RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & ISED Class 2 Permissive Change Report

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

MASTR V 800 MHz Base Station Transceiver
FCC ID: OWDTR-0158-E
IC: 3636B-0158

September 11, 2018

Standards Referenced for this Report	
Part 2: 2017	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2017	Private Land Portable Radio Services
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
RSS-119 Issue 12	Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz

Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Transmit Mode	Emission Designator
851 - 869	100	0.06	C4FM Data/Voice	8K00F1D/E
851 - 869	100	0.06	WCQPSK	9K70D1W
851 - 869	100	0.06	HDQPSK	9K80D7W
851 - 869	100	0.06	HVD SMR	18K8D1W
851 - 869	100	0.06	HVD NPSPAC	12K5D1W

Report Prepared By: Dan Baltzell

Document Number: 2018097

These test(s) are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 Test Result Summary

Test	FCC Reference	ISED Reference	Result
RF Power Output	2.1046(a), Part 90.205(k), 90.635	RSS-119 5.4 RSS-Gen 6.12	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210	RSS-Gen 6.13	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	RSS-119 5.5, 5.8 RSS-Gen 6.6	Complies

2 General Information

The following Class 2 permissive change 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 MASTR V Base Station; FCC ID: OWDTR-0158-E, IC: 3636B-0158.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47 Parts 2 and 90, and ISED RSS-119. 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)

The original FCC grant and ISED certificate were issued January 5, 2018.

2.3 Change Description

- Parts obsolescence issue with amplifiers in the TX chain
- Addition of HVD Emission Designators for 800 MHz SMR and NPSPAC

All the radio performance and functionality remain the same, including gain levels, TX power and clock frequencies; the approved antennas and all accessories remain the same as well.

2.4 Tested System Details

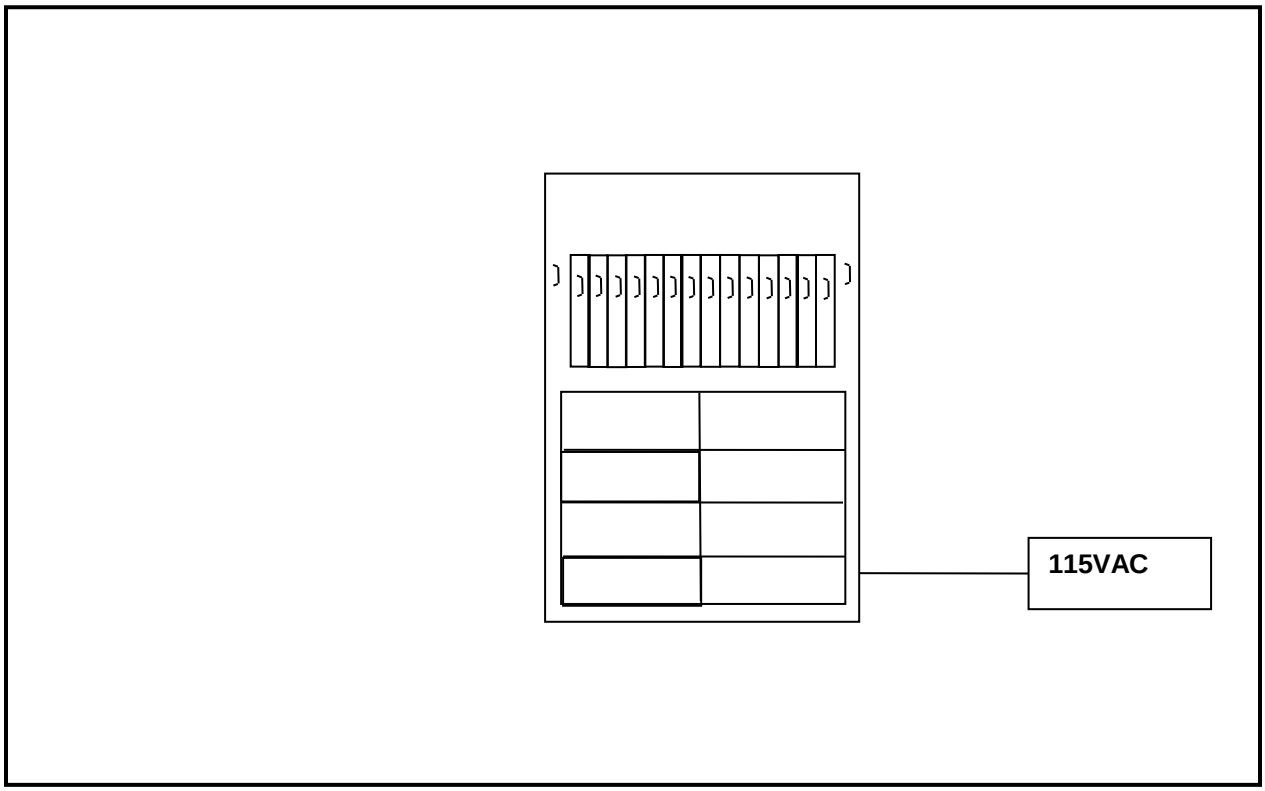
The test sample was received on August 27, 2018. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

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

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	FCC ID	RTL Bar Code
MASTR V Base Station, P25T, 800 MHz, 799-817 MHz RX	Harris Corporation	MASV-800M1-A	OWDTR-0158-E	22517
MASTR V Base Station, P25C, 800 MHz, 799-817 MHz RX	Harris Corporation	SV-8CXMV-A	OWDTR-0158-E	22517
MASTR V Base Station, P25T, 800 MHz, 806-824 MHz RX	Harris Corporation	MASV-STXMV-A	OWDTR-0158-E	22517
MASTR V Base Station, P25C, 800 MHz, 806-824 MHz RX	Harris Corporation	SV-SCXMV-A	OWDTR-0158-E	22517

Figure 2-1: Configuration of Tested System



3 FCC Part 2.1046(a): RF Power Output: Conducted; Part 90.205(k) Power and Antenna Height Limits; Part 90.635 Limitations on Power and Antenna Height; RSS-119 5.4 and RSS-Gen 6.12: Transmitter Output Power

3.1 Test Procedure

ANSI 63.26, section 5.2

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

Manufacturer's rated power: 100 W

3.2 Test Data

Table 3-1: RF Conducted Output Power – Measured

Frequency (MHz)	Low Power (dBm)	Low Power (W)	High Power (dBm)	High Power (W)
851.0125	40.1	10.3	50.1	102.7
860.0125	40.0	10.3	50.0	100.2
865.3375	40.0	10.0	50.0	100.7
868.9875	40.0	10.1	50.1	103.0

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

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

Table 3-2: 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	4/26/21
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/10/19
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	8/7/19
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/20/19
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/19

Test Personnel:

Daniel W. Baltzell		August 31, 2018
EMC Test Engineer	Signature	Date of Test

4 FCC Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations; RSS-Gen 6.13: Transmitter Unwanted Emissions

4.1 Test Procedure

ANSI 63.26, section 5.2

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.

4.2 Test Data

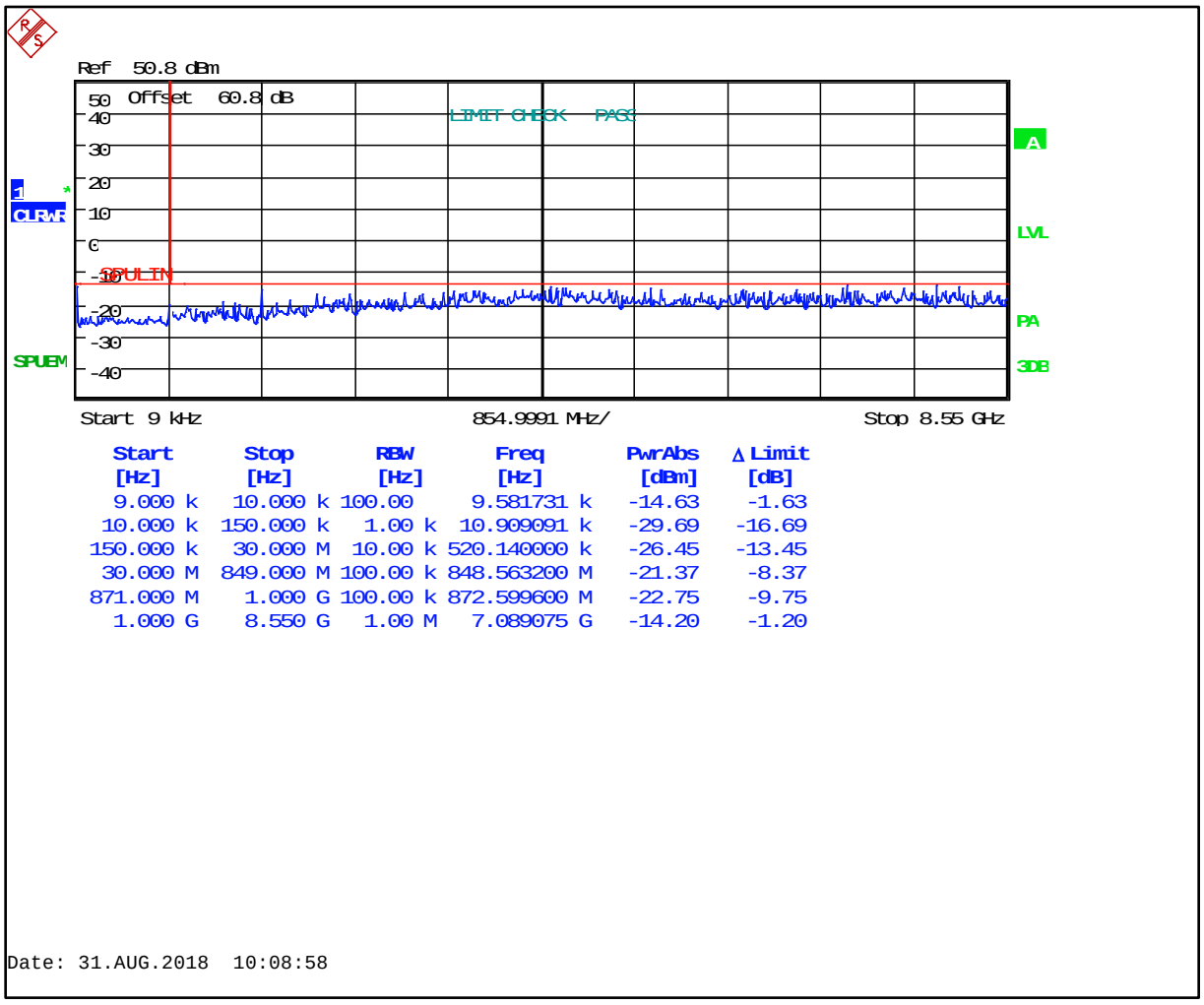
Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

Limits: 50 + 10 LOG P(W)) narrowband limit

The following frequencies (in MHz) were investigated: 851.0125, 860.0125, 865.3375 and 868.9875.

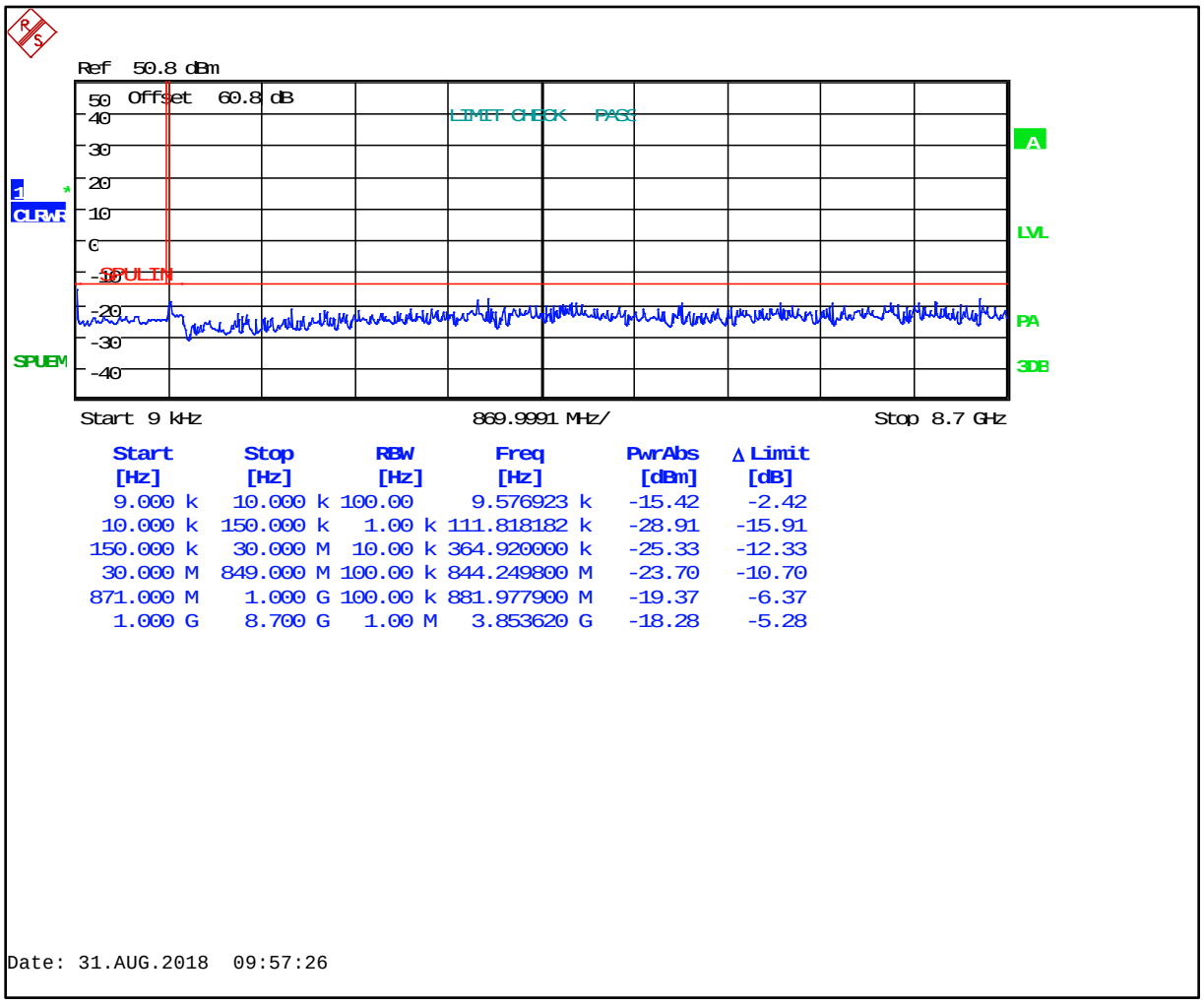
All modes were investigated; 868.9875 MHz is presented as worst case.

Plot 4-1: Conducted Antenna Spurious Emissions – 851.0125 MHz; HVD SMR



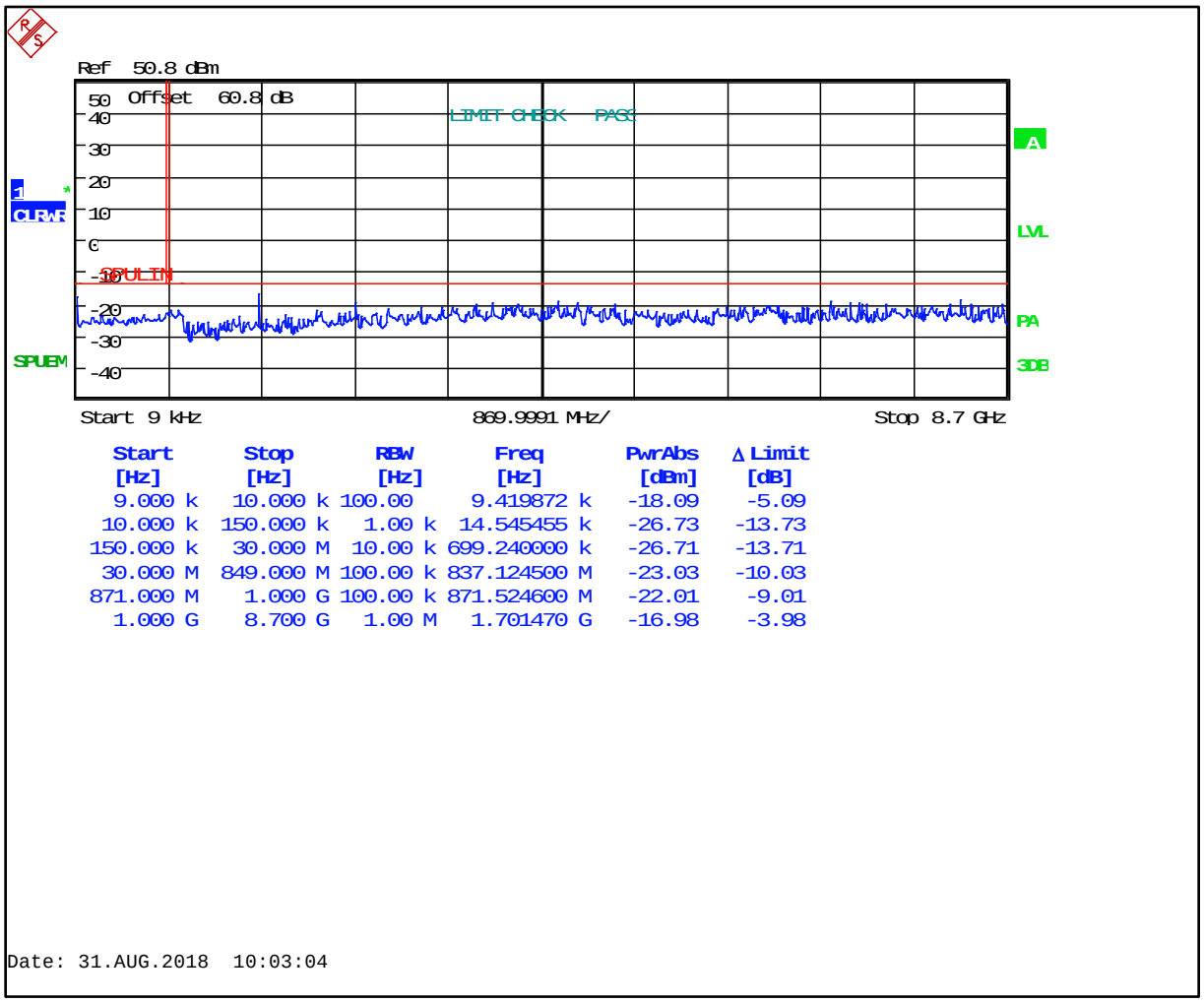
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	10.000 k	100.00	9.581731 k	-14.63	-1.63
10.000 k	150.000 k	1.00 k	10.909091 k	-29.69	-16.69
150.000 k	30.000 M	10.00 k	520.140000 k	-26.45	-13.45
30.000 M	849.000 M	100.00 k	848.563200 M	-21.37	-8.37
871.000 M	1.000 G	100.00 k	872.599600 M	-22.75	-9.75
1.000 G	8.550 G	1.00 M	7.089075 G	-14.20	-1.20

Plot 4-2: Conducted Antenna Spurious Emissions – 868.9875 MHz; HVD SMR



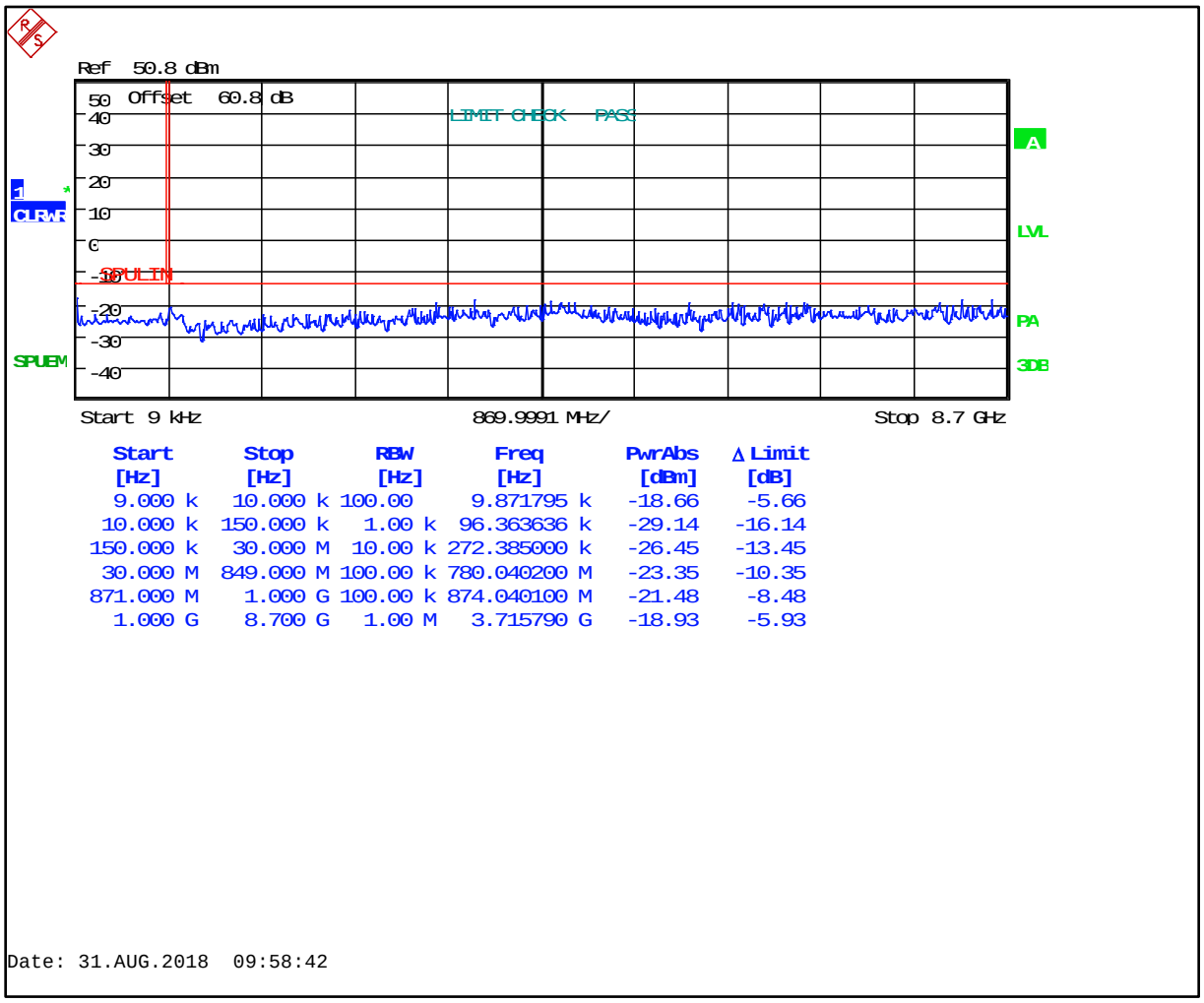
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	10.000 k	100.00	9.576923 k	-15.42	-2.42
10.000 k	150.000 k	1.00 k	111.818182 k	-28.91	-15.91
150.000 k	30.000 M	10.00 k	364.920000 k	-25.33	-12.33
30.000 M	849.000 M	100.00 k	844.249800 M	-23.70	-10.70
871.000 M	1.000 G	100.00 k	881.977900 M	-19.37	-6.37
1.000 G	8.700 G	1.00 M	3.853620 G	-18.28	-5.28

Plot 4-3: Conducted Antenna Spurious Emissions – 851.0125 MHz; HVD NPSPAC



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	10.000 k	100.00	9.419872 k	-18.09	-5.09
10.000 k	150.000 k	1.00 k	14.545455 k	-26.73	-13.73
150.000 k	30.000 M	10.00 k	699.240000 k	-26.71	-13.71
30.000 M	849.000 M	100.00 k	837.124500 M	-23.03	-10.03
871.000 M	1.000 G	100.00 k	871.524600 M	-22.01	-9.01
1.000 G	8.700 G	1.00 M	1.701470 G	-16.98	-3.98

Plot 4-4: Conducted Antenna Spurious Emissions – 868.9875 MHz; HVD NPSPAC



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	10.000 k	100.00	9.871795 k	-18.66	-5.66
10.000 k	150.000 k	1.00 k	96.363636 k	-29.14	-16.14
150.000 k	30.000 M	10.00 k	272.385000 k	-26.45	-13.45
30.000 M	849.000 M	100.00 k	780.040200 M	-23.35	-10.35
871.000 M	1.000 G	100.00 k	874.040100 M	-21.48	-8.48
1.000 G	8.700 G	1.00 M	3.715790 G	-18.93	-5.93

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

Table 4-1: Test Equipment Used For Testing Antenna Port Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	4/26/21
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/10/19
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	8/7/19
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36”	NA	8/20/19
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/19

Test Personnel:

Daniel W. Baltzell		August 31, 2018
EMC Test Engineer	Signature	Date of Test

5 FCC Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210: Emission Masks; RSS-119 5.5: Channel Bandwidth, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks; RSS-119 5.8: Transmitter Unwanted Emissions; RSS-Gen 6.6: Occupied Bandwidth

Occupied Bandwidth - Compliance with the Emission Masks

5.1 Test Procedure

ANSI 63.26, section 5.4.

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

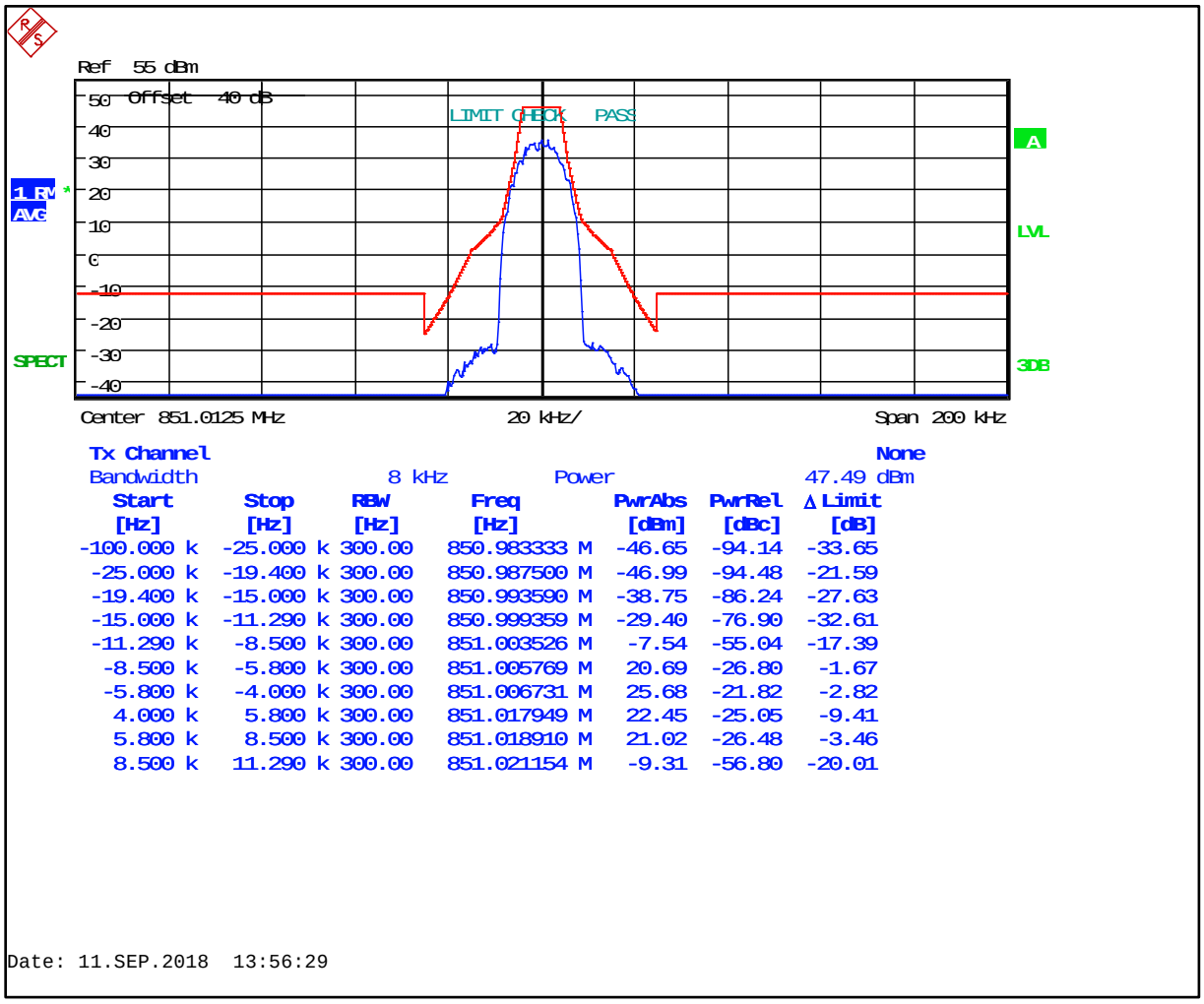
Part 90.210 Authorized Bandwidth

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

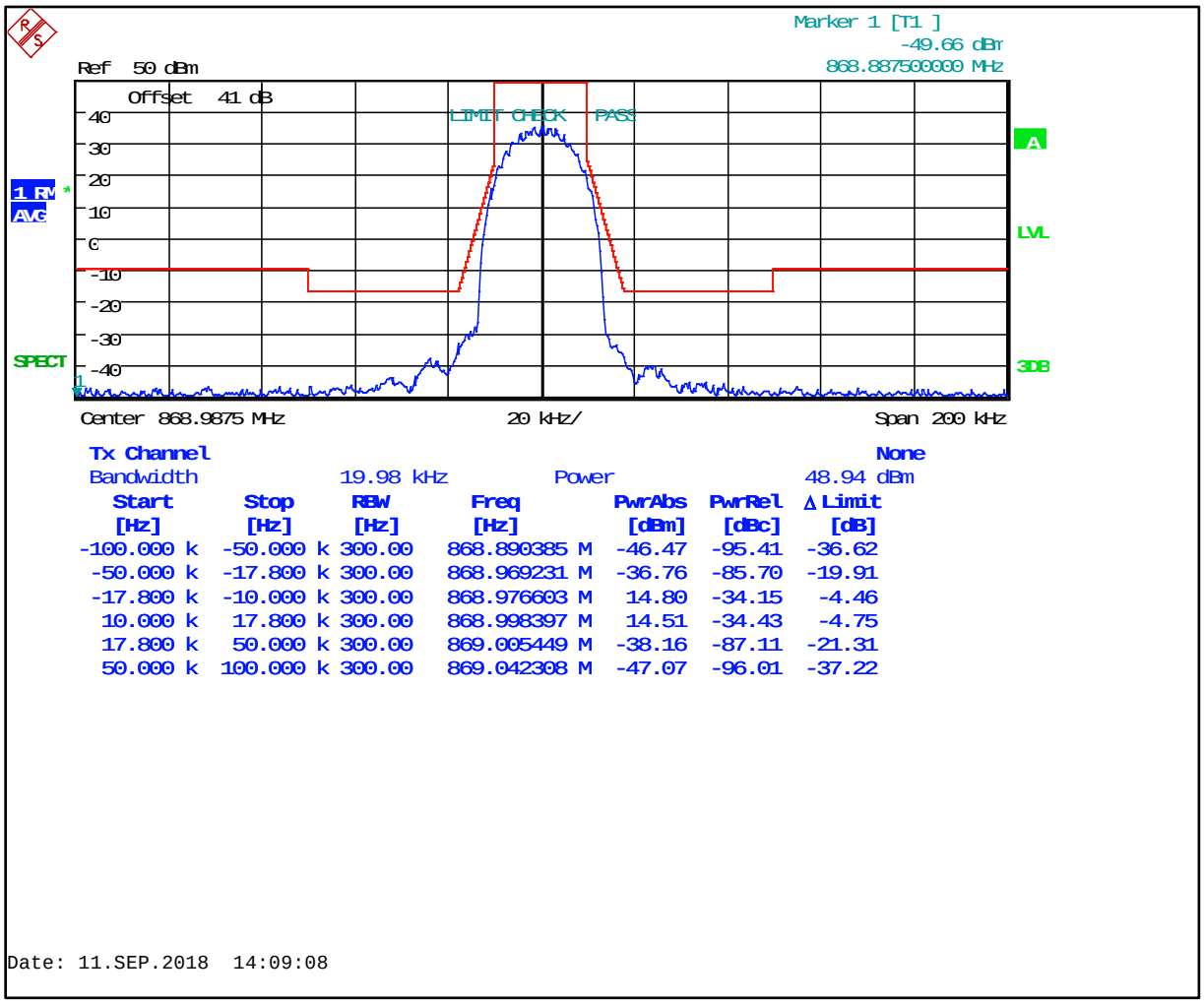
[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask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

5.2 Test Data

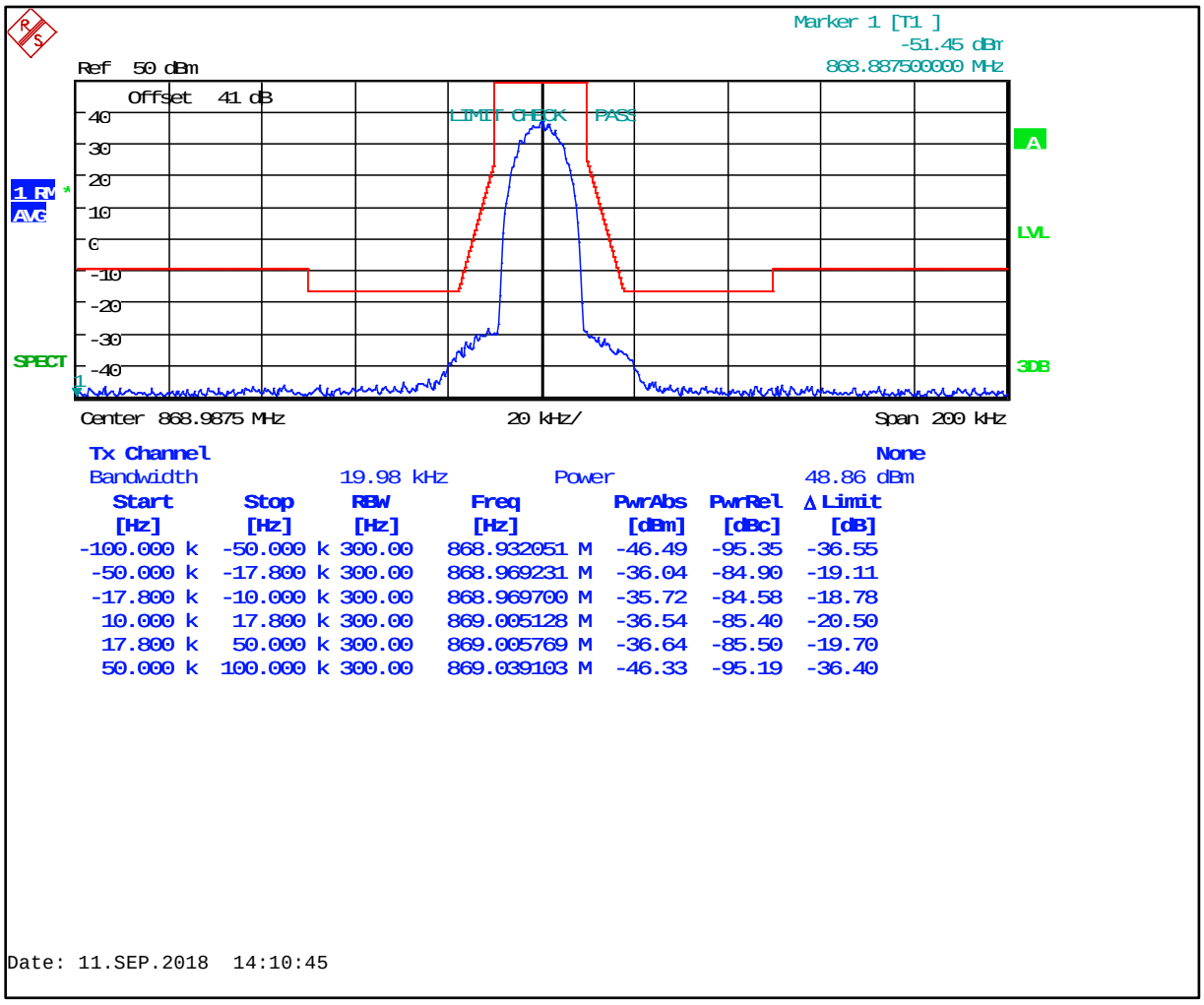
Plot 5-1: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; Mask H



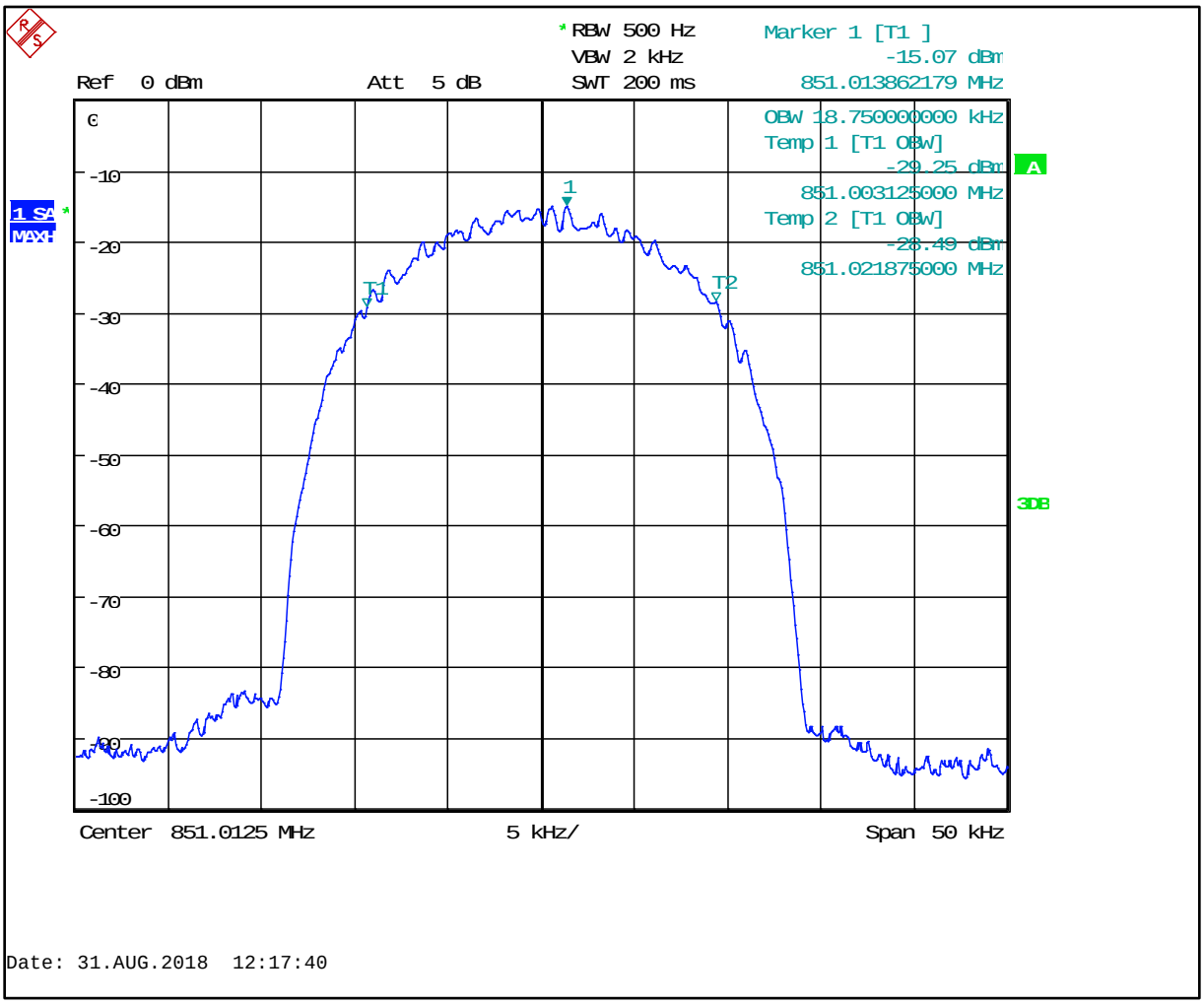
Plot 5-2: Occupied Bandwidth – 868.9875 MHz; HVD SMR; Mask G



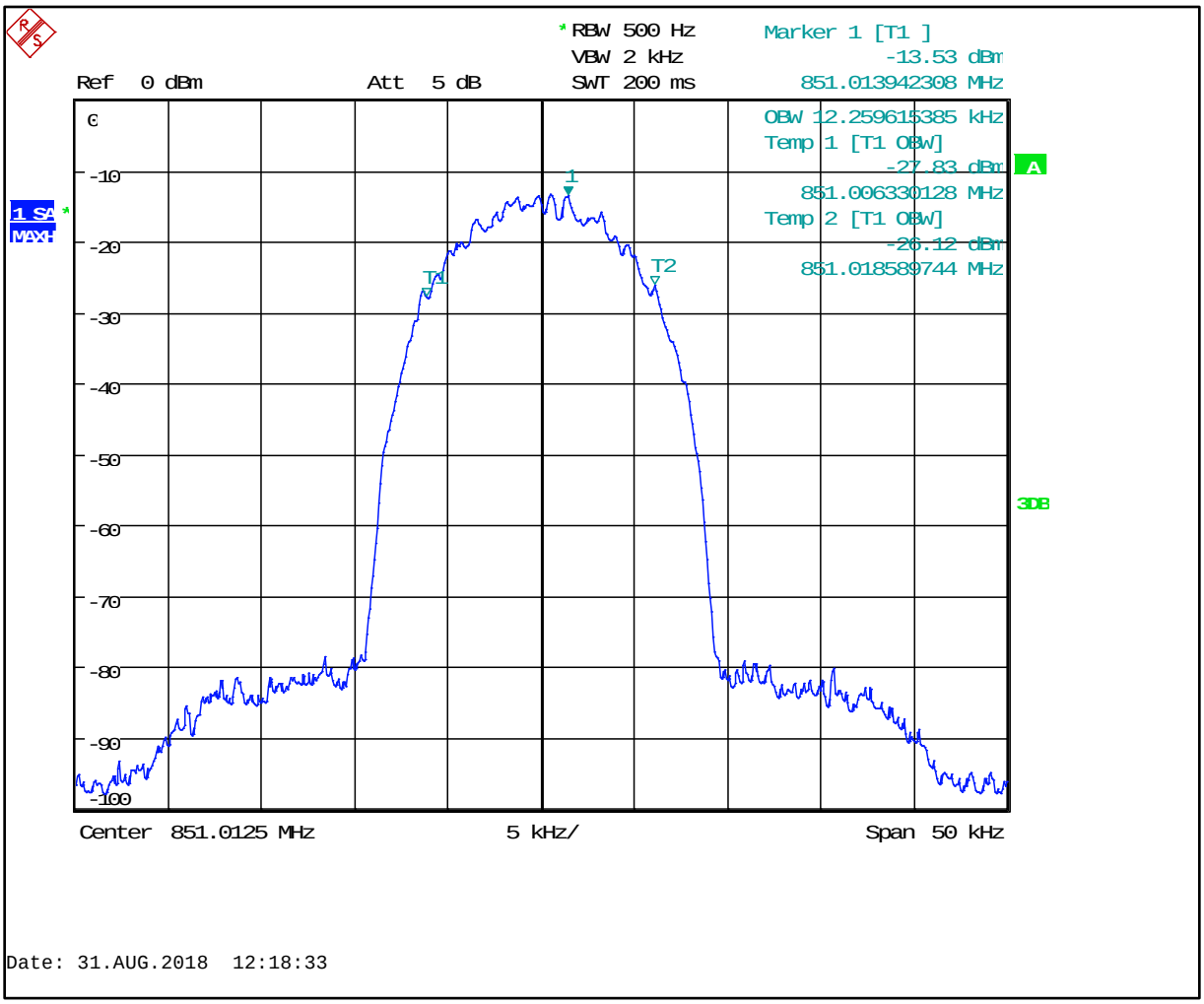
Plot 5-3: Occupied Bandwidth – 868.9875 MHz; HVD NPSPAC; Mask G



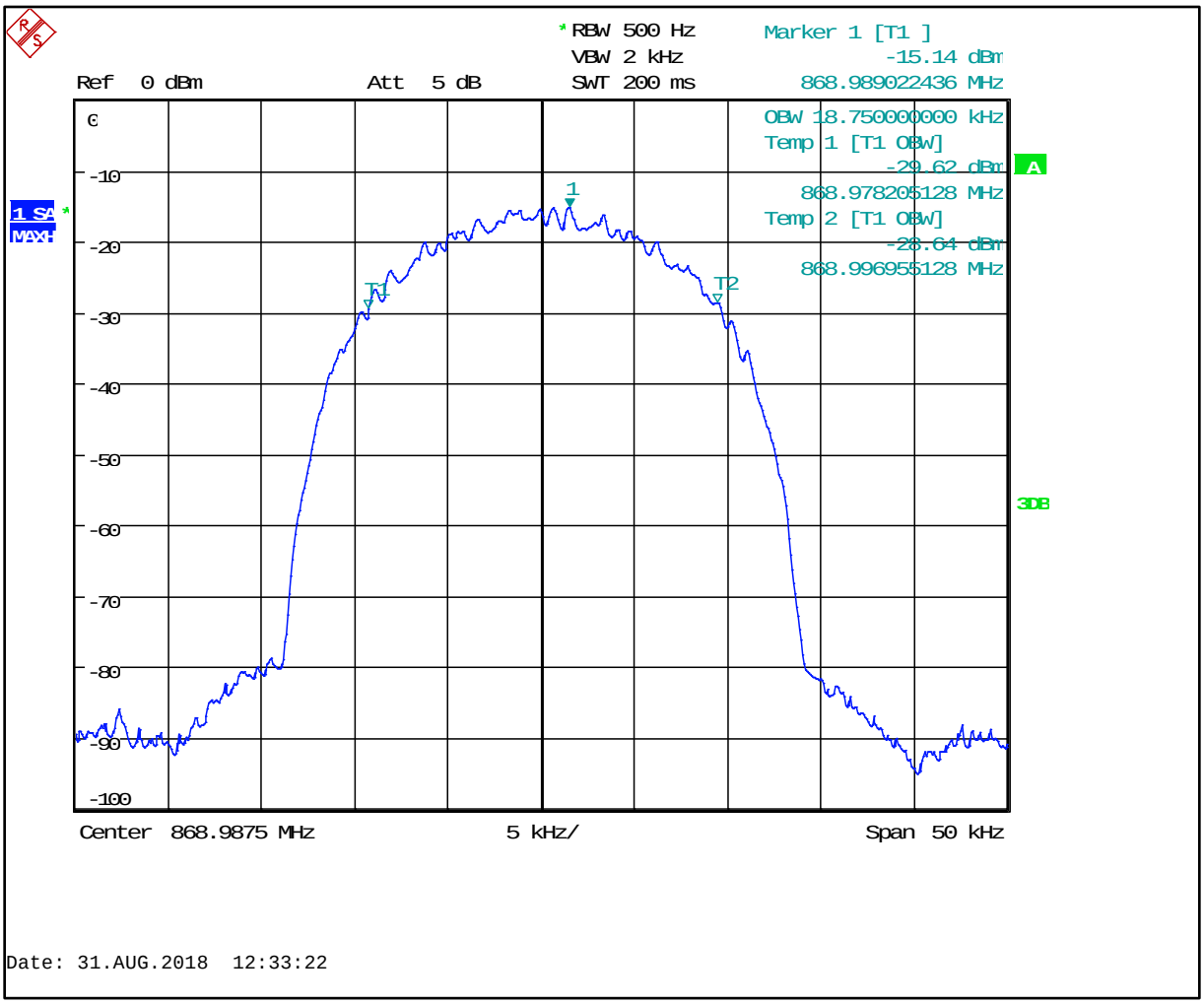
Plot 5-4: Occupied Bandwidth – 851.0125 MHz; HVD SMR; 99% BW



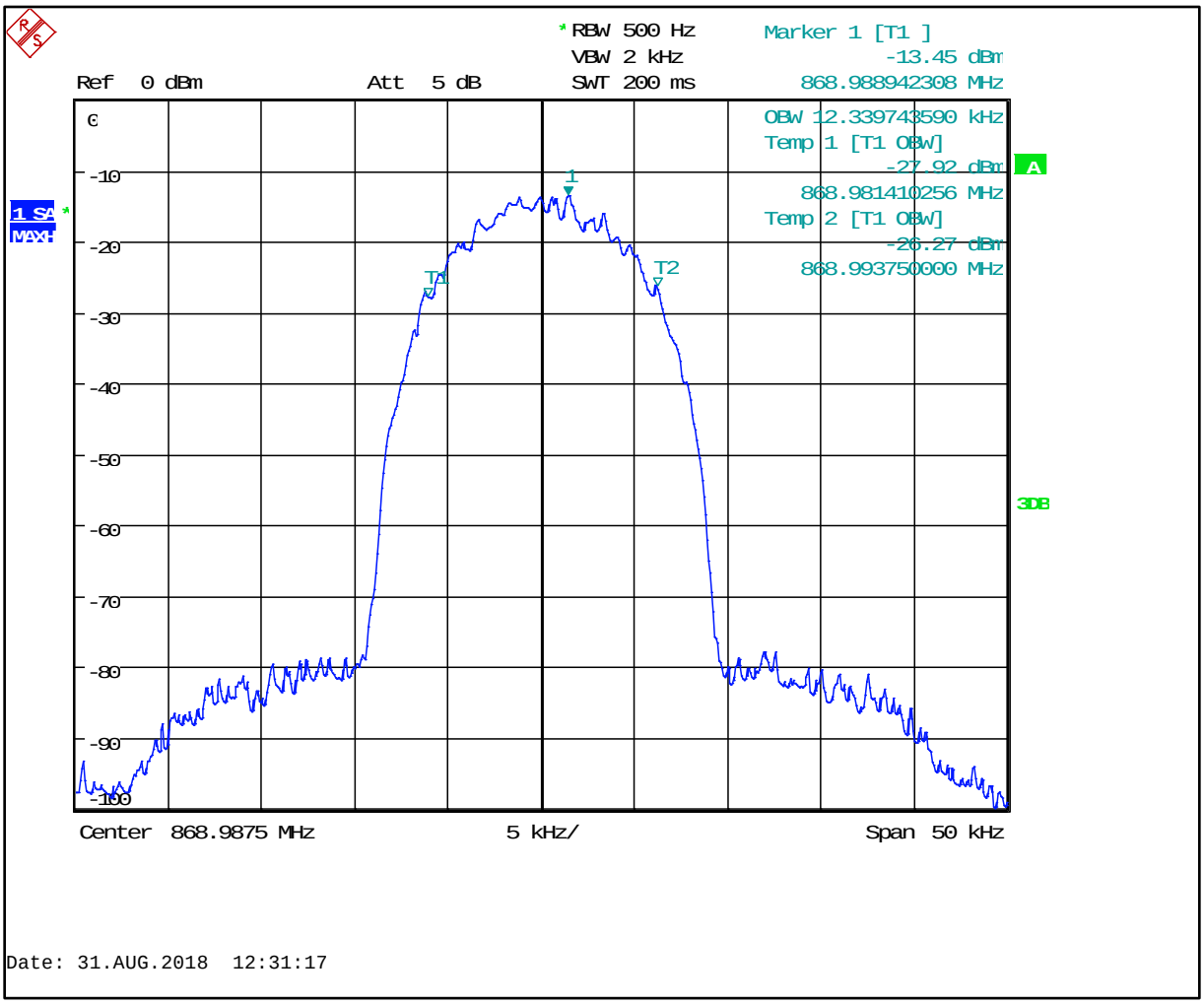
Plot 5-5: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; 99% BW



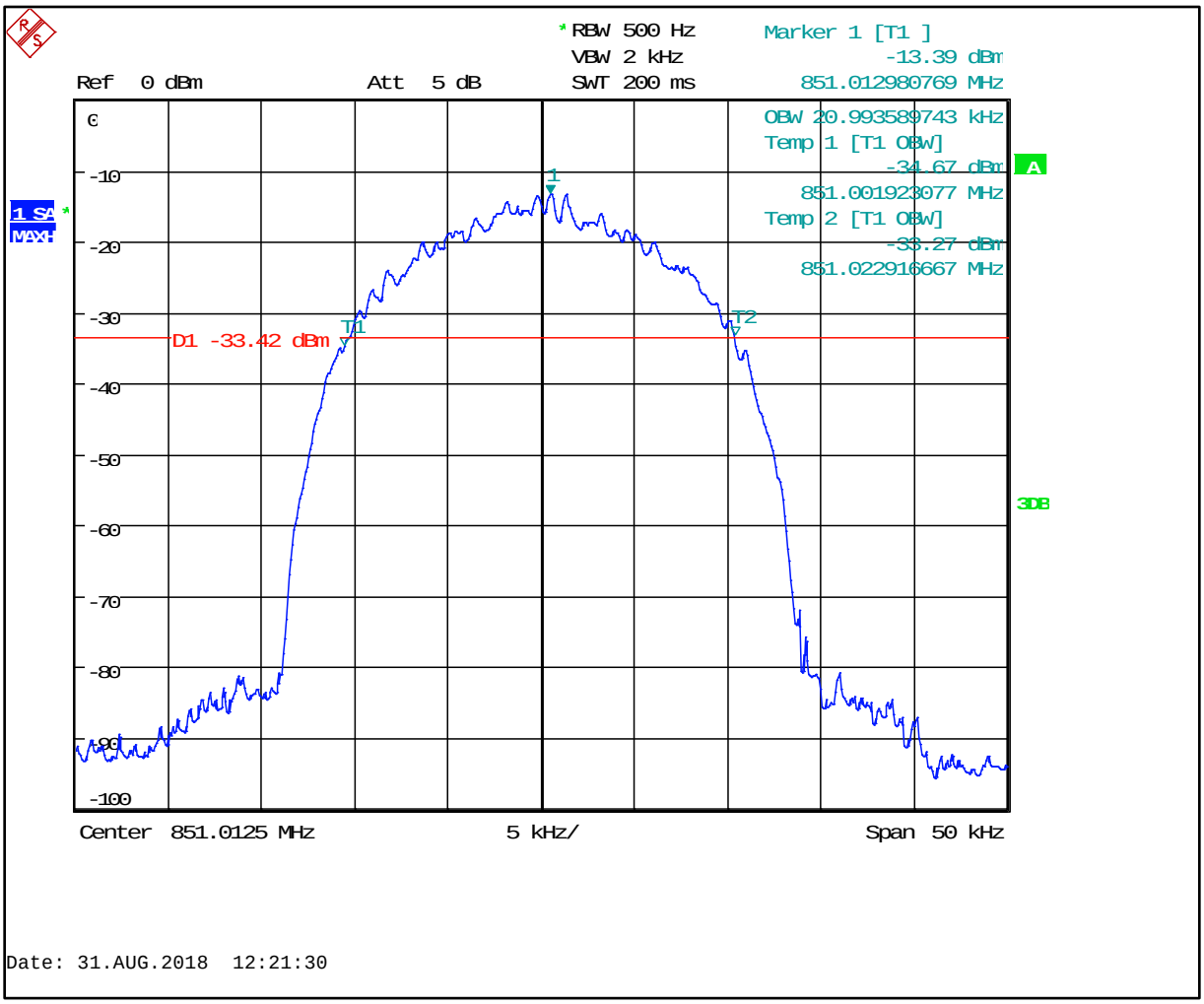
Plot 5-6: Occupied Bandwidth – 868.9875 MHz; HVD SMR 99% BW



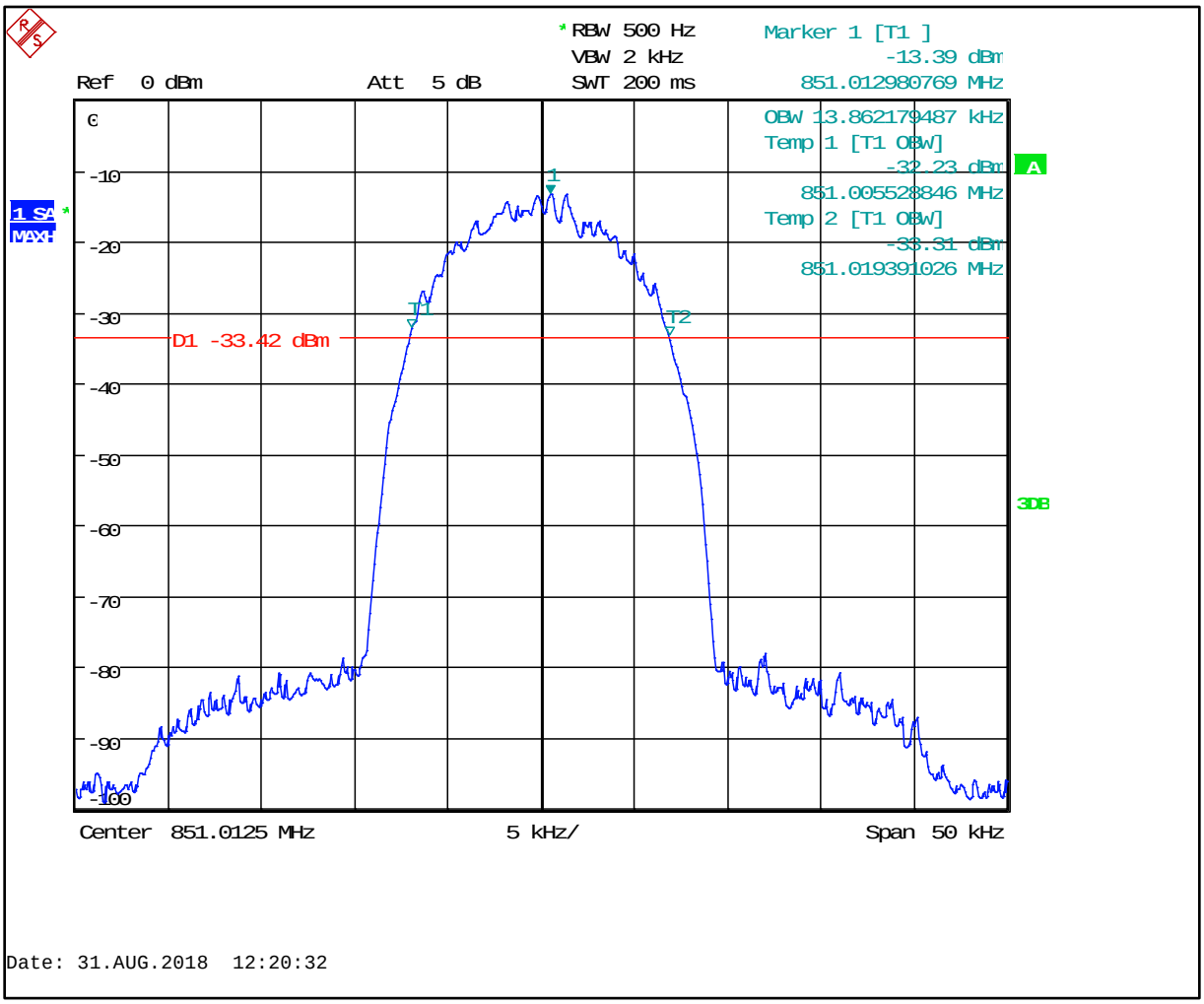
Plot 5-7: Occupied Bandwidth – 868.9875 MHz; HVD NPSPAC; 99% BW



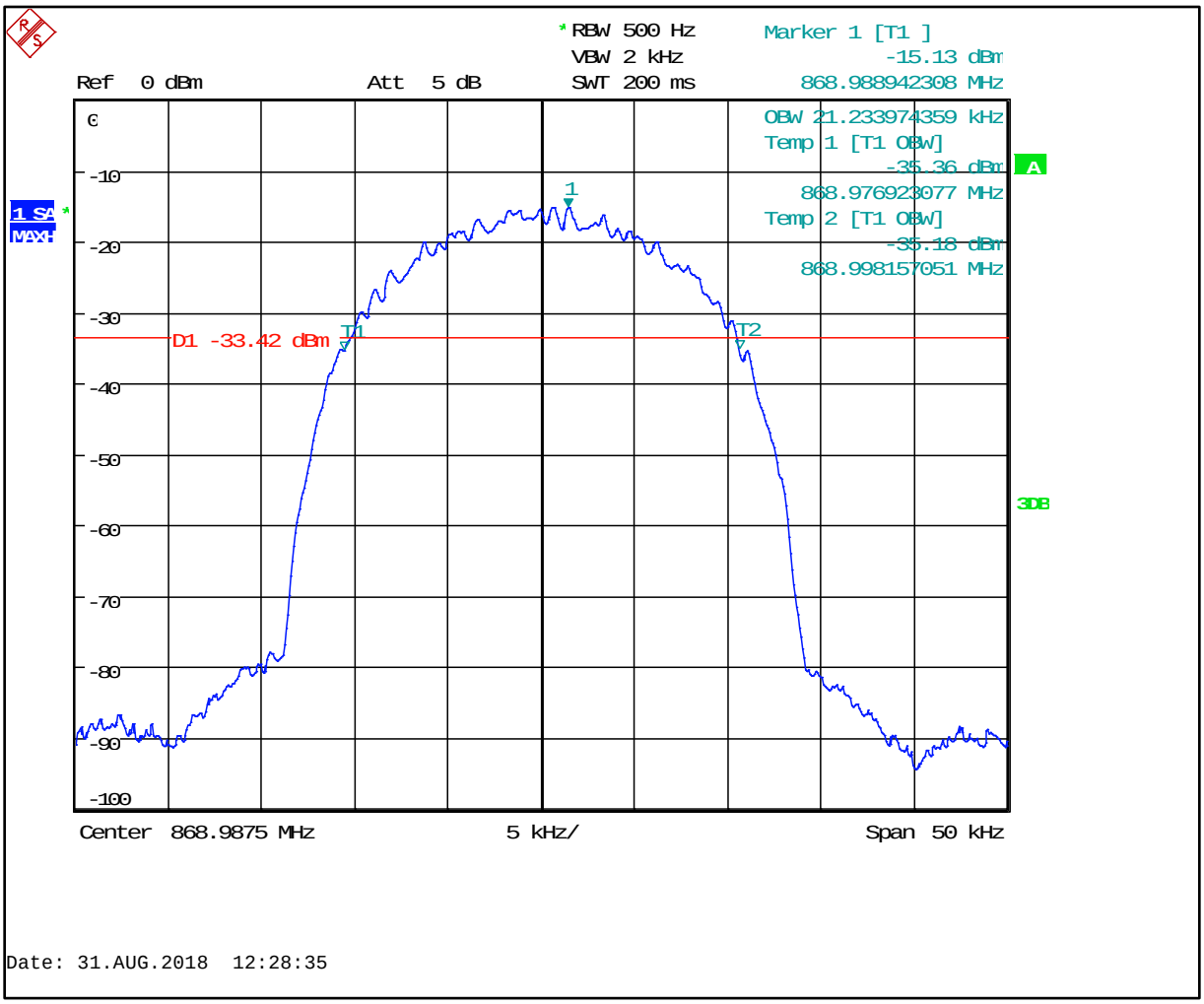
Plot 5-8: Occupied Bandwidth – 851.0125 MHz; HVD SMR; 20 dB BW



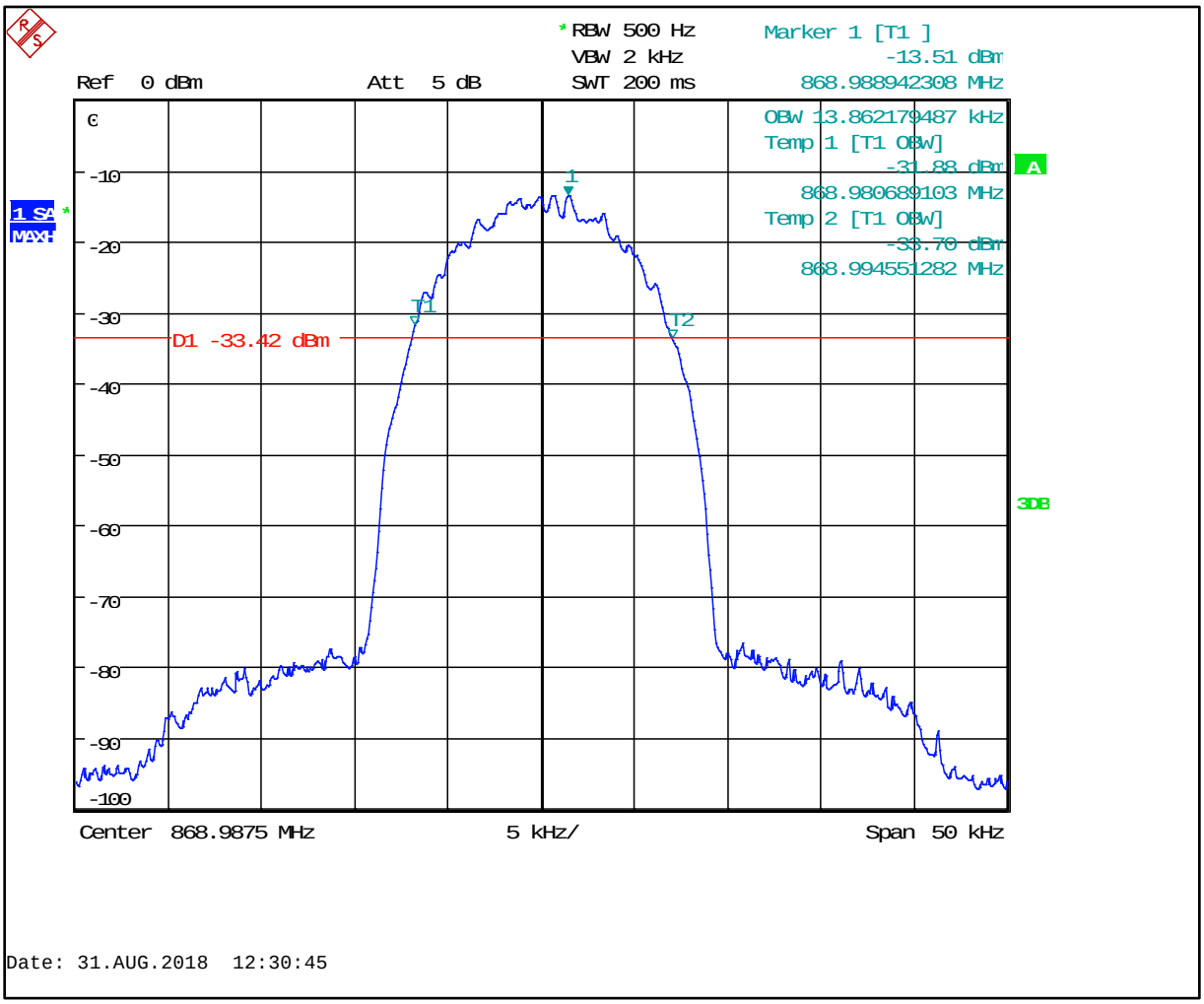
Plot 5-9: Occupied Bandwidth – 851.0125 MHz; HVD NPSPAC; 20 dB BW



Plot 5-10: Occupied Bandwidth – 868.9875 MHz; HVD SMR; 20 dB BW



Plot 5-11: Occupied Bandwidth – 868.9875 MHz; HVD NPSPAC; 20 dB BW



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

Table 5-1: 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	4/26/21
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/10/19
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	8/7/19
901727	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36”	NA	8/20/19
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/19

Test Personnel:

Daniel W. Baltzell		August 31 & September 11, 2018
EMC Test Engineer	Signature	Dates of Test

6 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

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

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

7 Conclusion

The data in this measurement report shows that the Harris Corporation MASTR V 800 MHz Base Station; FCC ID: OWDTR-0158-E, IC: 3636B-0158, complies with the applicable requirements of Parts 2 and 90 of the FCC Rules and ISED RSS-119 for a Class 2 permissive change.