



Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification 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**

April 2, 2018

Standards Referenced for this Report	
Part 2: 2017	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2017	Private Land Mobile Radio Services
RSS-119 Issue 12 2015	Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz
RSS-Gen Issue 4 2014	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

Report Prepared By: Daniel W. Baltzell

Document Number: 2017263TNF

This report may not be reproduced, except in full, without the full written approval of Rhein Tech Laboratories, Inc. and Harris Corporation. Test results relate only to the item tested.

*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.*

Table of Contents

1	Test Result Summary	5
2	General Information	5
2.1	Test Facility	5
2.2	Related Submittal(s)/Grant(s)	5
2.3	Grant Notes	5
2.4	Tested System Details	6
3	FCC Part 2.1033(C)(8): Voltages and Currents through the Final Amplifying Stage	7
4	FCC Part 2.1046(a): RF Power Output: Conducted; Part 90.205(k); Part 90.541(a) 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; RSS-119 4.1: Transmitter Output Power	7
4.1	Test Procedure	7
4.2	Test Data	7
5	FCC Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations; RSS-Gen 6.13: Transmitter Unwanted Emissions	8
5.1	Test Procedure	8
5.2	Test Data	8
6	FCC Part 90.543(a): Emission Limitations: ACP Requirements; RSS-119 5.8.9.1 Adjacent Channel Power (ACP)	22
6.1	Test Procedure	22
6.2	Test Data	23
7	FCC Part 2.1053(a): Field Strength of Spurious Radiation; RSS-Gen 6.13: Transmitter Unwanted Emissions	30
7.1	Test Procedure	30
7.2	Test Data	30
8	FCC Part 2.1055: Frequency Stability; Part 90.539: Frequency Stability; RSS-119 5.3 and RSS-Gen 6.11: Transmitter Frequency Stability	34
8.1	Test Procedure	34
8.2	Test Data	35
8.2.1	Temperature Frequency Stability	35
8.2.2	Frequency Stability/Voltage Variation	35
8.2.3	Frequency Stability/Voltage Variation	36
9	FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth	38
10	Conclusion	38

Table of Figures

Figure 2-1:	Configuration of Tested System	6
-------------	--------------------------------------	---

Table of Tables

Table 2-1:	Equipment Under Test (EUT)	6
Table 4-1:	RF Conducted Output Power – Measured	7
Table 4-2:	Test Equipment Used for Testing RF Power Output – Conducted	7
Table 5-1:	Test Equipment Used for Testing Antenna Port Spurious Emissions	21
Table 6-1:	Adjacent Channel Power – 768.00625 MHz; C4FM	23
Table 6-2:	Adjacent Channel Power - 771.00625 MHz; C4FM	23
Table 6-3:	Adjacent Channel Power - 773.50625 MHz; C4FM	24
Table 6-4:	Adjacent Channel Power - 775.99375 MHz; C4FM	24
Table 6-5:	Adjacent Channel Power - 768.00625 MHz; WCQPSK	25
Table 6-6:	Adjacent Channel Power - 771.00625 MHz; WCQPSK	25
Table 6-7:	Adjacent Channel Power - 773.50625 MHz; WCQPSK	26
Table 6-8:	Adjacent Channel Power - 775.99375 MHz; WCQPSK	26
Table 6-9:	Adjacent Channel Power - 768.00625 MHz; HDQPSK	27
Table 6-10:	Adjacent Channel Power - 771.00625 MHz; HDQPSK	27
Table 6-11:	Adjacent Channel Power - 773.50625 MHz; HDQPSK	28
Table 6-12:	Adjacent Channel Power - 775.99375 MHz; HDQPSK	28
Table 6-13:	Test Equipment Used for Testing ACP Requirements	29
Table 7-1:	Field Strength of Spurious Radiation – 768.00625 MHz	30
Table 7-2:	Field Strength of Spurious Radiation – 771.00625 MHz	31
Table 7-3:	Field Strength of Spurious Radiation – 773.50625 MHz	31
Table 7-4:	Field Strength of Spurious Radiation – 775.99375 MHz	32
Table 7-5:	Field Strength of Spurious Radiation in the 1559-1610 Band, FCC 90.543(f), RSS-119 5.8.9.2	32
Table 7-6:	Test Equipment Used for Testing Field Strength of Spurious Radiation	33
Table 8-1:	Temperature Frequency Stability – 768.00625 MHz	35
Table 8-2:	Temperature Frequency Stability – 775.99375 MHz	35
Table 8-3:	Frequency Stability/Voltage Variation – 768.00625 MHz	35
Table 8-4:	Frequency Stability/Voltage Variation – 775.99375 MHz	35
Table 8-5:	Temperature Frequency Stability – 771.00625 MHz	36
Table 8-6:	Temperature Frequency Stability – 773.50625 MHz	36
Table 8-7:	Frequency Stability/Voltage Variation – 771.00625 MHz	36
Table 8-8:	Frequency Stability/Voltage Variation – 773.50625 MHz	36
Table 8-9:	Test Equipment Used for Testing Frequency Stability	37

Table of Plots

Plot 5-1:	Conducted Antenna Spurious Emissions – 768.00625 MHz; C4FM	9
Plot 5-2:	Conducted Antenna Spurious Emissions – 768.00625 MHz; WCQPSK	10
Plot 5-3:	Conducted Antenna Spurious Emissions – 768.00625 MHz; HDQPSK	11
Plot 5-4:	Conducted Antenna Spurious Emissions – 771.00625 MHz; C4FM	12
Plot 5-5:	Conducted Antenna Spurious Emissions – 771.00625 MHz; WCQPSK	13
Plot 5-6:	Conducted Antenna Spurious Emissions – 771.00625 MHz; HDQPSK	14
Plot 5-7:	Conducted Antenna Spurious Emissions – 773.50625 MHz; C4FM	15
Plot 5-8:	Conducted Antenna Spurious Emissions – 773.50625 MHz; WCQPSK	16
Plot 5-9:	Conducted Antenna Spurious Emissions – 773.50625 MHz; HDQPSK	17

Plot 5-10:	Conducted Antenna Spurious Emissions – 775.99375 MHz; C4FM	18
Plot 5-11:	Conducted Antenna Spurious Emissions – 775.99375 MHz; WCQPSK	19
Plot 5-12:	Conducted Antenna Spurious Emissions – 775.99375 MHz; HDQPSK.....	20

Table of Appendixes

Appendix A:	RF Exposure - FCC Part 1.1307, 1.1310, 2.1091, 2.1093; RSS-102 Issue 5.....	39
Appendix B:	Agency Authorization	40
Appendix C:	IC Letters	41
Appendix D:	Canadian Representative.....	42
Appendix E:	FCC & IC Confidentiality Request Letter.....	43
Appendix F:	Frequency Band Attestation	44
Appendix G:	ID Label & Location.....	45
Appendix H:	Operational Description.....	46
Appendix I:	Parts List	47
Appendix J:	Test/Tune Procedure	48
Appendix K:	Schematics.....	49
Appendix L:	Block Diagrams.....	50
Appendix M:	Manual.....	51
Appendix N:	Test Configuration Photographs.....	52
Appendix O:	External Photographs.....	56
Appendix P:	Internal Photographs.....	57

Table of Photographs

Photograph 1:	Radiated Emissions (Spurious/Harmonics) – Front View (Above 1 GHz)	52
Photograph 2:	Radiated Emissions (Spurious/Harmonics) – Back View (Above 1 GHz).....	53
Photograph 3:	Radiated Emissions (Spurious/Harmonics) – Front View (Below 1 GHz).....	54
Photograph 4:	Radiated Emissions (Spurious/Harmonics) – Back View (Below 1 GHz)	55

1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), Part 90.205(a), 90.635	RSS-119 4.1 RSS-Gen 6.12	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210	RSS-Gen 6.13	Complies
Field Strength of Spurious Radiation	2.1053(a), 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
Frequency Stability vs. Temperature and Voltage	2.1055, 90.539	RSS-119 5.3 RSS-Gen 6.11	Complies

Note: As this is a combined FCC and ISSED 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 Certification Report is prepared on behalf of Harris Corporation in accordance with the Federal Communications Commission and I rules and regulations. The Equipment Under Test (EUT) was the MASTR V Base Station Transceiver; FCC ID: OWDTR-0159-E, IC: 3636B-0159.

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 and Industry Canada 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)

This is a new FCC and IC certification application. There are 2 models as indicated in Table 2-1.

2.3 Grant Notes

The output power is continuously variable from the value listed in this entry to 5%-10% of the value listed. Output power is conducted. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures. RF exposure compliance at the time of licensing, as required by the responsible FCC Bureau(s) including antenna co-location requirements if §1.1307(b)(3).

2.4 Tested System Details

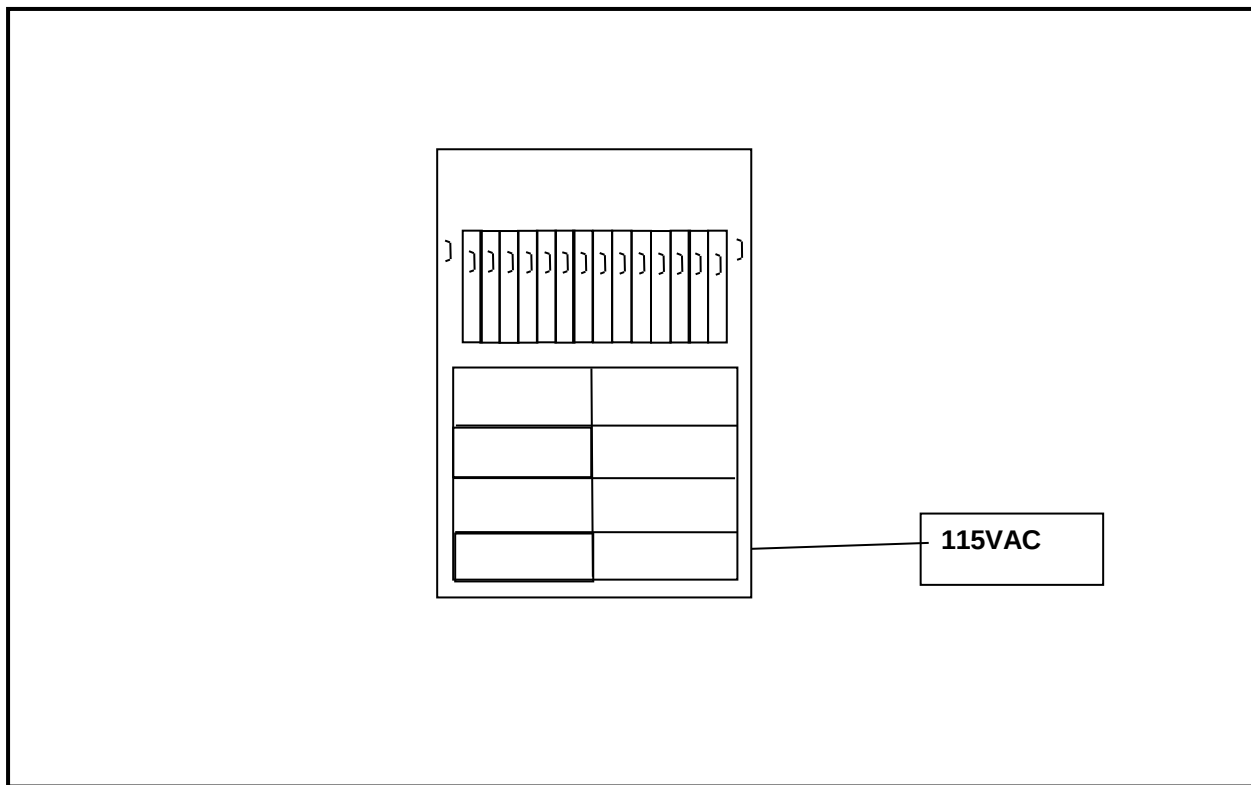
The test sample was received on February 22, 2018. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

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

48V / 7000mA

4 FCC Part 2.1046(a): RF Power Output: Conducted; Part 90.205(k); Part 90.541(a) 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; RSS-119 4.1: Transmitter Output Power

4.1 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

4.2 Test Data

Table 4-1: RF Conducted Output Power – Measured

Frequency (MHz)	Power (dBm)	Power (W)
768.00625	50.0	100.0
771.00625	50.0	100.0
773.50625	50.0	100.0
775.99375	50.0	100.2

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 4-2: Test Equipment Used for Testing RF Power Output – Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/21/18
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/24/18
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	9/1/18
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/18

Test Personnel:

Daniel W. Baltzell
EMC Test Engineer



Signature

February 23, 2018
Date of Test

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

5.1 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.

5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to $10 \times F_c$

Limits: $50 + 10 \text{ LOG } P(W)$ narrowband limit

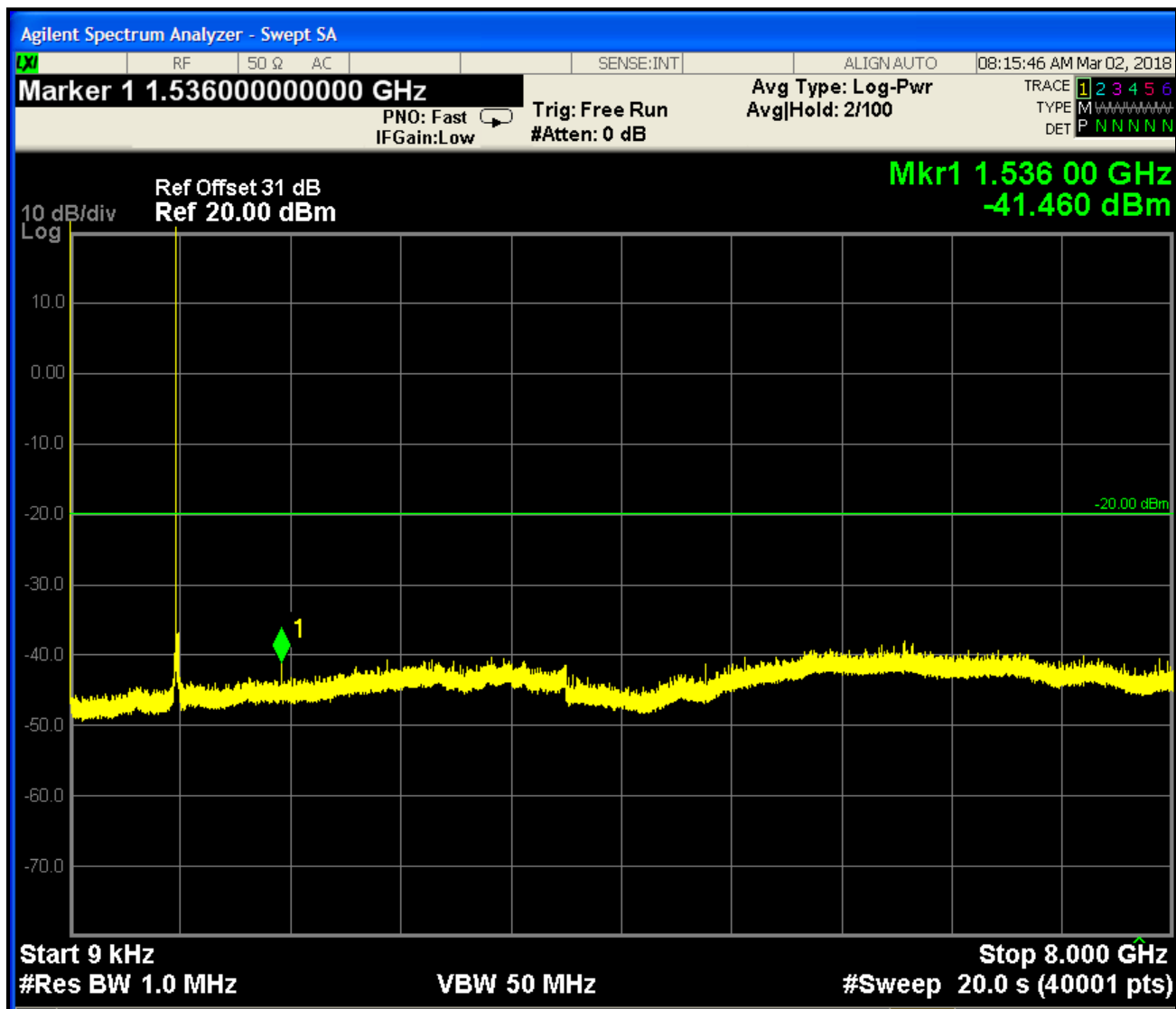
The following frequencies (in MHz) were investigated: 768.00625, 771.00625, 773.50625, and 775.99375

All modes and powers were investigated; high power is presented as worst case.

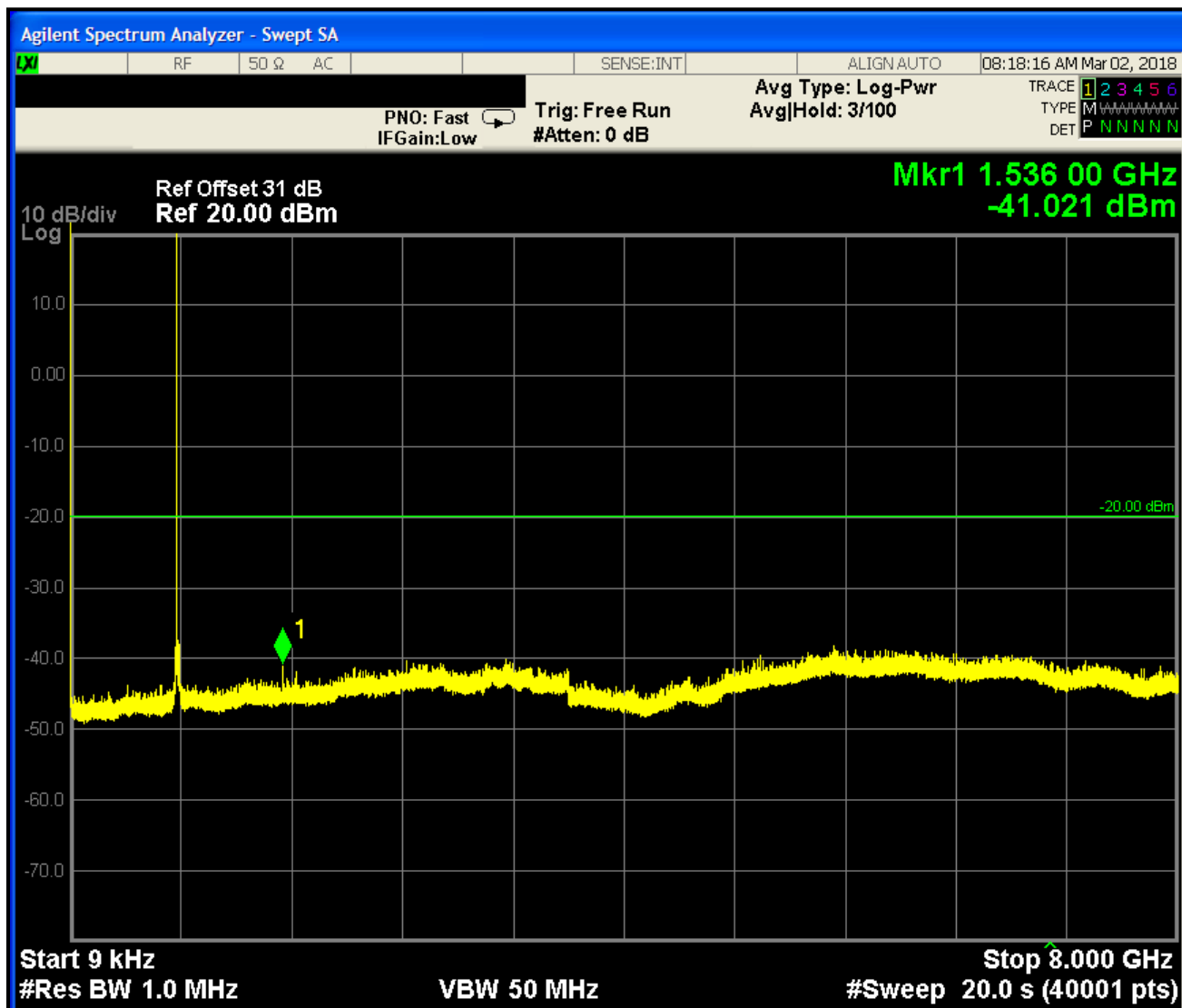
Plot 5-1: Conducted Antenna Spurious Emissions – 768.00625 MHz; C4FM



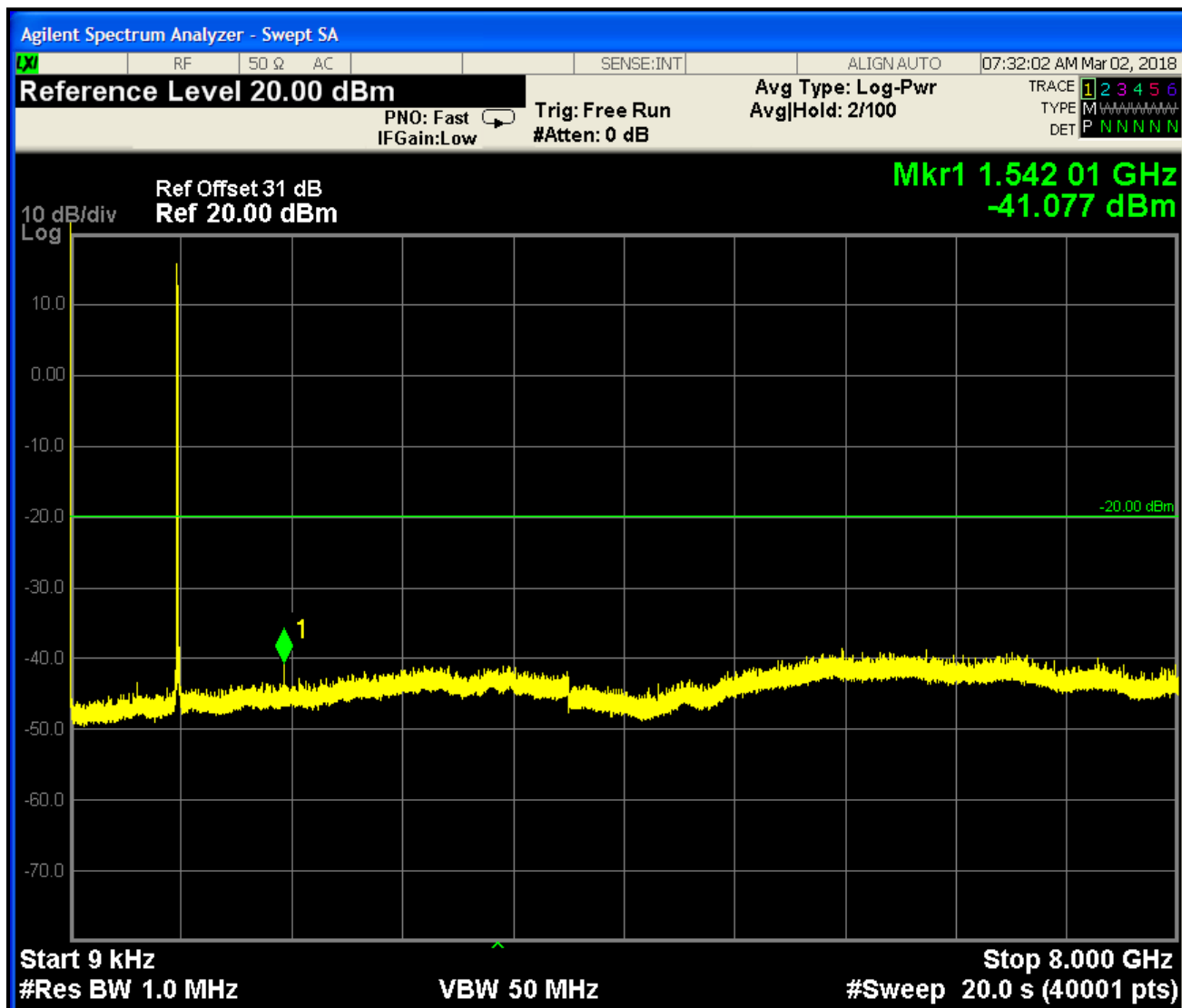
Plot 5-2: Conducted Antenna Spurious Emissions – 768.00625 MHz; WCQPSK



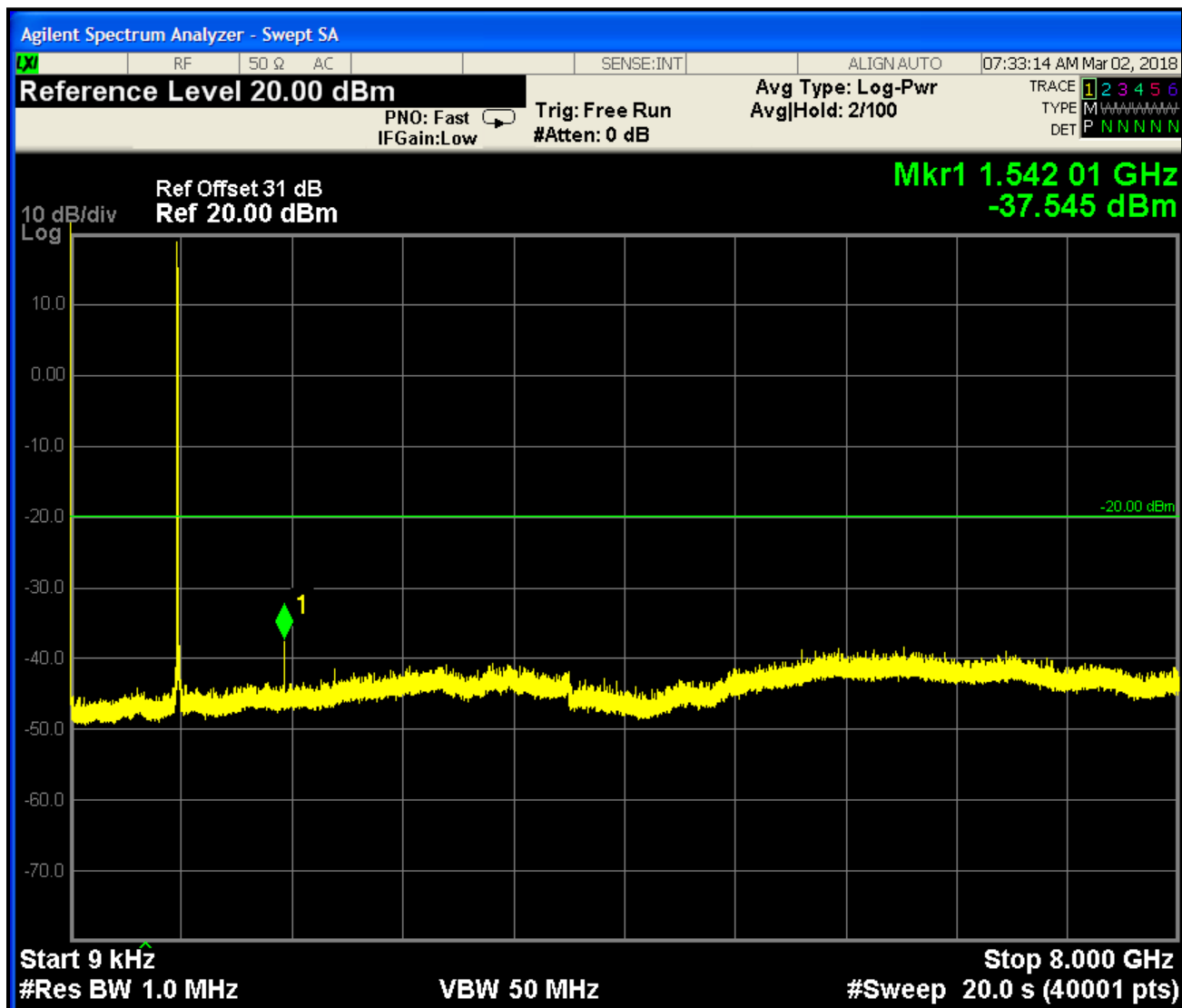
Plot 5-3: Conducted Antenna Spurious Emissions – 768.00625 MHz; HDQPSK



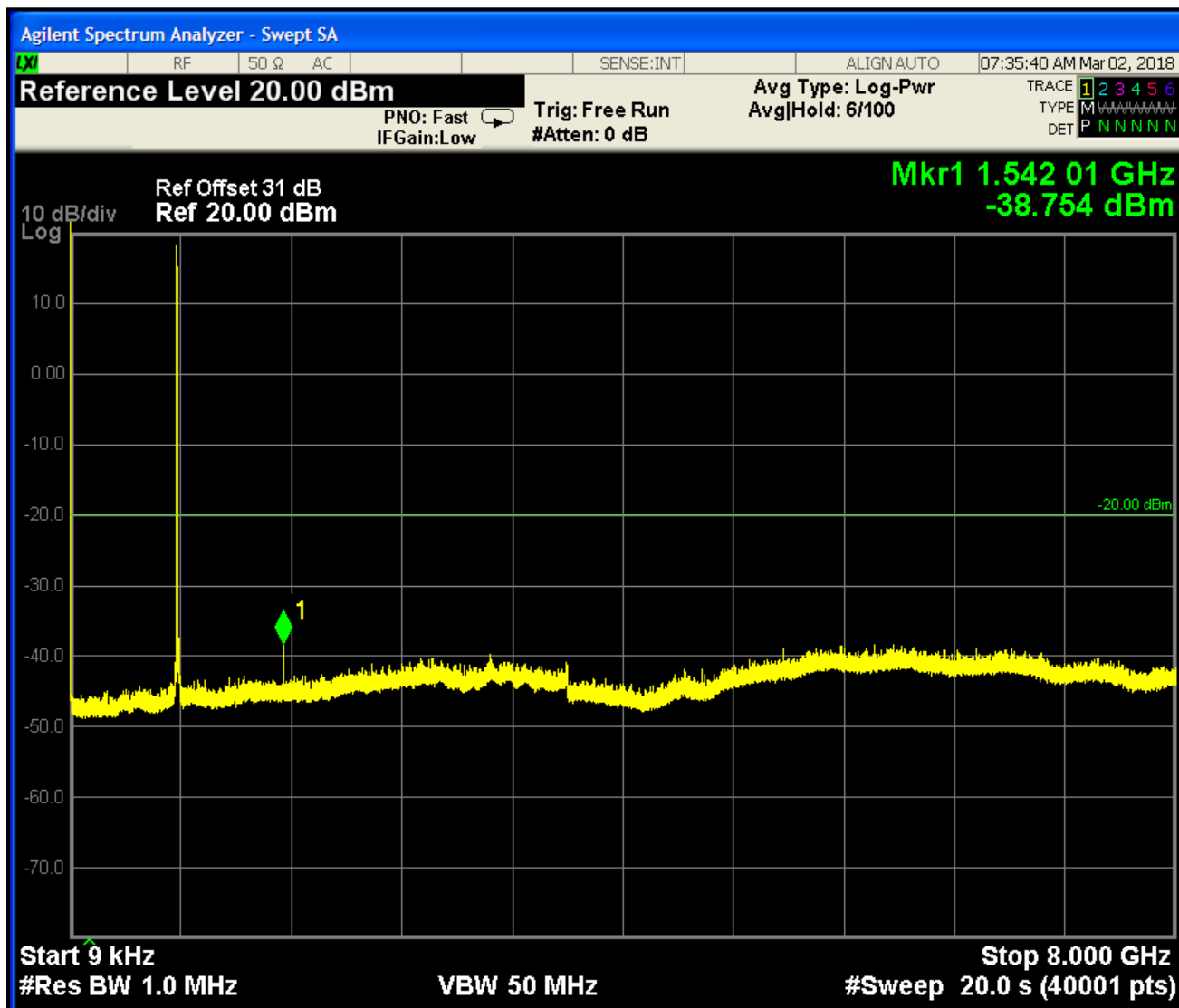
Plot 5-4: Conducted Antenna Spurious Emissions – 771.00625 MHz; C4FM



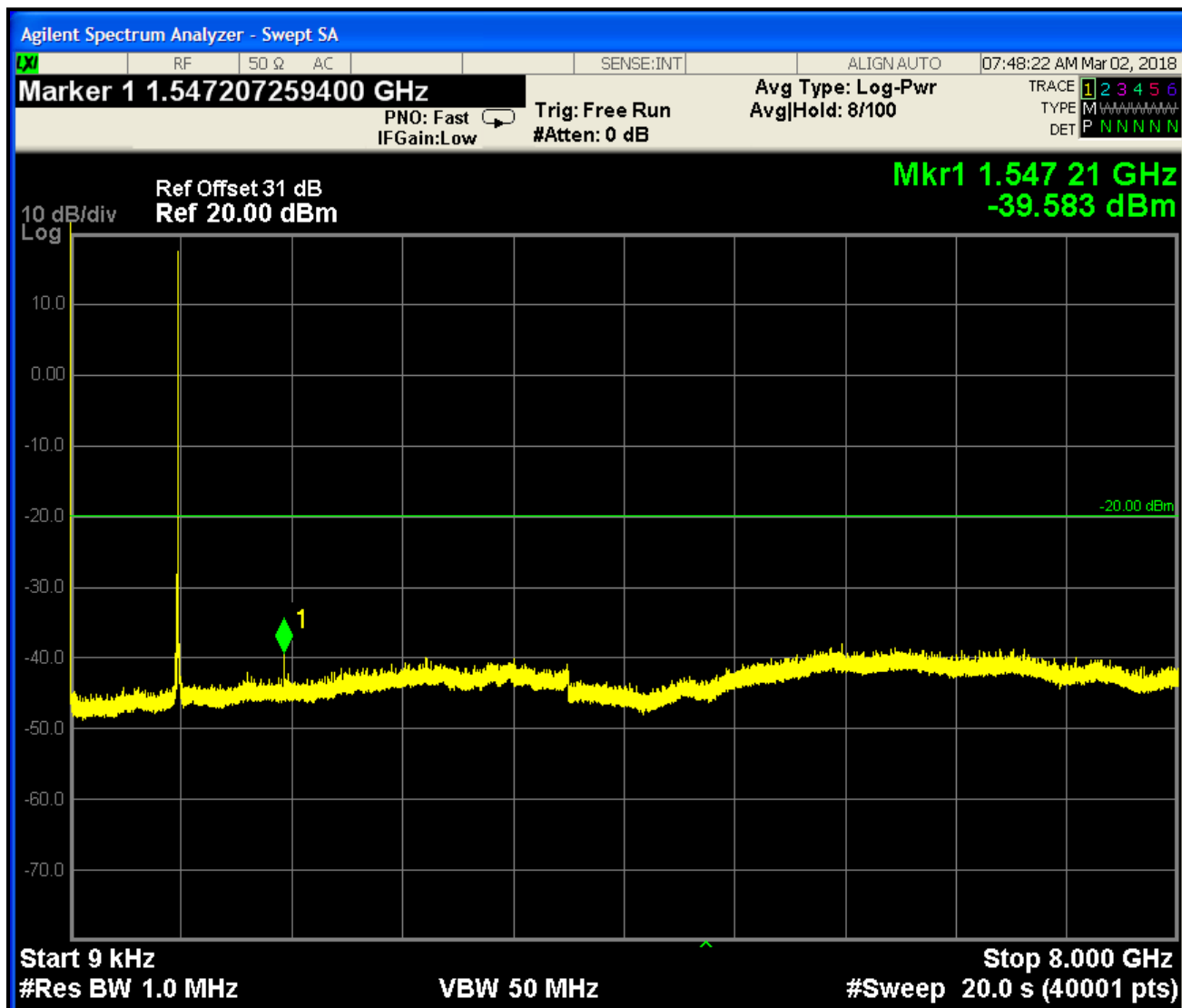
Plot 5-5: Conducted Antenna Spurious Emissions – 771.00625 MHz; WCQPSK



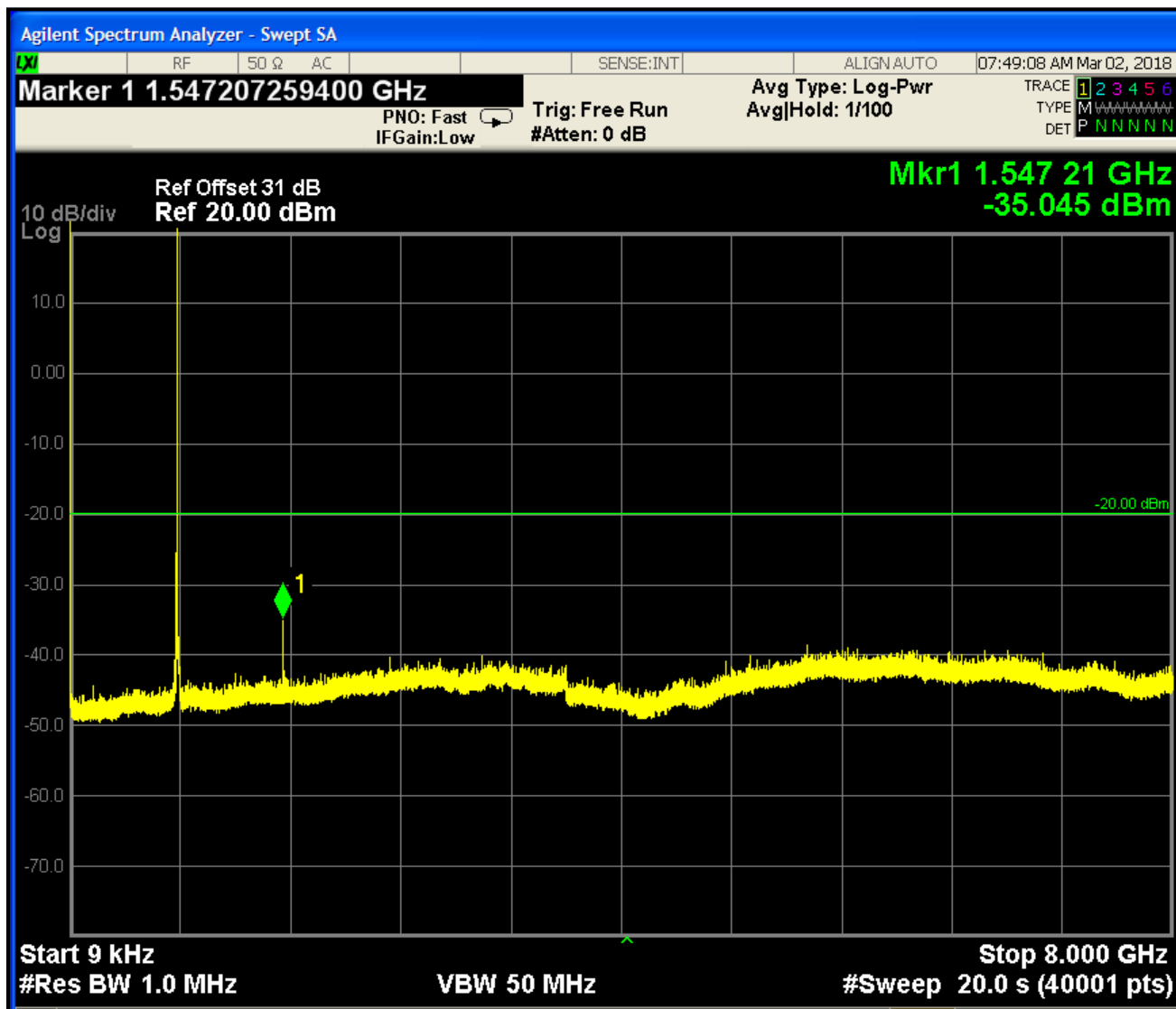
Plot 5-6: Conducted Antenna Spurious Emissions – 771.00625 MHz; HDQPSK



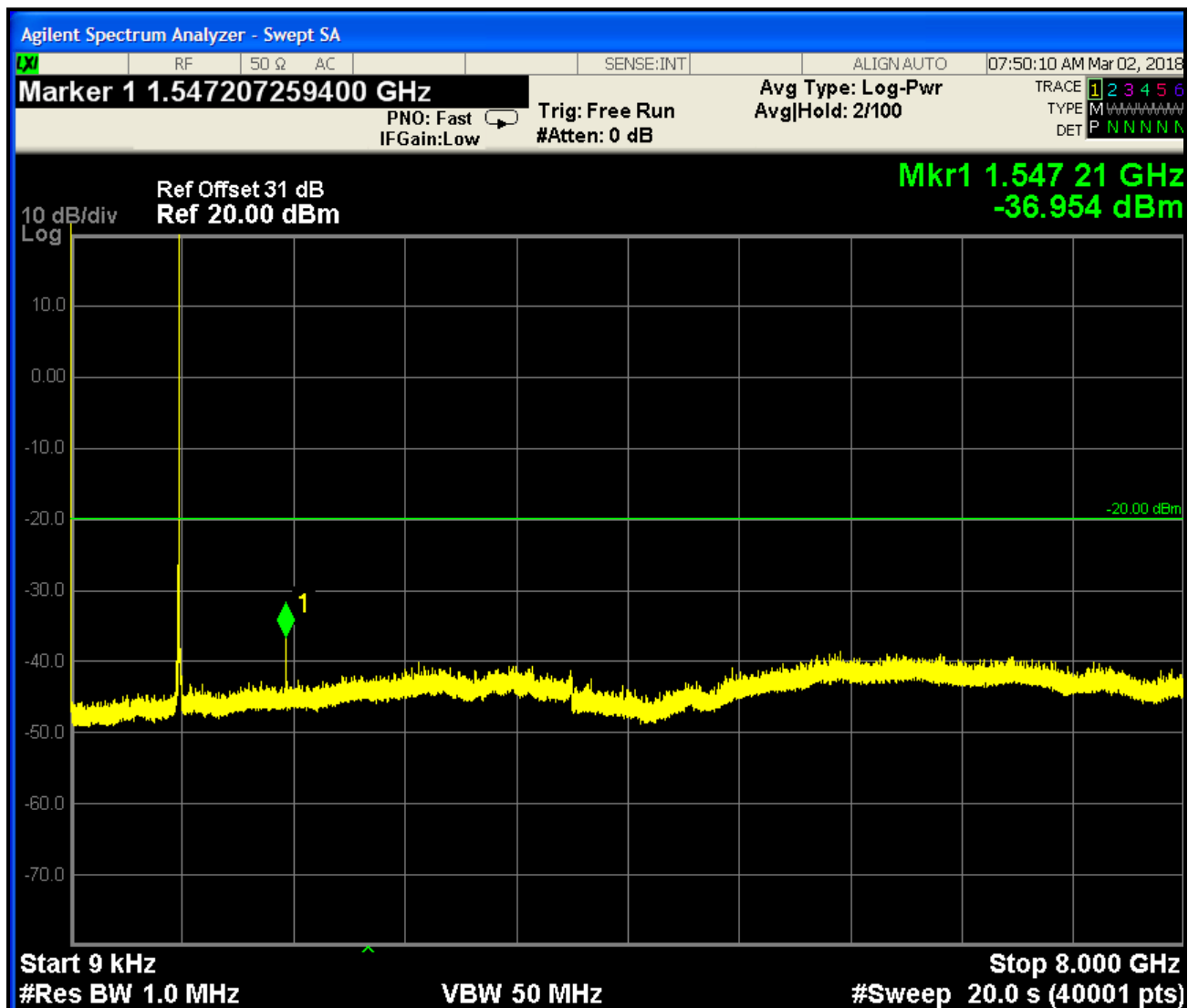
Plot 5-7: Conducted Antenna Spurious Emissions – 773.50625 MHz; C4FM



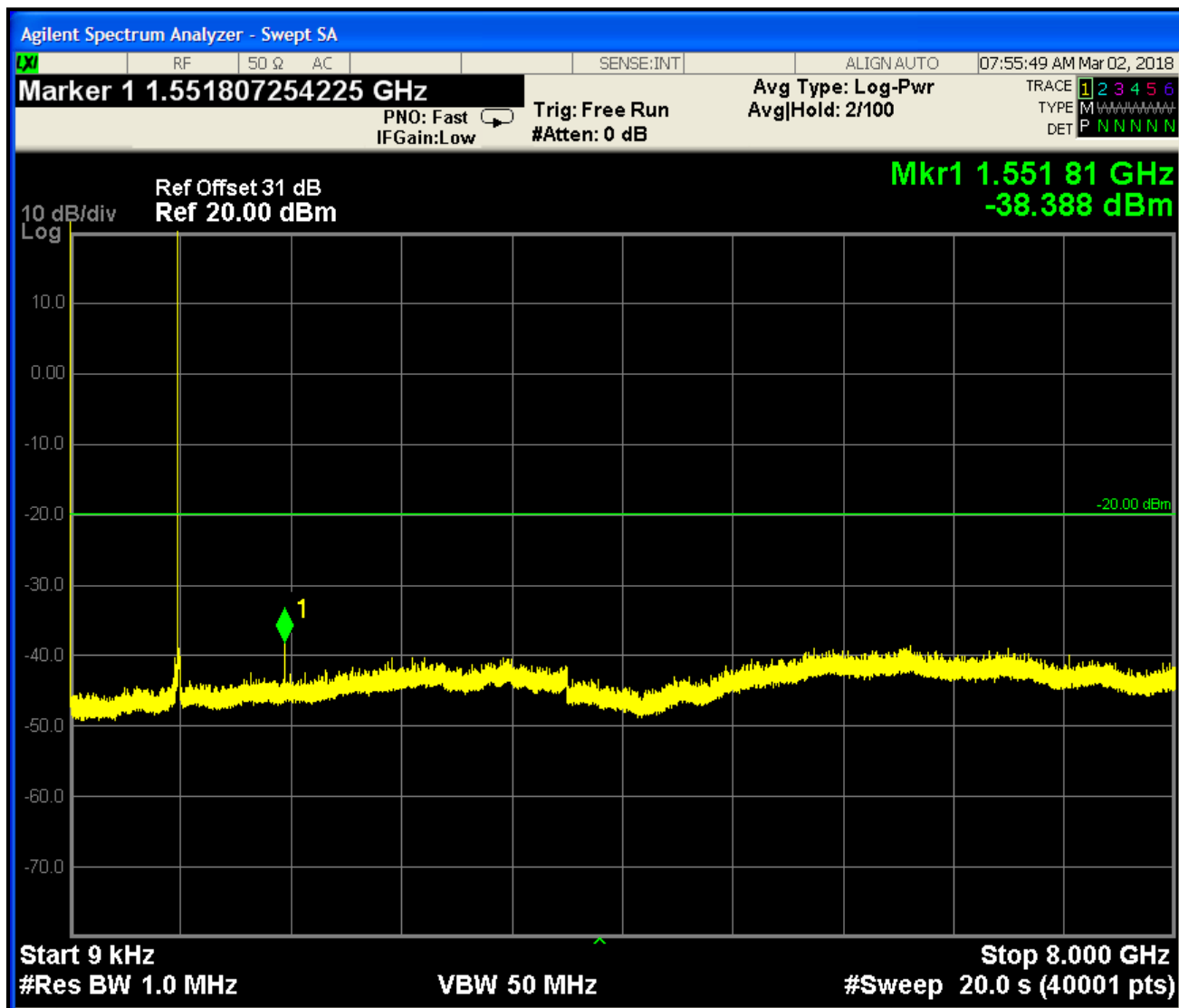
Plot 5-8: Conducted Antenna Spurious Emissions – 773.50625 MHz; WCQPSK



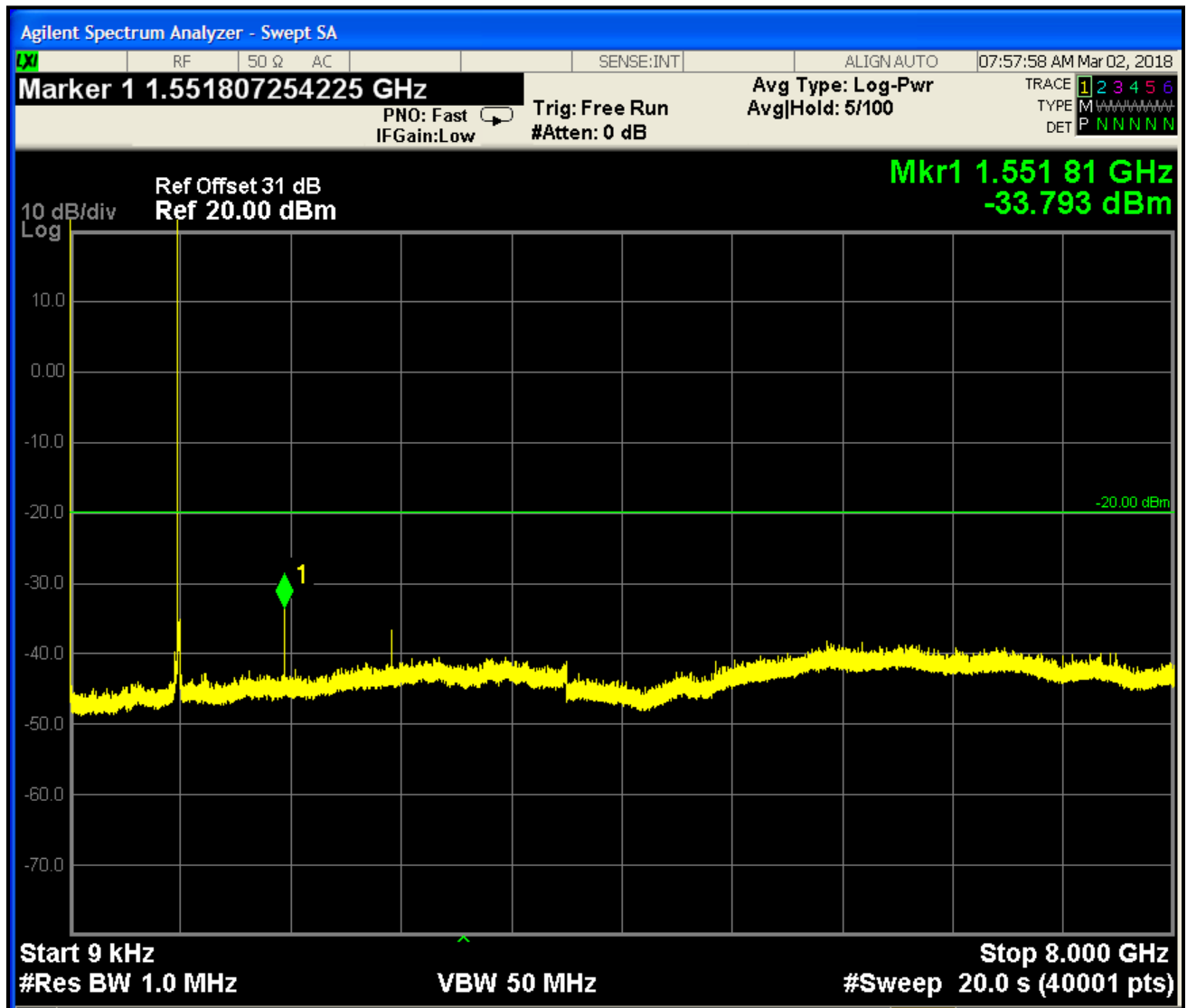
Plot 5-9: Conducted Antenna Spurious Emissions – 773.50625 MHz; HDQPSK



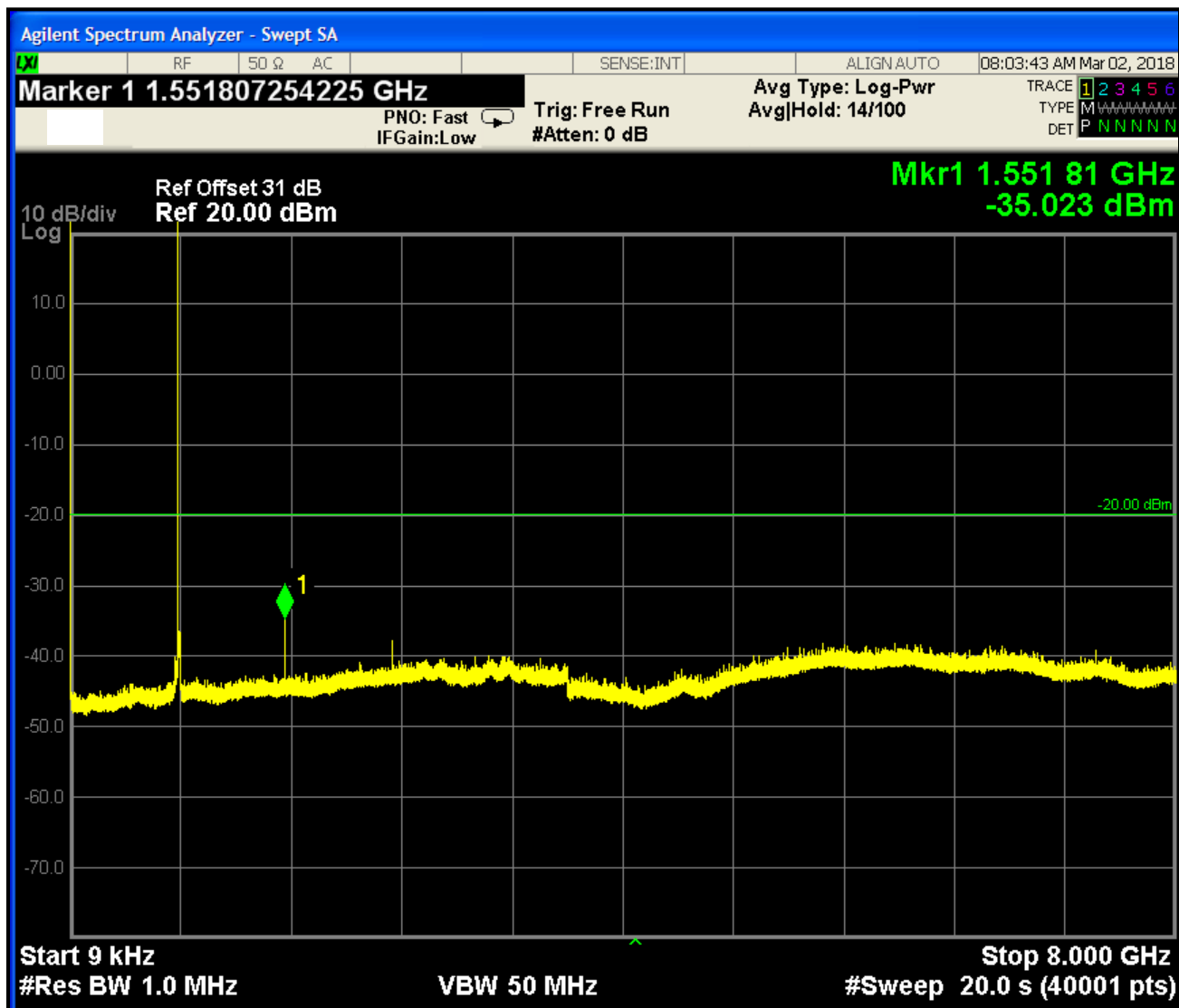
Plot 5-10: Conducted Antenna Spurious Emissions – 775.99375 MHz; C4FM



Plot 5-11: Conducted Antenna Spurious Emissions – 775.99375 MHz; WCQPSK



Plot 5-12: Conducted Antenna Spurious Emissions – 775.99375 MHz; HDQPSK



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 5-1: Test Equipment Used for Testing Antenna Port Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/21/18
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/24/18
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	9/1/18
901132	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	8/21/18
901590	Sucoflex	104	6.5' SMA Cable	145883/4	8/18/18
901591	Sucoflex	104	6.5' SMA Cable	145880/4	8/18/18

Test Personnel:

Daniel W. Baltzell EMC Test Engineer	 Signature	March 2, 2018 Date of Test
---	--	-------------------------------

6 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.

6.1 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 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)	-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.

6.2 Test Data

Table 6-1: Adjacent Channel Power – 768.00625 MHz; C4FM

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-46.2
(+/-)15.625	6.25	-60	-72.2
(+/-)21.875	6.25	-60	-77.8
(+/-)37.5	25	-60	-73.9
(+/-)62.5	25	-65	-80.9
(+/-)87.5	25	-65	-77.4
(+/-)150	100	-65	-71.5
(+/-)250	100	-65	-78.3
(+/-)350	100	-65	-83.0
>400 to 12 MHz	30(s)	-80	-81.8
12 MHz to receive band	30(s)	-80	-88.6
In receive band	30(s)	-100	-102.8

Table 6-2: Adjacent Channel Power - 771.00625 MHz; C4FM

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-42.6
(+/-)15.625	6.25	-60	-77.5
(+/-)21.875	6.25	-60	-72.1
(+/-)37.5	25	-60	-71.9
(+/-)62.5	25	-65	-73.1
(+/-)87.5	25	-65	-77.4
(+/-)150	100	-65	-72.9
(+/-)250	100	-65	-80.5
(+/-)350	100	-65	-83.8
>400 to 12 MHz	30(s)	-80	-83.6
12 MHz to receive band	30(s)	-80	-91.6
In receive band	30(s)	-100	-103.0

Table 6-3: Adjacent Channel Power - 773.50625 MHz; C4FM

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-41.8
(+/-)15.625	6.25	-60	-73.5
(+/-)21.875	6.25	-60	-76.0
(+/-)37.5	25	-60	-70.6
(+/-)62.5	25	-65	-76.1
(+/-)87.5	25	-65	-78.7
(+/-)150	100	-65	-78.5
(+/-)250	100	-65	-80.2
(+/-)350	100	-65	-82.1
>400 to 12 MHz	30(s)	-80	-83.7
12 MHz to receive band	30(s)	-80	-85.4
In receive band	30(s)	-100	-102.1

Table 6-4: Adjacent Channel Power - 775.99375 MHz; C4FM

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-42.3
(+/-)15.625	6.25	-60	-72.8
(+/-)21.875	6.25	-60	-75.1
(+/-)37.5	25	-60	-76.8
(+/-)62.5	25	-65	-77.4
(+/-)87.5	25	-65	-75.0
(+/-)150	100	-65	-75.2
(+/-)250	100	-65	-74.6
(+/-)350	100	-65	-79.1
>400 to 12 MHz	30(s)	-80	-80.3
12 MHz to receive band	30(s)	-80	-86.1
In receive band	30(s)	-100	-101.8

Table 6-5: Adjacent Channel Power - 768.00625 MHz; WCQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-45.8
(+/-)15.625	6.25	-60	-71.0
(+/-)21.875	6.25	-60	-74.0
(+/-)37.5	25	-60	-76.0
(+/-)62.5	25	-65	-74.1
(+/-)87.5	25	-65	-75.5
(+/-)150	100	-65	-77.2
(+/-)250	100	-65	-78.6
(+/-)350	100	-65	-78.4
>400 to 12 MHz	30(s)	-80	-80.9
12 MHz to receive band	30(s)	-80	-88.3
In receive band	30(s)	-100	-102.9

Table 6-6: Adjacent Channel Power - 771.00625 MHz; WCQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-44.0
(+/-)15.625	6.25	-60	-73.5
(+/-)21.875	6.25	-60	-75.3
(+/-)37.5	25	-60	-71.6
(+/-)62.5	25	-65	-81.6
(+/-)87.5	25	-65	-73.6
(+/-)150	100	-65	-77.6
(+/-)250	100	-65	-76.7
(+/-)350	100	-65	-80.0
>400 to 12 MHz	30(s)	-80	-84.5
12 MHz to receive band	30(s)	-80	-91.0
In receive band	30(s)	-100	-102.1

Table 6-7: Adjacent Channel Power - 773.50625 MHz; WCQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-42.7
(+/-)15.625	6.25	-60	-73.3
(+/-)21.875	6.25	-60	-72.1
(+/-)37.5	25	-60	-69.2
(+/-)62.5	25	-65	-73.9
(+/-)87.5	25	-65	-78.8
(+/-)150	100	-65	-72.0
(+/-)250	100	-65	-80.0
(+/-)350	100	-65	-82.8
>400 to 12 MHz	30(s)	-80	-85.3
12 MHz to receive band	30(s)	-80	-83.7
In receive band	30(s)	-100	-102.1

Table 6-8: Adjacent Channel Power - 775.99375 MHz; WCQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-43.3
(+/-)15.625	6.25	-60	-71.5
(+/-)21.875	6.25	-60	-73.5
(+/-)37.5	25	-60	-69.7
(+/-)62.5	25	-65	-72.3
(+/-)87.5	25	-65	-81.6
(+/-)150	100	-65	-78.4
(+/-)250	100	-65	-79.5
(+/-)350	100	-65	-77.4
>400 to 12 MHz	30(s)	-80	-81.2
12 MHz to receive band	30(s)	-80	-84.6
In receive band	30(s)	-100	-101.7

Table 6-9: Adjacent Channel Power - 768.00625 MHz; HDQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-44.6
(+/-)15.625	6.25	-60	-71.0
(+/-)21.875	6.25	-60	-76.0
(+/-)37.5	25	-60	-70.0
(+/-)62.5	25	-65	-76.0
(+/-)87.5	25	-65	-77.9
(+/-)150	100	-65	-75.9
(+/-)250	100	-65	-81.2
(+/-)350	100	-65	-82.1
>400 to 12 MHz	30(s)	-80	-80.9
12 MHz to receive band	30(s)	-80	-88.3
In receive band	30(s)	-100	-103.0

Table 6-10: Adjacent Channel Power - 771.00625 MHz; HDQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-43.9
(+/-)15.625	6.25	-60	-74.7
(+/-)21.875	6.25	-60	-76.7
(+/-)37.5	25	-60	-70.6
(+/-)62.5	25	-65	-72.9
(+/-)87.5	25	-65	-76.4
(+/-)150	100	-65	-77.4
(+/-)250	100	-65	-82.1
(+/-)350	100	-65	-79.9
>400 to 12 MHz	30(s)	-80	-83.7
12 MHz to receive band	30(s)	-80	-91.3
In receive band	30(s)	-100	-102.3

Table 6-11: Adjacent Channel Power - 773.50625 MHz; HDQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-42.8
(+/-)15.625	6.25	-60	-72.3
(+/-)21.875	6.25	-60	-74.2
(+/-)37.5	25	-60	-69.3
(+/-)62.5	25	-65	-70.7
(+/-)87.5	25	-65	-80.2
(+/-)150	100	-65	-74.9
(+/-)250	100	-65	-81.5
(+/-)350	100	-65	-78.9
>400 to 12 MHz	30(s)	-80	-85.0
12 MHz to receive band	30(s)	-80	-84.3
In receive band	30(s)	-100	-102.0

Table 6-12: Adjacent Channel Power - 775.99375 MHz; HDQPSK

Offset from Center Frequency (kHz)	Measurement BW (kHz)	Max ACP (dBc)	Measured ACP (dBc)
(+/-)9.375	6.25	-40	-45.4
(+/-)15.625	6.25	-60	-72.0
(+/-)21.875	6.25	-60	-75.3
(+/-)37.5	25	-60	-71.7
(+/-)62.5	25	-65	-76.2
(+/-)87.5	25	-65	-78.4
(+/-)150	100	-65	-73.0
(+/-)250	100	-65	-72.3
(+/-)350	100	-65	-76.0
>400 to 12 MHz	30(s)	-80	-80.8
12 MHz to receive band	30(s)	-80	-84.1
In receive band	30(s)	-100	-101.5

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 6-13: Test Equipment Used for Testing ACP Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/21/18
901139	Weinschel Corporation	48-20-34	Attenuator DC-18 GHz 20 dB 100W	BK5859	3/30/18
901291	Pasternack	PE7031-20	300W Attenuator, DC 1 GHz, 20 dB	NA	8/24/18

Test Personnel:

Daniel Baltzell		February 28, April 2, 2018
EMC Test Engineer	Signature	Dates of Tests

7 FCC Part 2.1053(a): Field Strength of Spurious Radiation; RSS-Gen 6.13: Transmitter Unwanted Emissions

7.1 Test Procedure

ANSI 63.26, section 5.5.

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, and compared to the limit.

7.2 Test Data

Table 7-1: Field Strength of Spurious Radiation – 768.00625 MHz

Conducted Power 50 dBm; 100 W; Limit=50+10LogP=70 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)
1536.013	40.9	-31.9	0.4	6.5	75.7	-5.7
2304.019	16.8	-59.9	0.5	7.3	103.0	-33.0
3072.025	26.6	-48.7	0.7	7.2	92.2	-22.2
3840.031	8.1	-66.7	0.8	7.0	110.6	-40.6
4608.038	9.6	-62.1	0.9	8.9	104.2	-34.2
5376.044	-18.2	-90.1	1.0	8.5	132.6	-62.6
6144.050	-18.4	-89.1	1.2	9.2	131.0	-61.0
6912.056	-11.9	-81.8	1.3	9.5	123.6	-53.6
7680.063	-15.1	-84.4	1.4	9.2	126.5	-56.5

Table 7-2: Field Strength of Spurious Radiation – 771.00625 MHz

Conducted Power 50 dBm; 100 W; Limit=50+10LogP=70 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)
1542.013	40.4	-32.4	0.4	6.6	76.2	-6.2
2313.019	23.9	-54.8	0.5	7.3	98.0	-28.0
3084.025	21.7	-53.6	0.7	7.1	97.2	-27.2
3855.031	-5.8	-79.5	0.8	7.0	123.4	-53.4
4626.038	-11.9	-83.6	0.9	8.9	125.6	-55.6
10794.088	-21.1	-93.0	1.0	8.5	135.5	-65.5
6168.050	-18.6	-89.6	1.2	9.1	131.7	-61.7
6939.056	-21.3	-91.4	1.3	9.5	133.2	-63.2
7710.063	-20.7	-90.0	1.4	9.3	132.1	-62.1

Table 7-3: Field Strength of Spurious Radiation – 773.50625 MHz

Conducted Power 50 dBm; 100 W; Limit=50+10LogP=70 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)
1547.013	40.2	-32.6	0.4	6.6	76.4	-6.4
2320.519	23.2	-55.5	0.5	7.3	98.7	-28.7
3094.025	23.4	-51.8	0.7	7.1	95.4	-25.4
3867.531	-1.9	-76.6	0.8	7.0	120.5	-50.5
4641.038	-4.3	-76.0	0.9	8.9	118.0	-48.0
5414.544	-19.9	-91.8	1.0	8.5	134.4	-64.4
6188.050	-22.1	-92.8	1.2	9.1	134.9	-64.9
6961.556	-19.8	-89.7	1.3	9.5	131.4	-61.4
7735.063	-19.0	-88.4	1.4	9.3	130.5	-60.5

Table 7-4: Field Strength of Spurious Radiation – 775.99375 MHz

Conducted Power 50 dBm; 100 W; Limit=50+10LogP=70 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)
1551.988	45.6	-27.3	0.4	6.6	71.1	-1.1
2327.981	25.3	-53.3	0.5	7.3	96.6	-26.6
3103.975	19.7	-55.5	0.7	7.1	99.1	-29.1
3879.969	-0.7	-75.4	0.8	7.0	119.3	-49.3
4655.963	-3.1	-74.8	0.9	8.9	116.8	-46.8
5431.956	-18.7	-90.5	1.1	8.5	133.0	-63.0
6207.950	-15.4	-86.0	1.2	9.1	128.1	-58.1
6983.944	-10.8	-80.6	1.3	9.5	122.3	-52.3
7759.938	-9.2	-78.6	1.4	9.3	120.7	-50.7

Table 7-5: Field Strength of Spurious Radiation in the 1559-1610 Band, FCC 90.543(f), RSS-119 5.8.9.2

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Corrected Spectrum Analyzer (dBuV/m)	Converted Level (dBW/MHz)	Limit (dBW)	Margin (dB)
1559.989	14.6	-10.5	4.1	-121.1	-80.0	-41.1
1559.991	22.3	-10.5	11.8	-113.4	-80.0	-33.4
1560.001	19.5	-10.5	9.0	-116.2	-80.0	-36.2
1562.464	31.4	-10.5	20.9	-104.3	-80.0	-24.3
1562.467	27.8	-10.5	17.3	-107.9	-80.0	-27.9
1562.482	28.5	-10.5	18.0	-107.2	-80.0	-27.2
1562.485	24.8	-10.5	14.3	-110.9	-80.0	-30.9
1562.489	38.2	-10.5	27.7	-97.5	-80.0	-17.5
1562.491	38.7	-10.5	28.2	-97.0	-80.0	-17.0
1562.491	27.2	-10.5	16.7	-108.5	-80.0	-28.5
1562.497	30.2	-10.5	19.7	-105.5	-80.0	-25.5
1566.625	20.2	-10.4	9.8	-115.5	-80.0	-35.5
1566.653	28.5	-10.4	18.1	-107.2	-80.0	-27.2
1566.662	15.3	-10.4	4.9	-120.4	-80.0	-40.4

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±4.6 dB

Table 7-6: 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	8/18/18
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/18/18
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	6/11/18
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
901592	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	3/20/18
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/21/18
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	8/21/18
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1-18 GHz)	2310	2/4/19
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	8/18/18
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/18

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

March 2-5, 2018
Dates of Test

8 FCC Part 2.1055: Frequency Stability; Part 90.539: Frequency Stability; RSS-119 5.3 and RSS-Gen 6.11: Transmitter Frequency Stability

8.1 Test Procedure

ANSI 63.26, section 5.6.

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

The EUT was evaluated over the temperature range -30°C to +55°C. The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the supply voltage to the EUT was varied +/-15% nominal input voltage.

Part 90.539: Base stations within 769–775 MHz and 799–805 MHz – 100 ppb

RSS-119: Base stations within 768-776 MHz and 798-806 MHz Narrowband – 0.1 ppm

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 onto the base station signal.

(b) The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.

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

(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.

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

8.2 Test Data

8.2.1 Temperature Frequency Stability

Table 8-1: Temperature Frequency Stability – 768.00625 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	768.006261	0.01
-20	768.006262	0.02
-10	768.006273	0.03
0	768.006269	0.02
10	768.006253	0.00
20 (reference)	768.006250	0.00
30	768.006240	-0.01
40	768.006232	-0.02
50	768.006230	-0.03
55	768.006228	-0.03
60	768.006224	-0.03

Table 8-2: Temperature Frequency Stability – 775.99375 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	775.993760	0.01
-20	775.993760	0.01
-10	775.993771	0.03
0	775.993769	0.02
10	775.993750	0.00
20 (reference)	775.993750	0.00
30	775.993739	-0.01
40	775.993731	-0.02
50	775.993728	-0.03
55	775.993726	-0.03
60	775.993722	-0.04

8.2.2 Frequency Stability/Voltage Variation

Table 8-3: Frequency Stability/Voltage Variation – 768.00625 MHz

Voltage (VAC)	Measured Frequency (MHz)	ppm
97.75	768.006250	0.00
115 (reference)	768.006250	0.00
132.25	768.006252	0.00

Table 8-4: Frequency Stability/Voltage Variation – 775.99375 MHz

Voltage (VAC)	Measured Frequency (MHz)	ppm
97.75	775.993750	0.00
115 (reference)	775.993750	0.00
132.25	775.993750	0.00

Table 8-5: Temperature Frequency Stability – 771.00625 MHz

Temperature (°C)	Measured Frequency (MHz)	ppb
-30	771.006258	10.52
-20	771.006254	5.45
-10	771.006253	4.18
0	771.006267	21.95
10	771.006260	12.70
20 (reference)	771.006250	0.00
30	771.006248	-2.54
40	771.006232	-22.96
50	771.006227	-30.32
55	771.006224	-34.02
60	771.006221	-37.70

Table 8-6: Temperature Frequency Stability – 773.50625 MHz

Temperature (°C)	Measured Frequency (MHz)	ppb
-30	773.506259	11.75
-20	773.506256	7.95
-10	773.506254	5.43
0	773.506268	22.78
10	773.506262	15.19
20 (reference)	773.506250	0.00
30	773.506248	-2.52
40	773.506234	-20.35
50	773.506229	-27.69
55	773.506226	-31.38
60	773.506220	-38.67

8.2.3 Frequency Stability/Voltage Variation

Table 8-7: Frequency Stability/Voltage Variation – 771.00625 MHz

Voltage (VAC)	Measured Frequency (MHz)	ppb
97.75	771.006250	0.00
115 (reference)	771.006250	0.00
132.25	771.006250	0.00

Table 8-8: Frequency Stability/Voltage Variation – 773.50625 MHz

Voltage (VAC)	Measured Frequency (MHz)	ppb
97.75	773.506252	2.53
115 (reference)	773.506250	0.00
132.25	773.506252	2.53

Results: The EUT is compliant.

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 8-9: Test Equipment Used for Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901350	Meterman	33XR	Multimeter	040402802	4/26/19
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	4/17/19
900946	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	3/26/18
901291	Pasternack	PE7031-20	300W Attenuator, DC - 1 GHz, 20 dB	NA	8/24/18
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	9/1/18
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/21/18
9015	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/18/18

Test Personnel:

 Daniel W. Baltzell EMC Test Engineer	Signature	February 26-27, 2018 Dates of Test
--	-----------	---------------------------------------

9 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

P25 Phase 1 (C4FM)

Calculation:

Data rate in bps (R) = 9600

Peak deviation of carrier (D) = 1800

$B_n = \lceil 9600 / \log_2(4) \rceil + 2 (1800) (0.89) = 8.0 \text{ kHz}$

Emission designator: 8K00F1D, 8K00F1E

P25 Linear Simulcast (WCQPSK)

Calculation:

Data rate in bps (R) = 9600

Peak deviation of carrier (D) = 1800

$B_n = \lceil 9600 / \log_2(4) \rceil + 2 (1800) (1.362) = 9.7 \text{ kHz}$

Emission designator: 9K70D1W

P25 Phase 2 (HDQPSK)

Calculation:

Data rate in bps (R) = 12000

Peak deviation of carrier (D) = 2250

$B_n = \lceil 12000 / \log_2(4) \rceil + 2 (2250) (0.841) = 9.8 \text{ kHz}$

Emission designator: 9K80D7W

10 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 FCC Parts 2 and 90 of the FCC Rules and IC RSS-119 and RSS-Gen.