FCC & ISED Class 2 Permissive Change Report

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

MASTR V 700 MHz Base Station Transceiver
FCC ID: OWDTR-0159-E
IC: 3636B-0159

November 26, 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
RSS-119 Issue 12	Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz
RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Transmit Mode	Emission Designator
769 – 775 (FCC) 768 – 776 (ISED)	100	0.04	C4FM Data/Voice	8K00F1D/E
769 – 775 (FCC) 768 – 776 (ISED)	100	0.04	WCQPSK	9K70D1W
769 – 775 (FCC) 768 – 776 (ISED)	100	0.04	HDQPSK	9K80D7W
769 – 775 (FCC) 768 – 776 (ISED)	100	0.04	HVD SMR	18K8D1W
769 – 775 (FCC) 768 – 776 (ISED)	100	0.04	HVD NPSPAC	12K5D1W

Report Prepared By: Daniel W. Baltzell

Document Number: 2018229

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), 90.541	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), 90.543(a)	RSS-119 5.8.9 RSS-Gen 6.6	Complies

Note: As this is a combined FCC and ISED test report, there is test data between 768 – 769 MHz and 775 – 776 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.

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 Innovation, Science and Economic Development Canada Rules and Regulations. The Equipment Under Test (EUT) was the MASTR V Base Station; FCC ID: OWDTR-0159-E, IC: 3636B-0159.

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 and RSS-Gen. 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 April 5, 2018.

2.3 Change Description

1. Parts obsolescence of amplifiers in the TX chain
2. Addition of HVD SMR Emission Designator for 700 MHz 25 kHz channel
3. Addition of HVD NPSPAC Emission Designator for 700 MHz 25 kHz channel

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

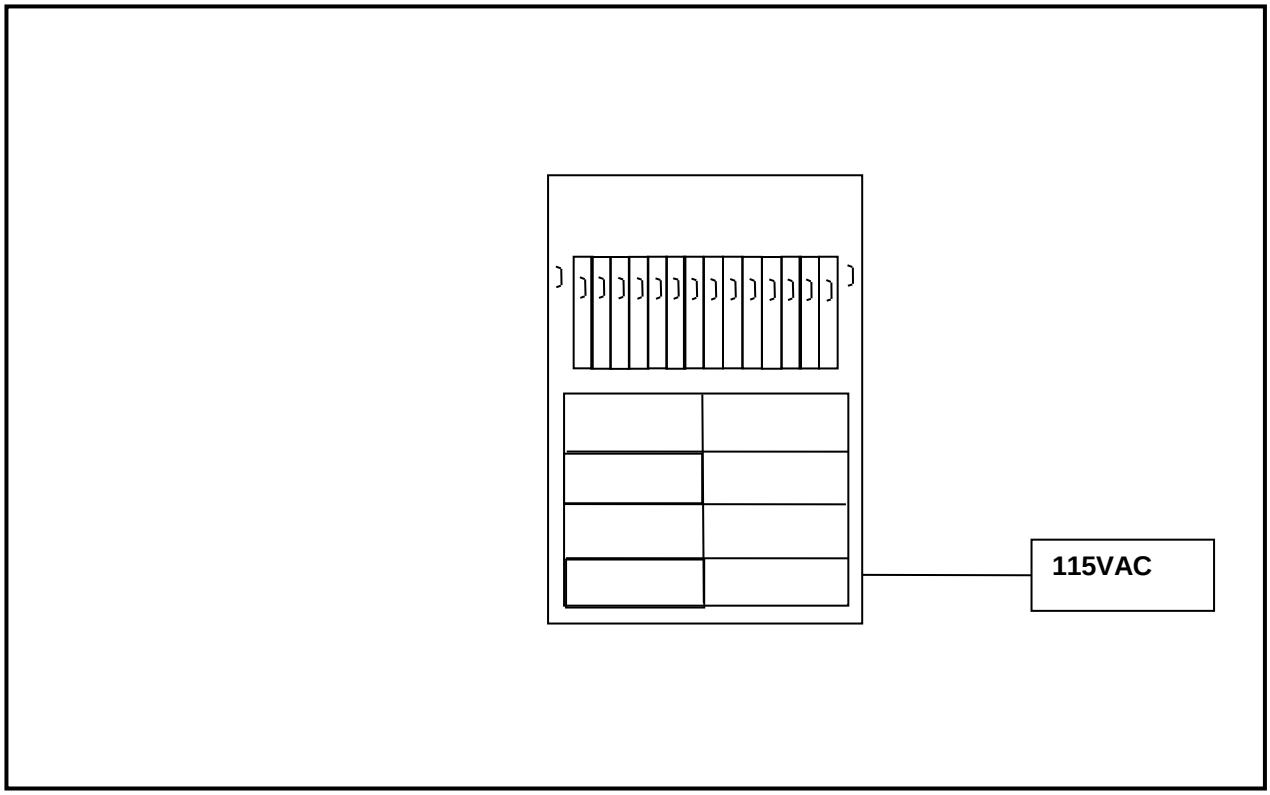
The test sample was received on November 13, 2018. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

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, 700 MHz	Harris Corporation	MASV-700M1-A	OWDTR-0159-E	22517
MASTR V Base Station, P25C, 700 MHz	Harris Corporation	SV-7CXMV-A	OWDTR-0159-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; 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)
768.0125	40.1	10.1	50.2	103.8
773.5125	40.1	10.3	50.3	106.2
775.9875	40.1	10.1	50.2	105.7

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		November 13, 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

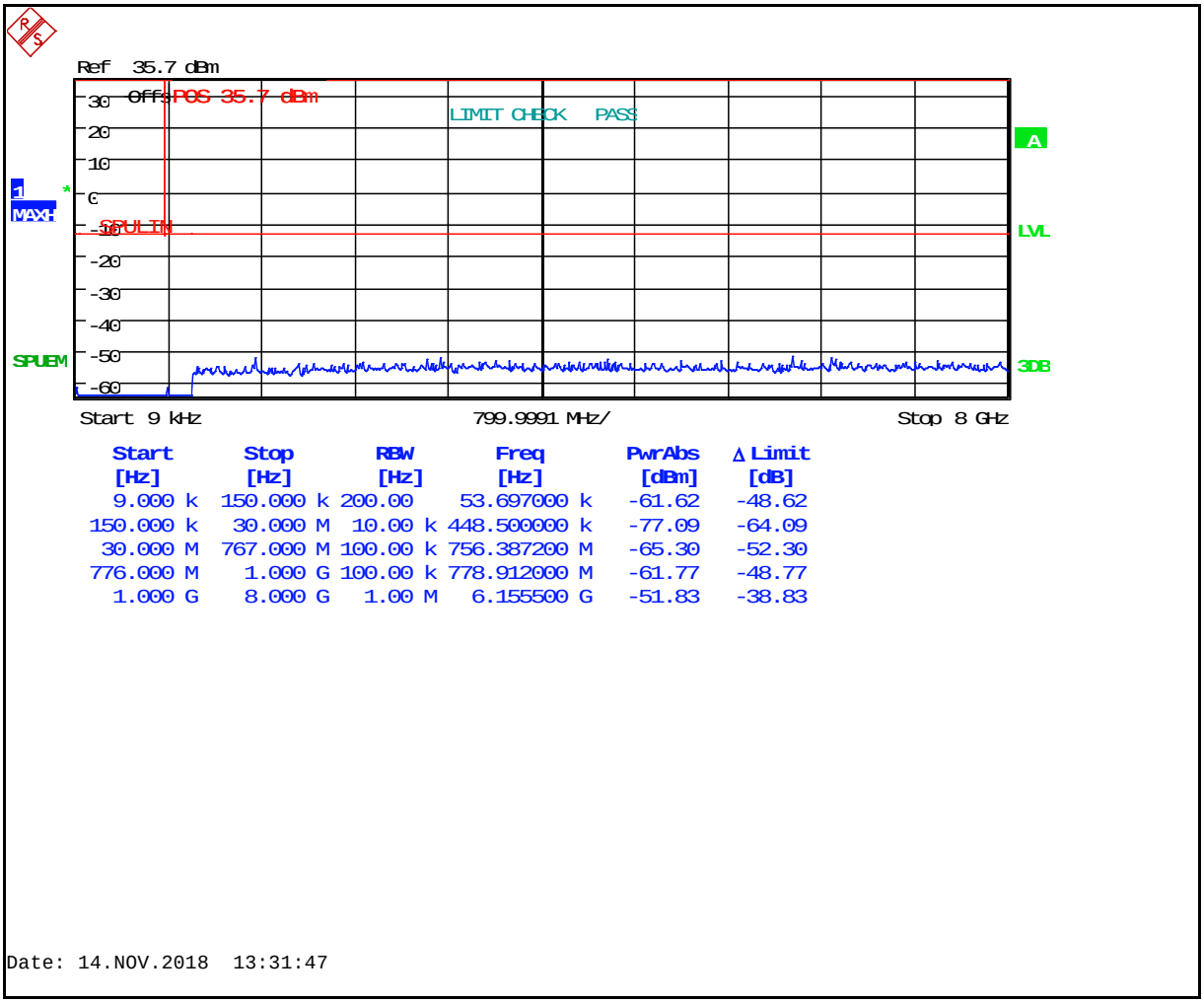
Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

Limits: 43 + 10log(P) dB where P is output power in Watts.

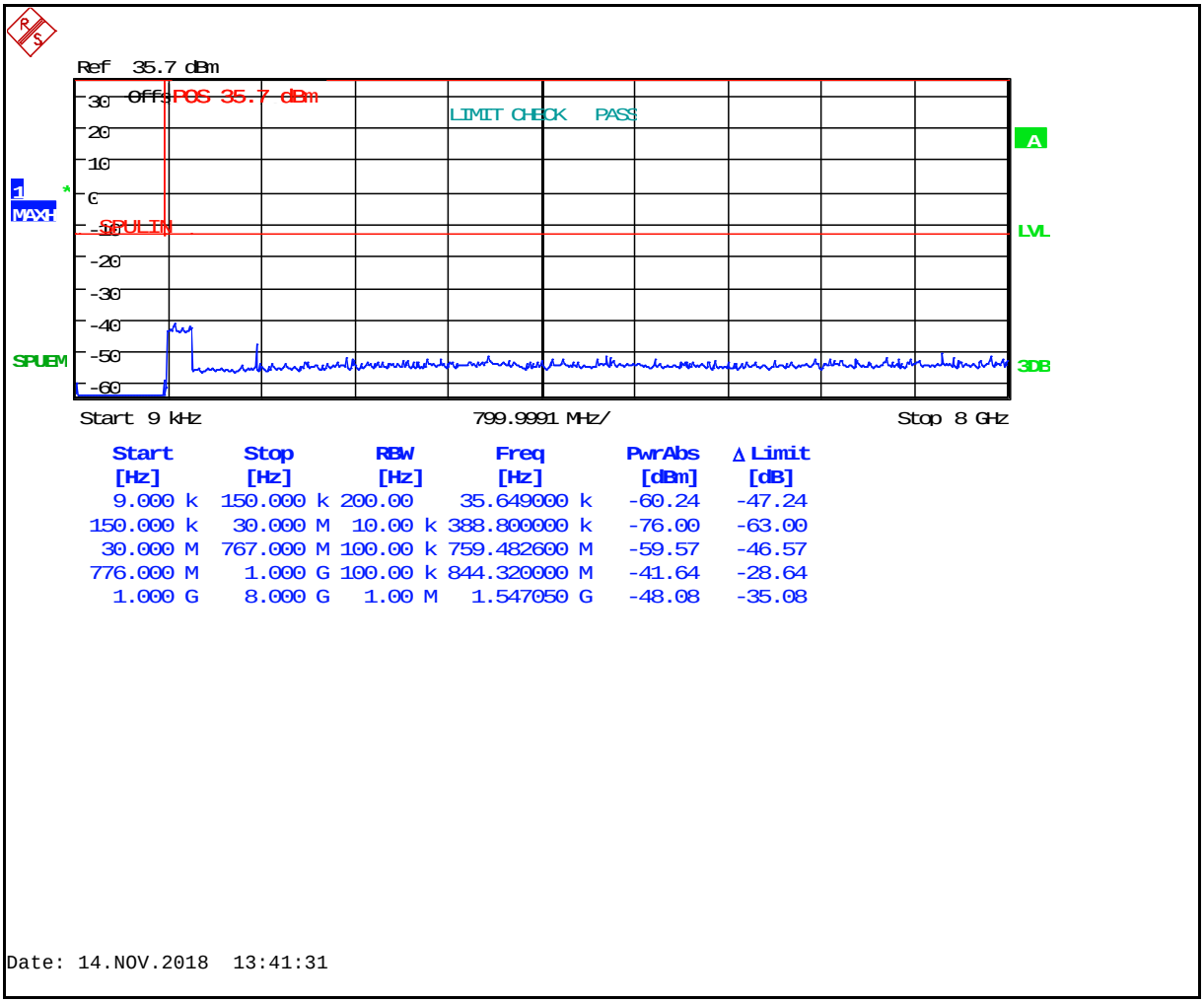
The following frequencies (in MHz) were investigated:

Frequencies (MHz)
768.0125
773.5125
775.9875

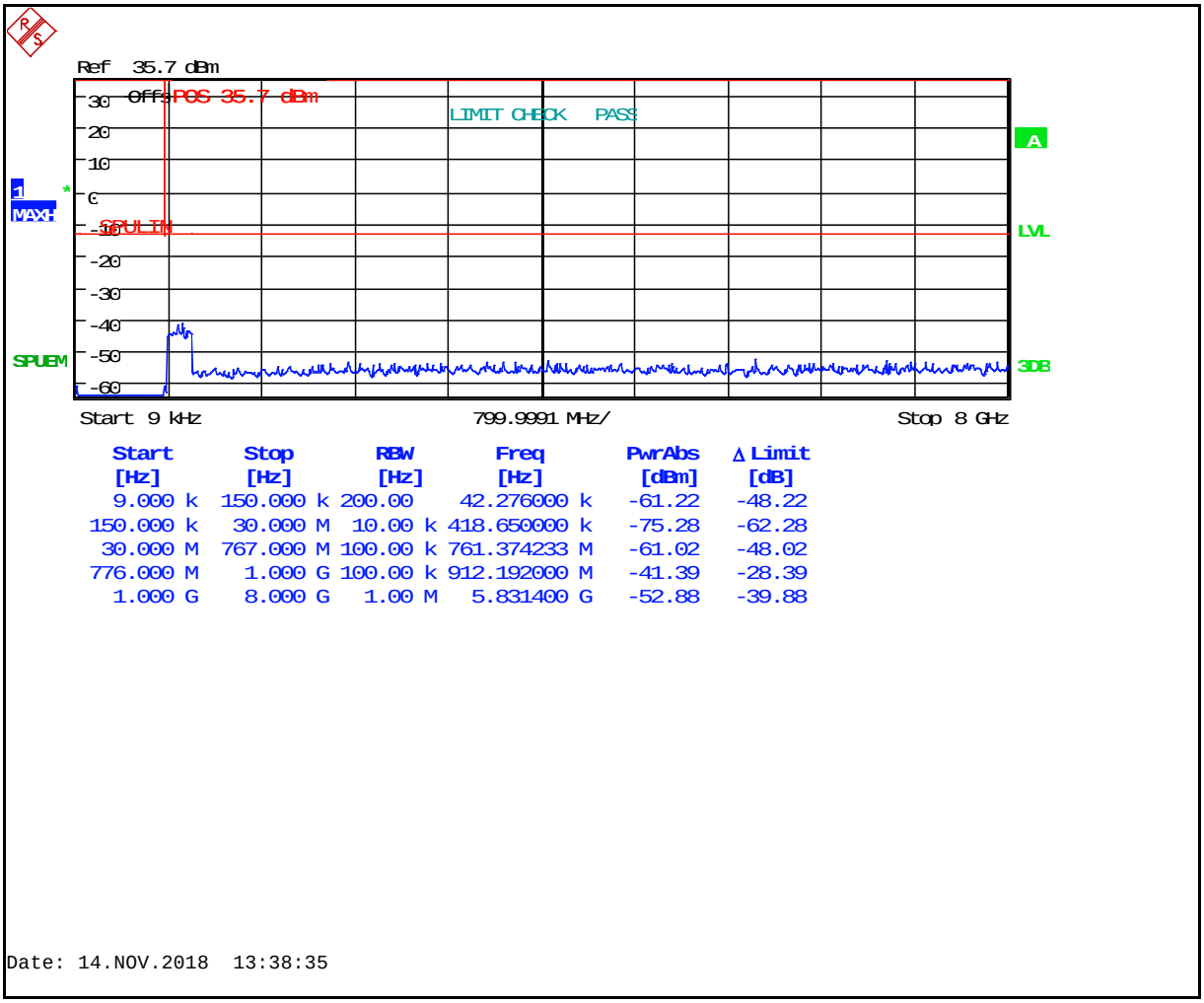
Plot 4-1: Conducted Antenna Spurious Emissions – 768.0125 MHz; HVD SMR



Plot 4-2: Conducted Antenna Spurious Emissions – 773.5125 MHz; HVD SMR



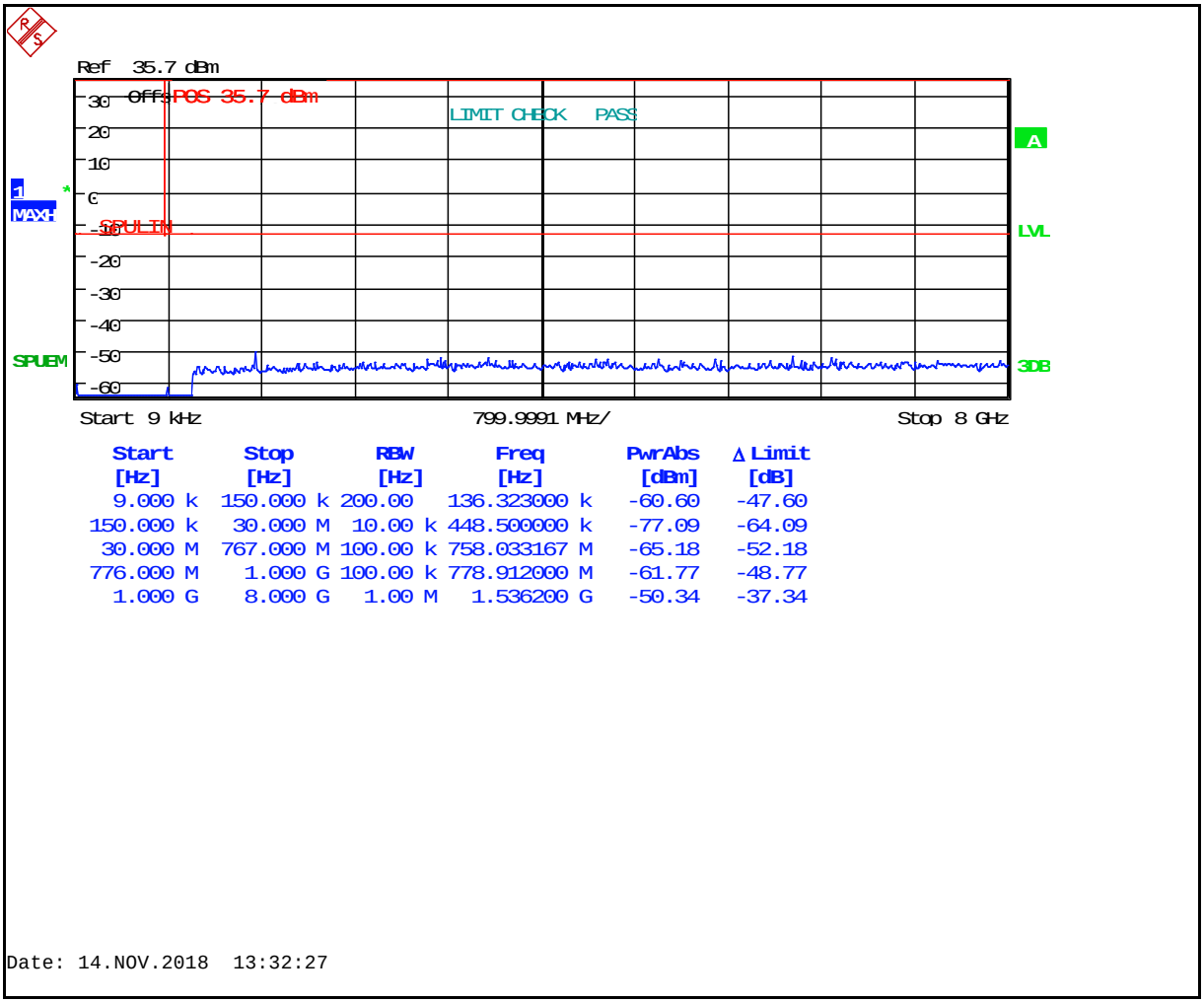
Plot 4-3: Conducted Antenna Spurious Emissions – 775.9875 MHz; HVD SMR



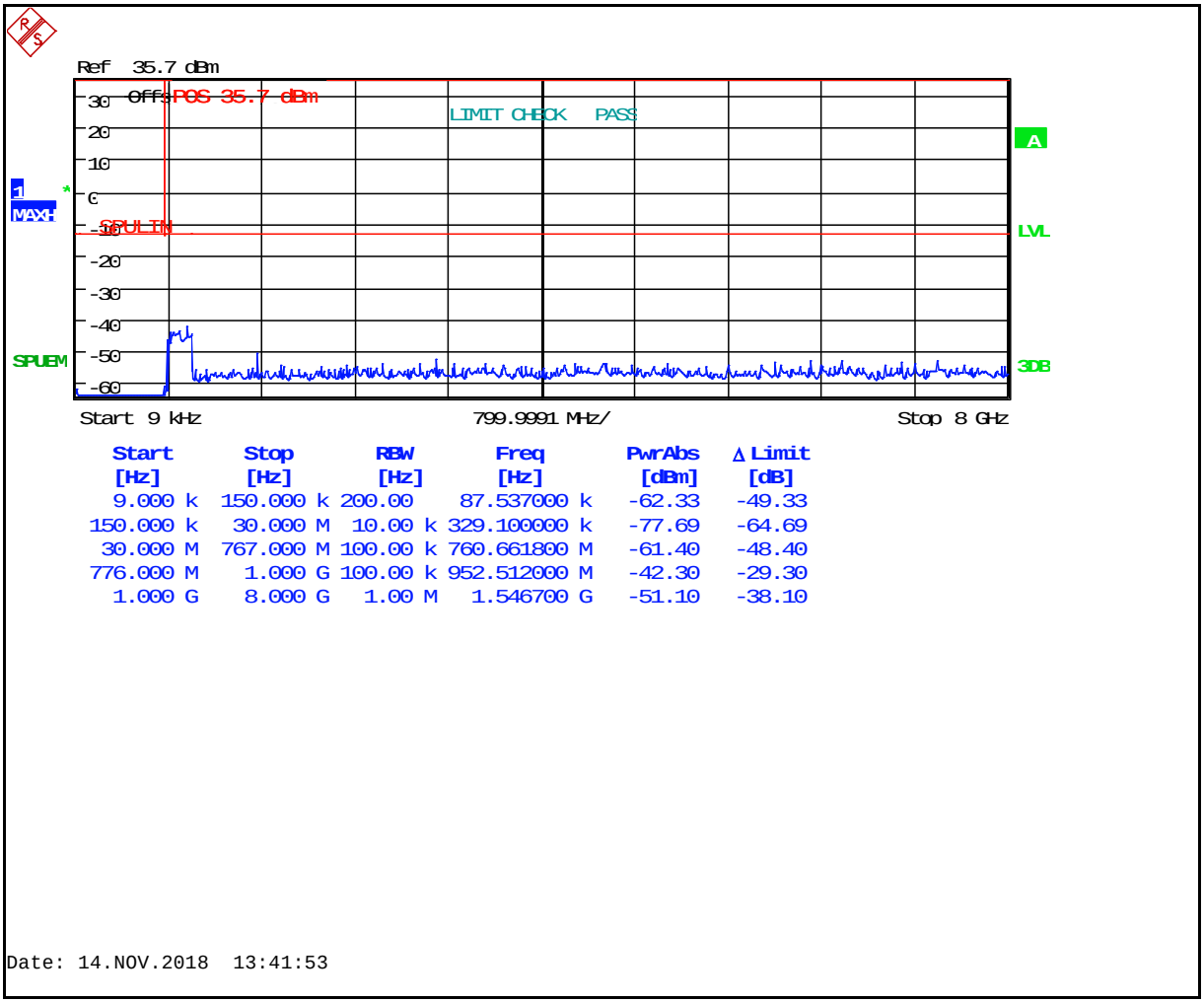
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	150.000 k	200.00	42.276000 k	-61.22	-48.22
150.000 k	30.000 M	10.00 k	418.650000 k	-75.28	-62.28
30.000 M	767.000 M	100.00 k	761.374233 M	-61.02	-48.02
776.000 M	1.000 G	100.00 k	912.192000 M	-41.39	-28.39
1.000 G	8.000 G	1.00 M	5.831400 G	-52.88	-39.88

Date: 14.NOV.2018 13:38:35

Plot 4-4: Conducted Antenna Spurious Emissions – 768.0125 MHz; HVD NPSPAC

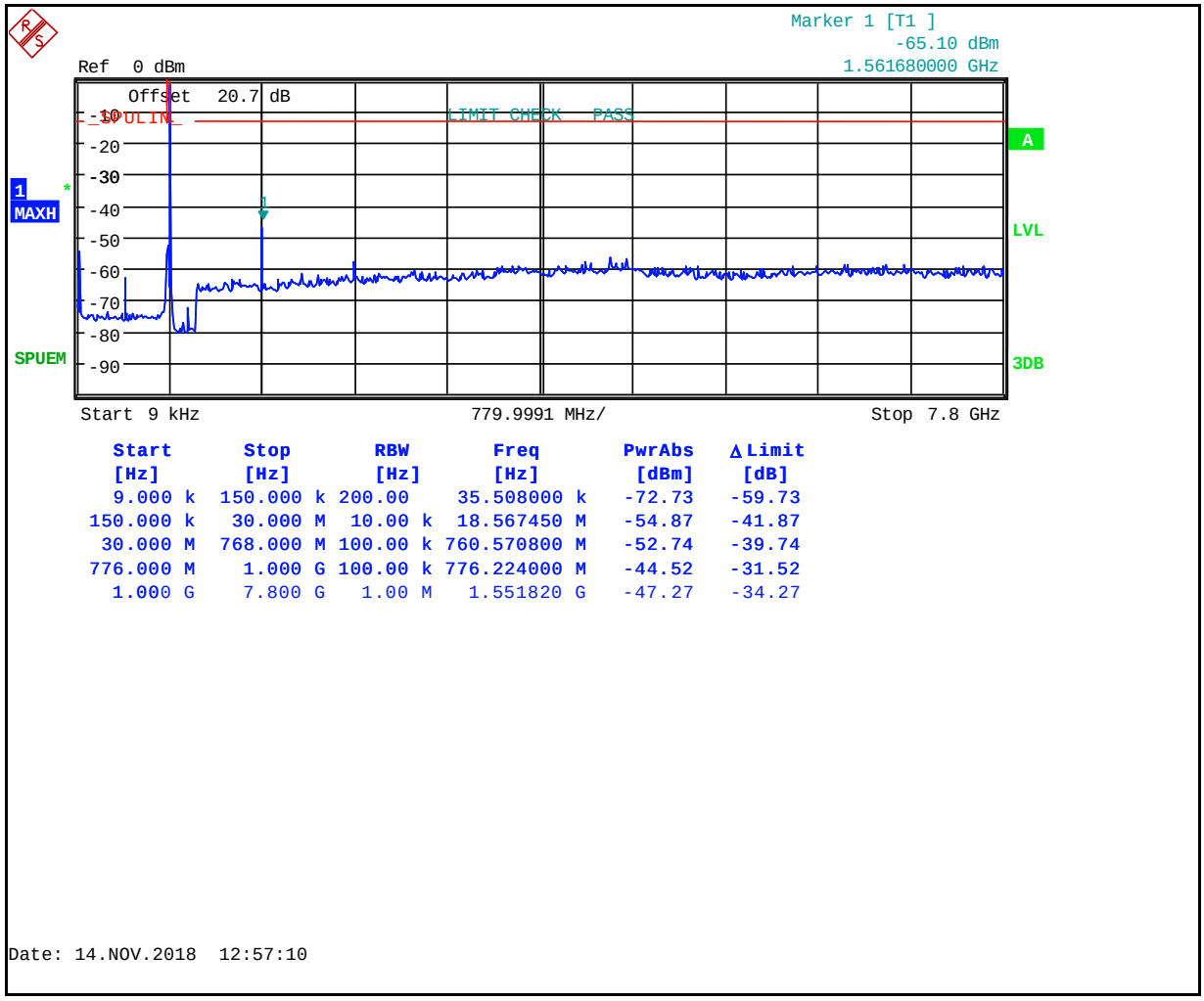


Plot 4-5: Conducted Antenna Spurious Emissions – 773.5125 MHz; HVD NPSPAC



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
9.000 k	150.000 k	200.00	87.537000 k	-62.33	-49.33
150.000 k	30.000 M	10.00 k	329.100000 k	-77.69	-64.69
30.000 M	767.000 M	100.00 k	760.661800 M	-61.40	-48.40
776.000 M	1.000 G	100.00 k	952.512000 M	-42.30	-29.30
1.000 G	8.000 G	1.00 M	1.546700 G	-51.10	-38.10

Plot 4-6: Conducted Antenna Spurious Emissions – 775.9875 MHz; HVD NPSPAC



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		November 14, 2018
EMC Test Engineer	Signature	Date of Test

5 FCC Part 90.543(a): Emission Limitations: ACP Requirements; RSS-119 5.8.9.1 Adjacent Channel Power (ACP)

Although we permit individual base transmitters to radiate a maximum ACP of 85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of -100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

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.

5.1 Test Procedure

ANSI C63.26-2015, Section 6.5.2.4: Adjacent Channel Power

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence. For a Base Station 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)	-80
12 MHz to paired receive band	30(s)	-80
In the paired receive band	30(s)	-85

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.

5.2 Test Data

Plot 5-1: Adjacent Channel Power – 768.01250 MHz; HVD SMR

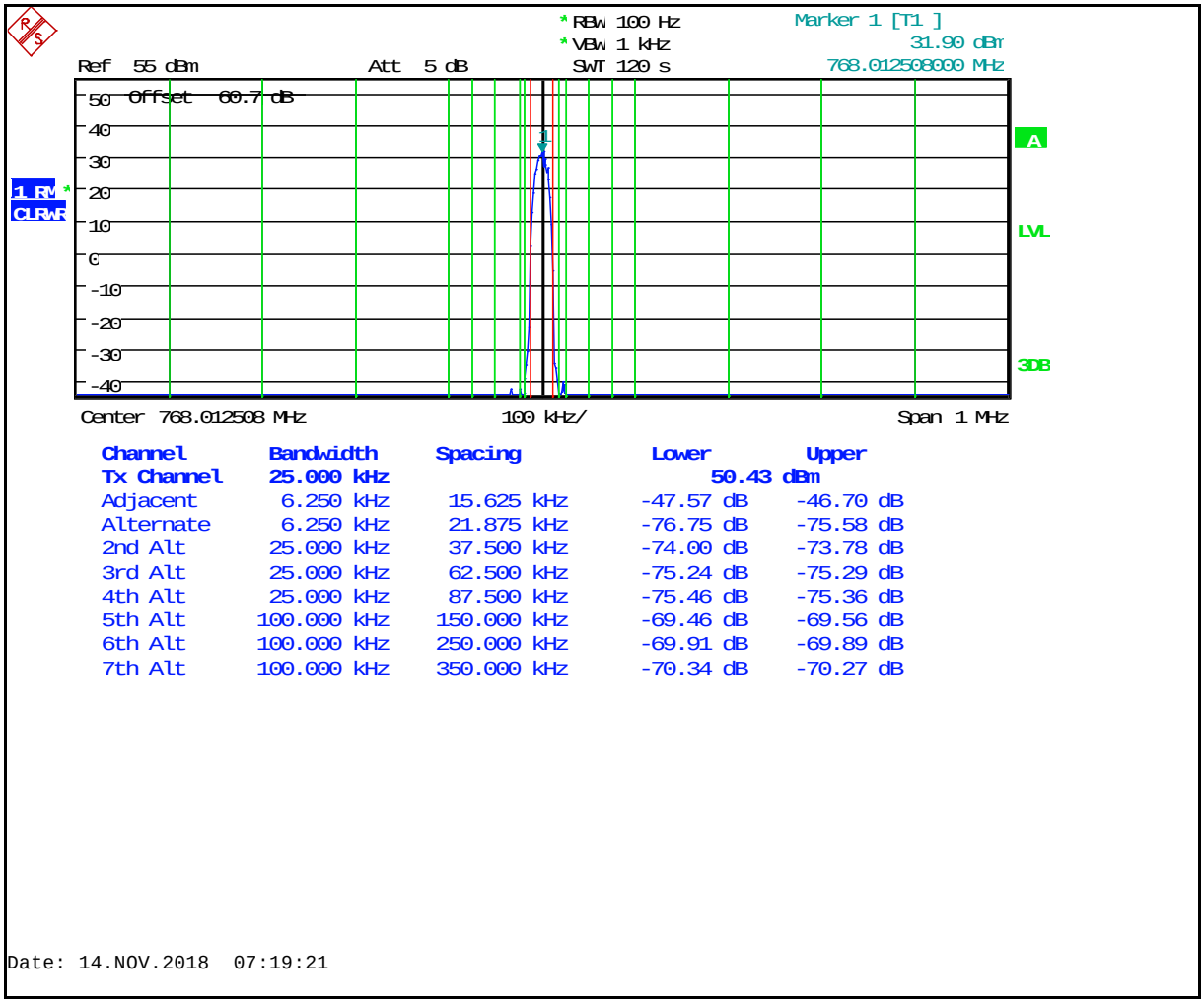


Table 5-1: Adjacent Channel Power – 768.01250 MHz; HVD SMR (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-89.2
12 MHz to receive band	30(s)	-80	-91.1
In receive band	30(s)	-100	-113.8

Plot 5-2: Adjacent Channel Power - 773.51250 MHz; HVD SMR

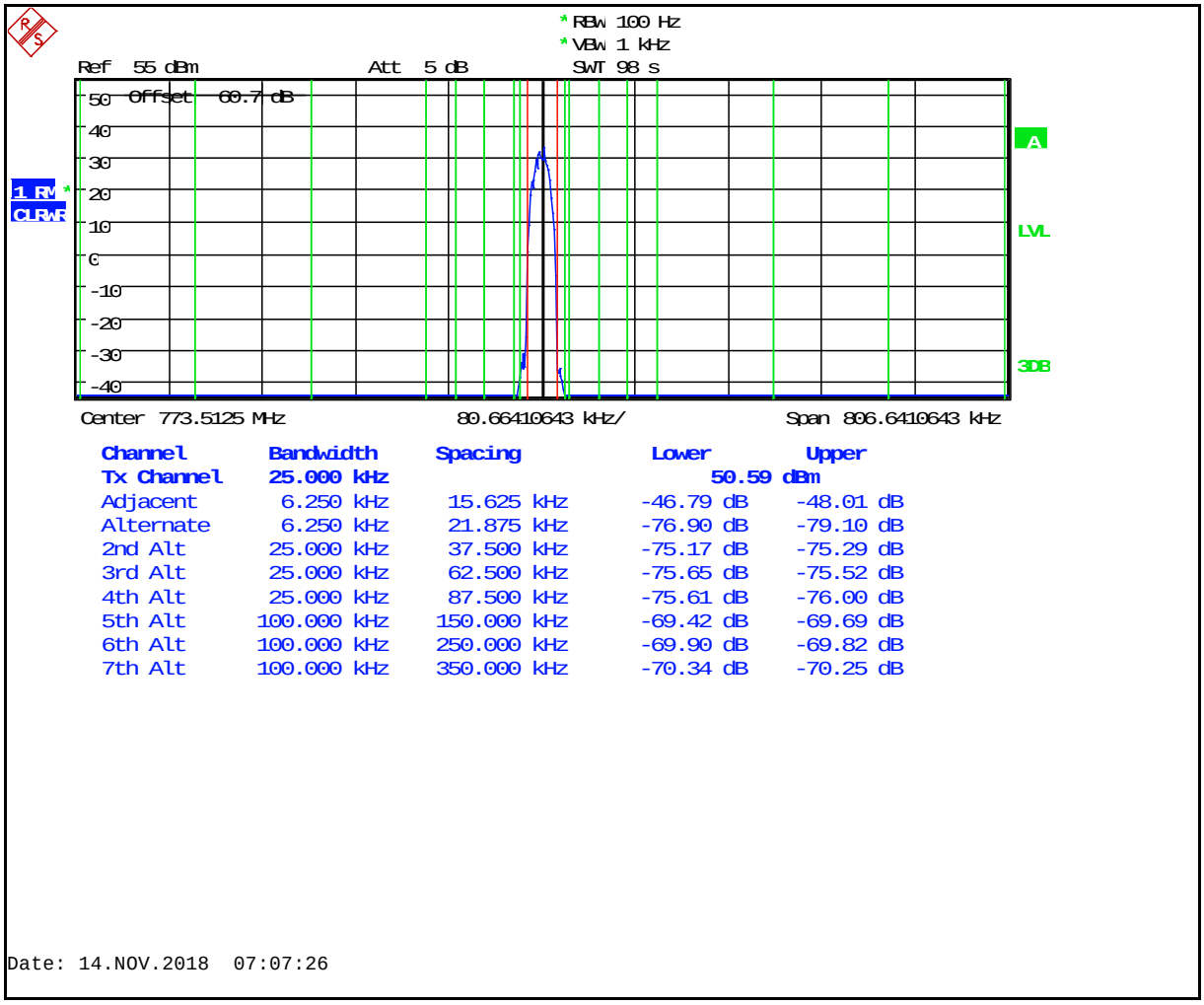


Table 5-2: Adjacent Channel Power – 773.51250 MHz; HVD SMR (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-87.2
12 MHz to receive band	30(s)	-80	-98.8
In receive band	30(s)	-100	-110.3

Plot 5-3: Adjacent Channel Power - 775.98750 MHz; HVD SMR

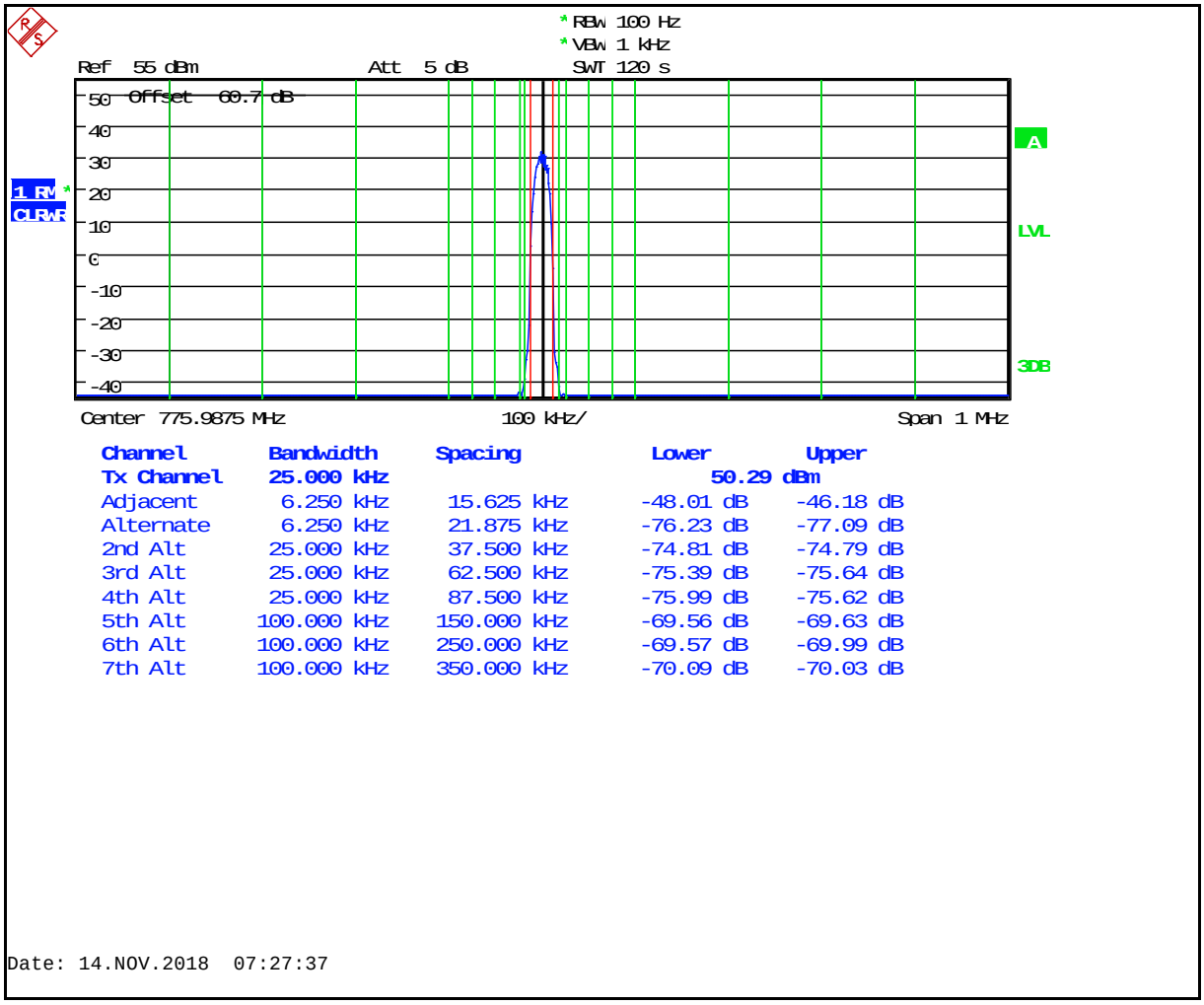


Table 5-3: Adjacent Channel Power – 775.98750 MHz; HVD SMR (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-99.1
12 MHz to receive band	30(s)	-80	-99.1
In receive band	30(s)	-100	-104.4

Plot 5-4: Adjacent Channel Power – 768.01250 MHz; HVD NPSPAC

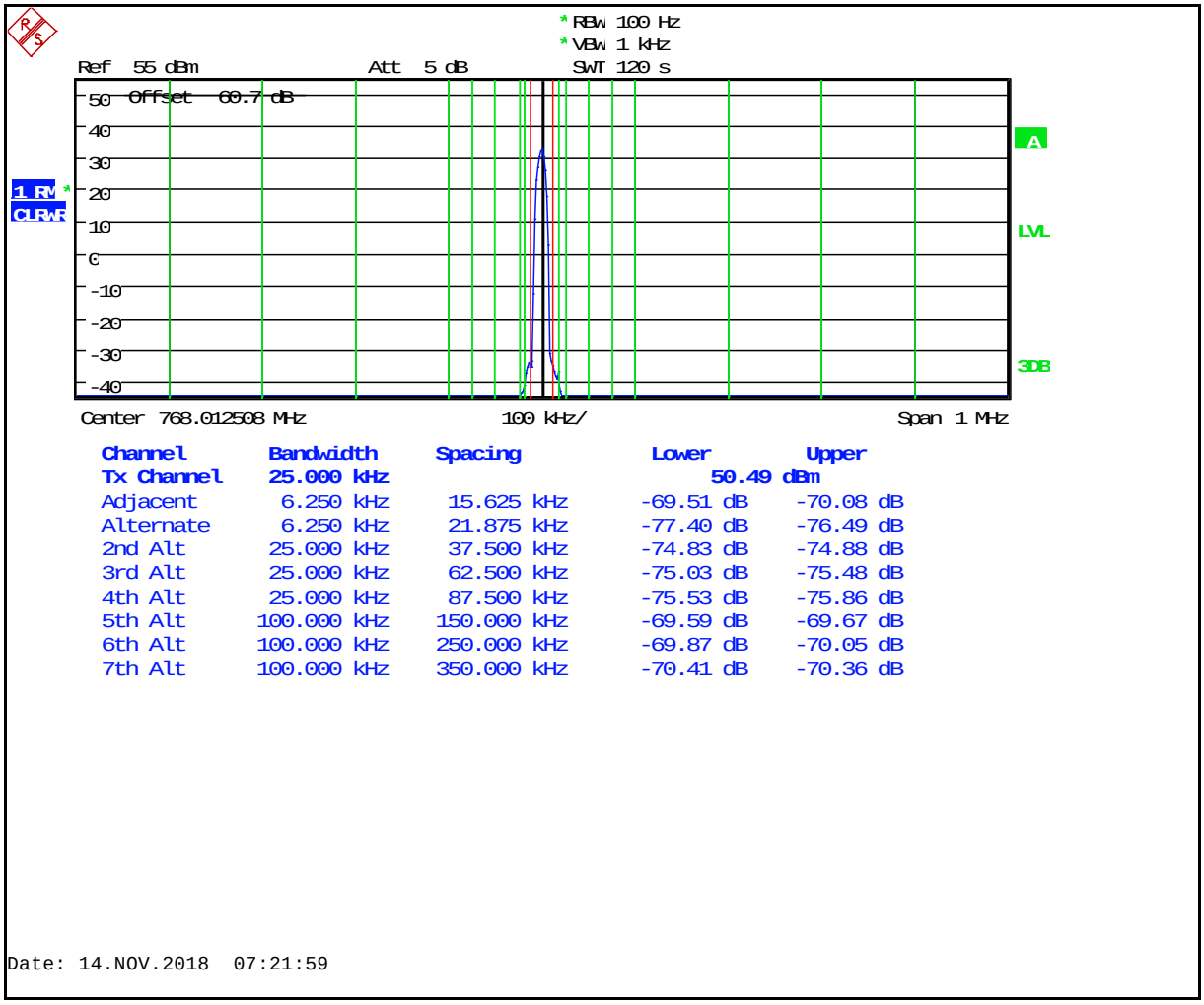


Table 5-4: Adjacent Channel Power – 768.01250 MHz; HVD NPSPAC (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-89.8
12 MHz to receive band	30(s)	-80	-91.0
In receive band	30(s)	-100	-114.0

Plot 5-5: Adjacent Channel Power - 773.51250 MHz; HVD NPSPAC

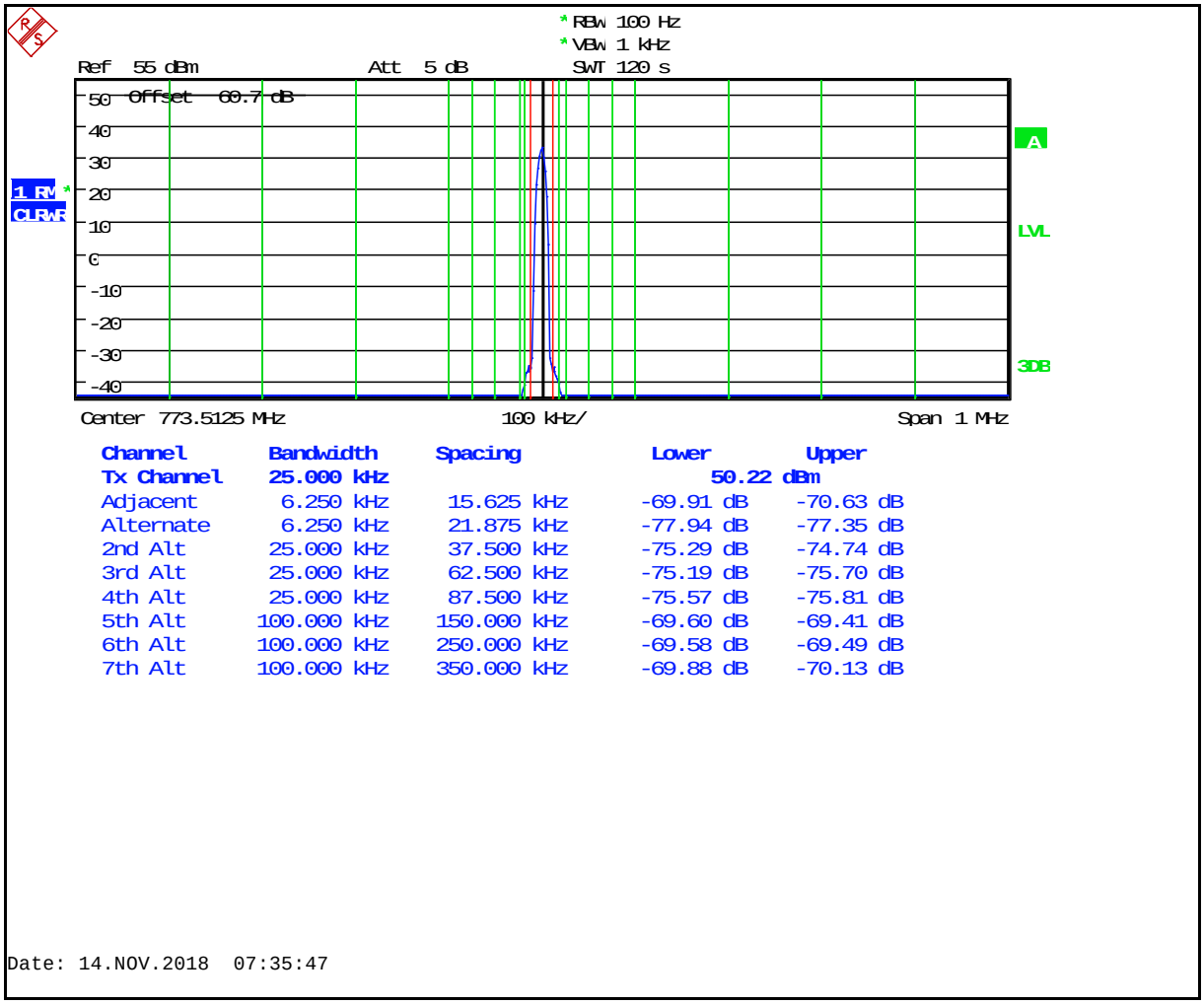


Table 5-5: Adjacent Channel Power – 773.51250 MHz; HVD NPSPAC (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-90.3
12 MHz to receive band	30(s)	-80	-99.3
In receive band	30(s)	-100	-110.8

Plot 5-6: Adjacent Channel Power - 775.98750 MHz; HVD NPSPAC

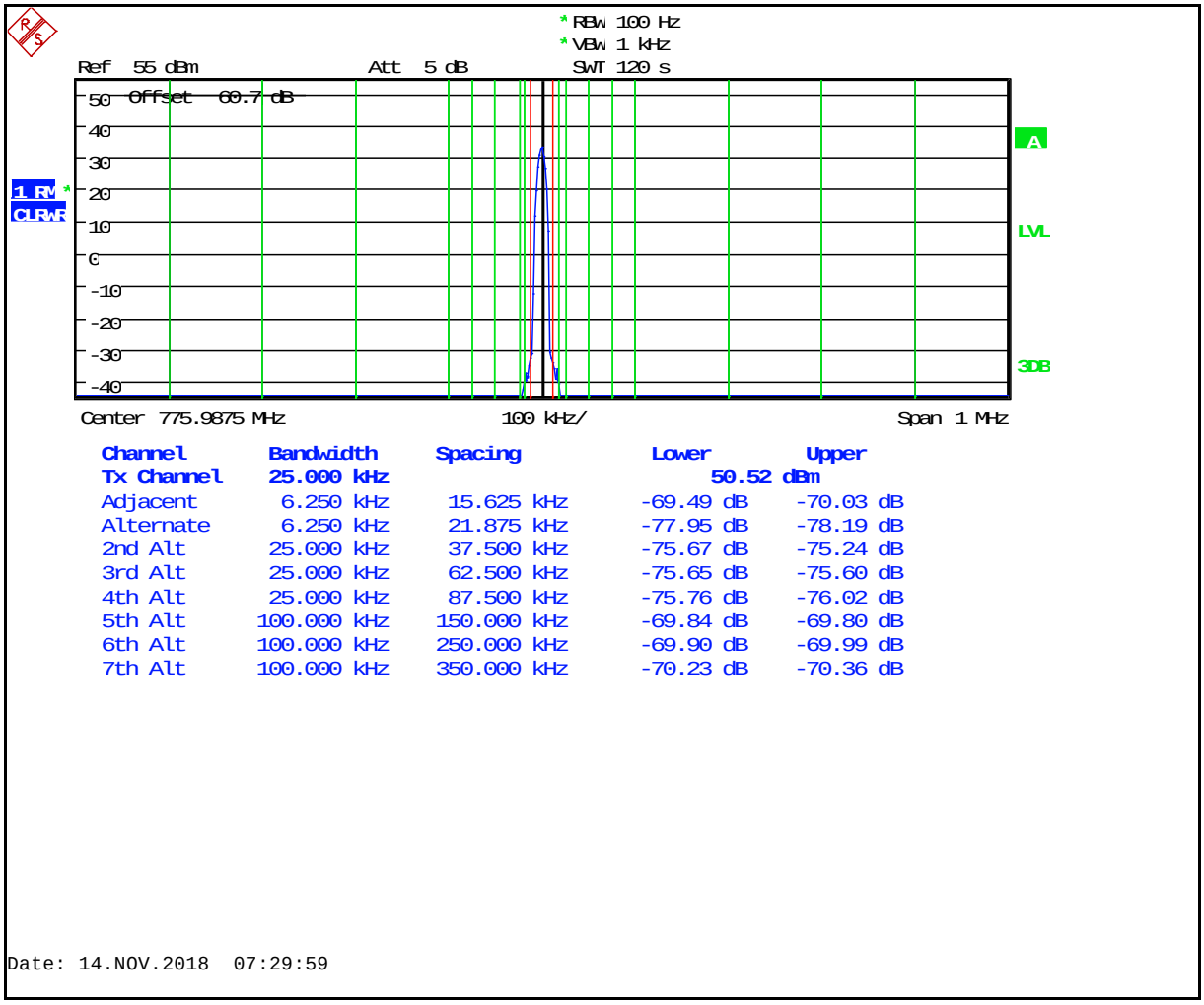


Table 5-6: Adjacent Channel Power – 775.98750 MHz; HVD NPSPAC (400 kHz to Receive Band)

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
>400 to 12 MHz	30(s)	-80	-100.3
12 MHz to receive band	30(s)	-80	-100.0
In receive band	30(s)	-100	-106.1

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor k=2. Measurement uncertainty: -2 dB/+2 dB.

Table 5-7: 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	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
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	8/10/19

Test Personnel:

Daniel W. Baltzell		November 14, 2018
EMC Test Engineer	Signature	Date of Test

6 FCC Part 2.1049(c)(1): Occupied Bandwidth; RSS-Gen 6.6: Occupied Bandwidth

Occupied Bandwidth - Compliance with the Emission Masks

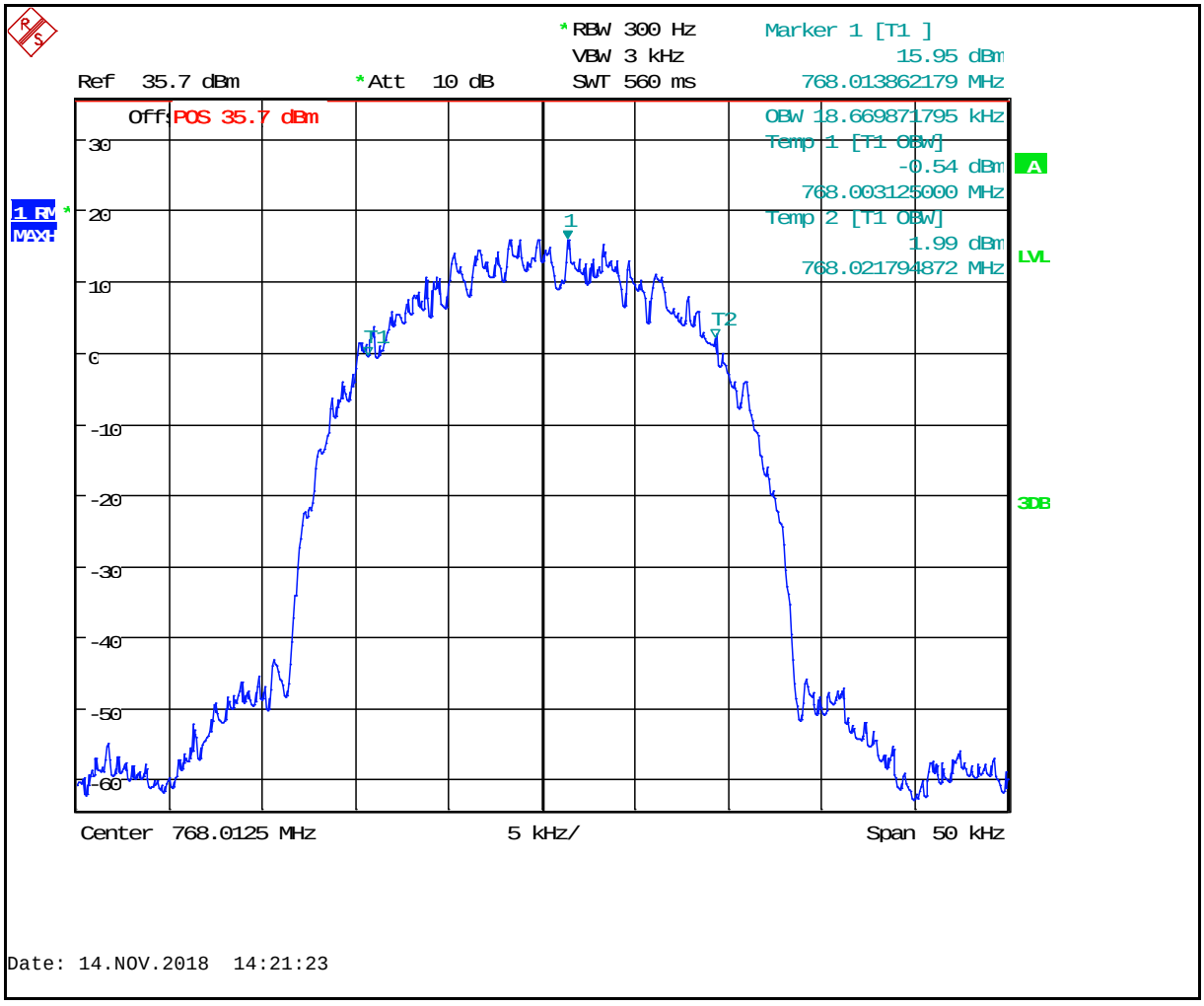
6.1 Test Procedure

ANSI 63.26, section 5.4.

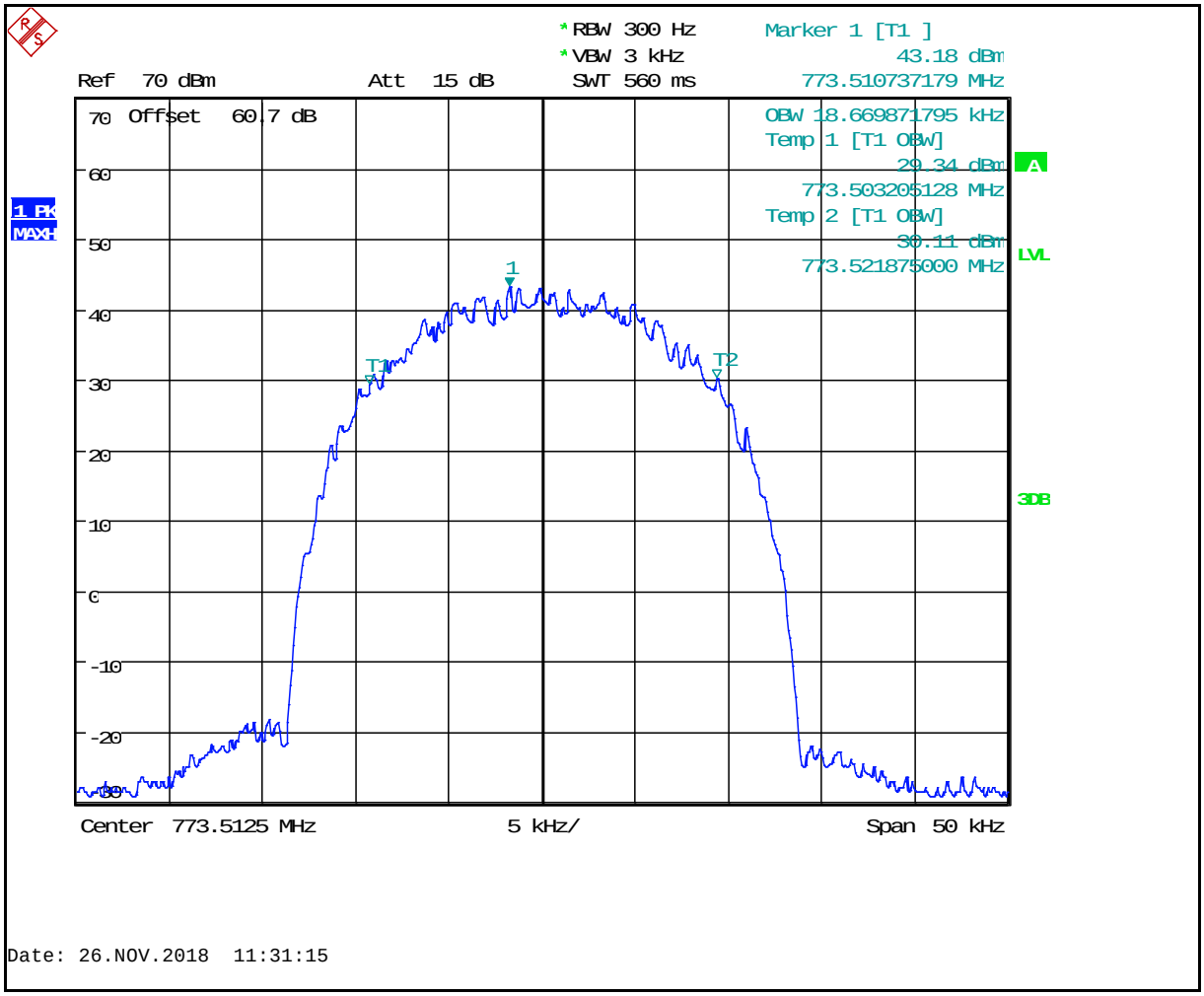
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

6.2 Test Data

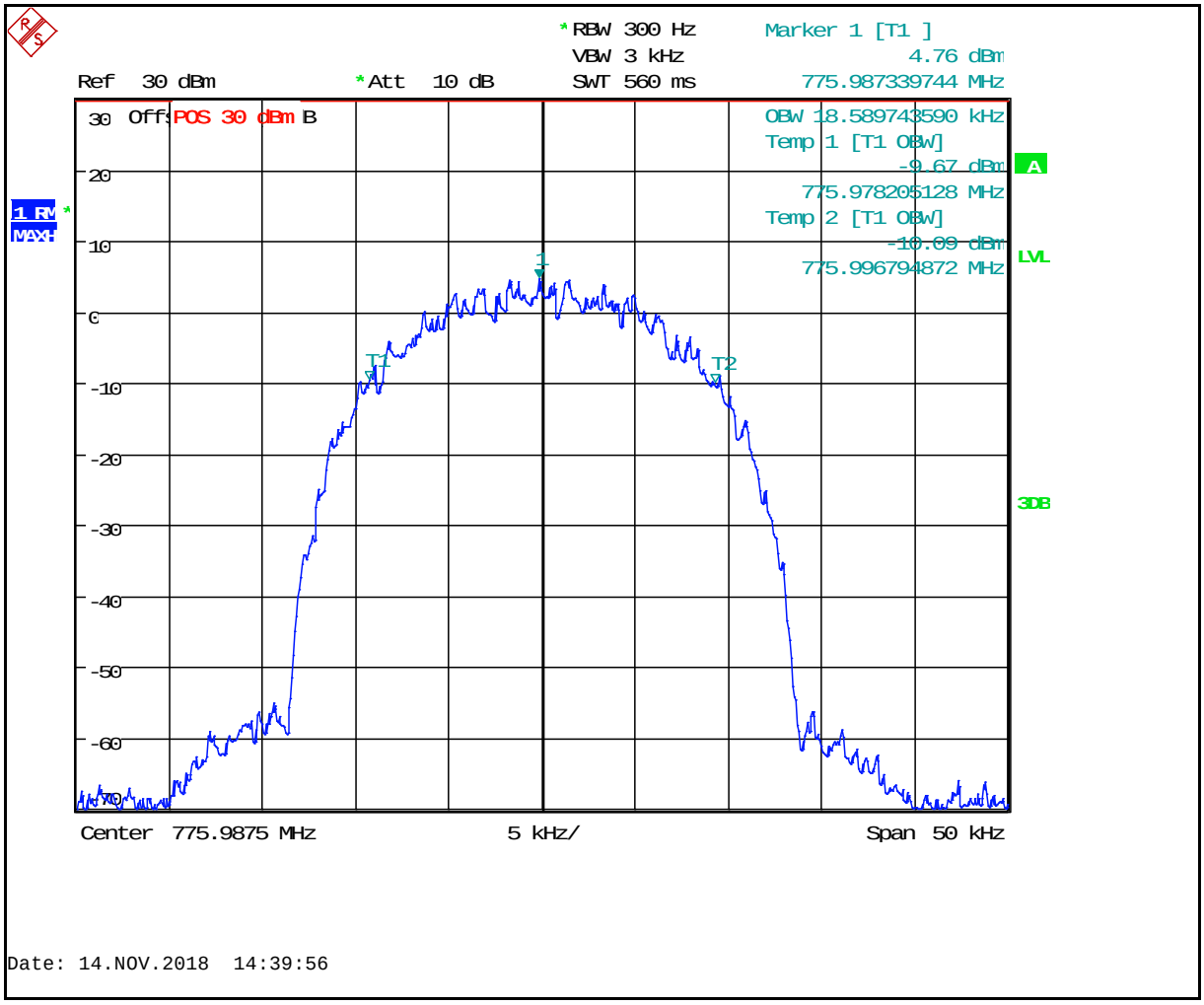
Plot 6-1: Occupied Bandwidth – 768.01250 MHz; HVD SMR; 99% BW



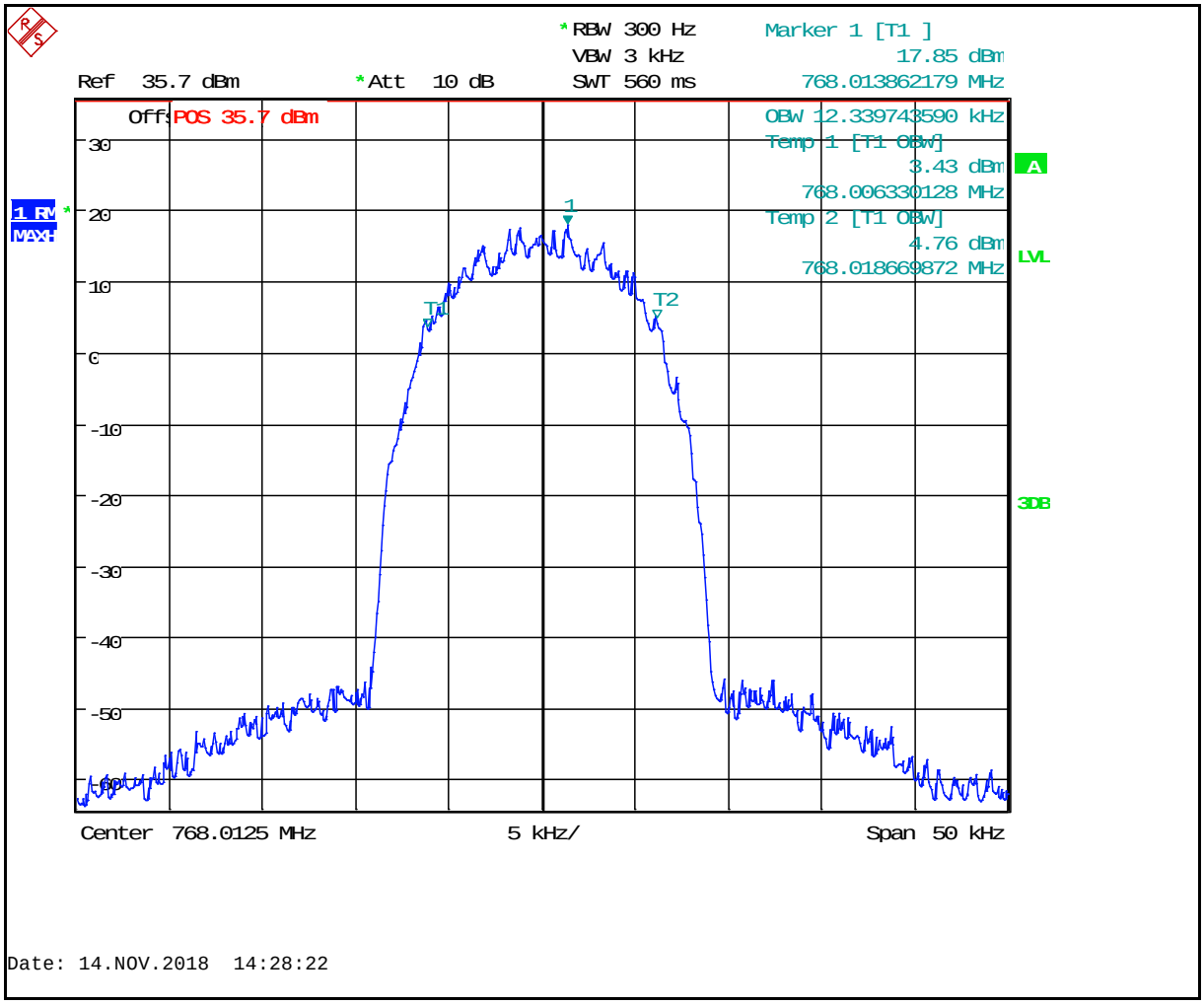
Plot 6-2: Occupied Bandwidth – 773.51250 MHz; HVD SMR; 99% BW



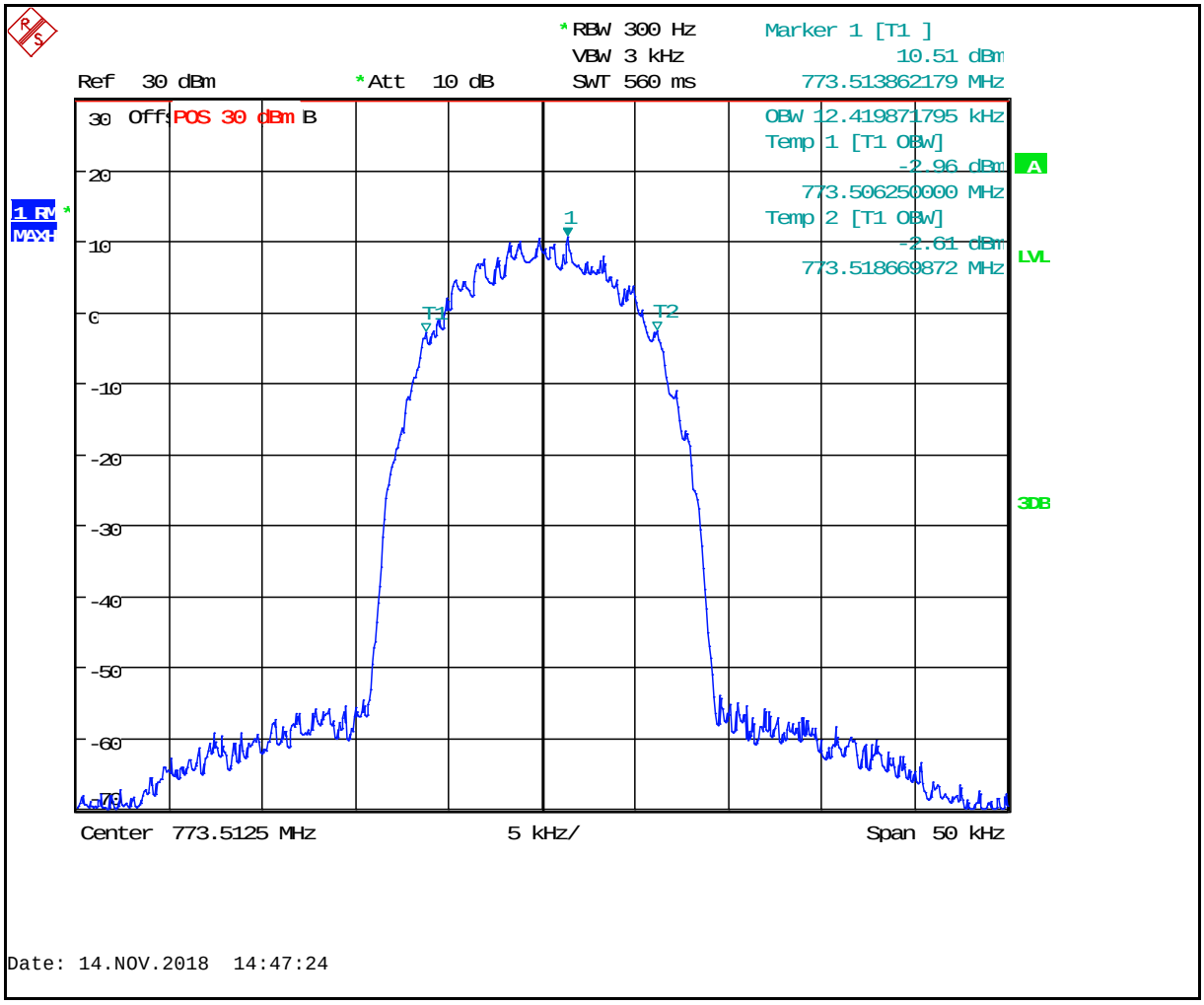
Plot 6-3: Occupied Bandwidth – 775.98750 MHz; HVD SMR; 99% BW



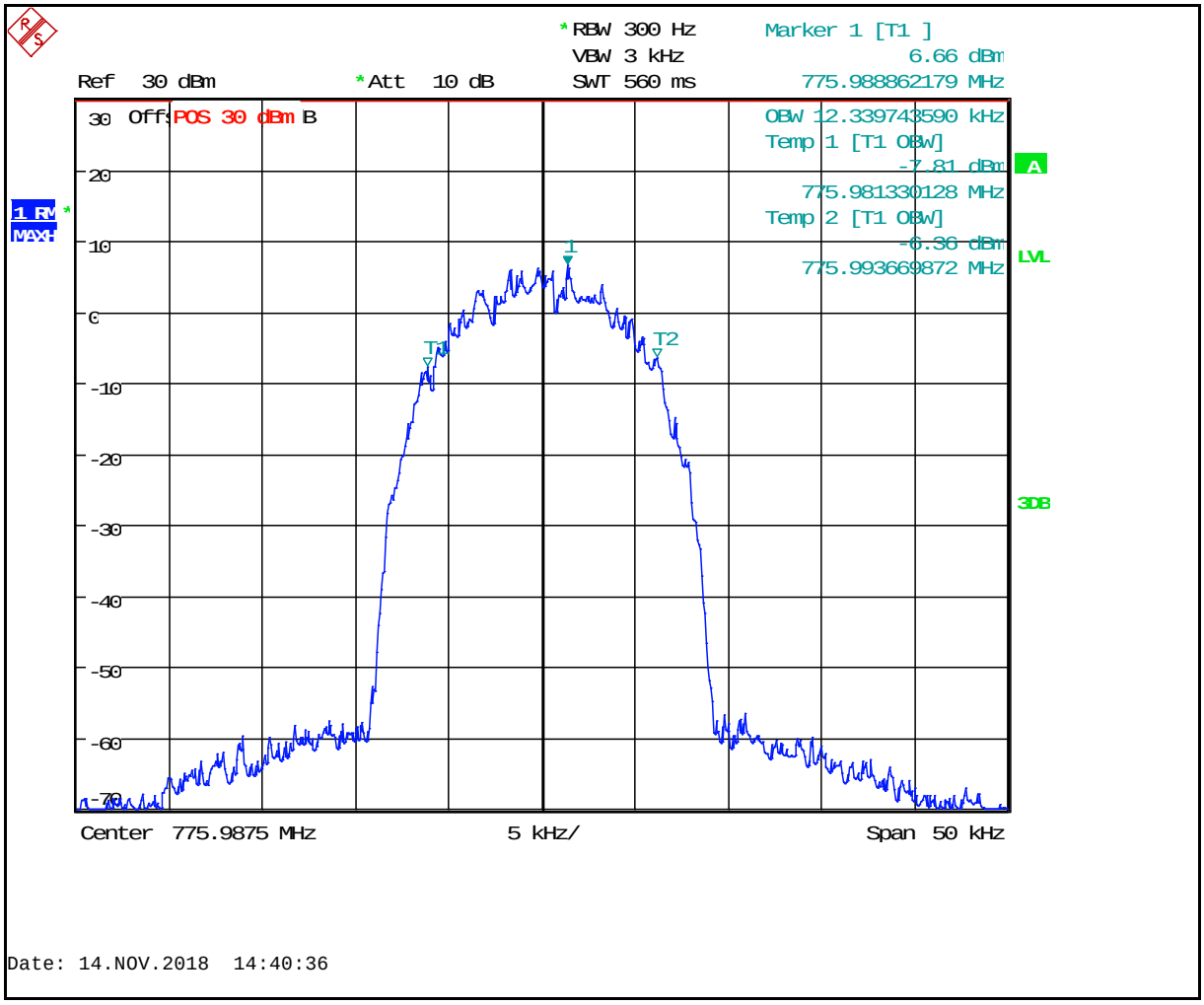
Plot 6-4: Occupied Bandwidth – 768.01250 MHz; HVD NPSPAC; 99% BW



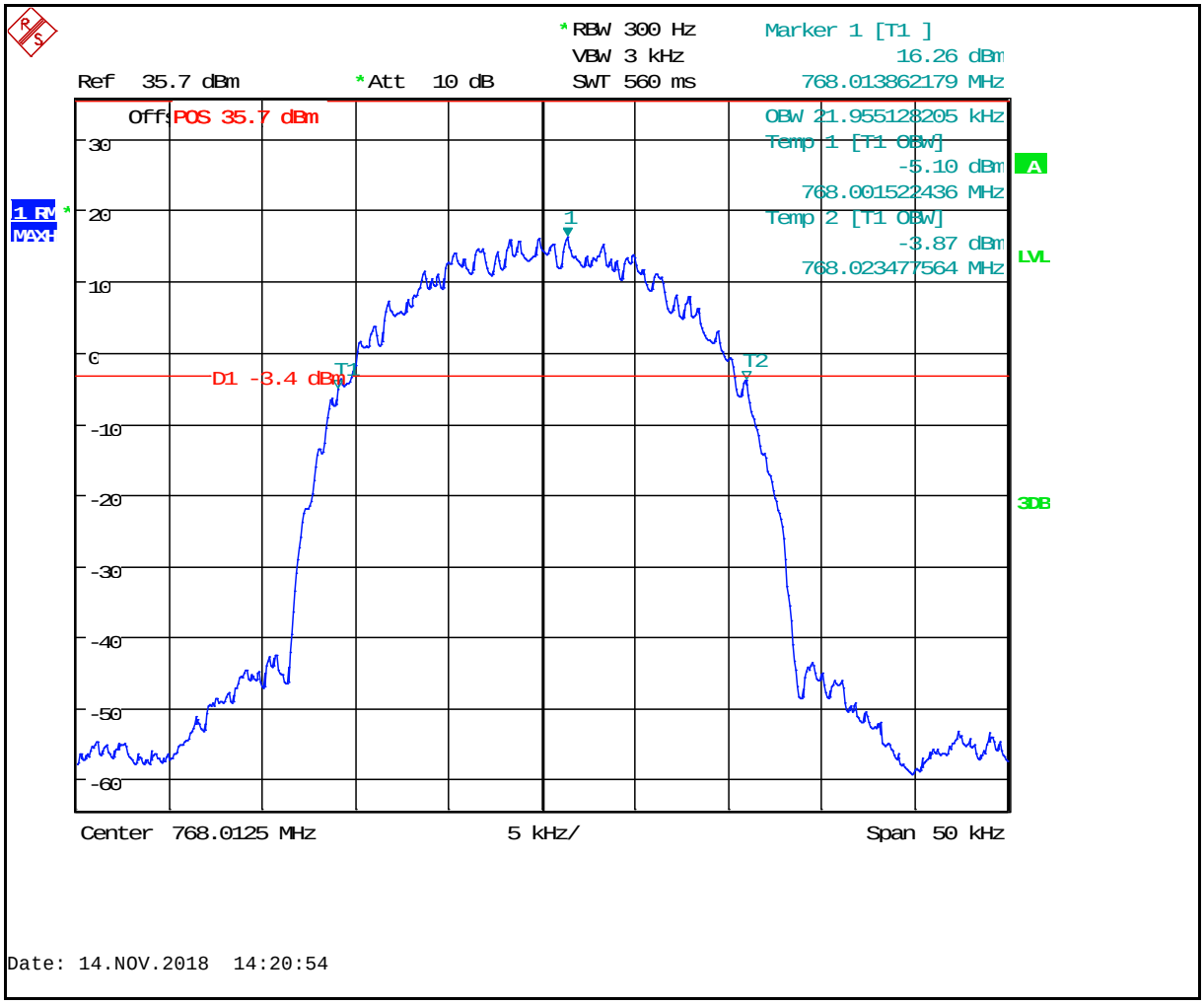
Plot 6-5: Occupied Bandwidth – 773.51250 MHz; HVD NPSPAC; 99% BW



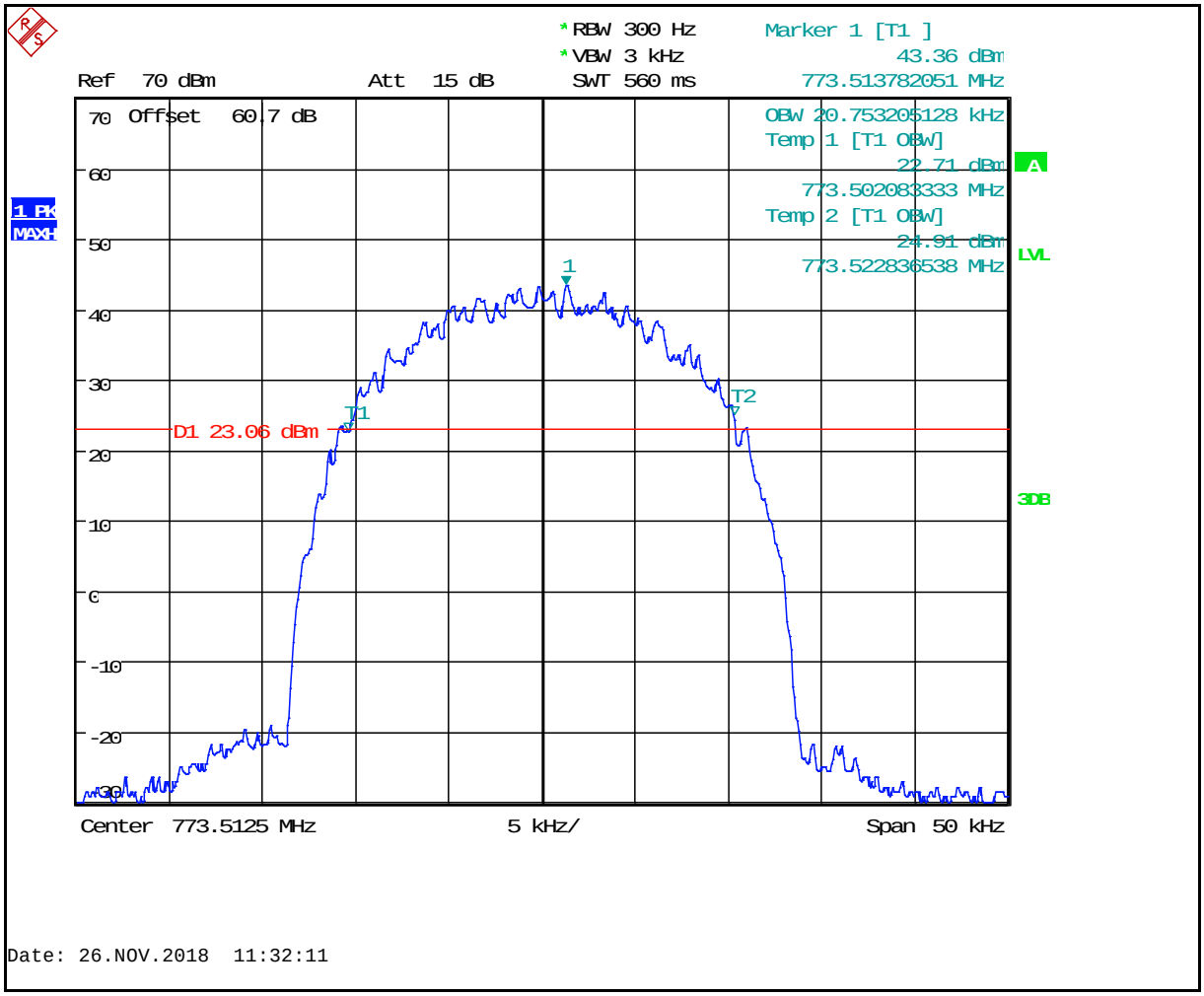
Plot 6-6: Occupied Bandwidth – 775.98750 MHz; HVD NPSPAC; 99% BW



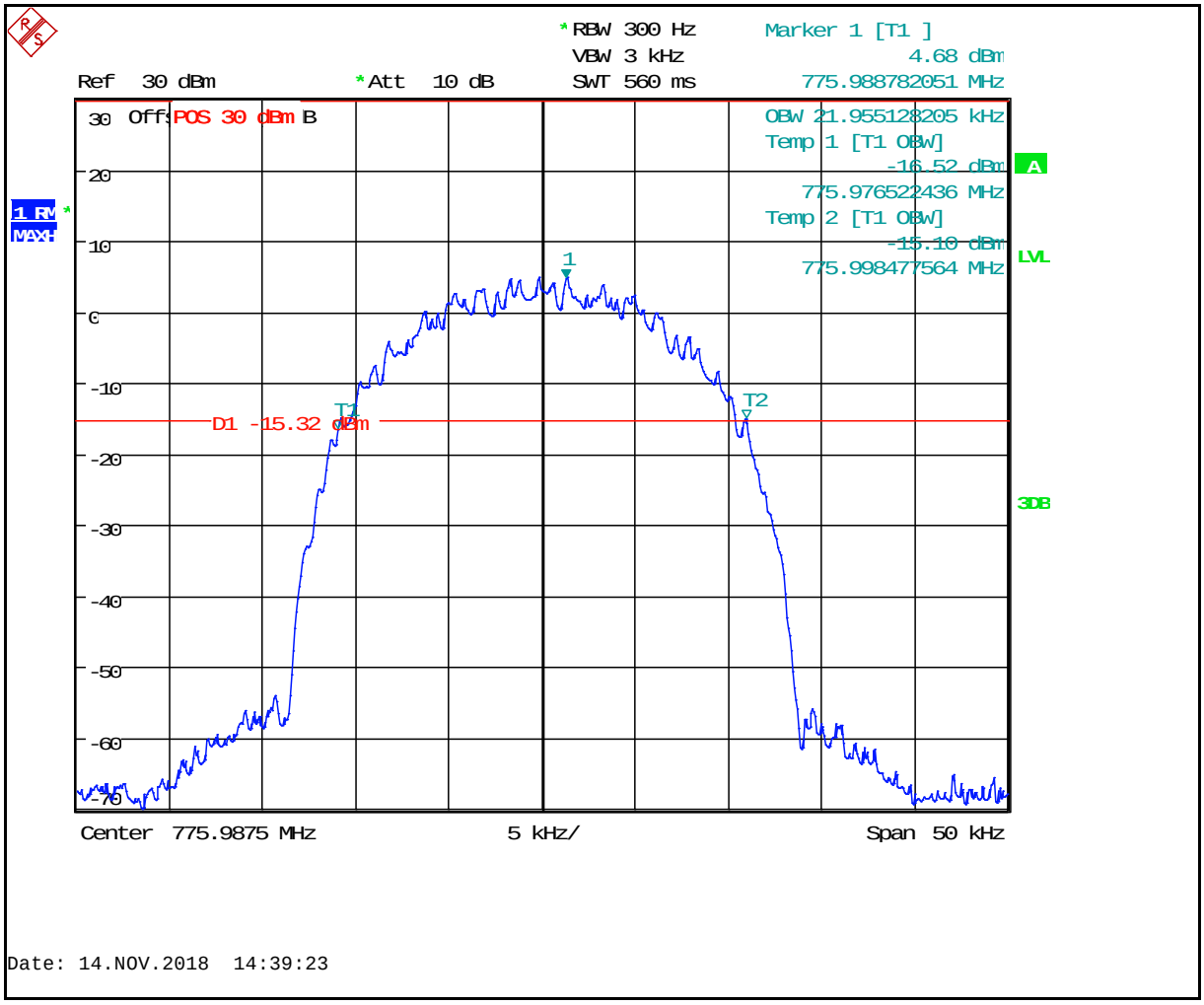
Plot 6-7: Occupied Bandwidth – 768.01250 MHz; HVD SMR; 20 dB BW



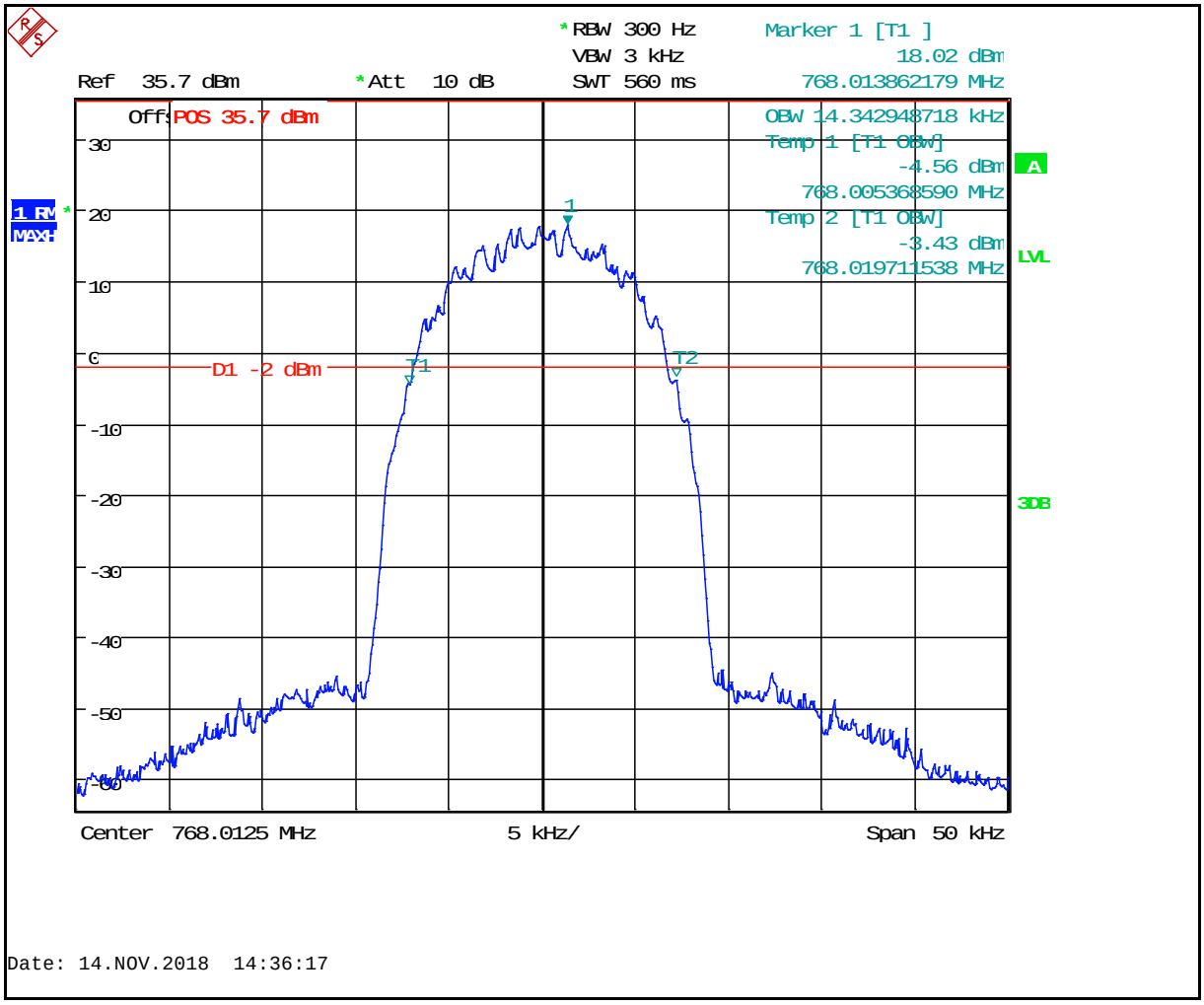
Plot 6-8: Occupied Bandwidth – 773.51250 MHz; HVD SMR; 20 dB BW



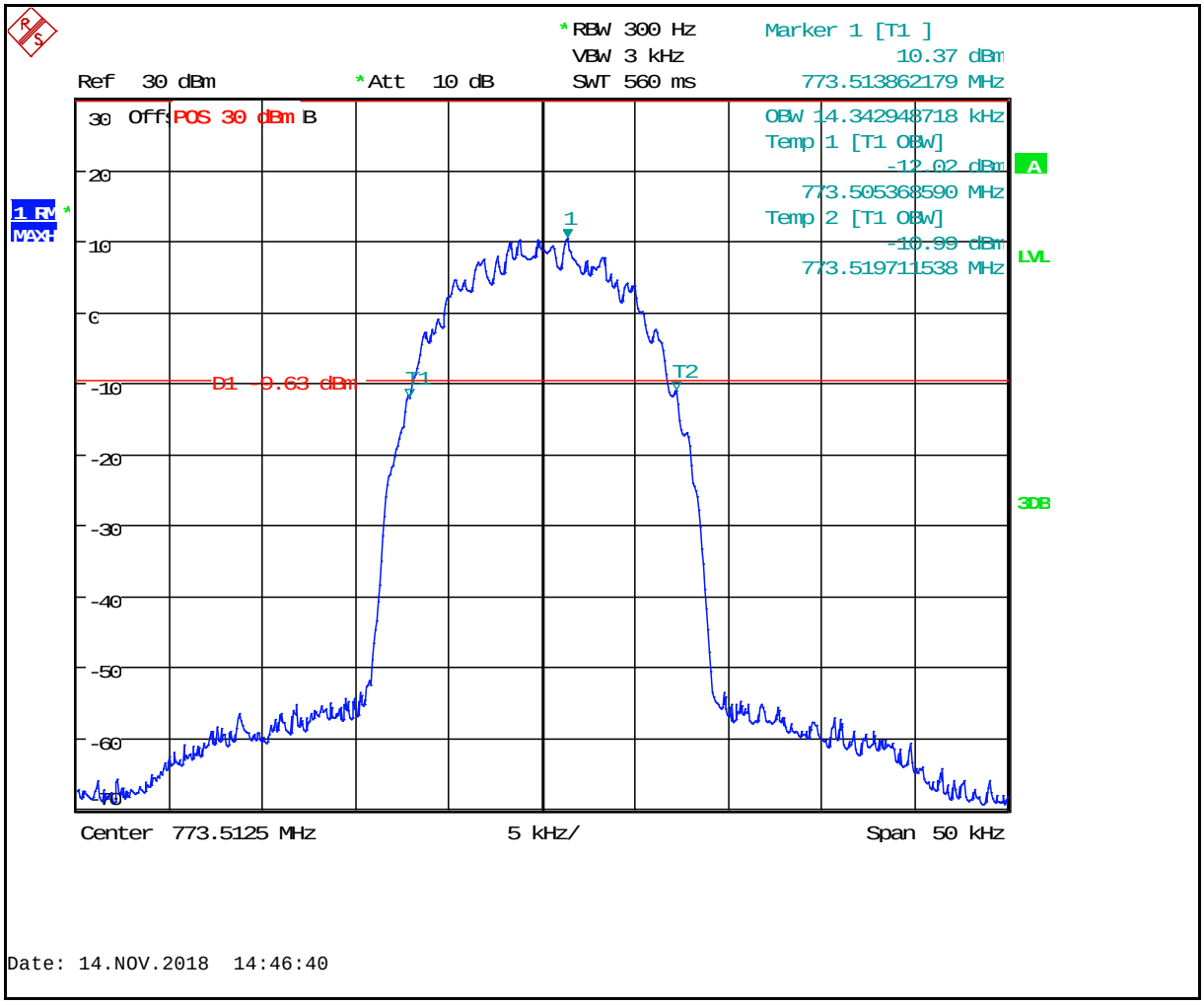
Plot 6-9: Occupied Bandwidth – 775.98750 MHz; HVD SMR; 20 dB BW



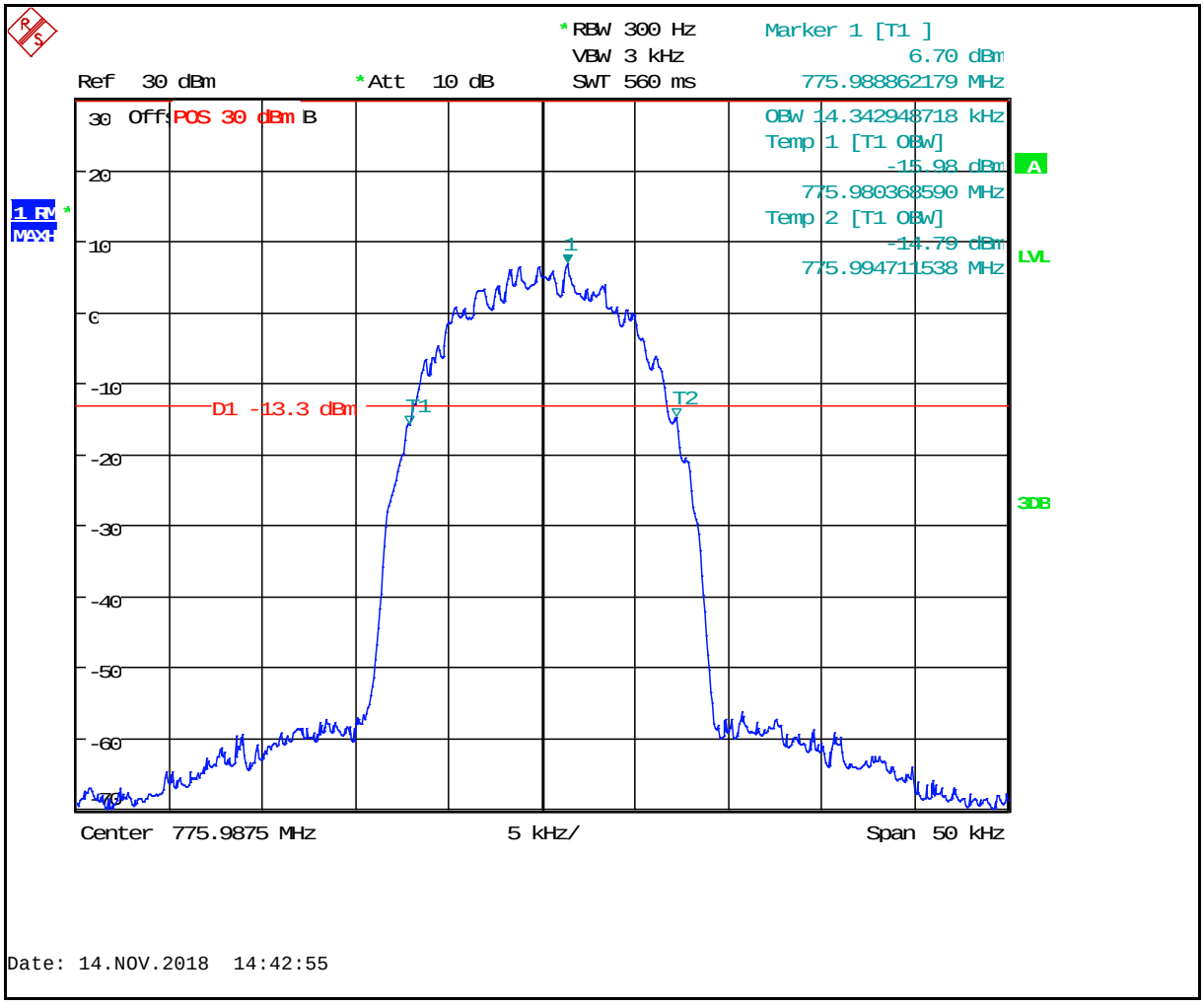
Plot 6-10: Occupied Bandwidth – 768.01250 MHz; HVD NPSPAC; 20 dB BW



Plot 6-11: Occupied Bandwidth – 773.51250 MHz; HVD NPSPAC; 20 dB BW



Plot 6-12: Occupied Bandwidth – 775.98750 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 6-1: 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		November 14 & 26, 2018
EMC Test Engineer	Signature	Dates of Test

7 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

8 Conclusion

The data in this measurement report shows that the Harris Corporation MASTR V 700 MHz Base Station; FCC ID: OWDTR-0159-E, IC: 3636B-0159, complies with the applicable requirements of Parts 2 and 90 of the FCC Rules and ISED RSS-119 and RSS-Gen for a Class 2 permissive change.