RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & ISED Certification Report

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Model: XL-185P 7/8 Rebanded C1D2
Portable Land Mobile Radio

FCC ID: OWDTR-0147-E
IC: 3636B-0147

July 20, 2017

Standards Referenced for this Report	
Part 2: 2016	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2016	Private Land Mobile Radio Services
ANSI/TIA-603-D 2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
RSS-119 Issue 12	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2017069TNF

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB. Refer to certificate and scope of accreditation AT-1445.

Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Transmit Mode	Emission Designator
809 – 816 851 – 861	0.5 – 3.0	0.5	Analog FM (WB)	16K0F3E
809 – 816 851 – 861	0.5 – 3.0	0.5	2-level FSK 9600 Data/ Digital Voice (WB)	16K0F1D/E
806 – 809 851 – 861	0.5 – 3.0	0.5	Analog FM (NPSPAC)	14K0F3E
806 – 809 851 – 861	0.5 – 3.0	0.5	2-level FSK 9600 Data/ Digital Voice (NPSPAC)	14K0F1D/E
769 – 775 (FCC) 768 – 776 (ISED) 799 – 805 (FCC) 798 – 806 (ISED) 806 – 816 851 – 861	0.5 – 3.0	0.5	Analog FM (NB)	11K0F3E
769 – 775 (FCC) 768 – 776 (ISED) 799 – 805 (FCC) 798 – 806 (ISED) 806 – 816 851 – 861	0.5 – 3.0	0.5	2-level FSK 9600 Data/ Digital Voice (NB)	11K7F1D/E
769 – 775 (FCC) 768 – 776 (ISED) 799 – 805 (FCC) 798 – 806 (ISED) 851 – 854 854 – 861	0.5 – 3.0	0.5	4-level C4FM Data/Voice; P25 Phase 1	8K40F1D/E
769 – 775 (FCC) 768 – 776 (ISED) 799 – 805 (FCC) 798 – 806 (ISED) 851 – 854 854 – 861	0.5 – 3.0	0.5	4-level H-CPM (TDMA) Data/Voice; P25 Phase 2)	8K10DXW

Note: As this is a combined FCC and ISED test report, there is test data between 768 – and 769 MHz, 775 – 776 MHz, 798 – 799 MHz and 805 – 806 MHz for frequencies that are only authorized for use in Canada; that is, any test data in the aforementioned frequency ranges is not applicable for the FCC, nor authorized for use in the United States.

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1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 90.541(d)	RSS-119 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210	RSS-119 5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.543(c); 90.210	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.543(d); 90.210	RSS-119 5.5, 5.8	Complies
Adjacent Channel Power	90.543	RSS-119 5.3	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213, 90.539	N/A	Complies
Modulation Characteristics	2.1047(a)(b)	RSS-119 5.9	Complies
Transient Frequency Response	90.214	RSS-119 5.9	N/A

2 General Information

The following Certification Report is prepared on behalf of **Harris Corporation** in accordance with the Federal Communications Commission and Industry Canada rules and regulations. The Equipment Under Test (EUT) was the **XL-185P 7/8 Rebanded C1D2 Portable Land Mobile Radio; FCC ID: OWDTR-0147-E, IC: 3636B-0147.**

The radio is subject to FCC DoC. DoC testing was performed and the data is contained in a separate DoC report.

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

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

This FCC and IC application includes an Industry Canada Family Certification application, which includes 4 model numbers under IC: 3636B-0147:

XS-PFS1M, XS-PFS1Y, XS-PPS1M, XS-PPS1Y

2.3 Grant Notes

Manufacturer's Rated Power:

700 MHz Bands: 3W
800 MHz Bands: 3W

2.4 Tested System Details

The test sample was received on December 12, 2016. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

The EUT includes a System model and a Scan model, the difference being that the System model has a DTMF keypad. The System model is considered to be representative of the radio family and to have the worst case emissions, and was therefore used for testing.

The device was programmed for multiple modes of operation and modulation types.

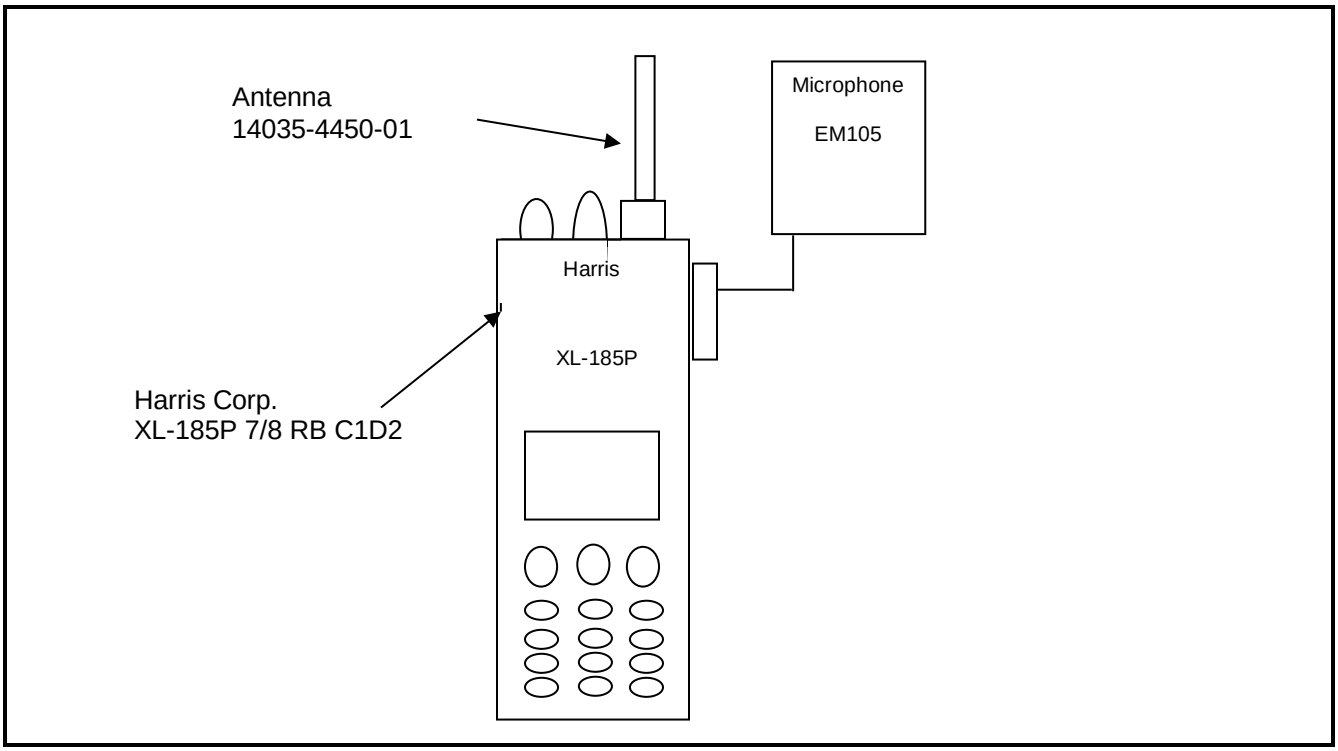
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	SN	FCC ID	RTL Bar Code
Radio	Harris Corporation	XL-185P 7/8 RB C1D2	A-40180xxxxxx	OWDTR-0147-E	22283

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Microphone	Harris Corporation	EM105	N/A	N/A	21563
Antenna (762-870 MHz)	Harris Corporation	N/A	14035-4450-01	N/A	22284
Battery	Harris Corporation	Li-Ion Rechargeable Battery	14035-4010-04	N/A	22299
Battery	Harris Corporation	Li-Ion Rechargeable Battery	14035-4010-04	N/A	22300
Power Supply	Hewlett Packard	E3610A	KR72917306	N/A	901699
Battery Eliminator	Harris Corporation	-	-	N/A	-

Figure 2-1: Configuration of Tested System



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

7.5VDC / 0.74 A

4 FCC Part 2.1046(a): RF power output: Conducted; Part 90.541(d) Transmitting power and antenna height requirements; IC RSS-119 4.1: Transmitter Output Power

4.1 Test Procedure

ANSI/TIA-603-D 2010, section 2.2.1

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

Manufacturer's rated power: 3 W for 700 and 800MHz bands; for the 2 W ERP used in the 700 MHz band on-scene incident channels, a power setting of 1.9 W is used.

4.2 Test Data

Table 4-1: RF Conducted Output Power – Measured

Frequency (MHz)	High Power (dBm)	High Power (W)	Low Power (dBm)	Low Power (W)
768.0125	34.3	2.7	27.0	0.5
769.0125	34.3	2.7	27.0	0.5
772.0125	34.3	2.7	27.0	0.5
775.9875	34.3	2.7	27.0	0.5
798.0125	34.3	2.7	27.0	0.5
799.0125	34.4	2.8	27.0	0.5
801.0125	34.3	2.7	27.0	0.5
805.9875	34.3	2.7	27.0	0.5
806.0125	35.0	3.2	27.2	0.5
811.0125	35.1	3.2	27.3	0.5
815.9875	35.2	3.3	27.3	0.5
851.0125	35.0	3.2	27.2	0.5
856.0125	35.1	3.2	27.3	0.5
860.9875	35.0	3.2	27.3	0.5

Notes: Data presented is for analog mode. All other modes were investigated and found to have equivalent power within measurement tolerances.

Table 4-2: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901536	Aeroflex	48-40-34	40 dB Attenuator	CB6627	9/6/17

Test Personnel:

Daniel Baltzell		December 13, 2016 & January 23, 2017
EMC Test Engineer	Signature	Dates of Test

5 FCC Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations

5.1 Test Procedure

ANSI/TIA-603-D 2010, Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

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

5.2 Test Data

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

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

The following channels (in MHz) were investigated:

700 MHz	800 MHz
768.0125	806.0125
769.0125	811.0125
772.0125	823.9875
775.9875	851.0125
798.0125	856.0125
799.0125	868.9875
801.0125	
805.9875	

Both high and low power settings were checked; high power was found to be worst case and is presented. All modes were investigated and no emissions were found within 20 dB below the limit, therefore no data is presented.

Table 5-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901139	Weinschel Corporation	47-20-34	Attenuator DC-18 GHz 20 dB 100W	BK5859	3/30/18
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	9/26/17

Test Personnel:

Daniel Baltzell		December 14, 2015 & January 23, 2017
EMC Test Engineer	Signature	Dates of Test

6 FCC Part 90.543(a): Emission Limitations: ACP Requirements; IC RSS-119 4.3 Adjacent Channel Power (ACP) Measurement for Equipment in the Bands 764-776 MHz and 794-806 MHz

Effective October 23, 2007, transmitters designed to operate in the 769–775 MHz and 799–805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Transmitters operating in the 763–768 MHz and 793–798 MHz bands must meet the emission limitations in (e) of this section.

6.1 Test Procedure

ANSI/TIA-603-D 2010, Section 2.2.14 Unwanted Emissions: Adjacent Channel Power Ratio

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

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

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP Relative (dBc)
(+/-)9.375	6.25	-40
(+/-)15.625	6.25	-60
(+/-)21.875	6.25	-60
(+/-)37.5	25	-60
(+/-)62.5	25	-65
(+/-)87.5	25	-65
(+/-)150	100	-65
(+/-)250	100	-65
(+/-)350	100	-65
>400 kHz to 12 MHz	30(s)	-75
12 MHz to paired receive band	30(s)	-75
In the paired receive band	30(s)	-100

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

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACP Relative (dBc)
(+/-)15.625	6.25	-40
(+/-)21.875	6.25	-60
(+/-)37.5	25	-60
(+/-)62.5	25	-65
(+/-)87.5	25	-65
(+/-)150	100	-65
(+/-)250	100	-65
(+/-)350	100	-65
>400 kHz to 12 MHz	30(s)	-75
12 MHz to paired receive band	30(s)	-75
In the paired receive band	30(s)	-100

FCC Rules and Regulations - 90.543(b)

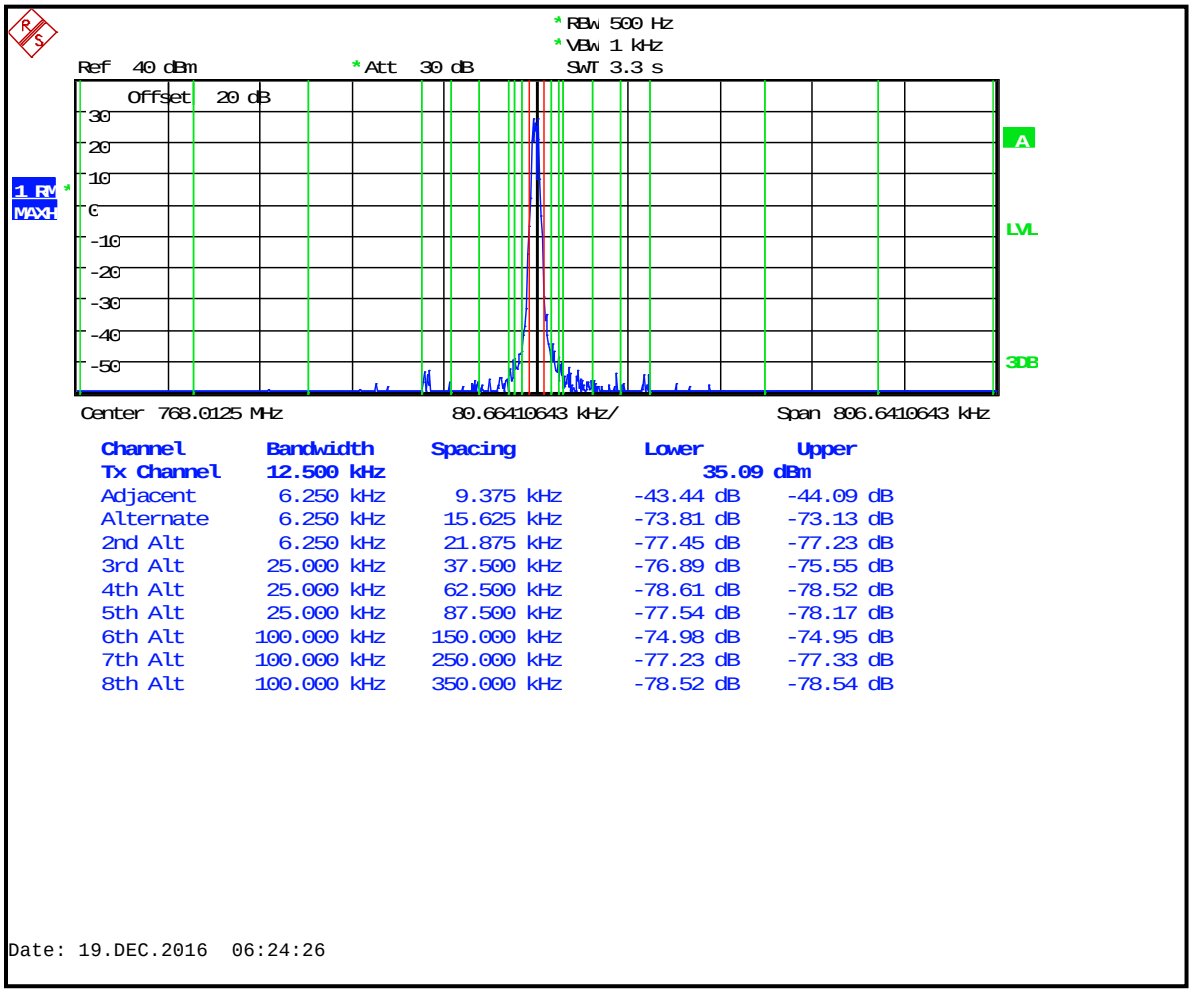
Setting Reference Level - 90.543(b)(1): Using a spectrum analyzer capable of ACP measurements, set the measurement bandwidth to the channel size. Set the frequency offset of the measurement to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth.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

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

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

6.2 Test Data

Plot 6-1: Adjacent Channel Power - 768.0125 MHz; Analog Mode (9.375 kHz - 350 kHz)



Channel	Bandwidth	Spacing	Lower	Upper
Tx Channel	12.500 kHz		35.09 dBm	
Adjacent	6.250 kHz	9.375 kHz	-43.44 dB	-44.09 dB
Alternate	6.250 kHz	15.625 kHz	-73.81 dB	-73.13 dB
2nd Alt	6.250 kHz	21.875 kHz	-77.45 dB	-77.23 dB
3rd Alt	25.000 kHz	37.500 kHz	-76.89 dB	-75.55 dB
4th Alt	25.000 kHz	62.500 kHz	-78.61 dB	-78.52 dB
5th Alt	25.000 kHz	87.500 kHz	-77.54 dB	-78.17 dB
6th Alt	100.000 kHz	150.000 kHz	-74.98 dB	-74.95 dB
7th Alt	100.000 kHz	250.000 kHz	-77.23 dB	-77.33 dB
8th Alt	100.000 kHz	350.000 kHz	-78.52 dB	-78.54 dB

Table 6-1: Adjacent Channel Power - 768.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.8
12 MHz to receive band	30(s)	-75	-82.6
In receive band	30(s)	-100	-103.6

Plot 6-2: Adjacent Channel Power - 769.0125 MHz; Analog Mode (9.375 kHz - 350 kHz)

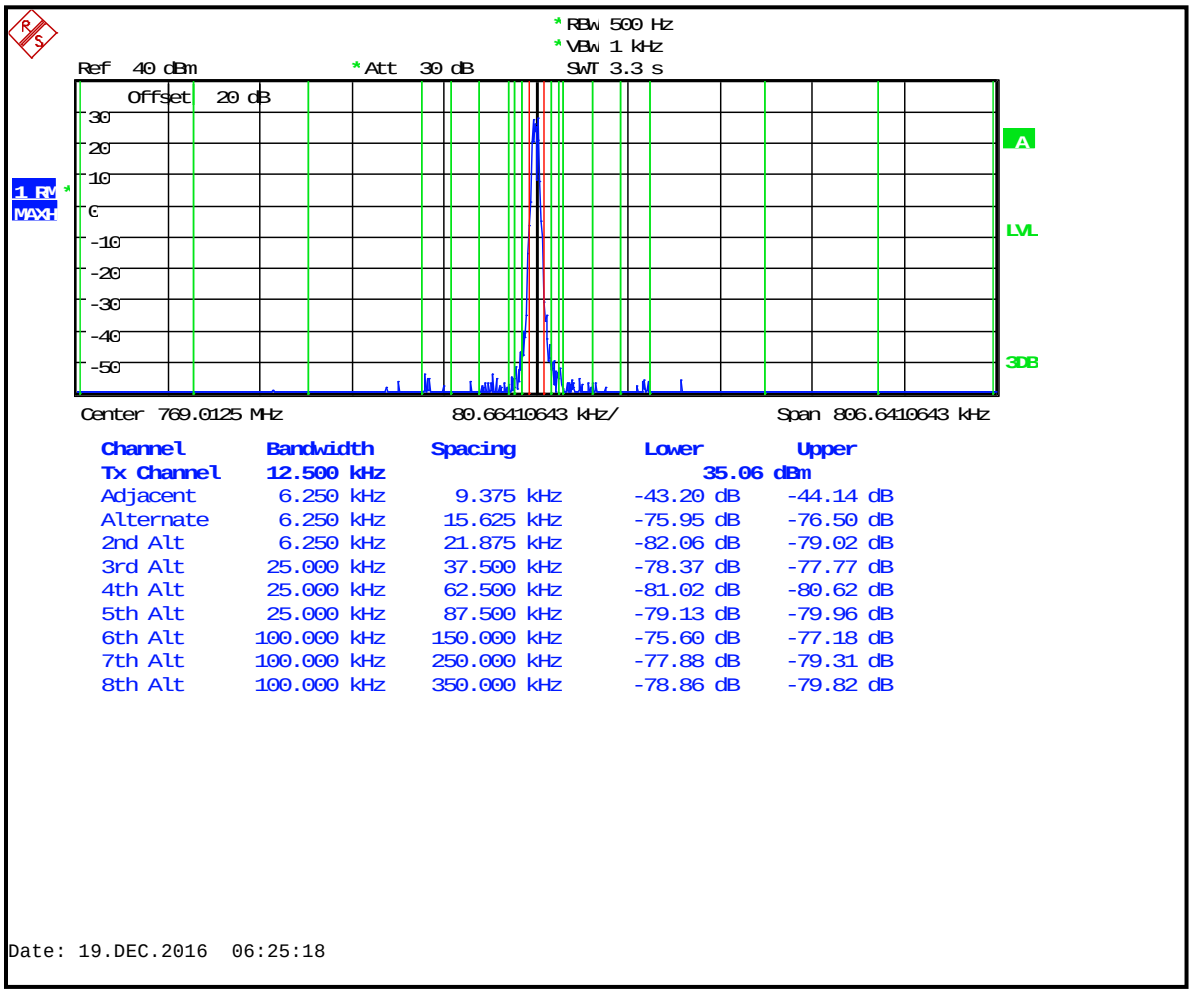


Table 6-2: Adjacent Channel Power - 769.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-88.4
12 MHz to receive band	30(s)	-75	-82.8
In receive band	30(s)	-100	-103.5

Plot 6-3: Adjacent Channel Power - 772.0125 MHz; Analog Mode (9.375 kHz - 350 kHz)

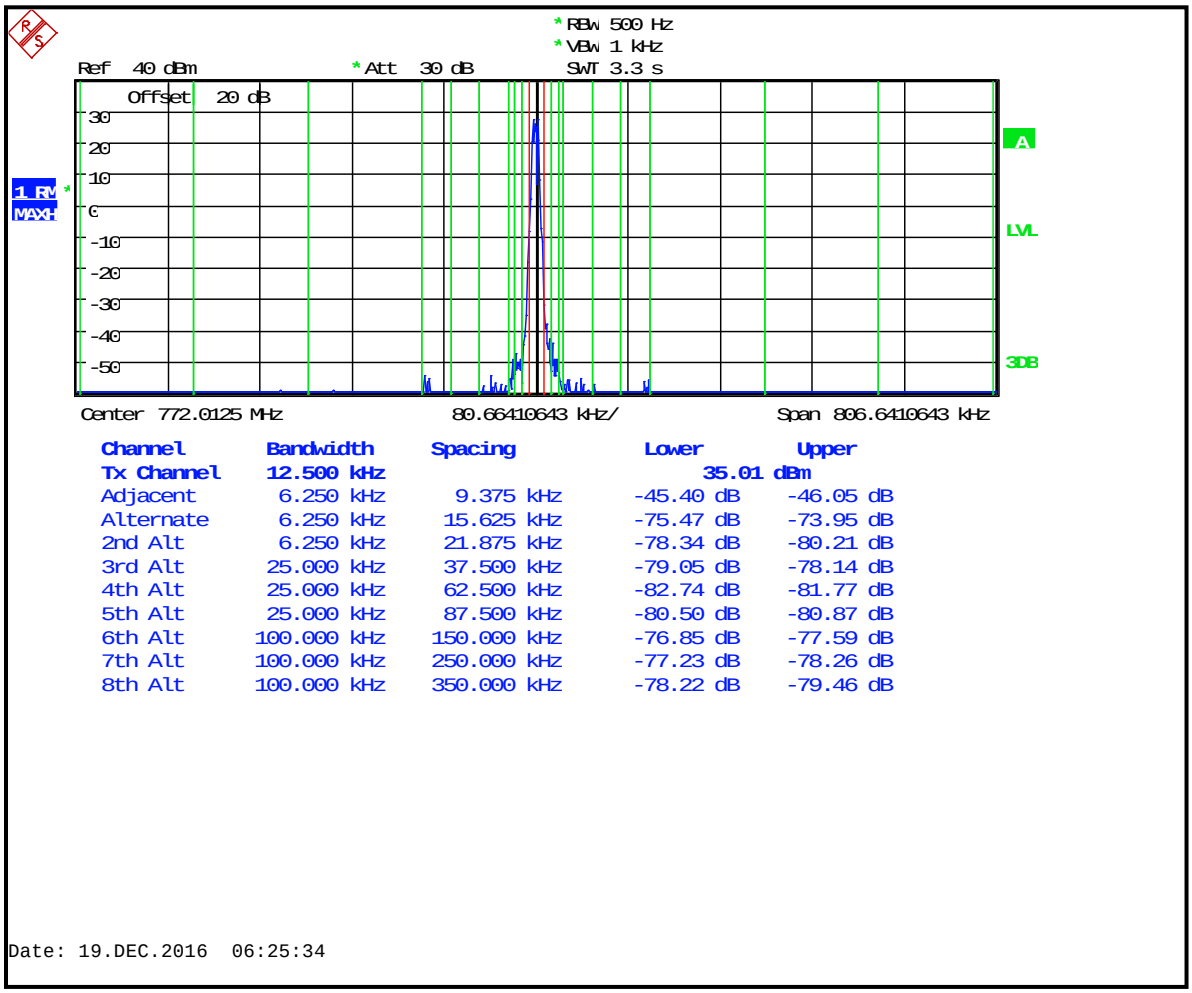


Table 6-3: Adjacent Channel Power - 772.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.2
12 MHz to receive band	30(s)	-75	-83.2
In receive band	30(s)	-100	-103.6

Plot 6-4: Adjacent Channel Power - 775.9875 MHz; Analog Mode (9.375 kHz - 350 kHz)

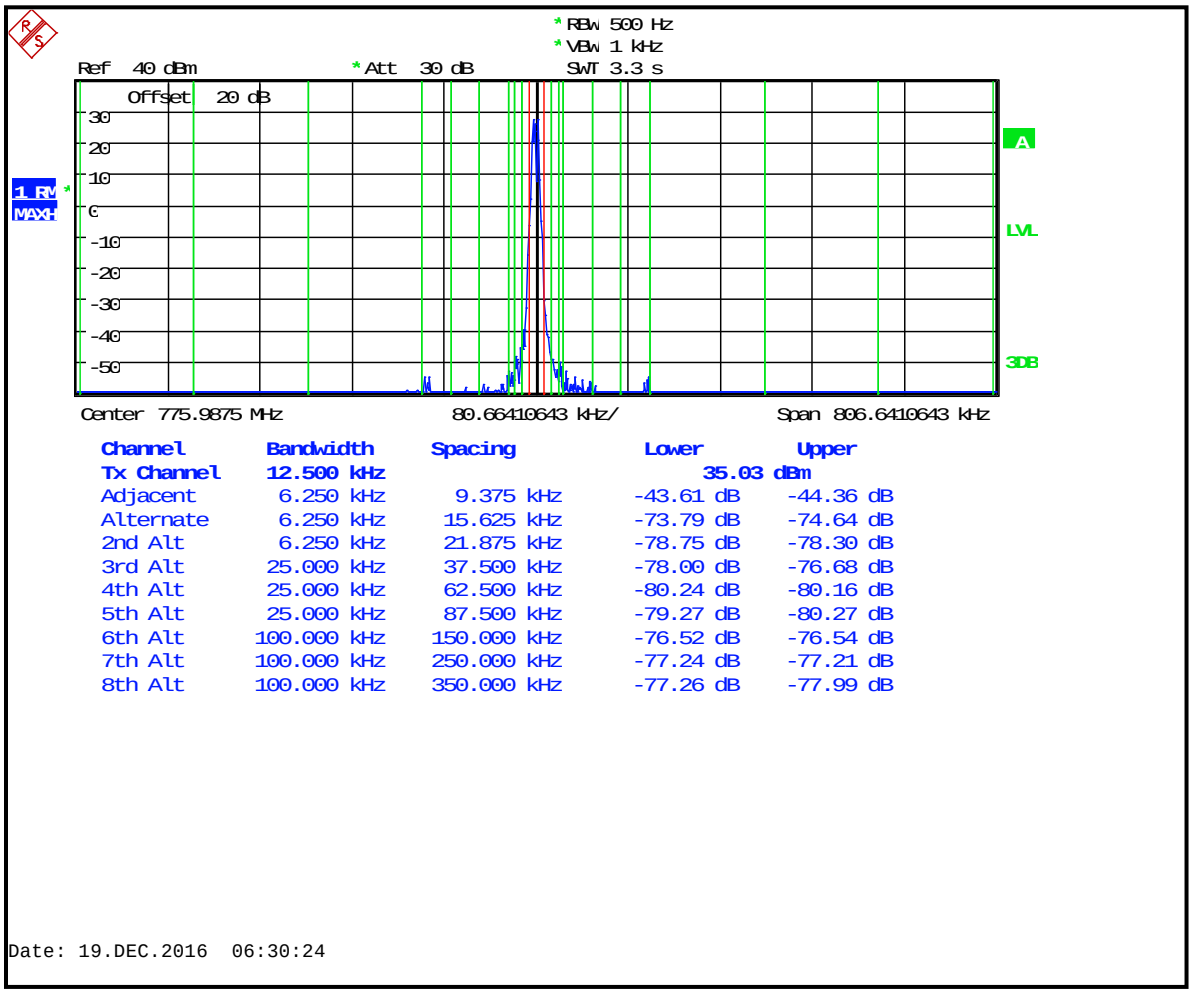


Table 6-4: Adjacent Channel Power - 775.9875 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-81.7
12 MHz to receive band	30(s)	-75	-83.2
In receive band	30(s)	-100	-103.2

Plot 6-5: Adjacent Channel Power – 798.0125 MHz; Analog Mode; (9.375 kHz - 350 kHz)

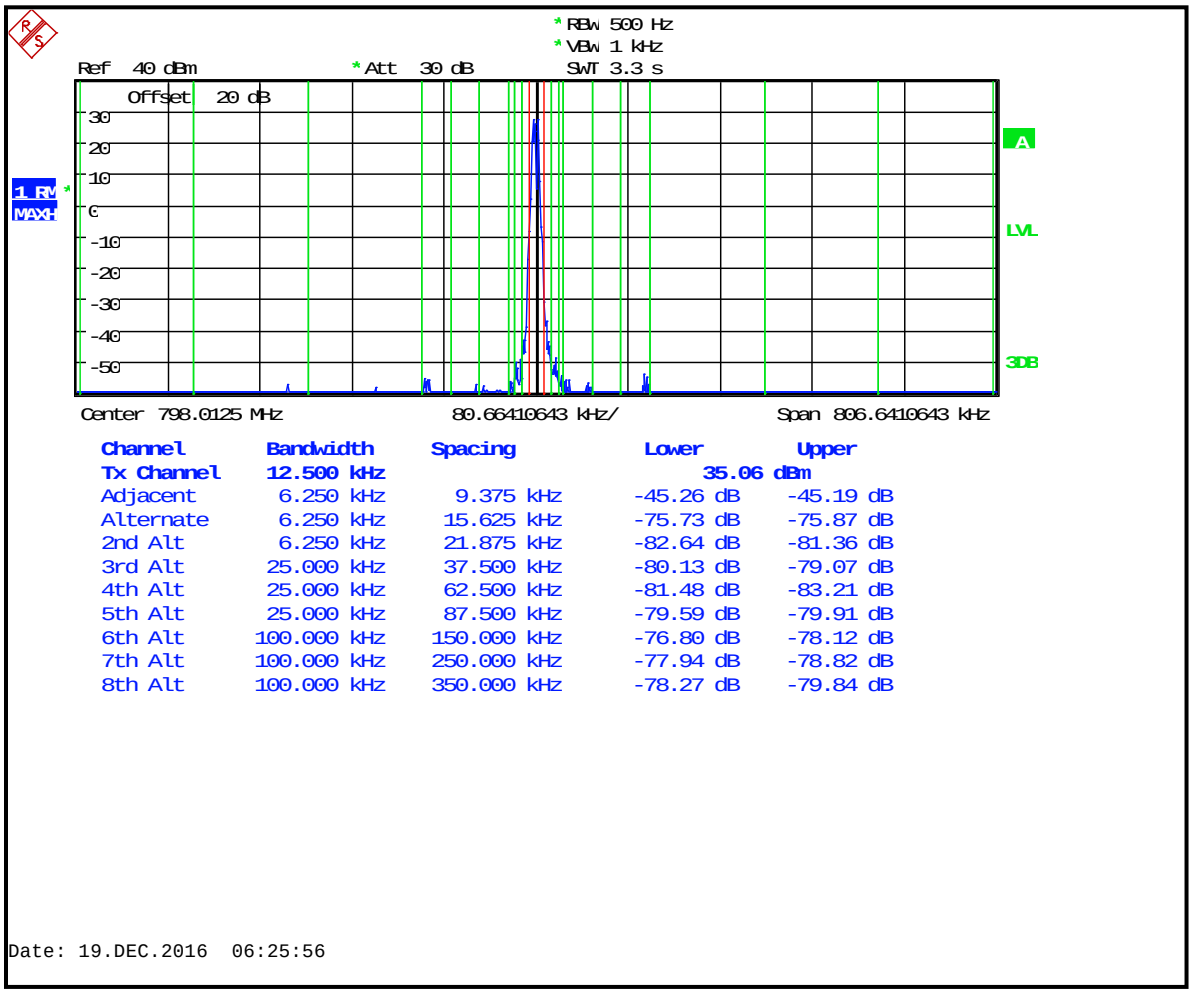


Table 6-5: Adjacent Channel Power – 798.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.8
12 MHz to receive band	30(s)	-75	-82.9
In receive band	30(s)	-100	-102.1

Plot 6-6: Adjacent Channel Power – 799.0125 MHz; Analog Mode; (9.375 kHz - 350 kHz)

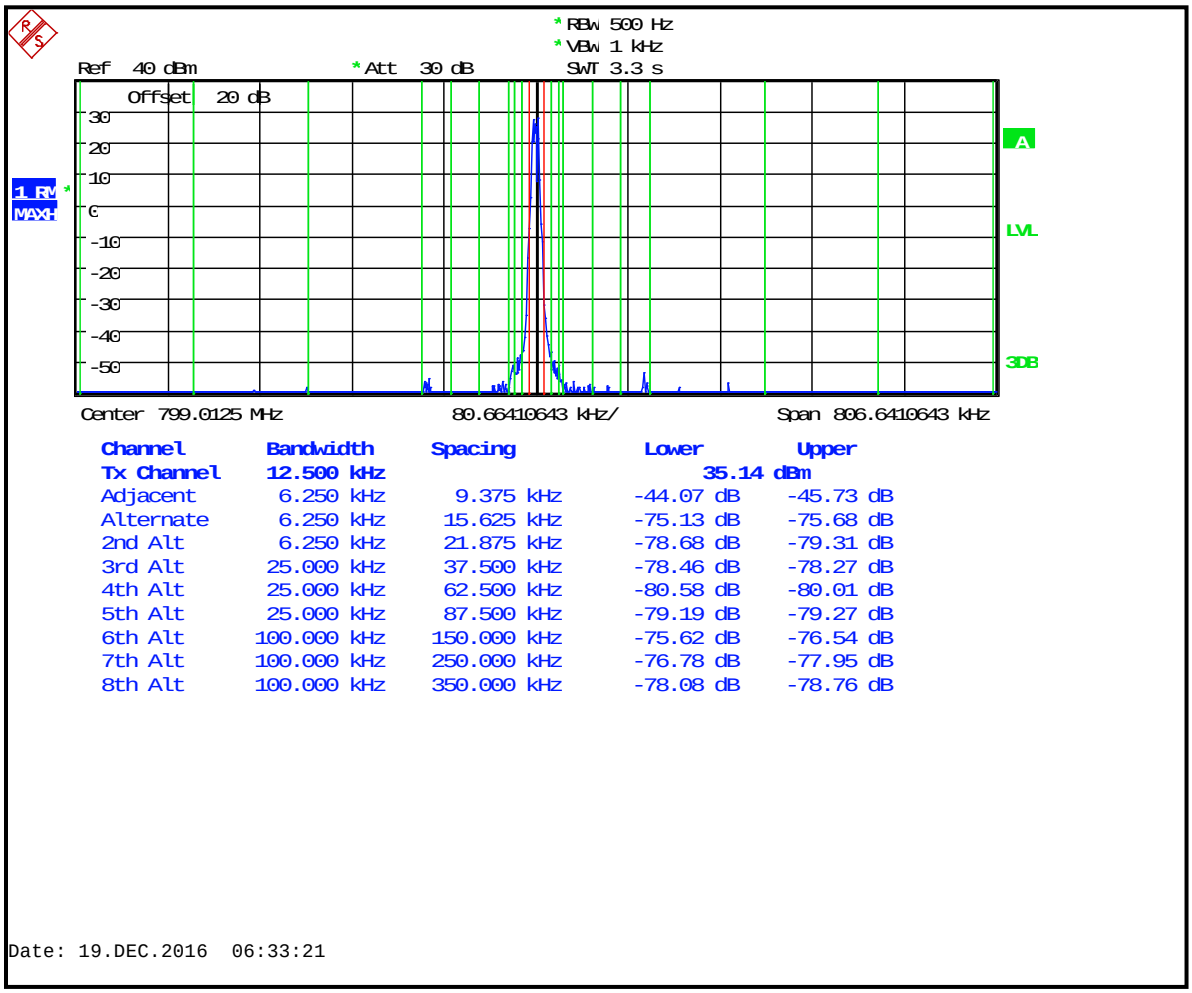


Table 6-6: Adjacent Channel Power – 799.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.8
12 MHz to receive band	30(s)	-75	-82.4
In receive band	30(s)	-100	-101.5

Plot 6-7: Adjacent Channel Power – 801.0125 MHz; Analog Mode; (9.375 kHz - 350 kHz)

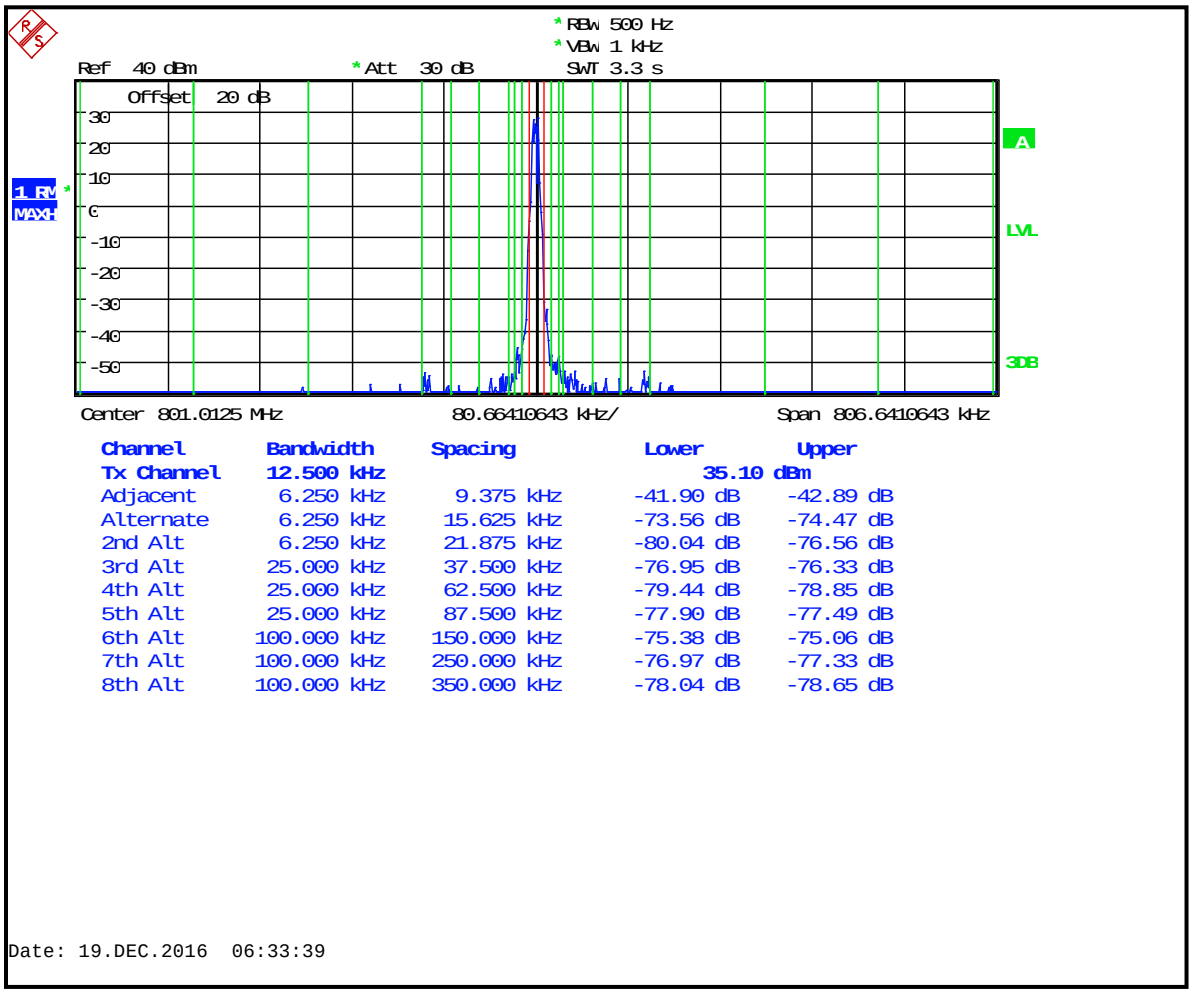


Table 6-7: Adjacent Channel Power – 801.0125 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.4
12 MHz to receive band	30(s)	-75	-82.9
In receive band	30(s)	-100	-102.6

Plot 6-8: Adjacent Channel Power – 805.9875 MHz; Analog Mode; (9.375 kHz - 350 kHz)

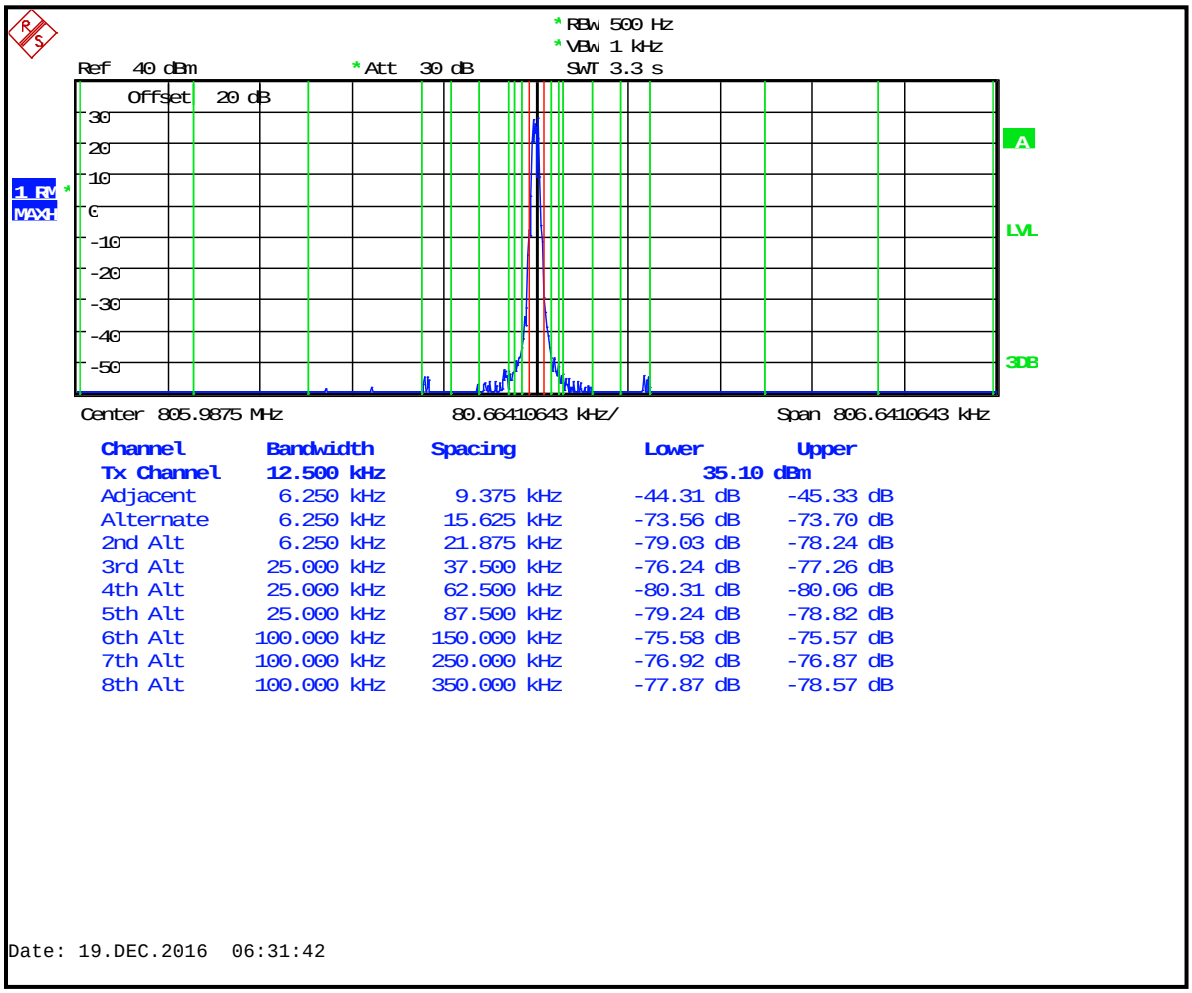


Table 6-8: Adjacent Channel Power – 805.9875 MHz; Analog Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-83.0
12 MHz to receive band	30(s)	-75	-83.3
In receive band	30(s)	-100	-103.5

Plot 6-9: Adjacent Channel Power - 768.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

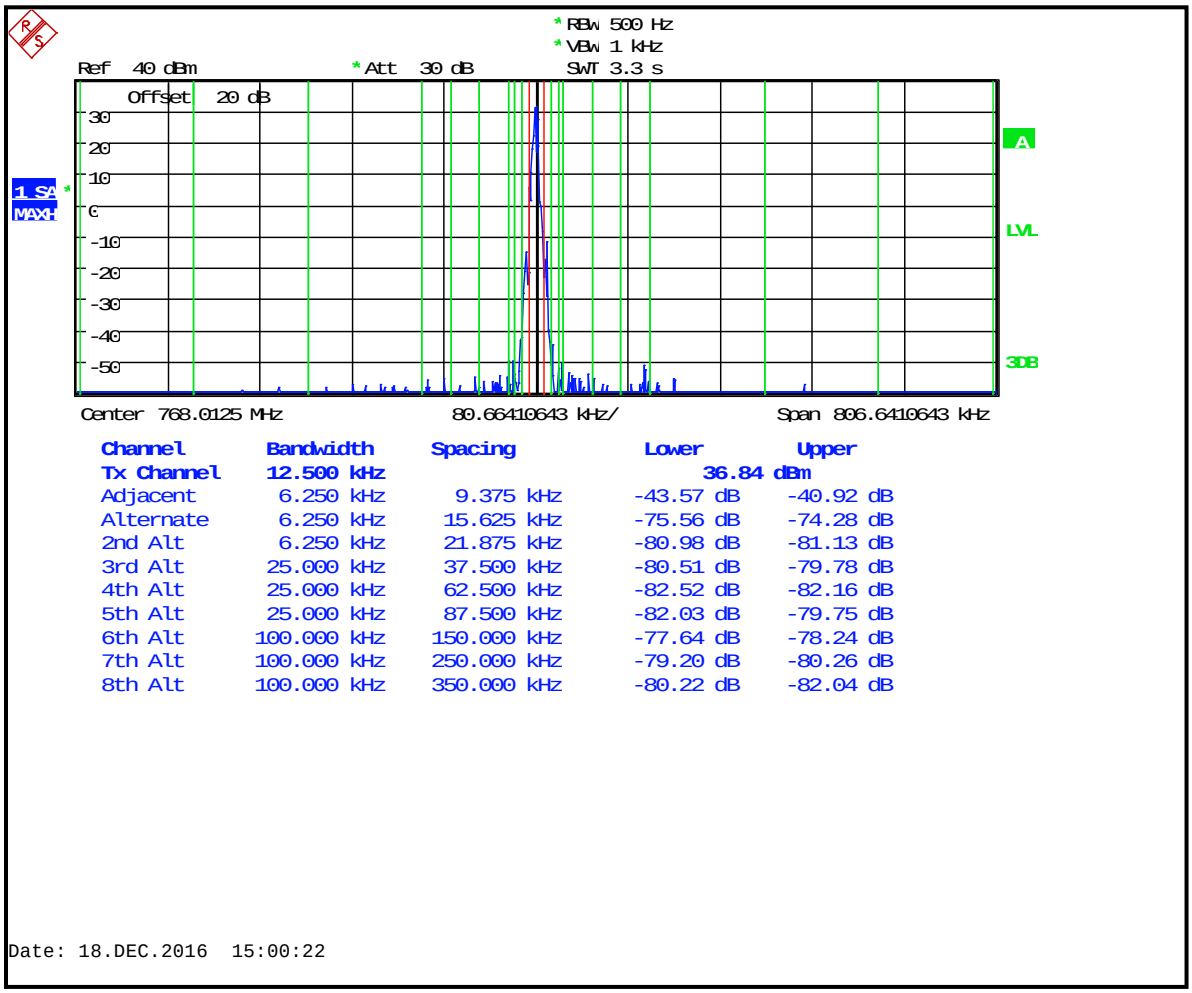


Table 6-9: Adjacent Channel Power - 768.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.6
12 MHz to receive band	30(s)	-75	-90.8
In receive band	30(s)	-100	-103.4

Plot 6-10: Adjacent Channel Power - 769.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

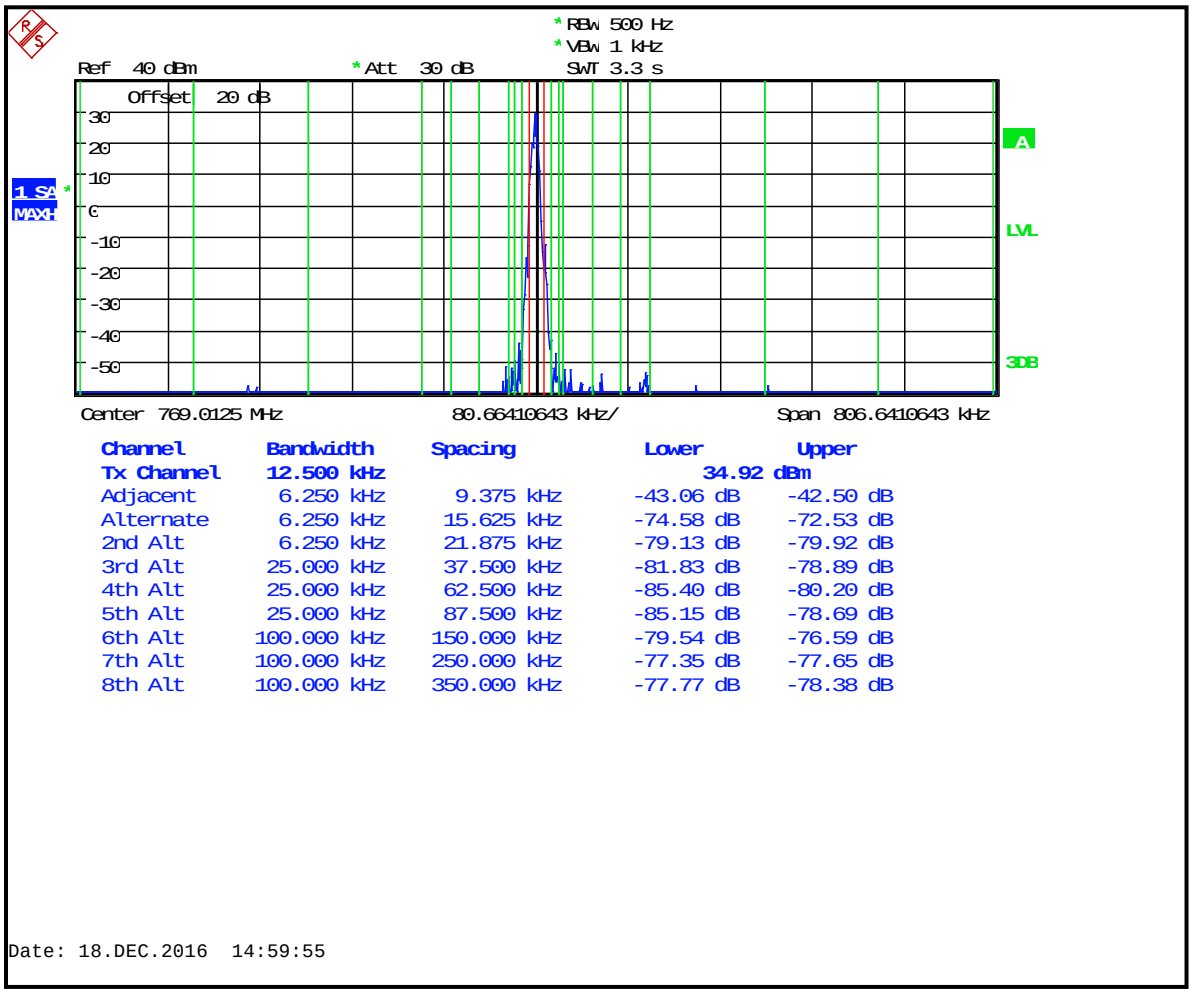


Table 6-10: Adjacent Channel Power - 769.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-83.8
12 MHz to receive band	30(s)	-75	-91.6
In receive band	30(s)	-100	-103.6

Plot 6-11: Adjacent Channel Power - 772.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

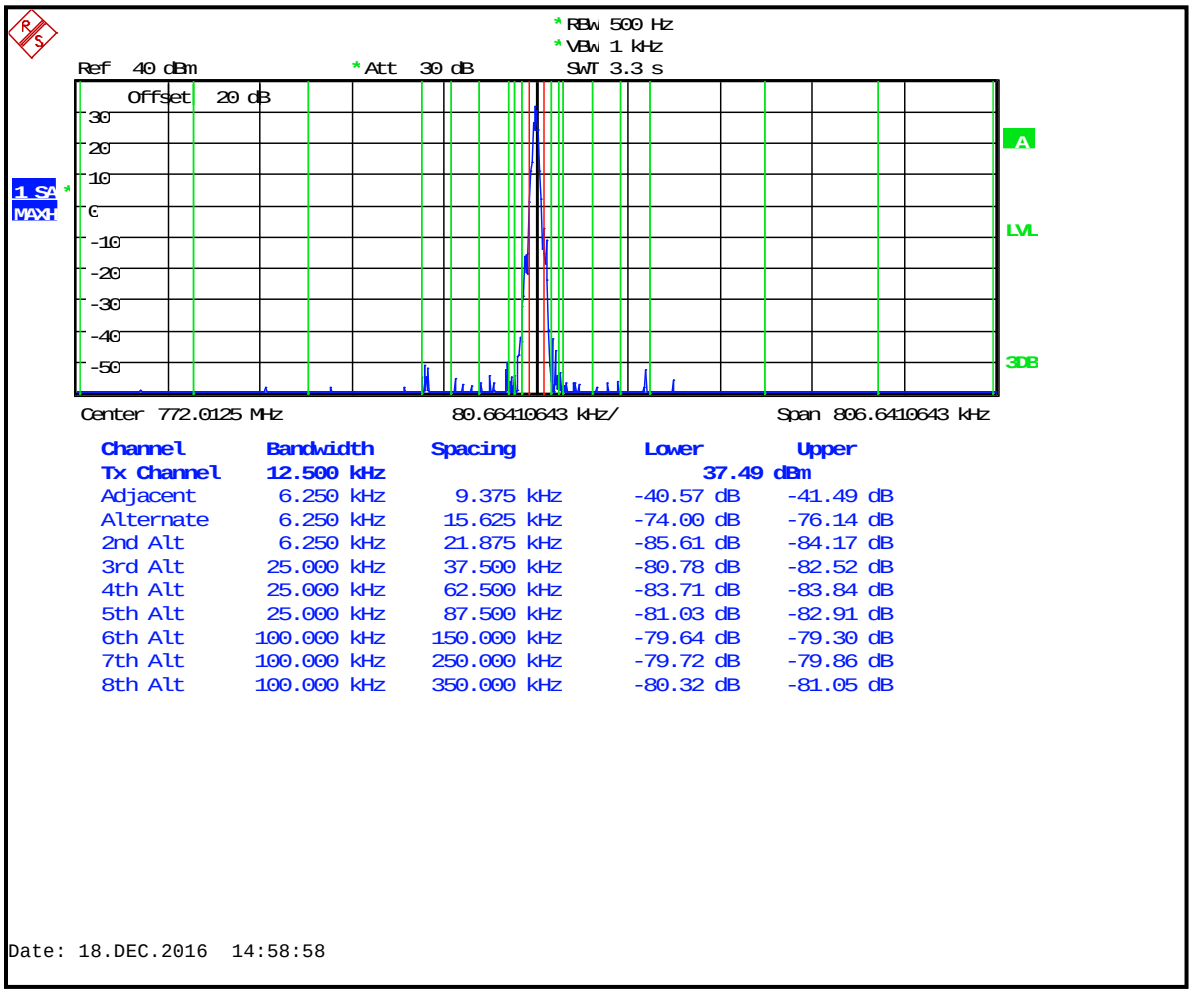


Table 6-11: Adjacent Channel Power - 772.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.0
12 MHz to receive band	30(s)	-75	-91.4
In receive band	30(s)	-100	-103.5

Plot 6-12: Adjacent Channel Power - 775.9875 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

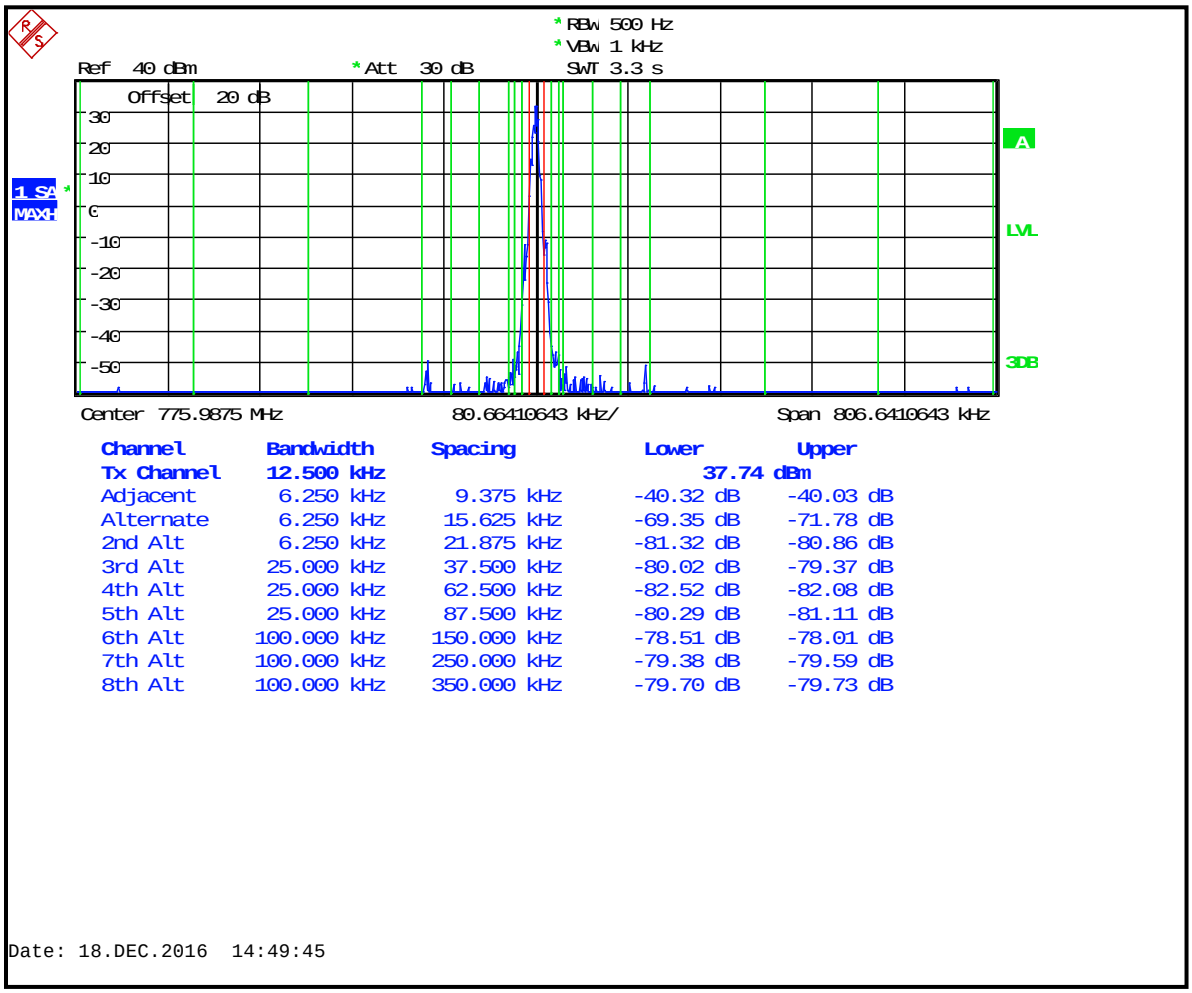


Table 6-12: Adjacent Channel Power - 775.9875 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.4
12 MHz to receive band	30(s)	-75	-91.5
In receive band	30(s)	-100	-103.4

Plot 6-13: Adjacent Channel Power – 798.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

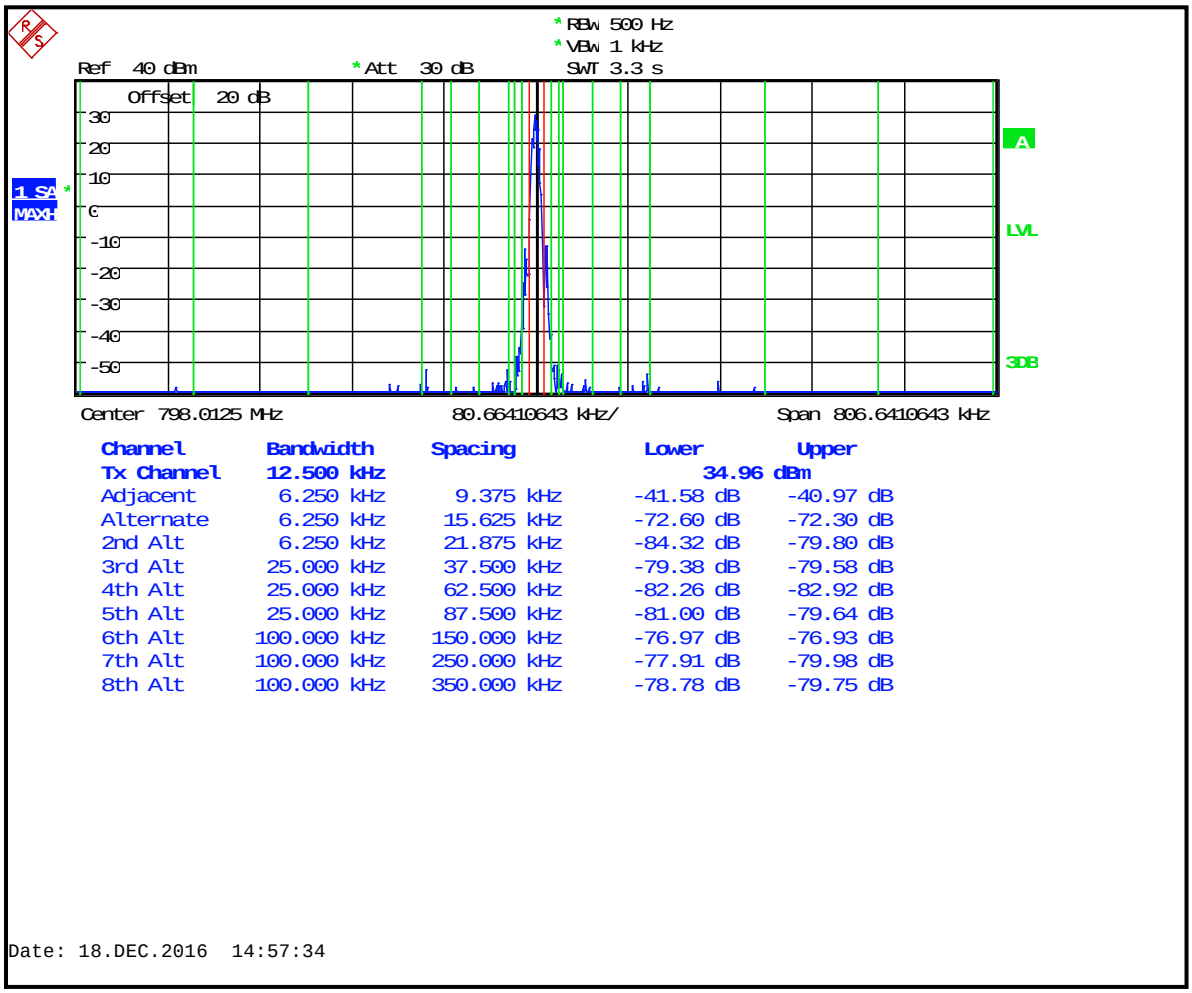


Table 6-13: Adjacent Channel Power – 798.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.4
12 MHz to receive band	30(s)	-75	-91.2
In receive band	30(s)	-100	-101.9

Plot 6-14: Adjacent Channel Power – 799.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

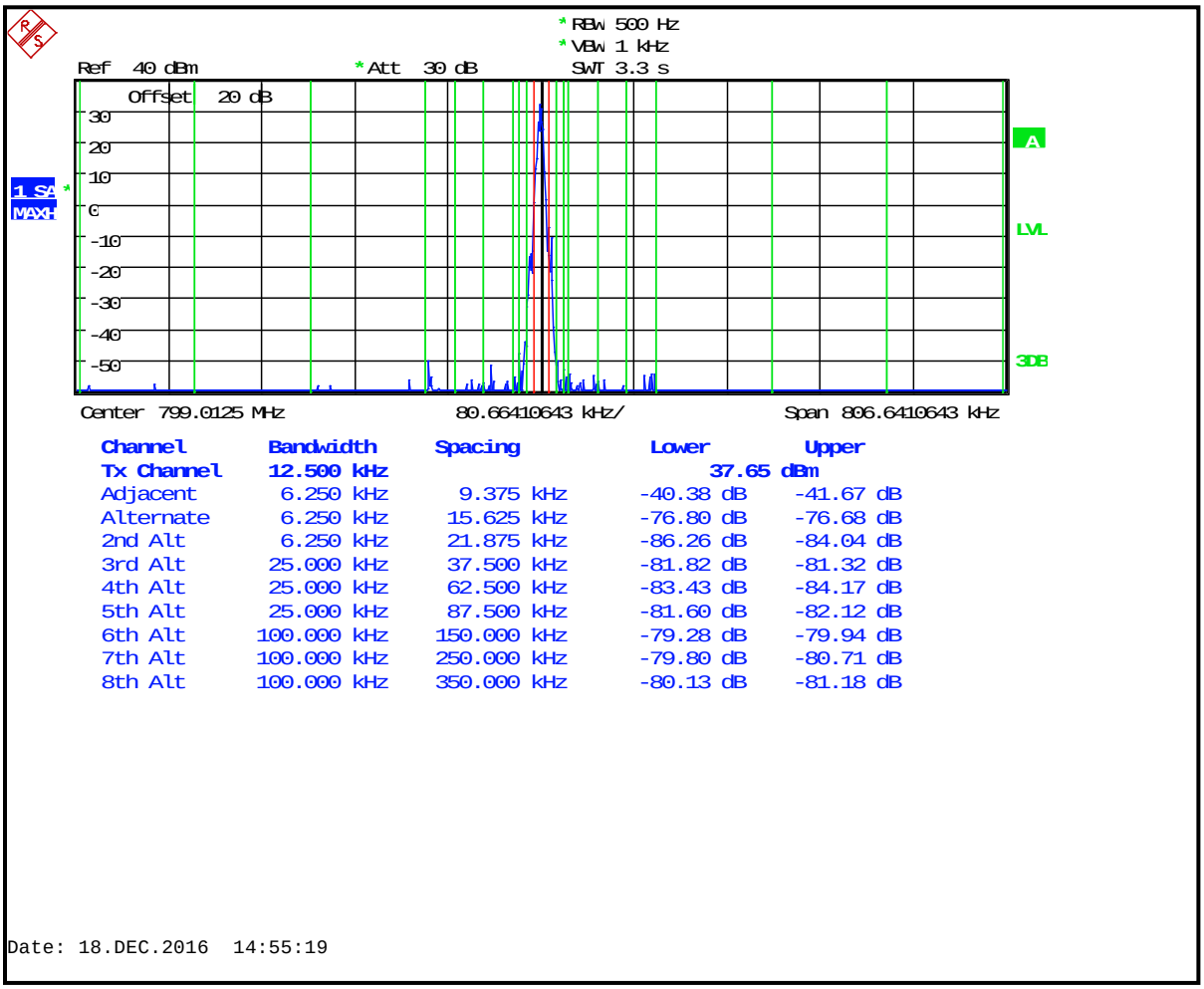


Table 6-14: Adjacent Channel Power – 799.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-83.8
12 MHz to receive band	30(s)	-75	-91.3
In receive band	30(s)	-100	-101.8

Plot 6-15: Adjacent Channel Power – 801.0125 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

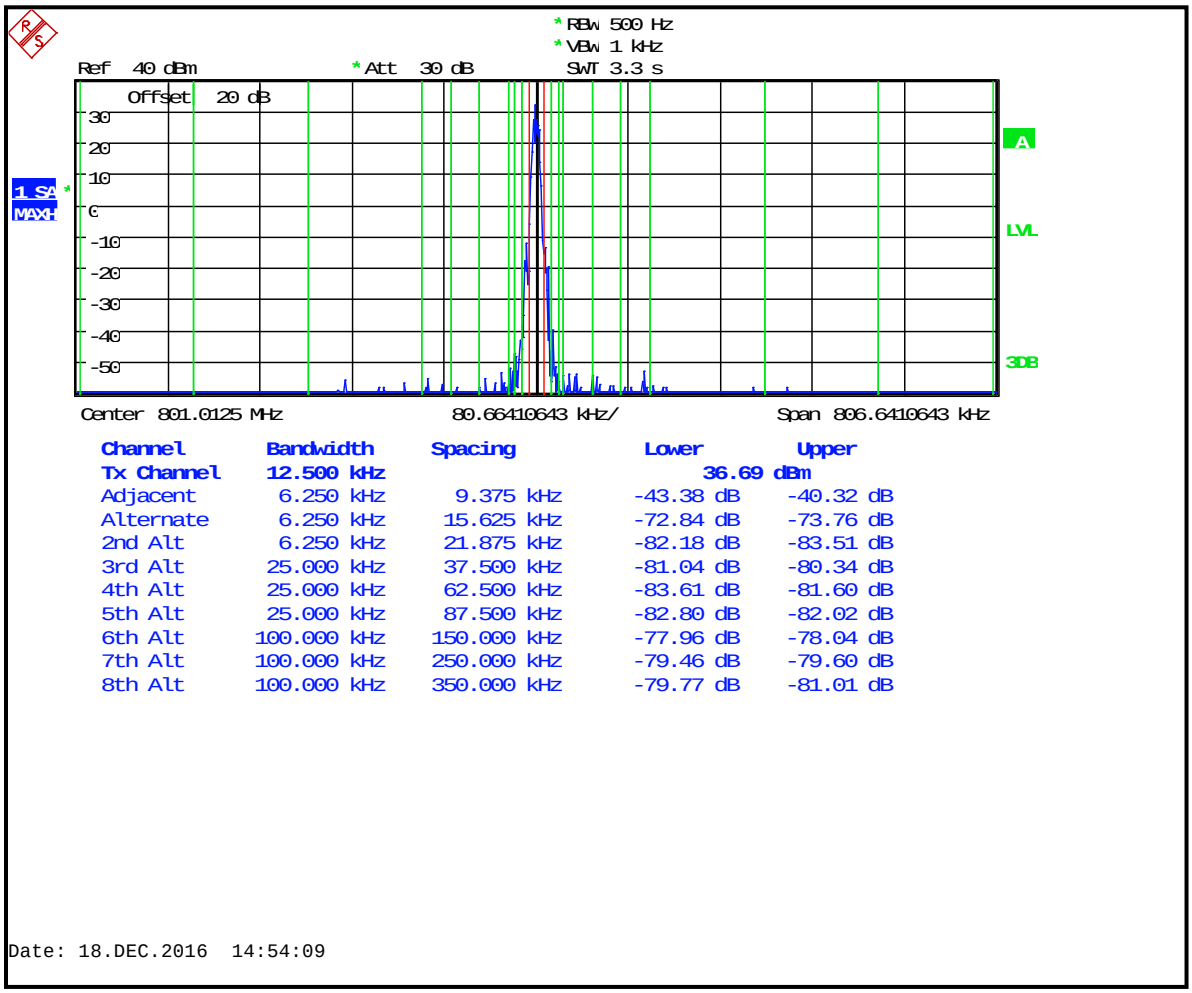


Table 6-15: Adjacent Channel Power – 801.0125 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.9
12 MHz to receive band	30(s)	-75	-91.0
In receive band	30(s)	-100	-102.3

Plot 6-16: Adjacent Channel Power – 805.9875 MHz; 2-Level FSK 9600 NB (9.375 kHz - 350 kHz)

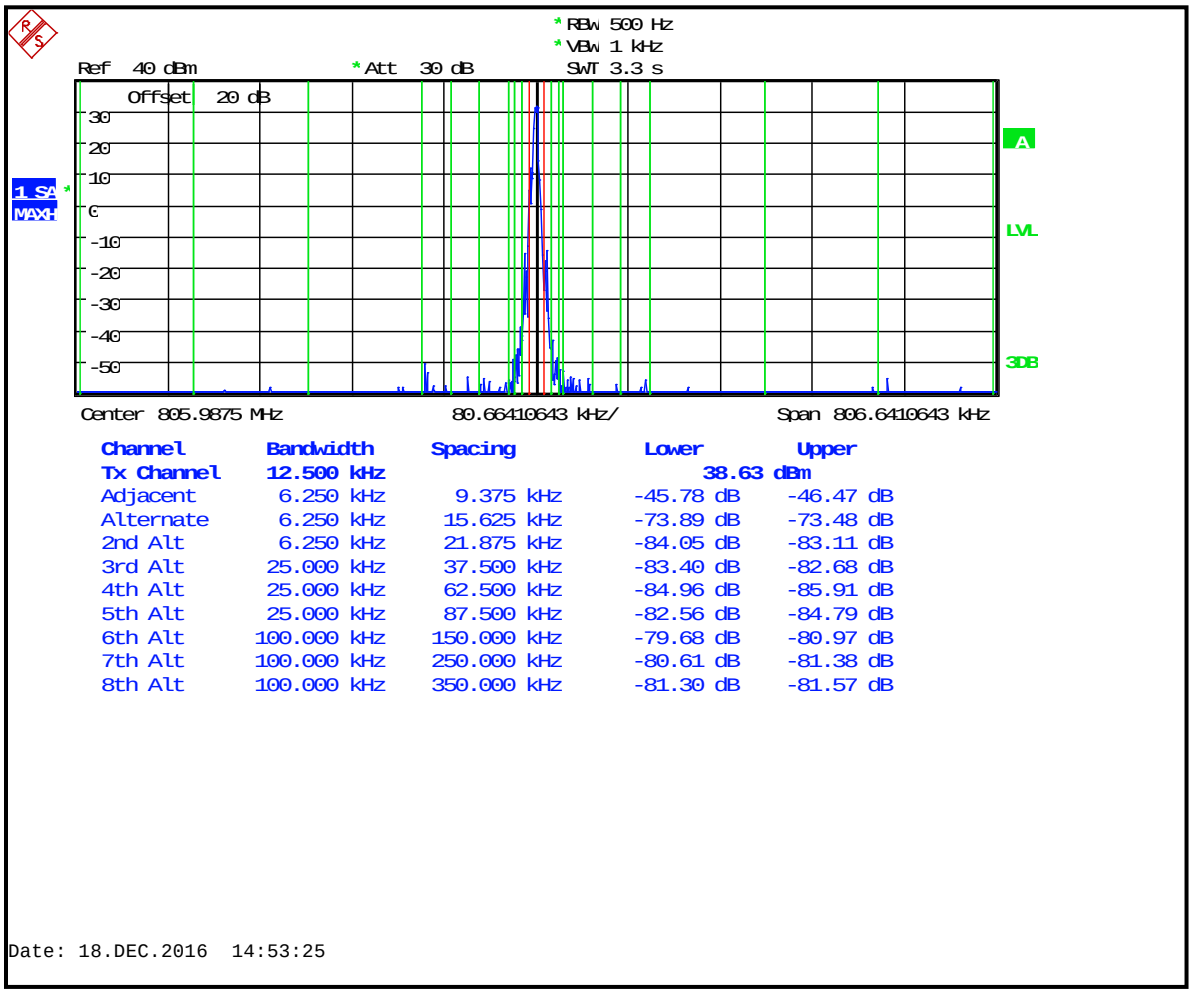


Table 6-16: Adjacent Channel Power – 805.9875 MHz; 2-Level FSK 9600 NB (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.2
12 MHz to receive band	30(s)	-75	-90.0
In receive band	30(s)	-100	-103.2

Plot 6-17: Adjacent Channel Power - 768.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

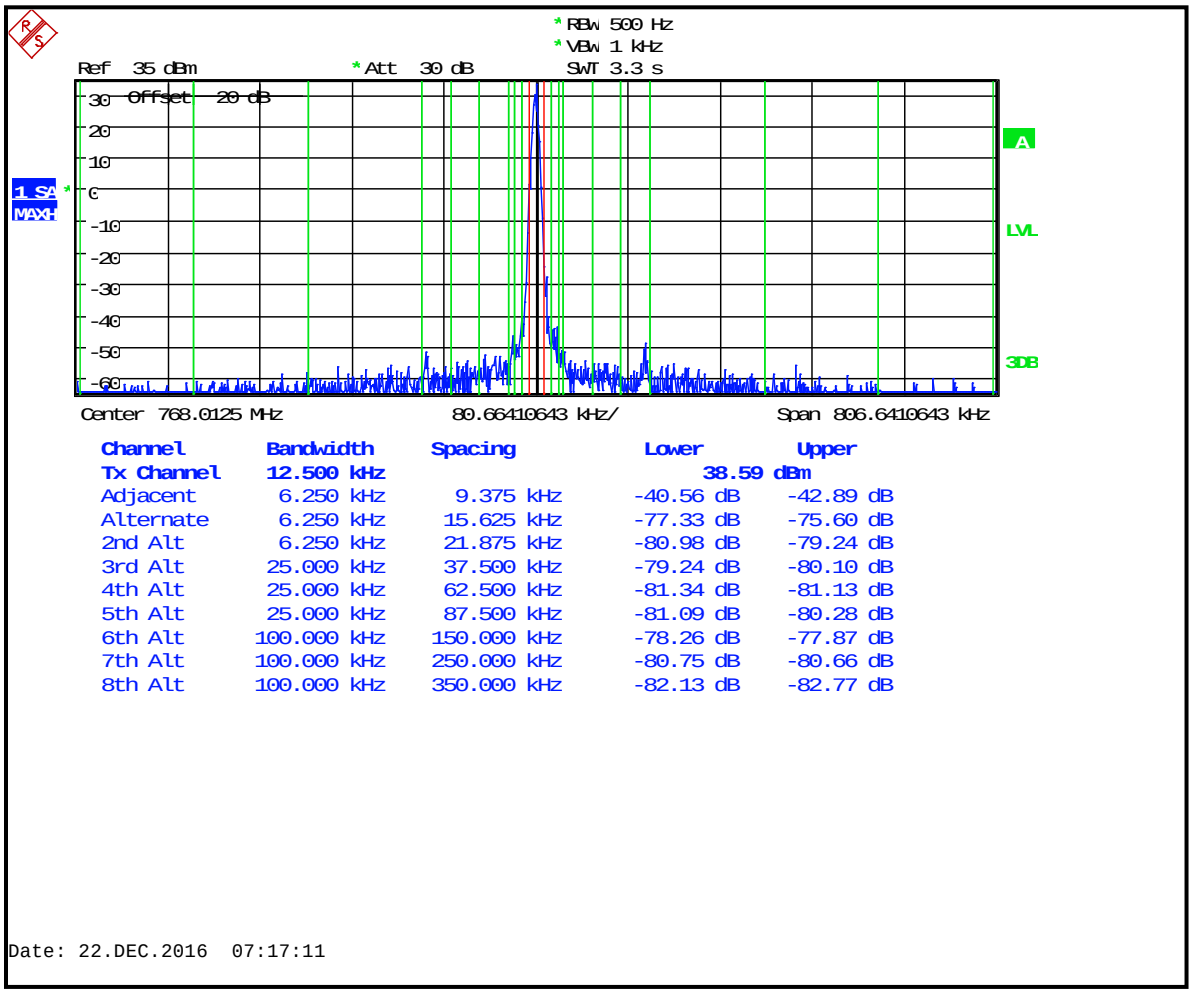


Table 6-17: Adjacent Channel Power - 768.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-83.2
12 MHz to receive band	30(s)	-75	-85.7
In receive band	30(s)	-100	-105.4

Plot 6-18: Adjacent Channel Power - 769.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

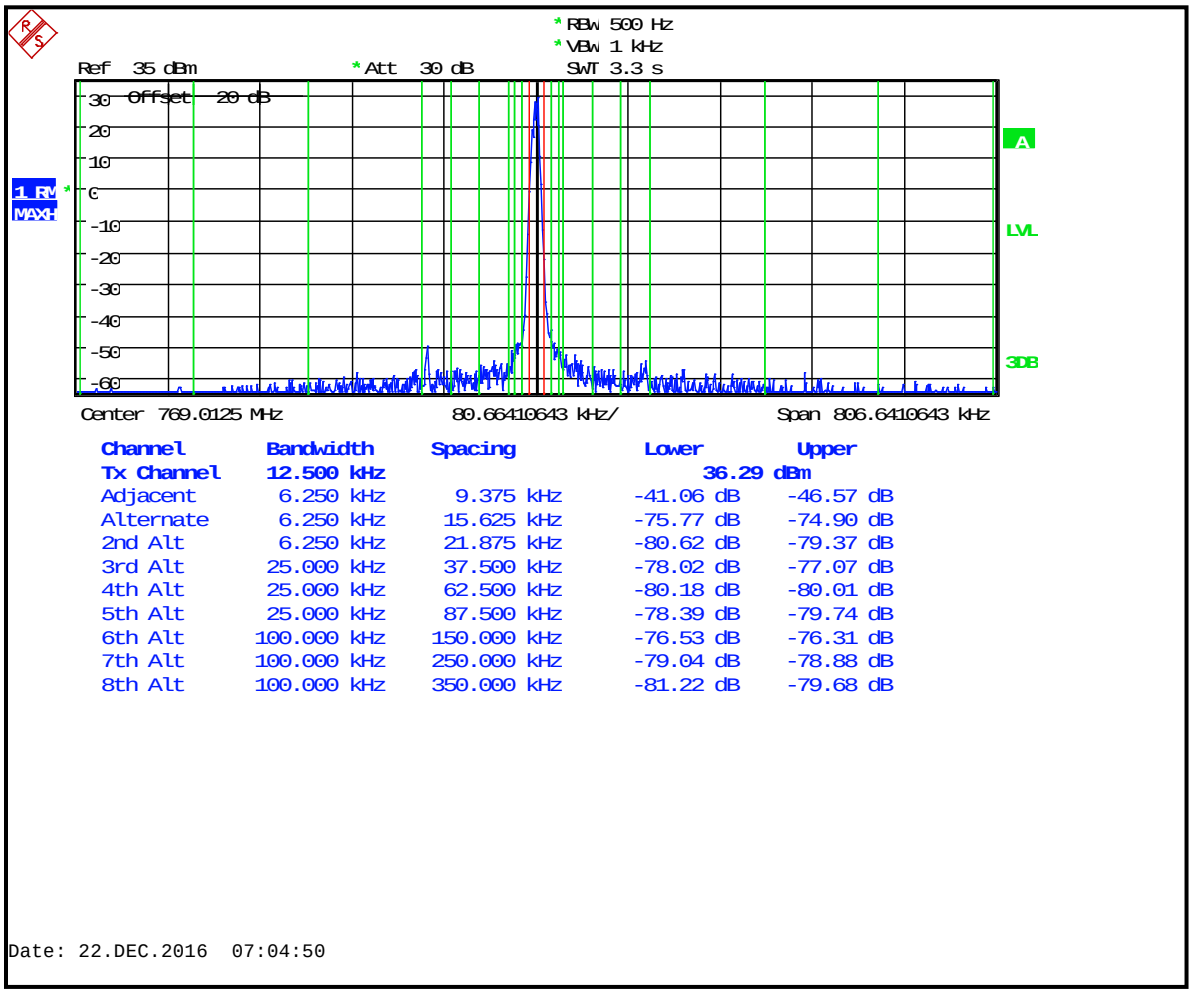


Table 6-18: Adjacent Channel Power - 769.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.5
12 MHz to receive band	30(s)	-75	-86.4
In receive band	30(s)	-100	-105.4

Plot 6-19: Adjacent Channel Power - 772.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

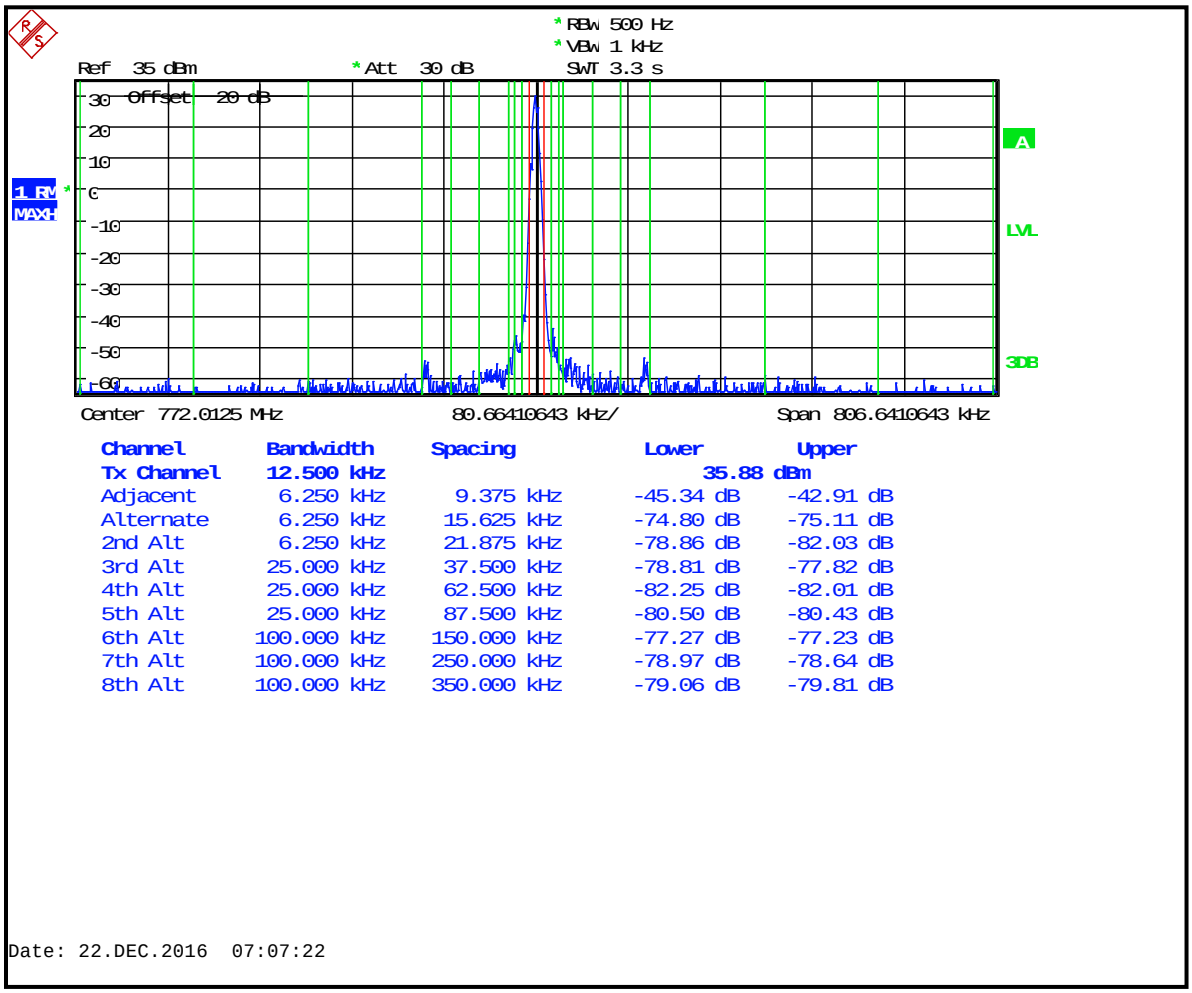


Table 6-19: Adjacent Channel Power - 772.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.5
12 MHz to receive band	30(s)	-75	-85.8
In receive band	30(s)	-100	-105.3

Plot 6-20: Adjacent Channel Power - 775.9875 MHz; C4FM Mode (9.375 kHz - 350 kHz)

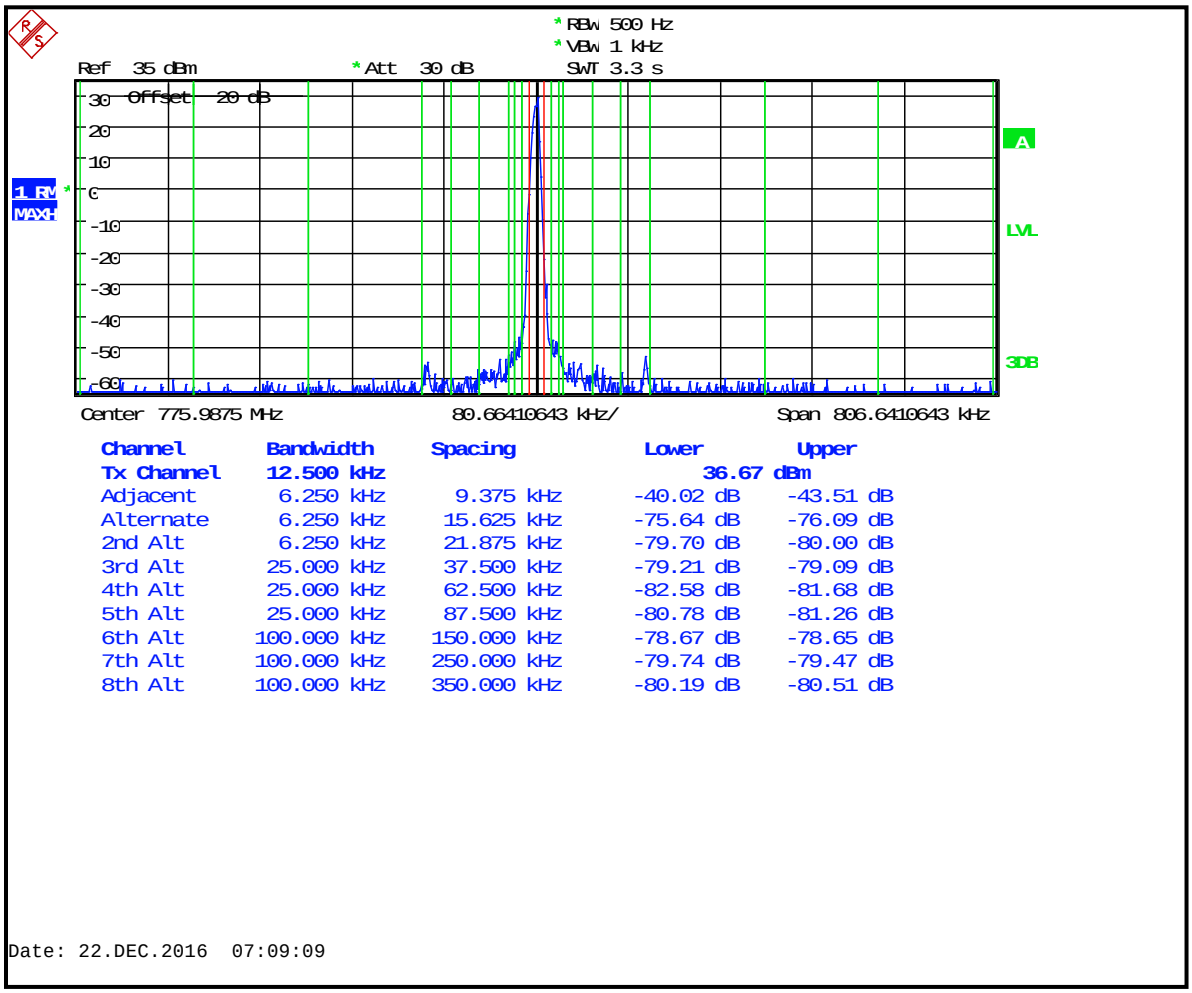


Table 6-20: Adjacent Channel Power - 775.9875 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.5
12 MHz to receive band	30(s)	-75	-85.4
In receive band	30(s)	-100	-105.4

Plot 6-21: Adjacent Channel Power – 798.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

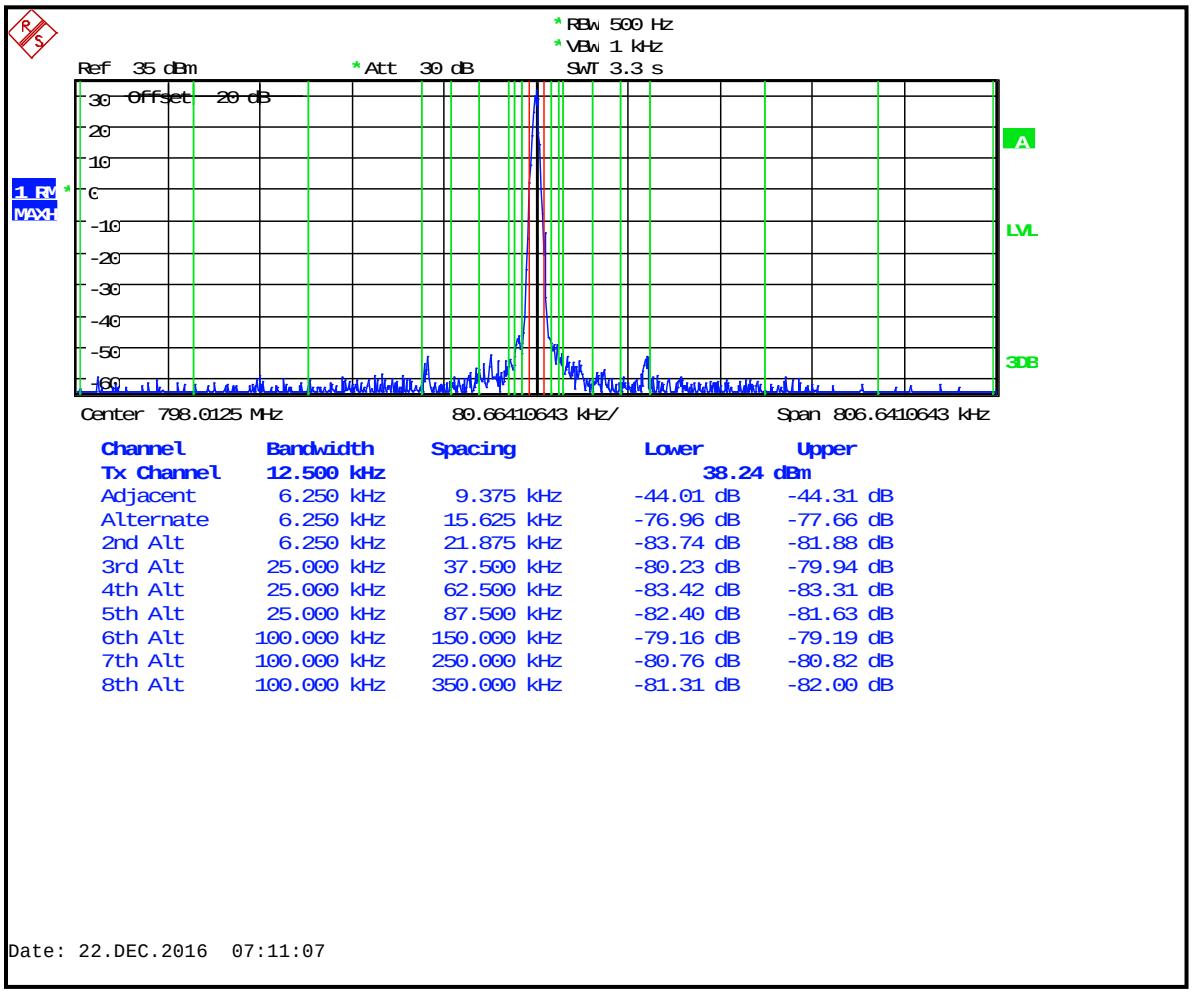


Table 6-21: Adjacent Channel Power – 798.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.5
12 MHz to receive band	30(s)	-75	-85.1
In receive band	30(s)	-100	-103.1

Plot 6-22: Adjacent Channel Power – 799.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

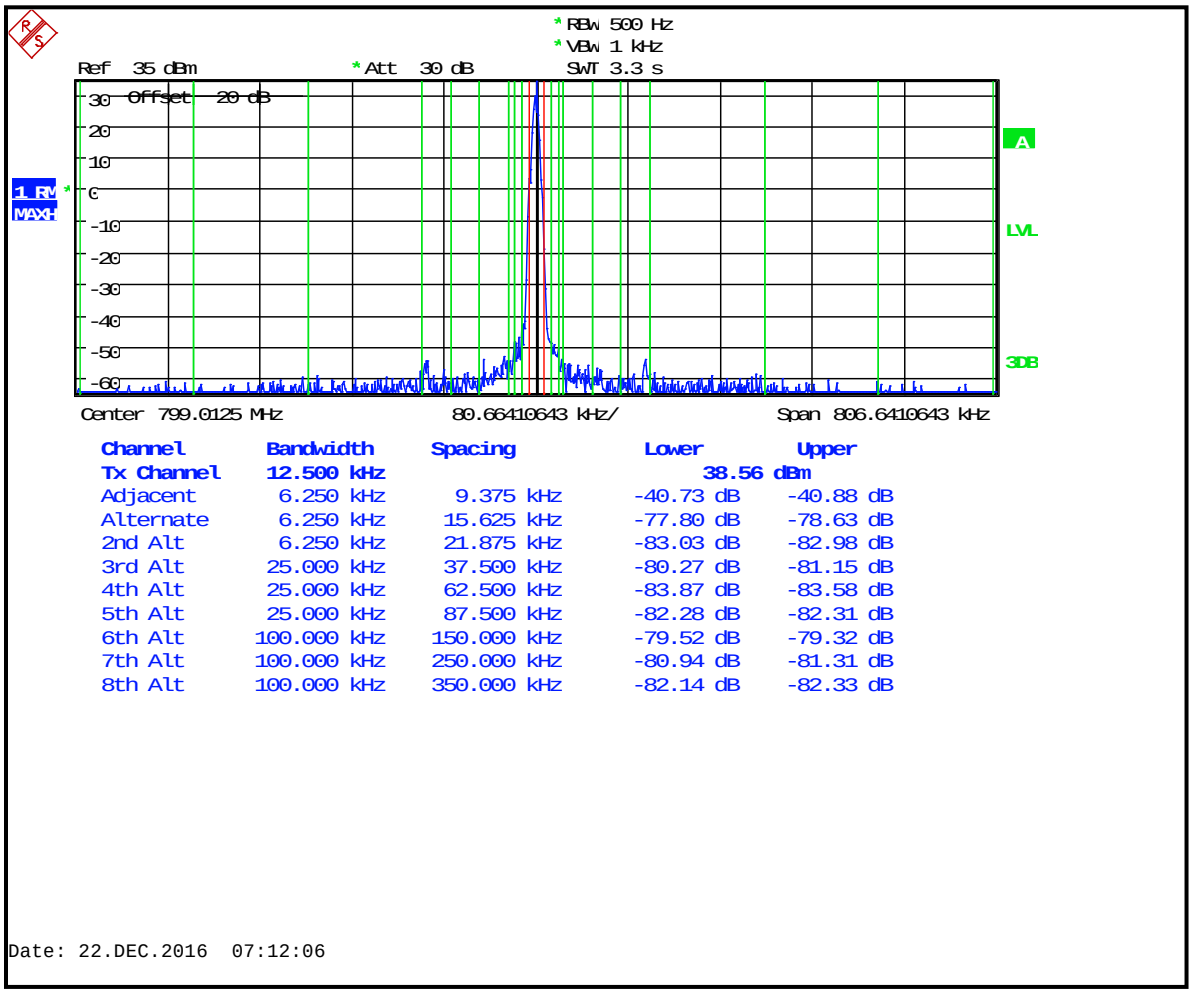


Table 6-22: Adjacent Channel Power – 799.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.2
12 MHz to receive band	30(s)	-75	-86.2
In receive band	30(s)	-100	-103.5

Plot 6-23: Adjacent Channel Power – 801.0125 MHz; C4FM Mode (9.375 kHz - 350 kHz)

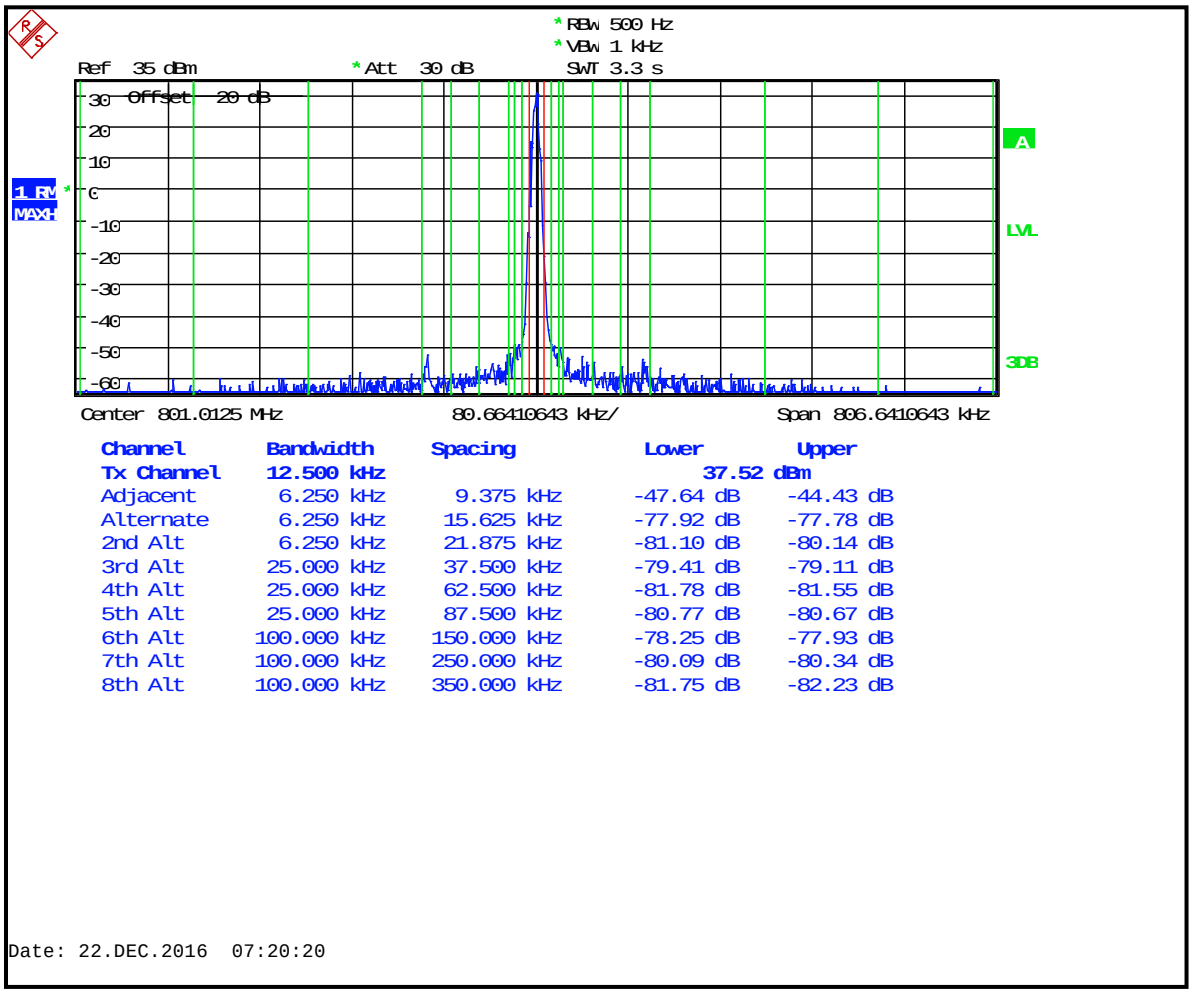


Table 6-23: Adjacent Channel Power – 801.0125 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-82.4
12 MHz to receive band	30(s)	-75	-85.9
In receive band	30(s)	-100	-103.8

Plot 6-24: Adjacent Channel Power – 805.9875 MHz; C4FM Mode (9.375 kHz - 350 kHz)

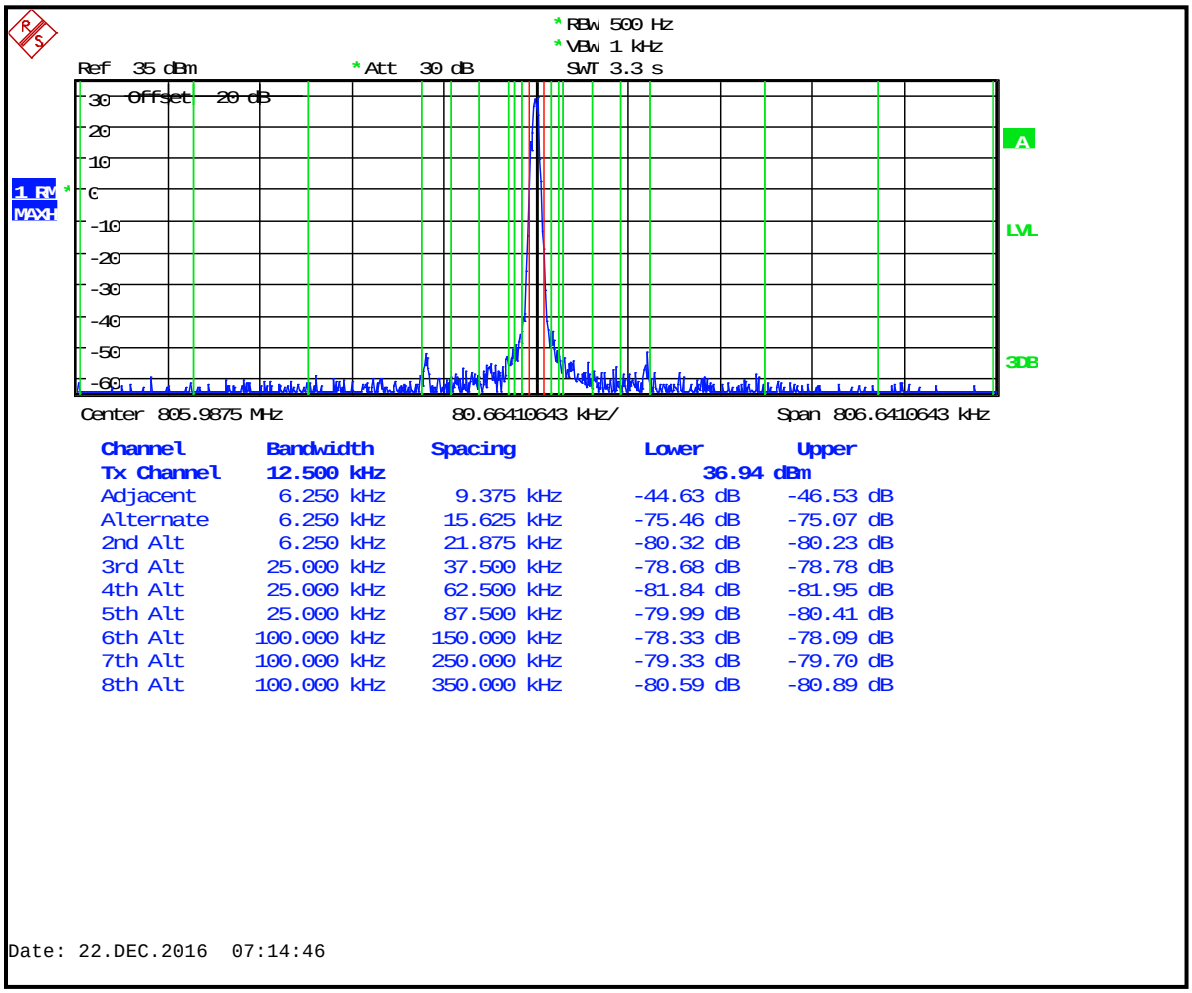


Table 6-24: Adjacent Channel Power – 805.9875 MHz; C4FM Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.1
12 MHz to receive band	30(s)	-75	-84.8
In receive band	30(s)	-100	-105.5

Plot 6-25: Adjacent Channel Power - 768.0125 MHz; H-CPM (TDMA) Mode (9.375 kHz - 350 kHz)

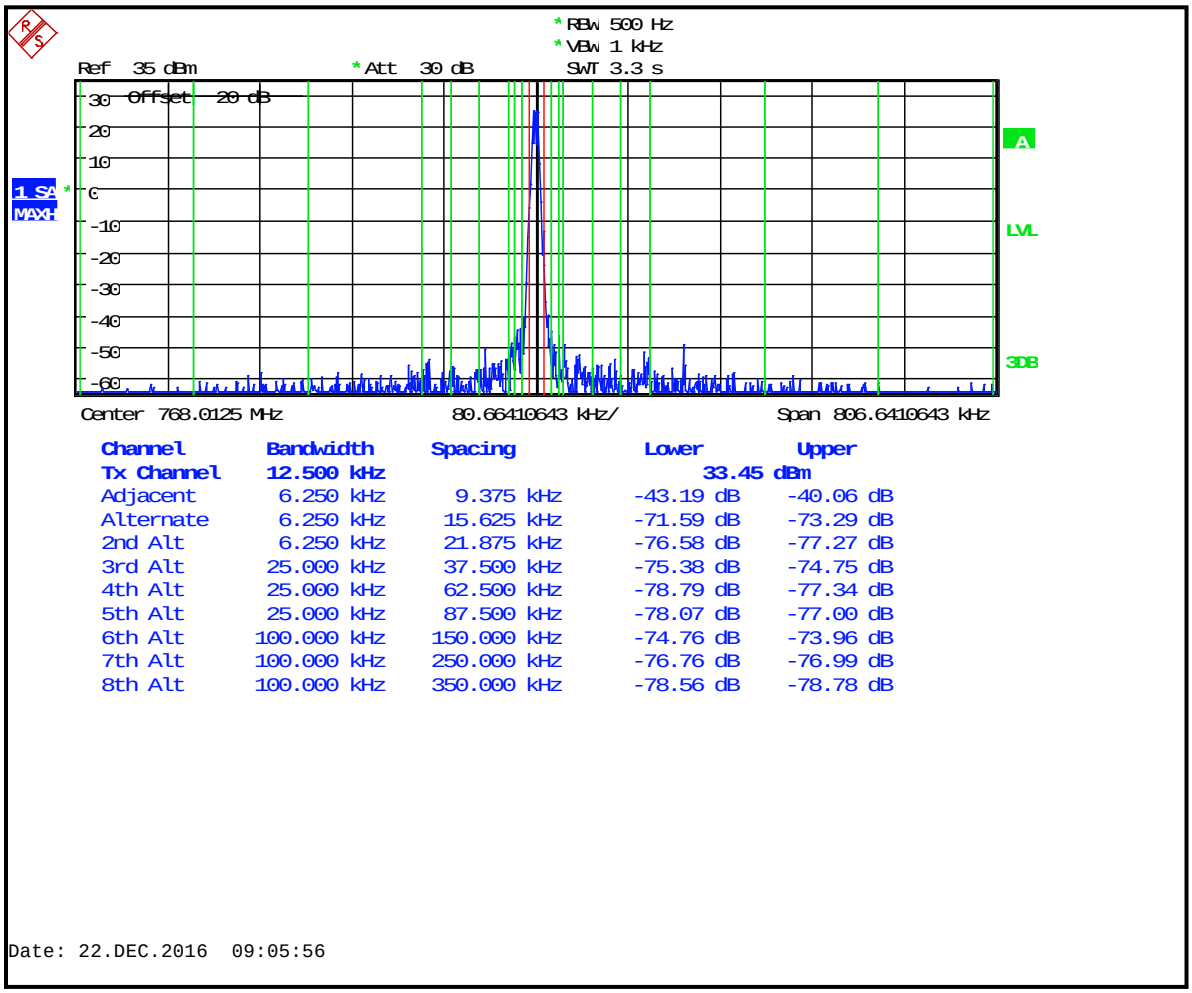


Table 6-25: Adjacent Channel Power - 768.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-87.1
12 MHz to receive band	30(s)	-75	-85.8
In receive band	30(s)	-100	-105.4

Plot 6-26: Adjacent Channel Power - 769.0125 MHz; H-CPM (TDMA) Mode (9.375 kHz - 350 kHz)

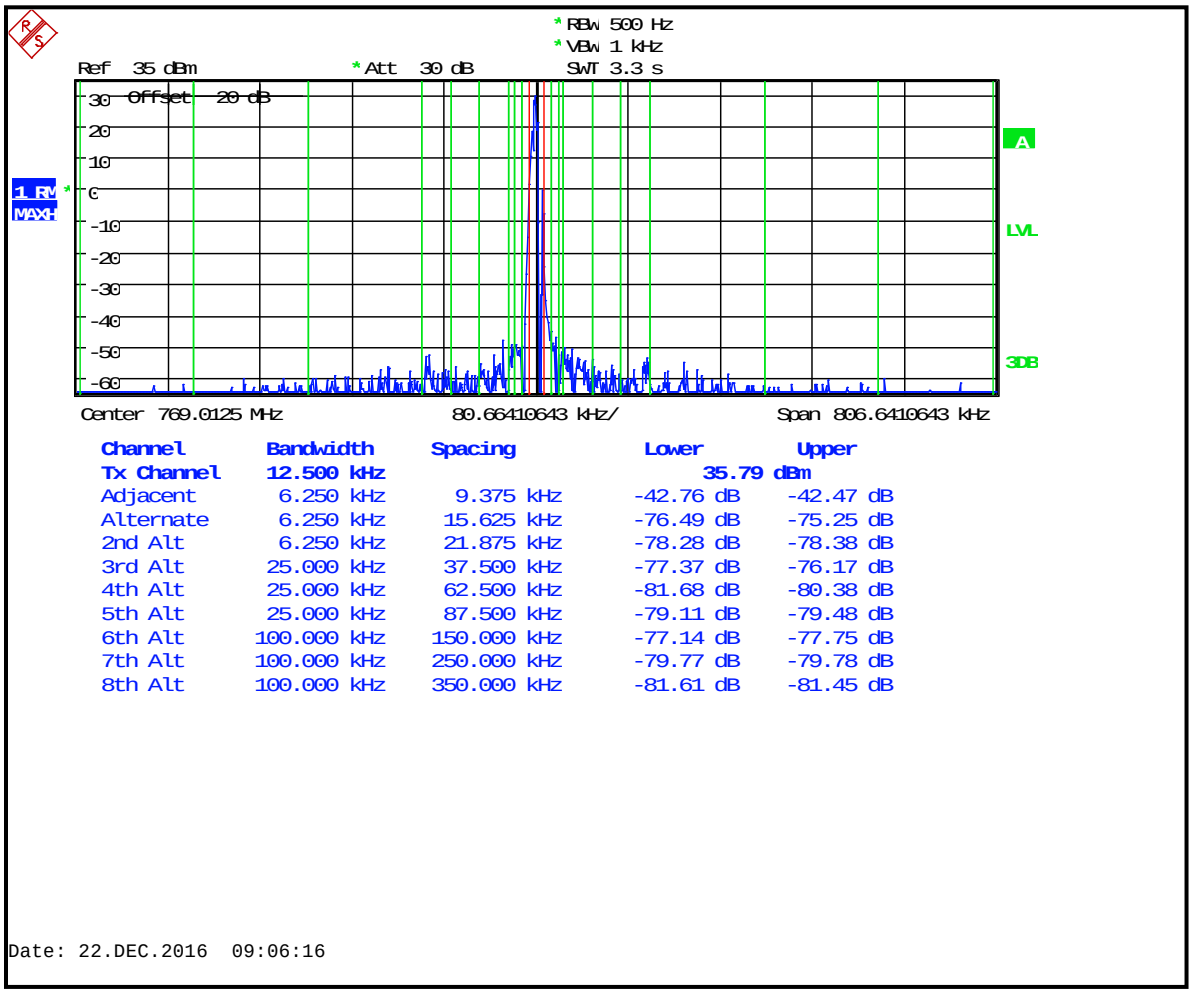


Table 6-26: Adjacent Channel Power - 769.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-85.6
12 MHz to receive band	30(s)	-75	-93.4
In receive band	30(s)	-100	-105.4

Plot 6-27: Adjacent Channel Power - 772.0125 MHz; H-CPM (TDMA) Mode (9.375 kHz - 350 kHz)

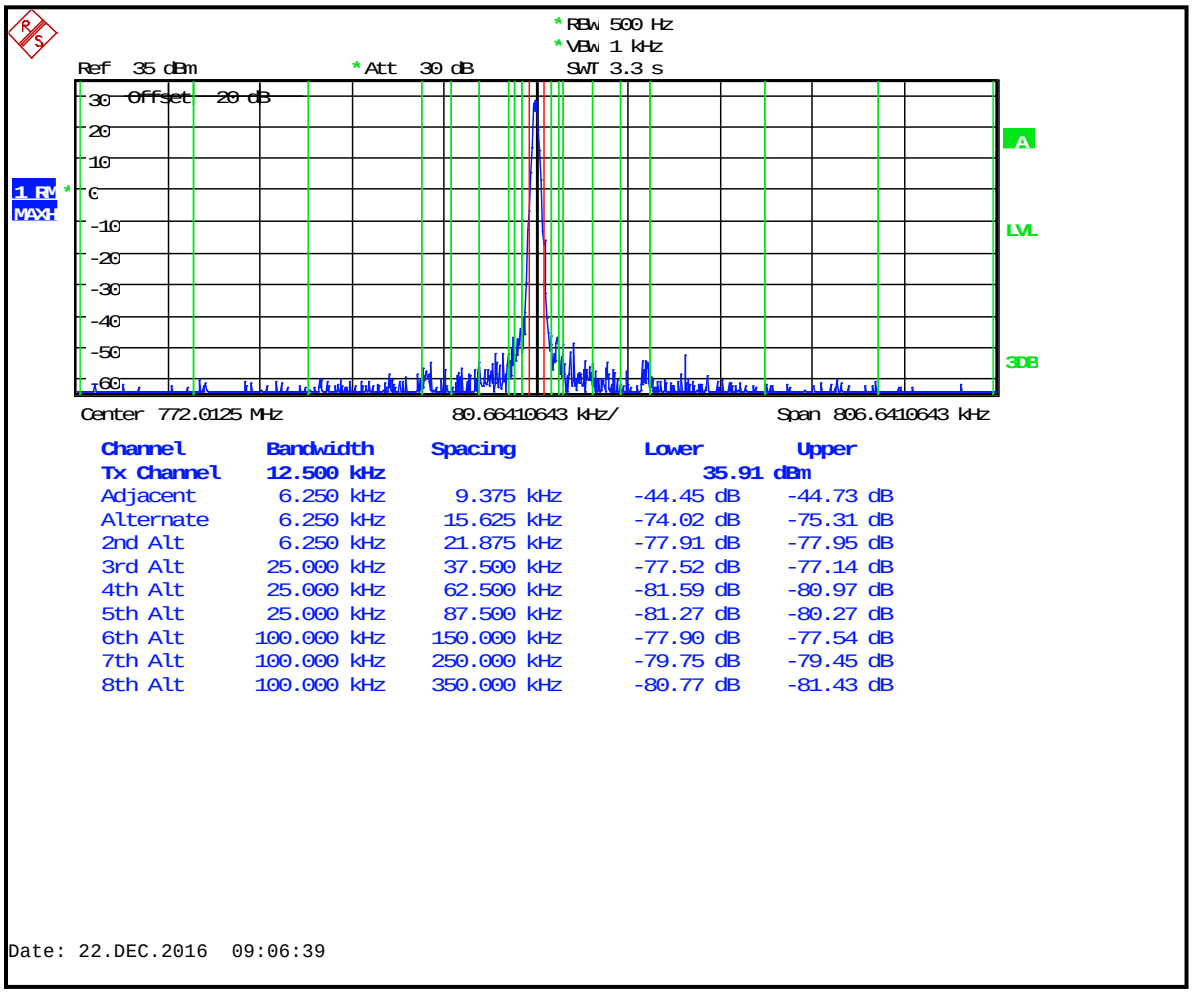


Table 6-27: Adjacent Channel Power - 772.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.5
12 MHz to receive band	30(s)	-75	-85.5
In receive band	30(s)	-100	-105.4

Plot 6-28: Adjacent Channel Power - 775.9875 MHz; H-CPM (TDMA) Mode (9.375 kHz - 350 kHz)

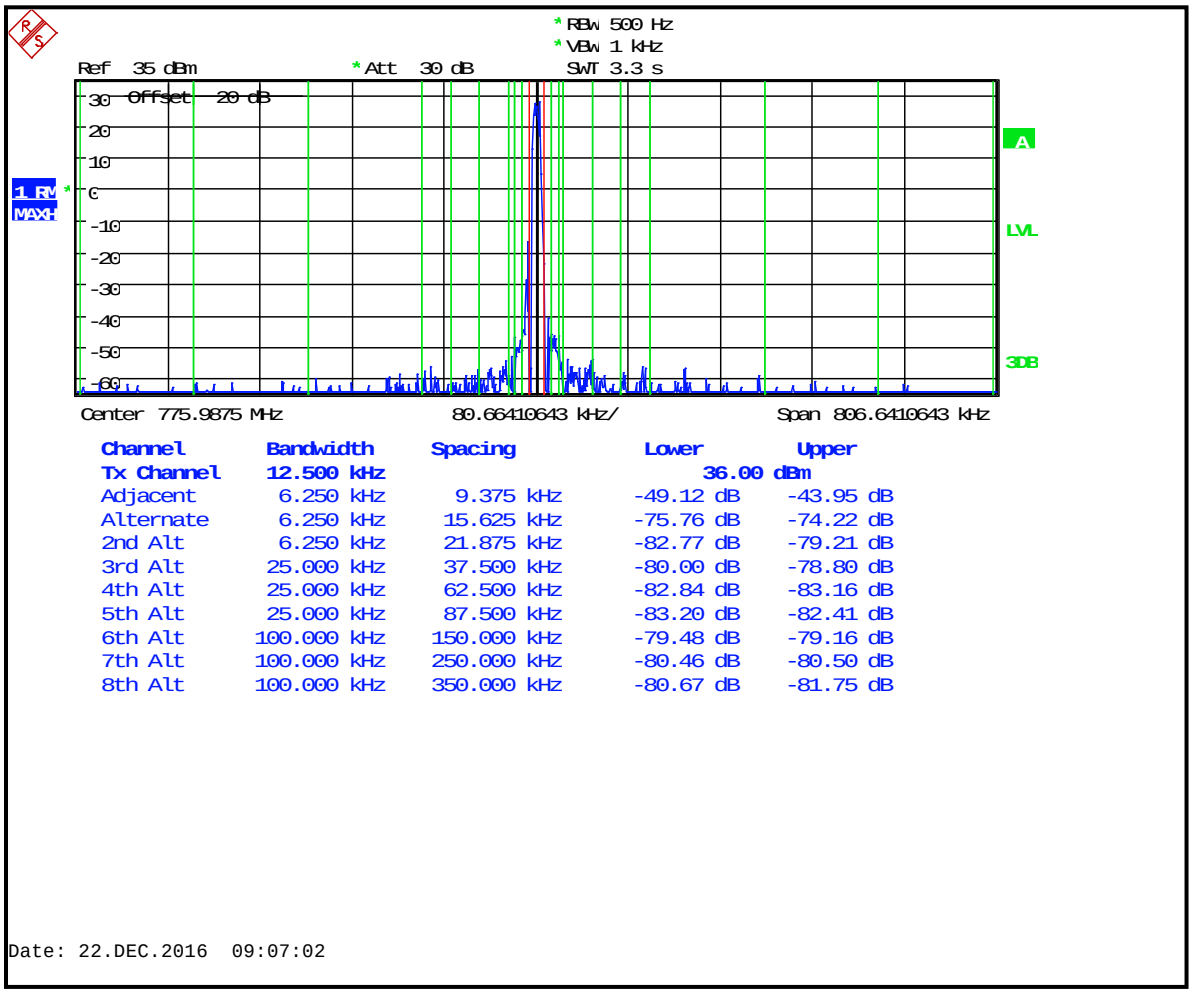


Table 6-28: Adjacent Channel Power - 775.9875 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-84.5
12 MHz to receive band	30(s)	-75	-85.6
In receive band	30(s)	-100	-105.3

Plot 6-29: Adjacent Channel Power – 798.0125 MHz; H-CPM (TDMA) Mode; (9.375 kHz - 350 kHz)

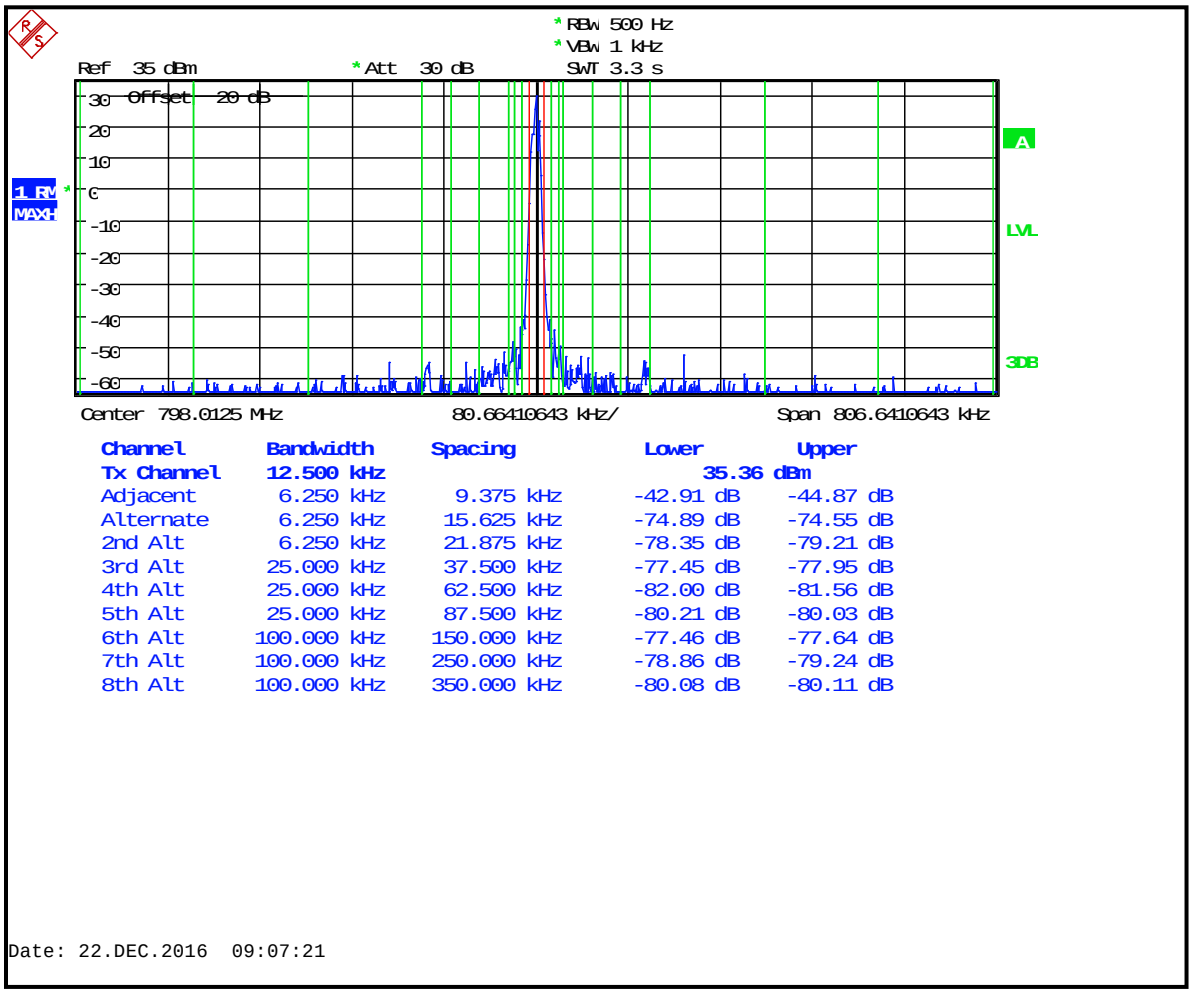


Table 6-29: Adjacent Channel Power – 798.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.3
12 MHz to receive band	30(s)	-75	-86.4
In receive band	30(s)	-100	-102.9

Plot 6-30: Adjacent Channel Power – 799.0125 MHz; H-CPM (TDMA) Mode; (9.375 kHz - 350 kHz)

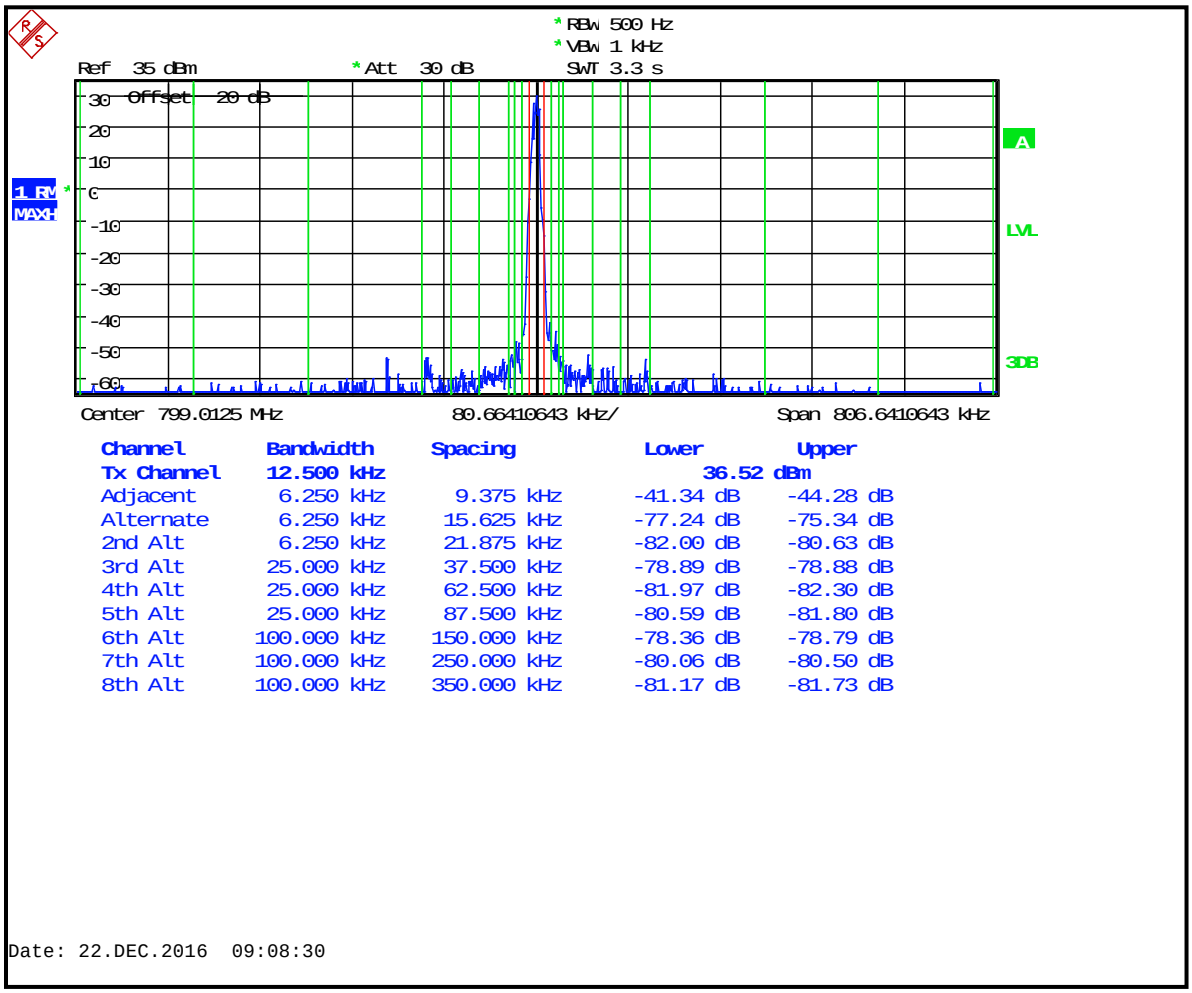


Table 6-30: Adjacent Channel Power – 799.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-79.2
12 MHz to receive band	30(s)	-75	-86.5
In receive band	30(s)	-100	-103.8

Plot 6-31: Adjacent Channel Power – 801.0125 MHz; H-CPM (TDMA) Mode; (9.375 kHz - 350 kHz)

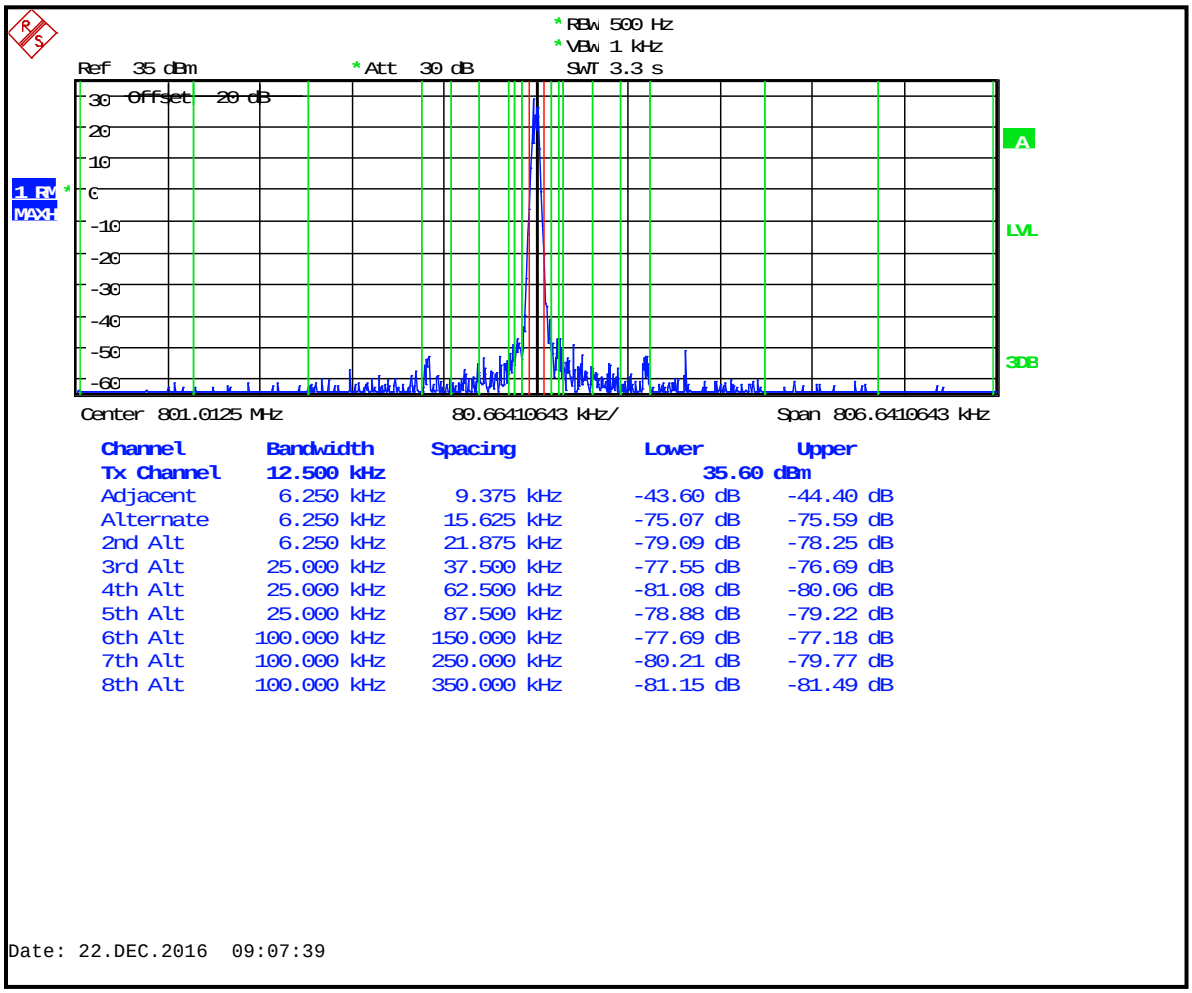


Table 6-31: Adjacent Channel Power – 801.0125 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.8
12 MHz to receive band	30(s)	-75	-86.2
In receive band	30(s)	-100	-103.8

Plot 6-32: Adjacent Channel Power – 805.9875 MHz; H-CPM (TDMA) Mode; (9.375 kHz - 350 kHz)

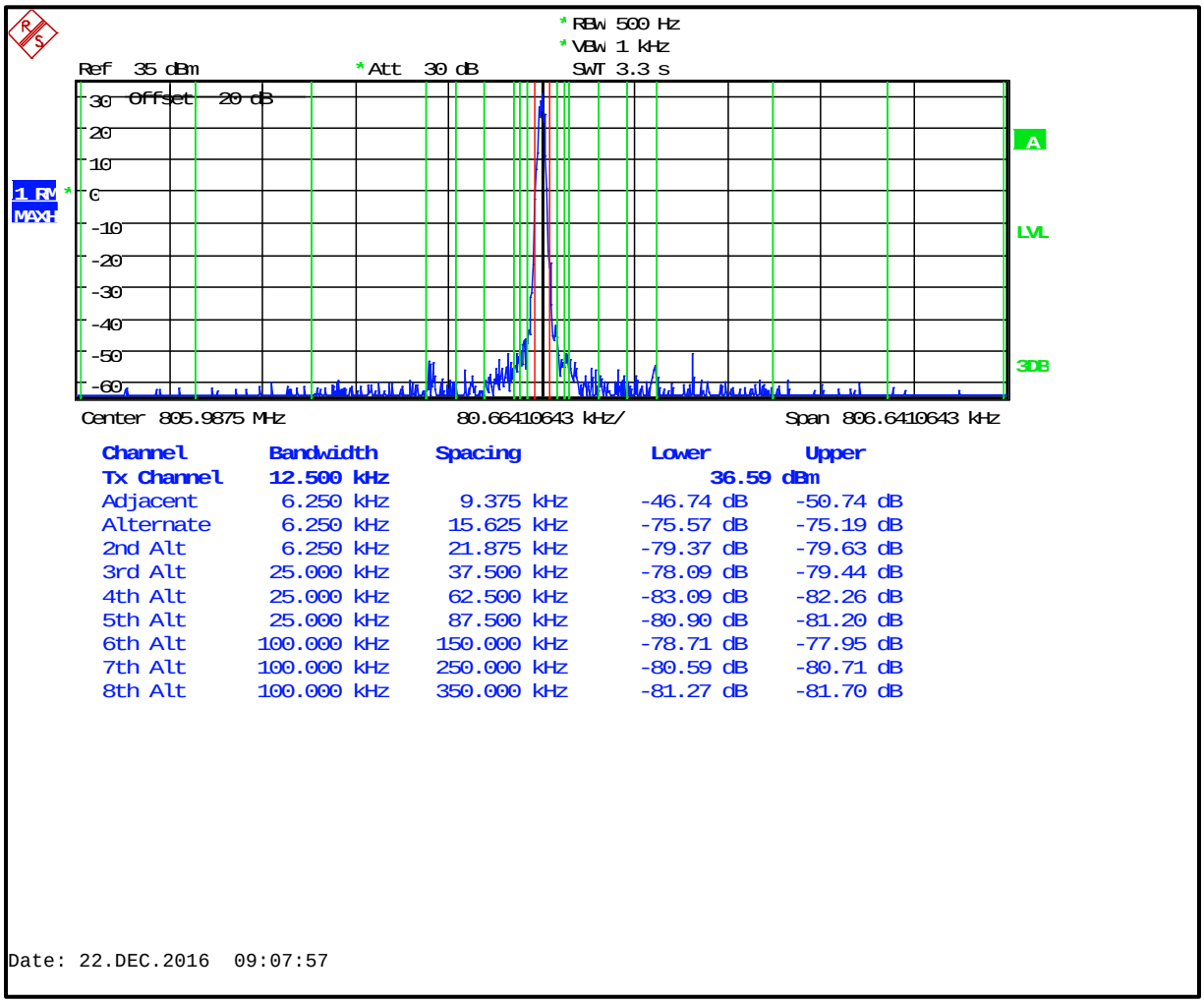


Table 6-32: Adjacent Channel Power – 805.9875 MHz; H-CPM (TDMA) Mode (>400 kHz - RX Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-75	-80.3
12 MHz to receive band	30(s)	-75	-84.3
In receive band	30(s)	-100	-105.2

Table 6-33: Test Equipment Used For Testing ACP Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901139	Weinschel Corporation	48-20-34	Attenuator DC-18 GHz 20 dB 100W	BK5859	3/30/18

Test Personnel:

Daniel Baltzell		December 18-19, 2016
EMC Test Engineer	Signature	Dates of Tests

7 FCC Part 90.210(g) and Part 2.1053(a): Field Strength of Spurious Radiation; Part 90.543(f): Out of Band Emissions Limit; IC RSS-119 5.8.9.2 Out-of-band Emission Limit

7.1 Test Procedure

ANSI/TIA-603-D 2010, section 2.2.12

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

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

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

7.2 Test Data

Table 7-1: Field Strength of Spurious Radiation – 768.0125 MHz

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1536.0250	20.2	-52.6	0.4	8.7	78.6	-24.3
2304.0375	5.0	-73.7	0.5	9.5	99.0	-44.7
3072.0500	10.0	-66.8	0.7	9.3	92.5	-38.2
3840.0625	-1.8	-75.5	0.8	9.1	101.5	-47.2
4608.0750	40.8	-65.7	0.9	11.0	89.9	-35.6
5376.0875	37.8	-68.5	1.0	10.7	93.1	-38.8
6144.1000	22.1	-48.6	1.2	11.3	72.7	-18.4
6912.1125	10.1	-59.8	1.3	11.6	83.8	-29.5
7680.1250	34.1	-69.4	1.4	11.4	93.7	-39.4

Table 7-2: Field Strength of Spurious Radiation – 769.0125 MHz

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1538.0250	19.5	-53.5	0.4	8.7	79.5	-25.2
2307.0375	7.4	-71.3	0.5	9.5	96.6	-42.3
3076.0500	11.1	-65.7	0.7	9.3	91.4	-37.1
3845.0625	-1.9	-75.6	0.8	9.1	101.6	-47.3
4614.0750	-2.4	-73.8	0.9	11.0	98.0	-43.7
5383.0875	-1.9	-73.3	1.0	10.7	97.9	-43.6
6152.1000	22.7	-48.0	1.2	11.3	72.2	-17.9
6921.1125	40.9	-63.9	1.3	11.6	87.9	-33.6
7690.1250	28.6	-74.9	1.4	11.4	99.2	-44.9

Table 7-3: Field Strength of Spurious Radiation – 772.0125 MHz

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1544.0250	17.5	-55.4	0.4	8.7	81.4	-27.1
2316.0375	19.1	-59.6	0.5	9.5	85.0	-30.7
3088.0500	17.3	-59.5	0.7	9.3	85.2	-30.9
3860.0625	-2.5	-76.2	0.8	9.1	102.2	-47.9
4632.0750	10.9	-60.5	0.9	11.0	84.6	-30.3
5404.0875	9.9	-61.5	1.0	10.6	86.2	-31.9
6176.1000	20.3	-50.4	1.2	11.3	74.6	-20.3
6948.1125	10.8	-59.1	1.3	11.6	83.0	-28.7
7720.1250	11.7	-57.1	1.4	11.4	81.4	-27.1

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

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1551.9750	20.5	-52.4	0.4	8.7	78.4	-24.1
2327.9625	13.0	-65.6	0.5	9.5	91.0	-36.7
3103.9500	17.4	-59.4	0.7	9.2	85.2	-30.9
3879.9375	-0.4	-74.0	0.8	9.1	100.0	-45.7
4655.9250	0.5	-70.9	0.9	11.1	95.1	-40.8
5431.9125	48.9	-57.4	1.1	10.7	82.1	-27.8
6207.9000	20.4	-50.2	1.2	11.2	74.4	-20.1
6983.8875	6.8	-63.0	1.3	11.7	86.9	-32.6
7759.8750	2.1	-66.7	1.4	11.4	91.0	-36.7

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

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1596.0250	23.3	-51.9	0.4	7.8	78.8	-24.5
2394.0375	8.2	-68.3	0.5	9.4	93.7	-39.4
3192.0500	15.0	-61.5	0.7	9.2	87.3	-33.0
3990.0625	-5.6	-79.0	0.8	9.6	104.5	-50.2
4788.0750	38.7	-67.8	0.9	11.0	92.0	-37.7
5586.0875	54.0	-52.2	1.1	10.8	76.7	-22.4
6384.1000	35.3	-70.0	1.2	11.7	93.8	-39.5
7182.1125	42.2	-62.1	1.3	11.4	86.4	-32.1
7980.1250	-3.5	-72.1	1.4	11.4	96.5	-42.2

Table 7-6: Field Strength of Spurious Radiation – 799.0125 MHz

Conducted Power 34.4 dBm; 2.8 W; Limit=50+10LogP=54.4 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1598.0250	18.8	-54.1	0.4	7.8	81.1	-26.7
2397.0375	10.7	-67.8	0.5	9.4	93.3	-38.9
3196.0500	15.0	-61.5	0.7	9.2	87.4	-33.0
3995.0625	-5.2	-78.6	0.8	9.6	104.2	-49.8
4794.0750	17.6	-54.2	1.0	11.0	78.5	-24.1
5593.0875	10.7	-60.5	1.1	10.9	85.1	-30.7
6392.1000	13.2	-57.3	1.2	11.7	81.2	-26.8
7191.1125	10.2	-59.4	1.3	11.3	83.8	-29.4
7990.1250	12.5	-57.0	1.4	11.4	81.5	-27.1

Table 7-7: Field Strength of Spurious Radiation – 801.0125 MHz

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1602.0250	20.7	-52.2	0.4	8.9	78.0	-23.7
2403.0375	18.7	-57.8	0.5	9.4	83.2	-28.9
3204.0500	12.5	-64.0	0.7	9.2	89.8	-35.5
4005.0625	30.2	-40.7	0.8	9.7	66.1	-11.8
4806.0750	36.7	-70.1	1.0	11.0	94.4	-40.1
5607.0875	55.2	-50.8	1.1	10.9	75.3	-21.0
6408.1000	10.1	-60.3	1.2	11.7	84.1	-29.8
7209.1125	8.4	-61.2	1.3	11.3	85.6	-31.3
8010.1250	-4.1	-72.3	1.4	11.3	96.7	-42.4

Table 7-8: Field Strength of Spurious Radiation – 805.9875 MHz

Conducted Power 34.3 dBm; 2.7 W; Limit=50+10LogP=54.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1611.9750	19.4	-53.6	0.4	8.9	79.4	-25.1
2417.9625	15.5	-61.0	0.6	9.5	86.4	-32.1
3223.9500	11.6	-64.9	0.7	9.2	90.7	-36.4
4029.9375	31.6	-39.3	0.8	9.8	64.6	-10.3
4835.9250	2.8	-68.8	1.0	11.0	93.1	-38.8
5641.9125	54.4	-51.6	1.1	11.0	76.1	-21.8
6447.9000	7.4	-63.0	1.2	11.8	86.7	-32.4
7253.8875	45.6	-58.8	1.3	11.1	83.4	-29.1
8059.8750	-4.0	-70.1	1.5	11.3	94.5	-40.2

Table 7-9: Field Strength of Spurious Radiation – 806.0125 MHz

Conducted Power 35.0 dBm; 3.2 W; Limit=50+10LogP=55.0 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1612.0250	26.3	-46.5	0.4	8.9	73.0	-18.0
2418.0375	21.1	-55.4	0.6	9.5	81.5	-26.5
3224.0500	16.7	-59.8	0.7	9.2	86.3	-31.3
4030.0625	33.7	-37.2	0.8	9.8	63.2	-8.2
4836.0750	4.1	-67.5	1.0	11.0	92.5	-37.5
5642.0875	63.7	-42.3	1.1	11.0	67.5	-12.5
6448.1000	45.8	-59.4	1.2	11.8	83.8	-28.8
7254.1125	55.0	-49.2	1.3	11.1	74.5	-19.5
8060.1250	-3.1	-69.2	1.5	11.3	94.3	-39.3

Table 7-10: Field Strength of Spurious Radiation – 811.0125 MHz

Conducted Power 35.1 dBm; 3.2 W; Limit=50+10LogP=55.1 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1622.0250	25.4	-47.2	0.4	8.8	73.9	-18.8
2433.0375	12.7	-63.7	0.6	9.5	89.9	-34.8
3244.0500	16.1	-60.3	0.7	9.2	86.9	-31.8
4055.0625	33.2	-37.7	0.8	9.9	63.7	-8.6
4866.0750	10.9	-60.8	1.0	11.0	85.8	-30.7
5677.0875	18.9	-52.3	1.1	11.1	77.4	-22.3
6488.1000	15.2	-55.2	1.2	11.9	79.6	-24.5
7299.1125	52.8	-51.4	1.3	10.9	77.0	-21.9
8110.1250	-6.8	-70.8	1.5	11.4	96.0	-40.9

Table 7-11: Field Strength of Spurious Radiation – 815.9875 MHz

Conducted Power 35.2 dBm; 3.3 W; Limit=50+10LogP=55.2 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1631.9750	32.3	-40.3	0.4	8.8	67.1	-11.9
2447.9625	18.0	-58.4	0.6	9.5	84.7	-29.5
3263.9500	16.3	-60.1	0.7	9.2	86.8	-31.6
4079.9375	33.9	-37.1	0.8	10.1	63.1	-7.9
4895.9250	10.0	-61.7	1.0	11.0	86.9	-31.7
5711.9125	20.2	-50.9	1.1	11.2	76.0	-20.8
6527.9000	12.4	-57.9	1.2	11.9	82.5	-27.3
7343.8875	13.5	-55.8	1.3	10.8	81.5	-26.3
8159.8750	-5.4	-67.4	1.5	11.4	92.7	-37.5

Table 7-12: Field Strength of Spurious Radiation – 851.0125 MHz

Conducted Power 35.0 dBm; 3.2 W; Limit=50+10LogP=55.0 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1702.0250	29.1	-43.4	0.4	8.5	70.3	-15.3
2553.0375	12.3	-63.9	0.6	9.5	89.9	-34.9
3404.0500	15.8	-60.2	0.7	9.7	86.2	-31.2
4255.0625	30.2	-40.9	0.9	10.8	66.0	-11.0
5106.0750	11.6	-60.1	1.0	10.9	85.2	-30.2
5957.0875	18.9	-52.0	1.1	11.8	76.4	-21.4
6808.1000	10.2	-59.8	1.3	11.6	84.5	-29.5
7659.1125	10.4	-58.4	1.4	11.3	83.4	-28.4
8510.1250	5.5	-55.6	1.5	11.6	80.6	-25.6

Table 7-13: Field Strength of Spurious Radiation – 856.0125 MHz

Conducted Power 35.1 dBm; 3.2 W; Limit=50+10LogP=55.1 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1712.0250	28.4	-44.1	0.4	8.6	71.1	-16.0
2568.0375	15.1	-63.0	0.6	9.6	89.1	-34.0
3424.0500	19.0	-56.9	0.7	9.7	83.0	-27.9
4280.0625	24.6	-46.5	0.9	10.8	71.6	-16.5
5136.0750	19.2	-52.5	1.0	10.8	77.8	-22.7
5992.0875	19.9	-51.0	1.1	11.7	75.6	-20.5
6848.1000	11.0	-59.0	1.3	11.6	83.8	-28.7
7704.1125	-0.8	-70.1	1.4	11.4	95.2	-40.1
8560.1250	2.5	-58.7	1.5	11.6	83.7	-28.6

Table 7-14: Field Strength of Spurious Radiation – 860.9875 MHz

Conducted Power 35.0 dBm; 3.2 W; Limit=50+10LogP=55.0 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
1721.9750	32.6	-40.0	0.4	8.6	66.8	-11.8
2582.9625	18.9	-59.1	0.6	9.6	85.1	-30.1
3443.9500	18.6	-57.3	0.7	9.7	83.3	-28.3
4304.9375	18.9	-52.2	0.9	10.9	77.2	-22.2
5165.9250	10.8	-60.8	1.0	10.8	86.1	-31.1
6026.9125	21.1	-49.7	1.1	11.6	74.3	-19.3
6887.9000	10.6	-59.3	1.3	11.6	84.0	-29.0
7748.8875	9.8	-59.0	1.4	11.4	83.9	-28.9
8609.8750	3.6	-57.8	1.5	11.7	82.6	-27.6

Table 7-15: Part 90.543(f): Out of Band Emissions Limit

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBW)	Limit (dBW)	Margin (dB)
1596.025	23.3	-51.9	0.4	7.8	-74.5	-70.0	-4.5
1598.025	18.8	-54.1	0.4	7.8	-76.7	-70.0	-6.7
1609.975	19.5	-53.1	0.4	7.7	-75.8	-70.0	-5.8

Table 7-16: Test Equipment Used For Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/3/17
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/1/17
901594	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/1/17
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	6/11/17
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/9/18
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	4/9/18
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/9/18
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	3/20/18
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz - 26.5 GHz)	MY51250846	4/21/17
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	9/16/17

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	December 13-January 24, 2017
Test Engineer	Signature	Dates of Tests

8 FCC Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; IC RSS-119 5.5 Channel Spacing, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

Occupied Bandwidth - Compliance with the Emission Masks

8.1 Test Procedure

ANSI/TIA-603-D 2010, section 2.2.11

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

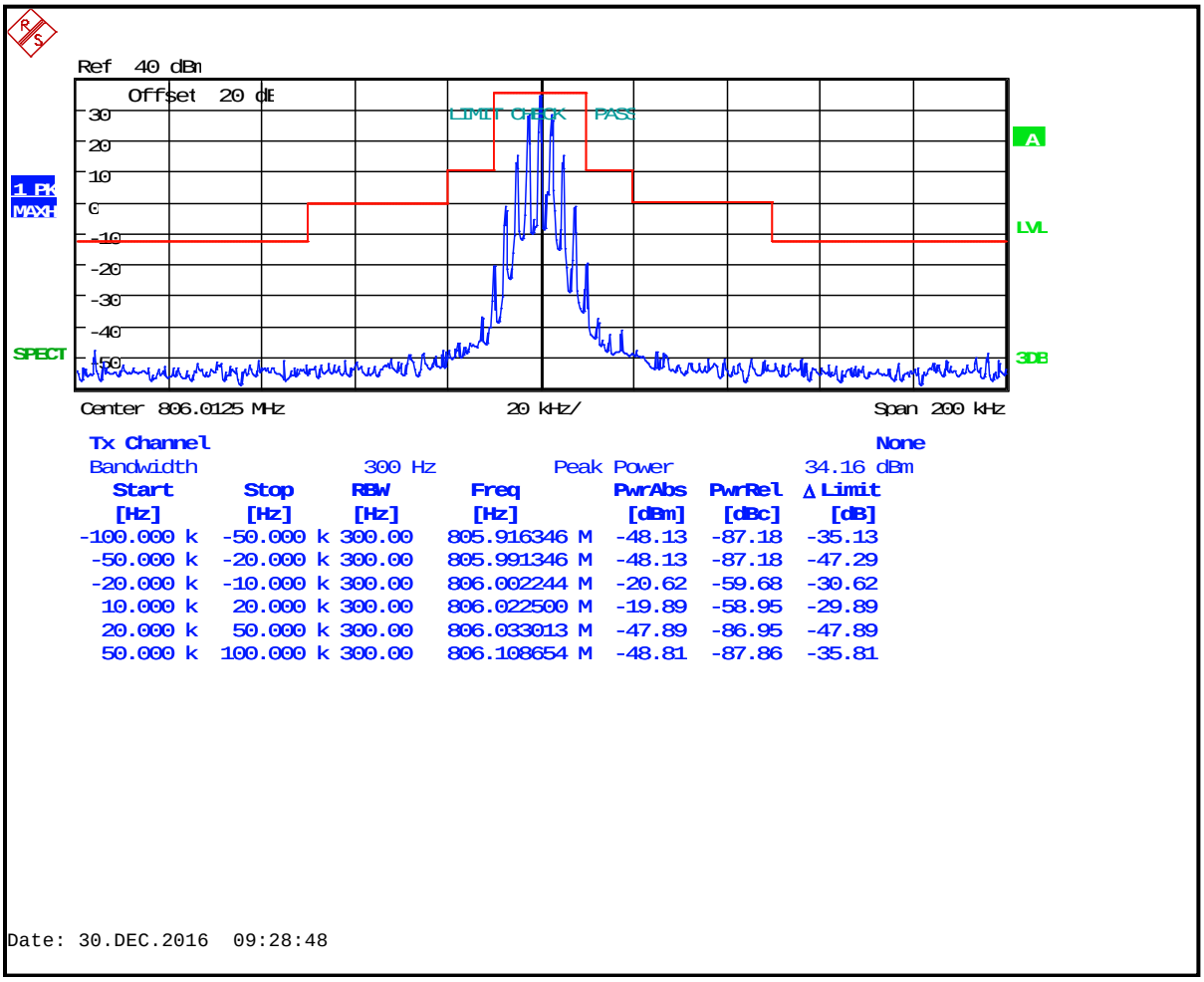
Part 90.210 Authorized Bandwidth

Applicable Emission Masks		
Frequency Band (MHz)	**Mask for Equipment With Audio Low Pass Filter**	**Mask for Equipment Without Audio Low Pass Filter**
Below 25 [1]	A or B	A or C
25–50	B	C
72–76	B	C
150–174 [2]	B, D, or E	C, D, or E
150 Paging-only	B	C
220–222	F	F
421–512 [2]	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869 [3 5]	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M
5850–5925 [4]		
All other bands	B	C

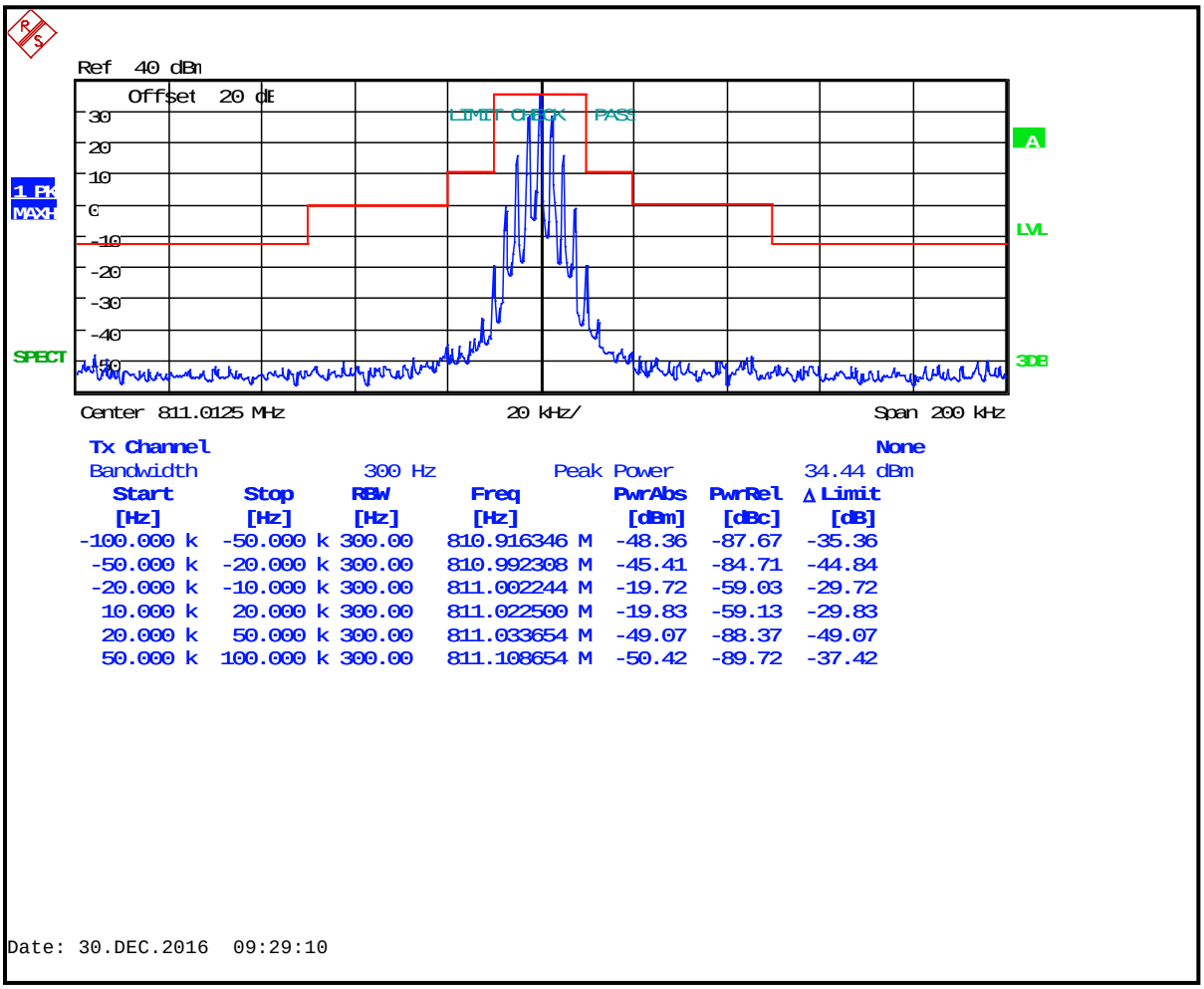
[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask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

8.2 Test Data

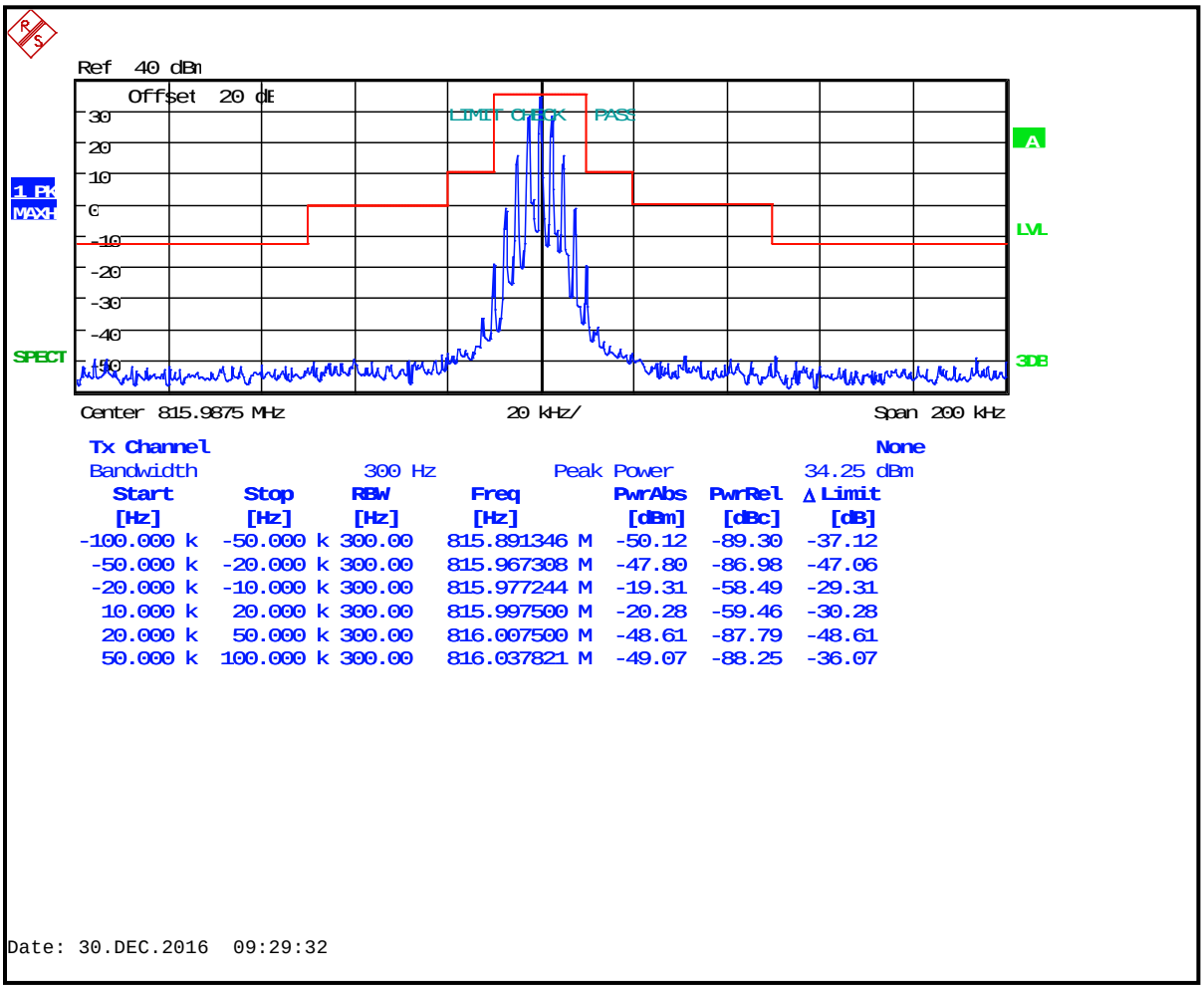
Plot 8-1: Occupied Bandwidth – 806.0125 MHz; NB Analog; Mask B



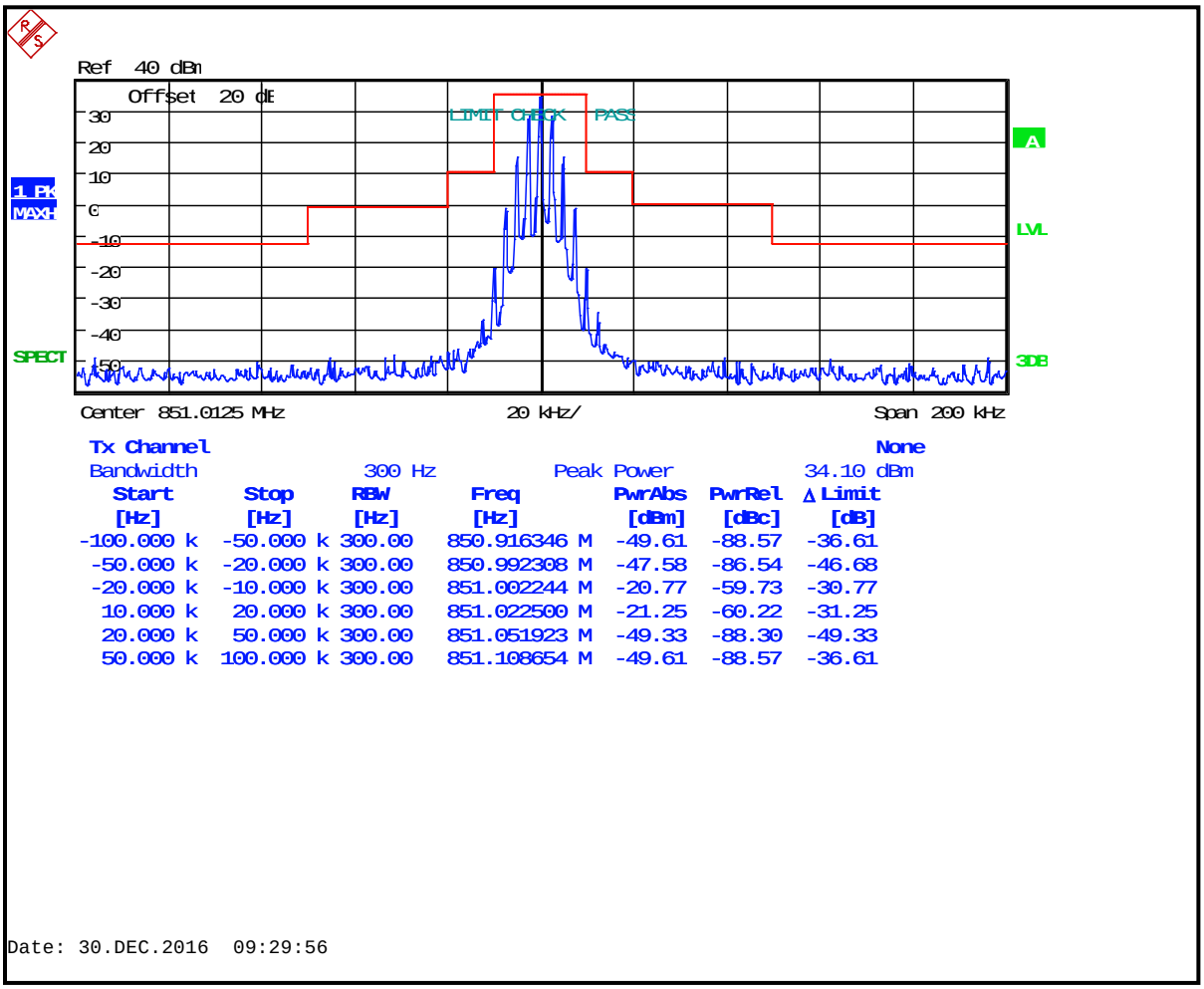
Plot 8-2: Occupied Bandwidth – 811.0125 MHz; NB Analog; Mask B



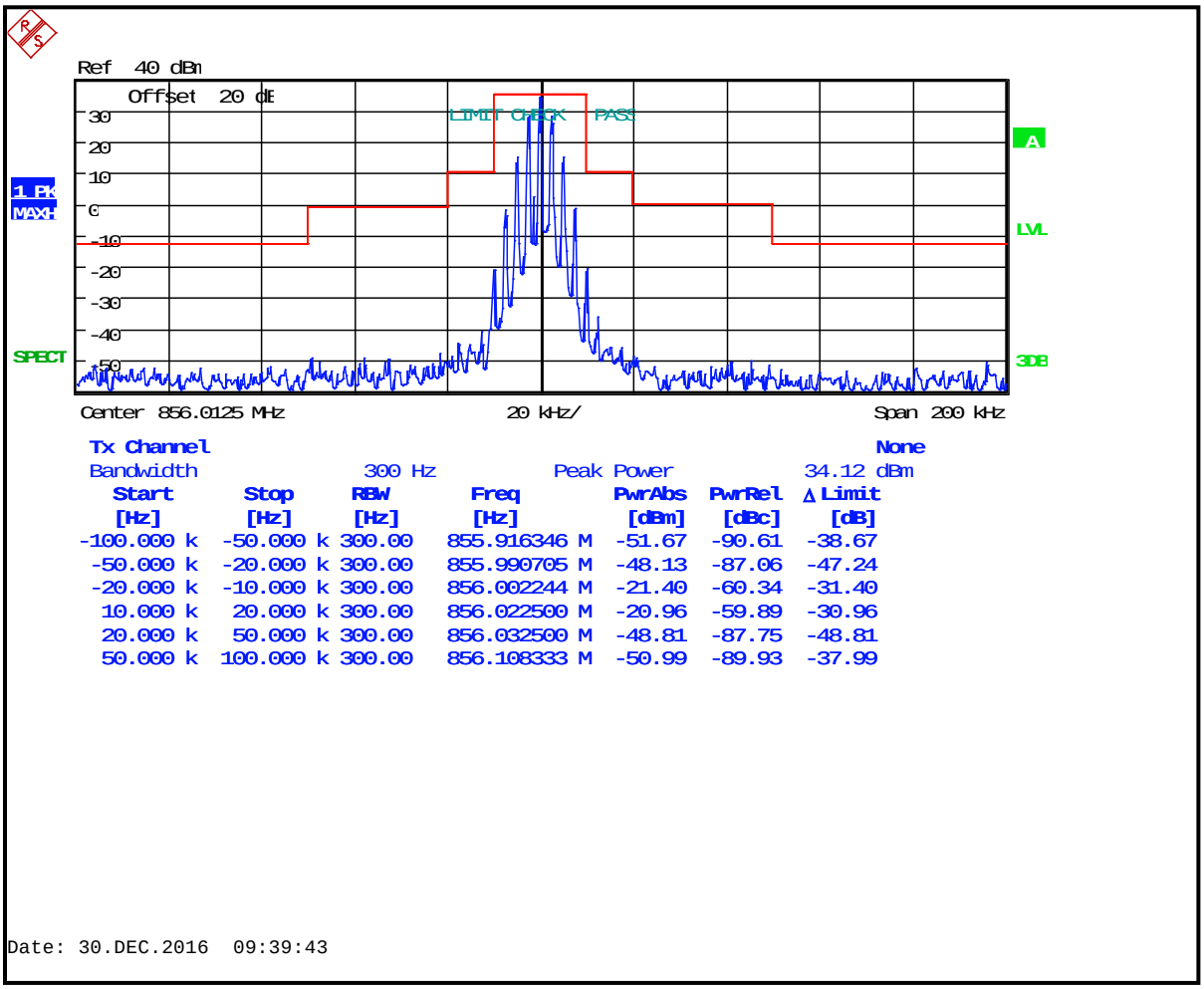
Plot 8-3: Occupied Bandwidth – 815.9875 MHz; NB Analog; Mask B



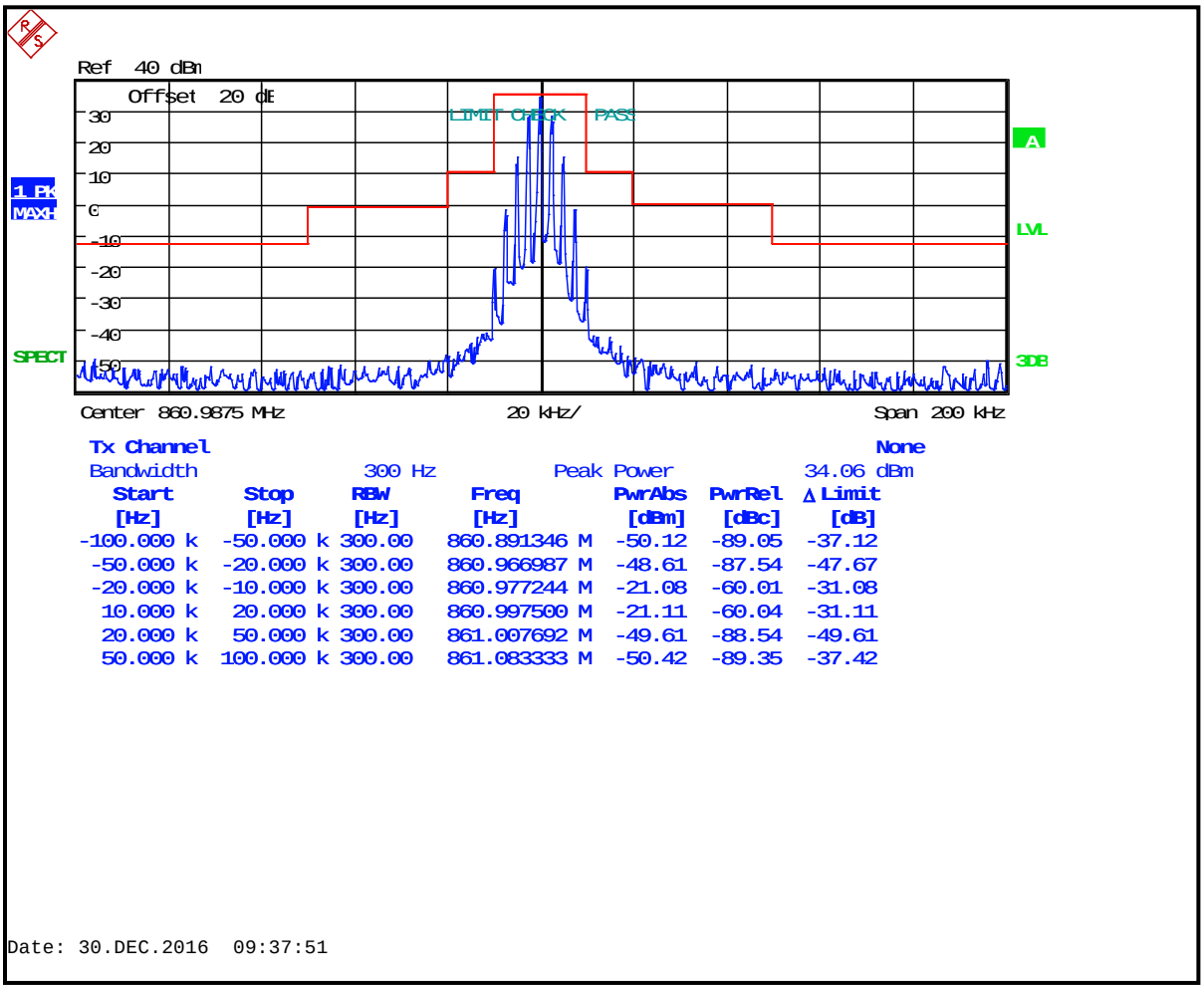
Plot 8-4: Occupied Bandwidth – 851.0125 MHz; NB Analog; Mask B



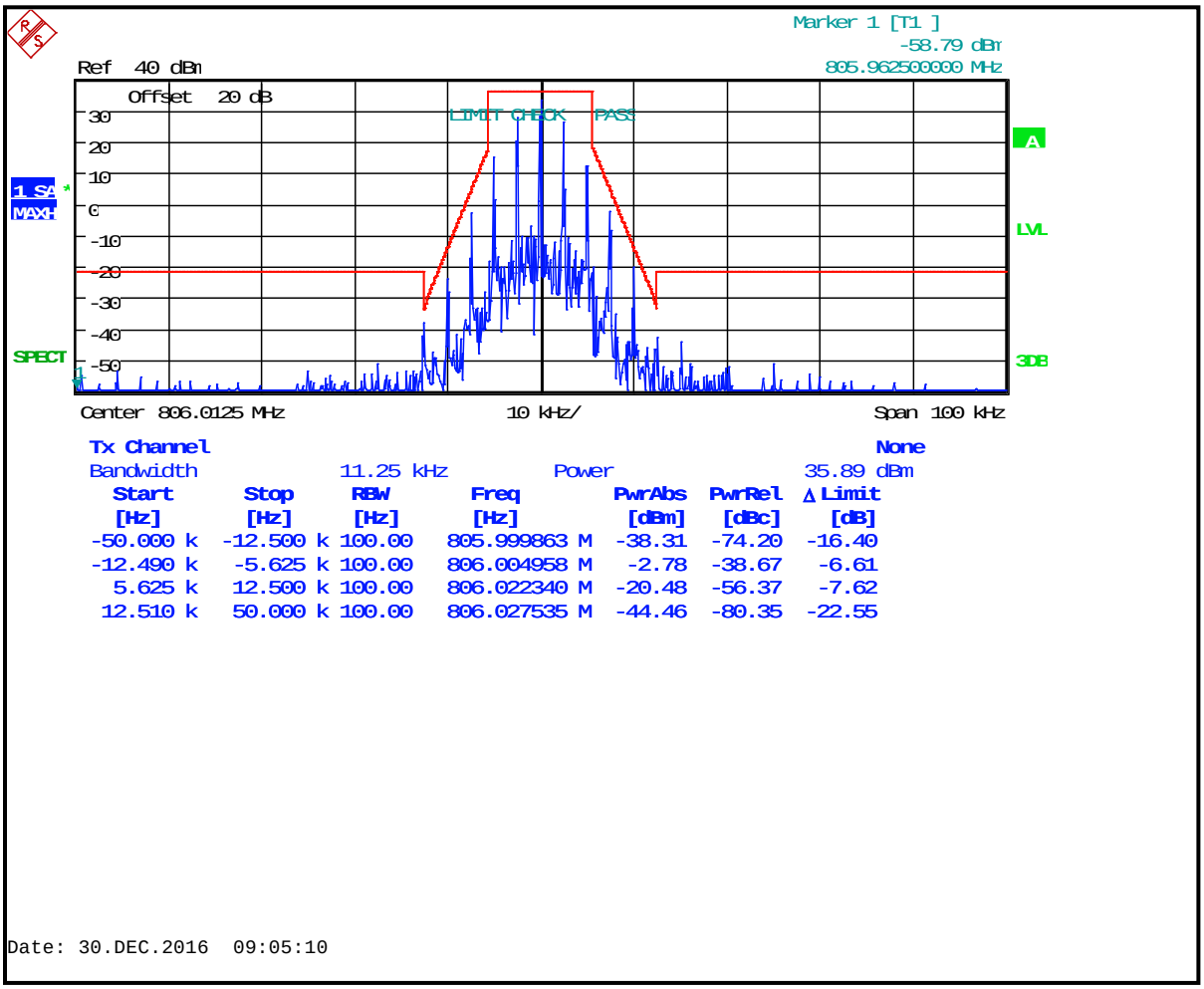
Plot 8-5: Occupied Bandwidth – 856.0125 MHz; NB Analog; Mask B



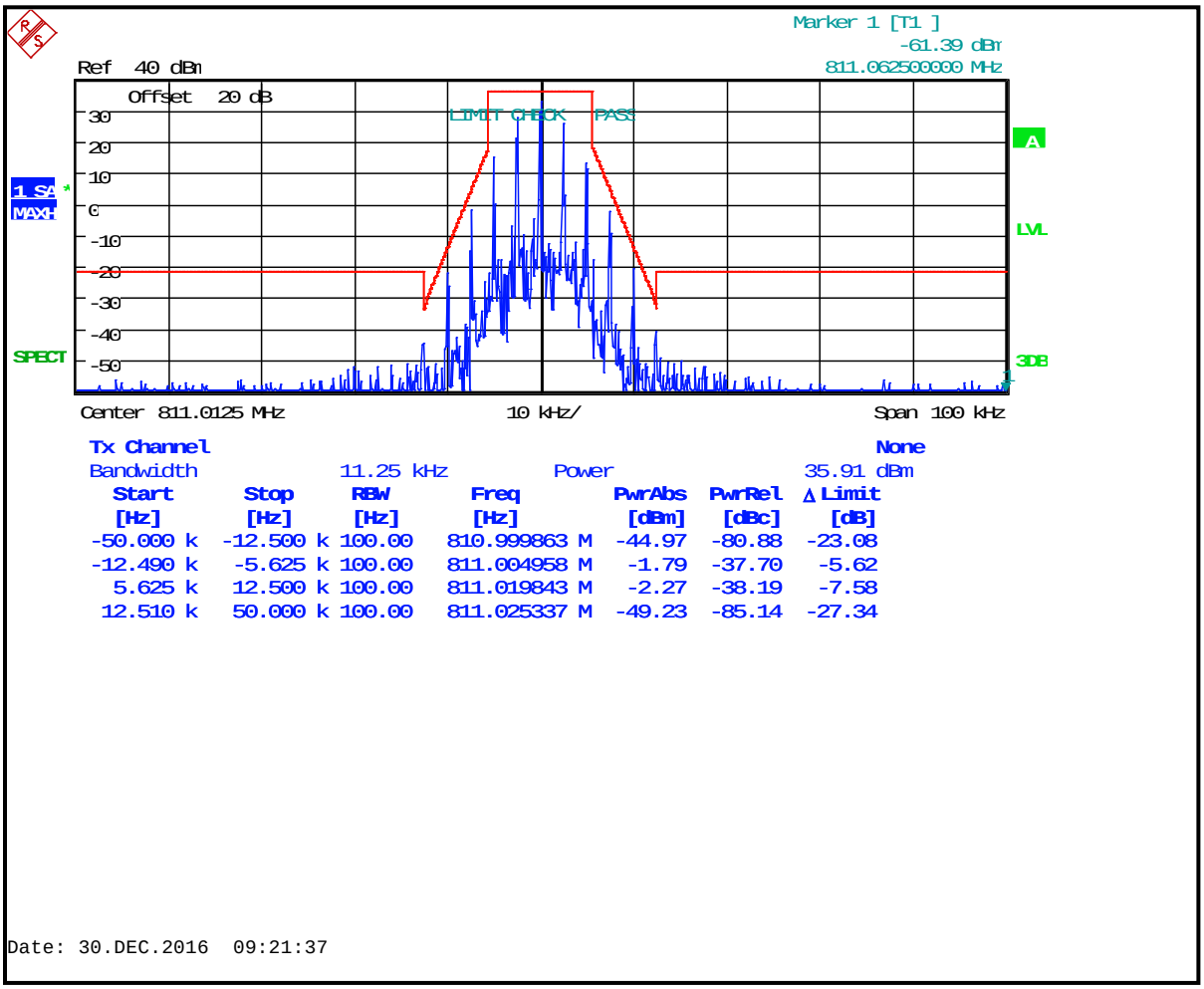
Plot 8-6: Occupied Bandwidth – 860.9875 MHz; NB Analog; Mask B



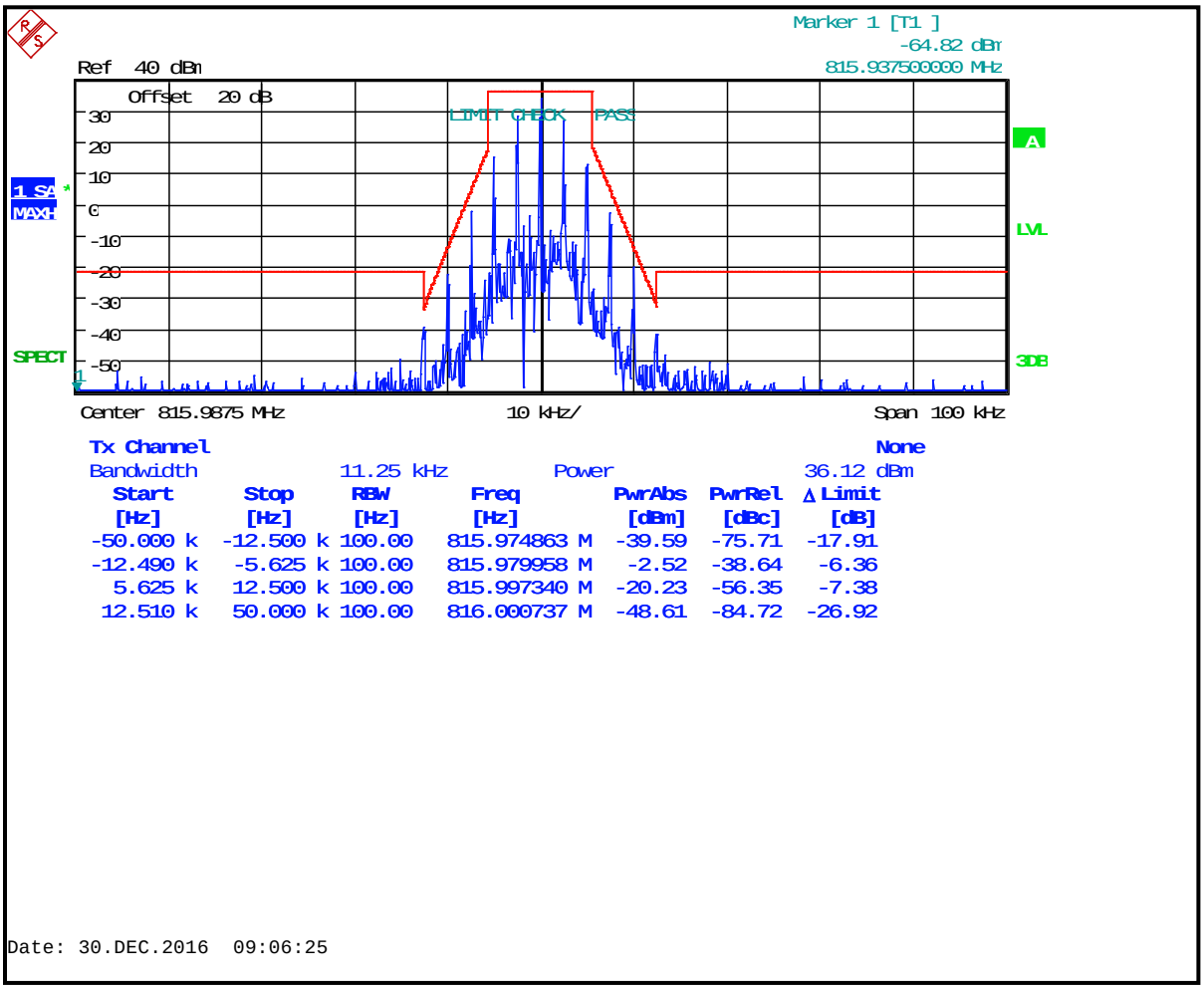
Plot 8-7: Occupied Bandwidth – 806.0125 MHz; NB Analog; Mask D (IC)



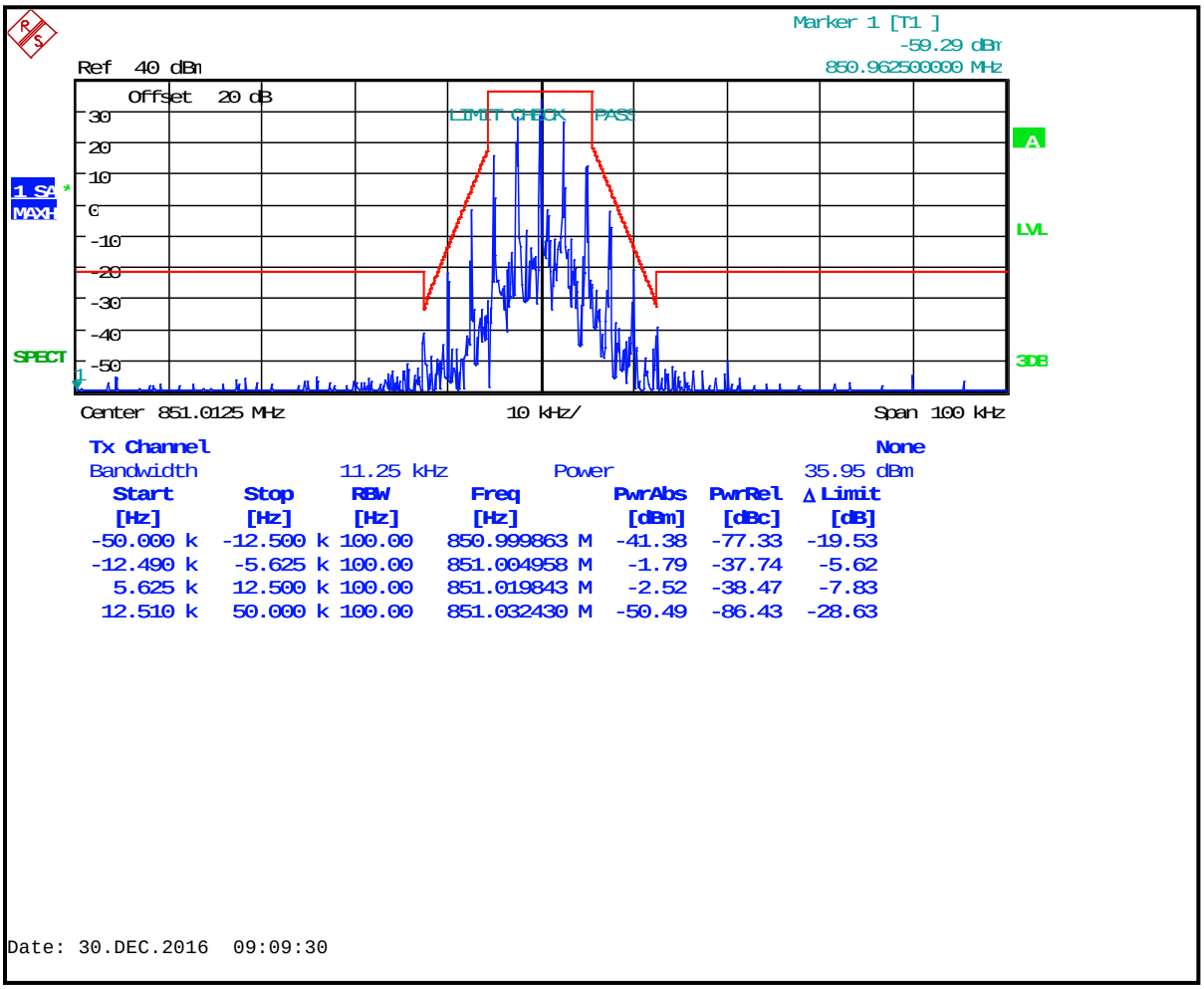
Plot 8-8: Occupied Bandwidth – 811.0125 MHz; NB Analog; Mask D (IC)



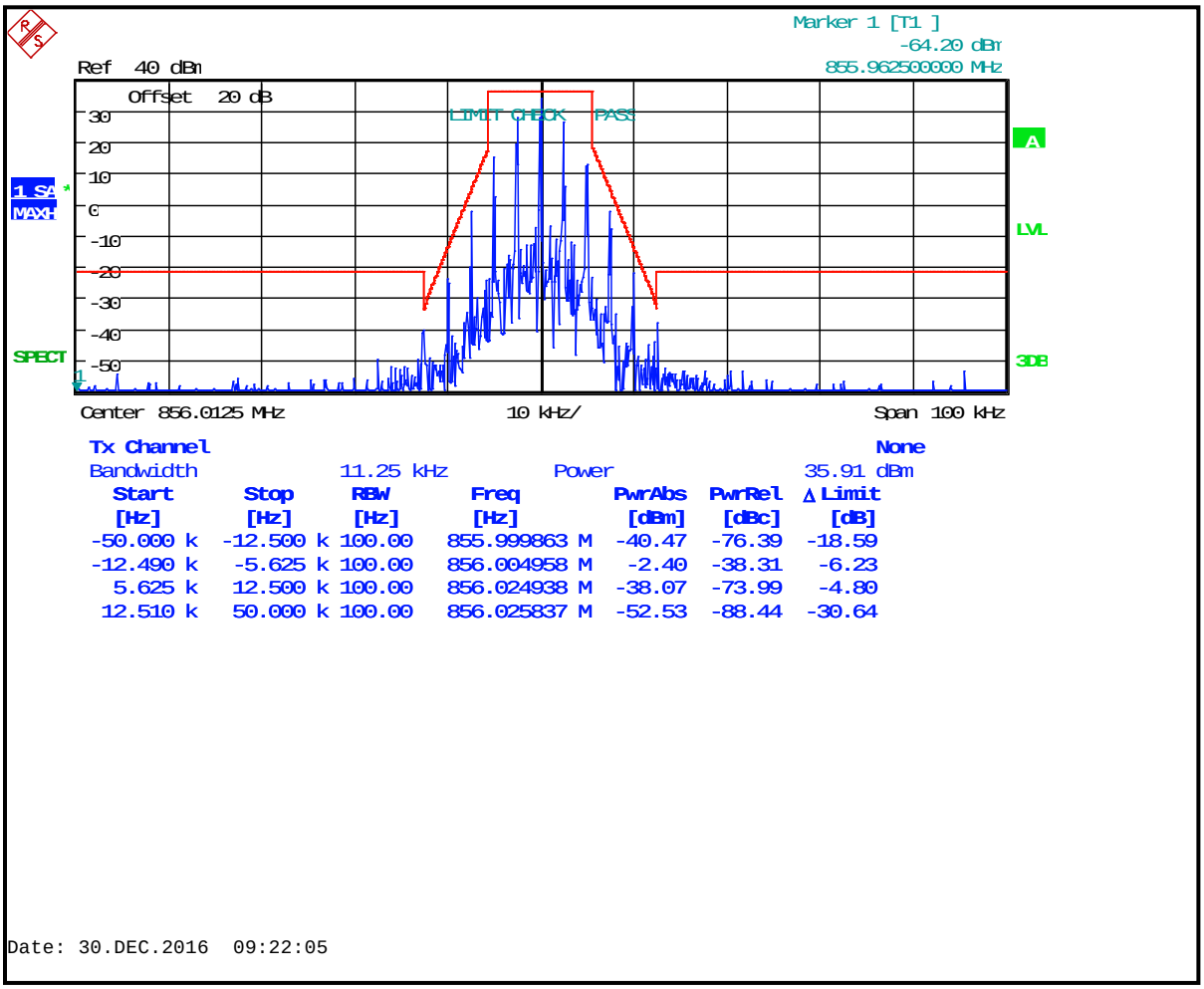
Plot 8-9: Occupied Bandwidth – 815.9875 MHz; NB Analog; Mask D (IC)



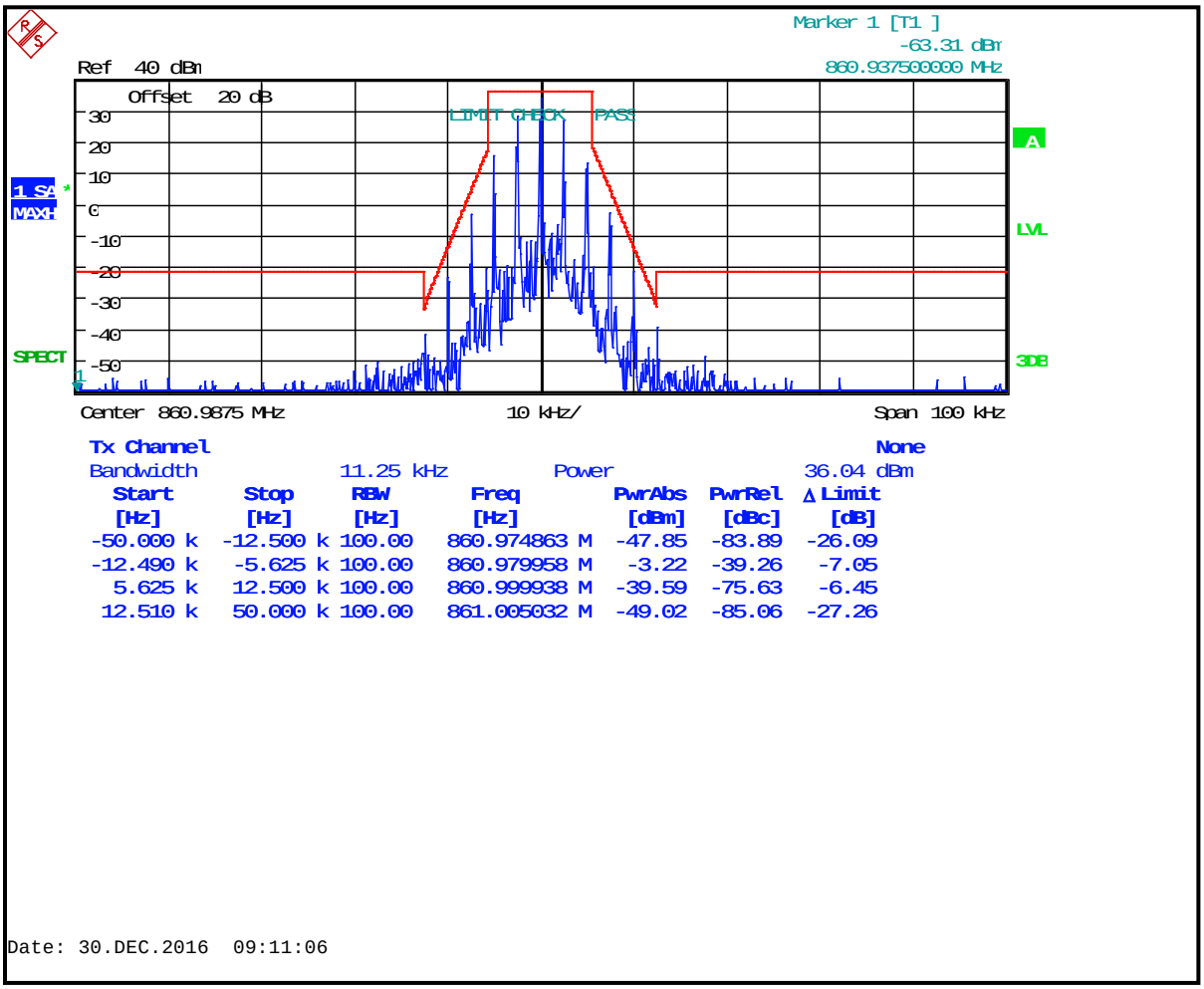
Plot 8-10: Occupied Bandwidth – 851.0125 MHz; NB Analog; Mask D (IC)



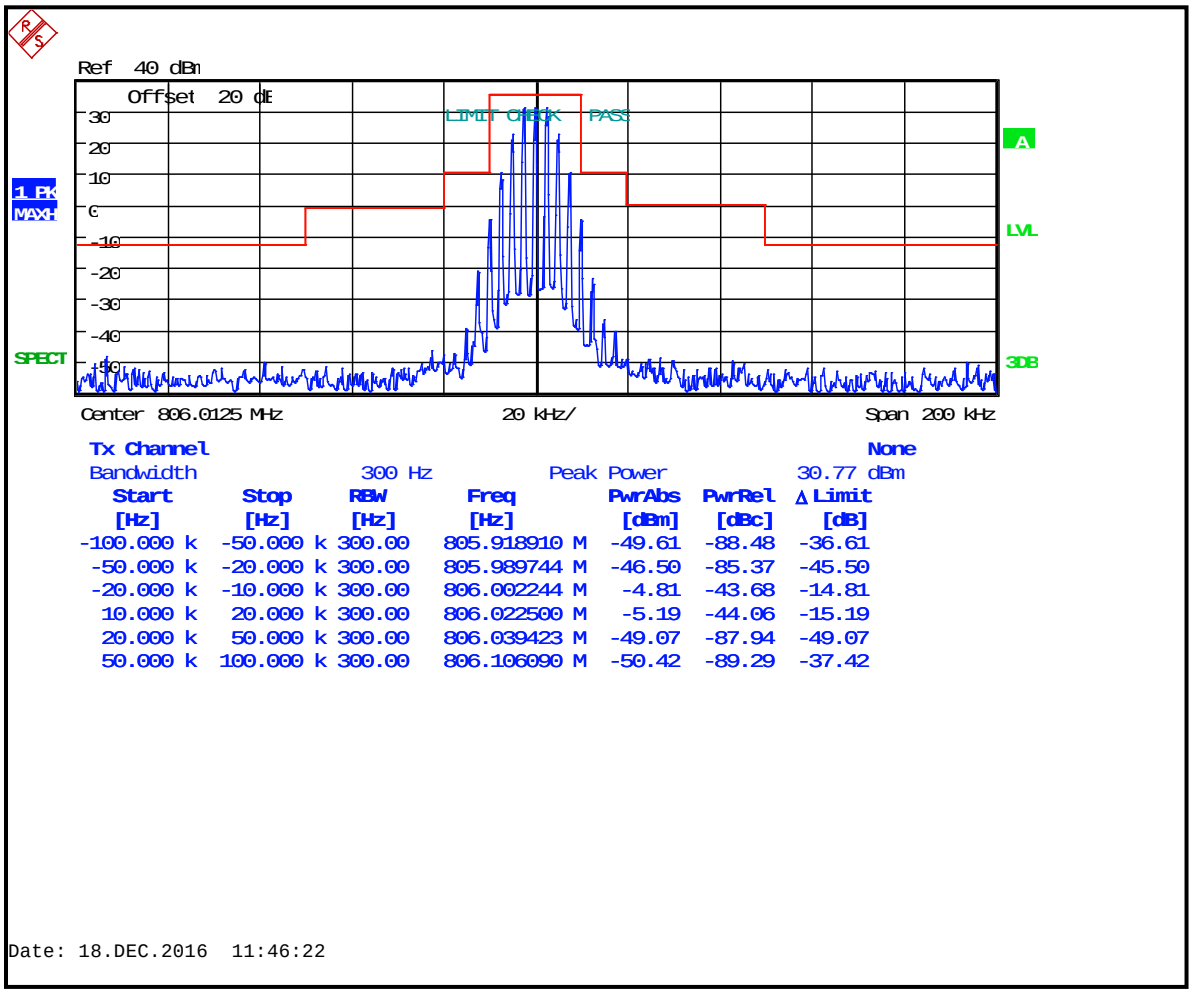
Plot 8-11: Occupied Bandwidth – 856.0125 MHz; NB Analog; Mask D (IC)



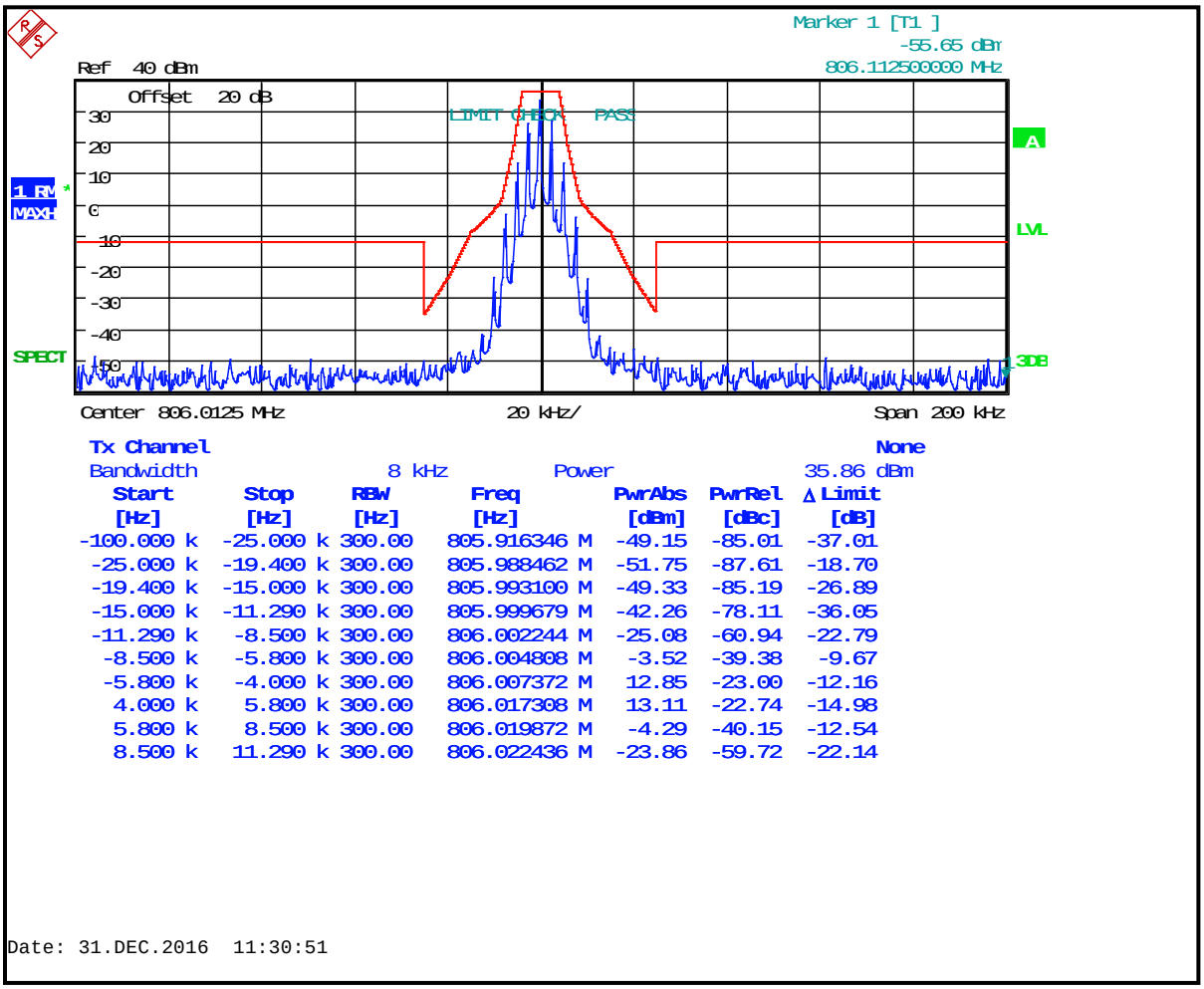
Plot 8-12: Occupied Bandwidth – 860.9875 MHz; NB Analog; Mask D (IC)



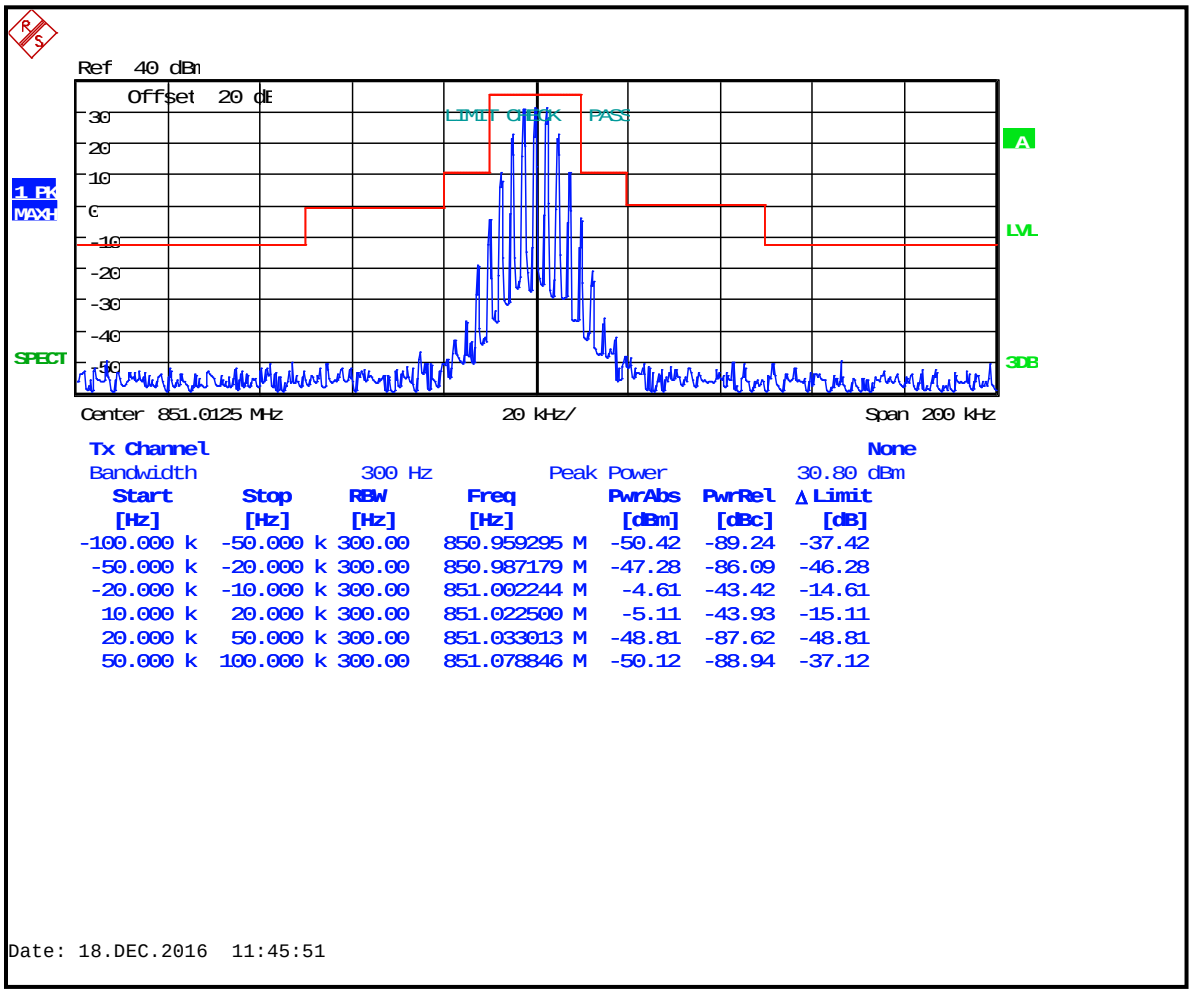
Plot 8-13: Occupied Bandwidth – 806.0125 MHz; Analog NPSPAC; Mask B



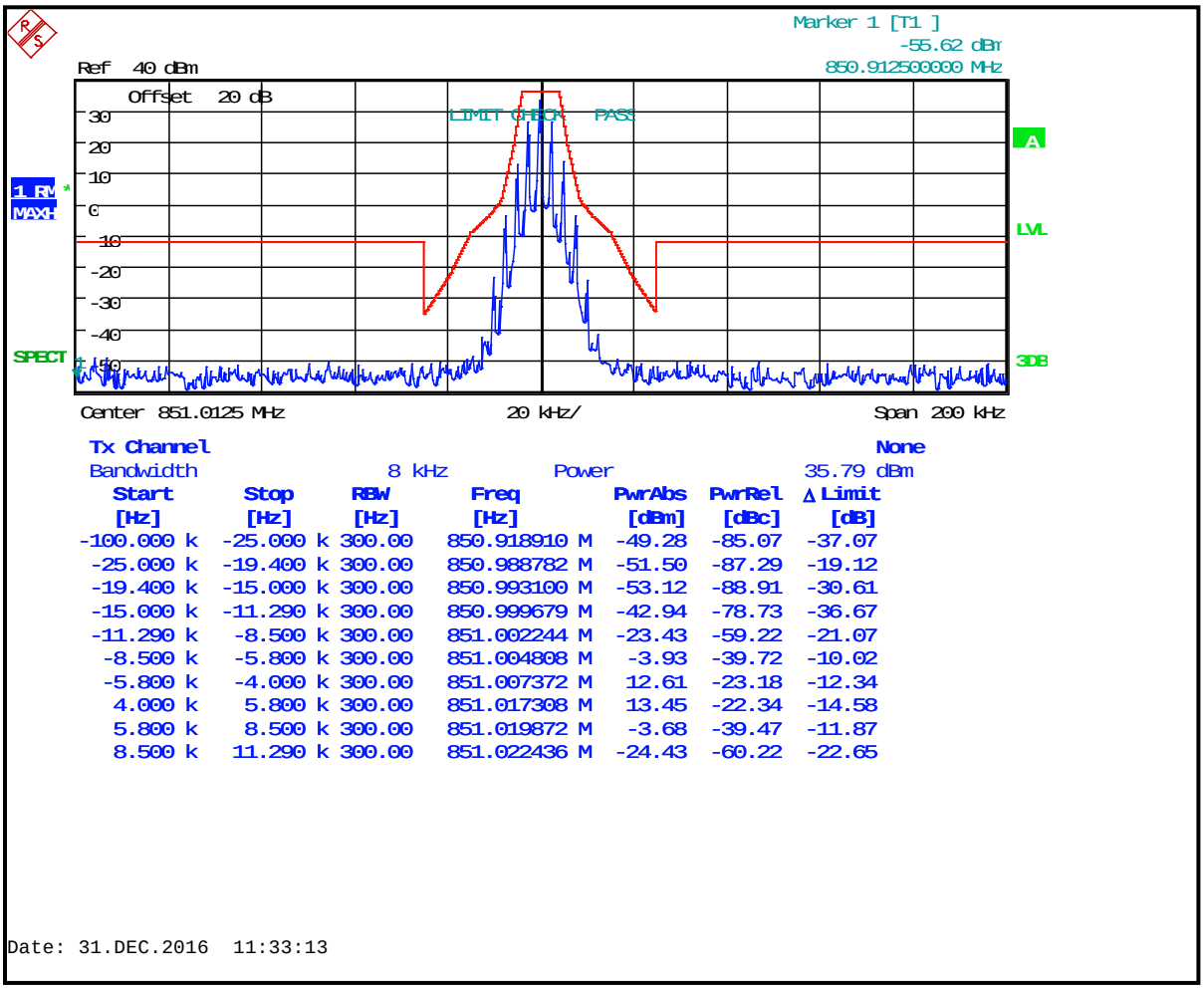
Plot 8-14: Occupied Bandwidth – 806.0125 MHz; Analog NPSPAC; Mask H



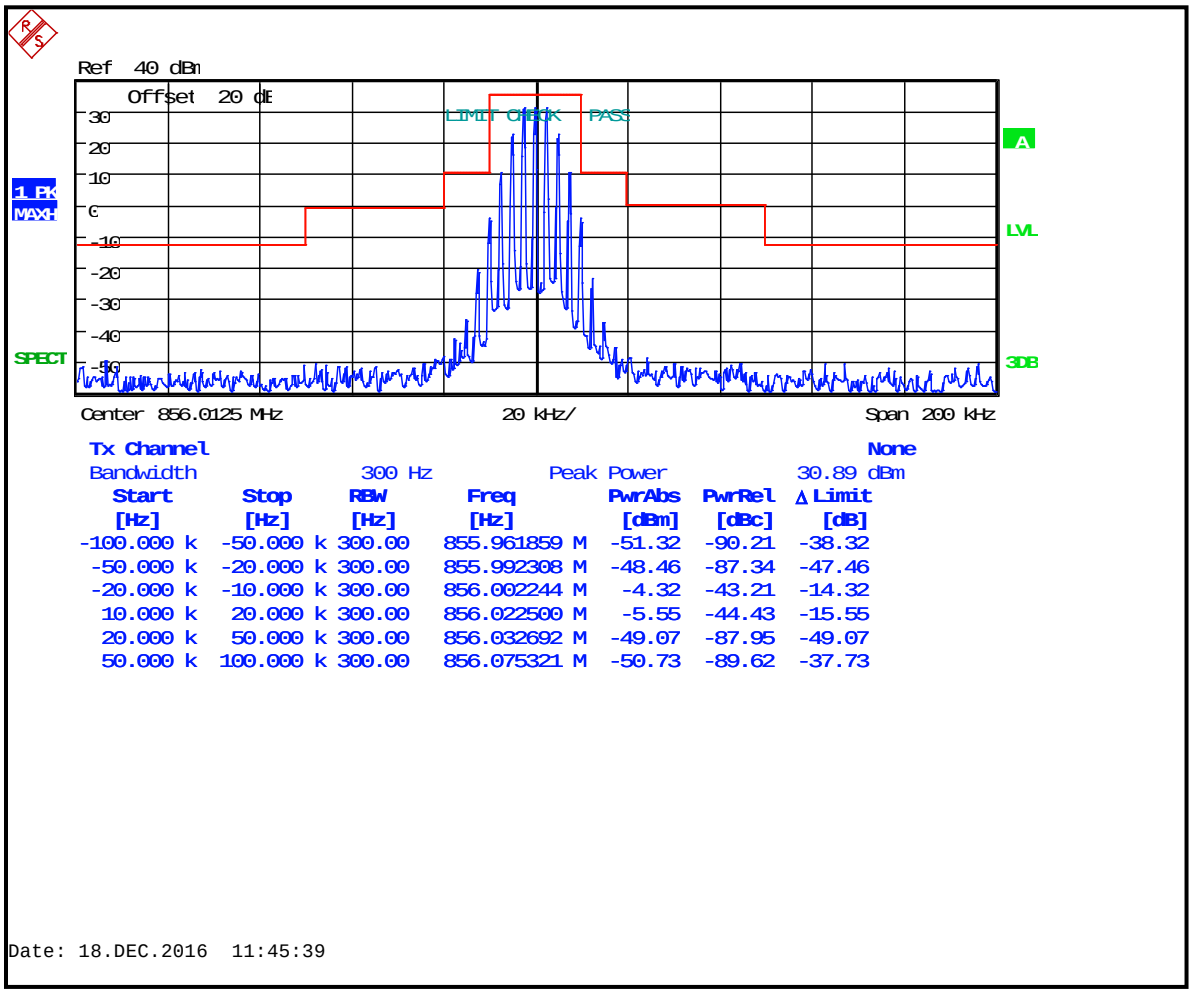
Plot 8-15: Occupied Bandwidth – 851.0125 MHz; Analog NPSPAC; Mask B



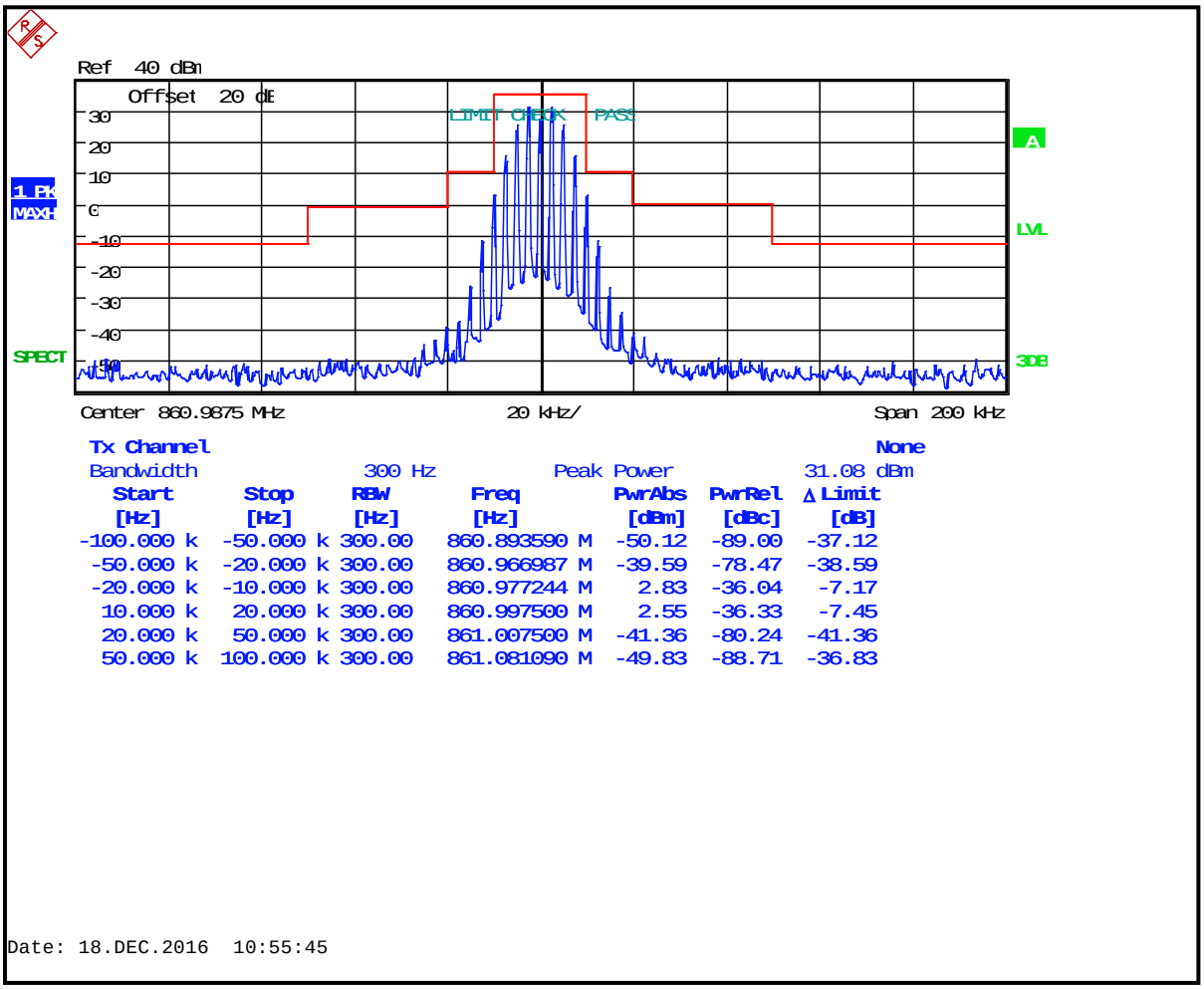
Plot 8-16: Occupied Bandwidth – 851.0125 MHz; Analog NPSPAC; Mask H



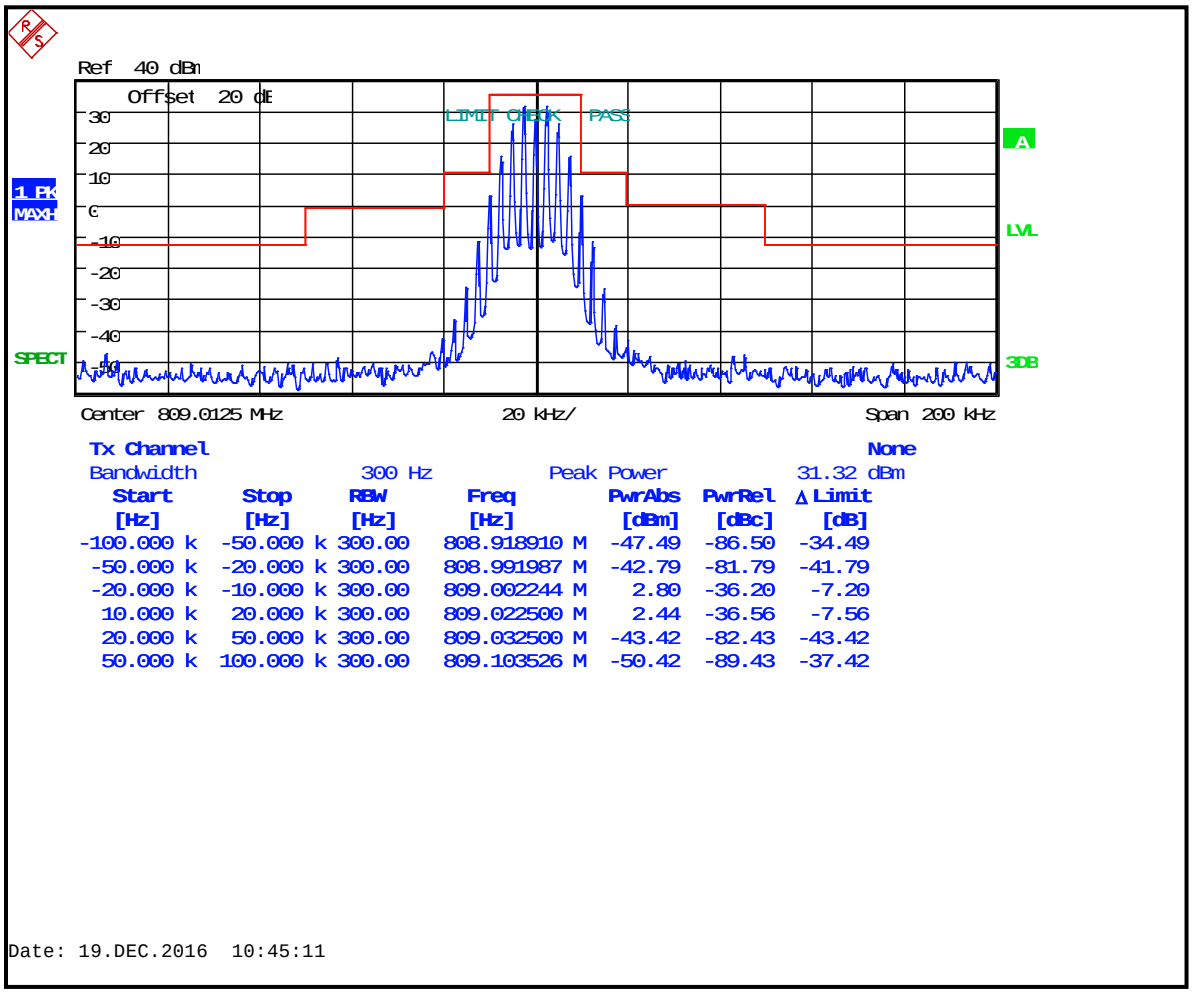
Plot 8-17: Occupied Bandwidth – 856.0125 MHz; Analog NPSPAC; Mask B



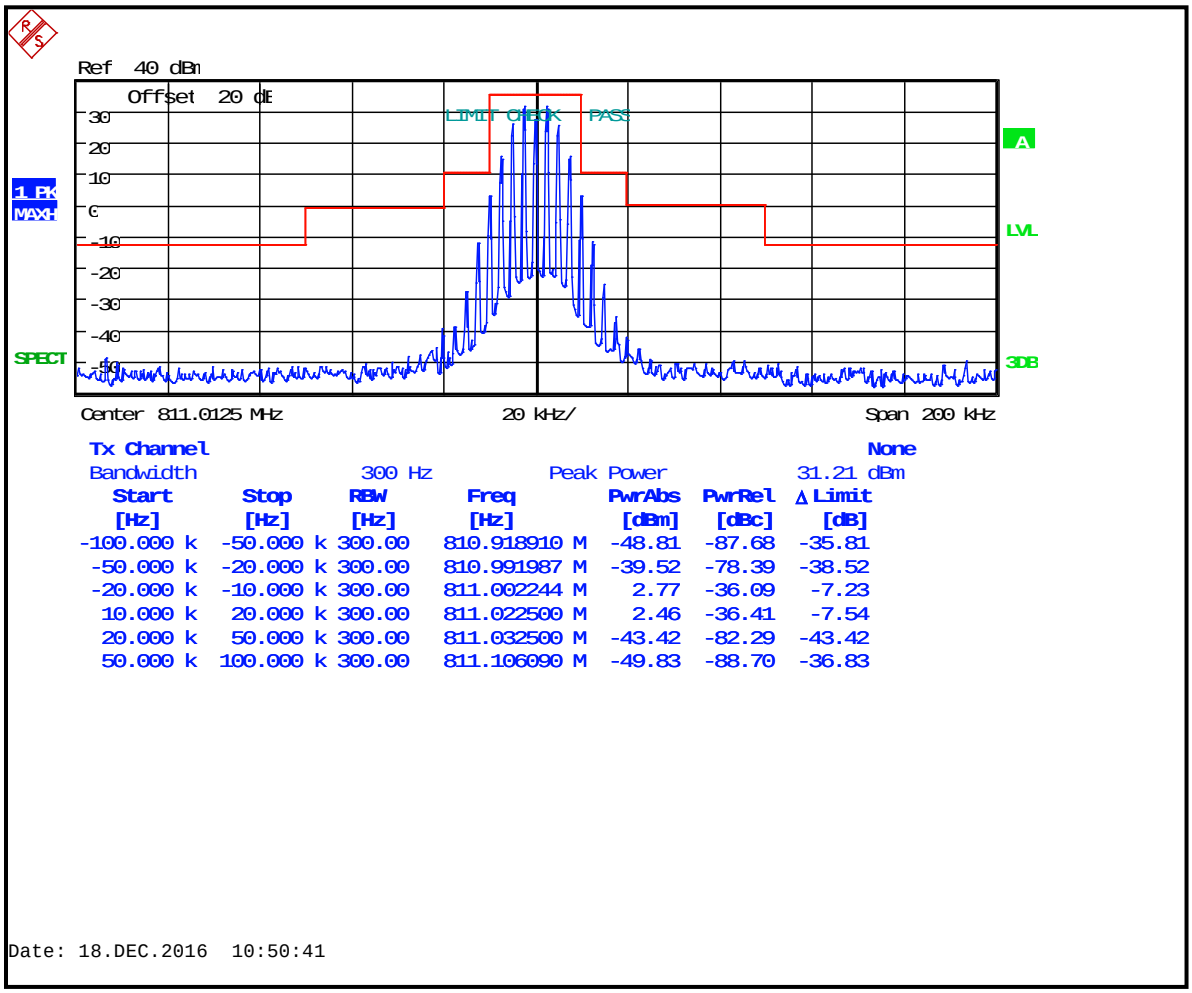
Plot 8-18: Occupied Bandwidth – 860.9875 MHz; Analog NPSPAC; Mask B



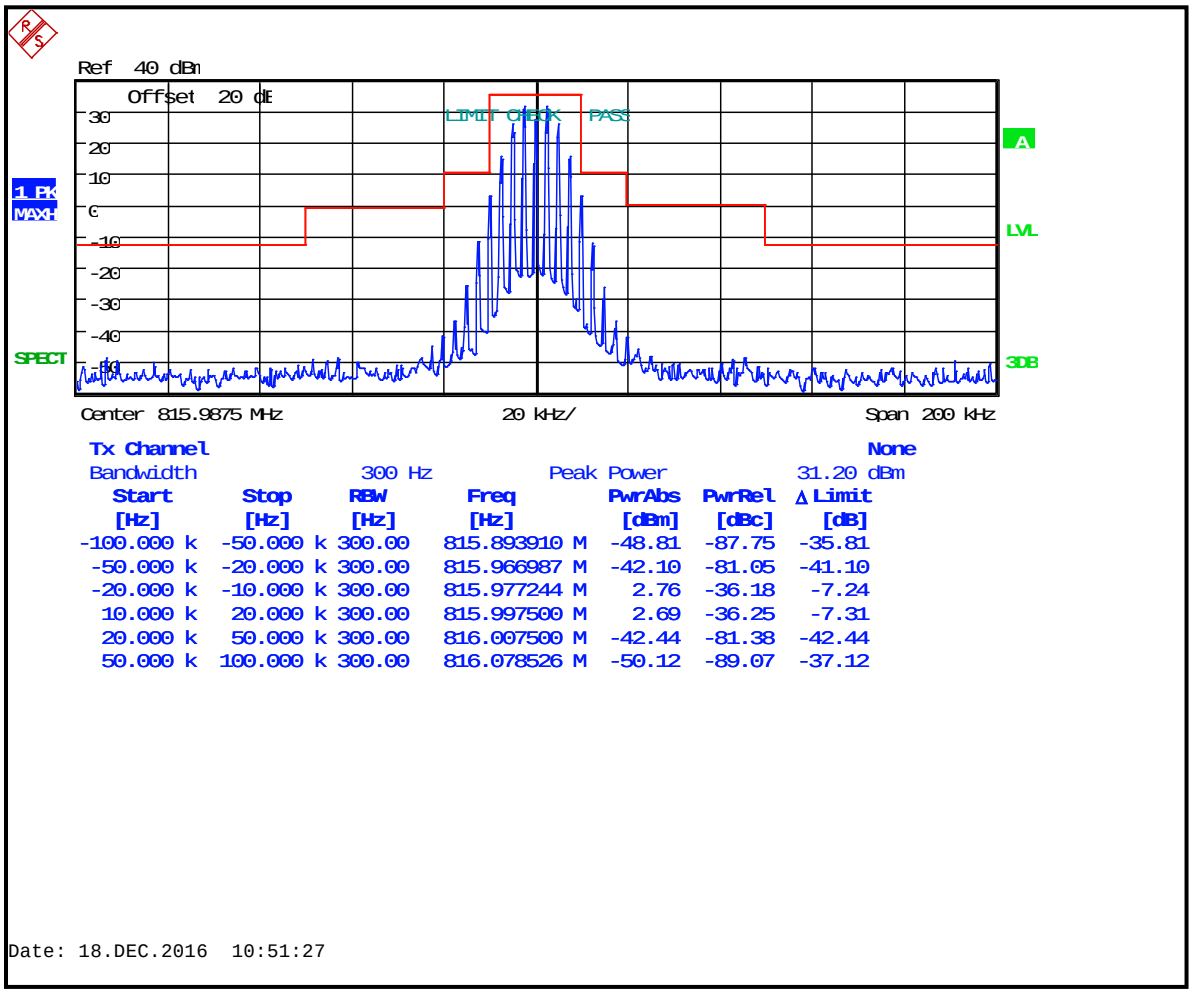
Plot 8-19: Occupied Bandwidth – 809.0125 MHz; WB Analog; Mask B



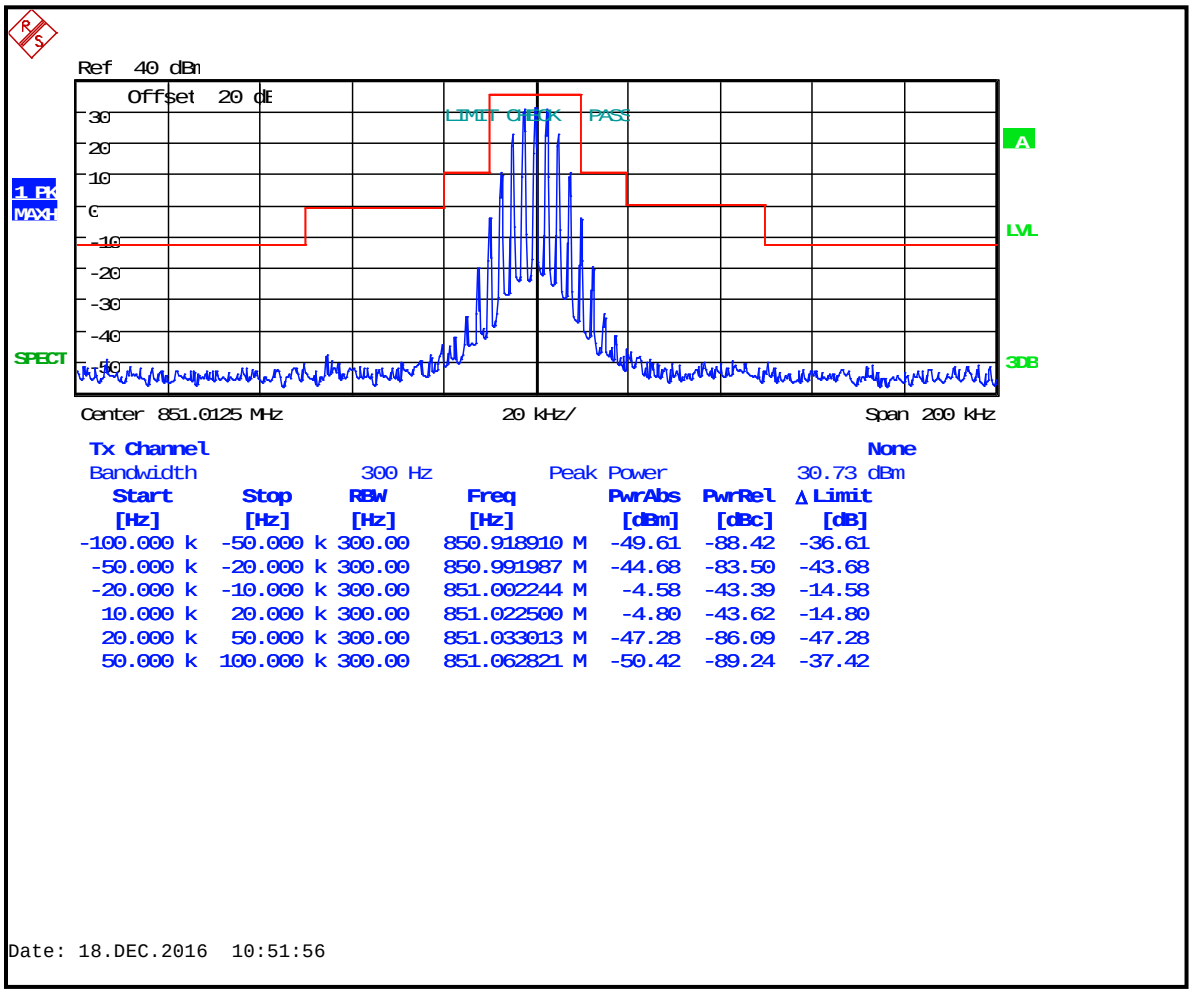
Plot 8-20: Occupied Bandwidth – 811.0125 MHz; WB Analog; Mask B



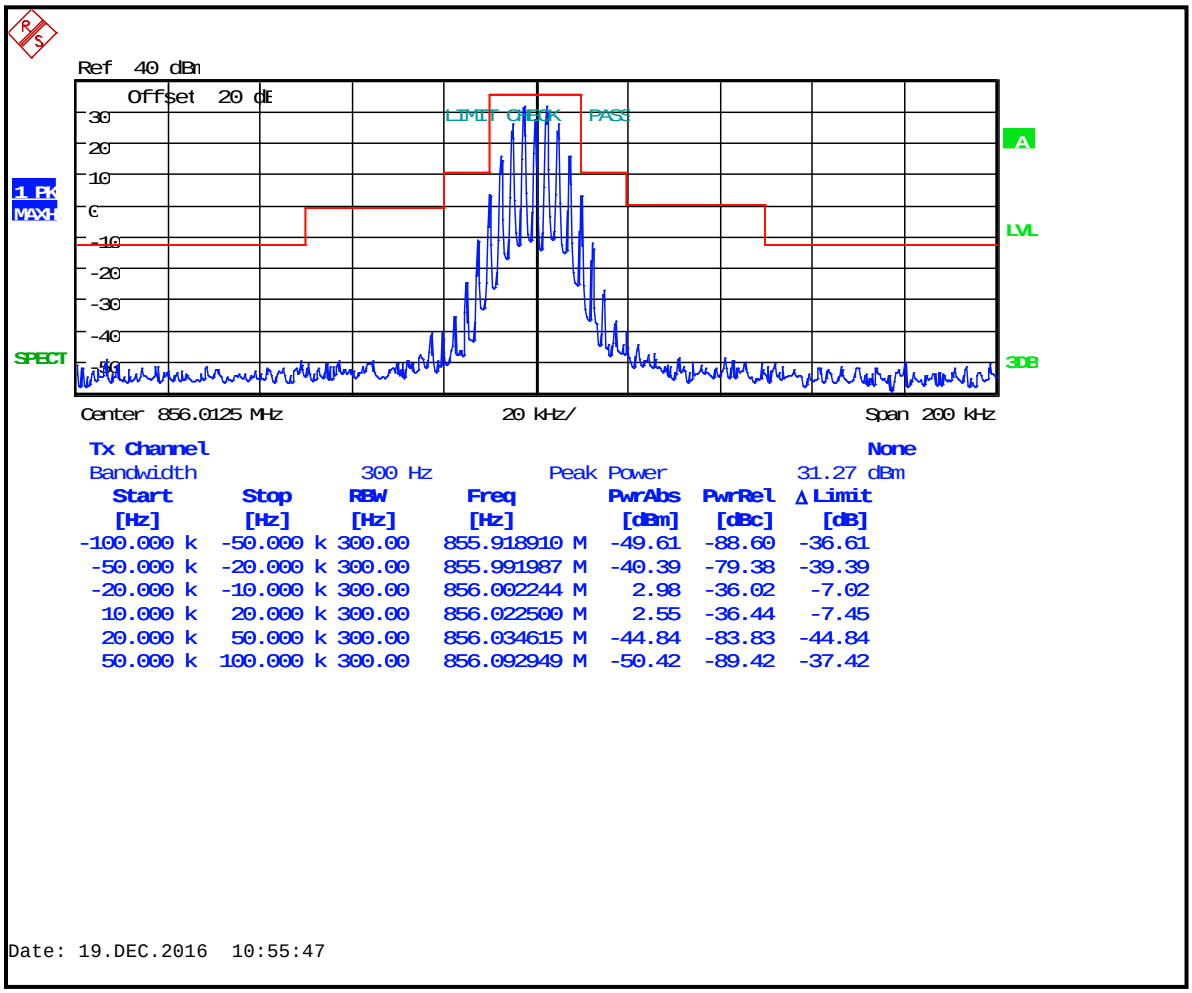
Plot 8-21: Occupied Bandwidth – 815.9875 MHz; WB Analog; Mask B



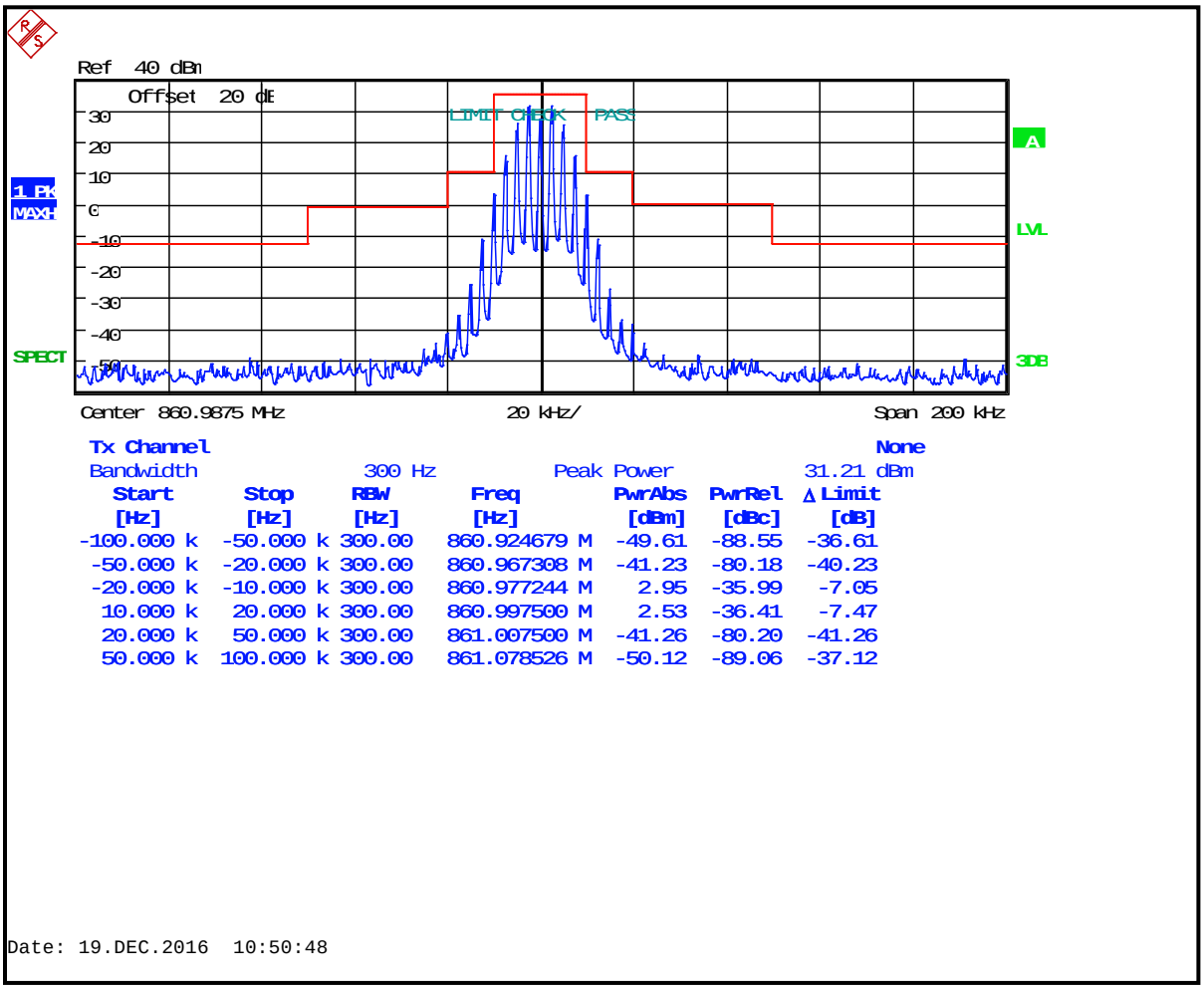
Plot 8-22: Occupied Bandwidth – 851.0125 MHz; WB Analog; Mask B



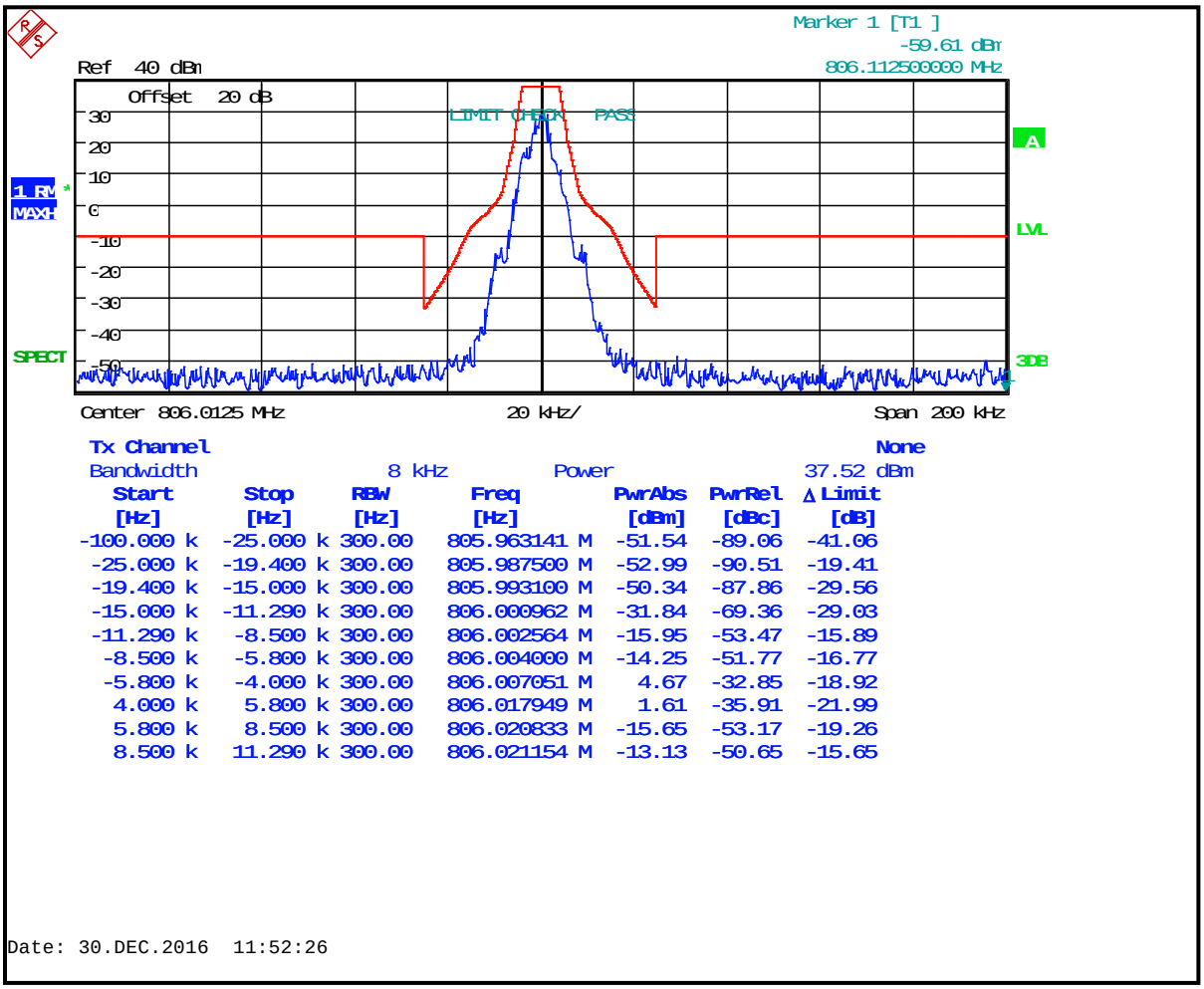
Plot 8-23: Occupied Bandwidth – 856.0125 MHz; WB Analog; Mask B



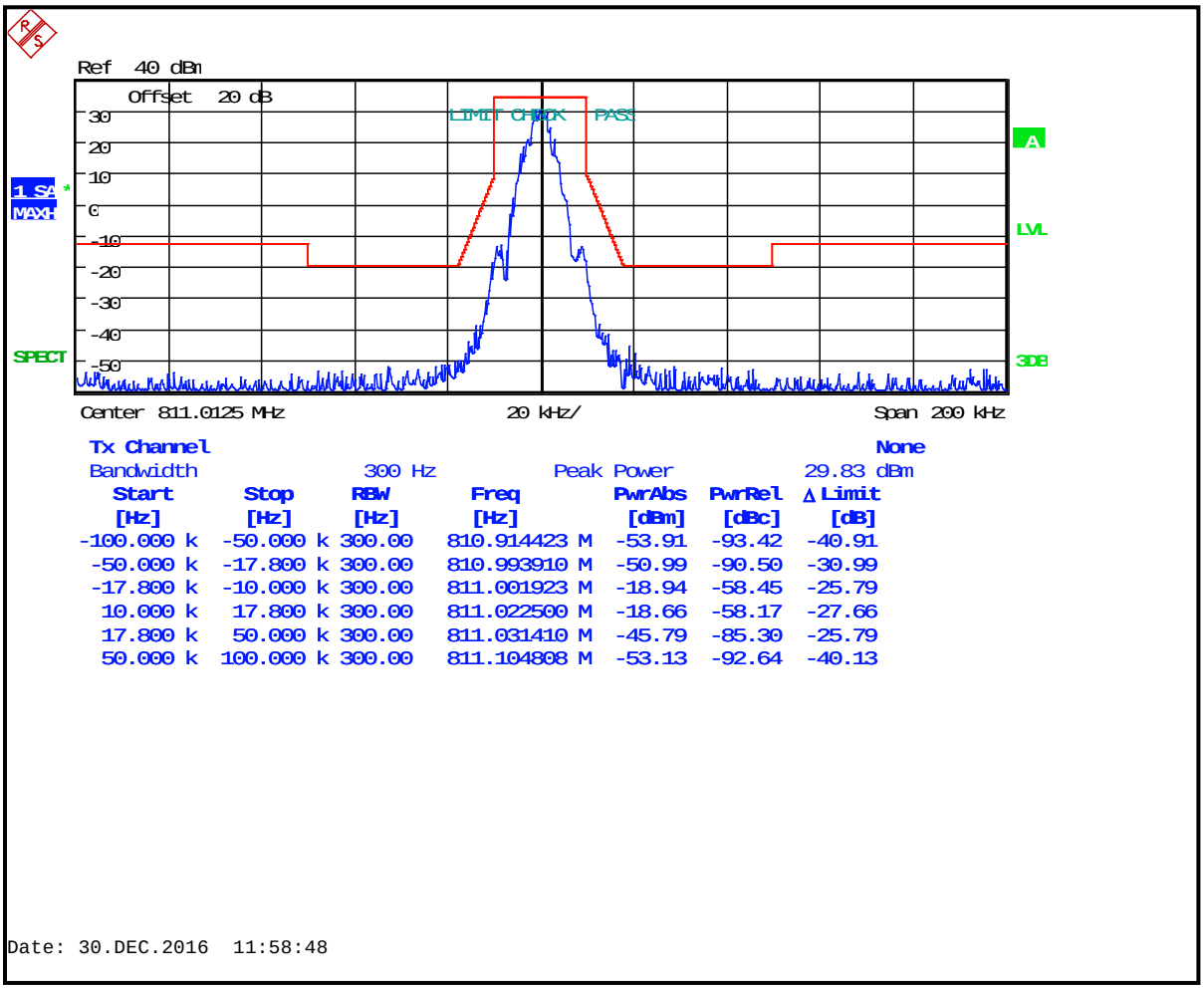
Plot 8-24: Occupied Bandwidth – 860.9875 MHz; WB Analog; Mask B



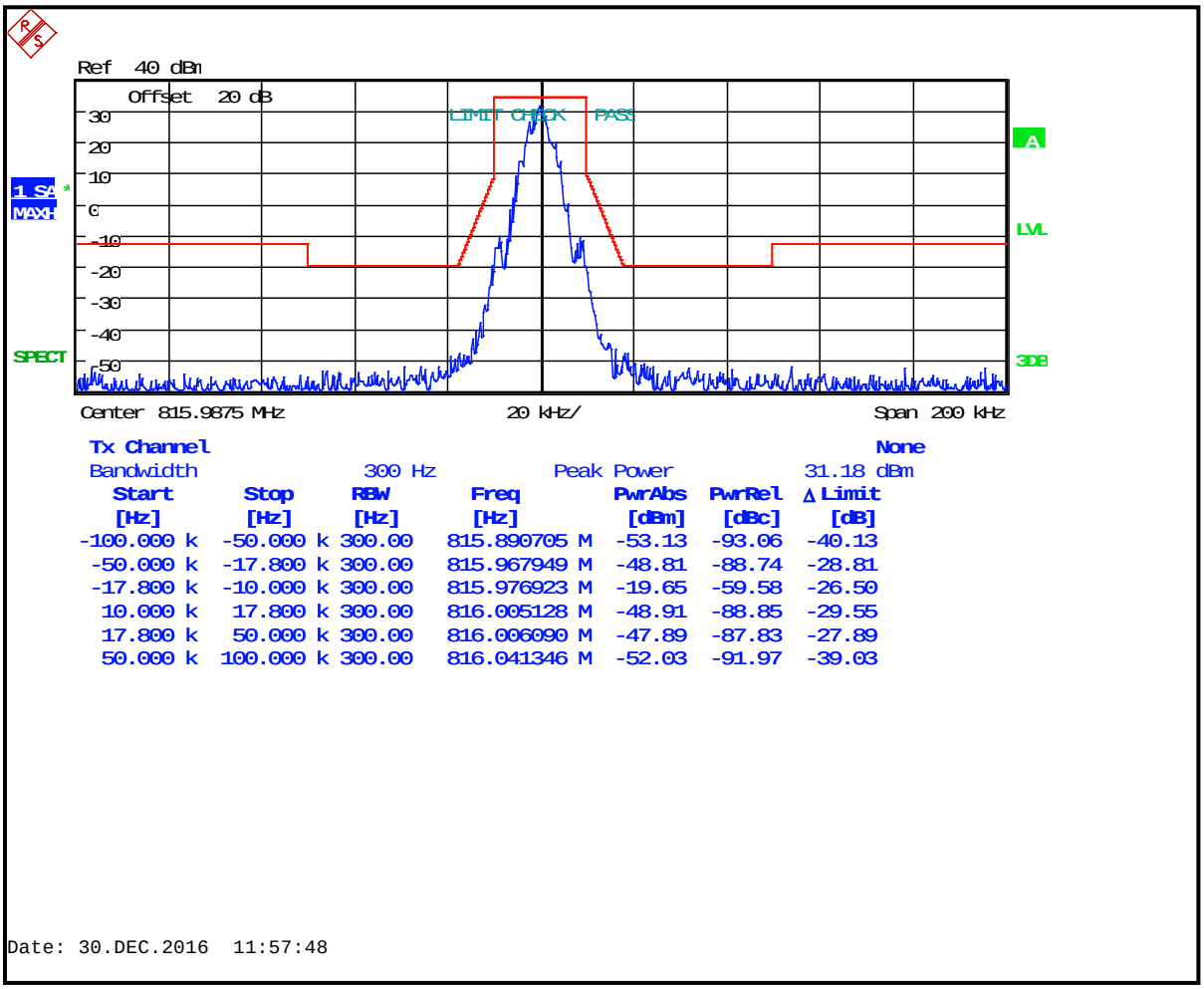
Plot 8-25: Occupied Bandwidth – 806.0125 MHz; 2-Level FSK 9600 NB; Mask H



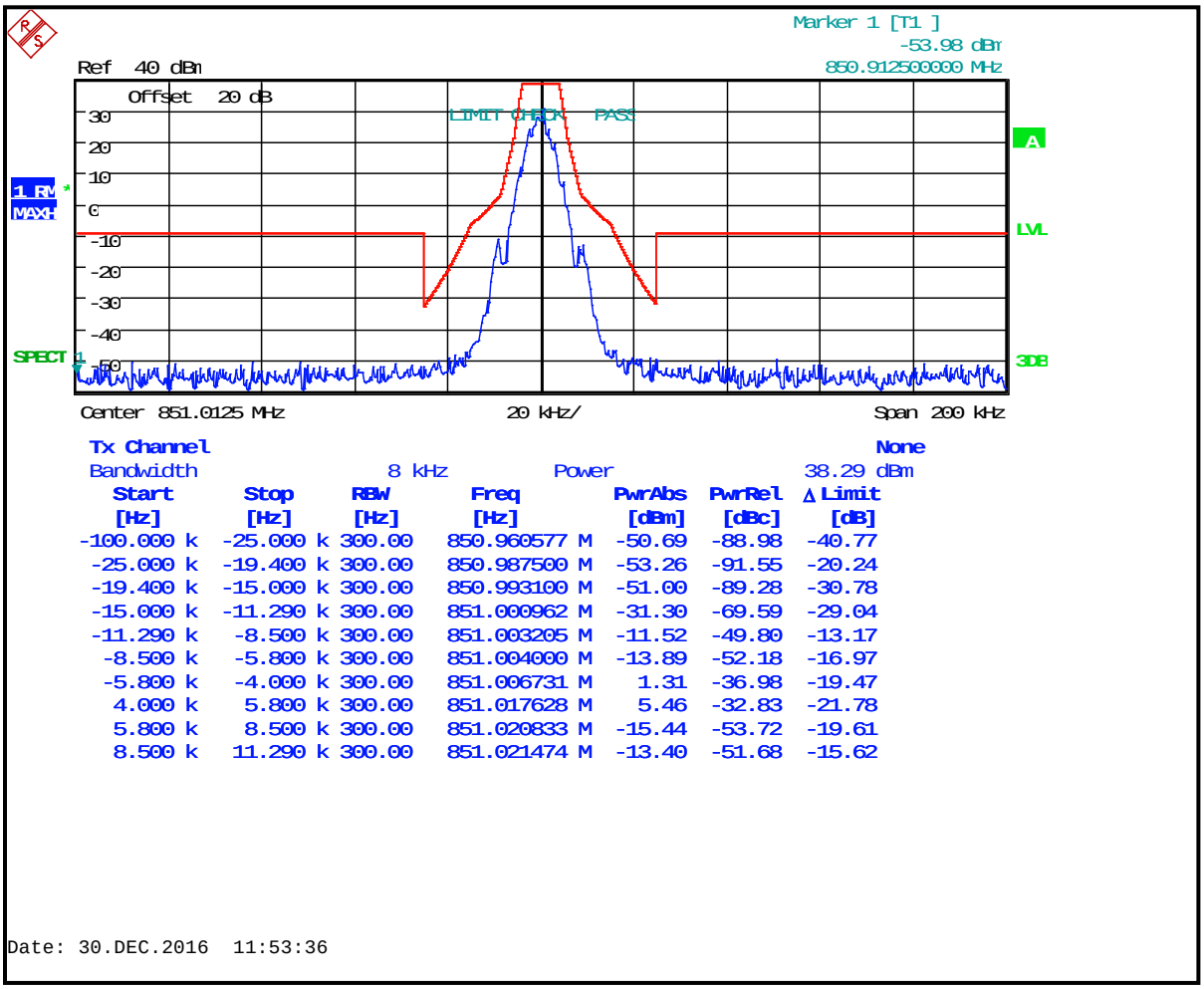
Plot 8-26: Occupied Bandwidth – 811.0125 MHz; 2-Level FSK 9600 NB; Mask G



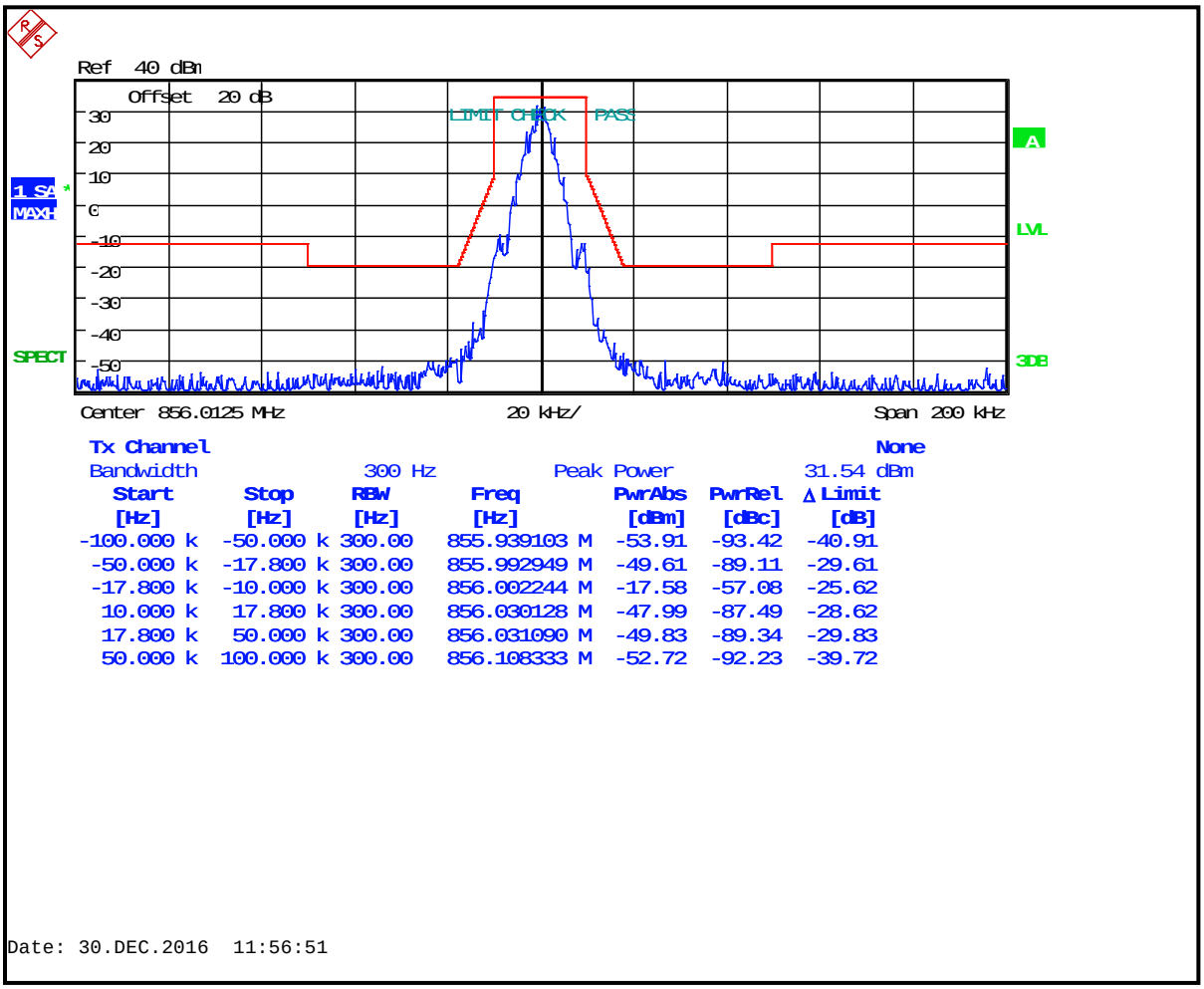
Plot 8-27: Occupied Bandwidth – 815.9875 MHz; 2-Level FSK 9600 NB; Mask G



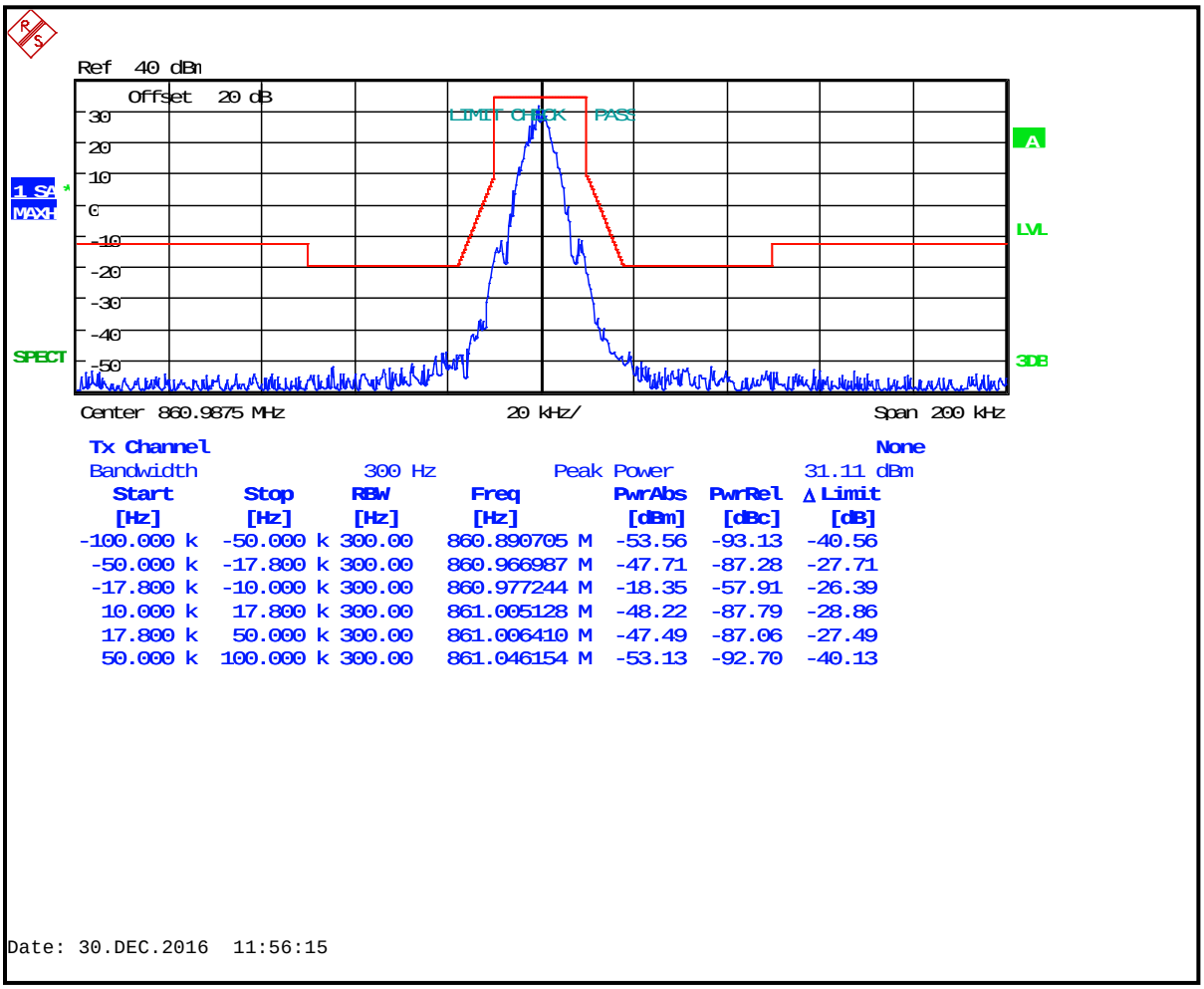
Plot 8-28: Occupied Bandwidth – 851.0125 MHz; 2-Level FSK 9600 NB; Mask H



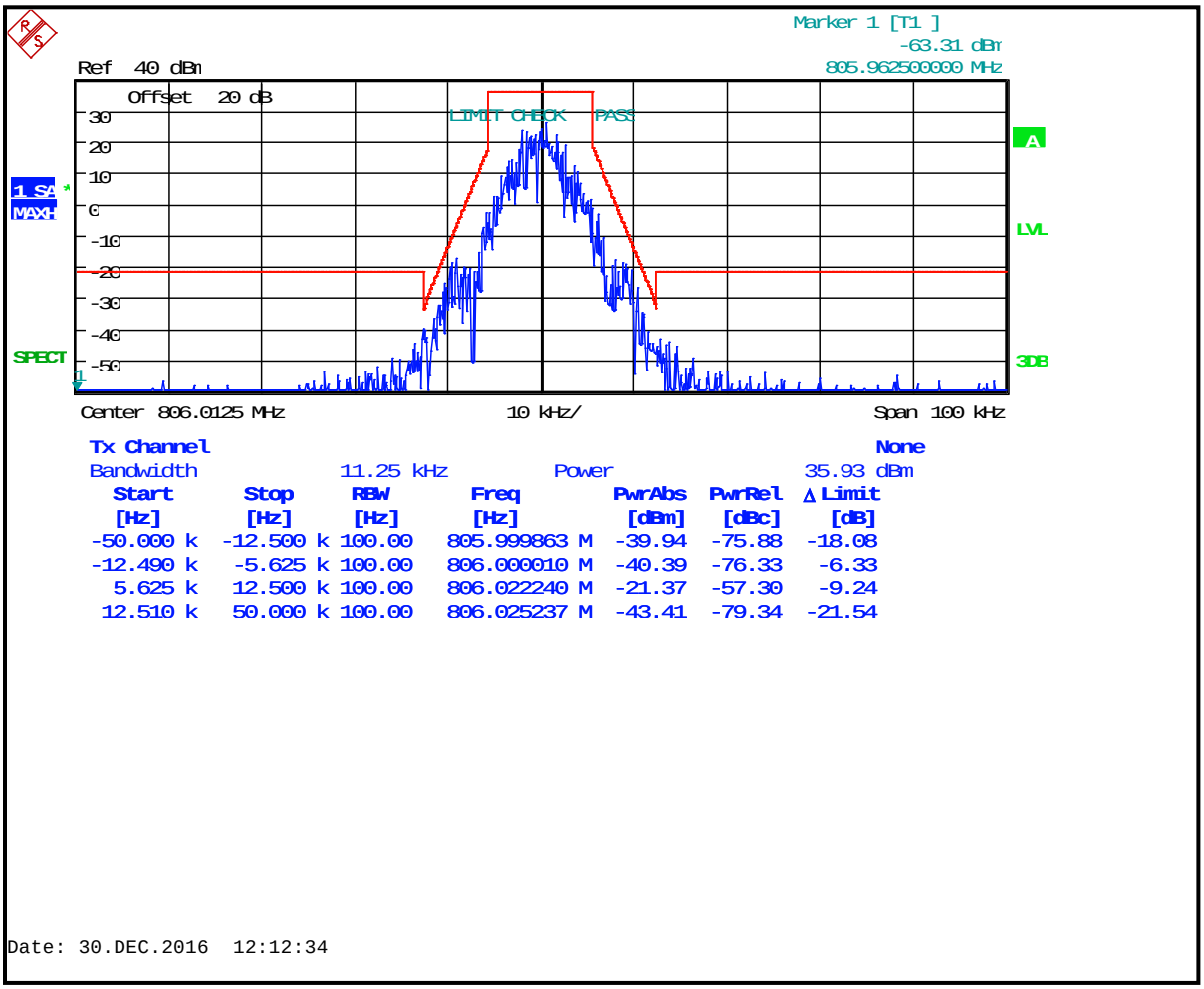
Plot 8-29: Occupied Bandwidth – 856.0125 MHz; 2-Level FSK 9600 NB; Mask G



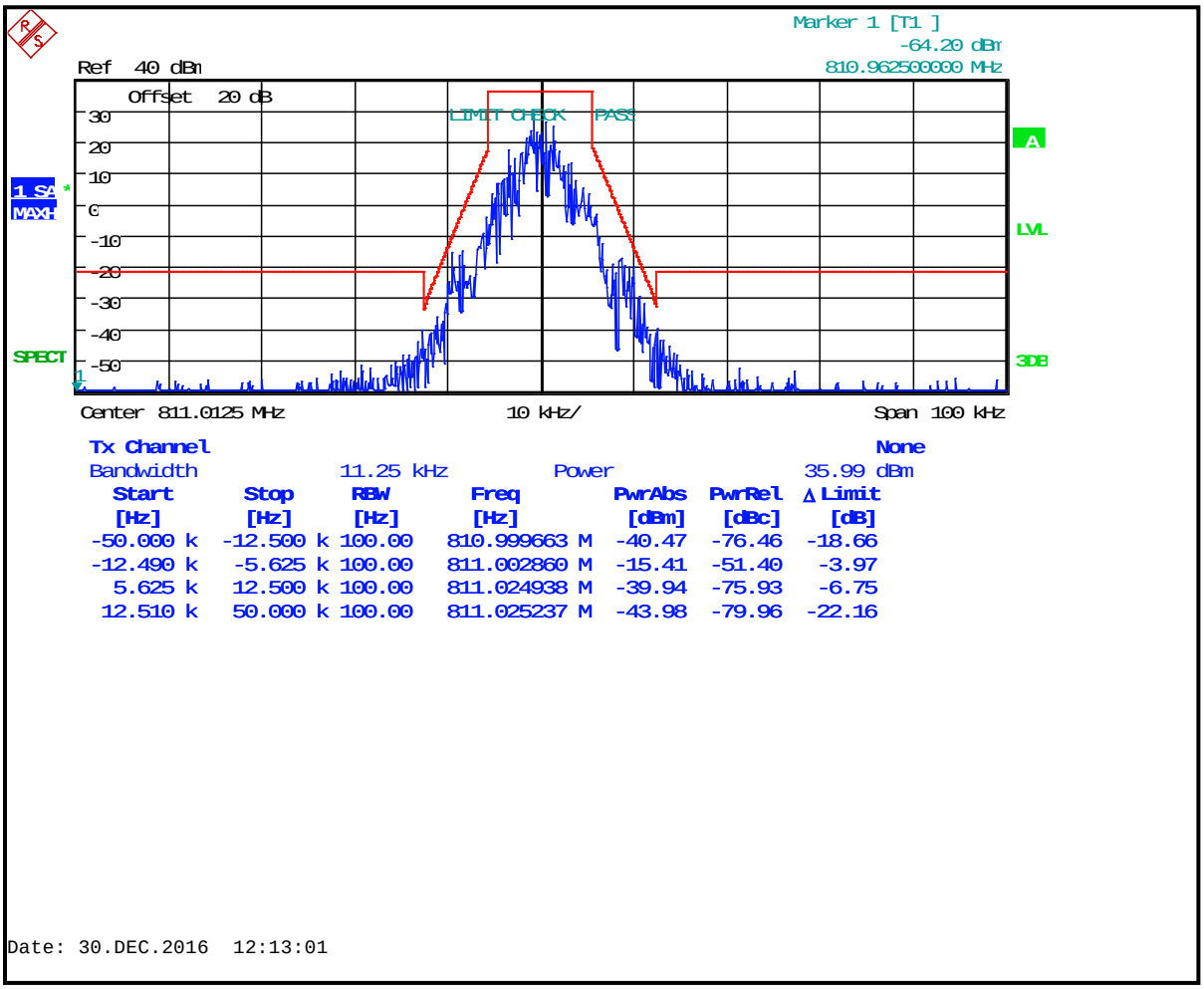
Plot 8-30: Occupied Bandwidth – 860.9875 MHz; 2-Level FSK 9600 NB; Mask G



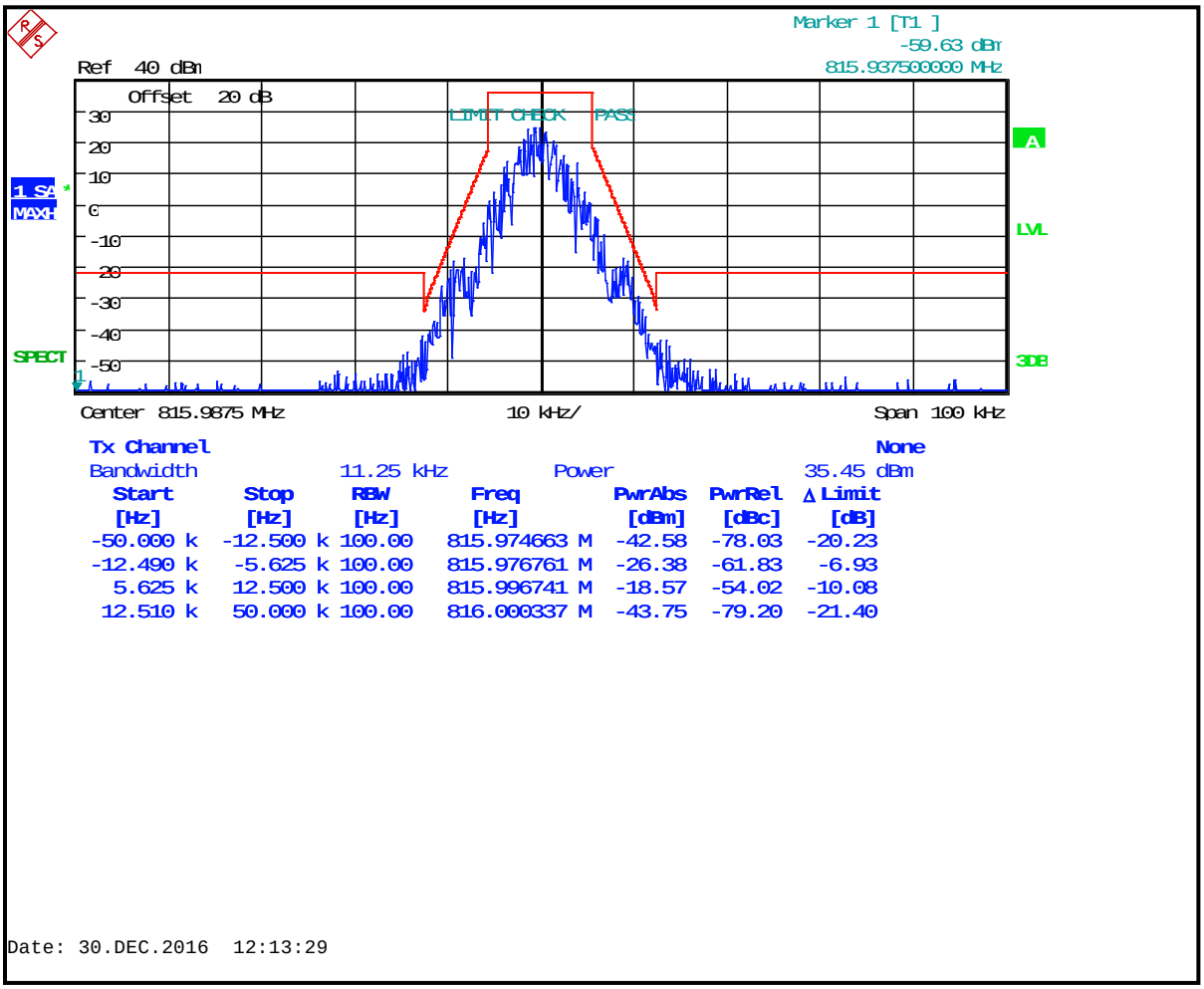
Plot 8-31: Occupied Bandwidth – 806.0125 MHz; 2-Level FSK 9600 NB; Mask D (IC)



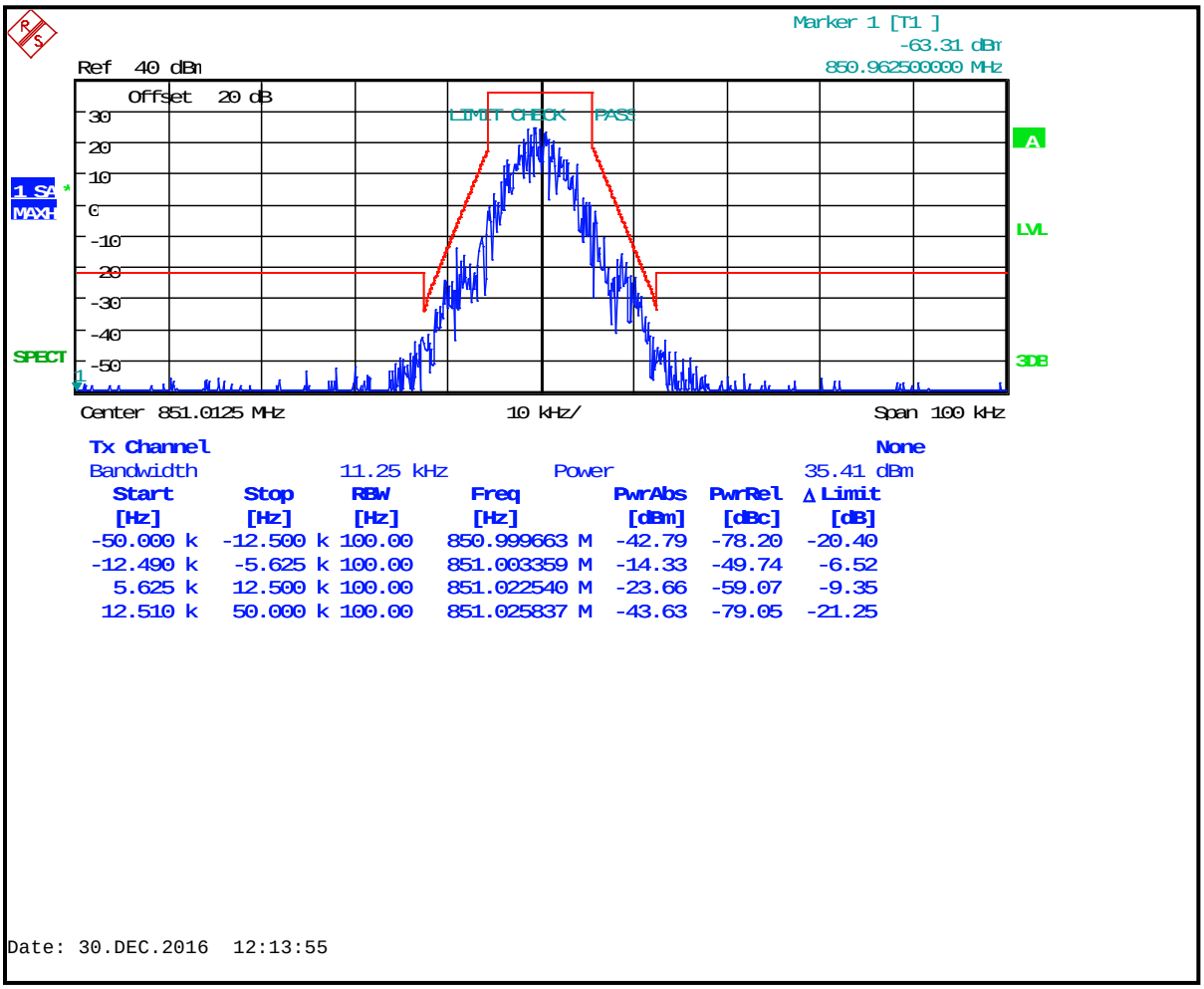
Plot 8-32: Occupied Bandwidth – 811.0125 MHz; 2-Level FSK 9600 NB; Mask D (IC)



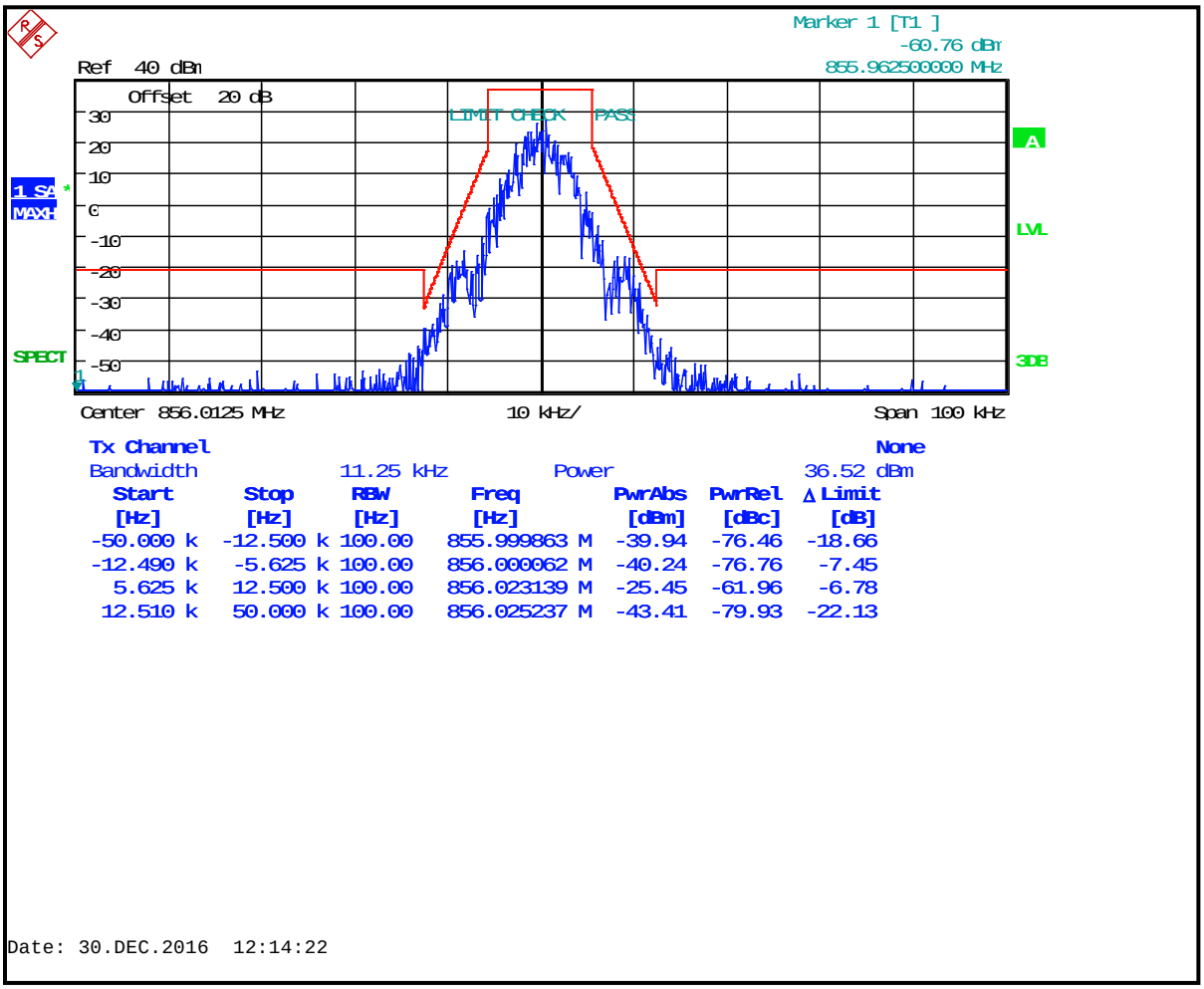
Plot 8-33: Occupied Bandwidth – 815.9875 MHz; 2-Level FSK 9600 NB; Mask D (IC)



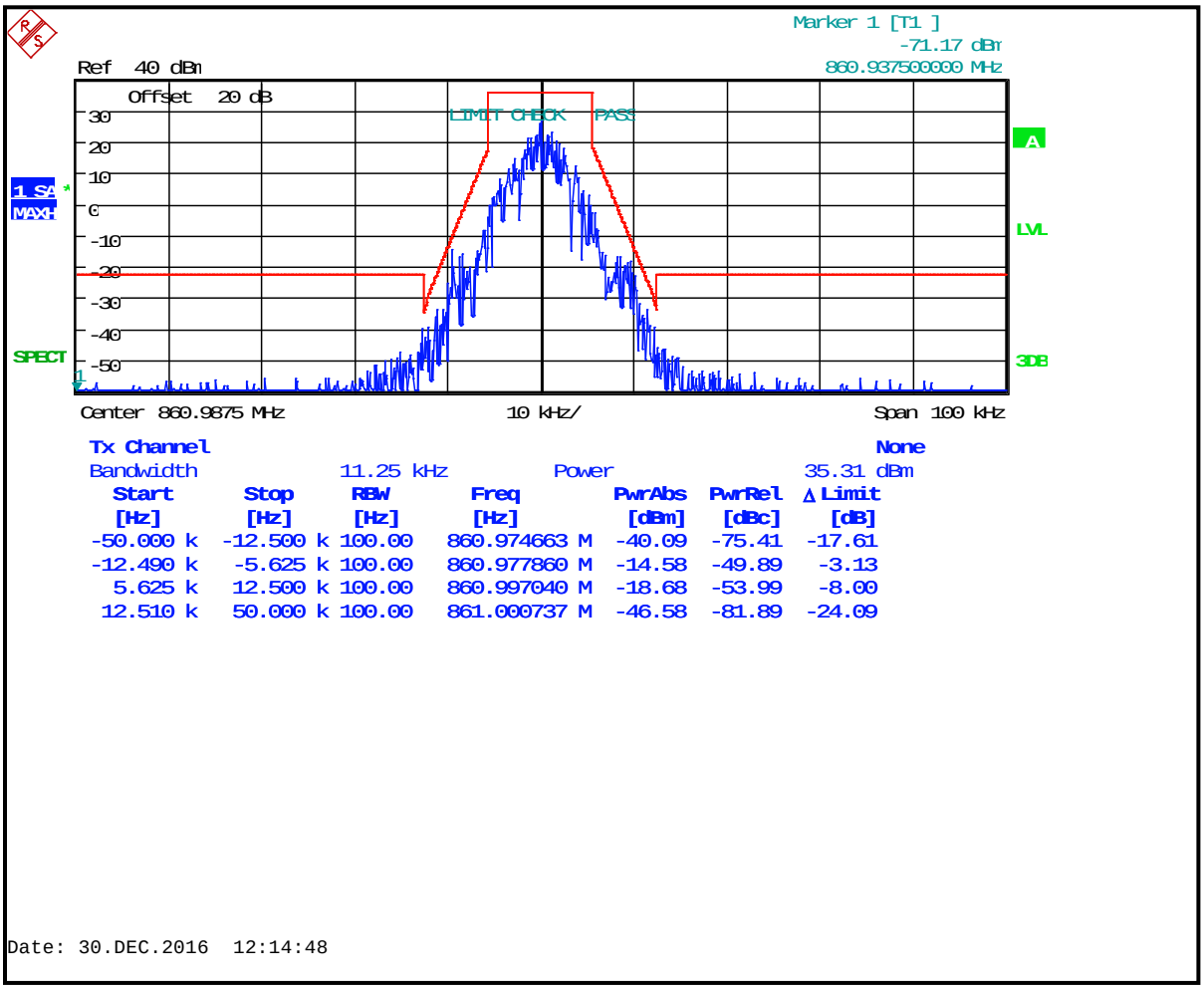
Plot 8-34: Occupied Bandwidth – 851.0125 MHz; 2-Level FSK 9600 NB; Mask D (IC)



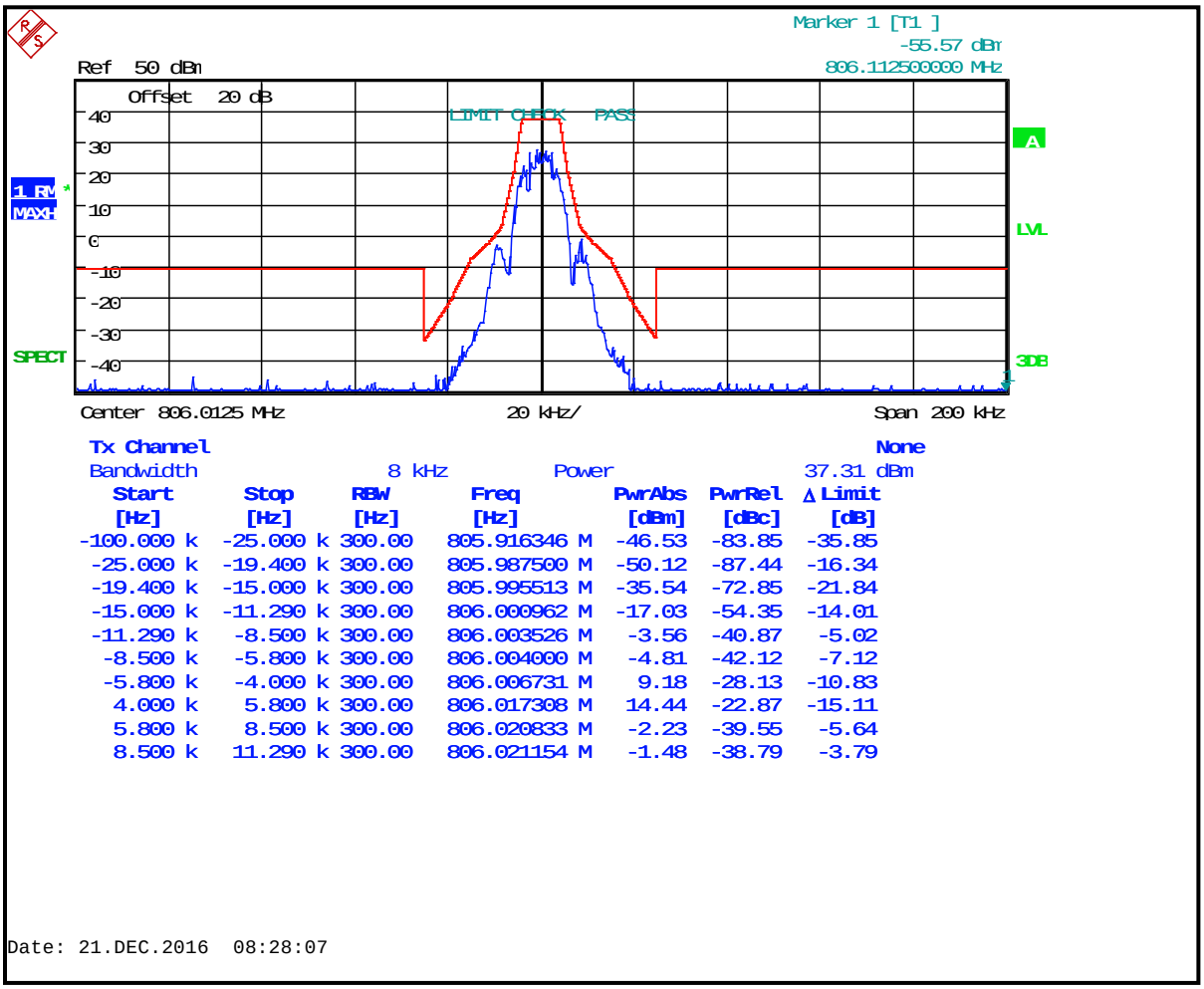
Plot 8-35: Occupied Bandwidth – 856.0125 MHz; 2-Level FSK 9600 NB; Mask D (IC)



Plot 8-36: Occupied Bandwidth – 860.9875 MHz; 2-Level FSK 9600 NB; Mask D (IC)



Plot 8-37: Occupied Bandwidth – 806.0125 MHz; 2-Level FSK 9600 NPSPAC; Mask H



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-25.000 k	300.00	805.916346 M	-46.53	-83.85	-35.85
-25.000 k	-19.400 k	300.00	805.987500 M	-50.12	-87.44	-16.34
-19.400 k	-15.000 k	300.00	805.995513 M	-35.54	-72.85	-21.84
-15.000 k	-11.290 k	300.00	806.000962 M	-17.03	-54.35	-14.01
-11.290 k	-8.500 k	300.00	806.003526 M	-3.56	-40.87	-5.02
-8.500 k	-5.800 k	300.00	806.004000 M	-4.81	-42.12	-7.12
-5.800 k	-4.000 k	300.00	806.006731 M	9.18	-28.13	-10.83
4.000 k	5.800 k	300.00	806.017308 M	14.44	-22.87	-15.11
5.800 k	8.500 k	300.00	806.020833 M	-2.23	-39.55	-5.64
8.500 k	11.290 k	300.00	806.021154 M	-1.48	-38.79	-3.79

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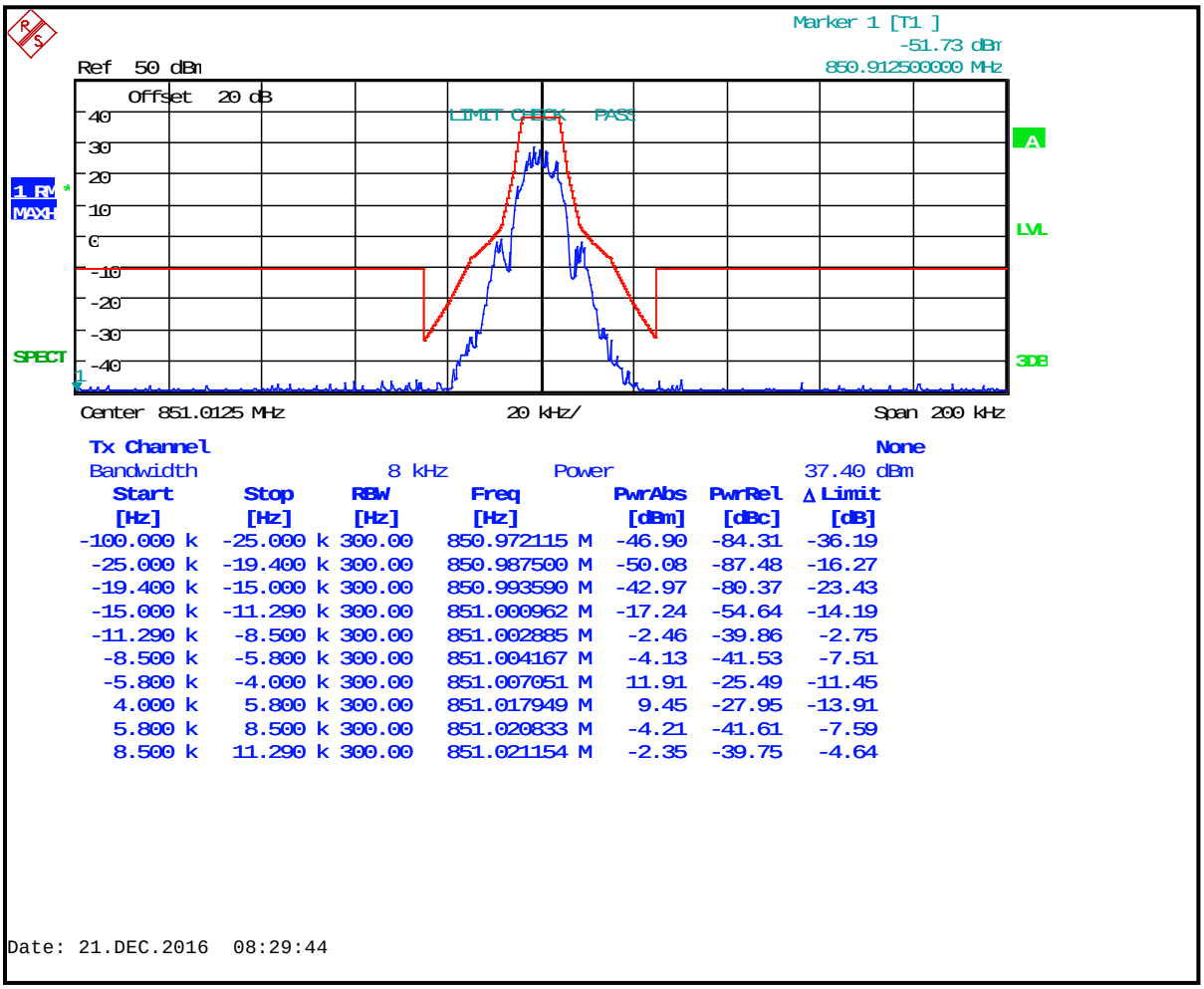
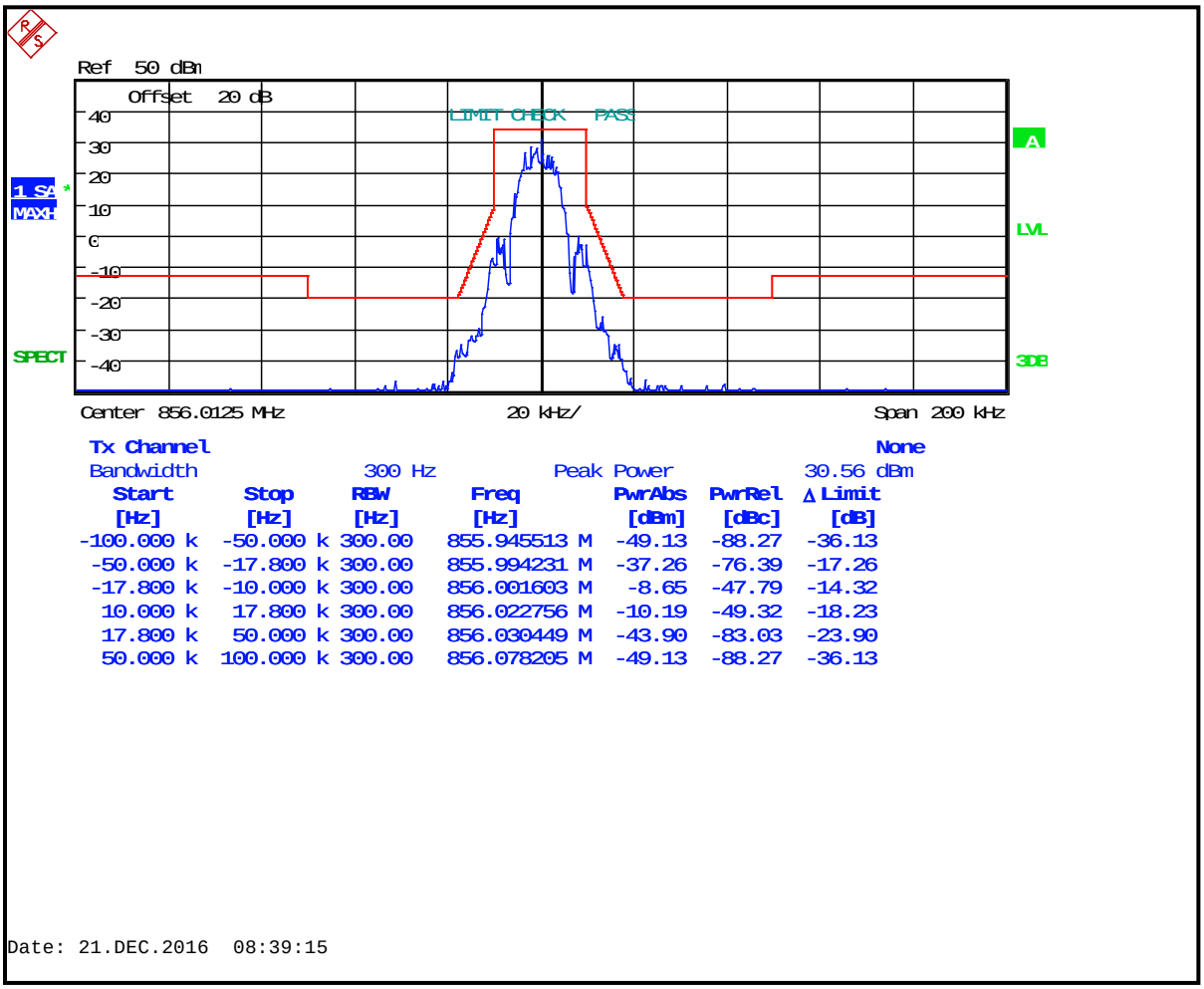
Plot 8-38: Occupied Bandwidth – 851.0125 MHz; 2-Level FSK 9600 NPSPAC; Mask H



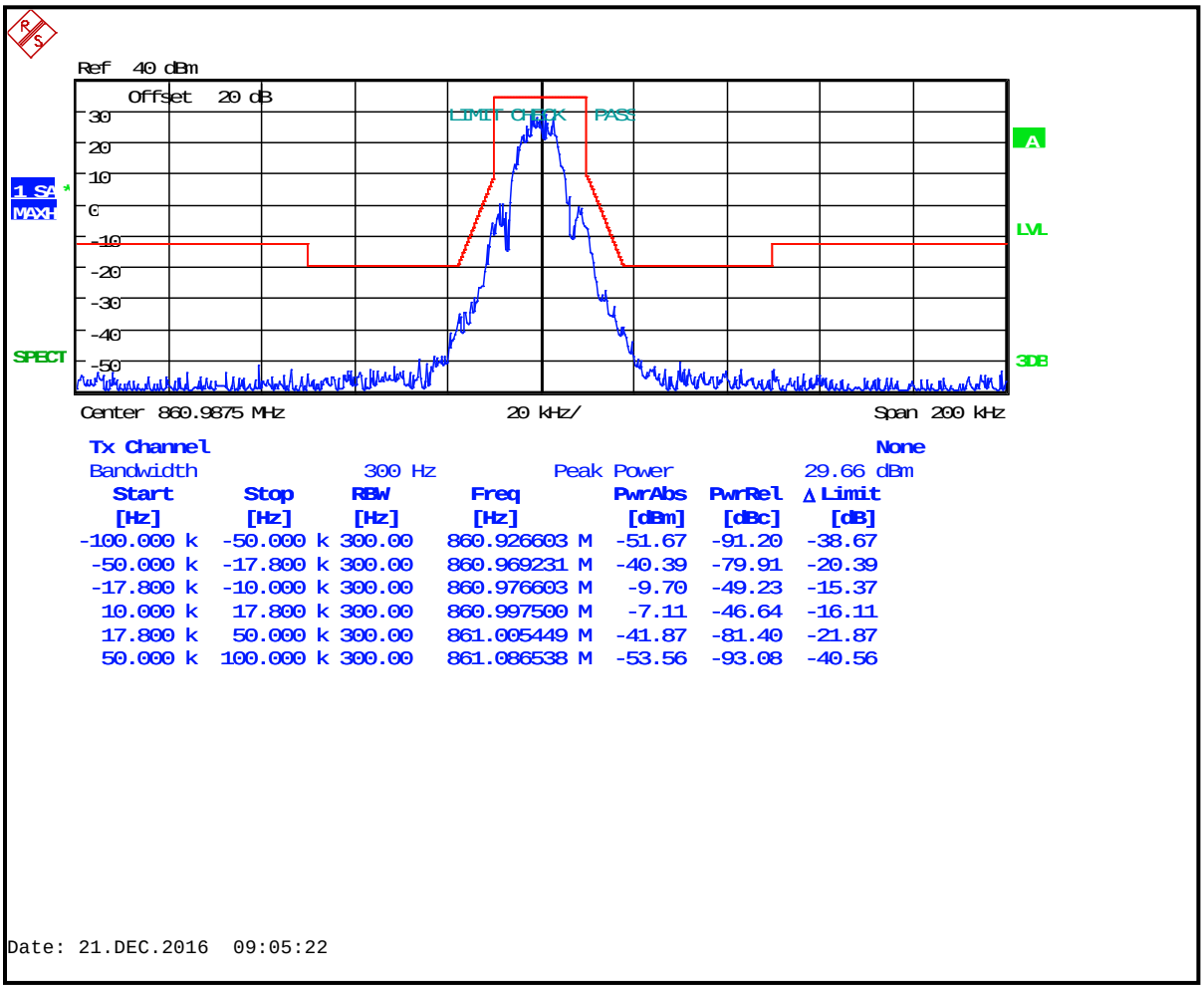
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-25.000 k	300.00	850.972115 M	-46.90	-84.31	-36.19
-25.000 k	-19.400 k	300.00	850.987500 M	-50.08	-87.48	-16.27
-19.400 k	-15.000 k	300.00	850.993590 M	-42.97	-80.37	-23.43
-15.000 k	-11.290 k	300.00	851.000962 M	-17.24	-54.64	-14.19
-11.290 k	-8.500 k	300.00	851.002885 M	-2.46	-39.86	-2.75
-8.500 k	-5.800 k	300.00	851.004167 M	-4.13	-41.53	-7.51
-5.800 k	-4.000 k	300.00	851.007051 M	11.91	-25.49	-11.45
4.000 k	5.800 k	300.00	851.017949 M	9.45	-27.95	-13.91
5.800 k	8.500 k	300.00	851.020833 M	-4.21	-41.61	-7.59
8.500 k	11.290 k	300.00	851.021154 M	-2.35	-39.75	-4.64

Date: 21.DEC.2016 08:29:44

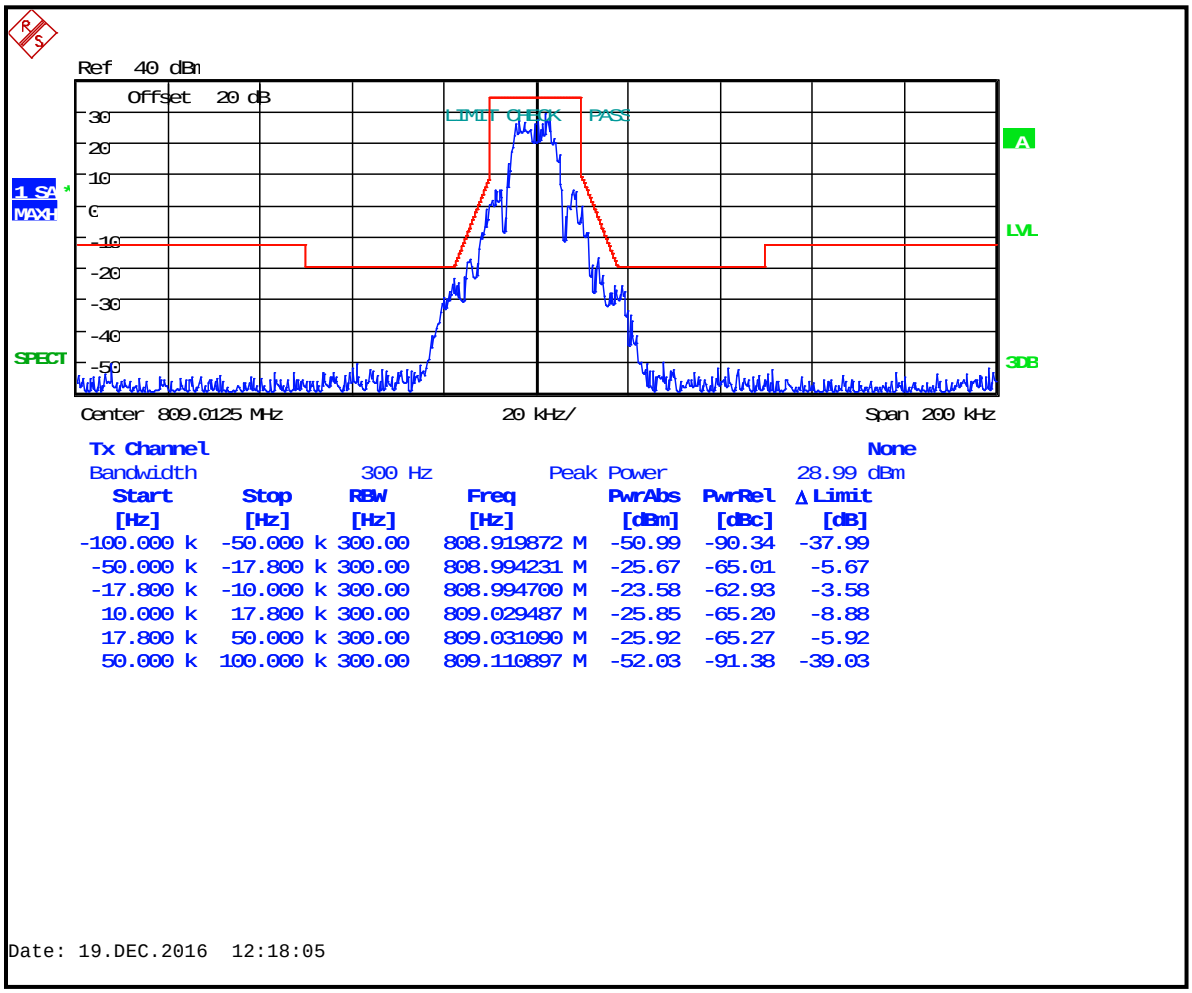
Plot 8-39: Occupied Bandwidth – 856.0125 MHz; 2-Level FSK 9600 NPSPAC; Mask G



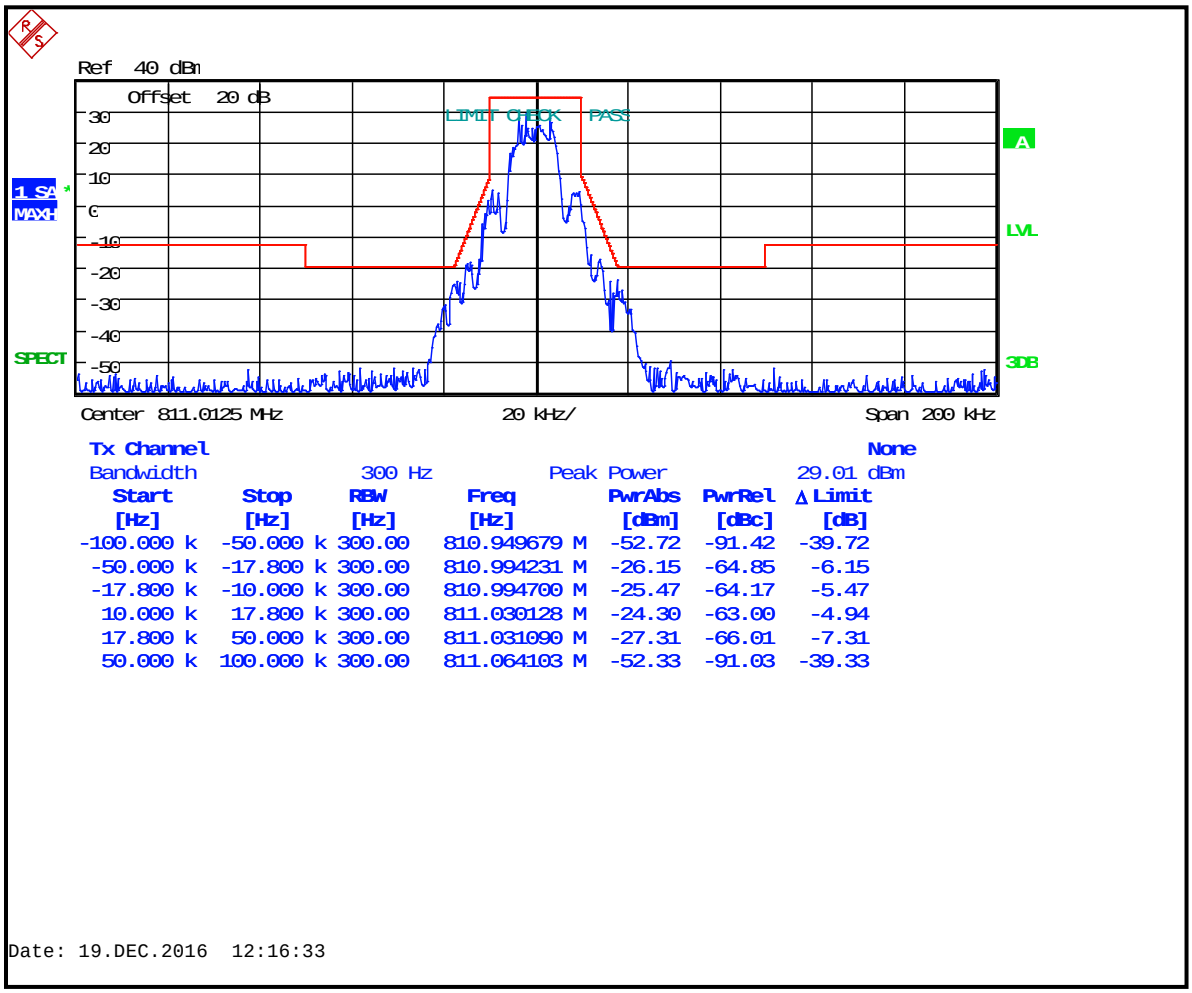
Plot 8-40: Occupied Bandwidth – 860.9875 MHz; 2-Level FSK 9600 NPSPAC; Mask G



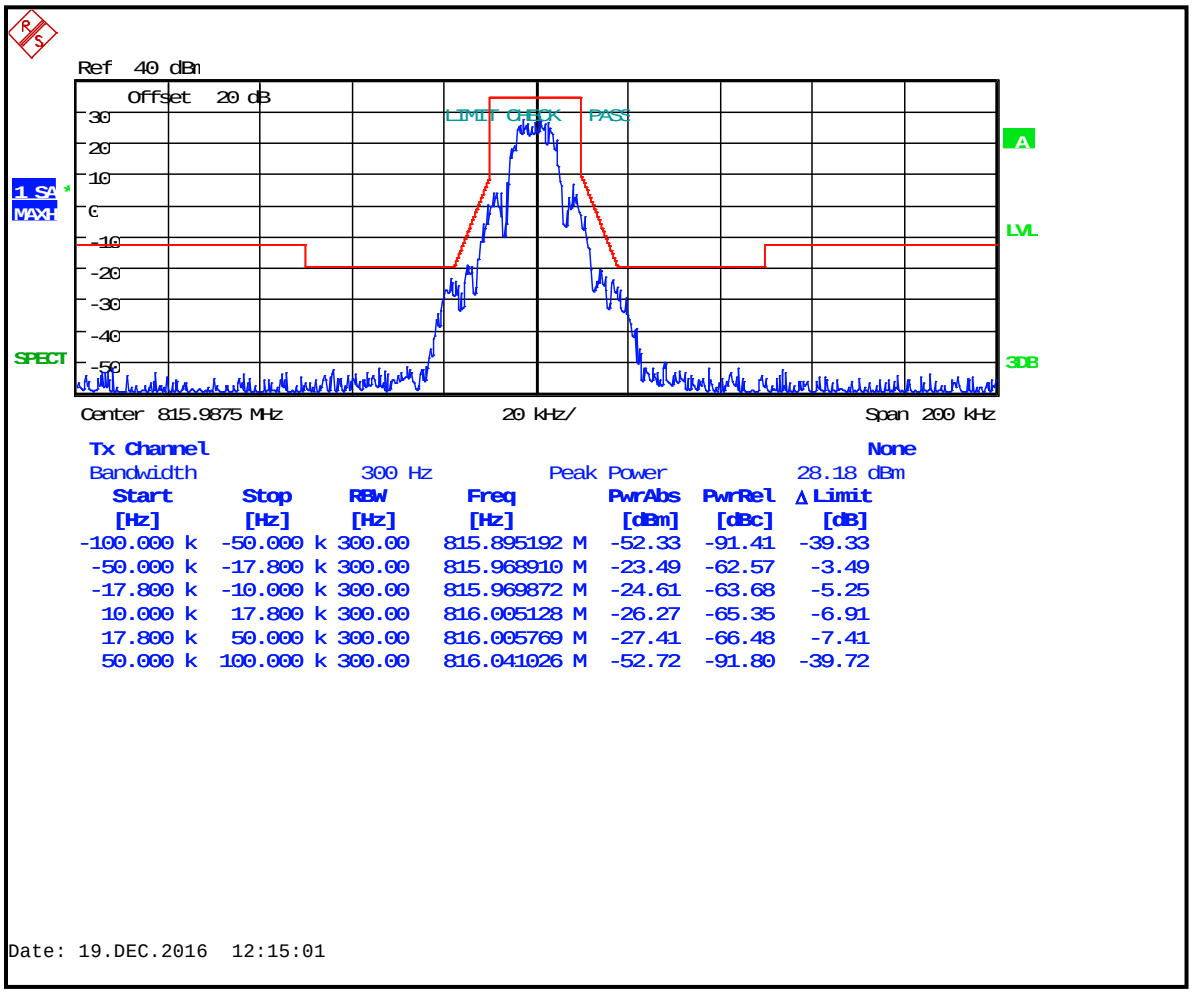
Plot 8-41: Occupied Bandwidth – 809.0125 MHz; WB 2-Level FSK 9600; Mask G



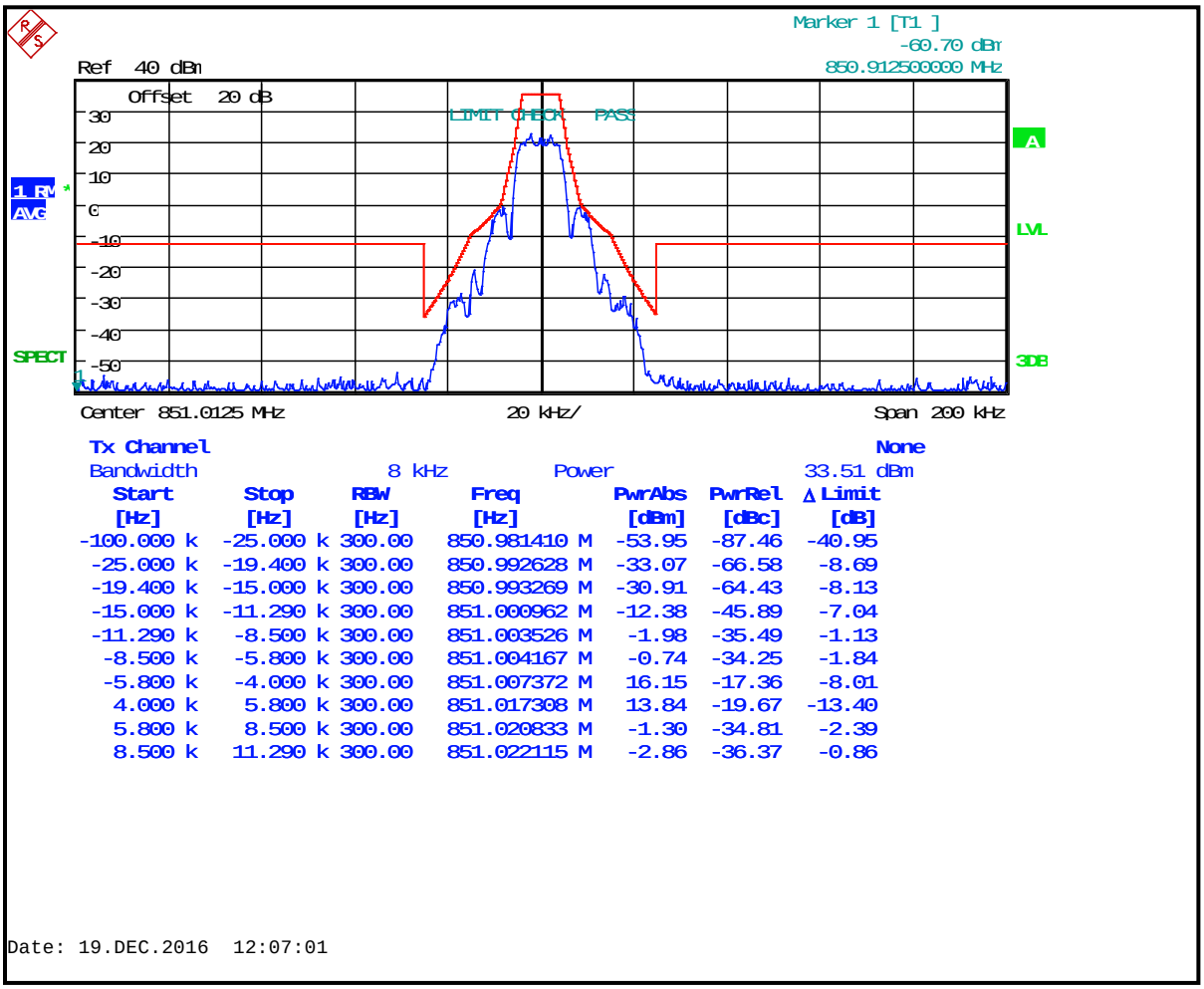
Plot 8-42: Occupied Bandwidth – 811.0125 MHz; WB 2-Level FSK 9600; Mask G



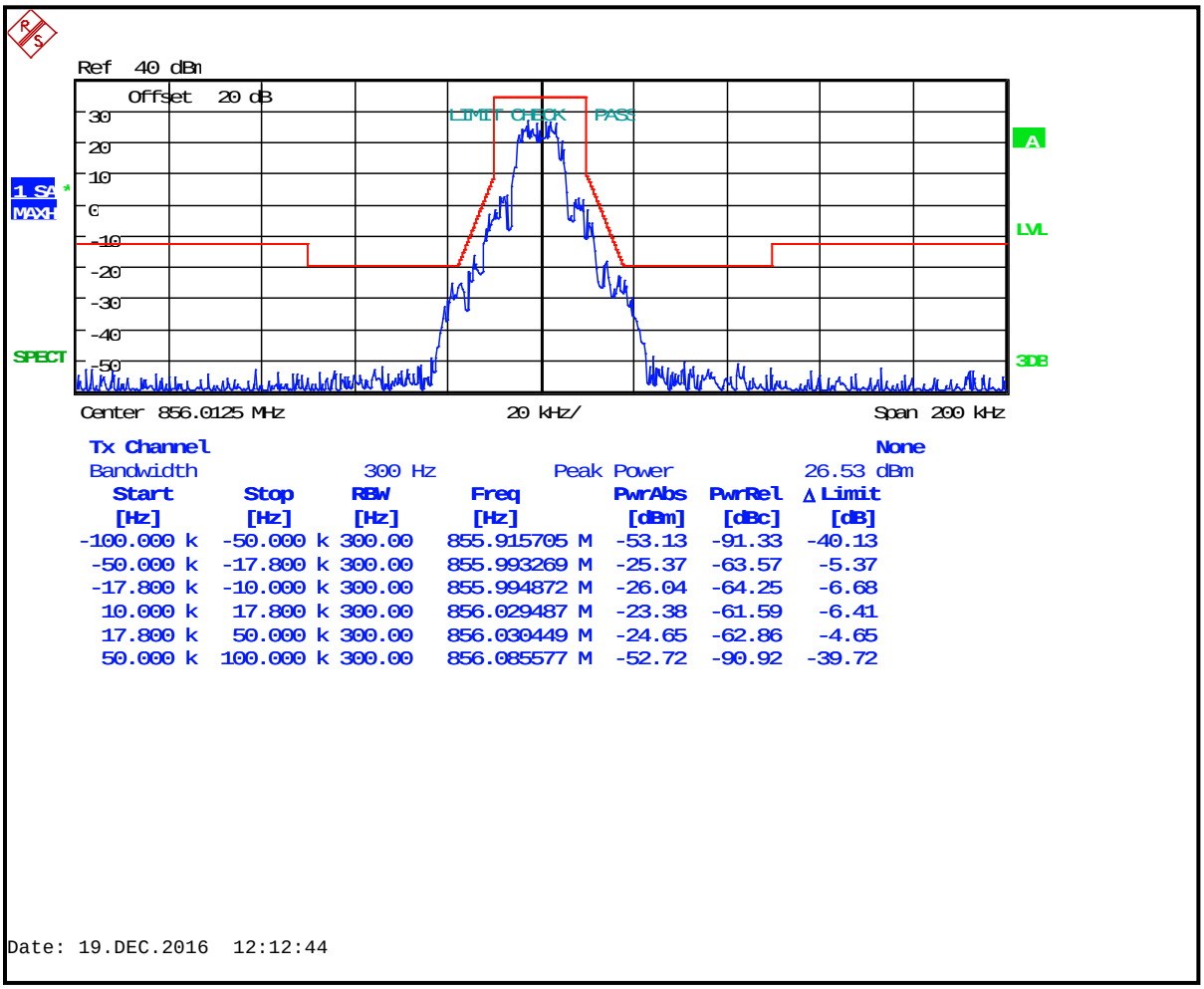
Plot 8-43: Occupied Bandwidth – 815.9875 MHz; WB 2-Level FSK 9600; Mask G



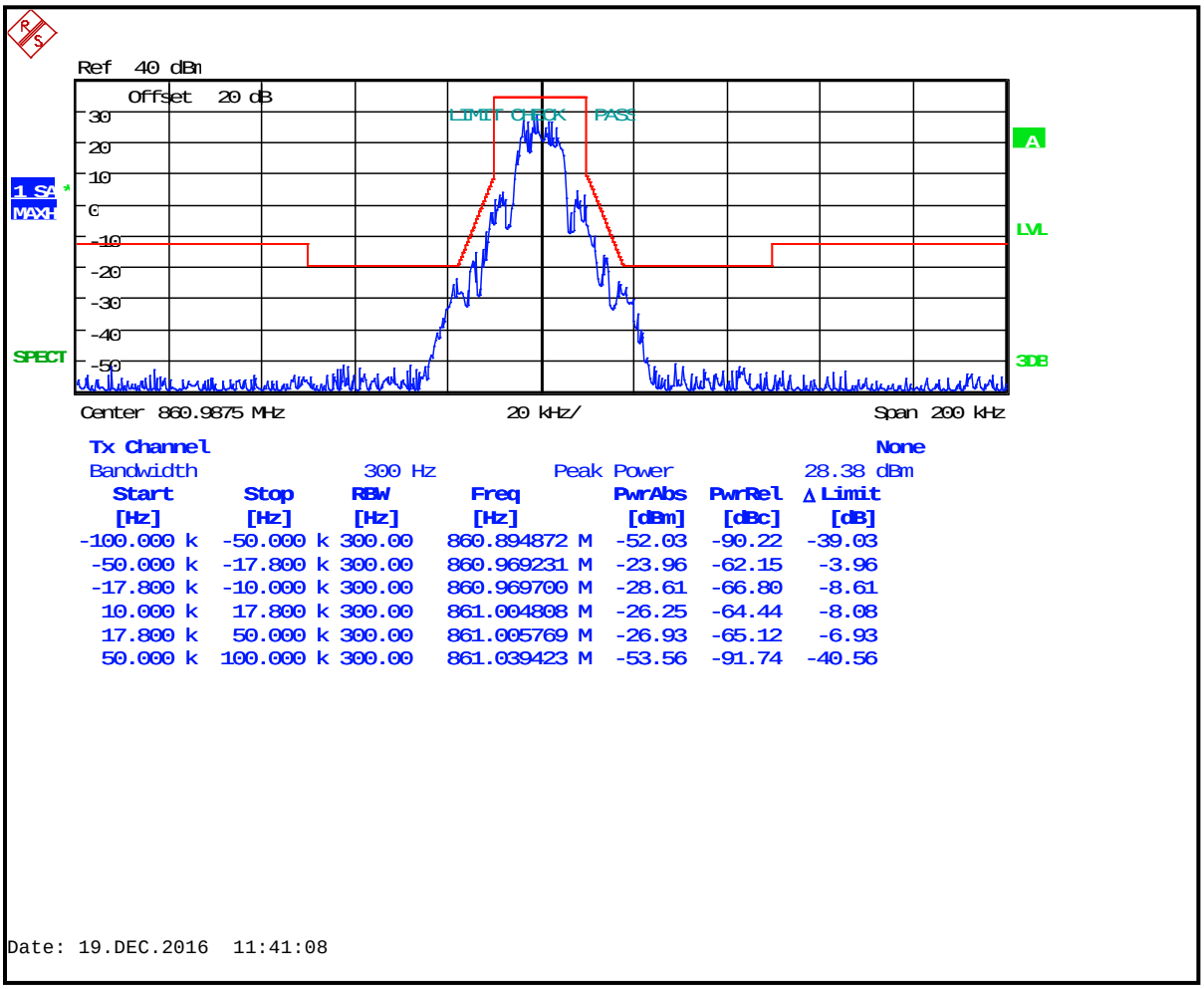
Plot 8-44: Occupied Bandwidth – 851.0125 MHz; WB 2-Level FSK 9600; Mask H



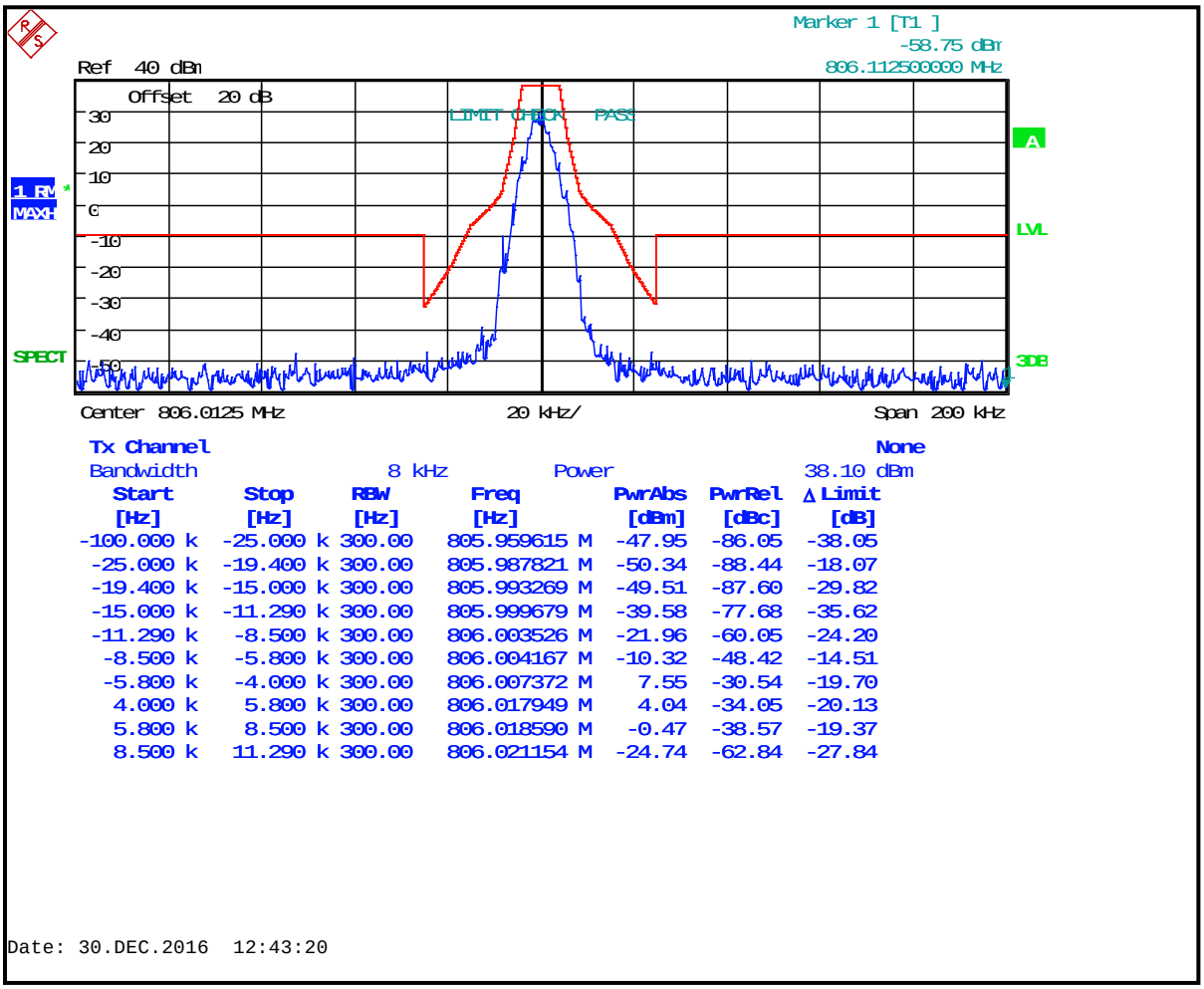
Plot 8-45: Occupied Bandwidth – 856.0125 MHz; WB 2-Level FSK 9600; Mask G



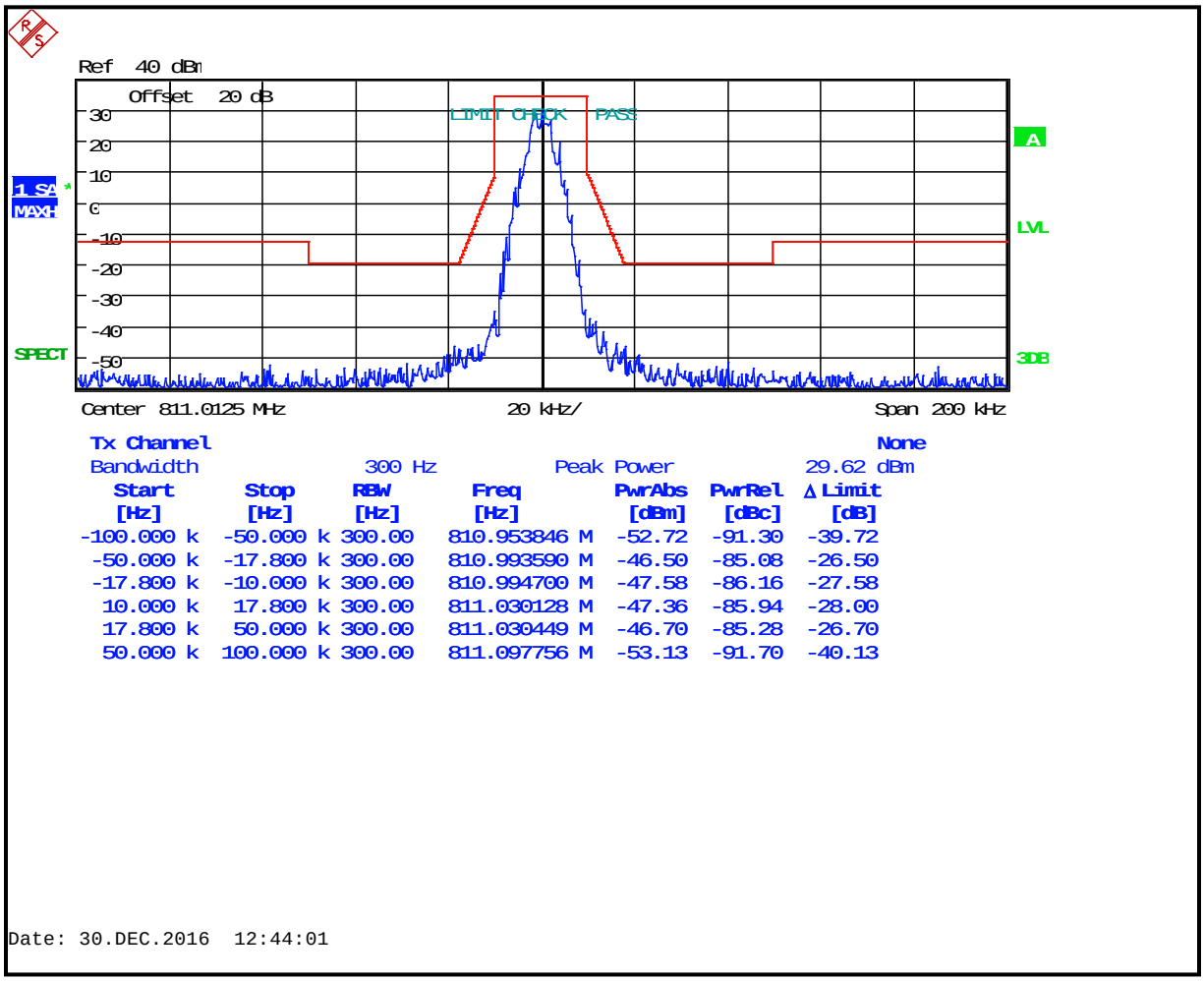
Plot 8-46: Occupied Bandwidth – 860.9875 MHz; WB 2-Level FSK 9600; Mask G



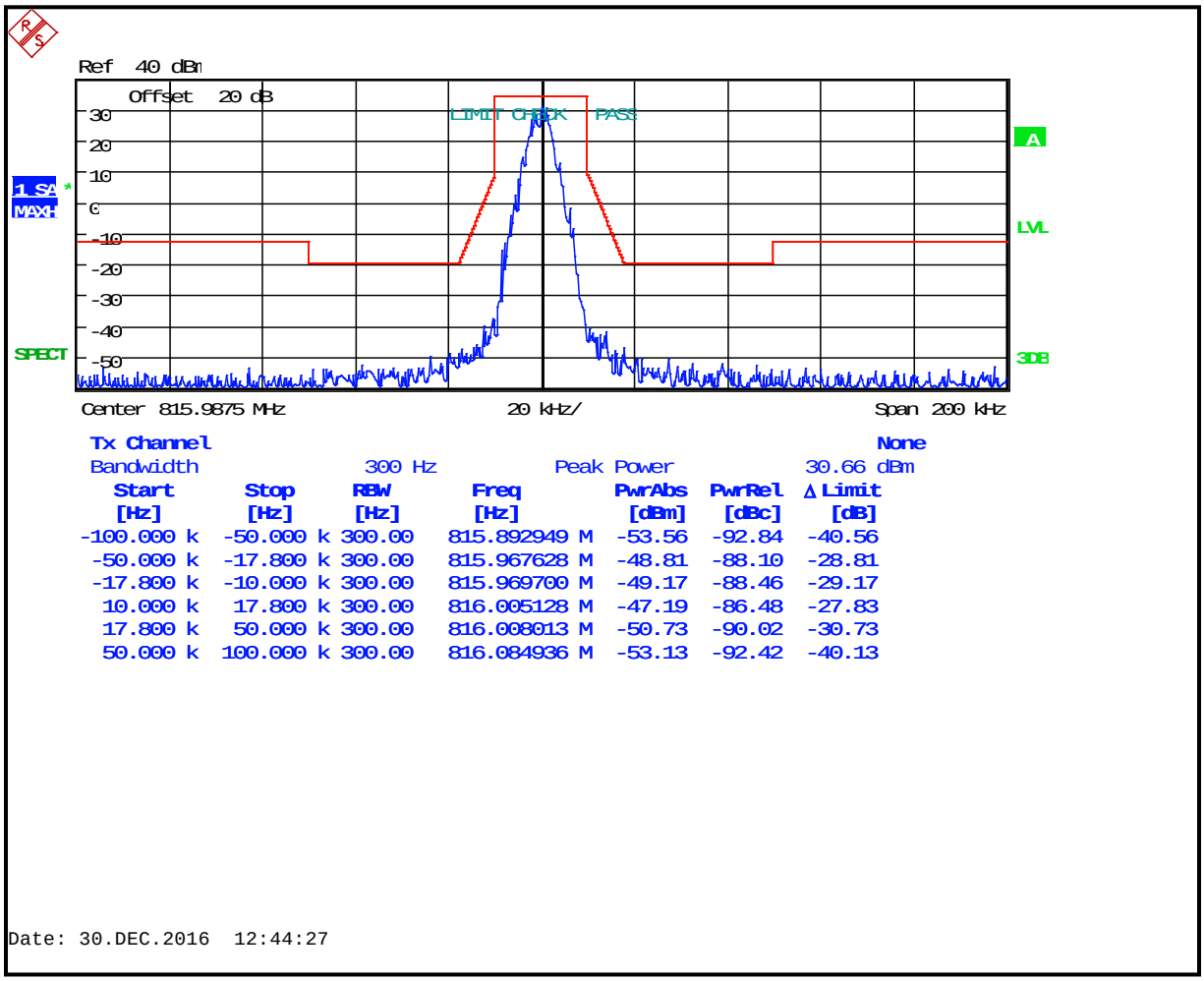
Plot 8-47: Occupied Bandwidth – 806.0125 MHz; P25; Mask H



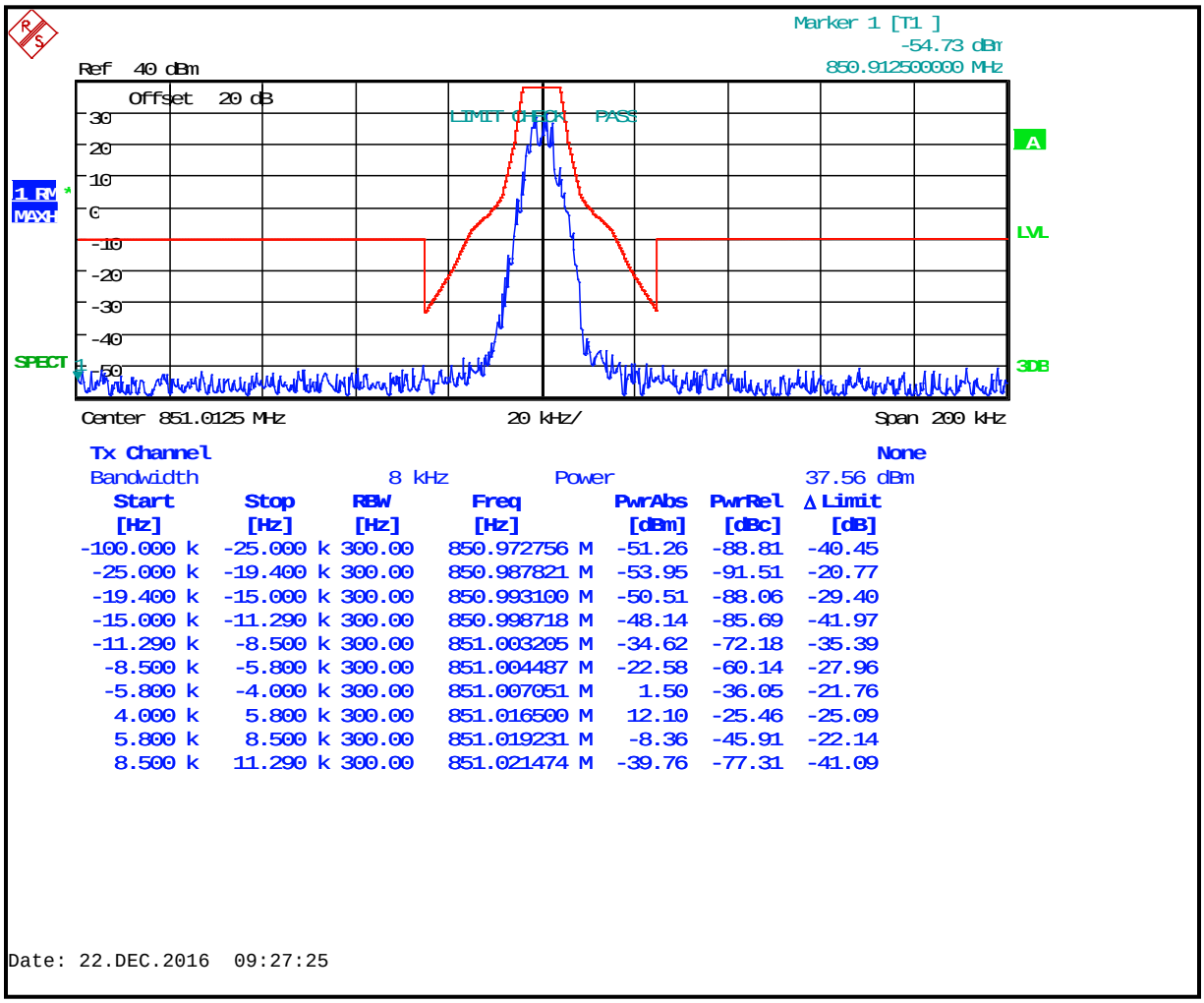
Plot 8-48: Occupied Bandwidth – 811.0125 MHz; P25; Mask G



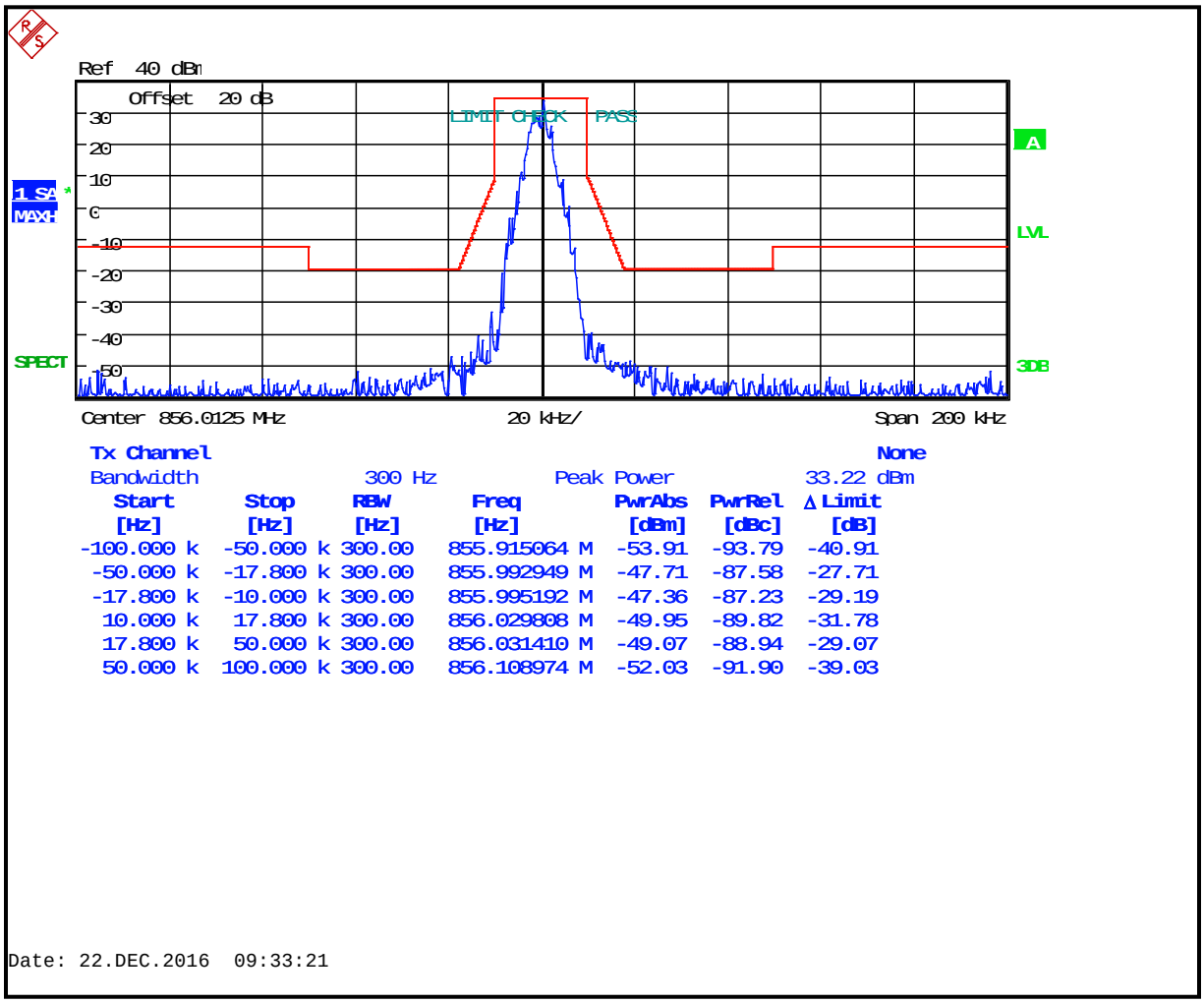
Plot 8-49: Occupied Bandwidth – 815.9875 MHz; P25; Mask G



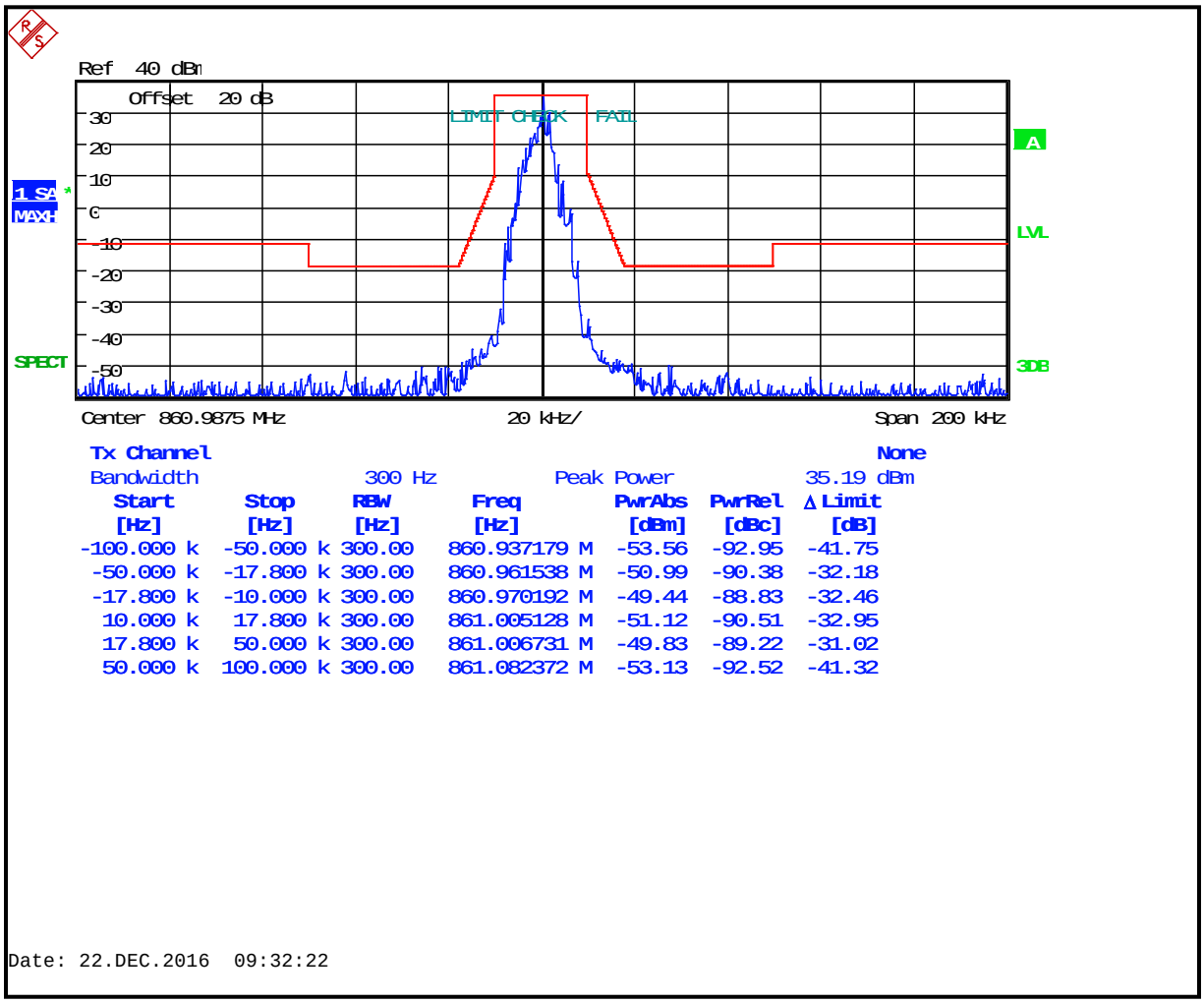
Plot 8-50: Occupied Bandwidth – 851.0125 MHz; P25; Mask H



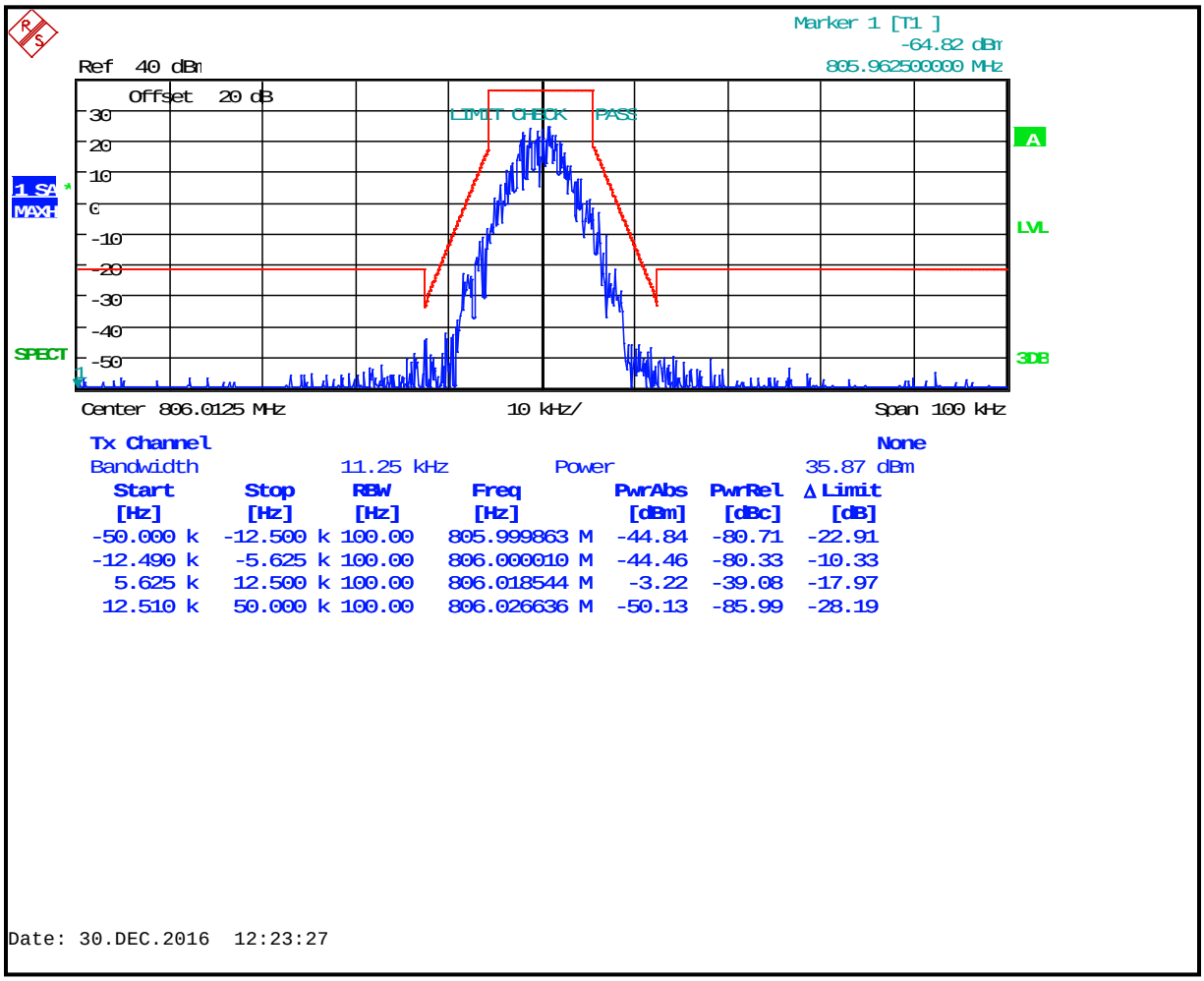
Plot 8-51: Occupied Bandwidth – 856.0125 MHz; P25; Mask G



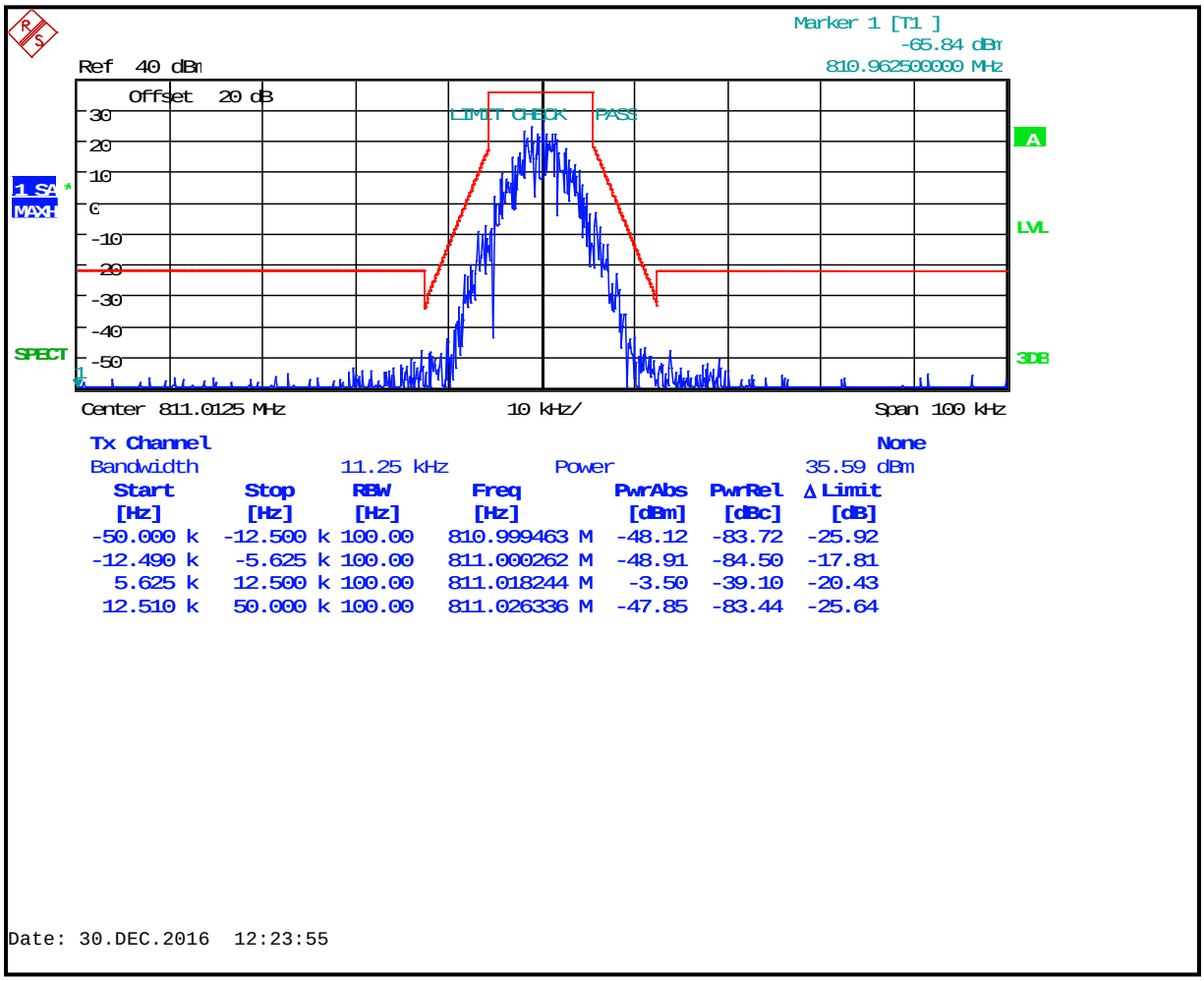
Plot 8-52: Occupied Bandwidth – 860.9875 MHz; P25; Mask G



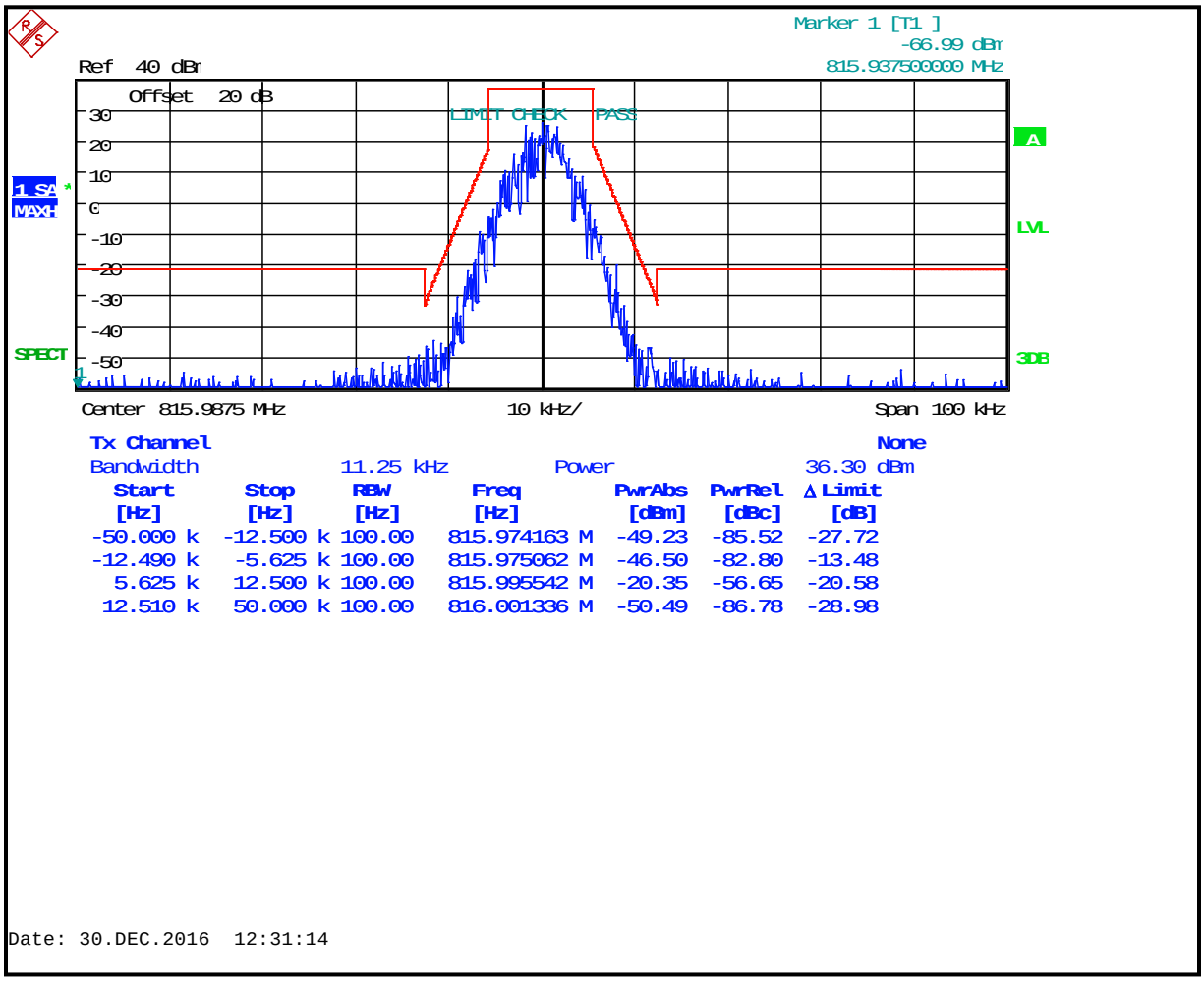
Plot 8-53: Occupied Bandwidth – 806.0125 MHz; P25; Mask D



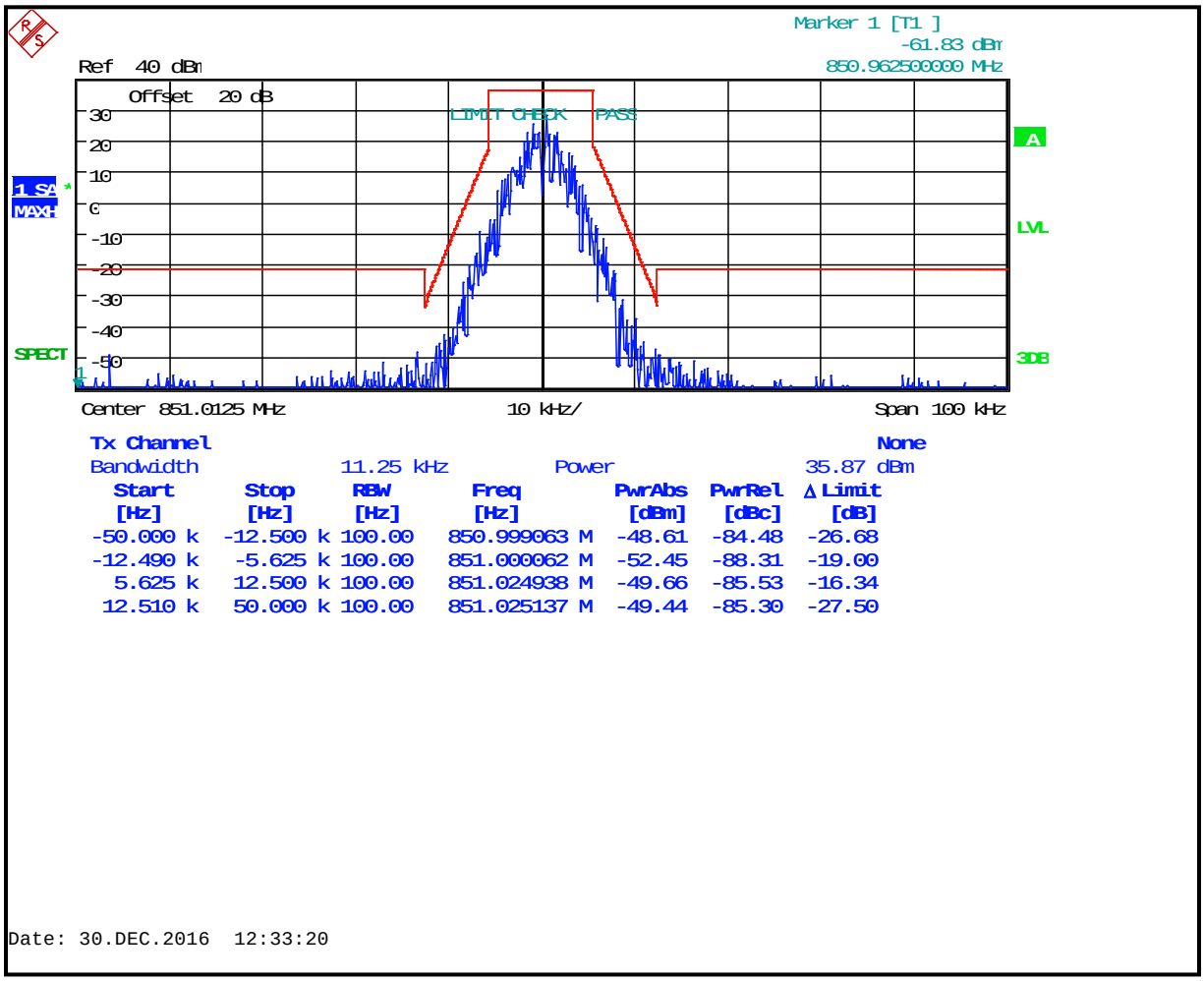
Plot 8-54: Occupied Bandwidth – 811.0125 MHz; P25; Mask D



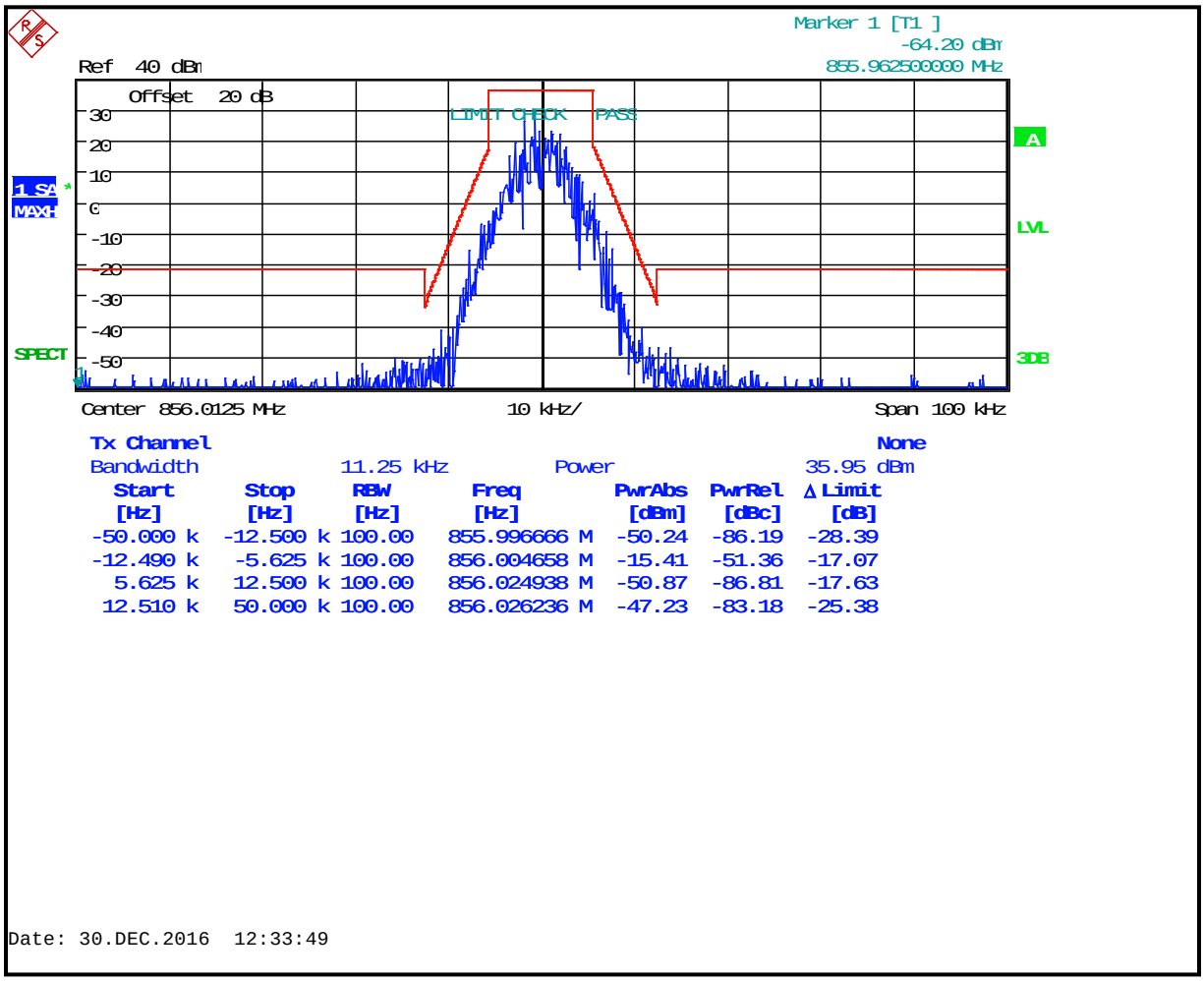
Plot 8-55: Occupied Bandwidth – 815.9875 MHz; P25; Mask D



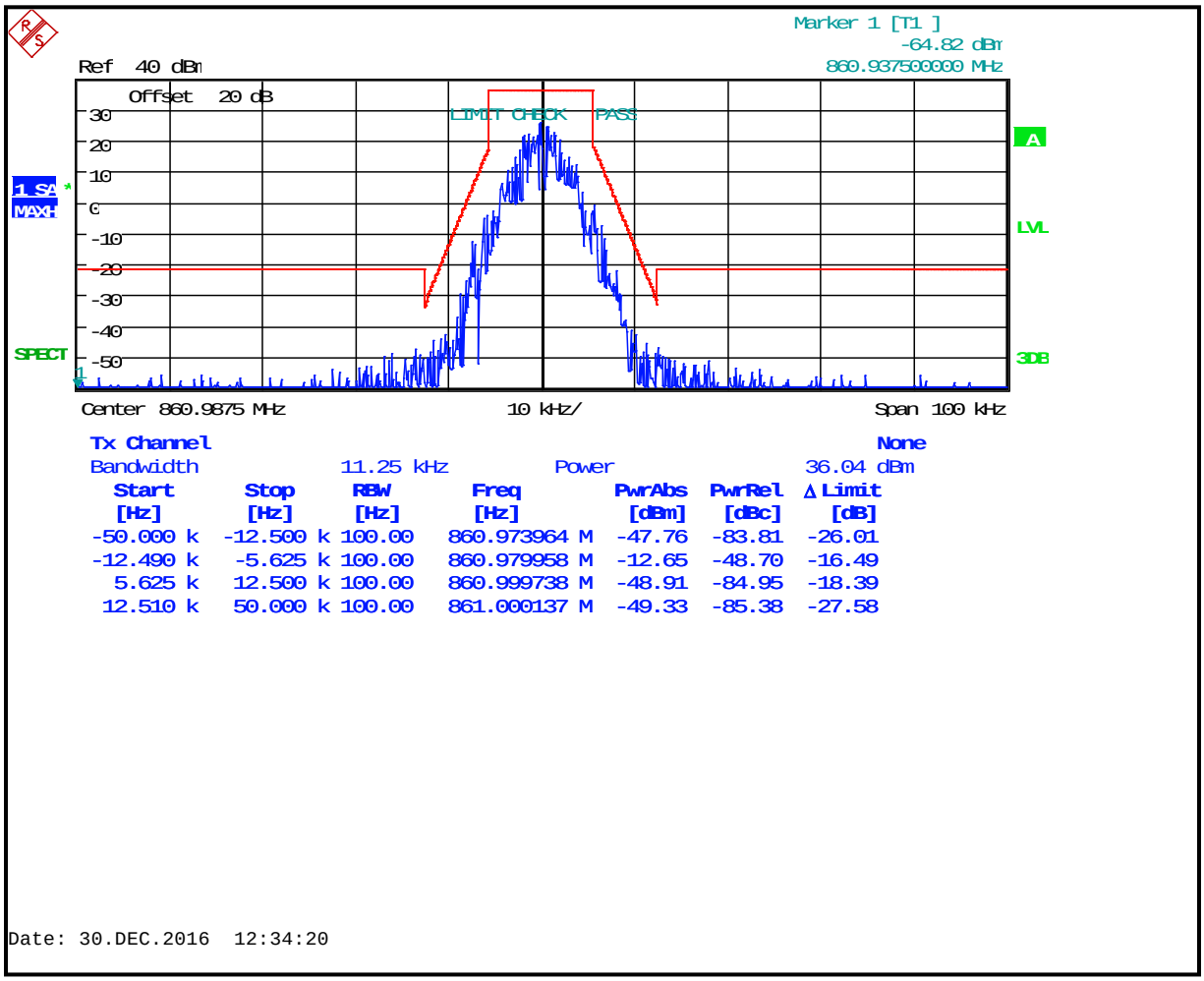
Plot 8-56: Occupied Bandwidth – 851.0125 MHz; P25; Mask D



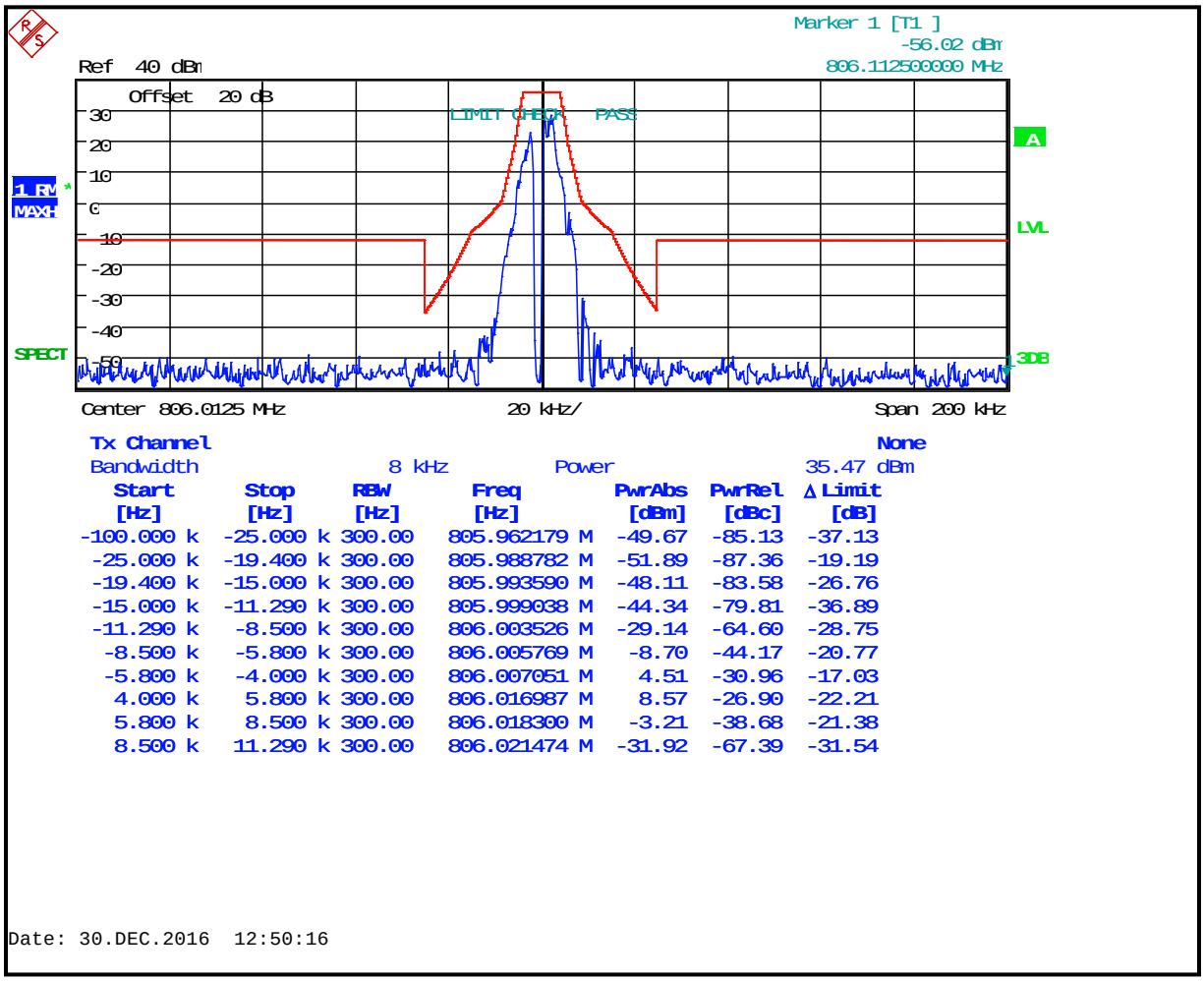
Plot 8-57: Occupied Bandwidth – 856.0125 MHz; P25; Mask D



Plot 8-58: Occupied Bandwidth – 860.9875 MHz; P25; Mask D



Plot 8-59: Occupied Bandwidth – 806.0125 MHz; P25 Phase 2; Mask H



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-25.000 k	300.00	805.962179 M	-49.67	-85.13	-37.13
-25.000 k	-19.400 k	300.00	805.988782 M	-51.89	-87.36	-19.19
-19.400 k	-15.000 k	300.00	805.993590 M	-48.11	-83.58	-26.76
-15.000 k	-11.290 k	300.00	805.999038 M	-44.34	-79.81	-36.89
-11.290 k	-8.500 k	300.00	806.003526 M	-29.14	-64.60	-28.75
-8.500 k	-5.800 k	300.00	806.005769 M	-8.70	-44.17	-20.77
-5.800 k	-4.000 k	300.00	806.007051 M	4.51	-30.96	-17.03
4.000 k	5.800 k	300.00	806.016987 M	8.57	-26.90	-22.21
5.800 k	8.500 k	300.00	806.018300 M	-3.21	-38.68	-21.38
8.500 k	11.290 k	300.00	806.021474 M	-31.92	-67.39	-31.54

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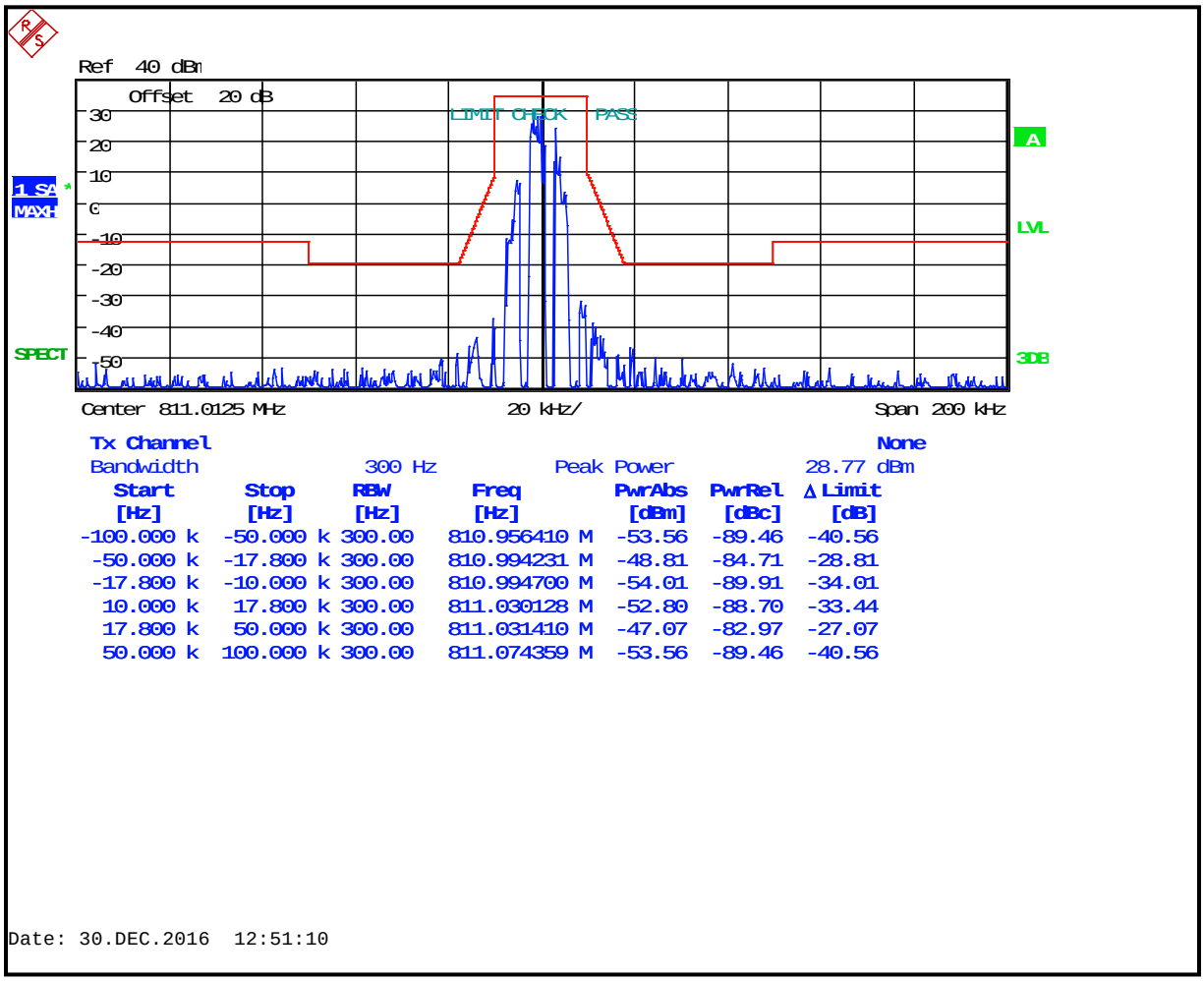
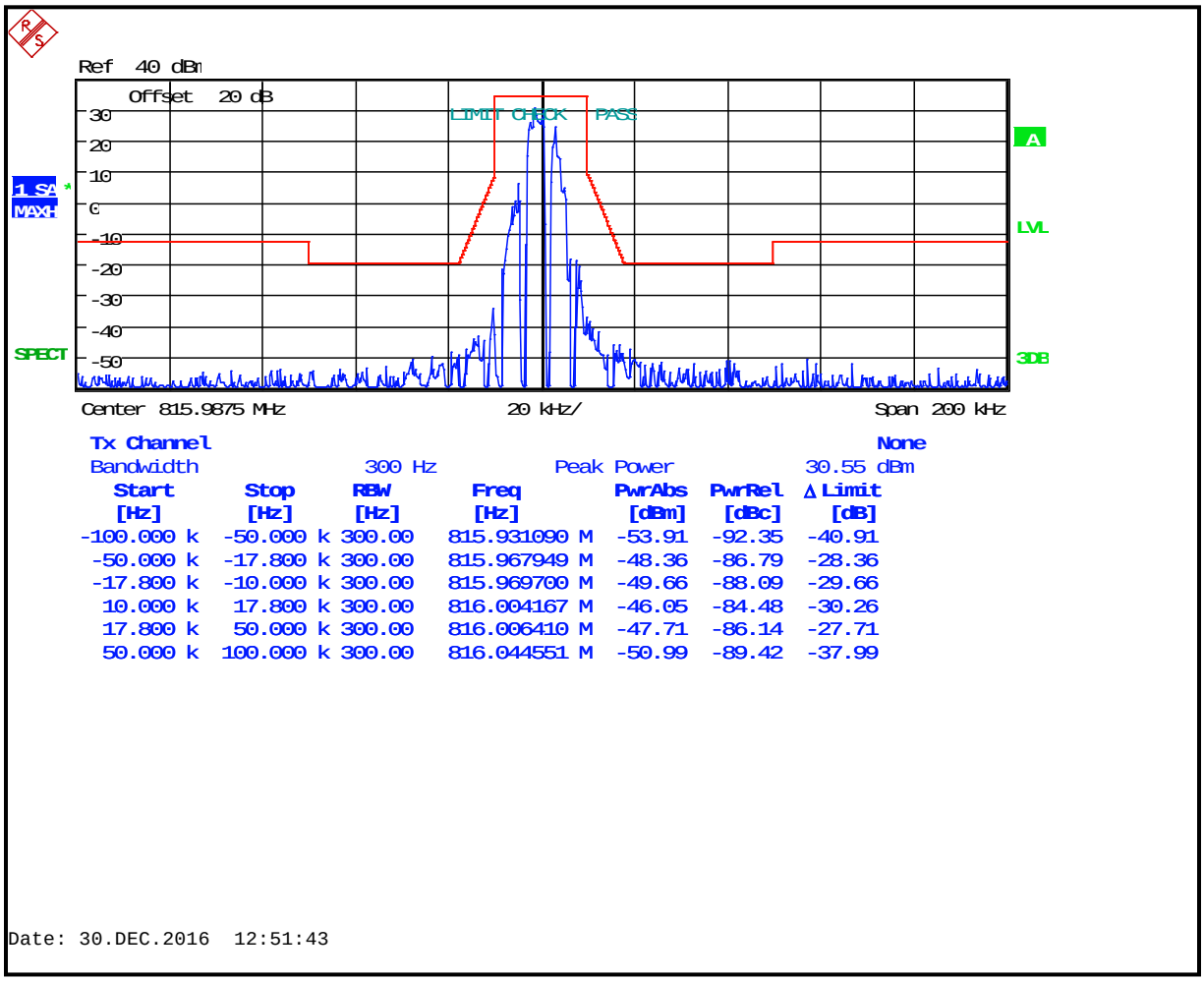
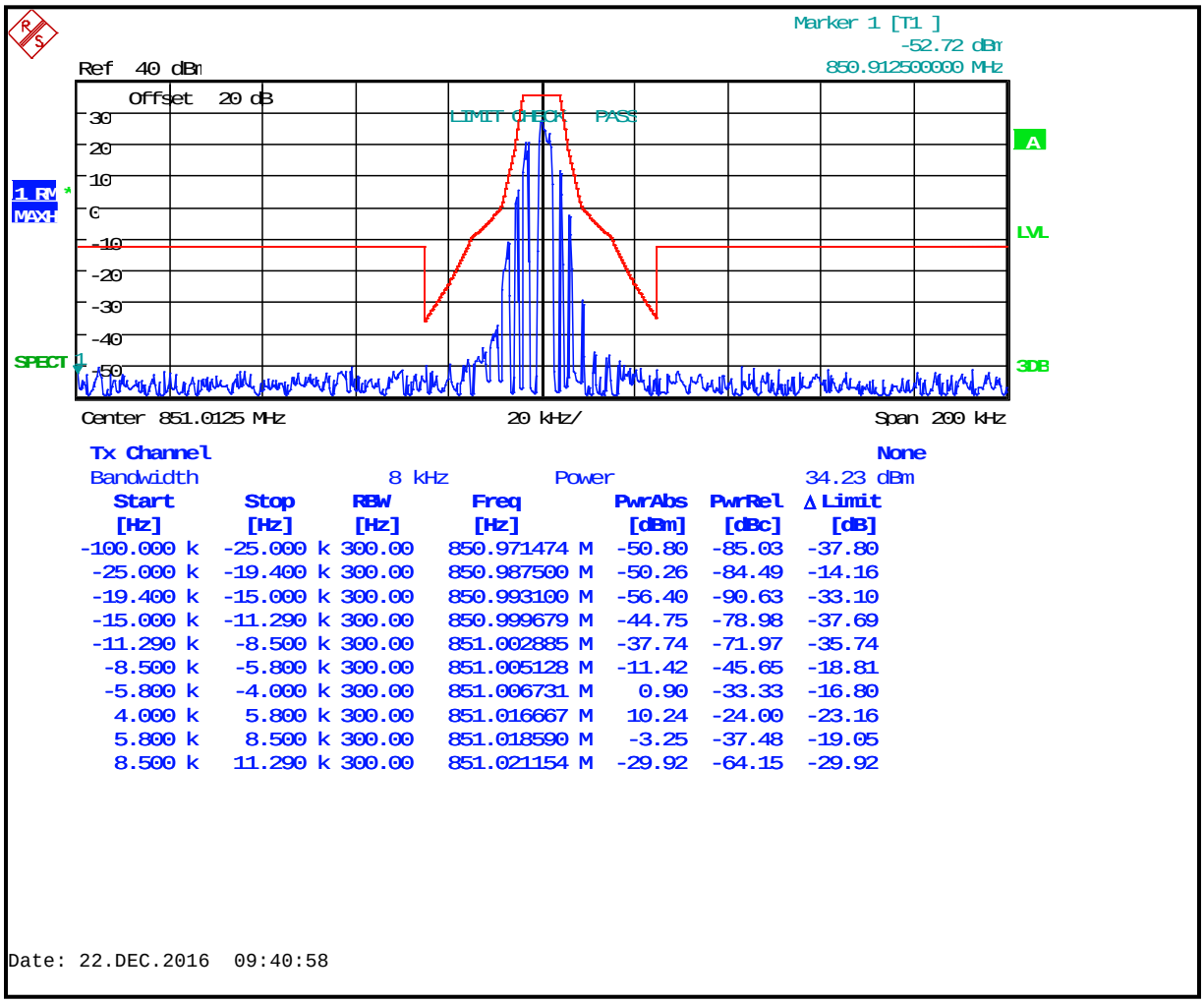
Plot 8-60: Occupied Bandwidth – 811.0125 MHz; P25 Phase 2; Mask G



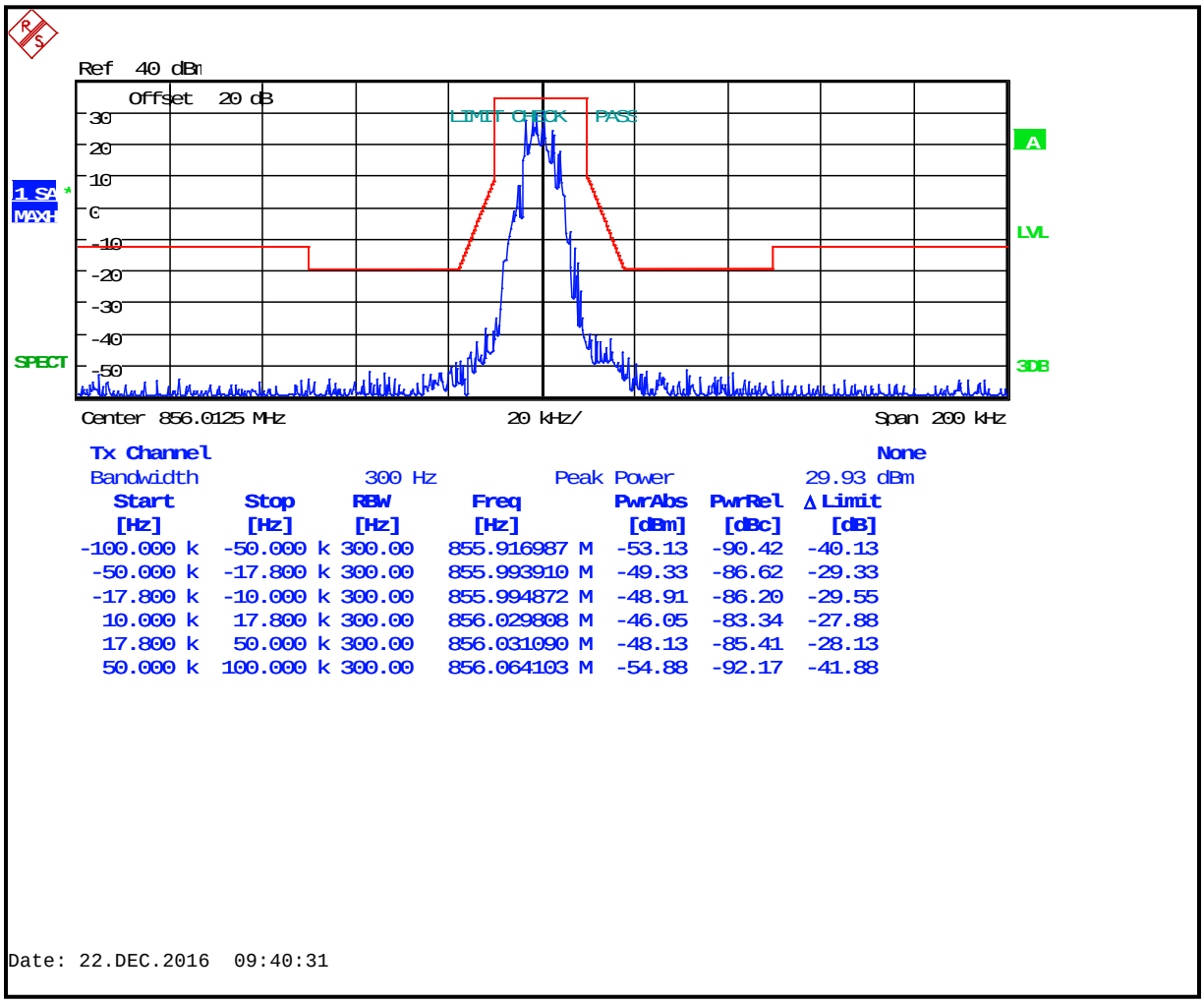
Plot 8-61: Occupied Bandwidth – 815.9875 MHz; P25 Phase 2; Mask G



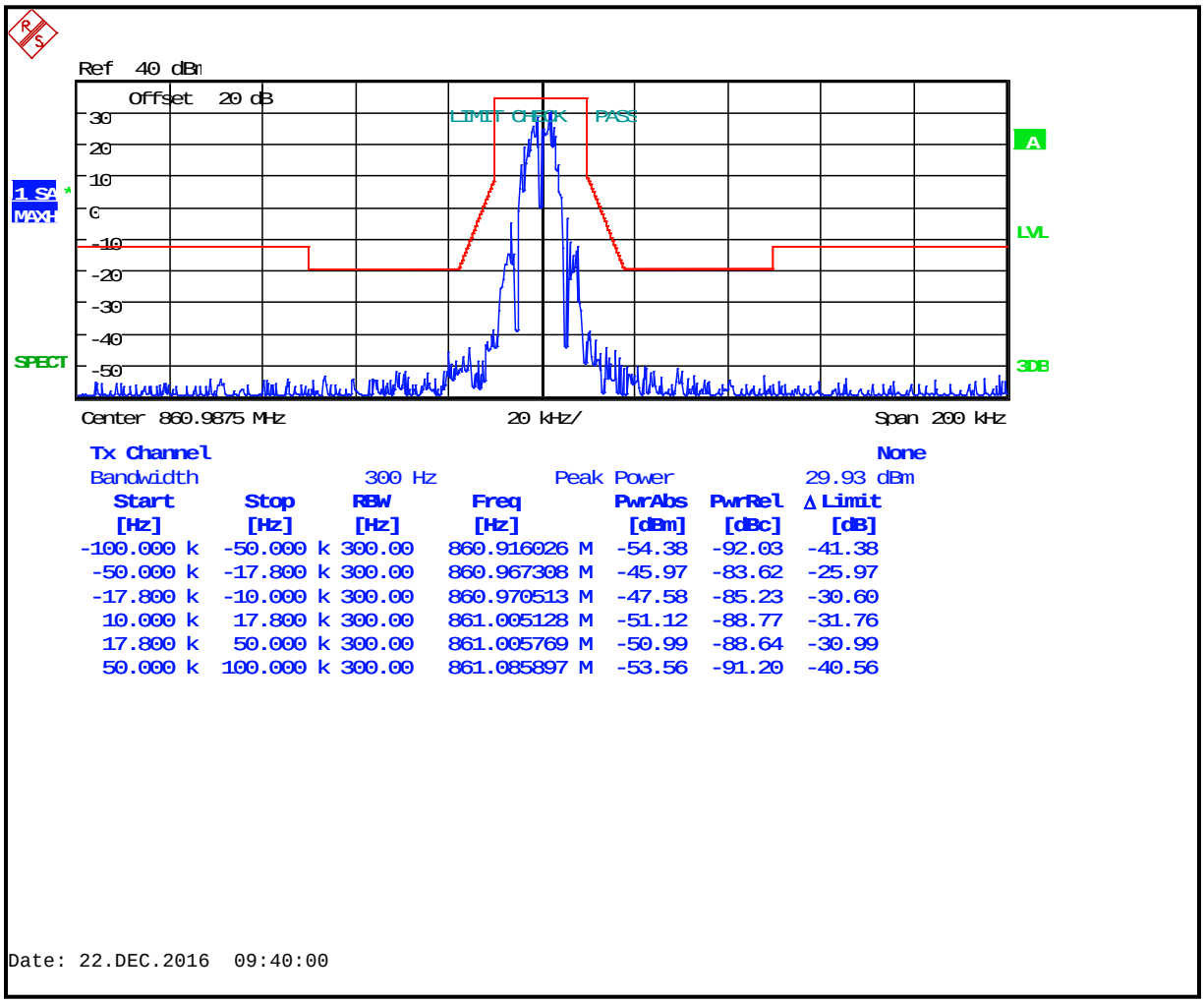
Plot 8-62: Occupied Bandwidth – 851.0125 MHz; P25 Phase 2; Mask H



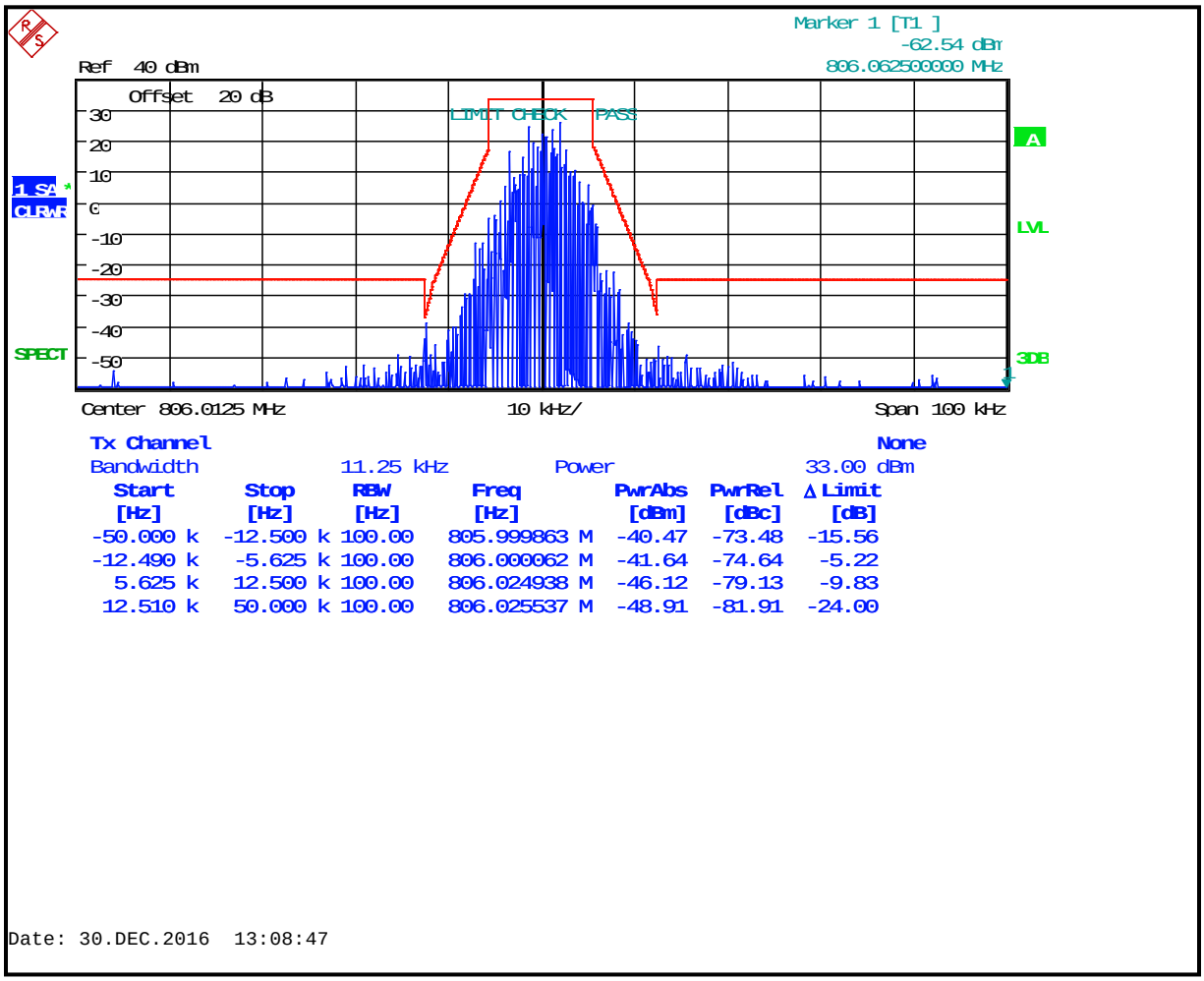
Plot 8-63: Occupied Bandwidth – 856.0125 MHz; P25 Phase 2; Mask G



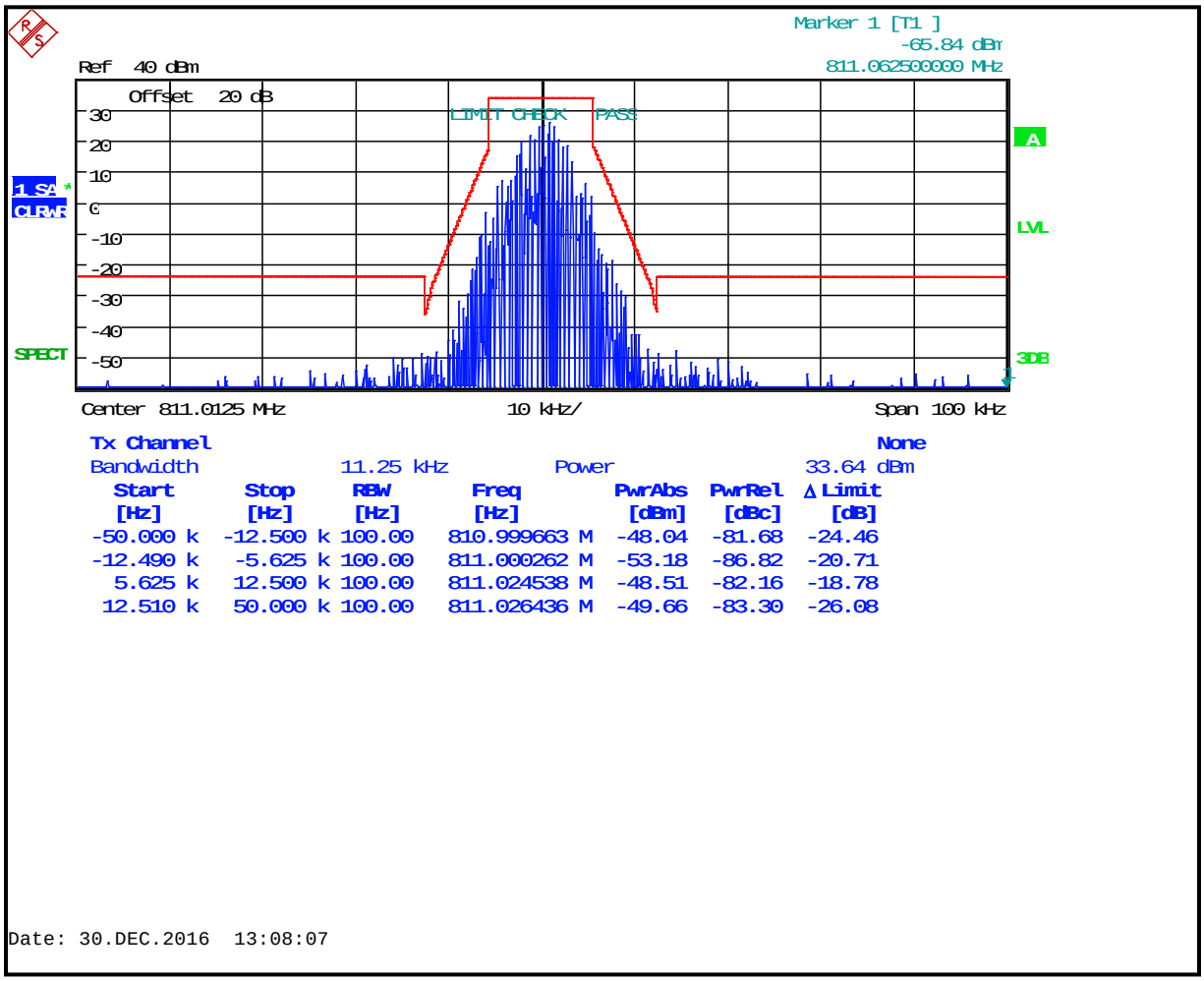
Plot 8-64: Occupied Bandwidth – 860.9875 MHz; P25 Phase 2; Mask G



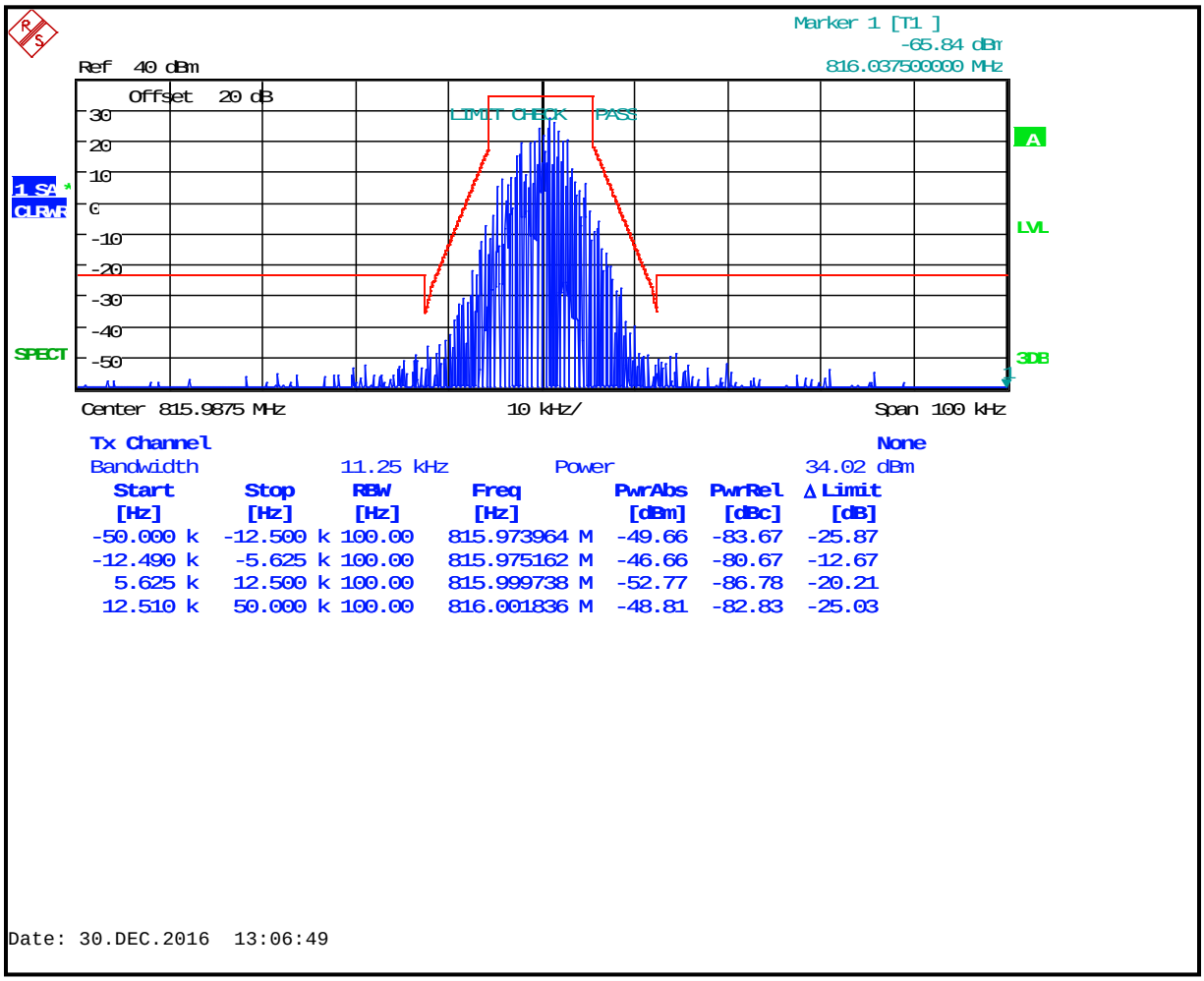
Plot 8-65: Occupied Bandwidth – 806.0125 MHz; P25 Phase 2; Mask D



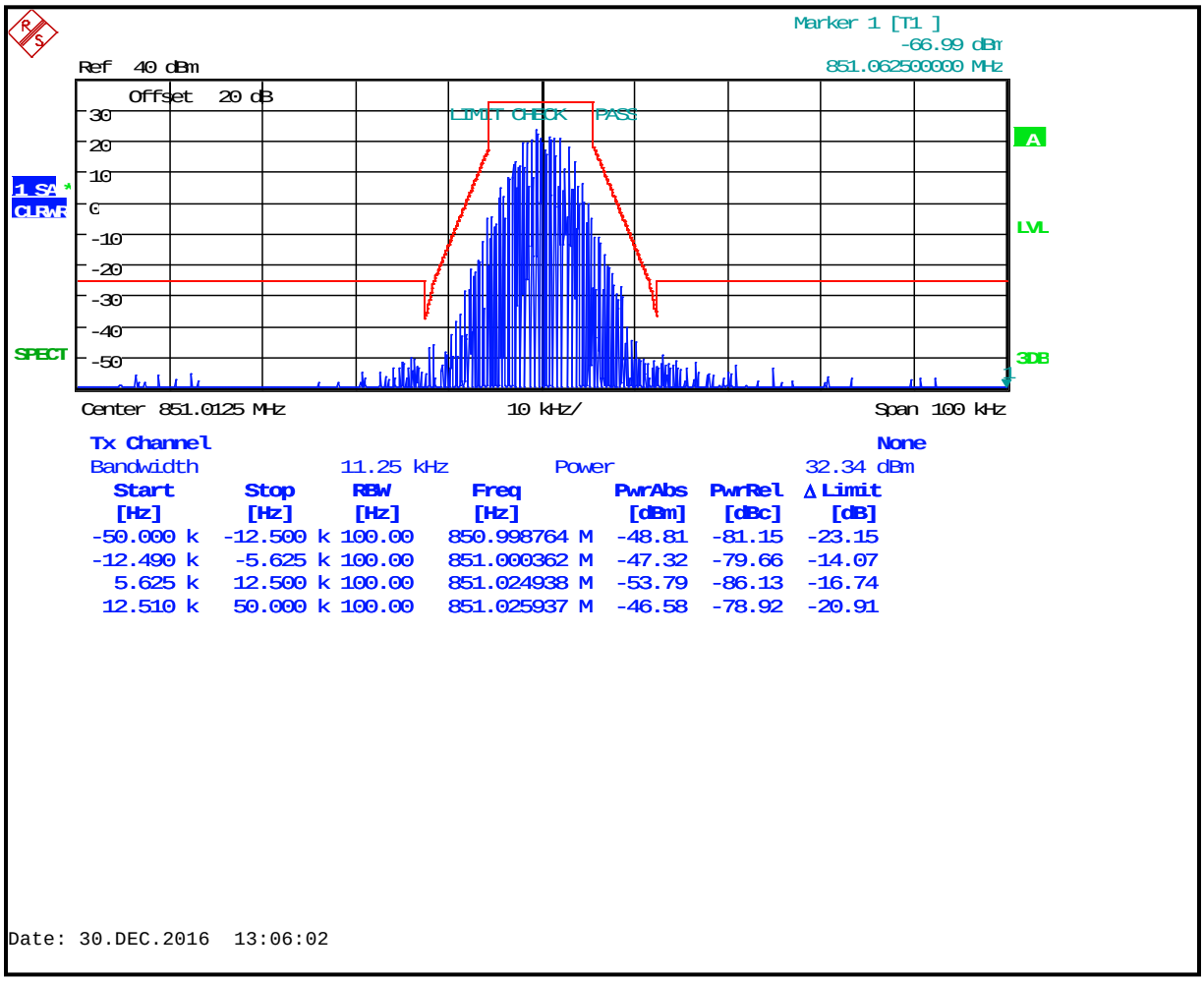
Plot 8-66: Occupied Bandwidth – 811.0125 MHz; P25 Phase 2; Mask D



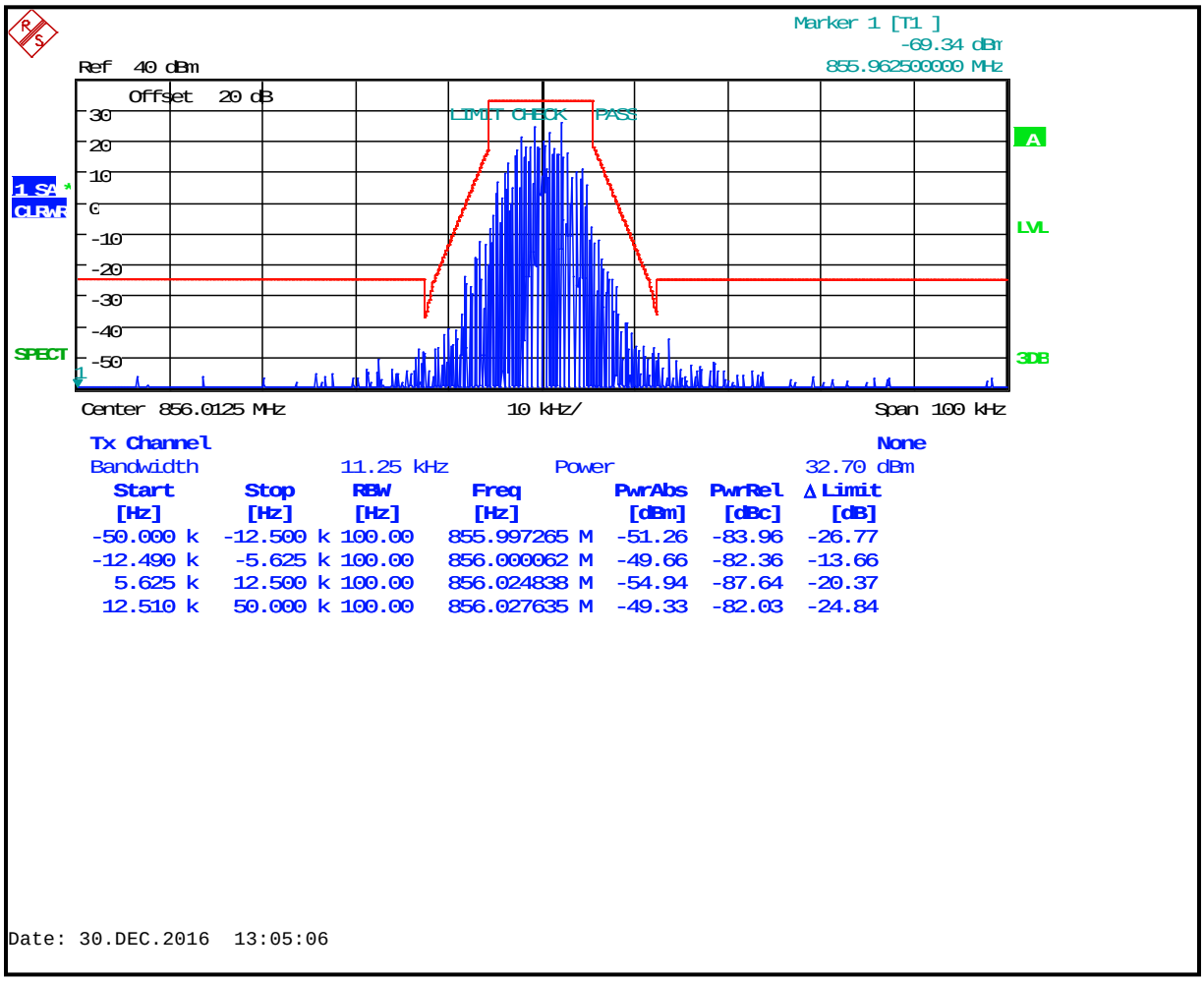
Plot 8-67: Occupied Bandwidth – 815.9875 MHz; P25 Phase 2; Mask D



Plot 8-68: Occupied Bandwidth – 851.0125 MHz; P25 Phase 2; Mask D



Plot 8-69: Occupied Bandwidth – 856.0125 MHz; P25 Phase 2; Mask D



Plot 8-70: Occupied Bandwidth – 860.9875 MHz; P25 Phase 2; Mask D

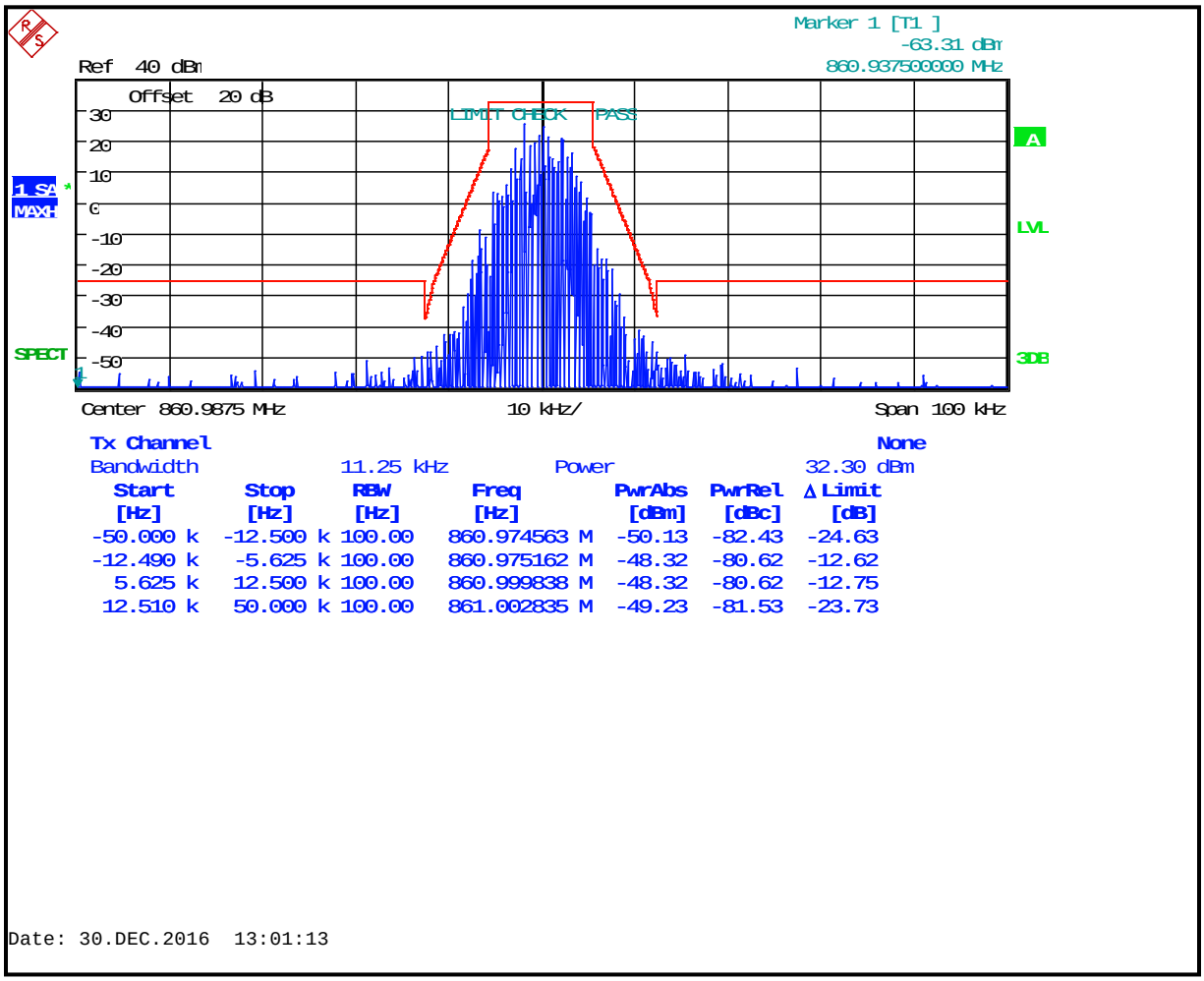


Table 8-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901139	Weinschel Corp.	48-20-34 DC-18GHz	Attenuator, 100W 20dB	BK5859	3/30/18
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	4/13/17

Test Personnel:

Daniel Baltzell		December 18, 2016- February 2, 2017
EMC Test Engineer	Signature	Dates of Test

9 FCC Part 2.1055: Frequency Stability; Part 90.213, Part 90.539: Frequency Stability; IC RSS-119 5.3 Transmitter Frequency Stability

9.1 Test Procedure

ANSI/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 AFC was not locked to the base station.

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

Part 90.213: Mobile stations over 2 W operating power - 1.5 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]	.....	.....	.....

Part 90.539 Frequency Stability

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

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

The EUT was tested while the AFC was not locked, therefore, the limit is 1.5 ppm. The worst-case deviation was found to be -0.46 ppm.

9.2 Test Data

Table 9-1: Temperature Frequency Stability – 776 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	775.999878	-0.16
-20	775.999877	-0.16
-10	775.999878	-0.16
0	775.999902	-0.13
10	776.000000	0.00
20 (reference)	776.000000	0.00
30	776.000000	0.00
40	776.000024	0.03
50	775.999645	-0.46
60	775.999926	-0.10

Table 9-2: Temperature Frequency Stability – 851 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	850.999878	-0.14
-20	850.999878	-0.14
-10	850.999853	-0.17
0	850.999902	-0.12
10	851.000000	0.00
20 (reference)	851.000000	0.00
30	851.000000	0.00
40	851.000000	0.00
50	850.999645	-0.42
60	850.999902	-0.12

Results: The EUT is compliant.

Table 9-3: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	4/14/17
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	4/17/19
901521	MA/COM	2082-6174-20	20 dB Attenuator (2W, DC-4GHz)	N/A	9/1/18
901525	MA/COM	2082-6174-20	20 dB Attenuator (2W, DC-4GHz)	N/A	9/1/18
901699	Hewlett Packard	E3610A	Power Supply	KR72917306	Not Required

Test Personnel:

Daniel Baltzell		December 13, 2016
EMC Test Engineer	Signature	Date of Test

9.2.1 Frequency Stability/Voltage Variation

Table 9-4: Frequency Stability/Voltage Variation – 776 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
6 (end of battery)	775.999993	-0.01
6.375	775.999990	-0.01
7.5 (reference)	775.999990	-0.01
8.625	775.999990	-0.01

Table 9-5: Frequency Stability/Voltage Variation – 851 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
6 (end of battery)	850.999992	-0.01
6.375	850.999992	-0.01
7.5 (reference)	850.999991	-0.01
8.625	850.999988	-0.01

Table 9-6: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	4/14/17
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	4/17/19
901521	MA/COM	2082-6174-20	20 dB Attenuator (2W, DC-4GHz)	N/A	9/1/18
901525	MA/COM	2082-6174-20	20 dB Attenuator (2W, DC-4GHz)	N/A	9/1/18
901699	Hewlett Packard	E3610A	Power Supply	KR72917306	Not Required

Test Personnel:

Daniel Baltzell		December 13, 2016
EMC Test Engineer	Signature	Date of Test

10 FCC Part 2.1047: Modulation Characteristics; IC RSS-119 5.8 Types of Modulation

10.1 Test Procedures

10.1.1 Audio Frequency Response

ANSI/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

ANSI/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

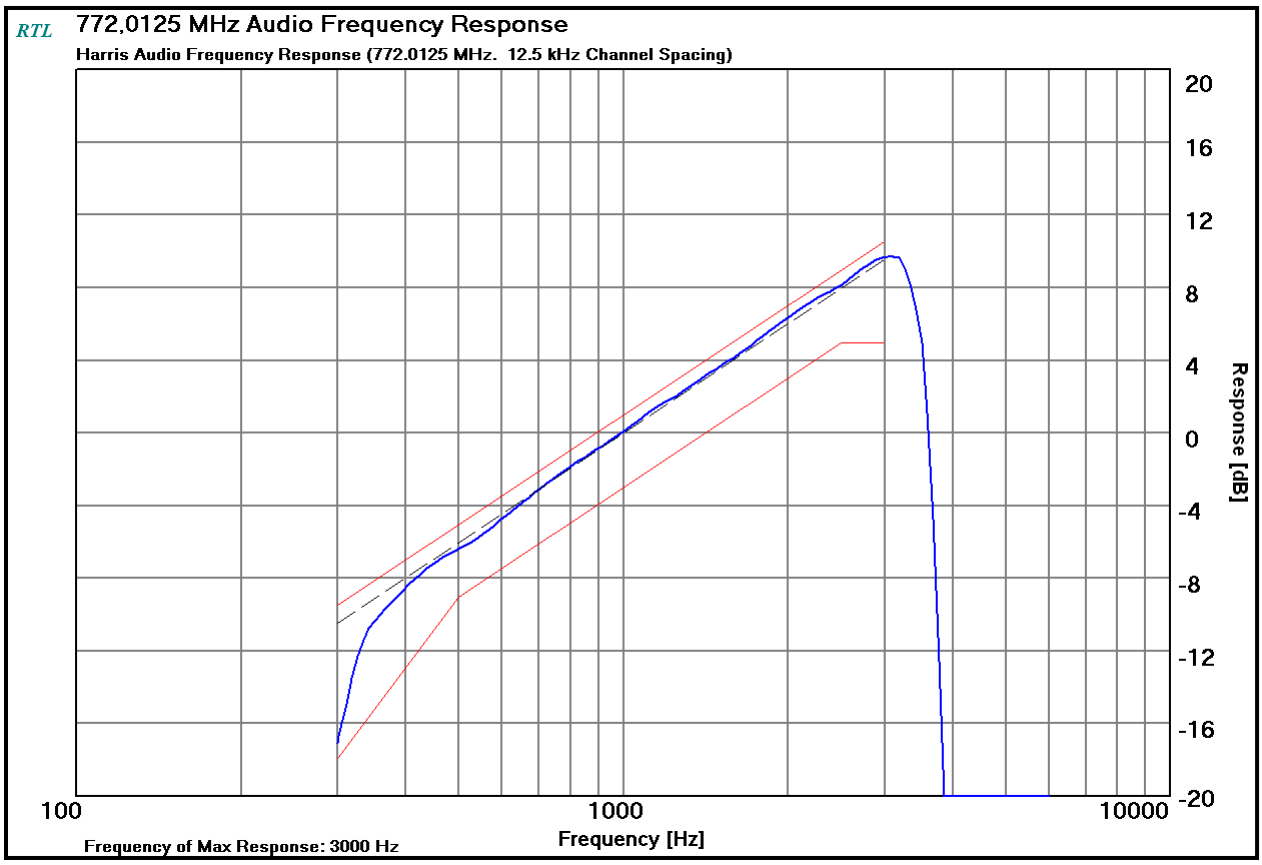
ANSI/TIA-603-D 2010, section 2.2.3

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.

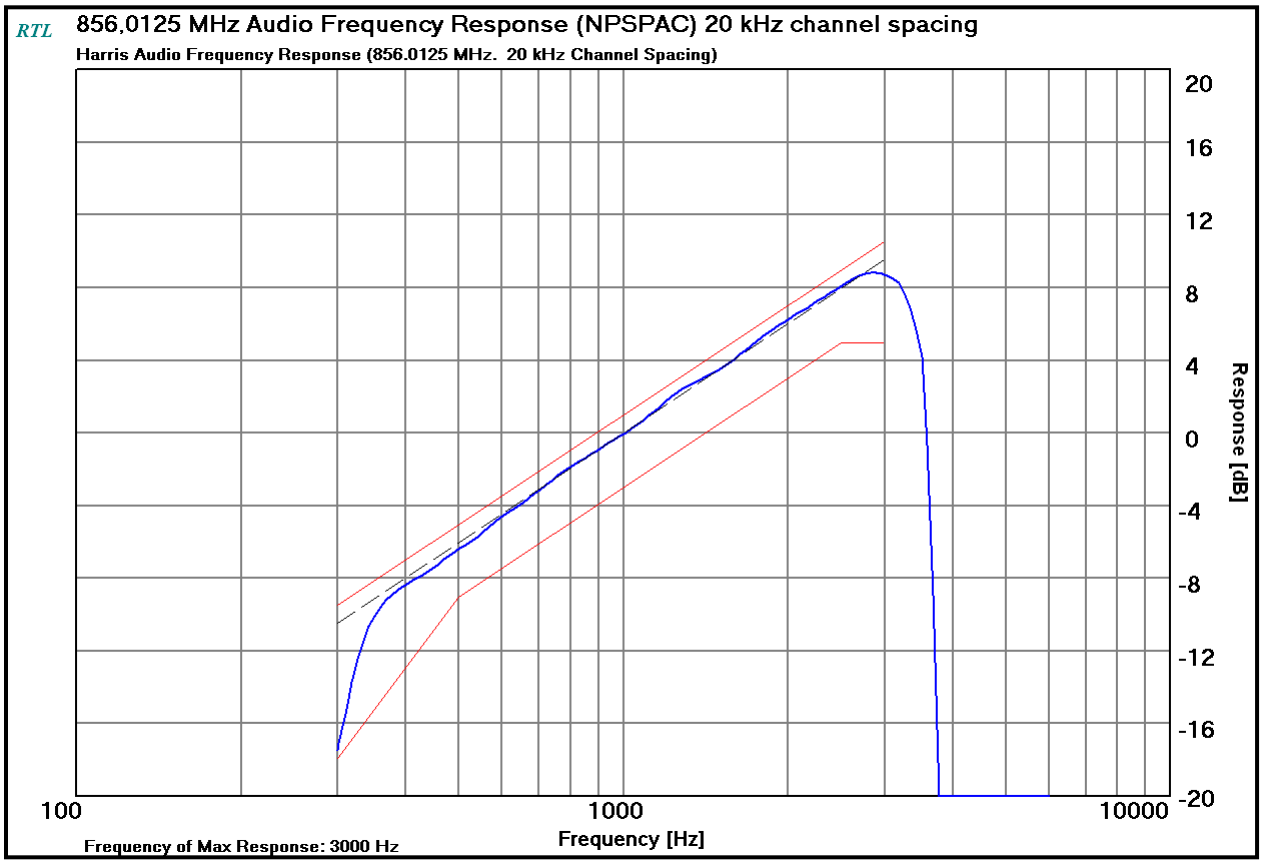
10.2 Test Data

10.2.1 Audio Frequency Response

Plot 10-1: Modulation Characteristics - Audio Frequency Response – 772.0125 MHz (NB)

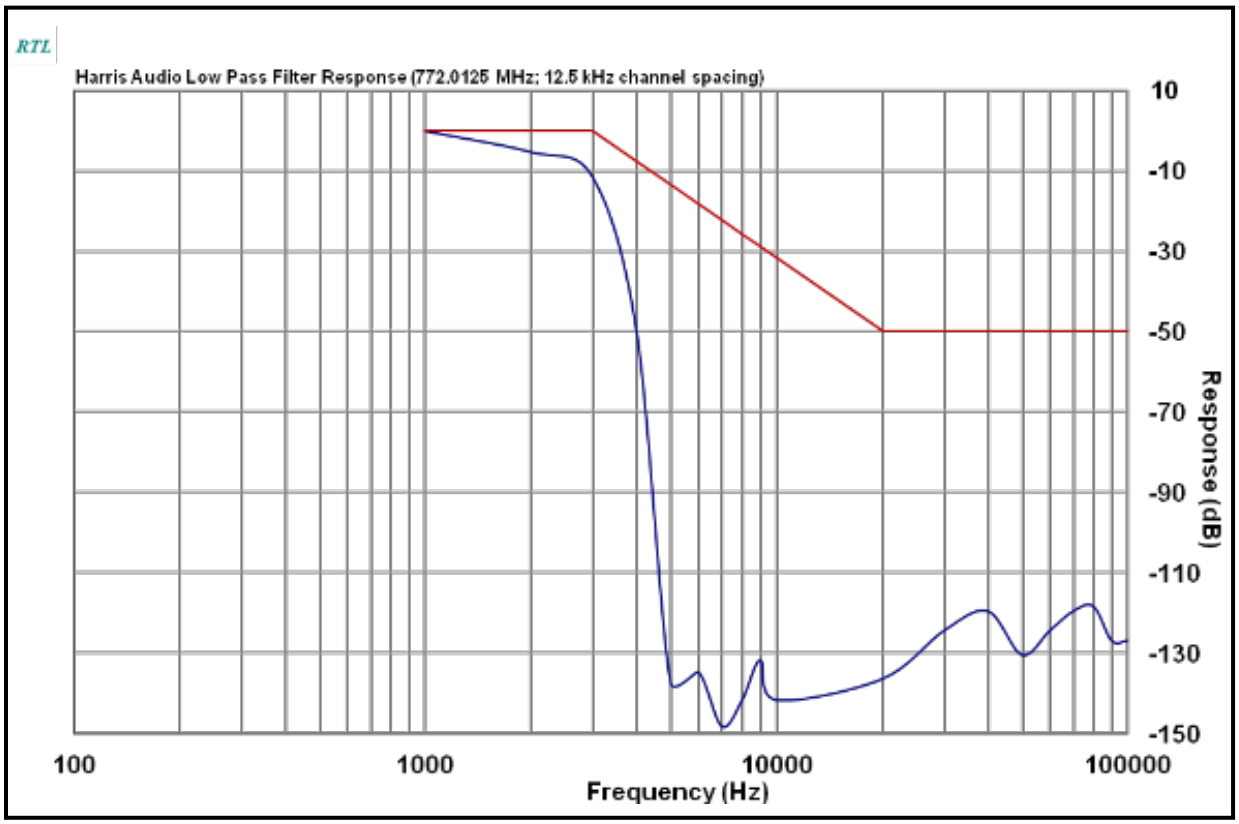


Plot 10-2: Modulation Characteristics - Audio Frequency Response – 856.0125 MHz (NPSPAC)

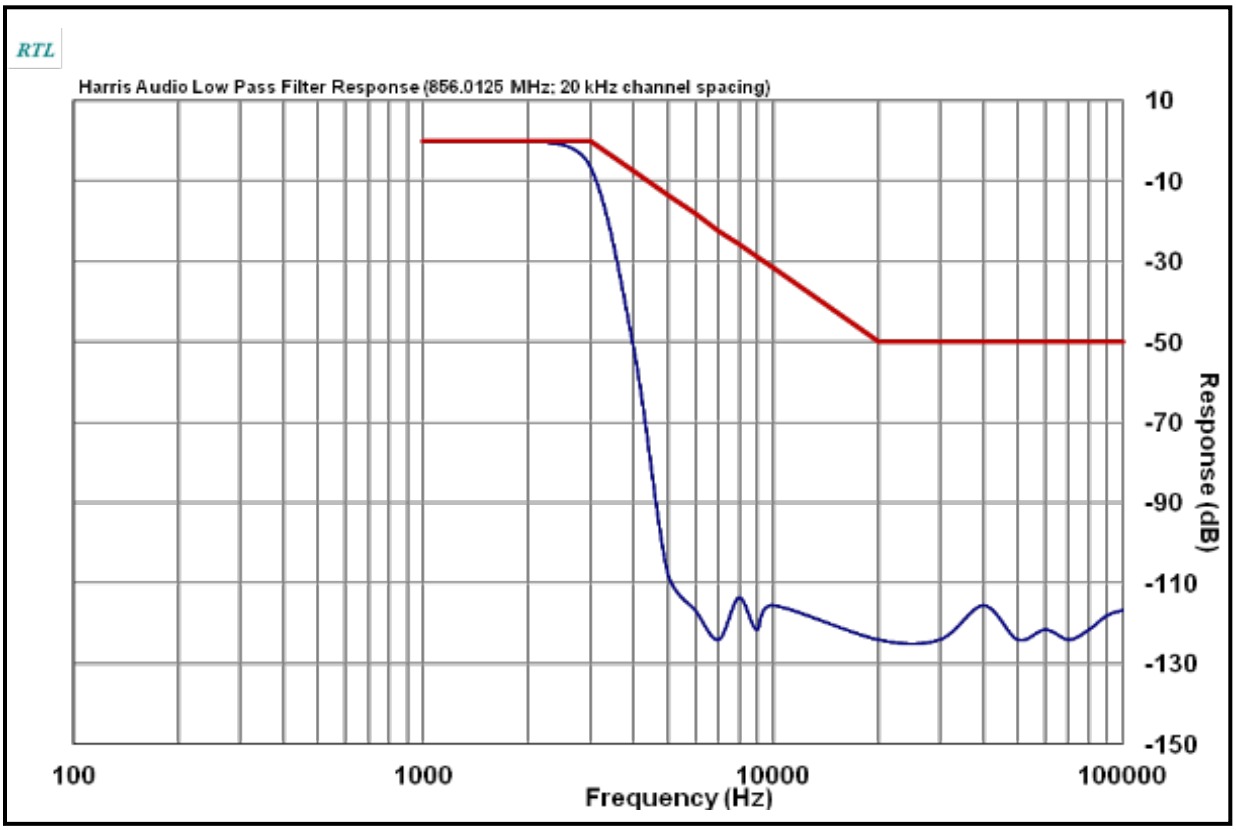


10.2.2 Audio Low Pass Filter Response

Plot 10-3: Modulation Characteristics – Audio Low Pass Filter – 772.0125 MHz (NB)

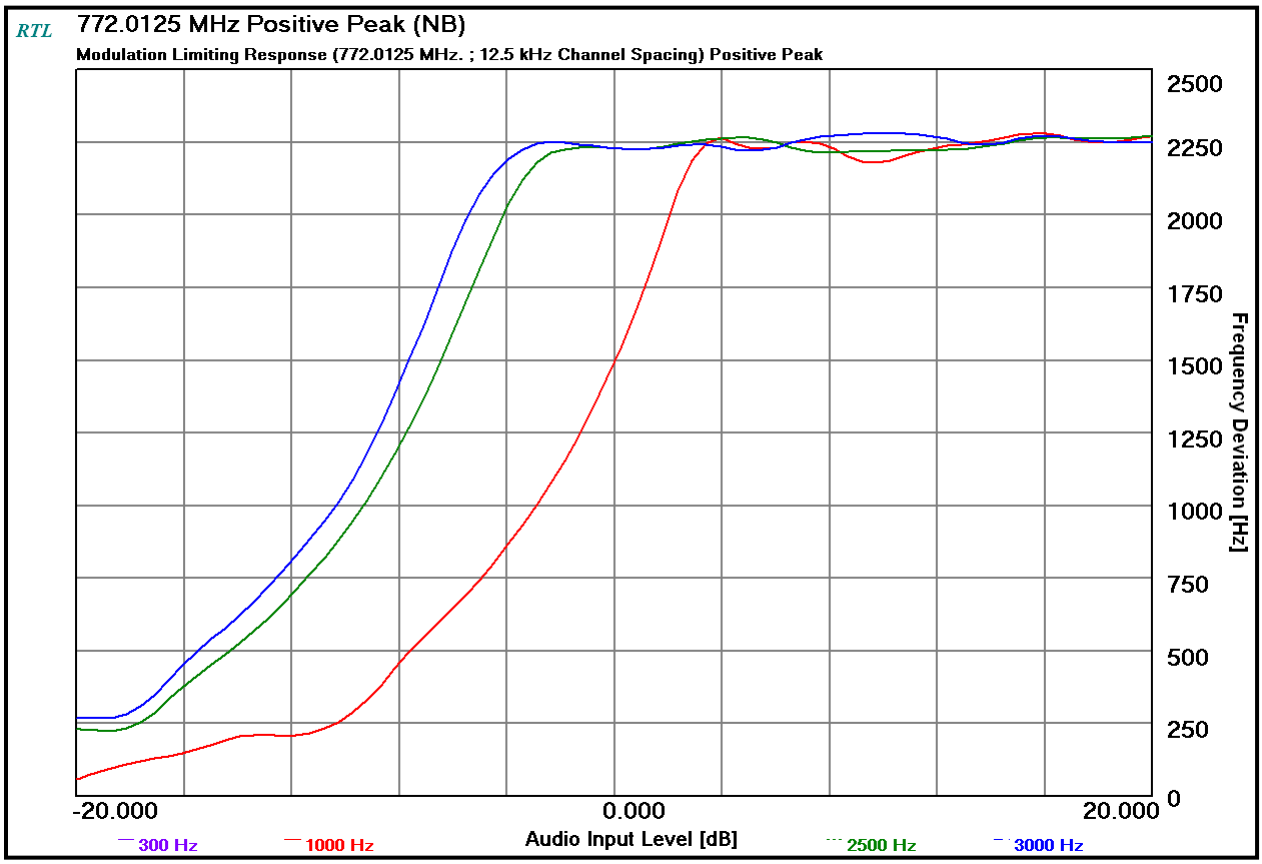


Plot 10-4: Modulation Characteristics – Audio Low Pass Filter – 856.0125 MHz (NPSPAC)

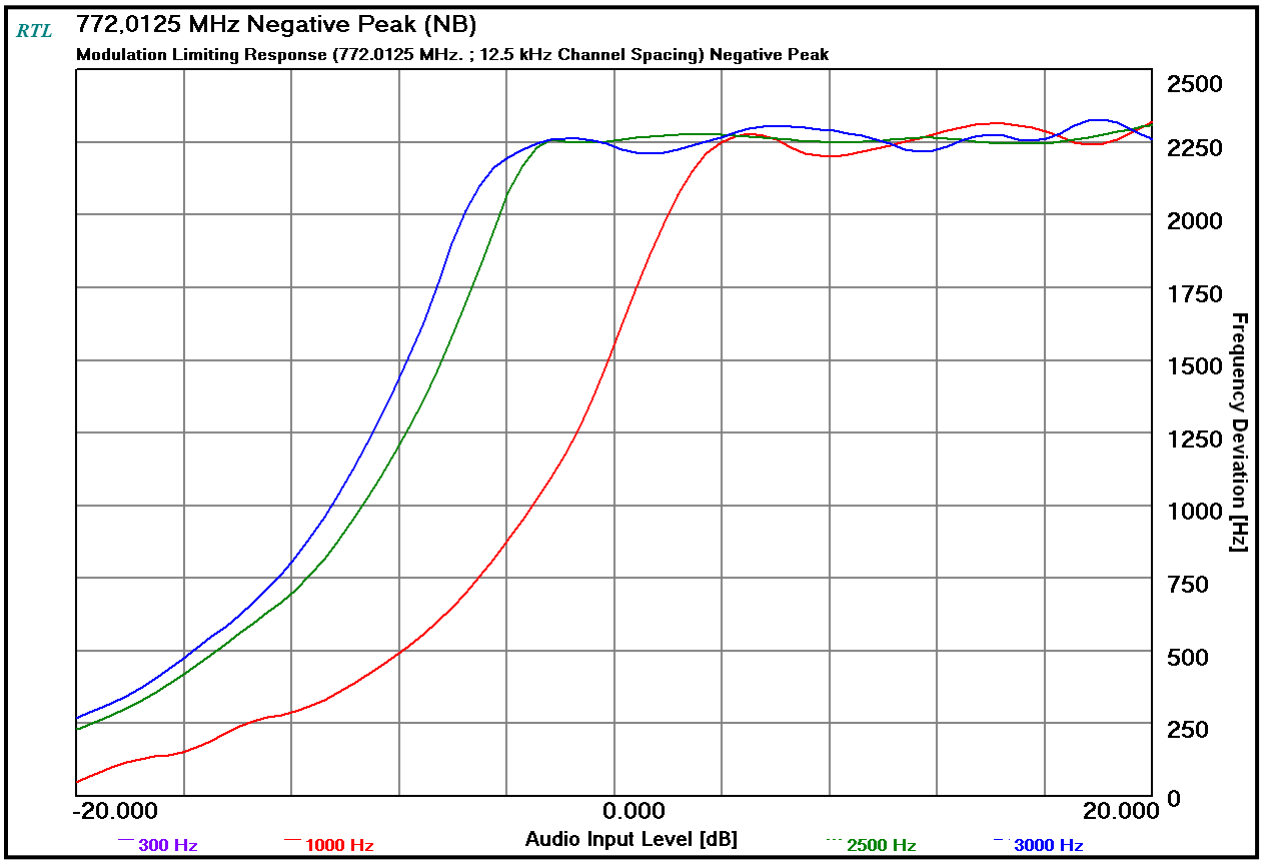


10.2.3 Modulation Limiting

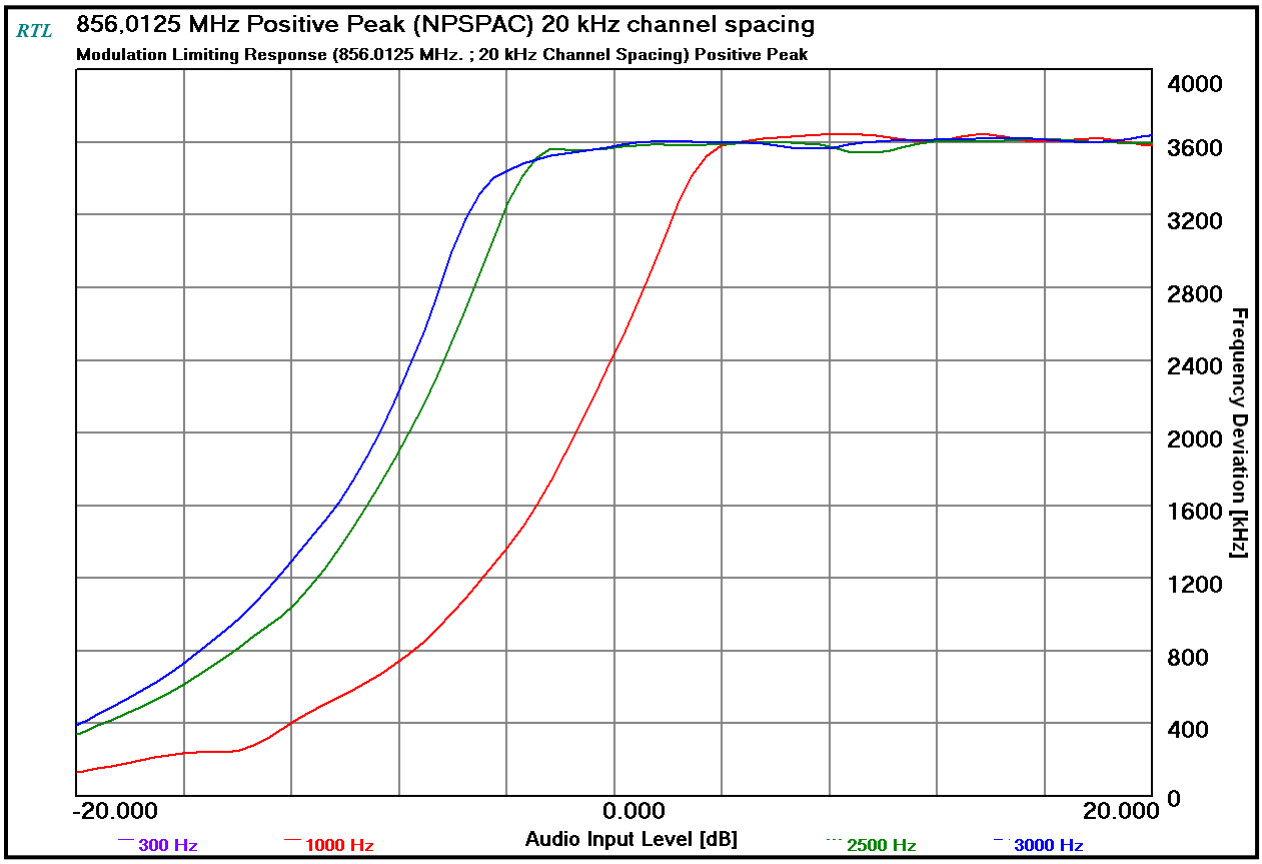
Plot 10-5: Modulation Characteristics – Modulation Limiting – 772.0125 MHz; (NB); Positive Peak



Plot 10-6: Modulation Characteristics – Modulation Limiting - 772.0125 MHz; (NB) Negative Peak



Plot 10-7: Modulation Characteristics – Modulation Limiting – 856.0125 MHz; (NPSPAC); Positive Peak



Plot 10-8: Modulation Characteristics – Modulation Limiting – 856.0125 MHz; (NPSPAC); Negative Peak

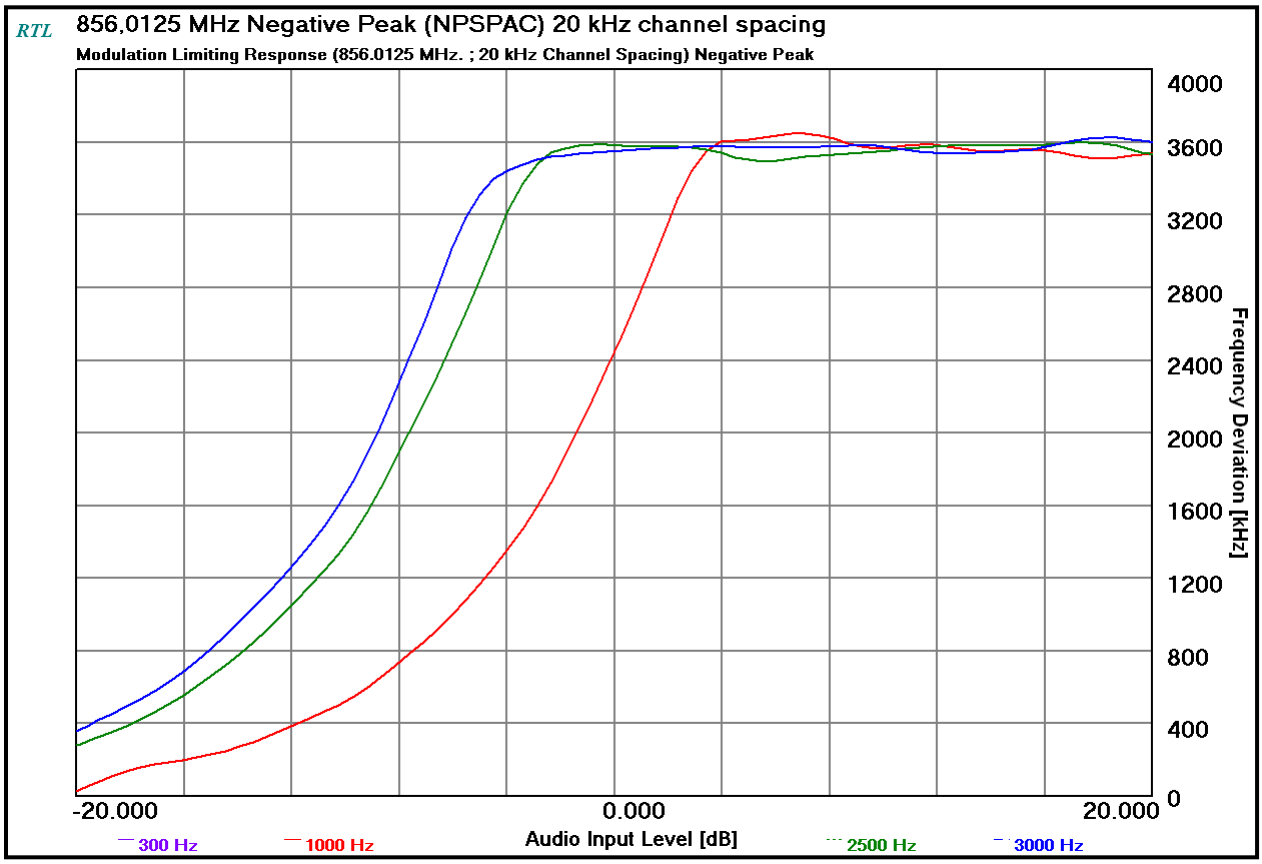


Table 10-1: Test Equipment Used For Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	4/13/17
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	4/14/17
901139	Weinschel Corporation	47-20-34	Attenuator DC-18 GHz 20 dB 100W	BK5859	3/30/18

Test Personnel:

Daniel Baltzell		December 28, 2016
EMC Test Engineer	Signature	Date of Test

11 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

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

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

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

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

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

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

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

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

12 Conclusion

The data in this measurement report shows that the **Harris Corporation XL-185P 7/8 Rebanded C1D2 Portable Land Mobile Radio, FCC ID: OWDTR-0147-E, IC: 3636B-0147**, complies with all the applicable requirements of Parts 2 and 90 of the FCC Rules and Industry Canada RSS-119.