RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

Harris Corporation
RF Communications Division
1680 University Avenue
Rochester, NY 14610

MODEL: XG-100M
Unity MultiBand Mobile Radio

FCC ID: AQZ-XG-100M00
IC: 122D-XG100M00

April 18, 2011

Standards Referenced for this Report	
Part 2: 2010	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 80: 2010	Stations in the Maritime Services
Part 90: 2010	Private Land Mobile Radio Services
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI/TIA/EIA–102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
ANSI/TIA/EIA–102.BAAA–1998	Project 25 FDMA Common Air Interface—New Technology Standards Project—Digital Radio Technical Standards
Industry Canada RSS-119 Issue 10	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41- 960 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2011028

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Emission Designator (Transmit Mode)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	1 - 52.5	0.5	11K0F3E (Analog Voice; NB)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	1 - 52.5	0.5	8K40F1D/E (4-level C4FM; P25)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	1 - 52.5	0.5	12K0G1D/E (H-CPM)
378 – 406.1, 512 - 520 (Federal) 406.1 – 512 (FCC) 406.1 – 430, 450 – 470 (IC)	1 - 52.5	0.5	11K0F3E (Analog Voice; NB)
378 – 406.1, 512 - 520 (Federal) 406.1 – 512 (FCC) 406.1 – 430, 450 – 470 (IC)	1 - 52.5	0.5	8K40F1D/E (4-level C4FM; P25)
378 – 406.1, 512 - 520 (Federal) 406.1 – 512 (FCC) 406.1 – 430, 450 – 470 (IC)	1 - 52.5	0.5	12K0G1D/E (H-CPM)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	11K0F3E (Analog Voice; NB)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	8K40F1D/E (4-level C4FM; P25)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	12K0G1D/E (H-CPM)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	11K0F3E (Analog Voice; NB)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	8K40F1D/E (4-level C4FM; P25)
769 – 775, 799 – 805 (FCC) 764 – 776, 794 – 806 (IC)	0.5 - 26.3	0.5	12K0G1D/E (H-CPM)
806 – 824	0.5 - 37.2	0.5	11K0F3E (Analog Voice; NB)
806 – 824	0.5 - 37.2	0.5	8K40F1D/E (4-level C4FM; P25)
806 – 824	0.5 - 37.2	0.5	12K0G1D/E (H-CPM)
806 – 809	0.5 - 37.2	0.5	14K0F3E (Analog Voice; NPSPAC)
821 – 824	0.5 - 37.2	0.5	14K0F3E (Analog Voice; NPSPAC)
851 – 869	0.5 - 37.2	0.5	11K0F3E (Analog Voice; NB)
851 – 869	0.5 - 37.2	0.5	8K40F1D/E (4-level C4FM; P25)
851 – 869	0.5 - 37.2	0.5	12K0G1D/E (H-CPM)

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1 Test Result Summary

Test	FCC Reference	Result
RF Power Output	2.1046(a), 90.541(b), 90.542(a)(6), 80.215	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210, 80.217	Complies
Field strength of spurious radiation	2.1053(a), 90.543(c)	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.543(d)	Complies
Adjacent Channel Power	90.543	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213, 90.539, 80.209	Complies
Modulation Characteristics	2.1047(a)(b), 80.213	Complies
Transient Frequency Response	90.214	Complies

2 General Information

The following Certification Report is prepared on behalf of Harris Corporation in accordance with the Federal Communications Commission rules and regulations and Industry Canada rules and regulations.
The Equipment Under Test (EUT) was the XG-100M Unity Multiband Radio; FCC ID: AQZ-XG-100M00, IC: 122D-XG100M00.

The radio is subject to FCC DoC. DoC testing was performed and the data is contained in a separate DoC report. There is a GPS in the Unity radio; it is not subject to receiver testing.

All measurements contained in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2, 80 and 90. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

N/A

2.3 Grant Notes

Power continuously adjustable down from rated power in steps of 1 W.

3 Tested System Details

The test sample was received on February 23, 2011. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

The device was programmed for multiple modes of operation and modulation types.

Table 3-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Radio	Harris Corporation	XG-100M	A40201000062	AQZ-XG-100M00	19993
Radio	Harris Corporation	XG-100M	A40201000061	AQZ-XG-100M00	19994
Control Head	Harris Corporation	12099-1200-01	A040203000077	N/A	20024
CH-721 Control Head	Harris	CU23218-0004	16014170	N/A	19998
CH-721 Control Head	Harris	CU23218-0003	95003243	N/A	19999
GPS Antenna	3M	VHB	N/A	N/A	20002
Full-Spectrum Multiband Antenna	Stico	N/A	12099-0310-01	N/A	19995
Full-Spectrum Multiband Antenna	Stico	N/A	12099-0310-01	N/A	19996
Microphone	Harris	MC-101616-041	N/A	N/A	19997
Speaker	Harris	LS102824010R1A	N/A	N/A	20005
Speaker	Harris	LS102824010R1A	N/A	N/A	20006

Table 3-2: Supplementary Test Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Laptop	Dell Corp	PP05L Latitude D600	N/A	N/A	20000
LMR Breakout Box	Harris	12099-999-01	N/A	N/A	20003
LMR Breakout Box	Harris	12099-999-01	N/A	N/A	20004
AC Adapter	Dell Corp	LA65N50-00	CN-ODF263-71615-891-14E3	N/A	20001

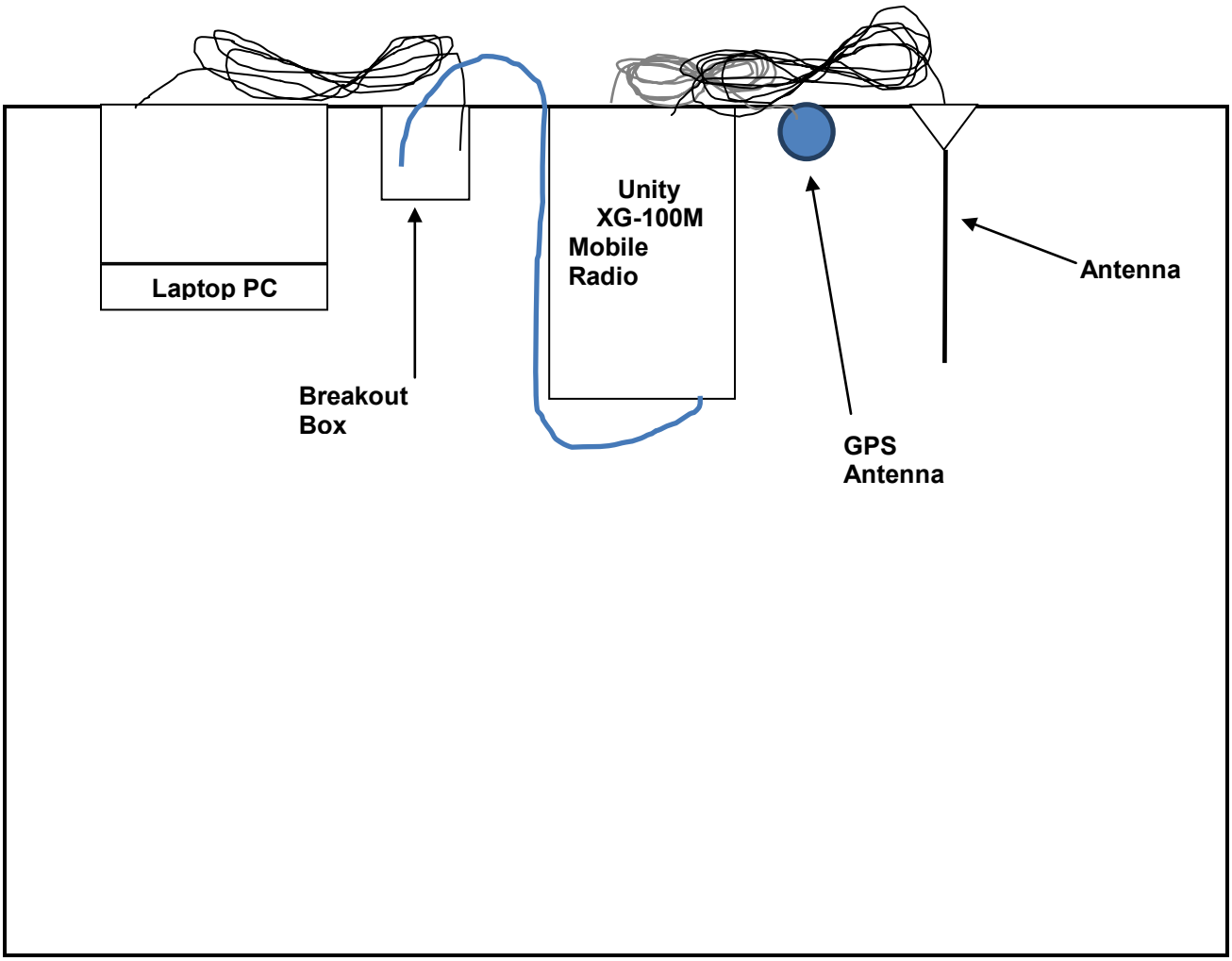


Figure 3-1: Configuration of Tested System

4 FCC Rules and Regulations Part 2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

13.6V / 8 A VHF/UHF/700/800 MHz

5 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.541(b)/90.542(a)(6): Transmitting Power Limits; Part 80.215: Transmitter Power; RSS-119 4.1 Transmitter Output Power

5.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

§80.215 Transmitter Power

(a) Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms:

(5) For all other emissions: the carrier power multiplied by 1.67.

(e) Ship stations frequencies above 27500 kHz, the maximum power must not exceed the values listed below:

(1) Ship stations 156–162 MHz: 25 W
(2) Marine utility stations and hand-held portable transmitters: 156–162 MHz: 10 W

Maximum Power Authorized to Use: 10.02 W for VHF, 8.35 W for UHF

Manufacturer's Rated Power: 52.5 W for VHF and UHF, 26.3 W for 700 Band, and 37.2 W for 800 Band

5.2 Test Data

Table 5-1: RF Conducted Output Power – Measured

Frequency (MHz)	Power (dBm)	Power (W)
136.0125 (Federal)	47.6	57.5
138.0125 (IC)	47.6	57.5
141.0000 (IC)	47.6	57.5
143.9875 (IC)	47.6	57.5
148.0125 (IC)	47.6	57.5
150.0125 (FCC)	47.6	57.5
154.0125 (FCC)	47.6	57.5
162.0000 (FCC/IC)	47.6	57.5
173.1875 (FCC)	47.6	57.5
173.9875 (FCC/IC)	47.6	57.5
378.0125 (Federal)	47.4	55.0
406.1125 (FCC/IC)	47.5	56.2
418.0000 (FCC/IC)	47.5	56.2
429.9875 (IC)	47.5	56.2
450.0125 (IC)	47.5	56.2
453.9875 (FCC/IC)	47.3	53.7
456.0125 (FCC)	47.4	55.0
469.9875 (FCC/IC)	47.3	53.7
511.9875 (FCC)	47.4	55.0
519.9875 (Federal)	47.0	50.1
764.0125 (IC)	44.7	29.5
769.0125 (FCC)	44.7	29.5
771.0000 (FCC/IC)	44.7	29.5
774.9875 (FCC)	44.7	29.5
775.9875 (IC)	44.7	29.5
794.0125 (IC)	44.7	29.5
799.0125 (FCC)	44.7	29.5
801.0000 (FCC/IC)	44.7	29.5
804.9875 (FCC)	44.7	29.5
805.9875 (IC)	45.8	38.0
806.0125 (FCC/IC)	45.8	38.0
815.0000 (FCC/IC)	45.8	38.0
823.9875 (FCC/IC)	45.8	38.0
851.0125 (FCC/IC)	45.6	36.3
860.0000 (FCC/IC)	45.6	36.3
868.9875 (FCC/IC)	45.6	36.3

Notes: Data presented is for Analog mode. All other modes were investigated and found to have equivalent power within measurement tolerances.

Table 5-2: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	1/11/13
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	1/20/13
901138	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	BK5883	2/14/12

Test Personnel:

Daniel Baltzell		February 28, 2011
EMC Test Engineer	Signature	Date of Test

6 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations; Part 80.217: Suppression of Interference Aboard Ships; RSS-119 5.8 Transmitter Unwanted Emissions

6.1 Test Procedure

ANSI/TIA/EIA-603-2004, Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

§80.217 Suppression of Interference Aboard Ships

(a) A voluntarily-equipped ship station receiver must not cause harmful interference to any receiver required by statute or treaty.
(b) The electromagnetic field from receivers required by statute or treaty must not exceed the following value at a distance over sea water of one nautical mile from the receiver:

Frequency of Interfering Emissions	Power to Artificial Antenna in Microwatts
Below 30 MHz	0.1
30 to 100 MHz	3.0
100 to 300 MHz	1.0
Over 300 MHz	3.0

or

Deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of Interfering Emissions	Power to Artificial Antenna in Microwatts
Below 30 MHz	400 (4 dBm)
30 to 100 MHz	4,000 (6 dBm)
100 to 300 MHz	40,000 (16 dBm)
Over 300 MHz	400,000 (26 dBm)

6.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

Limits: (43+10LOG P(W)) for wideband and 50 + 10 LOG P(W)) for narrowband

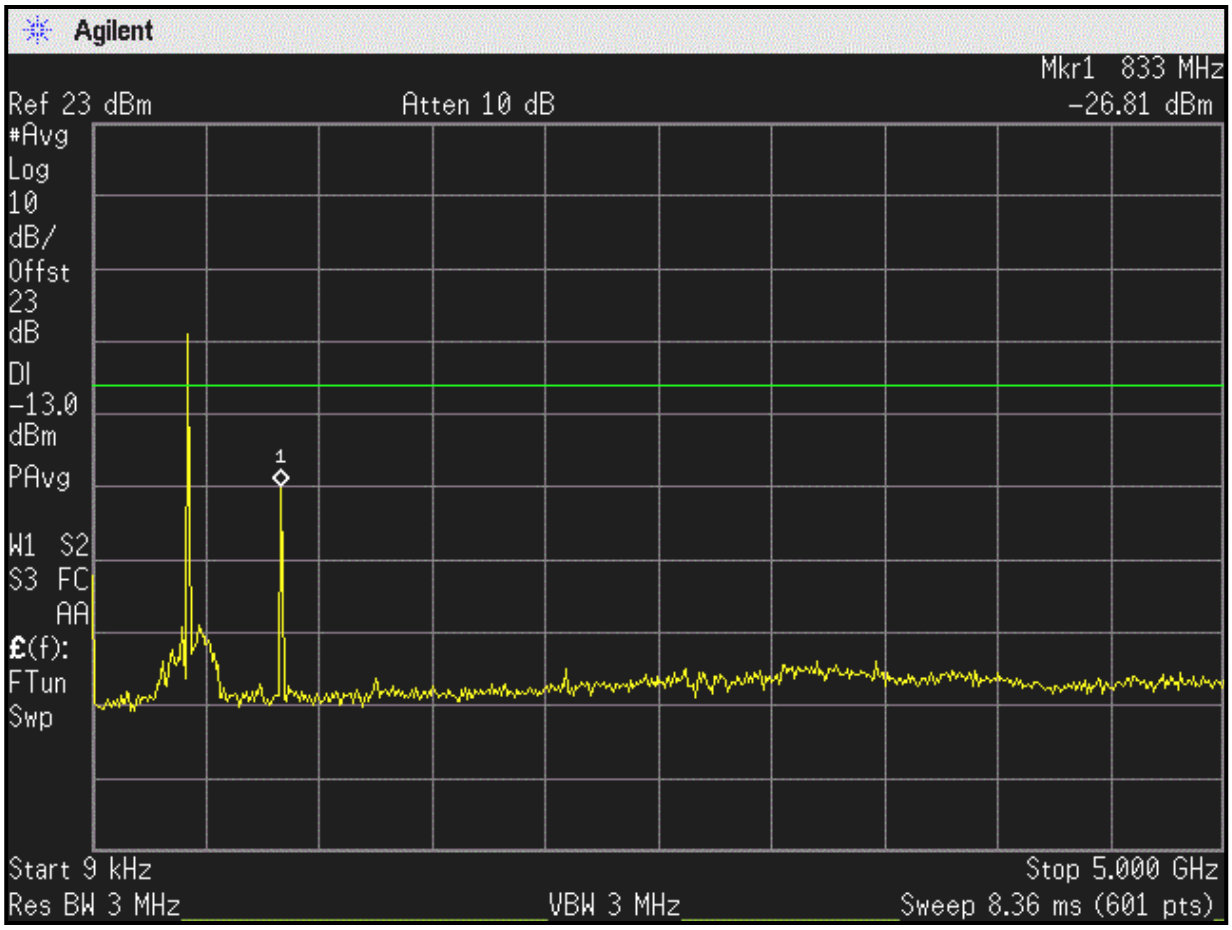
The following channels (in MHz) were investigated:

VHF (MHz)	UHF (MHz)	700 MHz	800 MHz
136.0125 (Federal)	378.0125 (Federal)	764.0125 (IC)	806.0125 (FCC/IC)
138.0125 (IC)	406.1125 (FCC/IC)	769.0125 (FCC)	815.0000 (FCC/IC)
141.0000 (IC)	418.0000 (FCC/IC)	771.0000 (FCC/IC)	823.9875 (FCC/IC)
143.9875 (IC)	429.9875 (IC)	774.9875 (FCC)	851.0125 (FCC/IC)
148.0125 (IC)	450.0125 (IC)	775.9875 (IC)	860.0000 (FCC/IC),
150.0125 (FCC)	453.9875 (FCC/IC),	794.0125 (IC),	868.9875 (FCC/IC)
154.0125 (FCC)	456.0125 (FCC)	799.0125 (FCC)	
162.0000 (FCC/IC)	469.9875 (FCC/IC)	801.0000 (FCC/IC)	
173.1875 (FCC)	511.9875 (FCC)	804.9875 (FCC)	
173.9875 (FCC/IC)	519.9875 (Federal)	805.9875 (IC)	

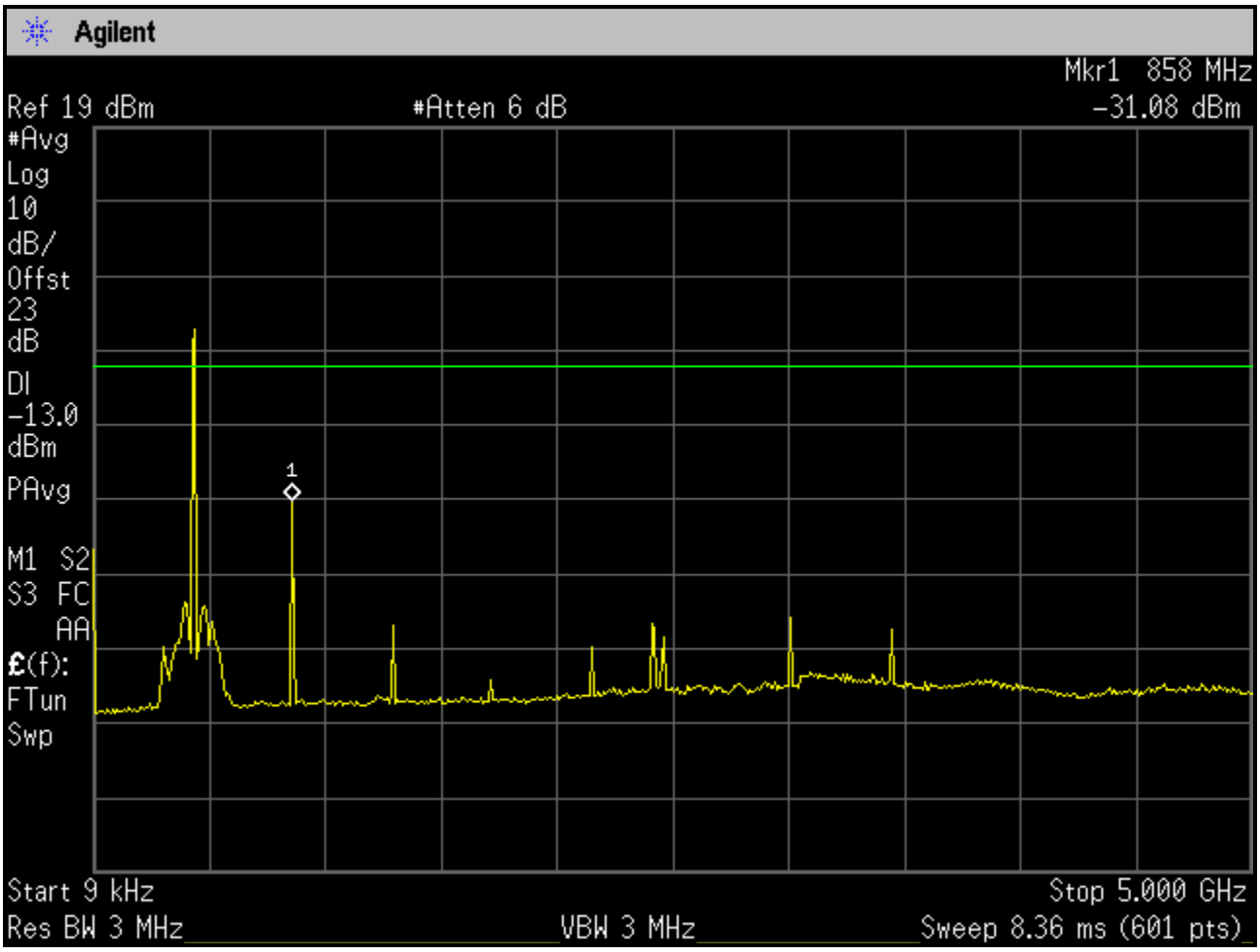
Both high and low power settings were checked; high power was found to be worst case and is presented. All modes were investigated and analog mode is presented as representative data.

All frequencies were found to be greater than 20 dB below the limit except those shown in the following plots (per 2.1051 data greater than 20 dB below the limit is not being reported).

Plot 6-1: Spurious Emissions at Antenna Terminals – 418.0000 MHz



Plot 6-2: Spurious Emissions at Antenna Terminals – 429.9875 MHz



Plot 6-3: Spurious Emissions at Antenna Terminals – 450.0125 MHz

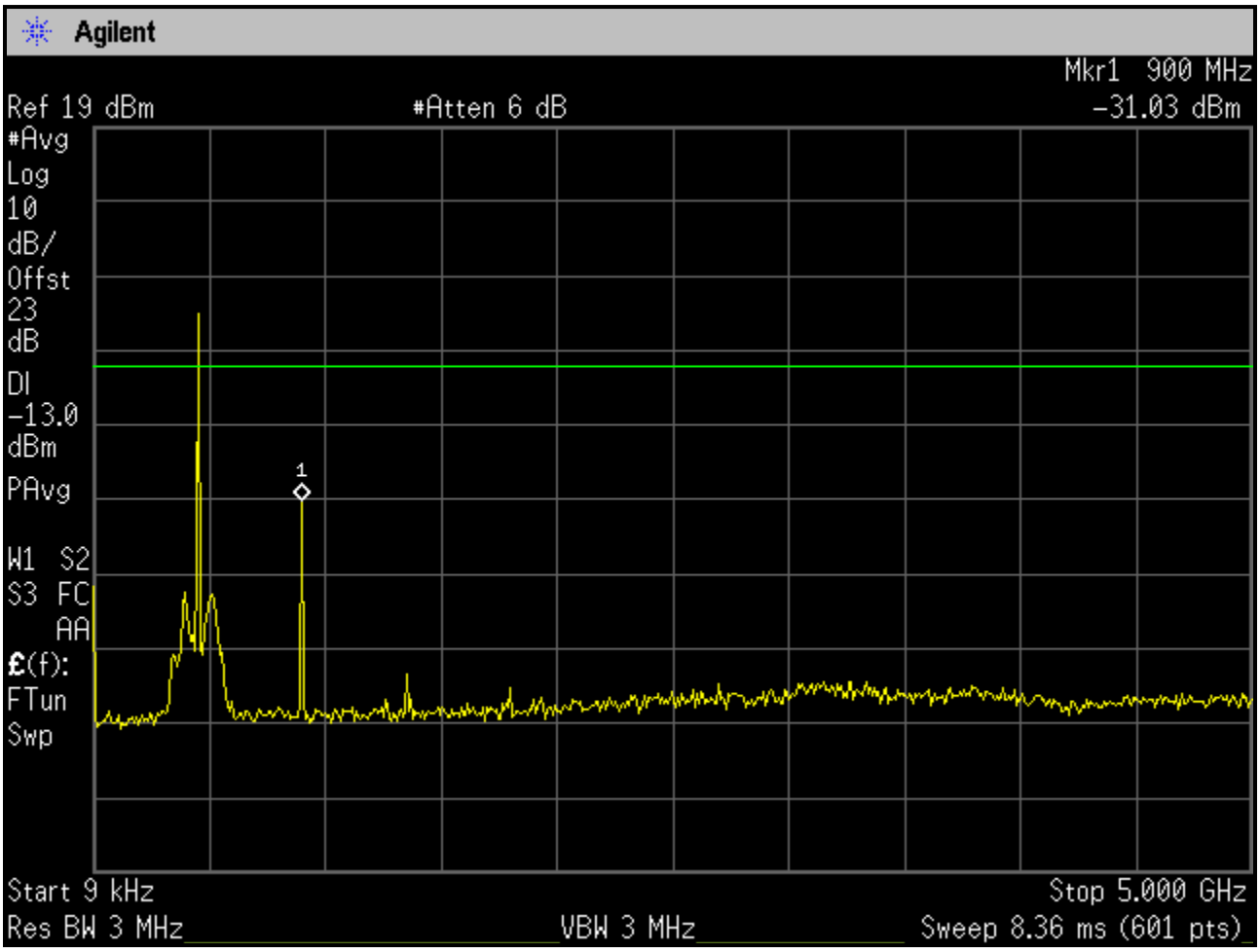


Table 6-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12
901139	Weinschel Corp.	48-20-34	Attenuator, 100W 20dB	BK5859	2/14/12
901129	Par Electronics	188-174 (25W)	VHF Notch Filters	N/A	3/10/12
901135	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	3/10/12
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	3/10/12

Test Personnel:

Daniel Baltzell		March 1, 2011
EMC Test Engineer	Signature	Date of Test

7 FCC Rules and Regulations Part 90.543(a): Emission Limitations: ACP Requirements; RSS-119 4.3 Adjacent Channel Power (ACP) Measurement for Equipment in the Bands 764-776 MHz and 794-806 MHz

Effective October 23, 2007, transmitters designed to operate in the 769–775 MHz and 799–805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Transmitters operating in the 763–768 MHz and 793–798 MHz bands must meet the emission limitations in (e) of this section.

7.1 Test Procedure

ANSI/TIA-603-C-2004, §2.2.14 Unwanted Emissions: Adjacent Channel Power Ratio

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

For a Portable transmitter designed to operate with a 12.5 kHz channel bandwidth, the ACP shall be in accordance with the values in the following table:

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP Relative (dBc)
(+/-)9.375	6.25	-40
(+/-)15.625	6.25	-60
(+/-)21.875	6.25	-60
(+/-)37.5	25	-60
(+/-)62.5	25	-65
(+/-)87.5	25	-65
(+/-)150	100	-65
(+/-)250	100	-65
(+/-)350	100	-65
>400 kHz to 12 MHz	30(s)	-75
12 MHz to paired receive band	30(s)	-75
In the paired receive band	30(s)	-100

FCC Rules and Regulations §90.543(b)

Setting Reference Level - §90.543(b)(1): Using a spectrum analyzer capable of ACP measurements, set the measurement bandwidth to the channel size. Set the frequency offset of the measurement to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power as the reference power level.

Measuring the power level at the frequency offset <600 kHz - §90.543(b)(2): Using a spectrum analyzer capable of adjacent channel power (ACP) measurements, set the measurement bandwidth as shown in the table. Measure ACP in dBm. These measurements are made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power level. The absolute ACP values must be less than the values given in the table for each condition.

Measuring the power level at the frequency offset >600 kHz - §90.543(b)(3): Set the spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample detection mode. Sweep +/-6 MHz from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the power. The response at frequencies >600 kHz must be less than the values listed in the table.

7.2 Test Data

Table 7-1: Adjacent Channel Power - 764.0125 MHz; Analog Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-56.7	-56.8
(+/-)15.625	6.25	-60	-63.8	-63.3
(+/-)21.875	6.25	-60	-67.3	-67.8
(+/-)37.5	25	-60	-69.0	-68.7
(+/-)62.5	25	-65	-73.6	-72.5
(+/-)87.5	25	-65	-73.9	-74.2
(+/-)150	100	-65	-69.0	-68.1
(+/-)250	100	-65	-67.3	-68.0
(+/-)350	100	-65	-69.0	-69.1

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.1
12 MHz to receive band	30(s)	-75	-93.2
In receive band	30(s)	-100	-103.3

Table 7-2: Adjacent Channel Power - 764.0125 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-44.2	-47.2
(+/-)15.625	6.25	-60	-63.5	-64.4
(+/-)21.875	6.25	-60	-68.9	-70.2
(+/-)37.5	25	-60	-67.6	-69.4
(+/-)62.5	25	-65	-72.4	-72.5
(+/-)87.5	25	-65	-74.8	-74.9
(+/-)150	100	-65	-68.8	-69.2
(+/-)250	100	-65	-67.6	-68.3
(+/-)350	100	-65	-71.6	-71.5

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.9
12 MHz to receive band	30(s)	-75	-93.3
In receive band	30(s)	-100	-103.1

Table 7-3: Adjacent Channel Power - 764.0125 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-44.3	-49.6
(+/-)15.625	6.25	-60	-63.7	-64.6
(+/-)21.875	6.25	-60	-70.5	-69.3
(+/-)37.5	25	-60	-68.2	-68.5
(+/-)62.5	25	-65	-72.6	-72.3
(+/-)87.5	25	-65	-73.7	-74.7
(+/-)150	100	-65	-66.9	-69.3
(+/-)250	100	-65	-71.1	-70.4
(+/-)350	100	-65	-69.8	-69.4

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.1
12 MHz to receive band	30(s)	-75	-94.2
In receive band	30(s)	-100	-102.4

Table 7-4: Adjacent Channel Power – 771.0000 MHz; Analog Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-59.0	-56.9
(+/-)15.625	6.25	-60	-62.1	-62.3
(+/-)21.875	6.25	-60	-66.3	-66.4
(+/-)37.5	25	-60	-69.0	-68.8
(+/-)62.5	25	-65	-72.8	-72.9
(+/-)87.5	25	-65	-73.4	-73.3
(+/-)150	100	-65	-70.7	-70.4
(+/-)250	100	-65	-67.7	-70.1
(+/-)350	100	-65	-68.1	-69.0

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.3
12 MHz to receive band	30(s)	-75	-90.7
In receive band	30(s)	-100	-111.0

Table 7-5: Adjacent Channel Power – 771.0000 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-44.9	-47.9
(+/-)15.625	6.25	-60	-64.9	-64.8
(+/-)21.875	6.25	-60	-70.2	-69.3
(+/-)37.5	25	-60	-67.2	-67.8
(+/-)62.5	25	-65	-72.0	-71.8
(+/-)87.5	25	-65	-73.7	-72.4
(+/-)150	100	-65	-66.6	-67.7
(+/-)250	100	-65	-70.7	-70.8
(+/-)350	100	-65	-71.6	-71.8

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.1
12 MHz to receive band	30(s)	-75	-90.5
In receive band	30(s)	-100	-110.1

Table 7-6: Adjacent Channel Power – 771.0000 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-41.6	-43.0
(+/-)15.625	6.25	-60	-63.7	-63.0
(+/-)21.875	6.25	-60	-67.7	-67.8
(+/-)37.5	25	-60	-67.7	-67.7
(+/-)62.5	25	-65	-73.0	-71.7
(+/-)87.5	25	-65	-74.7	-72.9
(+/-)150	100	-65	-68.8	-67.9
(+/-)250	100	-65	-70.4	-70.2
(+/-)350	100	-65	-69.8	-70.4

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.2
12 MHz to receive band	30(s)	-75	-90.0
In receive band	30(s)	-100	-109.8

Table 7-7: Adjacent Channel Power - 774.9875 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-42.4	-61.8
(+/-)15.625	6.25	-60	-71.8	-73.6
(+/-)21.875	6.25	-60	-75.7	-77.9
(+/-)37.5	25	-60	-72.9	-71.6
(+/-)62.5	25	-65	-74.6	-76.1
(+/-)87.5	25	-65	-76.6	-76.7
(+/-)150	100	-65	-66.9	-70.5
(+/-)250	100	-65	-73.0	-71.9
(+/-)350	100	-65	-71.6	-71.2

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-78.1
12 MHz to receive band	30(s)	-75	-91.4
In receive band	30(s)	-100	-101.9

Table 7-8: Adjacent Channel Power - 804.9875 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-43.2	-46.7
(+/-)15.625	6.25	-60	-72.5	-71.4
(+/-)21.875	6.25	-60	-74.6	-74.3
(+/-)37.5	25	-60	-72.2	-71.0
(+/-)62.5	25	-65	-75.5	-75.5
(+/-)87.5	25	-65	-77.6	-77.9
(+/-)150	100	-65	-67.2	-68.7
(+/-)250	100	-65	-71.1	-72.2
(+/-)350	100	-65	-72.1	-74.1

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-76.7
12 MHz to receive band	30(s)	-75	-79.9
In receive band	30(s)	-100	-101.7

Table 7-9: Adjacent Channel Power – 775.9875 MHz; Analog Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-57.5	-56.9
(+/-)15.625	6.25	-60	-63.3	-63.8
(+/-)21.875	6.25	-60	-68.3	-68.5
(+/-)37.5	25	-60	-69.1	-69.2
(+/-)62.5	25	-65	-72.7	-73.3
(+/-)87.5	25	-65	-74.6	-75.1
(+/-)150	100	-65	-70.3	-69.7
(+/-)250	100	-65	-67.7	-67.5
(+/-)350	100	-65	-70.2	-70.2

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.5
12 MHz to receive band	30(s)	-75	-88.7
In receive band	30(s)	-100	-117.5

Table 7-10: Adjacent Channel Power – 775.9875 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-45.0	-43.5
(+/-)15.625	6.25	-60	-63.9	-62.7
(+/-)21.875	6.25	-60	-69.8	-69.3
(+/-)37.5	25	-60	-69.8	-69.1
(+/-)62.5	25	-65	-74.2	-73.5
(+/-)87.5	25	-65	-73.0	-73.1
(+/-)150	100	-65	-67.7	-68.3
(+/-)250	100	-65	-69.9	-70.1
(+/-)350	100	-65	-70.1	-70.4

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.8
12 MHz to receive band	30(s)	-75	-88.7
In receive band	30(s)	-100	-117.1

Table 7-11: Adjacent Channel Power – 775.9875 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-41.3	-43.1
(+/-)15.625	6.25	-60	-64.5	-63.2
(+/-)21.875	6.25	-60	-67.4	-68.9
(+/-)37.5	25	-60	-69.0	-68.3
(+/-)62.5	25	-65	-72.5	-72.9
(+/-)87.5	25	-65	-74.2	-74.5
(+/-)150	100	-65	-68.4	-71.0
(+/-)250	100	-65	-71.1	-71.3
(+/-)350	100	-65	-63.8	-61.8

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.1
12 MHz to receive band	30(s)	-75	-88.9
In receive band	30(s)	-100	-117.2

Table 7-12: Adjacent Channel Power - 794.0125 MHz; Analog Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-55.8	-56.3
(+/-)15.625	6.25	-60	-60.3	-60.7
(+/-)21.875	6.25	-60	-66.0	-65.7
(+/-)37.5	25	-60	-69.0	-67.9
(+/-)62.5	25	-65	-72.4	-72.5
(+/-)87.5	25	-65	-74.4	-74.2
(+/-)150	100	-65	-67.2	-67.2
(+/-)250	100	-65	-69.8	-70.7
(+/-)350	100	-65	-70.2	-70.5

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.5
12 MHz to receive band	30(s)	-75	-85.3
In receive band	30(s)	-100	-125.1

Table 7-13: Adjacent Channel Power - 794.0125 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-42.0	-49.1
(+/-)15.625	6.25	-60	-60.3	-60.5
(+/-)21.875	6.25	-60	-66.1	-66.0
(+/-)37.5	25	-60	-66.9	-66.8
(+/-)62.5	25	-65	-66.1	-66.1
(+/-)87.5	25	-65	-67.7	-67.6
(+/-)150	100	-65	-68.4	-67.5
(+/-)250	100	-65	-69.9	-69.7
(+/-)350	100	-65	-68.1	-68.6

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.1
12 MHz to receive band	30(s)	-75	-91.2
In receive band	30(s)	-100	-127.2

Table 7-14: Adjacent Channel Power - 794.0125 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-45.0	-47.3
(+/-)15.625	6.25	-60	-60.4	-61.2
(+/-)21.875	6.25	-60	-65.0	-66.3
(+/-)37.5	25	-60	-68.1	-67.3
(+/-)62.5	25	-65	-71.2	-71.4
(+/-)87.5	25	-65	-74.3	-74.1
(+/-)150	100	-65	-68.9	-69.2
(+/-)250	100	-65	-68.2	-69.4
(+/-)350	100	-65	-72.0	-71.9

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-86.5
12 MHz to receive band	30(s)	-75	-90.8
In receive band	30(s)	-100	-127.4

Table 7-15: Adjacent Channel Power – 801.0000 MHz; Analog Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-56.1	-54.6
(+/-)15.625	6.25	-60	-60.5	-61.5
(+/-)21.875	6.25	-60	-66.9	-66.6
(+/-)37.5	25	-60	-67.7	-68.4
(+/-)62.5	25	-65	-73.0	-72.9
(+/-)87.5	25	-65	-74.0	-73.9
(+/-)150	100	-65	-70.6	-70.6
(+/-)250	100	-65	-69.7	-68.3
(+/-)350	100	-65	-71.1	-70.3

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-86.2
12 MHz to receive band	30(s)	-75	-92.1
In receive band	30(s)	-100	-111.9

Table 7-16: Adjacent Channel Power – 801.0000 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-42.1	-41.5
(+/-)15.625	6.25	-60	-62.6	-61.5
(+/-)21.875	6.25	-60	-61.8	-61.3
(+/-)37.5	25	-60	-63.7	-64.2
(+/-)62.5	25	-65	-67.5	-67.4
(+/-)87.5	25	-65	-67.9	-67.9
(+/-)150	100	-65	-66.3	-69.6
(+/-)250	100	-65	-72.1	-71.9
(+/-)350	100	-65	-73.0	-72.8

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-86.2
12 MHz to receive band	30(s)	-75	-92.6
In receive band	30(s)	-100	-111.2

Table 7-17: Adjacent Channel Power – 801.0000 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-41.8	-42.8
(+/-)15.625	6.25	-60	-61.7	-62.6
(+/-)21.875	6.25	-60	-64.2	-64.9
(+/-)37.5	25	-60	-64.4	-64.0
(+/-)62.5	25	-65	-66.4	-66.5
(+/-)87.5	25	-65	-67.8	-66.5
(+/-)150	100	-65	-70.7	-70.7
(+/-)250	100	-65	-71.0	-71.3
(+/-)350	100	-65	-70.8	-72.3

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.9
12 MHz to receive band	30(s)	-75	-92.6
In receive band	30(s)	-100	-110.5

Table 7-18: Adjacent Channel Power - 805.9875 MHz; Analog; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-56.6	-55.8
(+/-)15.625	6.25	-60	-60.8	-61.1
(+/-)21.875	6.25	-60	-66.5	-66.1
(+/-)37.5	25	-60	-67.0	-66.6
(+/-)62.5	25	-65	-67.4	-67.4
(+/-)87.5	25	-65	-68.2	-68.2
(+/-)150	100	-65	-68.5	-69.2
(+/-)250	100	-65	-69.1	-67.5
(+/-)350	100	-65	-69.4	-69.5

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-87.9
12 MHz to receive band	30(s)	-75	-94.8
In receive band	30(s)	-100	-107.8

Table 7-19: Adjacent Channel Power - 805.9875 MHz; P25 Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-40.6	-43.8
(+/-)15.625	6.25	-60	-61.6	-62.9
(+/-)21.875	6.25	-60	-65.5	-64.6
(+/-)37.5	25	-60	-65.6	-65.3
(+/-)62.5	25	-65	-66.4	-66.4
(+/-)87.5	25	-65	-65.3	-65.4
(+/-)150	100	-65	-66.6	-66.8
(+/-)250	100	-65	-68.9	-71.6
(+/-)350	100	-65	-70.0	-71.1

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-88.3
12 MHz to receive band	30(s)	-75	-94.1
In receive band	30(s)	-100	-106.5

Table 7-20: Adjacent Channel Power – 805.9875 MHz; CPM Mode; 12.5 kHz Channel Spacing

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP Low Offset (dBc)	Measured ACP High Offset (dBc)
(+/-)9.375	6.25	-40	-40.7	-42.9
(+/-)15.625	6.25	-60	-62.5	-63.7
(+/-)21.875	6.25	-60	-63.1	-62.3
(+/-)37.5	25	-60	-65.8	-65.6
(+/-)62.5	25	-65	-67.4	-66.8
(+/-)87.5	25	-65	-68.7	-67.9
(+/-)150	100	-65	-67.0	-68.2
(+/-)250	100	-65	-67.8	-68.2
(+/-)350	100	-65	-70.1	-70.2

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.7
12 MHz to receive band	30(s)	-75	-95.3
In receive band	30(s)	-100	-107.9

Table 7-21: Test Equipment Used For Testing ACP Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12
901138	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 40dB	BK5883	2/14/12

Test Personnel:

Daniel Baltzell		March 14-15, 2011
EMC Test Engineer	Signature	Dates of Tests

8 FCC Rules and Regulations Part 90.210(g) and Part 2.1053(a): Field Strength of Spurious Radiation; Part 90.543(f): Out of Band Emissions Limit; RSS-119 5.8.9.2 Out-of-band Emission Limit

8.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 and EDACS modes.

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna (dBi) was added to achieve the EIRP level, then converted from the corrected signal generator level (dBm) to dBW and compared to the limit.

For emissions in the 1559-1610 band, Part 15.543(f) states: "For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation."

8.2 Test Data

8.2.1 CFR 47 Part 90.210 Requirements

Per 2.1051(c), the magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

The following data are the only points found within 20 dB of the limit.

Table 8-1: Field Strength of Spurious Radiation - 406.1125 MHz

Conducted Power 47.5 dBm; 56.2 W; Limit=50+10LogP=67.5

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
812.2250	43.6	-32.2	0.9	1.0	79.5	-12.0

Table 8-2: Field Strength of Spurious Radiation – 418.0000 MHz

Conducted Power 47.5 dBm; 56.2 W; Limit=50+10LogP=67.5

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
836.000	38.8	-38.7	0.9	1.1	86.0	-18.5
2926.000	70.5	-45.1	2.0	7.6	87.0	-19.5

Table 8-3: Field Strength of Spurious Radiation - 429.9875 MHz

Conducted Power 47.5 dBm; 56.2 W; Limit=50+10LogP=67.5

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
859.975	45.1	-32.3	0.9	1.1	79.5	-12.0

Table 8-4: Field Strength of Spurious Radiation - 764.0125 MHz

Conducted Power 44.7dBm; 29.5 W; Limit=50+10LogP=64.7

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1528.025	32.8	-43.2	1.1	6.5	82.5	-17.8

Table 8-5: Field Strength of Spurious Radiation – 771.0000 MHz

Conducted Power 44.7 dBm; 29.5 W; Limit=50+10LogP=64.7

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1542.000	35.4	-42.8	1.1	6.6	82.0	-17.3
2313.000	77.4	-42.0	1.6	7.3	81.0	-16.3

Table 8-6: Field Strength of Spurious Radiation - 775.9875 MHz

Conducted Power 44.7 dBm; 29.5 W; Limit=50+10LogP=64.7

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1551.975	31.6	-44.7	1.1	6.6	83.9	-19.2
2327.963	75.4	-41.9	1.6	7.3	80.9	-16.2

Table 8-7: Field Strength of Spurious Radiation - 794.0125 MHz

Conducted Power 44.7 dBm; 29.5 W; Limit=50+10LogP=64.7

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2382.038	84.4	-35.5	1.7	7.2	74.7	-10.0

Table 8-8: Field Strength of Spurious Radiation – 801.0000 MHz

Conducted Power 44.7 dBm; 29.5 W; Limit=50+10LogP=64.7

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2403.000	84.1	-34.6	1.7	7.2	73.8	-9.1

Table 8-9: Field Strength of Spurious Radiation - 805.9875 MHz

Conducted Power 45.8dBm; 38 W; Limit=50+10LogP=58.8

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2417.963	93.3	-27.0	1.7	7.2	67.3	-8.5
3223.950	74.8	-37.4	2.0	7.0	78.2	-19.4
4029.938	66.1	-34.3	2.4	7.6	74.9	-16.1
4835.925	65.1	-34.7	2.6	8.8	74.3	-15.5

Table 8-10: Field Strength of Spurious Radiation - 806.0125 MHz

Conducted Power 45.8 dBm; 38 W; Limit=50+10LogP=58.8

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2418.038	93.0	-27.3	1.7	7.2	67.6	-8.8
4030.063	64.9	-37.7	2.4	7.6	78.3	-19.5
4836.075	65.2	-37.6	2.6	8.8	77.2	-18.4

Table 8-11: Field Strength of Spurious Radiation – 815.0000 MHz

Conducted Power 45.8 dBm; 38 W; Limit=50+10LogP=58.8

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2445.000	95.6	-23.4	1.7	7.3	63.6	-4.8
3260.000	86.4	-27.7	2.0	7.0	68.5	-9.7
4075.000	66.5	-32.7	2.4	7.9	73.0	-14.2
4890.000	70.1	-28.4	2.6	8.8	68.1	-9.3
5705.000	65.1	-33.9	2.8	9.2	73.3	-14.5

Table 8-12: Field Strength of Spurious Radiation - 823.9875 MHz

Conducted Power 45.8 dBm; 38 W; Limit=50+10LogP=58.8

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
4119.938	68.8	-36.8	2.4	8.2	76.9	-18.1
4943.925	65.8	-39.2	2.6	8.8	78.8	-20.0

Table 8-13: Field Strength of Spurious Radiation - 851.0125 MHz

Conducted Power 45.6dBm; 36.3 W; Limit=43+10LogP=58.6

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
2553.0375	96.5	-21.3	1.7	7.4	61.3	-2.7
3404.0500	84.1	-31.1	2.0	7.6	71.2	-12.6
4255.0625	73.2	-29.4	2.5	8.6	68.8	-10.2
5106.0750	70.8	-29.2	2.7	8.6	68.8	-10.2

8.2.2 CFR 47 Part 90.543(f) Requirements

The worst-case emissions test data are shown.

Limit: -80 dBW EIRP for discrete emissions

Table 8-14: Field Strength of Spurious Radiation – Worst Case Emissions

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBW)	Margin (dB)
1588.0250	28.6	-56.4	1.2	6.8	-80.8	-0.8
1598.0250	27.2	-60.8	1.1	6.8	-85.1	-5.1
1602.0000	31.8	-58.4	1.1	6.8	-82.7	-2.7
1609.9750	33.5	-56.7	1.1	6.8	-81.0	-1.0

Table 8-15: Test Equipment Used For Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901364	Rhein Tech Laboratories	PR-1042	Preamplifier (1 - 26.5 GHz)	N/A	2/22/12
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901516	Insulated Wire Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/11
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	1/31/13
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	6/14/11
900323	EMCO	3160-07	Horn Antennas (8.2 – 12 GHz)	9605-1054	6/14/11
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/11
901235	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	4/5/12
900928	Hewlett Packard	83752A	Synthesized Sweeper, 0.01 to 20 GHz	3610A00866	2/17/12

Test Personnel:

Daniel Baltzell		April 4, 2011
Test Engineer	Signature	Date of Tests

9 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; RSS-119 5.5 Channel Spacing, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

Occupied Bandwidth - Compliance with the Emission Masks

9.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.11 and TIA/EIA-102.CAAA-2002 section 2.2.5

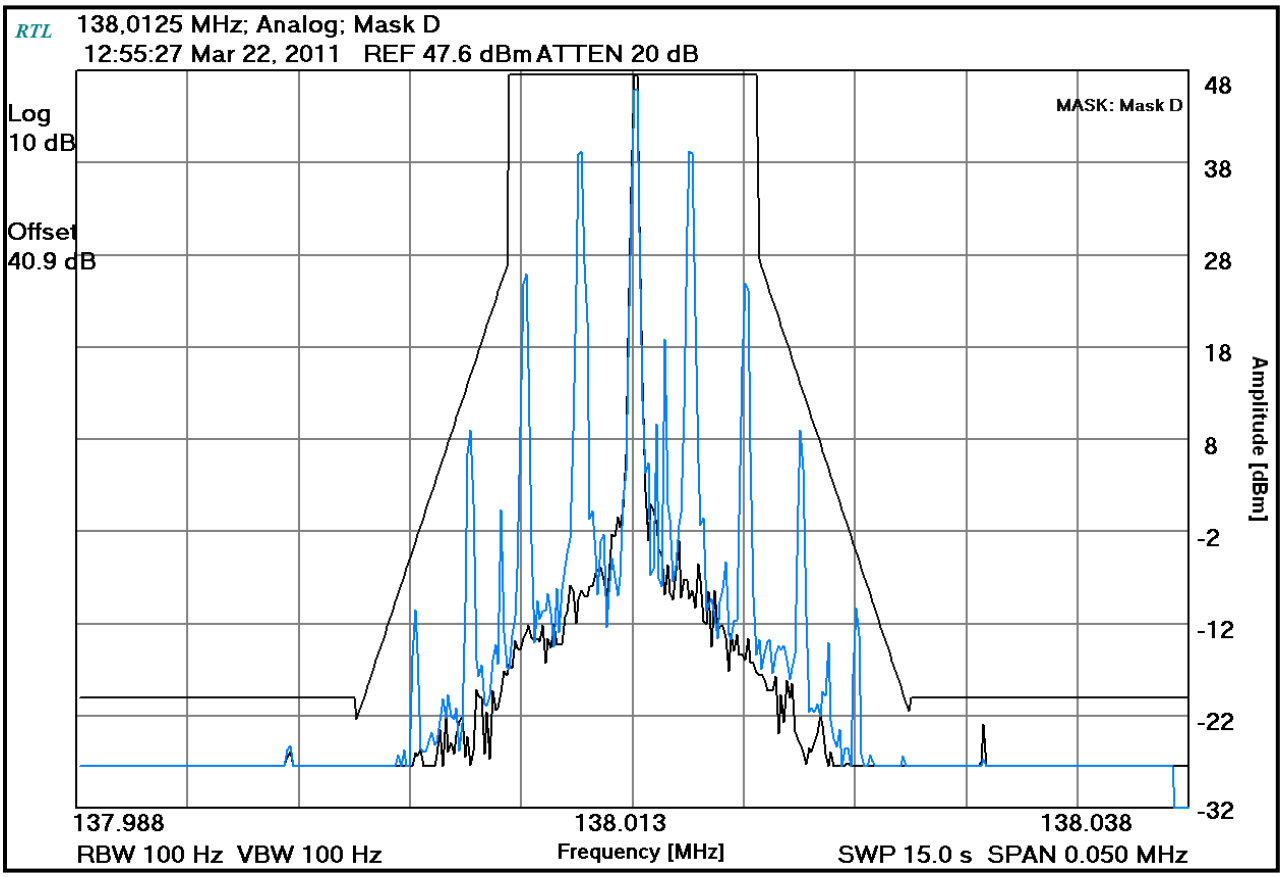
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

Applicable Emission Masks		
Frequency Band (MHz)	**Mask for Equipment with Audio LowPass Filter**	**Mask for Equipment Without AudioLowPass Filter**
Below 25 [1]	A or B	A or C
25–50	B	C
72–76	B	C
150–174 [2]	B, D, or E	C, D, or E
150 Paging-only	B	C
220–222	F	F
421–512 [2]	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869 [3]	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M
5850–5925 [4]		
All other bands	B	C

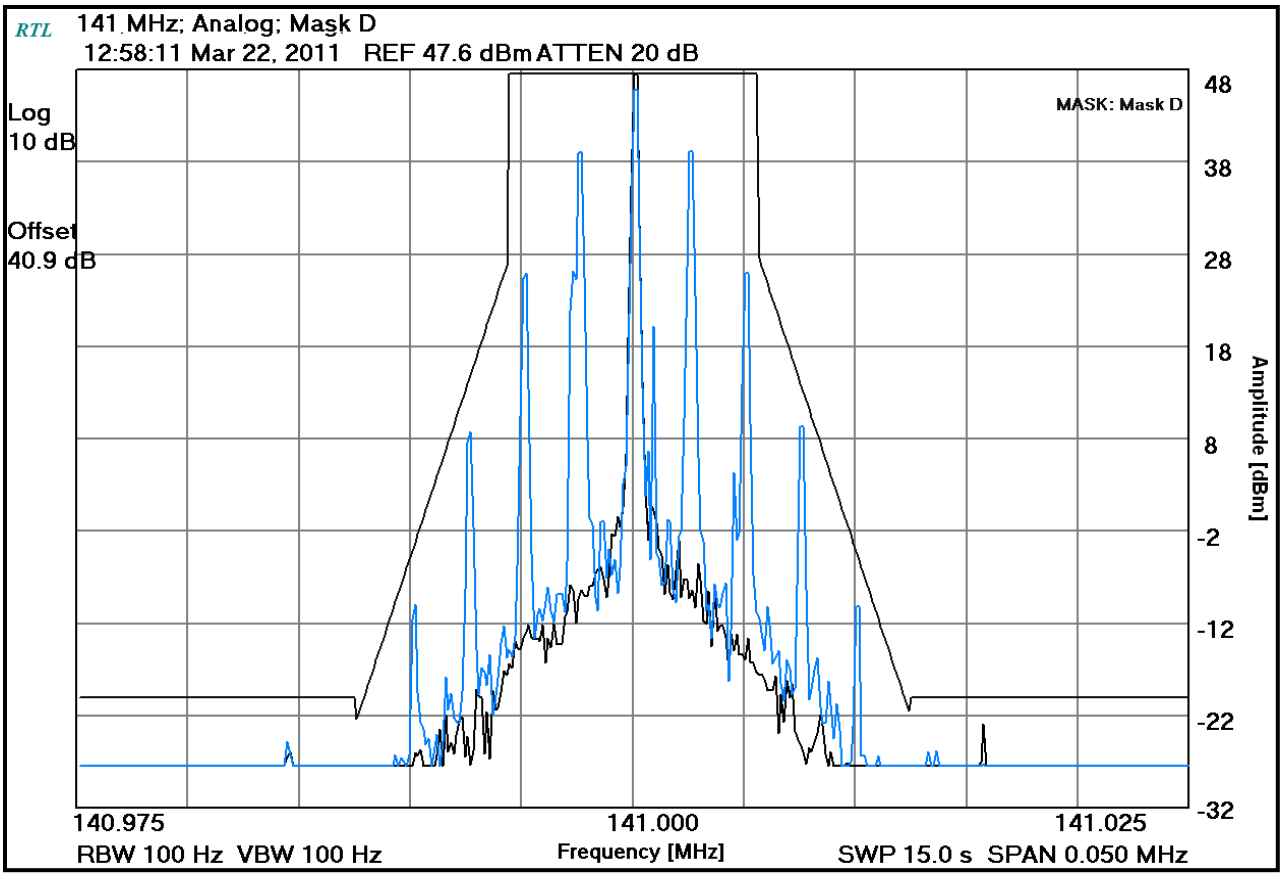
[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
[3] Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691.
[4] DSRCS Roadside Unit equipment in the 5850–5925 MHz band is governed under subpart M of this part.

9.2 Test Data

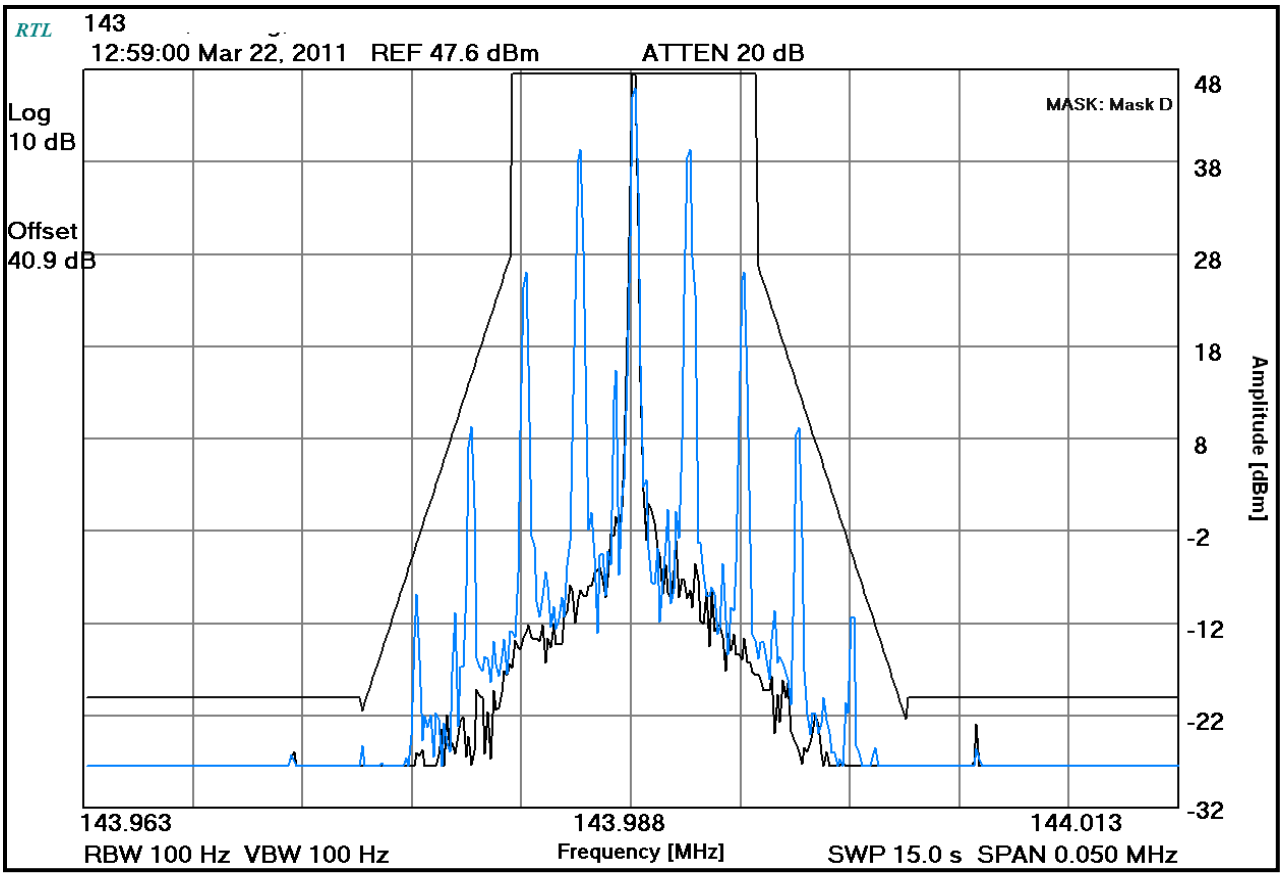
Plot 9-1: Occupied Bandwidth – 138.0125 MHz; Analog (Mask D)



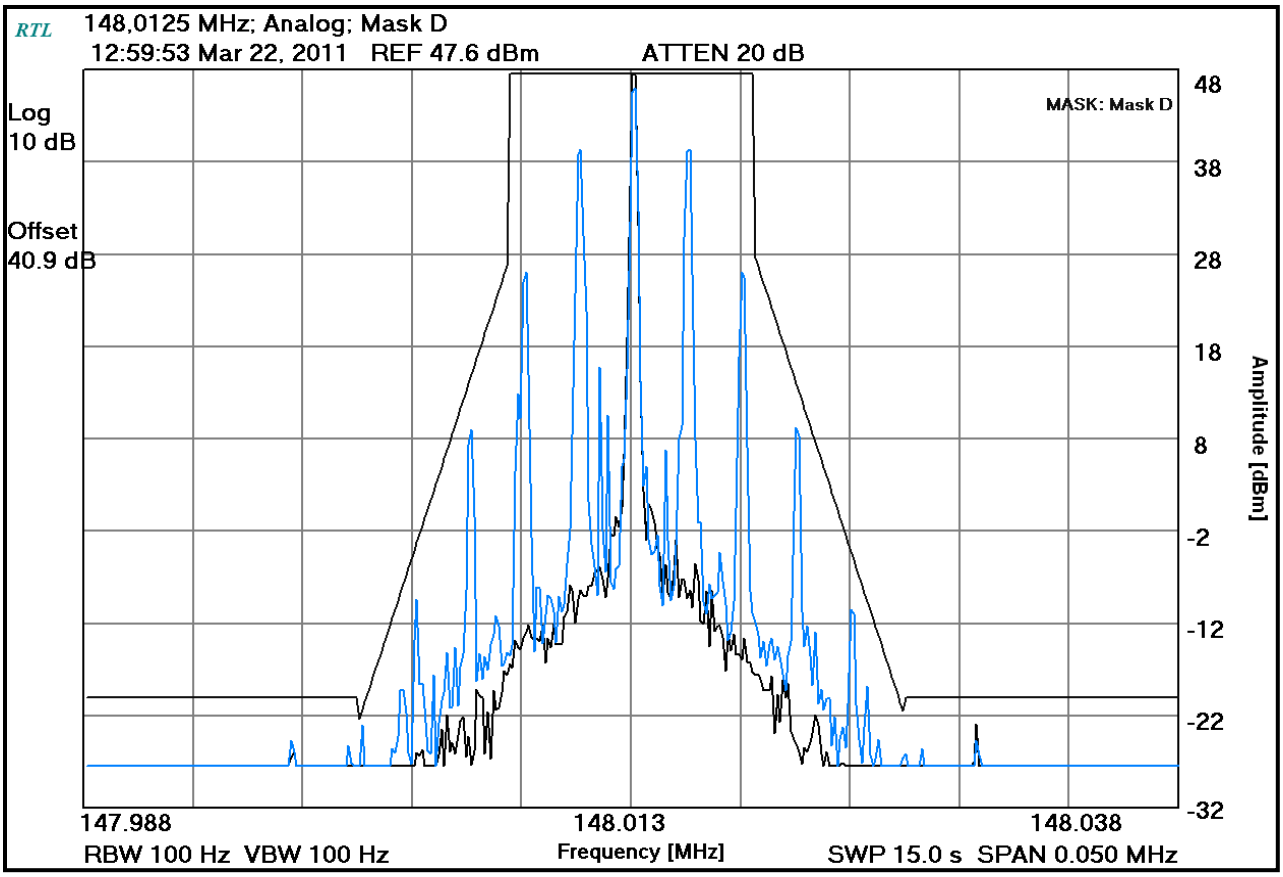
Plot 9-2: Occupied Bandwidth – 141.0000 MHz; Analog (Mask D)



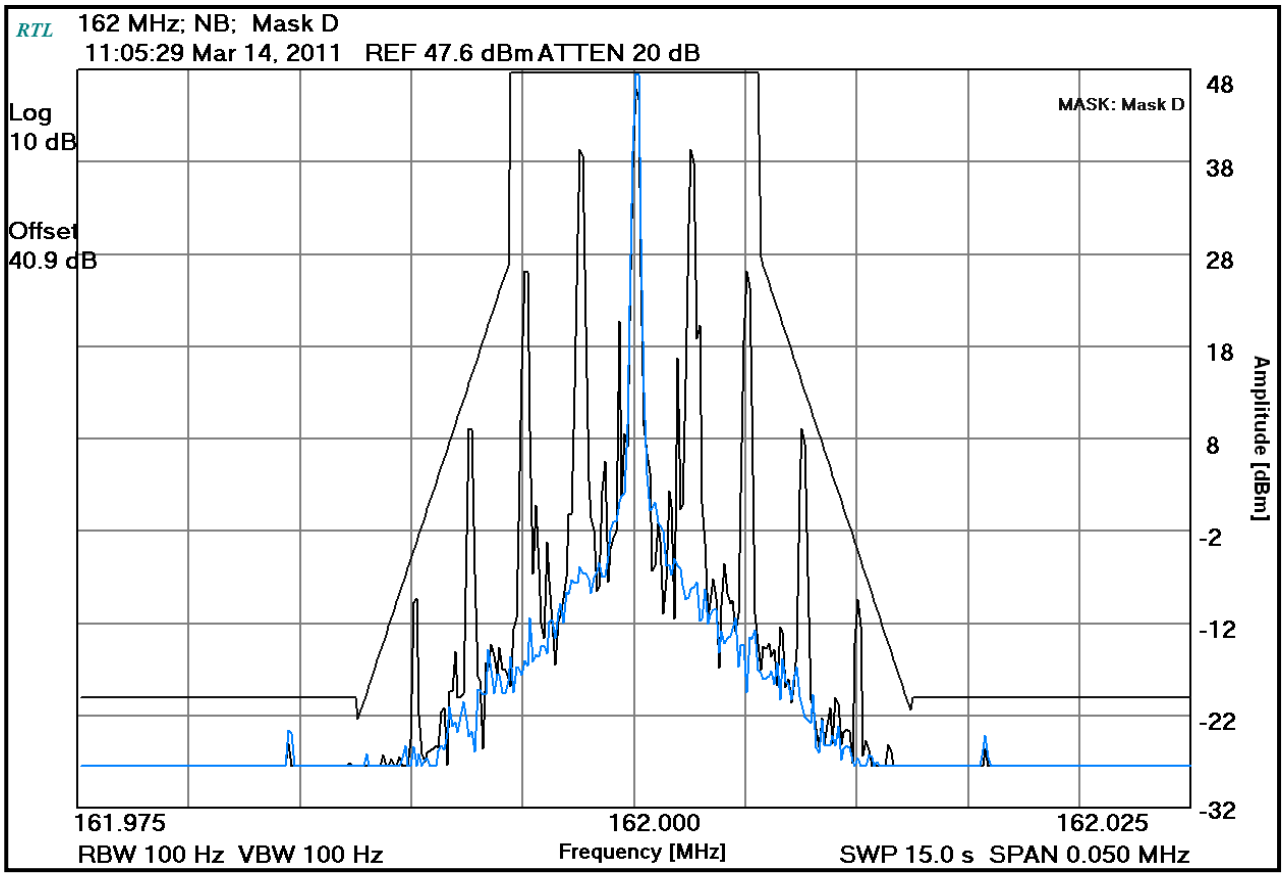
Plot 9-3: Occupied Bandwidth – 143.9875 MHz; Analog (Mask D)



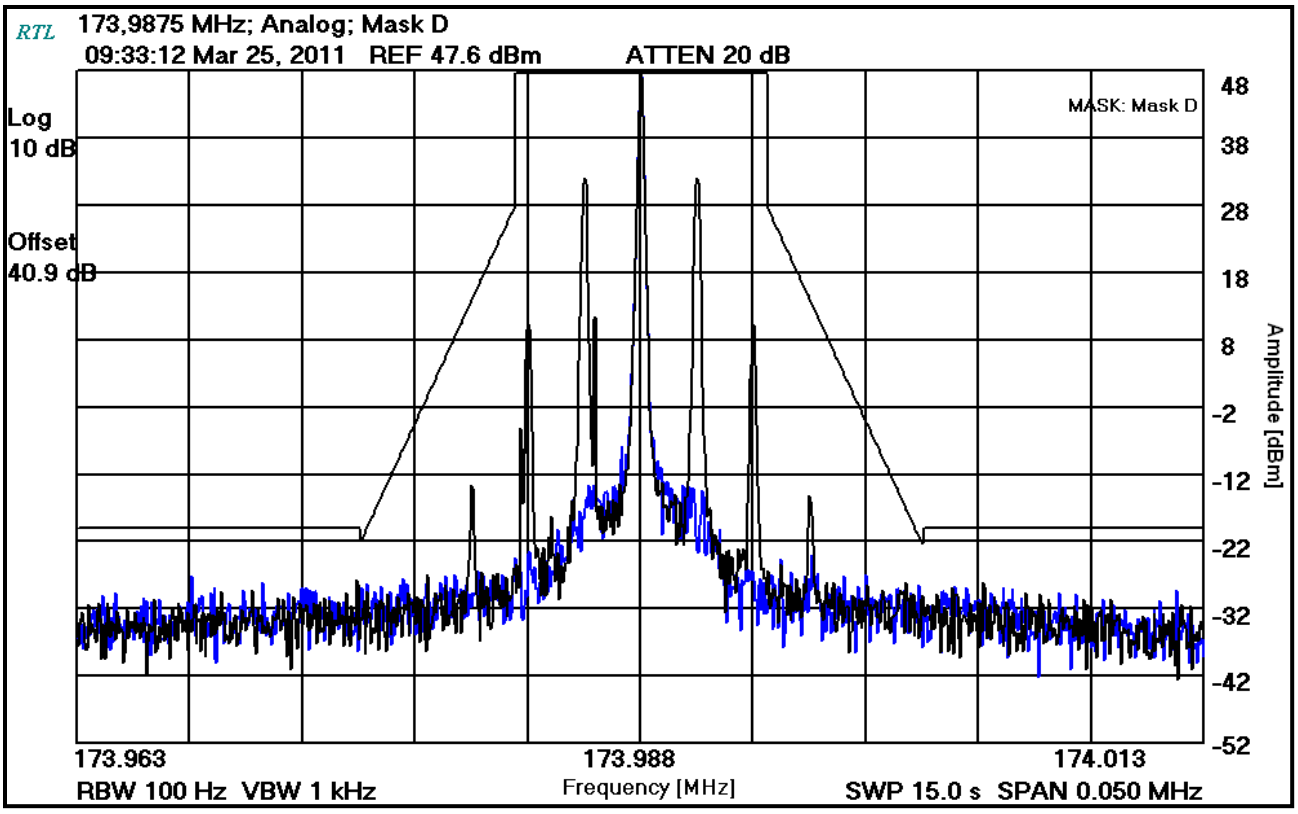
Plot 9-4: Occupied Bandwidth – 148.0125 MHz; Analog (Mask D)



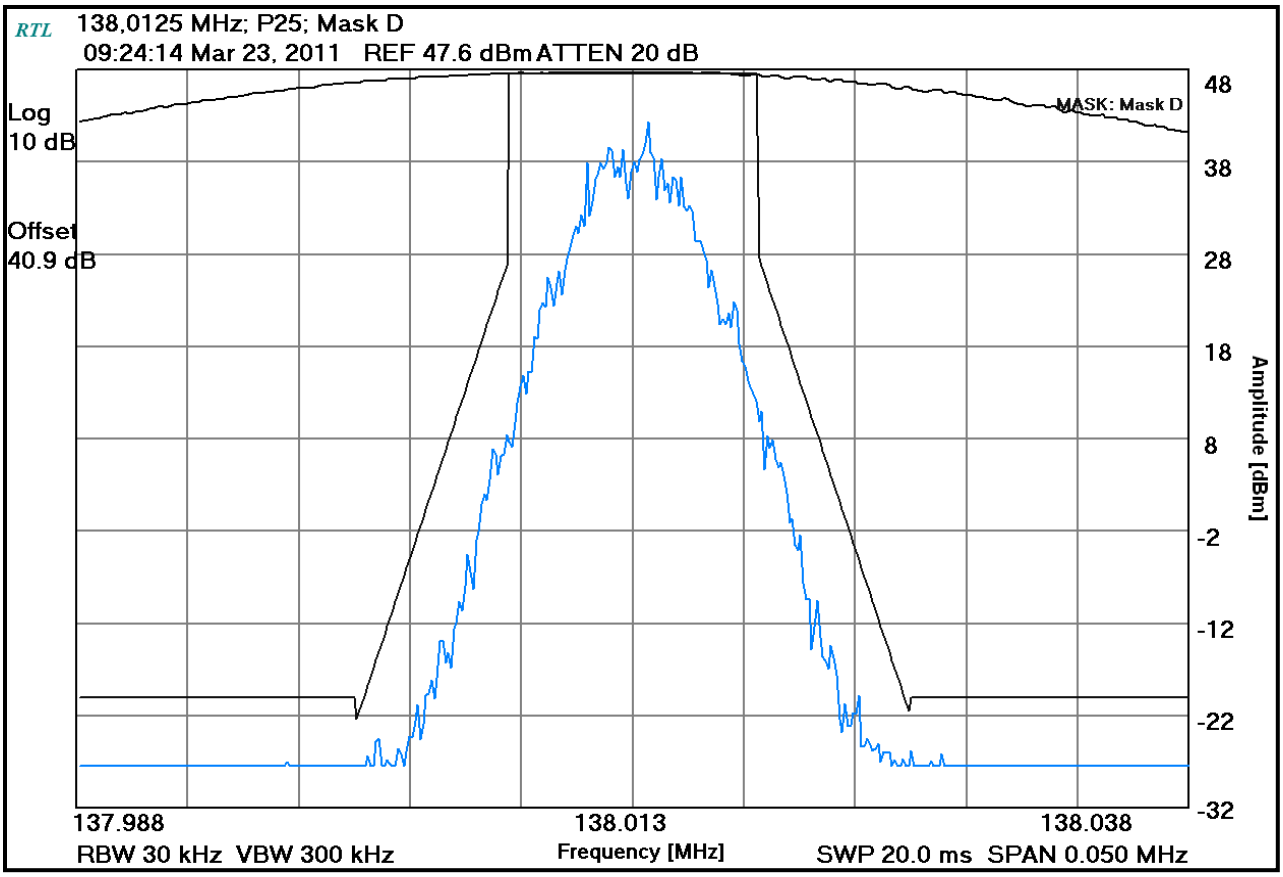
Plot 9-5: Occupied Bandwidth – 162.0000 MHz; Analog (Mask D)



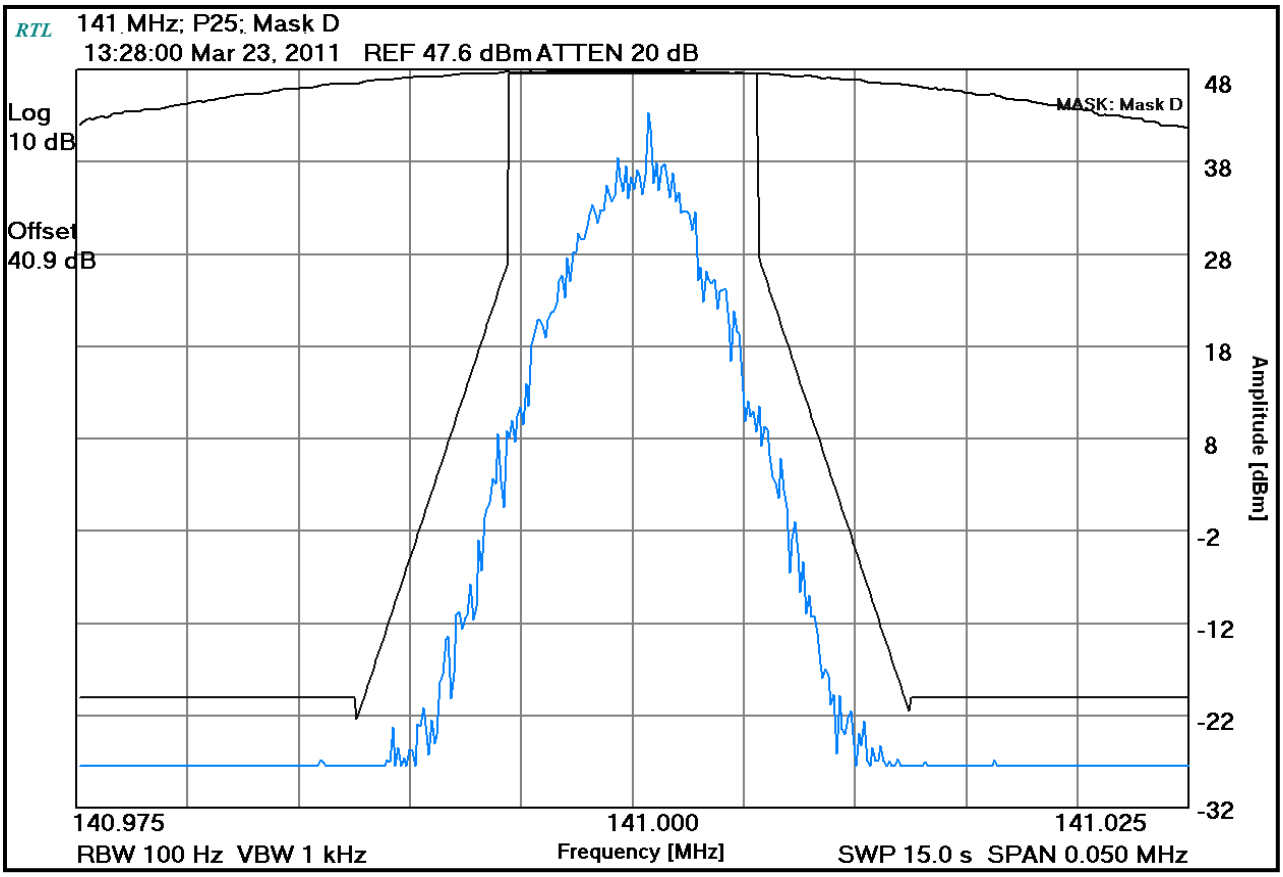
Plot 9-6: Occupied Bandwidth – 173.9875 MHz; Analog (Mask D)



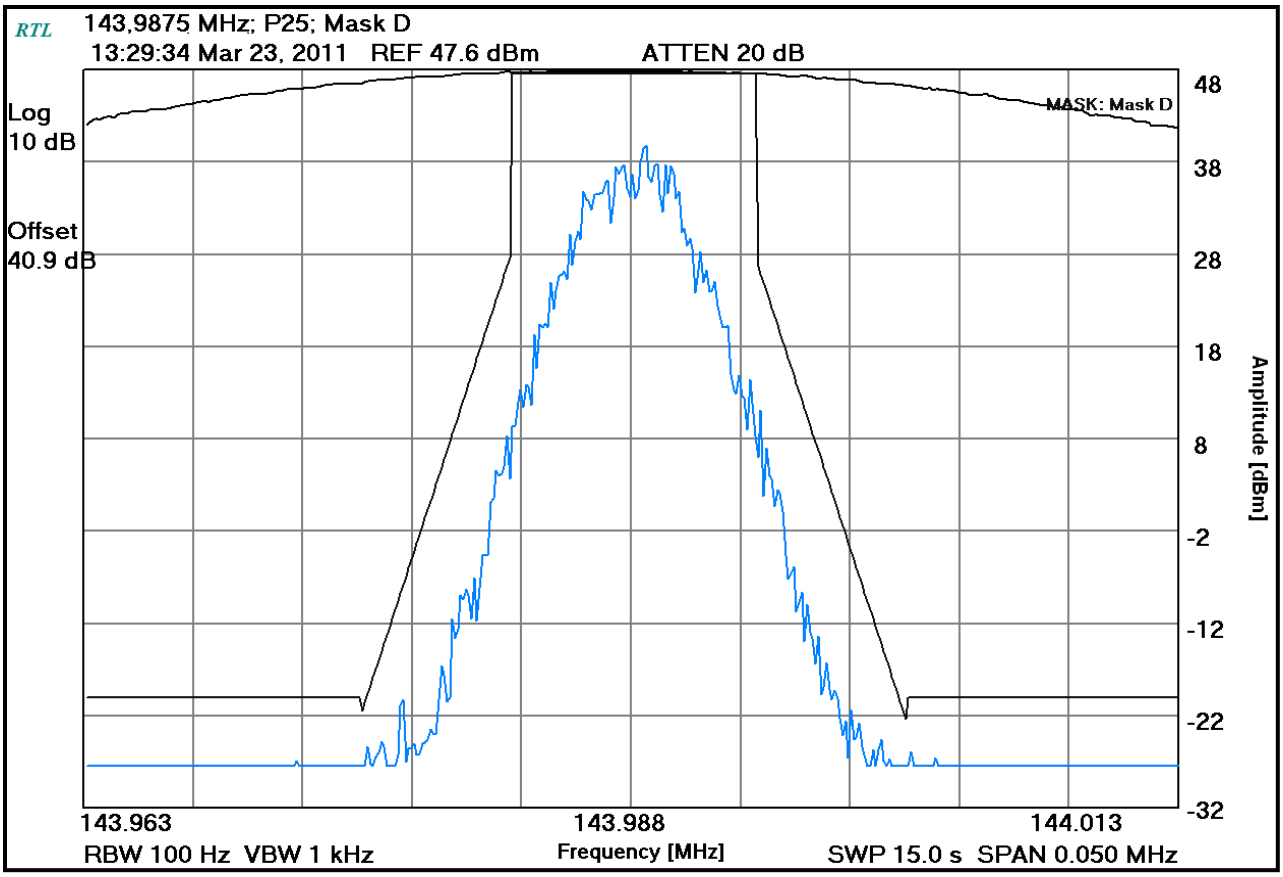
Plot 9-7: Occupied Bandwidth – 138.0125 MHz; P25; (Mask D)



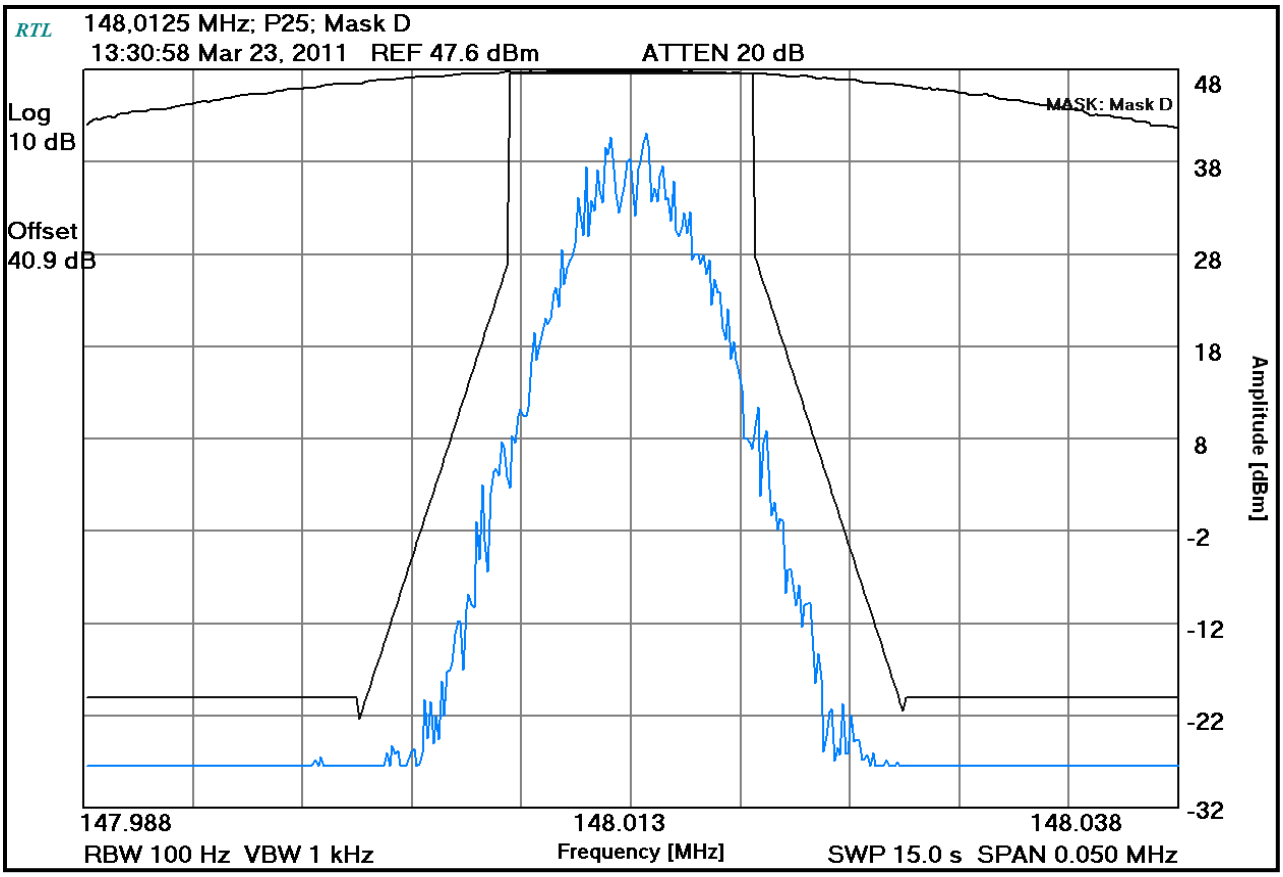
Plot 9-8: Occupied Bandwidth – 141.0000 MHz; P25; (Mask D)



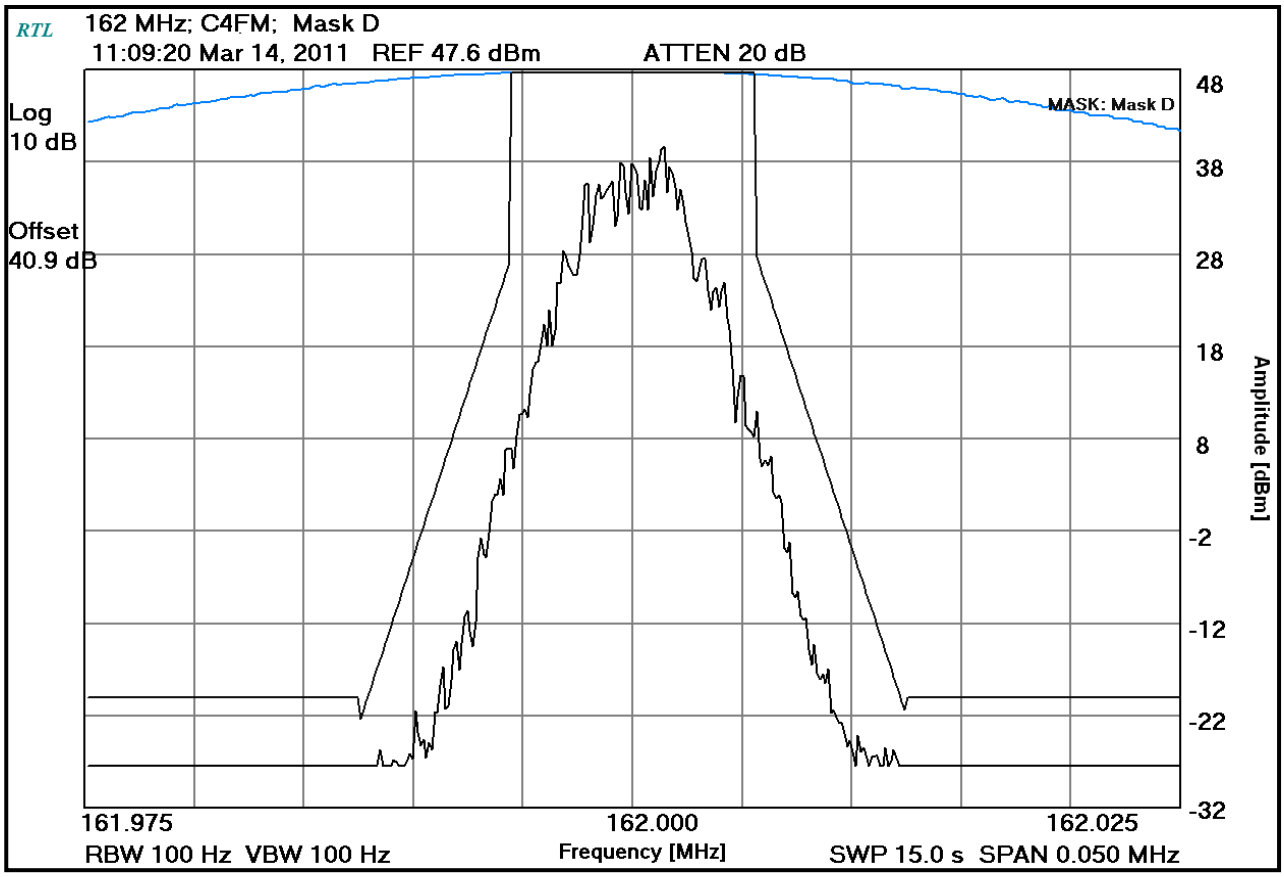
Plot 9-9: Occupied Bandwidth – 143.9875 MHz; P25; (Mask D)



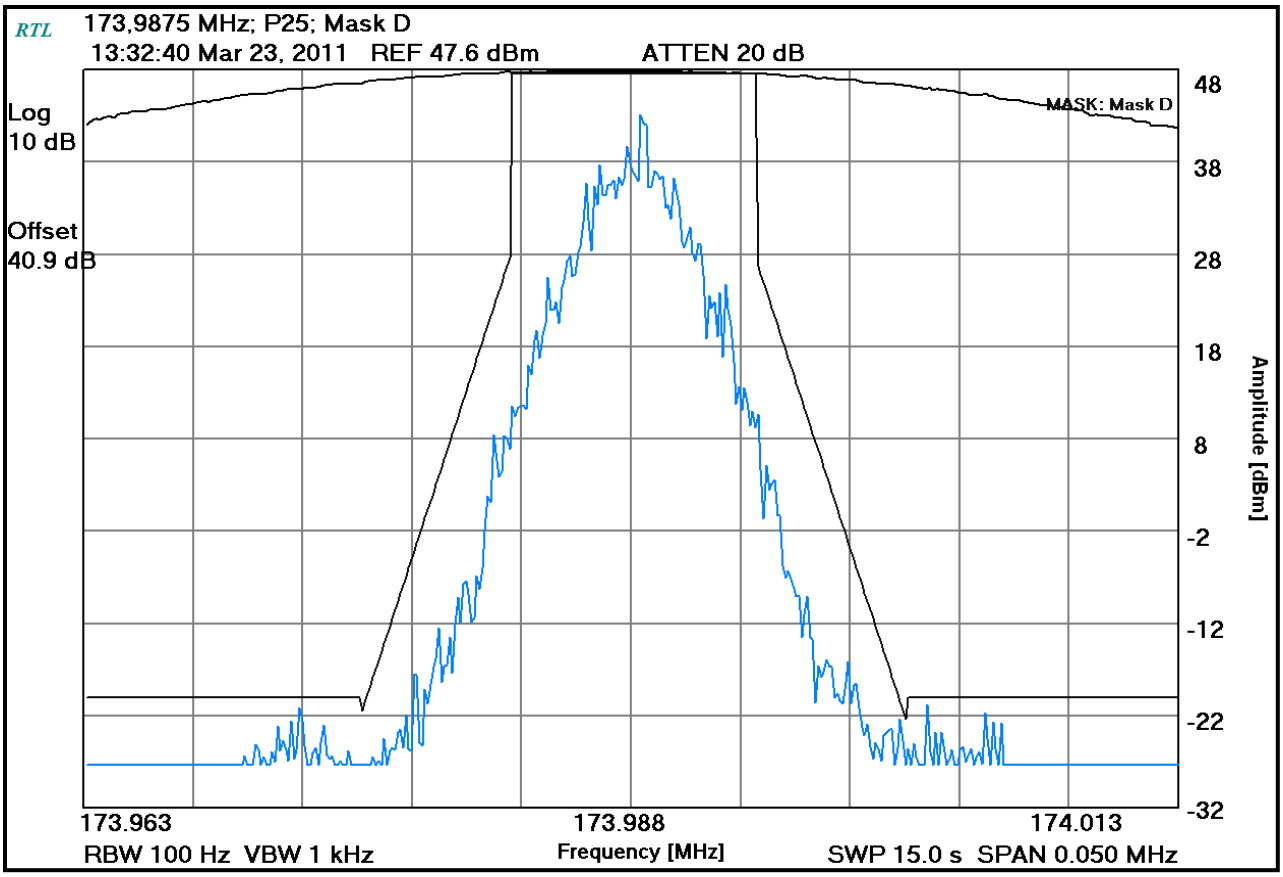
Plot 9-10: Occupied Bandwidth – 148.0125 MHz; P25; (Mask D)



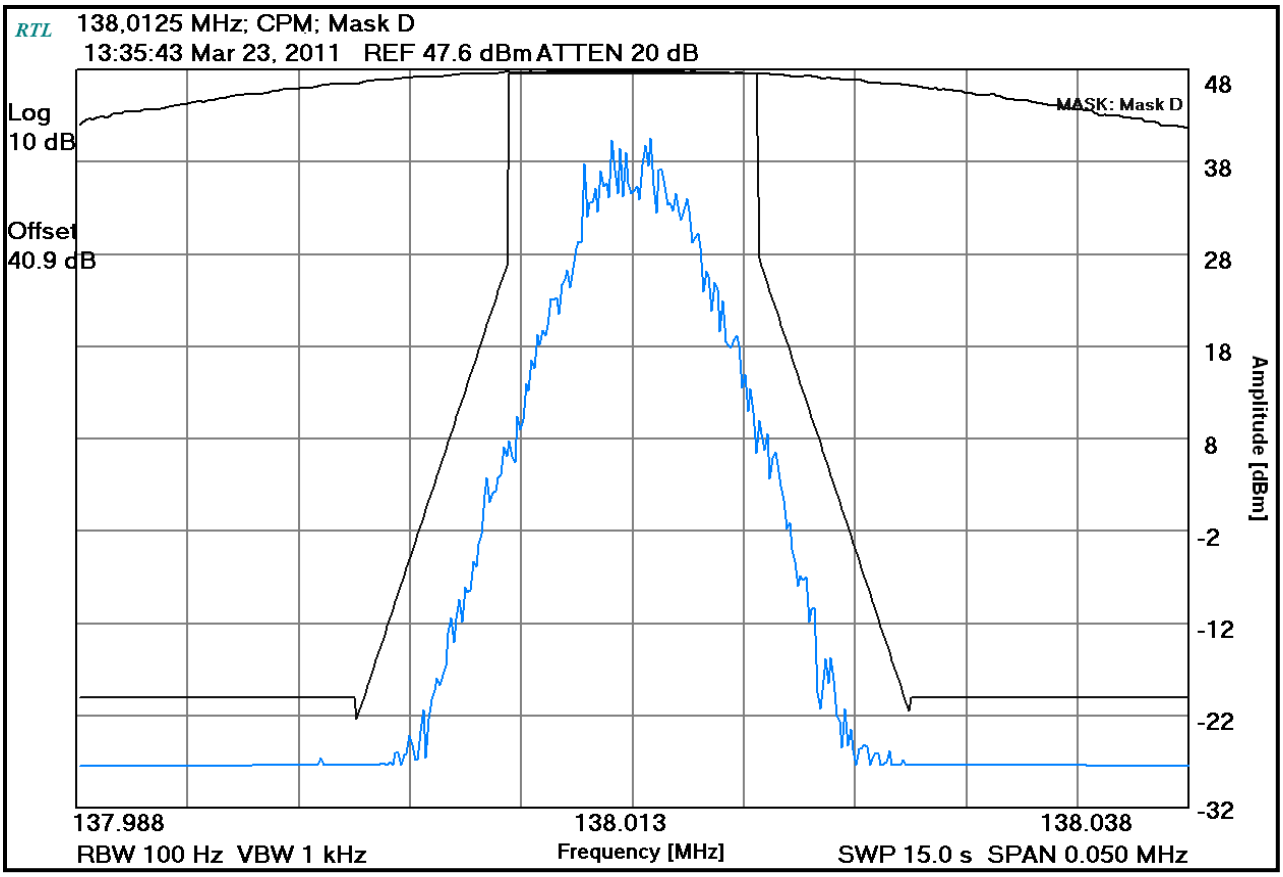
Plot 9-11: Occupied Bandwidth – 162.0000 MHz; P25; (Mask D)



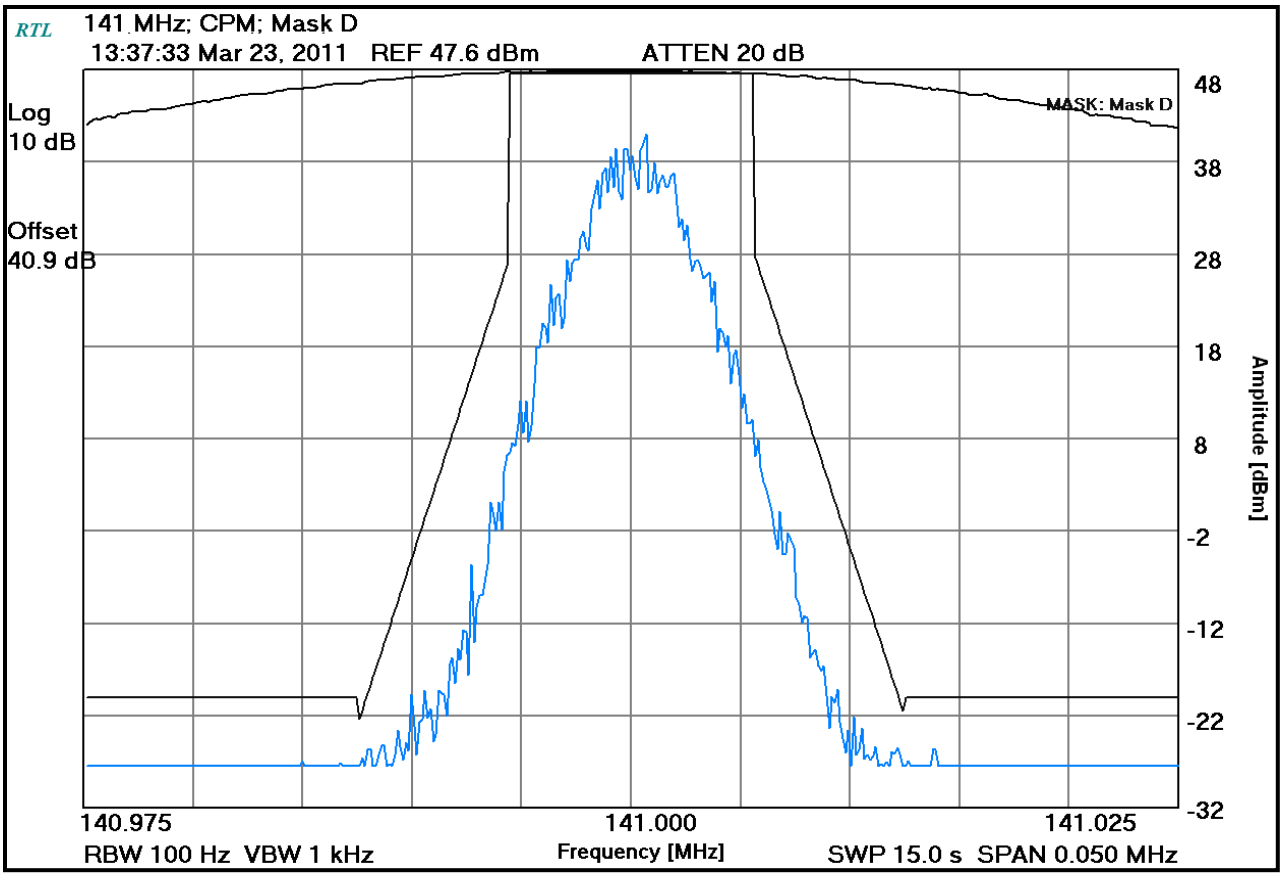
Plot 9-12: Occupied Bandwidth – 173.9875 MHz; P25; (Mask D)



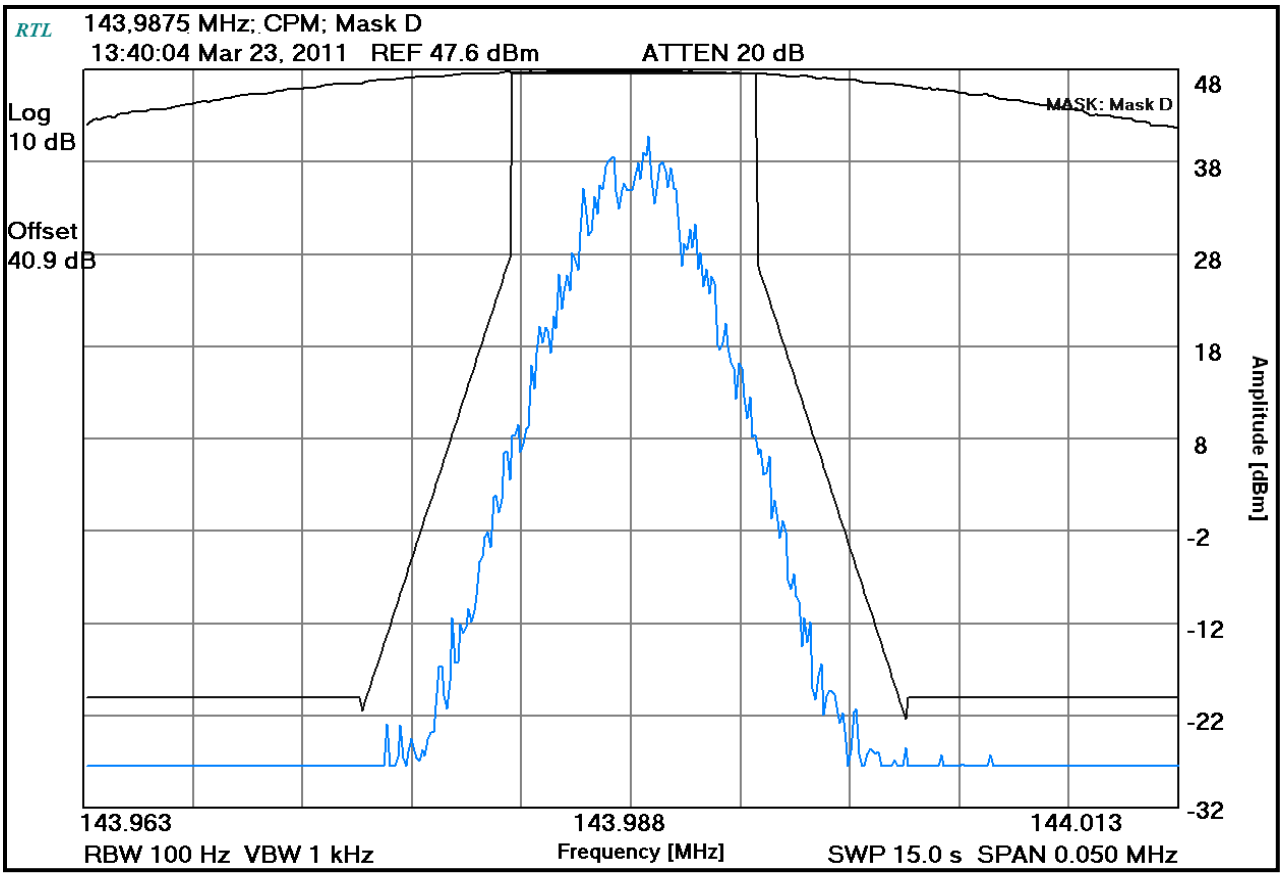
Plot 9-13: Occupied Bandwidth – 138.0125 MHz; CPM; (Mask D)



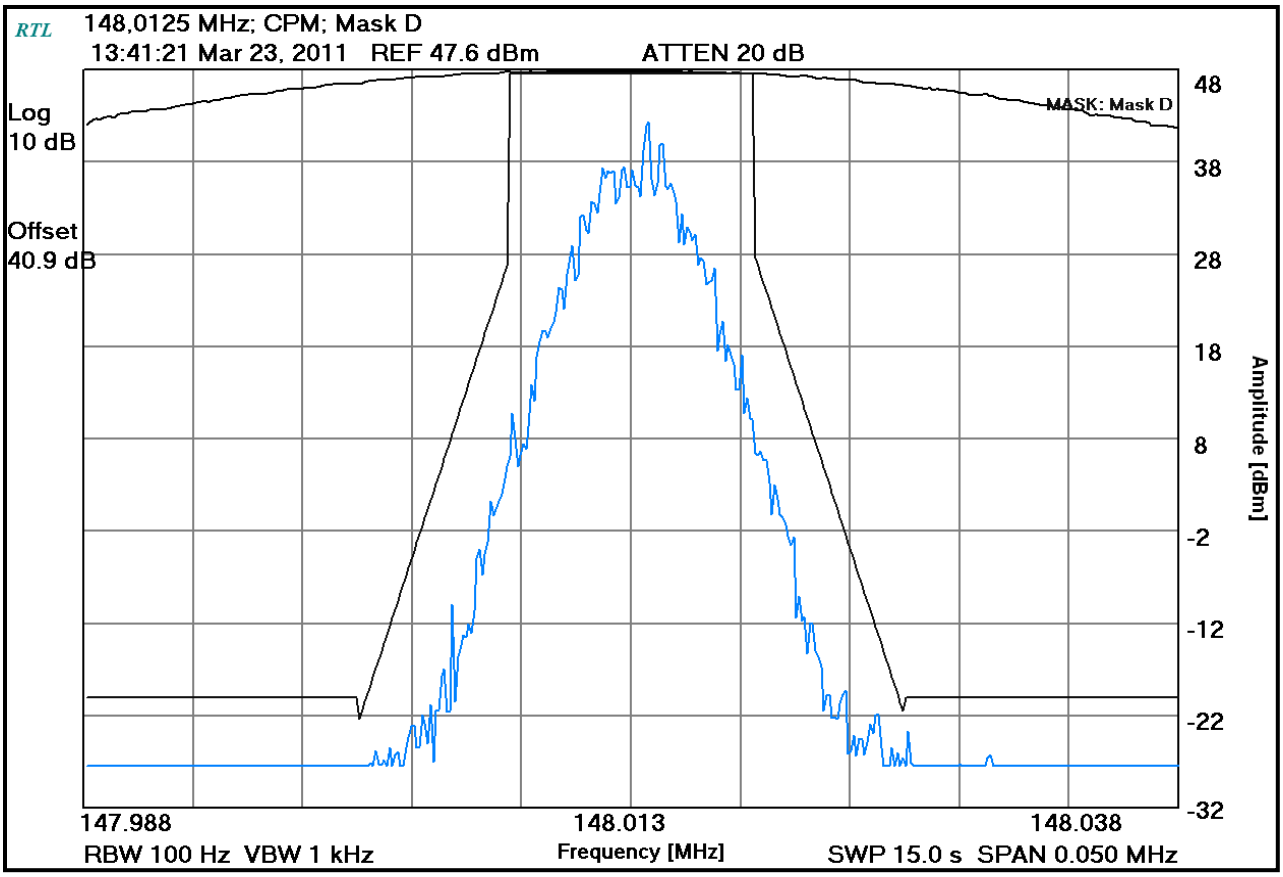
Plot 9-14: Occupied Bandwidth – 141.0000 MHz; CPM; (Mask D)



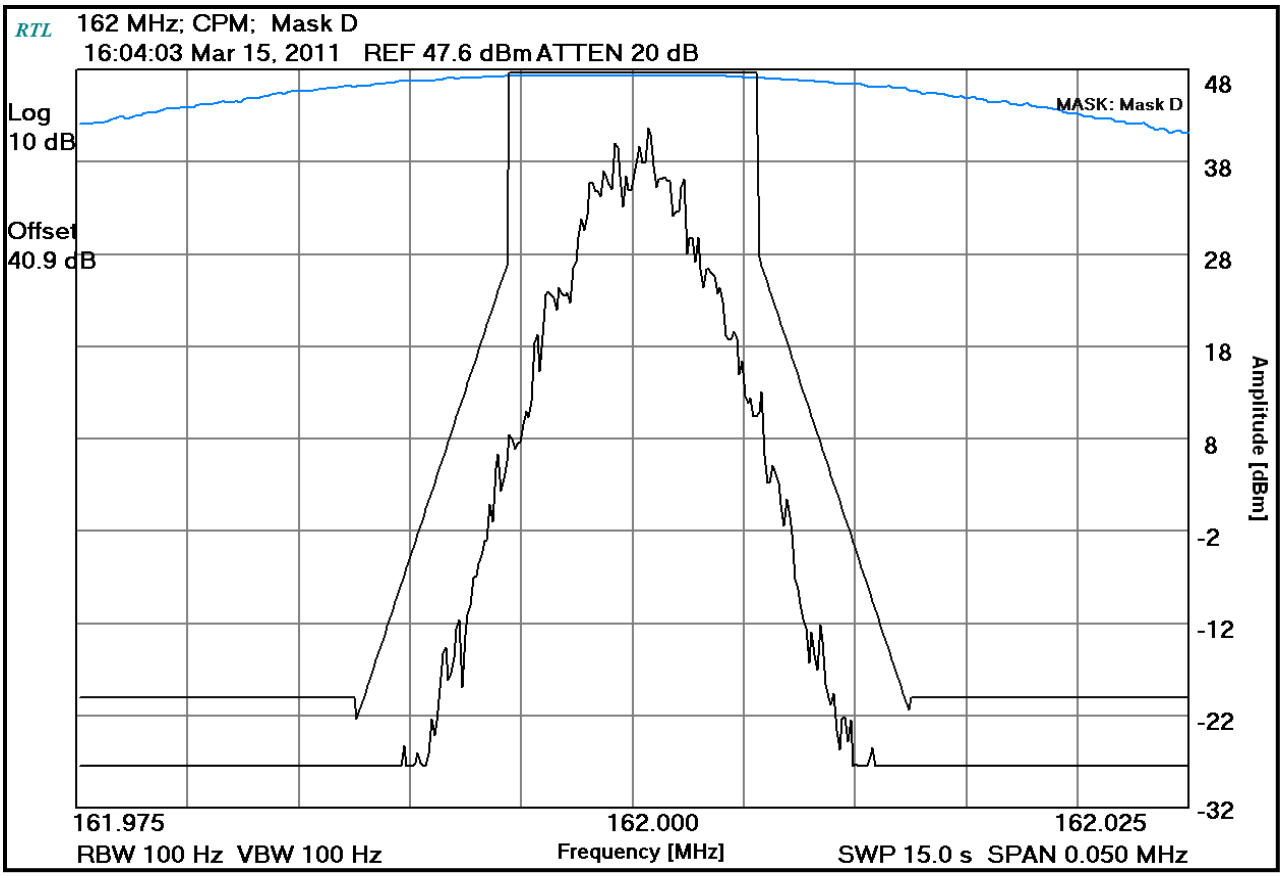
Plot 9-15: Occupied Bandwidth – 143.9875 MHz; CPM; (Mask D)



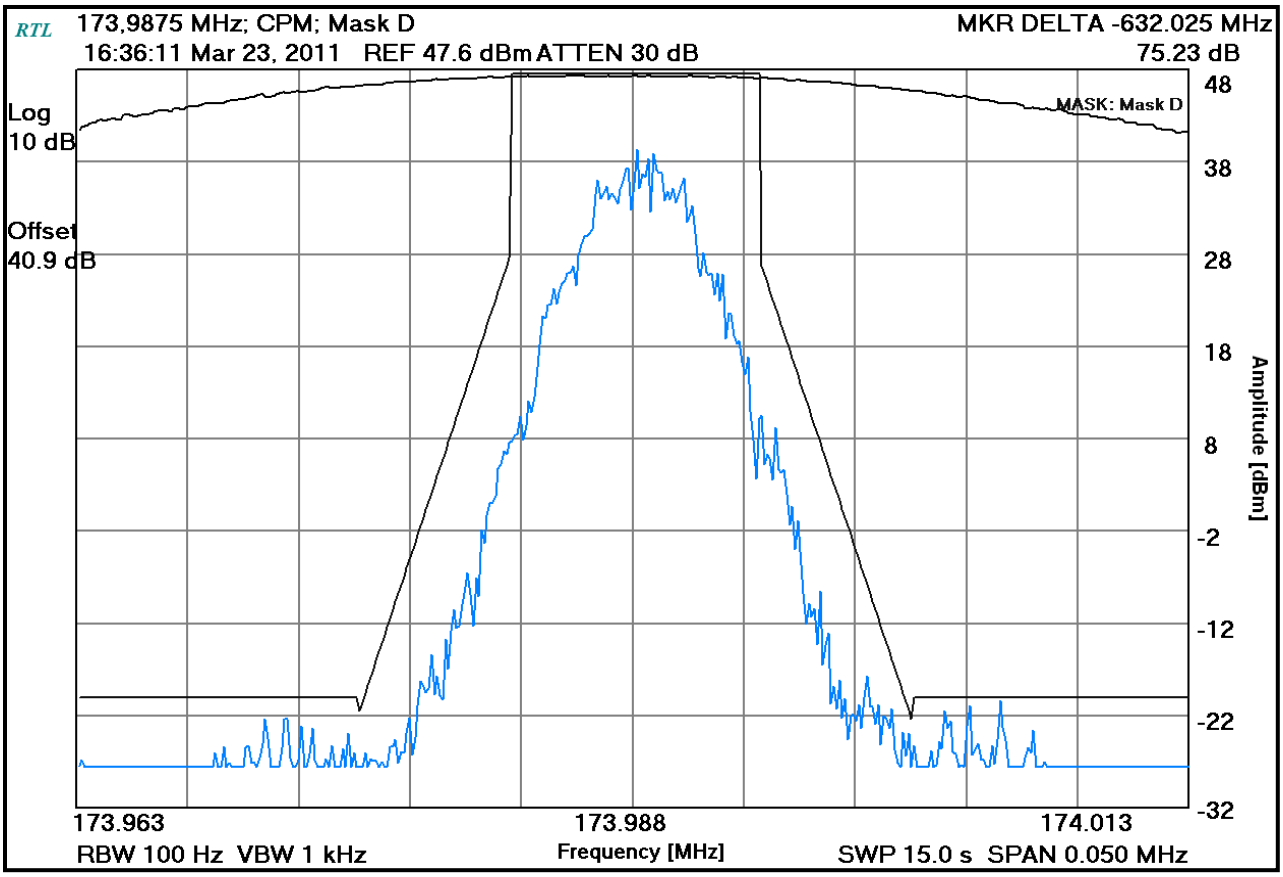
Plot 9-16: Occupied Bandwidth – 148.0125 MHz; CPM; (Mask D)



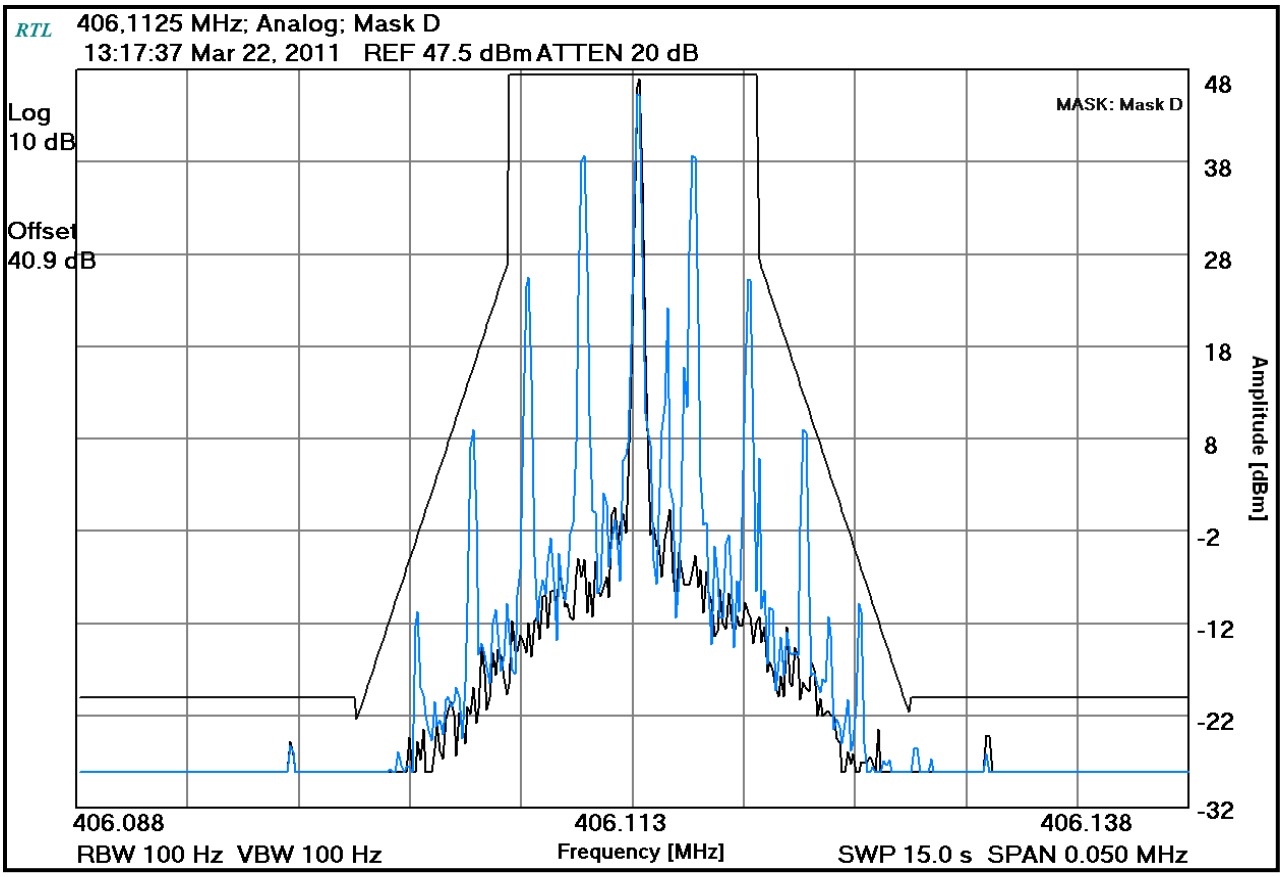
Plot 9-17: Occupied Bandwidth – 162.0000 MHz; CPM; (Mask D)



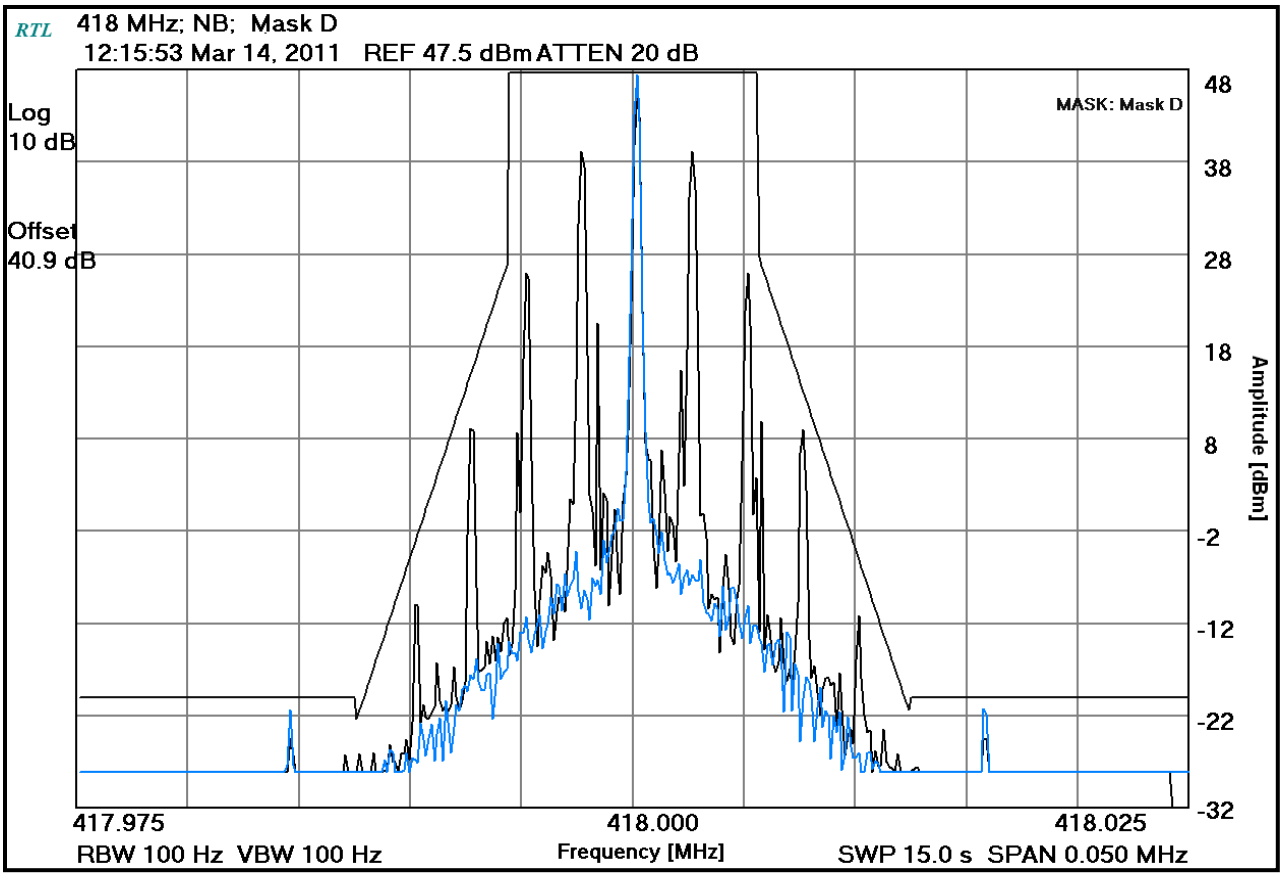
Plot 9-18: Occupied Bandwidth – 173.9875 MHz; CPM; (Mask D)



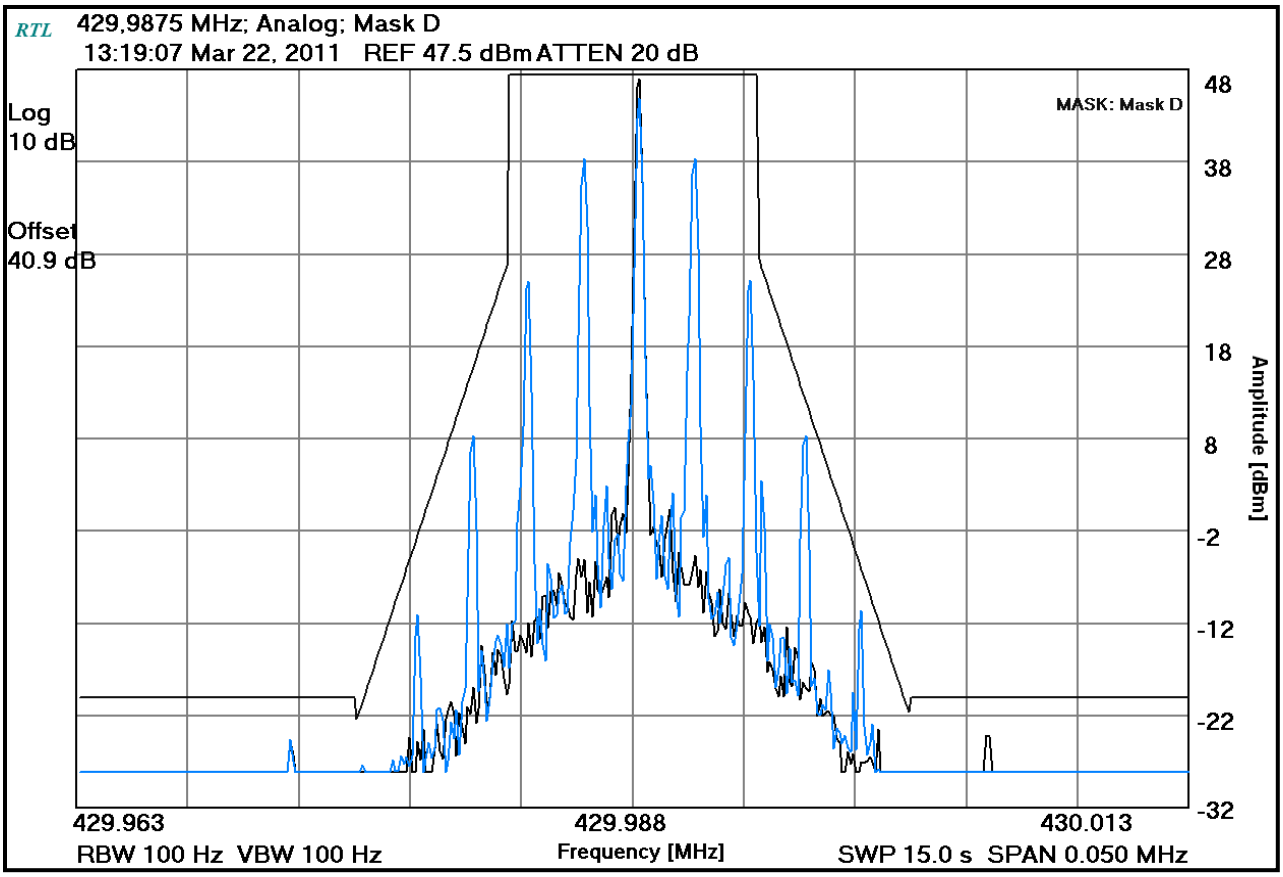
Plot 9-19: Occupied Bandwidth – 406.1125 MHz; Narrowband Analog; Mask D



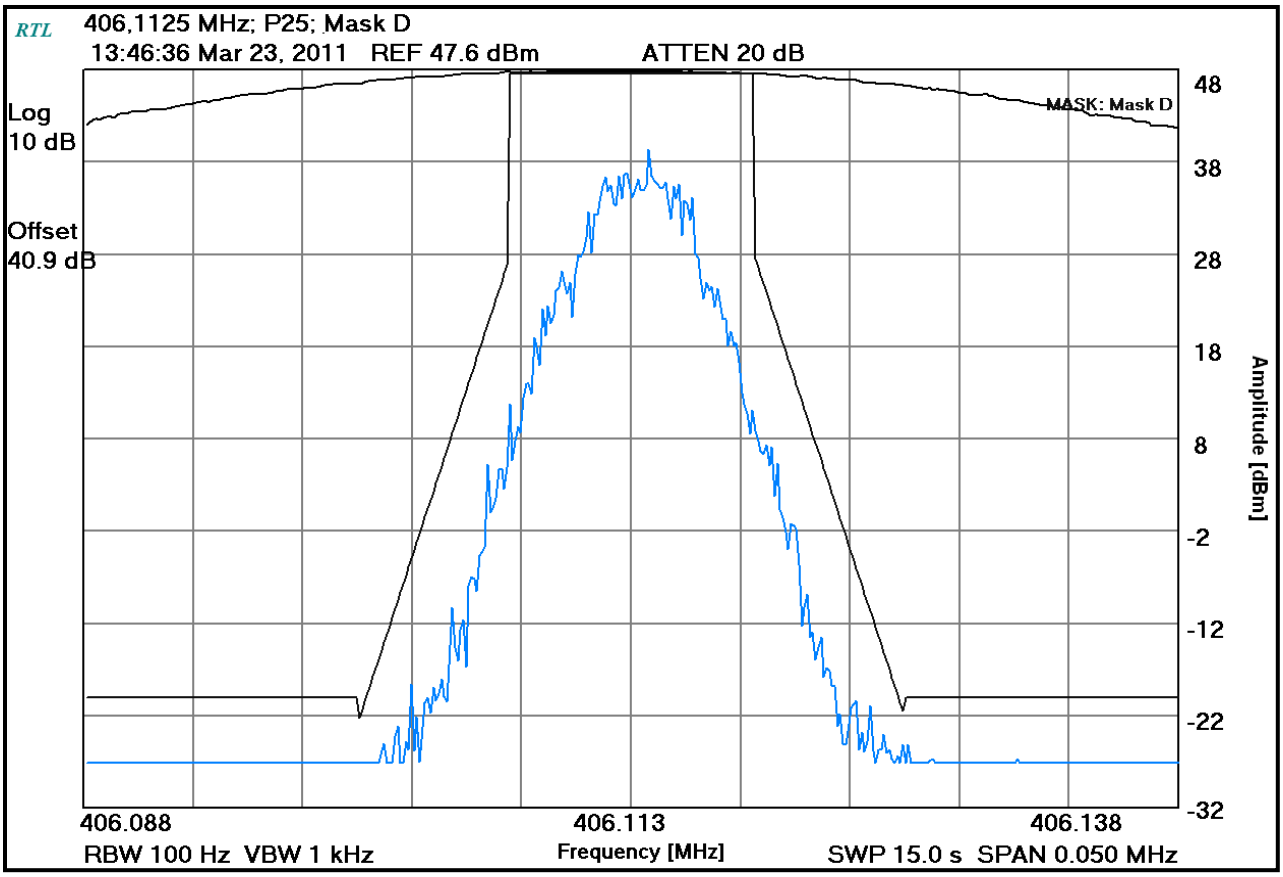
Plot 9-20: Occupied Bandwidth – 418.0000 MHz; Narrowband Analog; Mask D



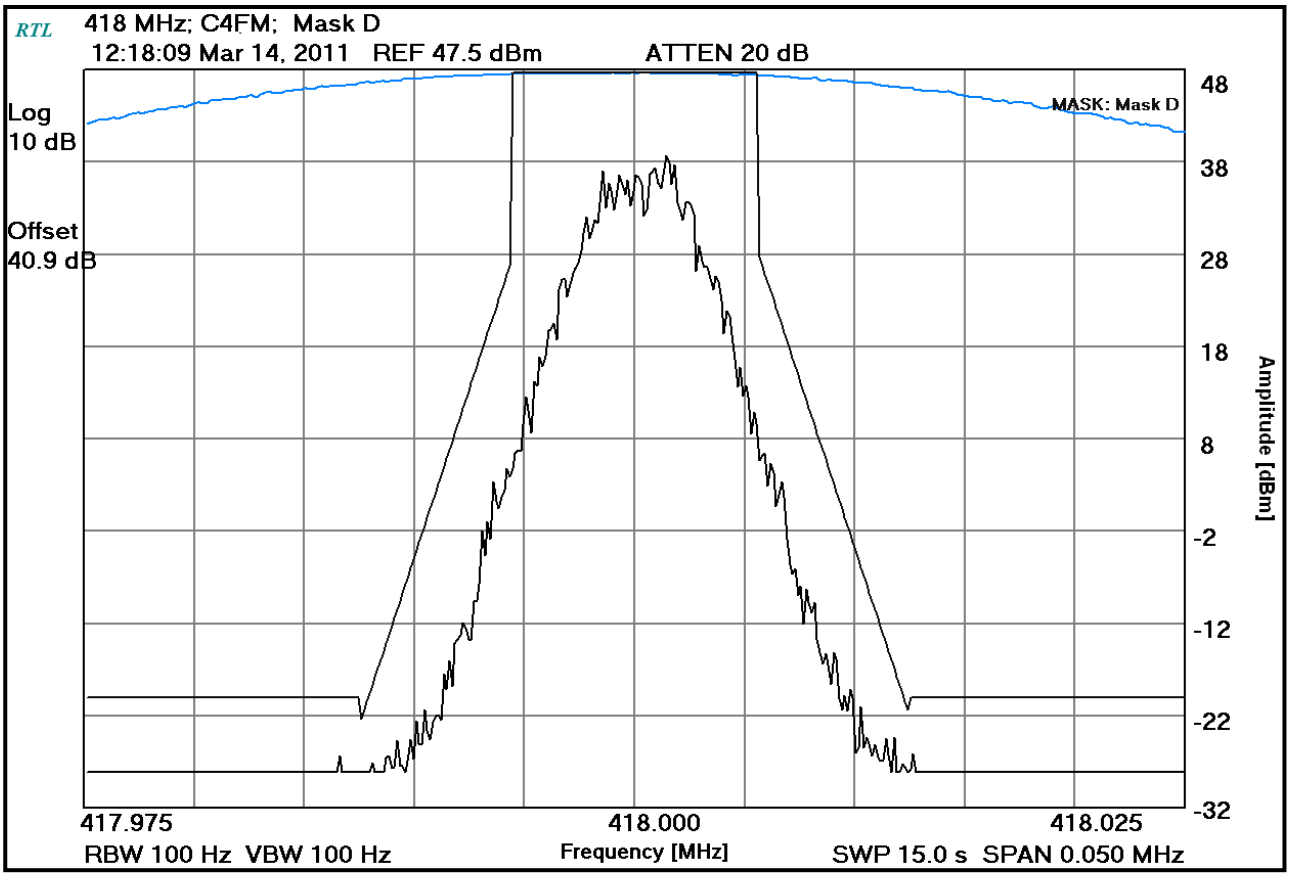
Plot 9-21: Occupied Bandwidth – 429.9875 MHz; Narrowband Analog; Mask D



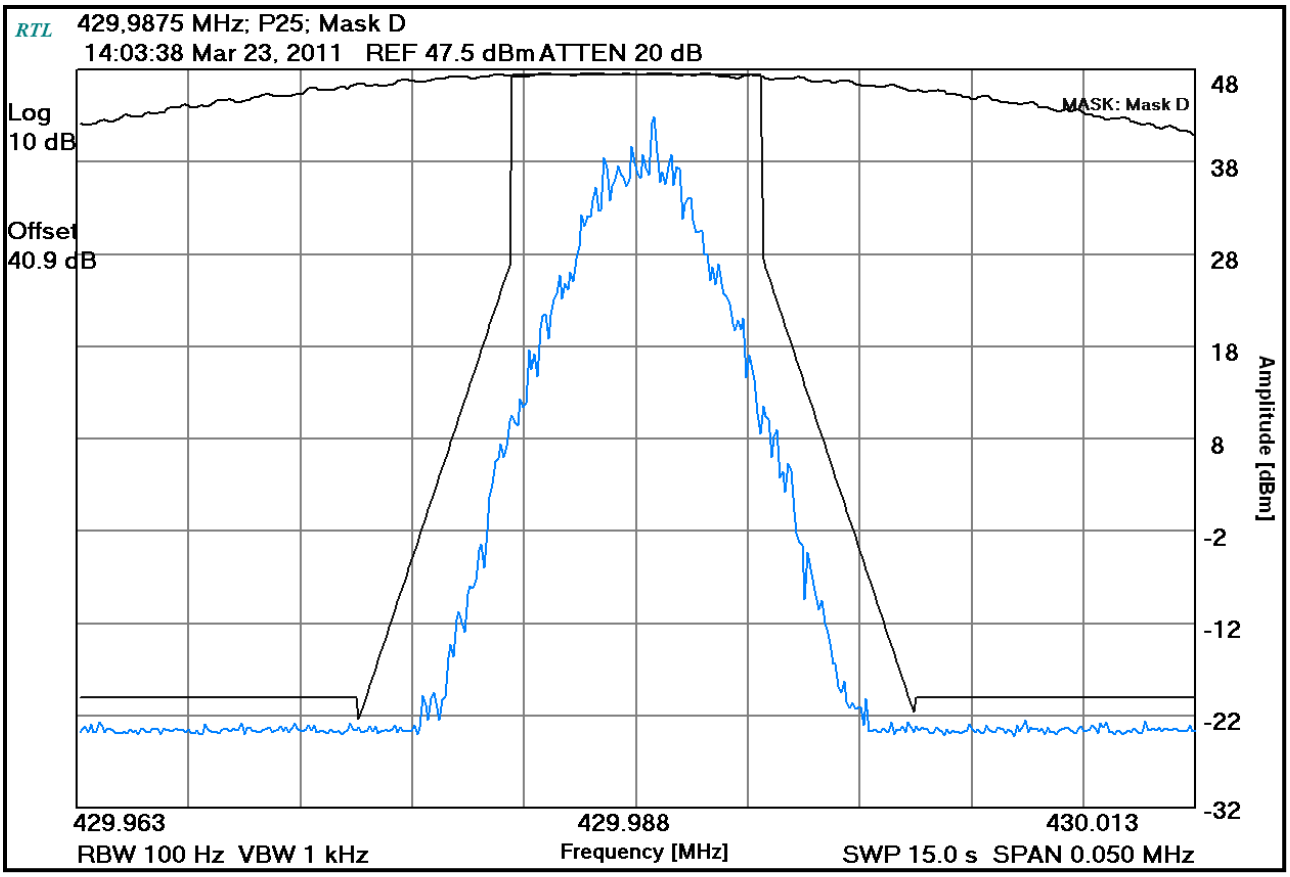
Plot 9-22: Occupied Bandwidth – 406.1125 MHz; P25; Mask D



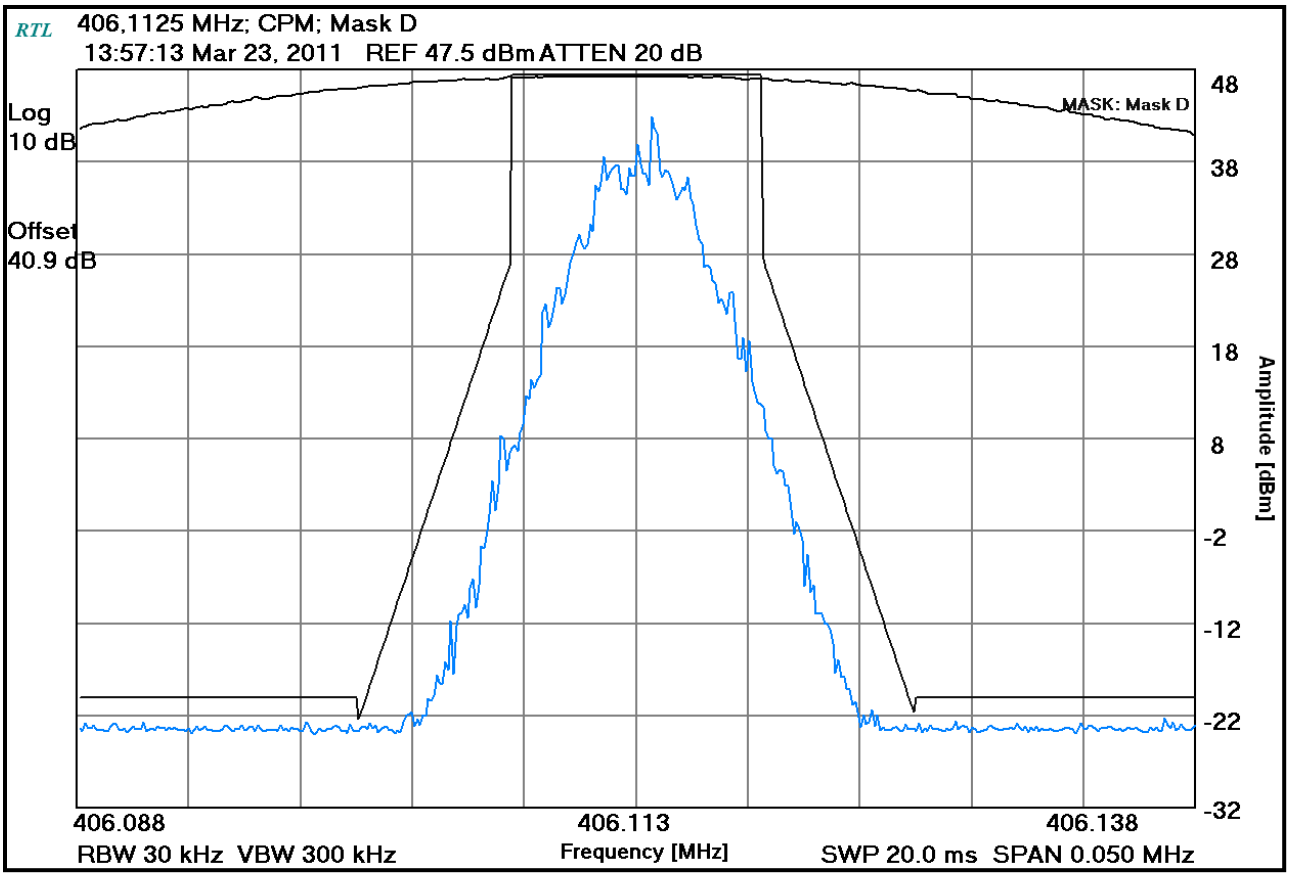
Plot 9-23: Occupied Bandwidth – 418.0000 MHz; P25; Mask D



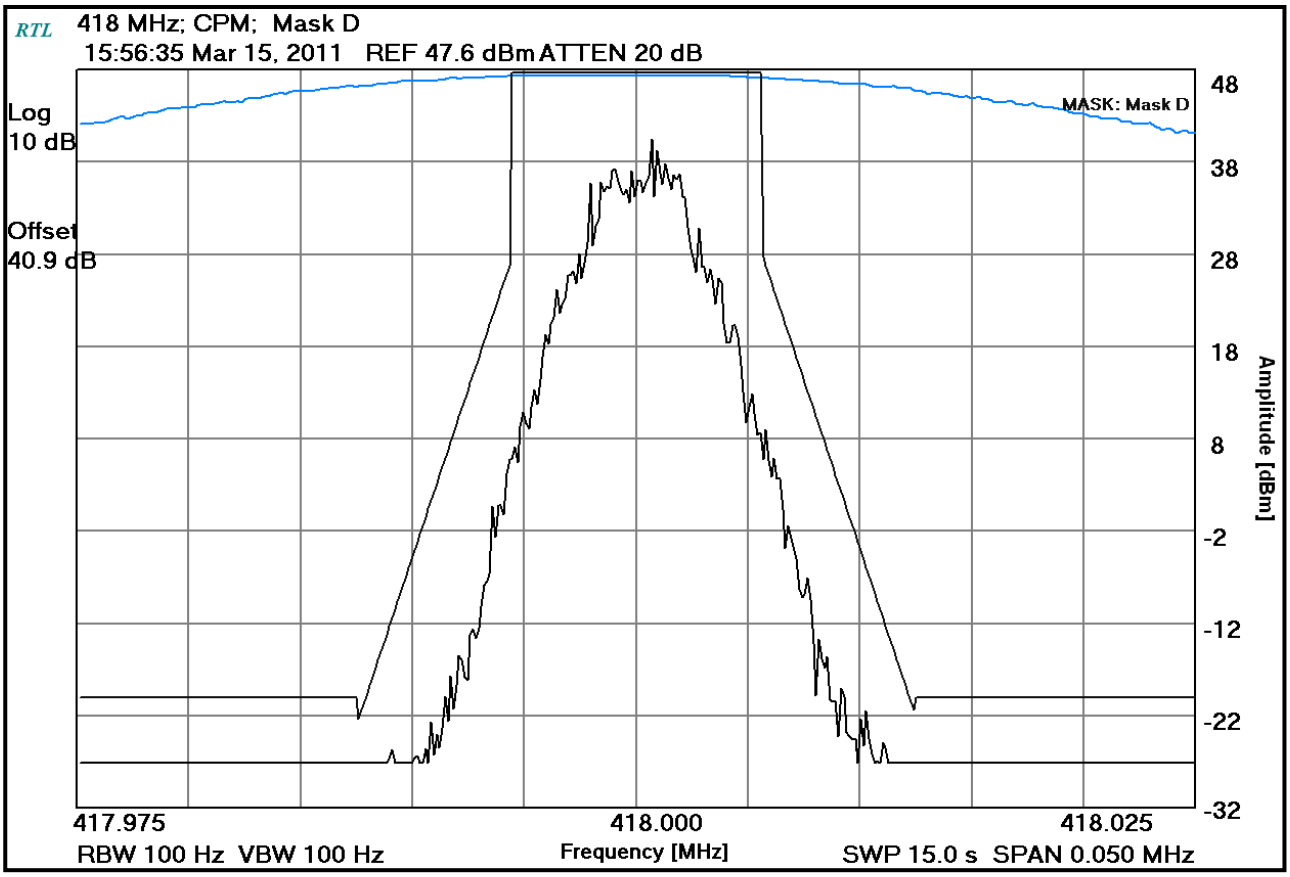
Plot 9-24: Occupied Bandwidth – 429.9875 MHz; P25; Mask D



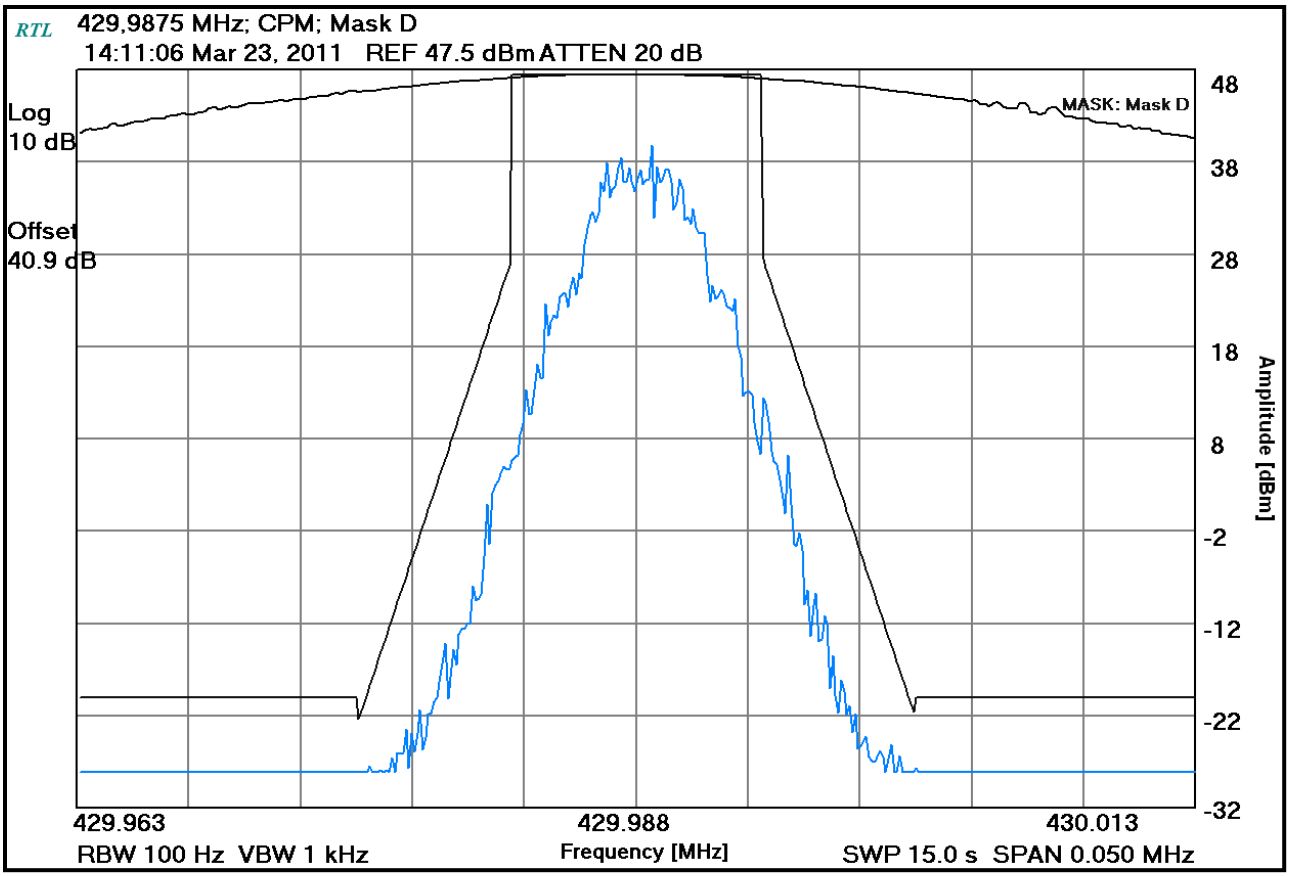
Plot 9-25: Occupied Bandwidth – 406.1125 MHz; CPM; Mask D



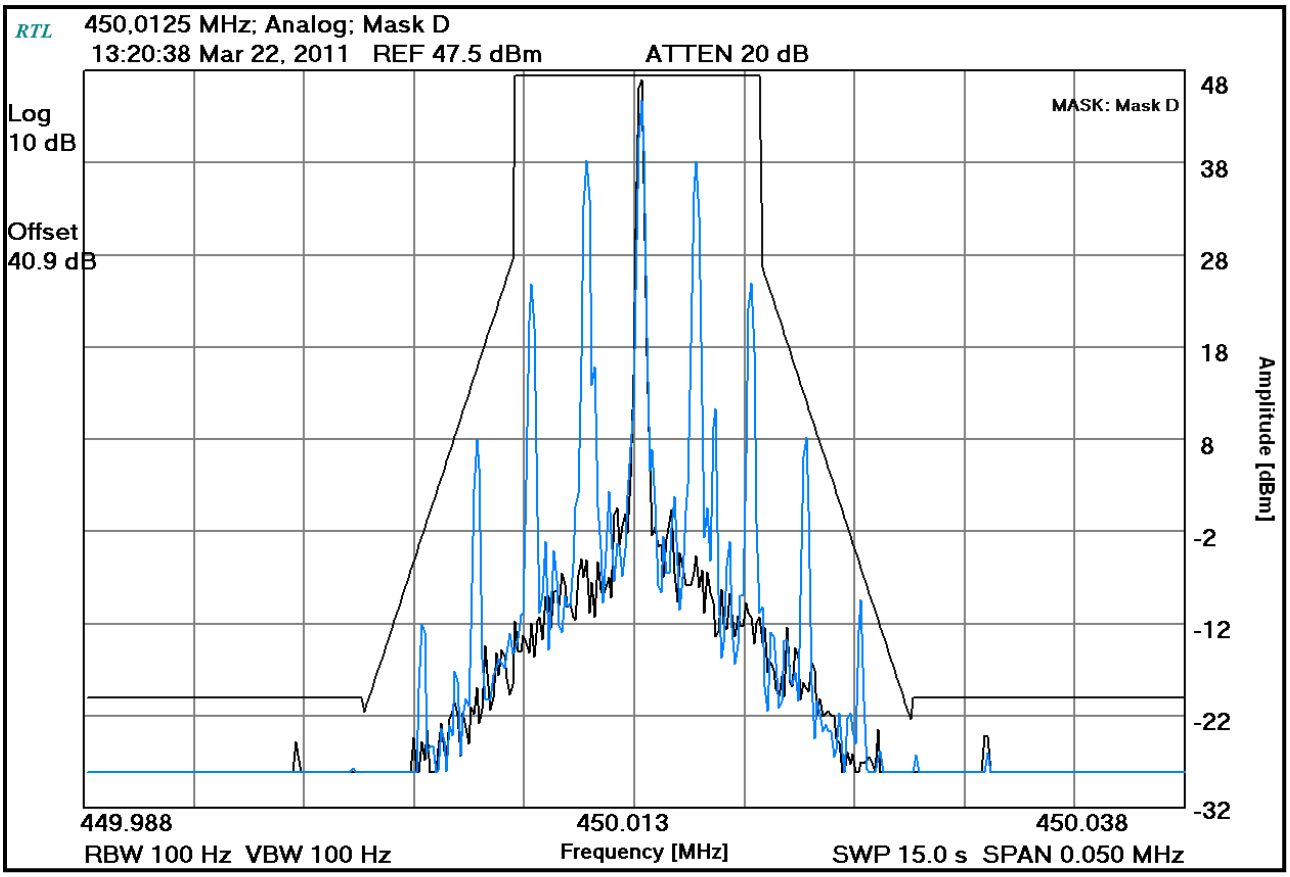
Plot 9-26: Occupied Bandwidth – 418.0000 MHz; CPM; Mask D



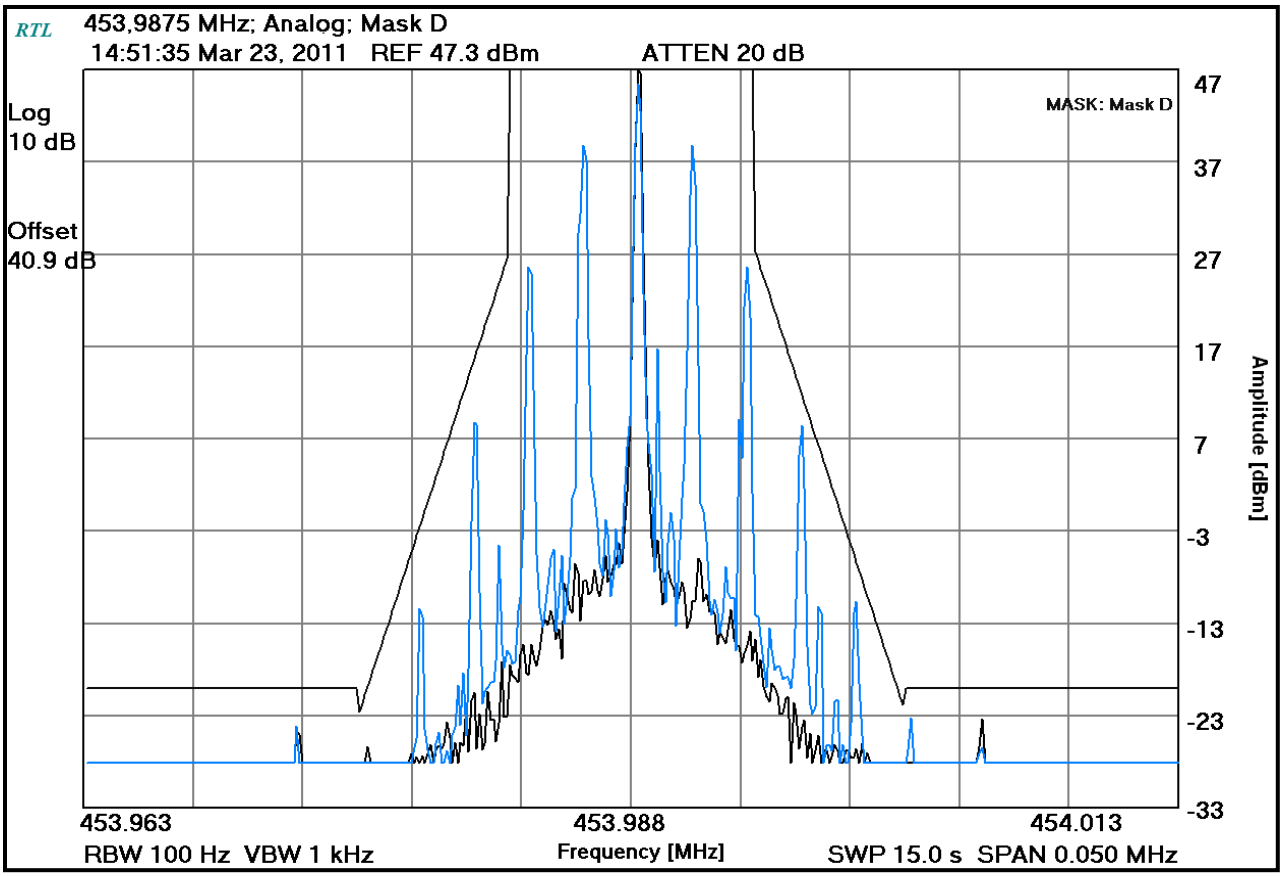
Plot 9-27: Occupied Bandwidth – 429.9875 MHz; CPM; Mask D



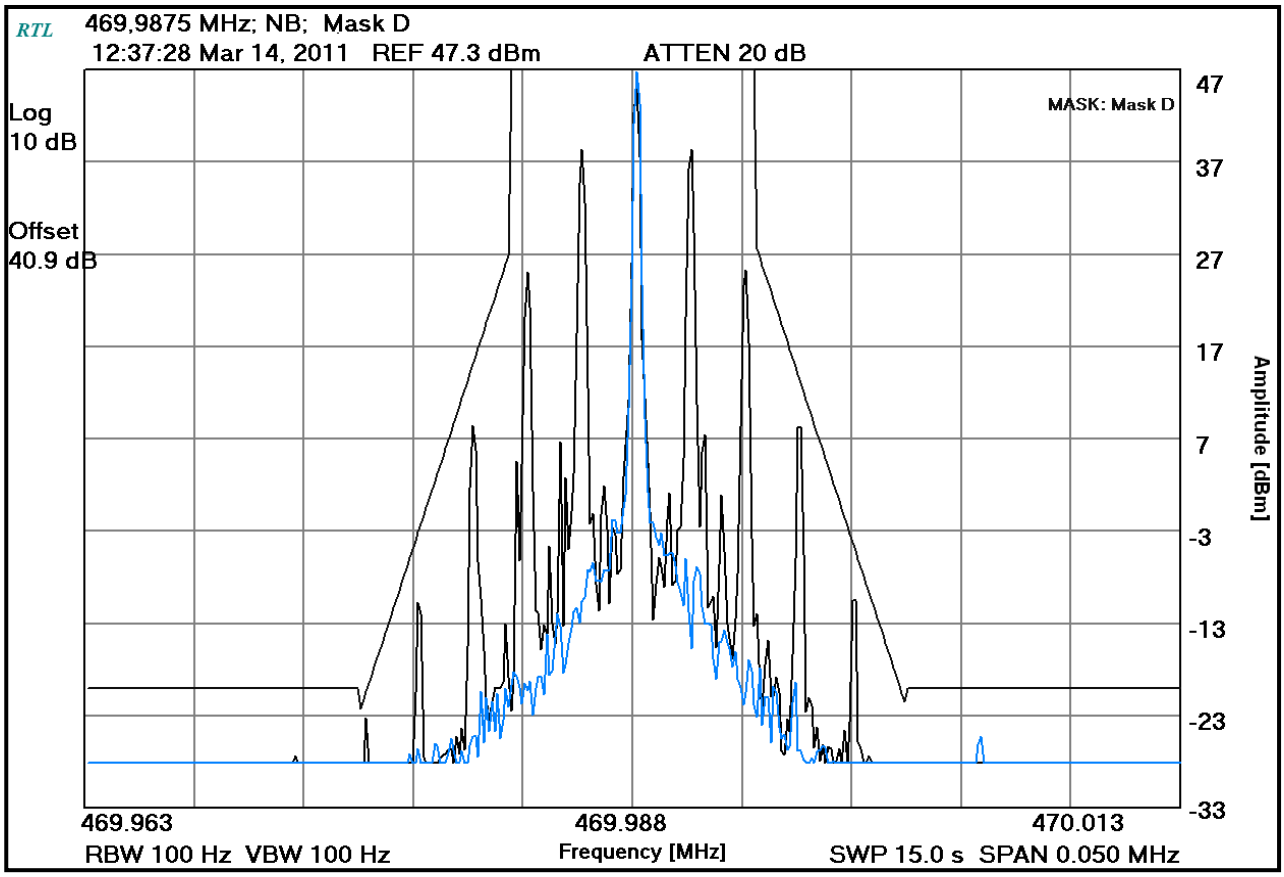
Plot 9-28: Occupied Bandwidth – 450.0125 MHz; Narrowband Analog; Mask D



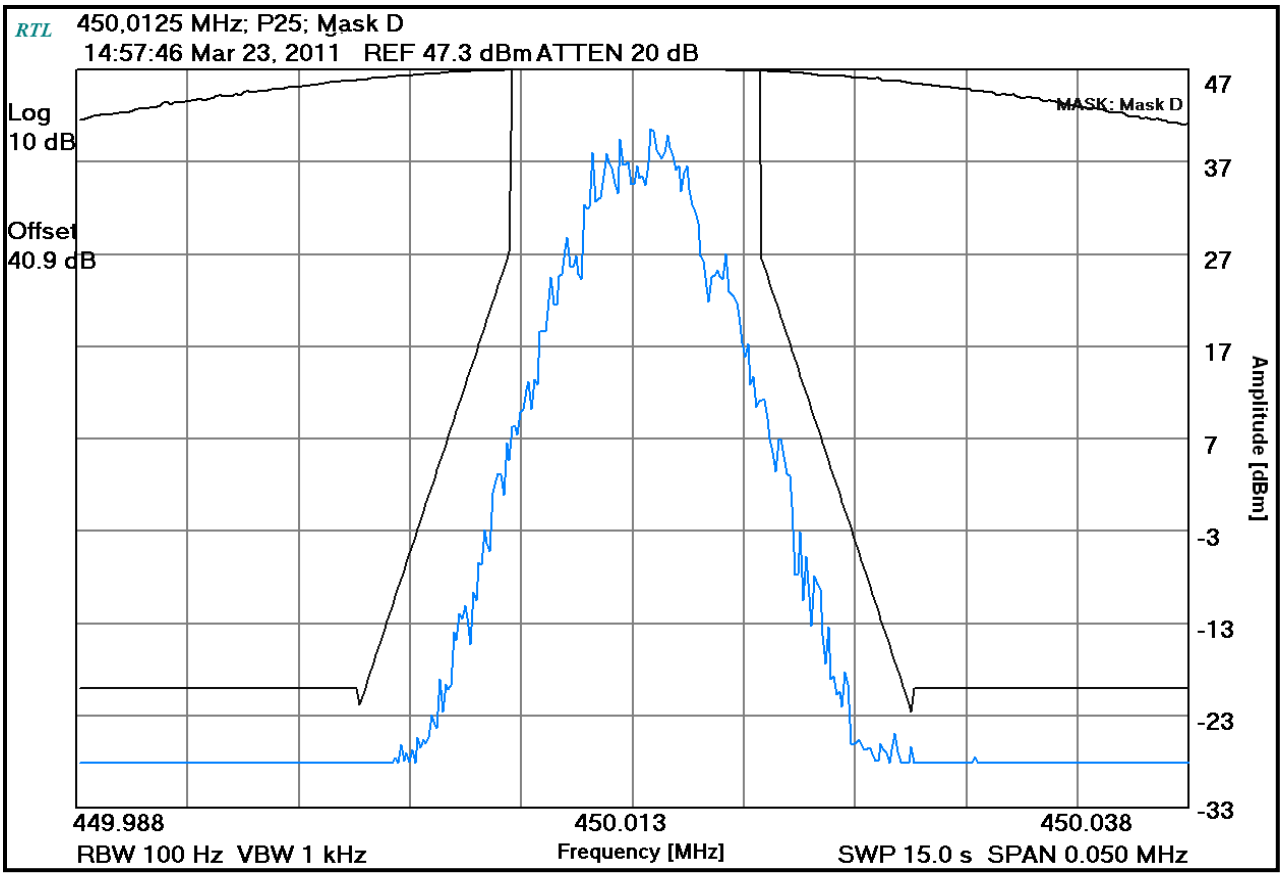
Plot 9-29: Occupied Bandwidth – 453.9875 MHz; Narrowband Analog; Mask D



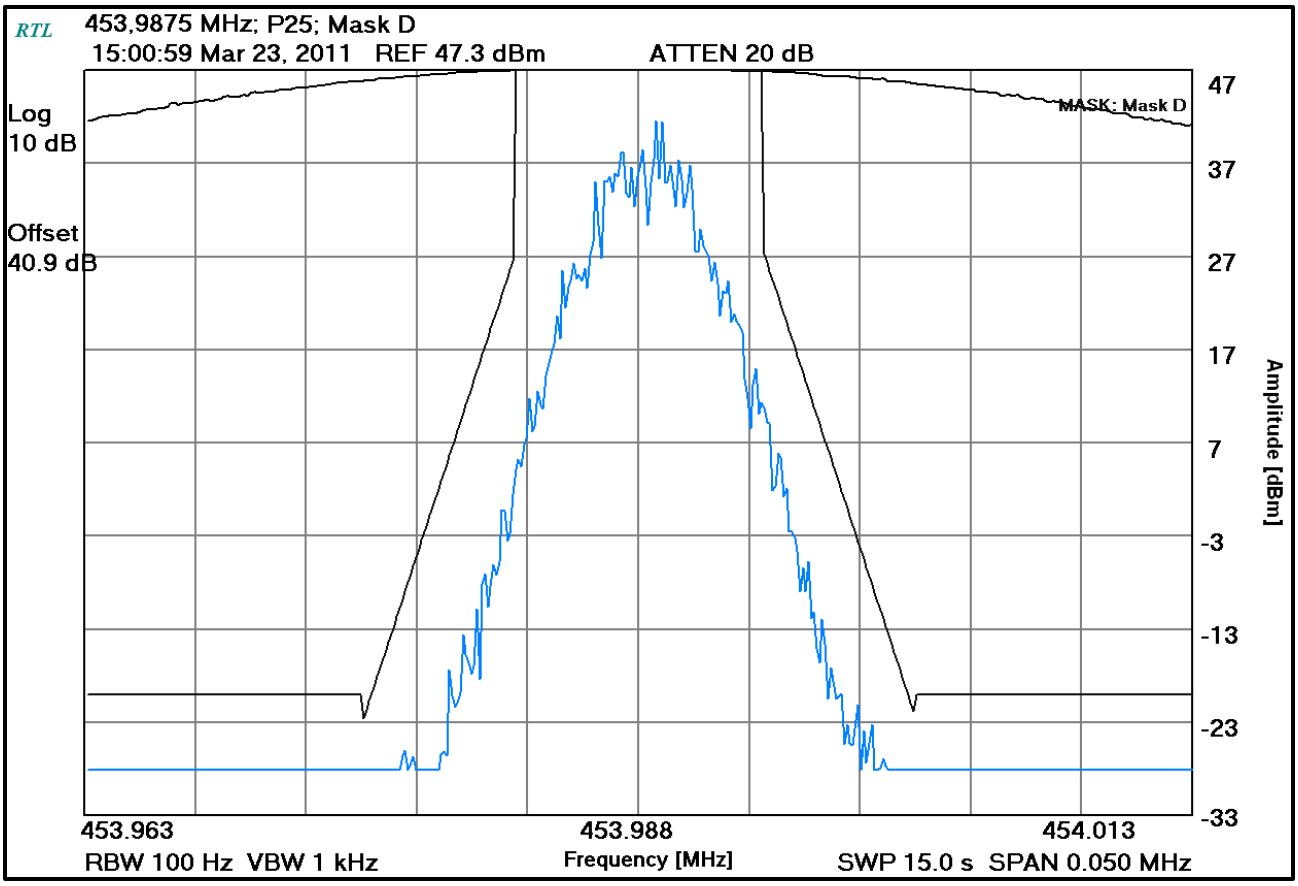
Plot 9-30: Occupied Bandwidth – 469.9875 MHz; Narrowband Analog; Mask D



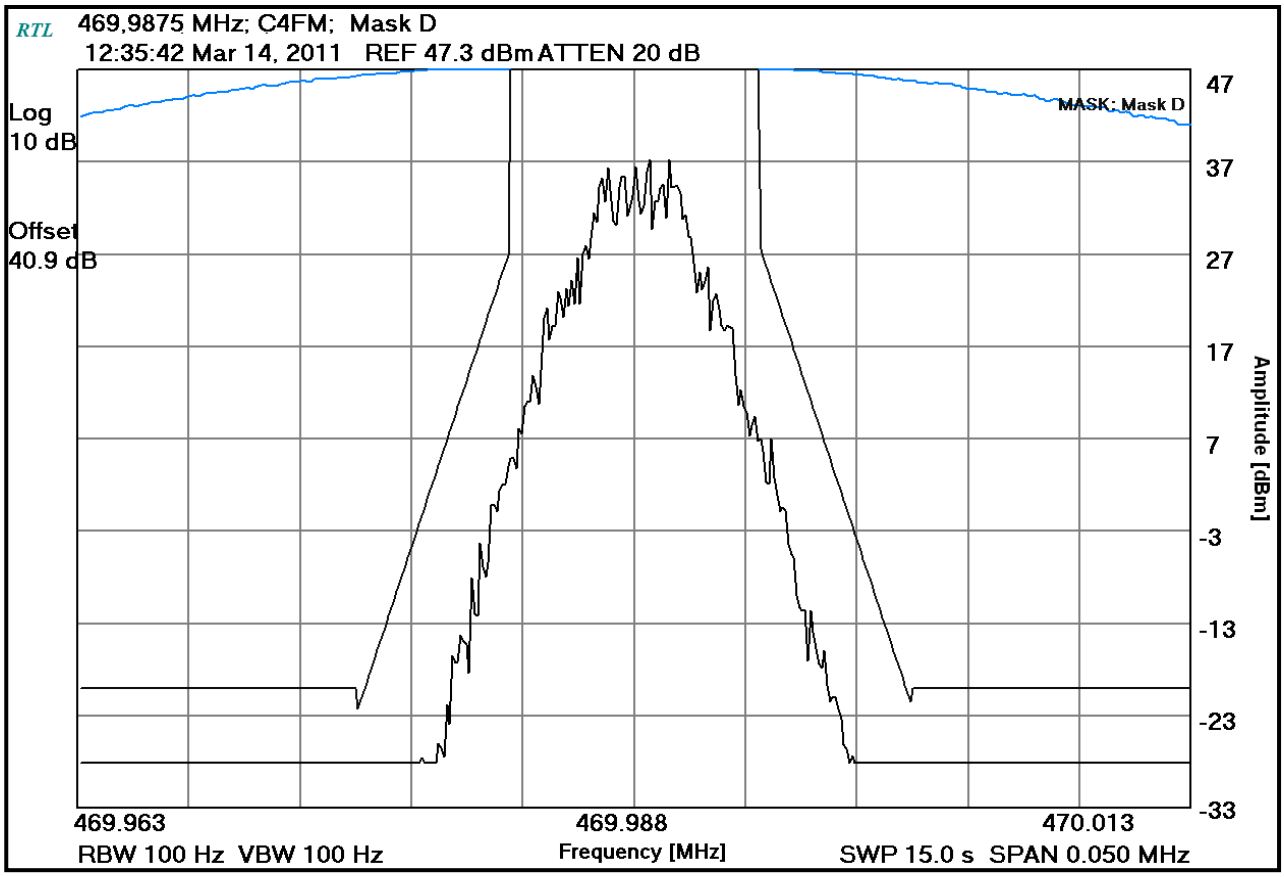
Plot 9-31: Occupied Bandwidth – 450.0125 MHz; P25; Mask D



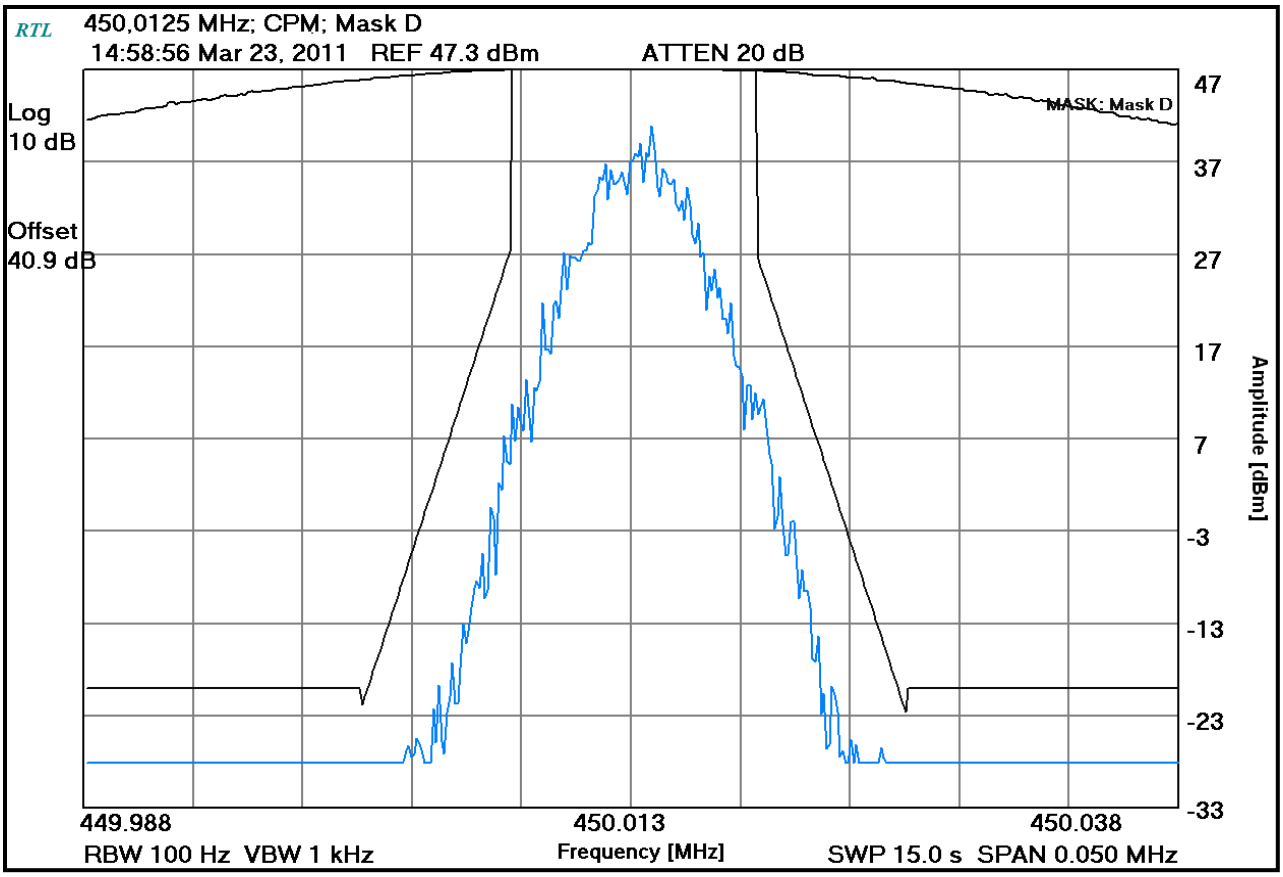
Plot 9-32: Occupied Bandwidth – 453.9875 MHz; P25; Mask D



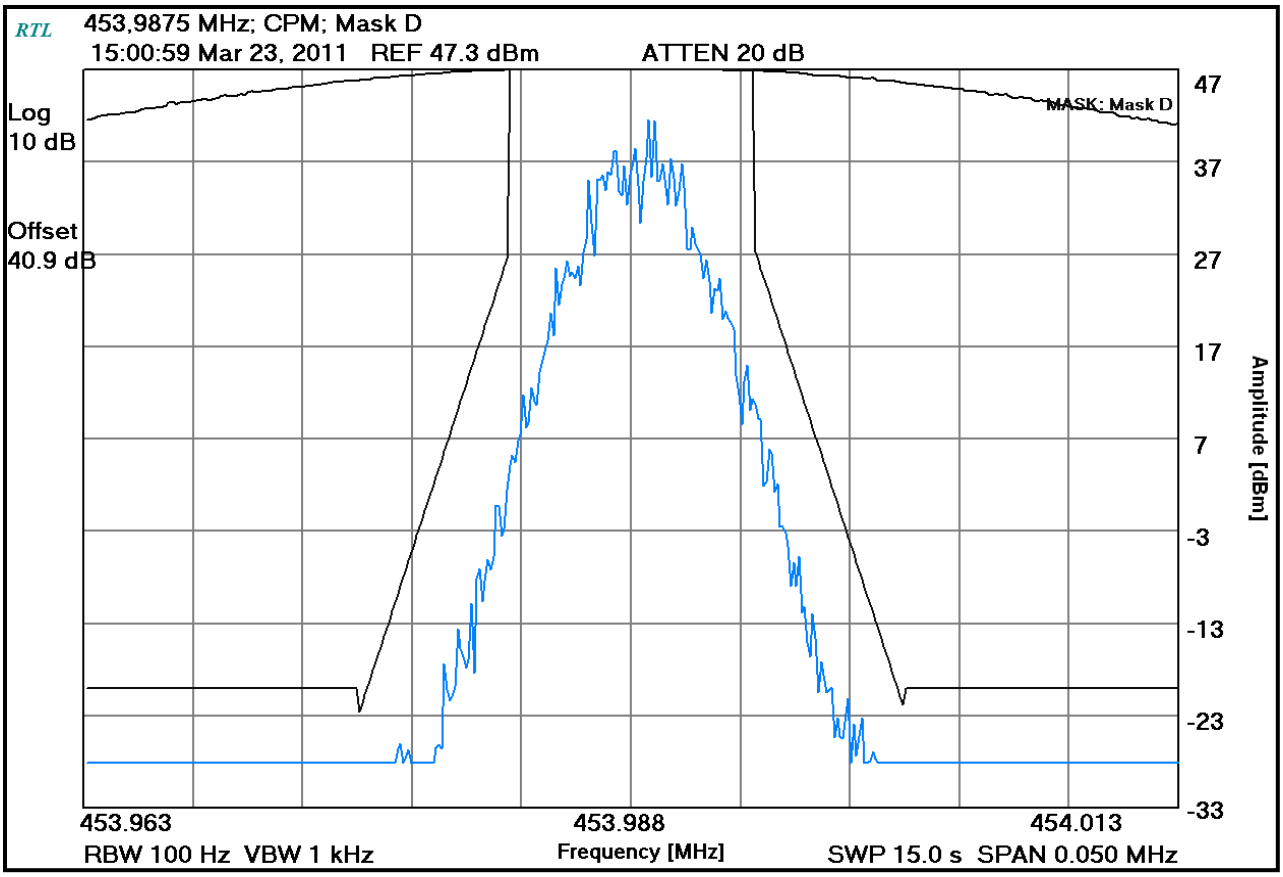
Plot 9-33: Occupied Bandwidth – 469.9875 MHz; P25; Mask D



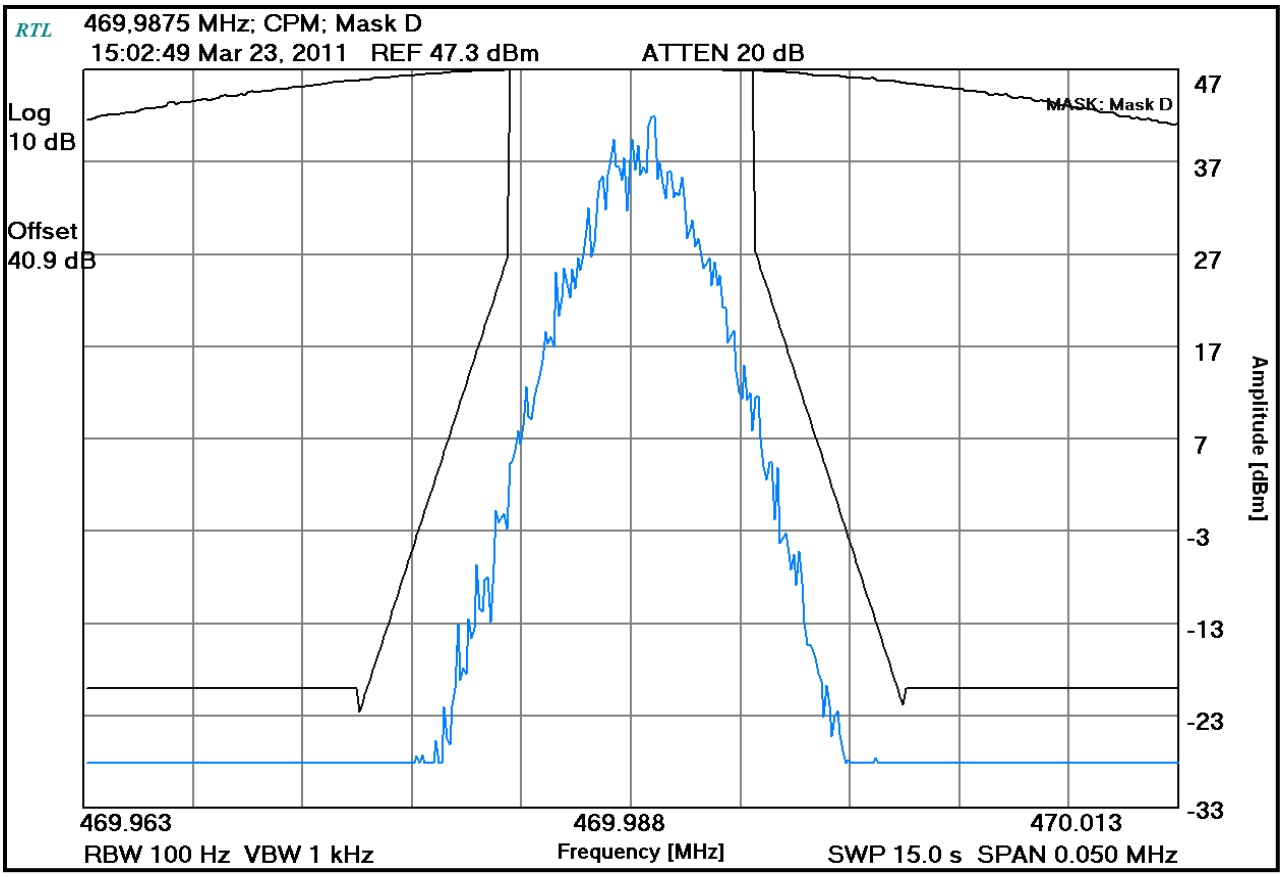
Plot 9-34: Occupied Bandwidth – 450.0125 MHz; CPM; Mask D



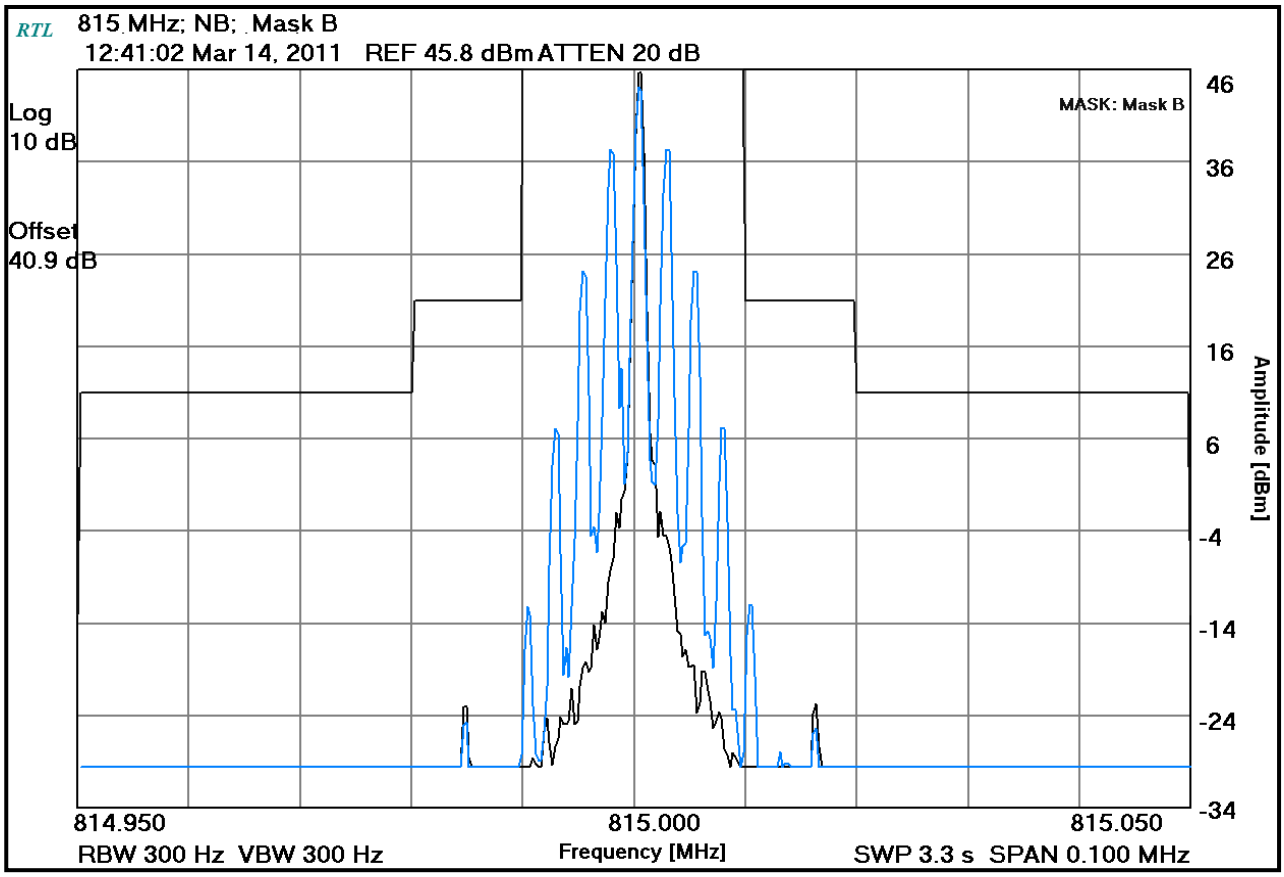
Plot 9-35: Occupied Bandwidth – 453.9875 MHz; CPM; Mask D



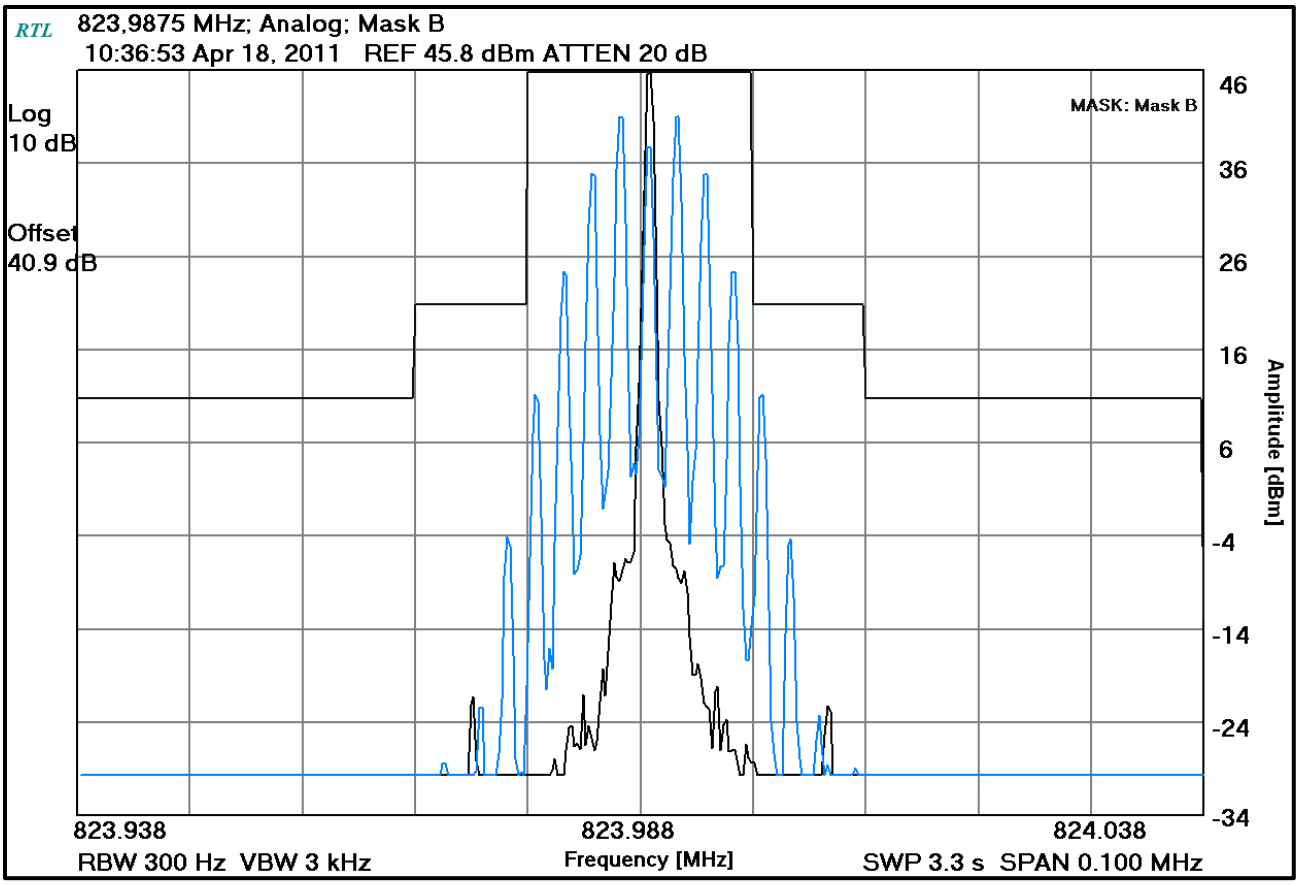
Plot 9-36: Occupied Bandwidth – 469.9875 MHz; CPM; Mask D



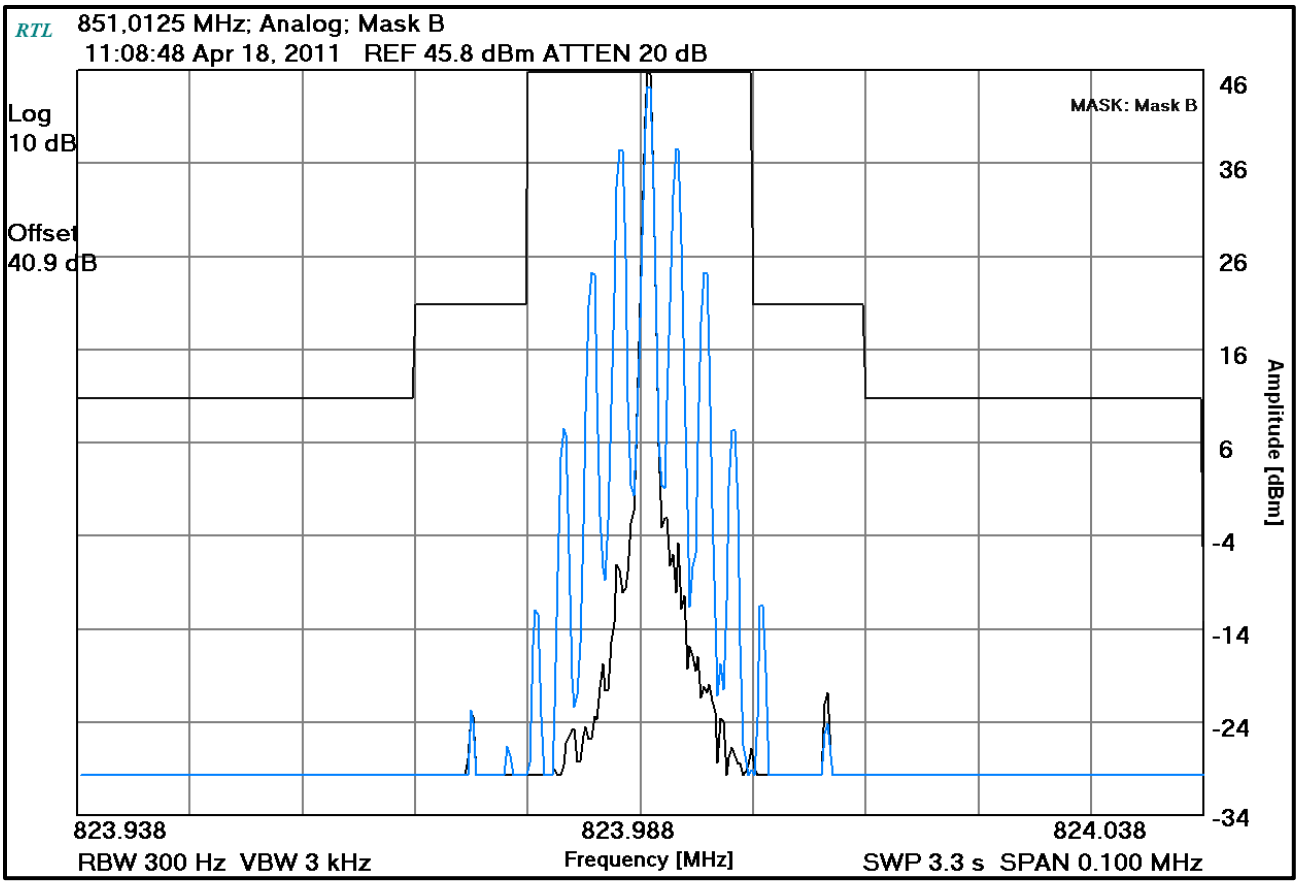
Plot 9-37: Occupied Bandwidth – 815.0000 MHz; Narrowband Analog; Mask B



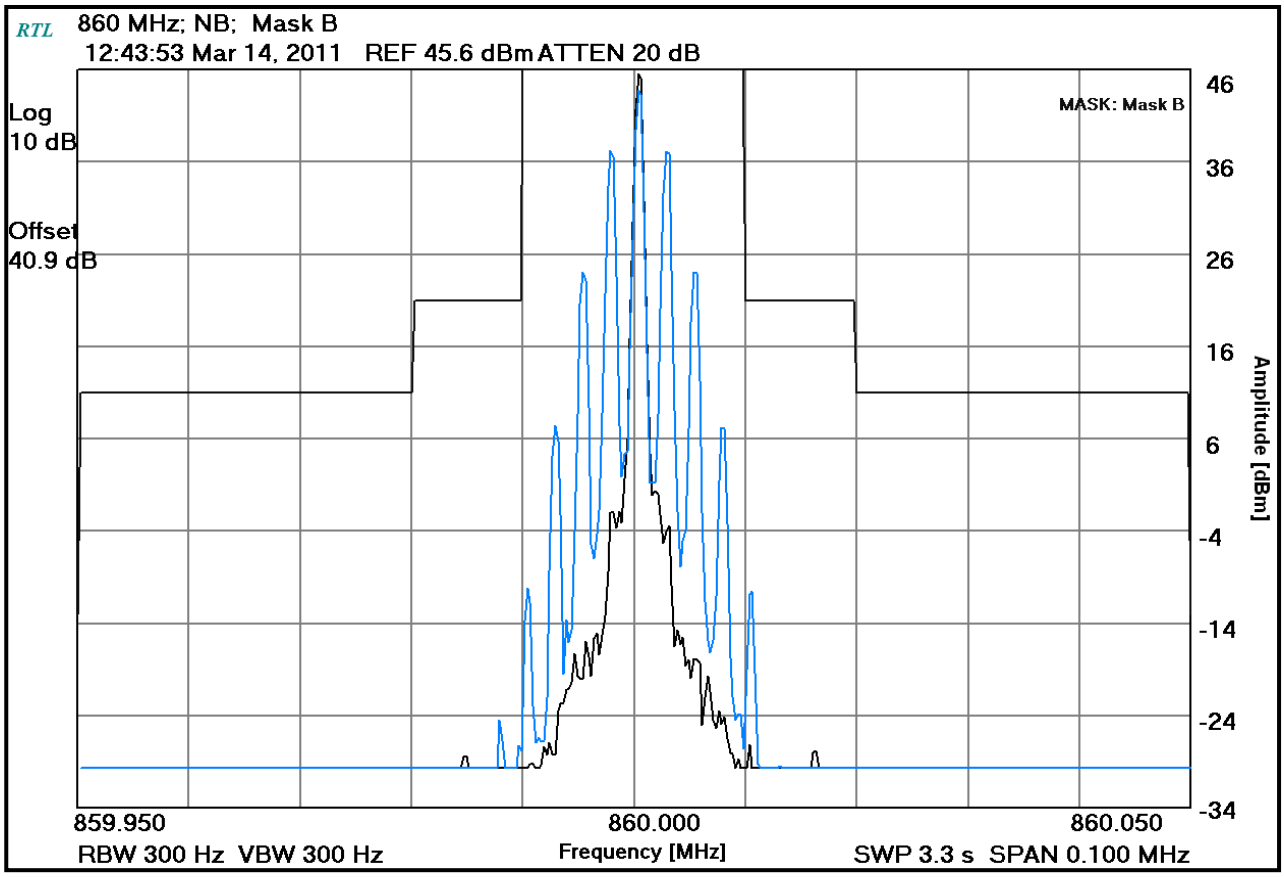
Plot 9-38: Occupied Bandwidth – 823.9875 MHz; Narrowband Analog; Mask B



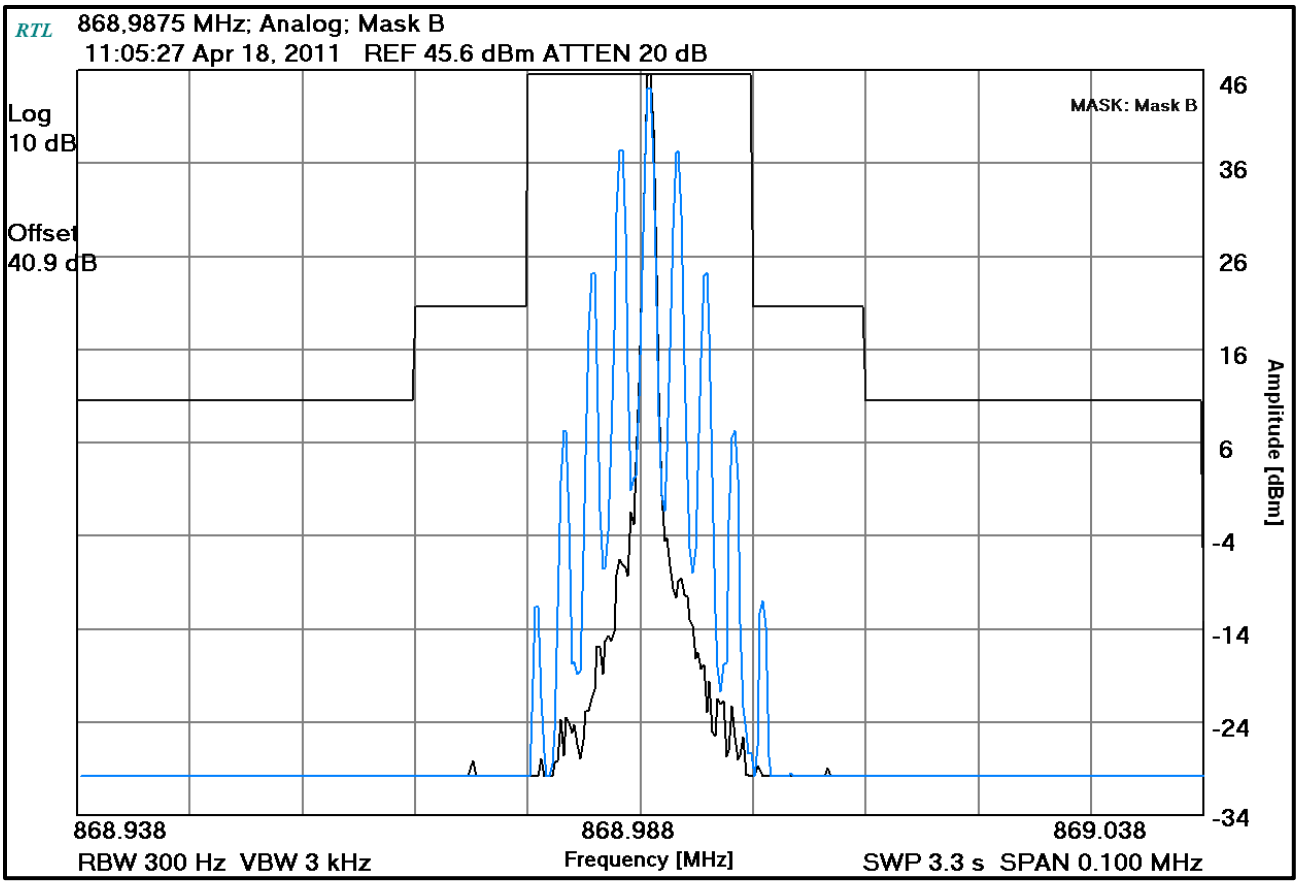
Plot 9-39: Occupied Bandwidth – 851.0125 MHz; Narrowband Analog; Mask B



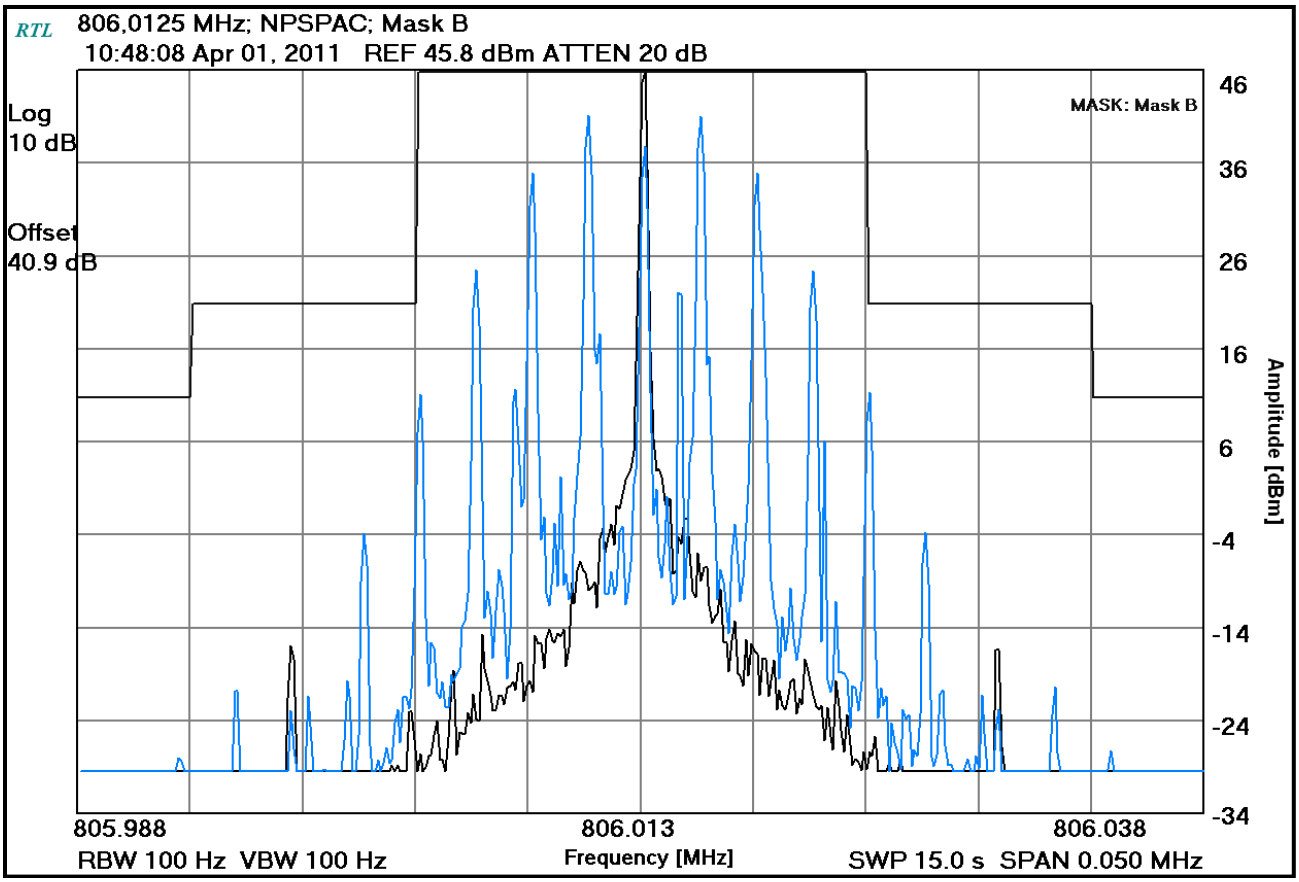
Plot 9-40: Occupied Bandwidth – 860.0000 MHz; Narrowband Analog; Mask B



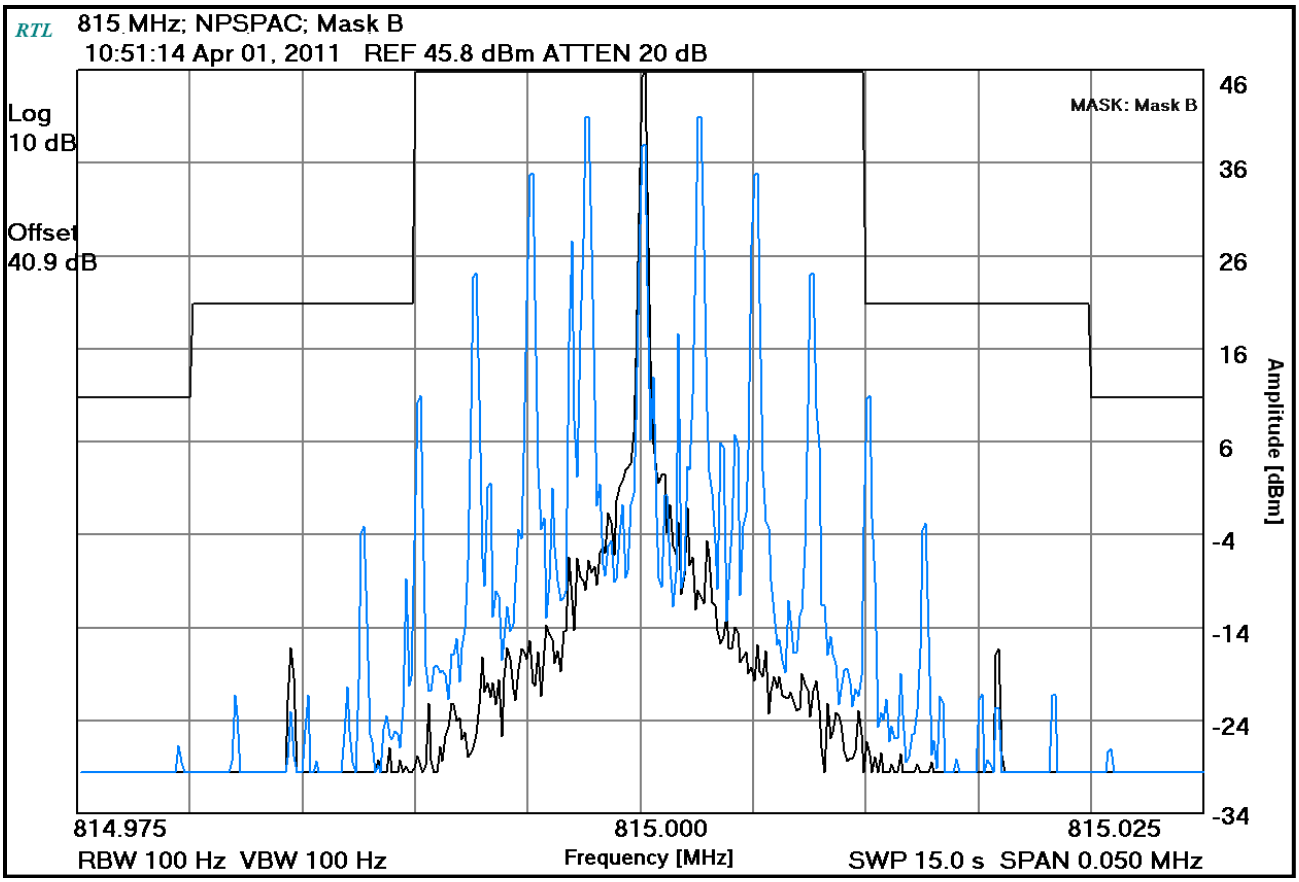
Plot 9-41: Occupied Bandwidth – 868.9875 MHz; Narrowband Analog; Mask B



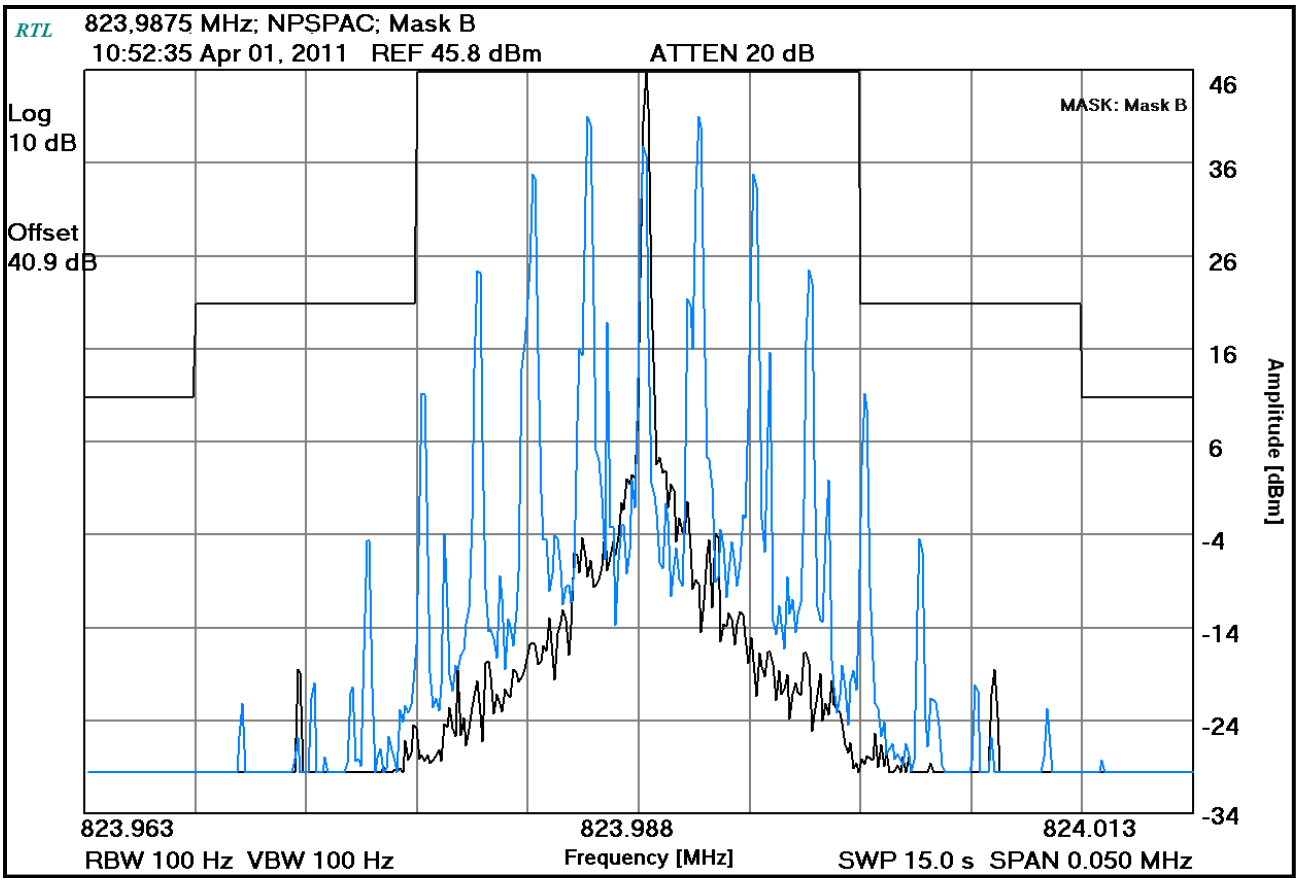
Plot 9-42: Occupied Bandwidth – 806.0125 MHz; NPSPAC; Mask B



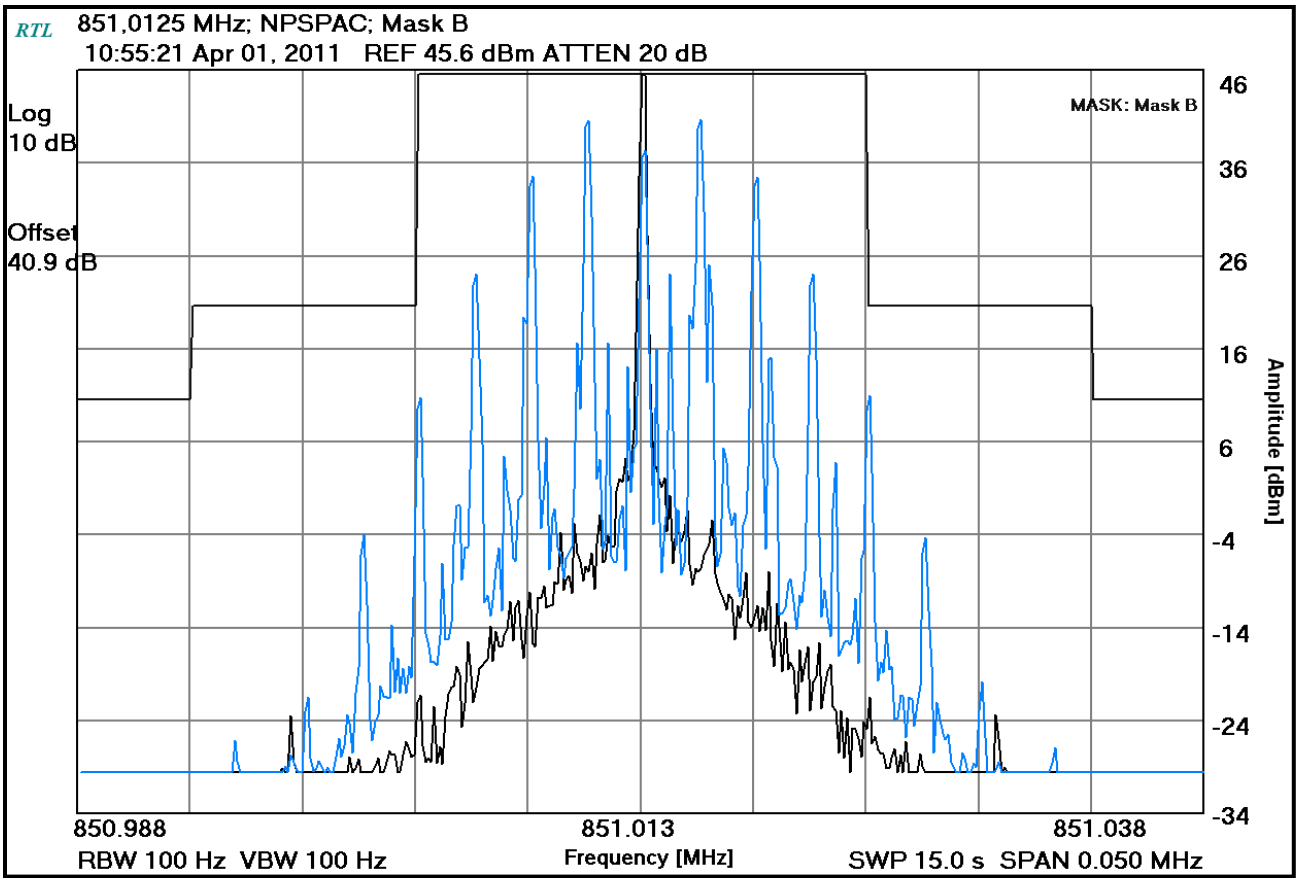
Plot 9-43: Occupied Bandwidth – 815.0000 MHz; NPSPAC; Mask B



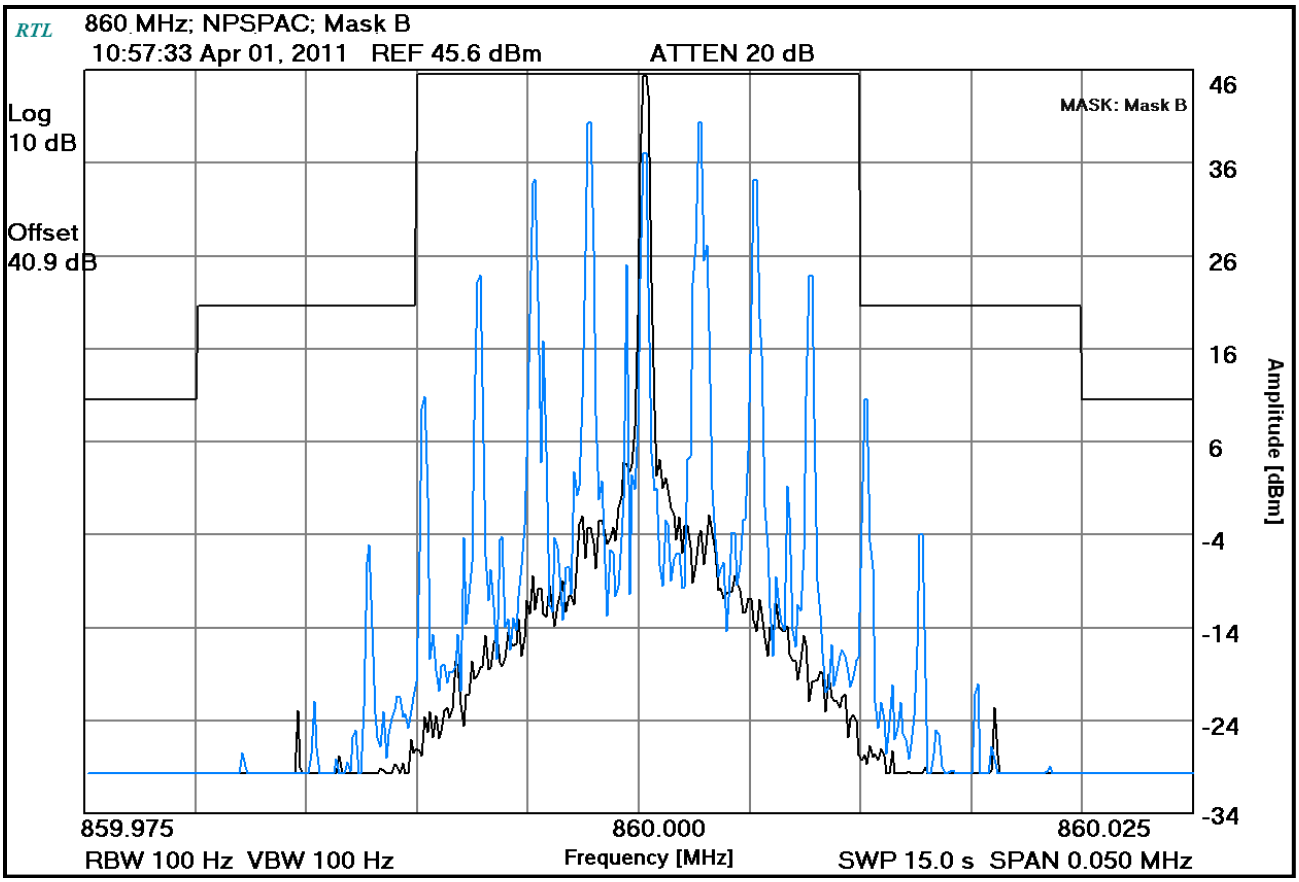
Plot 9-44: Occupied Bandwidth – 823.9875 MHz; NPSPAC; Mask B



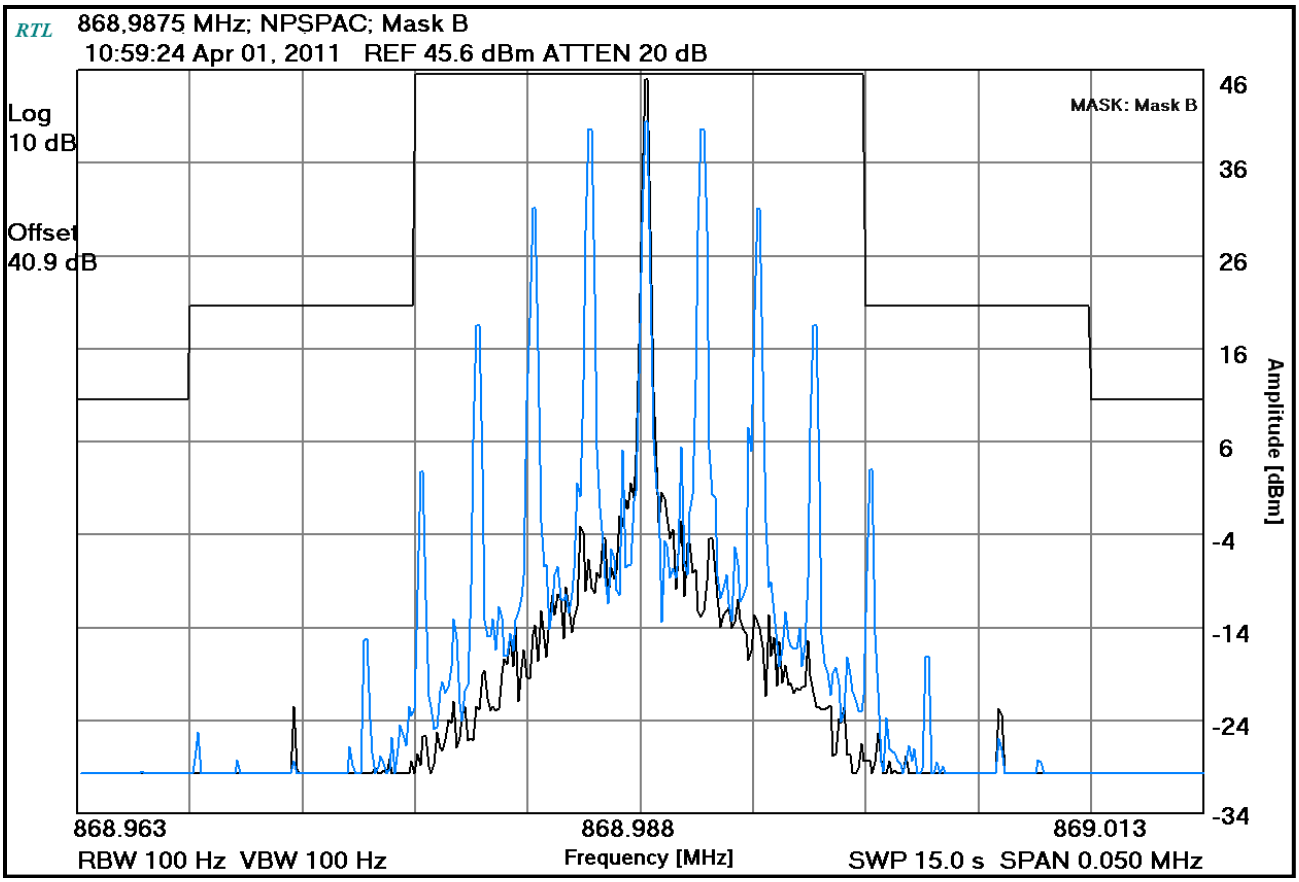
Plot 9-45: Occupied Bandwidth – 851.0125 MHz; NPSPAC; Mask B



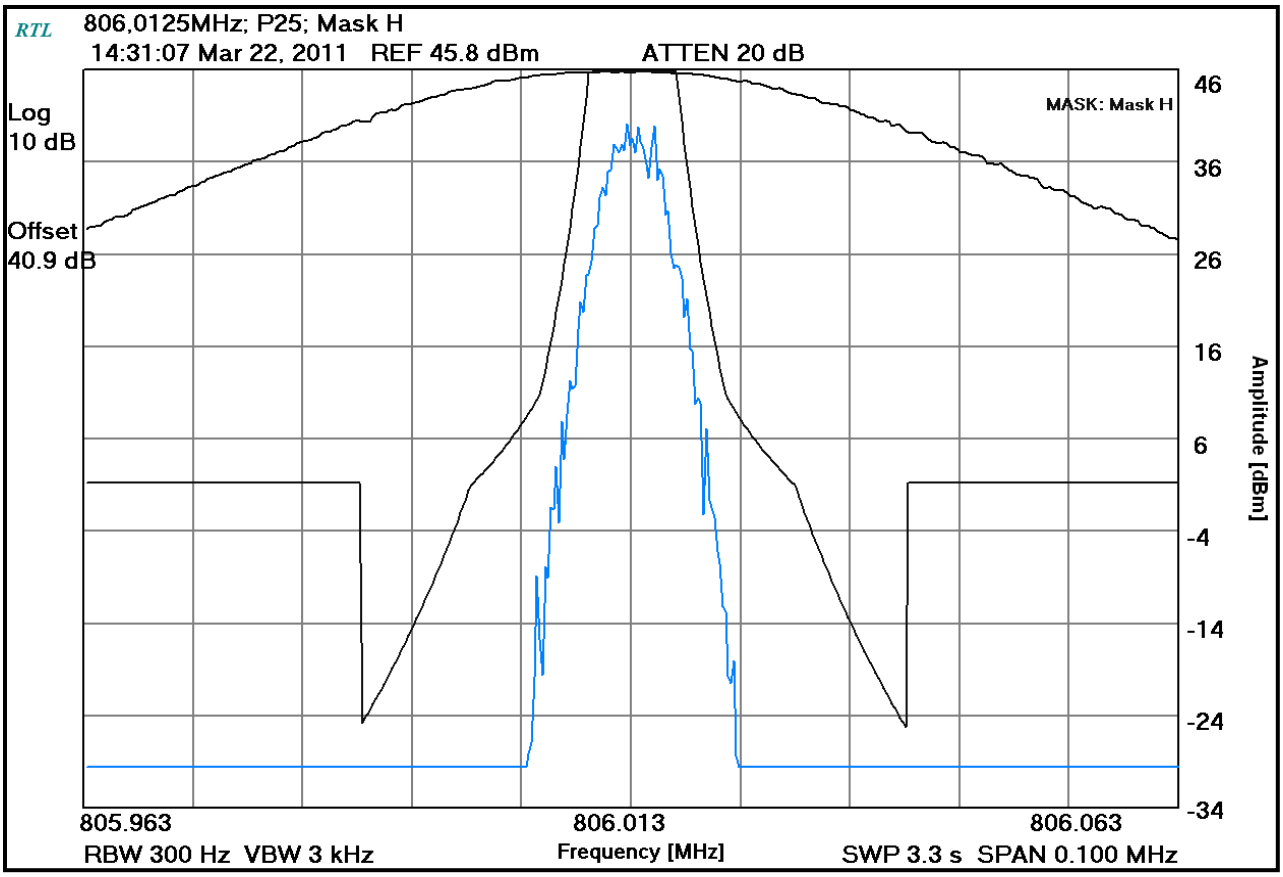
Plot 9-46: Occupied Bandwidth – 860.0000 MHz; NPSPAC; Mask B



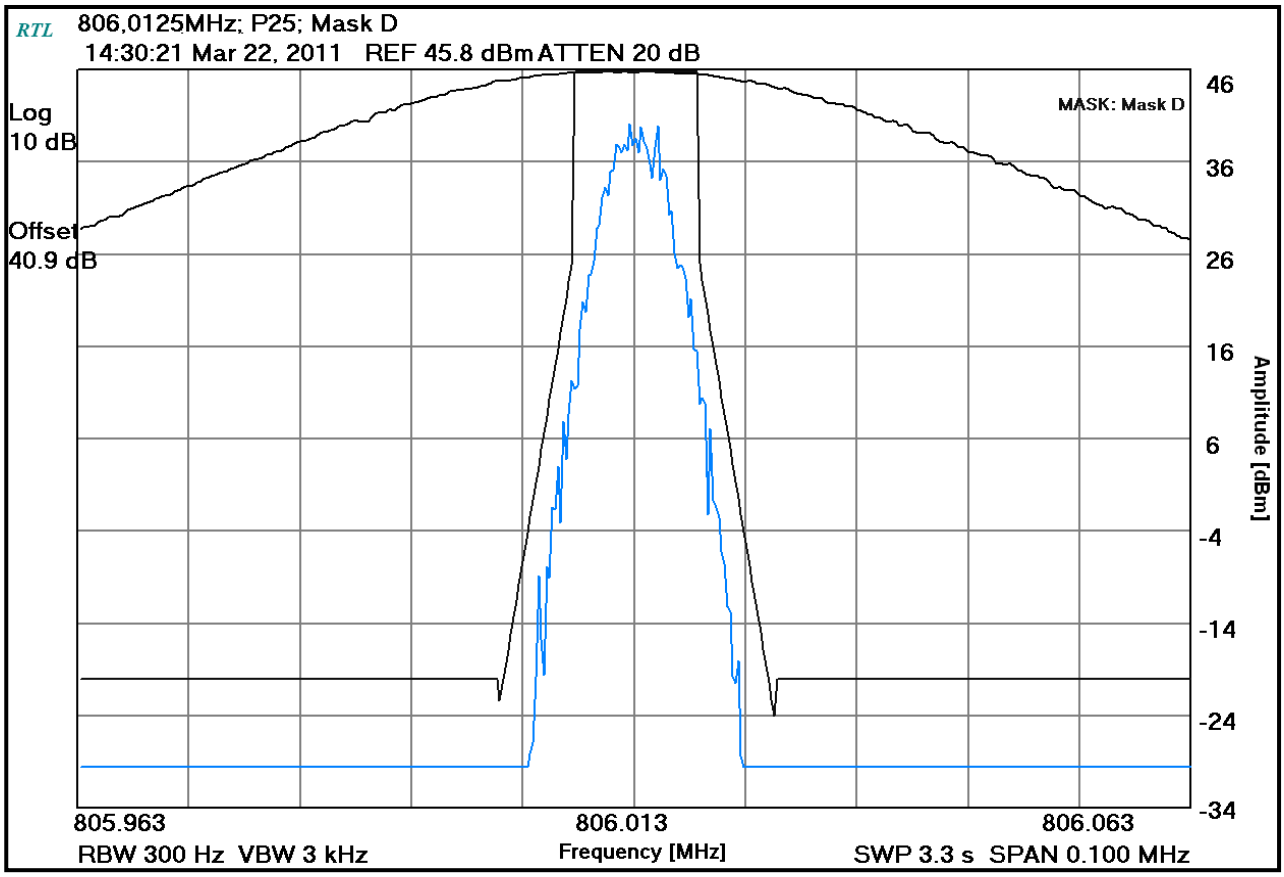
Plot 9-47: Occupied Bandwidth – 868.9875 MHz; NPSPAC; Mask B



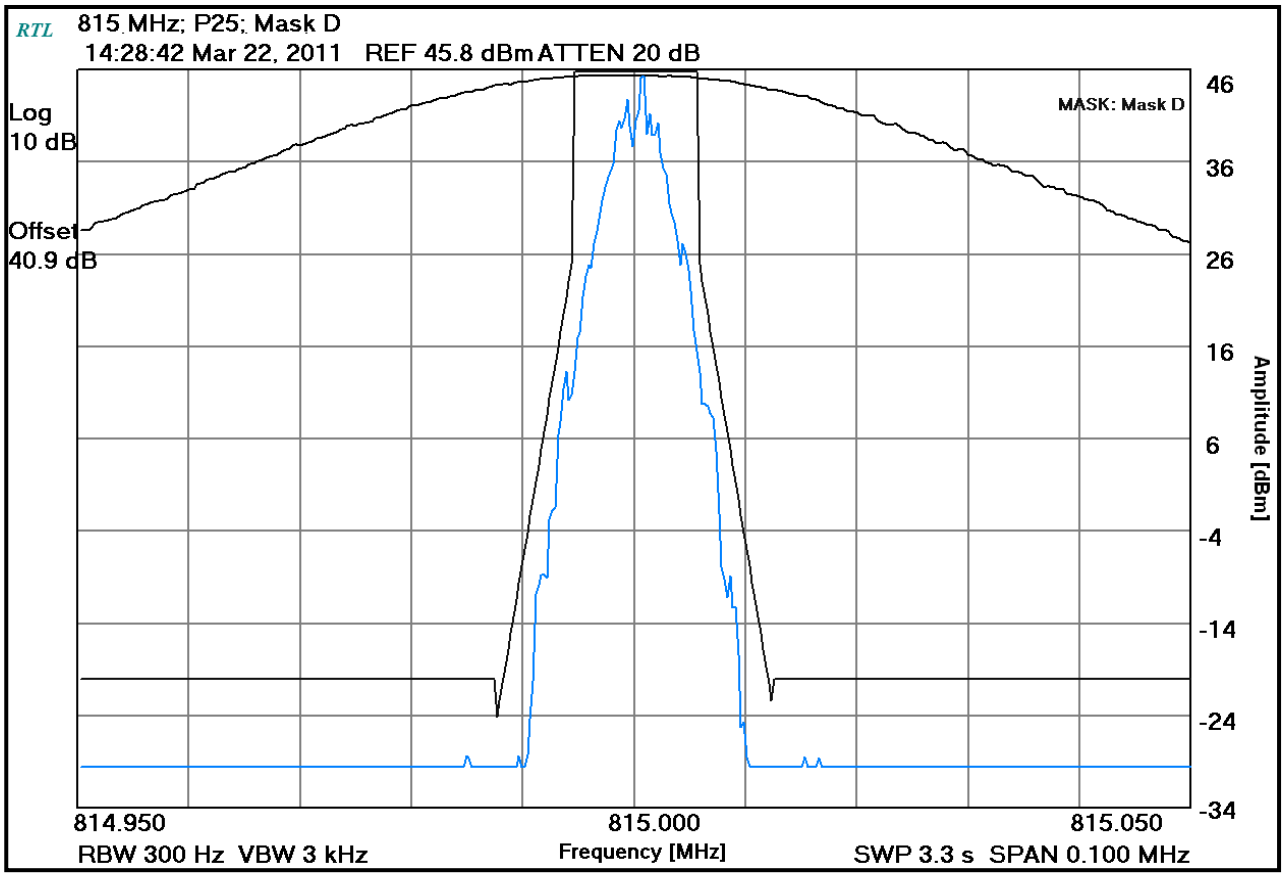
Plot 9-48: Occupied Bandwidth – 806.0125 MHz; P25; Mask H



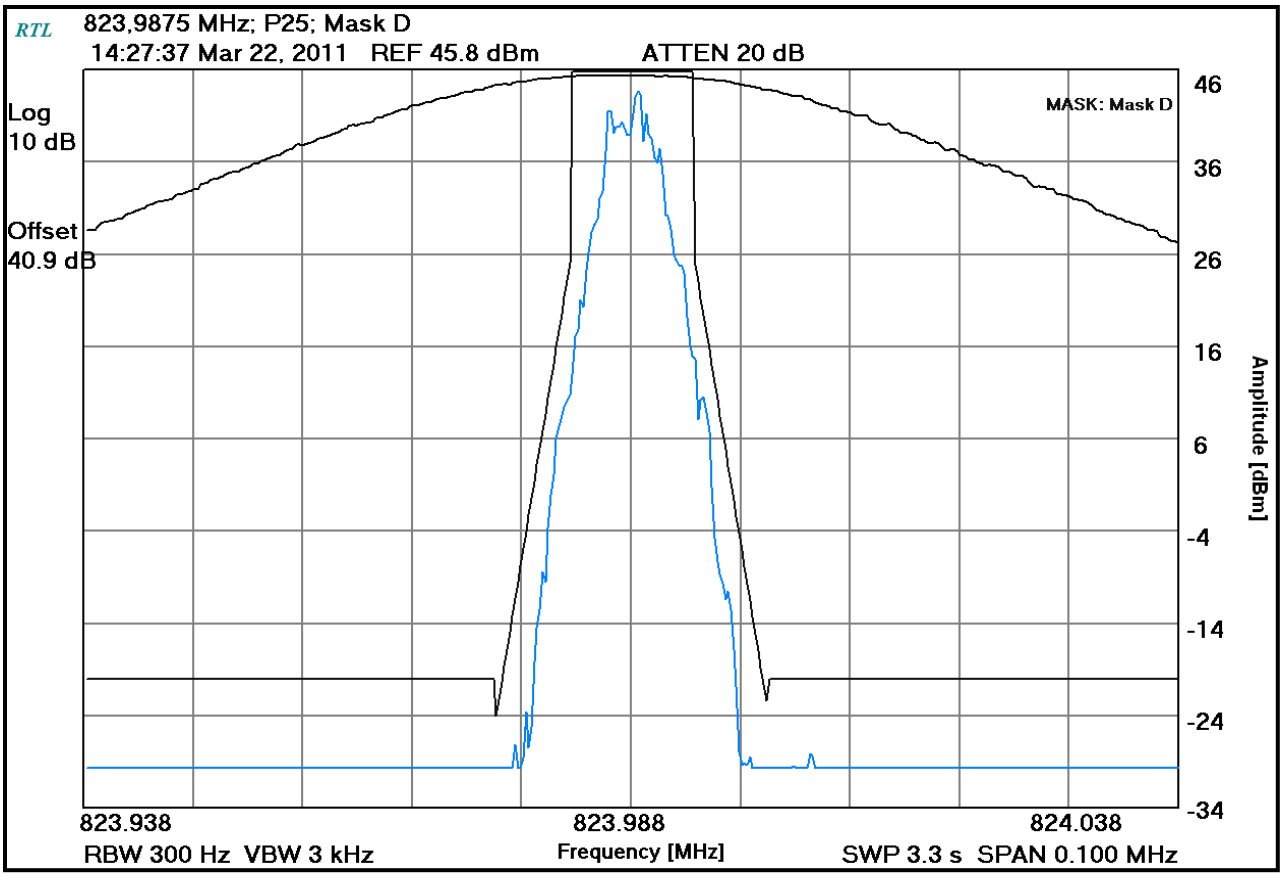
Plot 9-49: Occupied Bandwidth – 806.0125 MHz; P25; Mask D



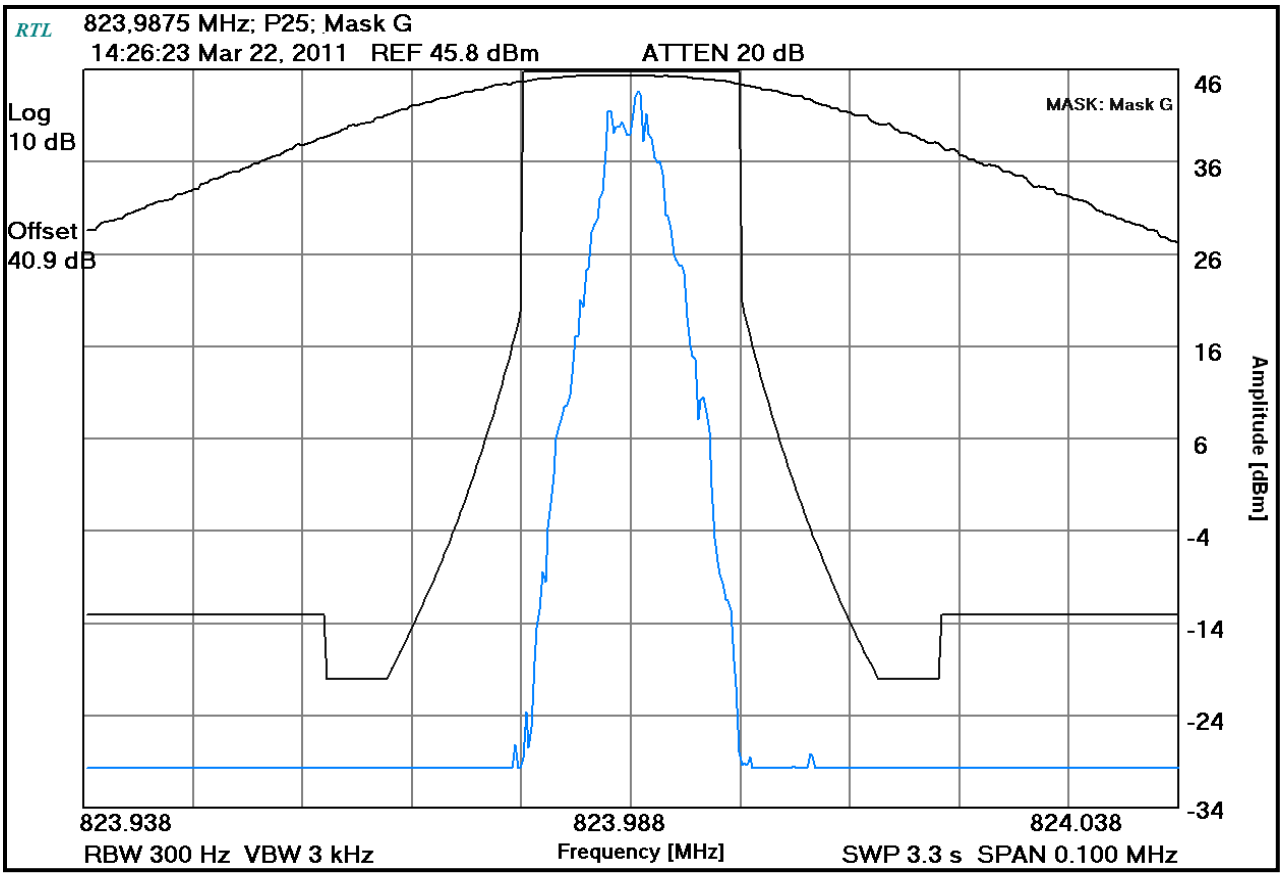
Plot 9-50: Occupied Bandwidth – 815.0000 MHz; P25; Mask D



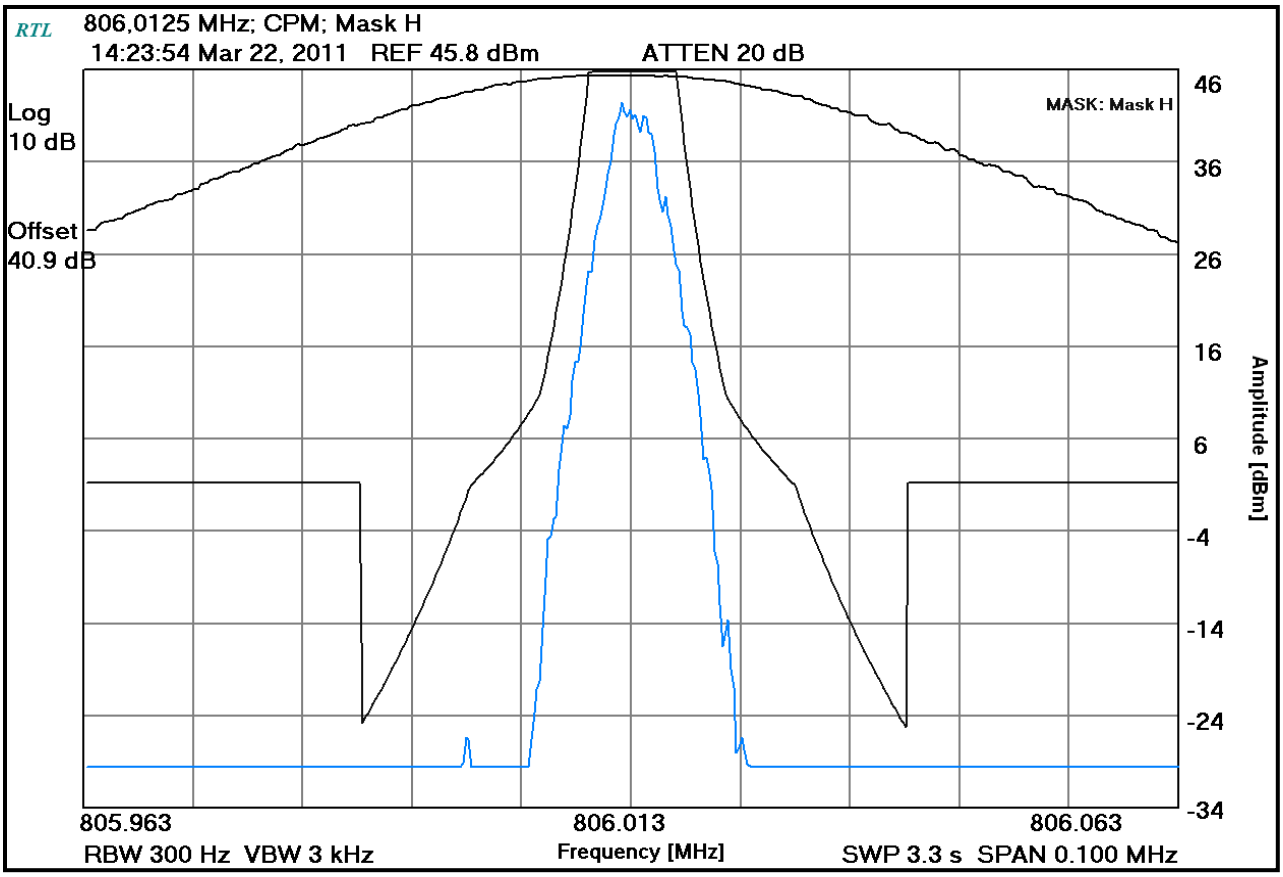
Plot 9-51: Occupied Bandwidth – 823.9875 MHz; P25; Mask D



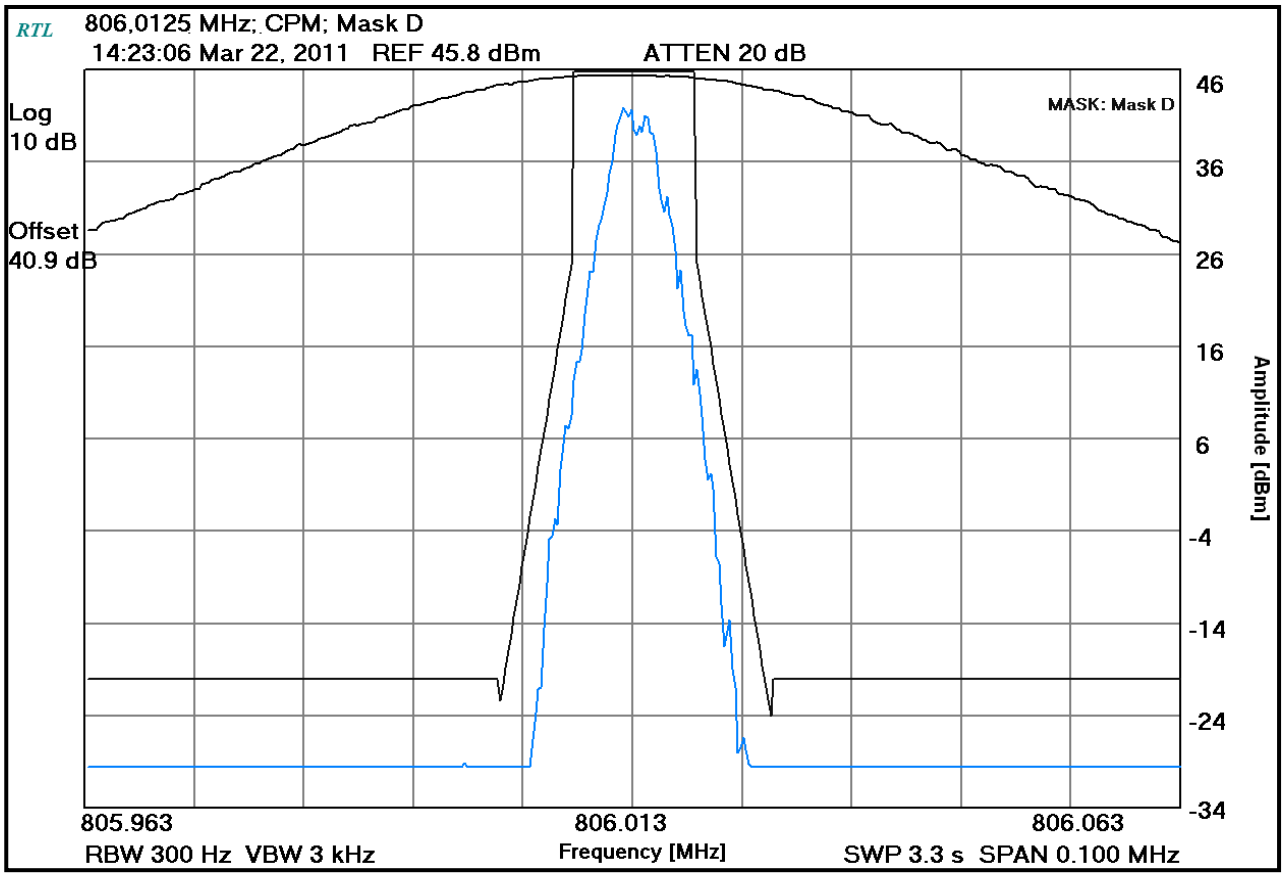
Plot 9-52: Occupied Bandwidth – 823.9875 MHz; P25; Mask G



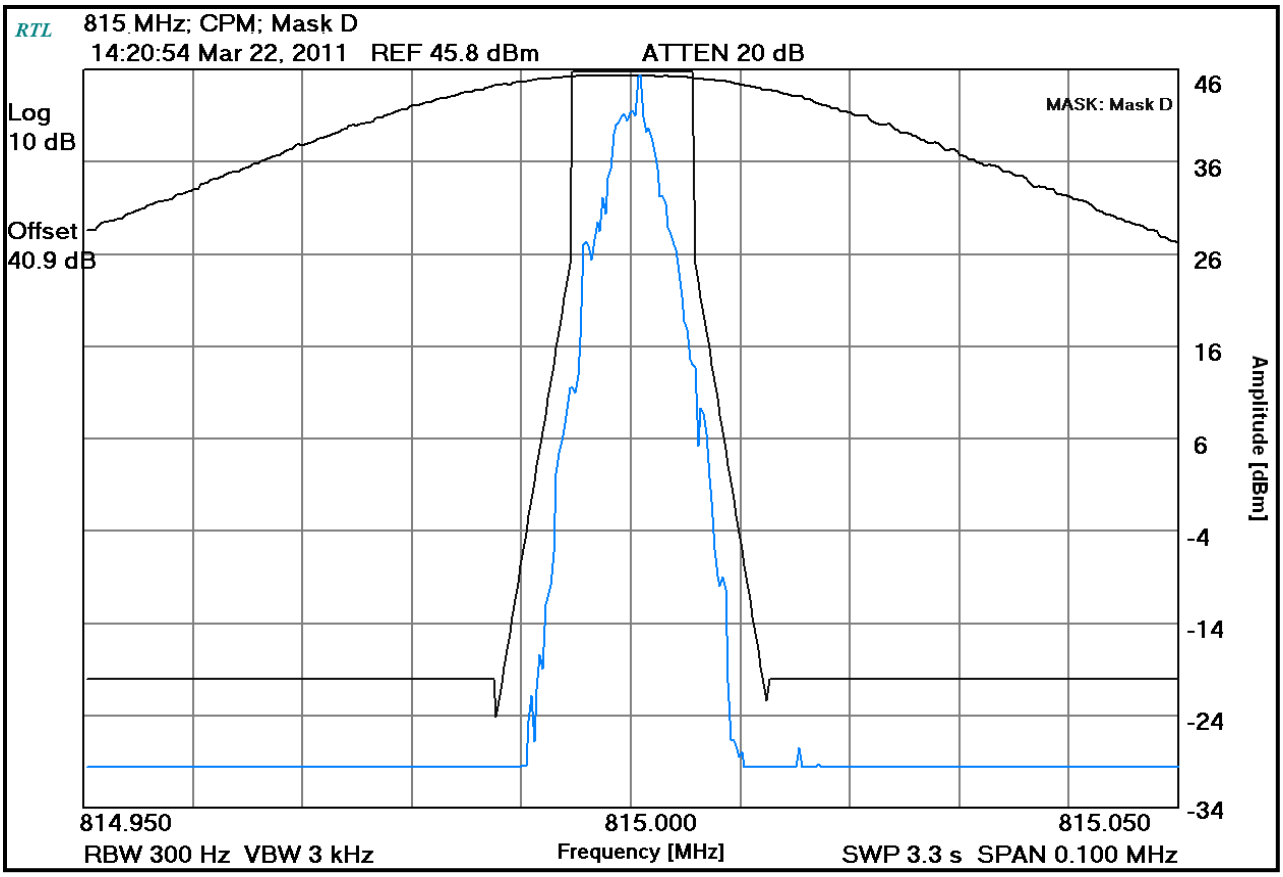
Plot 9-53: Occupied Bandwidth – 806.0125 MHz; CPM; Mask H



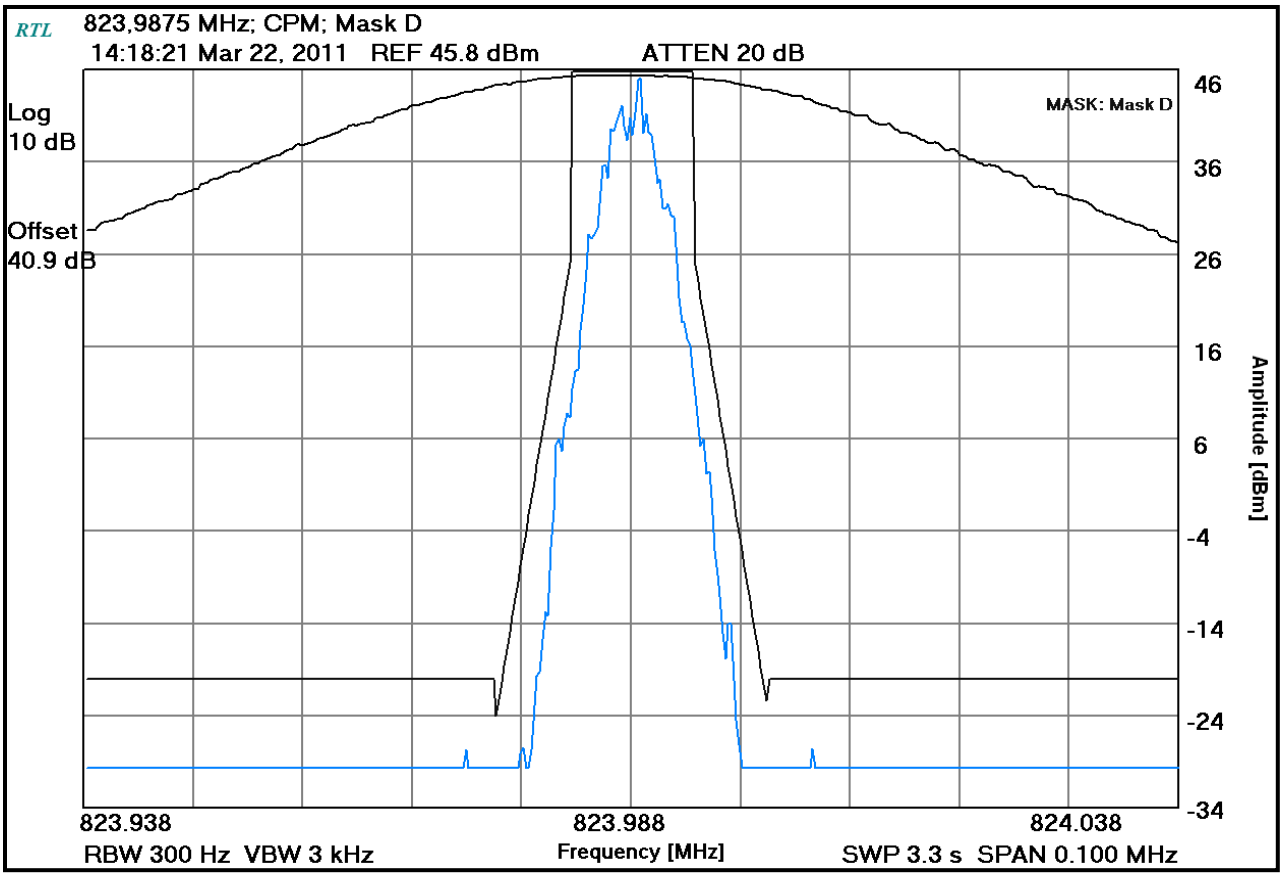
Plot 9-54: Occupied Bandwidth – 806.0125 MHz; CPM; Mask D



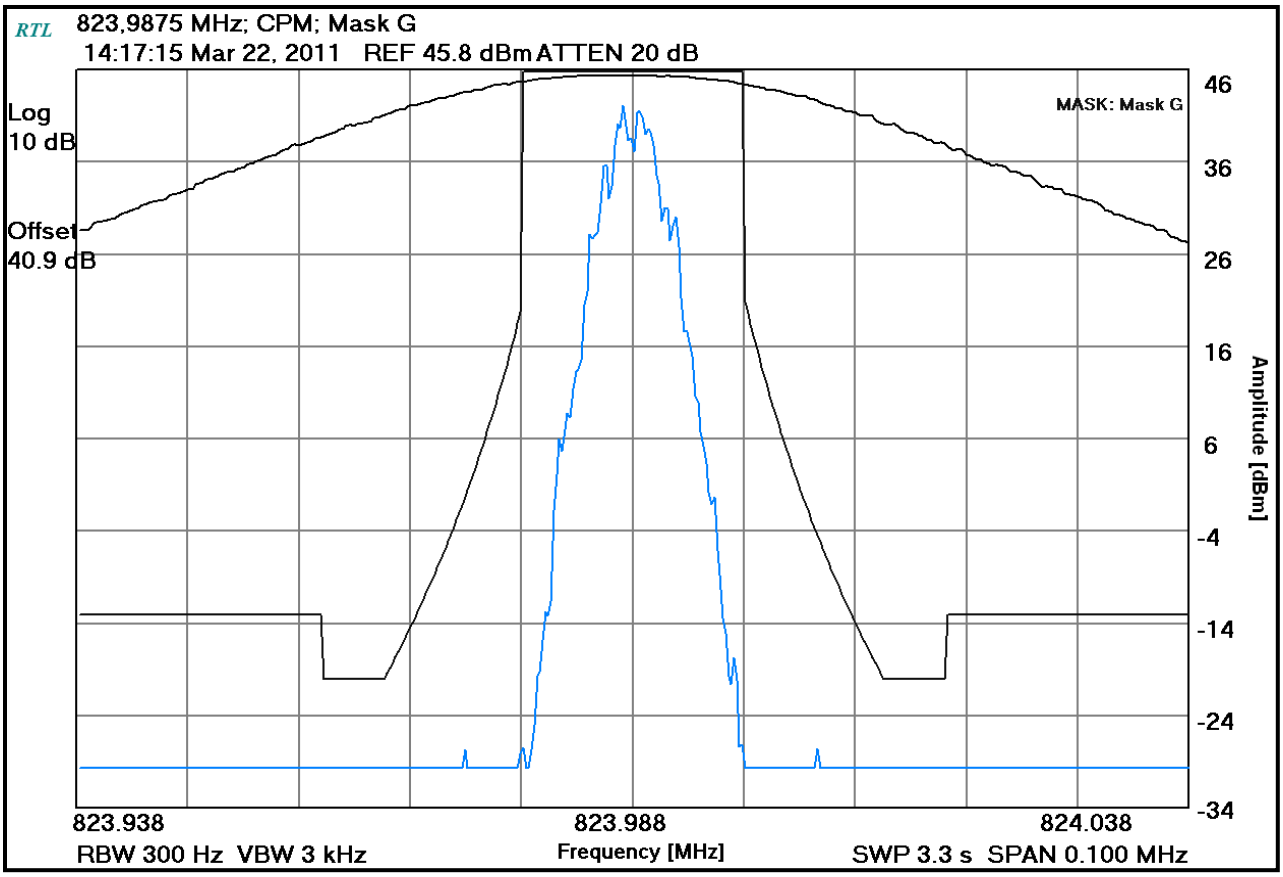
Plot 9-55: Occupied Bandwidth – 815.0000 MHz; CPM; Mask D



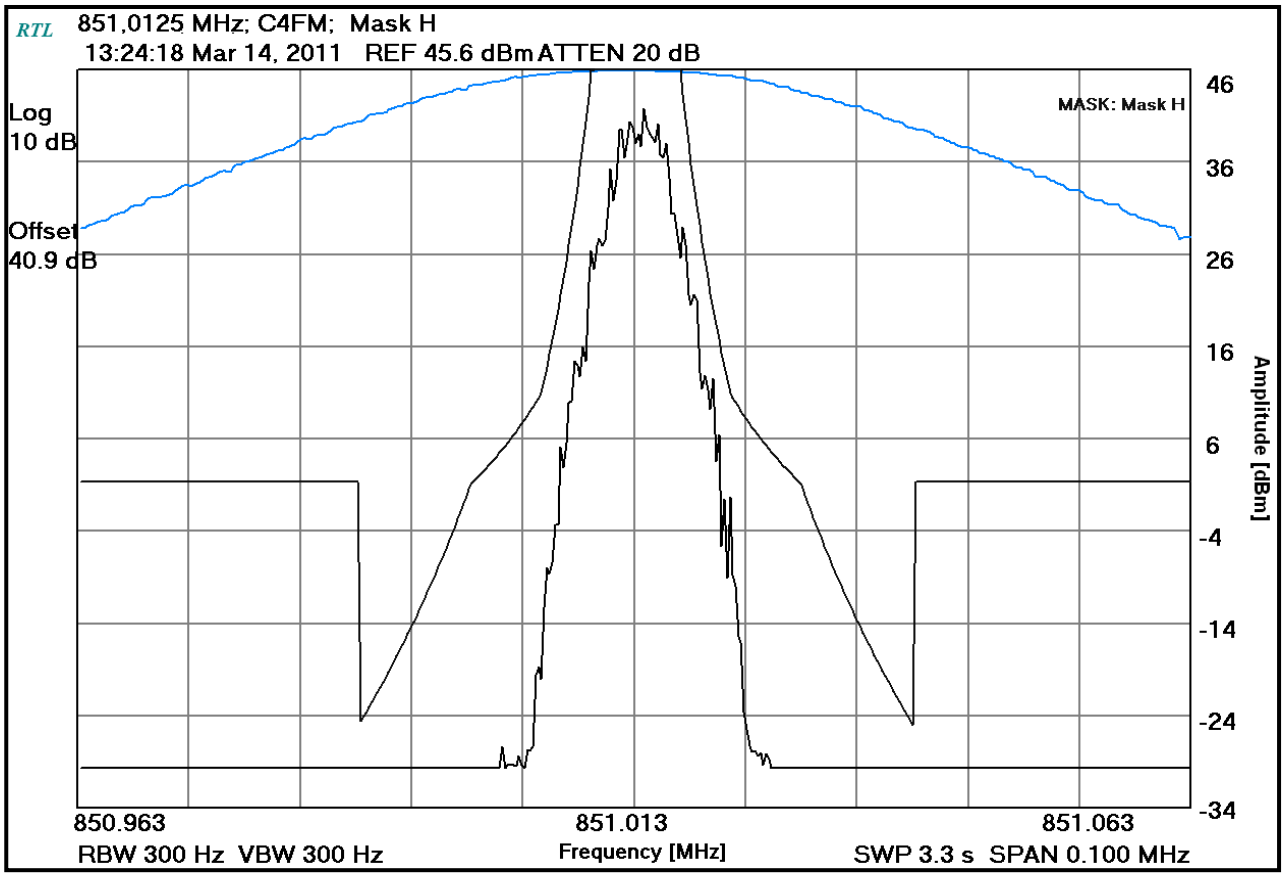
Plot 9-56: Occupied Bandwidth – 823.9875 MHz; CPM; Mask D



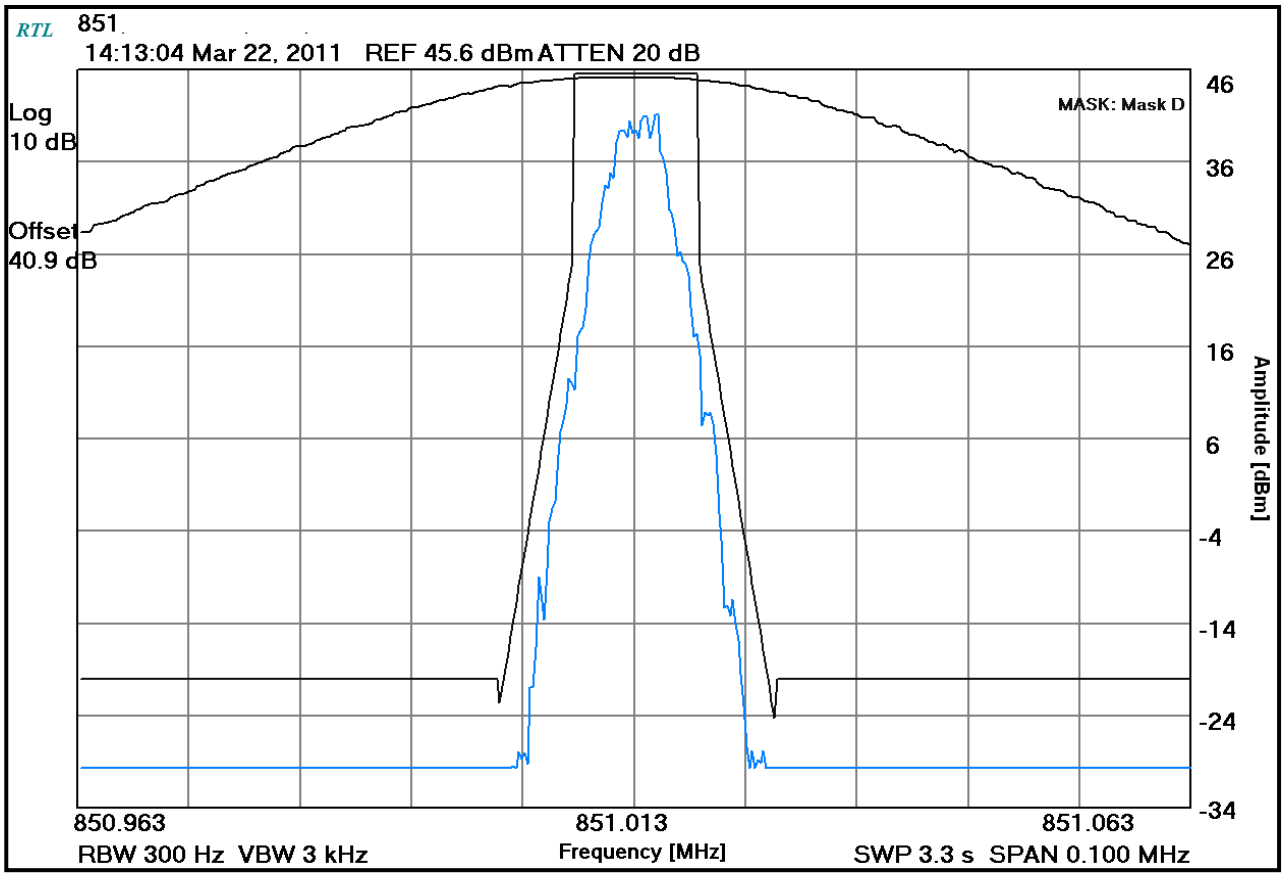
Plot 9-57: Occupied Bandwidth – 823.9875 MHz; CPM; Mask G



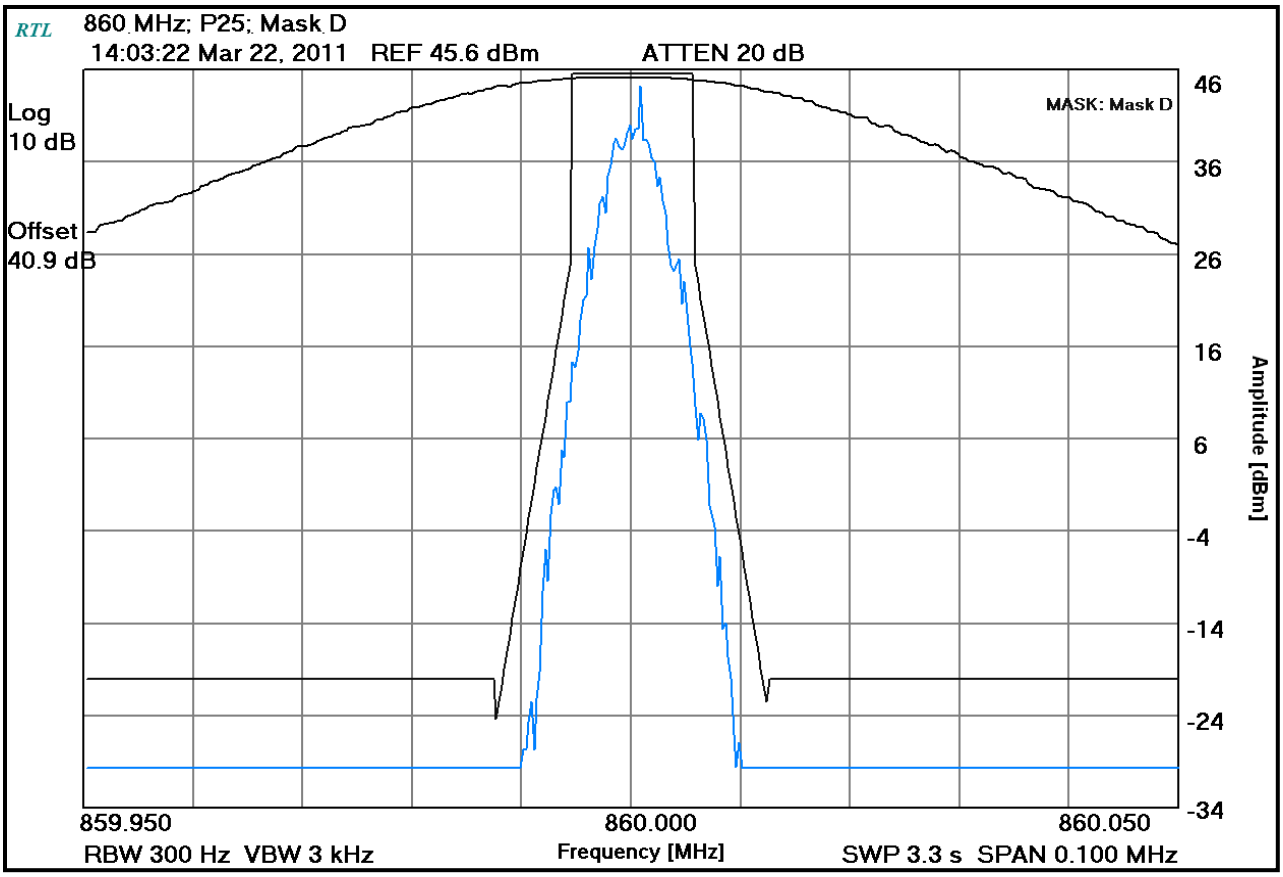
Plot 9-58: Occupied Bandwidth – 851.0125 MHz; P25; Mask H



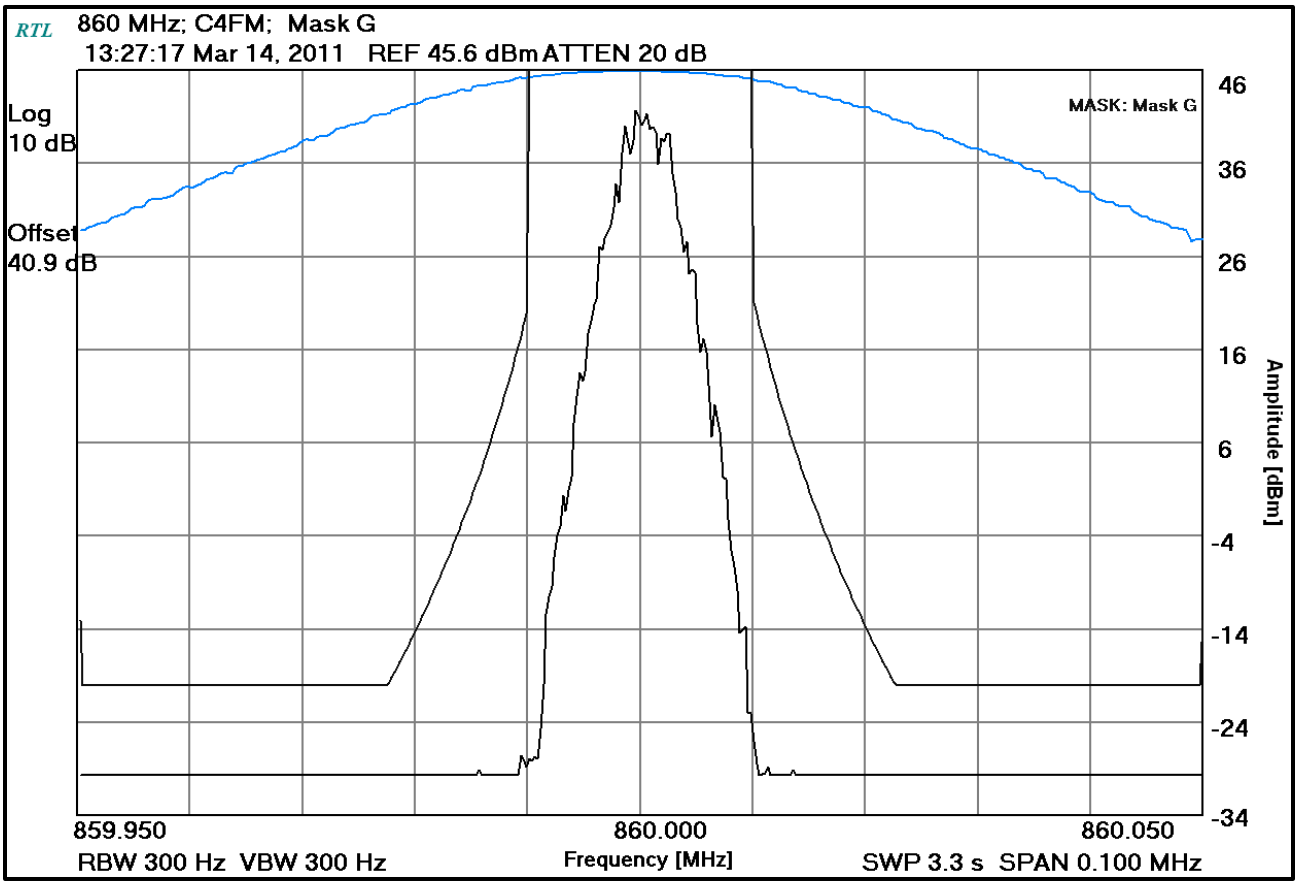
Plot 9-59: Occupied Bandwidth – 851.0125 MHz; P25 RND; Mask D



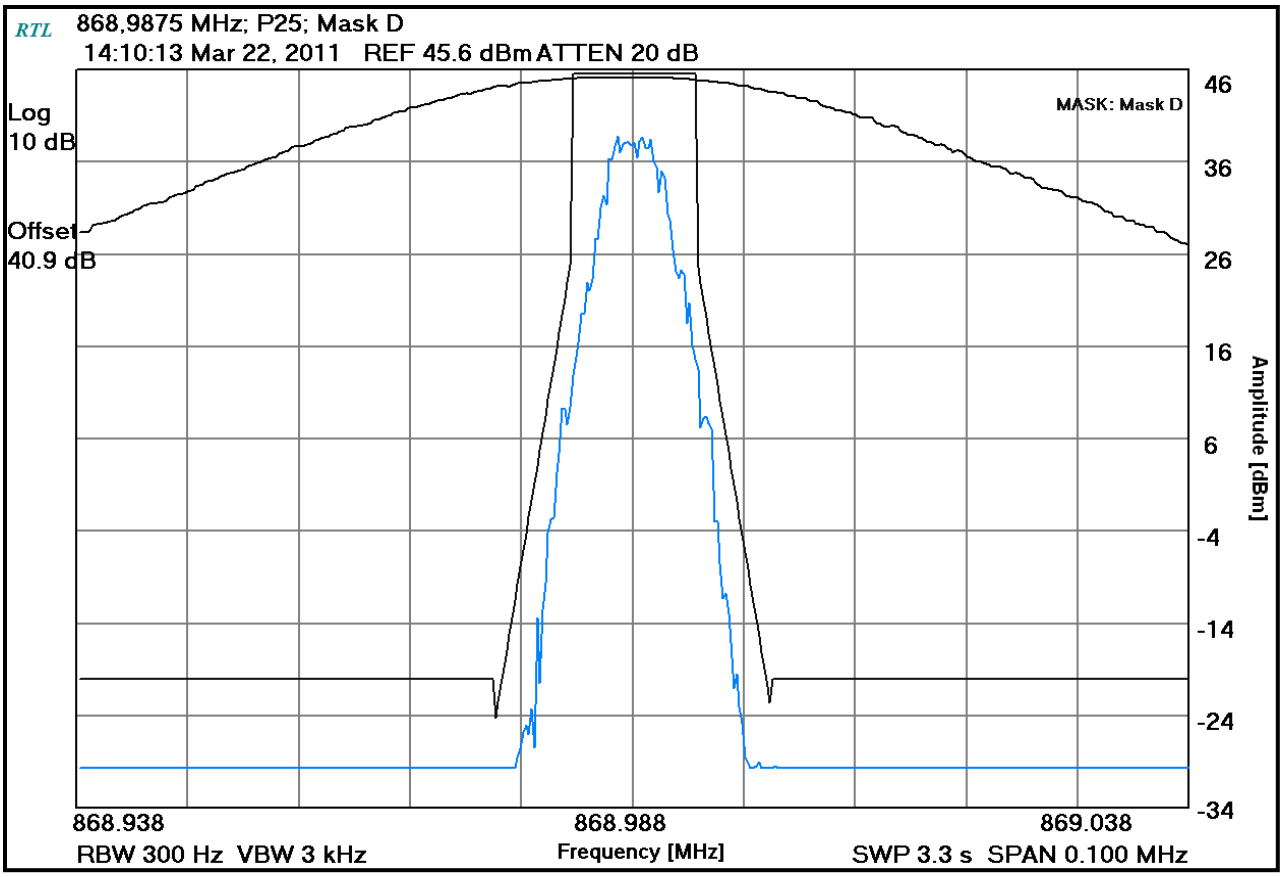
Plot 9-60: Occupied Bandwidth – 860.0000 MHz; P25; Mask D



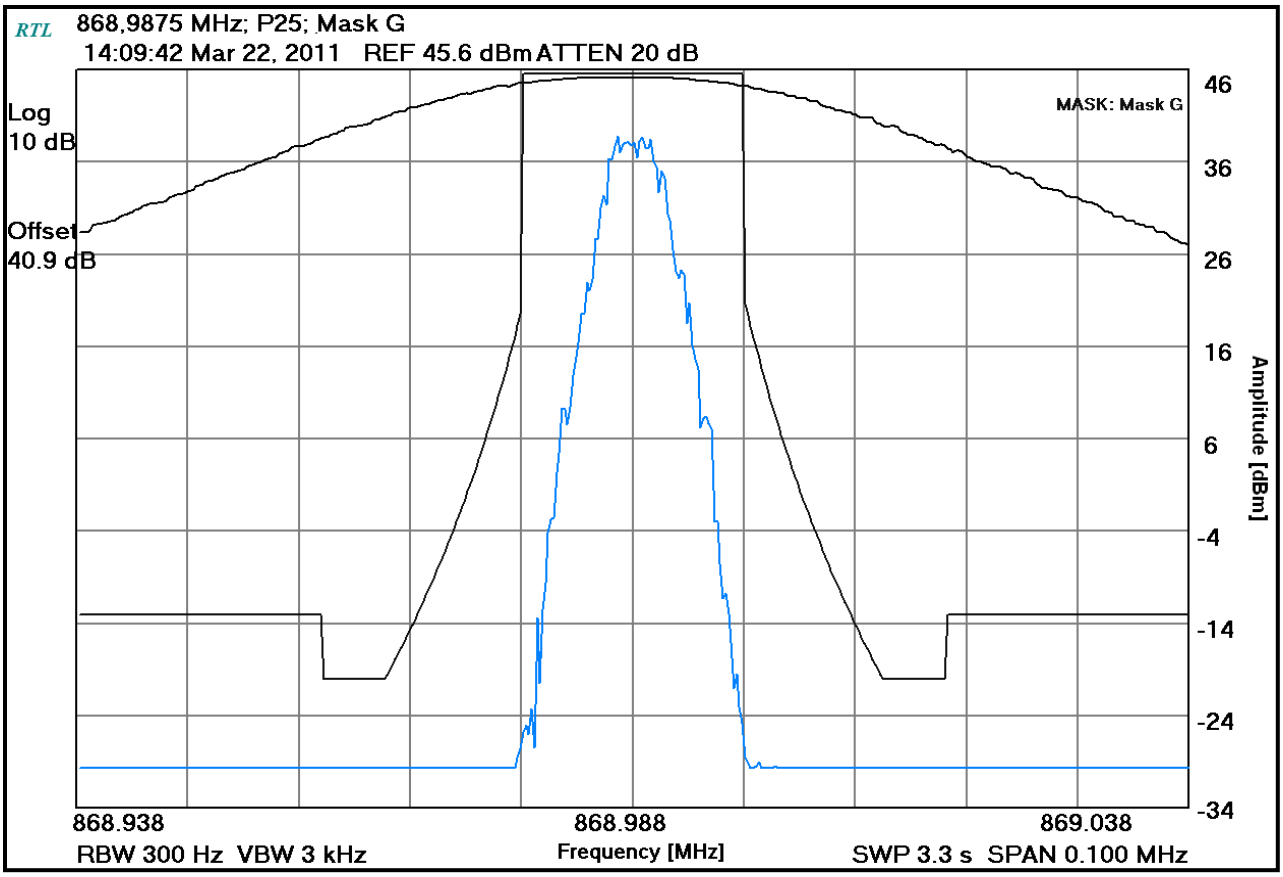
Plot 9-61: Occupied Bandwidth – 860.0000 MHz; P25; Mask G



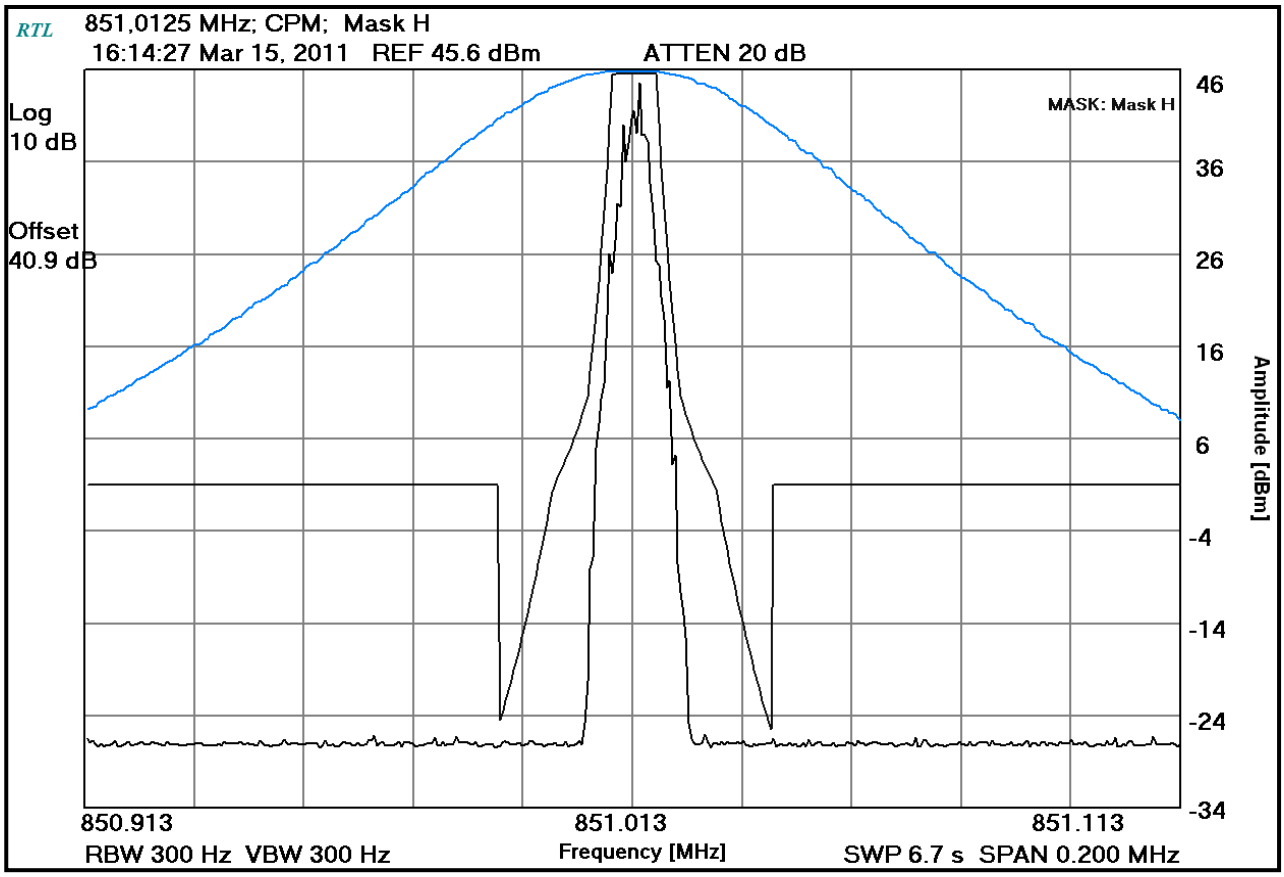
Plot 9-62: Occupied Bandwidth – 868.9875 MHz; P25 RND; Mask D



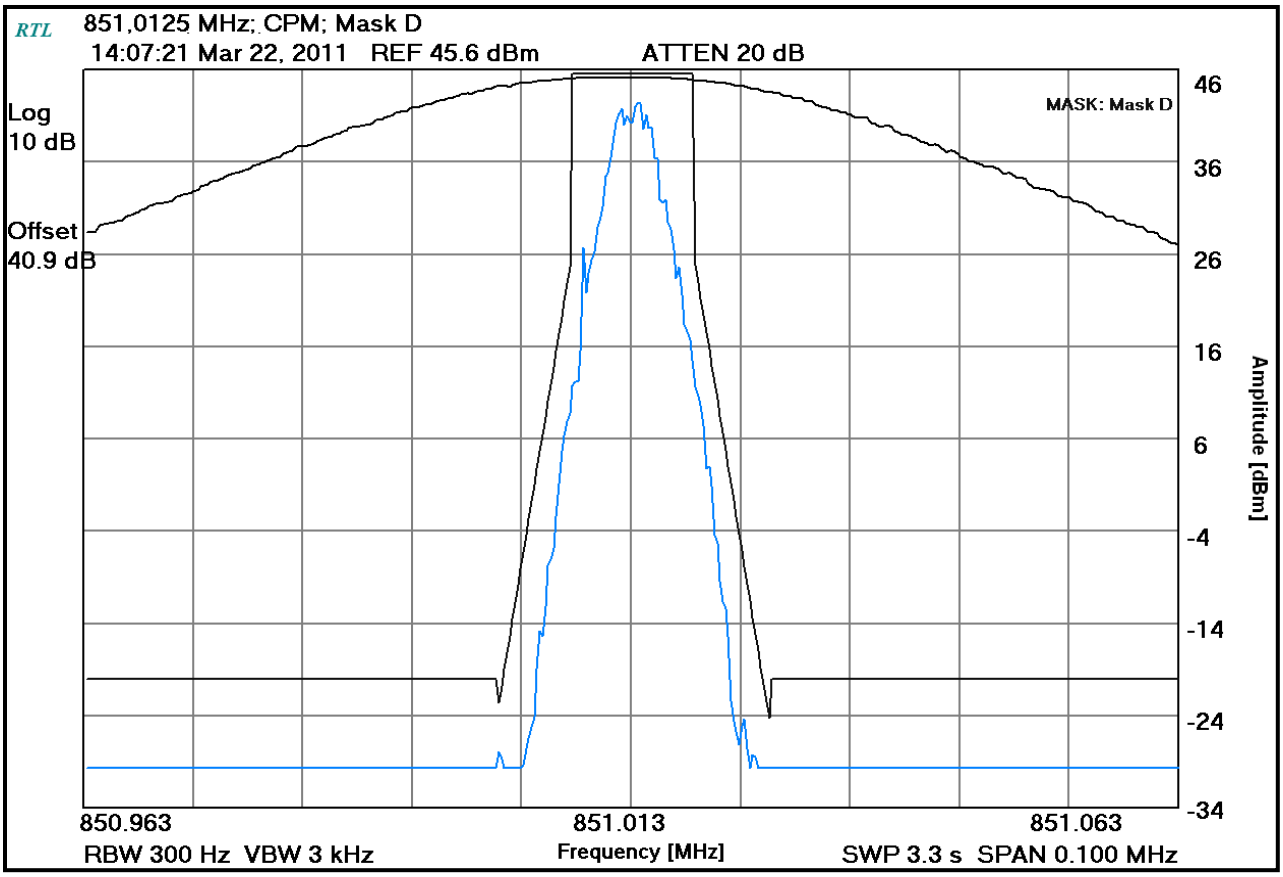
Plot 9-63: Occupied Bandwidth – 868.9875 MHz; P25 RND; Mask G



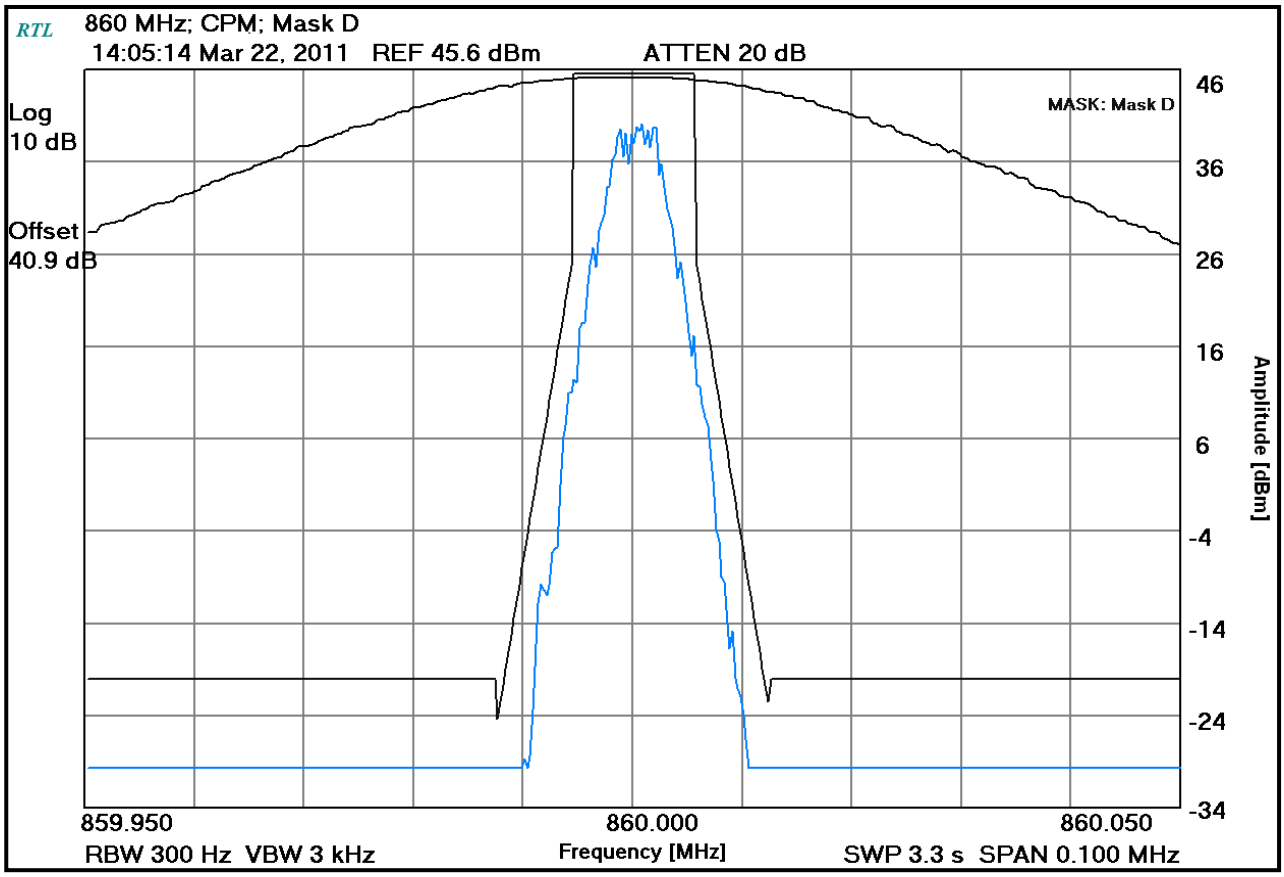
Plot 9-64: Occupied Bandwidth – 851.0125 MHz; CPM; Mask H



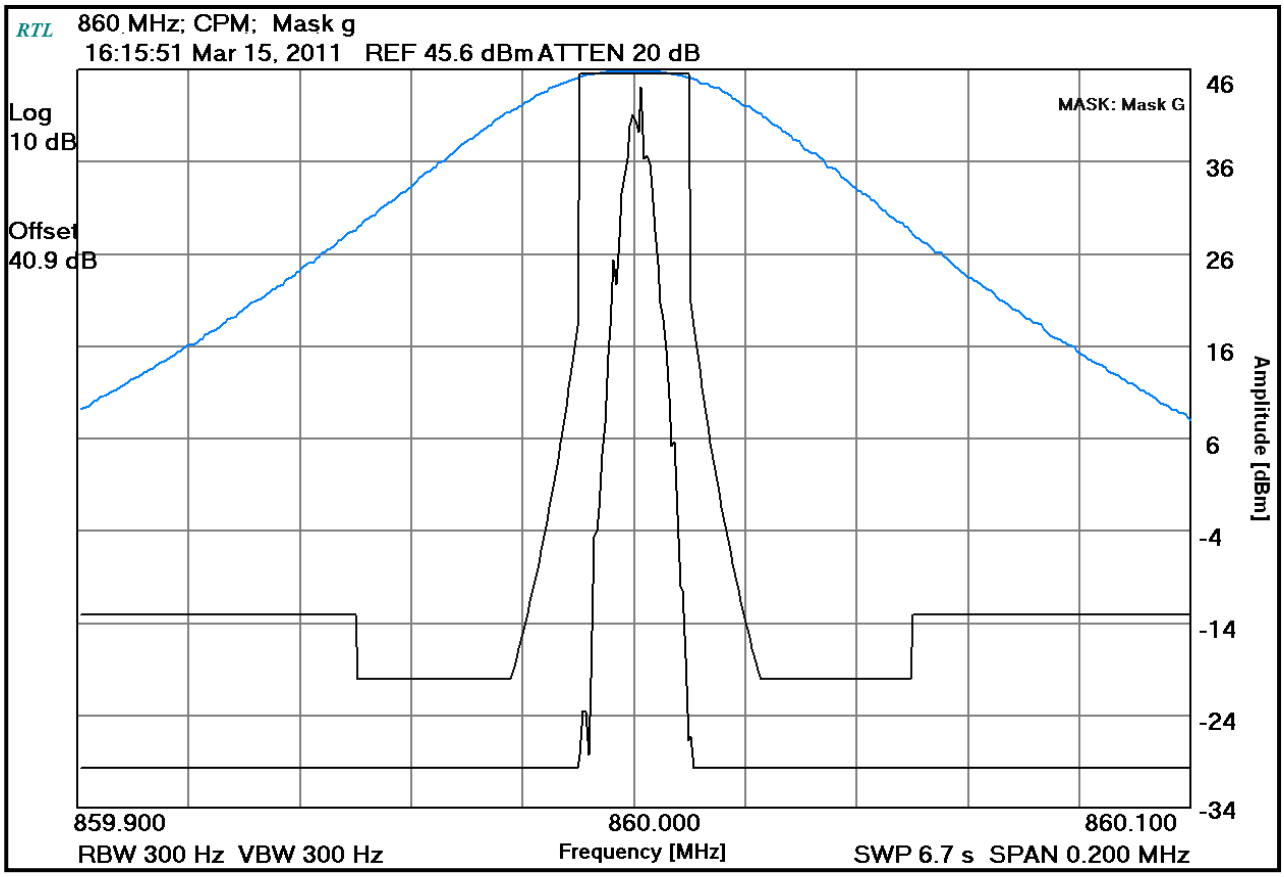
Plot 9-65: Occupied Bandwidth – 851.0125 MHz; CPM; Mask D



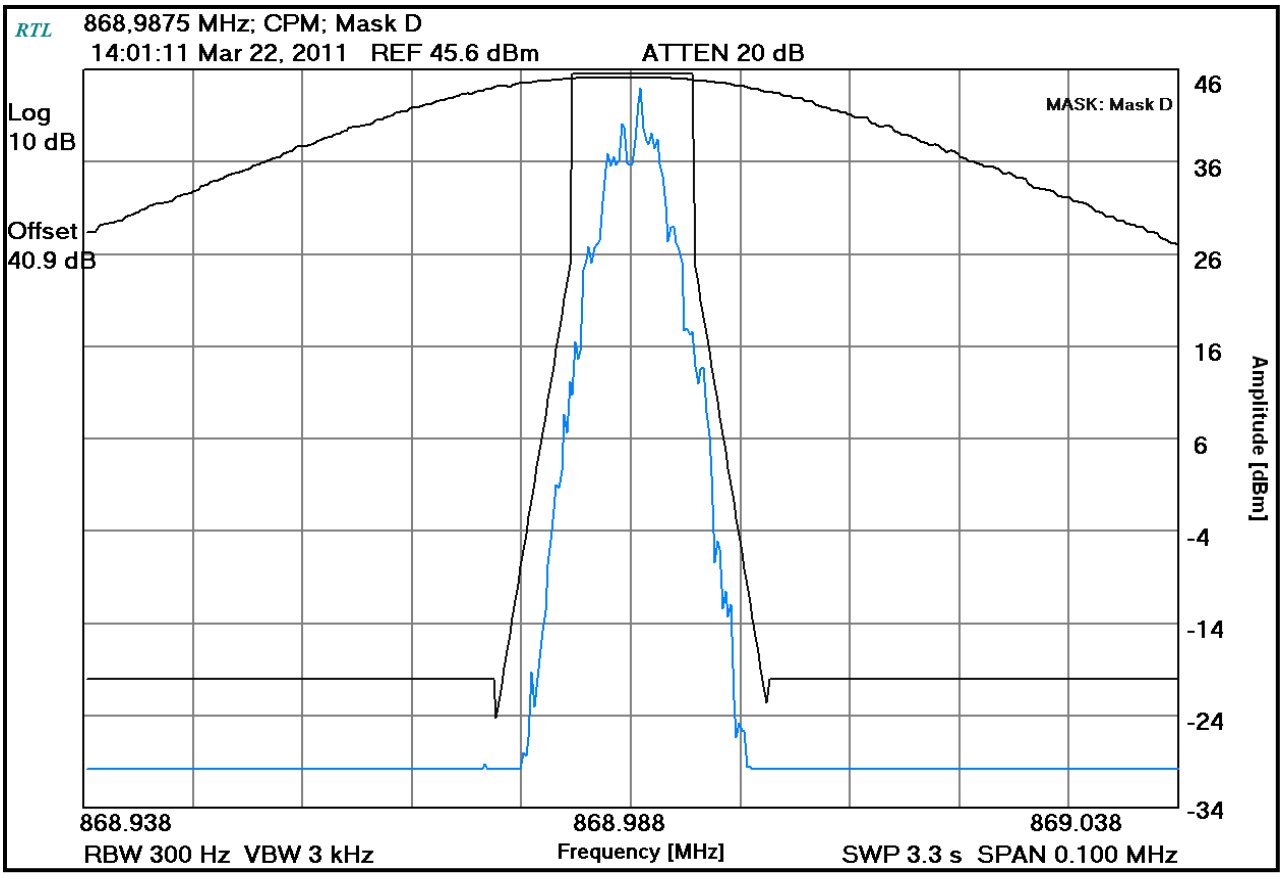
Plot 9-66: Occupied Bandwidth – 860.0000 MHz; CPM; Mask D



Plot 9-67: Occupied Bandwidth – 860.0000 MHz; CPM; Mask G



Plot 9-68: Occupied Bandwidth – 868.9875 MHz; CPM; Mask D



Plot 9-69: Occupied Bandwidth – 868.9875 MHz; CPM; Mask G

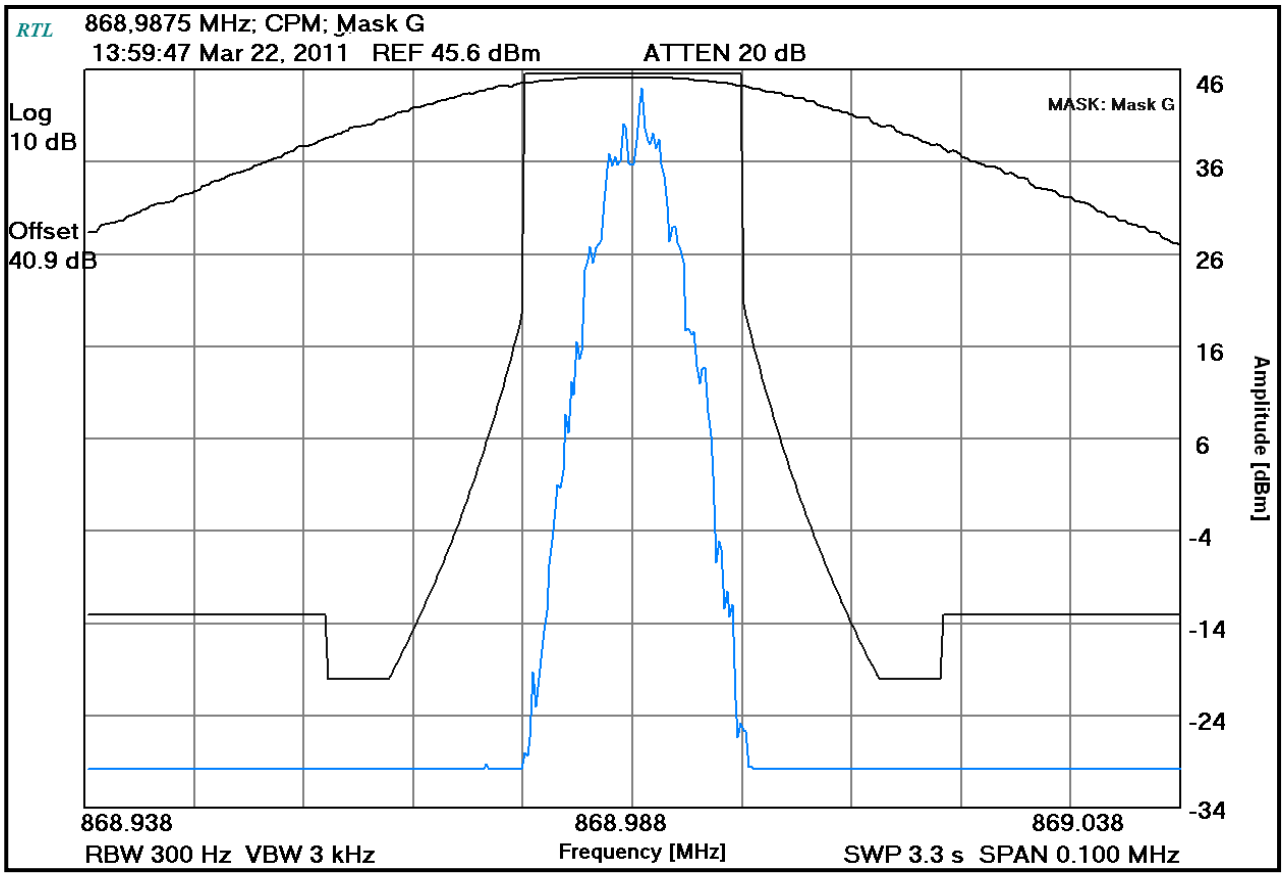


Table 9-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	1/13/12
901138	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 40dB	BK5883	2/14/12
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12

Test Personnel:

Daniel Baltzell		March 14-April 18, 2011
Test Engineer	Signature	Dates of Tests

10 FCC Rules and Regulation Part 2.1055: Frequency Stability; Part 90.213, 90.539: Frequency Stability; Part 80.209: Frequency Stability; RSS-119 5.3 Transmitter Frequency Stability

10.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.2

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

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

§80.209: 10 ppm; 400-466 MHz 5 ppm

§90.213: Mobile stations over 2 W operating power - 1.5 ppm.

§90.213 Frequency Stability

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3] 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	[5,11] 5	[6] 5	[4,6] 50
216–220	1.0	.....	1.0
220–222 [12]	0.1	1.5	1.5
421–512	[7,11,14] 2.5	[8] 5	[8] 5
806–809	[14] 1.0	1.5	1.5
809–824	[14] 1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	.....	.....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	.....	.....	.....

§90.539 Frequency Stability

Transmitters designed to operate in 769–775 MHz and 799–805 MHz frequency bands must meet the frequency stability requirements in this section.

(a) Mobile, portable and control transmitters must normally use automatic frequency control (AFC) to lock on to the base station signal.
(b) The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.
(c) The frequency stability of mobile, portable and control transmitters operating in the narrowband segment must be 400 parts per billion or better when AFC is locked to the base station. When AFC is not locked to the base station, the frequency stability must be at least 1.0 ppm for 6.25 kHz, 1.5 ppm for 12.5 kHz (2 channel aggregate), and 2.5 ppm for 25 kHz (4 channel aggregate).
(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.
(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

The EUT was tested while the AFC was not locked, therefore, the limit is 1.5 ppm. The worst-case deviation was found to be 0.5 ppm.

10.2 Test Data

Table 10-1: Temperature Frequency Stability – 162.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	161.999890	-0.29
-20	161.999939	0.02
-10	161.999943	0.04
0	161.999952	0.10
10	161.999956	0.12
20 (reference)	161.999936	0.00
30	161.999873	-0.39
40	161.999865	-0.44
50	161.999875	-0.38
60	161.999906	-0.19

Table10-2: Temperature Frequency Stability – 418.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	417.999719	-0.27
-20	417.999841	0.02
-10	417.999855	0.05
0	417.999974	0.34
10	417.999896	0.15
20 (reference)	417.999833	0.00
30	417.999676	-0.38
40	417.999654	-0.43
50	417.999683	-0.36
60	417.999758	-0.18

Table 10-3: Temperature Frequency Stability – 469.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	469.987123	-0.33
-20	469.987147	-0.28
-10	469.987204	-0.16
0	469.987199	-0.17
10	469.987261	-0.04
20 (reference)	469.987279	0.00
30	469.987254	-0.05
40	469.987253	-0.06
50	469.987310	0.07
60	469.987333	0.12

Table 10-4: Temperature Frequency Stability – 769.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	769.012111	-0.14
-20	769.012189	-0.04
-10	769.012234	0.02
0	769.012260	0.06
10	769.012320	0.13
20 (reference)	769.012218	0.00
30	769.011900	-0.41
40	769.011864	-0.46
50	769.011919	-0.39
60	769.012056	-0.21

Table 10-5: Temperature Frequency Stability – 799.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	Ppm
-30	799.012104	-0.13
-20	799.012164	-0.06
-10	799.012223	0.01
0	799.012249	0.05
10	799.012316	0.13
20 (reference)	799.012212	0.00
30	799.011876	-0.42
40	799.011840	-0.47
50	799.011897	-0.39
60	799.012039	-0.22

Table 10-6: Temperature Frequency Stability – 815.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	Ppm
-30	814.999608	-0.13
-20	814.999652	-0.07
-10	814.999717	0.01
0	814.999741	0.04
10	814.999814	0.13
20 (reference)	814.999712	0.00
30	814.999363	-0.43
40	814.999326	-0.47
50	814.999385	-0.40
60	814.999528	-0.23

Table 10-7: Temperature Frequency Stability – 860.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	859.999619	-0.10
-20	859.999633	-0.09
-10	859.999703	-0.01
0	859.999726	0.02
10	859.999807	0.11
20 (reference)	859.999708	0.00
30	859.999327	-0.44
40	859.999289	-0.49
50	859.999353	-0.41
60	859.999499	-0.24

Results: The EUT is compliant.

10.2.1 Frequency Stability/Voltage Variation

Table 10-8: Frequency Stability/Voltage Variation – 162.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	161.999939	-0.4
13.8	161.999936	-0.4
15.87	161.999936	-0.4

Table 10-9: Frequency Stability/Voltage Variation – 418.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	417.999832	-0.4
13.8	417.999833	-0.4
15.87	417.999834	-0.4

Table 10-10: Frequency Stability/Voltage Variation – 469.9875 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	469.987280	-0.5
13.8	469.987279	-0.5
15.87	469.987278	-0.5

Table 10-11: Frequency Stability/Voltage Variation – 769.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	769.012219	-0.4
13.8	769.012218	-0.4
15.87	769.012216	-0.4

Table 10-12: Frequency Stability/Voltage Variation – 799.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	799.012211	-0.4
13.8	799.012212	-0.4
15.87	799.012213	-0.4

Table 10-13: Frequency Stability/Voltage Variation – 815.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	814.999714	-0.4
13.8	814.999712	-0.4
15.87	814.999709	-0.4

Table 10-14: Frequency Stability/Voltage Variation – 860.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	859.999701	-0.3
13.8	859.999708	-0.3
15.87	859.999705	-0.3

Table 10-15: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	1/13/12
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	7/29/11
901138	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 40dB	BK5883	2/14/12

Test Personnel:

Daniel Baltzell		March 12, 2011
EMC Test Engineer	Signature	Date of Test

11 FCC Part 2.1047: Modulation Characteristics; Part 80.213 Modulation Requirements; RSS-119 5.8 Types of Modulation

§80.213 Modulation requirements.

(a)(2) When phase or frequency modulation is used in the 156–162 MHz band, the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ±5 kHz is defined as 100 percent peak modulation.
(b) Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license, or to transmitters whose output power does not exceed 3 watts.
(d) Ship and coast station transmitters operating in the 156–162 MHz and 216–220 MHz bands must be capable of proper operation with a frequency deviation that does not exceed ±5 kHz when using any emission authorized by §80.207.
(e) Coast station transmitters operating in the 156–162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz, it must have an attenuation greater than at 1 kHz by at least 60log10(f/3) dB where ‘‘f’’ is the audio frequency in kilohertz. At frequencies above 20 kHz, the attenuation must be at least 50 dB greater than at 1 kHz.

11.1 Test Procedures

11.1.1 Audio Frequency Response

ANSI/TIA/EIA-603-2004, section 2.2.6

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

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

11.1.2 Audio Low Pass Filter Response

ANSI/TIA/EIA-603-2004, 2.2.15

The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

11.1.3 Modulation Limiting

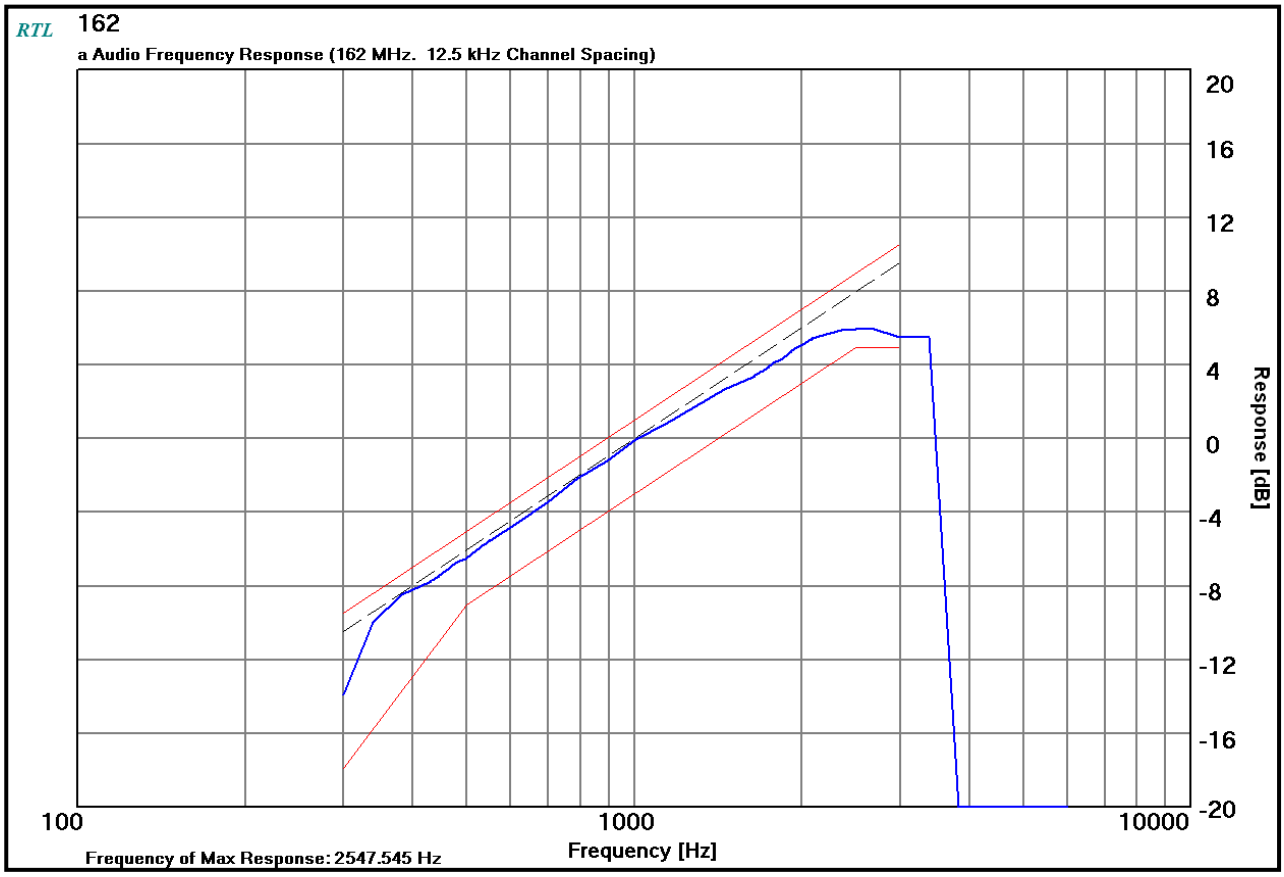
ANSI/TIA/EIA-603-2004, section 2.2.3

The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

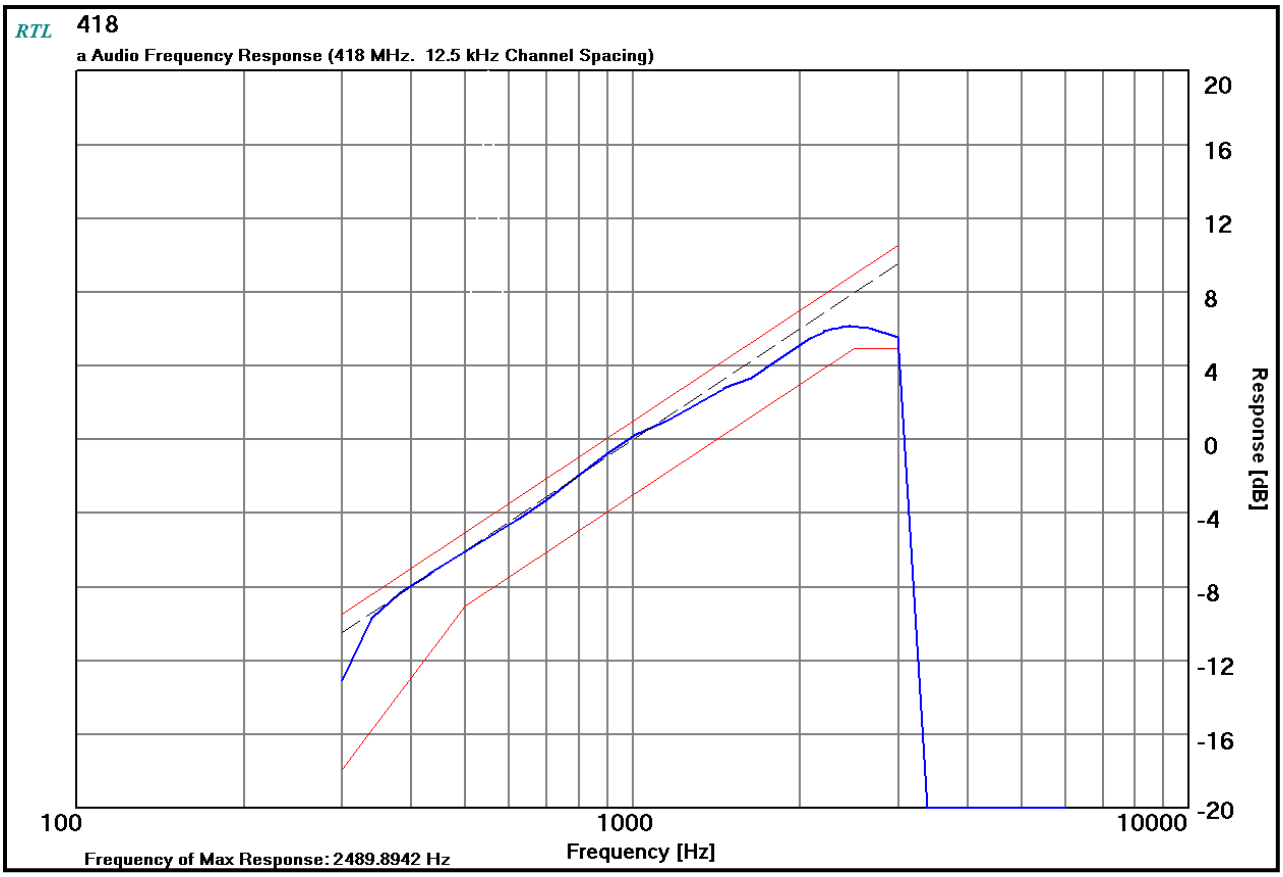
11.2 Test Data

11.2.1 Audio Frequency Response

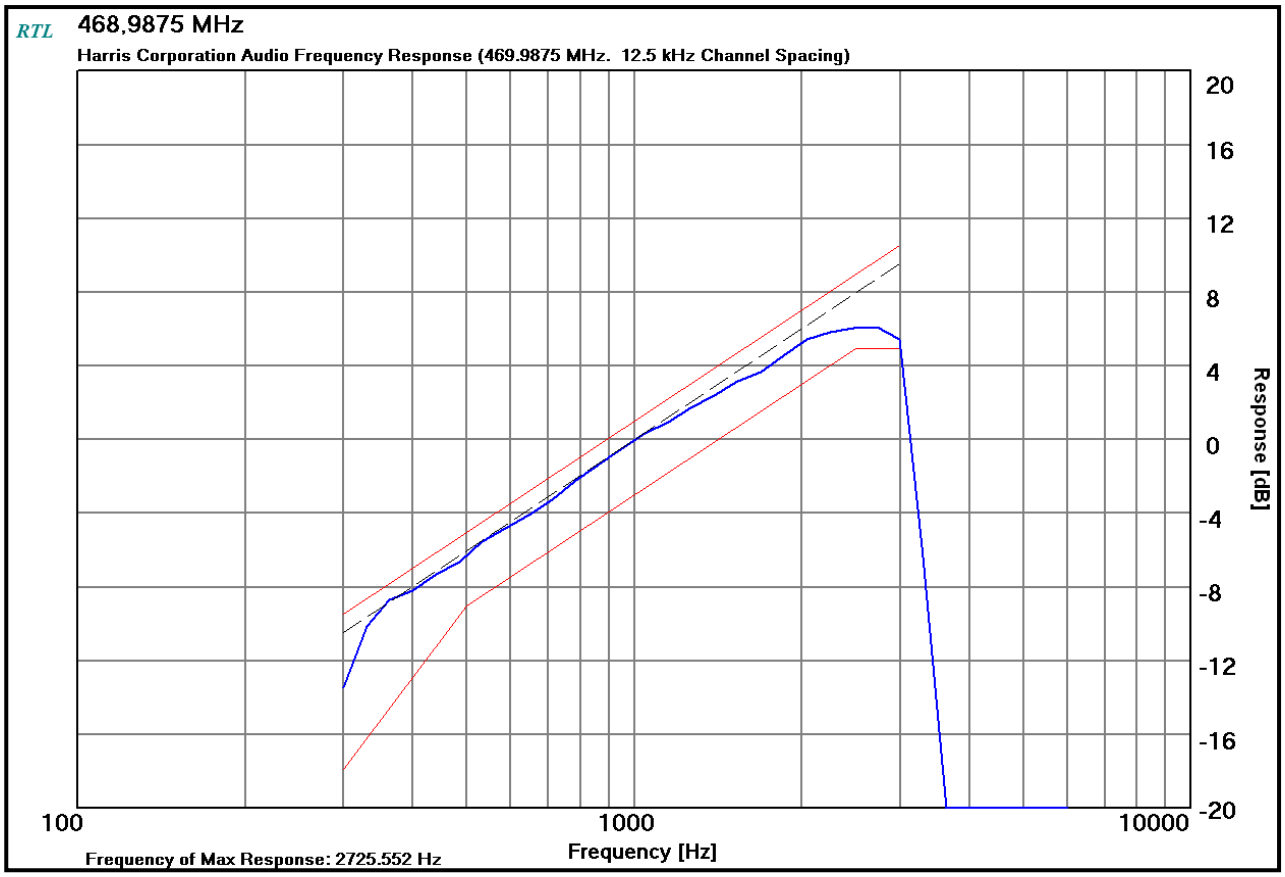
Plot 11-1: Modulation Characteristics - Audio Frequency Response – 162.0000 MHz



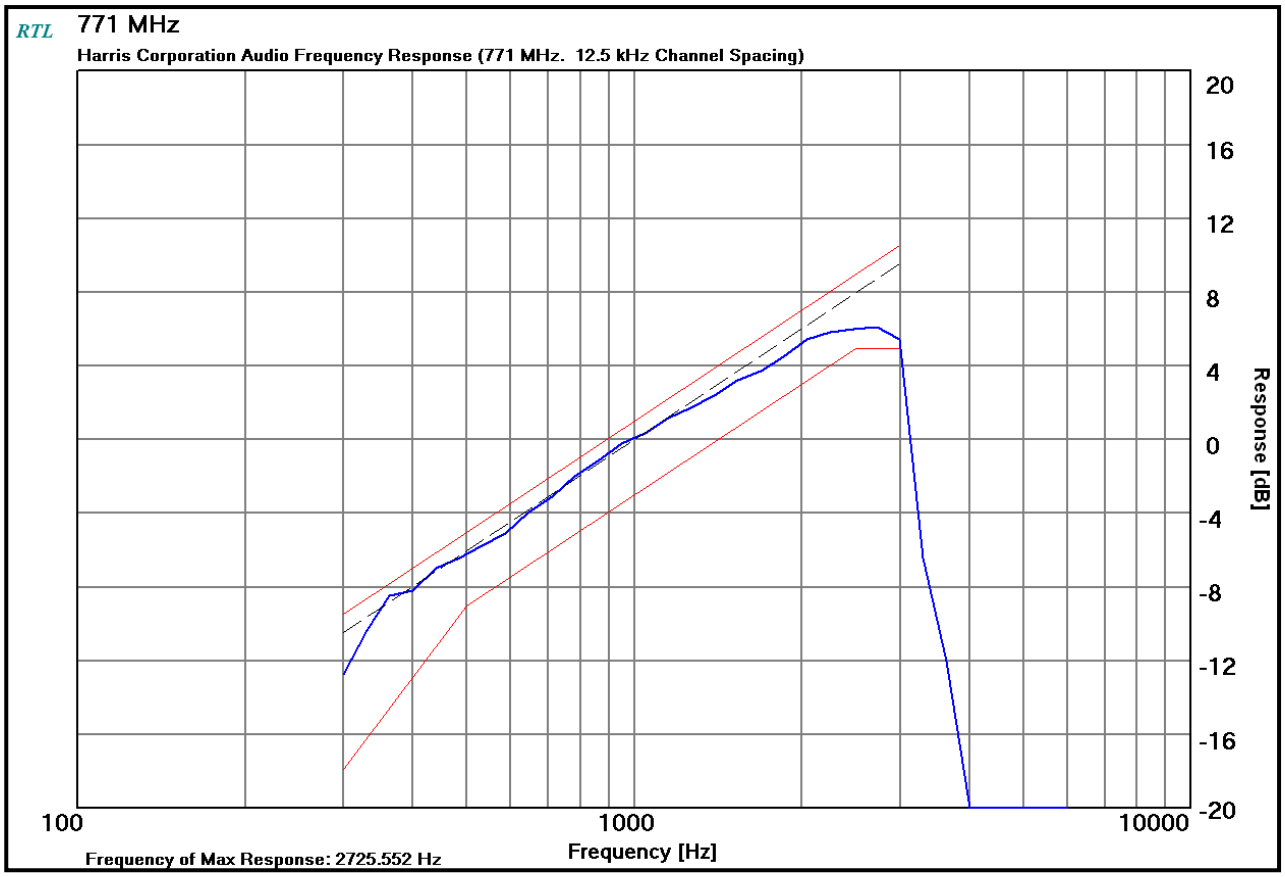
Plot 11-2: Modulation Characteristics - Audio Frequency Response – 418.0000 MHz



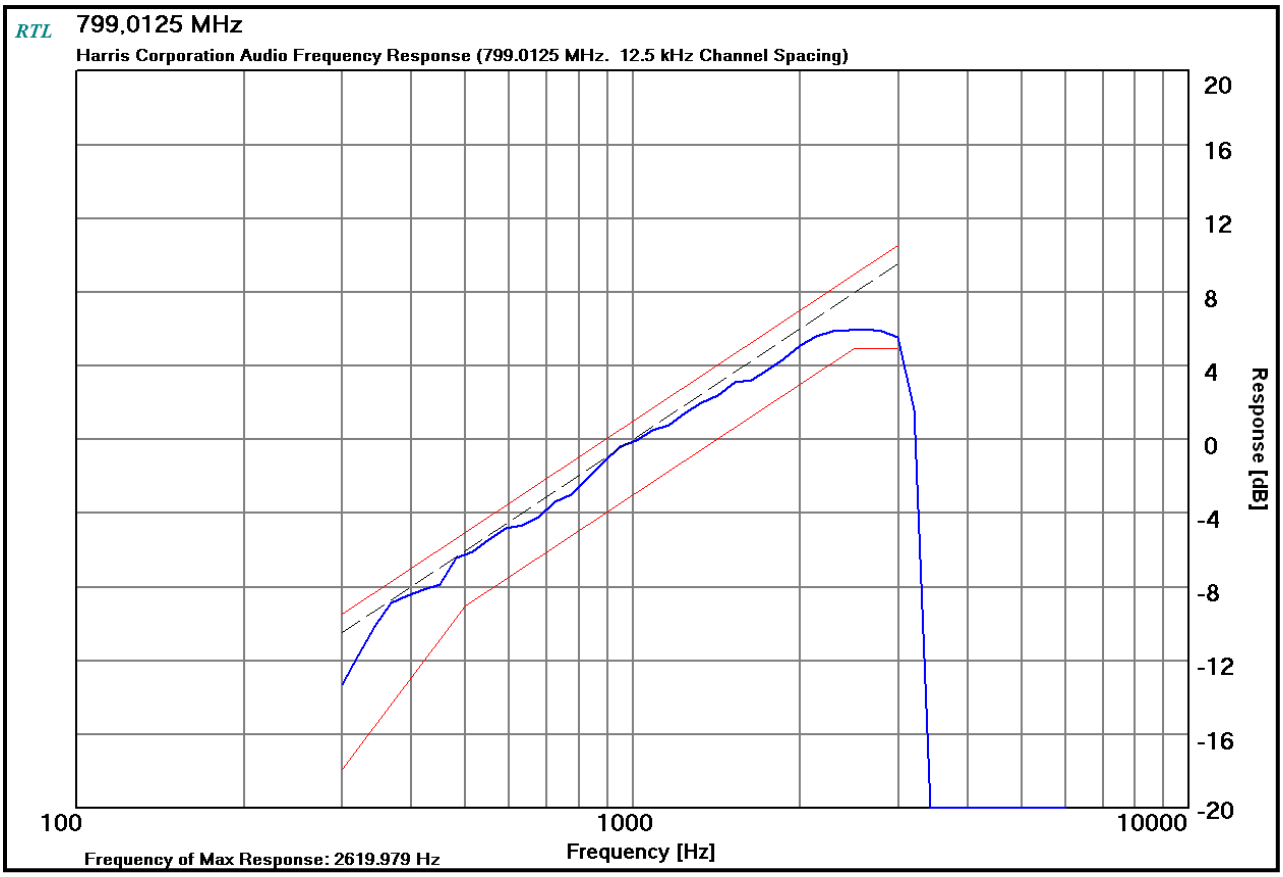
Plot 11-3: Modulation Characteristics - Audio Frequency Response – 469.9875 MHz



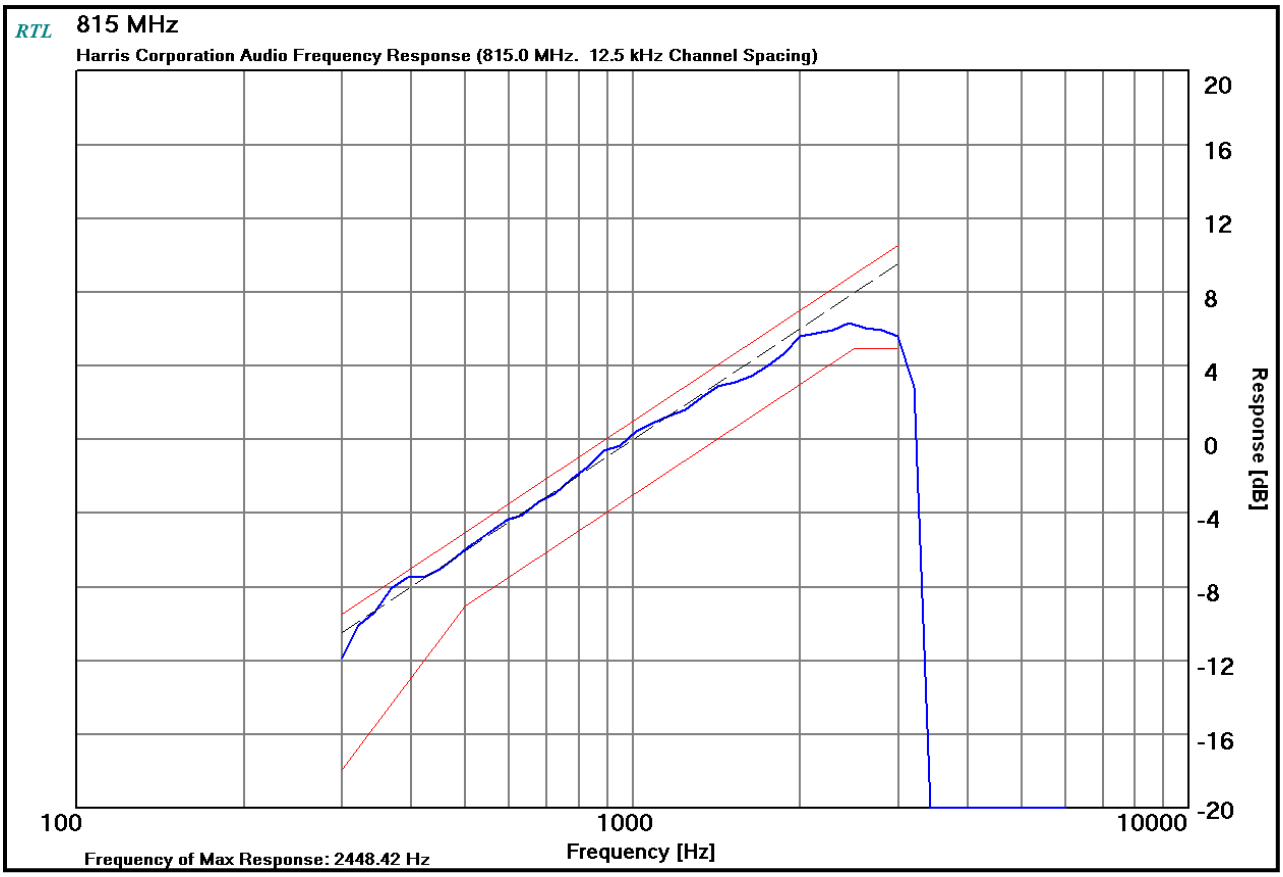
Plot 11-4: Modulation Characteristics - Audio Frequency Response – 771.0000 MHz



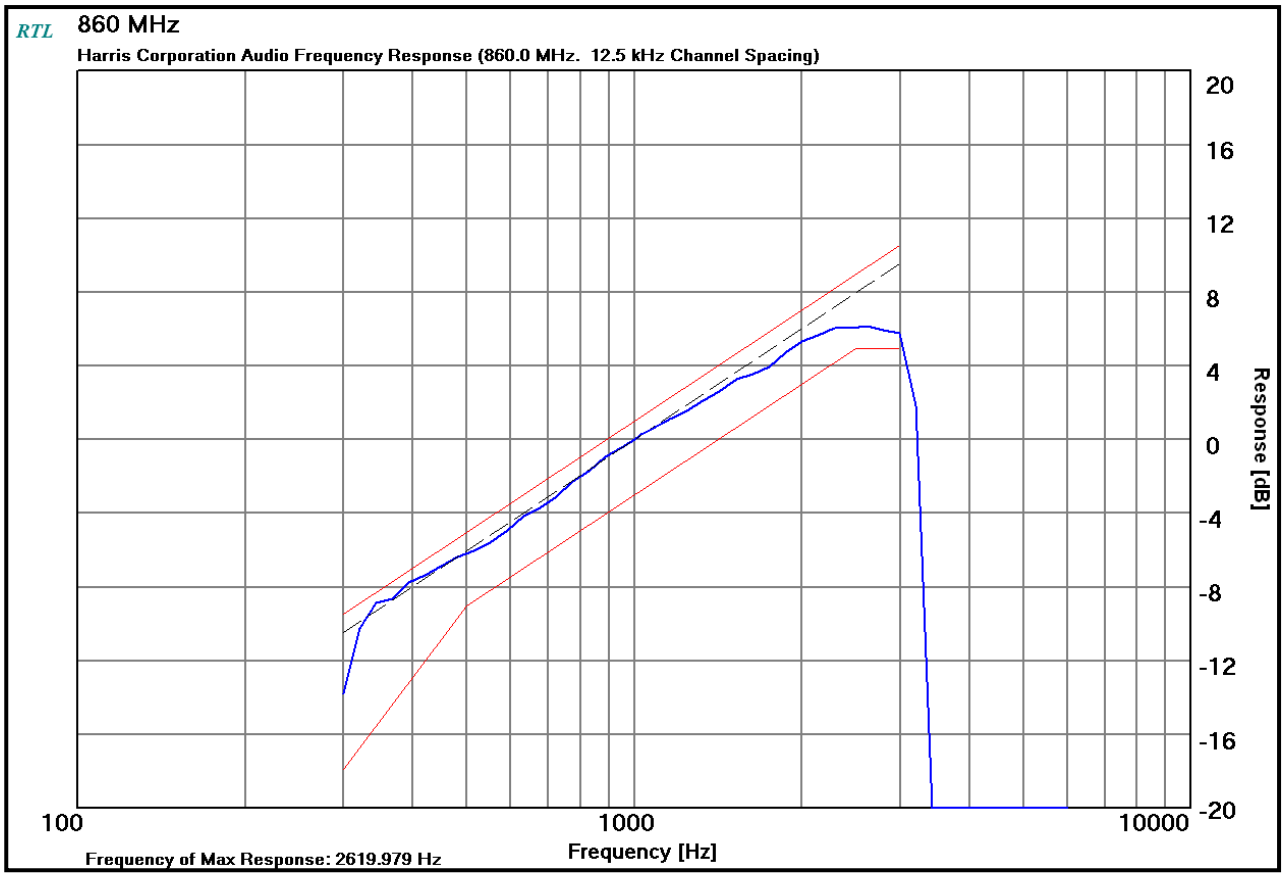
Plot 11-5: Modulation Characteristics - Audio Frequency Response - 799.0125 MHz



Plot 11-6: Modulation Characteristics - Audio Frequency Response – 815.0000 MHz

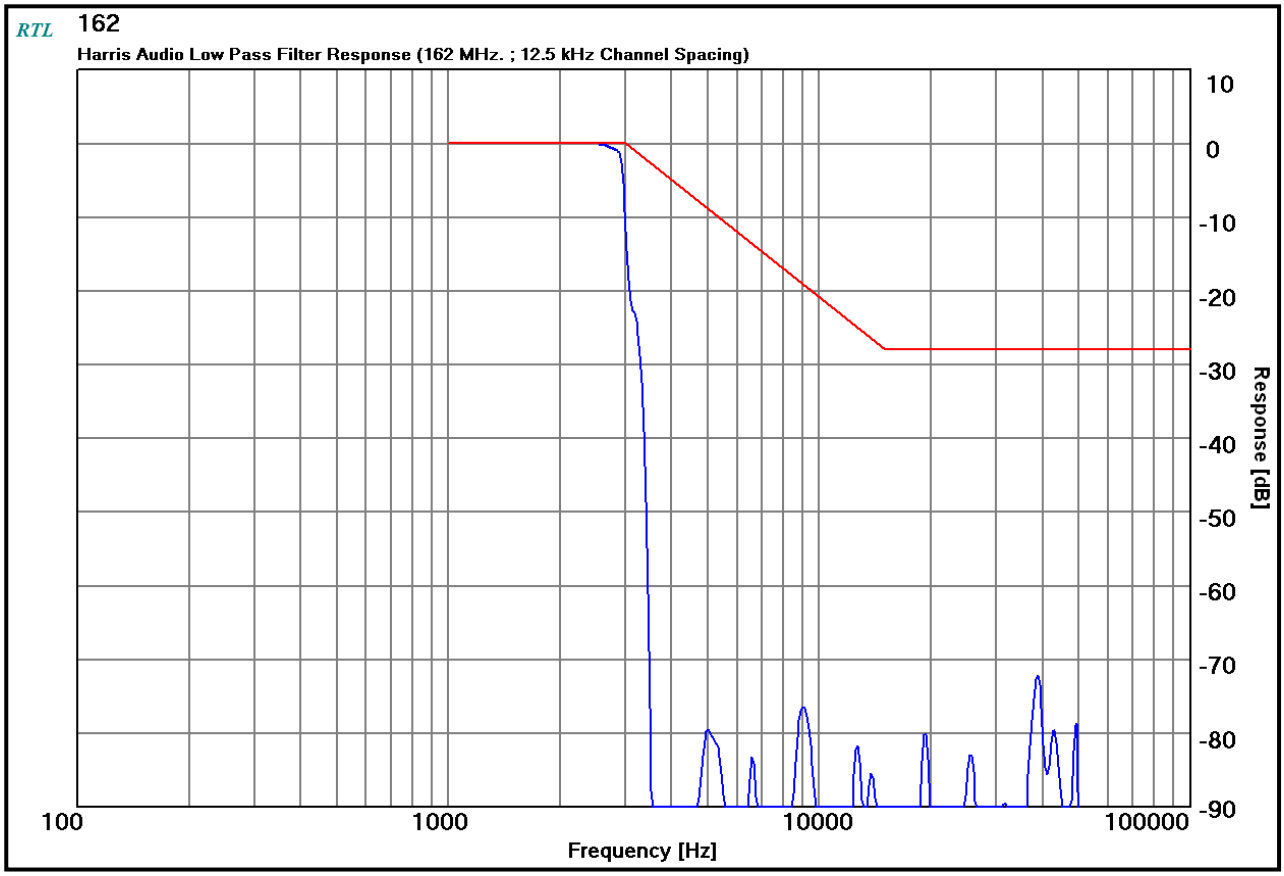


Plot 11-7: Modulation Characteristics - Audio Frequency Response – 860.0000 MHz

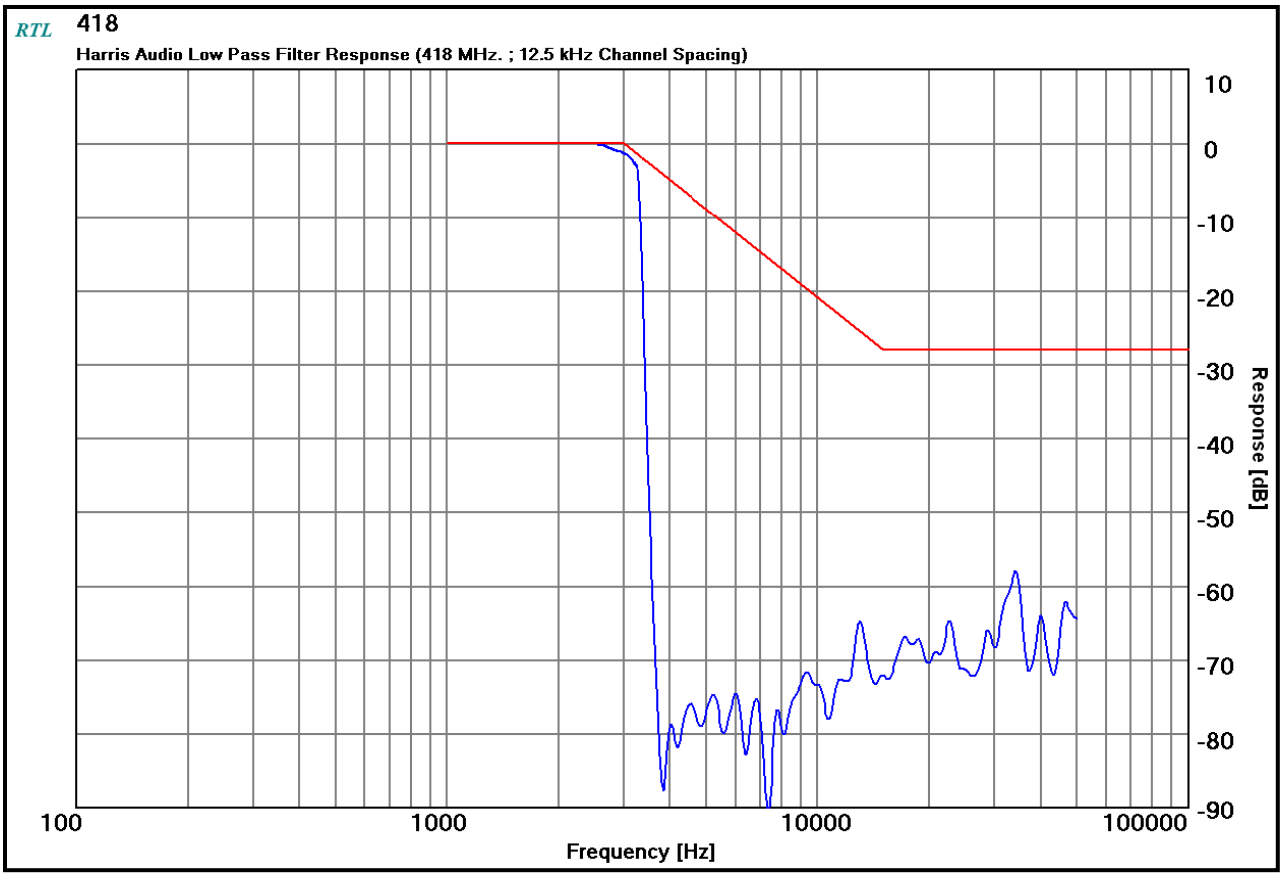


11.2.2 Audio Low Pass Filter Response

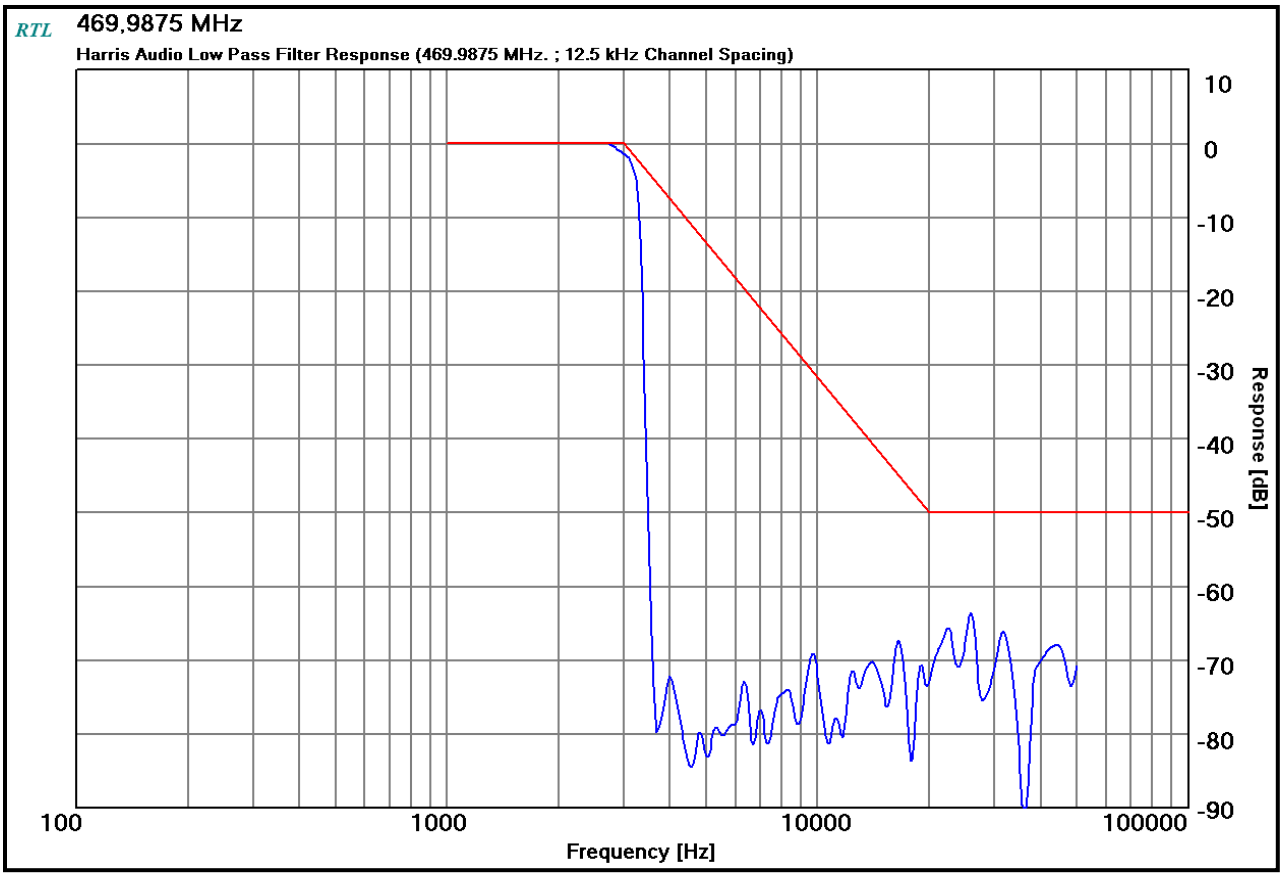
Plot 11-8: Modulation Characteristics – Audio Low Pass Filter – 162.0000 MHz



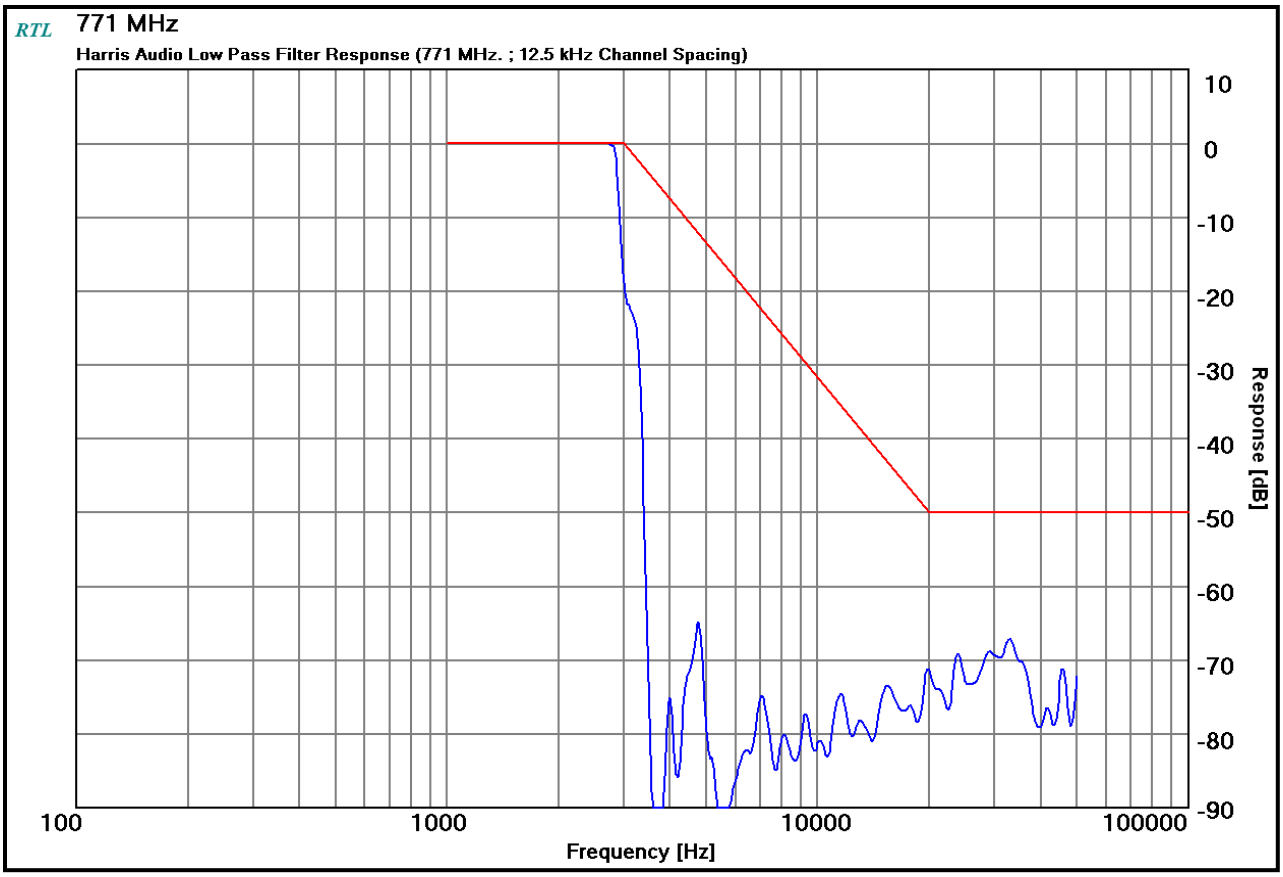
Plot 11-9: Modulation Characteristics – Audio Low Pass Filter – 418.0000 MHz



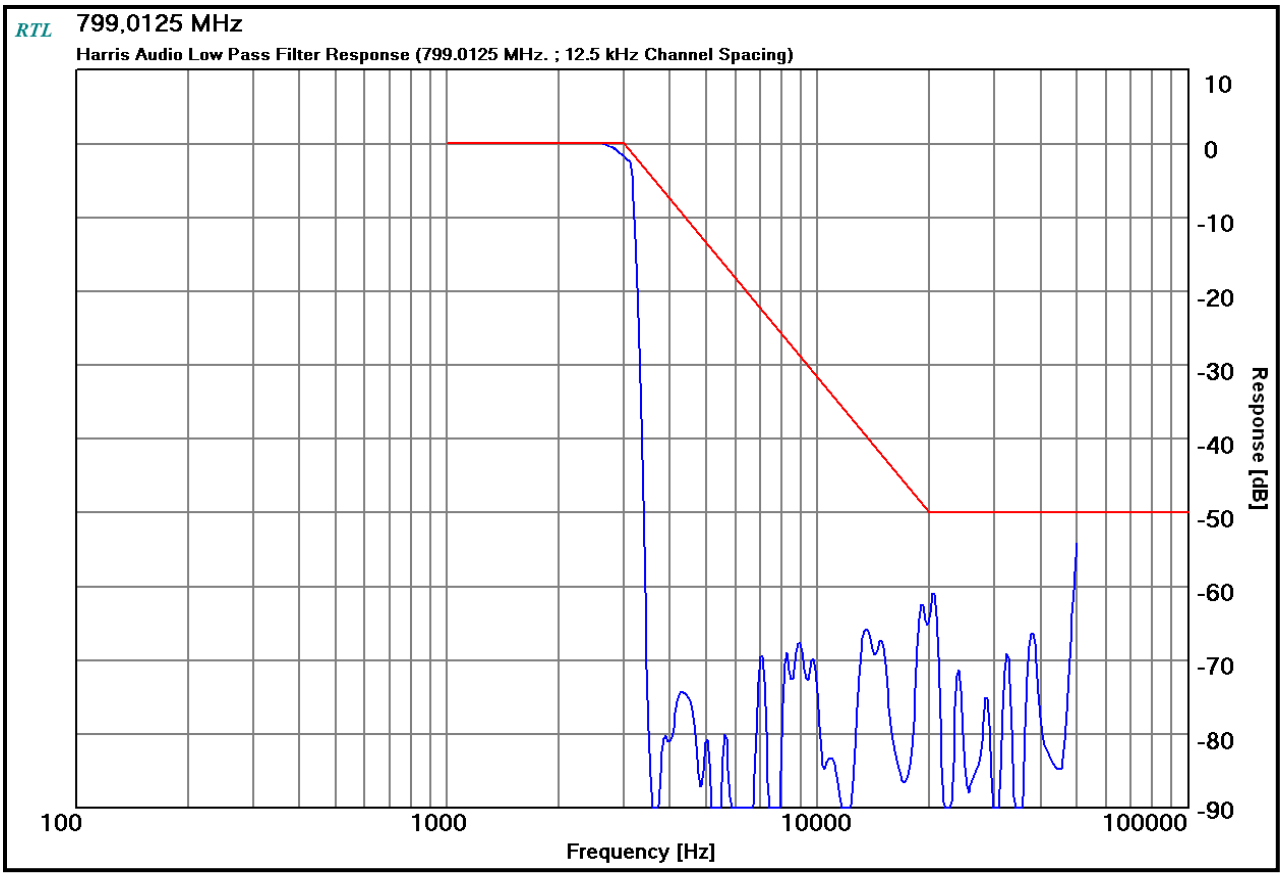
Plot 11-10: Modulation Characteristics – Audio Low Pass Filter – 469.9875 MHz



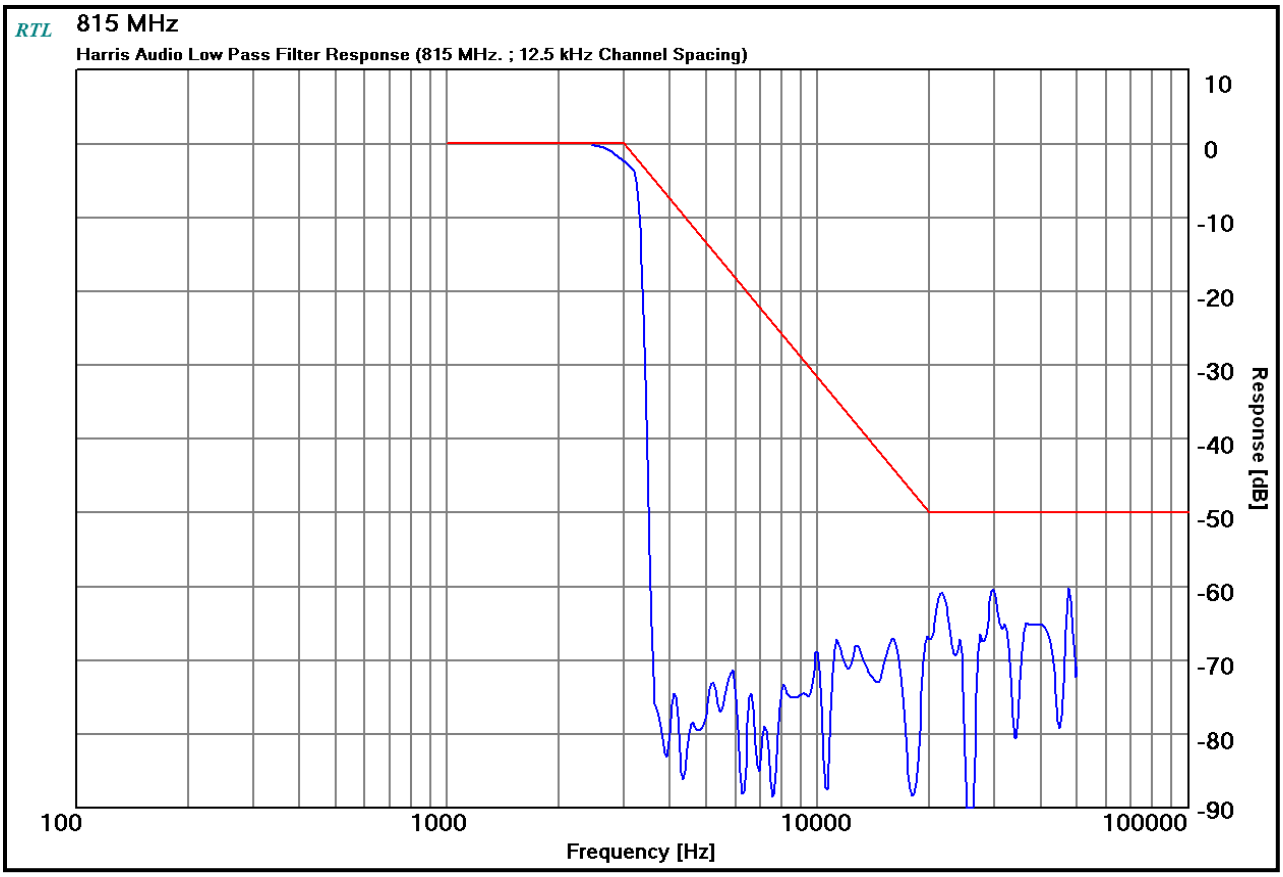
Plot 11-11: Modulation Characteristics – Audio Low Pass Filter – 771.0000 MHz



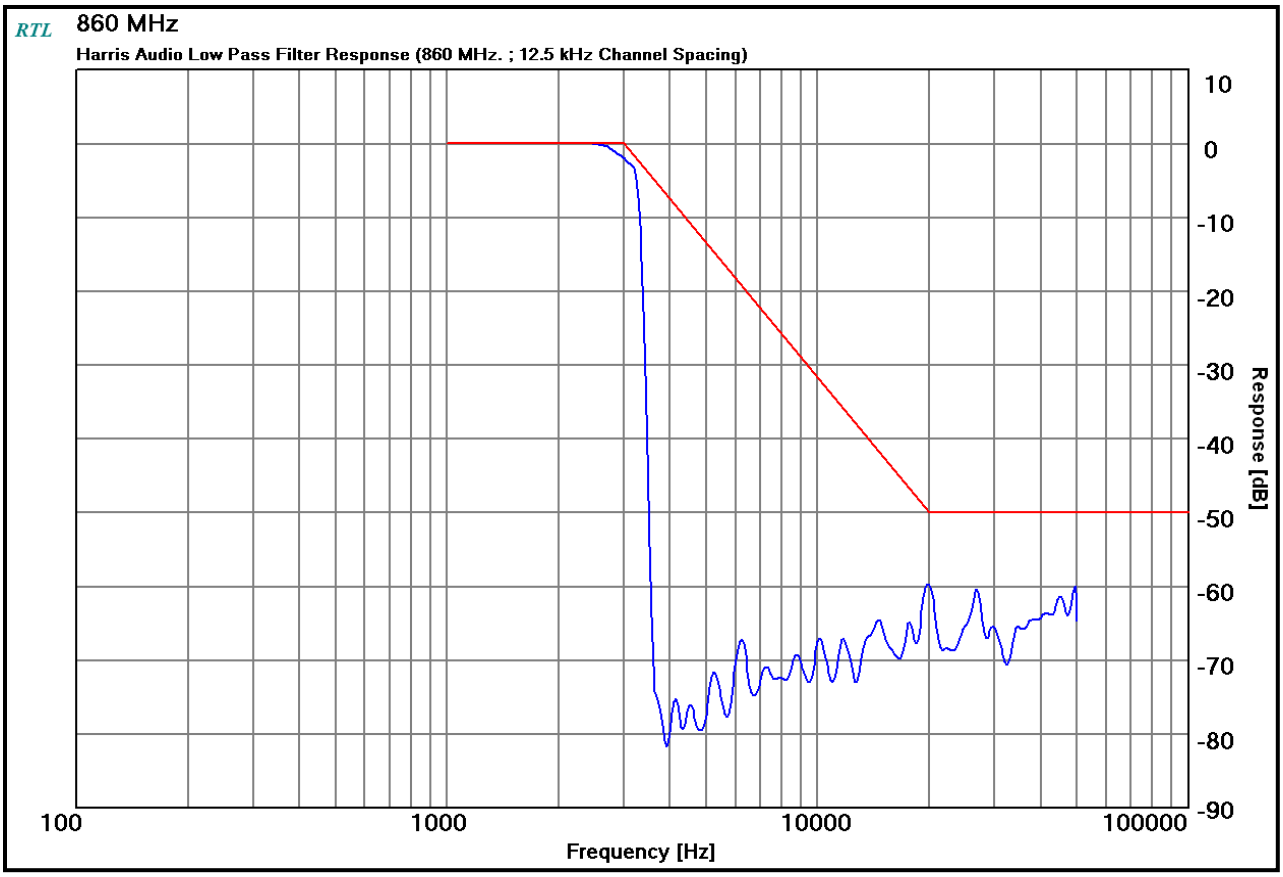
Plot 11-12: Modulation Characteristics – Audio Low Pass Filter - 799.0125 MHz



Plot 11-13: Modulation Characteristics – AudioLowPass Filter – 815.0000 MHz

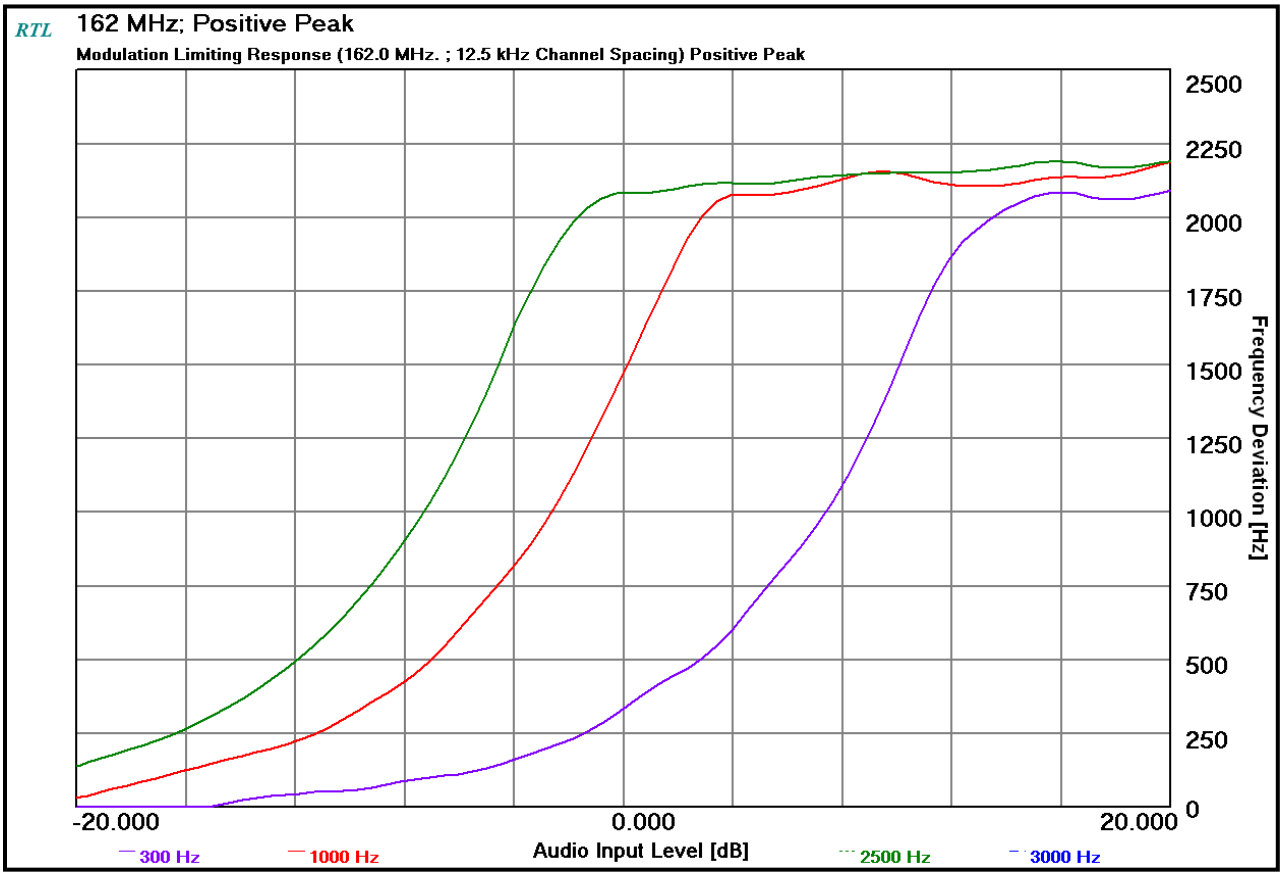


Plot 11-14: Modulation Characteristics – Audio Low Pass Filter – 860.0000 MHz

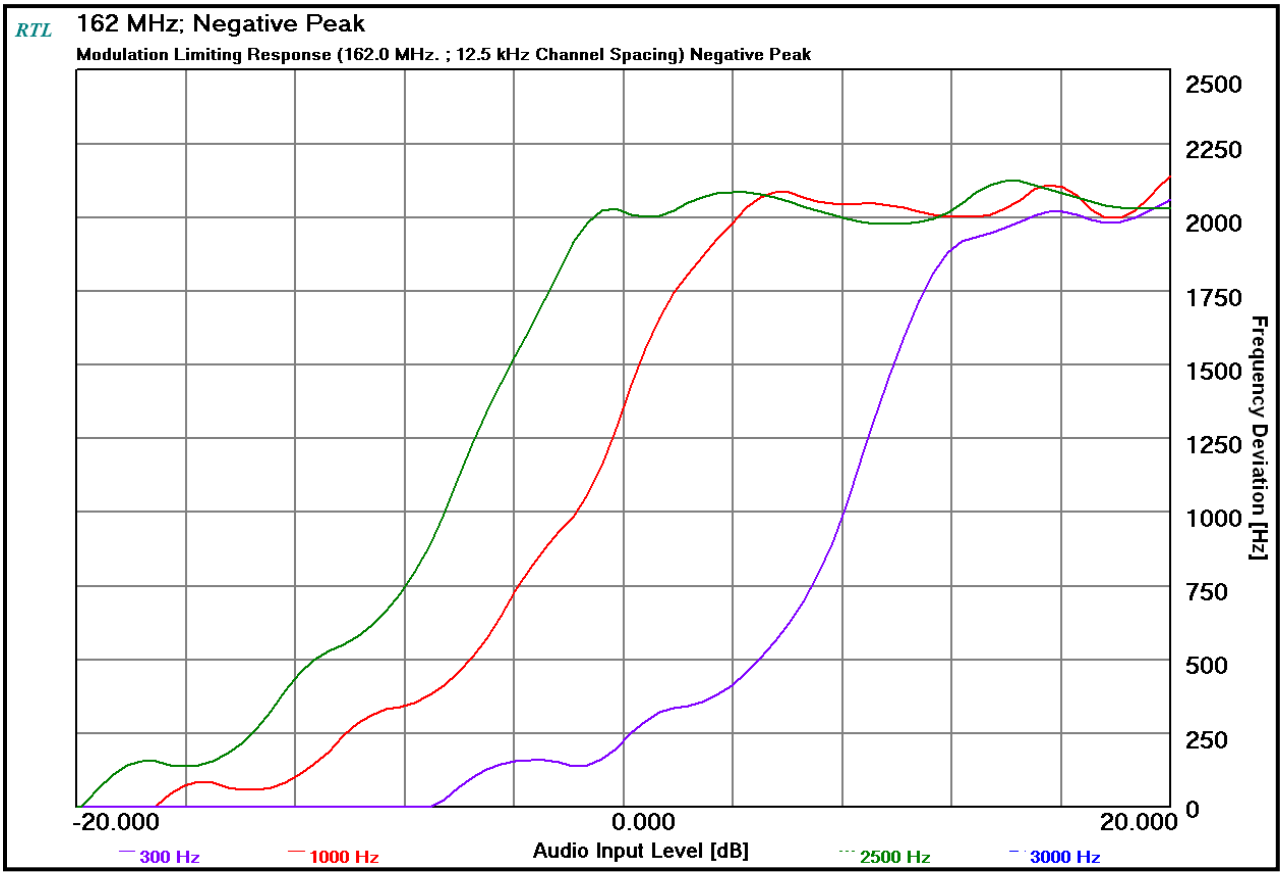


11.2.3 Modulation Limiting

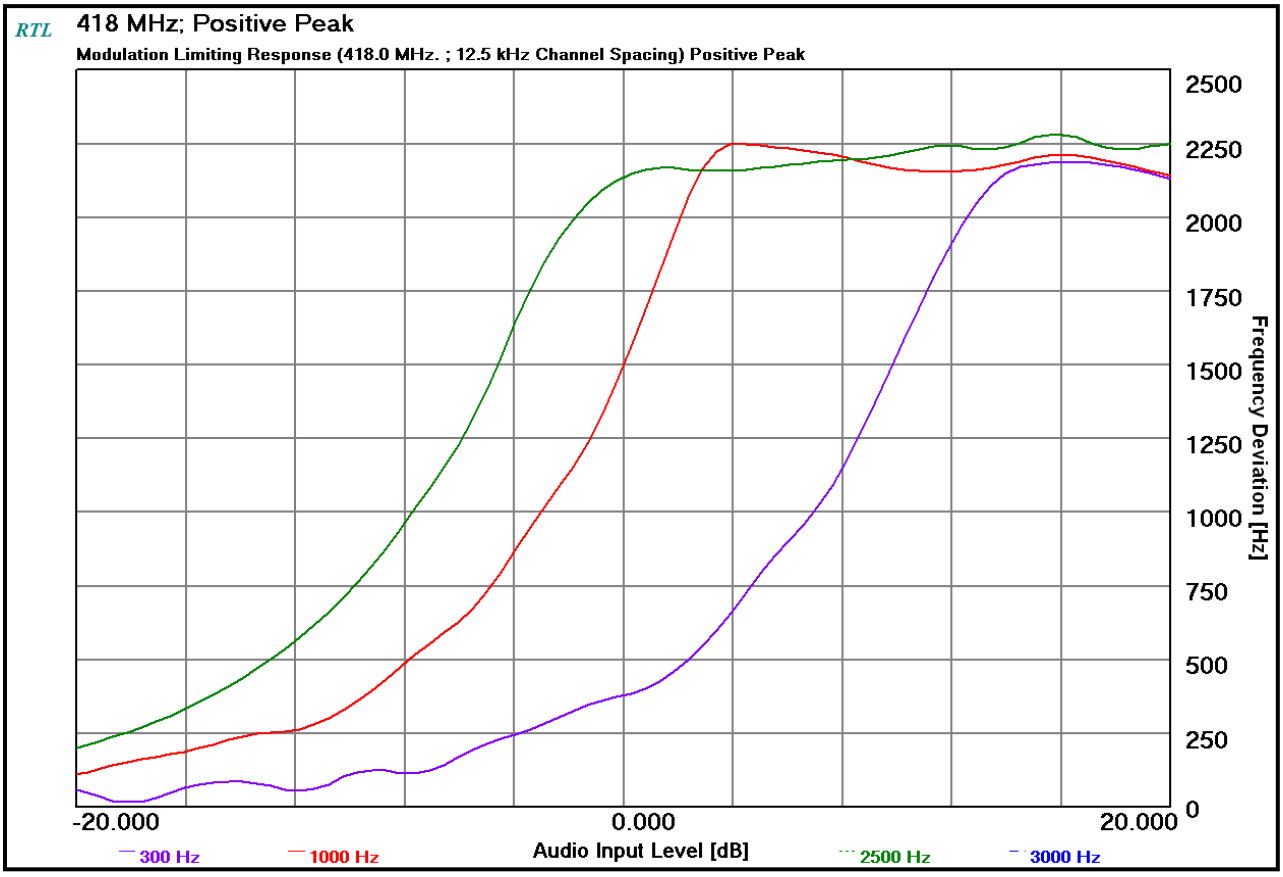
Plot 11-15: Modulation Characteristics – Modulation Limiting – 162.0000 MHz; Positive Peak



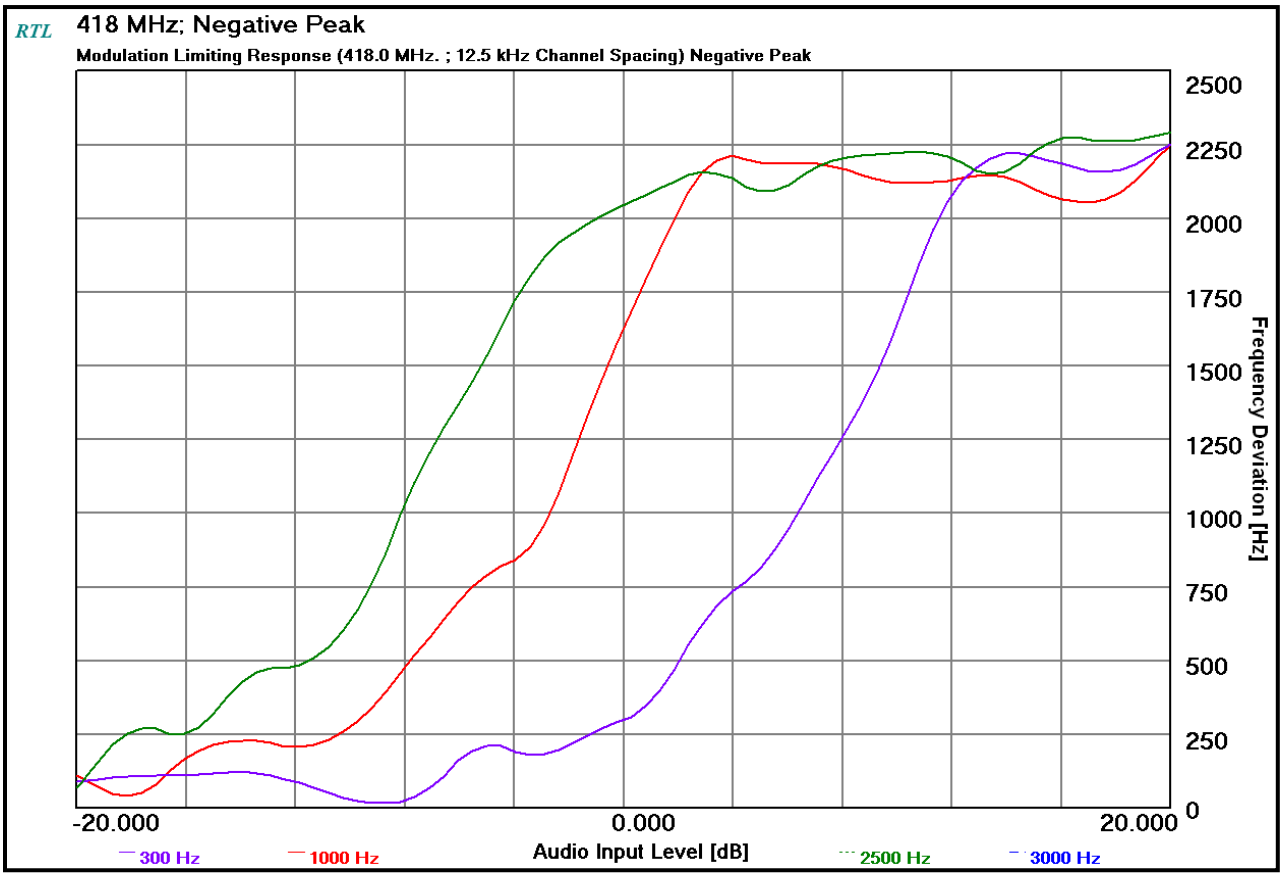
Plot 11-16: Modulation Characteristics – Modulation Limiting – 162.0000 MHz; Negative Peak



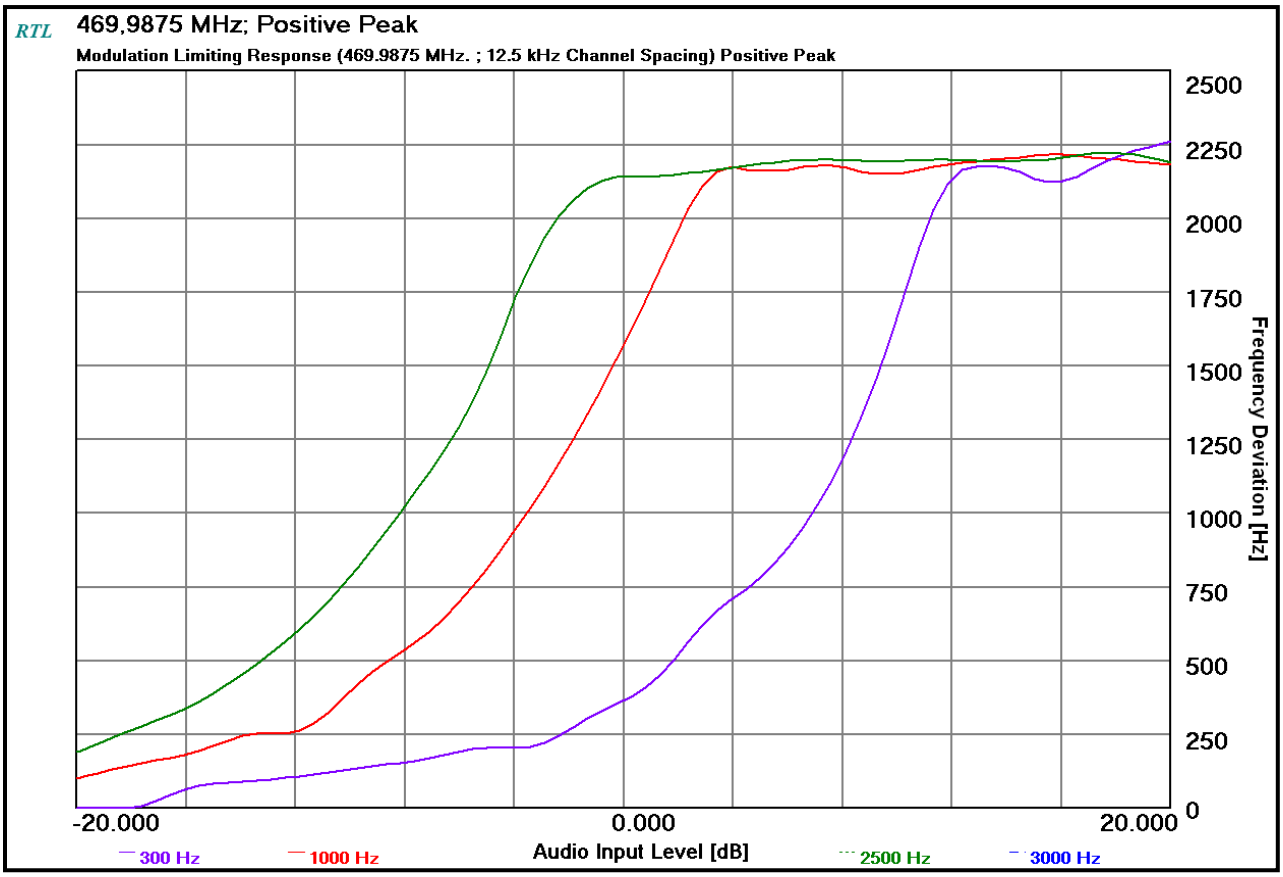
Plot 11-17: Modulation Characteristics – Modulation Limiting – 418.0000 MHz; Positive Peak



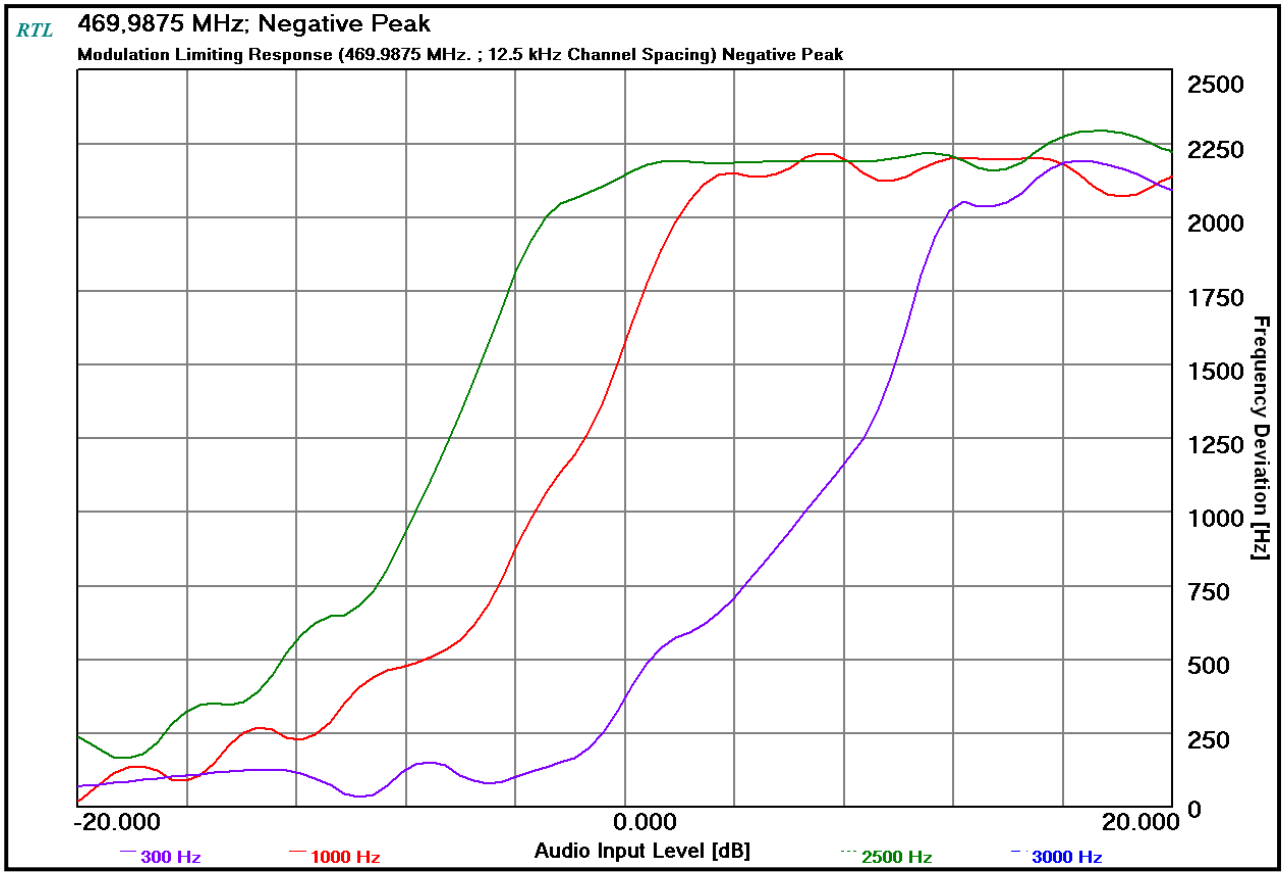
Plot 11-18: Modulation Characteristics – Modulation Limiting – 418.0000 MHz; Negative Peak



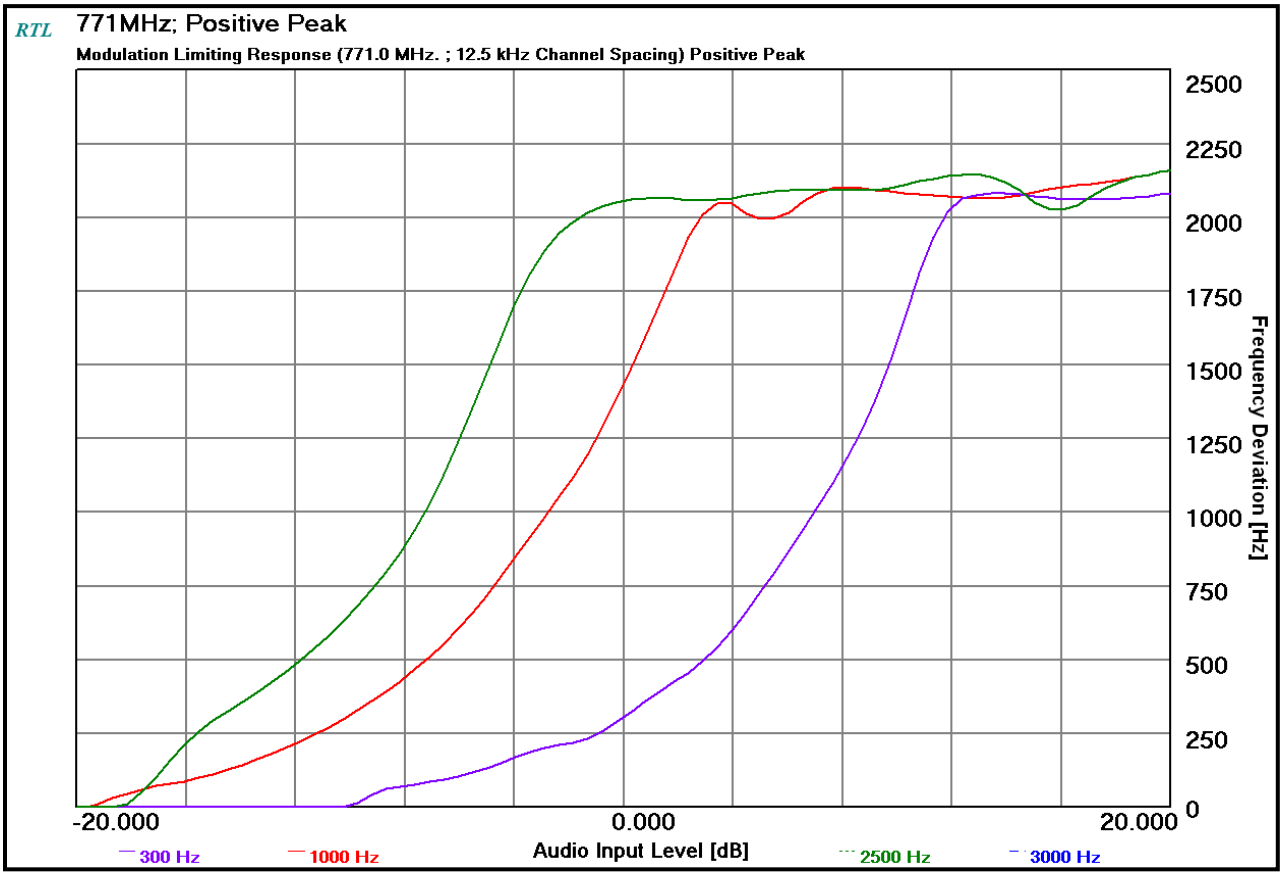
Plot 11-19: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; Positive Peak



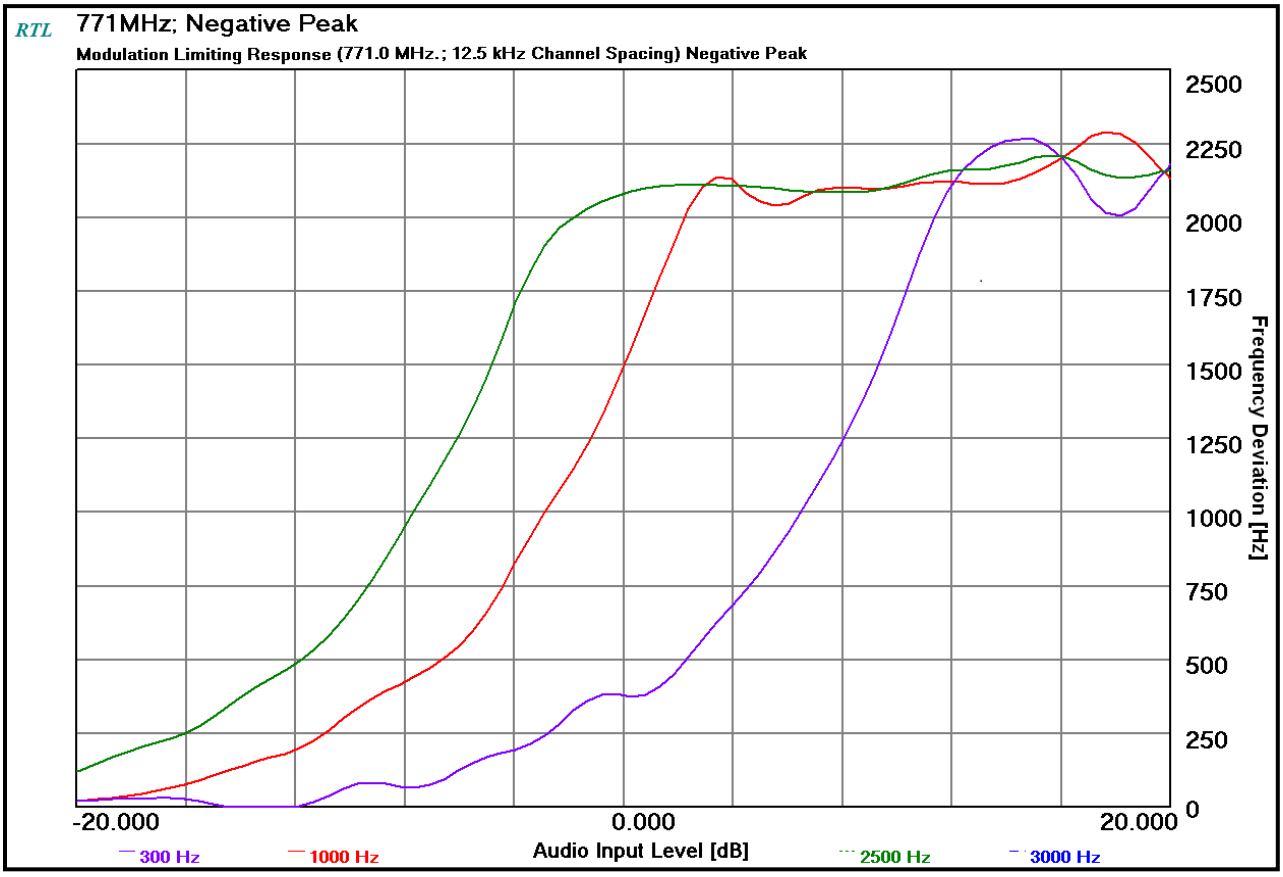
Plot 11-20: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; Negative Peak



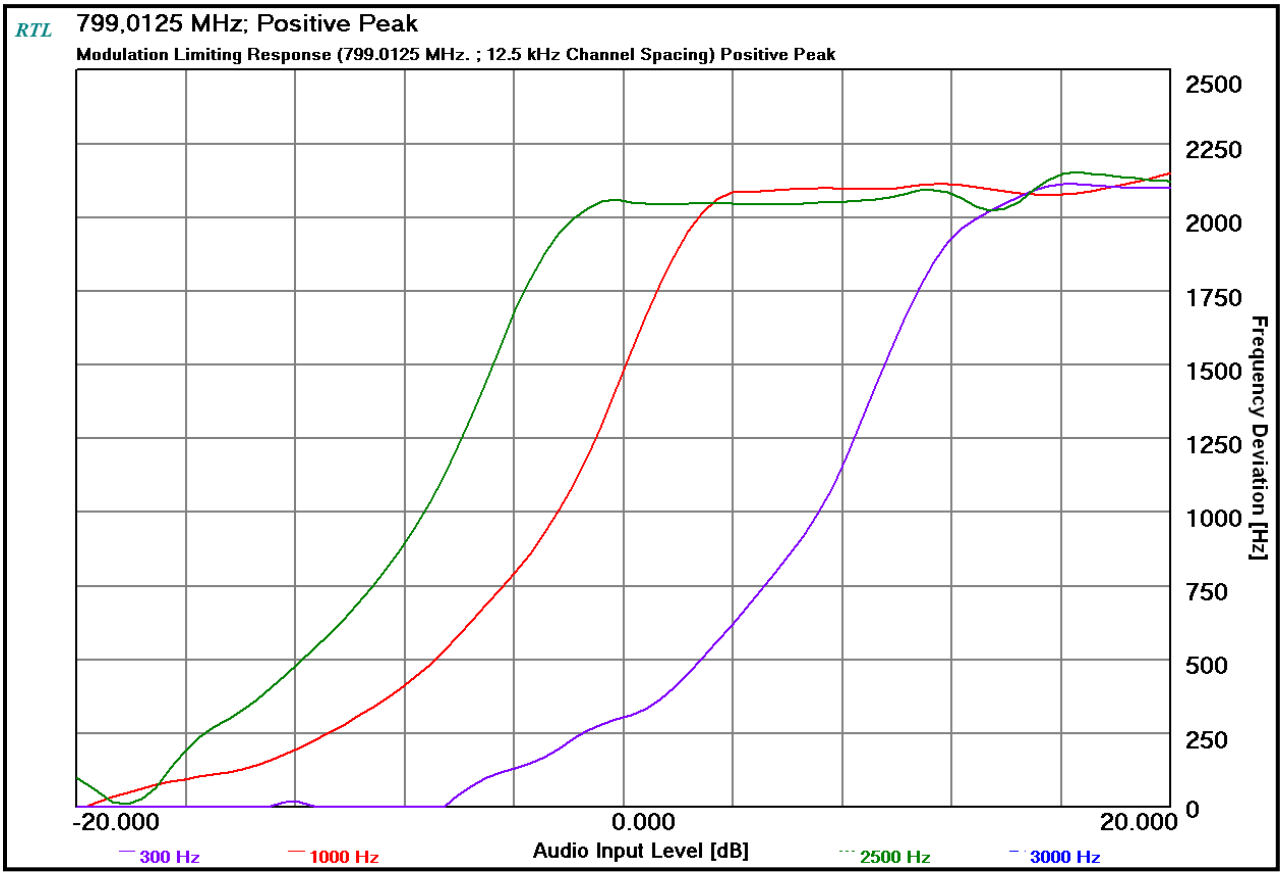
Plot 11-21: Modulation Characteristics – Modulation Limiting – 771.0000 MHz; Positive Peak



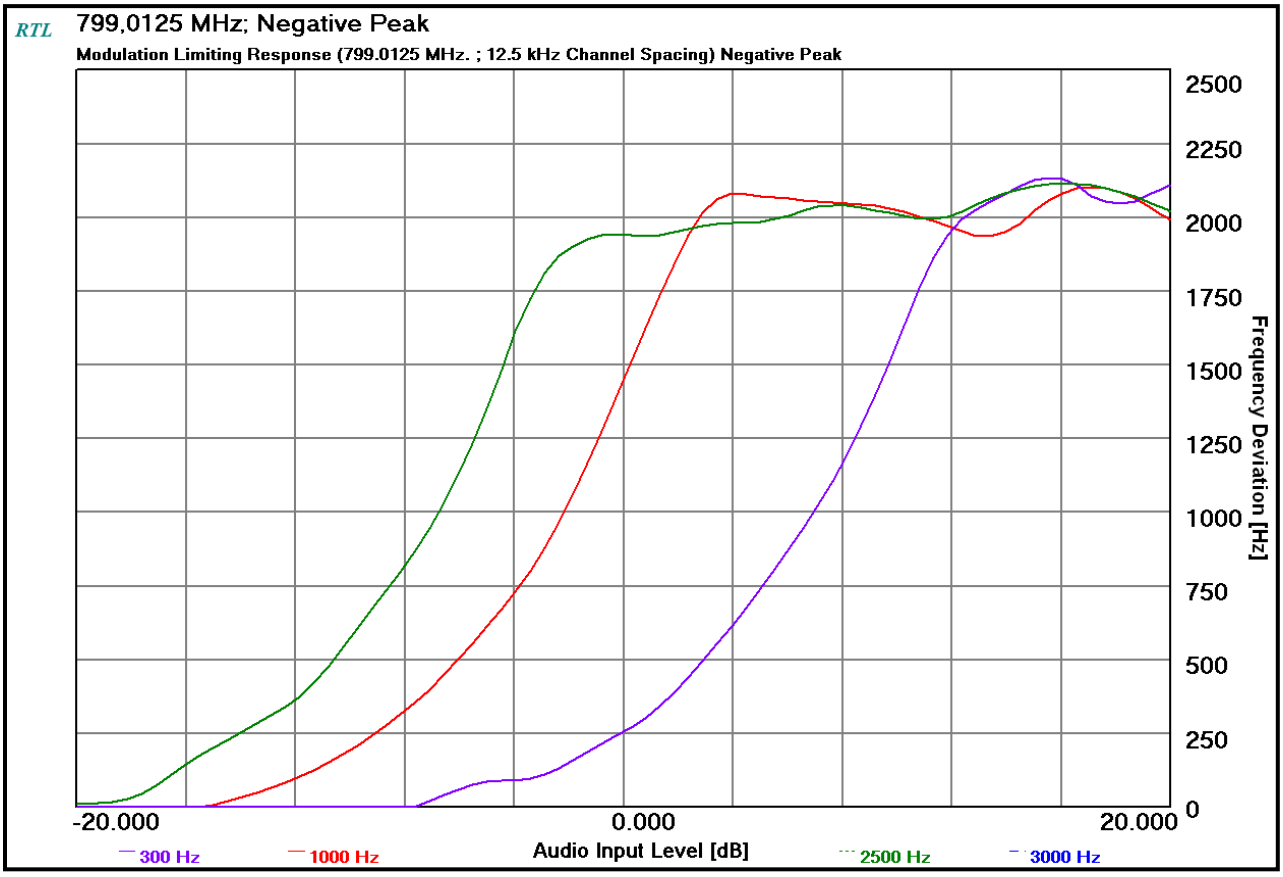
Plot 11-22: Modulation Characteristics – Modulation Limiting - 771.0000 MHz; Negative Peak



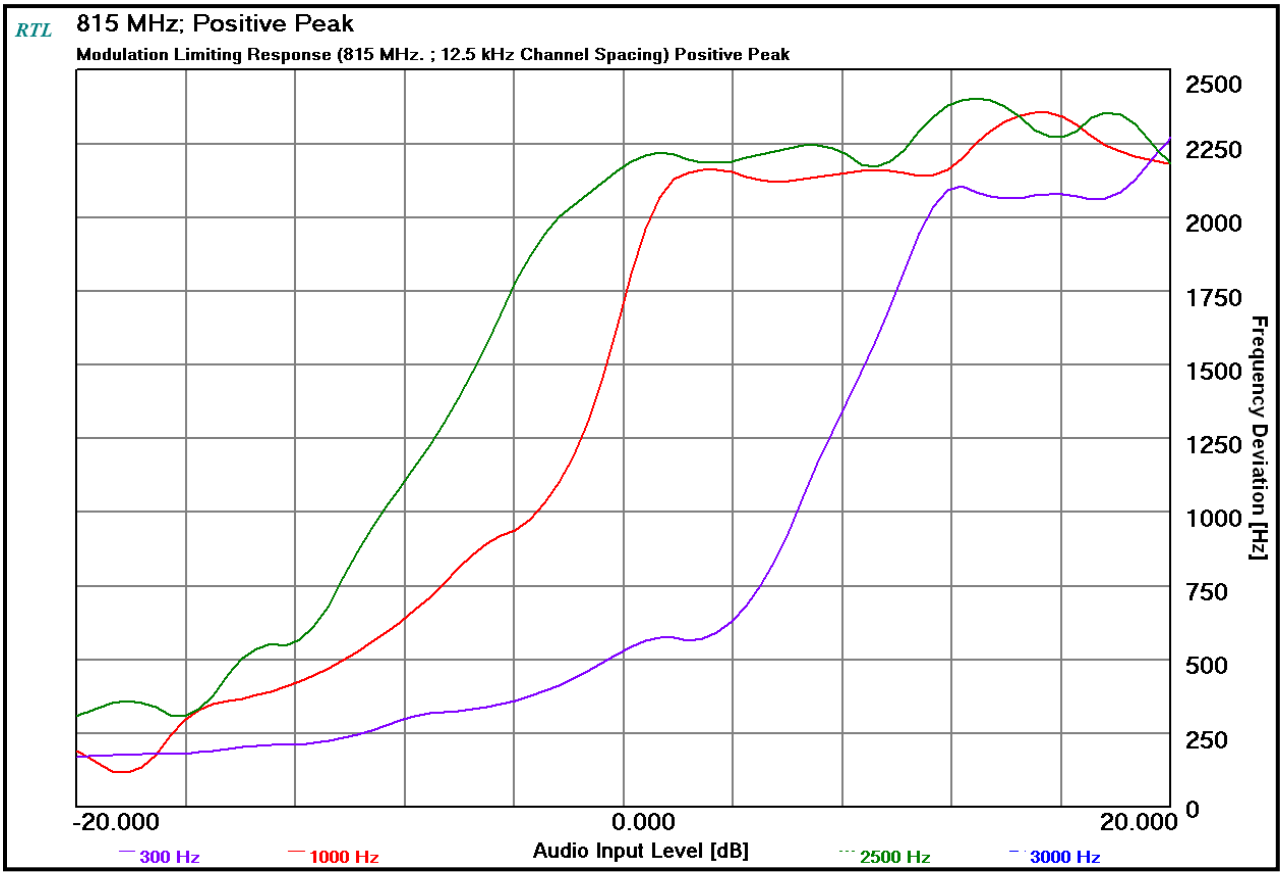
Plot 11-23: Modulation Characteristics – Modulation Limiting - 799.0125 MHz; Positive Peak



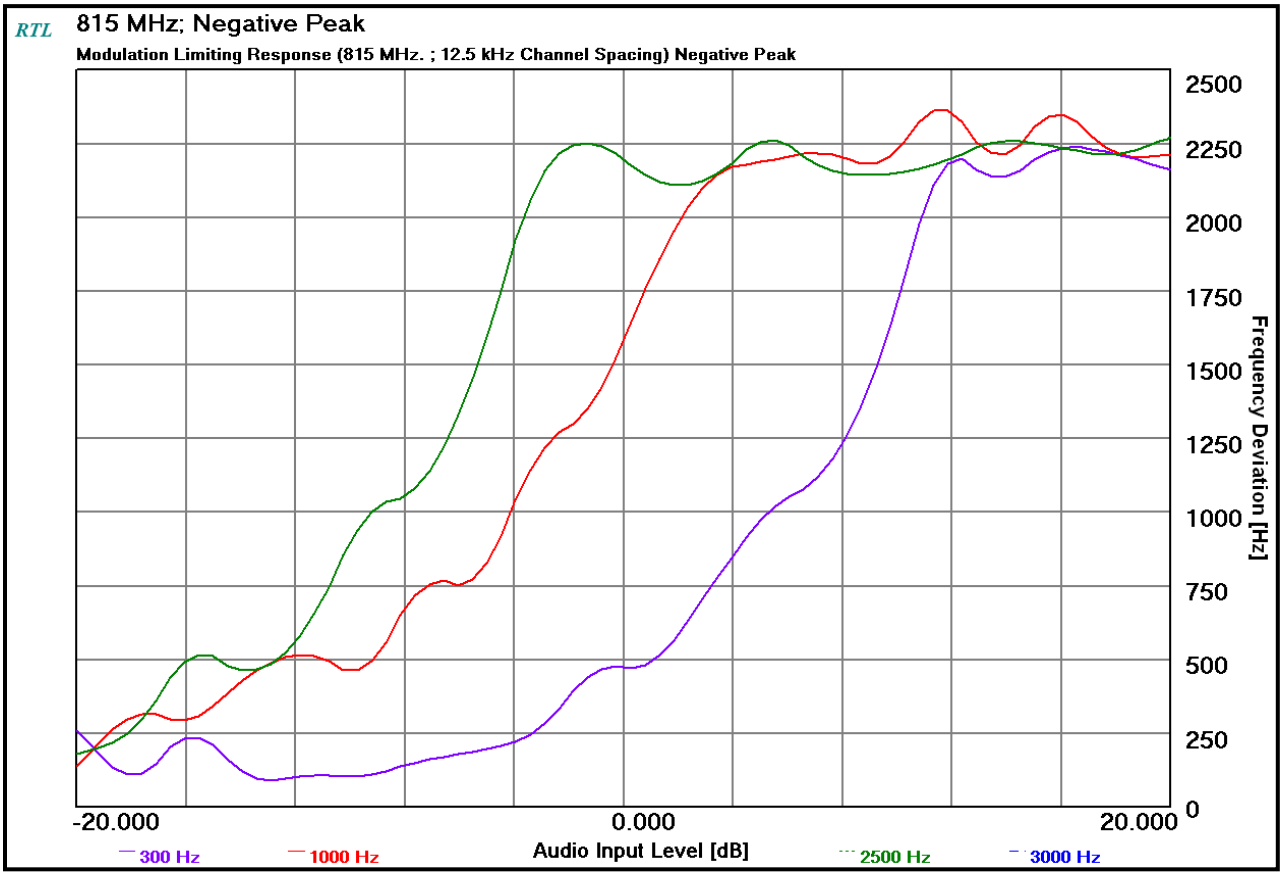
Plot 11-24: Modulation Characteristics – Modulation Limiting - 799.0125 MHz; Negative Peak



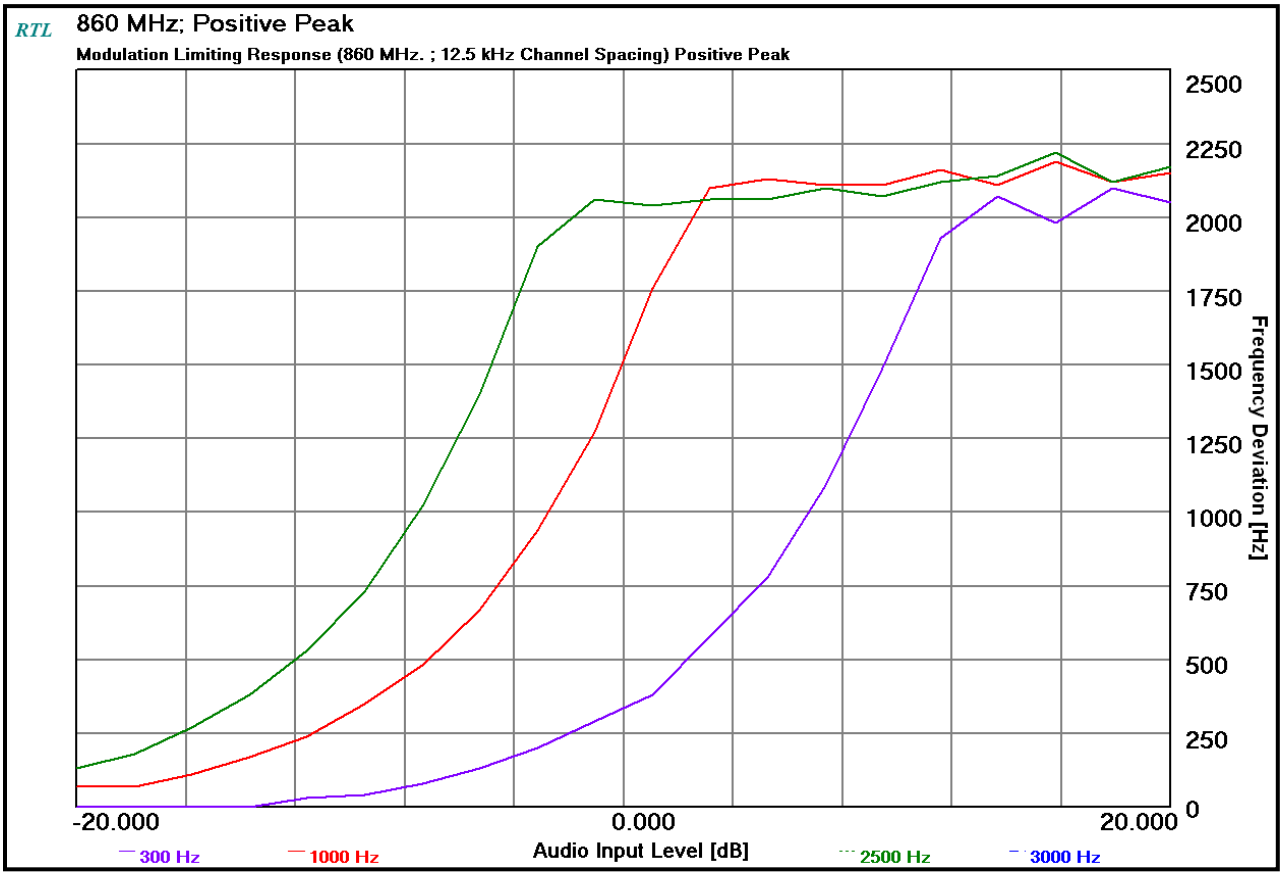
Plot 11-25: Modulation Characteristics – Modulation Limiting – 815.0000 MHz; Positive Peak



Plot 11-26: Modulation Characteristics – Modulation Limiting – 815.0000 MHz; Negative Peak



Plot 11-27: Modulation Characteristics – Modulation Limiting – 860.0000 MHz; Positive Peak



Plot 11-28: Modulation Characteristics – Modulation Limiting – 860.0000 MHz; Negative Peak

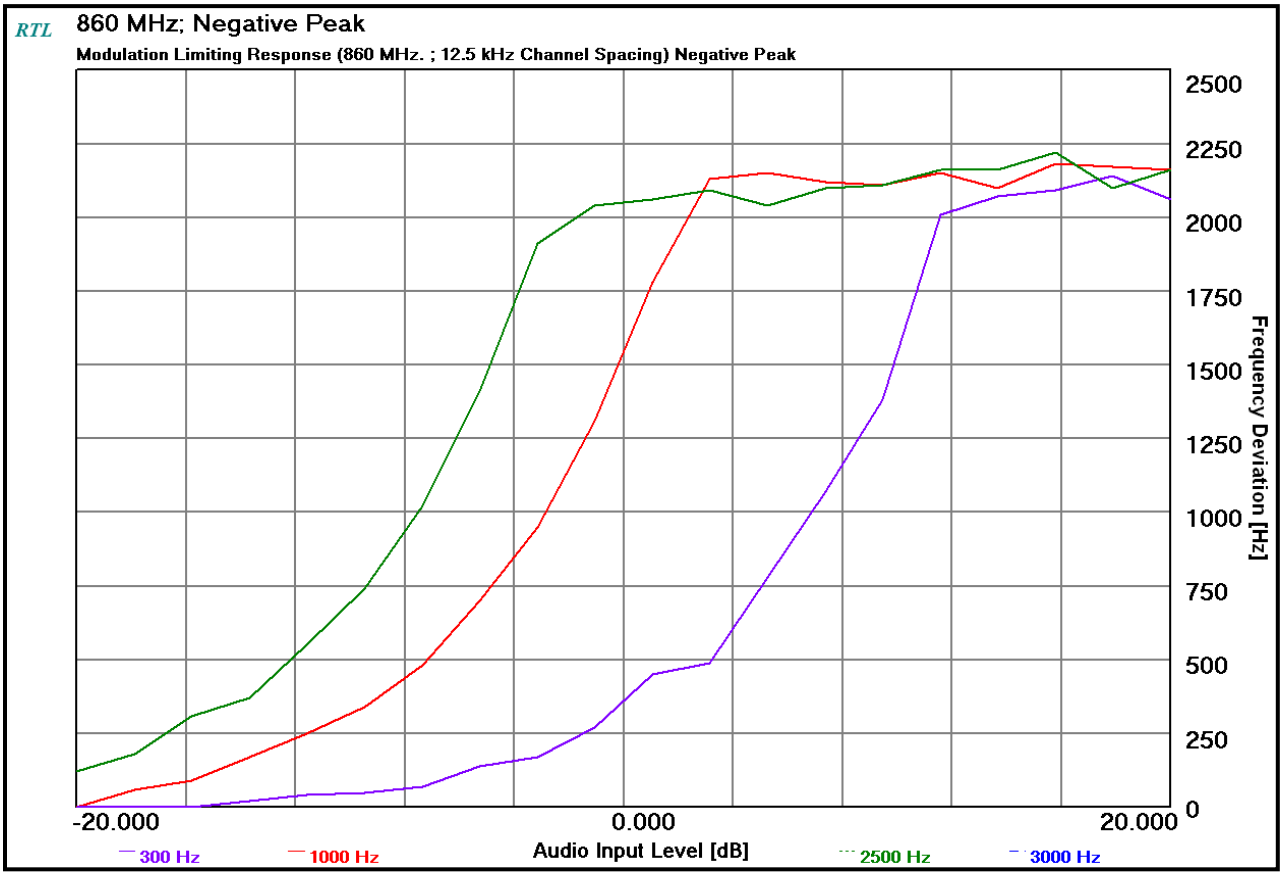


Table 11-1: Test Equipment Used For Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/11
901138	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 40dB	BK5883	2/14/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 6, 2011
Test Engineer	Signature	Date of Tests

12 FCC Rules and Regulations Part 90.214: Transient Frequency Behavior; RSS-119 5.9 Transmitter Frequency Behavior

12.1 Test Procedure

TIA-EIA-603-C 2004, section 2.2.3

§90.214 Transient Frequency Behavior

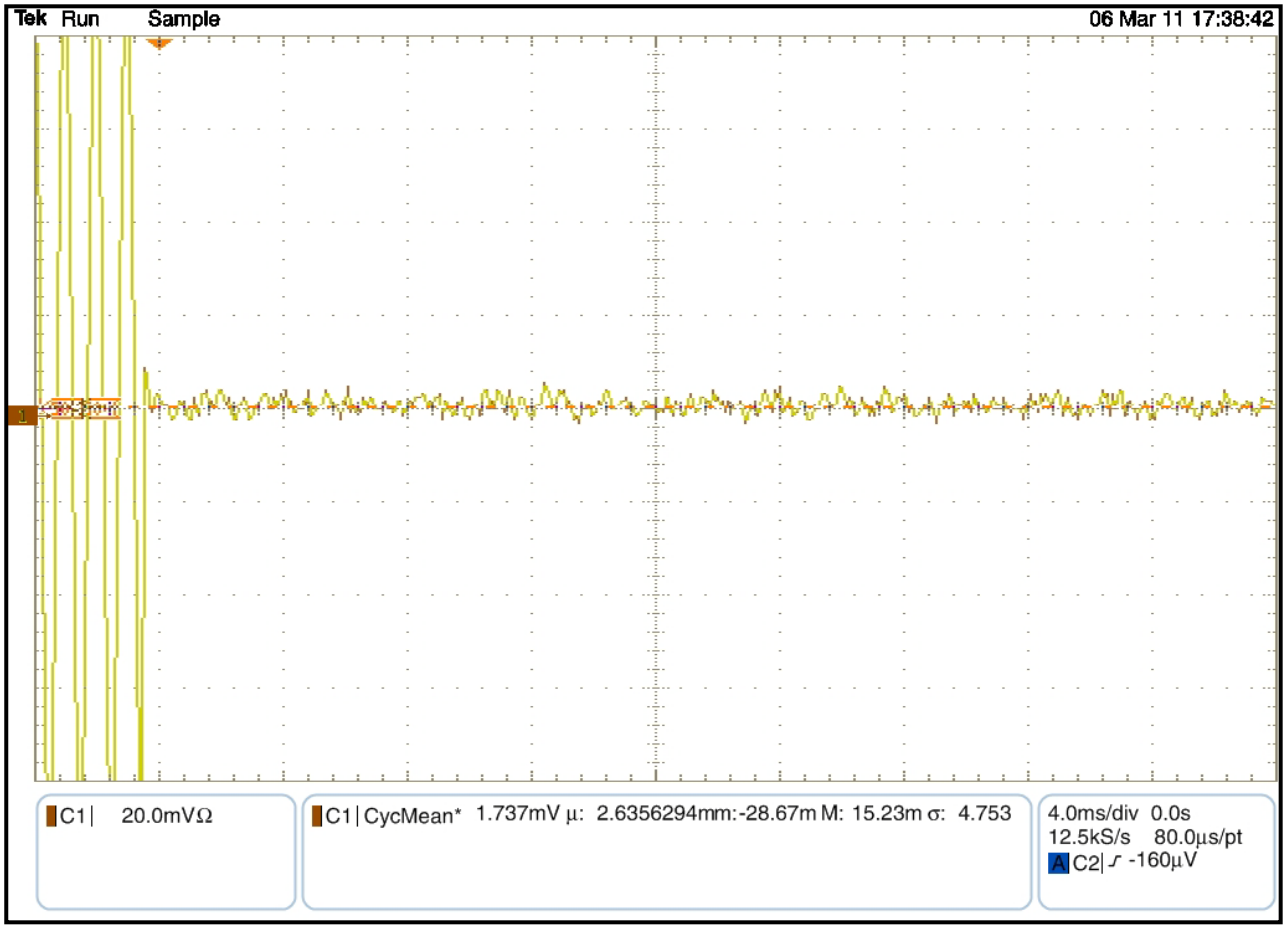
Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1,2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1 [4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3 [4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1 [4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 kHz	5.0 ms	10.0 ms

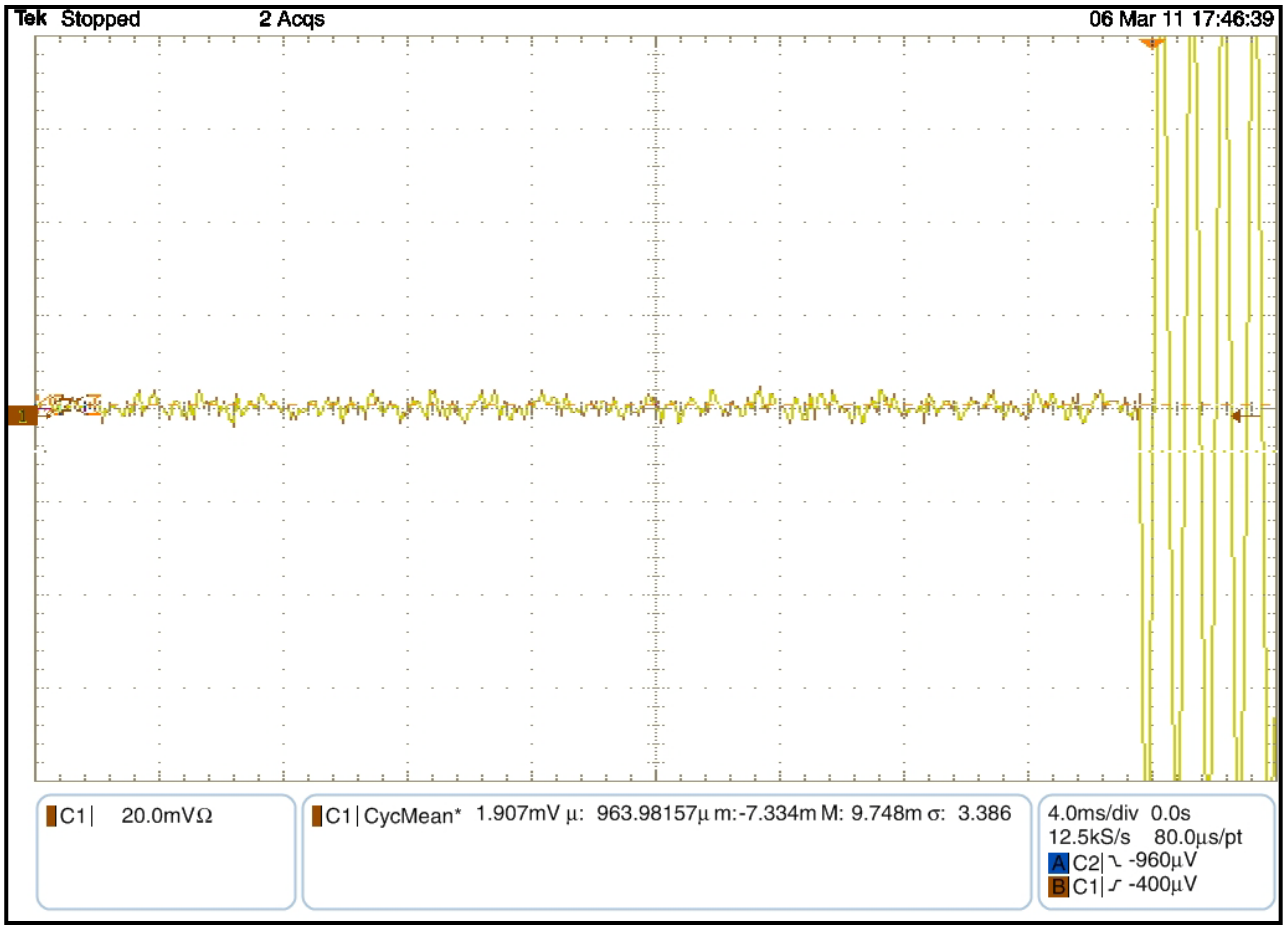
[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
t_{off} is the instant when the 1 kHz test signal starts to rise.
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

12.2 Test Data

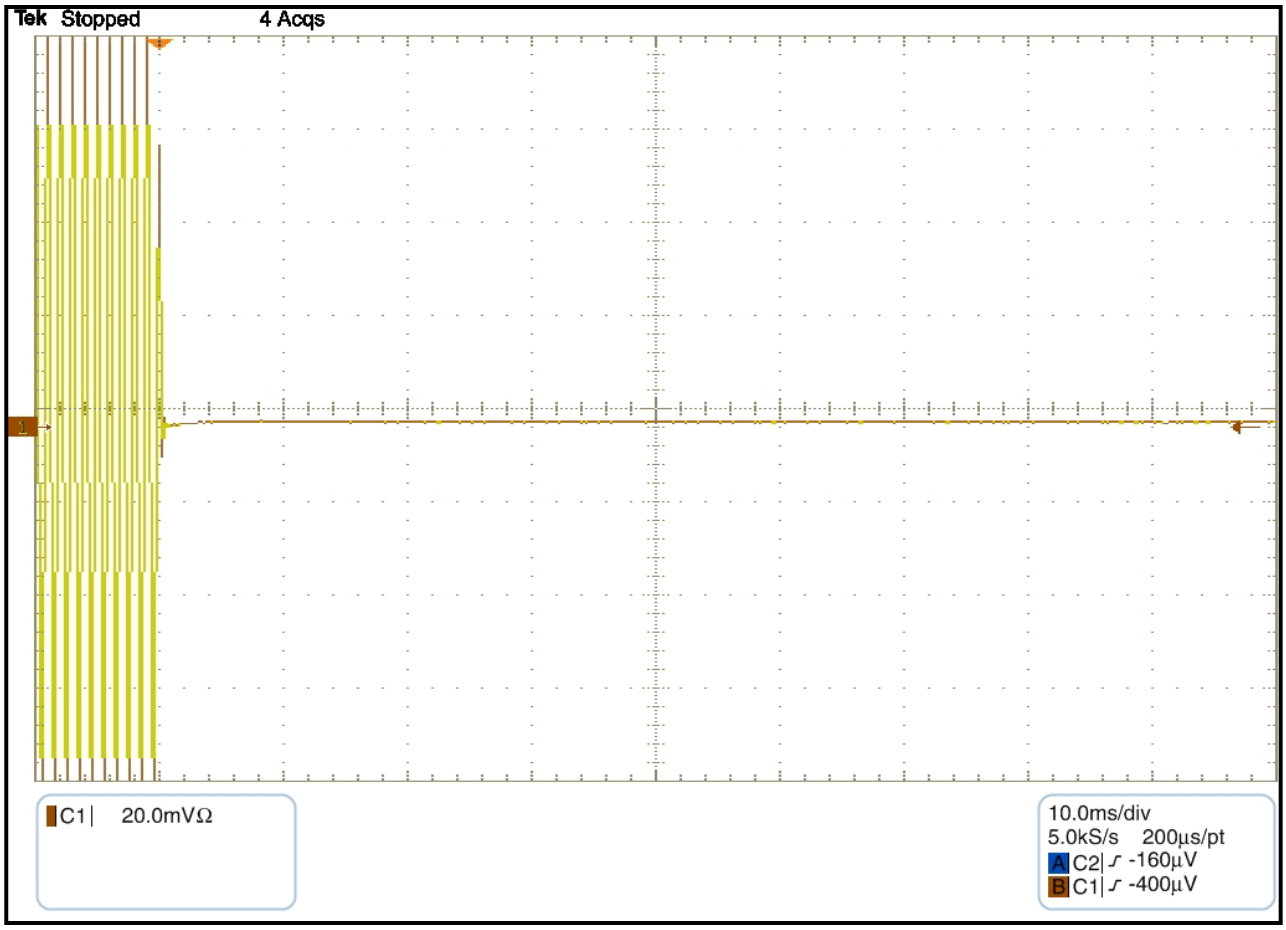
Plot 12-1: Transient Frequency Behavior – 162.0000 MHz; High Power; Carrier ON Time



Plot 12-2: Transient Frequency Behavior – 162.0000 MHz; High Power; Carrier OFF Time



Plot 12-3: Transient Frequency Behavior – 418.0000 MHz; High Power; Carrier ON Time



Plot 12-4: Transient Frequency Behavior – 418.0000 MHz; High Power; Carrier OFF Time

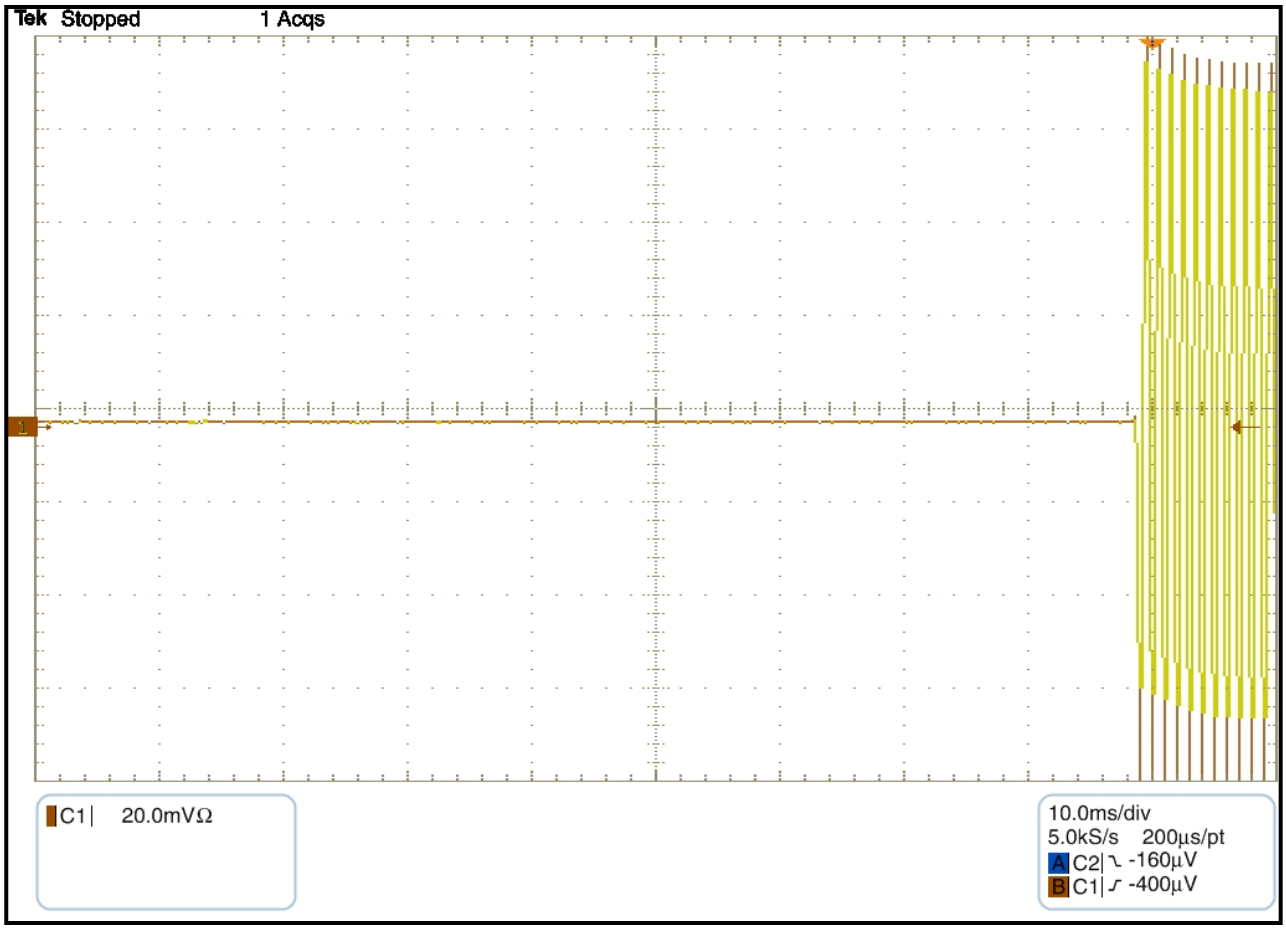


Table 12-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648C	Synthesized Signal Generator (9 kHz - 3200 MHz)	3537A01741	10/20/11
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz – 1300 MHz)	2406A00178	10/7/11
901514	Tektronix	TDS7404B	Oscilloscope	B010161	6/28/12
900352	Werlatone	Directional Coupler	Coupler	C1795/4989	2/18/12

Test Personnel:

Daniel Baltzell		March 6, 2011
Test Engineer	Signature	Date of Tests

13 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emissions: F3E, F1D, F1E, G1D, G1E

Voice – 12.5 kHz channel separation
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

P25 – 9600 bps
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1800
Bn = $[9600/\log_2(4) + 2\ (1800)\ (1) = 8.400$ kHz
Emission designator: 8K40F1D, 8K40F1E

H-CPM
Calculation:
Data rate in bps (R) = 12000
Number of states in each symbol (S) = 4
Bn = $2RK/\ \log_2 S=2(12000)(1)/\log_2(4)(1)] = 12.0$ kHz
Emission designator: 12K0G1D, 12K0G1E

806-824 MHz Trunked/Conventional; 851-869 MHz Talkaround on NPSPAC Channels
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 4.0
Constant factor (K): 1 (default)
Bn = 2xM+2xDK = 14.0 kHz
Emission designator: 14K0F3E

14 Conclusion

The data in this measurement report shows that the Harris Corporation Model XG-100M Unity Multiband Portable Radio, FCC ID: AQZ-XG-100M00, IC: 122D-XG100M00, complies with all the applicable requirements of Parts 80, 90, 15 and 2 of the FCC Rules and Industry Canada RSS-119.