RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & ISED Certification Report

L3Harris Technologies
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

TWO47 700 MHz Base-Station
Model: SN-7TXMX

FCC ID: OWDTR-0172-E
IC: 3636B-0172

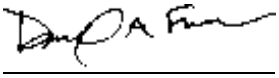
September 28, 2023

Standards Referenced for this Report	
Part 2: 2021	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2022	Private Land Mobile 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: 2023080TNB

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: September 28, 2023

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.

FCC Equipment Class: TNB

FCC Rule Part	Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Emission Designator	Transmit Mode
90	769 – 775 (FCC) 768 – 776 (ISED)	100.0	0.06	8K00F1D/E	C4FM Data/Voice
90	769 – 775 (FCC) 768 – 776 (ISED)	100.0	0.06	9K70D1W	WCQPSK
90	769 – 775 (FCC) 768 – 776 (ISED)	100.0	0.06	9K80D7W	HDQPSK
90	769 – 775 (FCC) 768 – 776 (ISED)	100.0	0.06	18K8D1W	HVD-SMR
90	769 – 775 (FCC) 768 – 776 (ISED)	100.0	0.06	12K5D1W	HVD-NPSPAC

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1 Test Result Summary

Test	FCC Reference	ISED Reference	Result
RF Power Output	2.1046(a), 90.542	RSS-119 4.1, 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210	RSS-119 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a)	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/ Adjacent Channel Power	2.1049, 90.543	RSS-119 4.3	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.539	RSS-119 5.3	Complies
99% Bandwidth	N/A	RSS-Gen	N/A

2 General Information

The following Certification Report is prepared on behalf of L3Harris Technologies in accordance with the Federal Communications Commission and ISED Canada rules and regulations. The Equipment Under Test (EUT) was the SN-7TXMX; FCC ID: OWDTR-0172-E, IC: 3636B-0172.

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 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

ISED CAB ID: US0079, Company Number: 2956A

2.2 Related Submittal(s)/Grant(s)

This is an original certification application for L3Harris Technologies Model/HVIN: SN-7TXMX, FCC ID: OWDTR-0172-E, IC: 3636B-0172.

2.3 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 site licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of §1.1307(b)(3).

2.4 Tested System Details

The test sample was received on September 5, 2023. 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 modulation types.

TX Band(s): 769-775 MHz for U.S.; 768-776 MHz for Canada
RX Band(s): 798-806 MHz

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model/HVIN	PN/SN	FCC ID	ISED ID	RTL Bar Code
Base Station	L3Harris Technologies	SN-7TXMX	CK22M2700693	OWDTR-0172-E	3636B-0172	24337
Base Station	L3Harris Technologies	SN-7TXMX	CK22M2700688	OWDTR-0172-E	3636B-0172	24339

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model/HVIN	PN/SN	Cable	RTL Bar Code
Yagi Antenna	Sinclair	SY450-SF1SNM	CC000095200-1-1	0.7m shielded	23370
Ethernet Switch	Cisco Systems	C1000-16T-E-2G-L	F0C2711Y1JC	1.8m & 4.2m unshielded ethernet	24342
-48VDC Power Supply	MeanWell	HRPG-1000-48	TC27090884	3m unshielded DC; 2.6 unshielded AC	24338

2.5 Configuration of Tested System

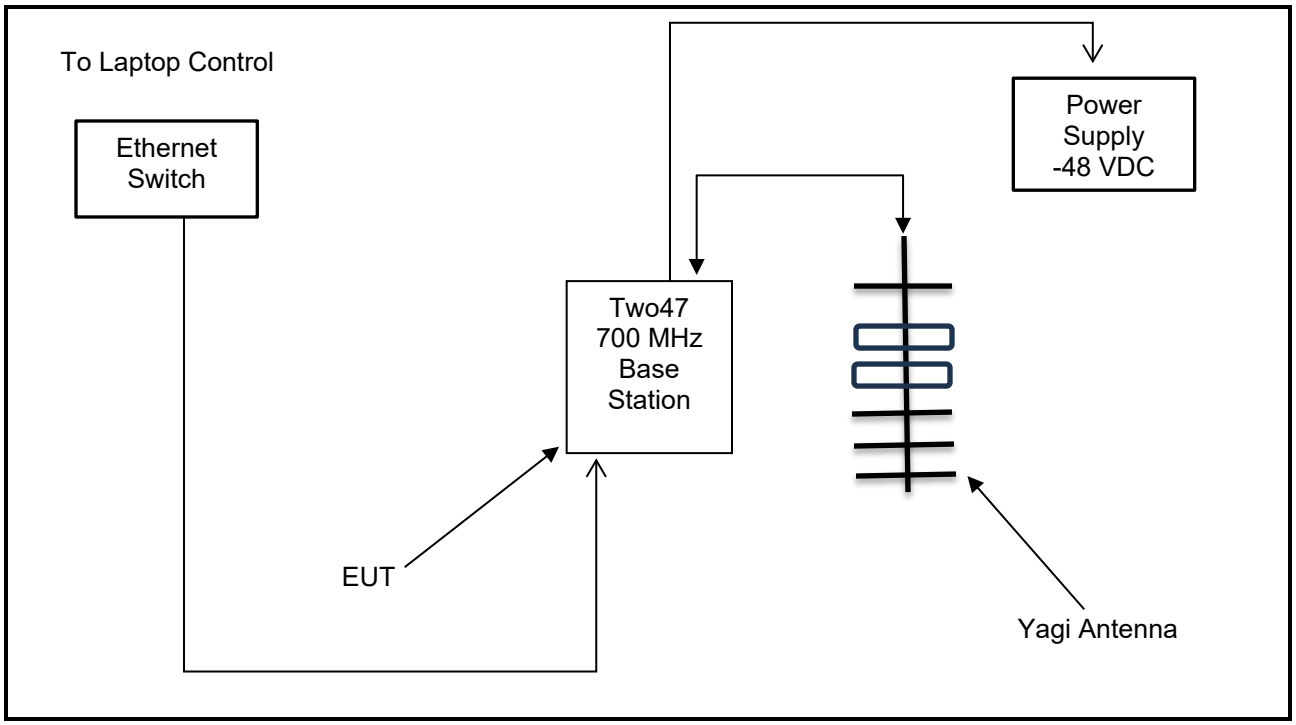


Figure 2-1: Configuration of Tested System

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

Channel	Frequency (MHz)
Low	768.006250
Middle	772.000000
High	775.993750

4 FCC Part 2.1046(a): RF Power Output; FCC 90.542(b) Transmitting Power and Antenna Height Limits; ISED RSS-119 4.1: Transmitter Output Power

4.1 Test Procedure

ANSI C63.26, section 5.2

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

Manufacturer's rated power: 100.0 W

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

The DC voltages applied to and DC currents into the several elements of the final radio frequency amplifying device for normal operation over the power range: -48 VDC / 7.5 A

§90.542(b) Transmitting Power and Antenna Height Limits

The transmitting power of a control station must not exceed 200 watts ERP.

RSS-119 §4.1 Transmitter Output Power

The output power shall be within ±1 dB of the manufacturer's rated power listed in the equipment specifications.

Frequency Bands (MHz)	Transmitter Output Power (W)
	Base/Fixed Equipment
Transmitter Output Power (W)	See SRSP-511 for ERP limit

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)
768.006250	50.0	100.0	40.0	10.0
772.000000	50.0	100.0	40.0	10.0
775.993750	50.0	100.0	40.0	10.0

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 4-2: 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	10/15/2023
901671	Agilent	E9300	Power Sensor	MY41495766	10/15/2023
901338	Weinschel	46-40-34	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024
901774	Rosenberger	LU7-022-1000	Cable	011	07/06/2024
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024

Test Personnel:

Daniel W. Baltzell		September 5, 2023
EMC Test Engineer	Signature	Date of Test

5 FCC Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations; ISED RSS-119 5.8: Transmitter Unwanted Emissions

5.1 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.

5.2 Test Data

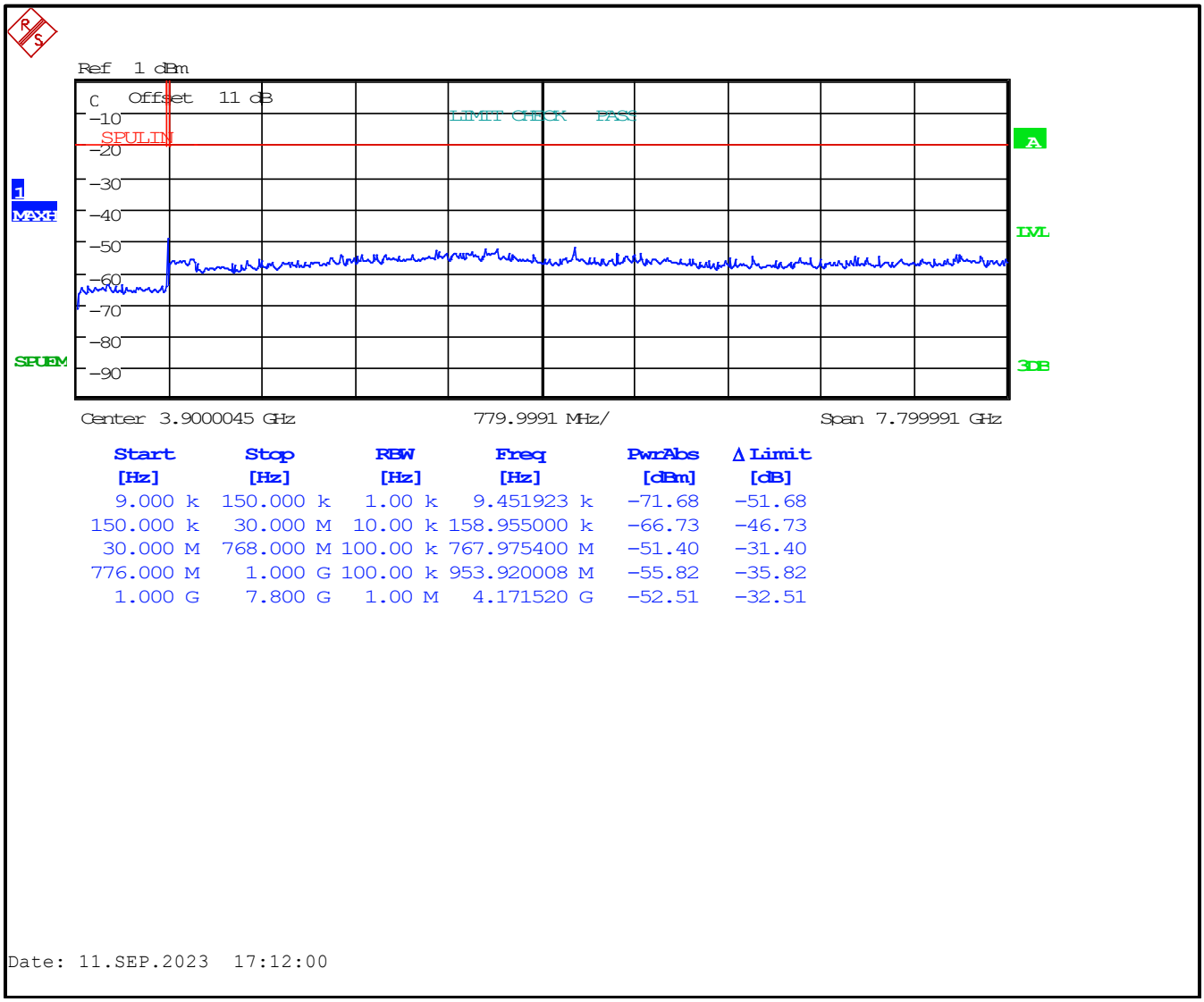
The frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

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

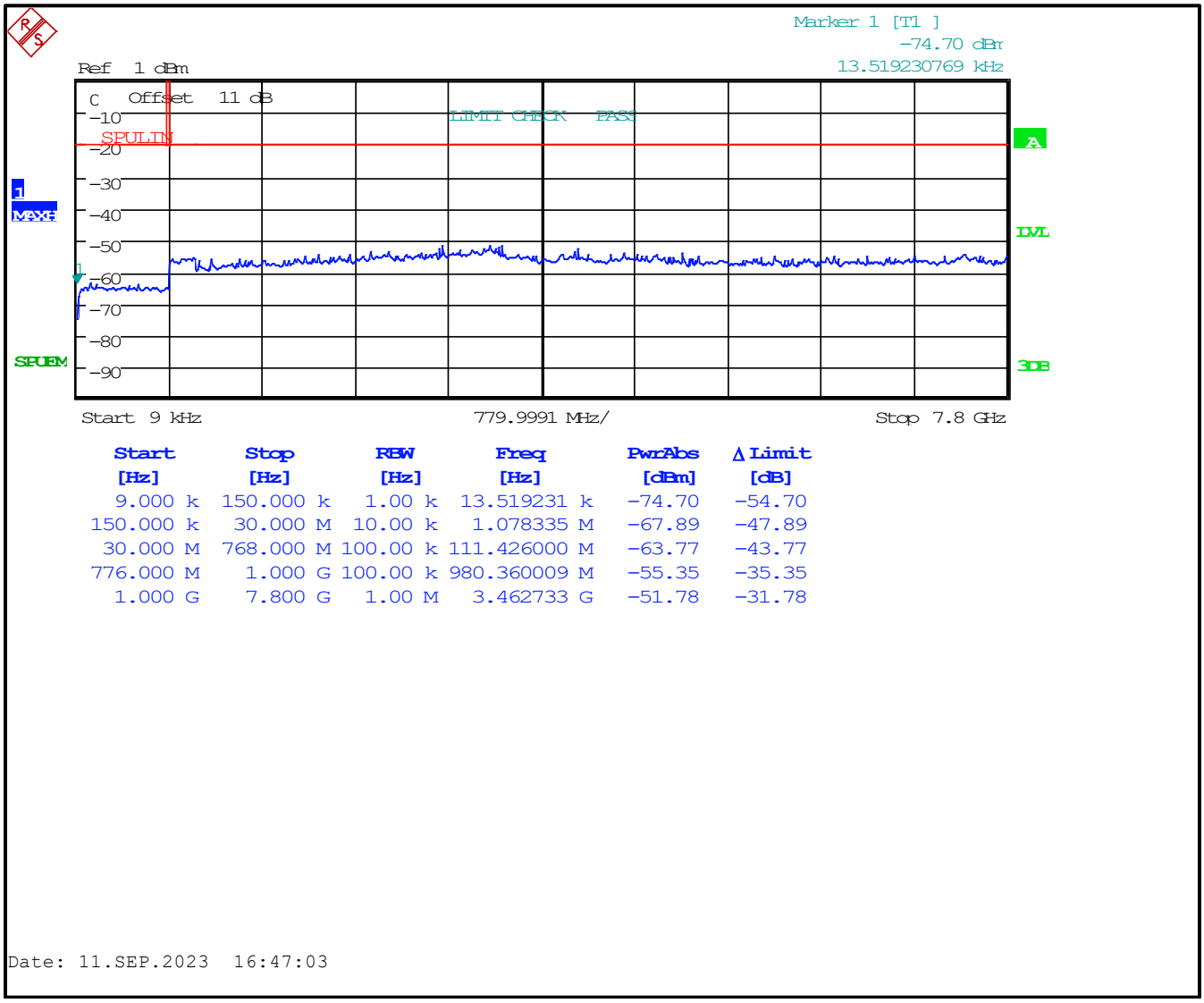
Both high and low power settings were investigated; high power was found to be the worst case and is presented.

5.3 Test Data

Plot 5-1: Conducted Spurious Emissions – 768.00625 MHz



Plot 5-2: Conducted Spurious Emissions – 772.000000 MHz



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	150.000 k	1.00 k	13.519231 k	-74.70	-54.70
150.000 k	30.000 M	10.00 k	1.078335 M	-67.89	-47.89
30.000 M	768.000 M	100.00 k	111.426000 M	-63.77	-43.77
776.000 M	1.000 G	100.00 k	980.360009 M	-55.35	-35.35
1.000 G	7.800 G	1.00 M	3.462733 G	-51.78	-31.78

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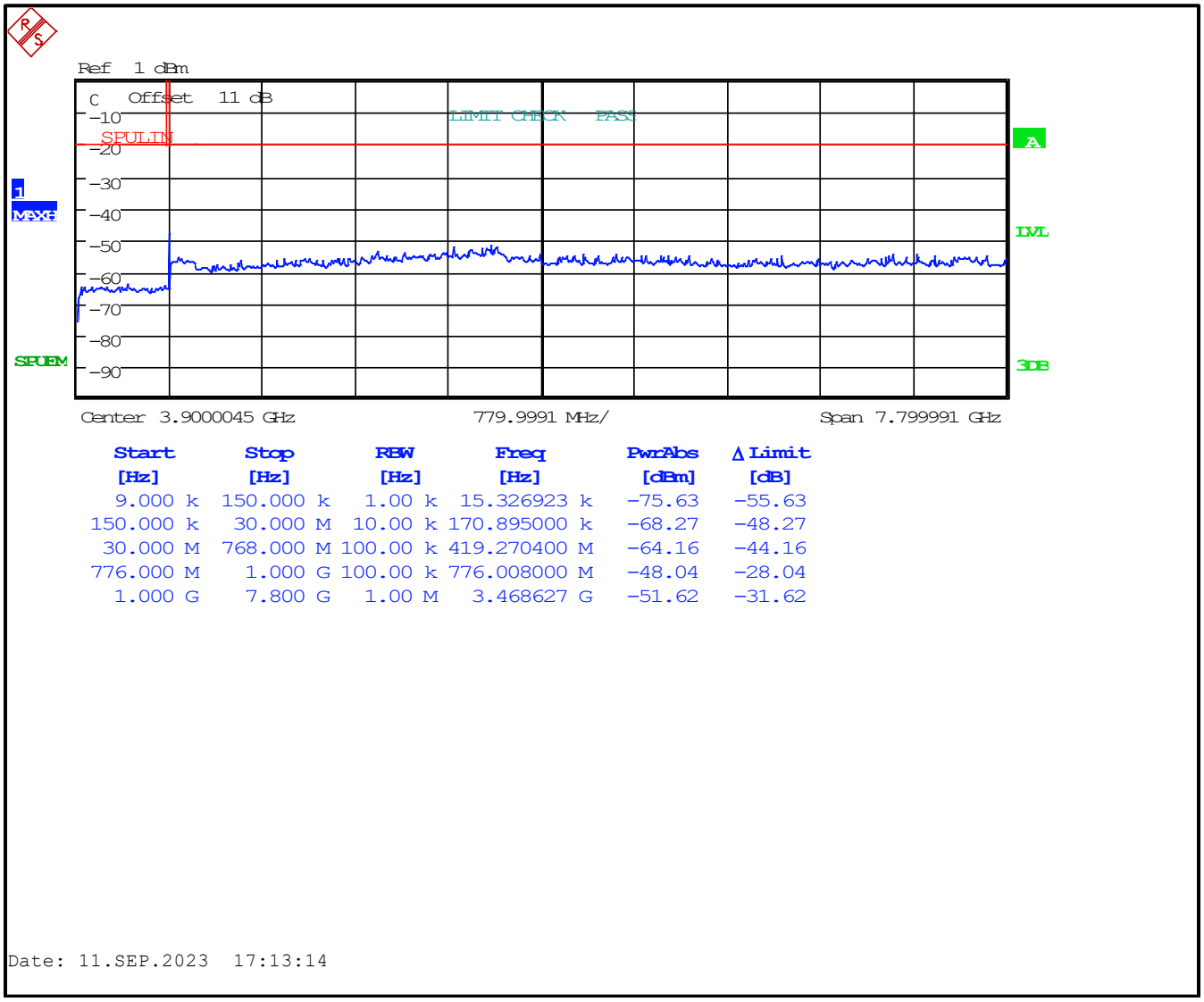
Plot 5-3: Conducted Spurious Emissions – 775.993750 MHz



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 Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
901338	Weinschel	46-40-34	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	11/28/2023
901775	Rosenberger	LU7-022-1000	1m SMA Cable	N/A	07/06/2024

Test Personnel:

Daniel W. Baltzell		September 11, 2023
EMC Test Engineer	Signature	Date of Test

6 FCC Part 90.543(a): Emission Limitations: ACP Requirements; ISED RSS-119 4.3: Adjacent Channel Power (ACP) Measurement for Equipment in the Bands 768-776 MHz and 798-806 MHz

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

6.1 Test Procedure

ANSI C63.26, Section 6.5.2.4

Adjacent channel power measurements for equipment operating in the 769 MHz to 775 MHz and 799 MHz to 805 MHz (public safety) bands.

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

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

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP Relative (dBc)
(+/-)9.375	6.25	-40
(+/-)15.625	6.25	-60
(+/-)21.875	6.25	-60
(+/-)37.5	25	-60
(+/-)62.5	25	-65
(+/-)87.5	25	-65
(+/-)150	100	-65
(+/-)250	100	-65
(+/-)350	100	-65
>400 kHz to 12 MHz	30(s)	-80
12 MHz to paired receive band	30(s)	-80
In the paired receive band	30(s)	-100

For a Base transmitter designed to operate with a 25 kHz channel bandwidth, the ACP shall be in accordance with the values in the following table:

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP Relative (dBc)
(+/-)15.625	6.25	-40
(+/-)21.875	6.25	-60
(+/-)37.5	25	-60
(+/-)62.5	25	-65
(+/-)87.5	25	-65
(+/-)150	100	-65
(+/-)250	100	-65
(+/-)350	100	-65
>400 kHz to 12 MHz	30(s)	-80
12 MHz to paired receive band	30(s)	-80
In the paired receive band	30(s)	-100

FCC Rules and Regulations - 90.543(b)

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

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

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

6.2 Test Data

Plot 6-1: Adjacent Channel Power - 768.006250 MHz; C4FM Mode (9.375 kHz - 350 kHz)

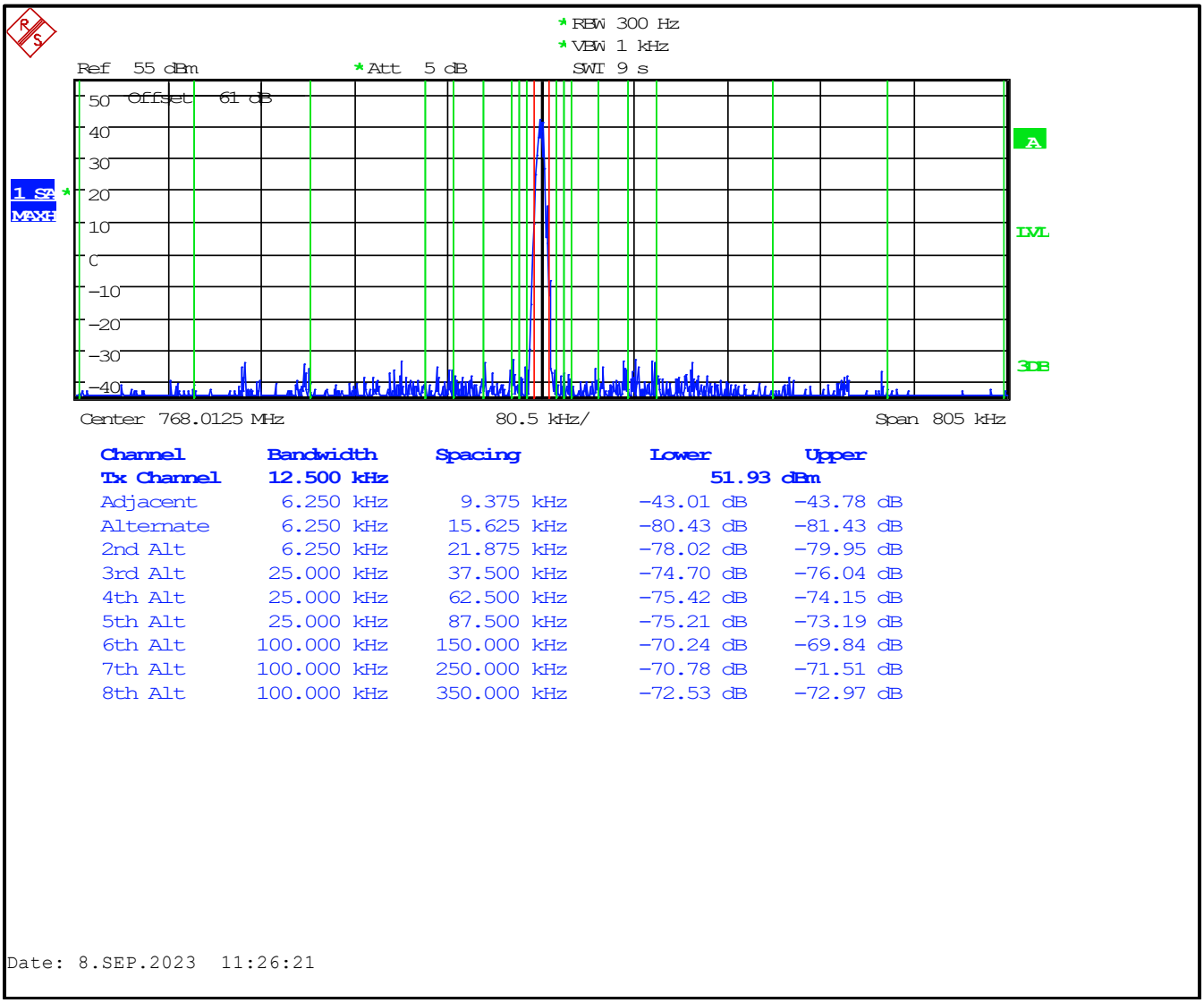


Table 6-1: Adjacent Channel Power - 768.006250 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-83.0
12 MHz to receive band	30(s)	-80	-97.4
In receive band	30(s)	-100	-107.6

Plot 6-2: Adjacent Channel Power – 772.000000 MHz; C4FM Mode (9.375 kHz - 350 kHz)

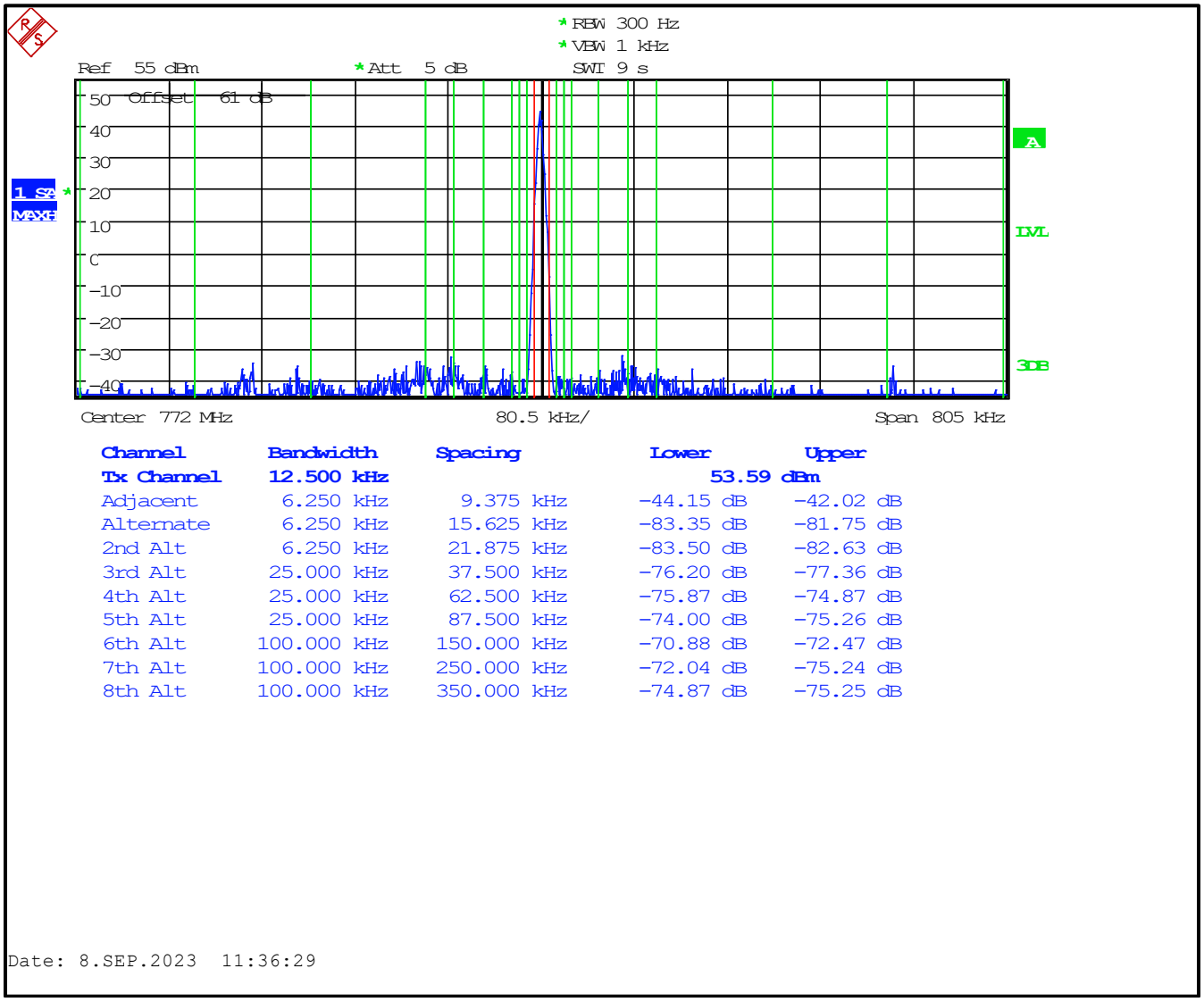


Table 6-2: Adjacent Channel Power – 772.000000 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-83.6
12 MHz to receive band	30(s)	-80	-95.7
In receive band	30(s)	-100	-107.3

Plot 6-3: Adjacent Channel Power – 775.993750 MHz; C4FM Mode (9.375 kHz - 350 kHz)

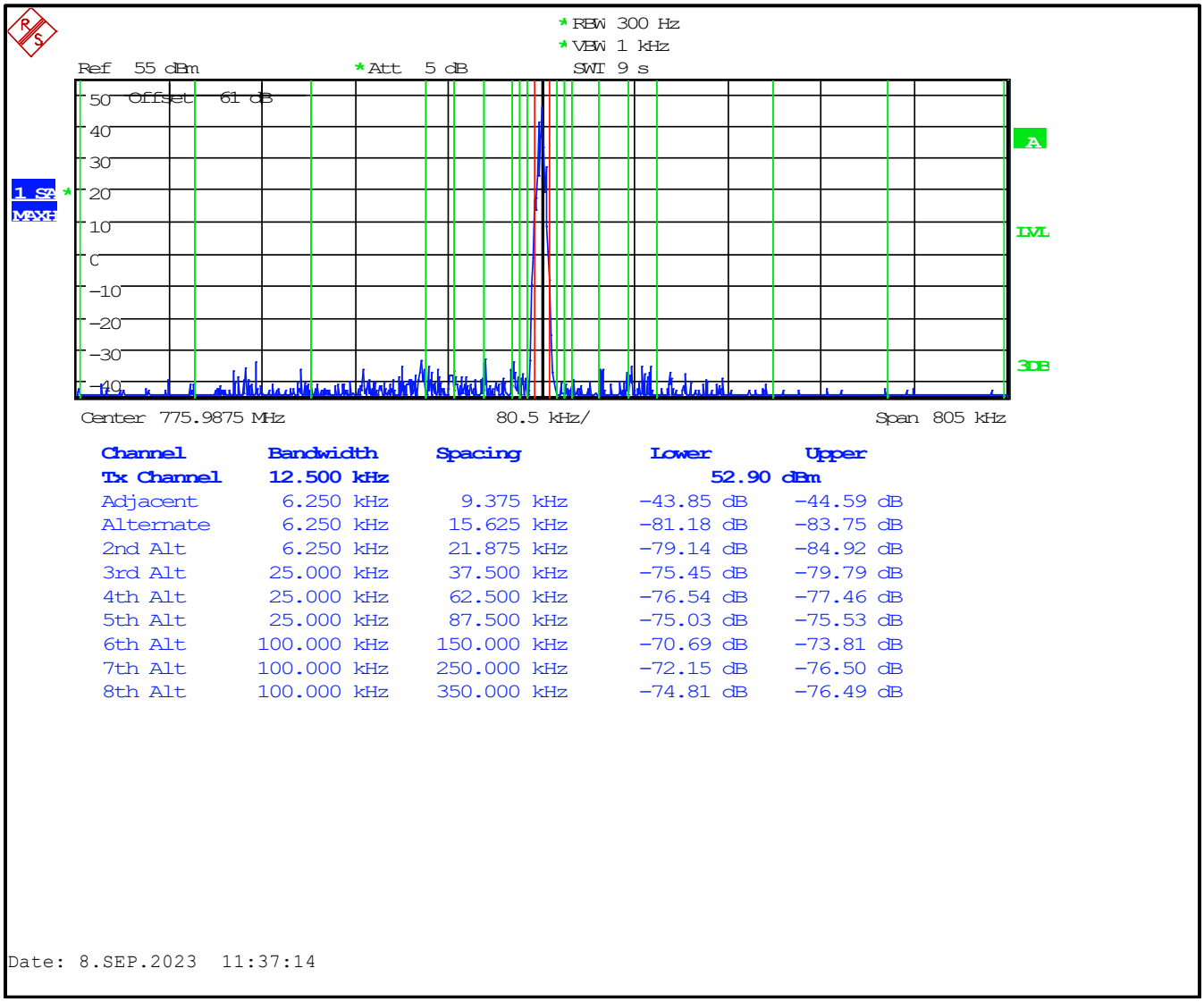
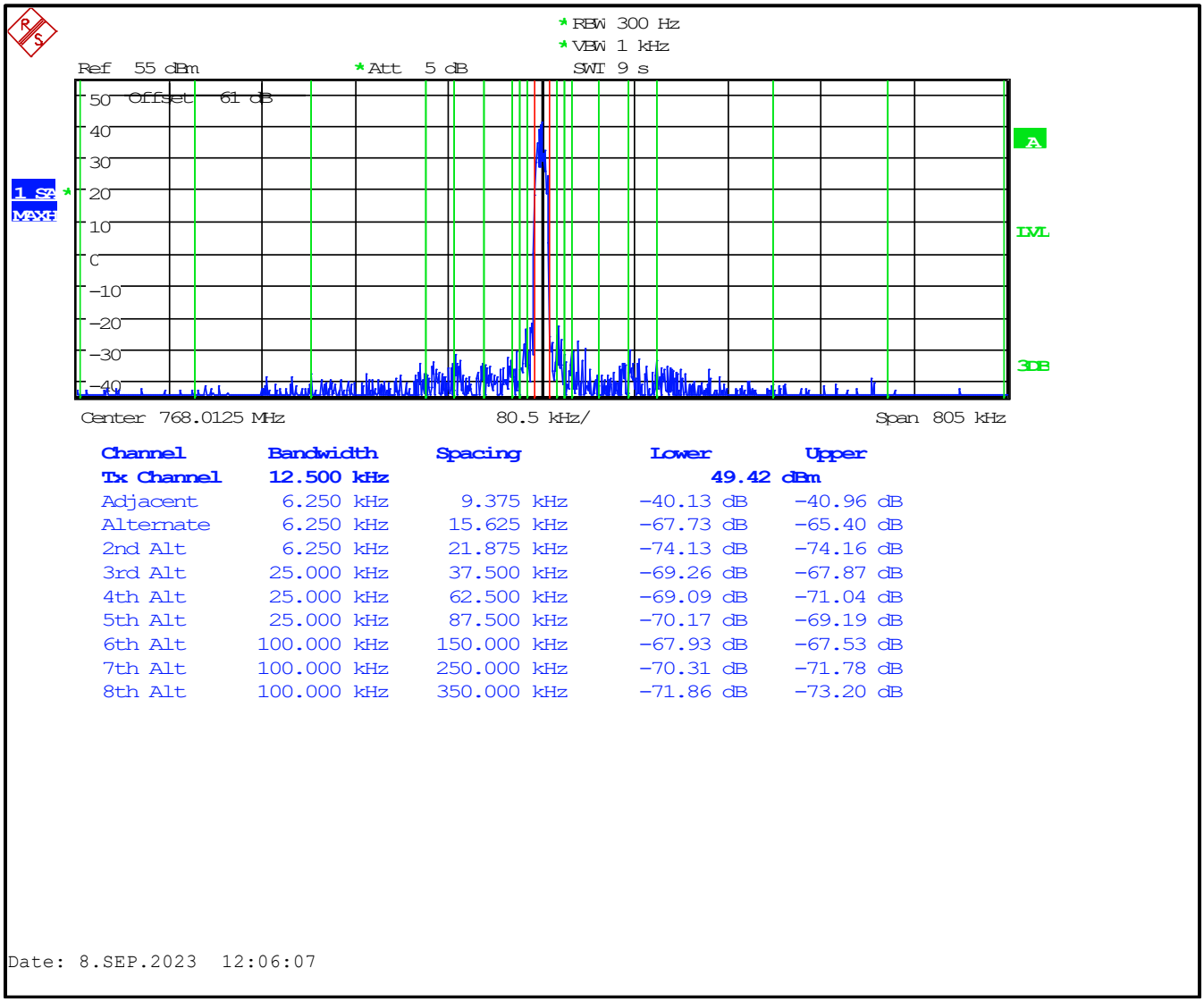


Table 6-3: Adjacent Channel Power – 775.987500 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-93.5
12 MHz to receive band	30(s)	-80	-95.9
In receive band	30(s)	-100	-107.2

Plot 6-4: Adjacent Channel Power - 768.006250 MHz; WCQPSK Mode (9.375 kHz - 350 kHz)



Channel	Bandwidth	Spacing	Lower	Upper
Tx Channel	12.500 kHz		49.42 dBm	
Adjacent	6.250 kHz	9.375 kHz	-40.13 dB	-40.96 dB
Alternate	6.250 kHz	15.625 kHz	-67.73 dB	-65.40 dB
2nd Alt	6.250 kHz	21.875 kHz	-74.13 dB	-74.16 dB
3rd Alt	25.000 kHz	37.500 kHz	-69.26 dB	-67.87 dB
4th Alt	25.000 kHz	62.500 kHz	-69.09 dB	-71.04 dB
5th Alt	25.000 kHz	87.500 kHz	-70.17 dB	-69.19 dB
6th Alt	100.000 kHz	150.000 kHz	-67.93 dB	-67.53 dB
7th Alt	100.000 kHz	250.000 kHz	-70.31 dB	-71.78 dB
8th Alt	100.000 kHz	350.000 kHz	-71.86 dB	-73.20 dB

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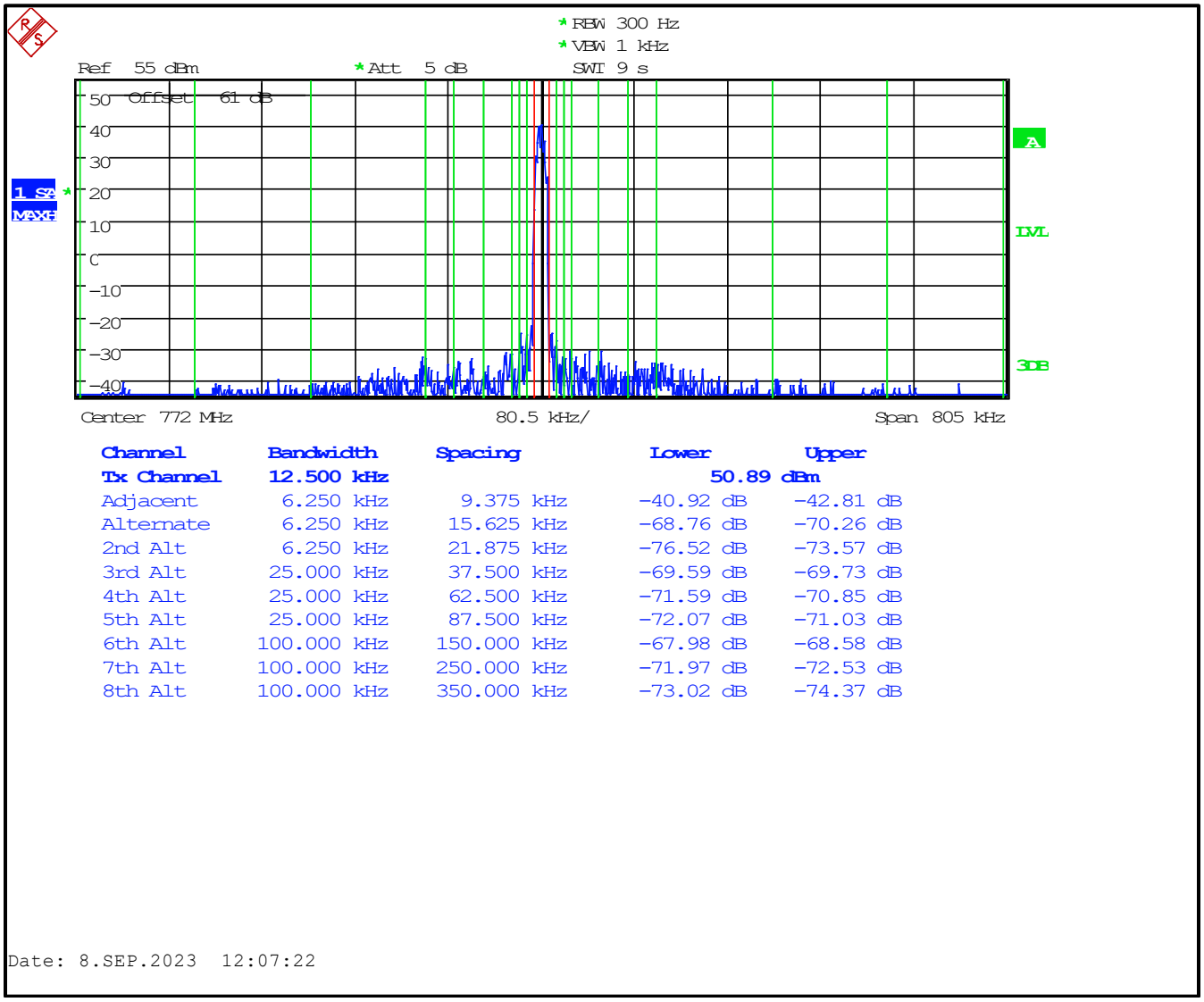
Table 6-4: Adjacent Channel Power - 768.006250 MHz; WCQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-81.9
12 MHz to receive band	30(s)	-80	-96.1
In receive band	30(s)	-100	-107.5

Plot 6-5: Adjacent Channel Power - 772.000000 MHz; WCQPSK Mode (9.375 kHz - 350 kHz)



Channel	Bandwidth	Spacing	Lower	Upper
Tx Channel	12.500 kHz		50.89 dBm	
Adjacent	6.250 kHz	9.375 kHz	-40.92 dB	-42.81 dB
Alternate	6.250 kHz	15.625 kHz	-68.76 dB	-70.26 dB
2nd Alt	6.250 kHz	21.875 kHz	-76.52 dB	-73.57 dB
3rd Alt	25.000 kHz	37.500 kHz	-69.59 dB	-69.73 dB
4th Alt	25.000 kHz	62.500 kHz	-71.59 dB	-70.85 dB
5th Alt	25.000 kHz	87.500 kHz	-72.07 dB	-71.03 dB
6th Alt	100.000 kHz	150.000 kHz	-67.98 dB	-68.58 dB
7th Alt	100.000 kHz	250.000 kHz	-71.97 dB	-72.53 dB
8th Alt	100.000 kHz	350.000 kHz	-73.02 dB	-74.37 dB

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Table 6-5: Adjacent Channel Power - 772.000000 MHz; WCQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-83.4
12 MHz to receive band	30(s)	-80	-96.2
In receive band	30(s)	-100	-107.6

Plot 6-6: Adjacent Channel Power - 775.993750 MHz; WCQPSK Mode (9.375 kHz - 350 kHz)

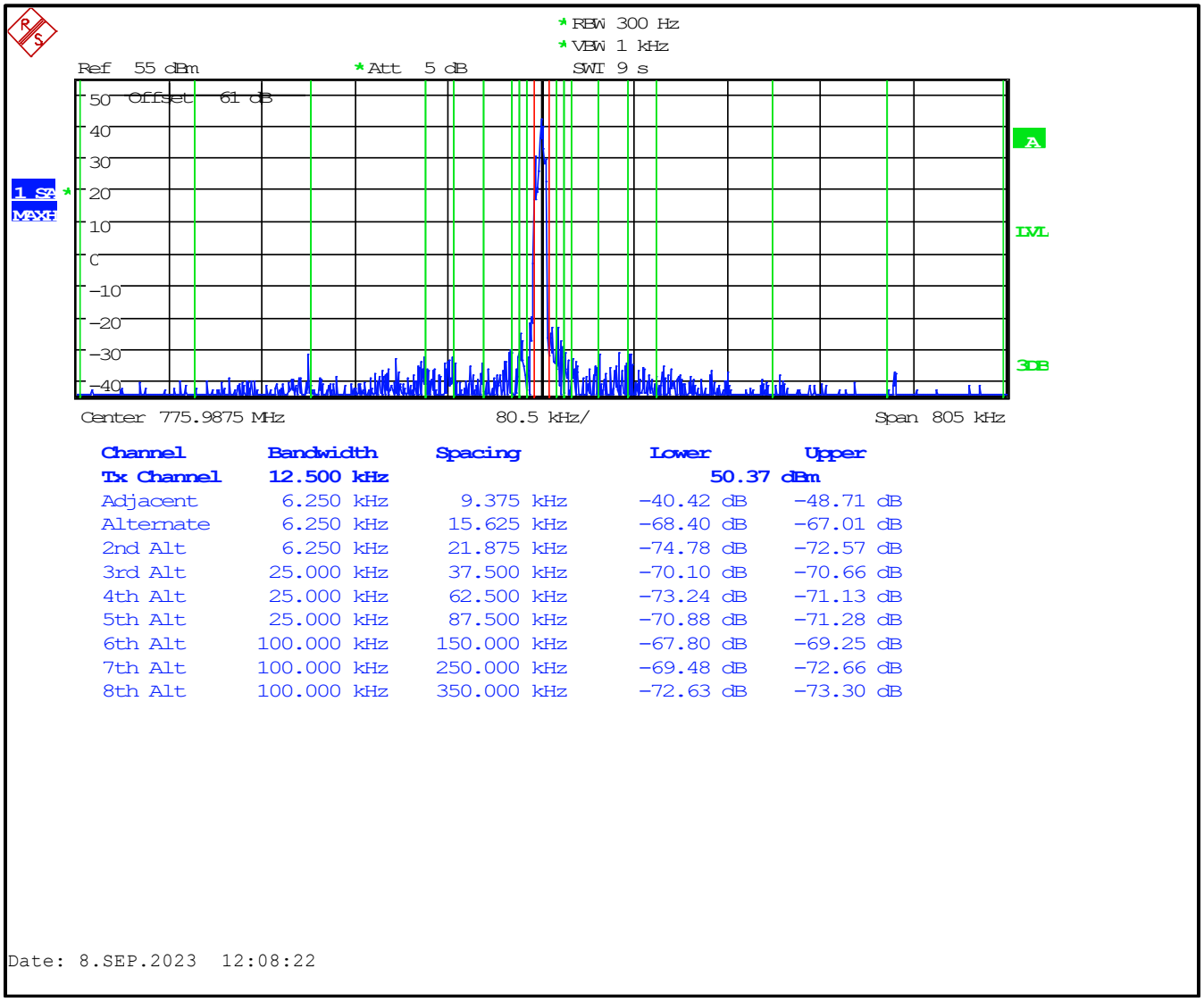


Table 6-6: Adjacent Channel Power - 775.993750 MHz; WCQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-92.5
12 MHz to receive band	30(s)	-80	-96.2
In receive band	30(s)	-100	-107.2

Plot 6-7: Adjacent Channel Power - 768.006250 MHz; HDQPSK Mode (9.375 kHz - 350 kHz)

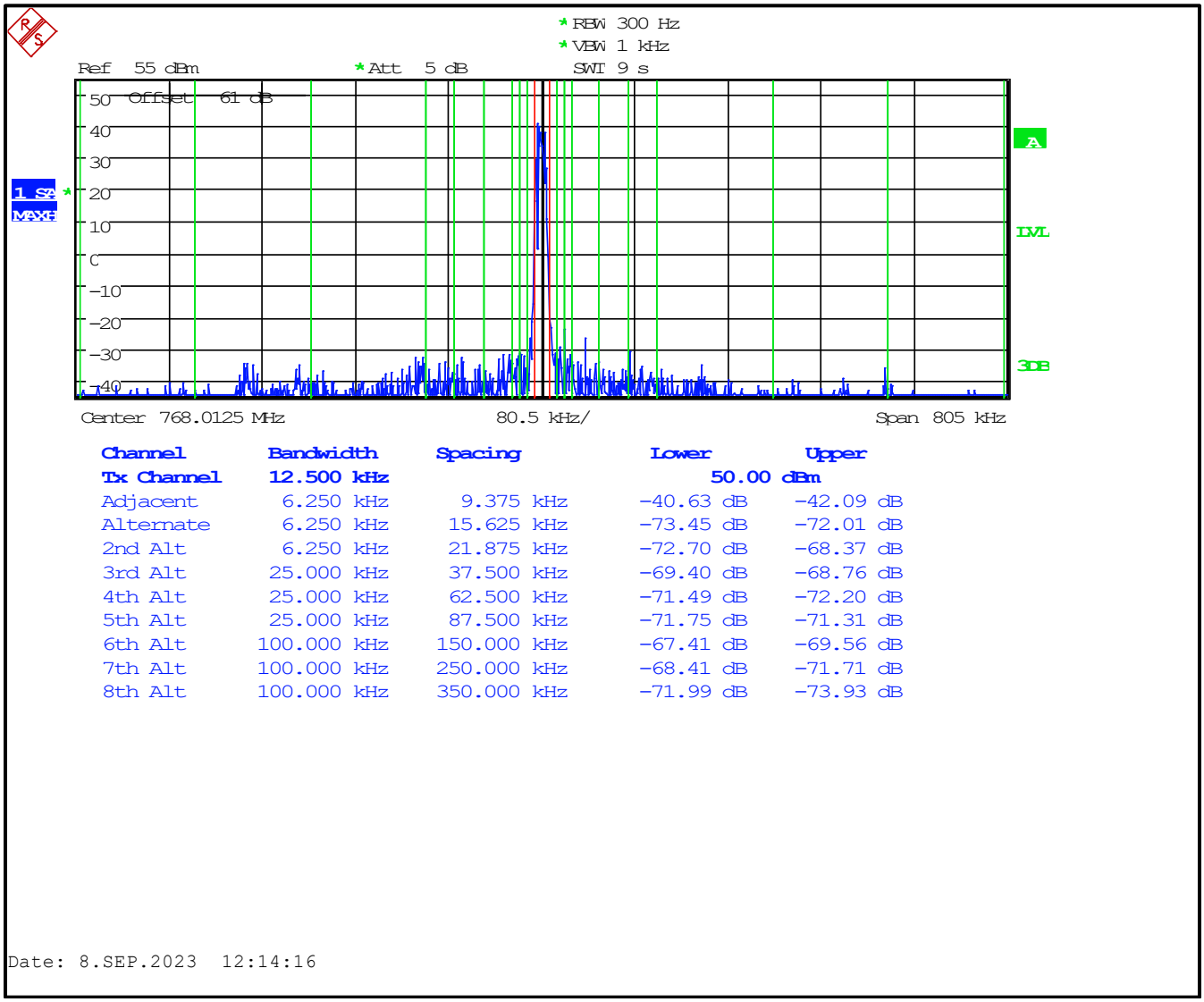


Table 6-7: Adjacent Channel Power - 768.006250 MHz; HDQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-81.8
12 MHz to receive band	30(s)	-80	-95.5
In receive band	30(s)	-100	-107.6

Plot 6-8: Adjacent Channel Power - 772.000000 MHz; HDQPSK Mode (9.375 kHz - 350 kHz)

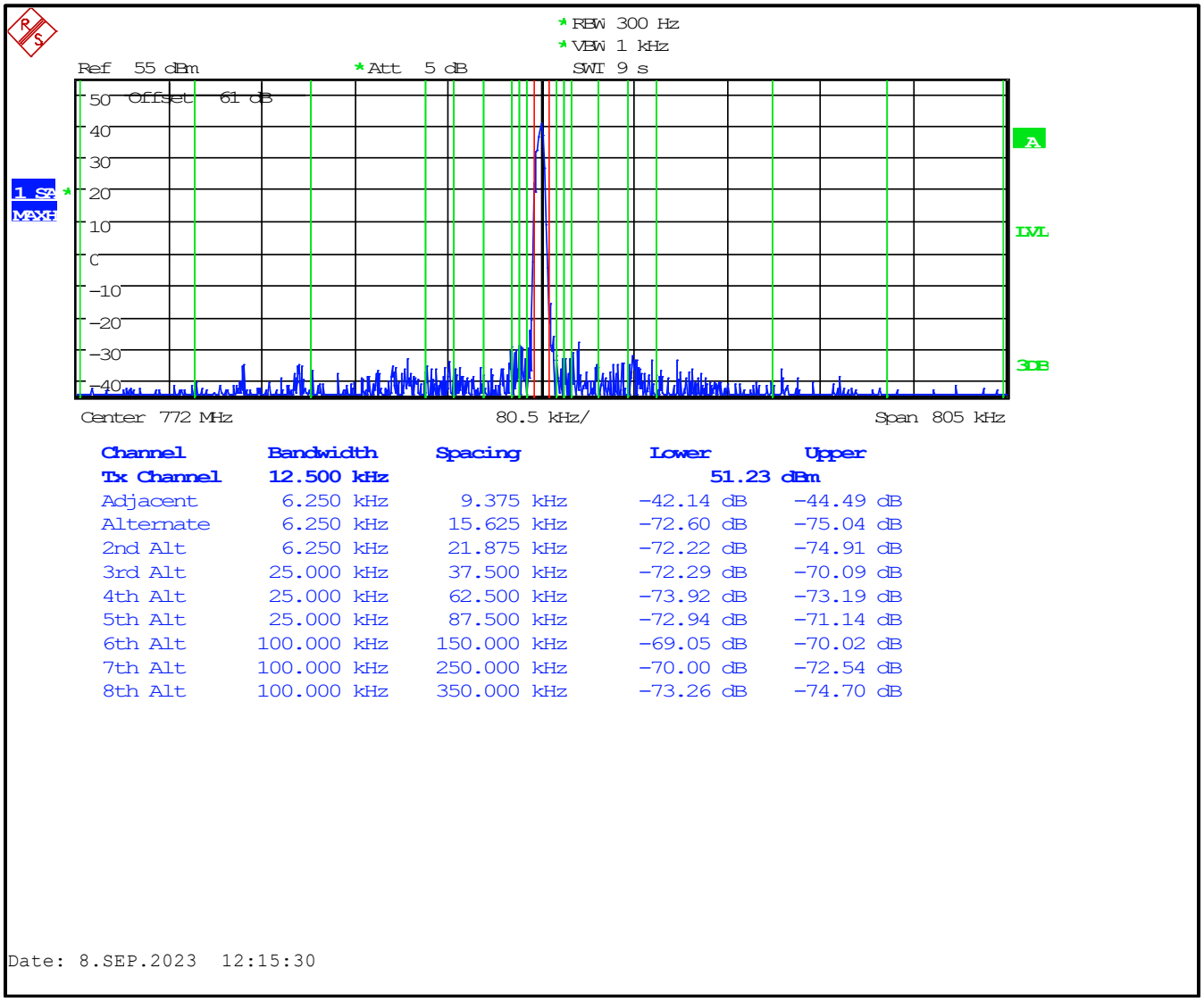


Table 6-8: Adjacent Channel Power - 772.000000 MHz; HDQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-81.5
12 MHz to receive band	30(s)	-80	-96.0
In receive band	30(s)	-100	-106.8

Plot 6-9: Adjacent Channel Power - 775.993750 MHz; HDQPSK Mode (9.375 kHz - 350 kHz)

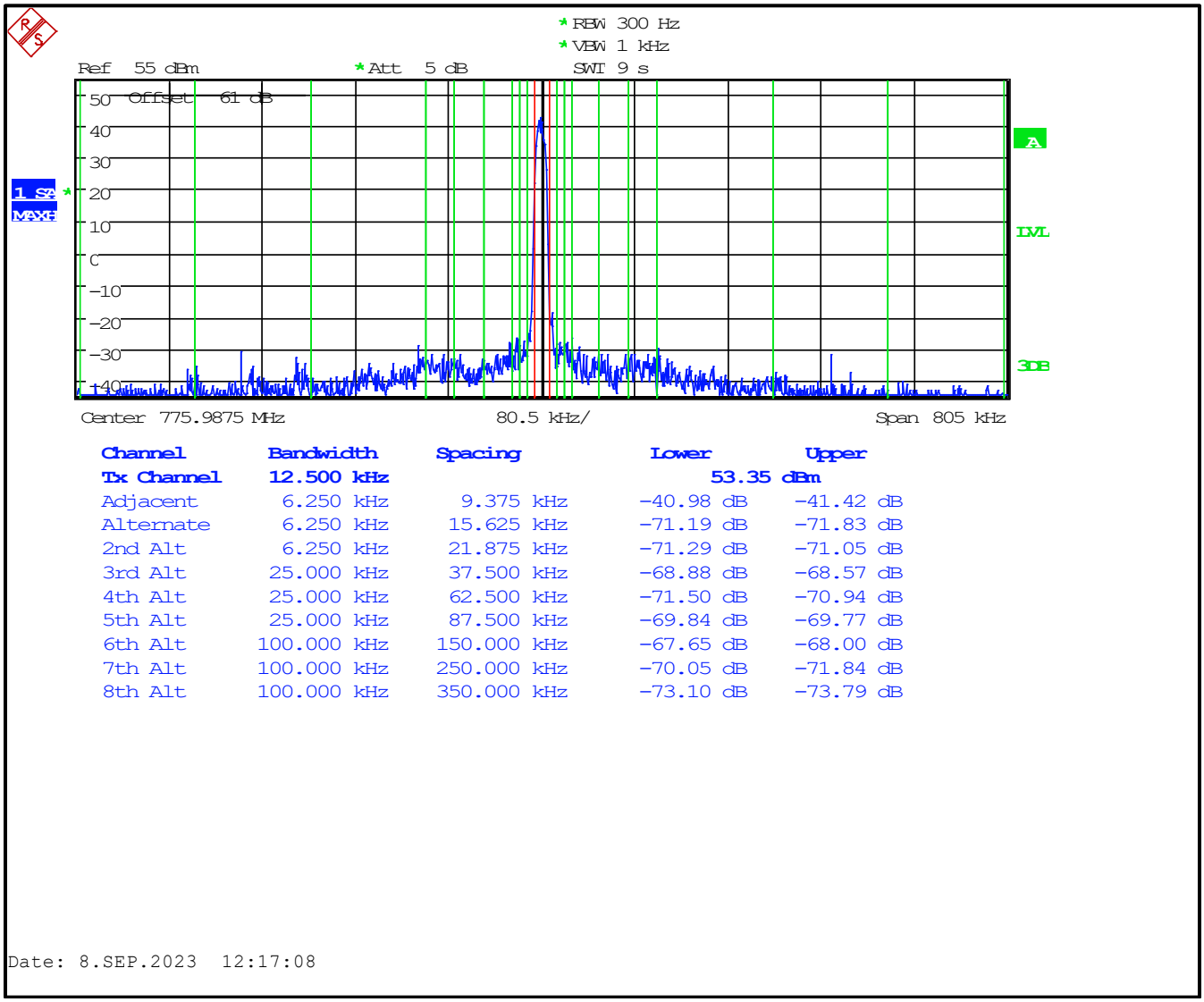
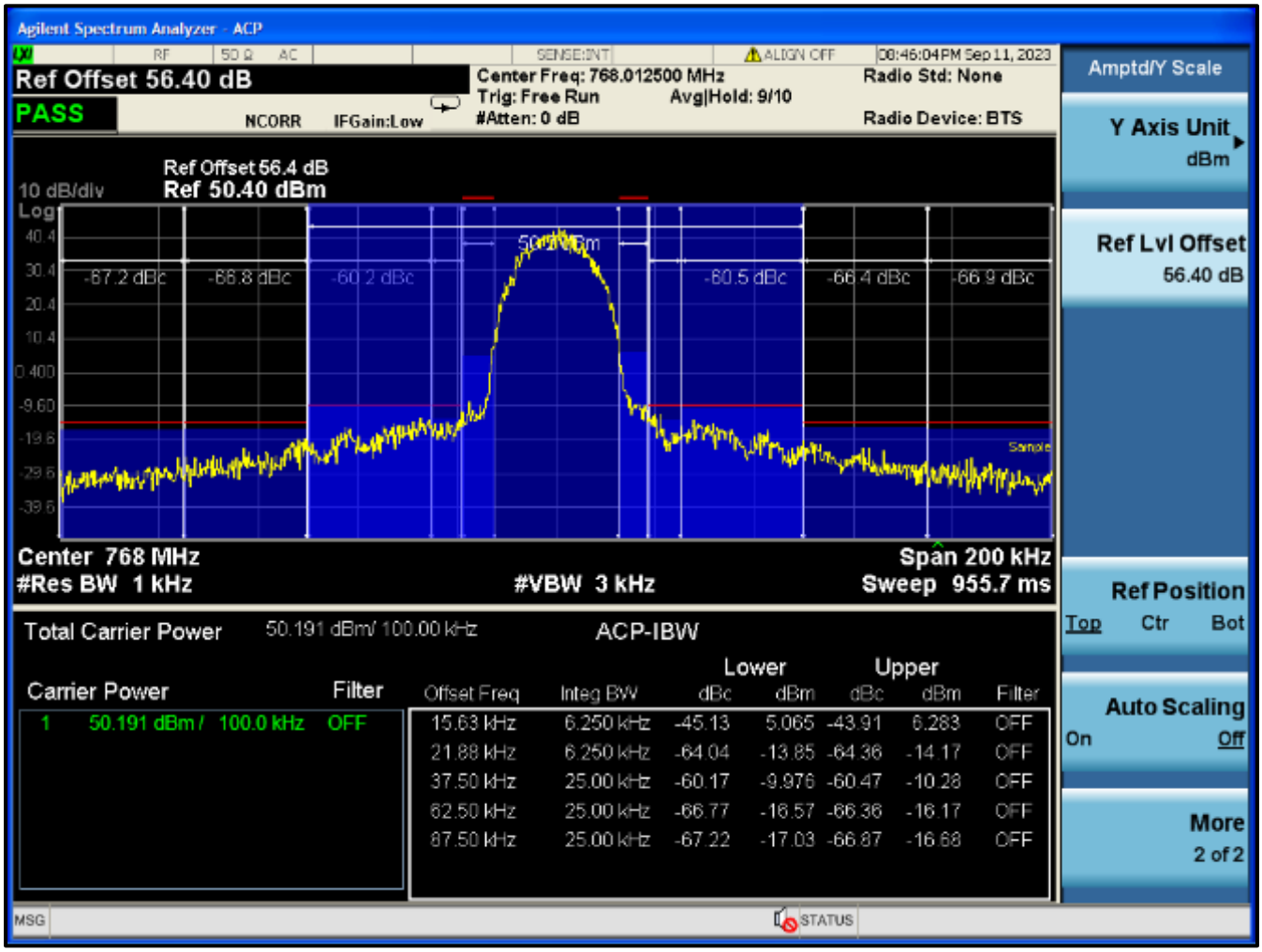


Table 6-9: Adjacent Channel Power - 775.993750 MHz; HDQPSK Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-92.1
12 MHz to receive band	30(s)	-80	-95.6
In receive band	30(s)	-100	-106.9

Plot 6-10: Adjacent Channel Power - 768.01250 MHz; HVD-SMR Mode (15.625 kHz – 87.5 kHz)



Plot 6-11: Adjacent Channel Power - 768.01250 MHz; HVD-SMR Mode (150 kHz – 350 kHz)

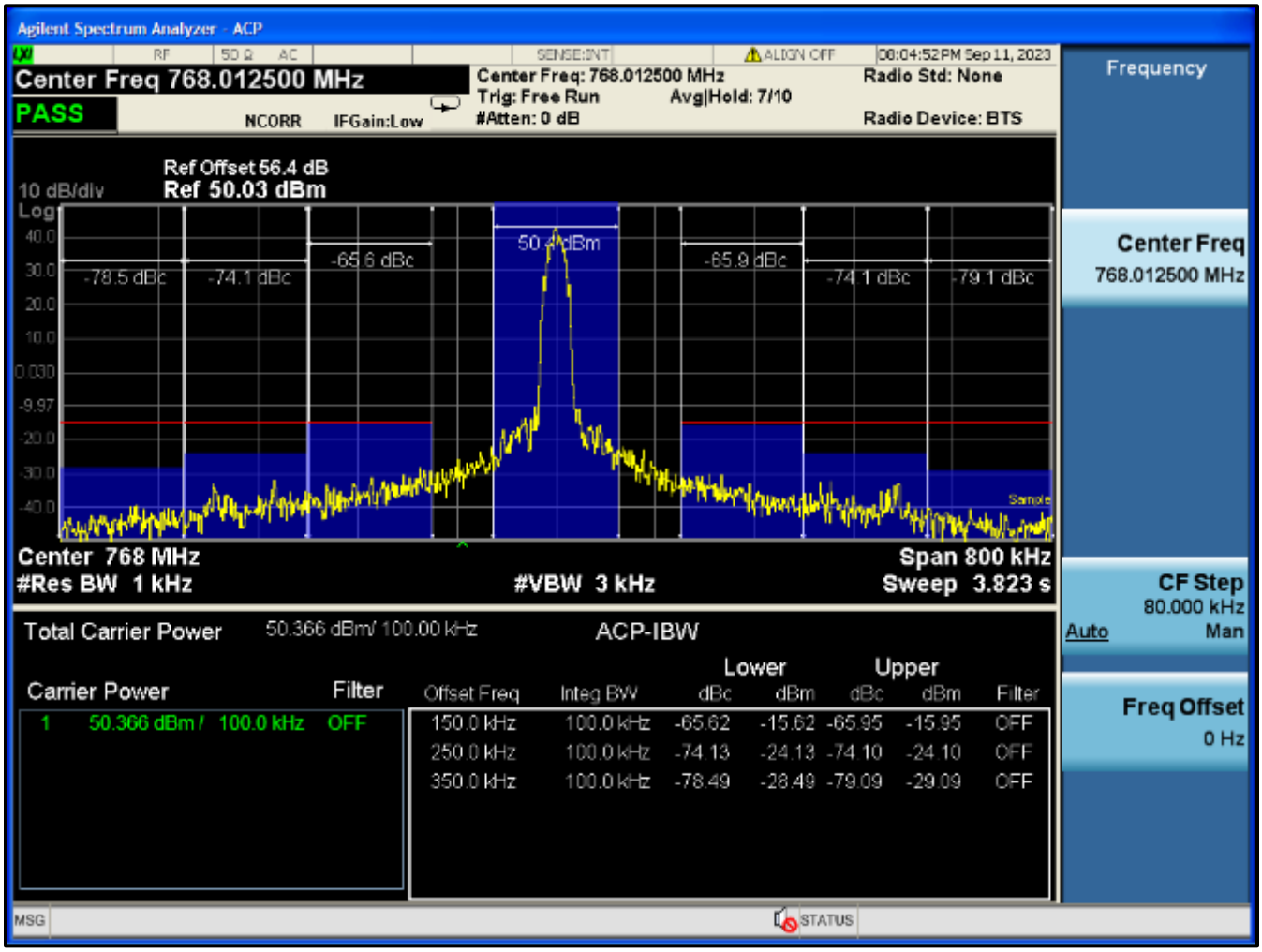
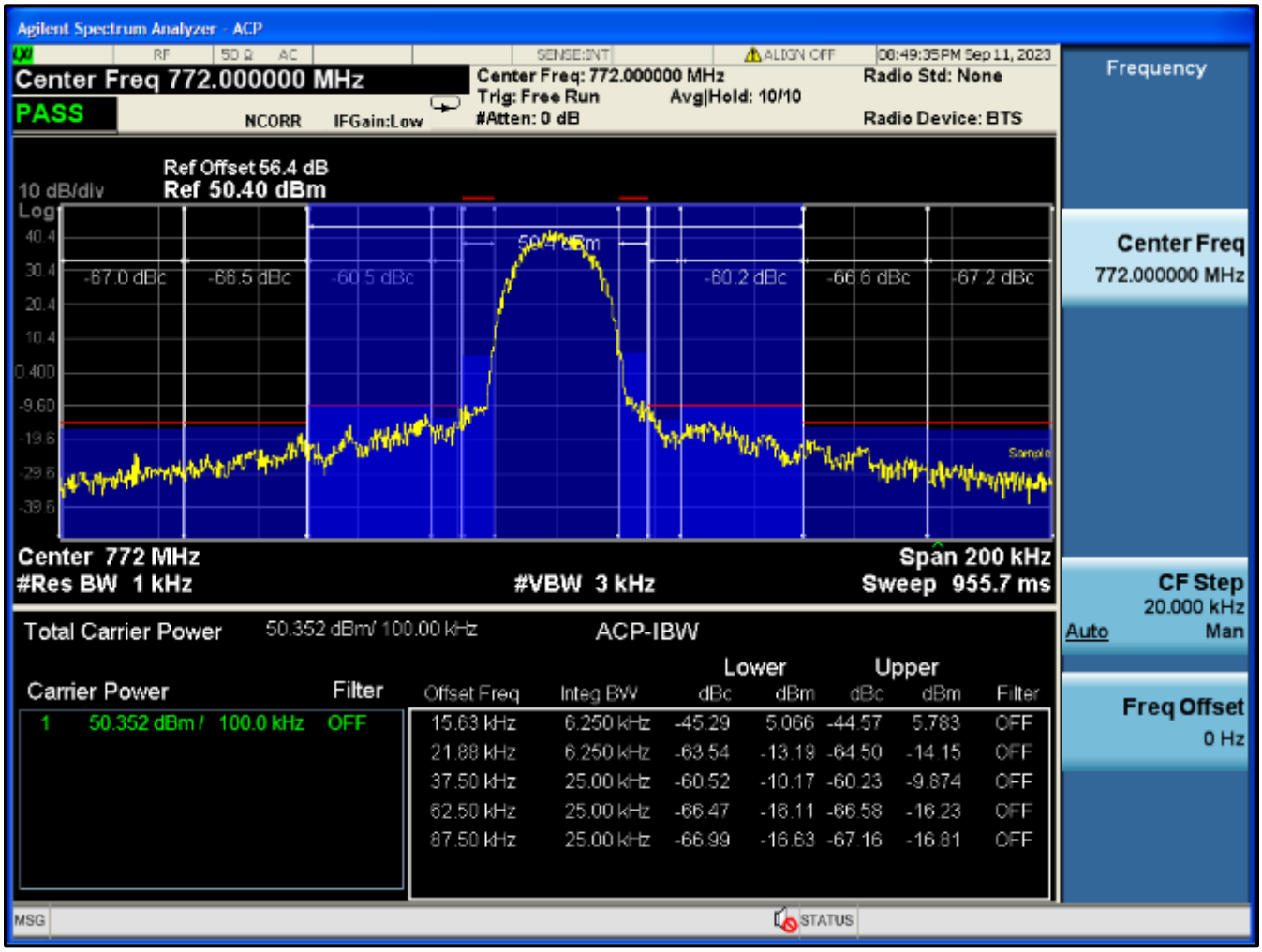


Table 6-10: Adjacent Channel Power - 768.01250 MHz; HVD-SMR Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-84.3
12 MHz to receive band	30(s)	-80	-95.9
In receive band	30(s)	-100	-107.5

Plot 6-12: Adjacent Channel Power - 772.000000 MHz; HVD-SMR Mode (15.625 kHz – 87.5 kHz)



Plot 6-13: Adjacent Channel Power - 772.000000 MHz; HVD-SMR Mode (150 kHz – 350 kHz)

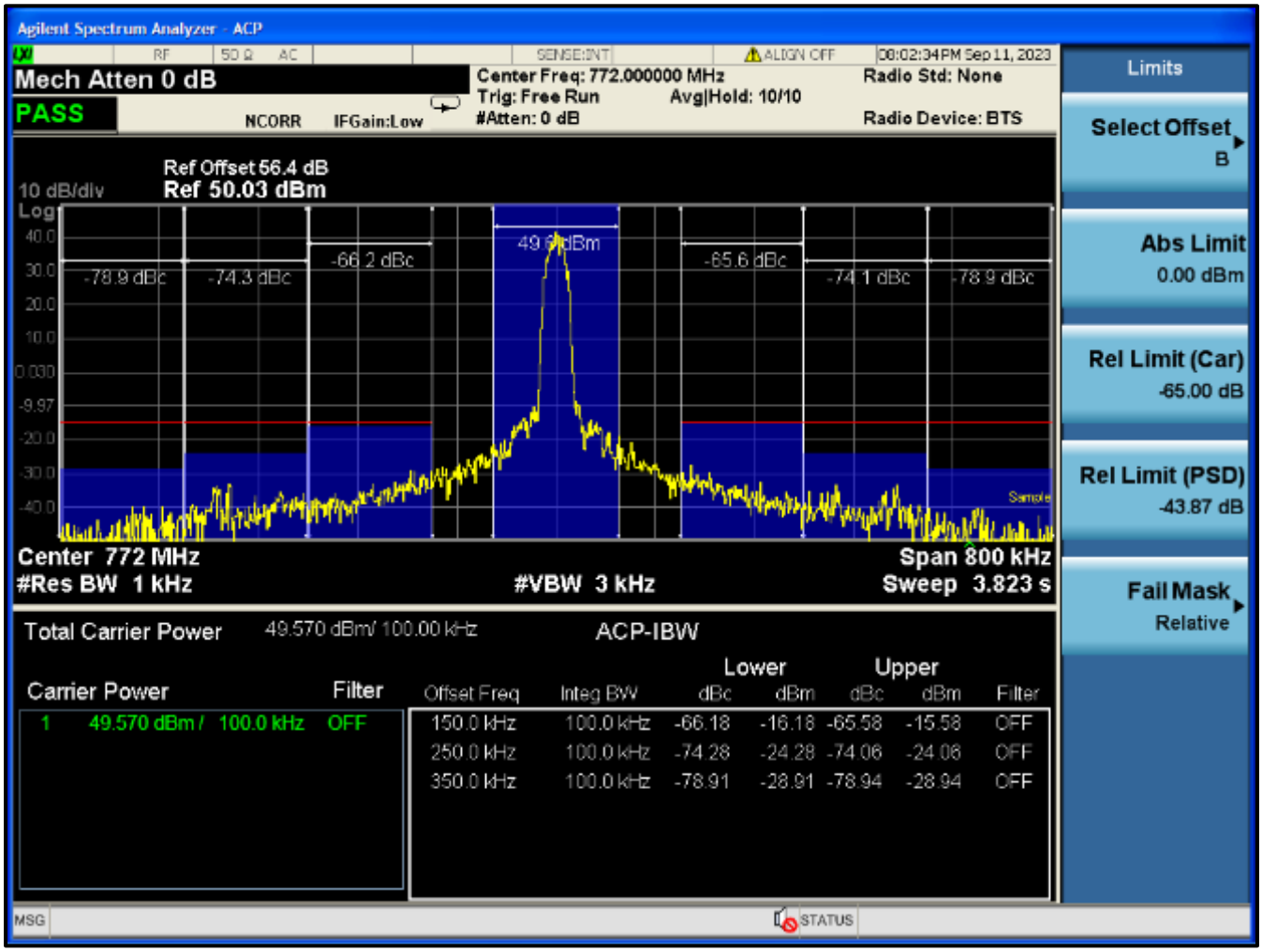
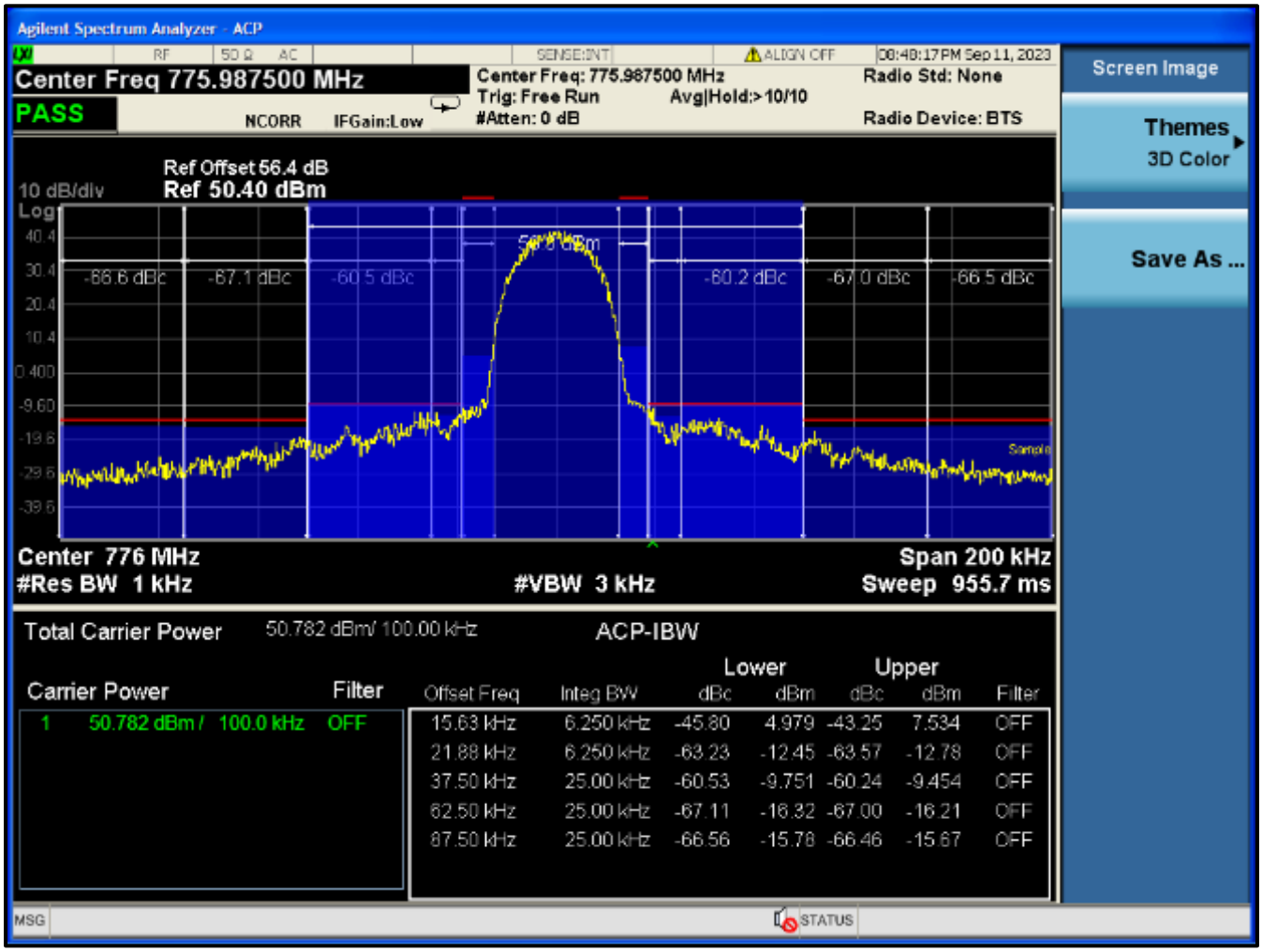


Table 6-11: Adjacent Channel Power - 772.000000 MHz; HVD-SMR Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-81.8
12 MHz to receive band	30(s)	-80	-96.3
In receive band	30(s)	-100	-107.7

Plot 6-14: Adjacent Channel Power - 775.98750 MHz; HVD-SMR Mode (15.625 kHz – 87.5 kHz)



Plot 6-15: Adjacent Channel Power - 775.98750 MHz; HVD-SMR Mode (150 kHz – 350 kHz)

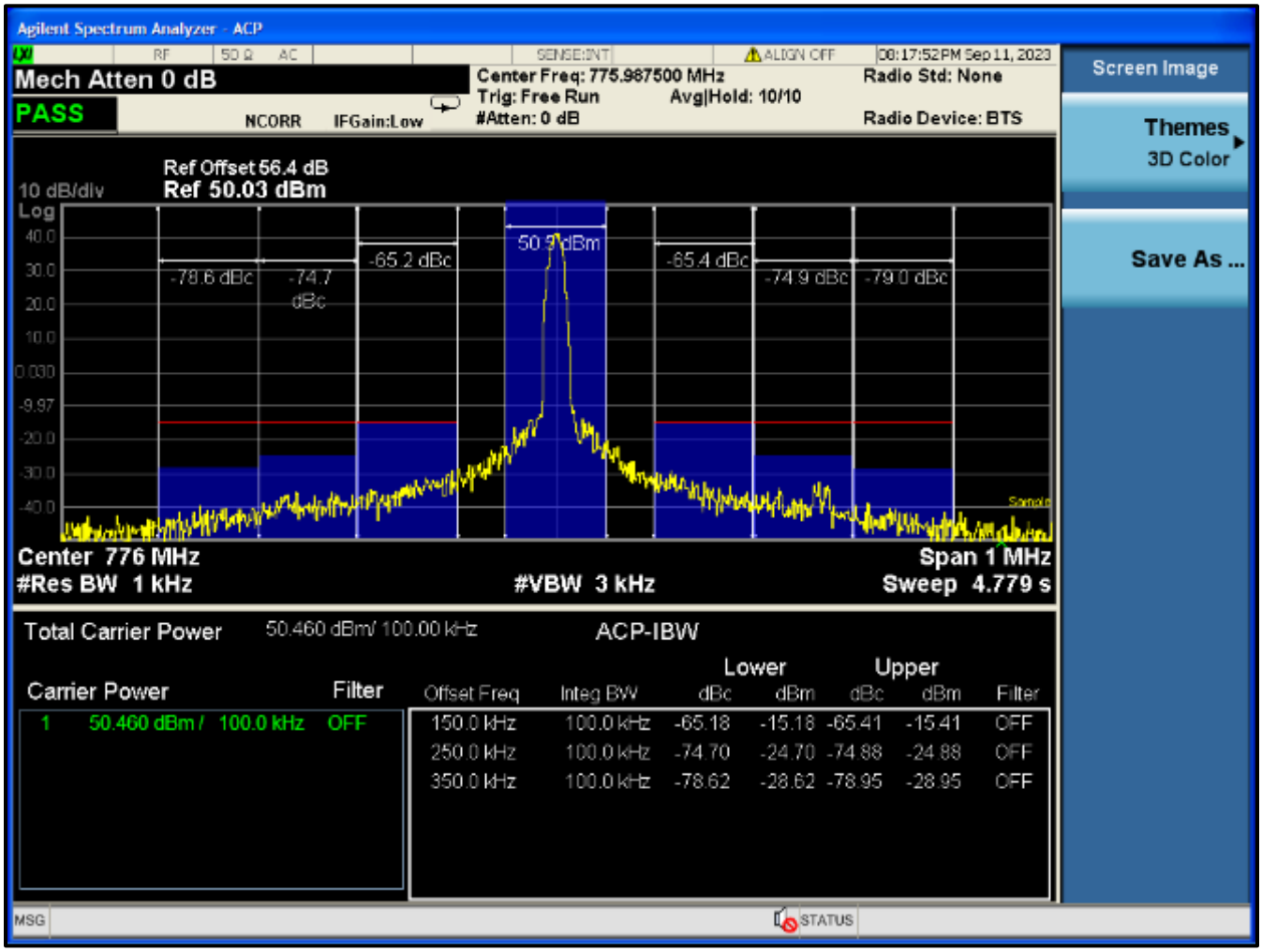


Table 6-12: Adjacent Channel Power - 775.98750 MHz; HVD-SMR Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-91.8
12 MHz to receive band	30(s)	-80	-96.2
In receive band	30(s)	-100	-106.8

Plot 6-16: Adjacent Channel Power - 768.006250 MHz; HVD-NPSPAC Mode (15.625 kHz - 350 kHz)

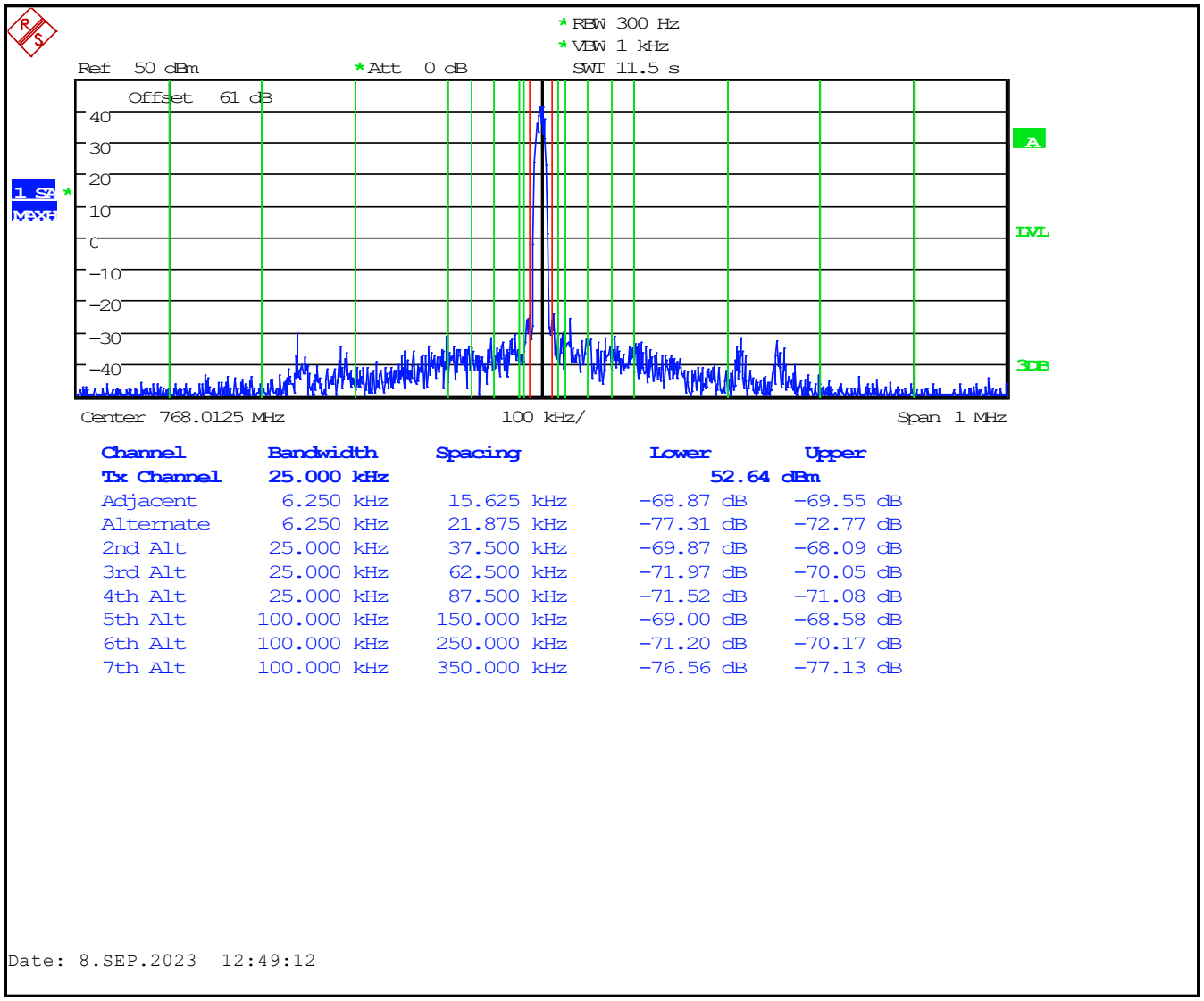


Table 6-13: Adjacent Channel Power - 768.006250 MHz; HVD-NPSPAC Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-83.9
12 MHz to receive band	30(s)	-80	-95.7
In receive band	30(s)	-100	-95.8

Plot 6-17: Adjacent Channel Power - 772.000000 MHz; HVD-NPSPAC Mode (15.625 kHz - 350 kHz)

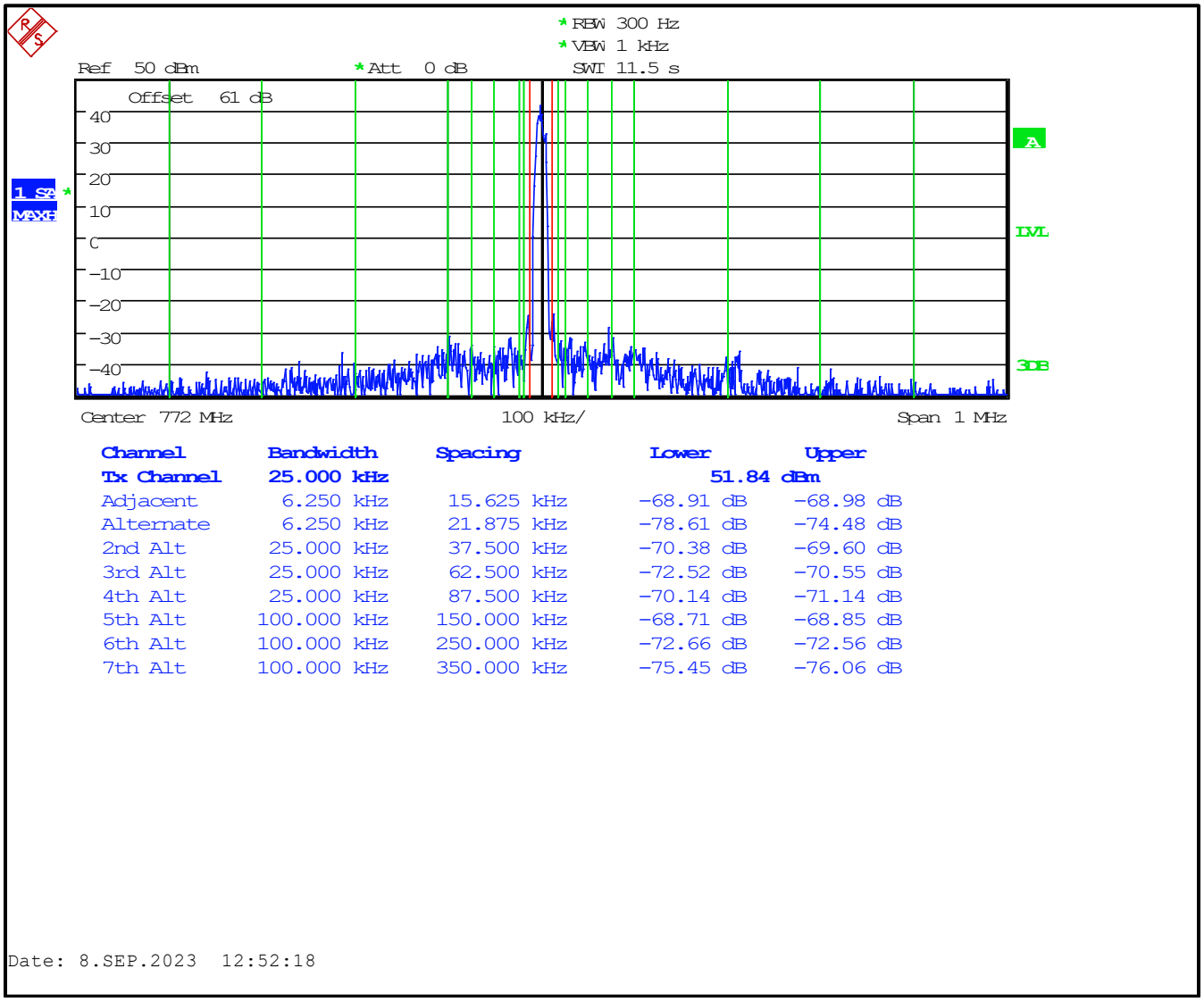


Table 6-14: Adjacent Channel Power - 772.000000 MHz; HVD-NPSPAC Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-82.1
12 MHz to receive band	30(s)	-80	-96.1
In receive band	30(s)	-100	-107.6

Plot 6-18: Adjacent Channel Power - 775.993750 MHz; HVD-NPSPAC Mode (15.625 kHz - 350 kHz)

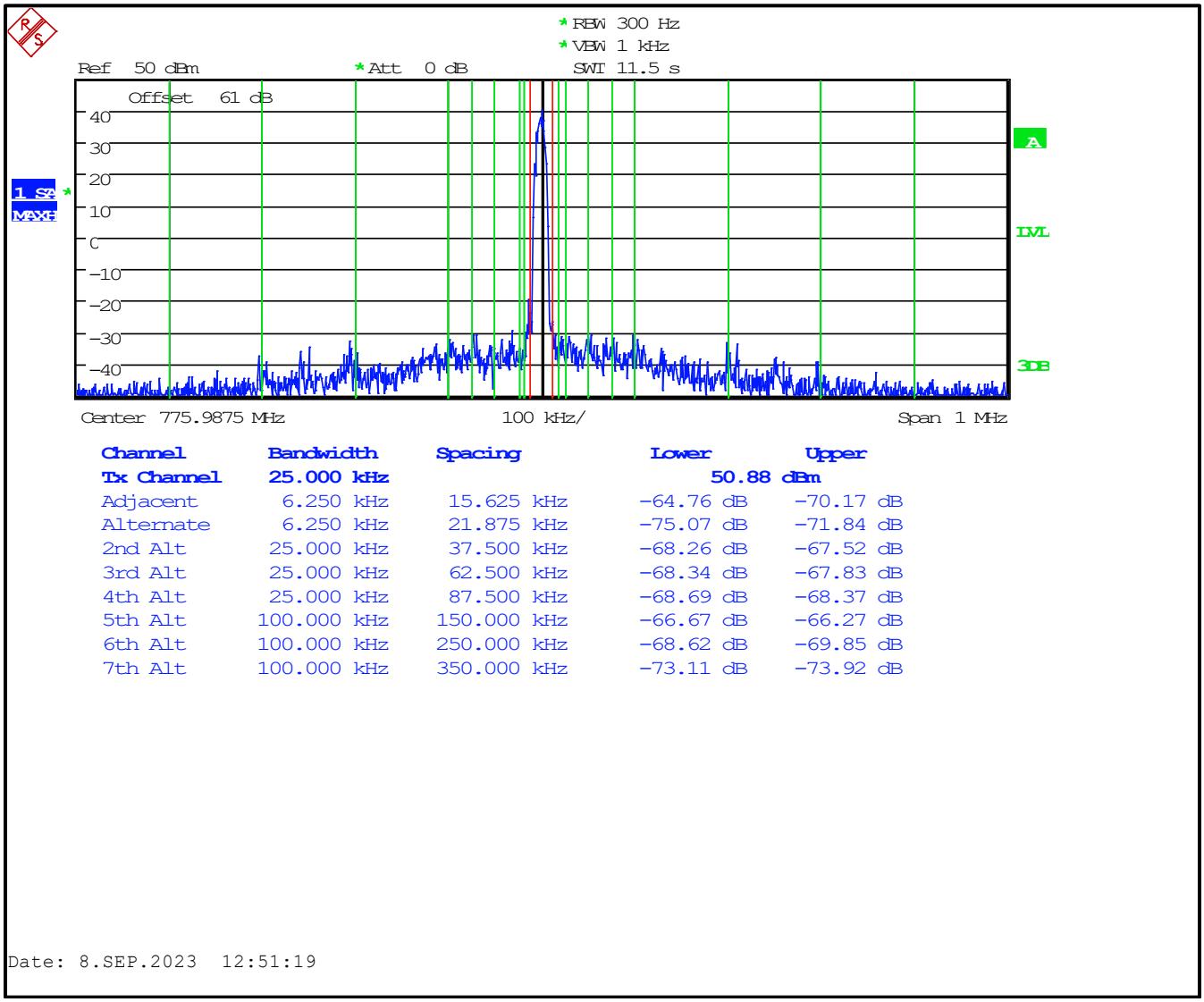


Table 6-15: Adjacent Channel Power - 775.993750 MHz; HVD-NPSPAC Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-93.5
12 MHz to receive band	30(s)	-80	-96.2
In receive band	30(s)	-100	-109.8

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 dB

Results: Pass

Table 6-16: Test Equipment Used for Testing ACP Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
901338	Weinschel	46-40-34	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024
901583	Agilent Technologies	N9010A	EXA Signal Analyzer 10 Hz-26.5 GHz	MY51250846	10/04/2024
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	2/10/24
901339	Weinschel Corp.	47-40-34	Attenuator (DC-18GHz, 40 dB, 25W)	B M4864	11/22/23
901772	Pasternack	PE7087-10	10 dB 2 W 26 GHz Attenuator	1011	11/30/23
901775	Rosenberger	LU7-022-1000	1m SMA Cable	N/A	07/06/24
901774	Rosenberger	LU7-022-1000	1m SMA Cable	N/A	07/06/24

Test Personnel:

Daniel W. Baltzell		September 8-19, 2023
EMC Test Engineer	Signature	Dates of Test

7 FCC Parts 2.1053(a), 90.210, 90.543; and ISED RSS-119 5.8.9.2: Out-of-band Emissions

7.1 Test Procedure

ANSI C63.26 section 5.5 and 6.5.2.7

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: Field Strength of Spurious Radiation – 768.006250 MHz

Conducted Power 50dBm; 100W; Limit=50+10 Log P=70dBc

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)
1536.01250	26.4	-42.4	0.5	6.5	86.4	-16.4
2304.01875	27.9	-50.0	0.5	7.3	93.2	-23.2
3072.02500	23.7	-52.5	0.7	7.2	96.0	-26.0
3840.03125	13.7	-61.0	0.7	7.0	104.8	-34.8
4608.03750	14.3	-56.7	0.8	8.9	98.6	-28.6
5376.04375	27.4	-42.4	0.9	8.5	84.8	-14.8
6144.05000	10.5	-59.0	1.0	9.2	100.8	-30.8
6912.05625	9.3	-59.3	1.1	9.5	100.9	-30.9
7680.06250	1.0	-66.6	1.1	9.2	108.5	-38.5

Table 7-2: Field Strength of Spurious Radiation – 772.000000 MHz

Conducted Power 50dBm; 100W; Limit=50+10 Log P=70dBc

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)
1544.00000	32.1	-38.4	0.5	6.6	82.3	-12.3
2316.00000	30.4	-47.5	0.5	7.3	90.7	-20.7
3088.00000	31.0	-45.2	0.7	7.1	88.8	-18.8
3860.00000	11.1	-63.6	0.7	7.0	107.4	-37.4
4632.00000	11.7	-59.4	0.8	8.9	101.3	-31.3
5404.00000	28.9	-40.7	0.9	8.5	83.1	-13.1
6176.00000	7.0	-62.3	1.0	9.1	104.2	-34.2
6948.00000	6.0	-62.7	1.1	9.5	104.3	-34.3
7720.00000	1.8	-65.9	1.1	9.3	107.8	-37.8

Table 7-3: Field Strength of Spurious Radiation – 775.993750 MHz

Conducted Power 50dBm; 100W; Limit=50+10 Log P=70dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1551.98750	28.6	-40.9	0.5	6.6	121.4	-51.4
2327.98125	29.5	-48.3	0.5	7.3	84.8	-14.8
3103.97500	31.0	-45.2	0.7	7.1	91.5	-21.5
3879.96875	8.8	-65.9	0.7	7.0	88.8	-18.8
4655.96250	9.8	-61.2	0.8	8.9	109.7	-39.7
5431.95625	25.5	-44.1	0.9	8.5	103.1	-33.1
6207.95000	4.8	-64.6	1.0	9.1	86.5	-16.5
6983.94375	11.0	-57.6	1.1	9.5	106.5	-36.5
7759.93750	3.4	-64.2	1.1	9.3	99.1	-29.1

Table 7-4: EIRP levels in the RNSS band (1.559 GHz to 1.610 GHz); Fundamental 768.00625 MHz

Frequency (MHz)	Measured (dBW/MHz)	Limit (dBW/MHz)	Margin (dB)	Modulation Type	Pass/Fail
1606.777	-84.0	-70.0	-14.0	C4FM	Pass
1601.350	-84.0	-70.0	-14.0	WCQPSK	Pass
1595.271	-85.0	-70.0	-15.0	HDQPSK	Pass
1607.796	-82.7	-70.0	-12.7	HVD SMR	Pass
1566.548	-84.0	-70.0	-14.0	HVD NPSPAC	Pass

Table 7-5: EIRP levels in the RNSS band (1.559 GHz to 1.610 GHz); Fundamental 772.00000 MHz

Frequency (MHz)	Measured (dBW/MHz)	Limit (dBW/MHz)	Margin (dB)	Modulation Type	Pass/Fail
1583.847	-82.0	-70.0	-12.0	C4FM	Pass
1596.413	-85.8	-70.0	-15.8	WCQPSK	Pass
1592.333	-84.1	-70.0	-14.1	HDQPSK	Pass
1595.924	-84.2	-70.0	-14.2	HVD SMR	Pass
1559.163	-83.2	-70.0	-13.2	HVD NPSPAC	Pass

Table 7-6: EIRP levels in the RNSS band (1.559 GHz to 1.610 GHz); Fundamental 775.99375 MHz

Frequency (MHz)	Measured (dBW/MHz)	Limit (dBW/MHz)	Margin (dB)	Modulation Type	Pass/Fail
1594.700	-83.6	-70.0	-13.6	C4FM	Pass
1560.061	-82.6	-70.0	-12.6	WCQPSK	Pass
1598.943	-79.6	-70.0	-9.6	HDQPSK	Pass
1580.053	-86.5	-70.0	-16.5	HVD SMR	Pass
1565.720	-85.2	-70.0	-15.2	HVD NPSPAC	Pass

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 7-7: 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
901729	Insulated Wire Inc.	KPS-1503-3150-KPR	SMK RF Cables 20'	NA	12/29/2023
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	11/28/2023
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	11/30/2023
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
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	08/05/2024
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	08/05/2024
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	05/23/2024

Test Personnel:

Daniel W. Baltzell		September 11, 2023
Test Engineer	Signature	Date of Tests

8 FCC Part 2.1049: Occupied Bandwidth; ISED RSS-119 5.5: Channel Bandwidth, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

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.

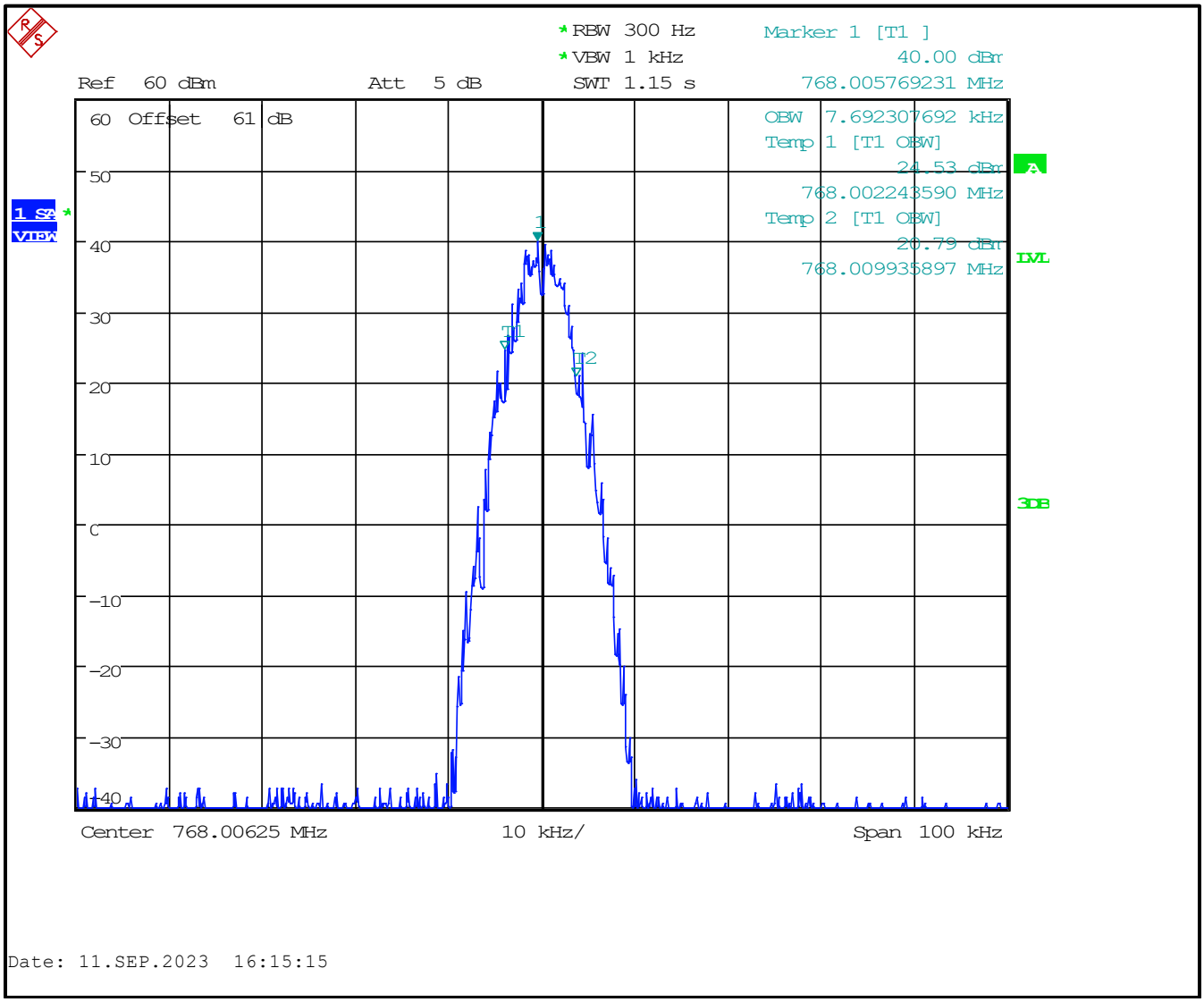
Applicable ISED Emission Masks					
Frequency Band (MHz)	**Related SRSP for Channeling Plan and ERP**	**Channel Bandwidth (kHz)**	**Authorized Bandwidth (kHz)**	**Spectrum Masks for Equipment With Audio Filter**	**Spectrum Masks for Equipment Without Audio Filter**
768-776 798-806	SRSP-511	6.25 12.5 25 50	(Note 2)	See Section 5.8.9	See Section 5.8.9

Table 8-1: 99% Occupied Bandwidth

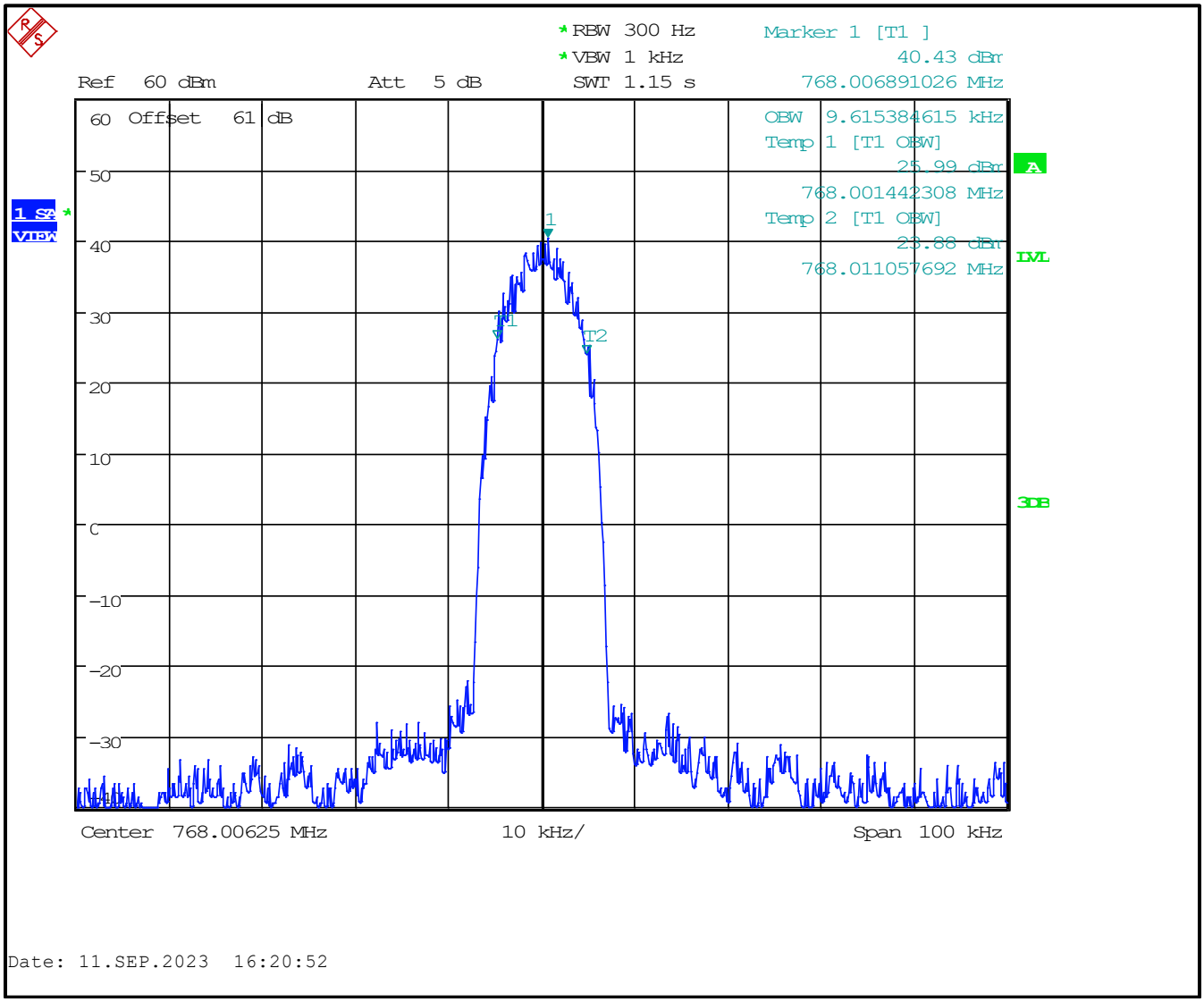
Frequency (MHz)	C4FM (kHz)	WCQPSK (kHz)	HDQPSK (kHz)	HVD-SMR (kHz)	HVD-NPSPAC (kHz)
768.006250	7.69	9.62	9.62	18.75	12.34
772.000000	7.69	9.62	9.62	18.75	12.50
775.993750	7.69	9.62	9.78	18.75	12.34

8.2 Test Data

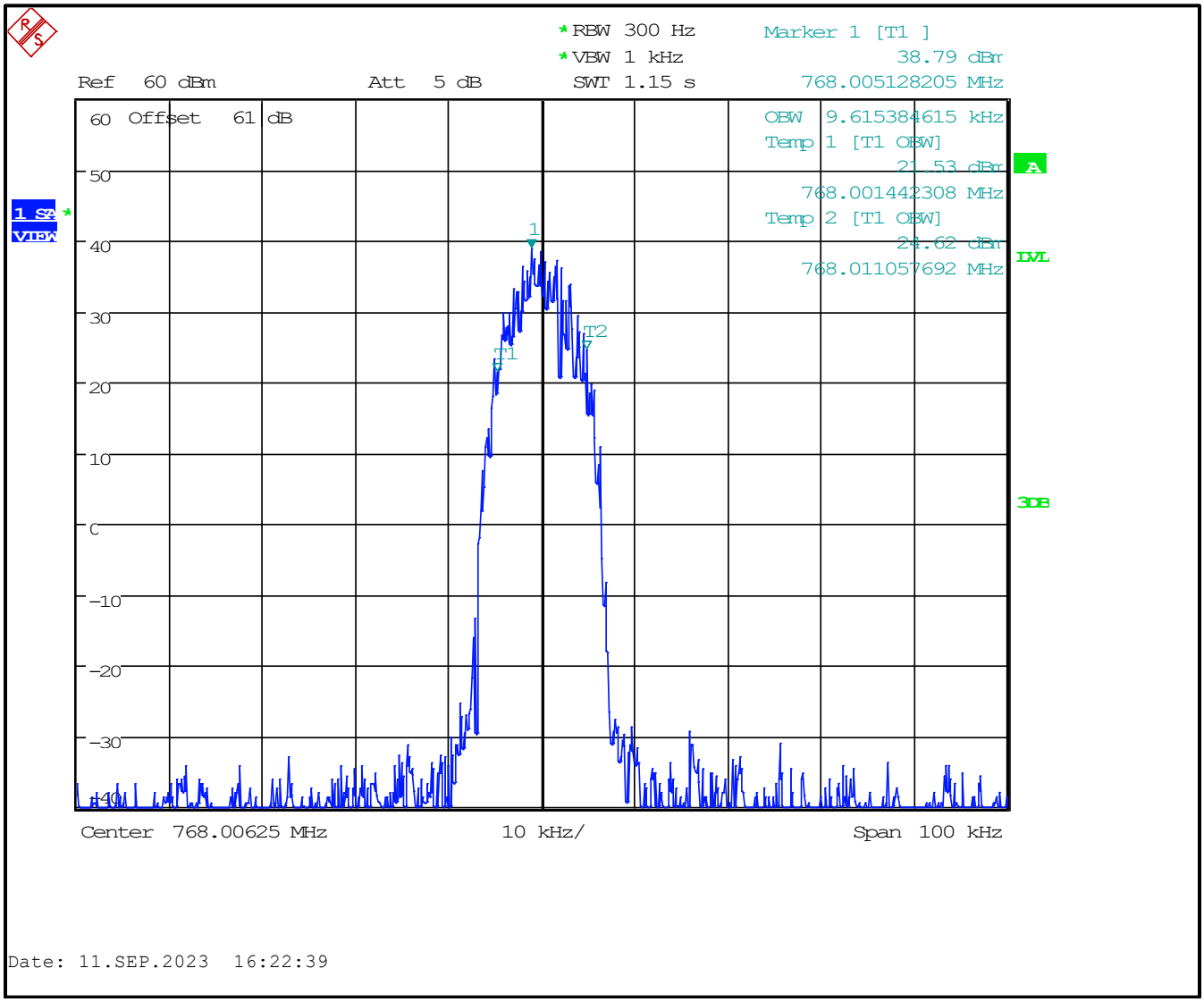
Plot 8-1: 99% BW, 768.006250 MHz, C4FM



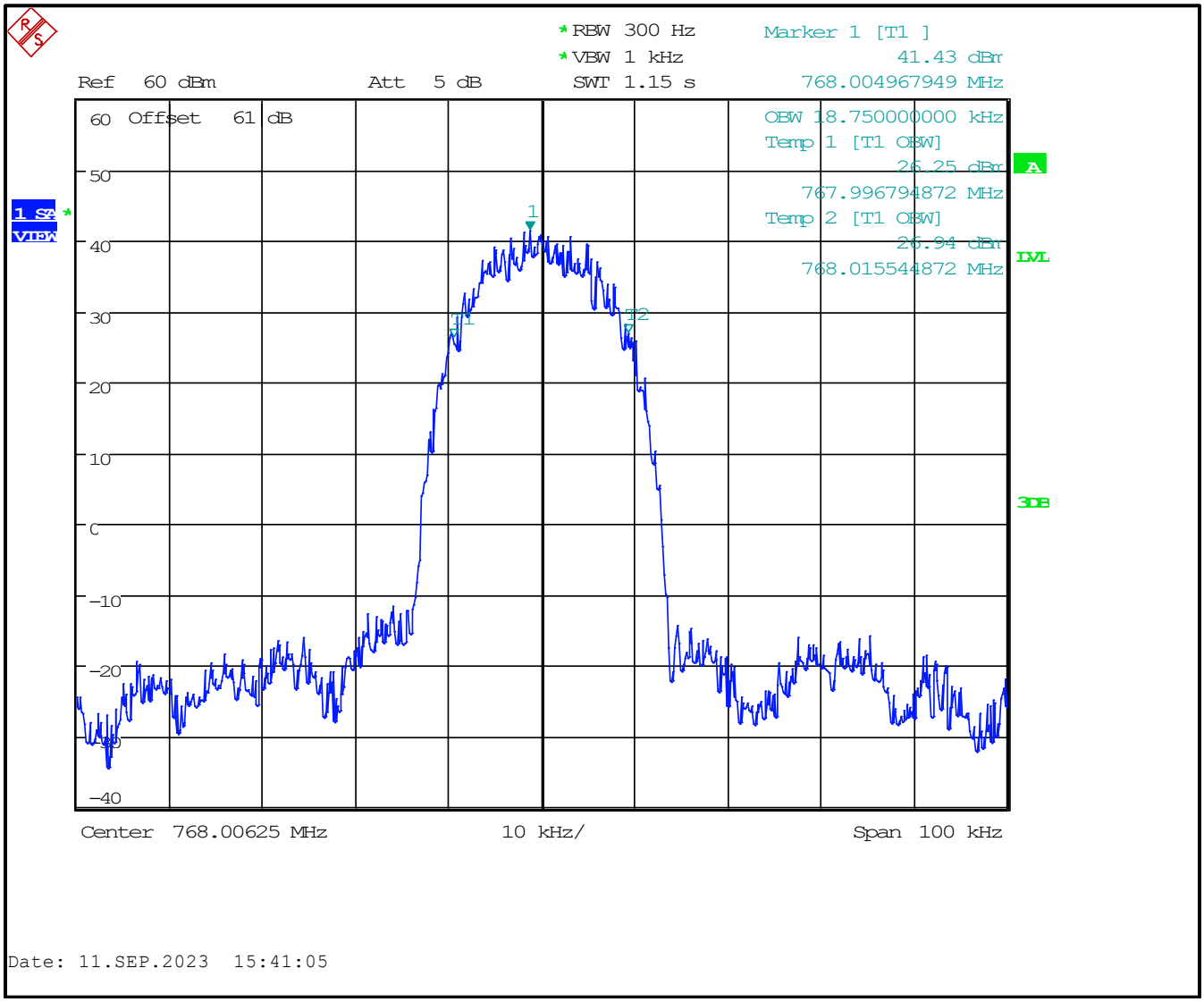
Plot 8-2: 99% BW, 768.00625 MHz, WCQPSK



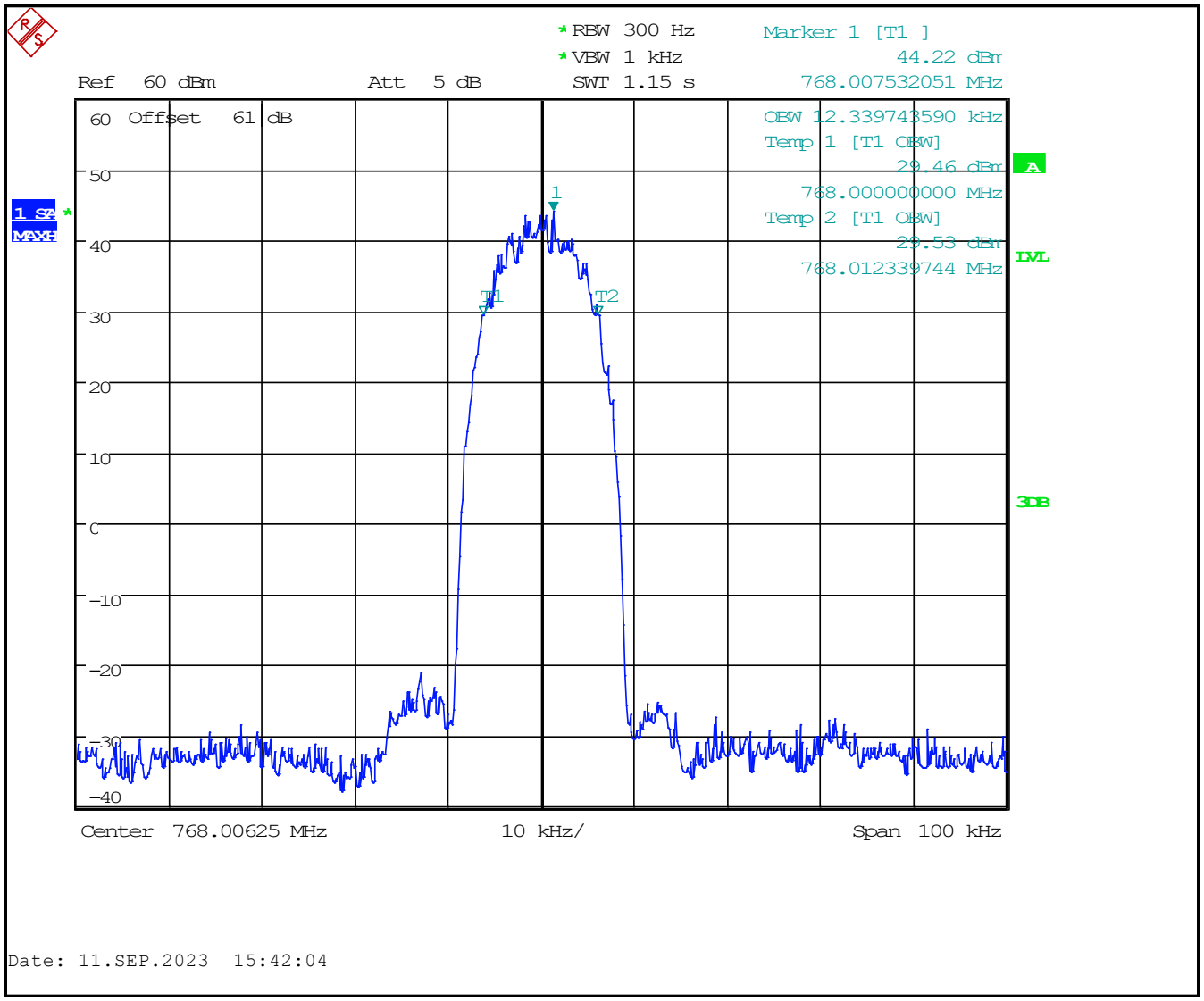
Plot 8-3: 99% BW, 768.00625 MHz, HDQPSK



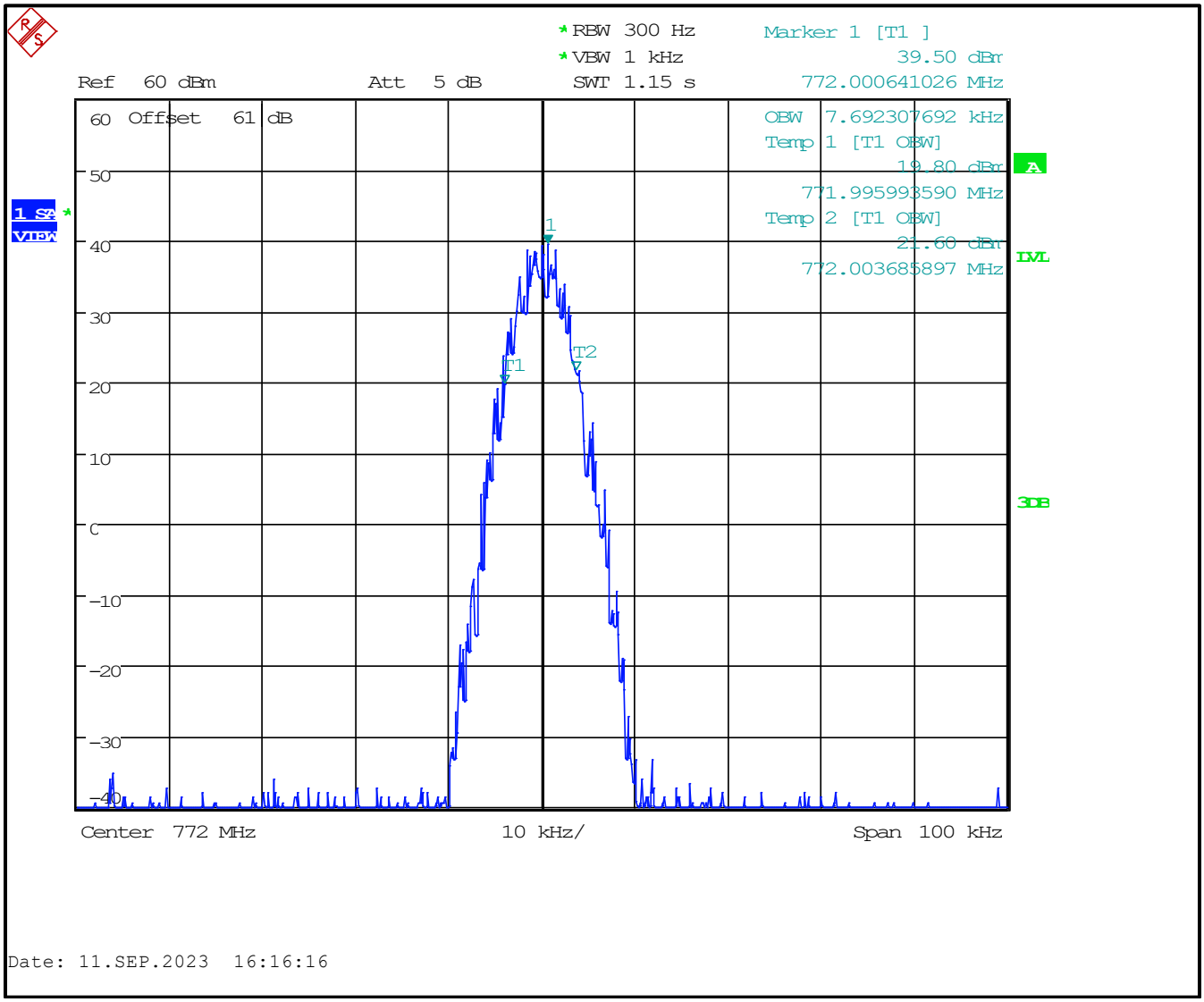
Plot 8-4: 99% BW, 768.00625 MHz, HVD-SMR



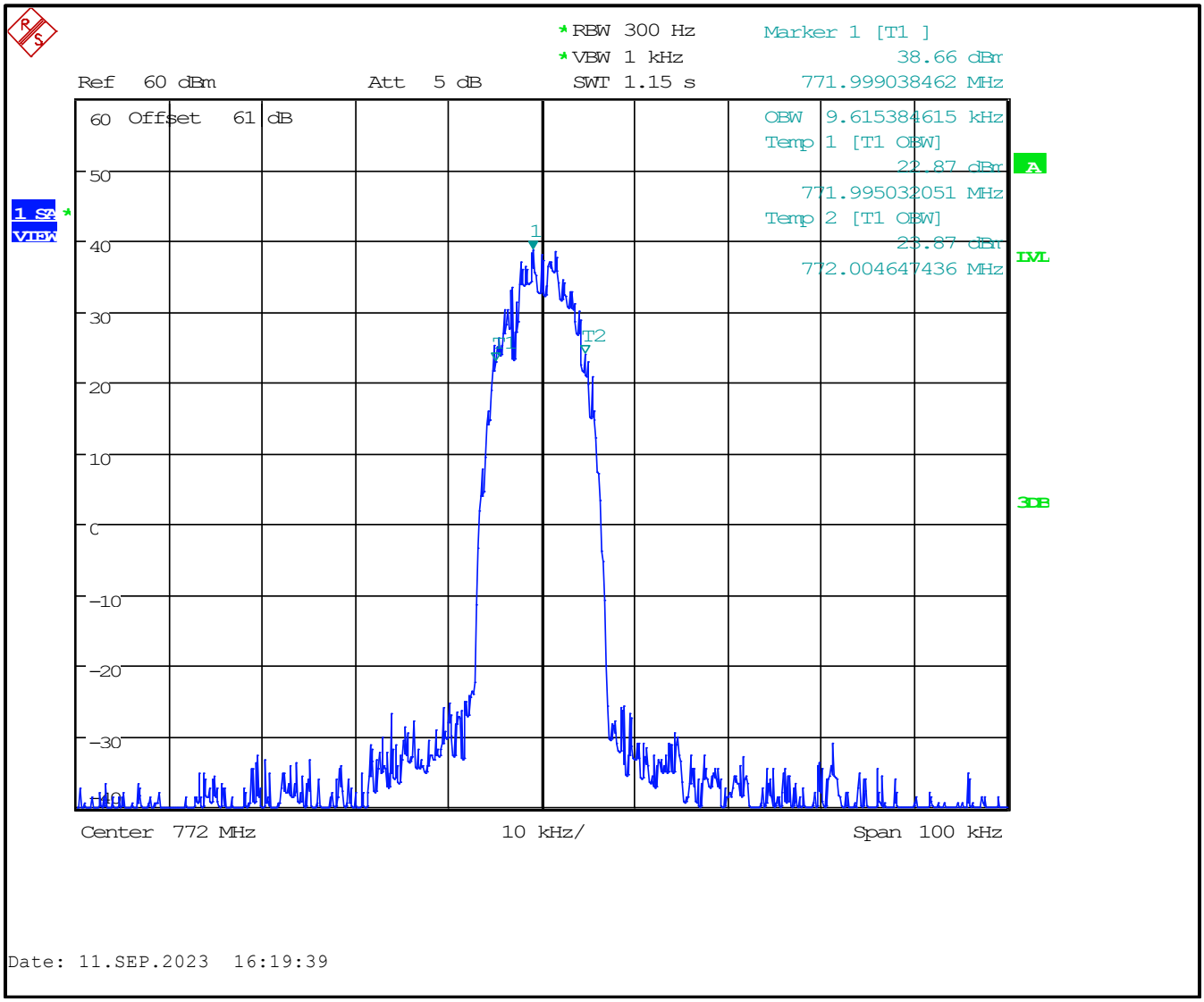
Plot 8-5: 99% BW, 768.00625 MHz, HVD-NPSPAC



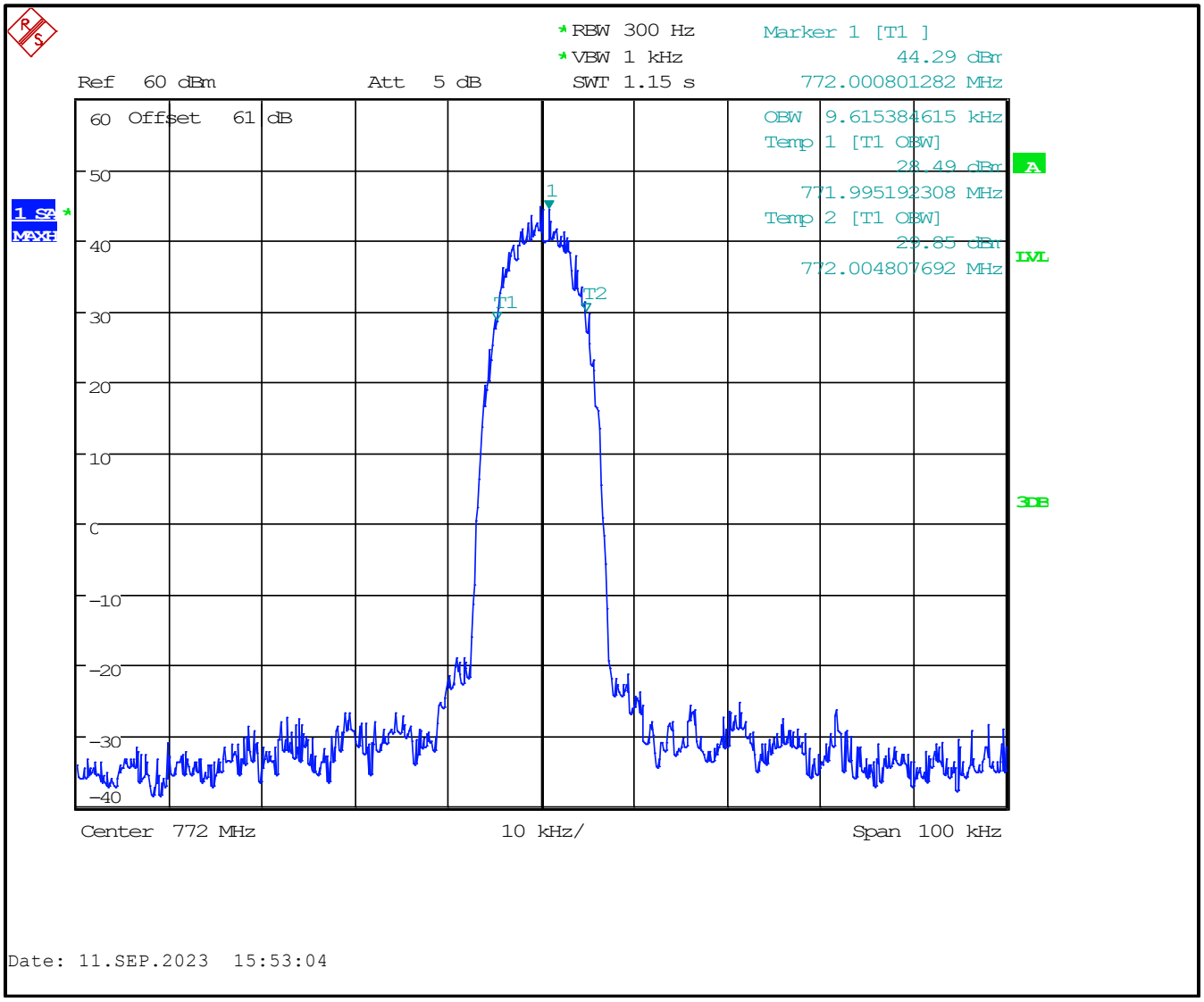
Plot 8-6: 99% BW, 772.000000 MHz, C4FM



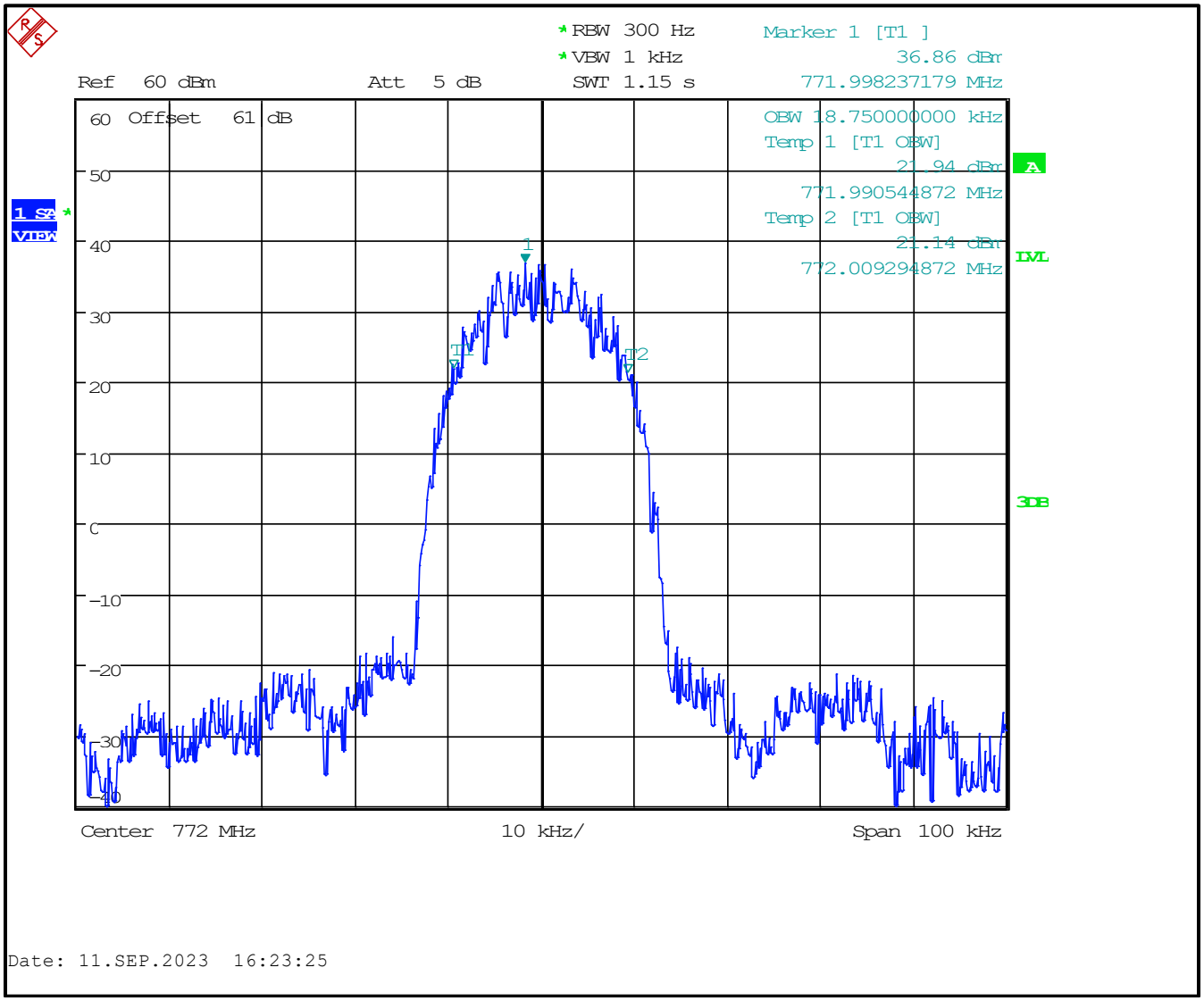
Plot 8-7: 99% BW, 772.000000 MHz, WCQPSK



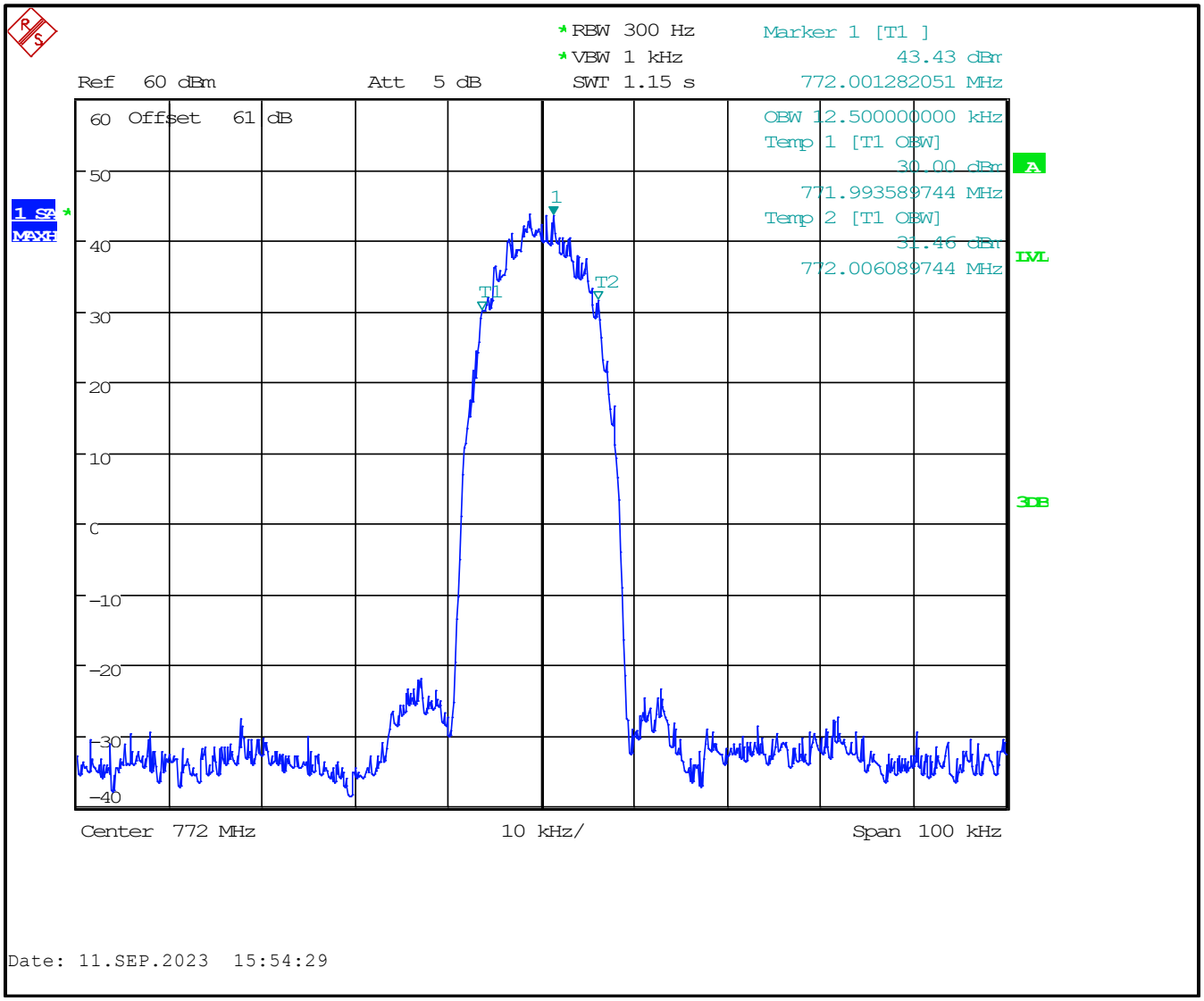
Plot 8-8: 99% BW, 772.000000 MHz, HDQPSK



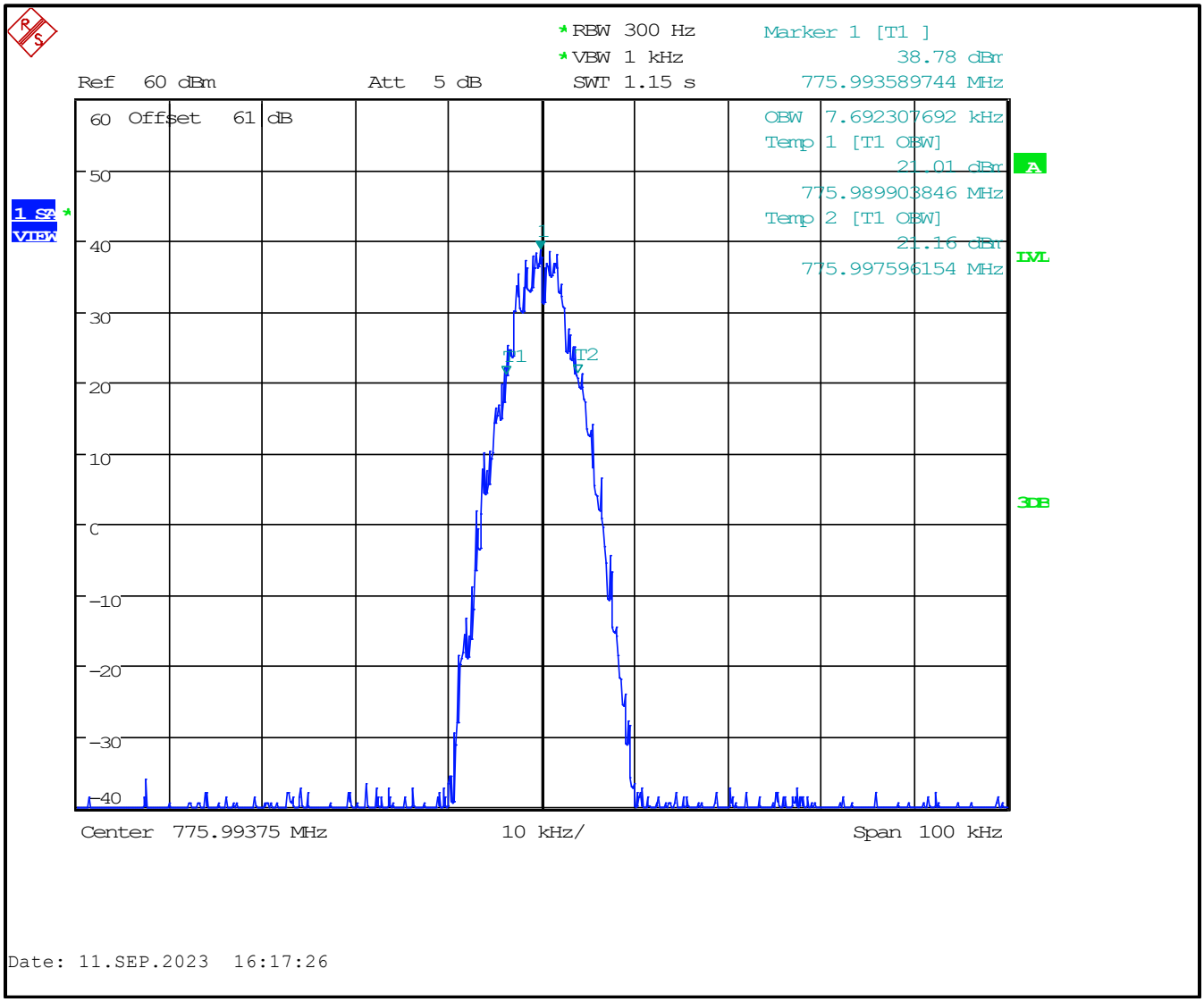
Plot 8-9: 99% BW, 772.000000 MHz, HVD-SMR



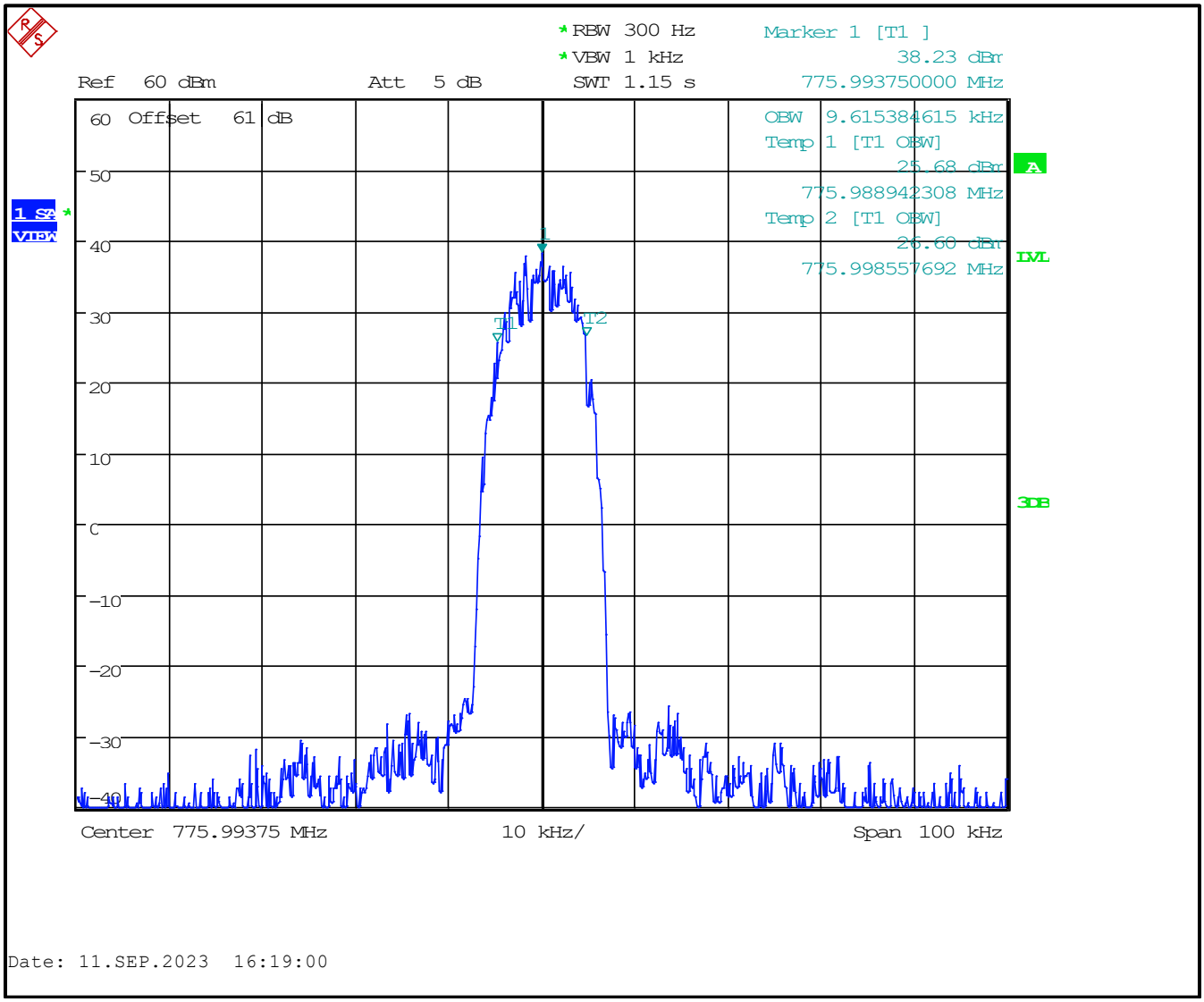
Plot 8-10: 99% BW, 772.000000 MHz, HVD-NPSPAC



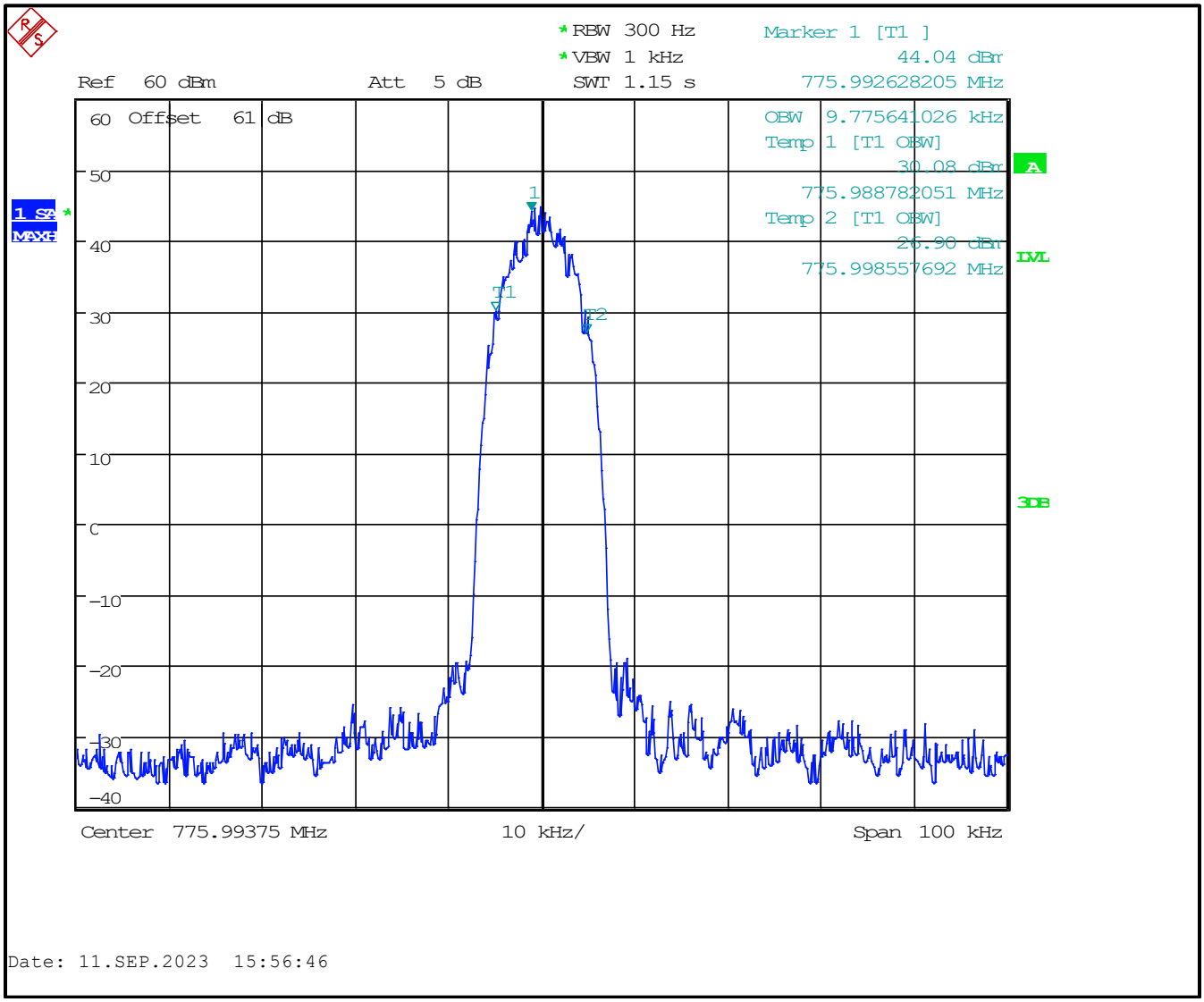
Plot 8-11: 99% BW, 775.993750 MHz, C4FM



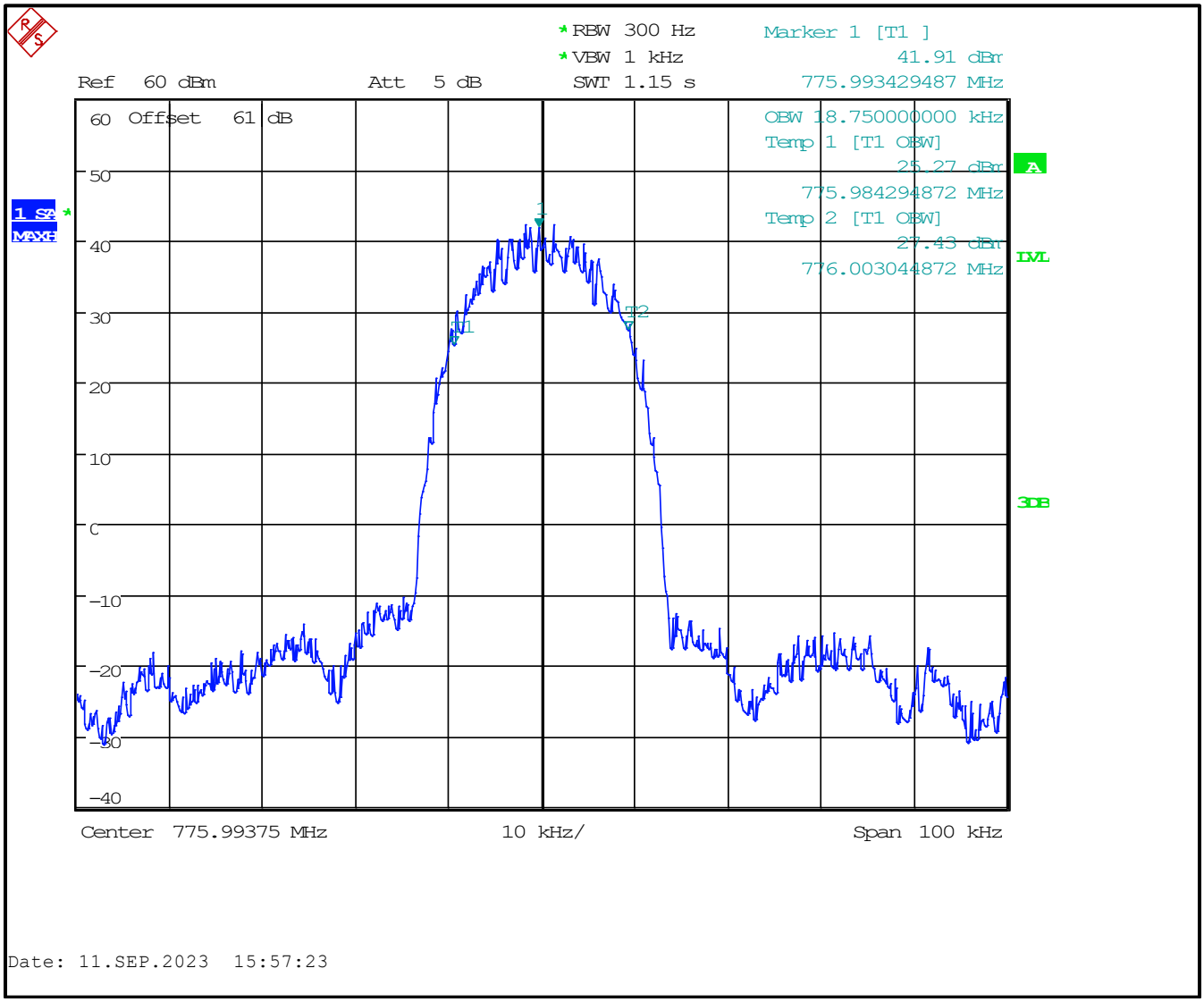
Plot 8-12: 99% BW, 775.993750 MHz, WCQPSK



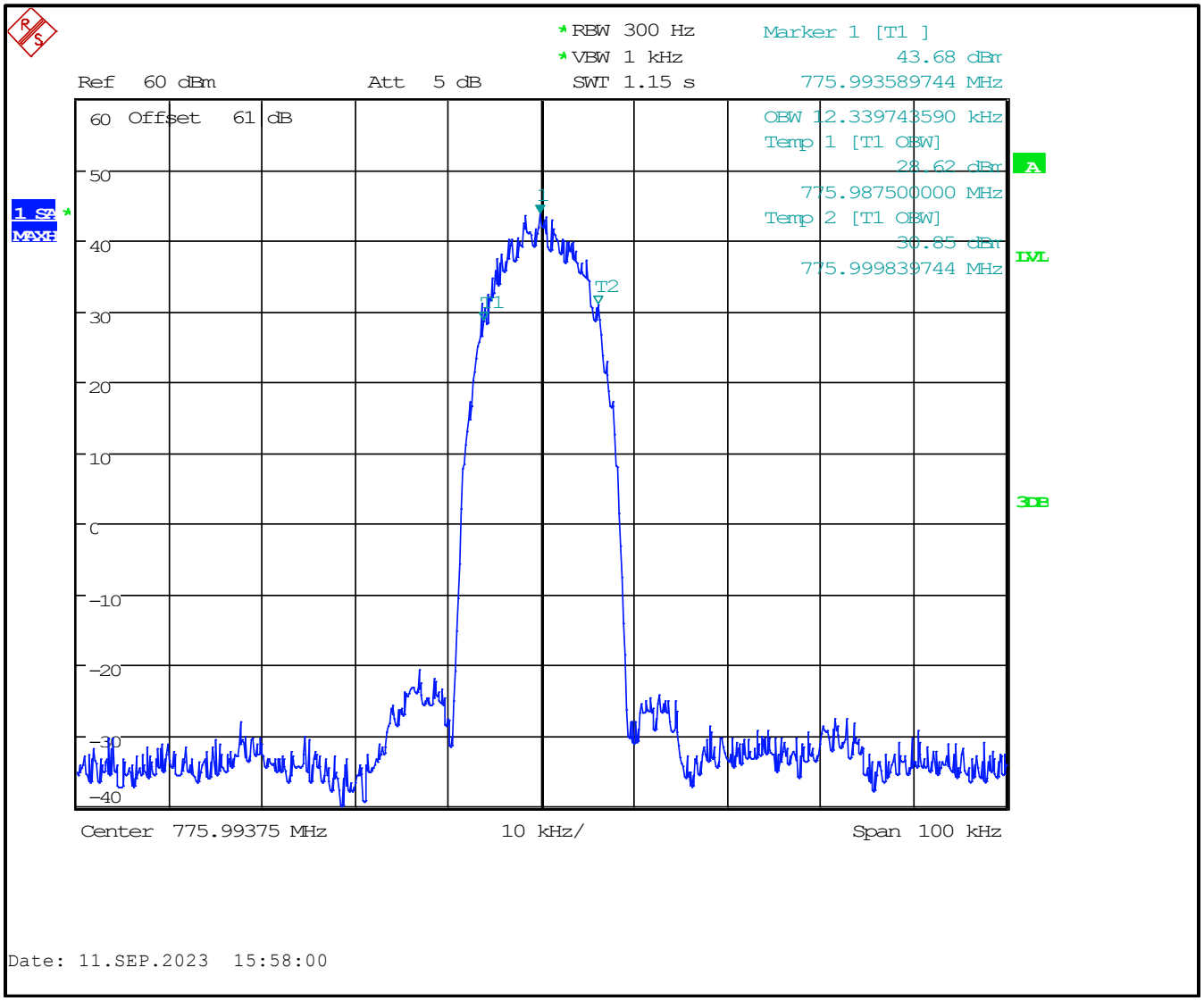
Plot 8-13: 99% BW, 775.993750 MHz, HDQPSK



Plot 8-14: 99% BW, 775.993750 MHz, HVD-SMR



Plot 8-15: 99% BW, 775.993750 MHz, HVD-NPSPAC



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
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
901775	Rosenberger	LU7-022-1000	1m SMA Cable	N/A	07/06/2024
901338	Weinschel	46-40-34	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024

Test Personnel:

Daniel W. Baltzell		September 11, 2023
EMC Test Engineer	Signature	Date of Test

9 FCC Part 2.1055: Frequency Stability; Part 90.539; ISED RSS-119 5.3: Transmitter Frequency Stability

9.1 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.

Part 90.539 (b) Frequency Stability

The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.

RSS-119 §5.3 Frequency Stability

Frequency Band (MHz)	Channel Bandwidth (kHz)	Base/Fixed Frequency Stability ppm
768-776 and 798-806	6.25/12.5/25	0.1

9.2 Test Data

Table 9-1: Temperature Frequency Stability – 768.00625 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	768.006299	0.06
-20	768.006274	0.03
-10	768.006267	0.02
0	768.006261	0.01
10	768.006253	0.00
20 (reference)	768.006250	0.00
30	768.006249	0.00
40	768.006246	-0.01
50	768.006248	0.00
60	768.006248	0.00

Table 9-2: Temperature Frequency Stability – 772.000000 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	772.00000039	0.05
-20	772.00000026	0.03
-10	772.00000022	0.03
0	772.00000011	0.01
10	772.00000006	0.01
20 (reference)	772.000000	0.00
30	771.999999	0.00
40	771.999998	0.00
50	771.999999	0.00
60	771.999998	0.00

Table 9-3: Temperature Frequency Stability – 775.993750 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	775.993795	0.06
-20	775.993781	0.04
-10	775.993774	0.03
0	775.993761	0.01
10	775.993758	0.01
20 (reference)	775.993750	0.00
30	775.993752	0.00
40	775.993750	0.00
50	775.993750	0.00
60	775.993753	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 9-4: Test Equipment Used For Testing Temperature Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901626	Amprobe	34XR-A	Multimeter	13041390A	10/18/2023
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	200106	12/01/2024
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	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024
901729	Insulated Wire Inc.	KPS-1503-3150-KPR	SMK RF Cables 20'	NA	12/29/2023

Test Personnel:

Daniel W. Baltzell		September 8, 2023
EMC Test Engineer	Signature	Date of Test

9.2.1 Frequency Stability/Voltage Variation

Table 9-5: Frequency Stability/Voltage Variation – 768.00625 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	768.006251	0.001
48.0 (reference)	768.006250	0.00
55.2	768.006250	0.00

Table 9-6: Frequency Stability/Voltage Variation – 772.000000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	771.999999	-0.001
48.0 (reference)	772.000000	0.00
55.2	772.000000	0.00

Table 9-7: Frequency Stability/Voltage Variation – 775.993750 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
40.8	775.993752	0.00
48.0 (reference)	775.993750	0.00
55.2	775.993750	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 9-8: Test Equipment Used For Testing Frequency Stability/Voltage Variation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901626	Amprobe	34XR-A	Multimeter	13041390A	10/18/2023
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	200106	12/01/2024
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	40 dB 25 W Attenuator	BM0556	02/07/2024
901291	Pasternack	PE7031-20	20 dB 300 W Attenuator	901291	02/08/2024
901729	Insulated Wire Inc.	KPS-1503-3150-KPR	SMK RF Cables 20'	NA	12/29/2023

Test Personnel:

Daniel W. Baltzell		September 8, 2023
EMC Test Engineer	Signature	Date of Test

10 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

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

WCQPSK
Calculation:
Data rate in bps (R) =9600
Peak deviation of carrier (D) = 1800
Bn = [9600/$\log_2$(4) + 2 (1800) (1.362) = 9.7 kHz
Emission designator: 9K70D1W

HDQPSK
Calculation:
Data rate in bps (R) =12000
Peak deviation of carrier (D) = 2250
Bn = [12000/$\log_2$(4) + 2 (2250) (0.841) = 9.8 kHz
Emission designator: 9K80D7W

HVD-SMR
Calculation:
Data rate in bps (R) = 19200
Signaling states (S) = 4
B_n = 2(19200)(.98)/$\log_2$(4) = 18.8 kHz
Emission designator: 18K8D1W

HVD-NPSPAC
Calculation:
Data rate in bps (R) = 19200
Signaling states (S) = 4
B_n = 2(19200)(.65)/$\log_2$(4) = 12.5 kHz
Emission designator: 12K5D1W

11 Conclusion

The data in this measurement report shows that the L3Harris Technologies Model/HVIN SN-7TXMX, FCC ID: OWDTR-0172-E, IC: 3636B-0172, complies with the applicable requirements of Parts 2 and 90 of the FCC Rules and Innovation, Science and Economic Development Canada RSS-119.