Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Contact: Jeremy Johnson

Model Number: DM-MU1B

Model Name: XG-25M 378-470 MHz 50 W

FCC ID: OWDTR-0077-E
IC: 3636B-0077

March 27, 2014

Standards Referenced for this Report	
Part 2: 2013	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 22: 2013	Public Mobile Services
Part 80: 2013	Stations in the Maritime Services
Part 90: 2013	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-102.CAAB-A-2002	Land Mobile Radio Transceiver Performance Recommendations - Project 25 - Digital Radio Technology, C4FM/CQPSK Modulation
TIA-102.CCAA August 2011	Two-Slot Time Division Multiple Access Transceiver Measurement Methods
TIA-102.CCAB October 2011	Two-Slot Time Division Multiple Access Transceiver Performance Recommendations
RSS-119 Issue 11	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2013143

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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-143.98755.

Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Transmit Mode	Emission Designator
378-406.1 (Federal)	50.0	0.9	Analog FM (NB)	11K0F3E
406.1-454 (FCC) 406.1-430 (IC)	50.0	0.9	Analog FM (NB)	11K0F3E
456-470 (FCC) 450-470 (IC)	50.0	0.9	Analog FM (NB)	11K0F3E
378-406.1 (Federal)	50.0	0.9	4-level FSK, digitized data/voice, P25 Phase 1, 9.6 kbps	8K40F1D/E
406.1-454 (FCC) 406.1-430 (IC)	50.0	0.9	4-level FSK, digitized data/voice, P25 Phase 1, 9.6 kbps	8K40F1D/E
456-470 (FCC) 450-470 (IC)	50.0	0.9	4-level FSK, digitized data/ voice, P25 Phase 1, 9.6 kbps	8K40F1D/E
378-406.1 (Federal)	50.0	0.9	4-level FSK, digitized data/voice, P25 Phase 2 (H-CPM TDMA)	12K1DXW
406.1-454 (FCC) 406.1-430 (IC)	50.0	0.9	4-level FSK, digitized data/voice, P25 Phase 2 (H-CPM TDMA)	12K1DXW
456-470 (FCC) 450-470 (IC)	50.0	0.9	4-level FSK, digitized data/voice, P25 Phase 2 (H-CPM TDMA)	12K1DXW
378-406.1 (Federal)	50.0	0.9	2-level FSK, digitized data/voice, 9.6 kbps	11K9F1E/D
406.1-454 (FCC) 406.1-430 (IC)	50.0	0.9	2-level FSK, digitized data/voice, 9.6 kbps	11K9F1E/D
456-470 (FCC) 450-470 (IC)	50.0	0.9	2-level FSK, digitized data/voice, 9.6 kbps	11K9F1E/D

Table of Contents

Table of Figures

Table of Tables

Table of Plots

Table of Appendixes

Table of Photographs

1 Test Result Summary

Test	FCC/IC Reference	Result
RF Power Output	2.1046(a), 22.659, 80.215, 90.205, RSS-119 §5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051, 22.359, 80.217, 90.210, RSS-119 5.5 5.8	Complies
Field strength of spurious radiation	2.1053(a), 80.211, 90.210, RSS-119 5.8.9.2	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 22.359(b), 80.205, 80.211(f), 90.210, RSS-119 5.5 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 22.355, 80.209, 90.213, RSS-119 5.3	Complies
Modulation Characteristics	2.1047(a)(b); 80.213 RSS-119 5.8	Complies
Transient Frequency Response	90.214, 80.213 RSS-119 5.9	Complies

2 General Information

The following Certification Report is prepared on behalf of Harris Corporation in accordance with the Federal Communications Commission and Industry Canada rules and regulations. The Equipment Under Test (EUT) was the XG-25M UHF mobile radio; FCC ID: OWDTR-0077-E, IC: 3636B-0077.

The radio is subject to FCC DoC. DoC testing was performed and the data is contained in a separate DoC report.

All measurements contained in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2, 22, 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)

This is a new family certification application for Industry Canada. The XG-25M UHF mobile radio model to be certified at this time is DM-MU1B.

2.3 Grant Notes

Power is continuously variable from 5 - 50 W. The grant listed power is rated power and actual measured power is shown in the test report. For Part 80 maritime operation, 50 W operation limited to fixed/coast stations; when used as a ship station, conducted power must not exceed 25 W.

2.4 Tested System Details

The test sample was received on March 7, 2014. 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.

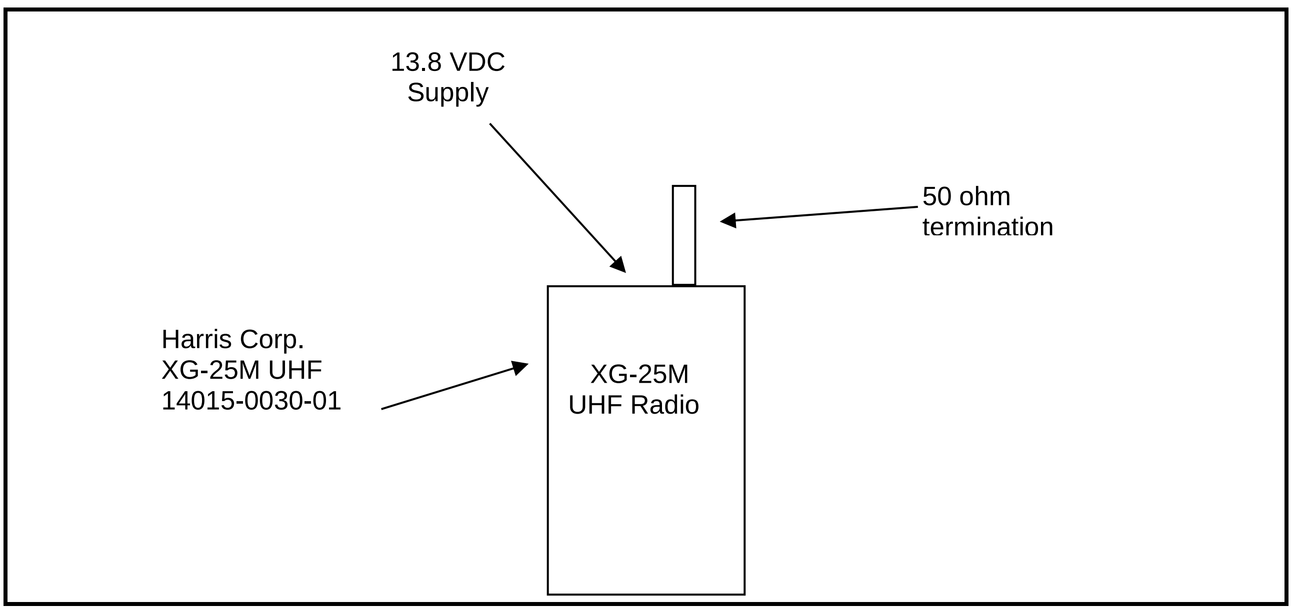
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
XG-25M UHF Radio	Harris Corporation	DM-MU1B	14015-0030-01	OWDTR-0077-E	21417
XG-25M UHF Radio	Harris Corporation	DM-MU1B	14015-0030-01	OWDTR-0077-E	21418

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model	P/N	FCC ID	RTL Bar Code
Breakout Box	Harris Corporation	N/A	N/A	N/A	20607
40 dB Attenuator with termination	Aeroflex.	48-40-34	CB6628	N/A	901537
Laptop	Sony	PCG-71314L	N/A	N/A	N/A

Figure 2-1: Configuration of Tested System



3 FCC Part 2.1033(C)(8) Voltages and Currents through the Final Amplifying Stage

13.6 VDC and 15 Amps max

4 FCC Part 2.1046(a), 22.659, 80.215, 90.205; IC RSS-119 5.4: Transmitter Power

4.1 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:

(3) On board stations 456–468 MHz—4W

NOTE: Certification based on a carrier power of 4 watts with transmitter connected to a dummy load of matching impedance. The effective radiated power must not exceed 2 watts.

(f) *Fixed stations.* The maximum power must not exceed the values listed below.

(1) Maritime support (receiver test): F3E emission—50W

Maximum Power Authorized to Use: 83.5 W for UHF less than 456 MHz, or EIRP 2W from 456-468 MHz.

Manufacturer's Rated Power: 50.0 W

4.2 Test Data

Table 4-1: RF Conducted Output Power – Measured

Frequency (MHz)	Power (dBm)	Power (W)	Power (dBm)	Power (W)
378.0125	37.3	5.4	47.4	55.0
406.1125	37.2	5.2	47.3	53.7
418.0000	37.2	5.2	47.3	53.7
429.9875	37.2	5.2	47.2	52.5
450.0125	37.1	5.1	47.3	53.7
454.0125	37.1	5.1	47.3	53.7
456.0125	37.2	5.2	47.3	53.7
458.9875	37.1	5.1	47.3	53.7
459.0250	37.1	5.1	47.3	53.7
459.9750	37.1	5.1	47.2	52.5
469.9875	37.2	5.2	47.3	53.7

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

Table 4-2: Test Equipment Used for Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 10, 2014
EMC Test Engineer	Signature	Date of Test

5 FCC Part 2.1051, 22.359, 80.217, 90.210; RSS-119 5.8: Conducted Spurious Emissions

5.1 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.

Part 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) used 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)

5.2 Test Data

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

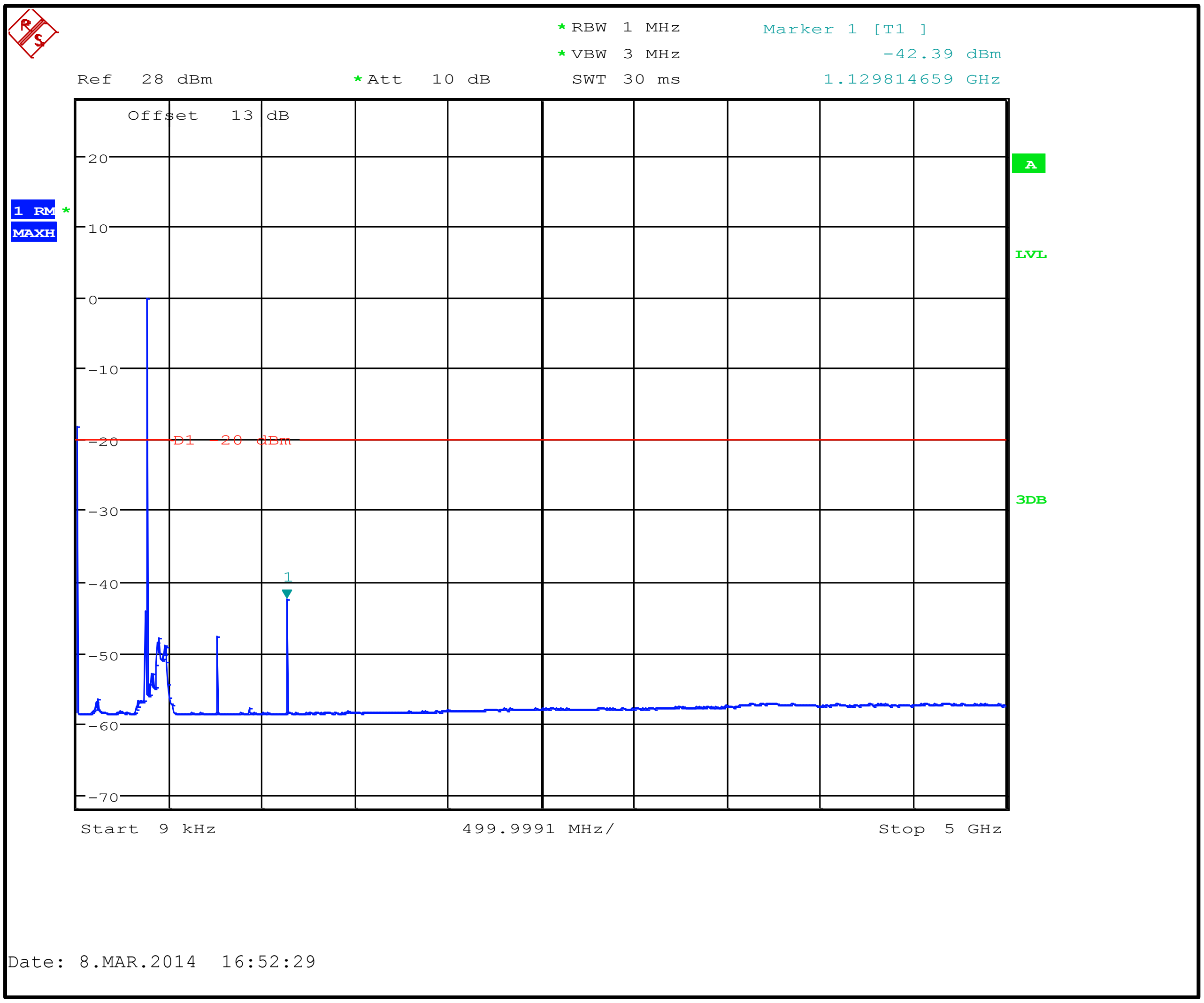
Limits: (43+10LOG P(W)) for wideband and (50+10 LOG P(W)) for narrowband

The following channels (in MHz) were investigated:

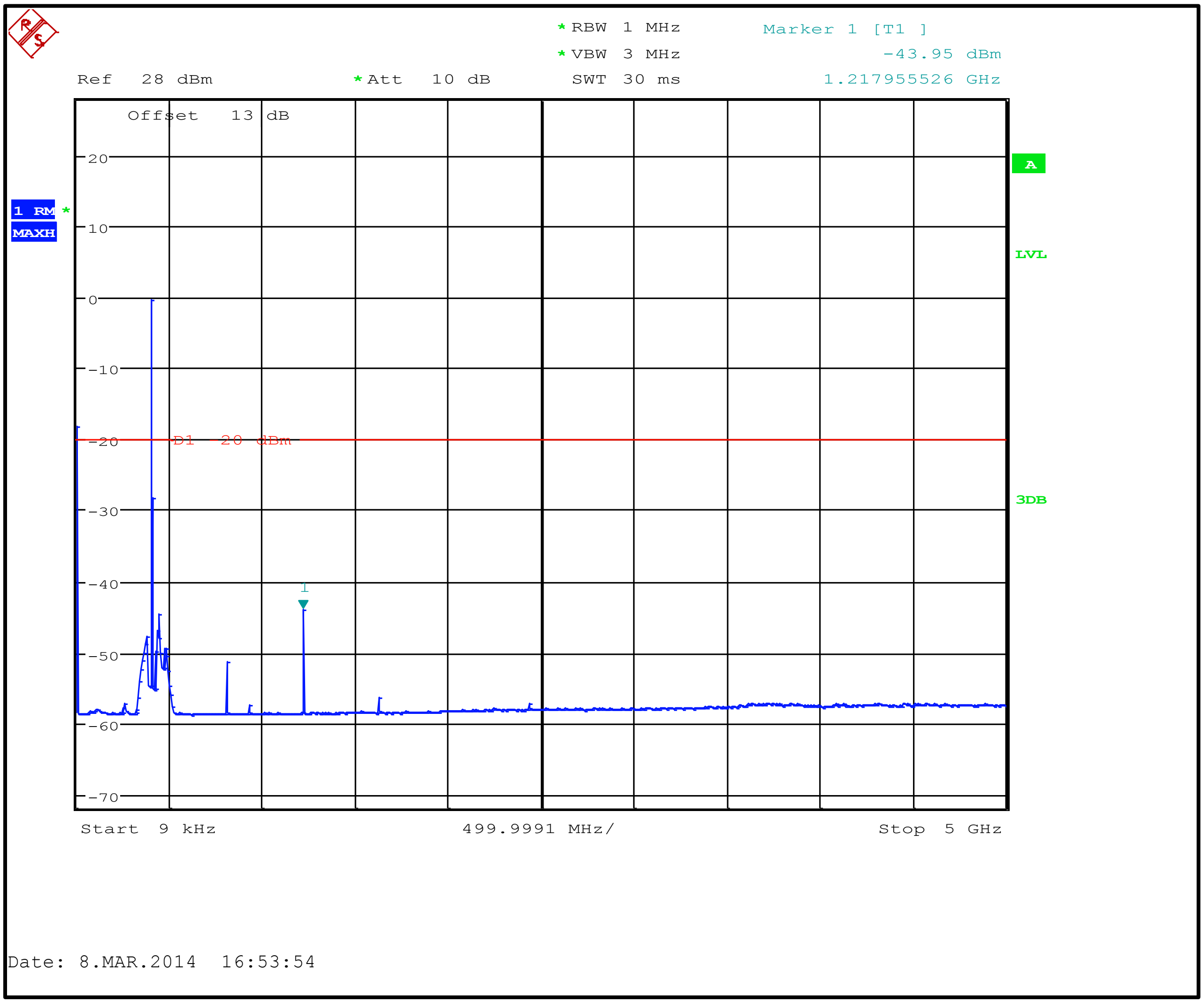
UHF Test Frequencies
378.0125
406.1125
418.0000
429.9875
450.0125
454.0125
456.0125
458.9875
459.0250
459.9750
469.9875

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.

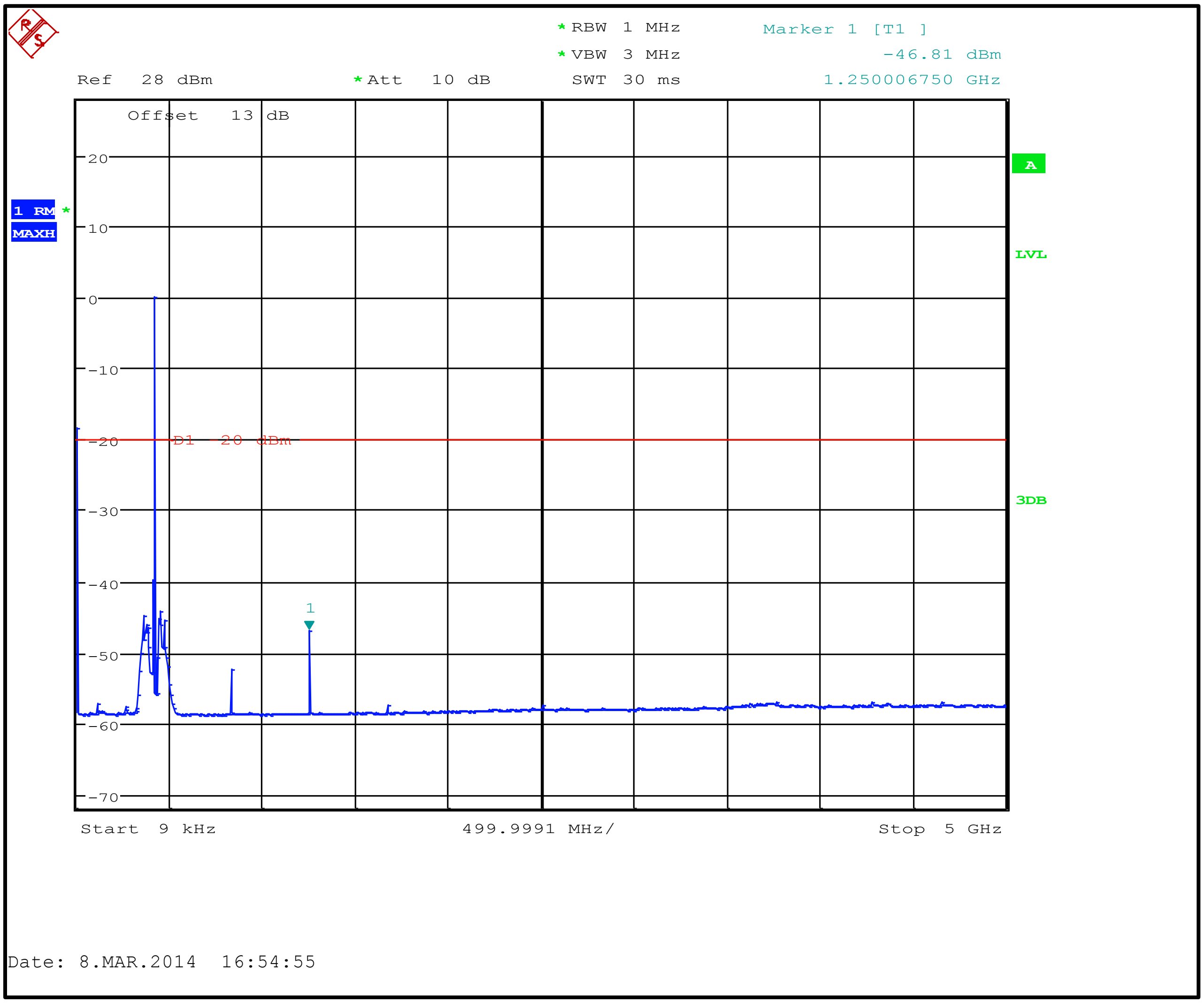
Plot 5-1: Spurious Emissions at Antenna Terminals – 378.0125 MHz



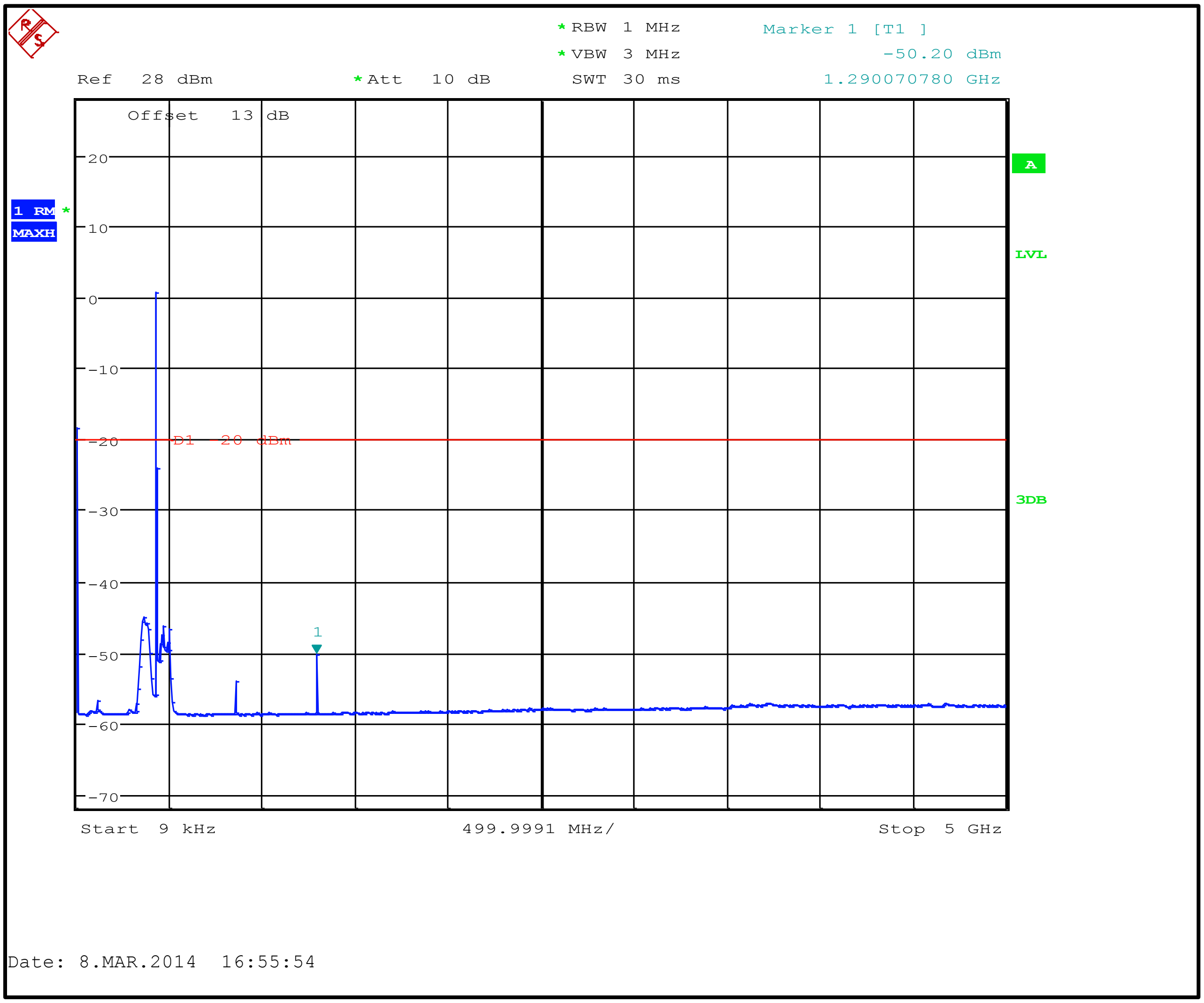
Plot 5-2: Spurious Emissions at Antenna Terminals – 406.1125 MHz



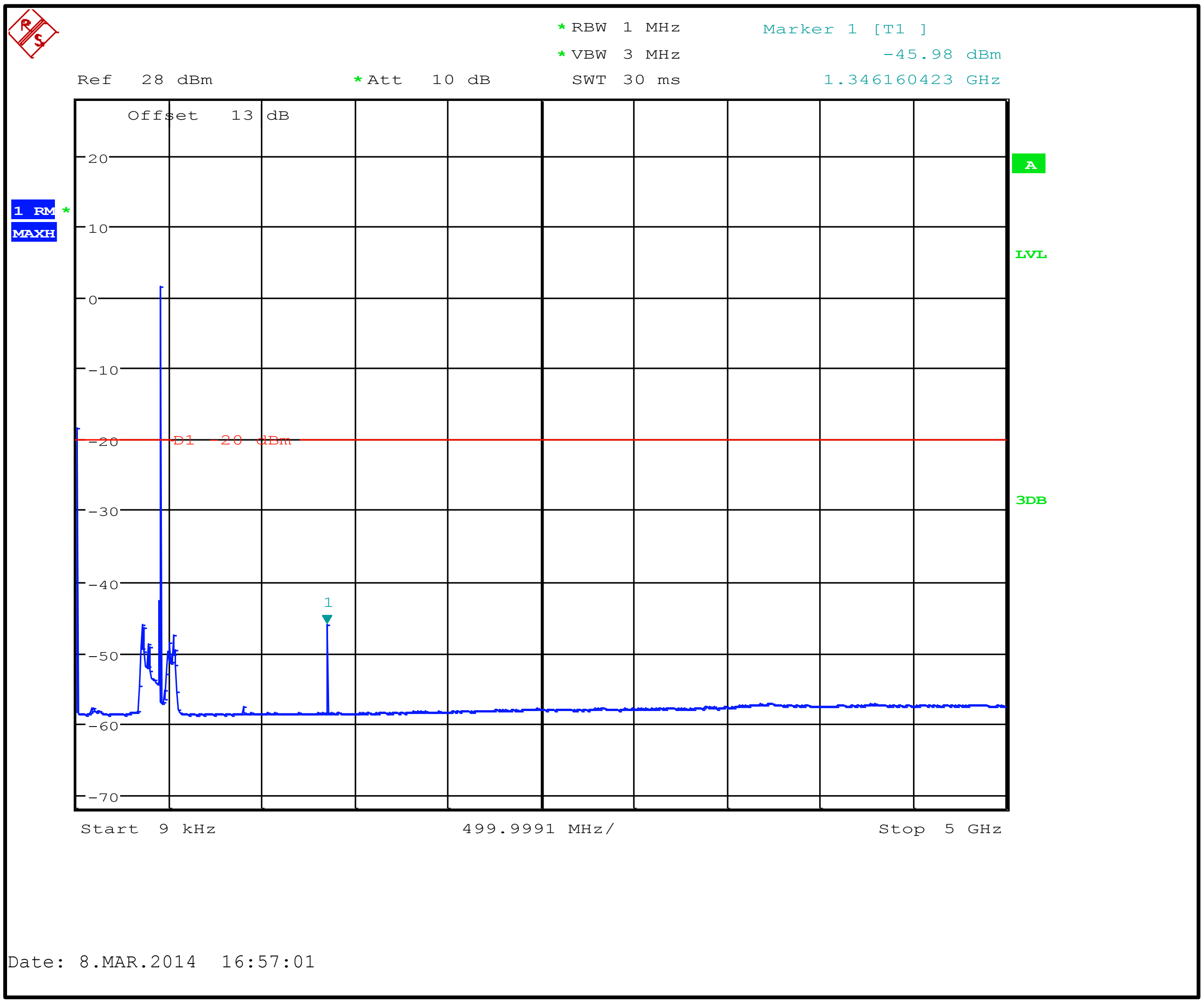
Plot 5-3: Spurious Emissions at Antenna Terminals – 418.0000 MHz



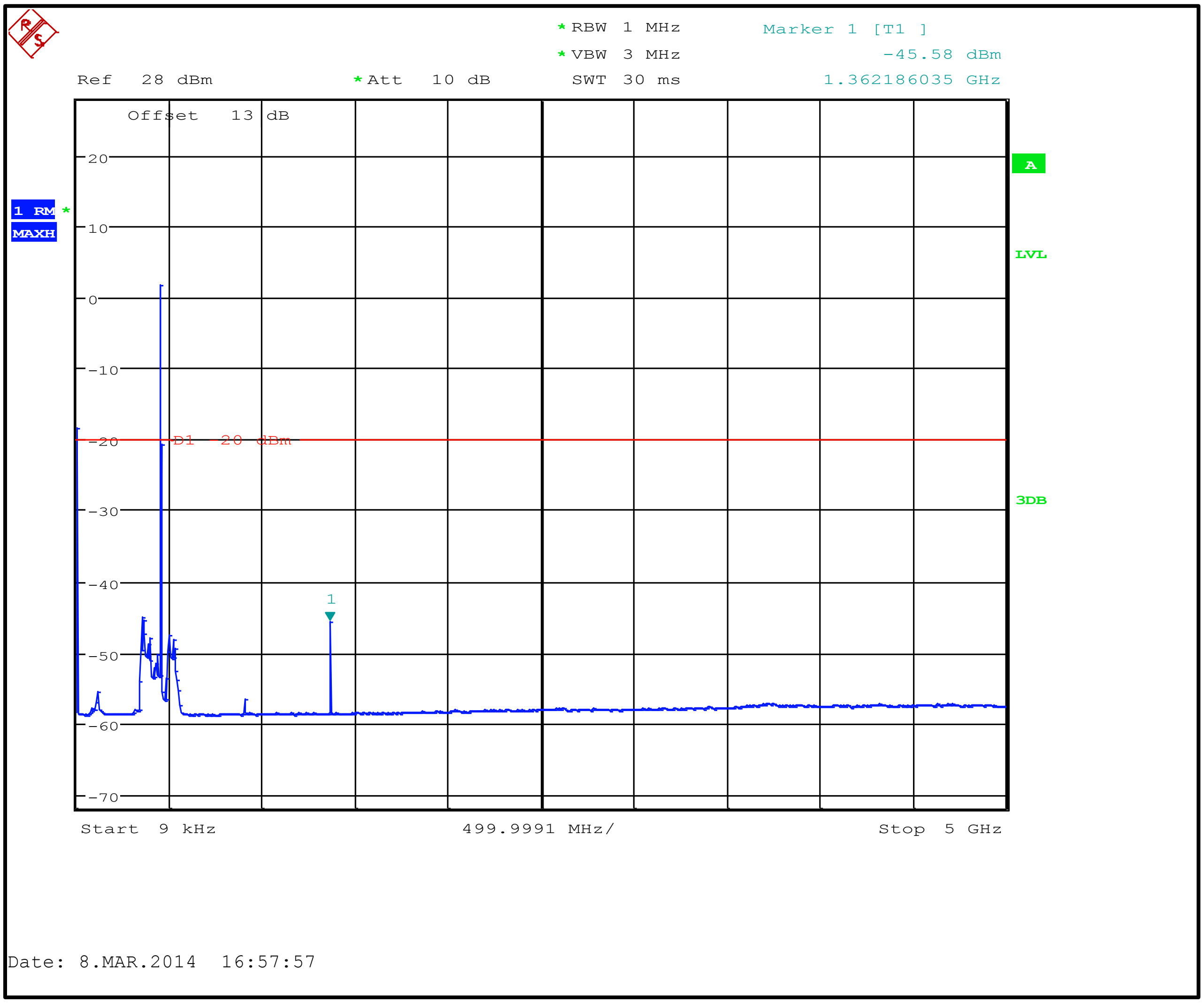
Plot 5-4: Spurious Emissions at Antenna Terminals – 429.9875 MHz



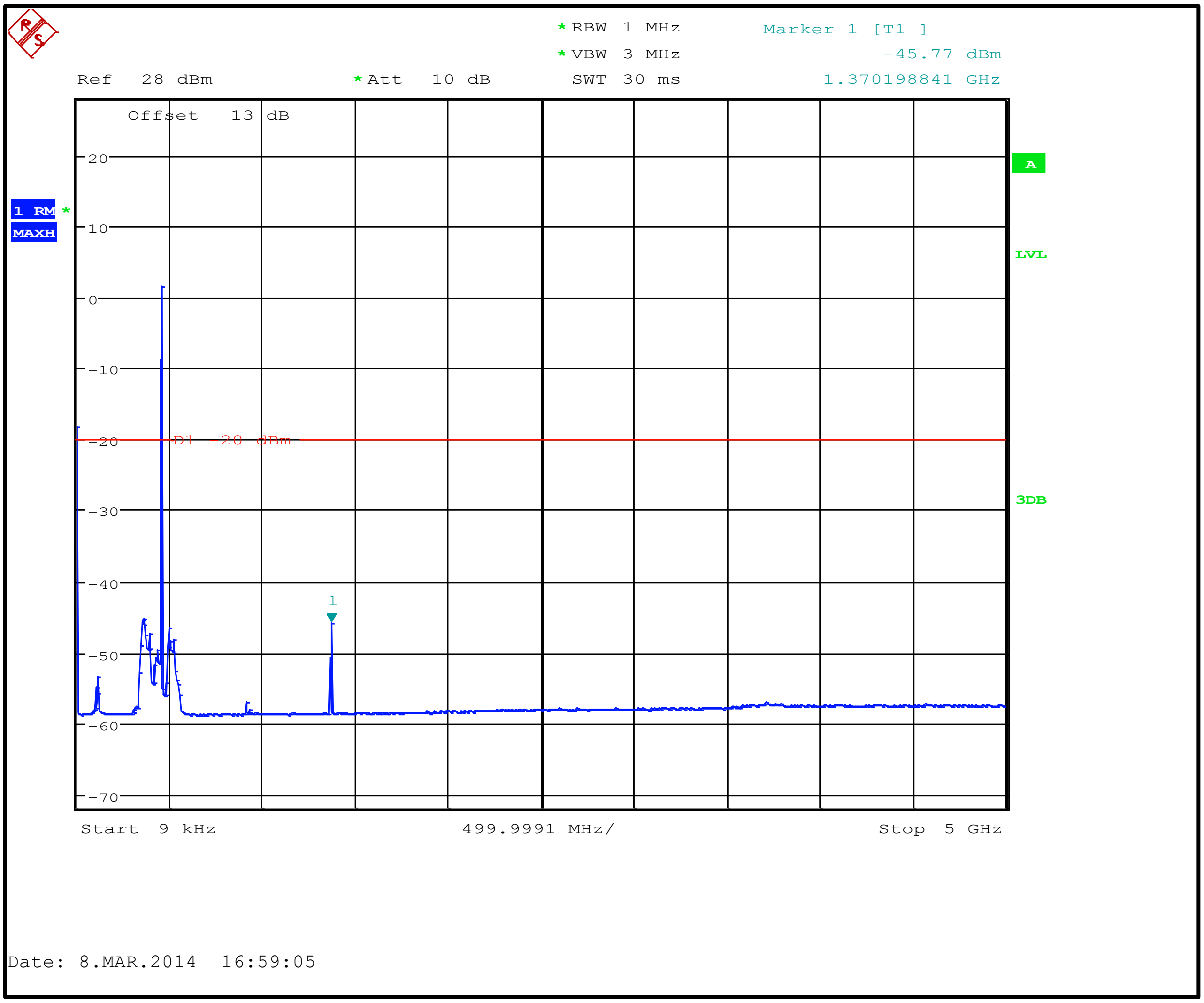
Plot 5-5: Spurious Emissions at Antenna Terminals – 450.0125 MHz



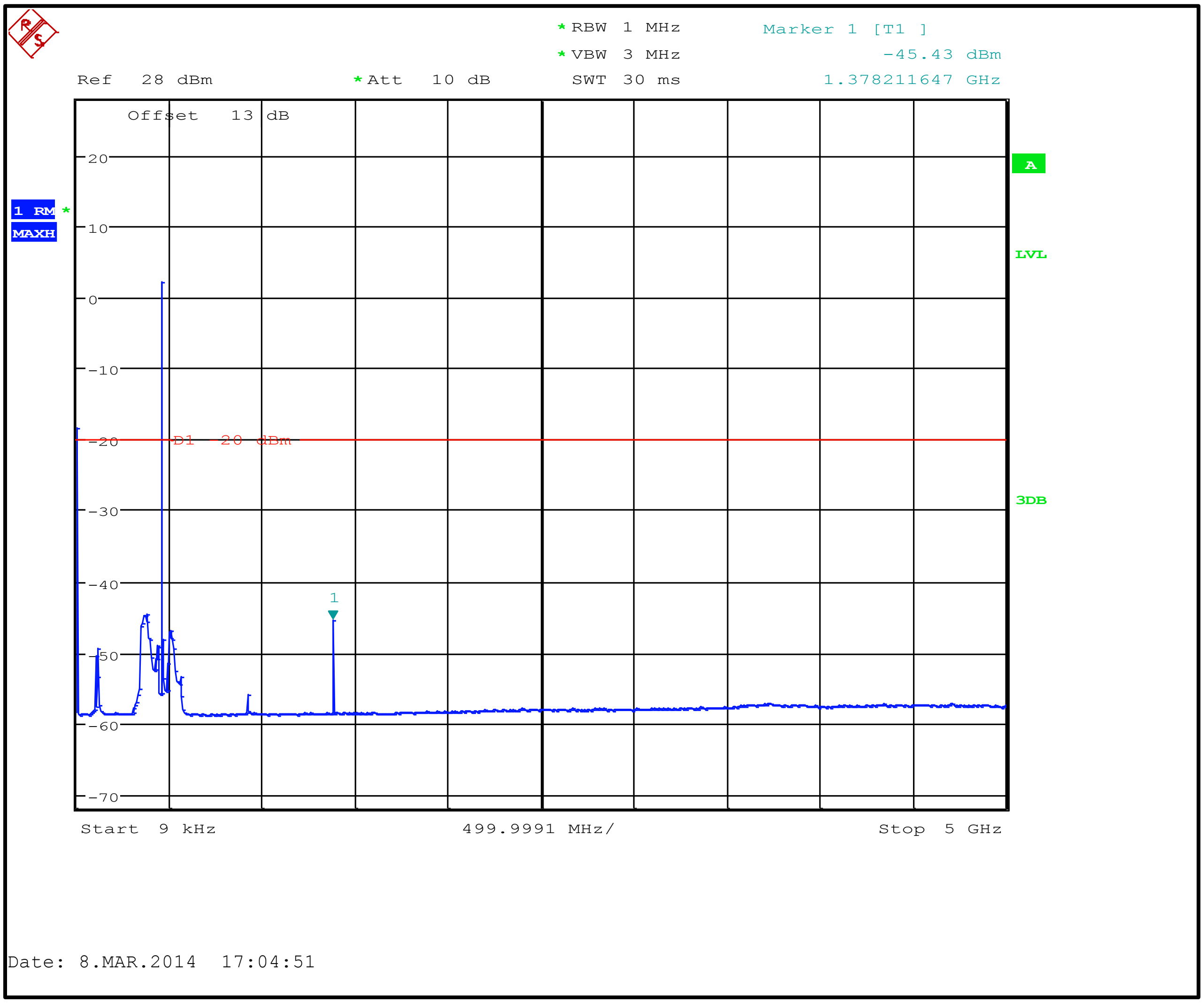
Plot 5-6: Spurious Emissions at Antenna Terminals – 454.0125 MHz



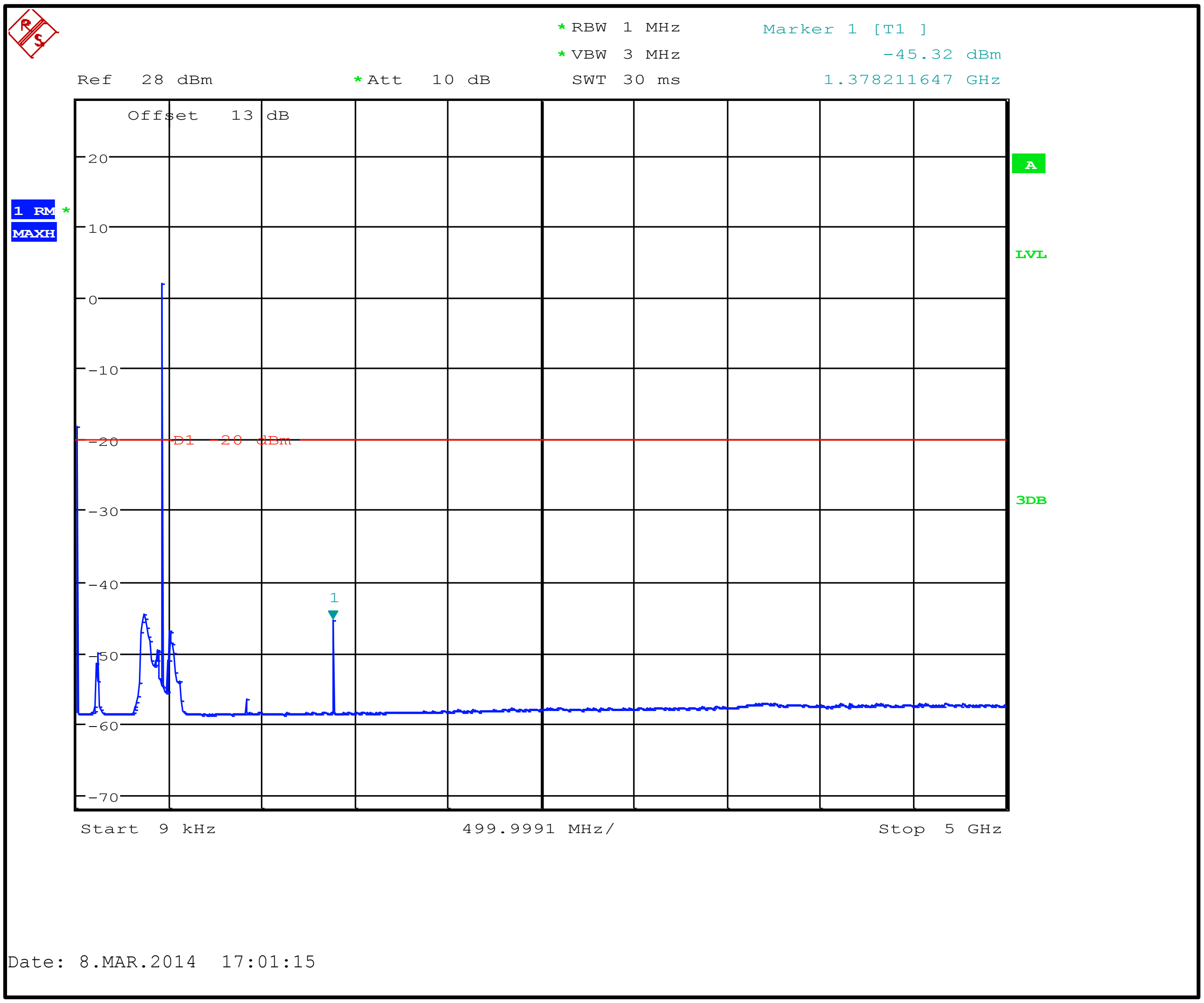
Plot 5-7: Spurious Emissions at Antenna Terminals – 456.0125 MHz



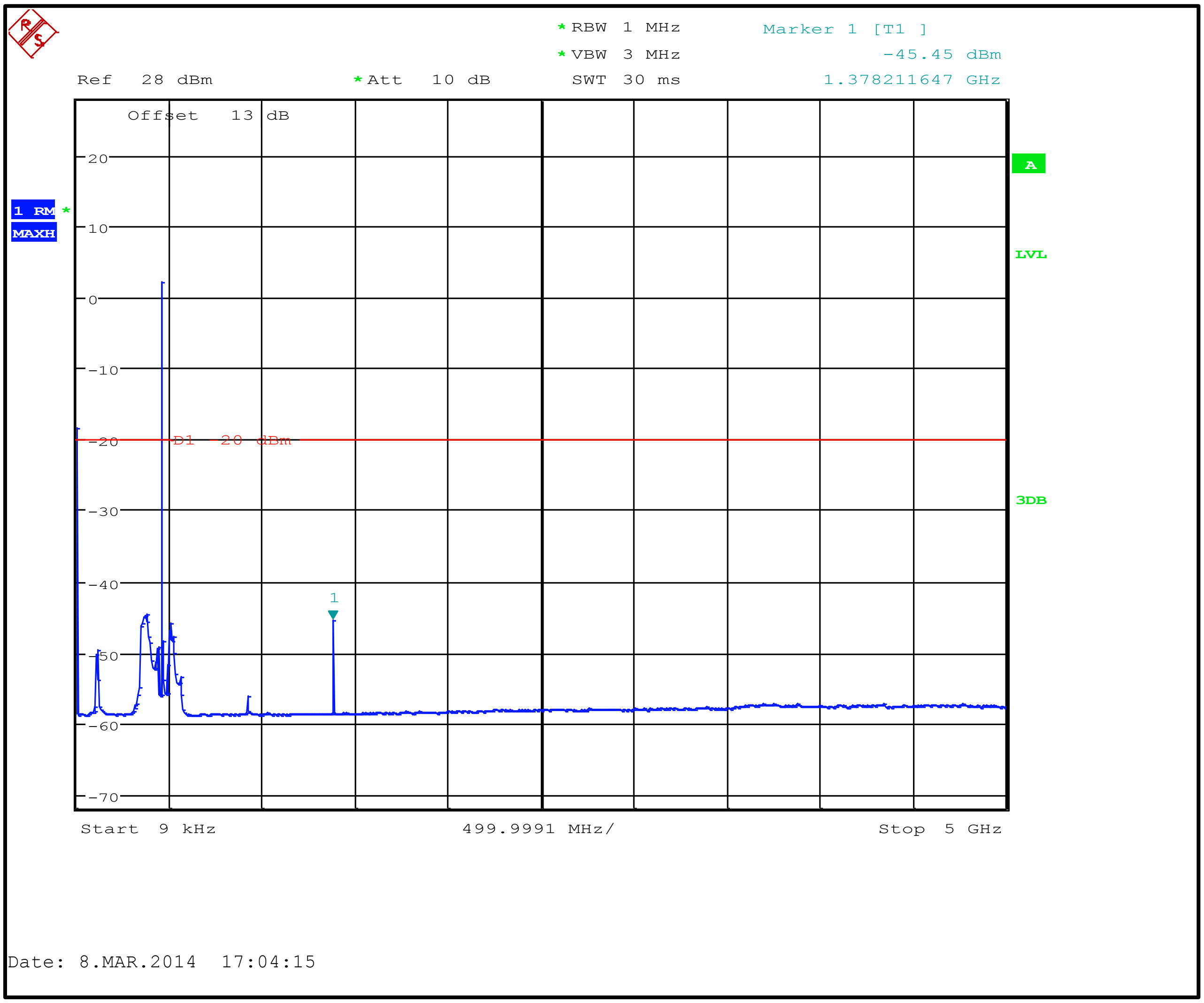
Plot 5-8: Spurious Emissions at Antenna Terminals – 458.9875 MHz



Plot 5-9: Spurious Emissions at Antenna Terminals – 459.0250 MHz



Plot 5-10: Spurious Emissions at Antenna Terminals – 459.9750 MHz



Plot 5-11: Spurious Emissions at Antenna Terminals – 469.9875 MHz

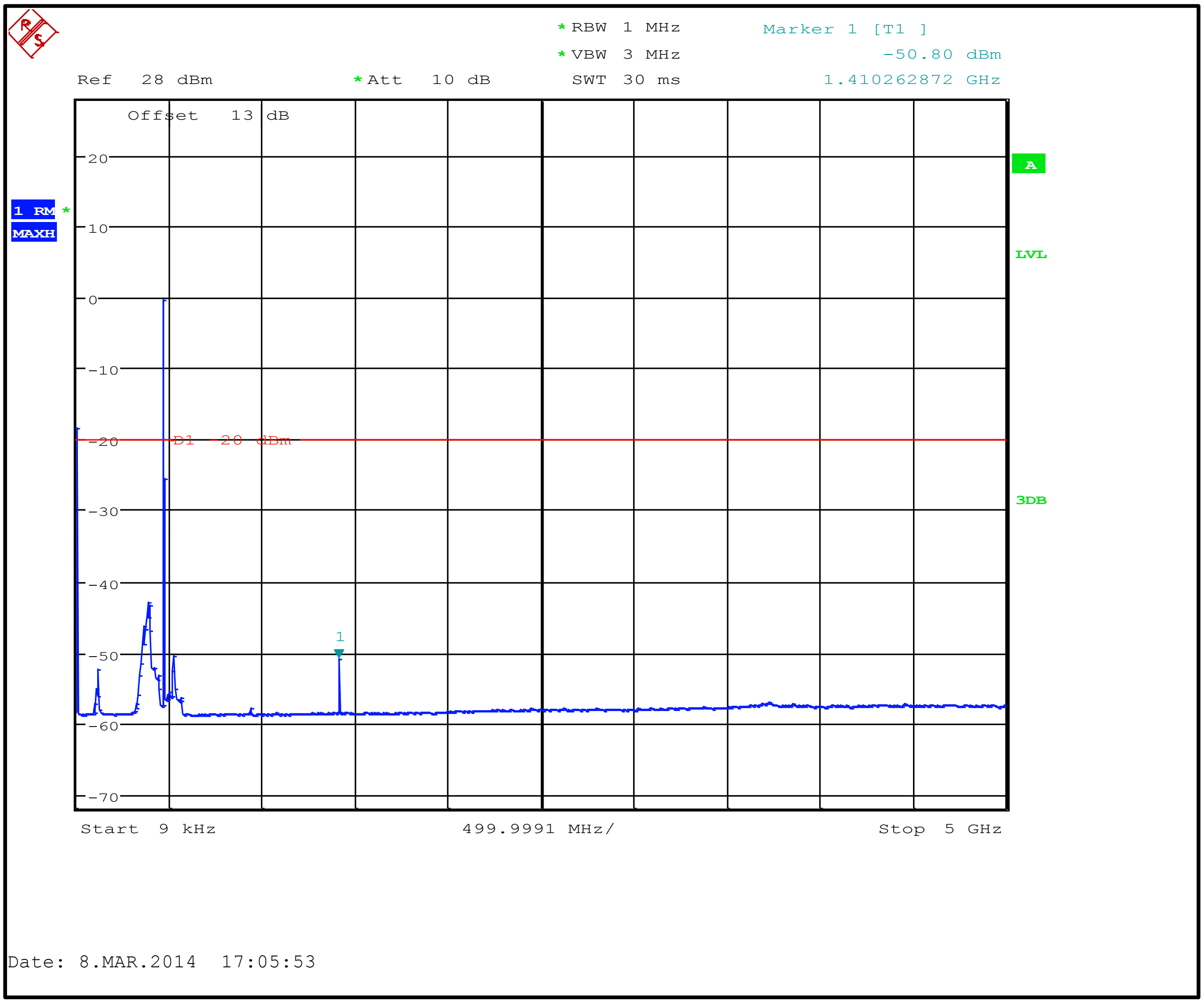


Table 5-1: Test Equipment Used for Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
900819	Narda Microline	766-10	10 dB Attenuator; 20 W	06242	9/3/14
901358	Aeroflex/ Ewinschel	47-3-34	3 dB Attenator, 100W	BS0146	3/25/16
901129	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	2/29/15

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 11, 2014
EMC Test Engineer	Signature	Date of Test

6 FCC Part 2.1053(a), 80.211, 90.210; IC RSS-119 5.8.9.2: Radiated Emissions

6.1 Test Procedure

ANSI/TIA-603-2004, section 2.2.12

The device uses digital modulation modulated to its maximum extent using a pseudo-random data sequence. 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 dBc, and compared to the limit.

6.2 Test Data

Table 6-1: Field Strength of Spurious Radiation – 378.0125 MHz

Conducted Power 47.4 dBm; 55.0 W; Limit=50+10LogP=67.4 dBc

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)
756.0250	64.2	-55.3	0.2	0.9	102.0	-34.6
1134.0375	58.8	-62.0	0.3	3.0	106.8	-39.4
1512.0500	43.2	-74.7	0.4	5.5	117.0	-49.5
1890.0625	42.1	-75.6	0.4	6.7	116.7	-49.3
2268.0750	46.4	-67.5	0.5	7.6	107.8	-40.3
2646.0875	32.3	-81.0	0.5	7.6	121.3	-53.9
3024.1000	43.6	-68.4	0.6	7.8	108.6	-41.2
3402.1125	39.0	-72.3	0.6	7.3	113.0	-45.6
3780.1250	26.5	-81.8	0.7	7.1	122.8	-55.4

Table 6-2: Field Strength of Spurious Radiation – 406.1125 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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	67.2	-53.789	0.2	0.6	100.7	-33.4
1218.3375	61.6	-57.9003	0.3	3.3	102.2	-34.9
1624.4500	45.8	-73.189	0.4	6.9	113.9	-46.6
2030.5625	58.1	-55.8	0.4	6.4	97.1	-29.8
2436.6750	50.1	-62.7	0.5	7.6	102.9	-35.6
2842.7875	35.9	-75.8	0.6	8.1	115.5	-48.2
3248.9000	40.4	-71.7	0.6	7.4	112.3	-45.0
3655.0125	34.0	-75.6	0.7	7.4	116.2	-48.9
4061.1250	28.1	-78.1	0.7	7.9	118.2	-50.9
812.2250	67.2	-53.789	0.2	0.6	100.7	-33.4

Table 6-3: Field Strength of Spurious Radiation – 418.0000 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
836.0000	66.5	-54.1	0.2	0.7	100.9	-33.6
1254.0000	52.1	-65.4	0.3	3.7	109.3	-42.0
1672.0000	34.8	-83.6	0.4	7.2	124.0	-56.7
2090.0000	55.8	-57.9	0.4	6.4	99.3	-32.0
2508.0000	47.7	-64.9	0.5	7.6	105.1	-37.8
2926.0000	47.6	-63.9	0.6	8.1	103.7	-36.4
3344.0000	36.6	-73.8	0.6	7.3	114.4	-47.1
3762.0000	34.0	-75.3	0.7	7.2	116.1	-48.8
4180.0000	24.6	-82.0	0.7	8.5	121.5	-54.2
836.0000	66.5	-54.1	0.2	0.7	100.9	-33.6

Table 6-4: Field Strength of Spurious Radiation – 429.9875 MHz

Conducted Power 47.2 dBm; 52.5 W; Limit=50+10LogP=67.2 dBc

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)
859.9750	48.9	-71.7	0.2	0.7	118.4	-51.2
1289.9625	29.0	-88.6	0.3	4.1	132.0	-64.8
1719.9500	32.9	-85.7	0.4	7.4	125.8	-58.6
2149.9375	57.0	-56.5	0.5	6.8	97.3	-30.1
2579.9250	44.7	-67.7	0.5	7.5	107.9	-40.7
3009.9125	46.5	-66.4	0.6	7.8	106.4	-39.2
3439.9000	45.8	-64.4	0.6	7.5	104.8	-37.6
3869.8875	35.0	-74.0	0.7	7.2	114.7	-47.5
4299.8750	21.6	-85.0	0.8	8.8	124.2	-57.0

Table 6-5: Field Strength of Spurious Radiation – 450.0125 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
900.0250	63.9	-55.2995	0.2	0.9	101.9	-34.6
1350.0375	43.8	-74.0985	0.3	4.5	117.2	-49.9
1800.0500	41.3	-74.505	0.4	7.5	114.7	-47.4
2250.0625	50.1	-63.2	0.5	7.5	103.4	-36.1
2700.0750	38.1	-74	0.5	7.8	114.1	-46.8
3150.0875	47.1	-65.3	0.6	7.4	105.8	-38.5
3600.1000	33.4	-76.3	0.7	7.5	116.8	-49.5
4050.1125	30.3	-75.9	0.7	7.9	116.1	-48.8
4500.1250	26.3	-80.4	0.8	8.9	119.6	-52.3

Table 6-6: Field Strength of Spurious Radiation – 454.0125 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
908.0250	65.1	-54.0	0.3	0.9	100.6	-33.3
1362.0375	52.0	-65.3	0.3	4.5	108.4	-41.1
1816.0500	44.3	-71.9	0.4	7.4	112.3	-45.0
2270.0625	48.4	-64.8	0.5	7.6	104.9	-37.6
2724.0750	41.8	-70.2	0.5	7.9	110.2	-42.9
3178.0875	43.0	-69.4	0.6	7.4	109.9	-42.6
3632.1000	35.4	-74.3	0.7	7.4	114.8	-47.5
4086.1125	34.4	-71.8	0.7	8.0	111.8	-44.5
4540.1250	26.7	-79.7	0.8	8.9	118.9	-51.6

Table 6-7: Field Strength of Spurious Radiation – 456.0125 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
912.0250	65.7	-56.2	0.3	0.9	102.8	-35.5
1368.0375	67.6	-52.4	0.3	4.6	95.5	-28.2
1824.0500	51.0	-67.1	0.4	7.3	107.5	-40.2
2280.0625	49.5	-63.7	0.5	7.7	103.8	-36.5
2736.0750	36.8	-75.2	0.5	7.9	115.1	-47.8
3192.0875	44.8	-67.5	0.6	7.4	108.0	-40.7
3648.1000	31.3	-78.3	0.7	7.4	118.9	-51.6
4104.1125	35.2	-71.0	0.7	8.1	110.9	-43.6
4560.1250	29.8	-76.7	0.8	8.9	115.9	-48.6

Table 6-8: Field Strength of Spurious Radiation – 458.9875 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
917.9750	67.1	-54.2025	0.3	1.0	100.8	-33.5
1376.9625	50.3	-69.557	0.3	4.6	112.6	-45.3
1835.9500	42.8	-72.157	0.4	7.2	112.7	-45.4
2294.9375	49.4	-63.8	0.5	7.7	103.8	-36.5
2753.9250	35.7	-76.3	0.5	8.0	116.2	-48.9
3212.9125	43.5	-68.7	0.6	7.4	109.2	-41.9
3671.9000	35.6	-74	0.7	7.3	114.6	-47.3
4130.8875	34.5	-71.8	0.7	8.3	111.6	-44.3
4589.8750	30.7	-75.8	0.8	9.0	114.9	-47.6

Table 6-9: Field Strength of Spurious Radiation – 459.0250 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
918.0500	69.0	-52.3	0.3	1.0	98.9	-31.6
1377.0750	52.9	-64.4	0.3	4.6	107.4	-40.1
1836.1000	44.7	-72.6	0.4	7.2	113.1	-45.8
2295.1250	49.8	-63.4	0.5	7.7	103.4	-36.1
2754.1500	34.3	-77.7	0.5	8.0	117.6	-50.3
3213.1750	35.7	-75.1	0.6	7.4	115.6	-48.3
3672.2000	43.5	-67.3	0.7	7.3	107.9	-40.6
4131.2250	35.0	-71.3	0.7	8.3	111.1	-43.8
4590.2500	31.6	-74.9	0.8	9.0	114.0	-46.7

Table 6-10: Field Strength of Spurious Radiation – 459.9750 MHz

Conducted Power 47.2 dBm; 52.5 W; Limit=50+10LogP=67.2 dBc

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)
919.9500	68.2	-52.9	0.3	1.0	99.4	-32.2
1379.9250	51.0	-69.0	0.3	4.6	111.9	-44.7
1839.9000	44.9	-72.6	0.4	7.2	113.0	-45.8
2299.8750	47.0	-66.2	0.5	7.7	106.1	-38.9
2759.8500	49.1	-62.8	0.5	8.0	102.6	-35.4
3219.8250	43.6	-68.6	0.6	7.4	109.0	-41.8
3679.8000	31.1	-78.4	0.7	7.3	118.9	-51.7
4139.7750	34.9	-71.4	0.7	8.3	111.0	-43.8
4599.7500	31.8	-74.7	0.8	9.0	113.7	-46.5

Table 6-11: Field Strength of Spurious Radiation – 469.9875 MHz

Conducted Power 47.3 dBm; 53.7 W; Limit=50+10LogP=67.3 dBc

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)
939.9750	79.9	-41.6005	0.3	1.1	88.0	-20.7
1409.9625	68.3	-51.7985	0.3	4.8	94.6	-27.3
1879.9500	48.9	-68.803	0.4	6.8	109.7	-42.4
2349.9375	48.2	-64.8	0.5	7.7	104.9	-37.6
2819.9250	34.2	-77.6	0.6	8.1	117.3	-50.0
3289.9125	42.4	-69.6	0.6	7.3	110.2	-42.9
3759.9000	32.8	-76.5	0.7	7.2	117.3	-50.0
4229.8875	27.5	-79.1	0.8	8.7	118.5	-51.2
4699.8750	35.6	-70.9	0.8	9.1	109.9	-42.6

Table 6-12: Test Equipment Used for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	8/27/14
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/27/14
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/27/14
901594	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/27/14
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
900724	Antenna Research Associates, Inc.	LPB-2520	BiLog Antenna (25 – 1000 MHz)	1037	4/19/14
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	4/19/14
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/19/14
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	11/14/14
901629	Teledyne Cougar	A4C2123	Amplifier	003-003	9/4/14

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 11, 2014
Test Engineer	Signature	Date of Tests

7 FCC Part 2.1049(c)(1), 22.359(b), 80.205, 90.210; IC RSS-119 5.5: Bandwidths/Masks

Occupied Bandwidth - Compliance with the Emission Masks

FCC 22.359(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) Measurement procedure: In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

7.1 Test Procedure

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

TIA-102.CCAA August 2011, section 2.2.5

Notes: FCC 90.210, RSS-119 and TIA-102.CCAB October 2011 section 3.2.5.1 all specify mask D

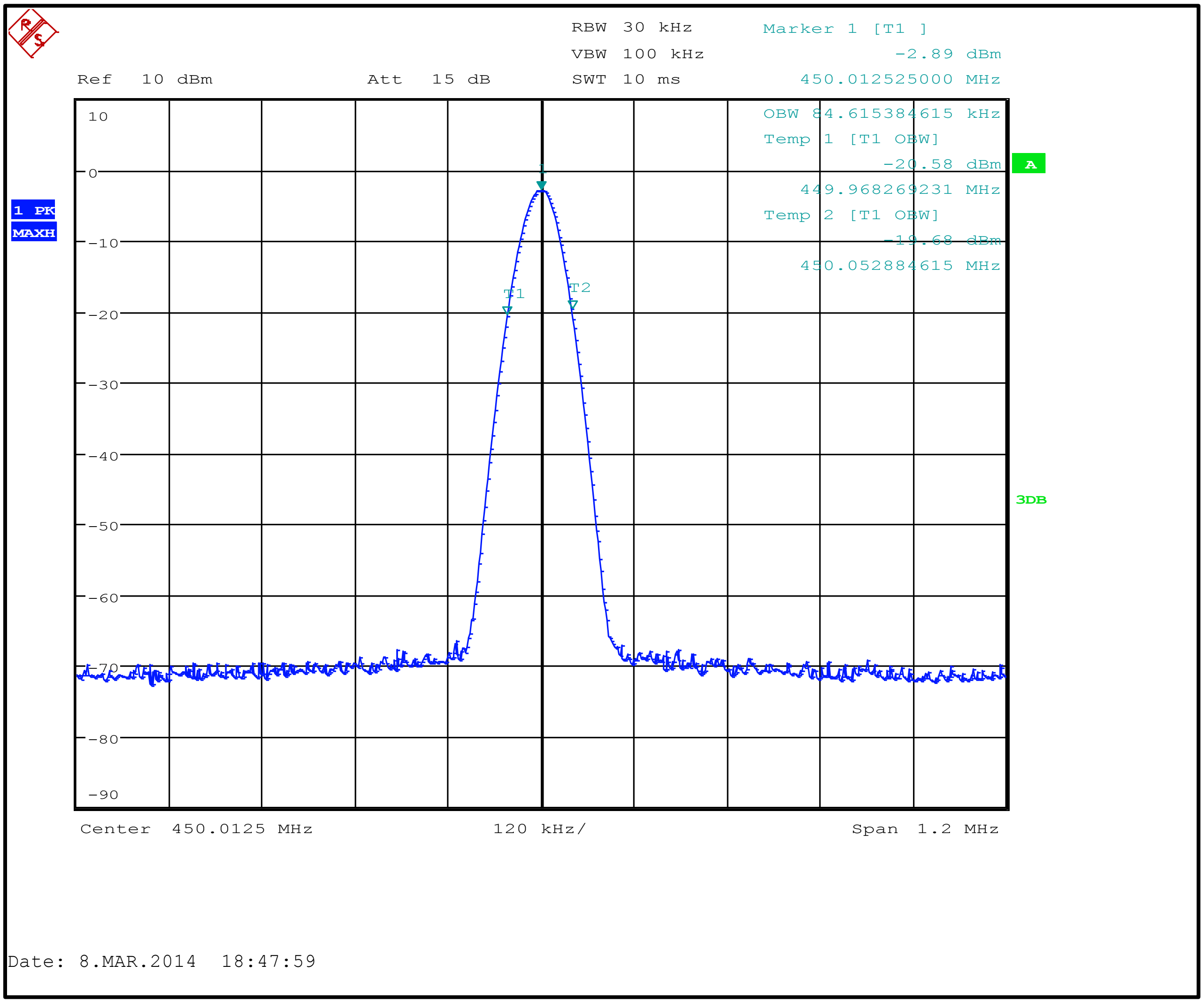
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

Applicable Emission Masks		
Frequency Band (MHz)	**Mask for Equipment With Audio Low Pass Filter**	**Mask for Equipment Without Audio Low Pass 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

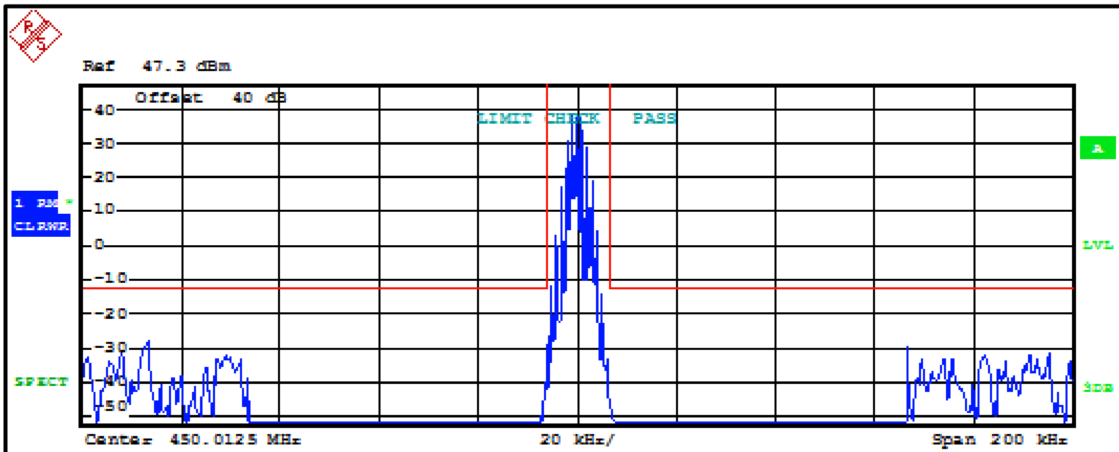
[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask 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.

7.2 Test Data

Plot 7-1: Occupied Bandwidth – 450.0125 MHz; Analog (FCC Part 22)



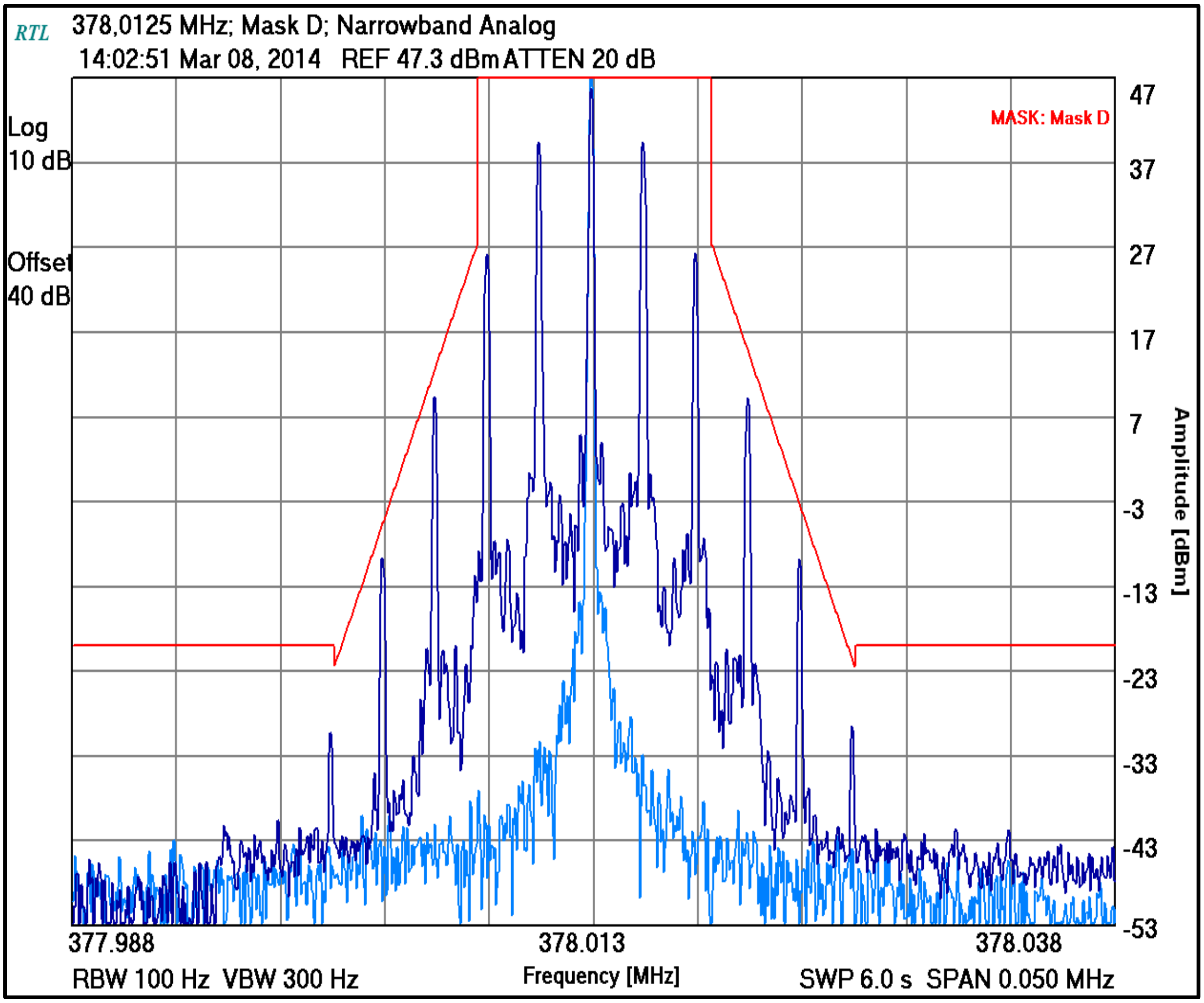
Plot 7-2: Occupied Bandwidth – 450.0125 MHz; NB Mask; (FCC Part 22)



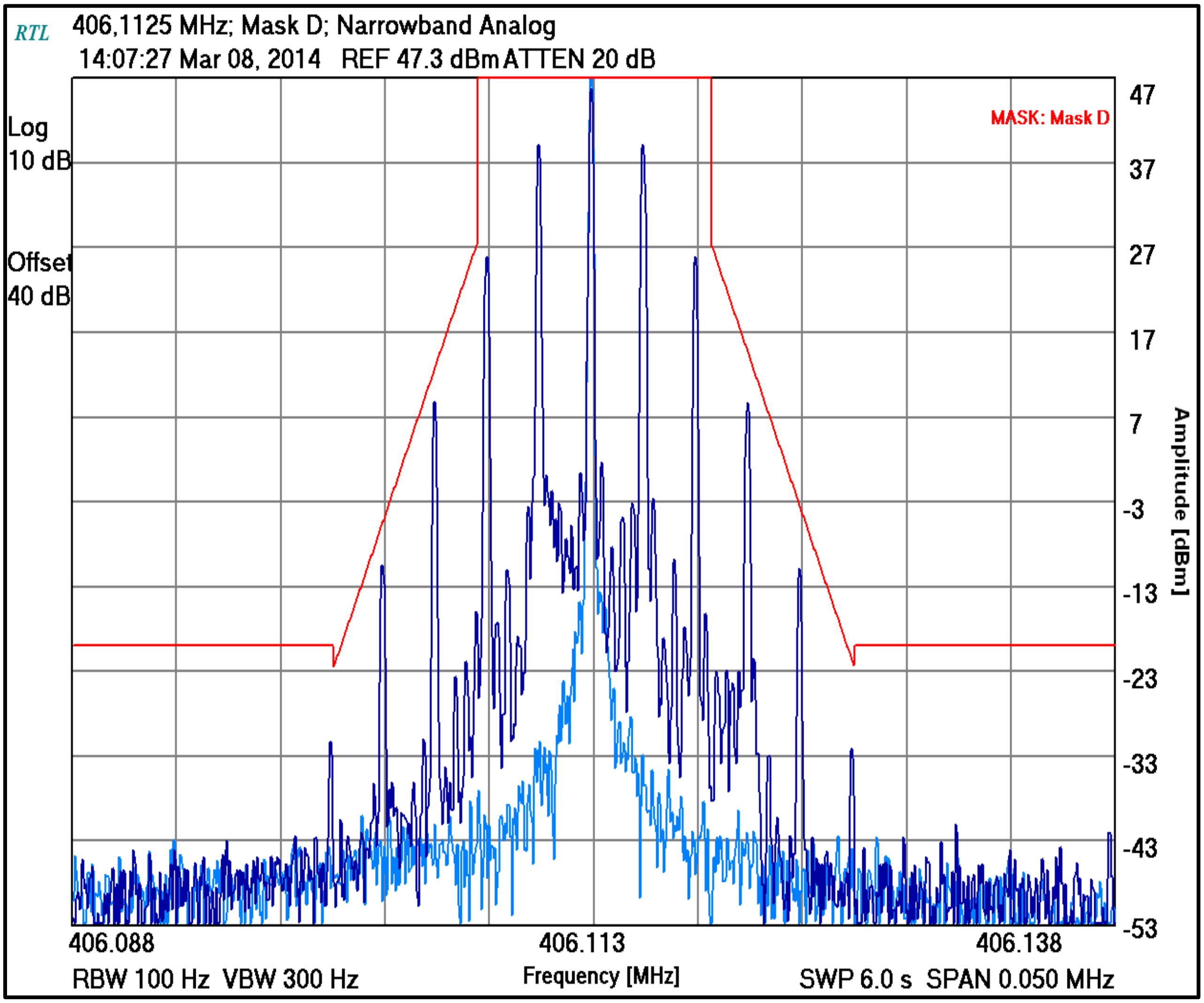
Tx Channel				None		
Bandwidth		12.5 kHz	Power		45.72 dBm	
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-66.250 k	10.00 k	449.942628 M	-31.91	-77.63	-18.91
-66.250 k	-6.250 k	1.00 k	450.006090 M	-29.74	-75.46	-16.74
6.250 k	66.250 k	1.00 k	450.018910 M	-44.25	-89.97	-31.25
66.250 k	100.000 k	10.00 k	450.079167 M	-31.49	-77.21	-18.49

Date: 8.MAR.2014 19:02:31

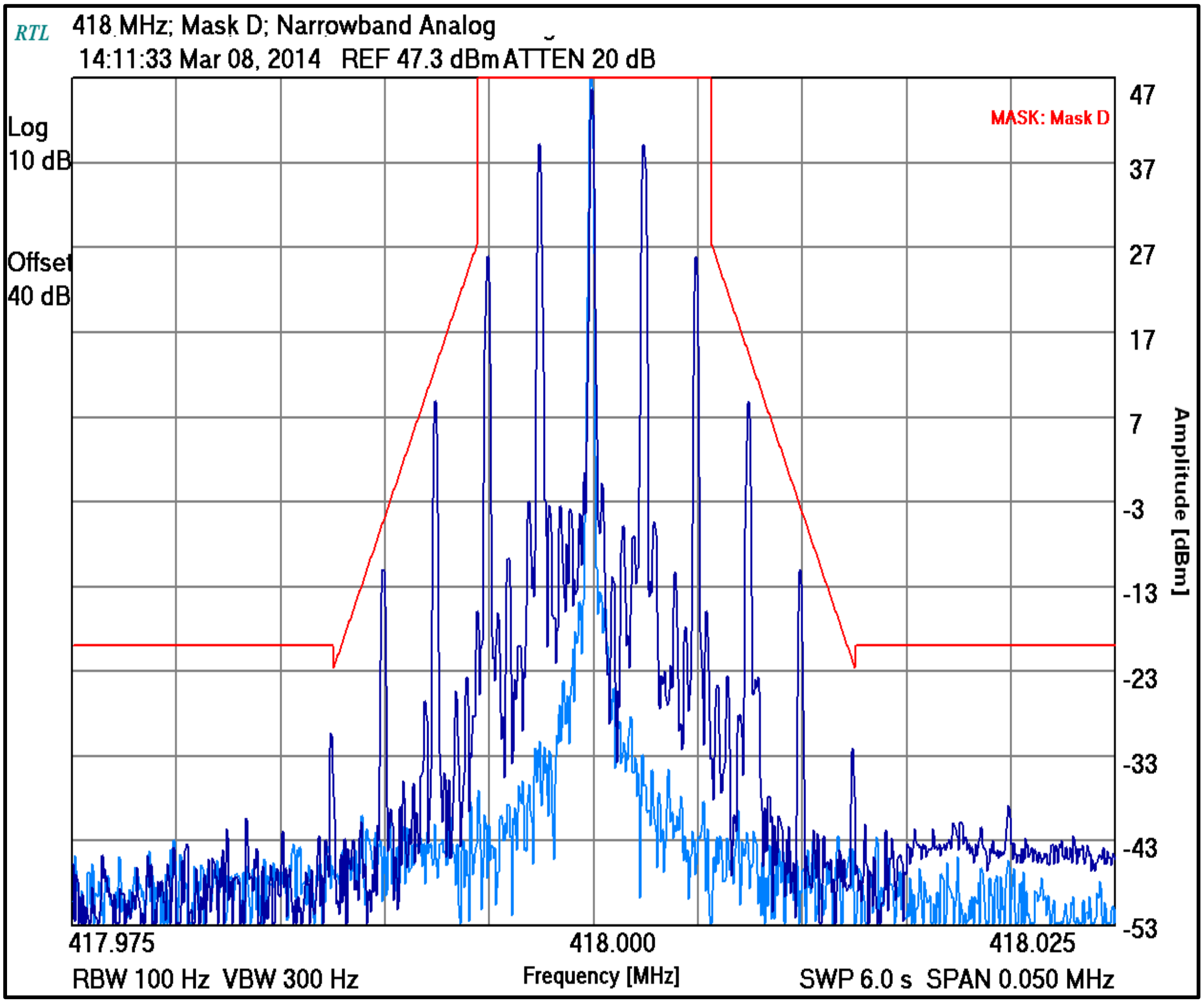
Plot 7-3: Occupied Bandwidth – 378.0125 MHz; Narrowband Analog; Mask D



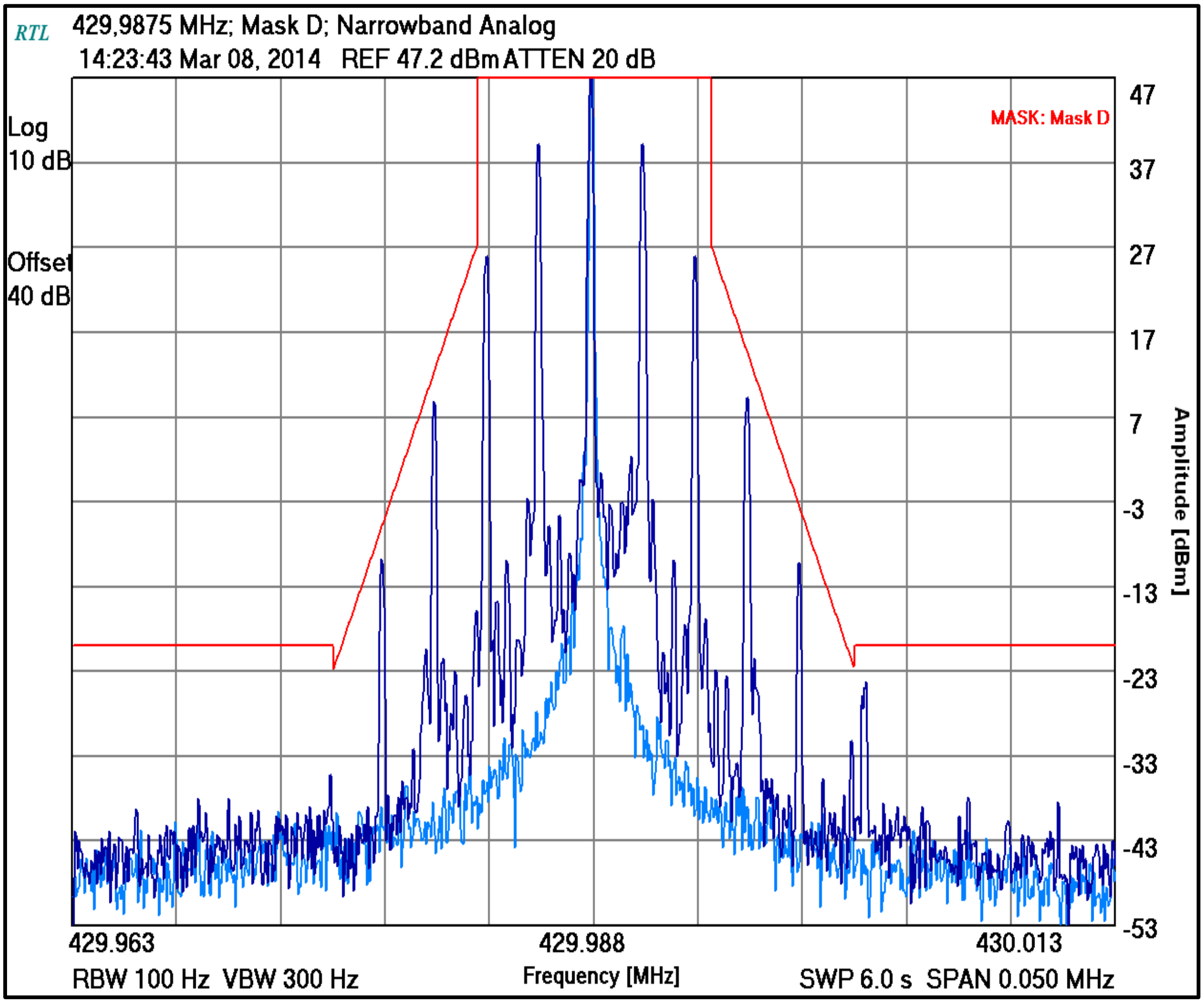
Plot 7-4: Occupied Bandwidth – 406.1125 MHz; Narrowband Analog; Mask D



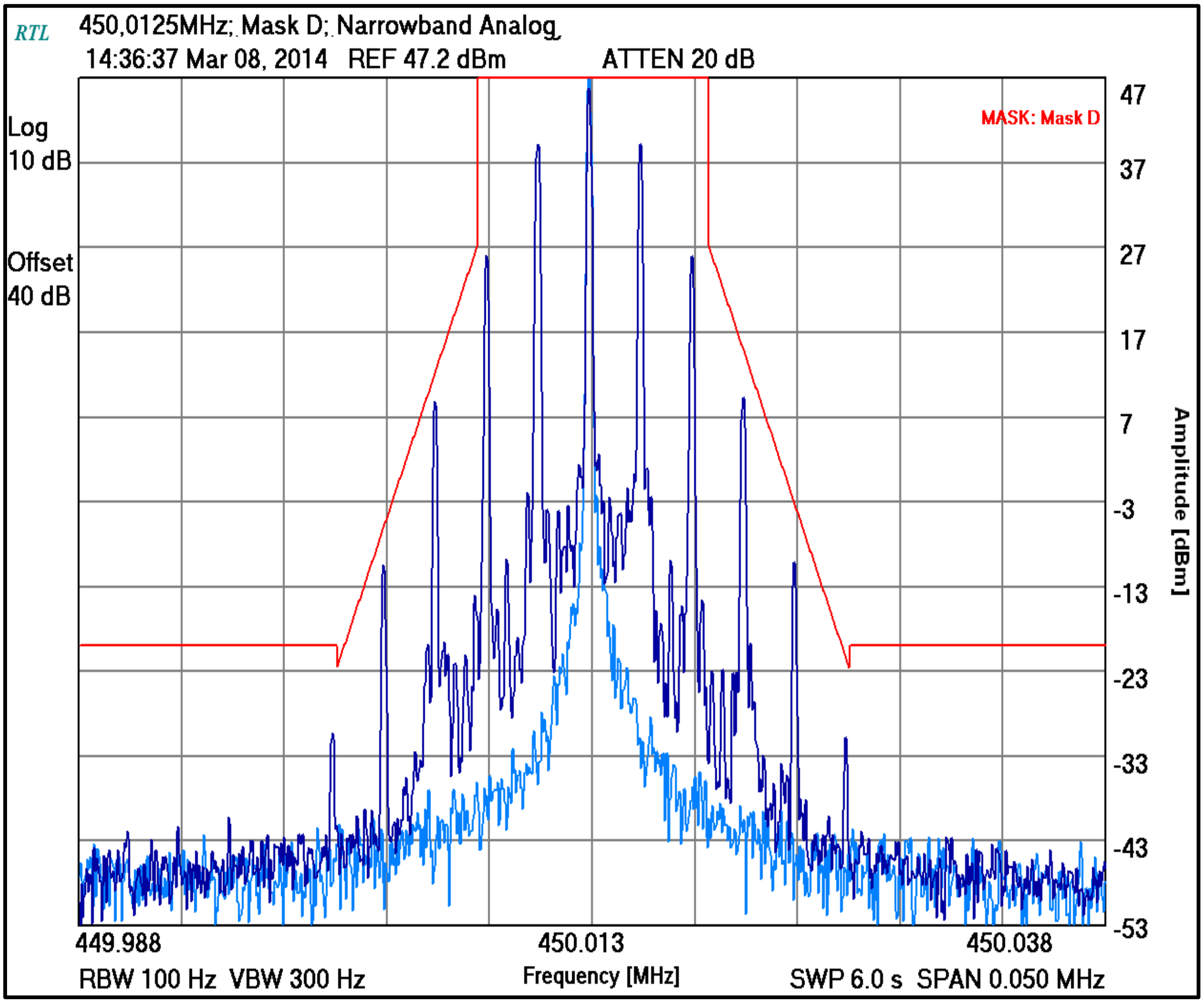
Plot 7-5: Occupied Bandwidth – 418.0000 MHz; Narrowband Analog; Mask D



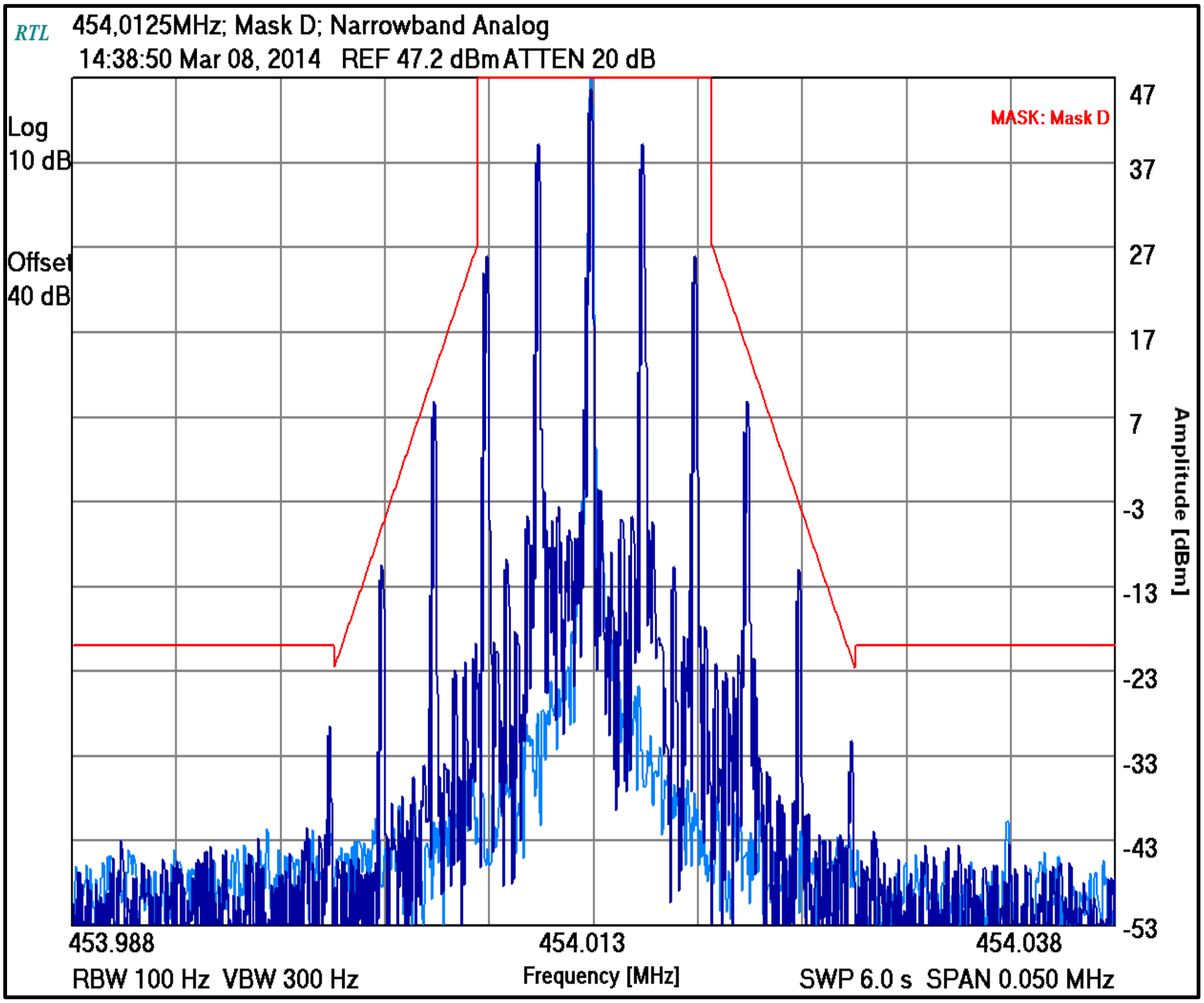
Plot 7-6: Occupied Bandwidth – 429.9875 MHz; Narrowband Analog; Mask D



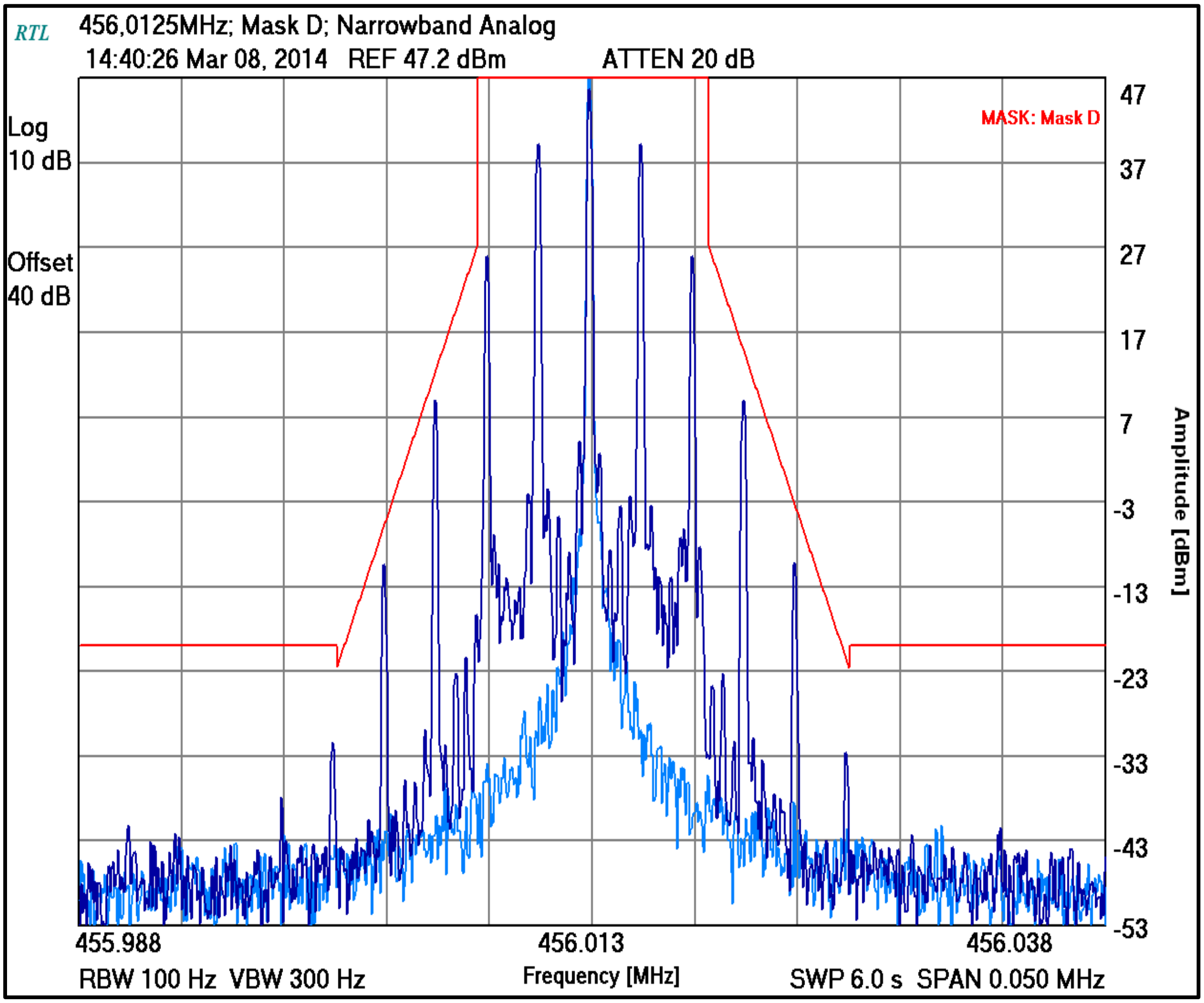
Plot 7-7: Occupied Bandwidth – 450.0125 MHz; Narrowband Analog; Mask D



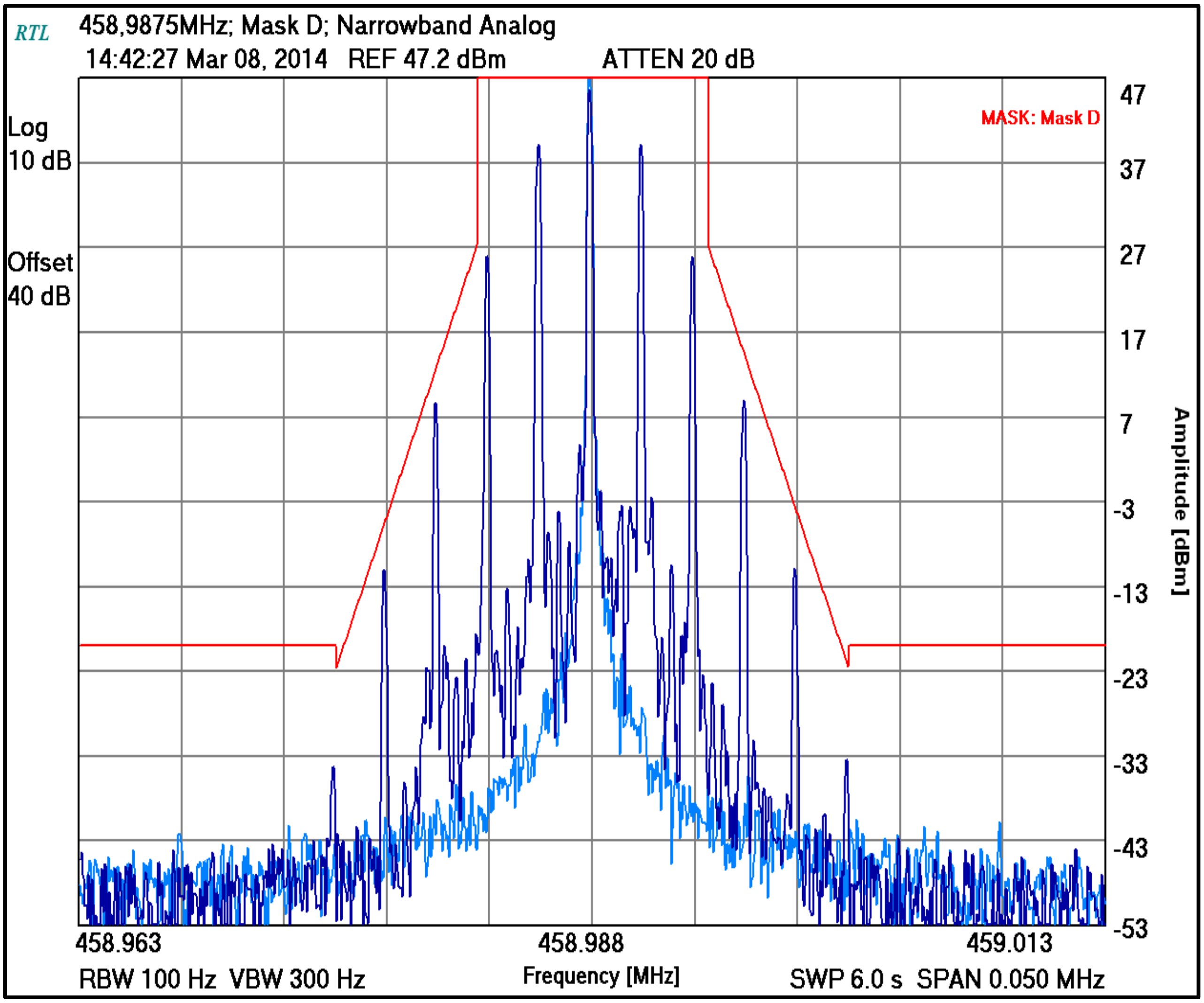
Plot 7-8: Occupied Bandwidth – 454.0125 MHz; Narrowband Analog; Mask D



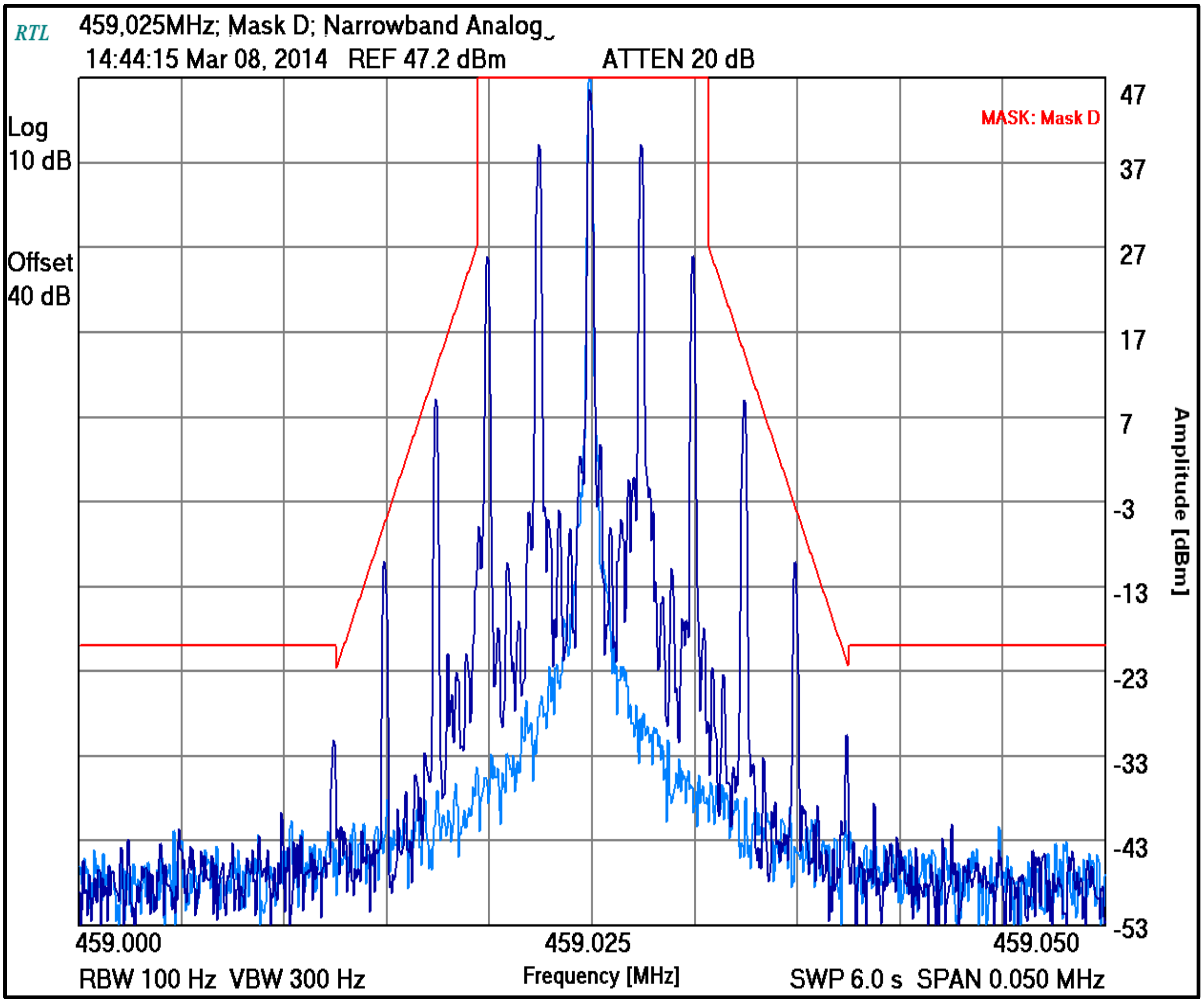
Plot 7-9: Occupied Bandwidth – 456.0125 MHz; Narrowband Analog; Mask D



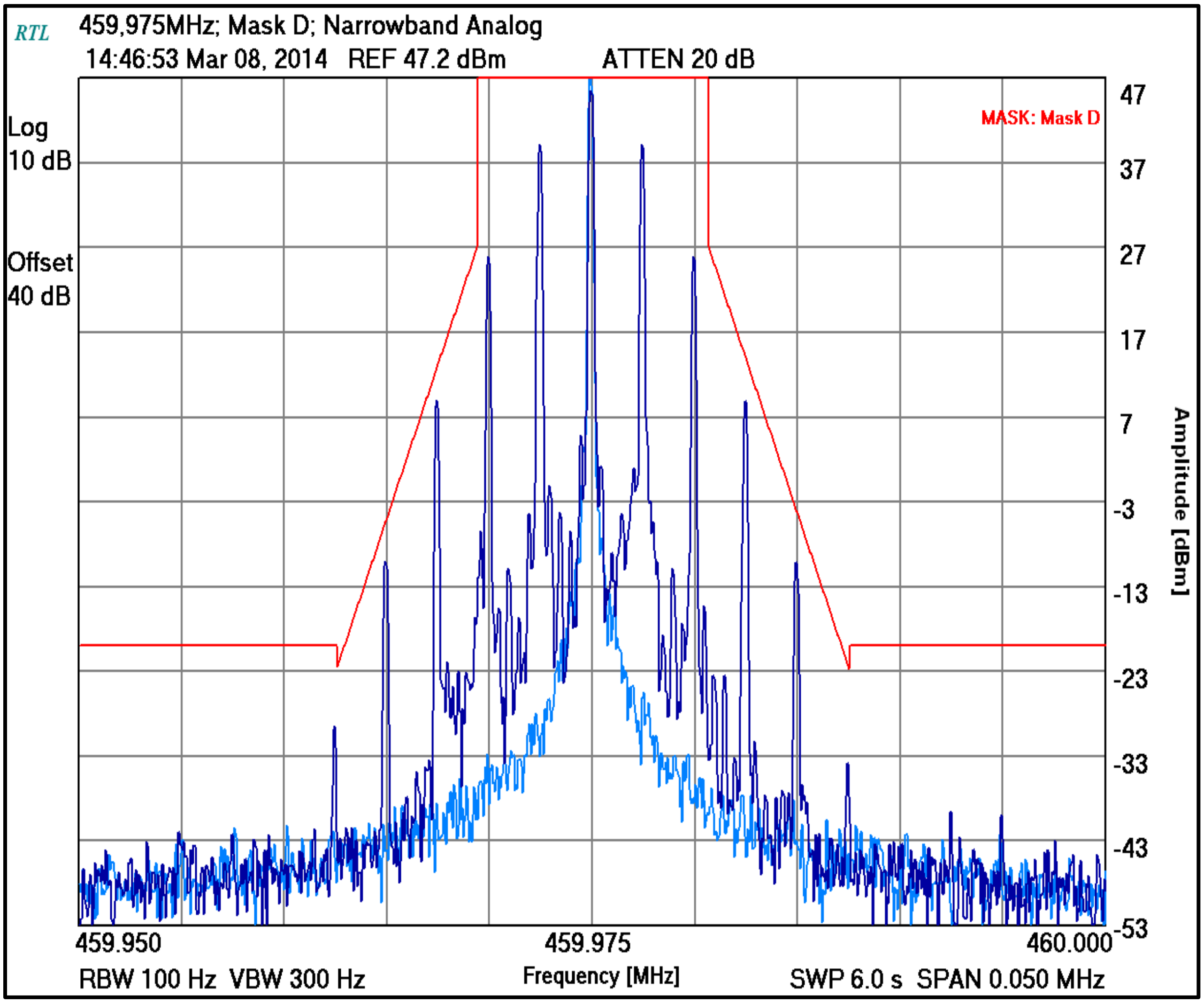
Plot 7-10: Occupied Bandwidth – 458.9875 MHz; Narrowband Analog; Mask D



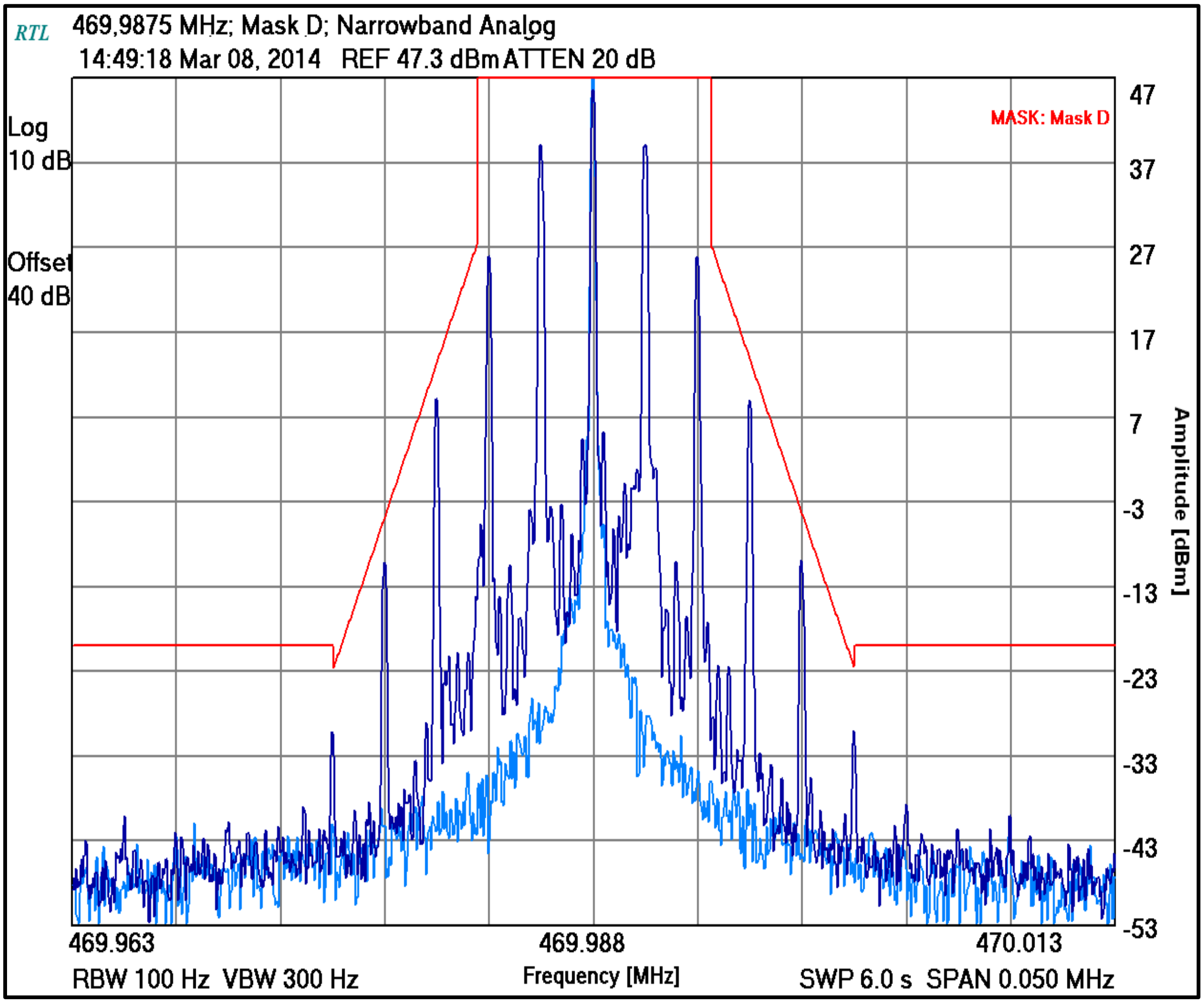
Plot 7-11: Occupied Bandwidth – 459.0250 MHz; Narrowband Analog; Mask D



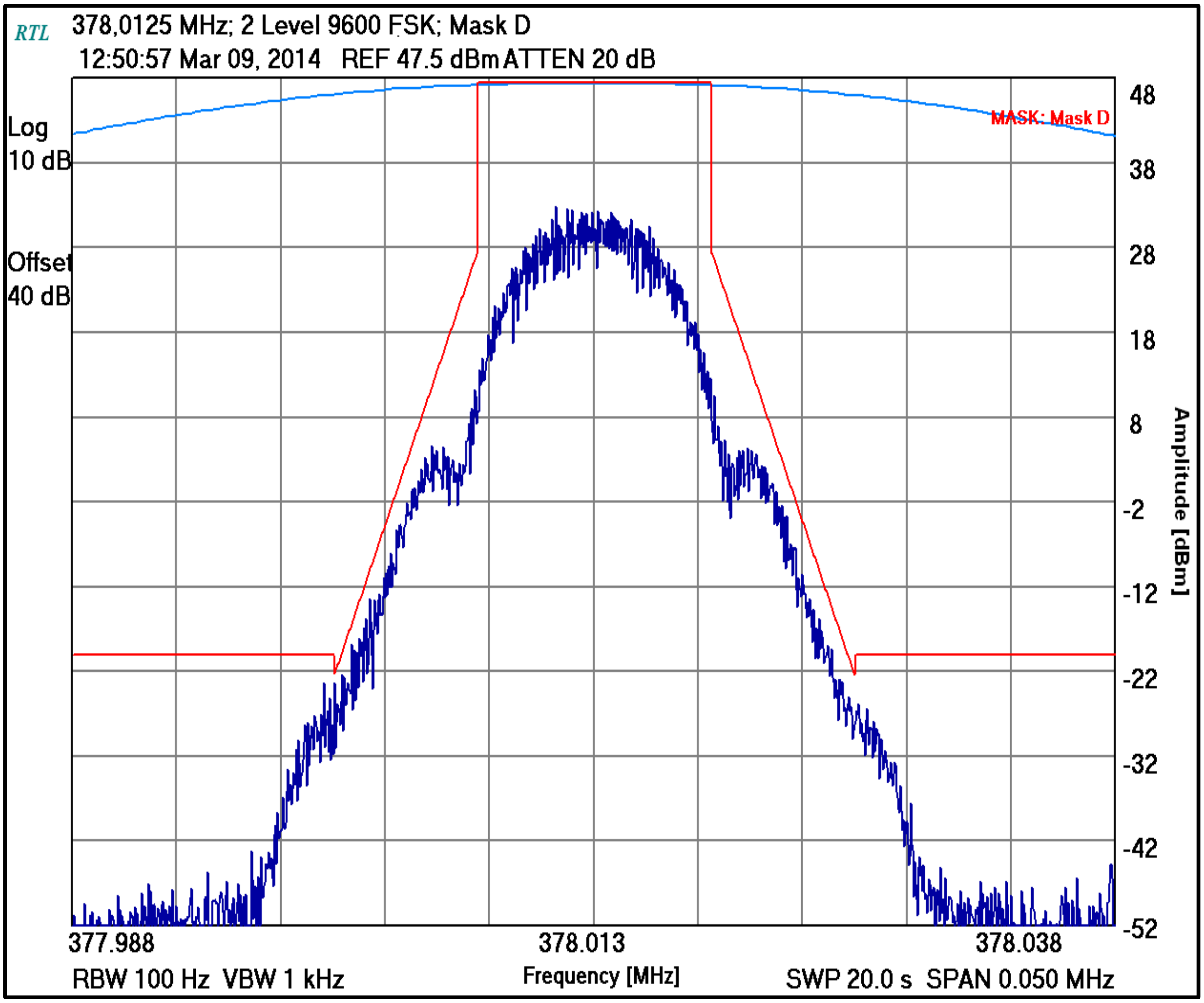
Plot 7-12: Occupied Bandwidth – 459.9750 MHz; Narrowband Analog; Mask D



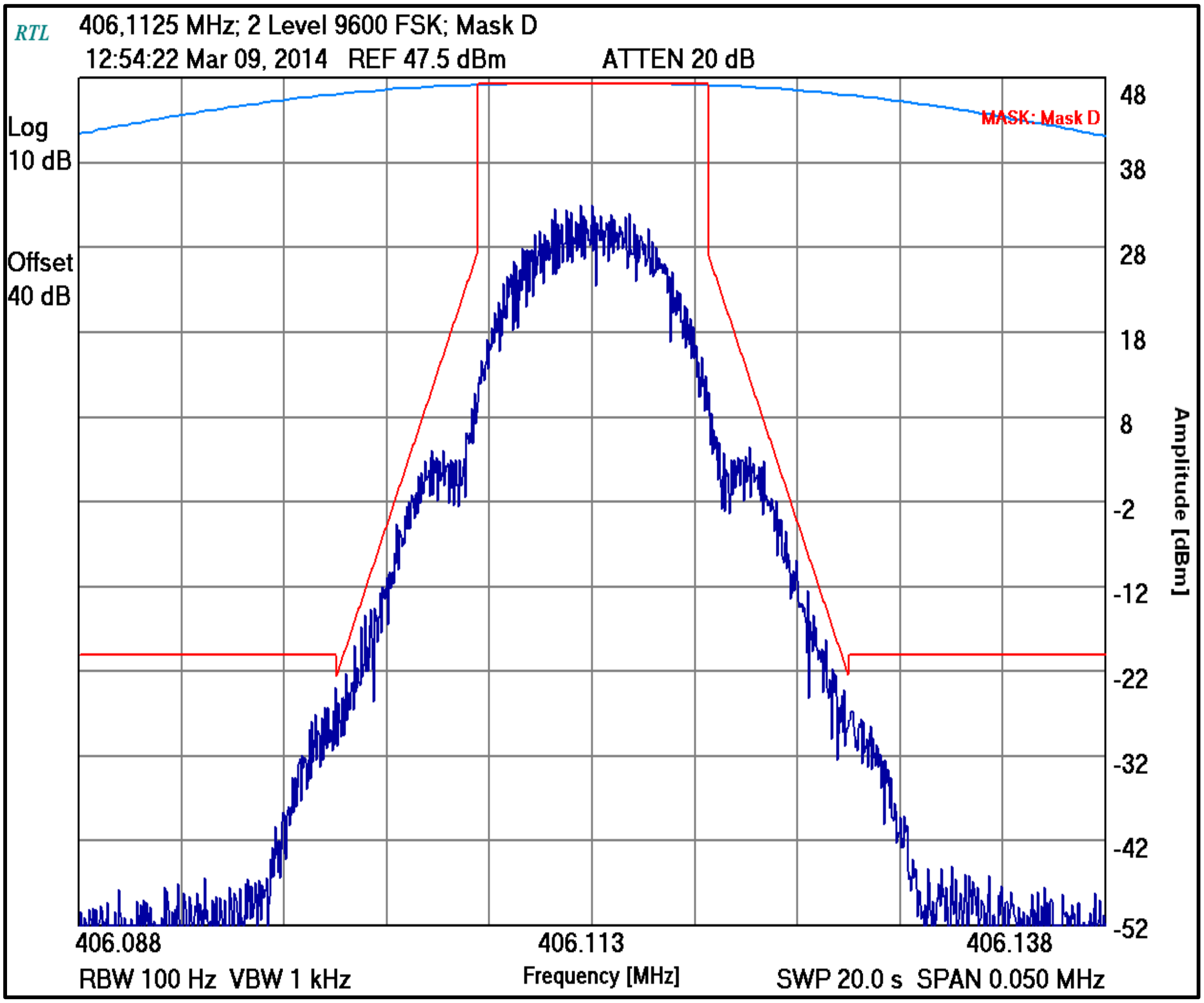
Plot 7-13: Occupied Bandwidth – 469.9875 MHz; Narrowband Analog; Mask D



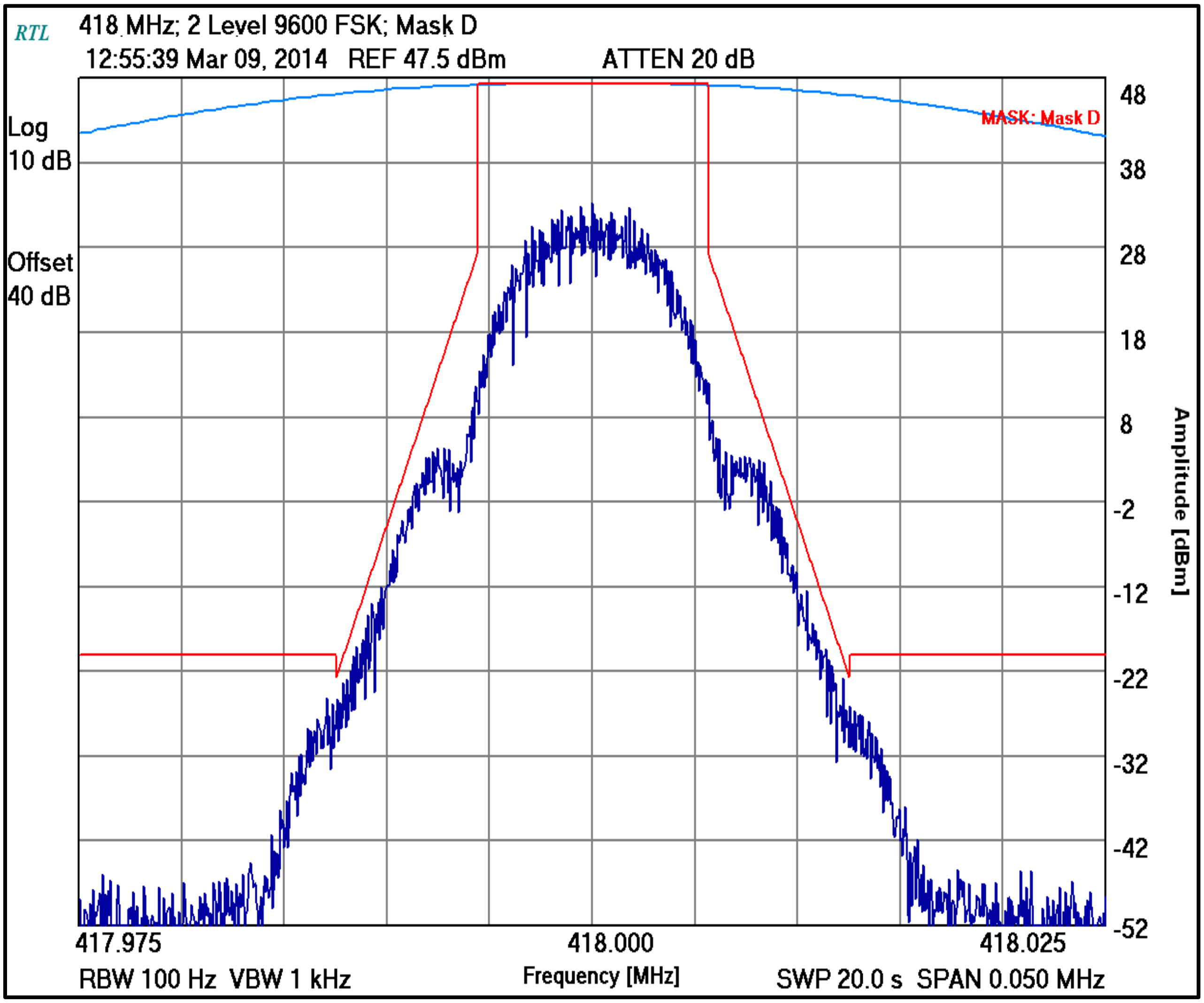
Plot 7-14: Occupied Bandwidth – 378.0125 MHz; Narrowband 2-level 9600 FSK; Mask D



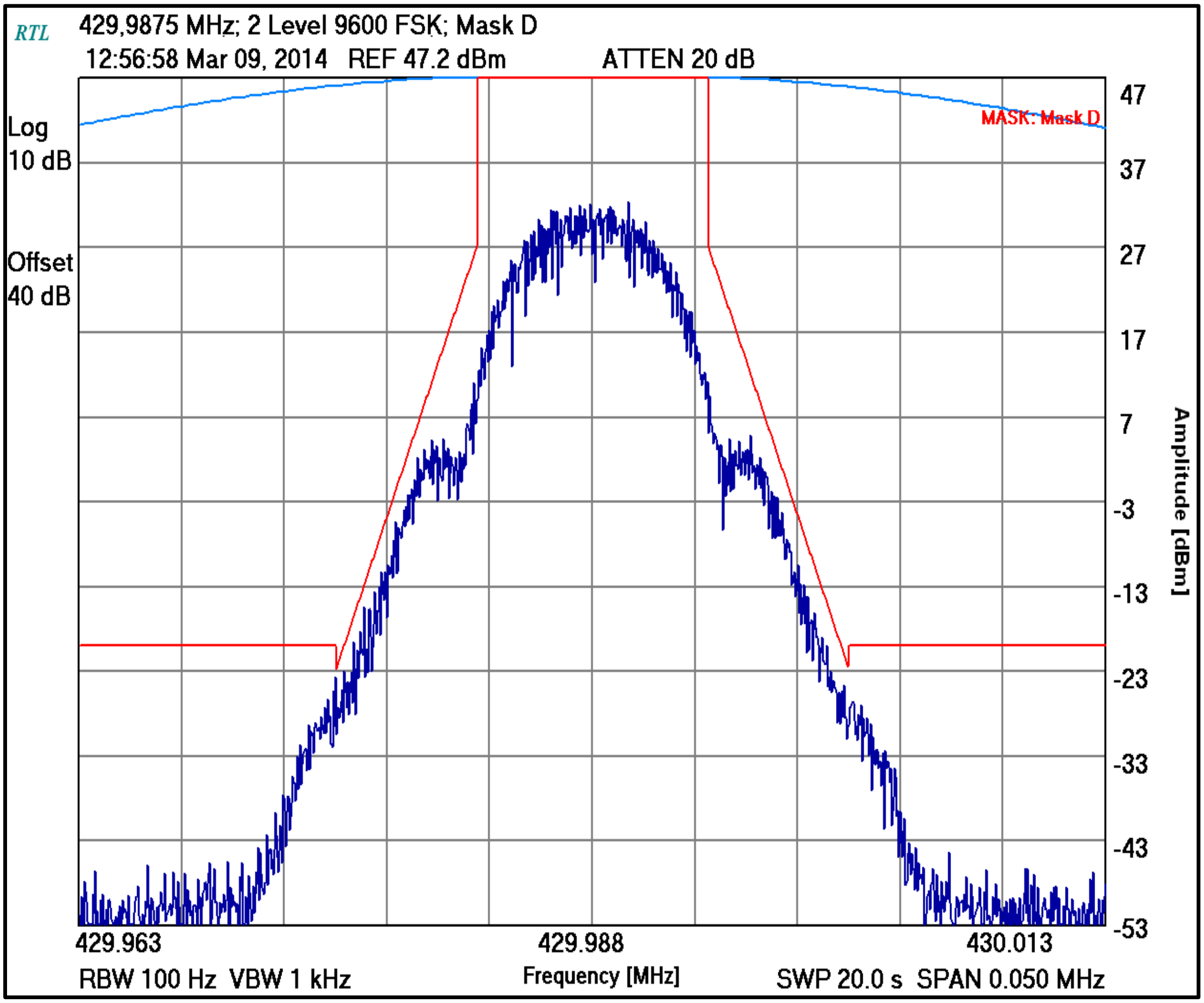
Plot 7-15: Occupied Bandwidth – 406.1125 MHz; Narrowband 2-level 9600 FSK; Mask D



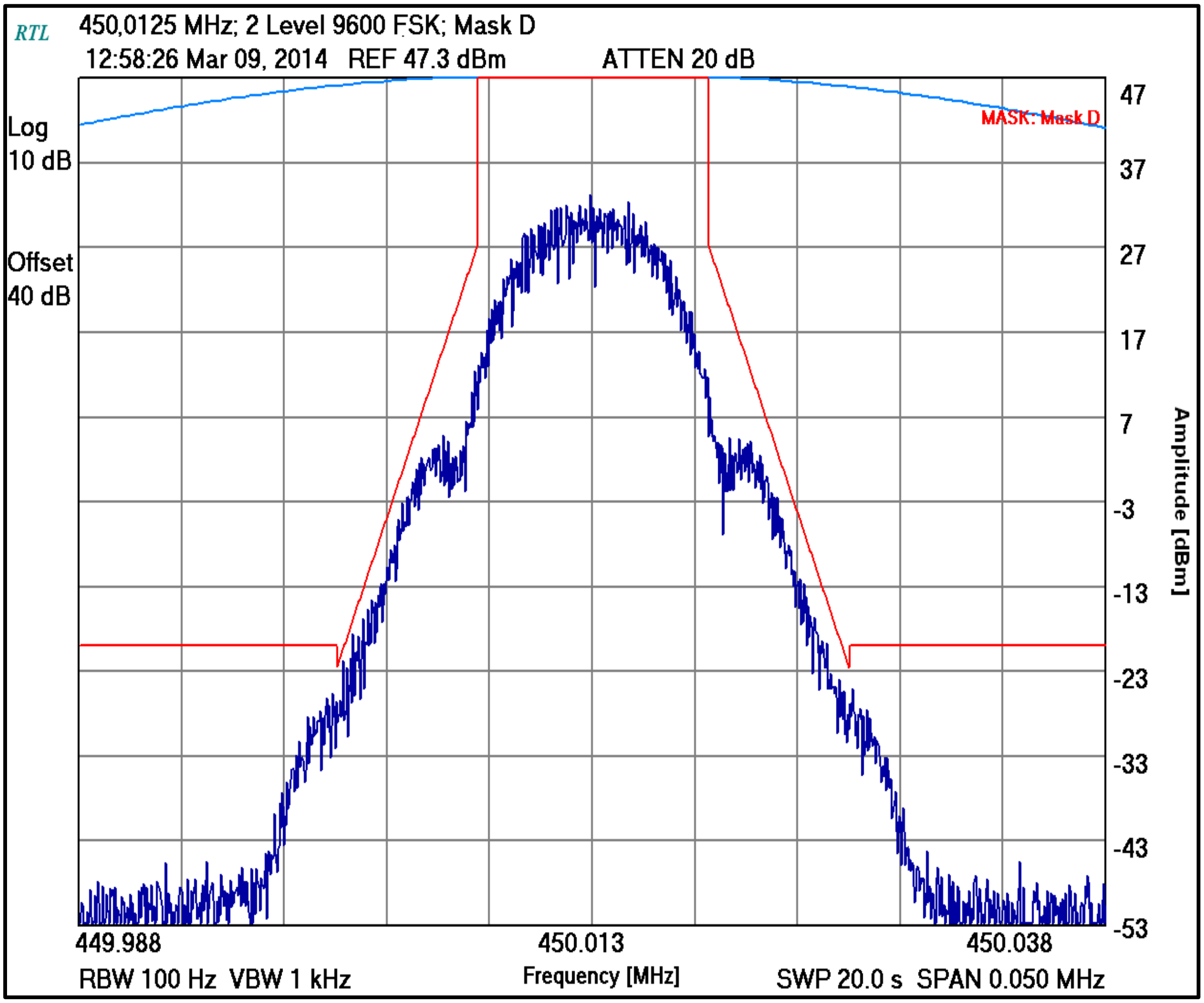
Plot 7-16: Occupied Bandwidth – 418.0000 MHz; Narrowband 2-level 9600 FSK; Mask D



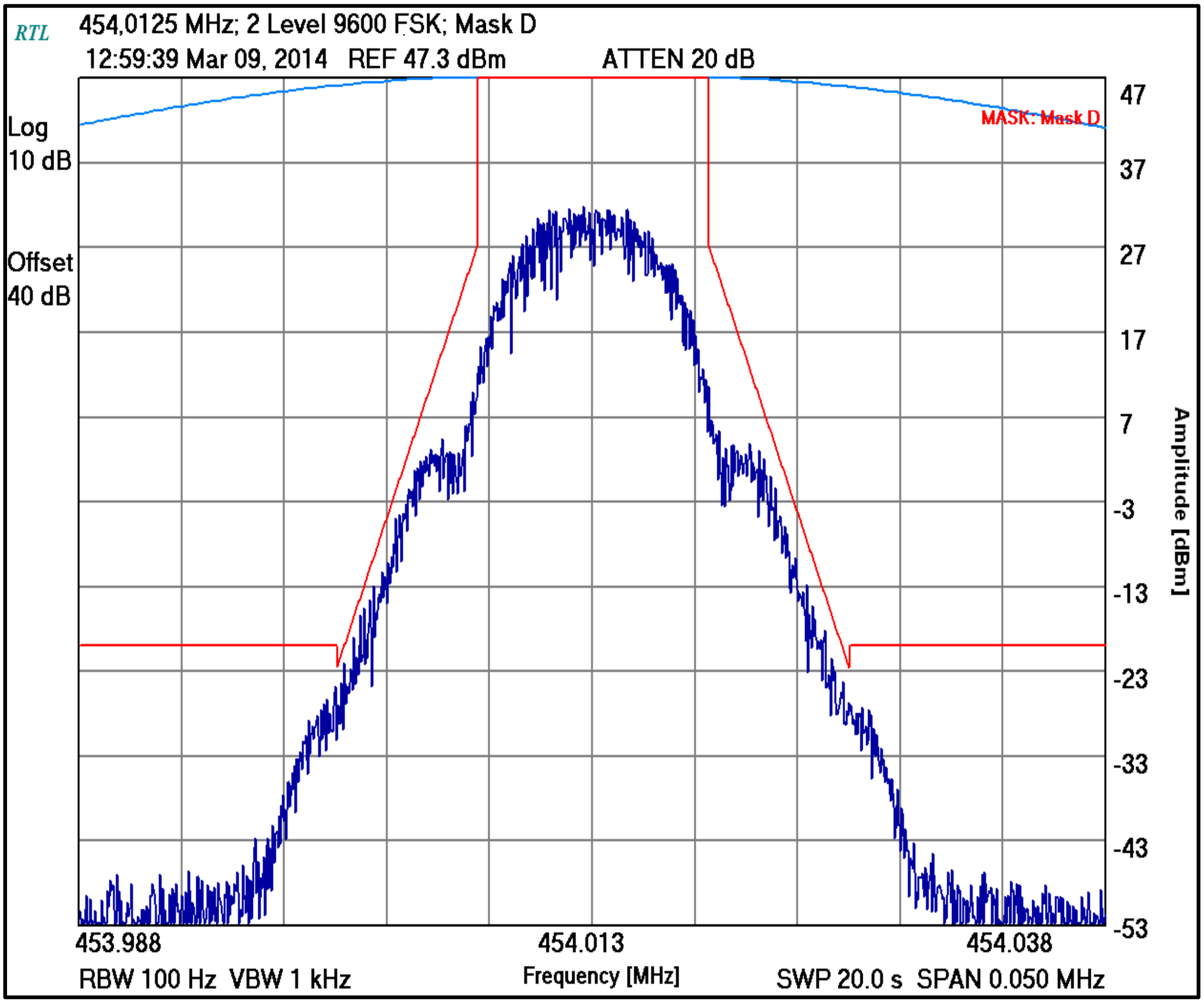
Plot 7-17: Occupied Bandwidth – 429.9875 MHz; Narrowband 2-level 9600 FSK; Mask D



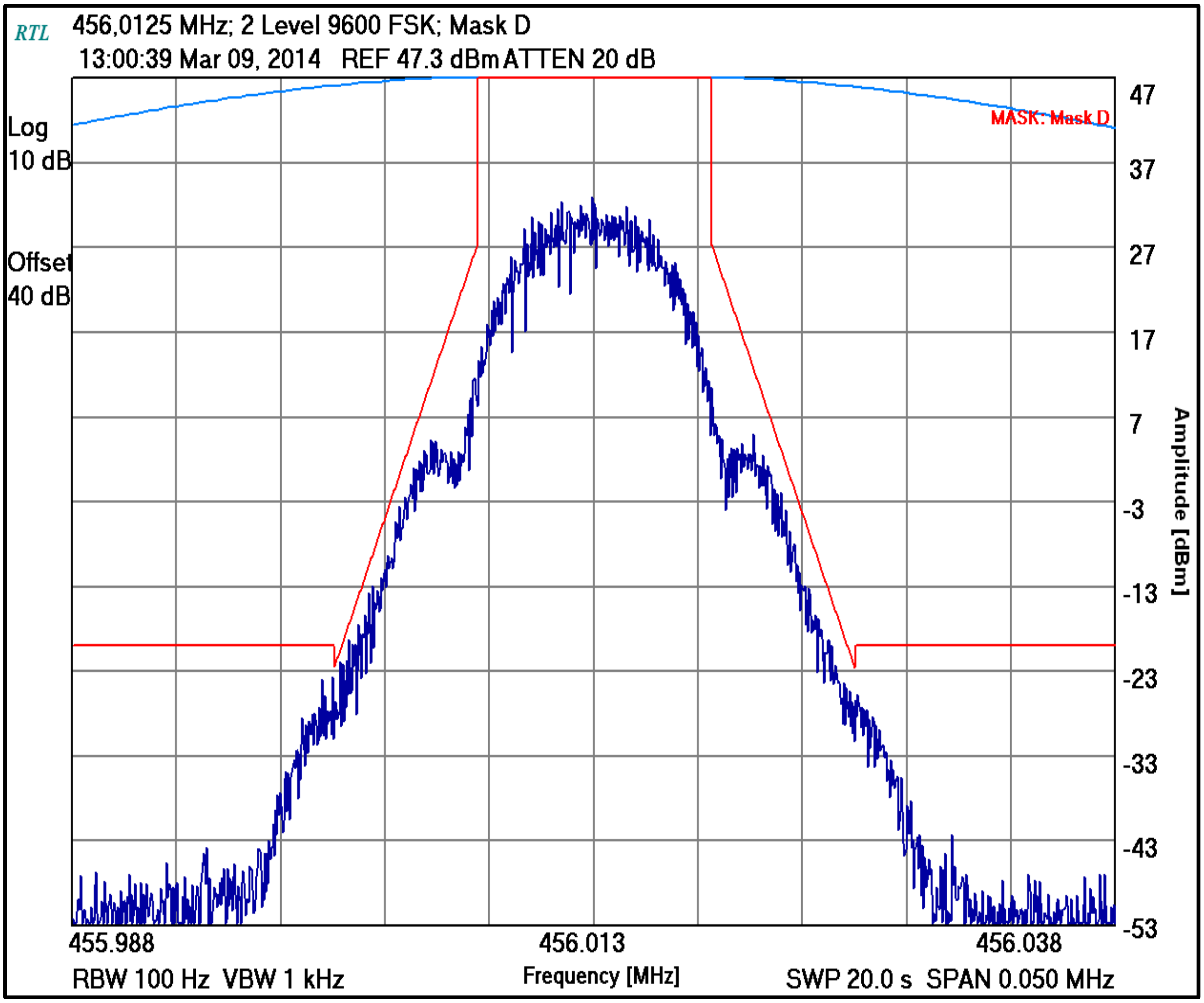
Plot 7-18: Occupied Bandwidth – 450.0125 MHz; Narrowband 2-level 9600 FSK; Mask D



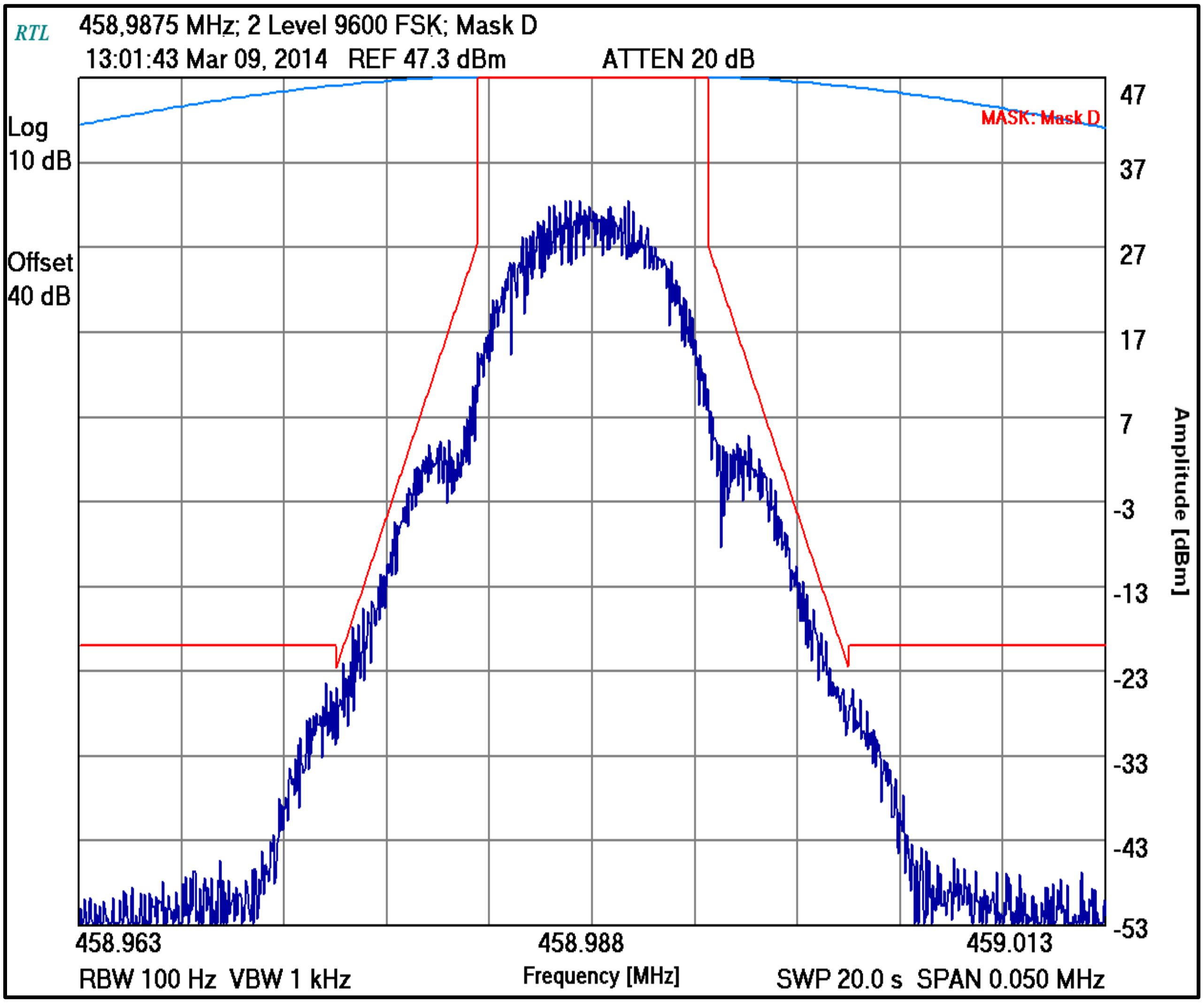
Plot 7-19: Occupied Bandwidth – 454.0125 MHz; Narrowband 2-level 9600 FSK; Mask D



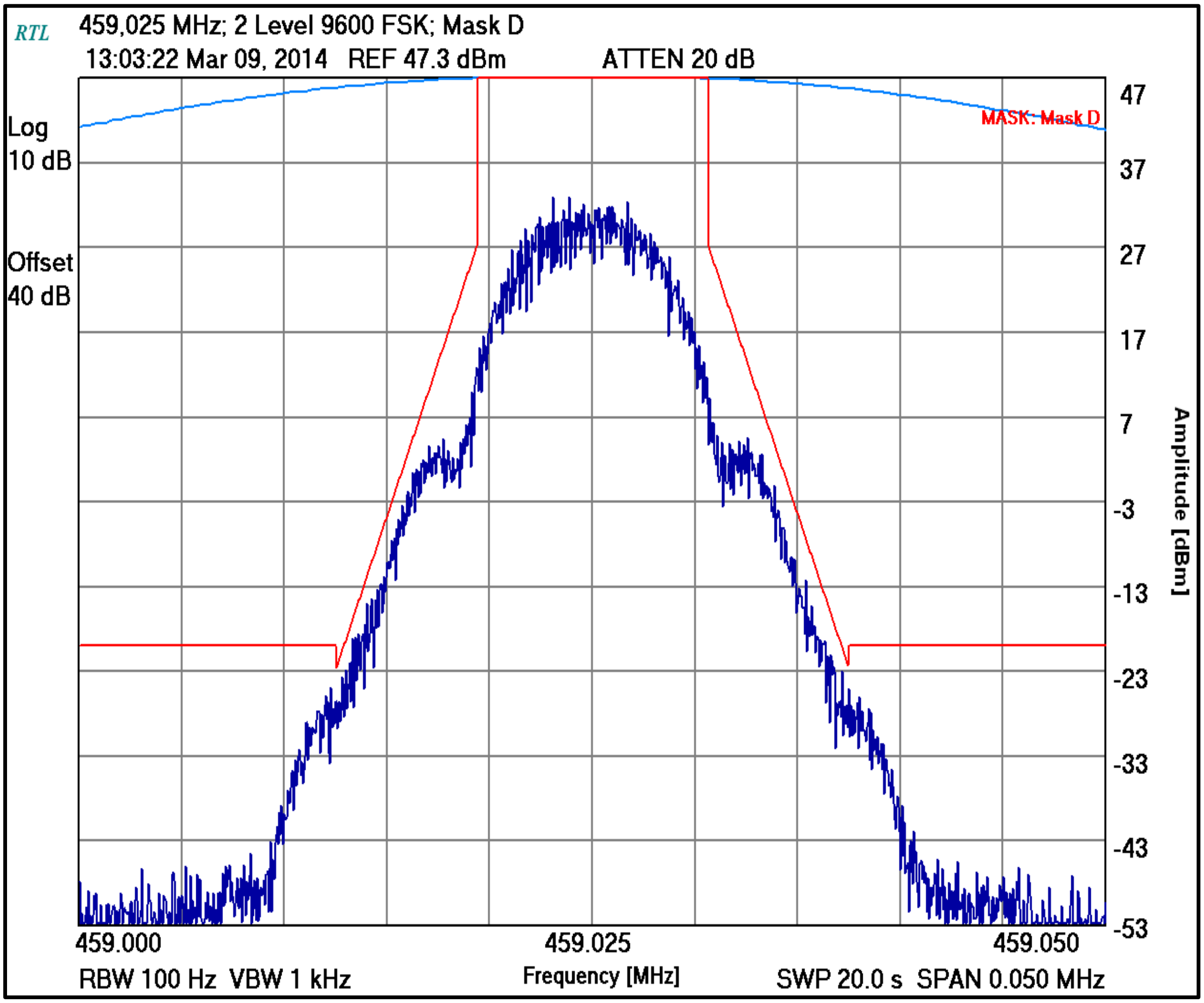
Plot 7-20: Occupied Bandwidth – 456.0125 MHz; Narrowband 2-level 9600 FSK; Mask D



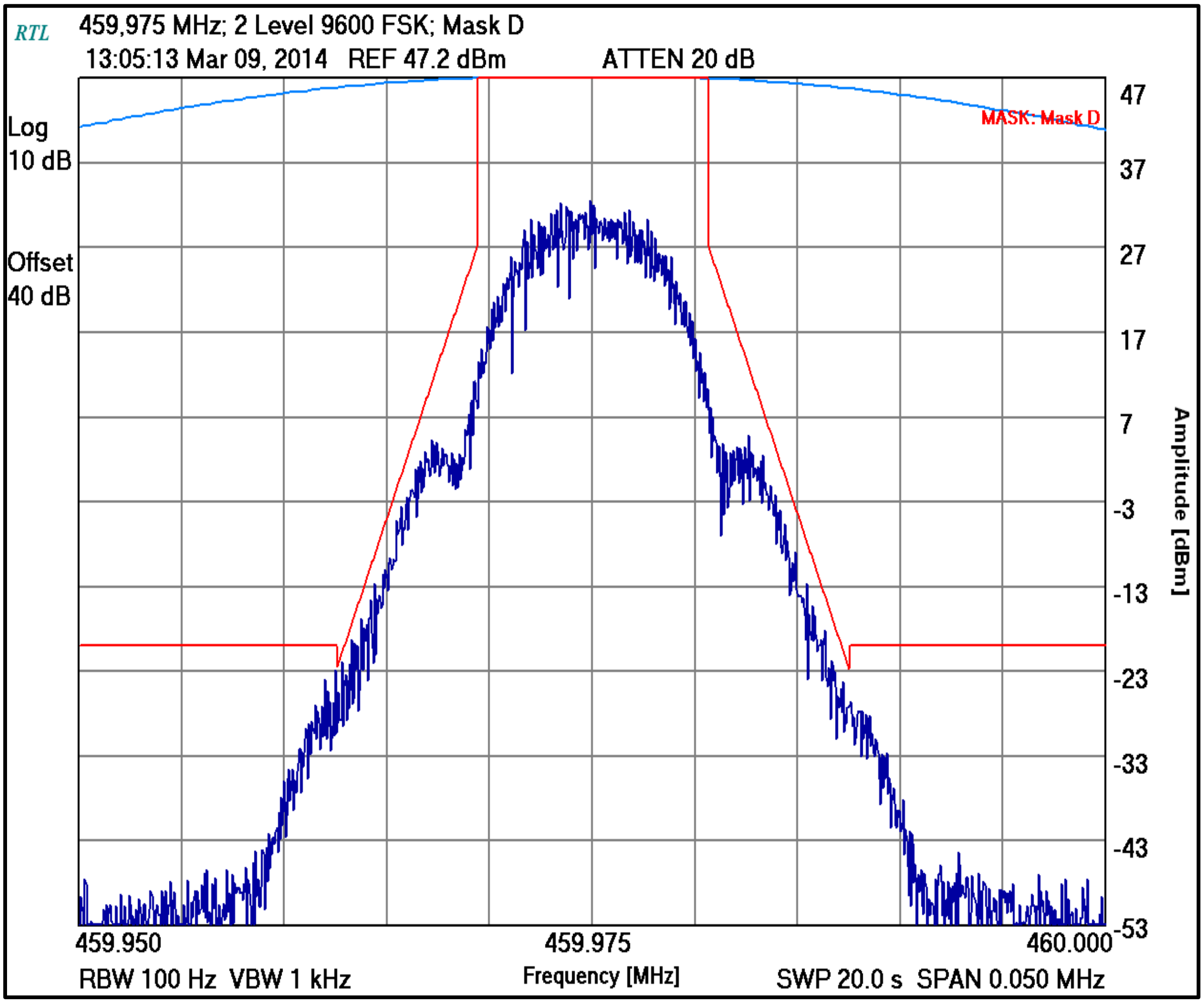
Plot 7-21: Occupied Bandwidth – 458.9875 MHz; Narrowband 2-level 9600 FSK; Mask D



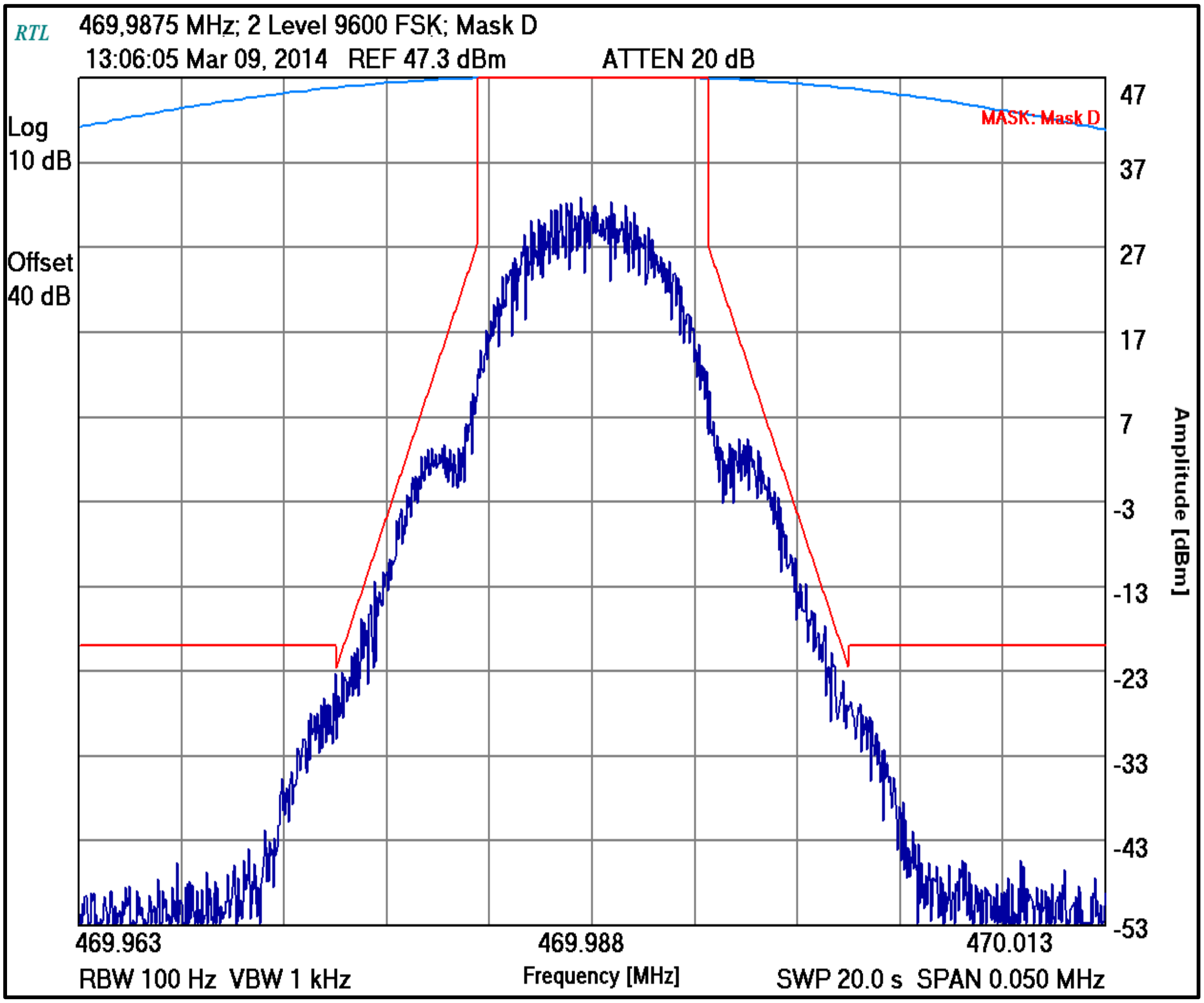
Plot 7-22: Occupied Bandwidth – 459.0250 MHz; Narrowband 2-level 9600 FSK; Mask D



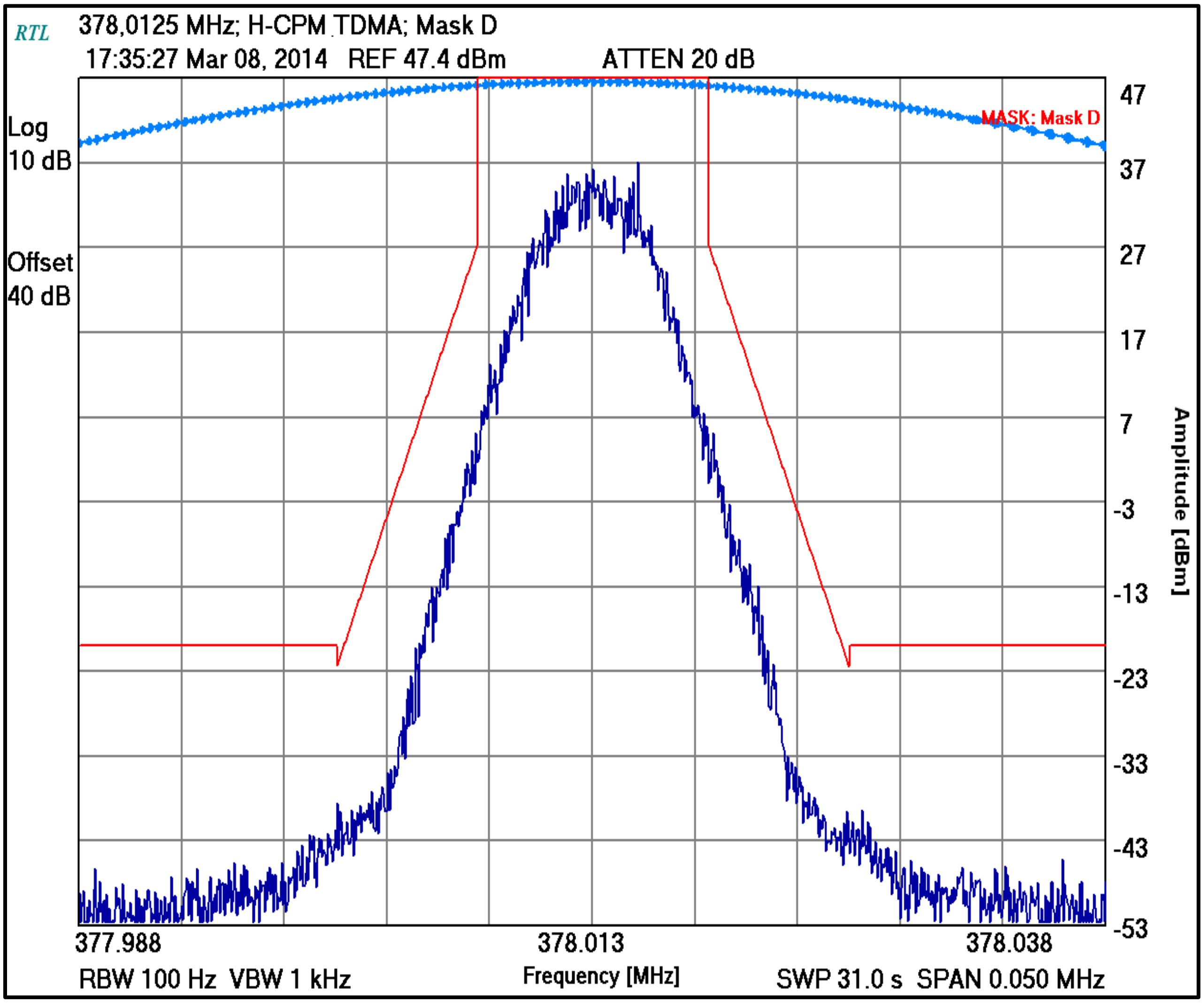
Plot 7-23: Occupied Bandwidth – 459.9750 MHz; Narrowband 2-level 9600 FSK; Mask D



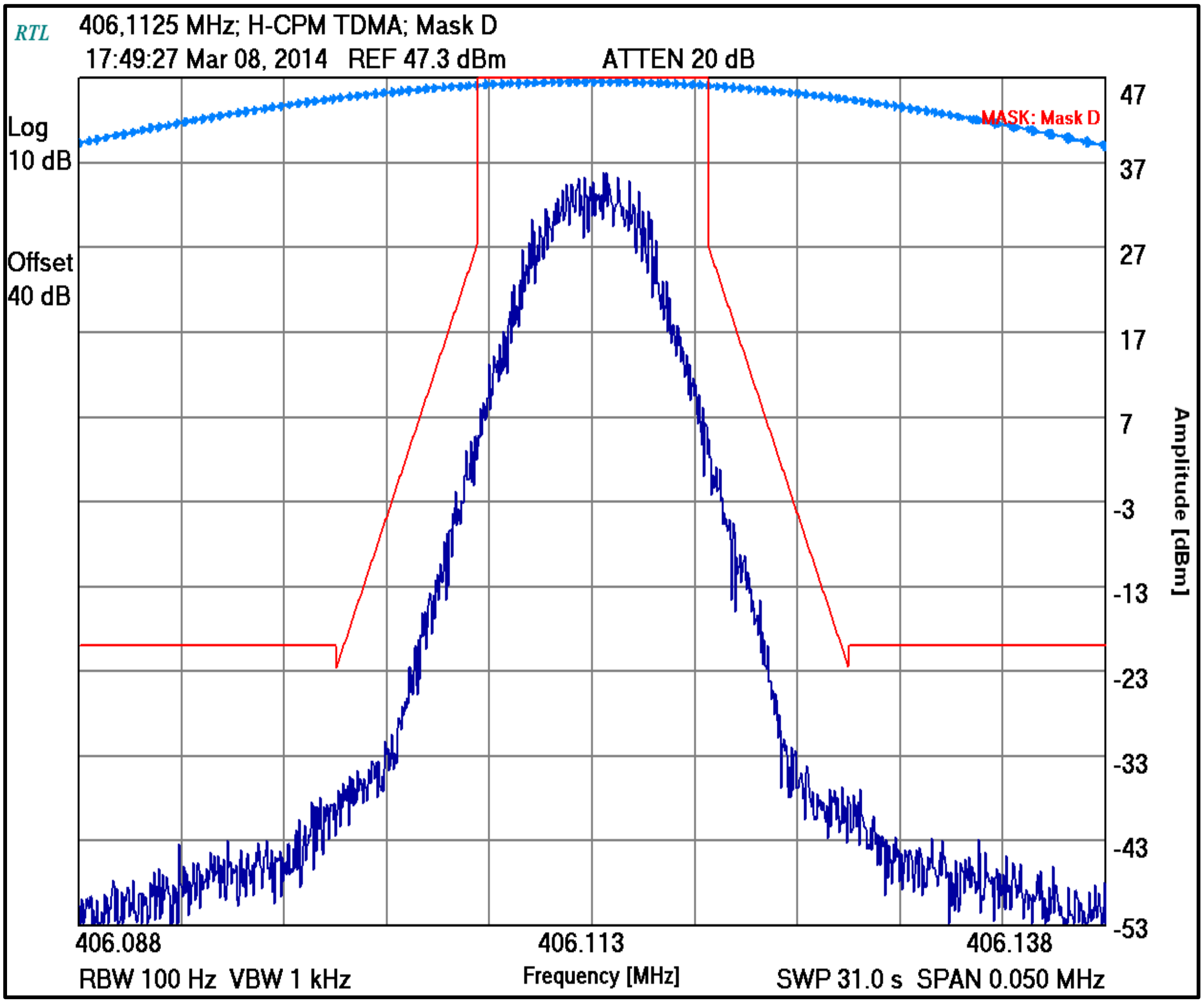
Plot 7-24: Occupied Bandwidth – 469.9875 MHz; Narrowband 2-level 9600 FSK; Mask D



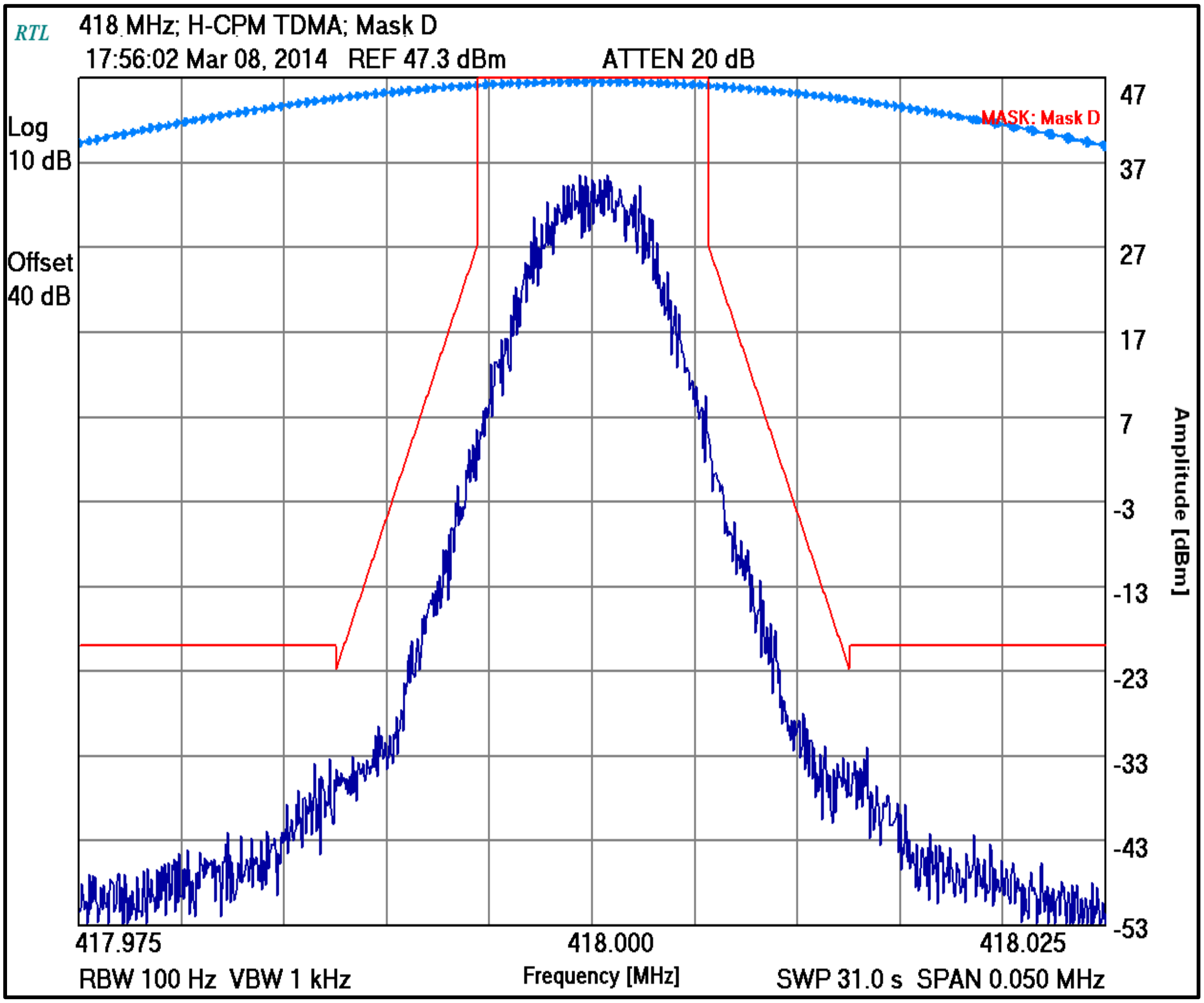
Plot 7-25: Occupied Bandwidth – 378.0125 MHz; Narrowband H-CPM TDMA; Mask D



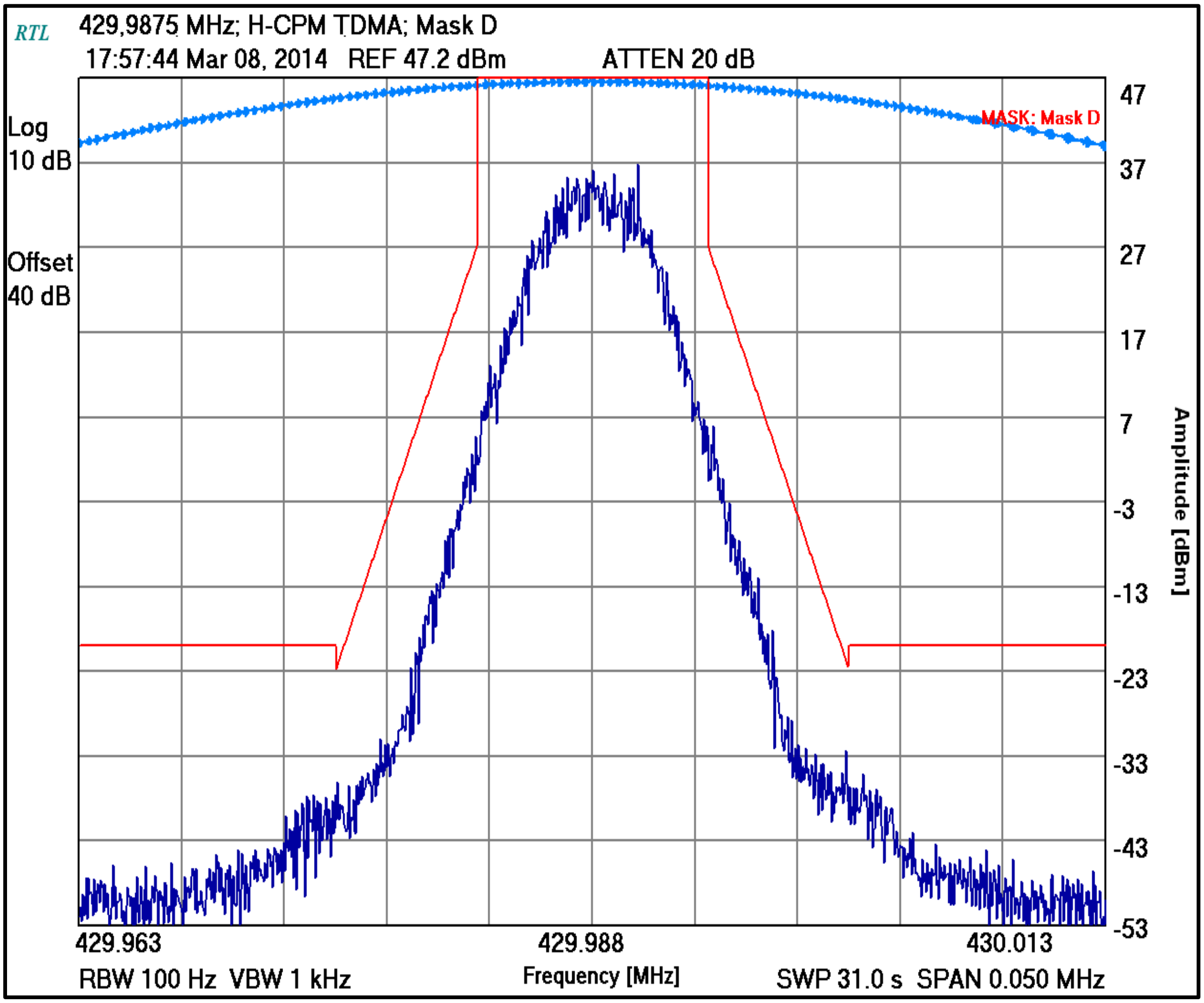
Plot 7-26: Occupied Bandwidth – 406.1125 MHz; Narrowband H-CPM TDMA; Mask D



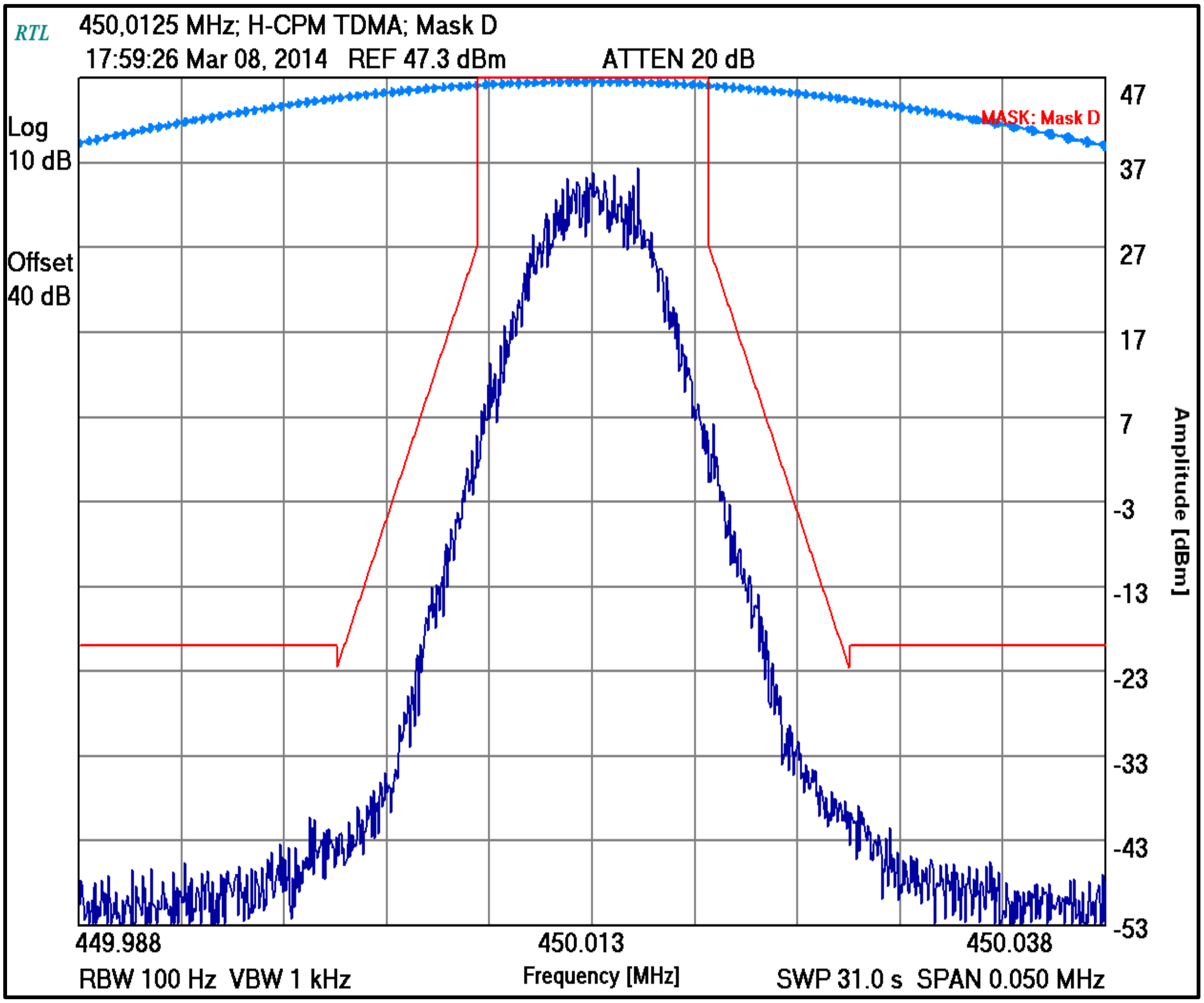
Plot 7-27: Occupied Bandwidth – 418.0000 MHz; Narrowband H-CPM TDMA; Mask D



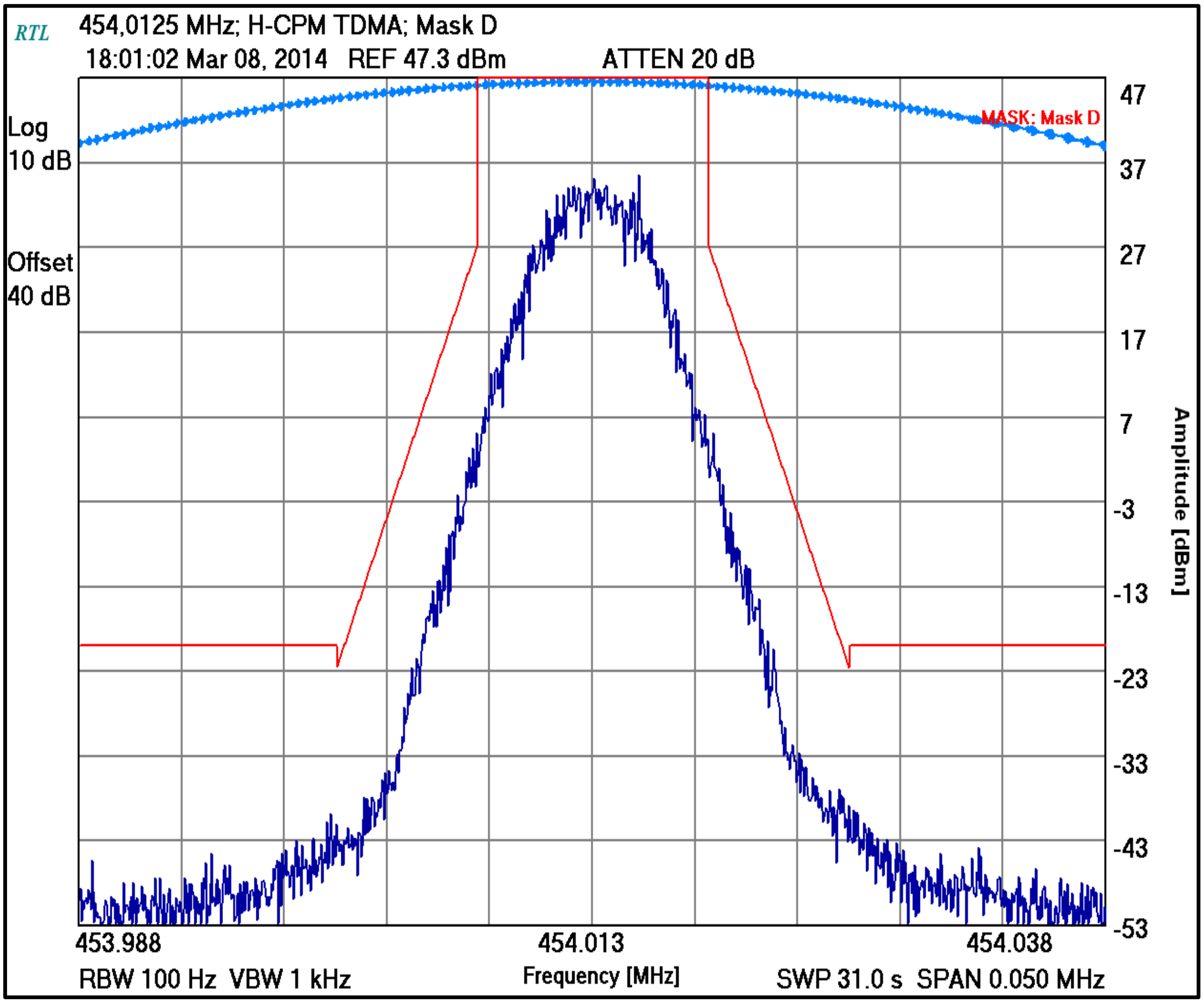
Plot 7-28: Occupied Bandwidth – 429.9875 MHz; Narrowband H-CPM TDMA; Mask D



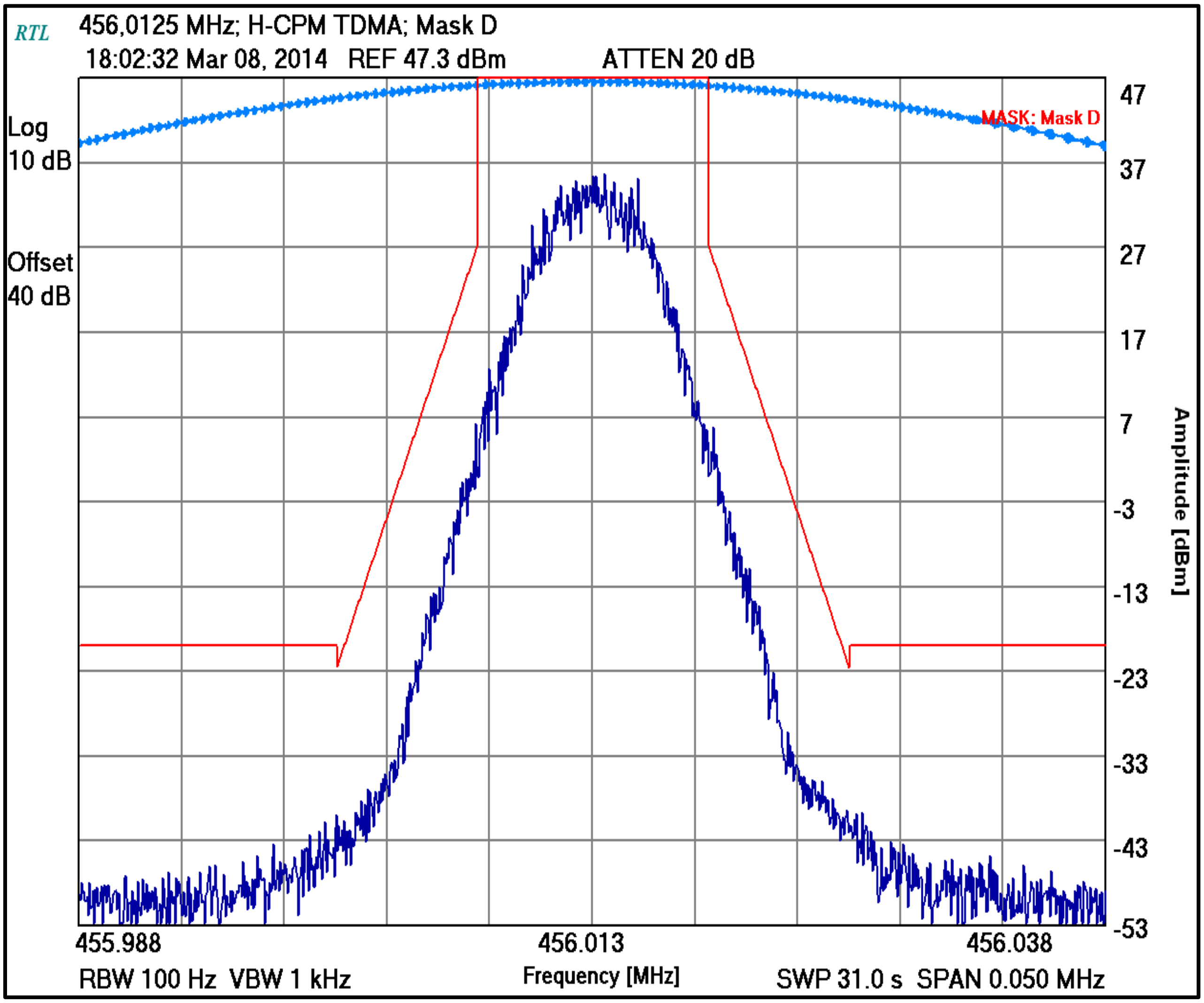
Plot 7-29: Occupied Bandwidth – 450.0125 MHz; Narrowband H-CPM TDMA; Mask D



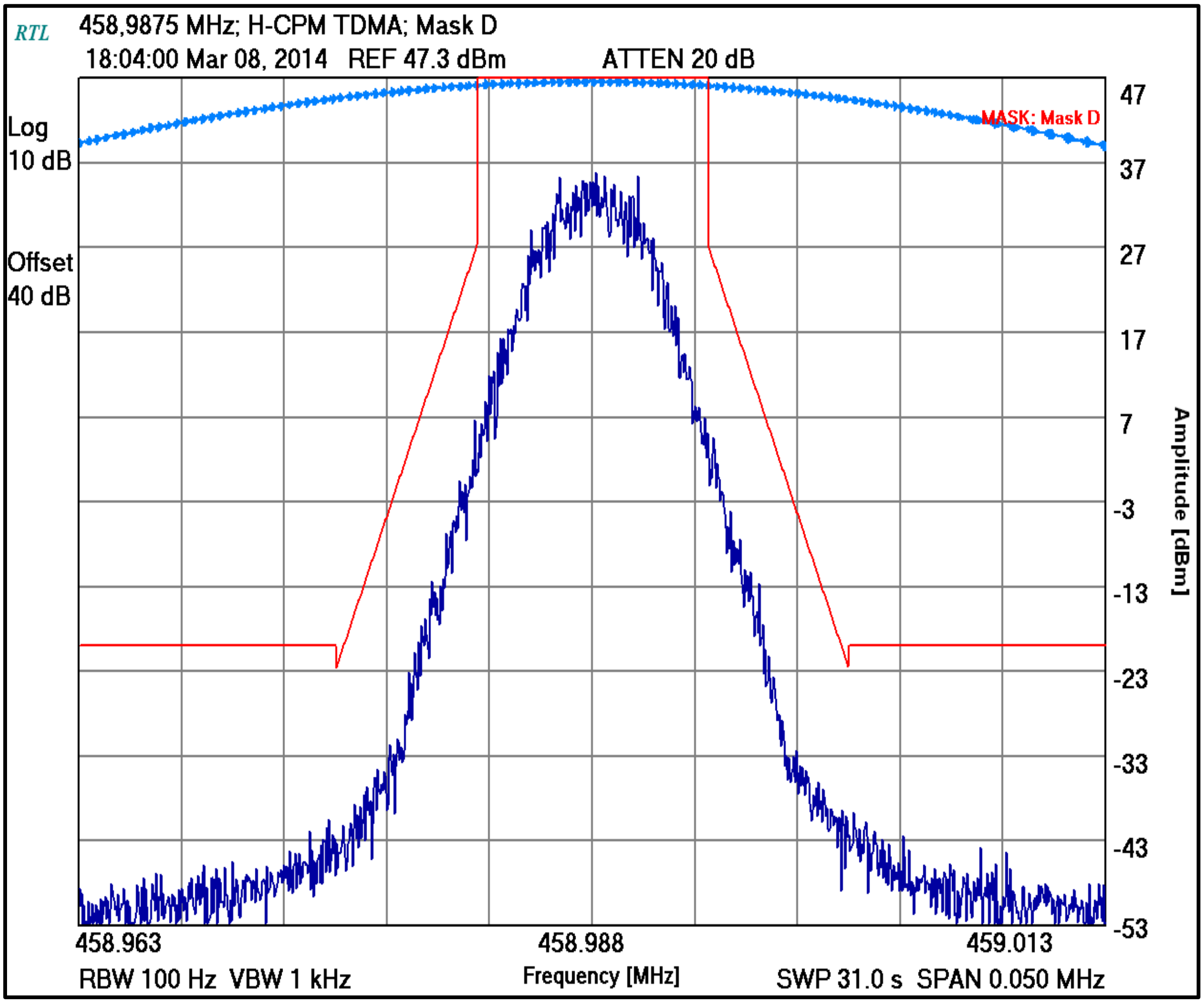
Plot 7-30: Occupied Bandwidth – 454.0125 MHz; Narrowband H-CPM TDMA; Mask D



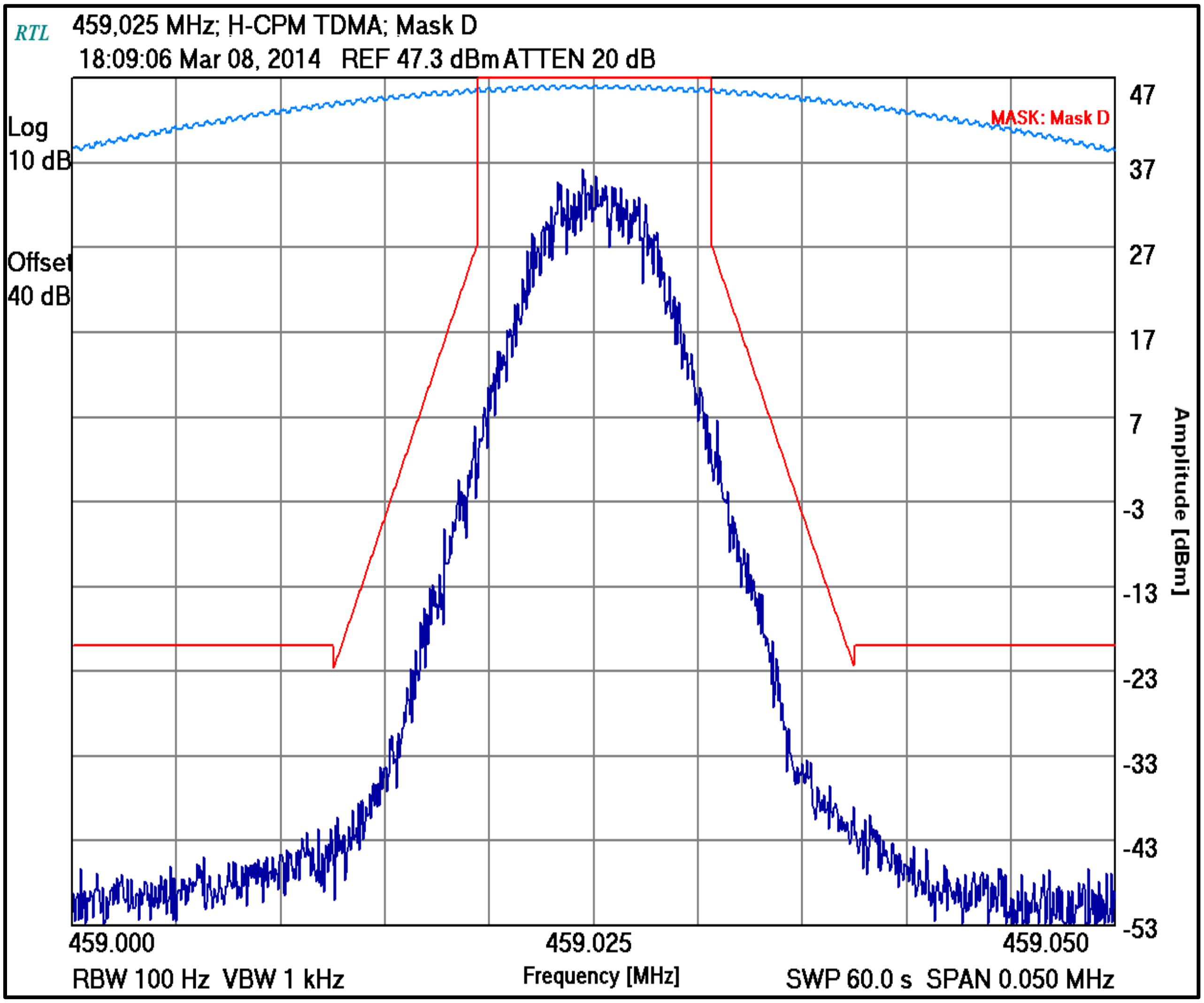
Plot 7-31: Occupied Bandwidth – 456.0125 MHz; Narrowband H-CPM TDMA; Mask D



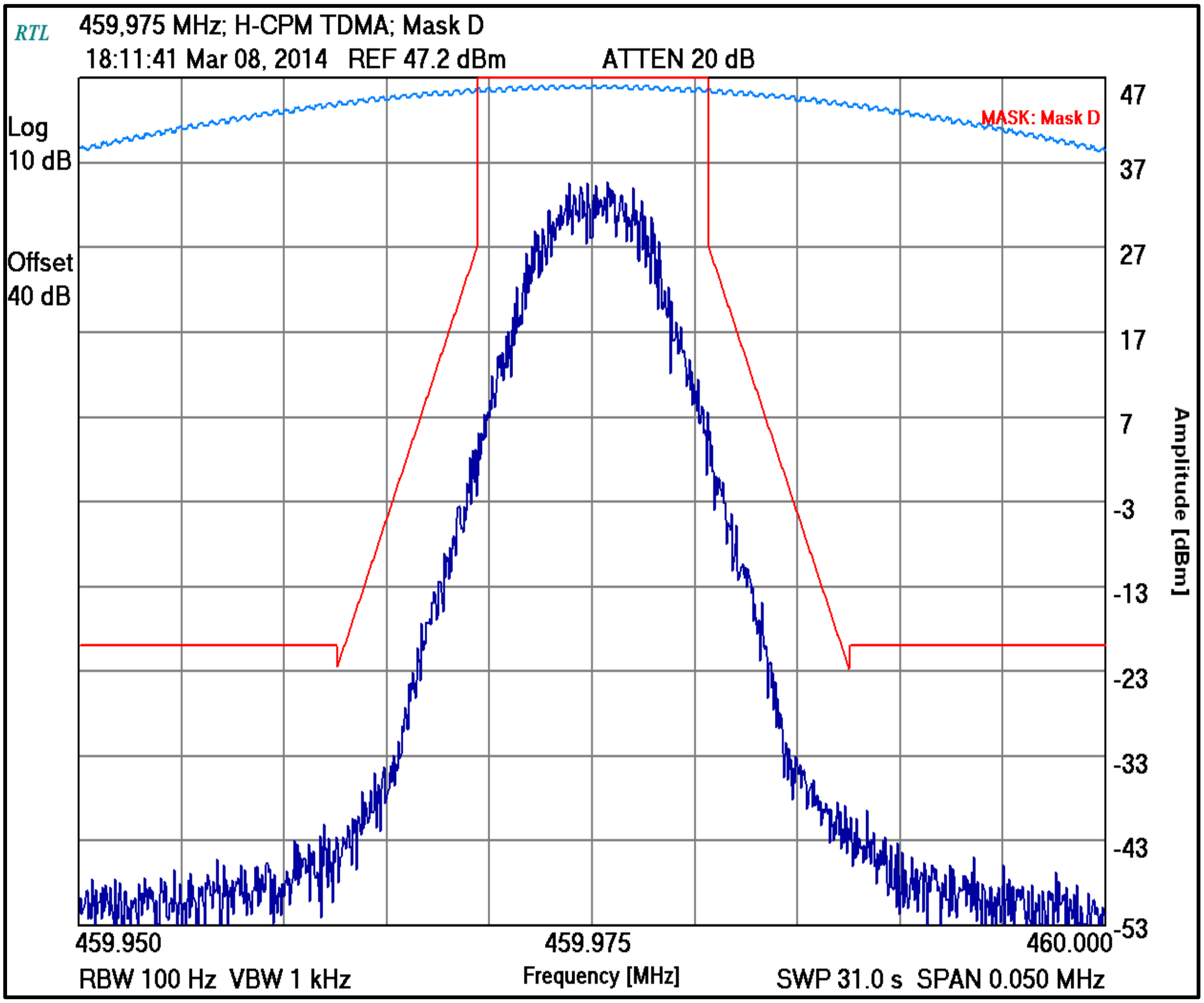
Plot 7-32: Occupied Bandwidth – 458.9875 MHz; Narrowband H-CPM TDMA; Mask D



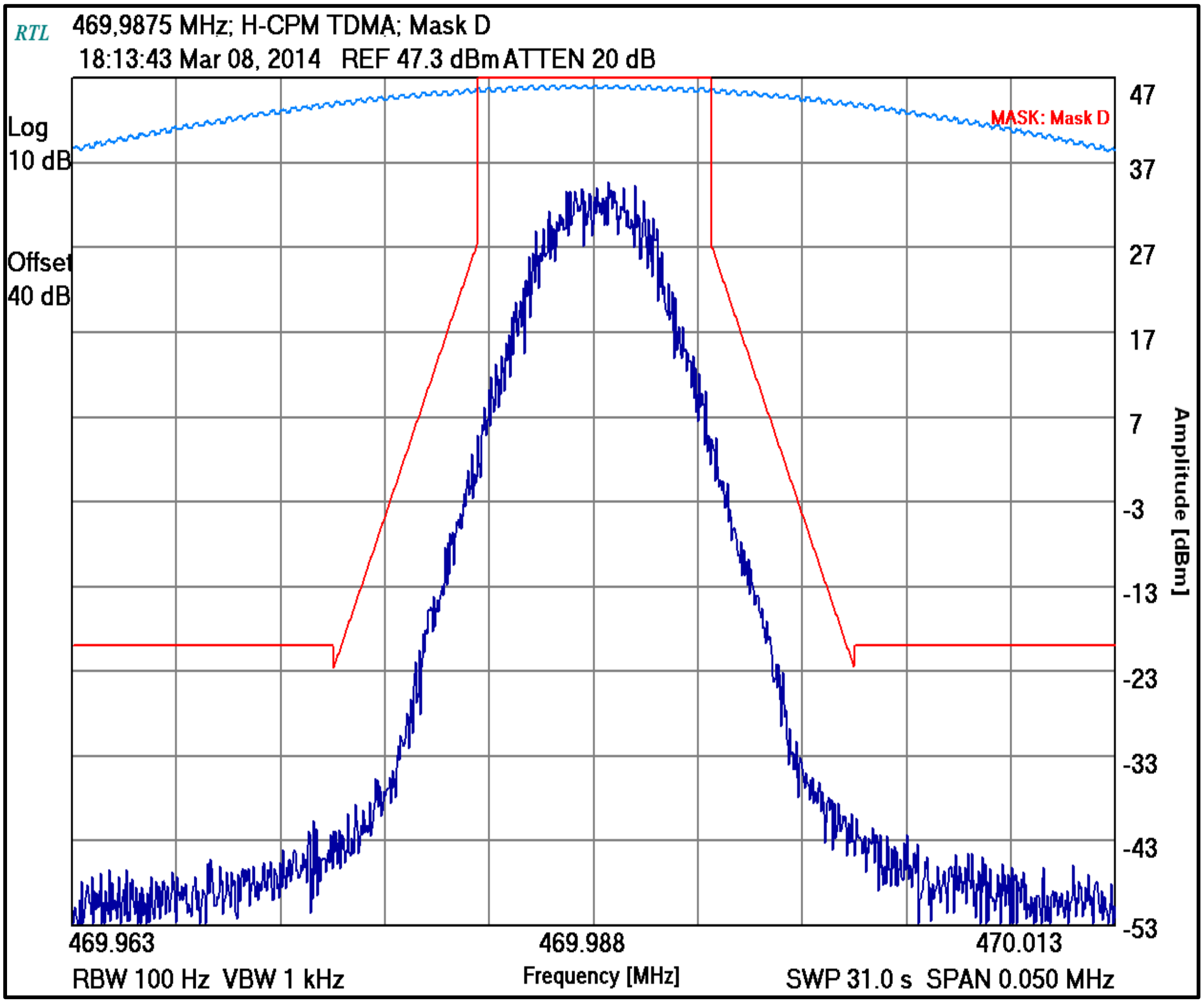
Plot 7-33: Occupied Bandwidth – 459.0250 MHz; Narrowband H-CPM TDMA; Mask D



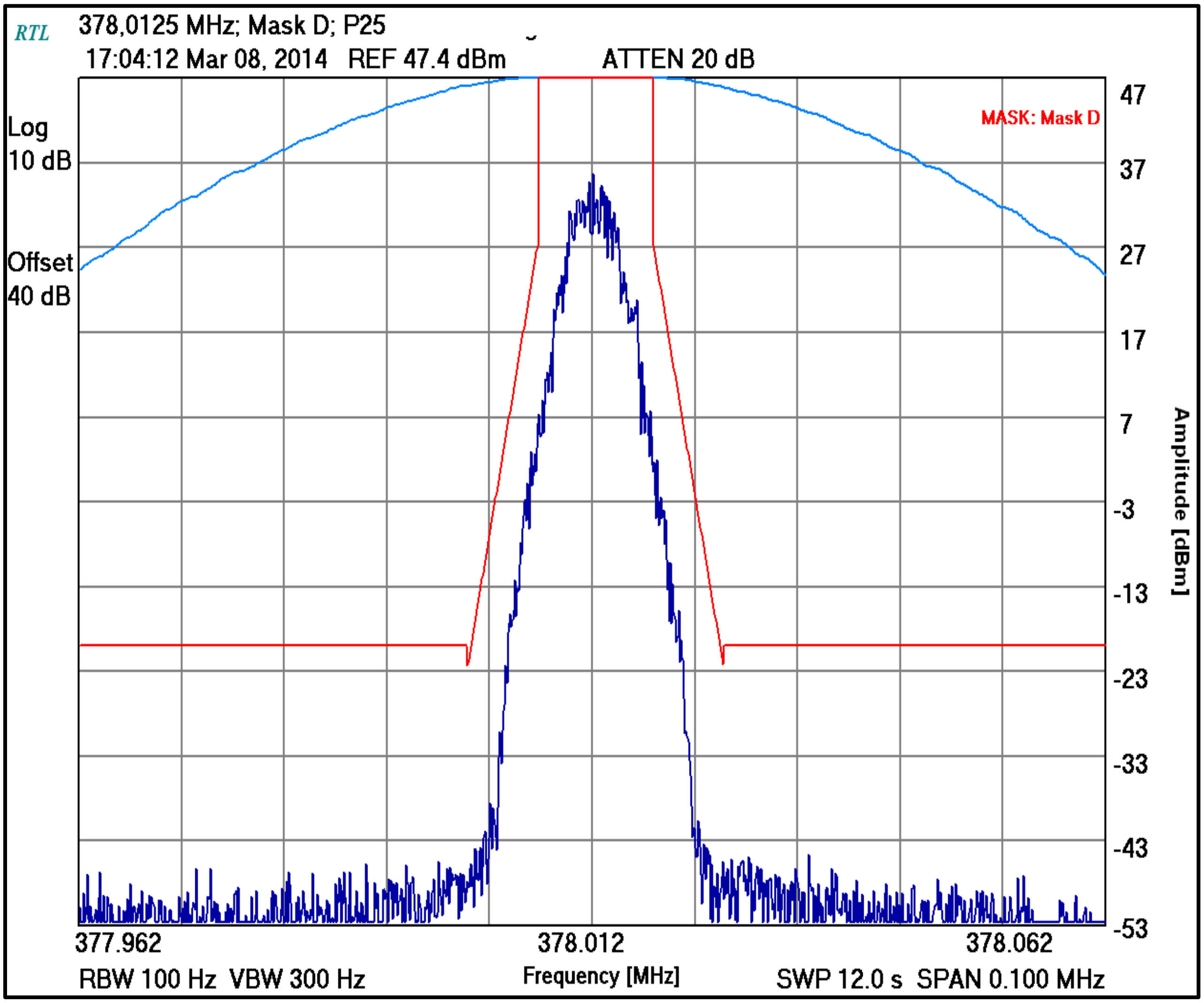
Plot 7-34: Occupied Bandwidth – 459.9750 MHz; Narrowband H-CPM TDMA; Mask D



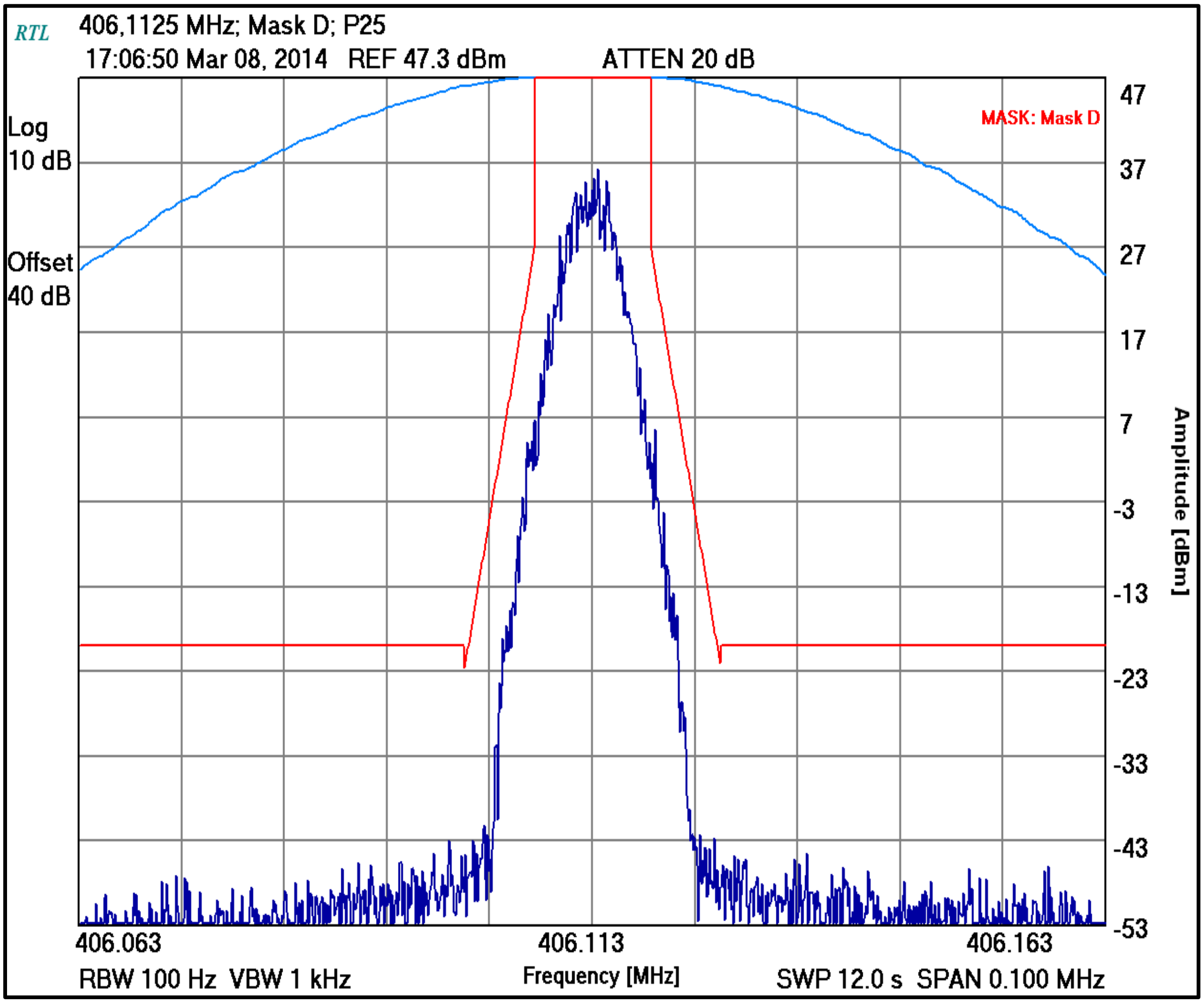
Plot 7-35: Occupied Bandwidth – 469.9875 MHz; Narrowband H-CPM TDMA; Mask D



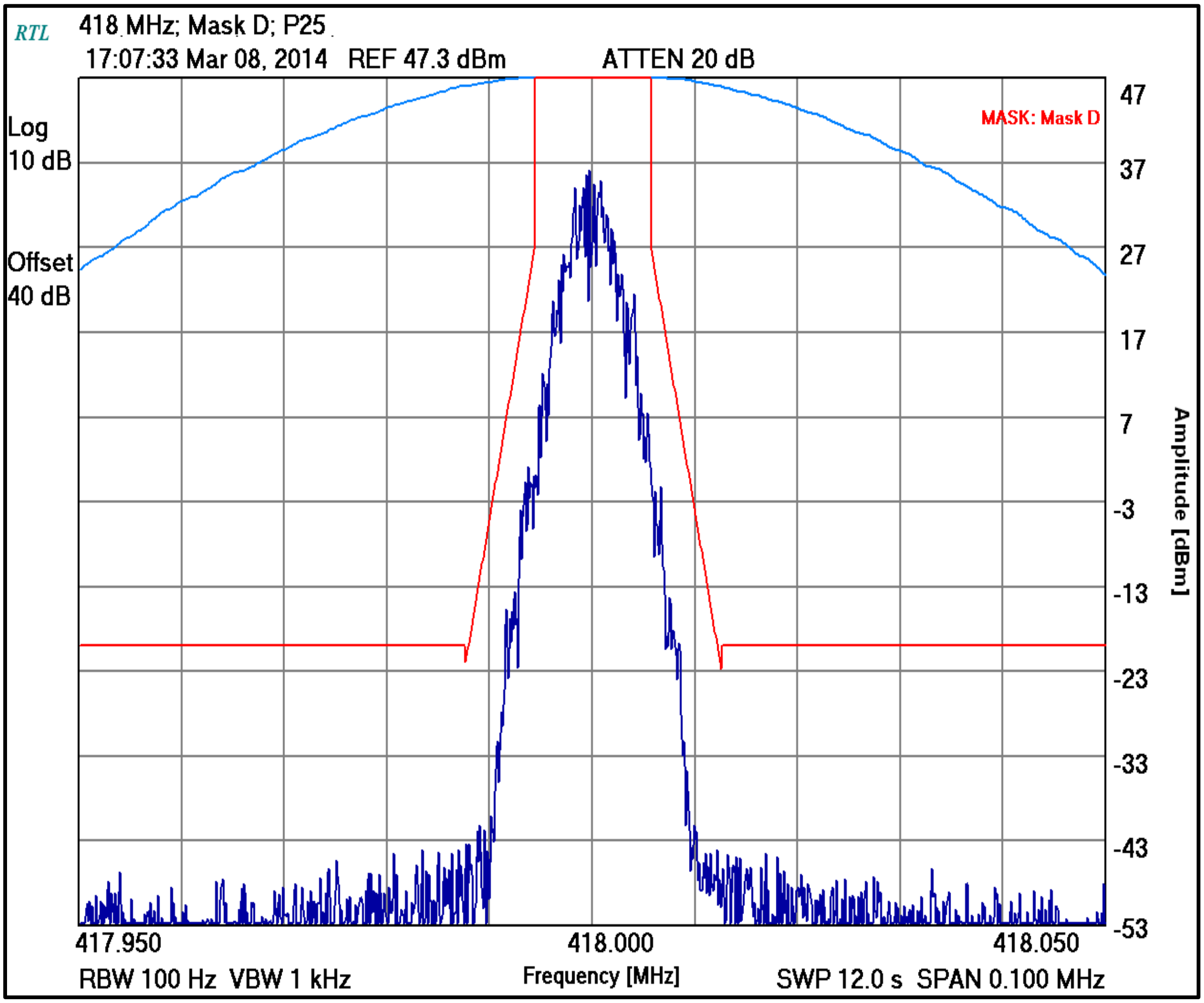
Plot 7-36: Occupied Bandwidth – 378.0125 MHz; Narrowband P25; Mask D



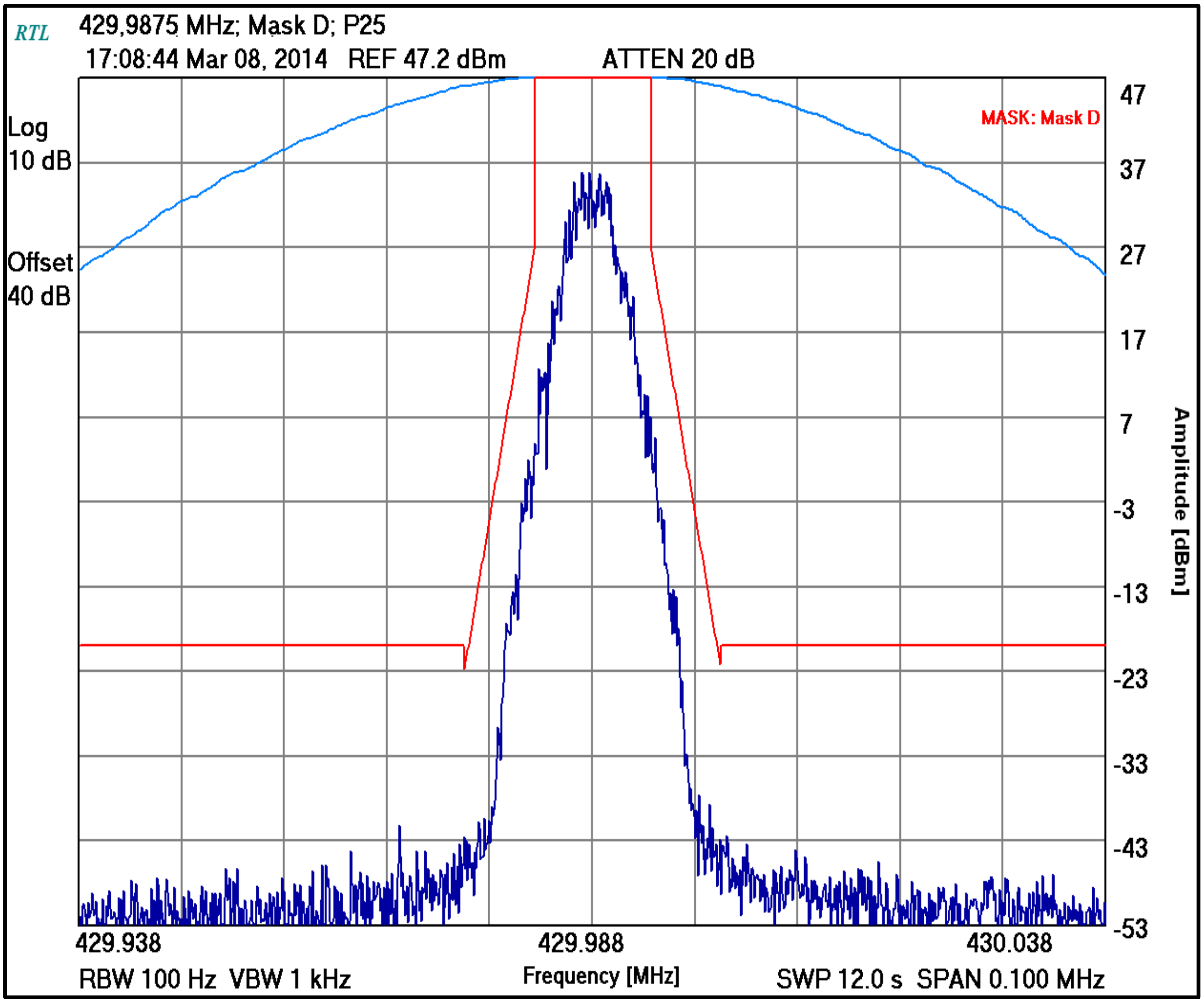
Plot 7-37: Occupied Bandwidth – 406.1125 MHz; Narrowband P25; Mask D



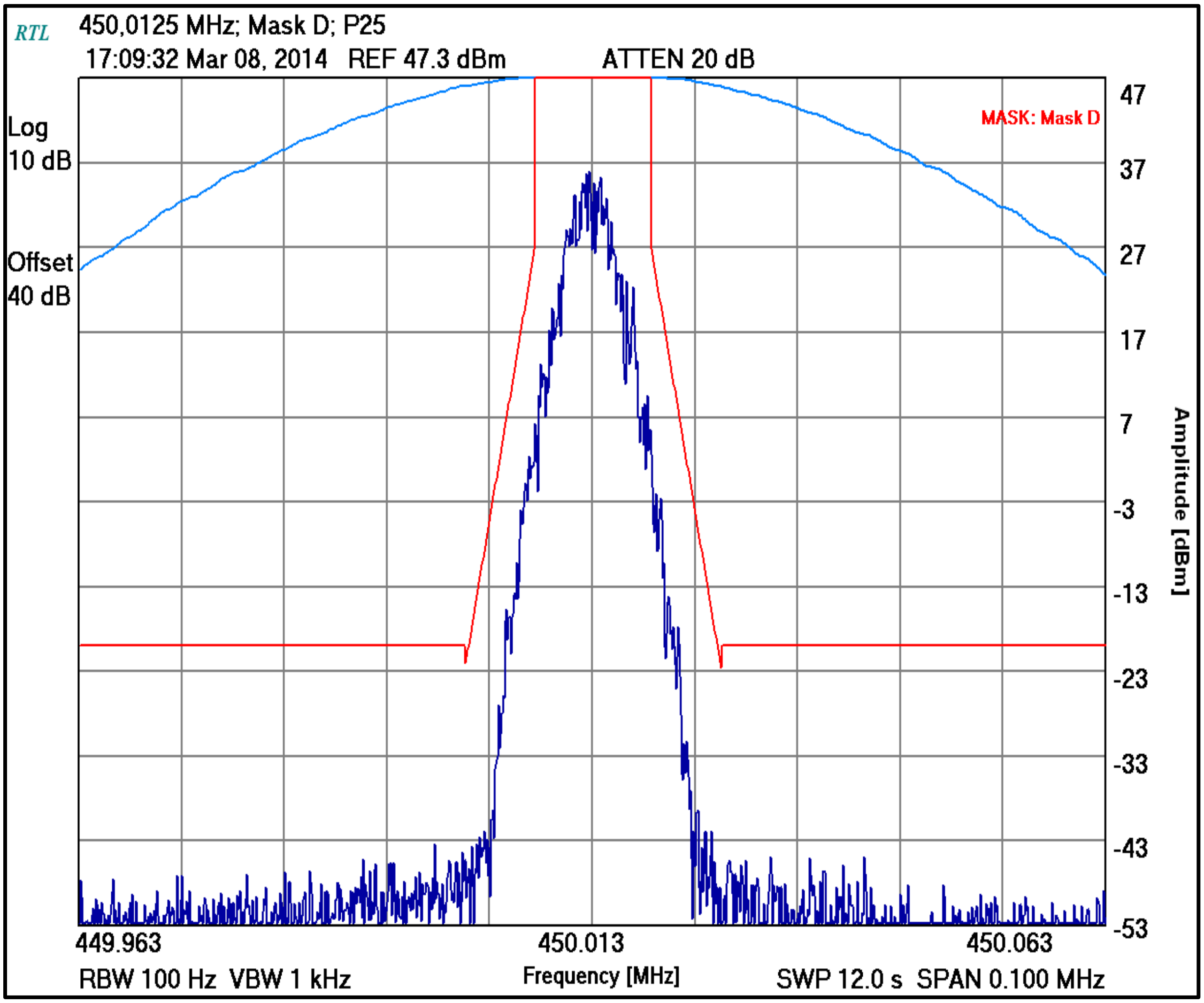
Plot 7-38: Occupied Bandwidth – 418.0000 MHz; Narrowband P25; Mask D



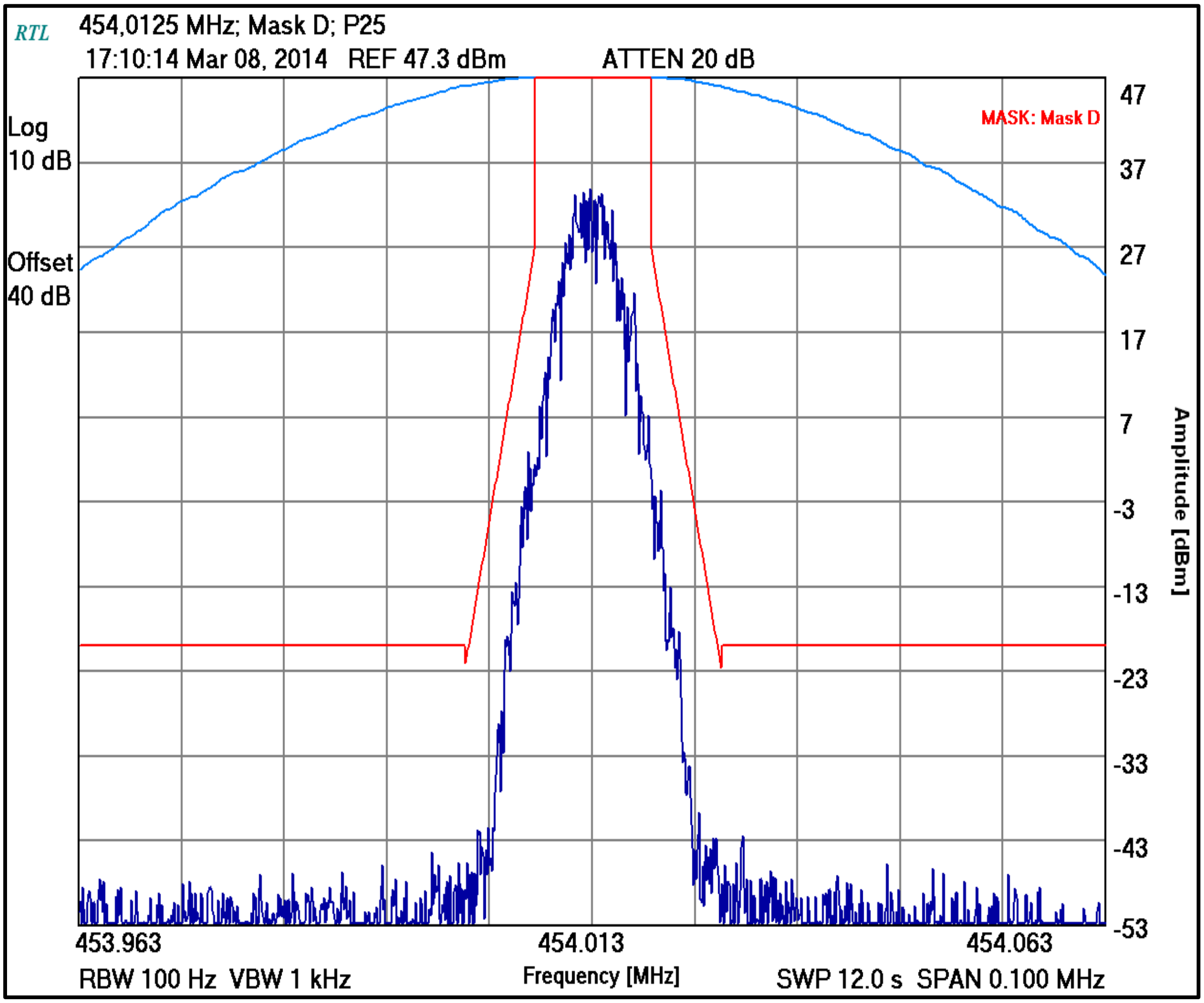
Plot 7-39: Occupied Bandwidth – 429.9875 MHz; Narrowband P25; Mask D



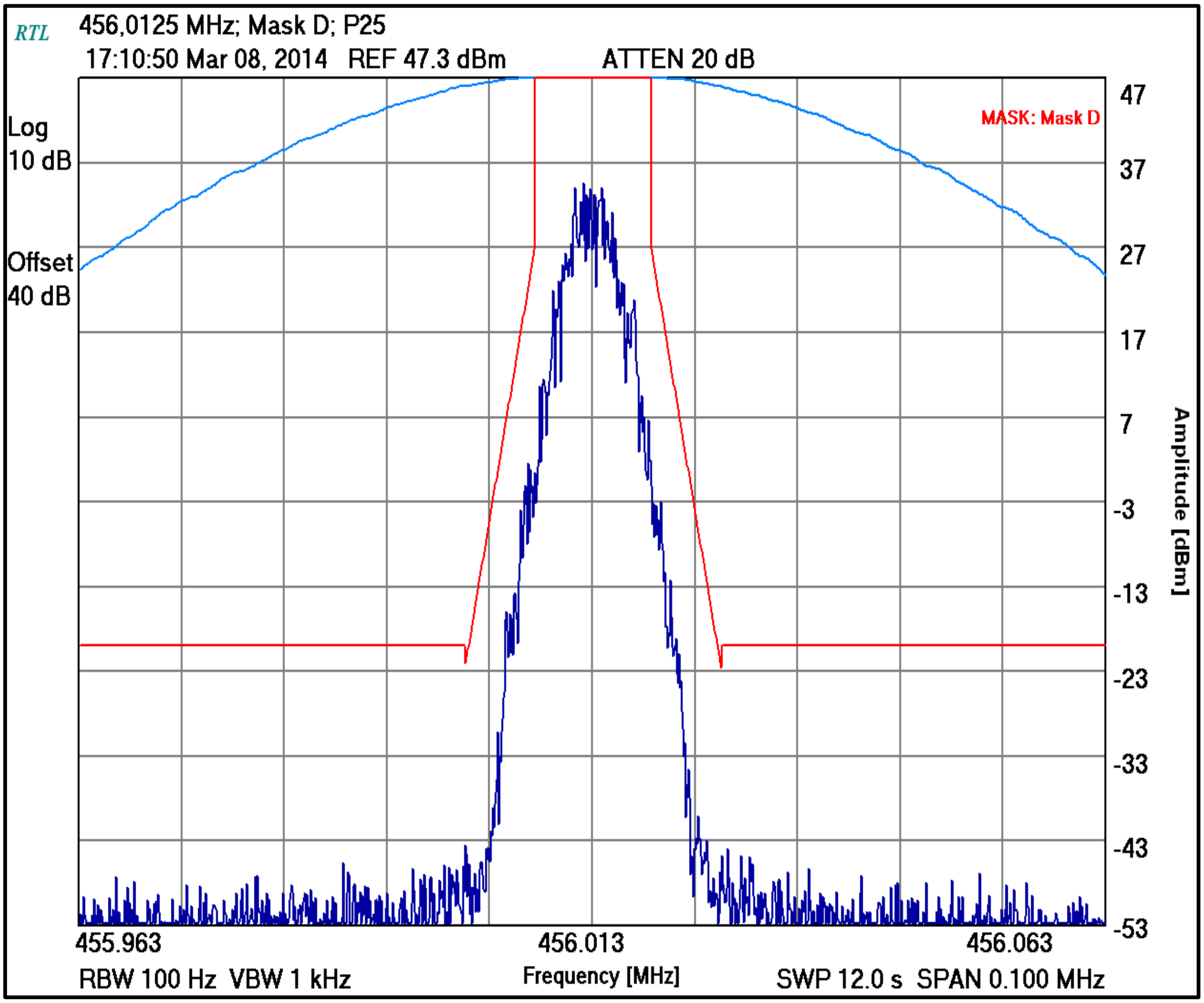
Plot 7-40: Occupied Bandwidth – 450.0125 MHz; Narrowband P25; Mask D



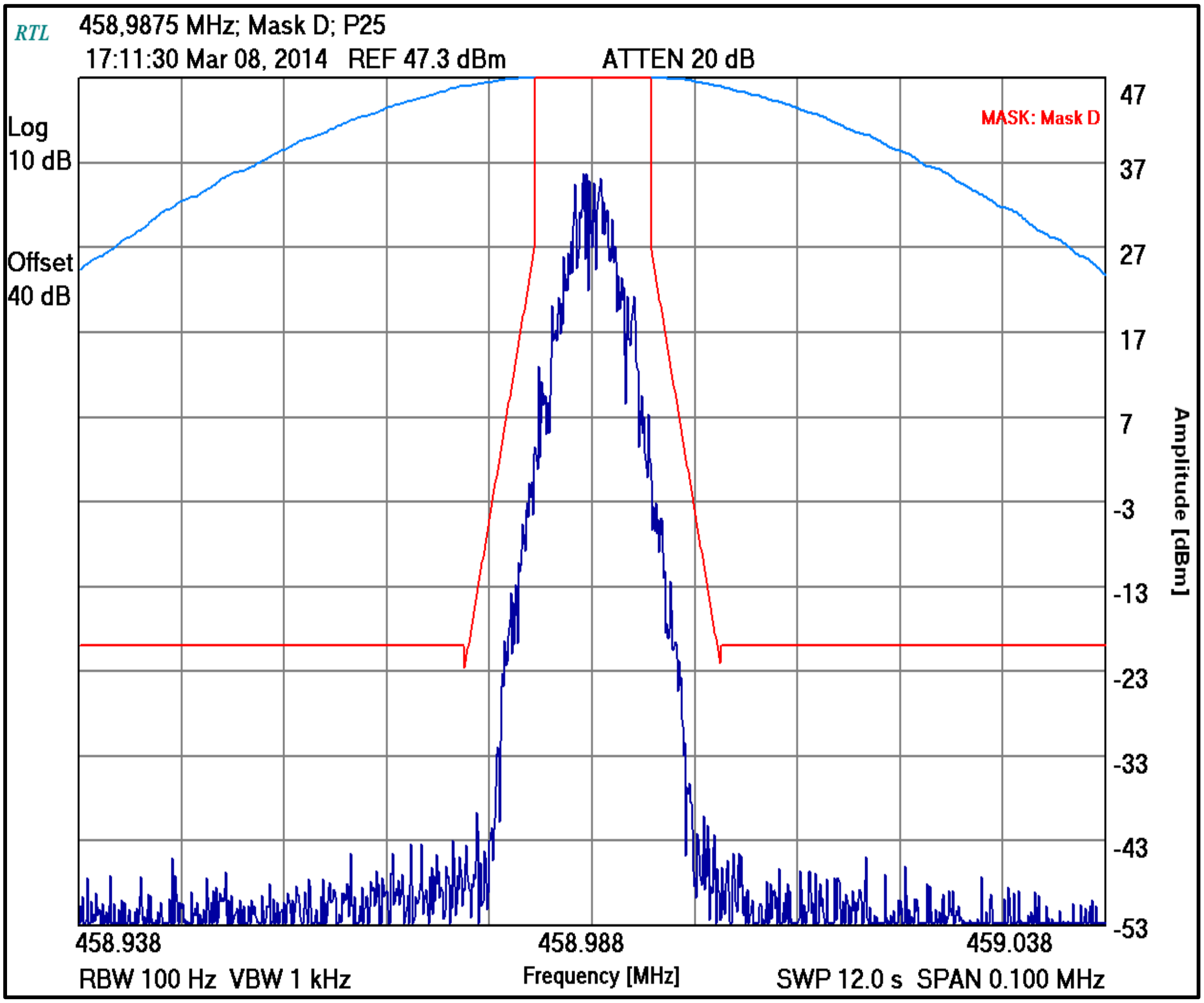
Plot 7-41: Occupied Bandwidth – 454.0125 MHz; Narrowband P25; Mask D



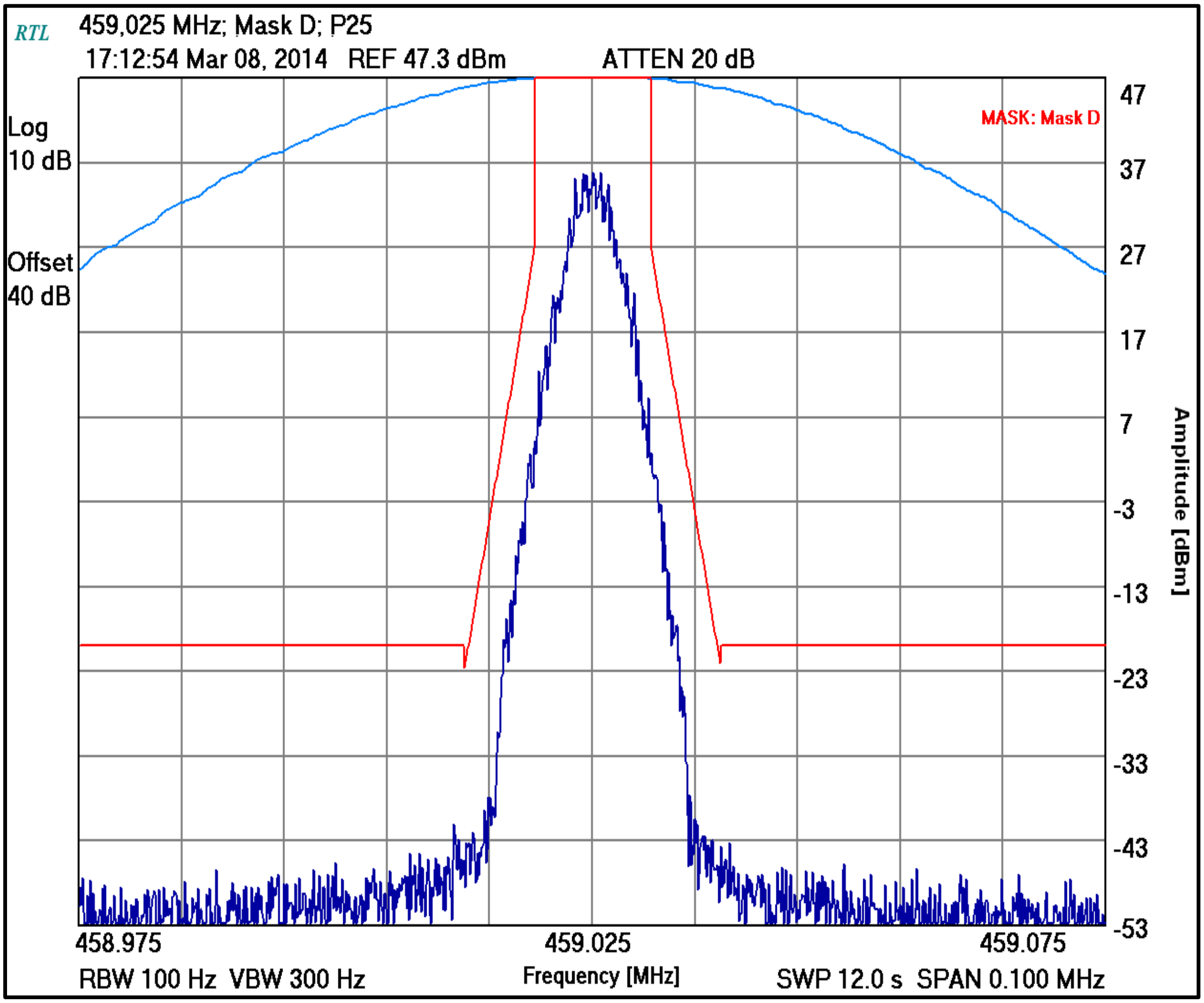
Plot 7-42: Occupied Bandwidth – 456.0125 MHz; Narrowband P25; Mask D



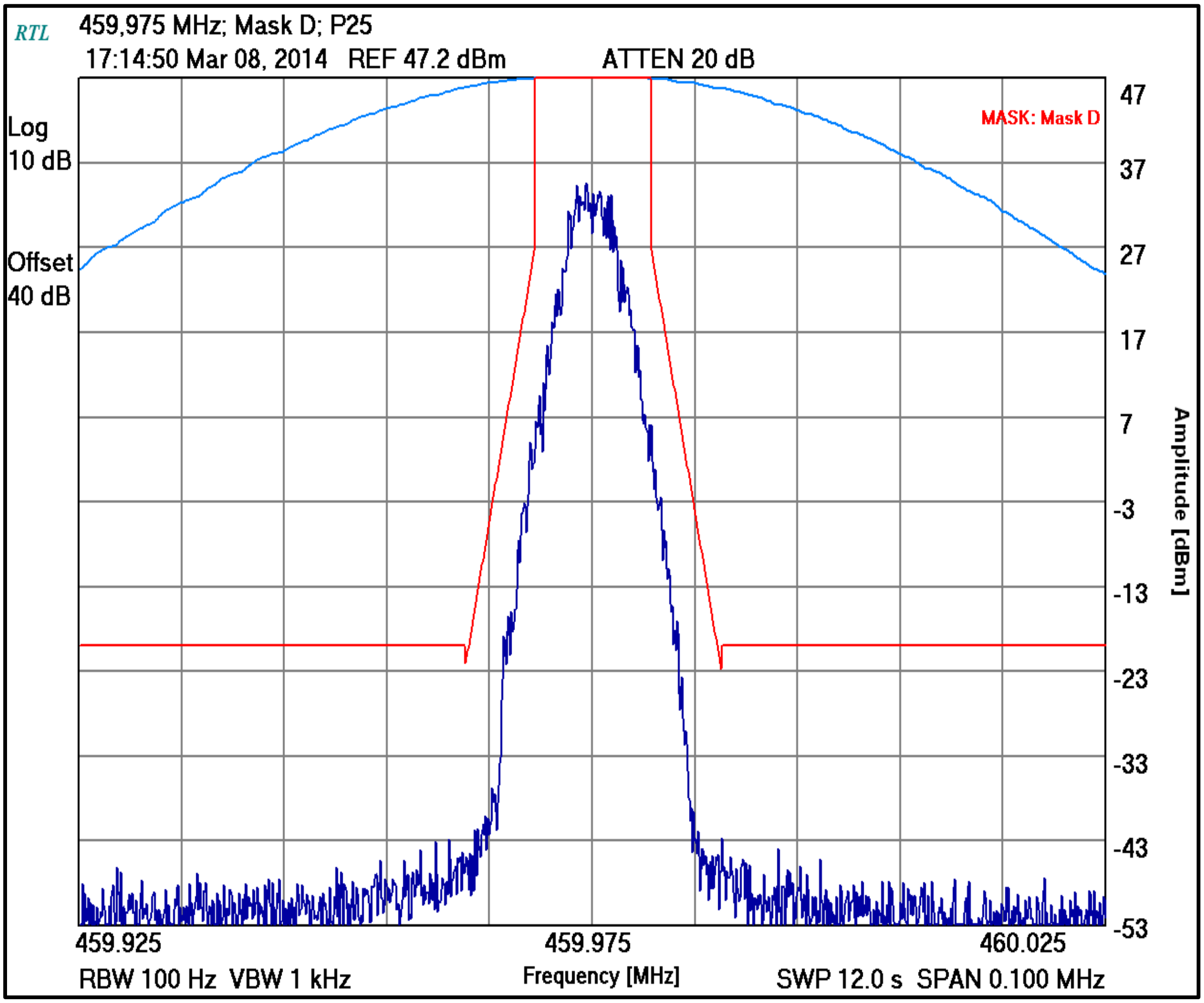
Plot 7-43: Occupied Bandwidth – 458.9875 MHz; Narrowband P25; Mask D



Plot 7-44: Occupied Bandwidth – 459.0250 MHz; Narrowband P25; Mask D



Plot 7-45: Occupied Bandwidth – 459.9750 MHz; Narrowband P25; Mask D



Plot 7-46: Occupied Bandwidth – 469.9875 MHz; Narrowband P25; Mask D

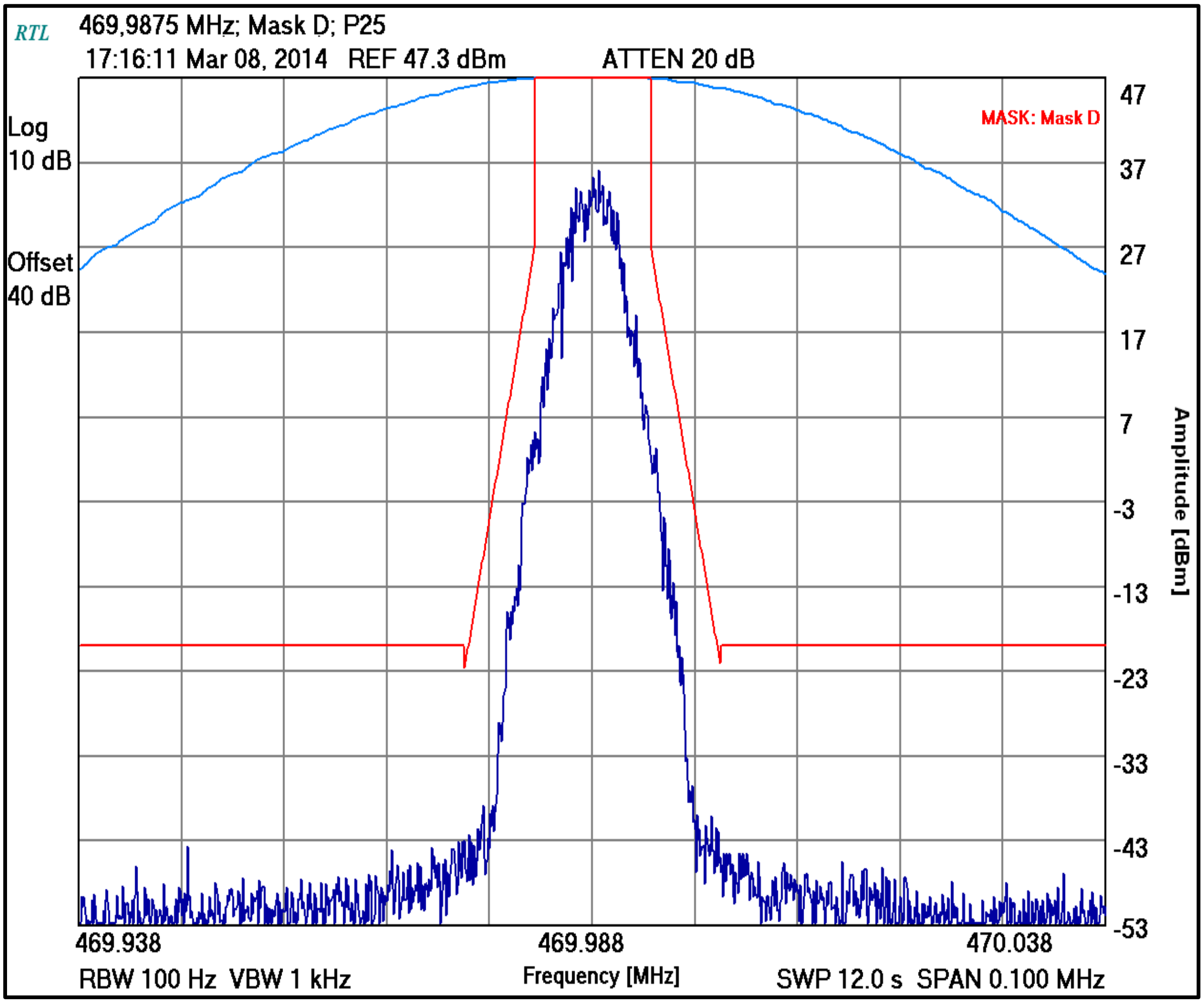


Table 7-1: Test Equipment Used for Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	4/17/15

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 8-9, 2014
Test Engineer	Signature	Dates of Tests

8 FCC Part 2.1055, 22.355, 80.209, 90.213; IC RSS-119 5.3: Frequency Stability

8.1 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.

Part 22.355 and 90.213: Mobile stations over 2 W operating power - 5 ppm.

80.209(a)(7) Band 400–466 MHz: 5ppm.

Part 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	Mobile stations: 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]	....	....	....

8.2 Test Data

8.2.1 Temperature Frequency Stability

Table 8-1: Temperature Frequency Stability – 406.1125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	406.112133	-0.90
-20	406.112392	-0.27
-10	406.112505	0.01
0	406.112502	0.00
10	406.112482	-0.04
20 (reference)	406.112500	0.00
30	406.112505	0.01
40	406.112475	-0.06
50	406.112426	-0.18
55	406.112416	-0.21
60	406.112414	-0.21

Table 8-2: Temperature Frequency Stability – 459.9750 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	459.974619	-0.83
-20	459.974882	-0.26
-10	459.974994	-0.01
0	459.974994	-0.01
10	459.974972	-0.06
20	459.975000	0.00
30	459.974994	-0.01
40	459.974970	-0.07
50	459.974906	-0.20
55	459.974894	-0.23
60	459.974898	-0.22

Results: The EUT is compliant.

Table 8-3: 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	1/13/15
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14
901350	Meterman	33XR	Multimeter	040402802	3/20/15

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 8, 2014
Test Engineer	Signature	Date of Tests

8.2.2 Frequency Stability/Voltage Variation

Table 8-4: Frequency Stability/Voltage Variation – 406.1125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
11.56	406.112500	0.00
13.6 (reference)	406.112500	0.00
15.64	406.112504	0.01

Table 8-5: Frequency Stability/Voltage Variation – 459.9750 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
11.56	459.974998	0.00
13.6 (reference)	459.975000	0.00
15.64	459.974994	-0.01

Table 8-6: Test Equipment Used for Testing Frequency Stability/Voltage Variation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	1/13/15
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14
901350	Meterman	33XR	Multimeter	040402802	3/20/15

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 8, 2014
EMC Test Engineer	Signature	Date of Test

9 FCC Rules and Regulations Part 90.214; IC RSS-119 5.9: Transient Frequency Response

9.1 Test Procedure

ANSI/TIA-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:

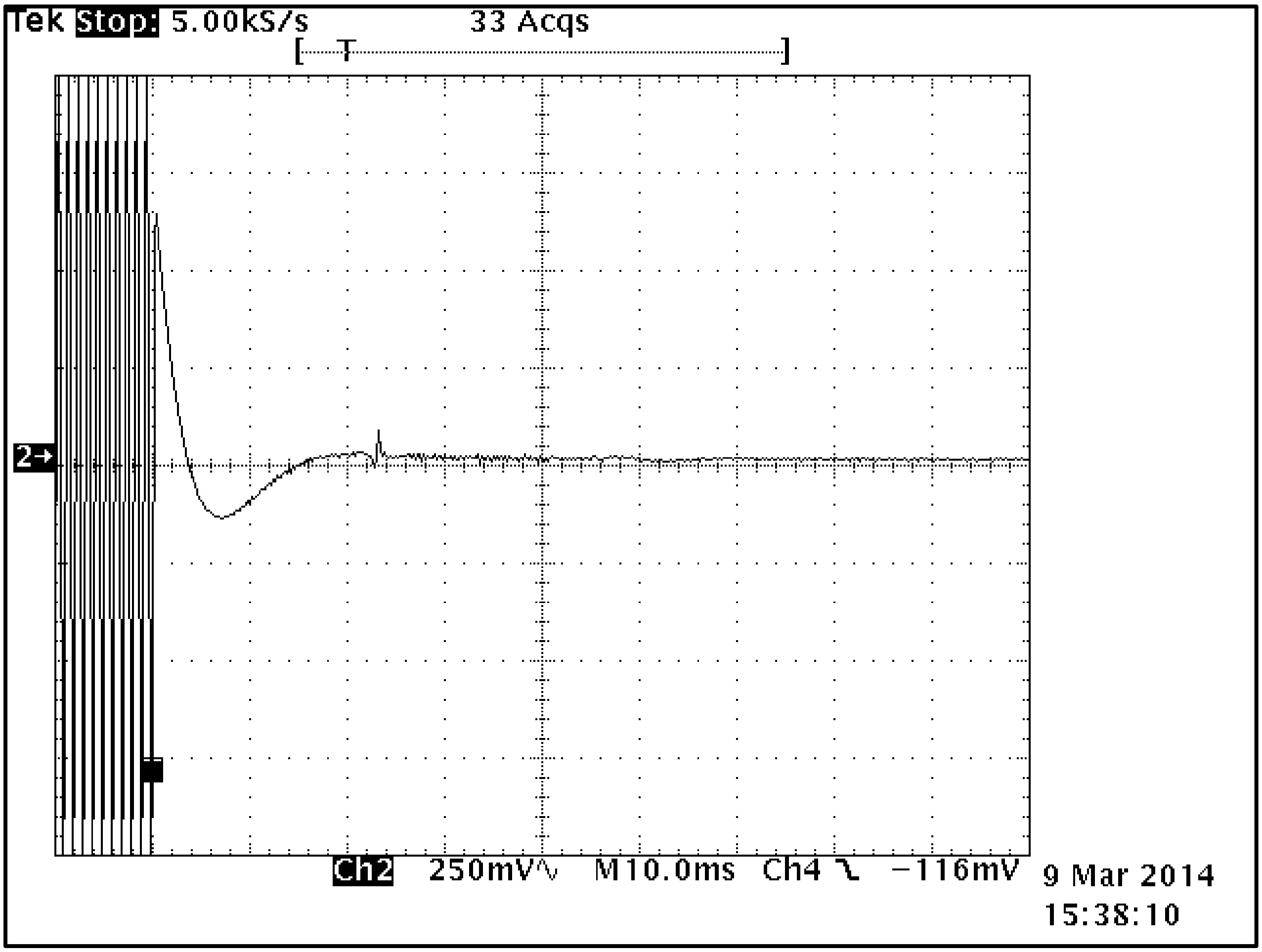
Time intervals [1] [2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	±25.0 kHz	5.0 ms	10.0 ms

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 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.

9.2 Test Data

Plot 9-1: Transient Frequency Behavior – NB; Carrier On Time; 424 MHz



Plot 9-2: Transient Frequency Behavior – NB; Carrier Off Time; 424 MHz

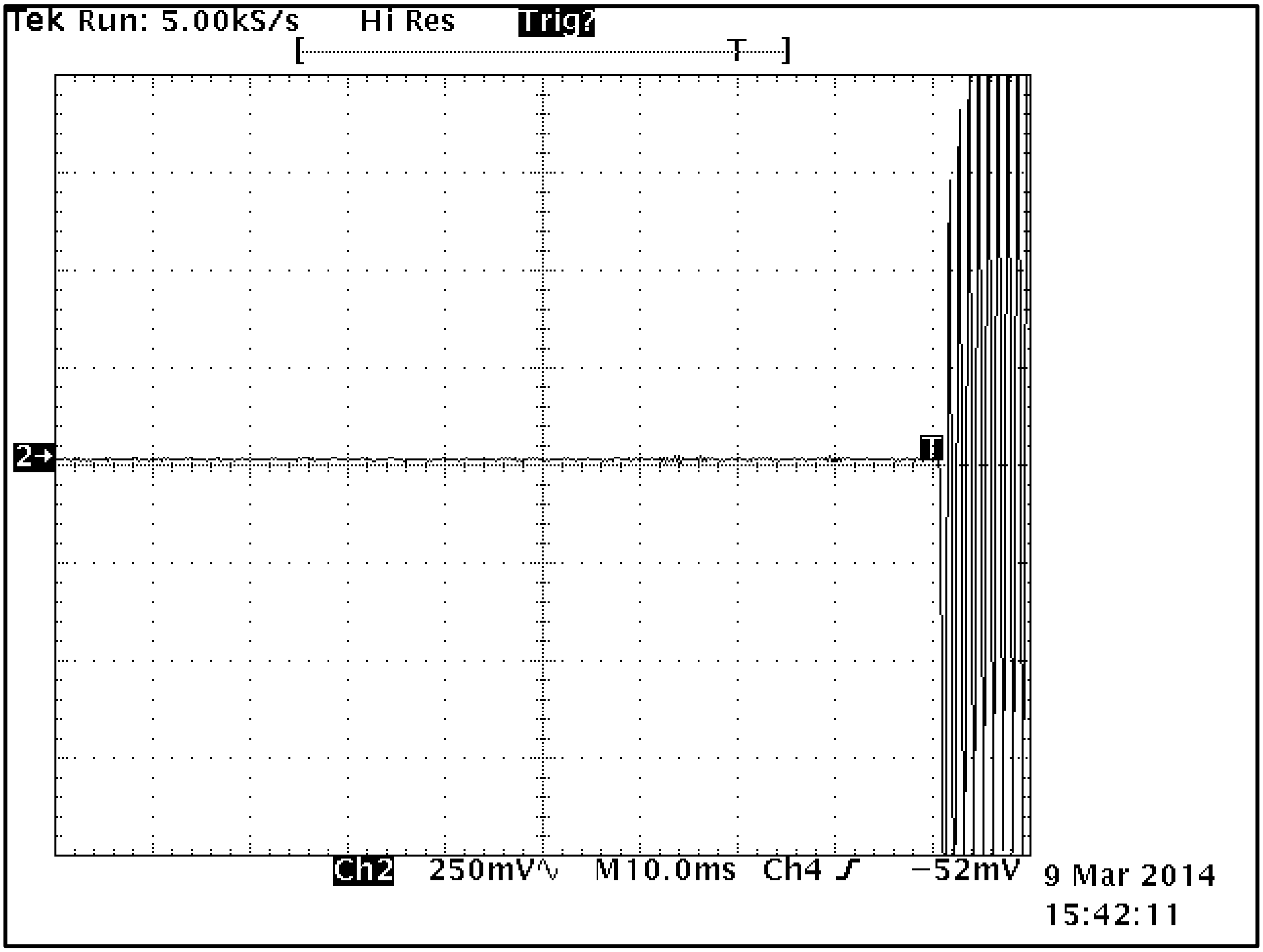


Table 9-1: Test Equipment Used for Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900561	Tektronix	TDS540B	Oscilloscope	B020129	4/20/14
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz to 3200 MHz)	3537A01741	2/17/15
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	9/3/14
901511	Pasternack	PE 2003	Power Divider (10 MHz - 1 GHz)	NA	N/A
900352	Werlatone	Directional Coupler	Coupler	C1795/4989	11/22/14
901263	Agilent Technologies	.01-12 GHz	SMA Detector	2936A05505	N/A
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	4/1/15
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14

Test Personnel:

Test Engineer	Signature	Date of Test
Daniel Baltzell	Daniel W. Baltzell	March 9, 2014

10 FCC Part 2.1047(a)(b), 80.213; IC RSS-119 5.8: Modulation Characteristics

§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.

10.1 Test Procedures

10.1.1 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)

10.1.2 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.

10.1.3 Modulation Limiting

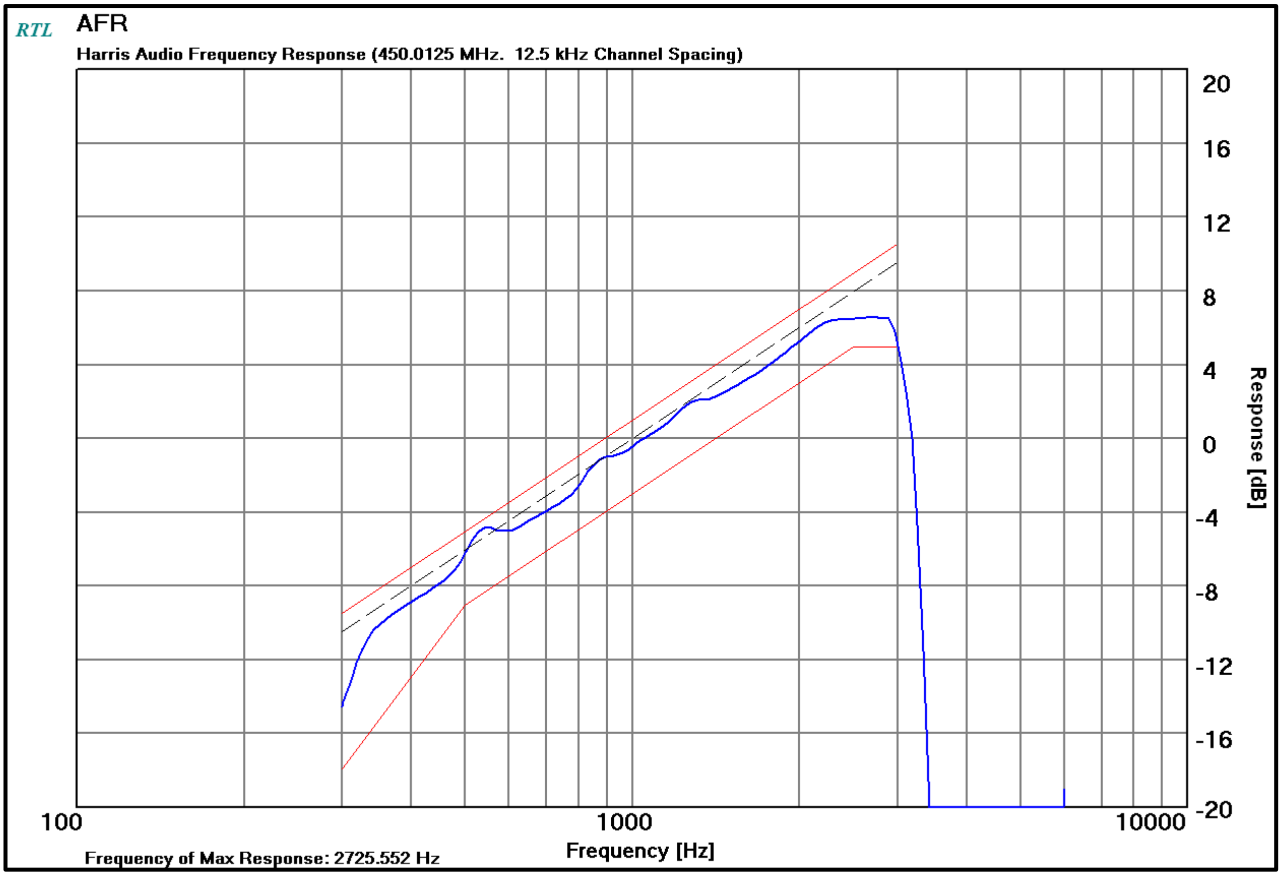
ANSI/TIA/EIA-603-2004, section 2.2.3

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.

10.2 Test Data

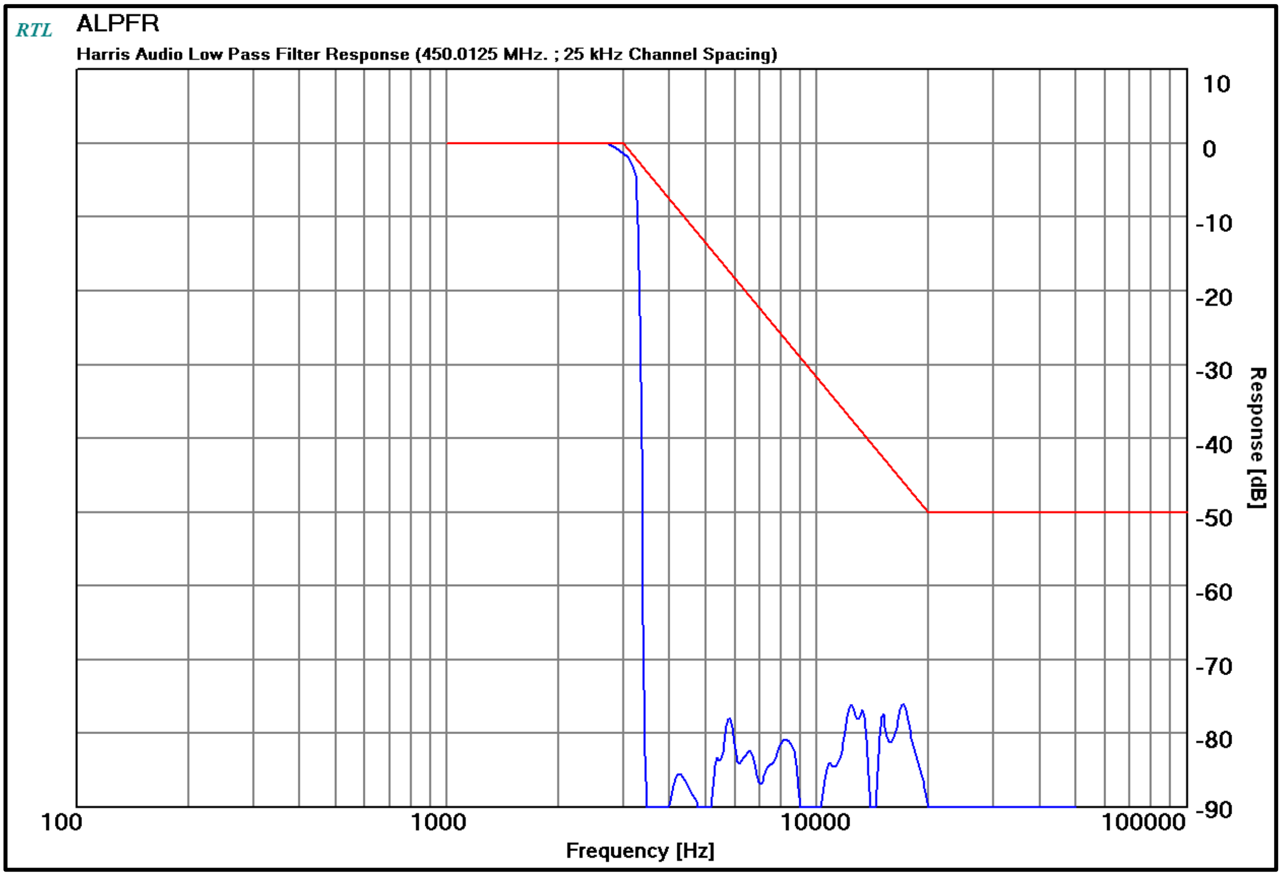
10.2.1 Audio Frequency Response

Plot 10-1: Modulation Characteristics - Audio Frequency Response – 450.0125 MHz



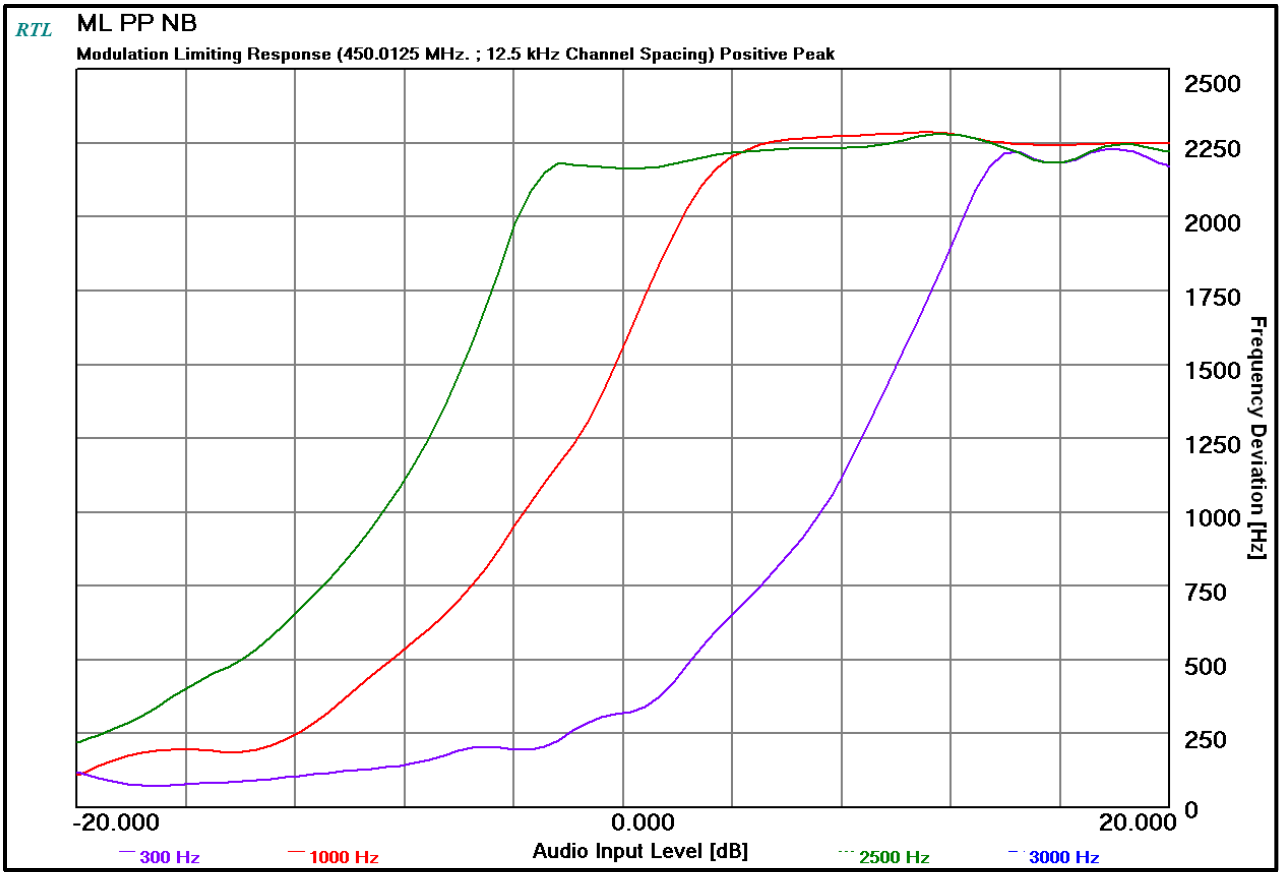
10.2.2 Audio Low Pass Filter Response

Plot 10-2: Modulation Characteristics – Audio Low Pass Filter – 450.0125 MHz



10.2.3 Modulation Limiting

Plot 10-3: Modulation Characteristics – Modulation Limiting – 450.0125 MHz; NB, Positive Peak



Plot 10-4: Modulation Characteristics – Modulation Limiting - 450.0125 MHz; NB, Negative Peak

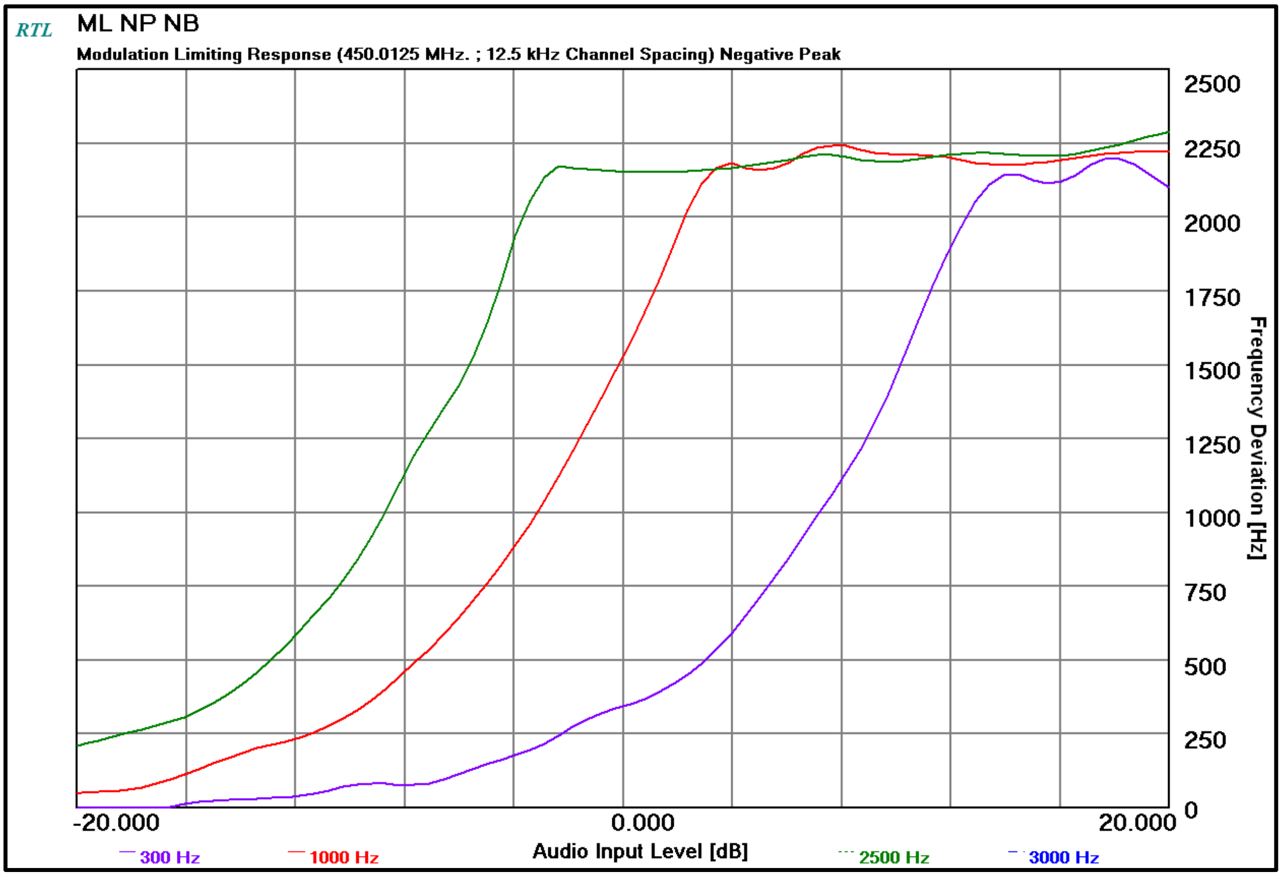


Table 10-1: Test Equipment Used for Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	4/17/15
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	4/1/15
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	11/22/14

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	March 9, 2014
Test Engineer	Signature	Date of Tests

11 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

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
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

9600 digital voice/data (12.5 kHz) 2-level FSK
Calculation:
Data rate in bps (R) =9600
Deviation Peak deviation of carrier (D) = 2400
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(2400) + 0.27(9600)(1) =11.9 kHz
Emission designator: 11K9F1E/D

P25 – 9600 sps - 4-level FSK (nb)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1800
Constant factor (K): 1 (default)
Bn = [9600/$\log_2$(4) + 2 (1800) (1) = 8.4 kHz
Emission designator: 8K40F1D, 8K40F1E

P25 Phase 2 data/voice (H-CPM TDMA) 4-level FSK (smr/np)
Calculation:
Data rate in bps (R) =19200
Peak deviation of carrier (D) = 3750
Constant factor (K): 0.335
Bn = [19200/$\log_2$(4) + 2 (3750) (0.335) = 12.1 kHz
Emission designator: 12K1DXW

12 Conclusion

The data in this measurement report shows that the Harris Corporation Model XG-25M UHF Mobile Radio, Model DM-MU1B, FCC ID: OWDTR-0077-E, IC: 3636B-0077, complies with the applicable requirements of Parts 90, 80, 22 and 2 of the FCC Rules and Industry Canada RSS-119.