RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC Certification Report

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

Two47 VHF-H Base Station

FCC ID: OWDTR-0175-E

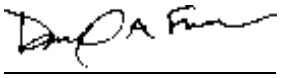
February 7, 2025

Standards Referenced for this Report	
Part 2: 2023	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 22: 2023	Public Mobile Services
Part 74: 2023	Experimental Radio, Auxiliary, Special Broadcast and Other Program Distributional Services
Part 80: 2023	Stations in the Maritime Services
Part 90: 2023	Private Land Mobile Radio Services
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
ANSI/TIA/EIA – 102.CAAA-2002	Digital C4FM/CQPSK Transceiver Measurement Methods
ANSI/TIA/EIA– 102.BAAA–1998	Project 25 FDMA Common Air Interface—New Technology Standards Project—Digital Radio Technical Standards

Report Prepared By: Daniel W. Baltzell

Document Number: 2024052TNB

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: February 7, 2025

Typed/Printed Name: Desmond A. Fraser Position: President

This report may not be reproduced, except in full, without the full written approval of Rhein Tech Laboratories, Inc. and L3 Harris Technologies, Inc. Test results relate only to the item tested.
This report replaces FCC DRAFT R0.07.

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.

FCC Equipment Class: TNB

FCC Rule Part	Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Emission Designator	Transmit Mode
22, 74, 80, 90	150 – 174	100.0	0.07	8K00F1D/E	C4FM Data/Voice
22, 74, 80, 90	150 – 174	100.0	0.07	11K0F3E	Analog FM (Narrowband)
22, 74, 80	150 – 174	100.0	0.07	16K0F3E	Analog FM (Wideband)

** power is conducted*

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1 Test Result Summary

Test	FCC Reference	Result
RF Power Output	2.1046(a), 22.565, 22.913, 74.461, 80.215, 90.205,	Complies
Conducted Spurious Emissions	2.1046(a)	Complies
Spurious Emissions at Antenna Terminals	2.1051, 22.359, 22.917, 80.217, 90.210, 2.1046(a)	Complies
Field Strength of Spurious Radiation	2.1053(a), 22.359, 80.211(f)(3), 90.210, 2.1046(a), 74.462	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 22.359(b), 74.462, 80.205, 80.211, 90.210,80.211(f)	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 22.355, 74.464, 80.209, 90.213	Complies
99% Bandwidth	N/A	N/A
Transient Frequency Behavior	74.462(c), 90.214	Complies
Modulation Characteristics	2.1047(a)(b), 74.463, 80.213	Complies

2 General Information

The following Certification Report is prepared on behalf of L3Harris Technologies, Inc. in accordance with the Federal Communications Commission rules and regulations. The Equipment Under Test (EUT) was the Two47 VHF-H; FCC ID: OWDTR-0175-E.

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

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 is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

2.3 Related Submittal(s)/Grant(s)

This is an original certification report for L3Harris Technologies, Inc. Model: Two47 VHF-H, FCC ID: OWDTR-0175-E.

2.4 Grant Notes

The output power is continuously variable from the value listed in this entry to 5%-10% of the value listed. Output power is conducted. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures. RF exposure compliance is determined at the time of licensing, as required by the responsible FCC Bureau(s) including antenna co-location requirements of §1.1307(b)(3).

2.5 Tested System Details

The test sample was received on October 19, 2024. 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.

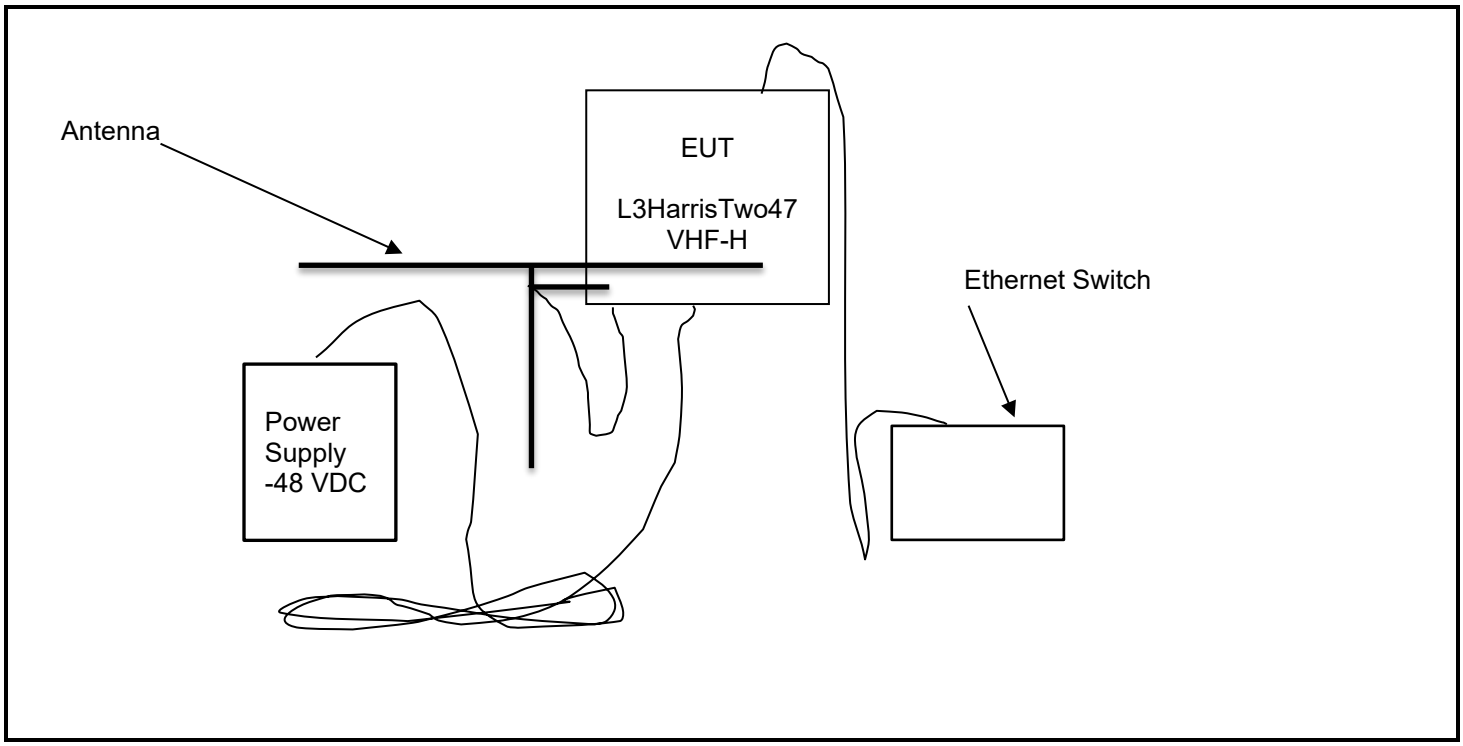
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
VHF-H Base Station (Analog)	L3Harris Technologies	Two47 VHF-H	14600-2500-32	OWDTR-0175-E	24444
VHF-H Base Station (C4FM)	L3Harris Technologies	Two47 VHF-H	14600-2500-32	OWDTR-0175-E	24435

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model	PN/SN	RTL Bar Code
Ethernet Switch	D-Link	DGS-1005P	TM1502C002320	24427
AC Adapter	Channel Well Technology	XPL-065P-B	11-22090000-89757	24432
Control Head	L3Harris Technologies	XL-CH	A40314067467	24431
Mobile Radio	L3Harris Technologies	XL200	A40312061684	24430
DC Power Supply	Samlex	SEC-1223BBM	03064-2333-0585	24433
PTT Box	L3Harris Technologies	N/A	N/A	2444
Ethernet Switch	Cisco Systems	C1000-16T-E-2G-L	F0C2711Y1JC	24342

Figure 2-1: Configuration of Tested System



3 Test Modes

In accordance with C63.26-2015 Table 2, because the EUT operates over a frequency range greater than 10 MHz the following frequencies were tested:

Table 3-1: Channels Tested

Frequency (MHz)
150.0125
152.8550
156.8000
159.5125
162.0000
164.0750
173.9875

4 FCC §2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

50.0 V / 7.6 A

5 FCC §2.1046(a): RF Power Output: Conducted; §80.215: Transmitter Power; §22.659: Effective Radiated Power Limits; §74.461: Transmitter Power

5.1 Test Procedure

ANSI C63.26, section 5.2

§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.

(c) Coast station frequencies above 27500 kHz. The maximum power must not exceed the values listed below.
(1) Coast stations: 156–162 MHz–50W

(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: Coast 83.5W for VHF

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

Manufacturer's Rated Power: 100.0 W

5.2 Test Data

Table 5-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 21, 2024	24.6	32	101.4
November 27, 2024	24.6	35	100.6

Table 5-2: RF Conducted Output Power – Measured

Frequency (MHz)	High Power (dBm)	High Power (W)
150.0125	50.1	102.3
152.8550	50.1	102.1
156.8000	50.1	102.3
159.5125	50.1	102.3
162.0000	50.2	103.5
164.0750	50.1	102.6
173.9875	50.2	103.5

Notes: 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 5-3: Test Equipment Used For Testing RF Power Output – Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent	E4416A	Power Meter	GB41050573	05/17/2027
901755	Agilent	E4412A	Power Sensor	MY41501646	05/17/2027
901338	Weinschel	46-40-34	Attenuator 40 dB 25 W	BM0556	02/07/2025
901355	JFW Industries	50FH-003-300	Attenuator 3 dB 300 W DC 1000 MHz	N/A	03/23/2025
901291	Pasternack	PE7031-20	Attenuator 20 dB 300 W	901291	02/08/2025
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025

Test Personnel:

Daniel W. Baltzell		October 21, November 27, 2024
EMC Test Engineer	Signature	Dates of Test

6 FCC §2.1051: Spurious Emissions at Antenna Terminals; §90.210: Emission Limitations; §80.217: Suppression of Interference Aboard Ships; §22.359: Emission Limitations

6.1 Test Procedure

ANSI C63.26, 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. Both high and low power settings were investigated; high power was found to be worst case and is presented.

§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
100 to 300 MHz	1.0
Over 300 MHz	3.0

or

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

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

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

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

The following channels (in MHz) were investigated:

VHF: 150.0125, 152.855, 156.8, 159.5125, 162, 164.075, and 173.9875

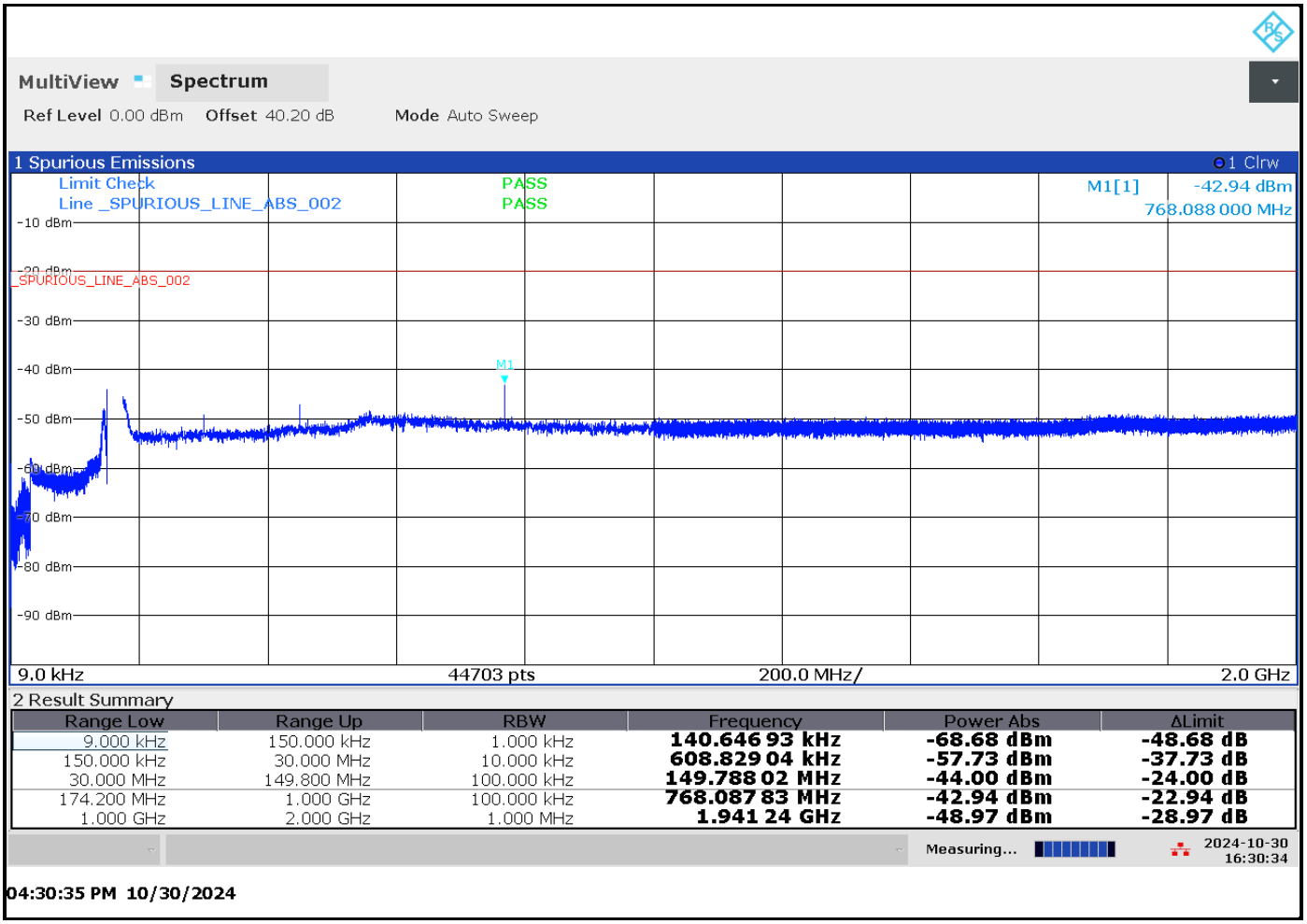
Both high and low power settings were checked; high power was found to be worst case. All modes were investigated and analog mode is presented as representative data.

6.2 Test Data

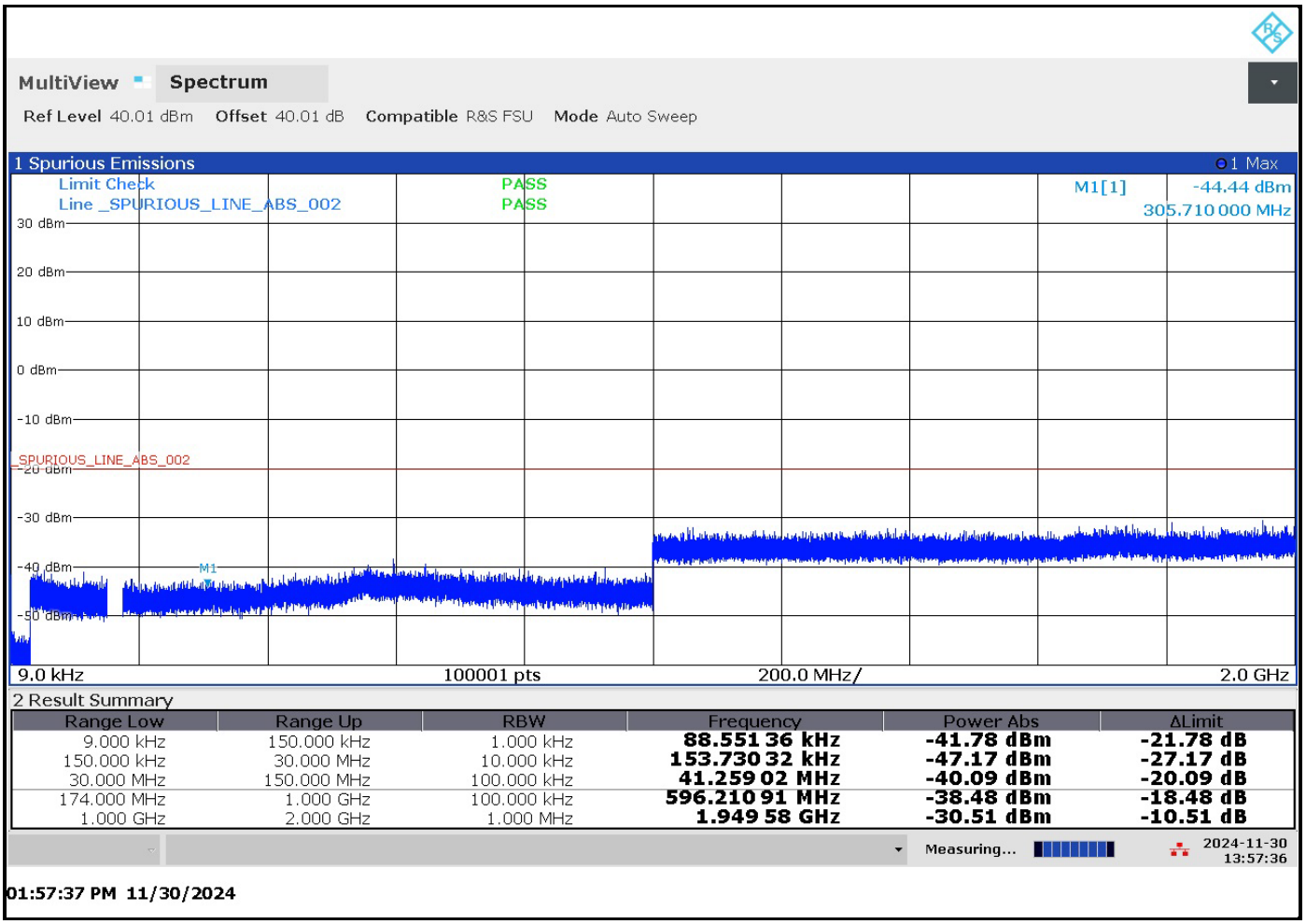
Table 6-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 30, 2024	22.3	23	102.5
November 30, 2024	14.4	21	102.0

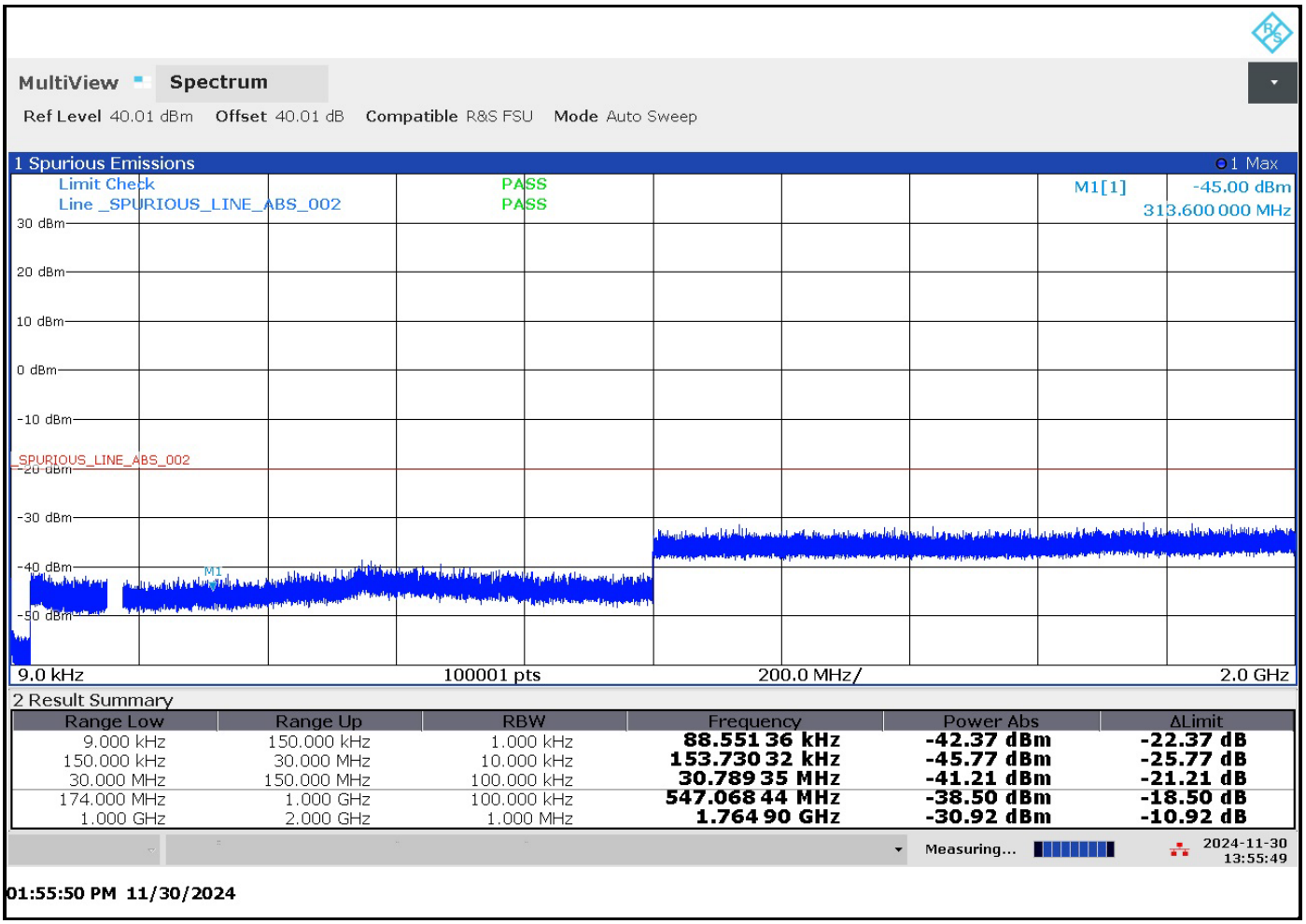
Plot 6-1: Conducted Spurious Emissions – 150.0125 MHz



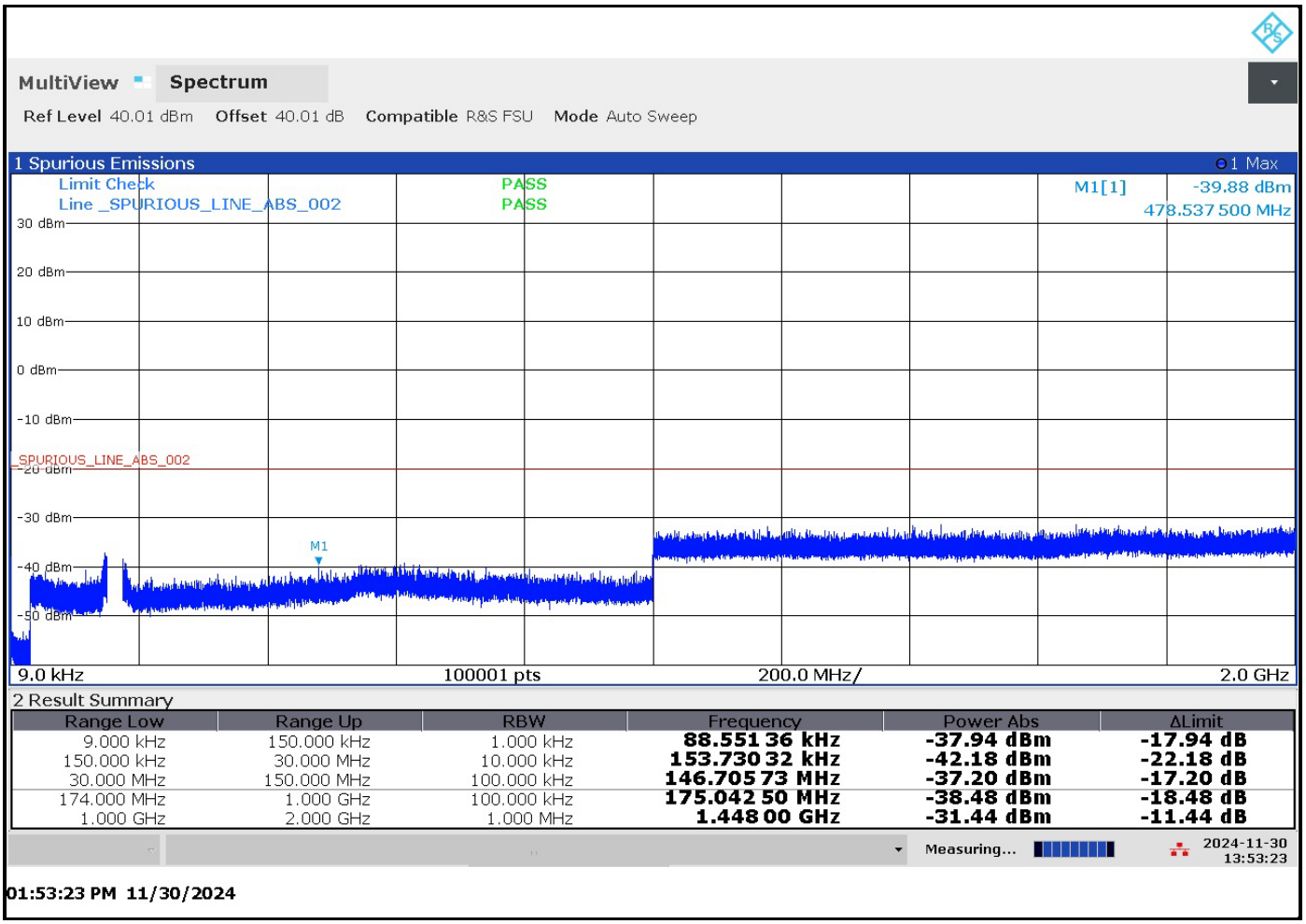
Plot 6-2: Conducted Spurious Emissions – 152.8550 MHz



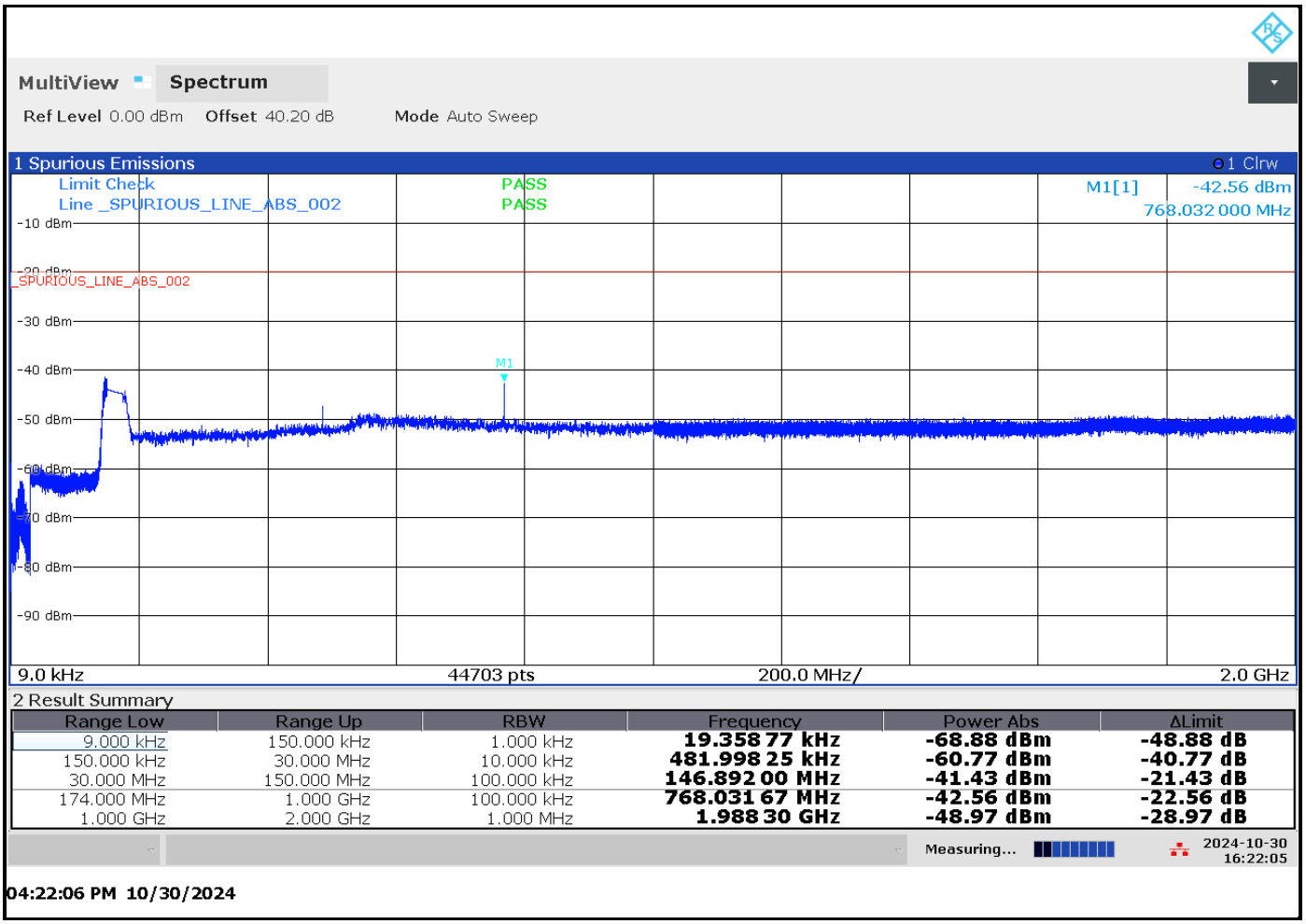
Plot 6-3: Conducted Spurious Emissions – 156.8000 MHz



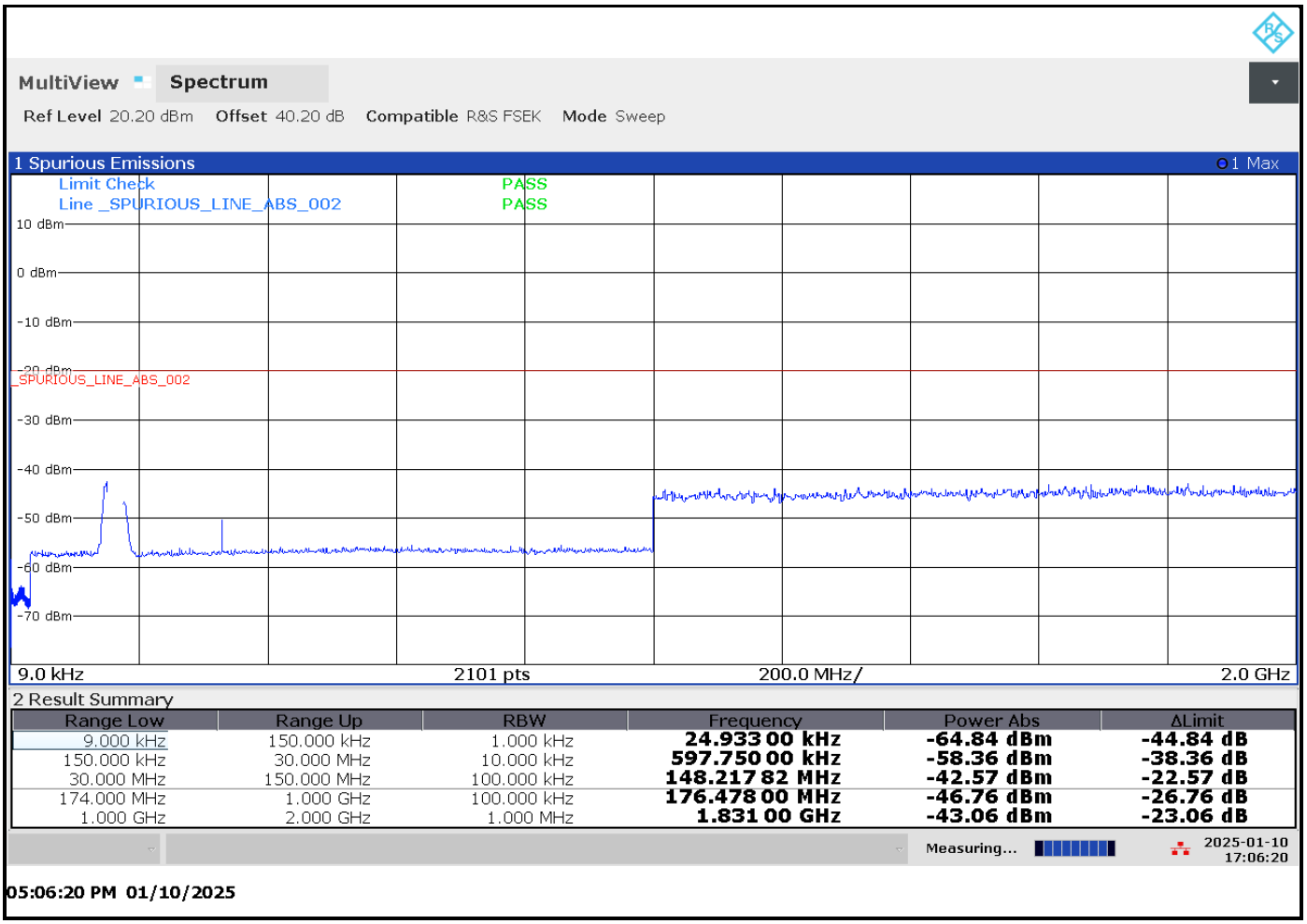
Plot 6-4: Conducted Spurious Emissions – 159.5125 MHz



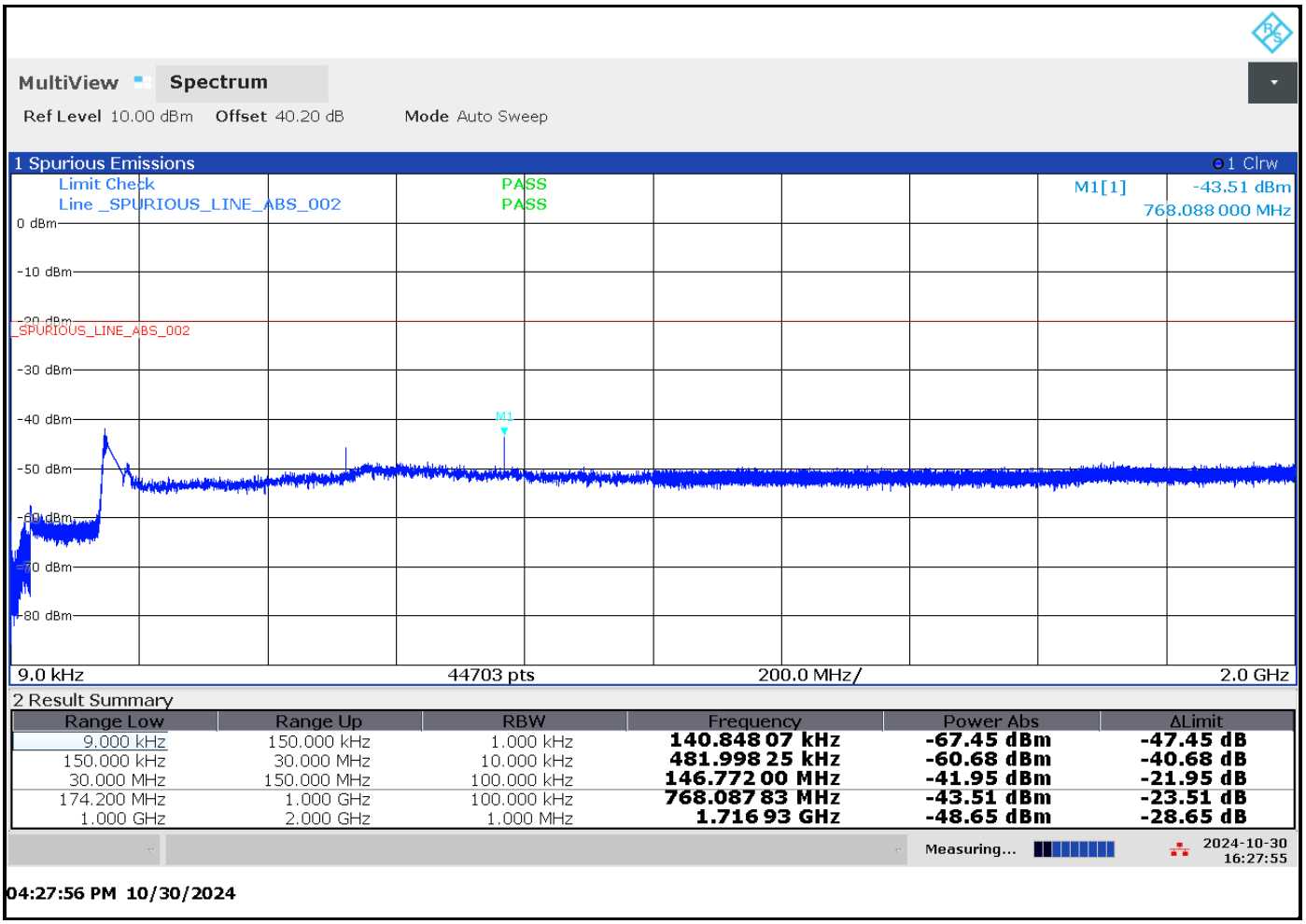
Plot 6-5: Conducted Spurious Emissions – 162.0000 MHz



Plot 6-6: Conducted Spurious Emissions – 164.0750 MHz



Plot 6-7: Conducted Spurious Emissions – 173.9875 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 6-2: Test Equipment Used for Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Analyzer	101021	05/30/2025
901338	Weinschel	48-20-34	Attenuator 20 dB 100 W	BM0556	11/22/2025
901291	Pasternack	PE7031-20	Attenuator 20 dB 300 W	901291	02/08/2025
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	10/04/2025
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	05/14/2026
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025

Test Personnel:

Daniel W. Baltzell		October 30-November 30, 2024, January 10, 2025
EMC Test Engineer	Signature	Dates of Test

7 FCC §2.1053(a): Field Strength of Spurious Radiation; §90.210

7.1 Test Procedure

ANSI C63.26 section 5.5

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.

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 signal generator. The 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, and compared to the limit.

7.2 Test Data

Table 7-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 19, 2024	20	33	102.2

Table 7-2: Field Strength of Spurious Radiation – 150.01250 MHz

Conducted Power 50.1 dBm; 102.3 W; Limit=50+10 Log P=70.1 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)
300.0250	52.2	-29.7	0.2	-0.7	80.8	-10.7
450.0375	35.4	-39.1	0.3	-0.4	89.9	-19.8
600.0500	52.6	-20.1	0.3	-0.8	71.4	-1.3
750.0625	37.3	-35.5	0.3	-1.2	87.2	-17.1
900.0750	20.2	-49.4	0.4	-1.2	101.1	-31.0
1050.0875	34.6	-37.9	0.4	4.5	83.9	-13.8
1200.1000	26.5	-44.8	0.4	4.7	90.6	-20.5
1350.1125	4.5	-66.3	0.5	5.6	111.3	-41.2
1500.1250	3.3	-66.9	0.5	6.4	111.1	-41.0

Table 7-3: Field Strength of Spurious Radiation – 152.8550 MHz

Conducted Power 50.1 dBm; 101.6 W; Limit=50+10 Log P=70.1 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)
305.710	57.5	-21.6	0.2	-0.7	72.6	-2.5
458.565	51.6	-23.1	0.3	-0.5	73.9	-3.9
611.420	42.7	-29.7	0.3	-0.8	80.9	-10.9
764.275	27.9	-44.6	0.4	-1.3	96.3	-26.3
917.130	32.5	-38.1	0.4	-1.2	89.7	-19.6
1069.985	25.6	-46.5	0.4	4.5	92.5	-22.4
1222.840	12.2	-59.0	0.4	4.8	104.7	-34.6
1375.695	13.2	-57.6	0.5	5.8	102.4	-32.3
1528.550	12.5	-58.0	0.5	6.5	102.1	-32.0

Table 7-4: Field Strength of Spurious Radiation – 156.8000 MHz

Conducted Power 50.1 dBm; 101.6 W; Limit=50+10 Log P=70.1 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)
313.600	47.9	-33.9	0.2	-0.6	84.8	-14.8
470.400	49.5	-26.8	0.3	-0.5	77.7	-7.6
627.200	30.7	-44.8	0.3	-0.8	96.0	-26.0
784.000	20.6	-51.4	0.4	-1.4	103.3	-33.2
940.800	5.0	-65.6	0.4	-1.0	117.1	-47.0
1097.600	29.0	-43.2	0.4	4.6	89.1	-19.0
1254.400	12.3	-59.2	0.4	4.9	104.8	-34.7
1411.200	11.4	-59.6	0.5	6.0	104.1	-34.0
1568.000	11.1	-59.2	0.5	6.7	103.1	-33.0

Table 7-5: Field Strength of Spurious Radiation – 159.5125 MHz

Conducted Power 50.1 dBm; 101.6 W; Limit=50+10 Log P=70.1 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)
319.0250	57.4	-24.3	0.2	-0.6	75.3	-5.2
478.5375	49.7	-26.8	0.3	-0.6	77.8	-7.7
638.0500	29.6	-45.7	0.3	-0.8	96.9	-26.9
797.5625	25.9	-43.8	0.4	-1.5	95.8	-25.7
957.0750	24.1	-44.8	0.4	-0.9	96.2	-26.1
1116.5875	26.6	-45.3	0.4	4.6	91.2	-21.1
1276.1000	12.1	-59.3	0.5	5.0	104.8	-34.7
1435.6125	12.2	-58.9	0.5	6.1	103.3	-33.2
1595.1250	13.7	-56.8	0.5	6.8	100.6	-30.5

Table 7-6: Field Strength of Spurious Radiation – 162.0000 MHz

Conducted Power 50.2 dBm; 103.5 W; Limit=50+10 Log P=70.2 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)
324.000	42.7	-36.3	0.2	-0.6	87.3	-17.1
486.000	43.5	-32.0	0.3	-0.6	83.0	-12.9
648.000	43.3	-31.8	0.3	-0.8	83.1	-13.0
810.000	30.8	-40.7	0.4	-1.5	92.7	-22.6
972.000	29.0	-41.5	0.4	-0.9	92.9	-22.7
1134.000	28.9	-42.9	0.4	4.7	88.8	-18.7
1296.000	-5.6	-76.5	0.5	5.1	122.0	-51.8
1458.000	-3.0	-73.5	0.5	6.2	117.9	-47.8
1620.000	-5.3	-75.2	0.5	6.7	119.1	-49.0

Table 7-7: Field Strength of Spurious Radiation – 164.0750 MHz

Conducted Power 50.1 dBm; 101.6 W; Limit=50+10 Log P=70.1 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)
328.150	55.8	-23.2	0.2	-0.6	74.1	-4.0
492.225	42.1	-33.6	0.3	-0.6	84.6	-14.5
656.300	25.9	-45.2	0.3	-0.9	96.5	-26.4
820.375	28.3	-41.3	0.4	-1.5	93.2	-23.2
984.450	22.0	-46.5	0.4	-0.8	97.8	-27.7
1148.525	25.0	-46.7	0.4	4.7	92.5	-22.5
1312.600	10.8	-60.3	0.5	5.2	105.6	-35.5
1476.675	2.7	-67.4	0.5	6.3	111.7	-41.6
1640.750	-1.8	-71.4	0.5	6.6	115.3	-45.3

Table 7-8: Field Strength of Spurious Radiation – 173.9875 MHz

Conducted Power 50.2 dBm; 103.5 W; Limit=50+10 Log P=70.2 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)
347.9750	42.8	-38.5	0.2	-0.5	89.4	-19.2
521.9625	24.3	-52.6	0.3	-0.6	103.7	-33.5
695.9500	32.8	-37.3	0.3	-0.9	88.7	-18.5
869.9375	26.9	-42.7	0.4	-1.4	94.6	-24.4
1043.9250	24.5	-47.9	0.4	4.5	94.0	-23.8
1217.9125	8.6	-62.9	0.4	4.8	108.7	-38.5
1391.9000	-5.9	-77.4	0.4	5.9	122.1	-52.0
1565.8875	-4.0	-74.6	0.5	6.7	118.6	-48.4
1739.8750	-2.6	-71.0	0.5	6.5	115.2	-45.0

Measurement uncertainty 30 MHz – 6 GHz = ±4.8 dB and from 6 GHz and above = ±5.2 dB: This measurement uncertainty is expanded for a 95% confidence level received with a coverage factor k=2 for the entire frequency range.

Results: Pass

Table 7-9: Test Equipment Used For Testing Field Strength of Spurious Radiation

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
901792	Shireen	UF1-2.92	40 GHz 300” Cable	N/A	08/02/2025
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MHz – 6000 MHz)	00166065	07/11/2025
901773	Rohde & Schwarz	FSW50	Analyzer	101021	05/30/2025
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	05/27/2027

Test Personnel:

Daniel W. Baltzell		October 19, 2024
Test Engineer	Signature	Date of Test

8 FCC §2.1049(c)(1): Occupied Bandwidth; §90.543(d), §90.210 Authorized Bandwidth; §74.462: Authorized Bandwidth and Emissions; §80.205: Bandwidths; §80.211: Emission Limitations

Occupied Bandwidth - Compliance with the Emission Masks

8.1 Test Procedure

ANSI C63.26-2015, section 5.4

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

Part 90.210 Authorized Bandwidth

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 [3 5]	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
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 of this chapter.

[4] DSRCS Roadside Unit equipment in the 5895–5925 MHz band is 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.

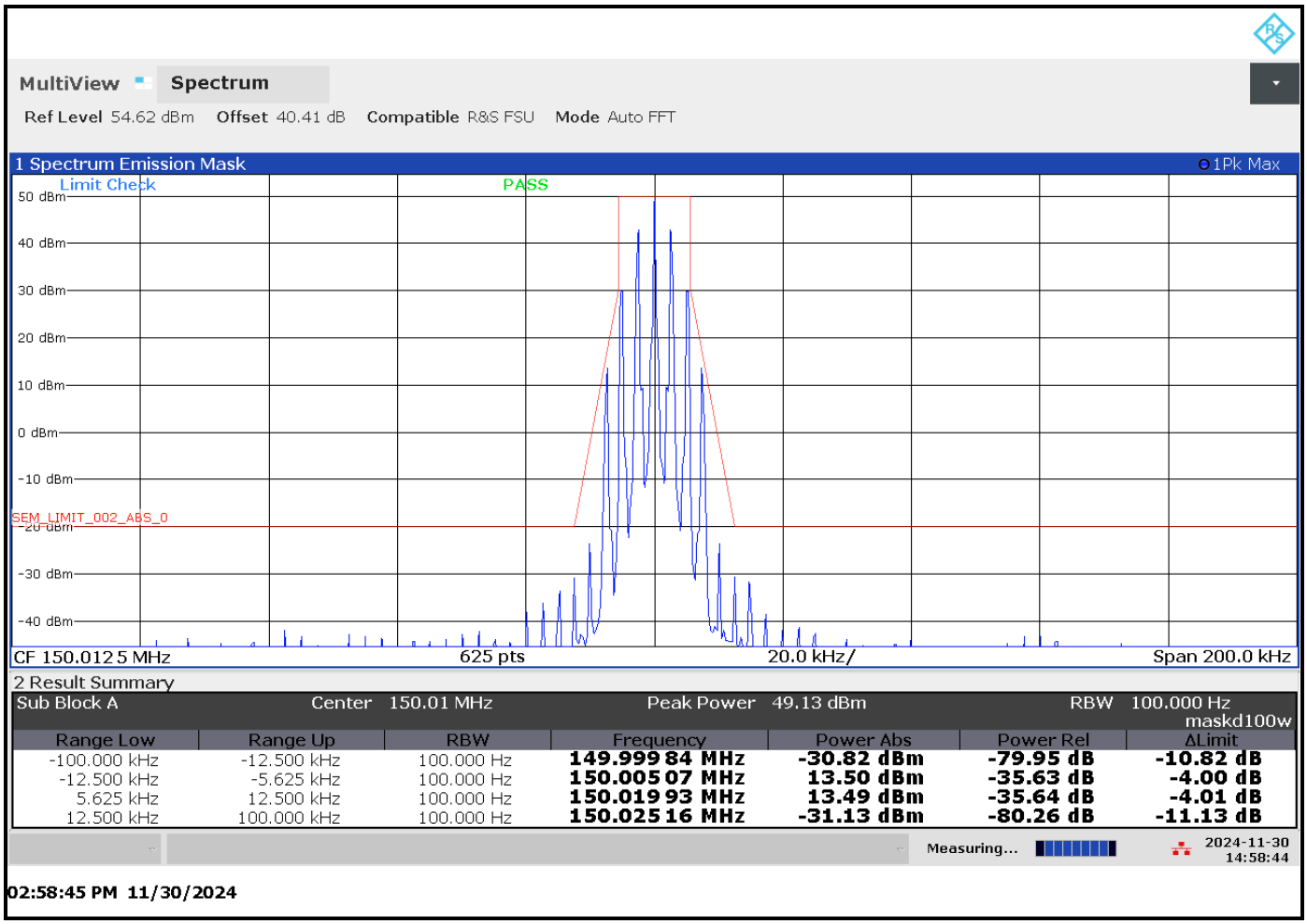
[6] Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet Emission Mask B. All transmitters utilizing digital emissions and those transmitters using analog emissions without an audio low-pass filter must meet Emission Mask H.

8.2 Test Data

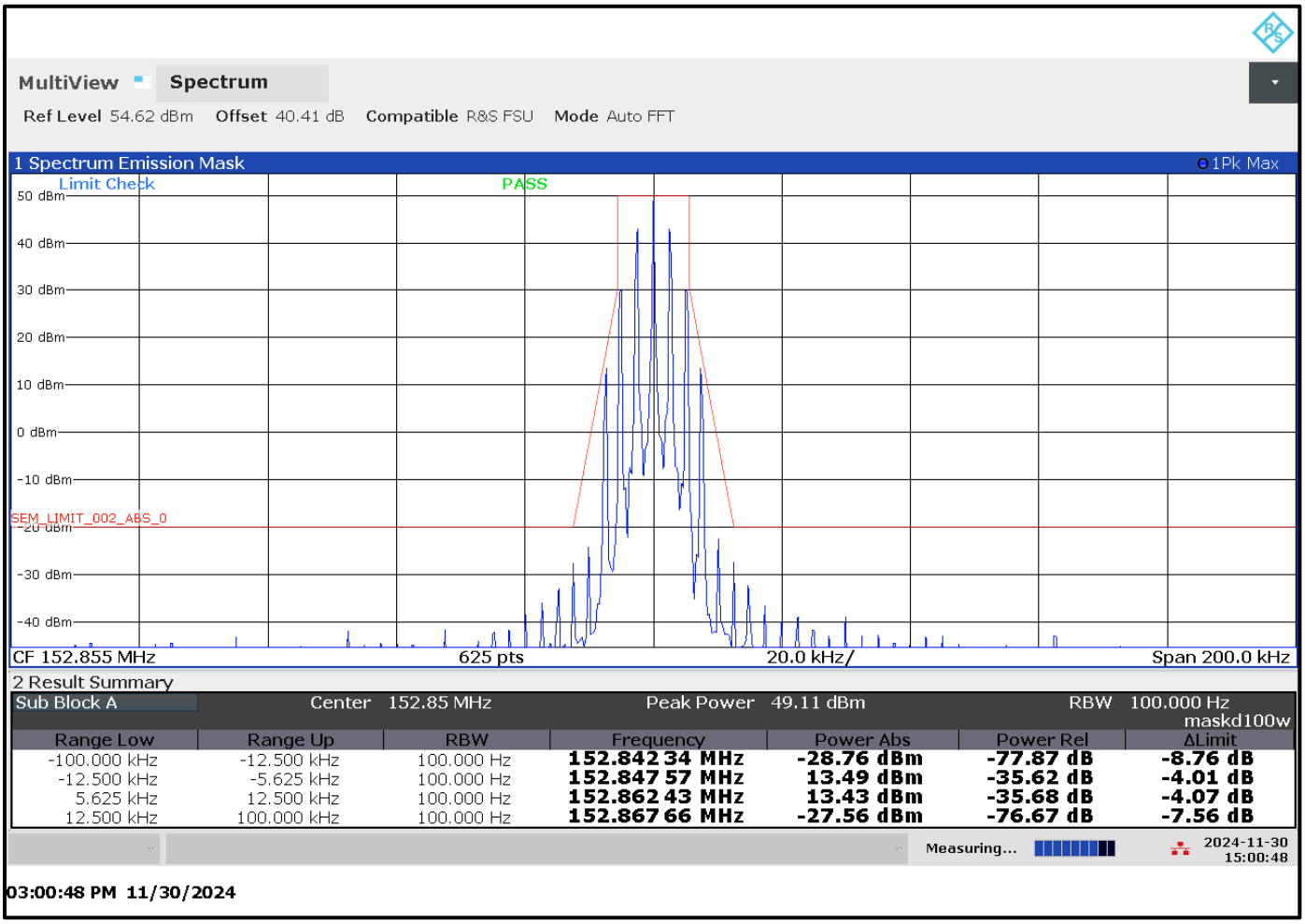
Table 8-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 31, 2024	25.1	27	102.2

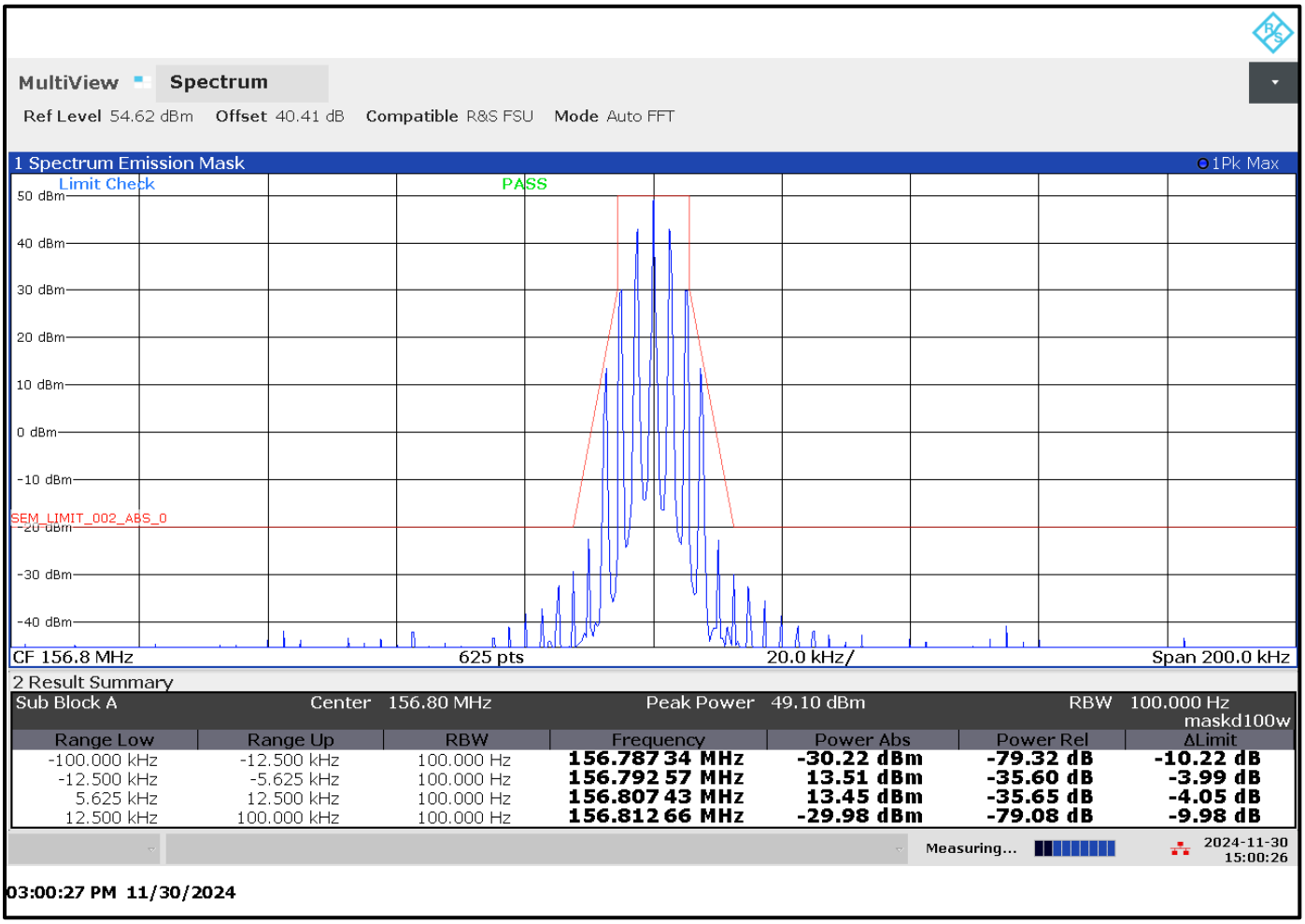
Plot 8-1: Occupied Bandwidth, 150.0125 MHz, NARROWBAND ANALOG, Mask D



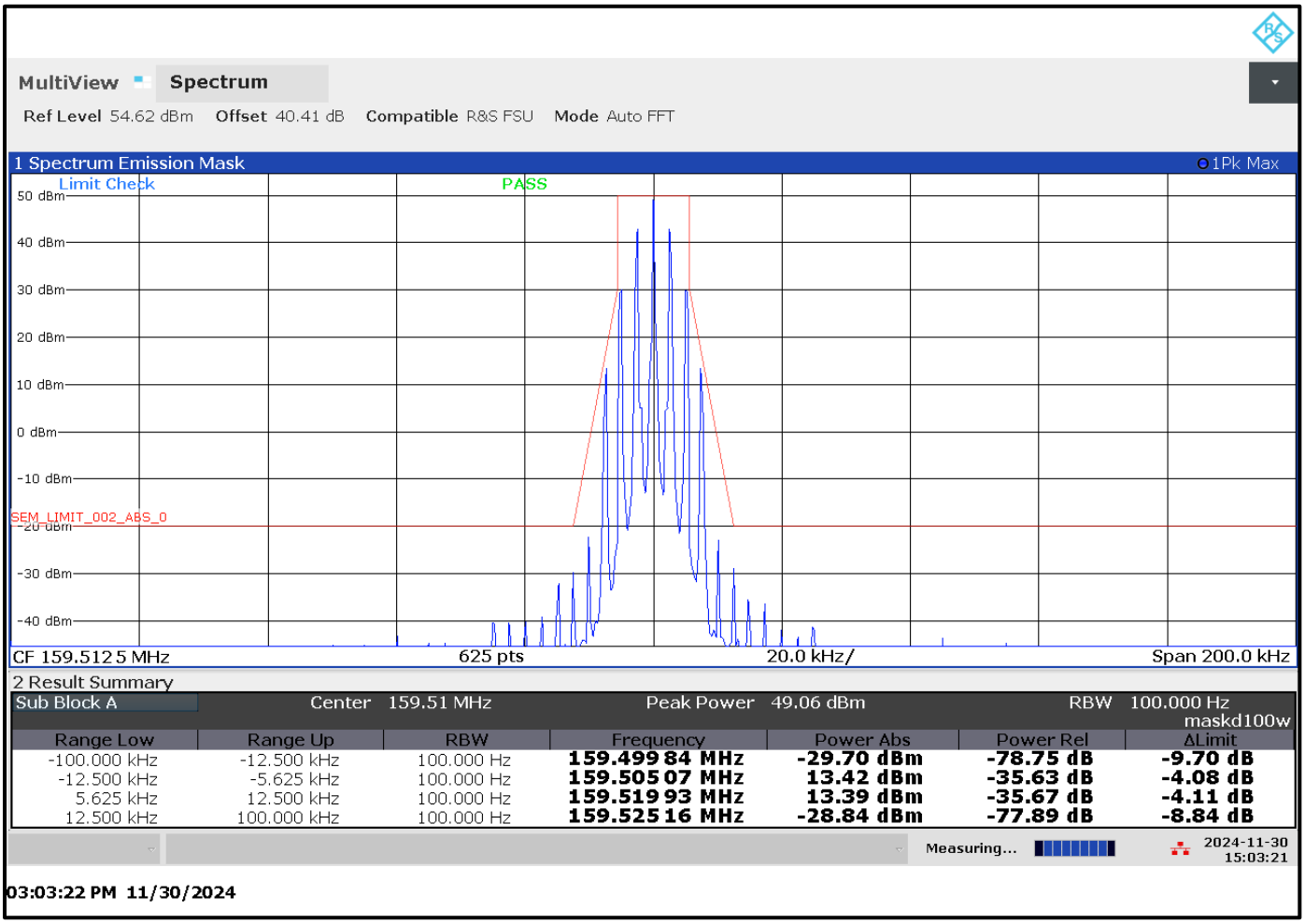
Plot 8-2: Occupied Bandwidth, 152.8550 MHz, NARROWBAND ANALOG, Mask D



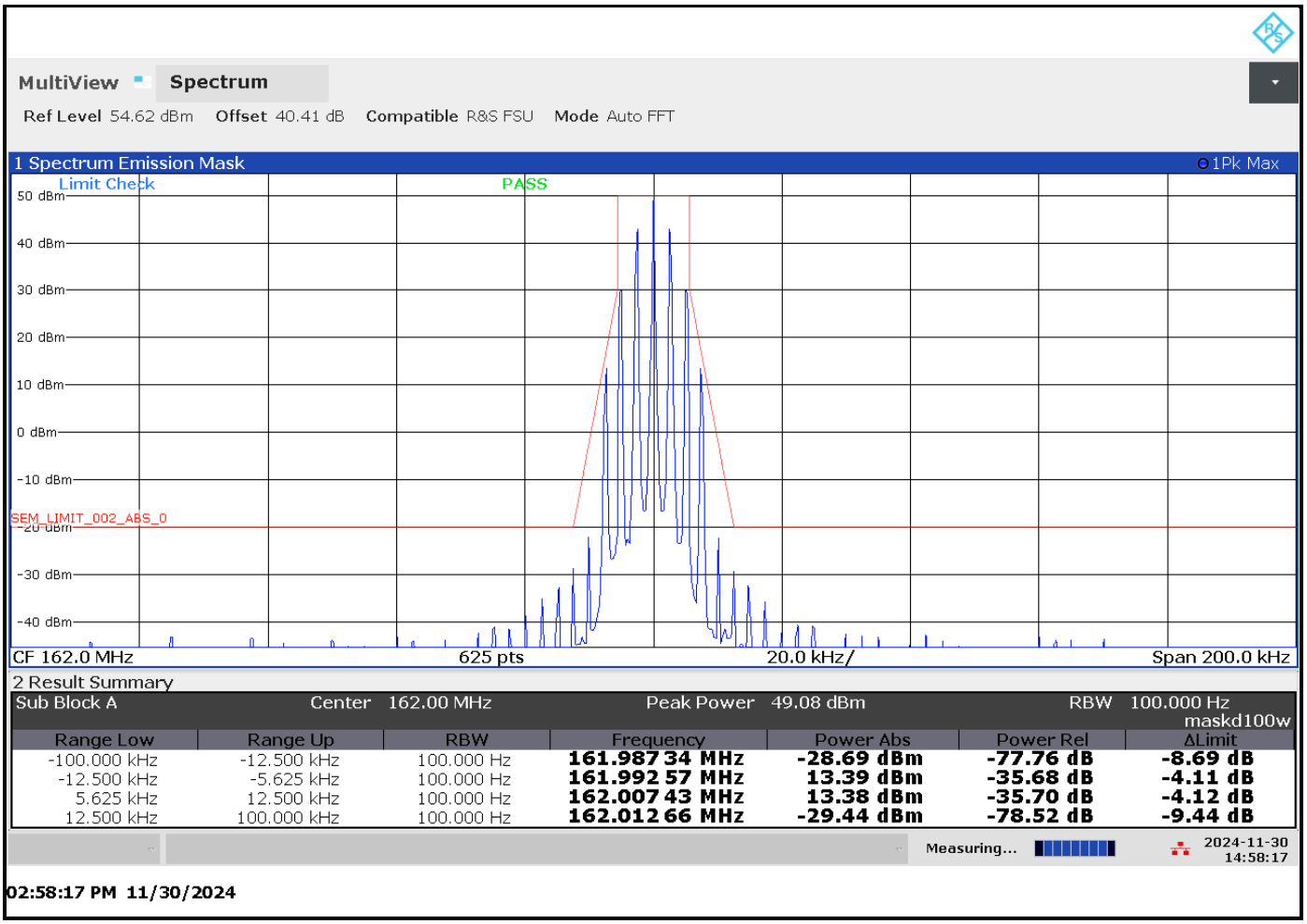
Plot 8-3: Occupied Bandwidth, 156.8000 MHz, NARROWBAND ANALOG, Mask D



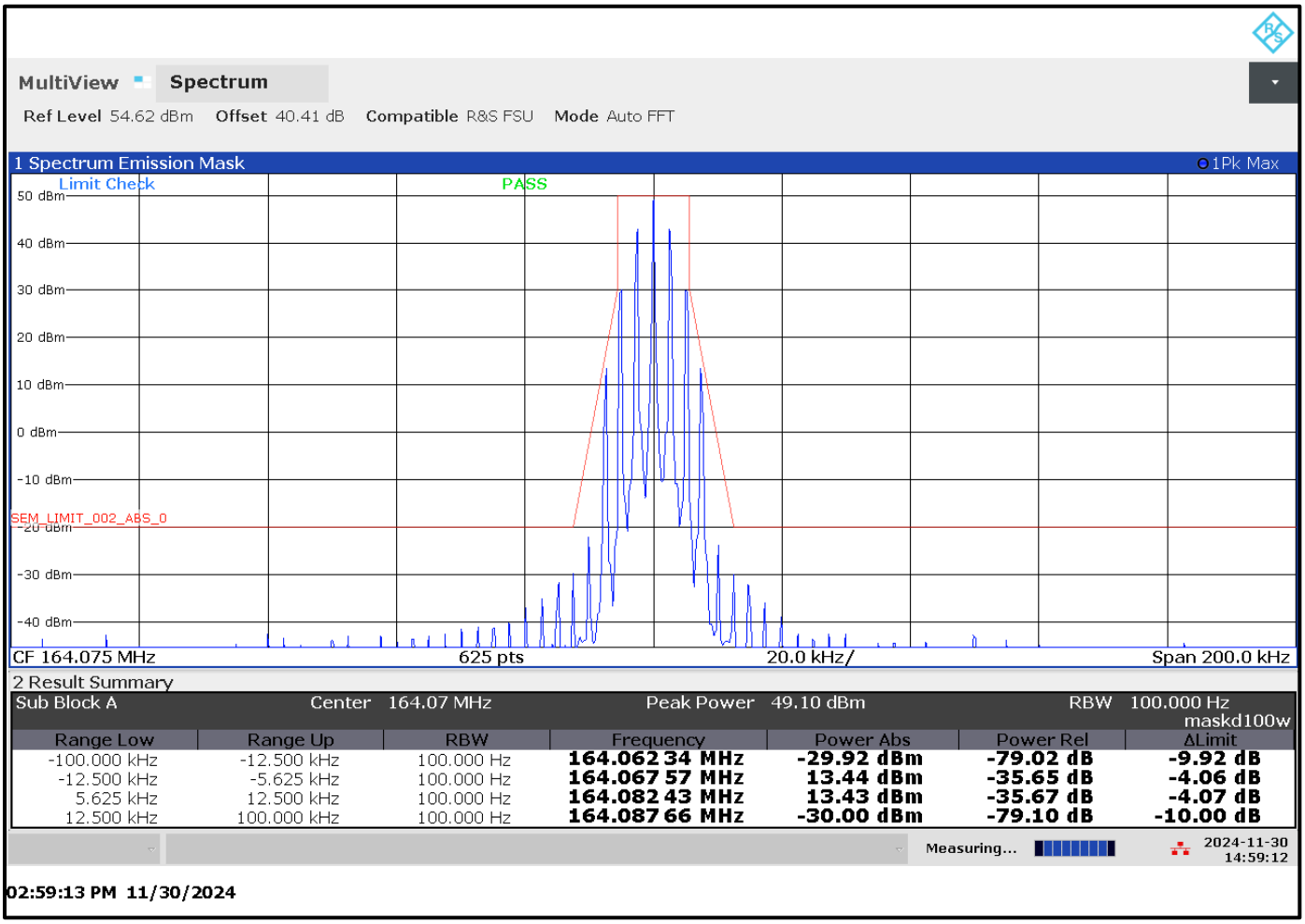
Plot 8-4: Occupied Bandwidth, 159.5125 MHz, NARROWBAND ANALOG, Mask D



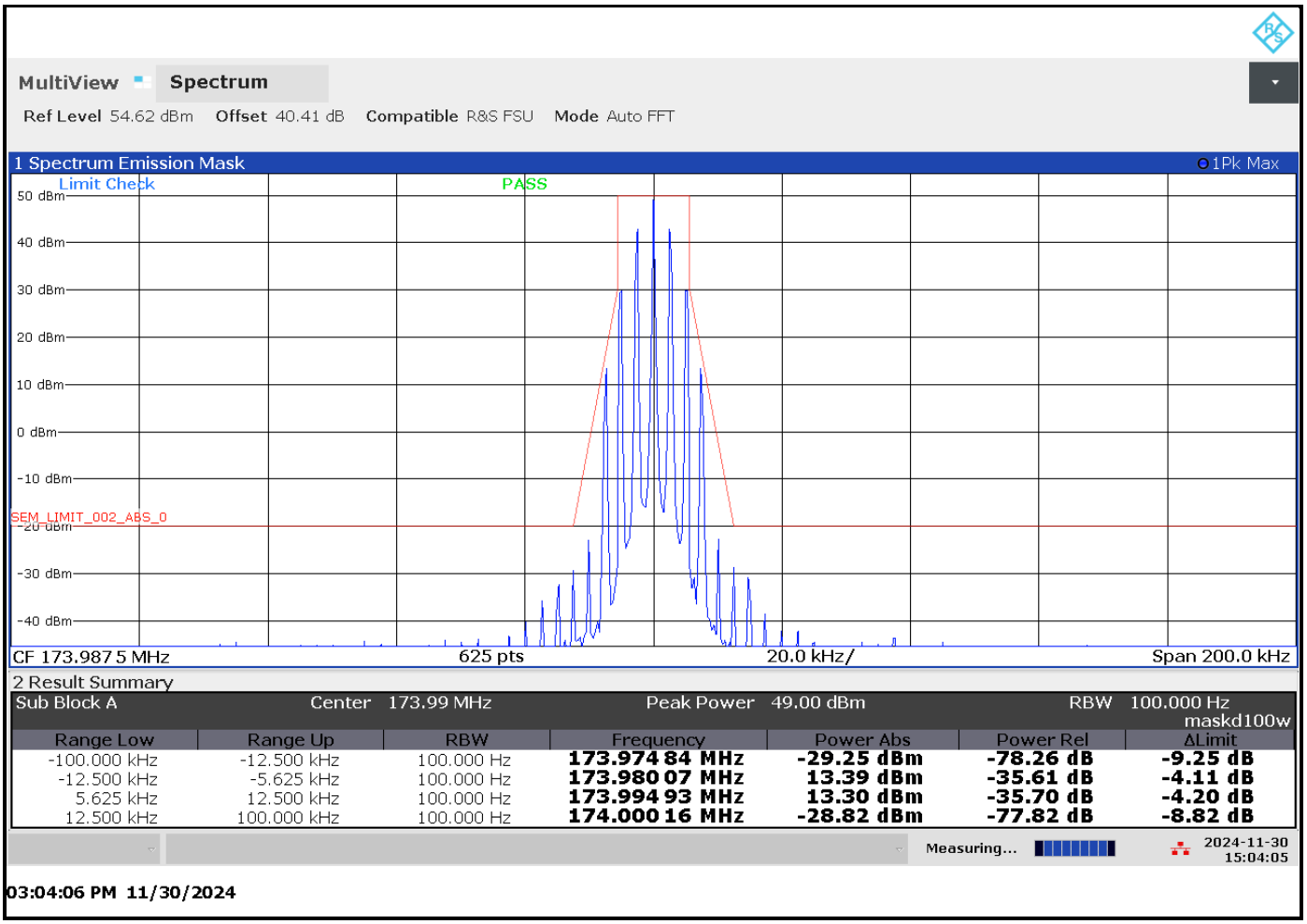
Plot 8-5: Occupied Bandwidth, 162.0000 MHz, NARROWBAND ANALOG, Mask D



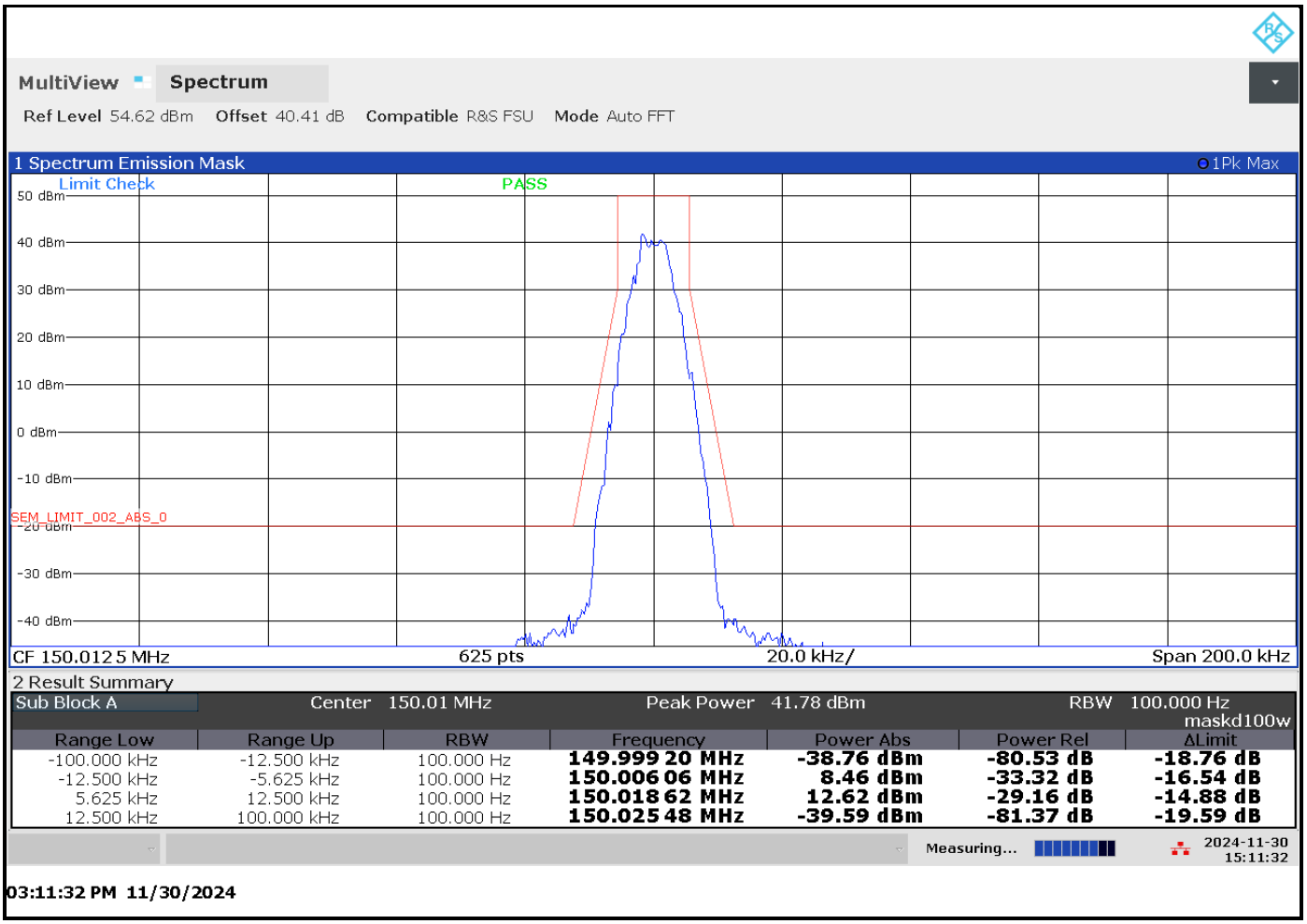
Plot 8-6: Occupied Bandwidth, 164.0750 MHz, NARROWBAND ANALOG, Mask D



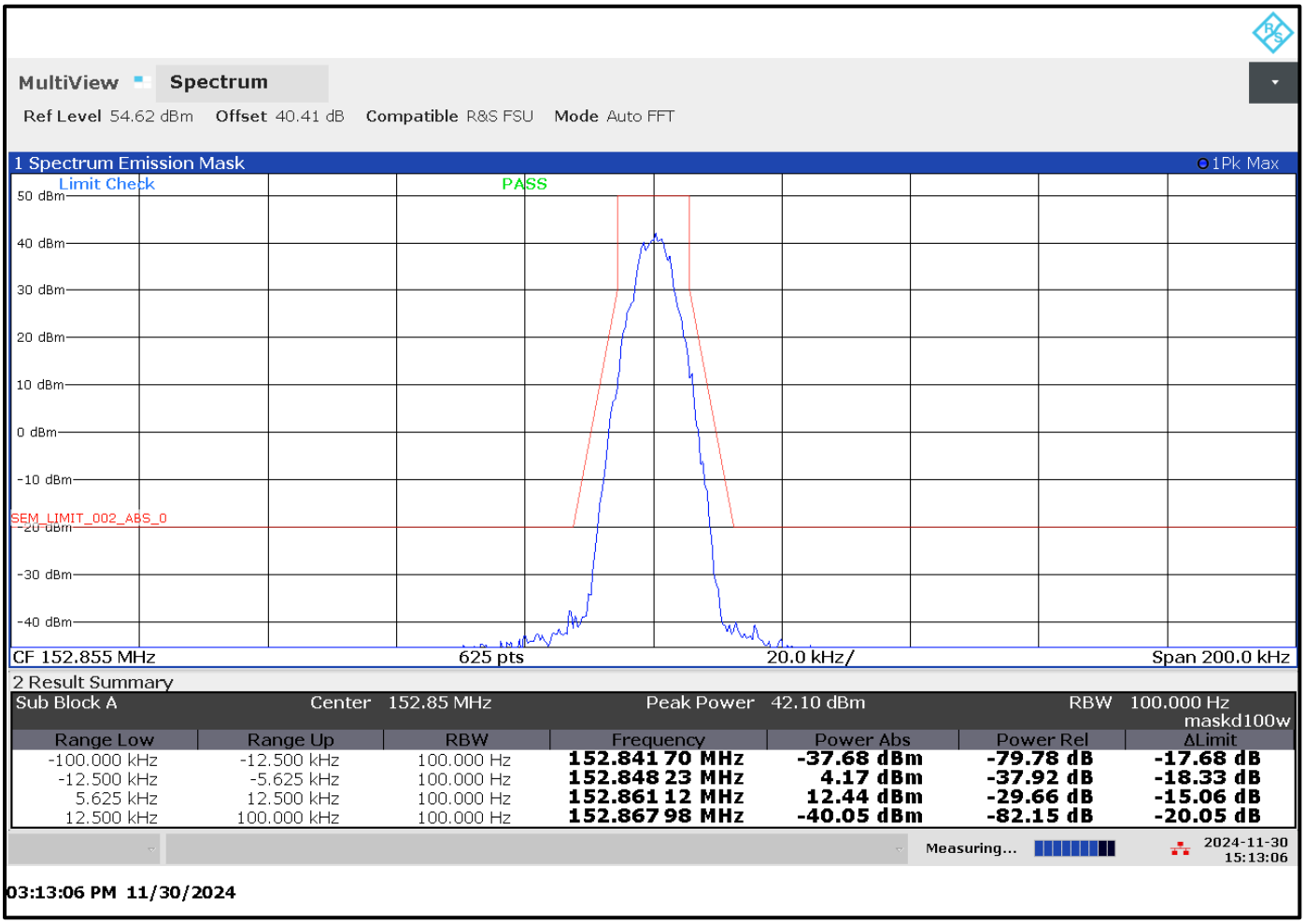
Plot 8-7: Occupied Bandwidth, 173.9875 MHz, NARROWBAND ANALOG, Mask D



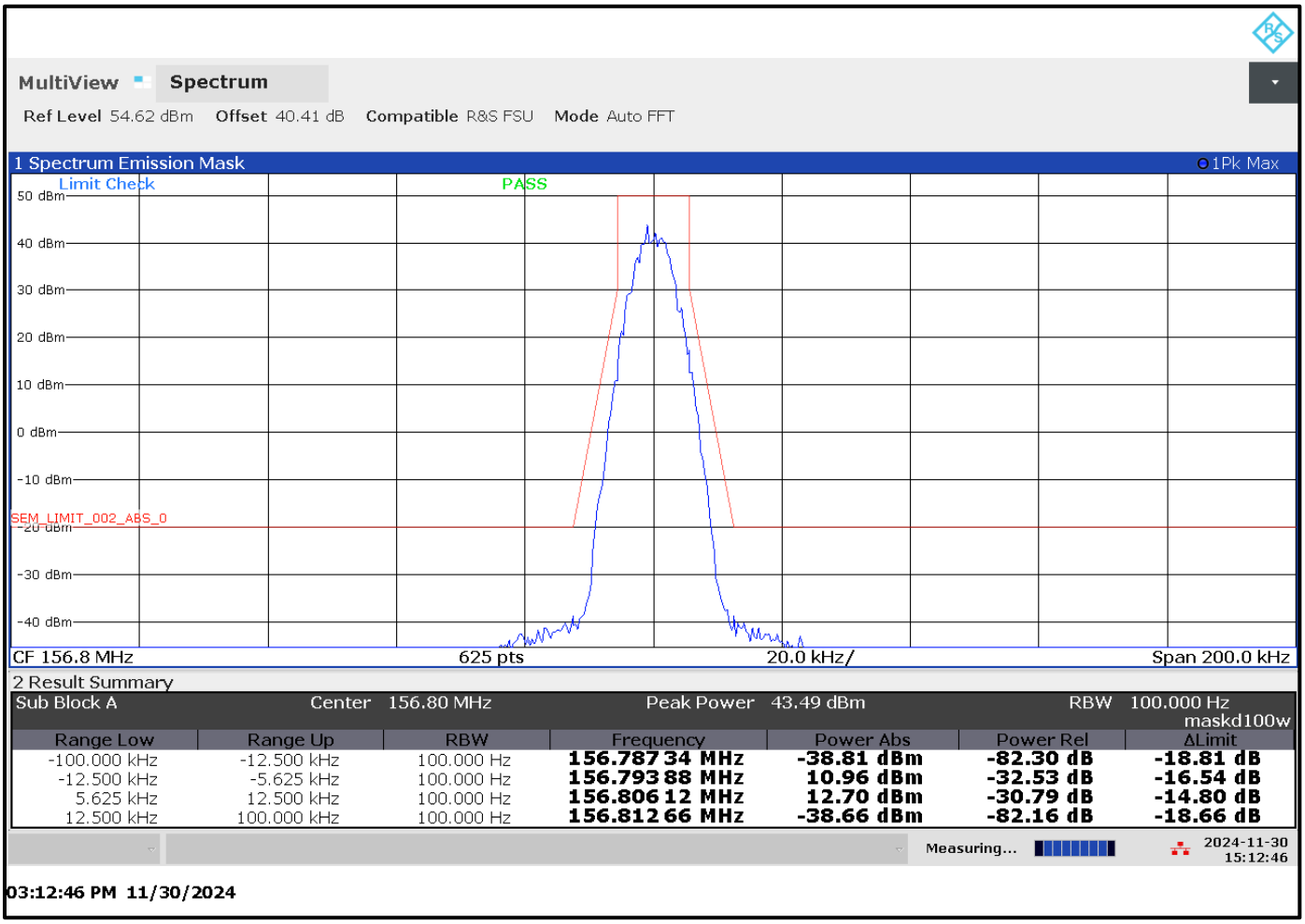
Plot 8-8: Occupied Bandwidth, 150.0125 MHz, C4FM, Mask D



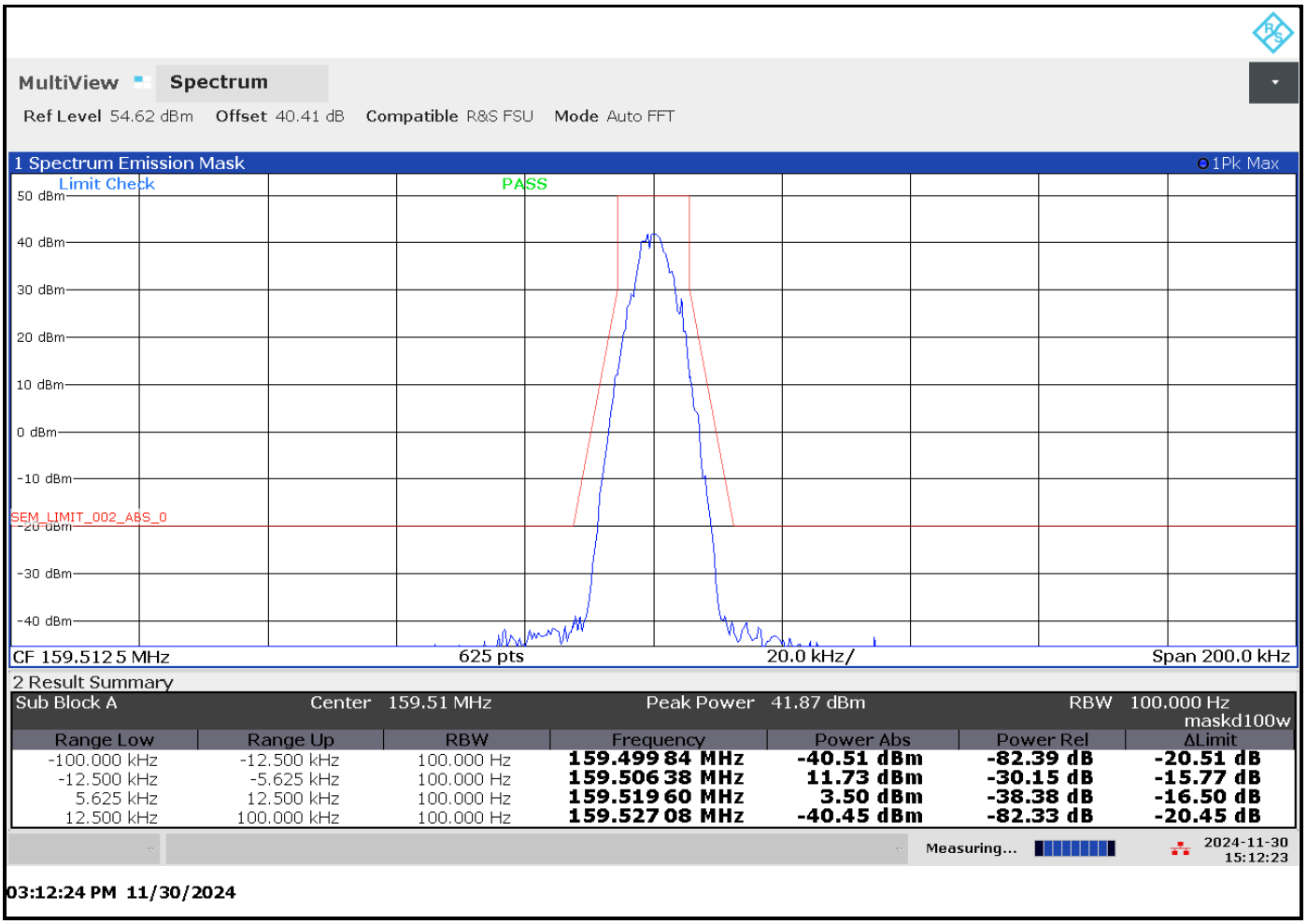
Plot 8-9: Occupied Bandwidth, 152.8550 MHz, C4FM, Mask D



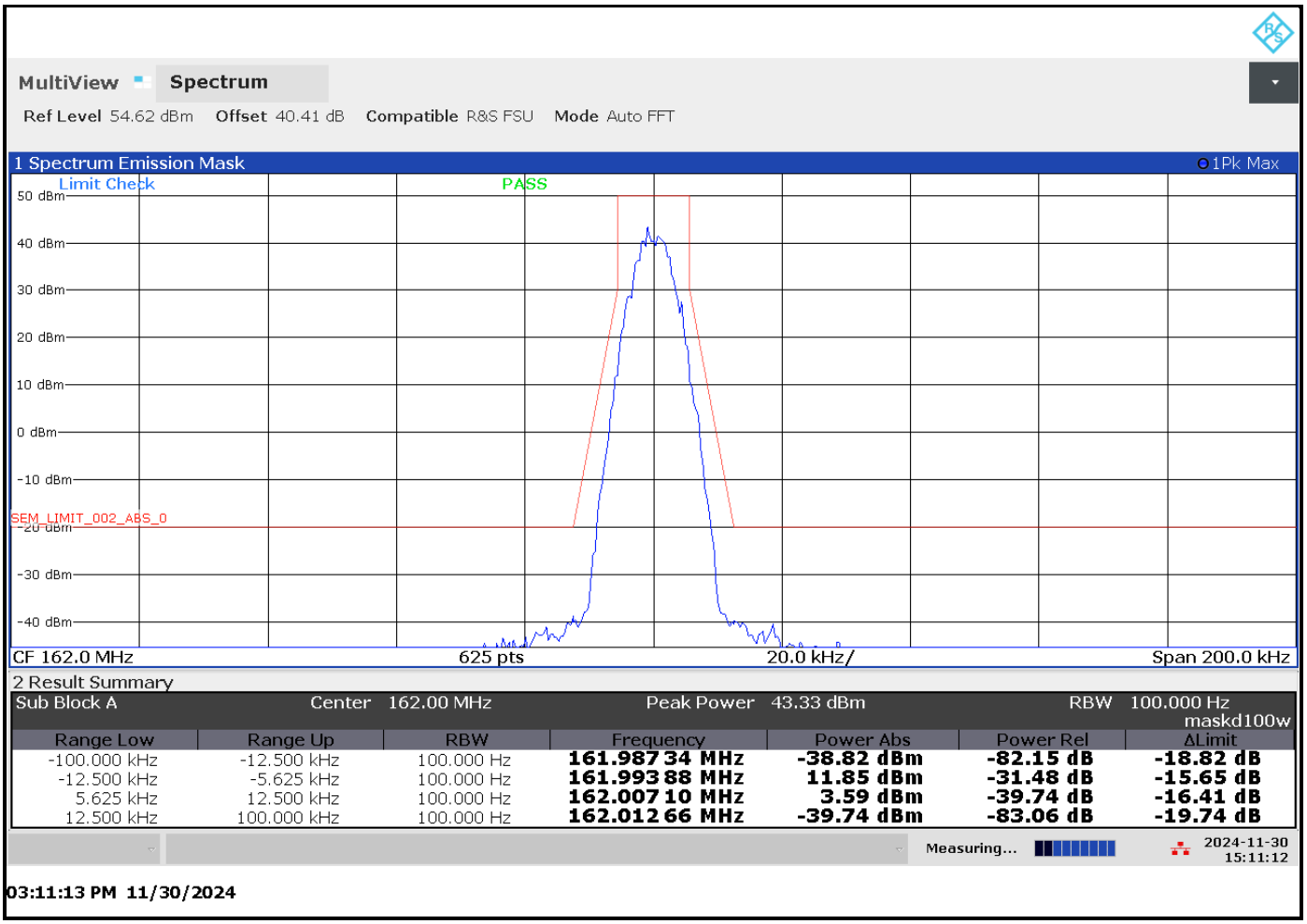
Plot 8-10: Occupied Bandwidth, 156.8000 MHz, C4FM, Mask D



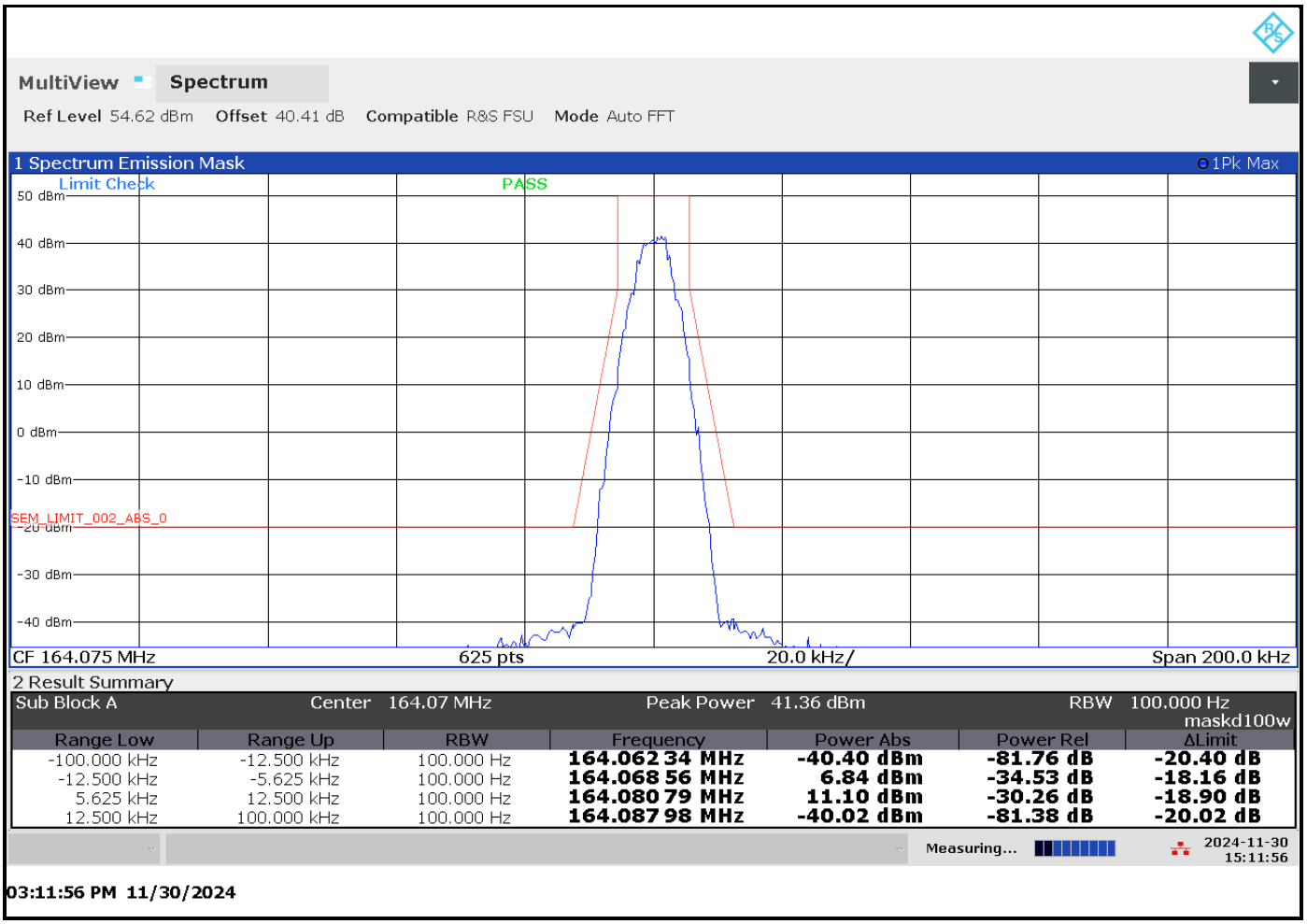
Plot 8-11: Occupied Bandwidth, 159.5125 MHz, C4FM, Mask D



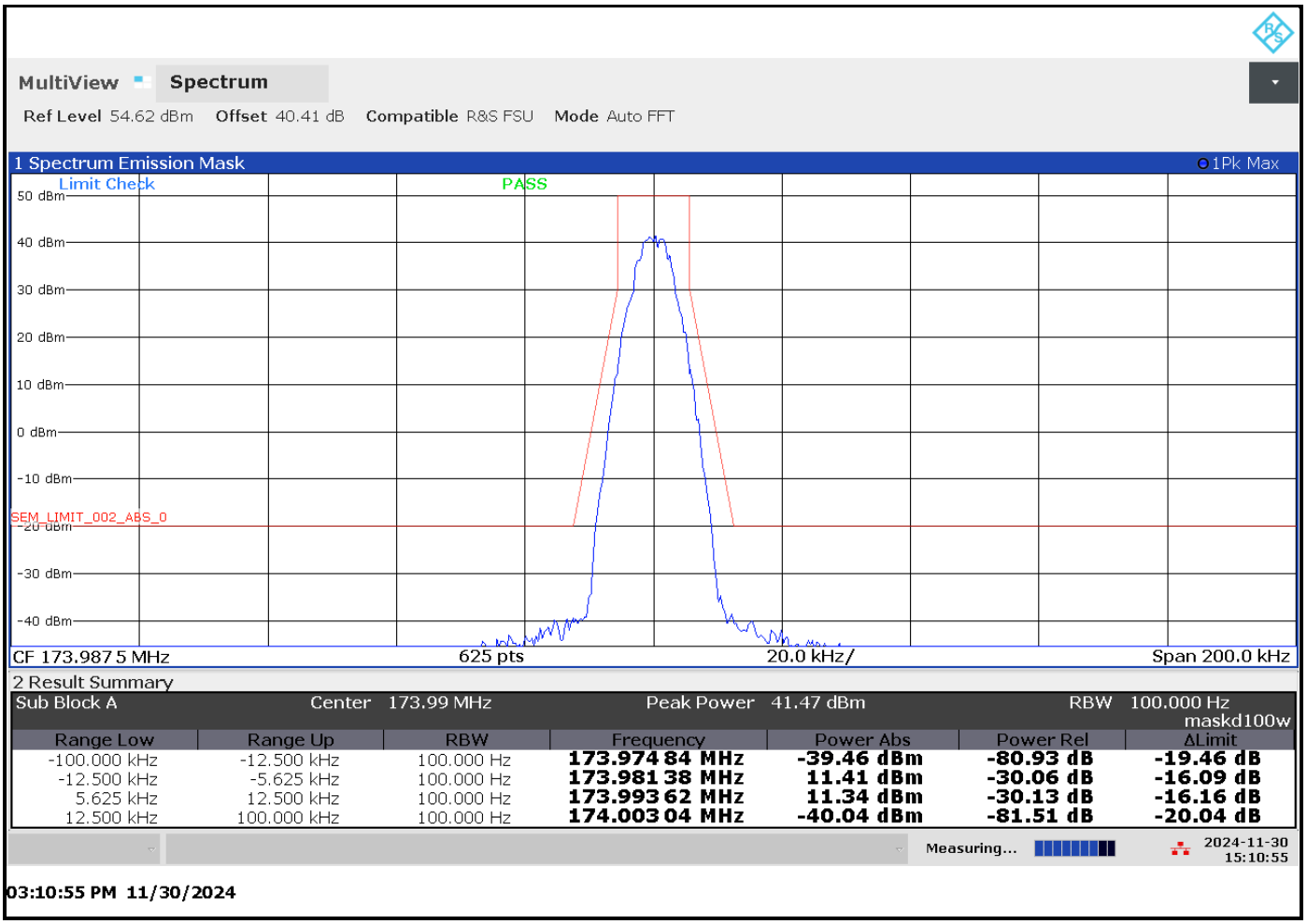
Plot 8-12: Occupied Bandwidth, 162.0000 MHz, C4FM, Mask D



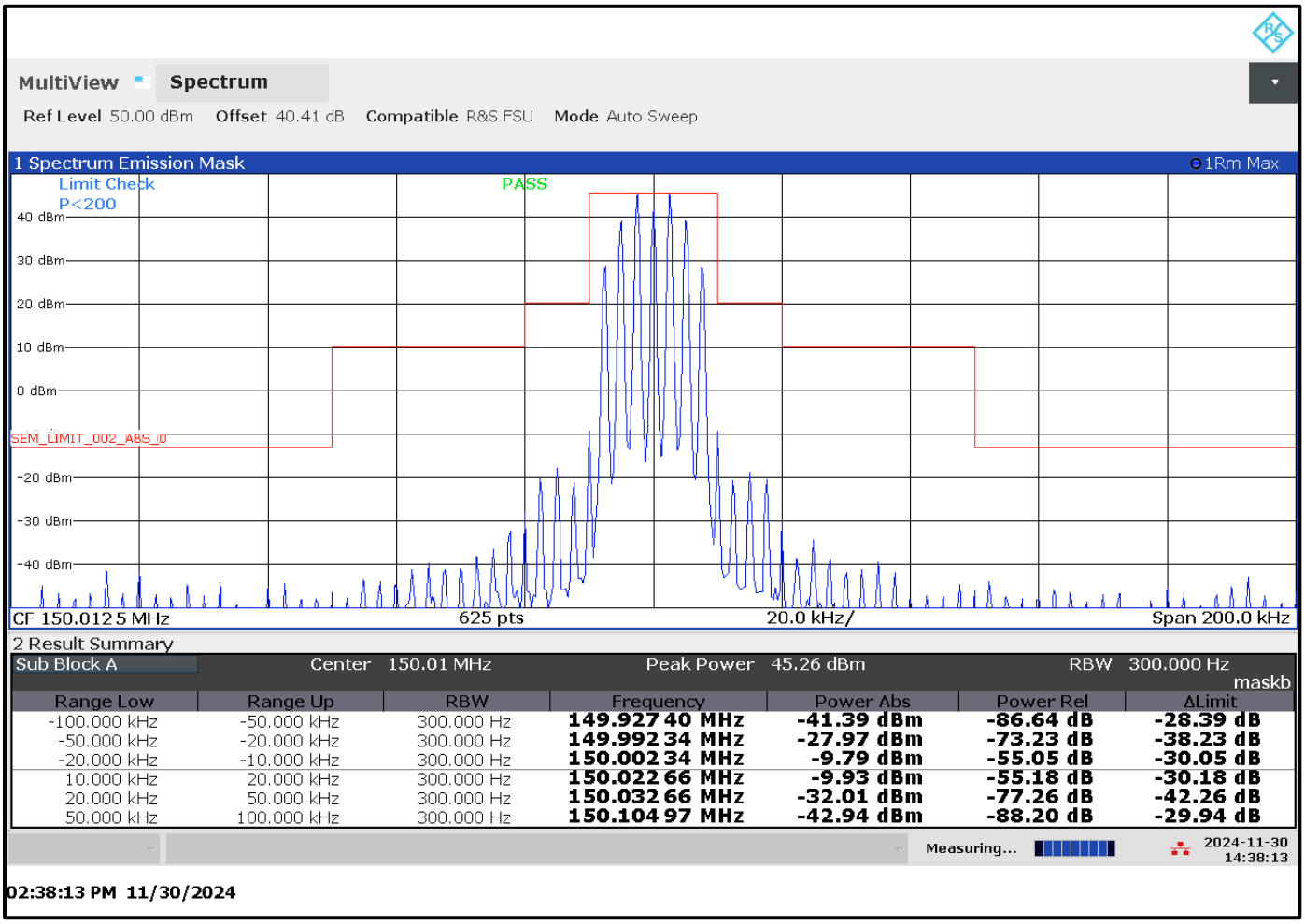
Plot 8-13: Occupied Bandwidth, 164.0750 MHz, C4FM, Mask D



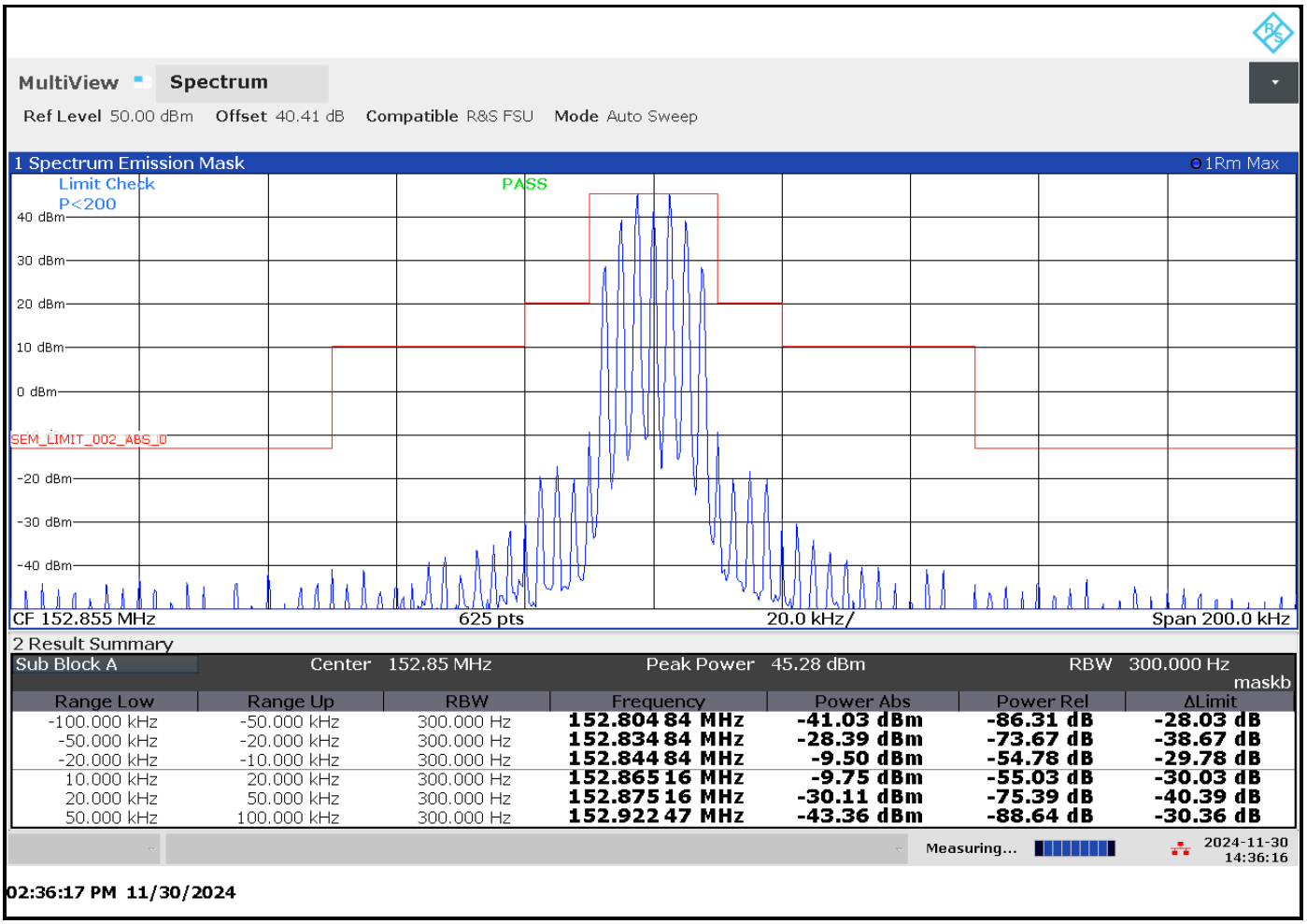
Plot 8-14: Occupied Bandwidth, 173.9875 MHz, C4FM, Mask D



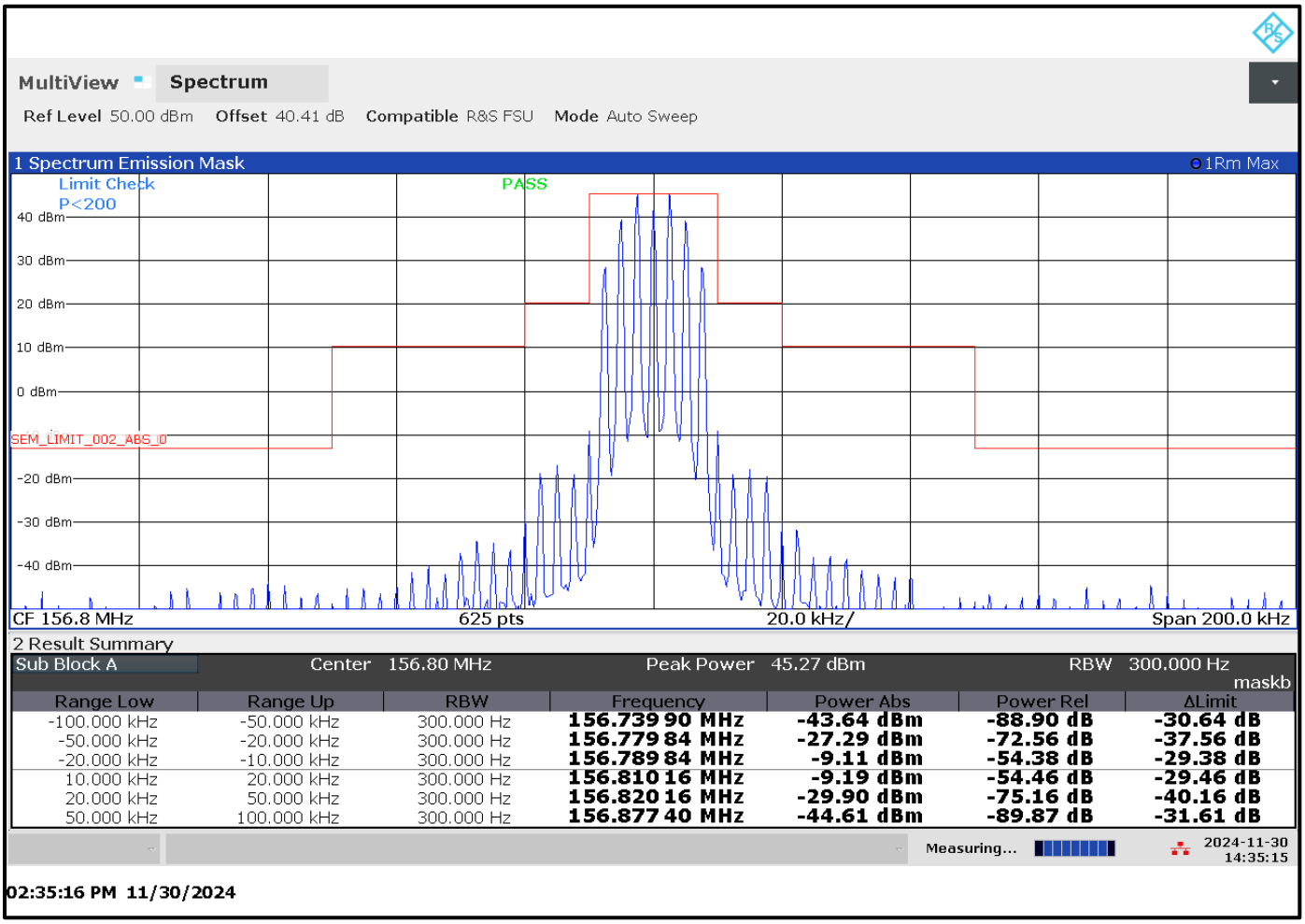
Plot 8-15: Occupied Bandwidth, 150.0125 MHz, Wideband Analog, Mask B



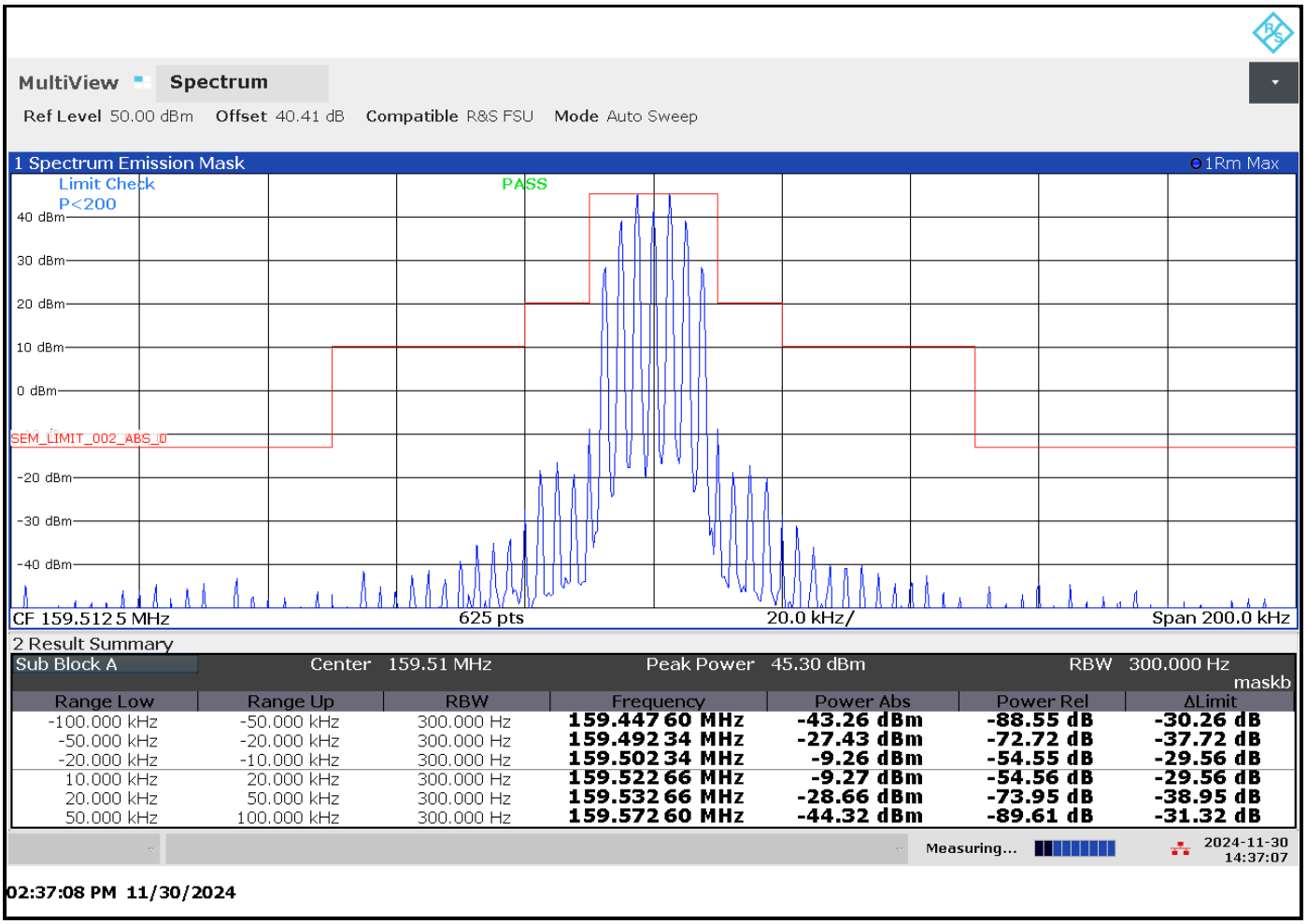
Plot 8-16: Occupied Bandwidth, 152.8550 MHz, Wideband Analog, Mask B



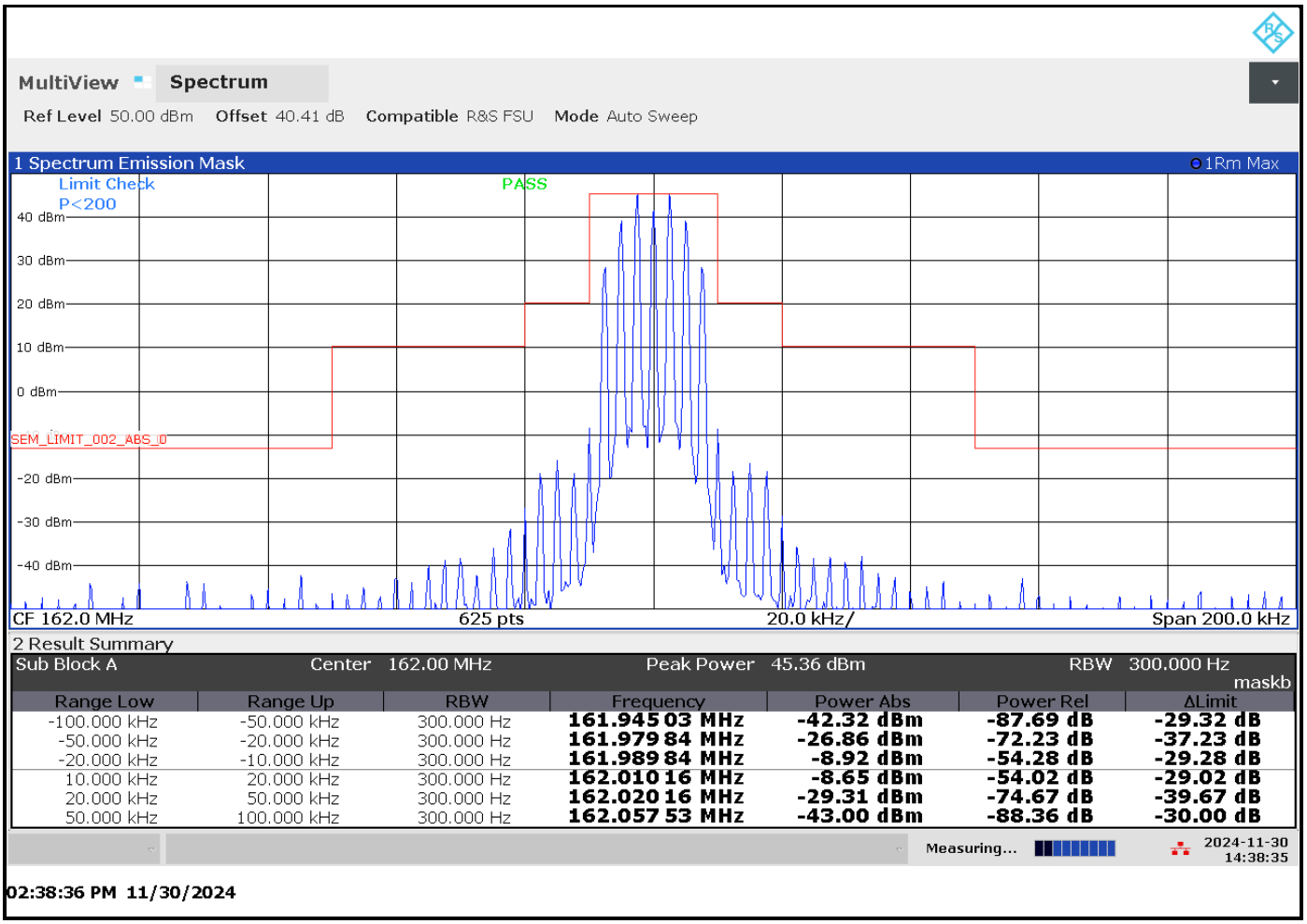
Plot 8-17: Occupied Bandwidth, 156.8000 MHz, Wideband Analog, Mask B



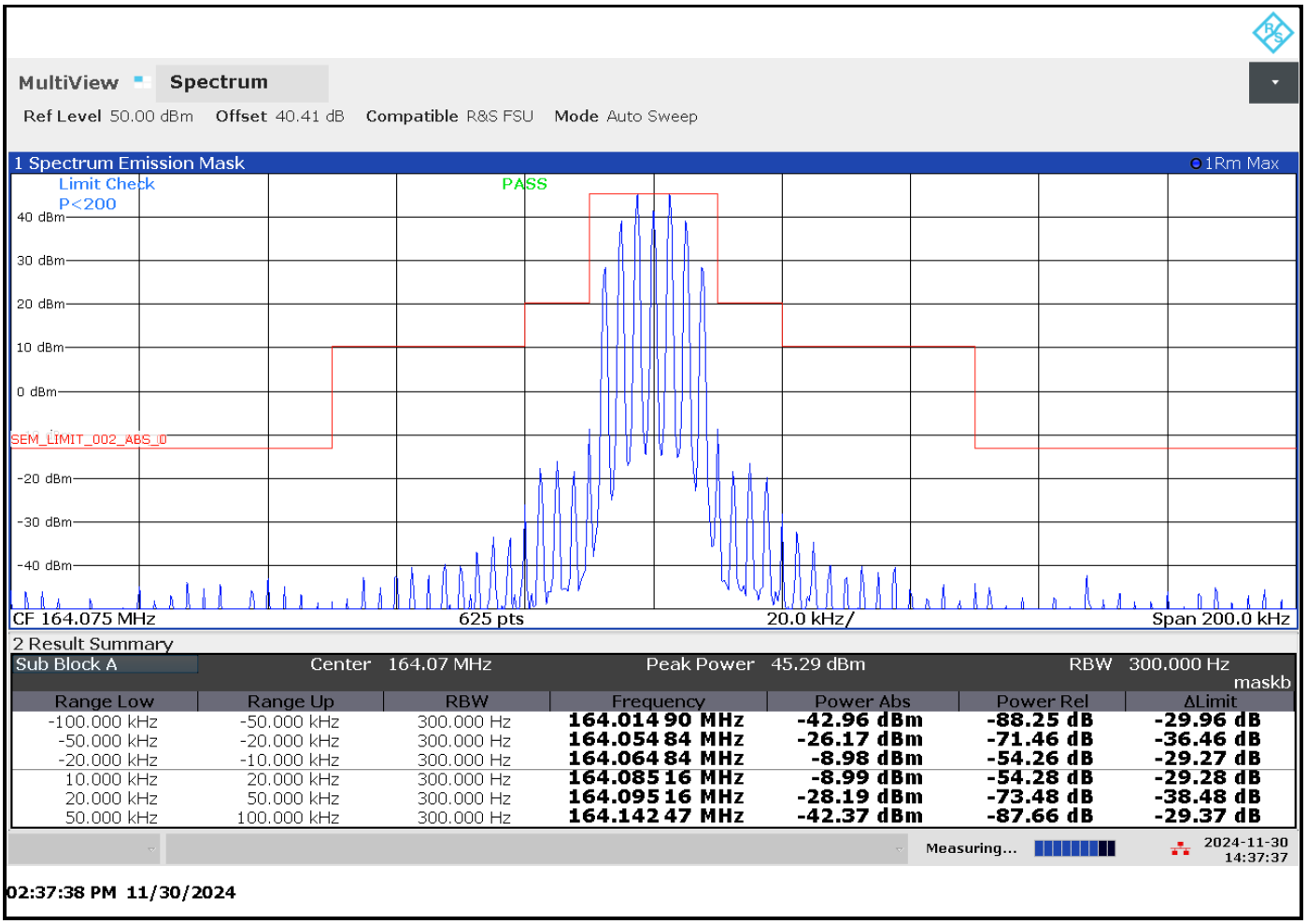
Plot 8-18: Occupied Bandwidth, 159.5125 MHz, Wideband Analog, Mask B



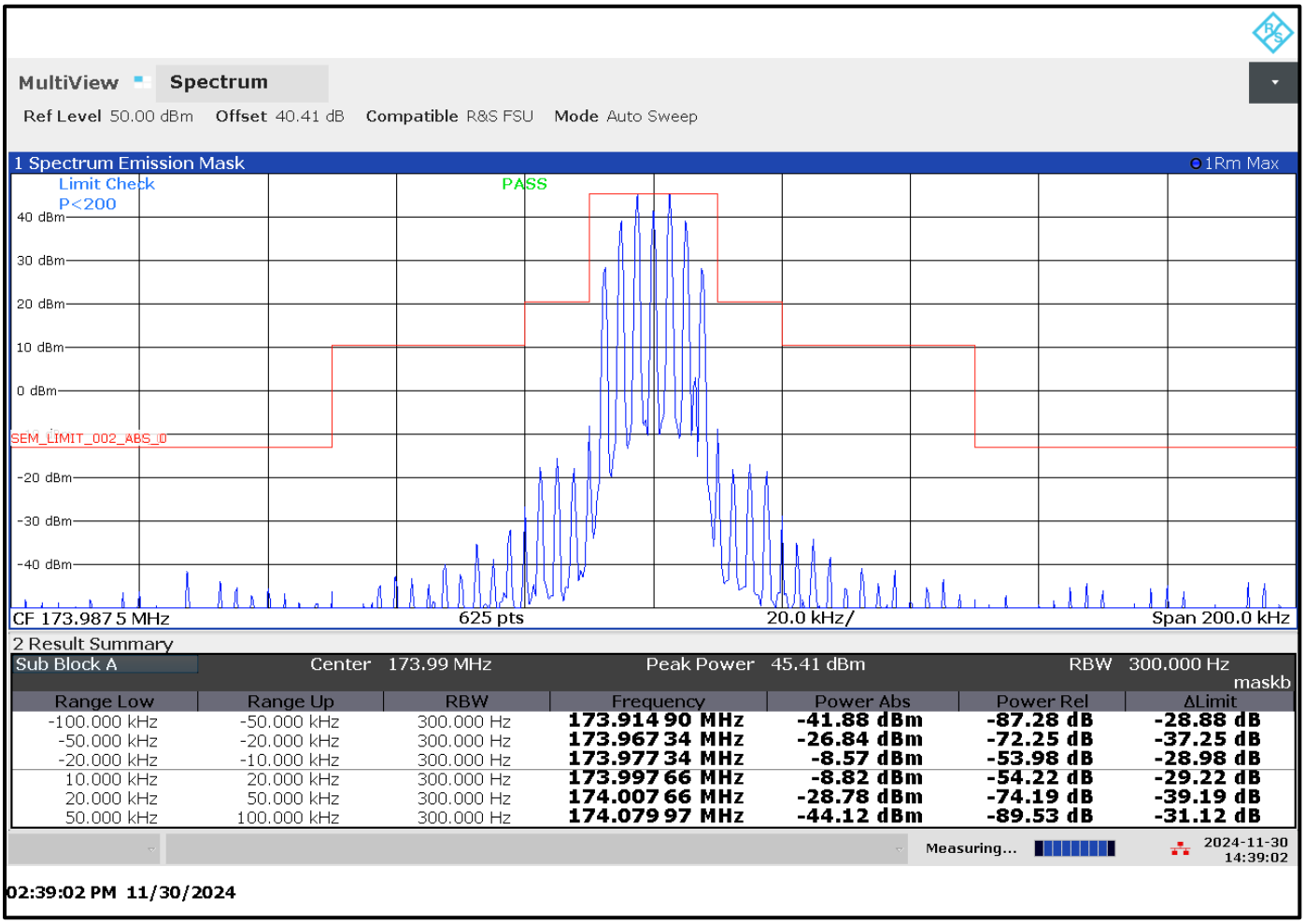
Plot 8-19: Occupied Bandwidth, 162.0000 MHz, Wideband Analog, Mask B



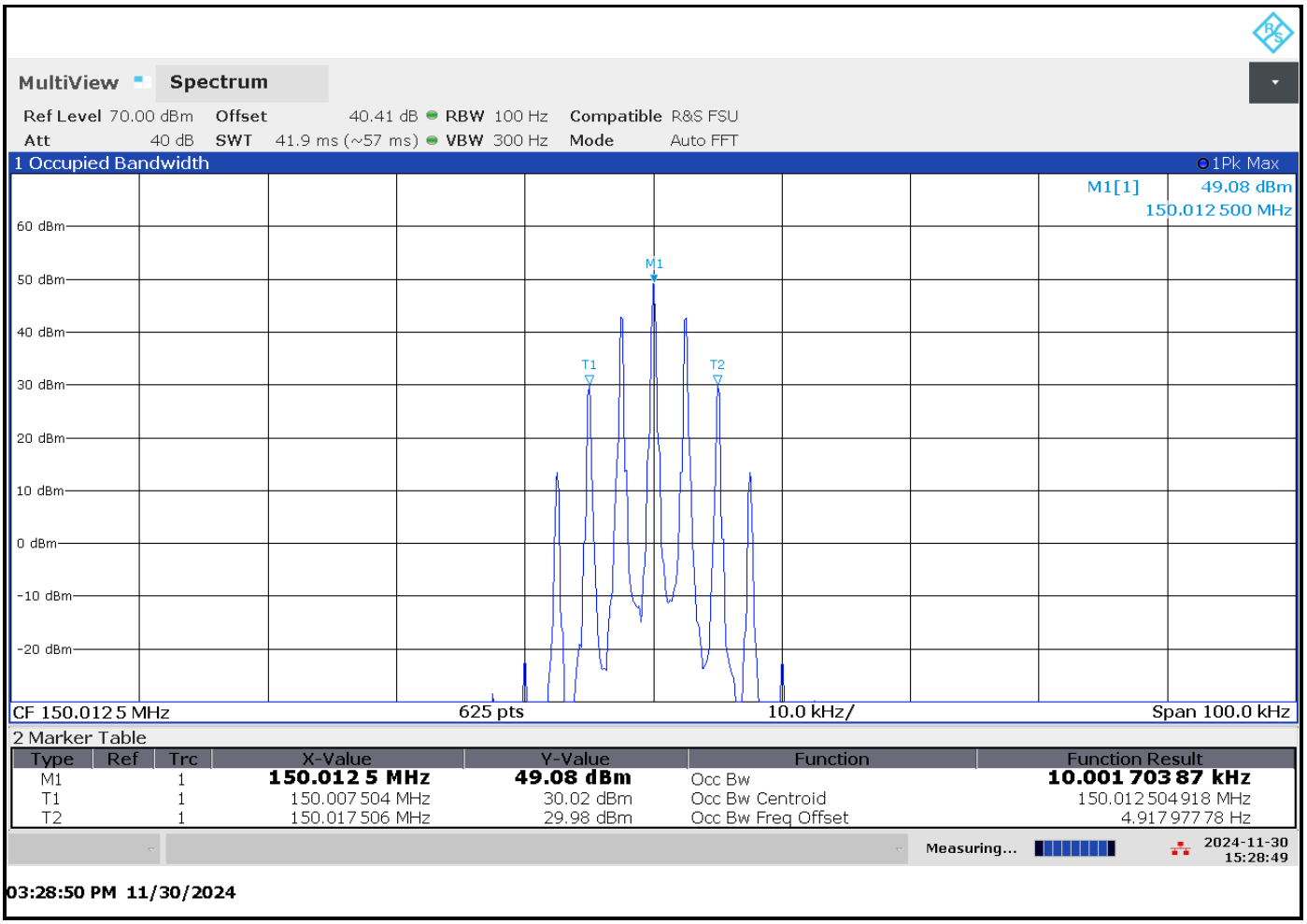
Plot 8-20: Occupied Bandwidth, 164.0750 MHz, Wideband Analog, Mask B



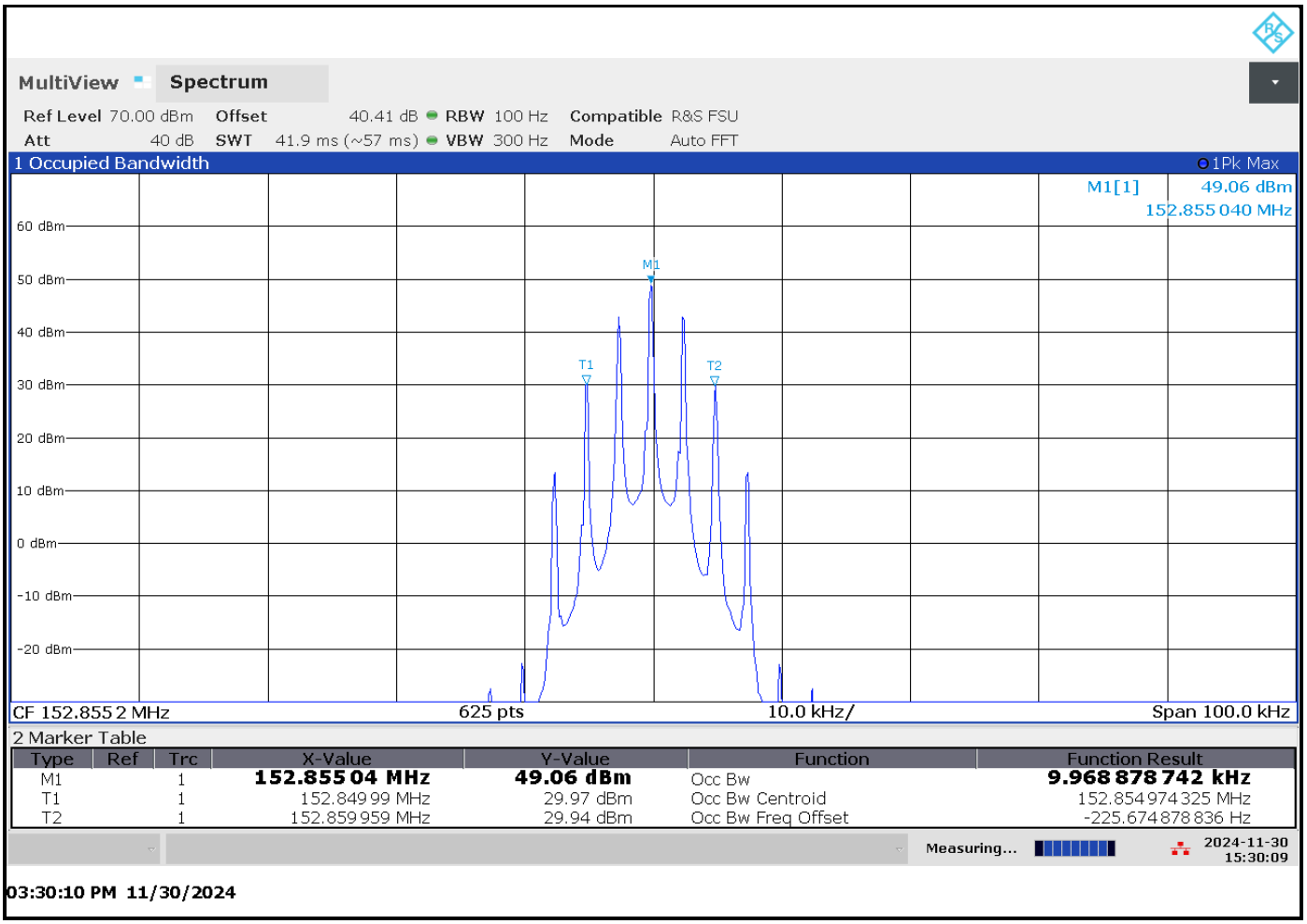
Plot 8-21: Occupied Bandwidth, 173.9875 MHz, Wideband Analog, Mask B



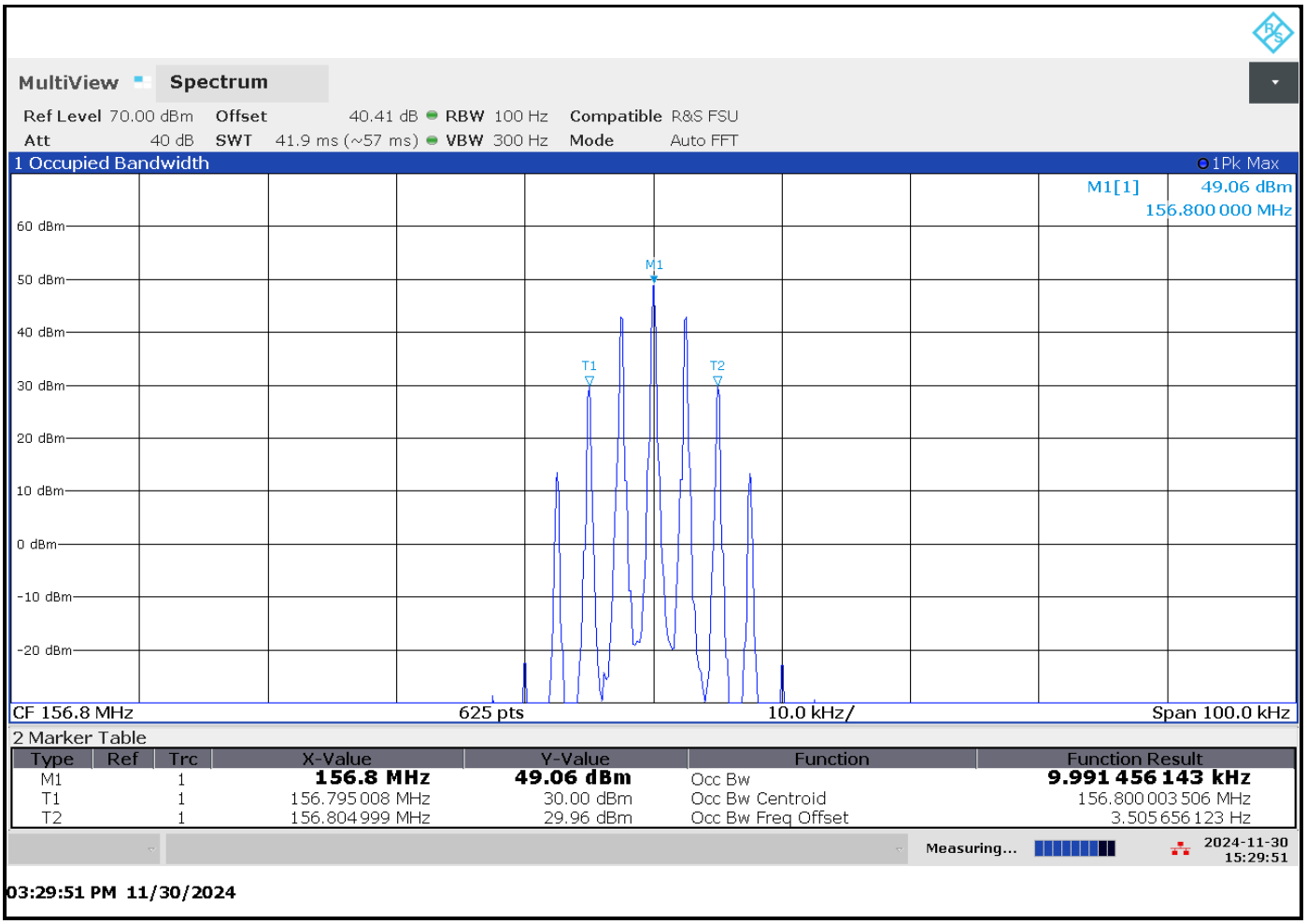
Plot 8-22: 99% BW, 150.0125 MHz, NARROWBAND ANALOG



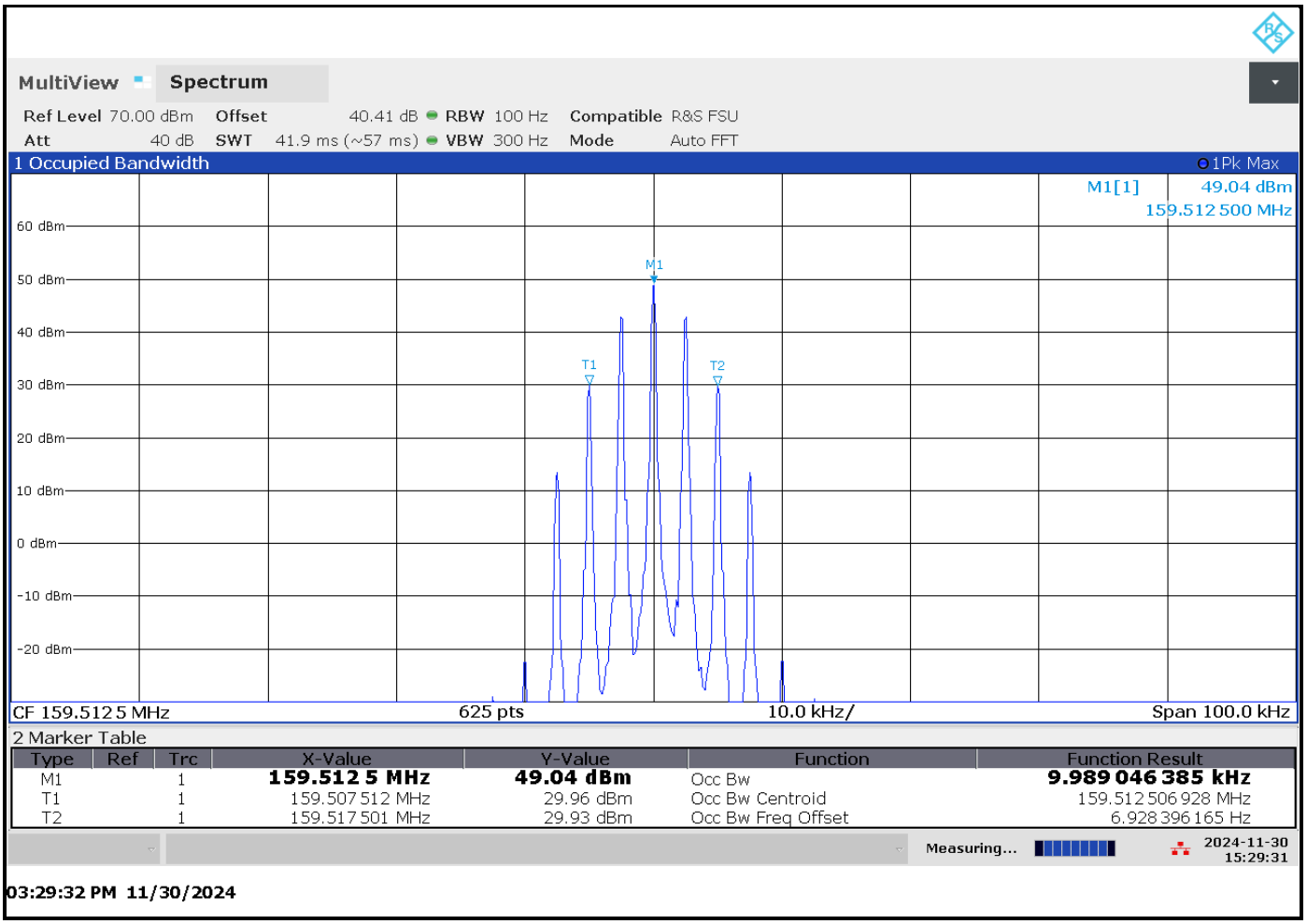
Plot 8-23: 99% BW, 152.8550 MHz, NARROWBAND ANALOG



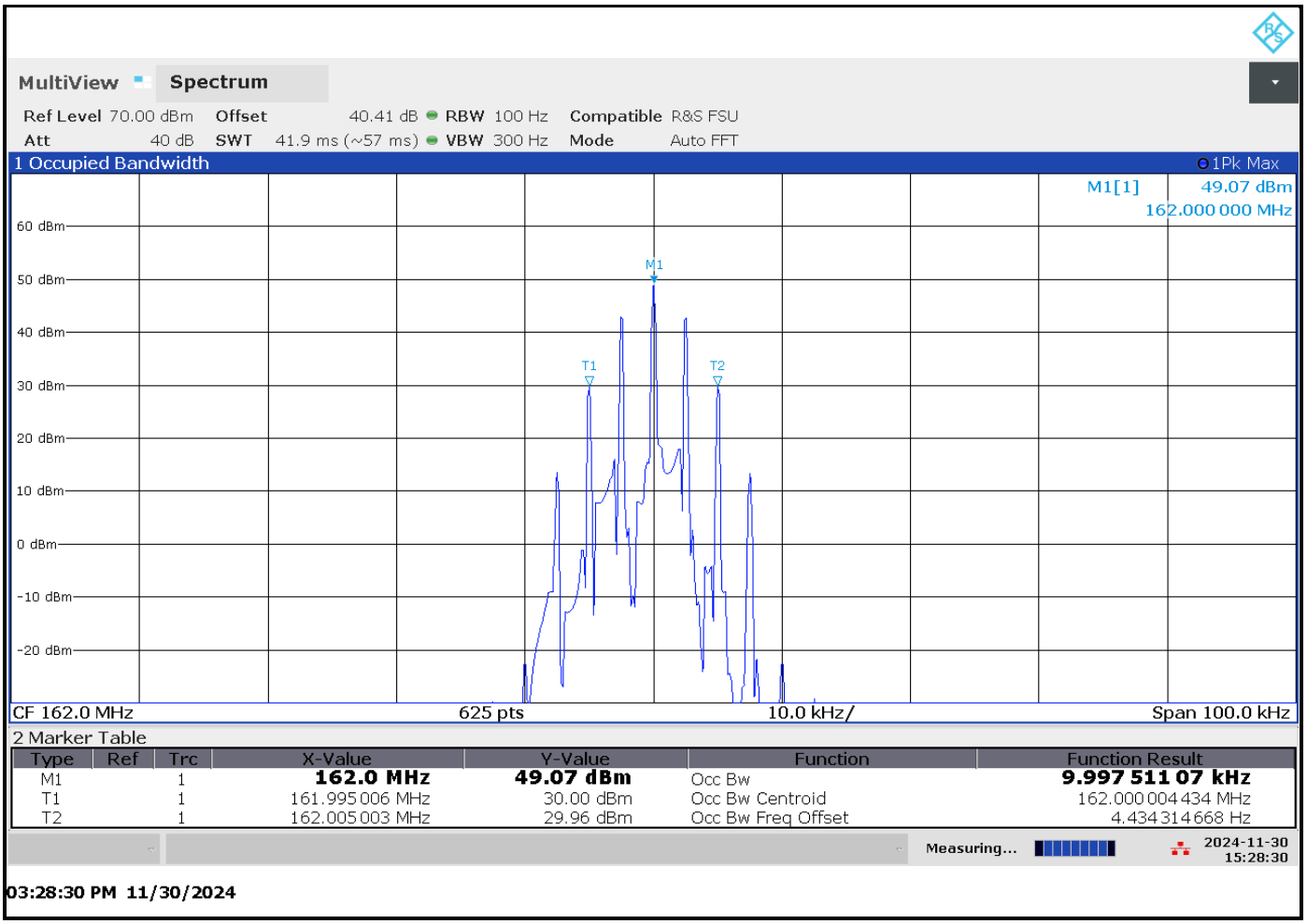
Plot 8-24: 99% BW, 156.8000 MHz, NARROWBAND ANALOG



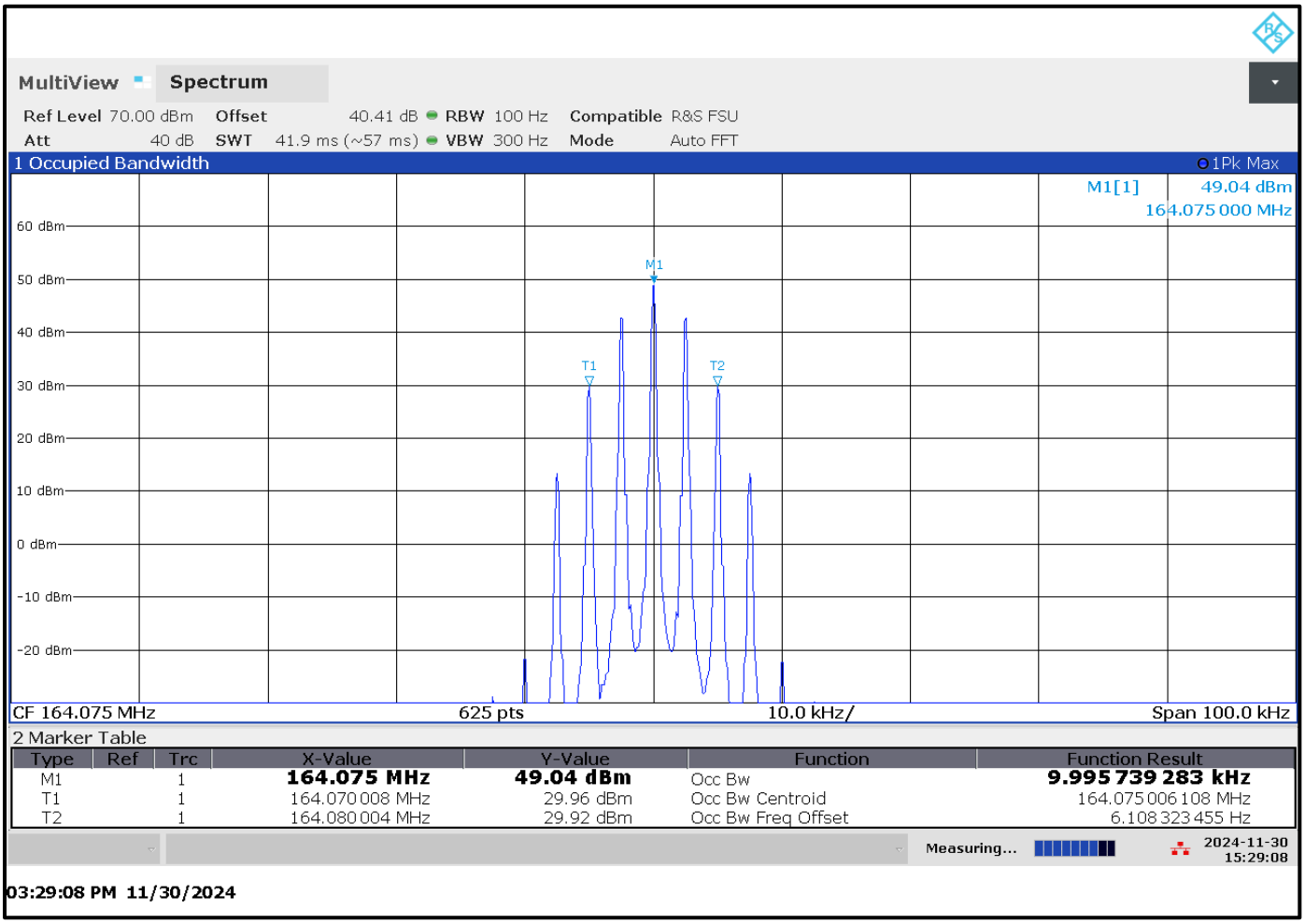
Plot 8-25: 99% BW, 159.5125 MHz, NARROWBAND ANALOG



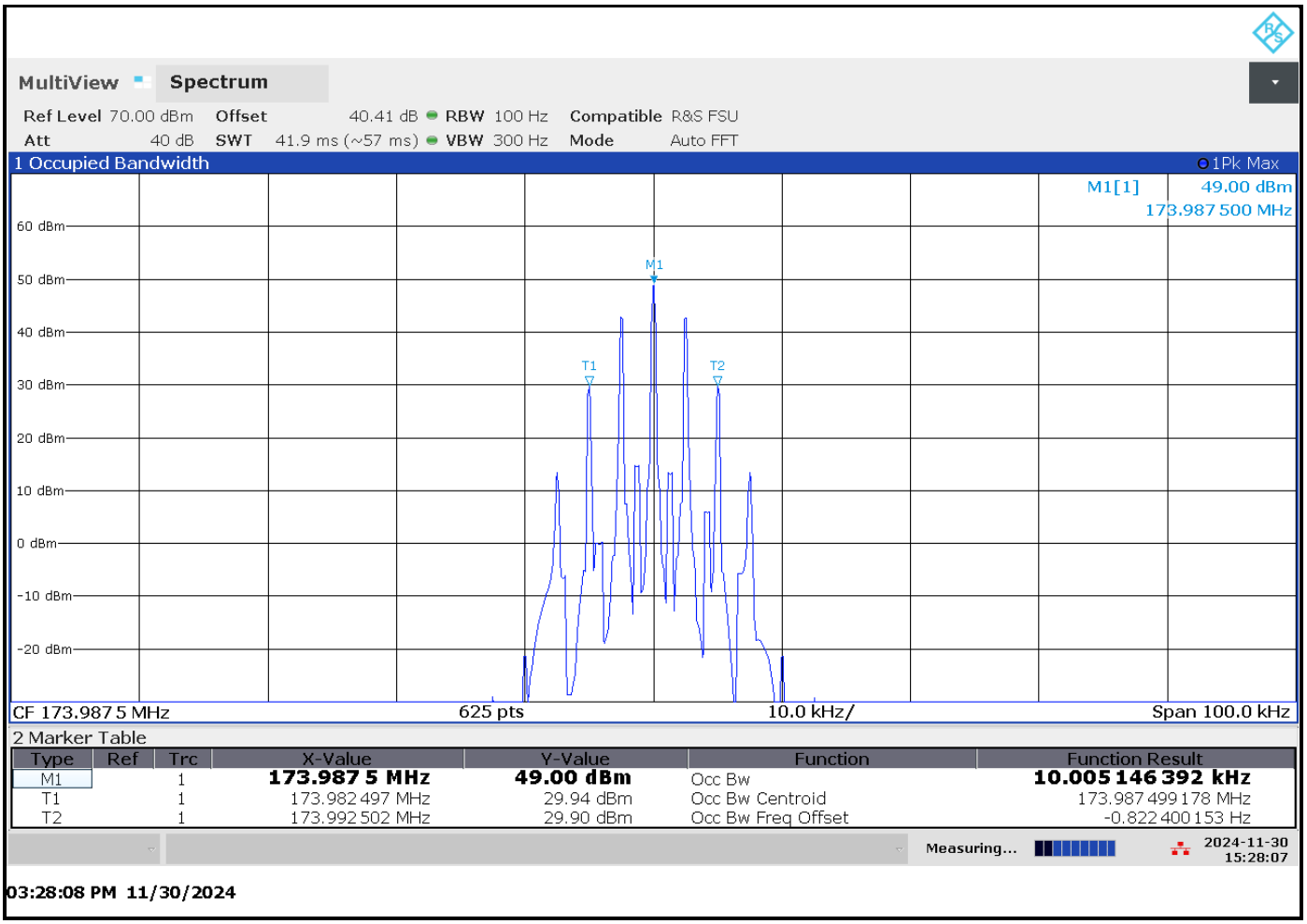
Plot 8-26: 99% BW, 162.0000 MHz, NARROWBAND ANALOG



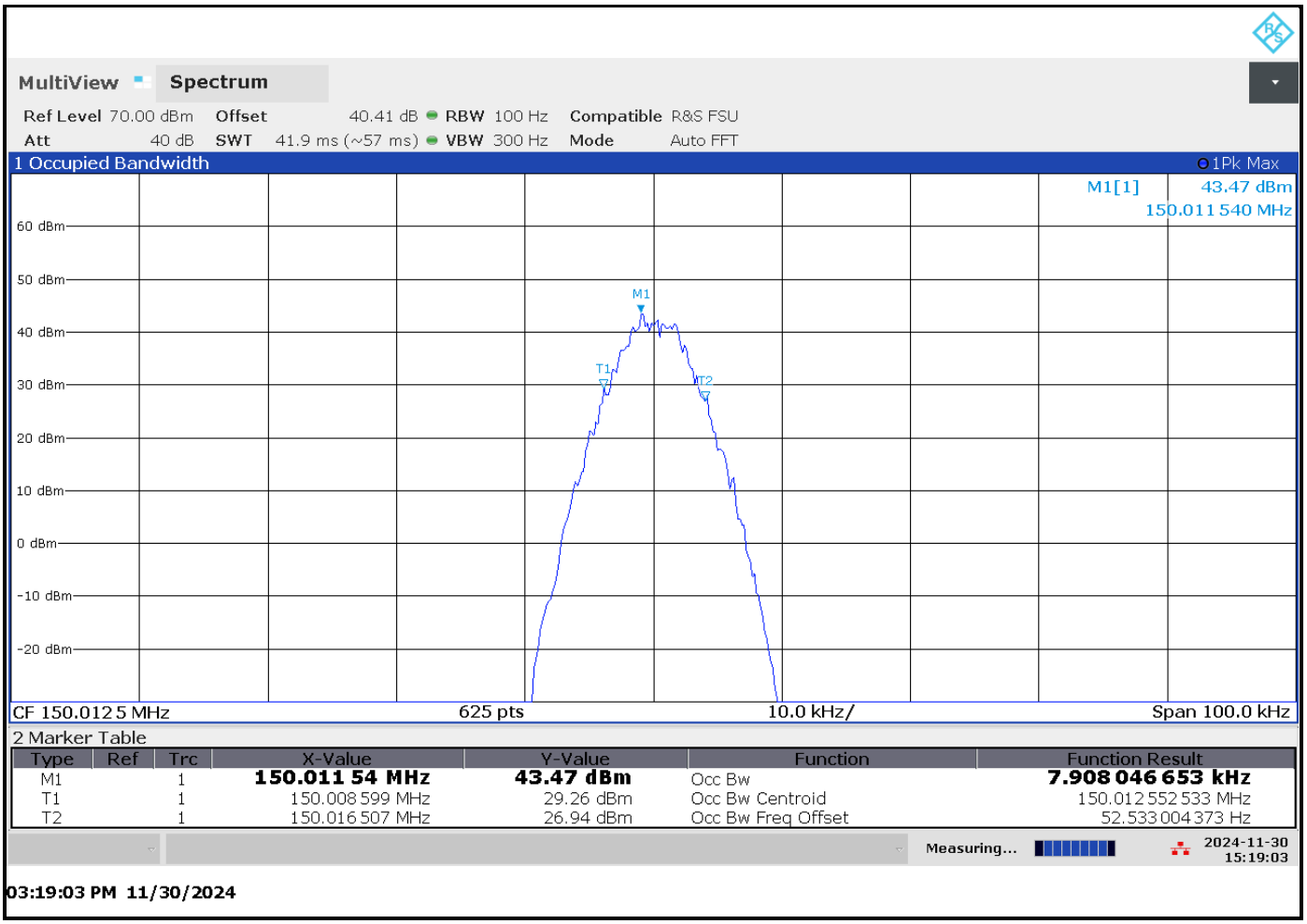
Plot 8-27: 99% BW, 164.0750 MHz, NARROWBAND ANALOG



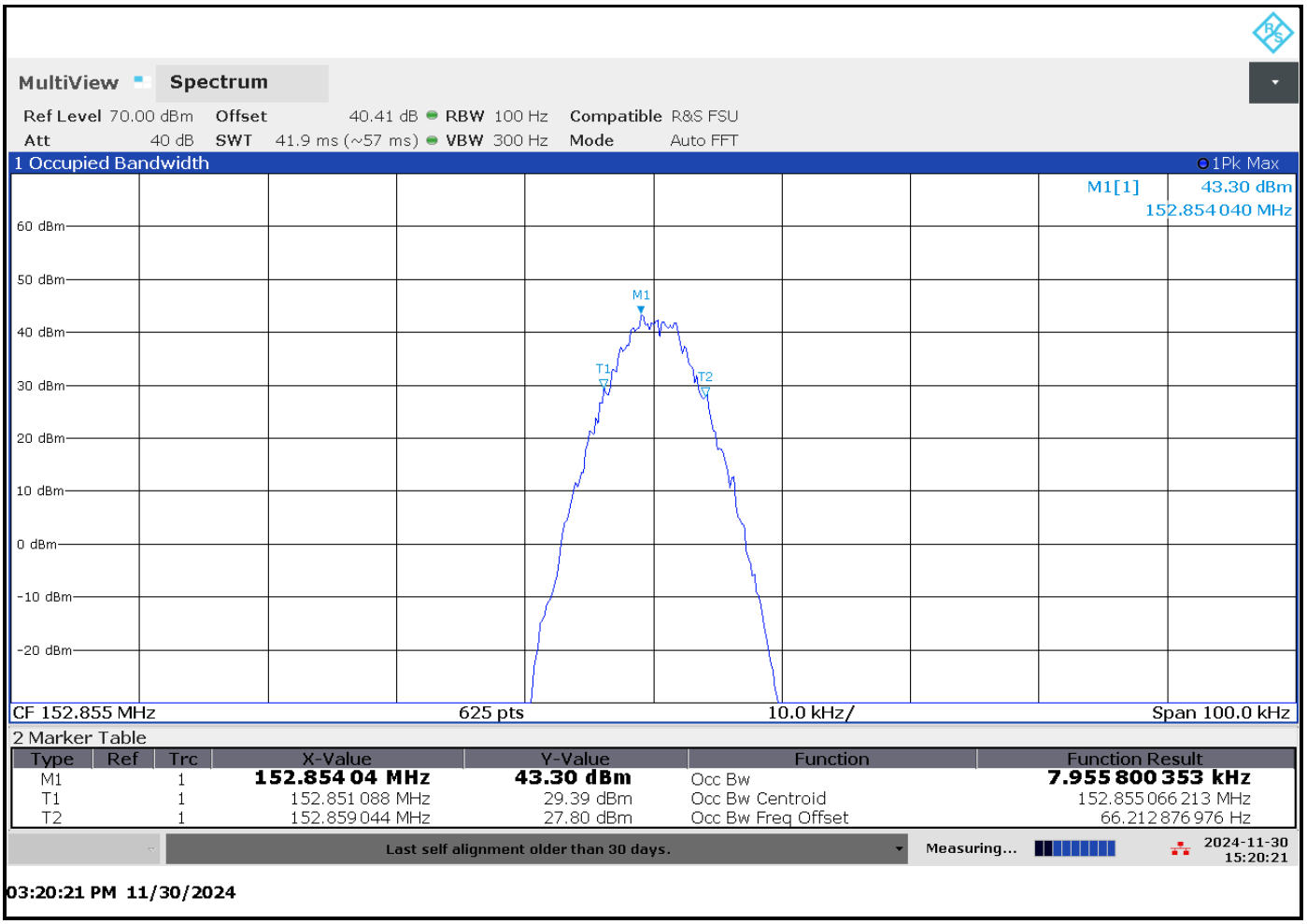
Plot 8-28: 99% BW, 173.9875 MHz, NARROWBAND ANALOG



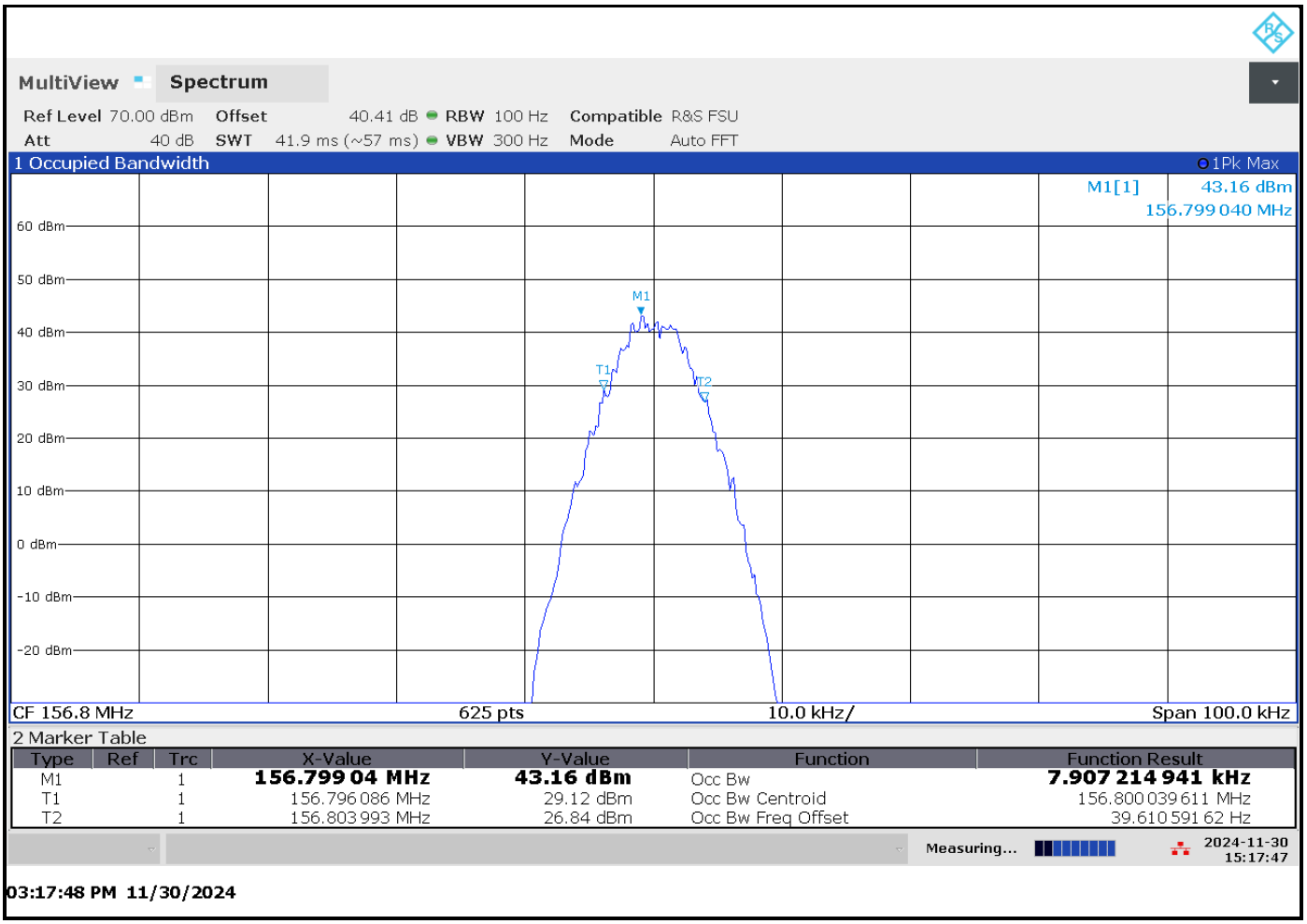
Plot 8-29: 99% BW, 150.0125 MHz, C4FM



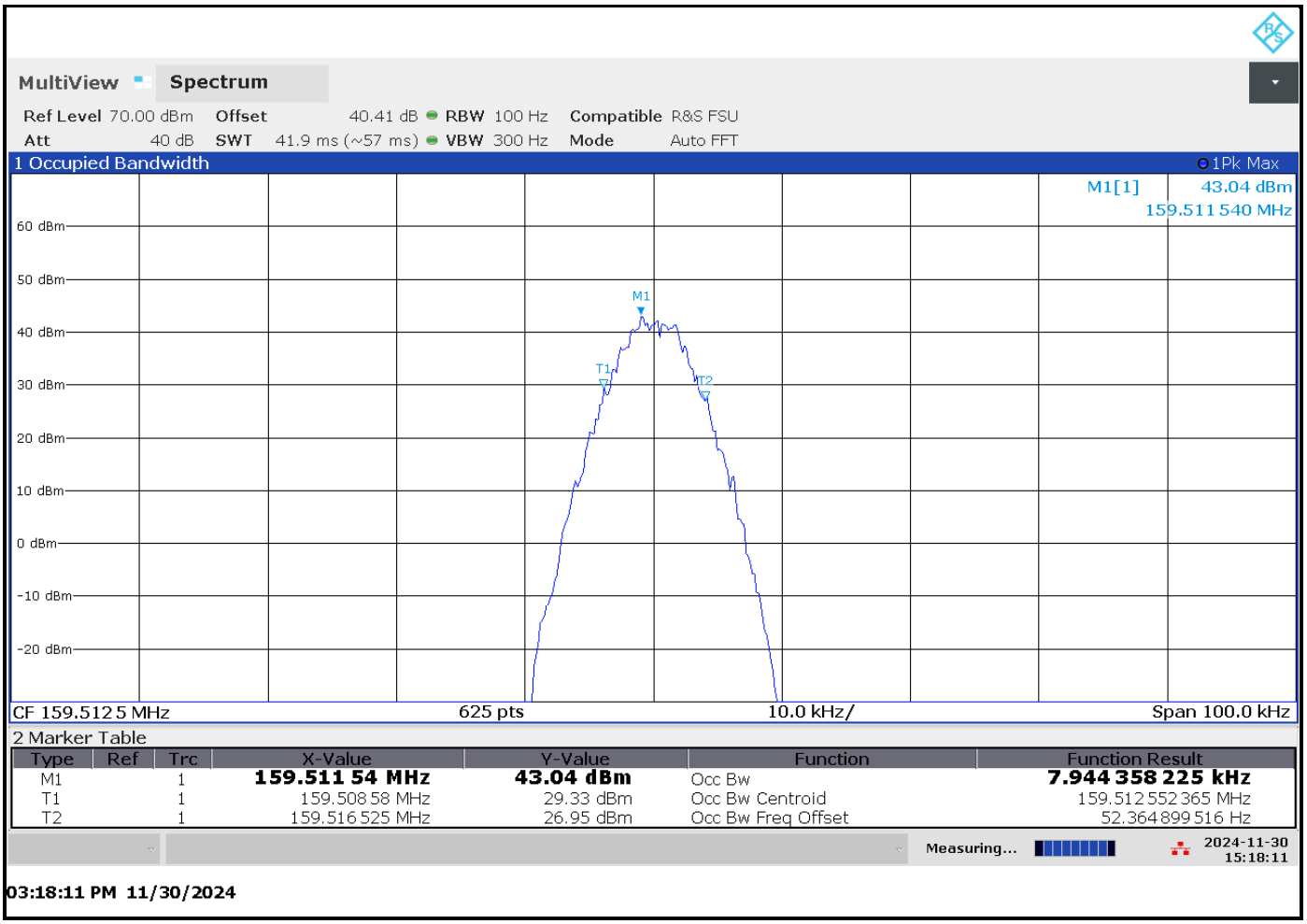
Plot 8-30: 99% BW, 152.8550 MHz, C4FM



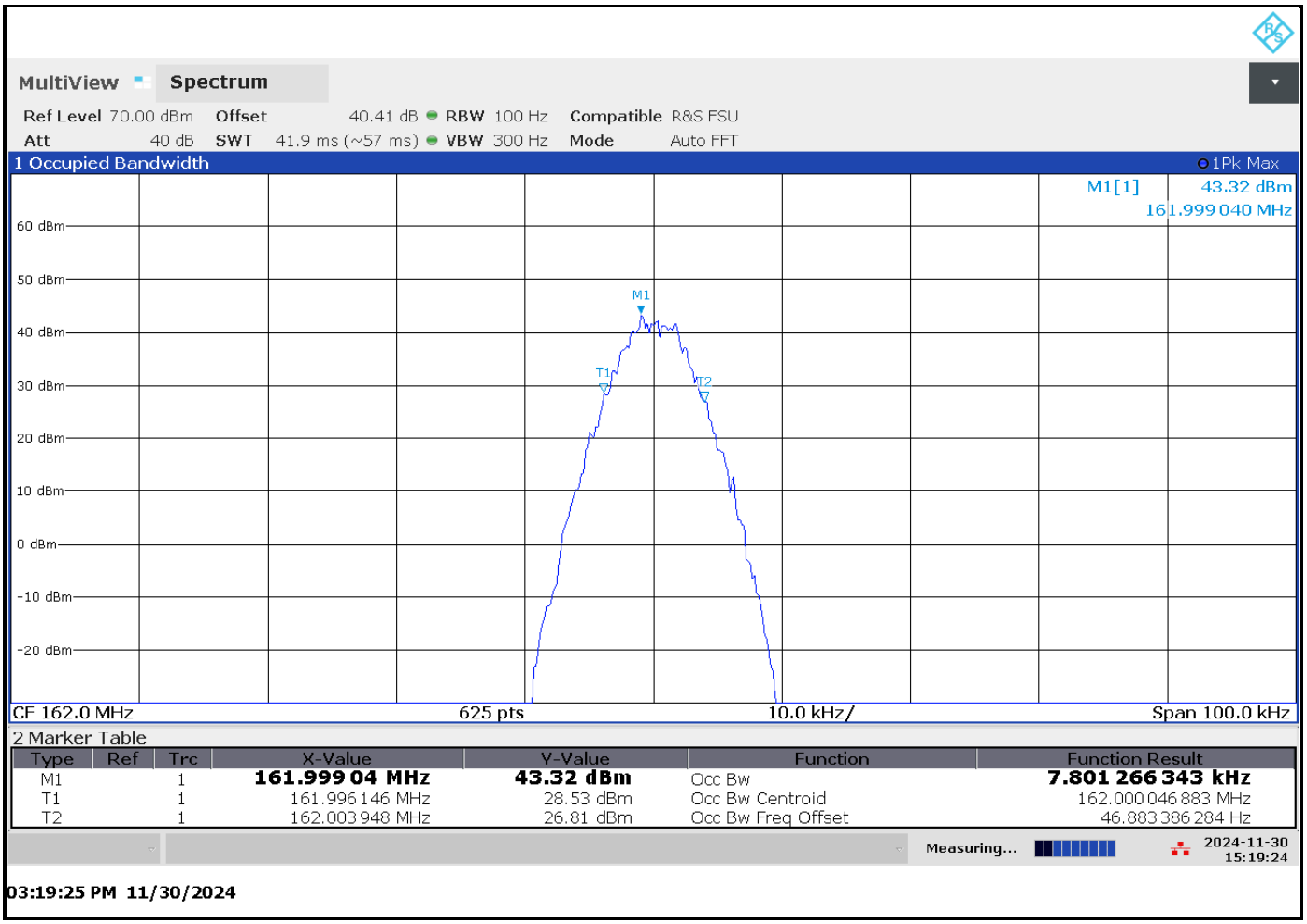
Plot 8-31: 99% BW, 156.8000 MHz, C4FM



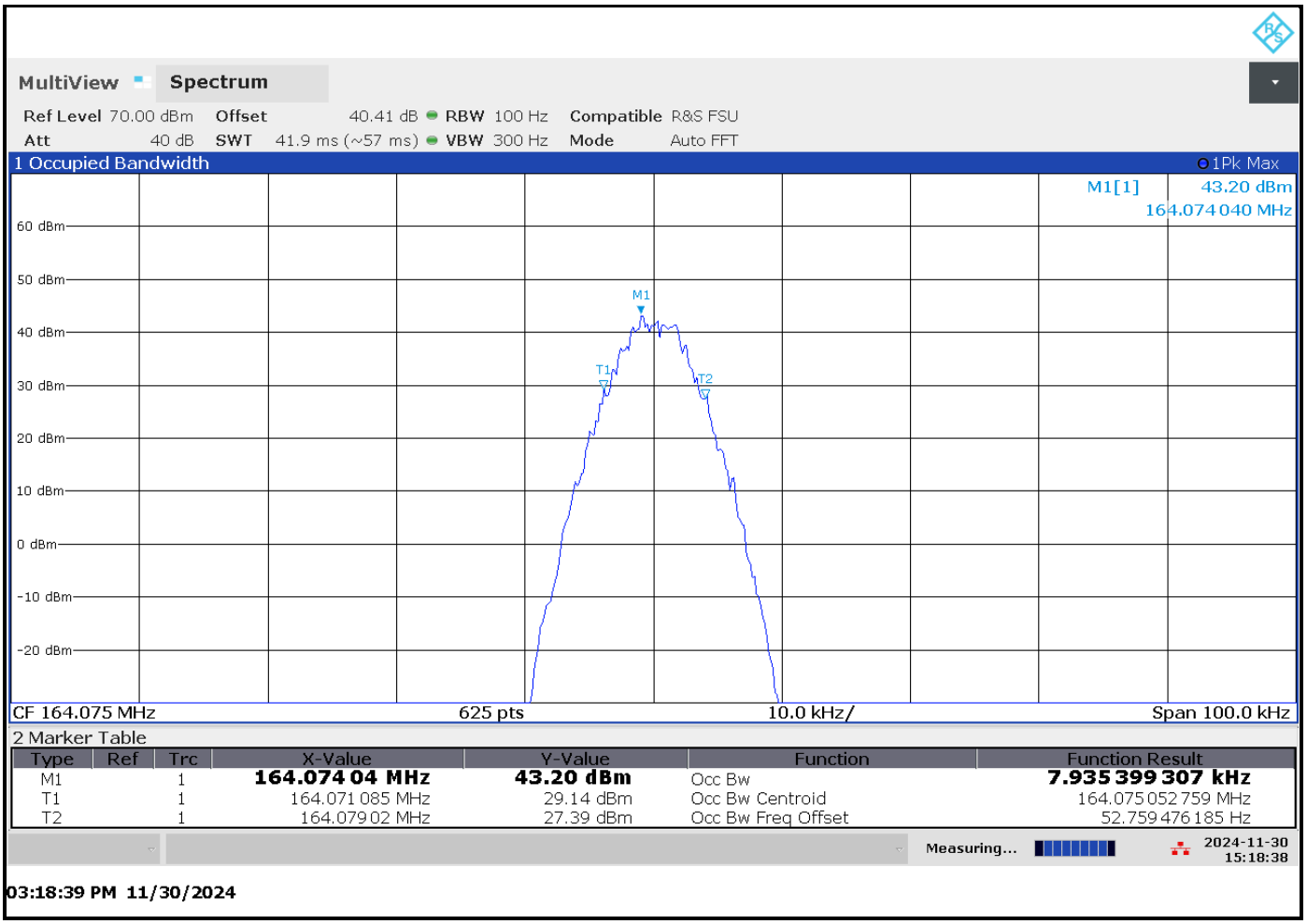
Plot 8-32: 99% BW, 159.5125 MHz, C4FM



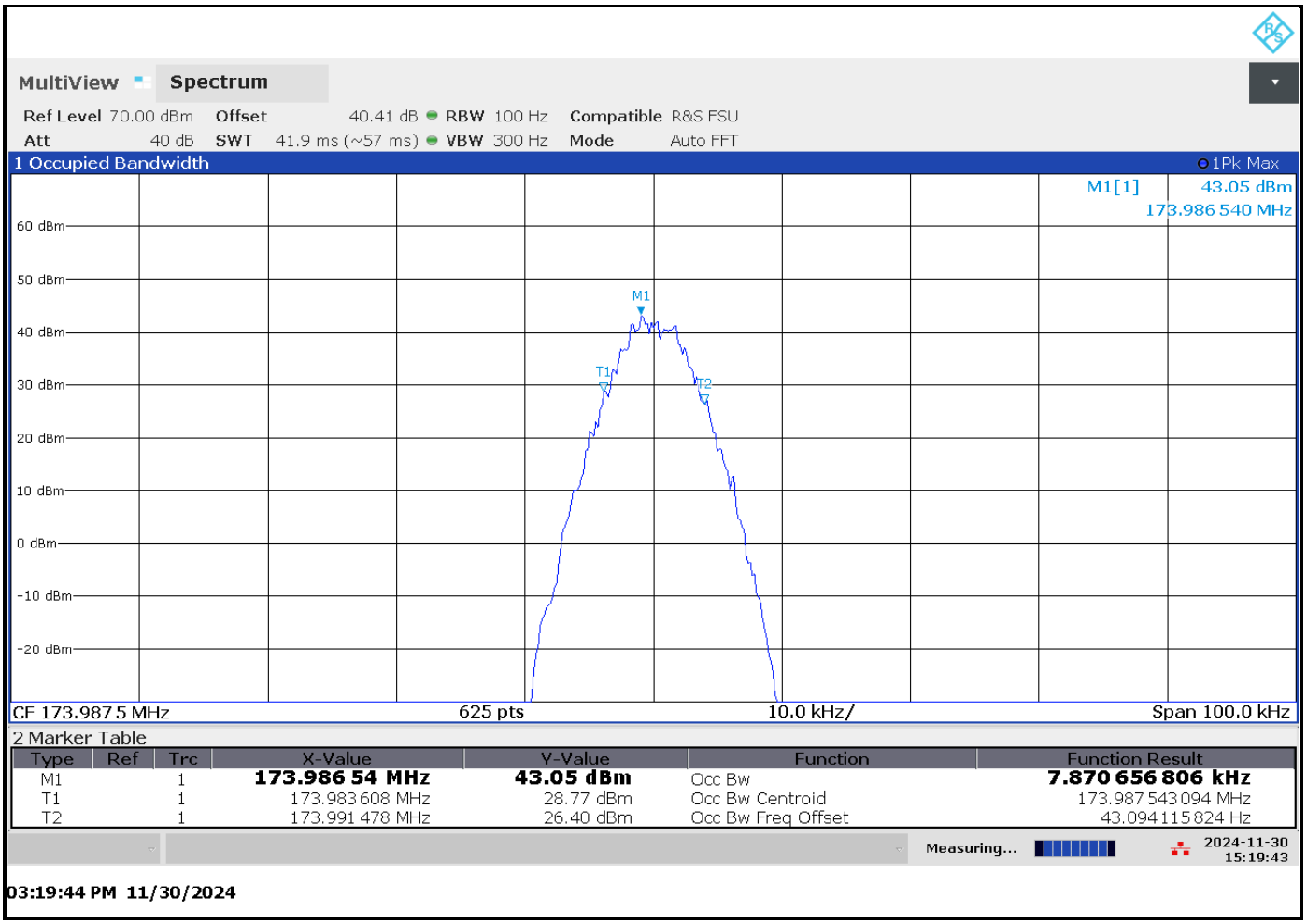
Plot 8-33: 99% BW, 162.0000 MHz, C4FM



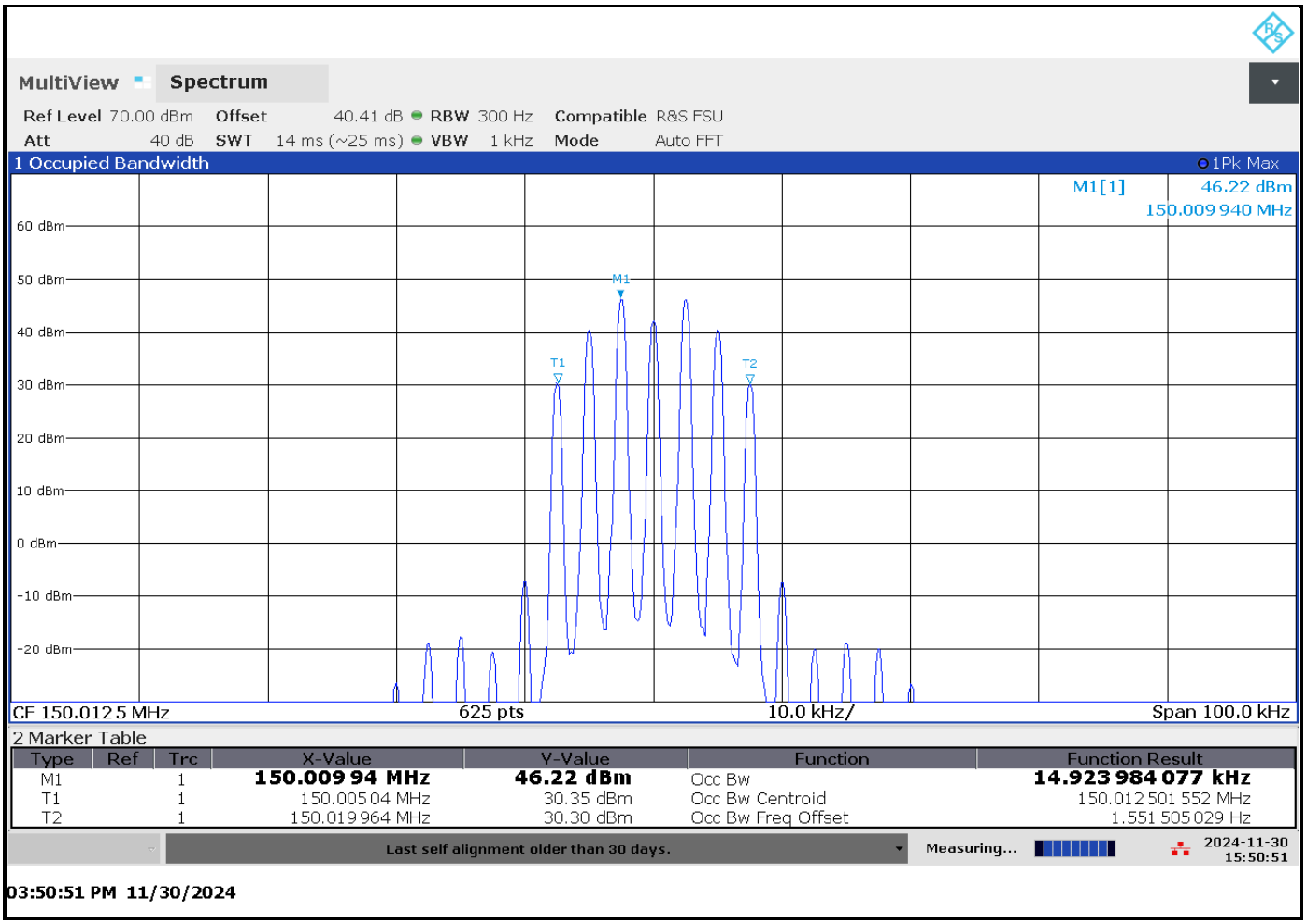
Plot 8-34: 99% BW, 164.0750 MHz, C4FM



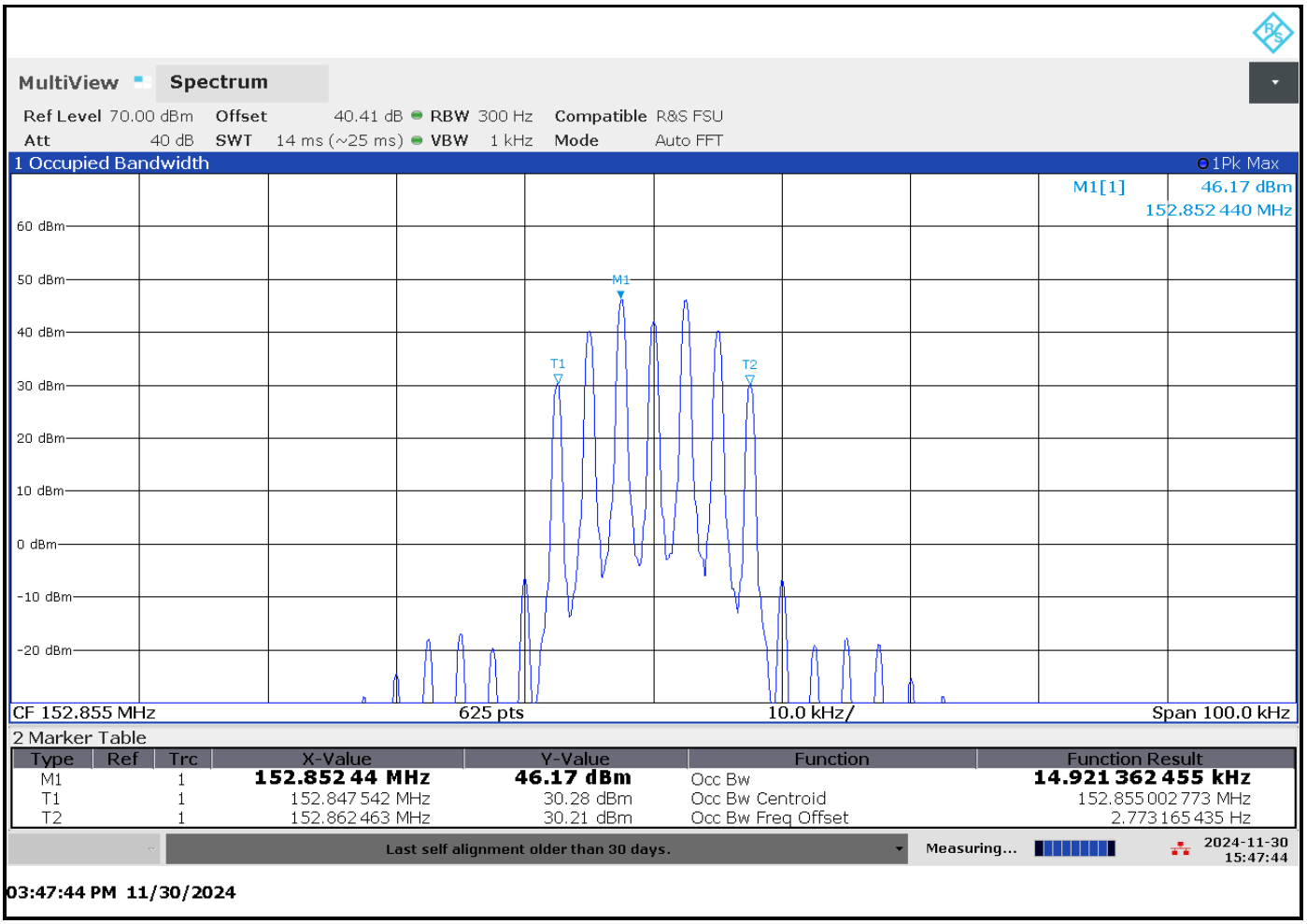
Plot 8-35: 99% BW, 173.9875 MHz, C4FM



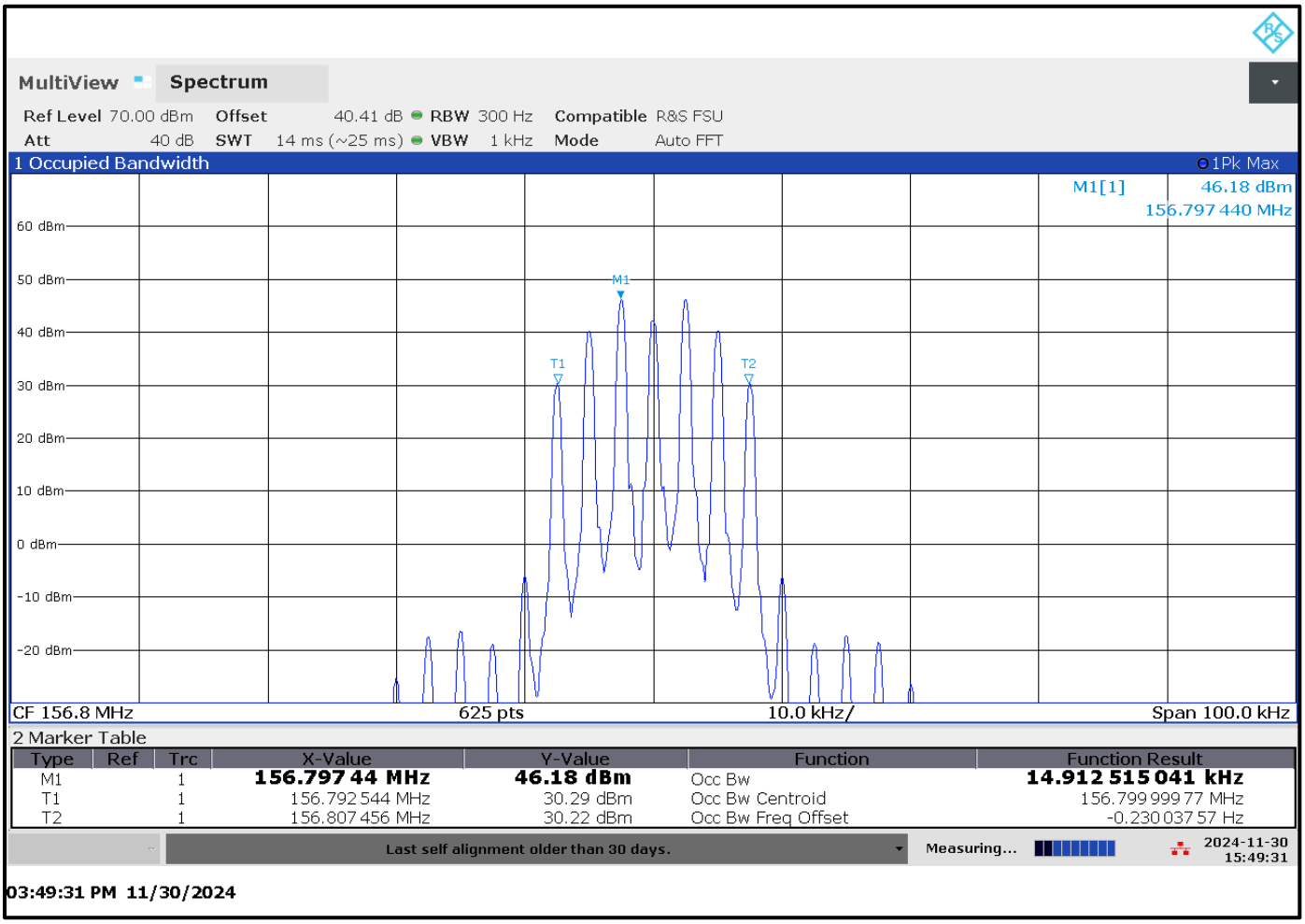
Plot 8-36: 99% BW, 150.0125 MHz, Wideband Analog



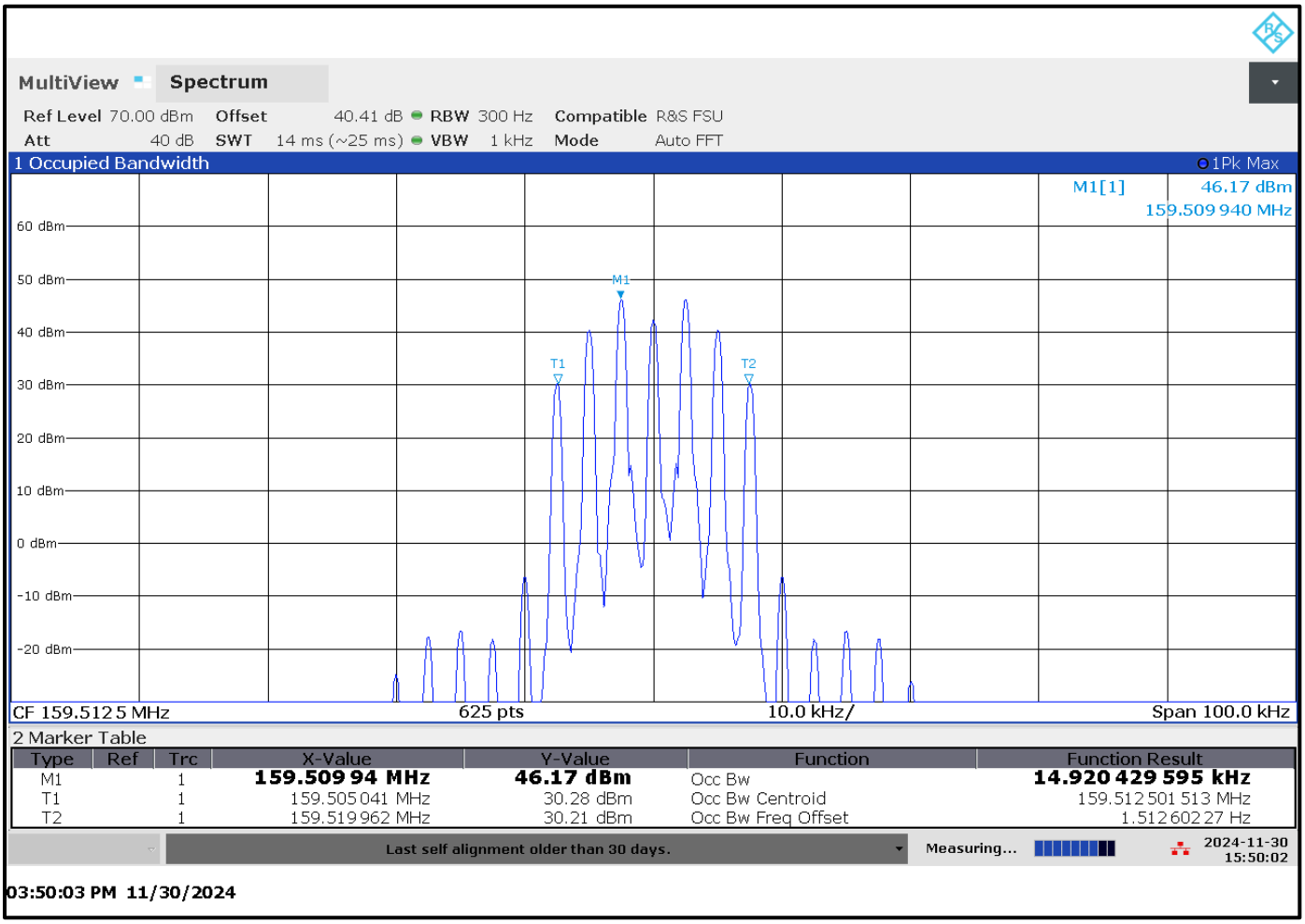
Plot 8-37: 99% BW, 152.8550 MHz, Wideband Analog



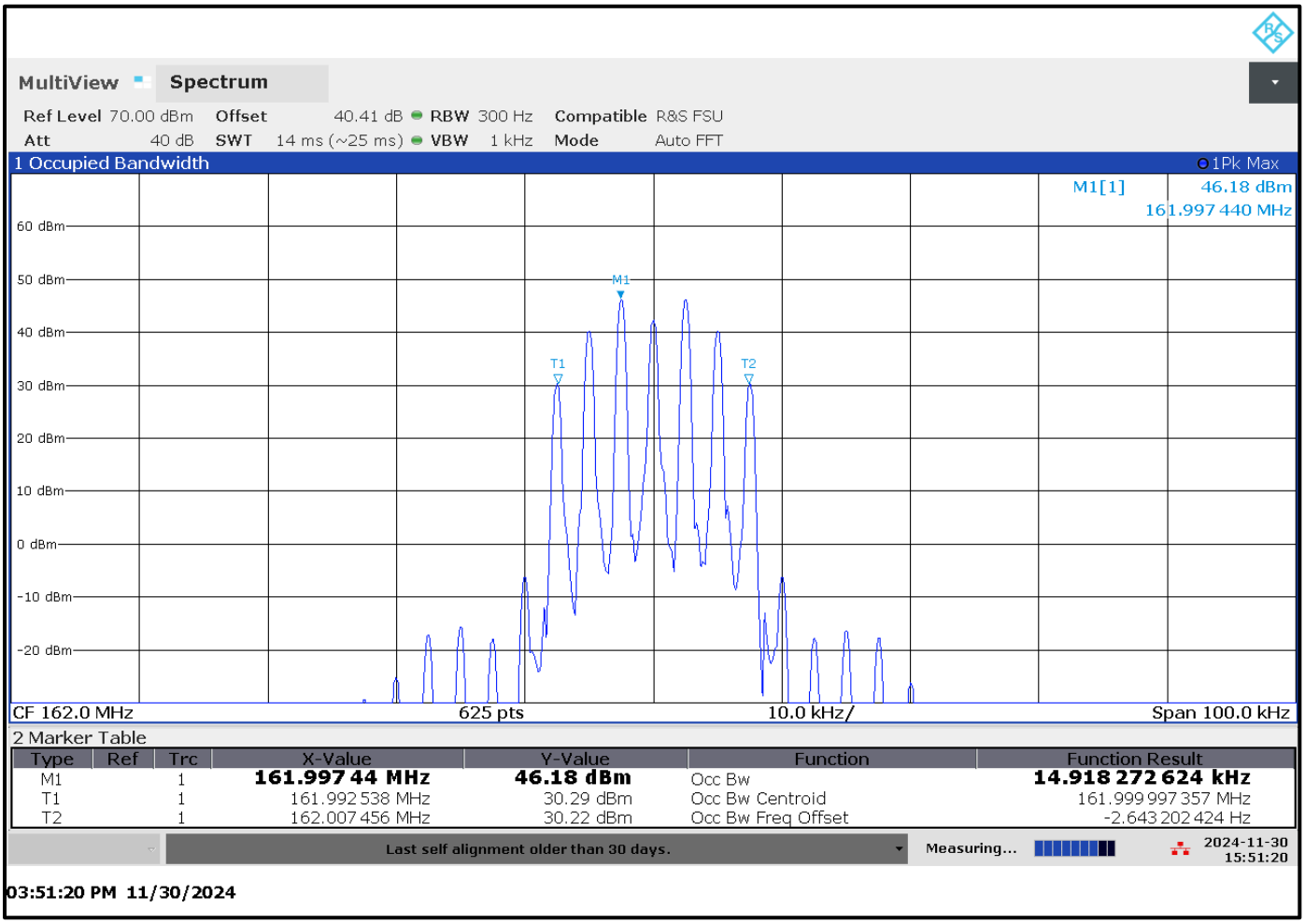
Plot 8-38: 99% BW, 156.8000 MHz, Wideband Analog



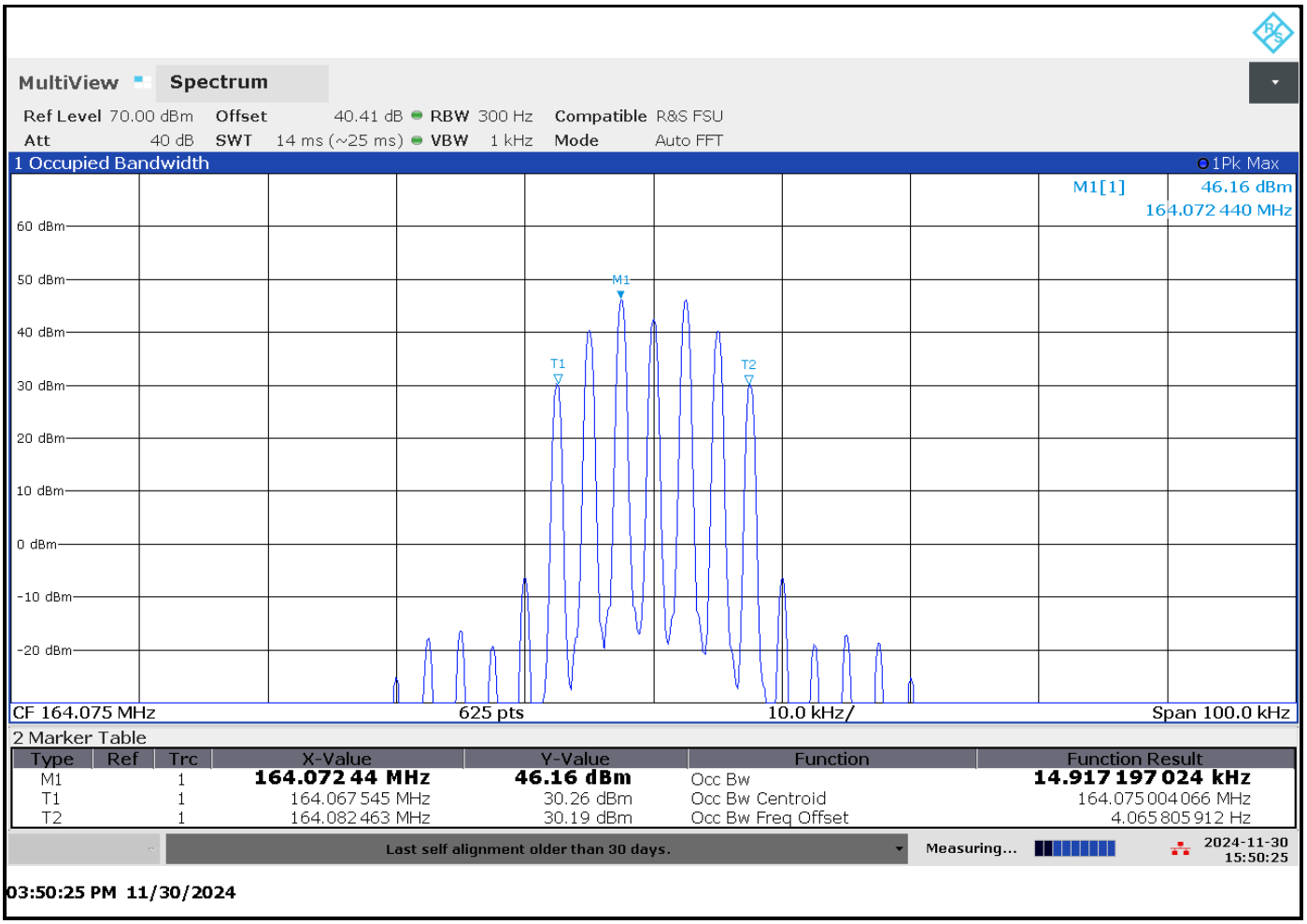
Plot 8-39: 99% BW, 159.5125 MHz, Wideband Analog



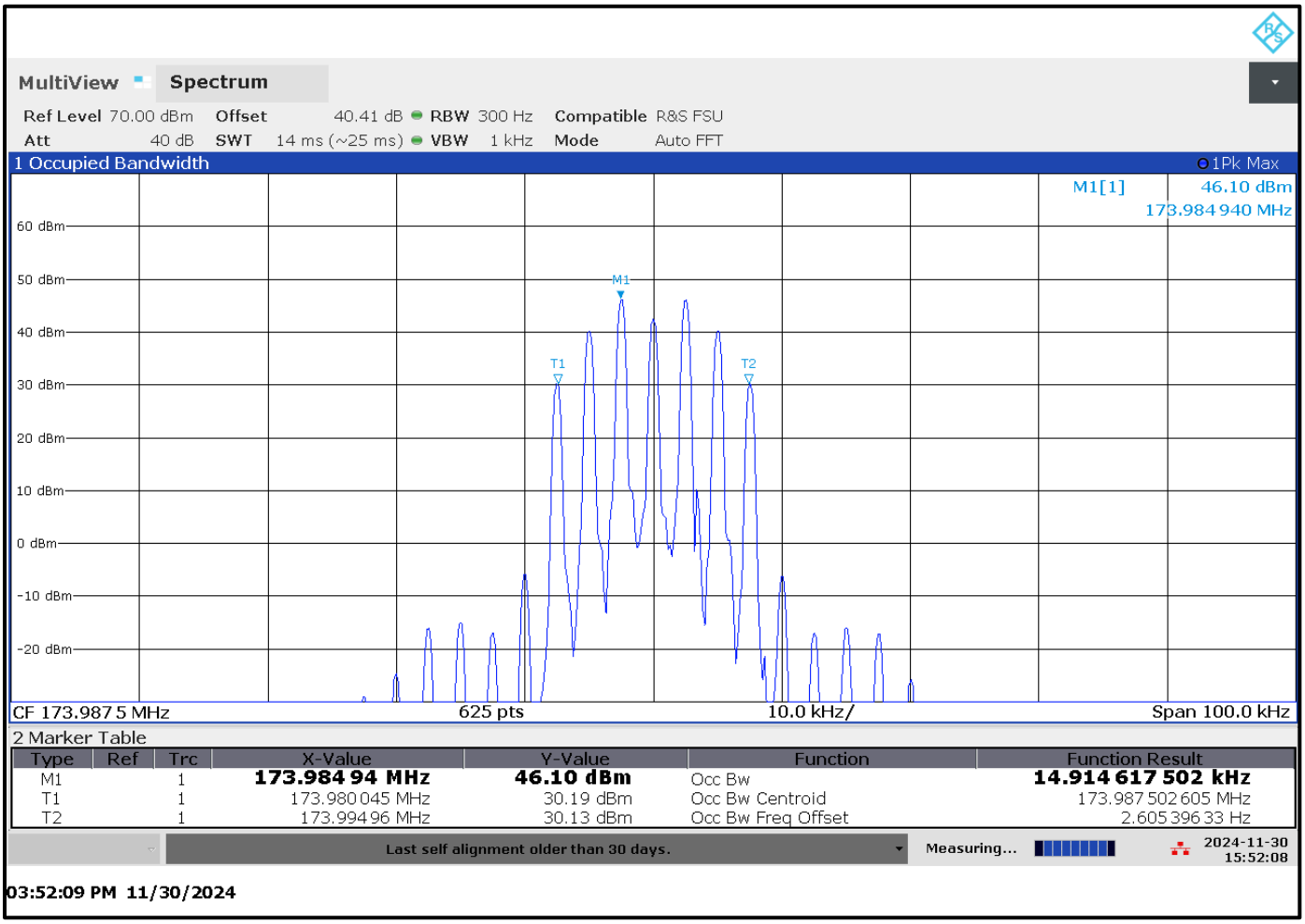
Plot 8-40: 99% BW, 162.0000 MHz, Wideband Analog



Plot 8-41: 99% BW, 164.0750 MHz, Wideband Analog



Plot 8-42: 99% BW, 173.9875 MHz, Wideband Analog



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 8-2: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Analyzer	101021	05/30/2025
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025
901139	Weinschel Corp.	48-20-34 DC-18GHz	Attenuator 100 W 20 dB	BK5859	10/14/2025
901291	Pasternack	PE7031-20	Attenuator 20 dB 300 W	901291	02/08/2025

Test Personnel:

Daniel W. Baltzell		October 30, 2024
EMC Test Engineer	Signature	Date of Test

9 FCC §2.1047(a)(b): Modulation Characteristics; §74.463: Modulation Requirements; §80.213: Modulation Requirements

§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.

9.1 Test Procedures

Table 9-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 30, 2024	22.3	23	102.5

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 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)

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.

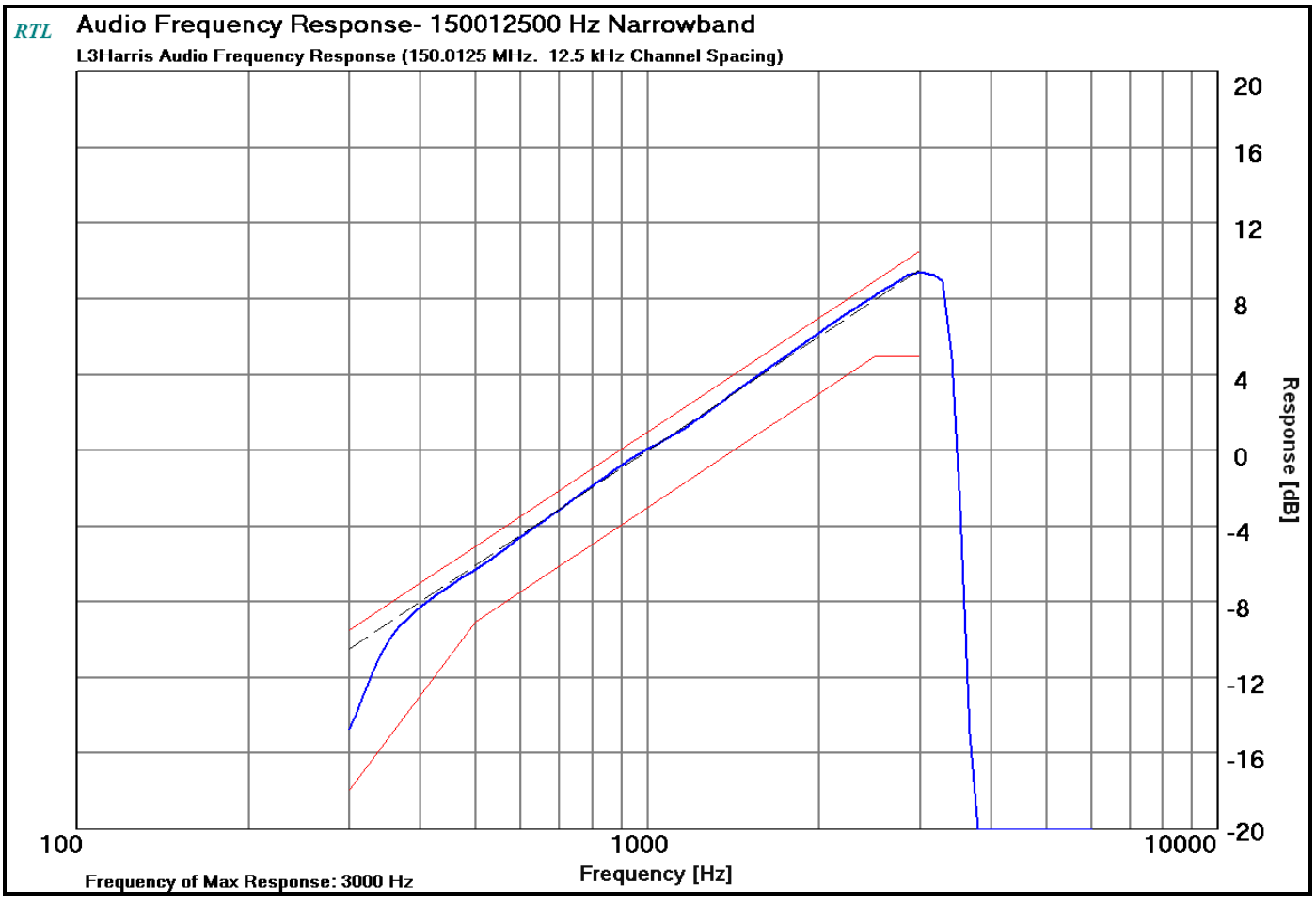
9.1.3 Modulation Limiting

ANSI C63.26 2015, section 5.3.2

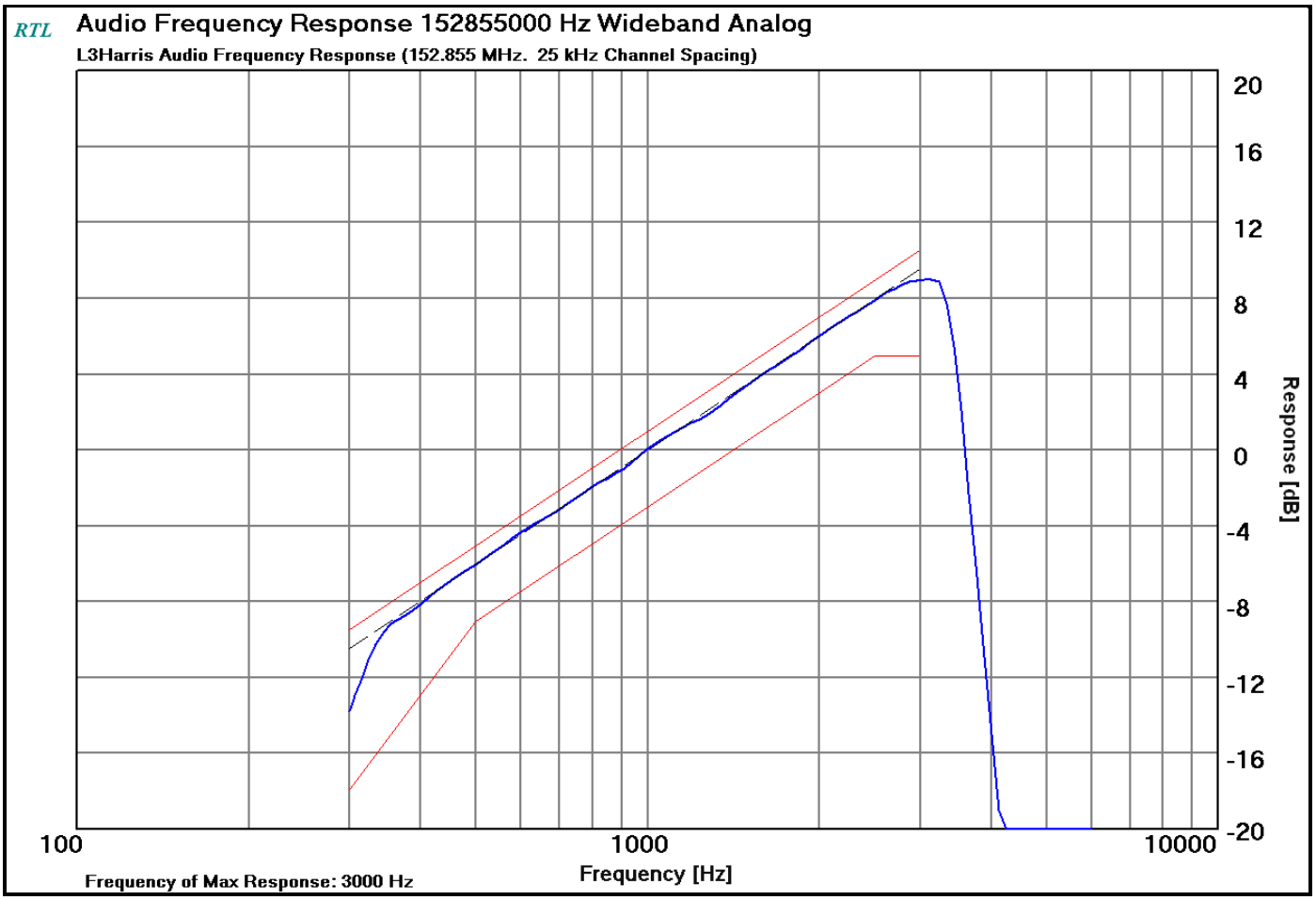
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500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

9.1.4 Audio Frequency Response

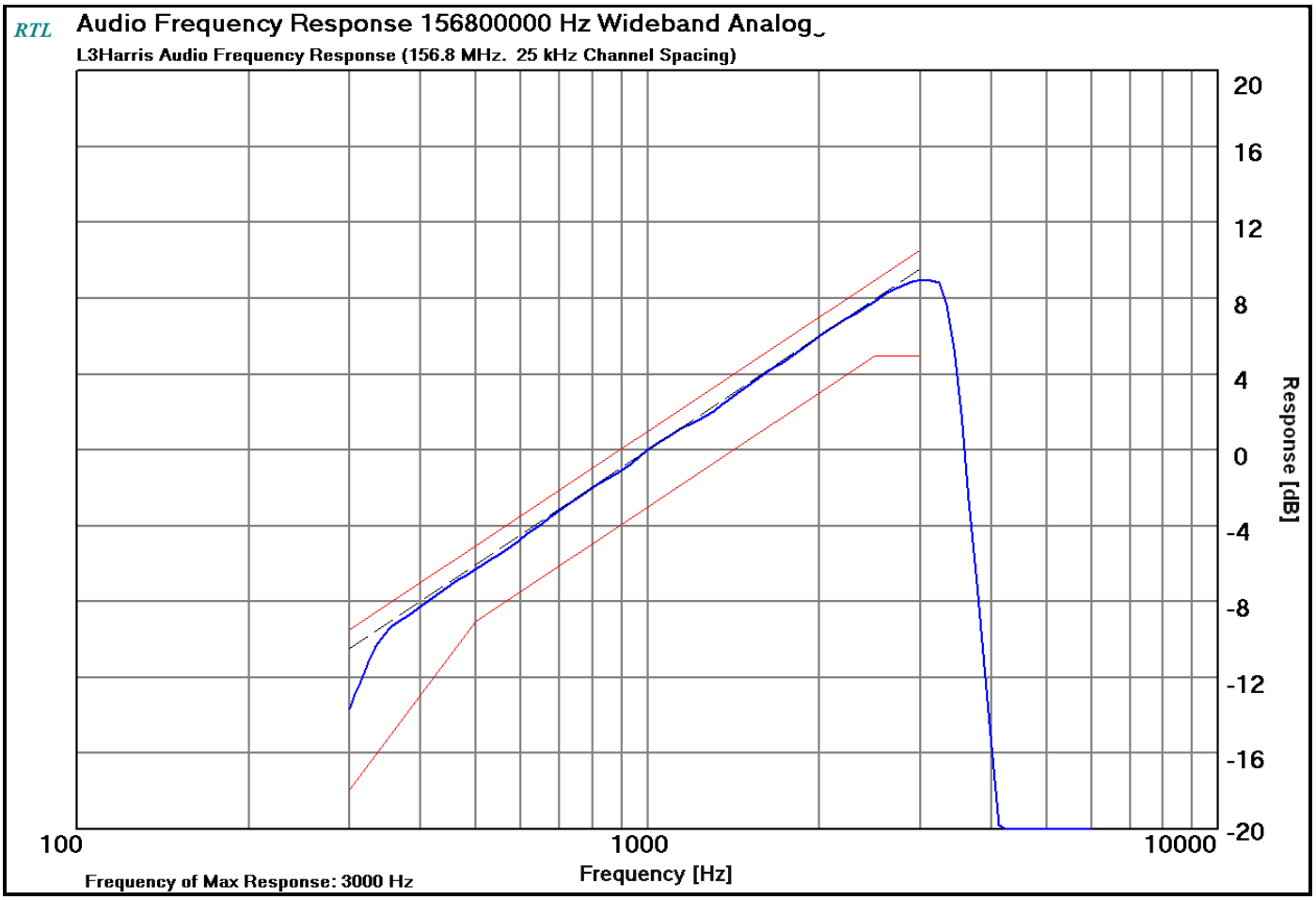
Plot 9-1: Modulation Characteristics - Audio Frequency Response – 150.0125 MHz (NB)



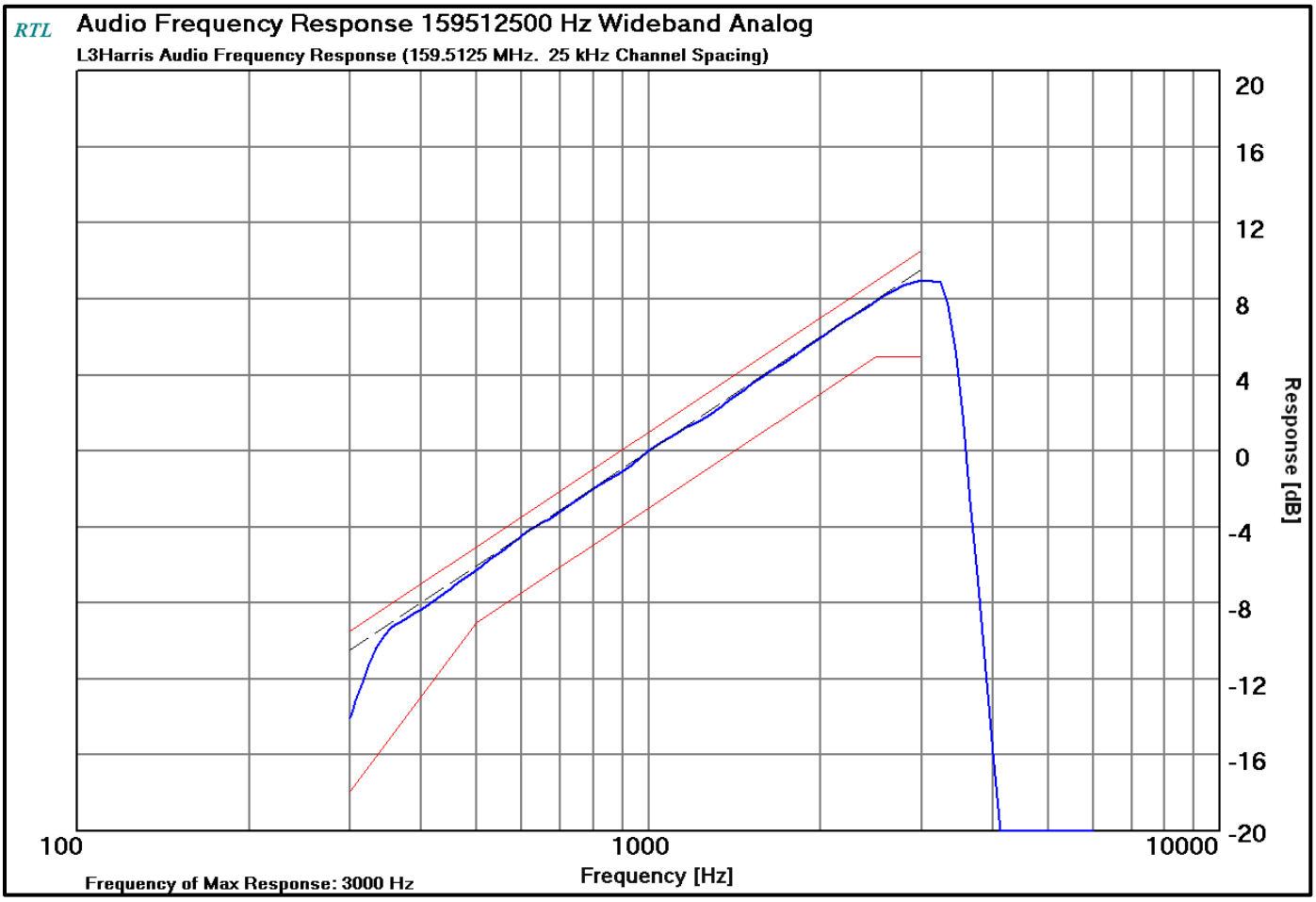
Plot 9-2: Modulation Characteristics - Audio Frequency Response – 152.8550 MHz (WB)



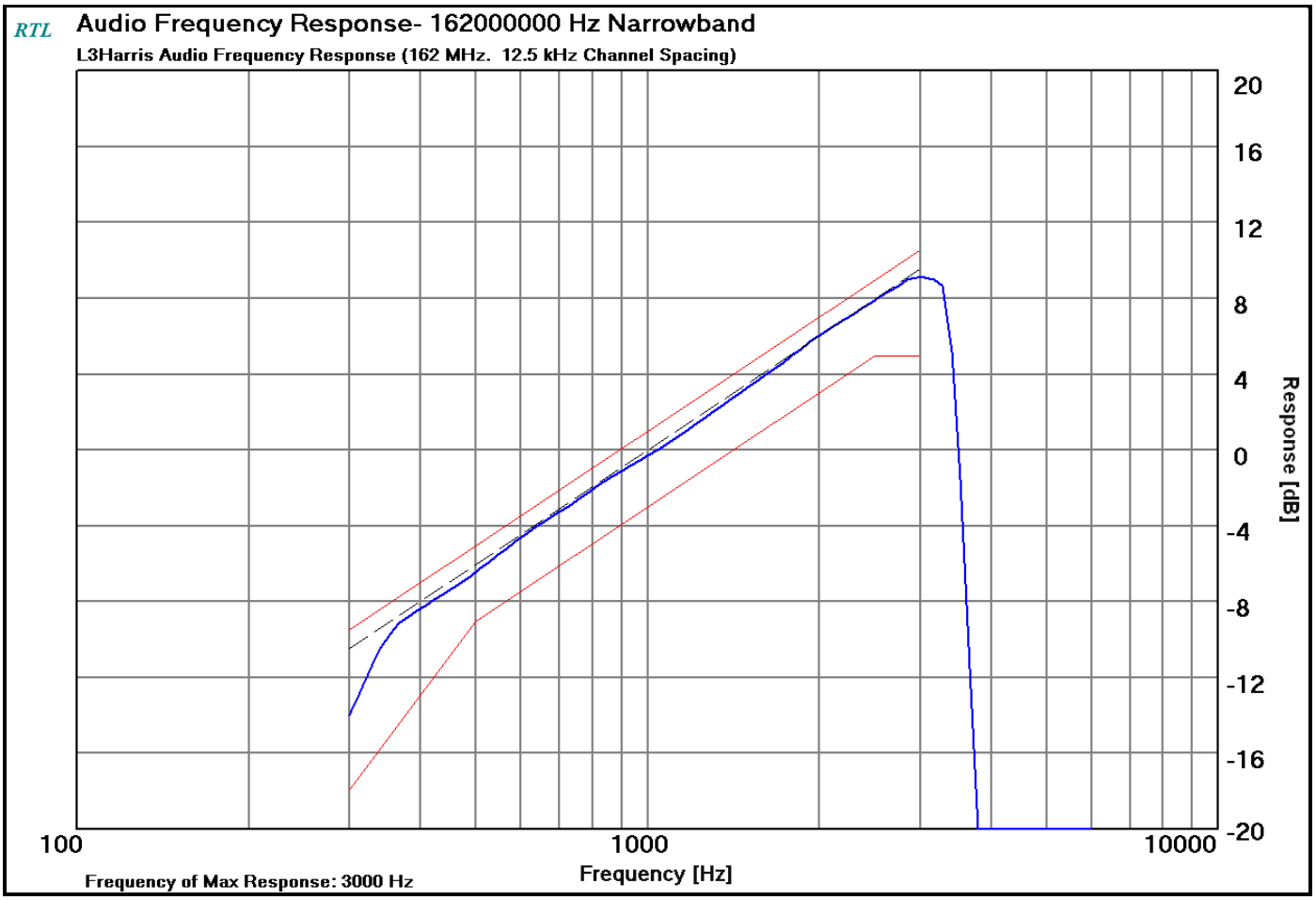
Plot 9-3: Modulation Characteristics - Audio Frequency Response – 156.8000 MHz (WB)



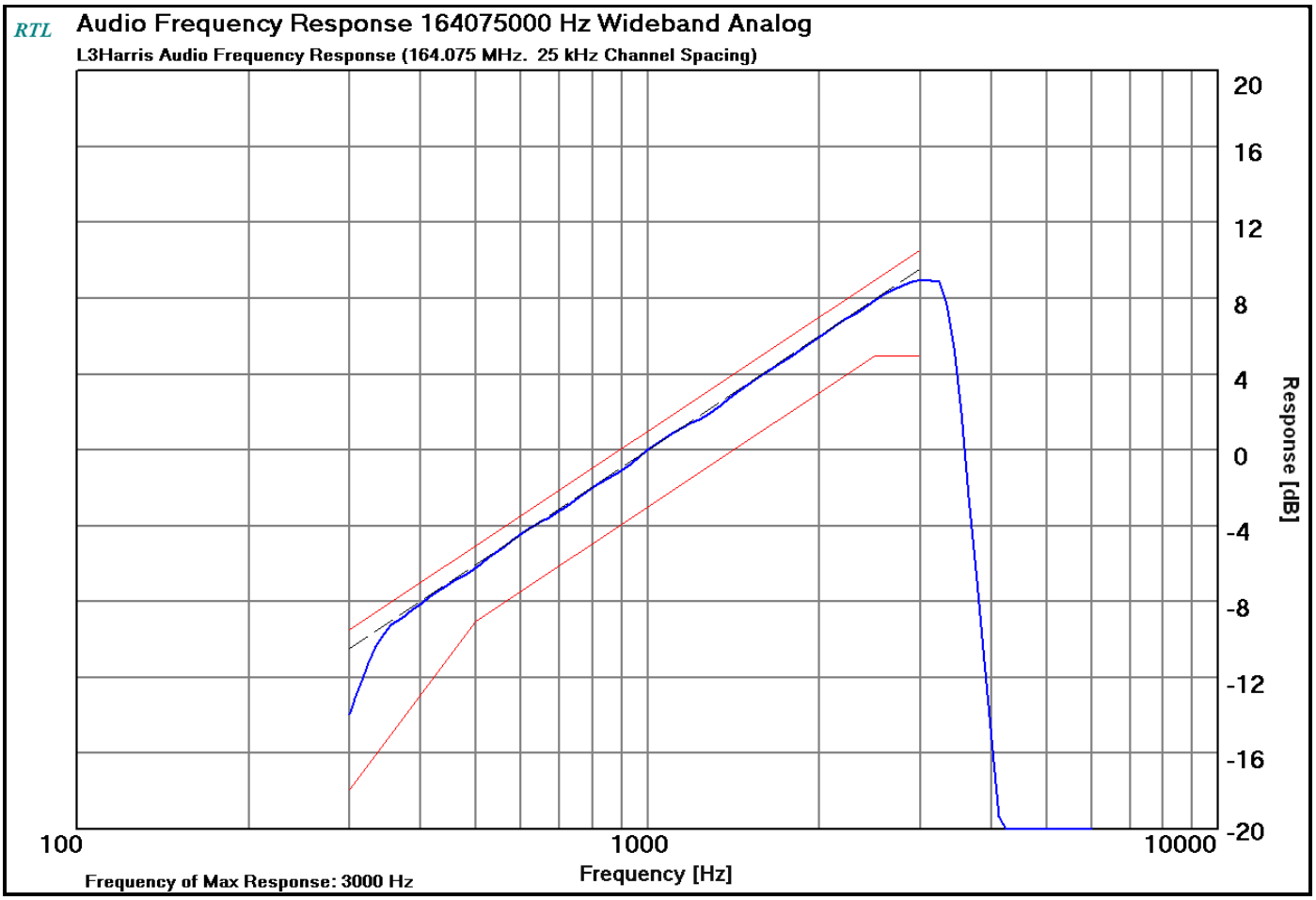
Plot 9-4: Modulation Characteristics - Audio Frequency Response – 159.5125 MHz (WB)



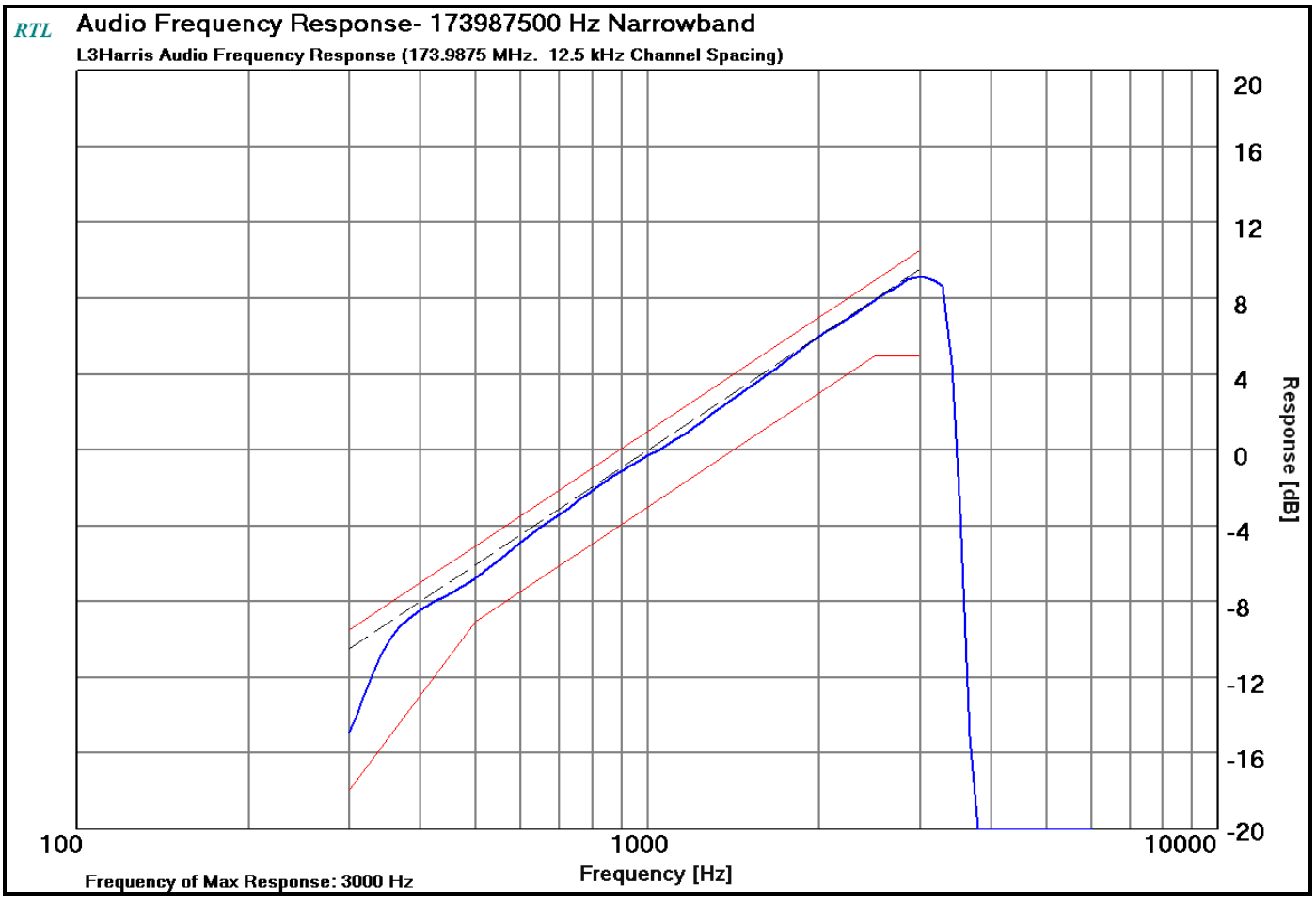
Plot 9-5: Modulation Characteristics - Audio Frequency Response – 162.0000 MHz (NB)



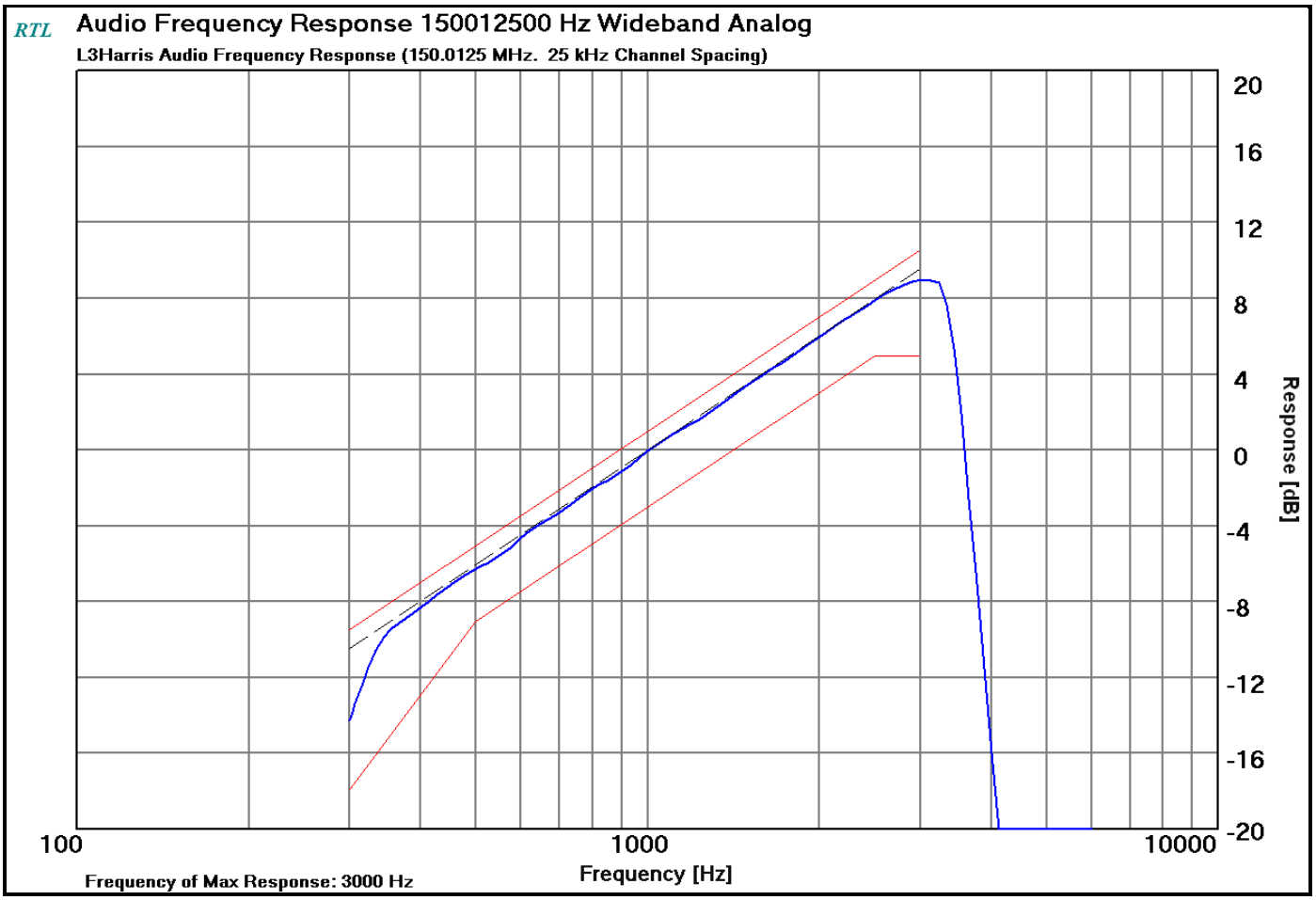
Plot 9-6: Modulation Characteristics - Audio Frequency Response – 164.0750 MHz (WB)



Plot 9-7: Modulation Characteristics - Audio Frequency Response – 173.9875 MHz (NB)

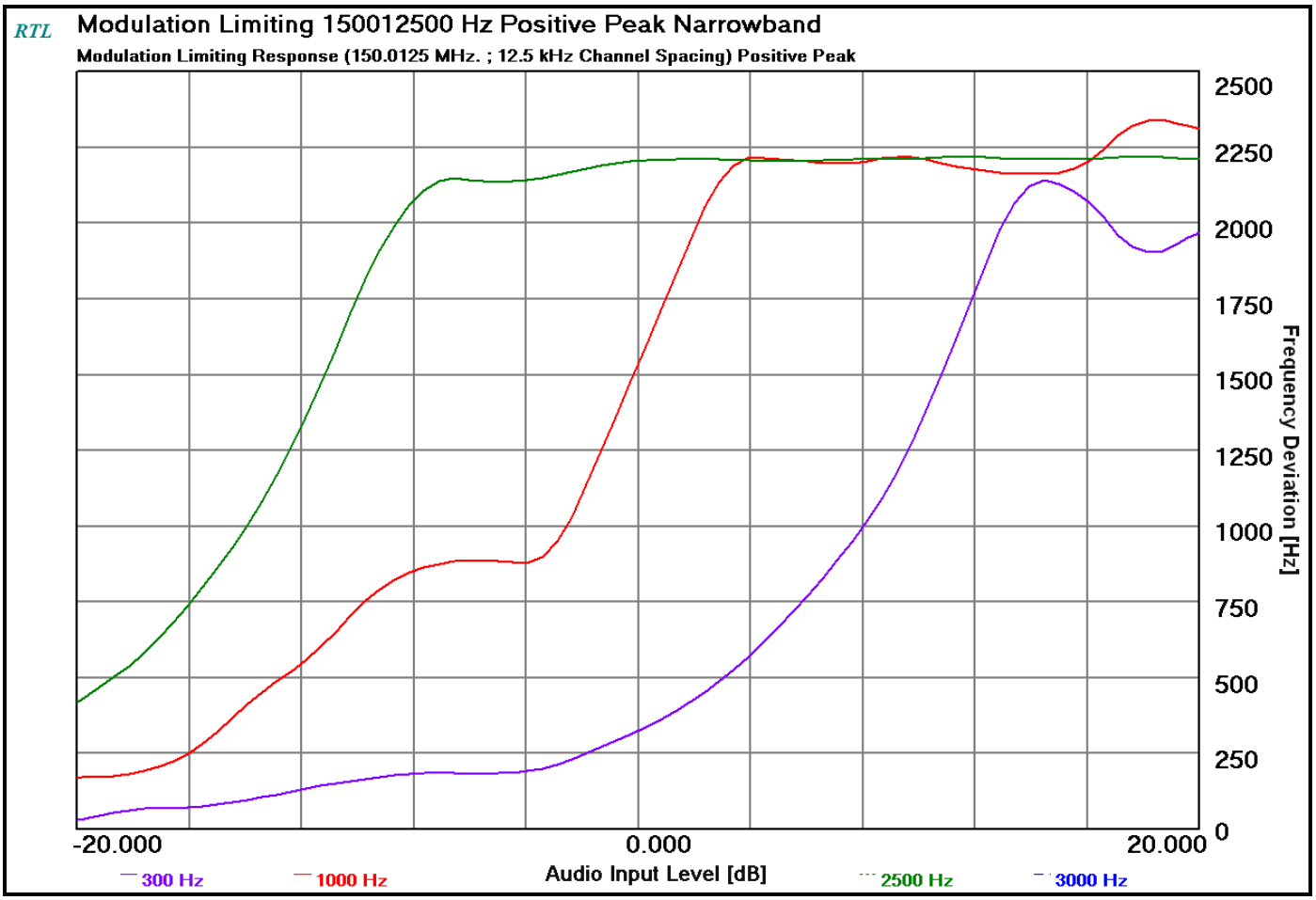


Plot 9-8: Modulation Characteristics - Audio Frequency Response – 150.0125 MHz (WB)

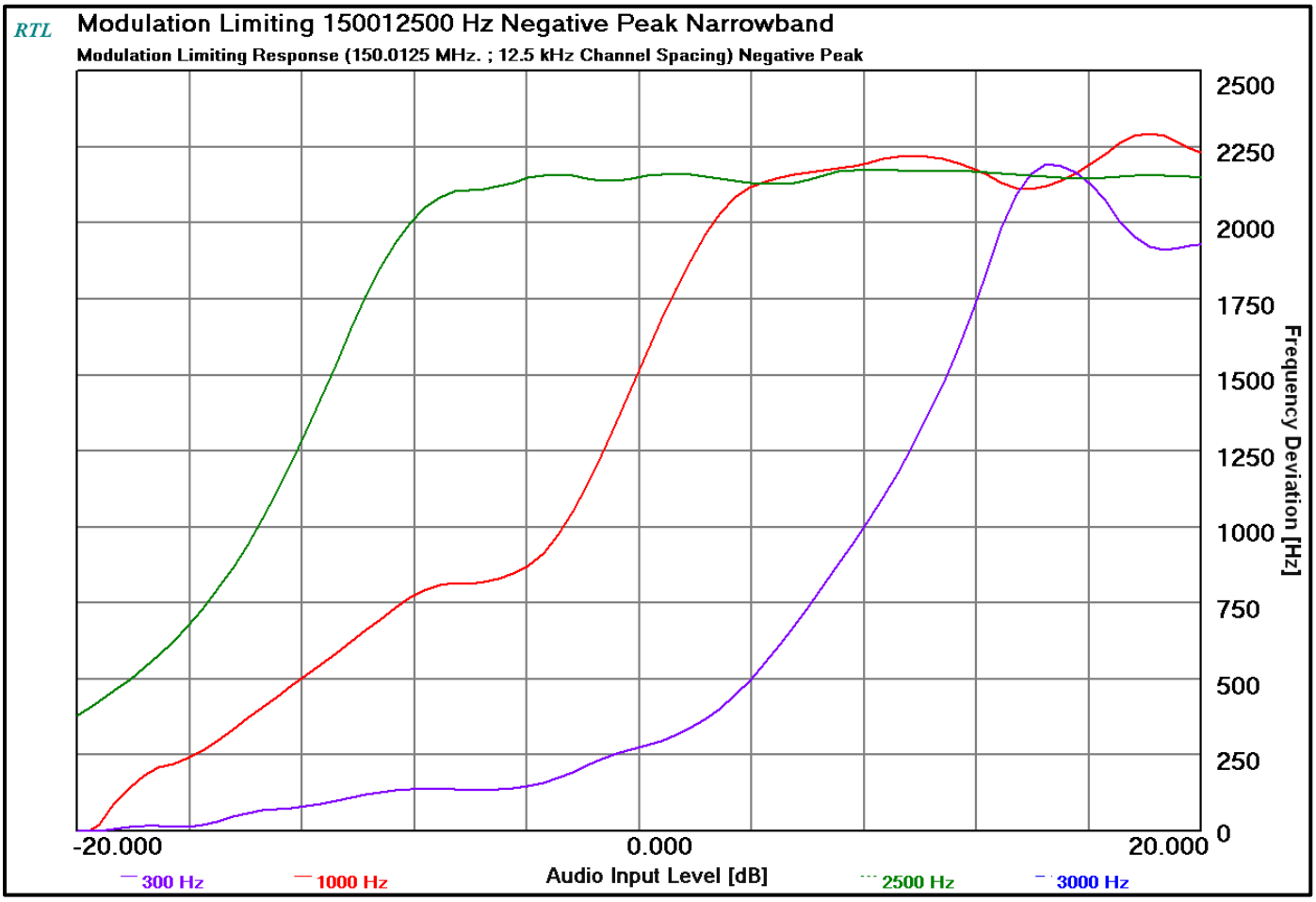


9.1.5 Modulation Limiting

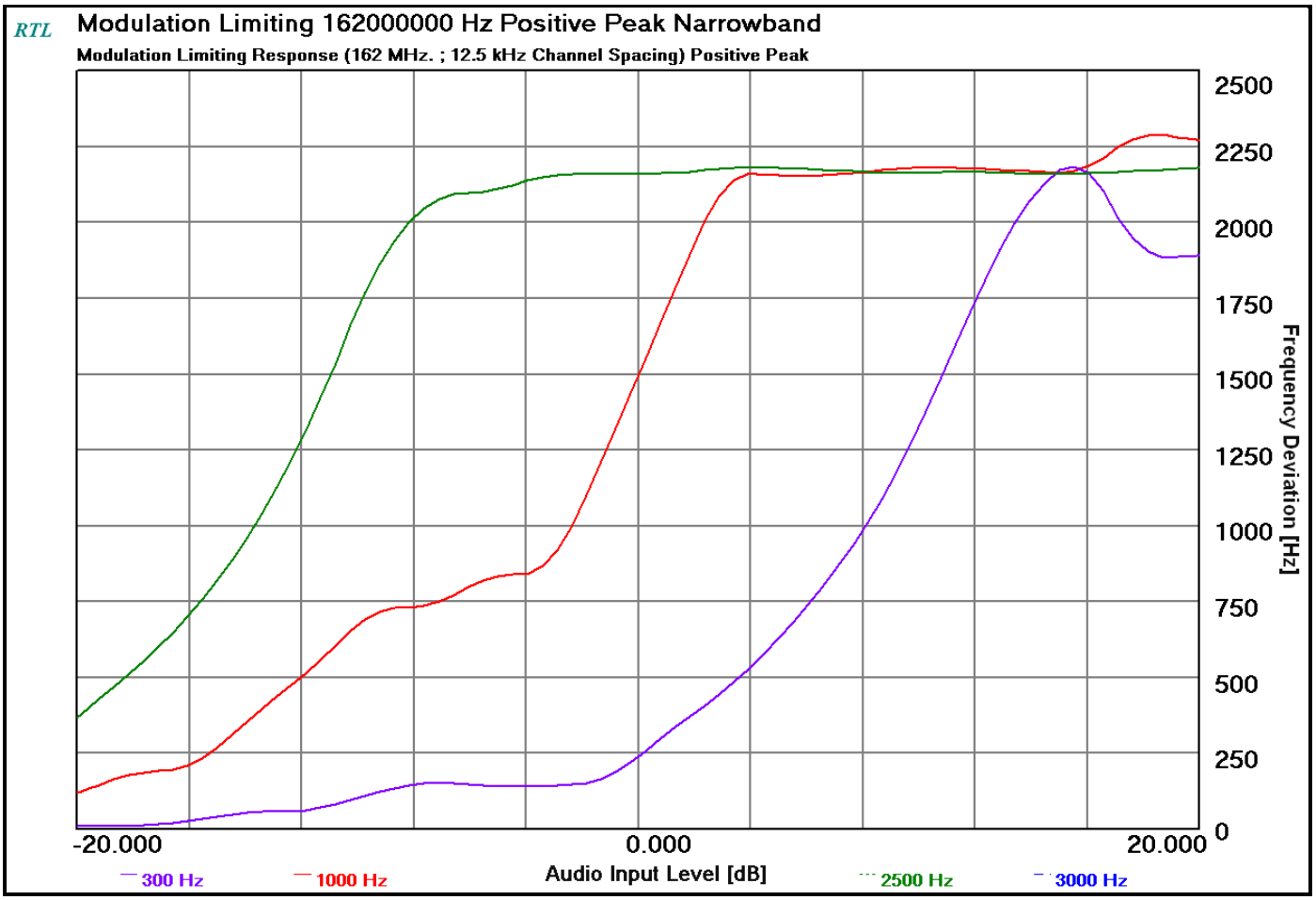
Plot 9-9: Modulation Characteristics – Modulation Limiting – 150.0125 MHz (NB); Positive Peak



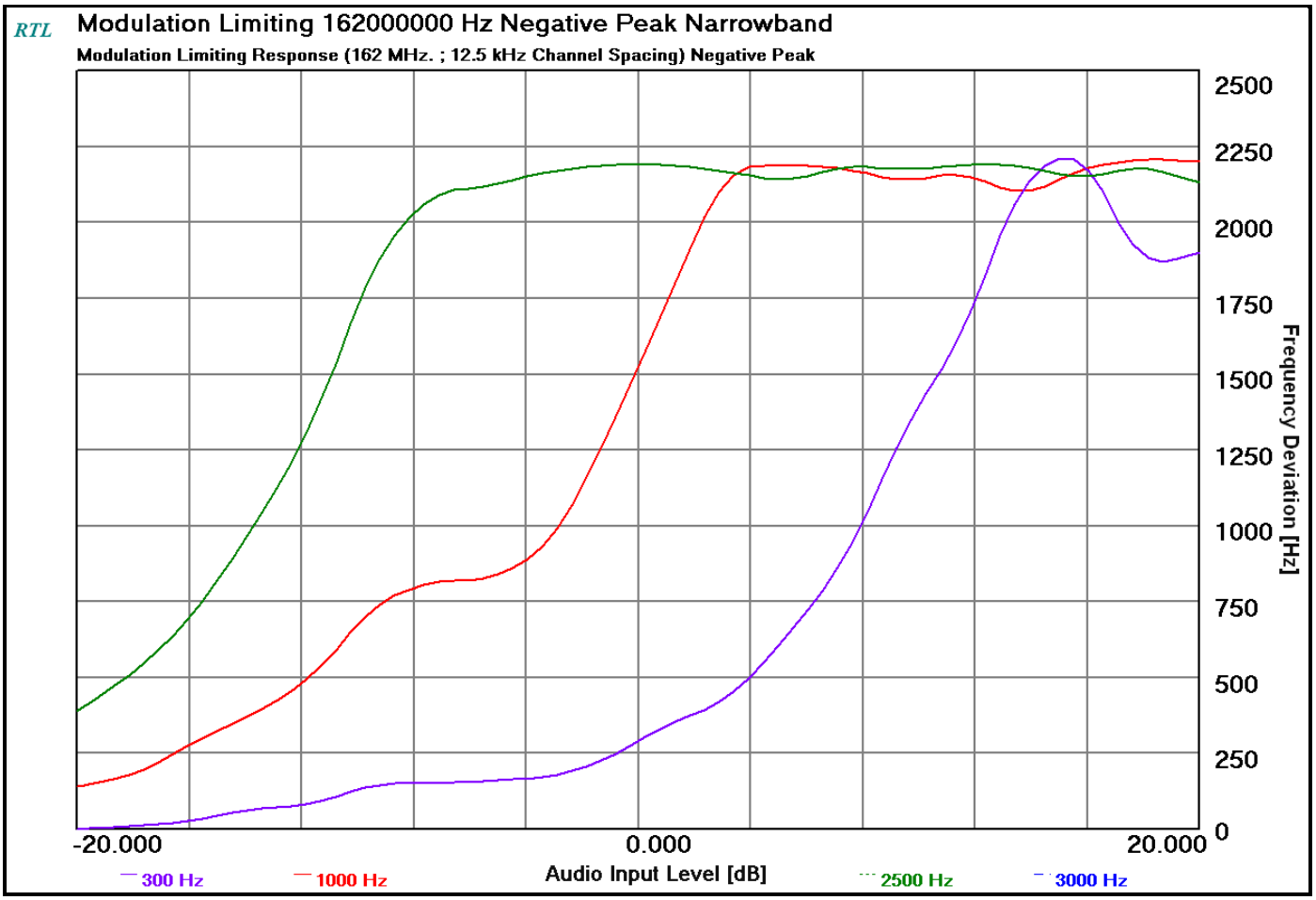
Plot 9-10: Modulation Characteristics – Modulation Limiting – 150.0125 MHz (NB); Negative Peak



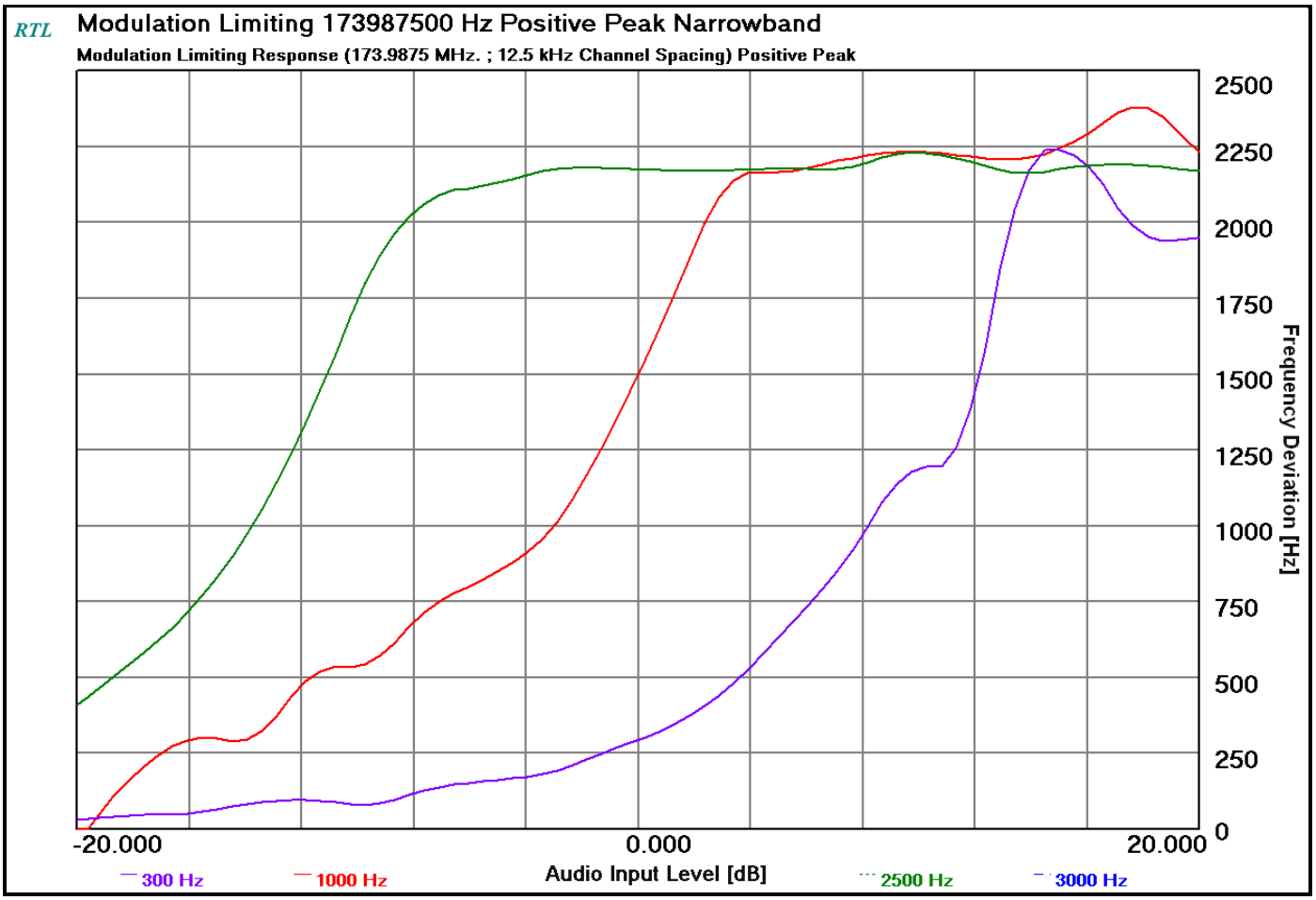
Plot 9-11: Modulation Characteristics – Modulation Limiting – 162.0000 MHz (NB); Positive Peak



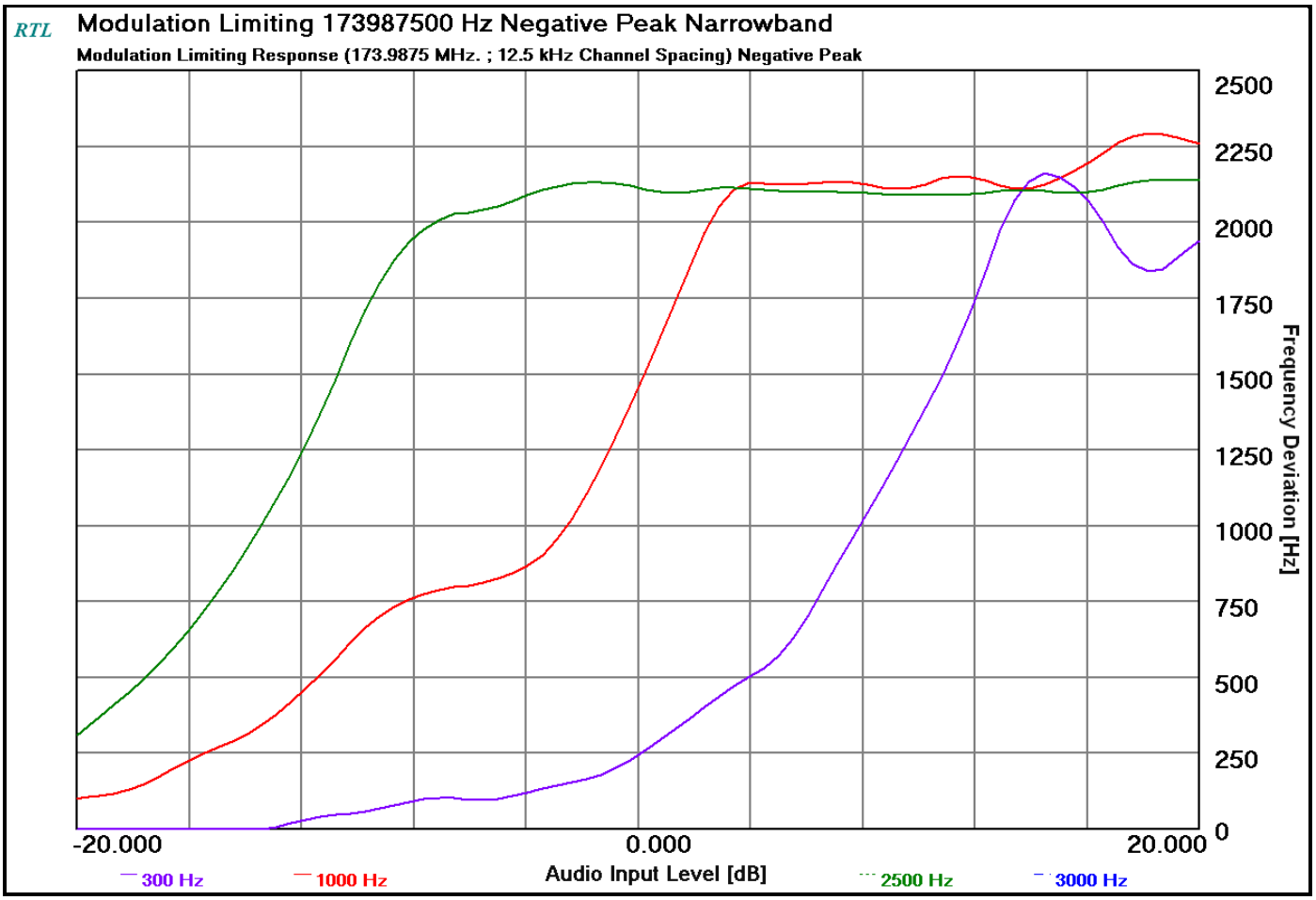
Plot 9-12: Modulation Characteristics – Modulation Limiting –162.0000 MHz (NB); Negative Peak



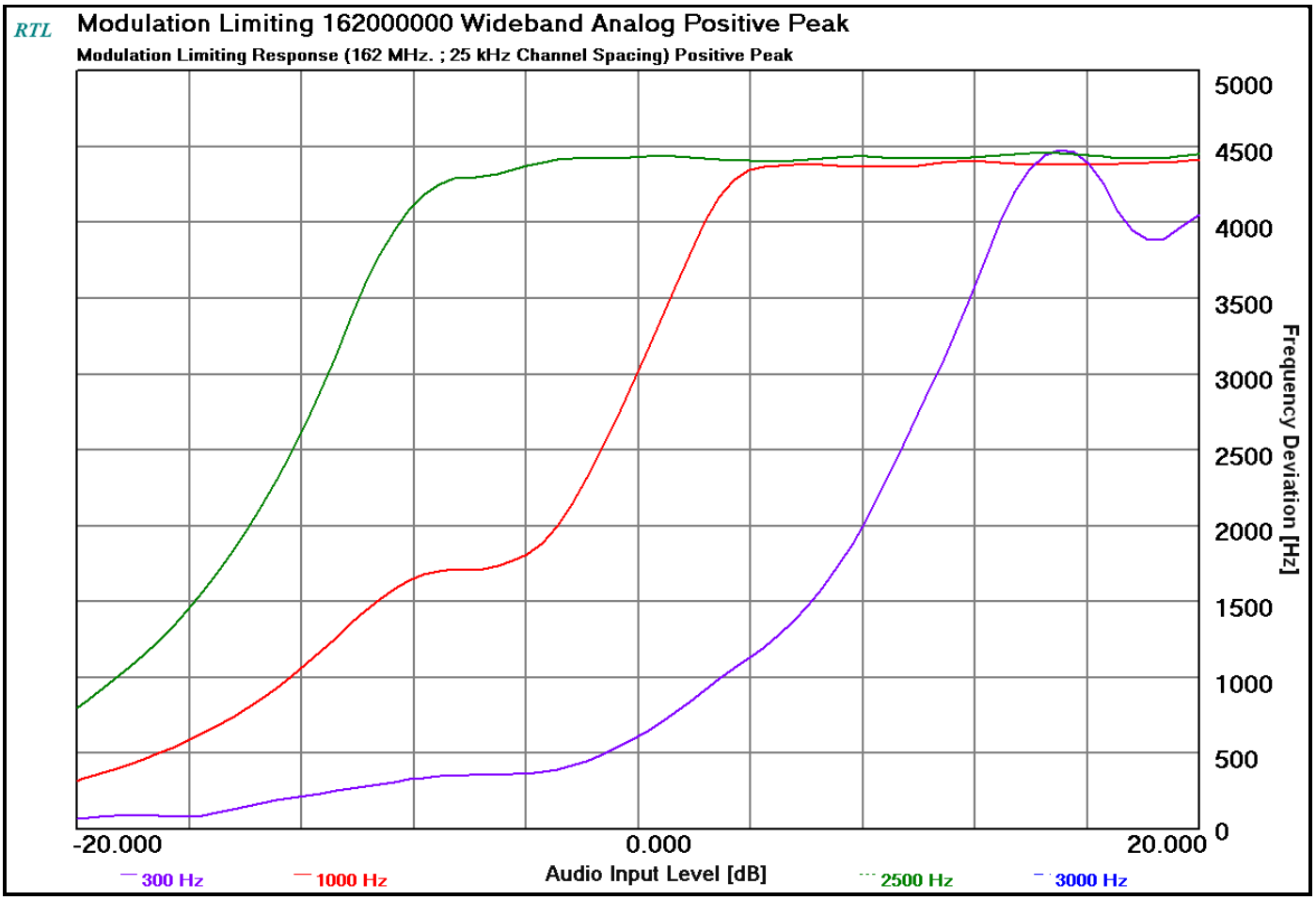
Plot 9-13: Modulation Characteristics – Modulation Limiting – 173.9875 MHz (NB); Positive Peak



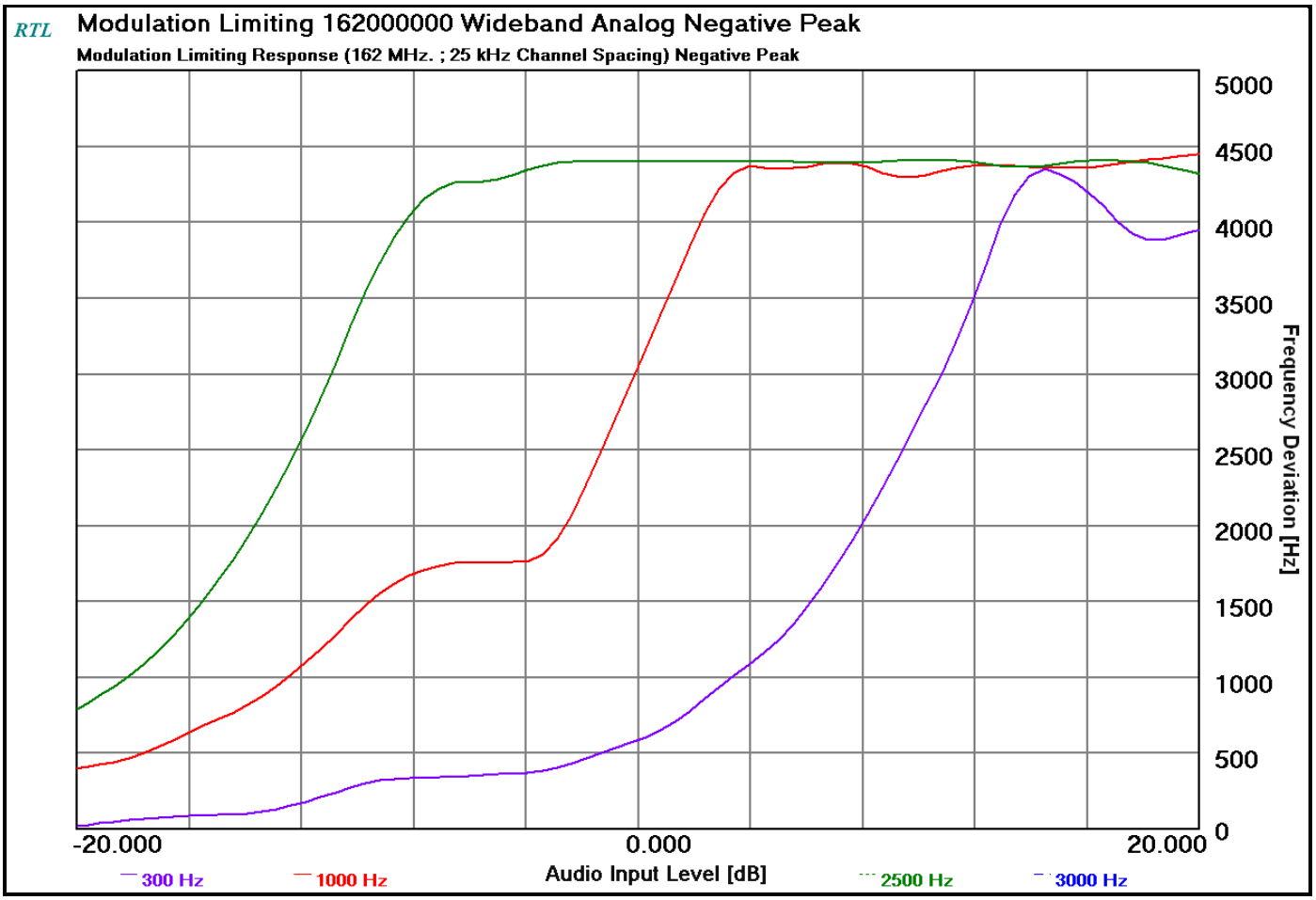
Plot 9-14: Modulation Characteristics – Modulation Limiting – 173.9875 MHz (NB); Negative Peak



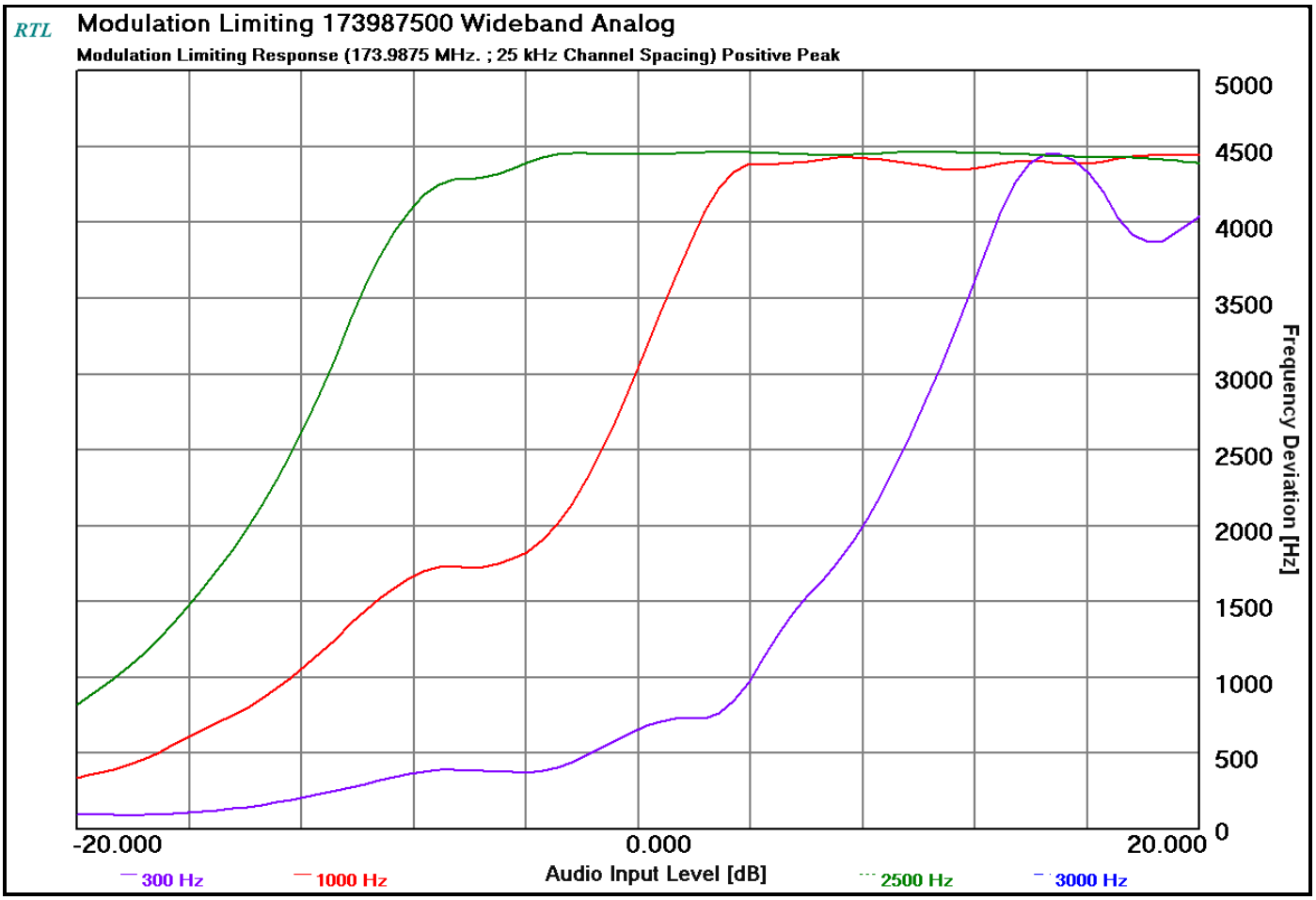
Plot 9-15: Modulation Characteristics – Modulation Limiting – 162.0000 MHz (WB); Positive Peak



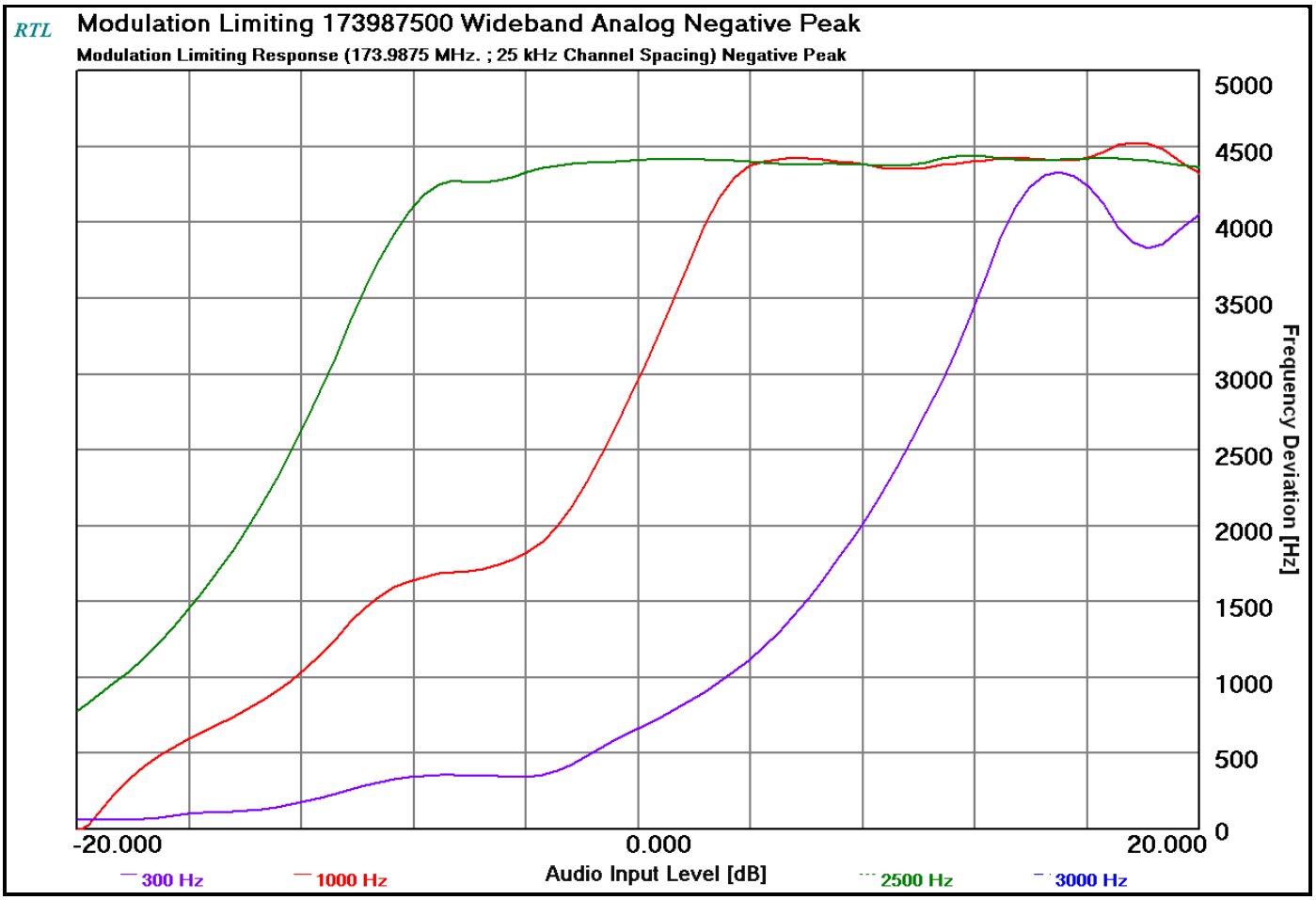
Plot 9-16: Modulation Characteristics – Modulation Limiting –162.0000 MHz (WB); Negative Peak



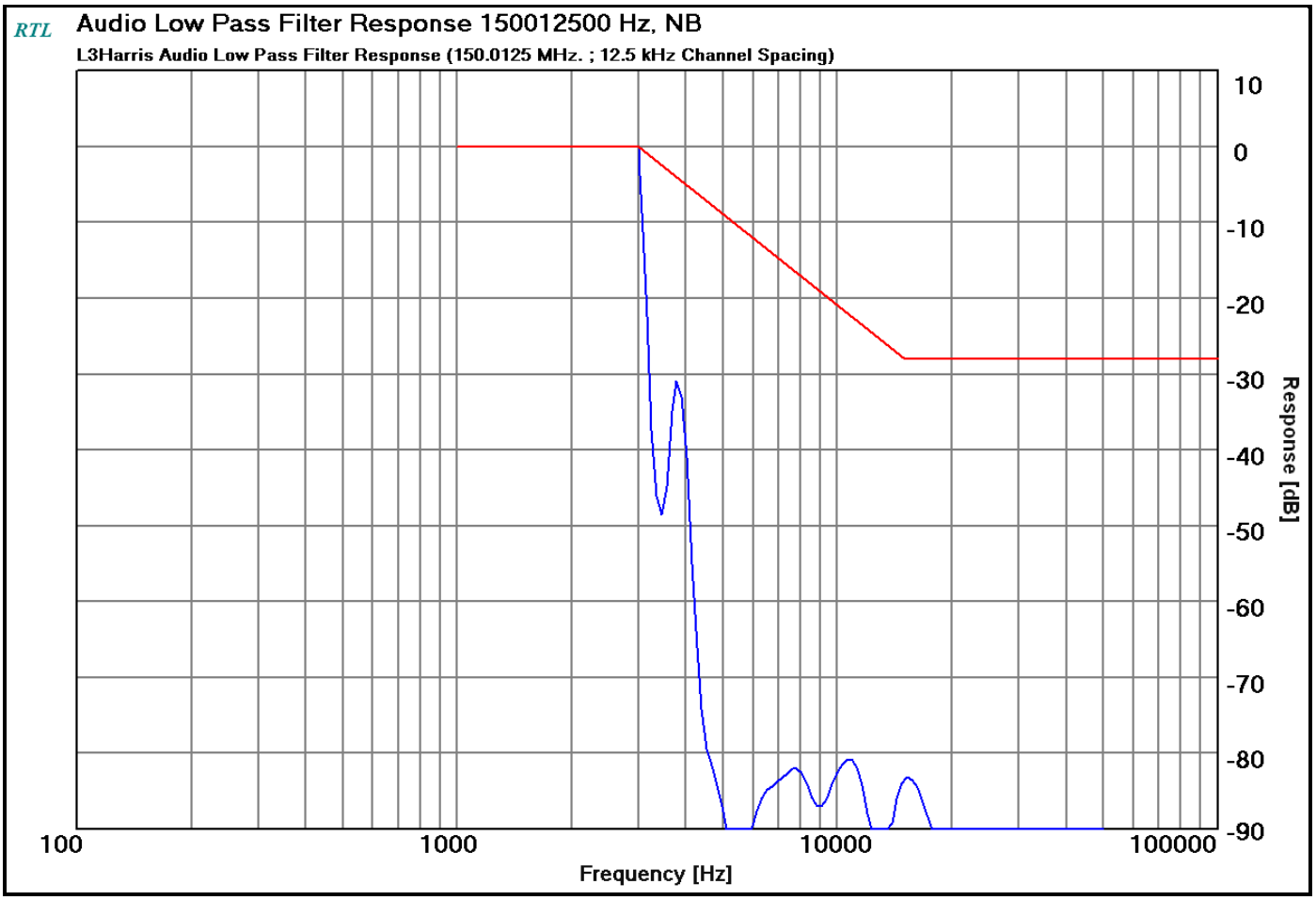
Plot 9-17: Modulation Characteristics – Modulation Limiting – 173.9875 MHz (WB); Positive Peak



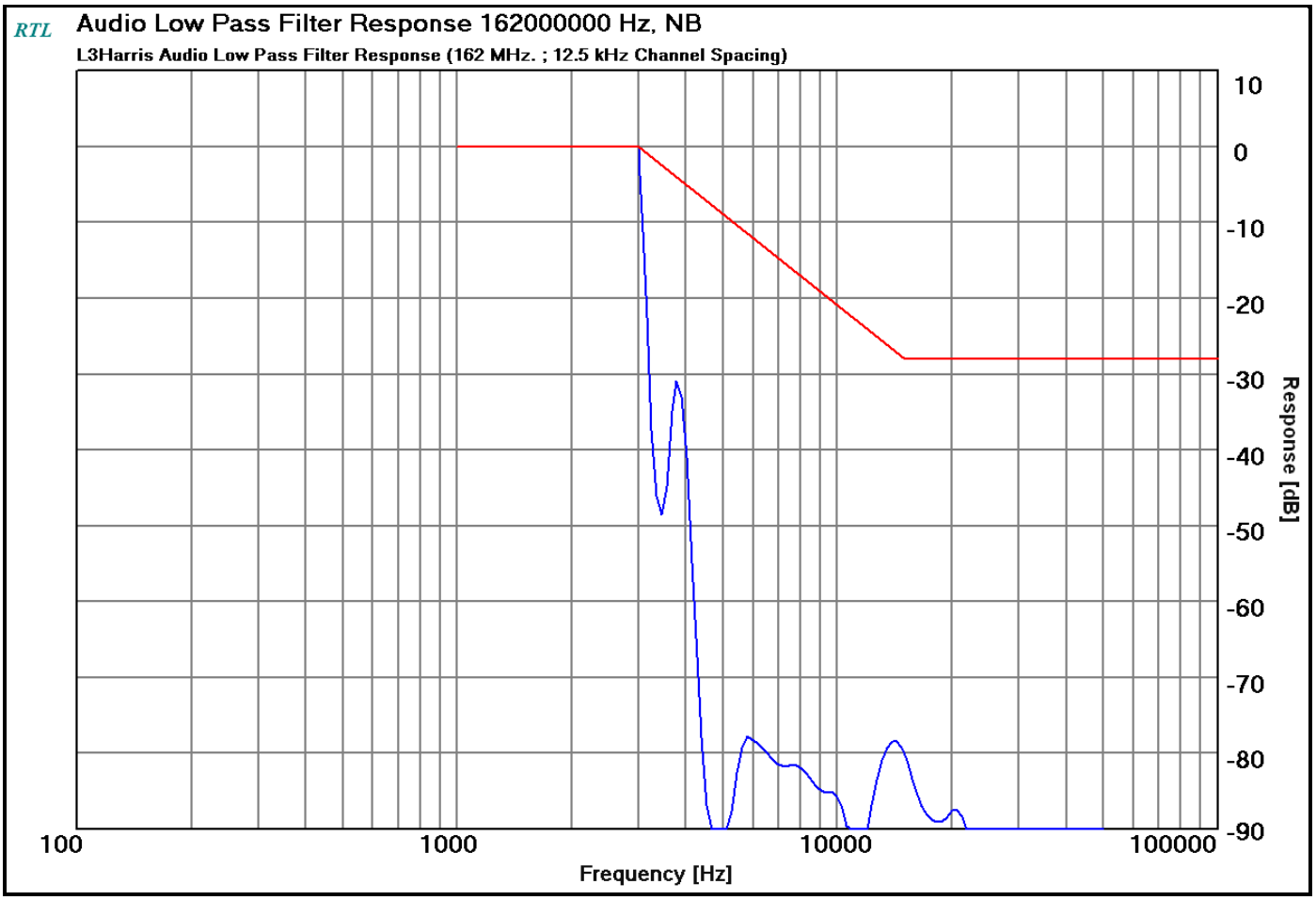
Plot 9-18: Modulation Characteristics – Modulation Limiting – 173.9875 MHz (WB); Negative Peak



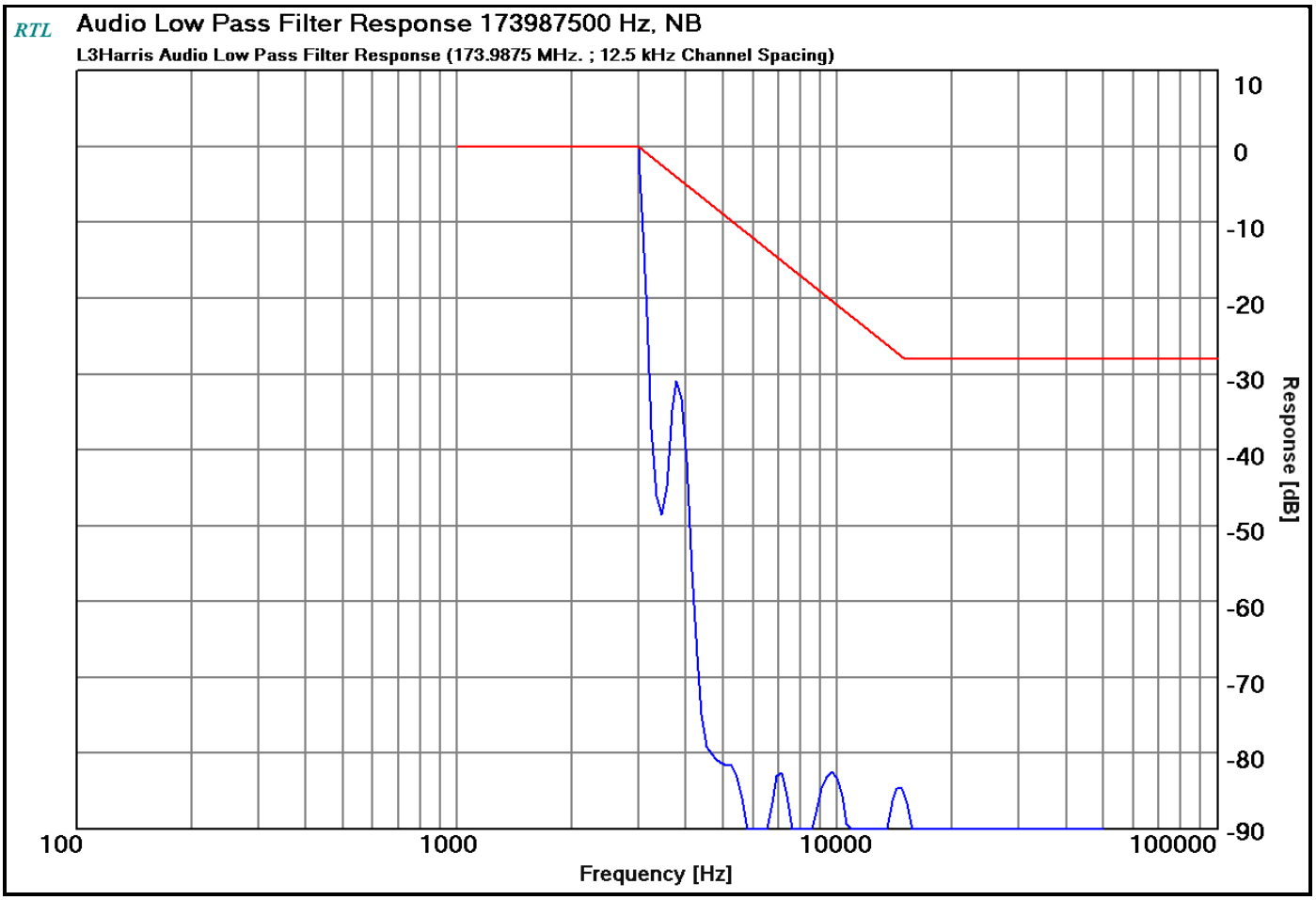
Plot 9-19: Modulation Characteristics – Audio Low Pass Filter Response – 150.0125 MHz (NB)



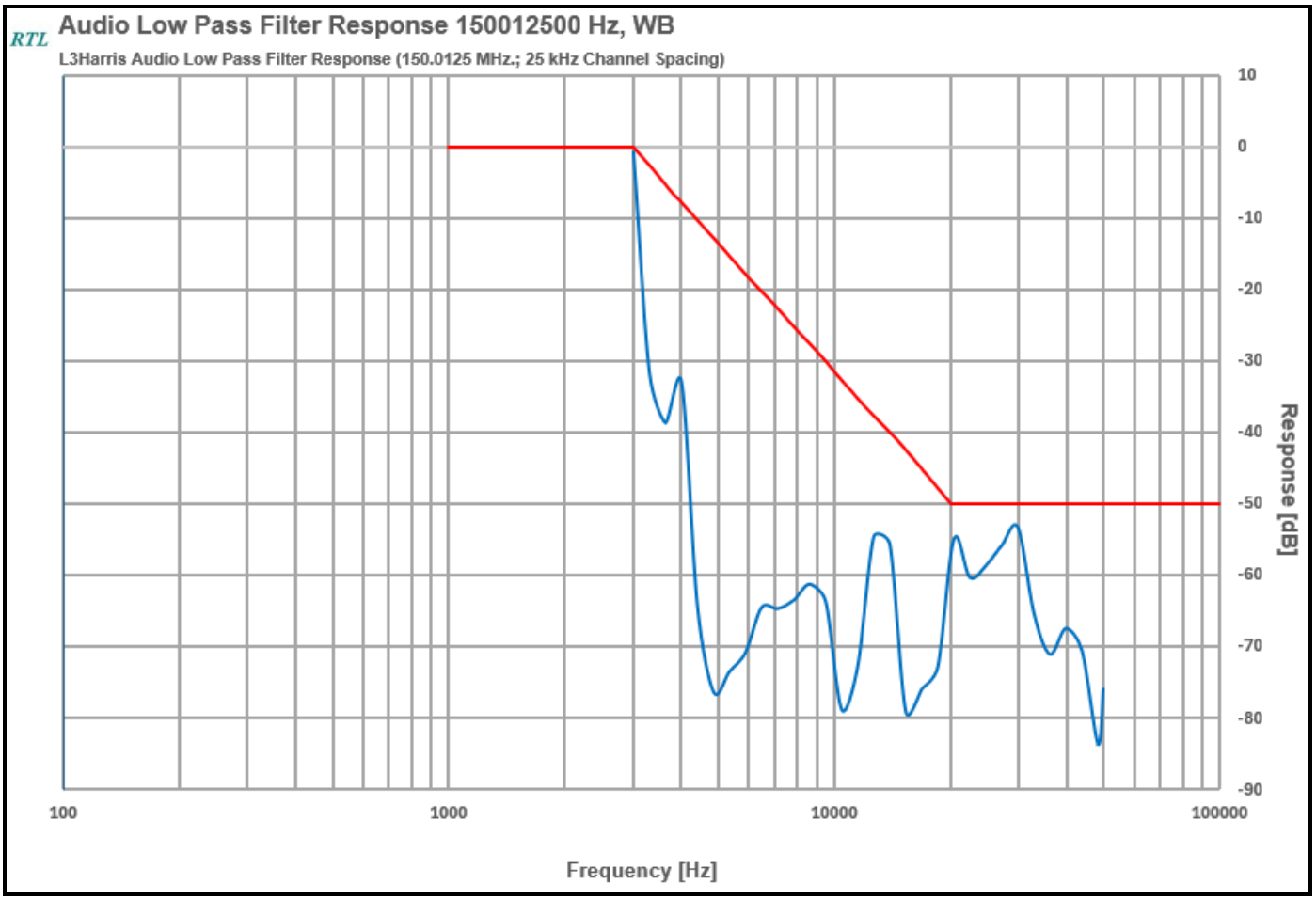
Plot 9-20: Modulation Characteristics – Audio Low Pass Filter Response – 162.0000 MHz (NB)



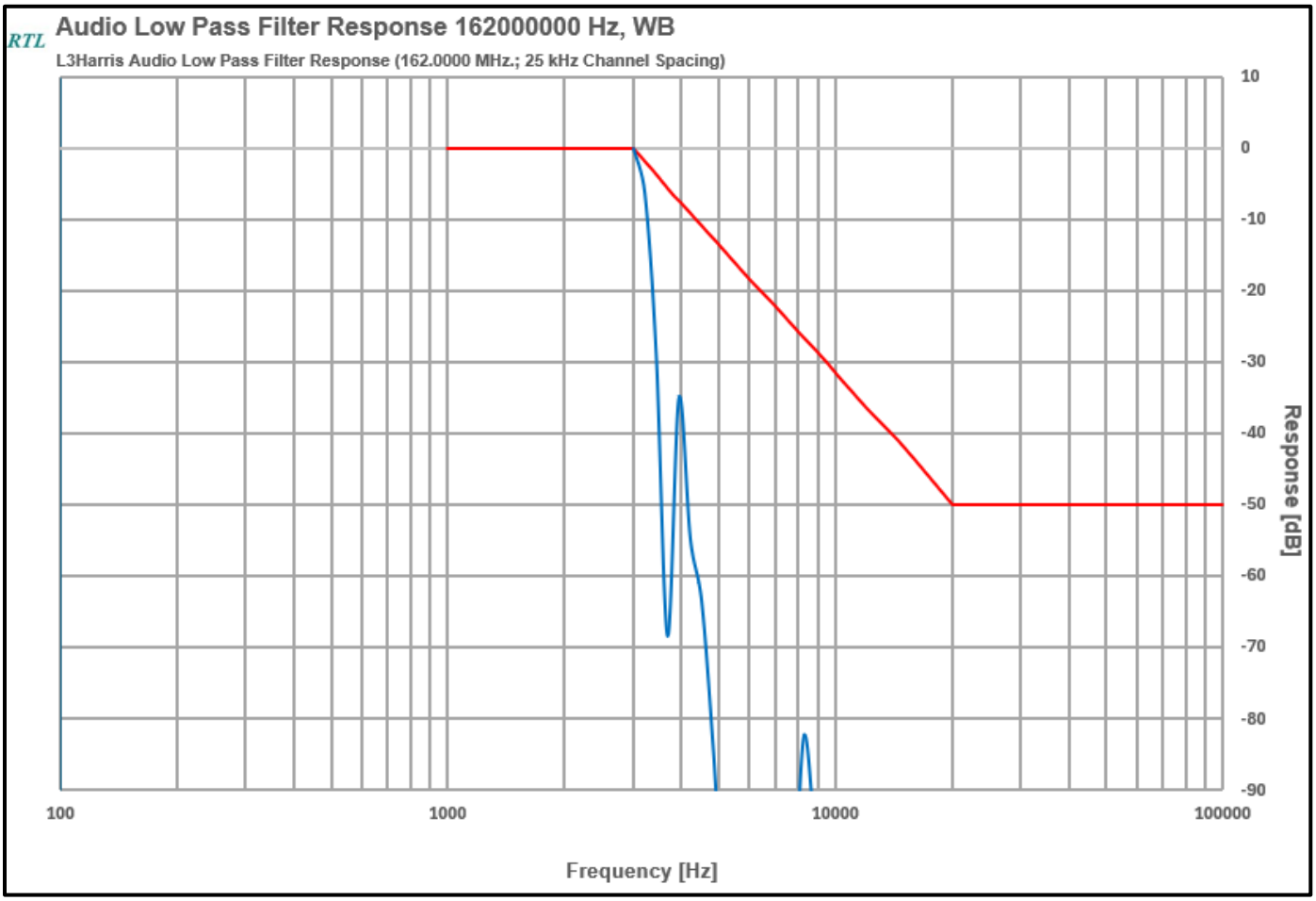
Plot 9-21: Modulation Characteristics – Audio Low Pass Filter Response – 173.9875 MHz (NB)



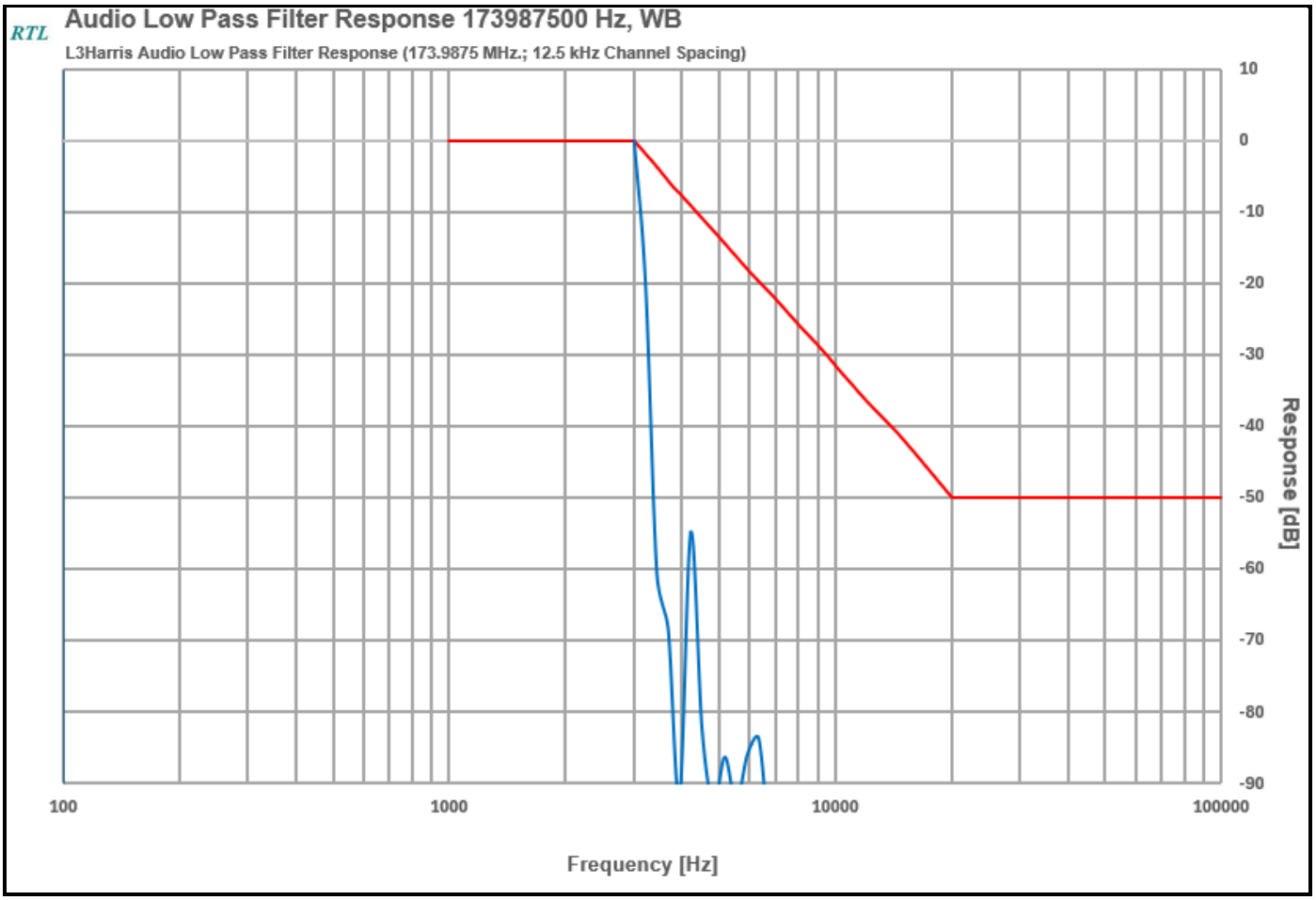
Plot 9-22: Modulation Characteristics – Audio Low Pass Filter Response – 150.0125 MHz (WB)



Plot 9-23: Modulation Characteristics – Audio Low Pass Filter Response – 162.0000 MHz (WB)



Plot 9-24: Modulation Characteristics – Audio Low Pass Filter Response – 173.9875 MHz (WB)



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 9-2: Test Equipment Used For Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901760	Hewlett Packard	3336B	Synthesizer/ Level Generator	1931401314	03/28/2025
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	11/02/2025
901759	Hewlett Packard	HP 3586B	Selective Level Meter	2510A03886	04/04/2025
901355	JFW Industries	50FH-003-300	Attenuator 300 W 3 dB DC 1000 MHz	N/A	03/23/2025
901291	Pasternack	PE7031-20	Attenuator 20 dB 300 W	901291	02/08/2025
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025

Test Personnel:

Daniel W. Baltzell		October 30, 2024
EMC Test Engineer	Signature	Date of Test

10 FCC §2.1055: Frequency Stability; §22.355: Frequency Tolerance; §74.464; Frequency Tolerance; §80.209: Frequency Stability; §90.213: Frequency Stability

10.1 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 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 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 the application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

§80.209:

Frequency bands and categories of stations	Tolerances
5) Band 156-162 MHz:	
(i) Coast stations:	
For carriers licensed to operate with a carrier power:	
Below 3 watts…….……..……..……..……..……..	10
3 to 100 watts…….……..……..……..……..……..	5.[7]
(ii) Ship stations ……..……..……..……..……..……..……	10.[4]
(iii) Survival craft stations operating on 121.500 MHz..…..……..……..……	50.
(iv) EPIRBs:	
Operating on 121.500 and 243.000 MHz …..…..……..……..……	50.
Operating on 156.750 and 156.800 MHz. …..…..……..……..……	10.

[4] For transmitters in the radiolocation and associated telecommand service operating on 154.584 MHz, 159.480 MHz, 160.725 MHz and 160.785 MHz the frequency tolerane is 15 parts in 10^6.

[7] For transmitters operated at private coast stations with antenna heights less than 6 meters (20 feet) above ground and output power of 25 watts or less the frequency tolerance is 10 parts in 10^6.

§90.213: Fixed and base stations - 5 ppm [5, 7]

[5] In the 150–174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

[11] Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150–174 MHz band and 2.5 ppm in the 421–512 MHz band.

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**
150-174	5.0

NOTE: In the 150-174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of **2.5 ppm.**

Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

10.2 Test Data

Table 10-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 28, 2024	24.4	21	102.8

Table 10-2: Frequency Stability/Temperature Variation – 150.0125 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	150.012510	0.07
-20	150.012510	0.07
-10	150.012500	0.00
0	150.012500	0.00
10	150.012500	0.00
20 (reference)	150.012500	0.00
30	150.012500	0.00
40	150.012500	0.00
50	150.012500	0.00
60	150.012498	-0.02

Table 10-3: Frequency Stability/Temperature Variation – 162.00000 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	162.000010	0.06
-20	162.000010	0.06
-10	162.000000	0.00
0	162.000000	0.00
10	162.000000	0.00
20 (reference)	162.000000	0.00
30	162.000000	0.00
40	162.000000	0.00
50	162.000000	0.00
60	161.999998	-0.01

Table 10-4: Frequency Stability/Temperature Variation – 173.98750 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	173.987510	0.06
-20	173.987510	0.06
-10	173.987500	0.00
0	173.987510	0.06
10	173.987500	0.00
20 (reference)	173.987500	0.00
30	173.987500	0.00
40	173.987500	0.00
50	173.987500	0.00
60	173.987498	-0.01

Table 10-5: Frequency Stability/Voltage Variation – 150.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	150.012500	0.00
48.(reference)	150.012500	0.00
55.2	150.012500	0.00

Table 10-6: Frequency Stability/Voltage Variation – 162.00000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	162.000000	0.00
48.(reference)	162.000000	0.00
55.2	162.000010	0.06

Table 10-7: Frequency Stability/Voltage Variation – 173.98750 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	173.987500	0.00
48.(reference)	173.987500	0.00
55.2	173.987500	0.00

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 10-8: Test Equipment Used for Testing Temperature Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW	Spectrum Analyzer	101021	05/30/2025
901014	Kikusui	PCR4000L	Power Supply	DB001921	Not Required
900946	Tenney Engineering	TH65	Temperature Chamber with Humidity	11380	06/23/2025
901338	Weinschel	46-40-34	Attenuator 40 dB 25 W	BM0556	02/07/2025
901291	Pasternack	PE7031-20	Attenuator 20 dB 300 W	901291	02/08/2025
901792	Shireen	UF1-2.92	40 GHz 300” Cable	N/A	08/02/2025
901791	Shireen	UF1-2.92	40 GHz 24” Cable	N/A	08/02/2025

Test Personnel:

Daniel W. Baltzell		October 28, 2024
EMC Test Engineer	Signature	Date of Test

11 FCC Rules and Regulations Part 90.214: Transient Frequency Response

11.1 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
t_3 [4]	±6.25 kHz	5.0 ms	10.0 ms

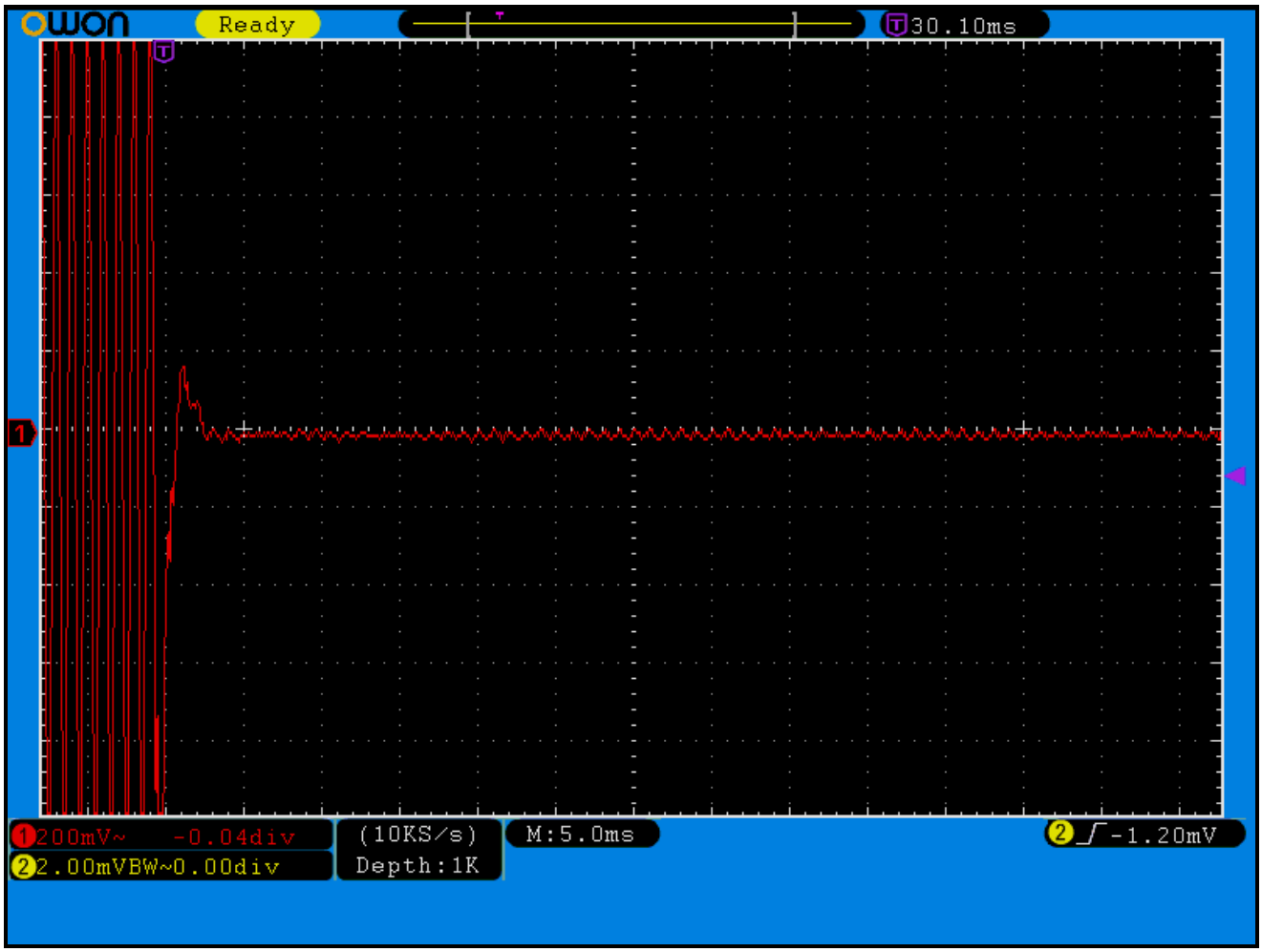
[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until 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.

11.2 Test Data

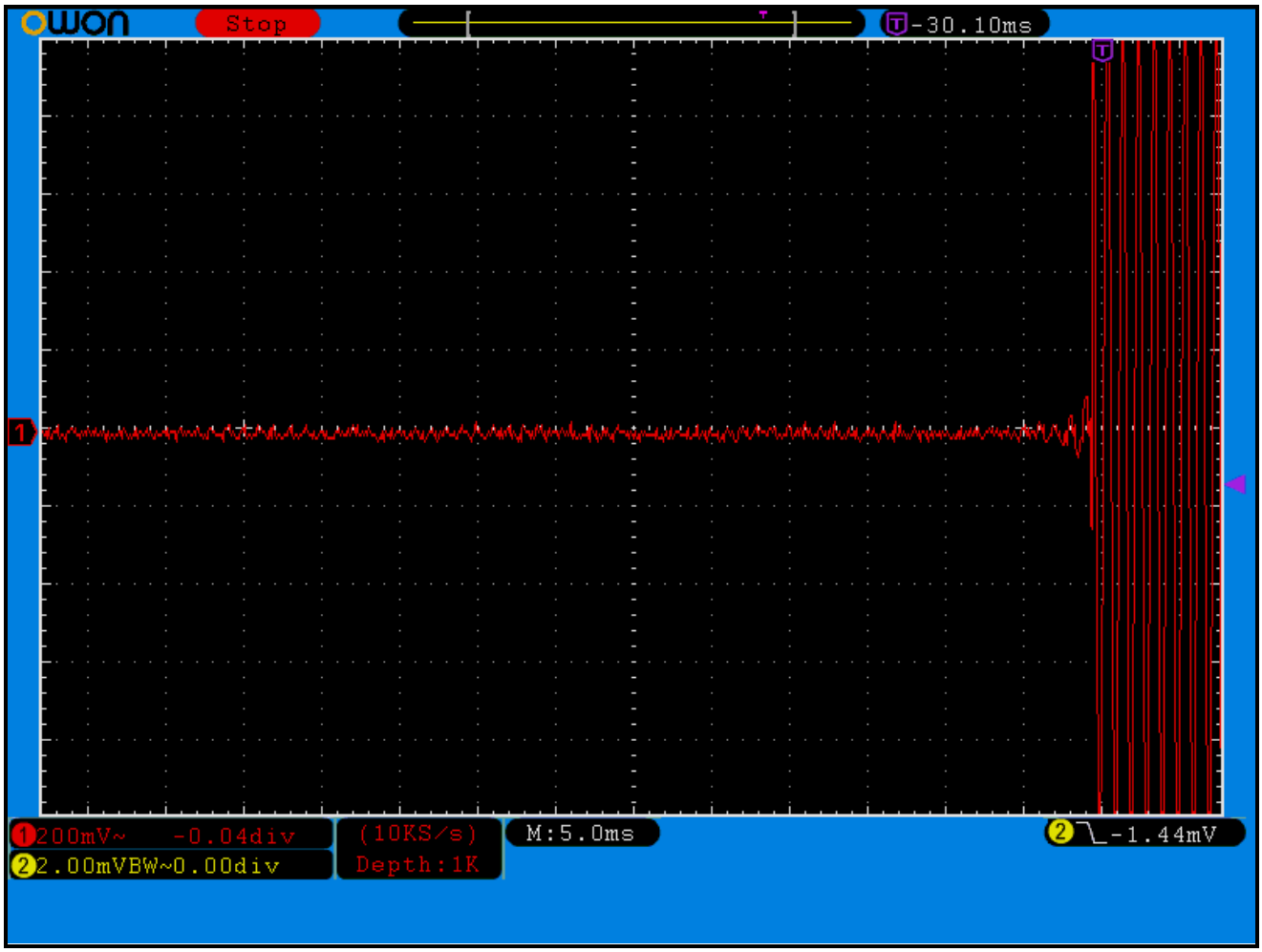
Table 11-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
October 30, 2024	22.3	23	102.5

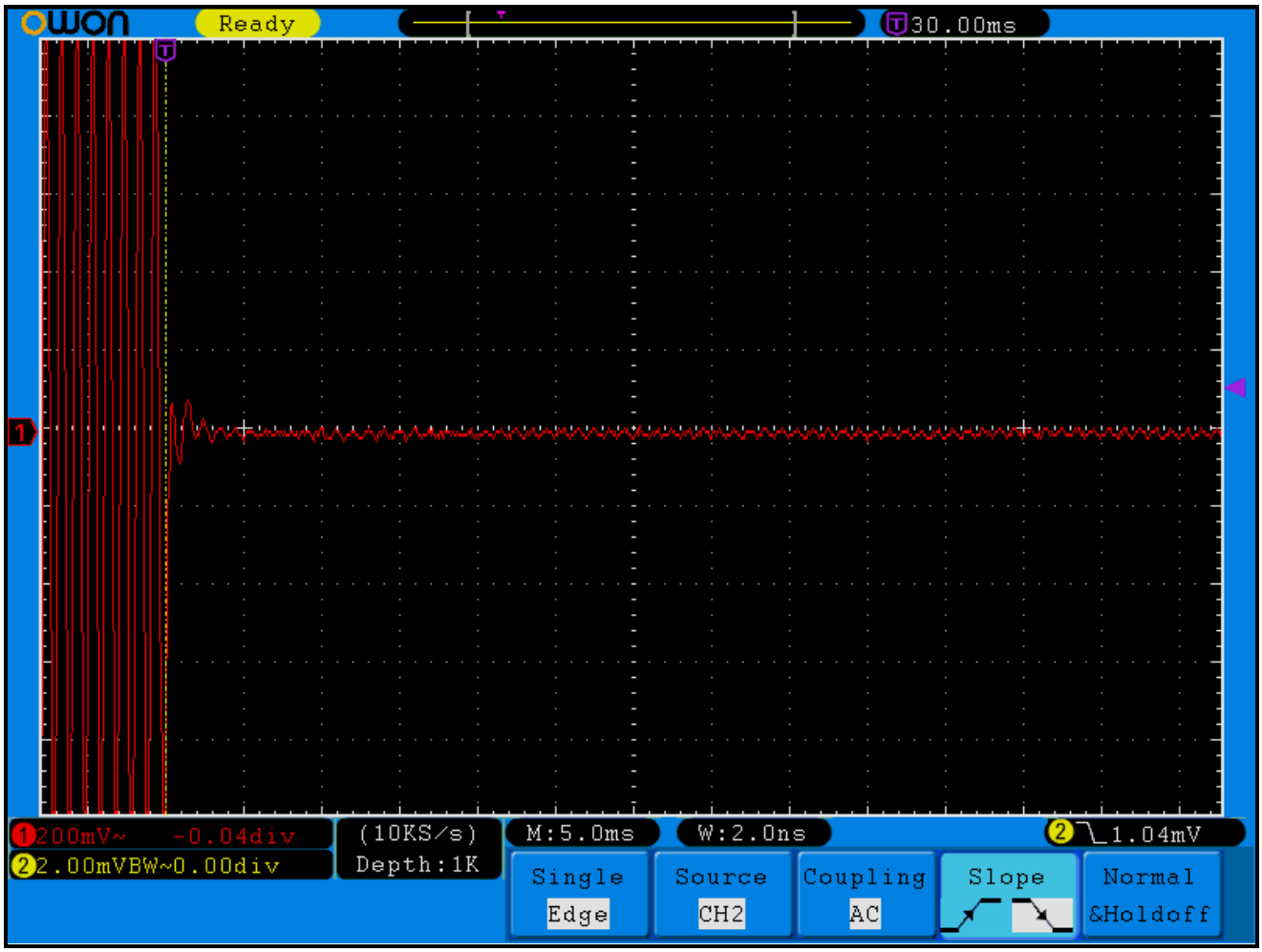
Plot 11-1: Transient Frequency Behavior – 150.0125 MHz; Carrier ON Time; Narrowband



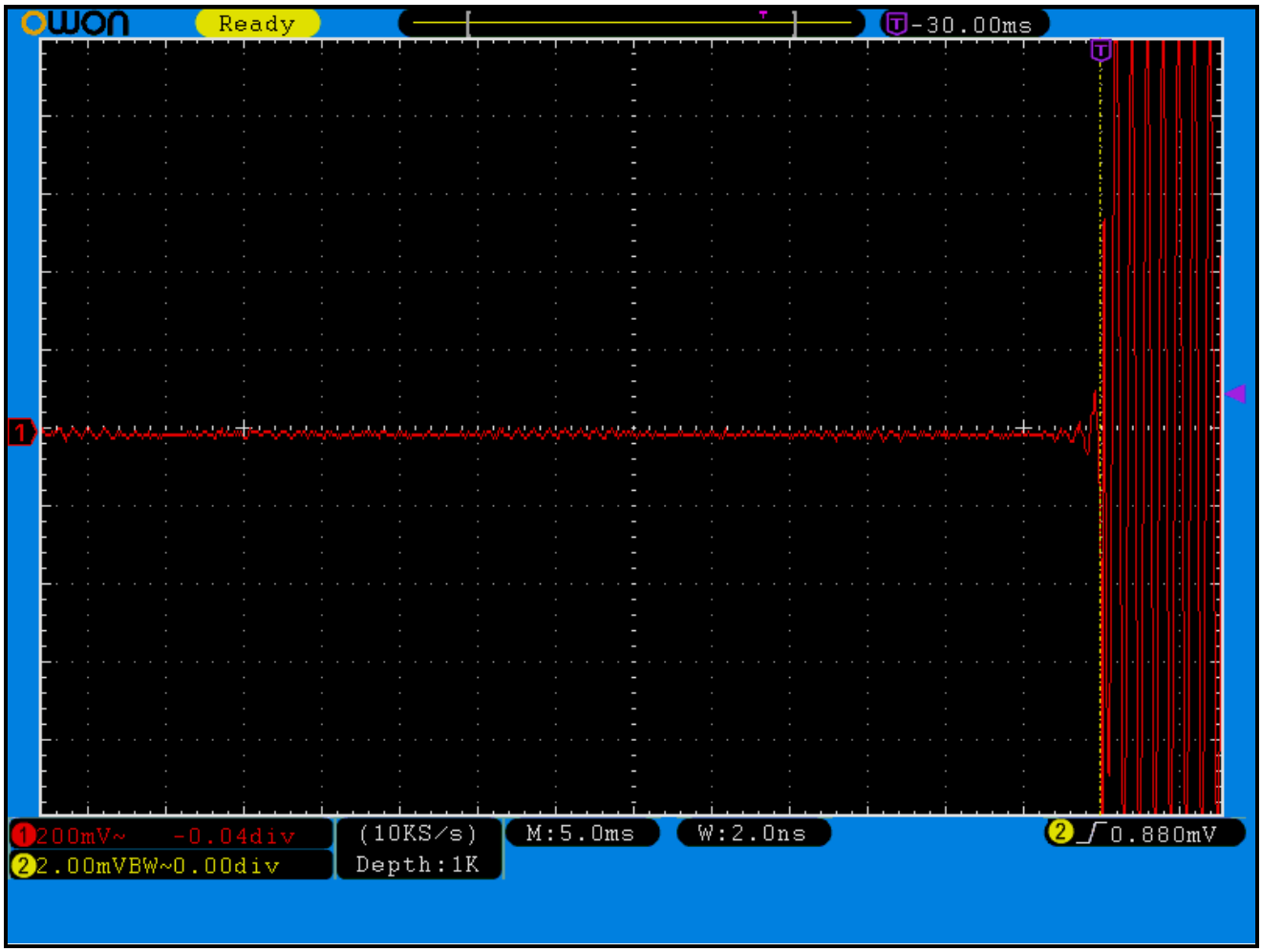
Plot 11-2: Transient Frequency Behavior – 150.0125 MHz; Carrier OFF Time; Narrowband



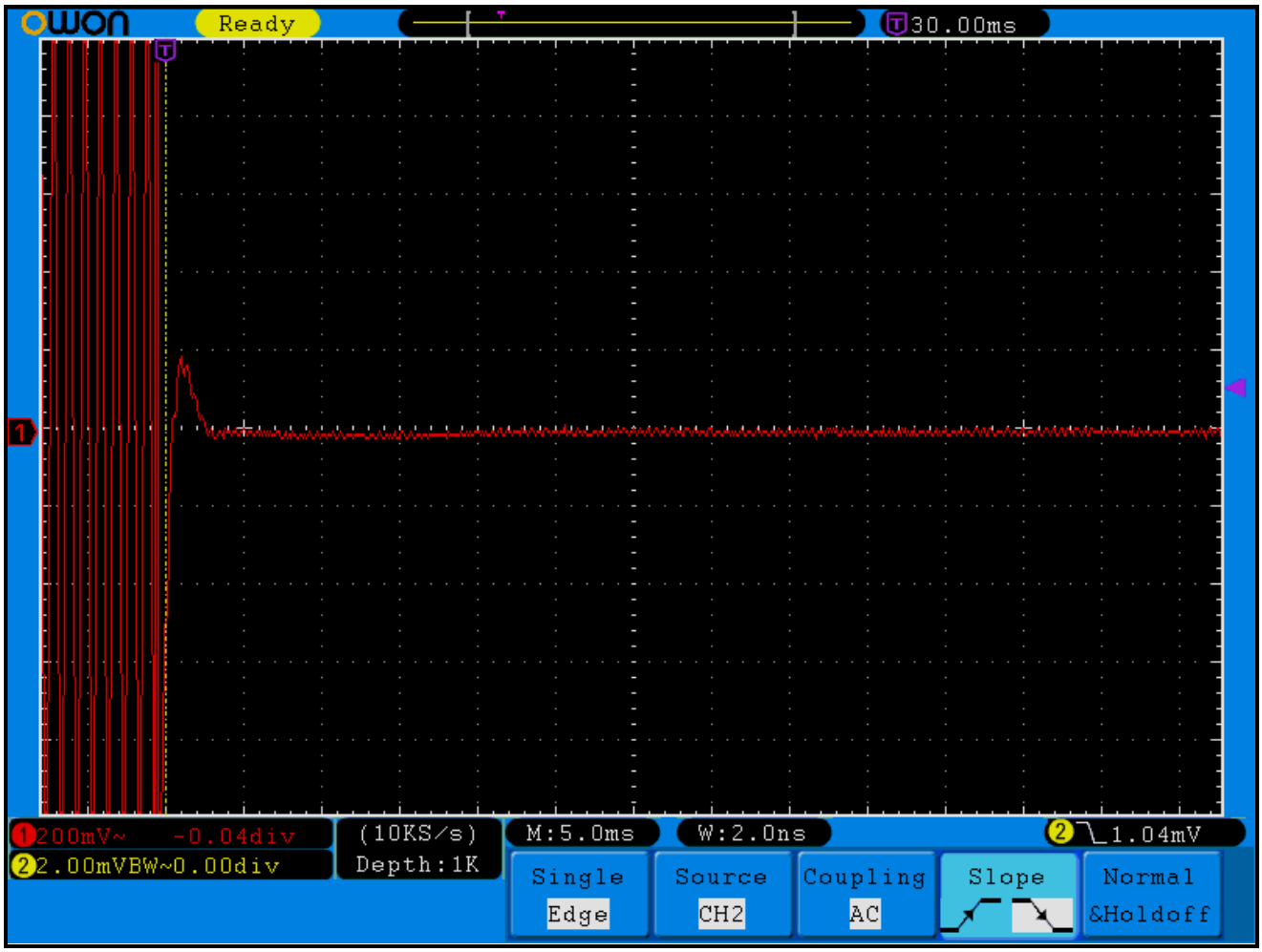
Plot 11-3: Transient Frequency Behavior – 162.0000 MHz; Carrier ON Time; Narrowband



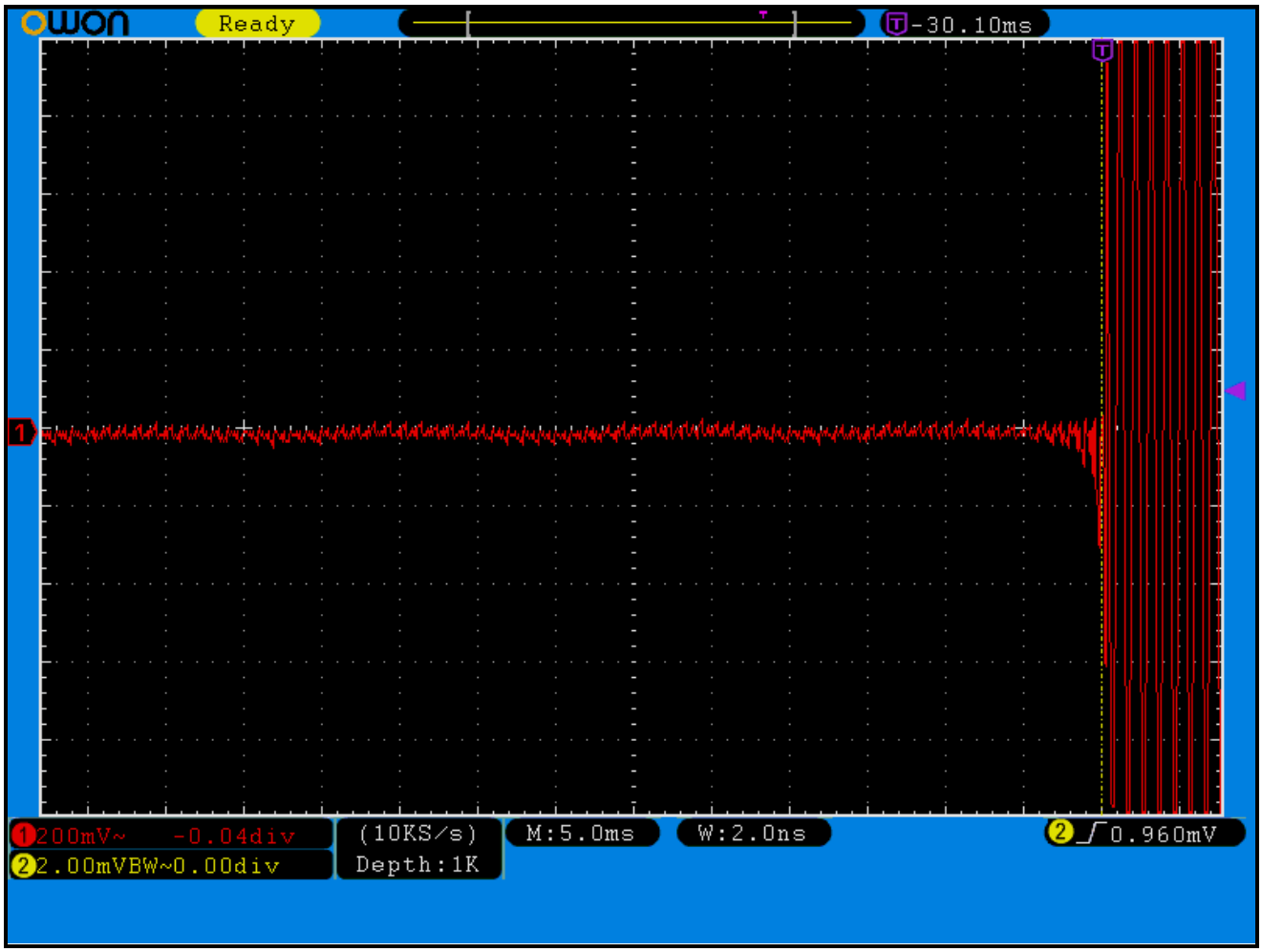
Plot 11-4: Transient Frequency Behavior – 162.0000 MHz; Carrier OFF Time; Narrowband



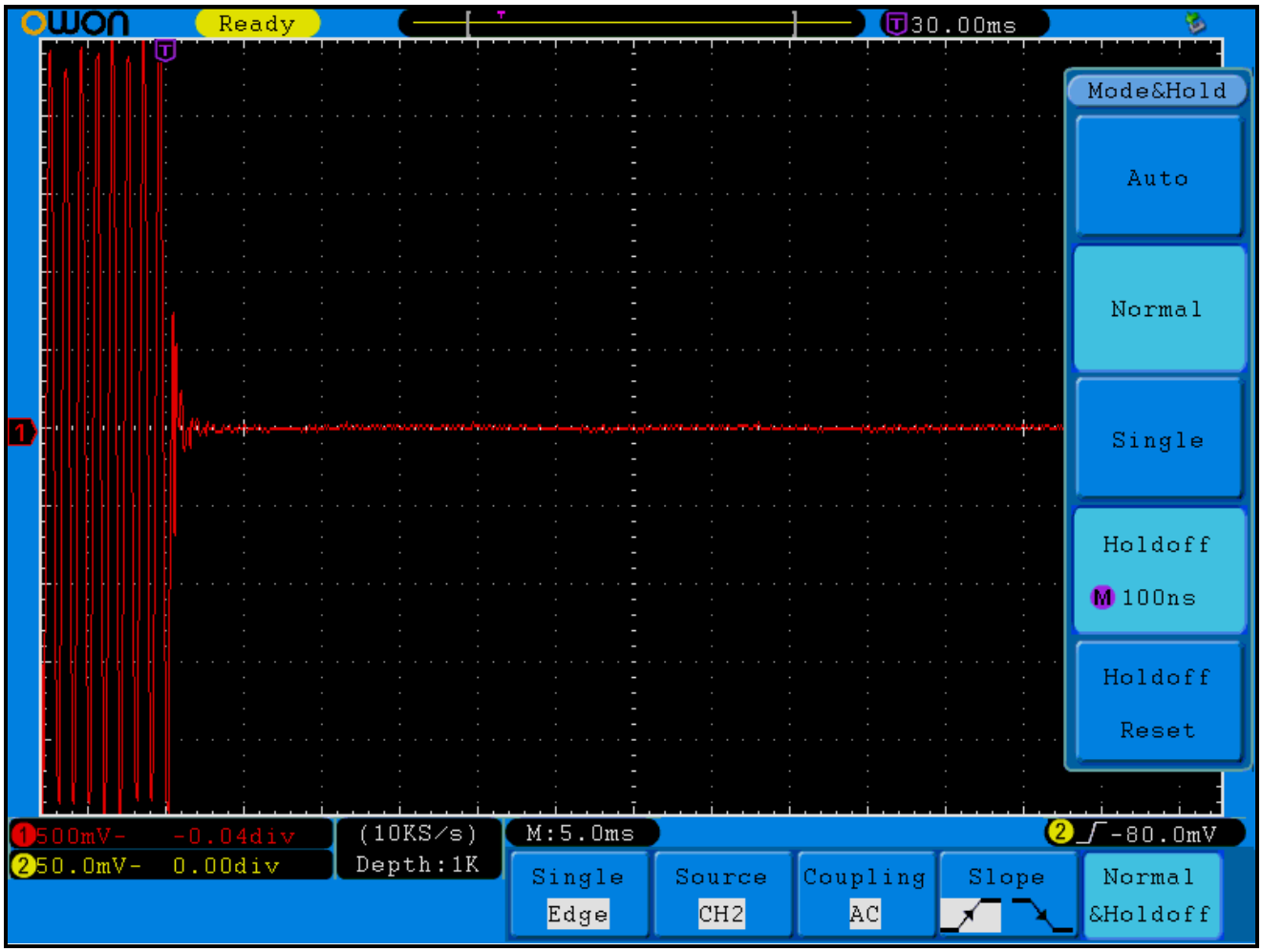
Plot 11-5: Transient Frequency Behavior – 173.9875 MHz; Carrier ON Time; Narrowband



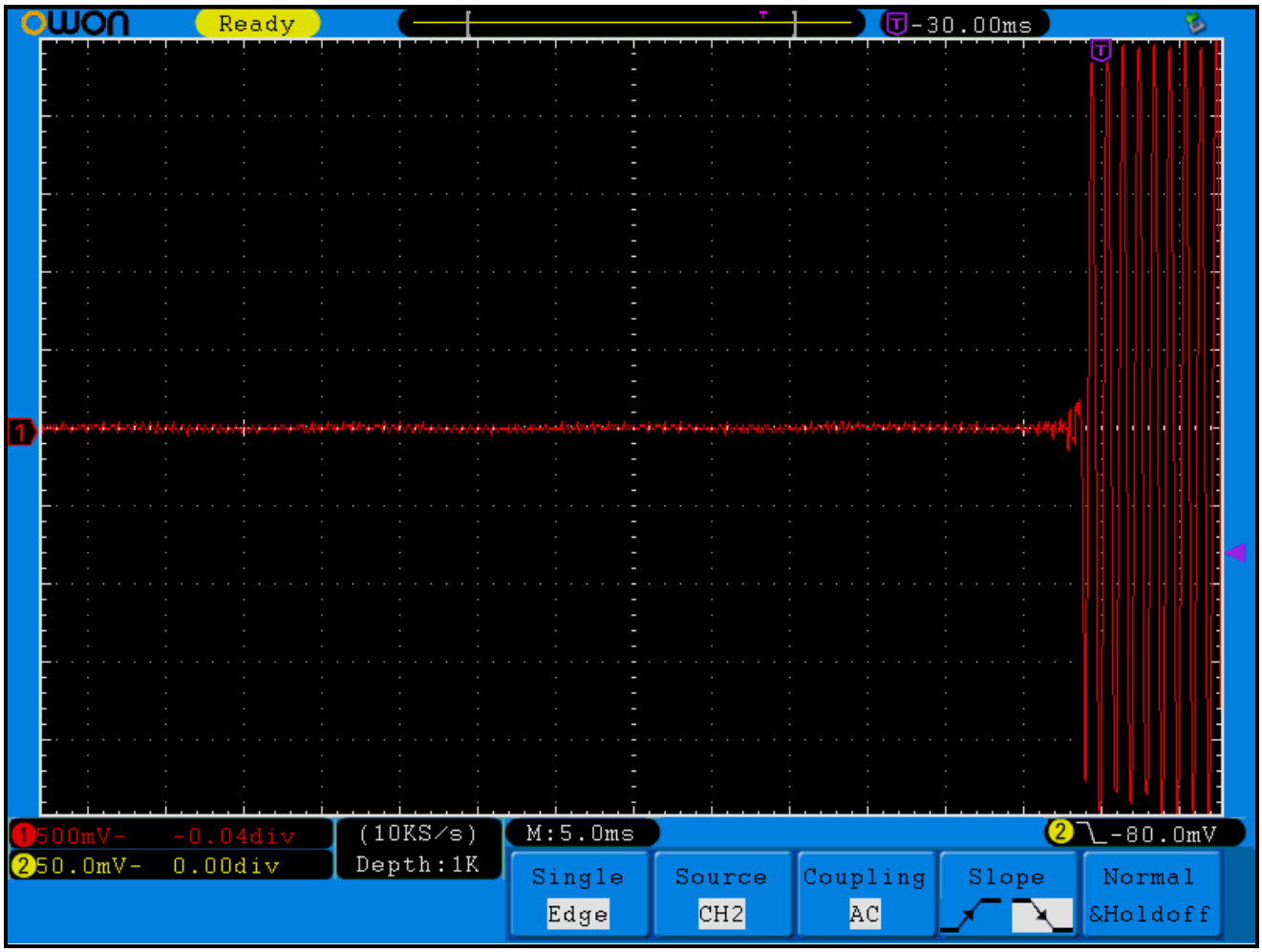
Plot 11-6: Transient Frequency Behavior – 173.9875 MHz; Carrier OFF Time; Narrowband



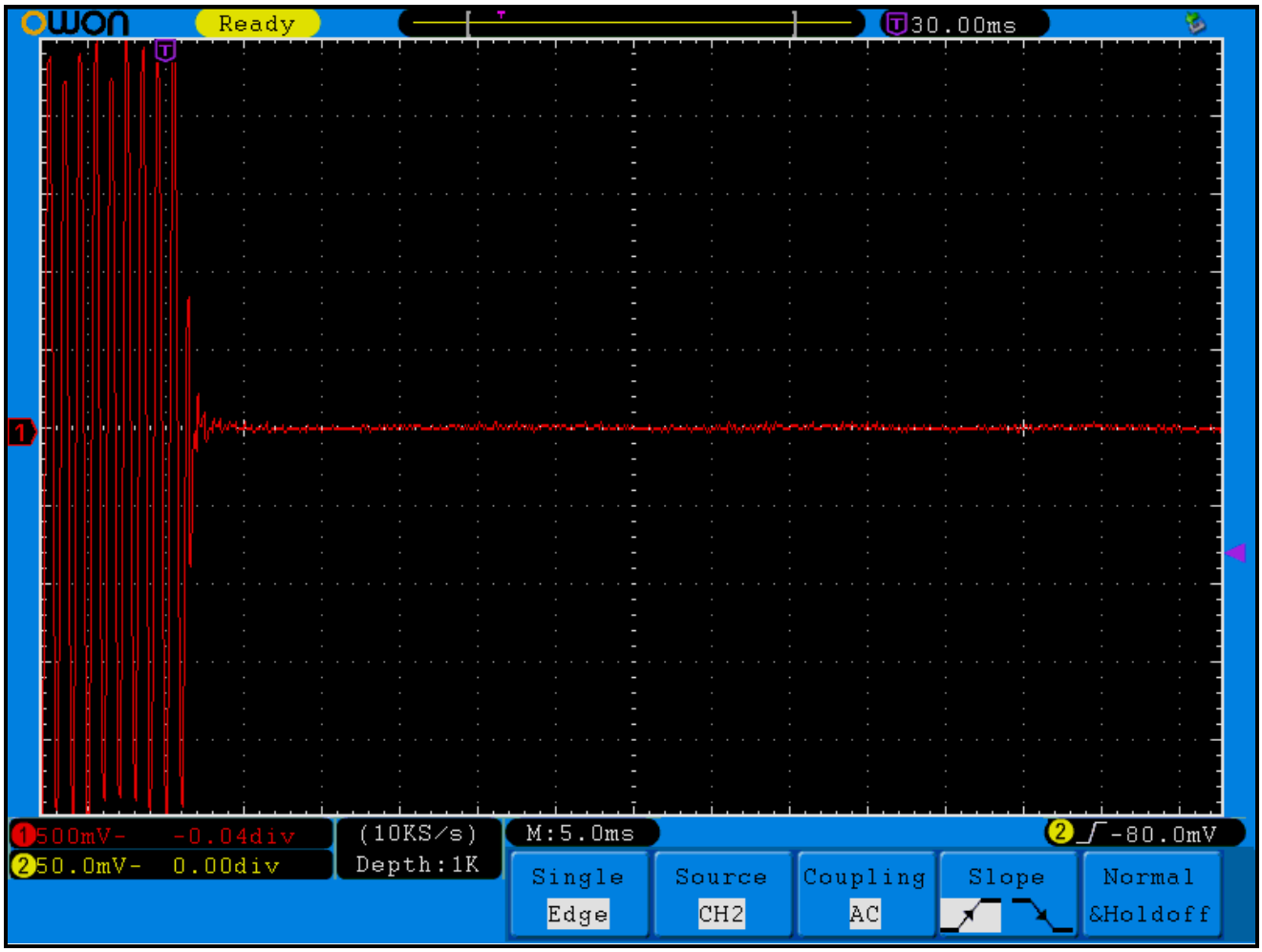
Plot 11-7: Transient Frequency Behavior – 150.0125 MHz; Carrier ON Time; Wideband



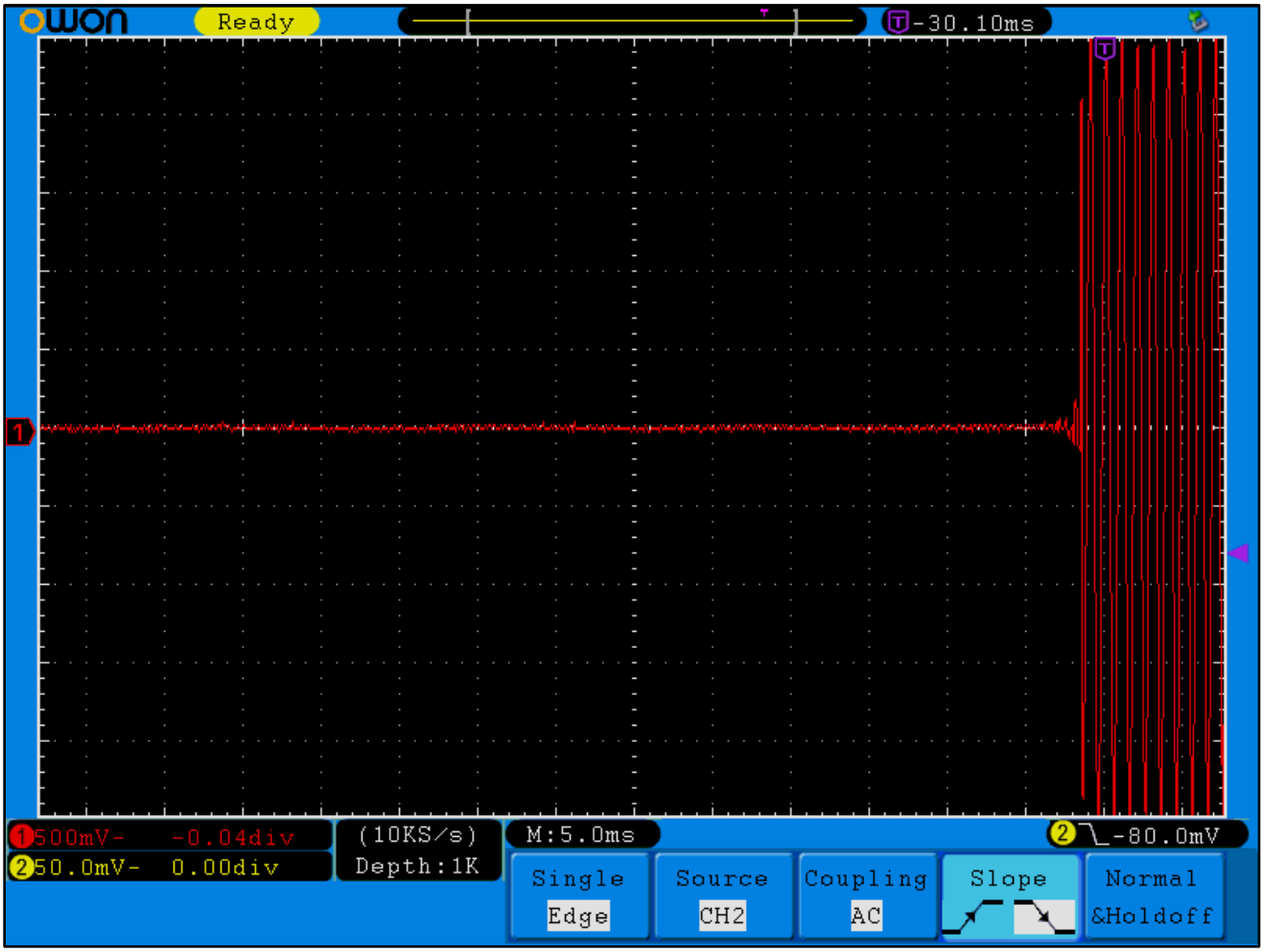
Plot 11-8: Transient Frequency Behavior – 150.0125 MHz; Carrier OFF Time; Wideband



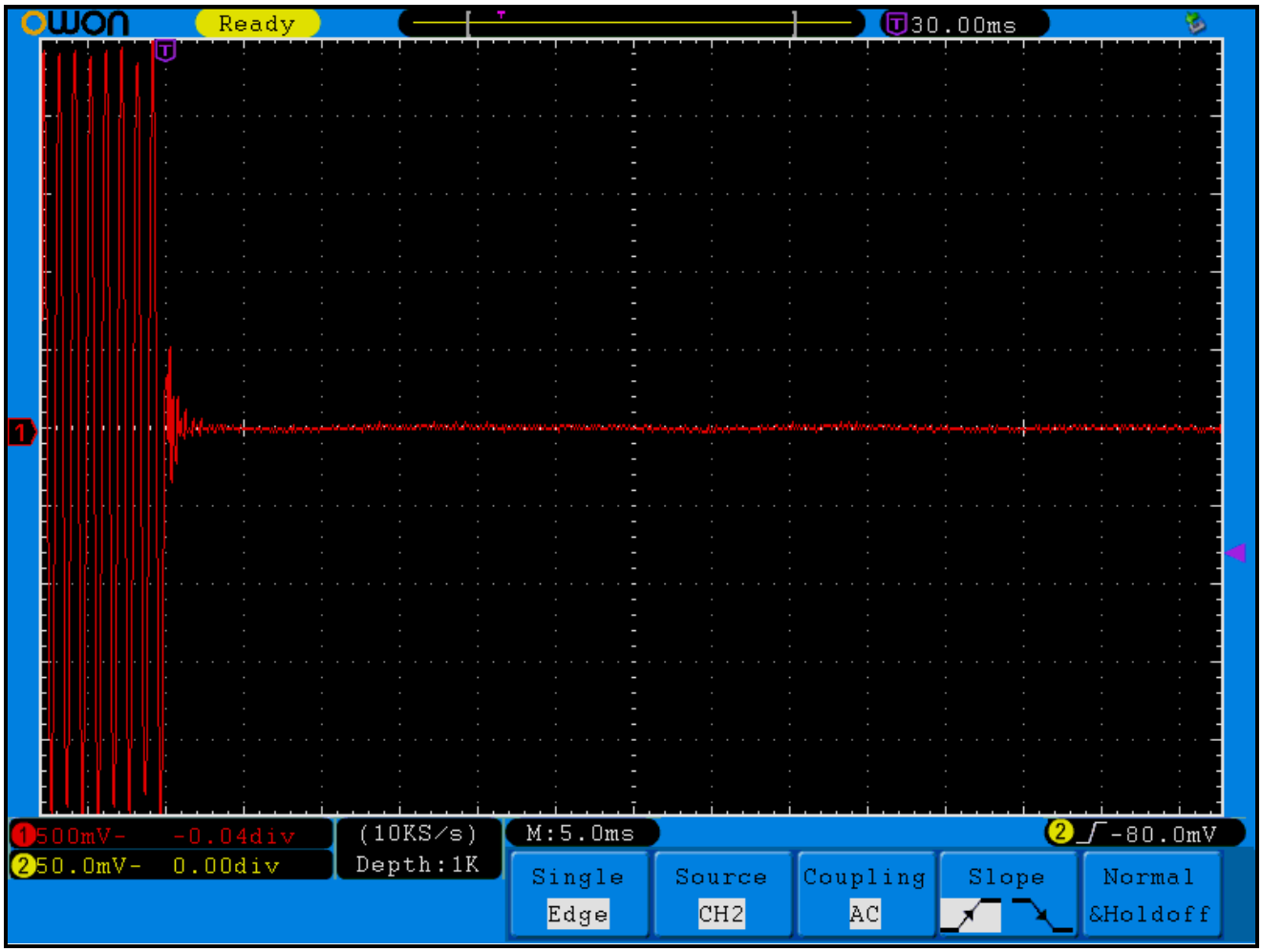
Plot 11-9: Transient Frequency Behavior – 162.0000 MHz; Carrier ON Time; Wideband



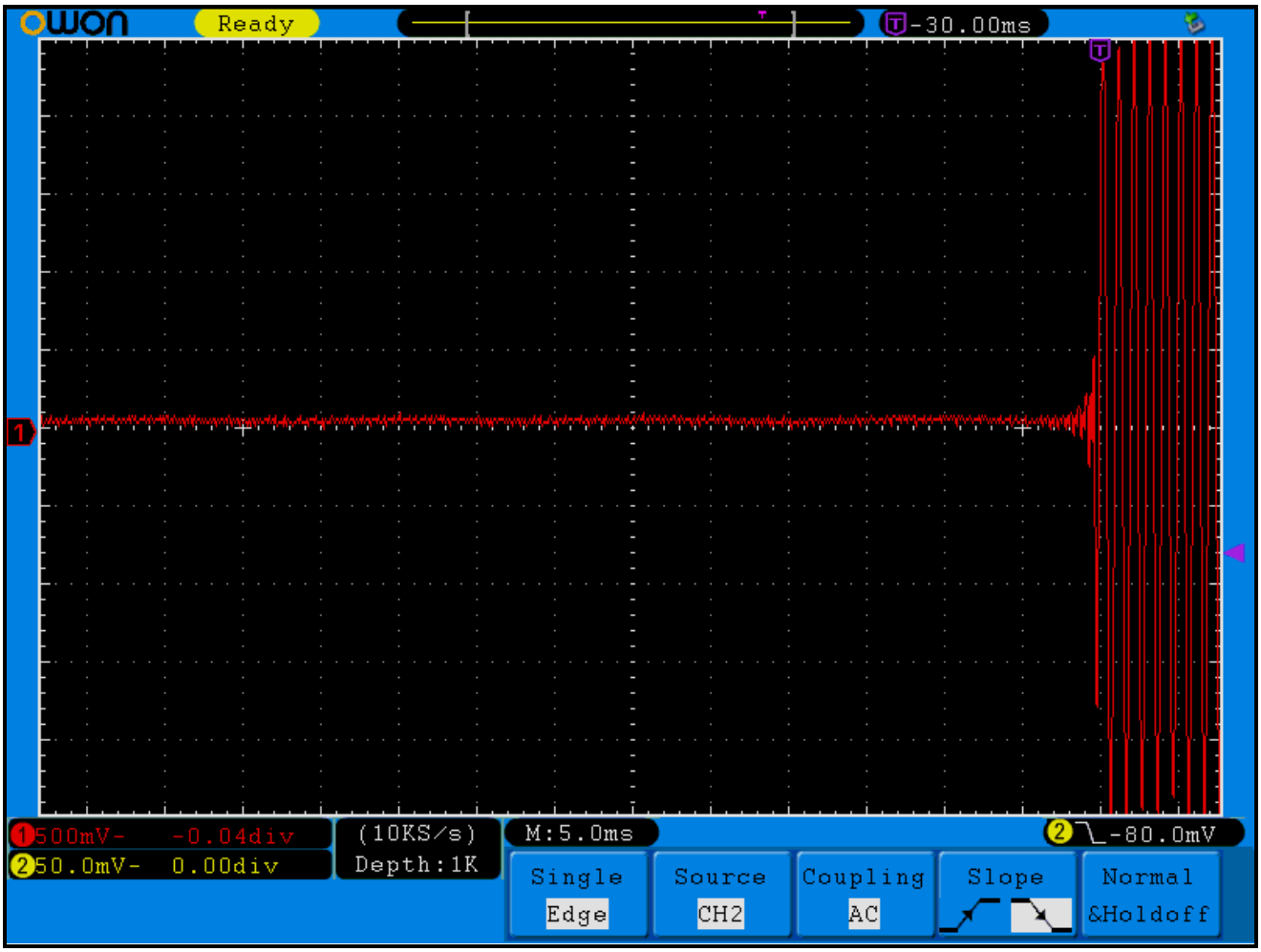
Plot 11-10: Transient Frequency Behavior – 162.0000 MHz; Carrier OFF Time; Wideband



Plot 11-11: Transient Frequency Behavior – 173.9875 MHz; Carrier ON Time; Wideband



Plot 11-12: Transient Frequency Behavior – 173.9875 MHz; Carrier OFF Time; Wideband



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 11-2: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648A	Signal Generator	3537A01741	08/16/2025
901118	Hewlett Packard	HP8901B	Modulation Analyzer 150 kHz–1300 MHz	2406A00178	11/02/2025
901778	Tektronix	DPO3052	Oscilloscope	C010197	05/14/2027
901705	RF Depot	191-M0M0-0360S	SMA 36” Cable	N/A	01/25/2025
901591	Sucoflex	104	SMA 6.5’ Cable	N/A	03/23/2025
900948	Weinschel Corp.	47-10-43	Attenuator 10 dB 50W	BH1487	12/23/2025
901355	JFW Industries	50FH-003-300	Attenuator 300W 3 dB DC 1000 MHz	N/A	03/23/2025
901463	Werlatone Inc.	C1795	Directional Coupler, 100 W, 40 dB, 1-1000 MHz	4067	03/22/2025
901337	Narda Microline	766-10	Attenuator DC-4 GHz, 10 dB, 20W	6242	02/10/2025
901263	Agilent	.01-12 GHz	SMA Detector	2936A05505	Not Required
901338	Weinschel Corp.	46-40-34	Attenuator 40 dB 25W	BM0556	02/27/2025
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36”	NA	11/30/2025

Test Personnel:

Daniel W. Baltzell		October 30, 2024
EMC Test Engineer	Signature	Date of Test

12 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

WIDEBAND ANALOG Data/Voice

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

NARROWBAND ANALOG Data/Voice

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

C4FM Data/Voice

Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1800
Bn = $[9600/\log_2(4) + 2\ (1800)\ (0.89)] = 8.0$ kHz
Emission designator: 8K00F1D, 8K00F1E

13 Conclusion

The data in this measurement report shows that the L3Harris Technologies, Inc. Model Two47 VHF-H; FCC ID: OWDTR-0175-E complies with the applicable requirements of Parts 2, 22, 74, 80 and 90 of the FCC Rules.