7 FCC Part 90.210 and Part 2.1053(a): Field Strength of Spurious Emissions; Part 90.543: Out of Band Emissions Limit; ISED RSS-119 5.8: Transmitter Unwanted Emissions

7.1 Test Procedure

ANSI C63.26 section 5.5

The device uses digital modulation modulated to its maximum extent using a pseudo-random data sequence.

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna (dBi) was added to achieve the EIRP level, then converted from the corrected signal generator level (dBm) to dBc, or dBW for 700 MHz band, and compared to the limit.

For emissions in the 1559-1610 band, Part 90.543(f) states: "For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation." All modes were investigated and emissions found are presented below.

The representative antenna used for the 90.543(f) testing was the Sinclair Yagi AN-025137-010, 746-896 MHz.

7.2 Test Data

Table 7-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
01/25/2024	22.3	24	100.8
02/05/2024	10	38	100.2

Table 7-2: Field Strength of Spurious Radiation – 768.0125 MHz

Conducted Power 44.3 dBm; 26.9 W; Limit = 50+10 Log P = 64.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1536.0250	21.4	-42.1	1.0	8.1	79.3	-15.0
2304.0375	22.0	-52.4	1.7	9.9	88.5	-24.2
3072.0500	35.1	-67.6	3.4	9.8	105.5	-41.2
3840.0625	37.8	-65.2	5.2	9.4	105.3	-41.0
4608.0750	23.4	-65.7	3.6	11.1	103.2	-38.1
5376.0875	29.3	-64.1	6.8	10.8	105.3	-40.2
6144.1000	27.1	-63.5	10.3	11.1	107.9	-42.8
6912.1125	16.1	-52.6	6.4	11.6	91.7	-27.4
7680.1250	18.5	-49.1	5.8	11.4	87.8	-23.5

Table 7-3: Field Strength of Spurious Radiation – 772.0000 MHz

Conducted Power 44.5 dBm; 28.2 W; Limit = 50+10 Log P = 64.5 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)
1544.0000	20.5	-43.1	1.0	8.2	80.4	-15.9
2316.0000	19.5	-54.3	1.7	9.9	90.7	-26.2
3088.0000	35.6	-65.5	3.3	9.7	104.2	-39.1
3860.0000	32.4	-71.1	5.2	9.4	112.0	-46.9
4632.0000	25.5	-63.7	3.5	11.2	101.1	-36.0
5404.0000	27.8	-65.5	7.3	10.8	107.1	-42.0
6176.0000	28.6	-61.5	10.4	11.0	106.0	-40.9
6948.0000	16.4	-52.2	1.1	9.5	88.2	-23.7
7720.0000	18.6	-49.1	1.1	9.3	85.4	-20.9

Table 7-4: Field Strength of Spurious Radiation – 775.9875 MHz

Conducted Power 44.3 dBm; 26.9 W; Limit = 50+10 Log P = 64.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1551.9750	20.5	-43.2	1.0	8.3	80.2	-15.9
2327.9625	26.8	-48.5	1.7	9.8	84.7	-20.4
3103.9500	35.5	-67.2	3.3	9.6	106.0	-40.9
3879.9375	33.6	-69.6	5.3	9.4	110.6	-45.5
4655.9250	25.1	-64.3	3.4	11.2	101.6	-36.5
5431.9125	28.0	-65.2	7.6	10.8	107.2	-42.1
6207.9000	26.8	-62.7	10.5	11.0	107.3	-42.2
6983.8875	16.3	-52.3	1.1	9.5	88.1	-23.8
7759.8750	19.5	-48.1	1.1	9.3	84.2	-19.9

Table 7-5: Field Strength of Spurious Radiation – 798.0125 MHz

Conducted Power 44.6 dBm; 28.8 W; Limit = 50+10 Log P = 64.6 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)
1596.0250	22.3	-42.3	1.1	8.9	79.1	-14.5
2394.0375	26.5	-50.2	1.7	9.7	86.8	-22.2
3192.0500	31.6	-69.7	3.3	9.5	108.6	-43.5
3990.0625	34.8	-65.5	4.7	9.7	105.6	-40.5
4788.0750	27.7	-62.4	2.6	11.1	98.9	-33.8
5586.0875	23.4	-69.2	8.7	11.0	112.0	-46.9
6384.1000	28.9	-57.8	9.4	11.3	101.0	-35.9
7182.1125	15.1	-53.1	1.1	9.2	89.6	-25.0
7980.1250	18.9	-48.1	1.1	9.2	84.6	-20.0

Table 7-6: Field Strength of Spurious Radiation – 802.0000 MHz

Conducted Power 44.4 dBm; 27.5 W; Limit = 50+10 Log P = 64.4 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1604.0000	20.5	-43.9	1.1	8.9	80.4	-16.0
2406.0000	35.1	-42.0	1.7	9.7	78.4	-14.0
3208.0000	35.7	-65.7	3.3	9.5	104.6	-39.5
4010.0000	31.5	-68.5	4.6	9.7	108.4	-43.3
4812.0000	28.1	-62.1	2.5	11.1	98.6	-33.5
5614.0000	21.8	-70.7	8.8	11.1	113.5	-48.4
6416.0000	30.6	-55.6	8.8	11.4	98.2	-33.1
7218.0000	15.1	-52.9	1.1	9.1	89.3	-24.9
8020.0000	19.9	-47.1	1.2	9.2	83.4	-19.0

Table 7-7: Field Strength of Spurious Radiation – 805.9875 MHz

Conducted Power 44.3 dBm; 26.9 W; Limit = 50+10 Log P = 64.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1611.9750	20.5	-44.3	1.1	9.0	80.7	-16.4
2417.9625	28.0	-49.5	1.8	9.7	85.8	-21.5
3223.9500	36.1	-65.3	3.4	9.5	103.5	-39.2
4029.9375	31.7	-67.9	4.5	9.8	107.7	-42.6
4835.9250	30.5	-61.2	2.6	11.1	97.8	-32.7
5641.9125	21.8	-70.6	8.7	11.1	113.3	-48.2
6447.9000	30.3	-55.4	8.3	11.4	97.5	-32.4
7253.8875	15.3	-52.4	1.1	8.9	88.9	-24.6
8059.8750	18.9	-48.1	1.2	9.2	84.3	-20.0

Table 7-8: Field Strength of Spurious Radiation – 806.0125 MHz

Conducted Power 45.1 dBm; 32.4 W; Limit = 50+10 Log P = 65.1 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)
1612.0250	20.5	-44.0	1.1	9.0	81.2	-16.1
2418.0375	33.4	-44.1	1.8	9.7	81.3	-16.2
3224.0500	34.3	-67.2	3.4	9.5	106.1	-41.0
4030.0625	31.1	-68.5	4.5	9.8	108.3	-43.2
4836.0750	29.3	-62.4	2.6	11.1	99.0	-33.9
5642.0875	21.3	-71.1	8.7	11.1	113.8	-48.7
6448.1000	29.8	-55.9	8.3	11.4	97.9	-32.8
7254.1125	15.1	-52.6	1.1	8.9	89.8	-24.7
8060.1250	18.8	-48.2	1.2	9.2	85.2	-20.1

Table 7-9: Field Strength of Spurious Radiation – 815.0000 MHz

Conducted Power 45.2 dBm; 33.1 W; Limit = 50+10 Log P = 65.2 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)
1630.0000	20.5	-44.5	1.1	9.1	81.8	-16.6
2445.0000	28.2	-50.3	1.9	9.8	87.5	-22.4
3260.0000	32.1	-69.5	3.5	9.5	108.7	-43.6
4075.0000	31.8	-67.0	4.5	10.0	106.5	-41.4
4890.0000	30.2	-60.5	2.8	11.0	97.3	-32.2
5705.0000	21.4	-71.7	8.5	11.2	114.2	-49.1
6520.0000	30.3	-54.3	7.4	11.4	95.5	-30.4
7335.0000	18.3	-49.1	1.1	8.7	86.7	-21.5
8150.0000	19.2	-47.6	1.2	9.3	84.7	-19.5

Table 7-10: Field Strength of Spurious Radiation – 823.9875 MHz

Conducted Power 45.4 dBm; 34.7 W; Limit = 50+10 Log P = 65.4 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1647.9750	20.5	-44.4	1.1	9.2	81.8	-16.4
2471.9625	27.1	-52.3	2.0	9.9	89.9	-24.5
3295.9500	33.7	-68.0	3.7	9.4	107.3	-42.2
4119.9375	30.8	-67.2	4.5	10.2	106.6	-41.5
4943.9250	28.4	-62.6	3.5	11.0	100.1	-35.0
5767.9125	23.0	-70.1	9.1	11.3	113.0	-47.9
6591.9000	30.3	-53.1	7.1	11.3	94.0	-28.9
7415.8875	19.4	-48.1	1.1	8.7	85.9	-20.5
8239.8750	19.5	-43.2	1.2	9.3	80.4	-15.0

Table 7-11: Field Strength of Spurious Radiation – 851.0125 MHz

Conducted Power 45.1 dBm; 32.4 W; Limit = 50+10 Log P = 65.1 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)
1702.0250	20.5	-45.1	1.2	9.5	81.9	-16.8
2553.0375	28.2	-54.2	2.3	9.8	91.7	-26.6
3404.0500	34.2	-68.9	4.4	9.7	108.7	-43.6
4255.0625	38.4	-57.1	5.1	10.7	96.6	-31.5
5106.0750	32.1	-59.8	4.3	10.8	98.4	-33.3
5957.0875	23.6	-67.7	10.0	11.2	111.7	-46.6
6808.1000	25.1	-54.8	7.1	10.9	96.0	-30.9
7659.1125	18.7	-48.9	1.1	9.2	85.9	-20.8
8510.1250	19.5	-43.3	1.2	9.4	80.2	-15.1

Table 7-12: Field Strength of Spurious Radiation – 860.0000 MHz

Conducted Power 44.9 dBm; 30.9 W; Limit = 50+10 Log P = 64.9 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)
1720.0000	22.3	-44.0	1.2	9.6	80.5	-15.6
2580.0000	29.7	-53.6	2.3	9.7	91.2	-26.3
3440.0000	35.9	-66.1	4.4	9.8	105.8	-40.7
4300.0000	31.7	-63.0	5.1	10.8	102.4	-37.3
5160.0000	31.1	-61.7	4.2	10.8	100.3	-35.2
6020.0000	26.0	-65.1	10.4	11.1	109.4	-44.3
6880.0000	25.2	-54.4	6.6	11.1	95.0	-29.9
7740.0000	19.2	-48.5	1.1	9.3	85.3	-20.4
8600.0000	21.3	-41.1	1.2	9.6	77.6	-12.7

Table 7-13: Field Strength of Spurious Radiation – 868.9875 MHz

Conducted Power 45.1 dBm; 32.4 W; Limit = 50+10 Log P = 65.1 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)
1737.9750	20.5	-45.6	1.2	9.6	82.3	-17.2
2606.9625	30.3	-54.0	2.4	9.7	91.8	-26.7
3475.9500	36.8	-65.3	4.4	9.9	105.0	-39.9
4344.9375	36.9	-57.0	4.7	10.9	95.8	-30.7
5213.9250	37.0	-55.9	4.4	10.7	94.6	-29.5
6082.9125	30.5	-62.2	10.2	11.1	106.5	-41.4
6951.9000	34.2	-45.0	6.4	11.2	85.2	-20.1
7820.8875	24.3	-43.0	1.1	9.3	79.9	-14.8
8689.8750	21.7	-40.8	1.2	9.5	77.6	-12.5

Table 7-14: Part 90.543(f): Out of Band Emissions Limit

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Losses (dB)	Corrected Signal Generator Level (dBW)	Limit (dBW)	Margin (dB)
1586.025	-88.8	19.5	-99.3	-70.0	-29.3
1596.025	-90.6	19.9	-100.7	-70.0	-30.7
1598.025	-90.7	19.8	-100.9	-70.0	-30.9
1604.000	-90.7	20.3	-100.4	-70.0	-30.4
1609.975	-90.6	20.1	-100.5	-70.0	-30.5

Table 7-15: Unintentional/Digital Emissions

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Corrected Spectrum Analyzer Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
157.715	33.5	-24.2	9.3	43.5	-34.2
197.395	31.6	-22.2	9.4	43.5	-34.1
227.770	38.9	-21.8	17.1	46.0	-28.9
251.733	38.3	-19.8	18.5	46.0	-27.5
264.791	38.3	-20.3	18.0	46.0	-28.0
275.718	41.9	-20.7	21.2	46.0	-24.8
299.677	32.3	-20.9	11.4	46.0	-34.6
770.354	35.6	-10.7	24.9	46.0	-21.1
782.378	35.5	-10.4	25.1	46.0	-20.9
794.390	39.9	-9.6	30.3	46.0	-15.7
806.414	29.3	-9.0	20.3	46.0	-25.7

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

NOTE: Radiated emissions were investigated with the modules collocated and transmitting simultaneously with the LMR, Bluetooth, and Wi-Fi transceivers. No non-compliant emissions were found; per FCC guidance, no data is being reported.

Table 7-16: 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	12/29/2024
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	04/28/2024
901477	Micro-Coax	UFA210A-0-0360-300300	RF Cable (0.04 - 18 GHz)	212349-002	09/01/2024
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
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	08/05/2024
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	08/05/2024
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	04/25/2024
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	05/23/2024
901650	ETS Lindgren	3117	Double Ridge Waveguide Horn Antenna (1 GHz - 18 GHz)	00152091	07/11/2024
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	04/30/2024
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	01/30/2025

Test Personnel:

Daniel W. Baltzell		January 25 and February 5, 2024
Test Engineer	Signature	Dates of Tests

8 FCC Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized 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.

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]	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869 [3 5]	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M
5850–5925 [4]		
All other bands	B	C

[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
[3] Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691.
[4] DSRCS Roadside Unit equipment in the 5850–5925 MHz band is governed under subpart M of this part.
[5] Equipment may alternatively meet the Adjacent Channel Power limits of §90.221.

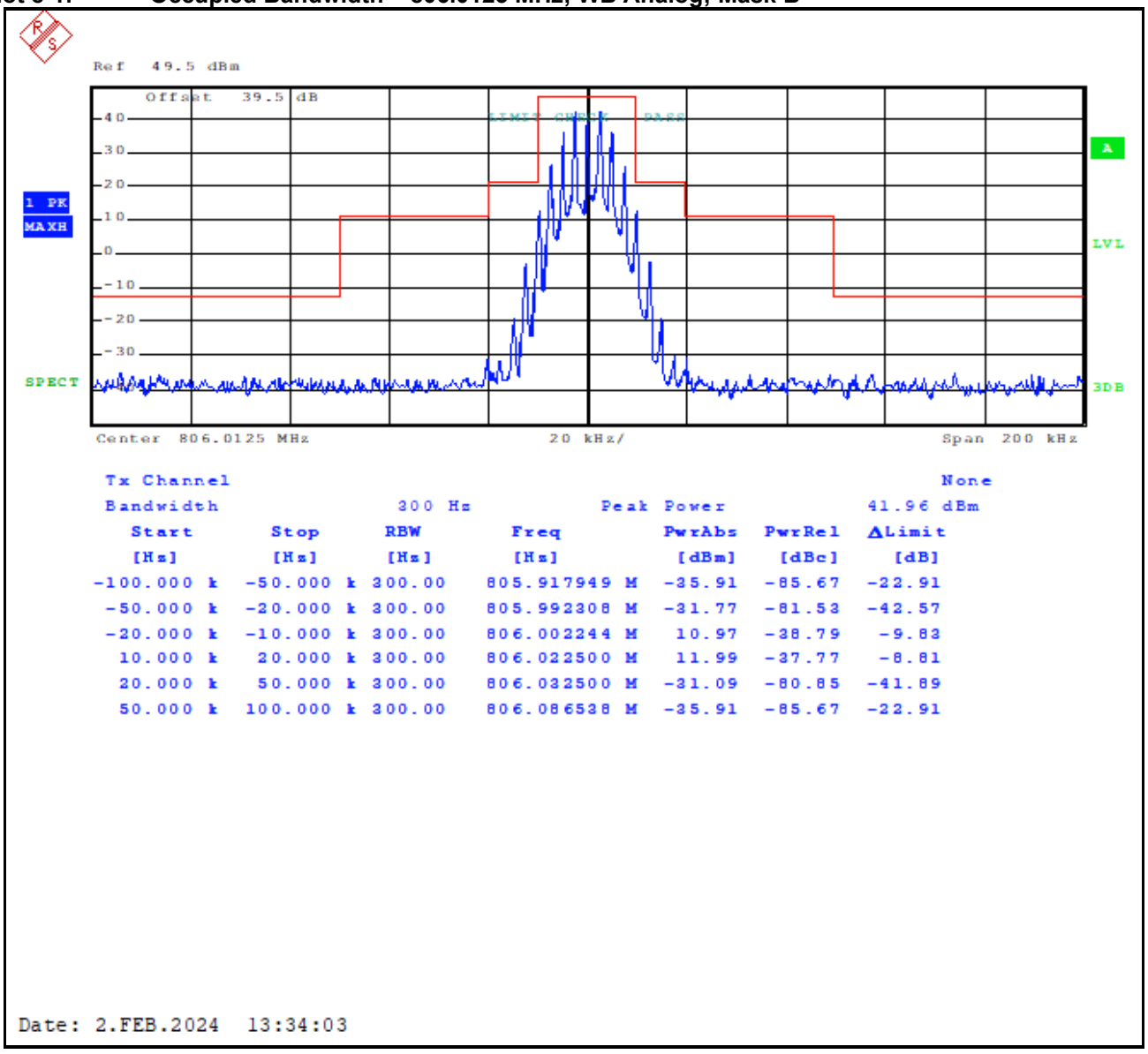
Applicable ISED Emission Masks					
Frequency Band (MHz)	**Related SRSP for Channeling Plan and ERP**	**Channel Bandwidth (kHz)**	**Authorized Bandwidth (kHz)**	**Masks for Equipment With Audio Filter**	**Masks for Equipment Without Audio Filter**
806-821/851-866, 821-824/866-869	SRSP-502	25	20 22	B Y	G Y
		12.5	11.25	D	D
		6.25	6	E	E

8.2 Test Data

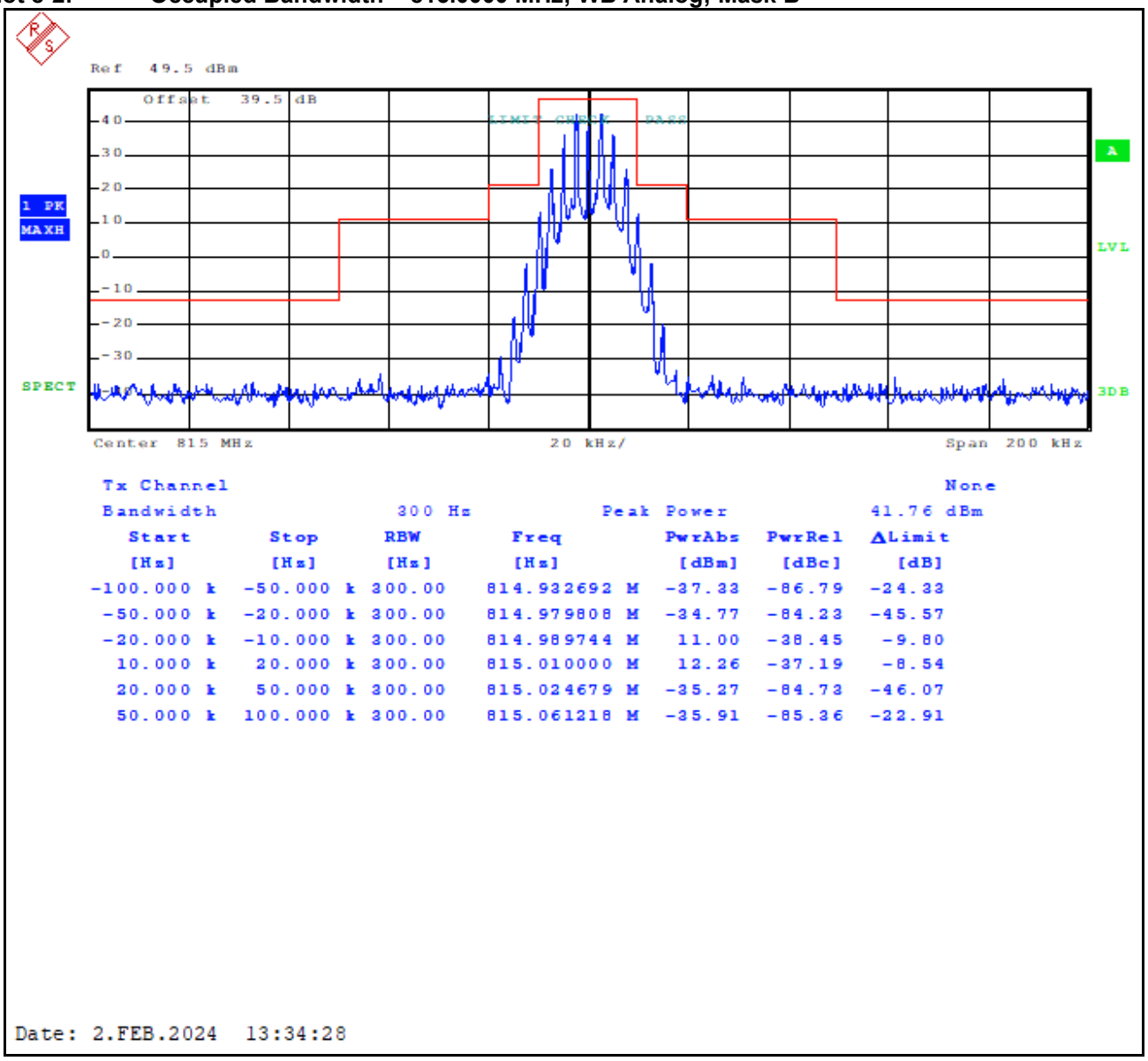
Table 8-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
02/01/2024	22.7	32	100.4
02/02/2024	22.4	32	100.1

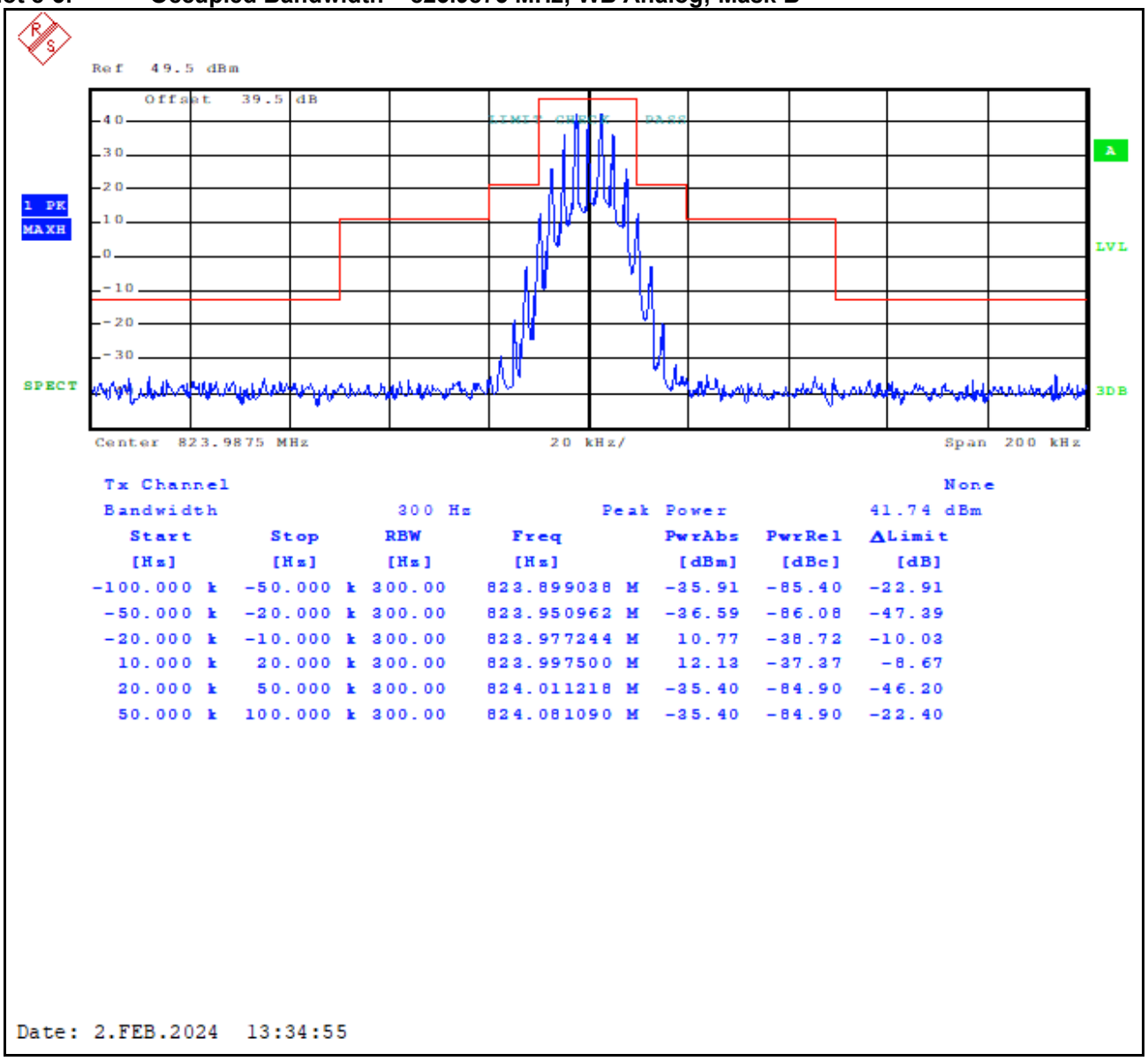
Plot 8-1: Occupied Bandwidth – 806.0125 MHz; WB Analog; Mask B



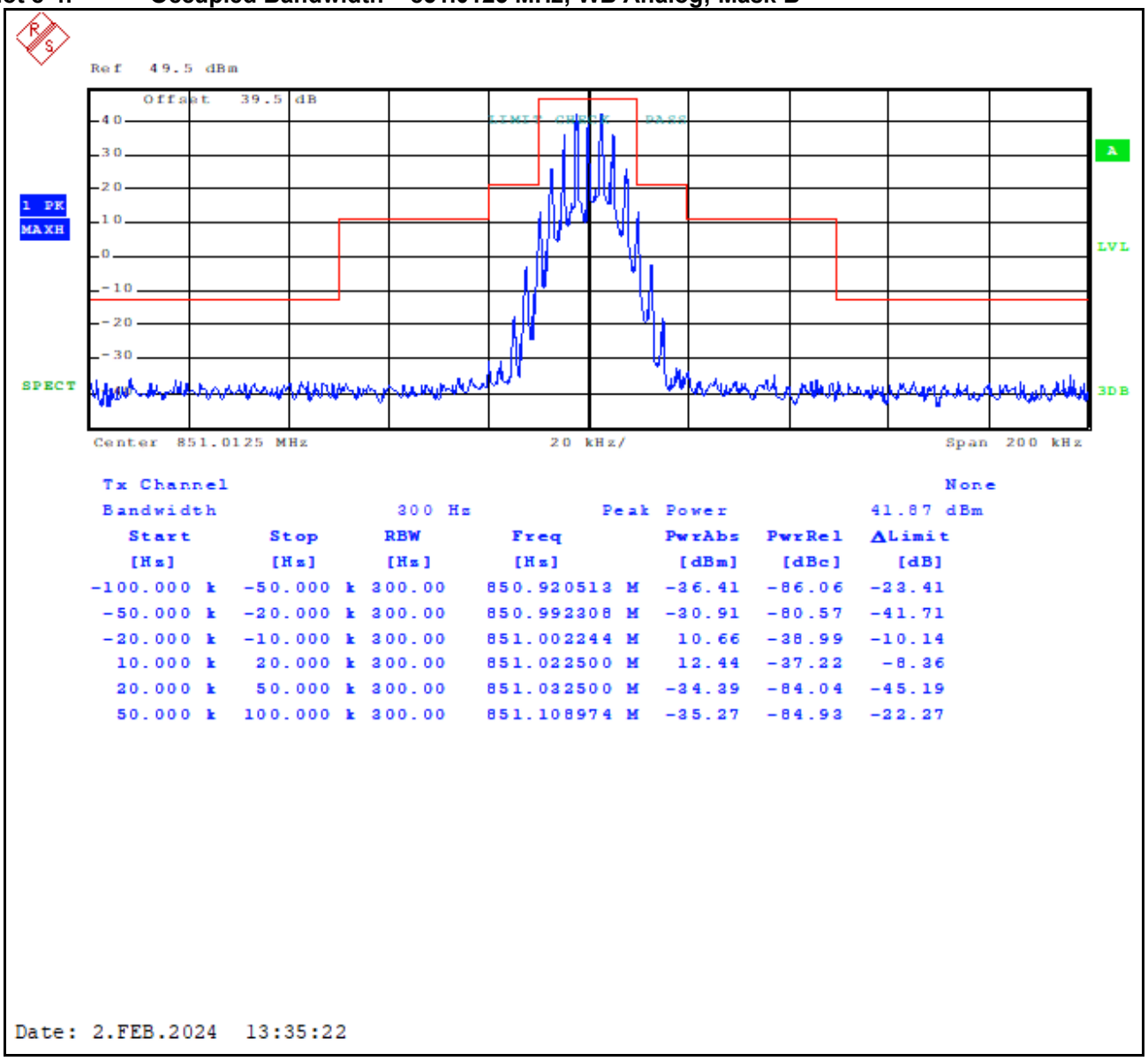
Plot 8-2: Occupied Bandwidth – 815.0000 MHz; WB Analog; Mask B



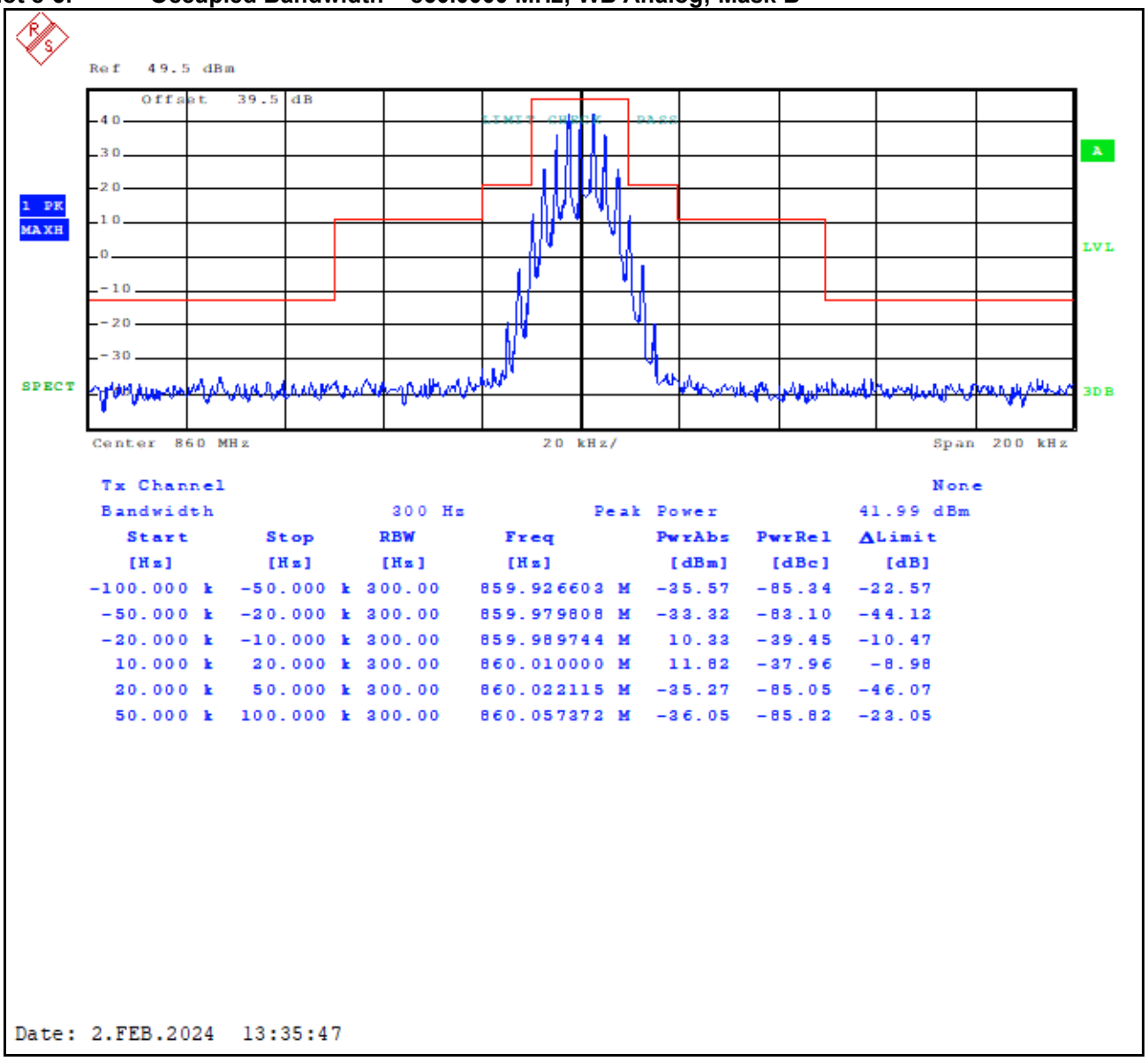
Plot 8-3: Occupied Bandwidth – 823.9875 MHz; WB Analog; Mask B



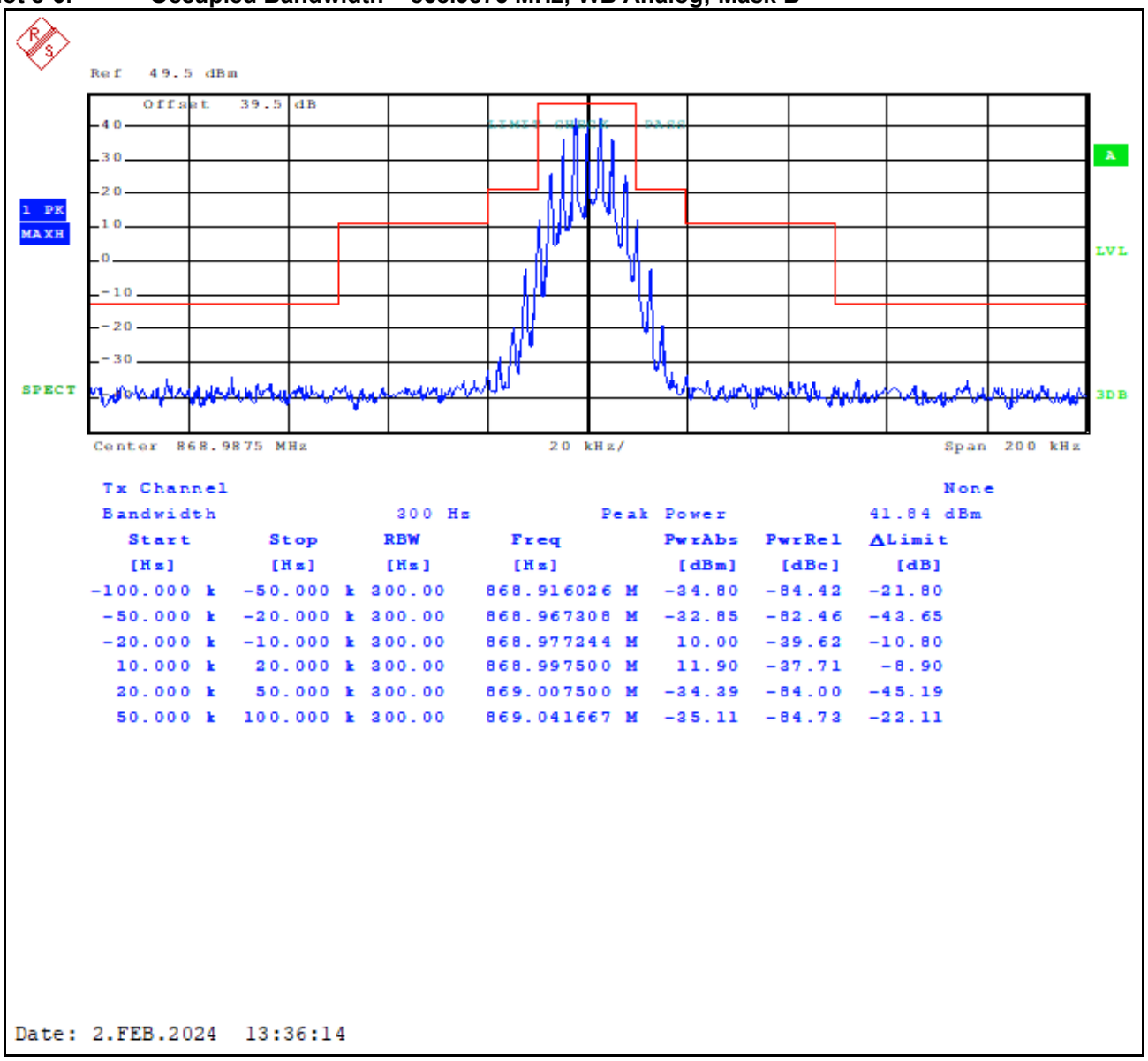
Plot 8-4: Occupied Bandwidth – 851.0125 MHz; WB Analog; Mask B



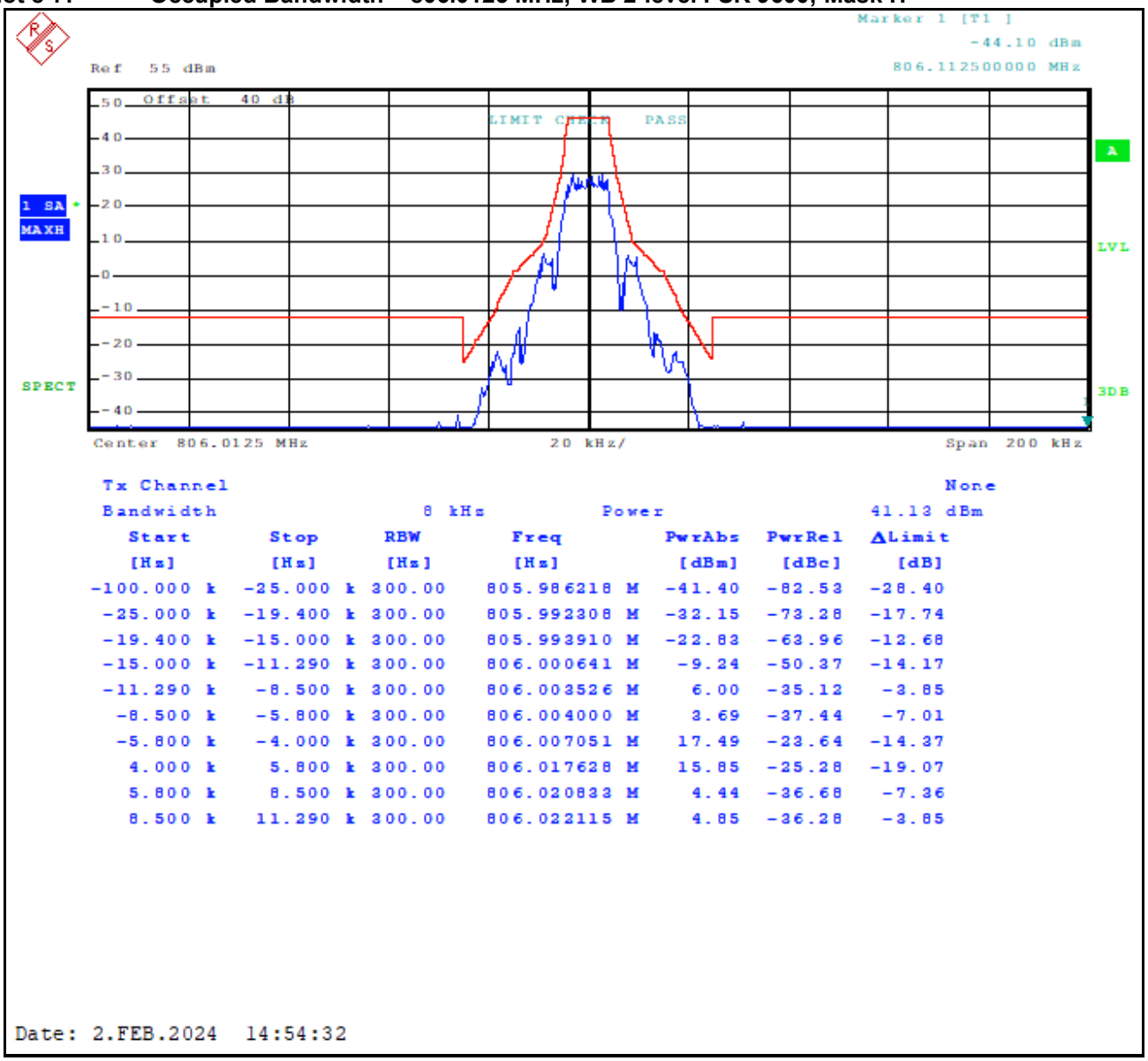
Plot 8-5: Occupied Bandwidth – 860.0000 MHz; WB Analog; Mask B



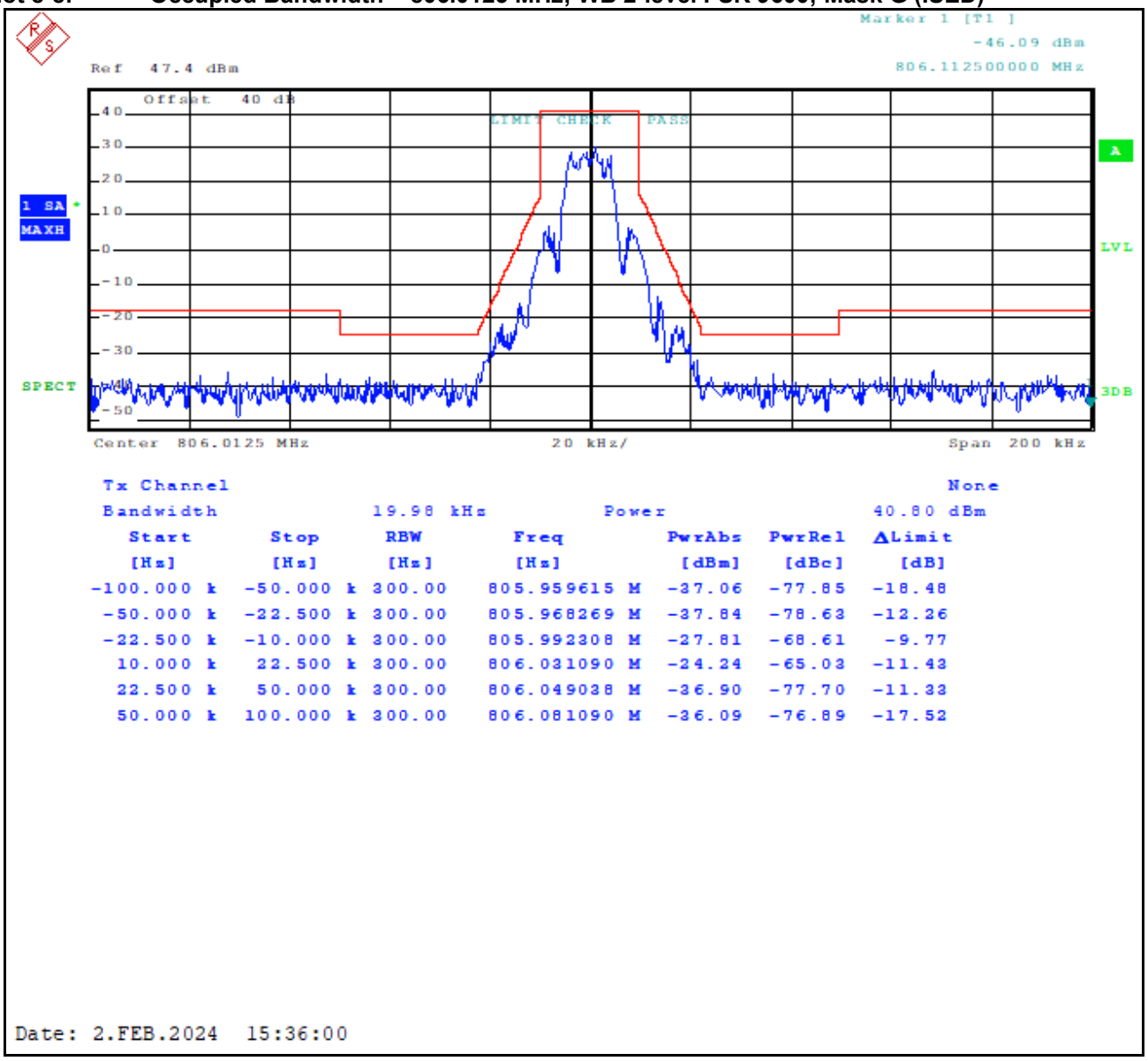
Plot 8-6: Occupied Bandwidth – 868.9875 MHz; WB Analog; Mask B



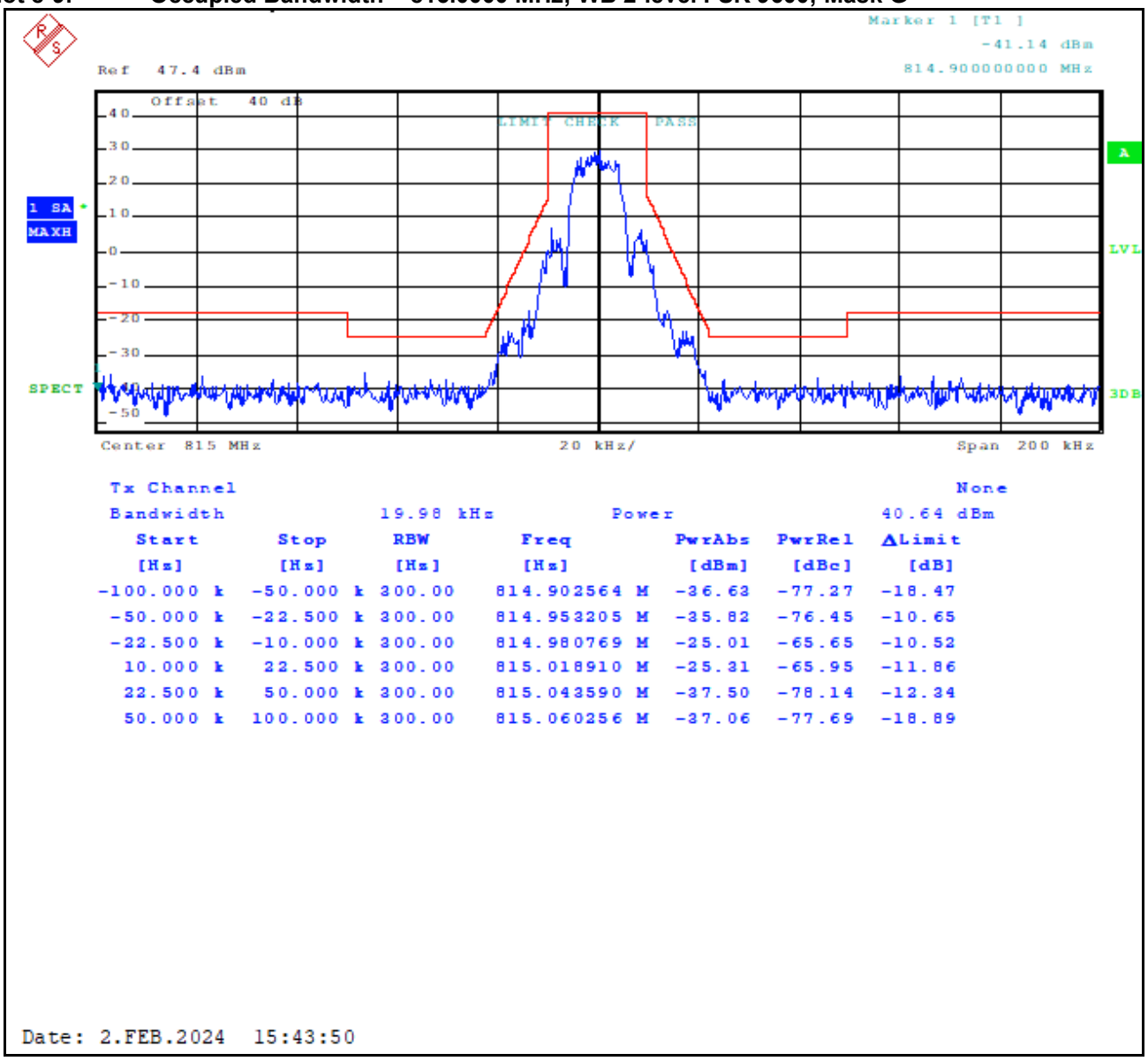
Plot 8-7: Occupied Bandwidth – 806.0125 MHz; WB 2-level FSK 9600; Mask H



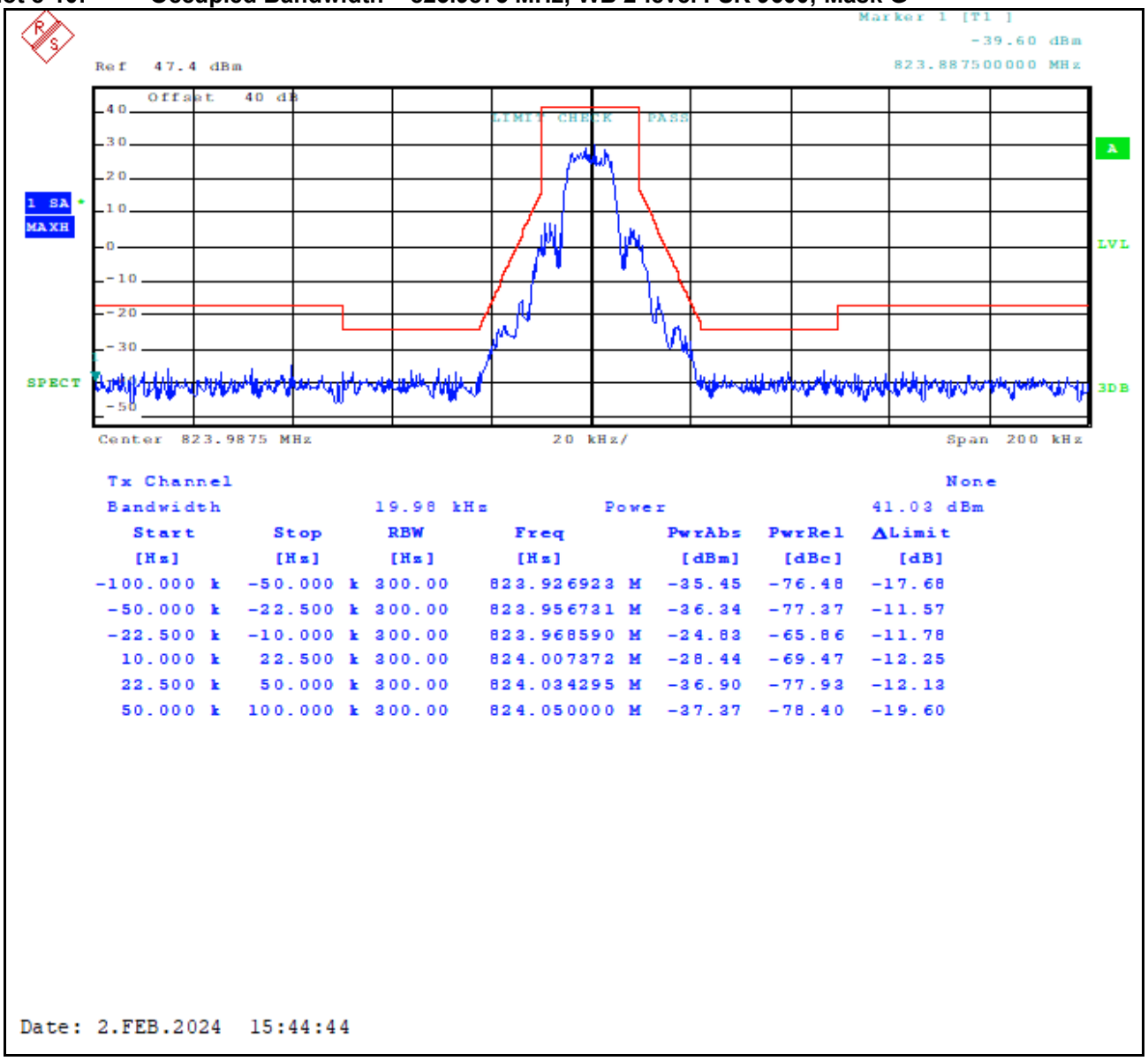
Plot 8-8: Occupied Bandwidth – 806.0125 MHz; WB 2-level FSK 9600; Mask G (ISED)



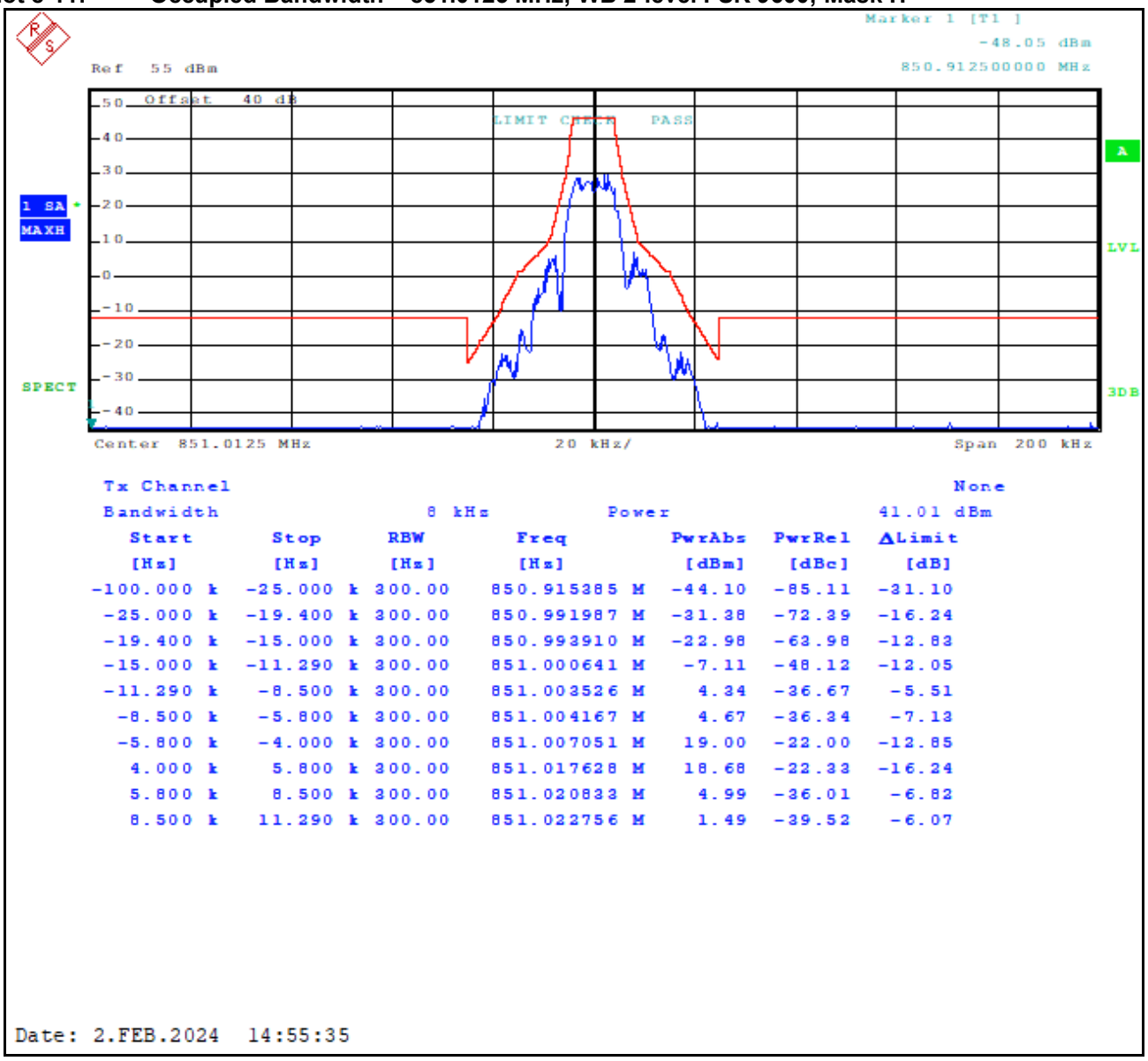
Plot 8-9: Occupied Bandwidth – 815.0000 MHz; WB 2-level FSK 9600; Mask G



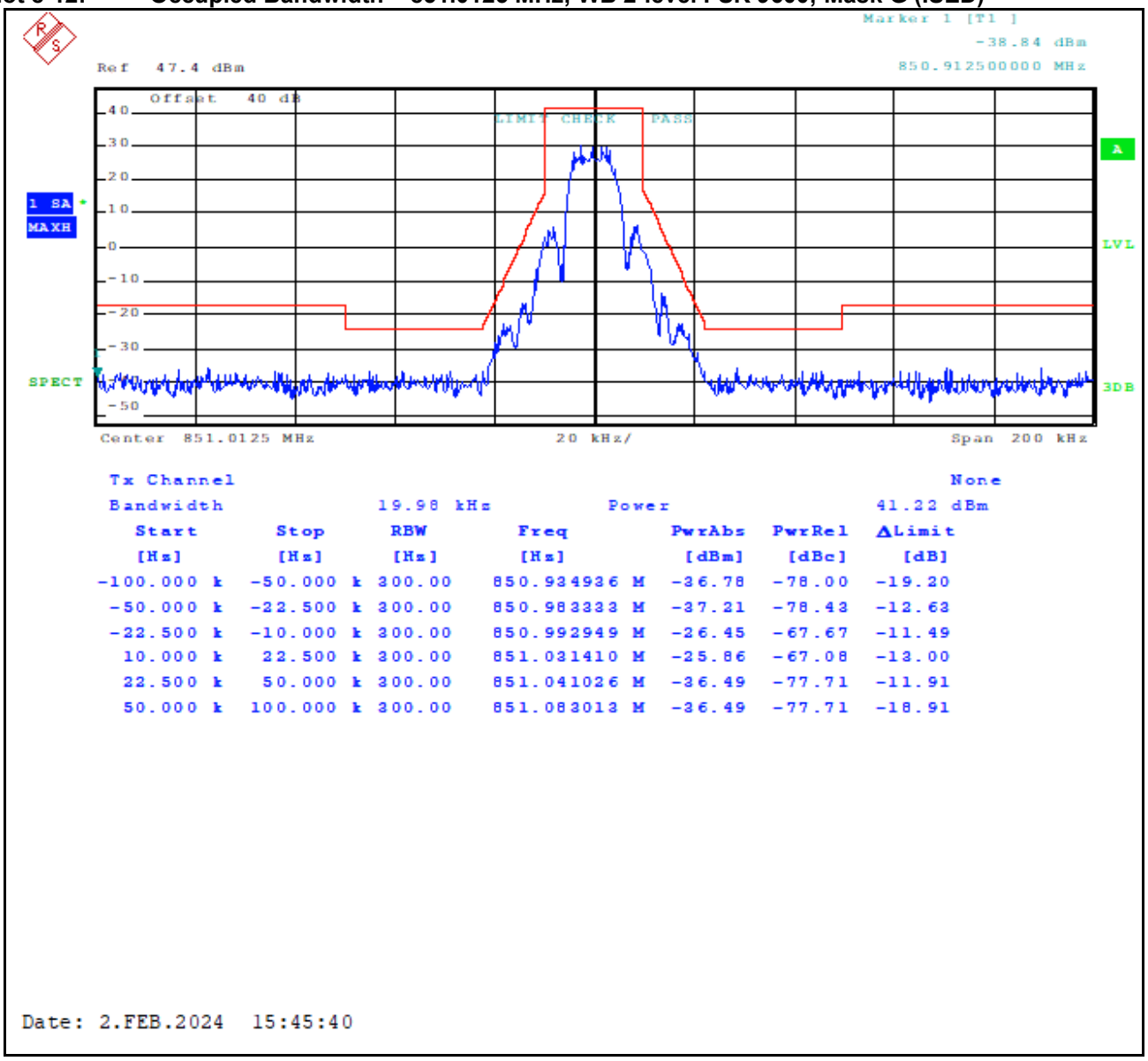
Plot 8-10: Occupied Bandwidth – 823.9875 MHz; WB 2-level FSK 9600; Mask G



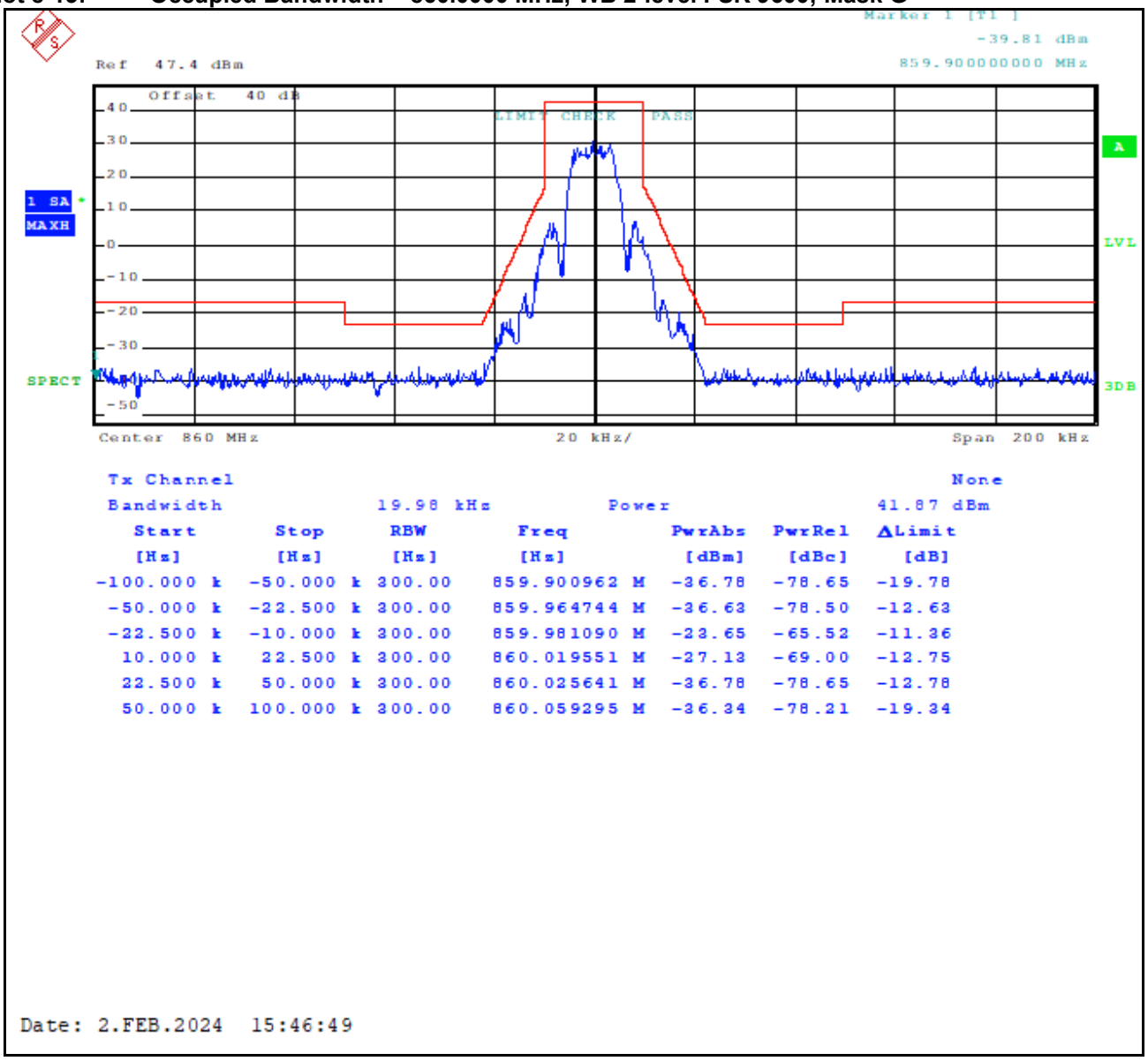
Plot 8-11: Occupied Bandwidth – 851.0125 MHz; WB 2-level FSK 9600; Mask H



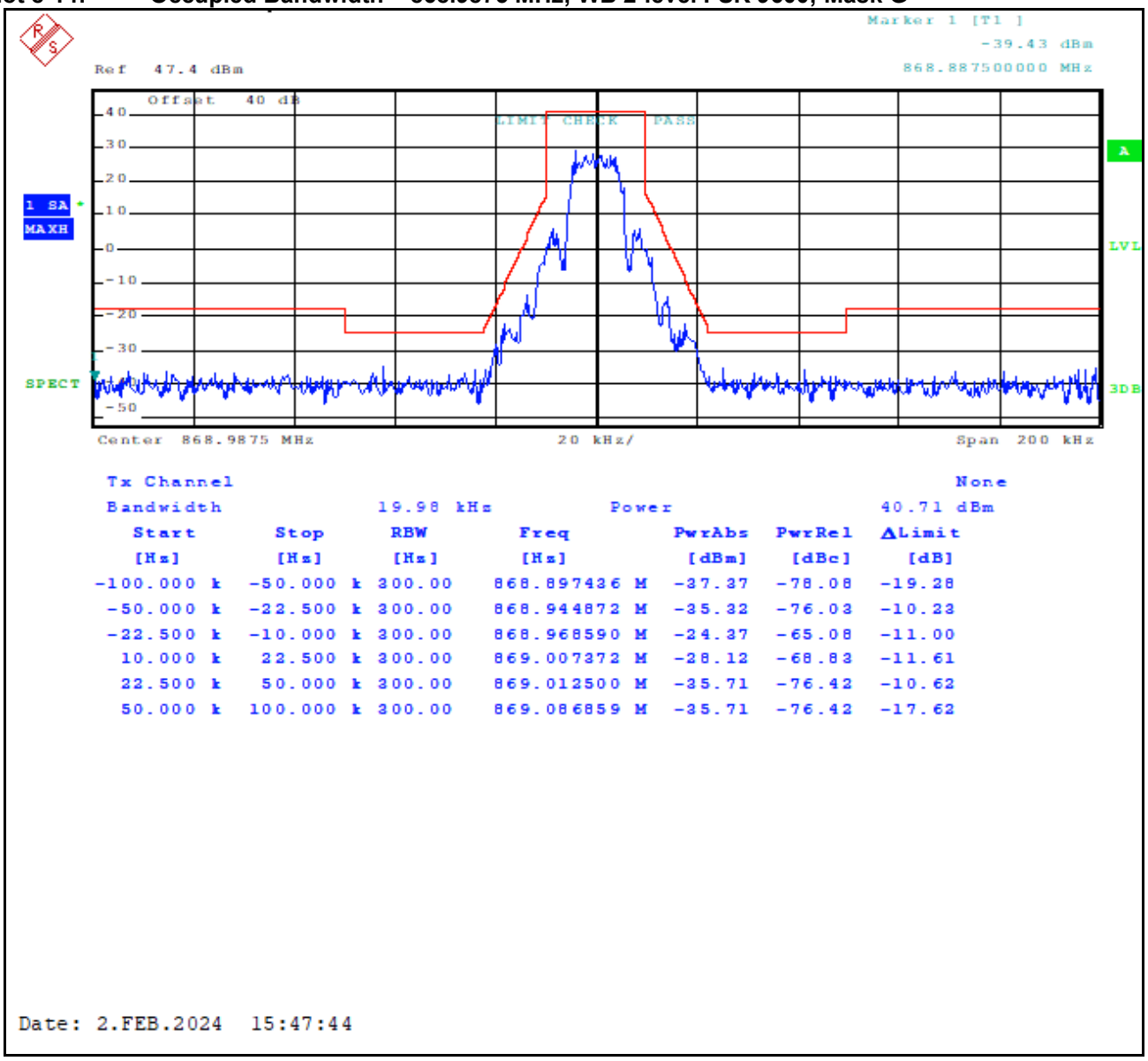
Plot 8-12: Occupied Bandwidth – 851.0125 MHz; WB 2-level FSK 9600; Mask G (ISED)



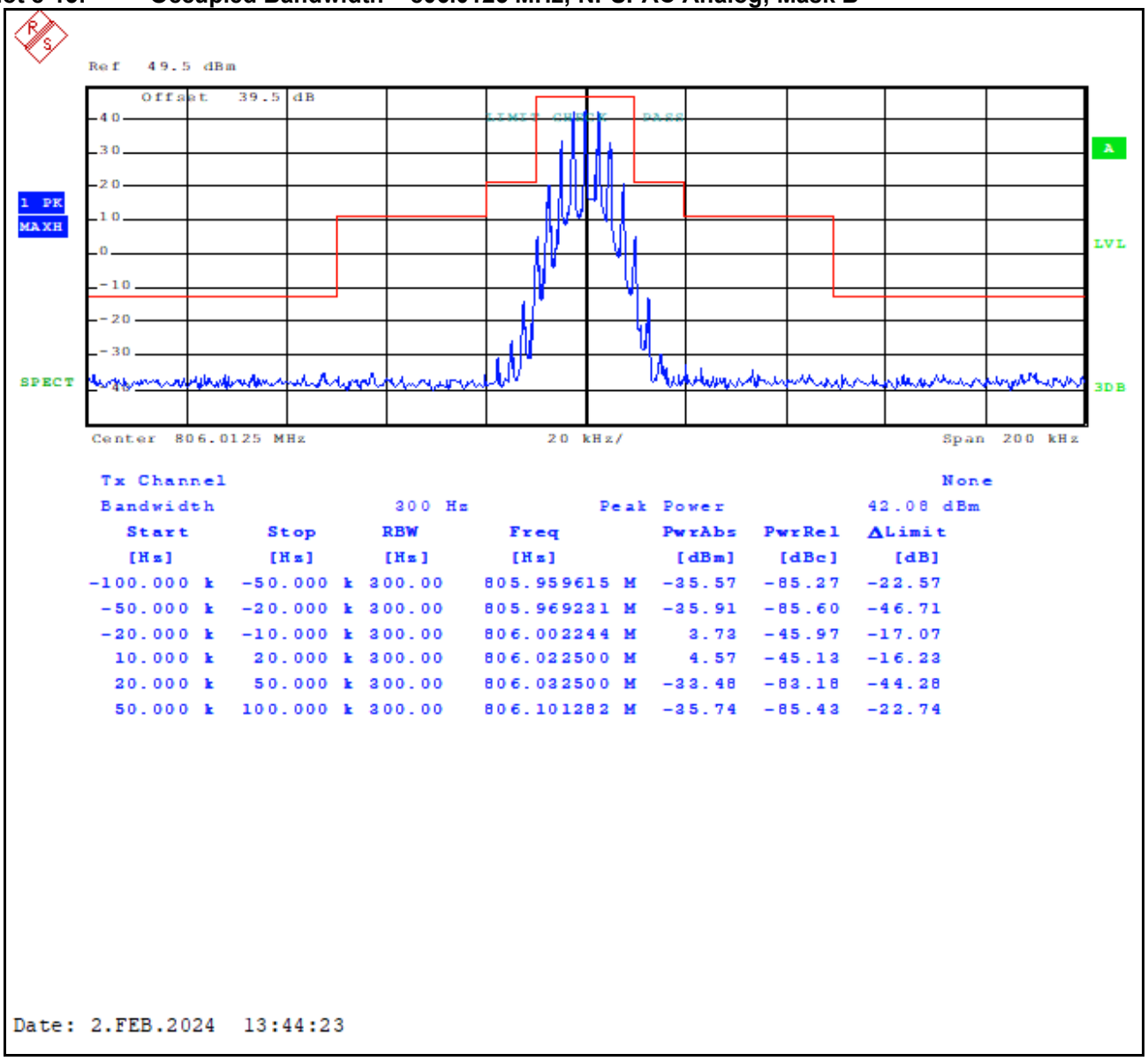
Plot 8-13: Occupied Bandwidth – 860.0000 MHz; WB 2-level FSK 9600; Mask G



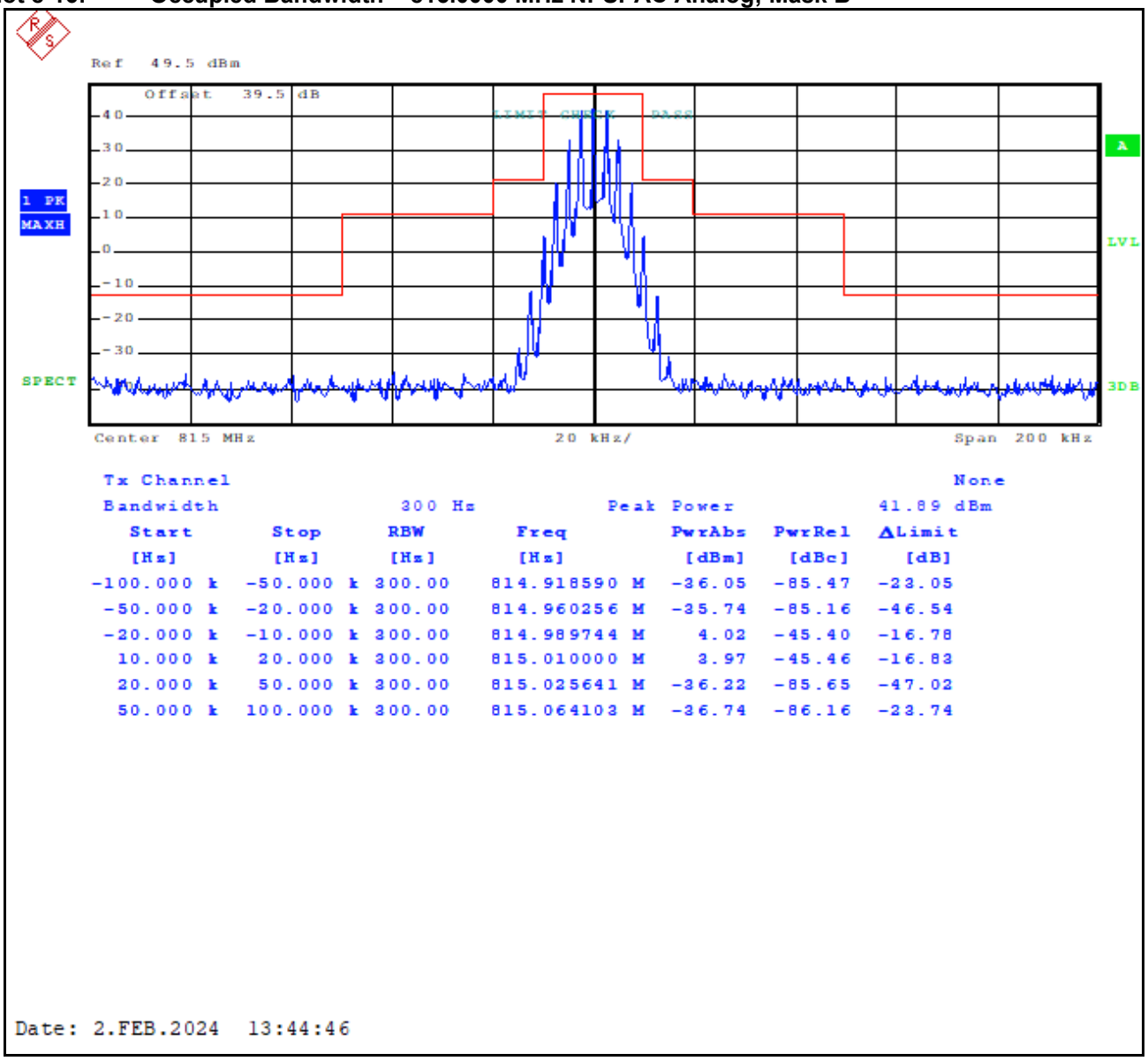
Plot 8-14: Occupied Bandwidth – 868.9875 MHz; WB 2-level FSK 9600; Mask G



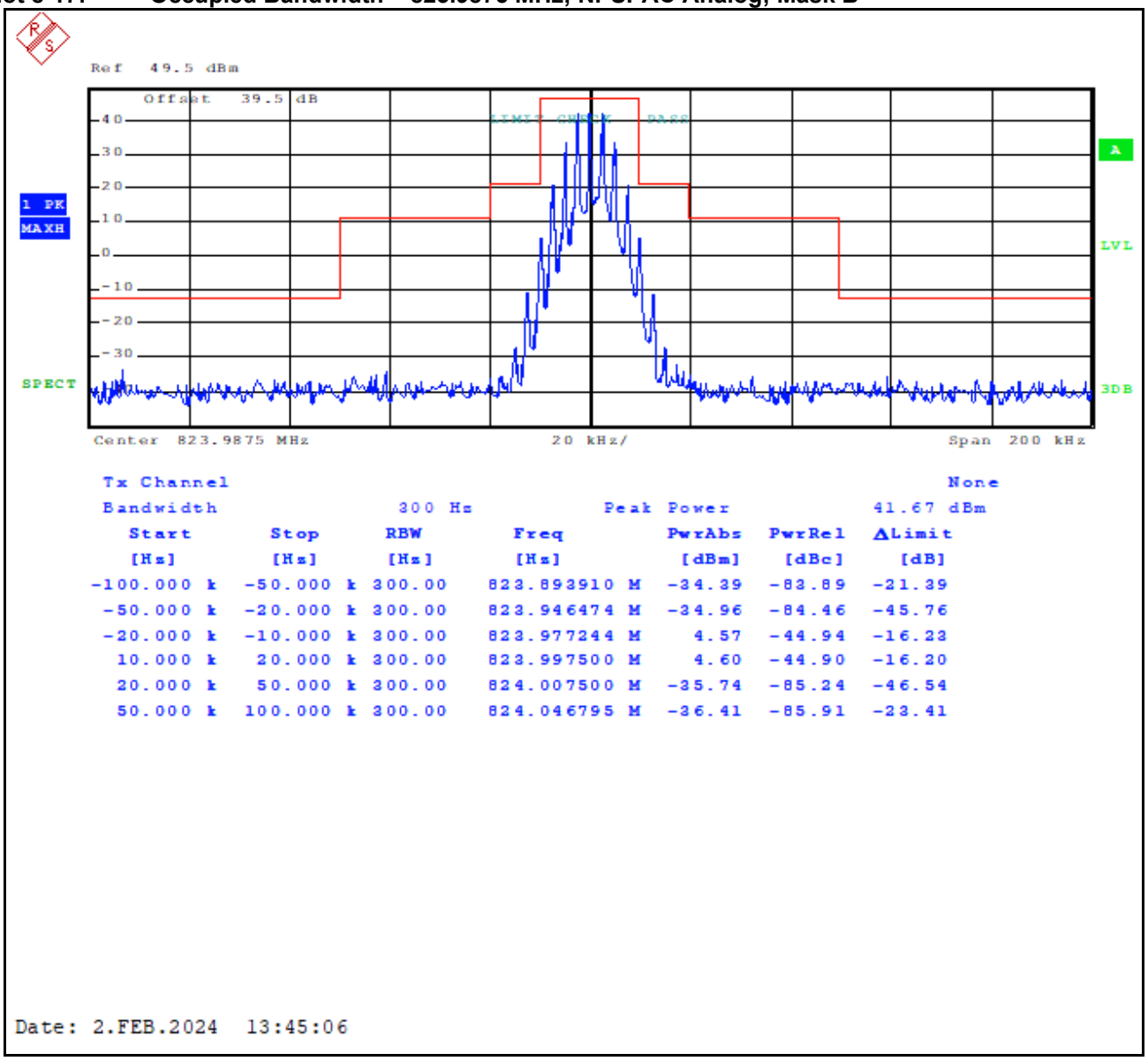
Plot 8-15: Occupied Bandwidth – 806.0125 MHz; NPSPAC Analog; Mask B



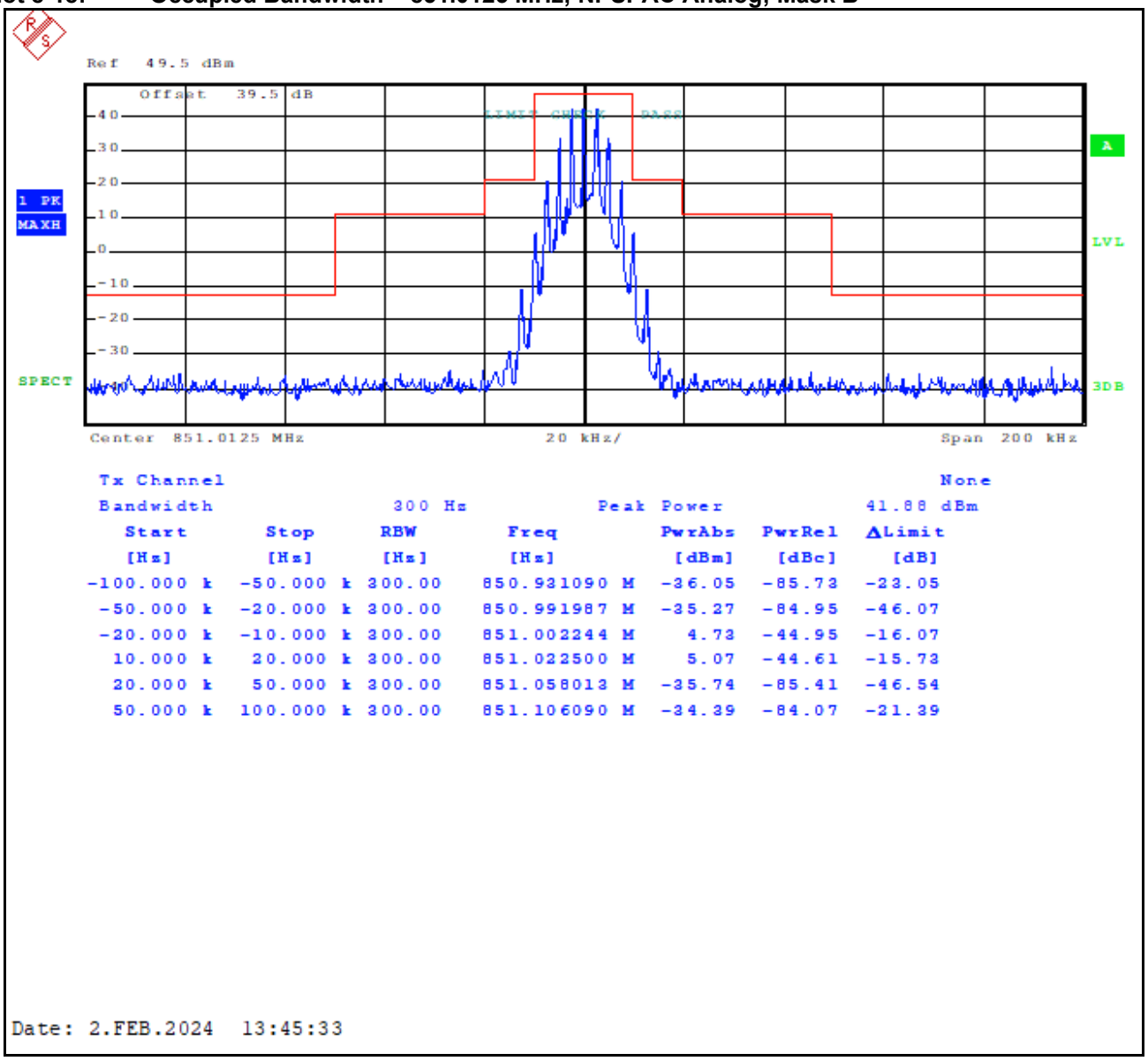
Plot 8-16: Occupied Bandwidth – 815.0000 MHz NPSPAC Analog; Mask B



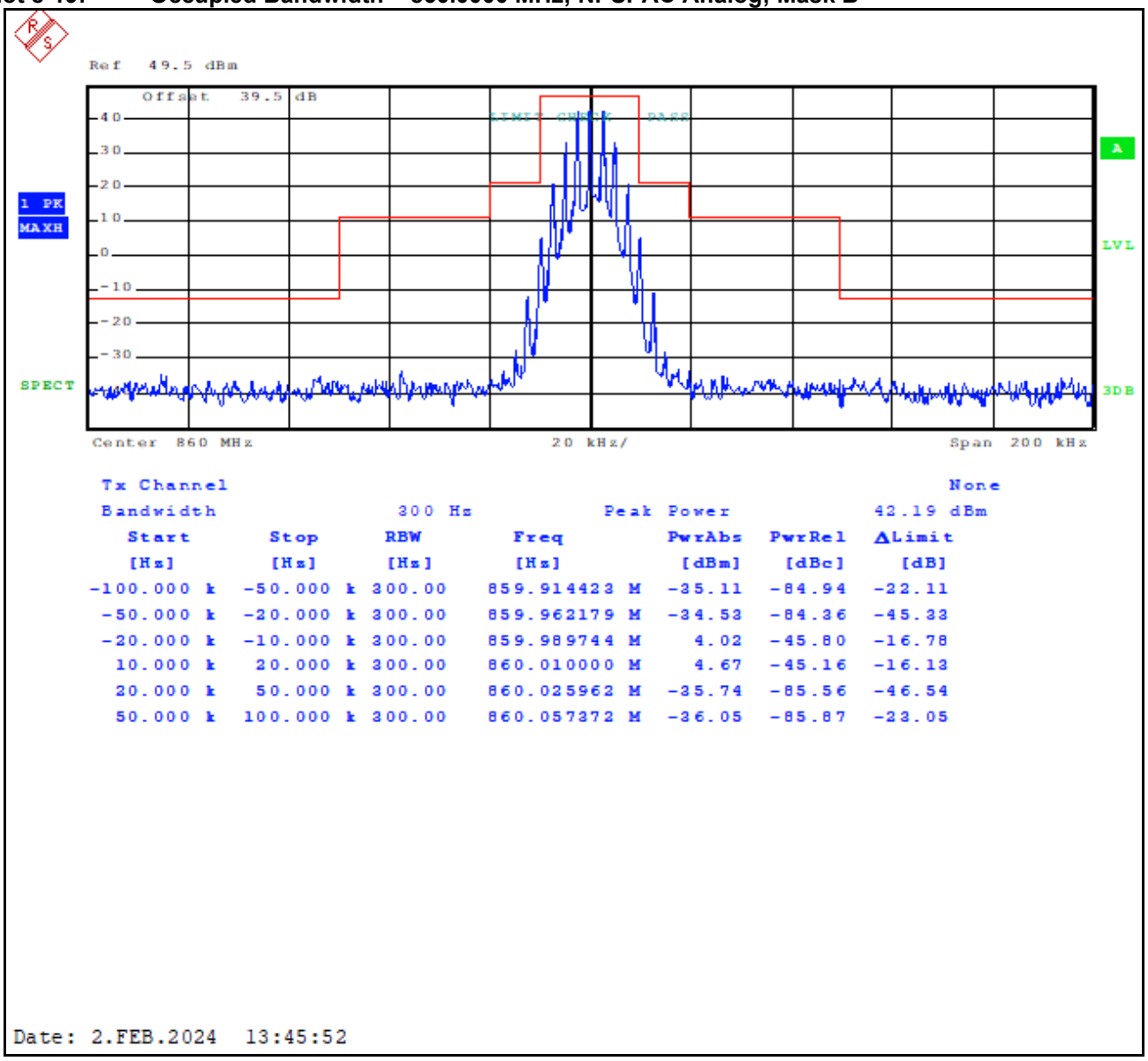
Plot 8-17: Occupied Bandwidth – 823.9875 MHz; NPSPAC Analog; Mask B



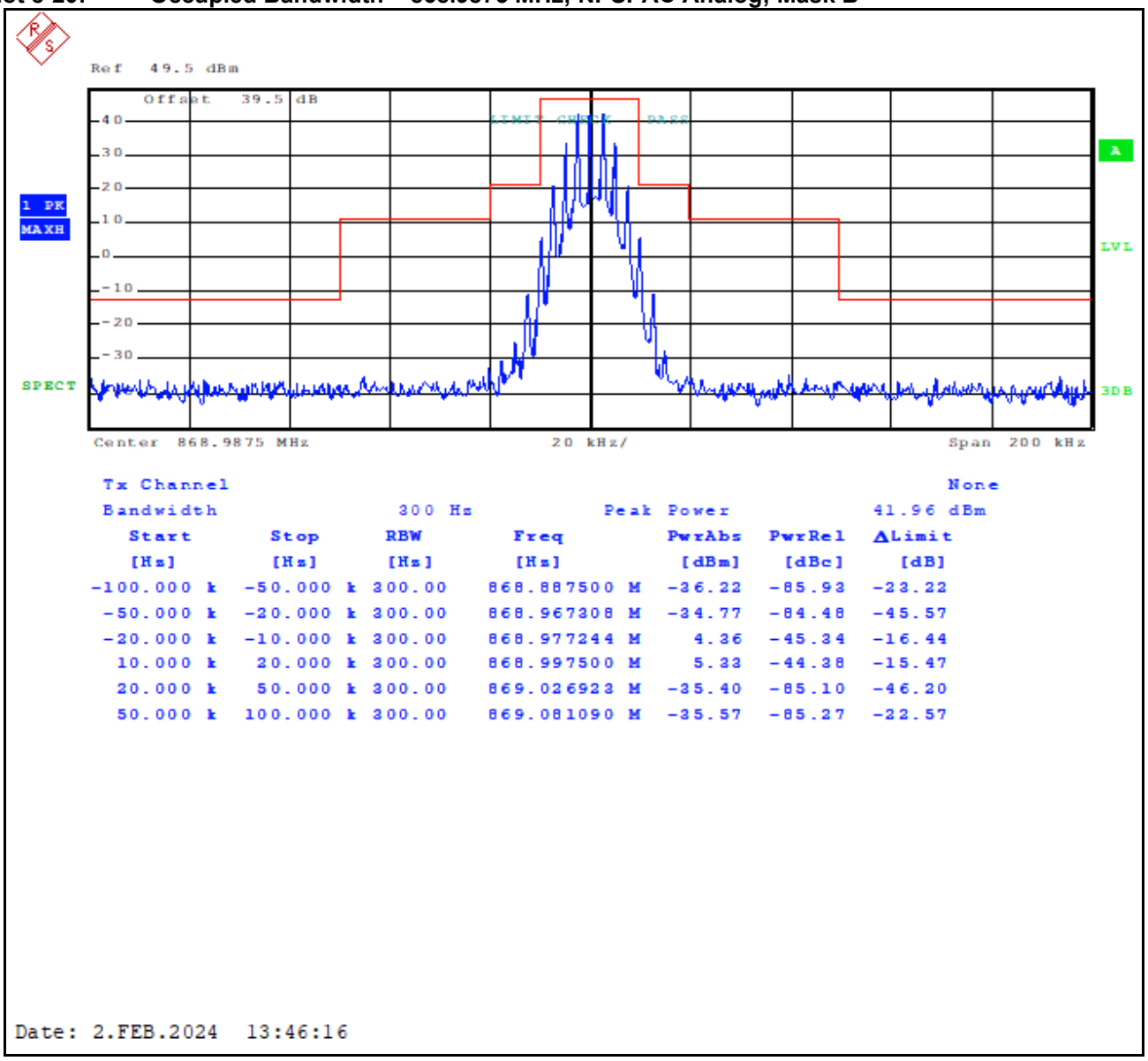
Plot 8-18: Occupied Bandwidth – 851.0125 MHz; NPSPAC Analog; Mask B



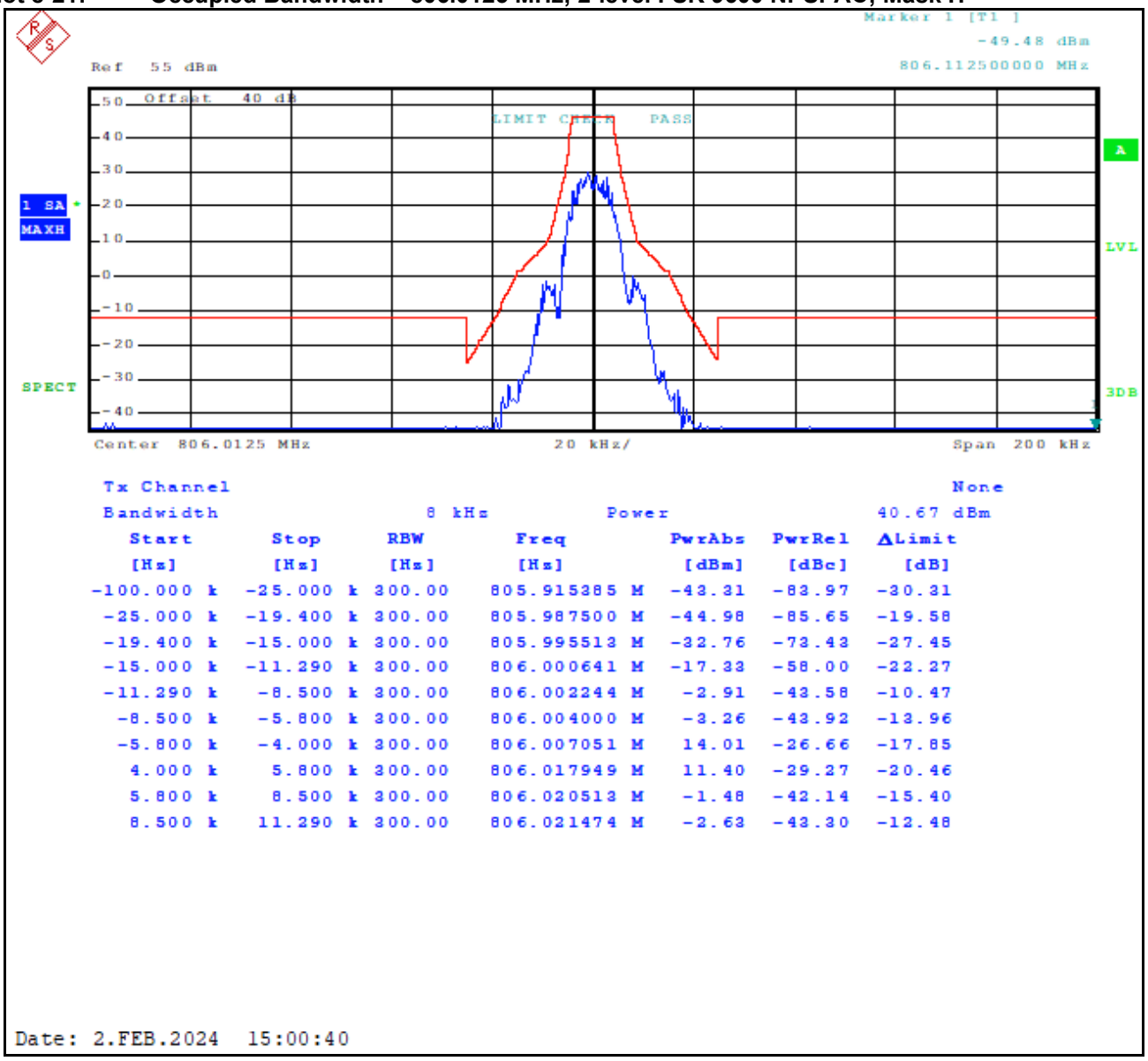
Plot 8-19: Occupied Bandwidth – 860.0000 MHz; NPSPAC Analog; Mask B



Plot 8-20: Occupied Bandwidth – 868.9875 MHz; NPSPAC Analog; Mask B



Plot 8-21: Occupied Bandwidth – 806.0125 MHz; 2-level FSK 9600 NPSPAC; Mask H



Tx Channel: None
Bandwidth: 8 kHz
Power: 40.67 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	805.915385 M	-43.31	-83.97	-30.31
-25.000 k	-19.400 k	300.00	805.987500 M	-44.98	-85.65	-19.58
-19.400 k	-15.000 k	300.00	805.995513 M	-32.76	-73.43	-27.45
-15.000 k	-11.290 k	300.00	806.000641 M	-17.33	-58.00	-22.27
-11.290 k	-8.500 k	300.00	806.002244 M	-2.91	-43.58	-10.47
-8.500 k	-5.800 k	300.00	806.004000 M	-3.26	-43.92	-13.96
-5.800 k	-4.000 k	300.00	806.007051 M	14.01	-26.66	-17.85
4.000 k	5.800 k	300.00	806.017949 M	11.40	-29.27	-20.46
5.800 k	8.500 k	300.00	806.020513 M	-1.48	-42.14	-15.40
8.500 k	11.290 k	300.00	806.021474 M	-2.63	-43.30	-12.48

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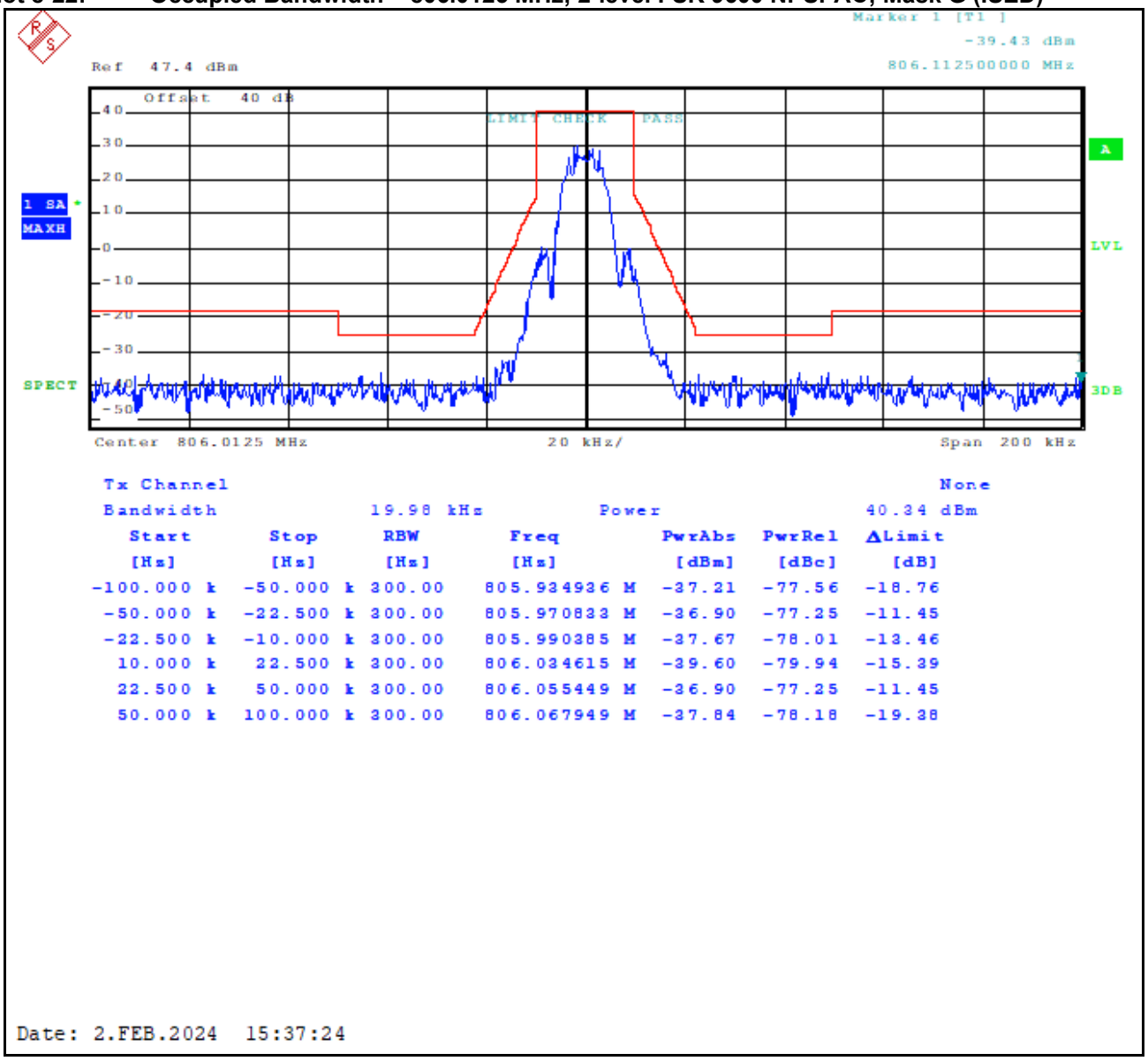
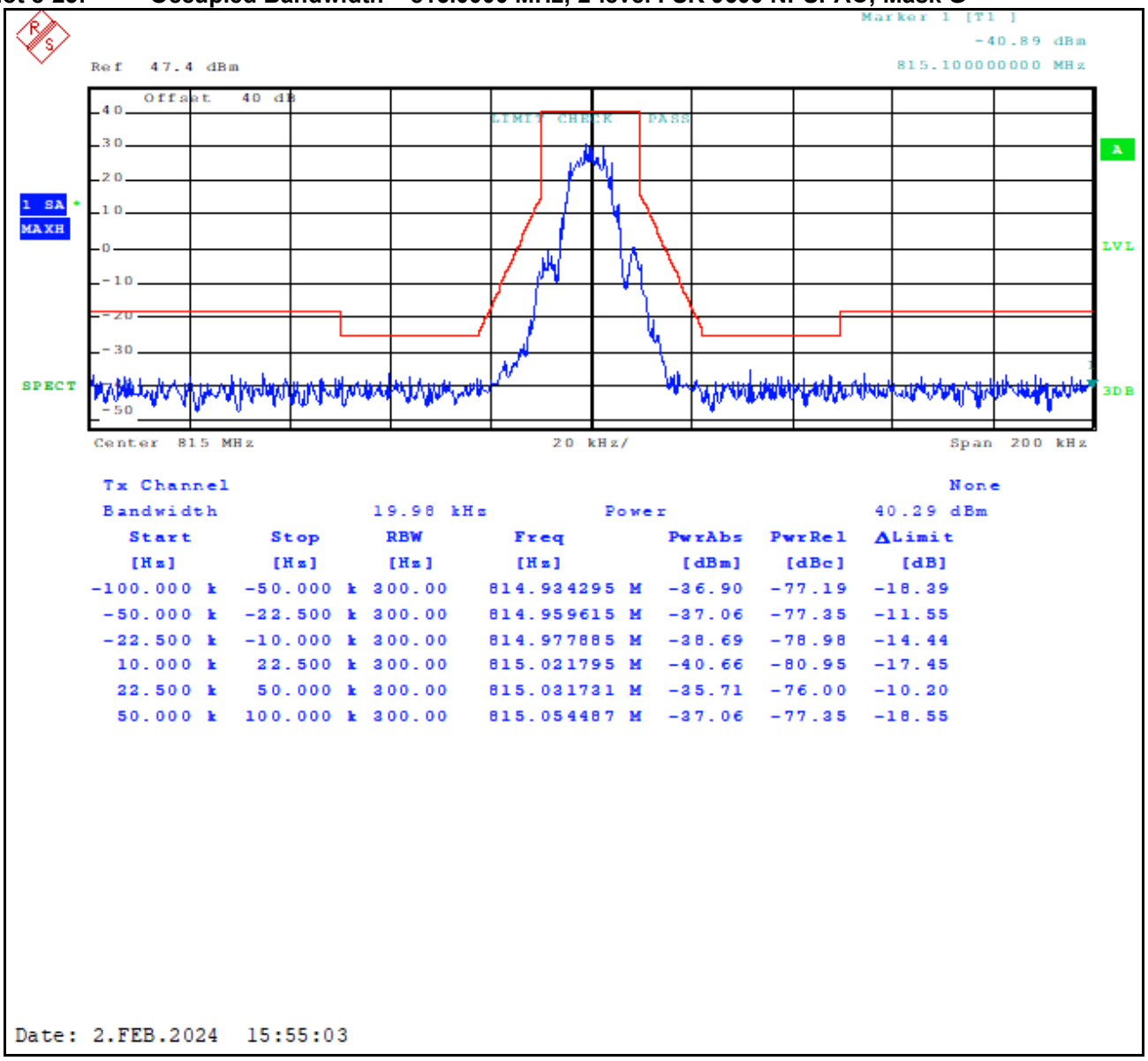
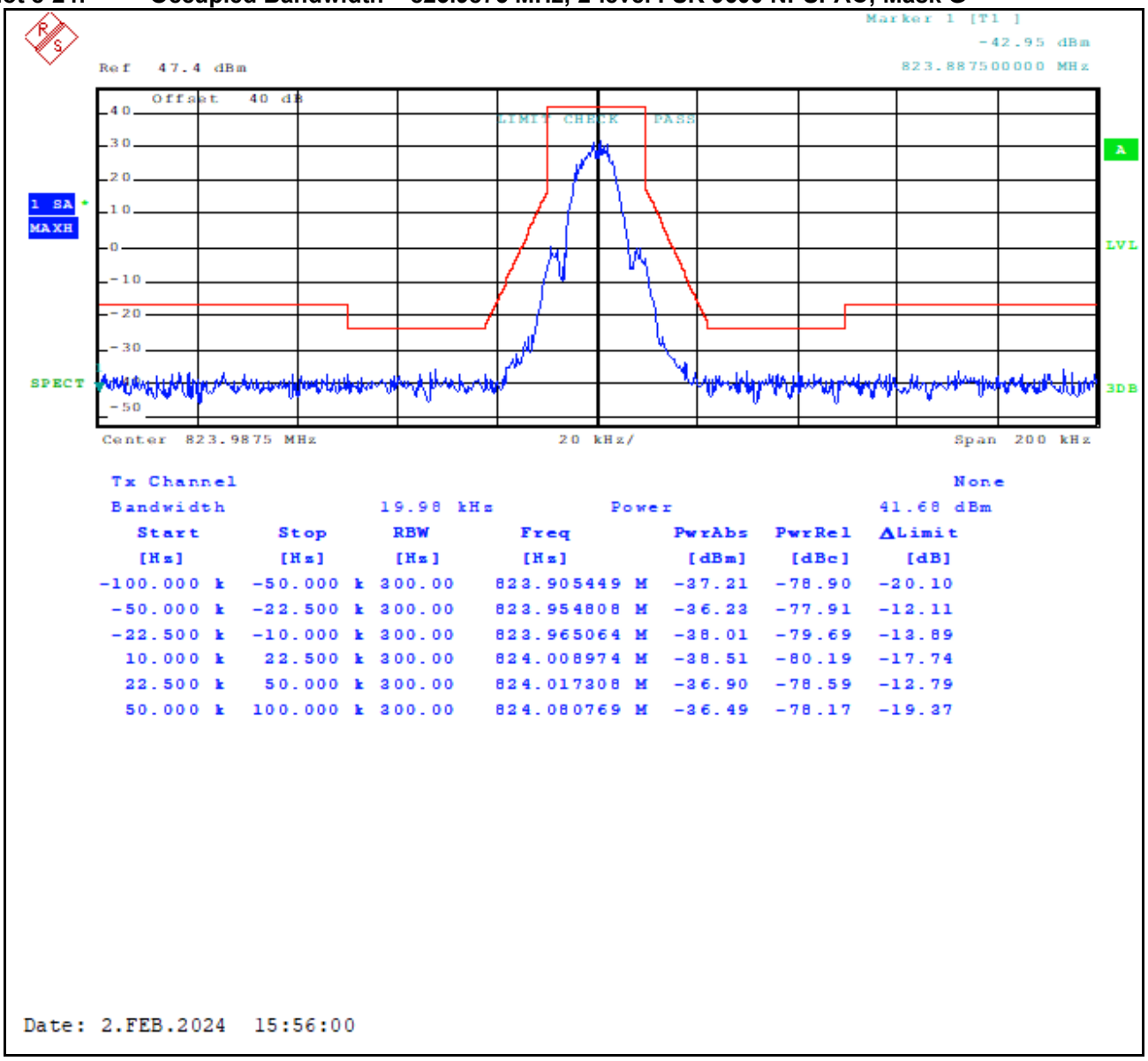
Plot 8-22: Occupied Bandwidth – 806.0125 MHz; 2-level FSK 9600 NPSPAC; Mask G (ISED)



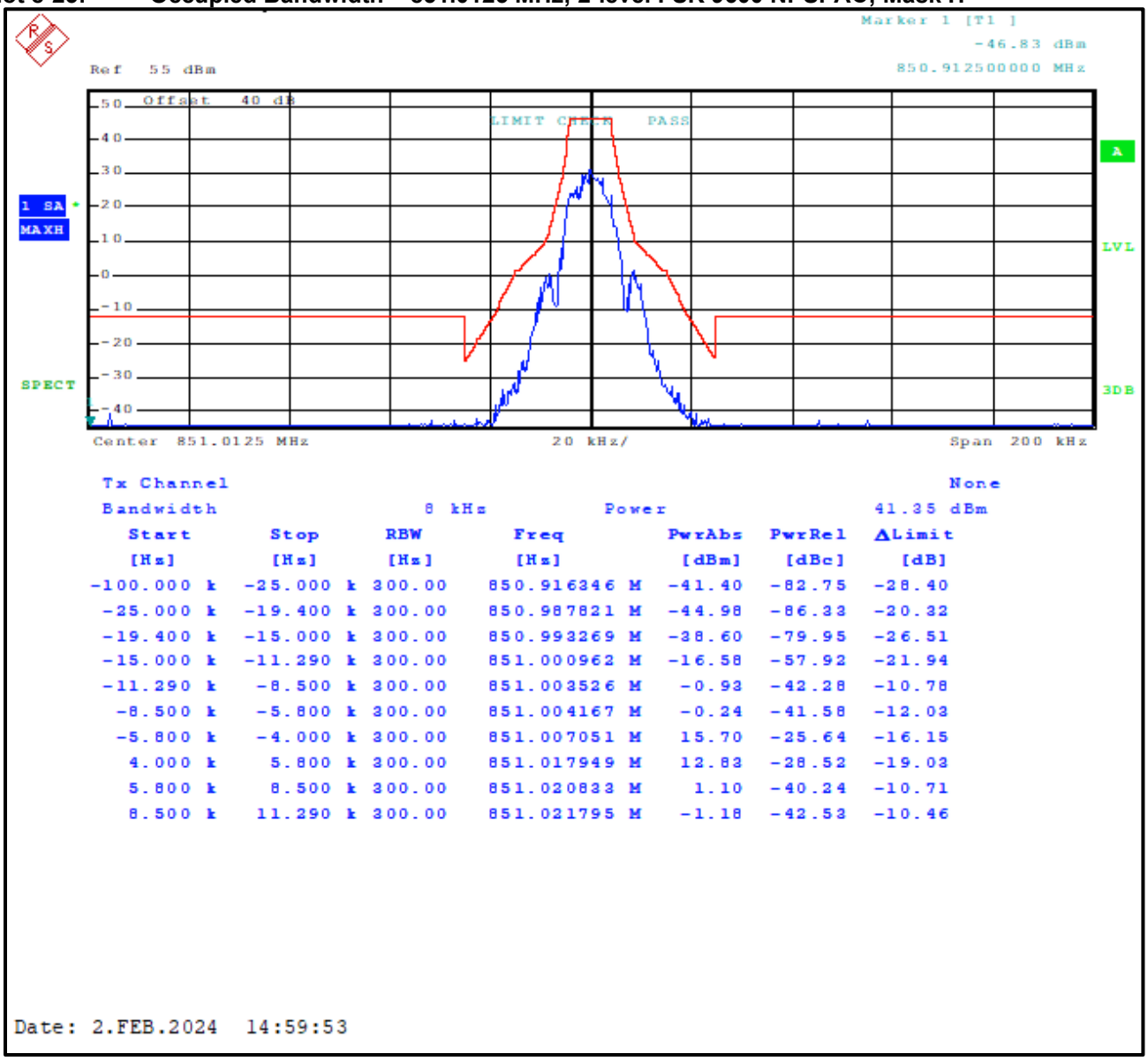
Plot 8-23: Occupied Bandwidth – 815.0000 MHz; 2-level FSK 9600 NPSPAC; Mask G



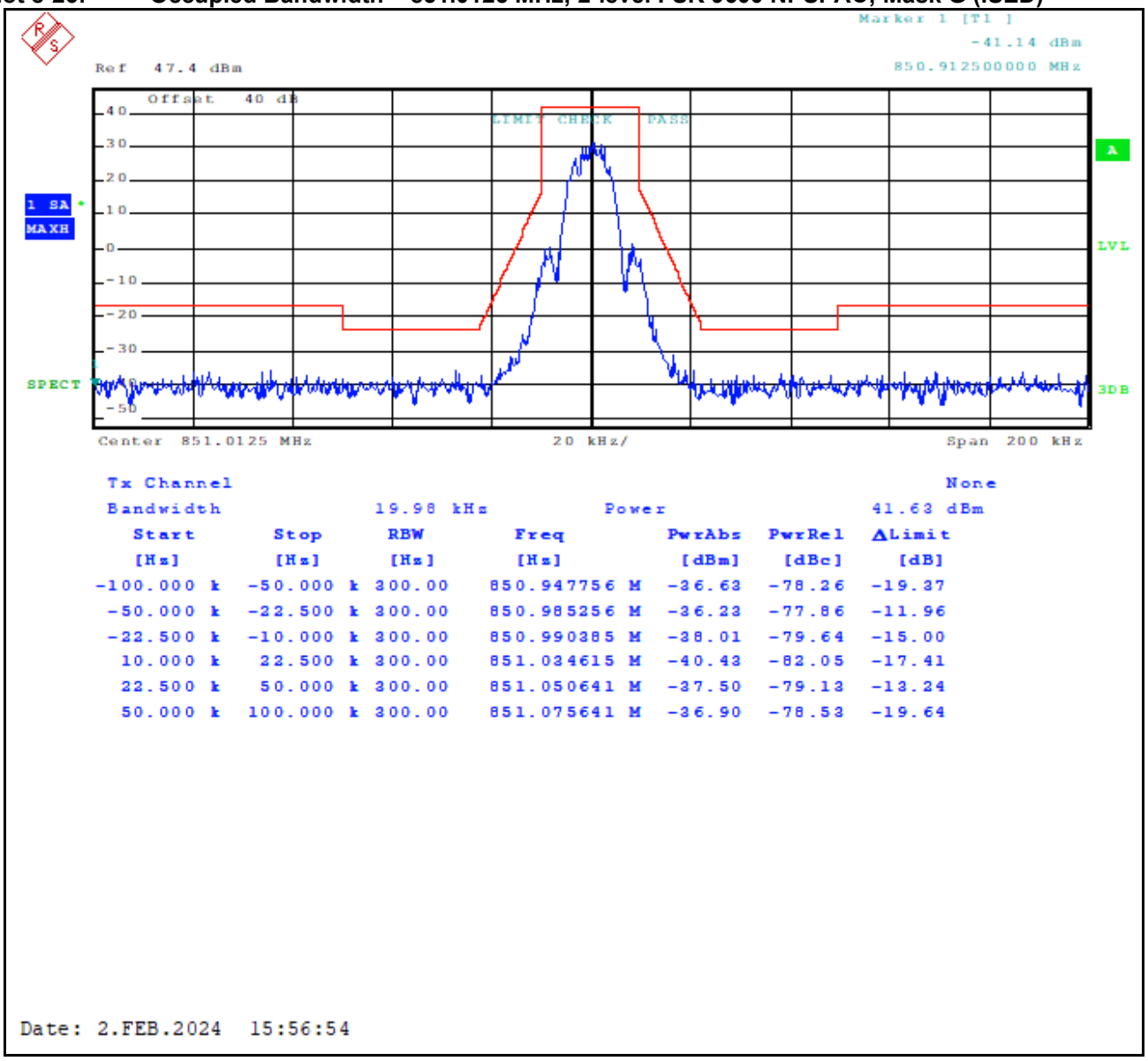
Plot 8-24: Occupied Bandwidth – 823.9875 MHz; 2-level FSK 9600 NPSPAC; Mask G



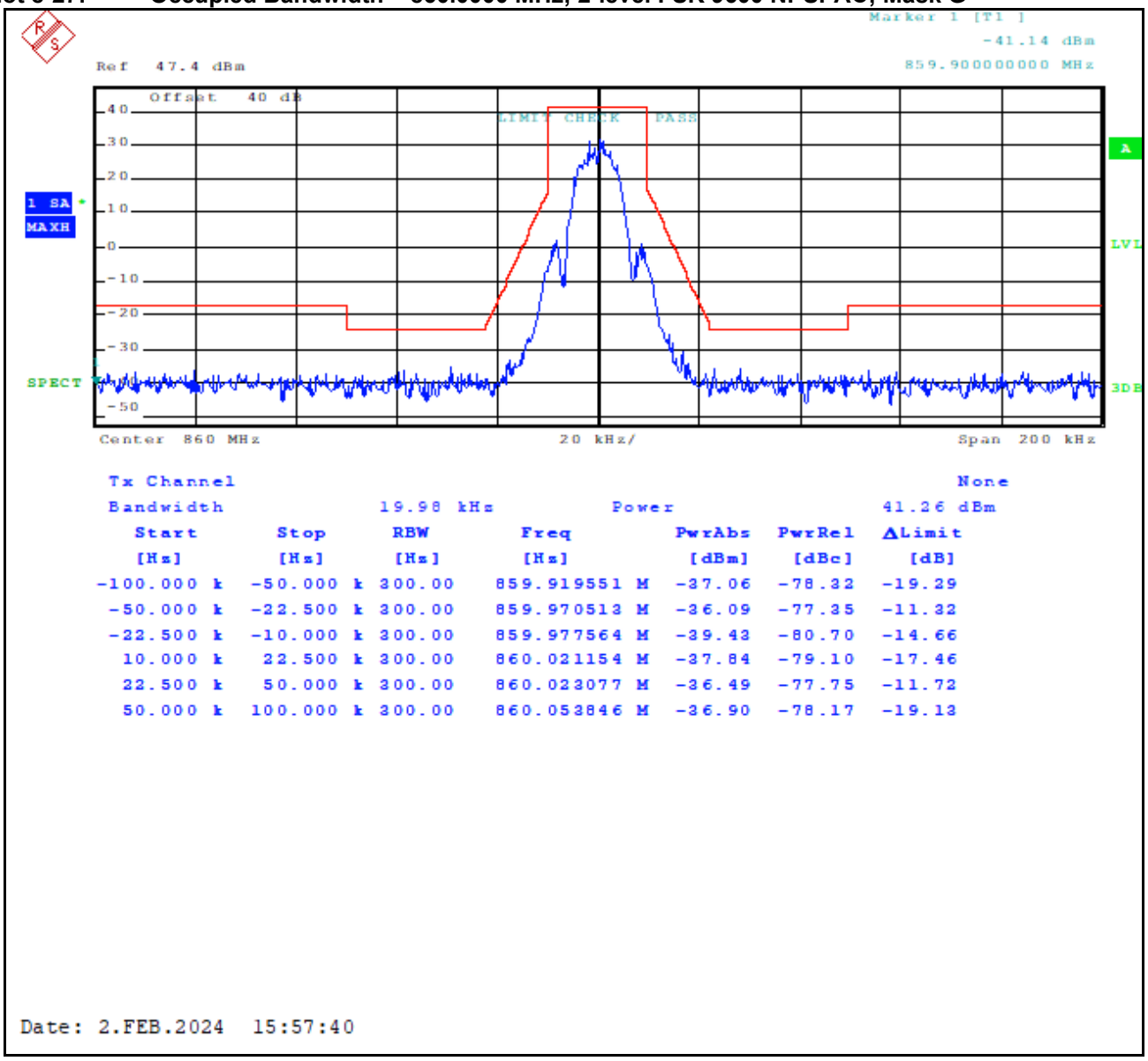
Plot 8-25: Occupied Bandwidth – 851.0125 MHz; 2-level FSK 9600 NPSPAC; Mask H



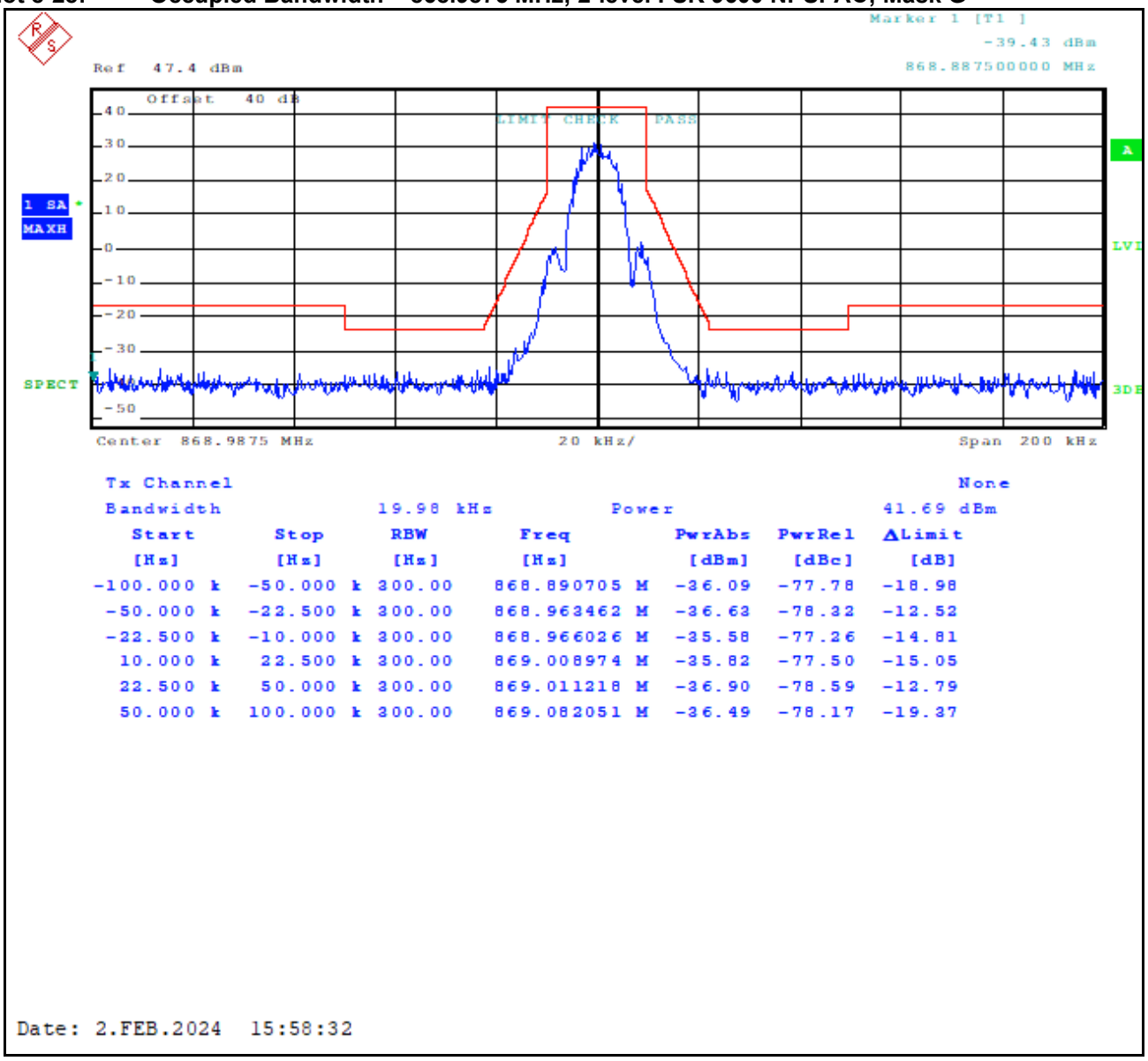
Plot 8-26: Occupied Bandwidth – 851.0125 MHz; 2-level FSK 9600 NPSPAC; Mask G (ISED)



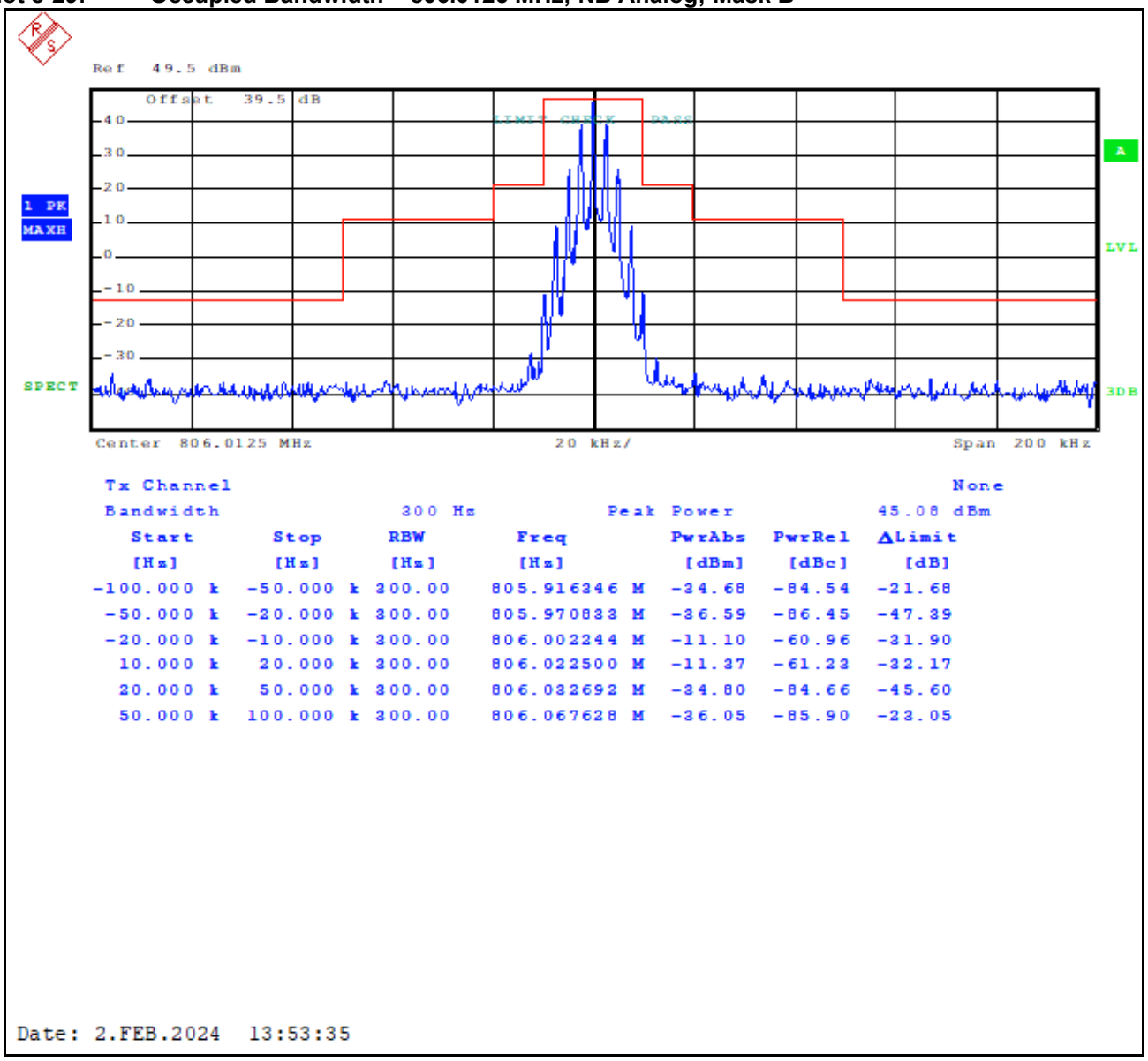
Plot 8-27: Occupied Bandwidth – 860.0000 MHz; 2-level FSK 9600 NPSPAC; Mask G



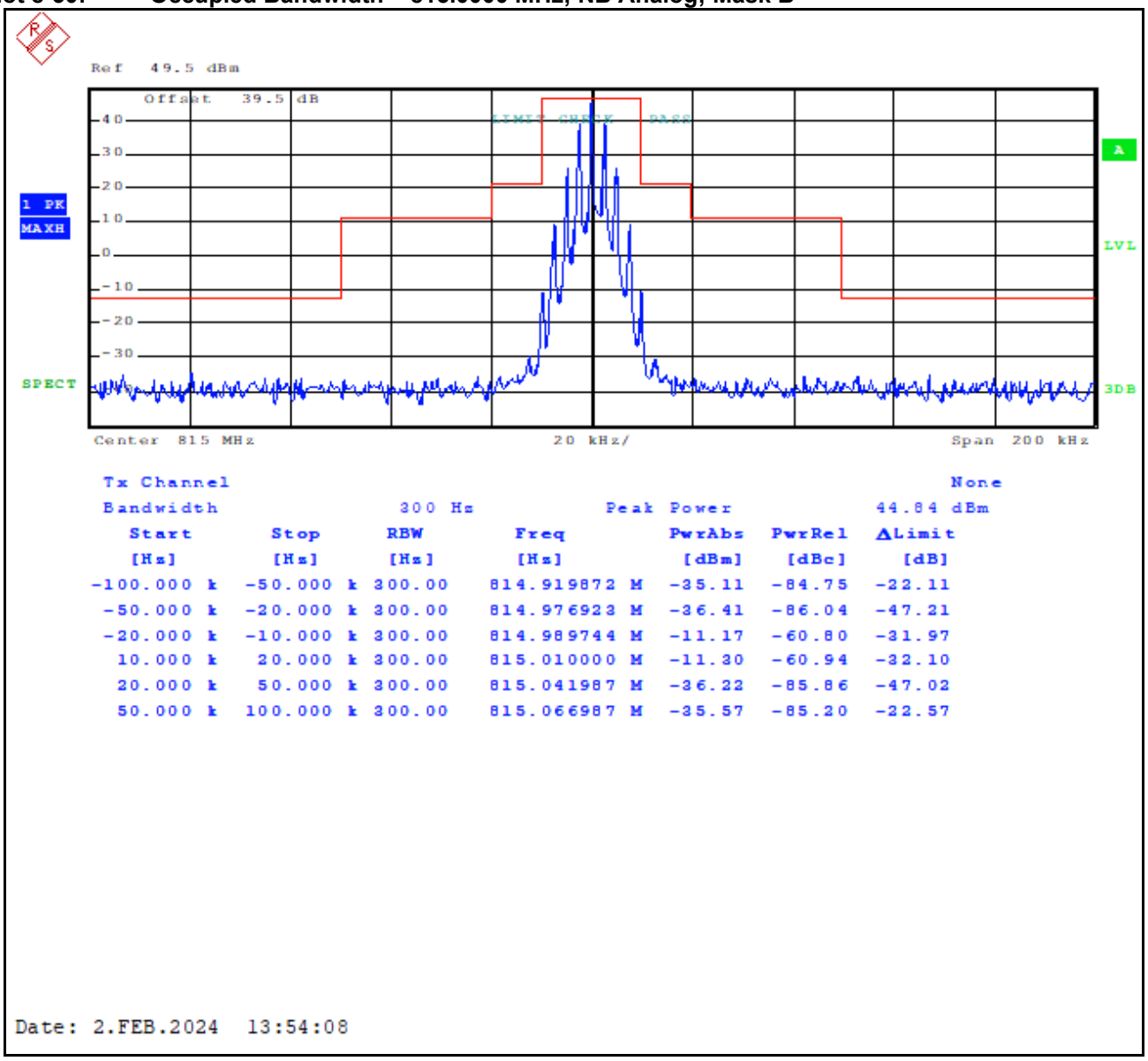
Plot 8-28: Occupied Bandwidth – 868.9875 MHz; 2-level FSK 9600 NPSPAC; Mask G



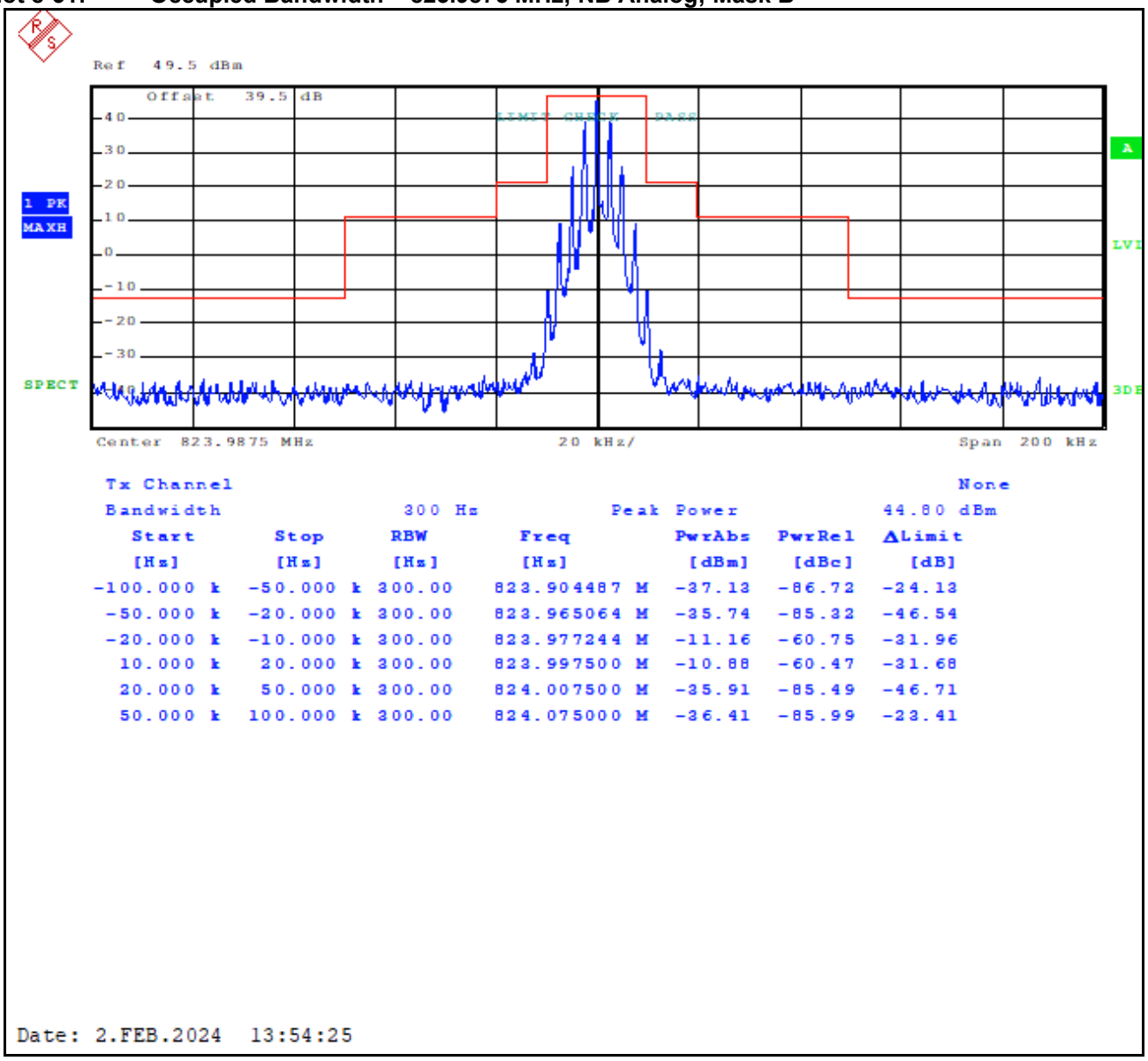
Plot 8-29: Occupied Bandwidth – 806.0125 MHz; NB Analog; Mask B



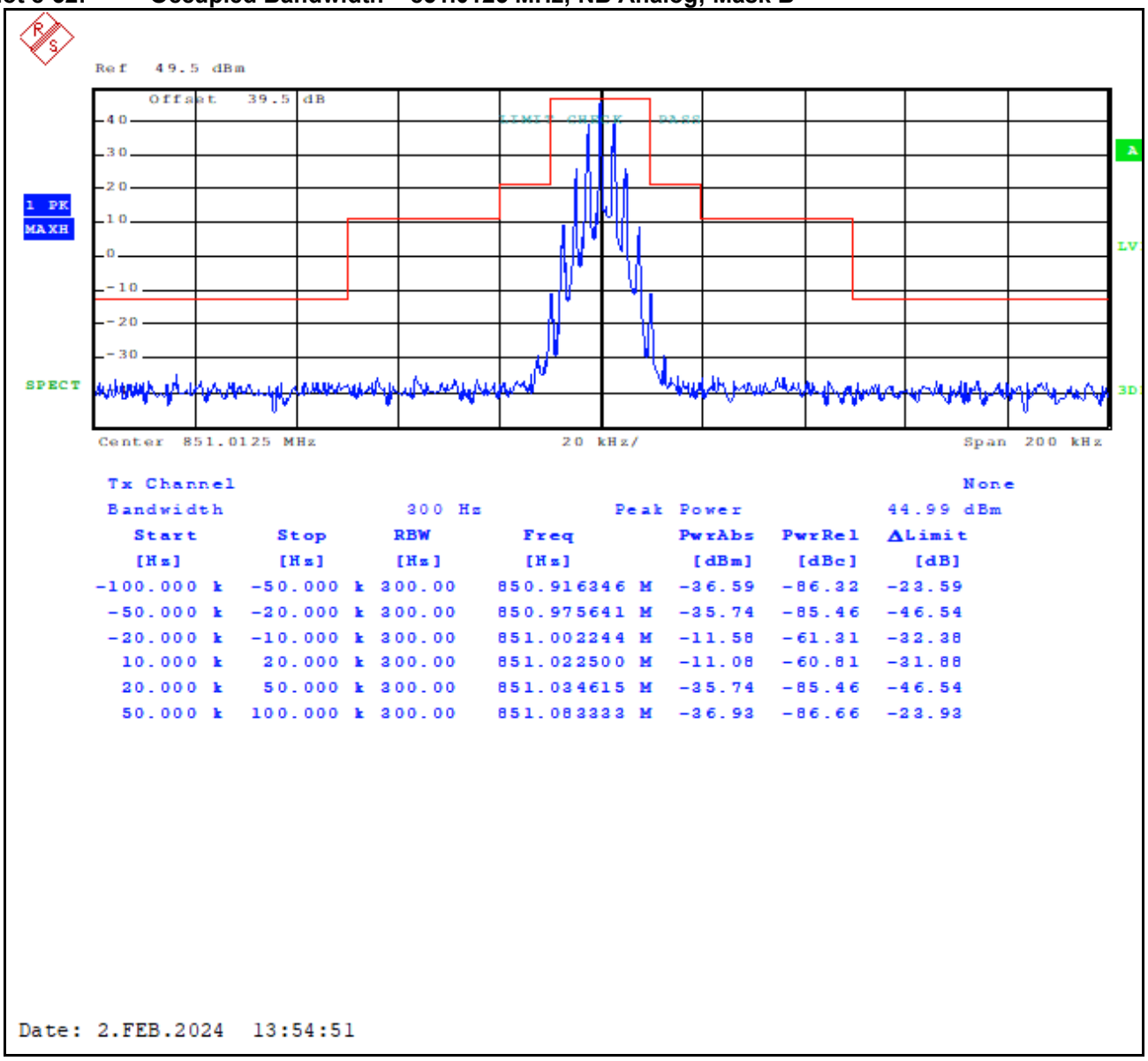
Plot 8-30: Occupied Bandwidth – 815.0000 MHz; NB Analog; Mask B



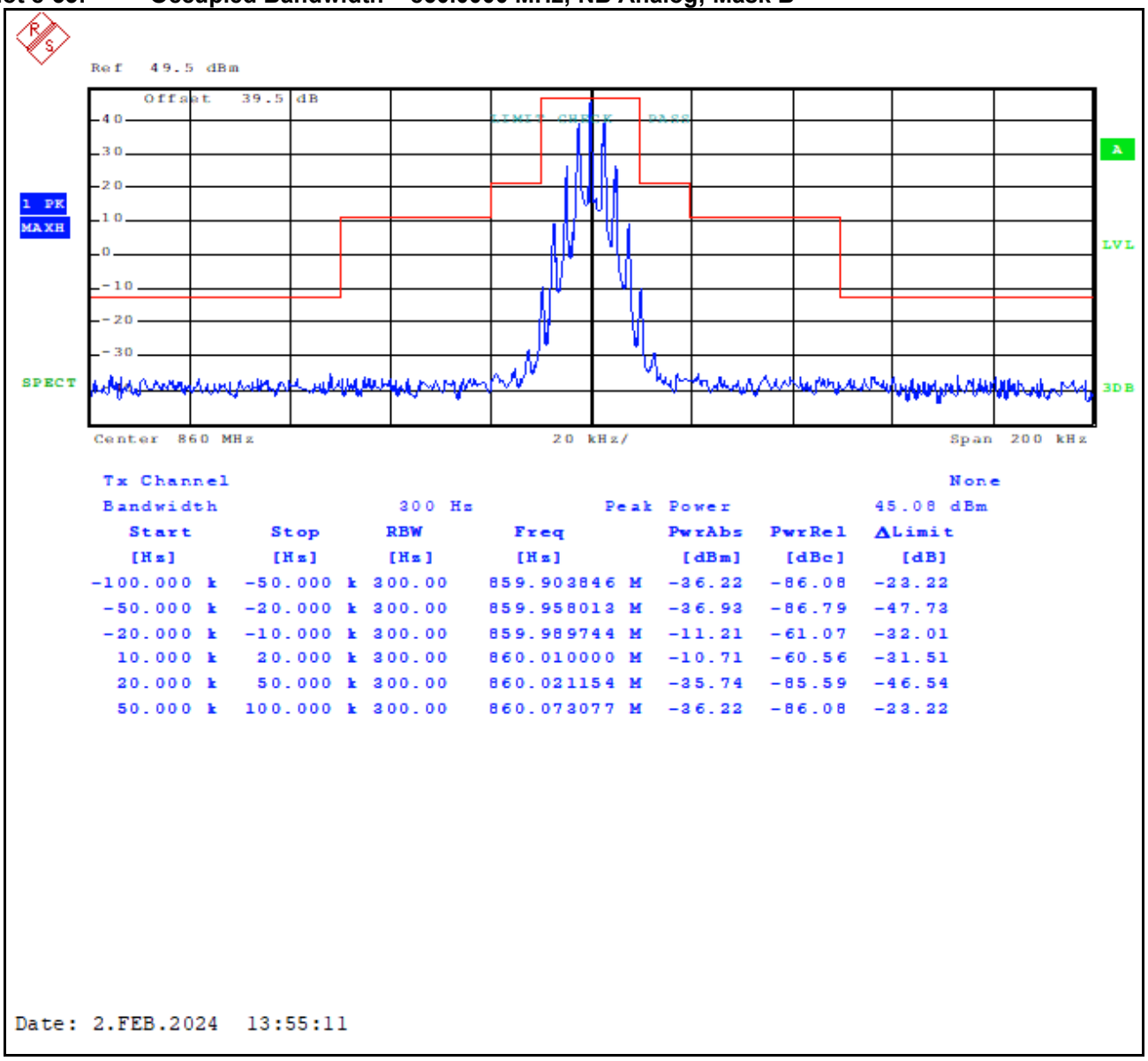
Plot 8-31: Occupied Bandwidth – 823.9875 MHz; NB Analog; Mask B



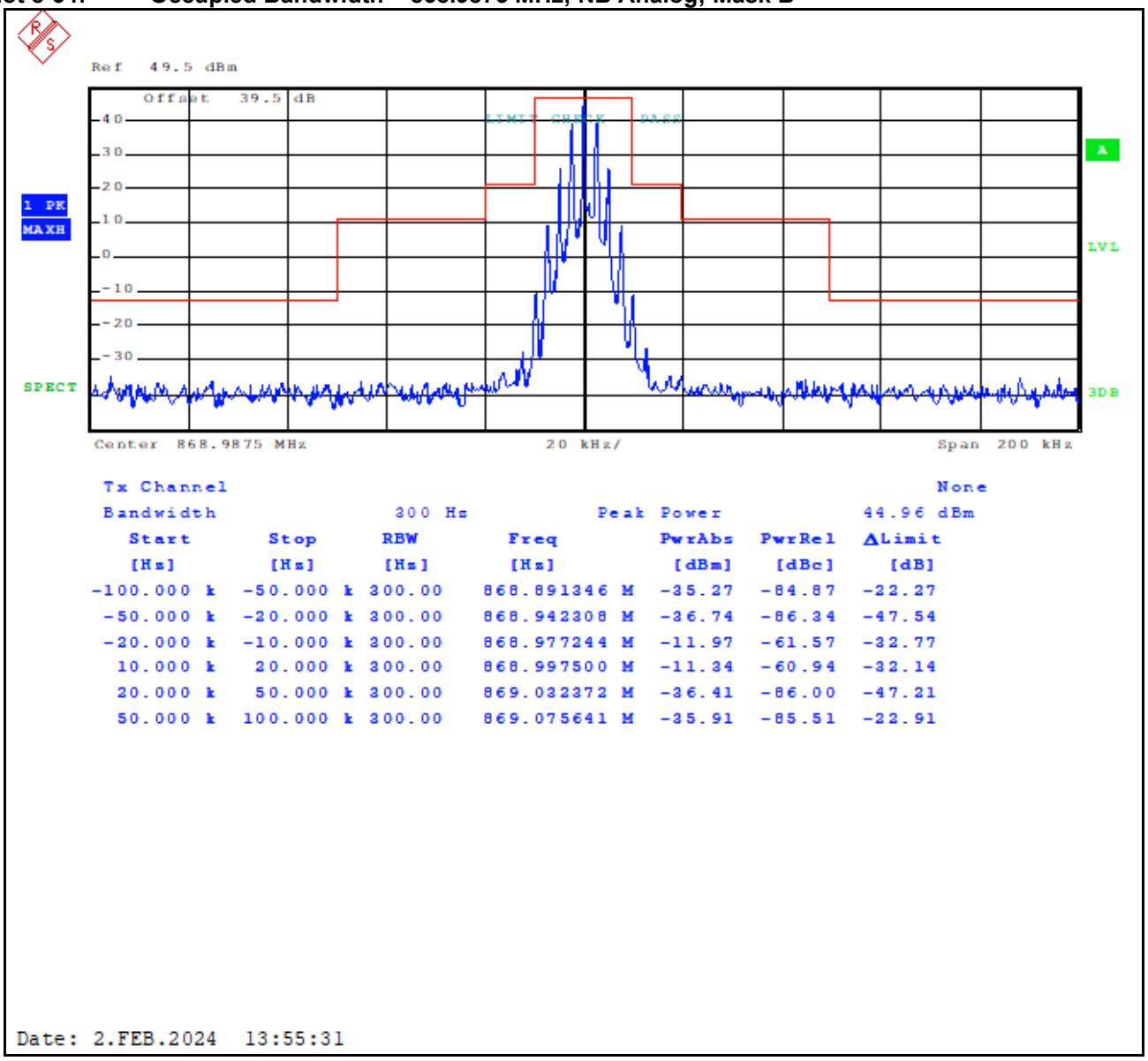
Plot 8-32: Occupied Bandwidth – 851.0125 MHz; NB Analog; Mask B



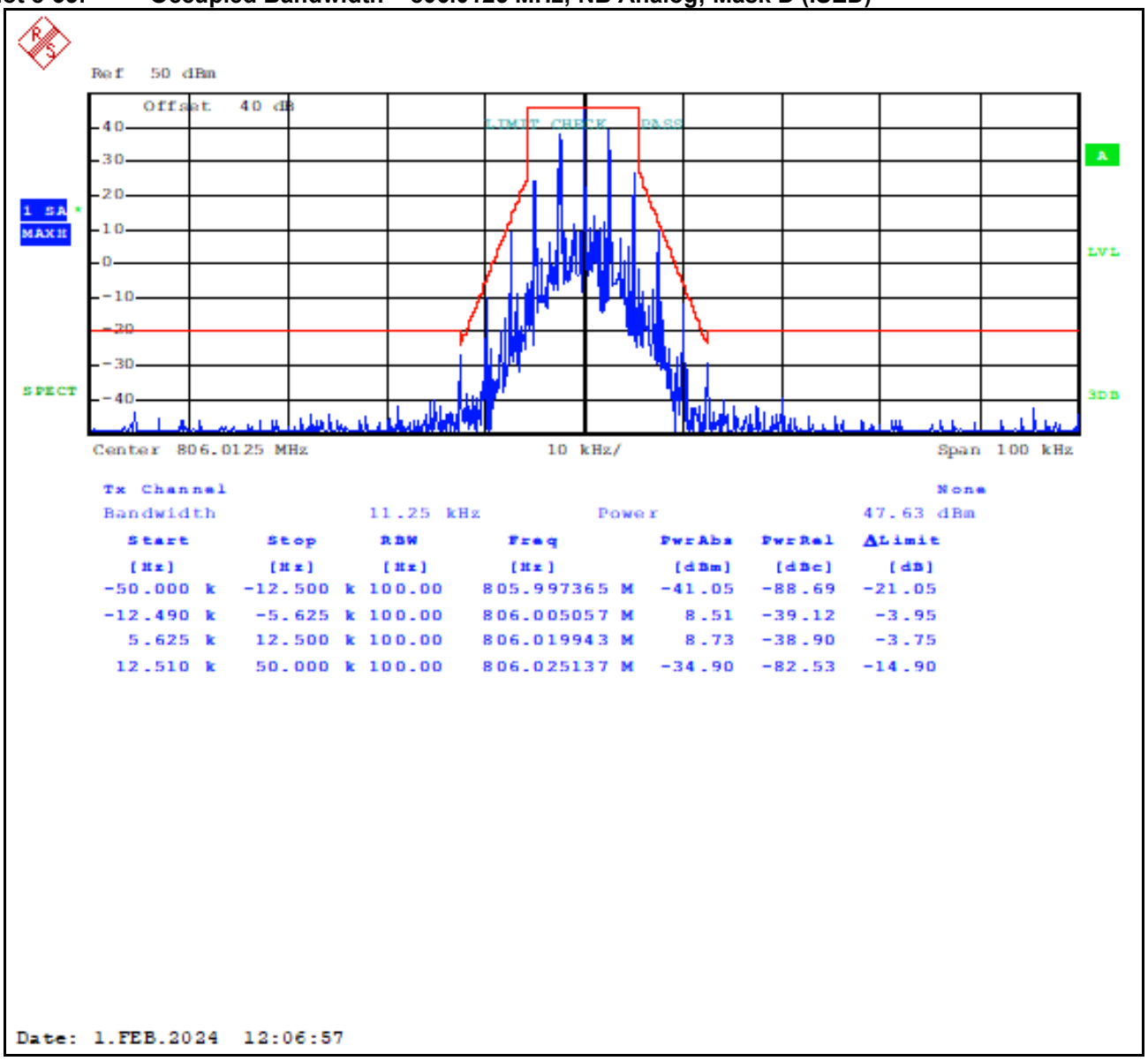
Plot 8-33: Occupied Bandwidth – 860.0000 MHz; NB Analog; Mask B



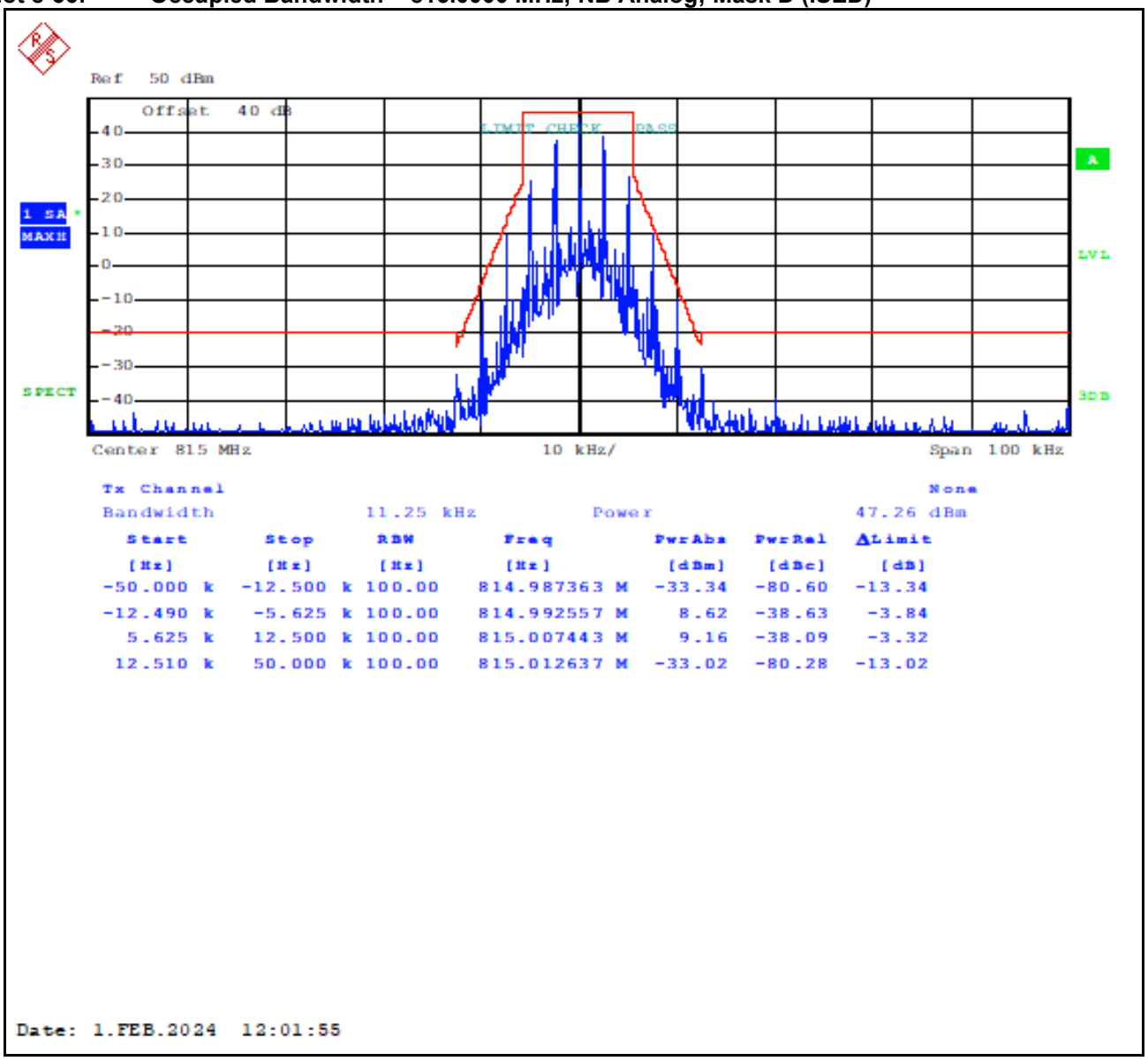
Plot 8-34: Occupied Bandwidth – 868.9875 MHz; NB Analog; Mask B



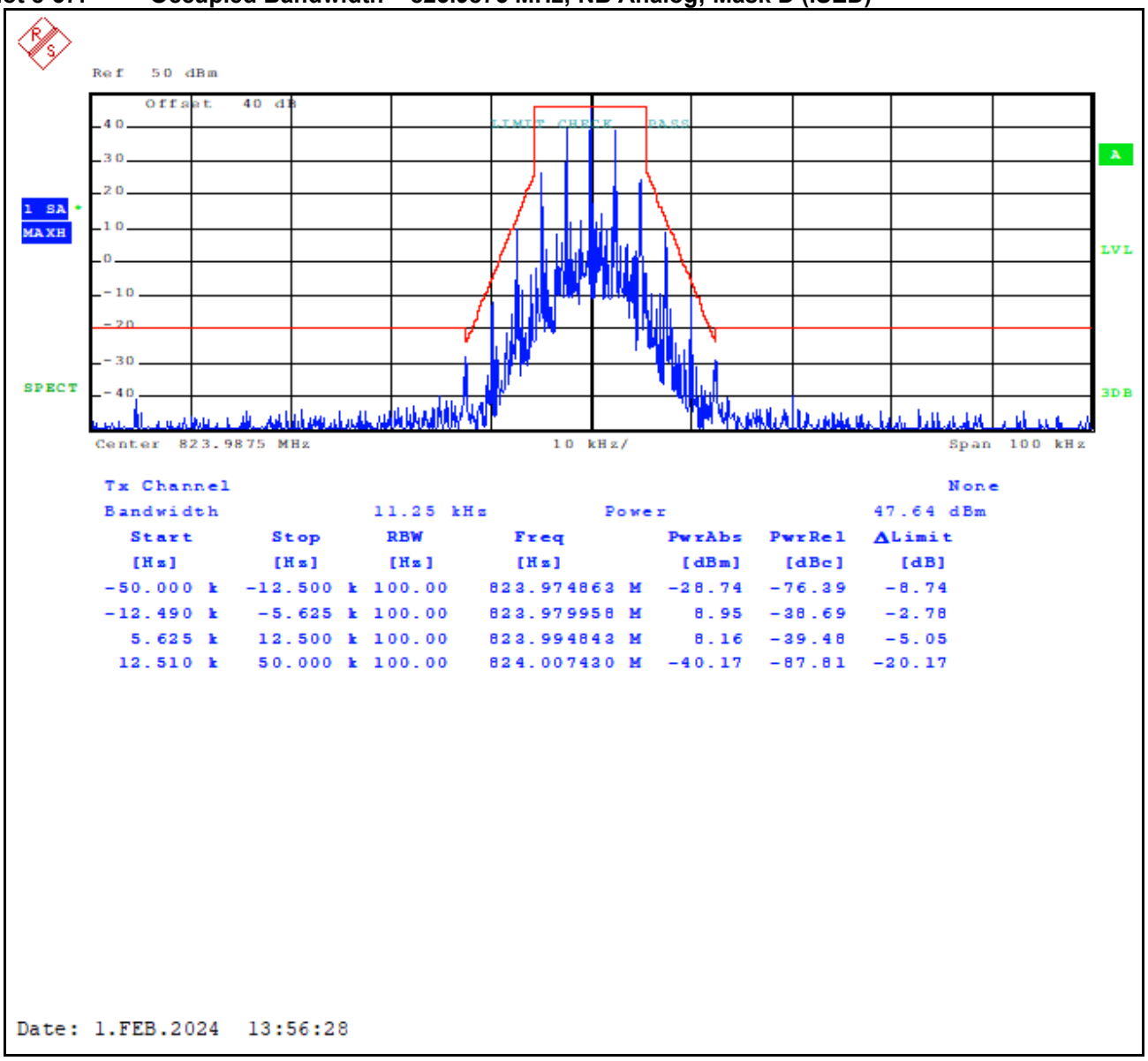
Plot 8-35: Occupied Bandwidth – 806.0125 MHz; NB Analog; Mask D (ISED)



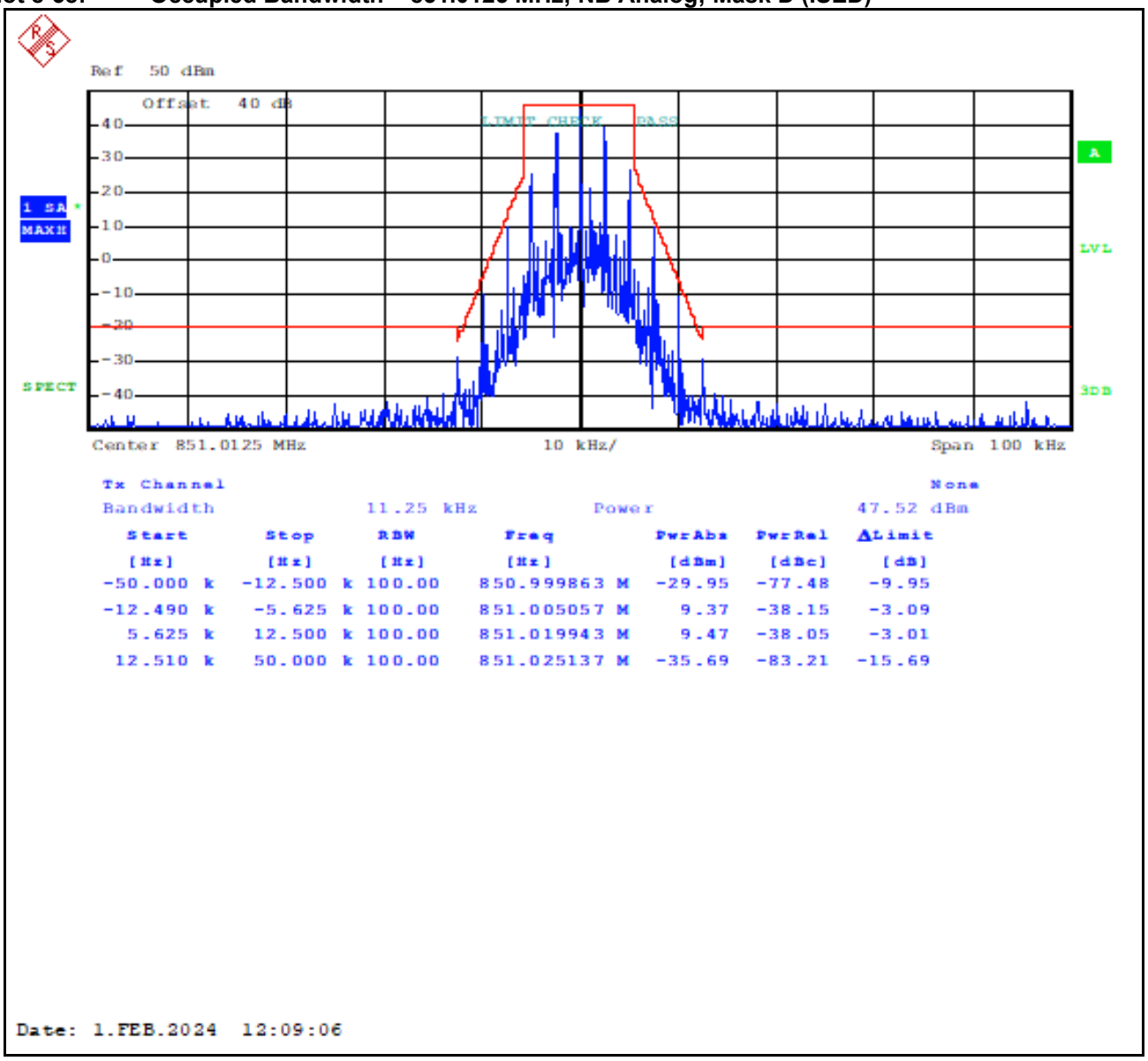
Plot 8-36: Occupied Bandwidth – 815.0000 MHz; NB Analog; Mask D (ISED)



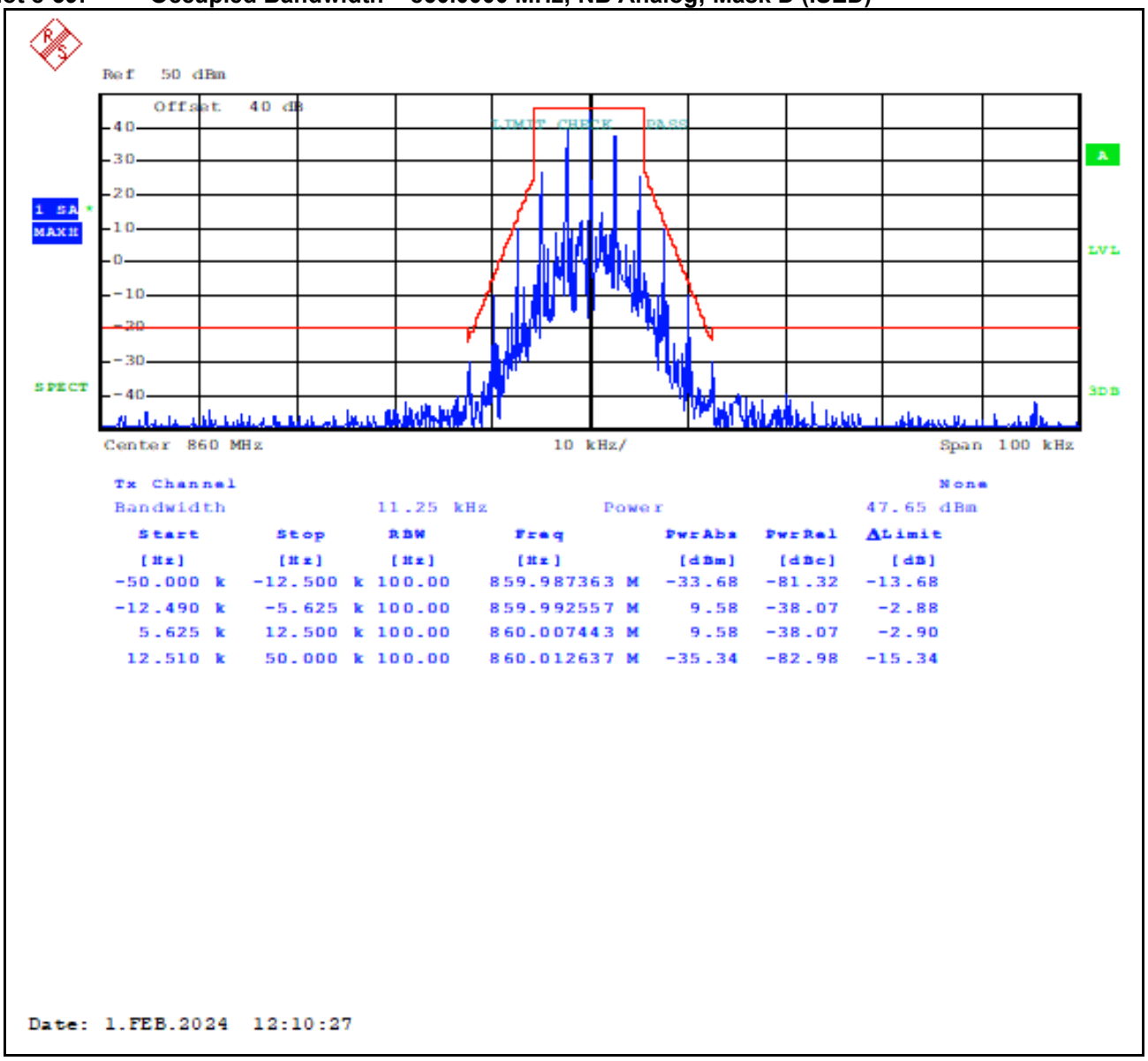
Plot 8-37: Occupied Bandwidth – 823.9875 MHz; NB Analog; Mask D (ISED)



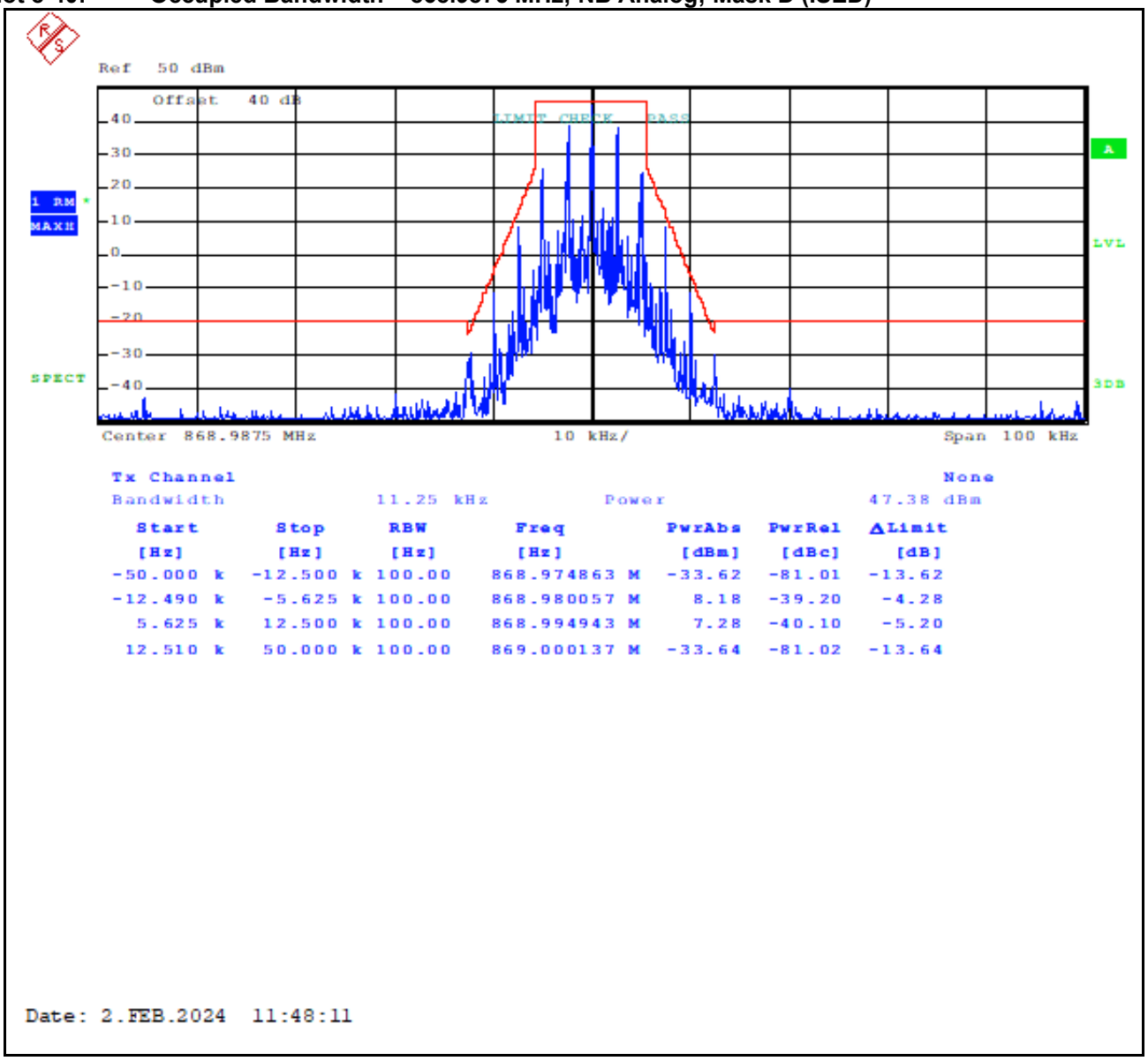
Plot 8-38: Occupied Bandwidth – 851.0125 MHz; NB Analog; Mask D (ISED)



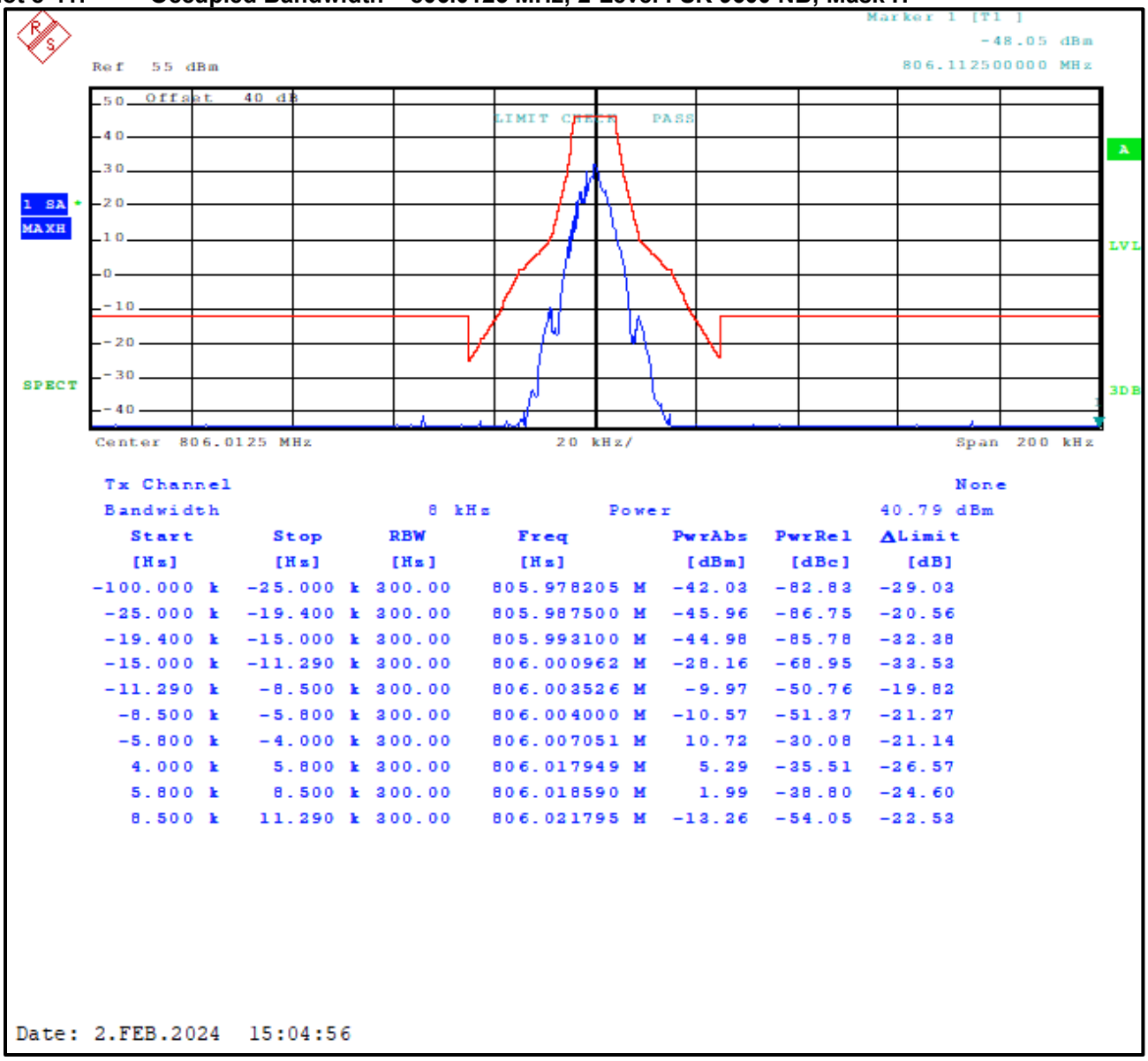
Plot 8-39: Occupied Bandwidth – 860.0000 MHz; NB Analog; Mask D (ISED)



Plot 8-40: Occupied Bandwidth – 868.9875 MHz; NB Analog; Mask D (ISED)



Plot 8-41: Occupied Bandwidth – 806.0125 MHz; 2-Level FSK 9600 NB; Mask H



Tx Channel: None
Bandwidth: 8 kHz
Power: 40.79 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	805.978205 M	-42.03	-82.83	-29.03
-25.000 k	-19.400 k	300.00	805.987500 M	-45.96	-86.75	-20.56
-19.400 k	-15.000 k	300.00	805.993100 M	-44.98	-85.78	-32.38
-15.000 k	-11.290 k	300.00	806.000962 M	-28.16	-68.95	-33.53
-11.290 k	-8.500 k	300.00	806.003526 M	-9.97	-50.76	-19.82
-8.500 k	-5.800 k	300.00	806.004000 M	-10.57	-51.37	-21.27
-5.800 k	-4.000 k	300.00	806.007051 M	10.72	-30.08	-21.14
4.000 k	5.800 k	300.00	806.017949 M	5.29	-35.51	-26.57
5.800 k	8.500 k	300.00	806.018590 M	1.99	-38.80	-24.60
8.500 k	11.290 k	300.00	806.021795 M	-13.26	-54.05	-22.53

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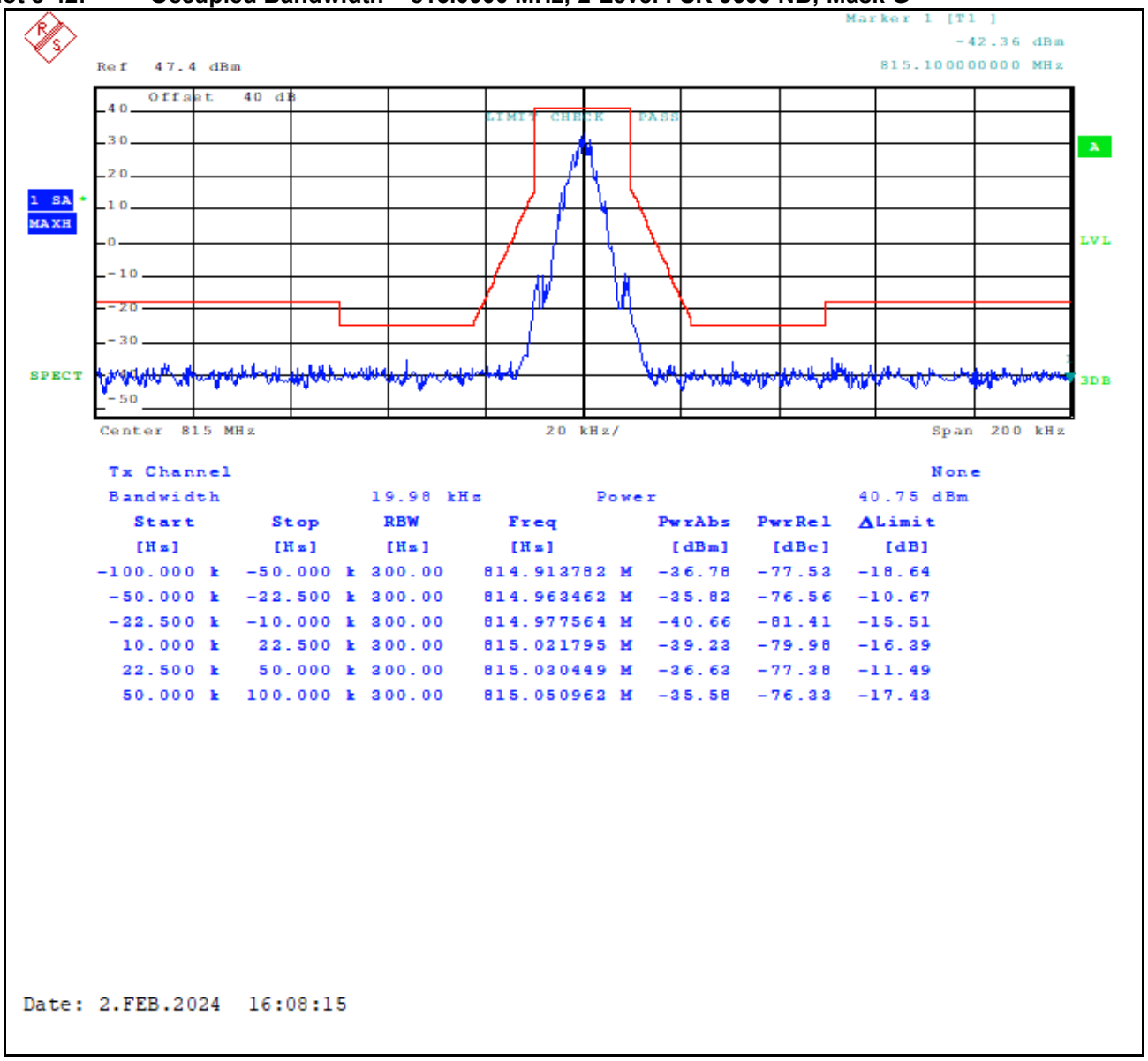
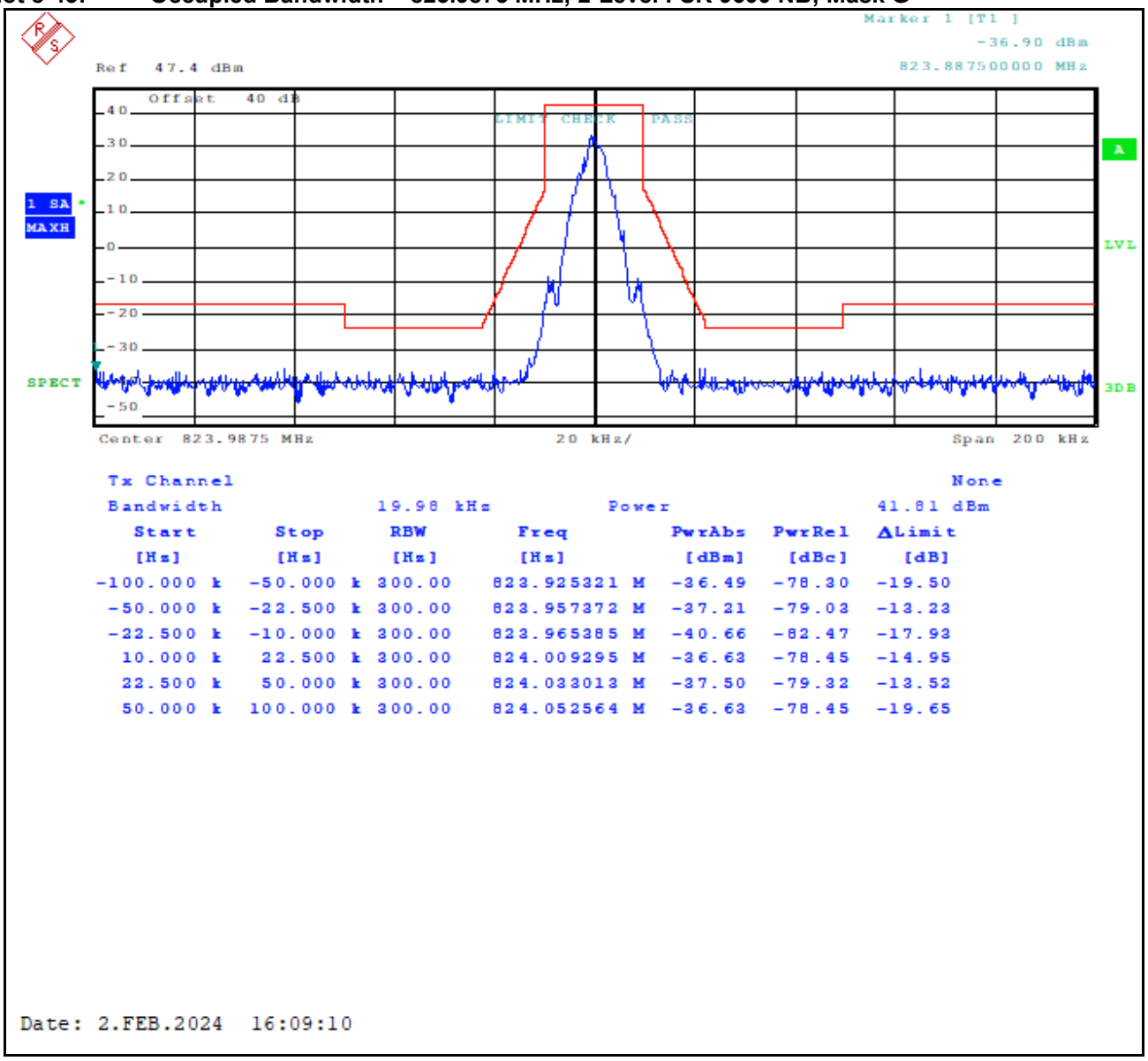
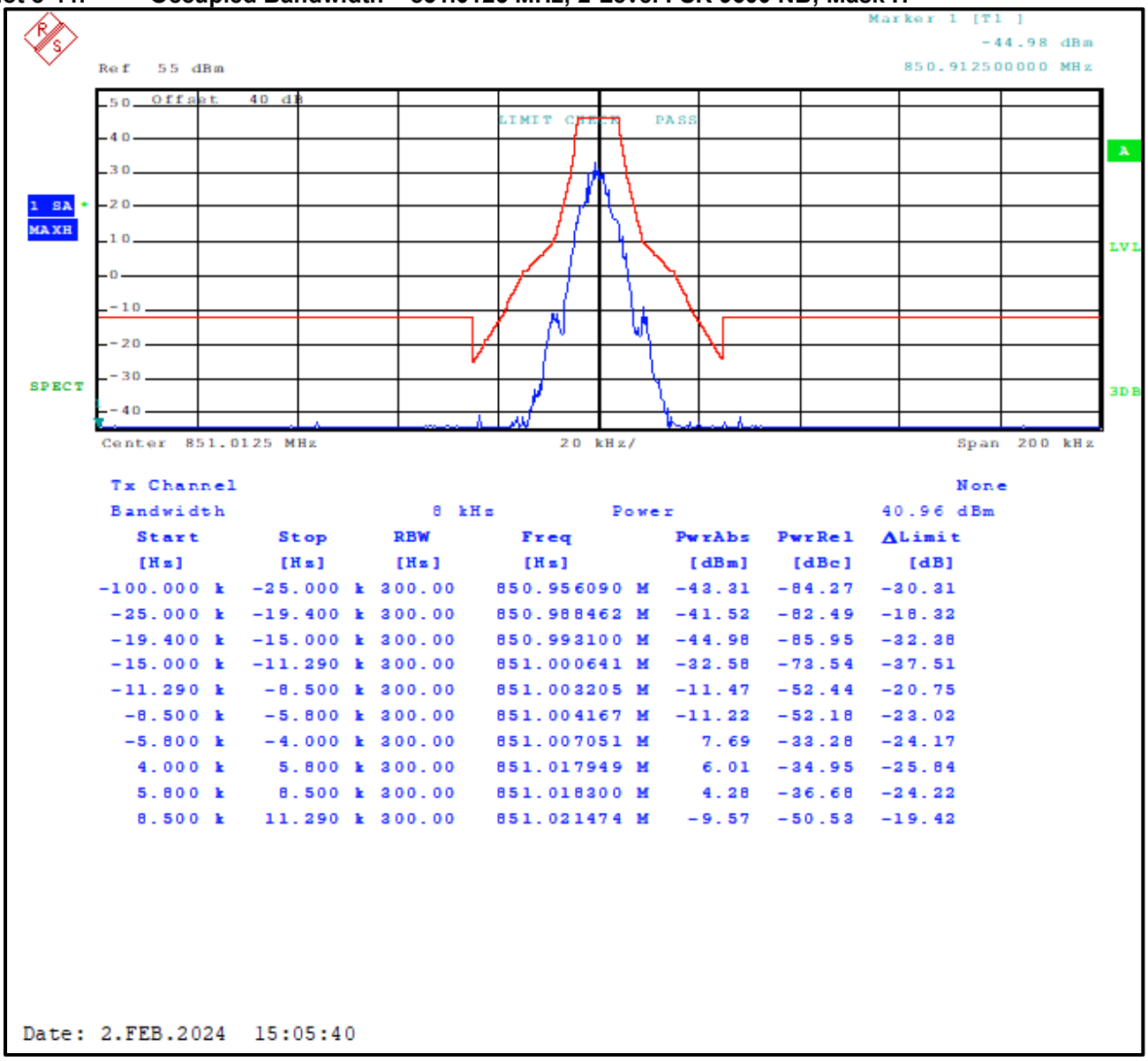
Plot 8-42: Occupied Bandwidth – 815.0000 MHz; 2-Level FSK 9600 NB; Mask G



Plot 8-43: Occupied Bandwidth – 823.9875 MHz; 2-Level FSK 9600 NB; Mask G



Plot 8-44: Occupied Bandwidth – 851.0125 MHz; 2-Level FSK 9600 NB; Mask H



Tx Channel: None
Bandwidth: 8 kHz Power: 40.96 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	850.956090 M	-43.31	-84.27	-30.31
-25.000 k	-19.400 k	300.00	850.988462 M	-41.52	-82.49	-18.32
-19.400 k	-15.000 k	300.00	850.993100 M	-44.98	-85.95	-32.38
-15.000 k	-11.290 k	300.00	851.000641 M	-32.58	-73.54	-37.51
-11.290 k	-8.500 k	300.00	851.003205 M	-11.47	-52.44	-20.75
-8.500 k	-5.800 k	300.00	851.004167 M	-11.22	-52.18	-23.02
-5.800 k	-4.000 k	300.00	851.007051 M	7.69	-33.28	-24.17
4.000 k	5.800 k	300.00	851.017949 M	6.01	-34.95	-25.84
5.800 k	8.500 k	300.00	851.018300 M	4.28	-36.68	-24.22
8.500 k	11.290 k	300.00	851.021474 M	-9.57	-50.53	-19.42

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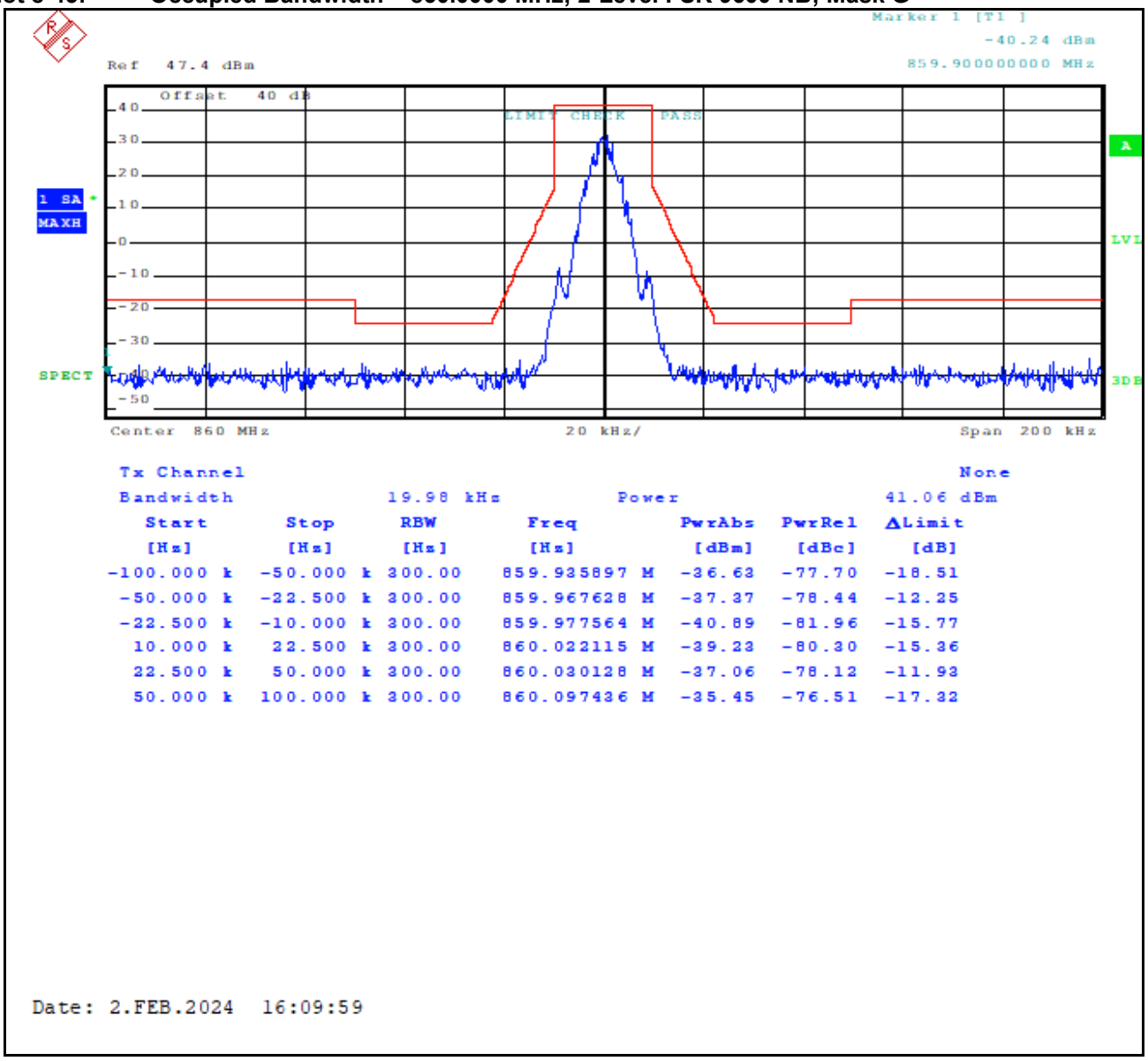
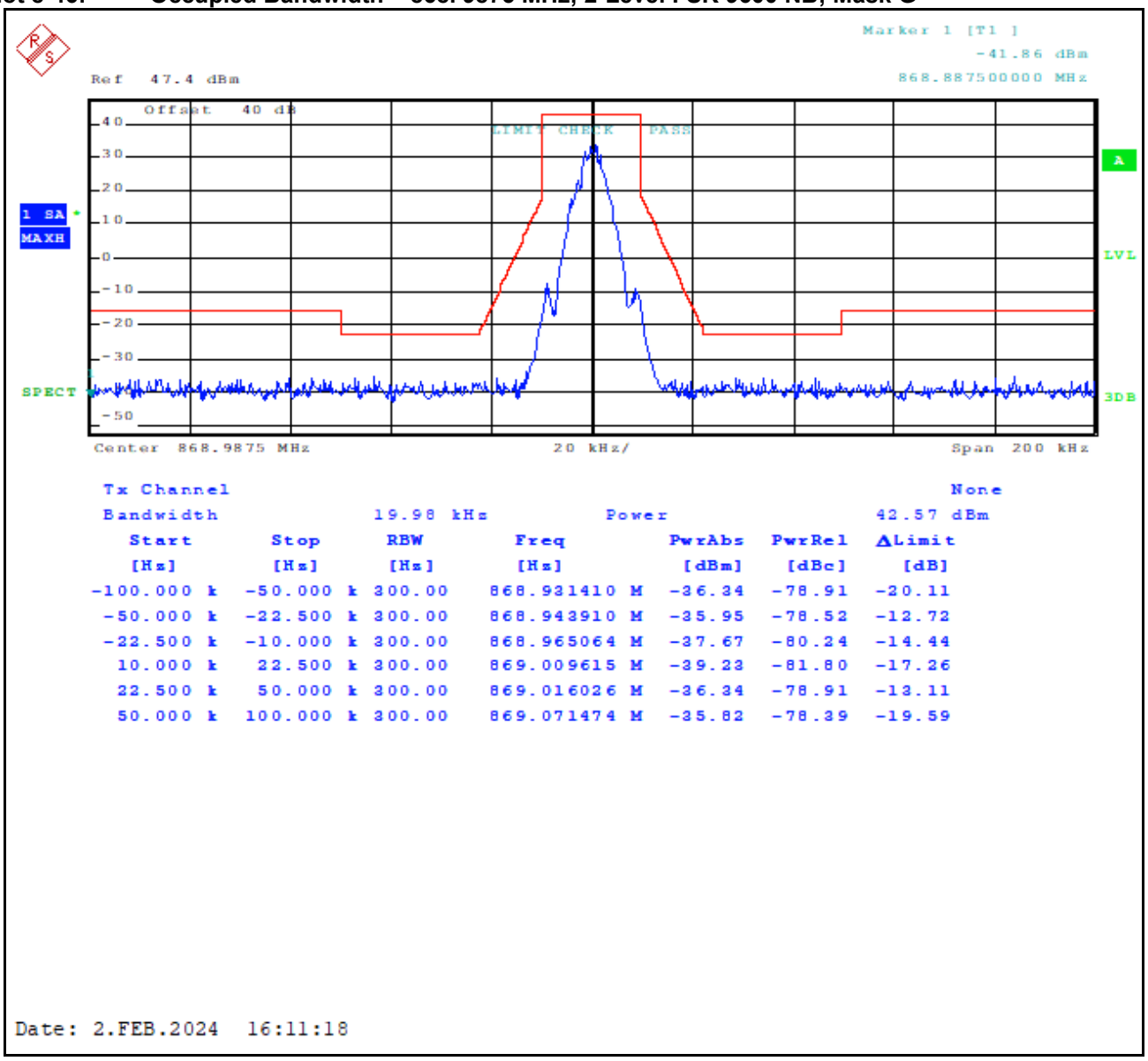
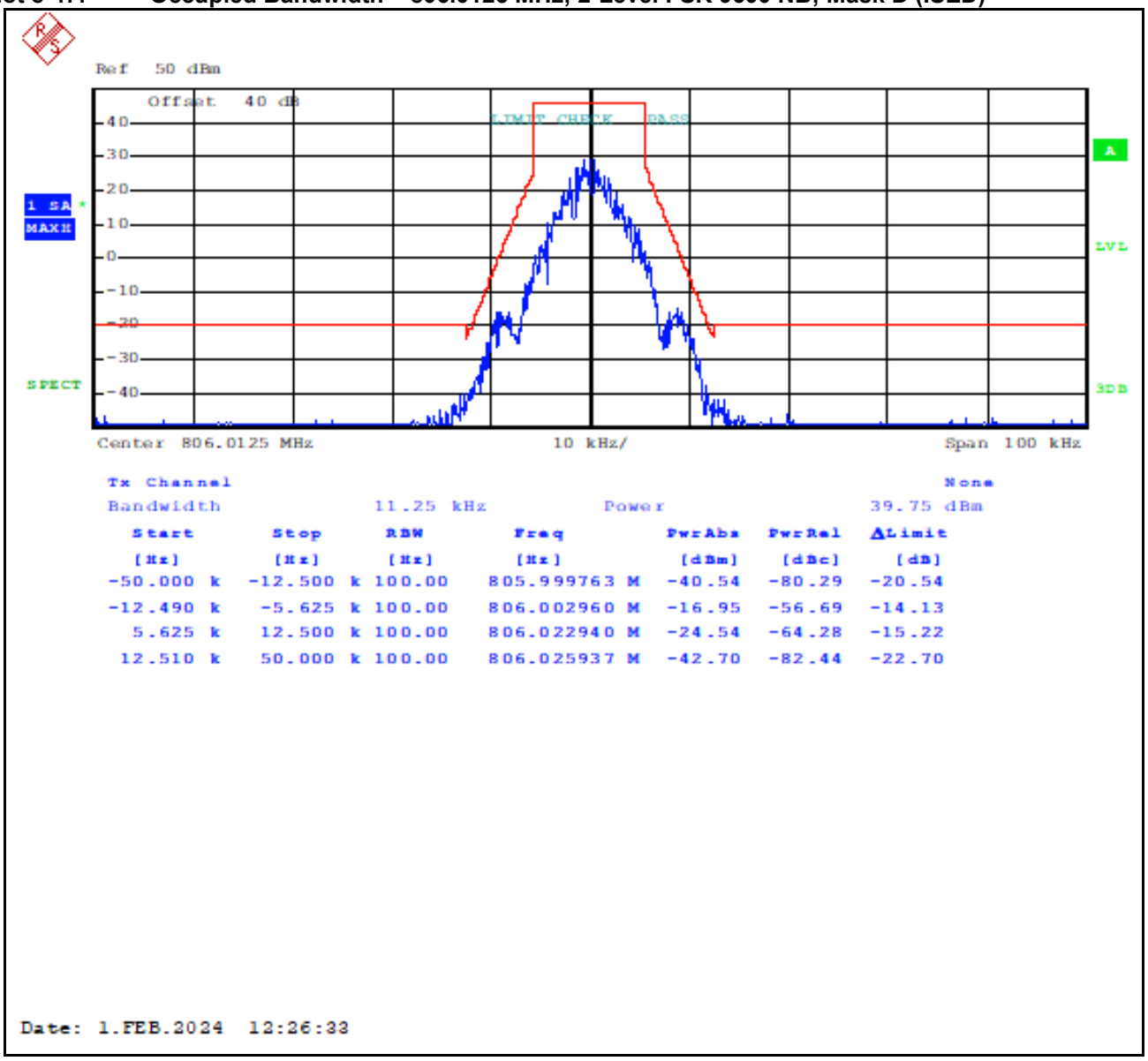
Plot 8-45: Occupied Bandwidth – 860.0000 MHz; 2-Level FSK 9600 NB; Mask G



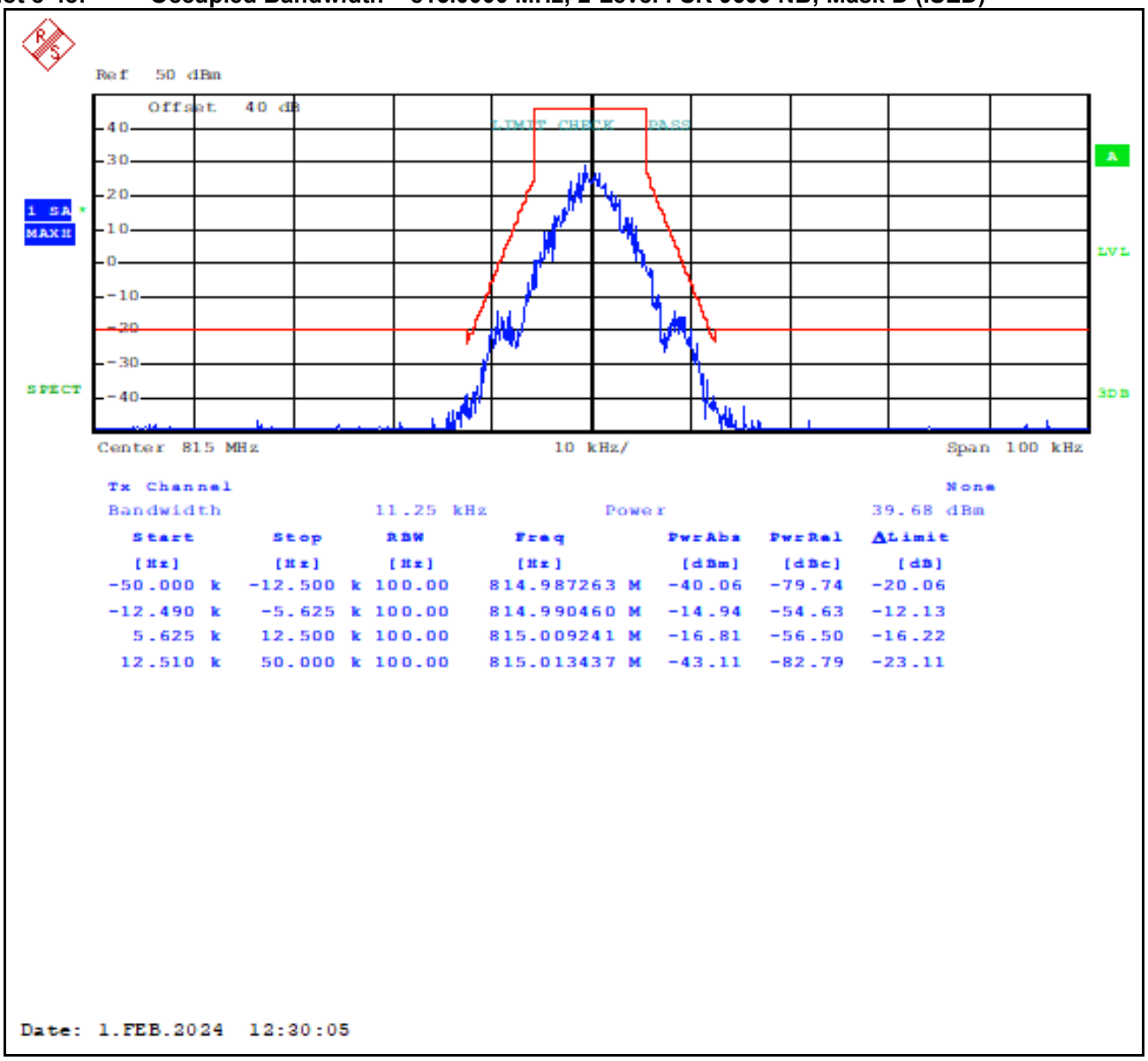
Plot 8-46: Occupied Bandwidth – 868. 9875 MHz; 2-Level FSK 9600 NB; Mask G



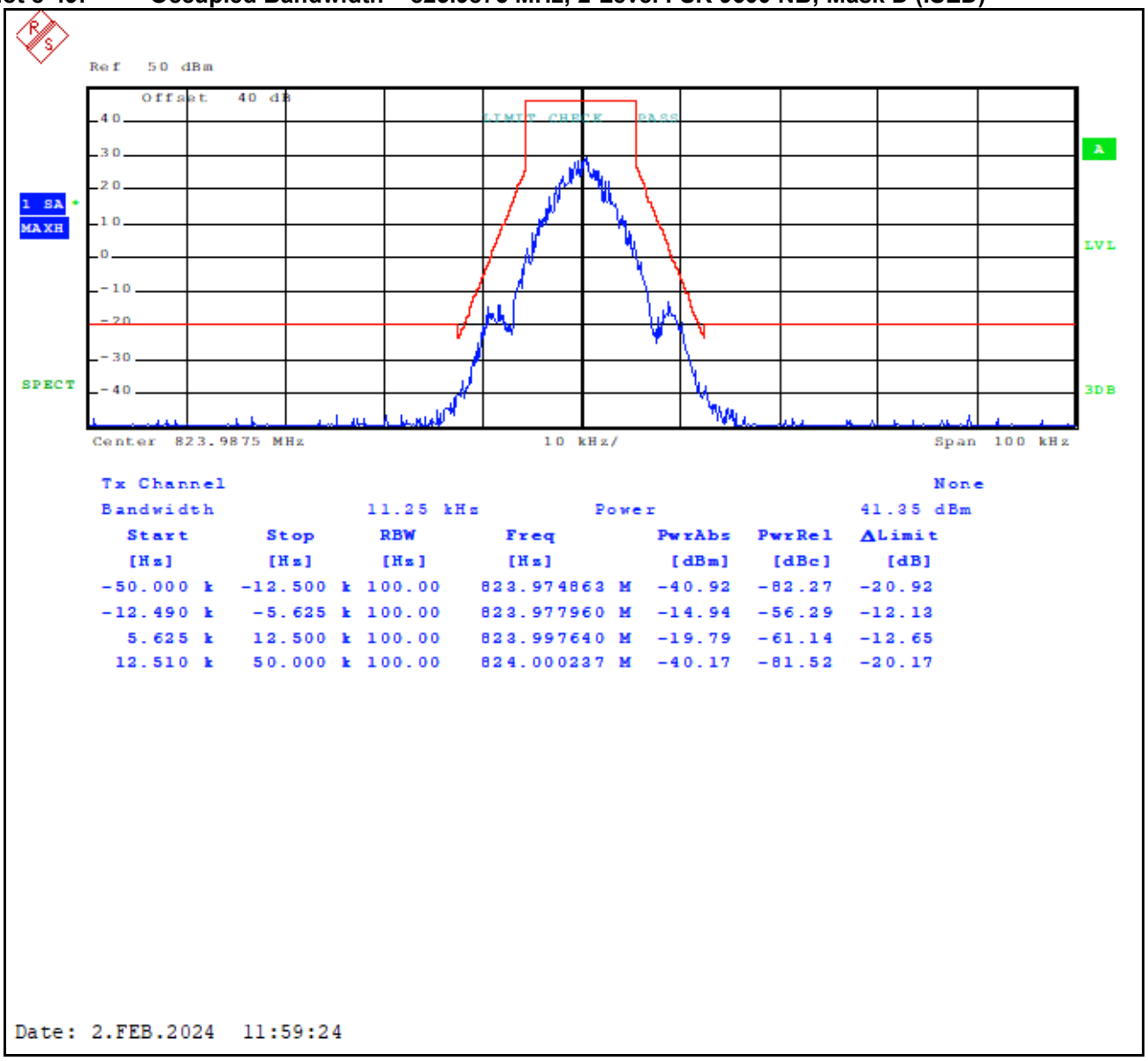
Plot 8-47: Occupied Bandwidth – 806.0125 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



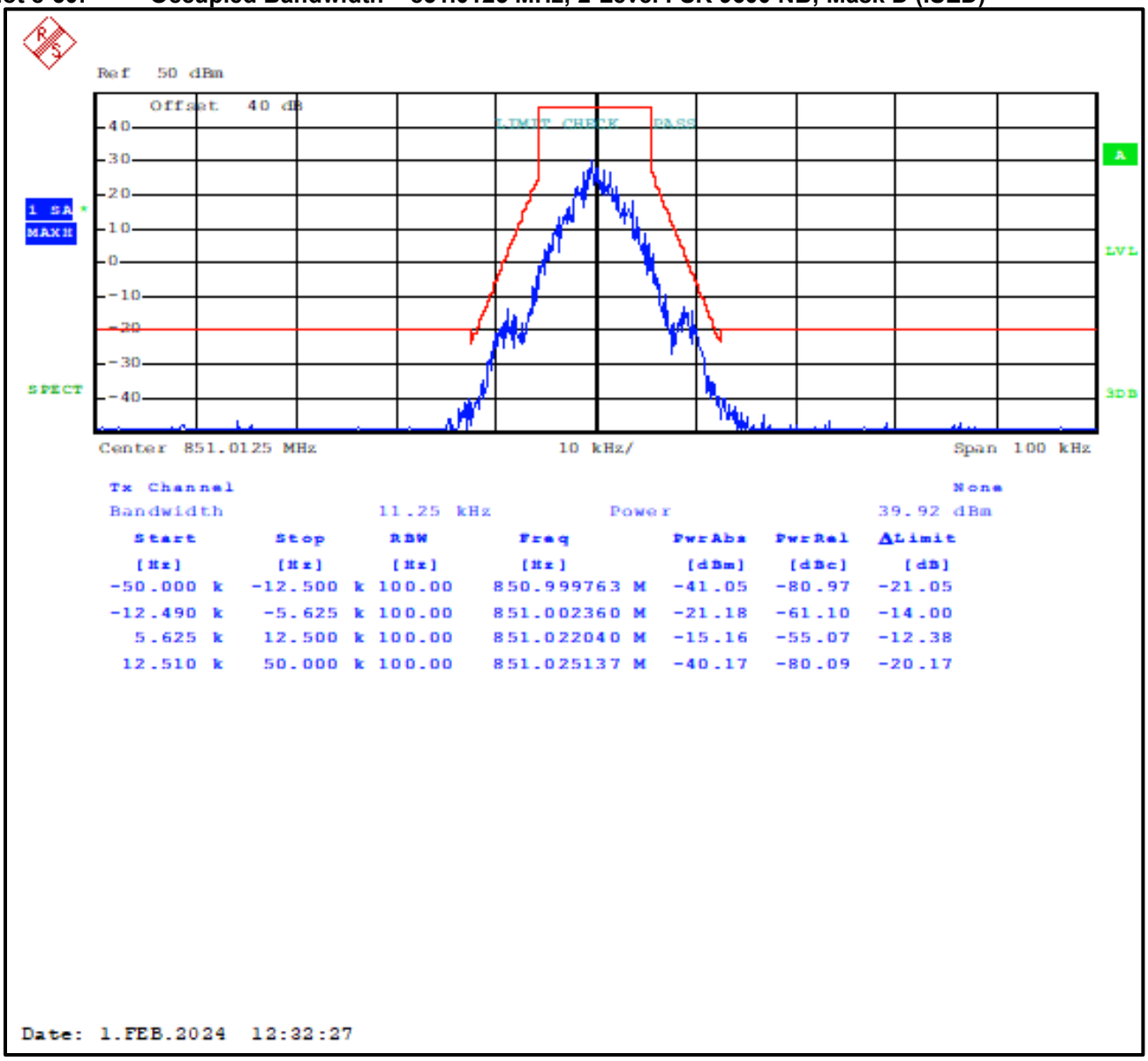
Plot 8-48: Occupied Bandwidth – 815.0000 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



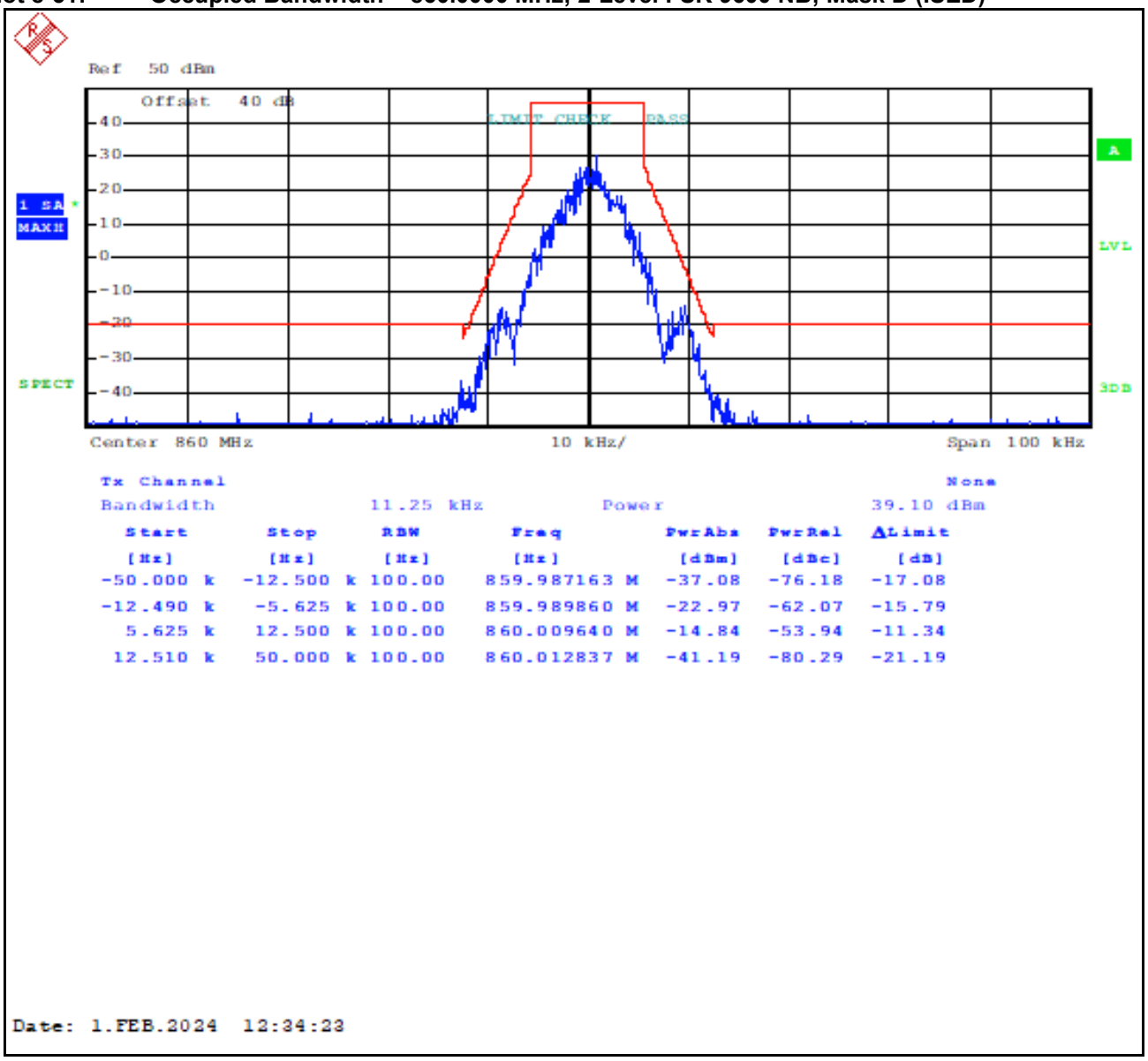
Plot 8-49: Occupied Bandwidth – 823.9875 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



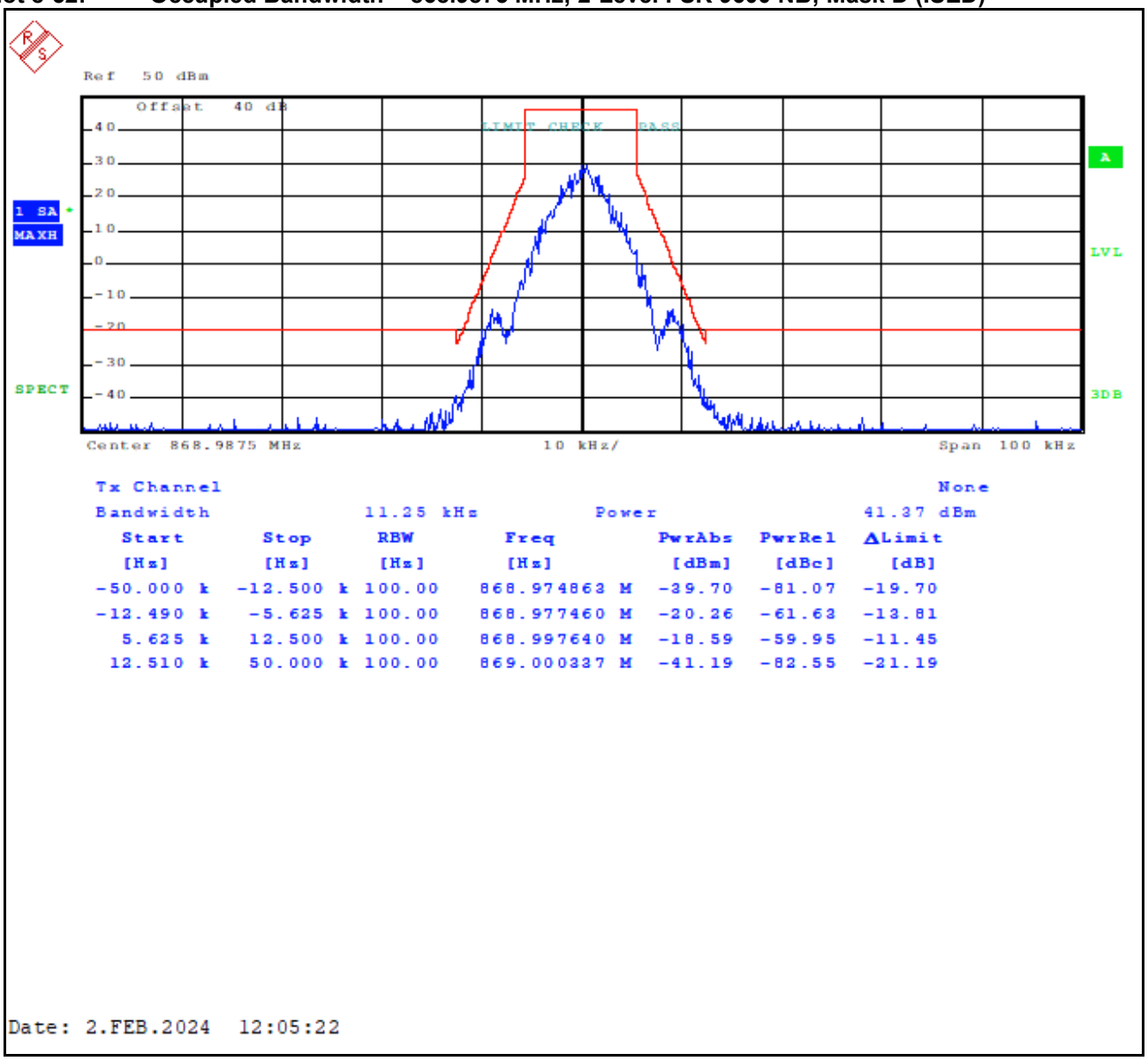
Plot 8-50: Occupied Bandwidth – 851.0125 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



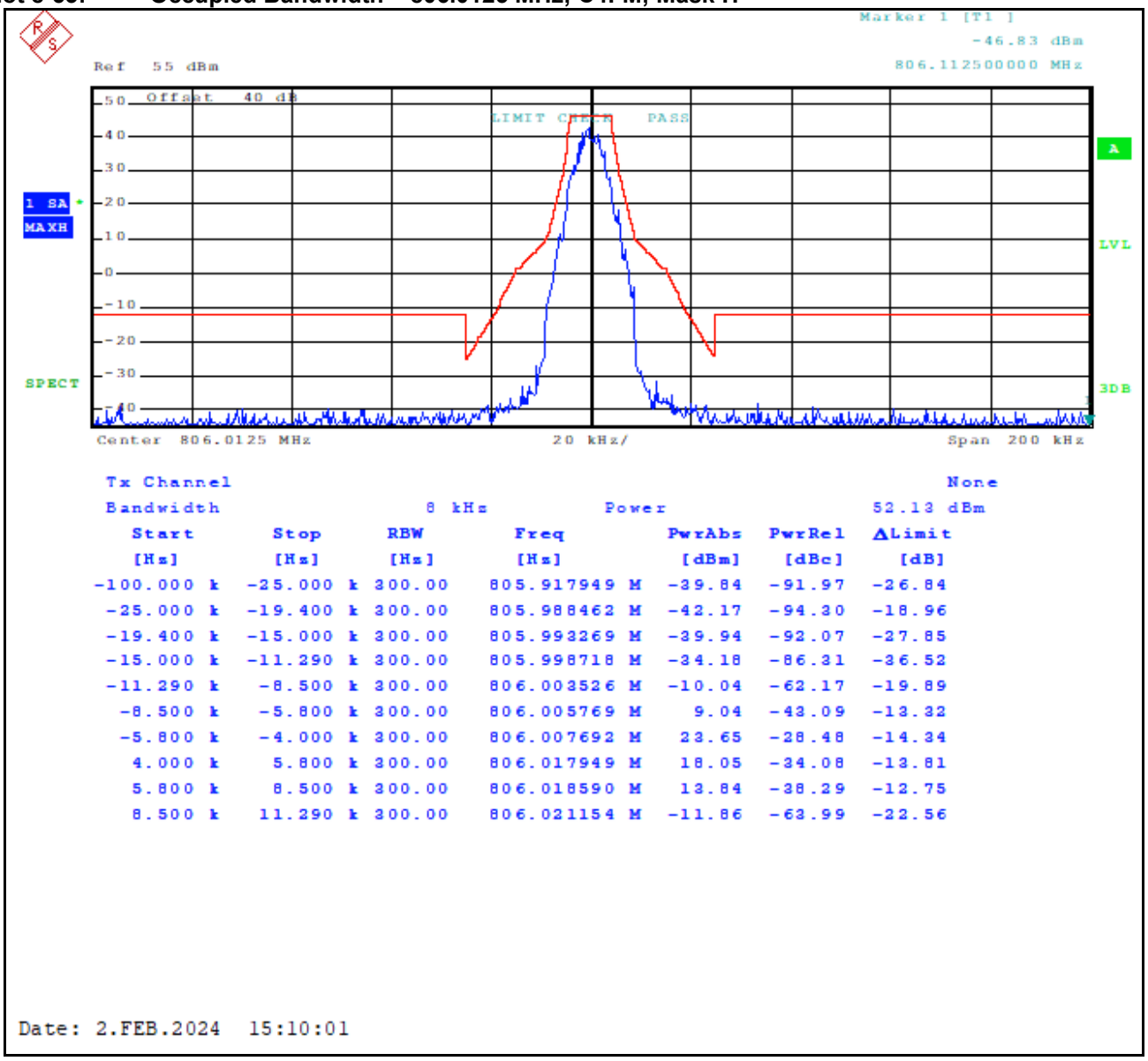
Plot 8-51: Occupied Bandwidth – 860.0000 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



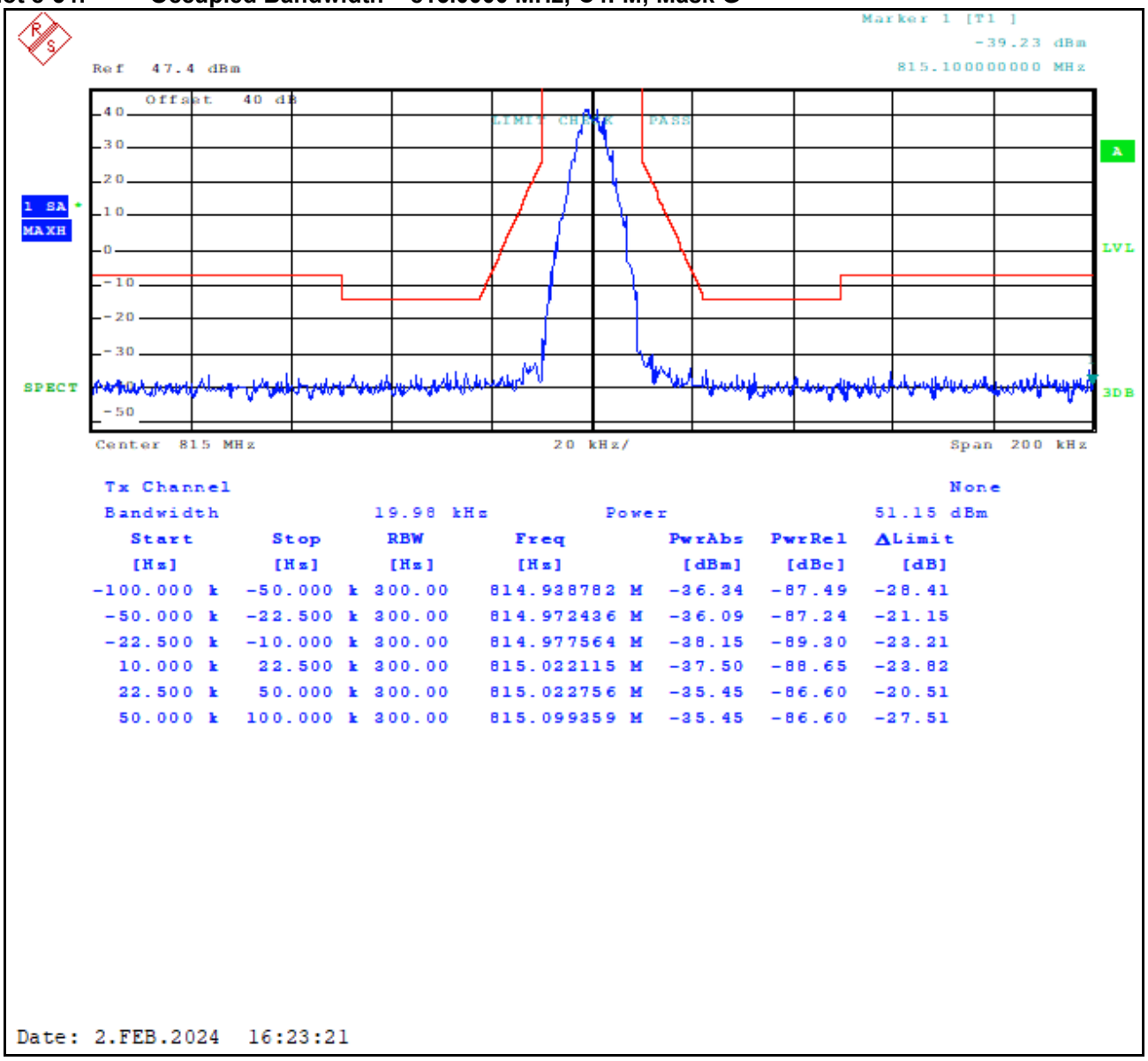
Plot 8-52: Occupied Bandwidth – 868.9875 MHz; 2-Level FSK 9600 NB; Mask D (ISED)



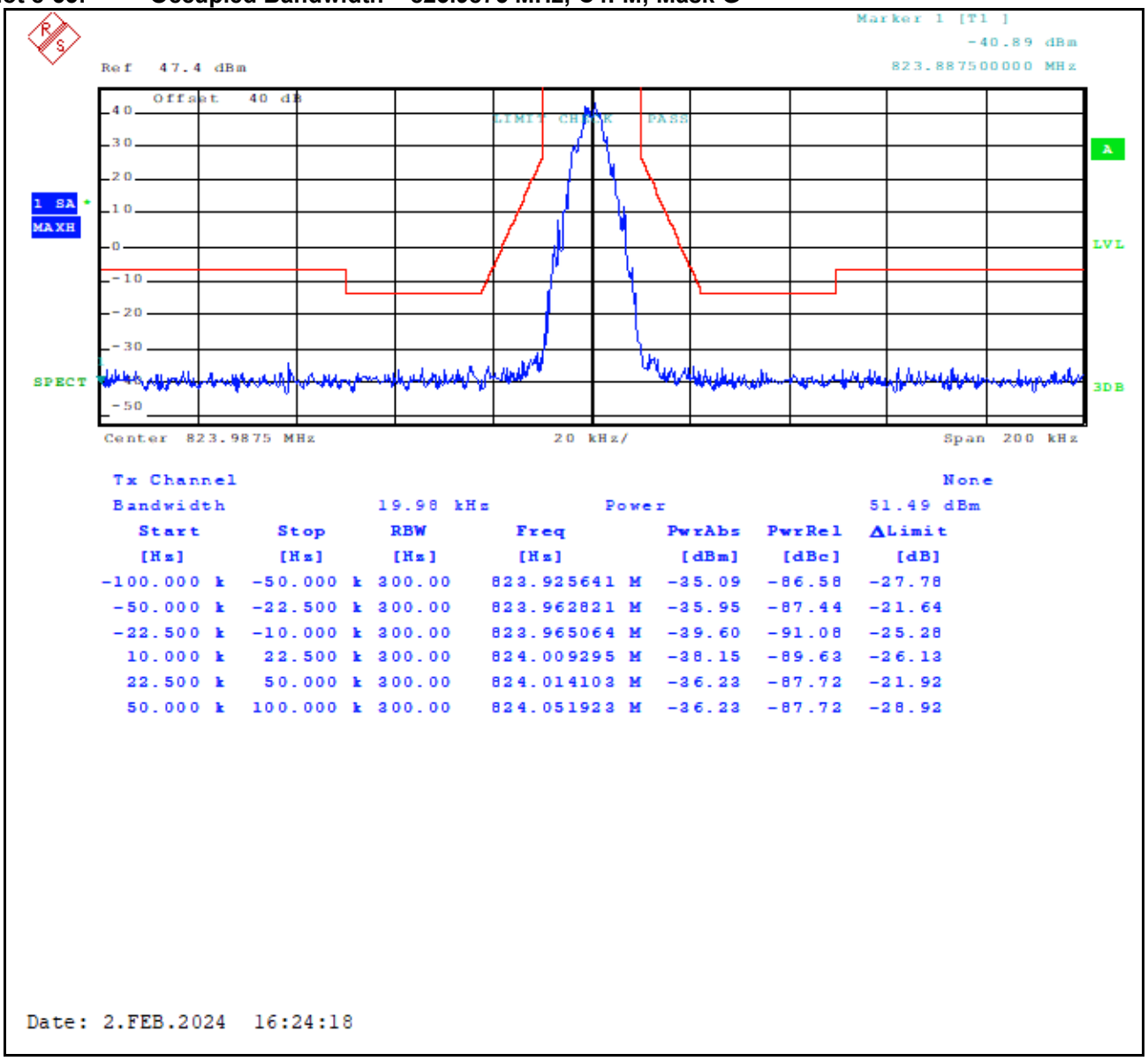
Plot 8-53: Occupied Bandwidth – 806.0125 MHz; C4FM; Mask H



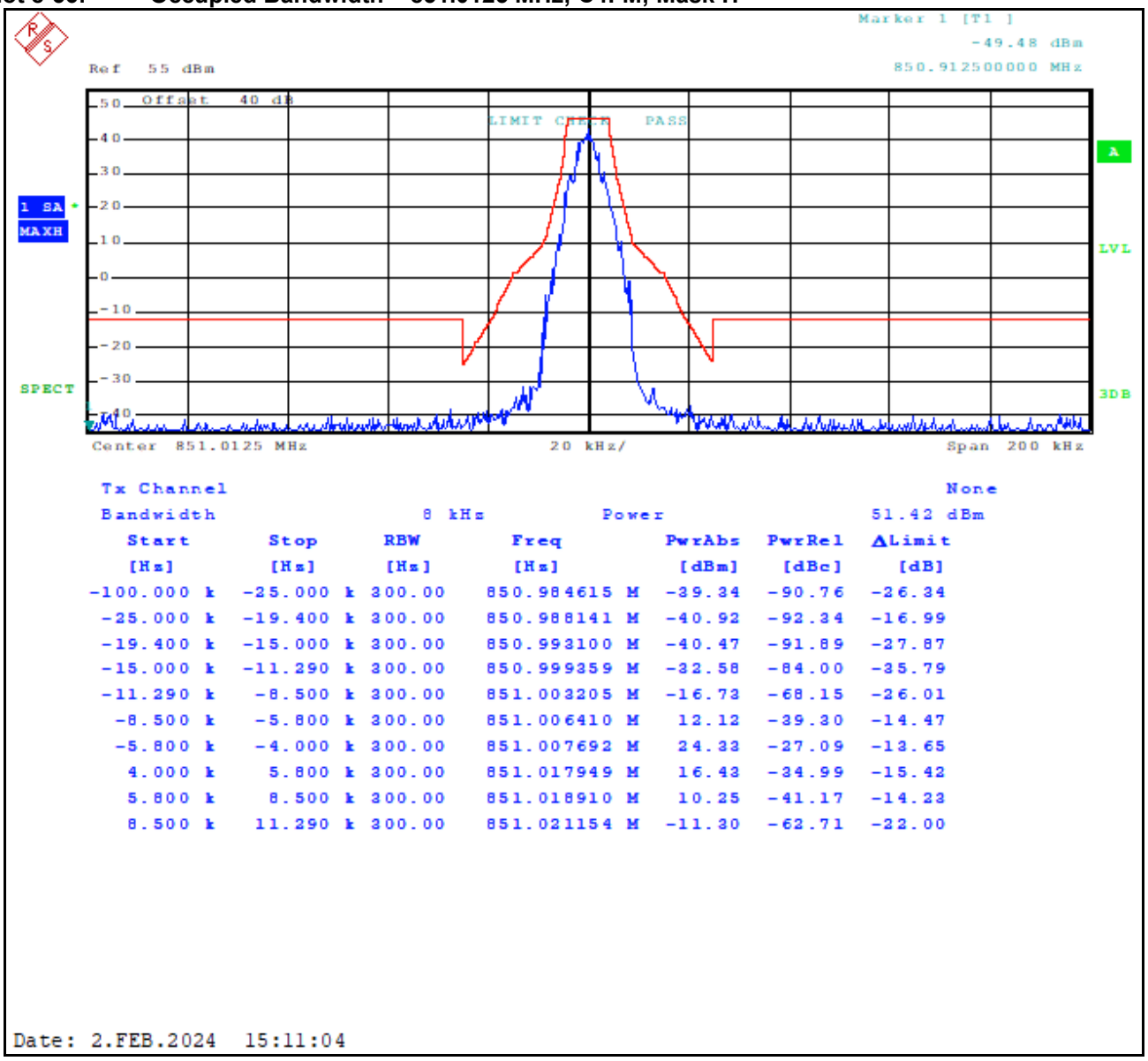
Plot 8-54: Occupied Bandwidth – 815.0000 MHz; C4FM; Mask G



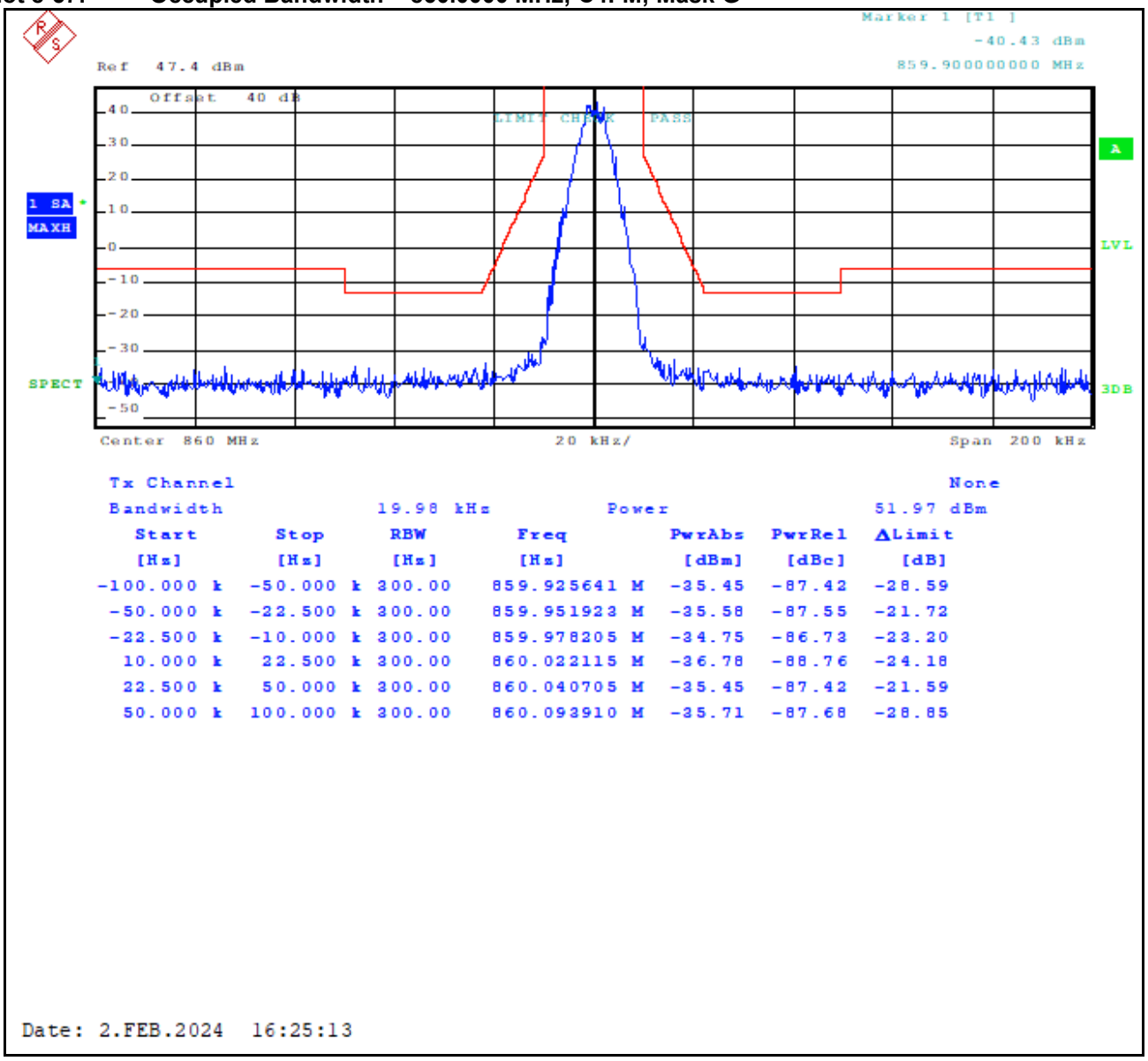
Plot 8-55: Occupied Bandwidth – 823.9875 MHz; C4FM; Mask G



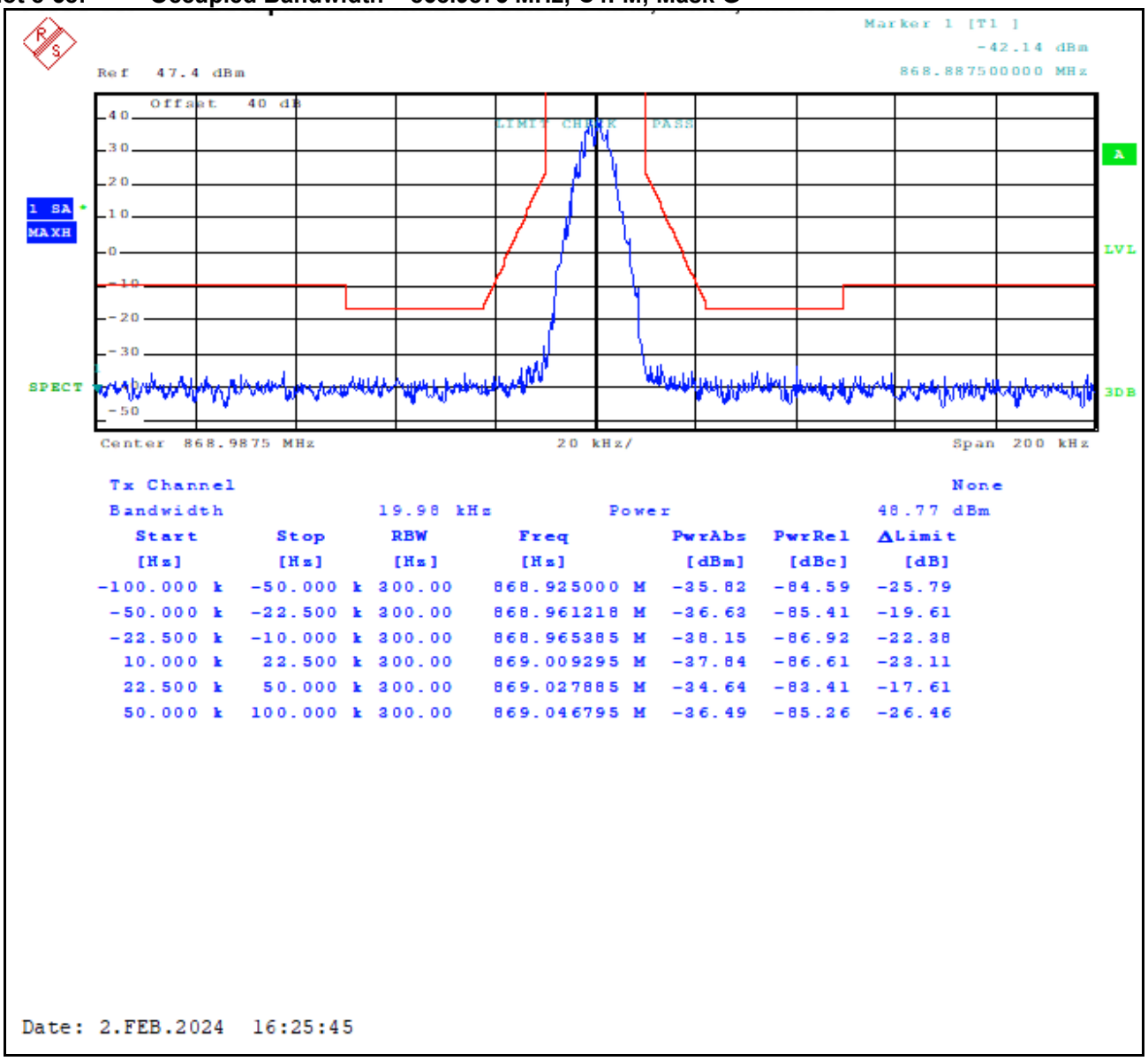
Plot 8-56: Occupied Bandwidth – 851.0125 MHz; C4FM; Mask H



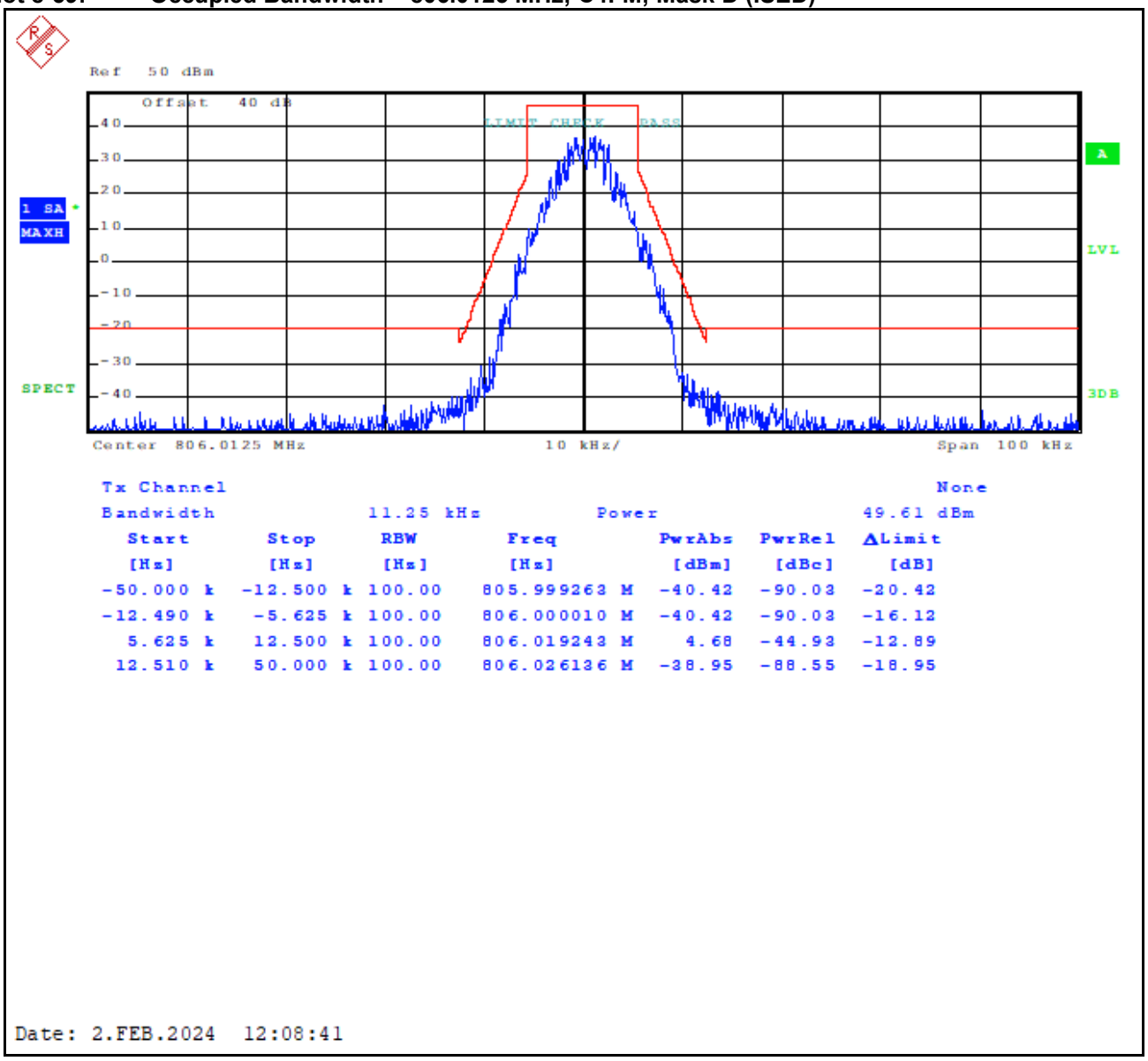
Plot 8-57: Occupied Bandwidth – 860.0000 MHz; C4FM; Mask G



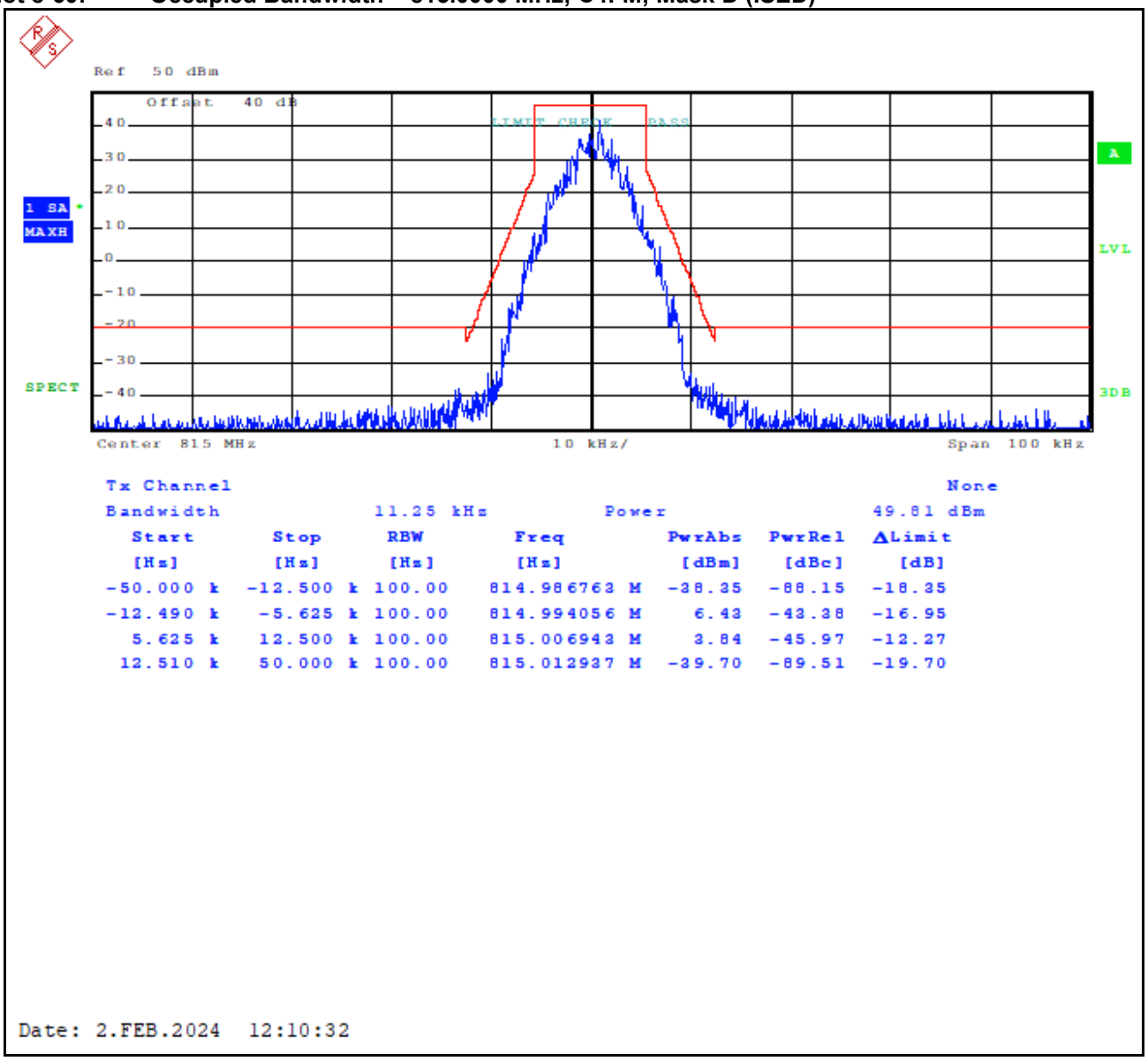
Plot 8-58: Occupied Bandwidth – 868.9875 MHz; C4FM; Mask G



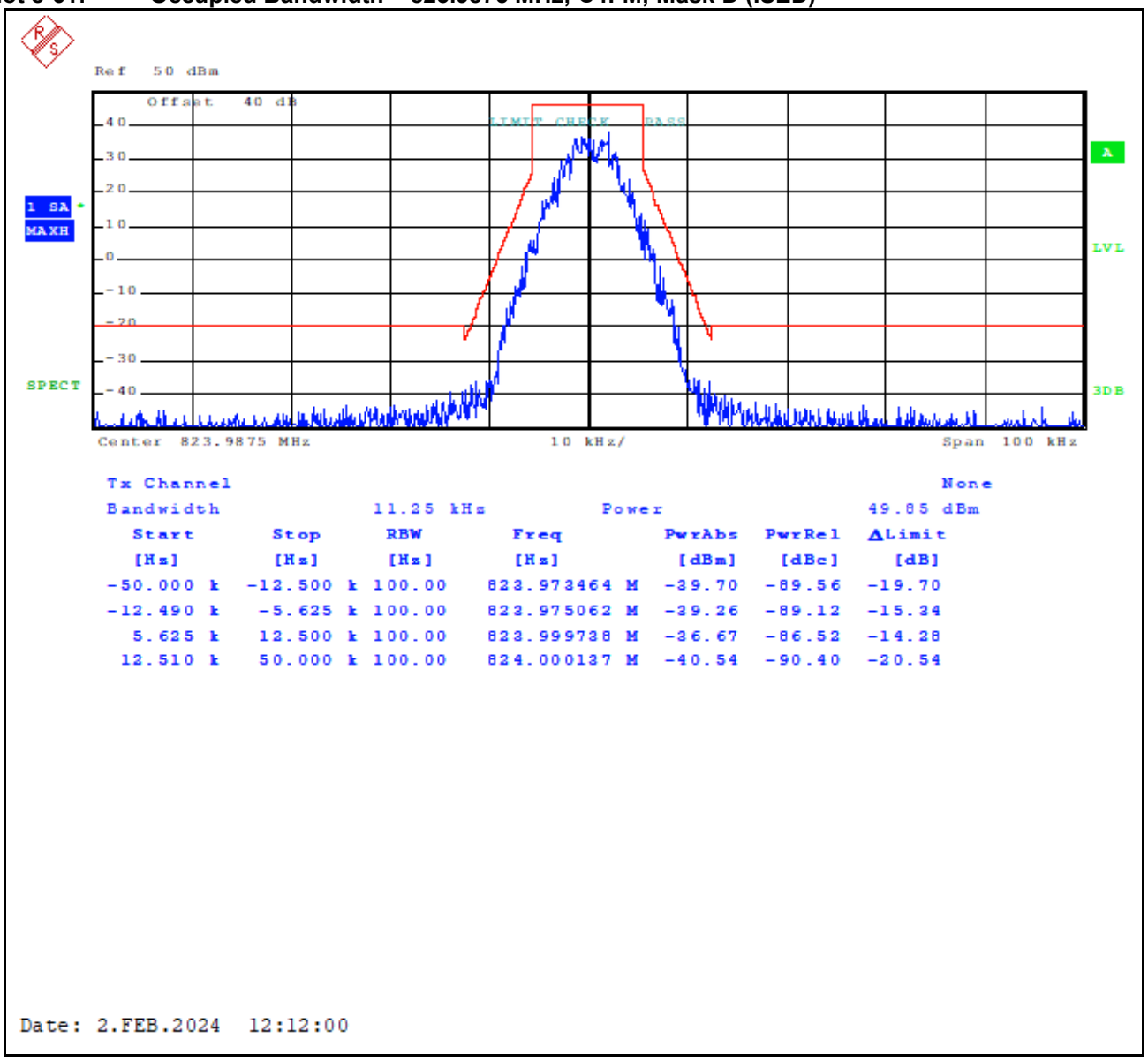
Plot 8-59: Occupied Bandwidth – 806.0125 MHz; C4FM; Mask D (ISED)



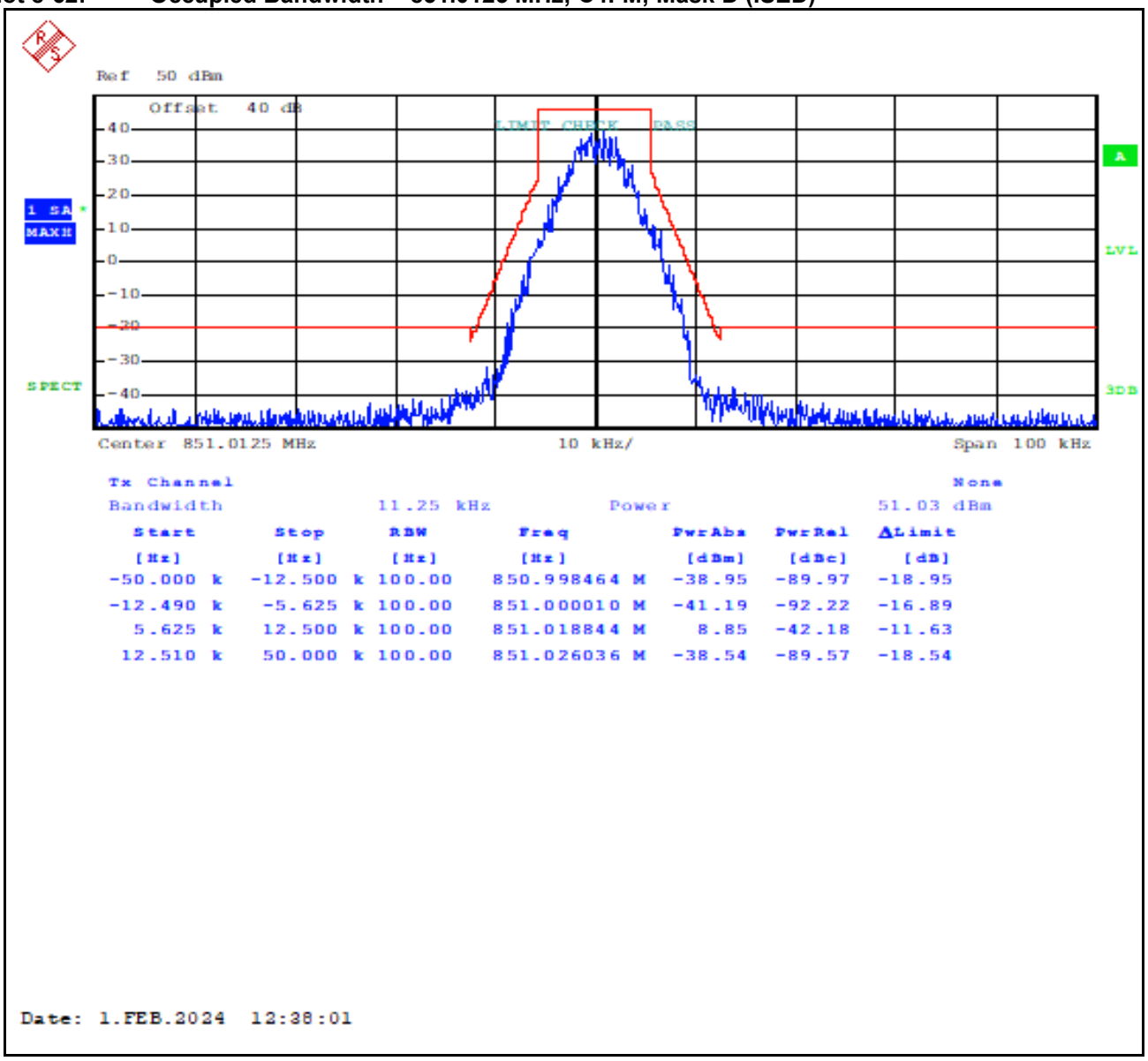
Plot 8-60: Occupied Bandwidth – 815.0000 MHz; C4FM; Mask D (ISED)



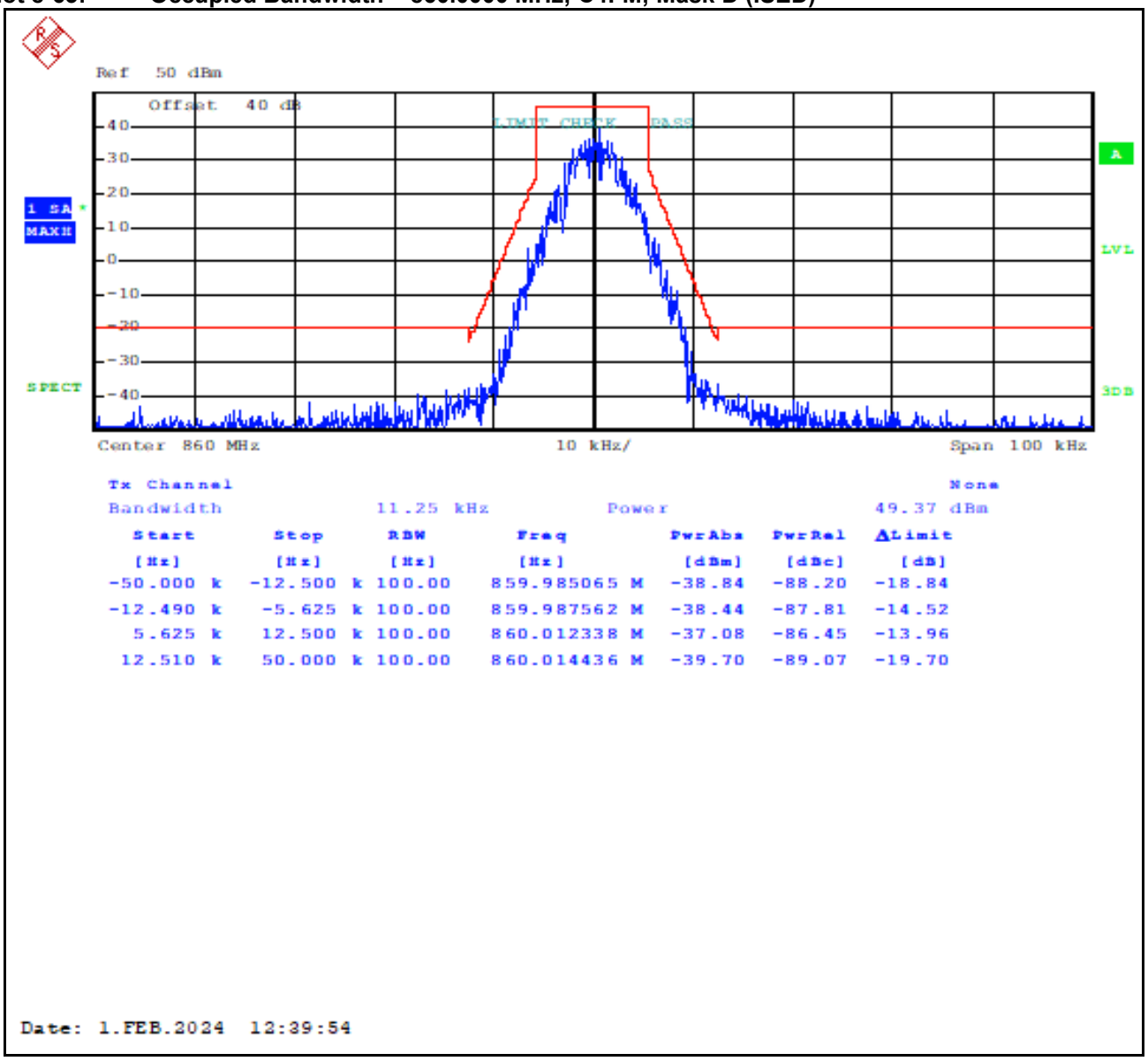
Plot 8-61: Occupied Bandwidth – 823.9875 MHz; C4FM; Mask D (ISED)



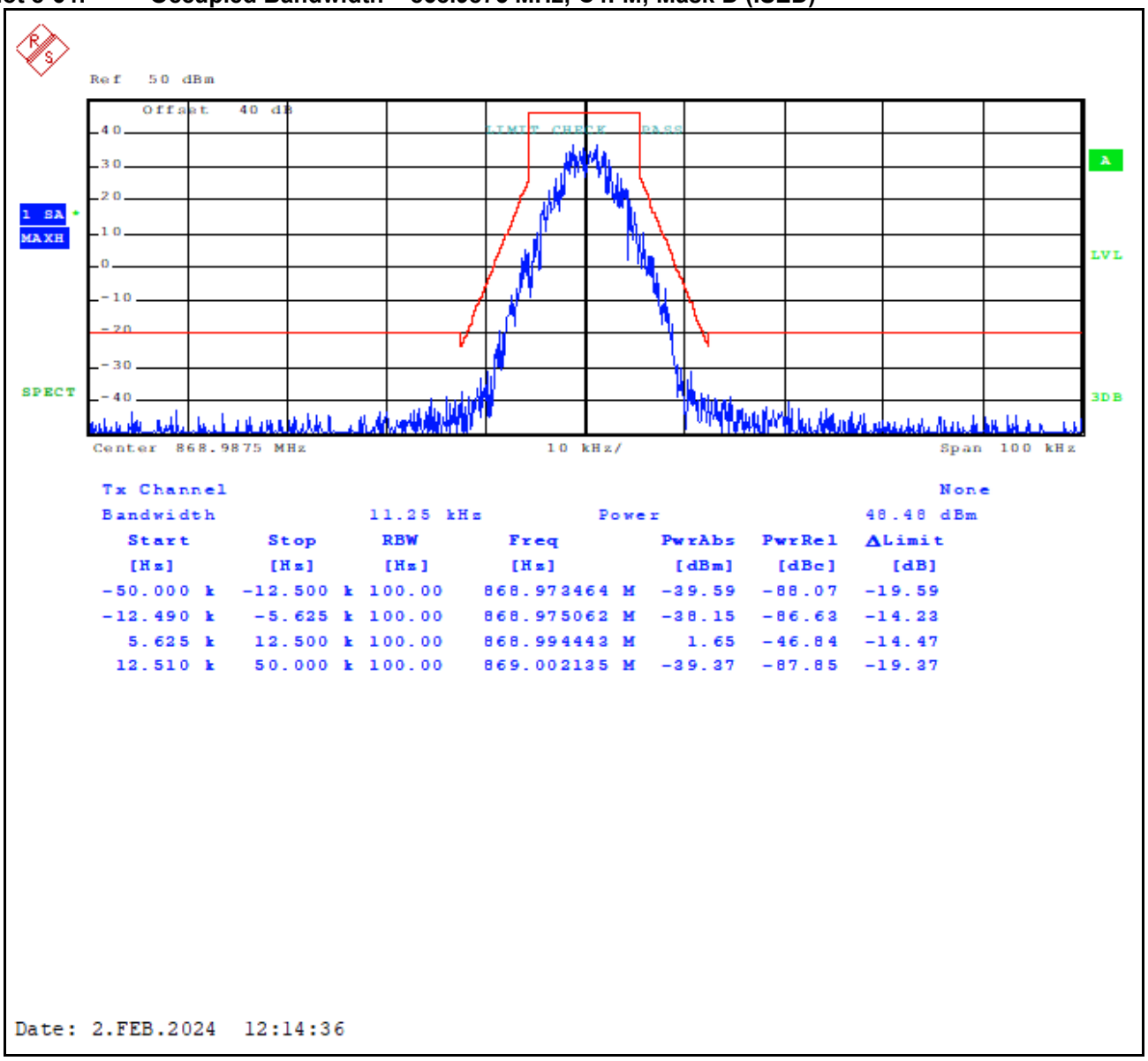
Plot 8-62: Occupied Bandwidth – 851.0125 MHz; C4FM; Mask D (ISED)



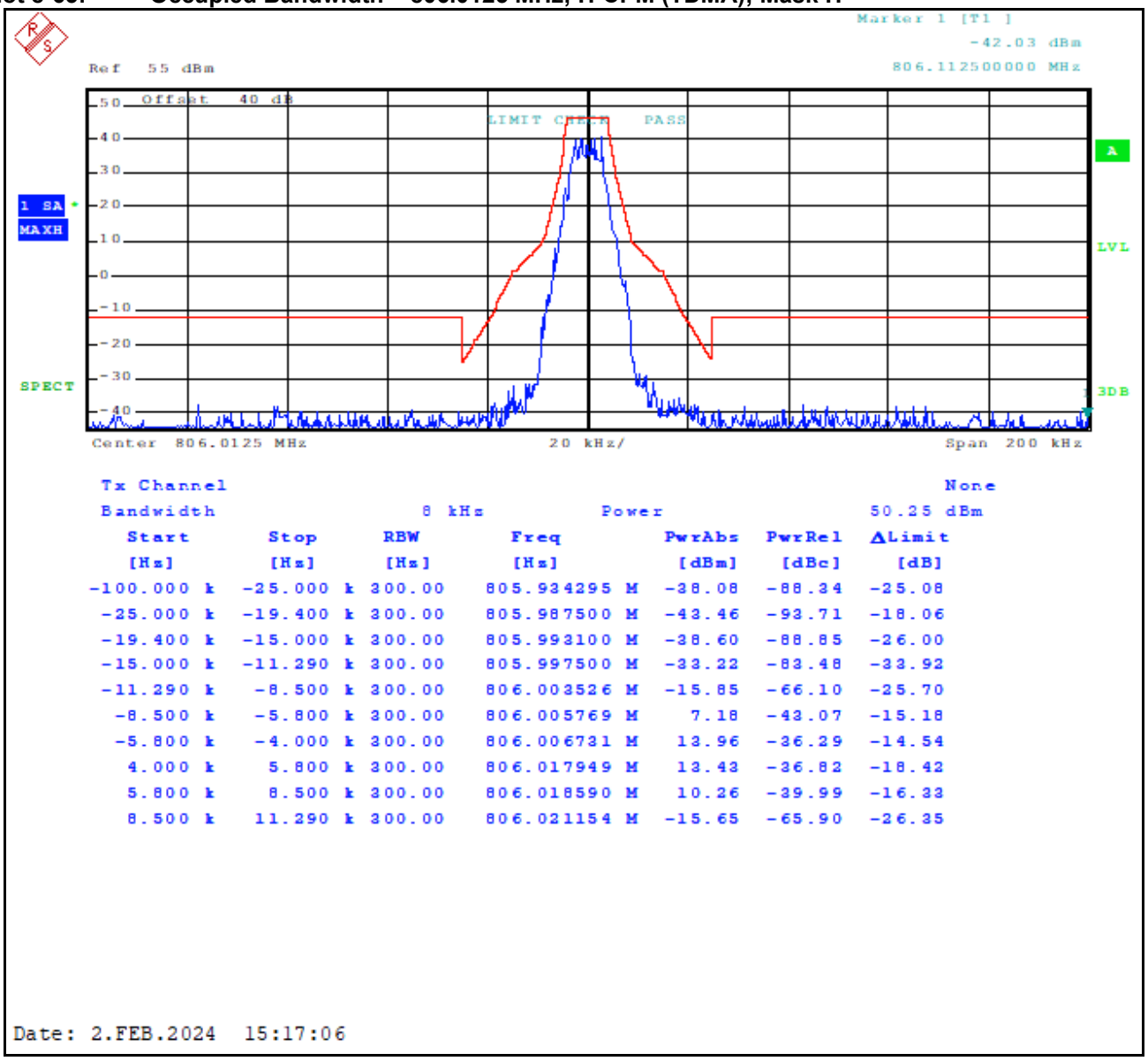
Plot 8-63: Occupied Bandwidth – 860.0000 MHz; C4FM; Mask D (ISED)



Plot 8-64: Occupied Bandwidth – 868.9875 MHz; C4FM; Mask D (ISED)



Plot 8-65: Occupied Bandwidth – 806.0125 MHz; H-CPM (TDMA); Mask H



Tx Channel: None
Bandwidth: 8 kHz
Power: 50.25 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	805.934295 M	-38.08	-88.34	-25.08
-25.000 k	-19.400 k	300.00	805.987500 M	-43.46	-93.71	-18.06
-19.400 k	-15.000 k	300.00	805.993100 M	-38.60	-88.85	-26.00
-15.000 k	-11.290 k	300.00	805.997500 M	-33.22	-83.48	-33.92
-11.290 k	-8.500 k	300.00	806.003526 M	-15.85	-66.10	-25.70
-8.500 k	-5.800 k	300.00	806.005769 M	7.18	-43.07	-15.18
-5.800 k	-4.000 k	300.00	806.006731 M	13.96	-36.29	-14.54
4.000 k	5.800 k	300.00	806.017949 M	13.42	-36.82	-18.42
5.800 k	8.500 k	300.00	806.018590 M	10.26	-39.99	-16.33
8.500 k	11.290 k	300.00	806.021154 M	-15.65	-65.90	-26.35

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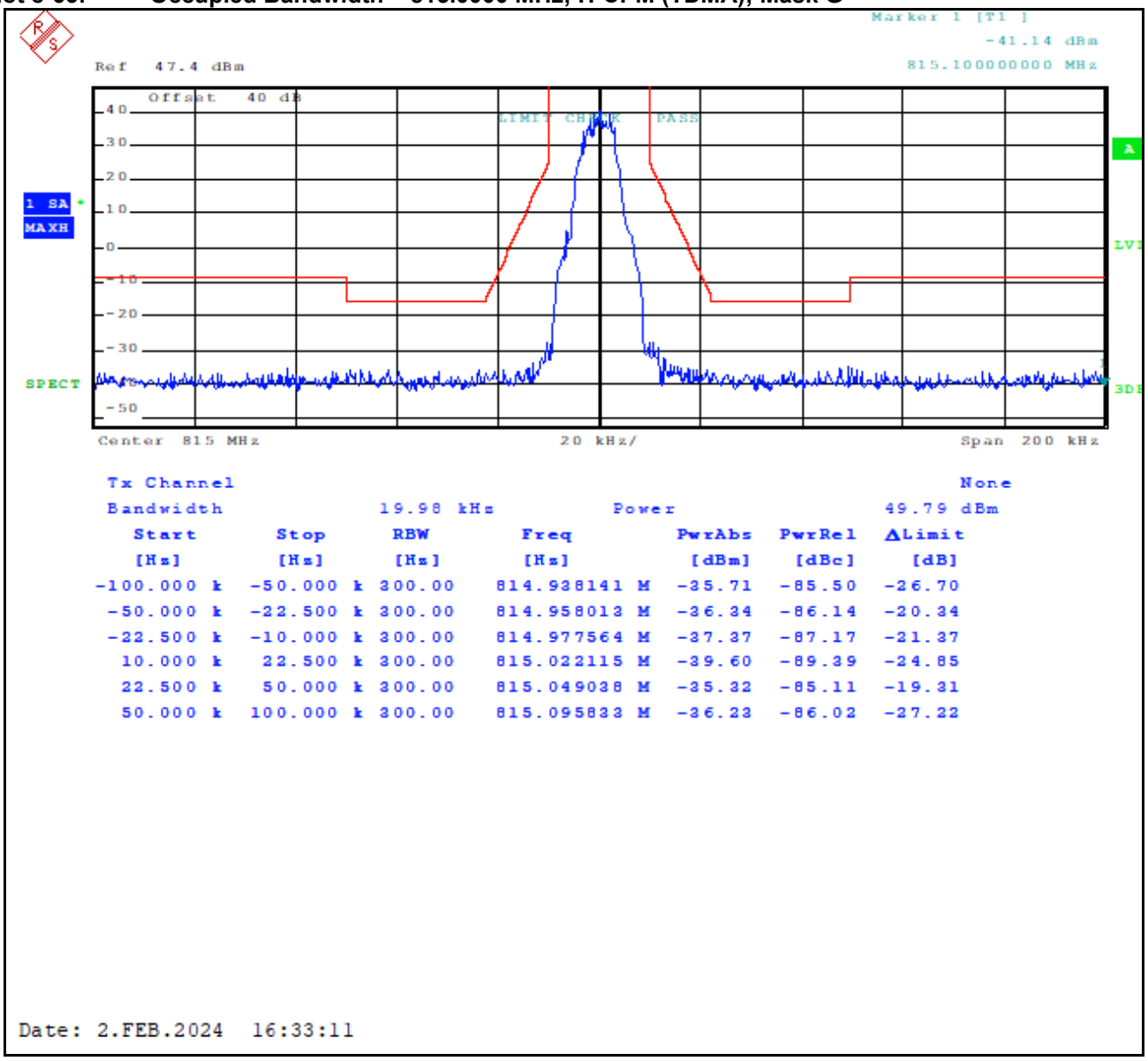
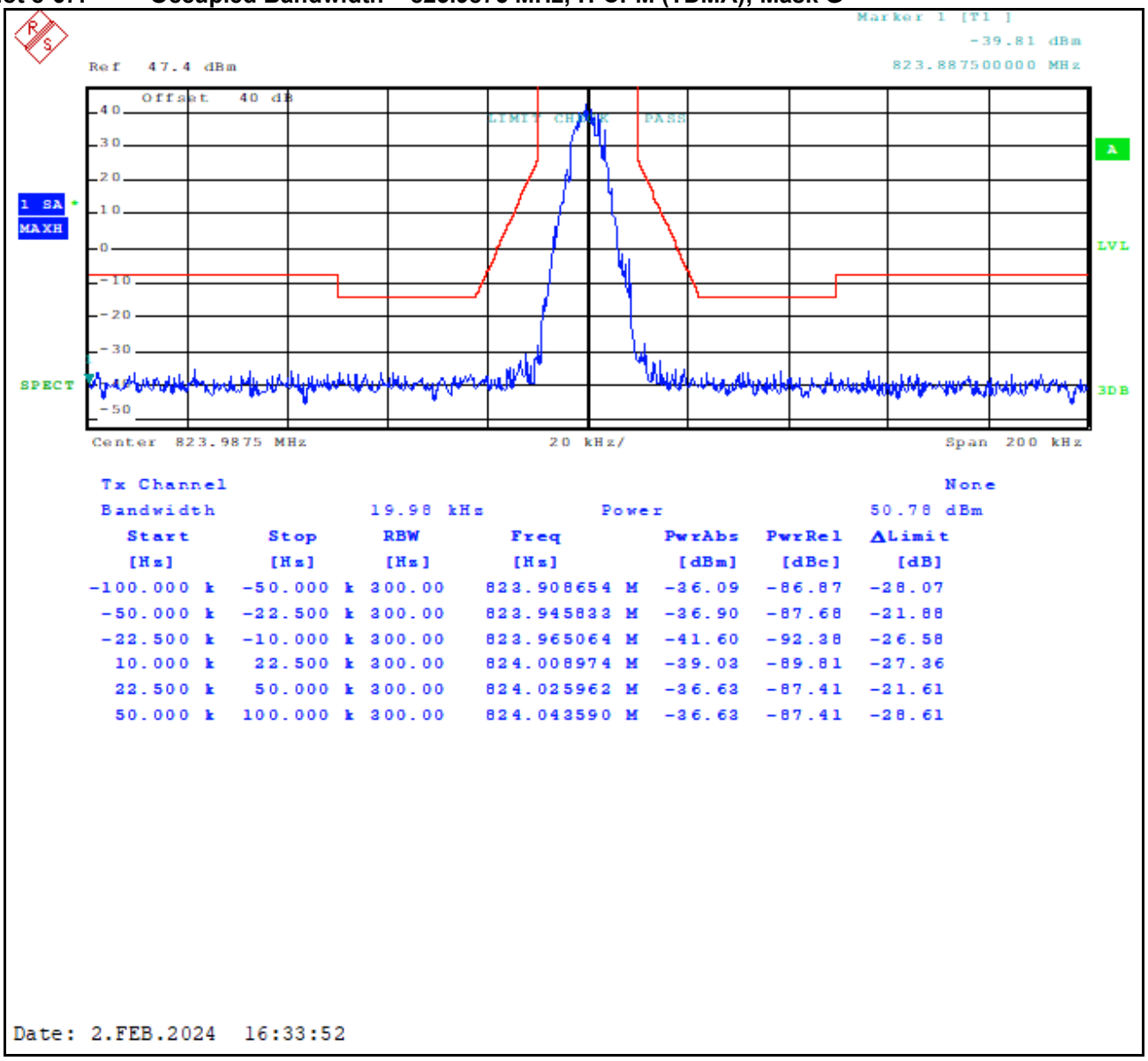
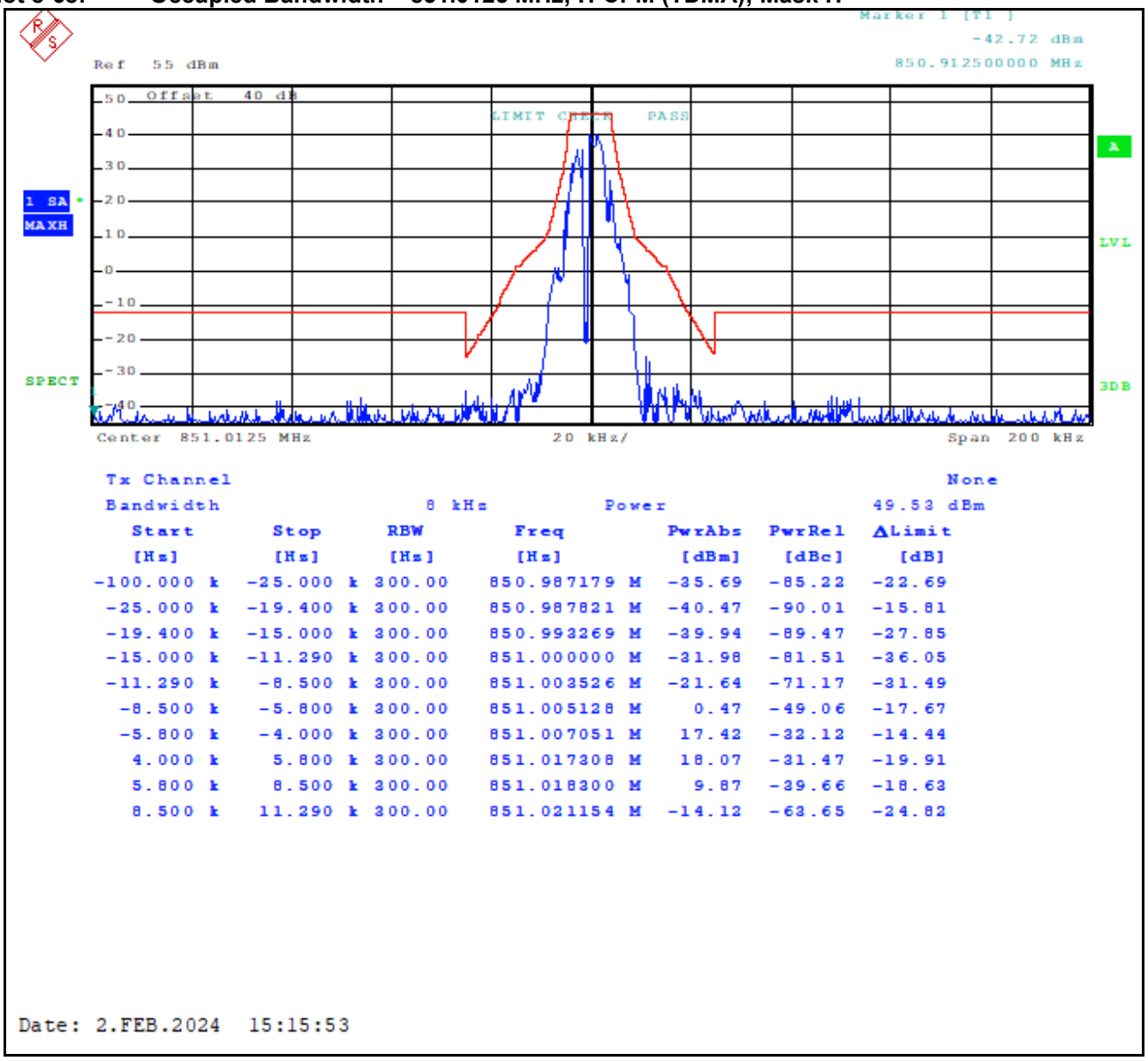
Plot 8-66: Occupied Bandwidth – 815.0000 MHz; H-CPM (TDMA); Mask G



Plot 8-67: Occupied Bandwidth – 823.9875 MHz; H-CPM (TDMA); Mask G



Plot 8-68: Occupied Bandwidth – 851.0125 MHz; H-CPM (TDMA); Mask H



Tx Channel: None
Bandwidth: 8 kHz
Power: 49.53 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	850.987179 M	-35.69	-85.22	-22.69
-25.000 k	-19.400 k	300.00	850.987821 M	-40.47	-90.01	-15.81
-19.400 k	-15.000 k	300.00	850.993269 M	-39.94	-89.47	-27.85
-15.000 k	-11.290 k	300.00	851.000000 M	-31.98	-81.51	-36.05
-11.290 k	-8.500 k	300.00	851.003526 M	-21.64	-71.17	-31.49
-8.500 k	-5.800 k	300.00	851.005128 M	0.47	-49.06	-17.67
-5.800 k	-4.000 k	300.00	851.007051 M	17.42	-32.12	-14.44
4.000 k	5.800 k	300.00	851.017308 M	18.07	-31.47	-19.91
5.800 k	8.500 k	300.00	851.018300 M	9.87	-39.66	-18.63
8.500 k	11.290 k	300.00	851.021154 M	-14.12	-63.65	-24.82

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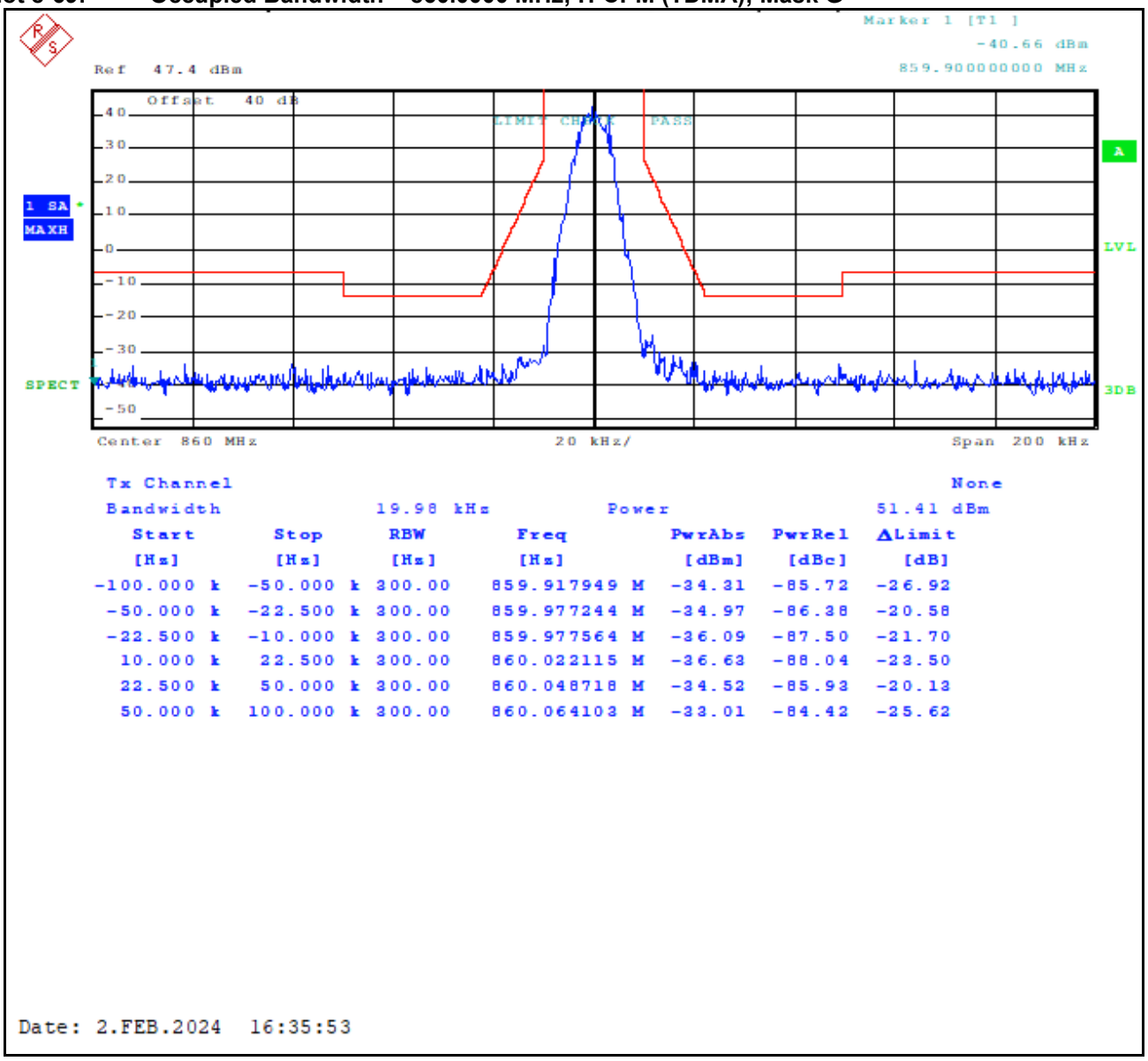
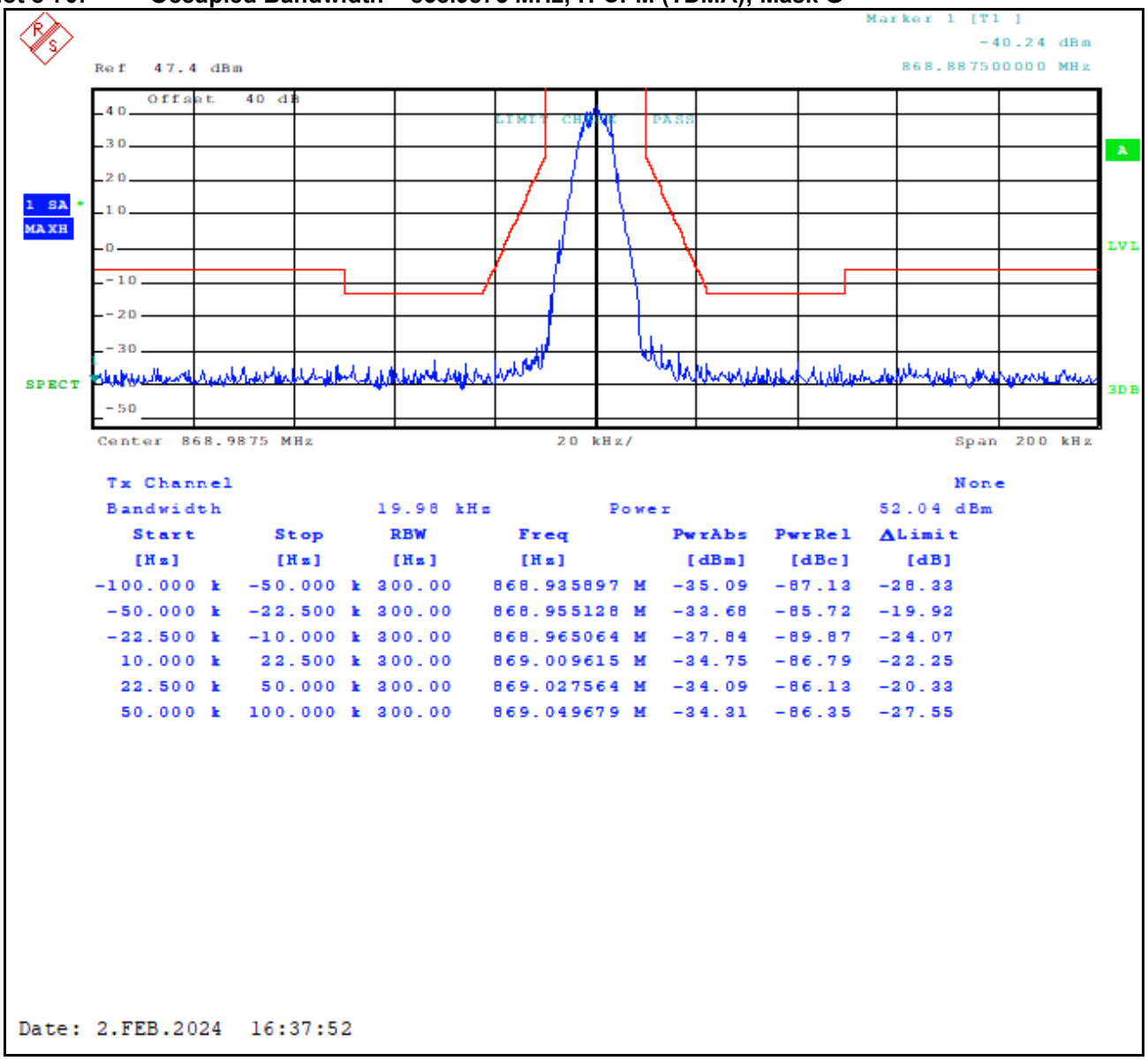
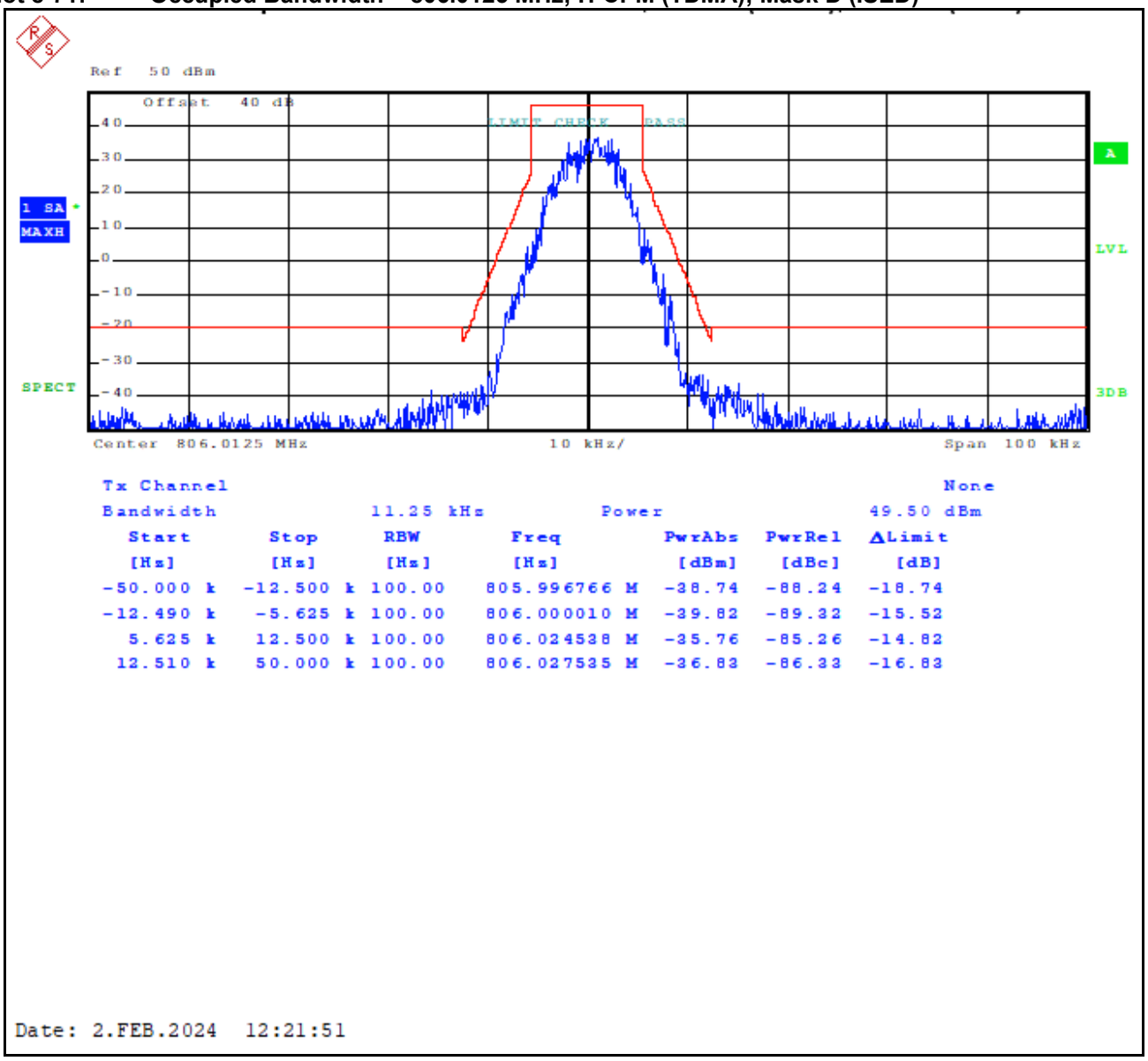
Plot 8-69: Occupied Bandwidth – 860.0000 MHz; H-CPM (TDMA); Mask G



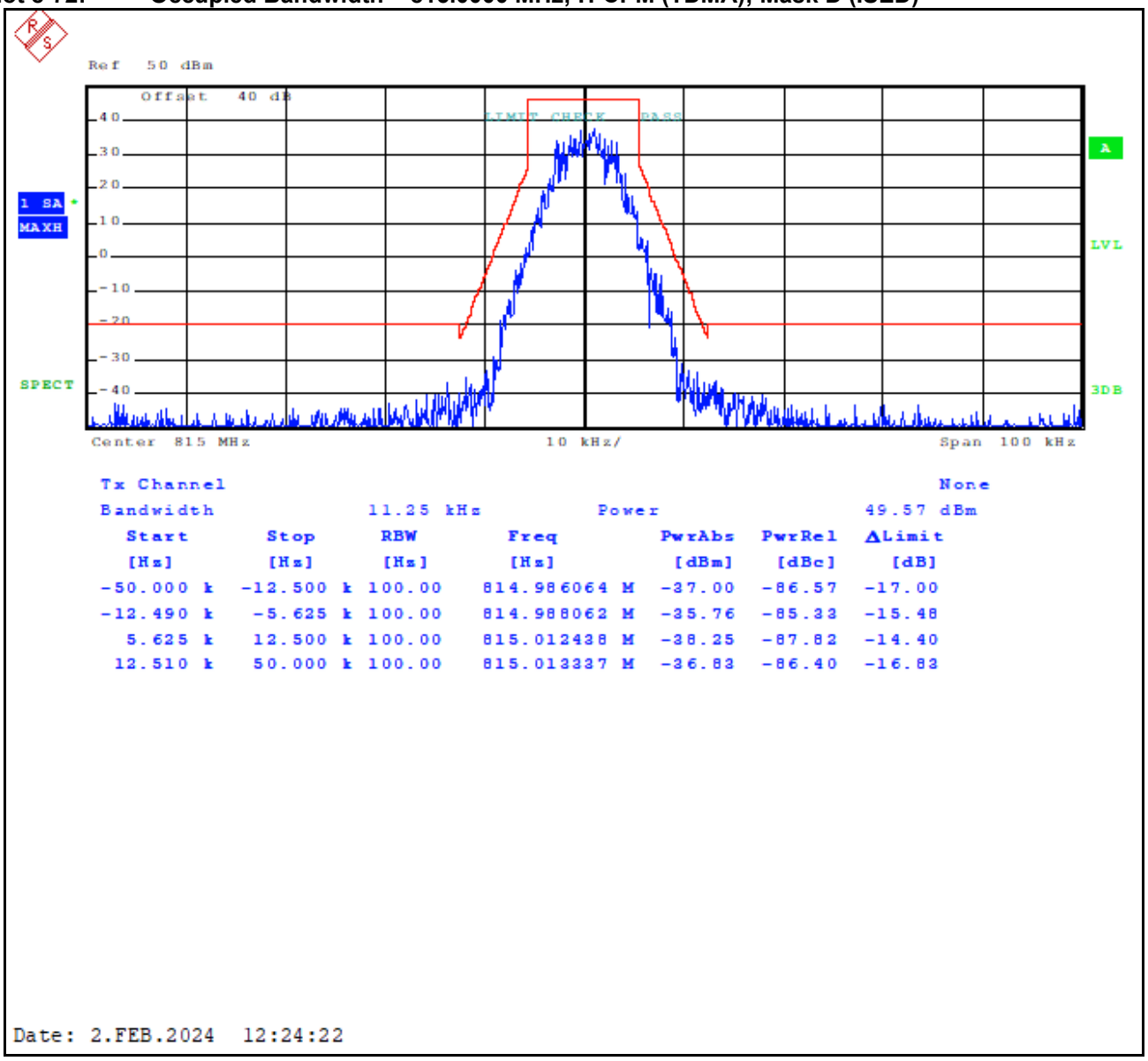
Plot 8-70: Occupied Bandwidth – 868.9875 MHz; H-CPM (TDMA); Mask G



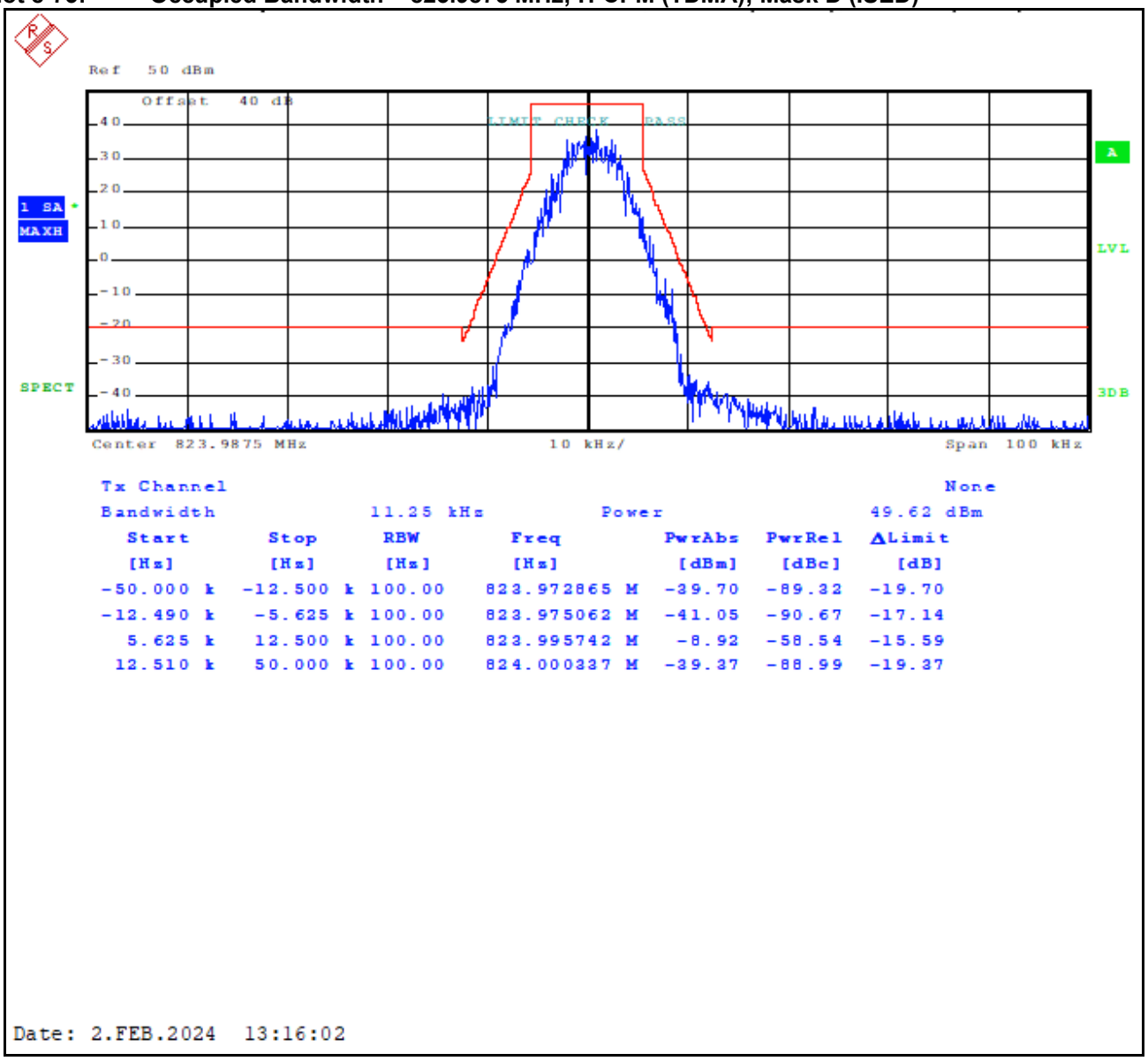
Plot 8-71: Occupied Bandwidth – 806.0125 MHz; H-CPM (TDMA); Mask D (ISED)



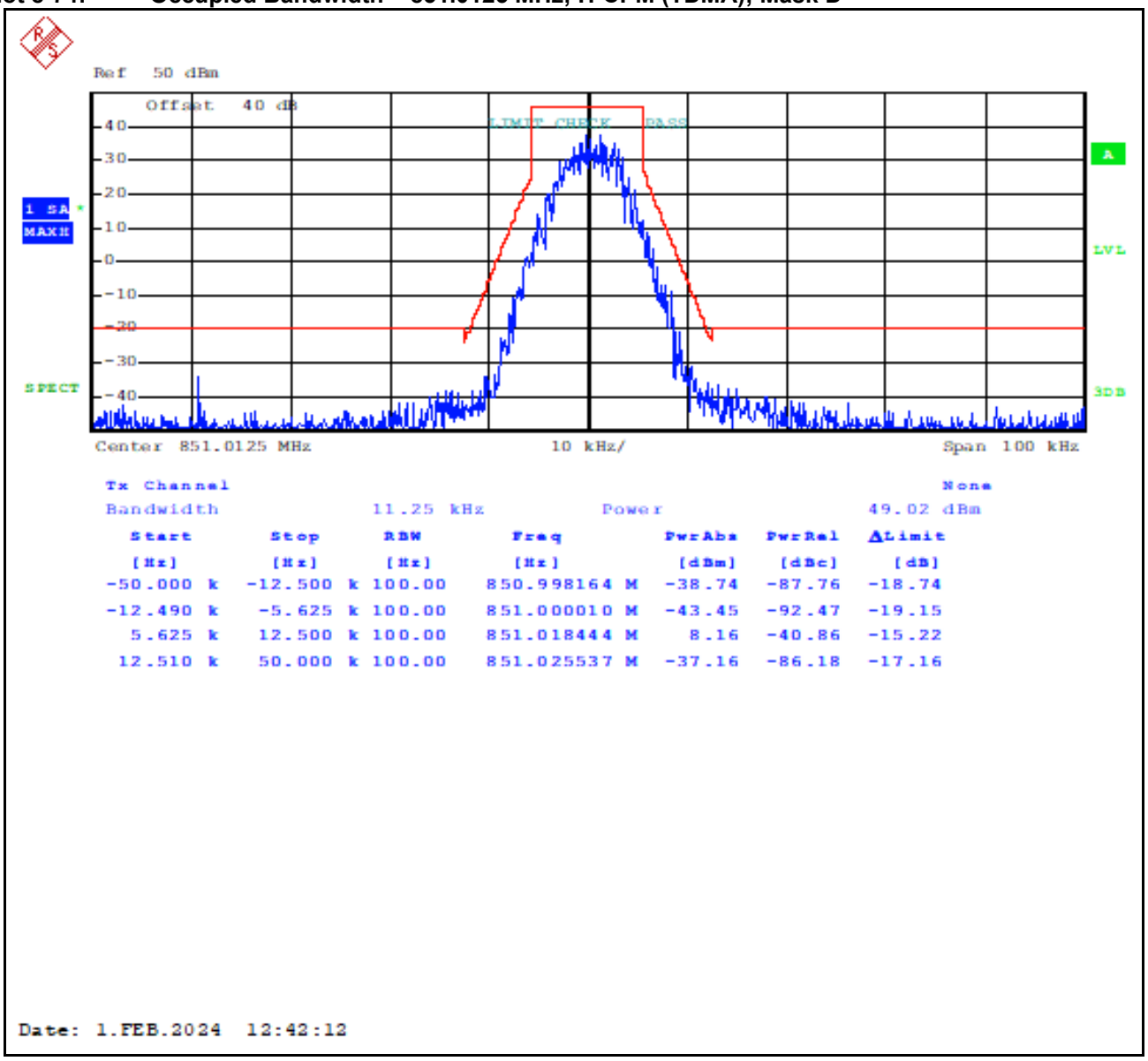
Plot 8-72: Occupied Bandwidth – 815.0000 MHz; H-CPM (TDMA); Mask D (ISED)



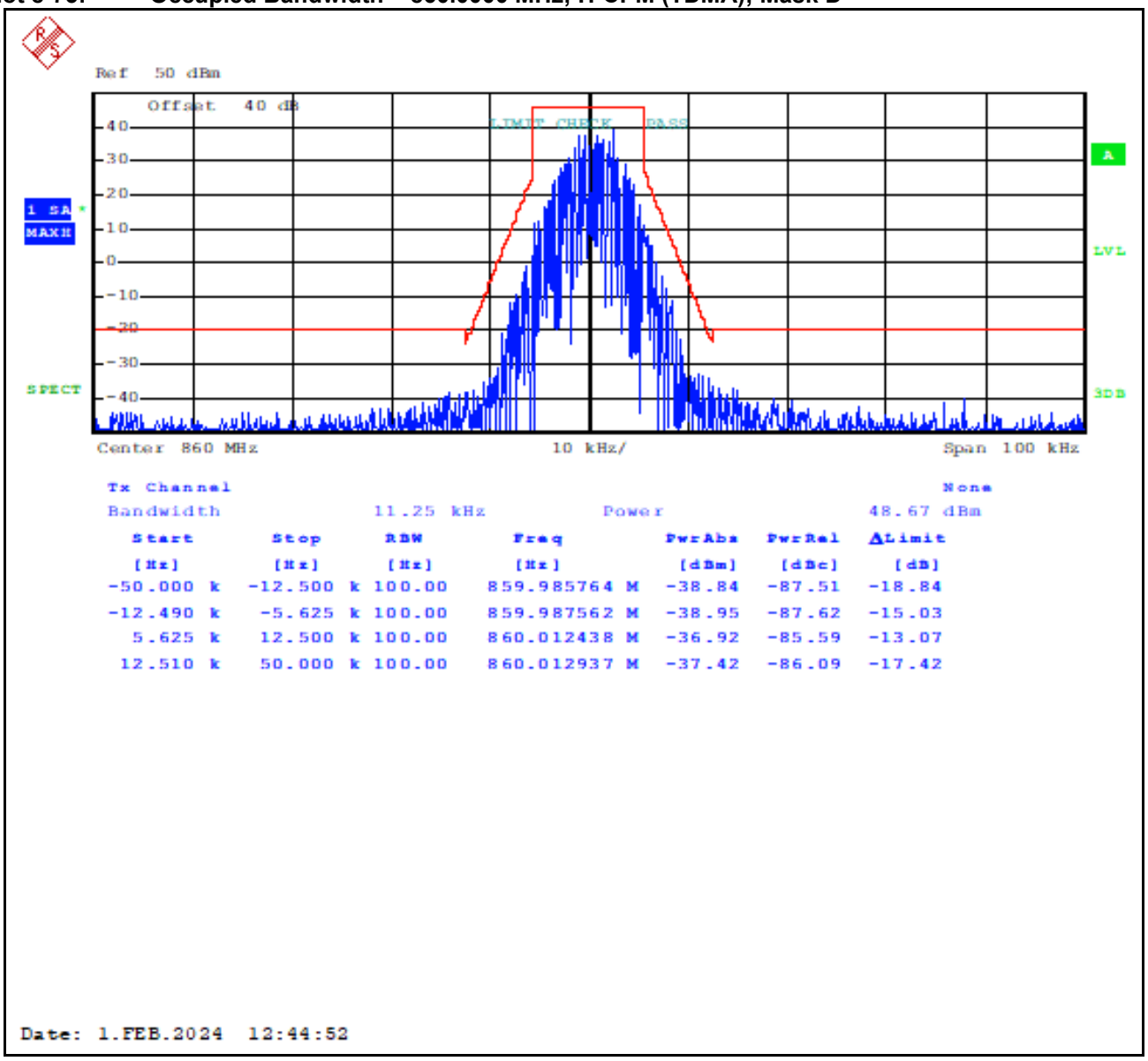
Plot 8-73: Occupied Bandwidth – 823.9875 MHz; H-CPM (TDMA); Mask D (ISED)



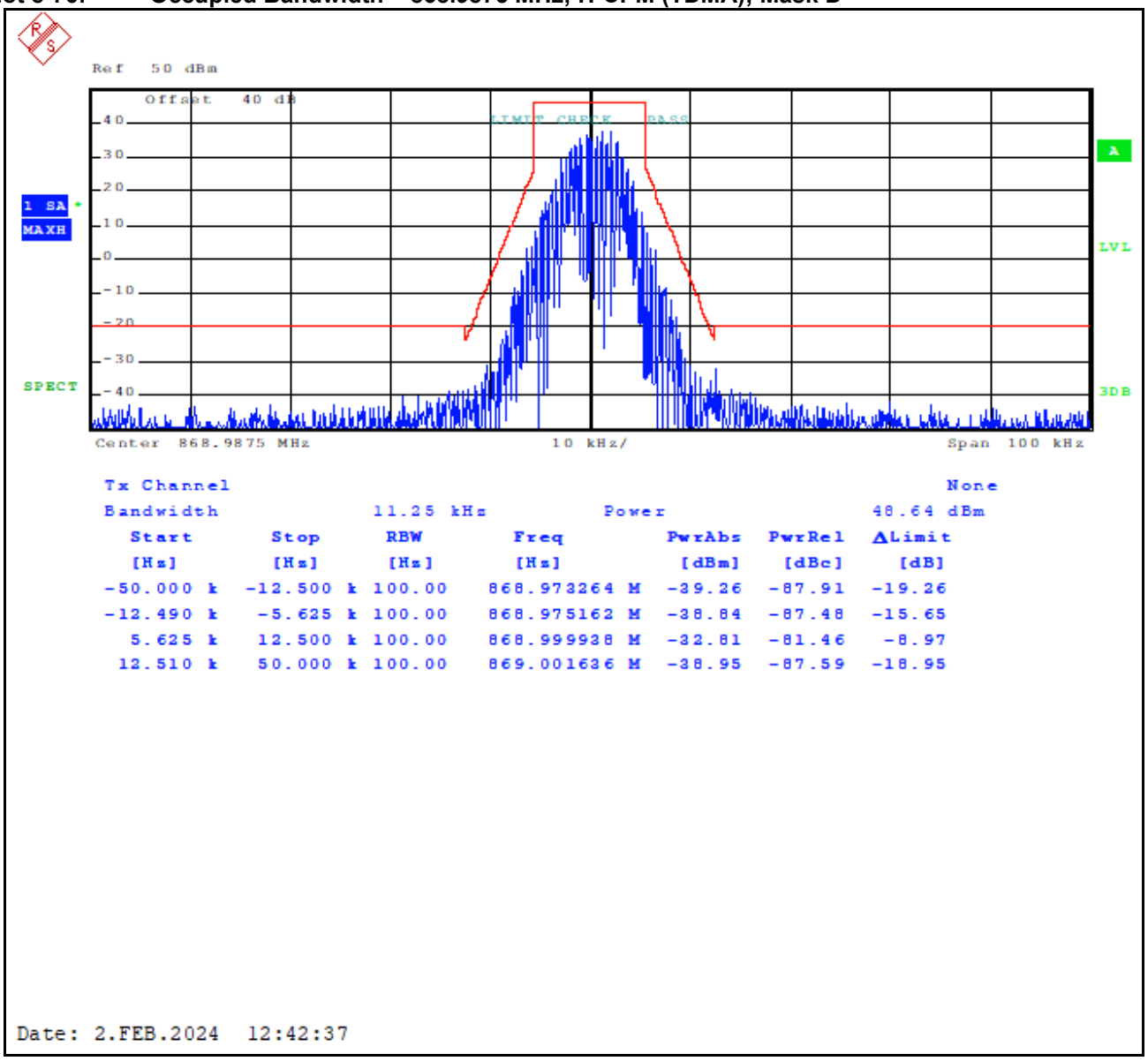
Plot 8-74: Occupied Bandwidth – 851.0125 MHz; H-CPM (TDMA); Mask D



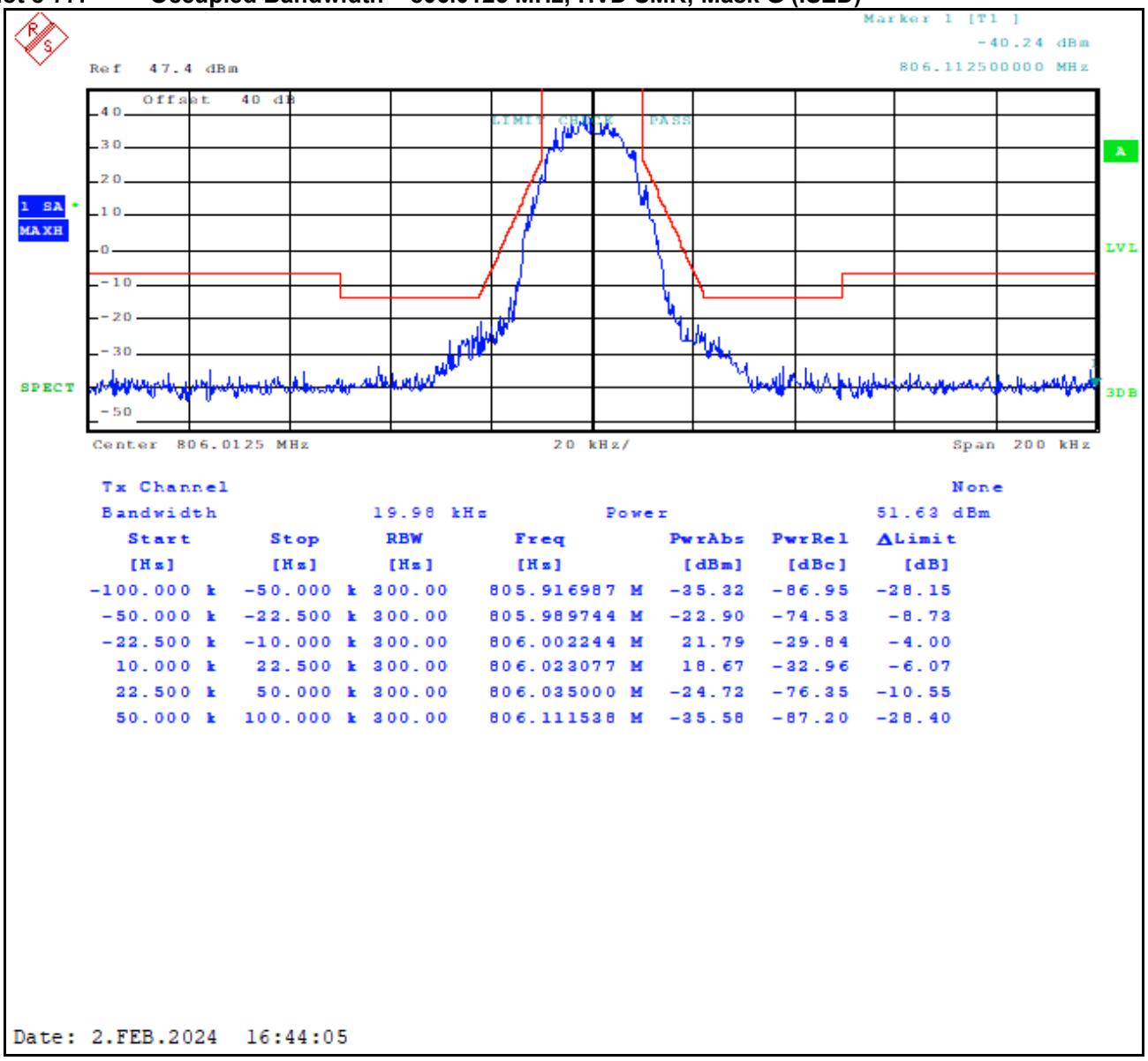
Plot 8-75: Occupied Bandwidth – 860.0000 MHz; H-CPM (TDMA); Mask D



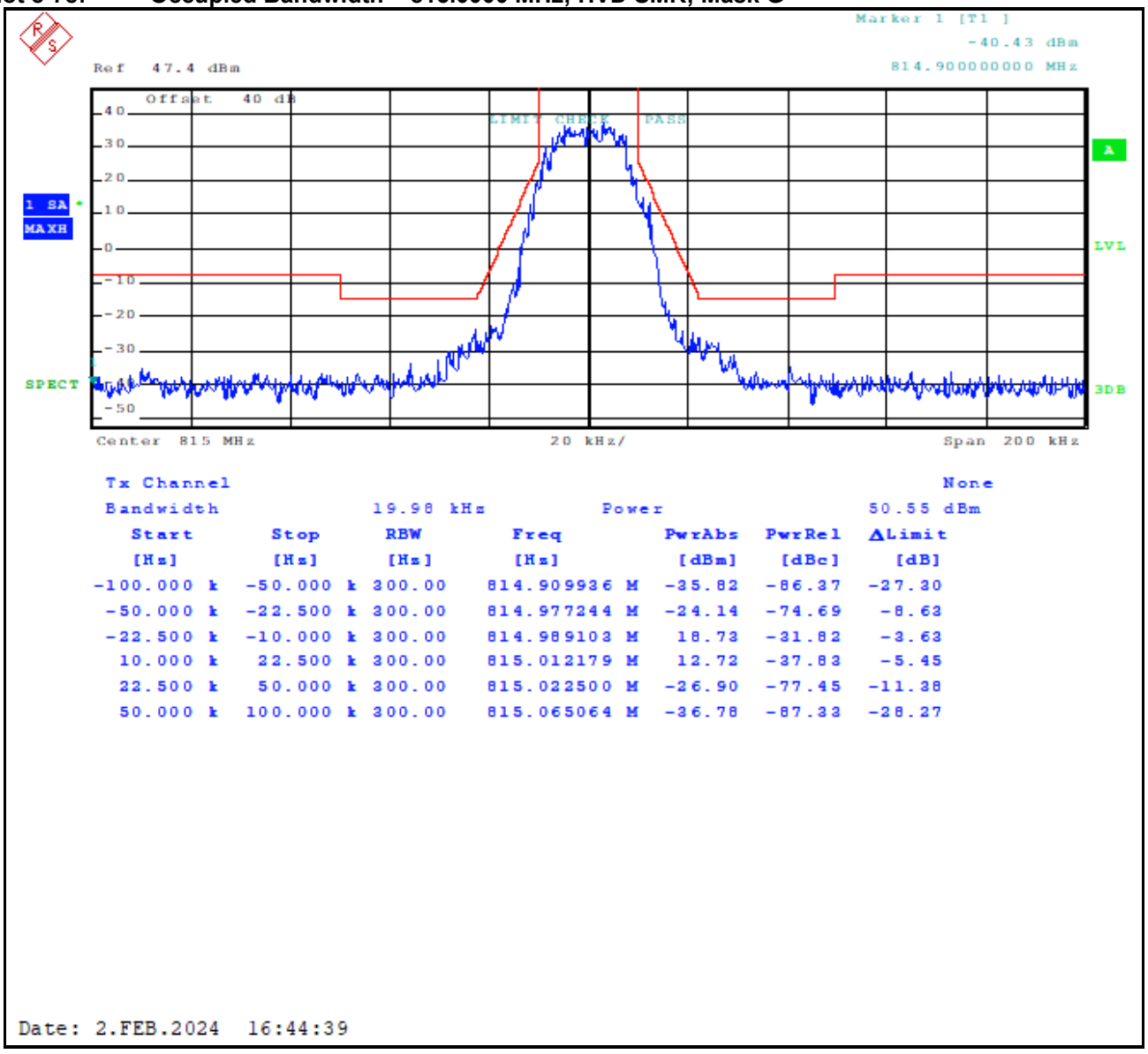
Plot 8-76: Occupied Bandwidth – 868.9875 MHz; H-CPM (TDMA); Mask D



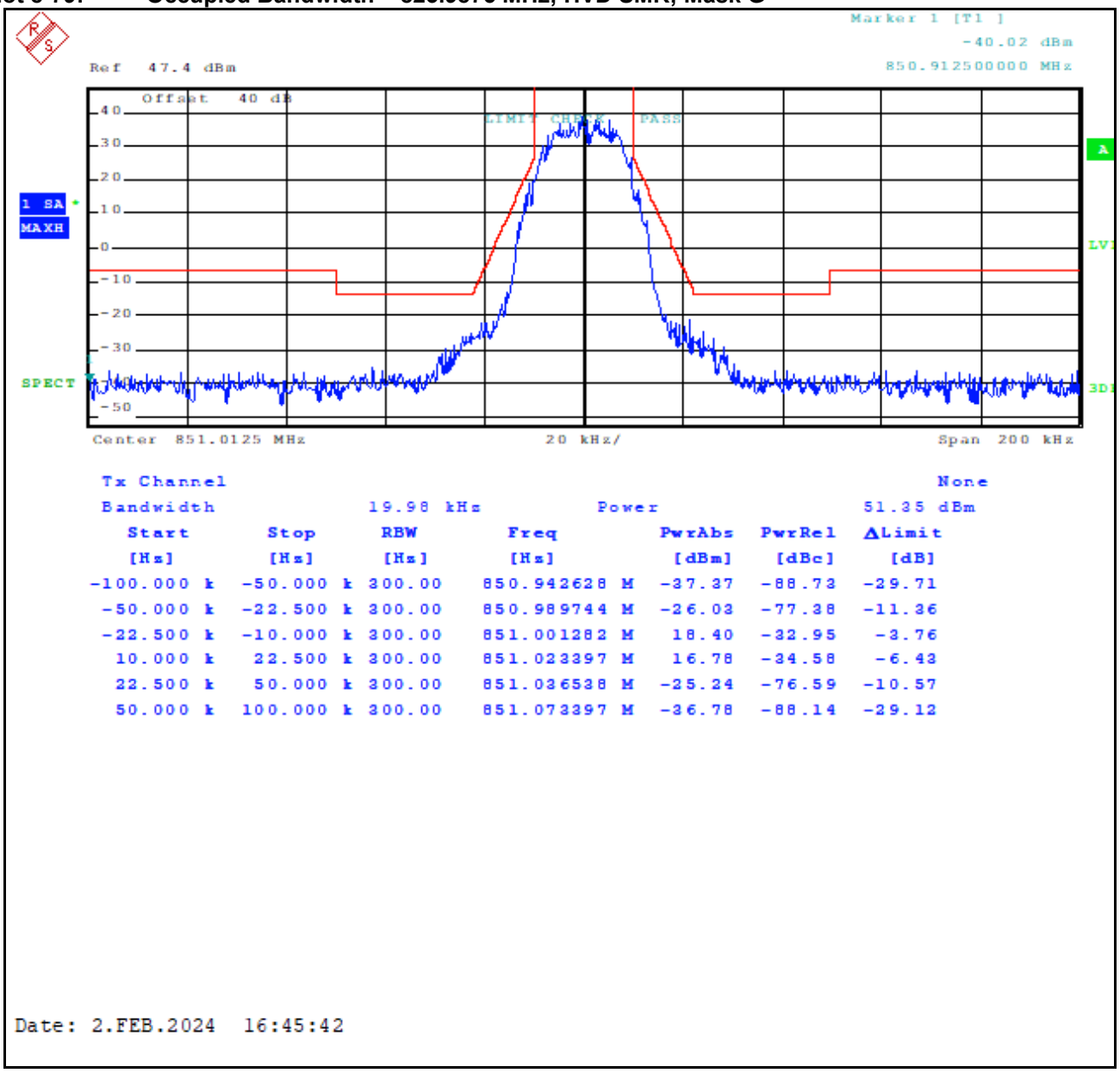
Plot 8-77: Occupied Bandwidth – 806.0125 MHz; HVD SMR; Mask G (ISED)



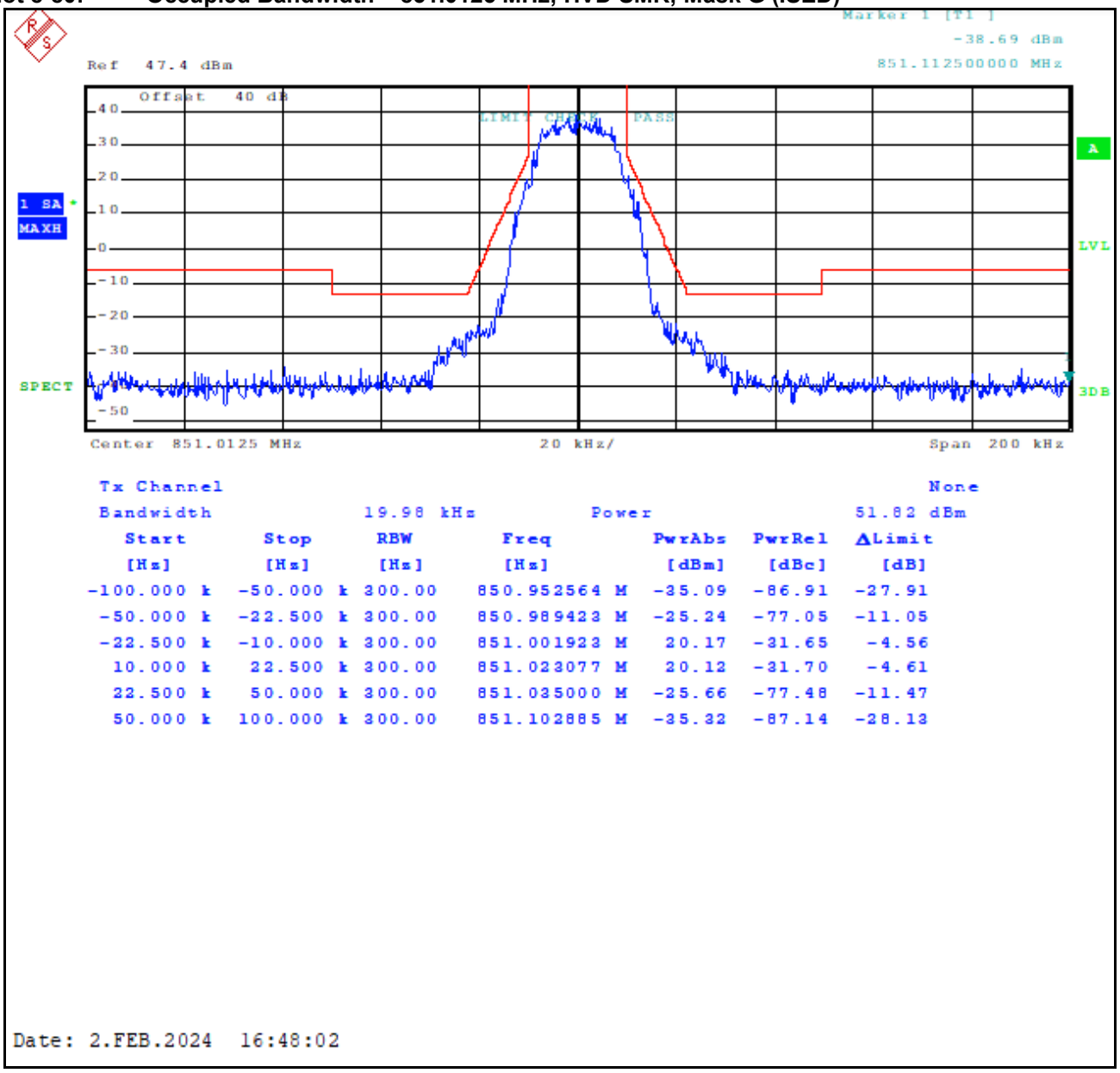
Plot 8-78: Occupied Bandwidth – 815.0000 MHz; HVD SMR; Mask G



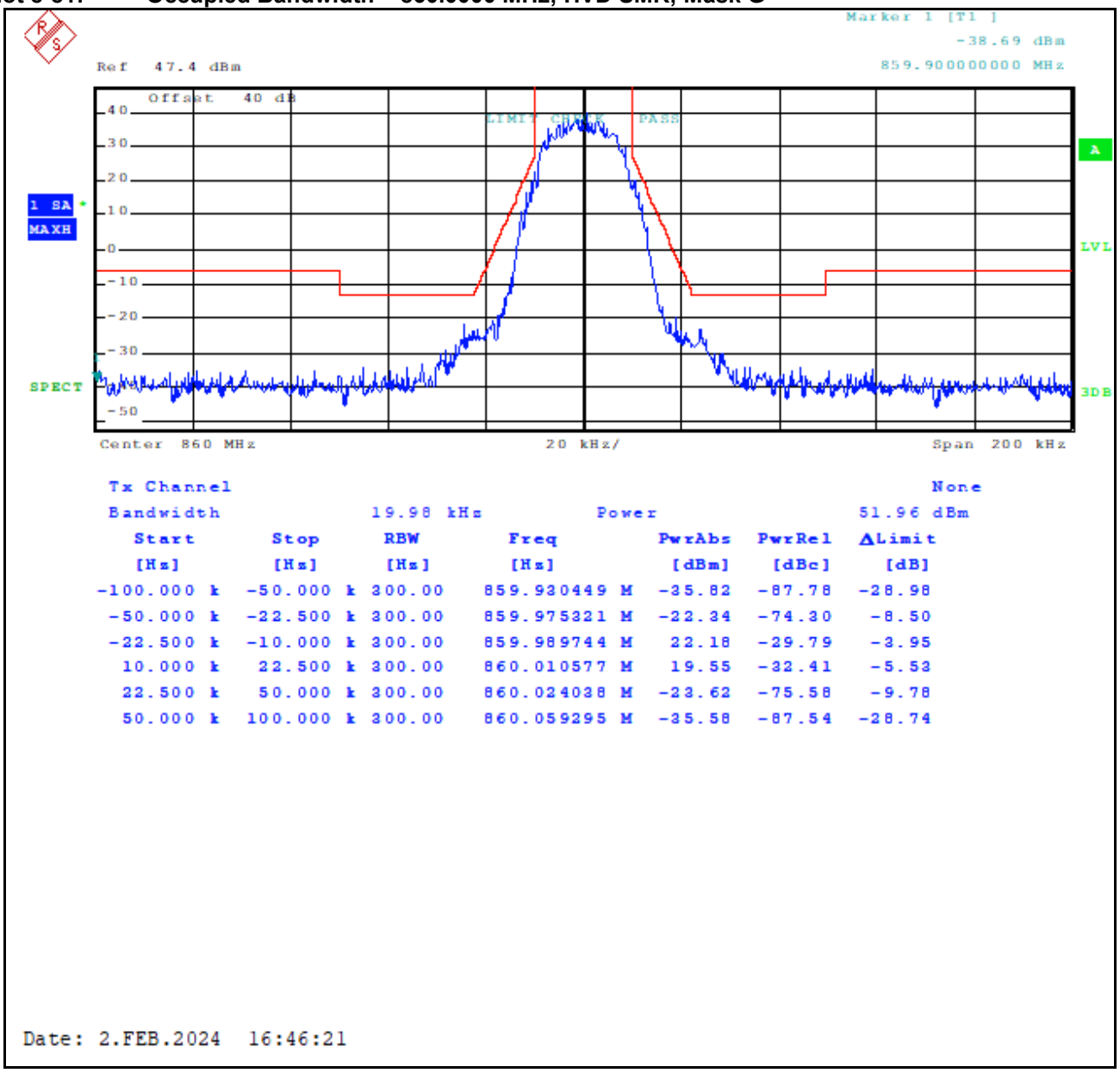
Plot 8-79: Occupied Bandwidth – 823.9875 MHz; HVD SMR; Mask G



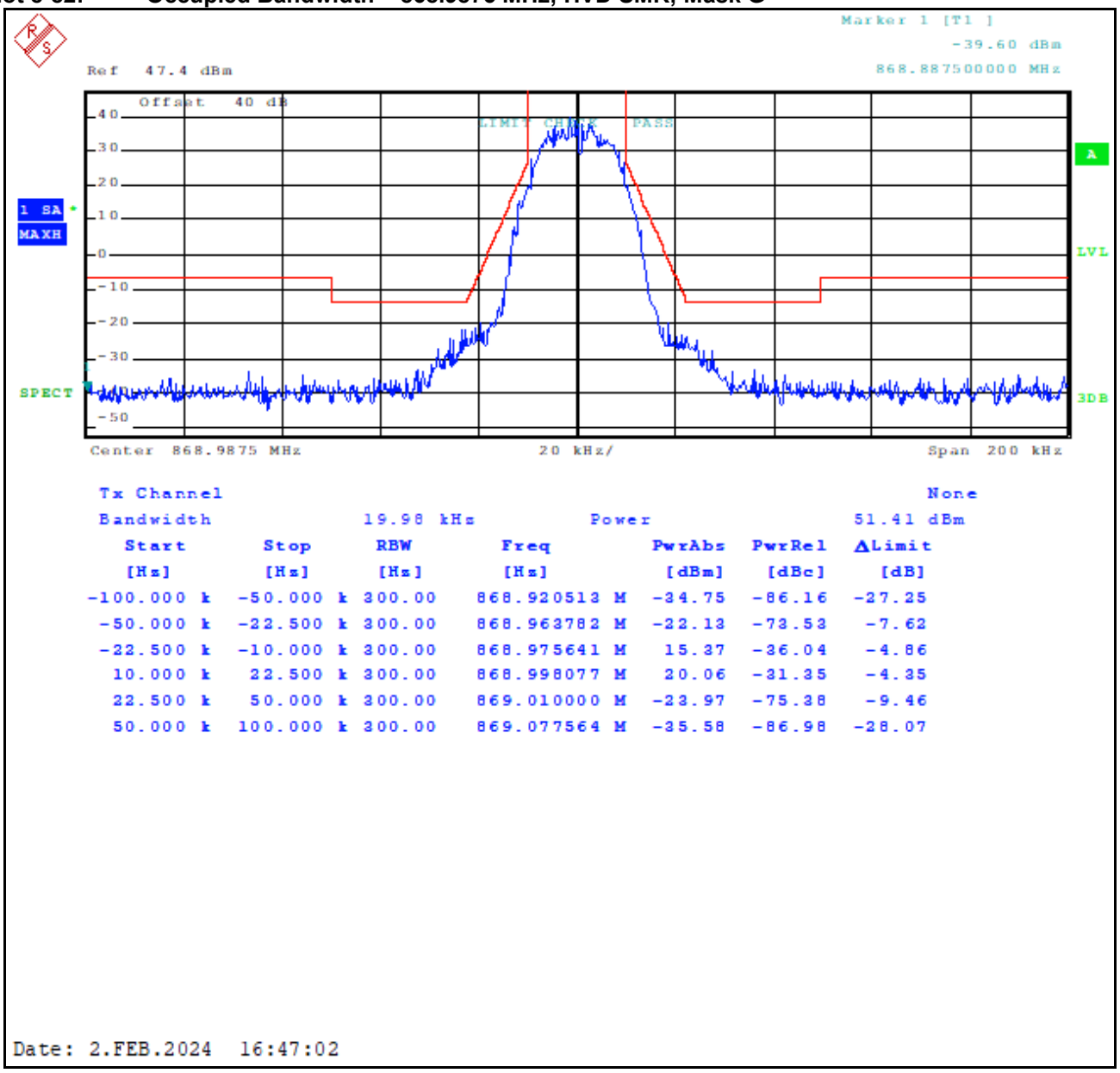
Plot 8-80: Occupied Bandwidth – 851.0125 MHz; HVD SMR; Mask G (ISED)



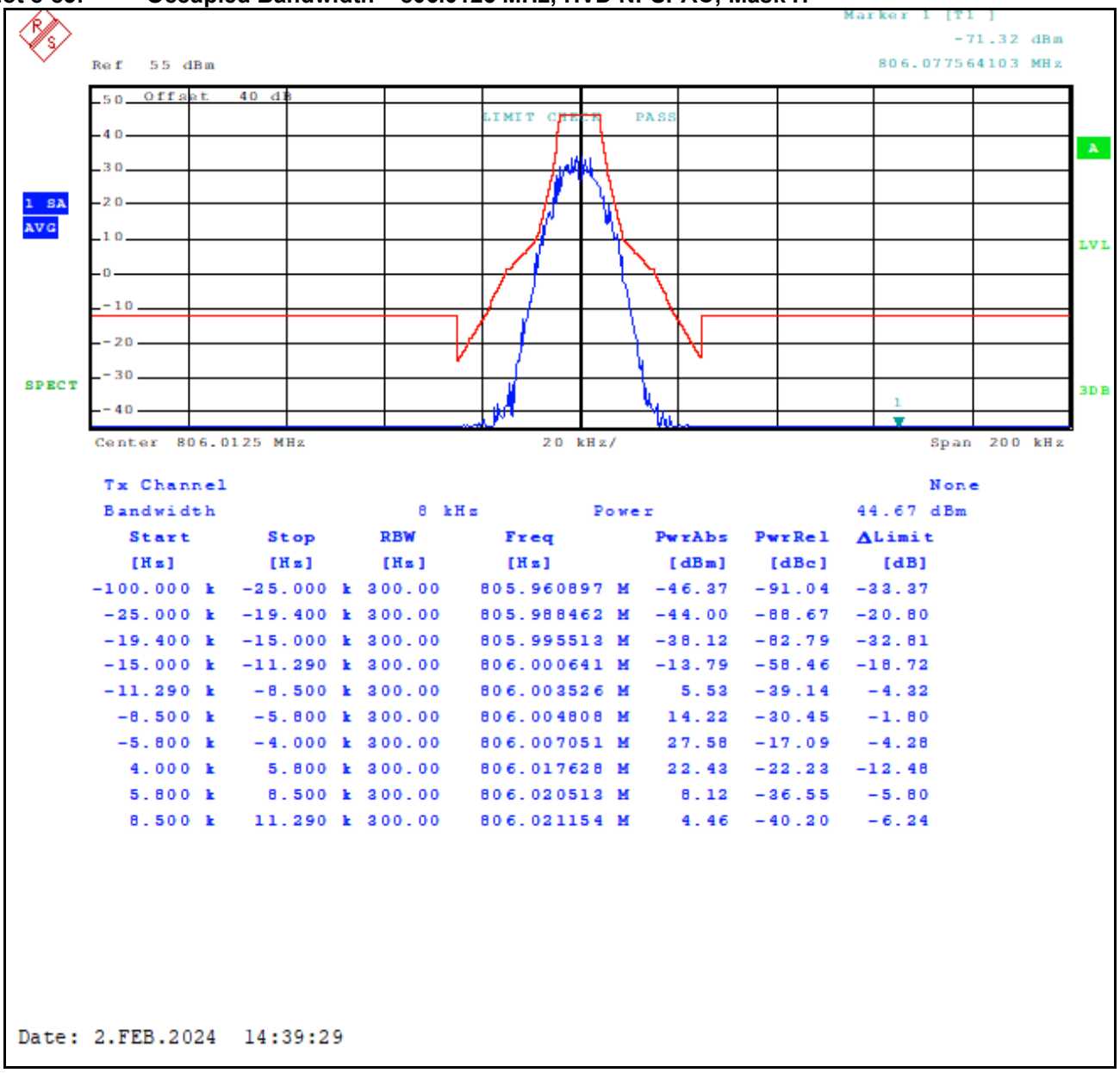
Plot 8-81: Occupied Bandwidth – 860.0000 MHz; HVD SMR; Mask G



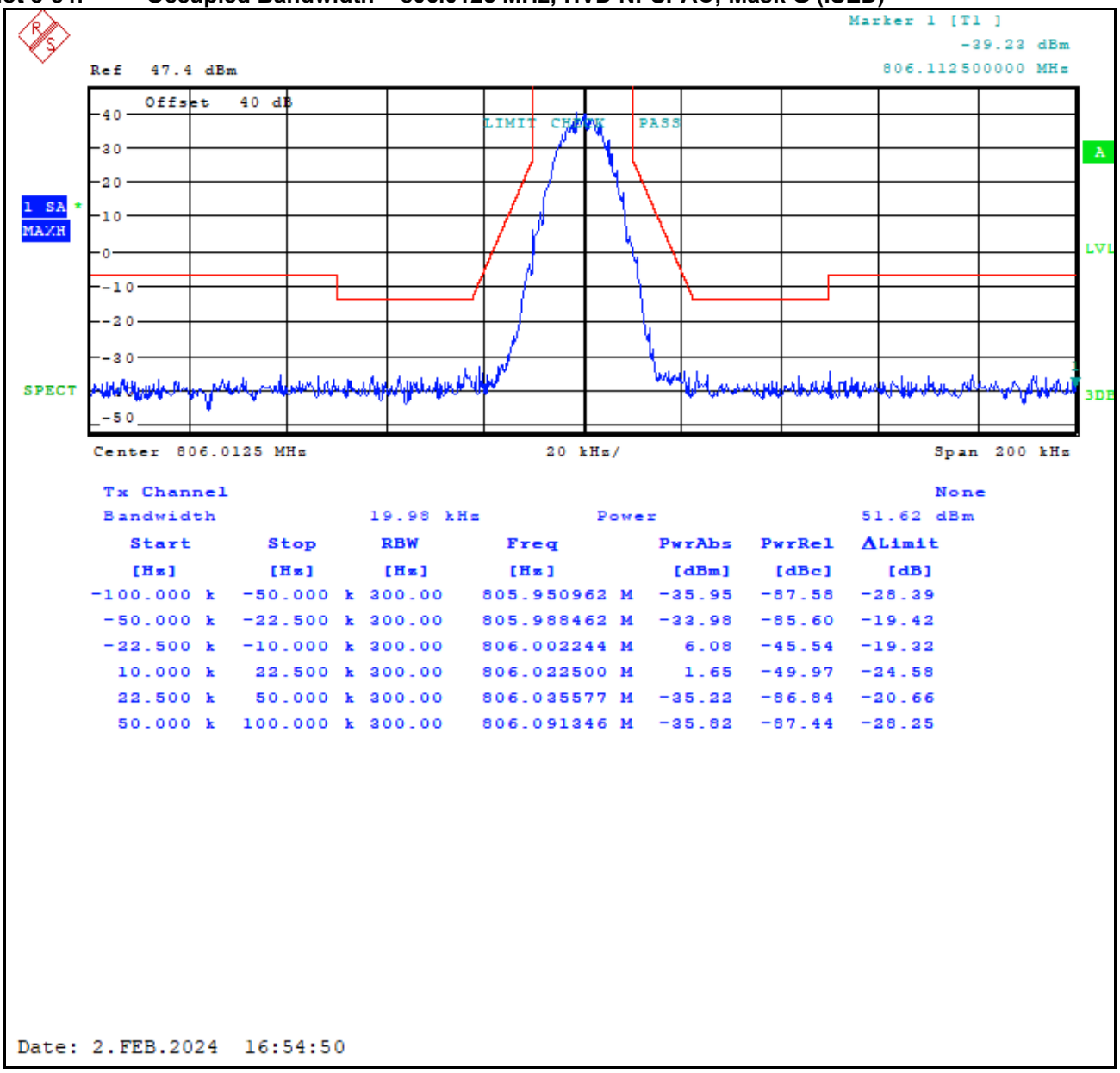
Plot 8-82: Occupied Bandwidth – 868.9875 MHz; HVD SMR; Mask G



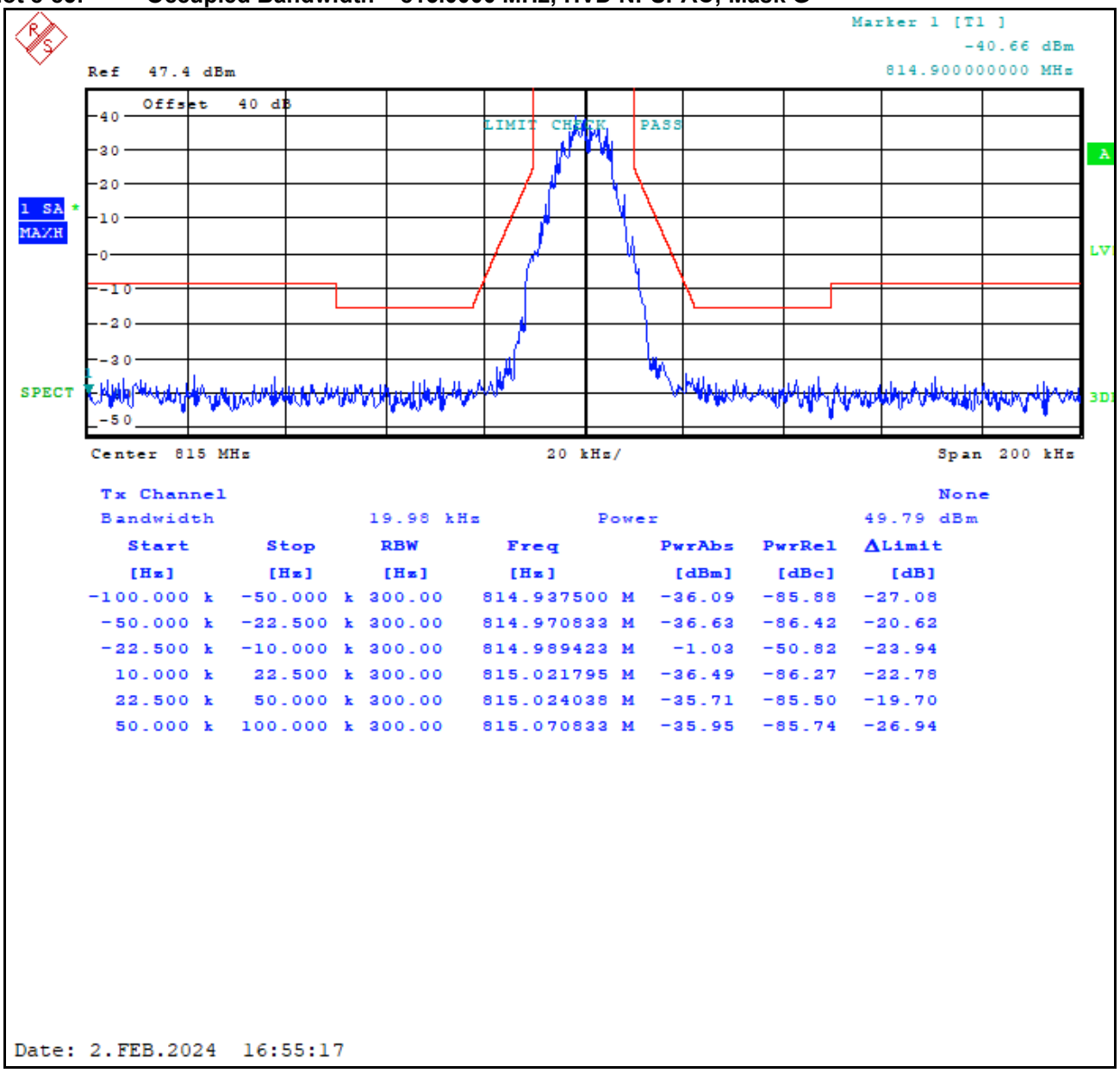
Plot 8-83: Occupied Bandwidth – 806.0125 MHz; HVD NPSPAC; Mask H



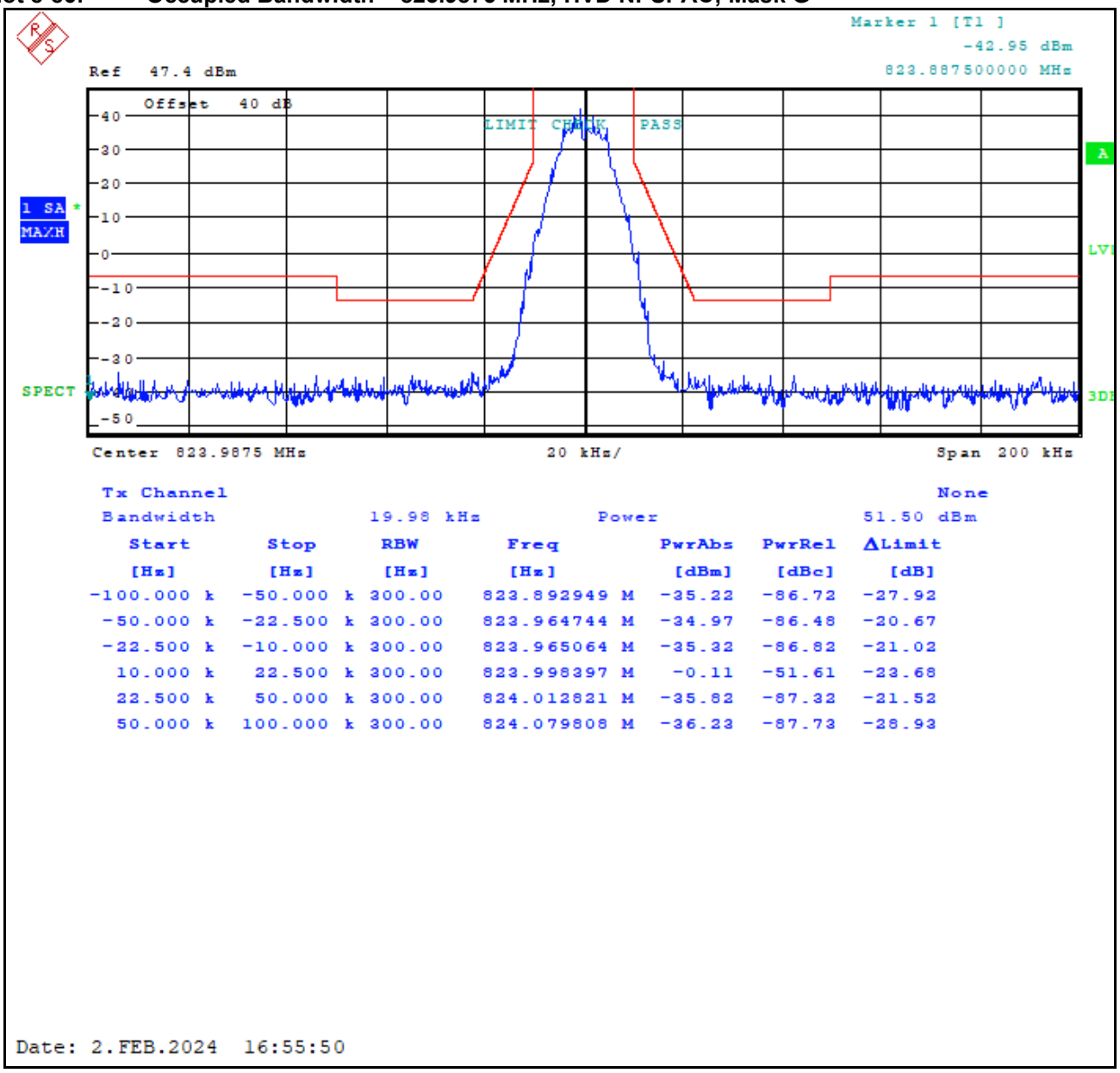
Plot 8-84: Occupied Bandwidth – 806.0125 MHz; HVD NPSPAC; Mask G (ISED)



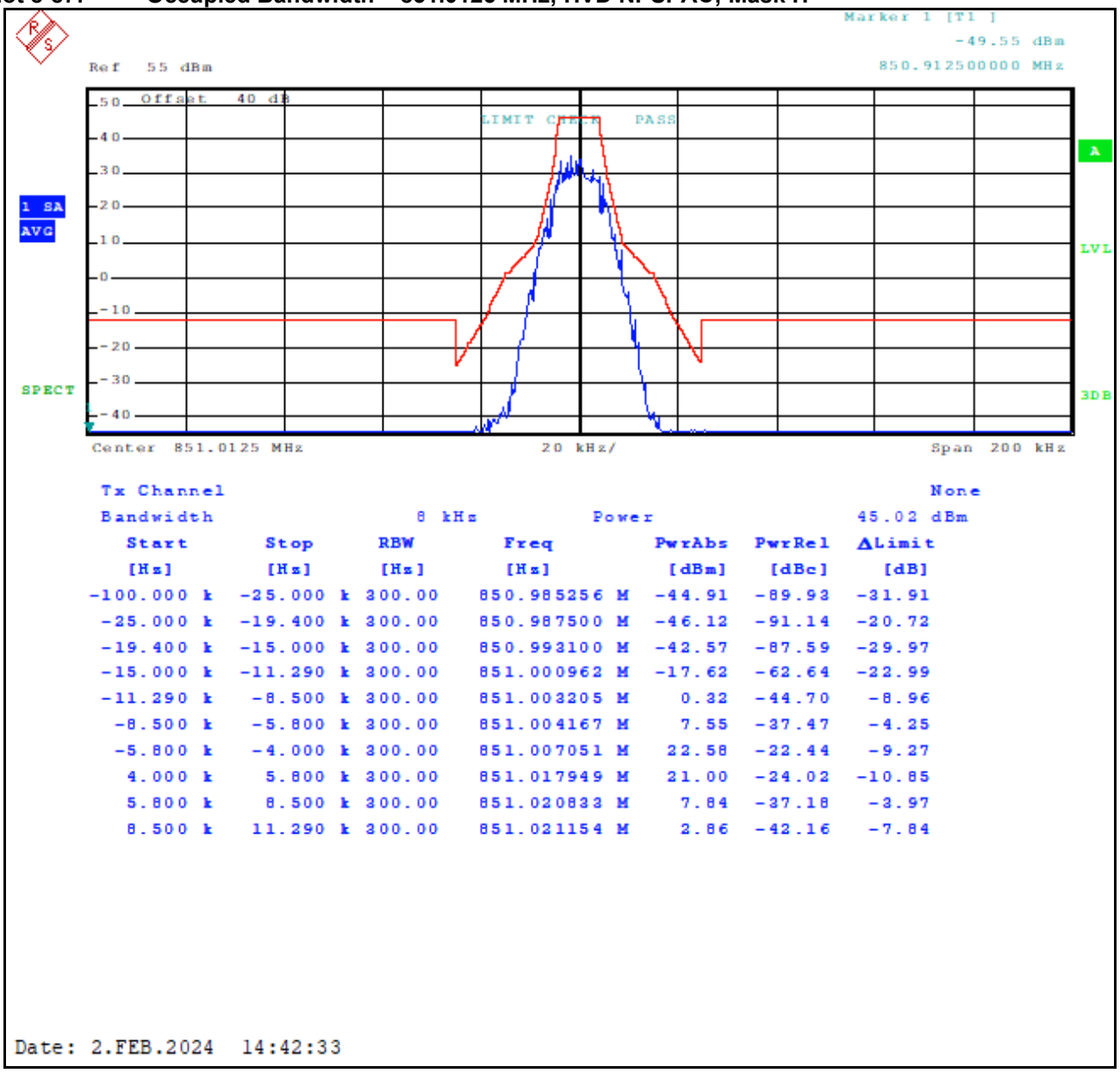
Plot 8-85: Occupied Bandwidth – 815.0000 MHz; HVD NPSPAC; Mask G



Plot 8-86: Occupied Bandwidth – 823.9875 MHz; HVD NPSPAC; Mask G



Plot 8-87: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; Mask H



Tx Channel — None
Bandwidth 8 kHz — Power 45.02 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-100.000 k	-25.000 k	300.00	850.985256 M	-44.91	-89.93	-31.91
-25.000 k	-19.400 k	300.00	850.987500 M	-46.12	-91.14	-20.72
-19.400 k	-15.000 k	300.00	850.993100 M	-42.57	-87.59	-29.97
-15.000 k	-11.290 k	300.00	851.000962 M	-17.62	-62.64	-22.99
-11.290 k	-8.500 k	300.00	851.003205 M	0.32	-44.70	-8.96
-8.500 k	-5.800 k	300.00	851.004167 M	7.55	-37.47	-4.25
-5.800 k	-4.000 k	300.00	851.007051 M	22.58	-22.44	-9.27
4.000 k	5.800 k	300.00	851.017949 M	21.00	-24.02	-10.85
5.800 k	8.500 k	300.00	851.020833 M	7.84	-37.18	-3.97
8.500 k	11.290 k	300.00	851.021154 M	2.86	-42.16	-7.84

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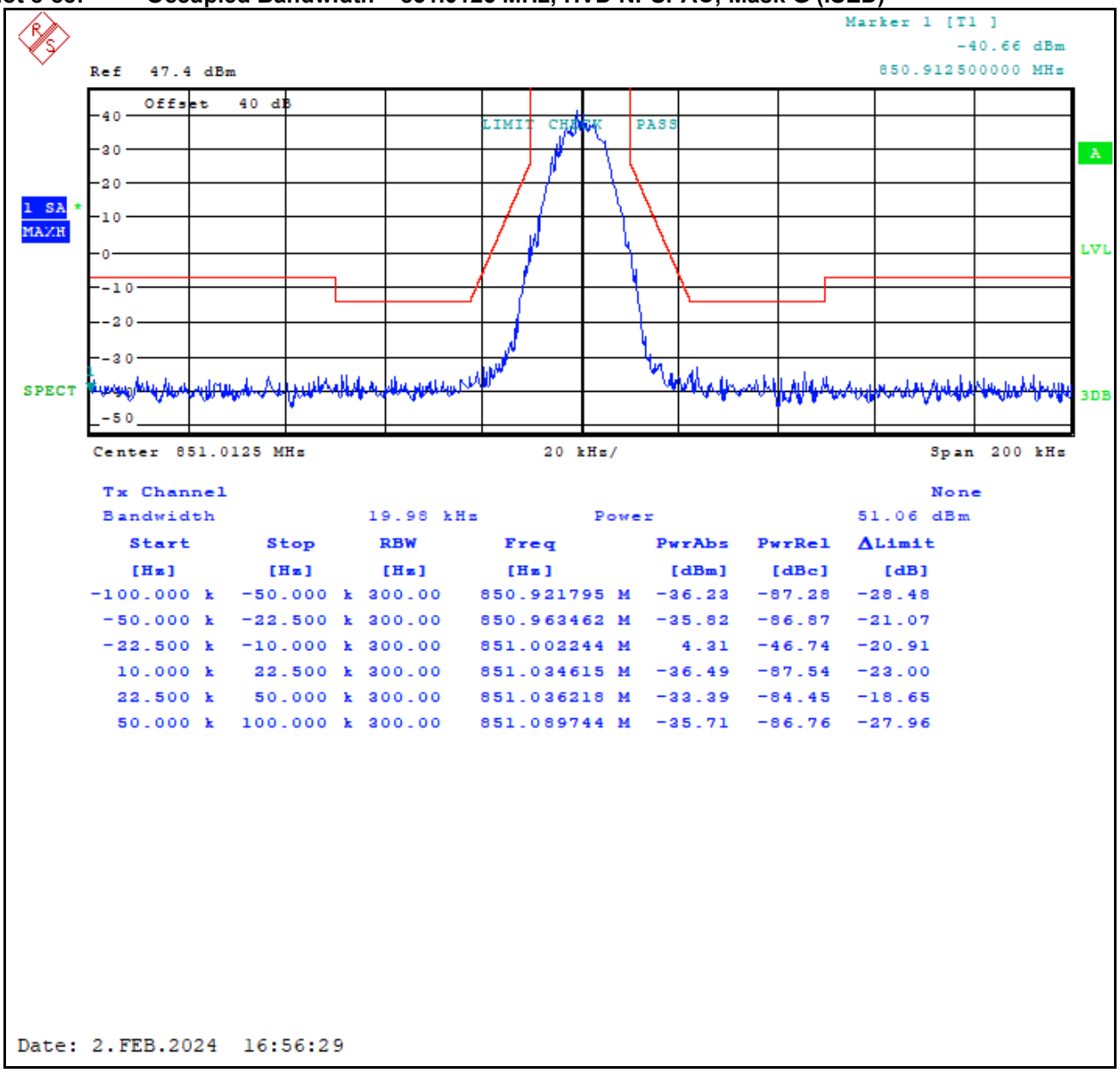
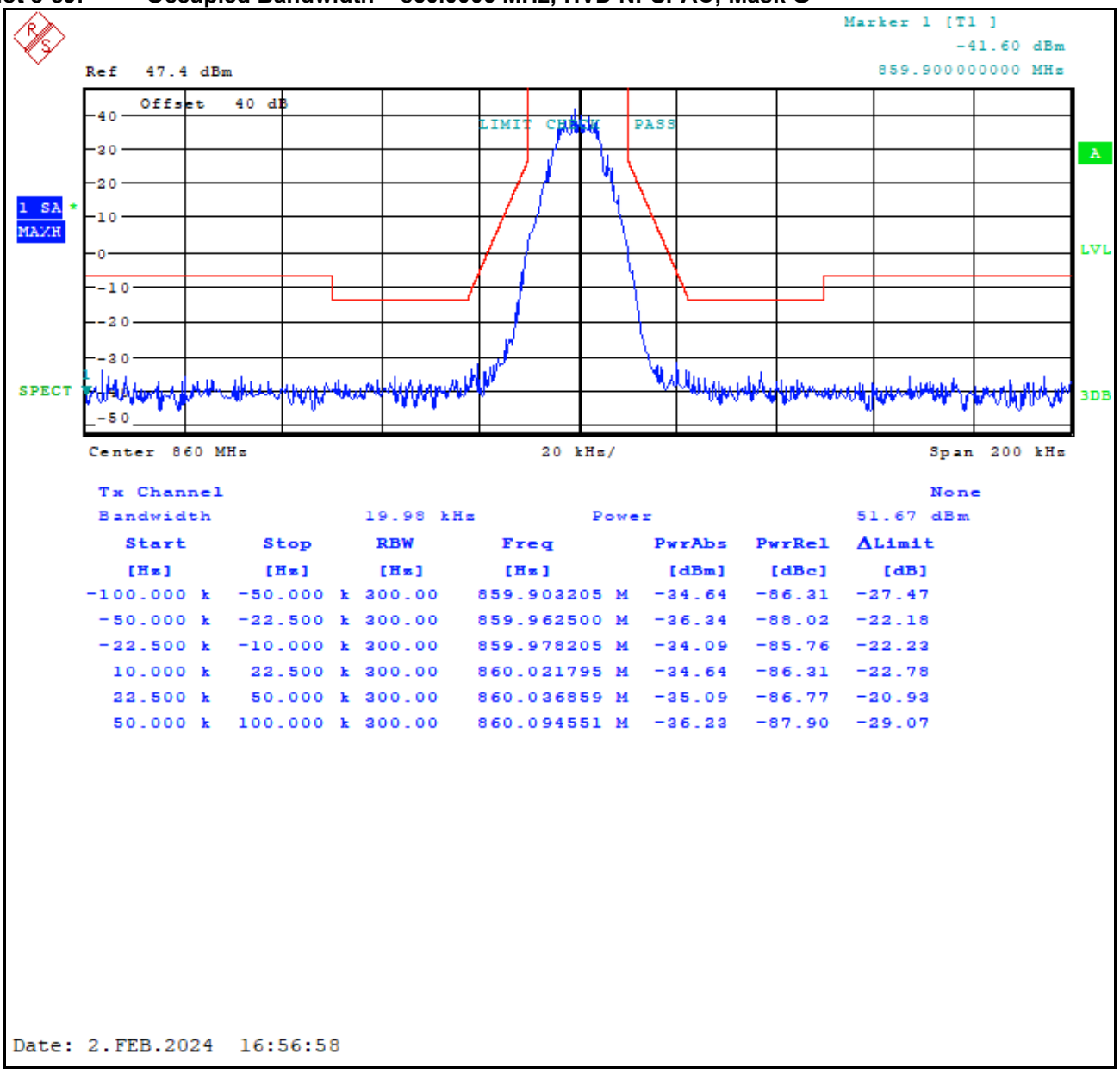
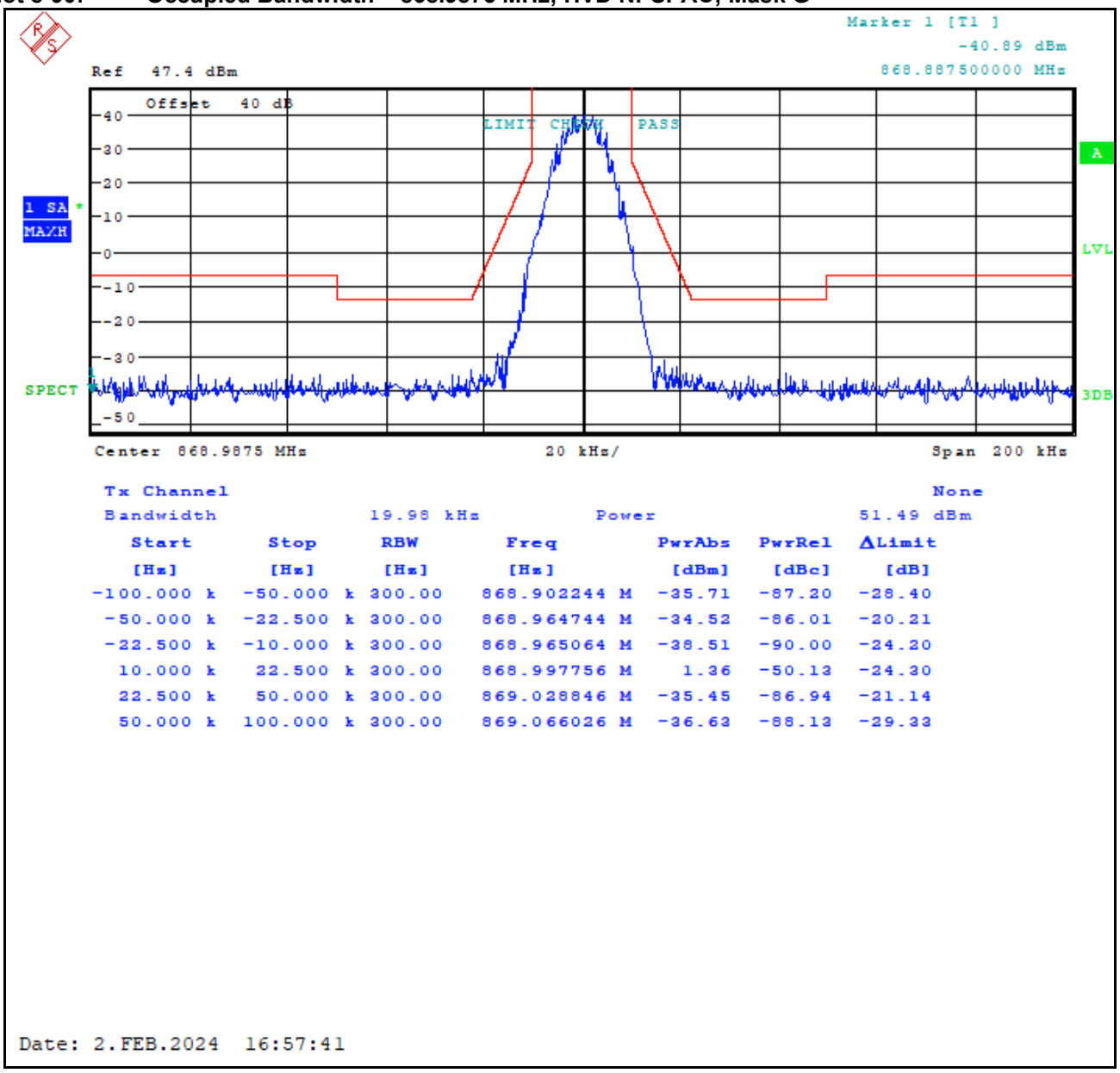
Plot 8-88: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; Mask G (ISED)



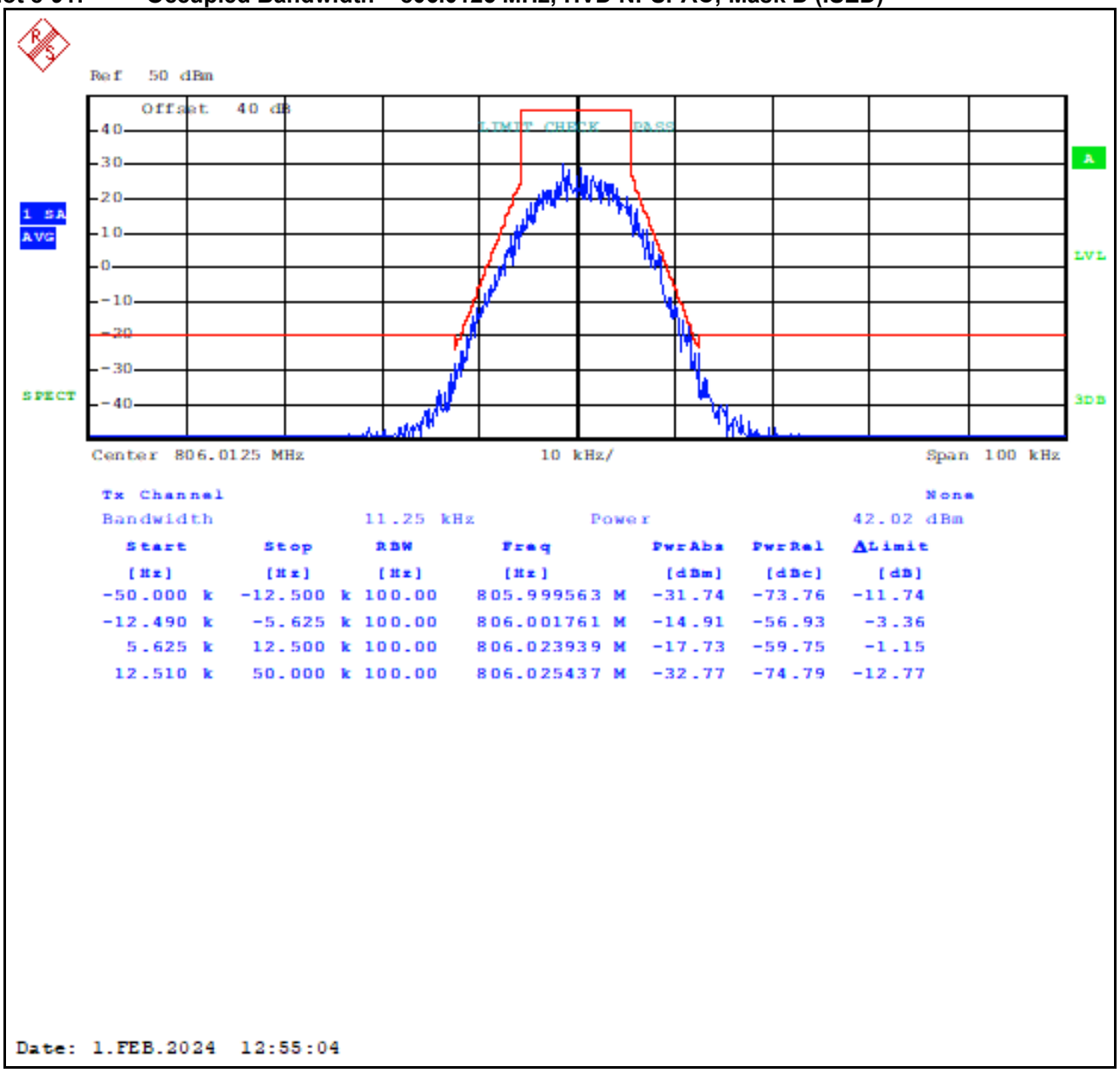
Plot 8-89: Occupied Bandwidth – 860.0000 MHz; HVD NPSPAC; Mask G



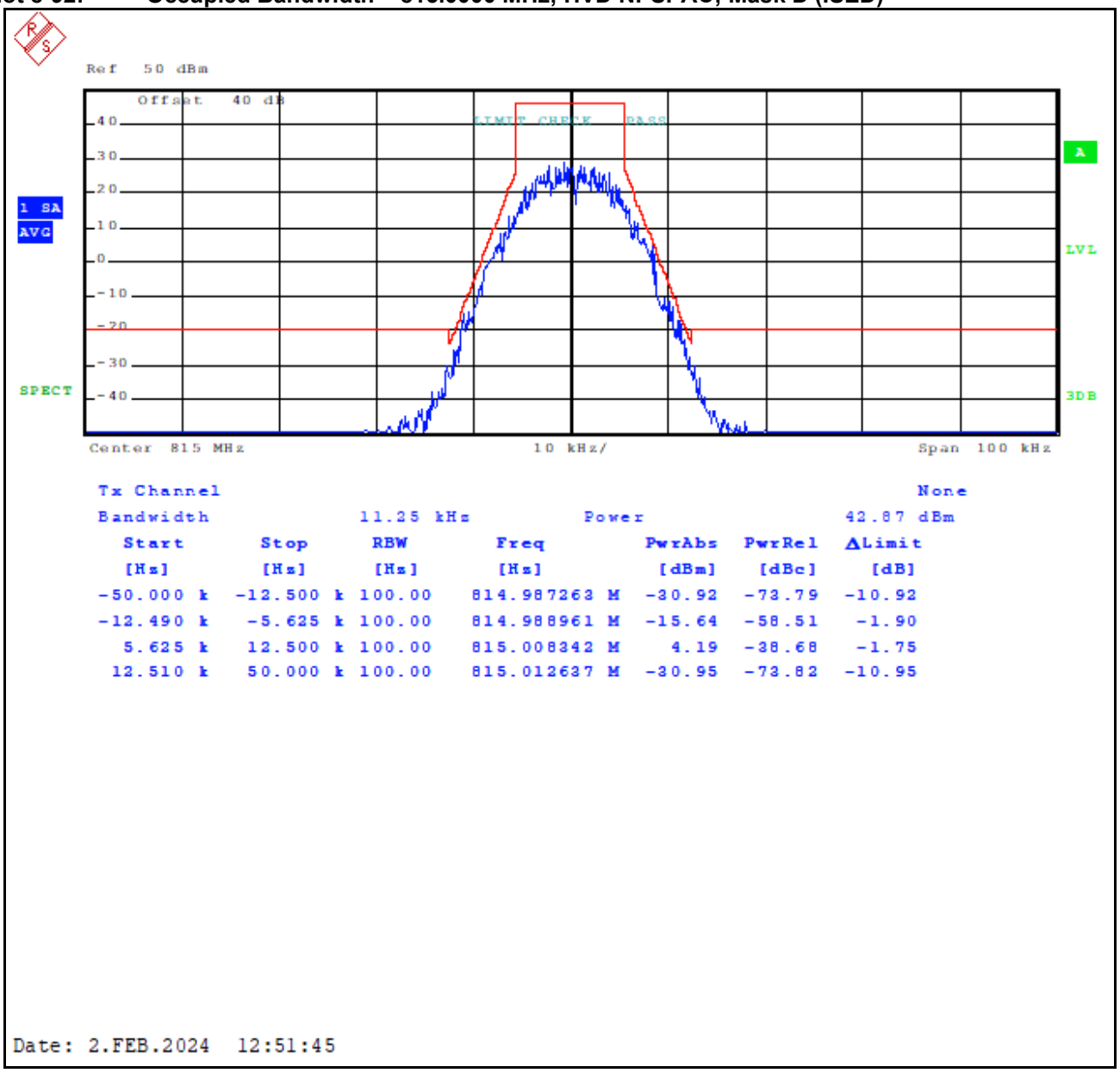
Plot 8-90: Occupied Bandwidth – 868.9875 MHz; HVD NPSPAC; Mask G



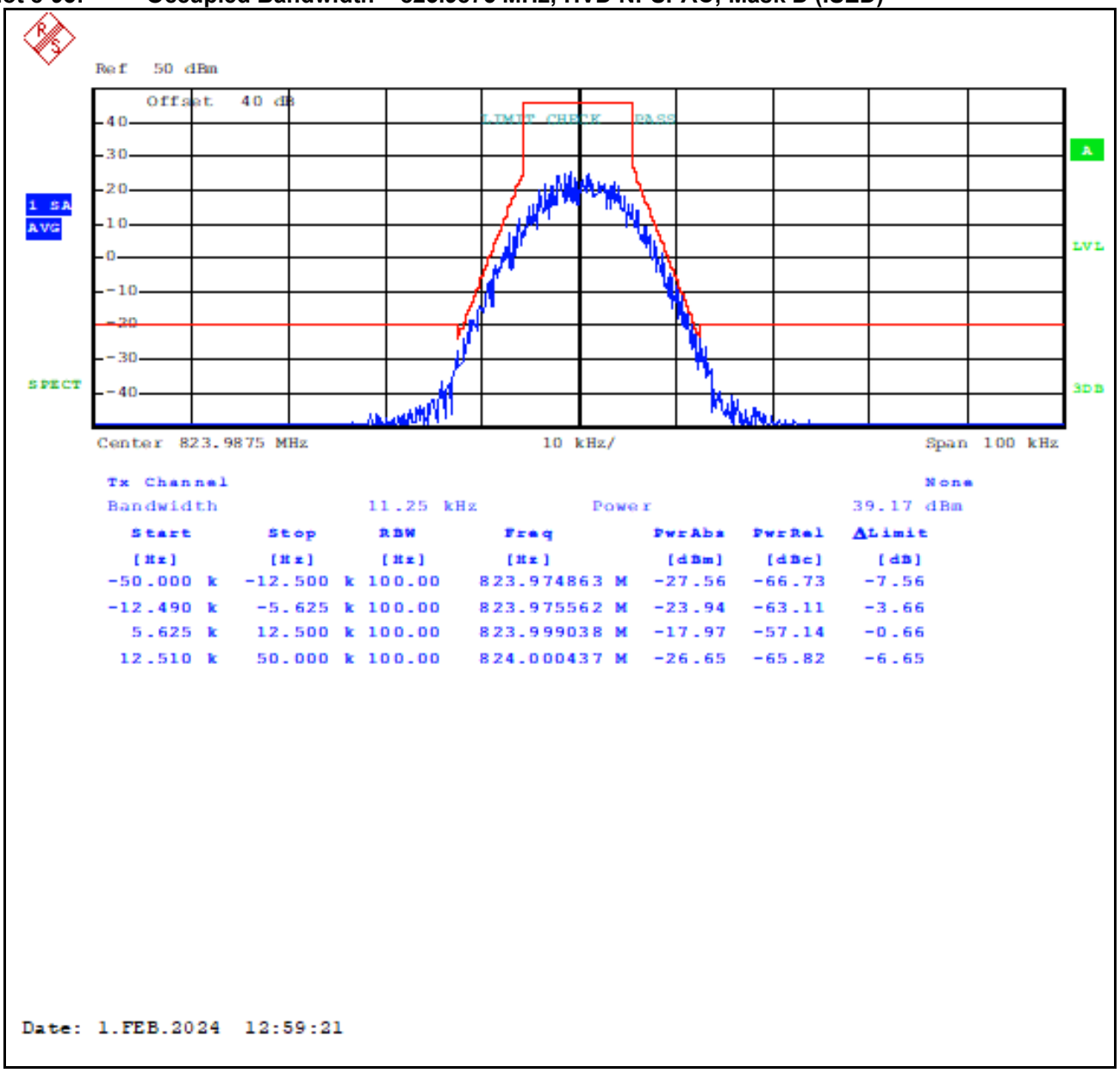
Plot 8-91: Occupied Bandwidth – 806.0125 MHz; HVD NPSPAC; Mask D (ISED)



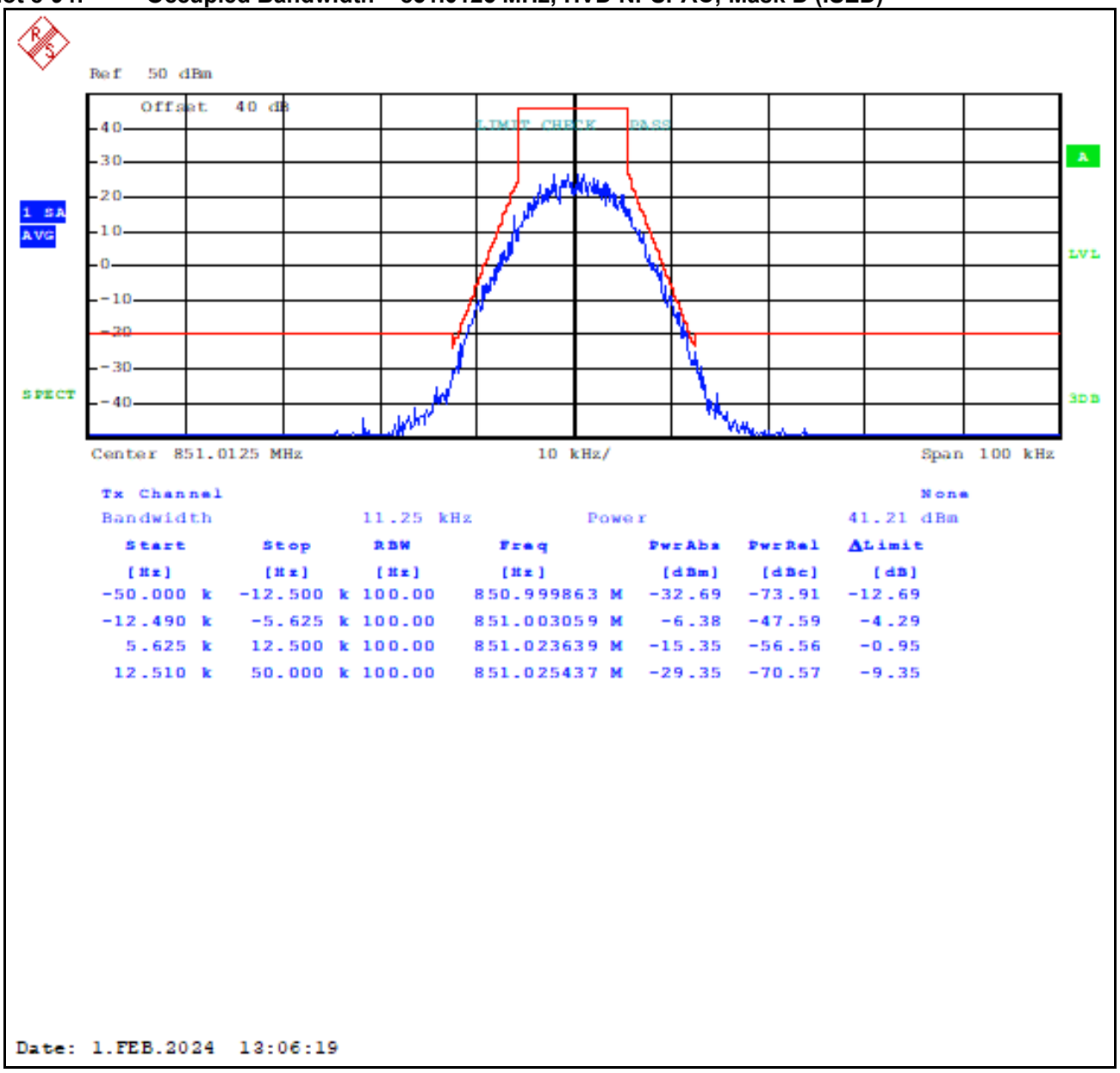
Plot 8-92: Occupied Bandwidth – 815.0000 MHz; HVD NPSPAC; Mask D (ISED)



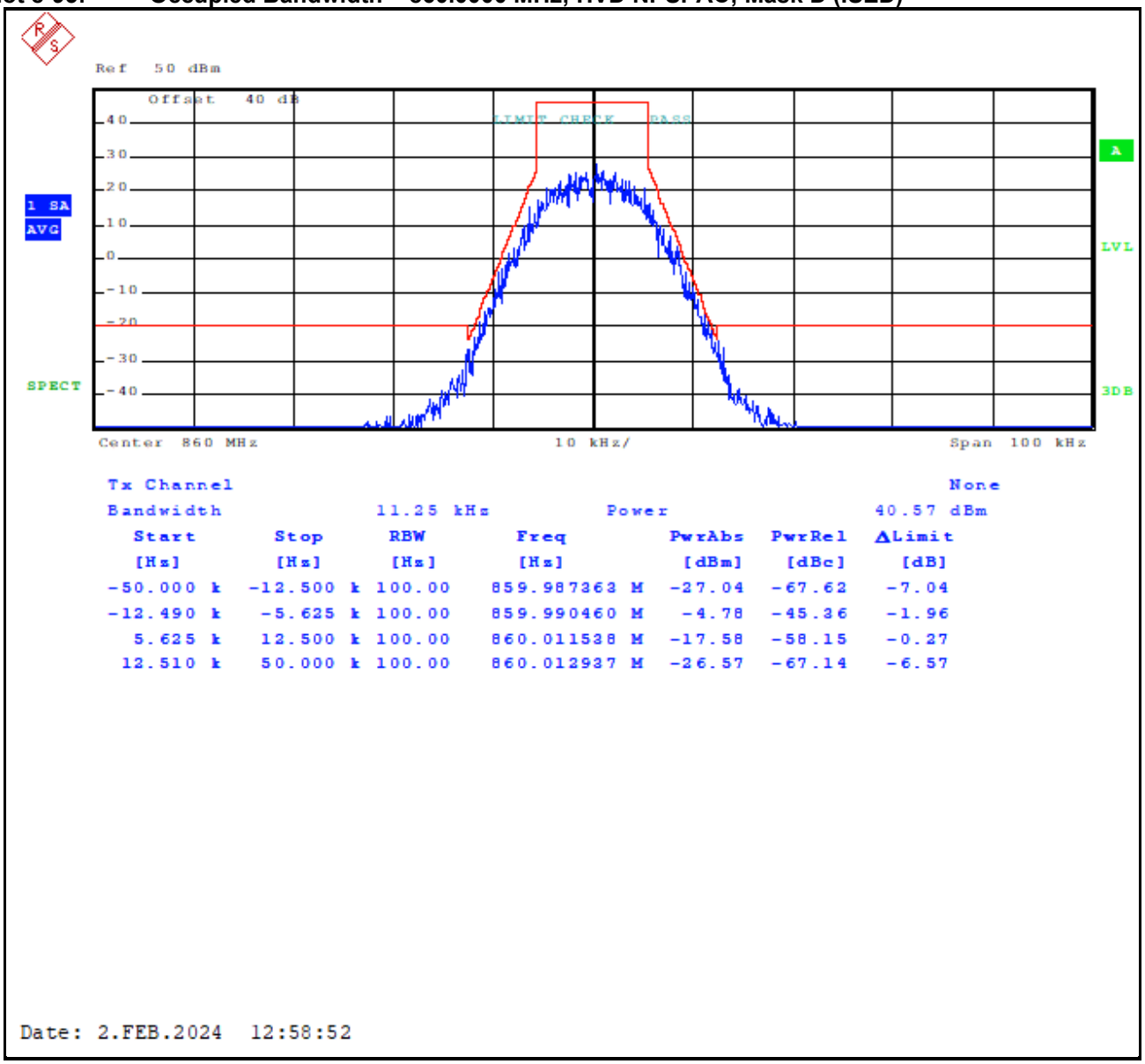
Plot 8-93: Occupied Bandwidth – 823.9875 MHz; HVD NPSPAC; Mask D (ISED)



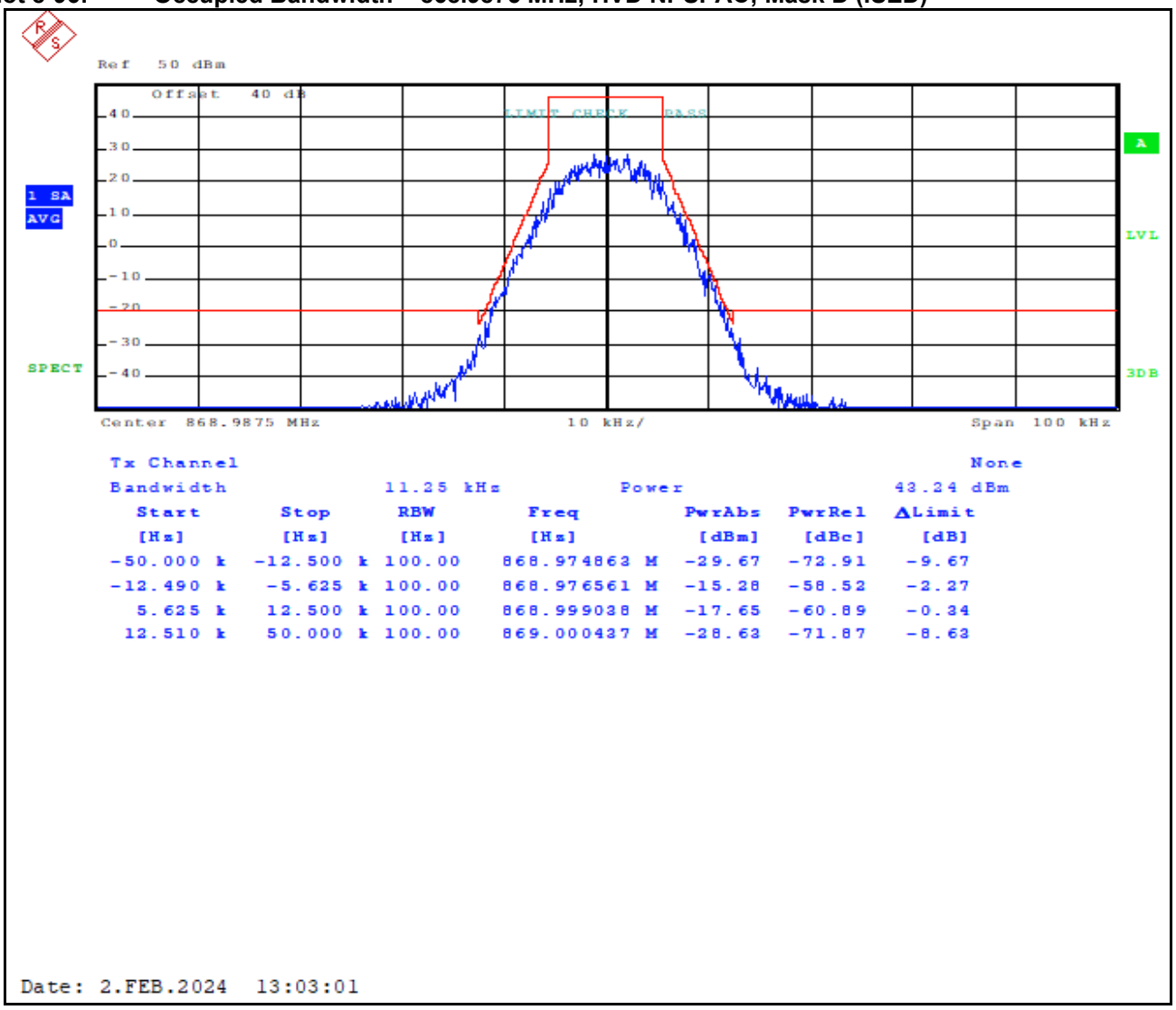
Plot 8-94: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; Mask D (ISED)



Plot 8-95: Occupied Bandwidth – 860.0000 MHz; HVD NPSPAC; Mask D (ISED)



Plot 8-96: Occupied Bandwidth – 868.9875 MHz; HVD NPSPAC; Mask D (ISED)



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
901724	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 20dB	CJ8921	11/22/2024
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	03/28/2024

Test Personnel:

Daniel W. Baltzell		February 1-2, 2024
Test Engineer	Signature	Dates of Tests

9 FCC Part 2.1055: Frequency Stability; Part 90.213, Part 90.539: Frequency Stability; 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 AFC was not locked to the base station.

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

Part 90.213 Frequency Stability

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

MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

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

Part 90.213: Mobile stations over 2 W operating power - 1.5 ppm (806-809 MHz, 851-854 MHz); 2.5 ppm (809-824 MHz, and 854-869 MHz)

Part 90.539 Frequency Stability

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

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

The EUT was tested while the AFC was not locked, therefore, the limit is 1.5 ppm. The worst-case deviation was found to be 0.4 ppm.

9.2 Test Data

Table 9-1: Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
01/29/2024	23.7	32	100.3

Table 9-2: Temperature Frequency Stability – 768.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	768012380	-0.2
-20	768012340	-0.2
-10	768012500	0.0
0	768012500	0.0
10	768012420	-0.1
20 (reference)	768012500	0.0
30	768012340	-0.2
40	768012460	-0.1
50	768012500	0.0
60	768012580	0.1

Table 9-3: Temperature Frequency Stability – 772.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	771999920	-0.1
-20	771999840	-0.2
-10	772000040	0.1
0	772000000	0.0
10	771999920	-0.1
20 (reference)	772000000	0.0
30	771999840	-0.2
40	771999960	-0.1
50	772000000	0.0
60	772000080	0.1

Table 9-4: Temperature Frequency Stability – 775.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	775987620	0.2
-20	775987620	0.2
-10	775987780	0.4
0	775987740	0.3
10	775987660	0.2
20 (reference)	775987500	0.0
30	775987580	0.1
40	775987740	0.3
50	775987740	0.3
60	775987820	0.4

Table 9-5: Temperature Frequency Stability – 798.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	798012400	-0.1
-20	798012400	-0.1
-10	798012520	0.0
0	798012480	0.0
10	798012400	-0.1
20 (reference)	798012500	0.0
30	798012360	-0.2
40	798012480	0.0
50	798012520	0.0
60	798012600	0.1

Table 9-6: Temperature Frequency Stability – 802.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	802000000	0.0
-20	802000000	0.0
-10	802000080	0.1
0	802000000	0.0
10	801999960	0.0
20 (reference)	802000000	0.0
30	801999960	0.0
40	802000080	0.1
50	802000080	0.1
60	802000160	0.2

Table 9-7: Temperature Frequency Stability – 805.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	805987500	0.0
-20	805987540	0.0
-10	805987580	0.1
0	805987500	0.0
10	805987460	0.0
20 (reference)	805987500	0.0
30	805987460	0.0
40	805987580	0.1
50	805987580	0.1
60	805987700	0.2

Table 9-8: Temperature Frequency Stability – 806.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	806012460	0.0
-20	806012540	0.0
-10	806012580	0.1
0	806012500	0.0
10	806012460	0.0
20 (reference)	806012500	0.0
30	806012460	0.0
40	806012580	0.1
50	806012500	0.0
60	806012700	0.2

Table 9-9: Temperature Frequency Stability – 815.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	814999960	0.0
-20	815000000	0.0
-10	815000000	0.0
0	814999960	0.0
10	814999920	-0.1
20 (reference)	815000000	0.0
30	814999960	0.0
40	815000040	0.0
50	815000040	0.0
60	815000180	0.2

Table 9-10: Temperature Frequency Stability – 823.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	823987460	0.0
-20	823987540	0.0
-10	823987500	0.0
0	823987460	0.0
10	823987380	-0.1
20 (reference)	823987500	0.0
30	823987460	0.0
40	823987540	0.0
50	823987540	0.0
60	823987660	0.2

Table 9-11: Temperature Frequency Stability – 851.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	851012480	0.0
-20	851012580	0.1
-10	851012540	0.0
0	851012500	0.0
10	851012420	-0.1
20 (reference)	851012500	0.0
30	851012500	0.0
40	851012580	0.1
50	851012620	0.1
60	851012740	0.3

Table 9-12: Temperature Frequency Stability – 860.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	860000040	0.0
-20	860000080	0.1
-10	860000040	0.0
0	859999960	0.0
10	859999920	-0.1
20 (reference)	860000000	0.0
30	860000040	0.0
40	860000120	0.1
50	860000120	0.1
60	860000240	0.3

Table 9-13: Temperature Frequency Stability – 868.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	868987620	0.1
-20	868987660	0.2
-10	868987620	0.1
0	868987540	0.0
10	868987500	0.0
20 (reference)	868987500	0.0
30	868987620	0.1
40	868987660	0.2
50	868987700	0.2
60	868987860	0.4

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

9.2.1 Frequency Stability/Voltage Variation

Table 9-14: Frequency Stability/Voltage Variation – 768.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	768012500	0.0
13.8(reference)	768012500	0.0
15.87	768012460	-0.1

Table 9-15: Frequency Stability/Voltage Variation – 772.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	771999860	-0.2
13.8(reference)	772000000	0.0
15.87	772000000	0.0

Table 9-16: Frequency Stability/Voltage Variation – 775.9875

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	775987500	0.0
13.8(reference)	775987500	0.0
15.87	775987508	0.0

Table 9-17: Frequency Stability/Voltage Variation – 798.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	798012340	-0.2
13.8(reference)	798012500	0.0
15.87	798012440	-0.1

Table 9-18: Frequency Stability/Voltage Variation – 802.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	801999900	-0.1
13.8(reference)	802000000	0.0
15.87	802000040	0.0

Table 9-19: Frequency Stability/Voltage Variation – 805.9875

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	805987400	-0.1
13.8(reference)	805987500	0.0
15.87	805987540	0.0

Table 9-20: Frequency Stability/Voltage Variation – 806.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	806012500	0.0
13.8(reference)	806012500	0.0
15.87	806012540	0.0

Table 9-21: Frequency Stability/Voltage Variation – 815.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	815000000	0.0
13.8(reference)	815000000	0.0
15.87	815000000	0.0

Table 9-22: Frequency Stability/Voltage Variation – 823.9875

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	823987500	0.0
13.8(reference)	823987500	0.0
15.87	823987500	0.0

Table 9-23: Frequency Stability/Voltage Variation – 851.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	851012400	-0.1
13.8(reference)	851012500	0.0
15.87	851012580	0.1

Table 9-24: Frequency Stability/Voltage Variation – 860.0000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	859999900	-0.1
13.8(reference)	860000000	0.0
15.87	860000080	0.1

Table 9-25: Frequency Stability/Voltage Variation – 868.9875 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	868987480	0.0
13.8(reference)	868987500	0.0
15.87	868987660	0.2

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 9-26: Test Equipment Used For Testing Frequency Stability/Voltage Variation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	10/18/2024
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	04/25/2024
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	11/22/2024
901635	Hewlett Packard	6024A	DC Power Supply	1912A00331	Not Required
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber	11380	06/23/2025

Test Personnel:

Daniel W. Baltzell		January 24, 2024
EMC Test Engineer	Signature	Date of Test

10 FCC §2.1047(a)(b): Modulation Characteristics; RSS-119 5.2: Types of Modulation

10.1 Test Procedures

10.1.1 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)

10.1.2 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.

10.1.3 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.

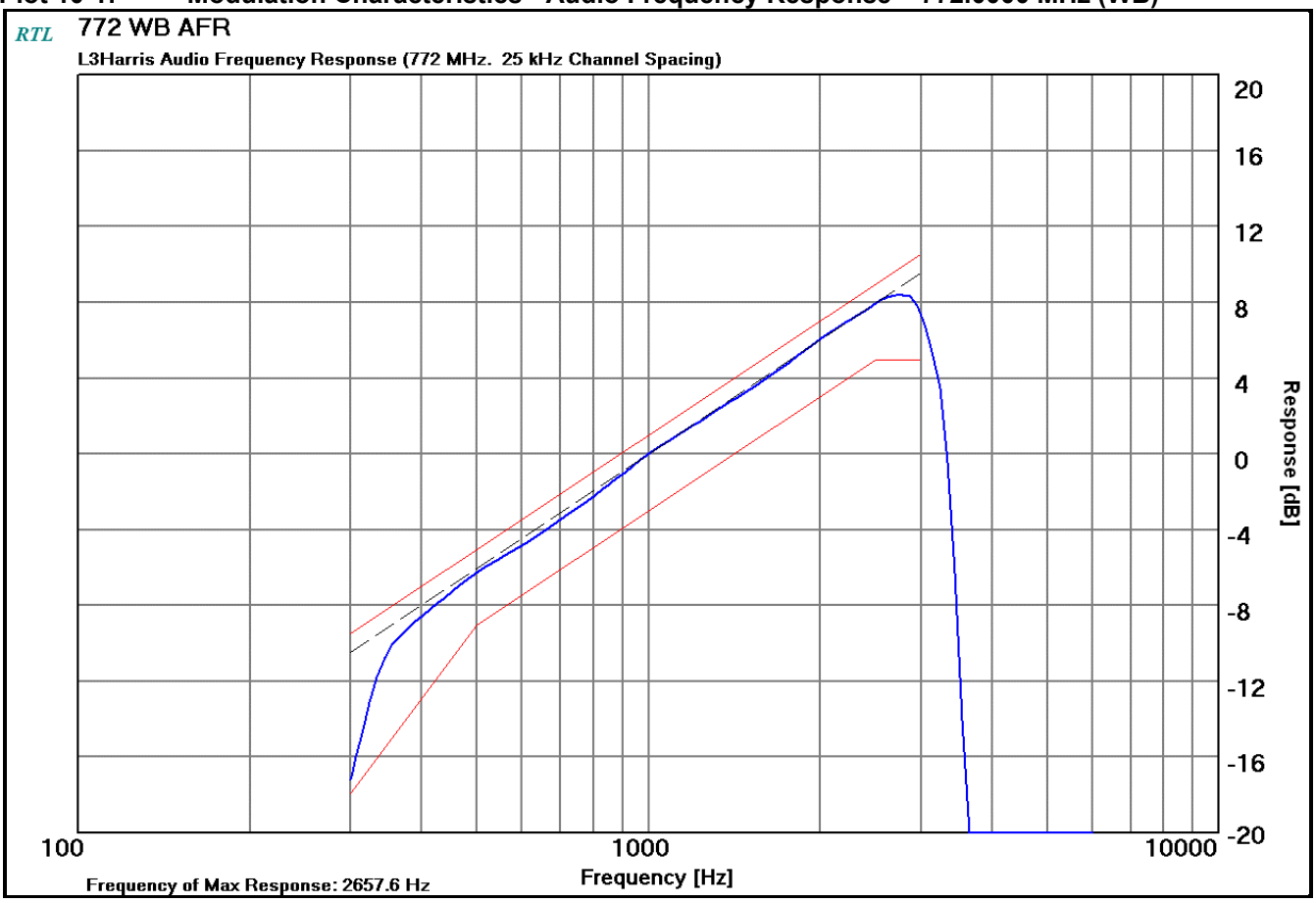
10.2 Test Data

Table 10-1: Environmental Conditions

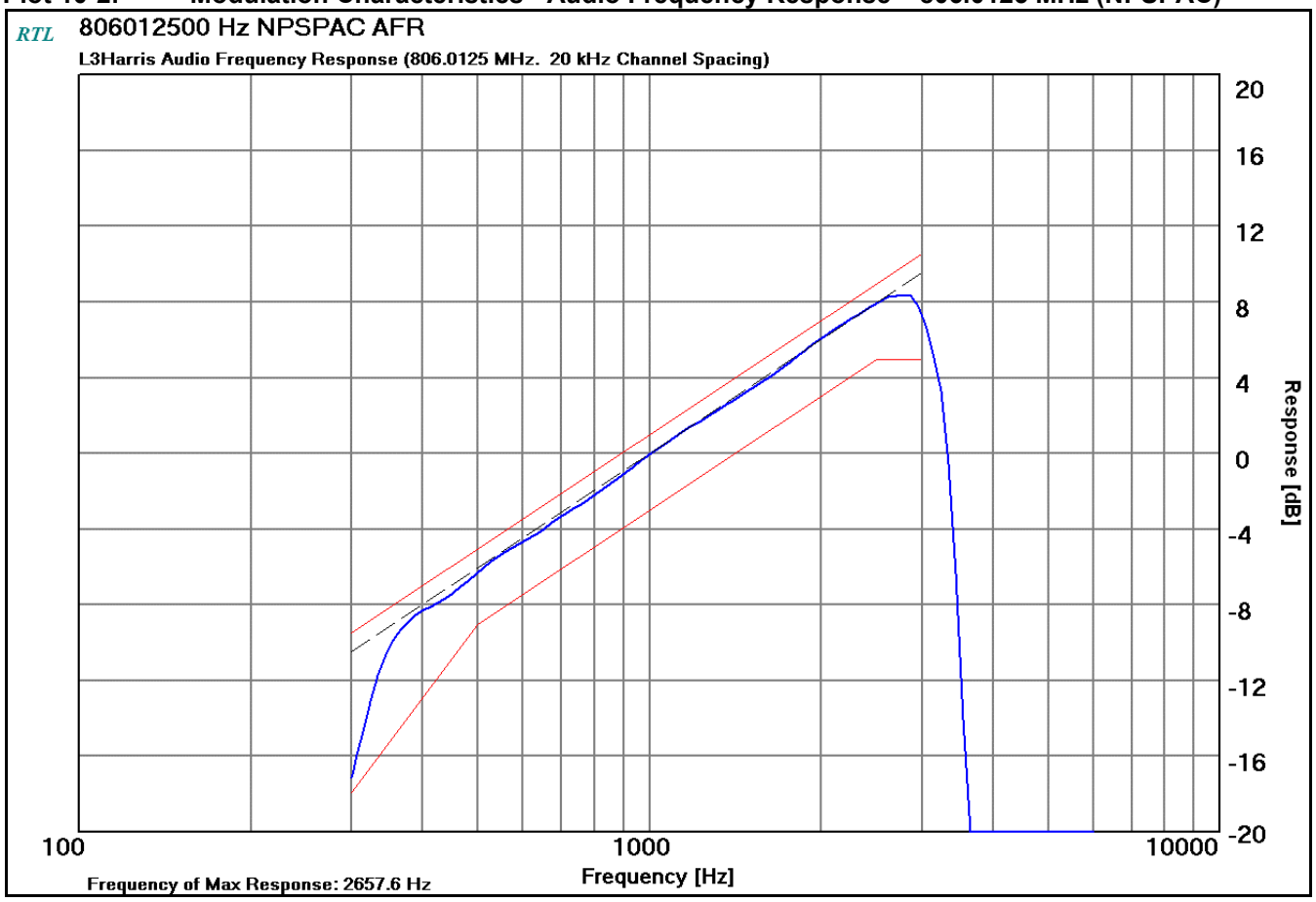
Date	Temperature (°C)	Humidity (%)	Atmospheric Pressure (kPa)
02/03/2024	22.3	28	100.7

10.2.1 Audio Frequency Response

Plot 10-1: Modulation Characteristics - Audio Frequency Response – 772.0000 MHz (WB)

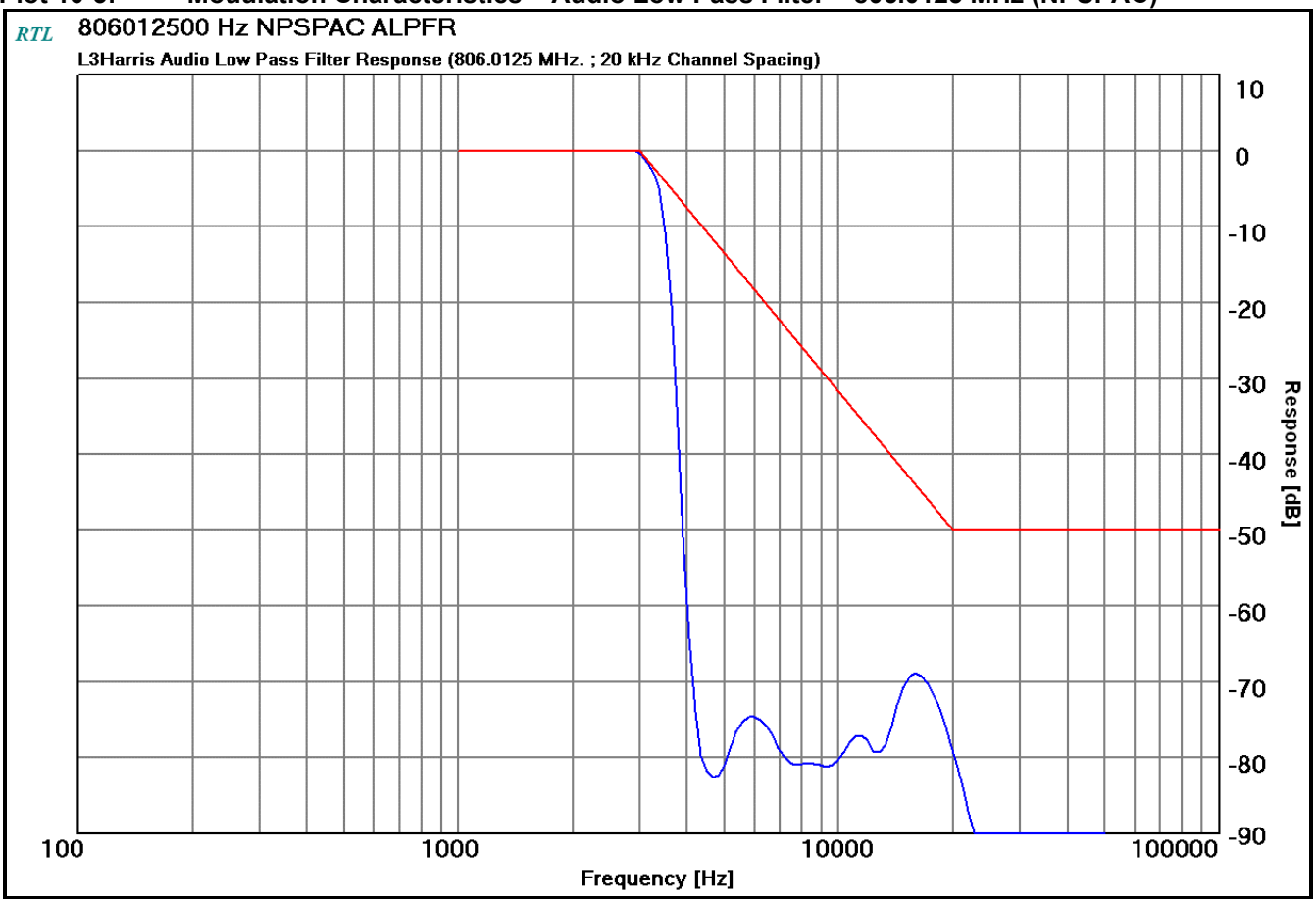


Plot 10-2: Modulation Characteristics - Audio Frequency Response – 806.0125 MHz (NPSPAC)

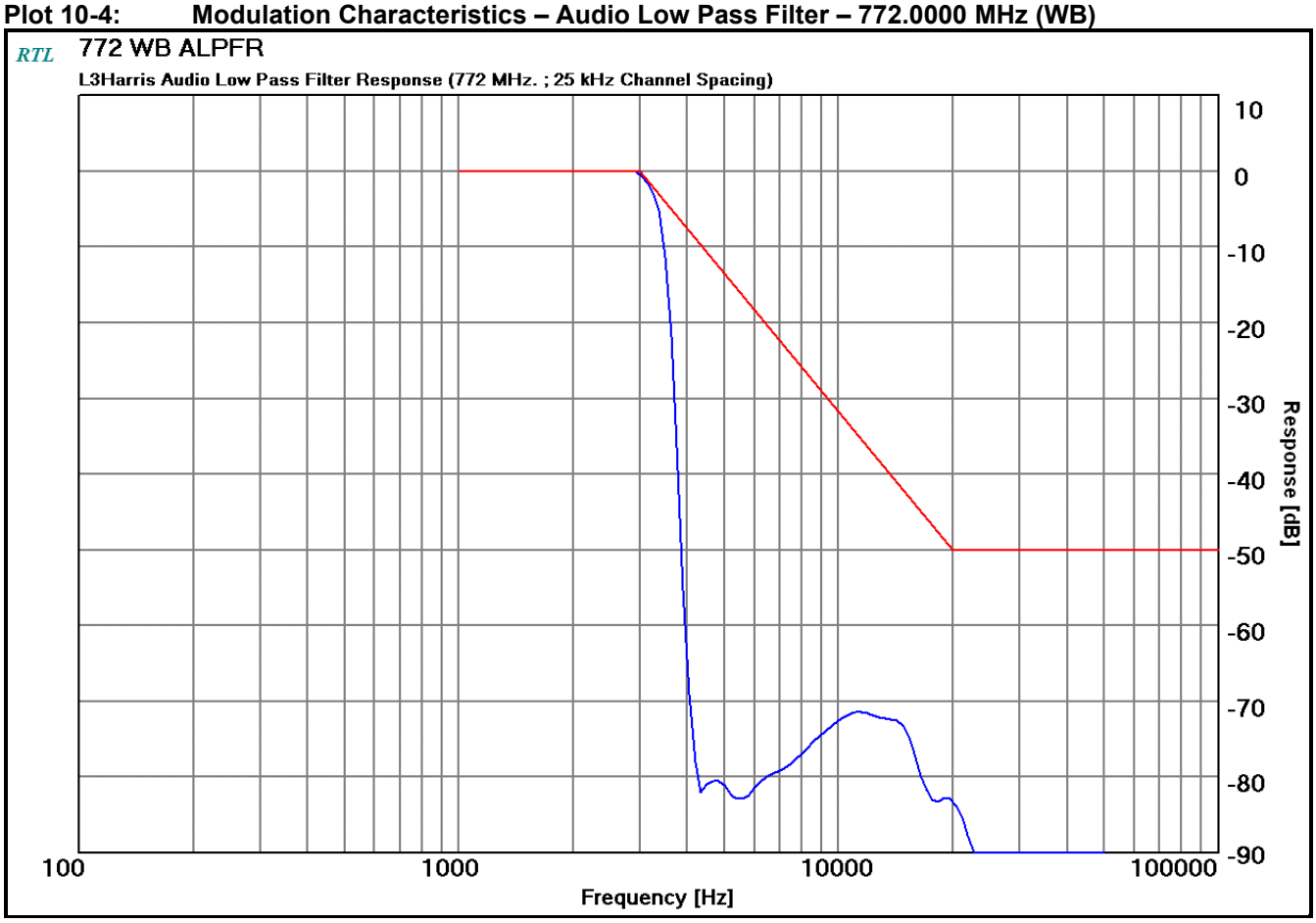


10.2.2 Audio Low Pass Filter Response

Plot 10-3: Modulation Characteristics – Audio Low Pass Filter – 806.0125 MHz (NPSPAC)

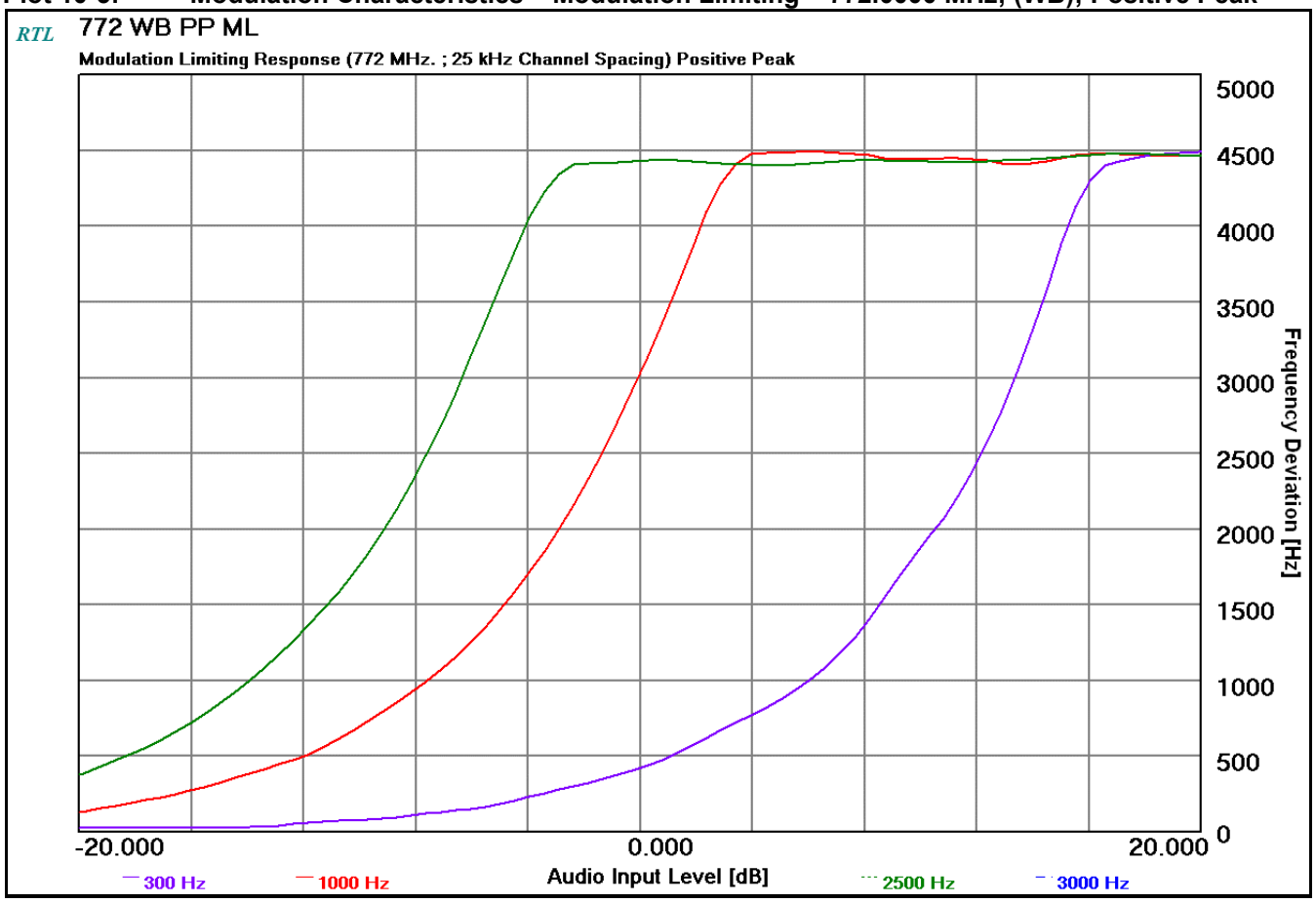


Plot 10-4: Modulation Characteristics – Audio Low Pass Filter – 772.0000 MHz (WB)

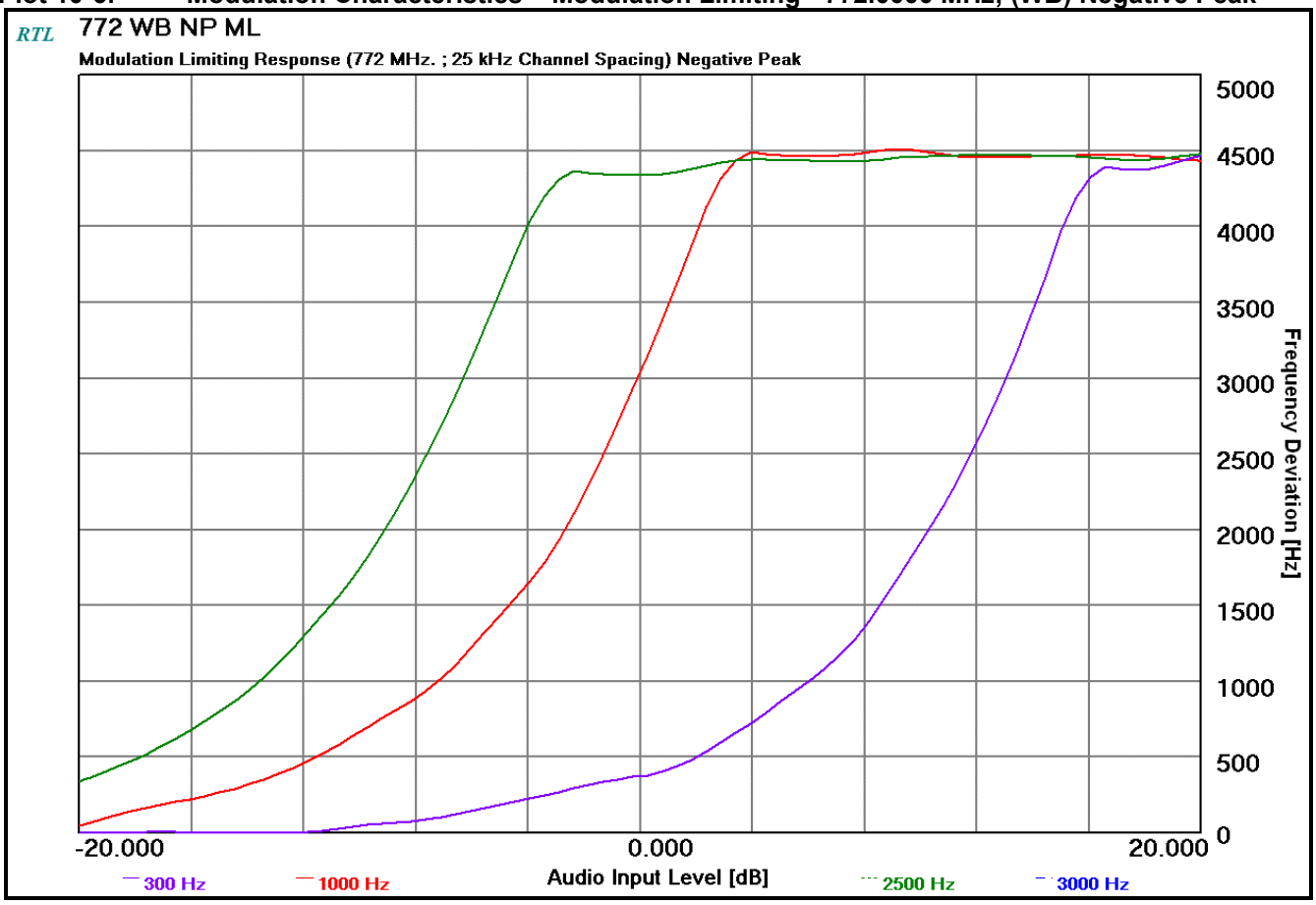


10.2.3 Modulation Limiting

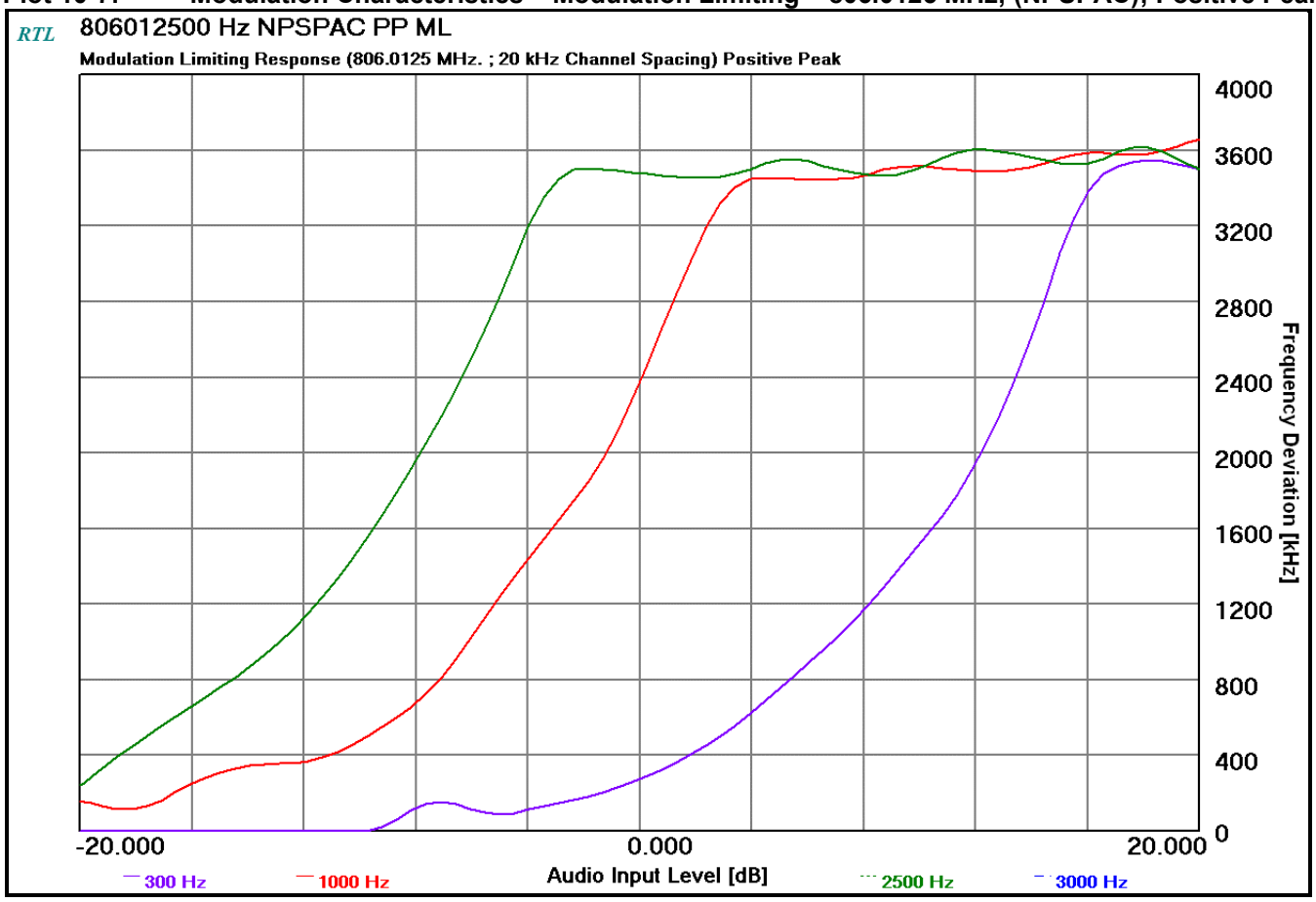
Plot 10-5: Modulation Characteristics – Modulation Limiting – 772.0000 MHz; (WB); Positive Peak



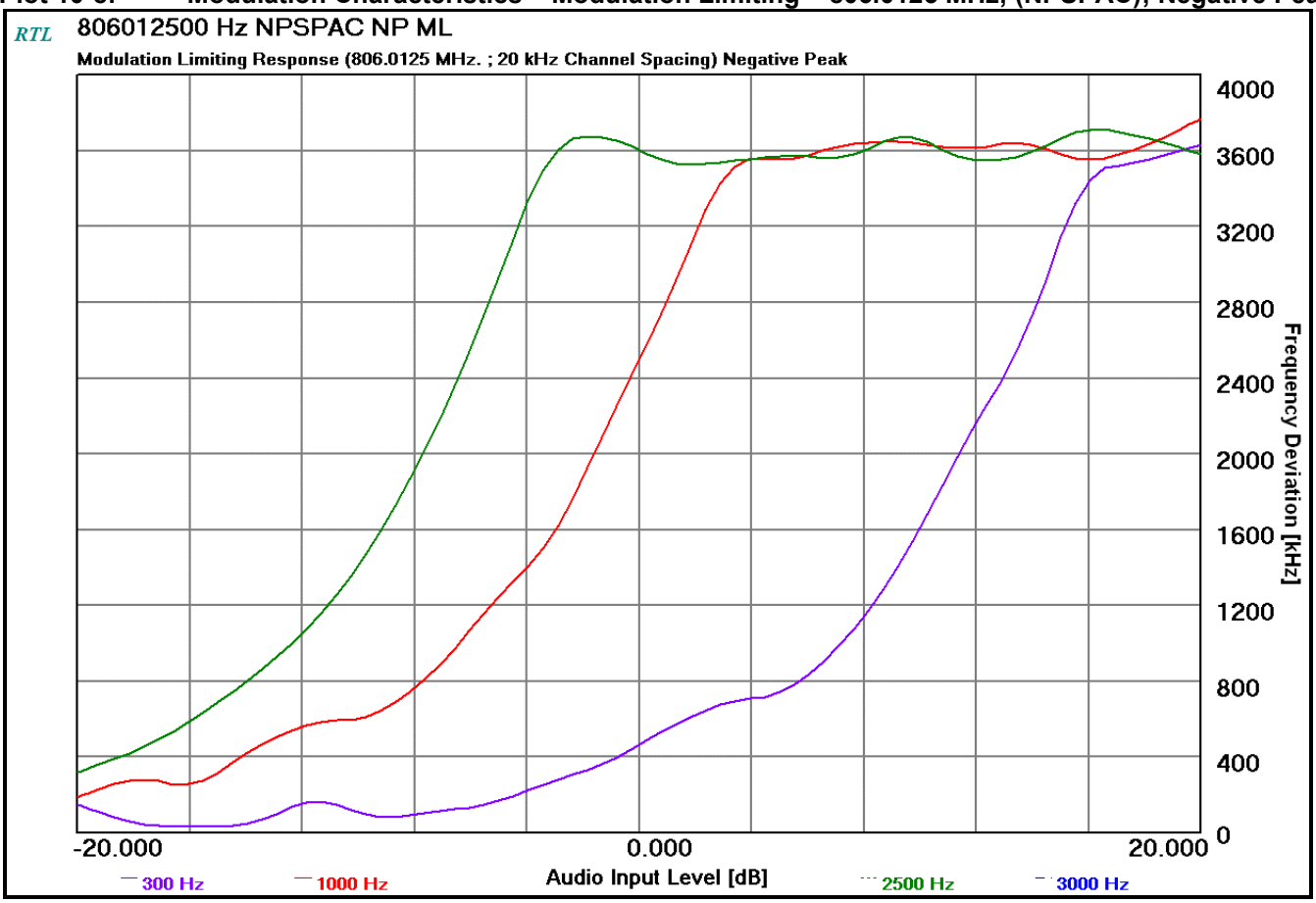
Plot 10-6: Modulation Characteristics – Modulation Limiting - 772.0000 MHz; (WB) Negative Peak



Plot 10-7: Modulation Characteristics – Modulation Limiting – 806.0125 MHz; (NPSPAC); Positive Peak



Plot 10-8: Modulation Characteristics – Modulation Limiting – 806.0125 MHz; (NPSPAC); Negative Peak



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

Results: Pass

Table 10-2: Test Equipment Used For Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	03/28/2024
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	11/02/2024
901724	Weinschel Corporation	47-40-34	Attenuator DC-18 GHz 40 dB 100W	BK5859	11/22/2024

Test Personnel:

Daniel W. Baltzell	Signature	February 3, 2024
EMC Test Engineer		Date of Test

11 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

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

Voice – 25 kHz channel separation (NPSPAC)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 4
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 14.0 kHz
Emission designator: 14K0F3E

Voice – 25 kHz channel separation
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 5
Constant factor (K): 1 (assumed)
Bn = 2M+2DK = 16.0 kHz
Emission designator: 16K0F3E

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

P25 Phase 2 Data/Voice (H-CPM TDMA)
Calculation:
Data rate in bps (R) =12000
Peak deviation of carrier (D) = 1050
Bn = [12000/$\log_2$(4) + 2 (1050) (1) = 8.1 kHz
Emission designator: 8K10DXW

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

2-level FSK 9600 Data/Digital Voice (WB)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 5600
Bn = [9600/log2(4) + 2 (5600) (1) = 16.000 kHz
Emission designator: 16K0F1D, 16K0F1E

2-level FSK 9600 Data/Digital Voice (NPSPAC)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 4600
Bn = [9600/log2(4) + 2 (4600) (1) = 14.000 kHz
Emission designator: 14K0F1D, 14K0F1E

2-level FSK 4800 Data/Digital Voice (XNB)
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1800
Bn = [4800/log2(4) + 2 (2350) (1) = 7.100 kHz
Emission designator: 7K10F1D, 7K10F1E

HVD SMR
Calculation:
Data rate in bps (R) = 19200
Signaling states (S) = 4
$B_n = 2(19200)(.96)/\log_2(4) = 18.5$ kHz
Emission designator: 18K5F1W

HVD NPSPAC
Calculation:
Data rate in bps (R) = 19200
Signaling states (S) = 4
$B_n = 2(19200)(.67)/\log_2(4) = 12.9$ kHz
Emission designator: 12K9F1W

12 Conclusion

The data in this measurement report shows that the L3Harris Corporation XL-85M 7/800 MHz Land Mobile Radio, FCC ID: OWDTR-0170-E, IC: 3636B-0170, complies with the applicable requirements of Parts 2 and 90 of the FCC Rules and ISED Canada RSS-119. Furthermore, the collocation testing for RF conducted fundamental emissions, harmonic emissions levels and intermodulation frequencies demonstrated passing results.