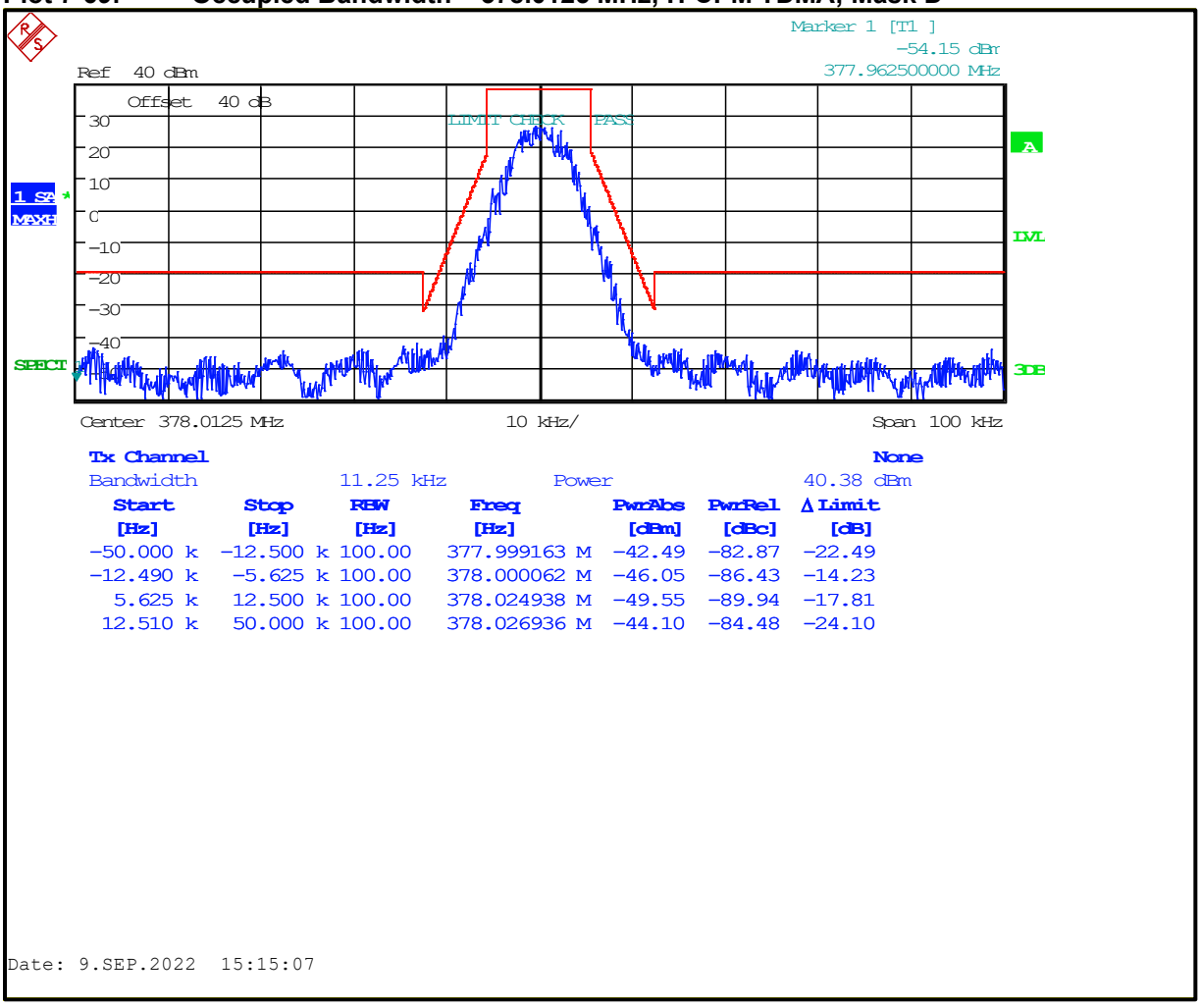
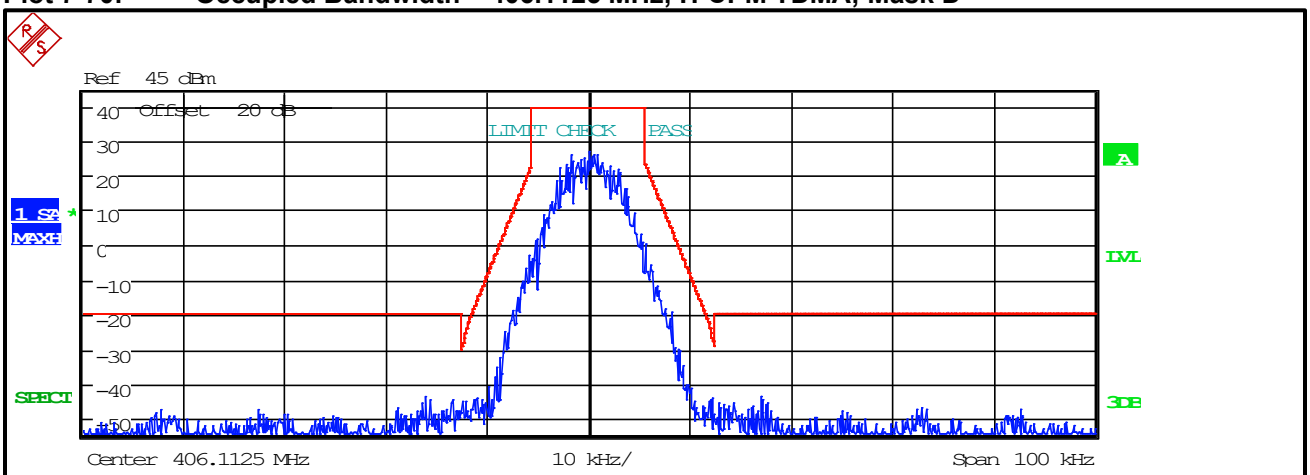
Plot 7-69: Occupied Bandwidth – 378.0125 MHz; H-CPM TDMA; Mask D



Plot 7-70: Occupied Bandwidth – 406.1125 MHz; H-CPM TDMA; Mask D



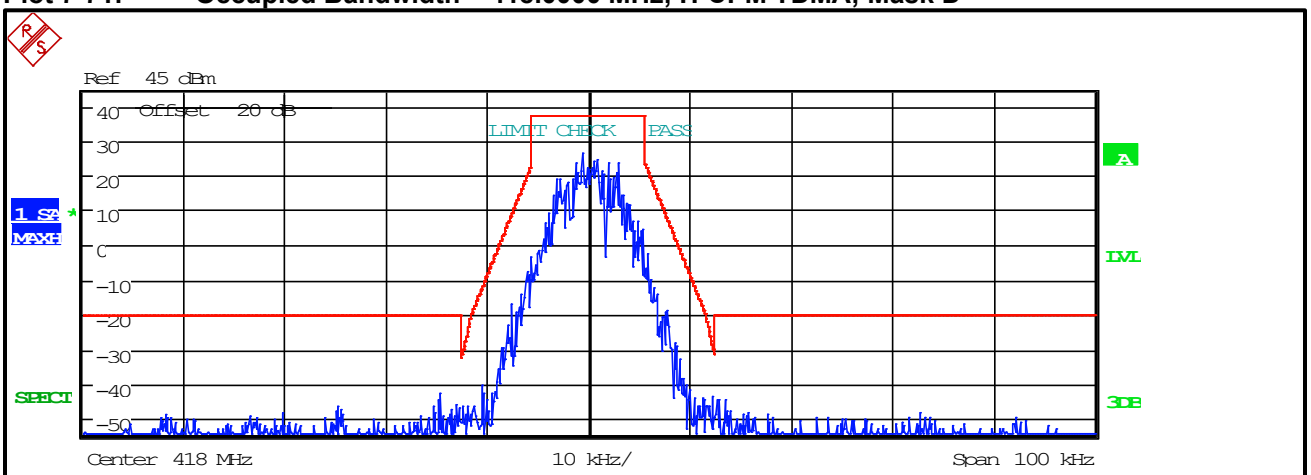
Tx Channel **None**

Bandwidth 11.25 kHz Power 39.73 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	406.096366 M	-43.81	-83.54	-23.81
-12.490 k	-5.625 k	100.00	406.100010 M	-45.49	-85.21	-15.21
5.625 k	12.500 k	100.00	406.124638 M	-44.66	-84.39	-19.13
12.510 k	50.000 k	100.00	406.129433 M	-44.02	-83.74	-24.02

Date: 30.AUG.2022 16:37:35

Plot 7-71: Occupied Bandwidth – 418.0000 MHz; H-CPM TDMA; Mask D



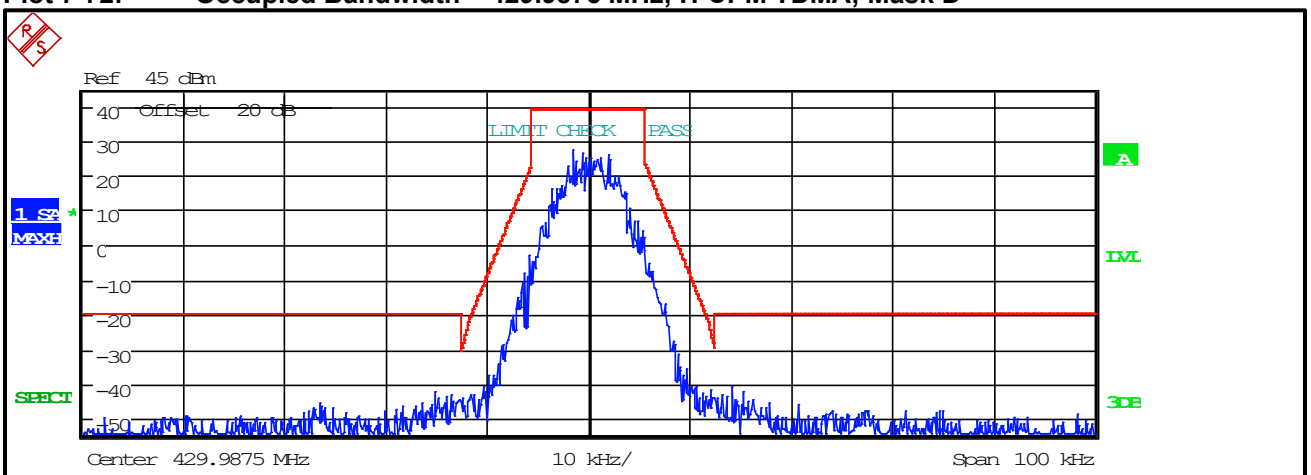
Tx Channel **None**

Bandwidth 11.25 kHz Power 37.45 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	417.985265 M	-42.85	-80.30	-22.50
-12.490 k	-5.625 k	100.00	417.987510 M	-47.23	-84.68	-14.68
5.625 k	12.500 k	100.00	418.012138 M	-43.81	-81.26	-16.00
12.510 k	50.000 k	100.00	418.012637 M	-44.89	-82.34	-24.54

Date: 30.AUG.2022 16:38:38

Plot 7-72: Occupied Bandwidth – 429.9875 MHz; H-CPM TDMA; Mask D



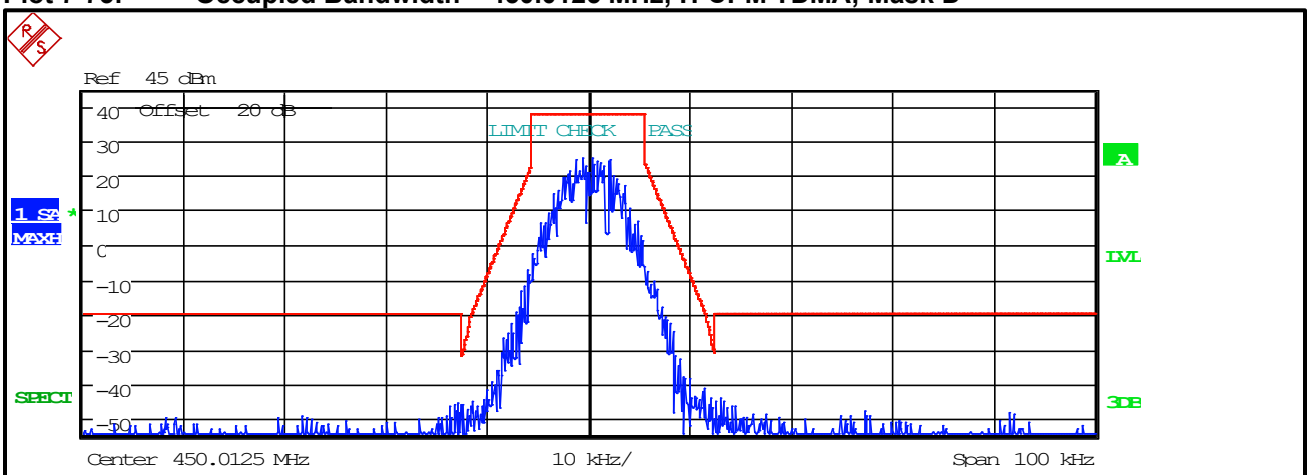
Tx Channel **None**

Bandwidth 11.25 kHz Power 39.30 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	429.972265 M	-42.49	-81.79	-22.49
-12.490 k	-5.625 k	100.00	429.975010 M	-44.44	-83.74	-13.35
5.625 k	12.500 k	100.00	429.999938 M	-45.24	-84.54	-14.97
12.510 k	50.000 k	100.00	430.001036 M	-43.81	-83.11	-23.81

Date: 30.AUG.2022 16:40:30

Plot 7-73: Occupied Bandwidth – 450.0125 MHz; H-CPM TDMA; Mask D



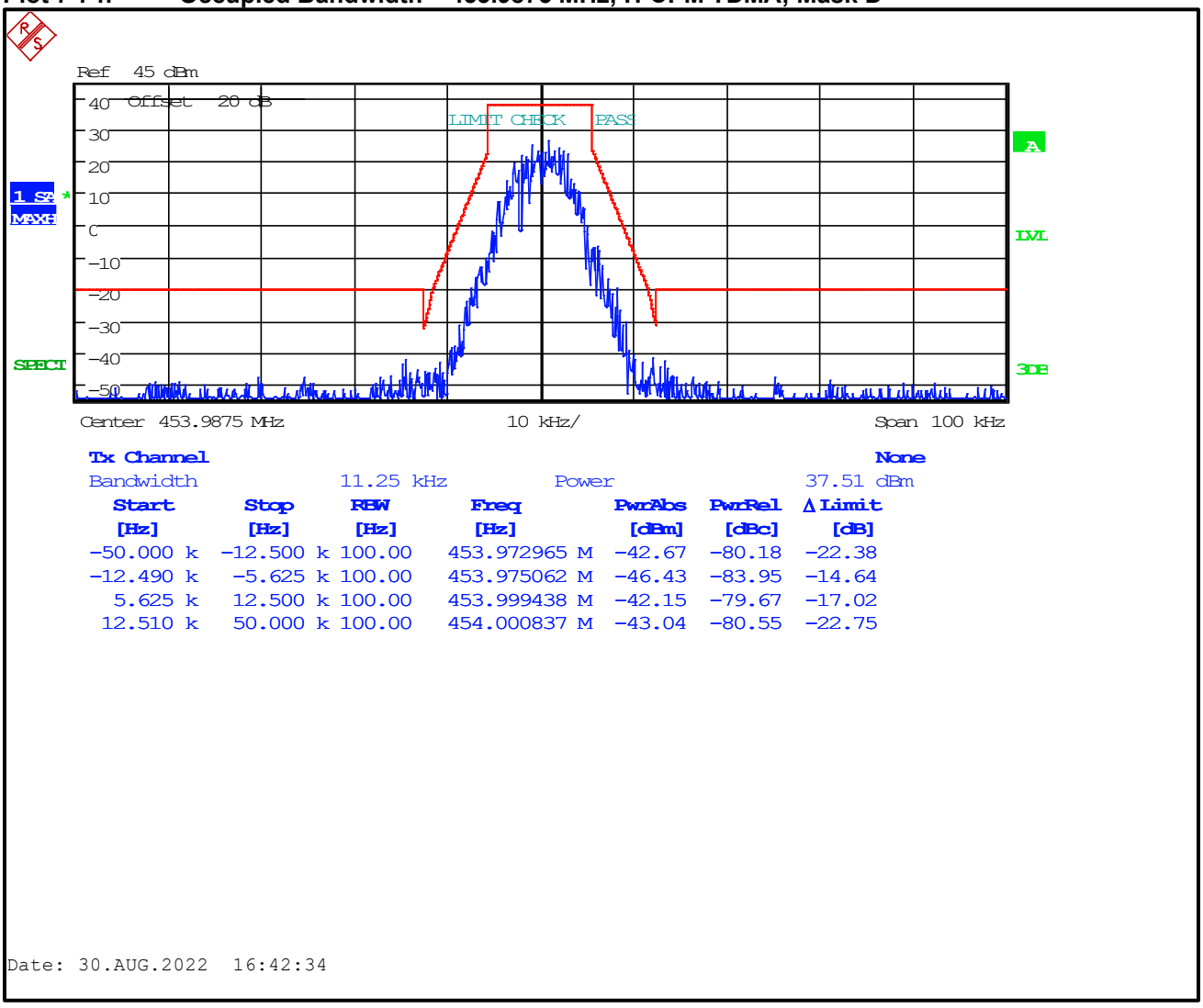
Tx Channel **None**

Bandwidth 11.25 kHz Power 37.71 dBm

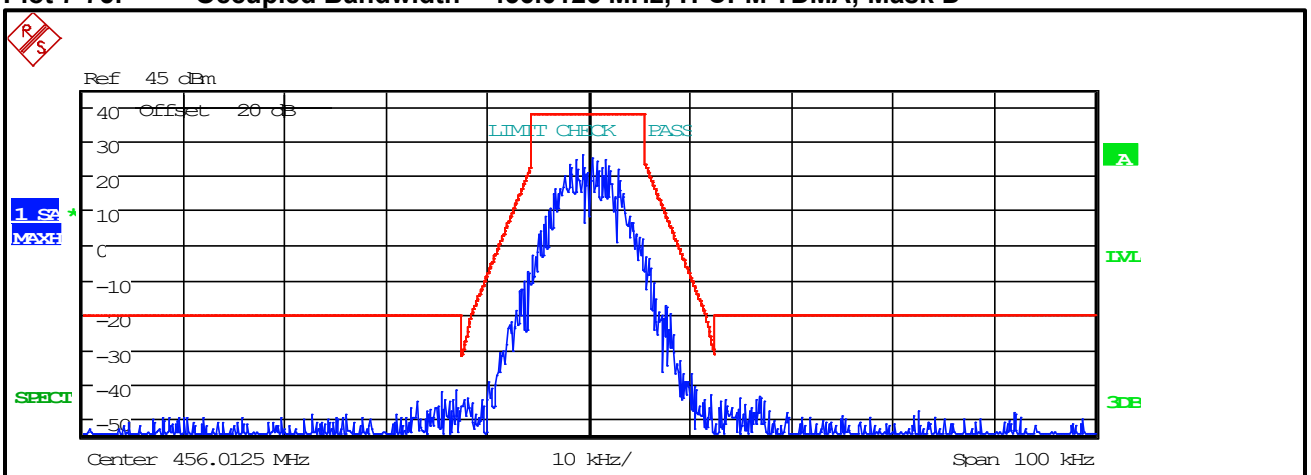
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	449.999163 M	-46.26	-83.96	-25.55
-12.490 k	-5.625 k	100.00	450.000010 M	-46.12	-83.83	-13.22
5.625 k	12.500 k	100.00	450.024938 M	-45.49	-83.20	-13.40
12.510 k	50.000 k	100.00	450.025737 M	-45.24	-82.95	-24.54

Date: 30.AUG.2022 16:41:22

Plot 7-74: Occupied Bandwidth – 453.9875 MHz; H-CPM TDMA; Mask D



Plot 7-75: Occupied Bandwidth – 456.0125 MHz; H-CPM TDMA; Mask D



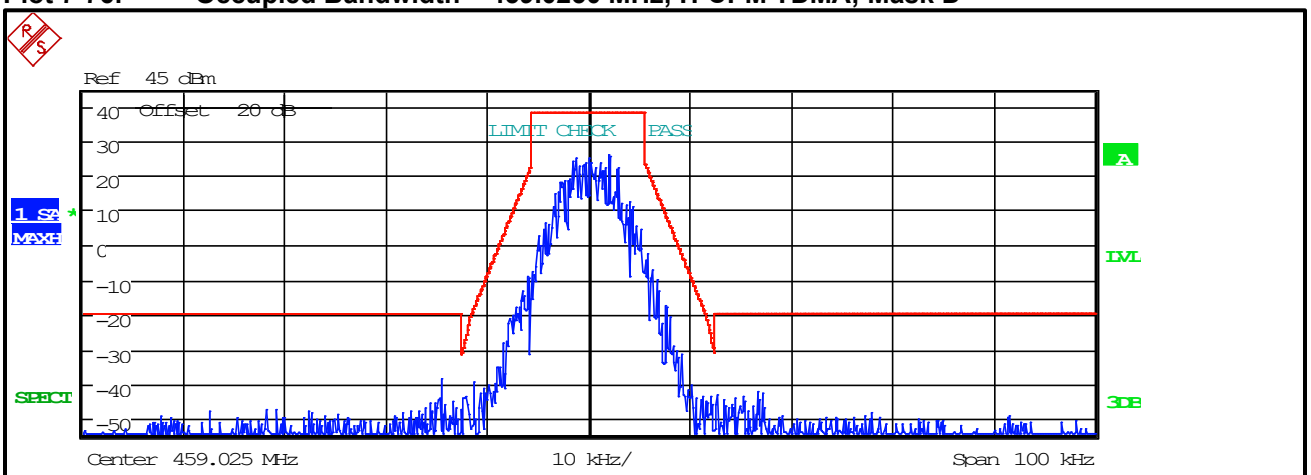
Tx Channel **None**

Bandwidth 11.25 kHz Power 37.54 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	455.997965 M	-44.44	-81.98	-23.97
-12.490 k	-5.625 k	100.00	456.000010 M	-46.72	-84.25	-14.05
5.625 k	12.500 k	100.00	456.024538 M	-43.61	-81.15	-16.99
12.510 k	50.000 k	100.00	456.029333 M	-44.02	-81.55	-23.55

Date: 30.AUG.2022 16:43:53

Plot 7-76: Occupied Bandwidth – 459.0250 MHz; H-CPM TDMA; Mask D



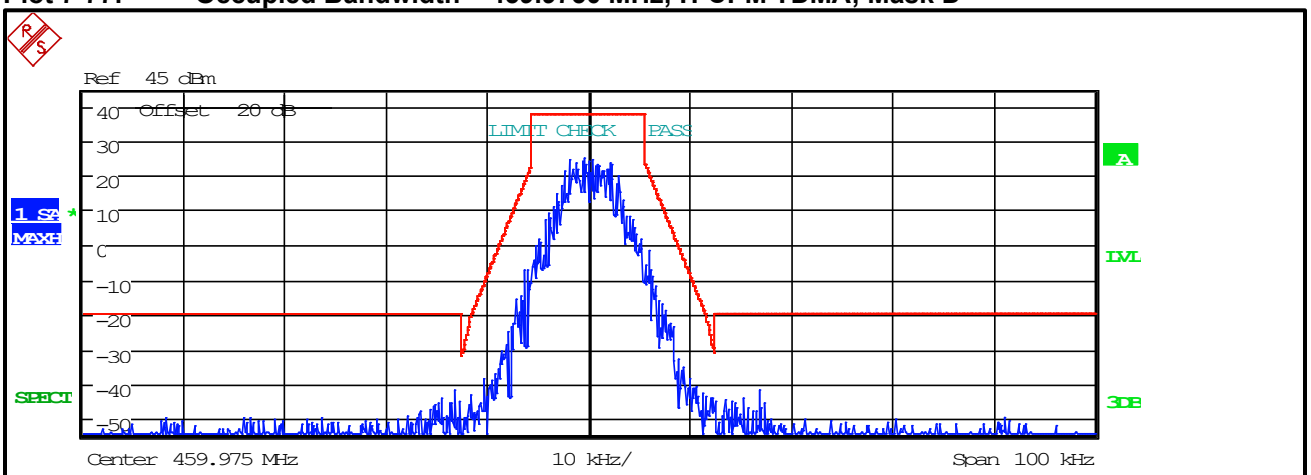
Tx Channel **None**

Bandwidth 11.25 kHz Power 38.06 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	459.010465 M	-38.98	-77.04	-18.98
-12.490 k	-5.625 k	100.00	459.012562 M	-44.66	-82.72	-13.41
5.625 k	12.500 k	100.00	459.037438 M	-46.12	-84.19	-15.01
12.510 k	50.000 k	100.00	459.041633 M	-42.67	-80.73	-22.67

Date: 30.AUG.2022 16:45:10

Plot 7-77: Occupied Bandwidth – 459.9750 MHz; H-CPM TDMA; Mask D



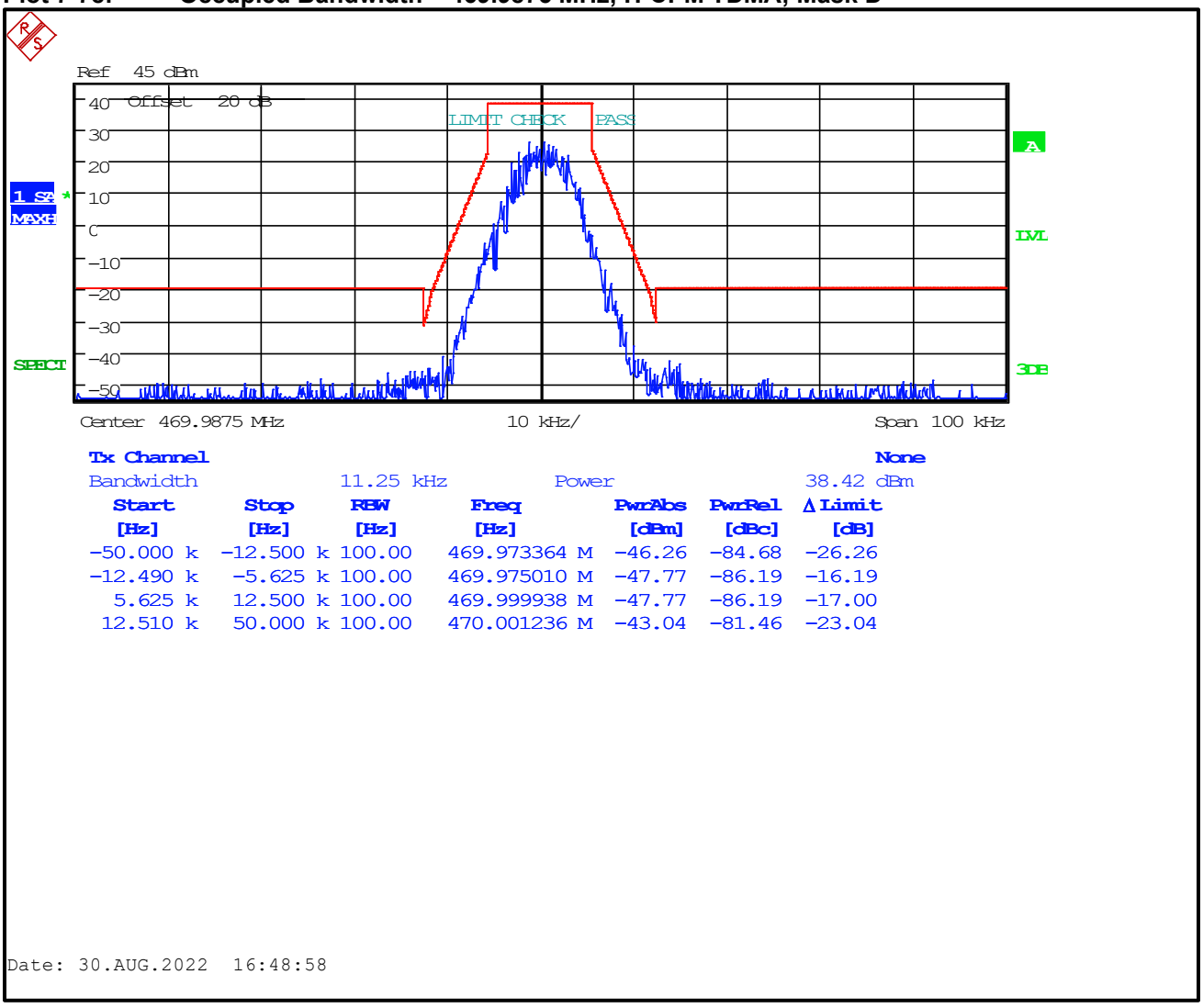
Tx Channel **None**

Bandwidth 11.25 kHz Power 37.81 dBm

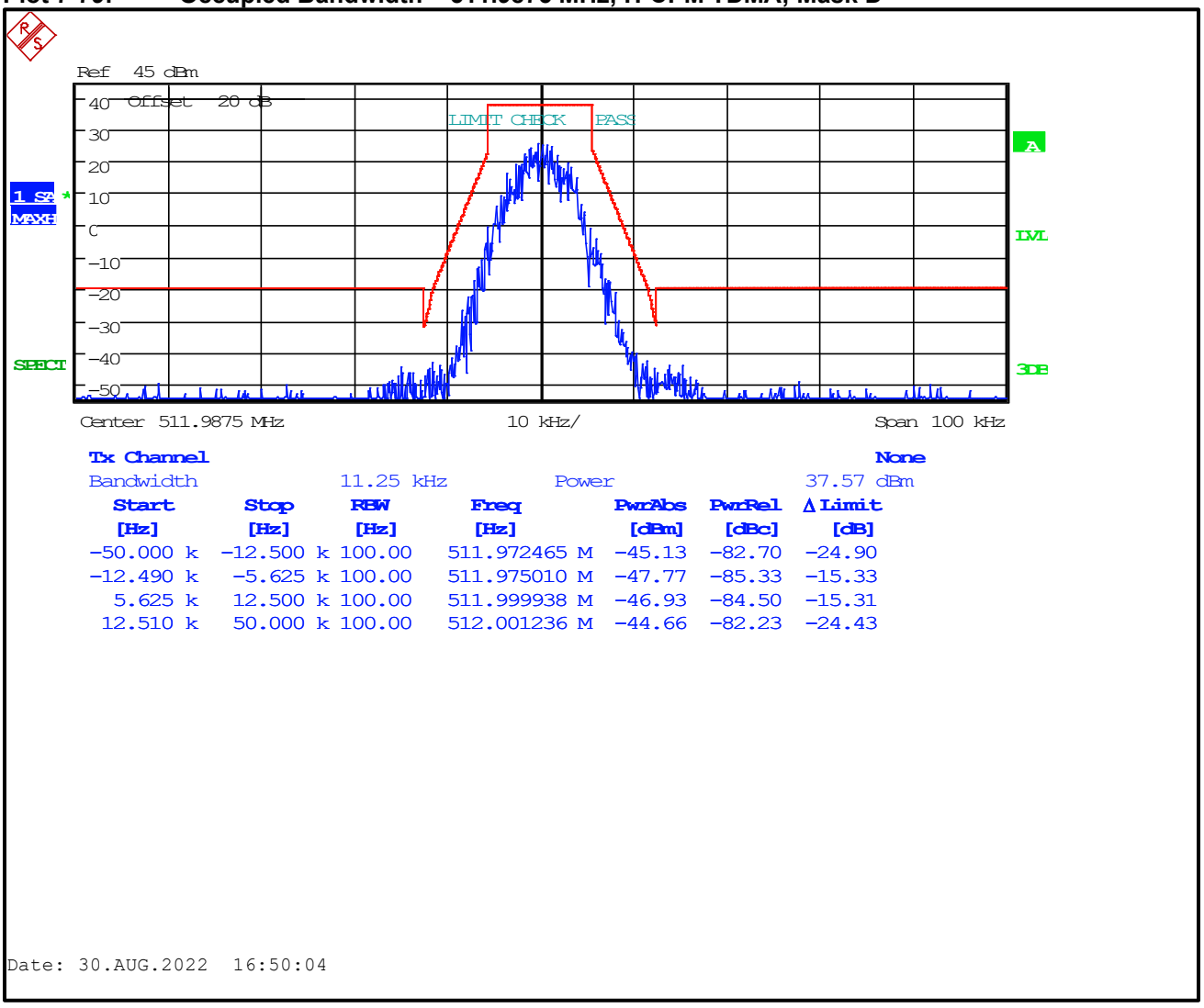
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	459.961663 M	-41.99	-79.80	-21.99
-12.490 k	-5.625 k	100.00	459.962662 M	-49.84	-87.65	-19.65
5.625 k	12.500 k	100.00	459.987138 M	-44.66	-82.47	-17.21
12.510 k	50.000 k	100.00	459.991733 M	-42.32	-80.14	-22.32

Date: 30.AUG.2022 16:47:22

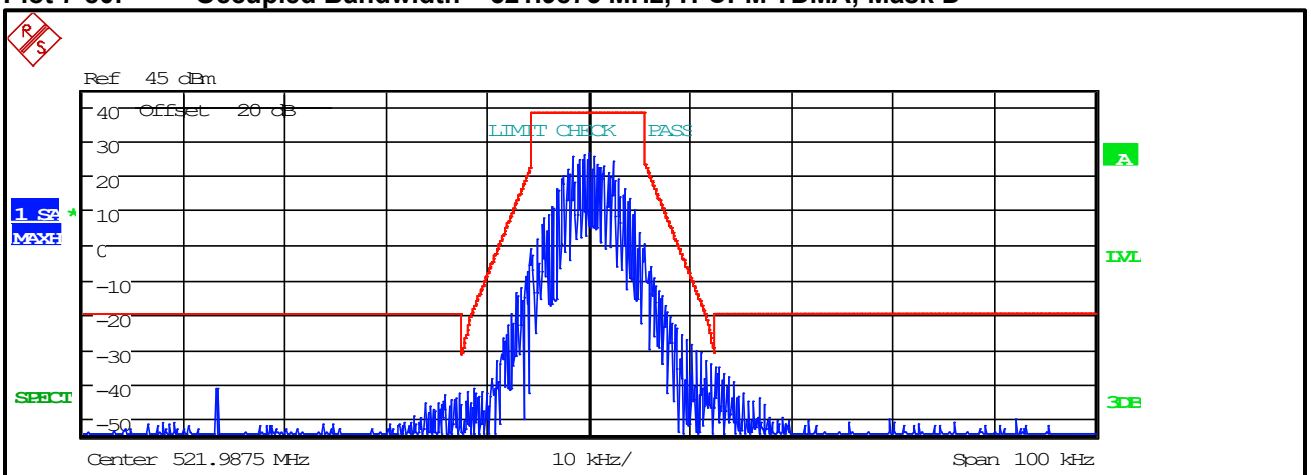
Plot 7-78: Occupied Bandwidth – 469.9875 MHz; H-CPM TDMA; Mask D



Plot 7-79: Occupied Bandwidth – 511.9875 MHz; H-CPM TDMA; Mask D



Plot 7-80: Occupied Bandwidth – 521.9875 MHz; H-CPM TDMA; Mask D



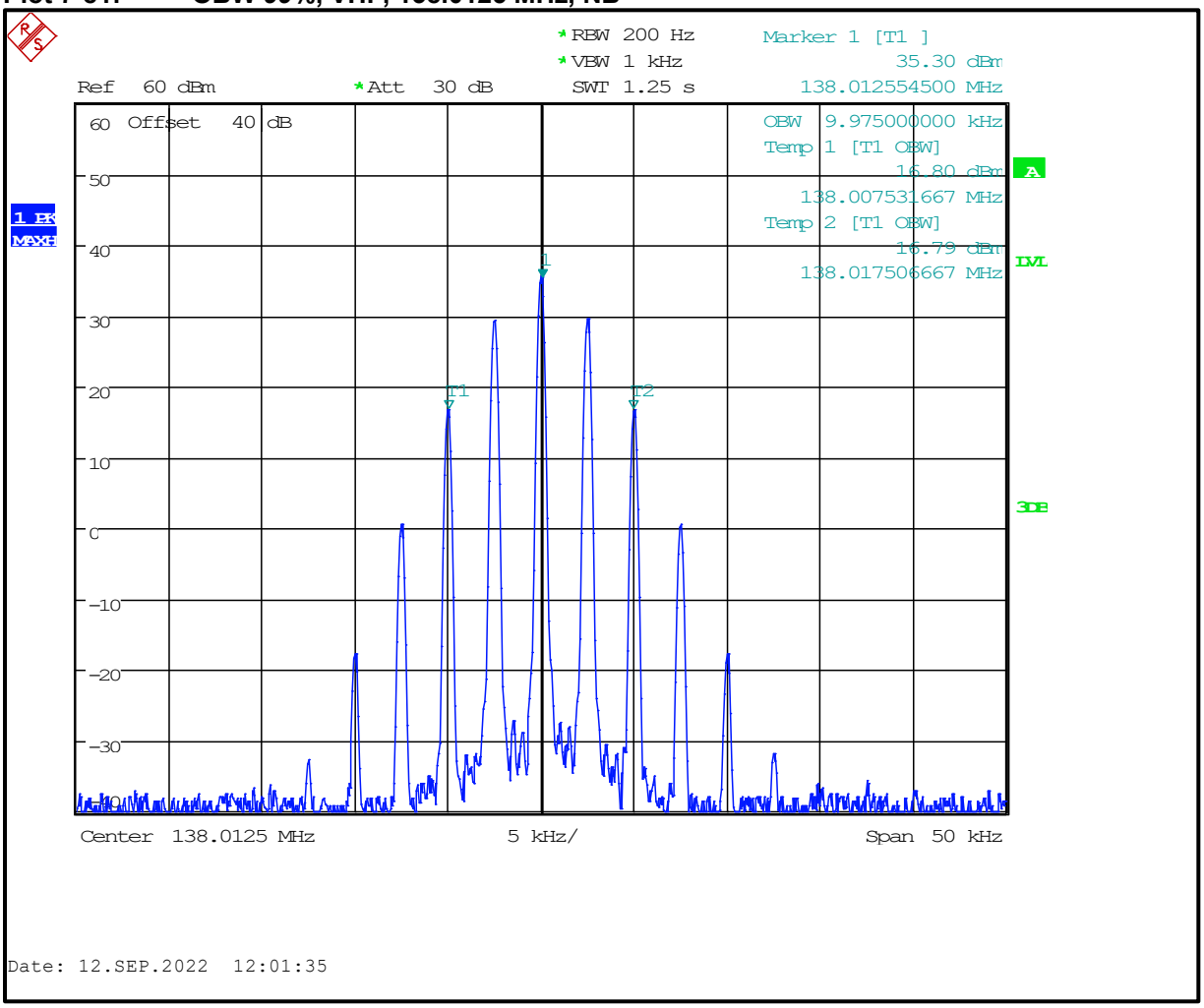
Tx Channel **None**

Bandwidth 11.25 kHz Power 38.12 dBm

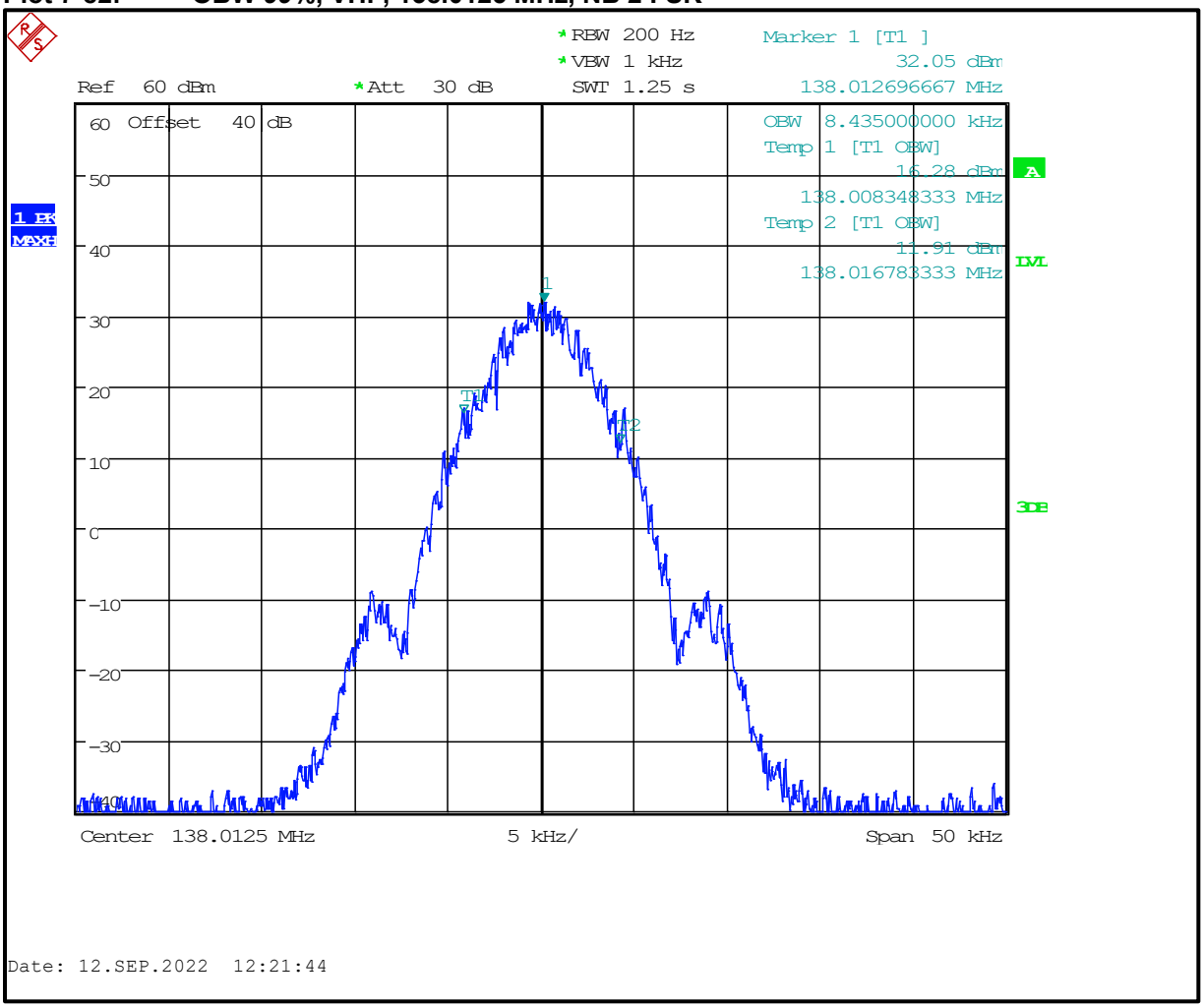
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	521.950687 M	-41.58	-79.70	-21.58
-12.490 k	-5.625 k	100.00	521.975462 M	-42.49	-80.61	-16.54
5.625 k	12.500 k	100.00	521.999938 M	-37.58	-75.70	-6.52
12.510 k	50.000 k	100.00	522.000237 M	-35.63	-73.75	-15.63

Date: 30.AUG.2022 16:52:32

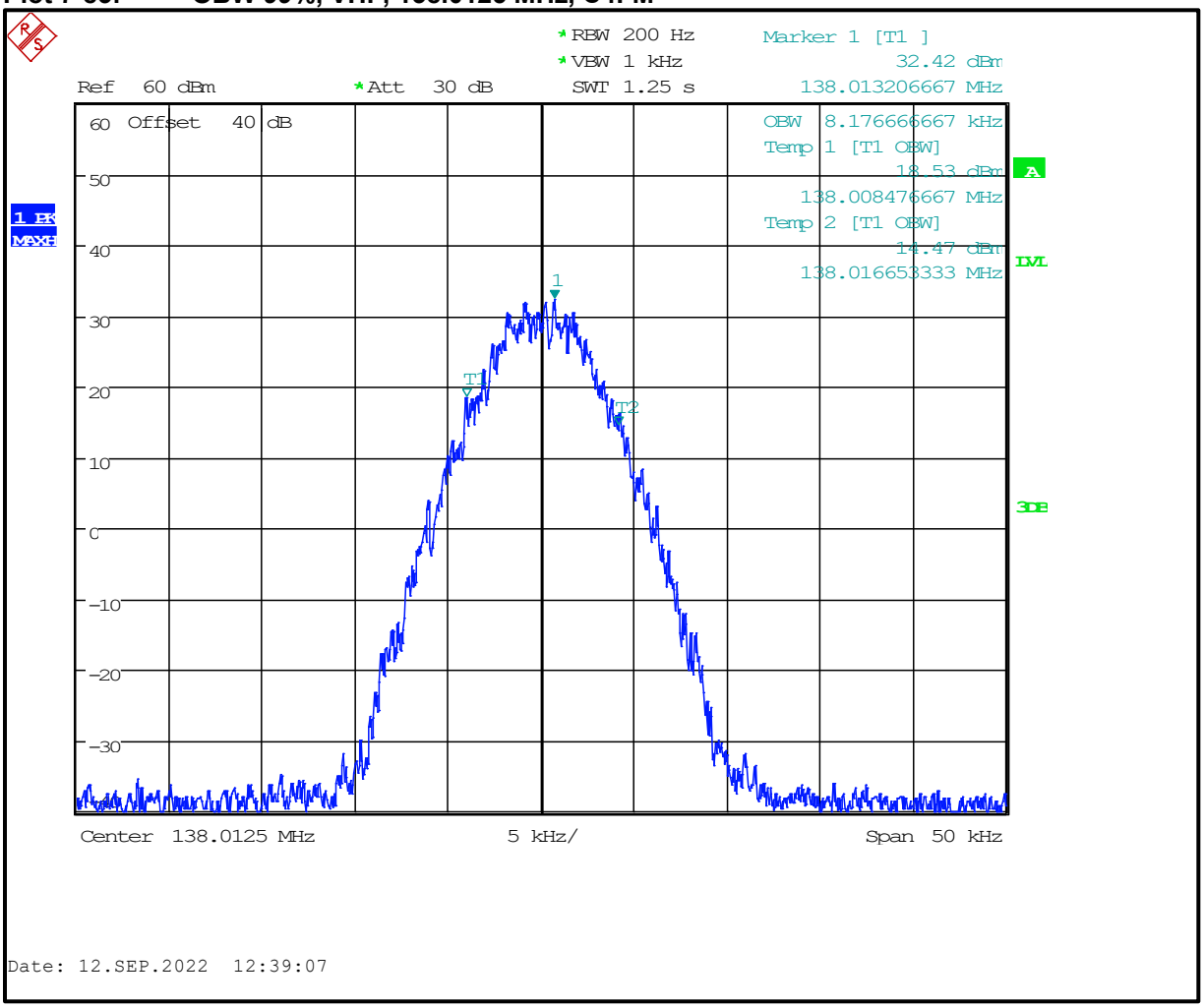
Plot 7-81: OBW 99%, VHF, 138.0125 MHz, NB



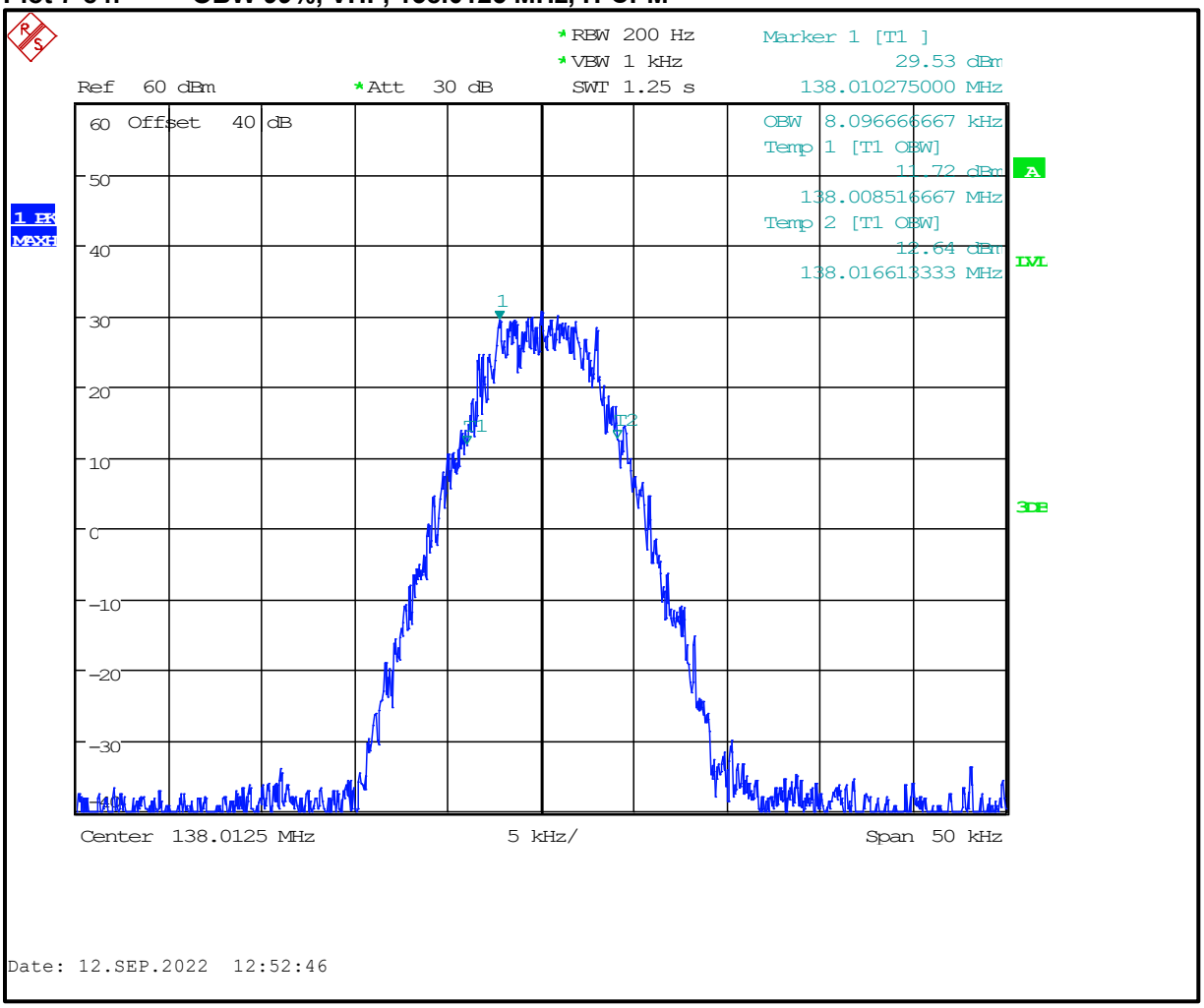
Plot 7-82: OBW 99%, VHF, 138.0125 MHz, NB 2 FSK



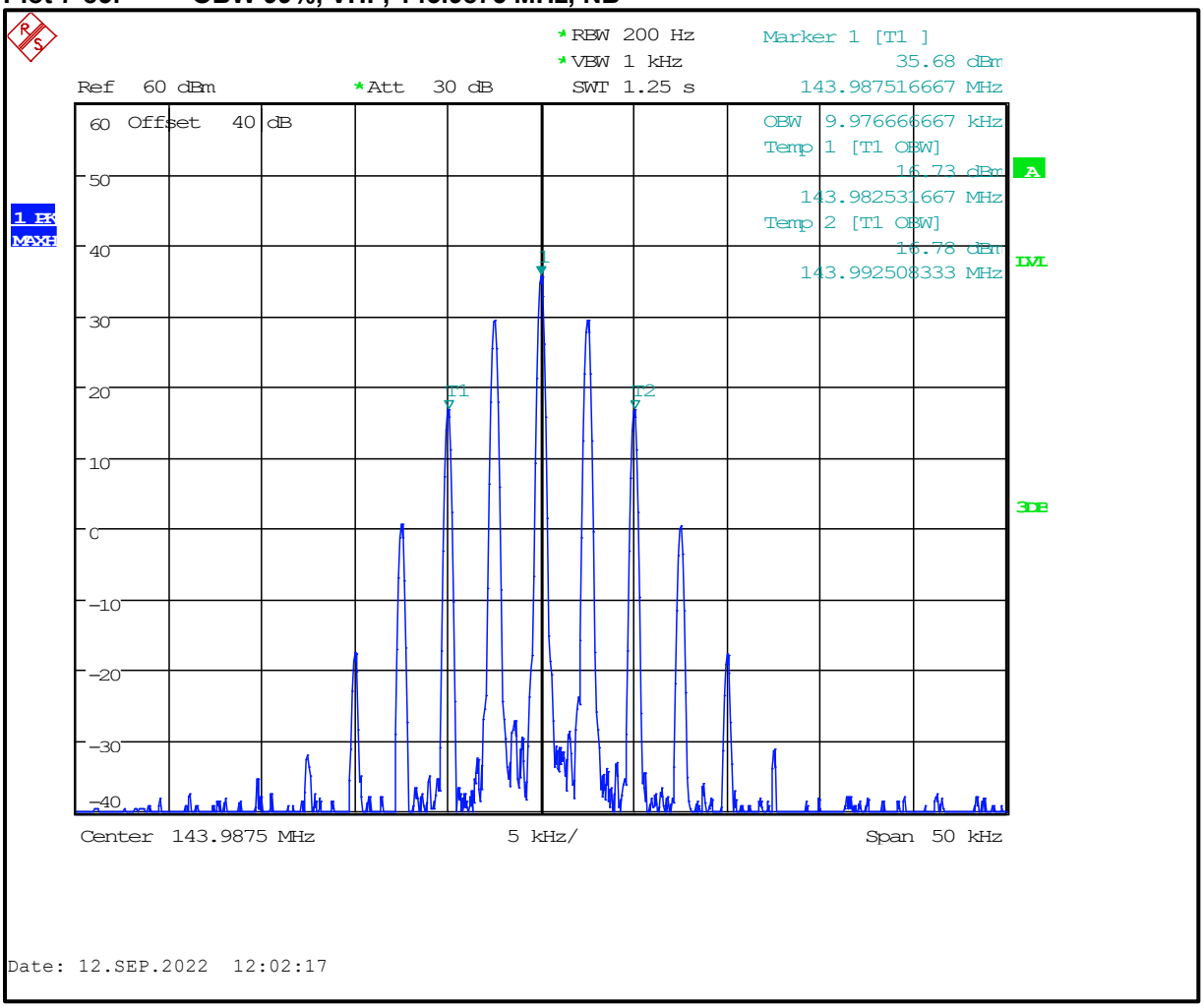
Plot 7-83: OBW 99%, VHF, 138.0125 MHz, C4FM



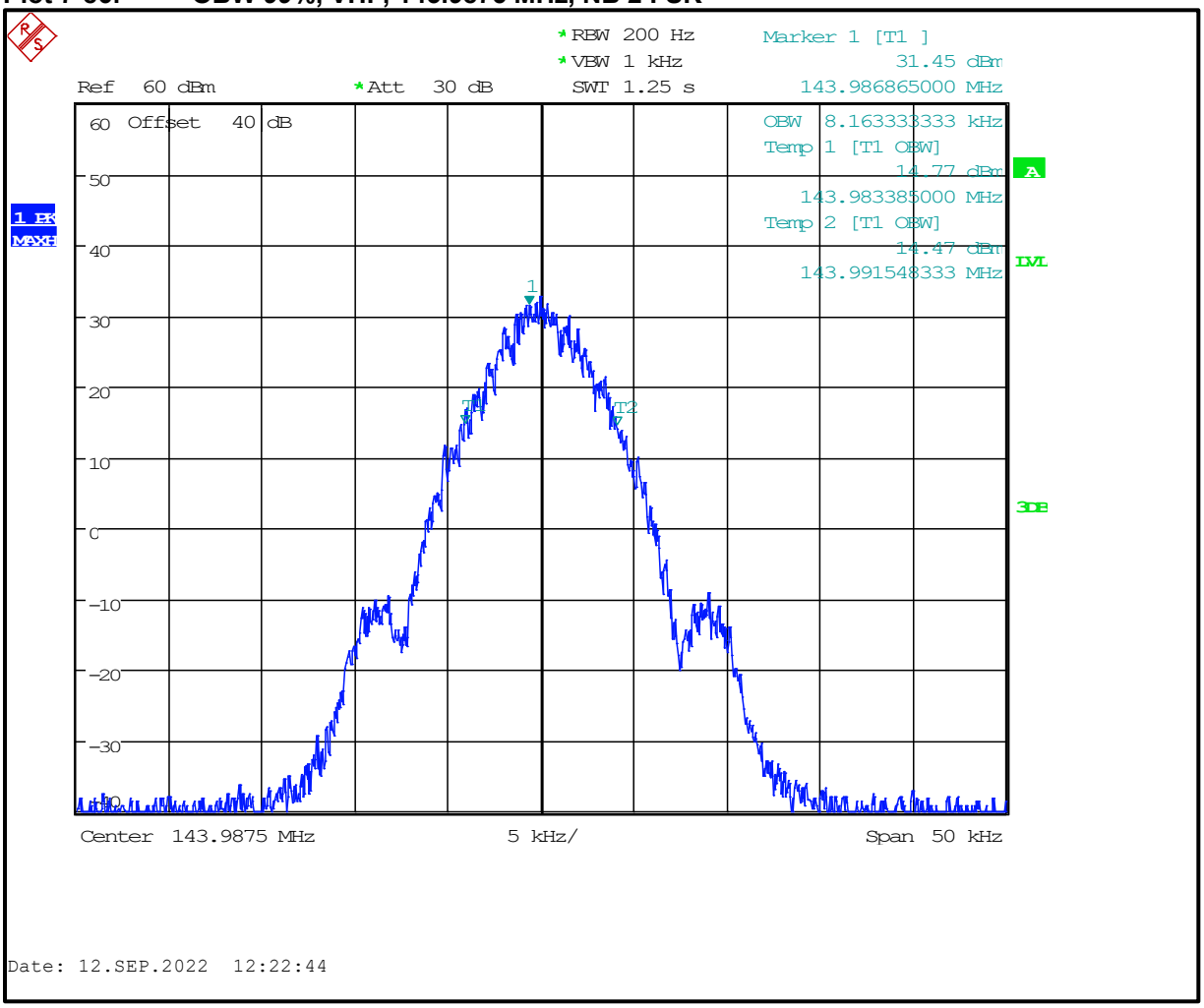
Plot 7-84: OBW 99%, VHF, 138.0125 MHz, H-CPM



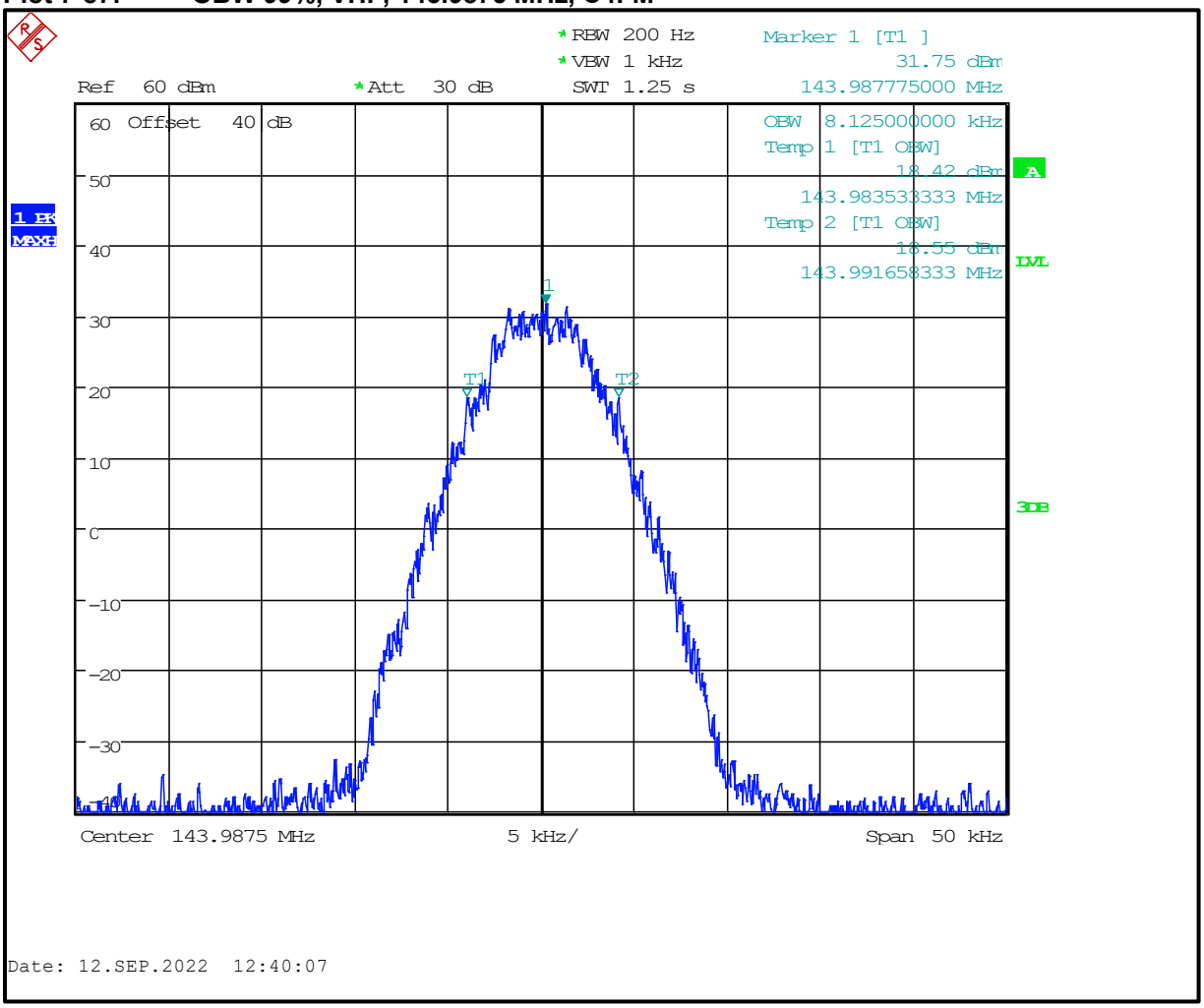
Plot 7-85: OBW 99%, VHF, 143.9875 MHz, NB



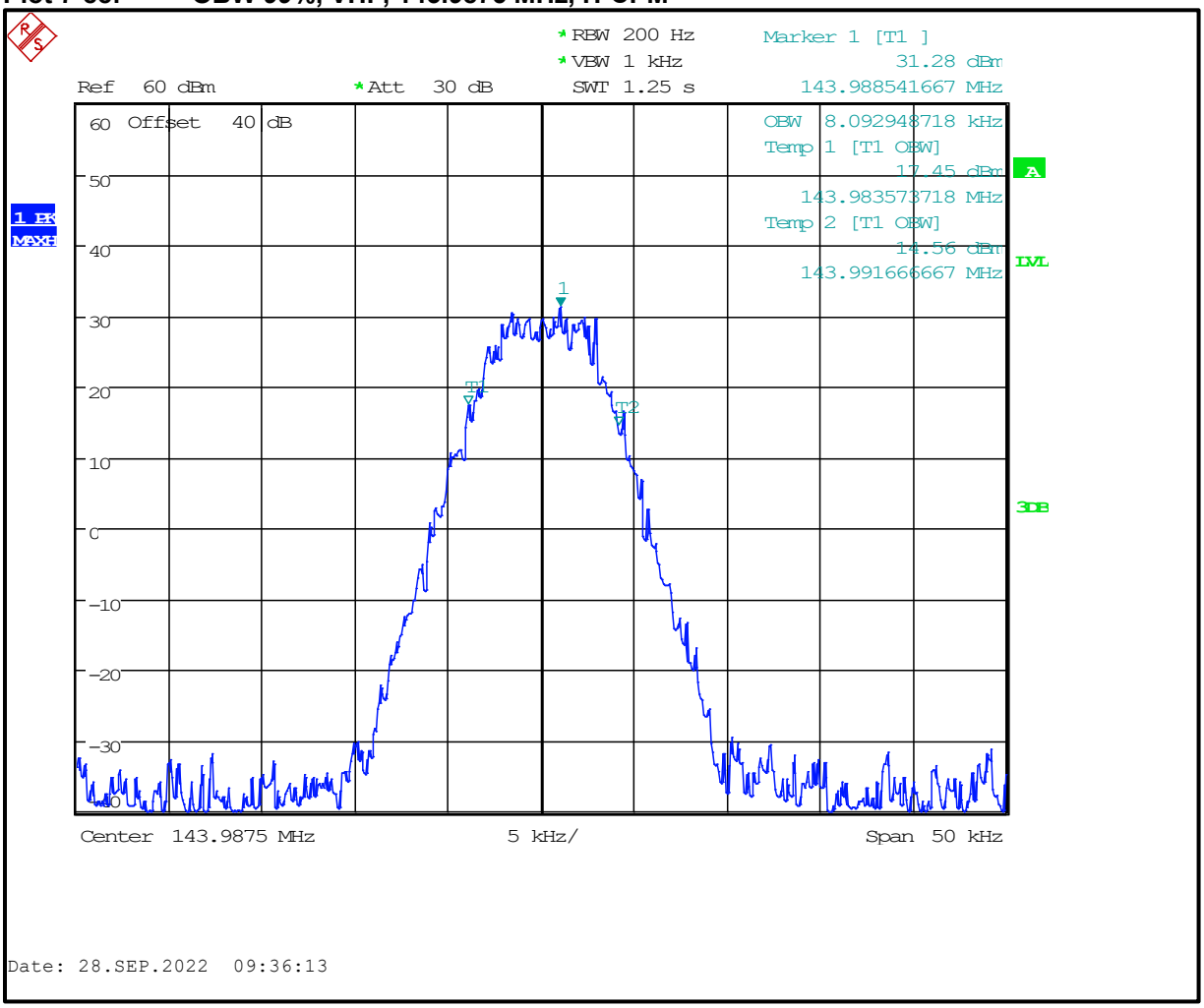
Plot 7-86: OBW 99%, VHF, 143.9875 MHz, NB 2 FSK



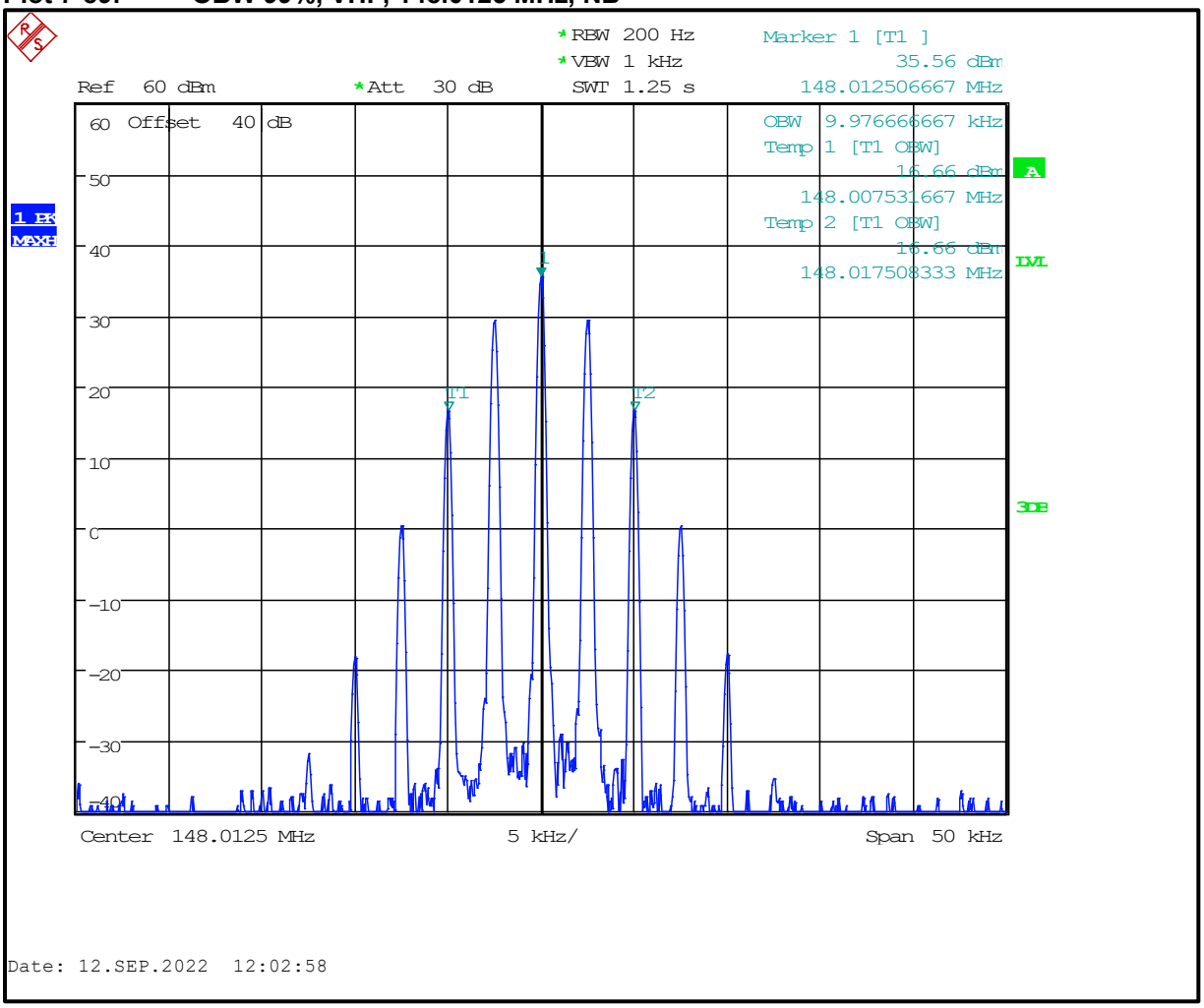
Plot 7-87: OBW 99%, VHF, 143.9875 MHz, C4FM



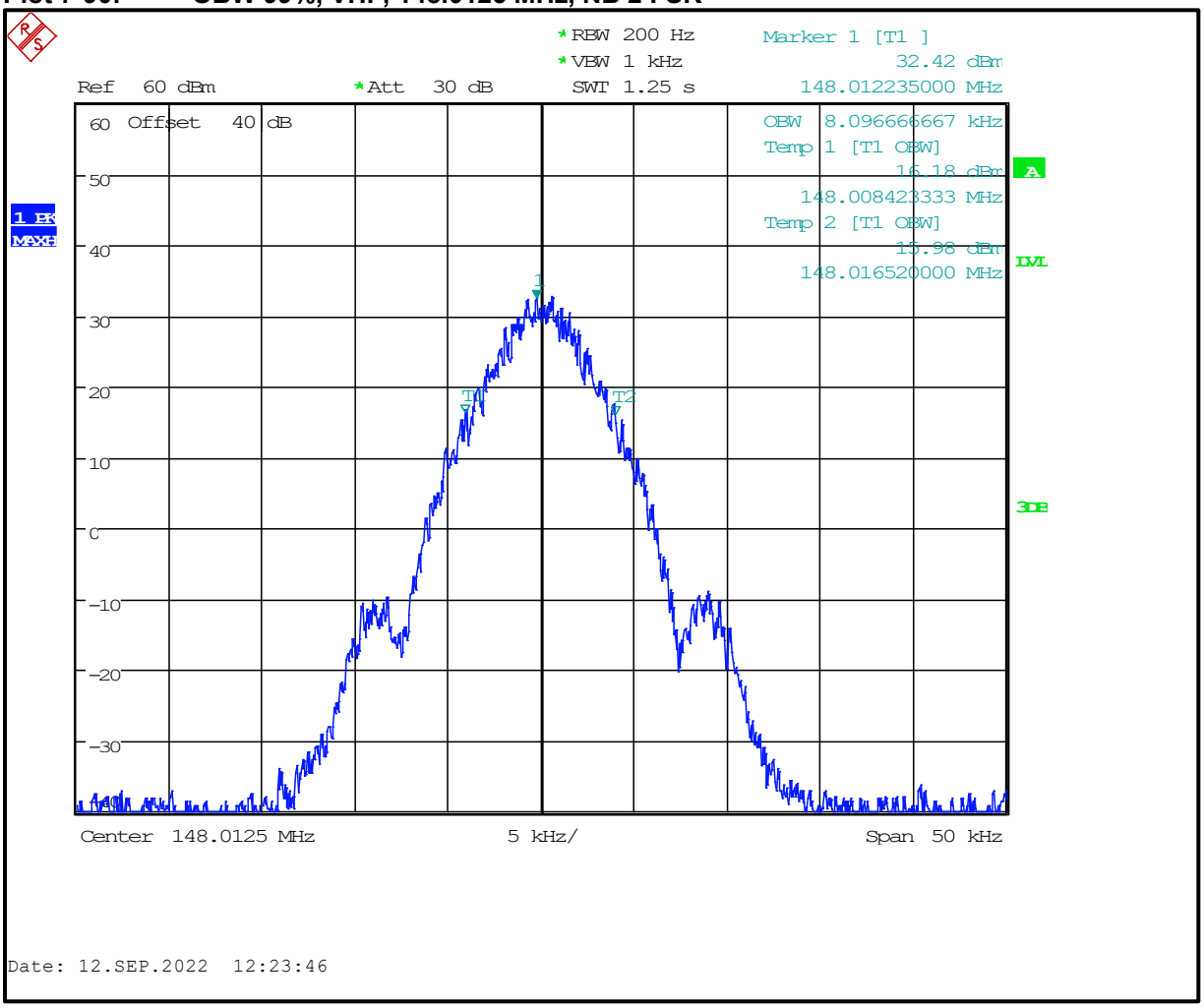
Plot 7-88: OBW 99%, VHF, 143.9875 MHz, H-CPM



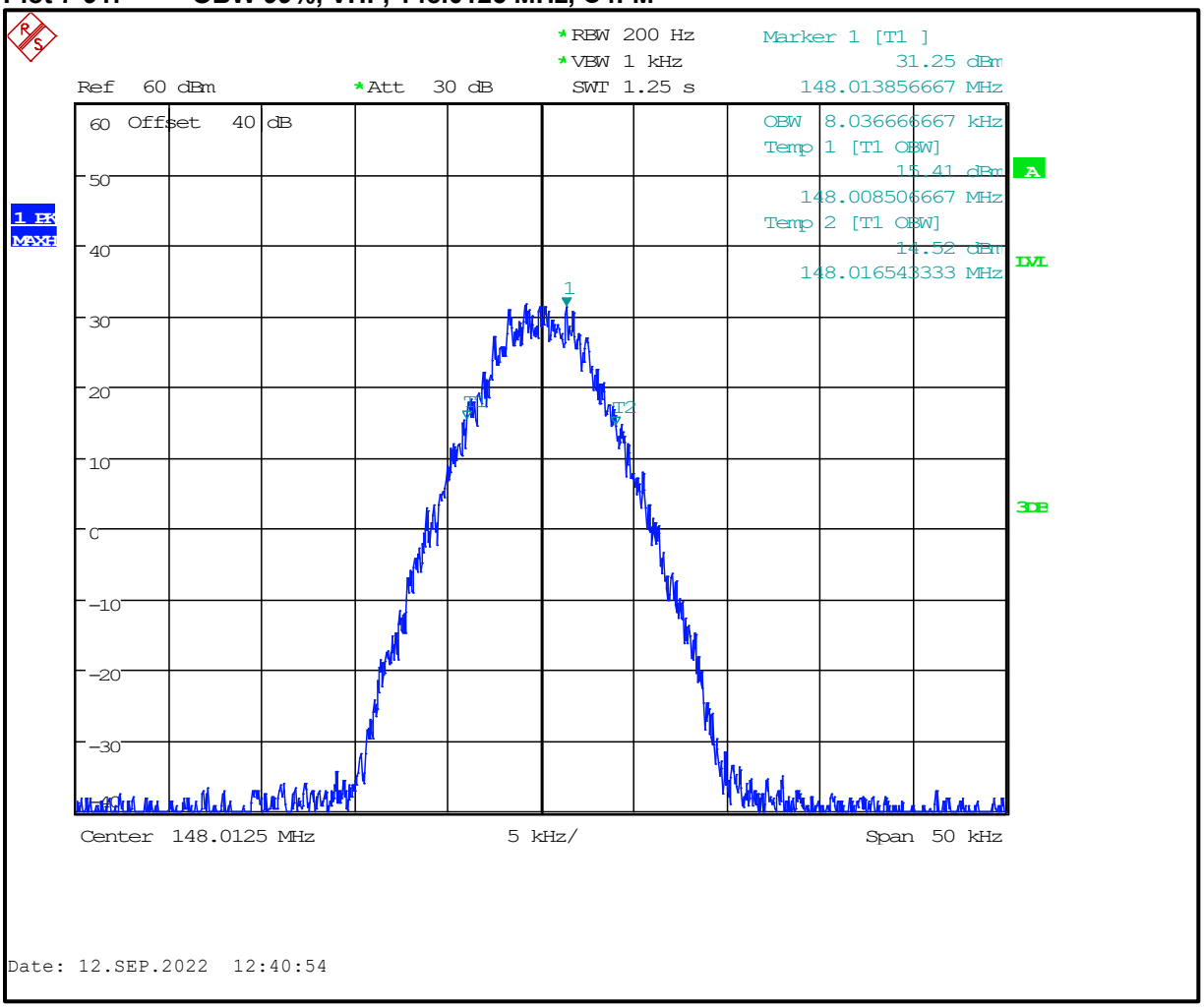
Plot 7-89: OBW 99%, VHF, 148.0125 MHz, NB



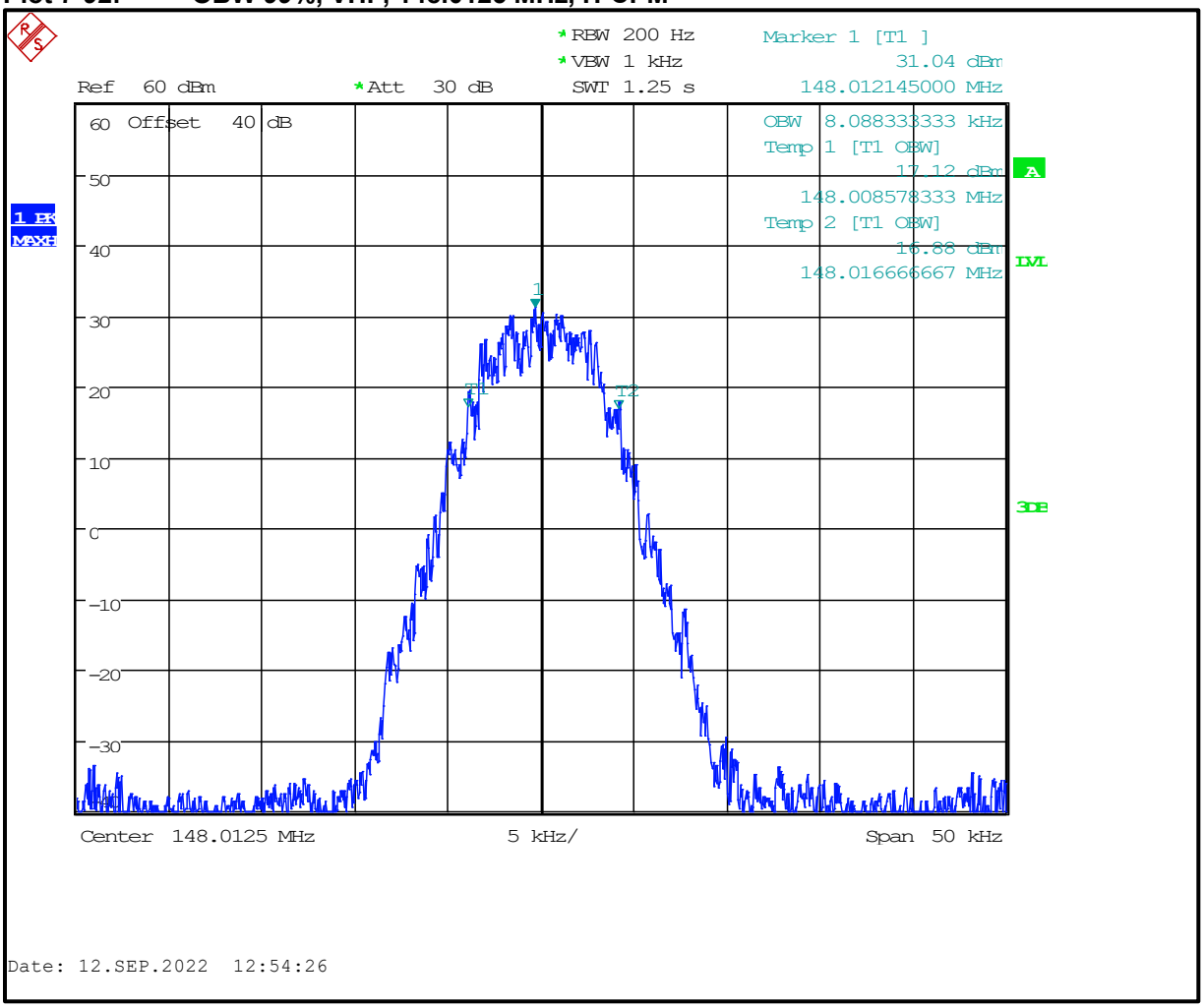
Plot 7-90: OBW 99%, VHF, 148.0125 MHz, NB 2 FSK



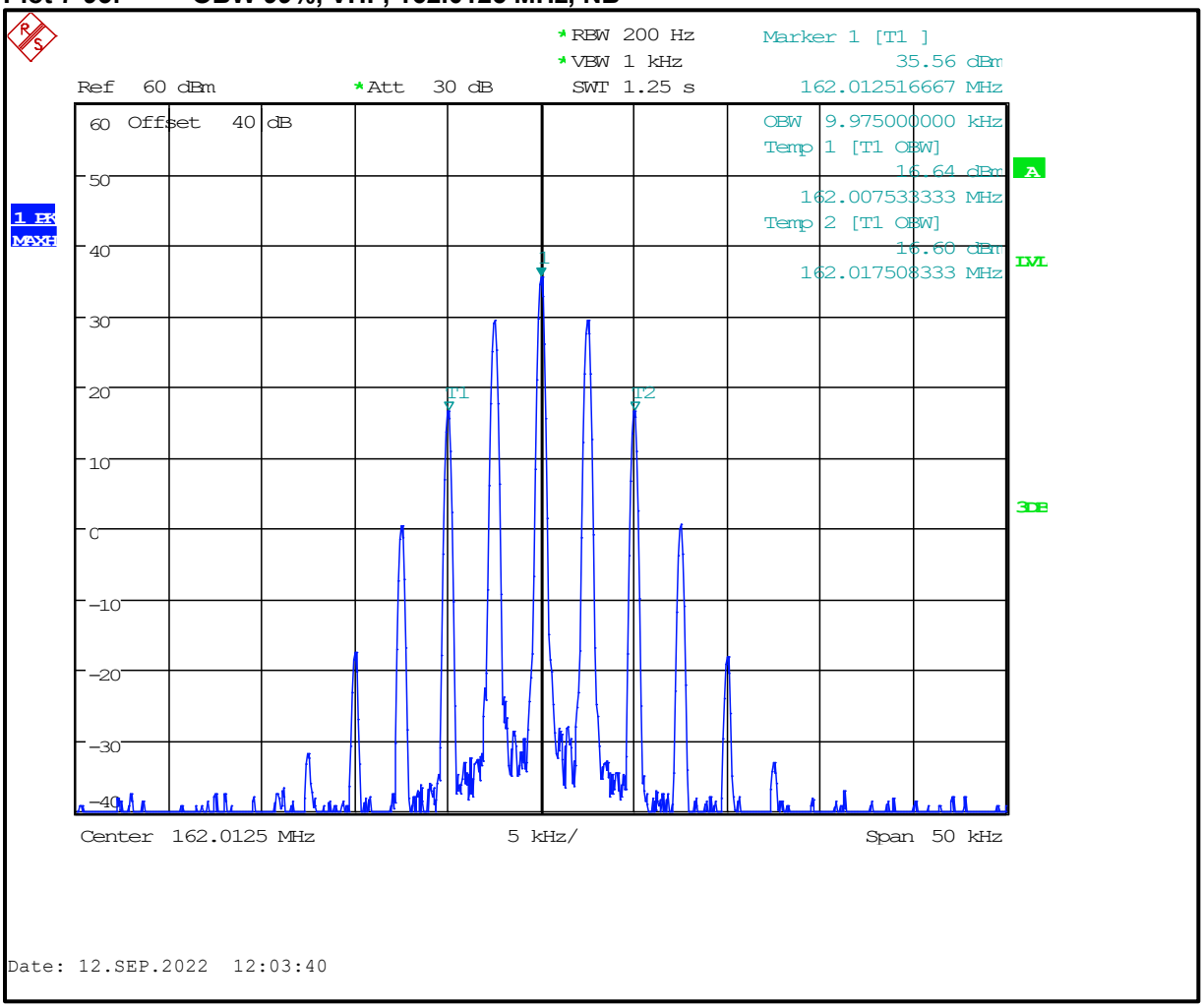
Plot 7-91: OBW 99%, VHF, 148.0125 MHz, C4FM



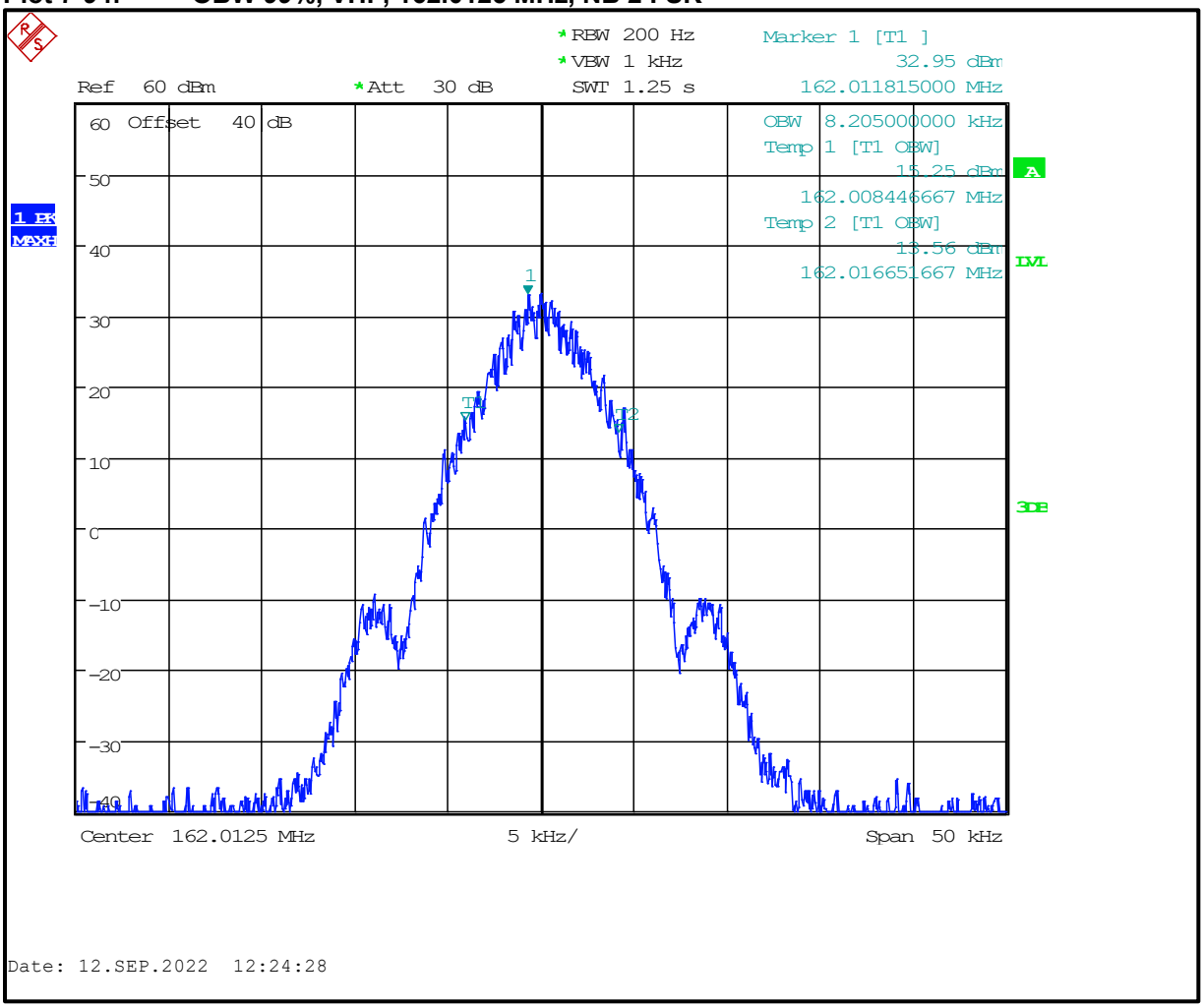
Plot 7-92: OBW 99%, VHF, 148.0125 MHz, H-CPM



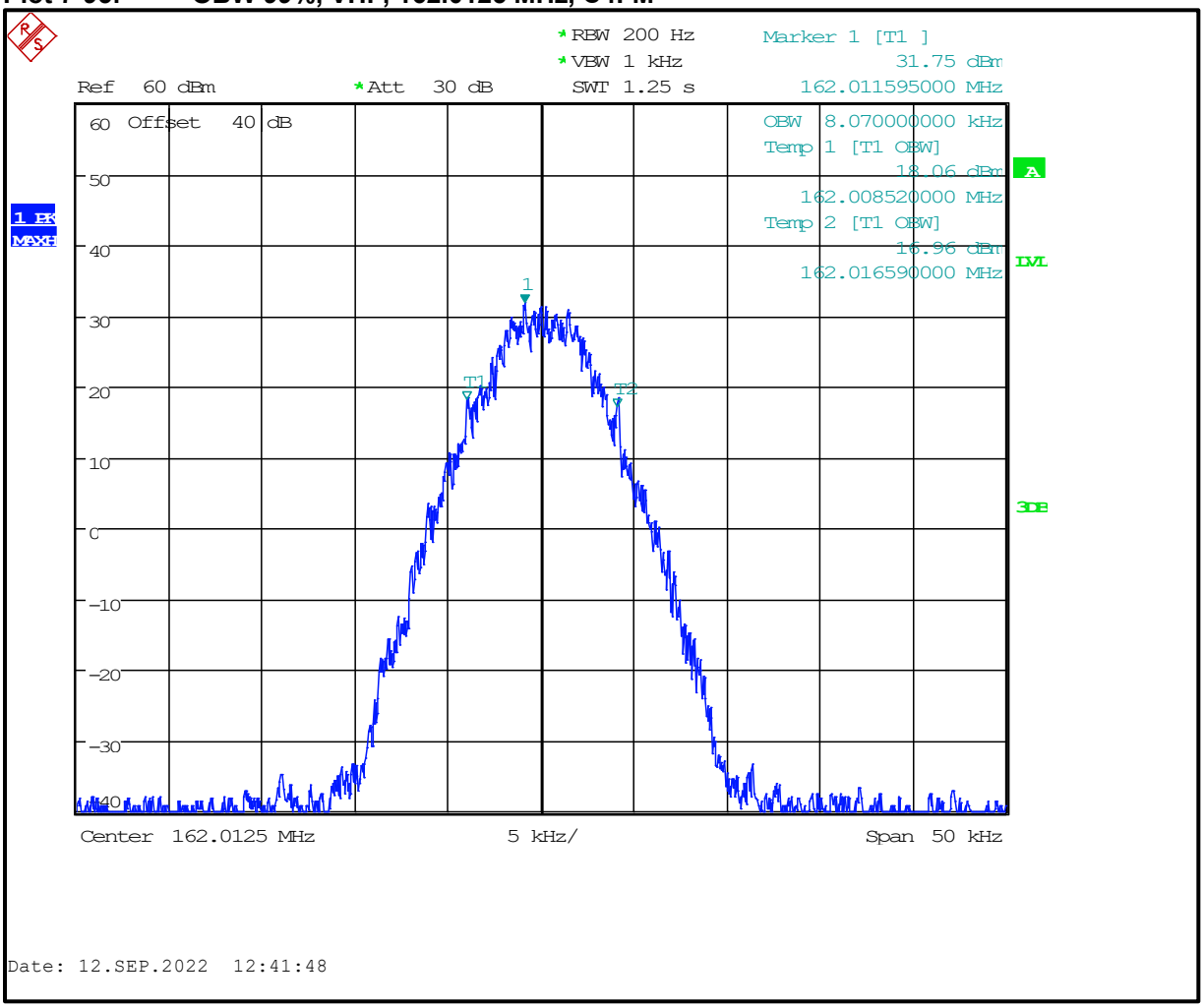
Plot 7-93: OBW 99%, VHF, 162.0125 MHz, NB



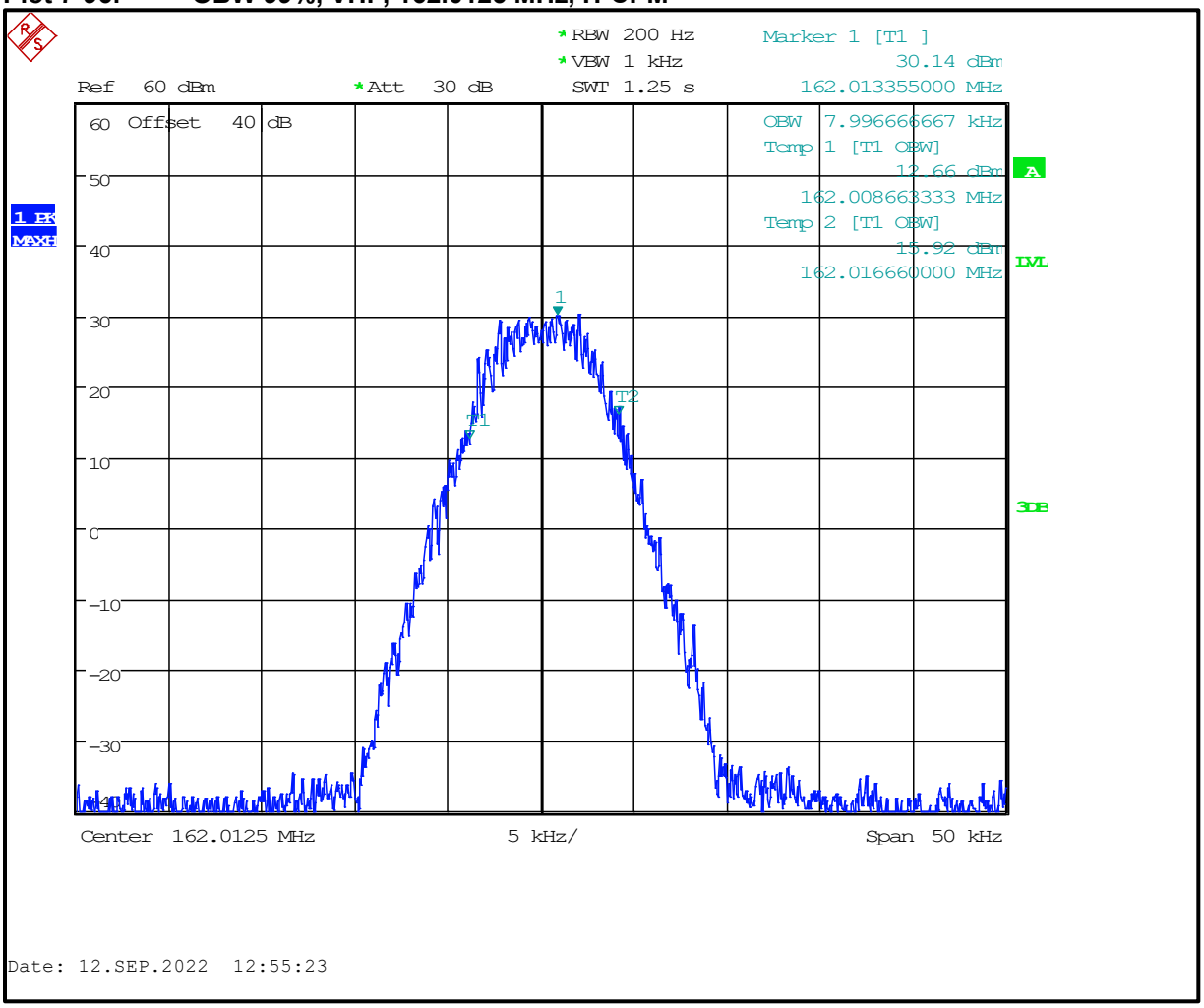
Plot 7-94: OBW 99%, VHF, 162.0125 MHz, NB 2 FSK



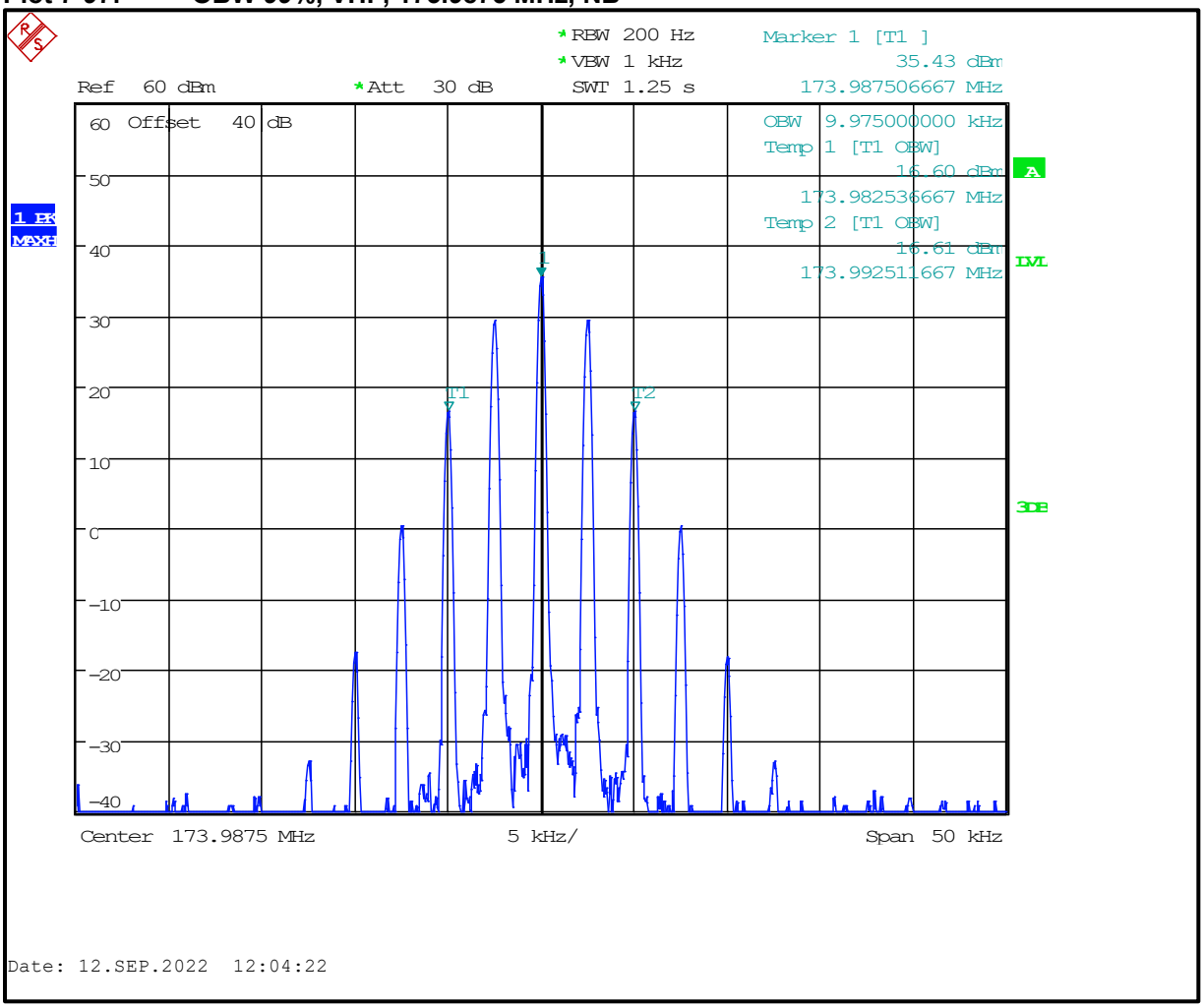
Plot 7-95: OBW 99%, VHF, 162.0125 MHz, C4FM



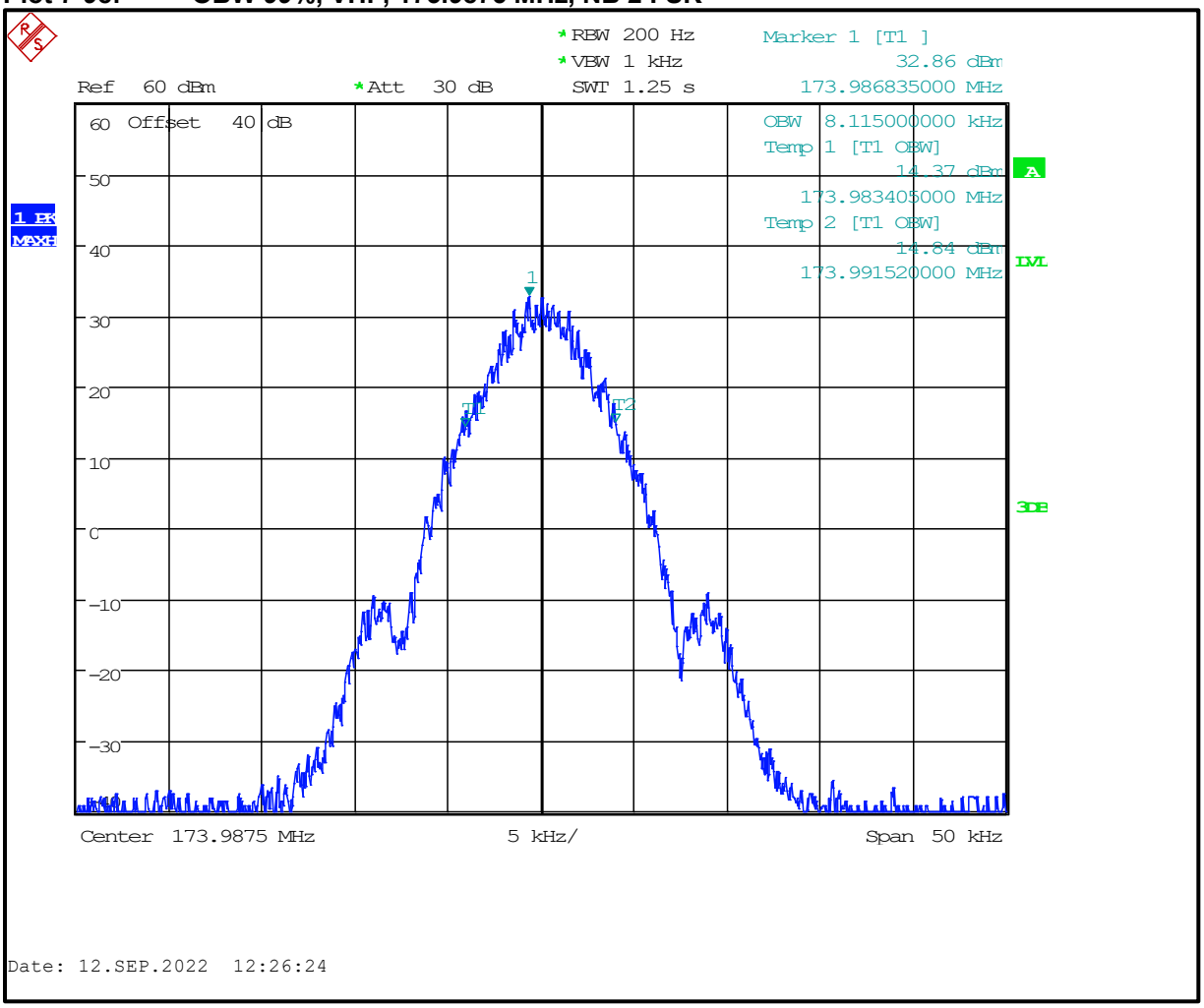
Plot 7-96: OBW 99%, VHF, 162.0125 MHz, H-CPM



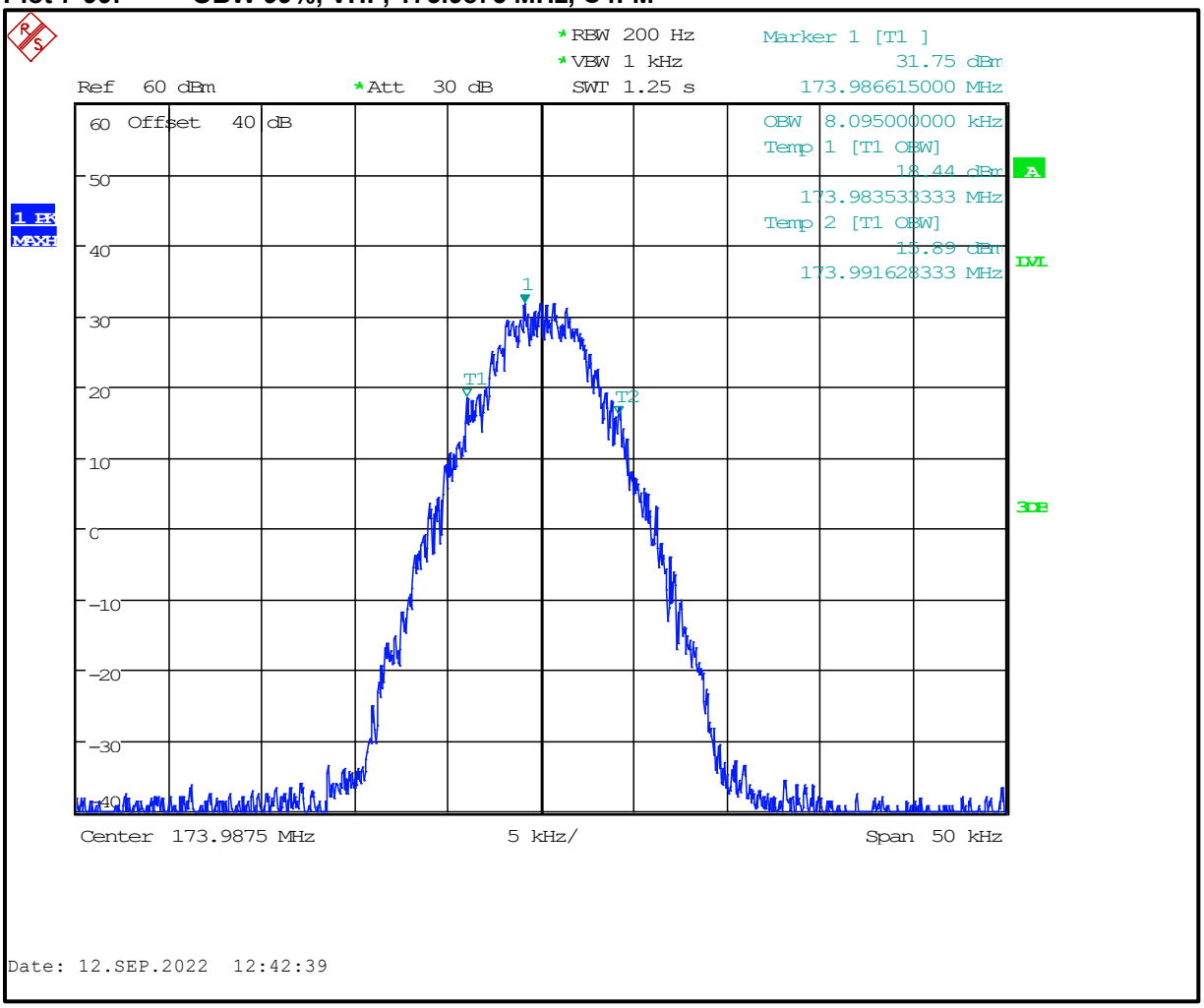
Plot 7-97: OBW 99%, VHF, 173.9875 MHz, NB



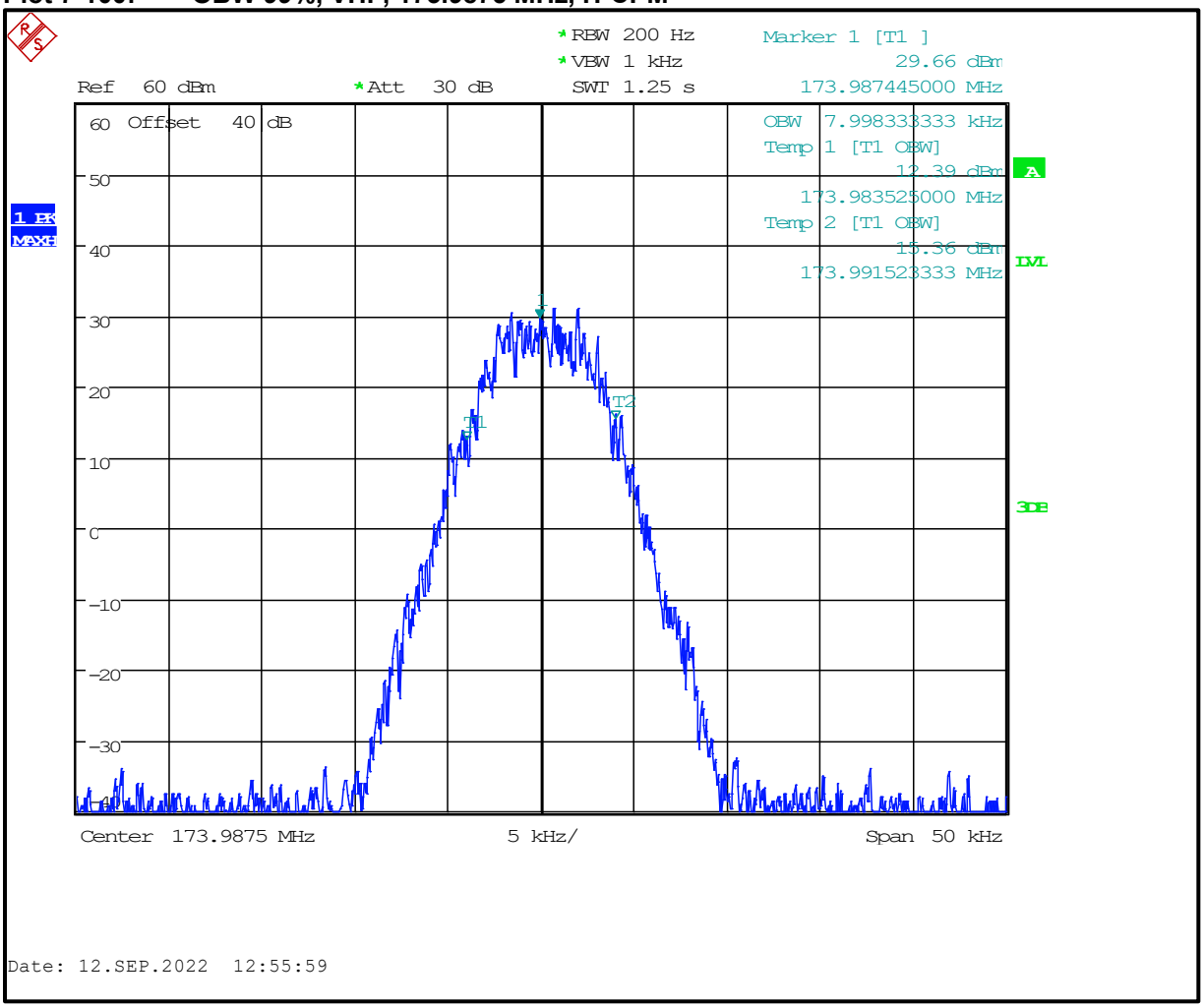
Plot 7-98: OBW 99%, VHF, 173.9875 MHz, NB 2 FSK



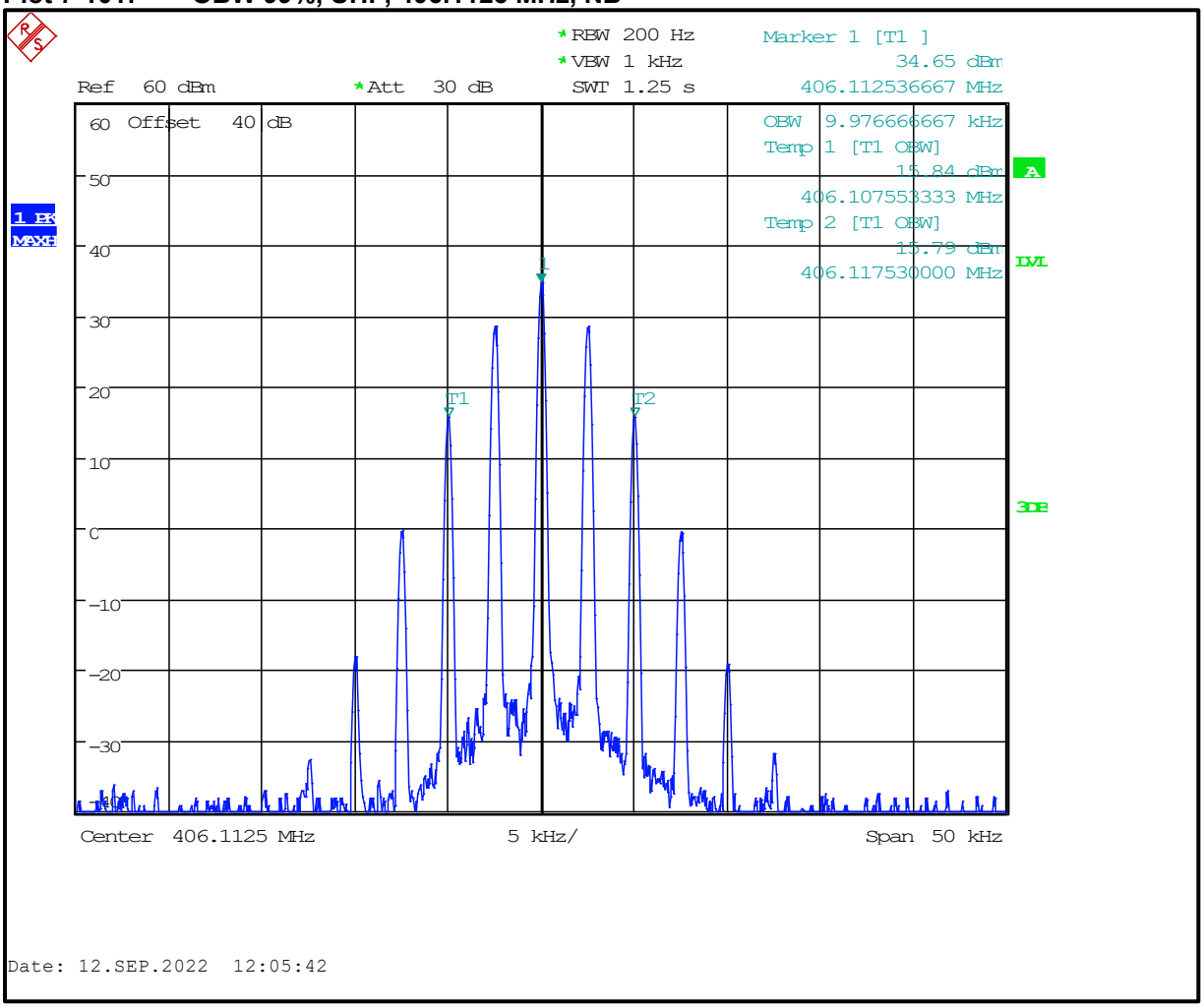
Plot 7-99: OBW 99%, VHF, 173.9875 MHz, C4FM



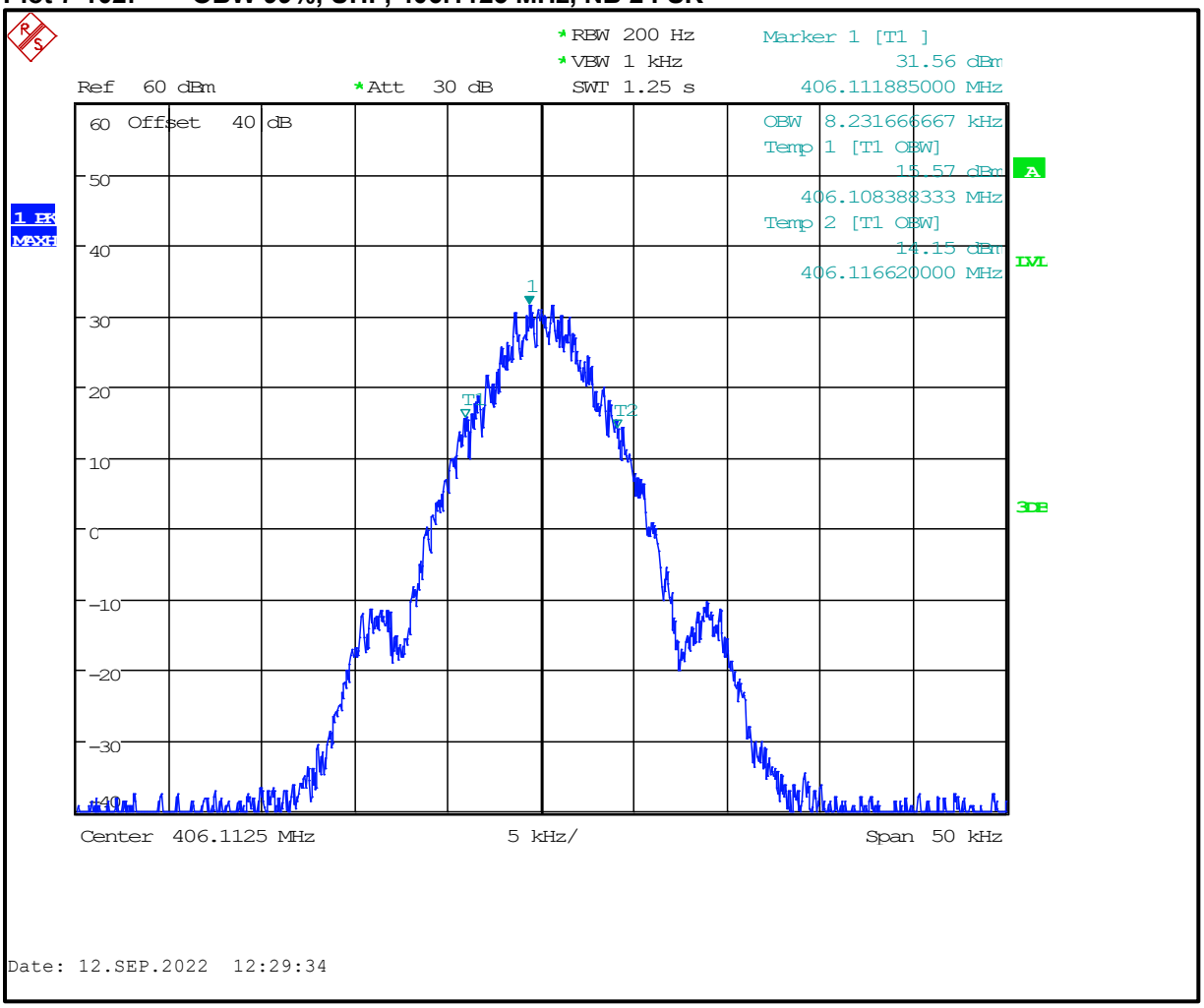
Plot 7-100: OBW 99%, VHF, 173.9875 MHz, H-CPM



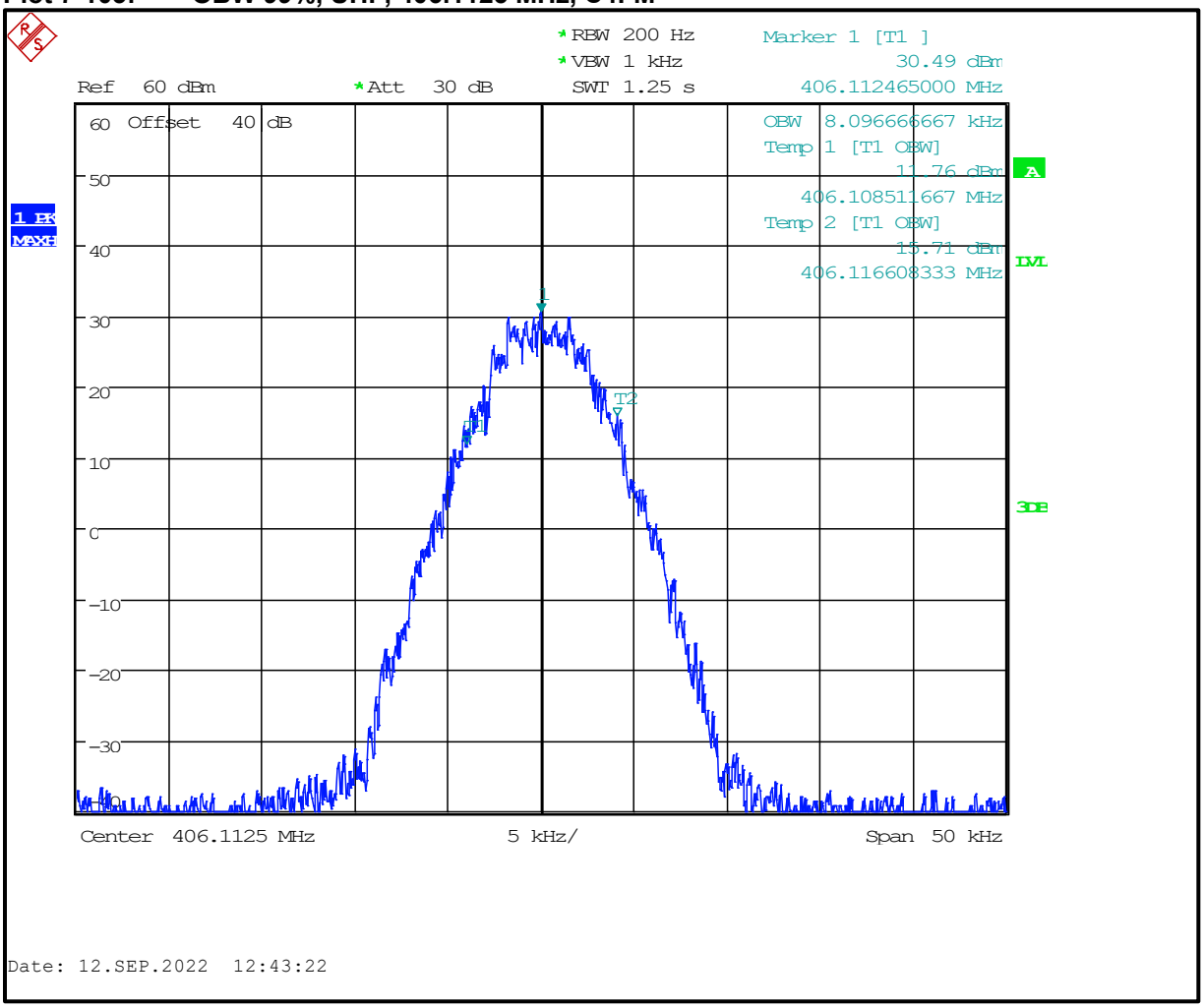
Plot 7-101: OBW 99%, UHF, 406.1125 MHz, NB



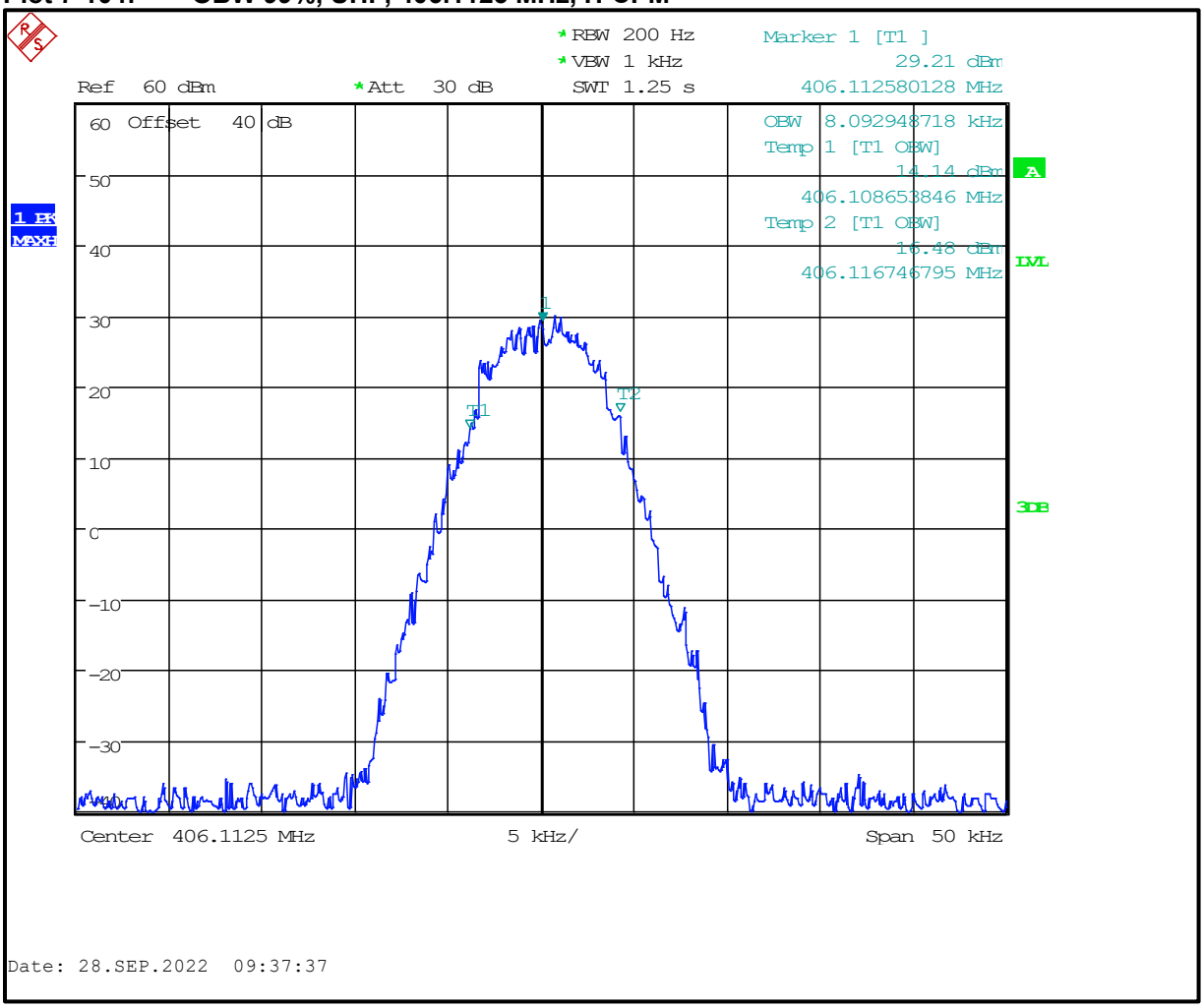
Plot 7-102: OBW 99%, UHF, 406.1125 MHz, NB 2 FSK



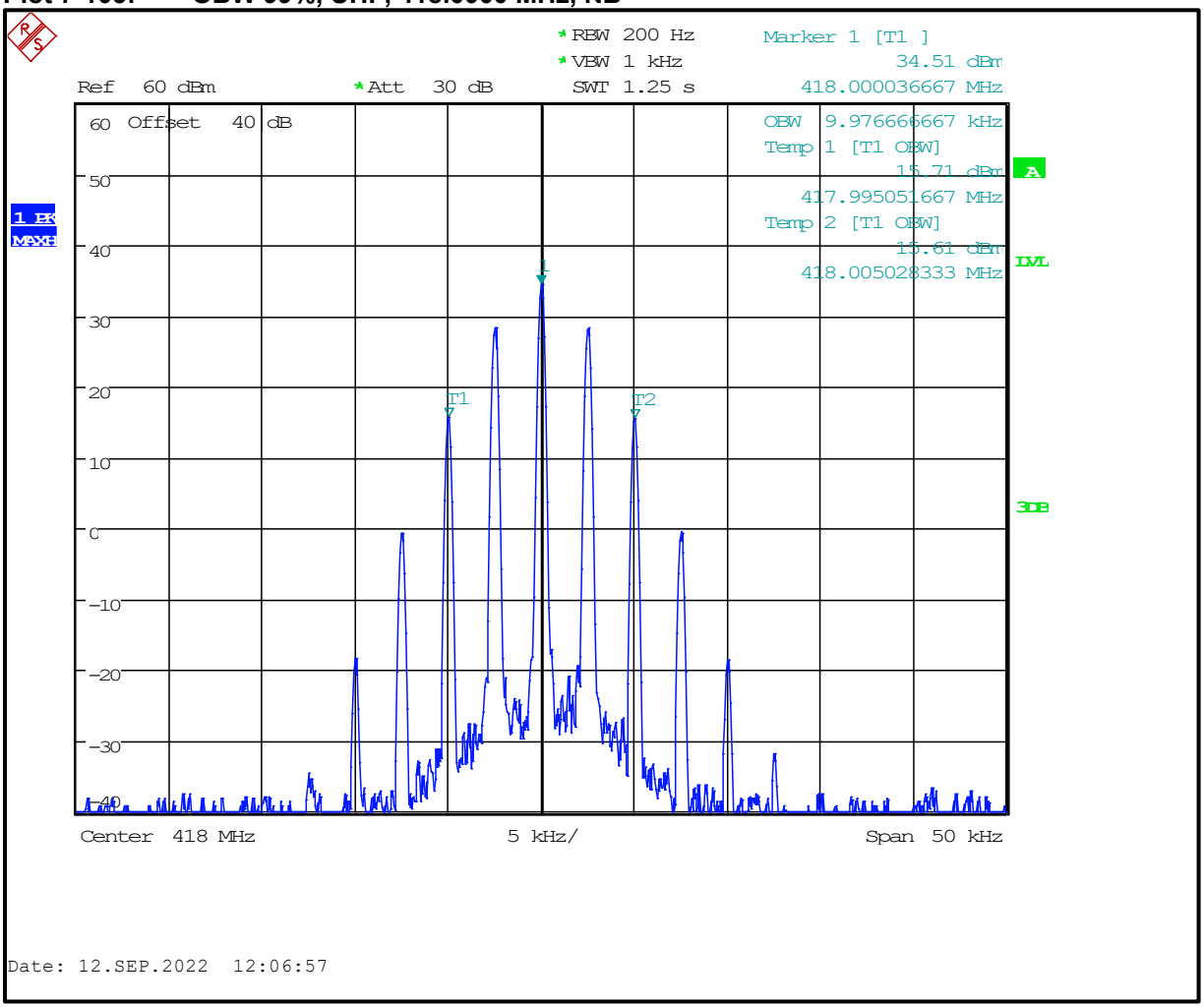
Plot 7-103: OBW 99%, UHF, 406.1125 MHz, C4FM



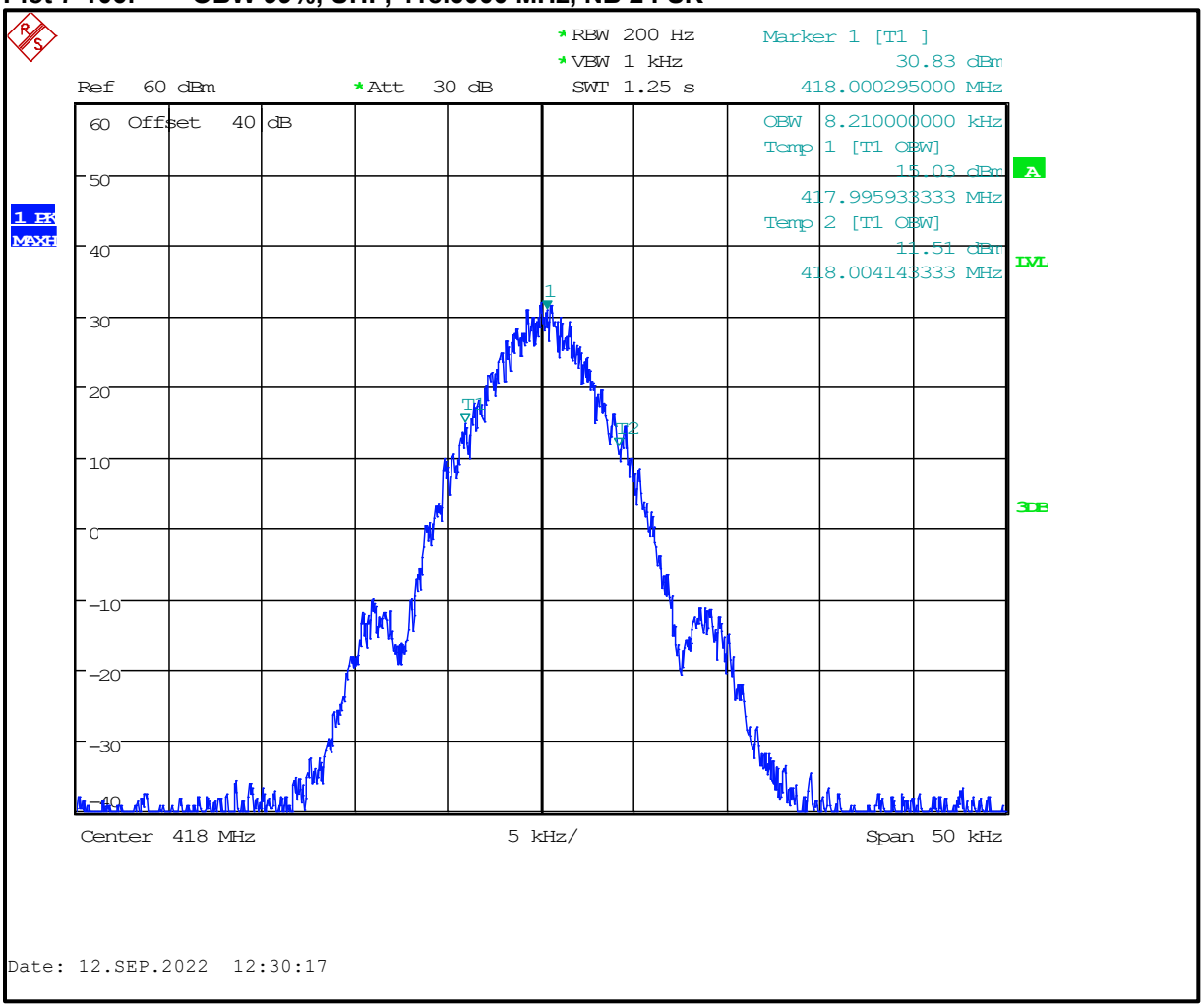
Plot 7-104: OBW 99%, UHF, 406.1125 MHz, H-CPM



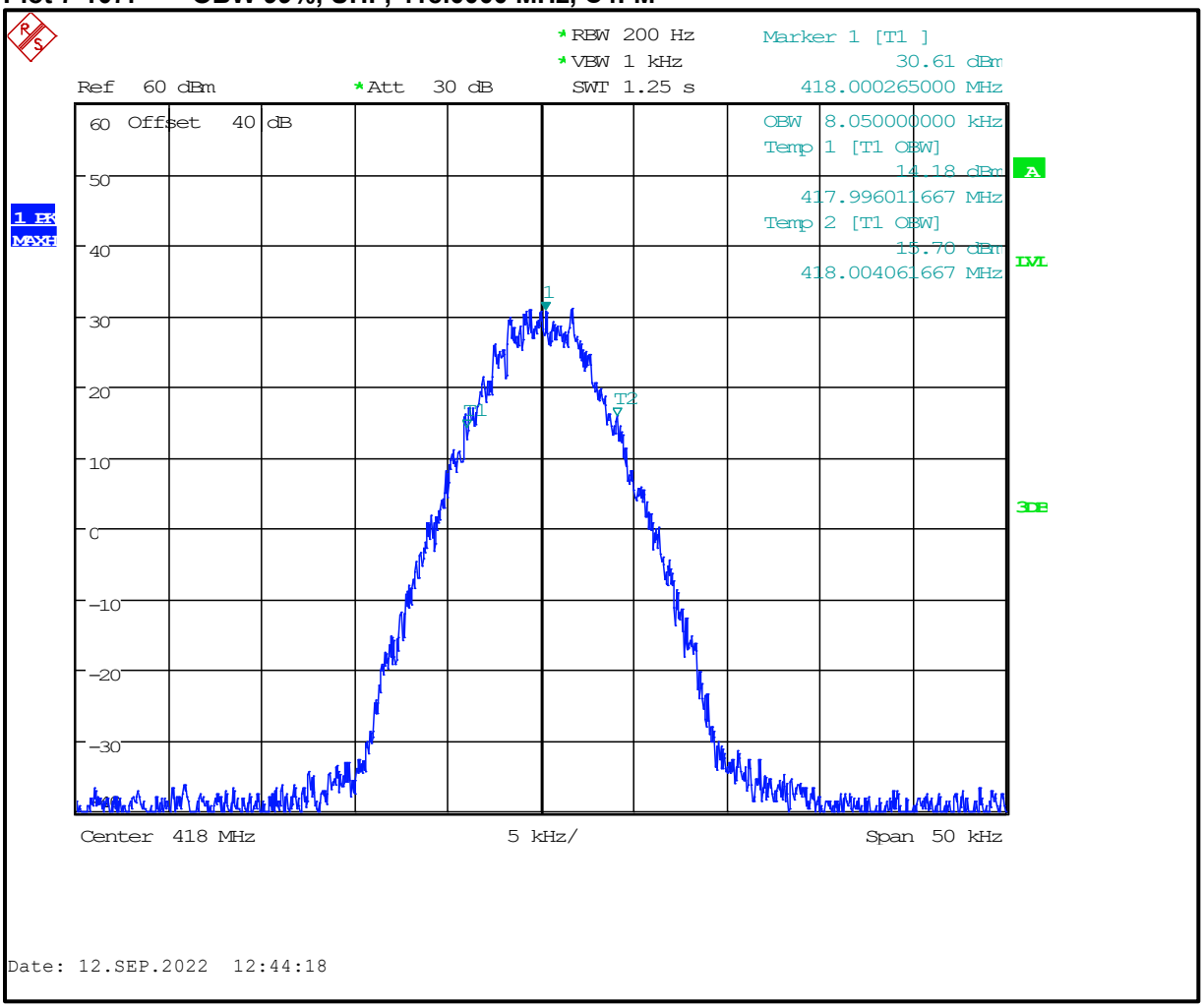
Plot 7-105: OBW 99%, UHF, 418.0000 MHz, NB



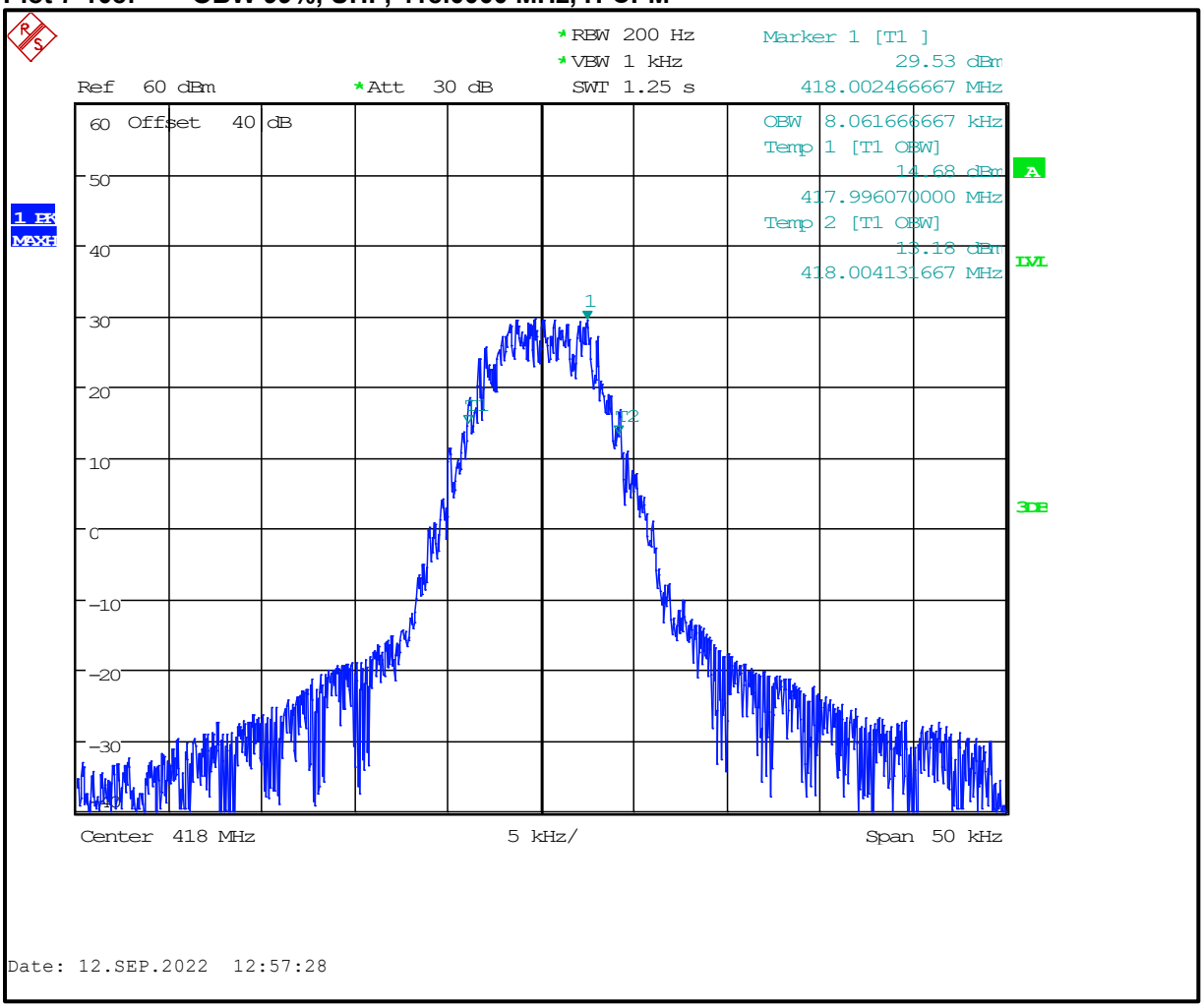
Plot 7-106: OBW 99%, UHF, 418.0000 MHz, NB 2 FSK



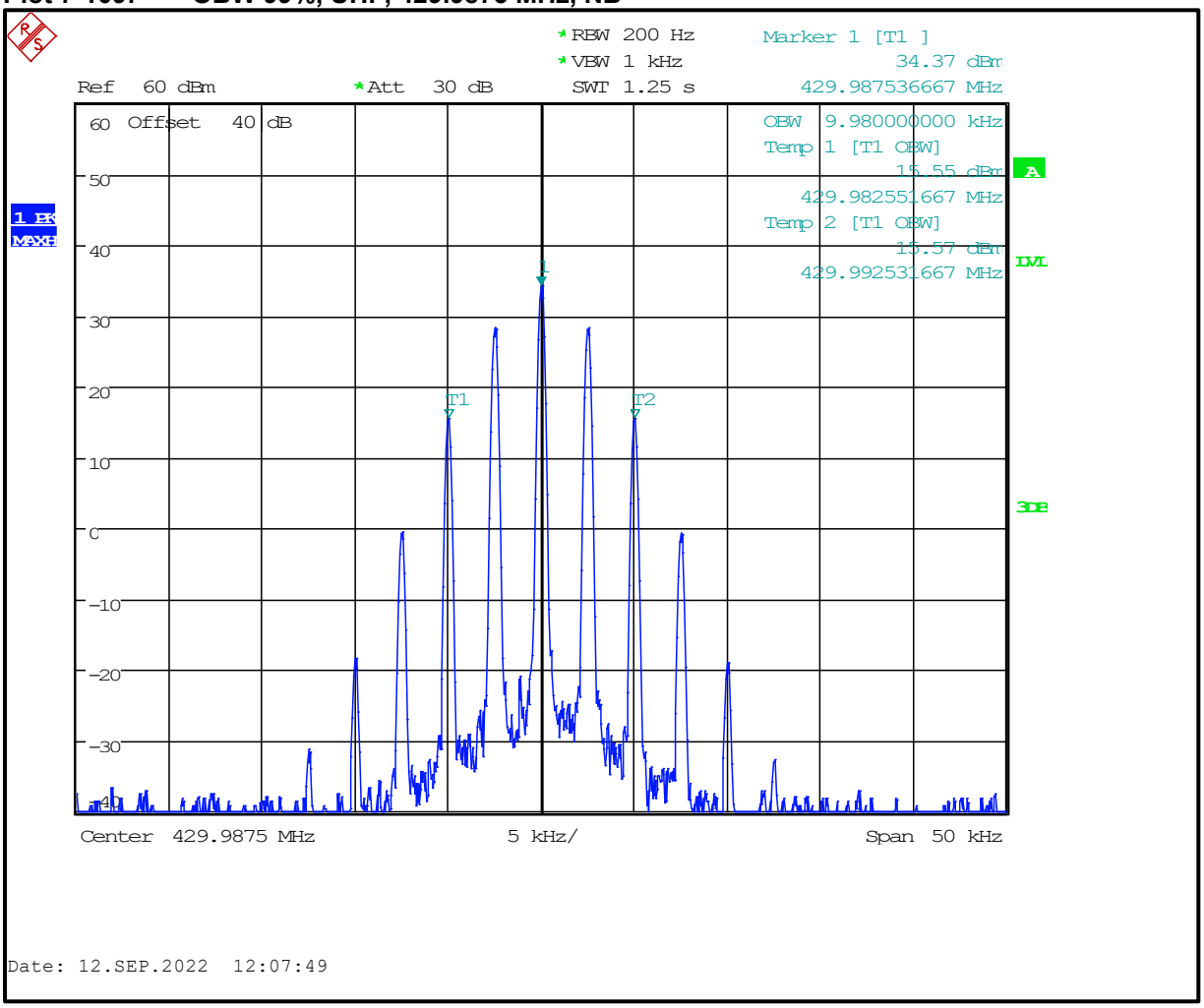
Plot 7-107: OBW 99%, UHF, 418.0000 MHz, C4FM



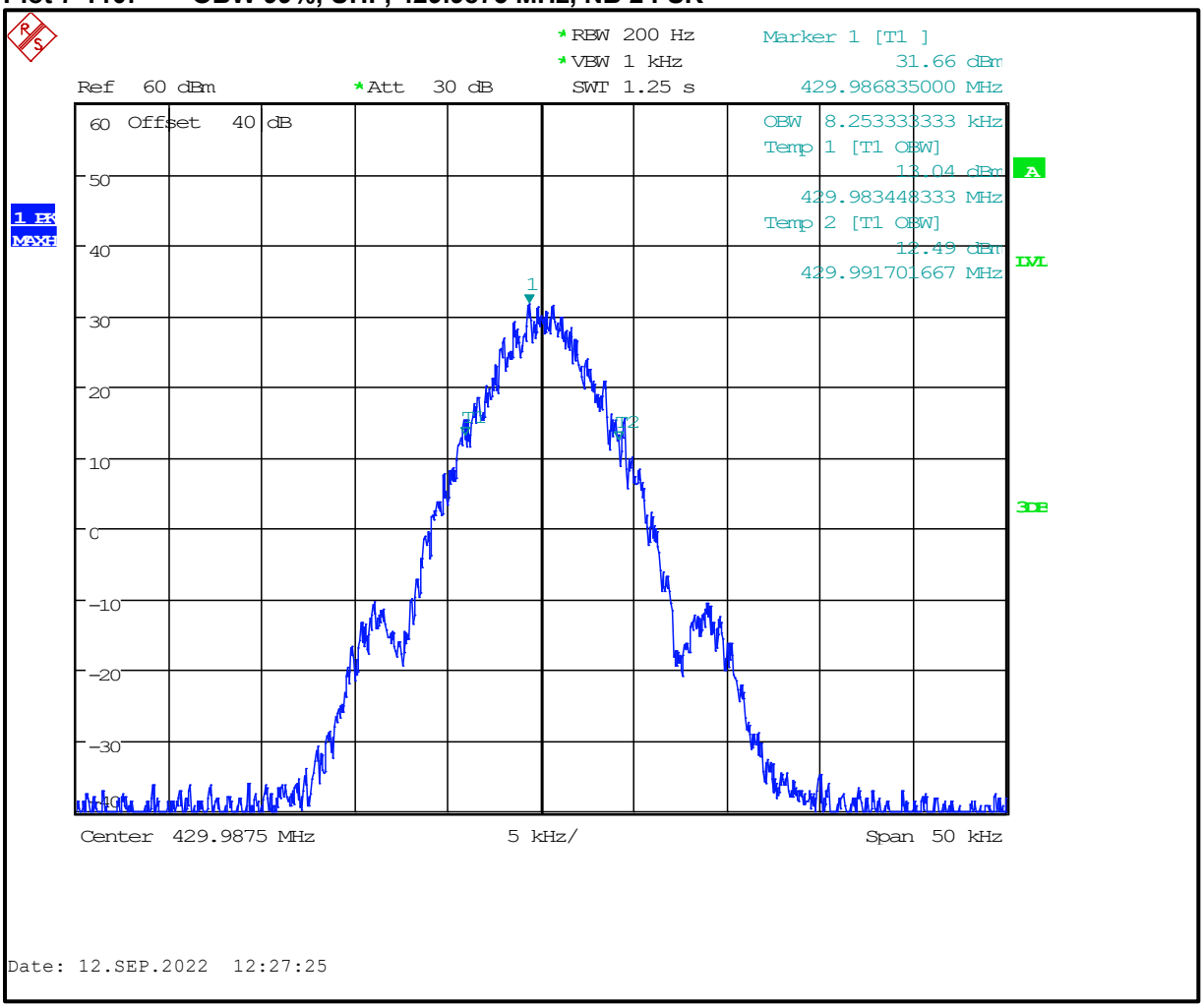
Plot 7-108: OBW 99%, UHF, 418.0000 MHz, H-CPM



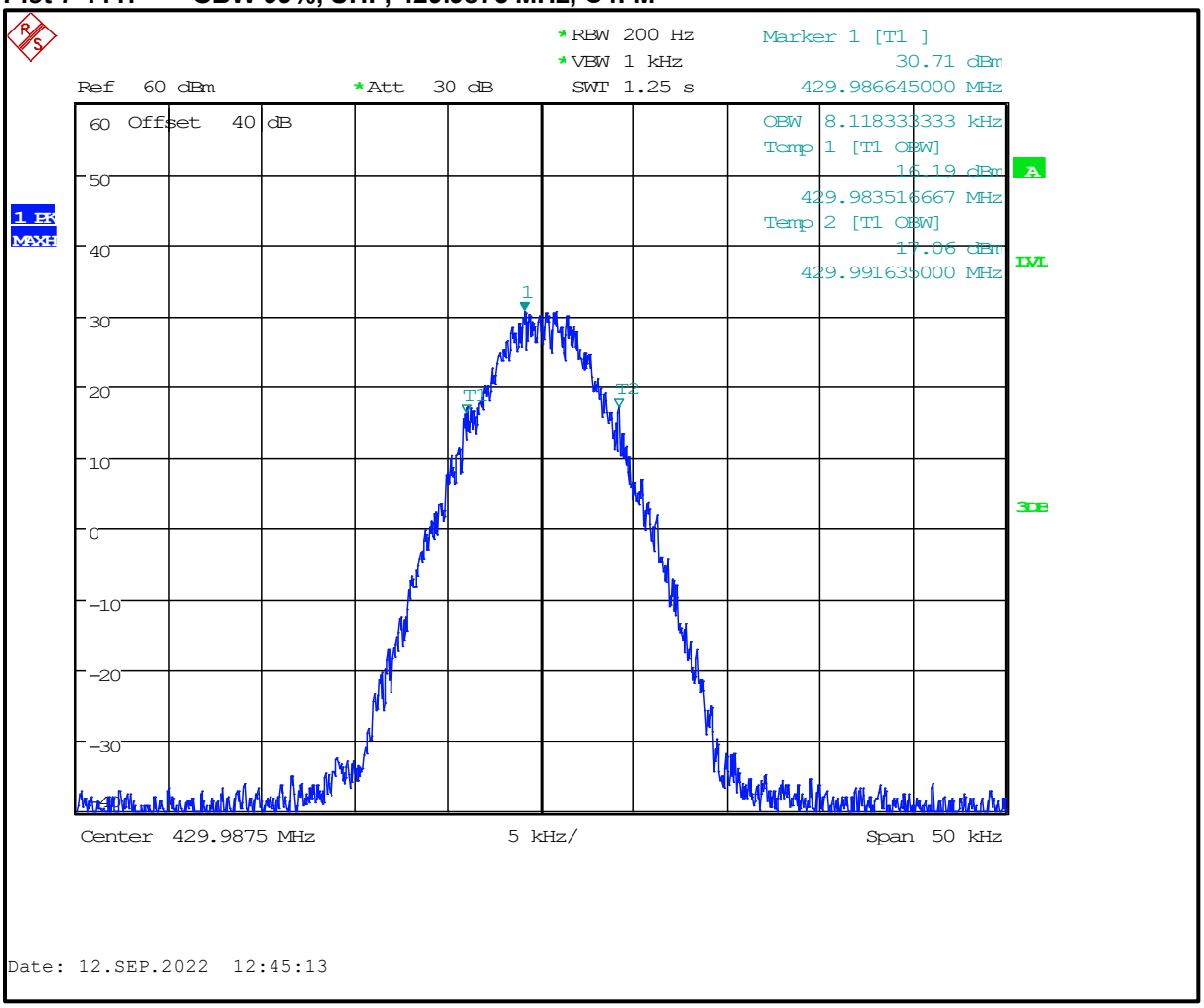
Plot 7-109: OBW 99%, UHF, 429.9875 MHz, NB



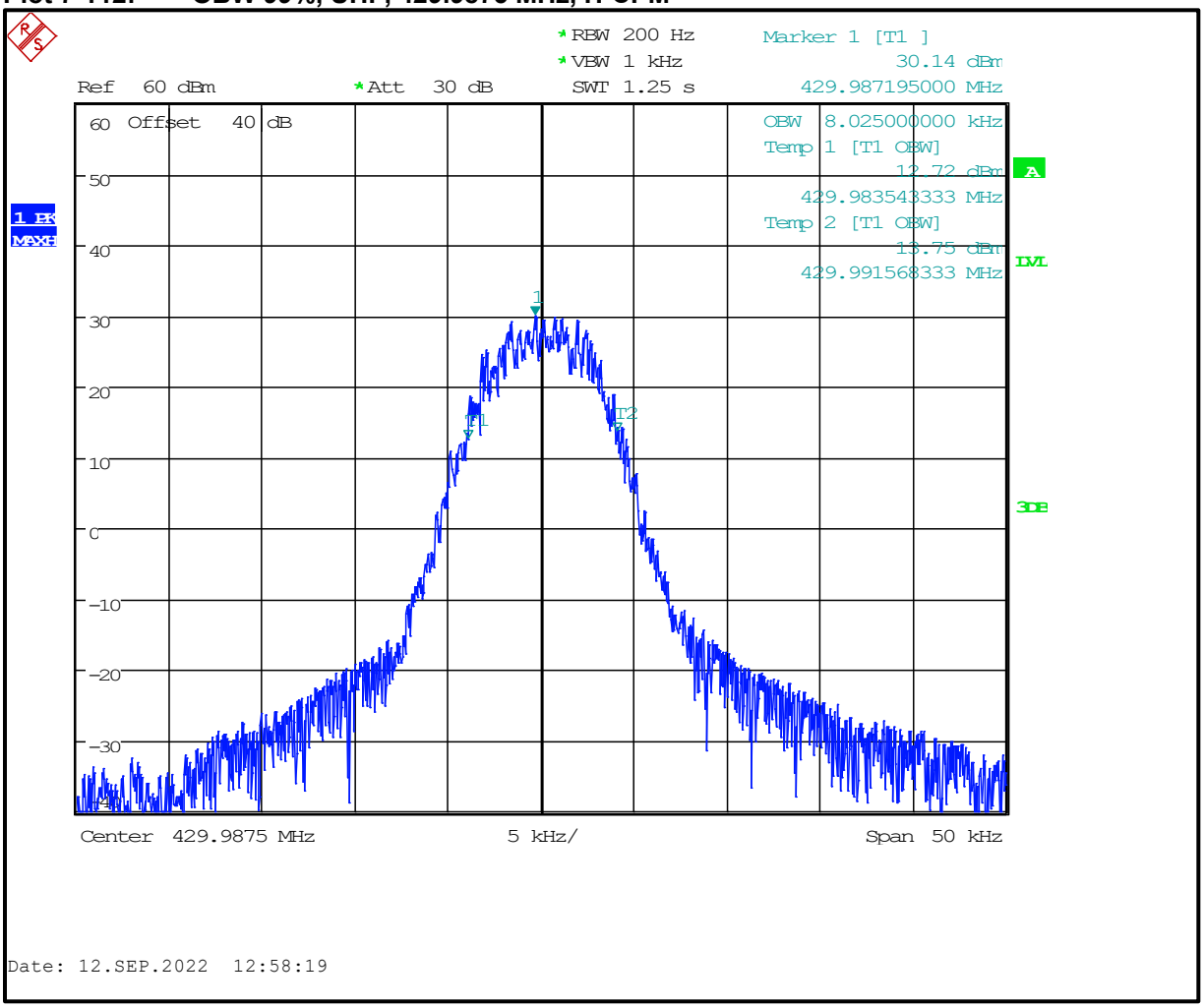
Plot 7-110: OBW 99%, UHF, 429.9875 MHz, NB 2 FSK



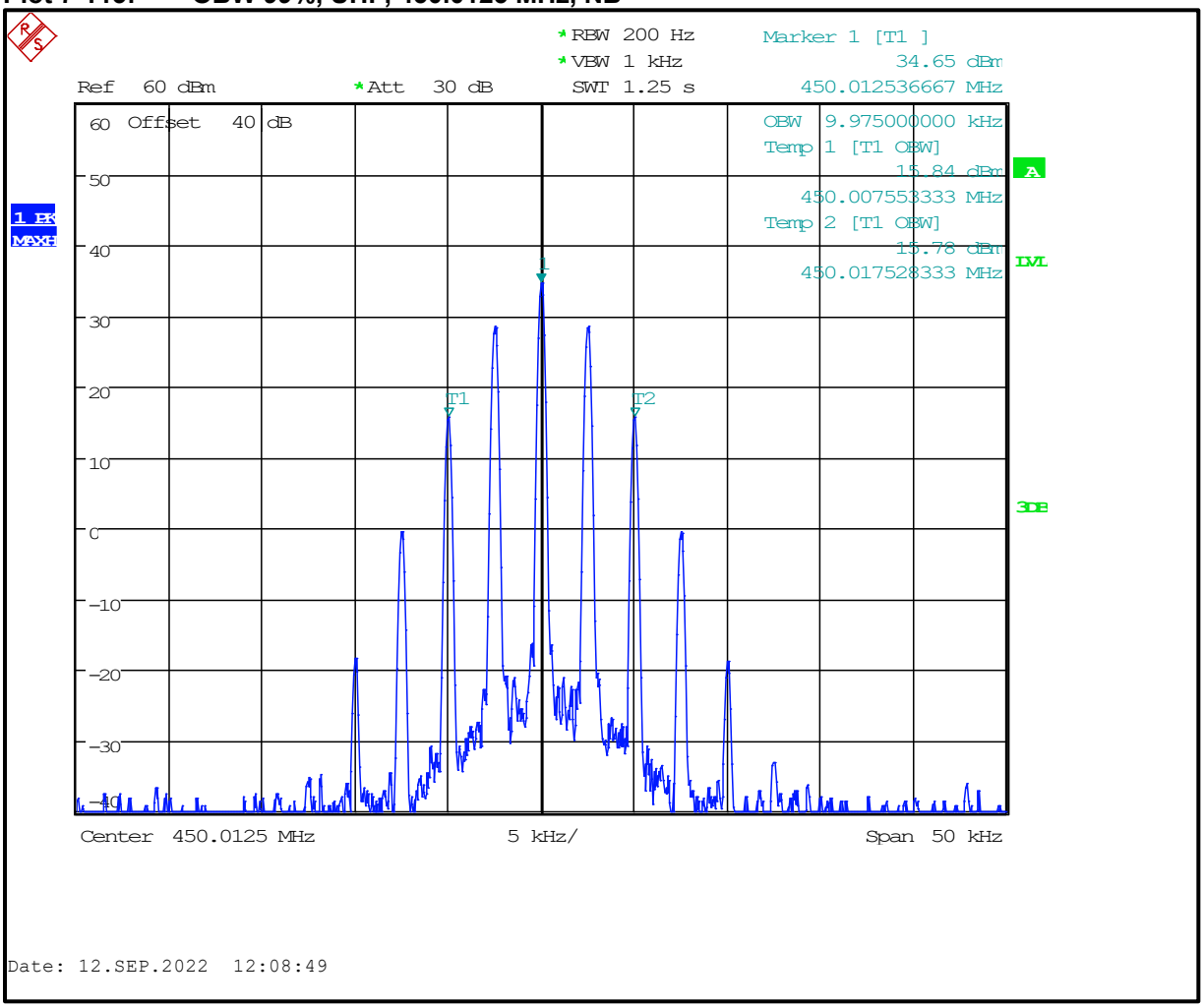
Plot 7-111: OBW 99%, UHF, 429.9875 MHz, C4FM



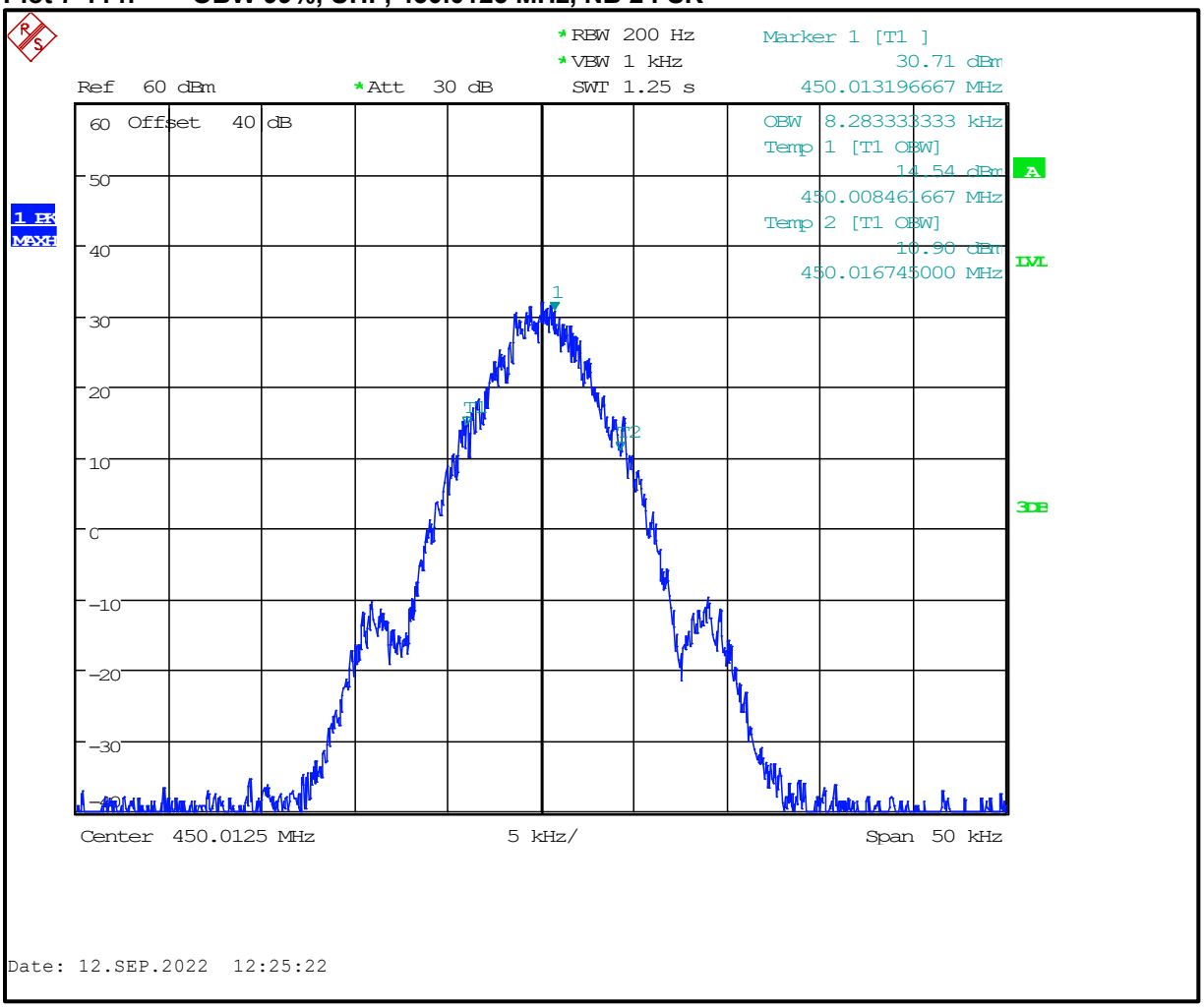
Plot 7-112: OBW 99%, UHF, 429.9875 MHz, H-CPM



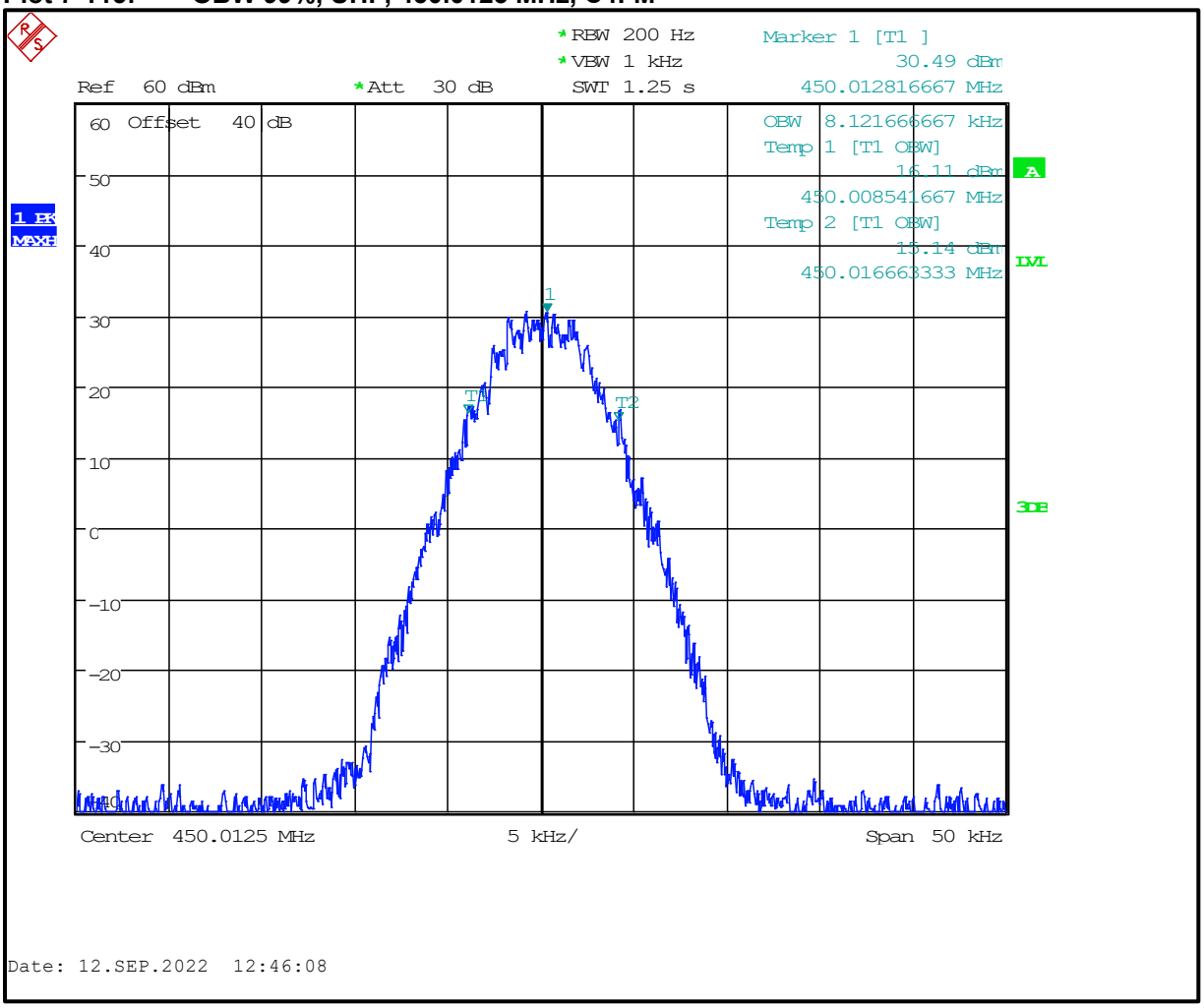
Plot 7-113: OBW 99%, UHF, 450.0125 MHz, NB



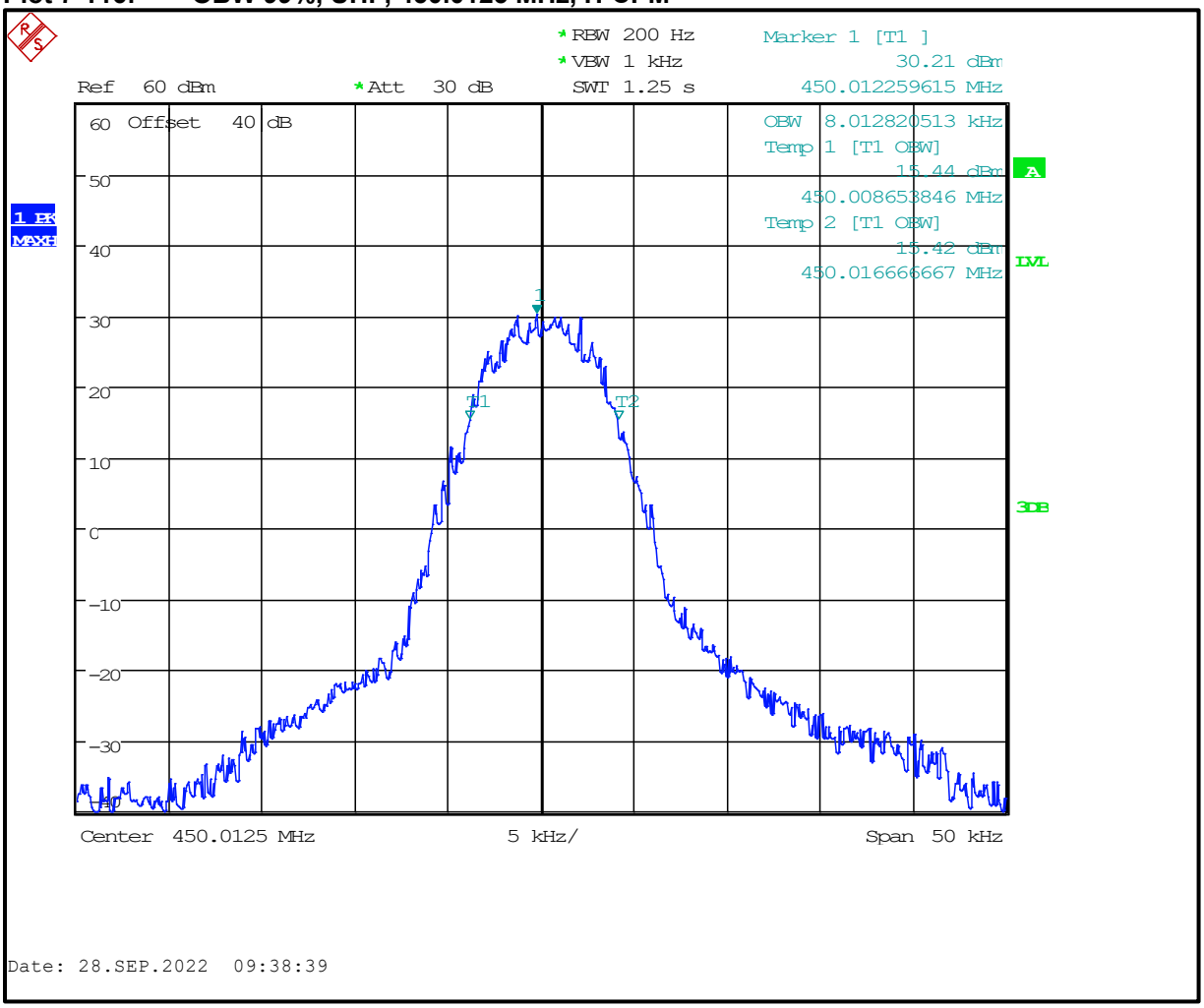
Plot 7-114: OBW 99%, UHF, 450.0125 MHz, NB 2 FSK



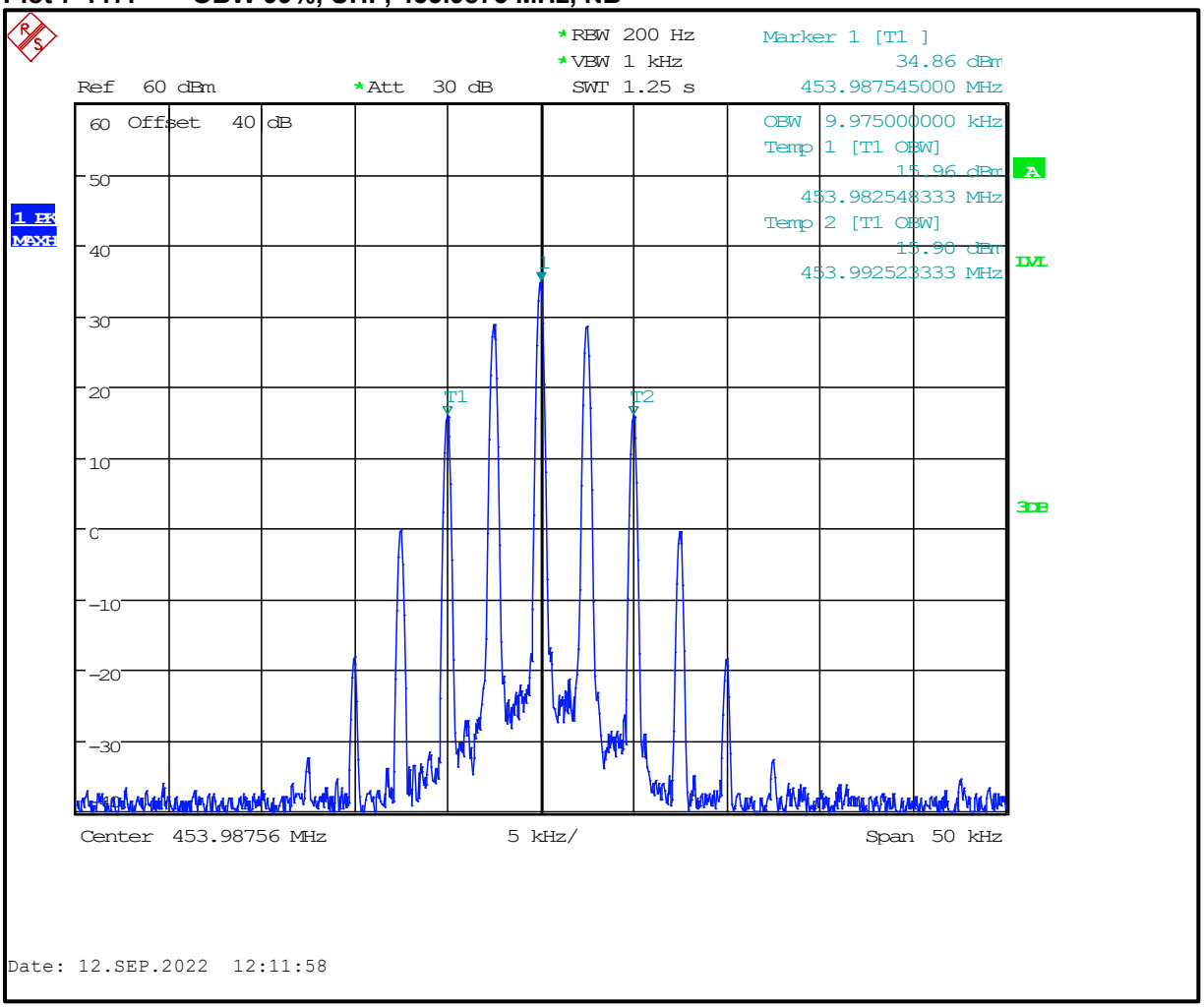
Plot 7-115: OBW 99%, UHF, 450.0125 MHz, C4FM



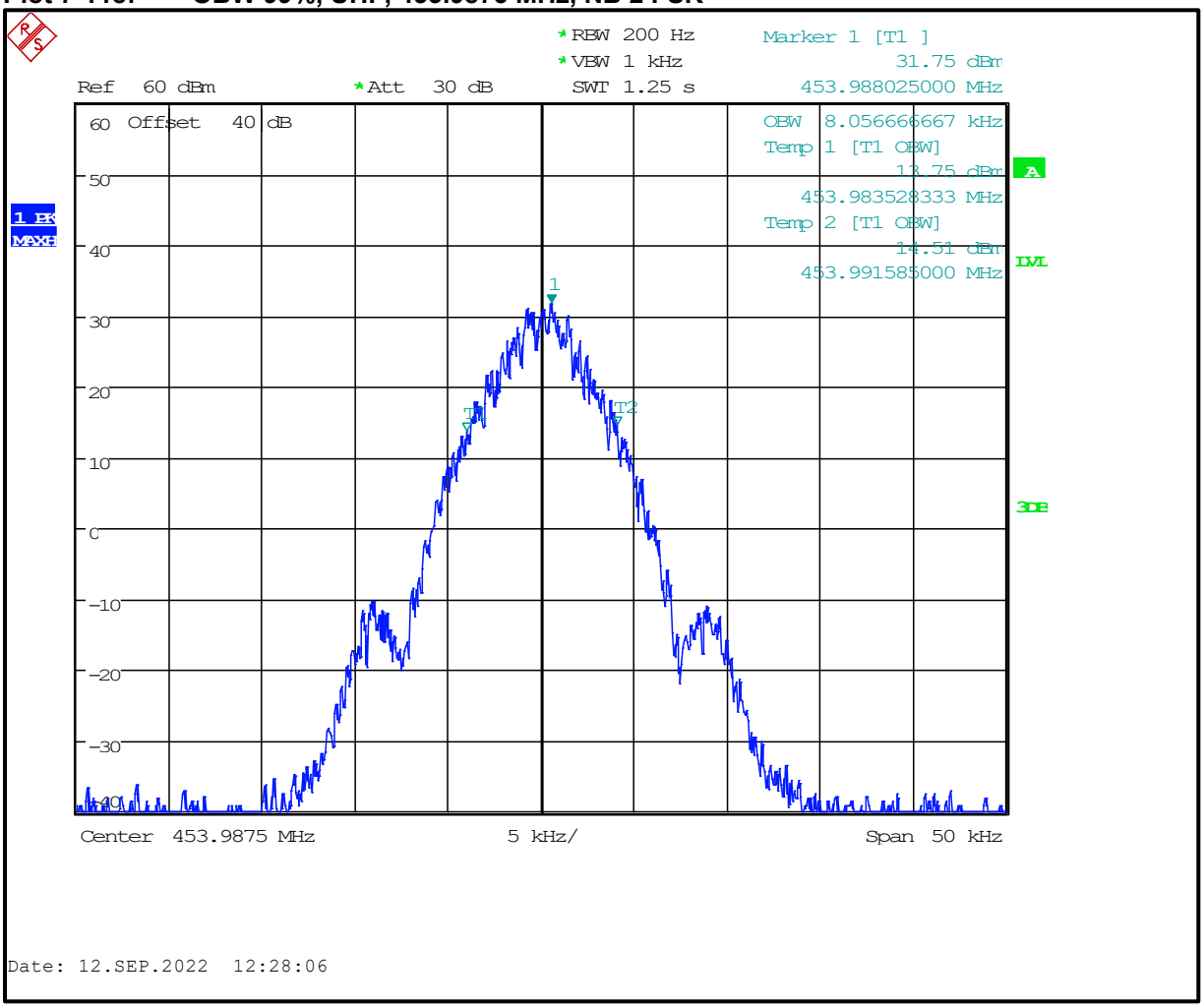
Plot 7-116: OBW 99%, UHF, 450.0125 MHz, H-CPM



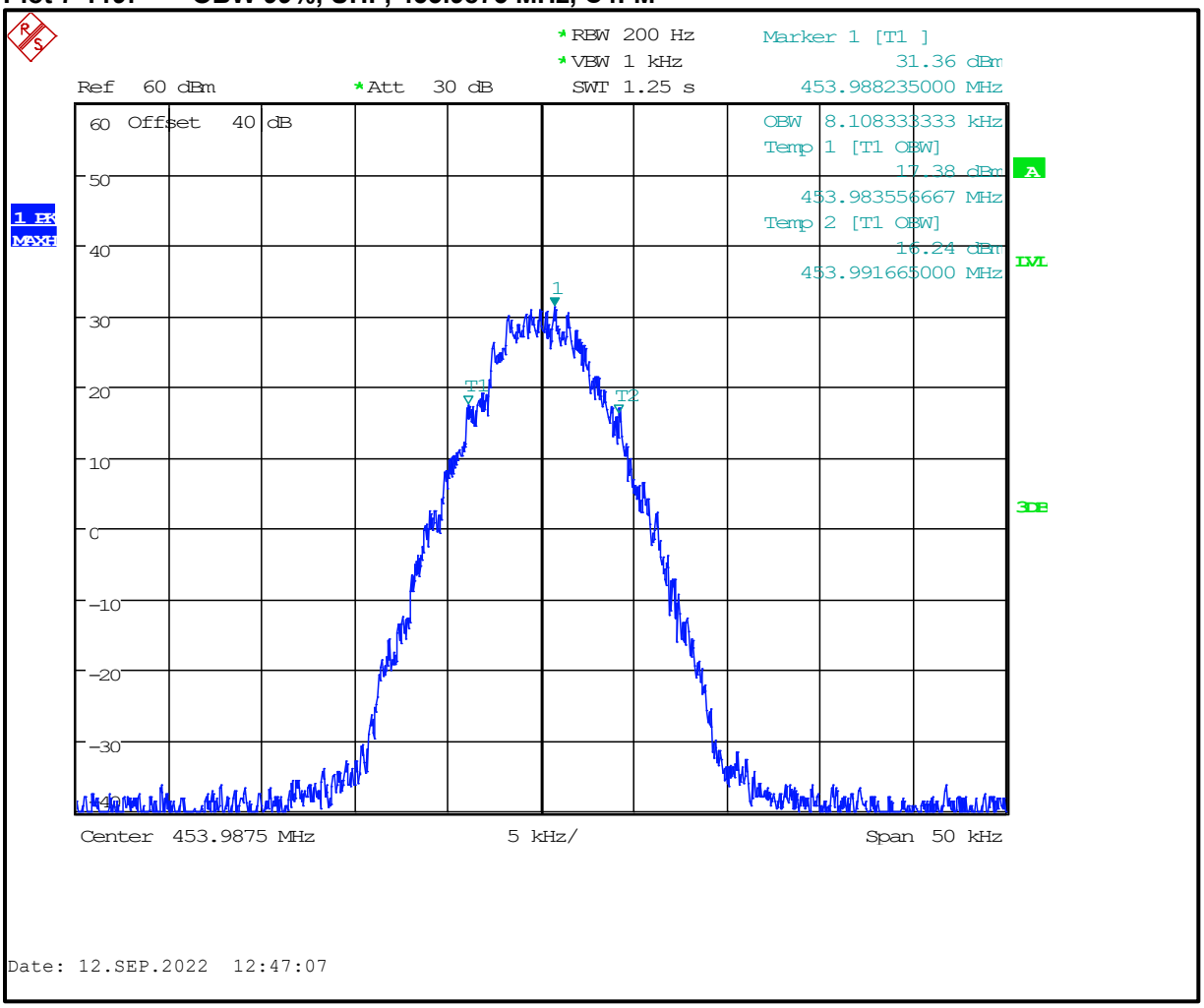
Plot 7-117: OBW 99%, UHF, 453.9875 MHz, NB



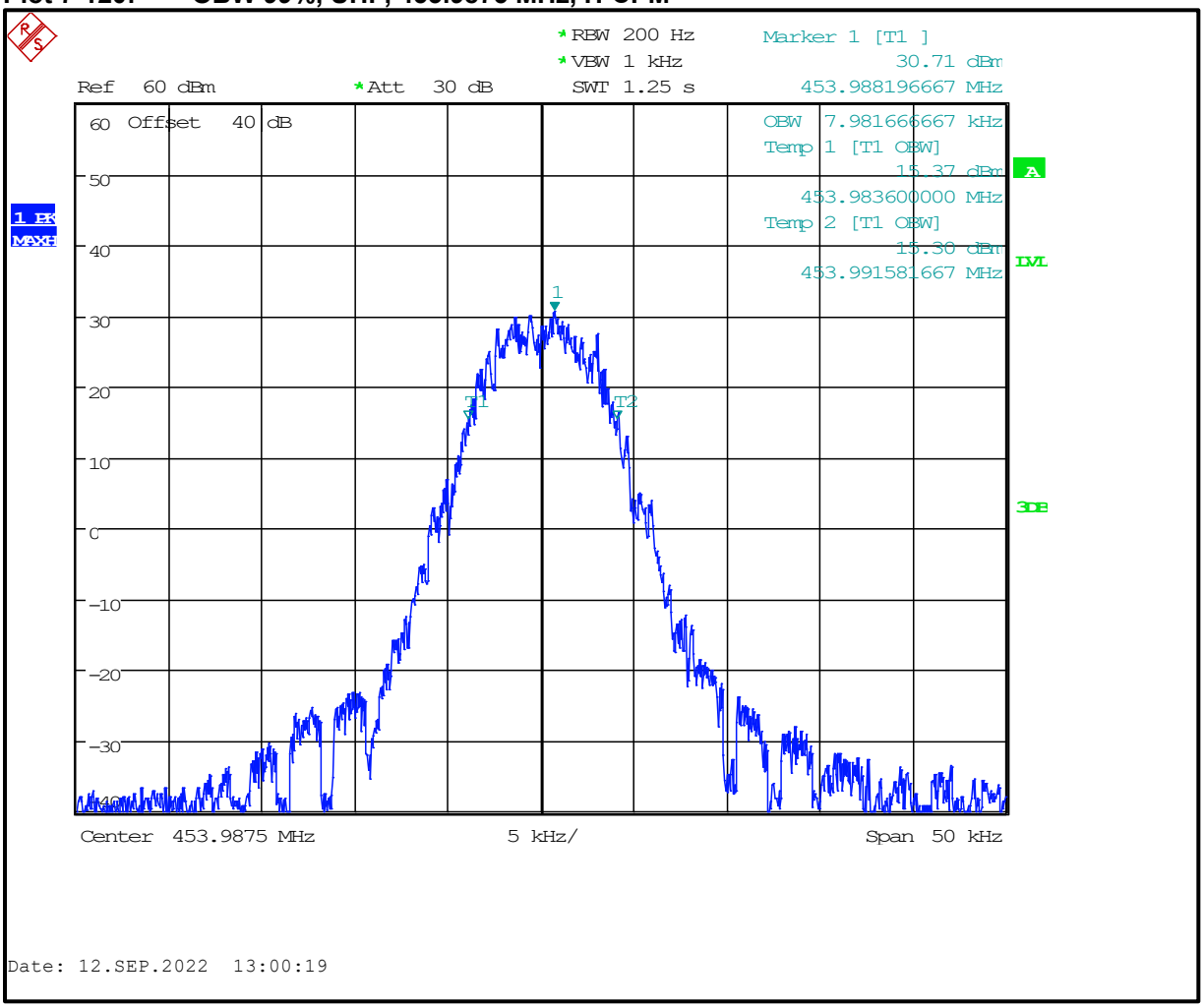
Plot 7-118: OBW 99%, UHF, 453.9875 MHz, NB 2 FSK



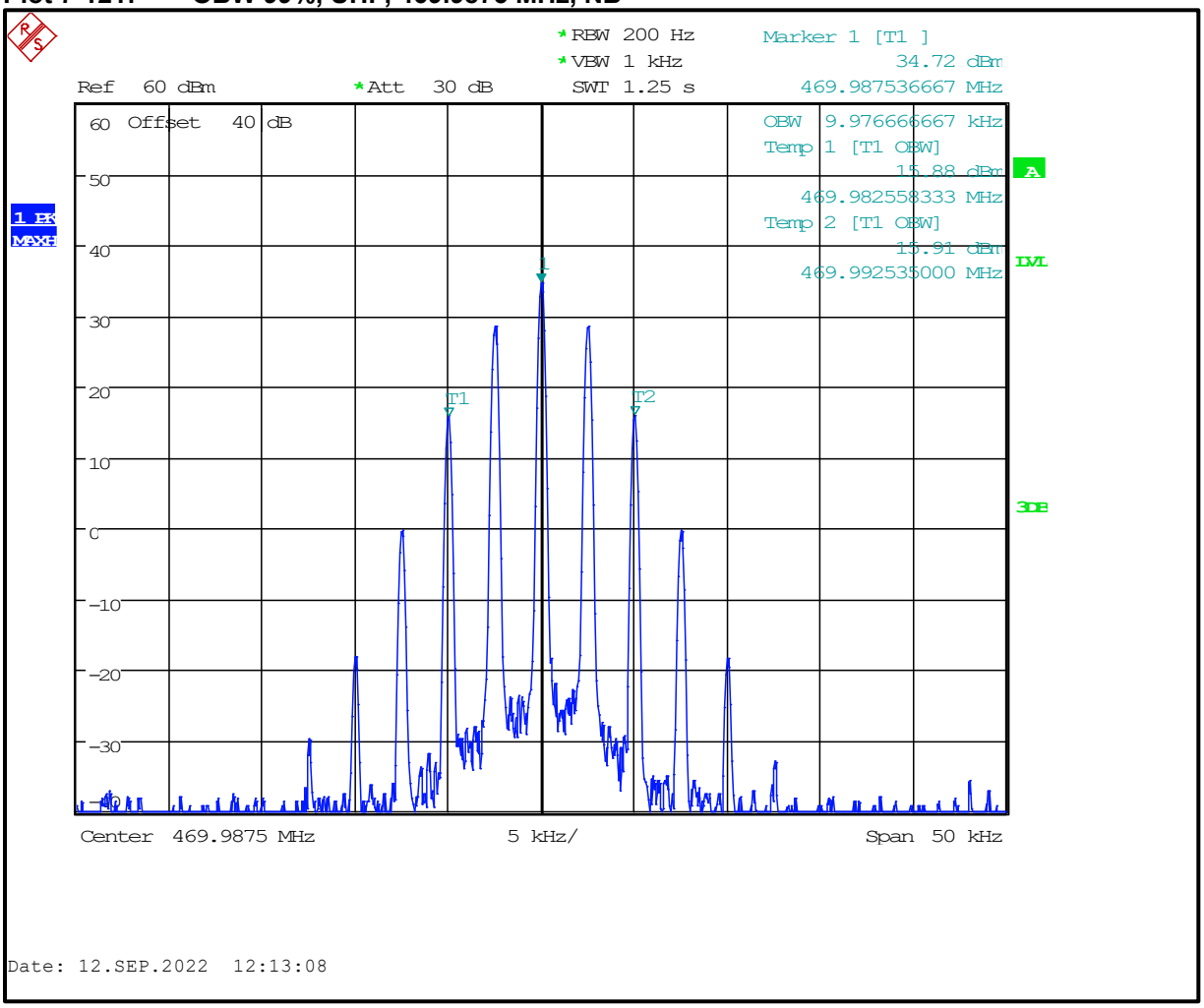
Plot 7-119: OBW 99%, UHF, 453.9875 MHz, C4FM



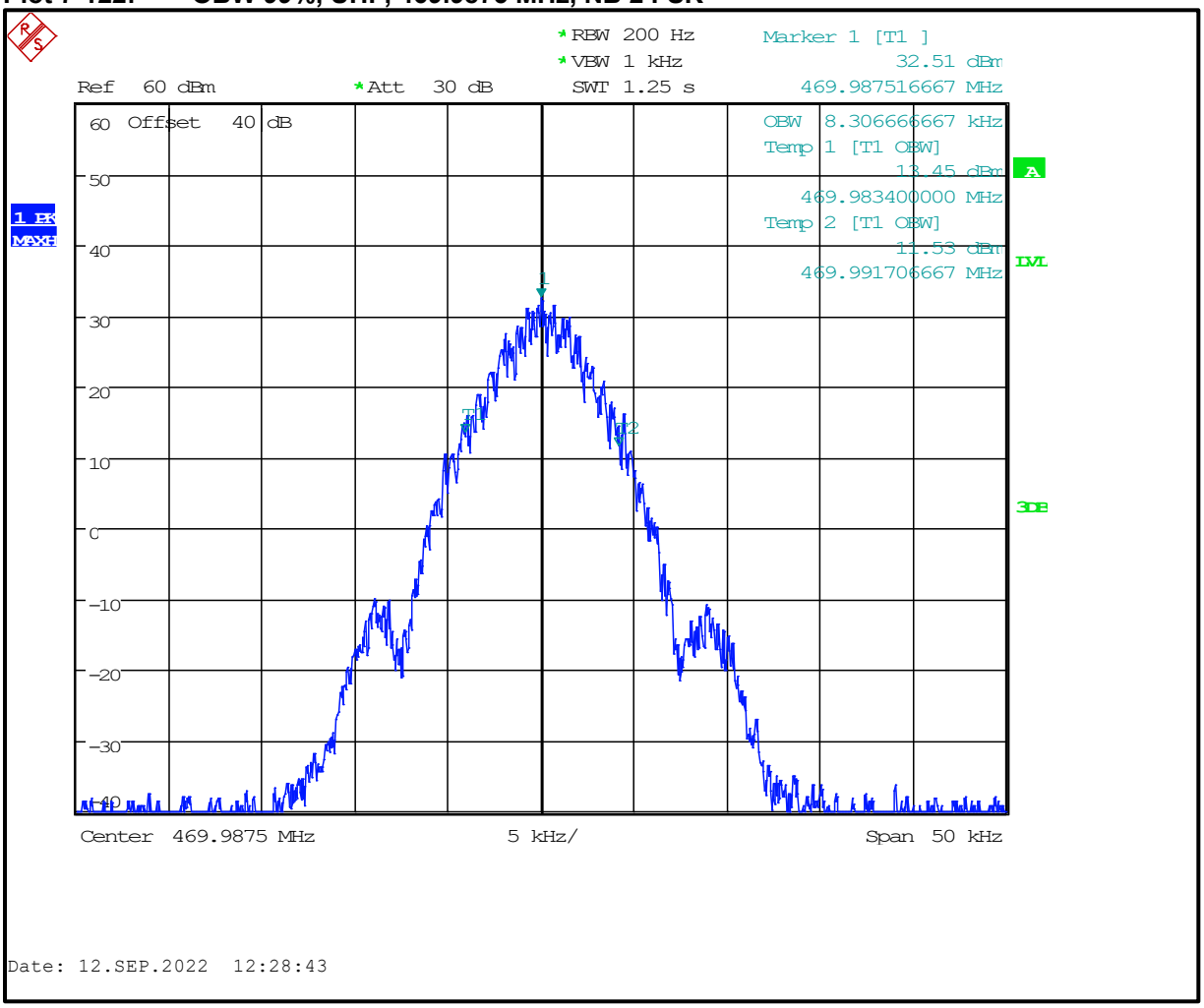
Plot 7-120: OBW 99%, UHF, 453.9875 MHz, H-CPM



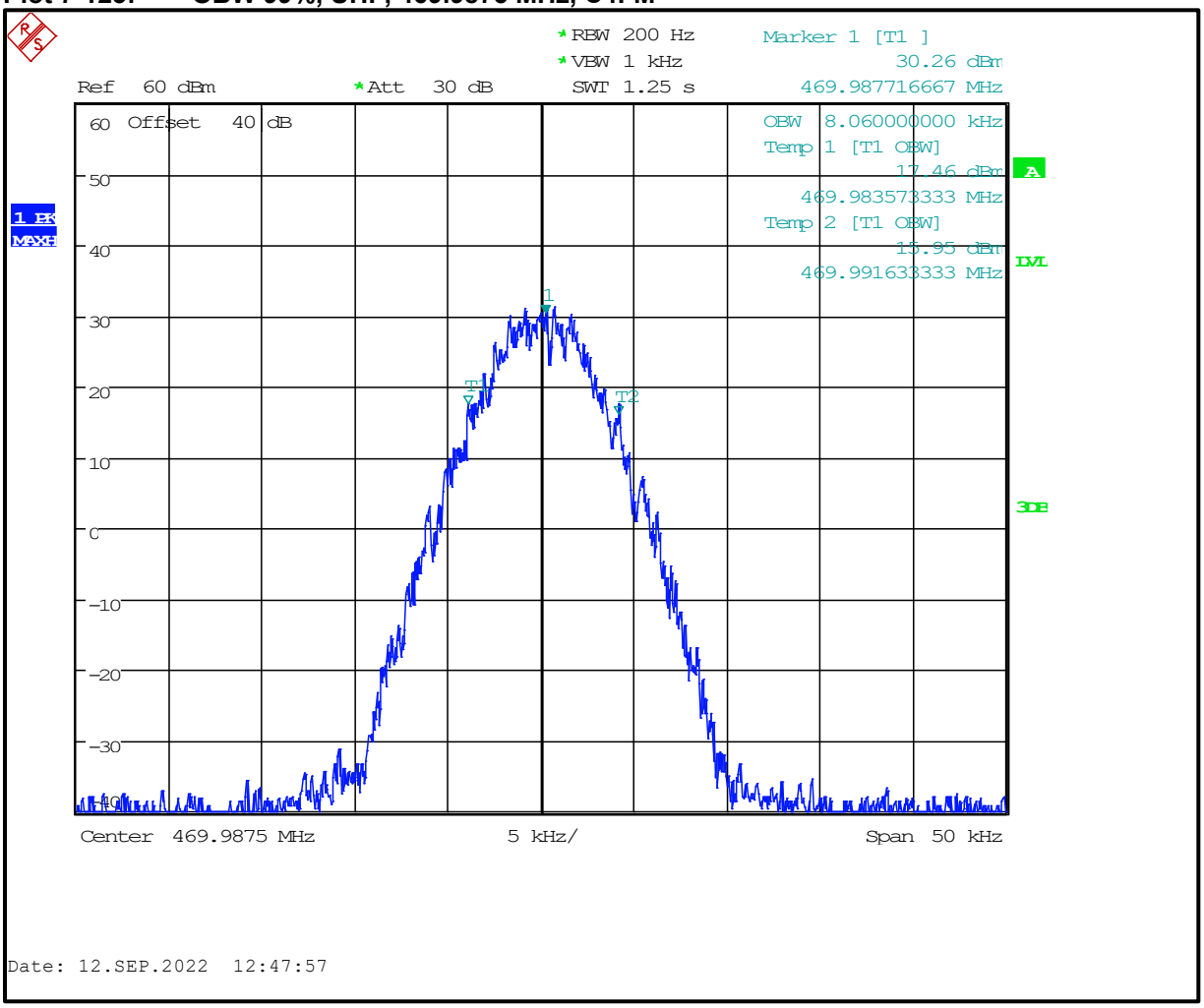
Plot 7-121: OBW 99%, UHF, 469.9875 MHz, NB



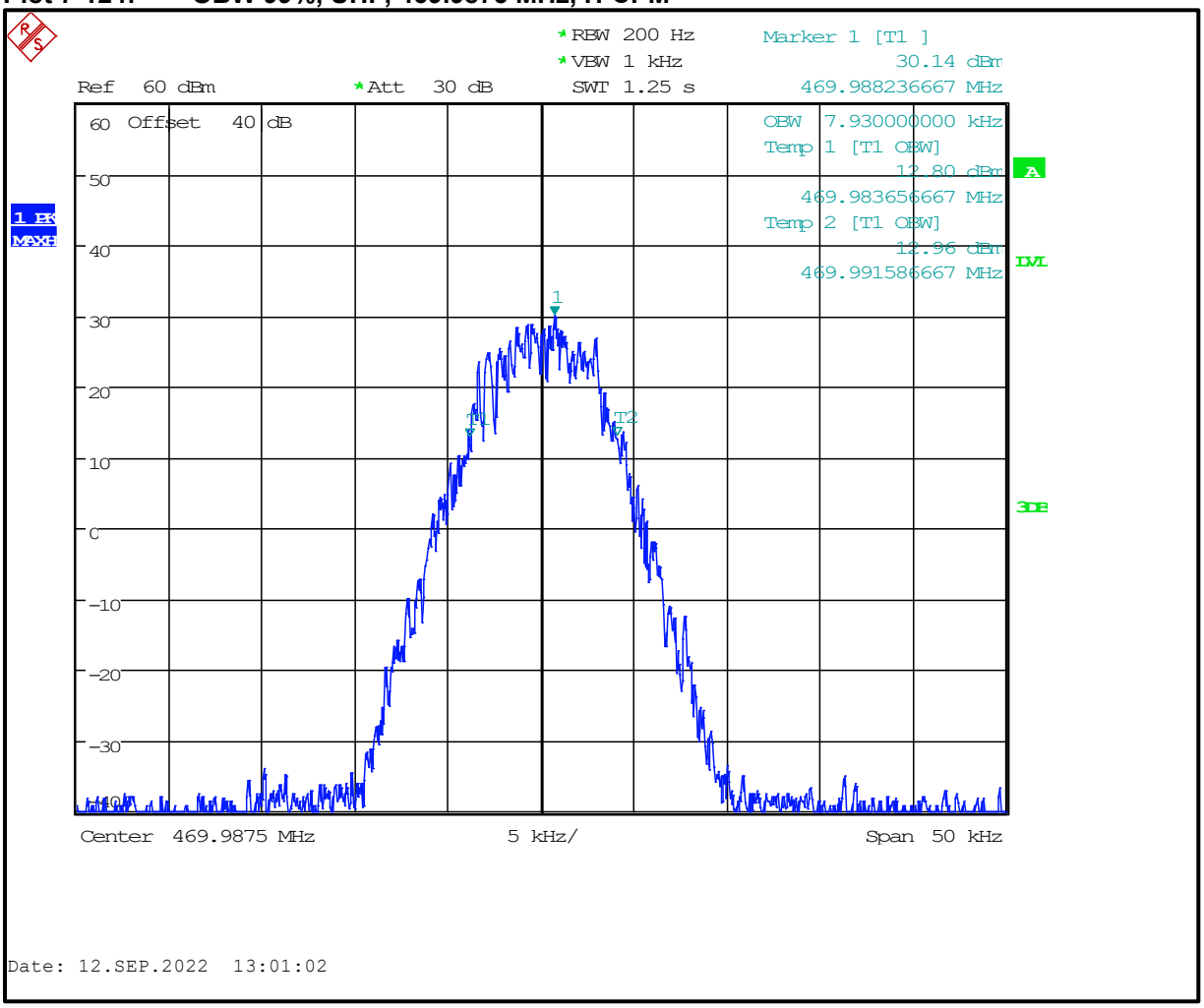
Plot 7-122: OBW 99%, UHF, 469.9875 MHz, NB 2 FSK



Plot 7-123: OBW 99%, UHF, 469.9875 MHz, C4FM



Plot 7-124: OBW 99%, UHF, 469.9875 MHz, H-CPM



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

Results: Pass

Table 7-1: Test Equipment 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
901338	Weinschel Corp.	46-40-34 DC-18GHz	Attenuator, 25W 40dB	BM0556	02/21/2023
901139	Weinschel Corp.	48-20-34 DC-18GHz	Attenuator, 100W 20dB	BK5859	09/21/2022
901760	Hewlett Packard	3336B	Syntheiszer/Level Generator	1931401314	03/28/2024

Test Personnel:

Daniel W. Baltzell		August 30 - September 28, 2022
EMC Test Engineer	Signature	Dates of Tests

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

8.1 Test Procedure

ANSI C63.26, section 5.6

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C. The AFC was not locked to the base station.

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

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

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Mobile <= 3 Watts (ppm)
50-450	50.0
450-512	5.0
821-896	2.5

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

Part 80.209: 156-162 MHz 10 ppm. 400-466 MHz 5 ppm

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]	.....	.....	.....

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

RSS-119 Limits:

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

8.2 Test Data

8.2.1 Temperature Frequency Stability

Table 8-1: Temperature Frequency Stability – 136.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	136.012530	0.22
-20	136.012531	0.23
-10	136.012516	0.12
0	136.012516	0.12
10	136.012516	0.12
20 (reference)	136.012500	0.00
30	136.012500	0.00
40	136.012508	0.06
50	136.012484	-0.12
60	136.012490	-0.07

Table 8-2: Temperature Frequency Stability – 156.8000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	156.800023	0.15
-20	156.800023	0.15
-10	156.800016	0.10
0	156.800016	0.10
10	156.800333	0.10
20 (reference)	156.800000	0.00
30	156.800000	0.00
40	156.800000	0.00
50	156.799992	-0.05
60	156.799984	-0.10

Table 8-3: Temperature Frequency Stability – 173.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	173.987523	0.13
-20	173.987523	0.13
-10	173.987523	0.13
0	173.987508	0.05
10	173.987508	0.05
20 (reference)	173.987500	0.00
30	173.987492	-0.05
40	173.987508	0.05
50	173.987484	-0.09
60	173.987484	-0.09

Table 8-4: Temperature Frequency Stability – 378.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	378.012563	0.17
-20	378.012555	0.14
-10	378.012555	0.14
0	378.012523	0.06
10	378.012516	0.04
20 (reference)	378.012500	0.00
30	378.012492	-0.02
40	378.012500	0.00
50	378.012461	-0.10
60	378.012478	-0.06

Table 8-5: Temperature Frequency Stability – 450.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	450.012594	0.21
-20	450.012586	0.19
-10	450.012578	0.17
0	450.012555	0.12
10	450.012539	0.09
20 (reference)	450.012500	0.00
30	450.012508	0.02
40	450.012523	0.05
50	450.012477	-0.05
60	450.012498	0.00

Table 8-6: Temperature Frequency Stability – 521.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	521.987602	0.19
-20	521.987610	0.21
-10	521.987586	0.16
0	521.987586	0.16
10	521.987539	0.07
20 (reference)	521.987500	0.00
30	521.987523	0.05
40	521.987531	0.06
50	521.987508	0.02
60	521.987482	-0.03

8.2.2 Frequency Stability/Voltage Variation

Table 8-7: Frequency Stability/Voltage Variation –136.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.33 (BEP)	136.012500	0.00
6.12	136.012500	0.00
7.2(reference)	136.012500	0.00
8.28	136.012500	0.00

Table 8-8: Frequency Stability/Voltage Variation – 156.8000 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.28 (BEP)	156.799992	-0.05
6.12	156.799992	-0.05
7.2(reference)	156.800000	0.00
8.28	156.799992	-0.05

Table 8-9: Frequency Stability/Voltage Variation – 173.9875 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.39 (BEP)	173.987477	-0.13
6.12	173.987484	-0.09
7.2(reference)	173.987500	0.00
8.28	173.987492	-0.05

Table 8-10: Frequency Stability/Voltage Variation – 378.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.37 (BEP)	378.012477	-0.06
6.12	378.012477	-0.06
7.2(reference)	378.012500	0.00
8.28	378.012484	-0.04

Table 8-11: Frequency Stability/Voltage Variation – 450.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.43 (BEP)	450.012500	0.00
6.12	450.012500	0.00
7.2(reference)	450.012500	0.00
8.28	450.012500	0.00

Table 8-12: Frequency Stability/Voltage Variation – 521.9875 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
5.53 (BEP)	521.987547	0.09
6.12	521.987539	0.07
7.2(reference)	521.987500	0.00
8.28	521.987508	0.02

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

Results: Pass

Table 8-13: Test Equipment Used For Testing Temperature Frequency Stability & Frequency Stability/Voltage Variation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	10/18/23
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	04/25/23
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/20/22
N/A	GW Instek	PSS-3203	Power Supply	2679	Not Required
6/23/	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	6/23/25

Test Personnel:

Daniel W. Baltzell		August 26, 2022
EMC Test Engineer	Signature	Date of Test

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

9.1 Test Procedures

9.1.1 Audio Frequency Response

ANSI C63.26-2015, section 5.3.3

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

9.1.2 Audio Low Pass Filter Response

ANSI C63.26-2015, section 5.3

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

9.1.3 Modulation Limiting

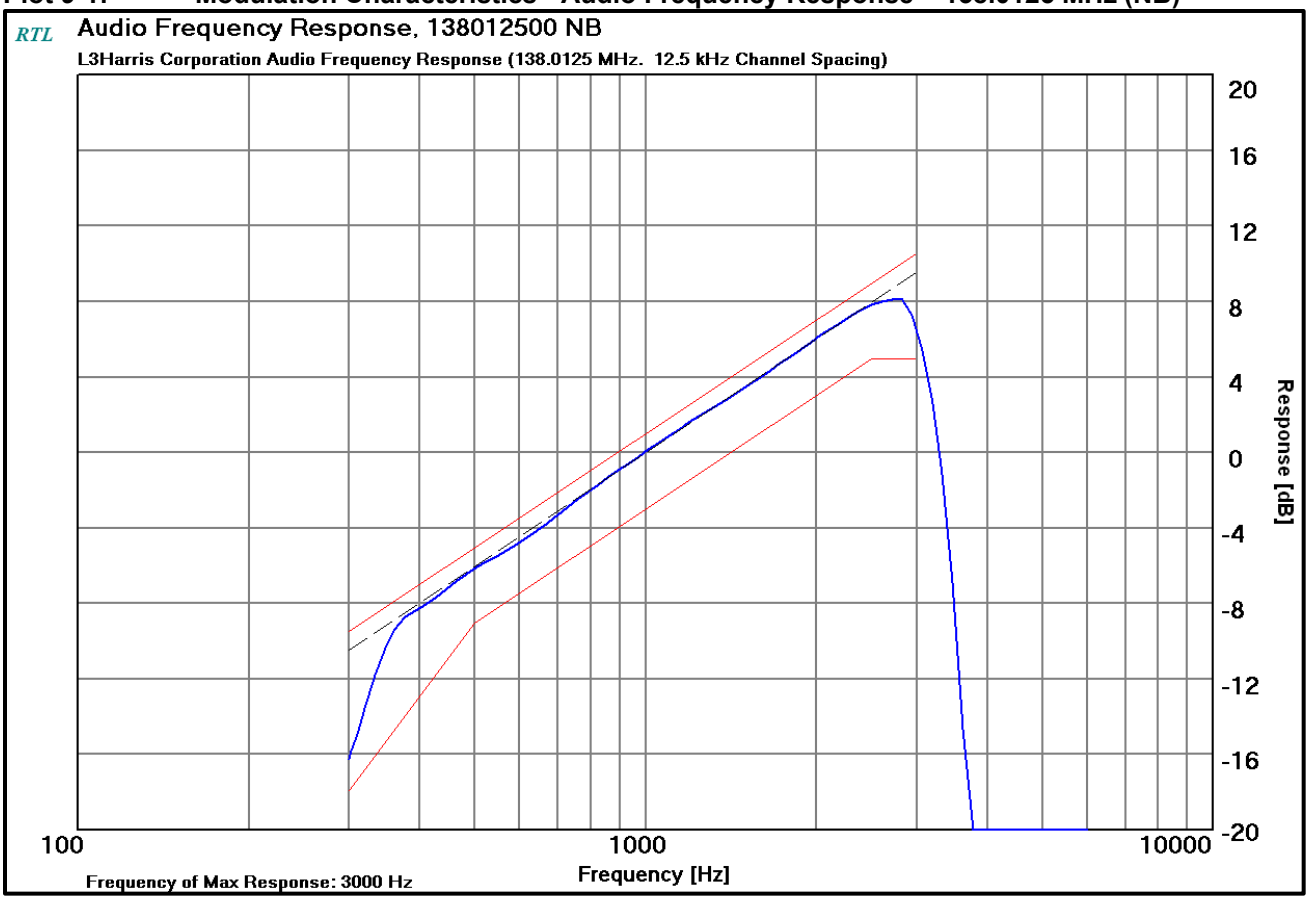
ANSI C63.26-2015, section 5.3.2

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

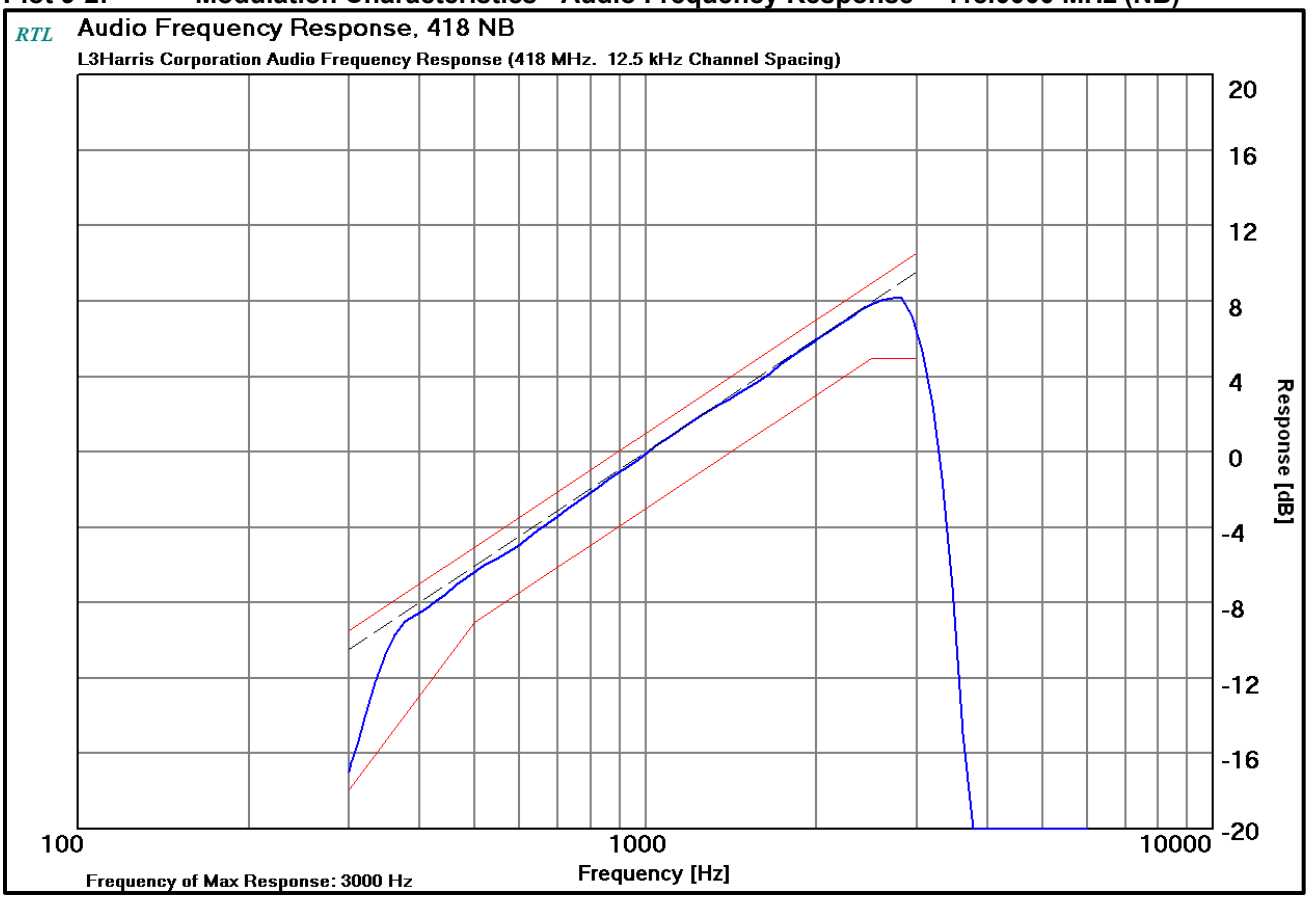
9.2 Test Data

9.2.1 Audio Frequency Response

Plot 9-1: Modulation Characteristics - Audio Frequency Response – 138.0125 MHz (NB)

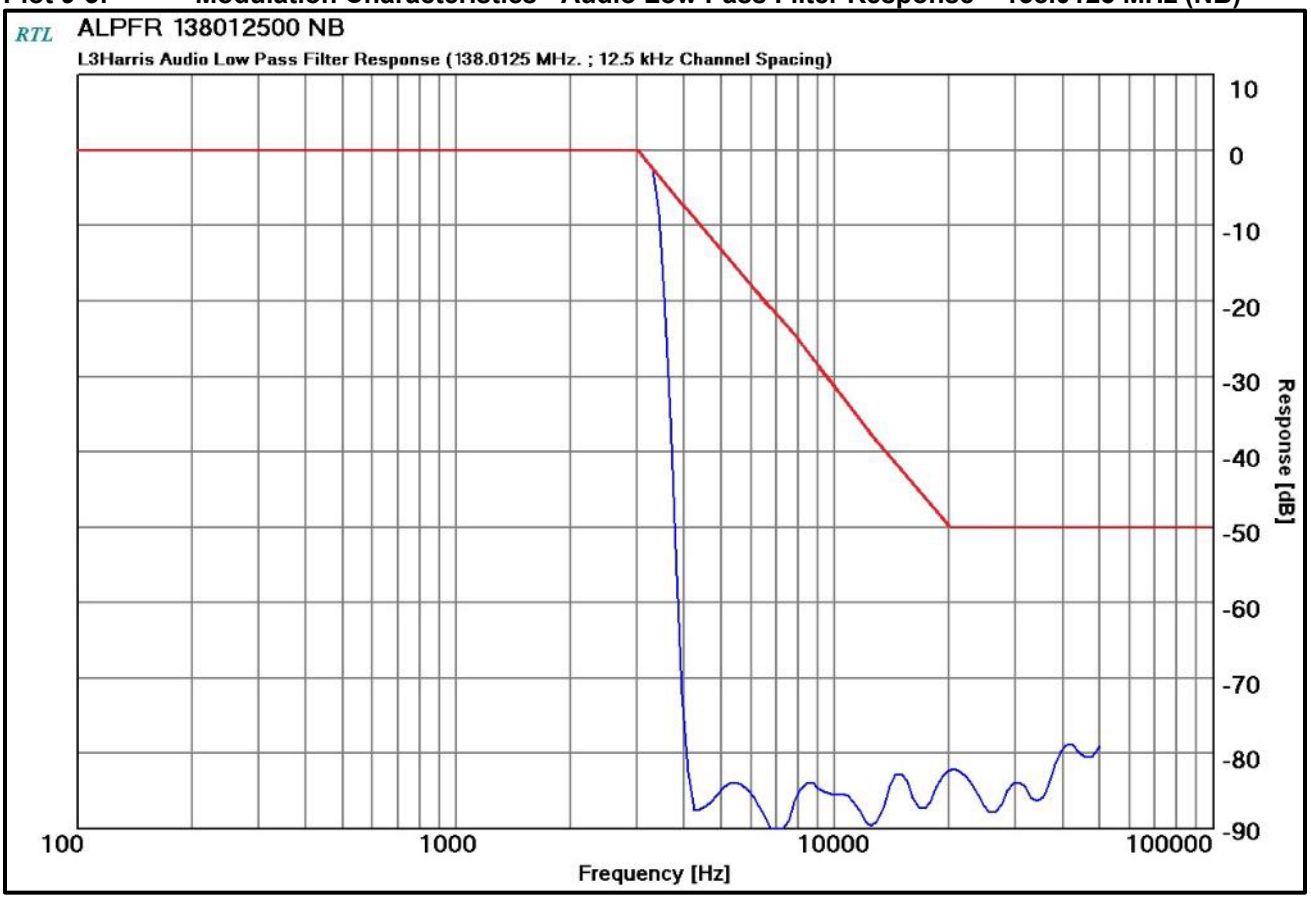


Plot 9-2: Modulation Characteristics - Audio Frequency Response – 418.0000 MHz (NB)

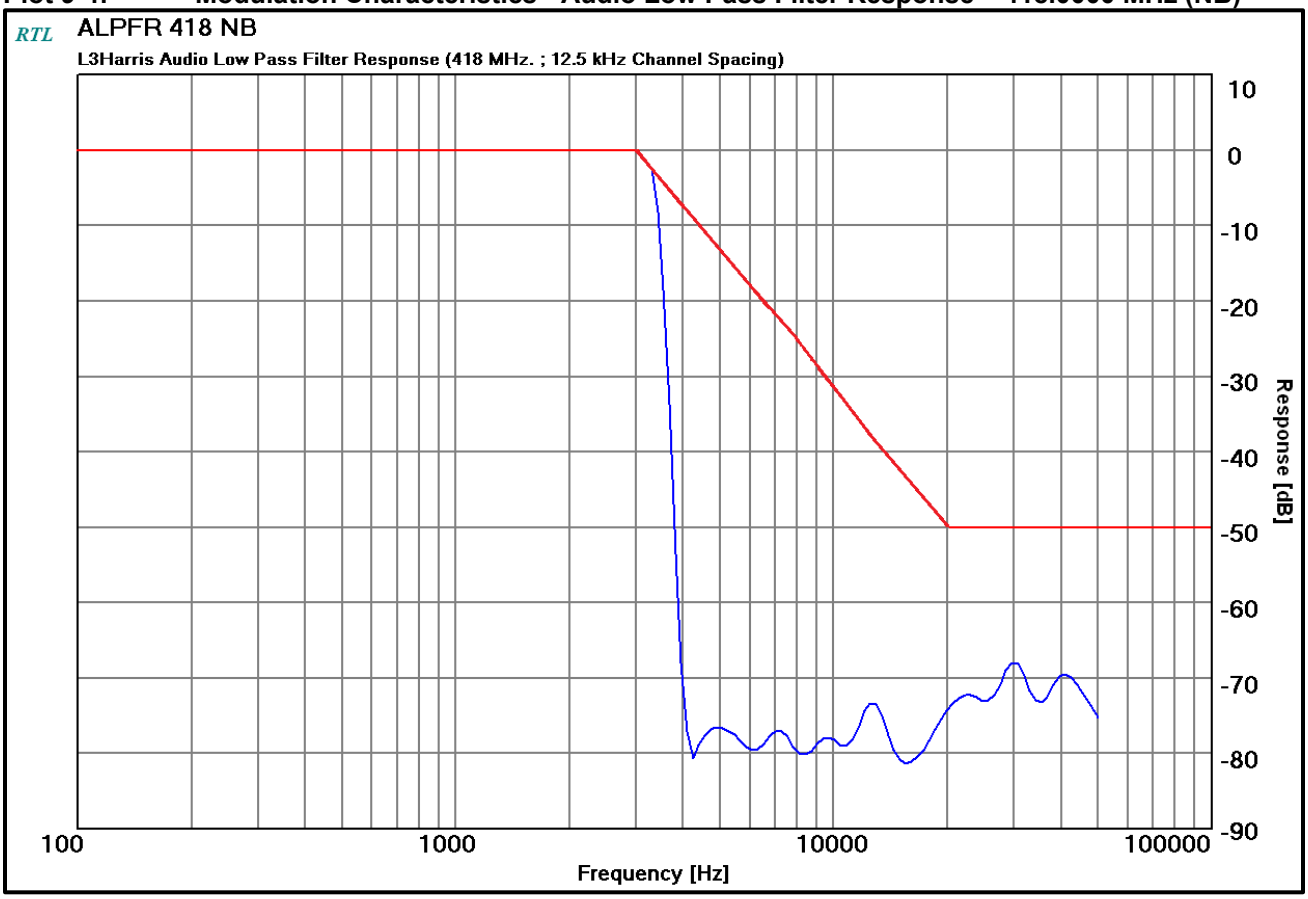


9.2.2 Audio Low Pass Filter Response

Plot 9-3: Modulation Characteristics - Audio Low Pass Filter Response – 138.0125 MHz (NB)

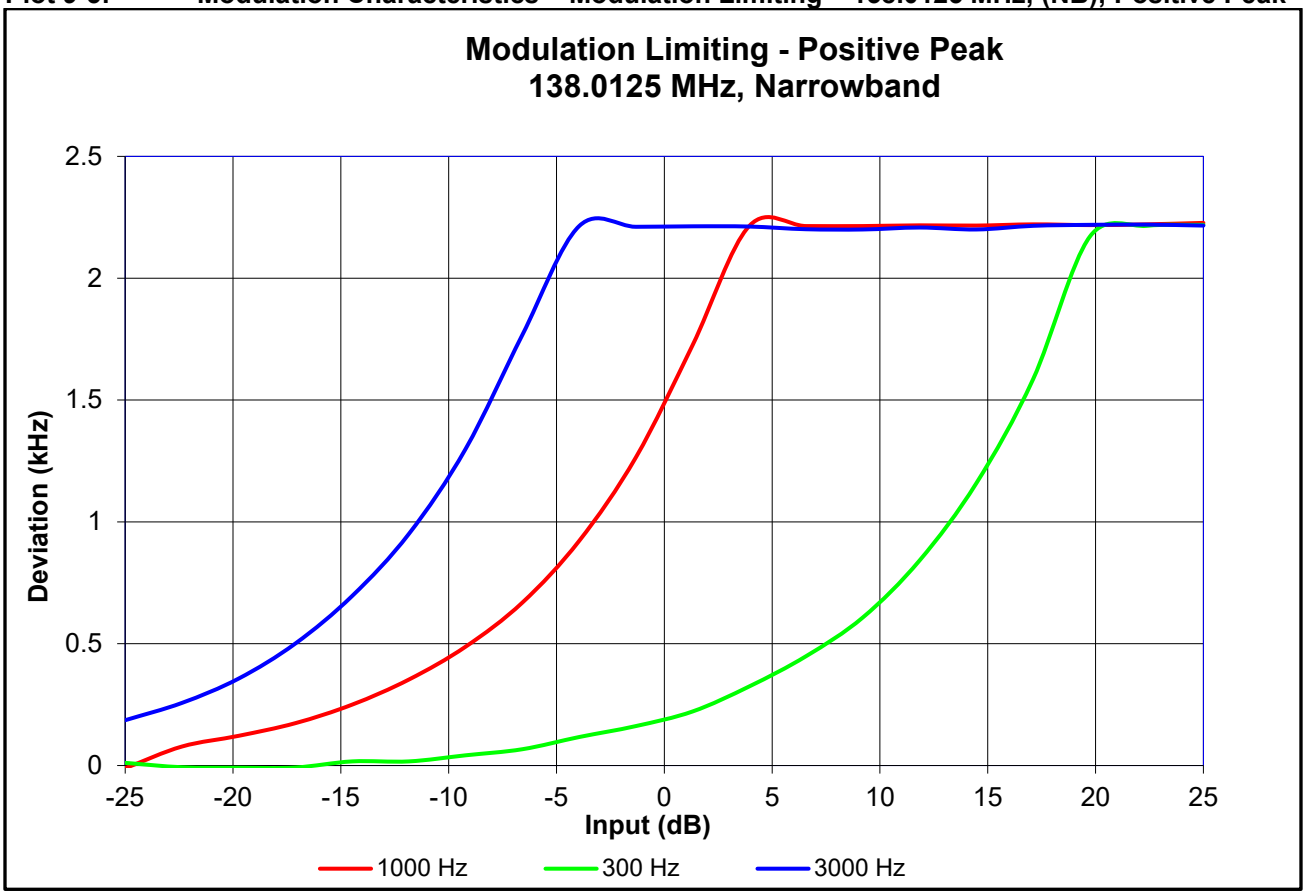


Plot 9-4: Modulation Characteristics - Audio Low Pass Filter Response – 418.0000 MHz (NB)

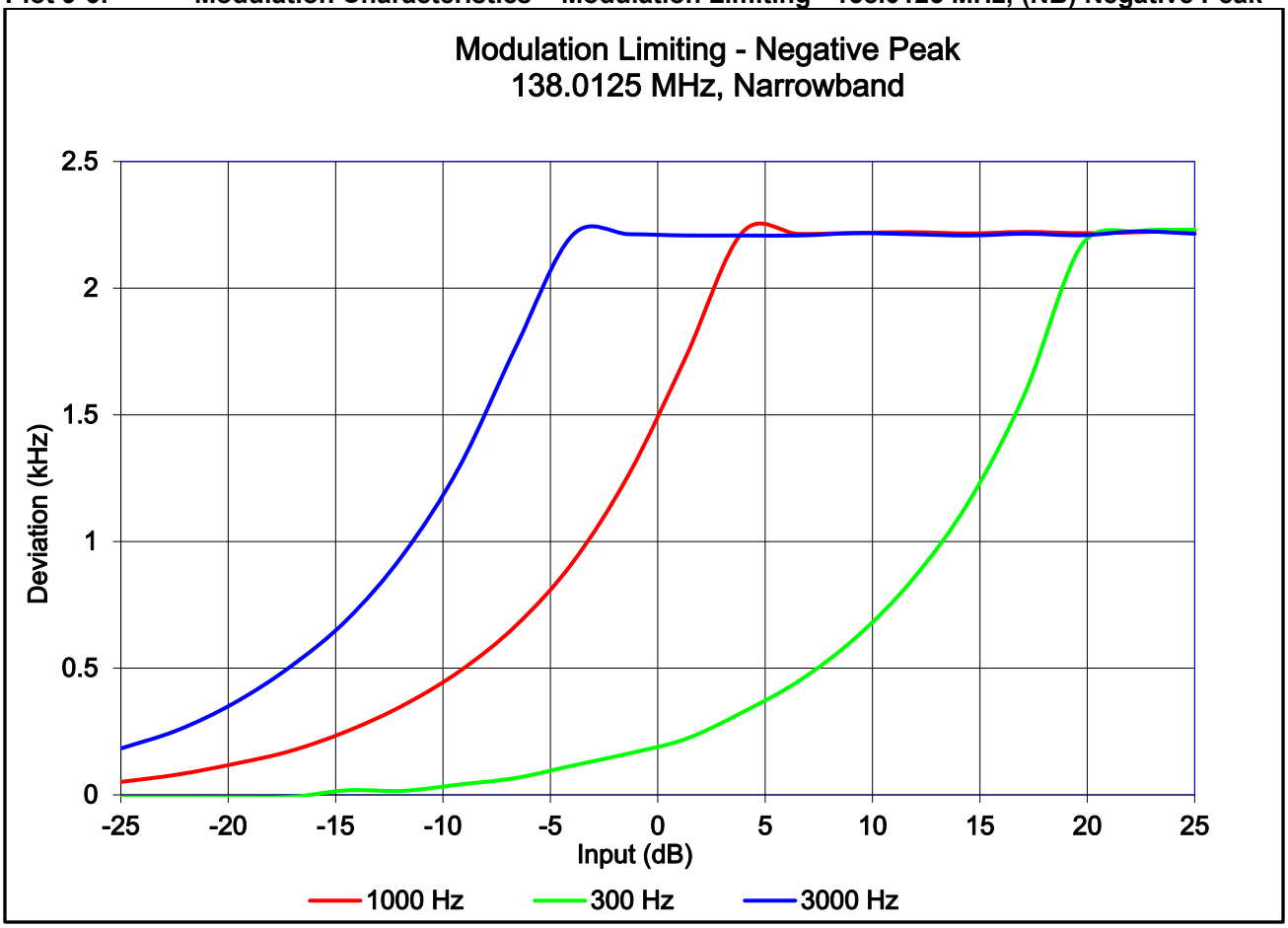


9.2.3 Modulation Limiting

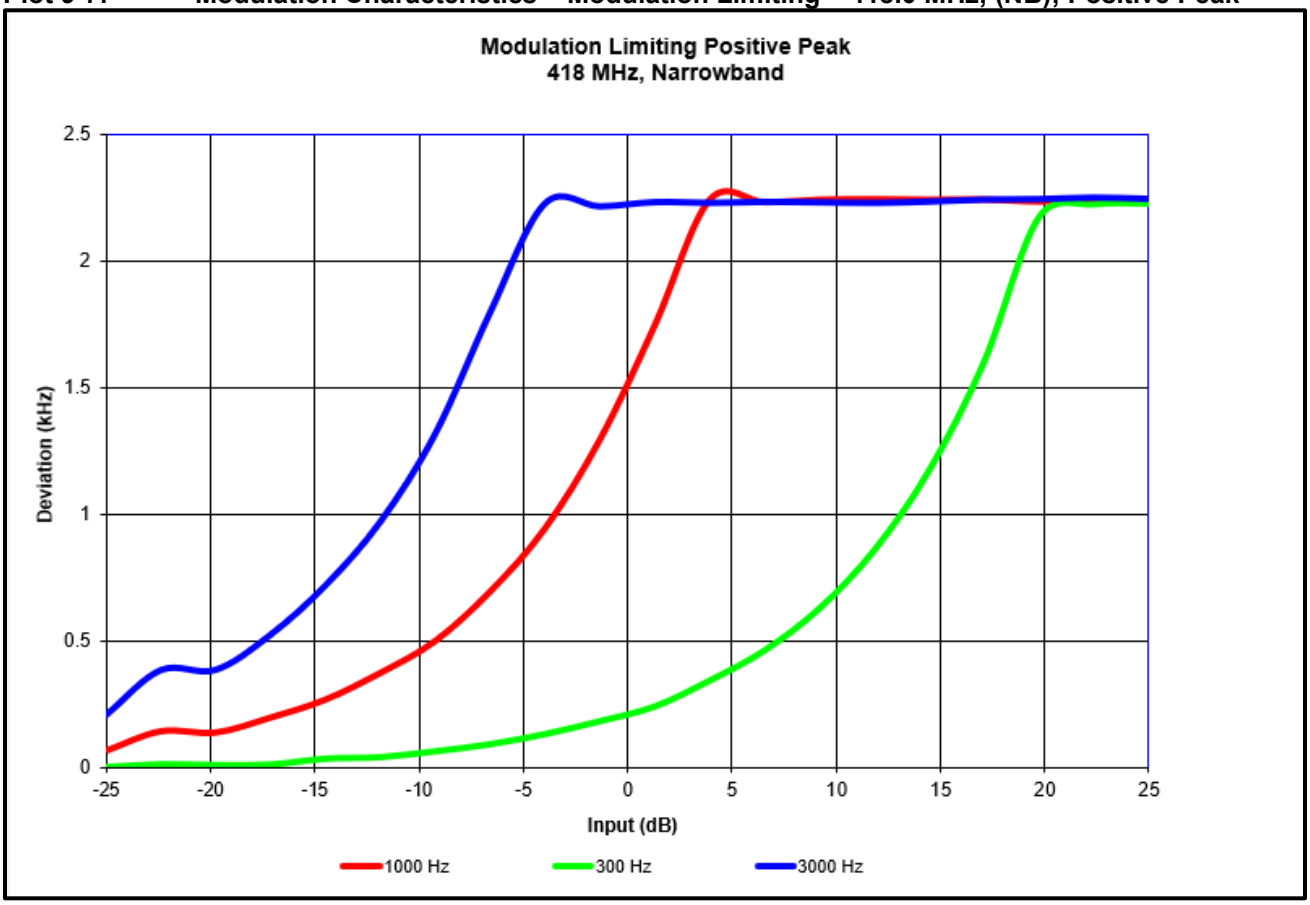
Plot 9-5: Modulation Characteristics – Modulation Limiting – 138.0125 MHz; (NB); Positive Peak



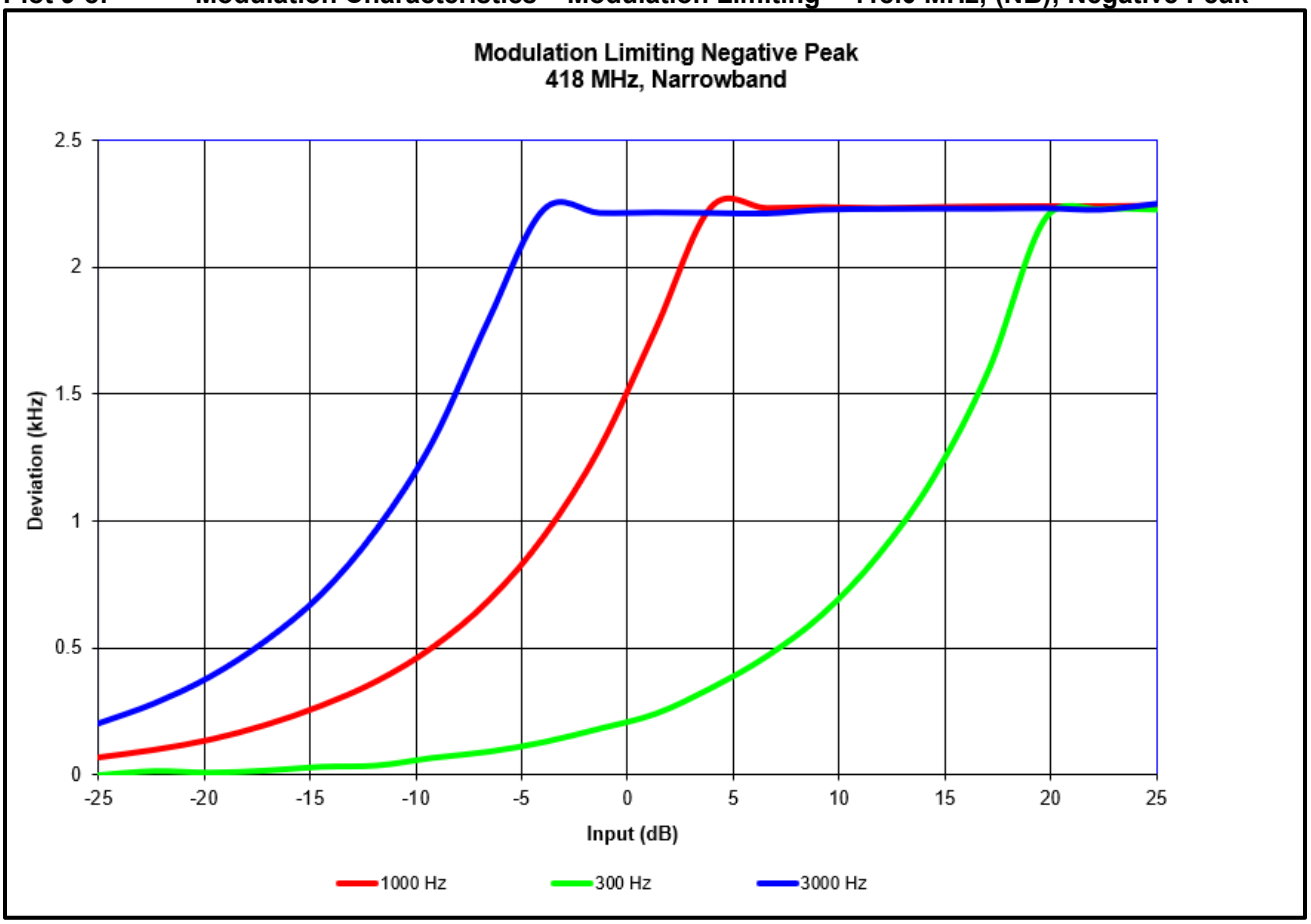
Plot 9-6: Modulation Characteristics – Modulation Limiting - 138.0125 MHz; (NB) Negative Peak



Plot 9-7: Modulation Characteristics – Modulation Limiting – 418.0 MHz; (NB); Positive Peak



Plot 9-8: Modulation Characteristics – Modulation Limiting – 418.0 MHz; (NB); Negative Peak



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

Results: Pass

Table 9-1: Test Equipment 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
901759	Hewlett Packard	HP 3586B	Selective Level Meter	2510A03886	04/04/2024
901338	Weinschel Corp.	46-40-34 DC-18GHz	Attenuator, 25W 40dB	BM0556	02/21/2023

Test Personnel:

Daniel W. Baltzell		September 12, 2022
EMC Test Engineer	Signature	Date of Test

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

10.1 Test Procedure

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

§90.214 Transient Frequency Behavior

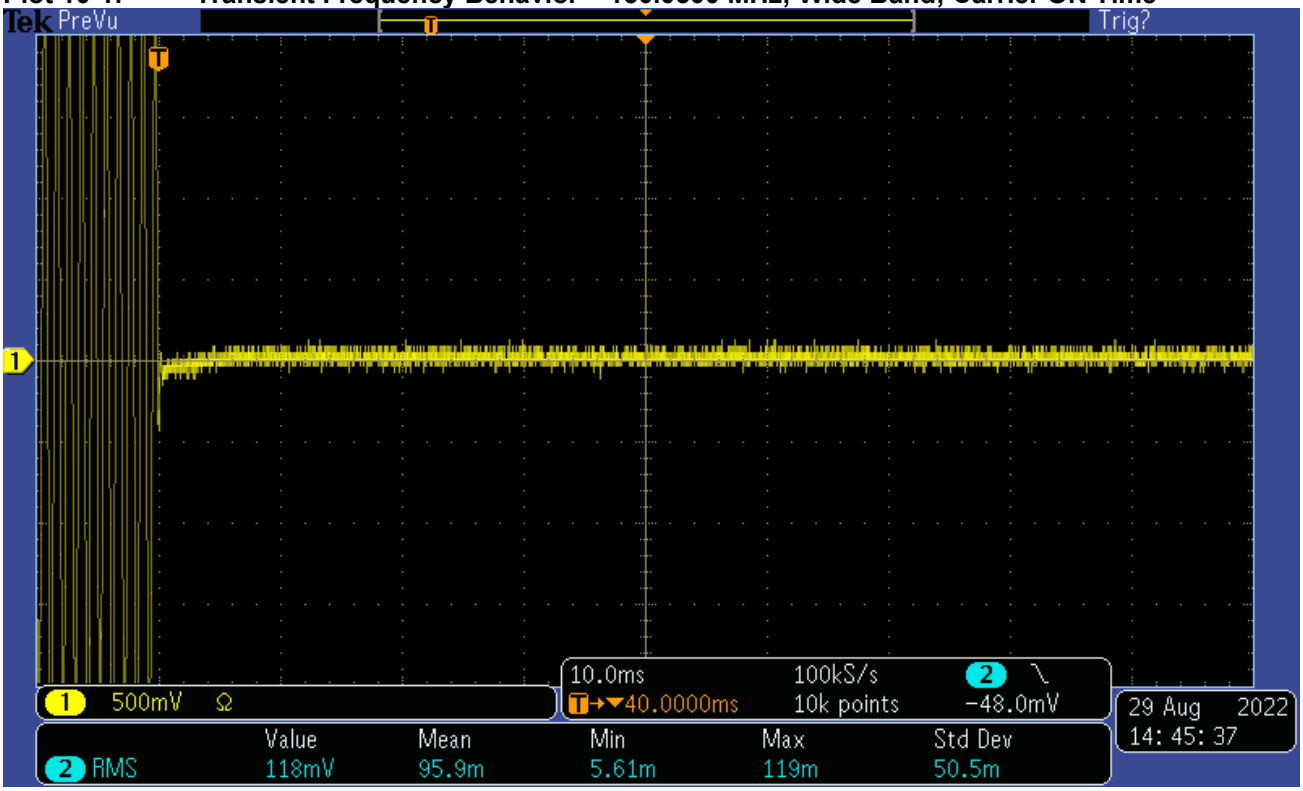
Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1,2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1 [4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3 [4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1 [4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 kHz	5.0 ms	10.0 ms

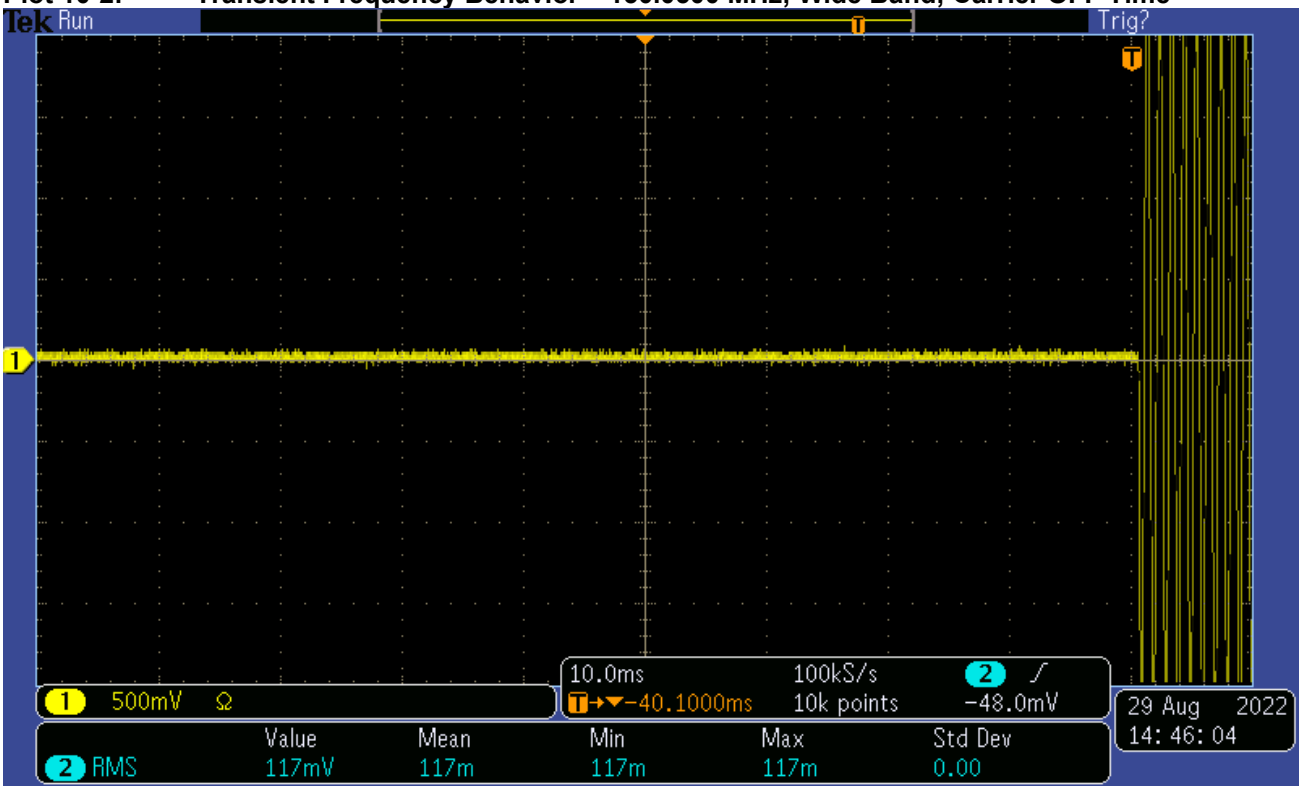
[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
t_{off} is the instant when the 1 kHz test signal starts to rise.
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

10.2 Test Data

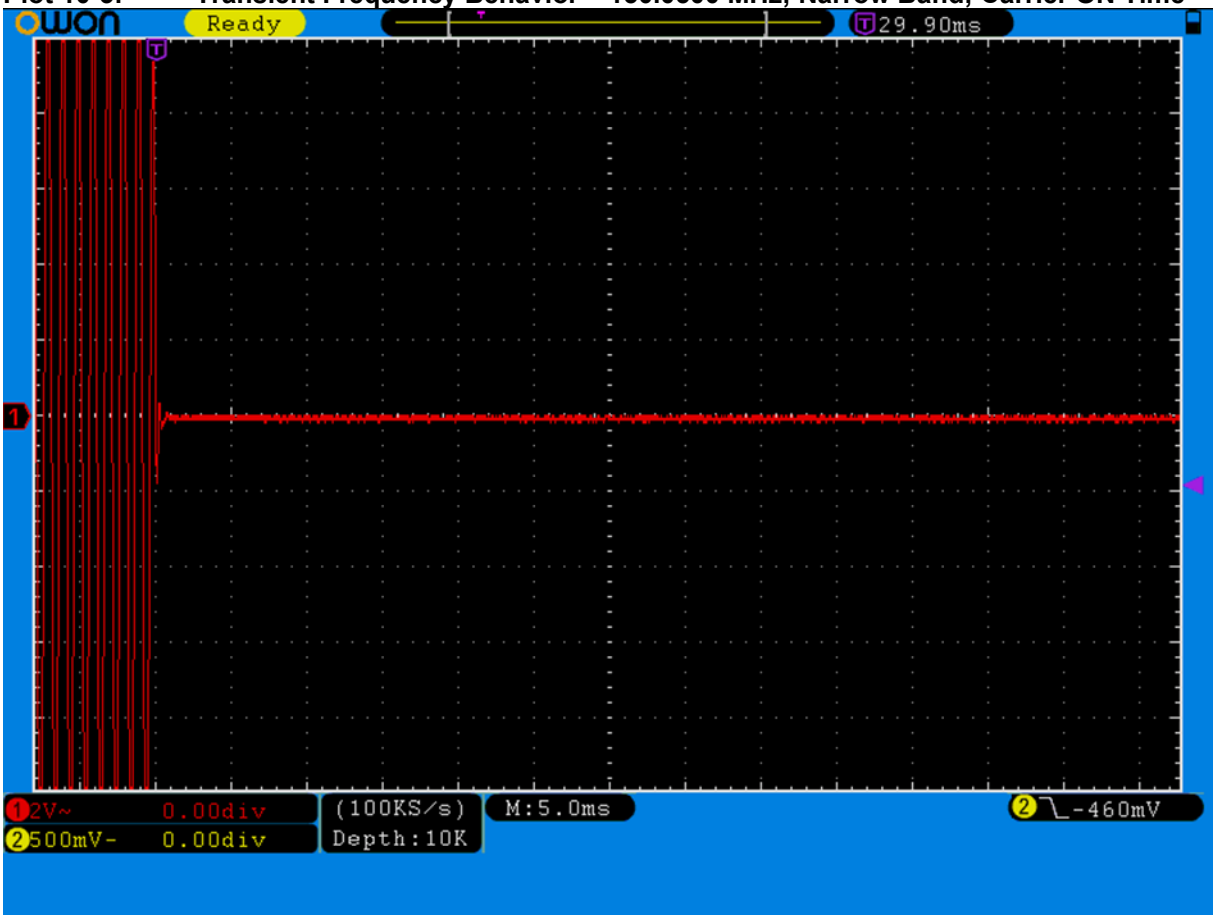
Plot 10-1: Transient Frequency Behavior – 150.0500 MHz; Wide Band; Carrier ON Time



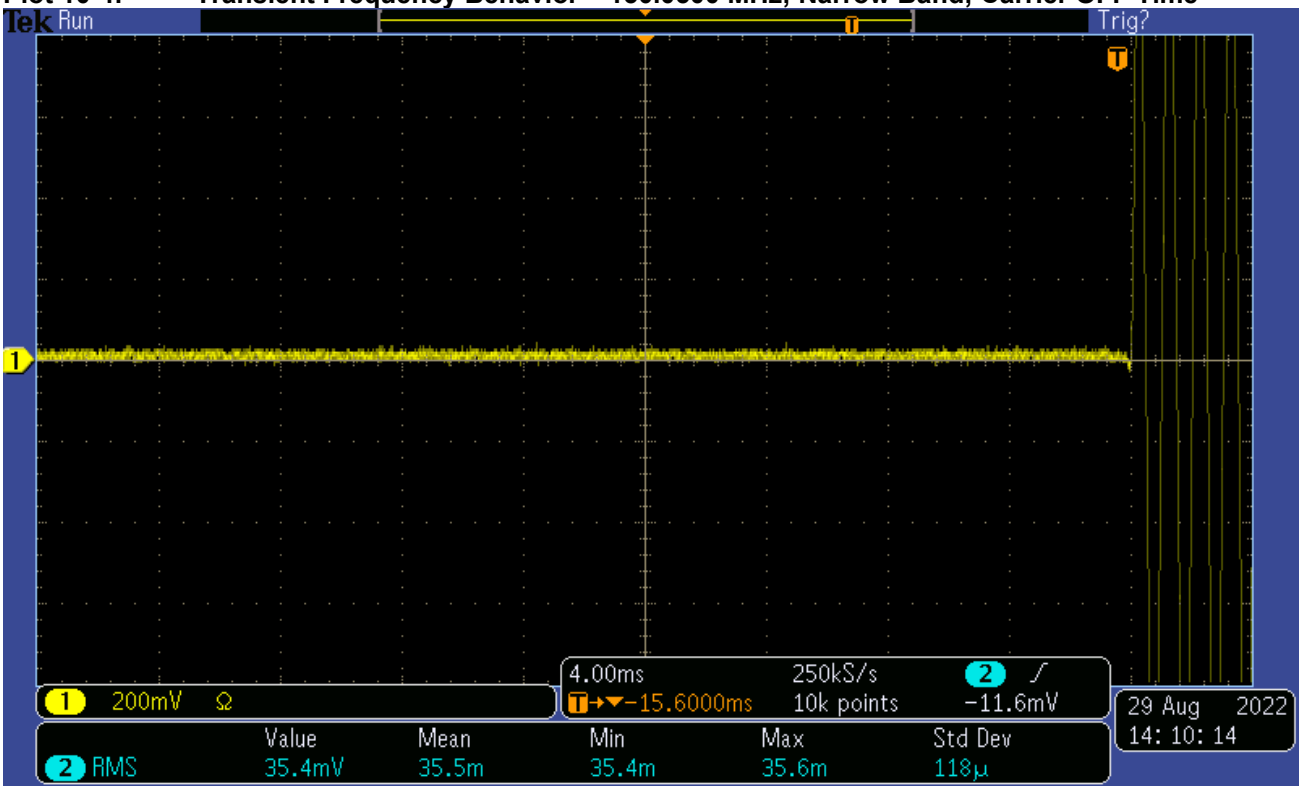
Plot 10-2: Transient Frequency Behavior – 150.0500 MHz; Wide Band; Carrier OFF Time



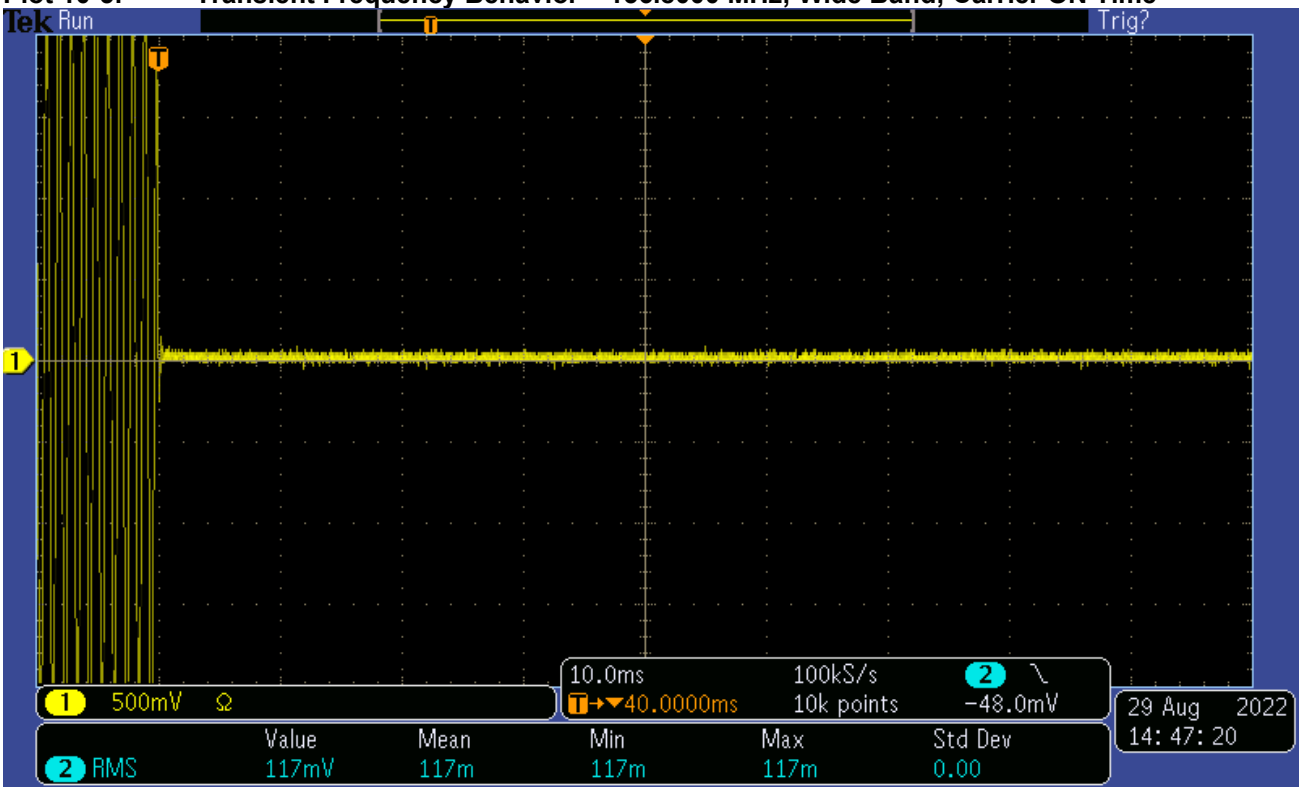
Plot 10-3: Transient Frequency Behavior – 150.0500 MHz; Narrow Band; Carrier ON Time



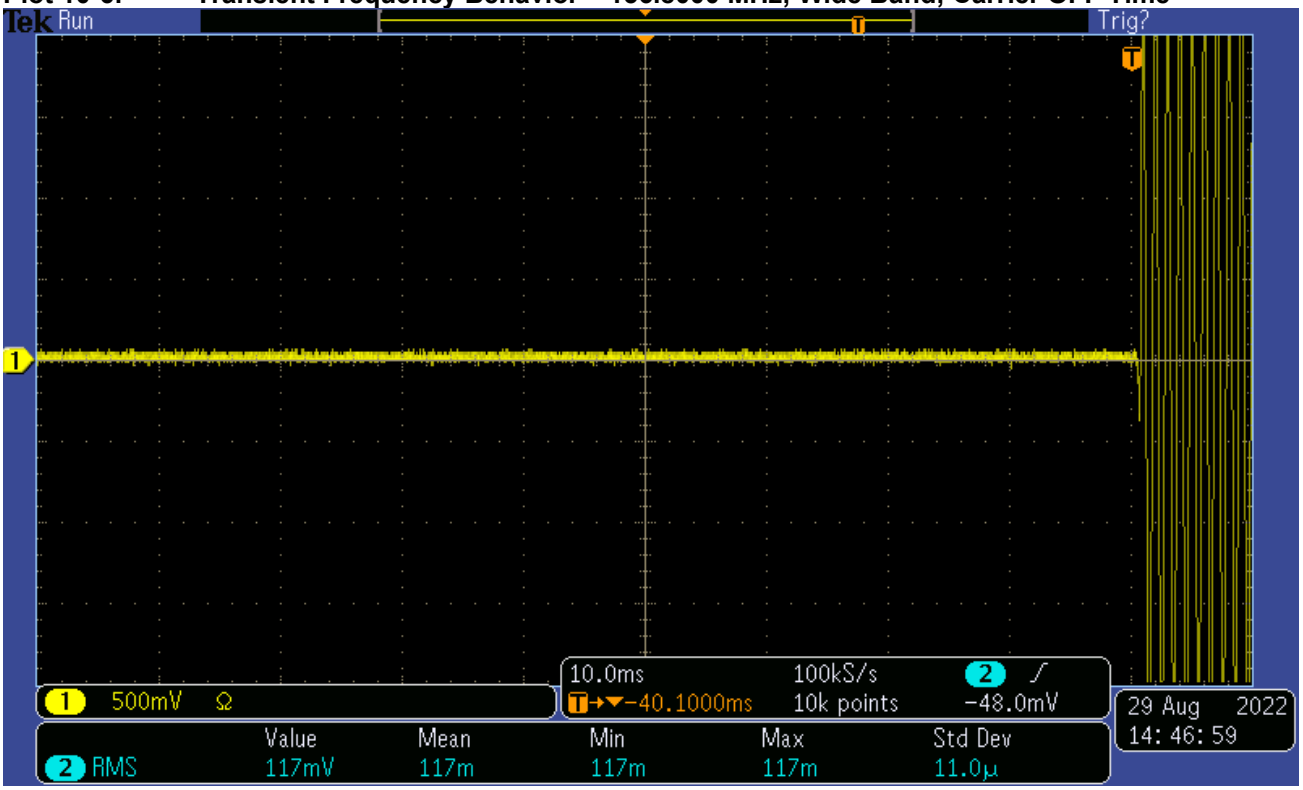
Plot 10-4: Transient Frequency Behavior – 150.0500 MHz; Narrow Band; Carrier OFF Time



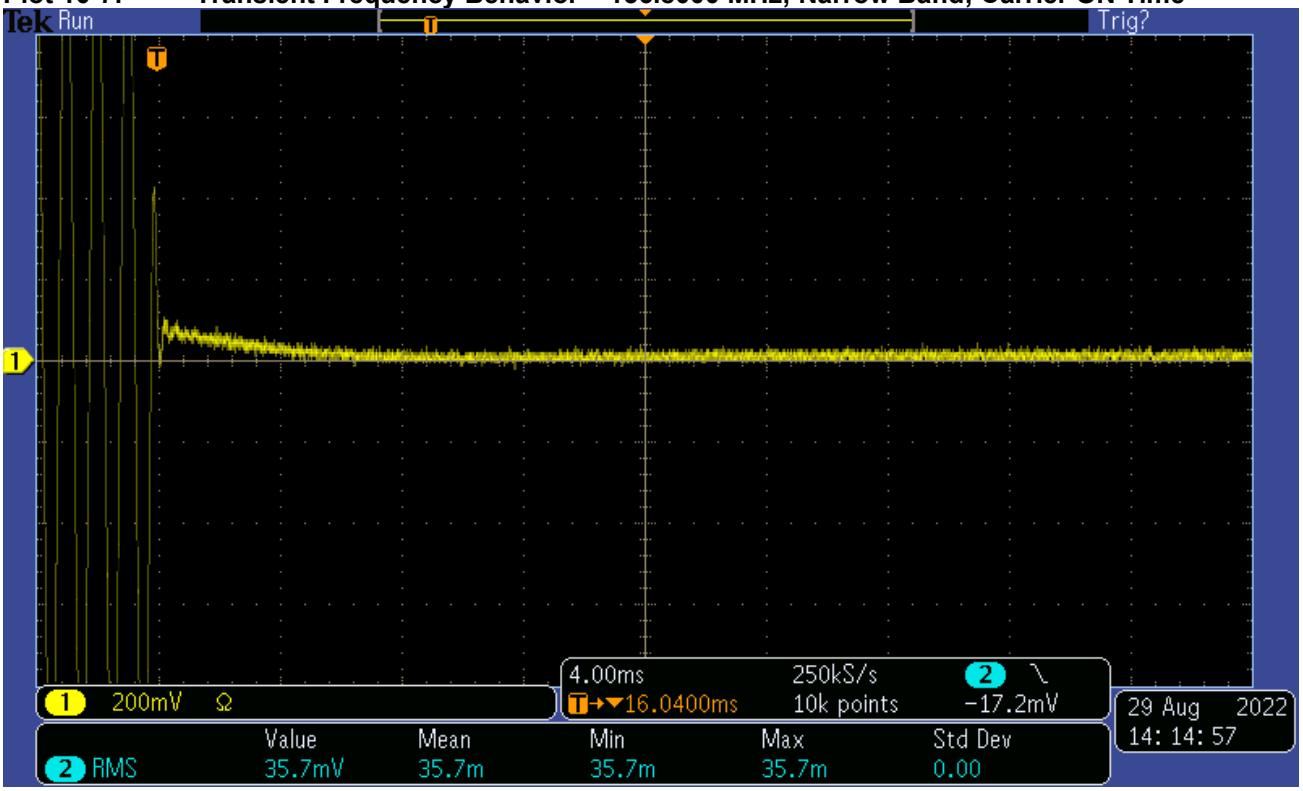
Plot 10-5: Transient Frequency Behavior – 156.8000 MHz; Wide Band; Carrier ON Time



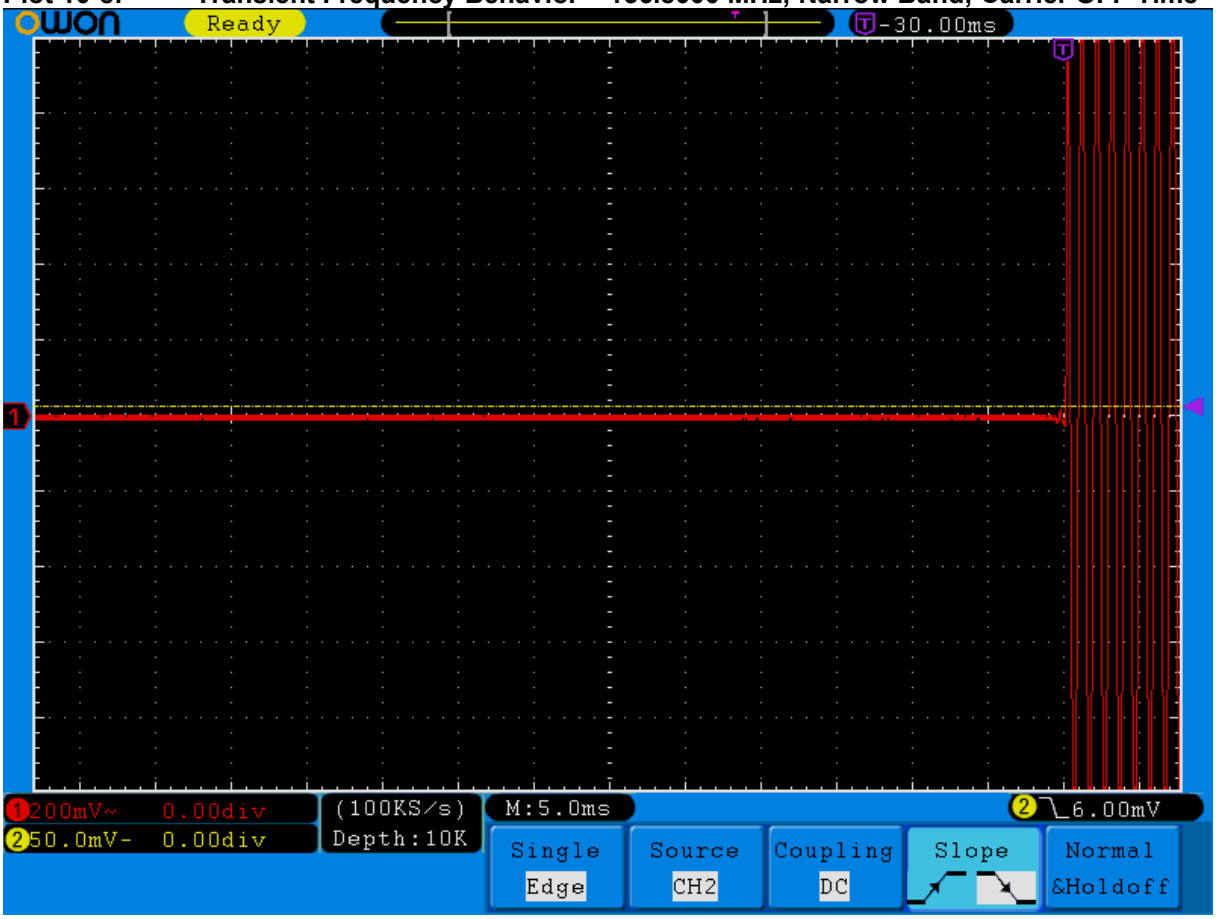
Plot 10-6: Transient Frequency Behavior – 156.8000 MHz; Wide Band; Carrier OFF Time



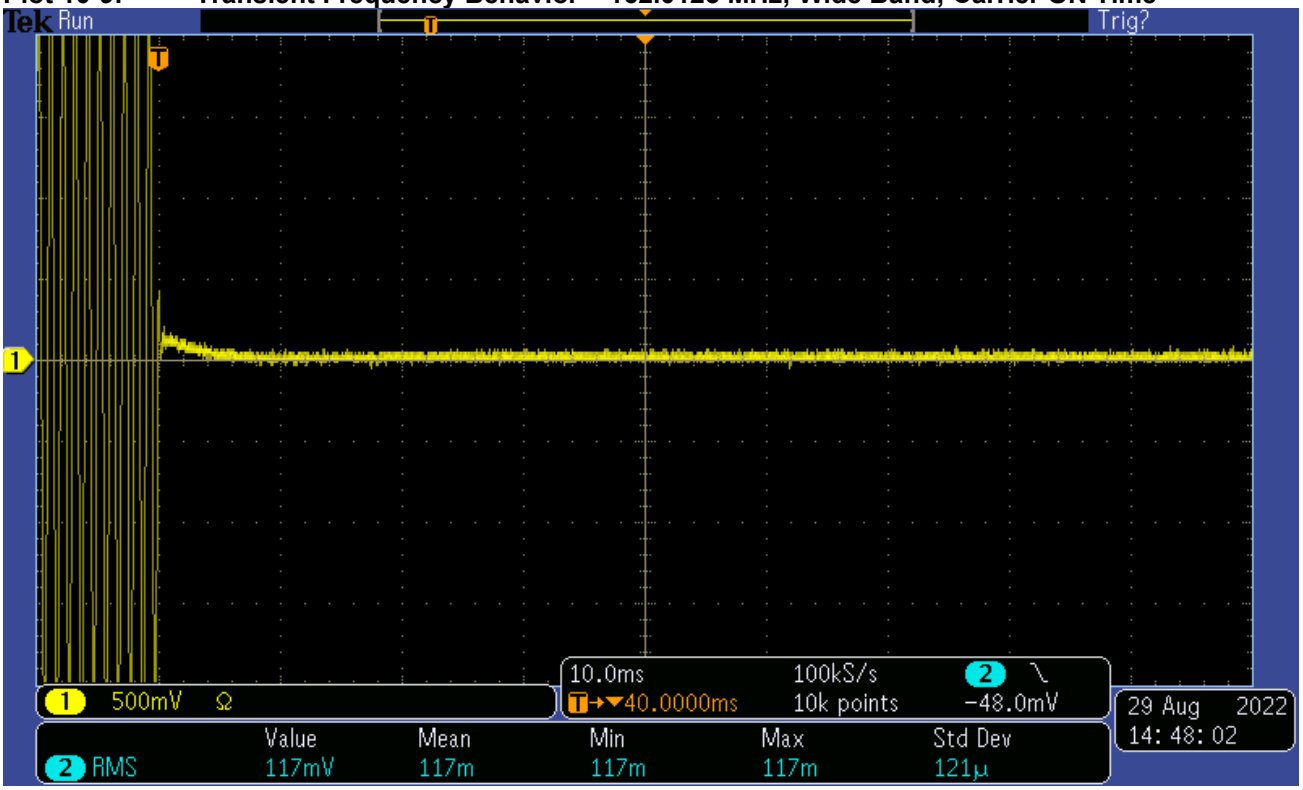
Plot 10-7: Transient Frequency Behavior – 156.8000 MHz; Narrow Band; Carrier ON Time



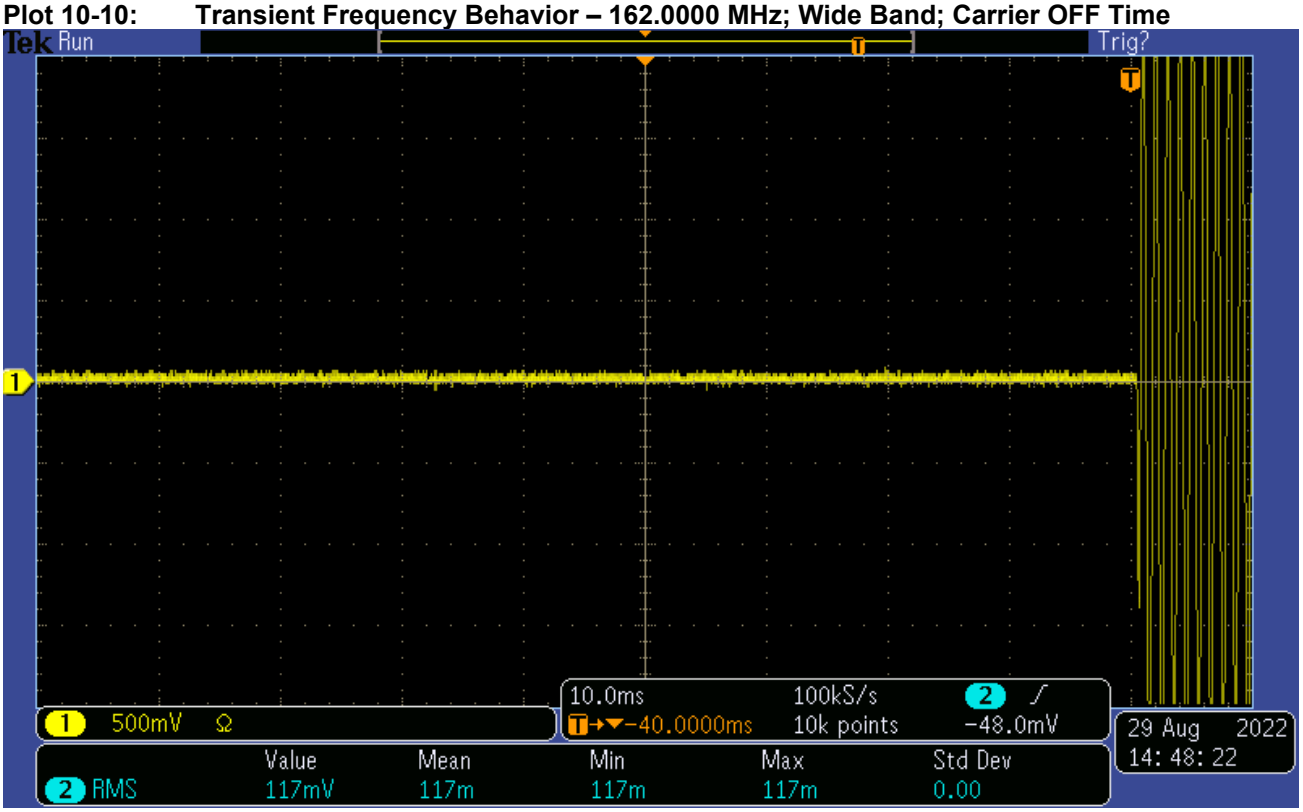
Plot 10-8: Transient Frequency Behavior – 156.8000 MHz; Narrow Band; Carrier OFF Time



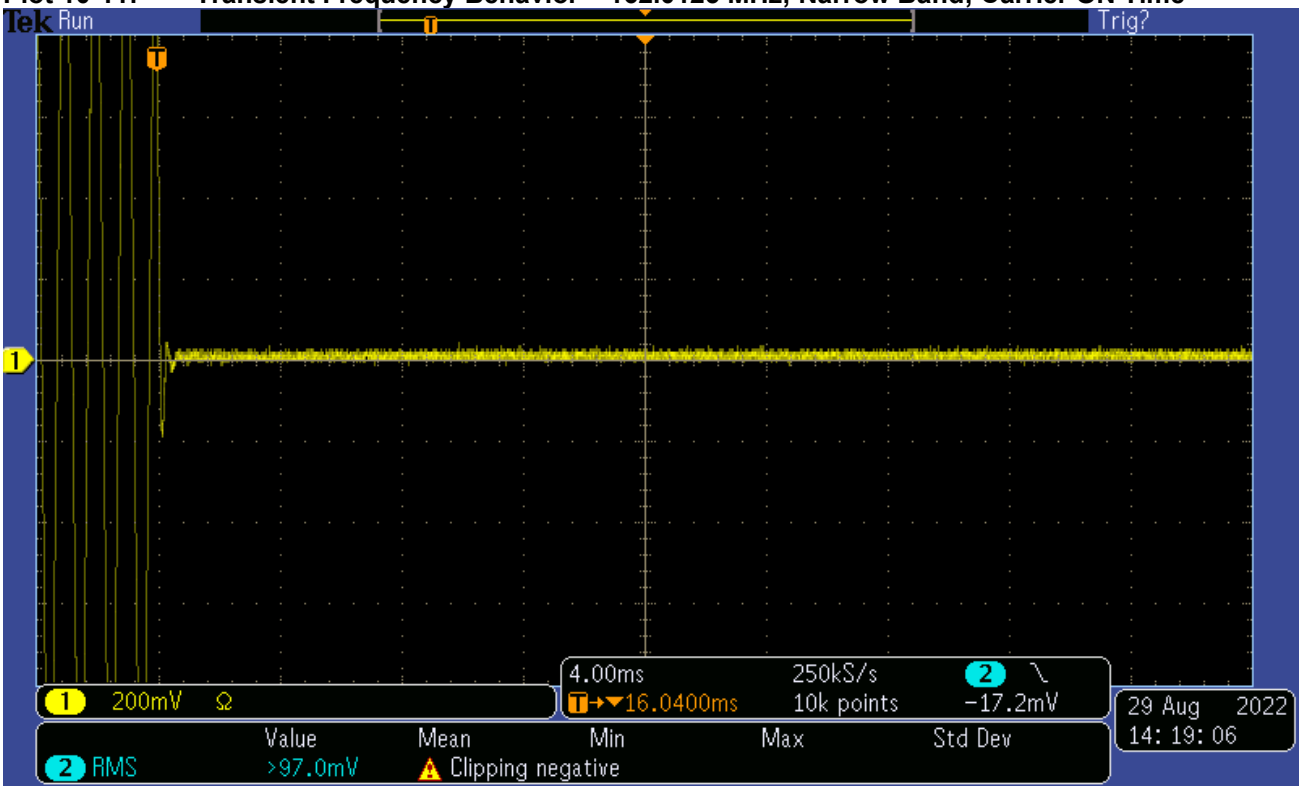
Plot 10-9: Transient Frequency Behavior – 162.0125 MHz; Wide Band; Carrier ON Time



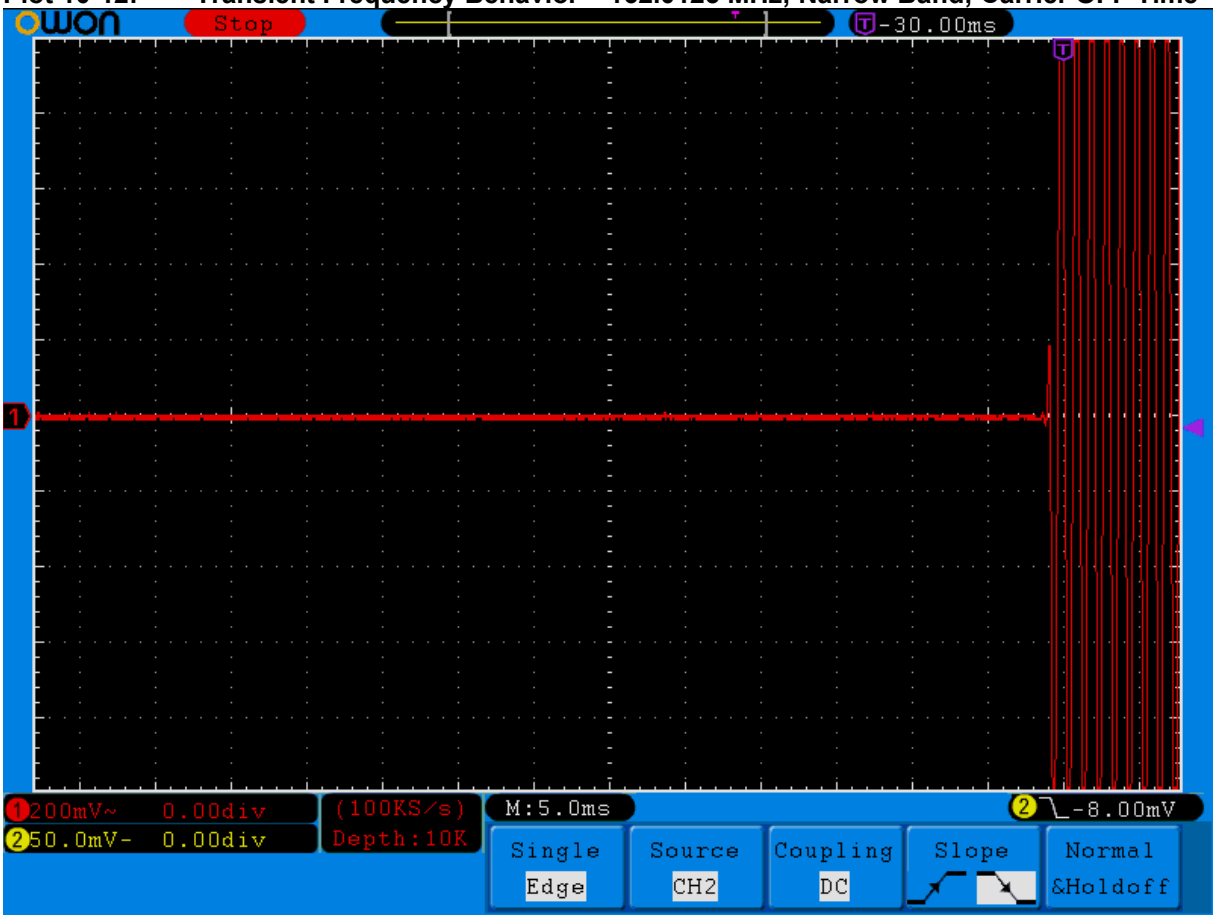
Plot 10-10: Transient Frequency Behavior – 162.0000 MHz; Wide Band; Carrier OFF Time



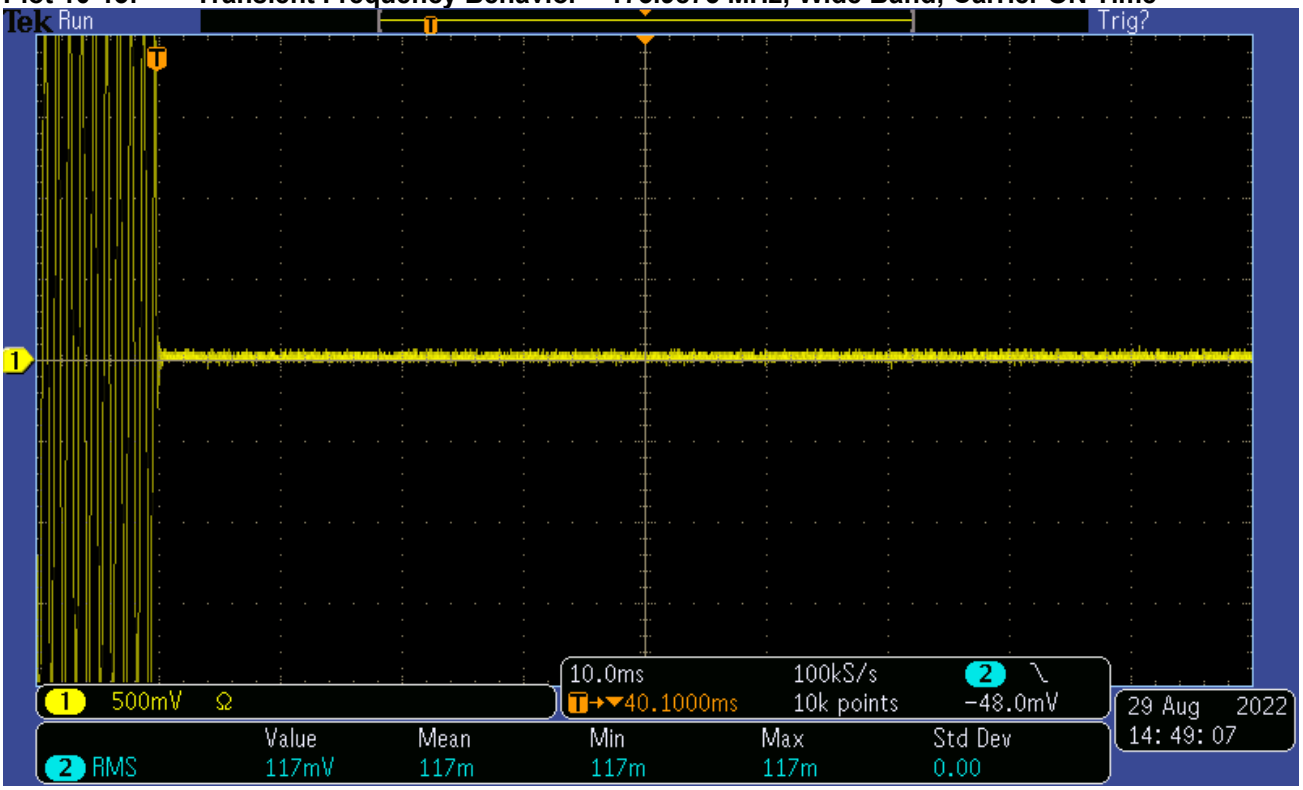
Plot 10-11: Transient Frequency Behavior – 162.0125 MHz; Narrow Band; Carrier ON Time



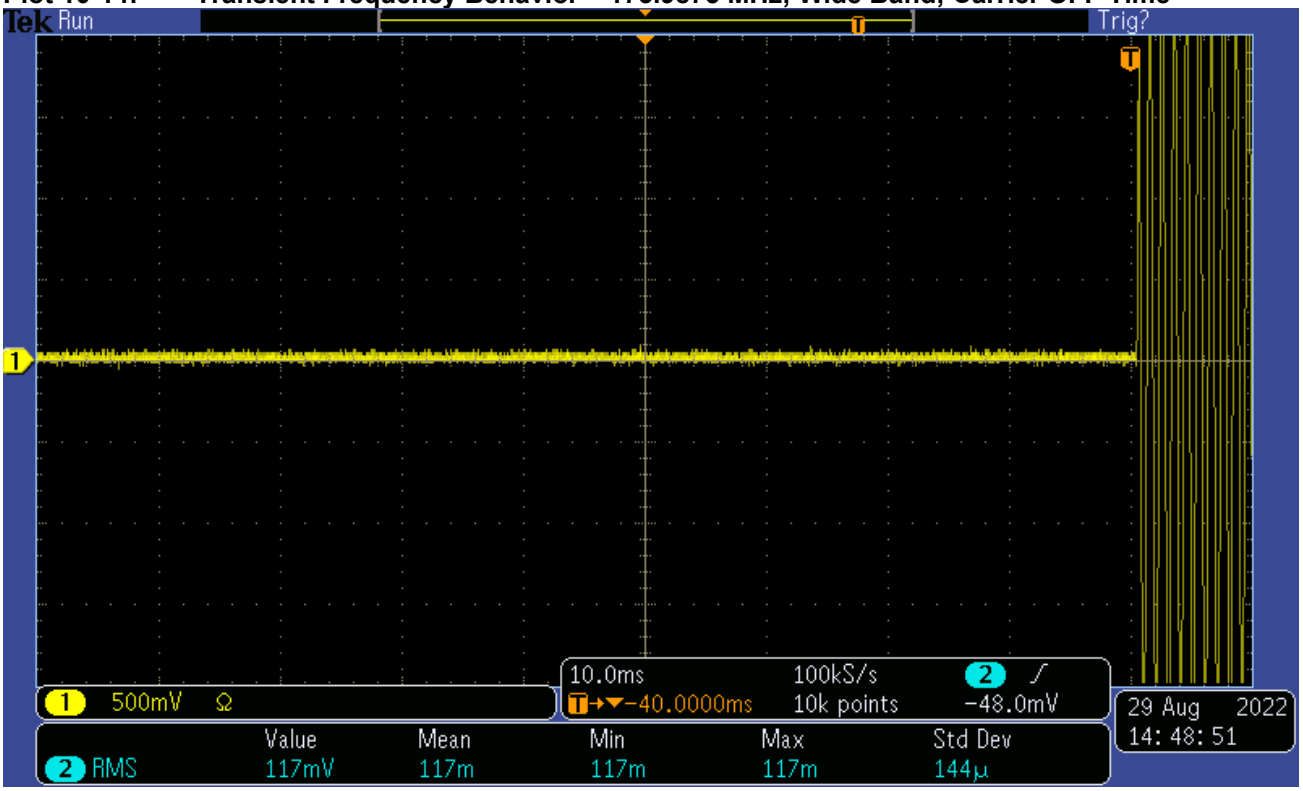
Plot 10-12: Transient Frequency Behavior – 162.0125 MHz; Narrow Band; Carrier OFF Time



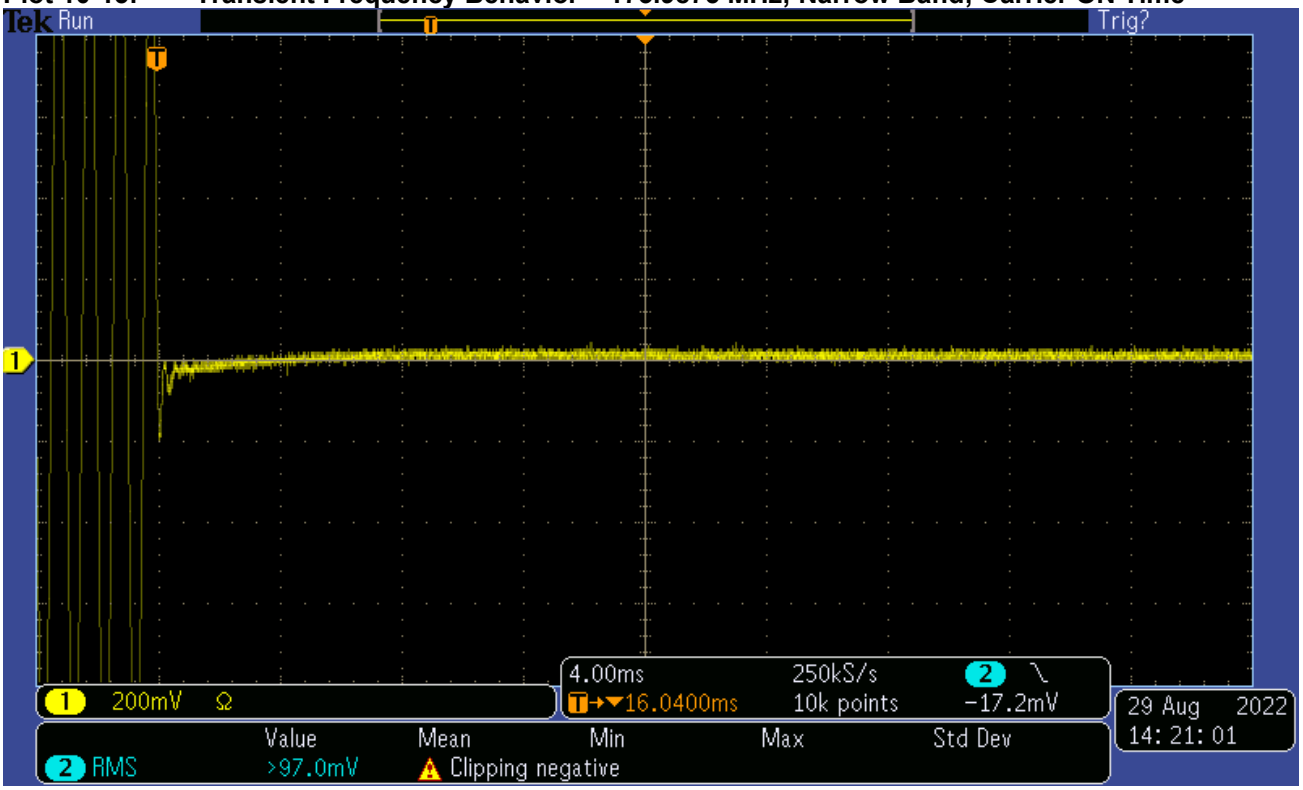
Plot 10-13: Transient Frequency Behavior – 173.9875 MHz; Wide Band; Carrier ON Time



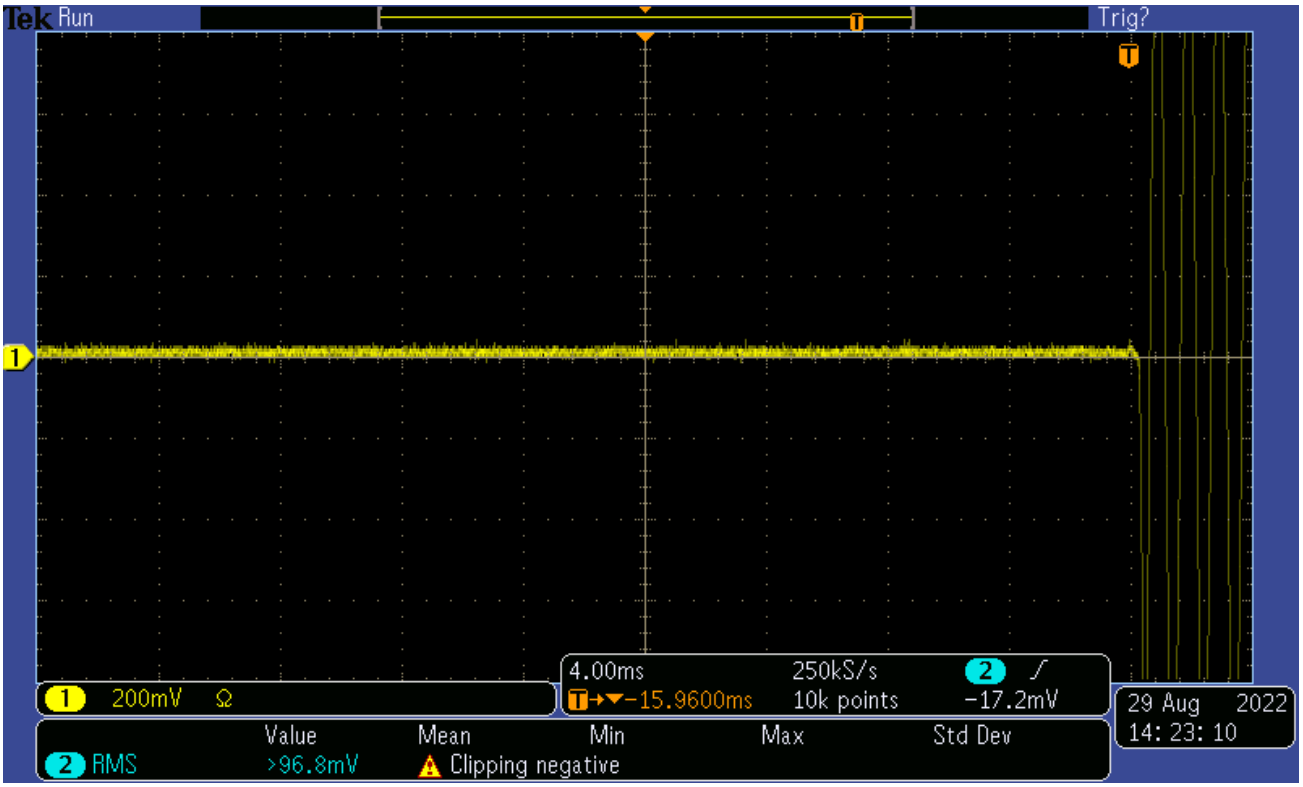
Plot 10-14: Transient Frequency Behavior – 173.9875 MHz; Wide Band; Carrier OFF Time



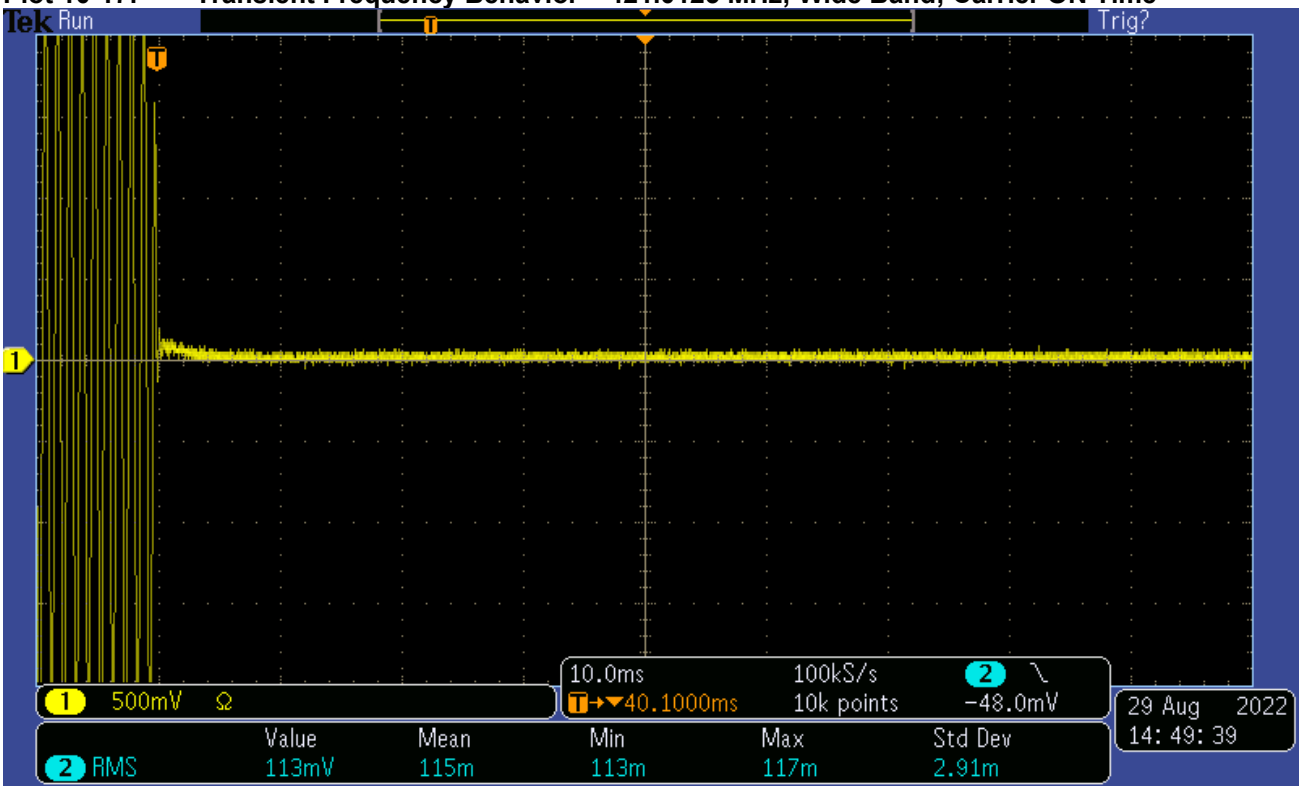
Plot 10-15: Transient Frequency Behavior – 173.9875 MHz; Narrow Band; Carrier ON Time



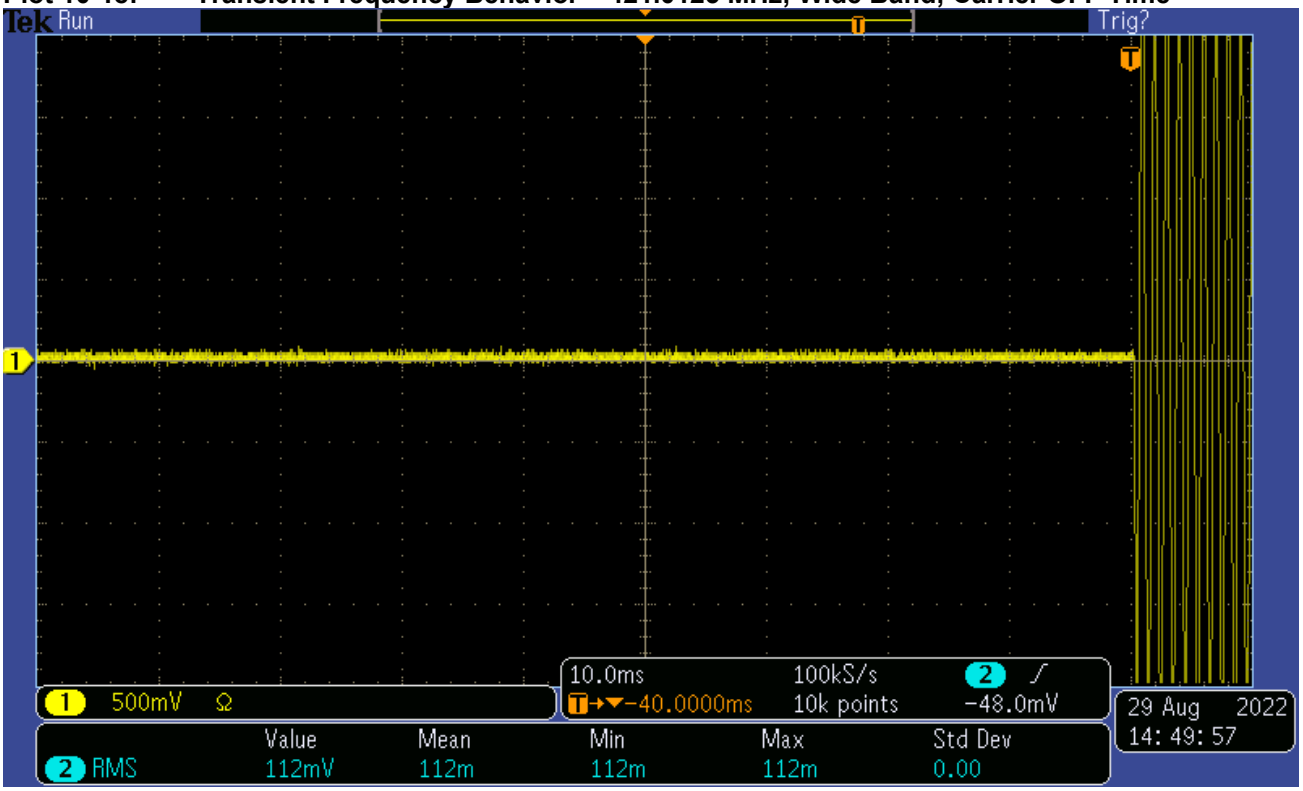
Plot 10-16: Transient Frequency Behavior – 173.9875 MHz; Narrow Band; Carrier OFF Time



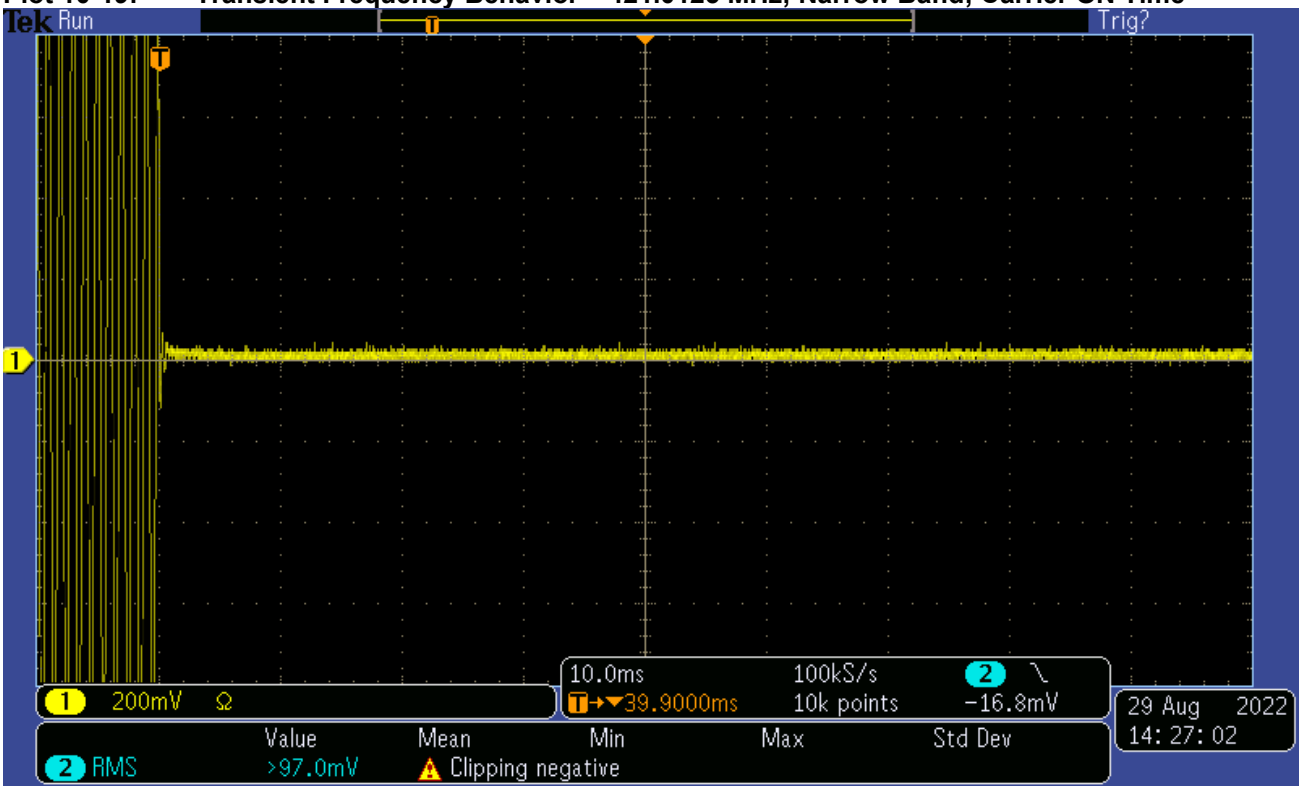
Plot 10-17: Transient Frequency Behavior – 421.0125 MHz; Wide Band; Carrier ON Time



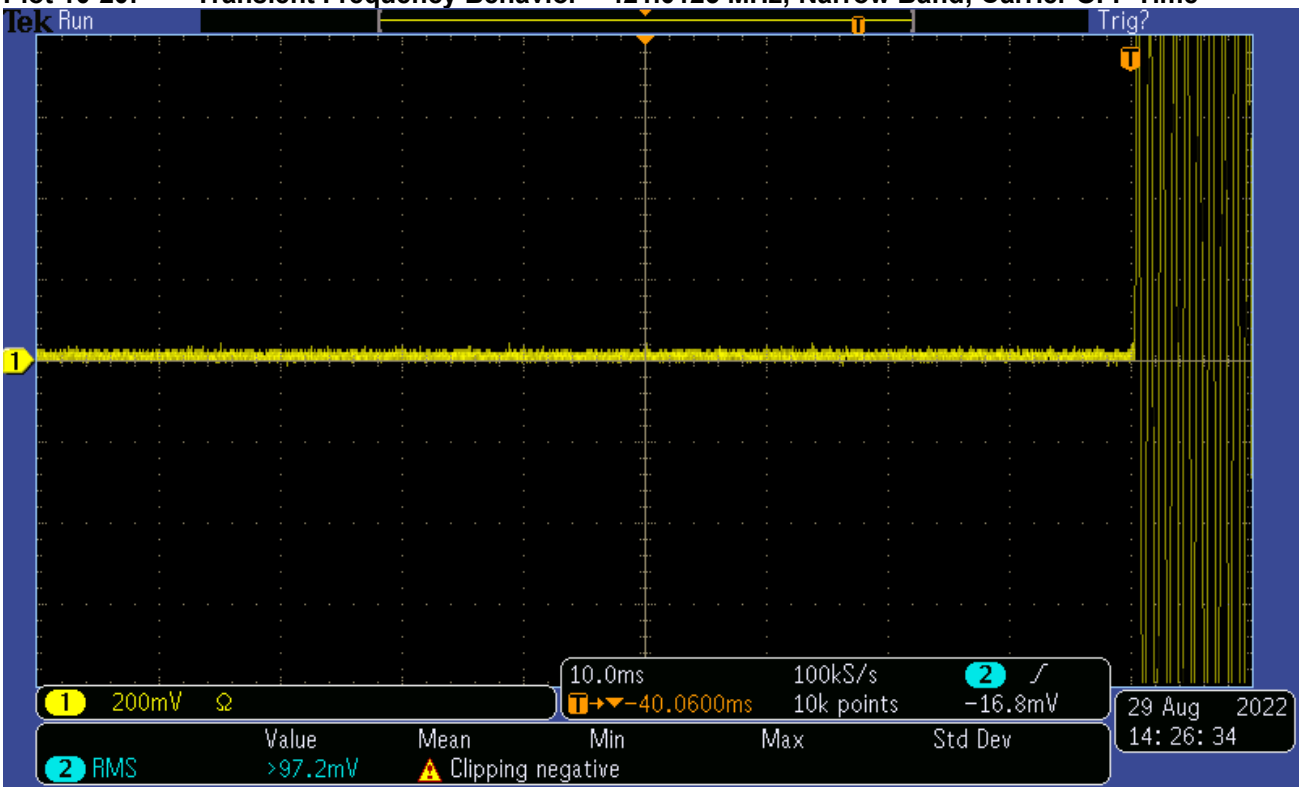
Plot 10-18: Transient Frequency Behavior – 421.0125 MHz; Wide Band; Carrier OFF Time



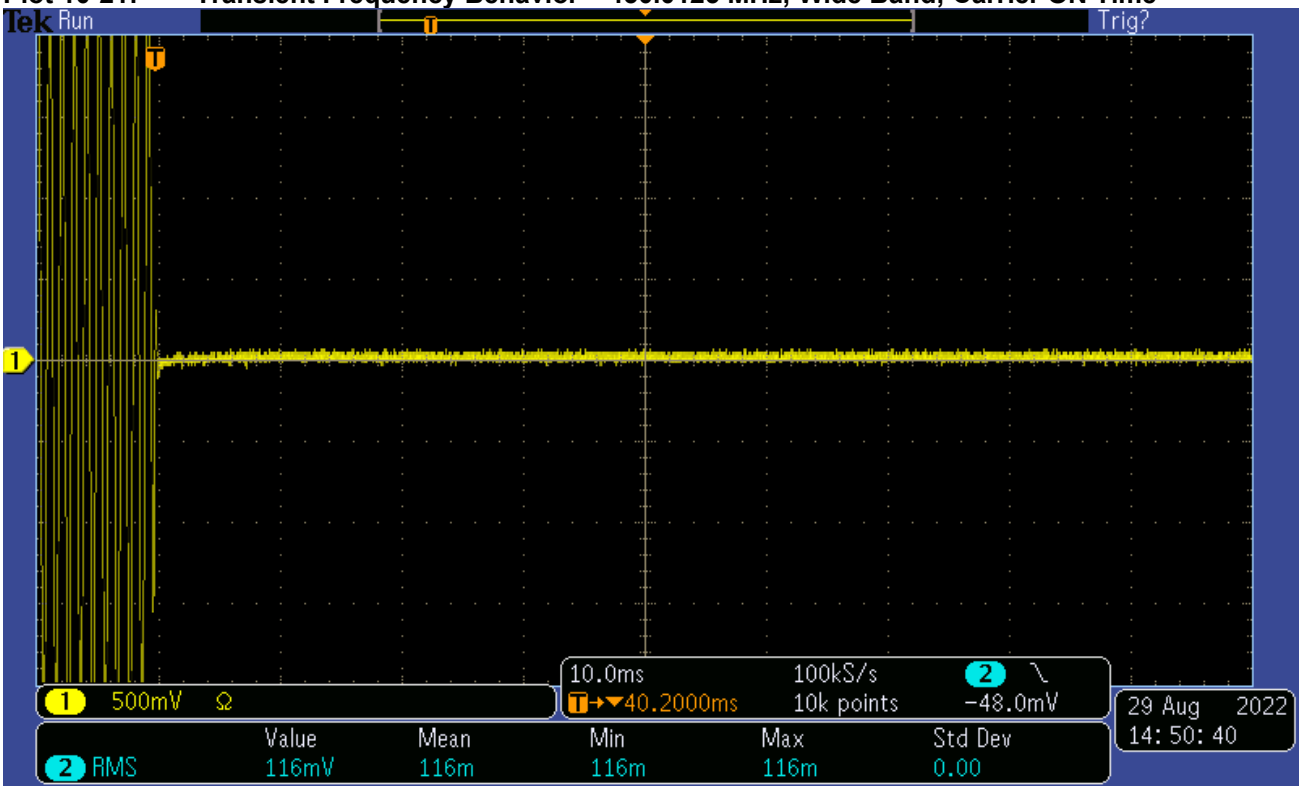
Plot 10-19: Transient Frequency Behavior – 421.0125 MHz; Narrow Band; Carrier ON Time



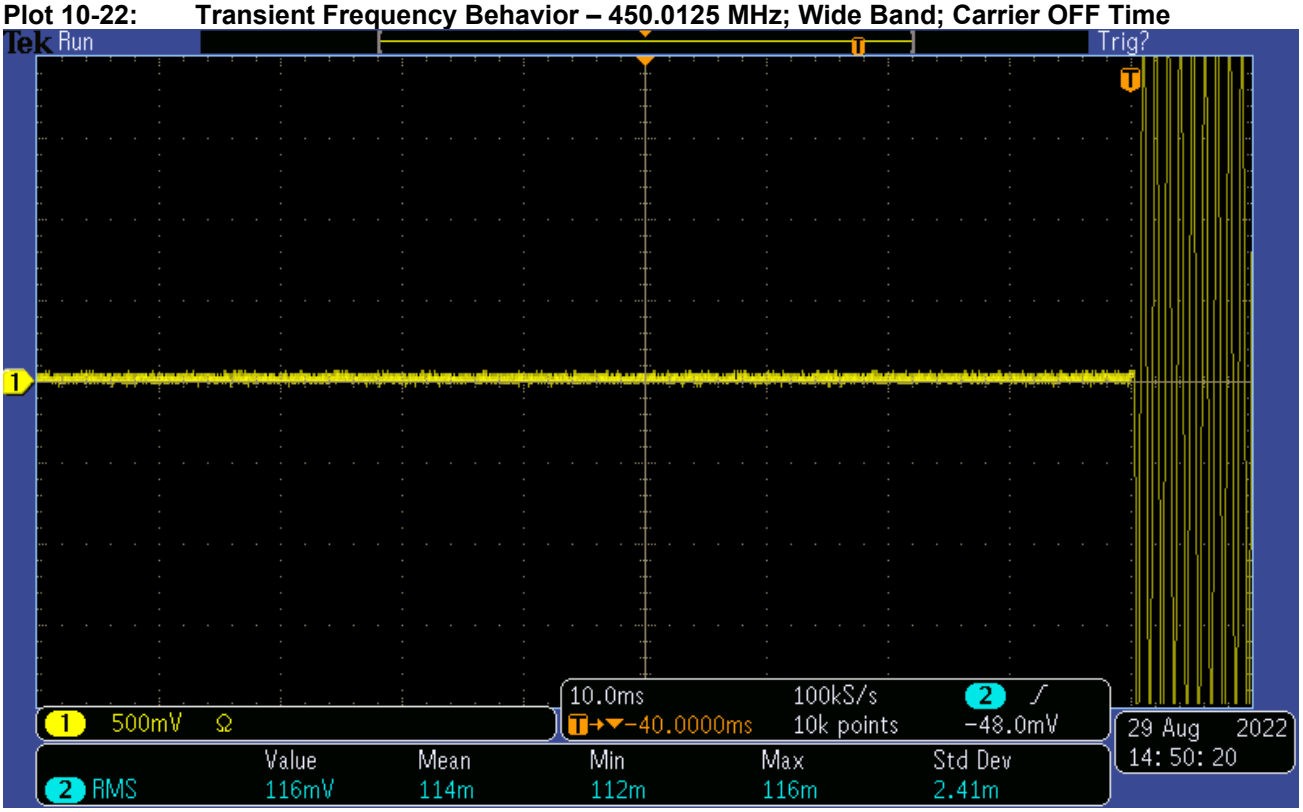
Plot 10-20: Transient Frequency Behavior – 421.0125 MHz; Narrow Band; Carrier OFF Time



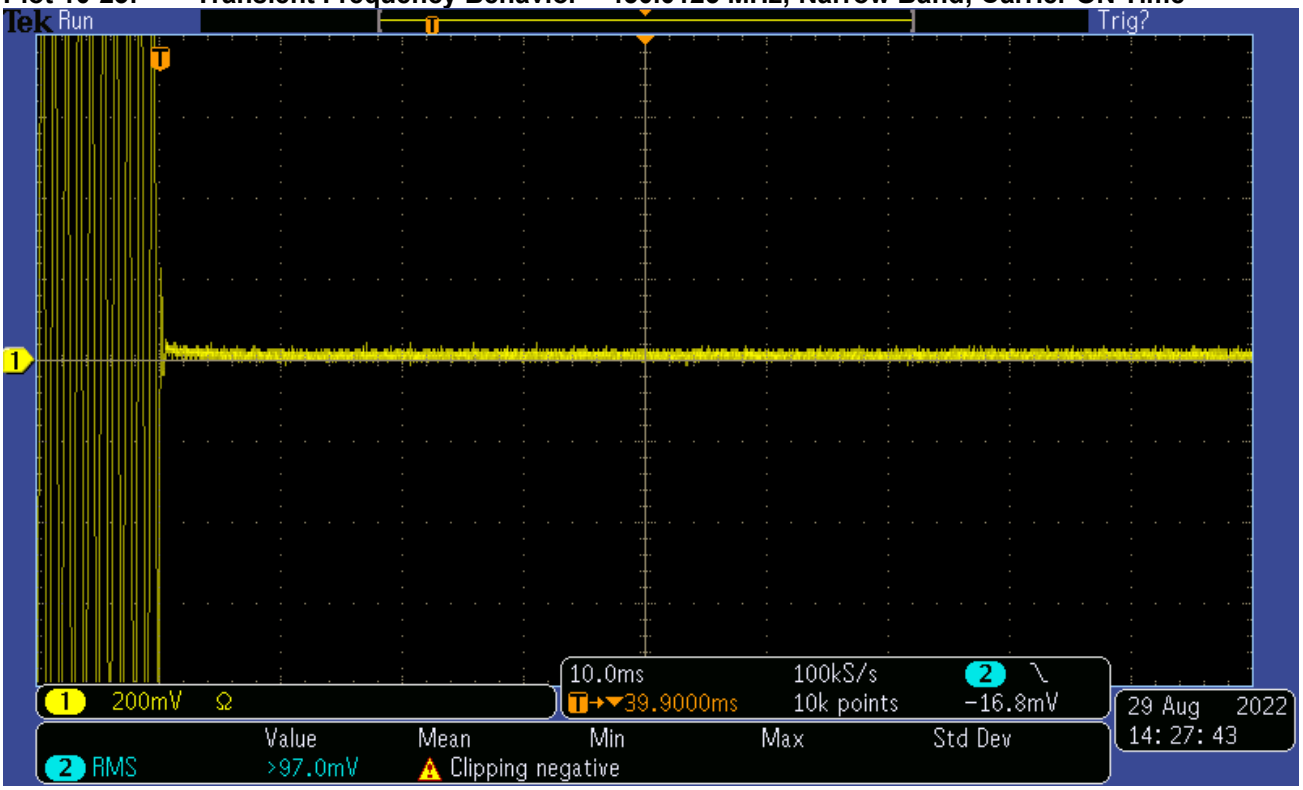
Plot 10-21: Transient Frequency Behavior – 450.0125 MHz; Wide Band; Carrier ON Time



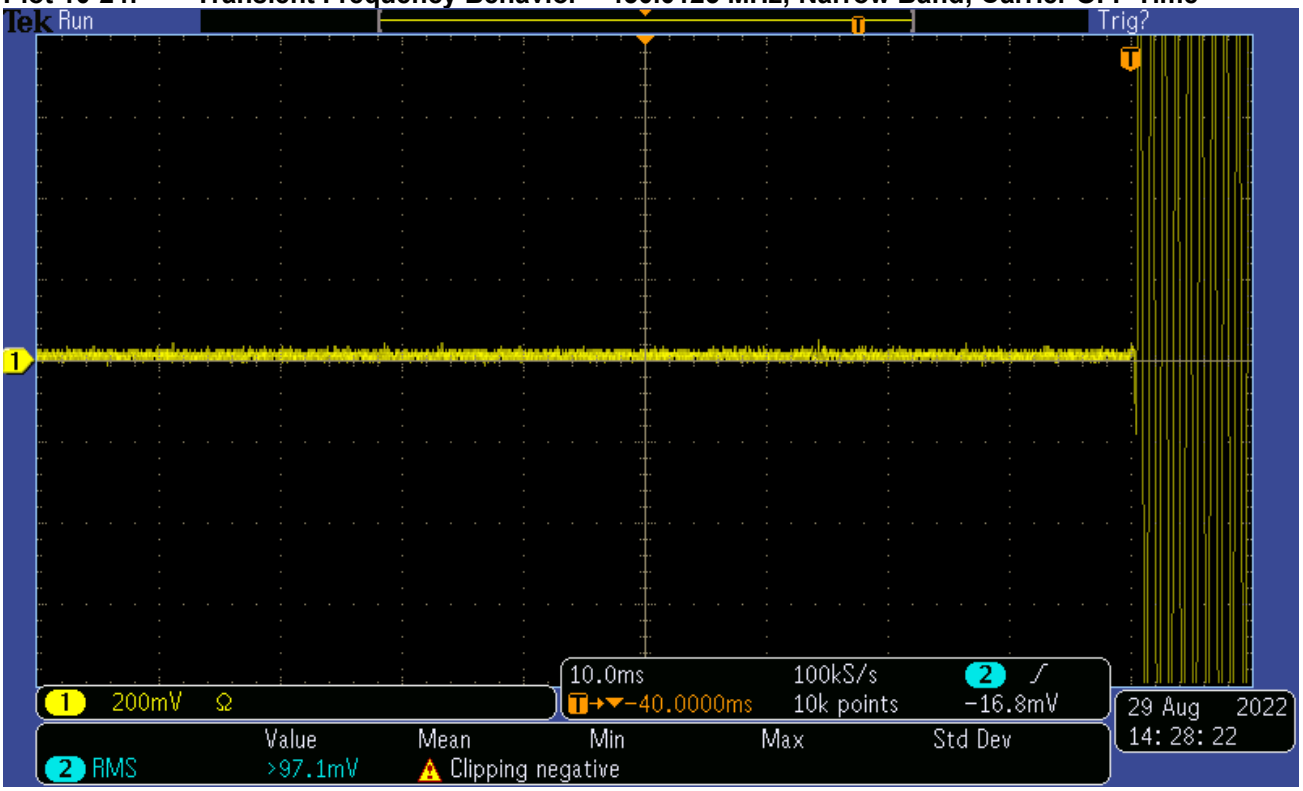
Plot 10-22: Transient Frequency Behavior – 450.0125 MHz; Wide Band; Carrier OFF Time



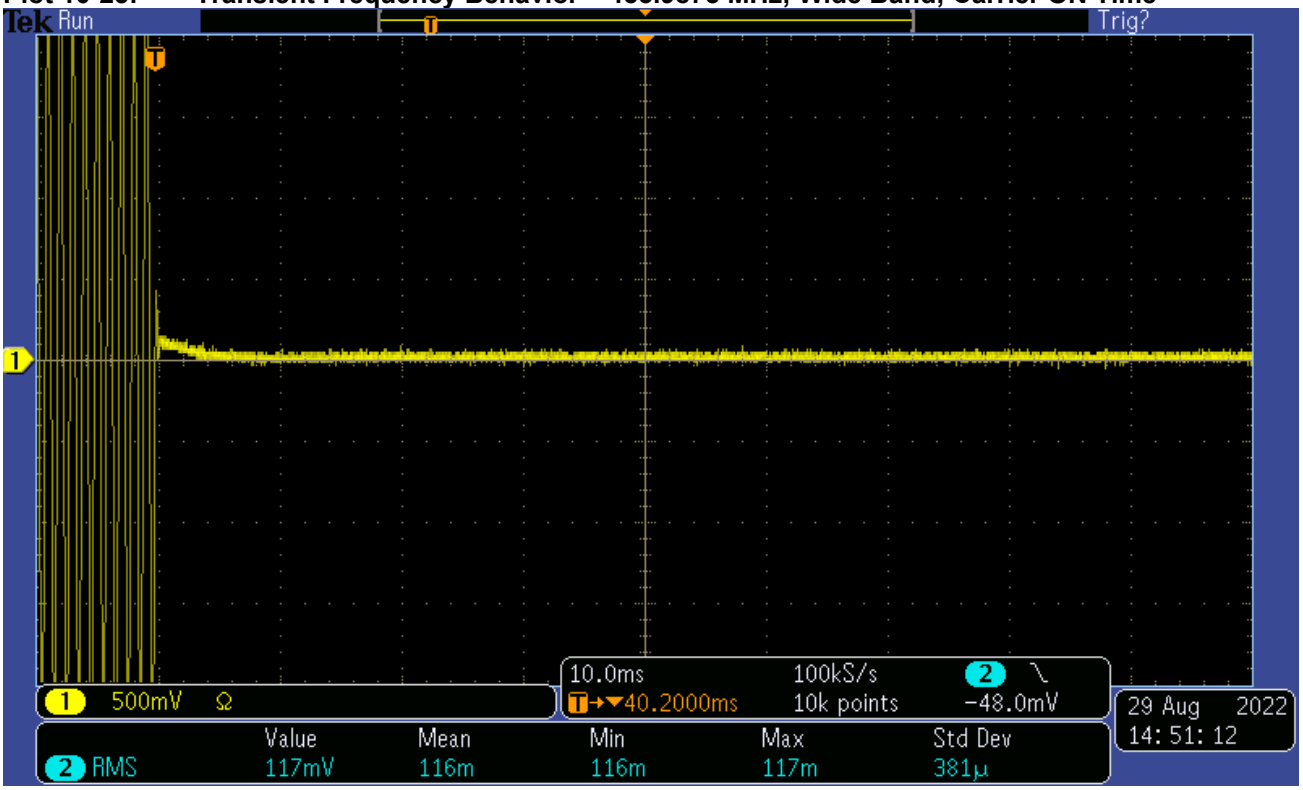
Plot 10-23: Transient Frequency Behavior – 450.0125 MHz; Narrow Band; Carrier ON Time



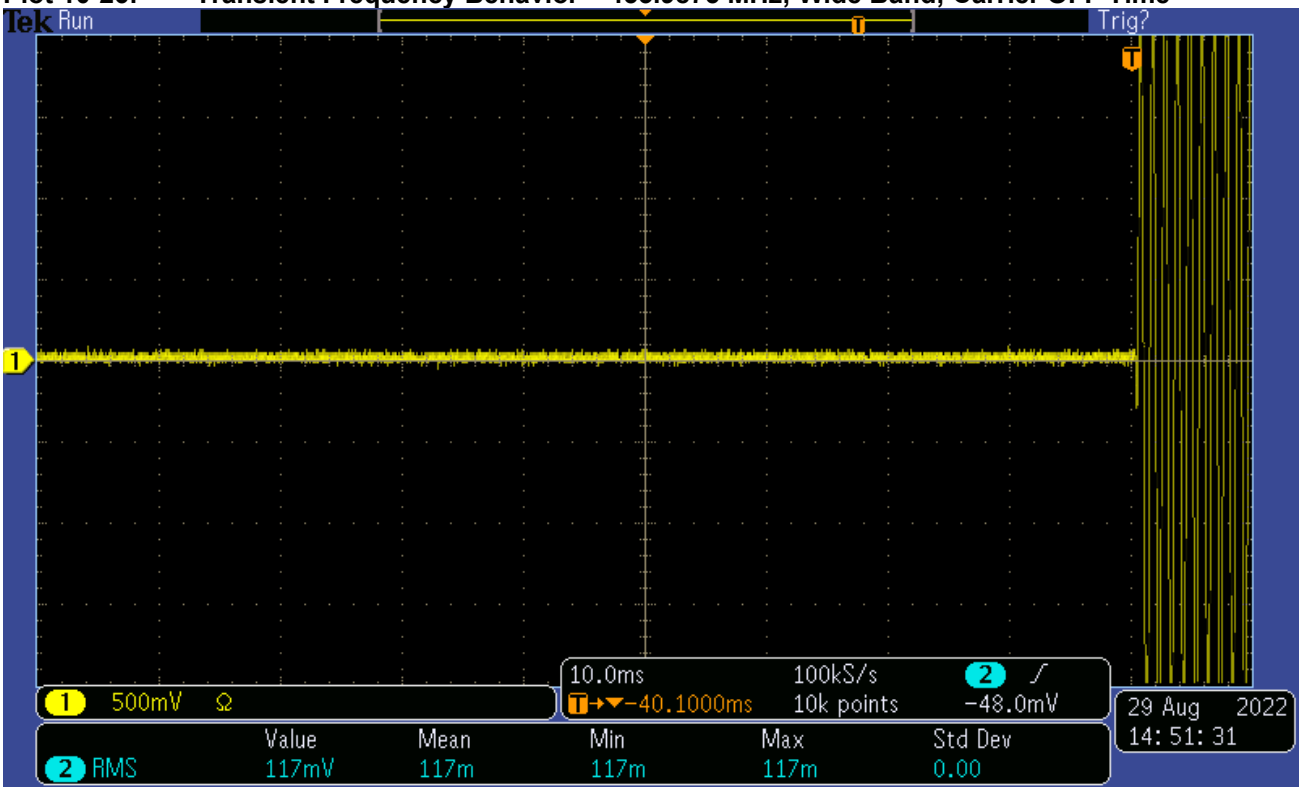
Plot 10-24: Transient Frequency Behavior – 450.0125 MHz; Narrow Band; Carrier OFF Time



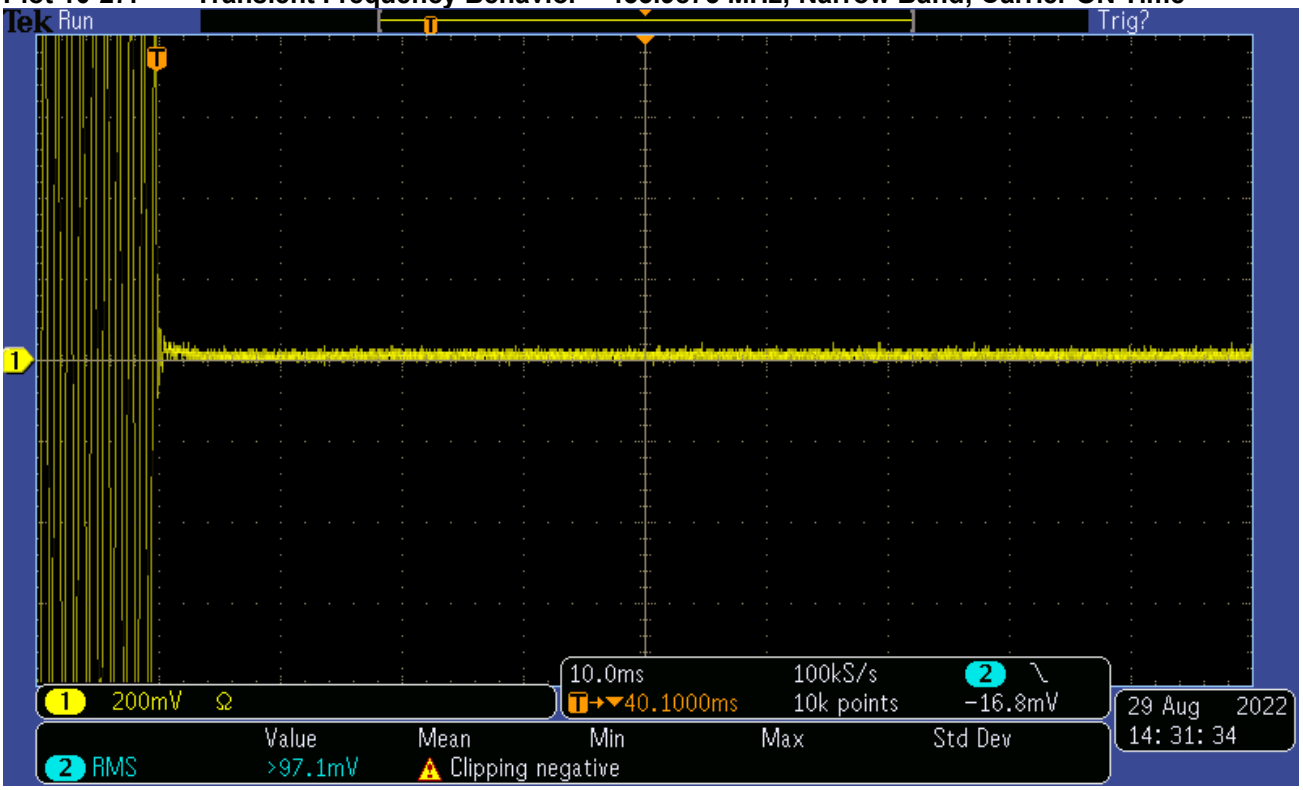
Plot 10-25: Transient Frequency Behavior – 453.9875 MHz; Wide Band; Carrier ON Time



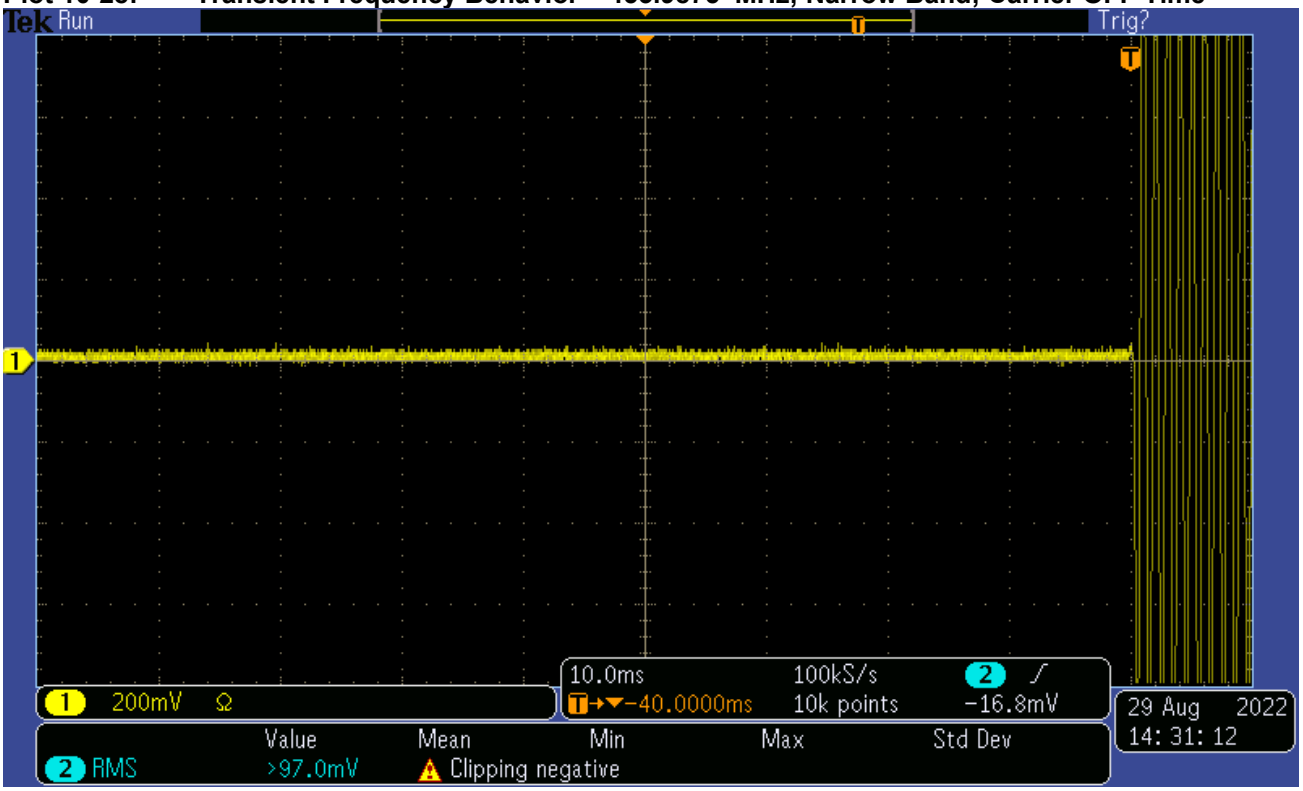
Plot 10-26: Transient Frequency Behavior – 453.9875 MHz; Wide Band; Carrier OFF Time



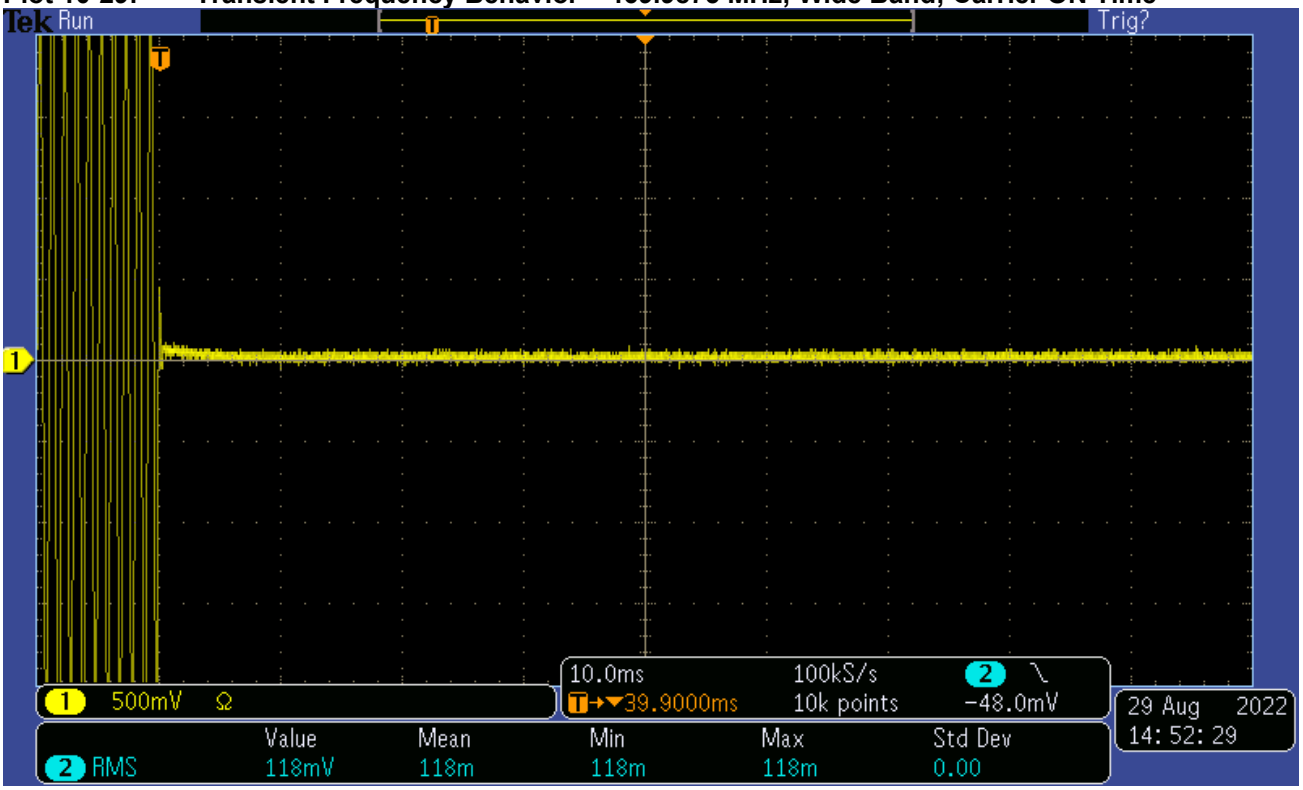
Plot 10-27: Transient Frequency Behavior – 453.9875 MHz; Narrow Band; Carrier ON Time



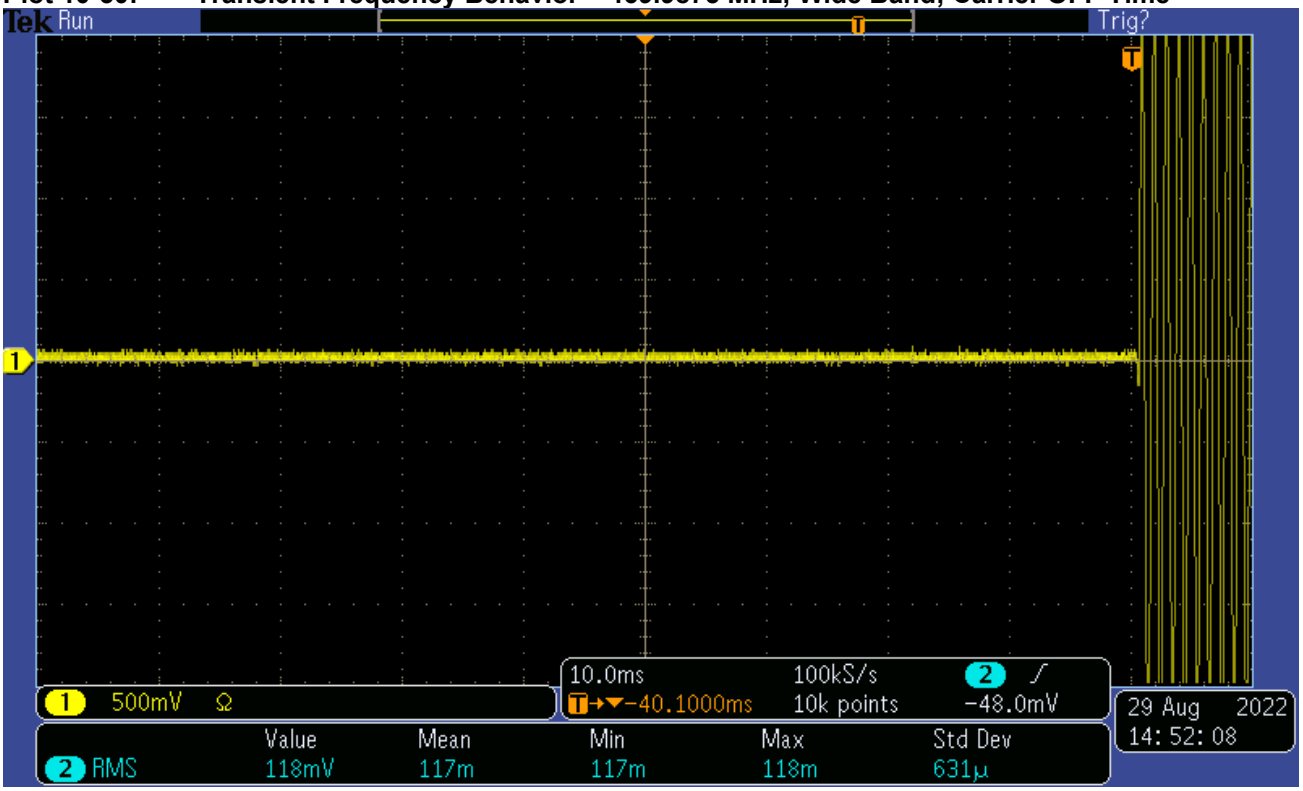
Plot 10-28: Transient Frequency Behavior – 453.9875 MHz; Narrow Band; Carrier OFF Time



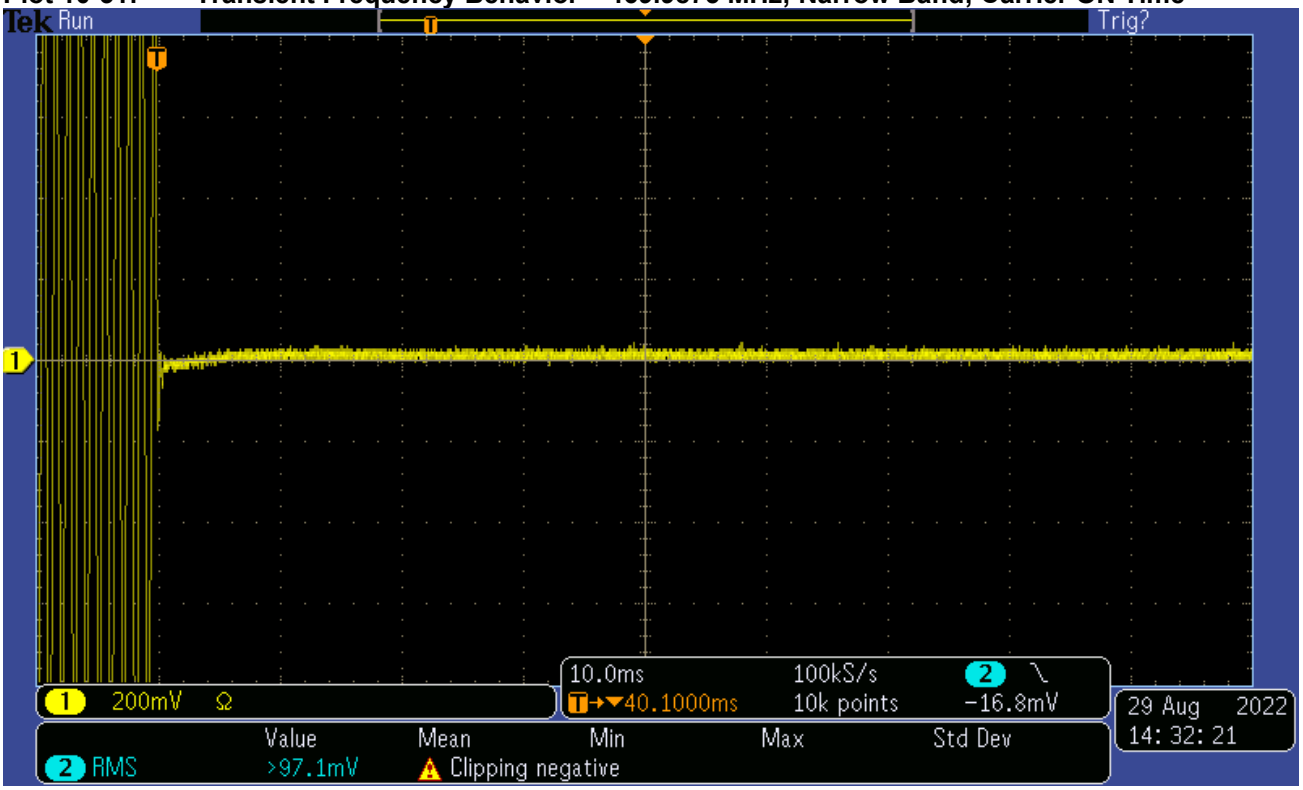
Plot 10-29: Transient Frequency Behavior – 469.9875 MHz; Wide Band; Carrier ON Time



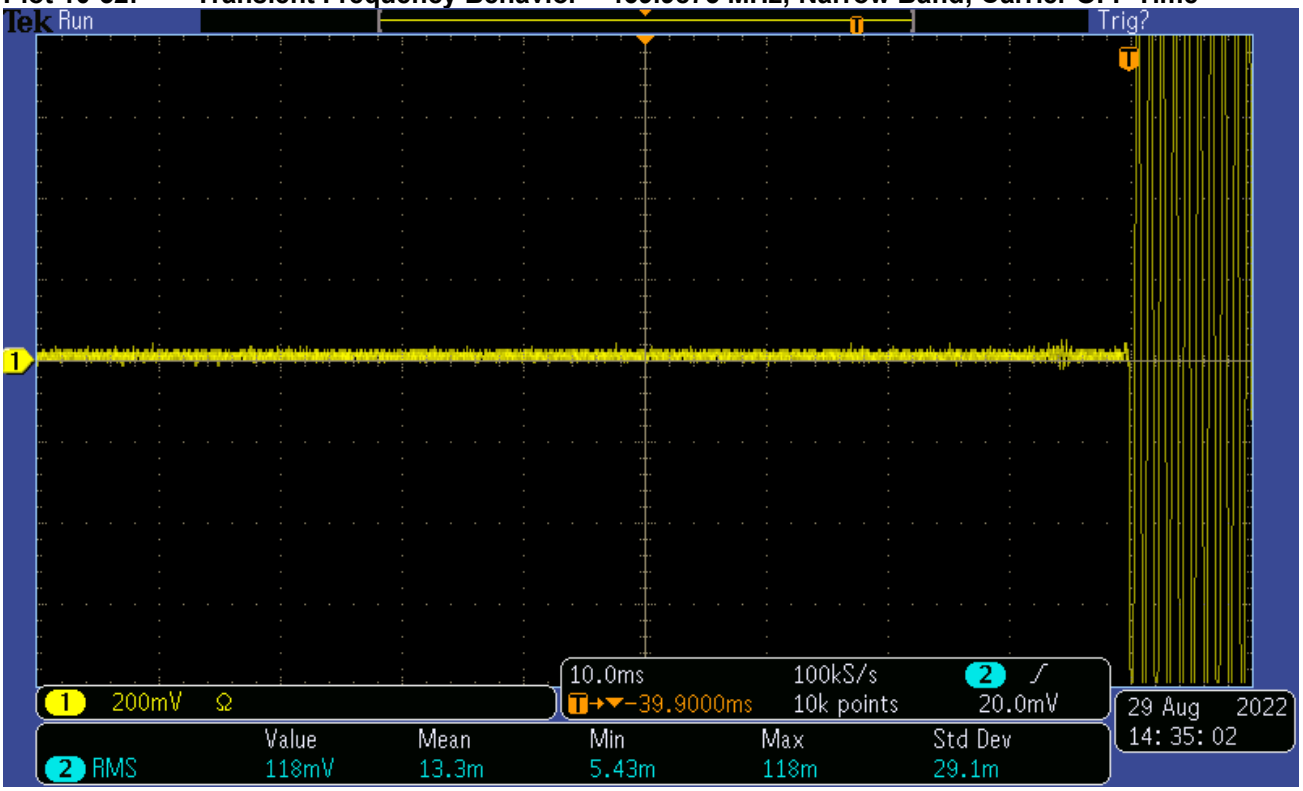
Plot 10-30: Transient Frequency Behavior – 469.9875 MHz; Wide Band; Carrier OFF Time



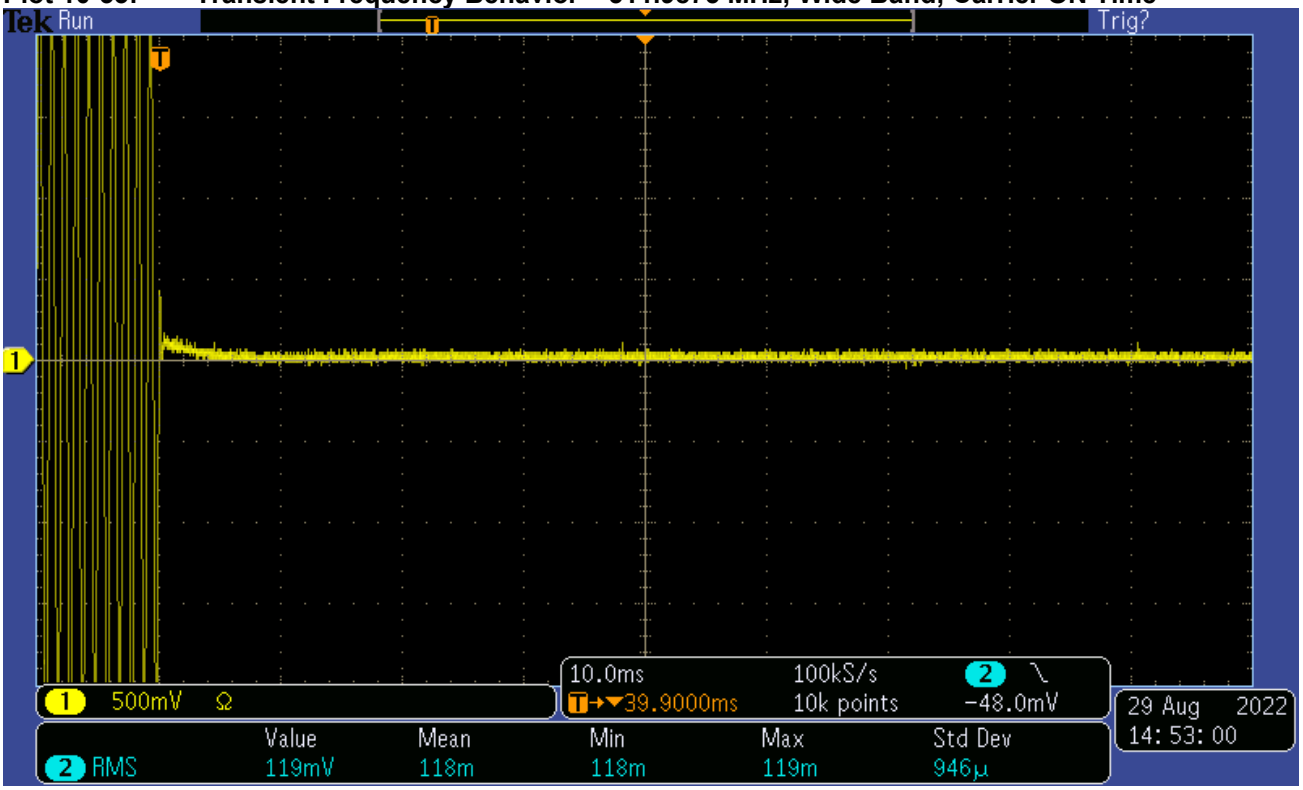
Plot 10-31: Transient Frequency Behavior – 469.9875 MHz; Narrow Band; Carrier ON Time



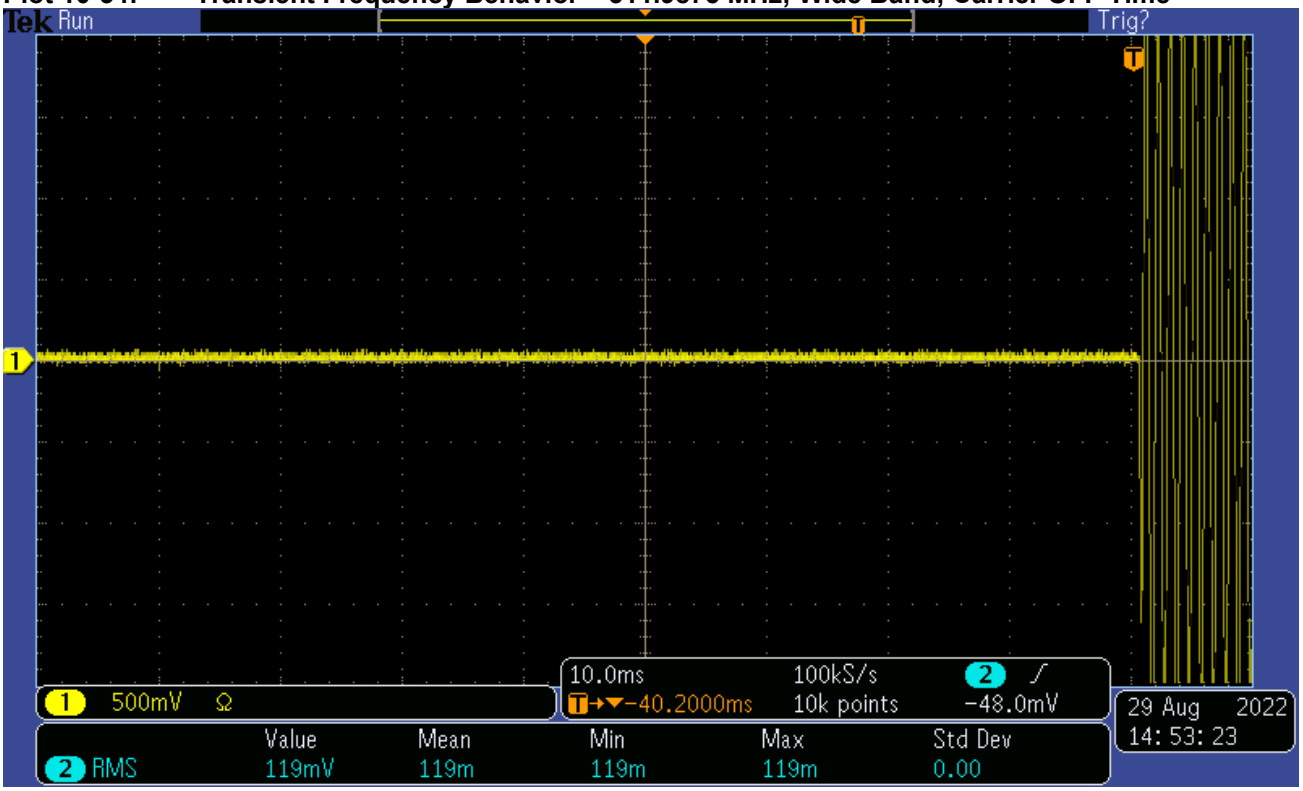
Plot 10-32: Transient Frequency Behavior – 469.9875 MHz; Narrow Band; Carrier OFF Time



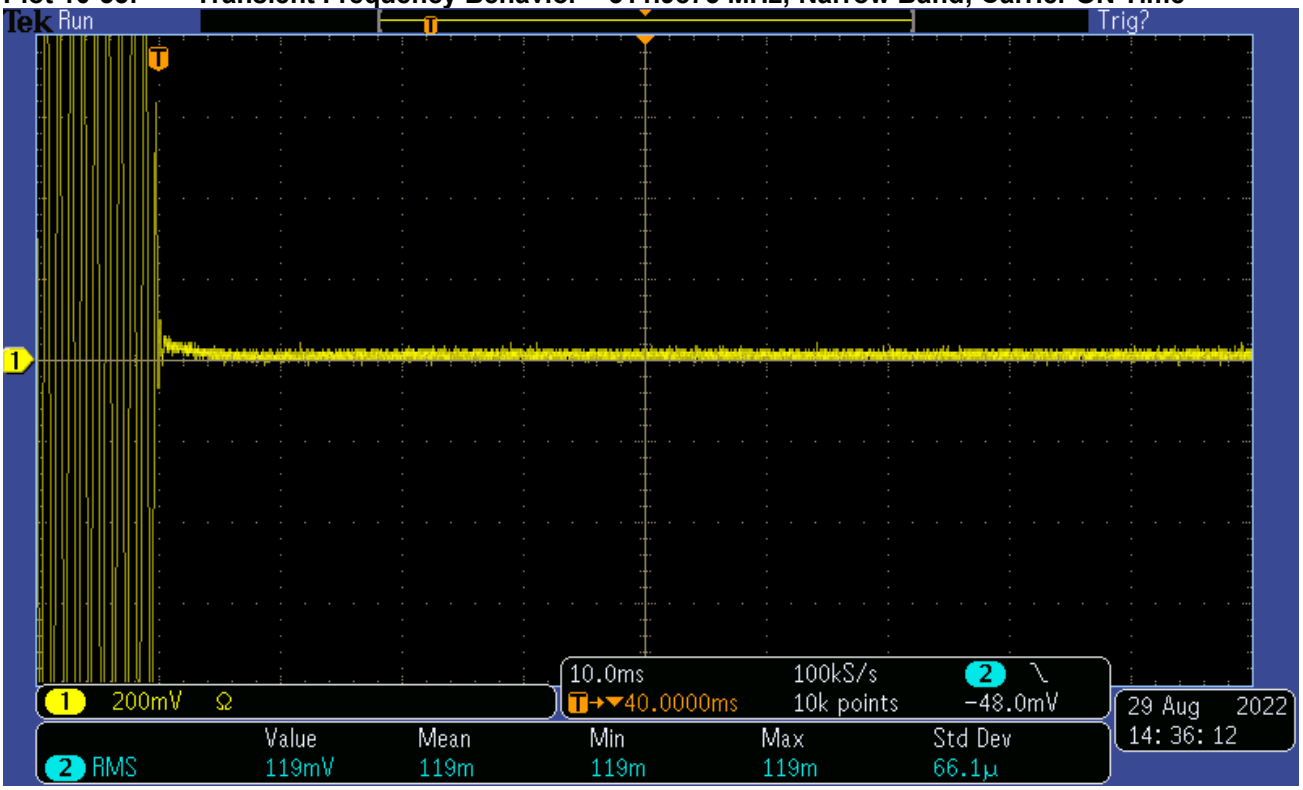
Plot 10-33: Transient Frequency Behavior – 511.9875 MHz; Wide Band; Carrier ON Time



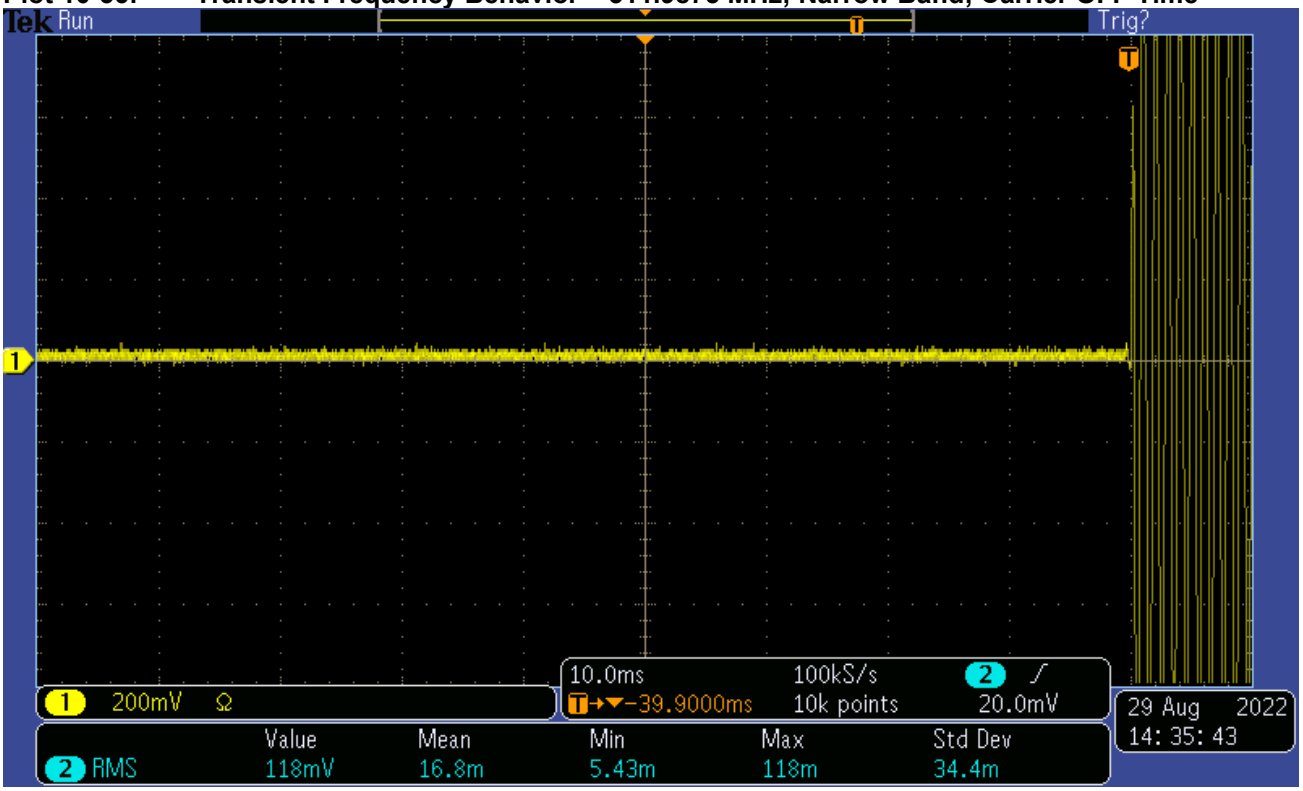
Plot 10-34: Transient Frequency Behavior – 511.9875 MHz; Wide Band; Carrier OFF Time



Plot 10-35: Transient Frequency Behavior – 511.9875 MHz; Narrow Band; Carrier ON Time



Plot 10-36: Transient Frequency Behavior – 511.9875 MHz; Narrow Band; Carrier OFF Time



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

Results: Pass

Table 10-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648A	Signal Generator	3537A01741	08/16/2024
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz–1300 MHz)	2406A00178	11/02/2024
901651	OWON	SmartDS7102V	Oscilloscope	SDS71021434850	02/28/2025
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	02/21/2023
901263	Agilent	.01-12 GHz	SMA Detector	2936A05505	Not Required
901590	Sucoflex	104	6.5' SMA Cable	145883/4	04/12/2023
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	09/21/2022
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	09/20/22

Test Personnel:

Daniel W. Baltzell		August 29, 2022
EMC Test Engineer	Signature	Date of Test

11 FCC 2.202: Necessary Bandwidth and Emission Bandwidth

Analog FM (Narrowband)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

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

C4FM Data/Voice
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1800
Bn = [9600/$\log_2$(4) + 2 (1800) (1) = 8.400 kHz
Emission designator: 8K40F1D, 8K40F1E

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

12 Conclusion

The data in this measurement report shows that the Harris Corporation, Model XL-95P V/U; FCC ID: OWDTR-0166-E, IC: 3636B-0166, complies with the applicable requirements of Parts 2, 22, 74, 80 and 90 of the FCC Rules and ISED RSS-119.