HCT CO.,LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC / ISED REPORT

FCC Certification

Applicant Name:
JVC KENWOOD Corporation

Address:
3-12,MORIYACHO,KANAGAWA-KU,YOKOHAMA-SHI,KANAHAWS,221-0022JAPAN

Date of Issue:
May 18, 2017

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

Report No.: HCT-R-1704-F014-1

HCT FRN: 0005866421

ISED Registration Number : 5944A-5

FCC ID:	**K44479000**
IC:	**282F-479000**
APPLICANT:	**JVC KENWOOD Corporation**

FCC Model(s):	NX-3220-K, NX-3220-K2, NX-3220-K3
IC Model(s):	NX-3220-K, NX-3220-K2, NX-3220-K3
EUT Type:	VHF DIGITAL TRANSCEIVER
Frequency Range:	FCC : 150 MHz - 174 MHz IC : 138 MHz – 144 MHz and 148 MHz – 174 MHz
FCC Rule Part(s):	Part 2, 80, 90
IC Rule:	RSS- Gen Issue 4, RSS-119 Issue 12

The measurements shown in this report were made in accordance with the procedures specified in §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 : Kwon Jeong
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1704-F014	April 28, 2017	- First Approval Report
HCT-R-1704-F014-1	May 18, 2017	- Added the Part 80 - Added the Type of Emission on page 7 - Added the Necessary Bandwidth on page 307 (7K60FXD, 7K60FXE) - Removed the 16K0F3E for FCC

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1. GENERAL INFORMATION

Manufacturer:	JVC KENWOOD Corporation
Address:	1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa, 226-8525 Japan
FCC ID:	K44479000
IC:	282F-479000
EUT Type:	VHF DIGITAL TRANSCEIVER
FCC Model(s):	NX-3220-K, NX-3220-K2, NX-3220-K3
IC Model(s):	NX-3220-K, NX-3220-K2, NX-3220-K3
Date(s) of Tests:	March 31, 2017 ~ April 20, 2017
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA (ISED Registration Number : 5944A-5)

2. EUT DESCRIPTION

EUT Type	VHF DIGITAL TRANSCEIVER	
FCC Model Name	NX-3220-K, NX-3220-K2, NX-3220-K3	
IC Model Name	NX-3220-K, NX-3220-K2, NX-3220-K3	
Power Supply	DC 7.5 V	
Output Power	5 W (Power output continuously variable to 1 W)	
Battery type	KNB-55L	Li-Ion Battery Pack (1480mA)
	KNB-56N	Ni-MH Battery Pack (1400mA)
	KNB-57L	Li-Ion Battery Pack (2000mA)
	KNB-68LC	Li-Ion Battery Pack (2000mA)
	KBP-5	AA Alkaline Battery Pack
Antenna type	KRA-22M	VHF Low Profile Helical Antenna (146-162 MHz)
	KRA-22M2	VHF Low Profile Helical Antenna (162-174 MHz)
	KRA-22M3	VHF Low Profile Helical Antenna (135-150 MHz)
	KRA-26M	VHF Helical Antenna (146-162 MHz)
	KRA-26M2	VHF Helical Antenna (162-174 MHz)
	KRA-26M3	VHF Helical Antenna (135-150MHz)
	KRA-25	VHF whip antenna (148-162 MHz)
	KRA-28	VHF whip antenna (140-170 MHz)
	KRA-41M	VHF Stubby antenna (146-162 MHz)
	KRA-41M2	VHF Stubby antenna (162-174 MHz)
	KRA-41M3	VHF Stubby antenna (136-150 MHz)
Channel Bandwidth	FCC : 12.5 kHz / 6.25 kHz IC : 25 kHz/ 12.5 kHz / 6.25 kHz (25 kHz is IC only)	
Operating Temperature	-30 ℃ ~ +60 ℃	
Frequency Range	FCC : 150 MHz - 174 MHz IC : 138 MHz – 144 MHz and 148 MHz – 174 MHz	
Test Frequency	150.05 MHz (FCC) 138.05 MHz (IC) 162.05 MHz (FCC / IC) 173.95 MHz (FCC / IC)	

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)
7K60FXD, 7K60FXE	(DMR)
8K30F1E, 8K30F1D, 8K30F7W	(NXDN)
4K00F1E, 4K00F1D, 4K00F7W	(NXDN)
4K00F2D	(CWID) : Use only low power

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 FACILITIES

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, 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. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	IC Part Section(s)	Test Limit	Test Condition	Test Result
Carrier RF Output Power	§90.205(i) §2.1046(a)	RSS119-i11(5.4)	Varies	CONDUCTED	PASS
Unwanted Emissions	§2.1051	RSS119-i11(5.8)			PASS
99% Bandwidth(IC)	NA	NA	NA		PASS
Carrier Frequency Stability	§80.209, §90.213(a), §2.1055	RSS119-i11(5.3)	Channel Spacing : 6.25 kHz = 2 ppm Channel Spacing : 12.5 kHz = 5 ppm 25 kHz = 5 ppm		PASS
Audio Frequency Response	§2.1047(a) §80.213	RSS119-i11(5.8.1)	Varies		PASS
Audio Low Pass Filter	§2.1047(a) §80.213	RSS119-i11(5.8.1)			PASS
Modulation Limiting	§2.1047(b) §80.213	RSS119-i11(5.8.1)			PASS
Transient Frequency Behavior	§90.214	RSS119-i11(5.2)	Varies		PASS
Emission Mask	§80.211, §90.210, §2.1049(c)(1)	RSS119-i11(5.5)	Varies		PASS
Field Strength of Spurious Radiation	§2.1053	RSS119-i11(5.8)	Varies	RADIATED	PASS
Receiver Spurious Emissions	§15.109(a)	RSS119-i11(5.11) RSS-Gen	cf. Section 7.10		PASS
Necessary Bandwidth	§2.202(g)		-	-	-

7. TEST RESULT

7.1 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

For FCC

Mode	Type of Emission	Freq.(MHz)	Carrier Output Power			
			Low		High	
			dBm	W	dBm	W
Digital	11K0F3E	150.05	30.445	1.108	36.832	4.822
		138.05	30.338	1.081	36.985	4.995
		162.05	29.874	0.971	36.675	4.651
		173.95	30.582	1.143	36.946	4.950
	7K60FXD, 7K60FXE	150.05	30.463	1.112	36.871	4.865
		138.05	30.310	1.074	36.931	4.933
		162.05	29.850	0.966	36.631	4.604
		173.95	30.535	1.131	36.914	4.914
	8K30F1E, 8K30F1D, 8K30F7W	150.05	30.564	1.139	37.040	5.058
		138.05	30.310	1.074	37.067	5.090
		162.05	29.898	0.977	36.755	4.737
		173.95	30.592	1.146	37.010	5.023
	4K00F1E, 4K00F1D, 4K00F7W	150.05	30.567	1.139	37.032	5.049
		138.05	30.257	1.061	36.951	4.956
		162.05	29.811	0.957	36.646	4.620
		173.95	30.498	1.122	36.878	4.873
	4K00F2D	150.05	30.545	1.134	N/A	
		138.05	30.309	1.074		
		162.05	29.855	0.967		
		173.95	30.562	1.138		

For IC

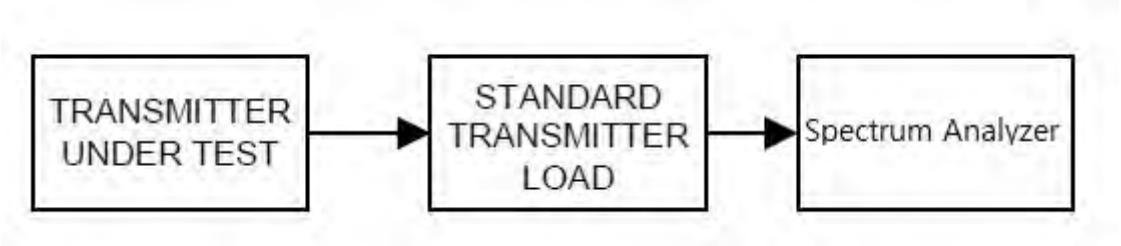
Mode	Type of Emission	Freq.(MHz)	Carrier Output Power			
			Low		High	
			dBm	W	dBm	W
Digital	11K0F3E	150.05	30.461	1.112	36.848	4.839
		138.05	30.350	1.084	36.988	5.010
		162.05	29.895	0.976	36.669	4.644
		173.95	30.589	1.145	36.953	4.958
	16K0F3E	150.05	30.475	1.116	36.851	4.843
		138.05	30.355	1.085	37.042	5.060
		162.05	29.918	0.981	36.730	4.710
		173.95	30.608	1.150	37.006	5.018
	7K60FXD, 7K60FXE	150.05	30.492	1.120	36.846	4.837
		138.05	30.318	1.076	36.925	4.926
		162.05	29.854	0.967	36.619	4.591
		173.95	30.555	1.136	36.900	4.898
	8K30F1E, 8K30F1D, 8K30F7W	150.05	30.572	1.141	36.969	4.976
		138.05	30.327	1.078	37.029	5.045
		162.05	29.912	0.980	36.734	4.714
		173.95	30.597	1.147	37.003	5.015
	4K00F1E, 4K00F1D, 4K00F7W	150.05	30.598	1.148	37.006	5.019
		138.05	30.269	1.061	36.935	4.956
		162.05	29.819	0.957	36.615	4.620
		173.95	30.514	1.122	36.869	4.873
	4K00F2D	150.05	30.539	1.132	N/A	
		138.05	30.319	1.076		
		162.05	29.869	0.970		
		173.95	30.569	1.140		

7.2 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

(1) Frequency Stability (Temperature Variation)

150.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	**150.049958641**	**-0.275635**
-20	**150.049960997**	**-0.259933**
-10	**150.049968521**	**-0.209790**
0	**150.049978234**	**-0.145058**
10	**150.049980817**	**-0.127844**
20	**150.050006436**	**0.042891**
30	**150.050030204**	**0.201293**
40	**150.050033755**	**0.224958**
50	**150.050034407**	**0.229304**

138.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	**138.049961458**	**-0.279189**
-20	**138.049965645**	**-0.248859**
-10	**138.049974915**	**-0.181710**
0	**138.049978321**	**-0.157037**
10	**138.049982417**	**-0.127367**
20	**138.050010189**	**0.073810**
30	**138.050027695**	**0.200616**
40	**138.050031690**	**0.229555**
50	**138.050030765**	**0.222854**

162.05 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	**162.049955396**	**-0.275248**
-20	**162.049958666**	**-0.255069**
-10	**162.049967837**	**-0.198476**
0	**162.049977152**	**-0.140994**
10	**162.049978699**	**-0.131447**
20	**162.050011825**	**0.072973**
30	**162.050032716**	**0.201888**
40	**162.050035581**	**0.219568**
50	**162.050030797**	**0.190046**

173.95 MHz (High Power)

Temperature (Degree C)	Frequency (MHz)	Frequency stability (ppm)
-30	**173.949952247**	**-0.274521**
-20	**173.949954460**	**-0.261799**
-10	**173.949967438**	**-0.187192**
0	**173.949972038**	**-0.160747**
10	**173.949977423**	**-0.129790**
20	**173.950010489**	**0.060300**
30	**173.950035101**	**0.201788**
40	**173.950037648**	**0.216430**
50	**173.950036094**	**0.207496**

(2) Frequency Stability (Voltage Variation)

150.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25+/-5	85	6.38	**150.050006769**	**0.045114**
25+/-5	100	7.50	**150.050006300**	**0.041987**
25+/-5	115	8.63	**150.050006225**	**0.041487**

138.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25+/-5	85	6.38	**138.050010298**	**0.074594**
25+/-5	100	7.50	**138.050010103**	**0.073186**
25+/-5	115	8.63	**138.050009896**	**0.071684**

162.05 MHz (High Power)

Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25+/-5	85	6.38	**162.050012151**	**0.074984**
25+/-5	100	7.50	**162.050011510**	**0.071025**
25+/-5	115	8.63	**162.050011553**	**0.071293**

173.95 MHz (High Power)

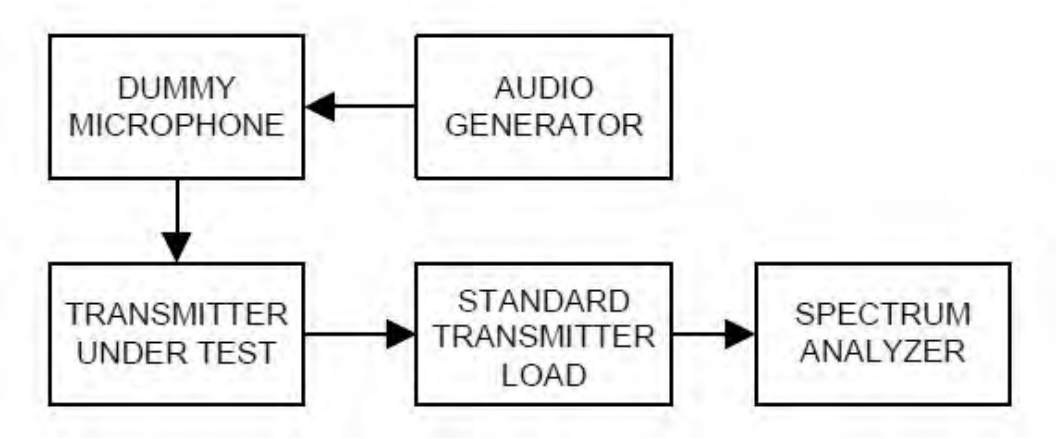
Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Frequency stability (ppm)
25+/-5	85	6.38	**173.950010733**	**0.061699**
25+/-5	100	7.50	**173.950009922**	**0.057037**
25+/-5	115	8.63	**173.950010150**	**0.058349**

7.3 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 / RSS-119 Section 5.5

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 (Authorized Band 6 kHz),
100Hz (Authorized Band 11.25 kHz),
300Hz (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 on the test results.

▣ LIMIT

Frequency Band (MHz)	Channel bandwidth (kHz)	Authorized Bandwidth (kHz)
138 - 174	12.5	11.25
	6.25	6
	25	20

▣ TEST RESULTS

Conducted 99% Bandwidth Measurements for 11K0F3E

11K0F3E Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	12.5 kHz	9.882	High Power
138.05		9.886	
162.05		9.888	
173.95		9.902	
150.05	12.5 kHz	9.884	Low Power
138.05		9.884	
162.05		9.889	
173.95		9.904	

Conducted 99% Bandwidth Measurements for 16K0F3E

16K0F3E Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	25.0 kHz	14.061	High Power
138.05		14.672	
162.05		14.676	
173.95		14.704	
150.05	25.0 kHz	14.645	Low Power
138.05		14.625	
162.05		14.652	
173.95		14.705	

Conducted 99% Bandwidth Measurements for 7K60FXD, 7K60FXE

7K60FXD, 7K60FXE Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	12.5 kHz	7.294	High Power
138.05		7.281	
162.05		7.267	
173.95		7.298	
150.05	12.5 kHz	7.301	Low Power
138.05		7.283	
162.05		7.280	
173.95		7.297	

Conducted 99% Bandwidth Measurements for 8K30F1E, 8K30F1D, 8K30F7W

8K30F1E, 8K30F1D, 8K30F7W Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	12.5 kHz	7.534	High Power
138.05		7.550	
162.05		7.533	
173.95		7.514	
150.05	12.5 kHz	7.535	Low Power
138.05		7.536	
162.05		7.521	
173.95		7.510	

Conducted 99% Bandwidth Measurements for 4K00F1E, 4K00F1D, 4K00F7W

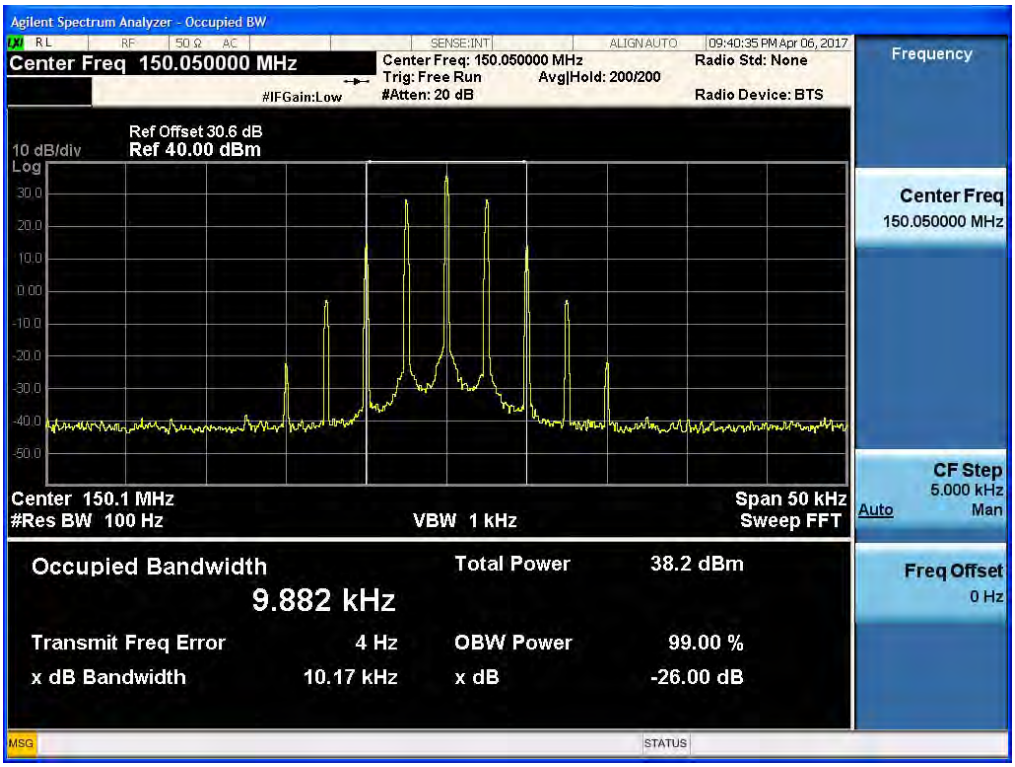
4K00F1E, 4K00F1D, 4K00F7W Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	6.25 kHz	3.515	High Power
138.05		3.497	
162.05		3.498	
173.95		3.487	
150.05	6.25 kHz	3.513	Low Power
138.05		3.502	
162.05		3.502	
173.95		3.486	

Conducted 99% Bandwidth Measurements for 4K00F2D

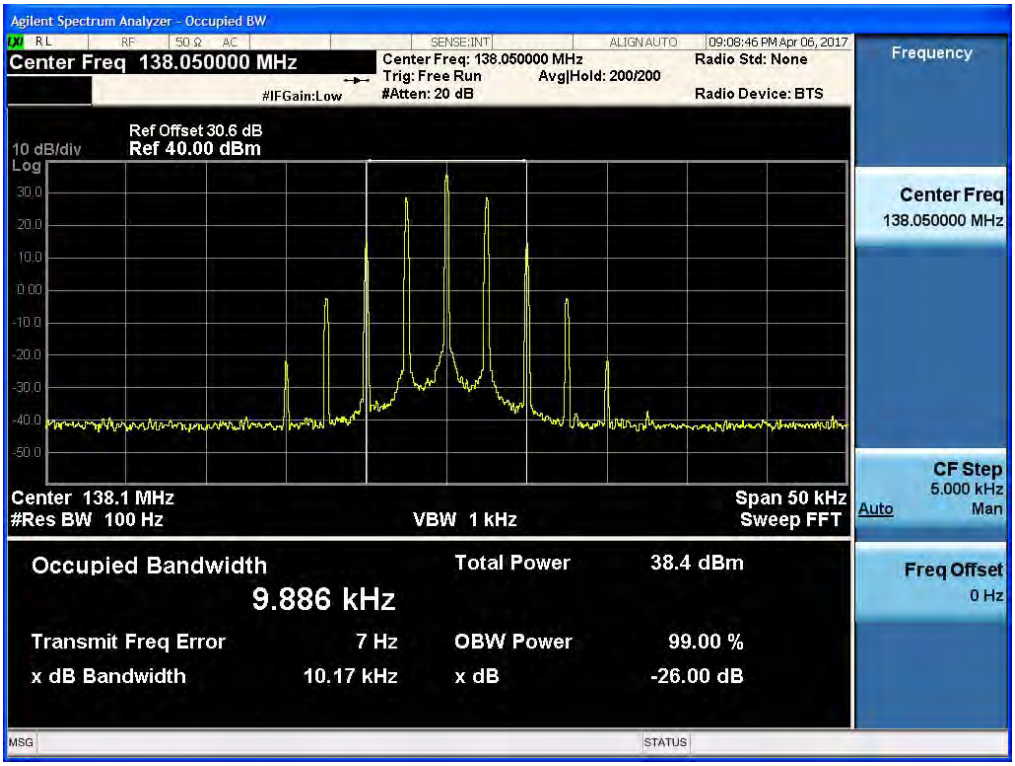
4K00F2D Mode		Measured Bandwidth [kHz]	Setting
Frequency [MHz]	Channel bandwidth		
150.05	6.25 kHz	3.297	Low Power
138.05		3.293	
162.05		3.291	
173.95		3.290	

▣ Plots of 99% Bandwidth

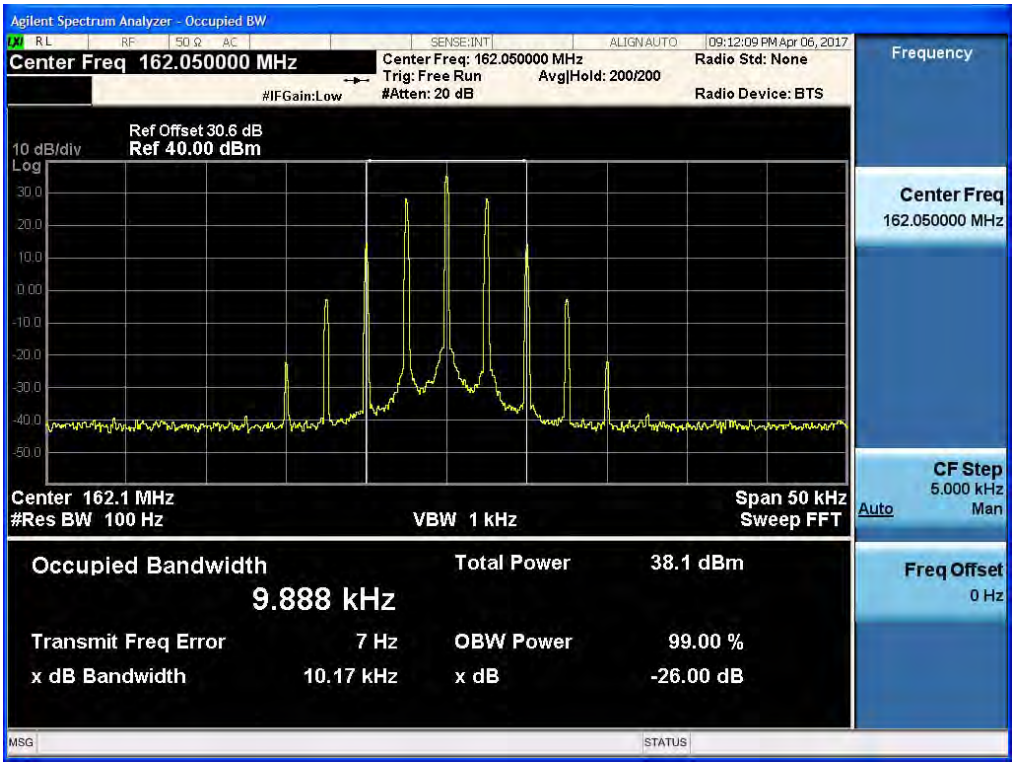
(11K0F3E _ 150.05 MHz)_High



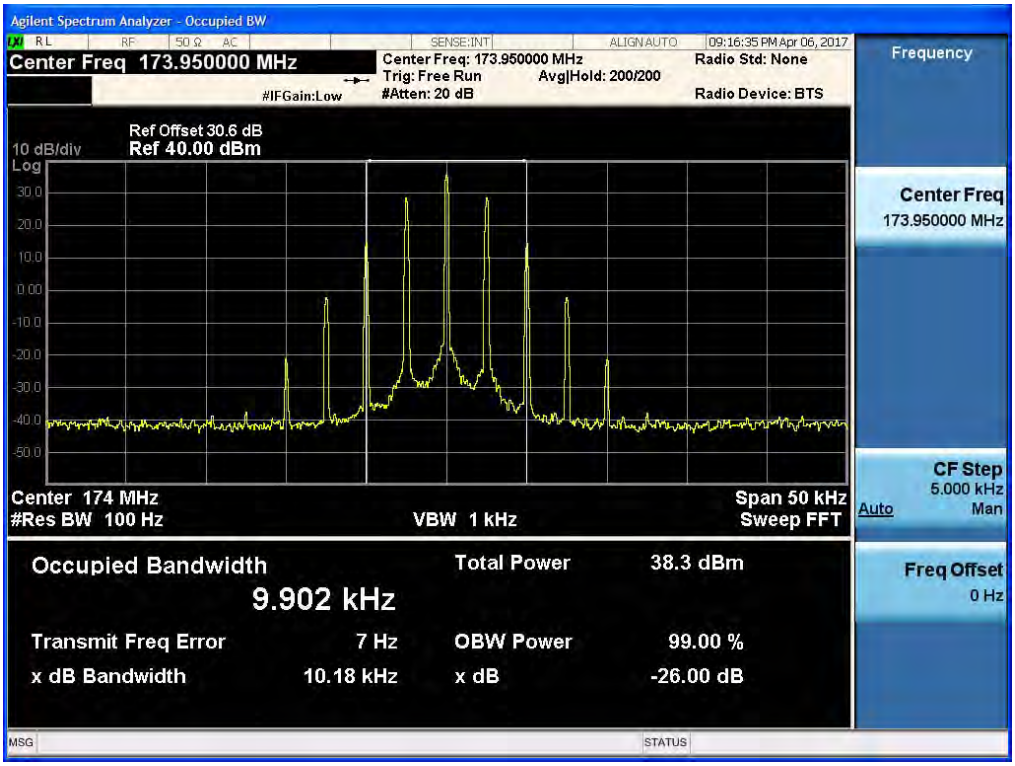
(11K0F3E _ 138.05 MHz)_High



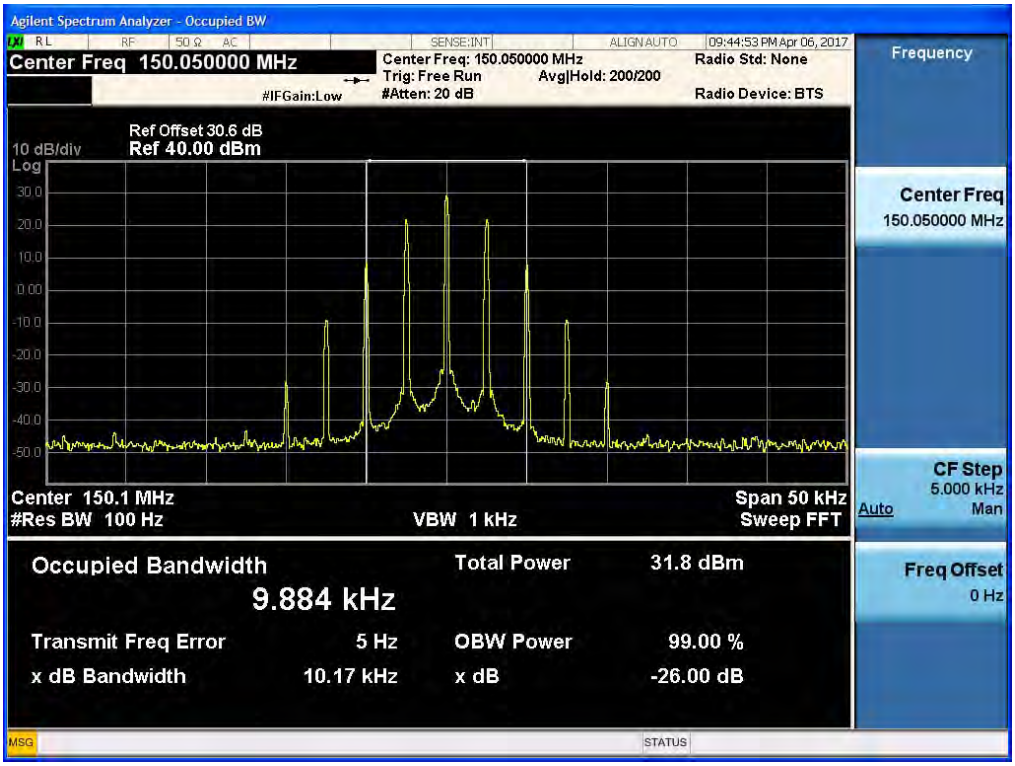
(11K0F3E _ 162.05 MHz)_High



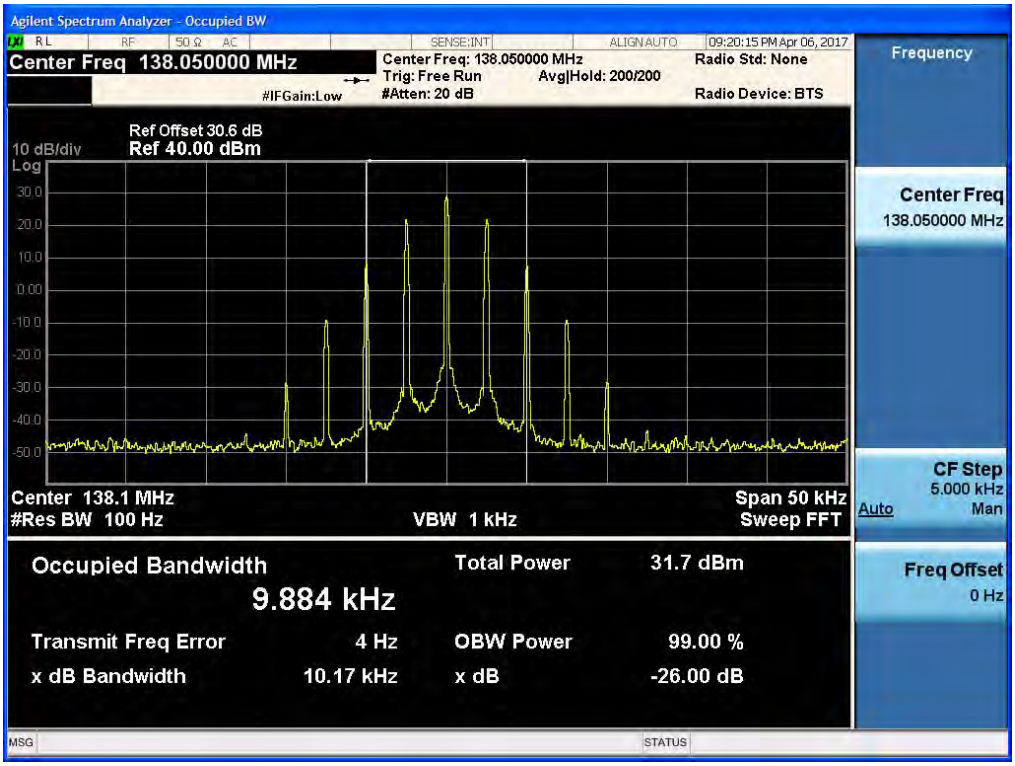
(11K0F3E _ 173.95 MHz)_High



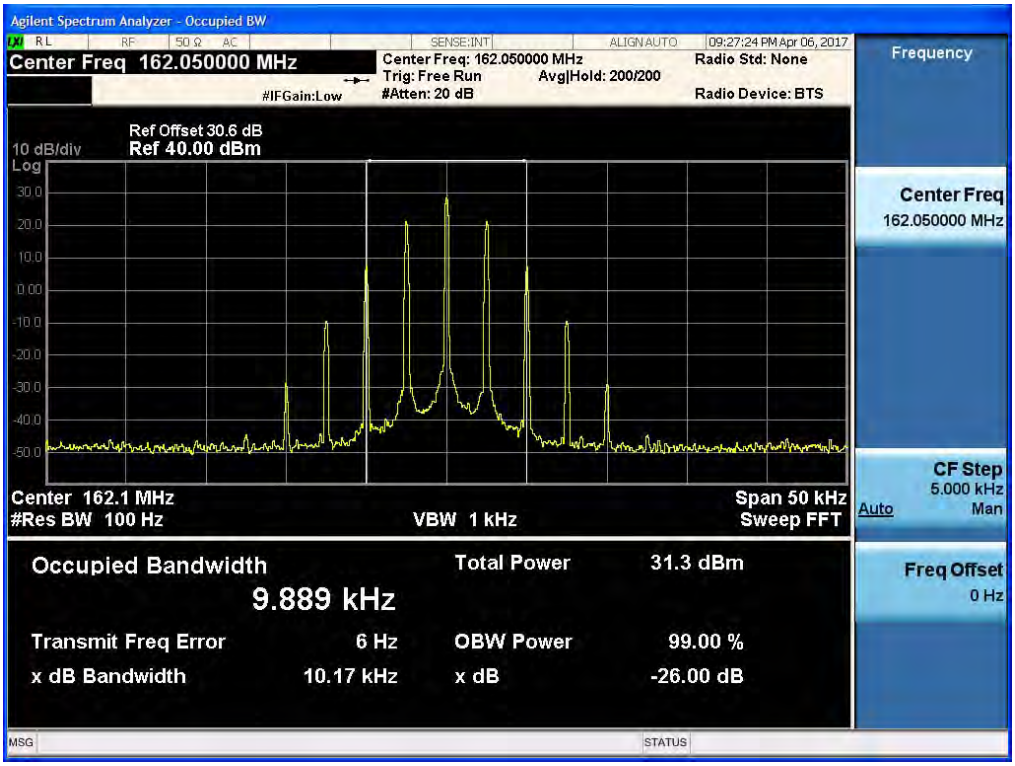
(11K0F3E _ 150.05 MHz)_Low



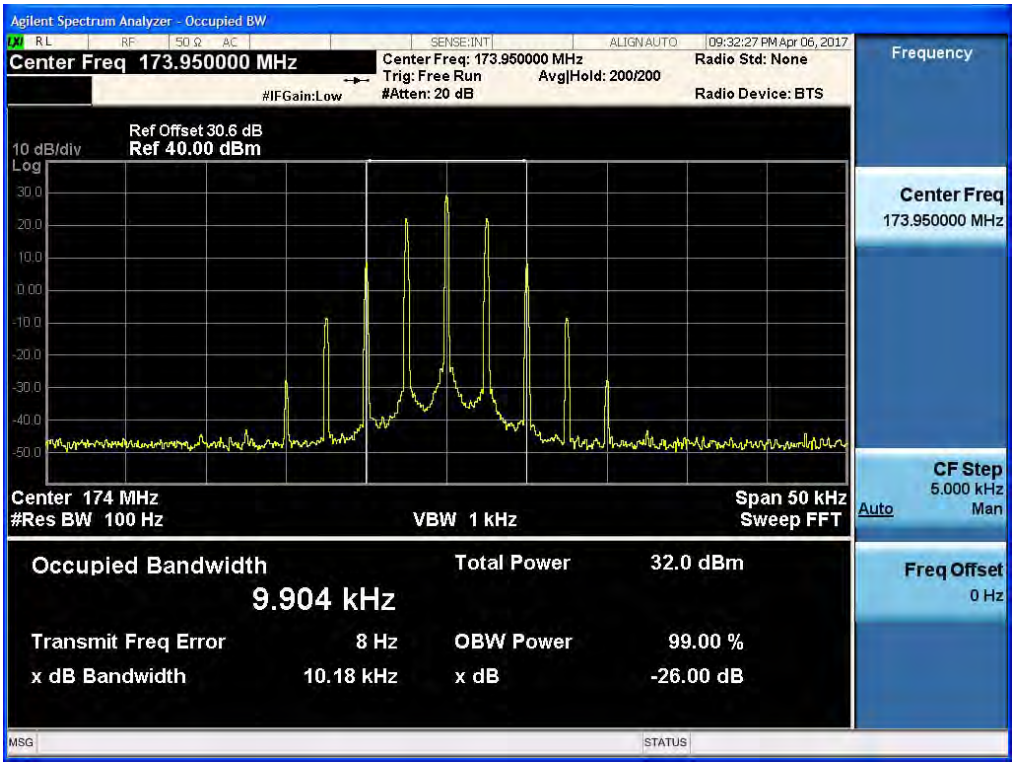
(11K0F3E _ 138.05 MHz)_Low



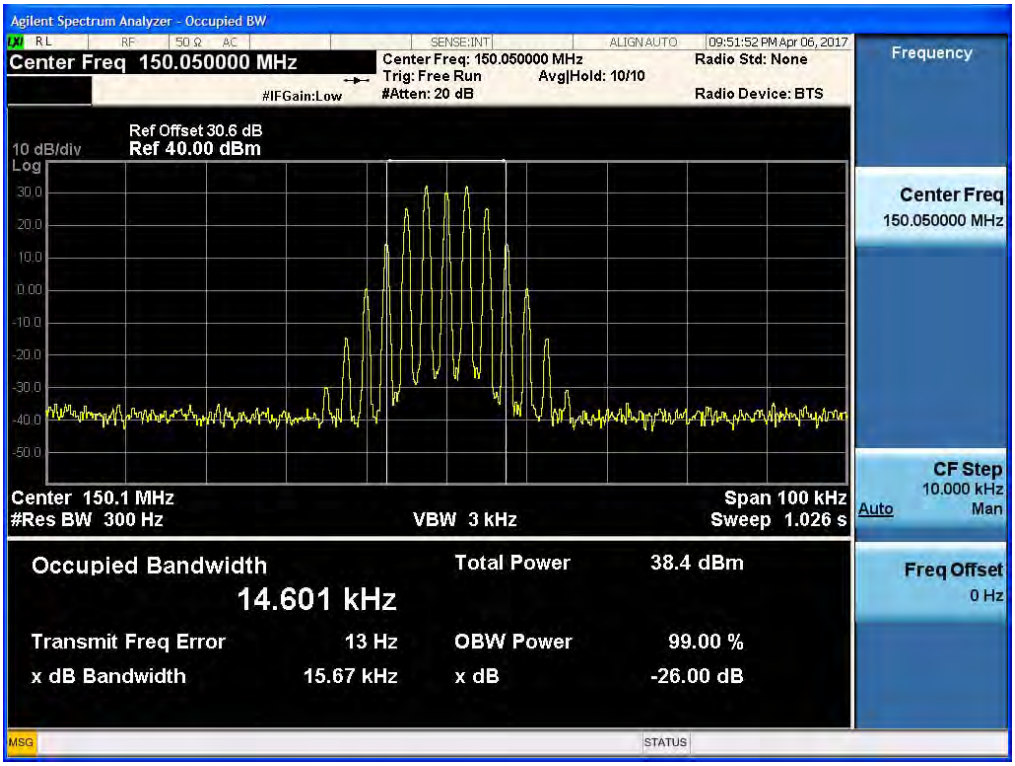
(11K0F3E _ 162.05 MHz)_Low



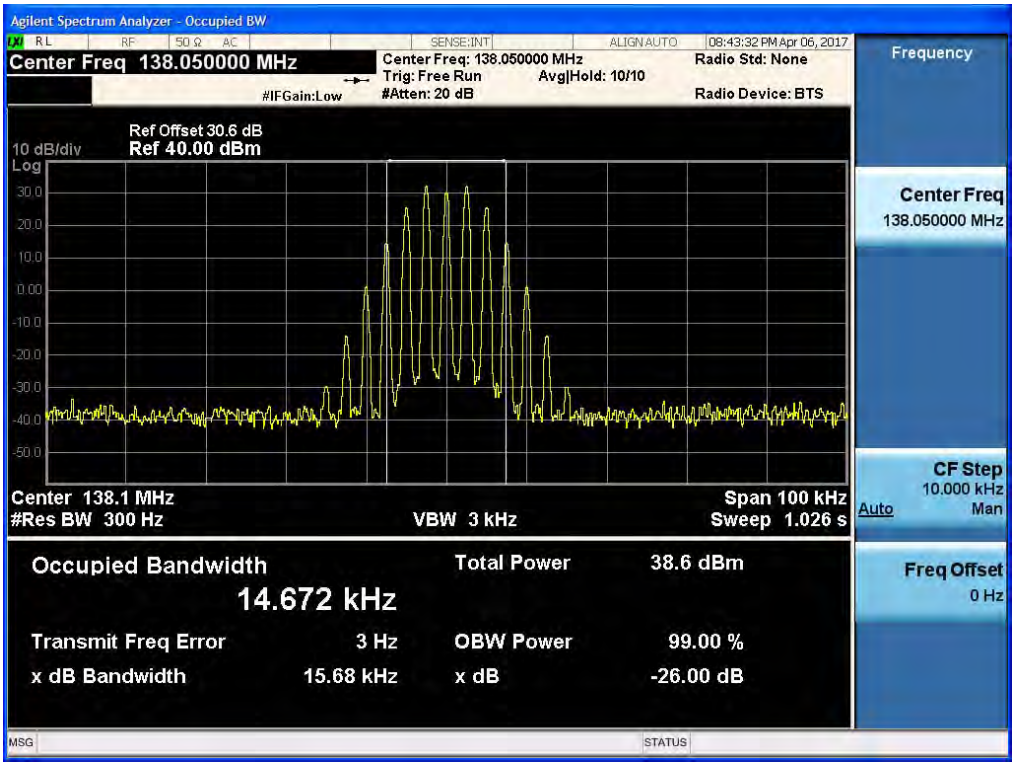
(11K0F3E _ 173.95 MHz)_Low



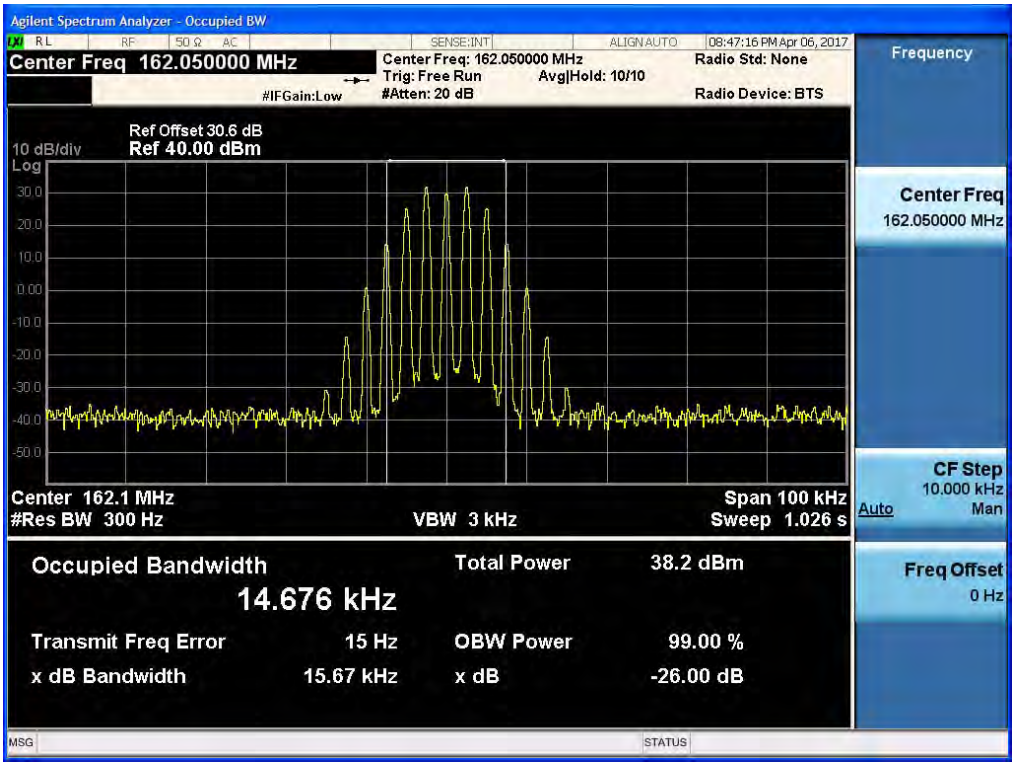
(16K0F3E _ 150.05 MHz)_High



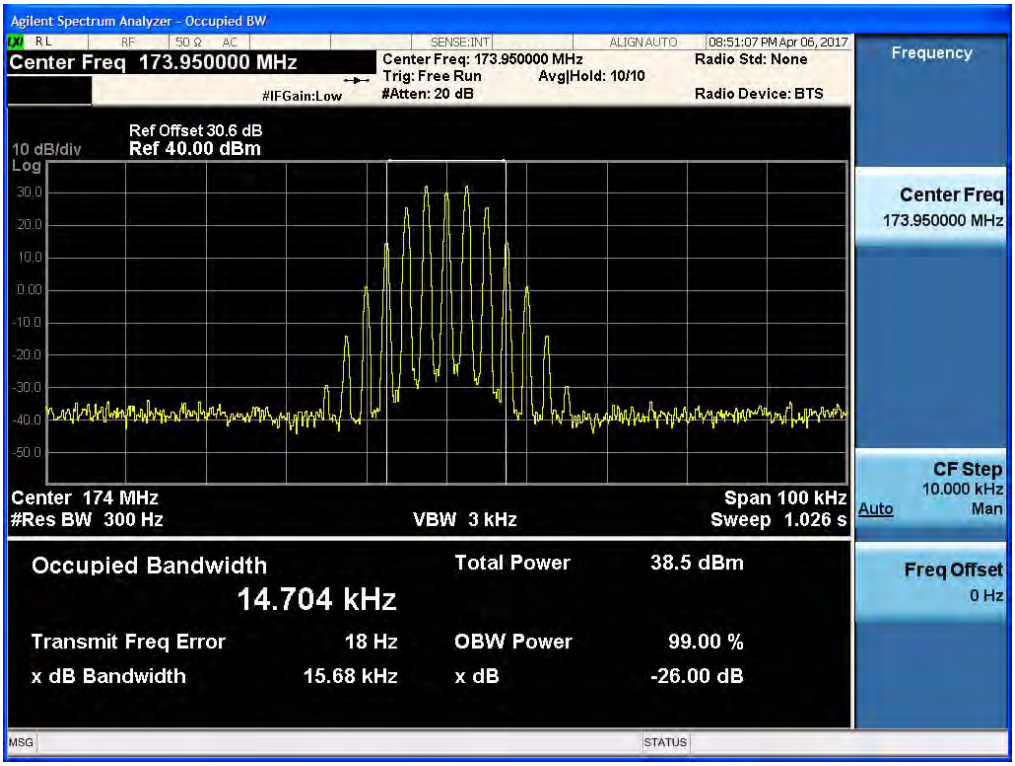
(16K0F3E _ 138.05 MHz)_High



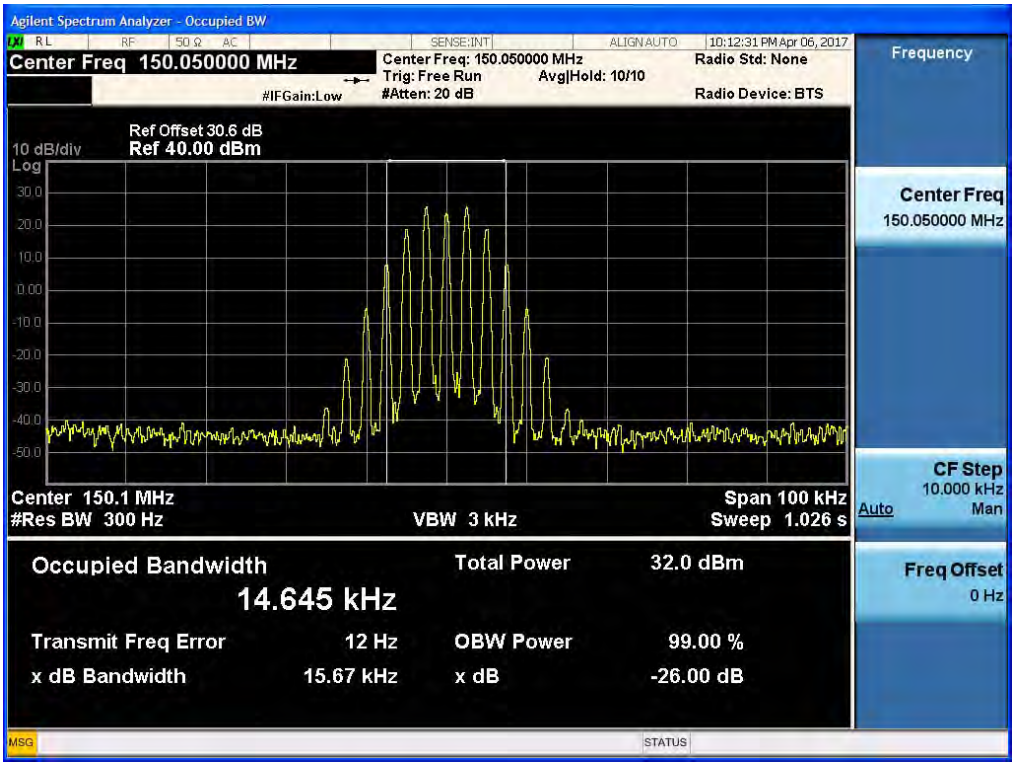
(16K0F3E _ 162.05 MHz)_High



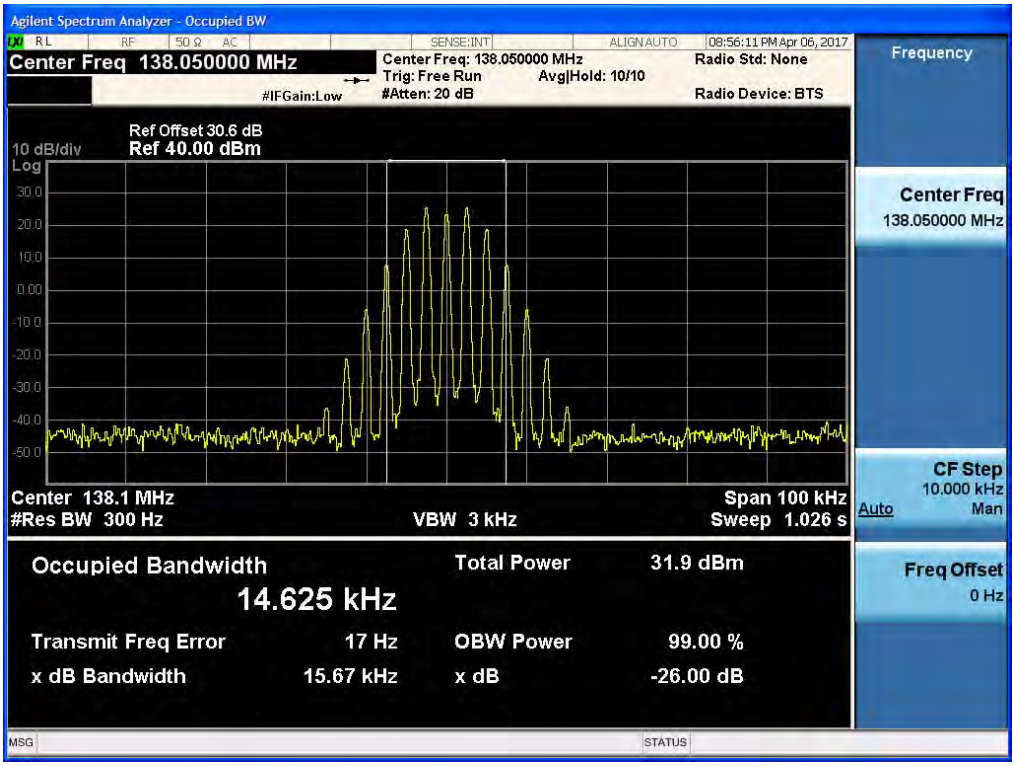
(16K0F3E _ 173.95 MHz)_High



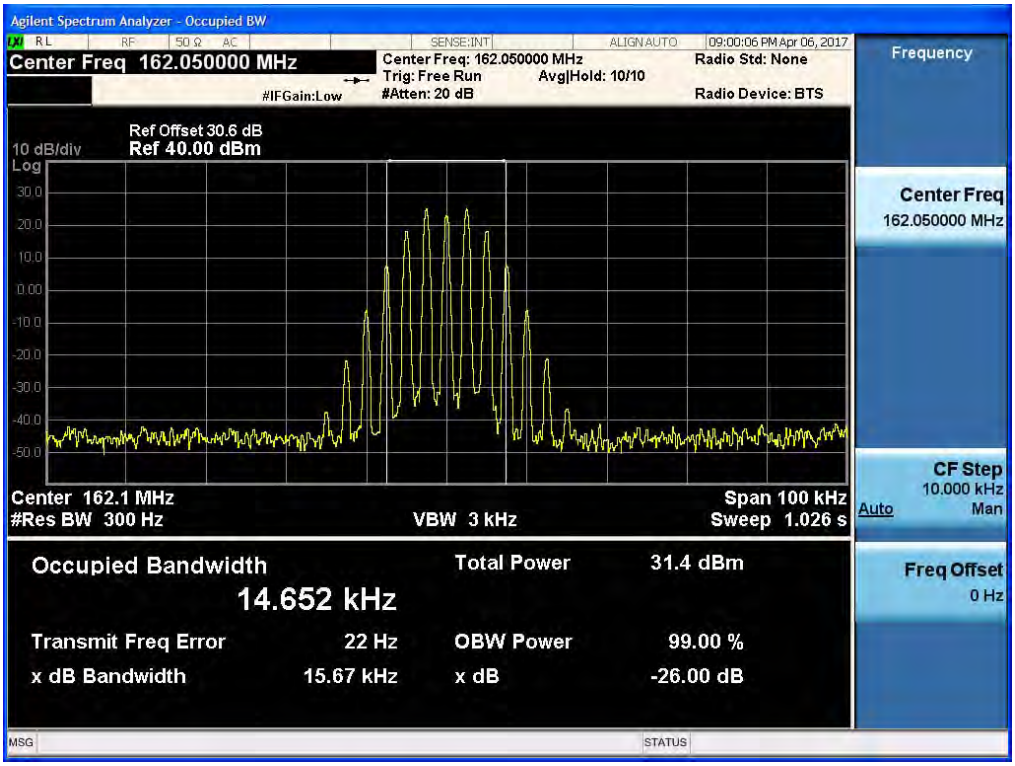
(16K0F3E _ 150.05 MHz)_Low



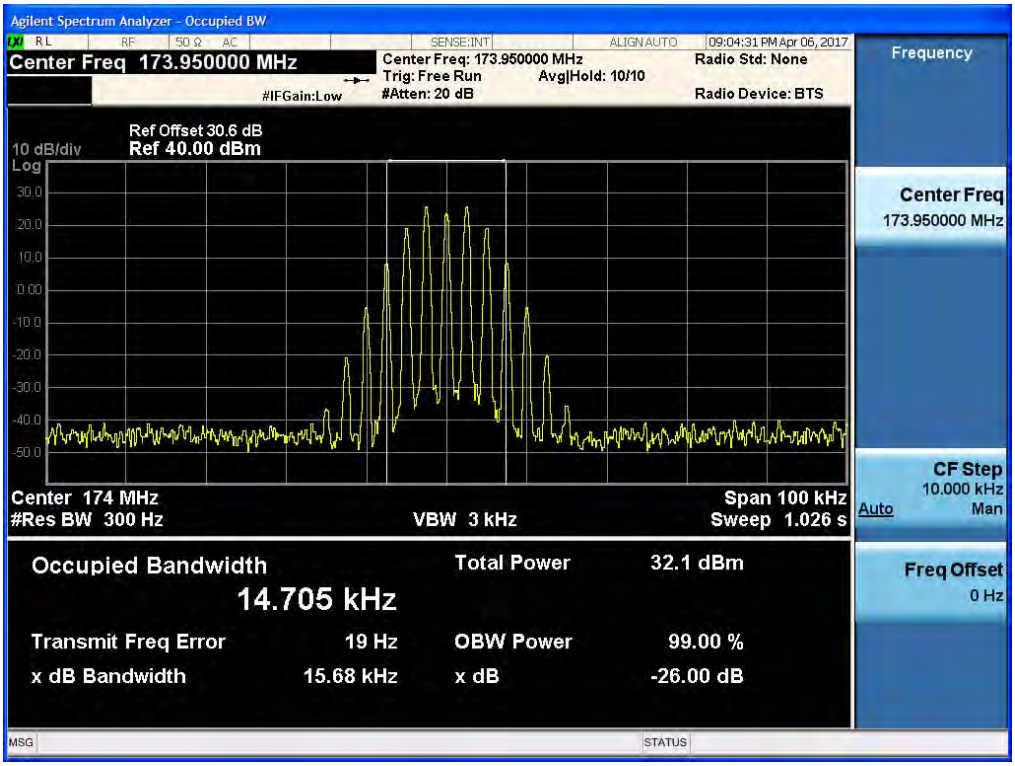
(16K0F3E _ 138.05 MHz)_Low



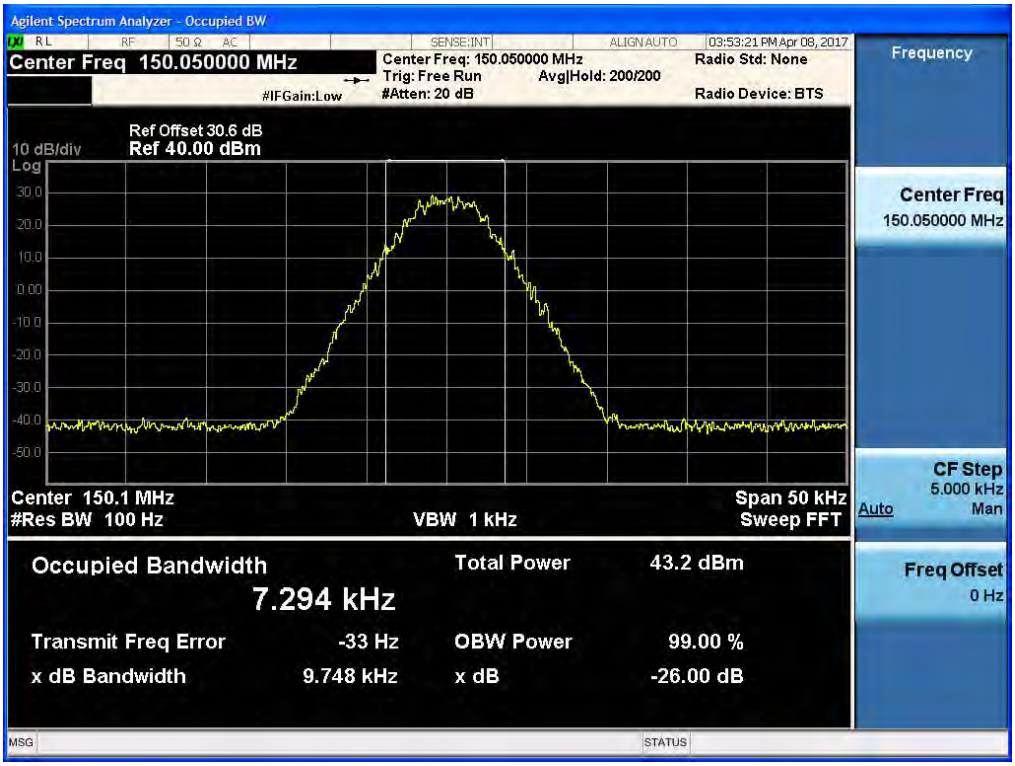
(16K0F3E _ 162.05 MHz)_Low



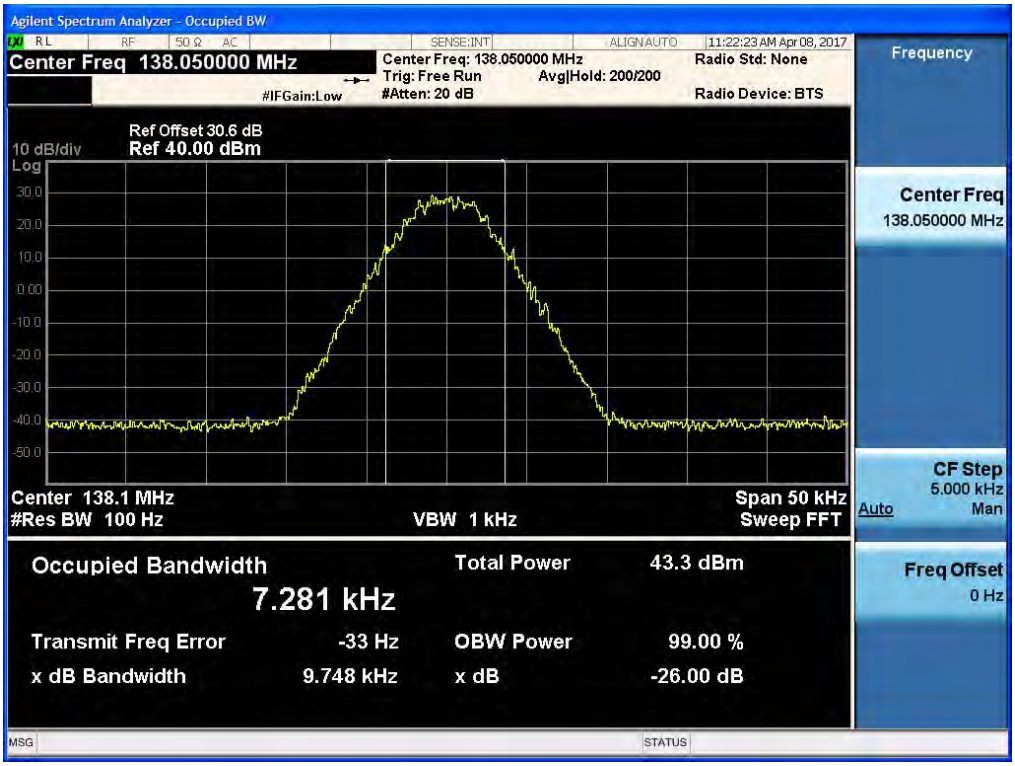
(16K0F3E _ 173.95 MHz)_Low



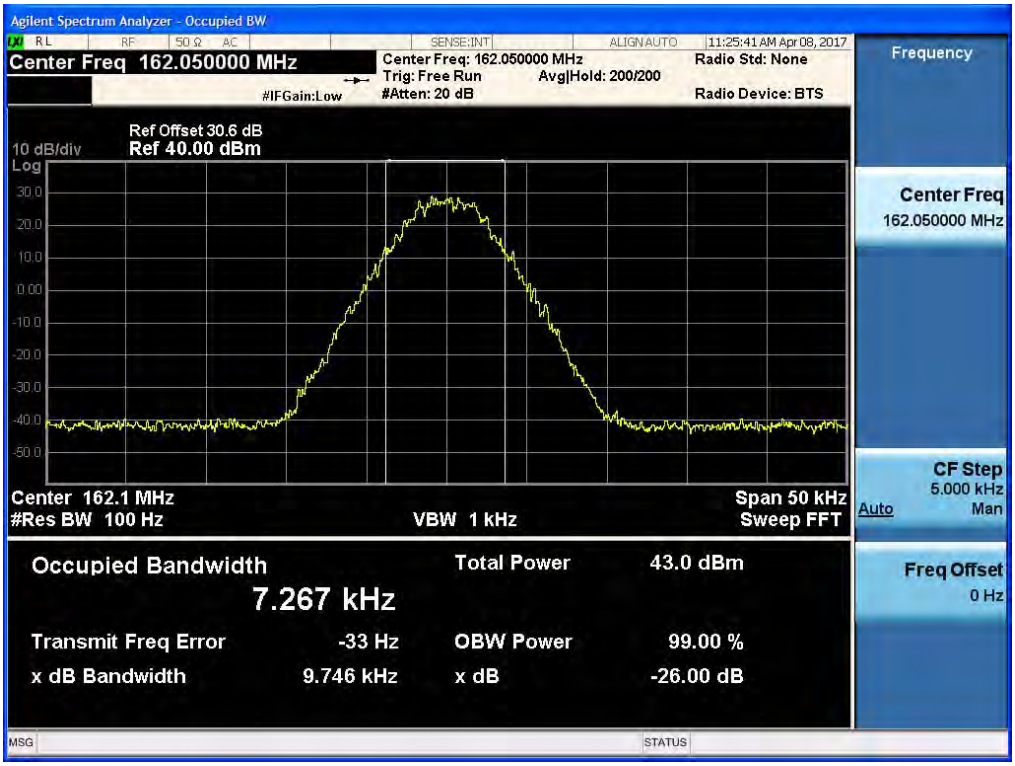
(7K60FXD, 7K60FXE _ 150.05 MHz)_High



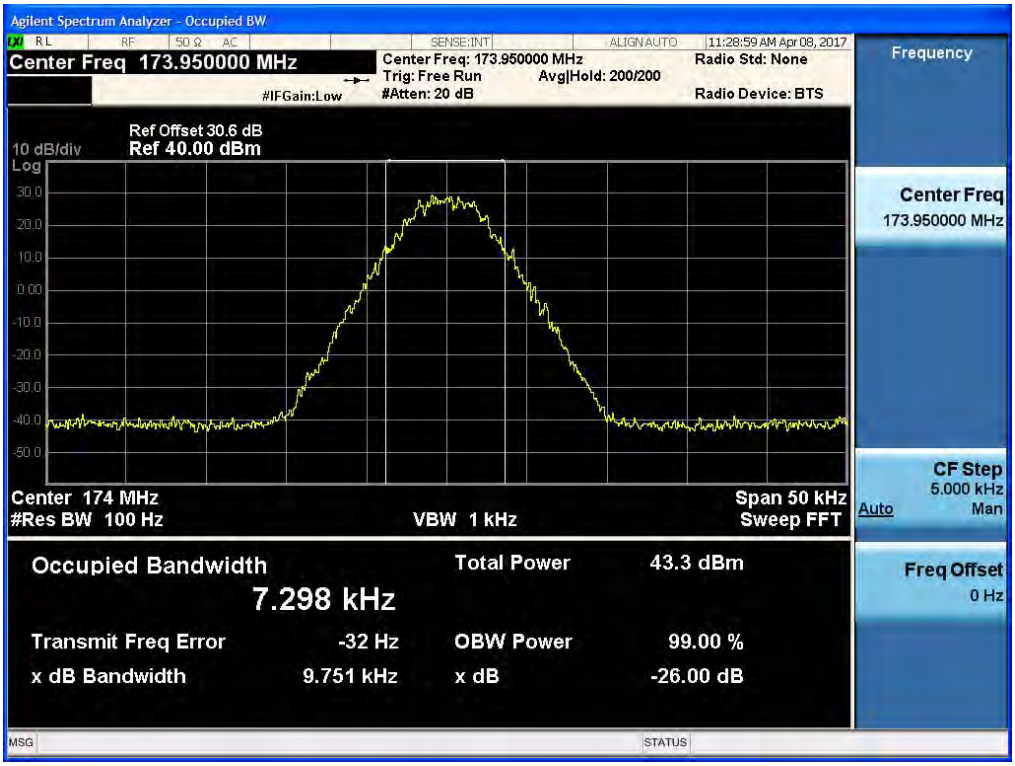
(7K60FXD, 7K60FXE _ 138.05 MHz)_High



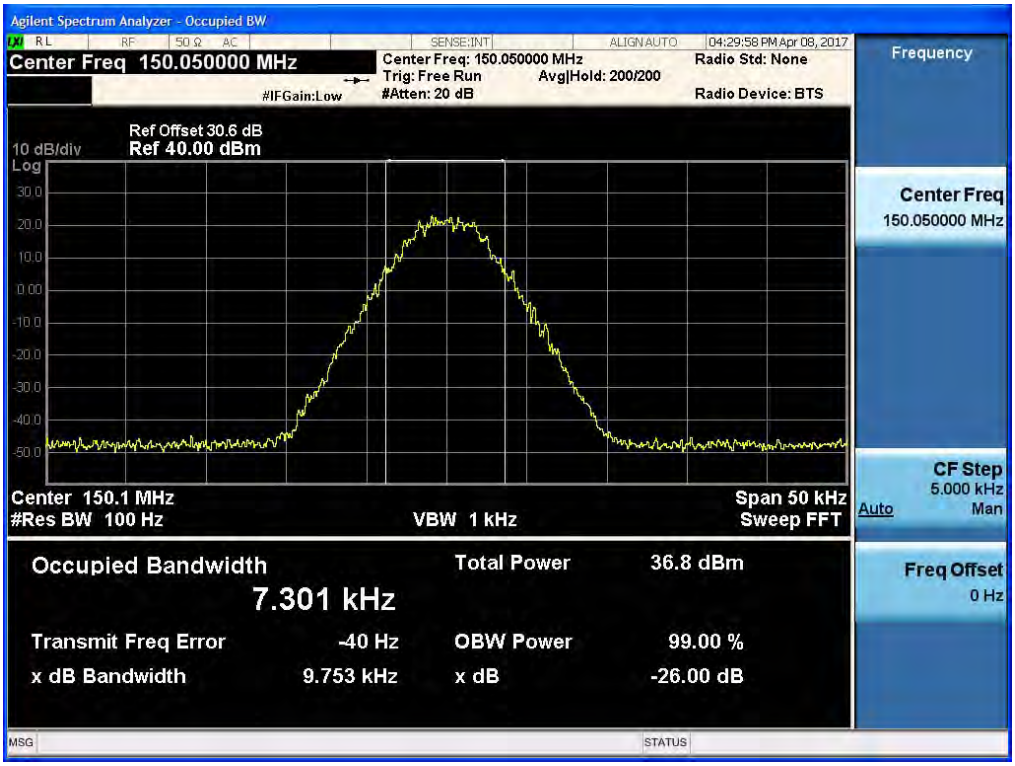
(7K60FXD, 7K60FXE _ 162.05 MHz)_High



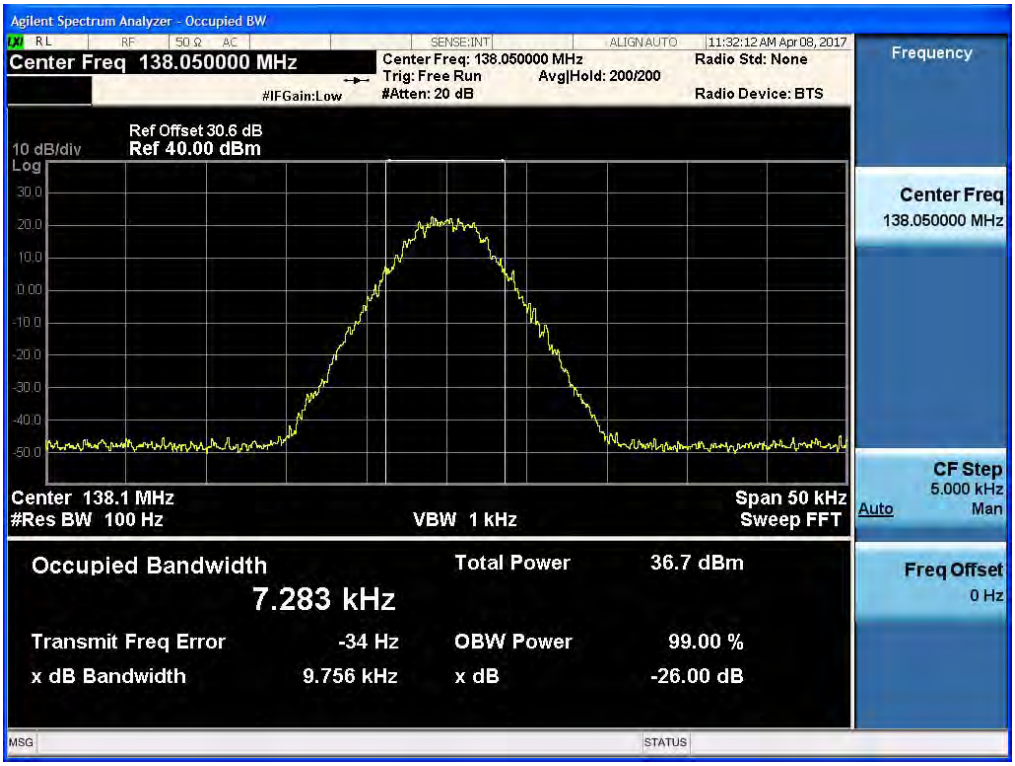
(7K60FXD, 7K60FXE _ 173.95 MHz)_High



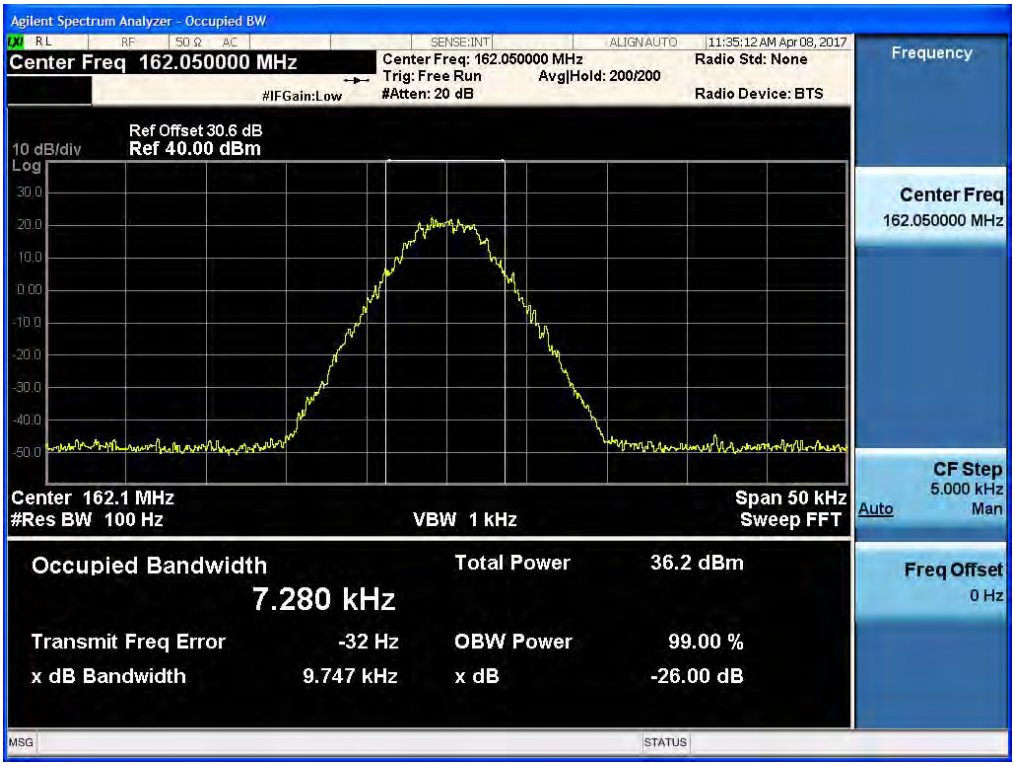
(7K60FXD, 7K60FXE _ 150.05 MHz)_Low



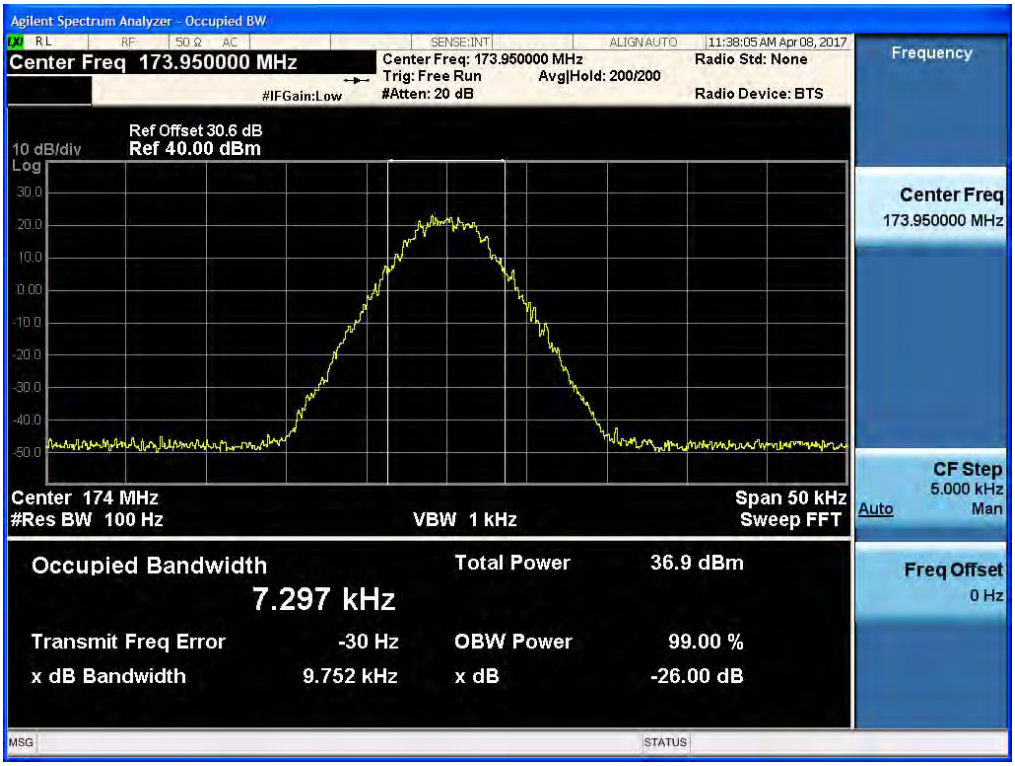
(7K60FXD, 7K60FXE _ 138.05 MHz)_Low



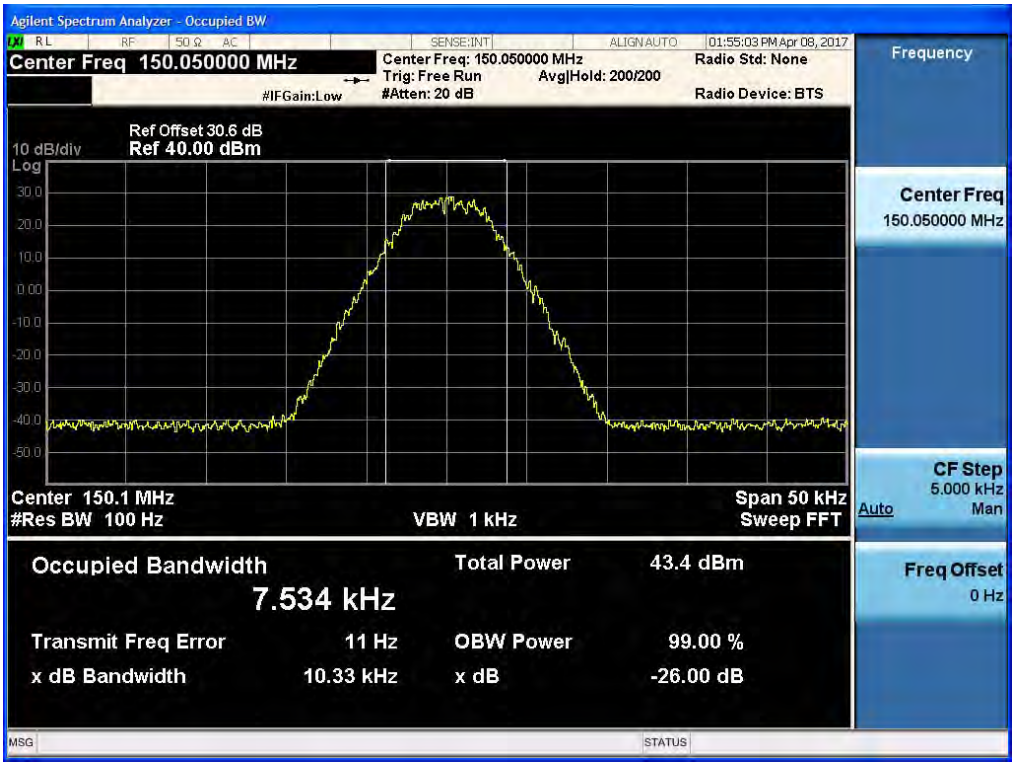
(7K60FXD, 7K60FXE _ 162.05 MHz)_Low



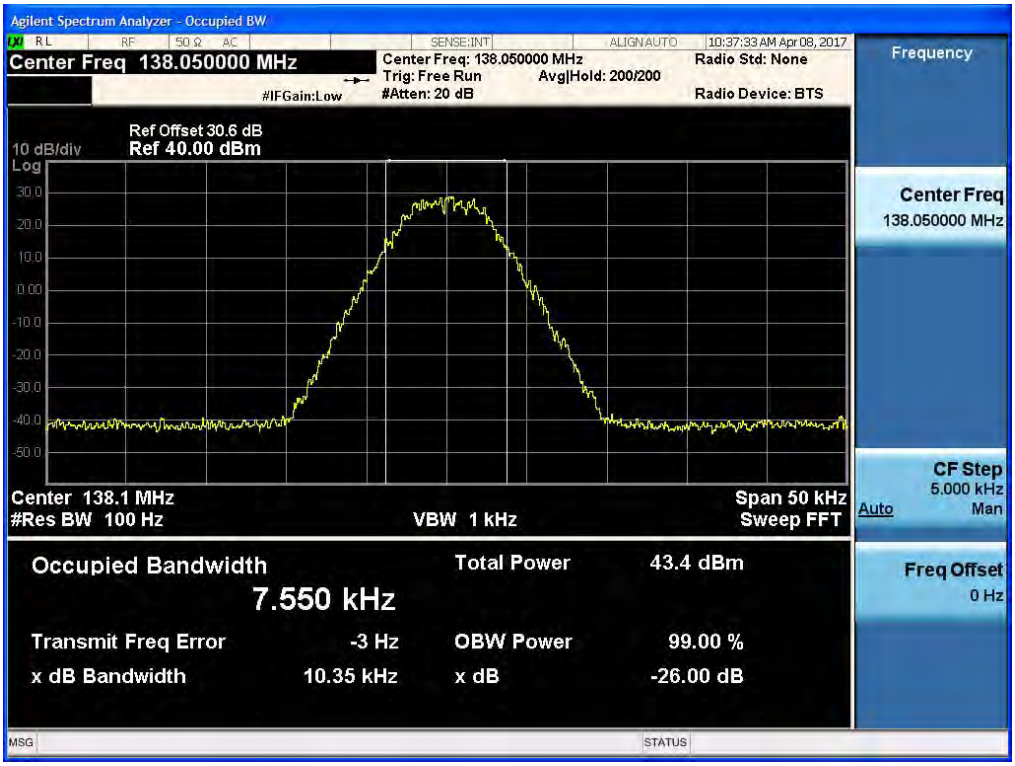
(7K60FXD, 7K60FXE _ 173.95 MHz)_Low



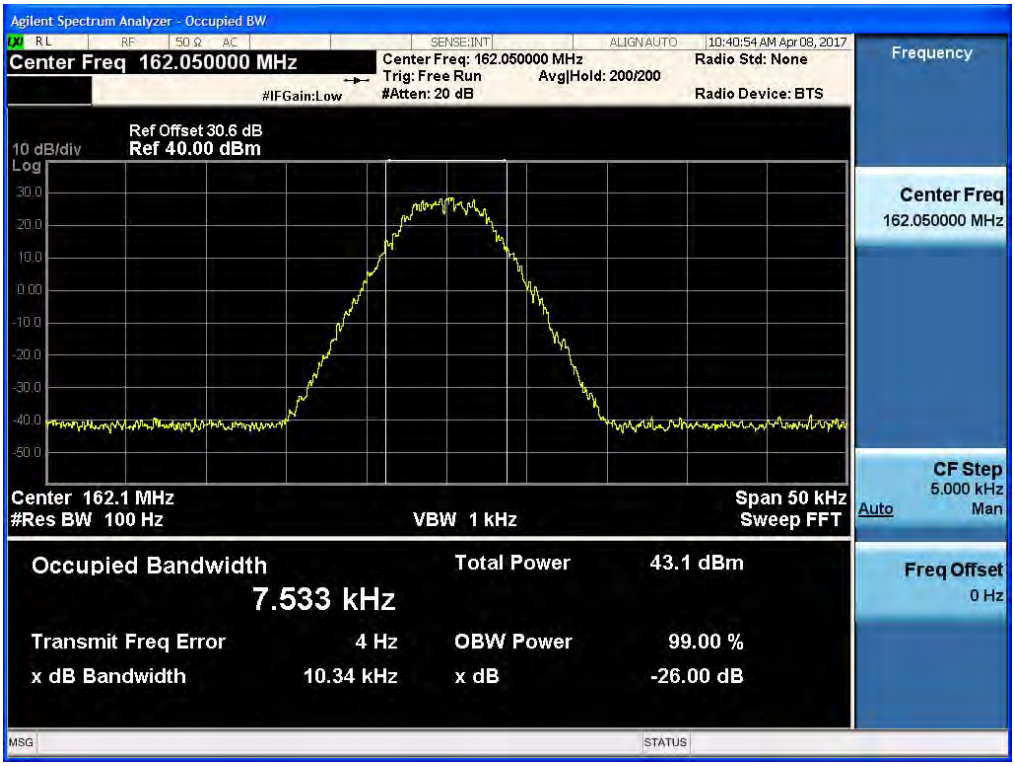
(8K30F1E, 8K30F1D, 8K30F7W _ 150.05 MHz)_High



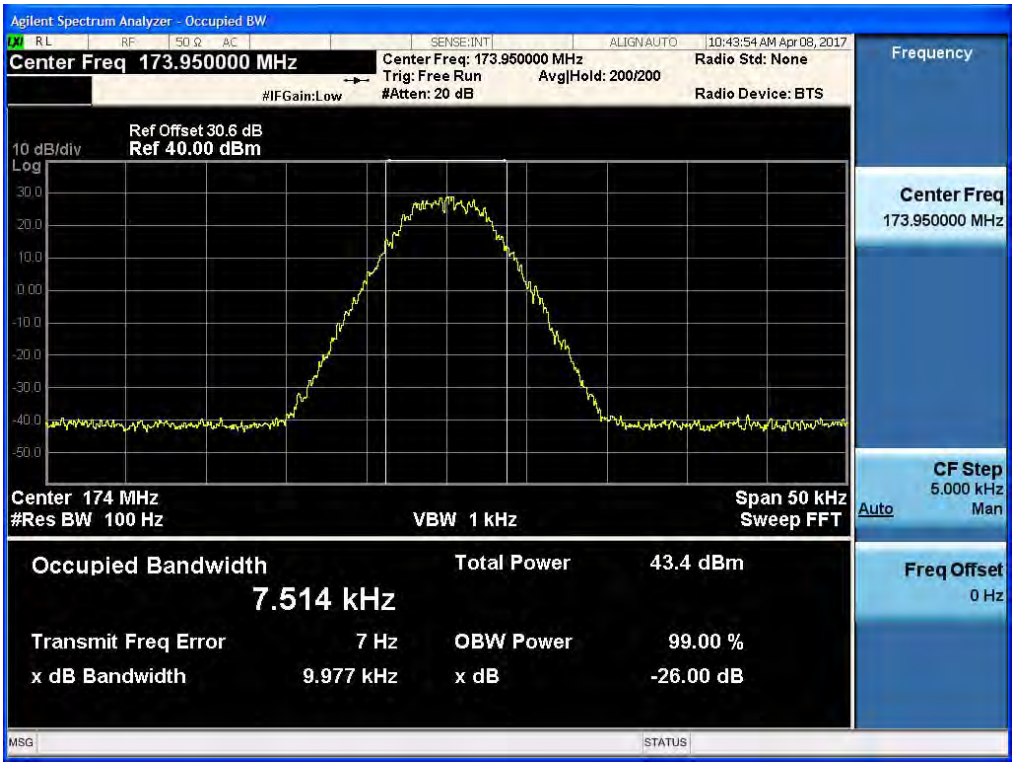
(8K30F1E, 8K30F1D, 8K30F7W _ 138.05 MHz)_High



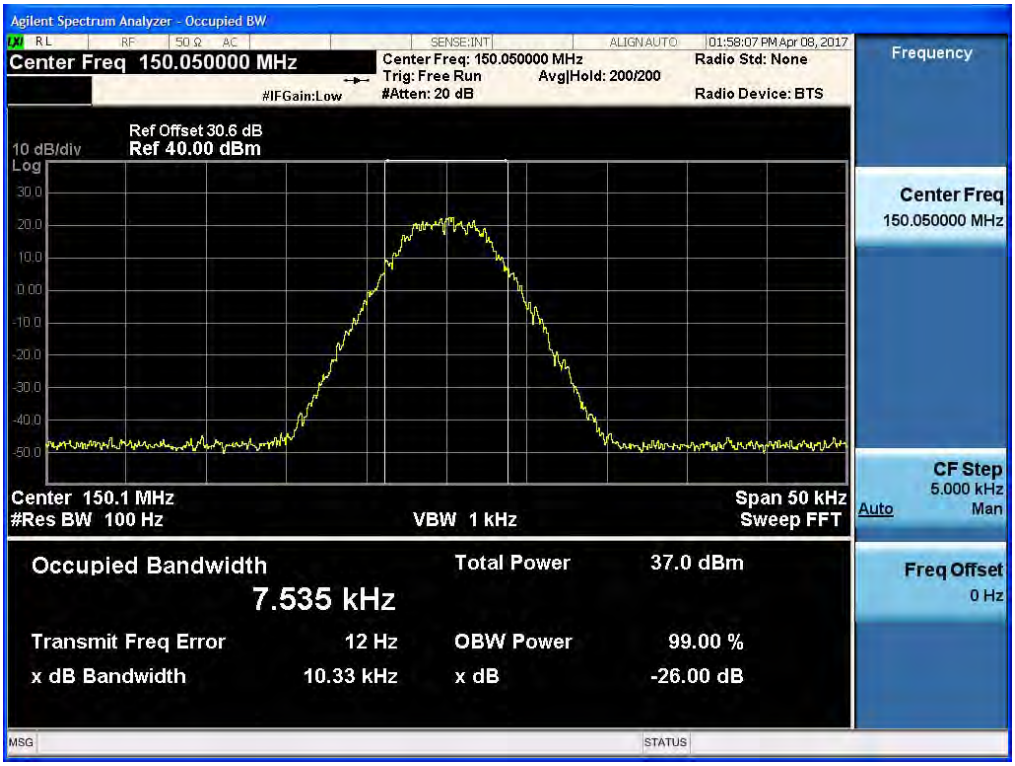
(8K30F1E, 8K30F1D, 8K30F7W _ 162.05 MHz)_High



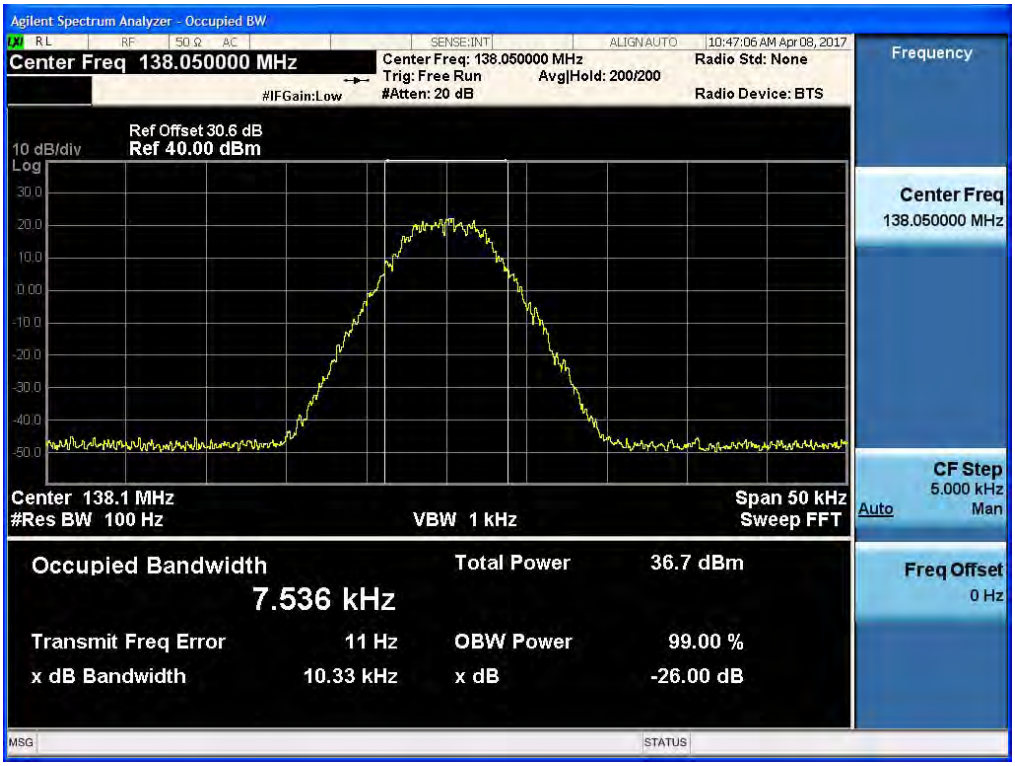
(8K30F1E, 8K30F1D, 8K30F7W _ 173.95 MHz)_High



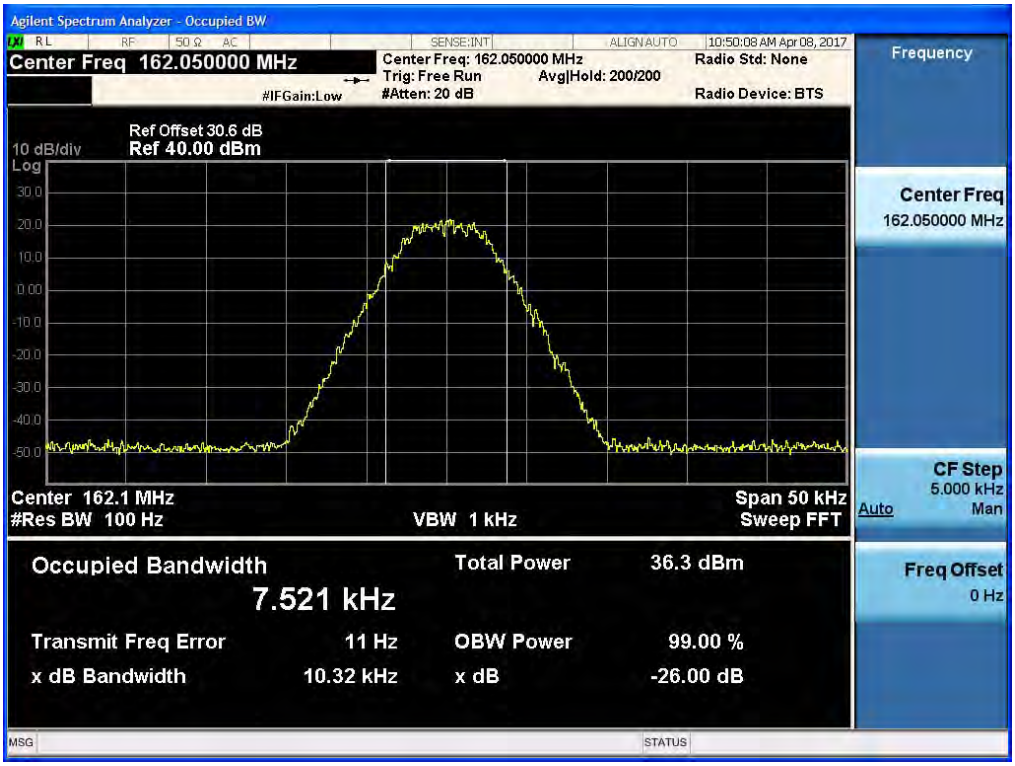
(8K30F1E, 8K30F1D, 8K30F7W _ 150.05 MHz)_Low



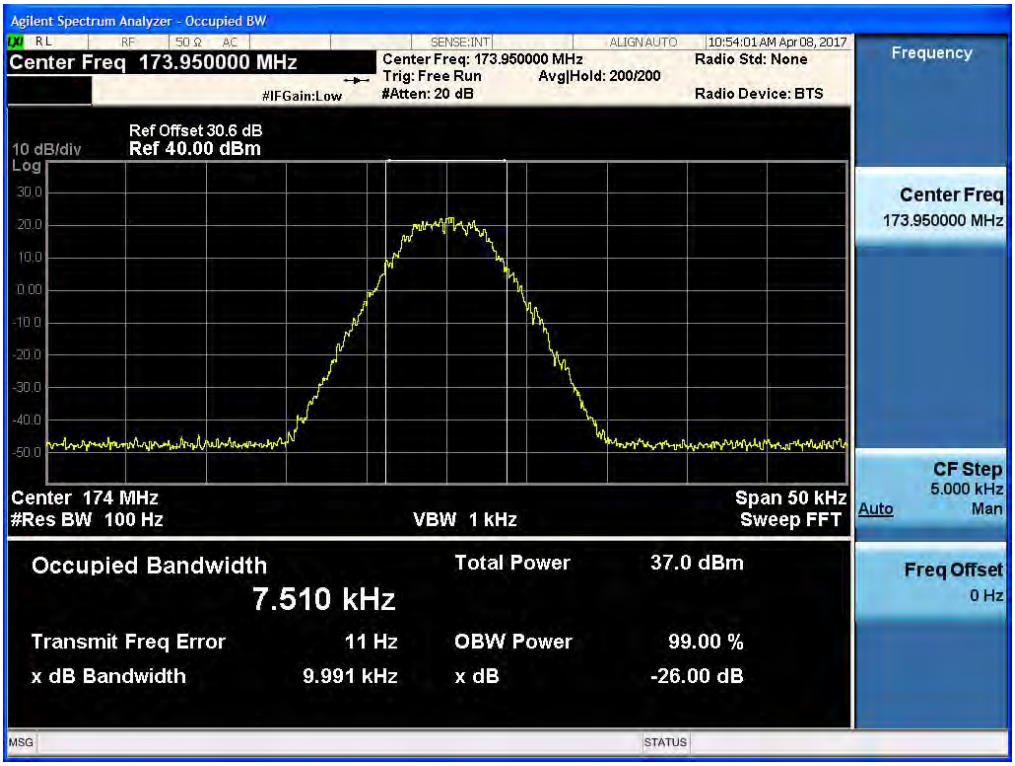
(8K30F1E, 8K30F1D, 8K30F7W _ 138.05 MHz)_Low



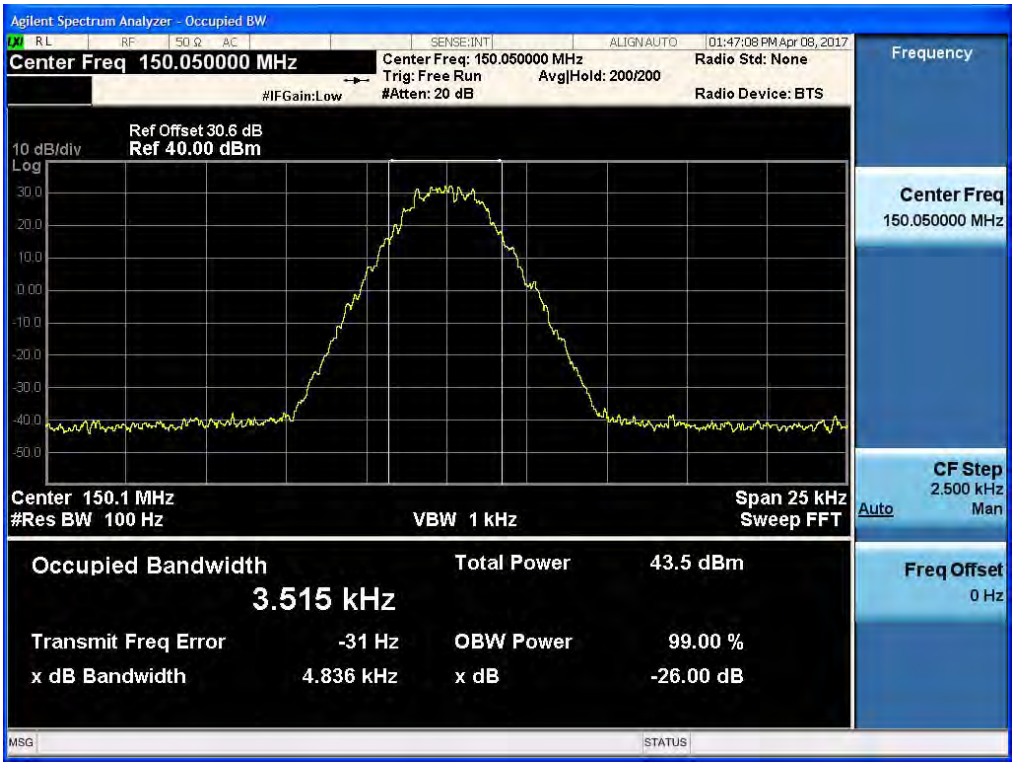
(8K30F1E, 8K30F1D, 8K30F7W _ 162.05 MHz)_Low



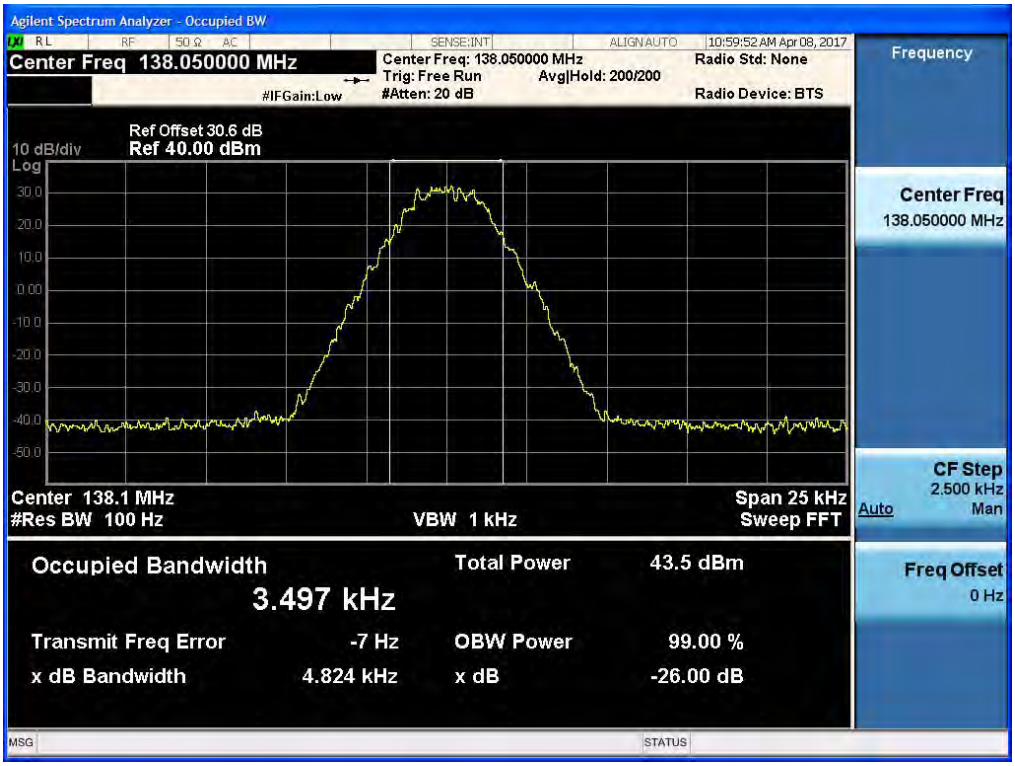
(8K30F1E, 8K30F1D, 8K30F7W _ 173.95 MHz)_Low



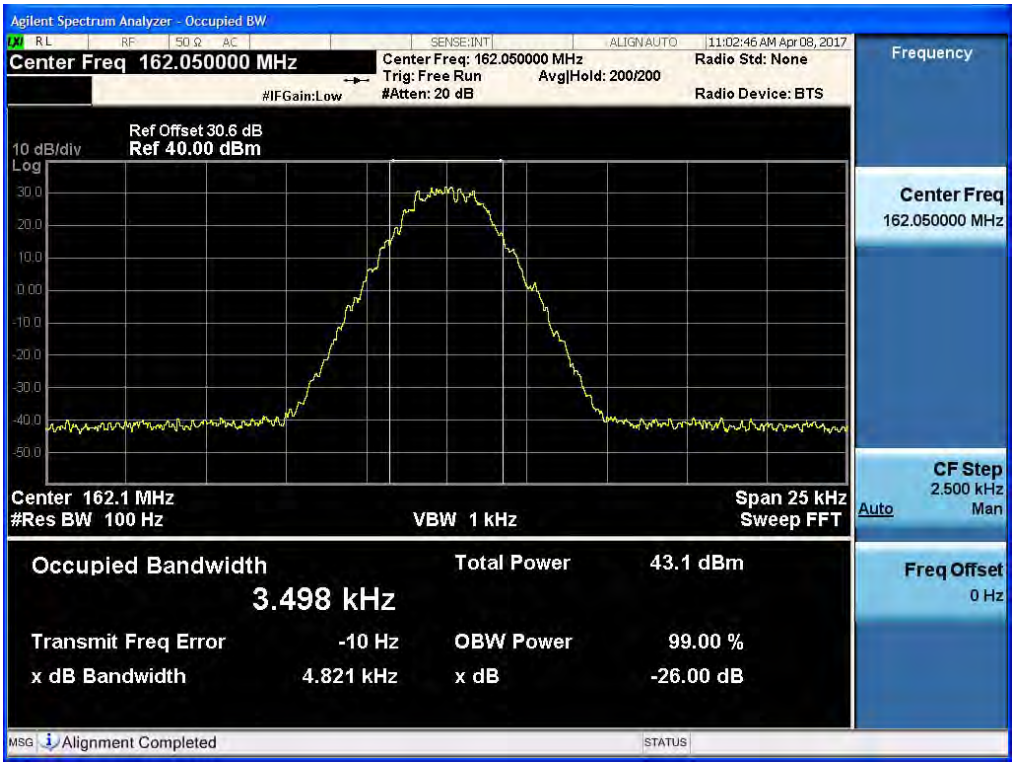
(4K00F1E, 4K00F1D, 4K00F7W _ 150.05 MHz)_High



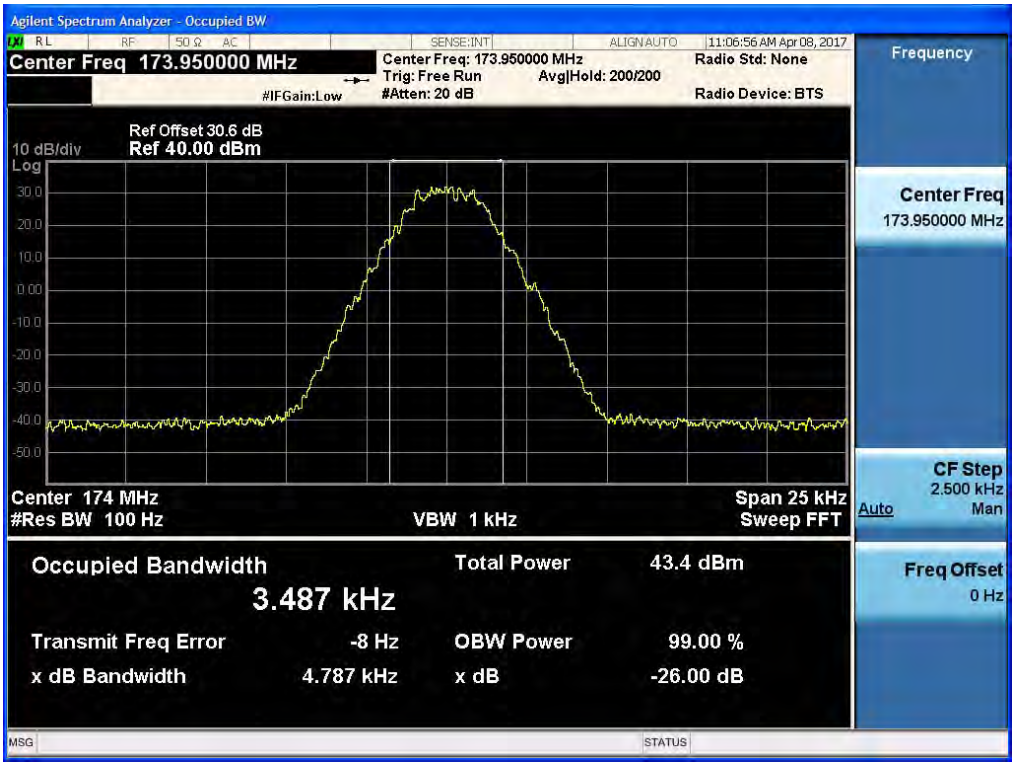
(4K00F1E, 4K00F1D, 4K00F7W _ 138.05 MHz)_High



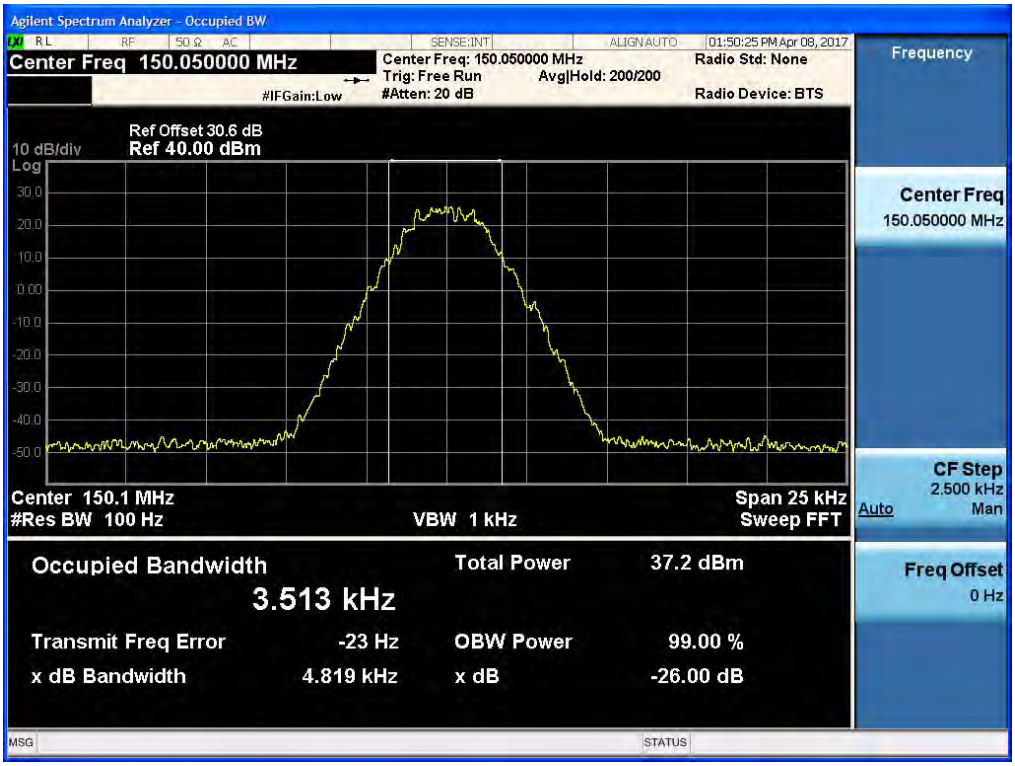
(4K00F1E, 4K00F1D, 4K00F7W _ 162.05 MHz)_High



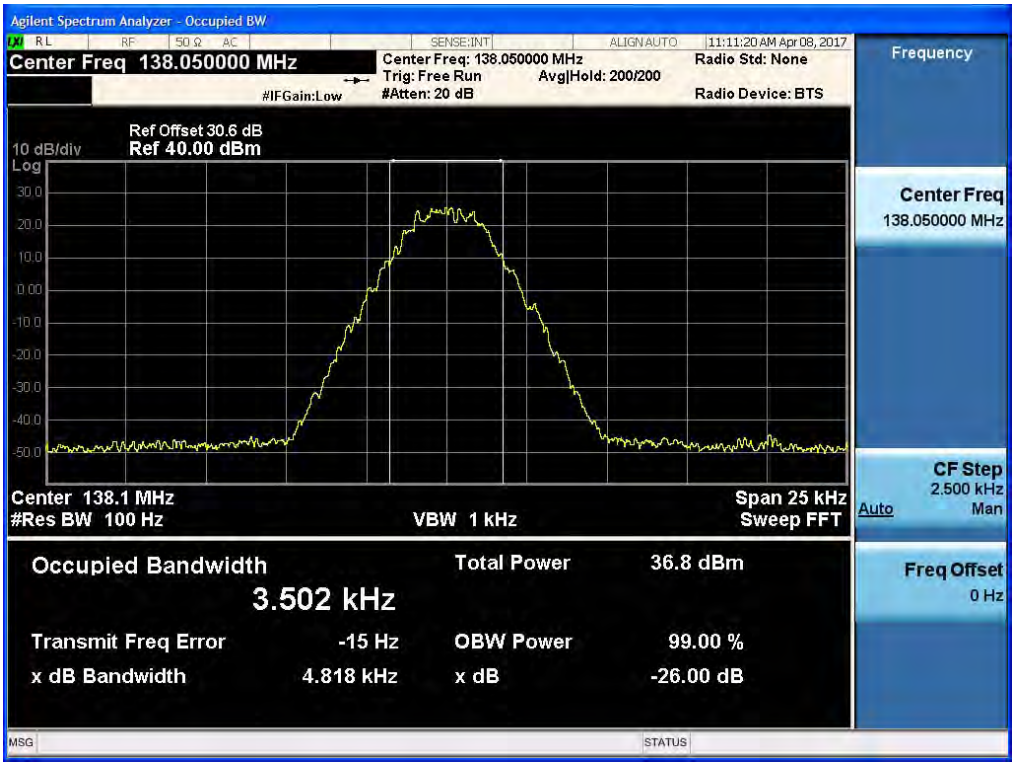
(4K00F1E, 4K00F1D, 4K00F7W _ 173.95 MHz)_High



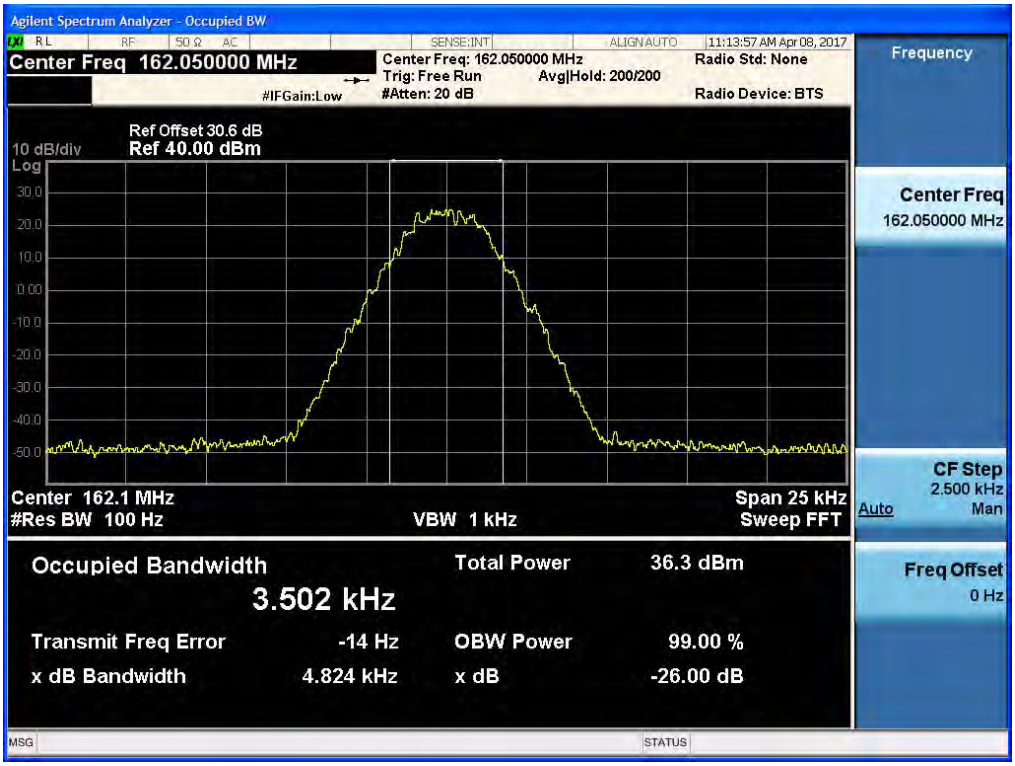
(4K00F1E, 4K00F1D, 4K00F7W _ 150.05 MHz)_Low



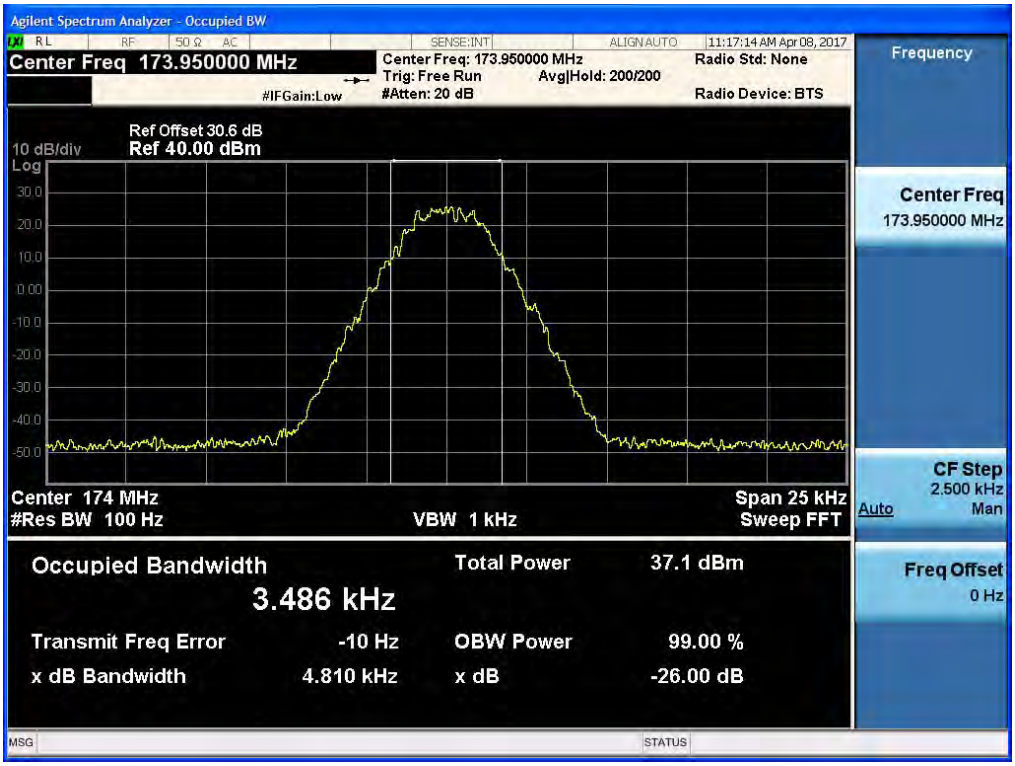
(4K00F1E, 4K00F1D, 4K00F7W _ 138.05 MHz)_Low



(4K00F1E, 4K00F1D, 4K00F7W _ 162.05 MHz)_Low



(4K00F1E, 4K00F1D, 4K00F7W _ 173.95 MHz)_Low



(4K00F2D_ 150.05 MHz)_Low

(4K00F2D_ 138.05 MHz)_Low

(4K00F2D_ 162.05 MHz)_Low

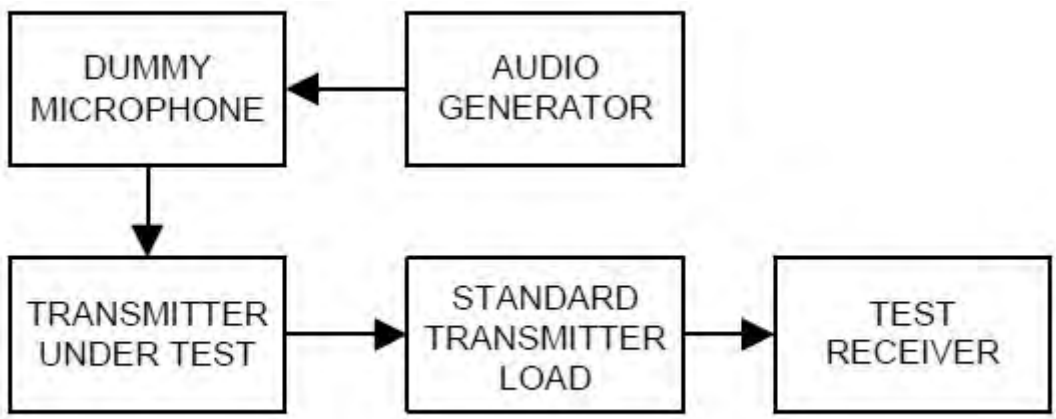
(4K00F2D_ 173.95 MHz)_Low

7.4 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.

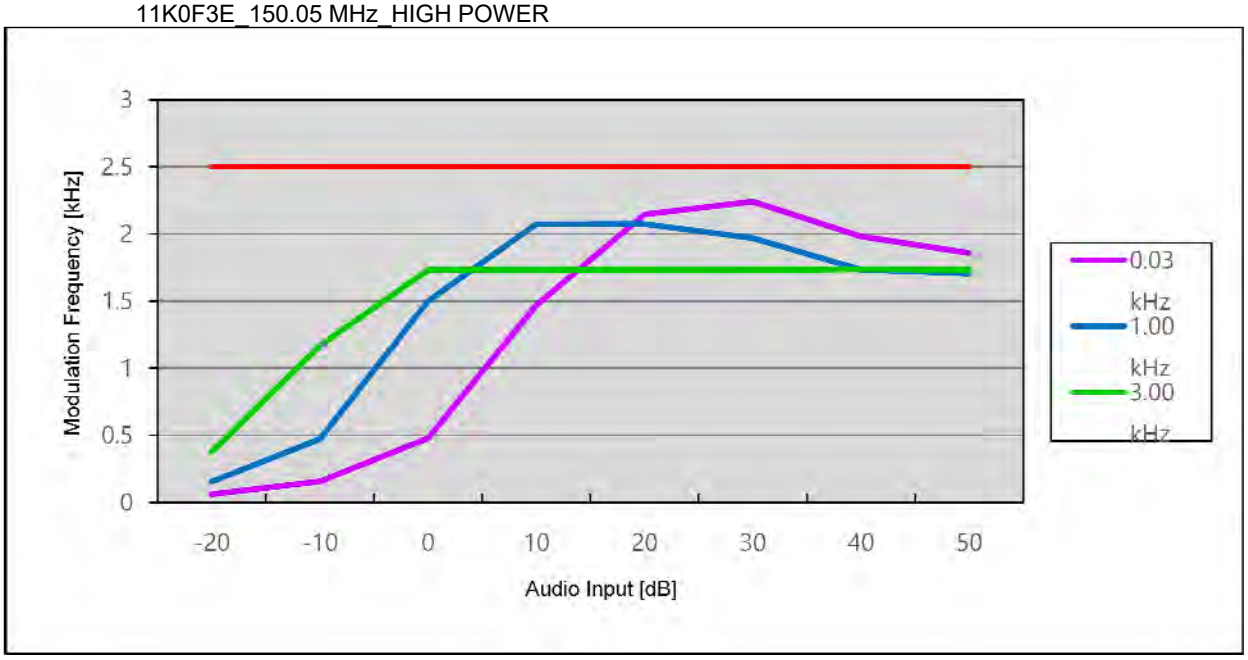
a) Connect the equipment as illustrated.
b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
c) Set the test receiver to measure peak positive deviation.
   Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz.
   Turn the de-emphasis function off.
d) Apply a 1000 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

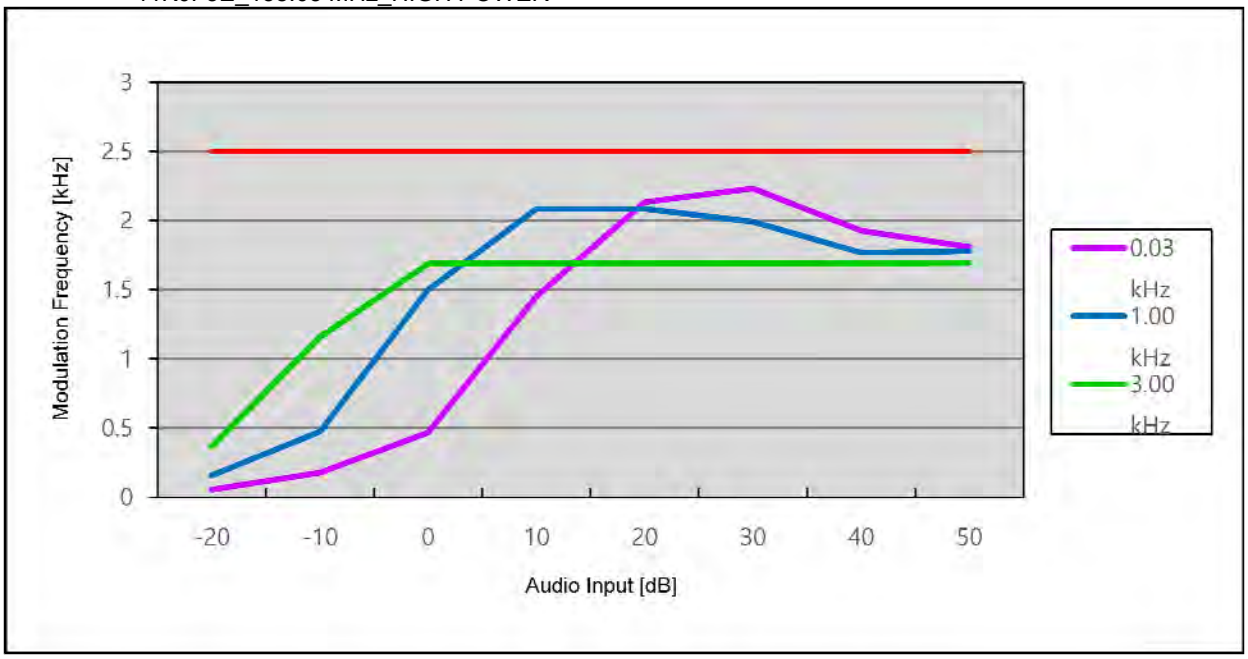
11K0F3E

Positive Peaks

11K0F3E_150.05 MHz_HIGH POWER

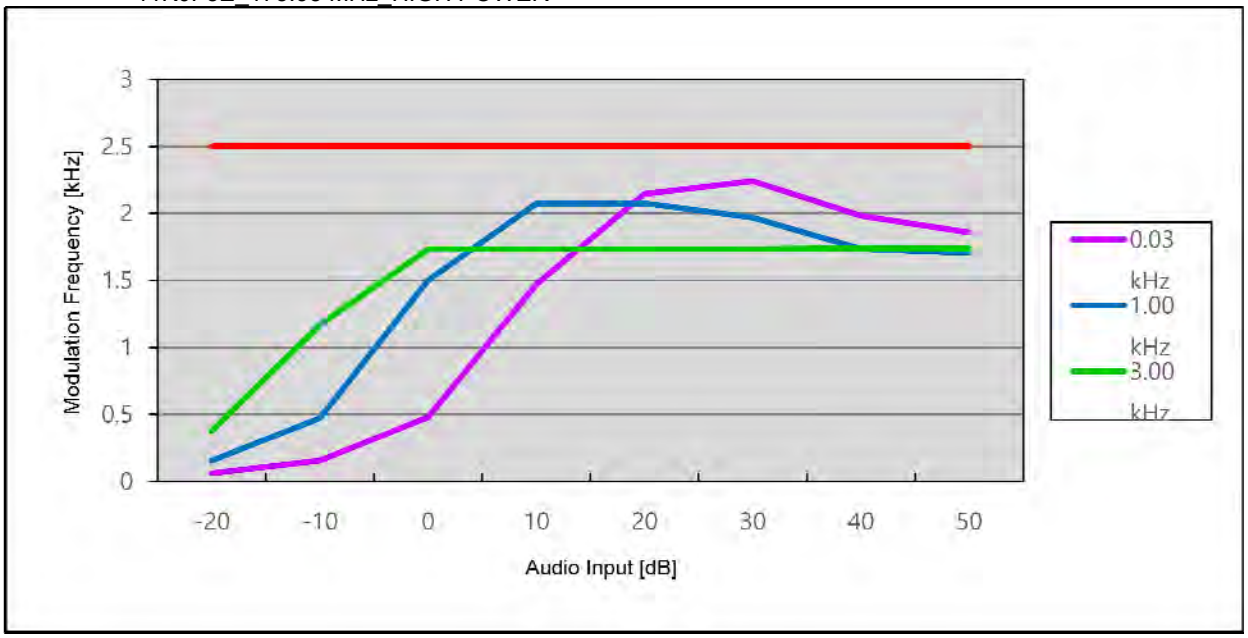


11K0F3E_138.05 MHz_HIGH POWER

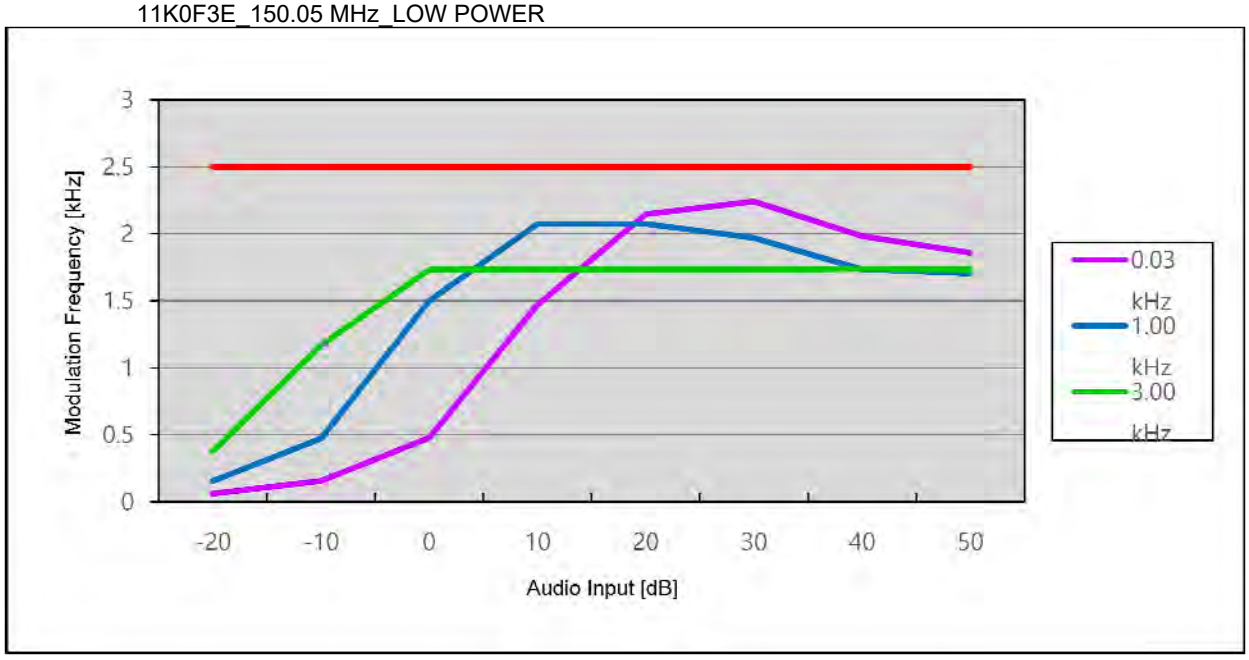


11K0F3E_162.05 MHz_HIGH POWER

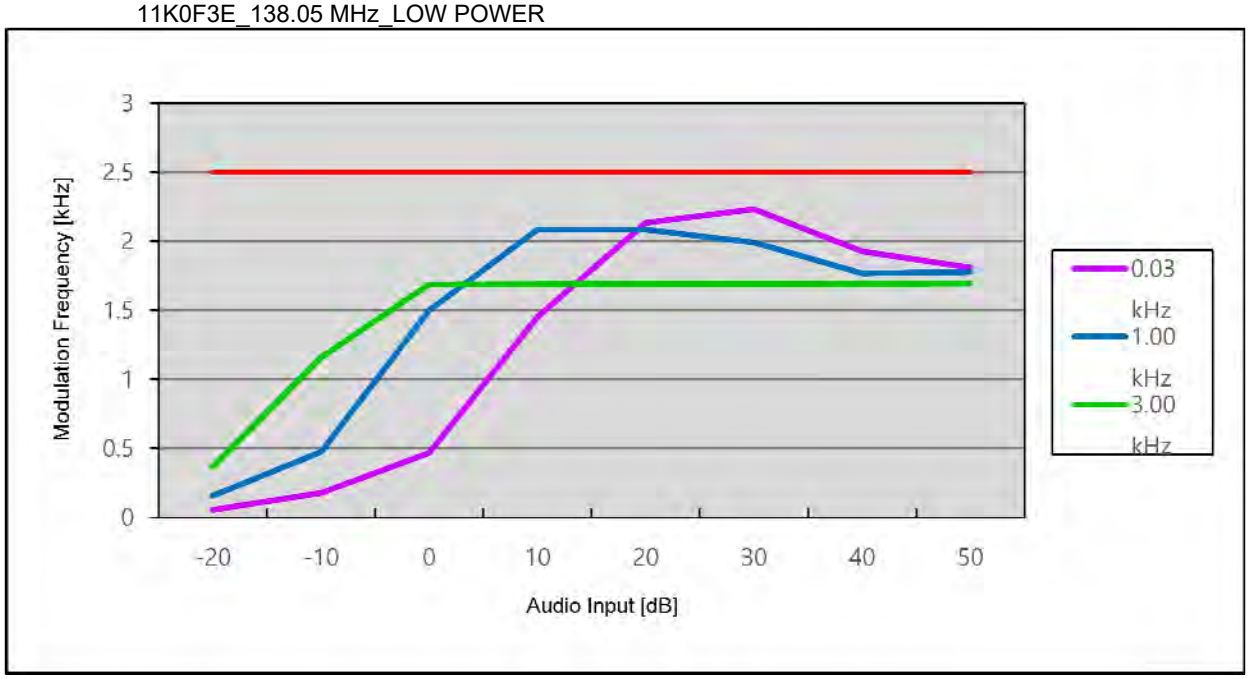
11K0F3E_173.95 MHz_HIGH POWER



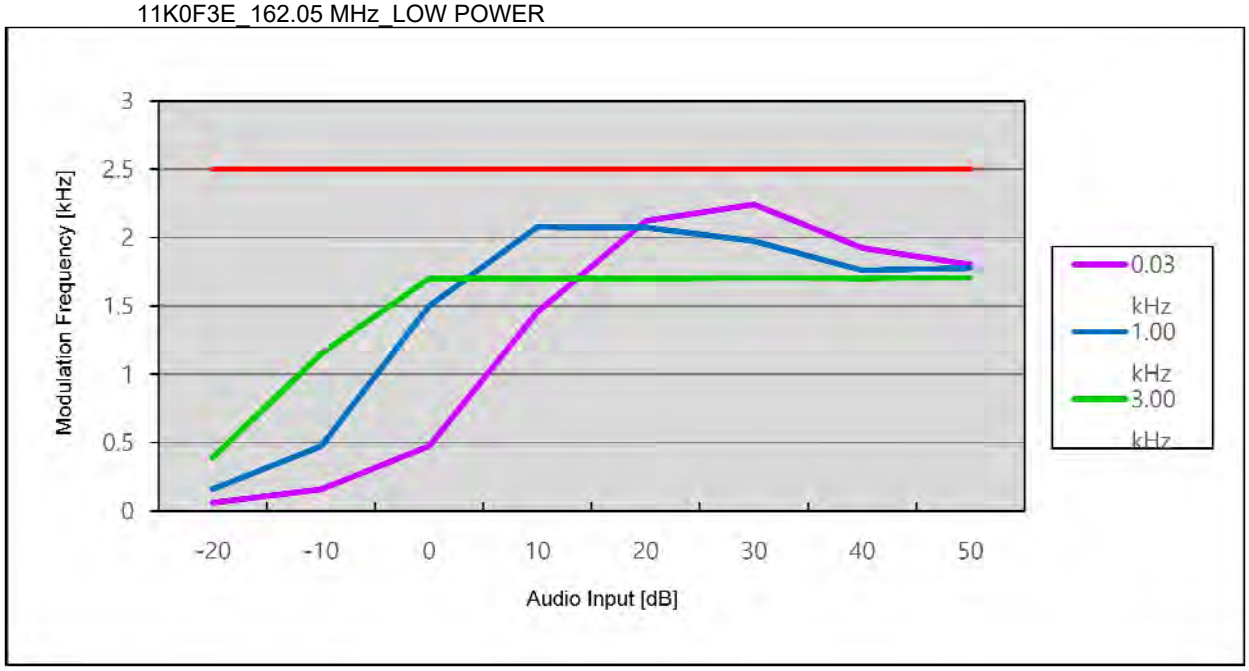
11K0F3E_150.05 MHz_LOW POWER



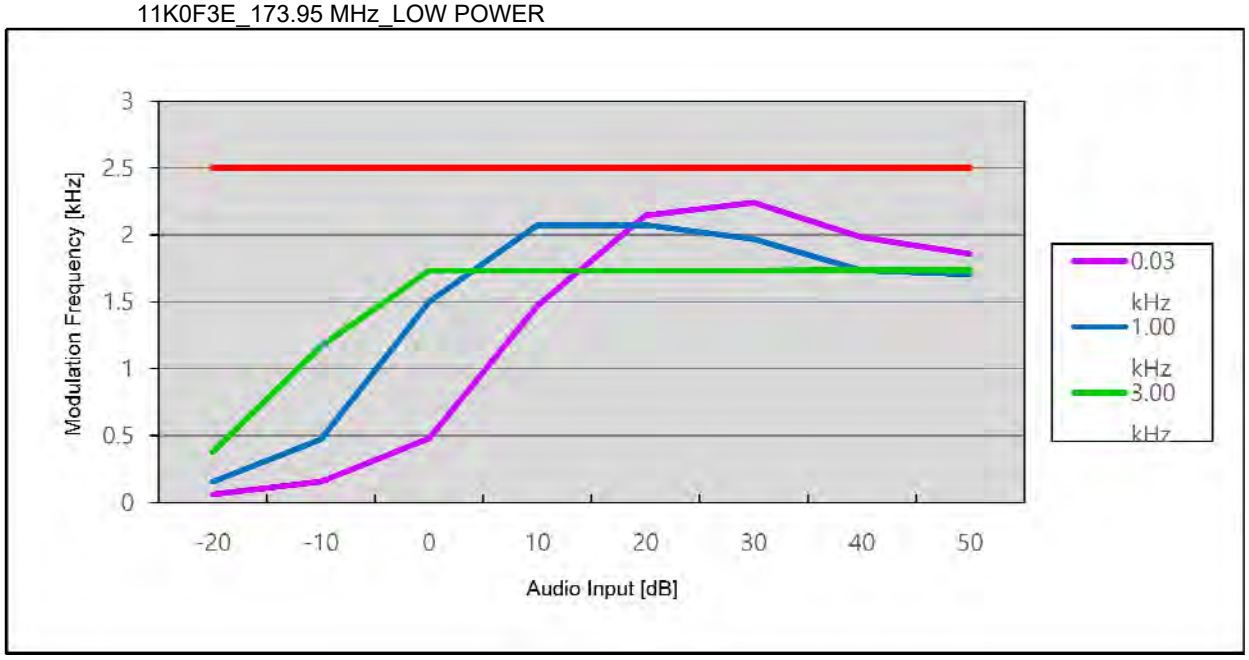
11K0F3E_138.05 MHz_LOW POWER



11K0F3E_162.05 MHz_LOW POWER

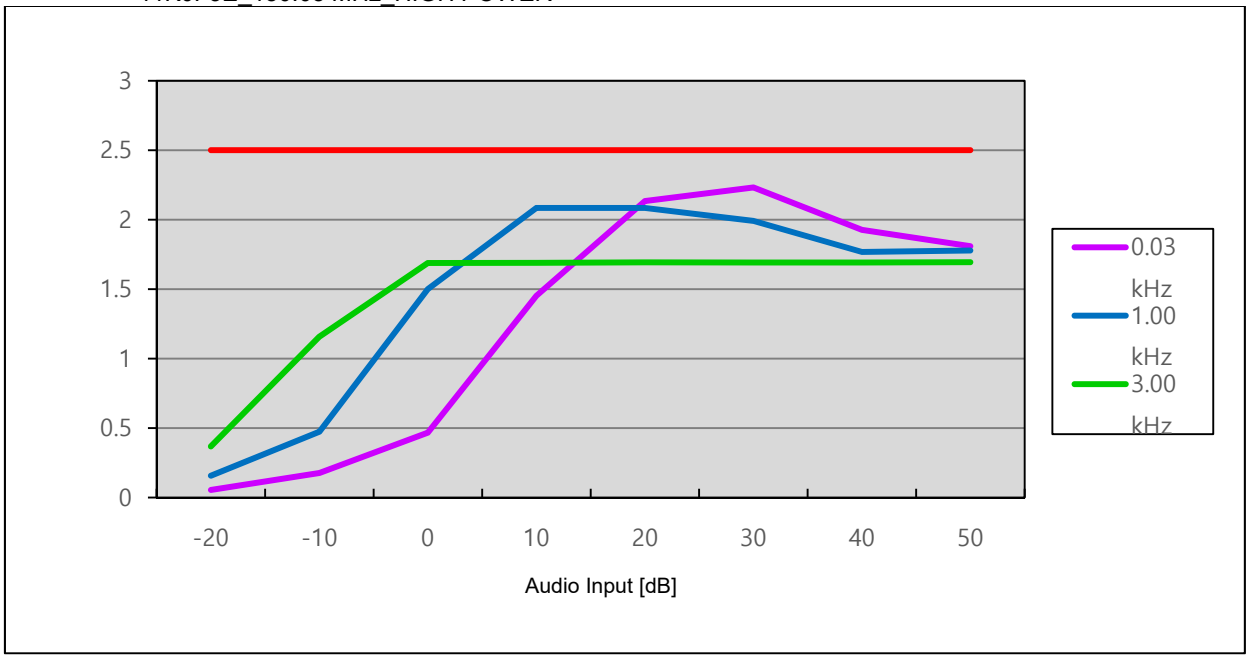


11K0F3E_173.95 MHz_LOW POWER

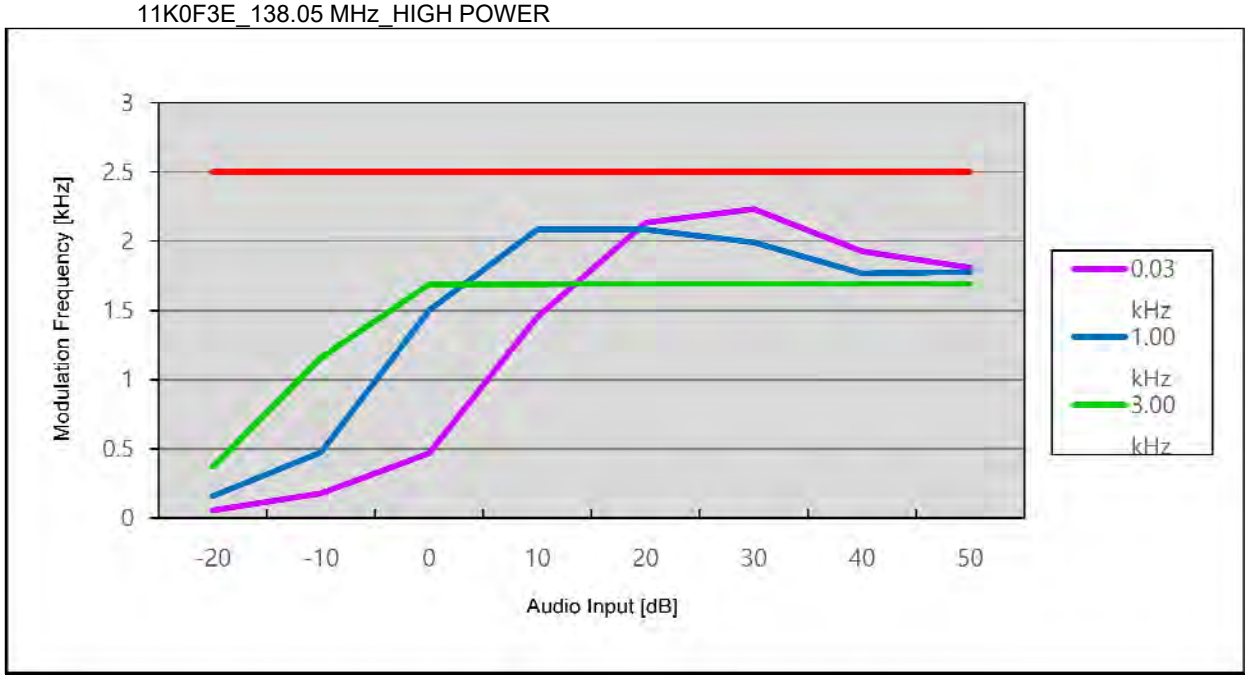


Negative Peaks

11K0F3E_150.05 MHz_HIGH POWER

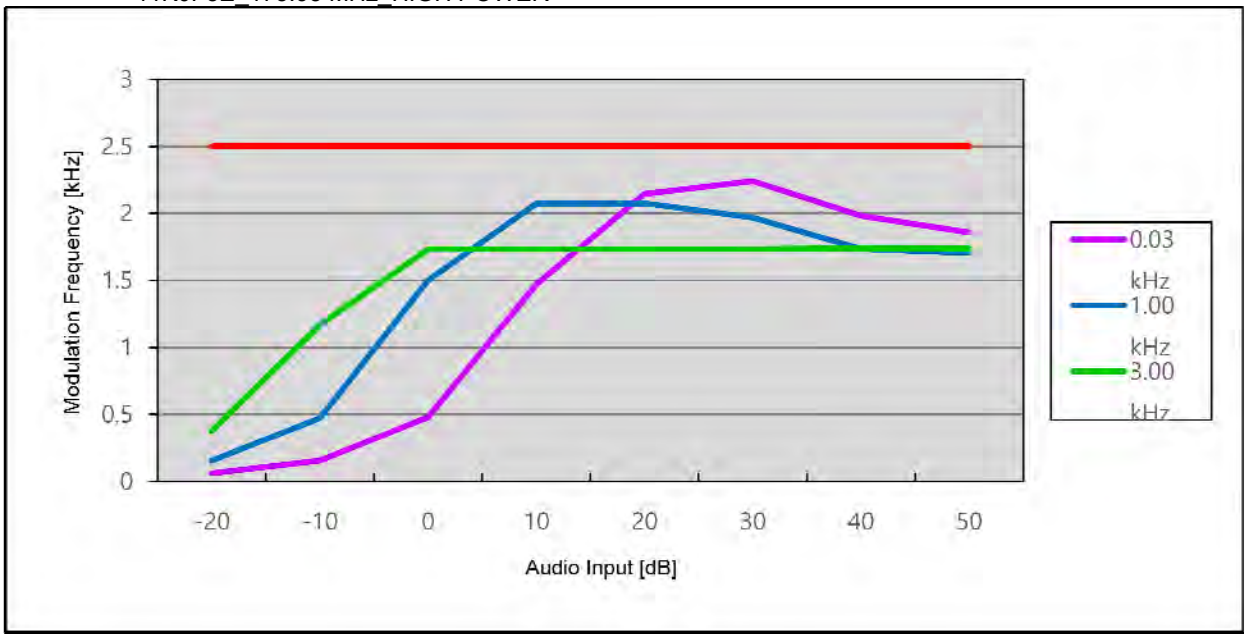


11K0F3E_138.05 MHz_HIGH POWER

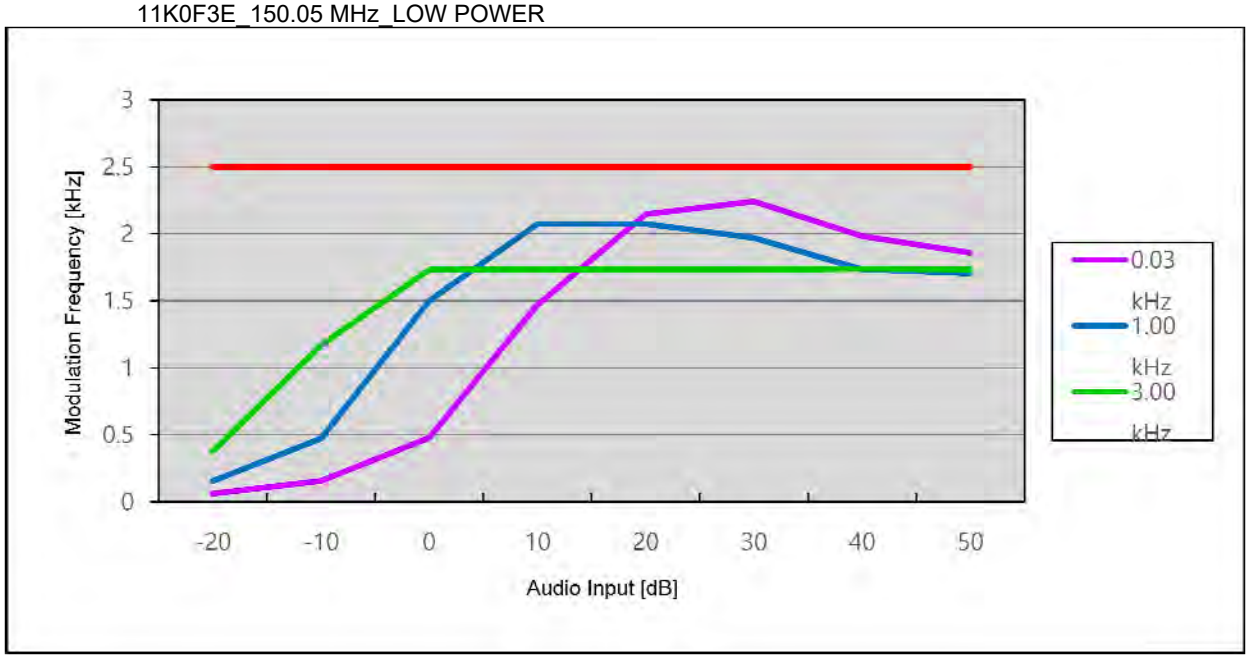


11K0F3E_162.05 MHz_HIGH POWER

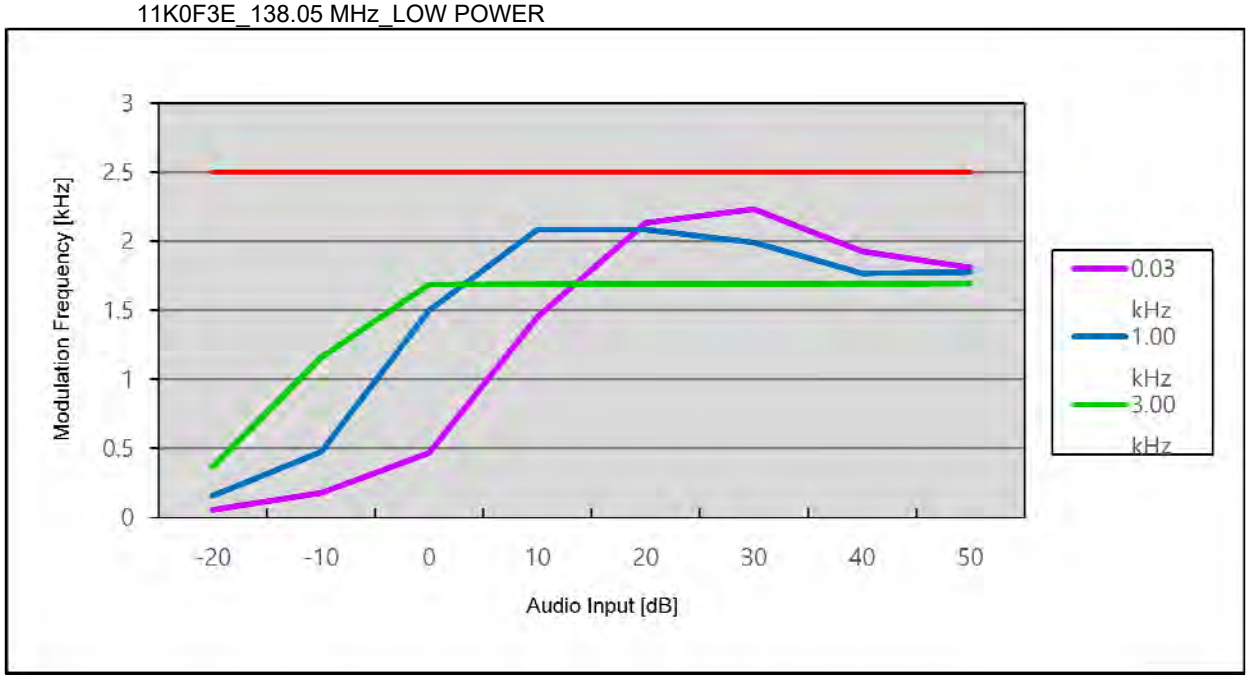
11K0F3E_173.95 MHz_HIGH POWER



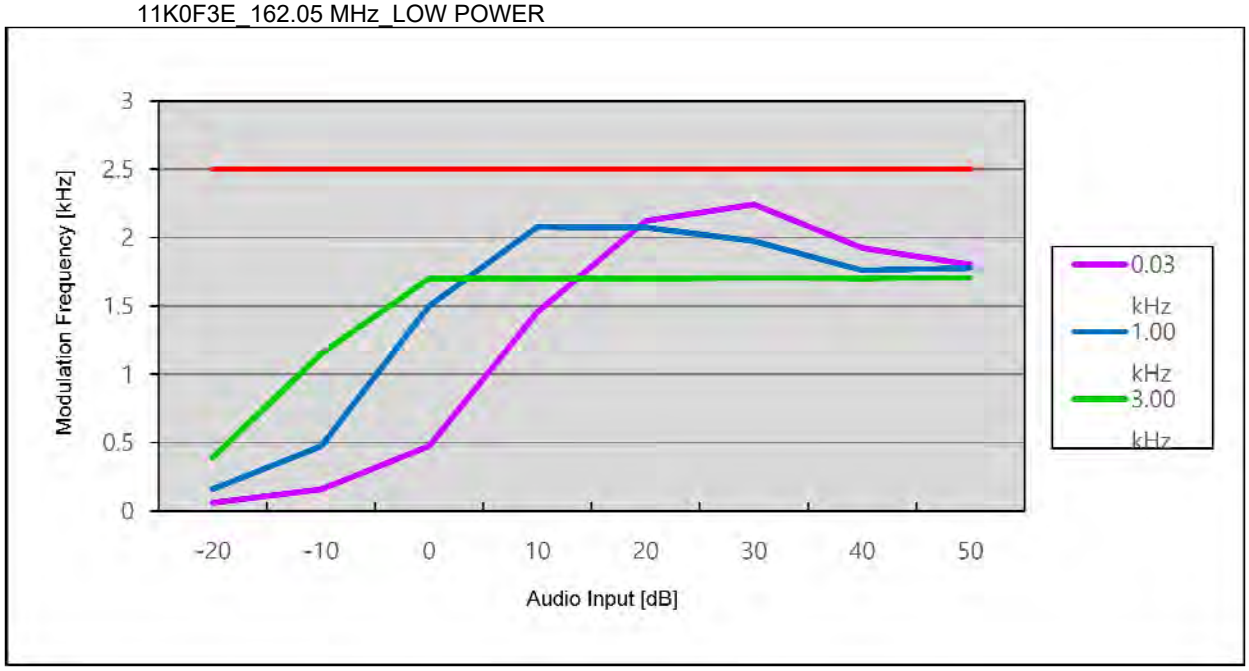
11K0F3E_150.05 MHz_LOW POWER



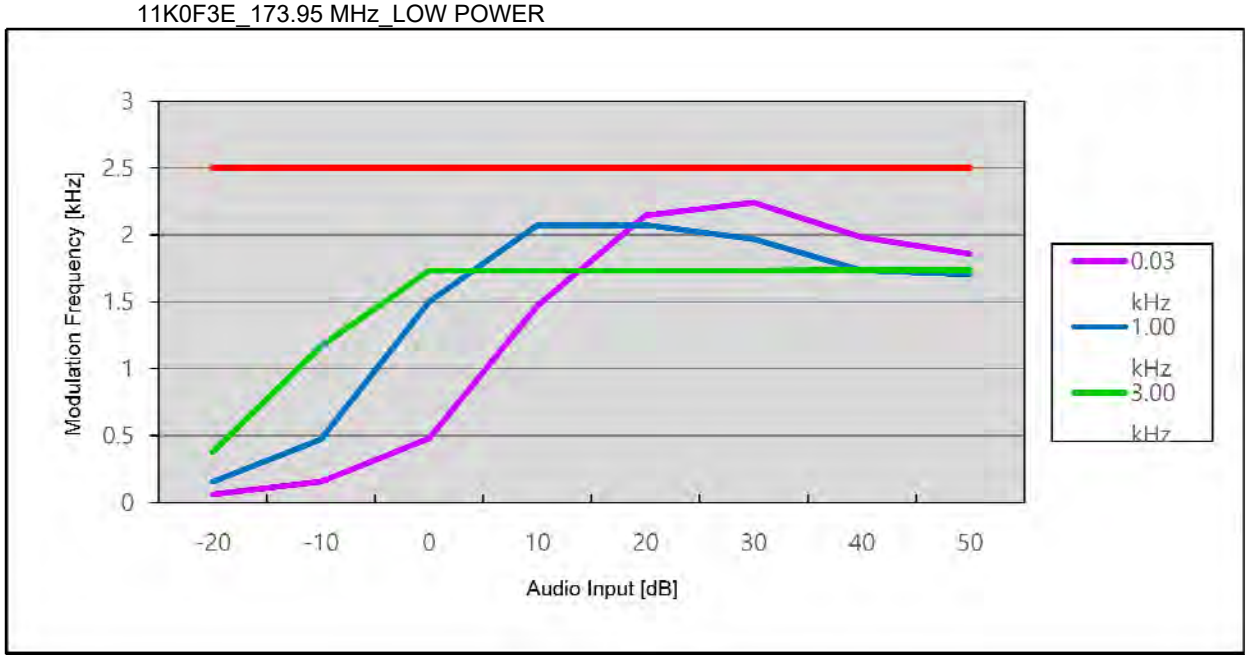
11K0F3E_138.05 MHz_LOW POWER



11K0F3E_162.05 MHz_LOW POWER



11K0F3E_173.95 MHz_LOW POWER

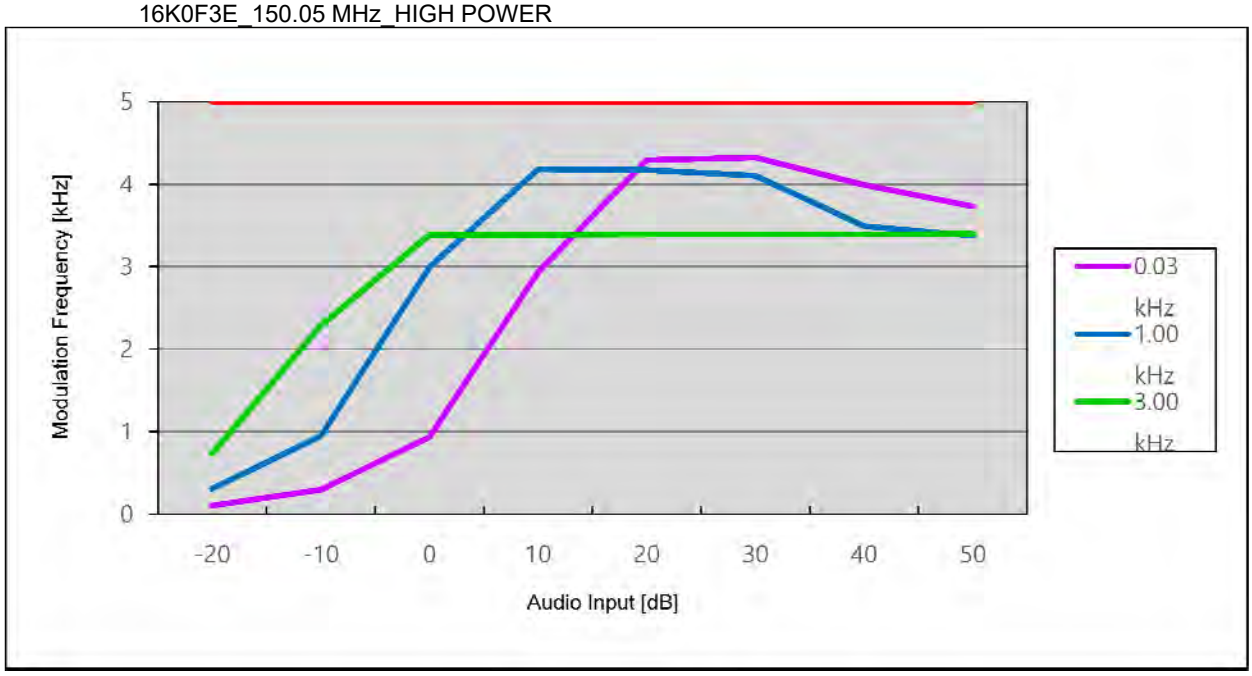


▣ TEST RESULTS

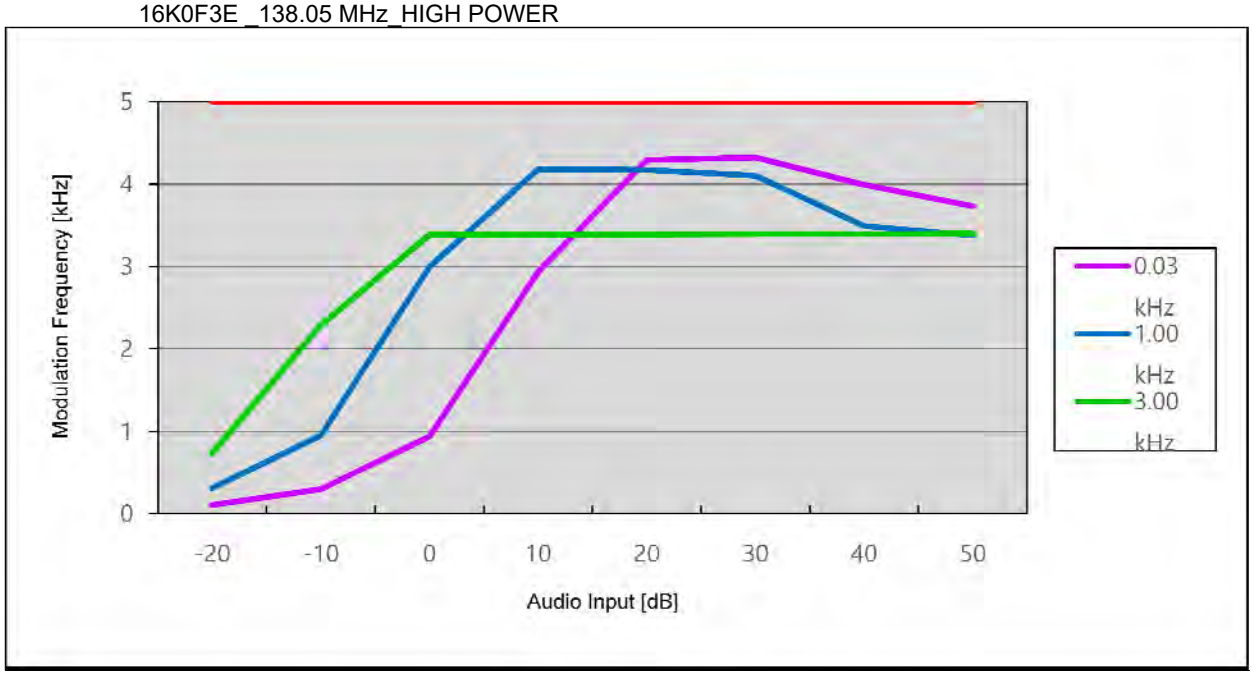
16K0F3E

Positive Peaks

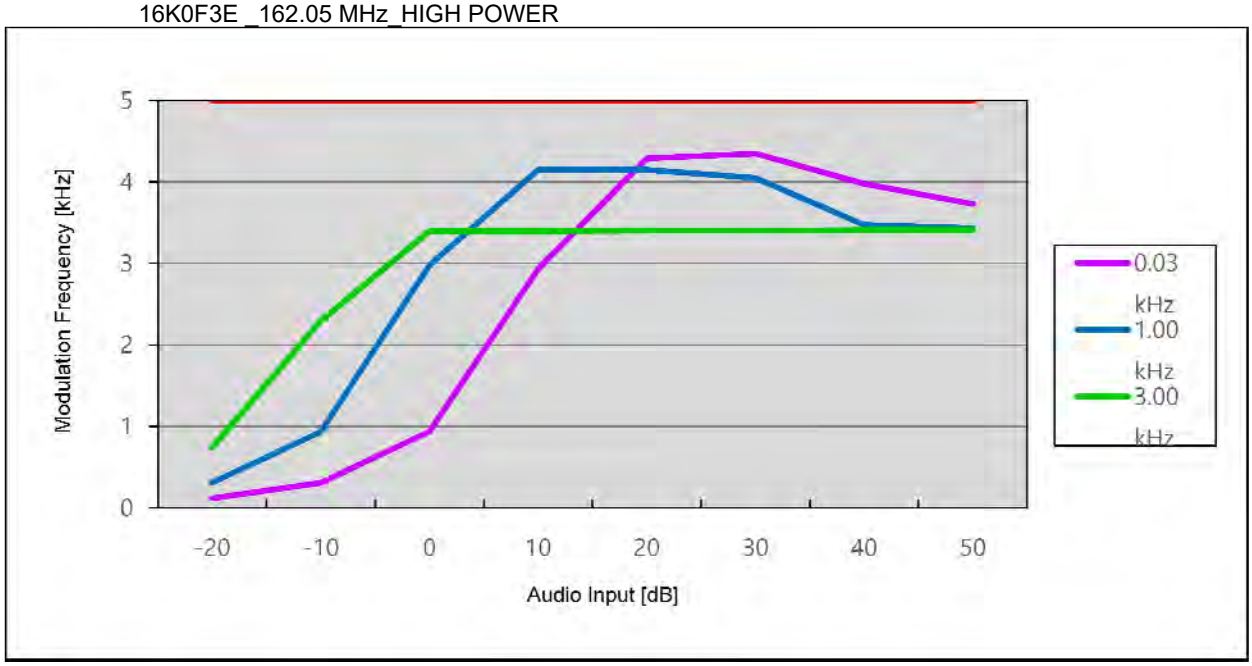
16K0F3E_150.05 MHz_HIGH POWER



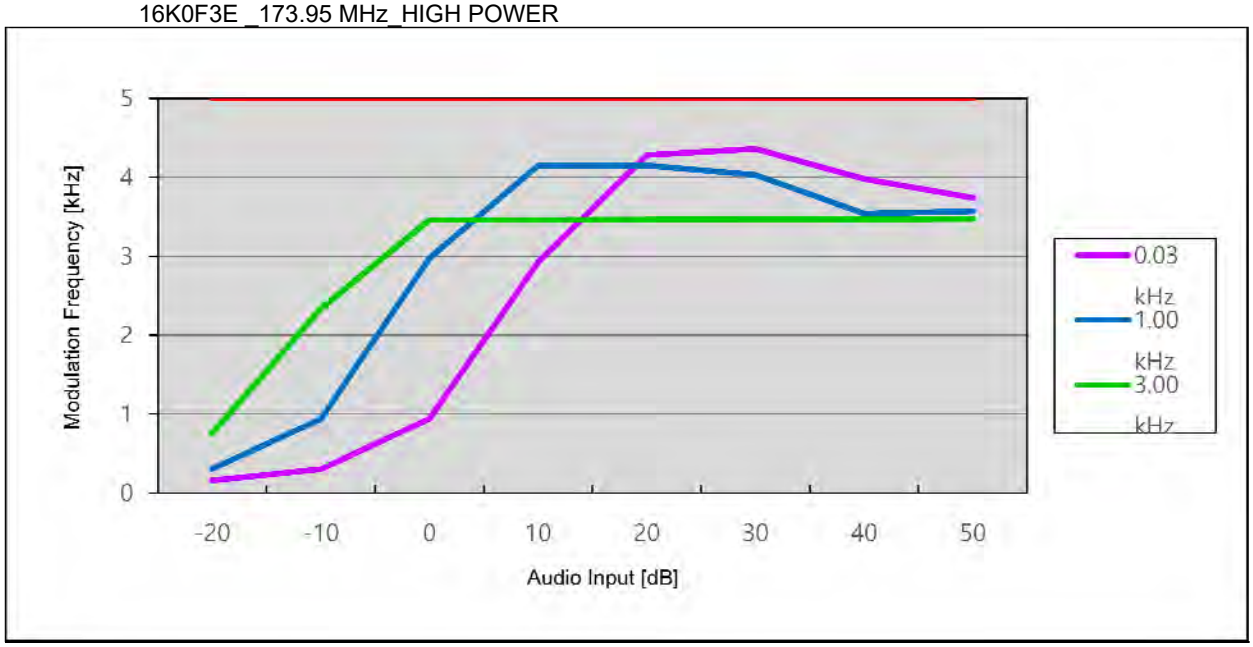
16K0F3E _138.05 MHz_HIGH POWER



16K0F3E _162.05 MHz_HIGH POWER

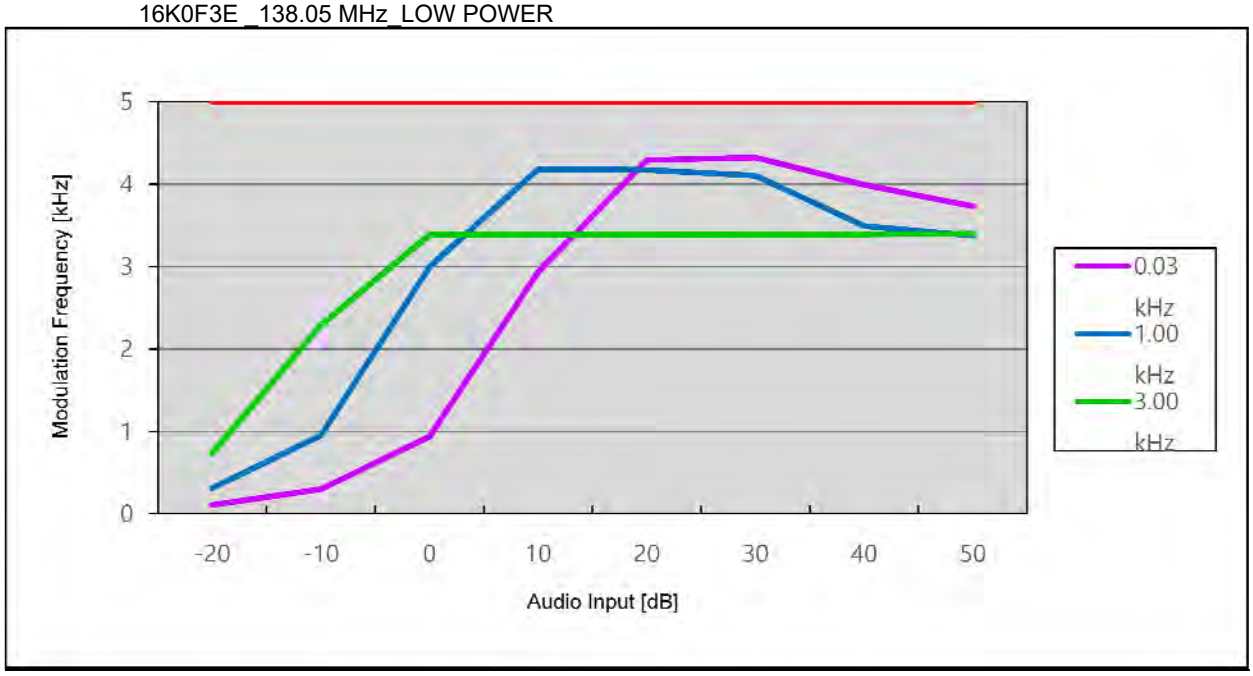


16K0F3E _173.95 MHz_HIGH POWER

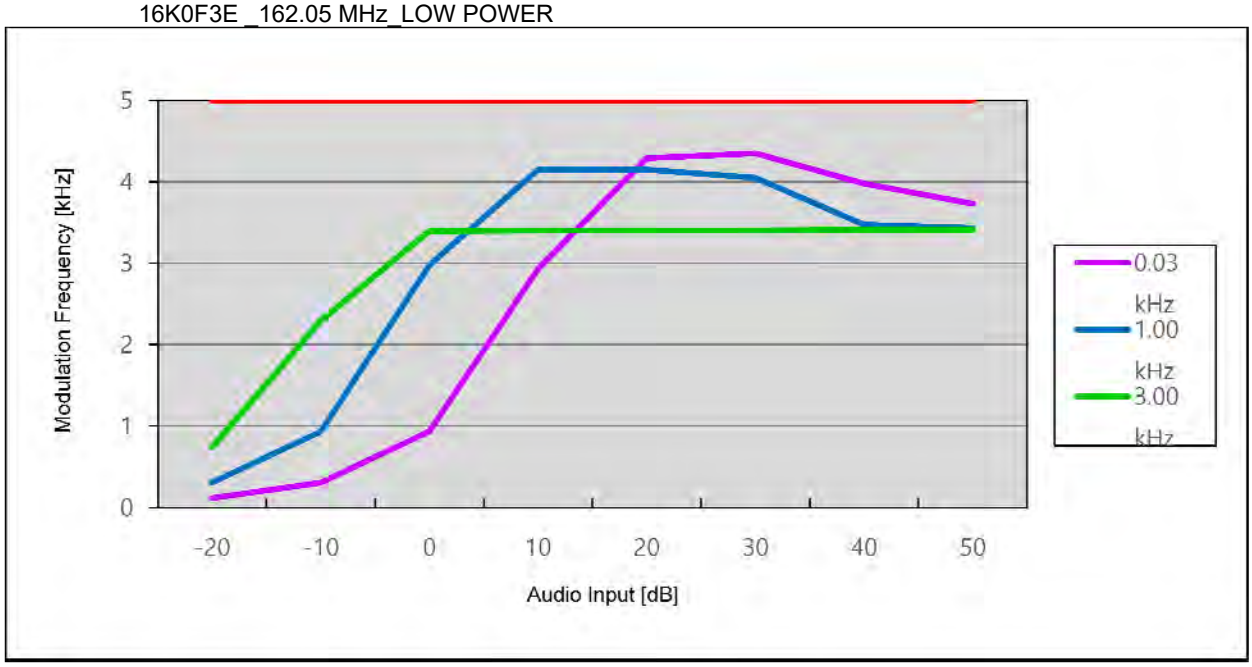


16K0F3E _150.05 MHz_LOW POWER

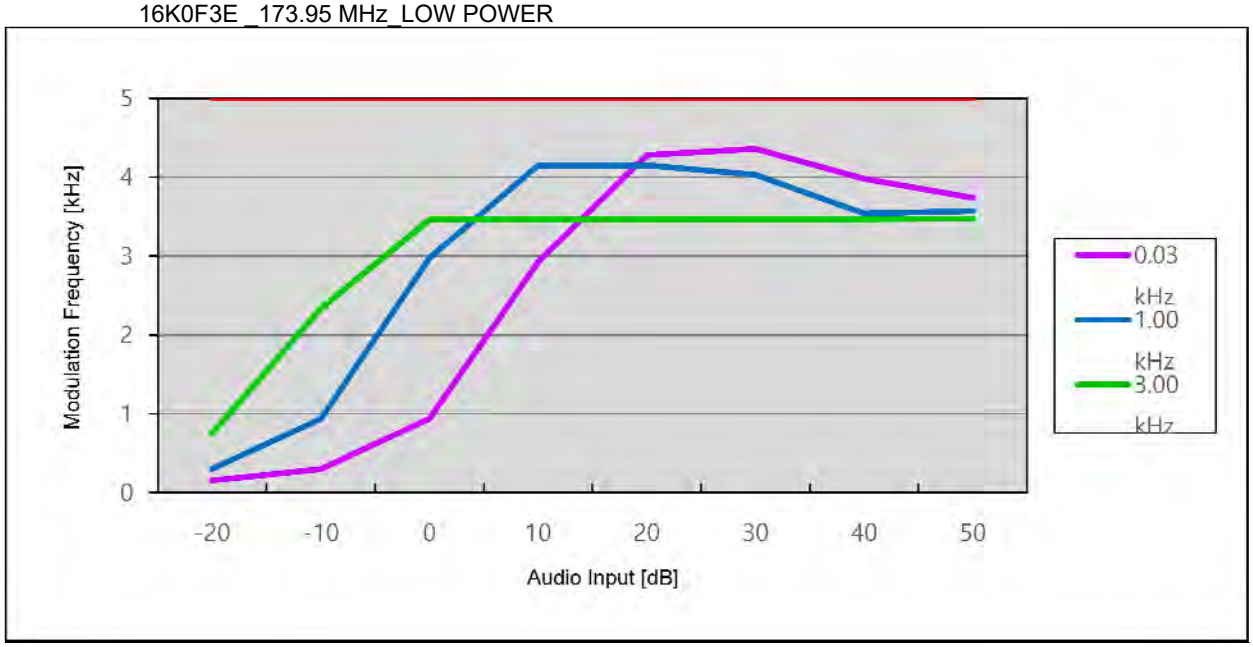
16K0F3E _138.05 MHz_LOW POWER



16K0F3E _162.05 MHz_LOW POWER

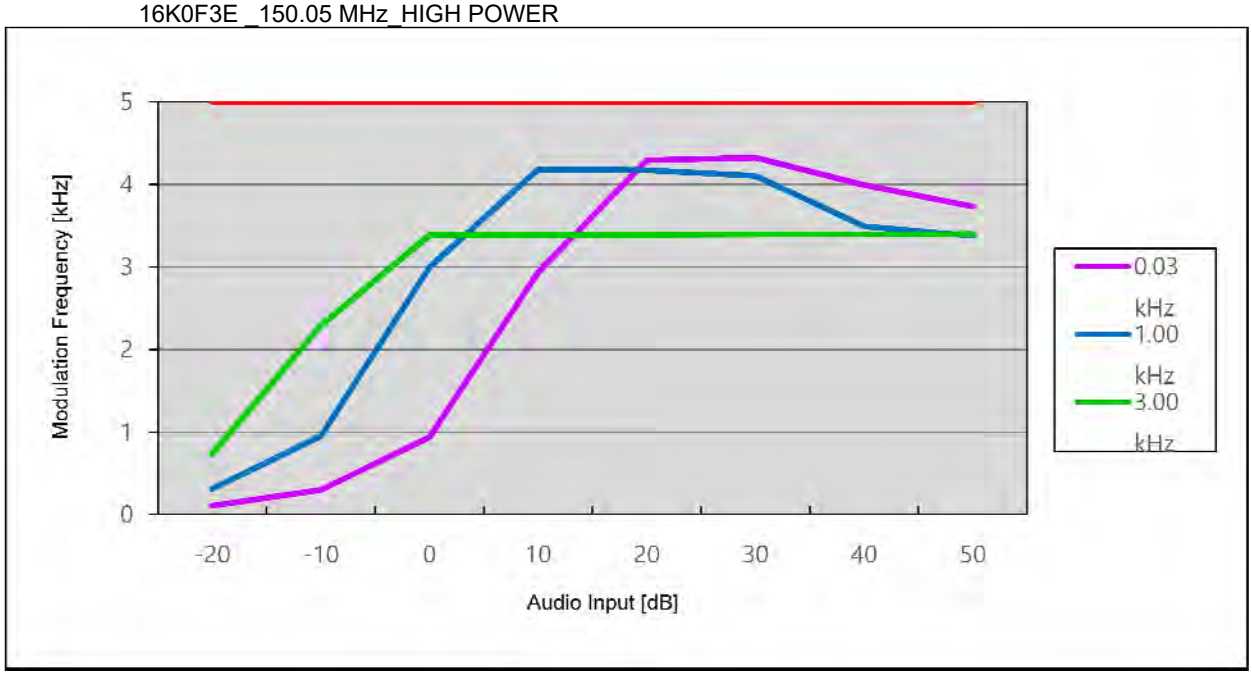


16K0F3E _173.95 MHz_LOW POWER

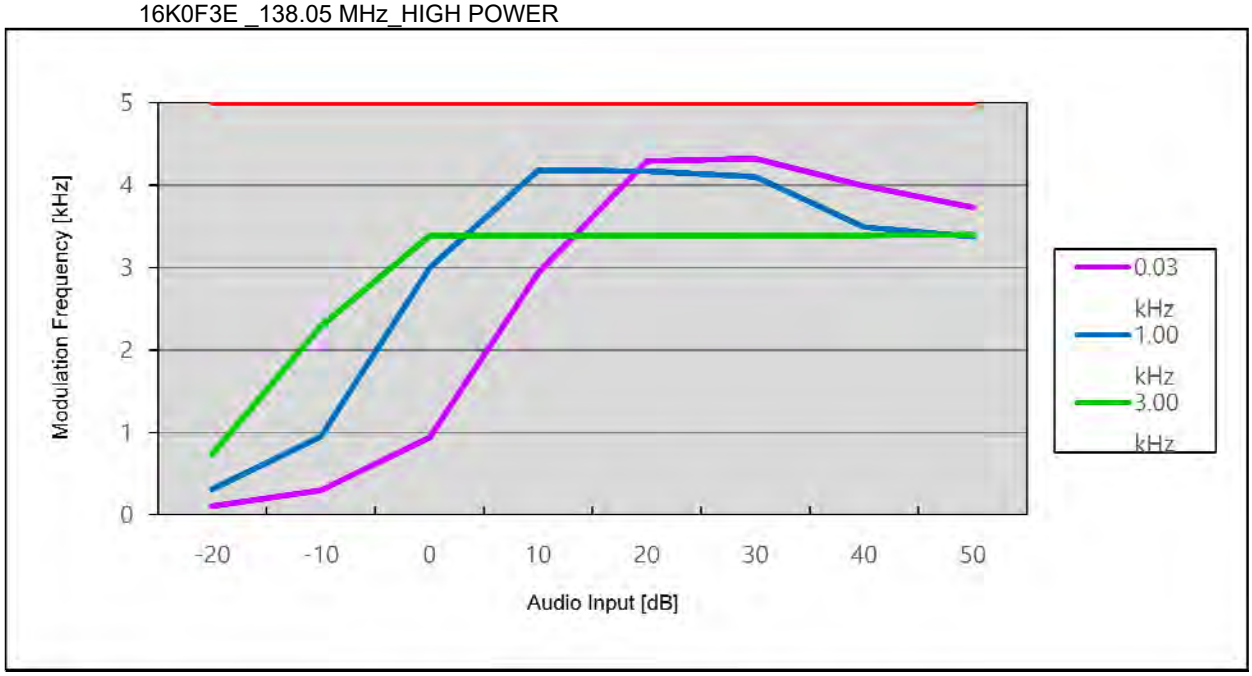


Negative Peaks

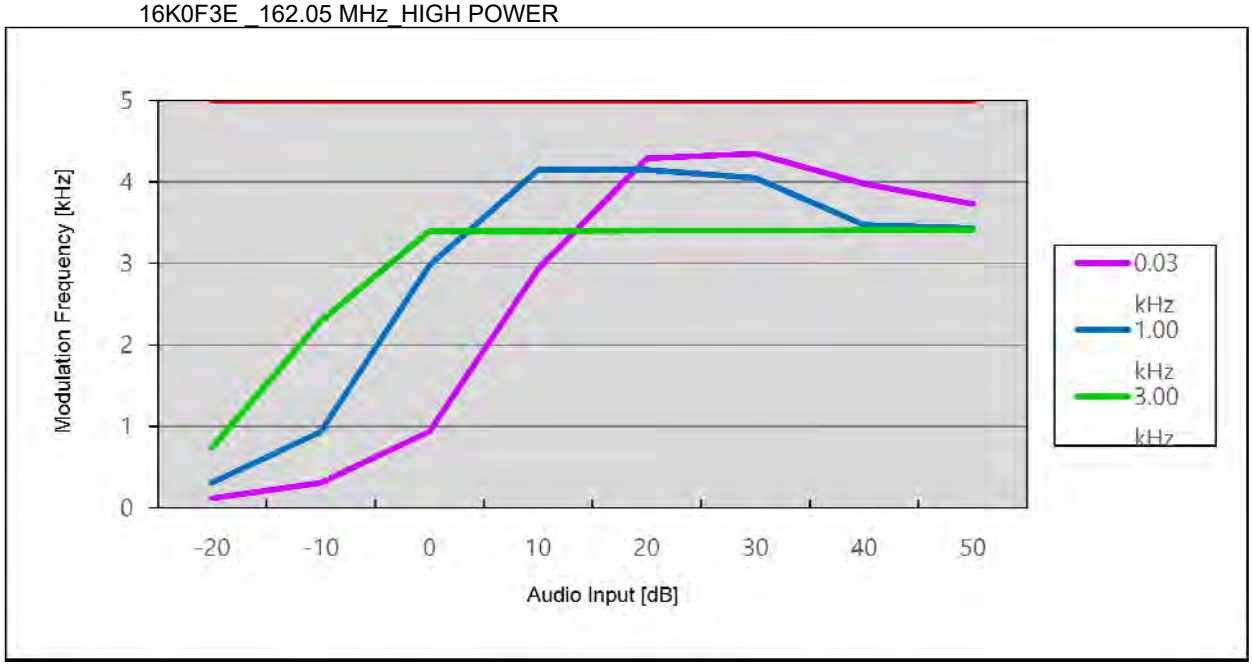
16K0F3E _150.05 MHz_HIGH POWER



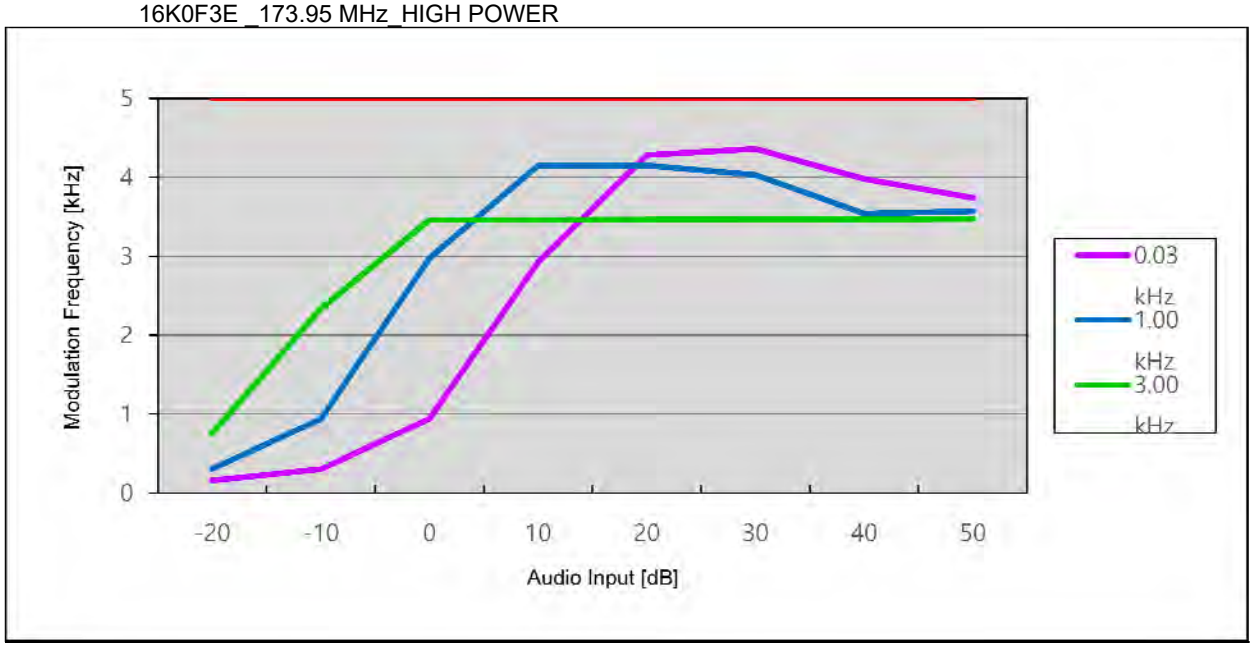
16K0F3E _138.05 MHz_HIGH POWER



16K0F3E _162.05 MHz_HIGH POWER

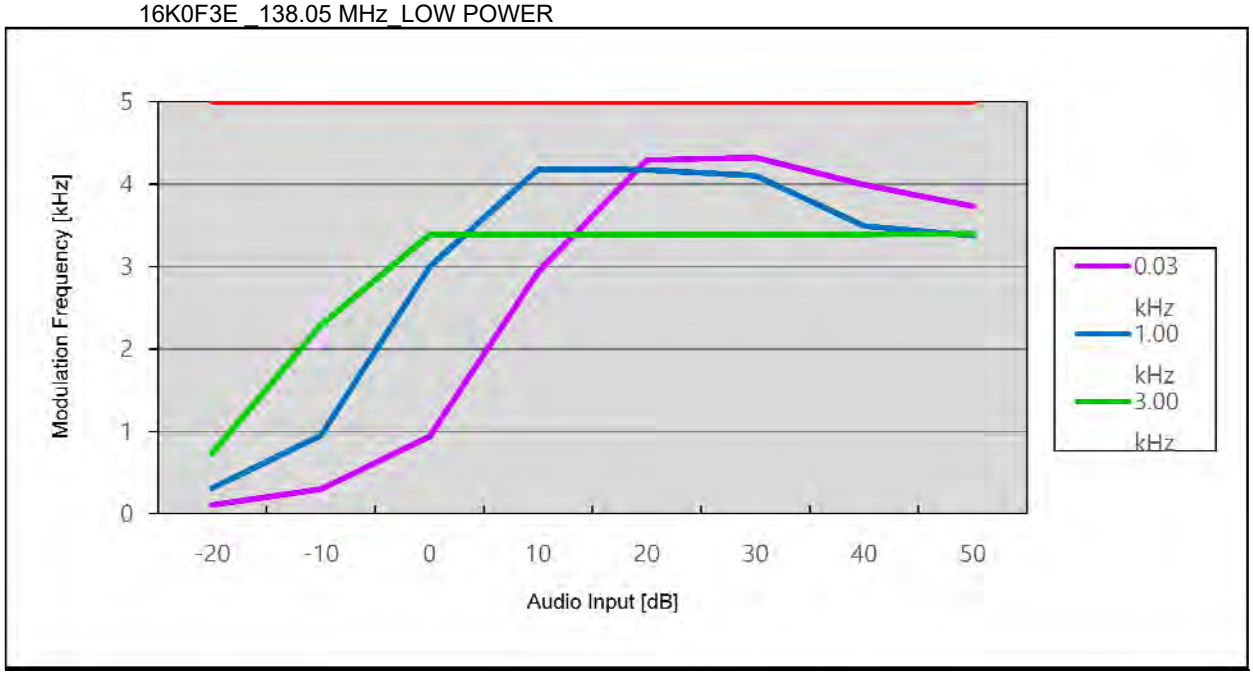


16K0F3E _173.95 MHz_HIGH POWER

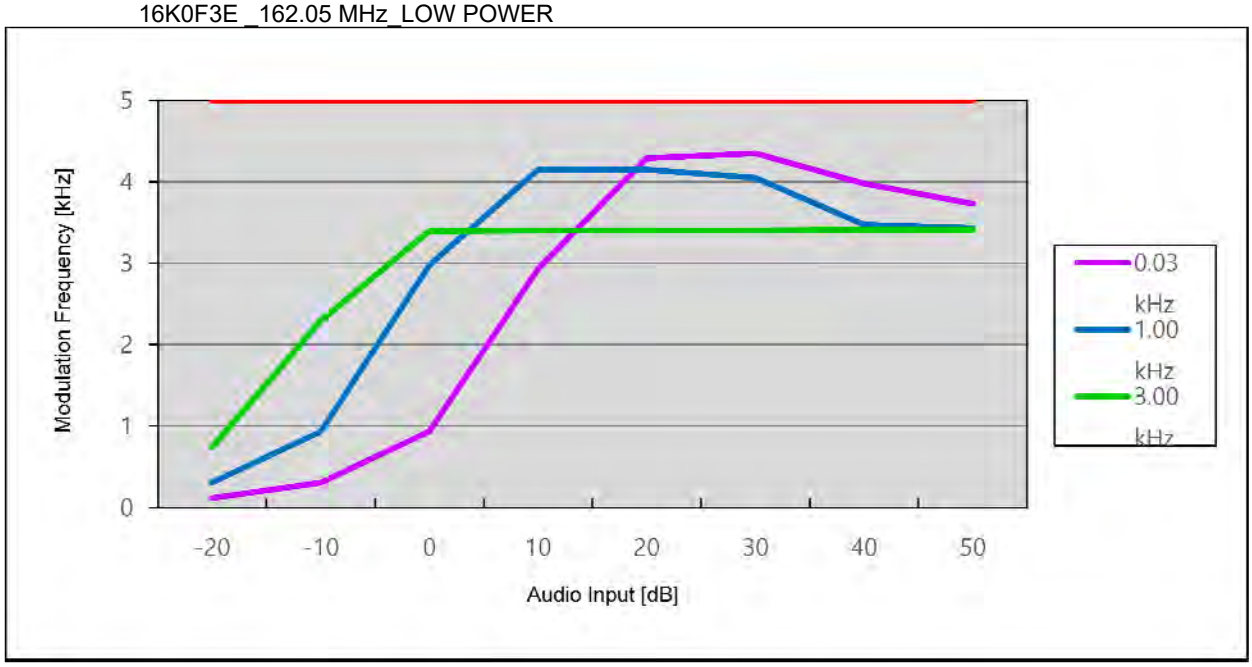


16K0F3E _150.05 MHz_LOW POWER

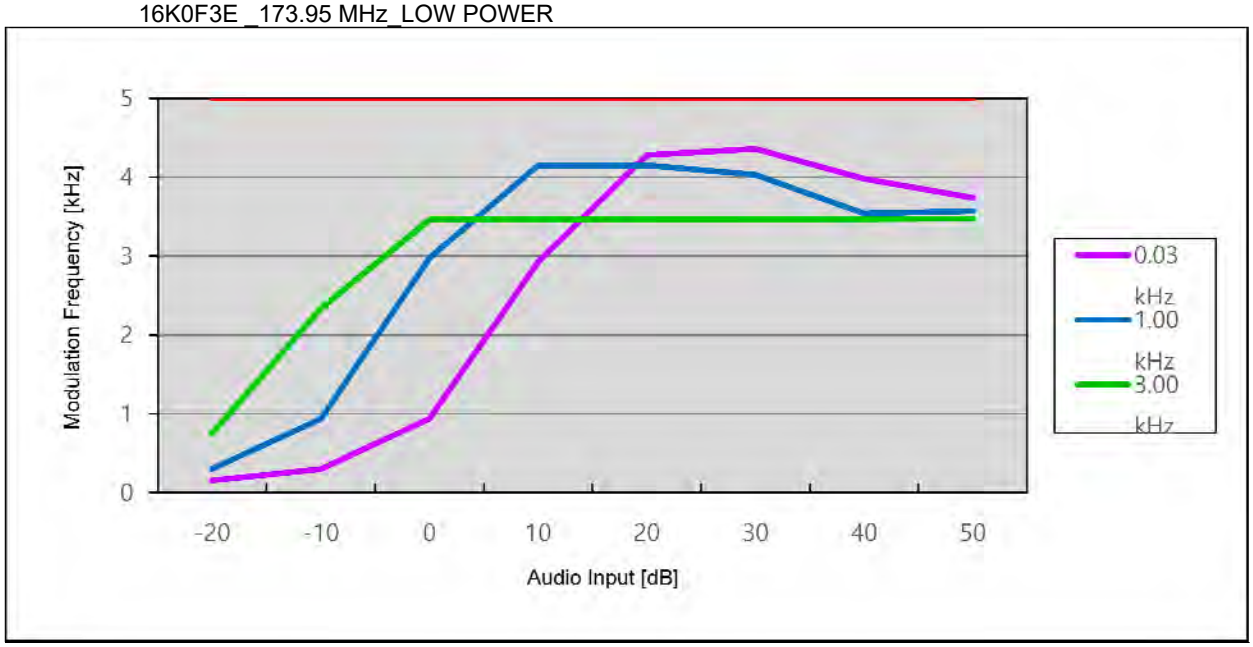
16K0F3E _138.05 MHz_LOW POWER



16K0F3E _162.05 MHz_LOW POWER



16K0F3E _173.95 MHz_LOW POWER

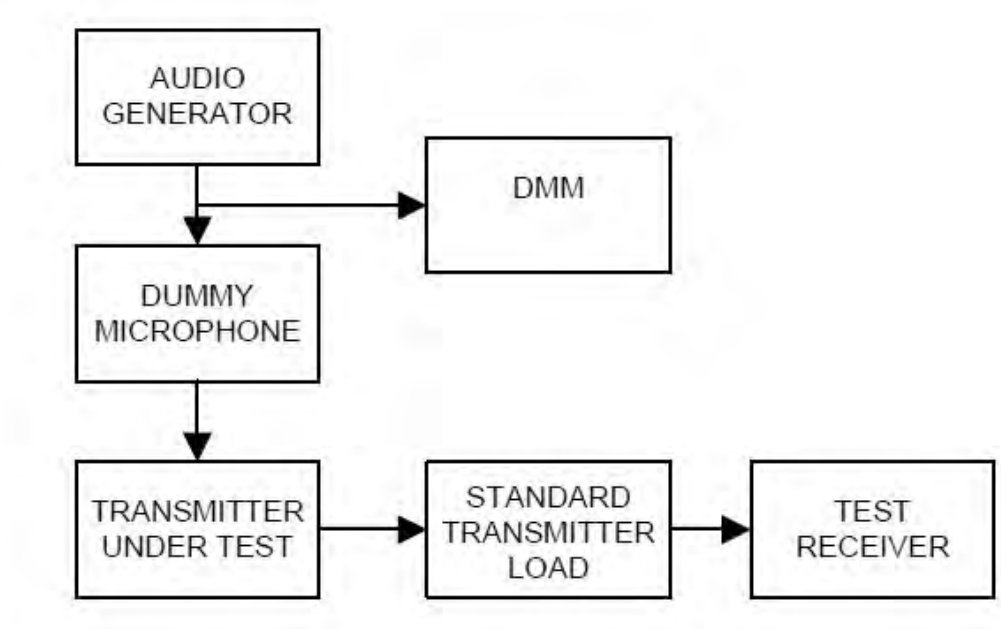


7.5 Audio Frequency Response / Audio Low Pass Filter Response

▣ 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.

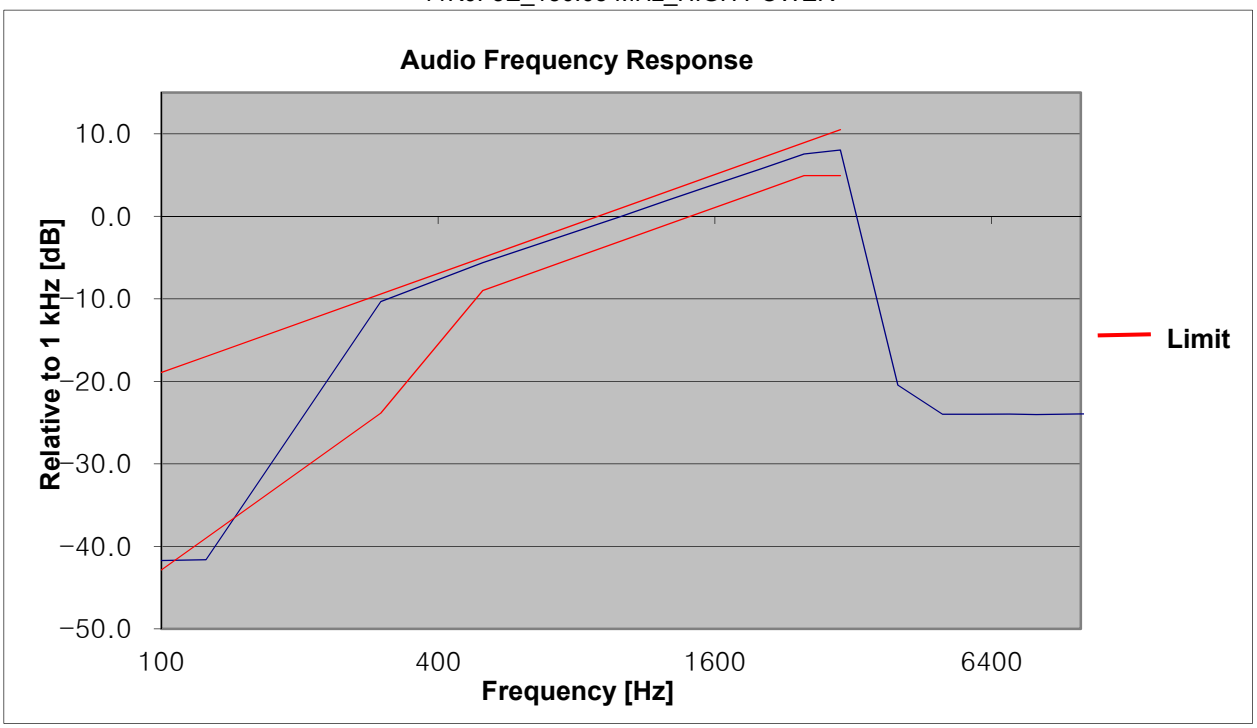
On the transmission condition above 3kHz, Transceiver shows Audio Low Pass Filter.

▣ TEST RESULTS

11K0F3E

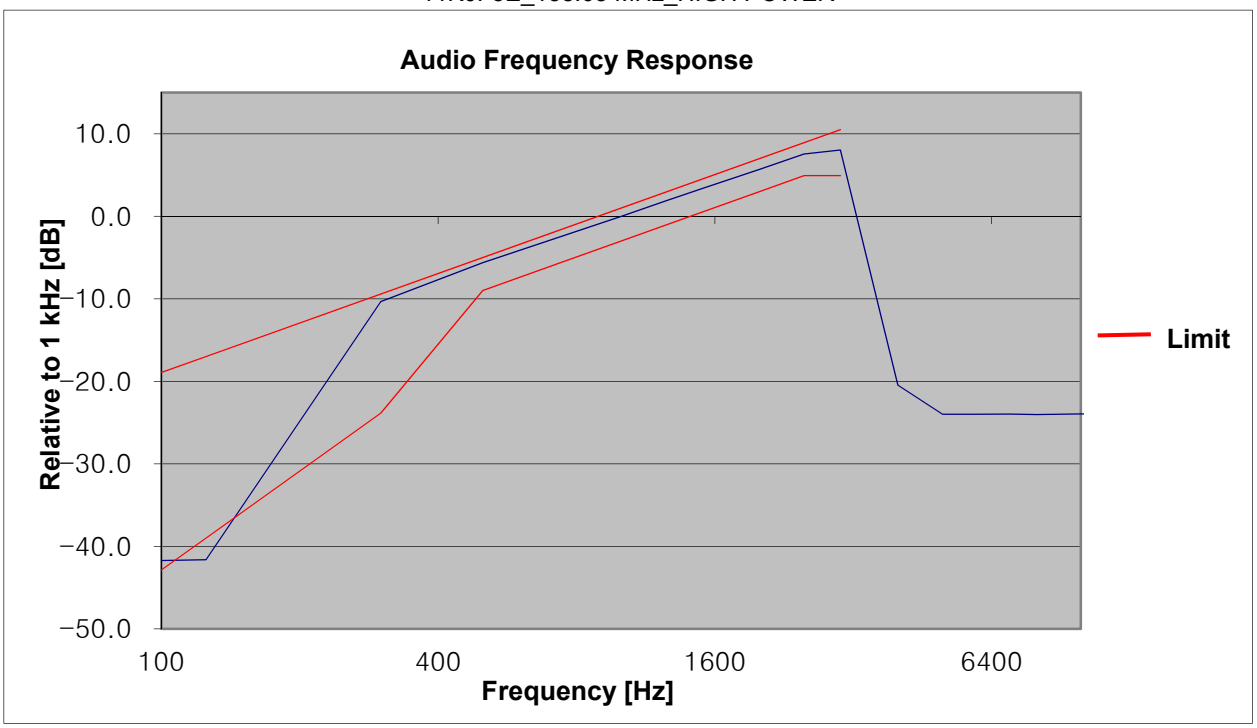
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-39.09	-18.93	-42.86
125	-39.09	-17.00	-39.00
300	-10.35	-9.42	-23.84
500	-5.6	-5.00	-9.00
750	-2.31	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.86	2.93	-1.07
1500	3.35	4.51	0.51
2000	5.59	7.00	3.00
2500	7.39	8.93	4.93
3000	7.81	10.51	4.93
4000	-28.36	-	-
5000	-28.36	-	-
6000	-28.36	-	-
7000	-28.18	-	-
8000	-28.5	-	-
9000	-28.29	-	-
10000	-28.11	-	-
20000	-28.36	-	-
30000	-28.36	-	-
40000	-28.36	-	-
50000	-28.5	-	-

11K0F3E_150.05 MHz_HIGH POWER



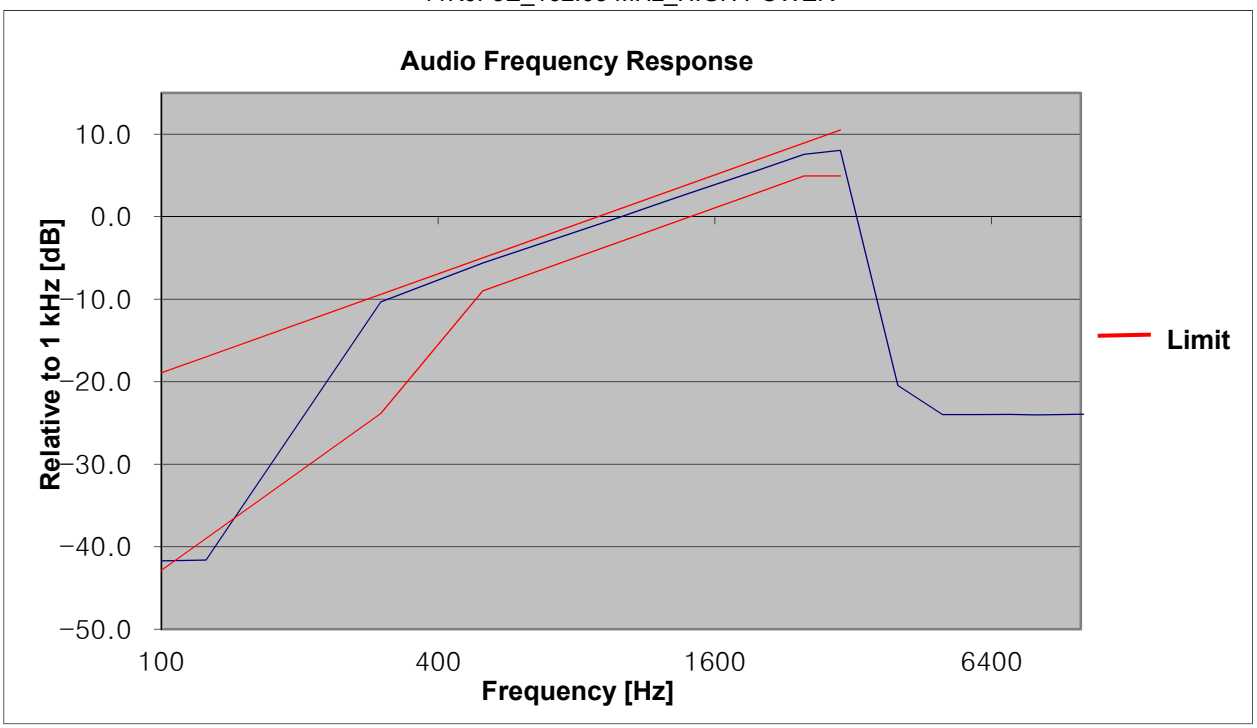
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-38.86	-18.93	-42.86
125	-38.42	-17.00	-39.00
300	-10.13	-9.42	-23.84
500	-5.58	-5.00	-9.00
750	-2.3	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.85	2.93	-1.07
1500	3.32	4.51	0.51
2000	5.59	7.00	3.00
2500	7.38	8.93	4.93
3000	7.79	10.51	4.93
4000	-28.09	-	-
5000	-28.09	-	-
6000	-27.89	-	-
7000	-27.96	-	-
8000	-28.02	-	-
9000	-27.89	-	-
10000	-28.09	-	-
20000	-28.16	-	-
30000	-28.09	-	-
40000	-28.09	-	-
50000	-28.16	-	-

11K0F3E_138.05 MHz_HIGH POWER



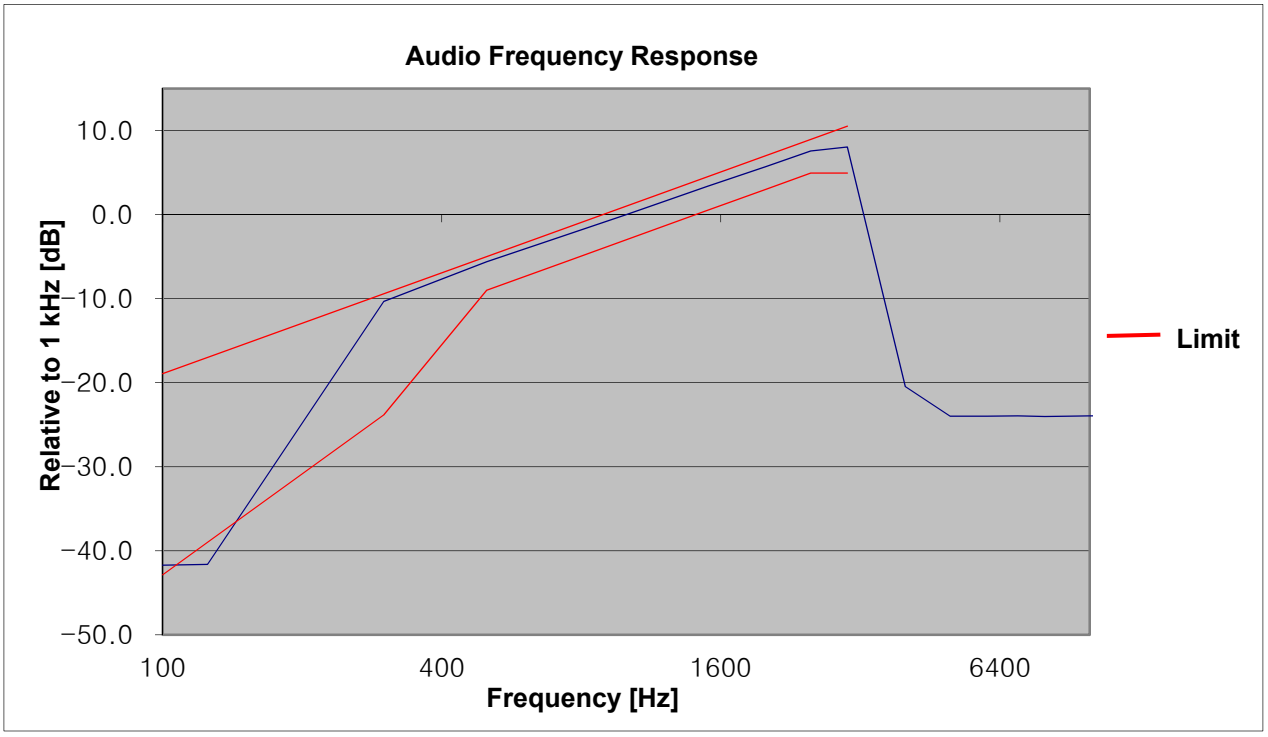
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-37.4	-18.93	-42.86
125	-37.2	-17.00	-39.00
300	-10.2	-9.42	-23.84
500	-5.59	-5.00	-9.00
750	-2.31	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.33	4.51	0.51
2000	5.61	7.00	3.00
2500	7.43	8.93	4.93
3000	7.86	10.51	4.93
4000	-23.33	-	-
5000	-23.37	-	-
6000	-23.37	-	-
7000	-23.44	-	-
8000	-23.44	-	-
9000	-23.4	-	-
10000	-23.25	-	-
20000	-23.33	-	-
30000	-23.33	-	-
40000	-23.44	-	-
50000	-23.25	-	-

11K0F3E_162.05 MHz_HIGH POWER



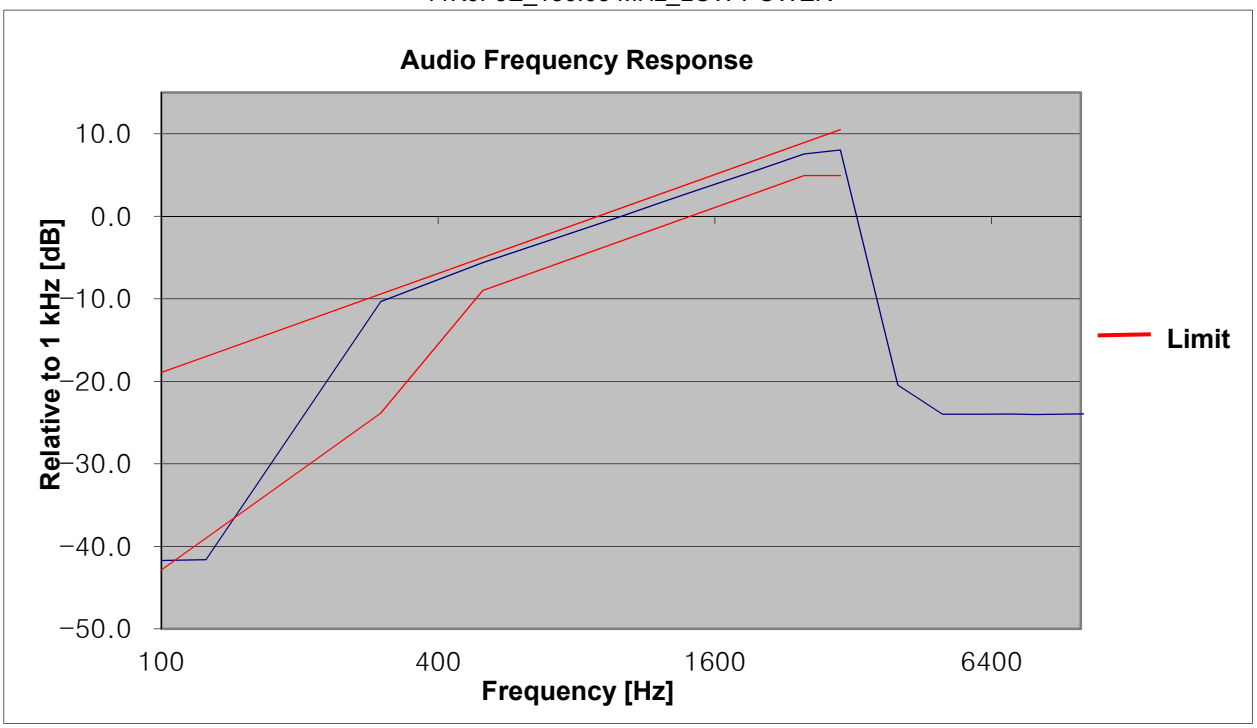
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-37.4	-18.93	-42.86
125	-37.2	-17.00	-39.00
300	-10.2	-9.42	-23.84
500	-5.58	-5.00	-9.00
750	-2.31	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.86	2.93	-1.07
1500	3.39	4.51	0.51
2000	5.7	7.00	3.00
2500	7.57	8.93	4.93
3000	8.04	10.51	4.93
4000	-23.87	-	-
5000	-24.1	-	-
6000	-23.91	-	-
7000	-24.14	-	-
8000	-24.03	-	-
9000	-24.07	-	-
10000	-23.91	-	-
20000	-24.07	-	-
30000	-24.03	-	-
40000	-24.03	-	-
50000	-23.99	-	-

11K0F3E_173.95 MHz_HIGH POWER



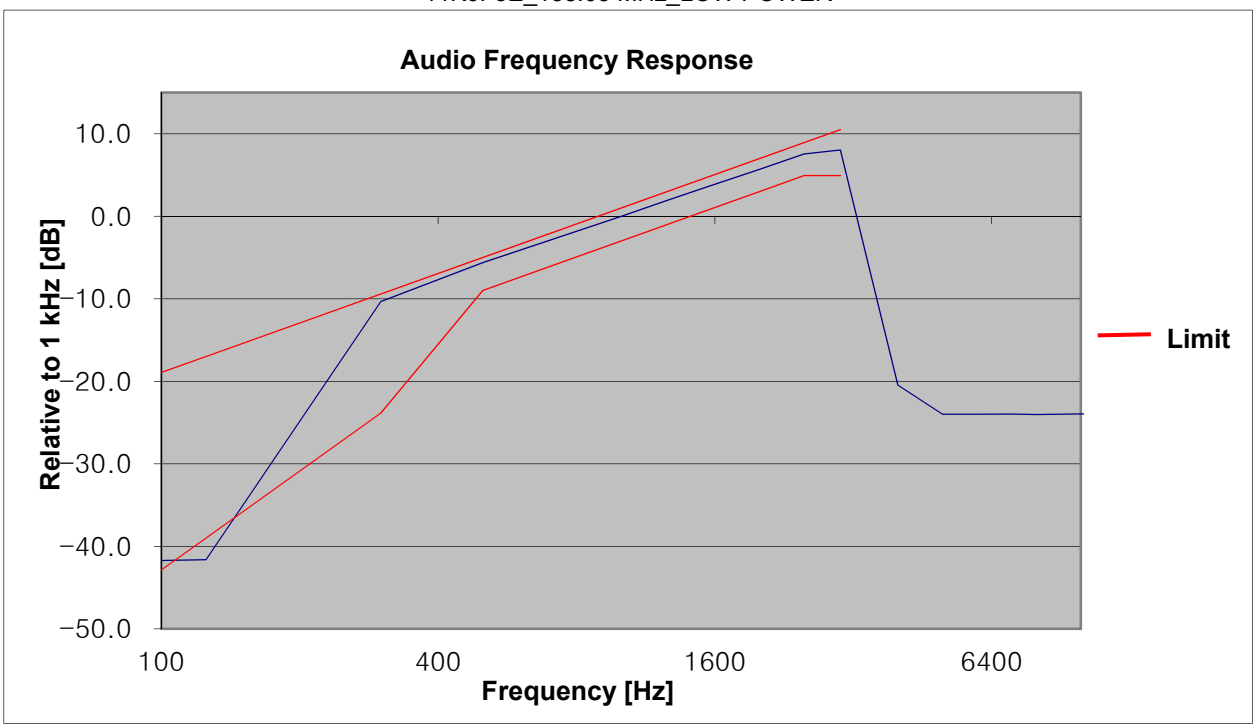
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-39.09	-18.93	-42.86
125	-38.86	-17.00	-39.00
300	-10.34	-9.42	-23.84
500	-5.59	-5.00	-9.00
750	-2.3	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.84	2.93	-1.07
1500	3.33	4.51	0.51
2000	5.59	7.00	3.00
2500	7.38	8.93	4.93
3000	7.8	10.51	4.93
4000	-28.29	-	-
5000	-28.25	-	-
6000	-28.29	-	-
7000	-28.36	-	-
8000	-28.36	-	-
9000	-28.36	-	-
10000	-28.43	-	-
20000	-28.29	-	-
30000	-28.36	-	-
40000	-28.29	-	-
50000	-28.36	-	-

11K0F3E_150.05 MHz_LOW POWER



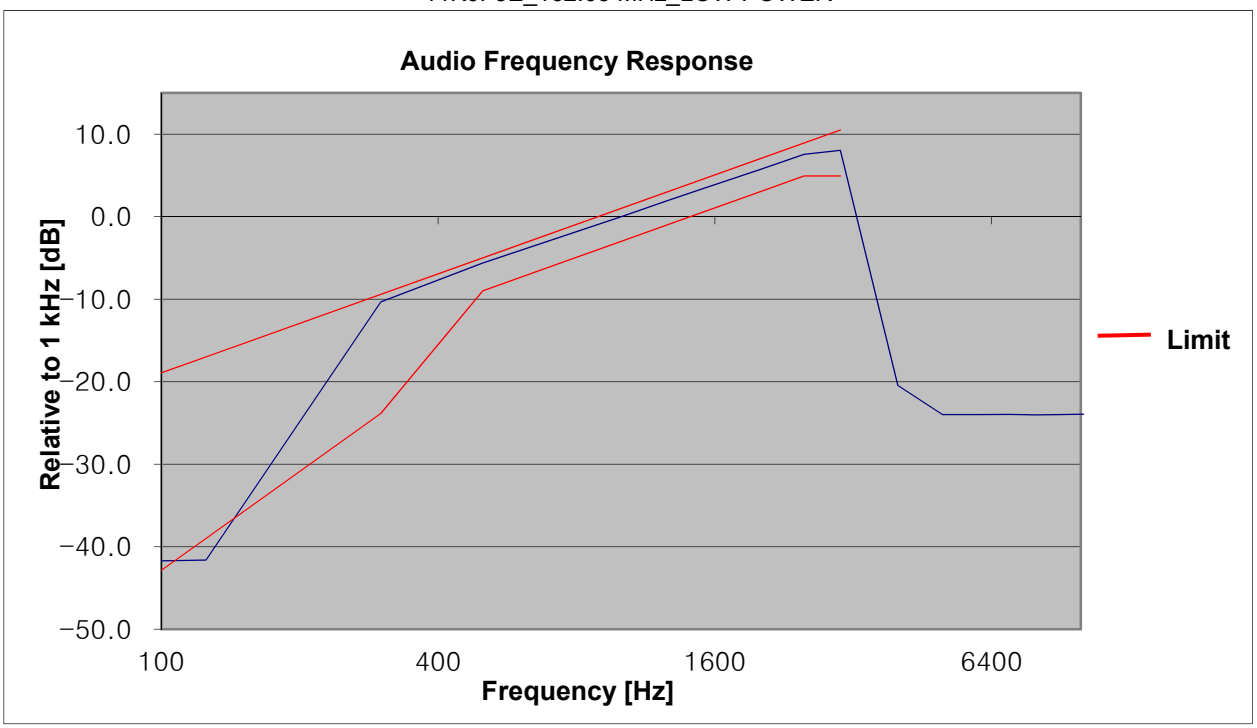
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-38.86	-18.93	-42.86
125	-38.64	-17.00	-39.00
300	-10.09	-9.42	-23.84
500	-5.58	-5.00	-9.00
750	-2.3	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.32	4.51	0.51
2000	5.58	7.00	3.00
2500	7.37	8.93	4.93
3000	7.78	10.51	4.93
4000	-28.09	-	-
5000	-27.96	-	-
6000	-28.09	-	-
7000	-28.09	-	-
8000	-28.02	-	-
9000	-28.02	-	-
10000	-28.16	-	-
20000	-28.09	-	-
30000	-28.09	-	-
40000	-28.02	-	-
50000	-28.09	-	-

11K0F3E_138.05 MHz_LOW POWER



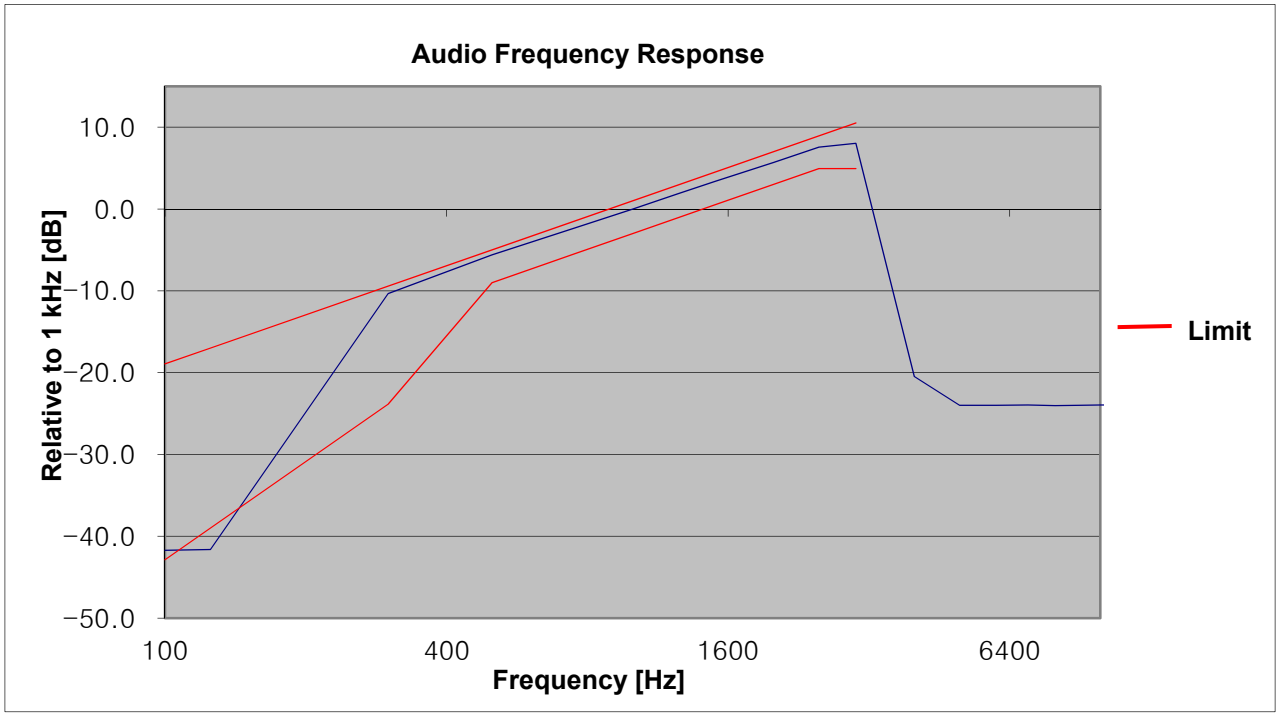
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-37.08	-18.93	-42.86
125	-37.2	-17.00	-39.00
300	-10.13	-9.42	-23.84
500	-5.58	-5.00	-9.00
750	-2.31	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.33	4.51	0.51
2000	5.6	7.00	3.00
2500	7.43	8.93	4.93
3000	7.85	10.51	4.93
4000	-23.37	-	-
5000	-23.19	-	-
6000	-23.37	-	-
7000	-23.29	-	-
8000	-23.33	-	-
9000	-23.44	-	-
10000	-23.37	-	-
20000	-23.37	-	-
30000	-23.44	-	-
40000	-23.33	-	-
50000	-23.29	-	-

11K0F3E_162.05 MHz_LOW POWER



Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-37.4	-18.93	-42.86
125	-37.2	-17.00	-39.00
300	-10.29	-9.42	-23.84
500	-5.58	-5.00	-9.00
750	-2.31	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.86	2.93	-1.07
1500	3.37	4.51	0.51
2000	5.7	7.00	3.00
2500	7.57	8.93	4.93
3000	8.05	10.51	4.93
4000	-24.14	-	-
5000	-23.82	-	-
6000	-24.03	-	-
7000	-23.95	-	-
8000	-23.95	-	-
9000	-24.03	-	-
10000	-23.95	-	-
20000	-24.07	-	-
30000	-23.99	-	-
40000	-23.95	-	-
50000	-23.99	-	-

11K0F3E_173.95 MHz_LOW POWER

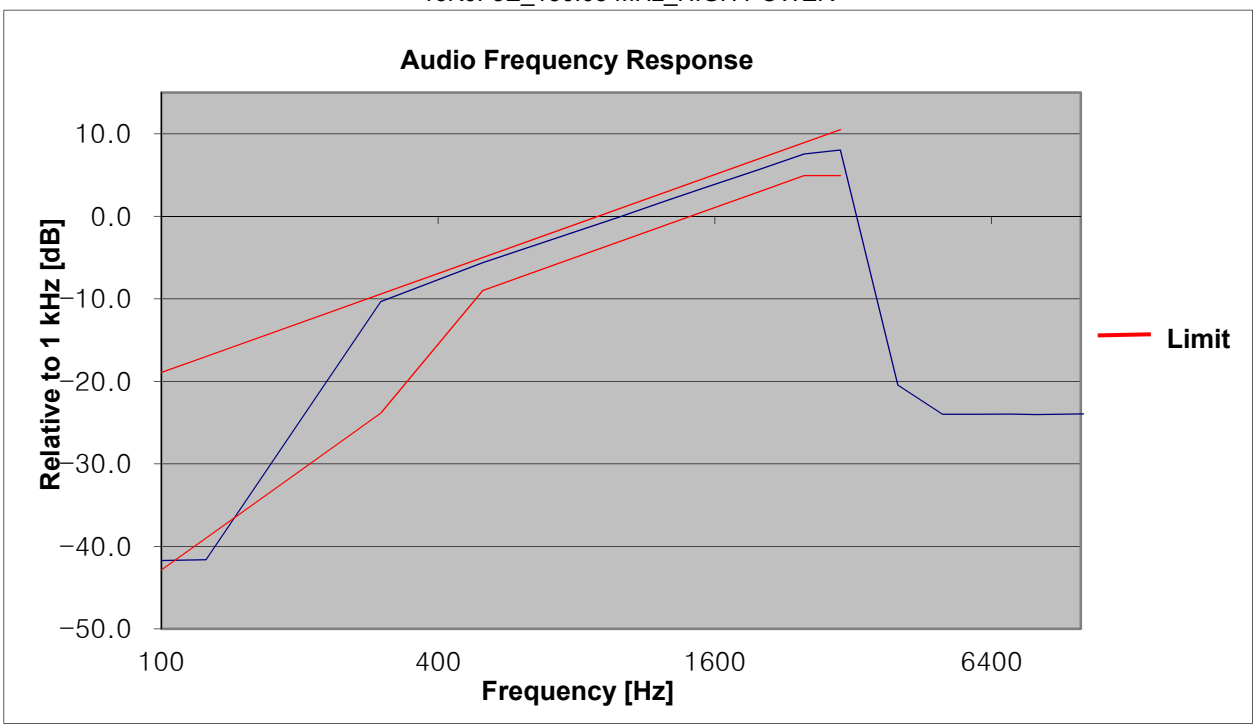


▣ TEST RESULTS

16K0F3E

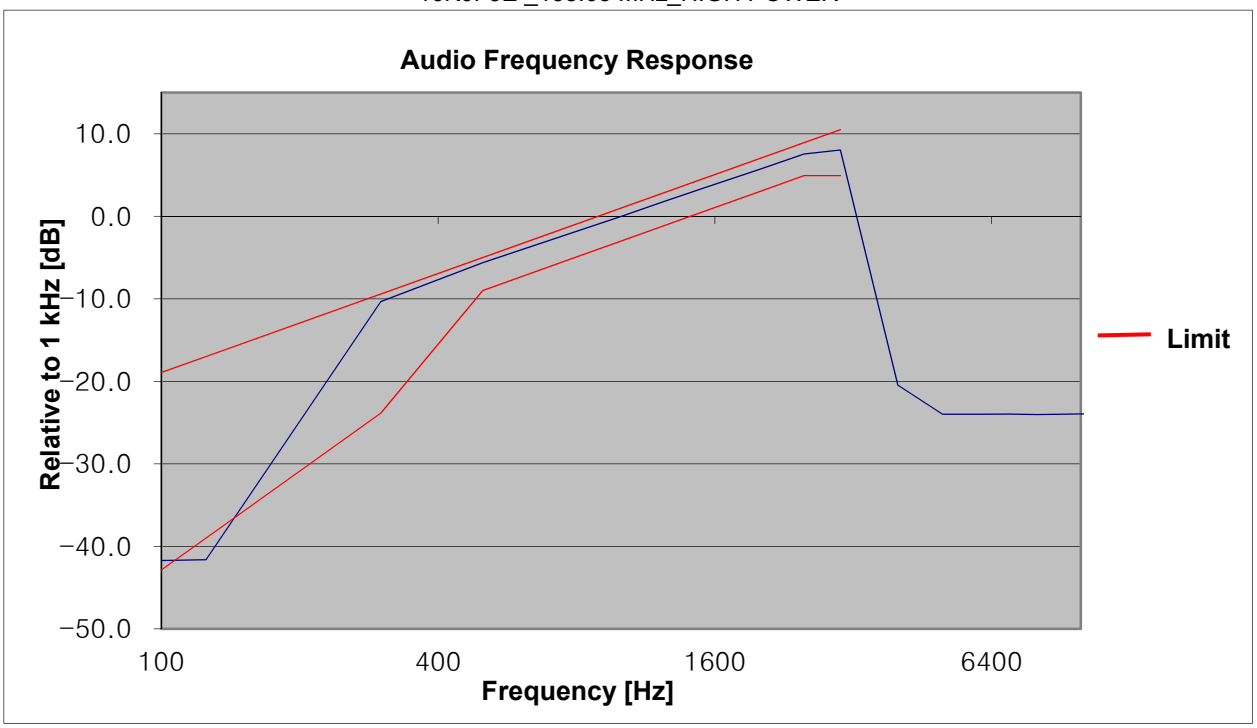
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-42.5	-18.93	-42.86
125	-42.5	-17.00	-39.00
300	-10.43	-9.42	-23.84
500	-5.65	-5.00	-9.00
750	-2.33	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.84	2.93	-1.07
1500	3.34	4.51	0.51
2000	5.59	7.00	3.00
2500	7.38	8.93	4.93
3000	7.81	10.51	4.93
4000	-34.2	-	-
5000	-33.89	-	-
6000	-34.07	-	-
7000	-34.11	-	-
8000	-34.24	-	-
9000	-34.11	-	-
10000	-34.11	-	-
20000	-34.2	-	-
30000	-34.2	-	-
40000	-34.2	-	-
50000	-34.07	-	-

16K0F3E_150.05 MHz_HIGH POWER



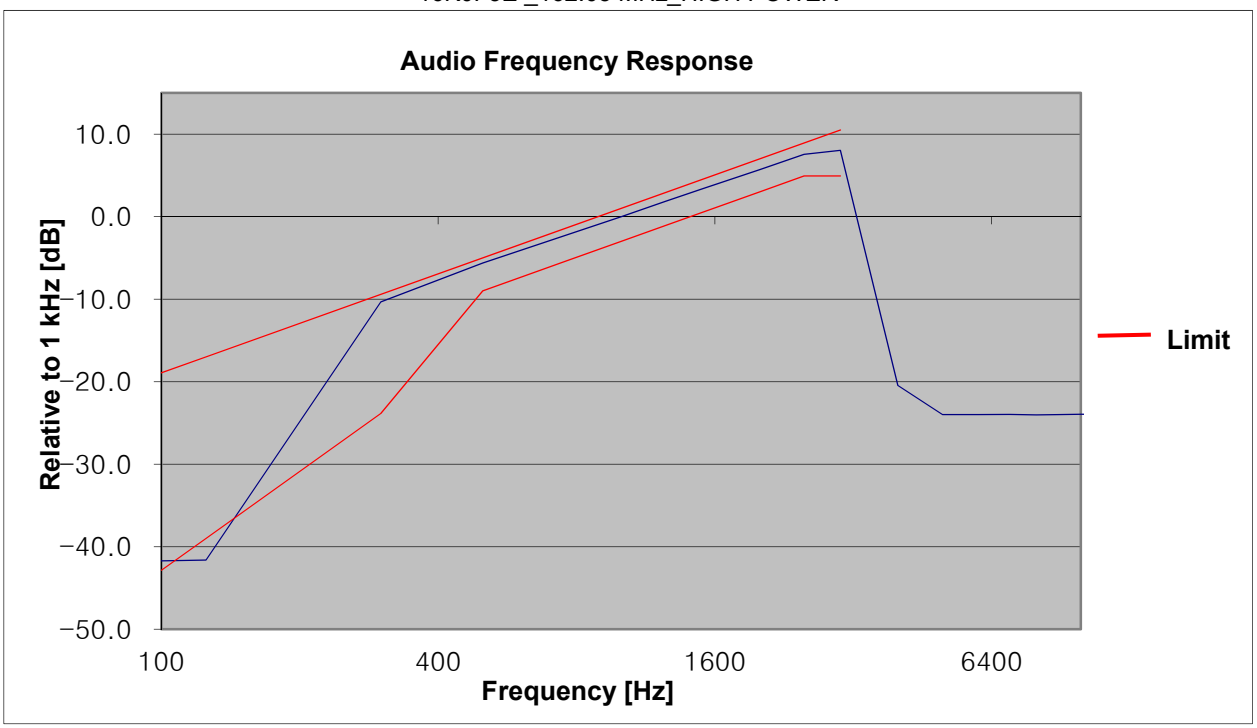
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-42.5	-18.93	-42.86
125	-42.73	-17.00	-39.00
300	-10.24	-9.42	-23.84
500	-5.61	-5.00	-9.00
750	-2.32	-1.49	-5.49
1000	0.01	1.00	-3.00
1250	1.84	2.93	-1.07
1500	3.34	4.51	0.51
2000	5.59	7.00	3.00
2500	7.38	8.93	4.93
3000	7.81	10.51	4.93
4000	-33.81	-	-
5000	-33.51	-	-
6000	-33.27	-	-
7000	-33.81	-	-
8000	-33.89	-	-
9000	-33.89	-	-
10000	-33.81	-	-
20000	-33.81	-	-
30000	-33.89	-	-
40000	-33.81	-	-
50000	-33.81	-	-

16K0F3E _138.05 MHz_HIGH POWER



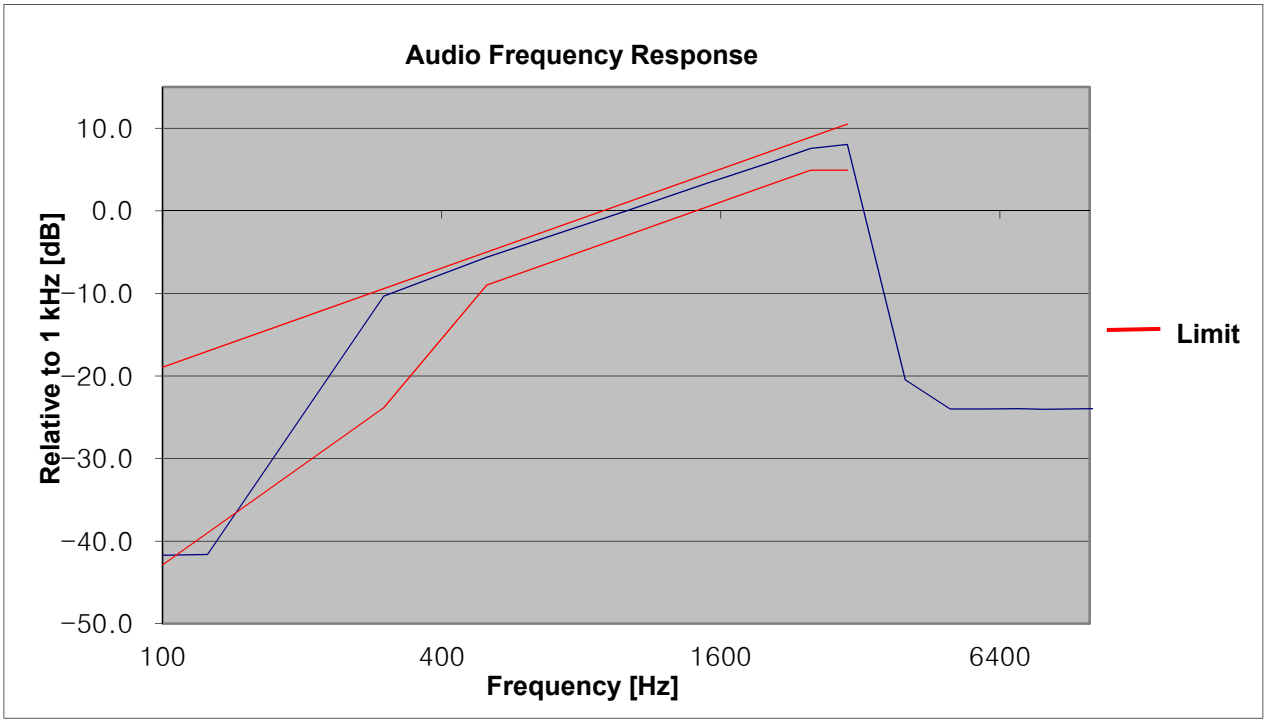
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-41.51	-18.93	-42.86
125	-41.62	-17.00	-39.00
300	-10.37	-9.42	-23.84
500	-5.6	-5.00	-9.00
750	-2.32	-1.49	-5.49
1000	-0.03	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.32	4.51	0.51
2000	5.6	7.00	3.00
2500	7.42	8.93	4.93
3000	7.86	10.51	4.93
4000	-29.35	-	-
5000	-29.1	-	-
6000	-29.27	-	-
7000	-29.35	-	-
8000	-29	-	-
9000	-29.32	-	-
10000	-29.37	-	-
20000	-29.37	-	-
30000	-29.32	-	-
40000	-29.37	-	-
50000	-29.19	-	-

16K0F3E _162.05 MHz_HIGH POWER



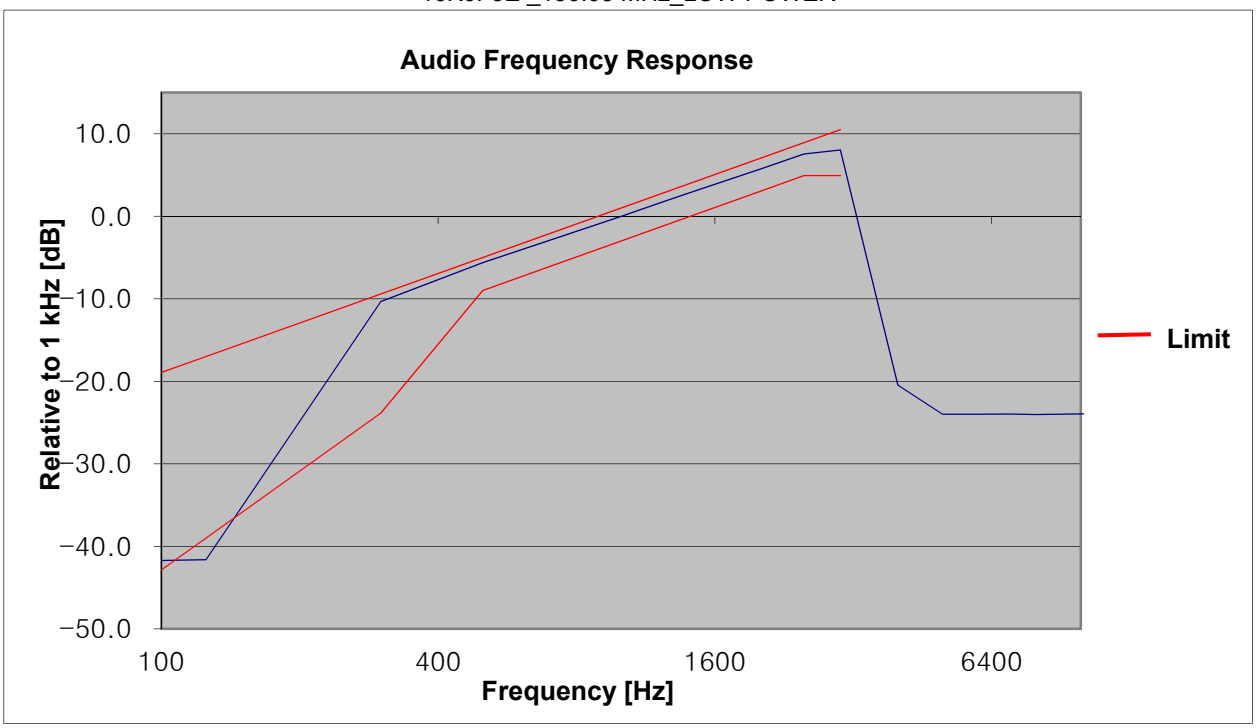
Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-41.41	-18.93	-42.86
125	-38.71	-17.00	-39.00
300	-10.23	-9.42	-23.84
500	-5.61	-5.00	-9.00
750	-2.33	-1.49	-5.49
1000	-0.01	1.00	-3.00
1250	1.86	2.93	-1.07
1500	3.37	4.51	0.51
2000	5.7	7.00	3.00
2500	7.56	8.93	4.93
3000	8.05	10.51	4.93
4000	-29.95	-	-
5000	-29.76	-	-
6000	-29.87	-	-
7000	-29.98	-	-
8000	-30.12	-	-
9000	-29.87	-	-
10000	-30.04	-	-
20000	-29.95	-	-
30000	-29.98	-	-
40000	-29.95	-	-
50000	-29.98	-	-

16K0F3E _173.95 MHz_HIGH POWER



Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-41.72	-18.93	-42.86
125	-41.51	-17.00	-39.00
300	-10.36	-9.42	-23.84
500	-5.63	-5.00	-9.00
750	-2.33	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.33	4.51	0.51
2000	5.59	7.00	3.00
2500	7.38	8.93	4.93
3000	7.79	10.51	4.93
4000	-33.39	-	-
5000	-33.23	-	-
6000	-33.27	-	-
7000	-33.39	-	-
8000	-33.27	-	-
9000	-33.27	-	-
10000	-33.43	-	-
20000	-33.43	-	-
30000	-33.39	-	-
40000	-33.43	-	-
50000	-33.39	-	-

16K0F3E _150.05 MHz_LOW POWER



Frequency (Hz)	Attenuation Rel. to 1kHz (dB)	Upper limit (dB)	Lower limit (dB)
100	-42.62	-18.93	-42.86
125	-42.5	-17.00	-39.00
300	-10.32	-9.42	-23.84
500	-5.61	-5.00	-9.00
750	-2.33	-1.49	-5.49
1000	0	1.00	-3.00
1250	1.83	2.93	-1.07
1500	3.32	4.51	0.51
2000	5.57	7.00	3.00
2500	7.37	8.93	4.93
3000	7.78	10.51	4.93
4000	-33.89	-	-
5000	-33.64	-	-
6000	-33.89	-	-
7000	-33.89	-	-
8000	-33.89	-	-
9000	-34.02	-	-
10000	-33.89	-	-
20000	-33.94	-	-
30000	-33.89	-	-
40000	-33.81	-	-
50000	-33.81	-	-

16K0F3E _138.05 MHz_LOW POWER