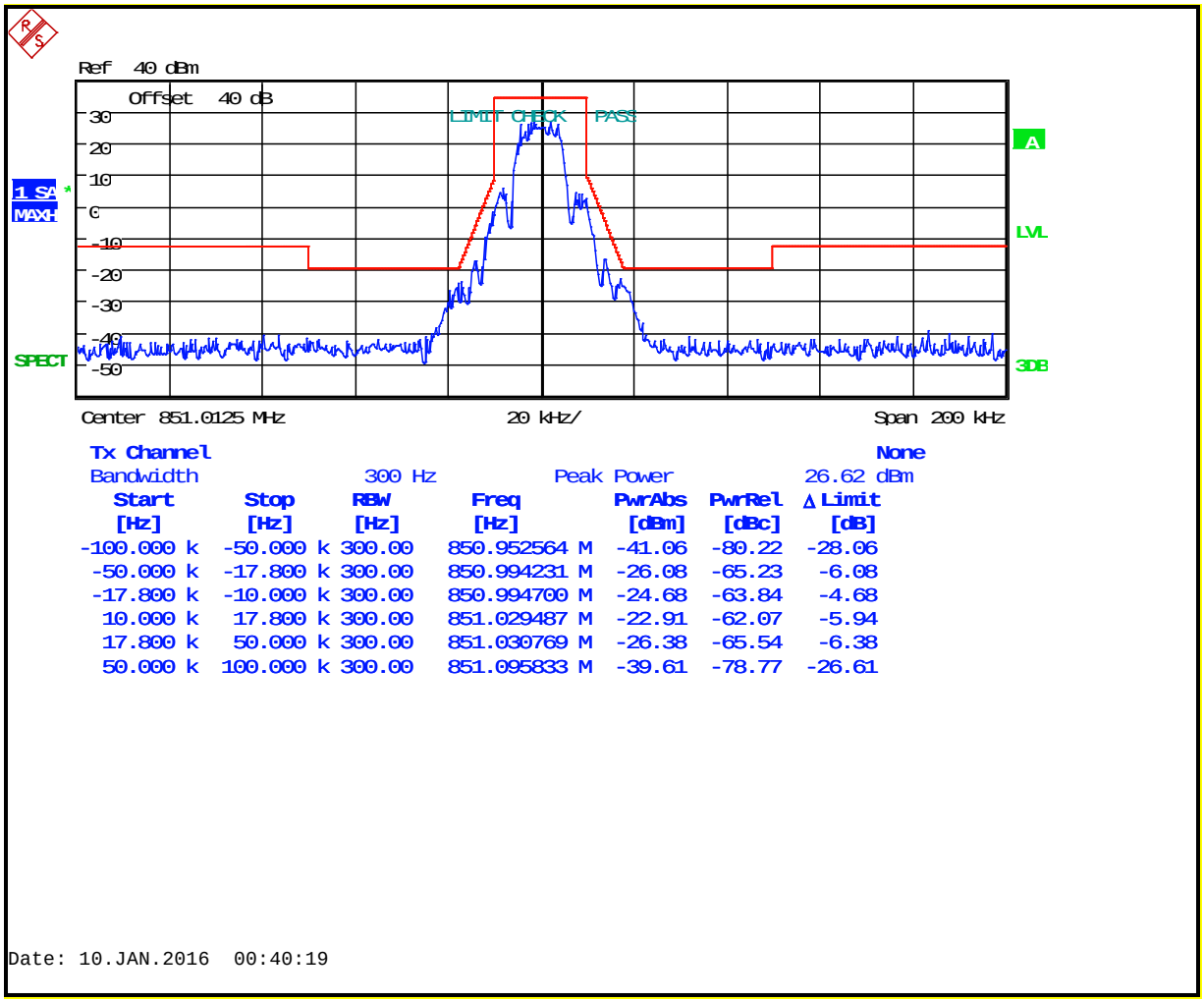
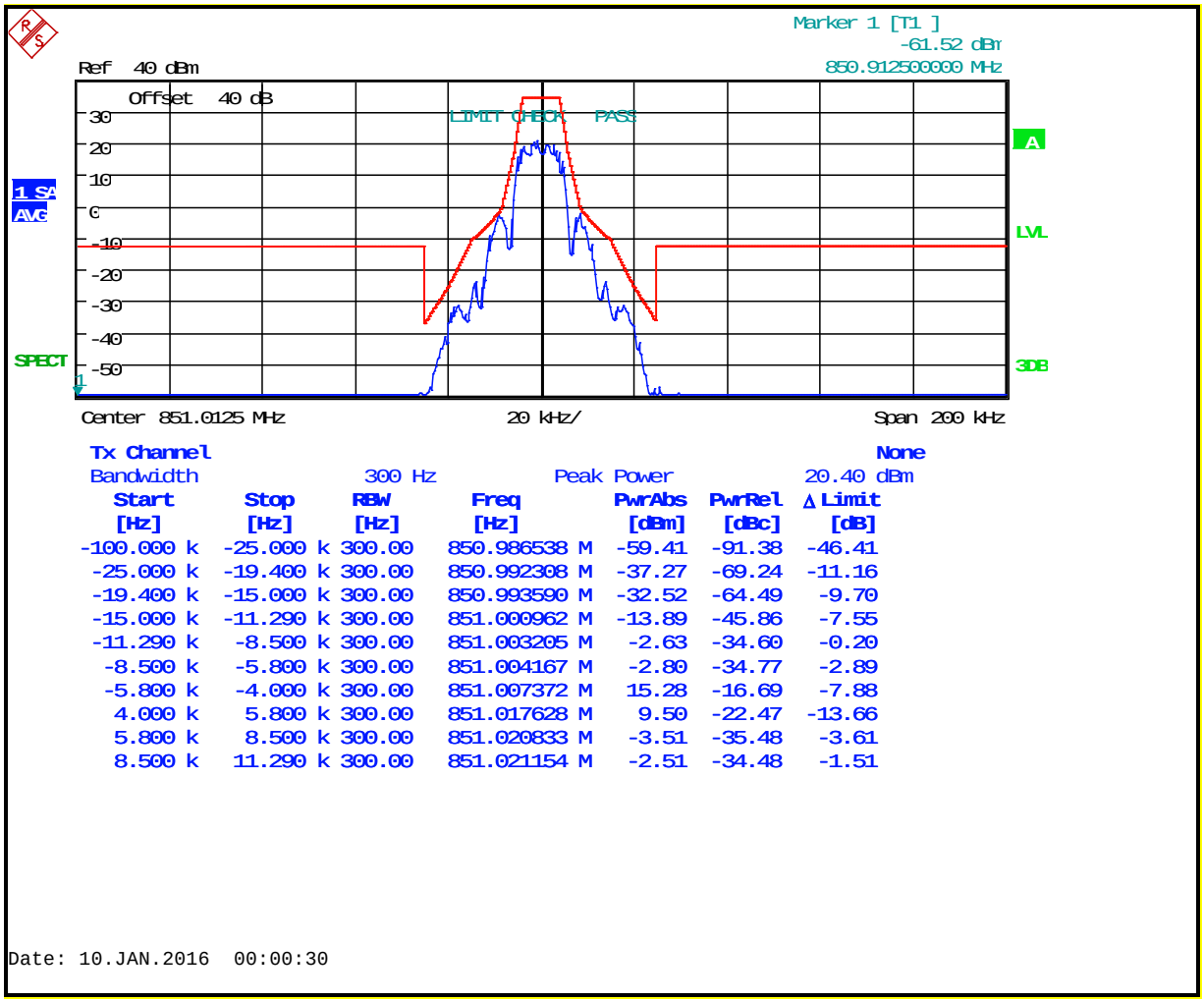
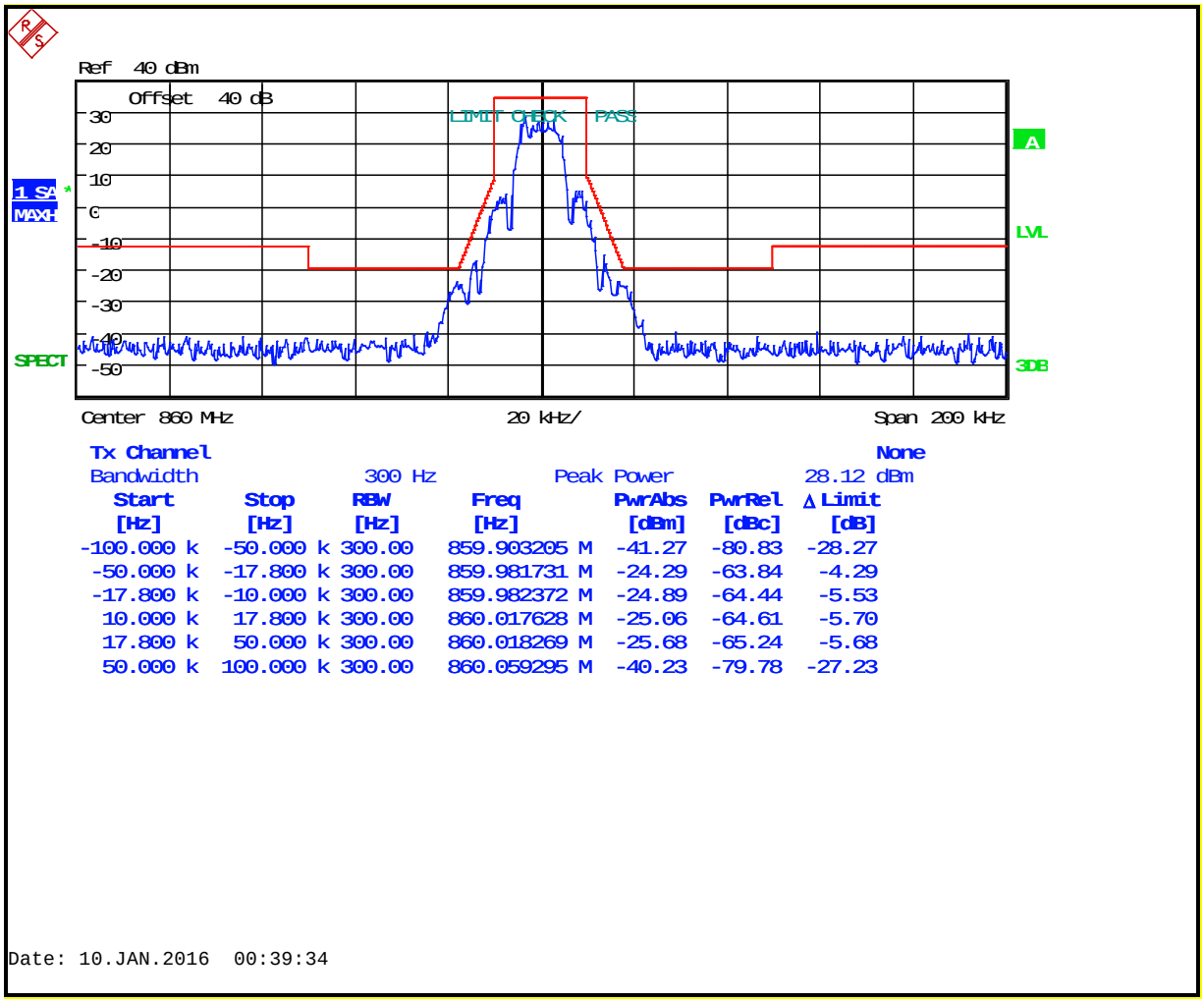
Plot 8-51: Occupied Bandwidth – 851.0125 MHz; EDACS Wideband 2-level FSK 9600 (Mask G)



Plot 8-52: Occupied Bandwidth – 851.0125 MHz; EDACS Wideband 2-level FSK 9600 (Mask H)



Plot 8-53: Occupied Bandwidth – 860.0000 MHz; EDACS Wideband 2-level FSK 9600 (Mask G)

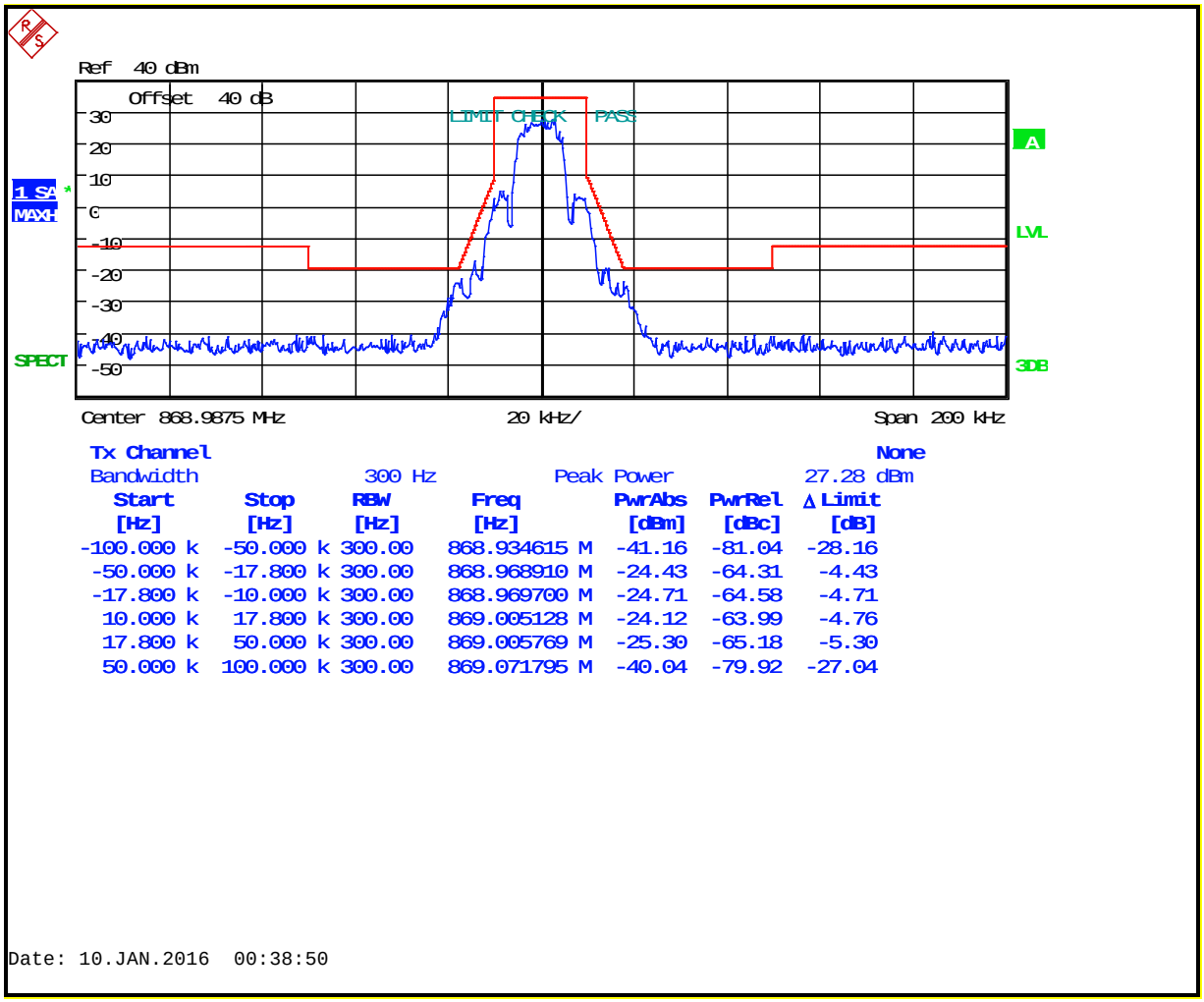


Tx Channel — None
Bandwidth 300 Hz — Peak Power 28.12 dBm

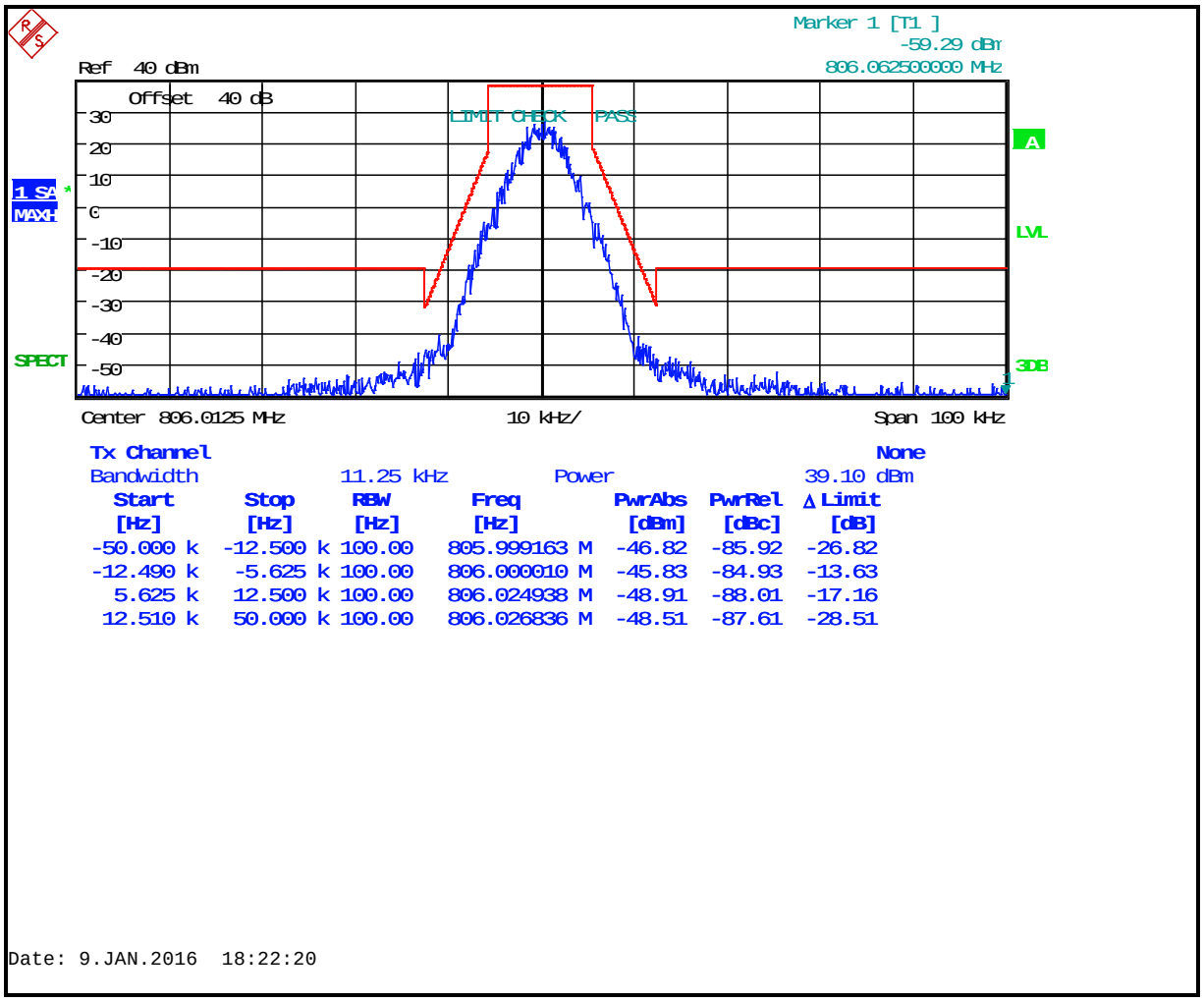
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	859.903205 M	-41.27	-80.83	-28.27
-50.000 k	-17.800 k	300.00	859.981731 M	-24.29	-63.84	-4.29
-17.800 k	-10.000 k	300.00	859.982372 M	-24.89	-64.44	-5.53
10.000 k	17.800 k	300.00	860.017628 M	-25.06	-64.61	-5.70
17.800 k	50.000 k	300.00	860.018269 M	-25.68	-65.24	-5.68
50.000 k	100.000 k	300.00	860.059295 M	-40.23	-79.78	-27.23

Date: 10.JAN.2016 00:39:34

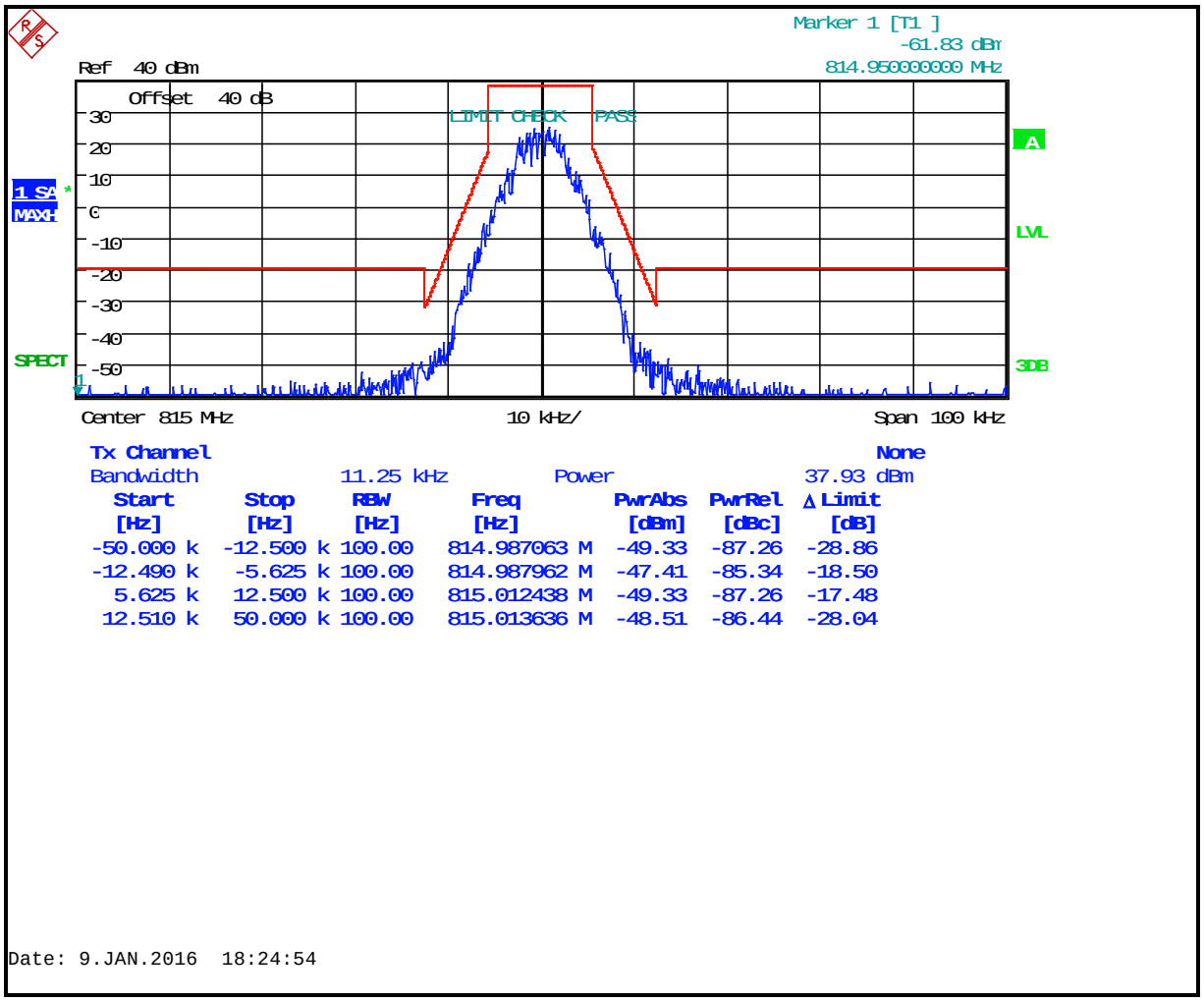
Plot 8-54: Occupied Bandwidth – 868.9875 MHz; EDACS Wideband 2-level FSK 9600 (Mask G)



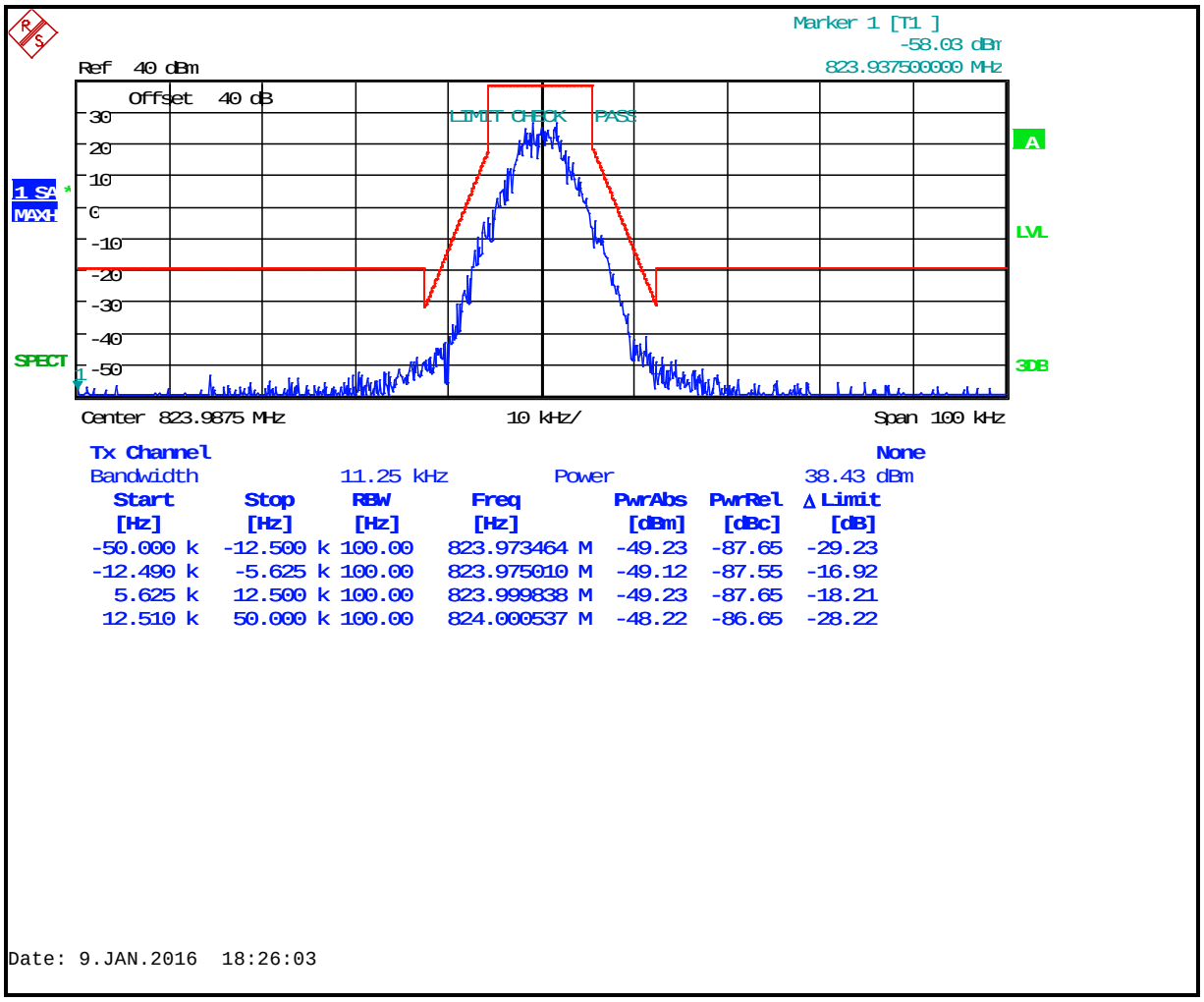
Plot 8-55: Occupied Bandwidth – 806.0125 MHz; OTP Narrowband 4-level FSK (Mask D)



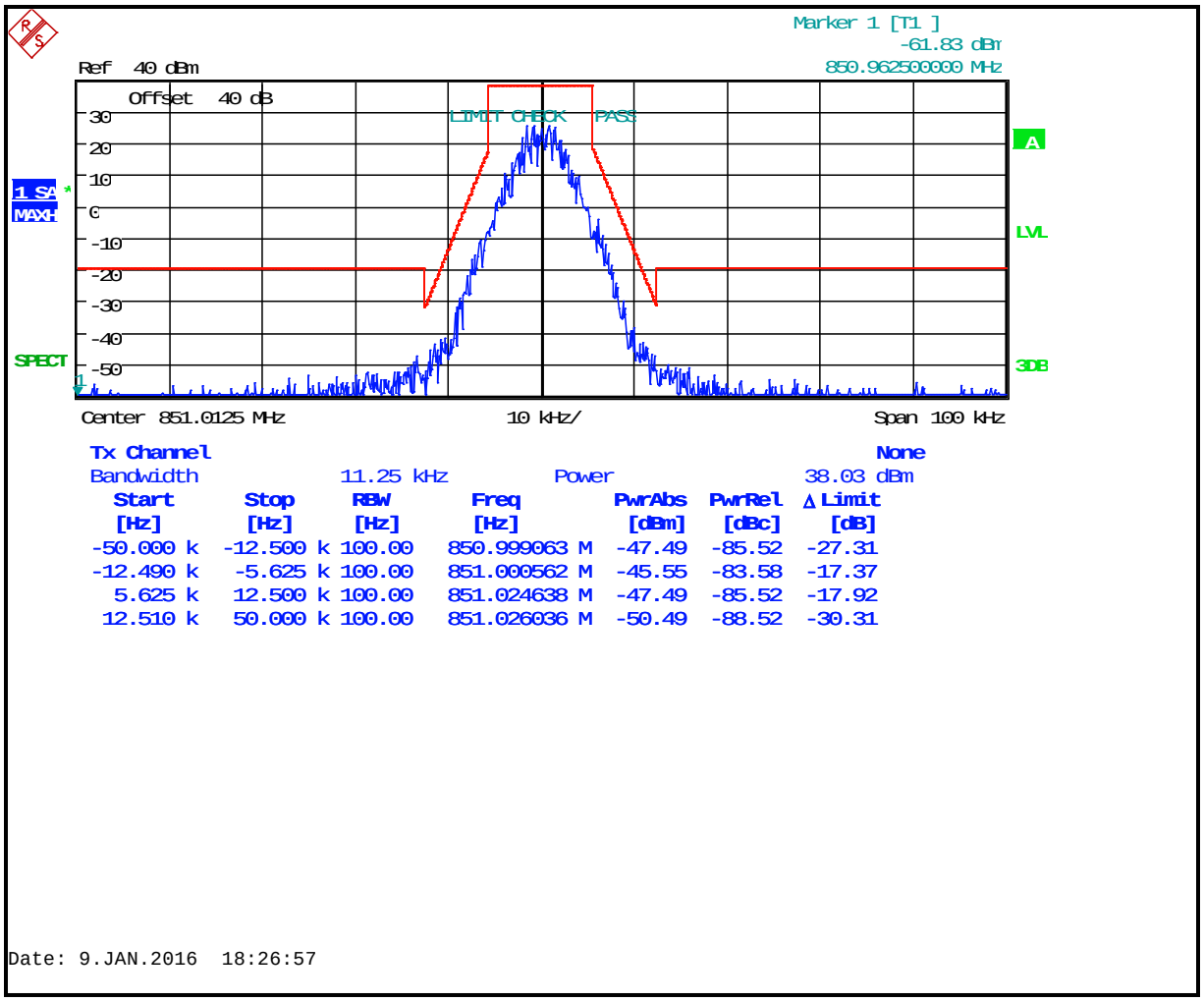
Plot 8-56: Occupied Bandwidth – 815.0000 MHz; OTP Narrowband 4-level FSK (Mask D)



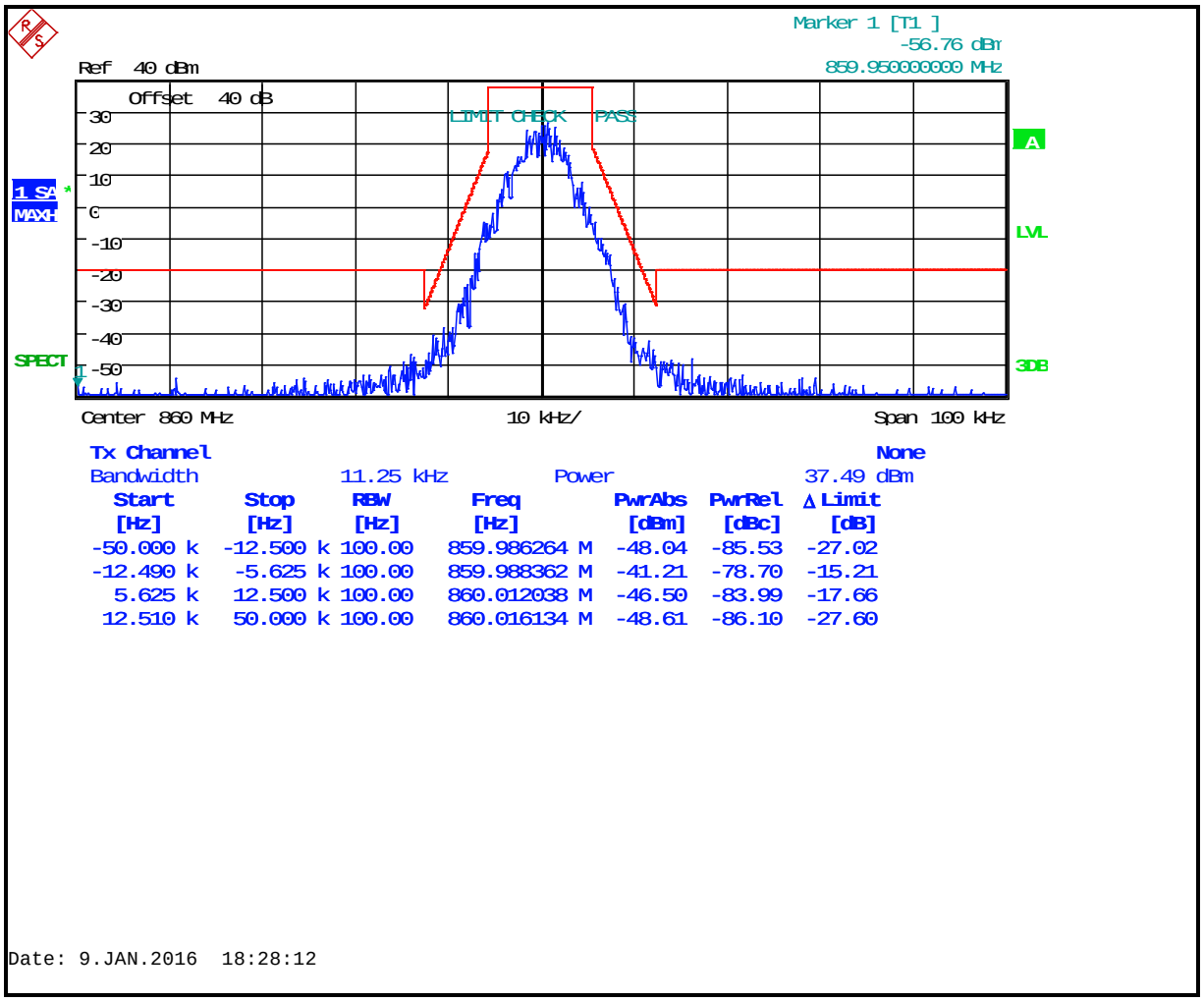
Plot 8-57: Occupied Bandwidth – 823.9875 MHz; OTP Narrowband 4-level FSK (Mask D)



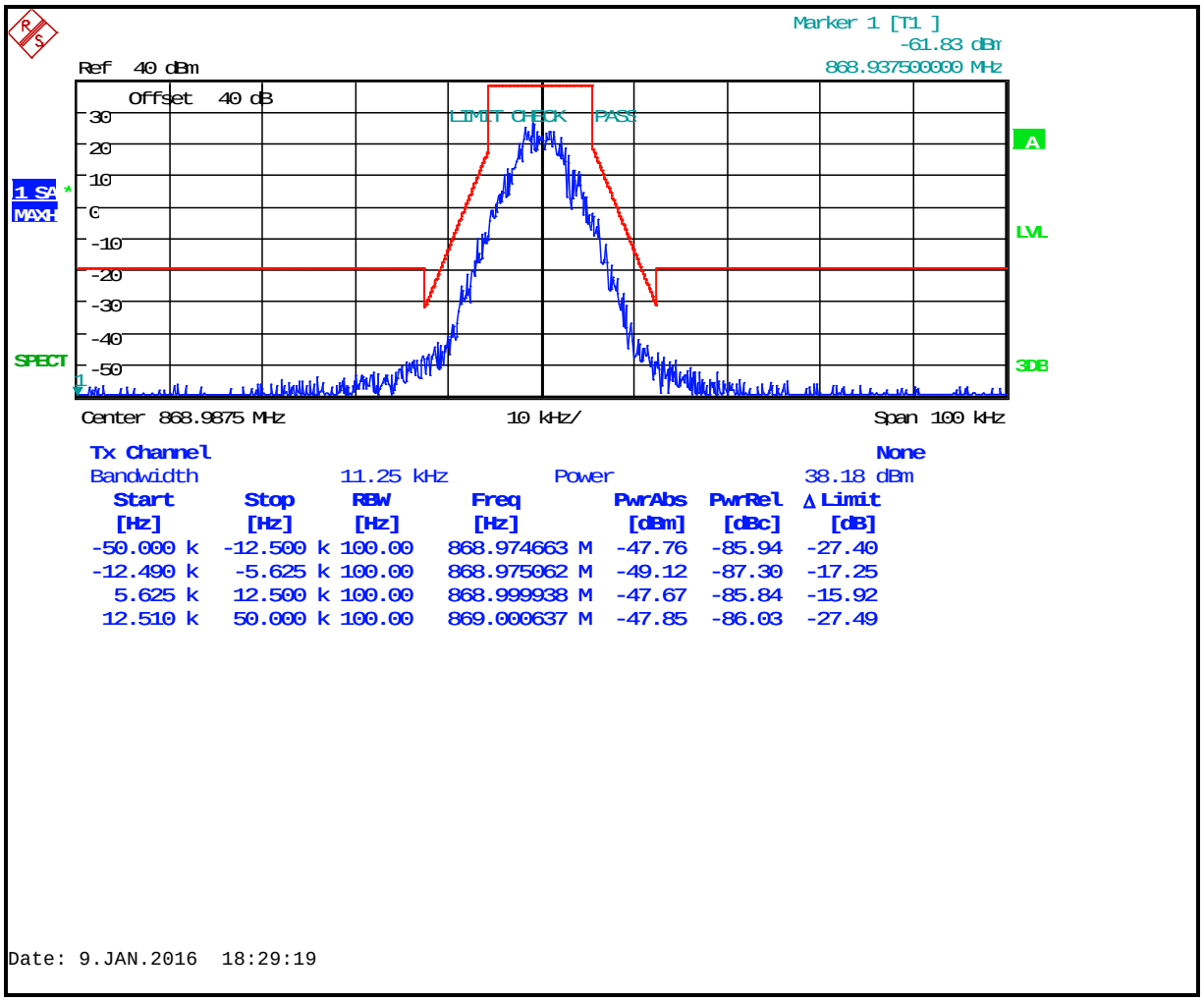
Plot 8-58: Occupied Bandwidth – 851.0125 MHz; OTP Narrowband 4-level FSK (Mask D)



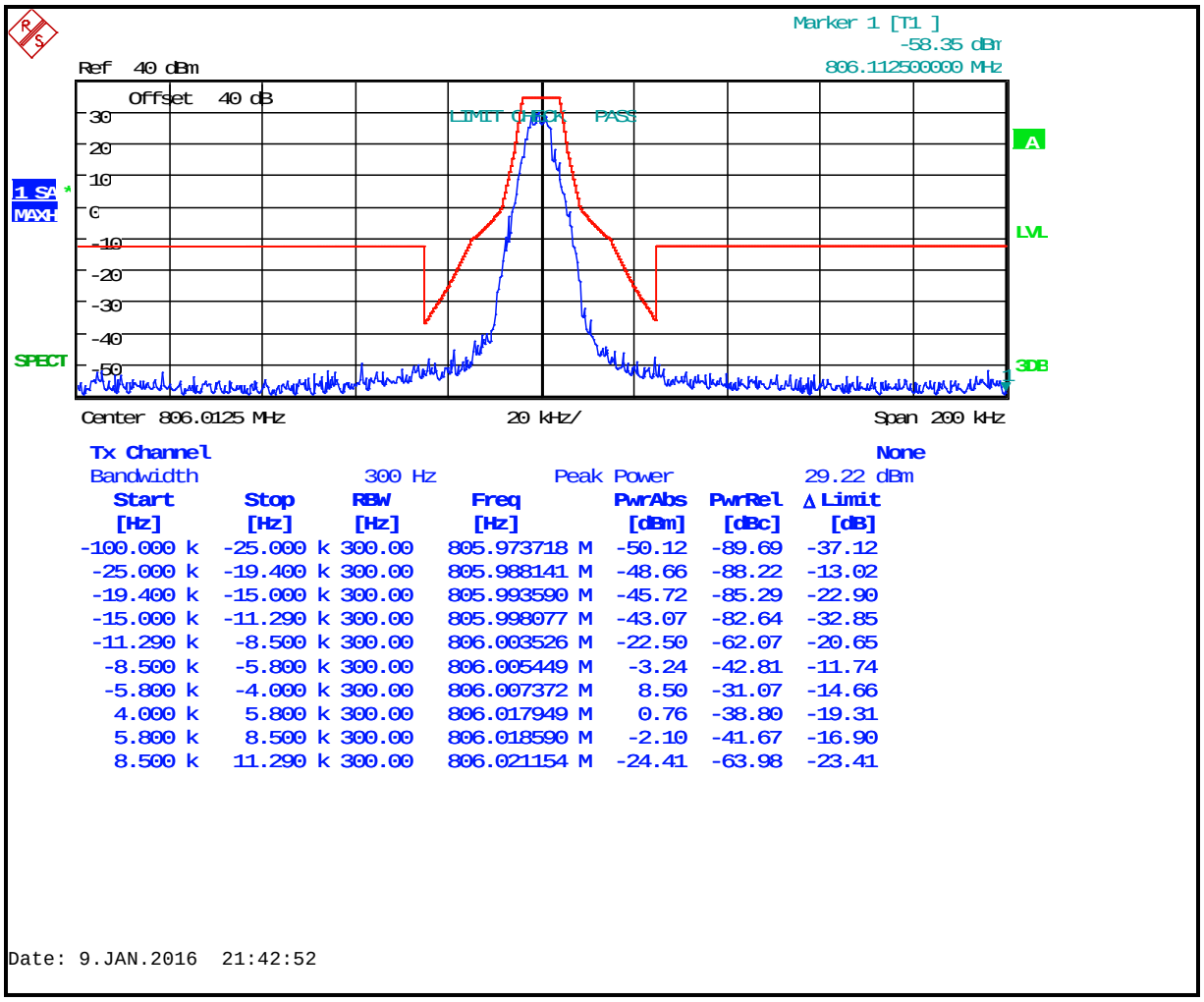
Plot 8-59: Occupied Bandwidth – 860.0000 MHz; OTP Narrowband 4-level FSK (Mask D)



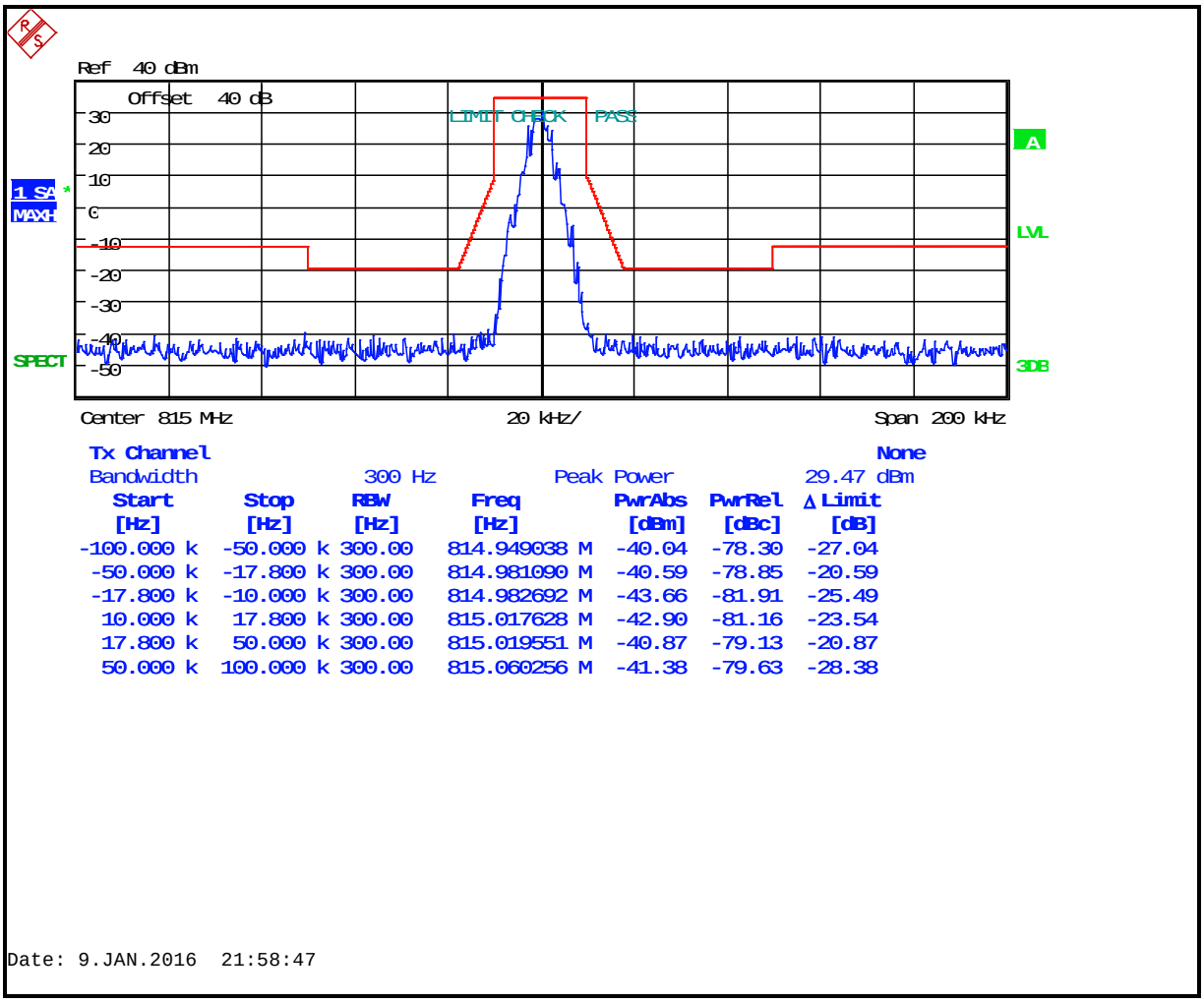
Plot 8-60: Occupied Bandwidth – 868.9875 MHz; OTP Narrowband 4-level FSK (Mask D)



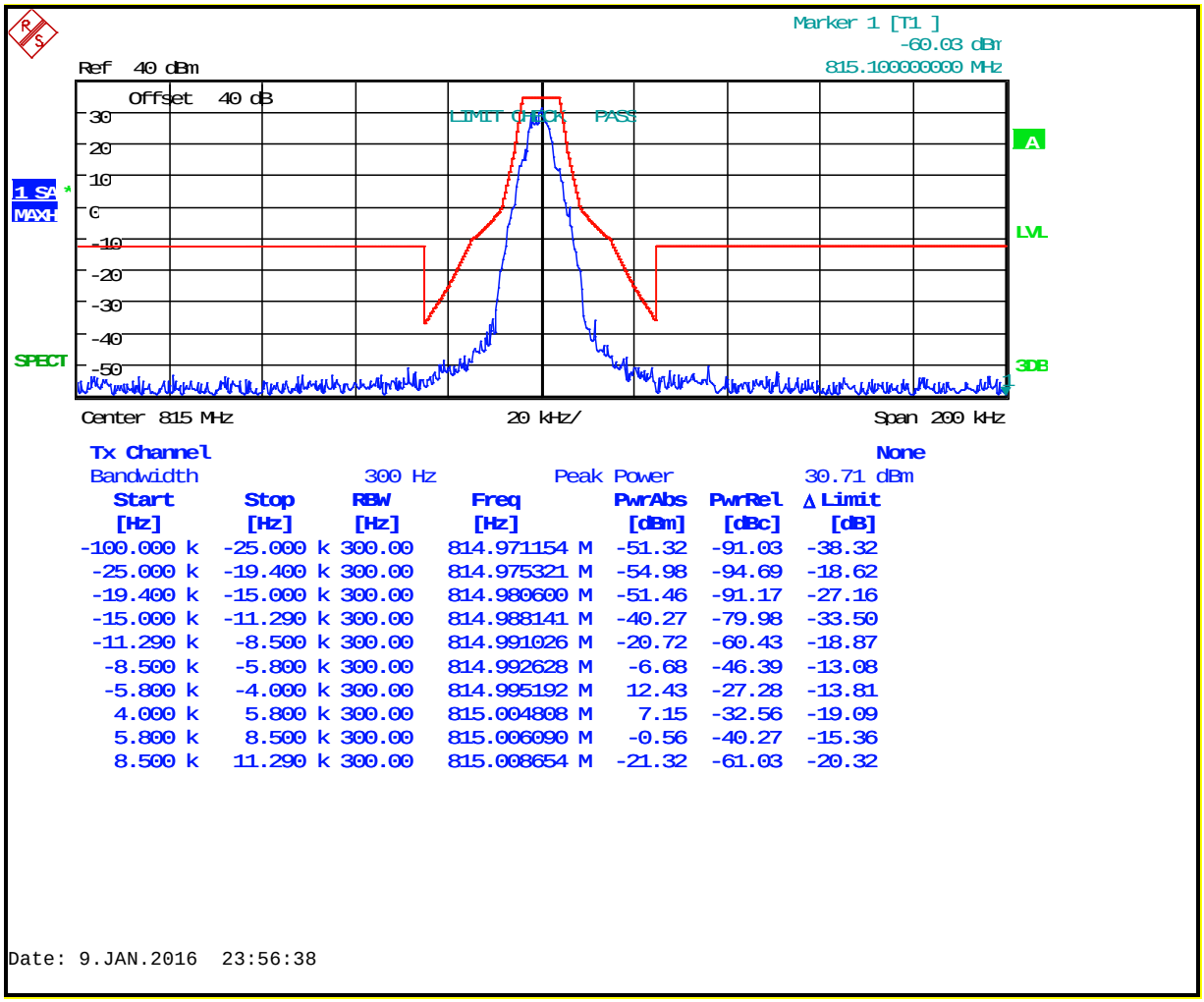
Plot 8-61: Occupied Bandwidth – 806.0125 MHz; OTP Narrowband 4-level FSK (Mask H)



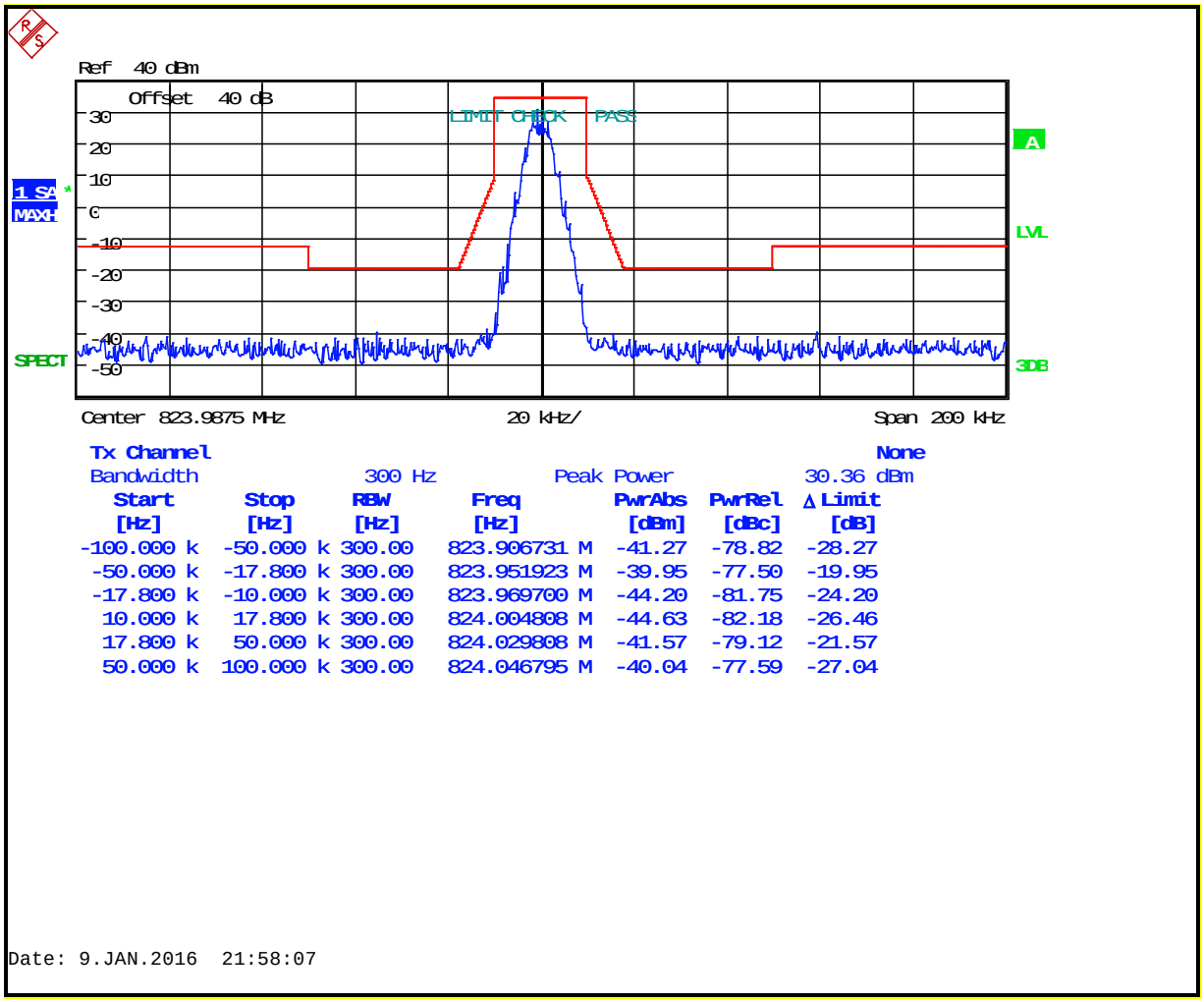
Plot 8-62: Occupied Bandwidth – 815.0000 MHz; OTP Narrowband 4-level FSK (Mask G)



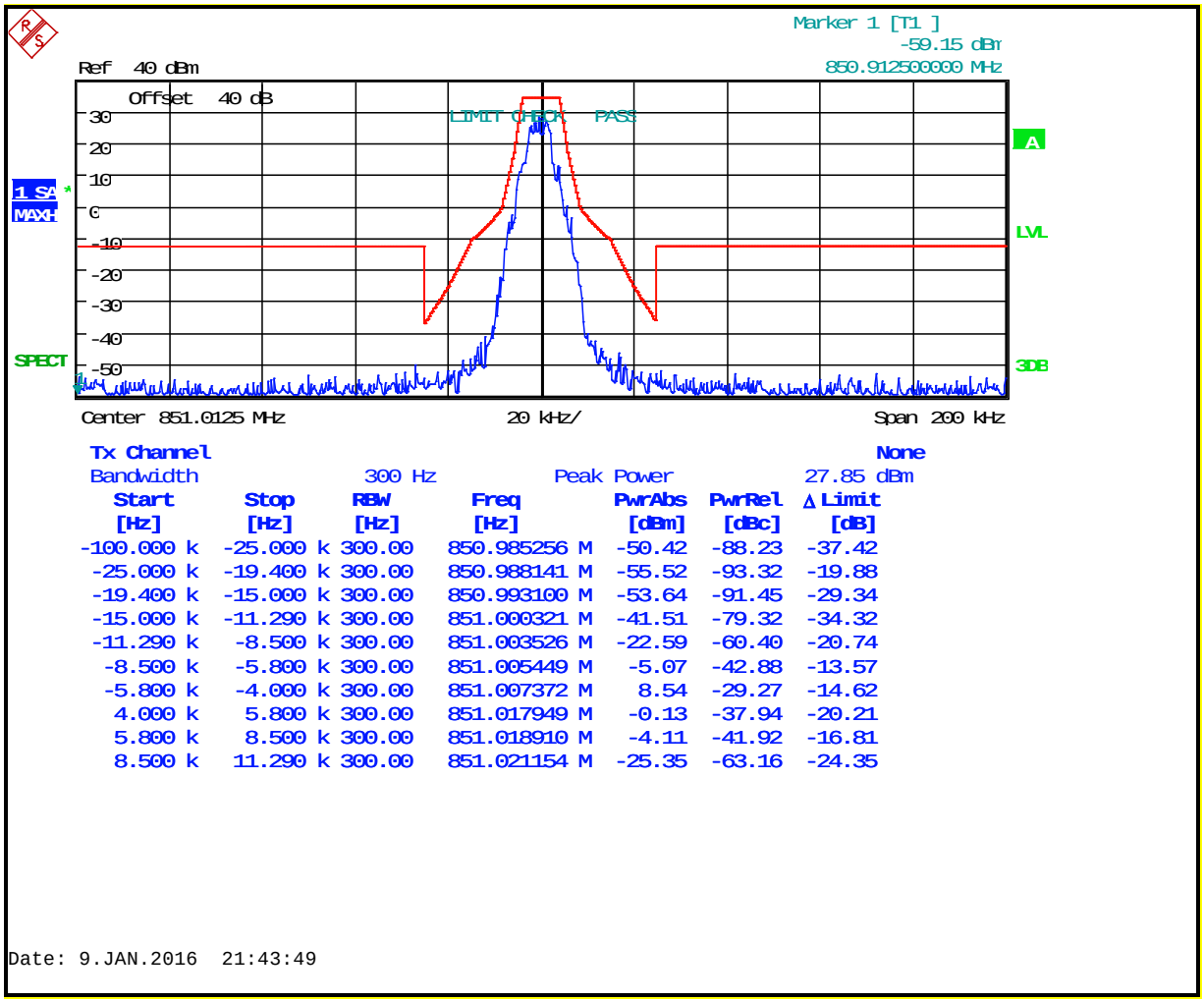
Plot 8-63: Occupied Bandwidth – 815.0000 MHz; OTP Narrowband 4-level FSK (Mask H)



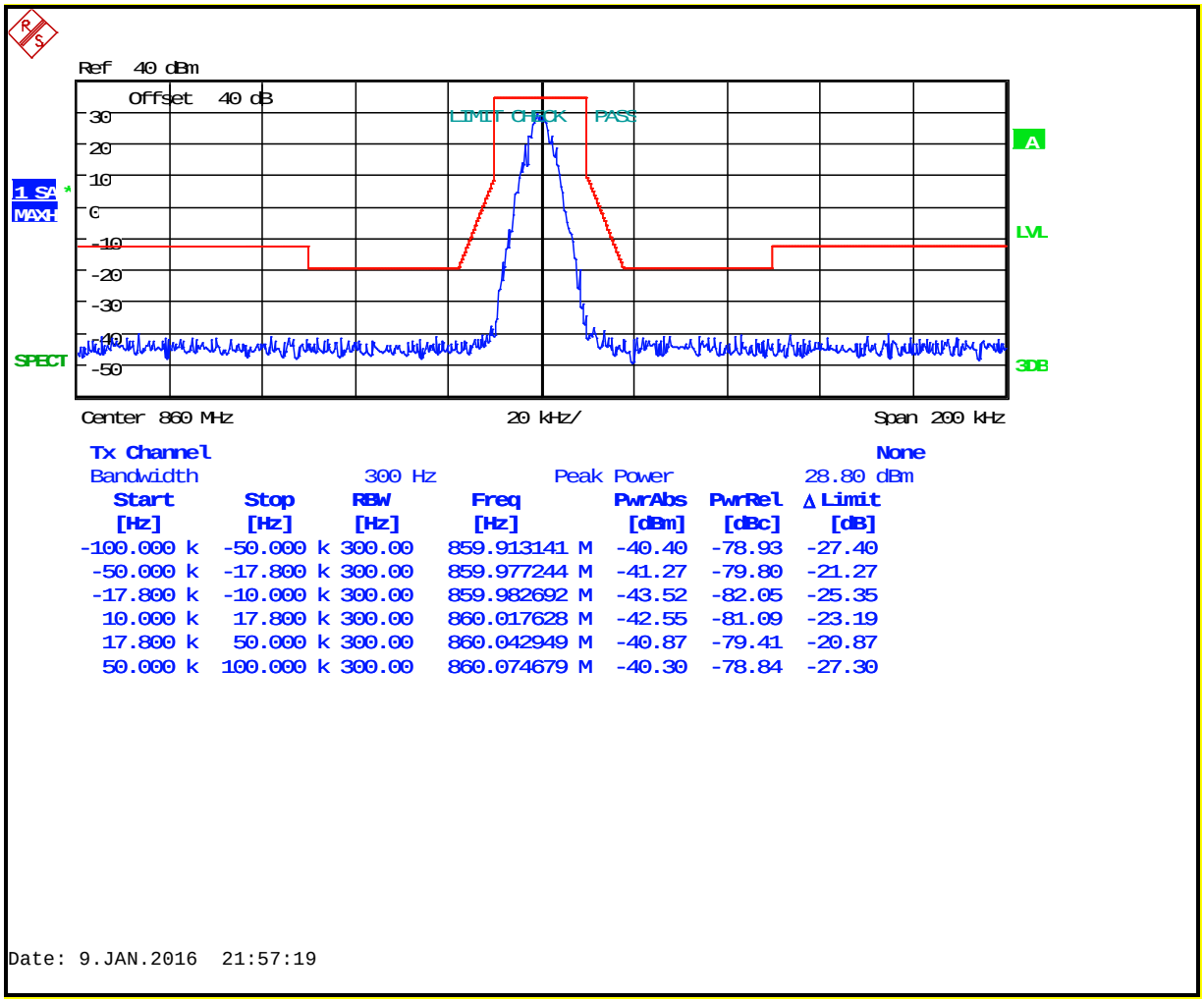
Plot 8-64: Occupied Bandwidth – 823.9875 MHz; OTP Narrowband 4-level FSK (Mask G)



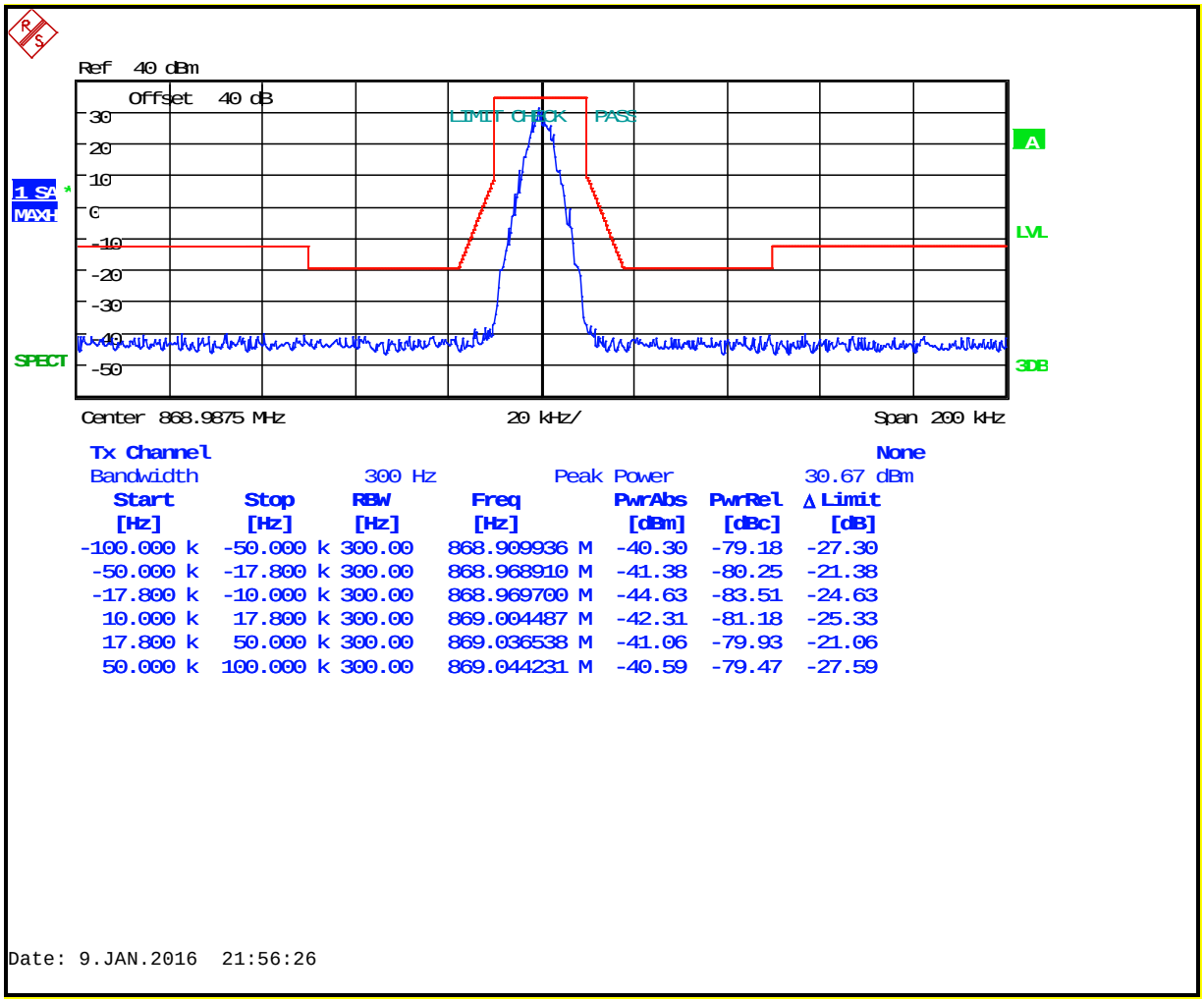
Plot 8-65: Occupied Bandwidth – 851.0125 MHz; OTP Narrowband 4-level FSK (Mask H)



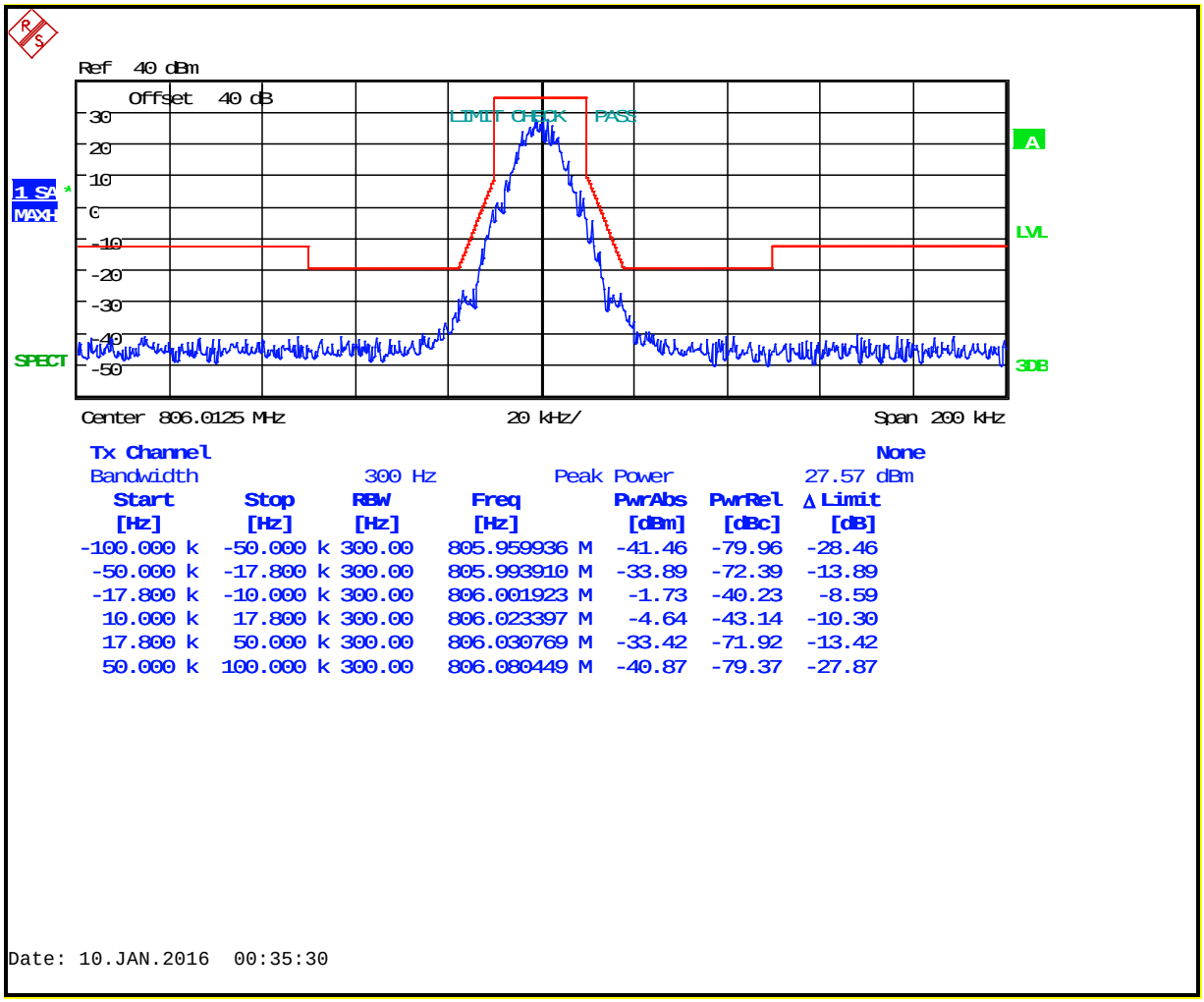
Plot 8-66: Occupied Bandwidth – 860.0000 MHz; OTP Narrowband 4-level FSK (Mask G)



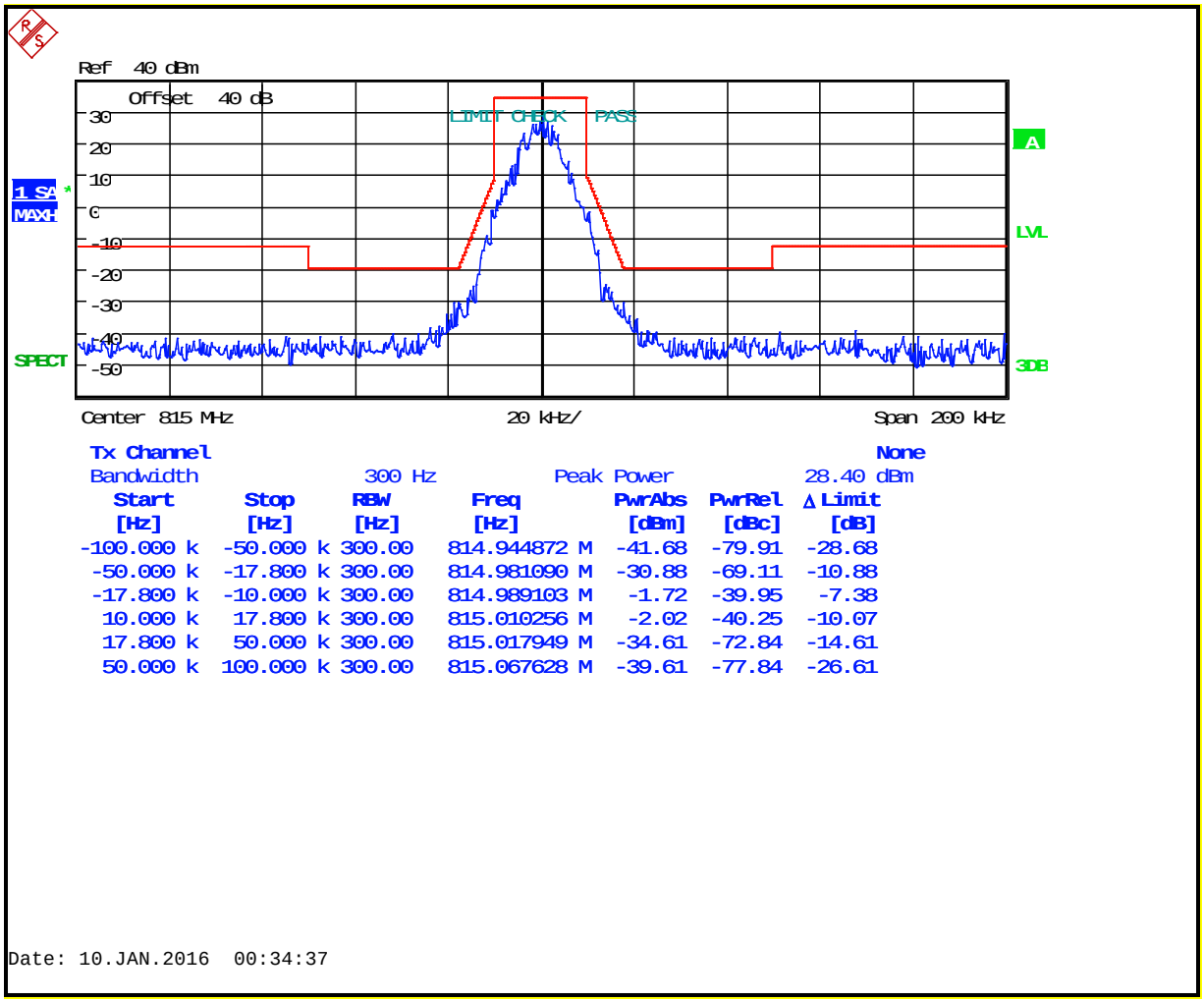
Plot 8-67: Occupied Bandwidth – 868.9875 MHz; OTP Narrowband 4-level FSK (Mask G)



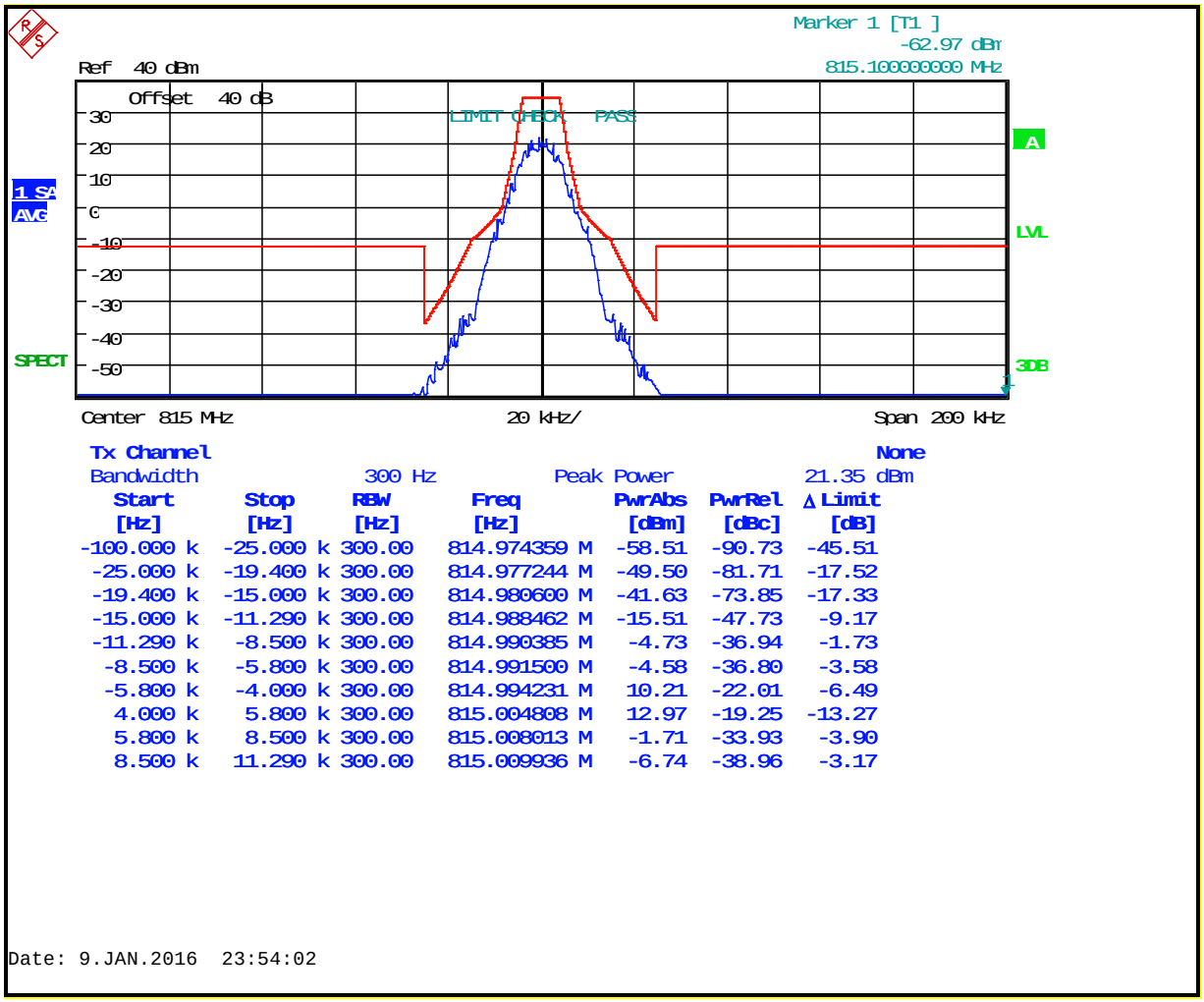
Plot 8-68: Occupied Bandwidth – 806.0125 MHz; OTP NPSPAC 4-level FSK (Mask G)



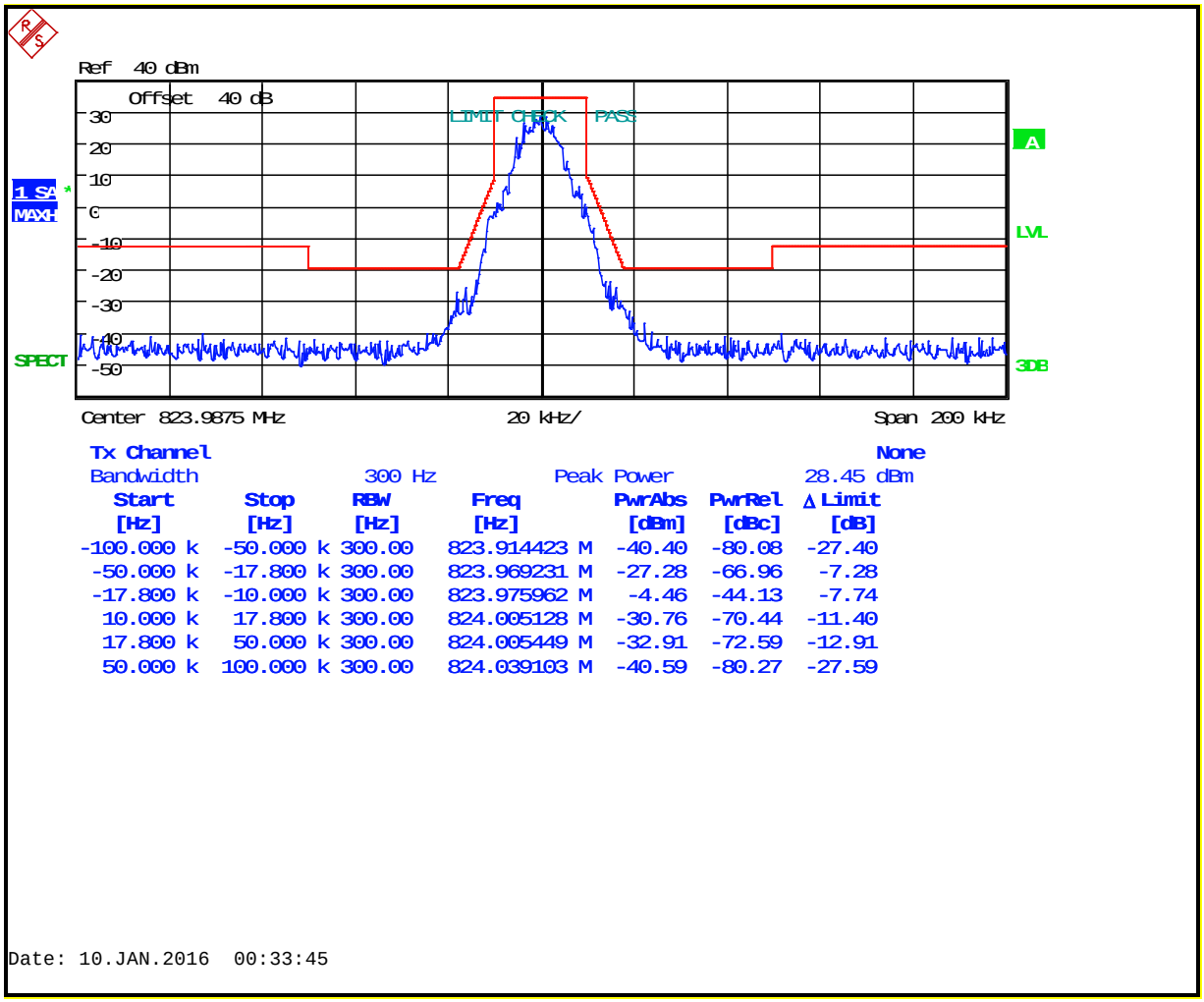
Plot 8-69: Occupied Bandwidth – 815.0000 MHz; OTP NPSPAC 4-level FSK (Mask G)



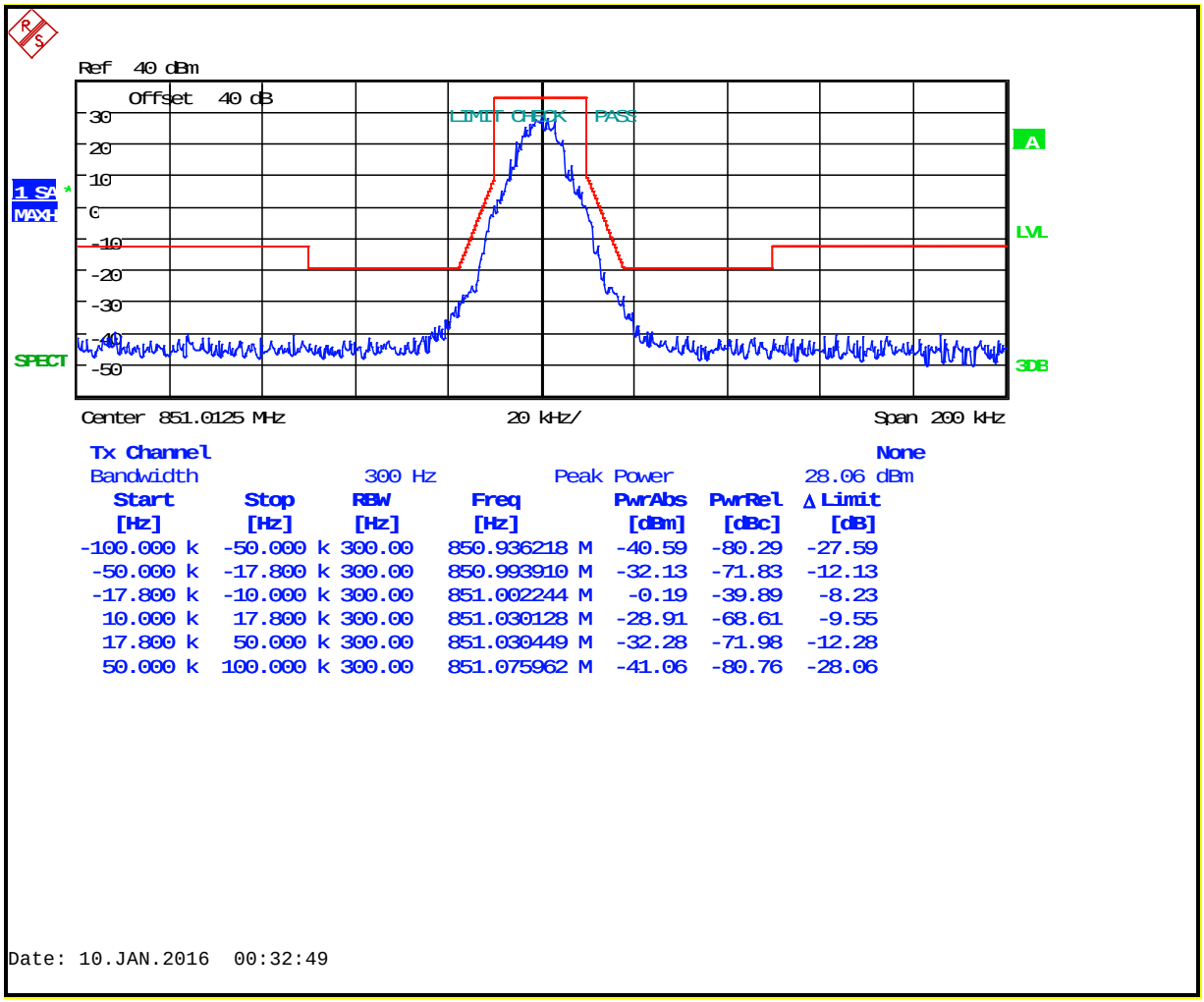
Plot 8-70: Occupied Bandwidth – 815.0000 MHz; OTP NPSPAC 4-level FSK (Mask H)



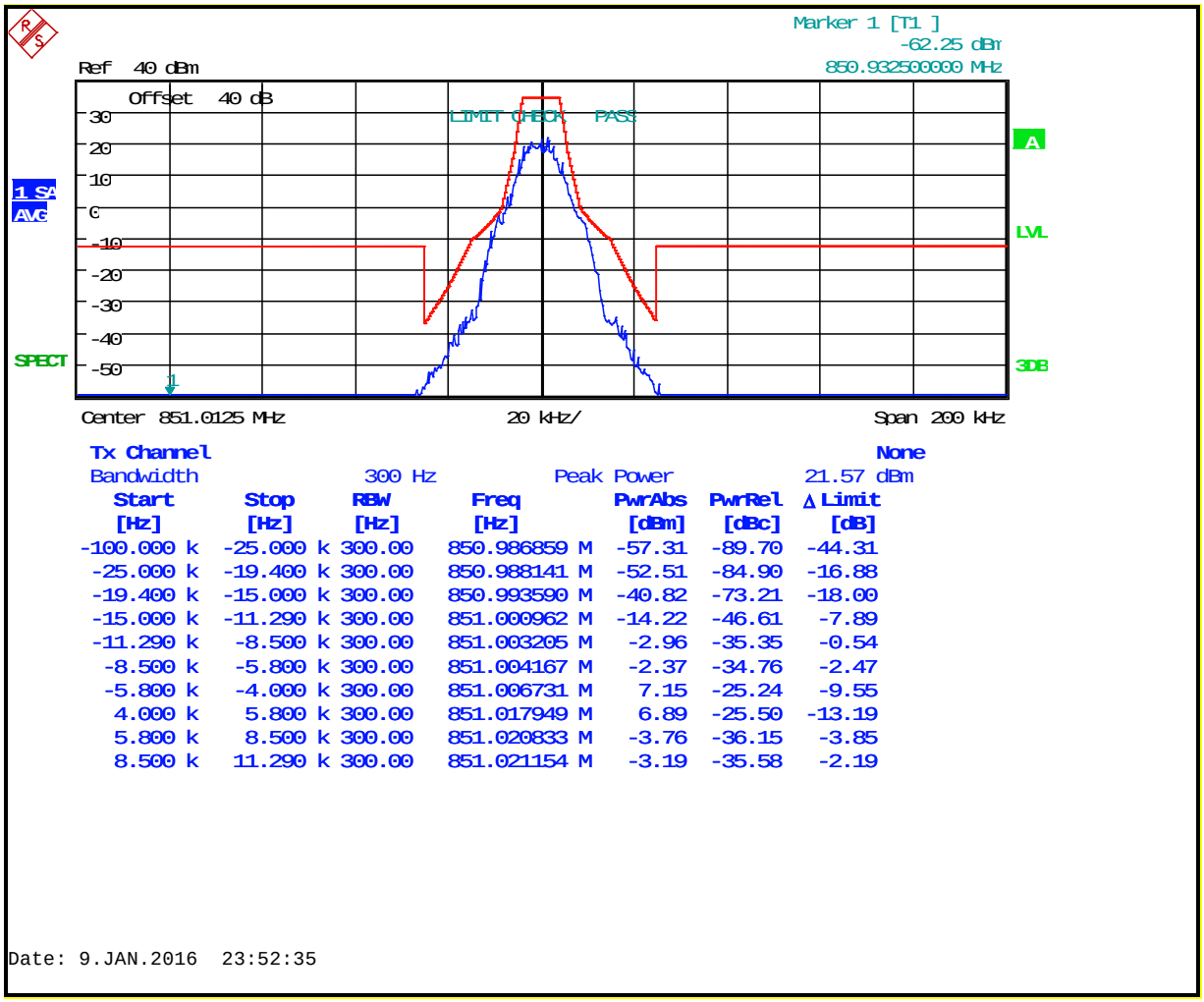
Plot 8-71: Occupied Bandwidth – 823.9875 MHz; OTP NPSPAC 4-level FSK (Mask G)



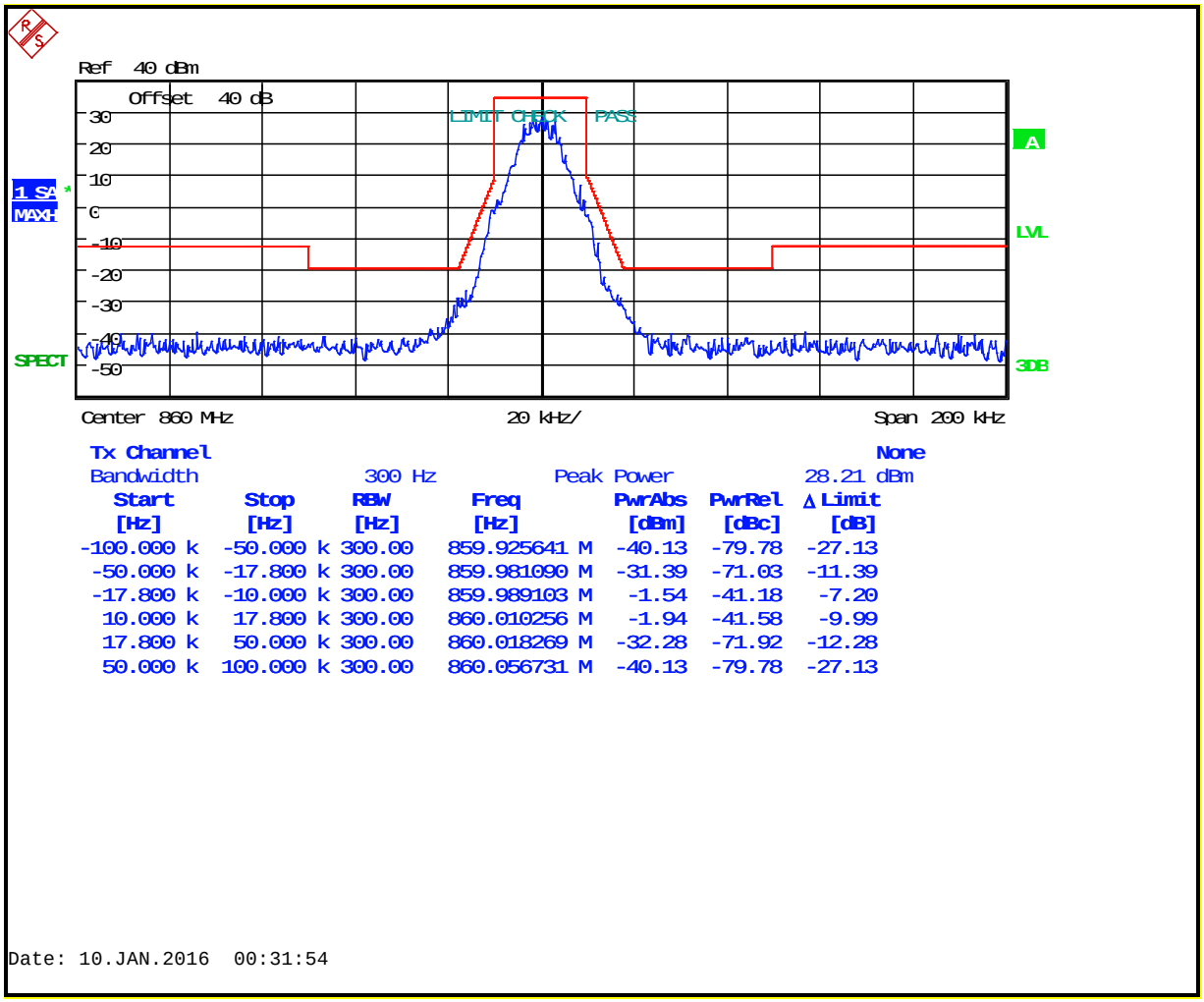
Plot 8-72: Occupied Bandwidth – 851.0125 MHz; OTP NPSPAC 4-level FSK (Mask G)



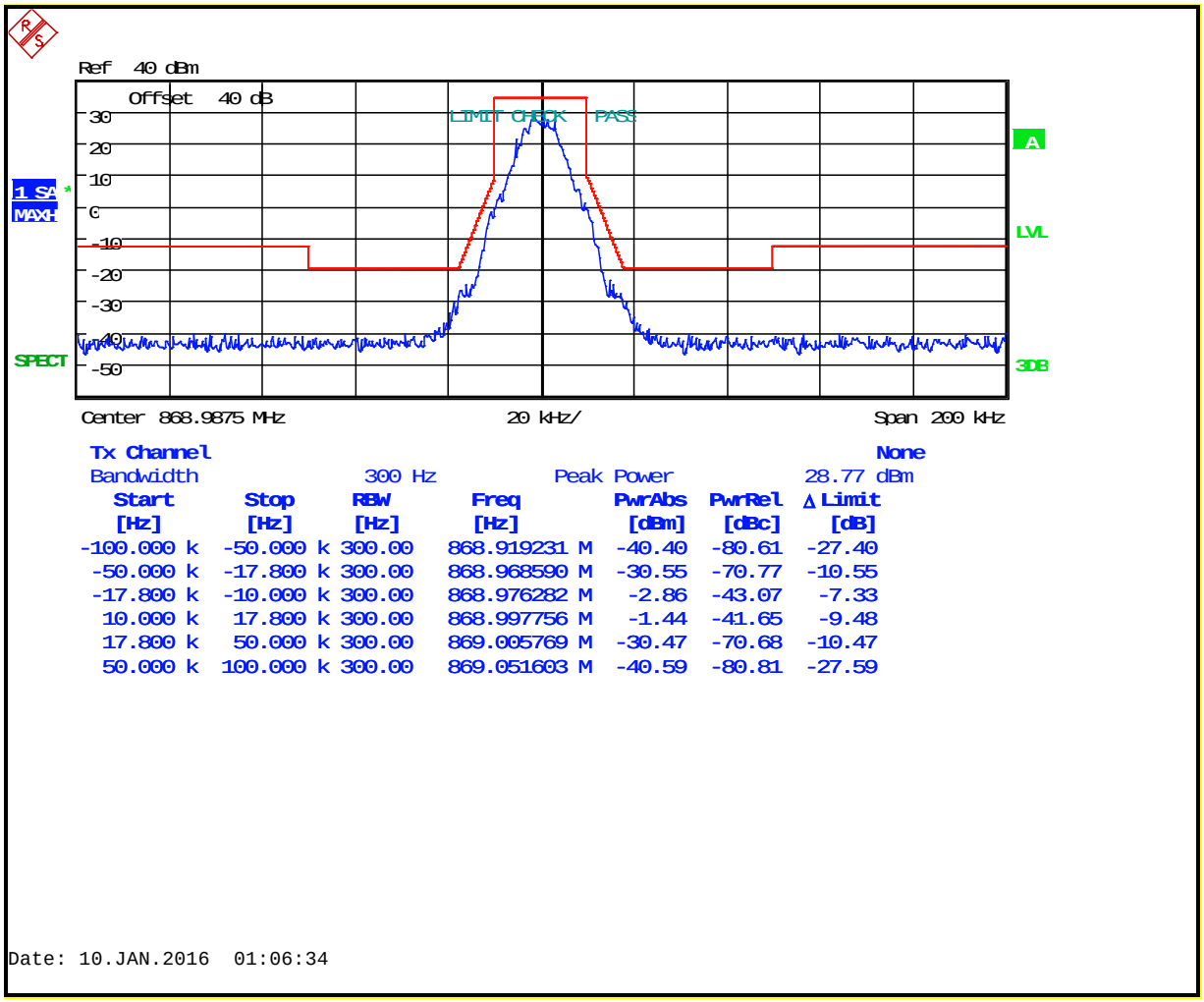
Plot 8-73: Occupied Bandwidth – 851.0125 MHz; OTP NPSPAC 4-level FSK (Mask H)



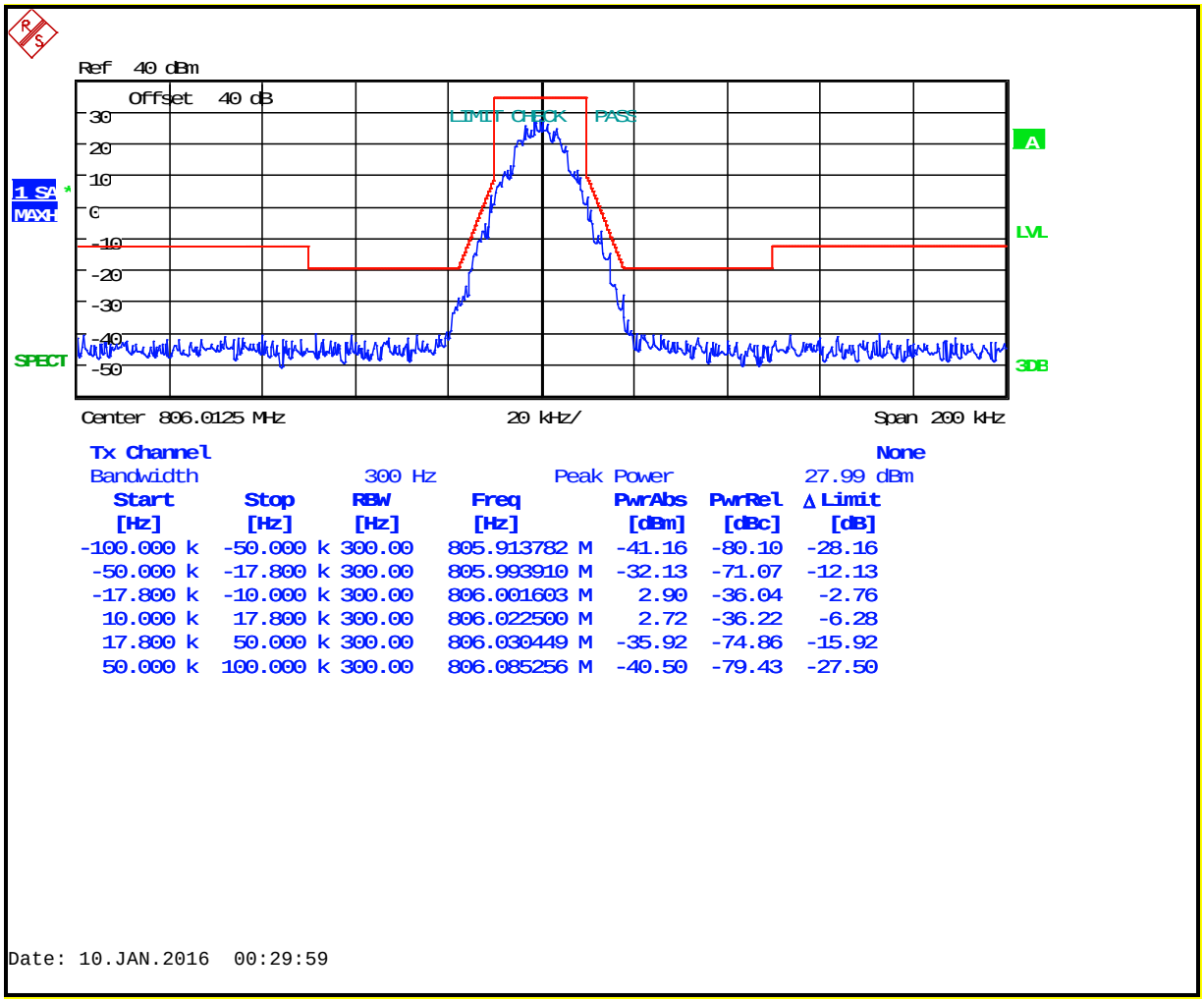
Plot 8-74: Occupied Bandwidth – 860.0000 MHz; OTP NPSPAC 4-level FSK (Mask G)



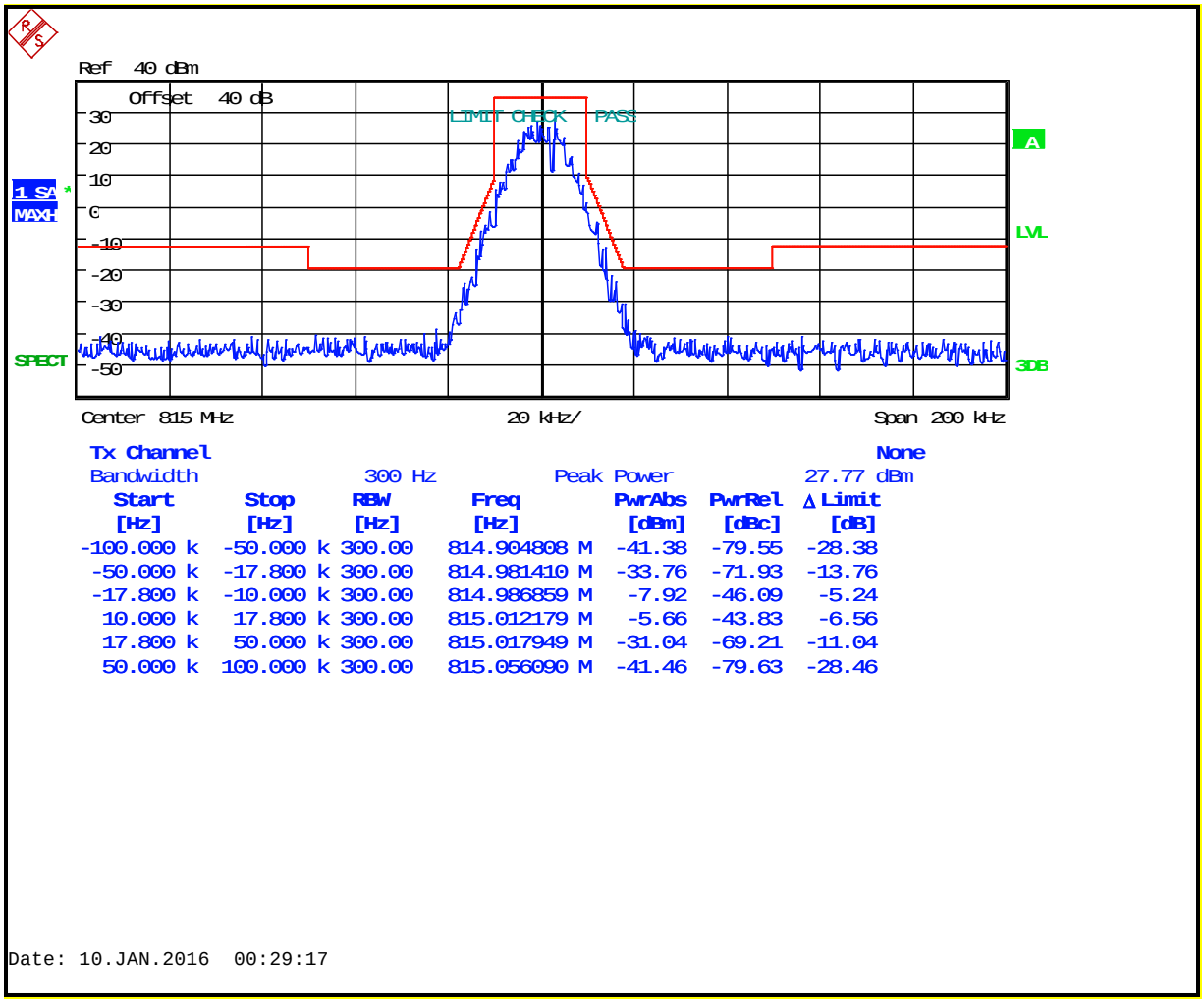
Plot 8-75: Occupied Bandwidth – 868.9875 MHz; OTP NPSPAC 4-level FSK (Mask G)



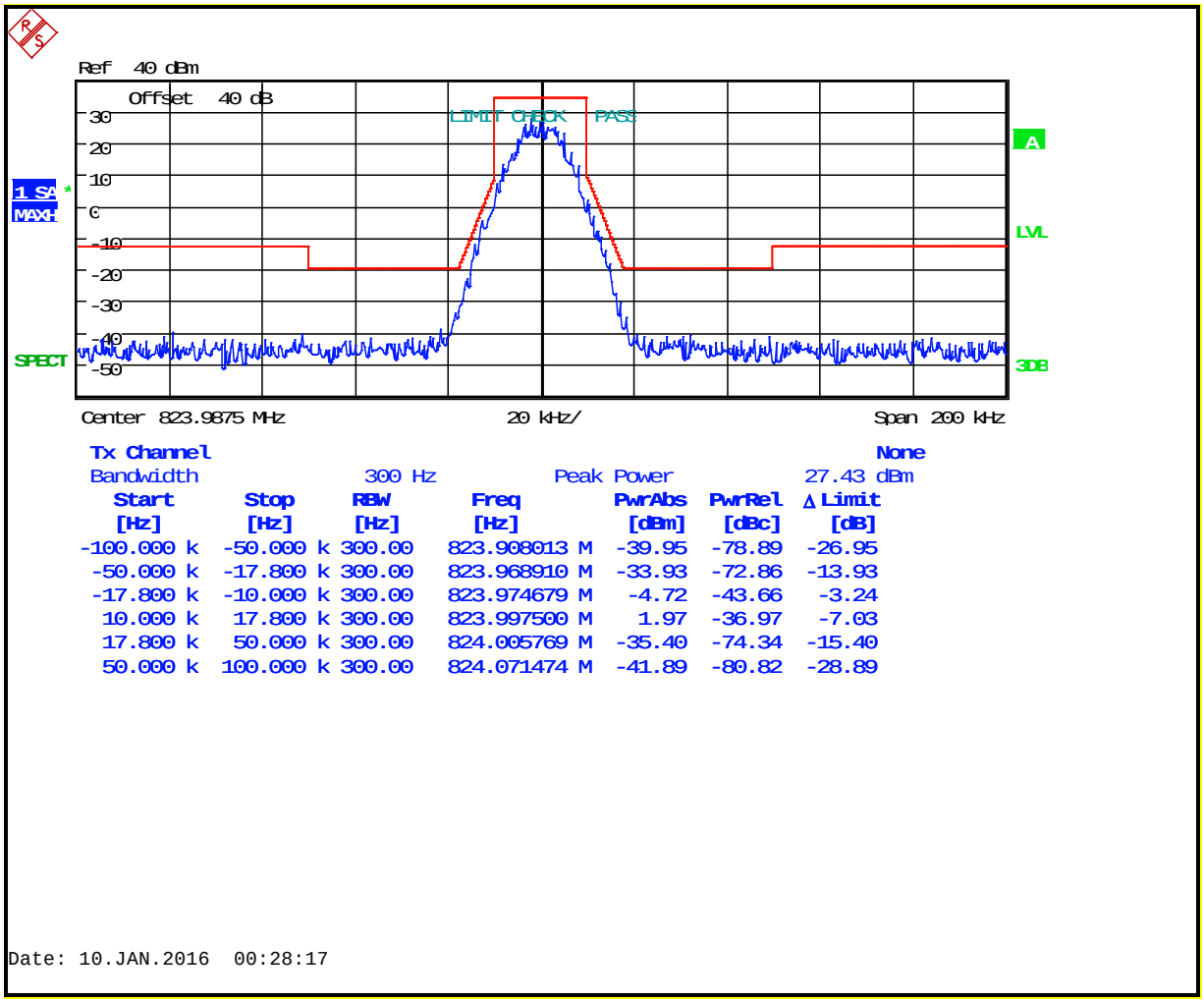
Plot 8-76: Occupied Bandwidth – 806.0125 MHz; OTP SMR 4-level FSK (Mask G)



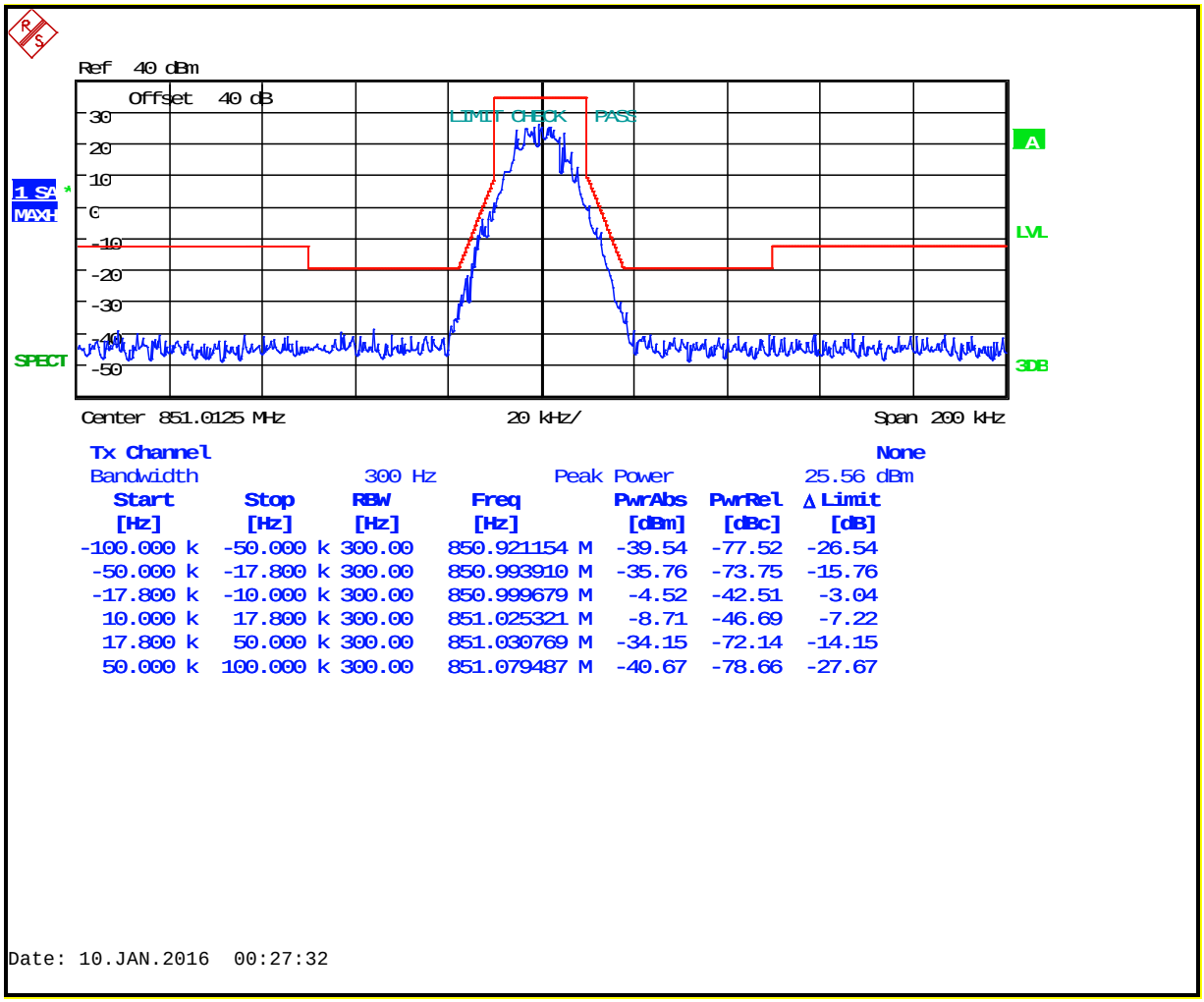
Plot 8-77: Occupied Bandwidth – 815.0000 MHz; OTP SMR 4-level FSK (Mask G)



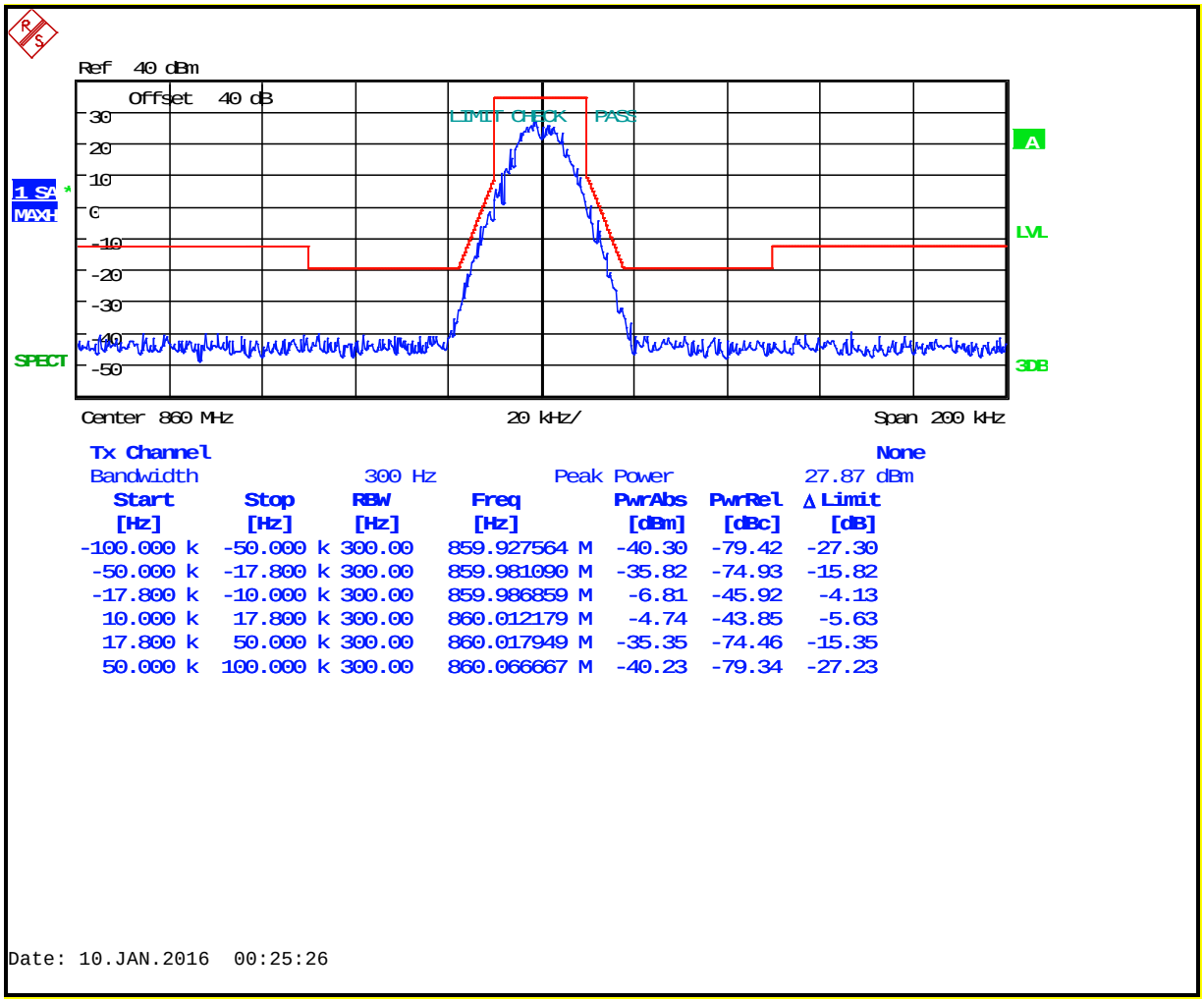
Plot 8-78: Occupied Bandwidth – 823.9875 MHz; OTP SMR 4-level FSK (Mask G)



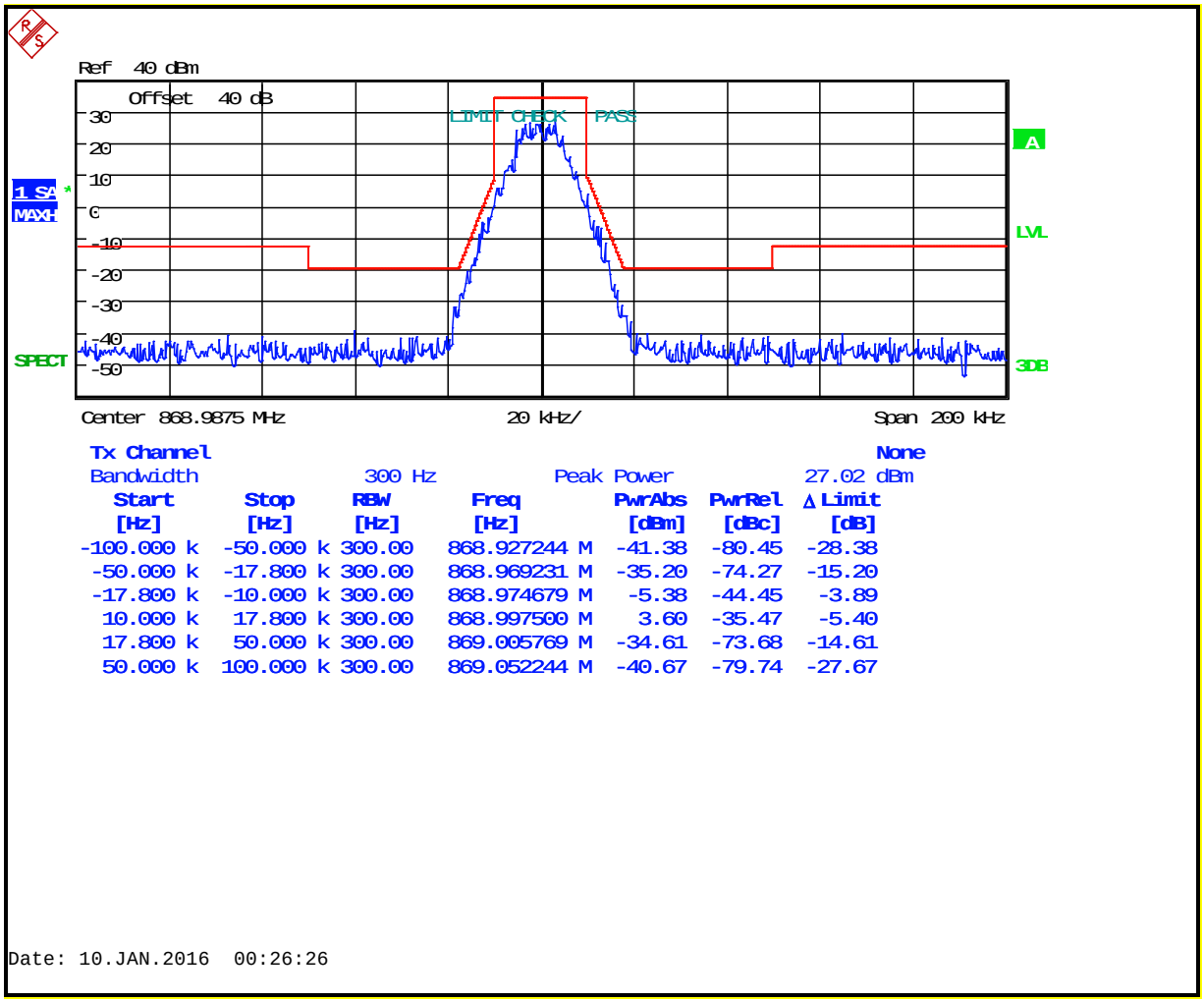
Plot 8-79: Occupied Bandwidth – 851.0125 MHz; OTP SMR 4-level FSK (Mask G)



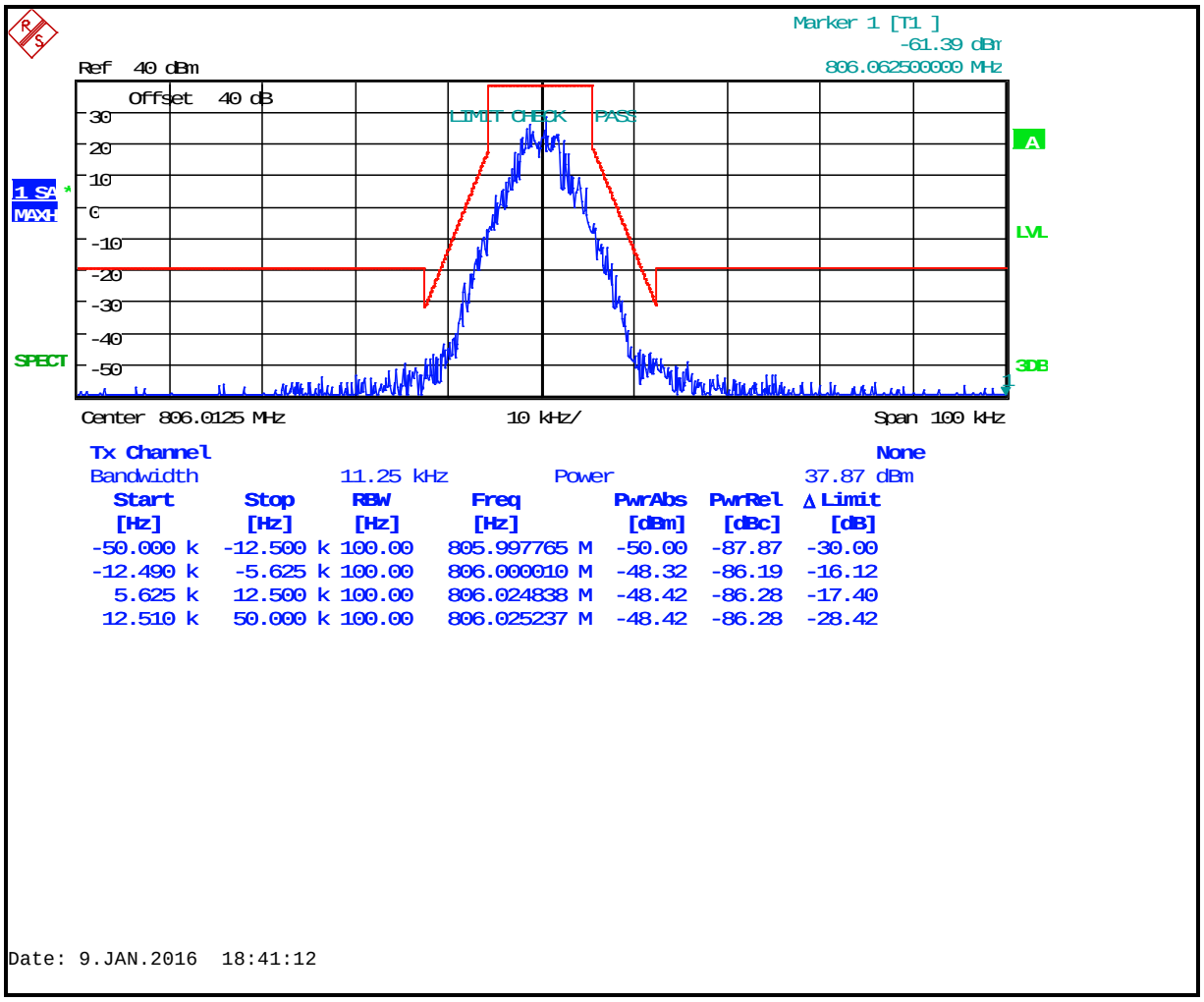
Plot 8-80: Occupied Bandwidth – 860.0000 MHz; OTP SMR 4-level FSK (Mask G)



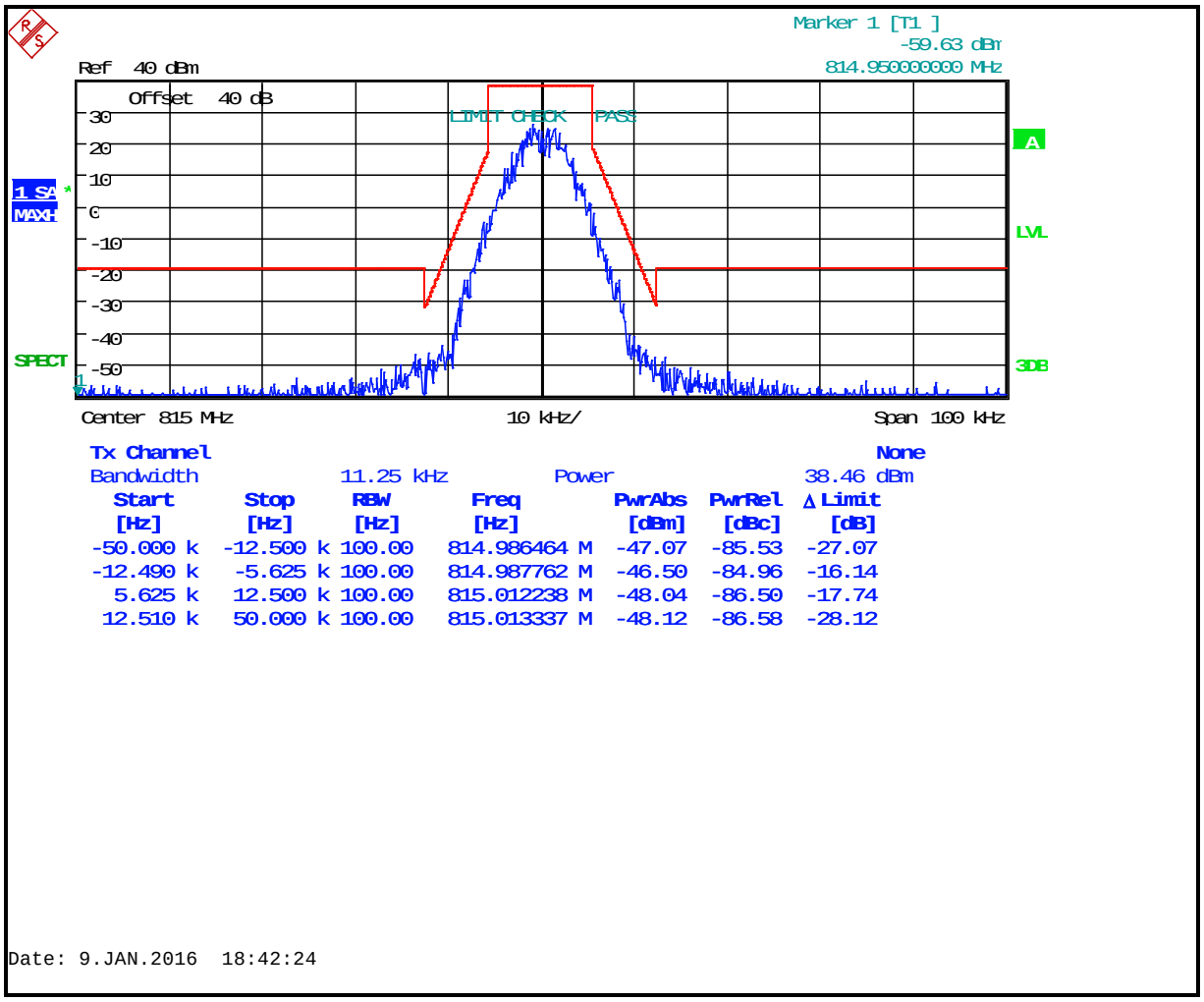
Plot 8-81: Occupied Bandwidth – 868.9875 MHz; OTP SMR 4-level FSK (Mask G)



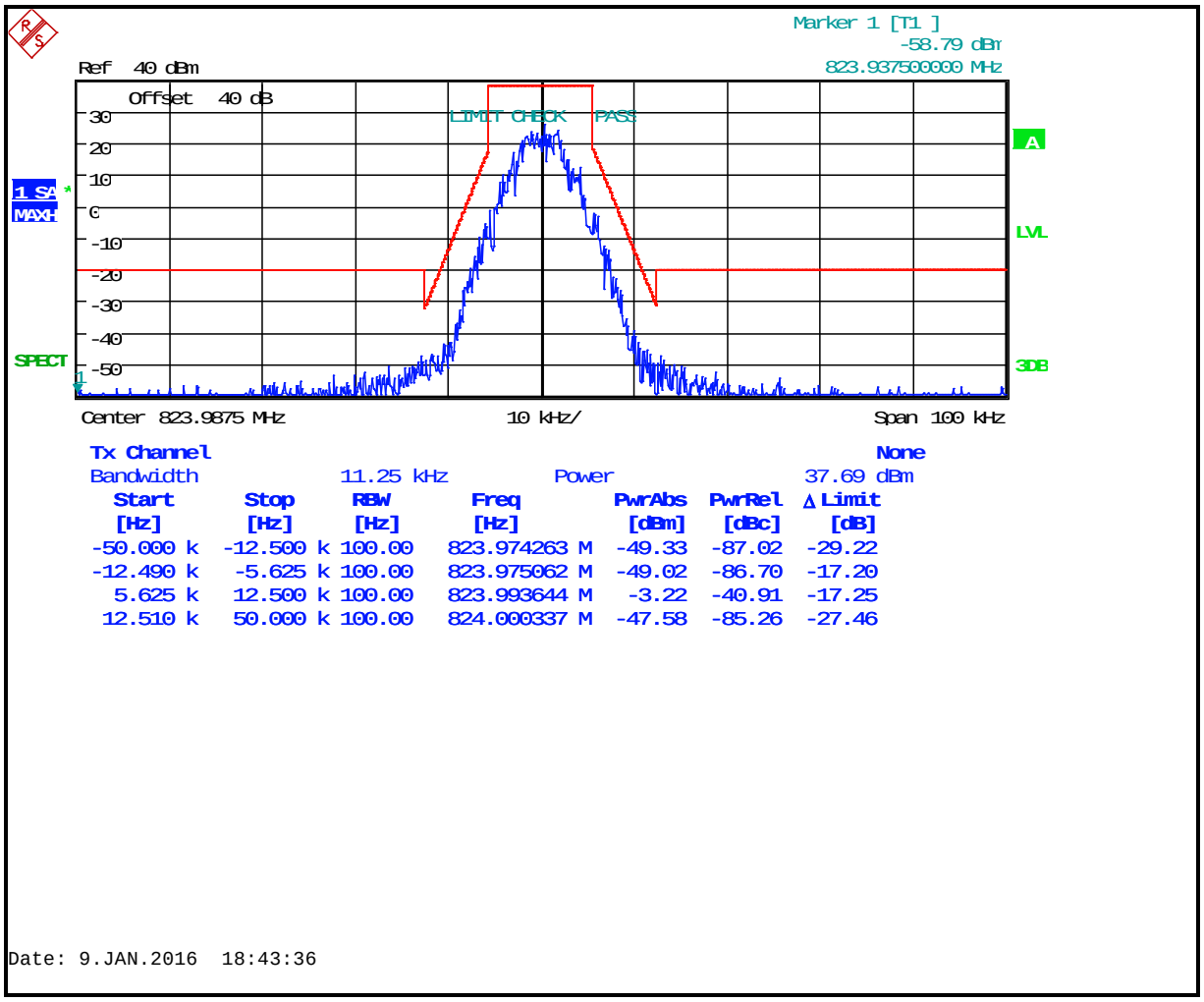
Plot 8-82: Occupied Bandwidth – 806.0125 MHz; C4FM (Mask D)



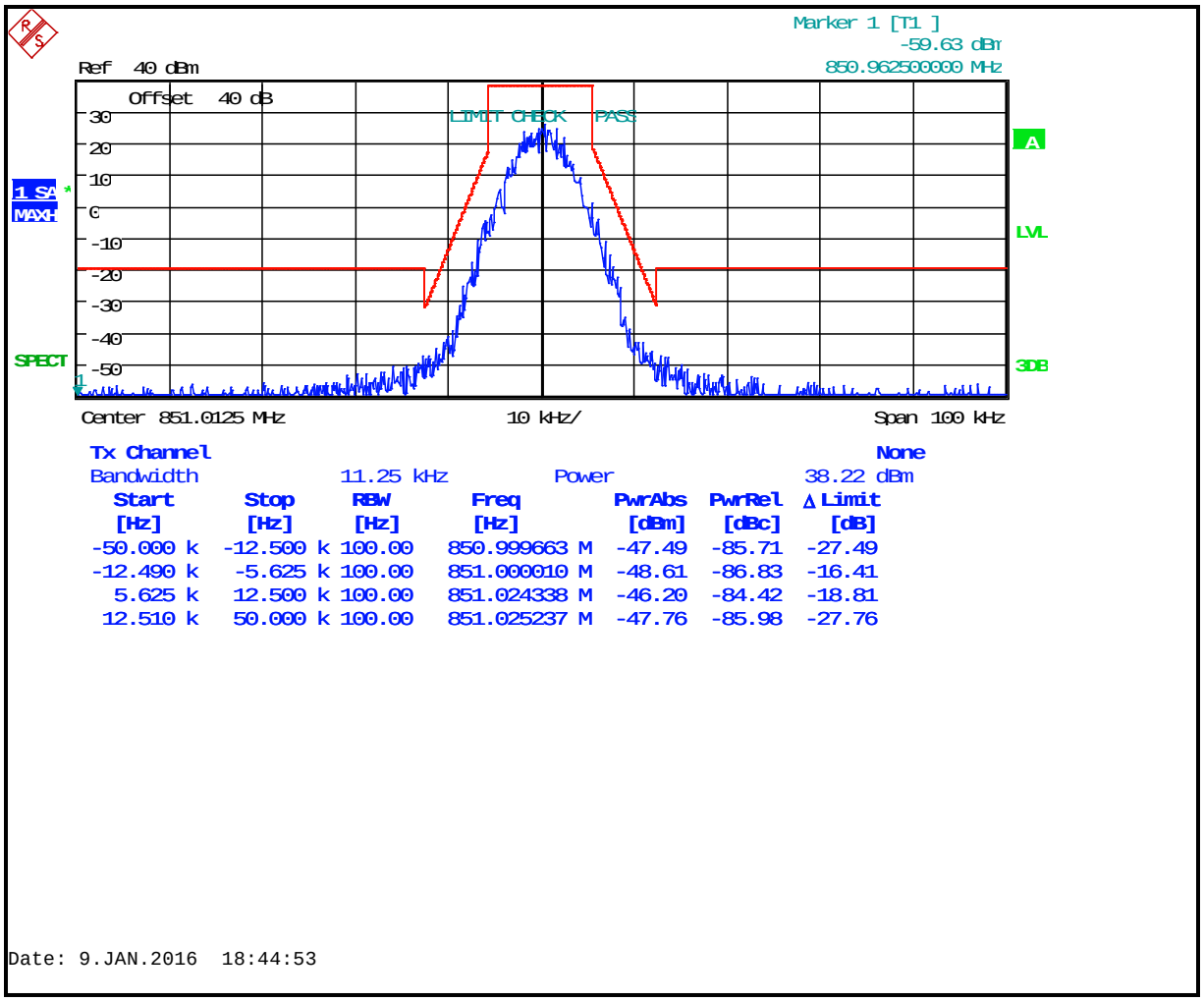
Plot 8-83: Occupied Bandwidth – 815.0000 MHz; C4FM (Mask D)



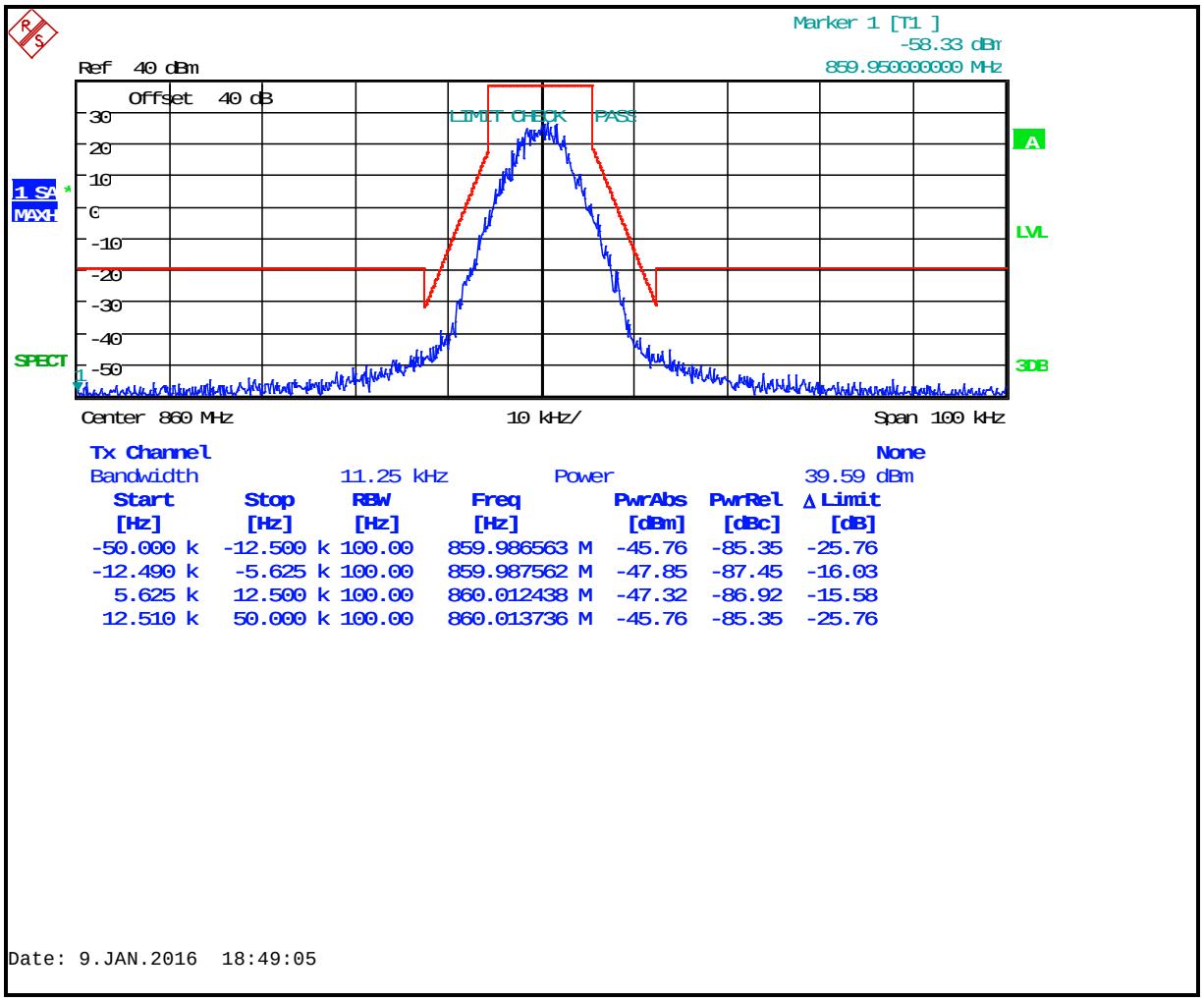
Plot 8-84: Occupied Bandwidth – 823.9875 MHz; C4FM (Mask D)



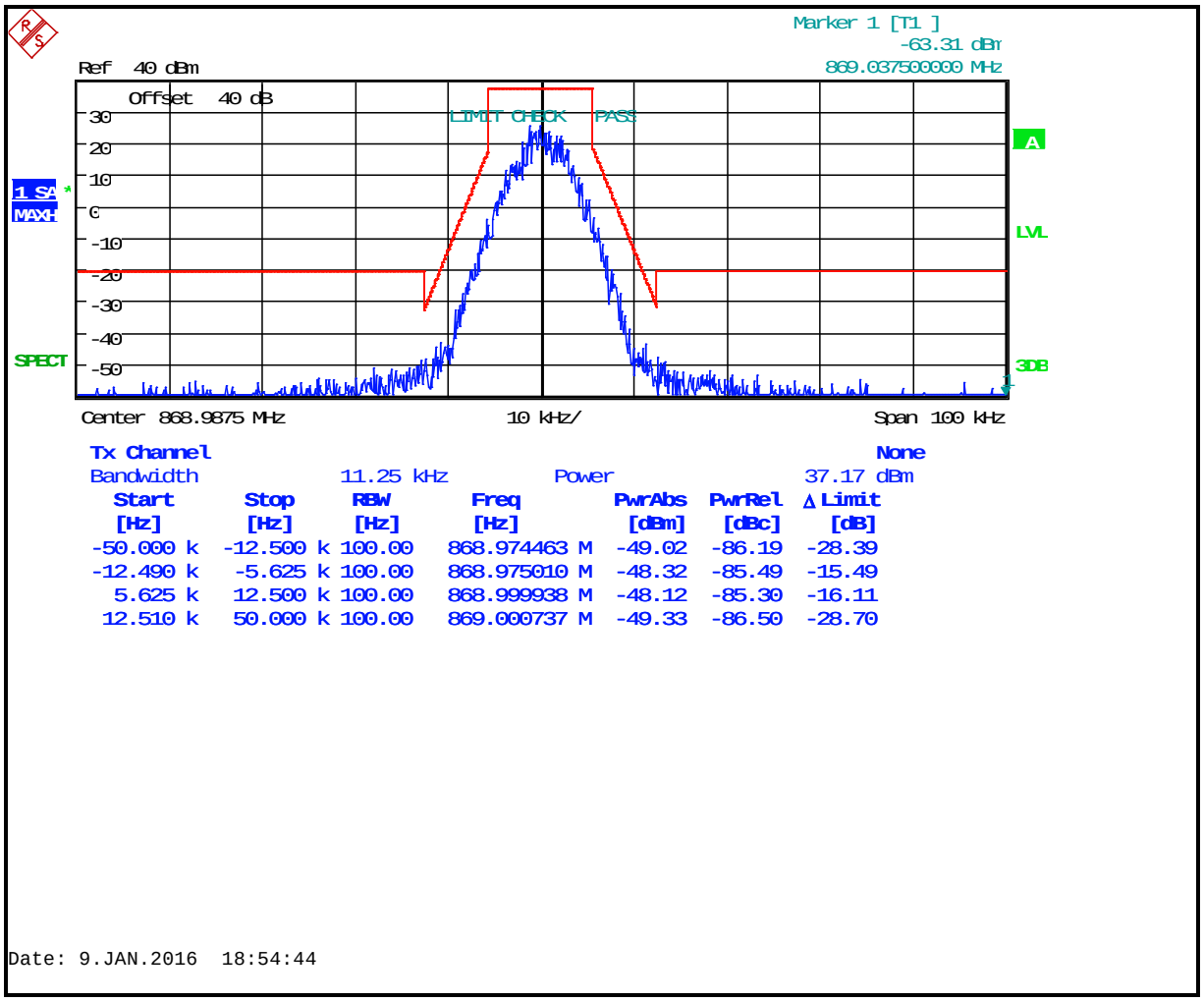
Plot 8-85: Occupied Bandwidth – 851.0125 MHz; C4FM (Mask D)



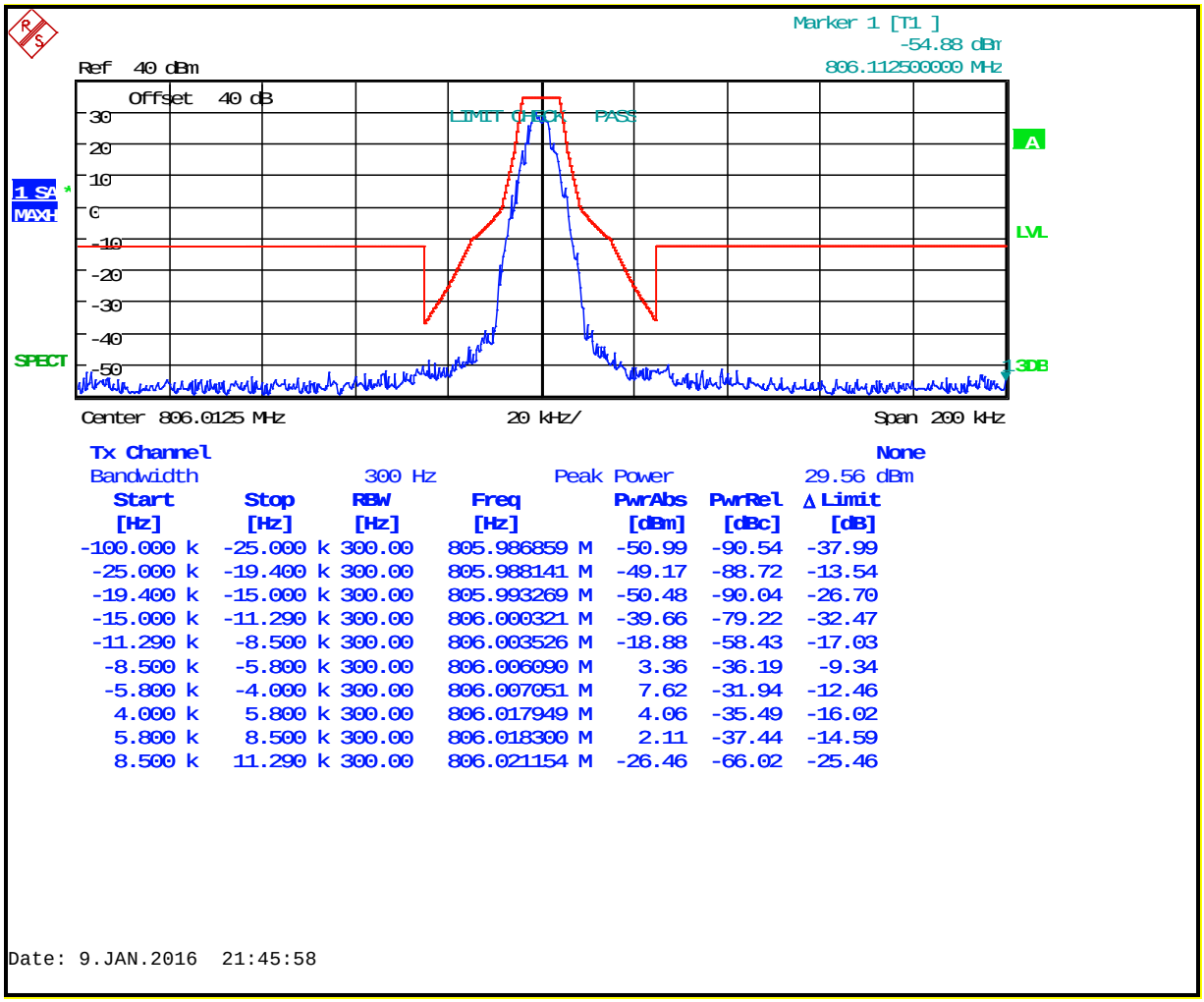
Plot 8-86: Occupied Bandwidth – 860.0000 MHz; C4FM (Mask D)



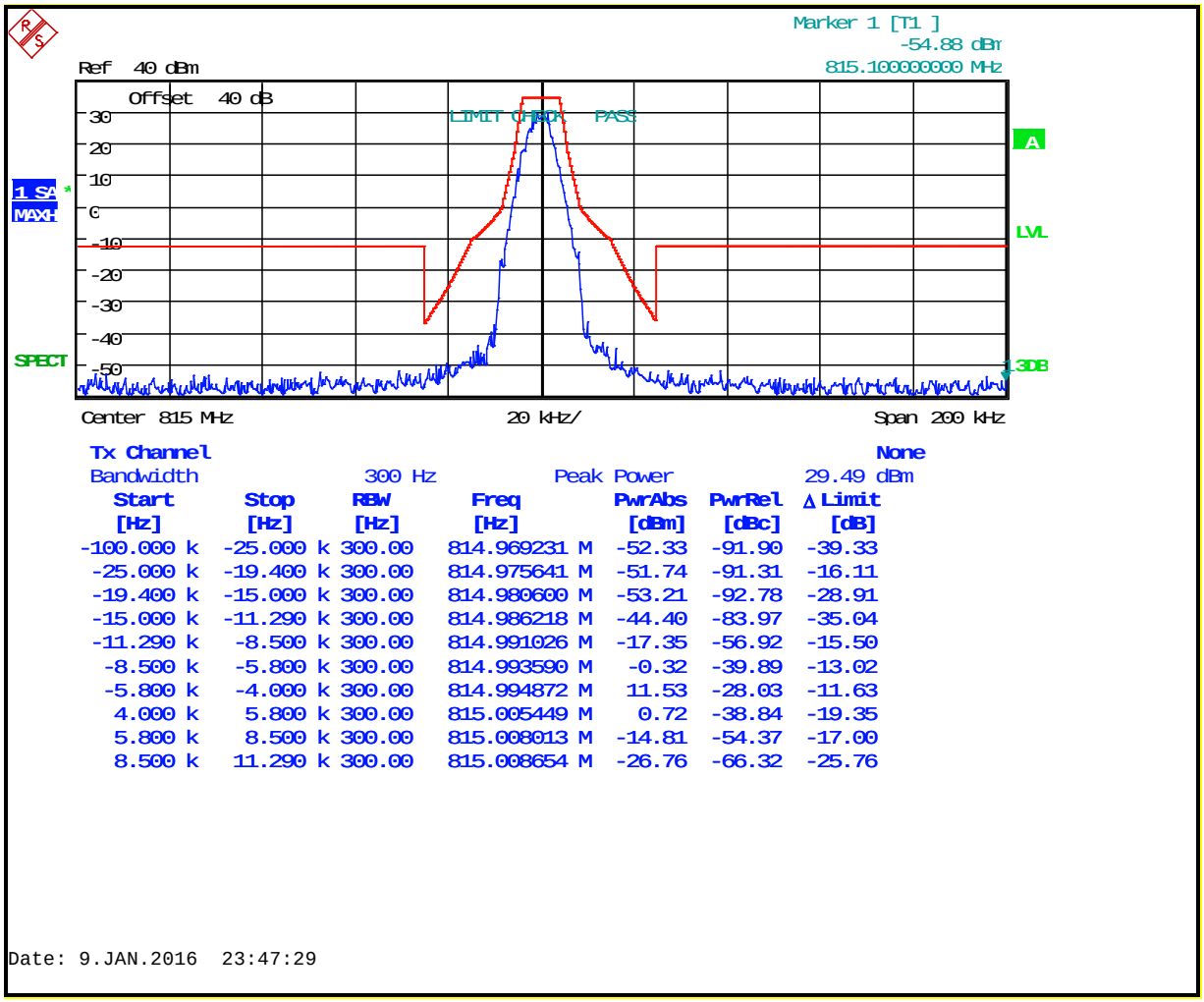
Plot 8-87: Occupied Bandwidth – 868.9875 MHz; C4FM (Mask D)



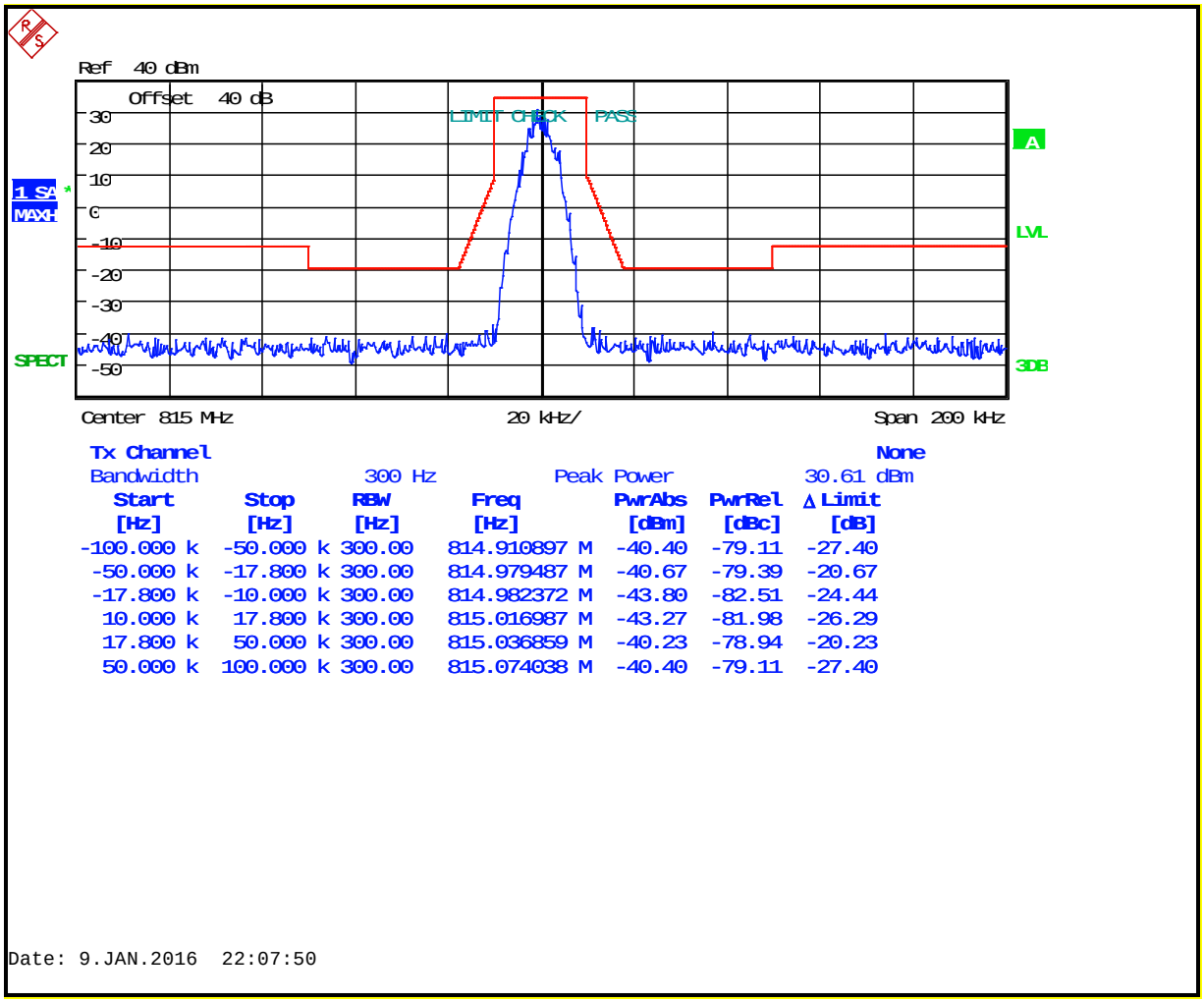
Plot 8-88: Occupied Bandwidth – 806.0125 MHz; C4FM (Mask H)



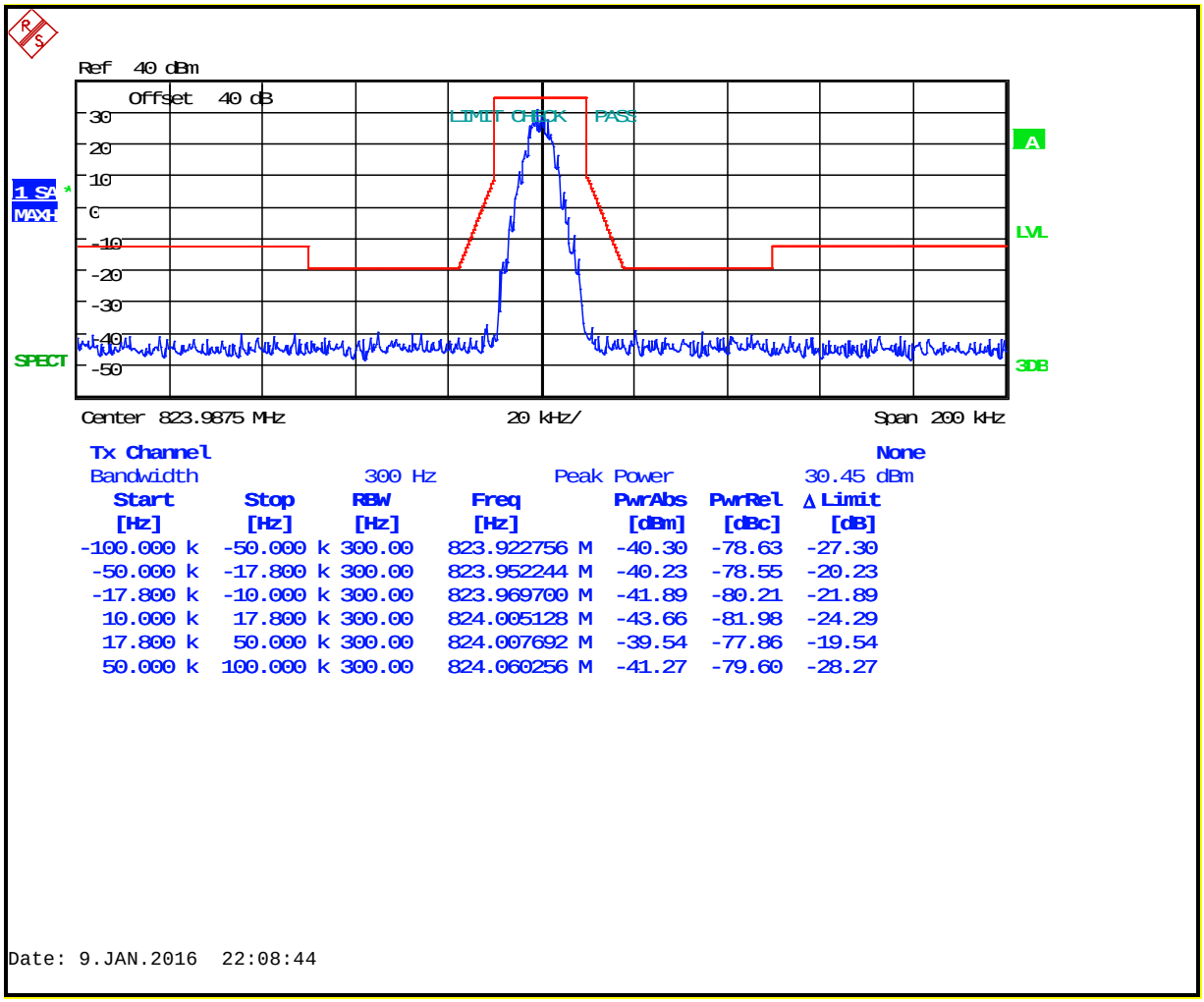
Plot 8-89: Occupied Bandwidth – 815.0000 MHz; C4FM (Mask H)



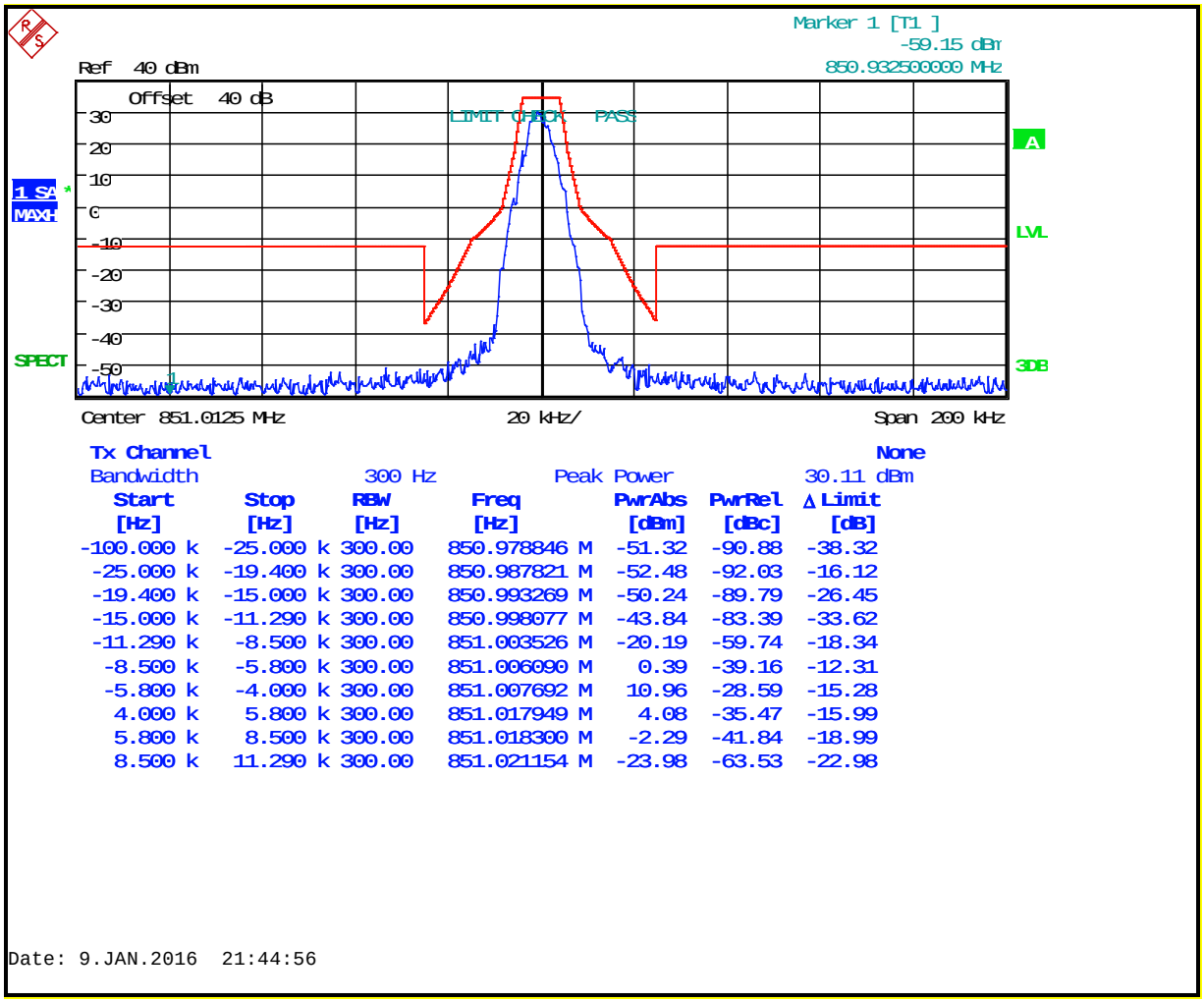
Plot 8-90: Occupied Bandwidth – 815.0000 MHz; C4FM (Mask G)



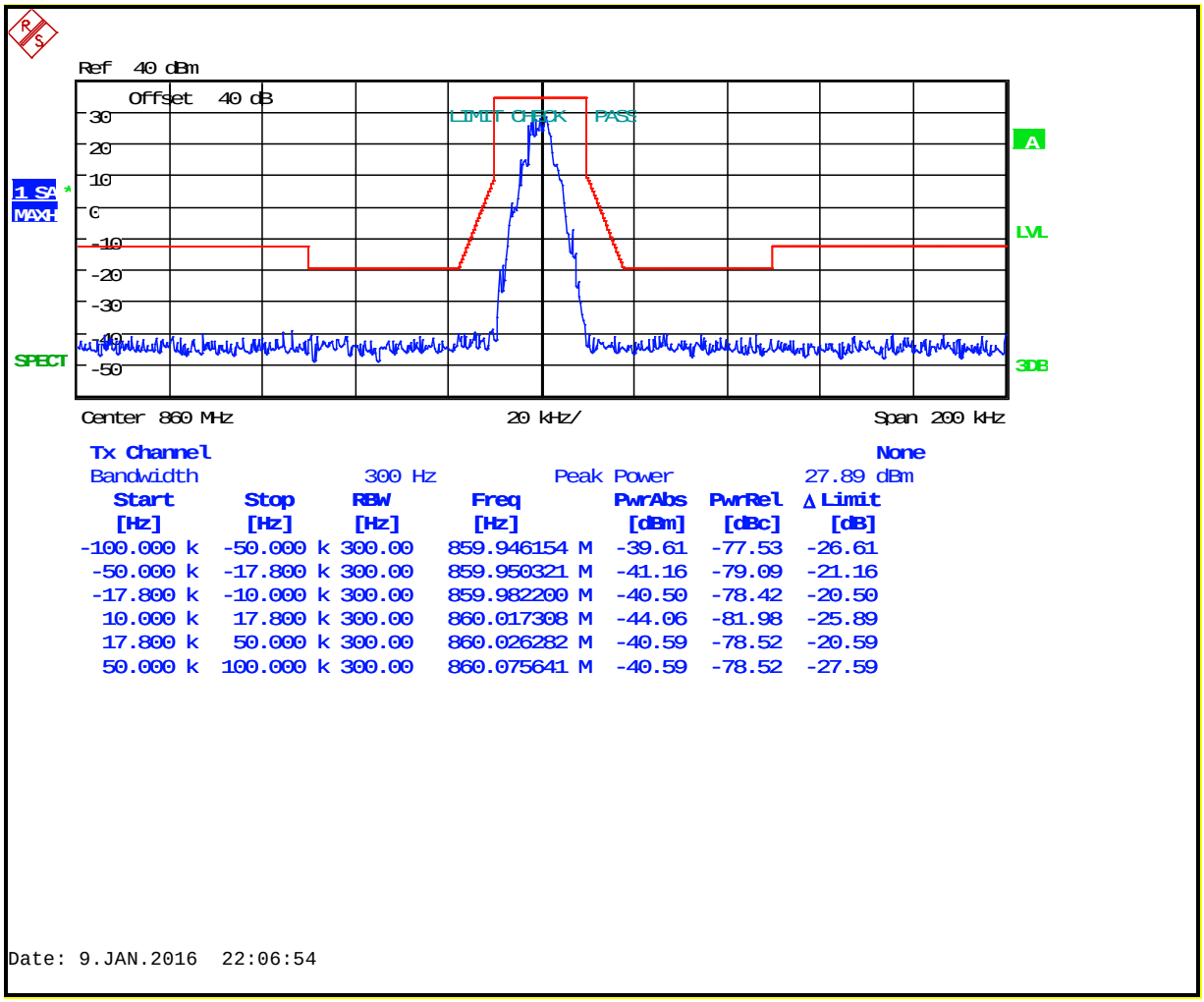
Plot 8-91: Occupied Bandwidth – 823.9875 MHz; C4FM (Mask G)



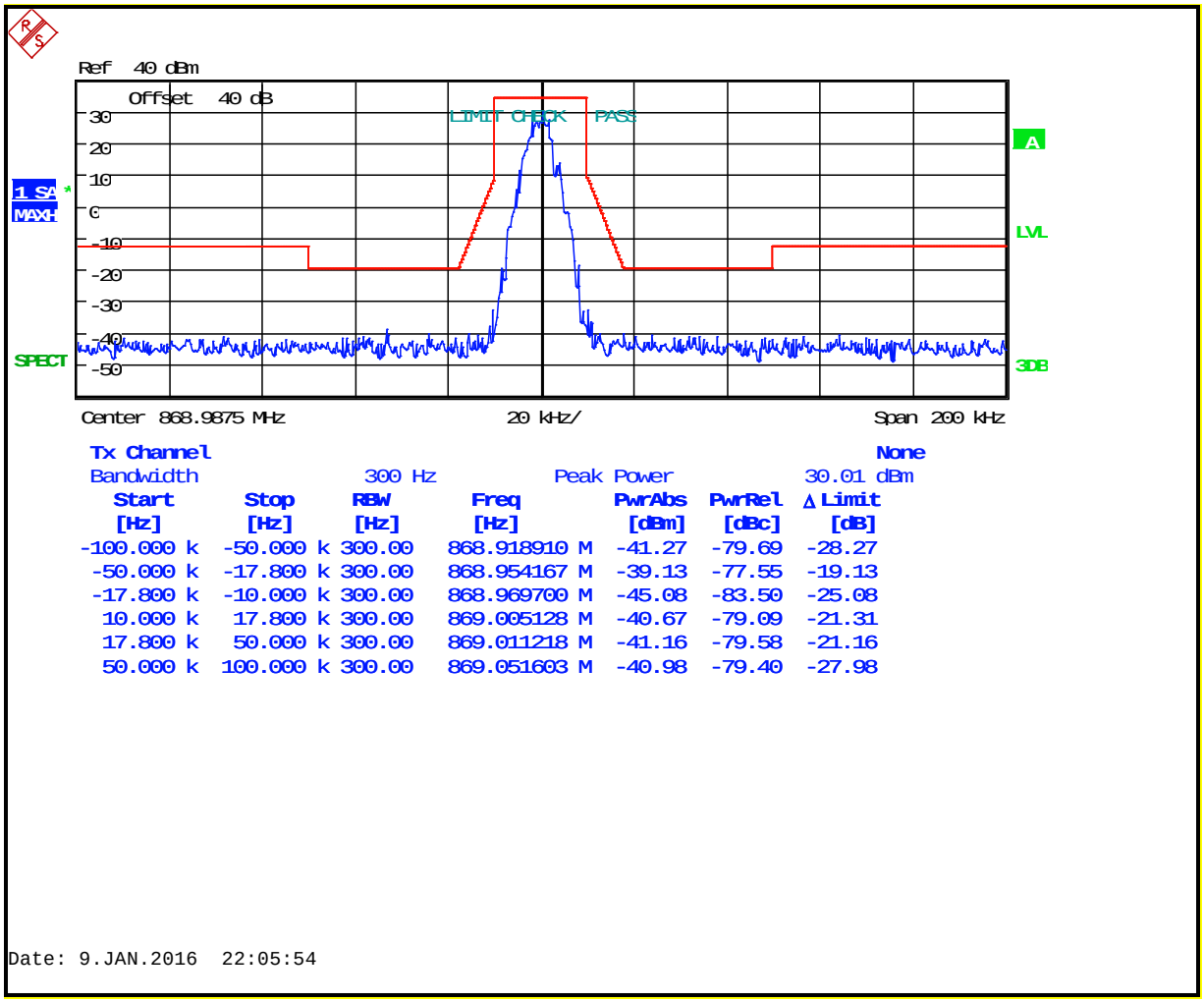
Plot 8-92: Occupied Bandwidth – 851.0125 MHz; C4FM (Mask H)



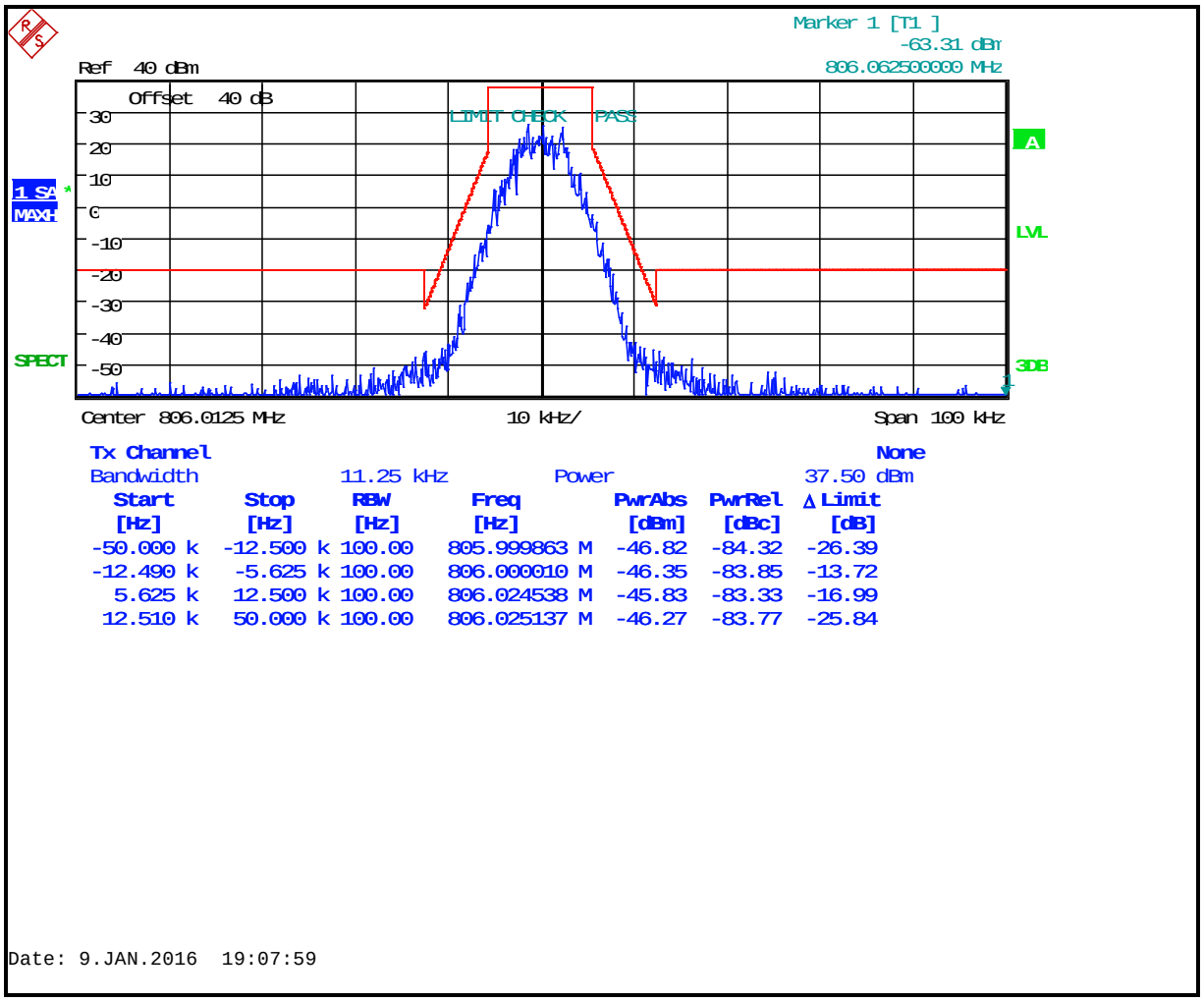
Plot 8-93: Occupied Bandwidth – 860.0000 MHz; C4FM (Mask G)



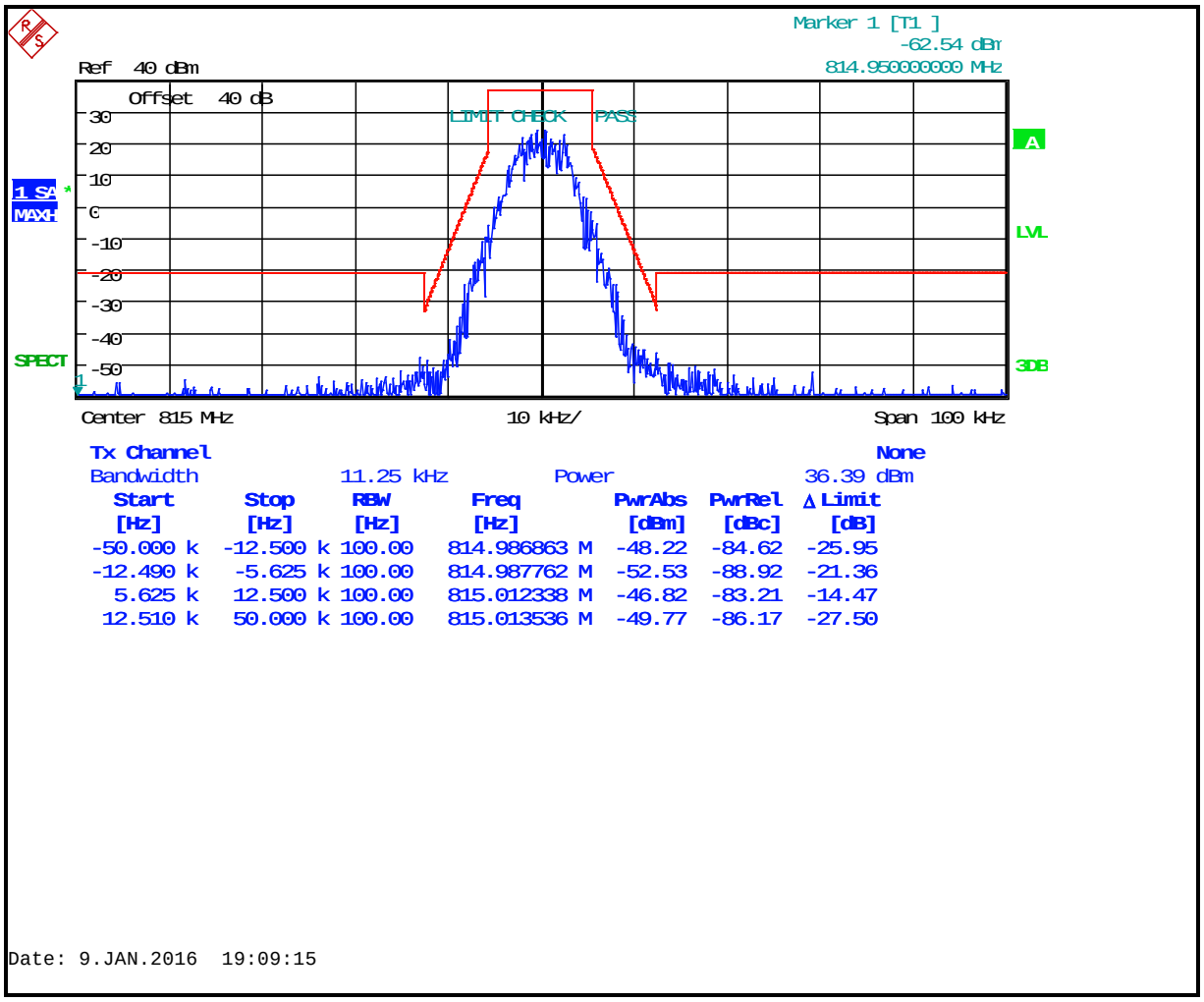
Plot 8-94: Occupied Bandwidth – 868.9875 MHz; C4FM (Mask G)



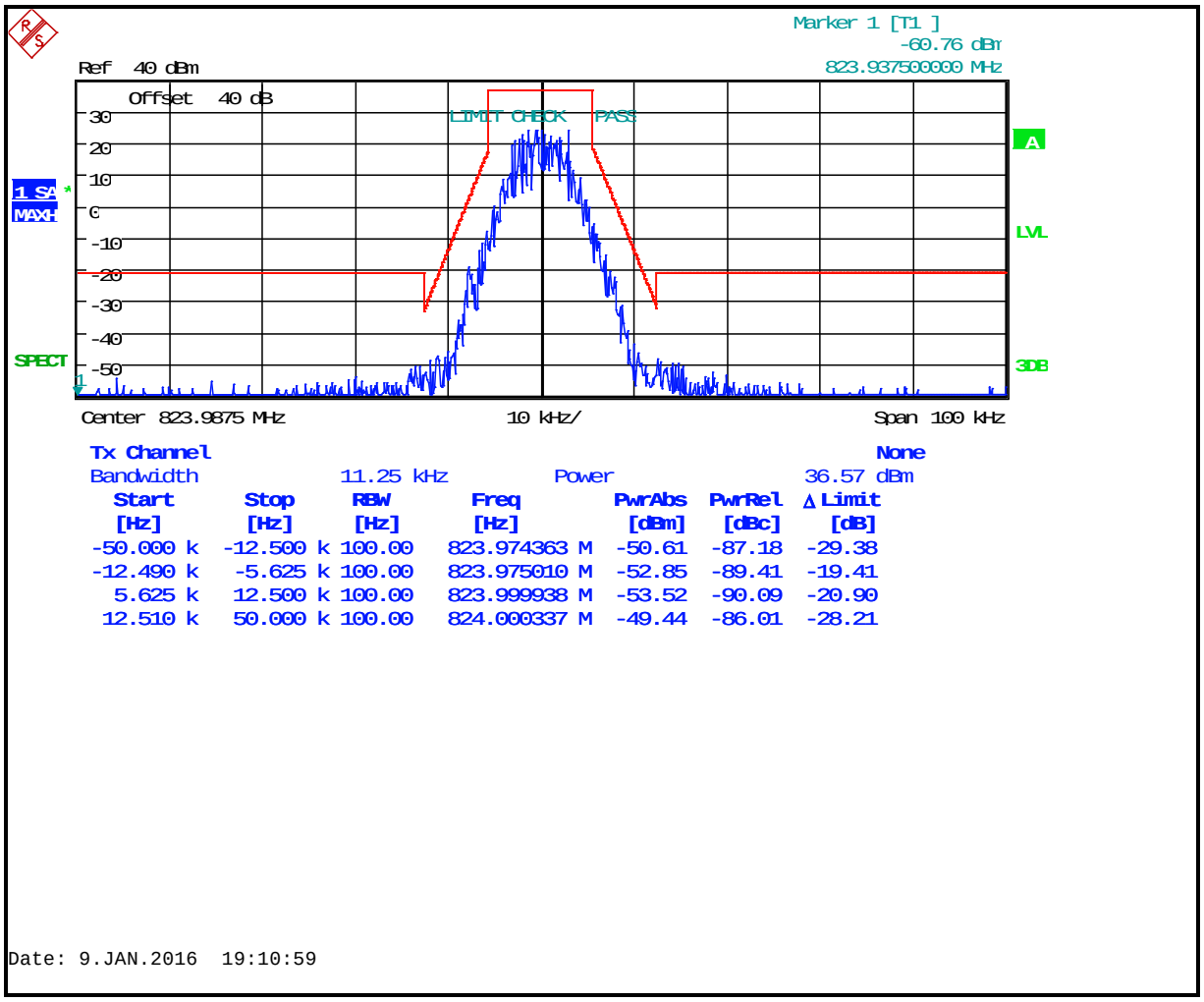
Plot 8-95: Occupied Bandwidth – 806.0125 MHz; C4FM Phase 2 (Mask D)



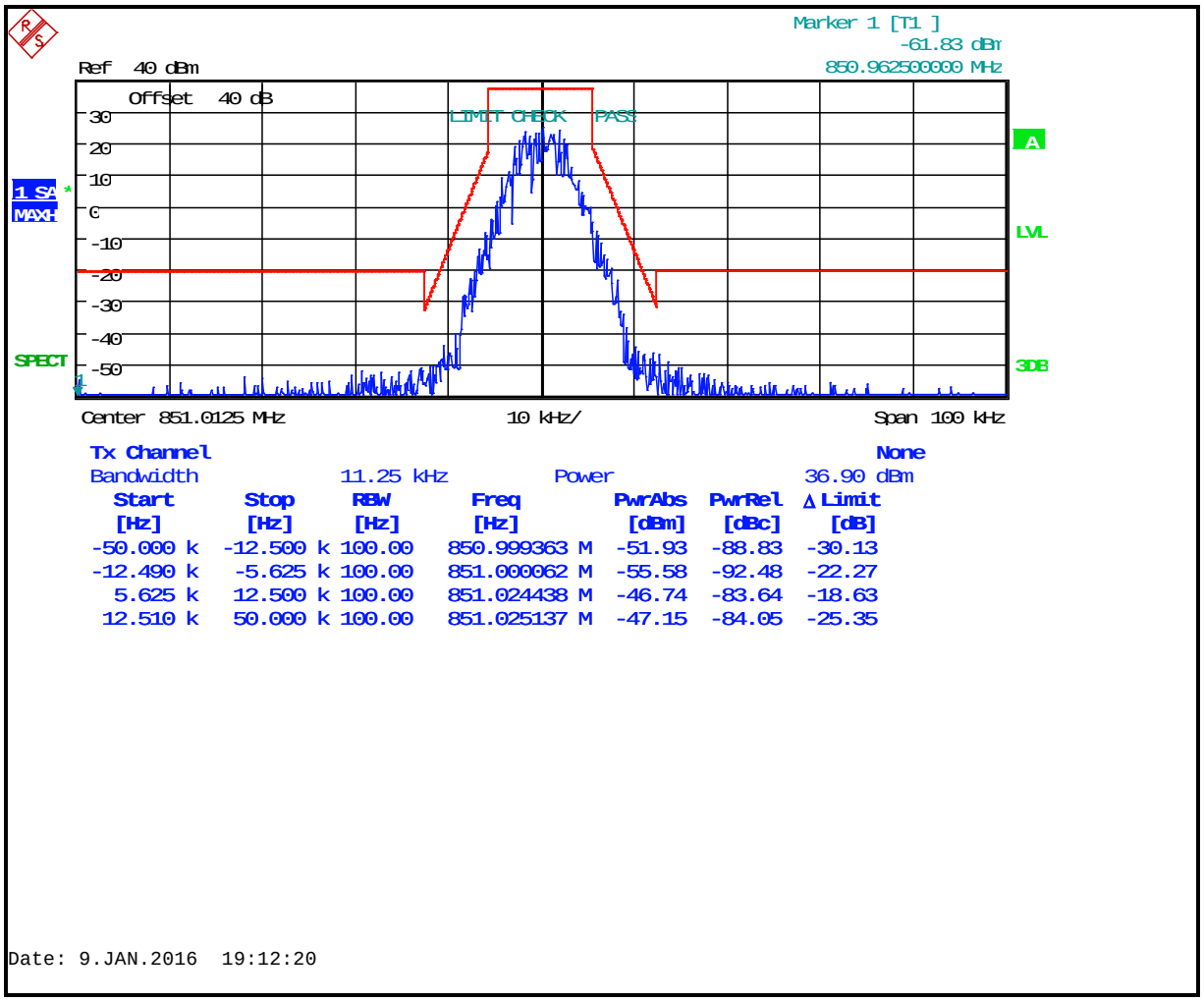
Plot 8-96: Occupied Bandwidth – 815.0000 MHz; C4FM Phase 2 (Mask D)



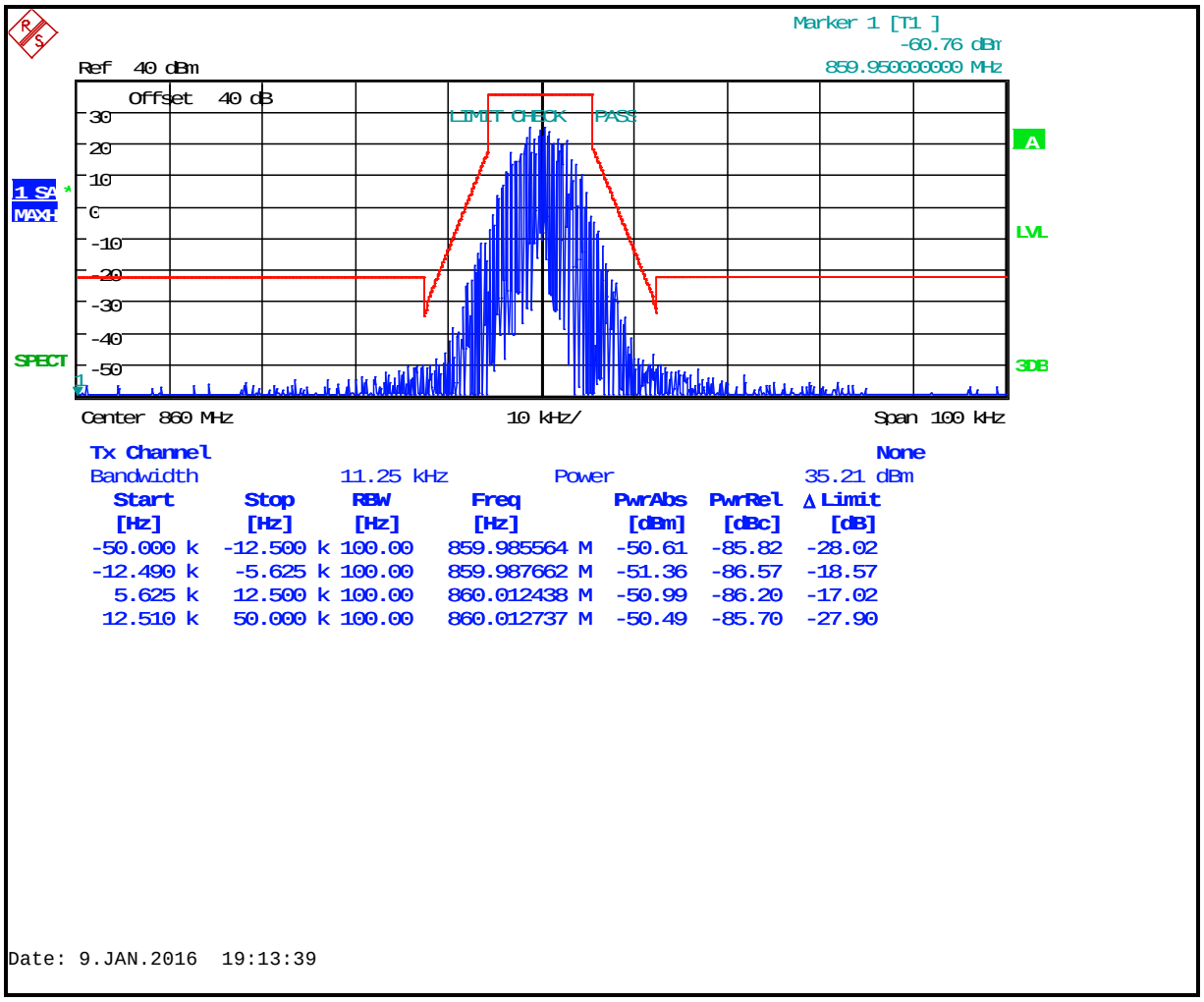
Plot 8-97: Occupied Bandwidth – 823.9875 MHz; C4FM Phase 2 (Mask D)



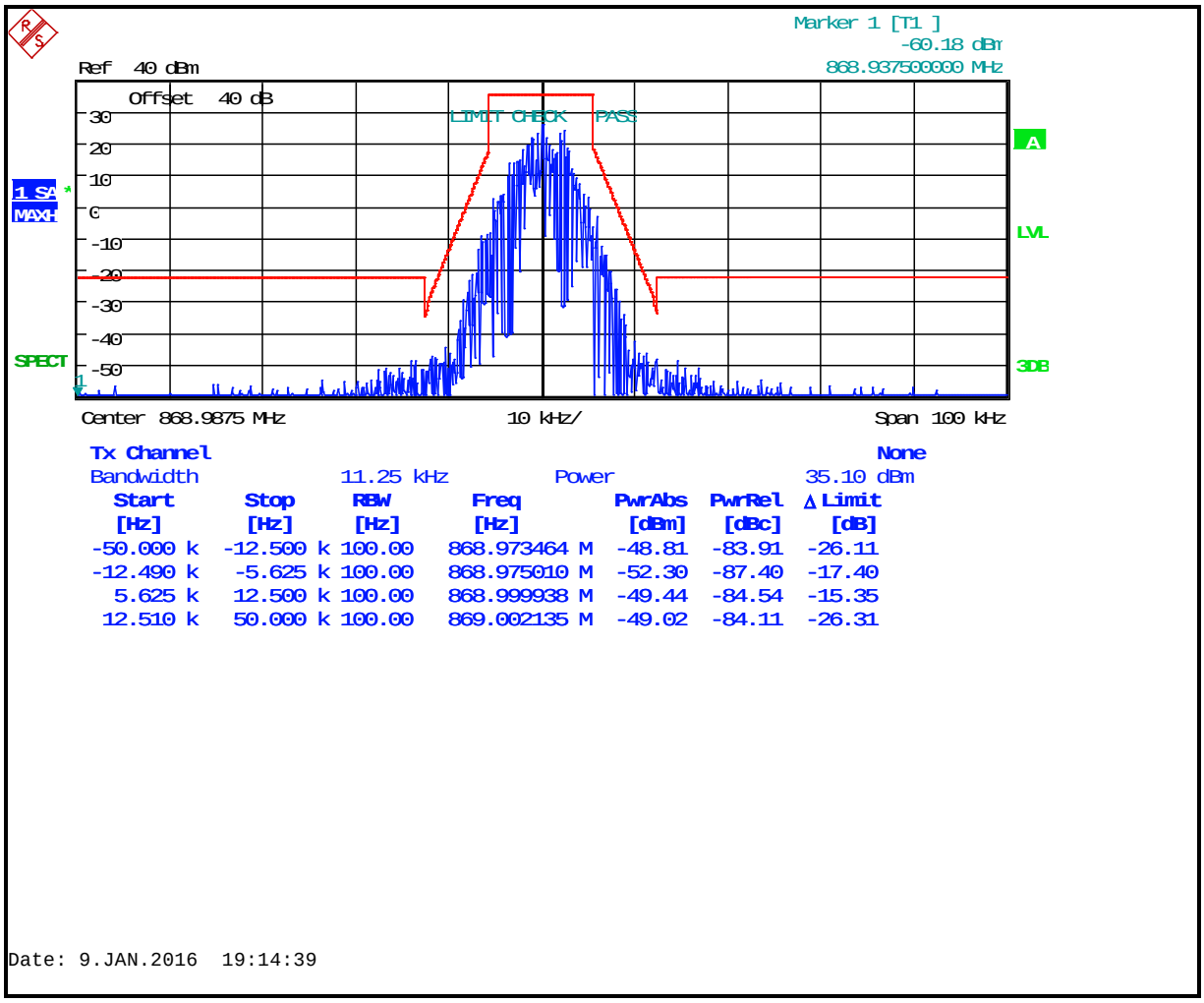
Plot 8-98: Occupied Bandwidth – 851.0125 MHz; C4FM Phase 2 (Mask D)



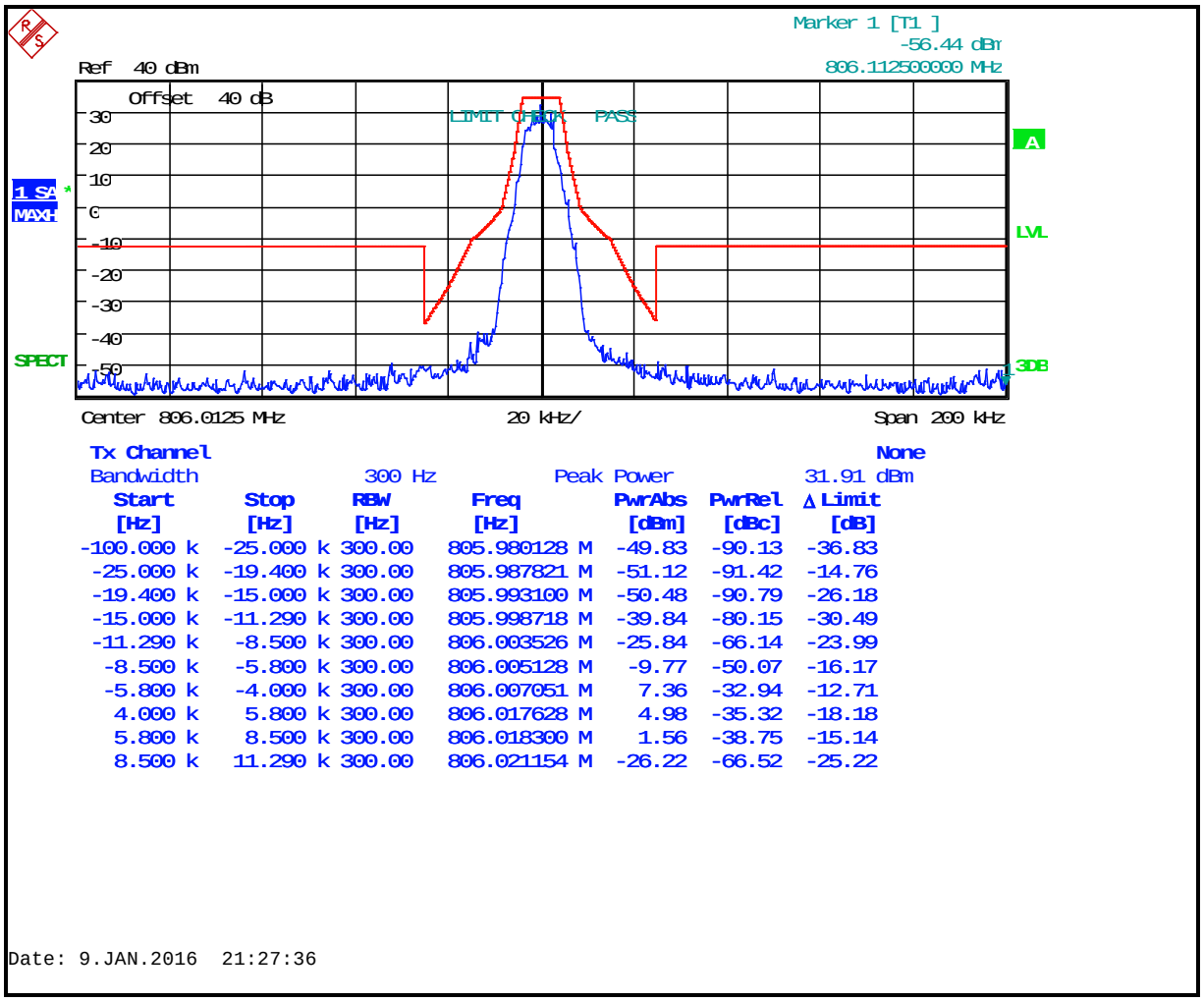
Plot 8-99: Occupied Bandwidth – 860.0000 MHz; C4FM Phase 2 (Mask D)



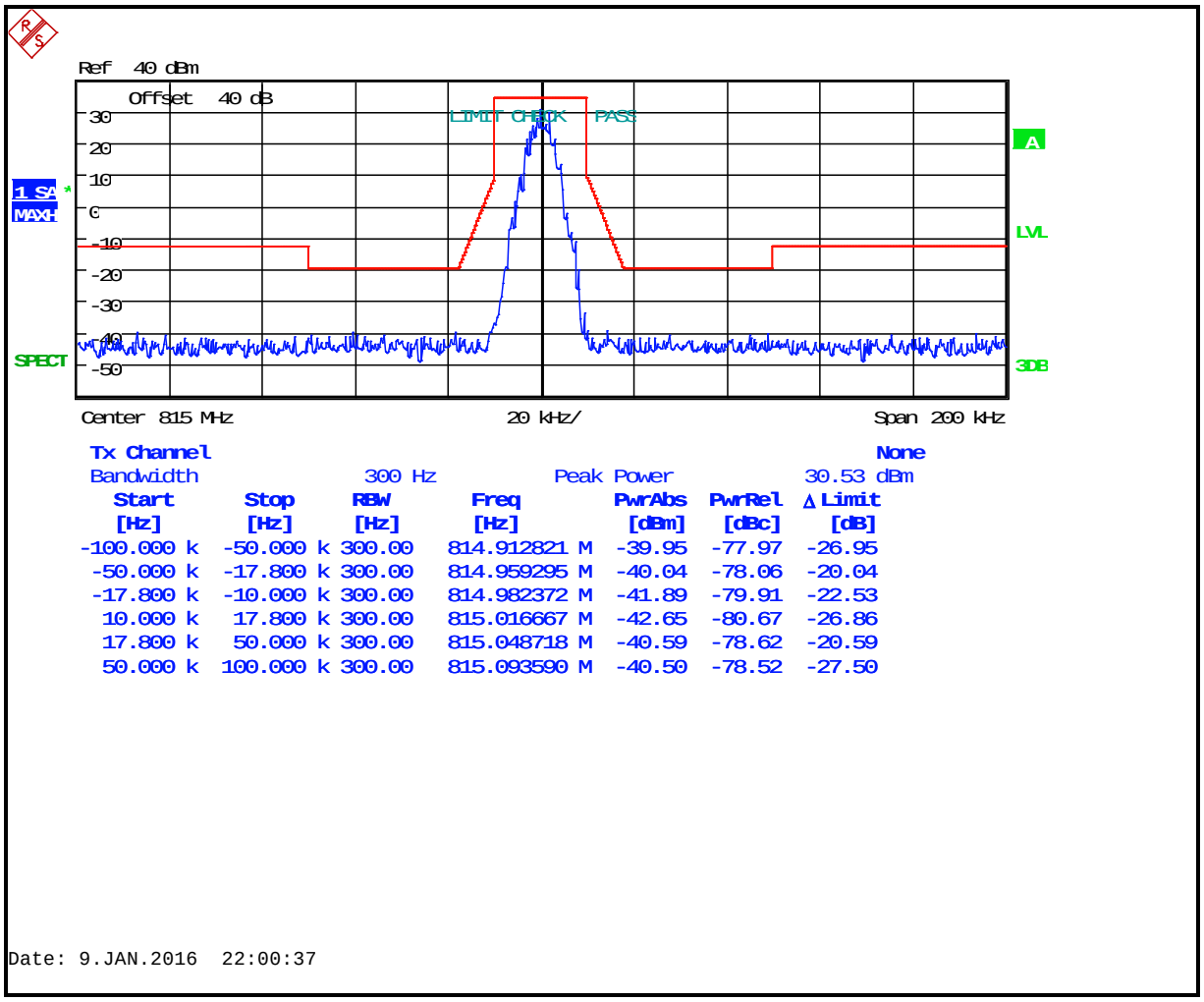
Plot 8-100: Occupied Bandwidth – 868.9875 MHz; C4FM Phase 2 (Mask D)



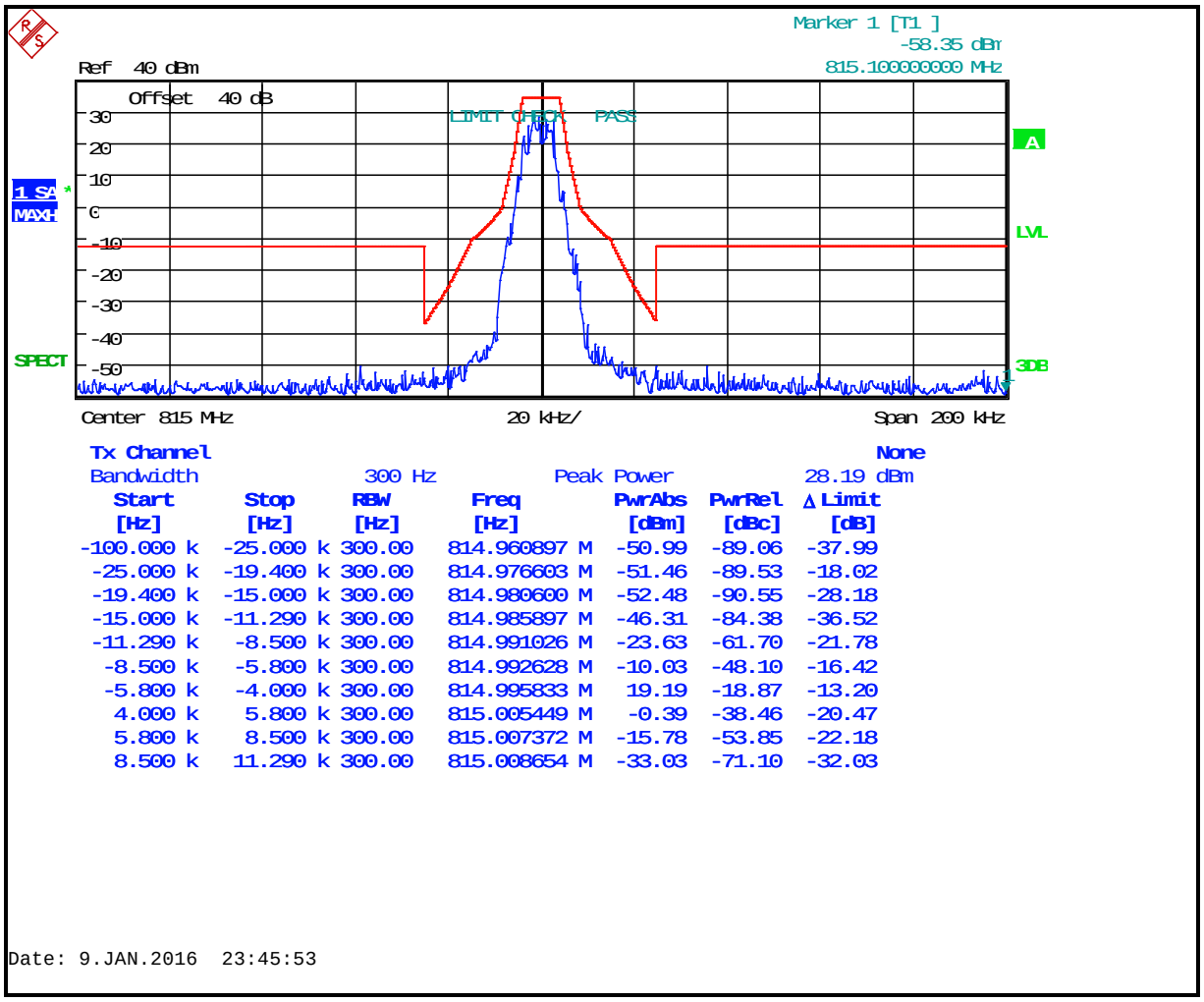
Plot 8-101: Occupied Bandwidth – 806.0125 MHz; C4FM Phase 2 (Mask H)



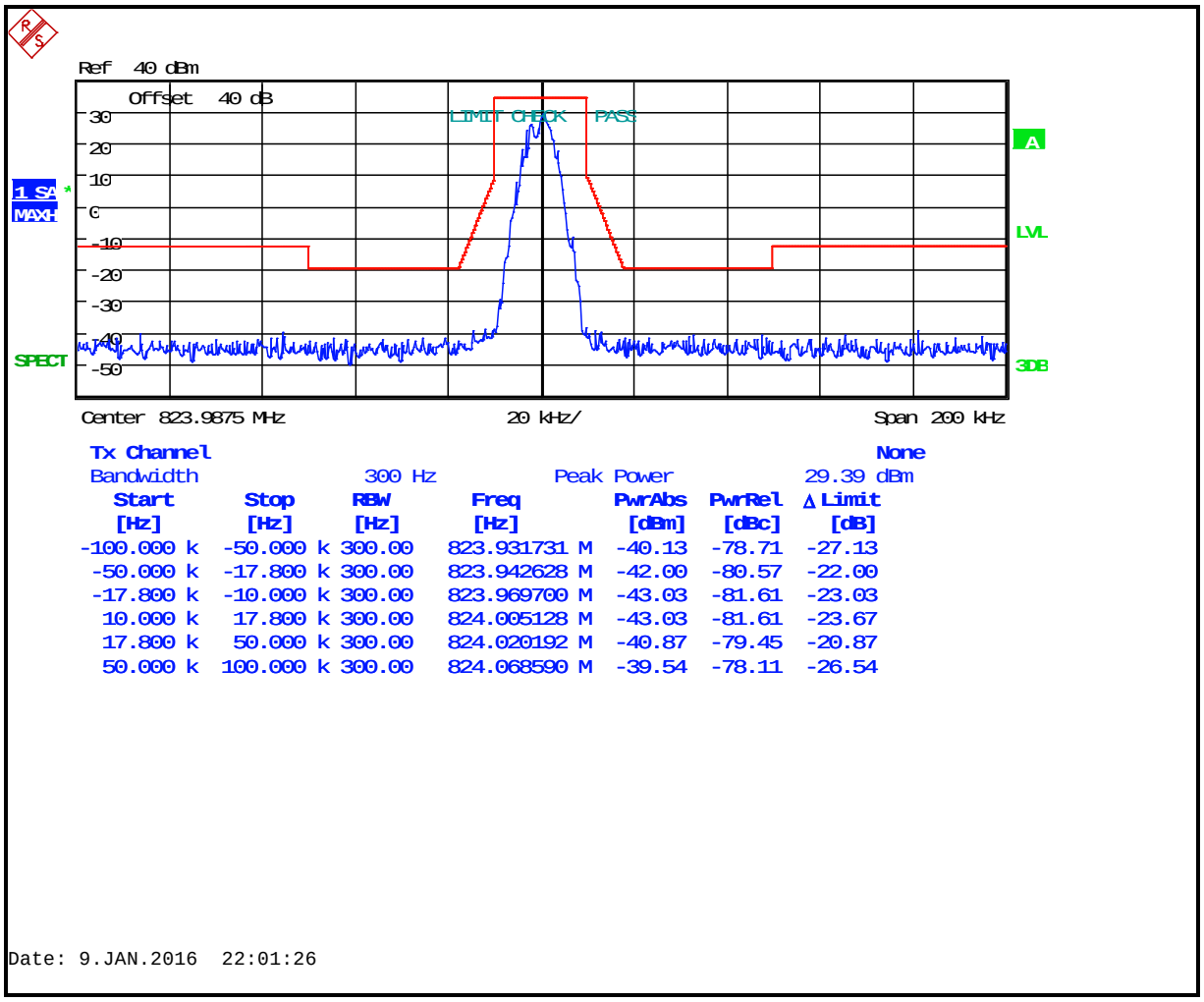
Plot 8-102: Occupied Bandwidth – 815.0000 MHz; C4FM Phase 2 (Mask G)



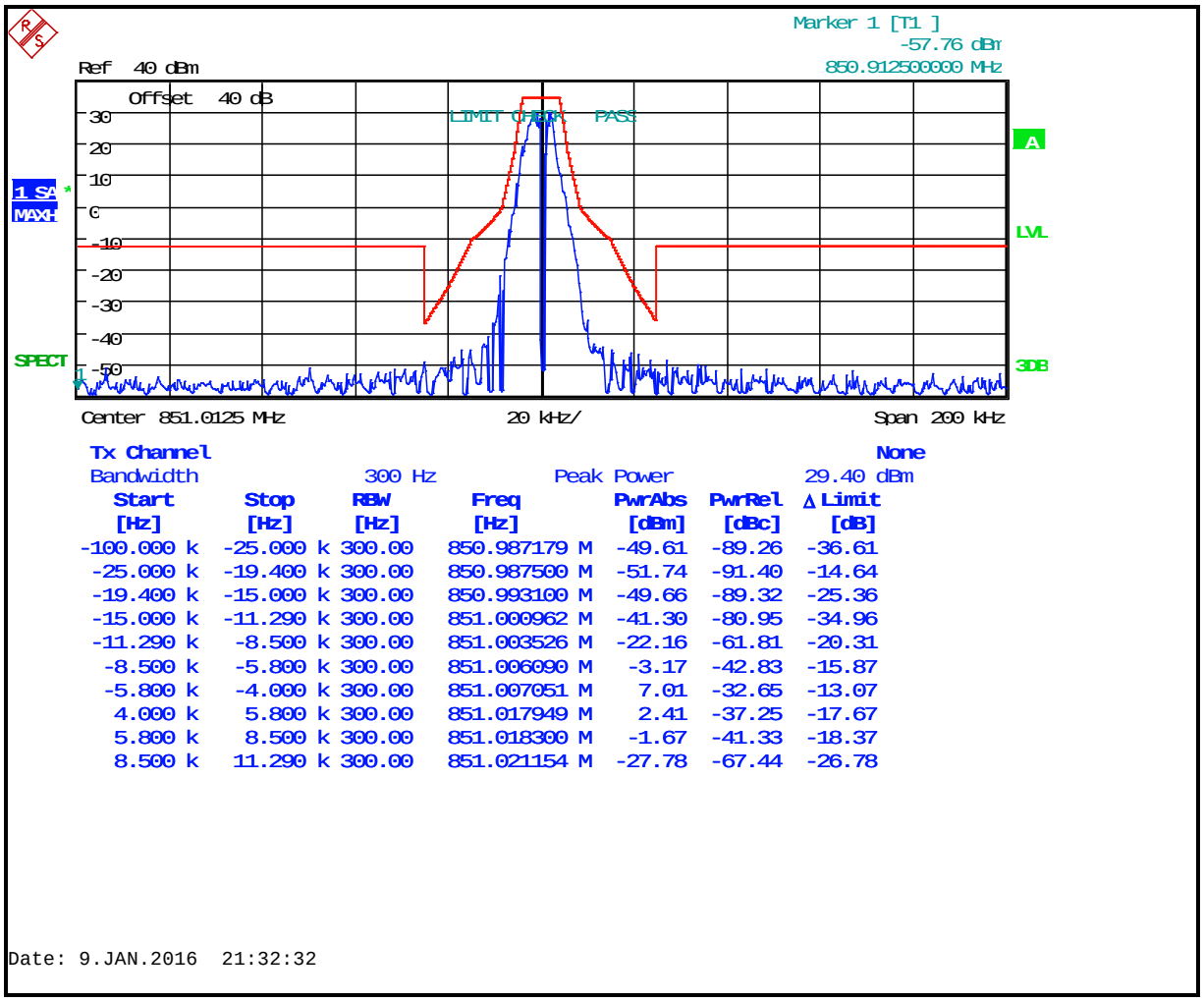
Plot 8-103: Occupied Bandwidth – 815.0000 MHz; C4FM Phase 2 (Mask H)



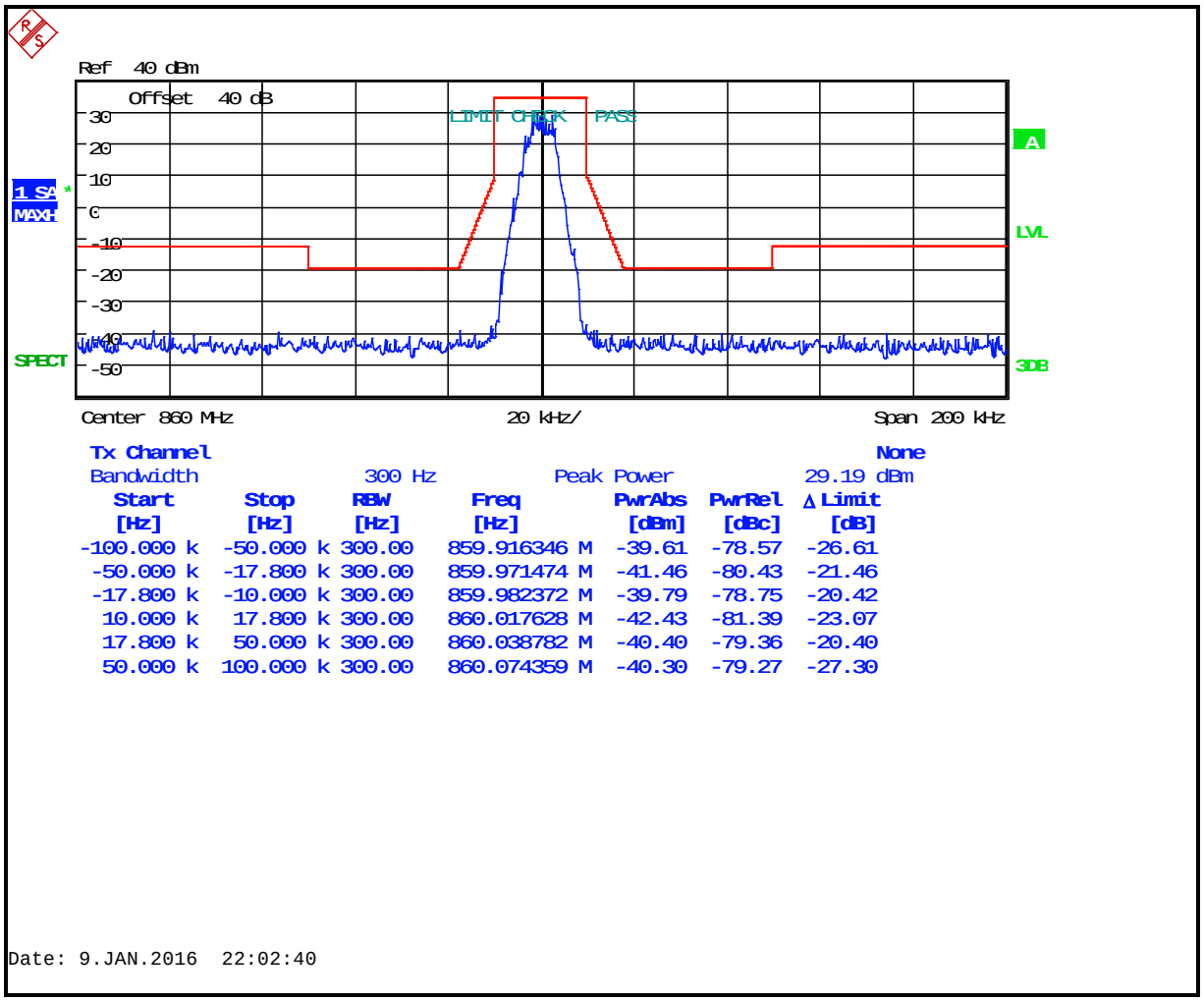
Plot 8-104: Occupied Bandwidth – 823.9875 MHz; C4FM Phase 2 (Mask G)



Plot 8-105: Occupied Bandwidth – 851.0125 MHz; C4FM Phase 2 (Mask H)



Plot 8-106: Occupied Bandwidth – 860.0000 MHz; C4FM Phase 2 (Mask G)



Plot 8-107: Occupied Bandwidth – 868.9875 MHz; C4FM Phase 2 (Mask G)

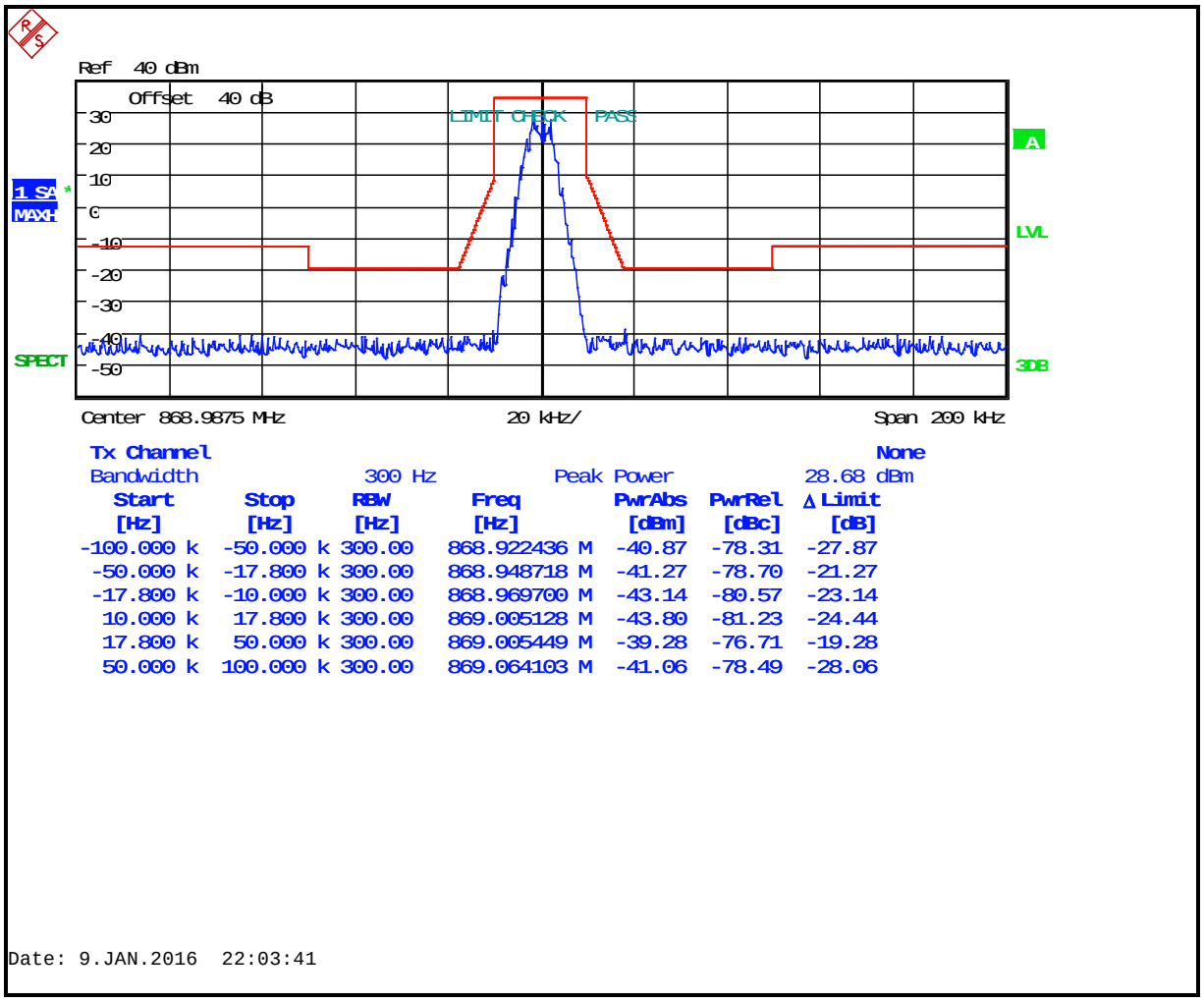


Table 8-1: Test Equipment Used for Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16
900819	Weinschel Corporation	2	10 dB Attenuator; 5 W	BF0830	9/11/16
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	9/11/16

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	December 19 2014 – February 18, 2015, January 8/9, 2016
Test Engineer	Signature	Dates of Tests

9 FCC Rules and Regulation Part 2.1055: Frequency Stability; Part 90.213, 90.539: Frequency Stability

9.1 Test Procedure

TIA-603-D 2010, section 2.2.2

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

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and 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.

§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]	.....	.....	.....

§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).
(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.
(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

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 0.8 ppm.

9.2 Test Data

Table 9-1: Temperature Frequency Stability – 768.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	768.0125364	0.05
-20	768.0125439	0.06
-10	768.0125528	0.07
0	768.0125000	0.00
10	768.0124809	-0.02
20 (reference)	768.0125000	0.00
30	768.0123532	-0.19
40	768.0124047	-0.12
50	768.0124160	-0.11
60	768.0124947	-0.01

Table 9-2: Temperature Frequency Stability – 769.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	769.0125186	0.02
-20	769.0125488	0.06
-10	769.0125523	0.07
0	769.0125000	0.00
10	769.0124830	-0.02
20 (reference)	769.0125000	0.00
30	769.0123495	-0.20
40	769.0124096	-0.12
50	769.0124238	-0.10
60	769.0124731	-0.03

Table 9-3: Temperature Frequency Stability – 771.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	771.0125262	0.03
-20	771.0125524	0.07
-10	771.0125531	0.07
0	771.0125000	0.00
10	771.0124864	-0.02
20 (reference)	771.0125000	0.00
30	771.0123632	-0.18
40	771.0124062	-0.12
50	771.0124277	-0.09
60	771.0124950	-0.01

Table 9-4: Temperature Frequency Stability – 775.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	775.0125271	0.03
-20	775.0125506	0.07
-10	775.0125519	0.07
0	775.0125000	0.00
10	775.0124794	-0.03
20 (reference)	775.0125000	0.00
30	775.0123896	-0.14
40	775.0123998	-0.13
50	775.0124300	-0.09
60	775.0125014	0.00

Table 9-5: Temperature Frequency Stability – 775.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	775.9875272	0.04
-20	775.9875363	0.05
-10	775.9875521	0.07
0	775.9875000	0.00
10	775.9874879	-0.02
20 (reference)	775.9875000	0.00
30	775.9873646	-0.17
40	775.9874032	-0.12
50	775.9874525	-0.06
60	775.9874963	0.00

Table 9-6: Temperature Frequency Stability – 798.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	798.0125308	0.04
-20	798.0125499	0.06
-10	798.0125322	0.04
0	798.0125000	0.00
10	798.0124793	-0.03
20 (reference)	798.0125000	0.00
30	798.0123740	-0.16
40	798.0123888	-0.14
50	798.0124280	-0.09
60	798.0124835	-0.02

Table 9-7: Temperature Frequency Stability – 799.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	799.0125237	0.03
-20	799.0125501	0.06
-10	799.0125509	0.06
0	799.0125000	0.00
10	799.0124791	-0.03
20 (reference)	799.0125000	0.00
30	799.0123570	-0.18
40	799.0123741	-0.16
50	799.0124286	-0.09
60	799.0125039	0.00

Table 9-8: Temperature Frequency Stability – 806.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	806.0124097	-0.11
-20	806.0124678	-0.04
-10	806.0124532	-0.06
0	806.0124383	-0.08
10	806.0124334	-0.08
20 (reference)	806.0125000	0.00
30	806.0124462	-0.07
40	806.0124379	-0.08
50	806.0124454	-0.07
60	806.0124563	-0.05

Table 9-9: Temperature Frequency Stability – 815.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	814.9999200	-0.10
-20	814.9999538	-0.06
-10	814.9999587	-0.05
0	814.9999323	-0.08
10	814.9999404	-0.07
20 (reference)	815.0000000	0.00
30	814.9999482	-0.06
40	814.9999464	-0.07
50	814.9999511	-0.06
60	814.9999620	-0.05

Table 9-10: Temperature Frequency Stability – 823.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	823.9874324	-0.08
-20	823.9874743	-0.03
-10	823.9874625	-0.05
0	823.9874366	-0.08
10	823.9874541	-0.06
20 (reference)	823.9875000	0.00
30	823.9874475	-0.06
40	823.9874530	-0.06
50	823.9874473	-0.06
60	823.9874659	-0.04

Table 9-11: Temperature Frequency Stability – 851.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	851.0124319	-0.08
-20	851.0124736	-0.03
-10	851.0124573	-0.05
0	851.0124270	-0.09
10	851.0124489	-0.06
20 (reference)	851.0125000	0.00
30	851.0124433	-0.07
40	851.0124504	-0.06
50	851.0124506	-0.06
60	851.0124701	-0.04

Table 9-12: Temperature Frequency Stability – 860.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	859.9999330	-0.08
-20	859.9999665	-0.04
-10	859.9999569	-0.05
0	859.9999195	-0.09
10	859.9999521	-0.06
20 (reference)	860.0000000	0.00
30	859.9999454	-0.06
40	859.9999503	-0.06
50	859.9999507	-0.06
60	859.9999657	-0.04

Table 9-13: Temperature Frequency Stability – 868.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	868.9874316	-0.08
-20	868.9874726	-0.03
-10	868.9874525	-0.05
0	868.9874256	-0.09
10	868.9874566	-0.05
20 (reference)	868.9875000	0.00
30	868.9874454	-0.06
40	868.9874493	-0.06
50	868.9874475	-0.06
60	868.9874701	-0.03

Result: The EUT is compliant.

9.2.1 Frequency Stability/Voltage Variation

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

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	768.012420	-0.10
6.12	768.012430	-0.09
7.20	768.012500	0.00
8.28	768.012440	-0.08

Table 9-15: Frequency Stability/Voltage Variation – 769.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	769.012320	-0.23
6.12	769.012330	-0.22
7.20	769.012500	0.00
8.28	769.012410	-0.12

Table 9-16: Frequency Stability/Voltage Variation – 771.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	771.012910	0.53
6.12	771.013030	0.69
7.20	771.012500	0.00
8.28	771.012420	-0.10

Table 9-17: Frequency Stability/Voltage Variation – 775.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	775.012500	0.00
6.12	775.012490	-0.01
7.20	775.012500	0.00
8.28	775.012500	0.00

Table 9-18: Frequency Stability/Voltage Variation – 775.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	775.987640	0.18
6.12	775.987590	0.12
7.20	775.987500	0.00
8.28	775.987670	0.22

Table 9-19: Frequency Stability/Voltage Variation – 798.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	798.013130	0.79
6.12	798.013070	0.71
7.20	798.012500	0.00
8.28	798.013110	0.76

Table 9-20: Frequency Stability/Voltage Variation – 799.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	799.012540	0.05
6.12	799.012500	0.00
7.20	799.012500	0.00
8.28	799.012530	0.04

Table 9-21: Frequency Stability/Voltage Variation – 806.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	806.0124881	-0.01
6.29	806.0124895	-0.01
7.4	806.0125000	0.00
8.51	806.0124914	-0.01

Table 9-22: Frequency Stability/Voltage Variation – 815.0000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	814.9999893	-0.01
6.29	814.9999931	-0.01
7.4	815.0000000	0.00
8.51	814.9999964	0.00

Table 9-23: Frequency Stability/Voltage Variation – 823.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	823.9874922	-0.01
6.29	823.9874980	0.00
7.4	823.9875000	0.00
8.51	823.9874960	0.00

Table 9-24: Frequency Stability/Voltage Variation – 851.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	851.0124907	-0.01
6.29	851.0124939	-0.01
7.4	851.0125000	0.00
8.51	851.0124969	0.00

Table 9-25: Frequency Stability/Voltage Variation – 860.0000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	859.9999893	-0.01
6.29	859.9999904	-0.01
7.4	860.0000000	0.00
8.51	859.9999967	0.00

Table 9-26: Frequency Stability/Voltage Variation – 868.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	868.9874901	-0.01
6.29	868.9874878	-0.01
7.4	868.9875000	0.00
8.51	868.9874919	-0.01

Table 9-27: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	3/28/16
901118	Hewlett Packard	HP8901B	Modulation Analyzer 150 kHz-1300 MHz	901057	4/14/17
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	9/10/16
901124	Alinco	DM-33MVT 32A	Power Supply	1638	N/A
901350	Meterman	33XR	Multimeter	040402802	4/14/17
901536	Weinschel Corporation	48-40-34	Attenuator DC-18 GHz 40 dB 100W	CB6627	9/11/16

Test Personnel:

Daniel Baltzell		January 2, 2015, January 9, 2016
EMC Test Engineer	Signature	Dates of Test

10 FCC Part 2.1047: Modulation Characteristics

10.1 Test Procedures

10.1.1 Audio Frequency Response

TIA-603-D 2010, section 2.2.6

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

TIA-603-D 2010, 2.2.15

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

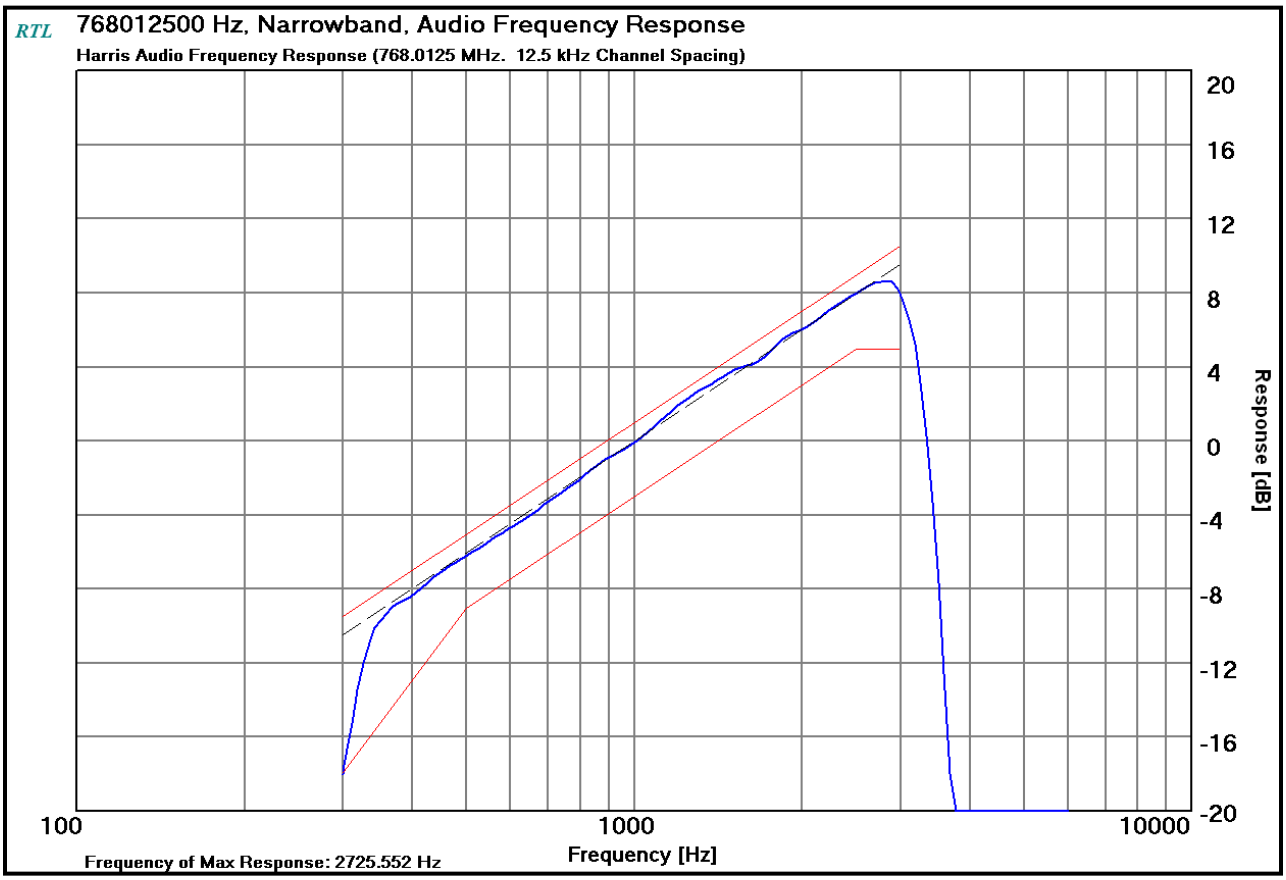
TIA-603-D 2010, section 2.2.3

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.

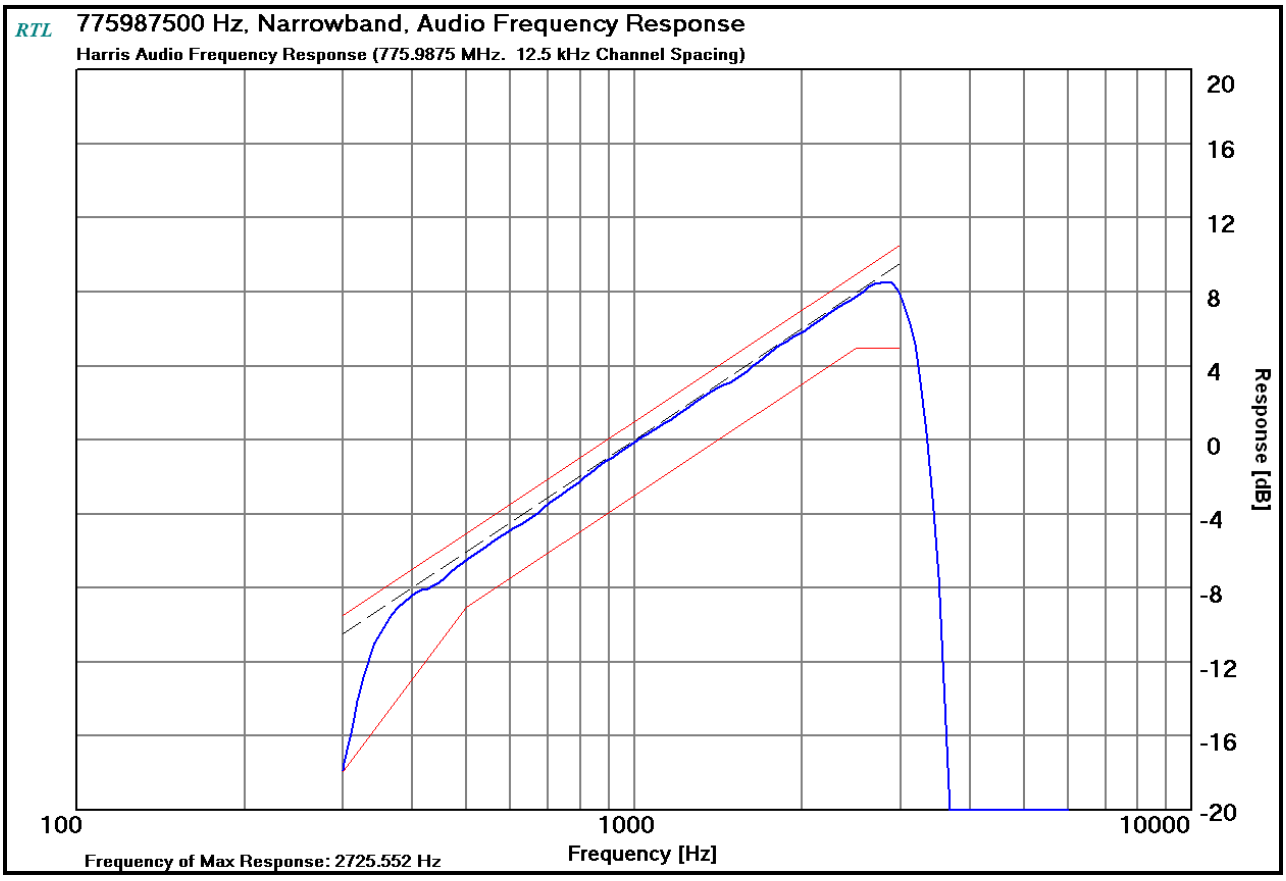
10.2 Test Data

10.2.1 Audio Frequency Response

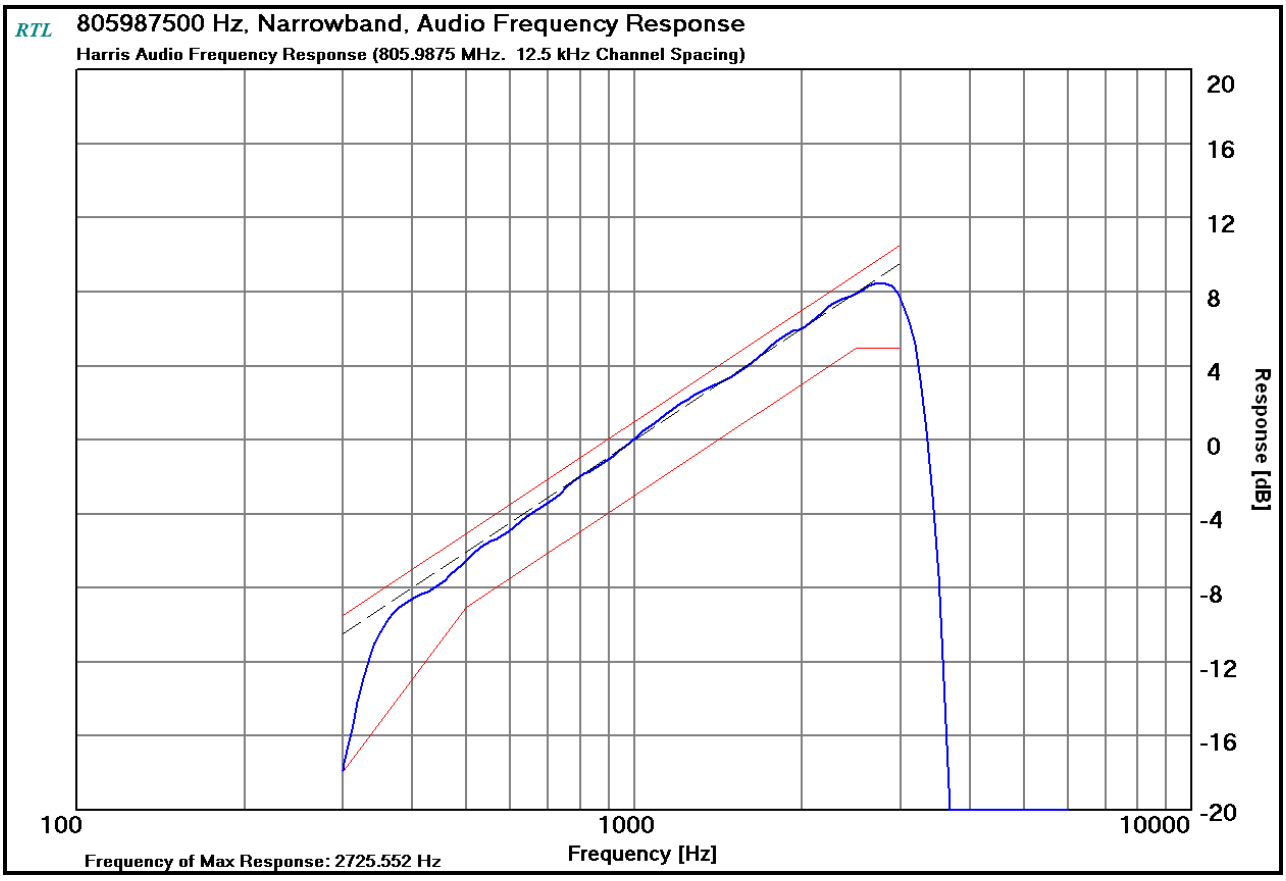
Plot 10-1: Modulation Characteristics - Audio Frequency Response – 768.0125 MHz



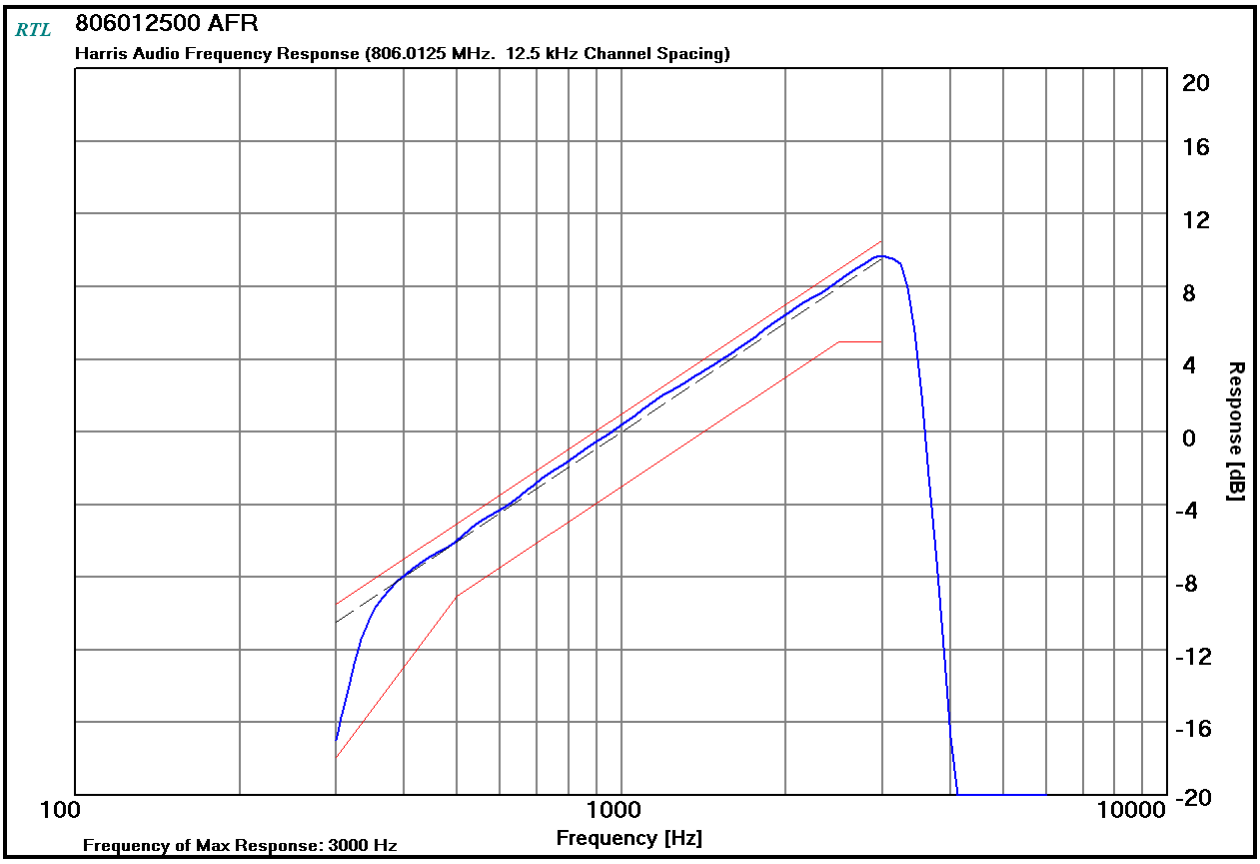
Plot 10-2: Modulation Characteristics - Audio Frequency Response – 775.9875 MHz



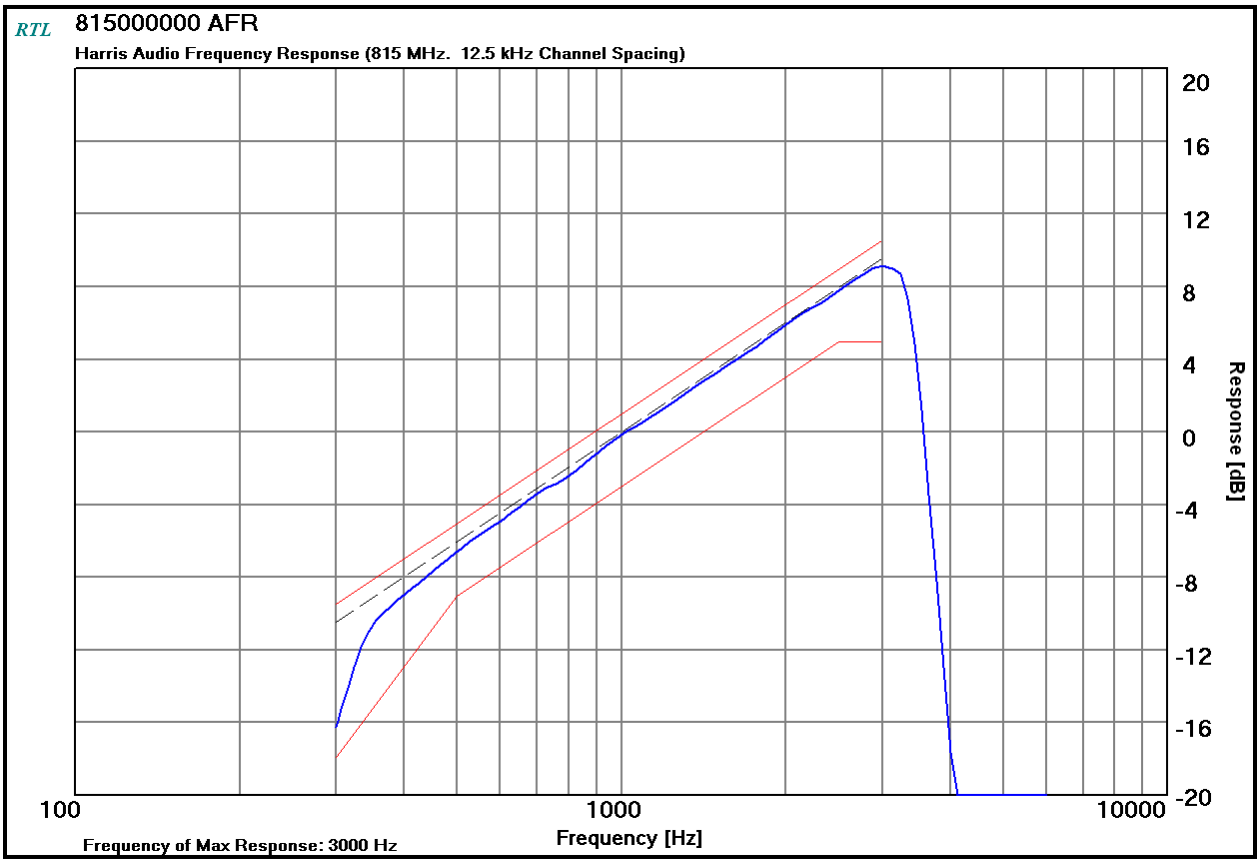
Plot 10-3: Modulation Characteristics - Audio Frequency Response – 805.9875 MHz



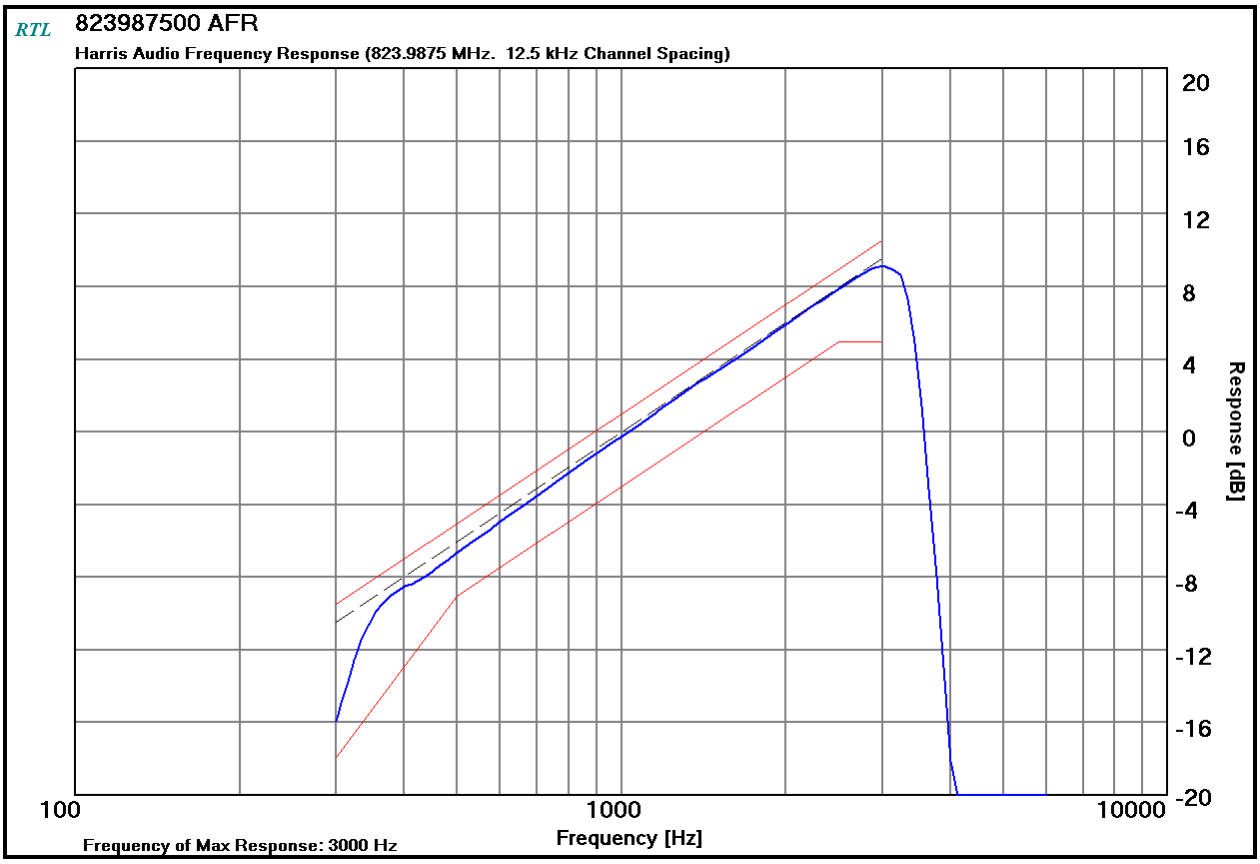
Plot 10-4: Modulation Characteristics - Audio Frequency Response – 806.0125 MHz



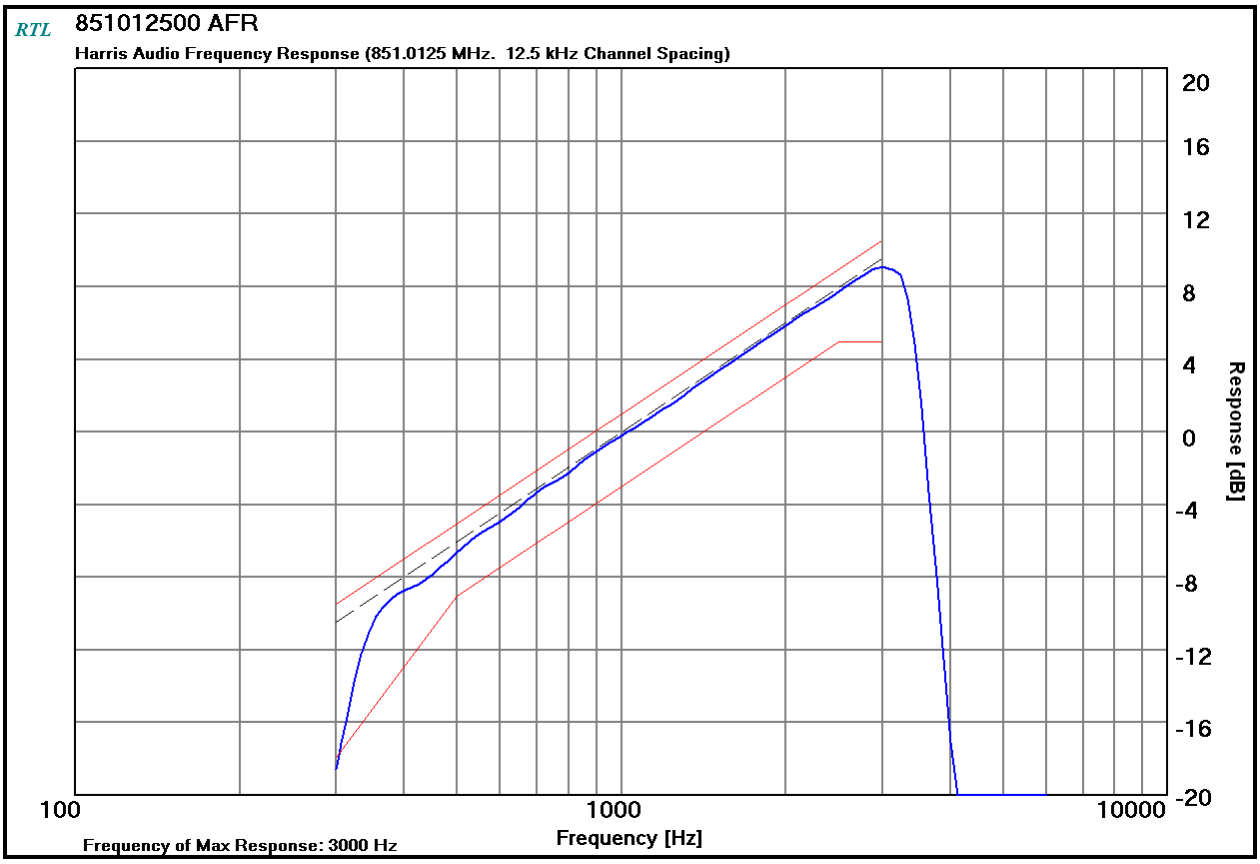
Plot 10-5: Modulation Characteristics - Audio Frequency Response – 815.0000 MHz



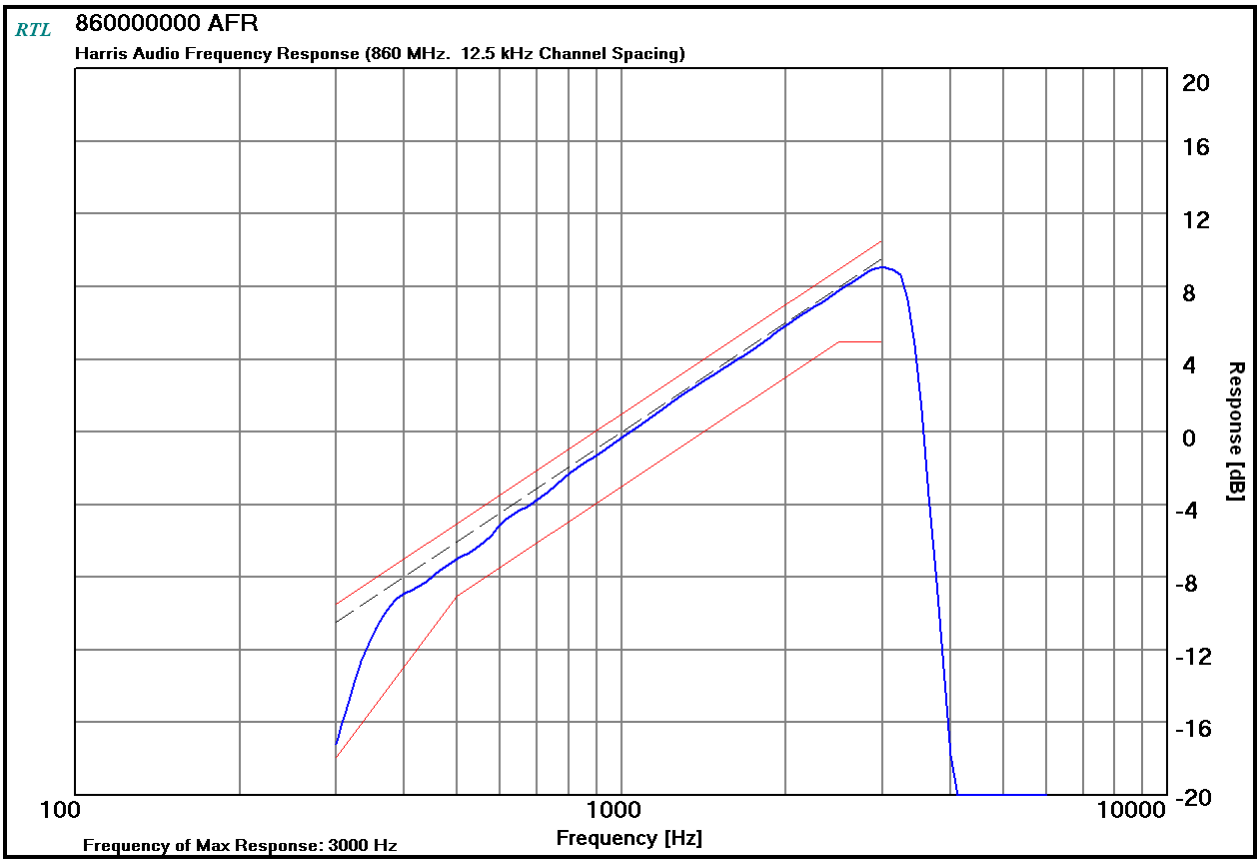
Plot 10-6: Modulation Characteristics - Audio Frequency Response – 823.9875 MHz



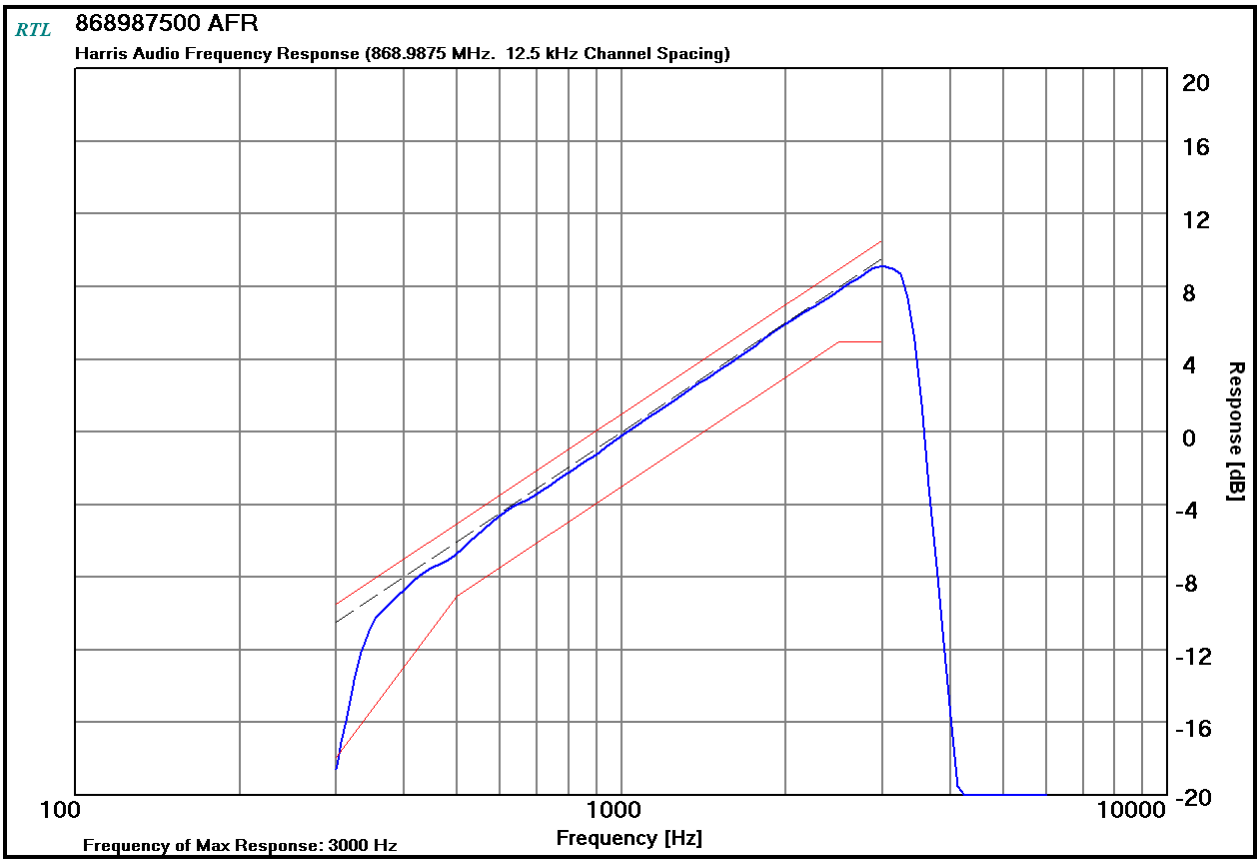
Plot 10-7: Modulation Characteristics - Audio Frequency Response – 851.0125 MHz



Plot 10-8: Modulation Characteristics - Audio Frequency Response – 860.0000 MHz

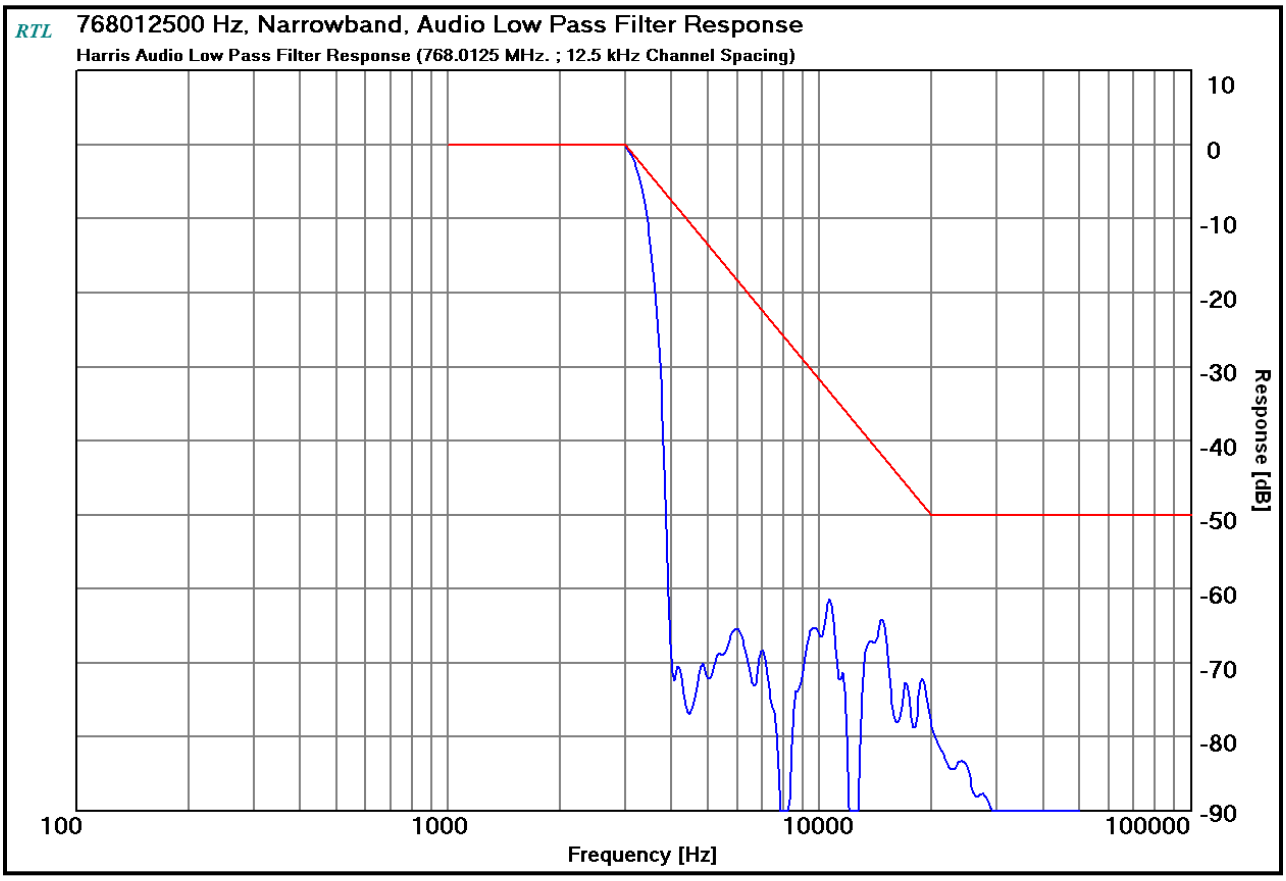


Plot 10-9: Modulation Characteristics - Audio Frequency Response – 868.9875 MHz

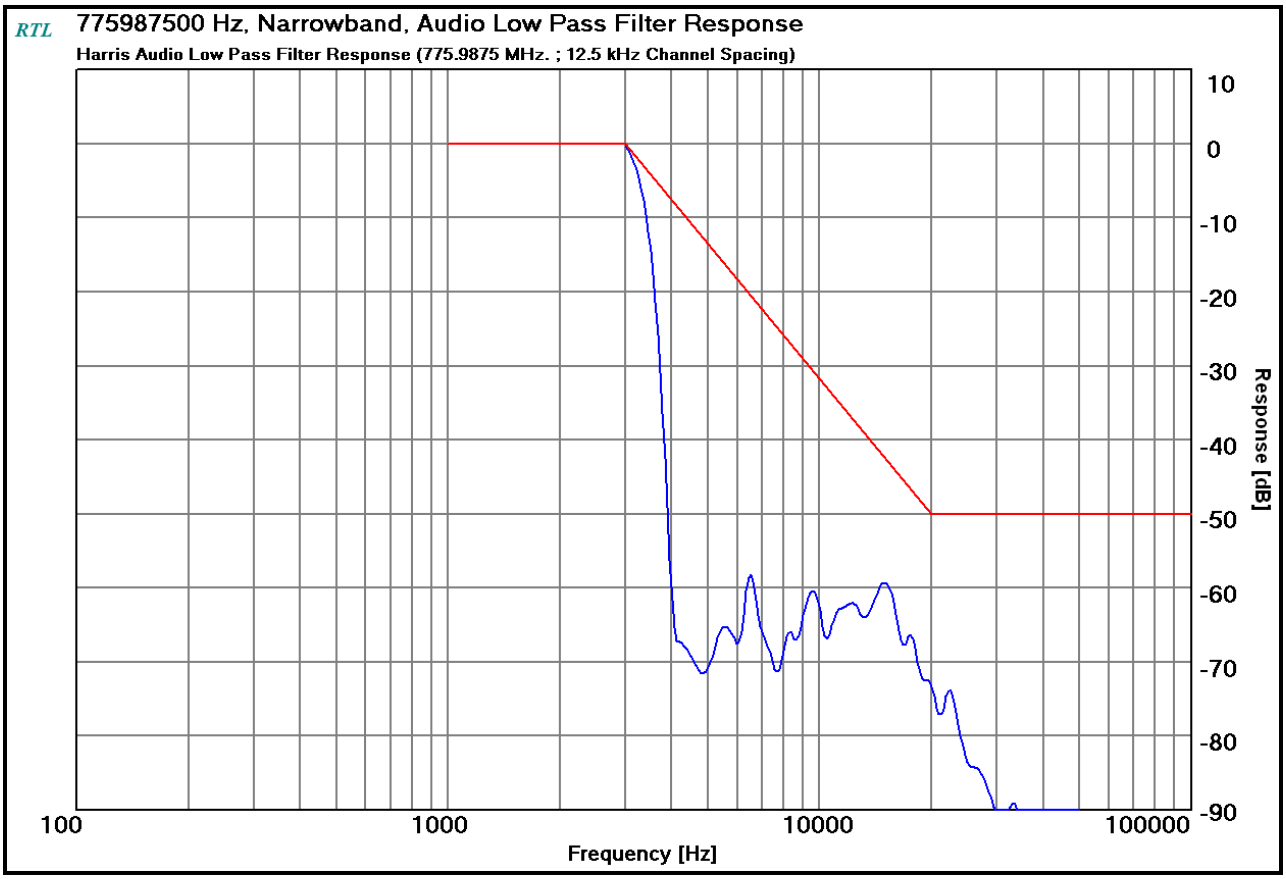


10.2.2 Audio Low Pass Filter Response

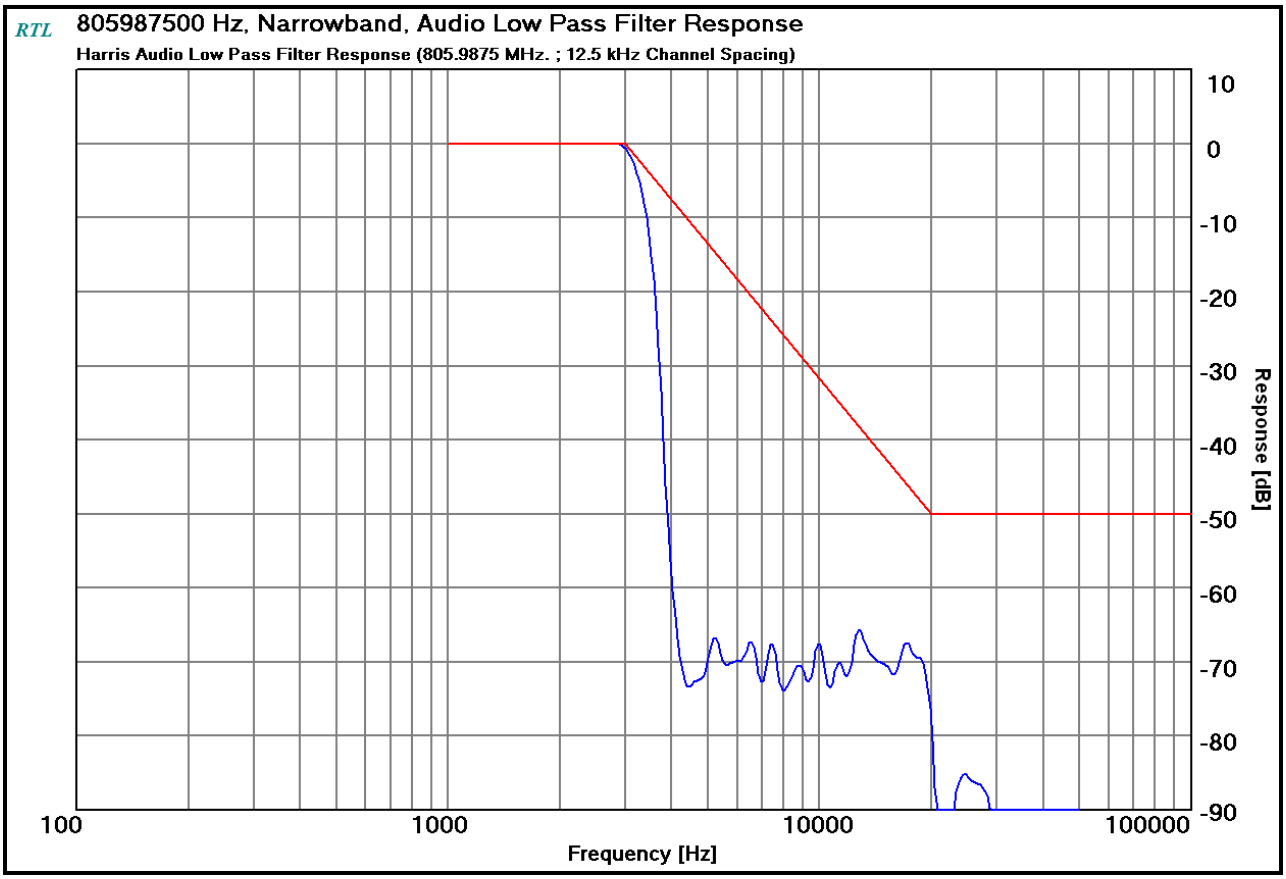
Plot 10-10: Modulation Characteristics – Audio Low Pass Filter – 768.0125 MHz



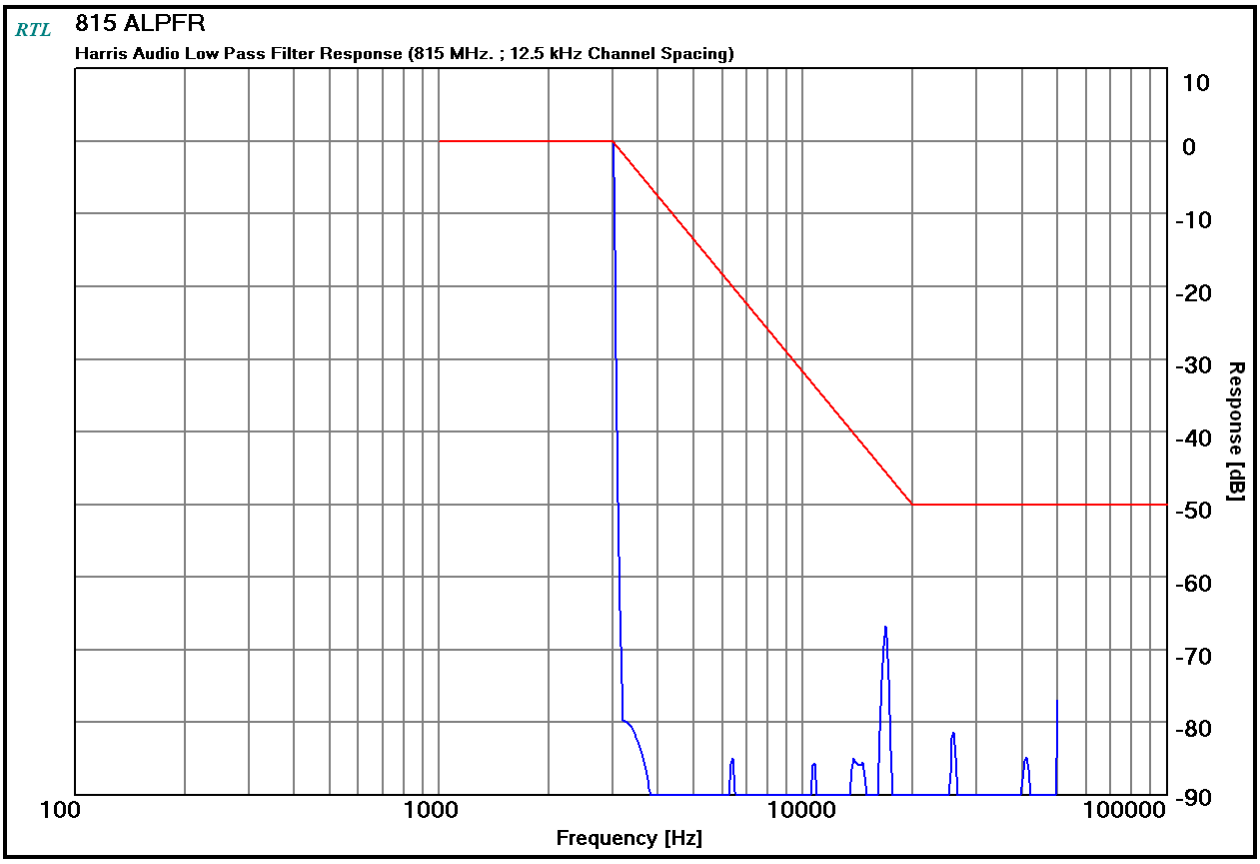
Plot 10-11: Modulation Characteristics – Audio Low Pass Filter – 775.9875 MHz



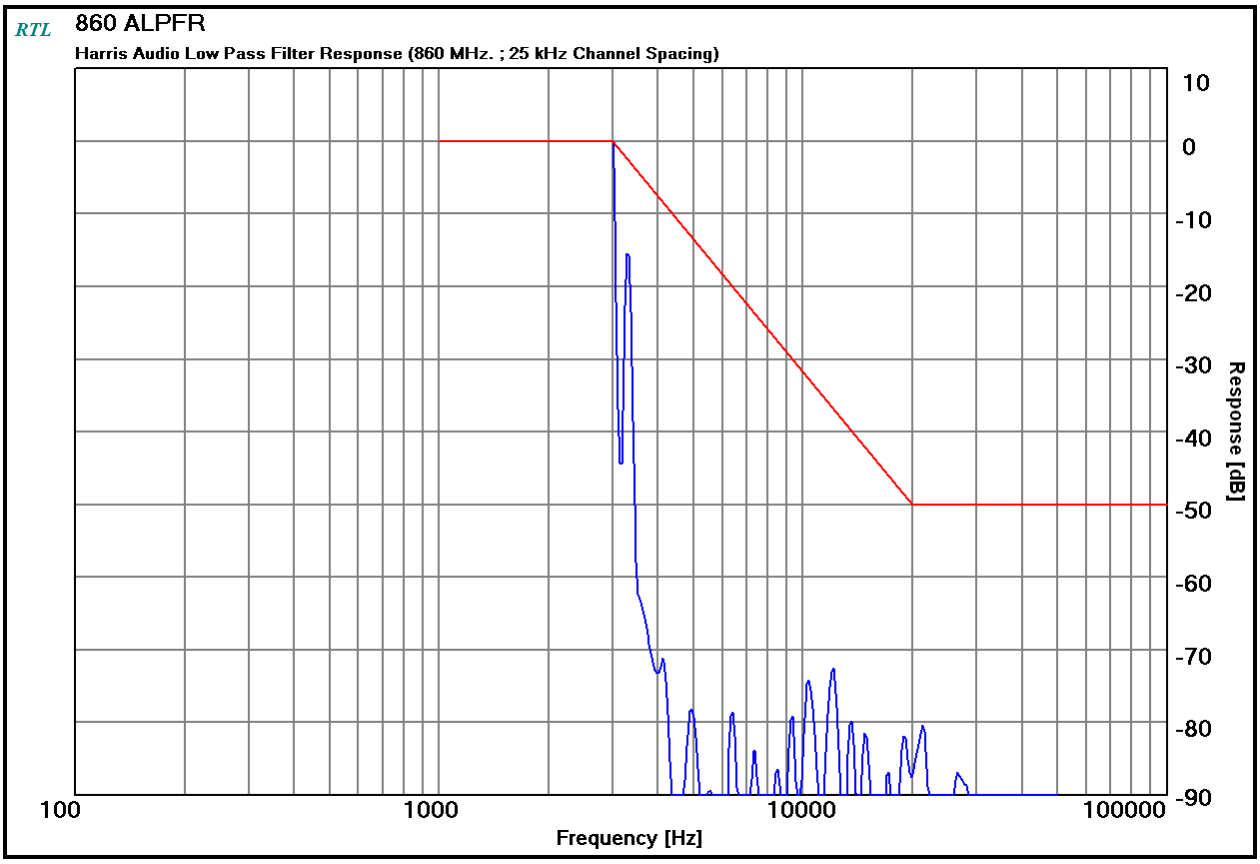
Plot 10-12: Modulation Characteristics – Audio Low Pass Filter – 805.9875 MHz



Plot 10-13: Modulation Characteristics – Audio Low Pass Filter – 815.0000 MHz

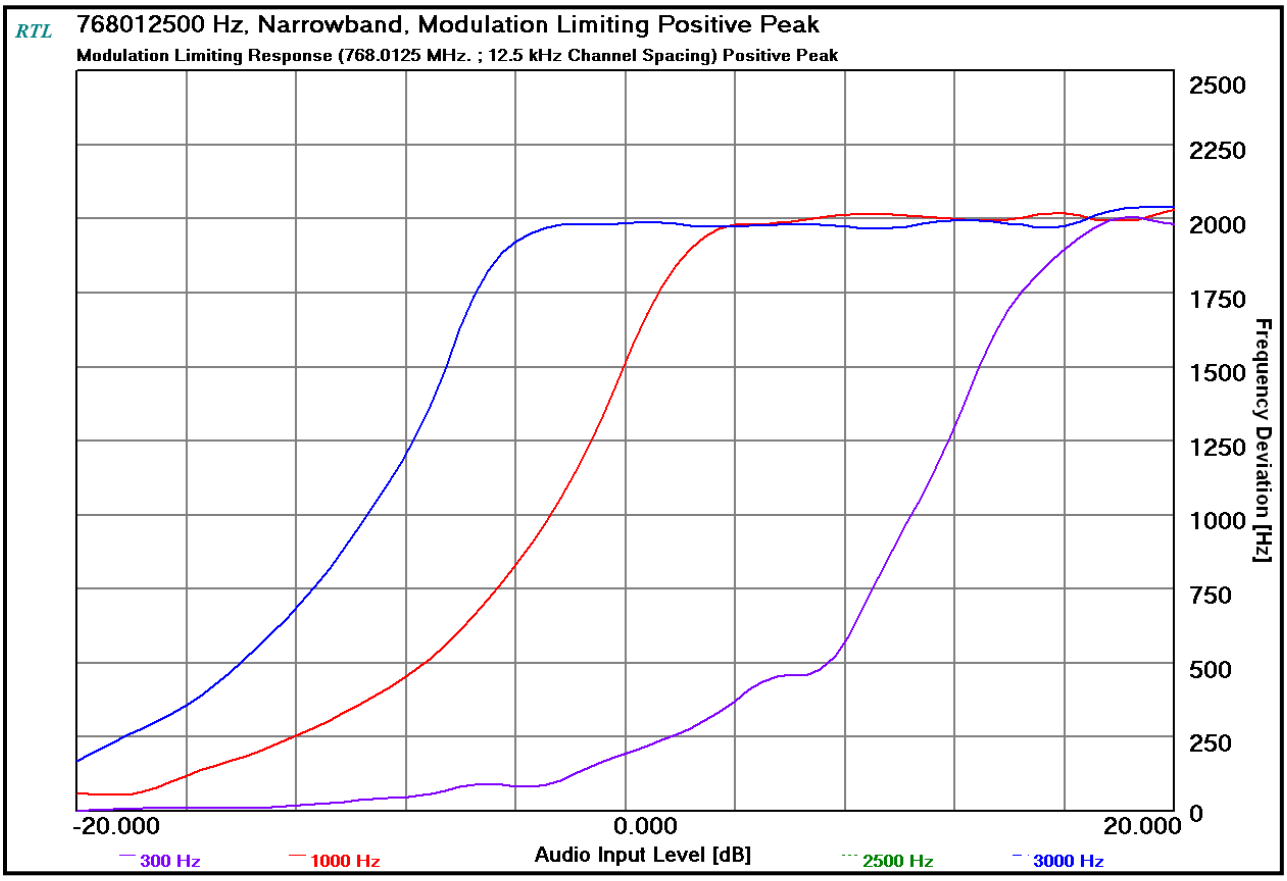


Plot 10-14: Modulation Characteristics – Audio Low Pass Filter – 860.0000 MHz

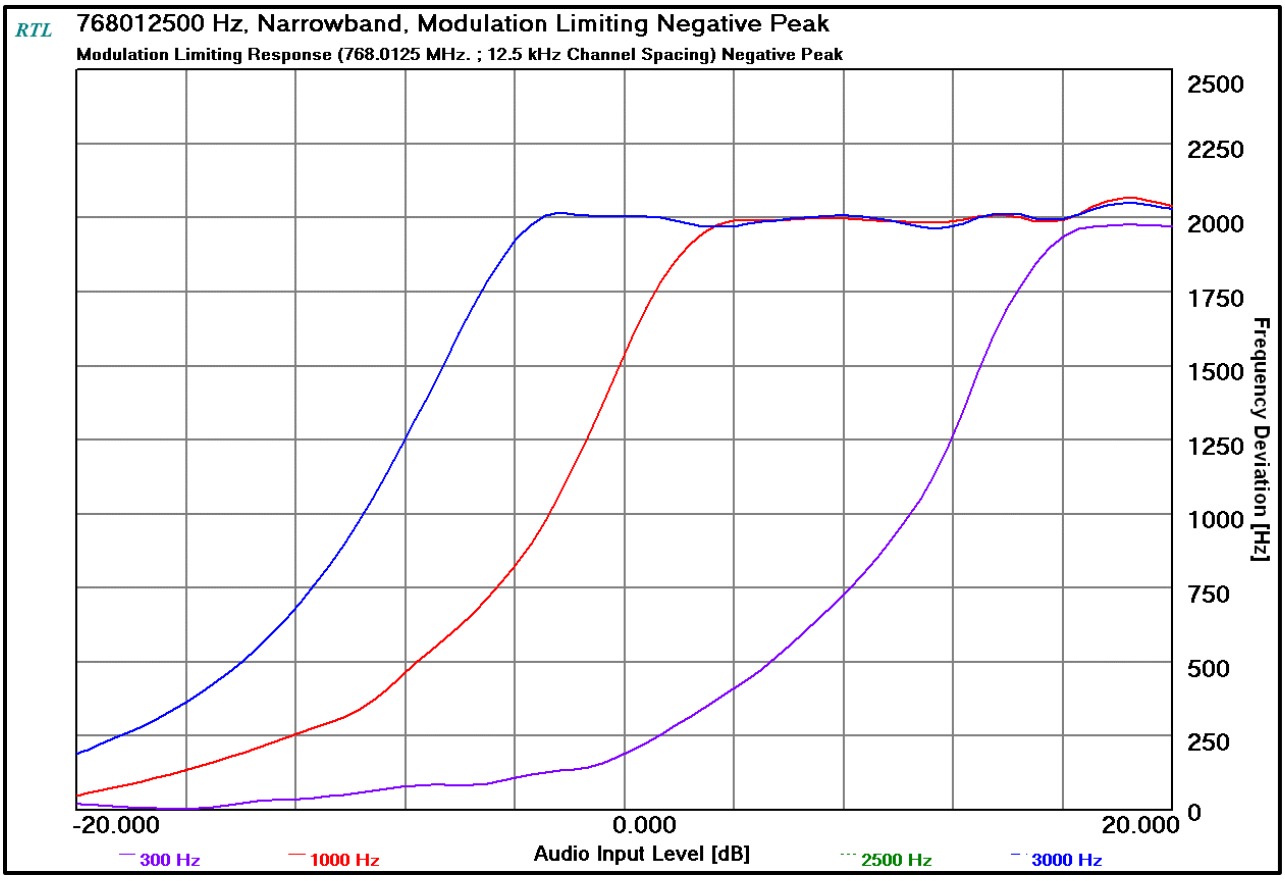


10.2.3 Modulation Limiting

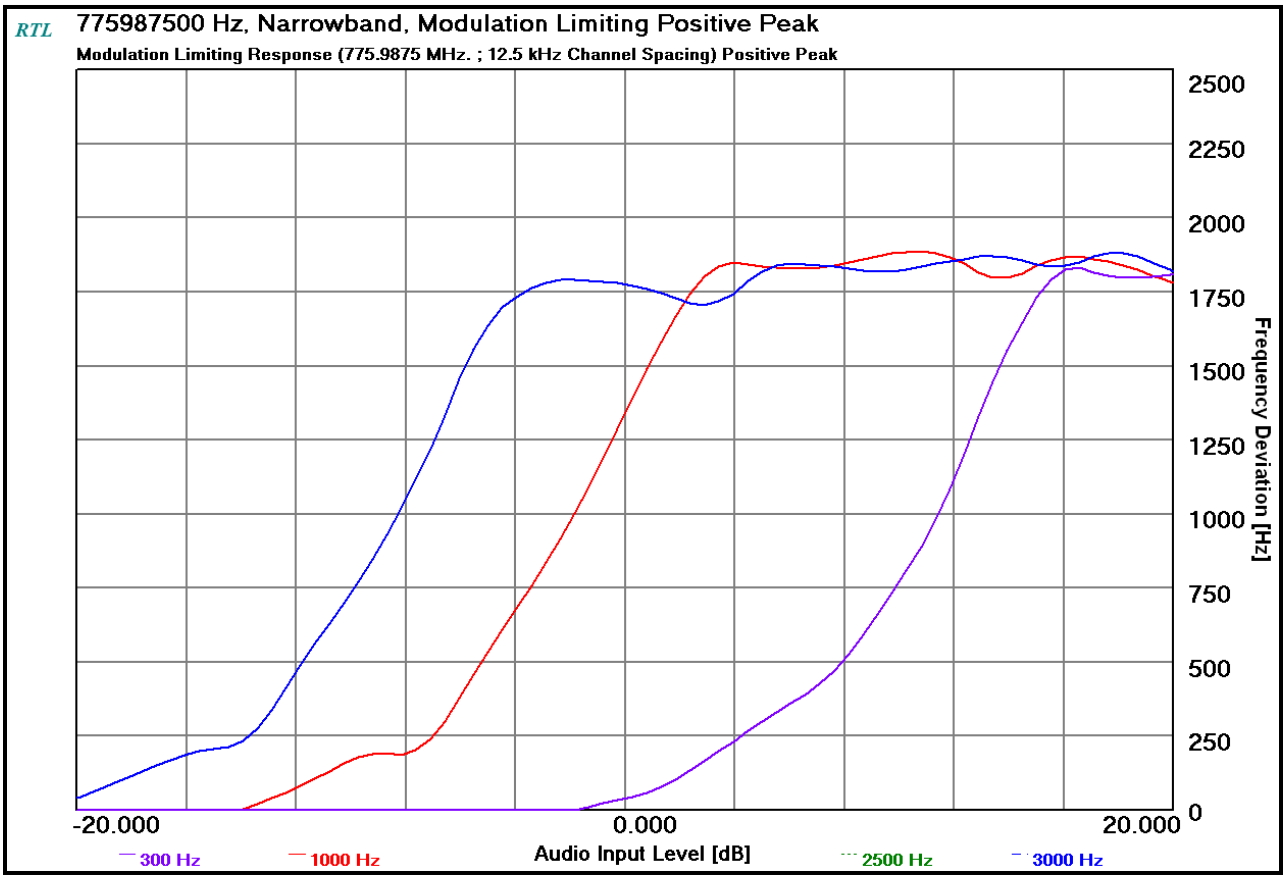
Plot 10-15: Modulation Characteristics – Modulation Limiting – 768.0125 MHz; Positive Peak; NB



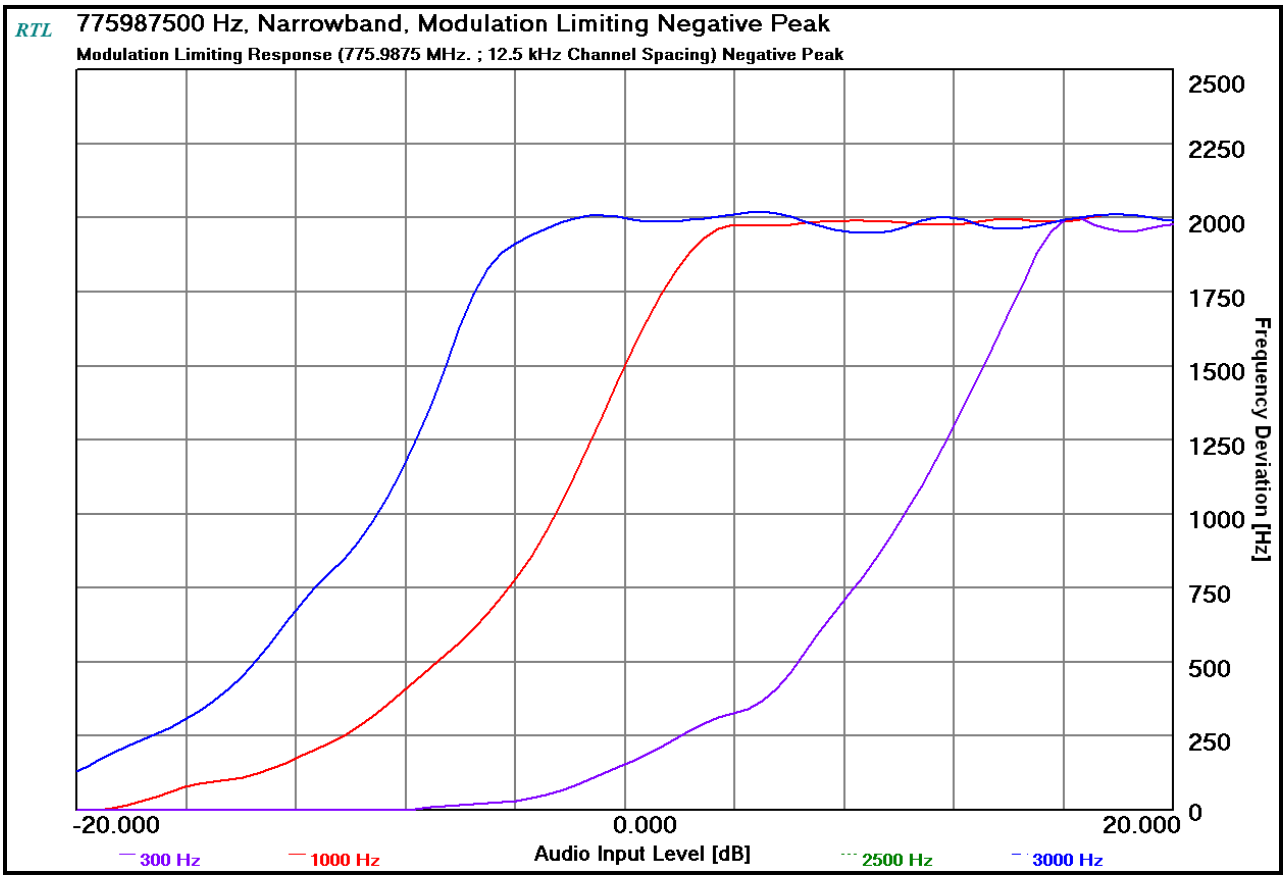
Plot 10-16: Modulation Characteristics – Modulation Limiting - 768.0125 MHz; Negative Peak; NB



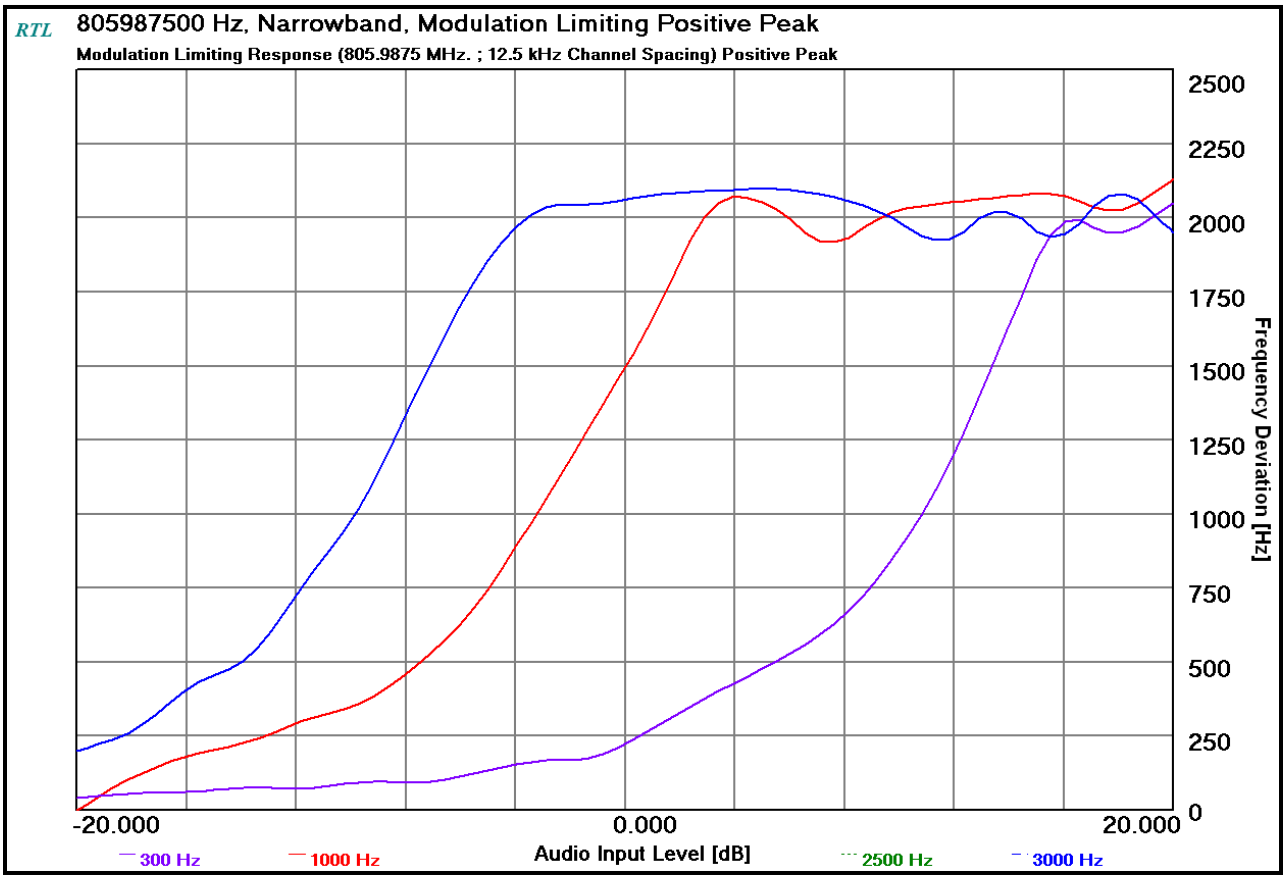
Plot 10-17: Modulation Characteristics – Modulation Limiting – 775.9875 MHz; Positive Peak; NB



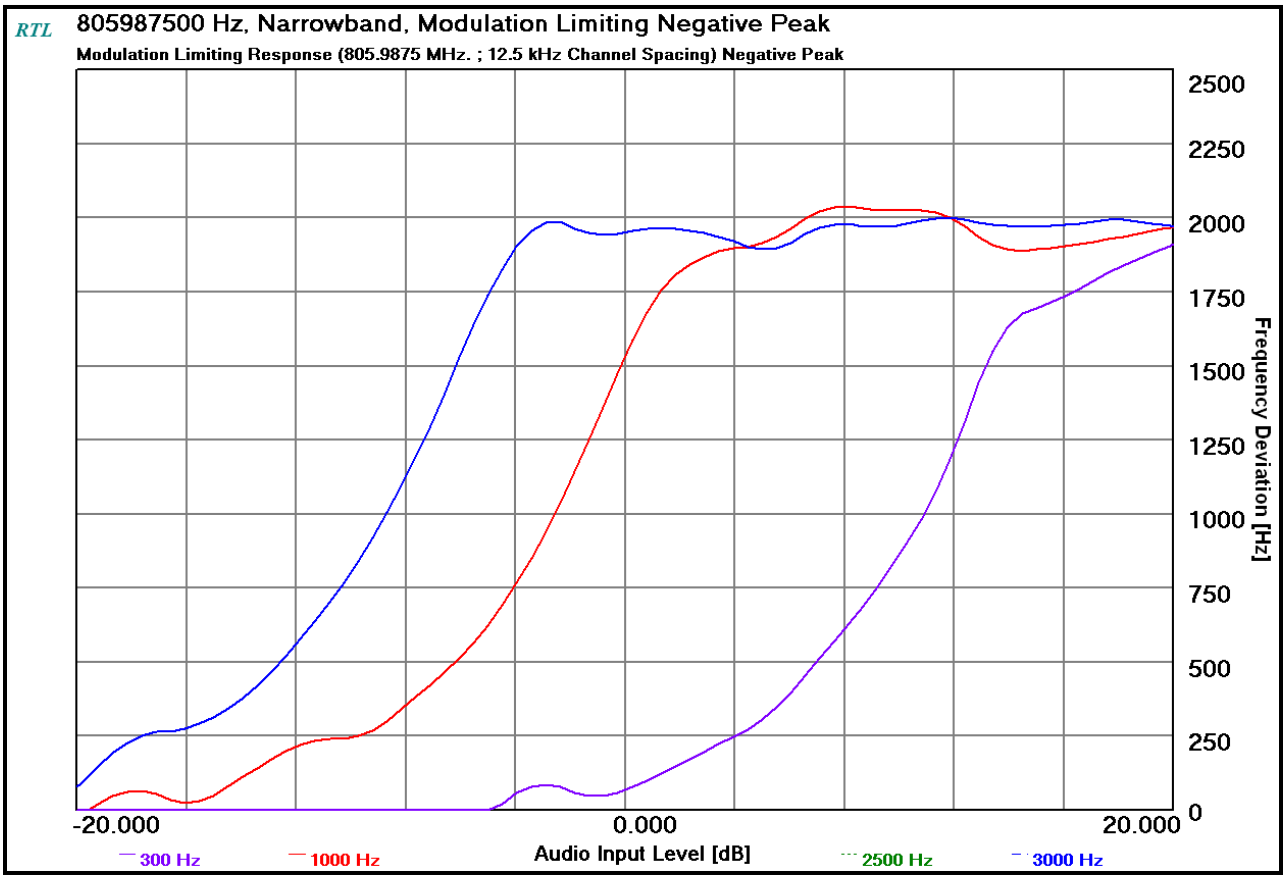
Plot 10-18: Modulation Characteristics – Modulation Limiting - 775.9875 MHz; Negative Peak; NB



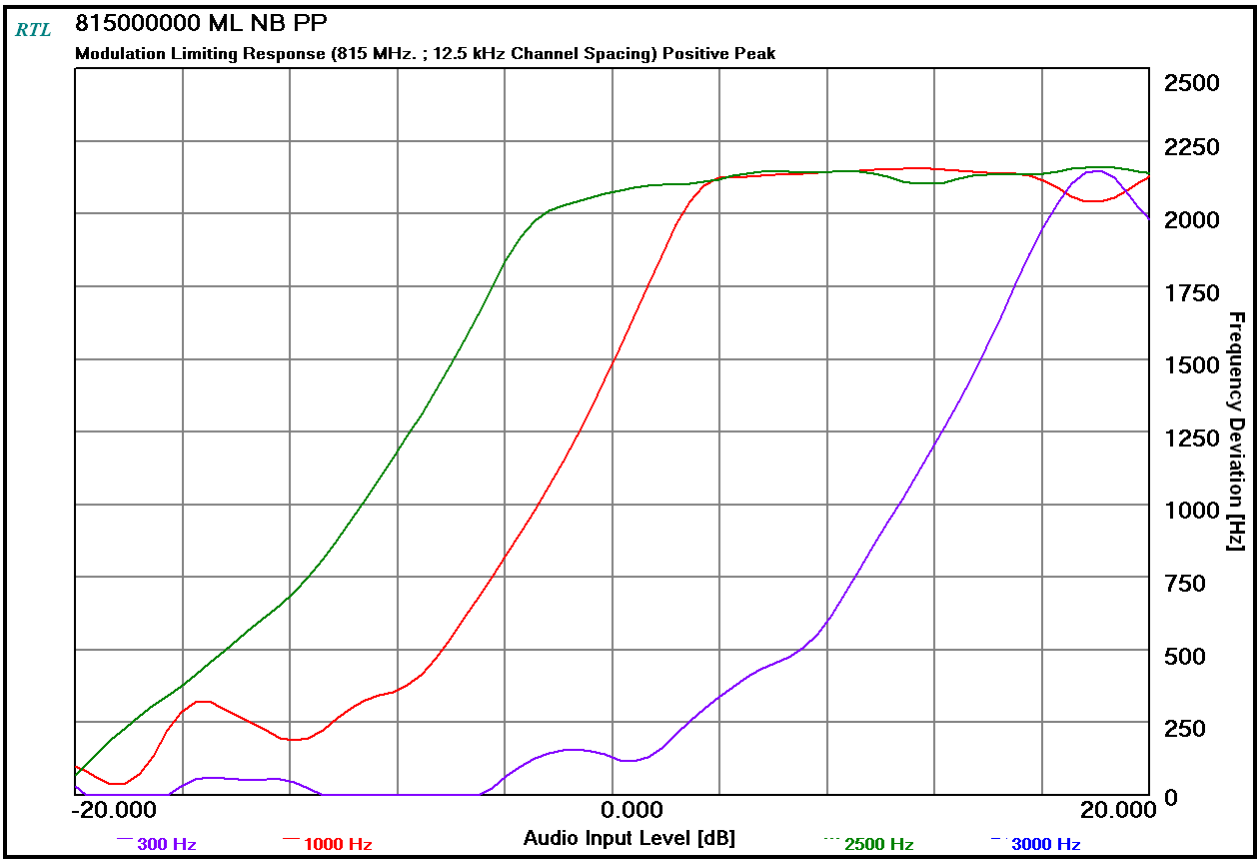
Plot 10-19: Modulation Characteristics – Modulation Limiting – 805.9875 MHz; Positive Peak; NB



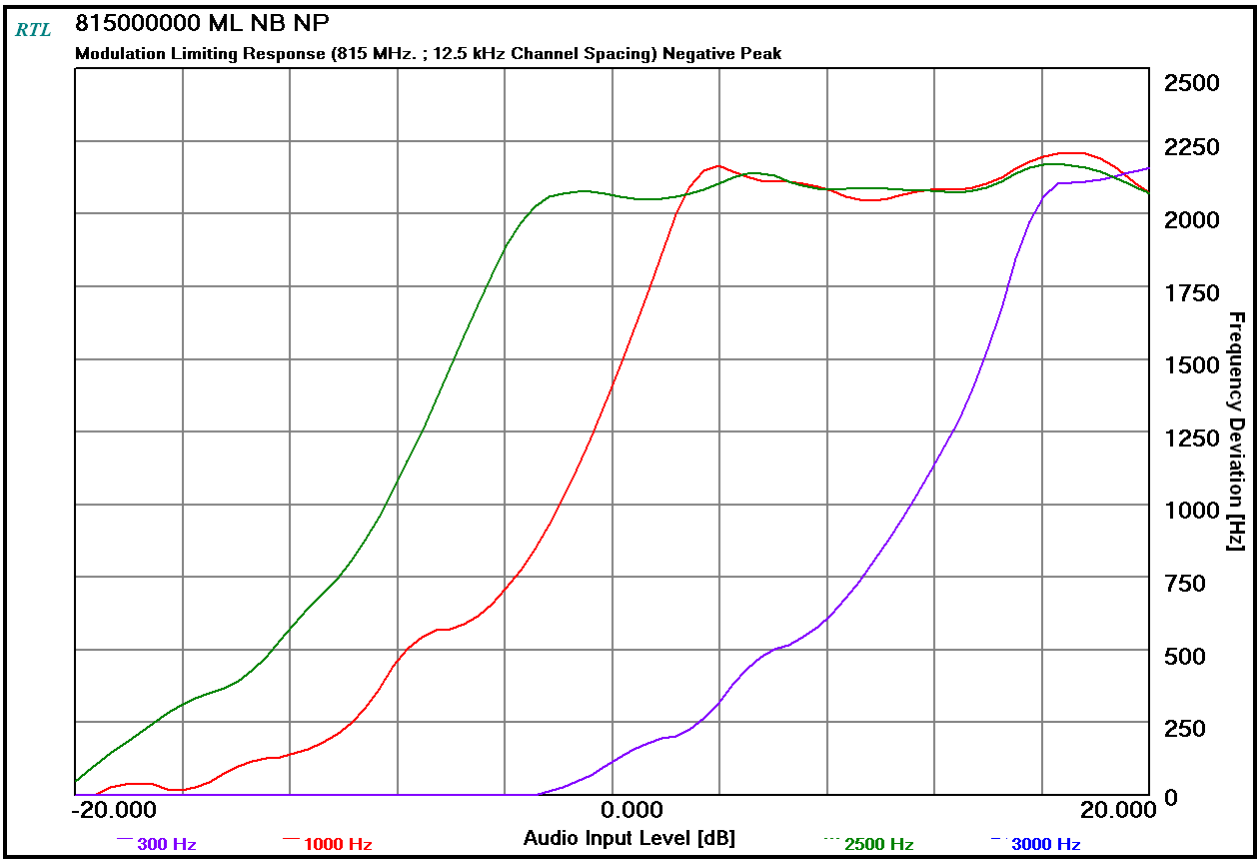
Plot 10-20: Modulation Characteristics – Modulation Limiting – 805.9875 MHz; Negative Peak; NB



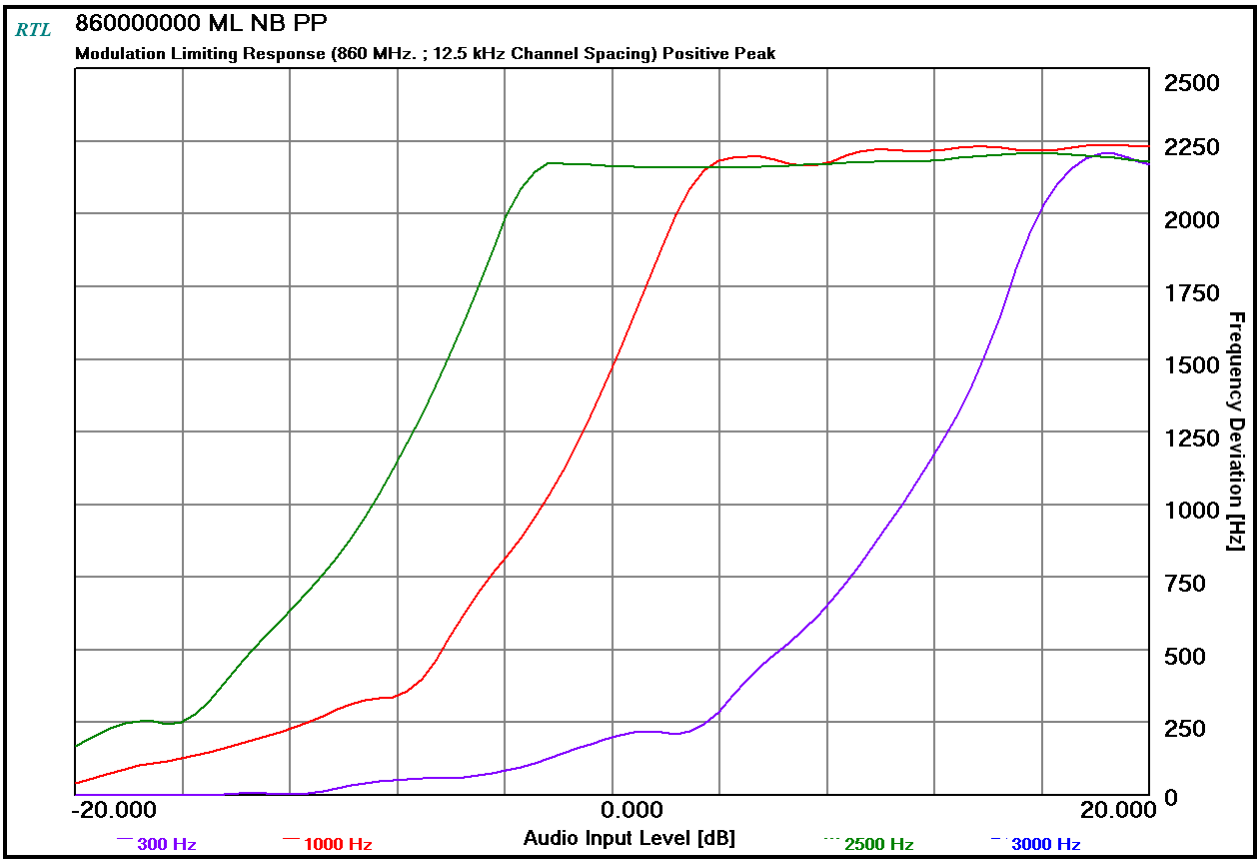
Plot 10-21: Modulation Characteristics – Modulation Limiting – 815 MHz; Positive Peak; NB



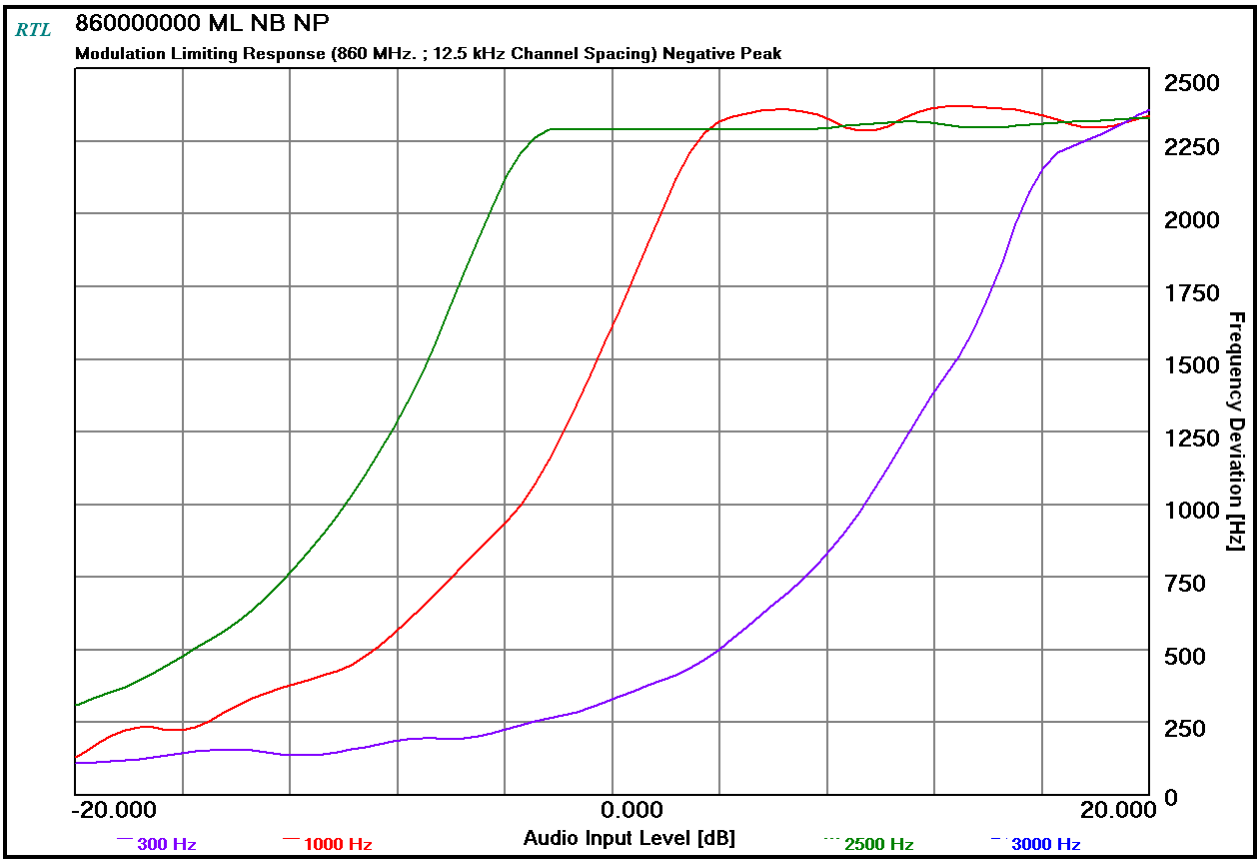
Plot 10-22: Modulation Characteristics – Modulation Limiting – 815 MHz; Negative Peak; NB



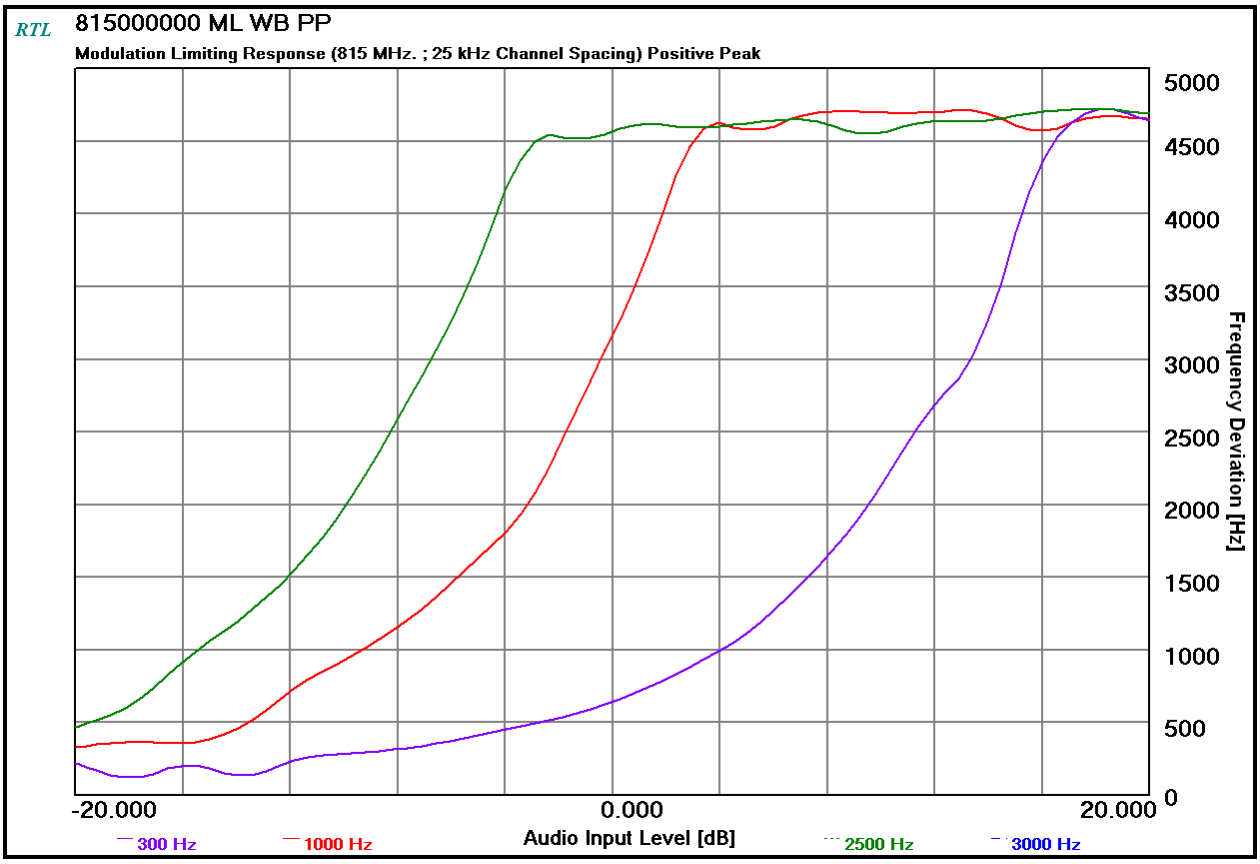
Plot 10-23: Modulation Characteristics – Modulation Limiting - 860 MHz; Positive Peak; NB



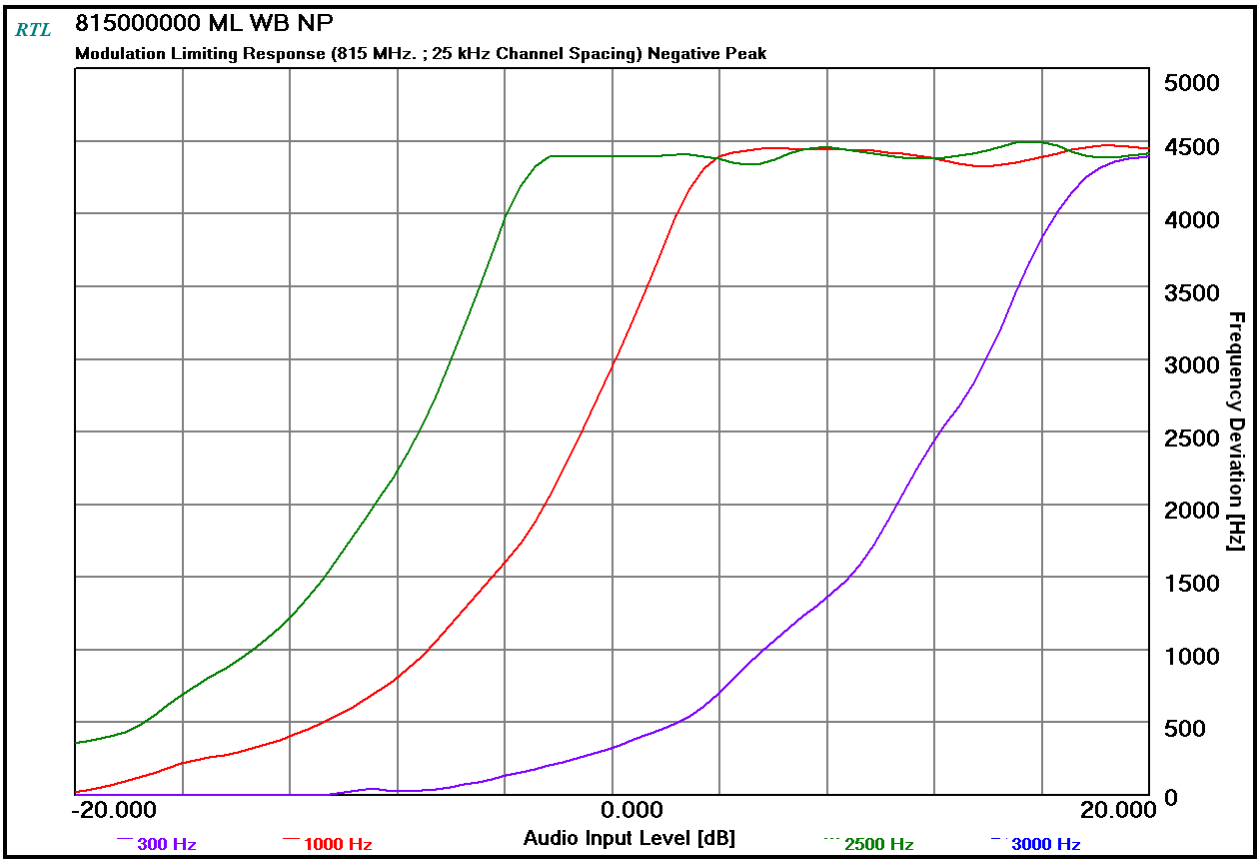
Plot 10-24: Modulation Characteristics – Modulation Limiting - 860 MHz; Negative Peak; NB



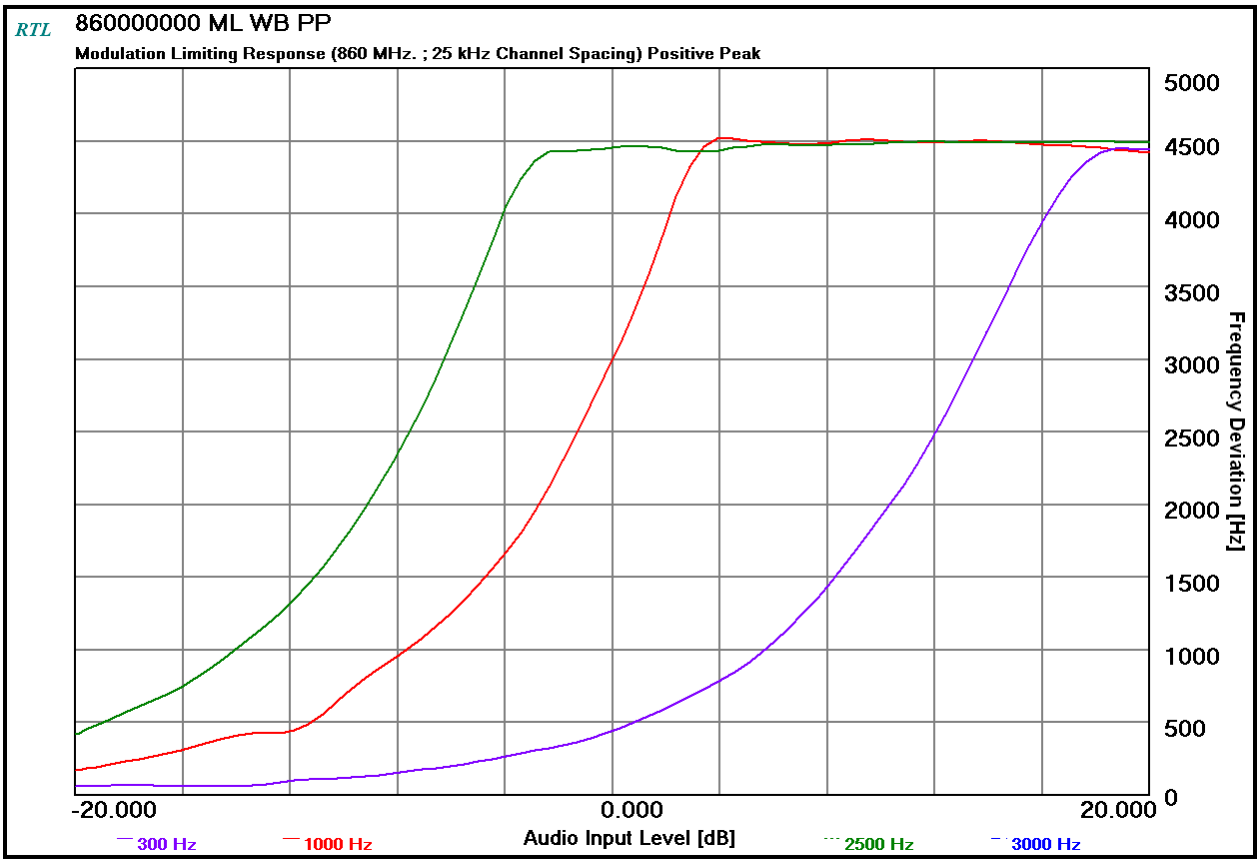
Plot 10-25: Modulation Characteristics – Modulation Limiting – 815 MHz; Positive Peak; WB



Plot 10-26: Modulation Characteristics – Modulation Limiting – 815 MHz; Negative Peak; WB



Plot 10-27: Modulation Characteristics – Modulation Limiting - 860 MHz; Positive Peak; WB



Plot 10-28: Modulation Characteristics – Modulation Limiting - 860 MHz; Negative Peak; WB

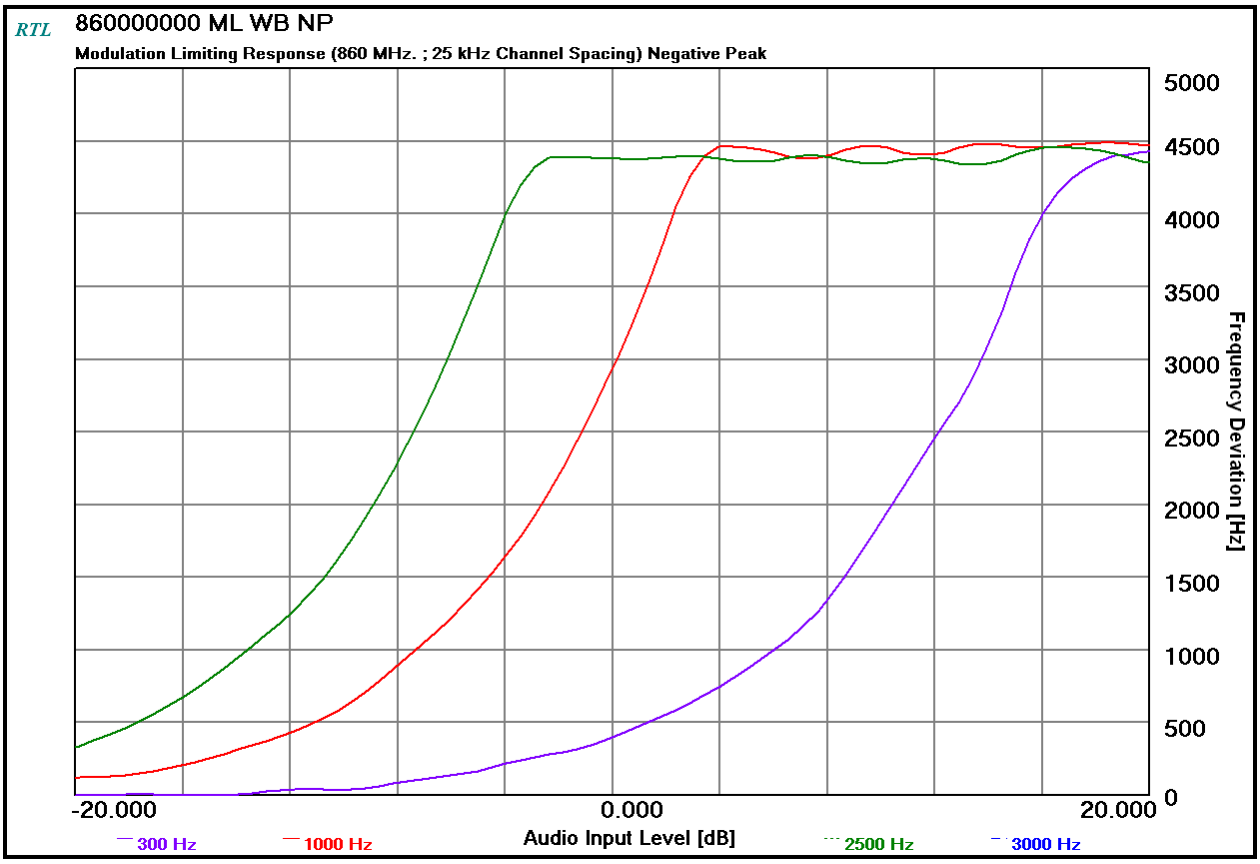


Table 10-1: Test Equipment Used For Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	4/13/17
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	4/14/17
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	4/21/17
901536	Weinschel Corporation	48-40-34	Attenuator DC-18 GHz 40 dB 100W	CB6627	9/11/16

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	January 3-8, 2015, January 10, 2016
Test Engineer	Signature	Dates of Tests

11 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

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

Voice – FM Analog (NPSPAC) (25 kHz)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 4.0
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 14.0 kHz
Emission designator: 14K0F3E

Voice – FM Analog (12.5 kHz)
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

EDACS WB 9600 Digital Voice/Data (25 kHz)
Calculation:
Data rate in bps (R) = 9600
Deviation Peak deviation of carrier (D) = 3474
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(3474) + 0.27(9600)(1) = 16.0 kHz
Emission designator: 16K0F1D/E

EDACS (NPSPAC) 9600 Digital Voice/Data (25 kHz)
Calculation:
Data rate in bps (R) = 9600
Deviation Peak deviation of carrier (D) = 2955
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(2955) + 0.27(9600)(1) = 14.0 kHz
Emission designator: 14K0F1D/E

EDACS NB 9600 Digital Voice/Data (12.5 kHz)
Calculation:
Data rate in bps (R) = 9600
Deviation Peak deviation of carrier (D) = 2359.585
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(2359.585) + 0.27(9600)(1) = 11.7 kHz
Emission designator: 11K7F1D/E

OpenSky SMR (25 kHz)
Calculation:
Data rate in bps (R) = 19200
Deviation Peak deviation of carrier (D) = 4000
Number of states in each symbol (S) = 4
K = 0.875
Bn = R/ $\log_2$S + 2DK=19200/$\log_2$(4)+2(4000)(0.875) = 15.4 kHz
Emission designator: 15K4F9W

OpenSky NPSPAC (25 kHz)
Calculation:
Data rate in bps (R) = 19200
Deviation Peak deviation of carrier (D) = 3750
Number of states in each symbol (S) = 4
K = 0.335
Bn = R/ $\log_2$S + 2DK=19200/$\log_2$(4)+2(3750)(0.335) = 12.1 kHz
Emission designator: 12K1F9W

OpenSky NB (25 kHz)
Calculation:
Data rate in bps (R) = 9600
Deviation Peak deviation of carrier (D) = 1800
Number of states in each symbol (S) = 4
K = 1
Bn = R/ $\log_2$S + 2DK=9600/$\log_2$(4)+2(1800)(1) = 8.4 kHz
Emission designator: 8K40F9W

P25 Phase 1 Data/Voice (C4FM) (12.5 kHz)
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/E

P25 Phase 2 Data/Voice (H-CPM TDMA) (12.5 kHz)
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-185P 7/8 Non-Rebanded C1D2 Portable Land Mobile Radio, FCC ID: OWDTR-0148-E, IC: 3636B-0148**, complies with the applicable requirements of FCC Parts 2 and 90, and Industry Canada RSS-119.