RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & ISED Certification Report

L3Harris Technologies, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Model: XL-85M UHF-L
Land Mobile Radio

FCC ID: OWDTR-0177-E
IC: 3636B-0177

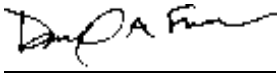
March 25, 2025

Standards Referenced for this Report	
Part 2: 2024	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 22: 2024	Public Mobile Services
Part 74: 2024	Experimental Radio, Auxiliary, Special Broadcast and Other Program Distributional Services
Part 80: 2024	Stations In the Maritime Services
Part 90: 2024	Private Land Portable Radio Services
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
RSS-119 Issue 12	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Report Prepared By: Daniel W. Baltzell

Document Number: 2024073TNB

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from the standards referenced above.

Signature: 

Date: March 31, 2025

Typed/Printed Name: Desmond A. Fraser

Position: President

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB.
Refer to certificate and scope of accreditation AT-1445.

Grant Note	FCC Rule Part	Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Emission Designator	Transmit Mode
EF	22, 74, 80, 90	378-470	50.0	0.2	11K0F3E	Analog FM (Narrowband)
EF	22, 74, 80, 90	378-470	50.0	0.2	11K7F1D/E	2-level FSK 9600 Data/Digital Voice (Narrowband)
EF	22, 74, 80, 90	378-470	50.0	0.2	8K40F1D/E	C4FM Data/Voice
EF	22, 74, 80, 90	378-470	50.0	0.2	8K10DXW	H-CPM (TDMA) Data/Voice
EF	22, 74, 80	378-470	50.0	0.2	16K0F3E	Analog FM (Wideband)
EF	22, 74, 80	378-470	50.0	0.2	16K0F1D/E	2-level FSK 9600 Data/Digital Voice (Wideband)

ISED Rule Part	Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Emission Designator	Transmit Mode
RSS-119	406.1-430	50.0	0.2	11K0F3E	Analog FM (Narrowband)
RSS-119	450-470	50.0	0.2	11K0F3E	Analog FM (Narrowband)
RSS-119	406.1-430	50.0	0.2	11K7F1D/E	2-level FSK 9600 Data/Digital Voice (Narrowband)
RSS-119	450-470	50.0	0.2	11K7F1D/E	2-level FSK 9600 Data/Digital Voice (Narrowband)
RSS-119	406.1-430	50.0	0.2	8K40F1D/E	C4FM Data/Voice
RSS-119	450-470	50.0	0.2	8K40F1D/E	C4FM Data/Voice
RSS-119	406.1-430	50.0	0.2	8K10DXW	H-CPM (TDMA) Data/Voice
RSS-119	450-470	50.0	0.2	8K10DXW	H-CPM (TDMA) Data/Voice
RSS-119	406.1-430	50.0	0.2	16K0F3E	Analog FM (Wideband)
RSS-119	450-470	50.0	0.2	16K0F3E	Analog FM (Wideband)
RSS-119	406.1-430	50.0	0.2	16K0F1D/E	2-level FSK 9600 Data/Digital Voice (Wideband)

RSS-119	450-470	50.0	0.2	16K0F1D/E	2-level FSK 9600 Data/Digital Voice (Wideband)

This device contains functions not operational in U.S Territories except as noted in the filing. The grant is requested to list extended frequencies as noted in the filing and Section 2.927(b) applies to this application.

Additionally, as this is a combined FCC and ISED test report, there are test frequencies contained within this report that may not be authorized for use in either the United States or Canada. Any data presented in this report between 378 and 406.0 MHz is for engineering use only per L3Harris Technologies' request.

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1 Test Summary

Test	FCC Reference	ISED Reference	Result
RF Power Output	2.1046(a), 22.565, 22.659, 74.461, 80.215, 90.205	RSS-119 4.1, 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051, 22.359, 74.462, 80.211, 90.210	RSS-119 5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 22.359, 80.211(f)(3), 90.210	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/ Emission Masks	2.1049(c)(1), 22.359(b), 74.462, 80.205, 80.211, 90.210	RSS-119 5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 22.355, 74.464, 80.209, 90.213	RSS-119 5.3	Complies
Modulation Characteristics	2.1047(a)(b), 74.463, 80.213	RSS-119 5.2	Complies
Transient Frequency Response	74.462(c), 90.214	RSS-119 5.9	Complies

2 General Information

The following certification report is prepared on behalf of **L3Harris Technologies, Inc.** in accordance with the Federal Communications Commission and Innovation, Science and Economic Development (ISED) Canada. The Equipment Under Test (EUT) was the XL-85M UHF-L, FCC ID: OWDTR-0177-E, IC: 3636B-0177 (HVIN: XLM-85M-UHF-L).

All measurements in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2, 22, 74, 80 and 90. The instruments and all accessories, including the high-pass filter, coaxial attenuator, preamplifier, and cables, are regularly calibrated.

The Part 15 test results for the receiver portion of the EUT are documented in an SDoC report.

2.1 Measurement Uncertainty

The measurement uncertainty complies with CISPR 16-4-2 limits and is not used to adjust measurements for compliance determination. Expanded uncertainty (U) for each scope, calculated per ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation, is provided in this RTL report. While this demonstrates RTL's commitment to transparency, compliance decisions are based solely on comparing measured values directly to the relevant standards' limits.

2.2 Test Facility

The open-area test site and conducted measurement facility used to collect the radiated data are located in the parking lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

ISED CAB ID: US0079, Company Number: 2956A

2.3 Related Submittal(s)/Grant(s)

This is an original certification report for L3Harris Technologies, Inc. Model XL-85M UHF-L, FCC ID: OWDTR-0177-E, IC: 3636B-0177 (HVIN: XLM-85M-UHF-L).

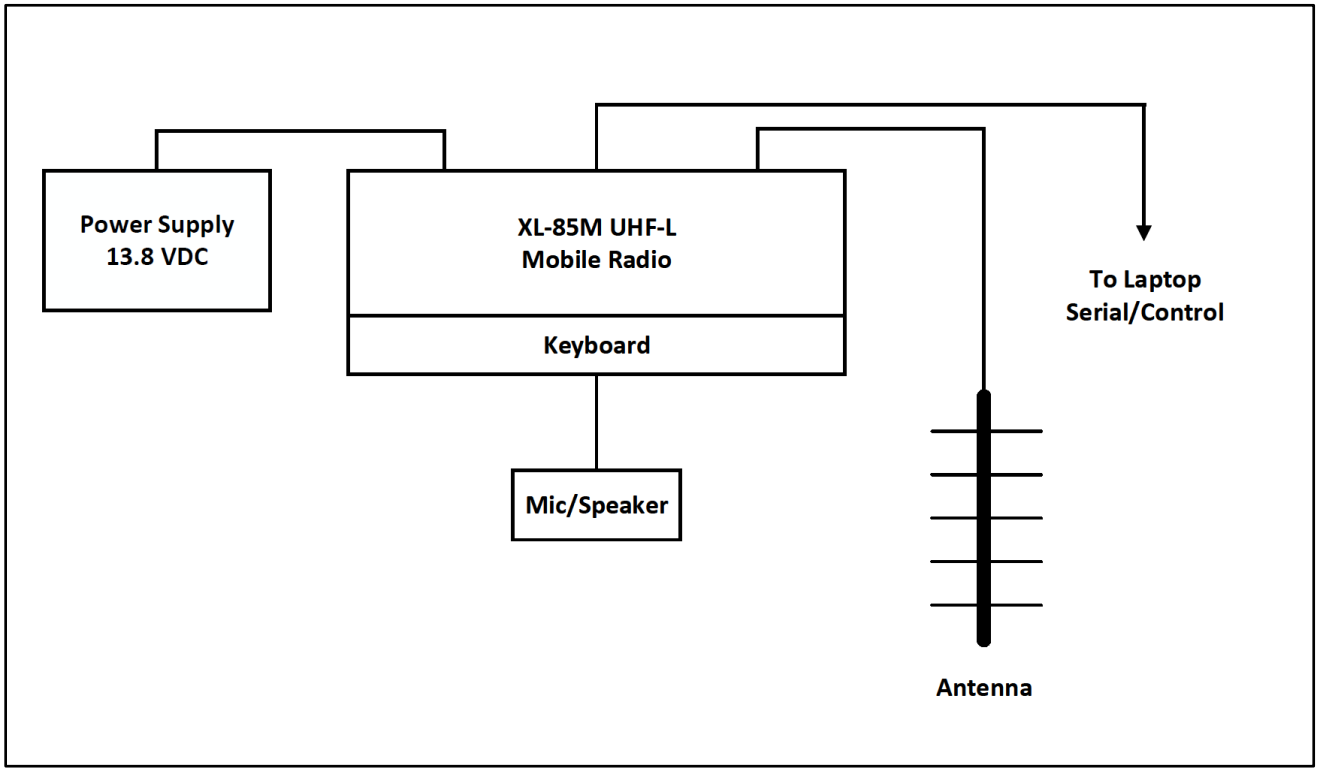
2.4 Tested System Details

The test sample was received on December 27, 2024. The identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test are listed below, 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
Mobile Radio	L3Harris Technologies	XL-85M UHF-L	FCC UNIT 2	OWDTR-0177-E	24455
Mobile Radio	L3Harris Technologies	XL-85M UHF-L	N/A	OWDTR-0177-E	24456
Control Head	L3Harris Technologies	XL-CH2	A4031A000186	OWDTR-0171-E	24454
Antenna, Whip 378-430 MHz 2.15 dBi	L3Harris Technologies	Whip	AN-225003-001	N/A	23367
Antenna, Yagi, UHF-L, 375-403 MHz, 12.15 dBi	L3Harris Technologies	Yagi	AN-025137-003	N/A	23372
Handset	L3Harris Technologies	N/A	14050-6010-01	N/A	24462

Figure 2-1: Configuration of Tested System



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

7.2VDC / 1.6 A

4 FCC §2.1046(a): RF power output: Conducted; §90.205, Transmitting power and antenna height requirements; §80.215: Transmitter Power; §22.565: Transmitting power limits; §22.659: Effective Radiated Power Limits; §74.461: Transmitter Power; ISED RSS-119 4.1: Transmitter Output Power

4.1 Test Procedure

ANSI C63.26-2015, section 5.2

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

Manufacturer's Rated Power: UHF: 50.0 W

4.2 Test Data

Table 4-1: RF Conducted Output Power - Measured

Frequency (MHz)	High Power (dBm)	High Power (W)	Low Power (dBm)	Low Power (W)
378.0125	47.27	53.3	33.19	2.1
418.0125	47.16	52.0	33.06	2.0
469.9875	46.65	46.2	32.99	2.0

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

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.8 dB

Results: Pass

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW	Spectrum Analyzer	101021	02/02/2027
901139	MCE Weinschel	48-20-34	Attenuator, 20 dB, DC-18 GHz, 100 W	BK5859	09/21/2027
901350	Meterman	33XR	Multimeter	040402802	10/18/2027

Test Personnel:

Daniel W. Baltzell		January 14, 2025
EMC Test Engineer	Signature	Date of Test

5 FCC §2.1051: Spurious Emissions at Antenna Terminals; §74.462: Authorized Bandwidth and Emissions; §90.210: Emission Limitations; §80.211: Emission Limitations; §22.359: Emission Limitations; ISED RSS-119 5.8: Transmitter Unwanted Emissions

5.1 Test Procedure

ANSI C63.26-2015, section 5.7

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.

5.2 Test Data

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

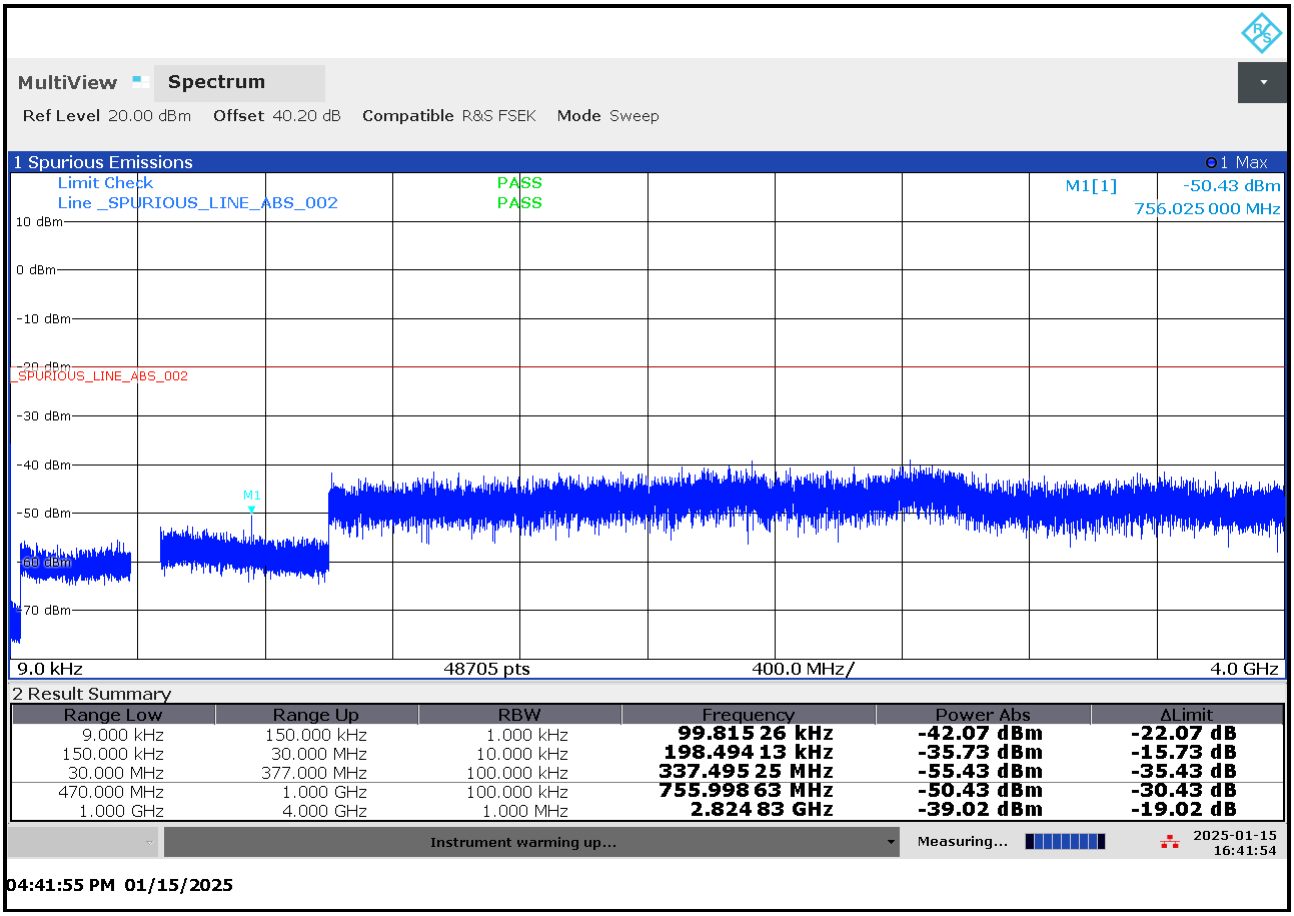
Limits: (43 + 10 LOG P(W)) for wideband and 50 + 10 LOG P(W)) for narrowband. A worst case limit of 50 + 10 Log P(W) was used.

The following channels (in MHz) were investigated:

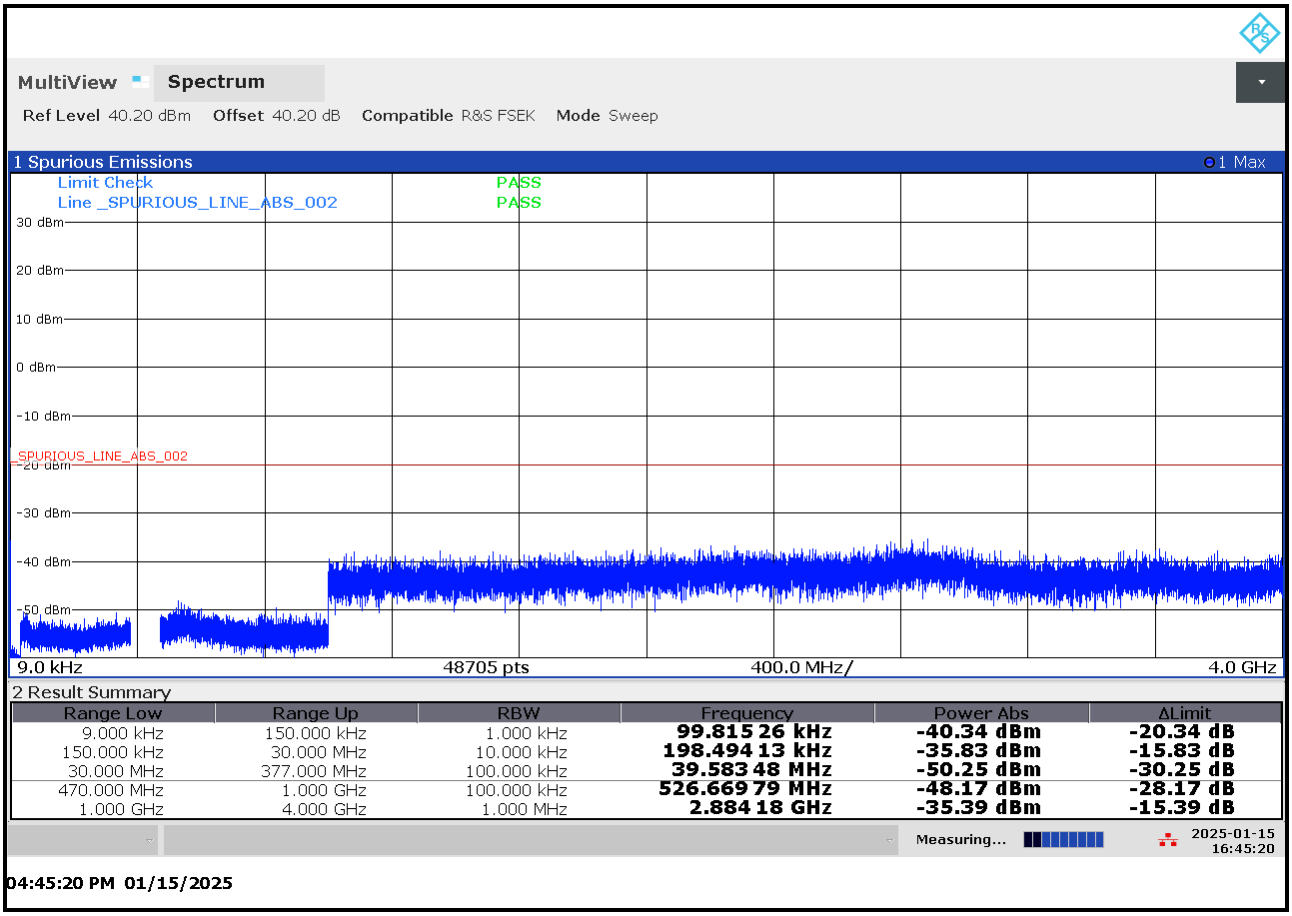
Frequency (MHz)
378.0125
418.0125
469.9875

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

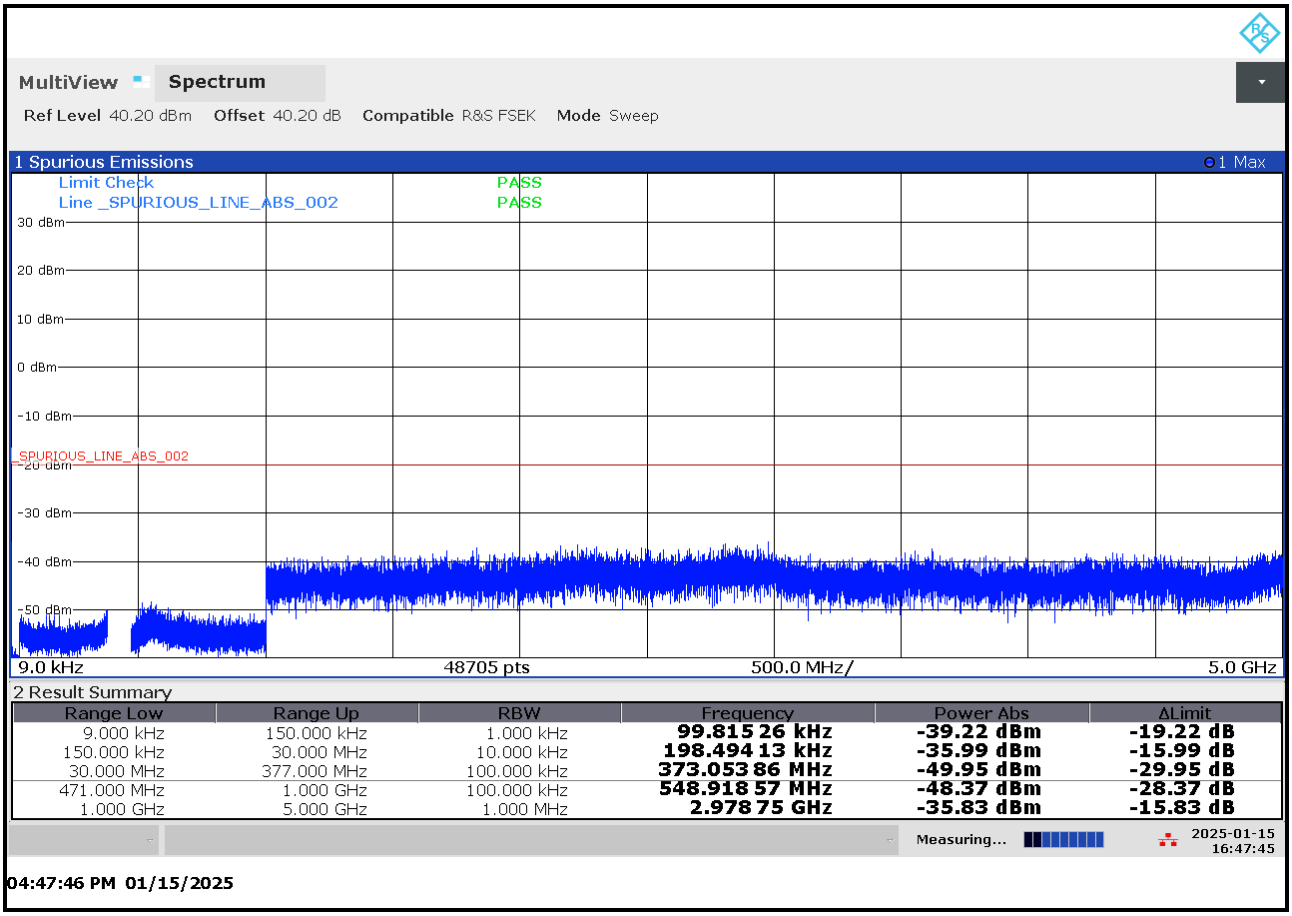
Plot 5-1: Conducted Antenna Spurious Emissions - 378.0125 MHz



Plot 5-2: Conducted Antenna Spurious Emissions - 418.0125 MHz



Plot 5-3: Conducted Antenna Spurious Emissions - 469.9875 MHz



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.8 dB

Results: Pass

Table 5-1: Test Equipment for Spurious Emissions Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW	Spectrum Analyzer	101021	02/02/2027
900819	MCE Weinschel	2	Attenuator, 10 dB, DC-18 GHz, 5 W	BF0830	09/21/2027
901135	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	10/15/2027
901133	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	10/15/2027

Test Personnel:

Daniel W. Baltzell		January 15, 2025
EMC Test Engineer	Signature	Date of Test

6 FCC §2.1053(a): Field Strength of Spurious Radiation; §22.359: Emission Limitations; §80.211: Emission Limitations; ISED RSS-119 5.8.9.2: Out-of-band Emission Limit

6.1 Test Procedure

§2.1053 - ANSI C63.26-2015 section 5.5.3

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.

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.

Additionally, radiated emissions were investigated with the licensed and unlicensed (DSS, DTS, NII) transmitters transmitting simultaneously. No non-compliances were found.

6.1.1 §2.1053 Requirements

Limit: 50+10LogP narrowband limit used as worst case limit.

ANSI C63.26-2015, Section 5.5 Radiated Emission Testing.

6.2 Test Data

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

Fundamental Power Measured = 47.3 dBm; 53.3W; Limit = 67.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
756.0250	38.1	-31.7	0.4	-1.3	80.6	-13.3
1134.0375	36.7	-35.1	0.4	4.7	78.1	-10.9
1512.0500	23.3	-47.2	0.5	6.5	88.5	-21.2
1890.0625	12.0	-54.6	0.6	6.3	96.1	-28.9
2268.0750	11.6	-66.2	0.6	7.2	106.8	-39.6
2646.0875	-3.0	-80.4	0.7	7.6	120.8	-53.5
3024.1000	2.3	-74.6	0.6	7.3	115.2	-48.0
3402.1125	3.5	-72.7	0.6	7.6	113.0	-45.8
3780.1250	-3.9	-78.7	0.7	7.0	119.7	-52.4

Table 6-2: Field Strength of Spurious Radiation - 418.0125 MHz

Fundamental Power Measured = 47.2 dBm; 52W; Limit = 67.2 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
836.0250	38.0	-33.2	0.4	-1.4	82.2	-15.0
1254.0375	31.9	-39.6	0.4	4.9	82.3	-15.1
1672.0500	4.3	-64.4	0.5	6.5	105.6	-38.4
2090.0625	18.9	-58.7	0.6	6.4	100.1	-32.9
2508.0750	9.6	-68.0	0.6	7.4	108.4	-41.2
2926.0875	6.9	-70.2	0.7	7.6	110.4	-43.2
3344.1000	10.0	-65.9	0.6	7.3	106.4	-39.2
3762.1125	-11.4	-86.3	0.7	7.0	127.1	-60.0
4180.1250	-10.7	-80.7	0.7	8.4	120.2	-53.0

Table 6-3: Field Strength of Spurious Radiation - 469.9875 MHz

Fundamental Power Measured = 46.7 dBm; 46.2 W; Limit = 66.7 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
939.9750	33.3	-35.8	0.4	-1.0	83.9	-17.2
1409.9625	15.2	-56.3	0.5	6.0	97.4	-30.7
1879.9500	16.0	-50.3	0.6	6.3	91.2	-24.5
2349.9375	3.5	-74.2	0.5	7.3	114.1	-47.4
2819.9250	2.3	-75.1	0.6	7.9	114.5	-47.9
3289.9125	3.5	-72.3	0.7	7.1	112.5	-45.9
3759.9000	5.0	-69.9	0.7	7.0	110.2	-43.6
4229.8875	3.6	-66.7	0.7	8.6	105.5	-38.9
4699.8750	4.7	-66.0	0.8	9.0	104.5	-37.9

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±4.6 dB

Results: Pass

Table 6-4: Test Equipment for Field Strength of Spurious Radiation & Digital/Receiver Emissions Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 20'	NA	09/21/2027
901729	Insulated Wire Inc.	KPS-1503-3150-KPR	SMK RF Cables 20'	NA	12/29/2027
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
901773	Rohde & Schwarz	FSW	Spectrum Analyzer	101021	02/02/2027
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	05/23/2027
900791	Chase	CBL6111B	Bilog Antenna (30 – 2000 MHz)	N/A	10/04/2027
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	08/05/2027
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	08/05/2027
901133	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	10/15/2027
901129	Par Electronics	188-174 (25W)	VHF Notch Filters	N/A	10/15/2027
901135	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	10/15/2027
901262	ETS	3160-9	Double ridge Antenna (1 - 18 GHz)	6748	02/08/2027

900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	09/16/2027
900914	Hewlett Packard	8546OA	RF Filter Section, 100 kHz - 6.5 GHz	3330A00107	09/16/2027
900905	Rhein Tech Laboratories, Inc.	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	09/30/2027

Test Personnel:

Daniel W. Baltzell		January 25-26, 2025
EMC Test Engineer	Signature	Dates of Tests

7 FCC §2.1049(c)(1): Occupied Bandwidth; §90.210 Authorized Bandwidth; §74.462: Authorized Bandwidth and Emissions; §80.205: Bandwidths; §80.211: Emission Limitations; ISED RSS-119 5.5: Channel Bandwidth, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

7.1 Test Procedure

ANSI C63.26-2015, section 5.4

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

§90.210 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 5]	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854[6]	B	H
809-824/854-869[35]	B, D	D, G.
896-901/935-940	I	J
902-928	K	K
929-930	B	G
4940-4990 MHz	L or M	L or M
5895-5925[4]		

[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 of this chapter.*

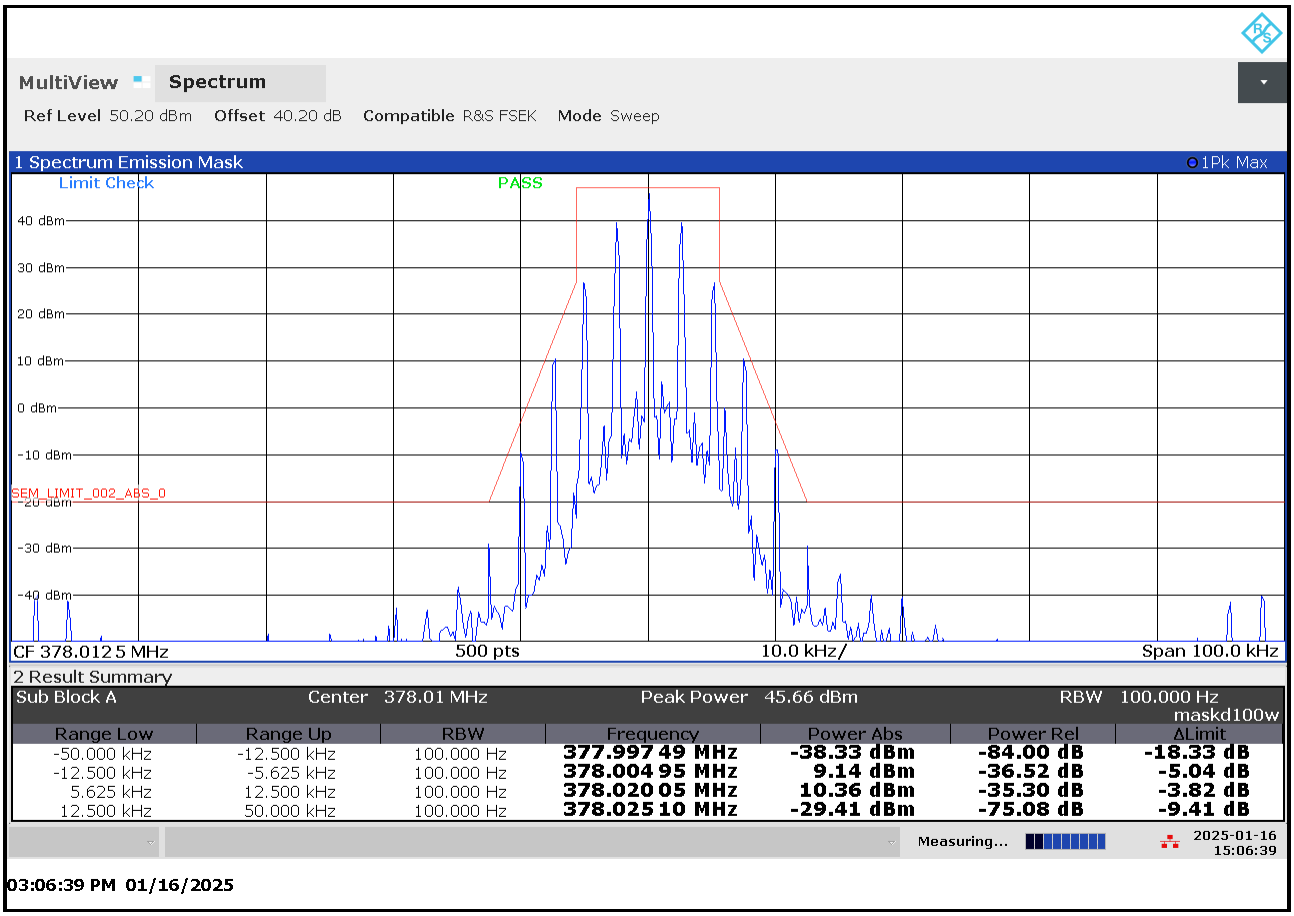
[4] *DSRCS Roadside Units in the 5895-5925 MHz band are governed under subpart M of this part.*

[5] *Equipment designed to operate on 25 kilohertz bandwidth channels must meet the requirements of either Emission Mask B or G, whichever is applicable, while equipment designed to operate on 12.5 kilohertz bandwidth channels must meet the requirements of Emission Mask D. Equipment designed to operate on 25 kilohertz bandwidth channels may alternatively meet the Adjacent Channel Power limits of § 90.221.*

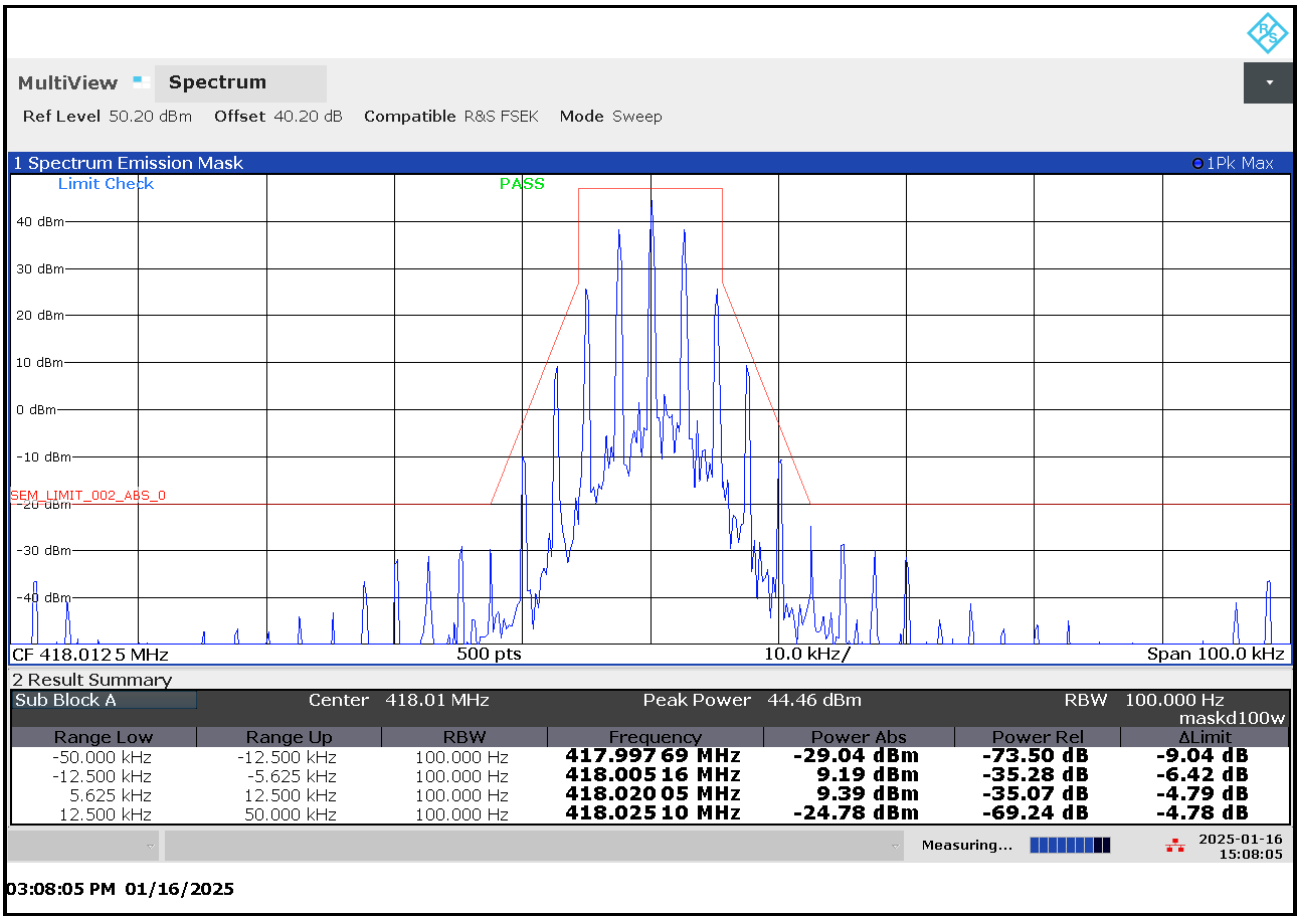
[6] *Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet Emission Mask B. All transmitters utilizing digital emissions and those transmitters using analog emissions without an audio low-pass filter must meet Emission Mask H.*

7.2 Test Data

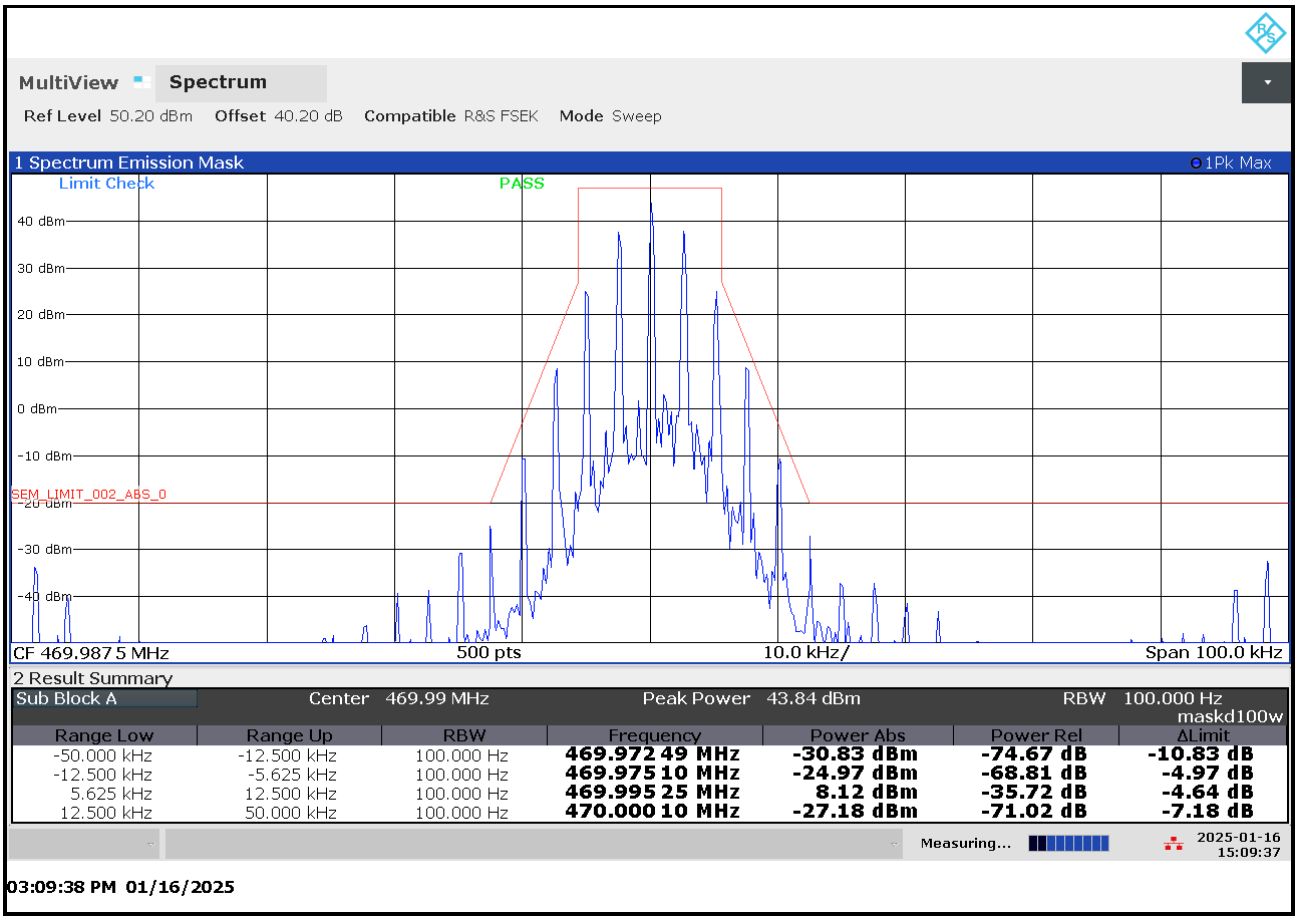
Plot 7-1: Occupied Bandwidth – 378.0125 MHz; Narrowband Analog; Mask D



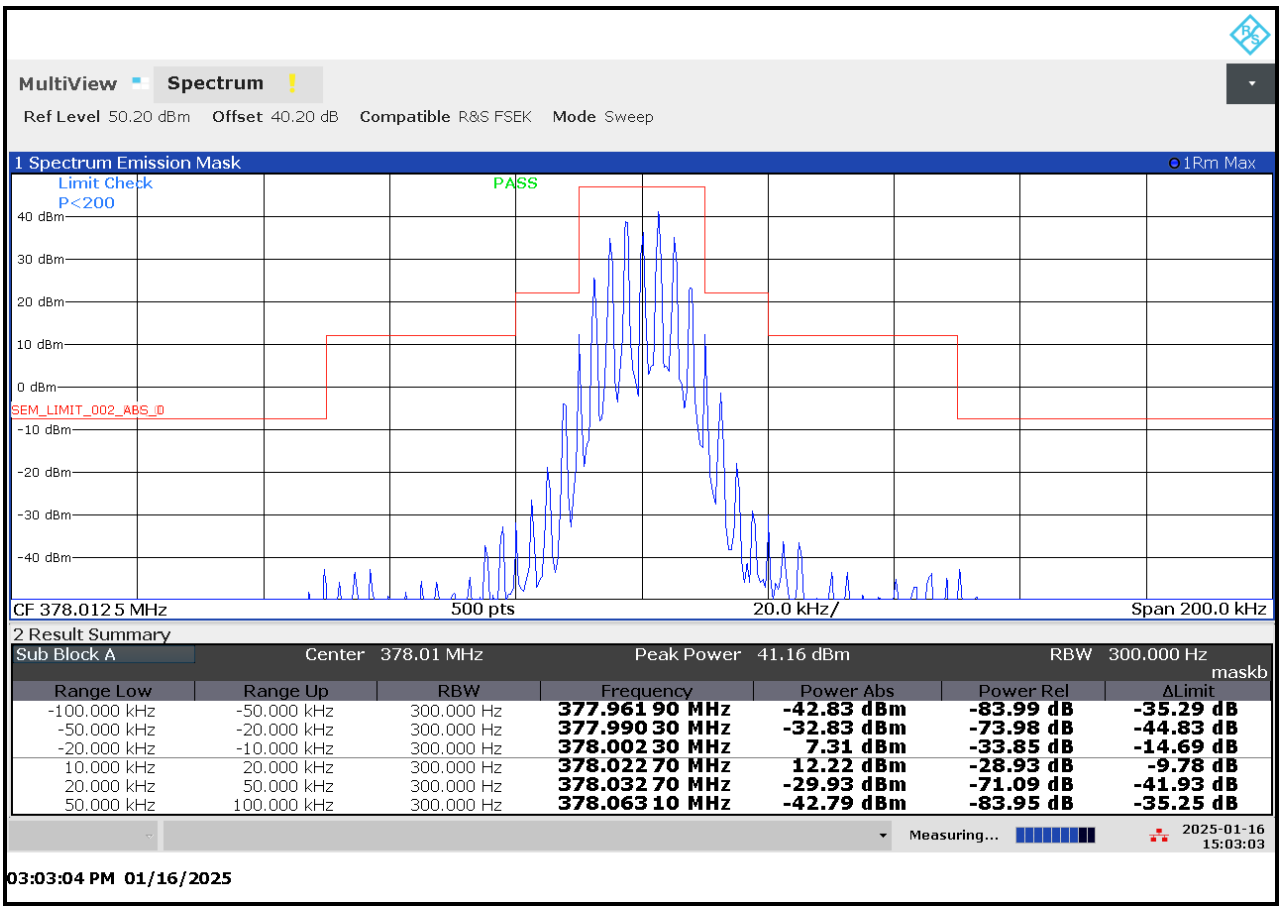
Plot 7-2: Occupied Bandwidth – 418.0125 MHz; Narrowband Analog; Mask D



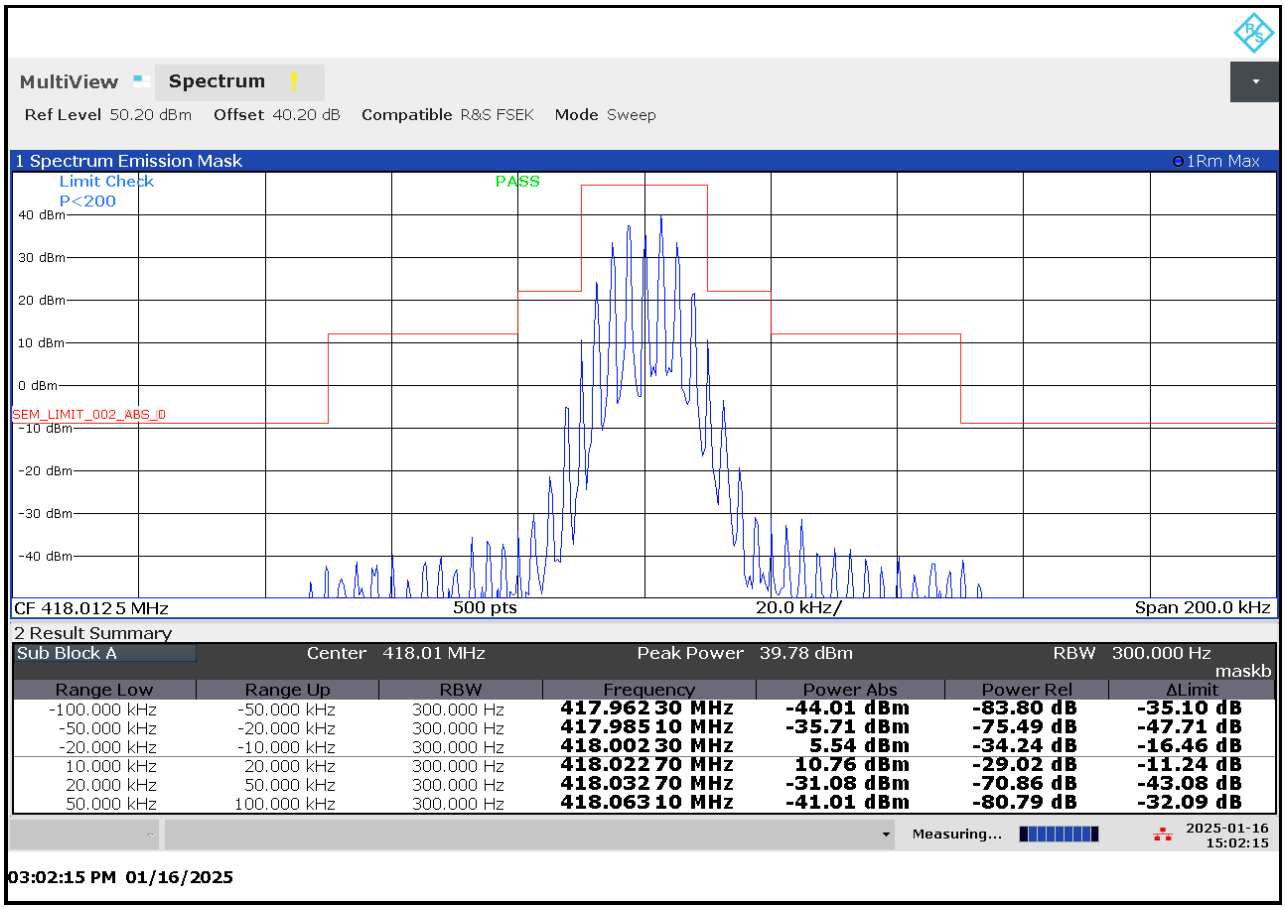
Plot 7-3: Occupied Bandwidth – 469.9875 MHz; Narrowband Analog; Mask D



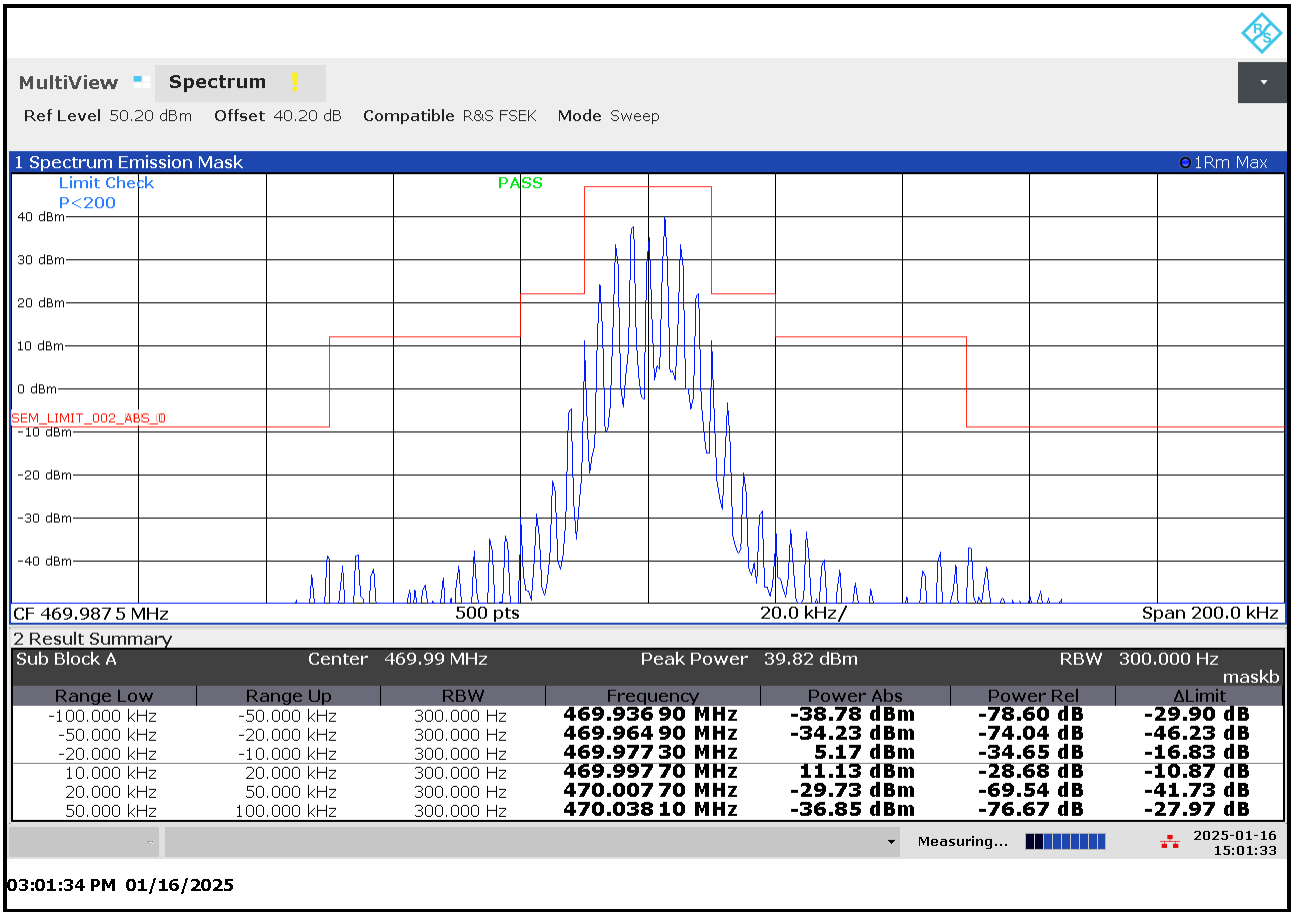
Plot 7-4: Occupied Bandwidth – 378.0125 MHz; Wideband Analog; Mask B



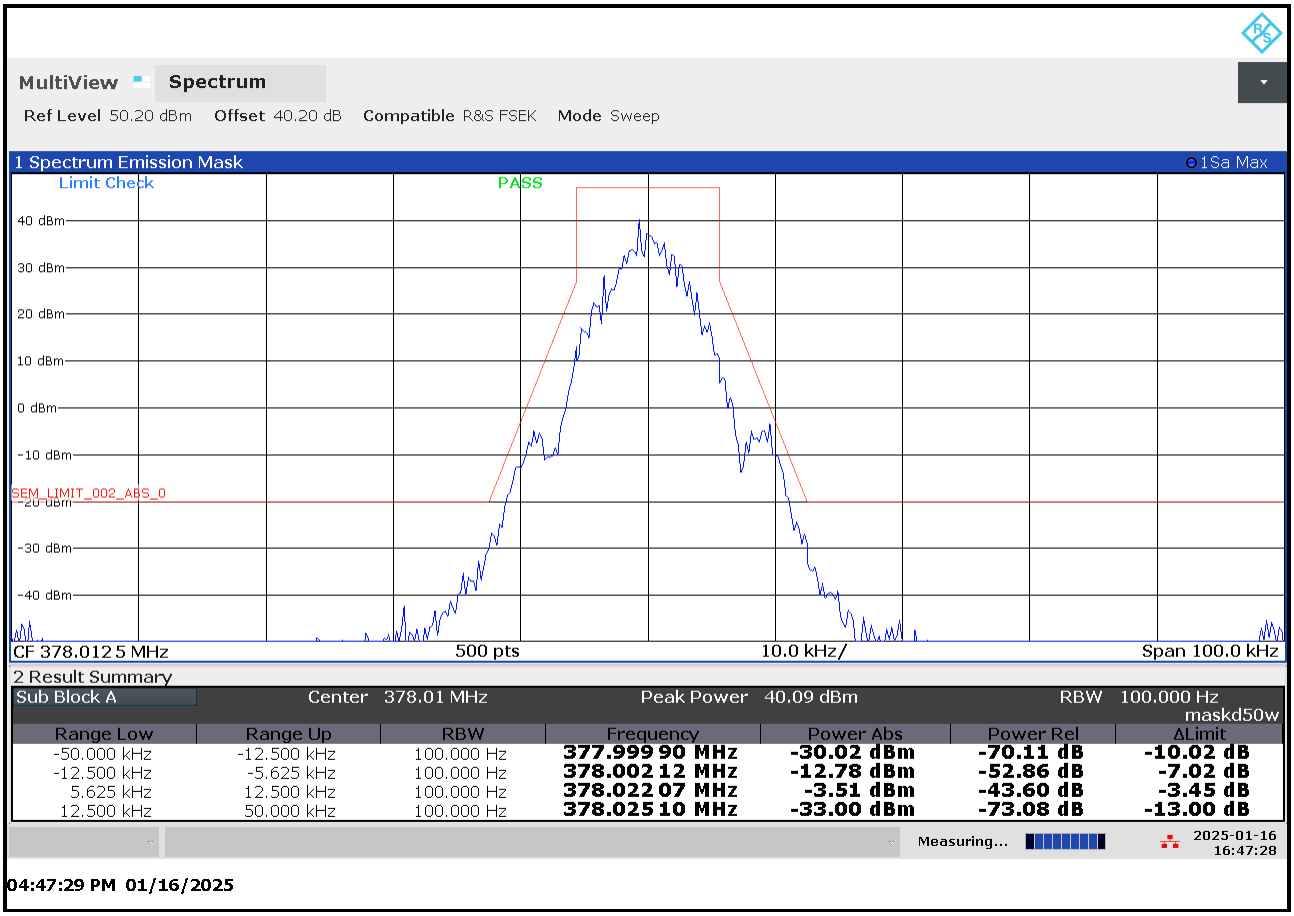
Plot 7-5: Occupied Bandwidth – 418.0125 MHz; Wideband Analog; Mask B



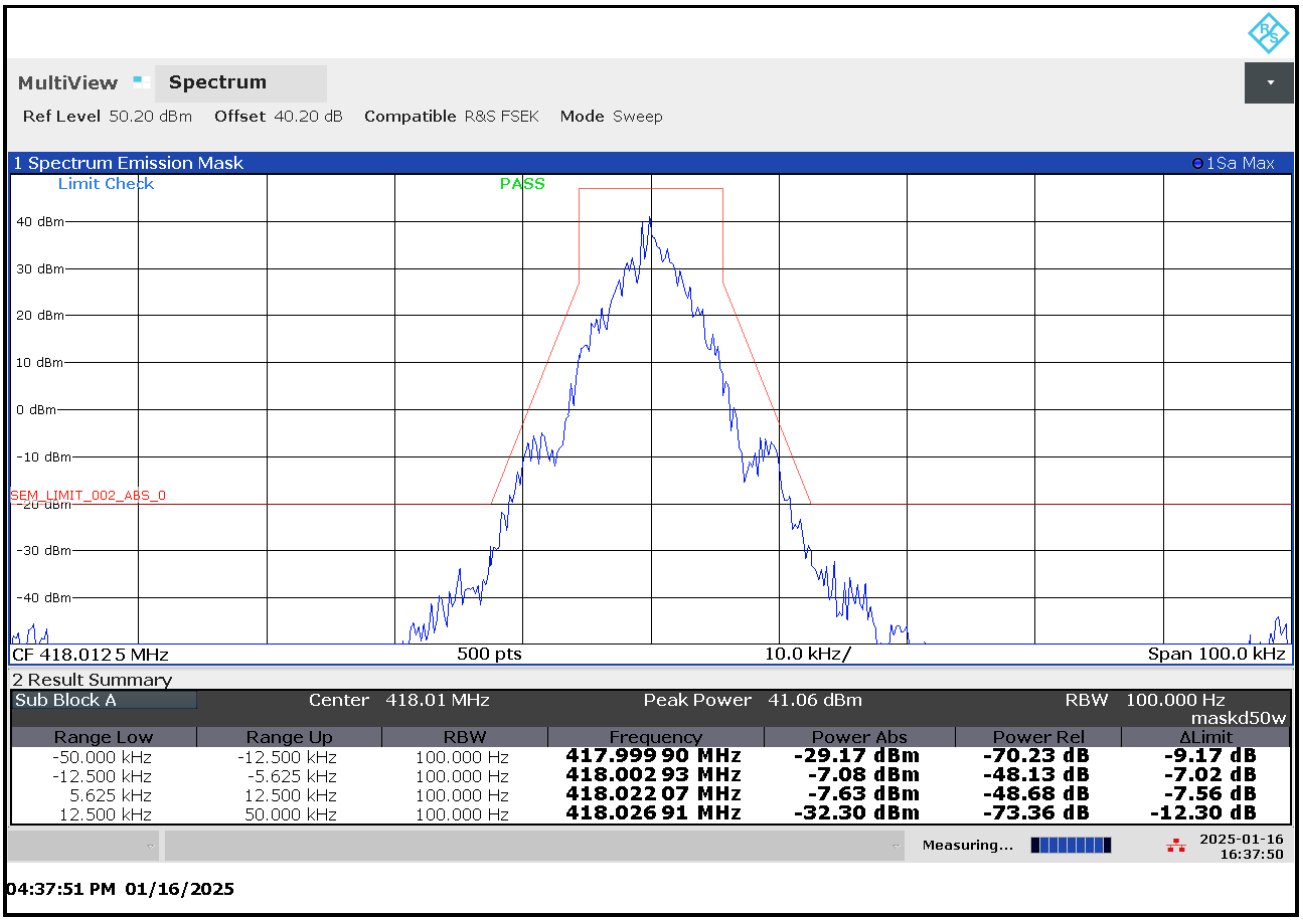
Plot 7-6: Occupied Bandwidth – 469.9875 MHz; Wideband Analog; Mask B



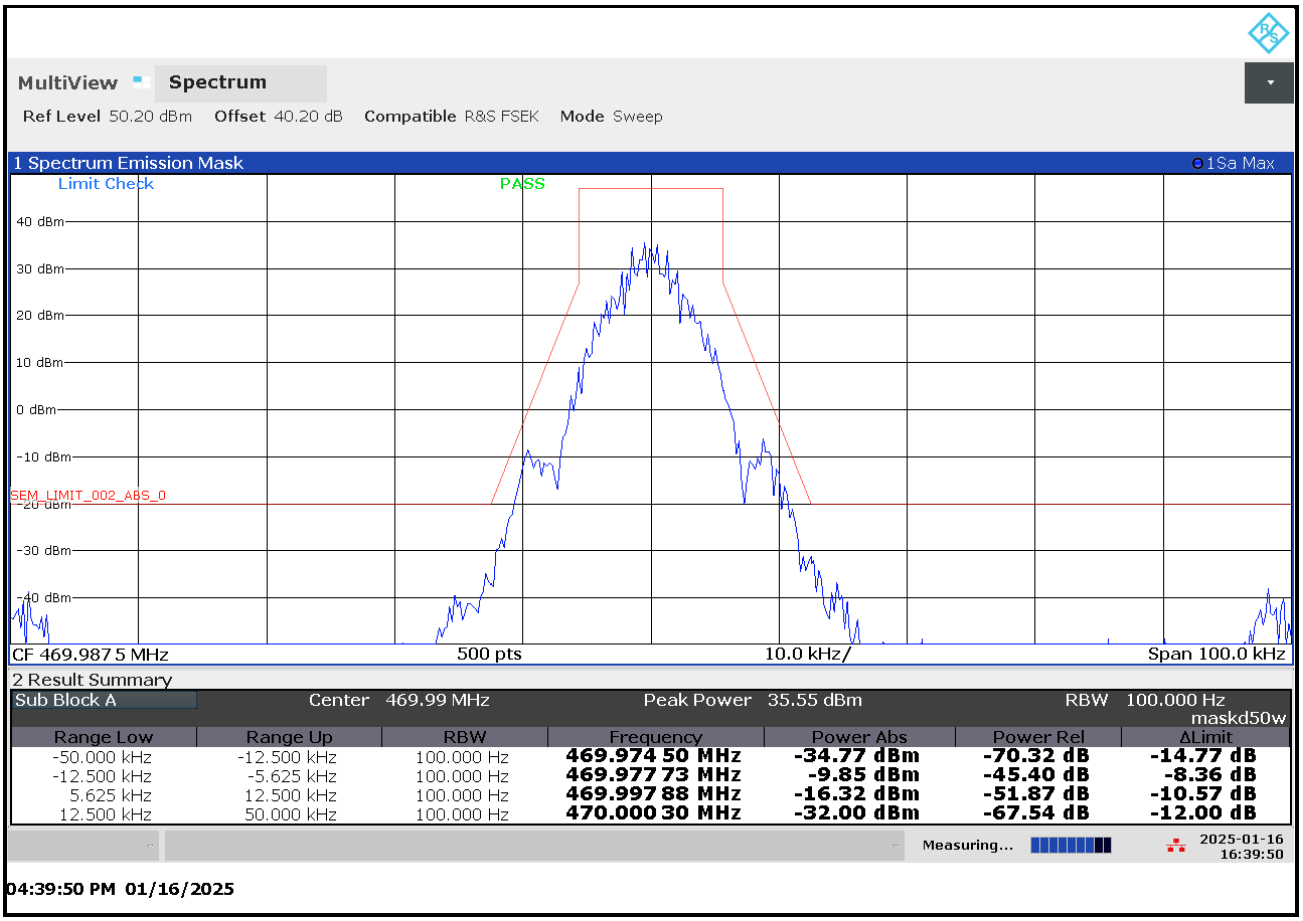
Plot 7-7: Occupied Bandwidth – 378.0125 MHz; Narrowband 2-level FSK 9600; Mask D



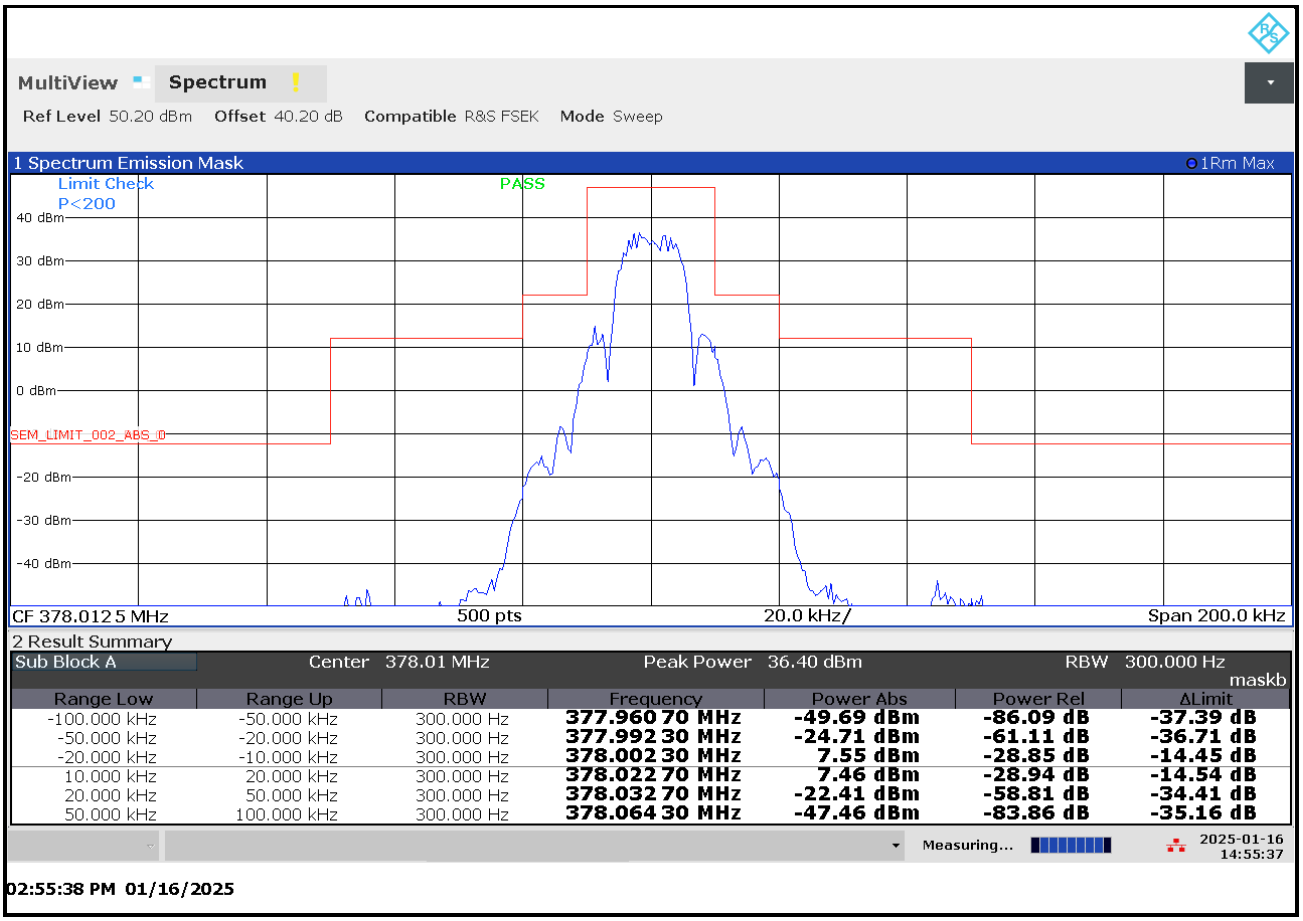
Plot 7-8: Occupied Bandwidth – 418.0125 MHz; Narrowband 2-level FSK 9600; Mask D



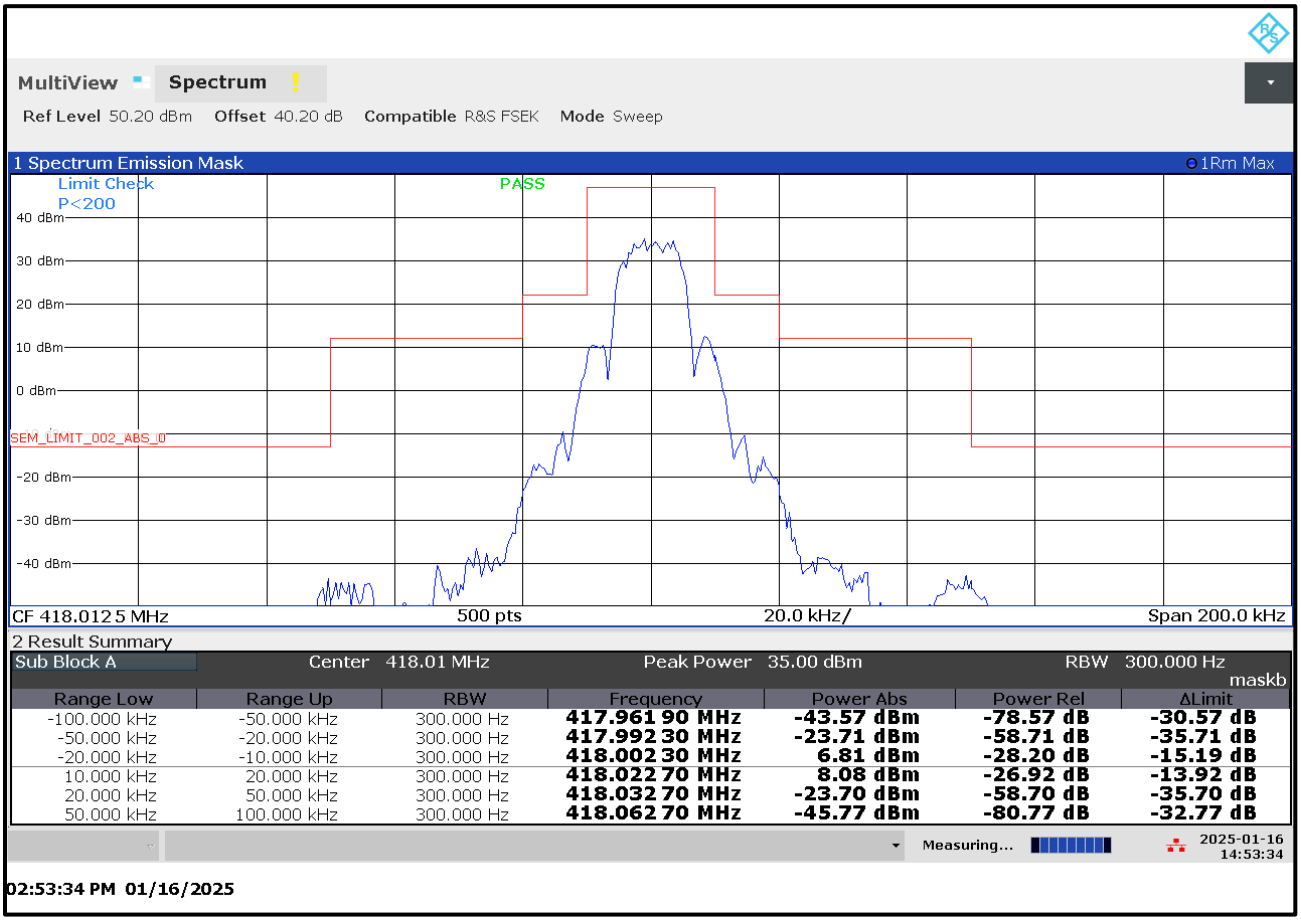
Plot 7-9: Occupied Bandwidth – 469.9875 MHz; Narrowband 2-level FSK 9600; Mask D



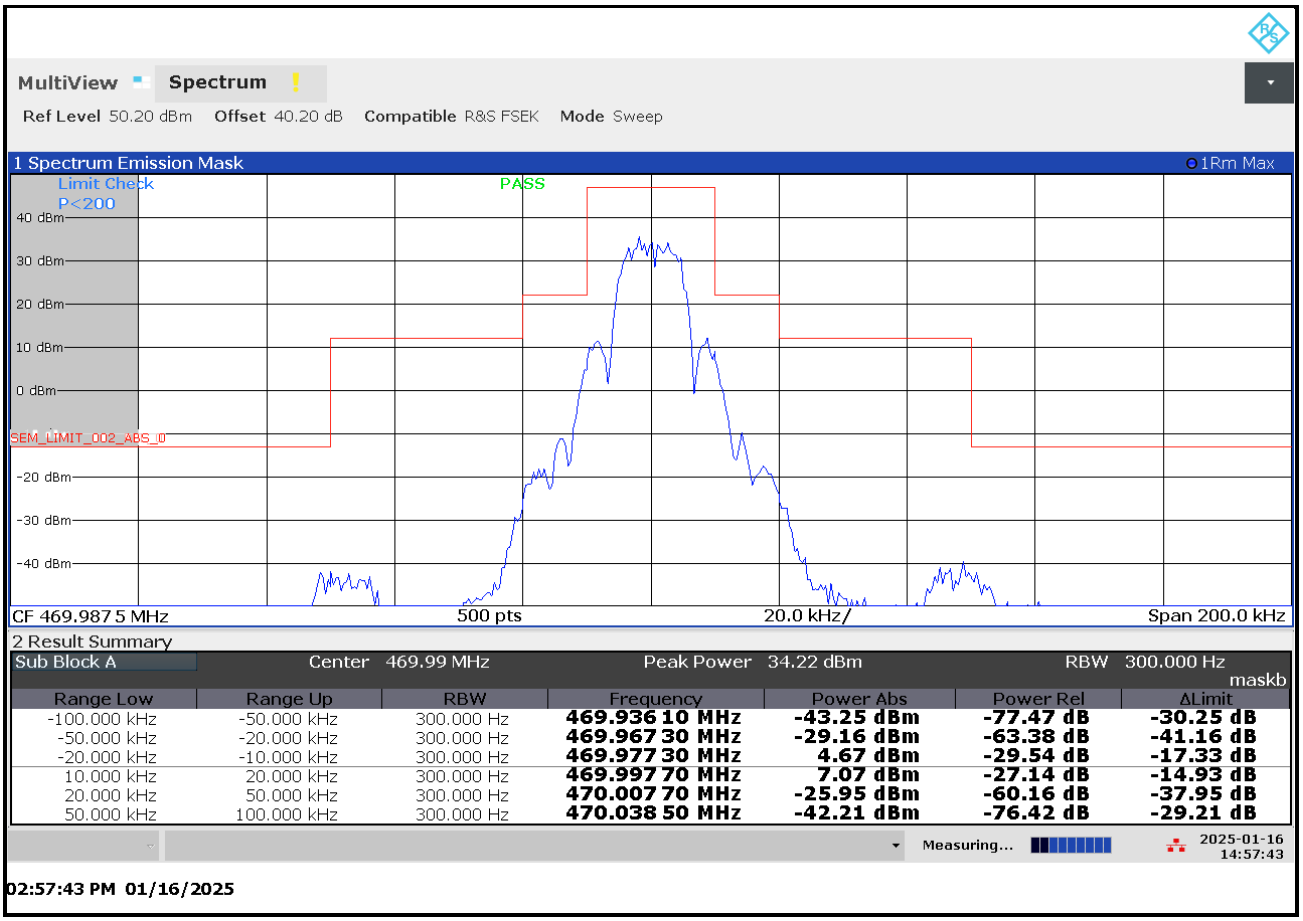
Plot 7-10: Occupied Bandwidth – 378.0125 MHz; Wideband 2-level FSK 9600; Mask B



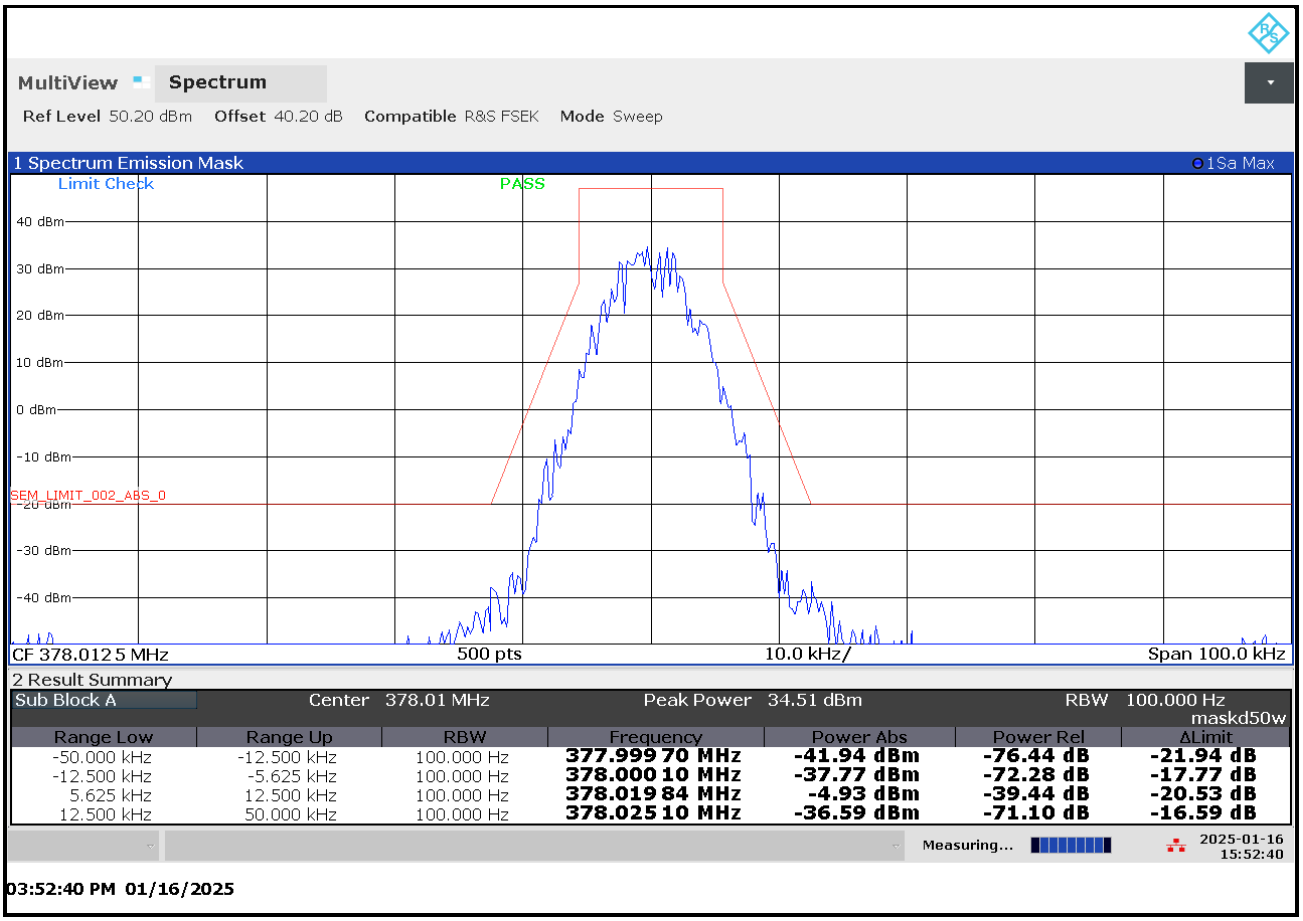
Plot 7-11: Occupied Bandwidth – 418.0125 MHz; Wideband 2-level FSK 9600; Mask B



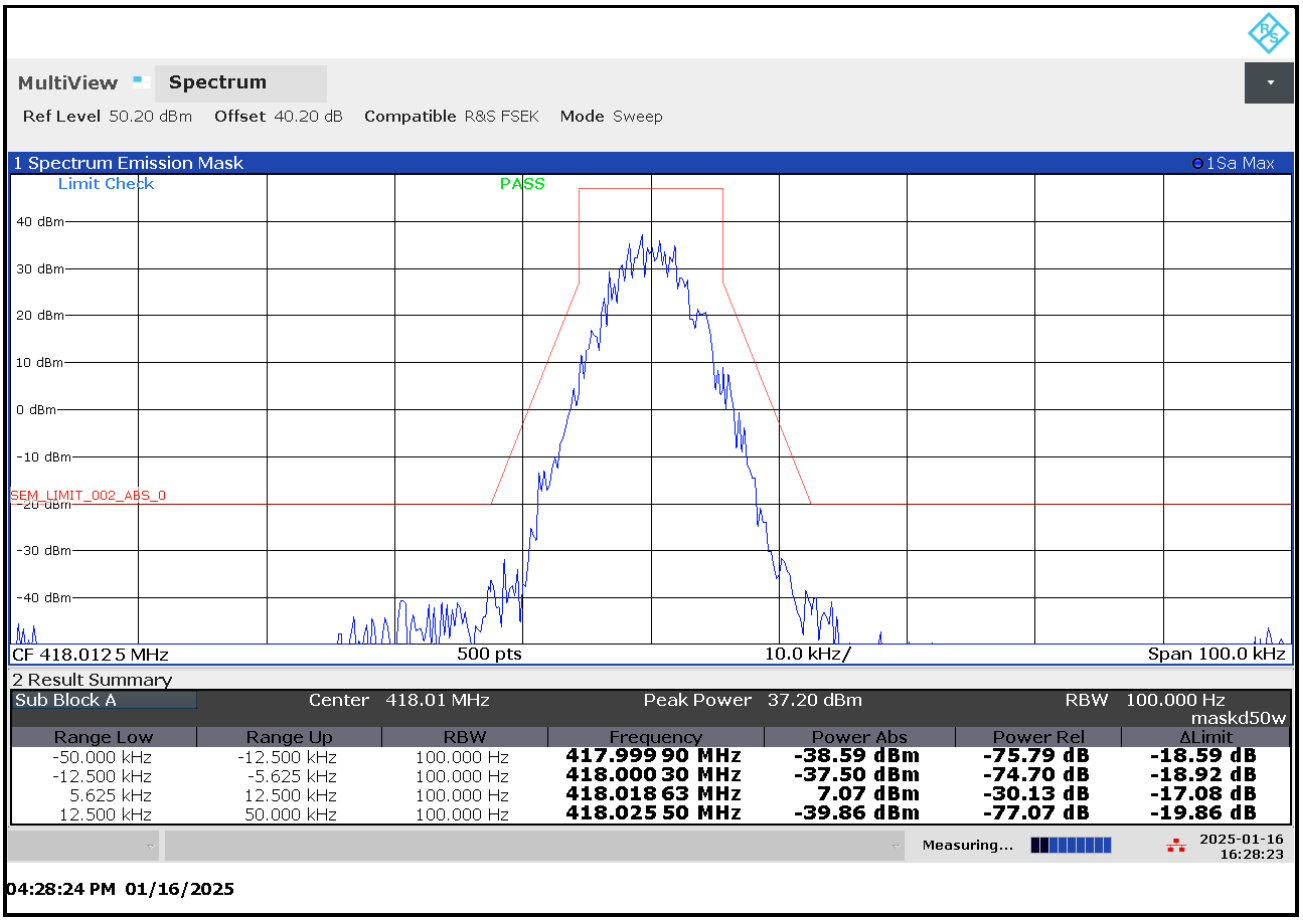
Plot 7-12: Occupied Bandwidth – 469.9875 MHz; Wideband 2-level FSK 9600; Mask B



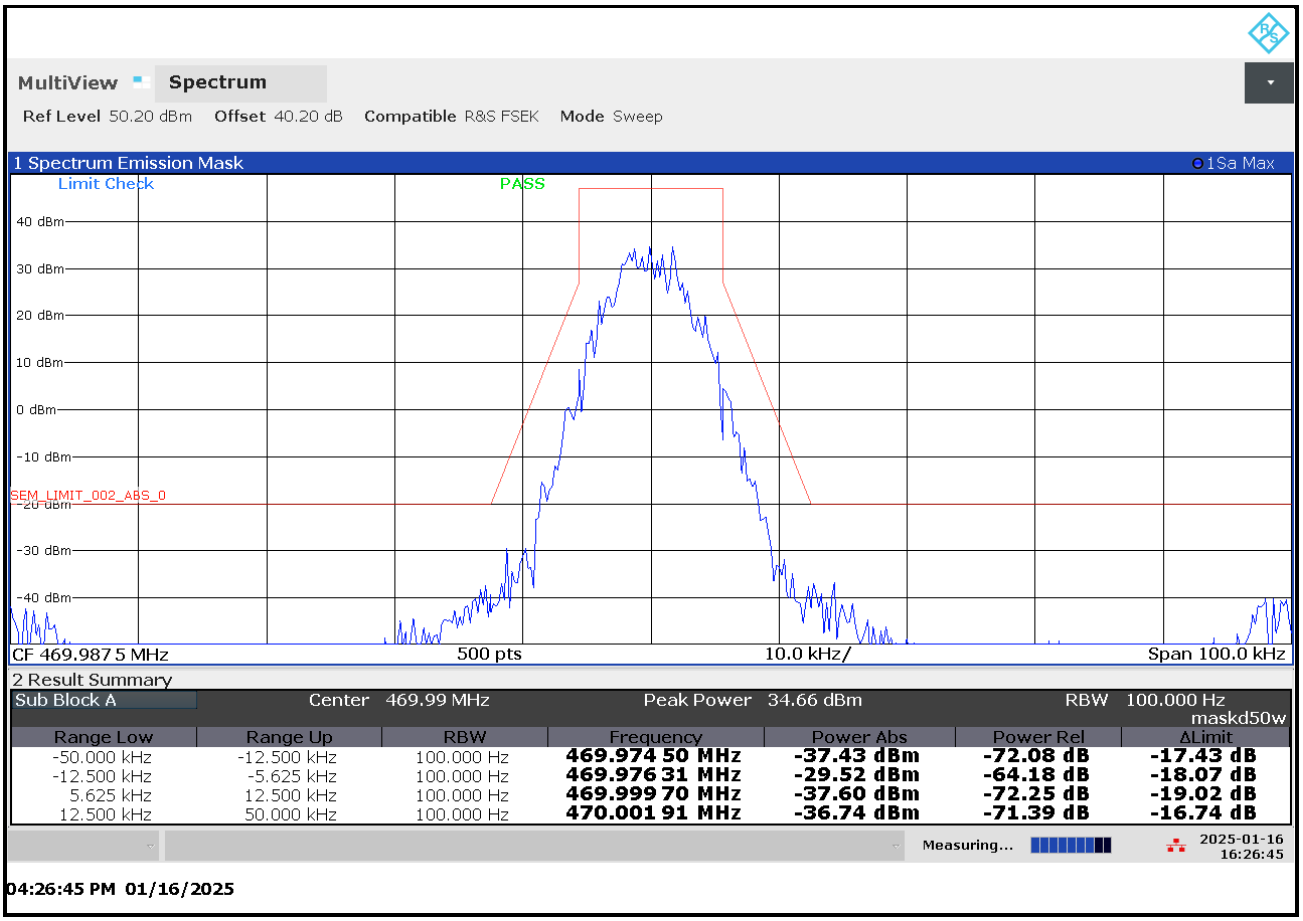
Plot 7-13: Occupied Bandwidth – 378.0125 MHz; C4FM; Mask D



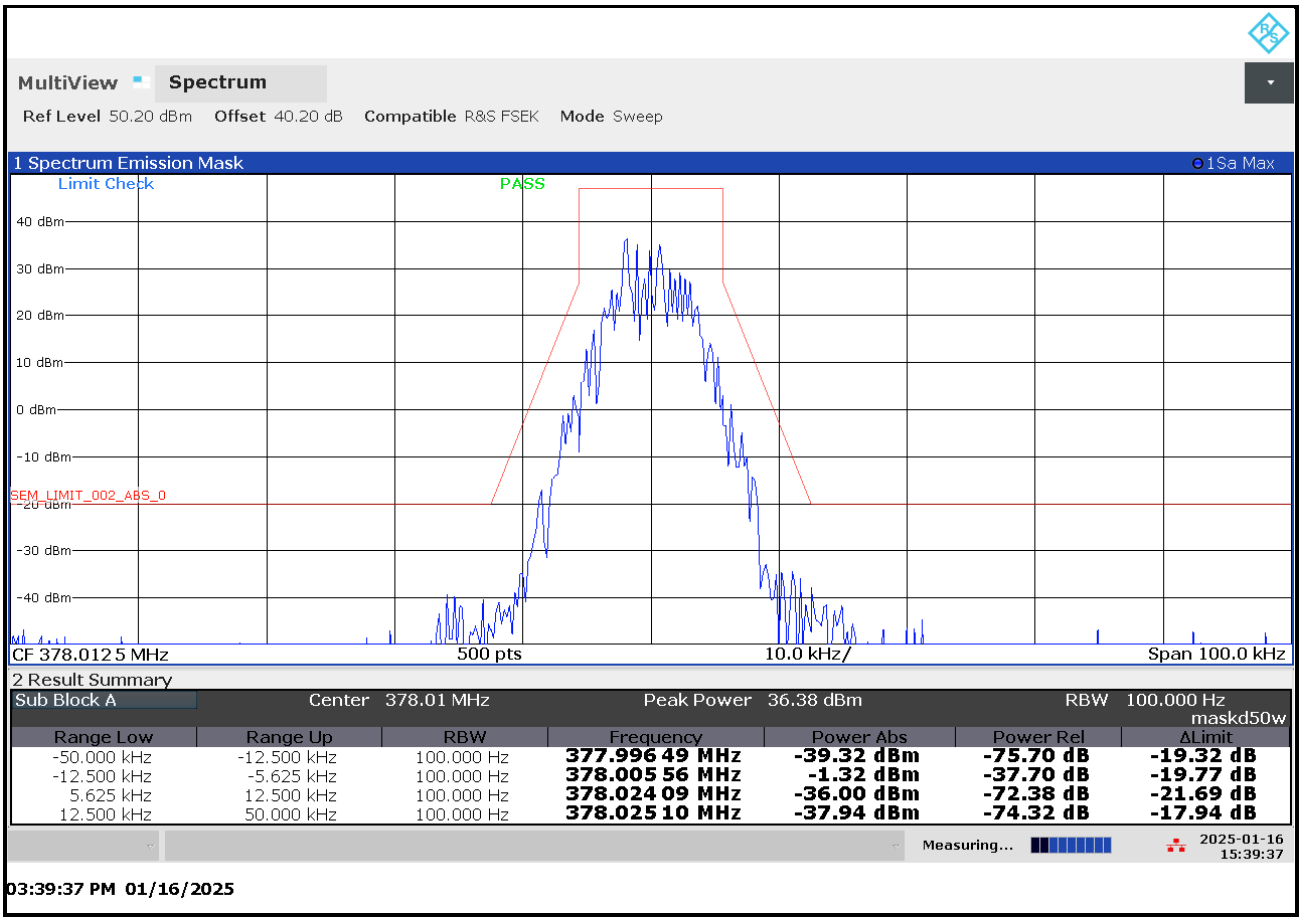
Plot 7-14: Occupied Bandwidth – 418.0125 MHz; C4FM; Mask D



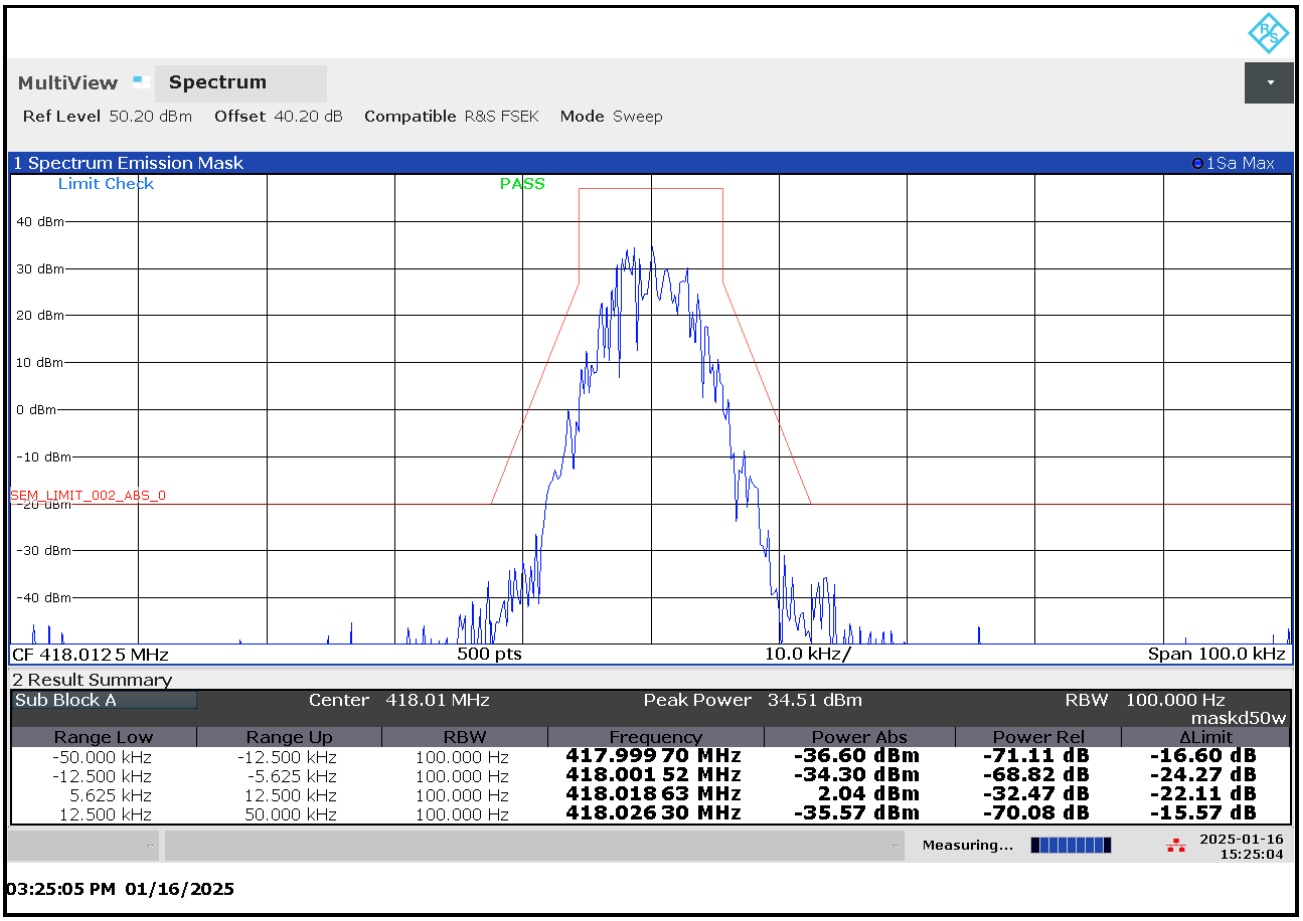
Plot 7-15: Occupied Bandwidth – 469.9875 MHz; C4FM; Mask D



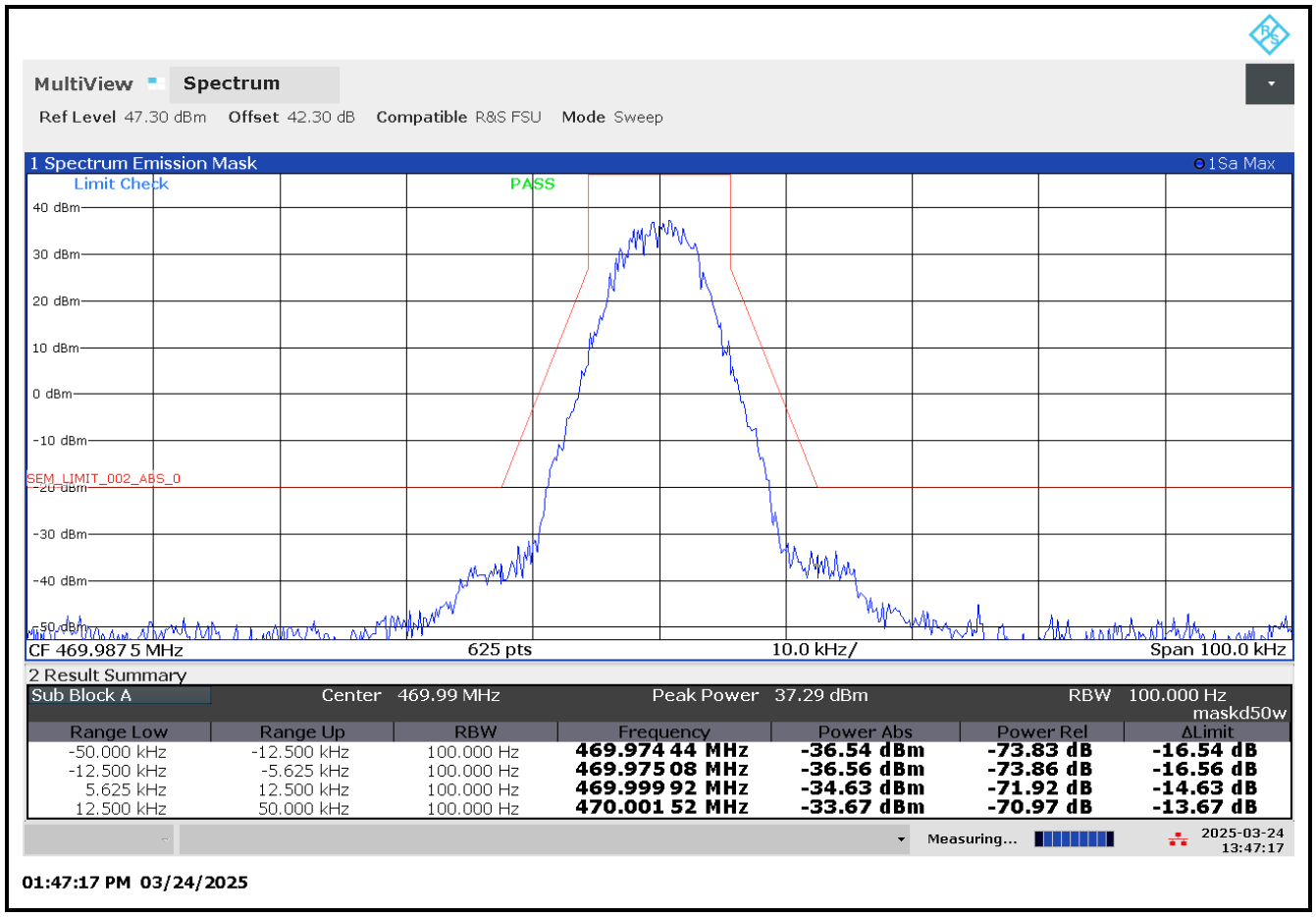
Plot 7-16: Occupied Bandwidth – 378.0125 MHz; H-CPM TDMA; Mask D



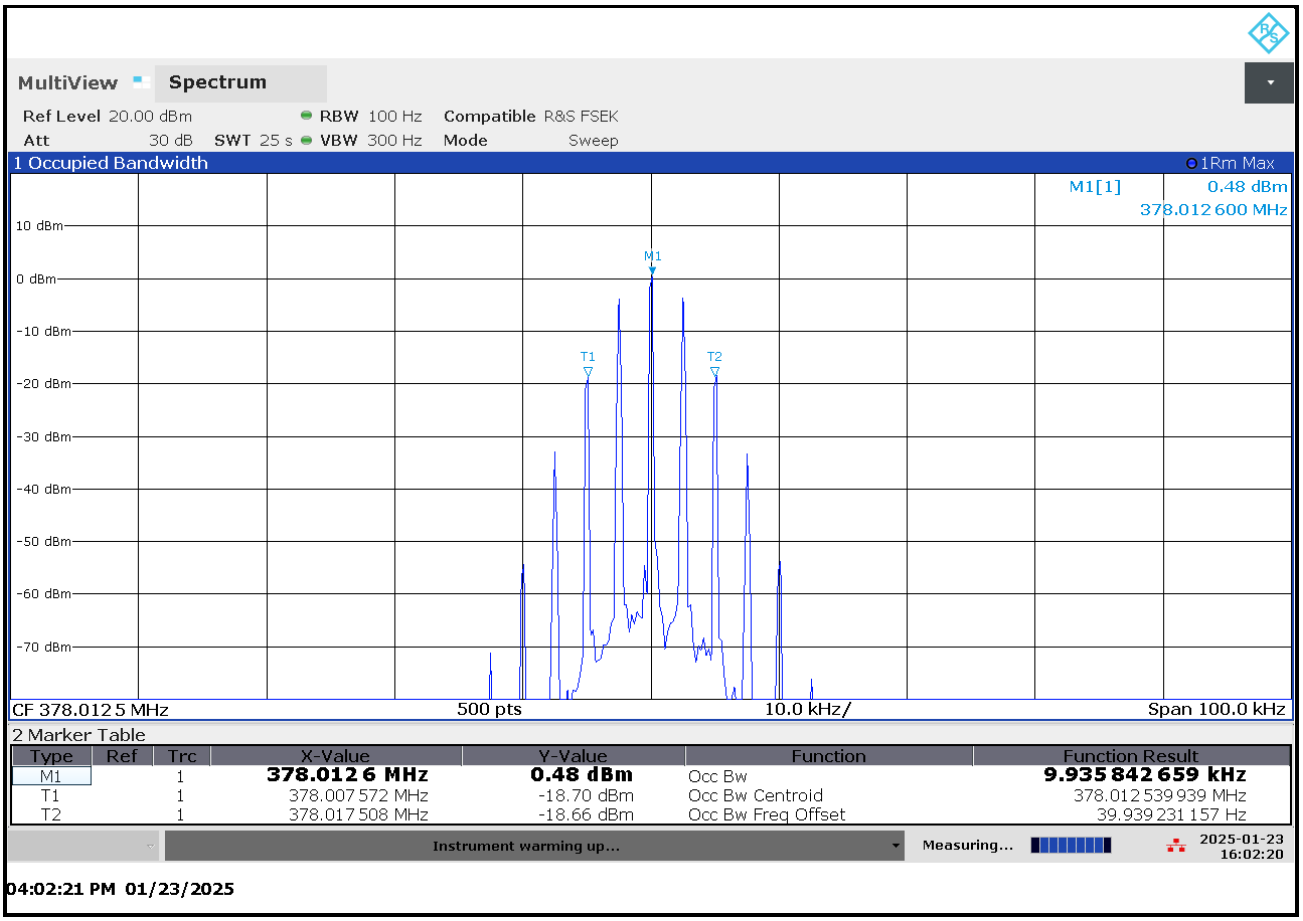
Plot 7-17: Occupied Bandwidth – 418.0125 MHz; H-CPM TDMA; Mask D



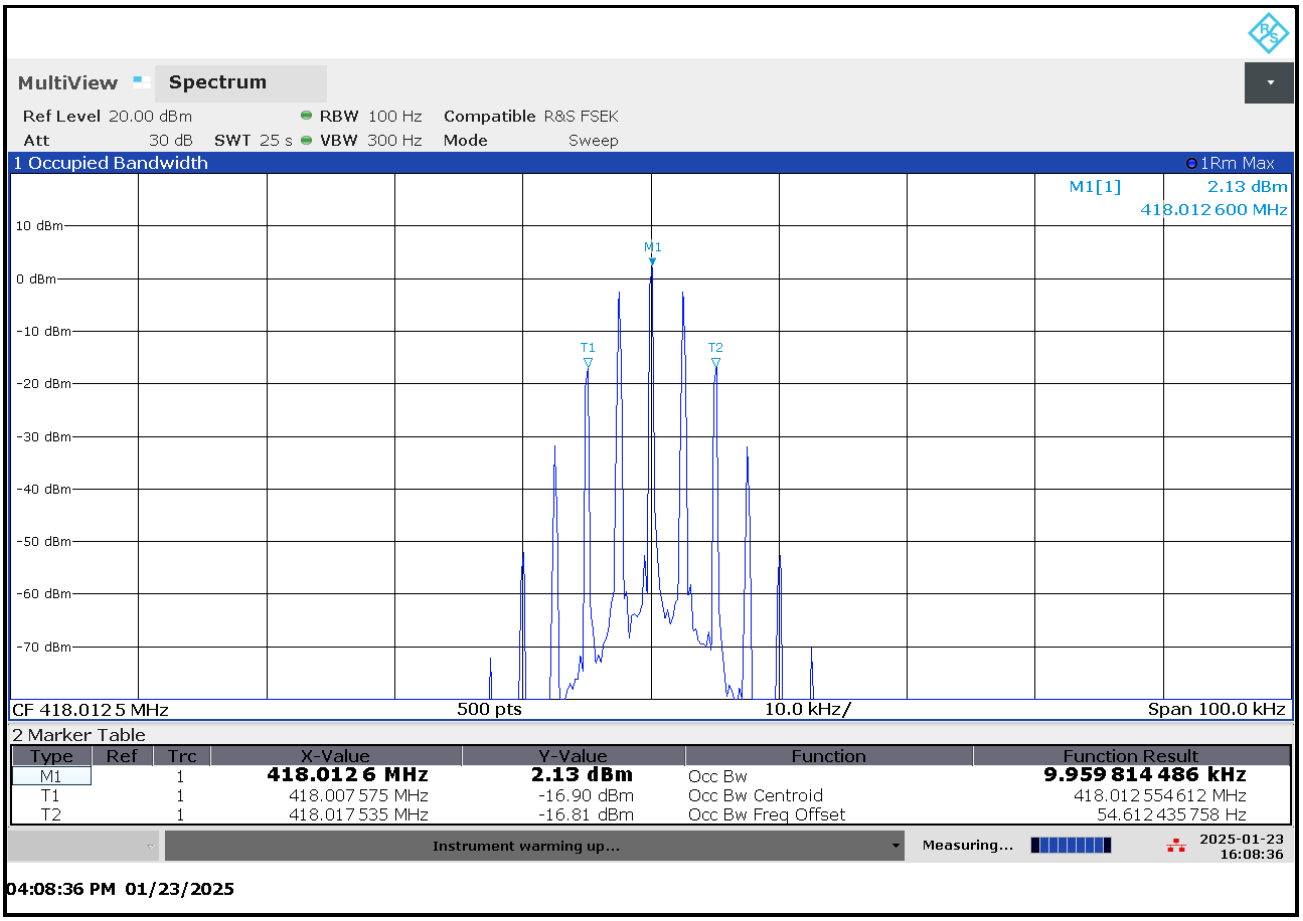
Plot 7-18: Occupied Bandwidth – 469.9875 MHz; H-CPM TDMA; Mask D



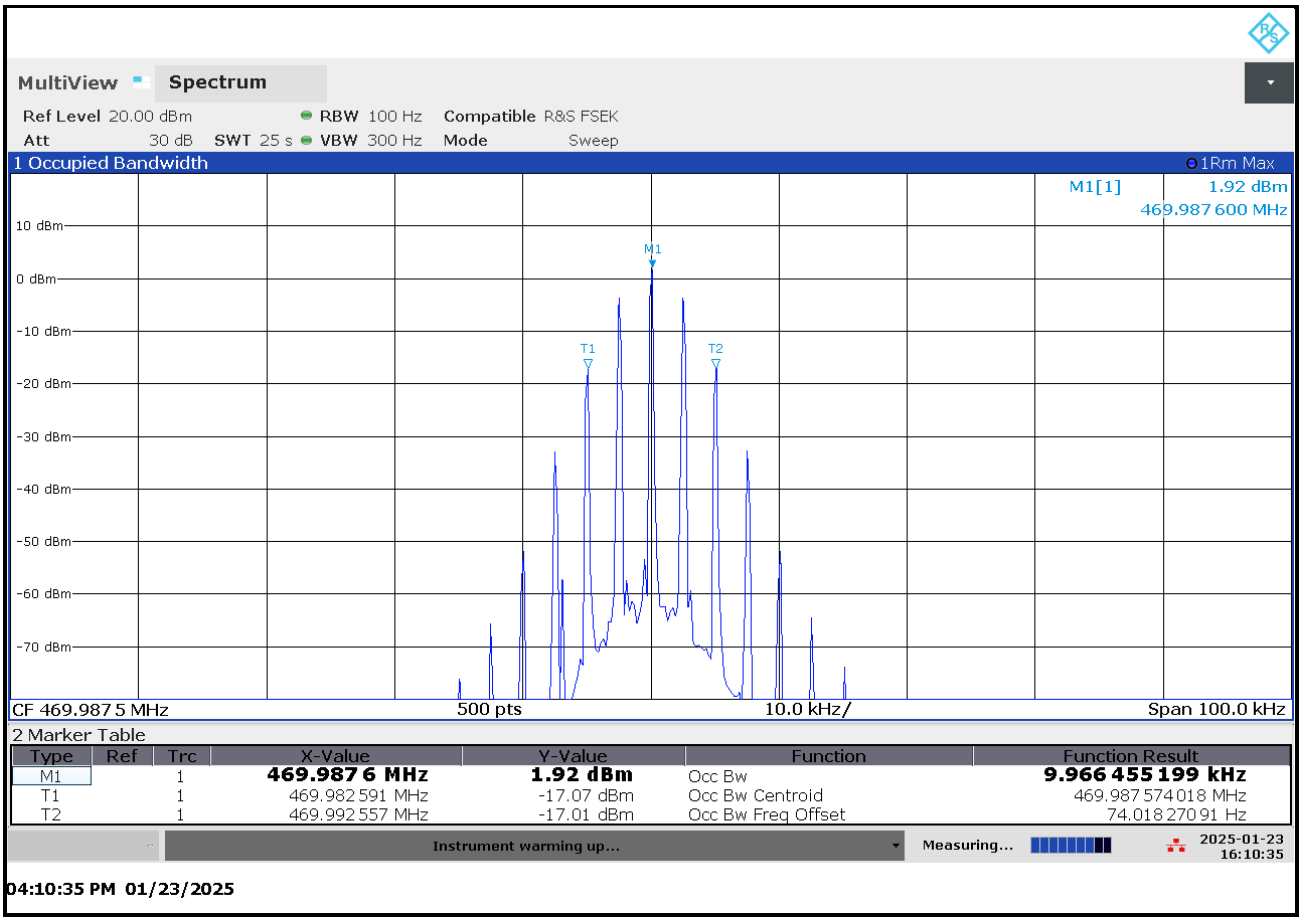
Plot 7-19: OBW 99%, 378.0125 MHz, NB Analog



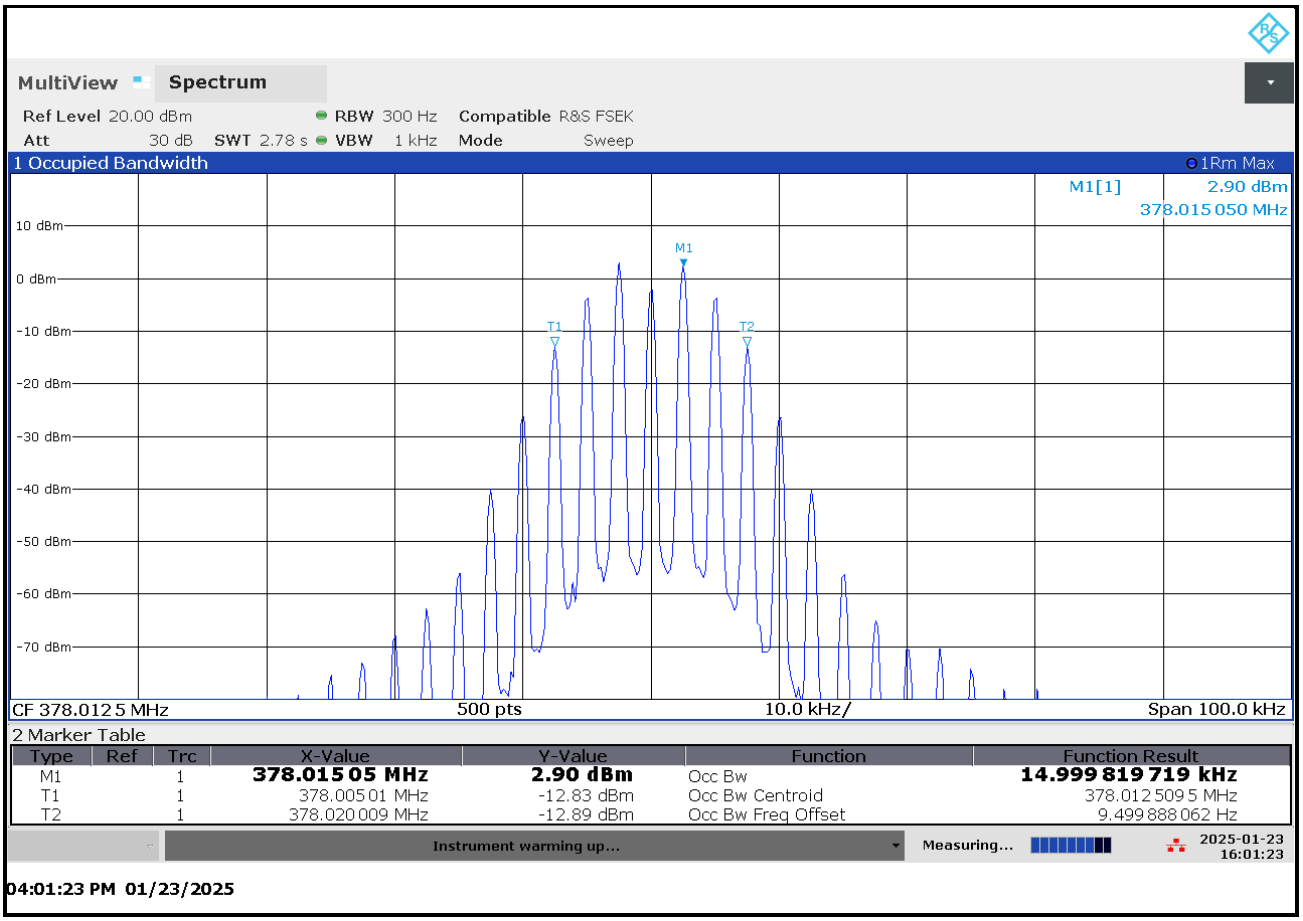
Plot 7-20: OBW 99%, 418.0125 MHz, NB Analog



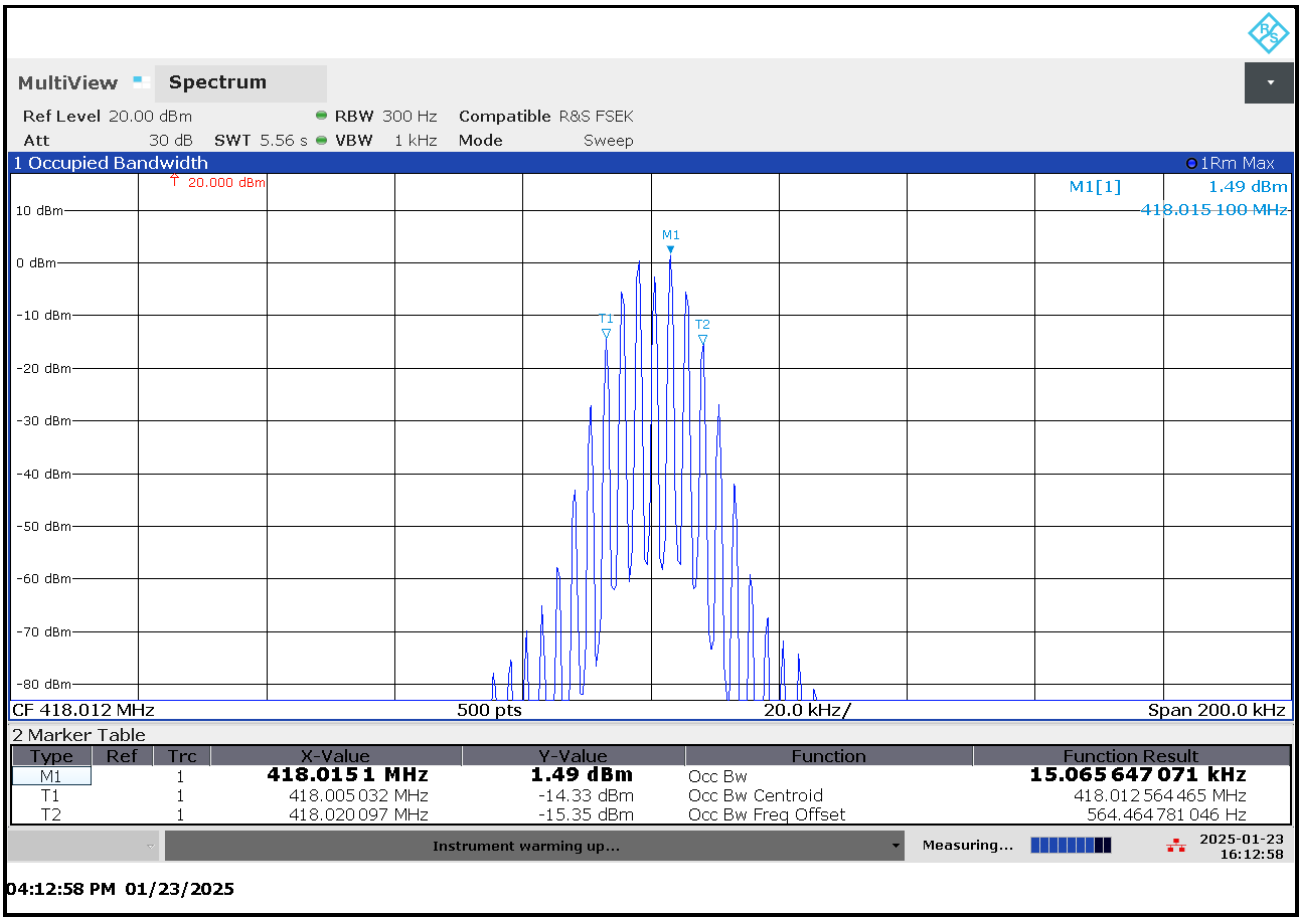
Plot 7-21: OBW 99%, 469.9875 MHz, NB Analog



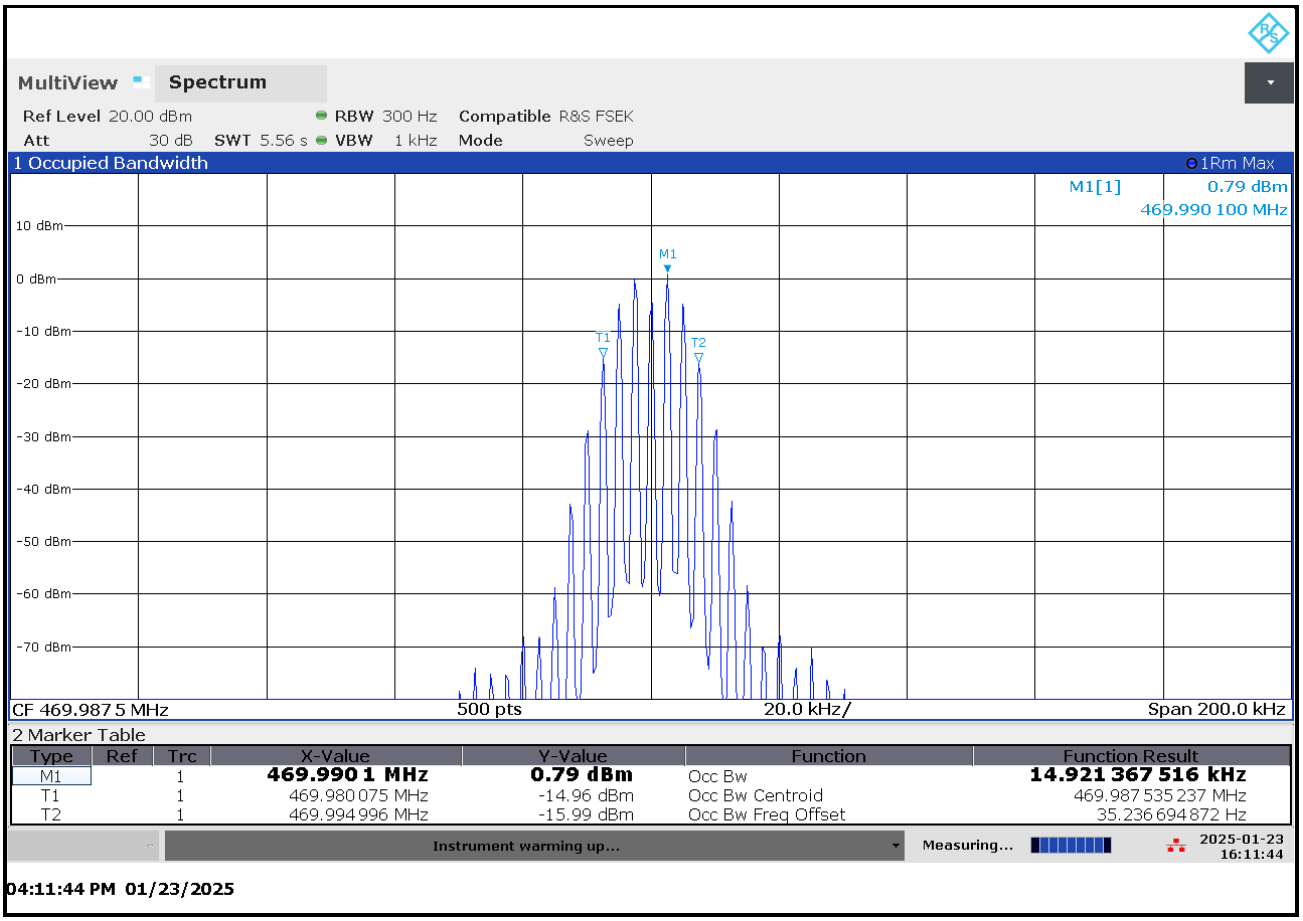
Plot 7-22: OBW 99%, 378.0125 MHz, WB Analog



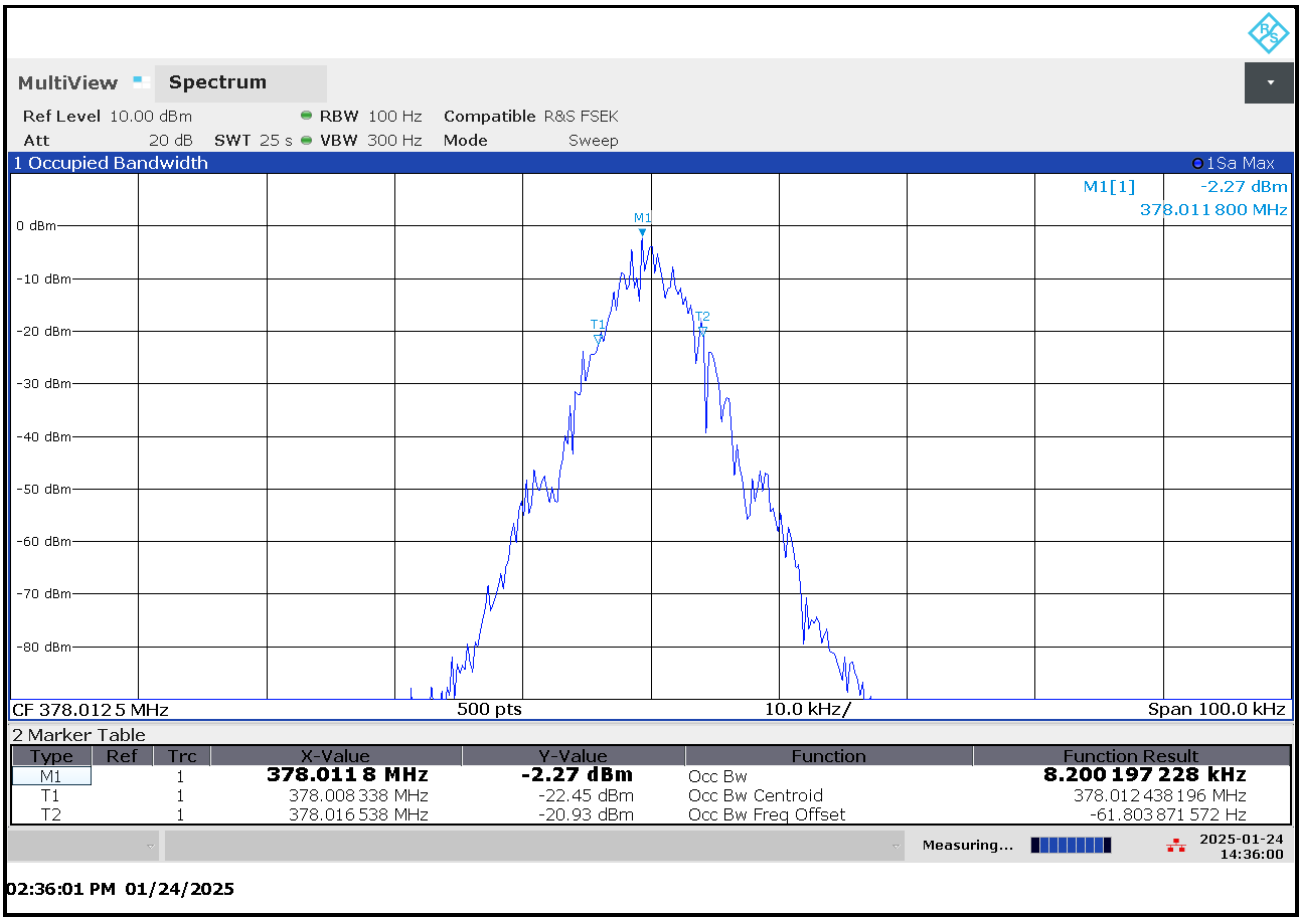
Plot 7-23: OBW 99%, 418.0125 MHz, WB Analog



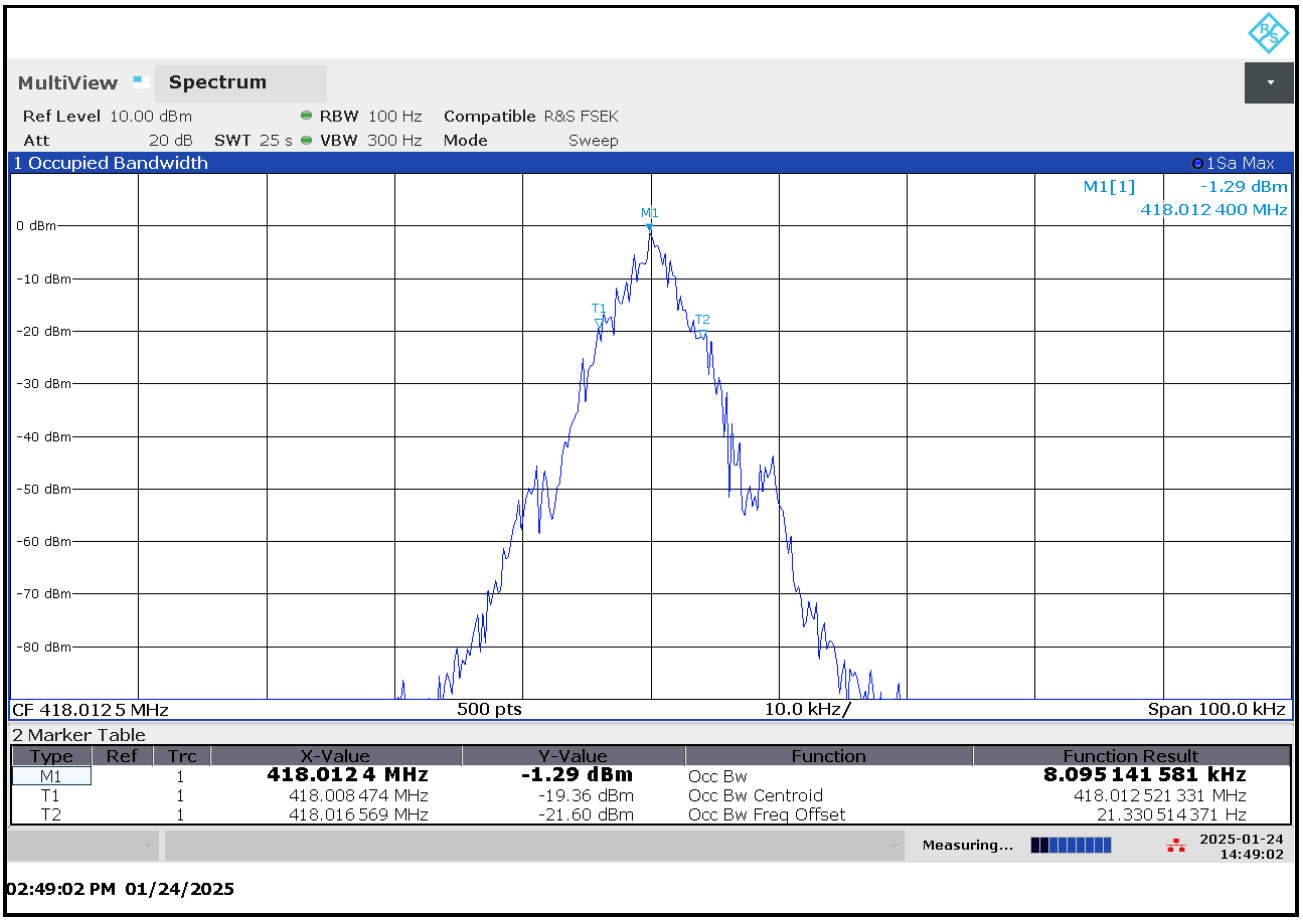
Plot 7-24: OBW 99%, 469.9875 MHz, WB Analog



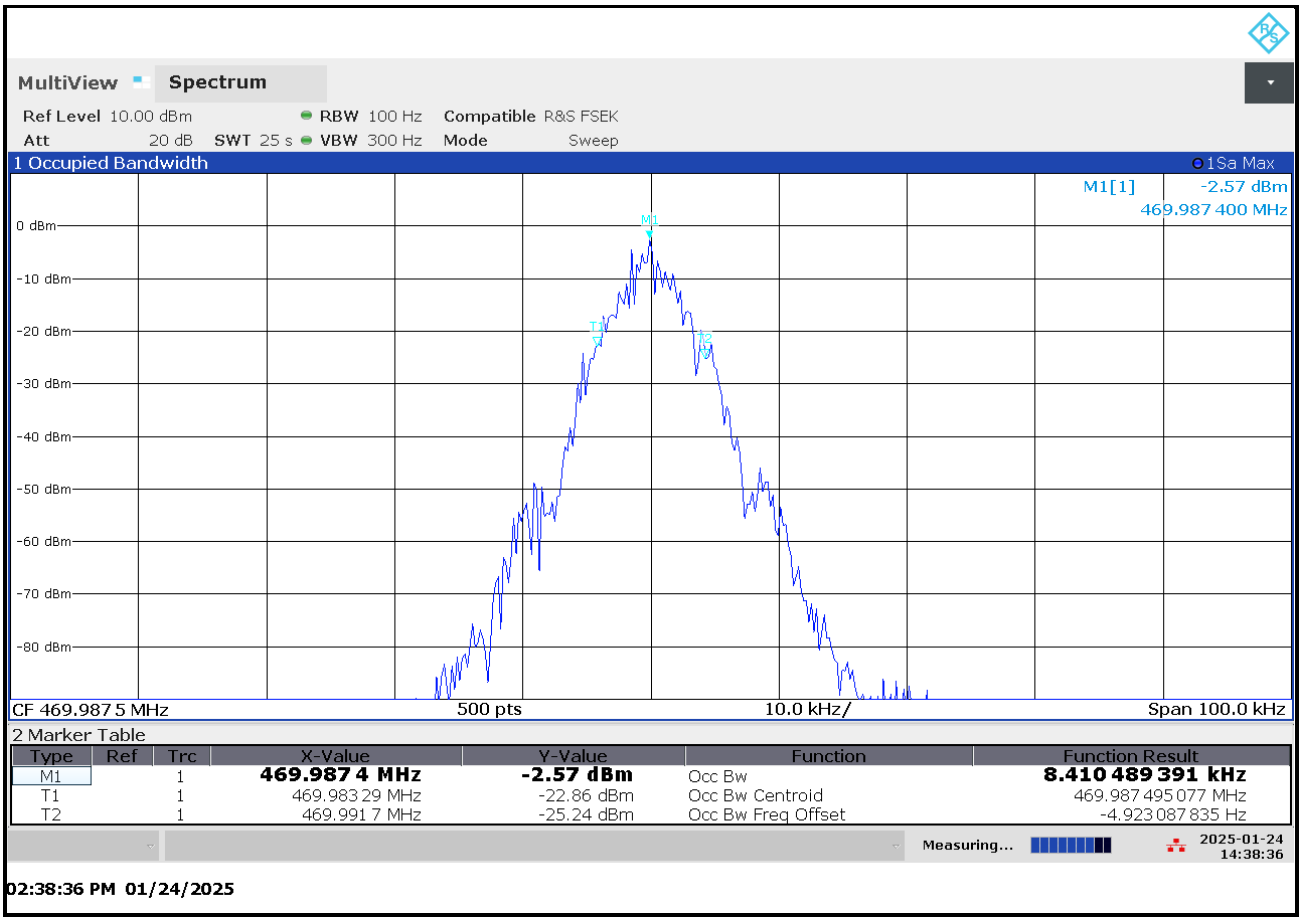
Plot 7-25: OBW 99%, 378.0125 MHz, NB 2 FSK



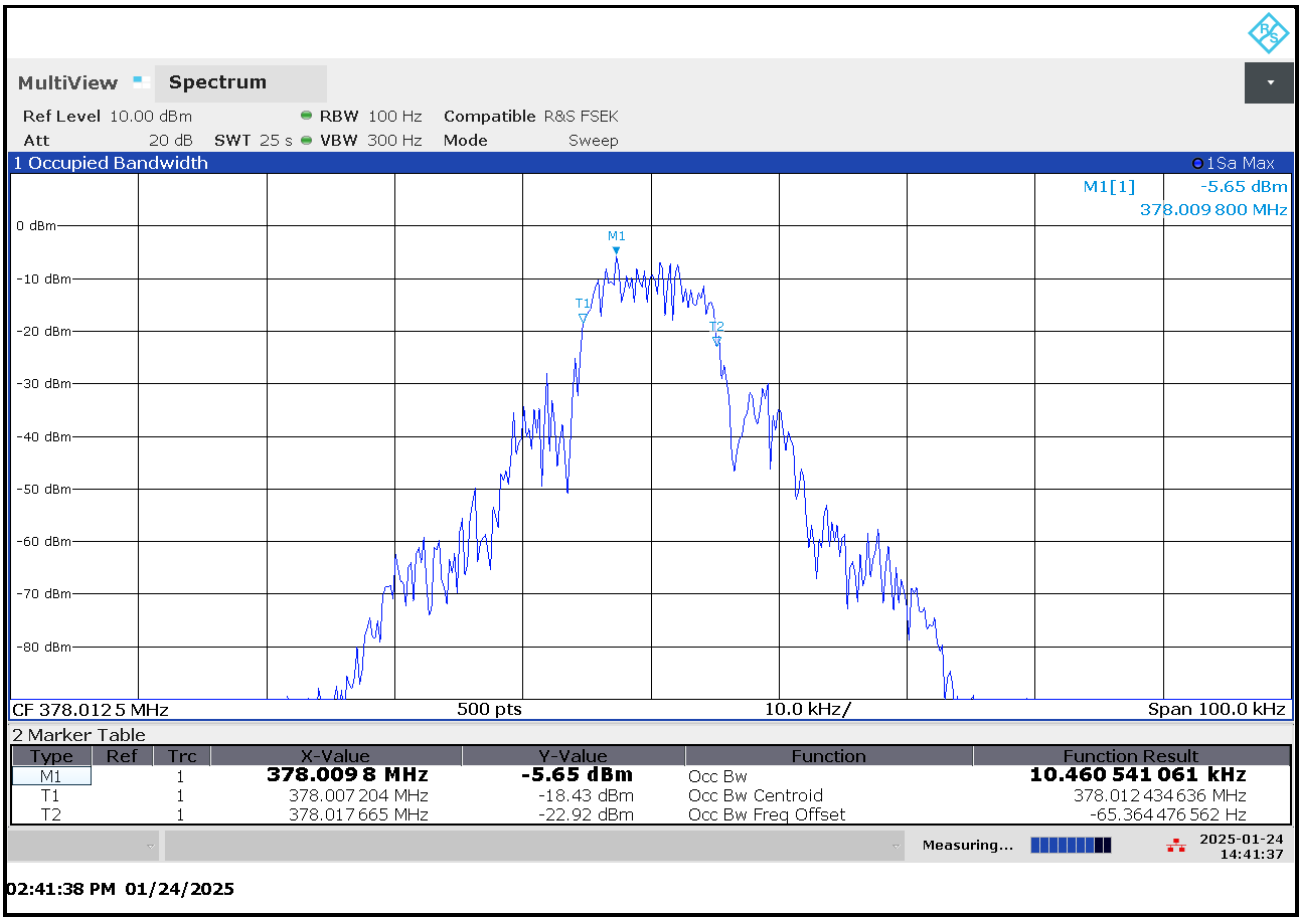
Plot 7-26: OBW 99%, 418.0125 MHz, NB 2 FSK



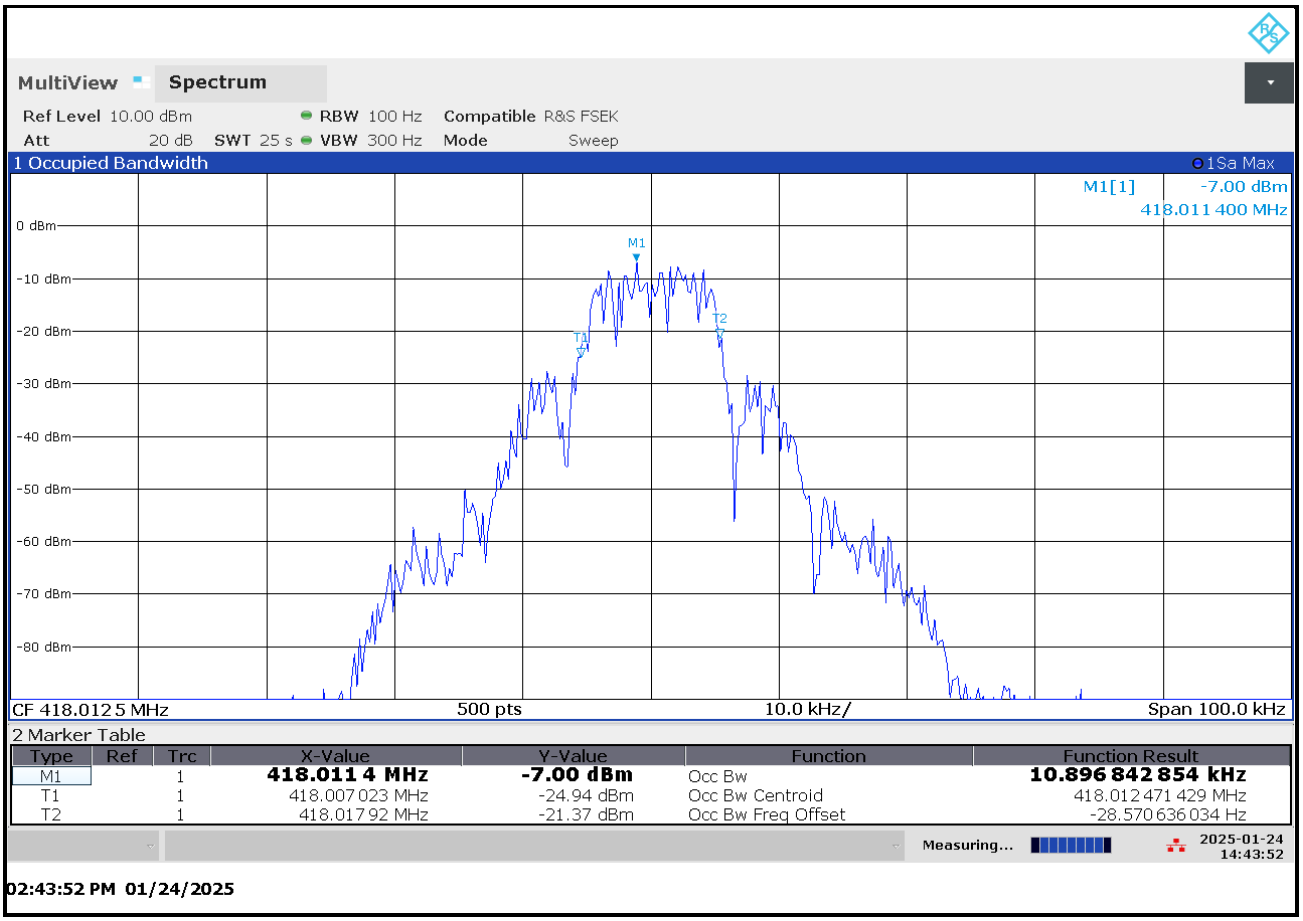
Plot 7-27: OBW 99%, 469.9875 MHz, NB 2 FSK



Plot 7-28: OBW 99%, 378.0125 MHz, WB 2 FSK

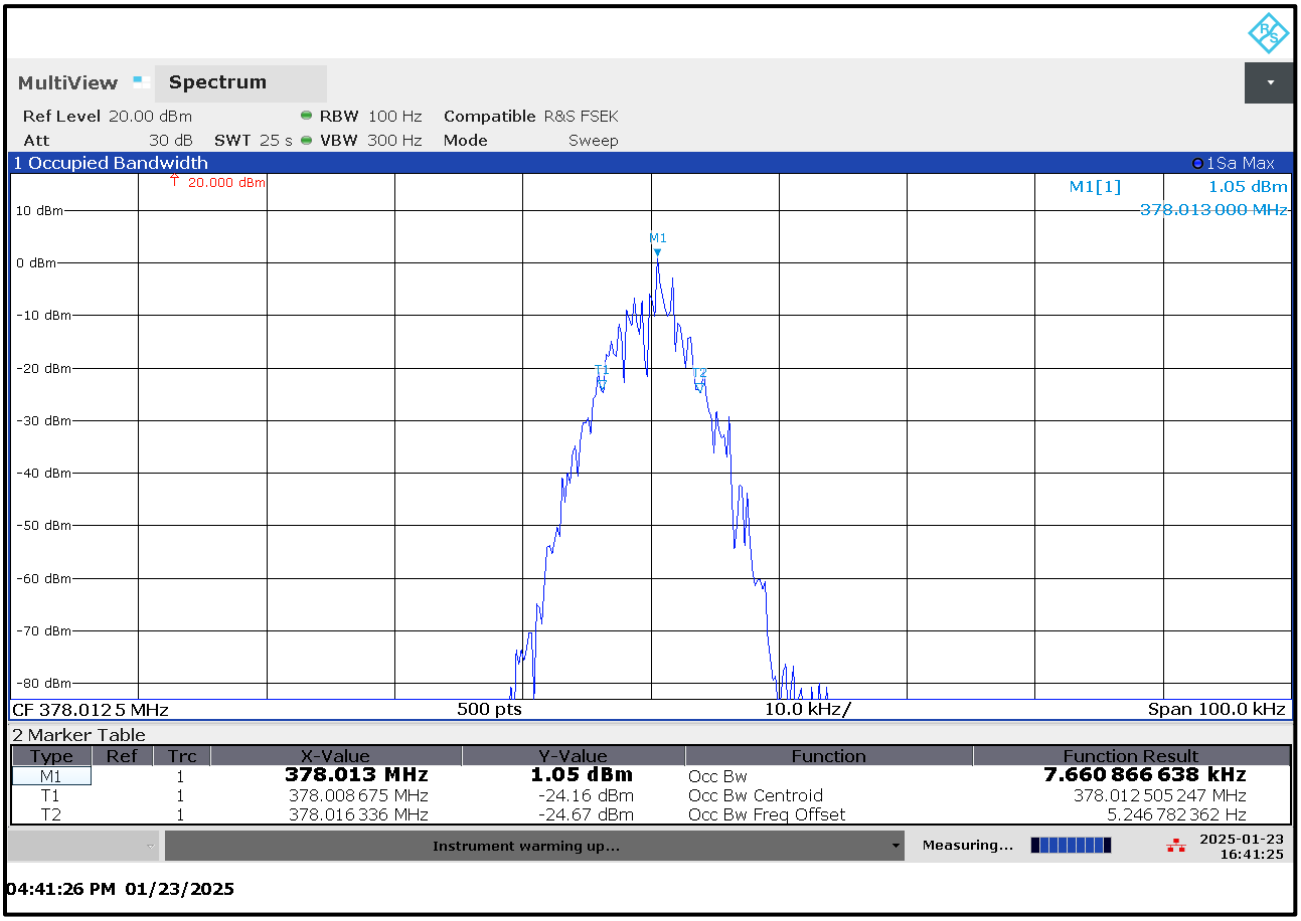


Plot 7-29: OBW 99%, 418.0125 MHz, WB 2 FSK

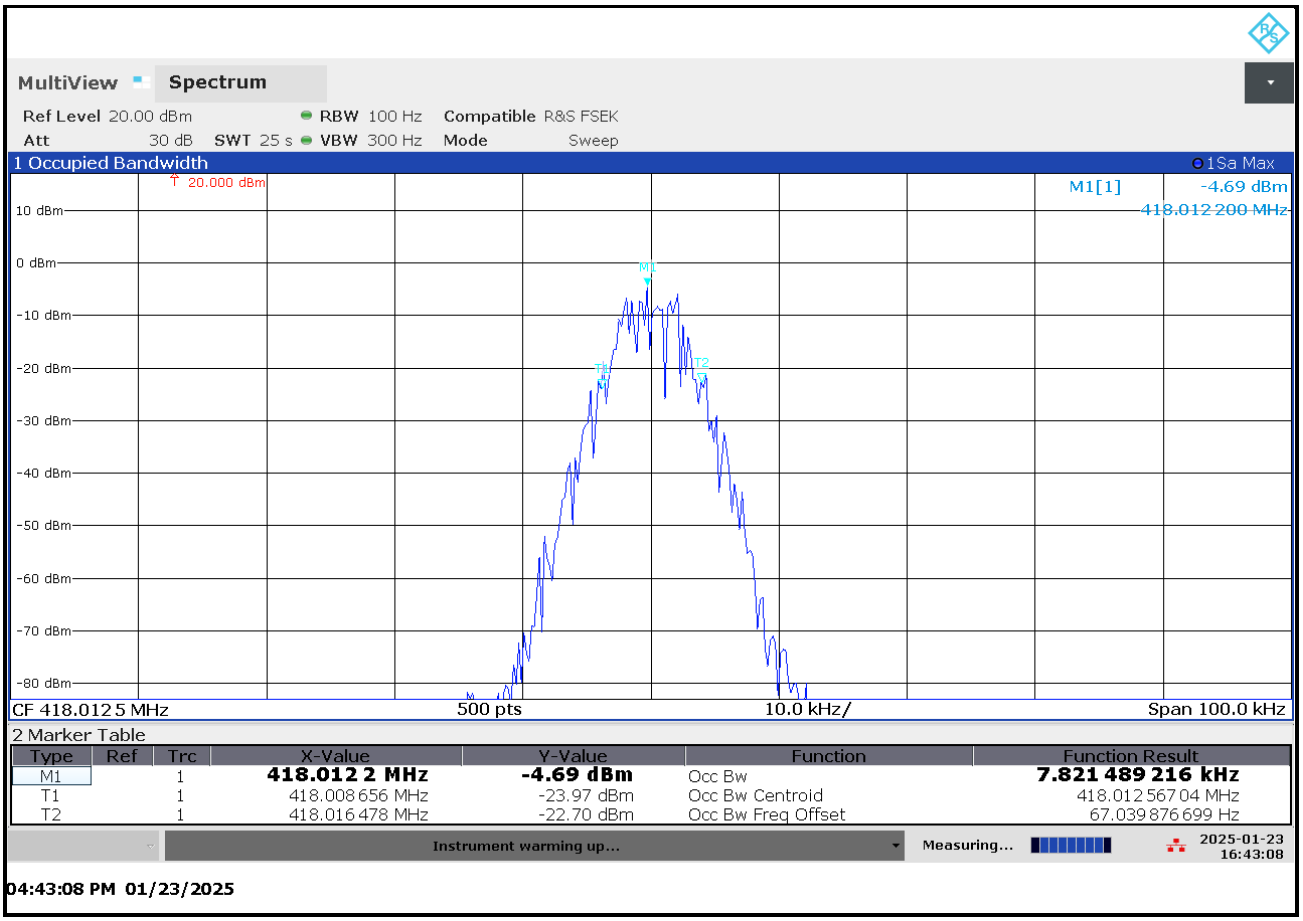


Plot 7-30: OBW 99%, 469.9875 MHz, WB 2 FSK

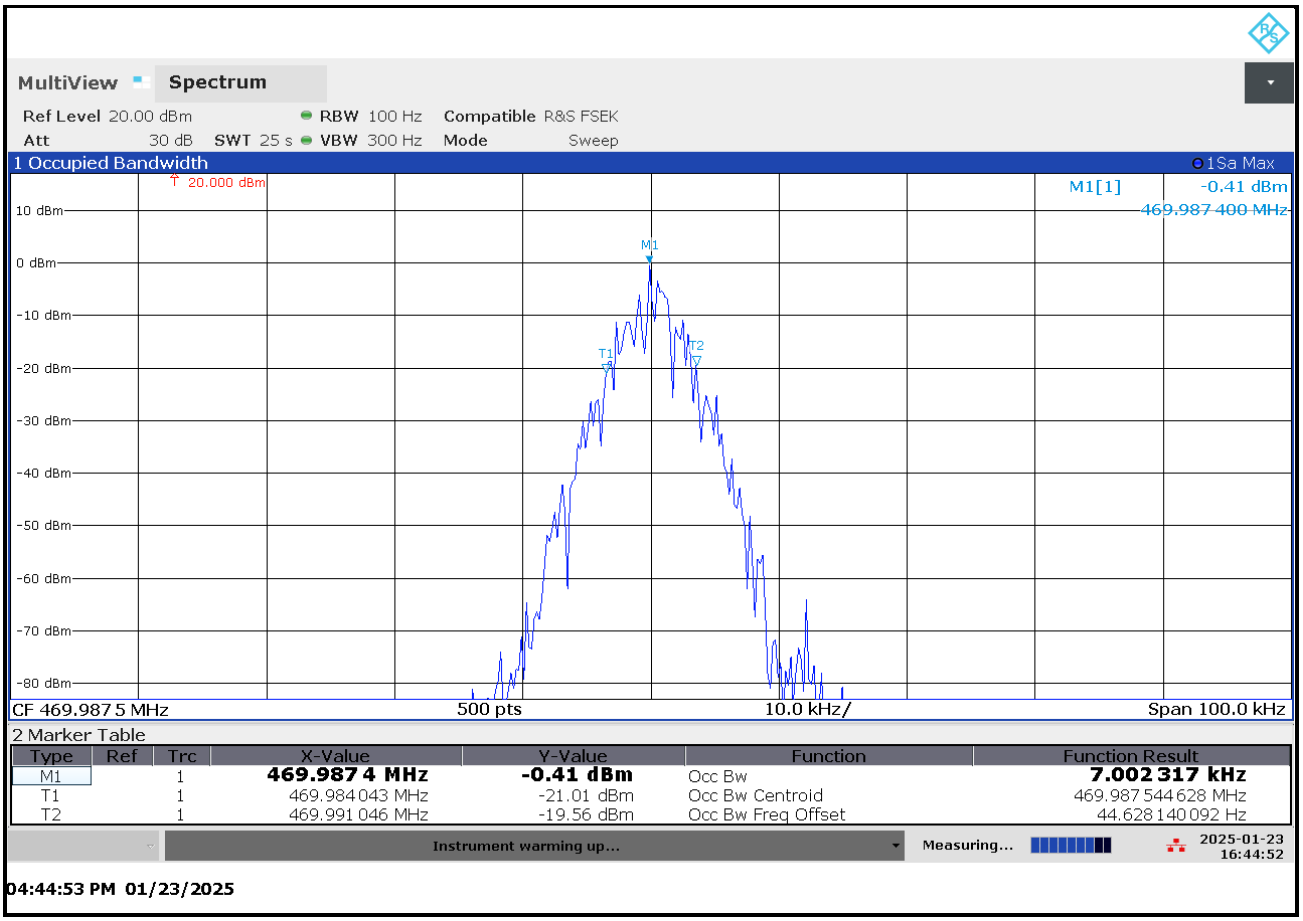
Plot 7-31: OBW 99%, 378.0125 MHz, C4FM



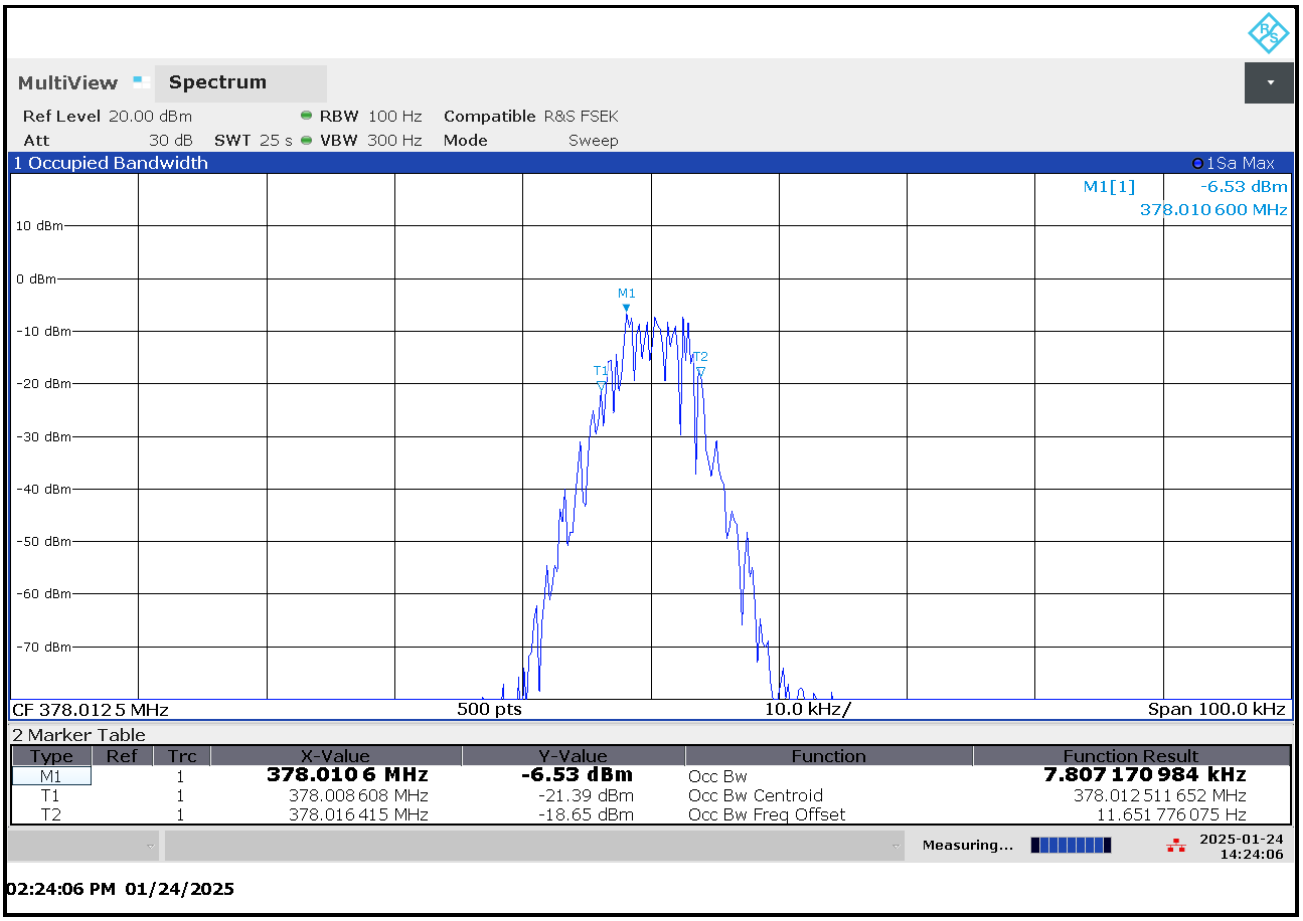
Plot 7-32: OBW 99%, 418.0125 MHz, C4FM



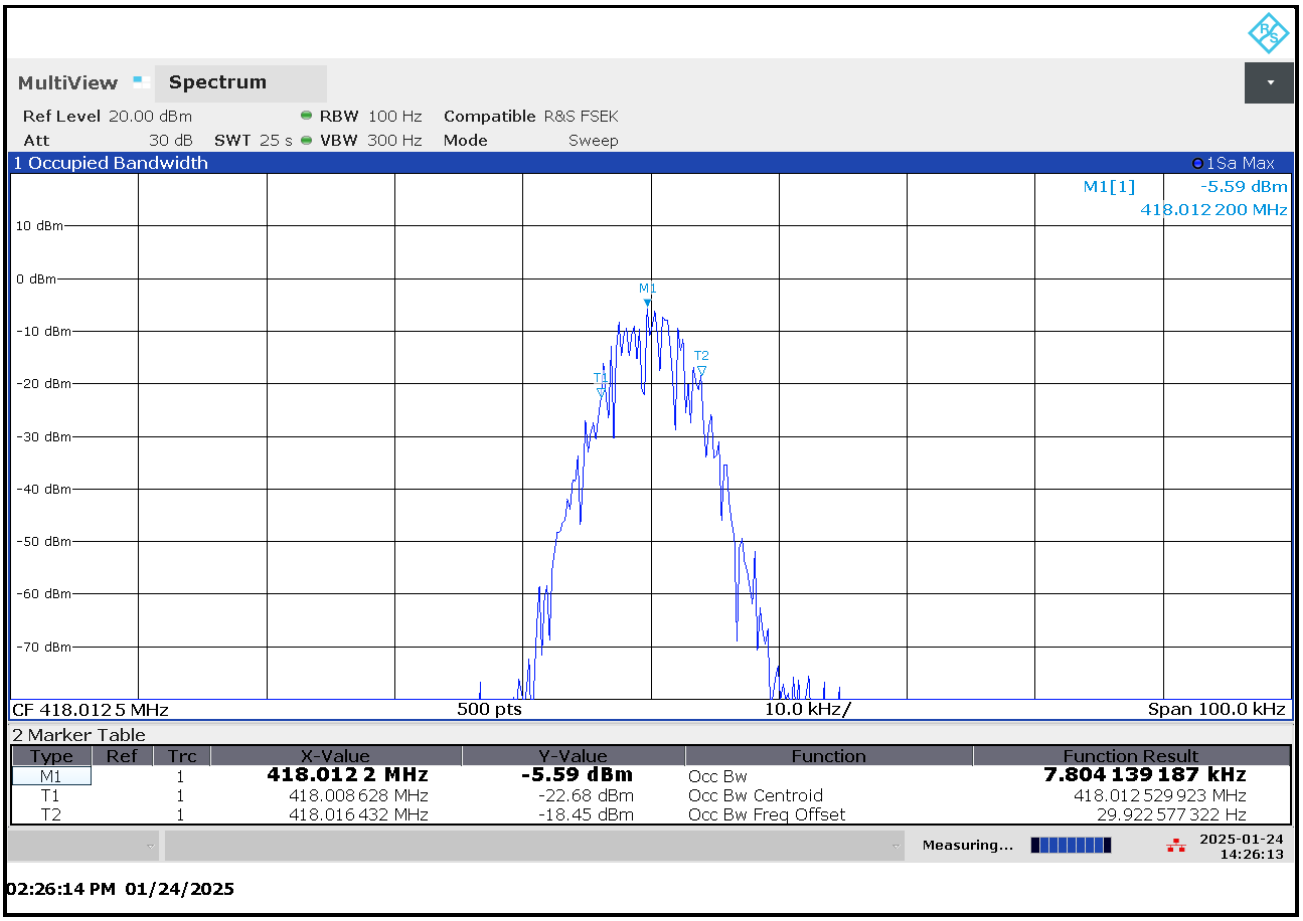
Plot 7-33: OBW 99%, 469.9875 MHz, C4FM



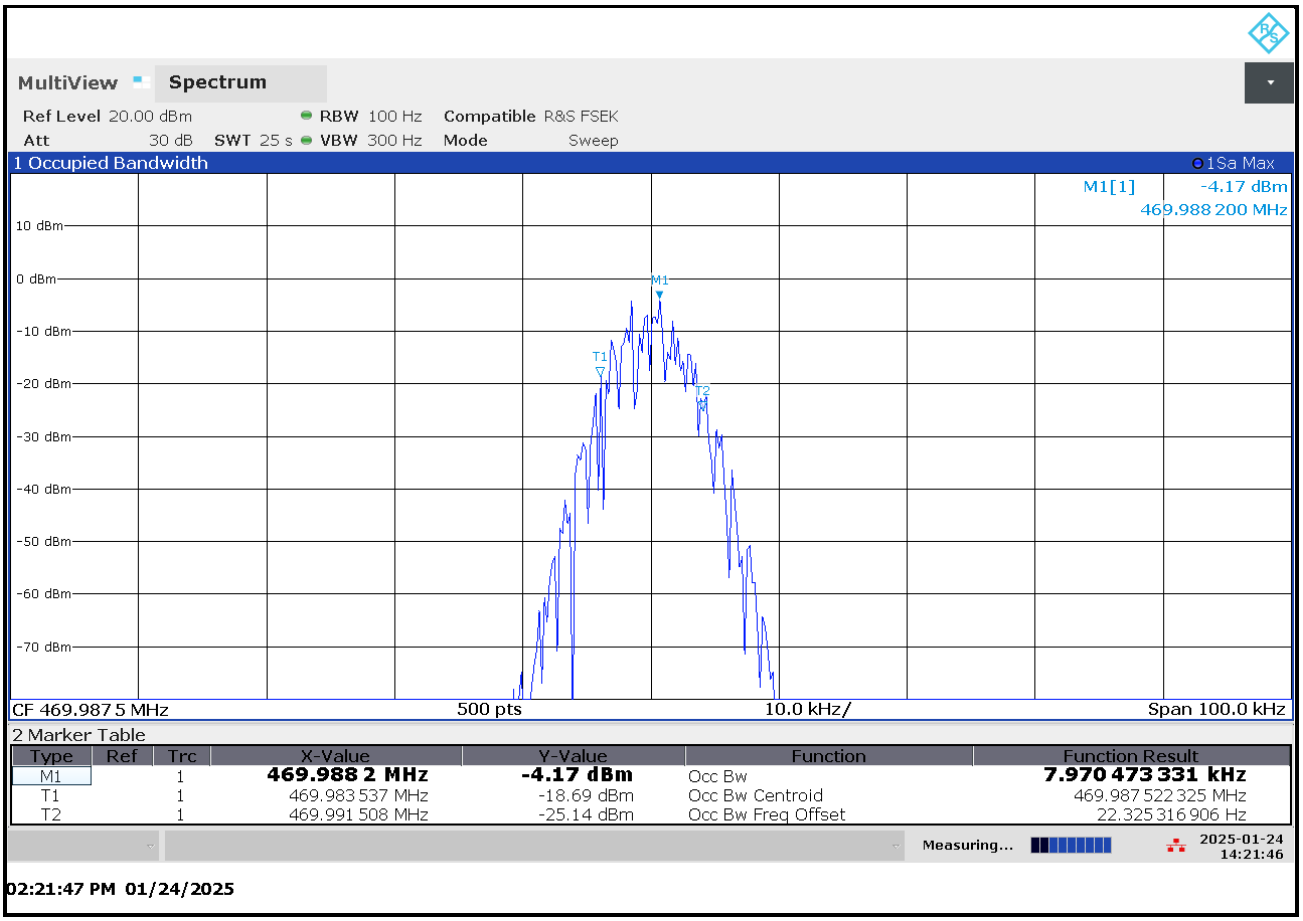
Plot 7-34: OBW 99%, 378.0125 MHz, H-CPM



Plot 7-35: OBW 99%, 418.0125 MHz, H-CPM



Plot 7-36: OBW 99%, 469.9875 MHz, H-CPM



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 Hz

Results: Pass

Table 7-1: Test Equipment for Occupied Bandwidth Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Analyzer	101021	02/02/2027
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2027
901760	Hewlett Packard	3336B	Synthesizer/ Level Generator	1931401314	03/28/2027
901791	Shireen	UF1-2.92	40 GHz 24" Cable	N/A	08/02/2027
901792	Shireen	UF1-2.92	40 GHz 300" Cable	N/A	08/02/2027

Test Personnel:

Daniel W. Baltzell		January 16 – March 24, 2025
EMC Test Engineer	Signature	Dates of Tests

8 FCC §2.1055: Frequency Stability; §22.355: Frequency Tolerance; §74.464; Frequency Tolerance; §80.209: Frequency Stability;§90.213: Frequency Stability; ISED RSS-119 5.3: Transmitter Frequency Stability

8.1 Test Procedure

ANSI C63.26, section 5.6

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 AFC was not locked to the base station. The temperature was initially set to -30°C, and 1 hour was observed to stabilize the EUT. The frequency stability was measured within one minute after the application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade throughout 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 the application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied by +/-15% nominal input voltage.

§22.355 Frequency tolerance. Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Mobile >3 Watts (ppm)
50-450	5.0
450-512	5.0
821-896	2.5

§74.464 Frequency tolerance. For operations on frequencies above 25 MHz using authorized bandwidths to 30 kHz, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in compliance with the frequency tolerance requirements of §90.213 of this chapter.

§80.209: 156-162 MHz = 5 ppm for coast stations operating between 3 W and 100 W. 400-466 MHz = 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.

§90.213 Minimum Frequency Stability [Parts Per Million (PPM)] Limit

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]			

[8] In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

RSS-119 Limits:

Frequency Band (MHz)	Channel Bandwidth (kHz)	Frequency Stability (ppm)		
		Base/Fixed	Mobile Station	
			Output Power > 2 W	Output Power ≤ 2 W
27.41-28 and 29.7-50	20	20	20	50
72-76	20	5	20	50
138-174	30	5	5	5
	15	2.5	5	5
	7.5	1	2	5
217-218 and 219-220	12.5	1	5	5
220-222 (Note 1)	5	0.1	1.5	1.5
406.1-430 and 450-470 (Note 6)	25 (Note 2)	0.5	1	1
	25	2.5	5	5
	12.5	1.5	2.5	2.5
	6.25	0.5	1	1

Note 2: This provision is for digital equipment with a channel bandwidth of 25 kHz and an occupied bandwidth greater than 20 kHz. The mobile station's frequency stability values given in Table 1 are for mobile, portable and control transmitters using automatic frequency control (AFC) to lock onto the base station signal. When the mobile, portable and control transmitters are operating without using AFC to lock onto the base station signal, the frequency stability limit shall be better than 1 kHz and the equipment's unwanted emissions measured with maximum frequency shift shall still comply with emission mask Y (Section 5.8.10) at nominal carrier frequency.

8.2 Test Data

8.2.1 Temperature Frequency Stability

Table 8-1: Temperature Frequency Stability – 378.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	378.012390	-0.29
-20	378.012370	-0.34
-10	378.012410	-0.24
0	378.012460	-0.11
10	378.012470	-0.08
20 (reference)	378.012500	0.00
30	378.012480	-0.05
40	378.012470	-0.08
50	378.012460	-0.11
60	378.012470	-0.08

Table 8-2: Temperature Frequency Stability – 418.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	418.012340	-0.38
-20	418.012350	-0.36
-10	418.012400	-0.24
0	418.012440	-0.14
10	418.012470	-0.07
20 (reference)	418.012500	0.00
30	418.012480	-0.05
40	418.012470	-0.07
50	418.012450	-0.12
60	418.012470	-0.07

Table 8-3: Temperature Frequency Stability – 469.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	469.987330	-0.36
-20	469.987330	-0.36
-10	469.987410	-0.19
0	469.987420	-0.17
10	469.987480	-0.04
20 (reference)	469.987500	0.00
30	469.987470	-0.06
40	469.987460	-0.09
50	469.987450	-0.11
60	469.987460	-0.09

8.2.2 Frequency Stability/Voltage Variation

Table 8-4: Frequency Stability/Voltage Variation – 378.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.22	378.012500	0.00
13.2(reference)	378.012500	0.00
15.18	378.012500	0.00

Table 8-5: Frequency Stability/Voltage Variation – 418.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.22	418.012500	0.00
13.2(reference)	418.012500	0.00
15.18	418.012490	-0.02

Table 8-6: Frequency Stability/Voltage Variation – 469.9875 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.22	469.987490	-0.02
13.2(reference)	469.987500	0.00
15.18	469.987490	-0.02

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 Hz

Results: Pass

Table 8-7: Test Equipment for Temperature Frequency Stability & Frequency Stability/Voltage Variation Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	10/18/2027
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	04/25/2027
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2027
N/A	GW Instek	PSS-3203	Power Supply	2679	Not Required
900946	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	04/07/2027

Test Personnel:

Daniel W. Baltzell		January 23, 2025
EMC Test Engineer	Signature	Date of Test

9 FCC §2.1047(a)(b): Modulation Characteristics; §74.463: Modulation Requirements; §80.213: Modulation Requirements; RSS-119 5.2: Types of Modulation

9.1 Test Procedures

9.1.1 Audio Frequency Response

ANSI C63.26-2015, section 5.3.3

The audio frequency response is the degree of closeness to which the transmitter's frequency deviation 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)

9.1.2 Audio Low Pass Filter Response

ANSI C63.26-2015, section 5.3

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

9.1.3 Modulation Limiting

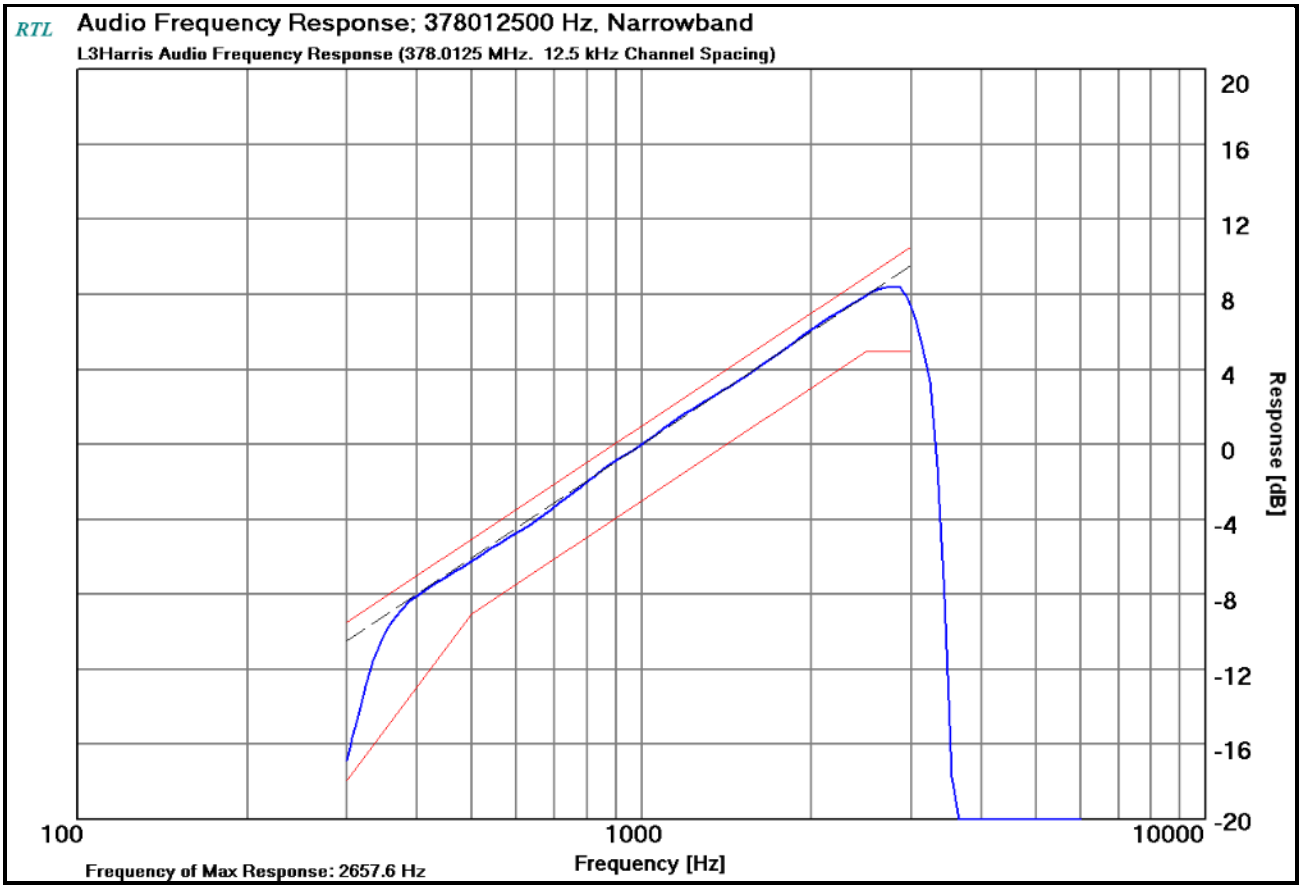
ANSI C63.26-2015, section 5.3.2

The transmitter was adjusted for full-rated system deviation. The audio input level was adjusted for 60% of the 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.

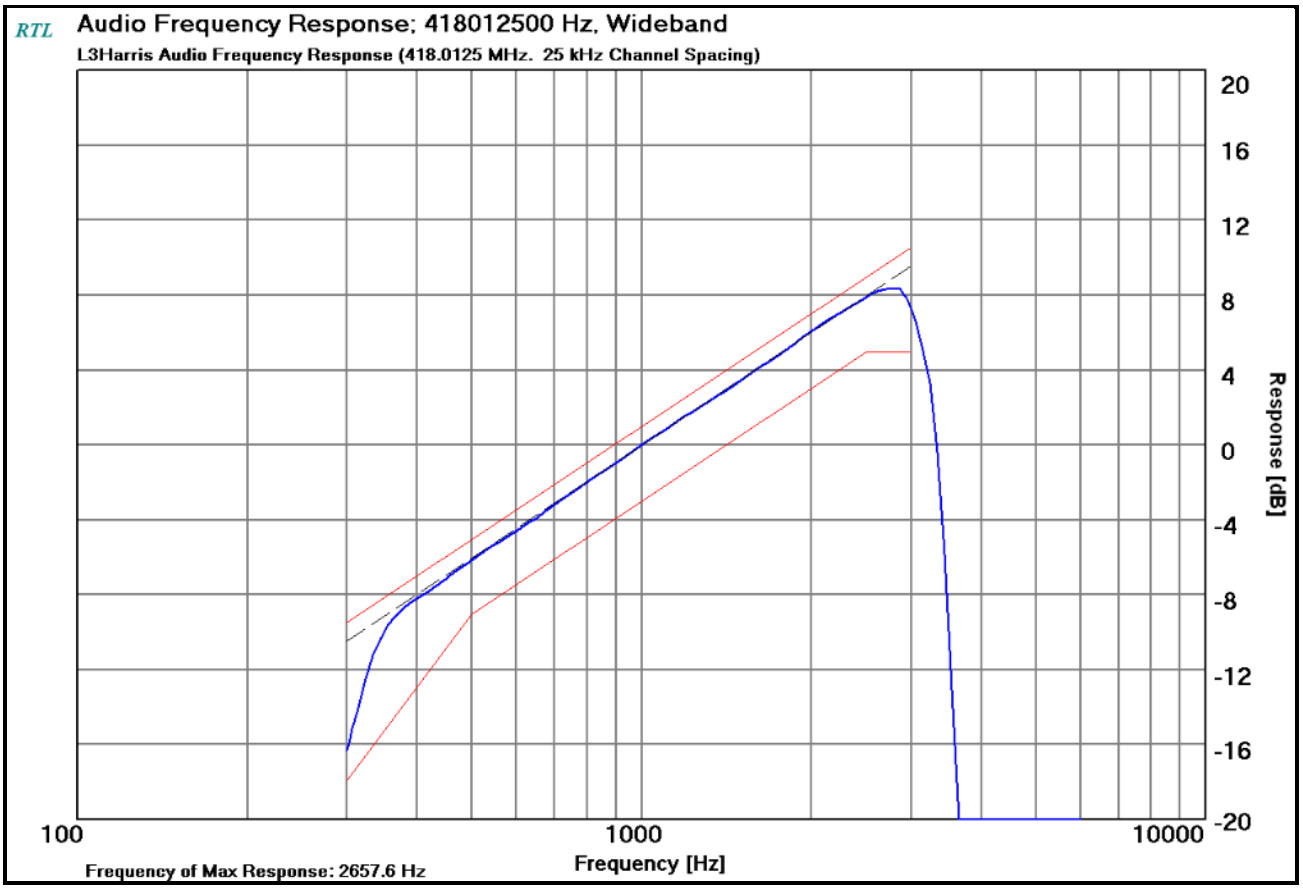
9.2 Test Data

9.2.1 Audio Frequency Response

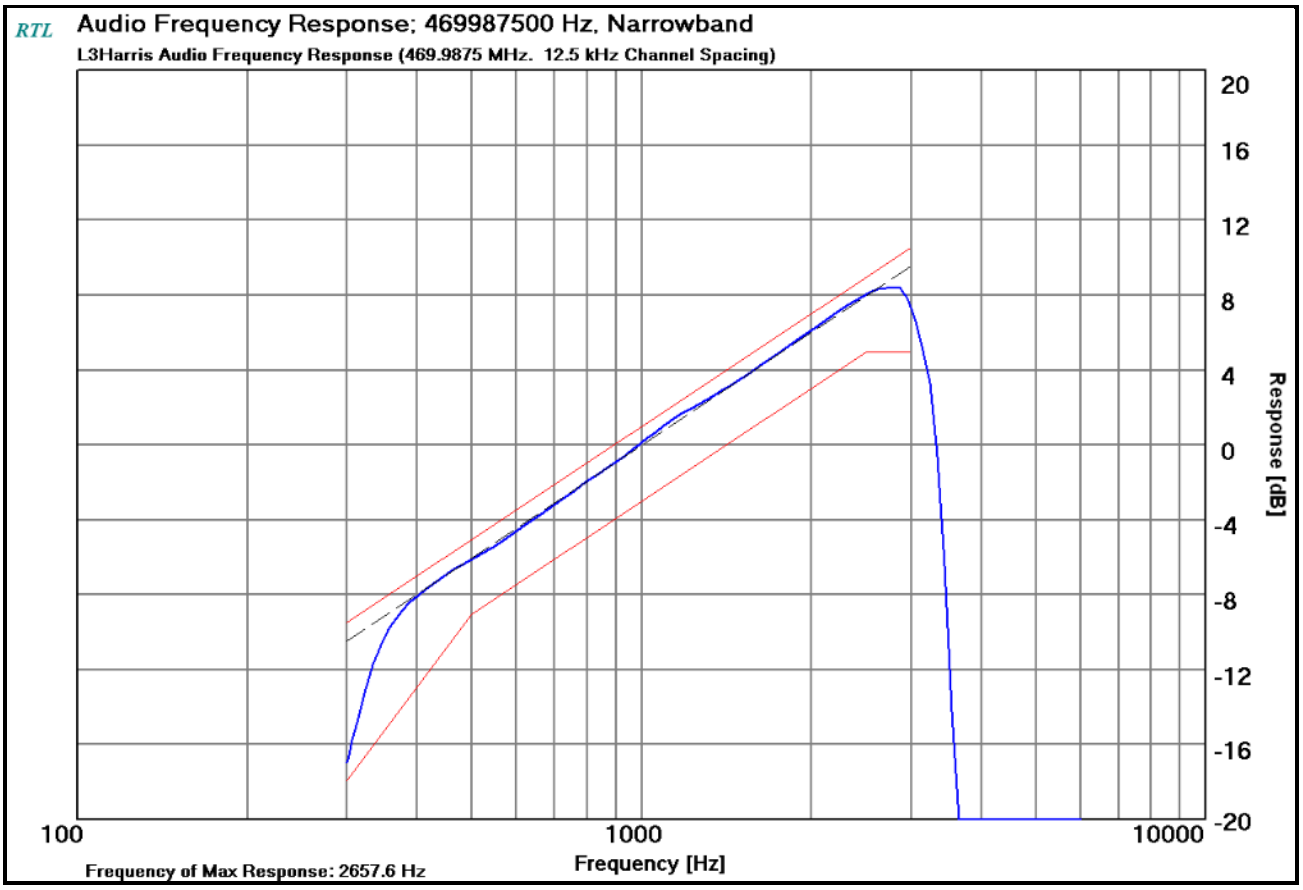
Plot 9-1: Modulation Characteristics - Audio Frequency Response – 378.0125 MHz (NB)



Plot 9-2: Modulation Characteristics - Audio Frequency Response – 418.0125 MHz (WB)

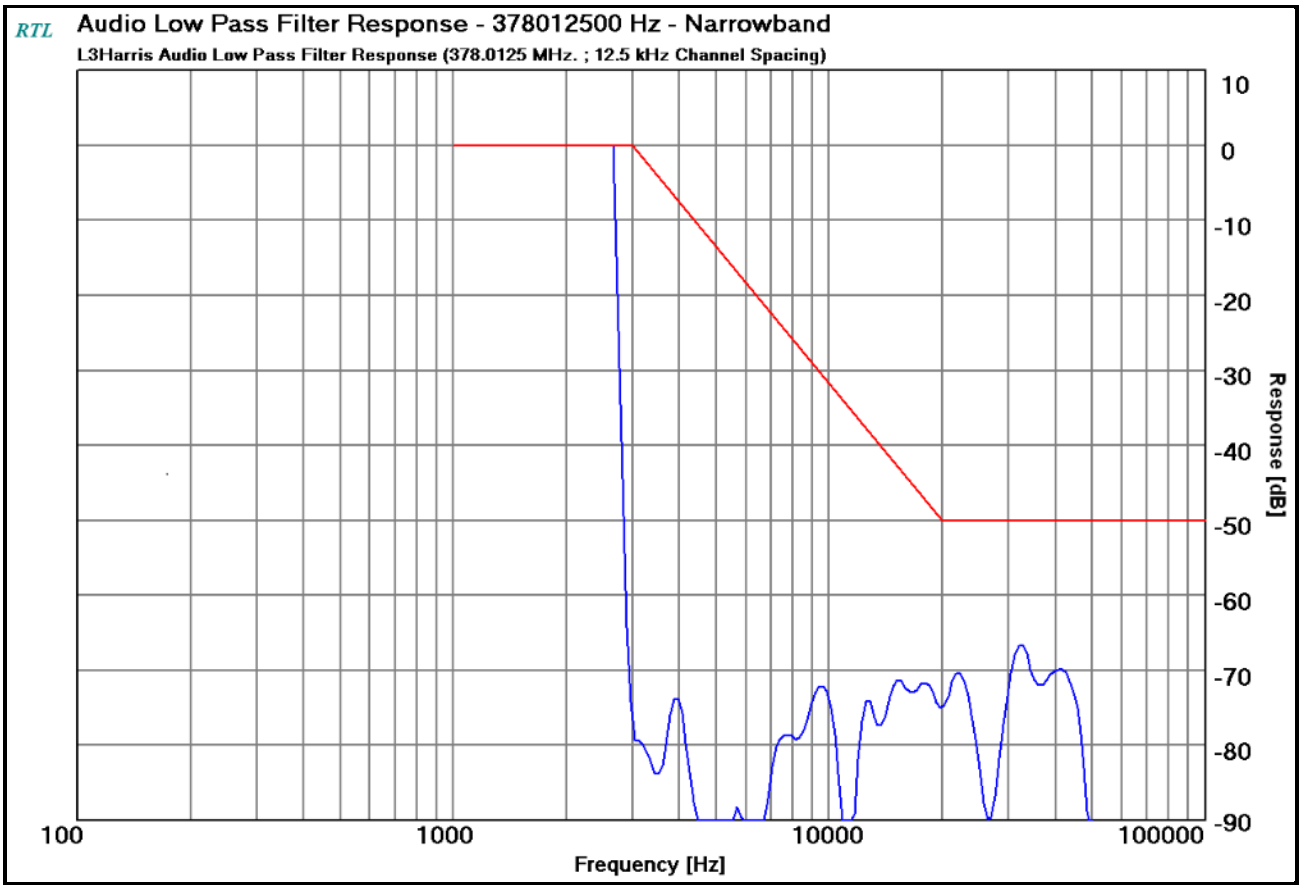


Plot 9-3: Modulation Characteristics - Audio Frequency Response – 469.0125 MHz (NB)

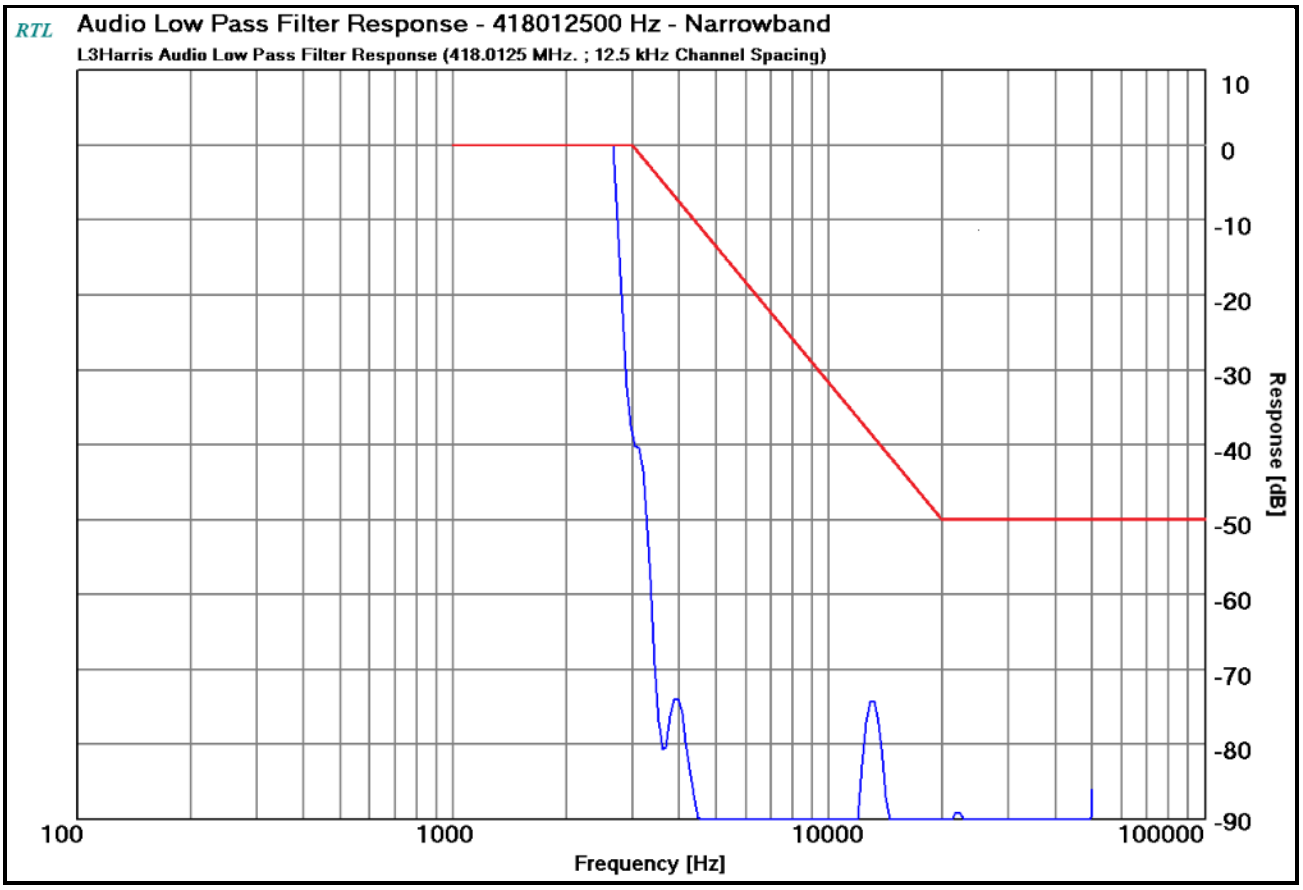


9.2.2 Audio Low Pass Filter Response

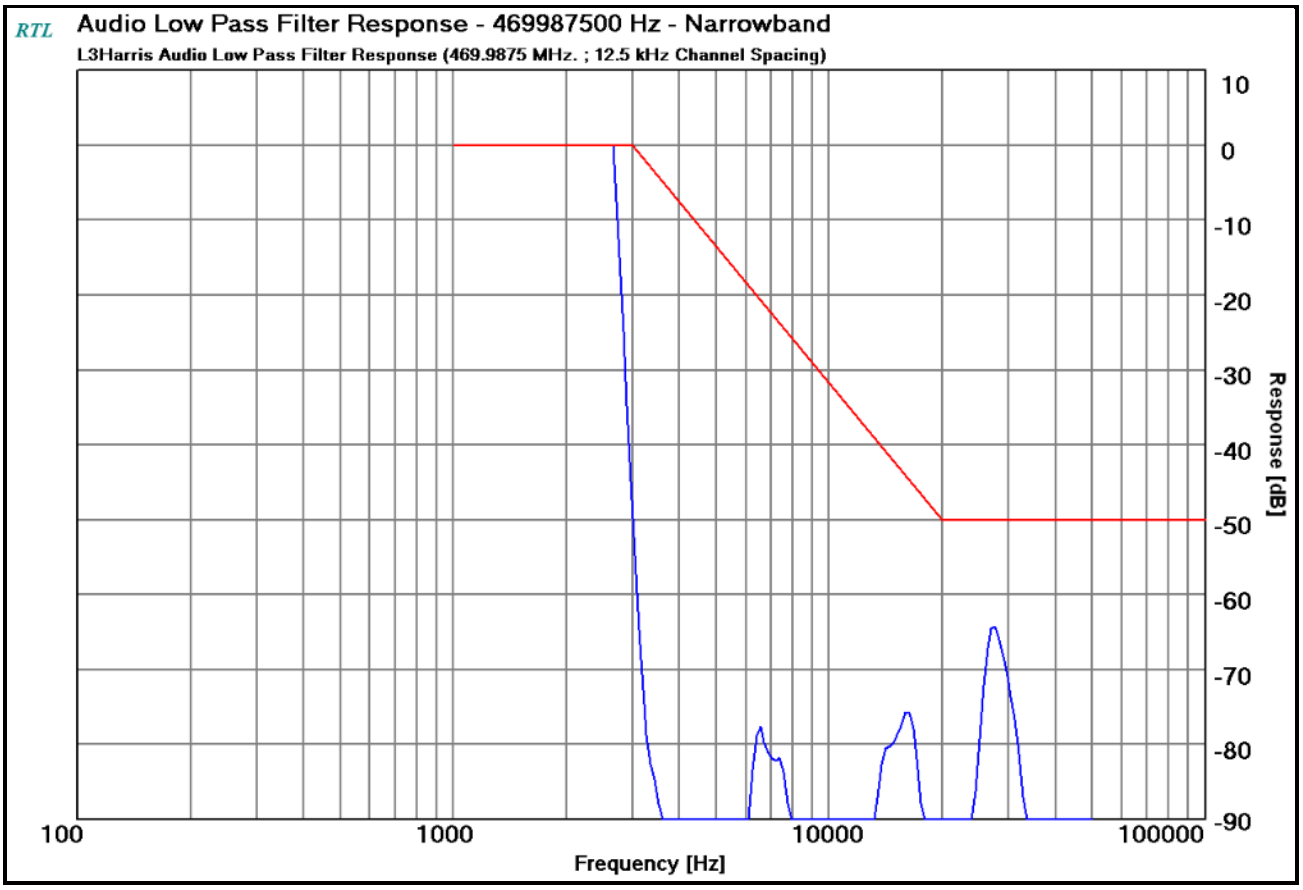
Plot 9-4: Modulation Characteristics - Audio Low Pass Filter Response – 378.0125 MHz (NB)



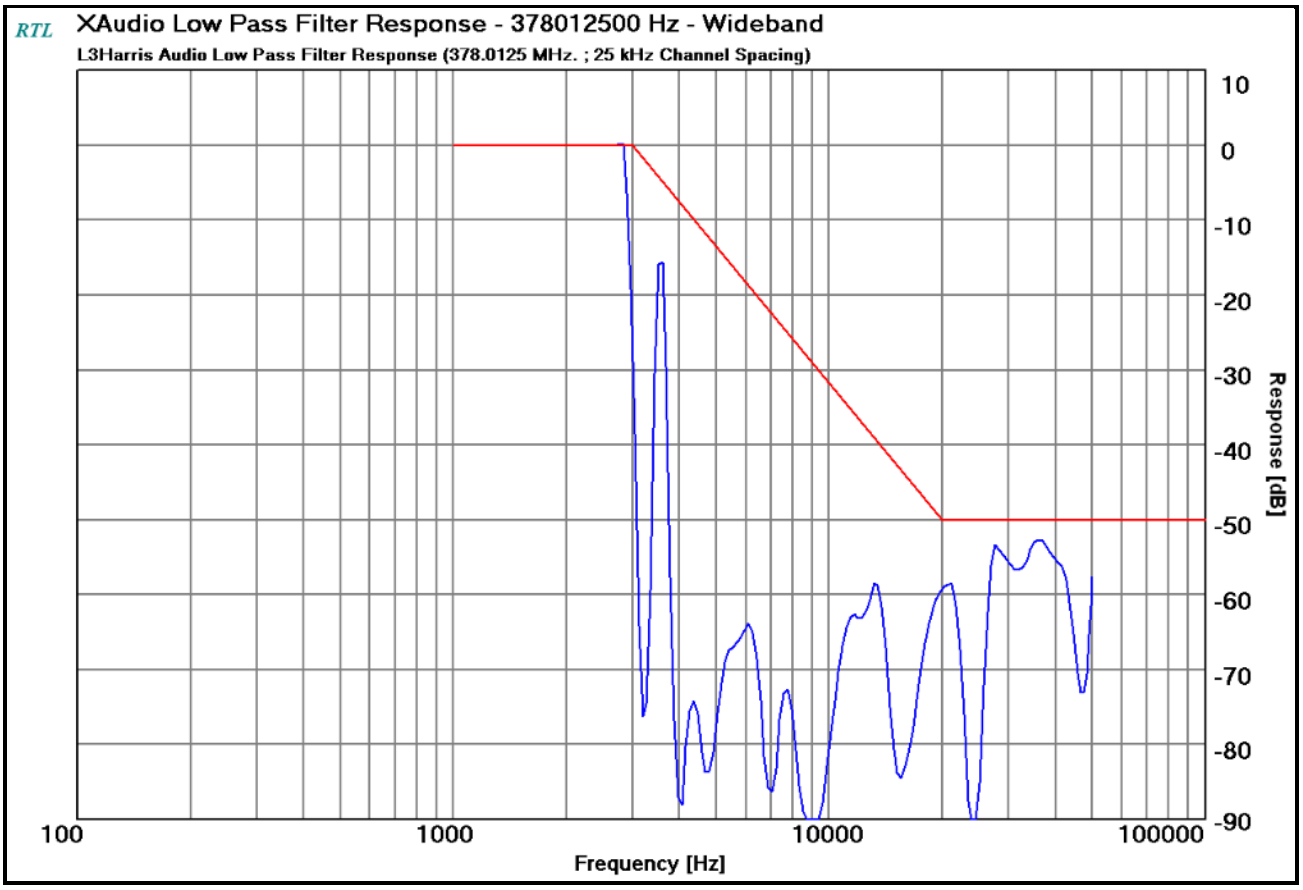
Plot 9-5: Modulation Characteristics - Audio Low Pass Filter Response – 418.0125 MHz (NB)



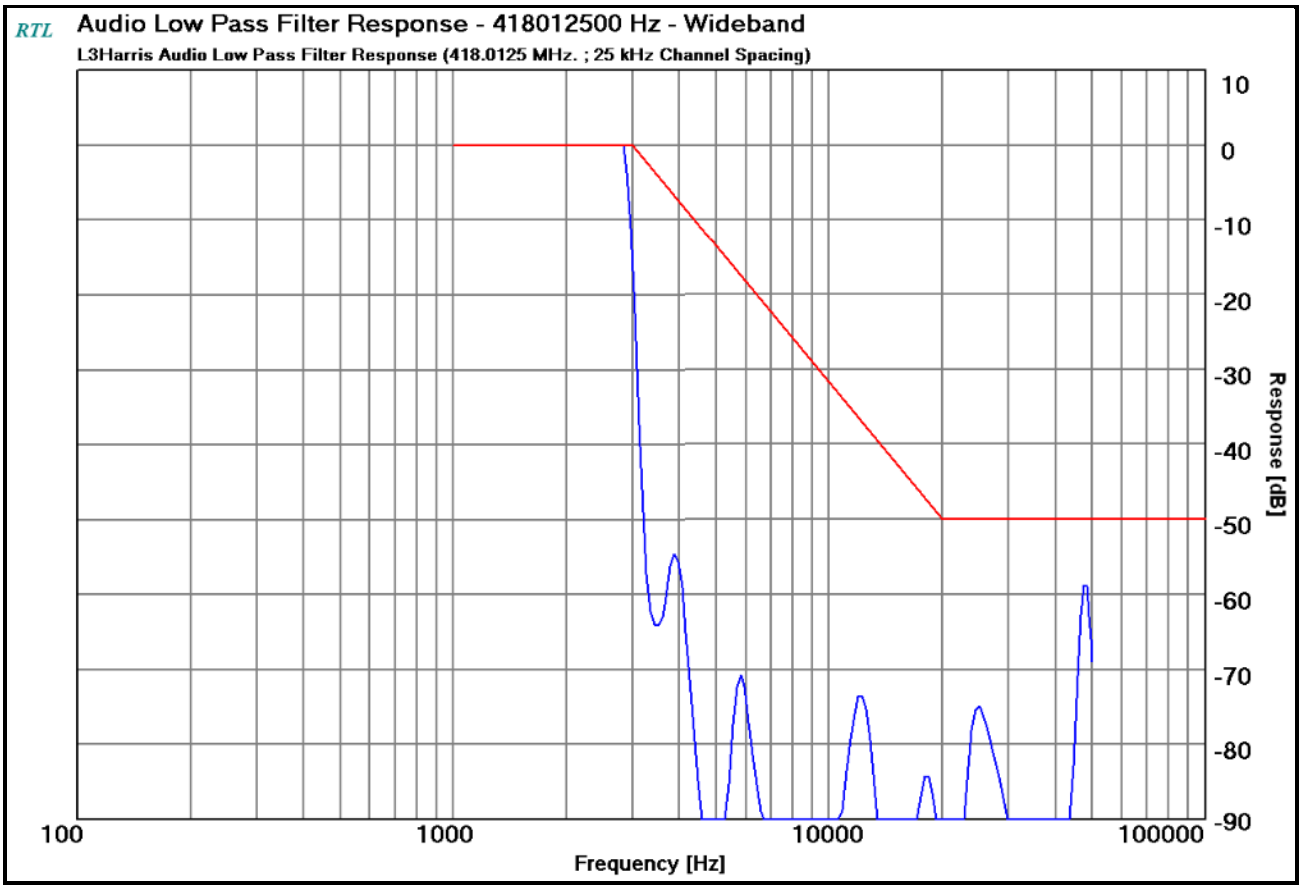
Plot 9-6: Modulation Characteristics - Audio Low Pass Filter Response – 469.9875 MHz (NB)



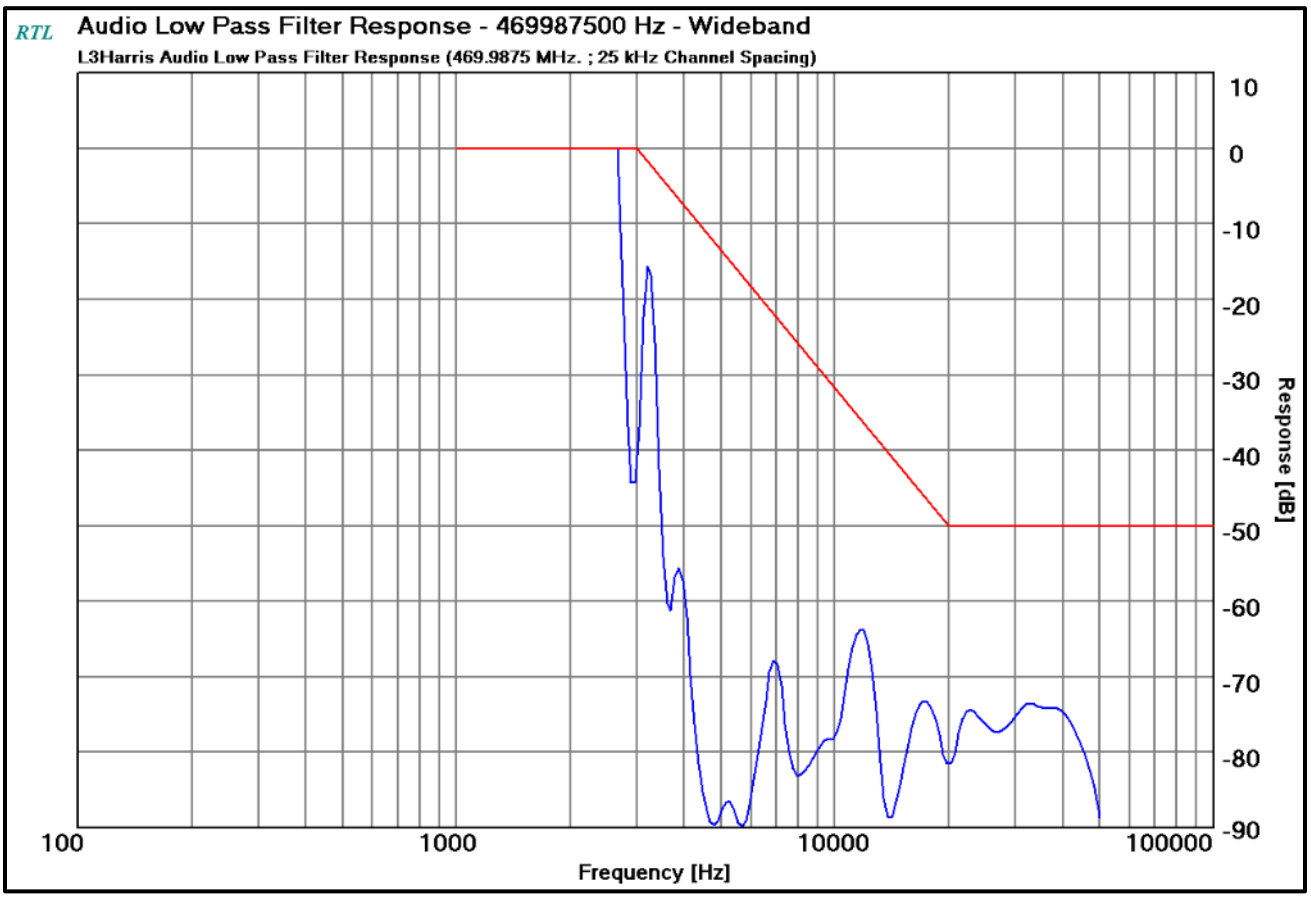
Plot 9-7: Modulation Characteristics - Audio Low Pass Filter Response – 378.0125 MHz (WB)



Plot 9-8: Modulation Characteristics - Audio Low Pass Filter Response – 418.0125 MHz (WB)

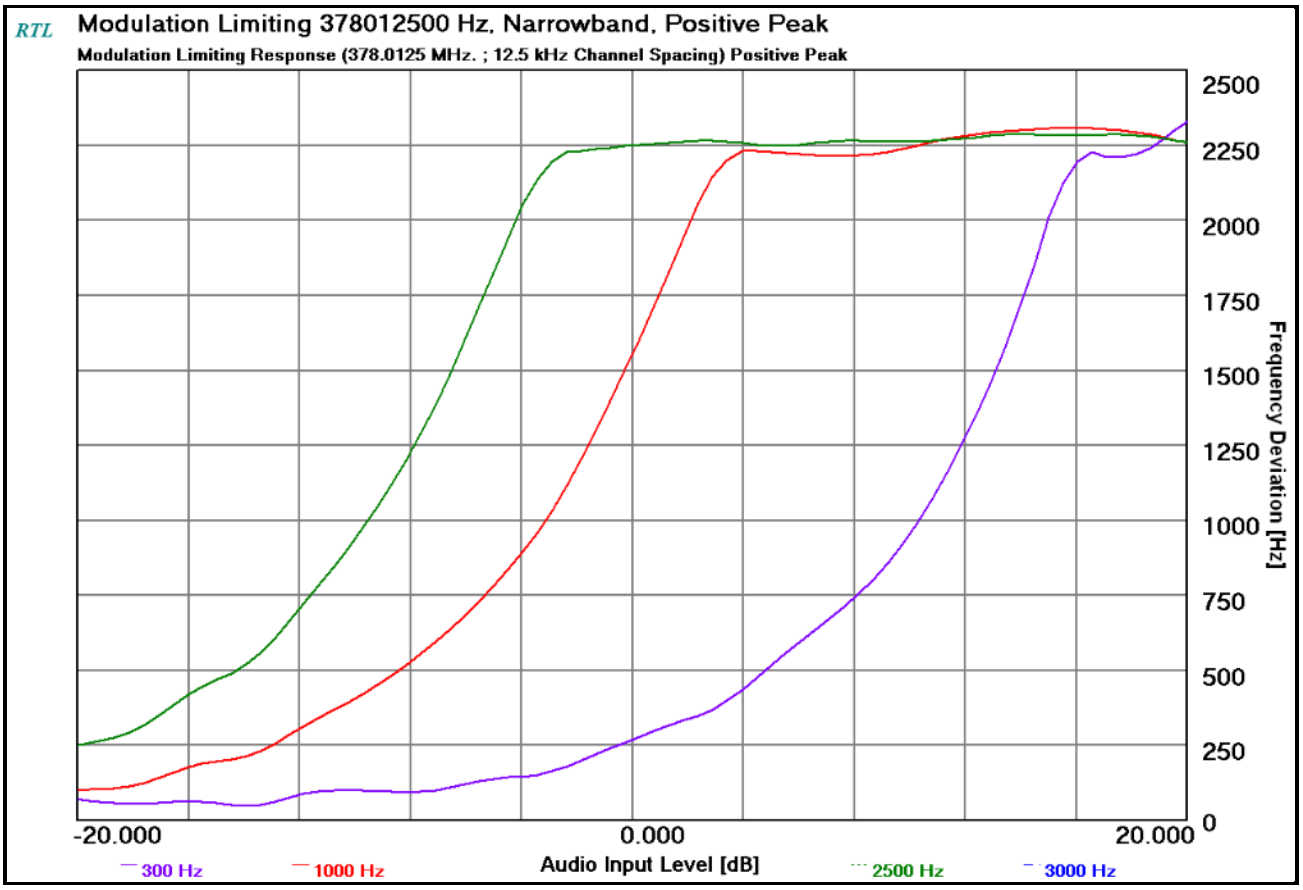


Plot 9-9: Modulation Characteristics - Audio Low Pass Filter Response – 469.9875 MHz (WB)

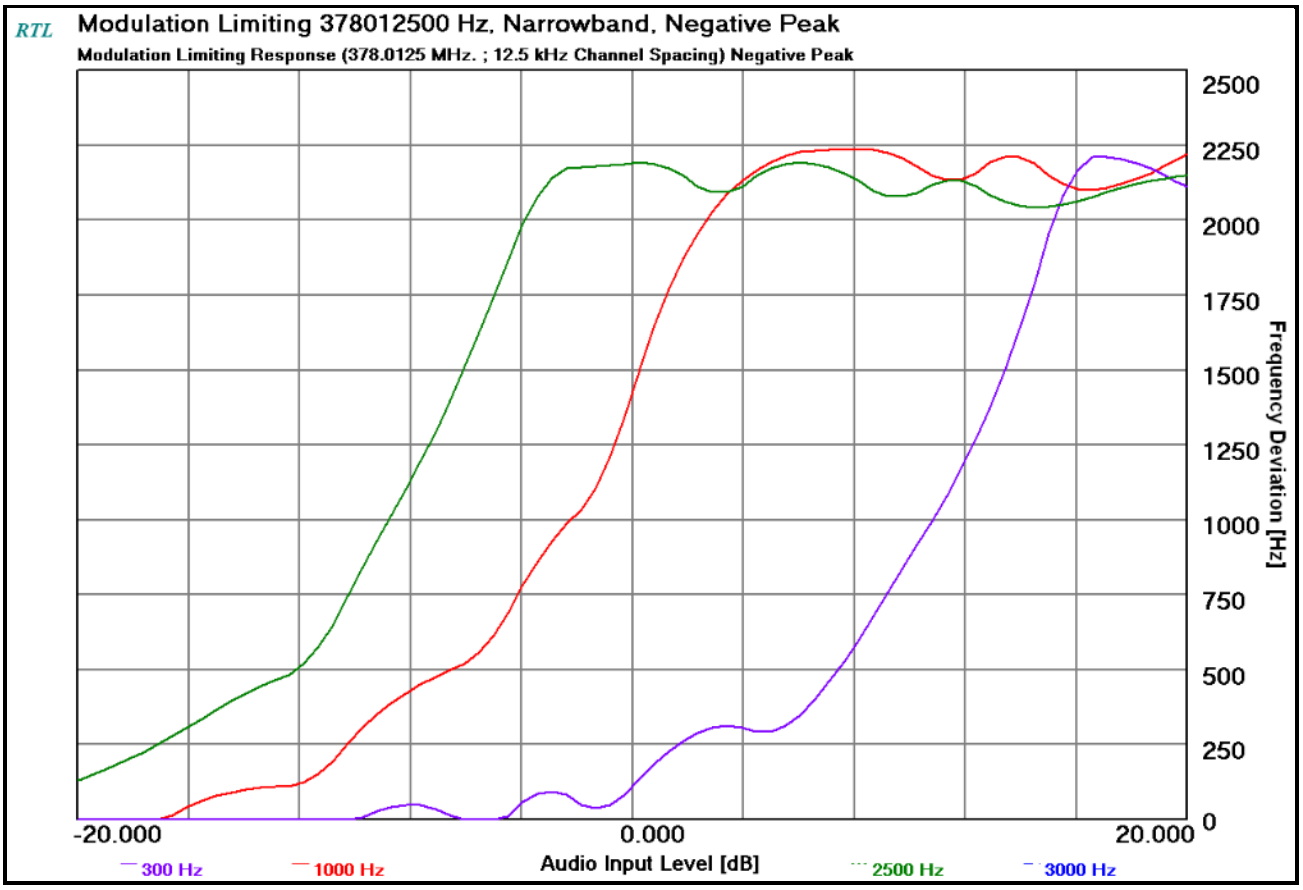


9.2.3 Modulation Limiting

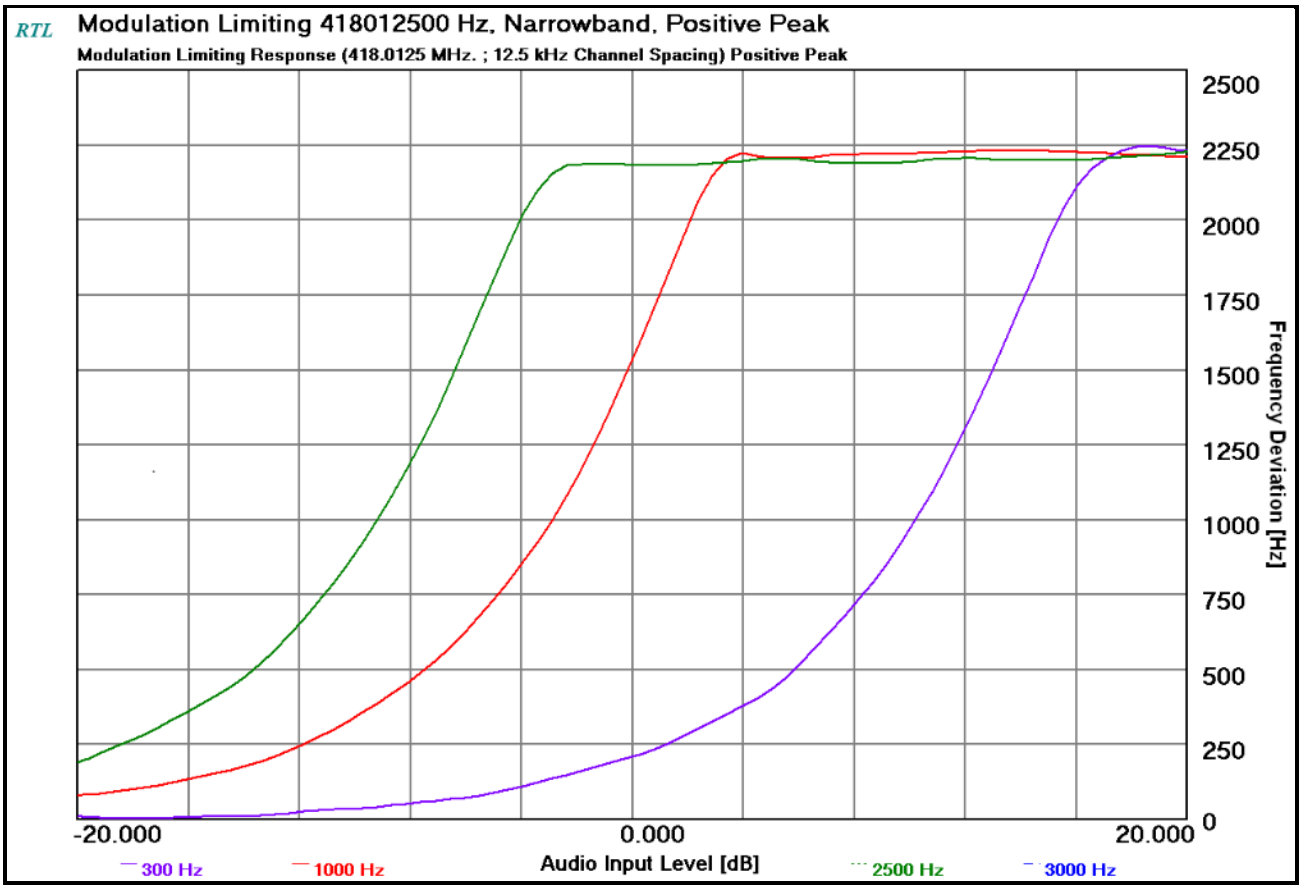
Plot 9-10: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; (NB); Positive Peak



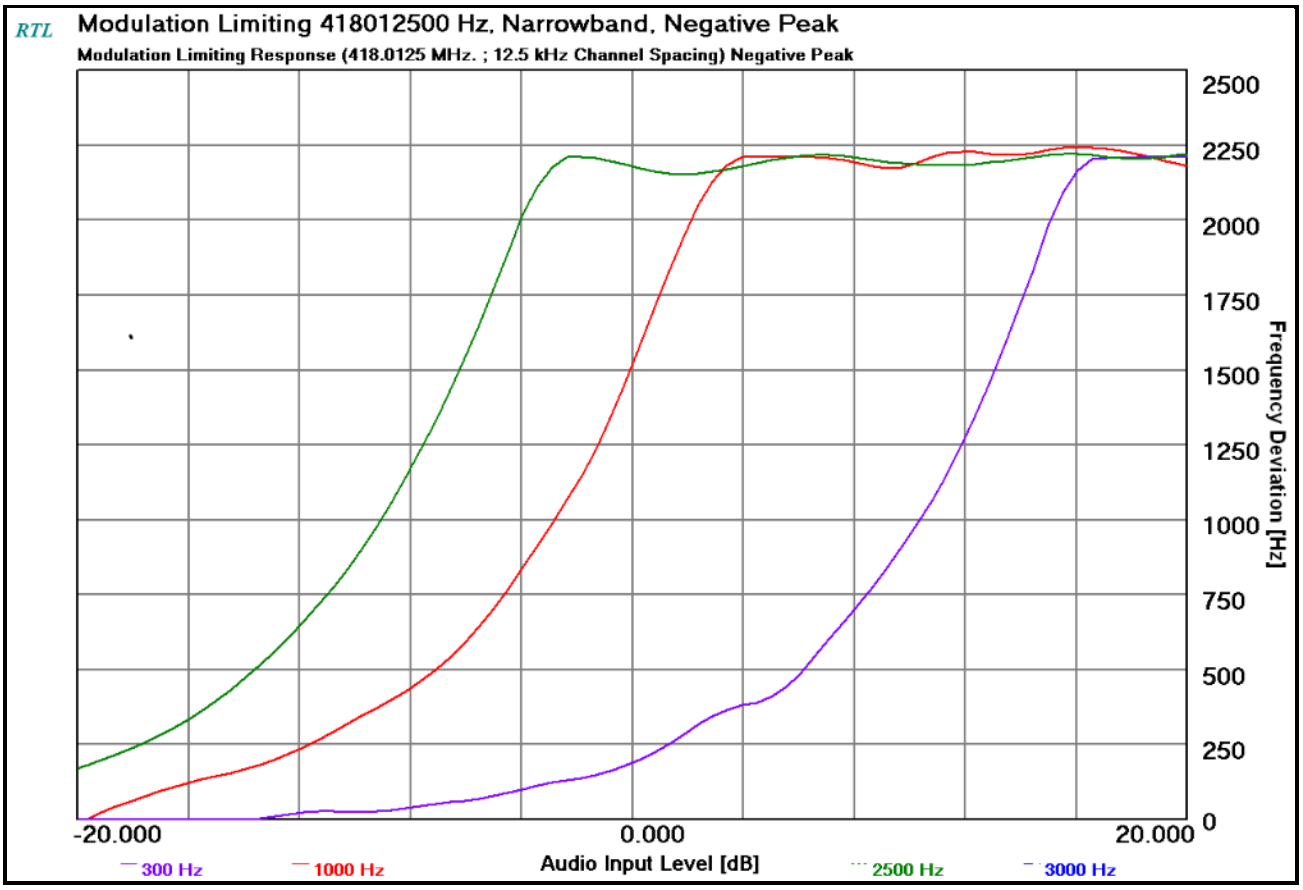
Plot 9-11: Modulation Characteristics – Modulation Limiting - 378.0125 MHz; (NB) Negative Peak



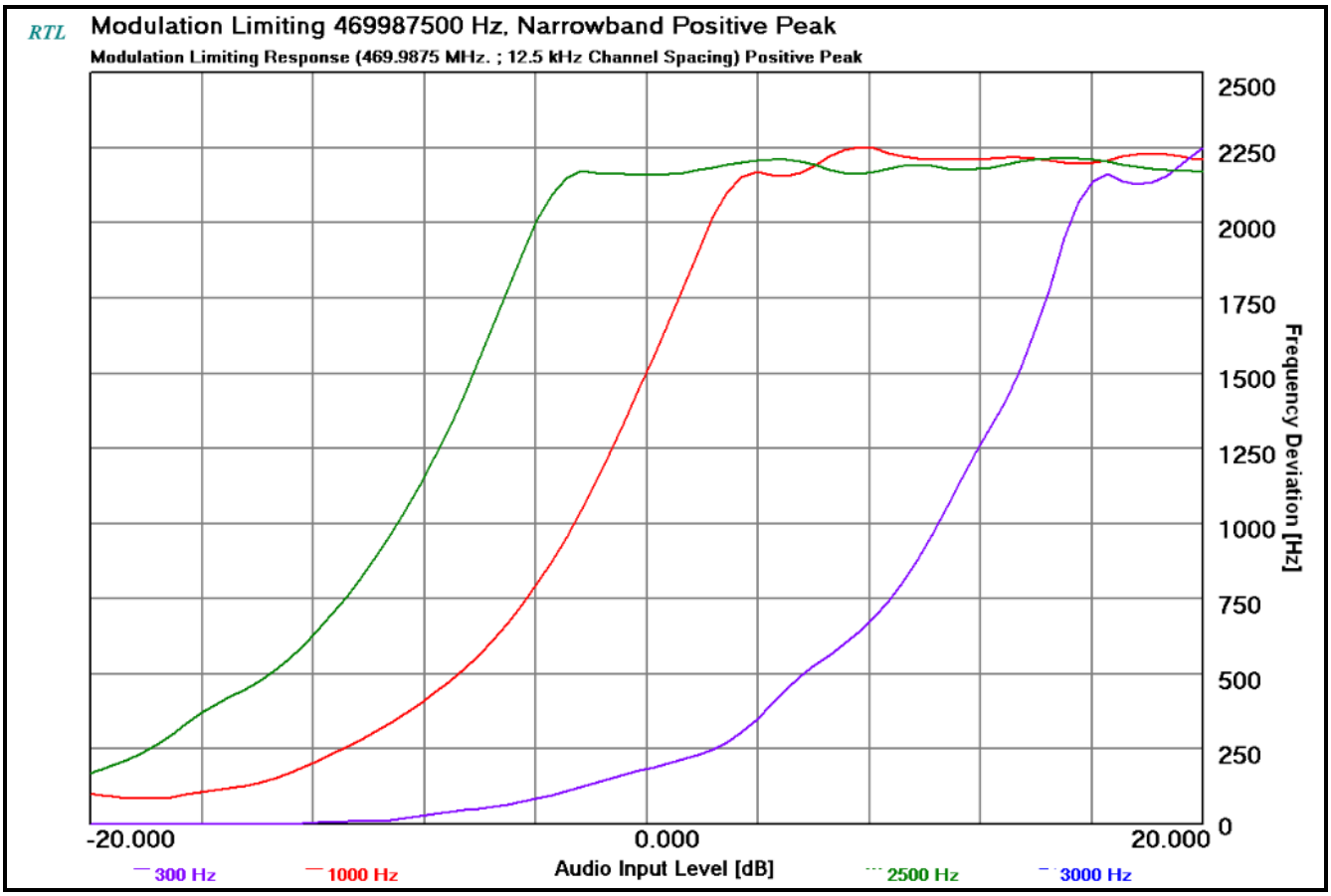
Plot 9-12: Modulation Characteristics – Modulation Limiting – 418.0125 MHz; (NB); Positive Peak



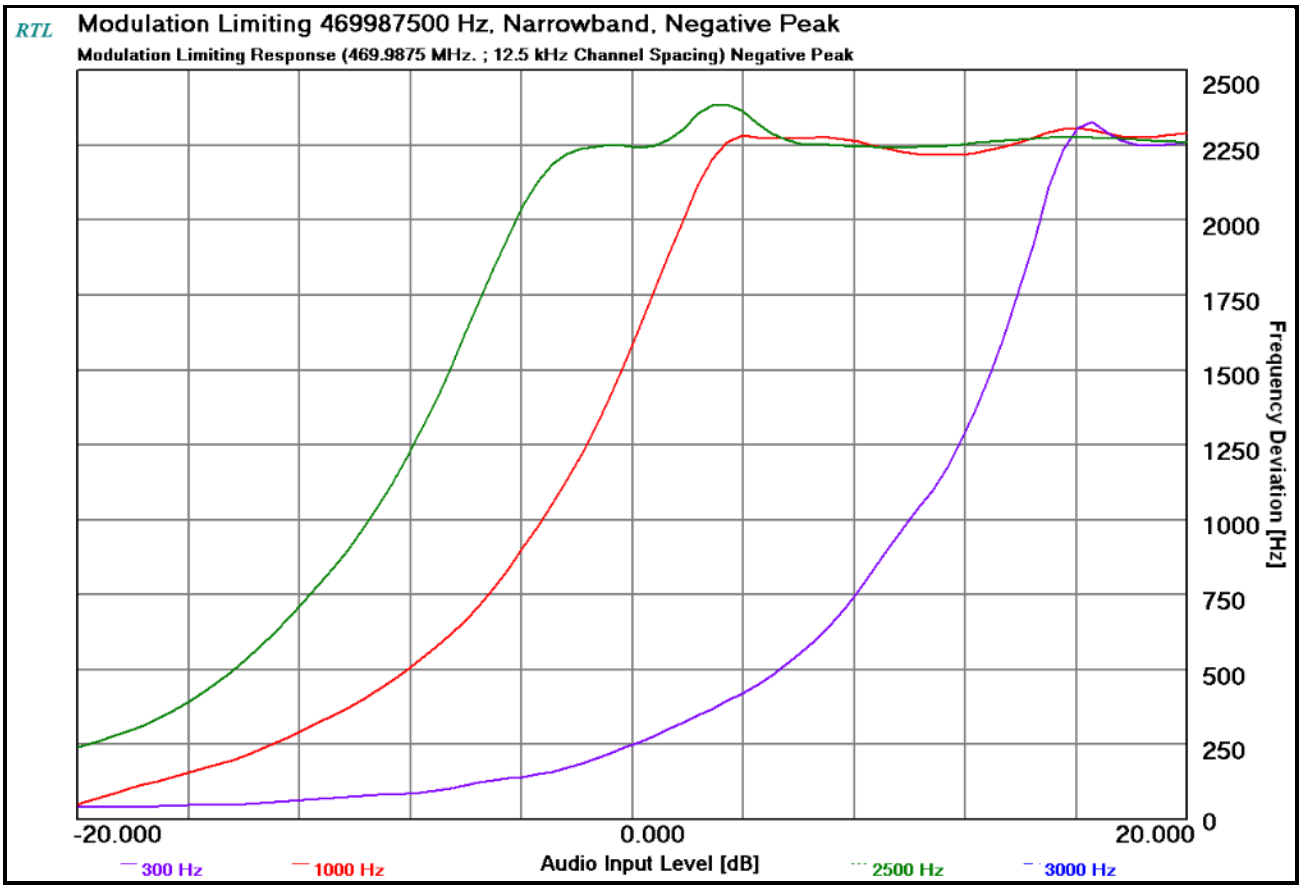
Plot 9-13: Modulation Characteristics – Modulation Limiting – 418.0125 MHz; (NB); Negative Peak



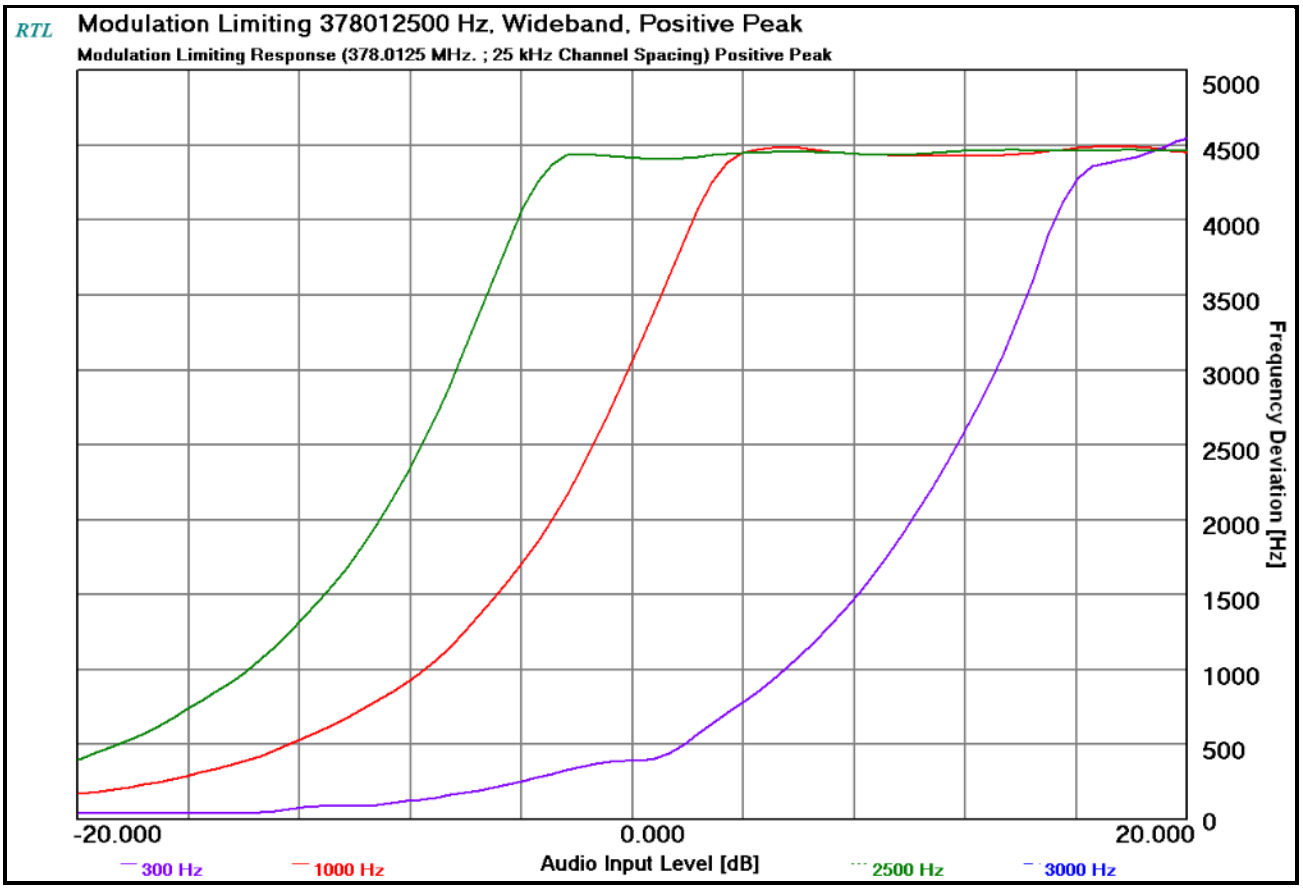
Plot 9-14: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; (NB); Positive Peak



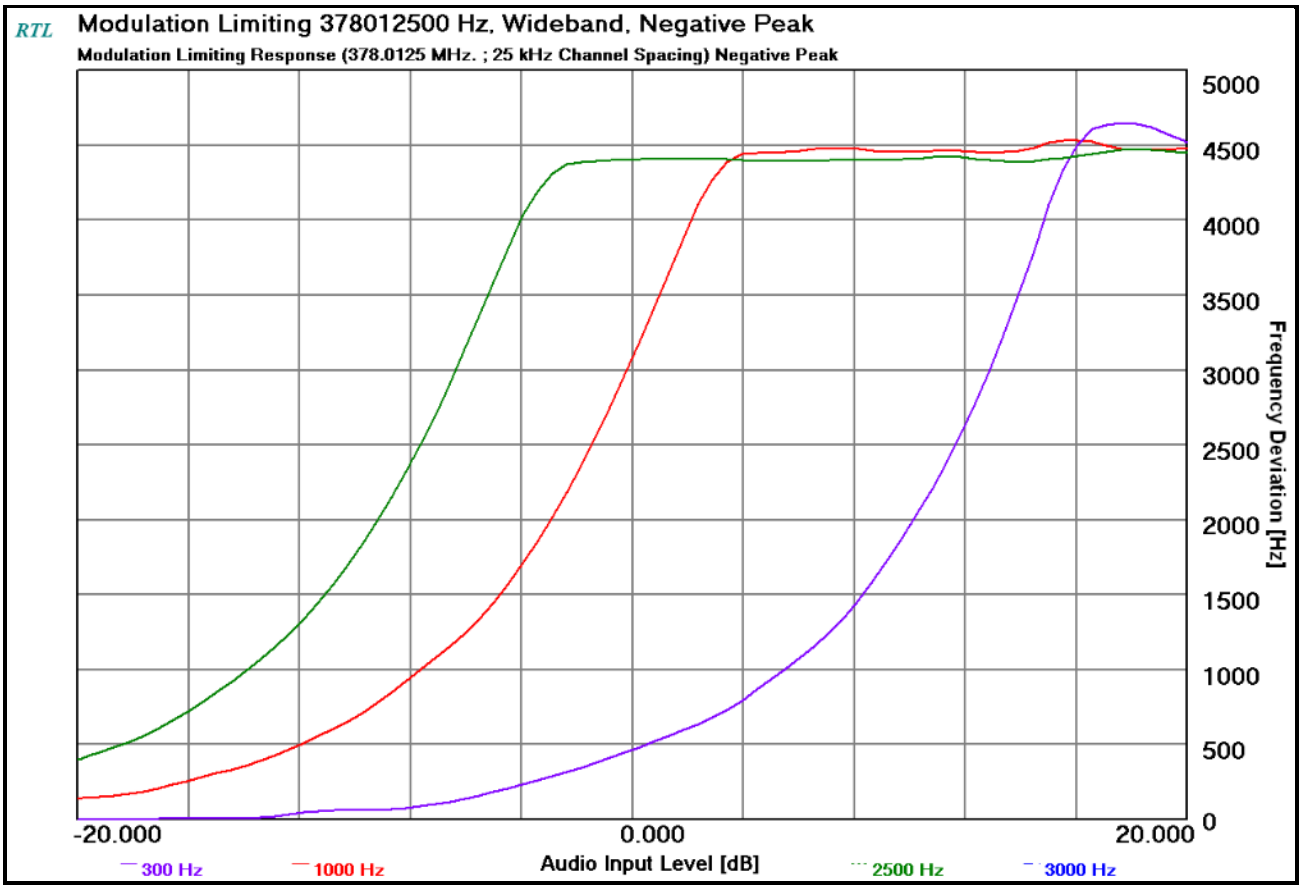
Plot 9-15: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; (NB); Negative Peak



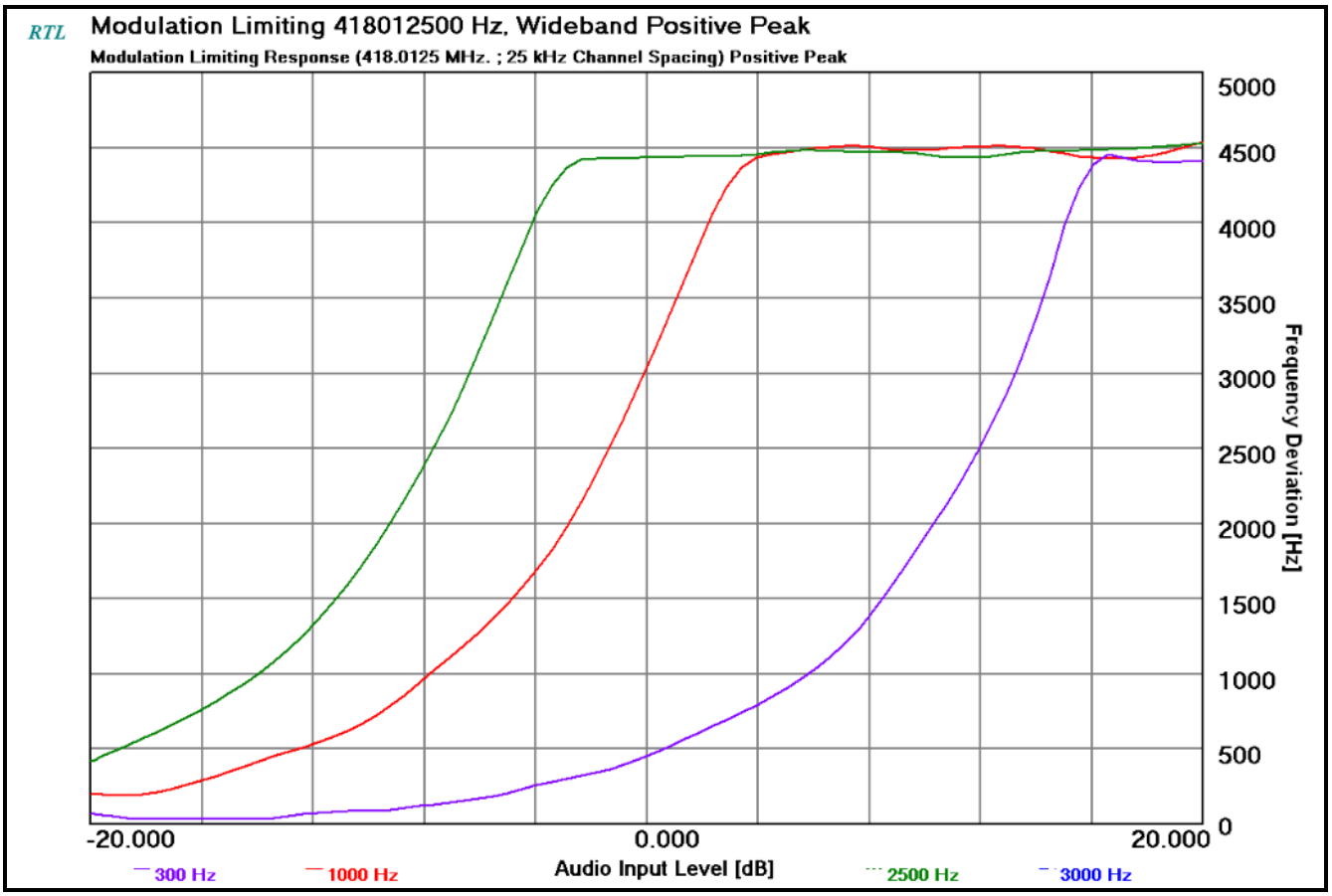
Plot 9-16: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; (WB); Positive Peak



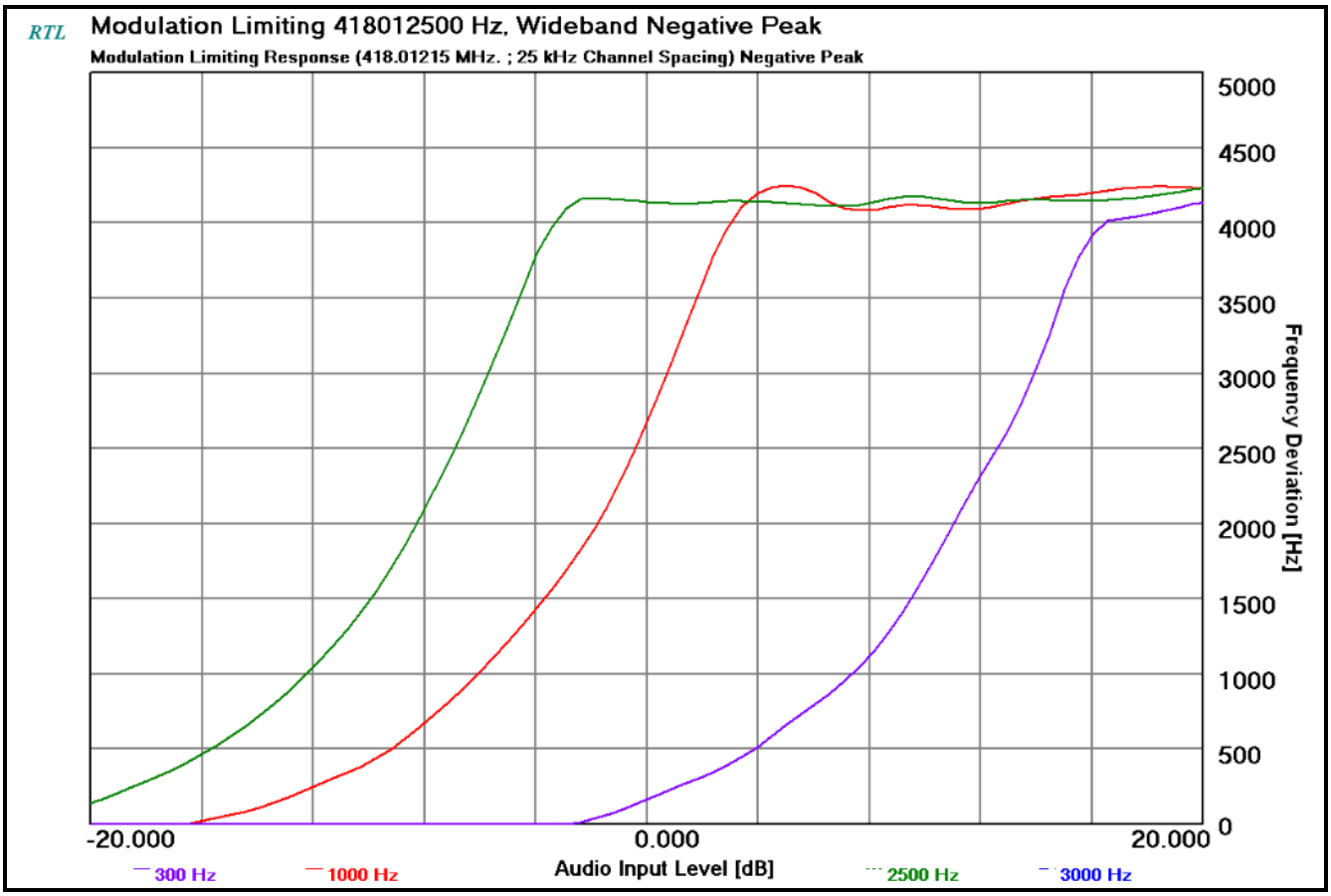
Plot 9-17: Modulation Characteristics – Modulation Limiting - 378.0125 MHz; (WB) Negative Peak



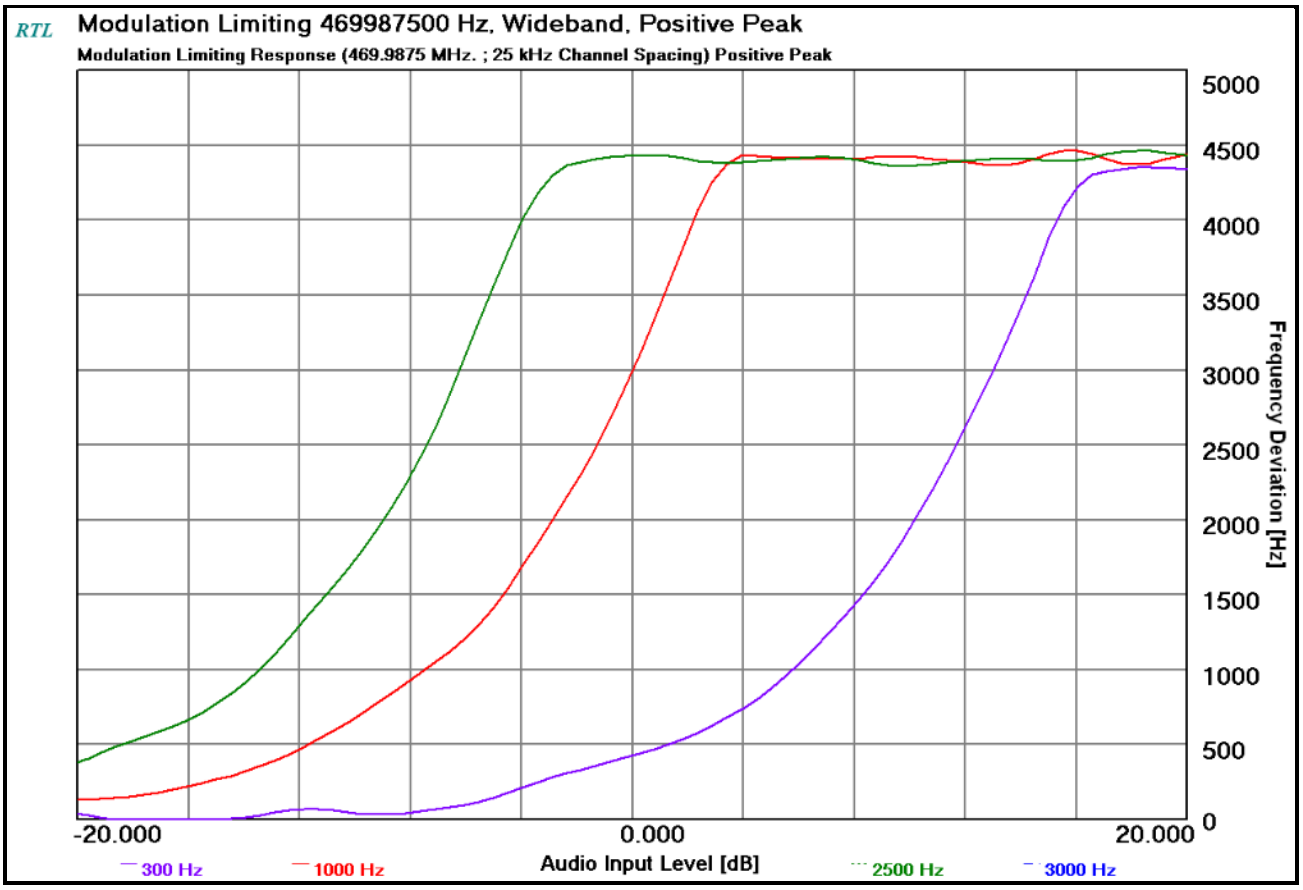
Plot 9-18: Modulation Characteristics – Modulation Limiting – 418.0125 MHz; (WB); Positive Peak



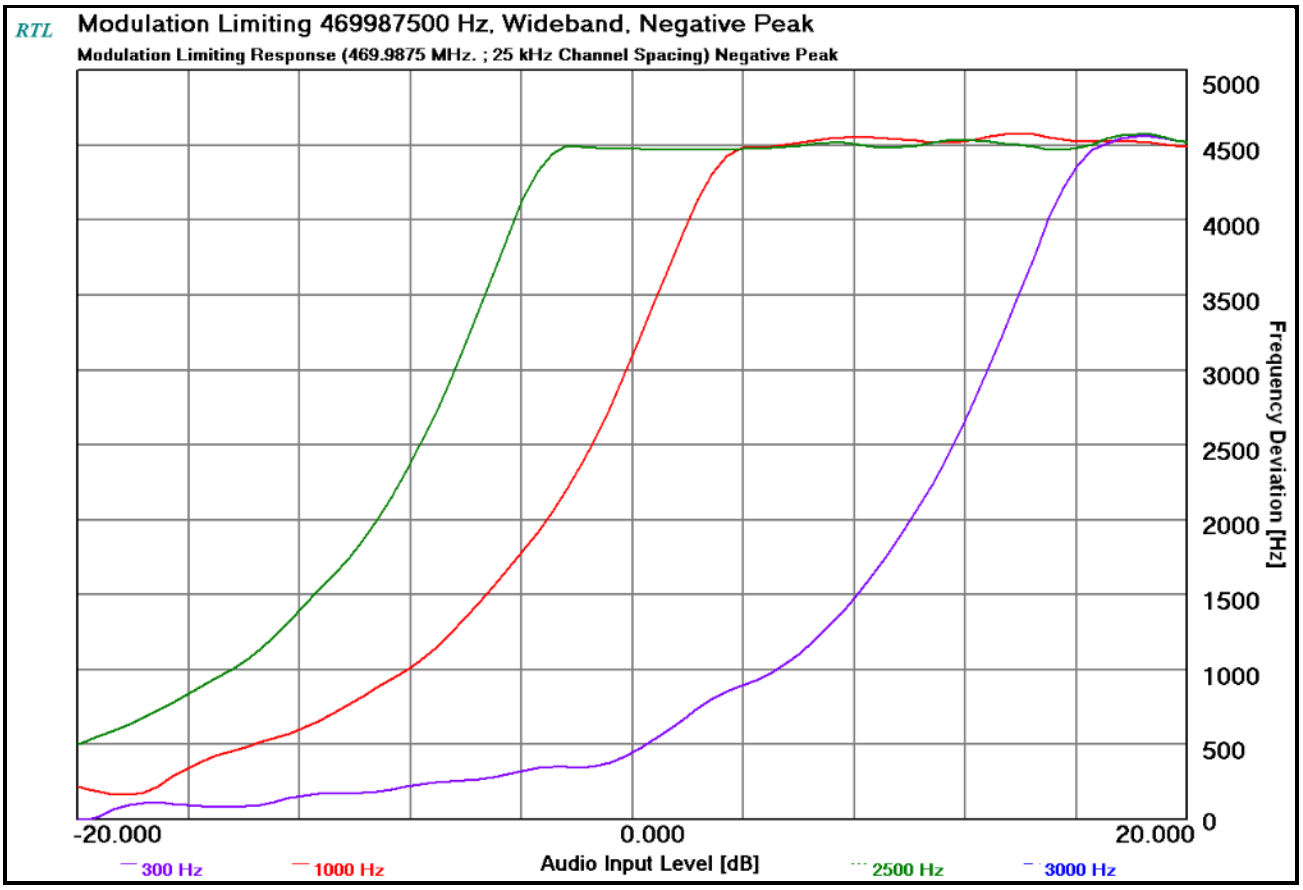
Plot 9-19: Modulation Characteristics – Modulation Limiting – 418.0125 MHz; (WB); Negative Peak



Plot 9-20: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; (WB); Positive Peak



Plot 9-21: Modulation Characteristics – Modulation Limiting – 469.9875 MHz; (WB); Negative Peak



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 Hz/±0.8 dB

Results: Pass

Table 9-1: Test Equipment for Modulation Requirements Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	03/28/2027
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	11/02/2027
901759	Hewlett Packard	HP 3586B	Selective Level Meter	2510A03886	04/04/2027
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2027

Test Personnel:

Daniel W. Baltzell		January 22-March 24, 2025
EMC Test Engineer	Signature	Dates of Test

10 FCC §90.214: Transient Frequency Response; §74.462(c): Authorized Bandwidth and Emissions; RSS-119 5.9: Transient Frequency Behavior

10.1 Test Procedure

ANSI C63.26-2015, Section 6.5.2.2. Transmitter plots were taken with the radio set at high power.

§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

[1] $_{on}$ 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.

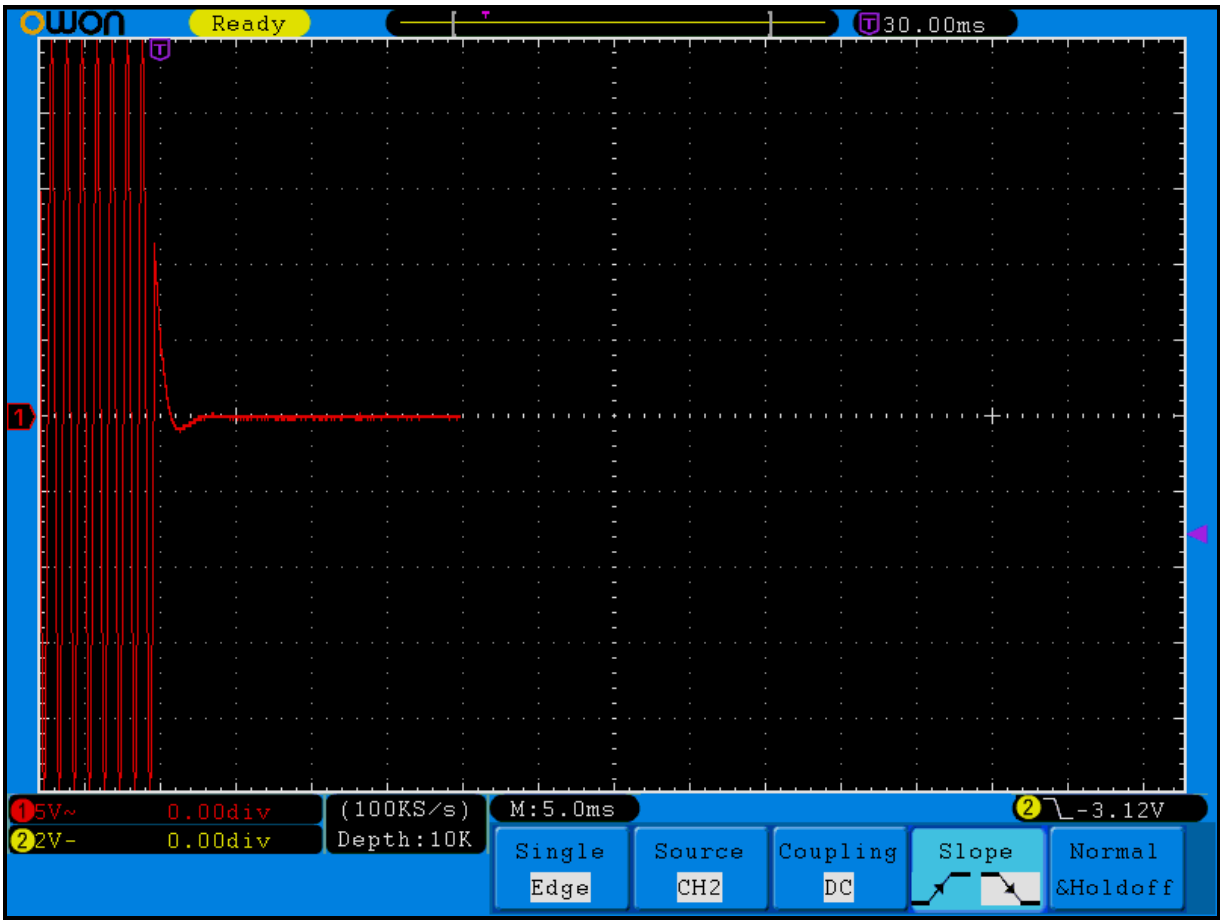
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.

[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.

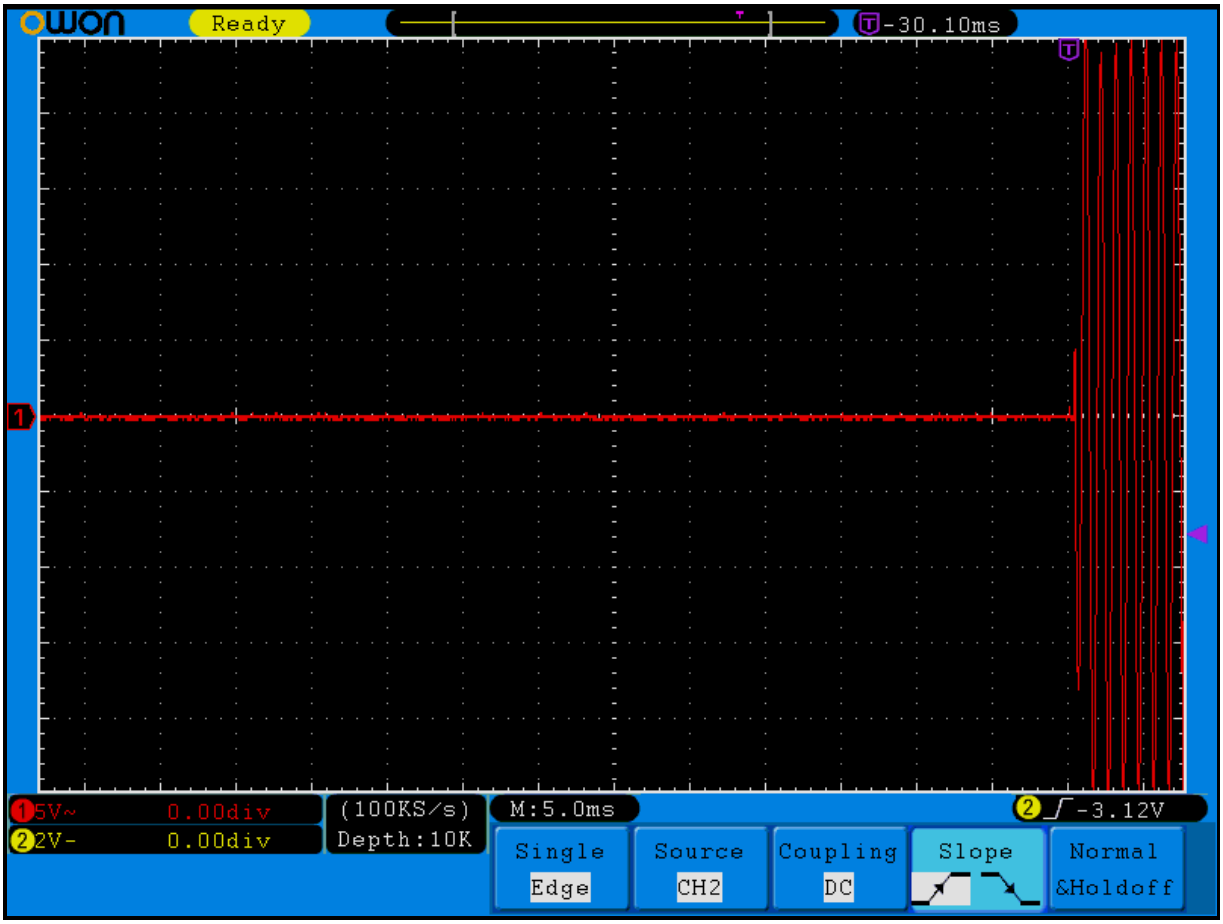
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

10.2 Test Data

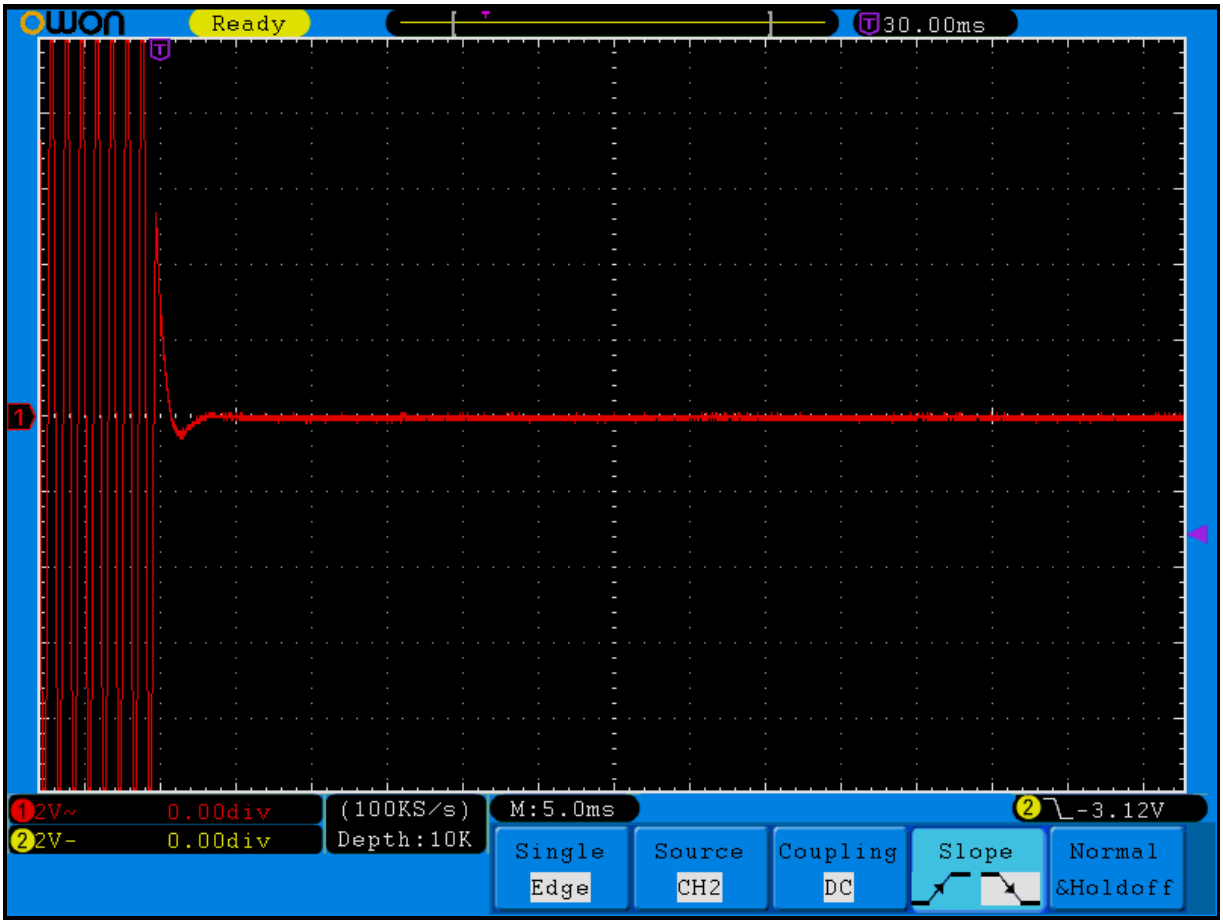
Plot 10-1: Transient Frequency Behavior – 469.9875 MHz; Wide Band; Carrier ON Time



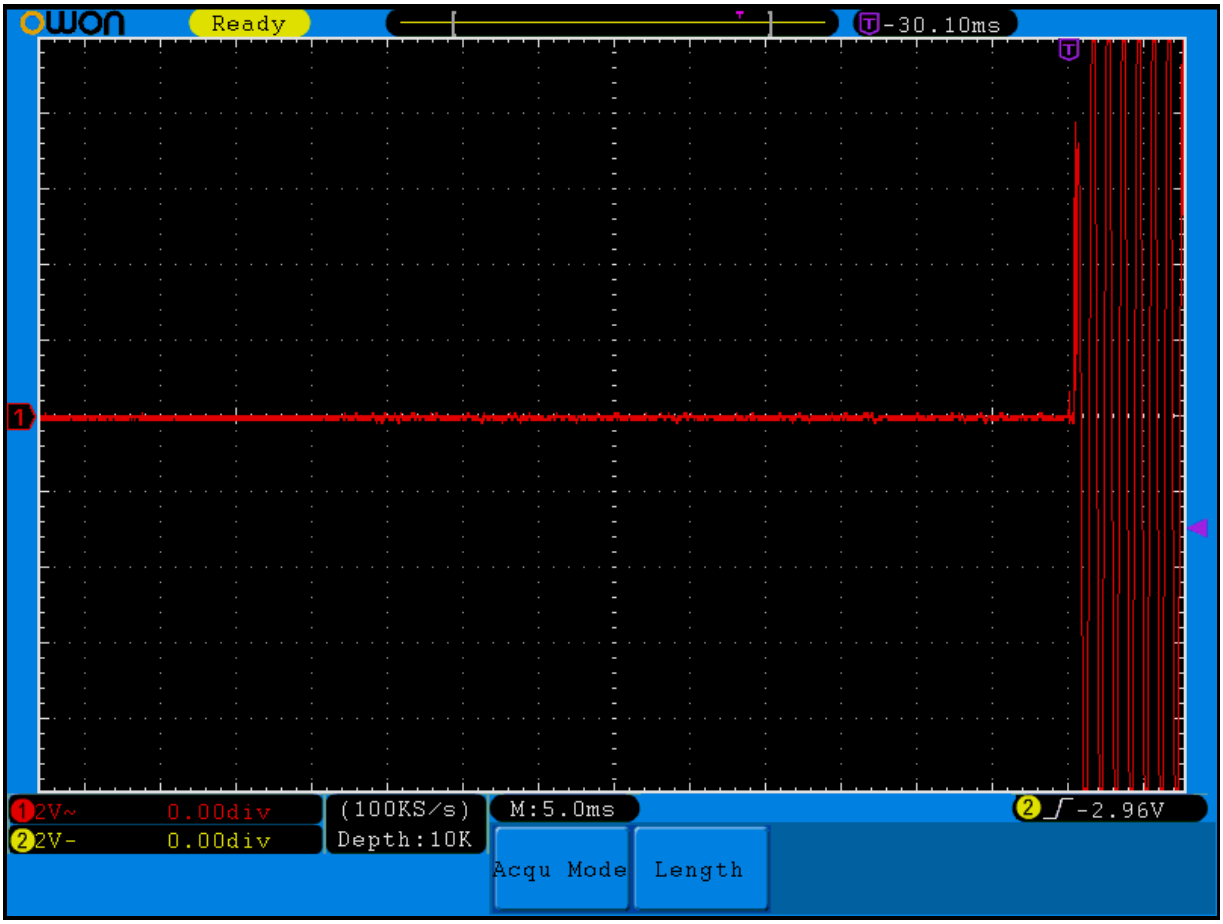
Plot 10-2: Transient Frequency Behavior – 469.9875 MHz; Wide Band; Carrier OFF Time



Plot 10-3: Transient Frequency Behavior – 469.9875 MHz; Narrow Band; Carrier ON Time



Plot 10-4: Transient Frequency Behavior – 469.9875 MHz; Narrow Band; Carrier OFF Time



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 Hz/±0.8 dB

Results: Pass

Table 10-1: Test Equipment for Transient Frequency Behavior Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648A	Signal Generator	3537A01741	08/16/2027
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz–1300 MHz)	2406A00178	11/02/2027
901651	OWON	SmartDS7102V	Oscilloscope	SDS71021434850	02/28/2027
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	02/21/2027
901263	Agilent	.01-12 GHz	SMA Detector	2936A05505	Not Required
901590	Sucoflex	104	6.5' SMA Cable	145883/4	04/12/2027
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	09/21/2027
901235	IW Microwave Products	KPS-1503-360-KPS	High-Frequency RF Cables	36"	09/20/2027

Test Personnel:

Daniel W. Baltzell		January 24, 2025
EMC Test Engineer	Signature	Date of Test

11 FCC §2.202: Necessary Bandwidth and Emission Bandwidth

Analog FM (Narrowband)
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

Analog FM (Wideband)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 16.0 kHz
Emission designator: 16K0F3E

4-level FSK 9600 Data/Digital Voice (Wideband)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 5600
Bn = [9600/log2(4) + 2 (5600) (1) = 16.0 kHz
Emission designator: 16K0F1D, 16K0F1E

4-level FSK 9600 Data/Digital Voice (Narrowband)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 3450
Bn = [9600/log2(4) + 2 (3450) (1) = 11.700 kHz
Emission designator: 11K7F1D, 11K7F1E

C4FM Data/Voice
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 (TDMA) Data/Voice
Calculation:
Data rate in bps (R) =12000
Peak deviation of carrier (D) = 1050
Bn = [12000/$\log_2$(4) + 2 (1050) (1) = 8.1 kHz
Emission designator: 8K10DXW

12 Conclusion

The data in this measurement report shows that the L3Harris Technologies, Inc. Model XL-85M UHF-L; FCC ID: OWDTR-0177-E, IC: 3636B-0177, complies with the applicable requirements of Parts 2, 22, 74, 80 and 90 of the FCC Rules and ISED RSS-119.