase the level form the audio frequency generator by 20 dB in one step(rise time between the 10% and 90% points shall be 0.1 second maximum).

f) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.

g) With the level from the audio frequency generator held constant at the level obtained in step e), Slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.

h) Set the test receiver to measure peak negative deviation and repeat steps d) through g).

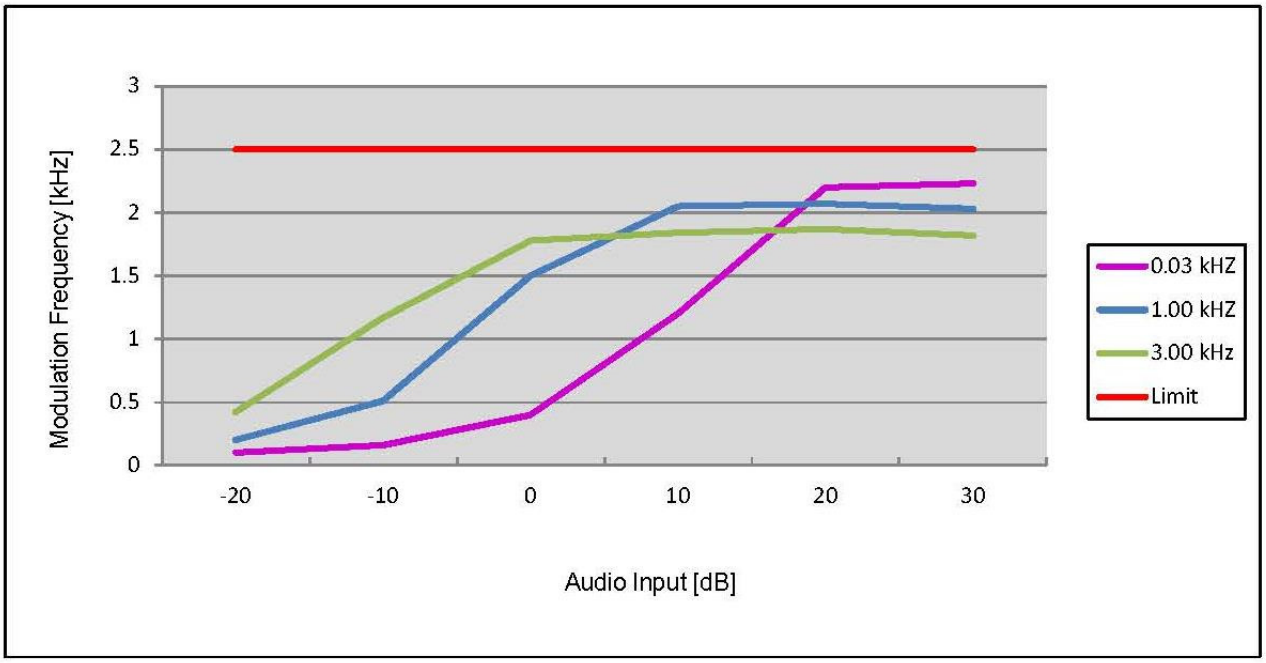
i) The values recorded in steps g) and h) are the modulation limiting.

▣ TEST RESULTS

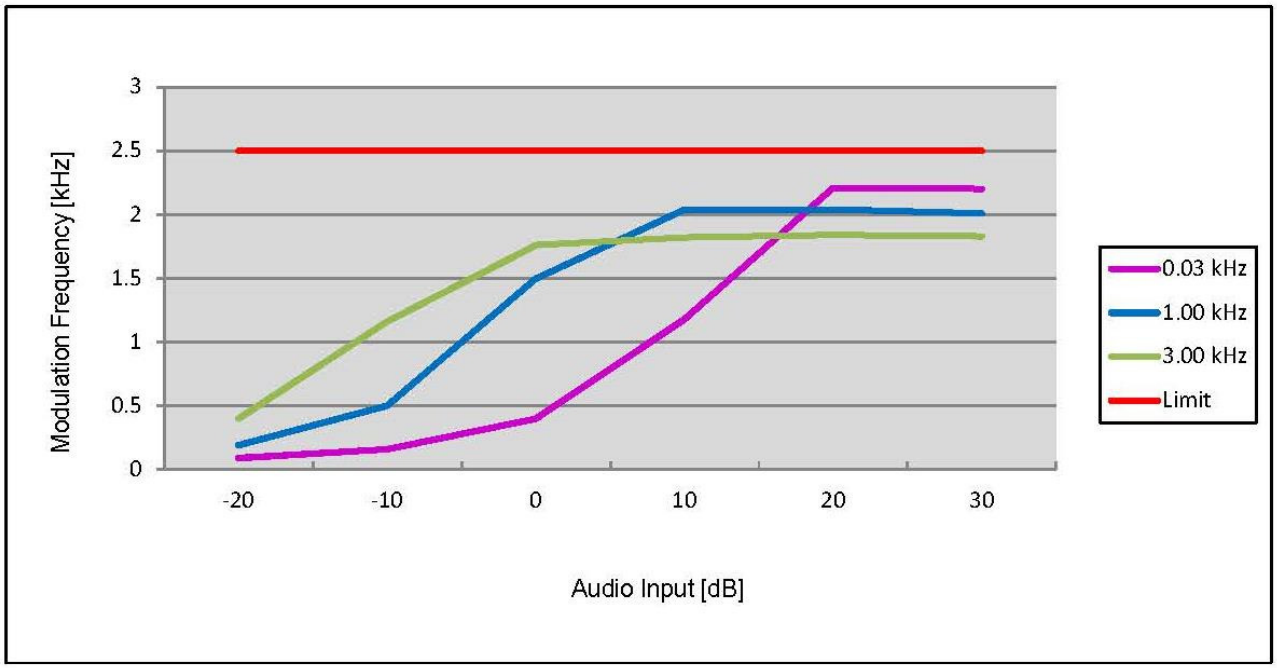
11K0F3E

Positive Peaks

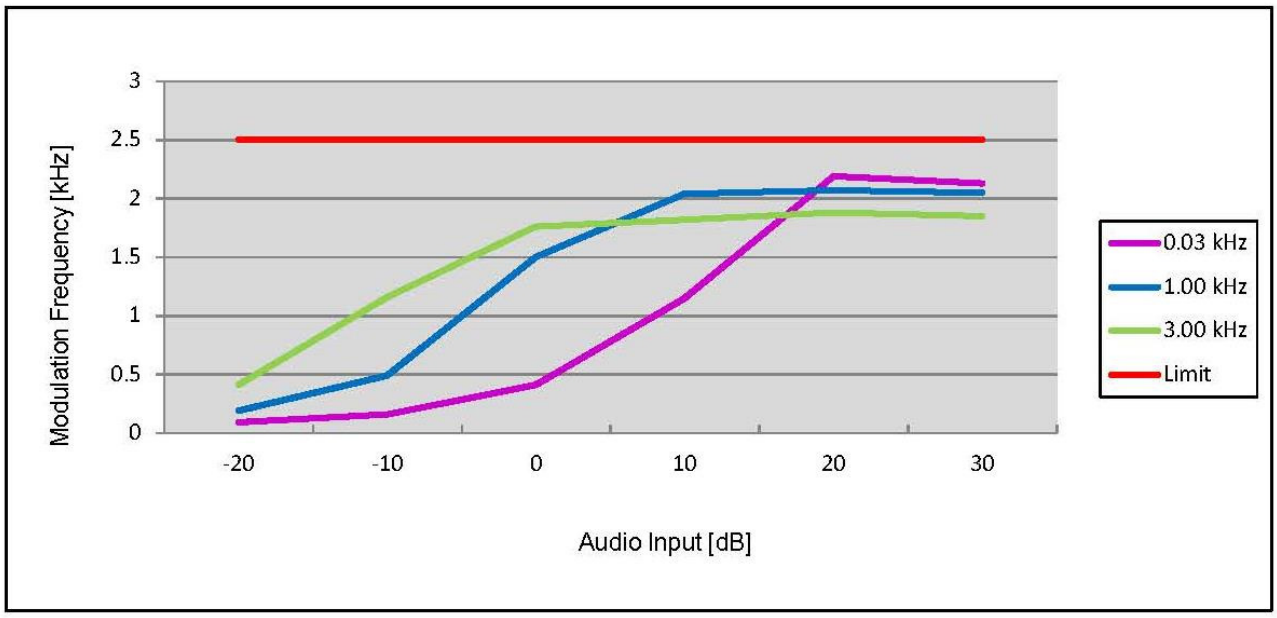
11K0F3E_450.05 MHz_HIGH POWER



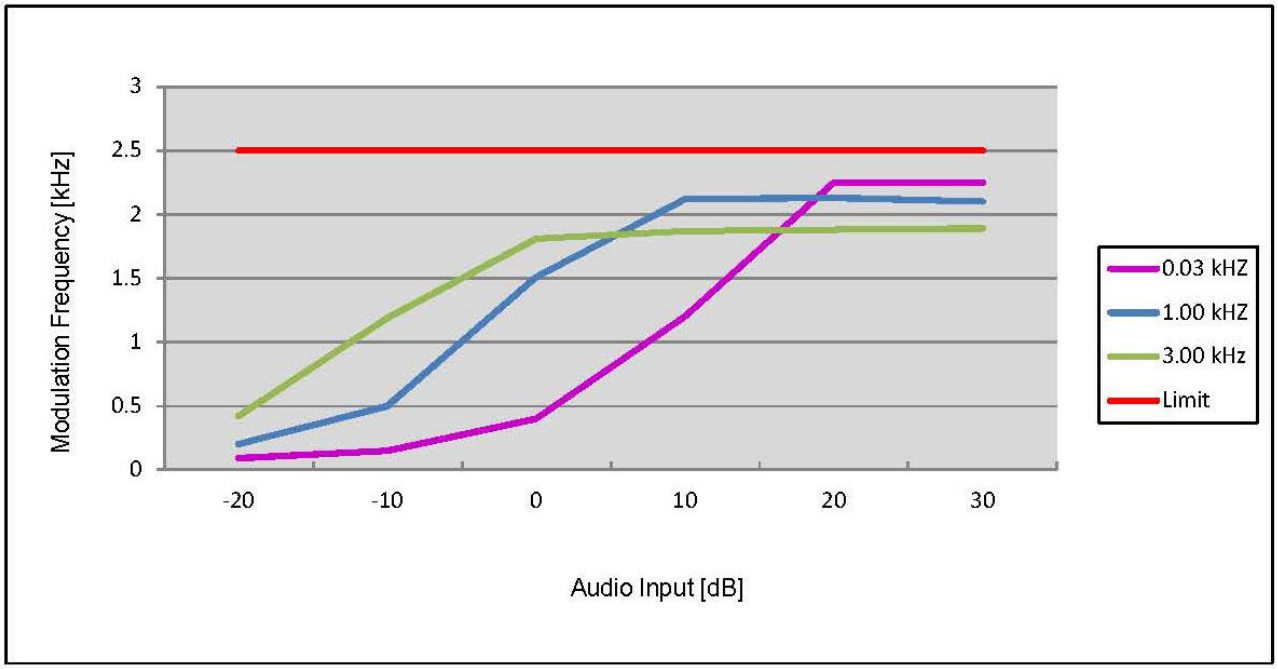
11K0F3E _460.05 MHz_HIGH POWER



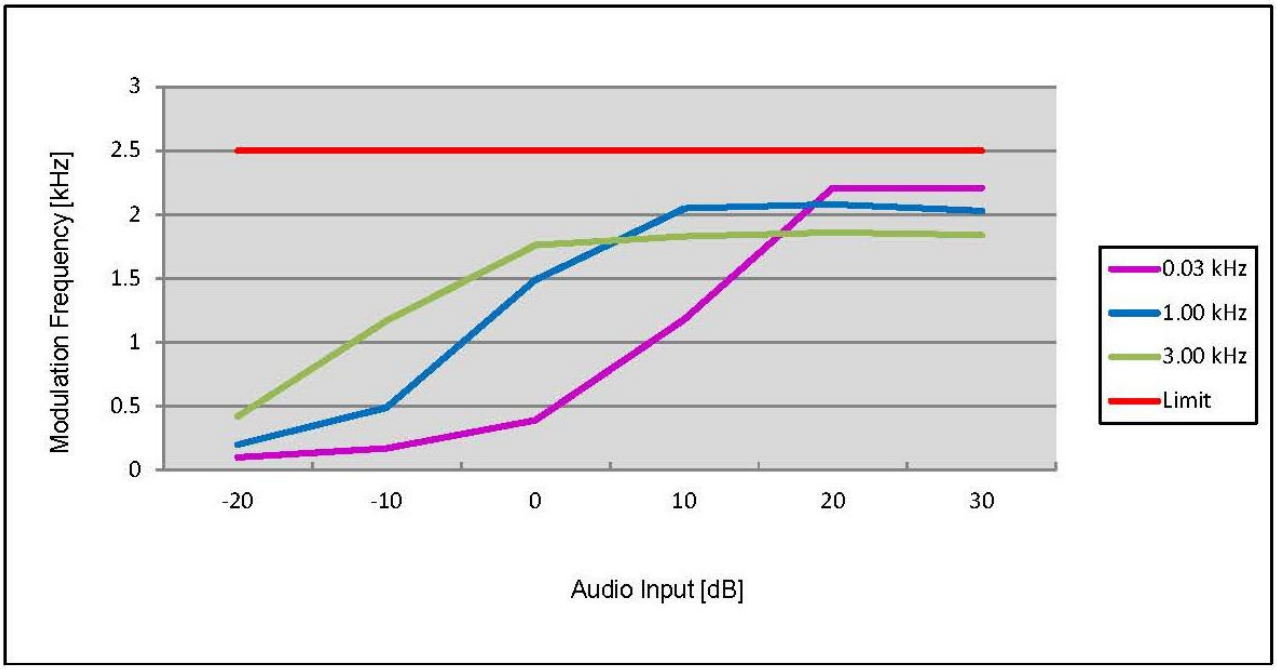
11K0F3E _469.95 MHz_HIGH POWER



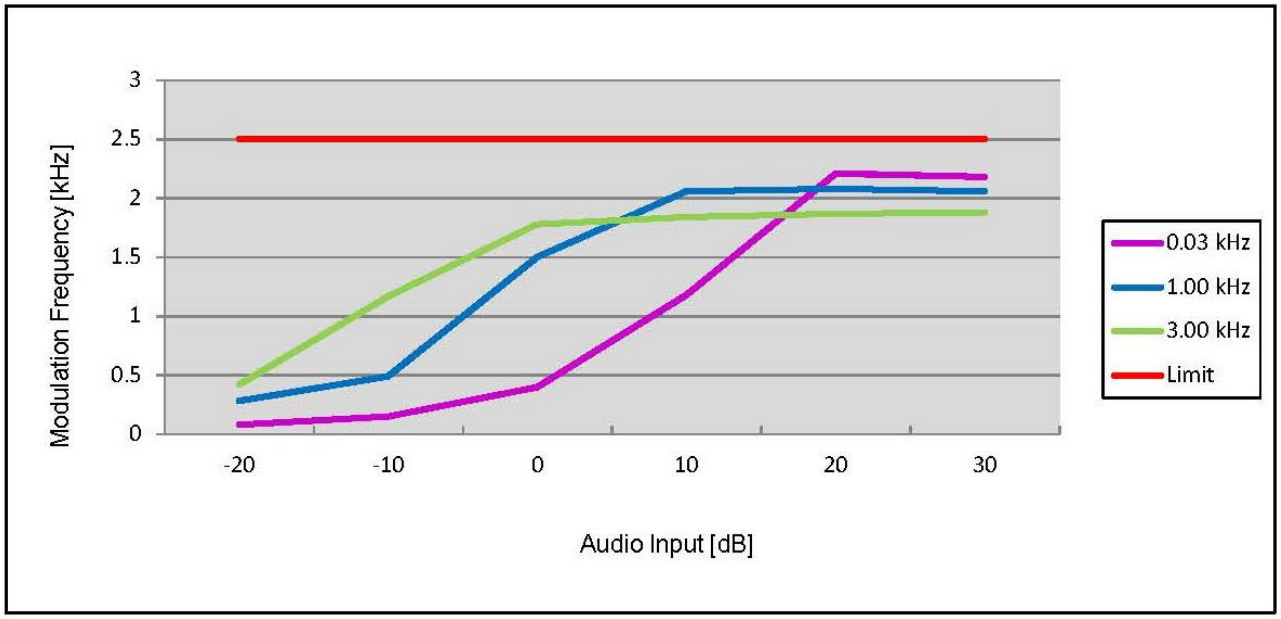
11K0F3E _450.05 MHz_LOW POWER



11K0F3E _460.05 MHz_LOW POWER

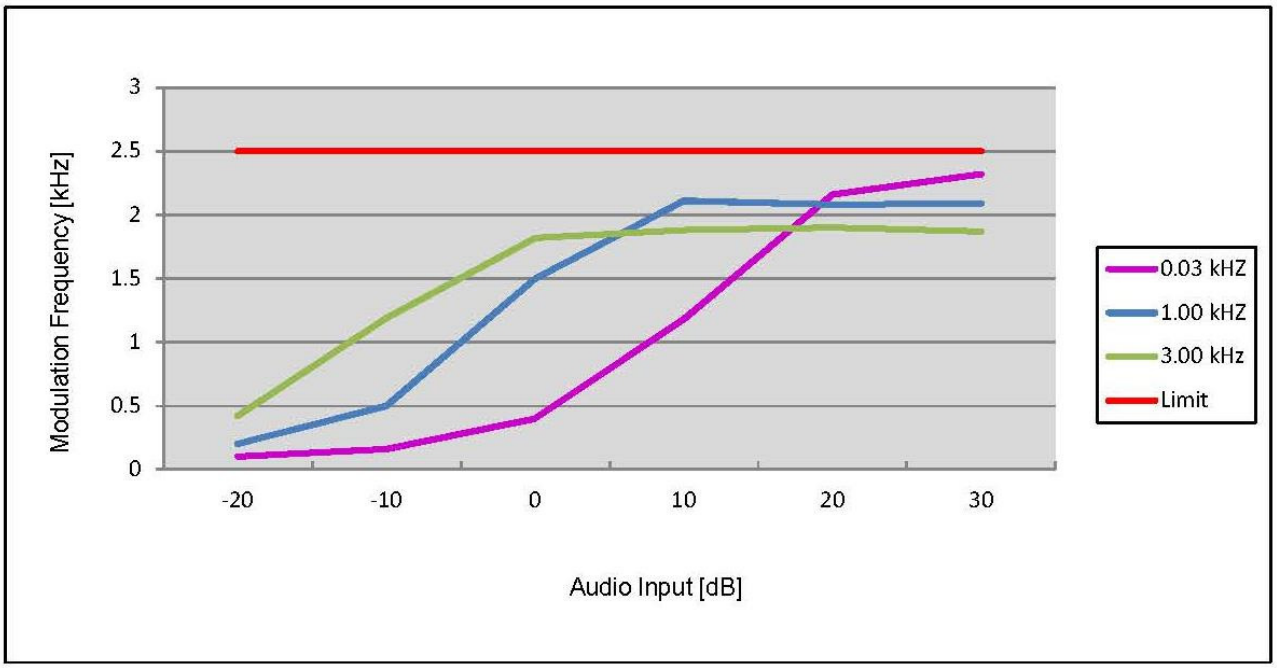


11K0F3E _469.95 MHz_LOW POWER

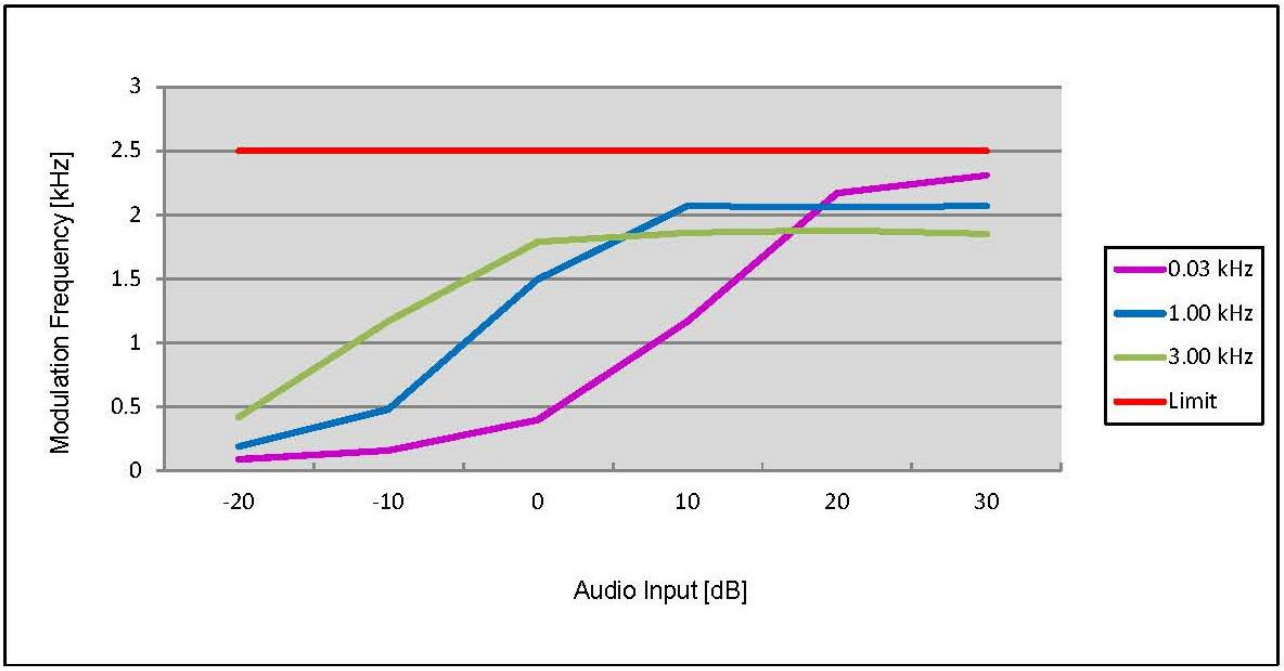


Negative Peaks

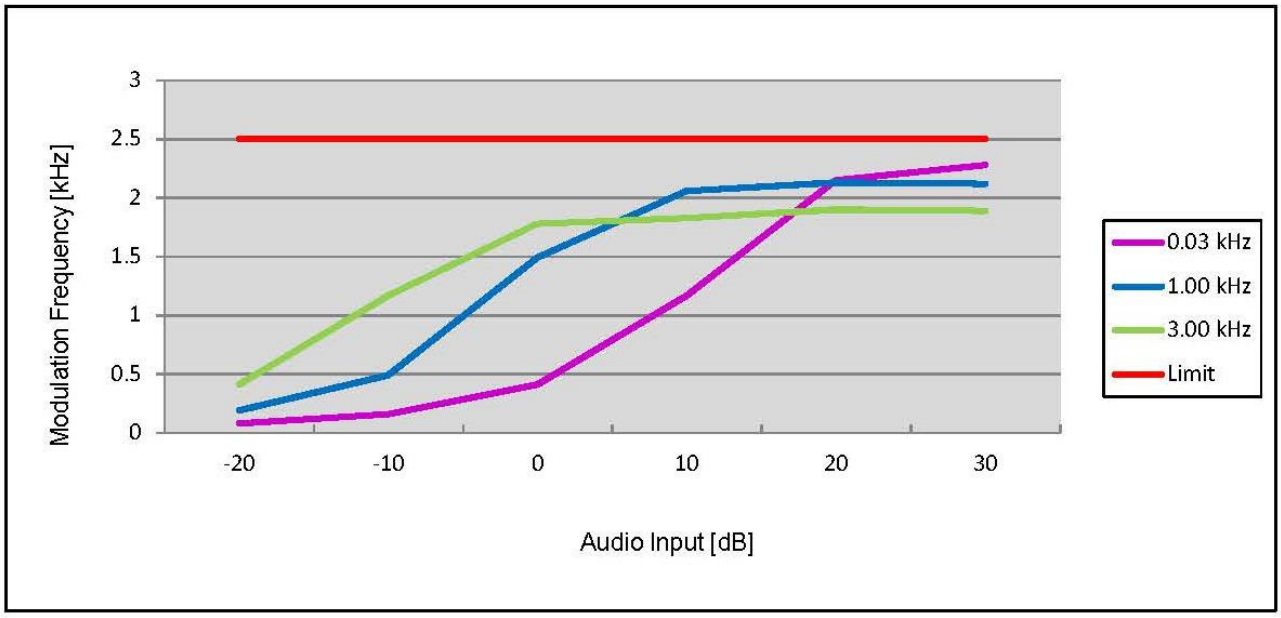
11K0F3E_450.05 MHz_HIGH POWER



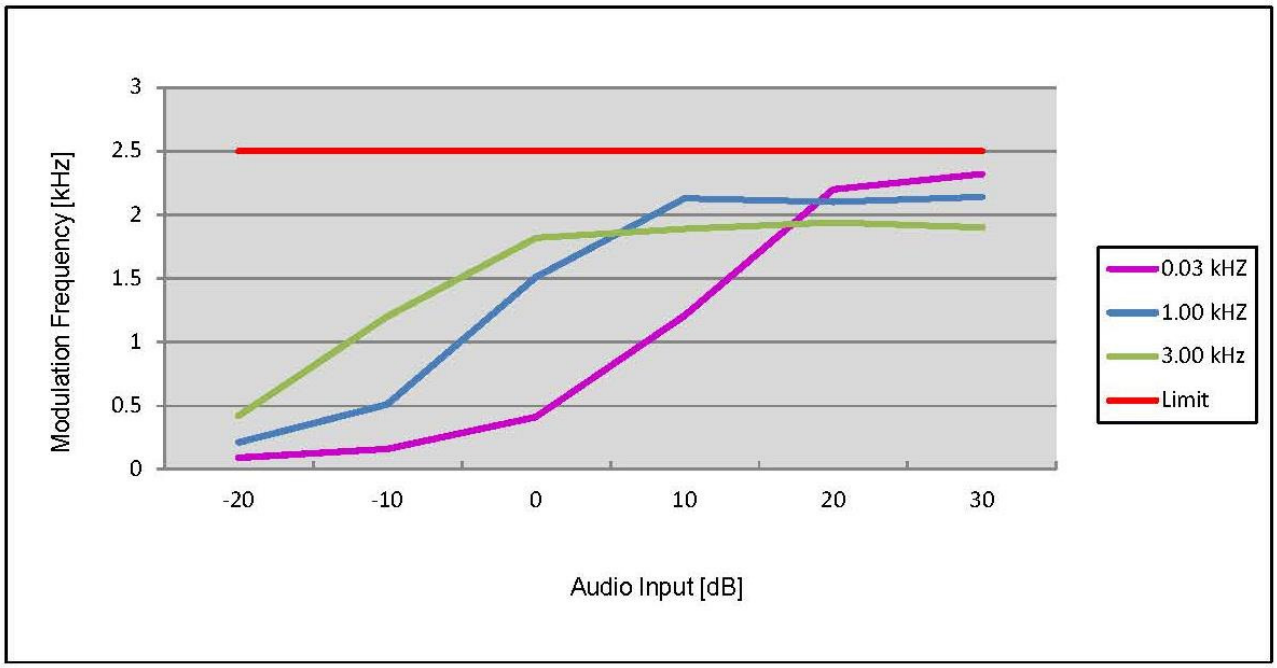
11K0F3E _460.05 MHz_HIGH POWER



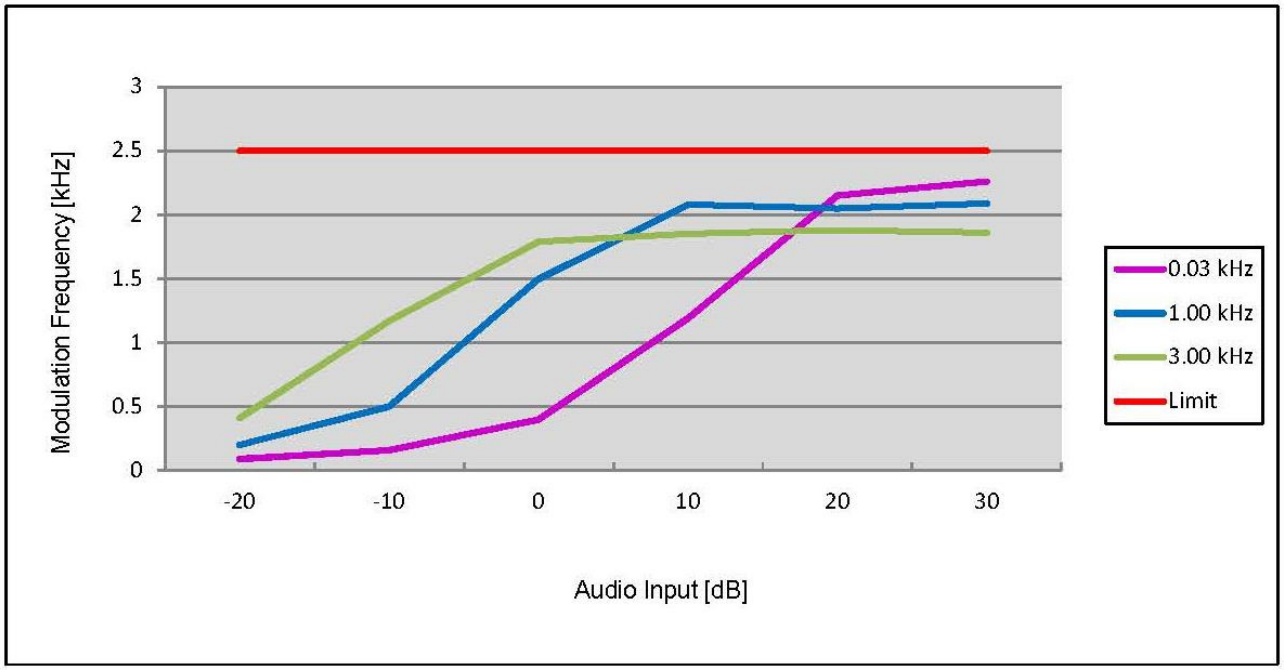
11K0F3E _469.95 MHz_HIGH POWER



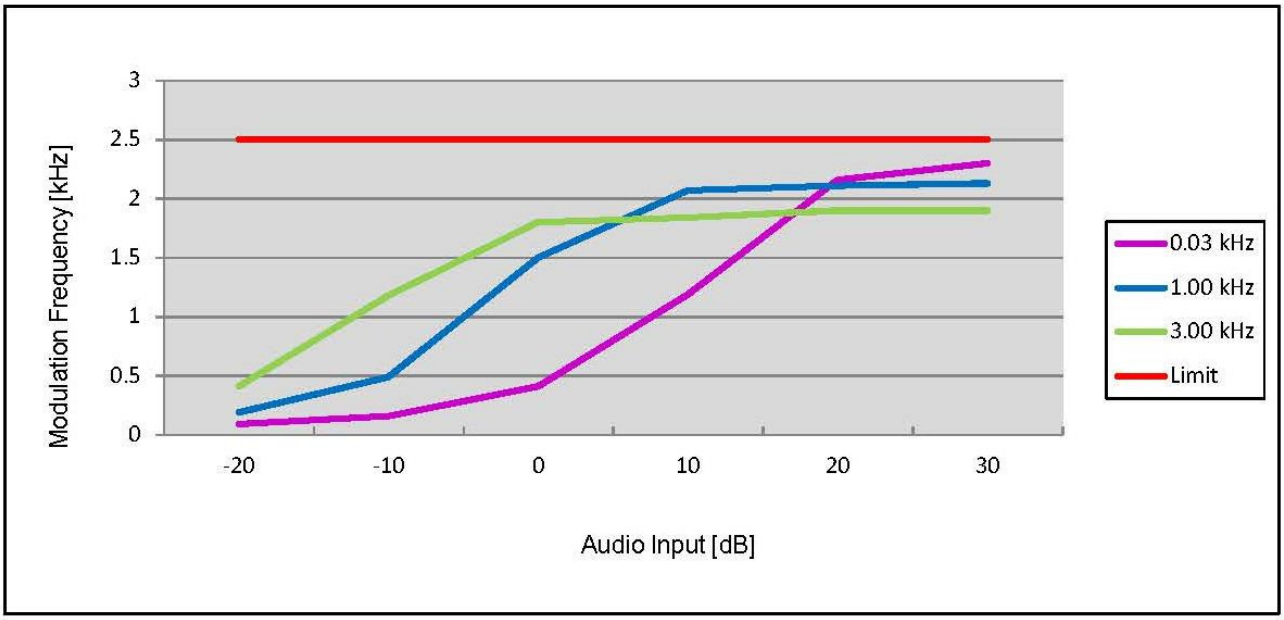
11K0F3E _450.05 MHz_LOW POWER



11K0F3E _460.05 MHz_LOW POWER



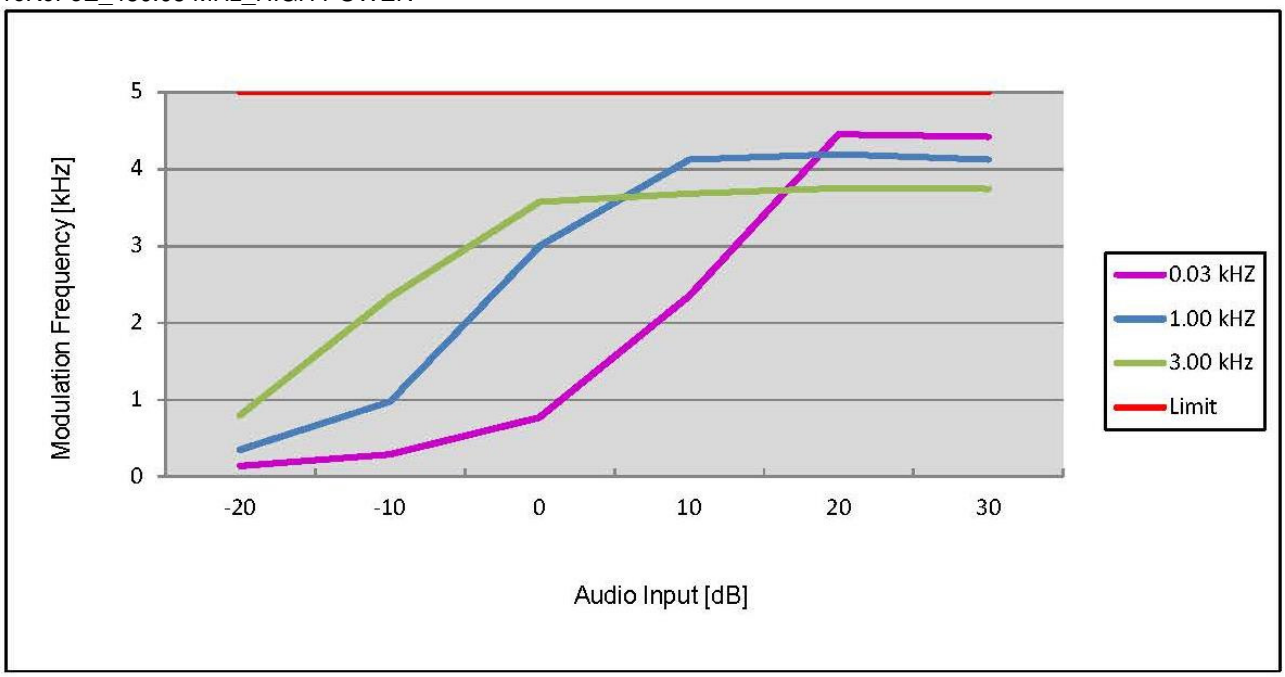
11K0F3E _469.95 MHz_LOW POWER



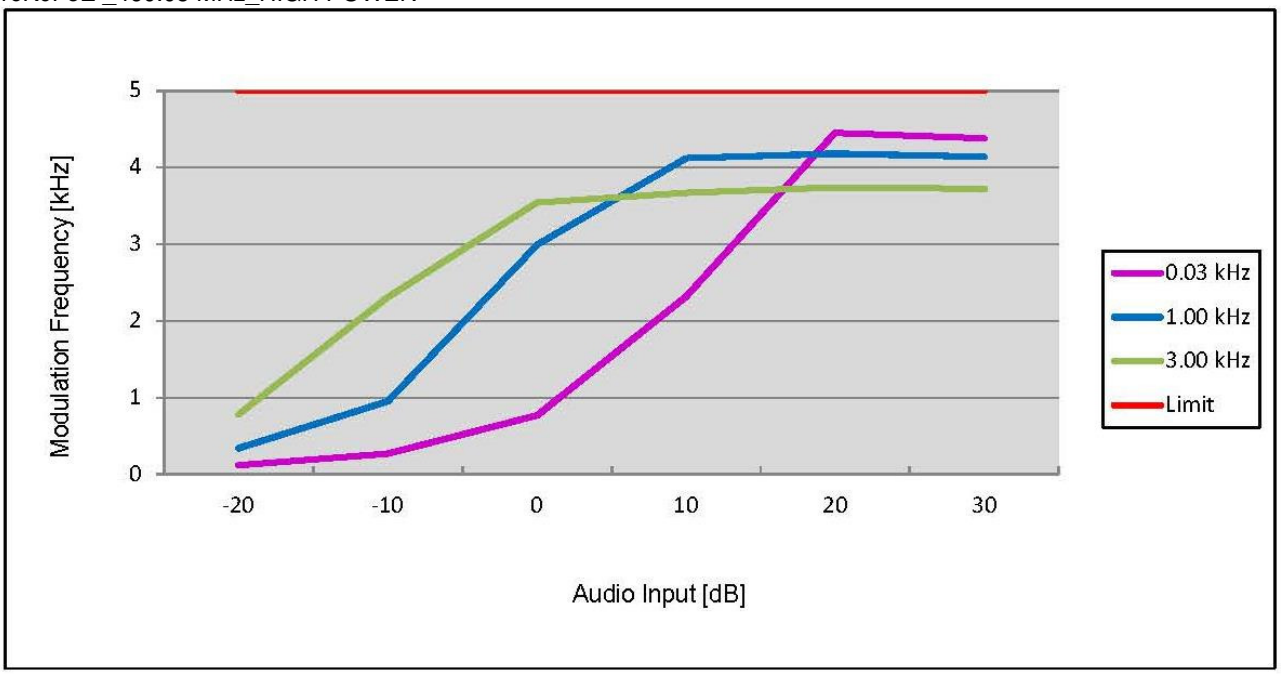
16K0F3E

Positive Peaks

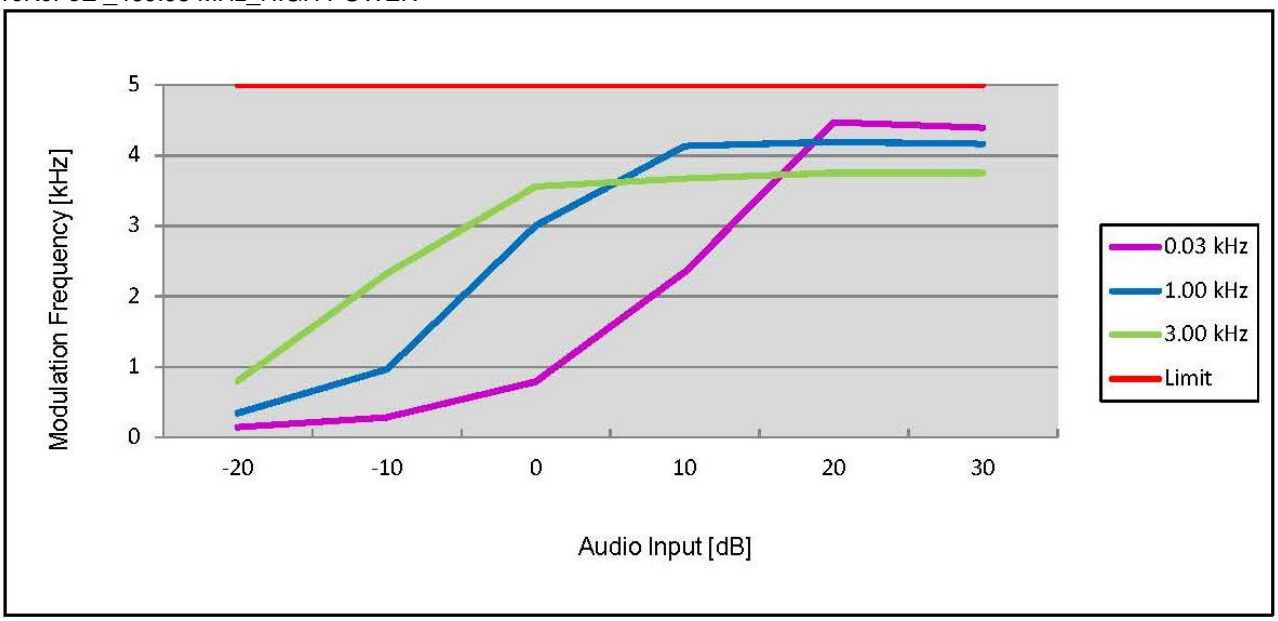
16K0F3E_450.05 MHz_HIGH POWER



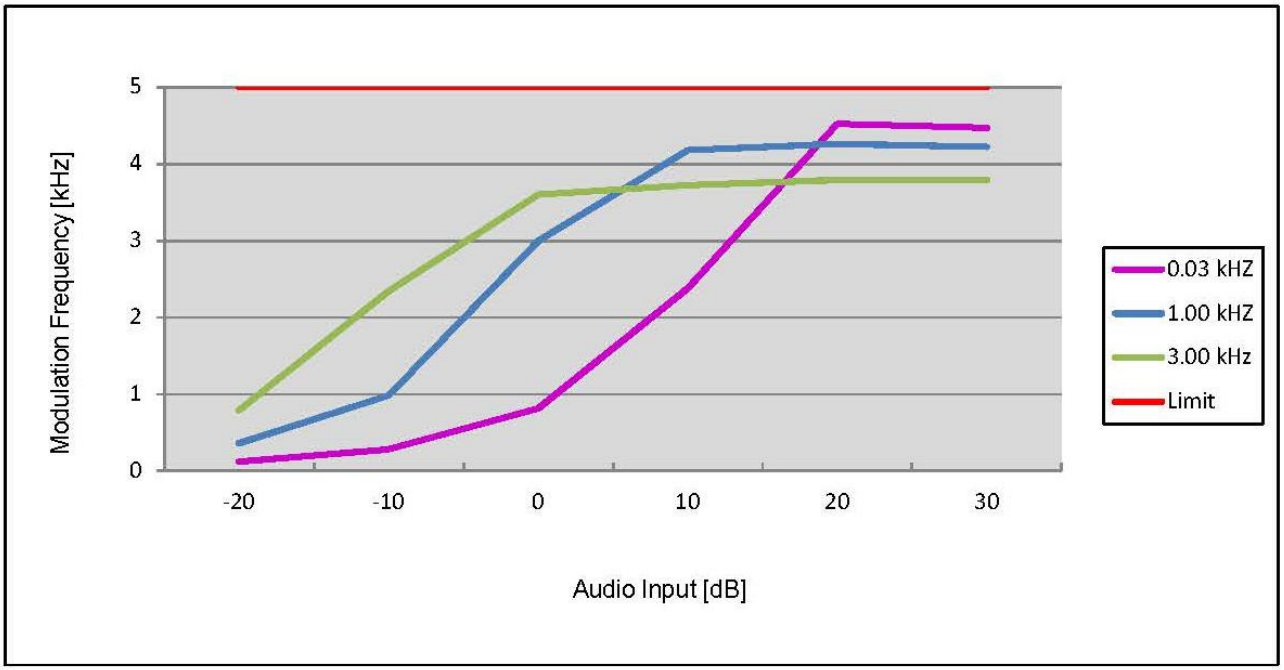
16K0F3E _460.05 MHz_HIGH POWER



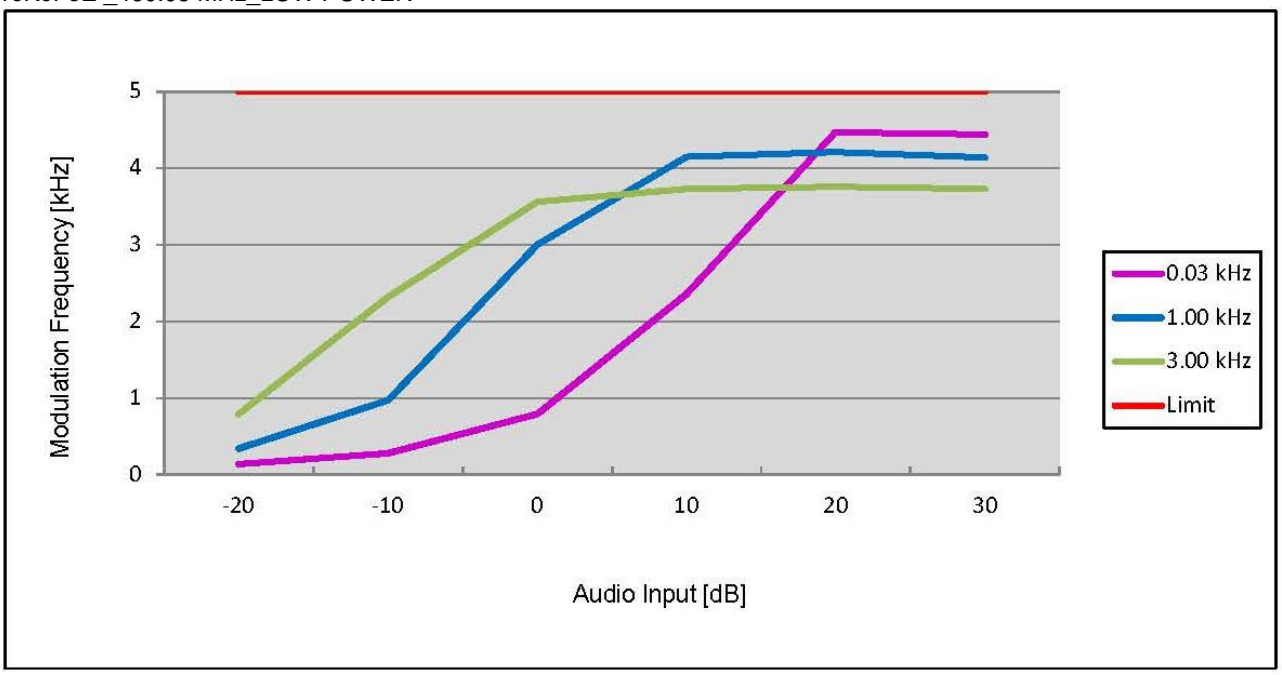
16K0F3E _469.95 MHz_HIGH POWER



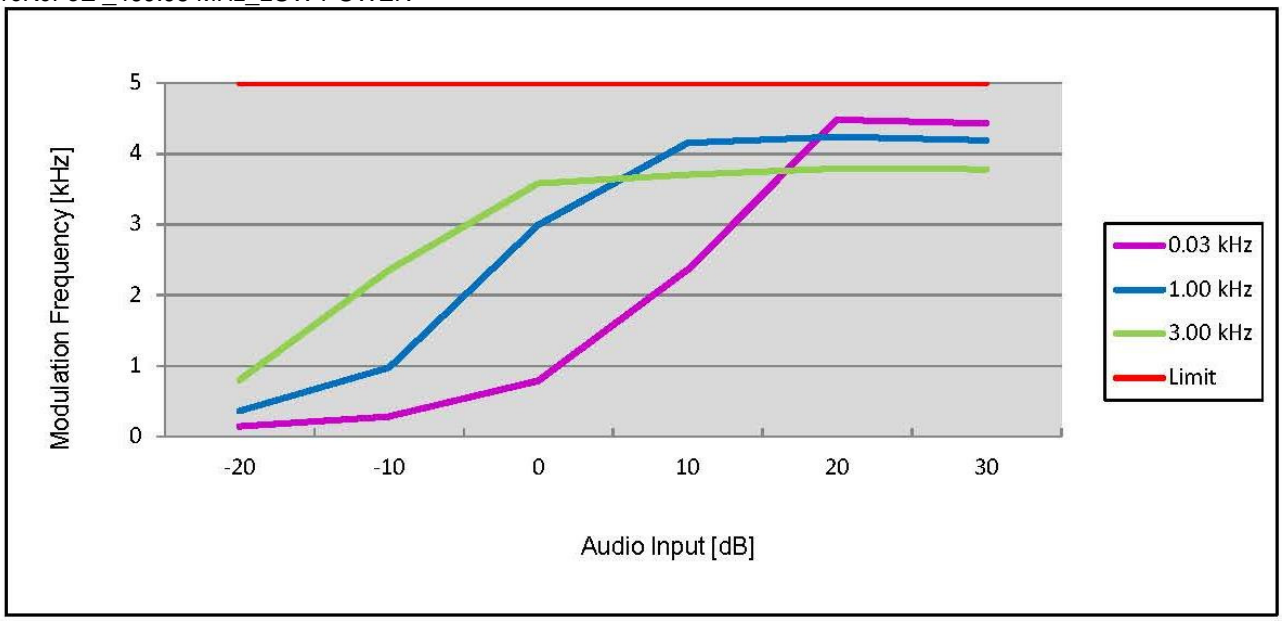
16K0F3E _450.05 MHz_LOW POWER



16K0F3E _460.05 MHz_LOW POWER

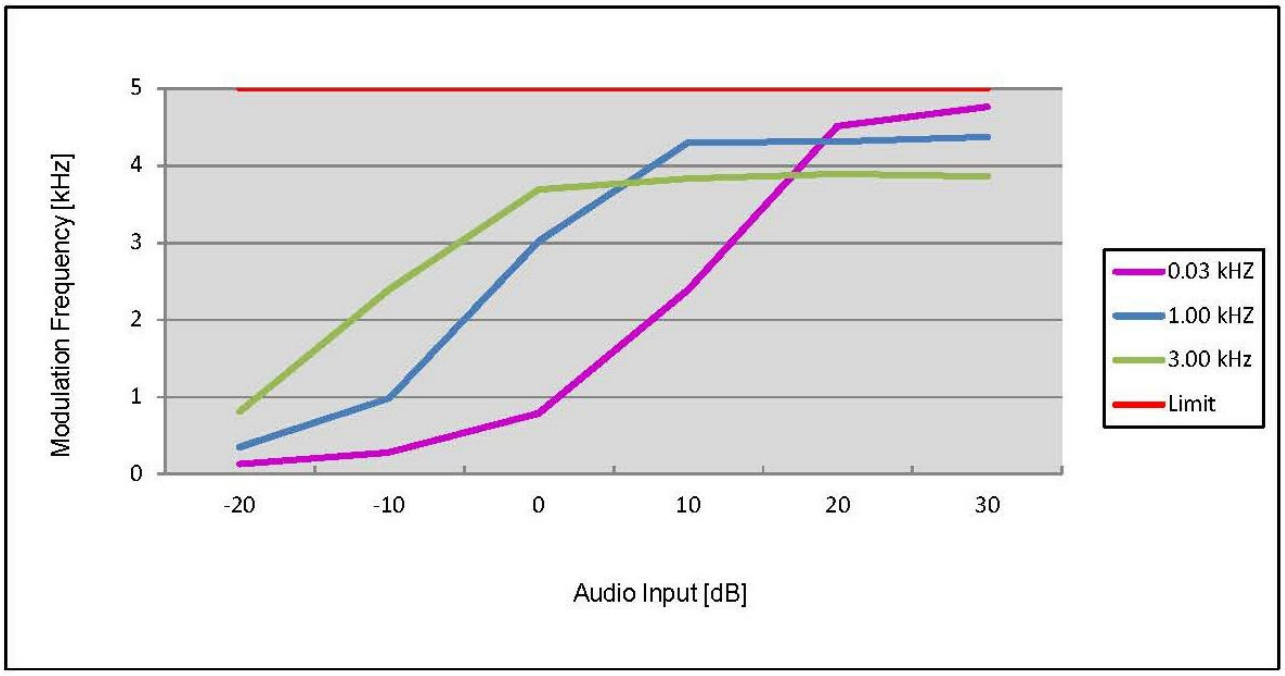


16K0F3E _469.95 MHz_LOW POWER

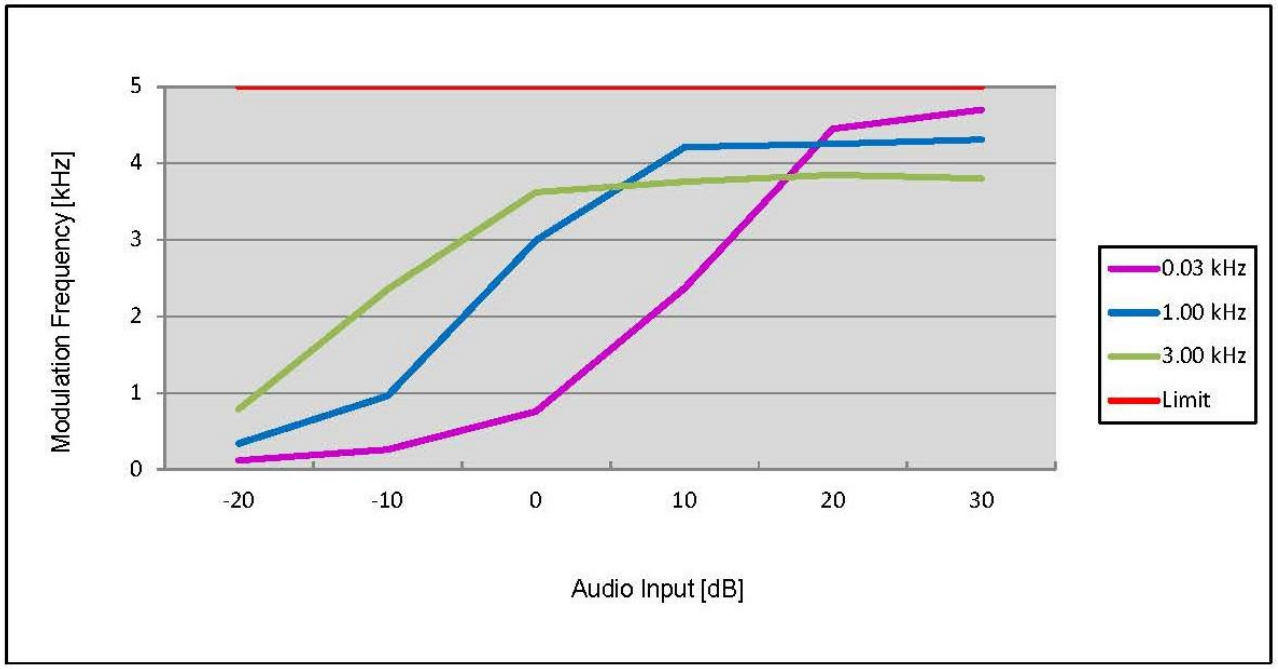


Negative Peaks

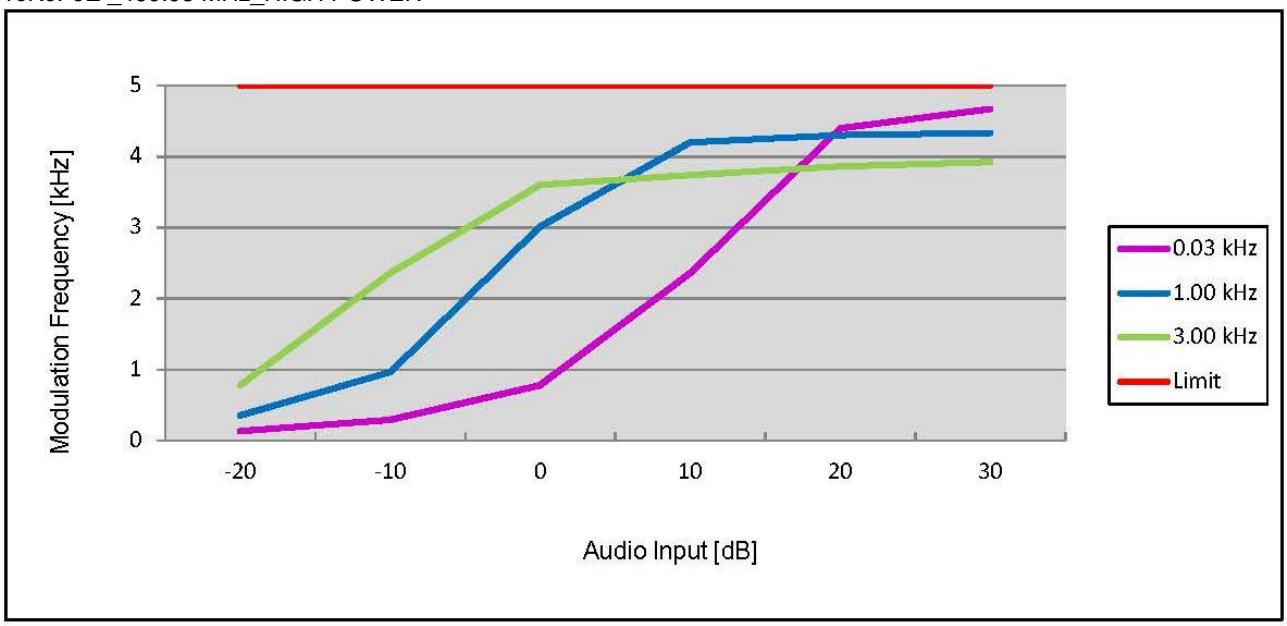
16K0F3E_450.05 MHz_HIGH POWER



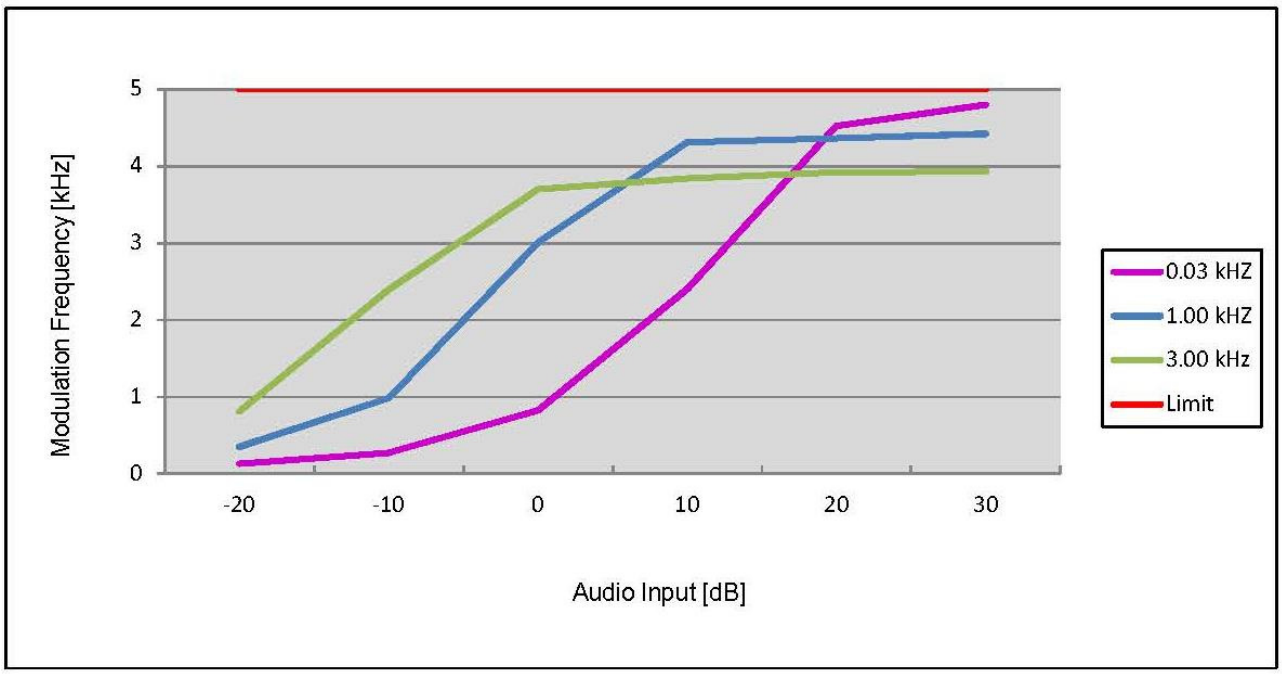
16K0F3E _460.05 MHz_HIGH POWER



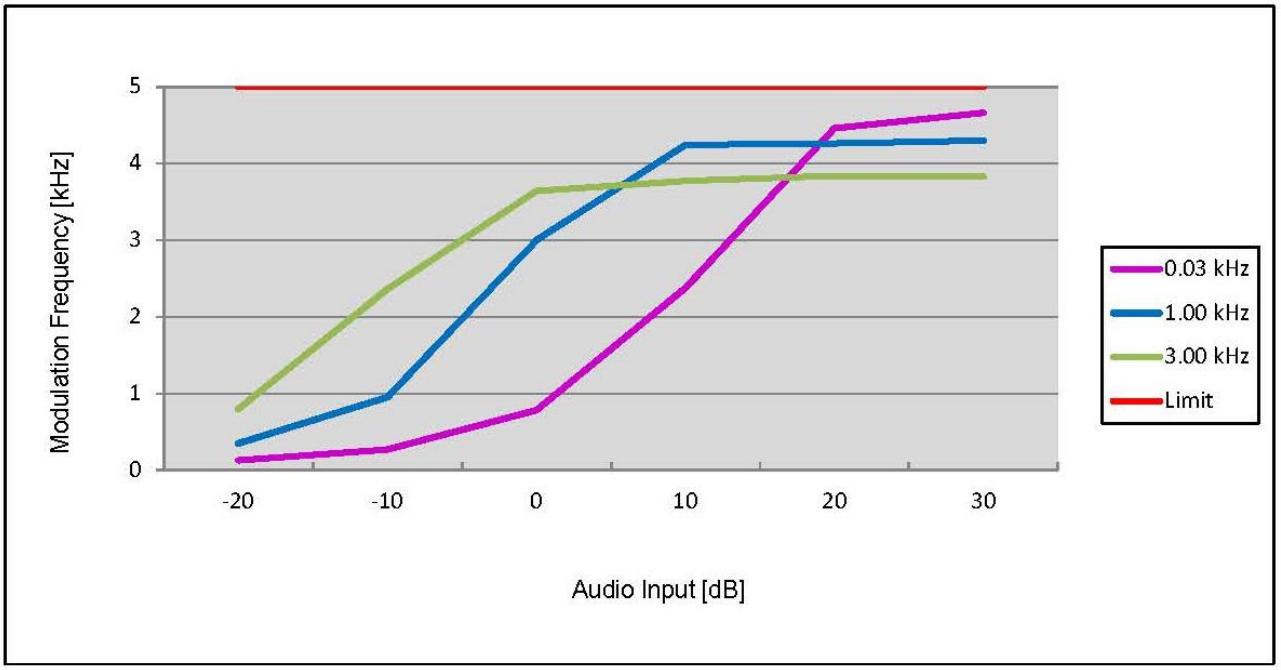
16K0F3E _469.95 MHz_HIGH POWER



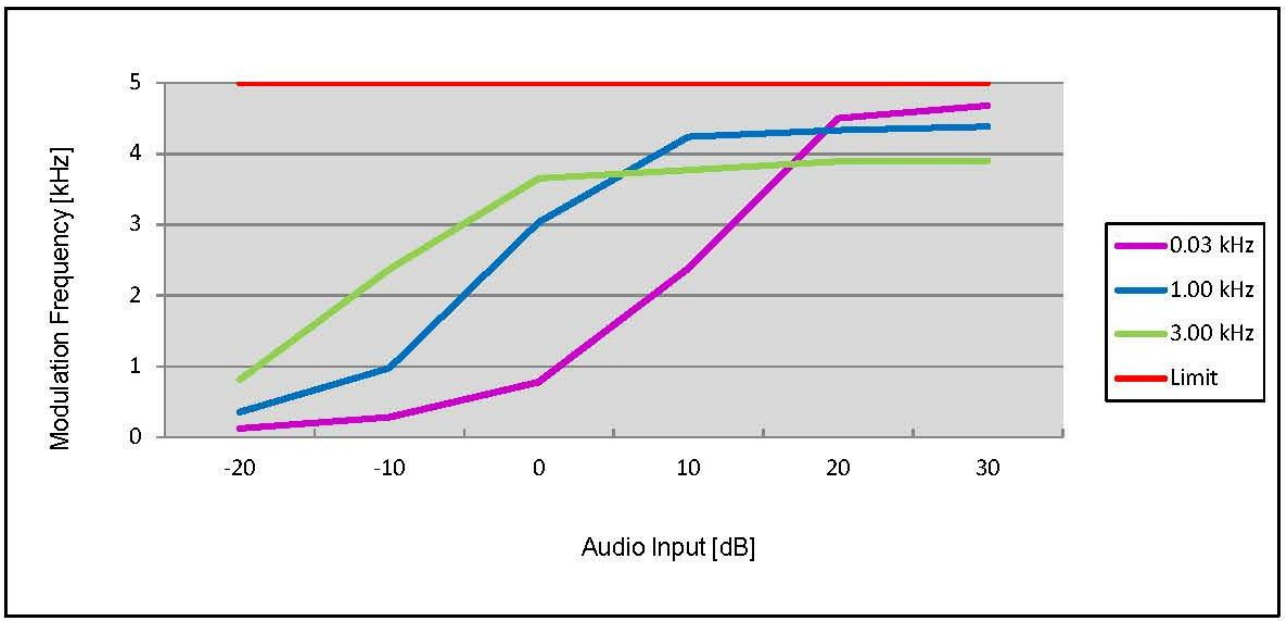
16K0F3E _450.05 MHz_LOW POWER



16K0F3E _460.05 MHz_LOW POWER



16K0F3E _469.95 MHz_LOW POWER

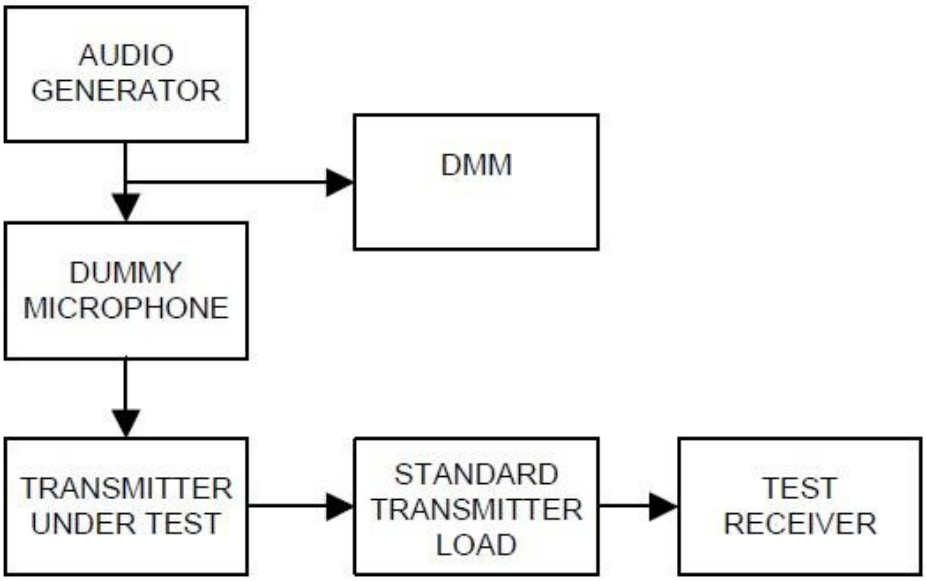


8.5 Audio Frequency Response / Audio Low Pass Filter Response

▣ Definition

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to 2.2.6 in TIA-603-D Standard.

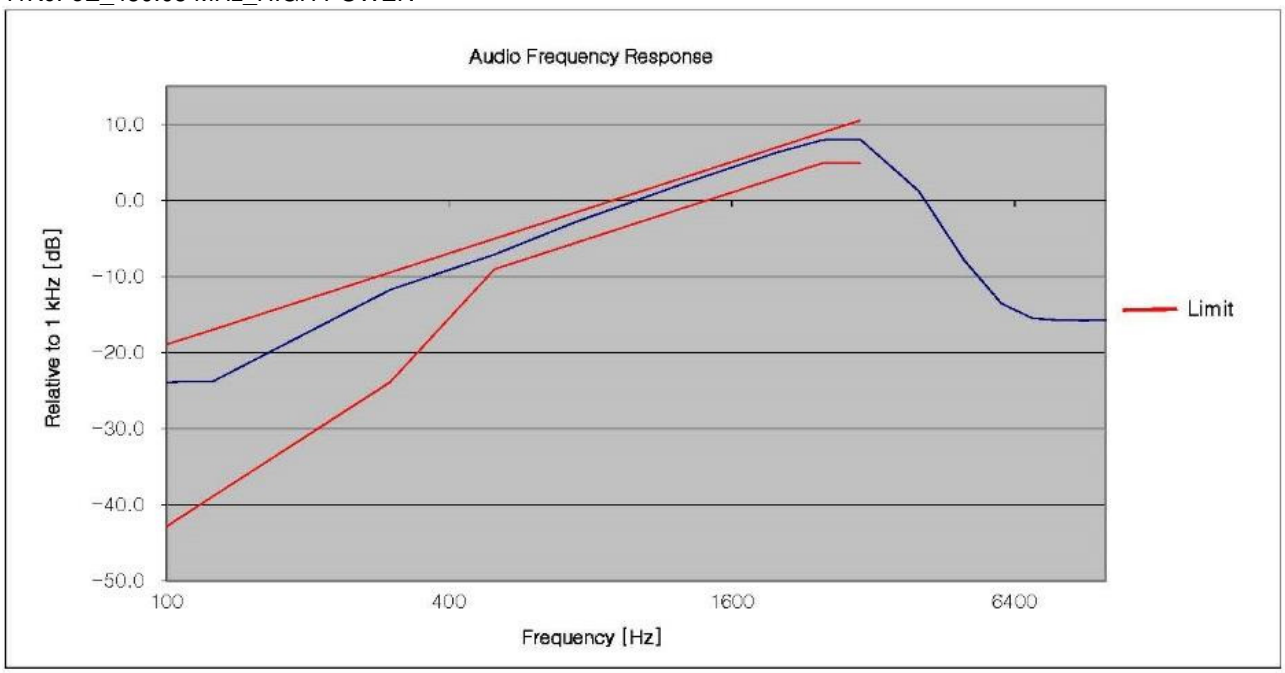
a) Connect the equipment as illustrated.
b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤ 50 Hz to ≥ 15,000 Hz. Turn the de-emphasis function off.
c) Set the DMM to measure rms voltage.
d) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
e) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
f) Set the test receiver to measure rms deviation and record the deviation reading.
g) Record the DMM reading as $V_{REF.}$
h) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
i) Vary the audio frequency generator output level until the deviation reading that was recorded in step f) is obtained.
j) Record the DMM reading as $V_{FREQ.}$
k) Calculate the audio frequency response at the present frequency as:
audio frequency response = $20 * \log_{10}(V_{FREQ}/V_{REF})$
l) Repeat steps h) through k) for all the desired test frequencies.

*Note : Audio Filter of the above result is substituted with the same structure as Audio Frequency Response.
On the transmission condition below 3kHz, Transceiver shows pre-emphasis condition of transmission function.
On the transmission condition above 3kHz, Transceiver shows Audio Low Pass Filter.

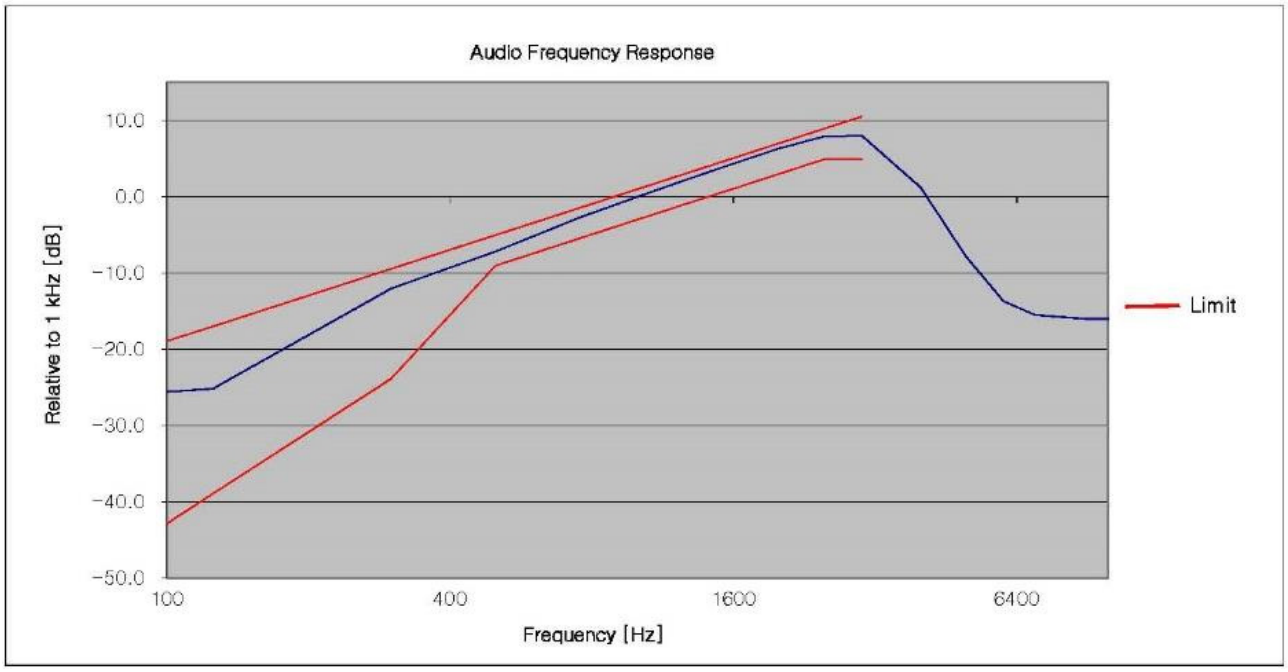
▣ TEST RESULTS

11K0F3E

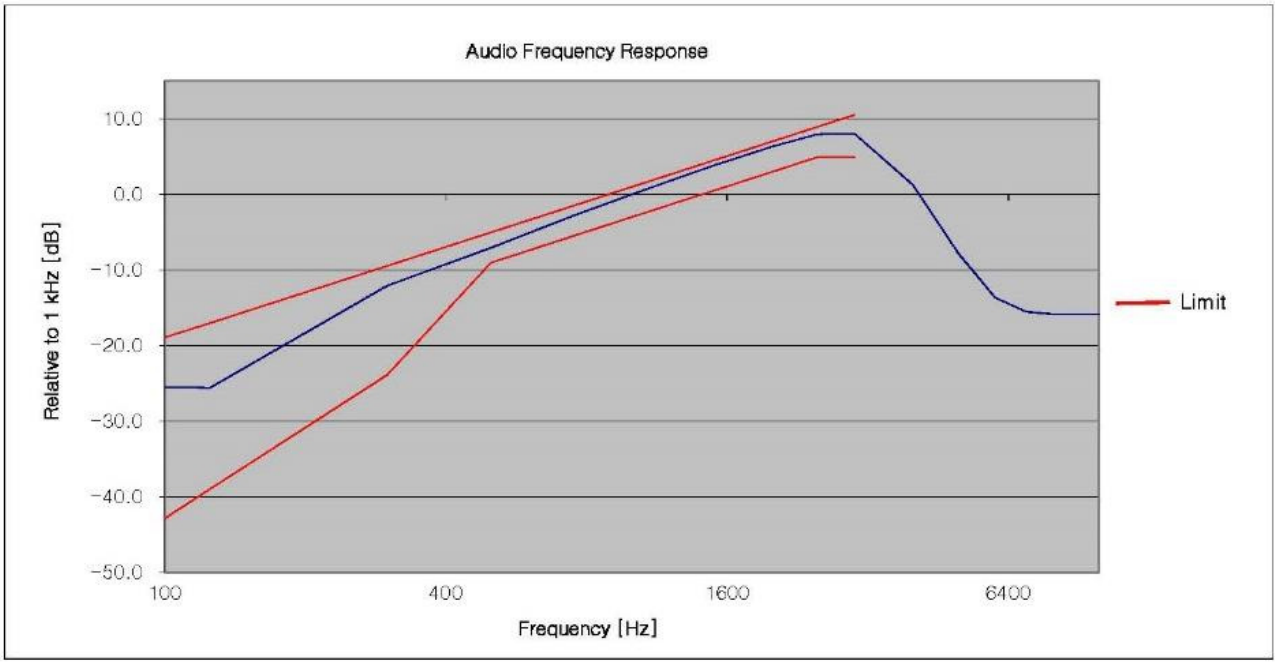
11K0F3E_450.05 MHz_HIGH POWER



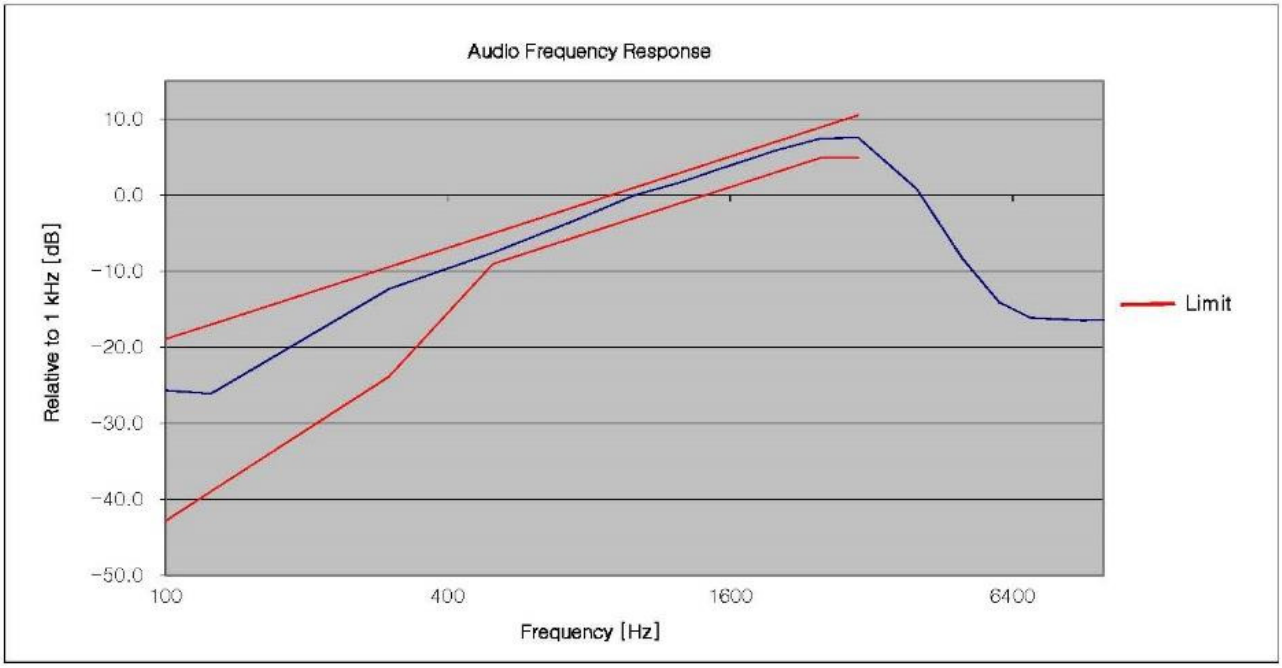
11K0F3E _460.05 MHz_HIGH POWER



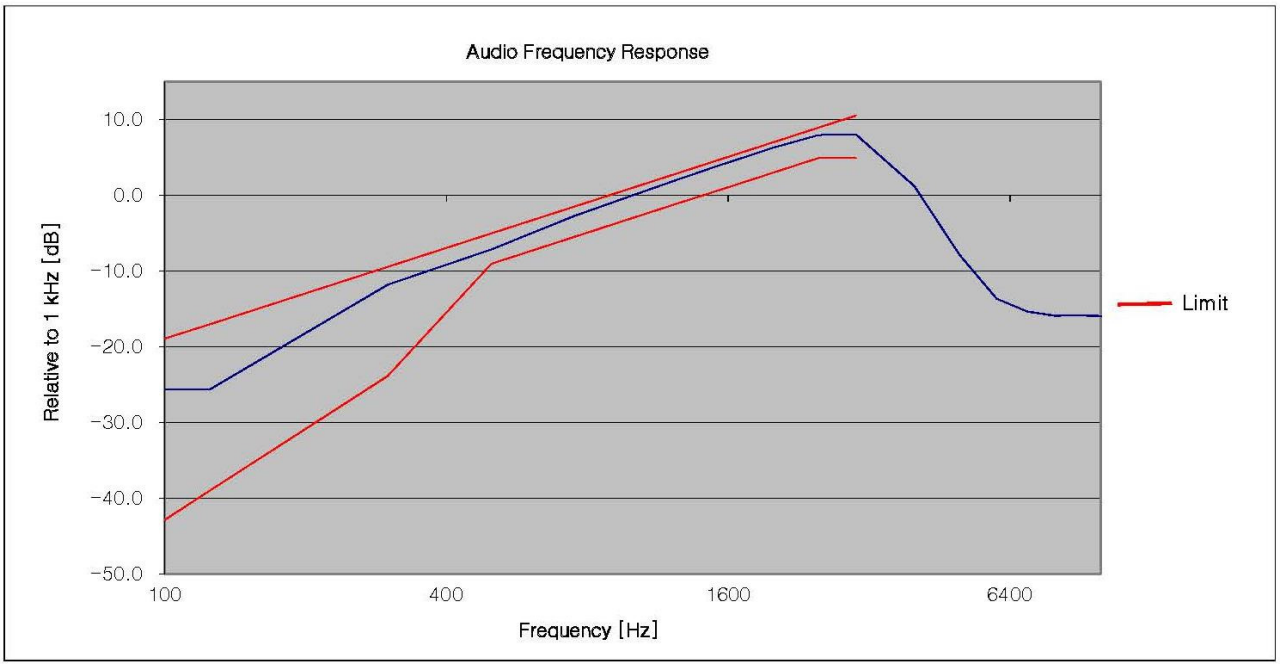
11K0F3E _469.95 MHz_HIGH POWER



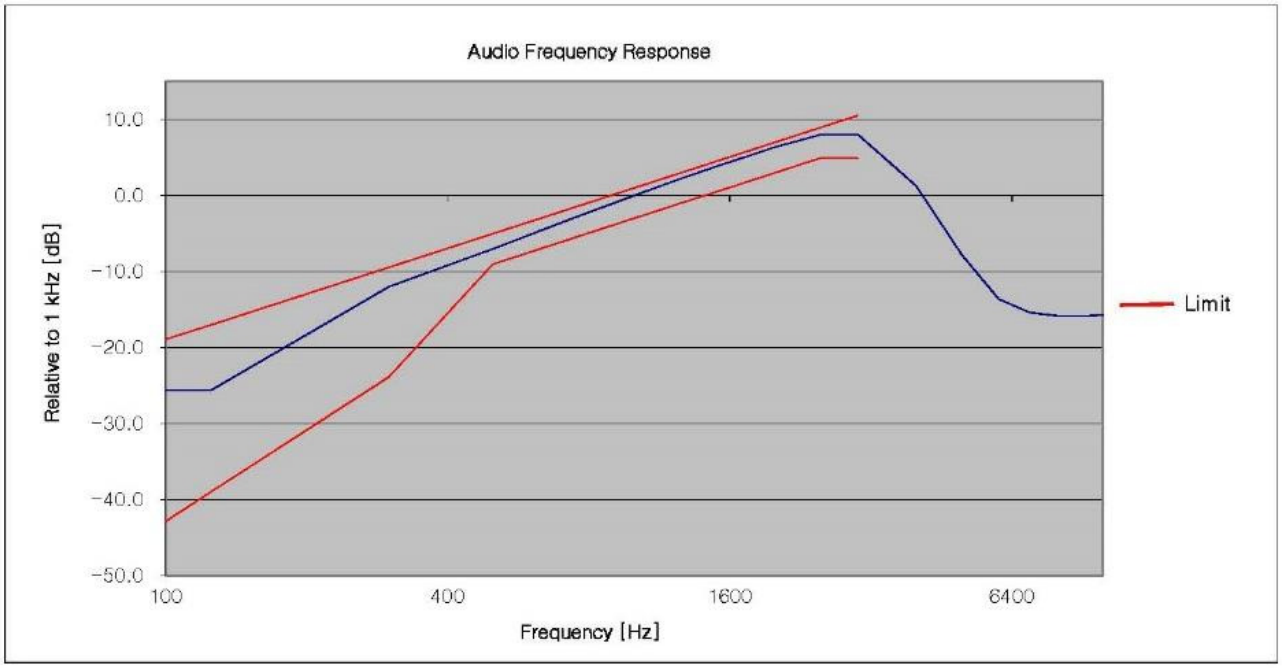
11K0F3E _450.05 MHz_LOW POWER



11K0F3E _460.05 MHz_LOW POWER

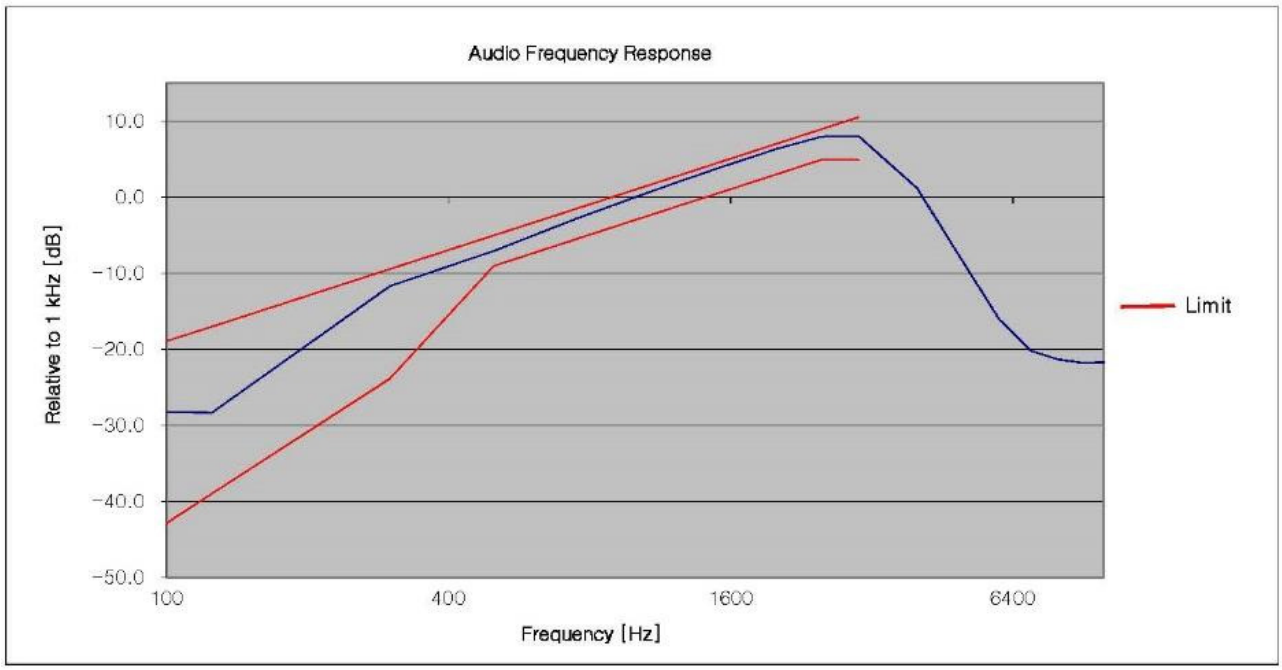


11K0F3E _469.95 MHz_LOW POWER

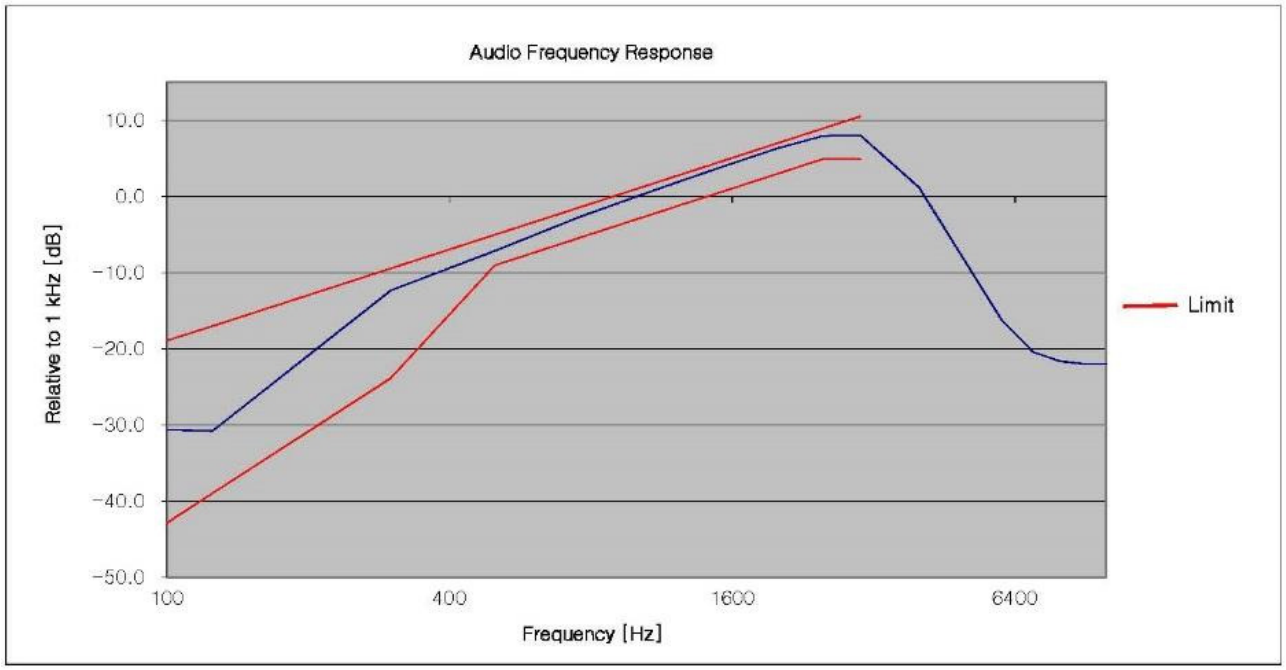


16K0F3E

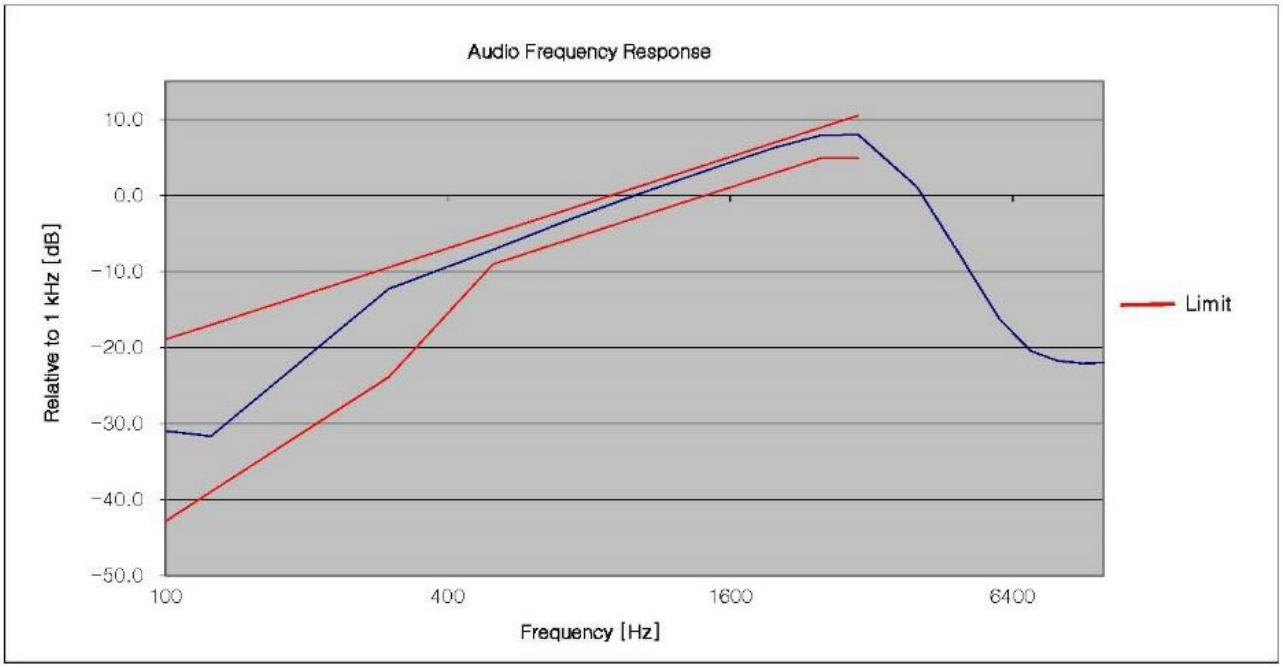
16K0F3E_460.05 MHz_HIGH POWER



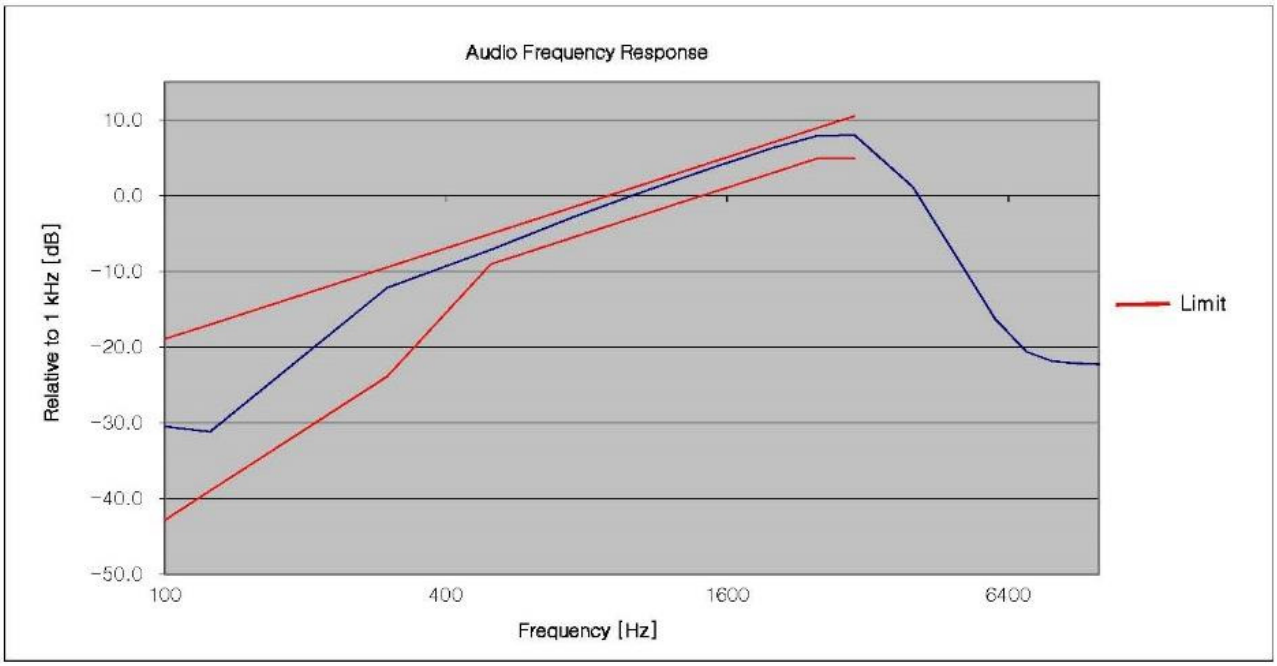
16K0F3E _460.05 MHz_HIGH POWER



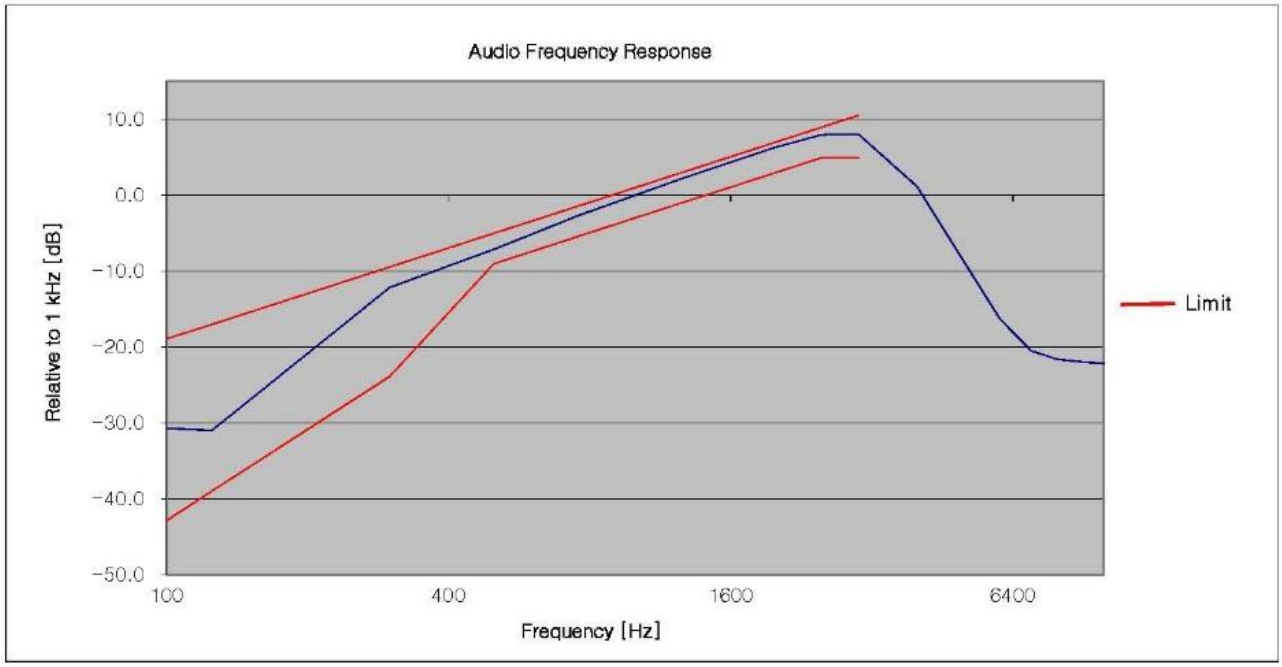
16K0F3E _469.95 MHz_HIGH POWER



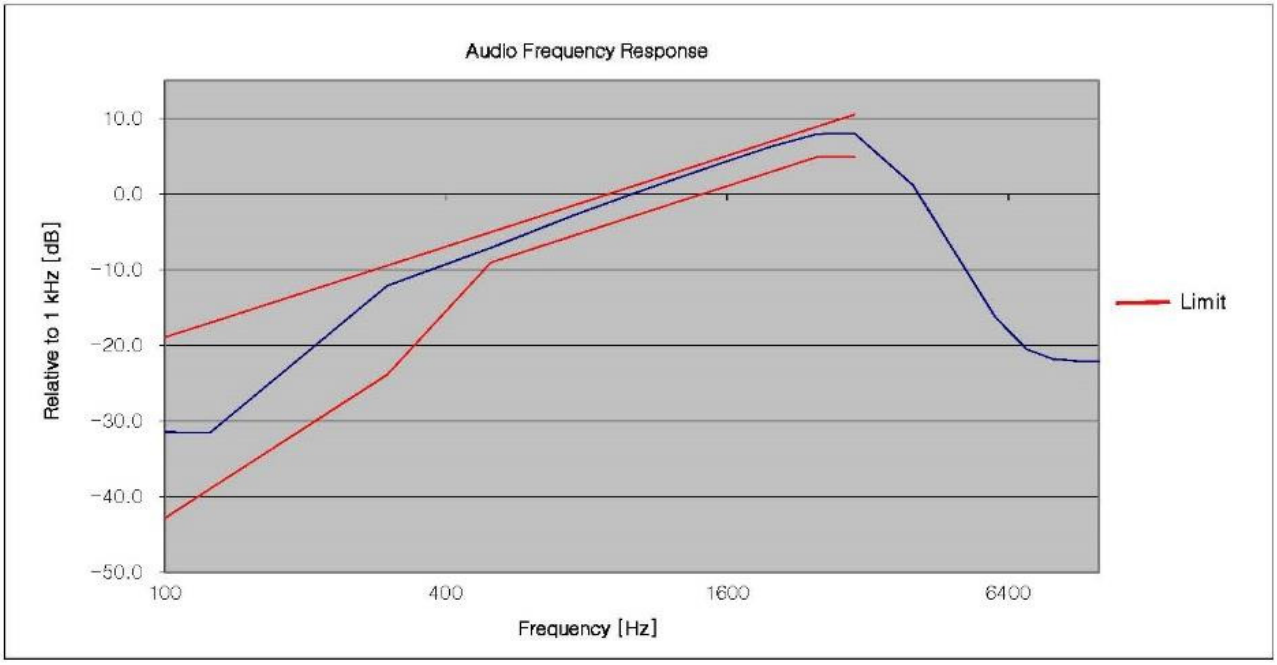
16K0F3E _460.05 MHz_LOW POWER



16K0F3E _460.05 MHz_LOW POWER



16K0F3E _469.95 MHz_LOW POWER

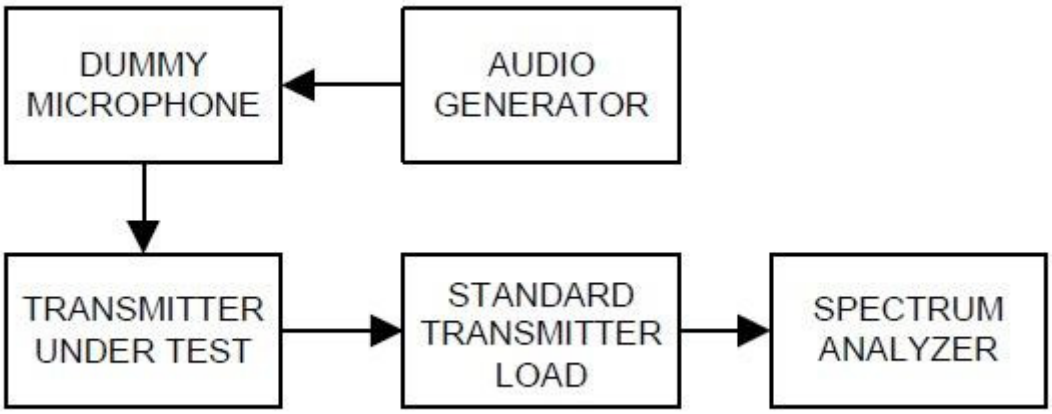


8.6 Emission Mask

▣ Definition

The transmitter Emission Mask denotes the sideband power produced at a discrete frequency separation from the carrier up to the test bandwidth (see 1.3.4.4) due to all sources of unwanted noise within the transmitter in a modulated condition.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to 2.2.11 in TIA-603-D Standard.

a) Connect the equipment as illustrated. Use the table to determine the spectrum analyzer resolution bandwidth:

Spectrum Analyzer Resolution Bandwidth

Frequency Band (MHz)	Mask for Equipment with Audio Low Pass Filter	Mask for Equipment without Low Pass Filter	Spectrum Analyzer Resolution Bandwidth (Hz)
25-50	B	C	300
72-76	B	C	300
138-174	NTIA	NTIA	300
150-174	B	C	300
150-174	D or E	D or E	100
406-420	NTIA	NTIA	300
421-512	B	C	300
421-512	D or E	D or E	100
806-821/851-866	B or EA	G or EA	300
821-824/866-869	B	H	300
896-901/935-940	I	J	300

b) Adjust the spectrum analyzer for the following settings:
   1) Resolution Bandwidth per the above table
   2) Video Bandwidth at least 10 times the resolution bandwidth.
   3) Sweep Speed slow enough to maintain measurement calibration.
   4) Detector Mode = Positive Peak.
   5) Span that will allow proper viewing of the test bandwidth (see 1.3.4.4).

c) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0 dB reference for the measurement.

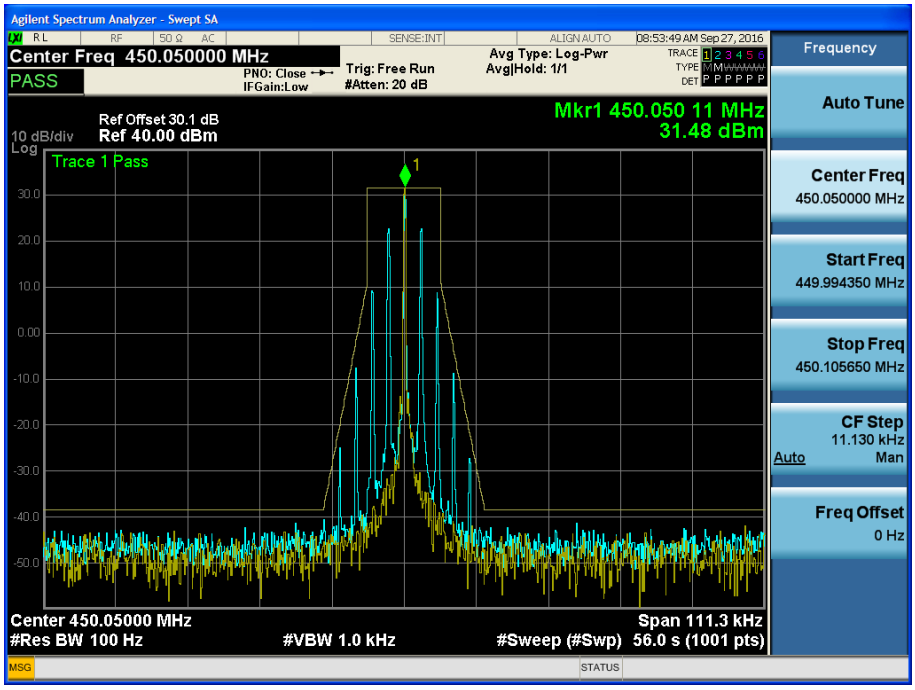
d) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.

e) Record the resulting spectrum analyzer presentation of the emission level with an on-line recording device or in a photograph. It is recommended that the emission limit (as given in 3.2.11) be drawn on the plotted graph or photograph. The spectrum analyzer presentation is the sideband spectrum.

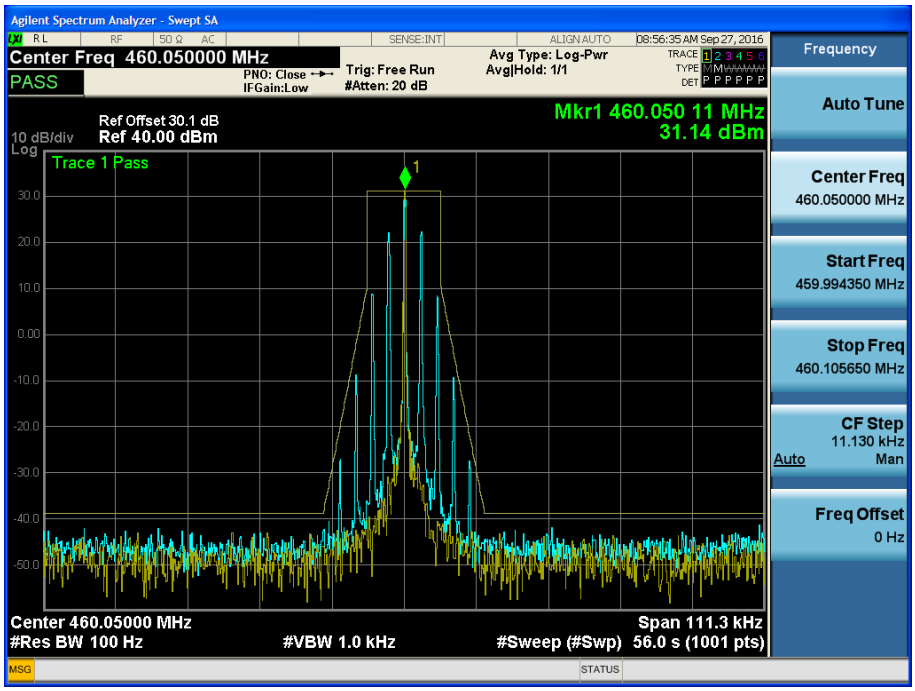
▣ TEST RESULTS

11K0F3E

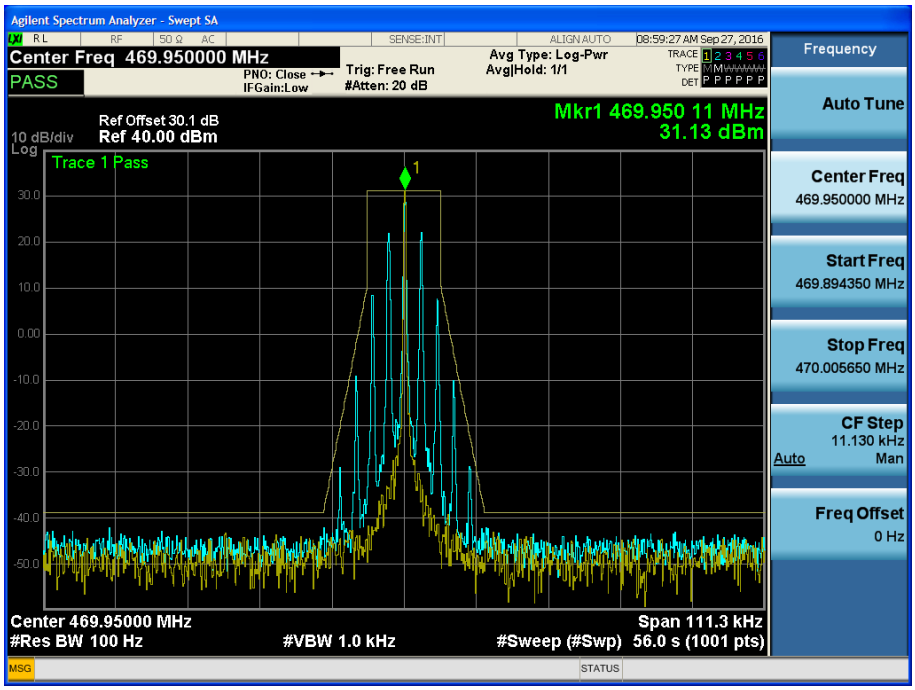
HIGH POWER_11K0F3E _450.05 MHz_Low



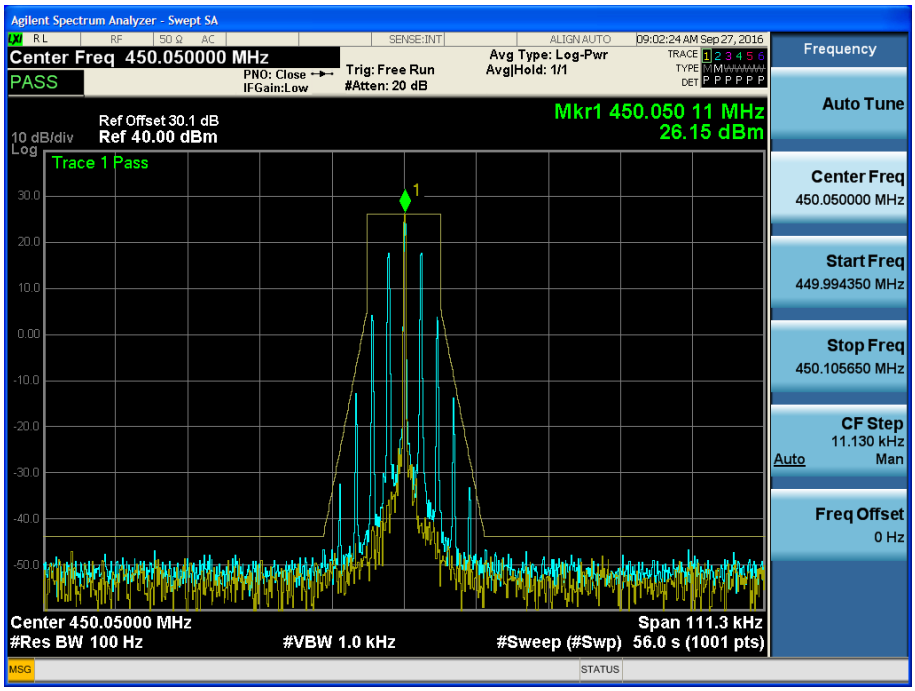
HIGH POWER_11K0F3E _460.05 MHz_Middle



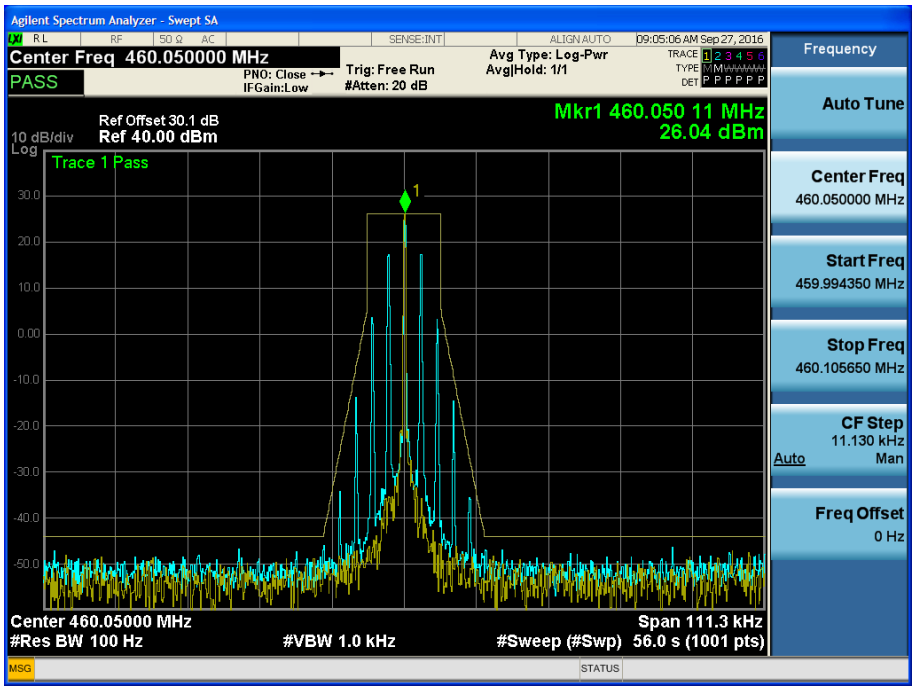
HIGH POWER_11K0F3E _469.95 MHz_High



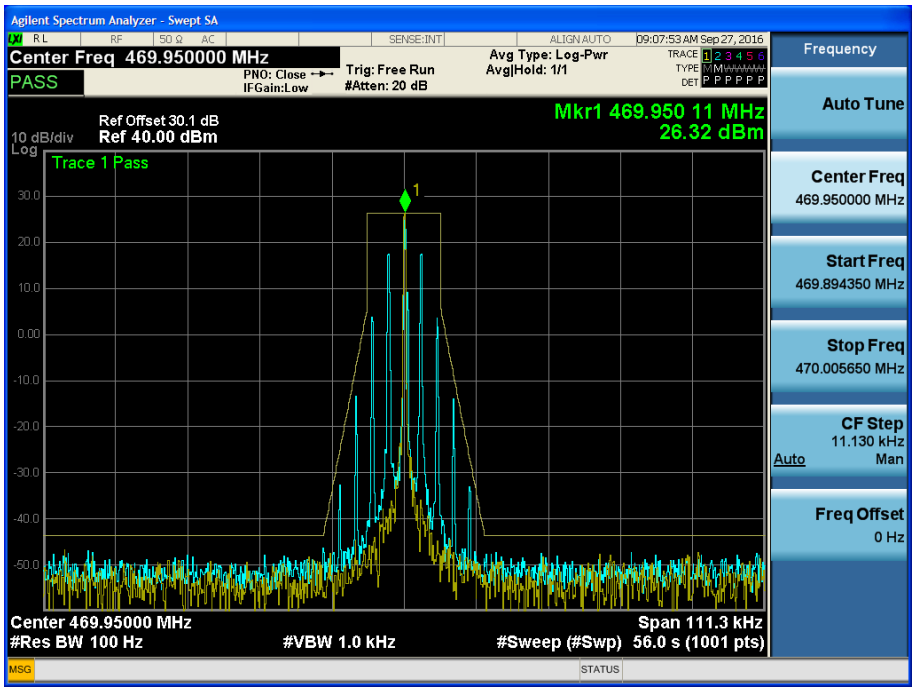
LOW POWER_11K0F3E _450.05 MHz_Low



LOW POWER_11K0F3E _460.05 MHz_Middle

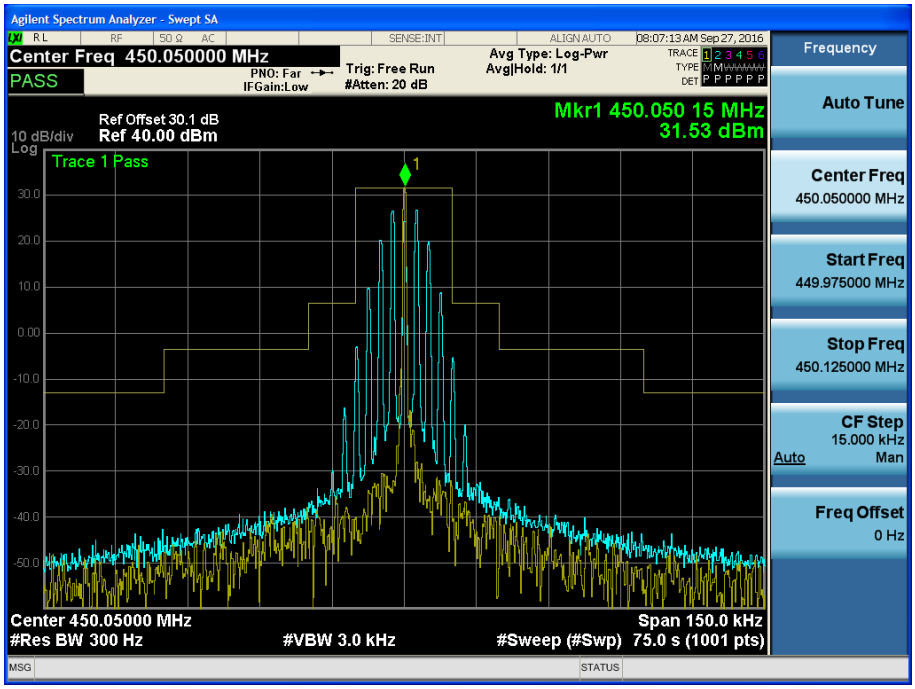


LOW POWER_11K0F3E _469.95 MHz_High

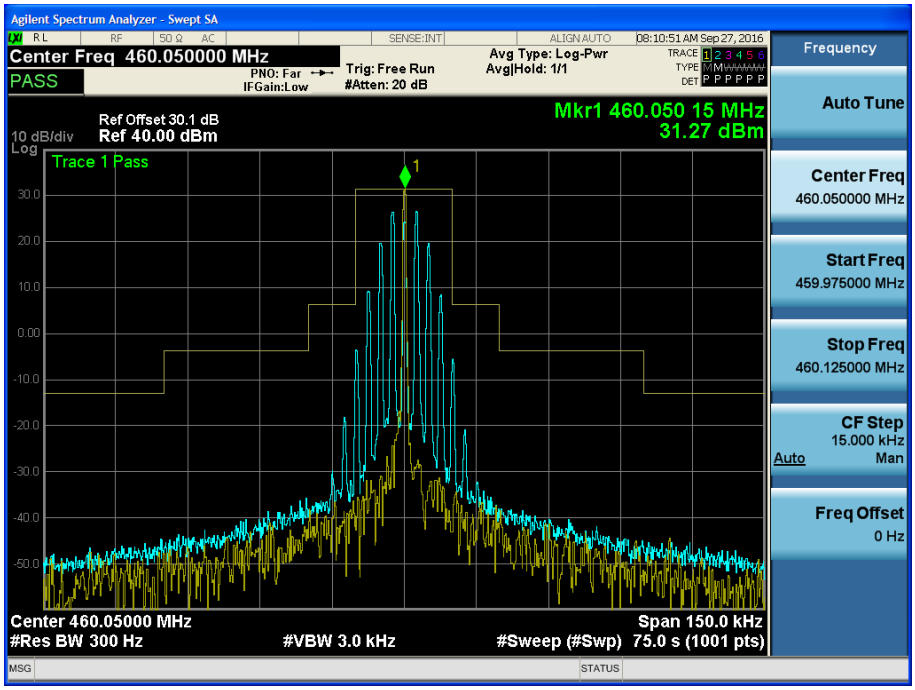


16K0F3E

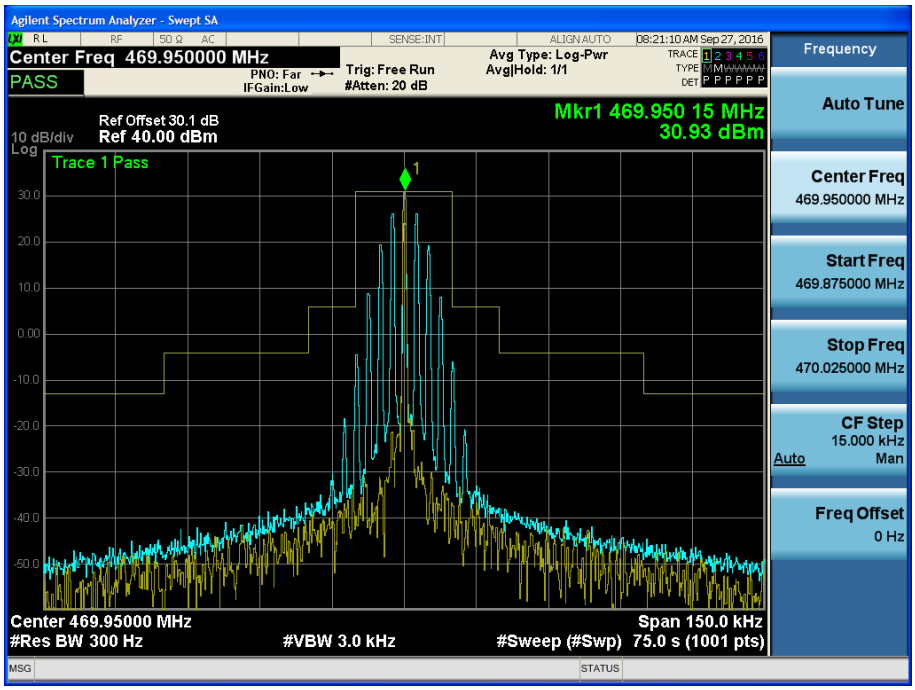
HIGH POWER_16K0F3E _450.05 MHz_Low



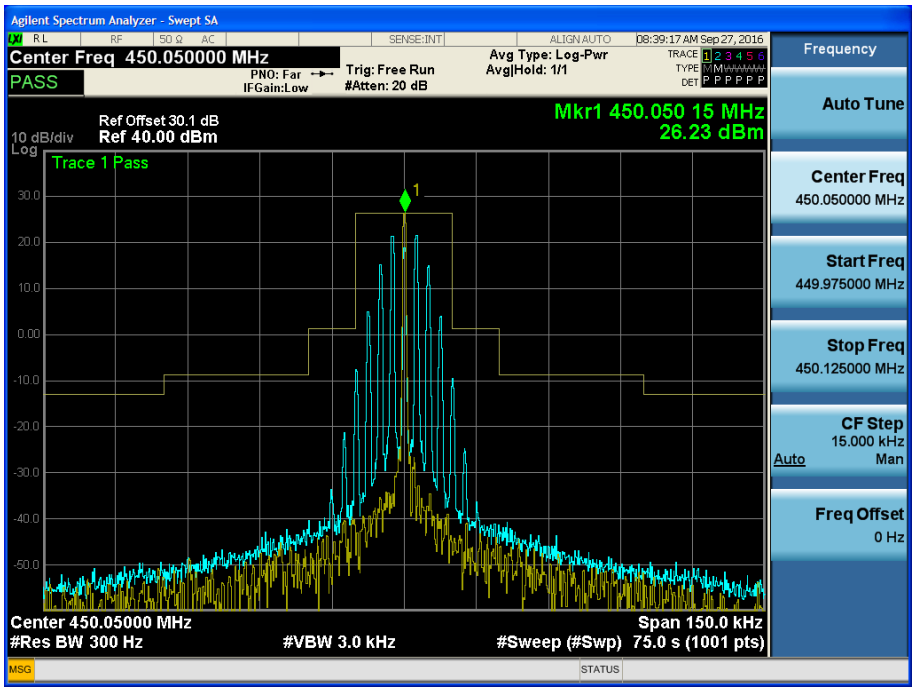
HIGH POWER_16K0F3E _460.05 MHz_Middle



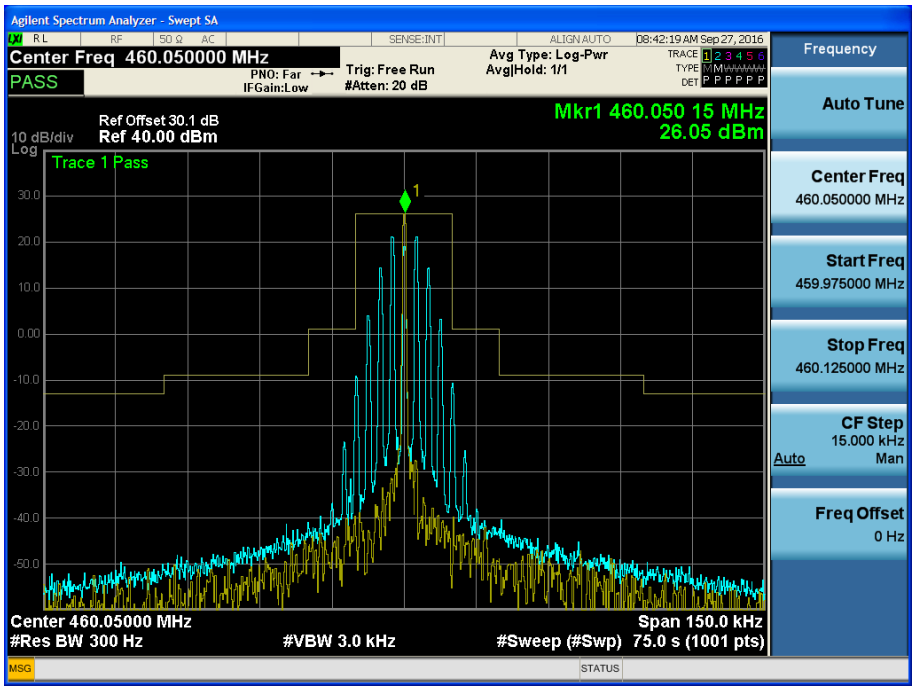
HIGH POWER_16K0F3E _469.95 MHz_High



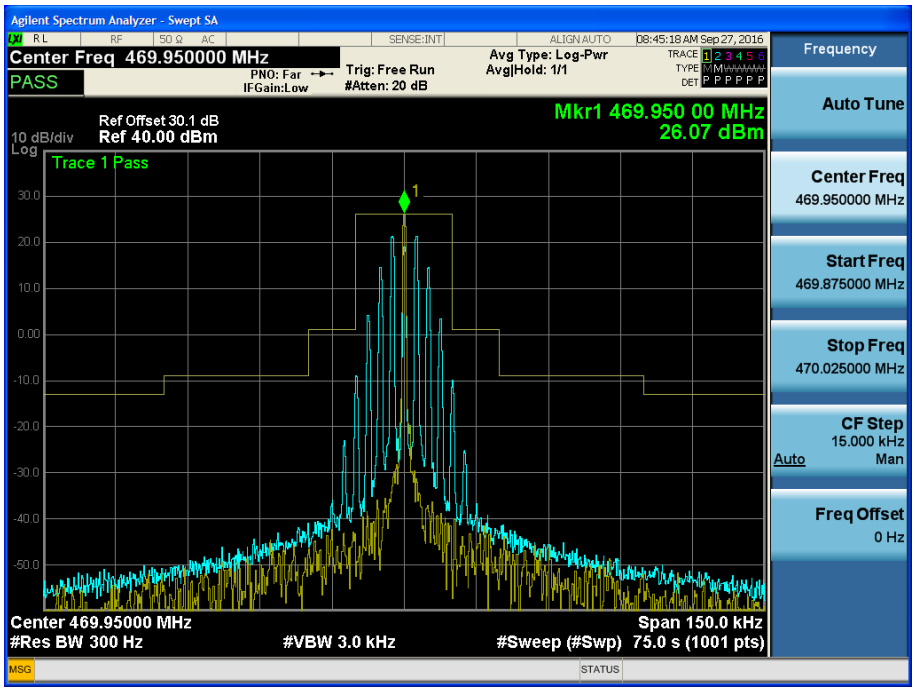
LOW POWER_16K0F3E _450.05 MHz_Low



LOW POWER_16K0F3E _460.05 MHz_Middle



LOW POWER_16K0F3E _469.95 MHz_High

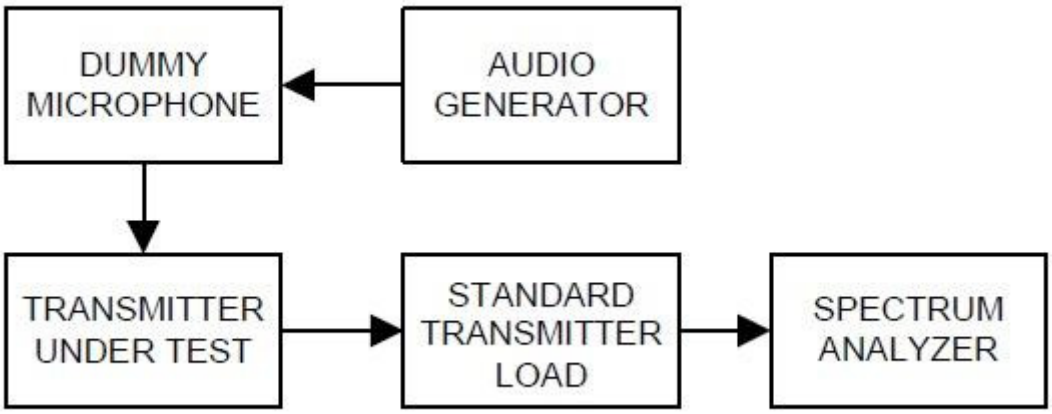


8.7 Adjacent Channel Power

▣ Definition

For 450 MHz – 470 MHz, operating using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power(ACP) limits. A measurement bandwidth is 18 kHz.

▣ TEST CONFIGURATION



▣ Limit

Frequency offset(kHz)	Maximum ACP(dBc) for devices 1 watt and less	Maximum ACP(dBc) for devices above 1 watt
25	-55	-60
50	-70	-70
75	-70	-70

▣ Sample Calculation

ACP(dBc) = Fundamental Level – (Fundamental Level – Delta Level)

= Fundamental Level – ACP Level at Offset Frequency

= Delta Level(dBc)

▣ **TEST RESULTS(only 16K0F3E)**

Fundamental Level(RBW : 18 kHz)

Frequency(MHz)	High Power(dBm)	Low Power(dBm)
450.05	31.169	26.225
460.05	31.010	25.826
469.95	31.154	26.228

Delta Level

Frequency(MHz)	Frequency offset(kHz)	Lower(dBc)	Upper(dBc)
450.05 (High Power)	25	-60.474	-61.924
	50	-71.429	-71.799
	75	-75.644	-75.538
450.05 (Low Power)	25	-61.221	-62.265
	50	-71.179	-71.138
	75	-75.452	-75.441
460.05 (High Power)	25	-61.588	-62.530
	50	-71.324	-71.586
	75	-76.007	-75.827
460.05 (Low Power)	25	-61.080	-61.718
	50	-71.368	-71.225
	75	-75.876	-75.147
469.95 (High Power)	25	-61.569	-62.437
	50	-71.272	-71.261
	75	-75.851	-75.524
469.95 (Low Power)	25	-60.946	-61.857
	50	-71.080	-71.155
	75	-75.194	-75.439