



Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Class II Permissive Change Report

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Standards Referenced for this Report	
Part 2: 2010	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 80: 2010	Stations in the Maritime Services
Part 90: 2010	Private Land Mobile Radio Services
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI/TIA/EIA-102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
ANSI/TIA/EIA-102.BAAA-1998	Project 25 FDMA Common Air Interface—New Technology Standards Project—Digital Radio Technical Standards
Industry Canada RSS-119 Issue 11	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41- 960 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2011157

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These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Emission Designator (Transmit Mode)
30-50 (FCC/IC)	0.009	0.5	16K0F3E (Analog Voice; WB)
30-50 (FCC/IC)	0.009	0.5	16K0F3E (Analog Voice; WB)
30-50 (FCC/IC)	0.009	0.5	16K0F3E (Analog Voice; WB)
156-162 (FCC Part 80)	50*	0.5	16K0F3E (Analog Voice; WB)

* coast station application, 25 W for ship stations

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1 Test Result Summary

Test	FCC Reference	Result
RF Power Output	2.1046(a), 90.541(b), 90.542(a)(6), 80.215	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210, 80.211(f)(3)	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.543(c)	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.543(d), 80.205, 80.211(f)	Complies

1.1 General Information

The following Class II 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 XG-100M Unity Multiband Radio; FCC ID: AQZ-XG-100M00, IC: 122D-XG100M00.

The first purpose of the permissive change testing is the addition of an antenna. The only testing applicable due to the addition of the antenna is EIRP testing per FCC Part 90.543(f) and MPE testing for the 700 and 800 MHz band (please see separate MPE report under the RF Exposure exhibit).

The second purpose of the permissive change testing is the addition of the 30 – 50 MHz band. The capability for the 30 – 50 MHz band operation was present in the radio at the time of the original filing, but not enabled.

The third purpose of the permissive change testing is the addition of the 16K0F3E emission designator under Part 80 for the 156 – 162 MHz band. The capability for this emission designator was present in the radio at the time of the original filing, but not enabled.

The last purpose of the permissive change is change the last three characters of the H-CPM emission designator from G1D/E to G7D/E. This corrects an oversight in the original filing. Modulation has not changed, nor has any aspect of the product as originally tested. The modulator continues to be an I & Q device operating as a frequency modulator. The specific details are provided in Appendix A.

All measurements contained in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2, 80 and 90. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.2 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.

1.3 Related Submittal(s)/Grant(s)

The original FCC certification was granted May 24, 2011; the original IC certification was granted May 25, 2011.

1.4 Grant Notes

2 Tested System Details

The test sample was received on September 16, 2011. 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 is capable of multiple modes of operation and modulation types using ASCII commands sent via serial interface.

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Radio	Harris Corporation	XG-100M	A40201000506	AQZ-XG-100M00	20268
Control Head	Harris Corporation	CU23218-0004	96008459	N/A	20270
CH-721 Control Head	Harris	CU23218-0004	16014170	N/A	19998
Antenna Base	N/A	N/A	N/A	N/A	20266
Antenna	Laird Technologies	WPD136M6C-001	N/A	N/A	20267
Microphone	Harris	MC-101616-041	N/A	N/A	20422
Speaker	Harris	LS102824010R1A	N/A	N/A	20423

Table 2-2: Supplementary Test Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Laptop	Panasonic	CF-28 Toughbook	N/A	N/A	N/A

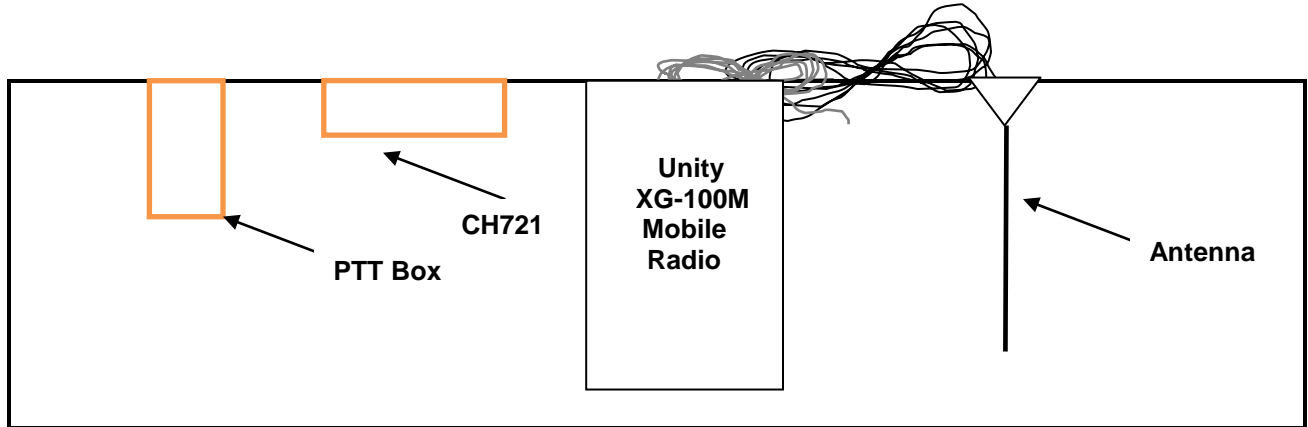


Figure 2-1: Configuration of Tested System

3 FCC Rules and Regulations Part 2.1033(c)(8) Voltages and Currents Through The Final Amplifying Stage

13.6V / 8 A VHF/UHF/700/800 MHz

4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.541(b)/90.542(a)(6), 80.215: Transmitting Power Limits; RSS-119 4.1 Transmitter Output Power

4.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.1

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

Rated power: 0.009 W

4.2 Test Data

Table 4-1: RF Conducted Output Power – Measured


Frequency (MHz)	Power (dBm)	Power (W)
30	8.8	0.008
40	9.7	0.009
50	7.9	0.006
156.8	47.3	53.7

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
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	1/11/13
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	1/20/13
901339	MCE Weinschel	47-40-34	Attenuator, 40 dB, DC-18 GHz, 50 W	BM4864	7/15/12

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	September 29, 2011 Date of Test
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5 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210, 80.211: Emission Limitations; RSS-119 5.8 Transmitter Unwanted Emissions

5.1 Test Procedure

ANSI/TIA/EIA-603-2004, Section 2.2.13

The transmitter is terminated with a 50Ω 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

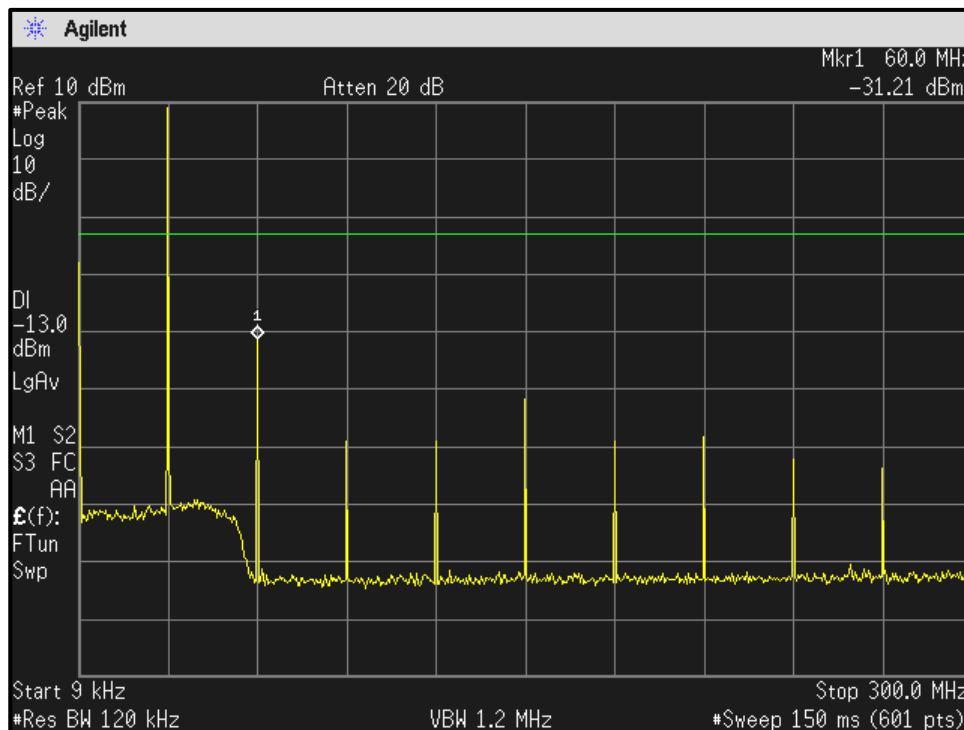
Limits: (43+10LOG P(W)) for wideband and 50 + 10 LOG P(W)) for narrowband

The following channels (in MHz) were investigated:

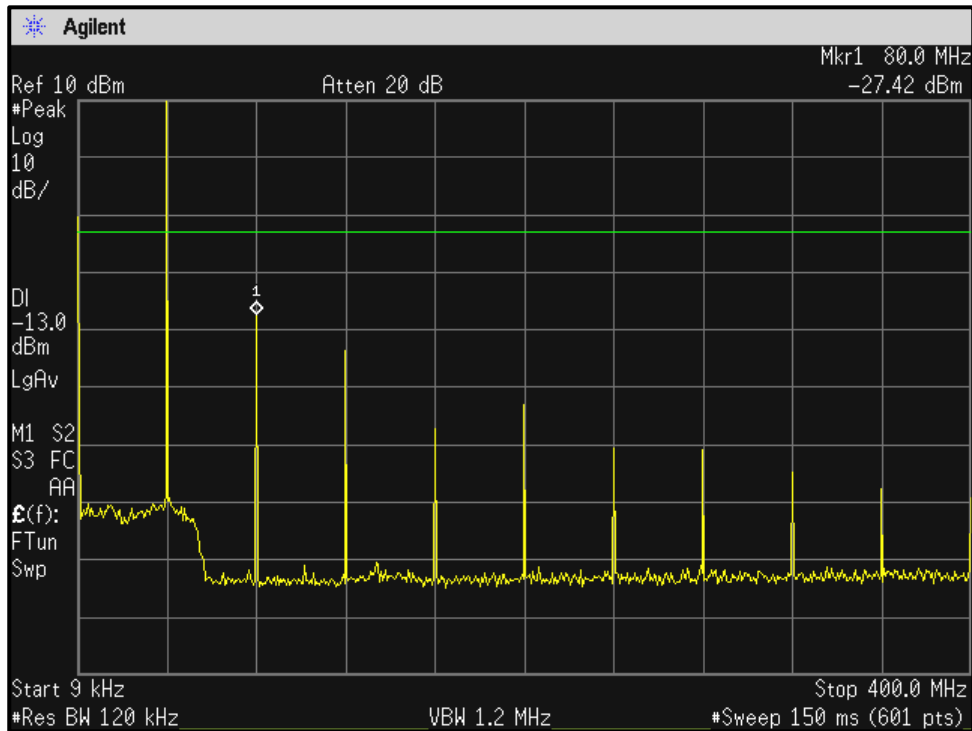
VHF (MHz)
30 (FCC/IC)
40 (FCC/IC)
50 (FCC/IC)
156.8 (FCC Part 80)

All modes were investigated; analog mode is presented as representative data.

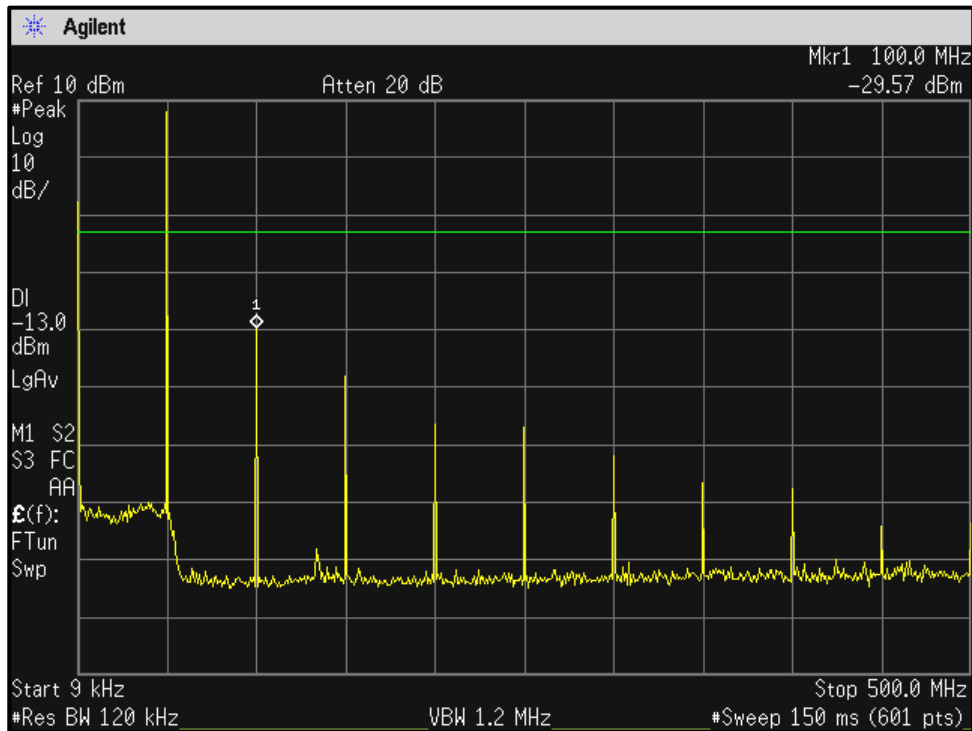
Plot 5-1: Spurious Emissions at Antenna Terminals – 30 MHz



Plot 5-2: Spurious Emissions at Antenna Terminals – 40 MHz



Plot 5-3: Spurious Emissions at Antenna Terminals – 50 MHz



Plot 5-4: Spurious Emissions at Antenna Terminals – 156.8 MHz

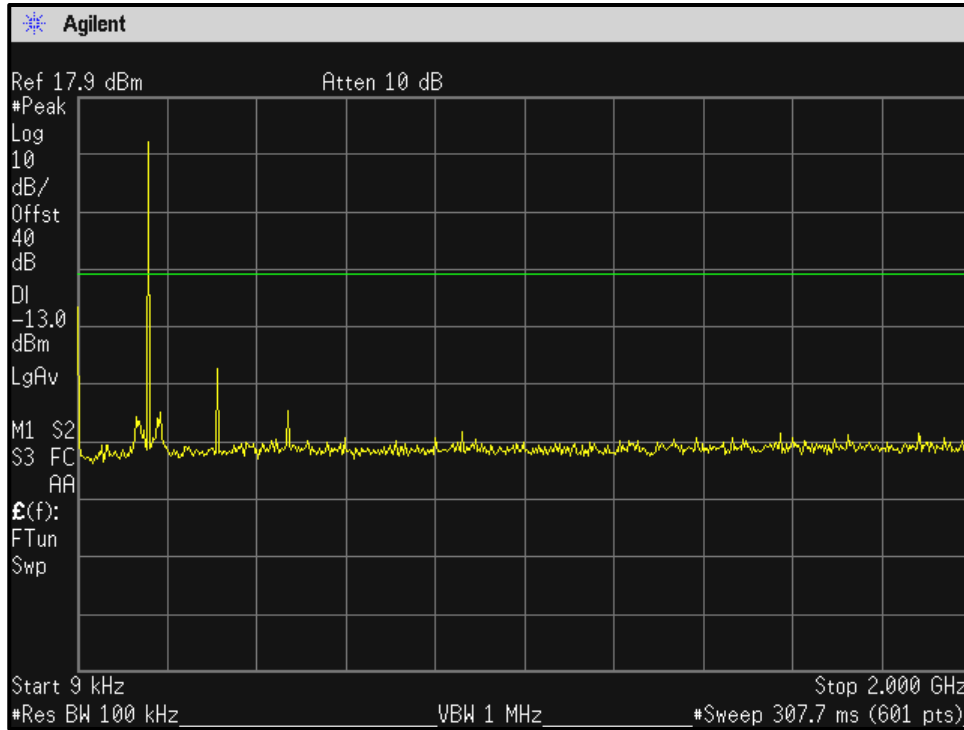


Table 5-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	September 29, 2011 Date of Test
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6 FCC Rules and Regulations Part 90.210(g) and Part 2.1053(a): Field Strength of Spurious Radiation; Part 90.543(f): Out of Band Emissions Limit; RSS-119 5.8.9.2 Out-of-band Emission Limit

6.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.12

Analog Modulation: The transmitter is terminated with a 50Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 and EDACS modes.

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 dBW and compared to the limit.

For emissions in the 1559-1610 band, Part 15.543(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."

6.2 Test Data

6.2.1 CFR 47 Part 90.210 Requirements

The following channels (in MHz) were investigated:

VHF (MHz)	700 MHz
30 (FCC/IC)	795.8500 (FCC/IC)
40 (FCC/IC)	797.6750 (FCC/IC)
50 (FCC/IC)	799.5000 (FCC/IC)
	794.0125 (FCC/IC)
	801.3250 (FCC/IC)
	804.9875 (FCC/IC)

All modes were investigated and analog mode is presented as representative data.

Per 2.1051(c), the magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 6-1: Field Strength of Spurious Radiation – 30 MHz

Conducted Power 8.8 dBm; 0.008 W; Limit=43+10LogP=21.8

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)
60.0	37.5	-78.4	0.3	2.1	85.4	-63.6
90.0	24.5	-90.1	0.4	1.8	97.4	-75.6
120.0	34.4	-80.7	0.4	2.2	87.7	-65.9
150.0	33.1	-83.9	0.4	1.6	91.5	-69.7
180.0	31.2	-84.5	0.5	1.8	91.9	-70.1
210.0	22.4	-91.7	0.5	1.6	99.4	-77.6
240.0	27.1	-85.5	0.6	1.6	93.2	-71.4
270.0	23.2	-87.7	0.6	1.8	95.3	-73.5
300.0	11.8	-97.8	0.5	1.9	105.2	-83.4

Table 6-2: Field Strength of Spurious Radiation – 40 MHz

Conducted Power 9.7 dBm; 0.009 W; Limit=50+10LogP=22.7

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)
80.0	35.1	-80.8	0.3	2.1	88.7	-66.0
120.0	44.1	-70.5	0.4	1.8	78.7	-56.0
160.0	42.5	-72.6	0.4	2.2	80.5	-57.8
200.0	37.5	-79.5	0.4	1.6	88.0	-65.3
240.0	24.4	-91.3	0.5	1.8	99.6	-76.9
280.0	27.6	-86.5	0.5	1.6	95.1	-72.4
320.0	30.6	-82.0	0.6	1.6	90.6	-67.9
360.0	29.5	-81.4	0.6	1.8	89.9	-67.2
400.0	28.4	-81.2	0.5	1.9	89.5	-66.8

Table 6-3: Field Strength of Spurious Radiation - 50 MHz

Conducted Power 7.9 dBm; 0.006 W; Limit=50+10LogP=20.9

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)
100.0	31.1	-84.1	0.3	2.1	90.2	-69.3
150.0	30.6	-83.7	0.4	1.8	90.2	-69.3
200.0	21.4	-95.6	0.4	1.6	102.3	-81.4
250.0	23.7	-91.6	0.5	1.8	98.2	-77.3
300.0	18.9	-94.4	0.6	1.4	101.5	-80.6
350.0	25.6	-85.8	0.6	1.8	92.4	-71.5
400.0	19.7	-89.9	0.5	1.9	96.4	-75.5
450.0	28.4	-80.2	0.6	1.7	87.0	-66.1
500.0	21.5	-86.1	0.6	1.4	93.2	-72.3

6.2.2 CFR 47 Part 90.543(f) Requirements

The worst-case emissions test data are shown.

Limit: -80 dBW EIRP for discrete emissions

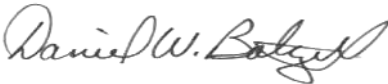
Table 6-4: Field Strength of Spurious Radiation – Worst Case Emissions

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBW)	Margin (dB)
1591.7000	40.5	-65.2	1.2	6.7	-89.7	-9.7
1595.3500	46.4	-59.3	1.2	6.7	-83.7	-3.7
1599.0000	45.8	-59.9	1.2	6.8	-84.3	-4.3
1588.0250	47.5	-57.5	1.2	6.7	-82.0	-2.0
1602.6500	46.5	-58.5	1.2	6.8	-82.9	-2.9
1609.9750	46.4	-58.6	1.2	6.7	-83.1	-3.1

Table 6-5: Test Equipment Used For Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901364	Rhein Tech Laboratories	PR-1042	Preamplifier (1 - 26.5 GHz)	N/A	2/22/12
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901516	Insulated Wire Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/11
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	1/31/13
901235	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	4/5/12
900928	Hewlett Packard	83752A	Synthesized Sweeper, 0.01 to 20 GHz	3610A00866	2/17/12
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12

Test Personnel:

Daniel Baltzell Test Engineer	 Signature	September 22 and 30, 2011 Dates of Tests
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7 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; RSS-119 5.5 Channel Spacing, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

Occupied Bandwidth - Compliance with the Emission Masks

7.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.11 and TIA/EIA-102.CAAA-2002 section 2.2.5

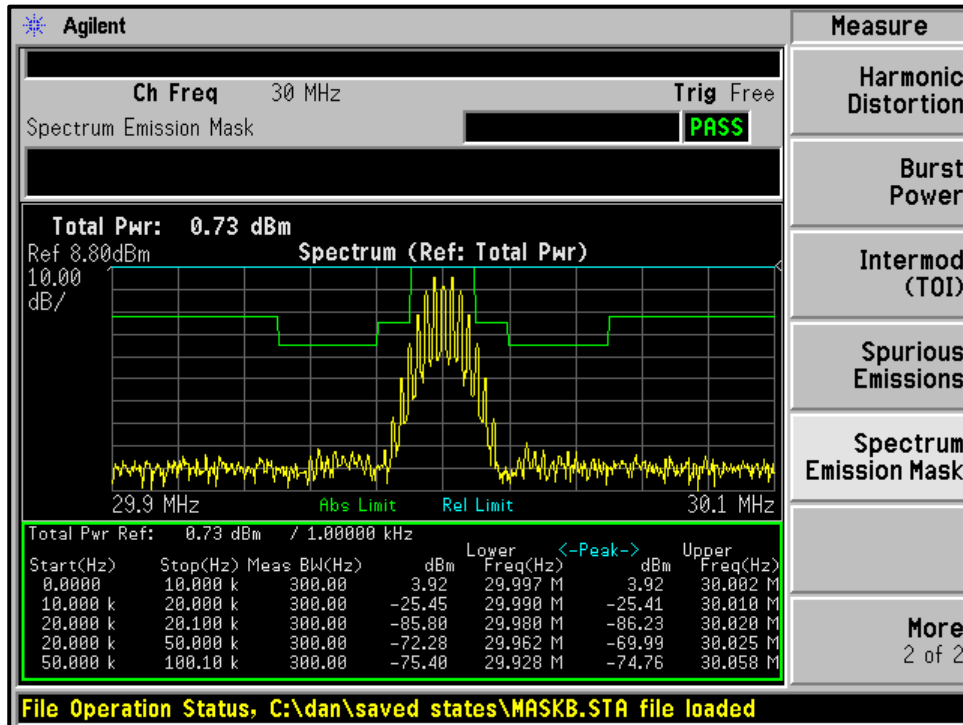
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

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	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

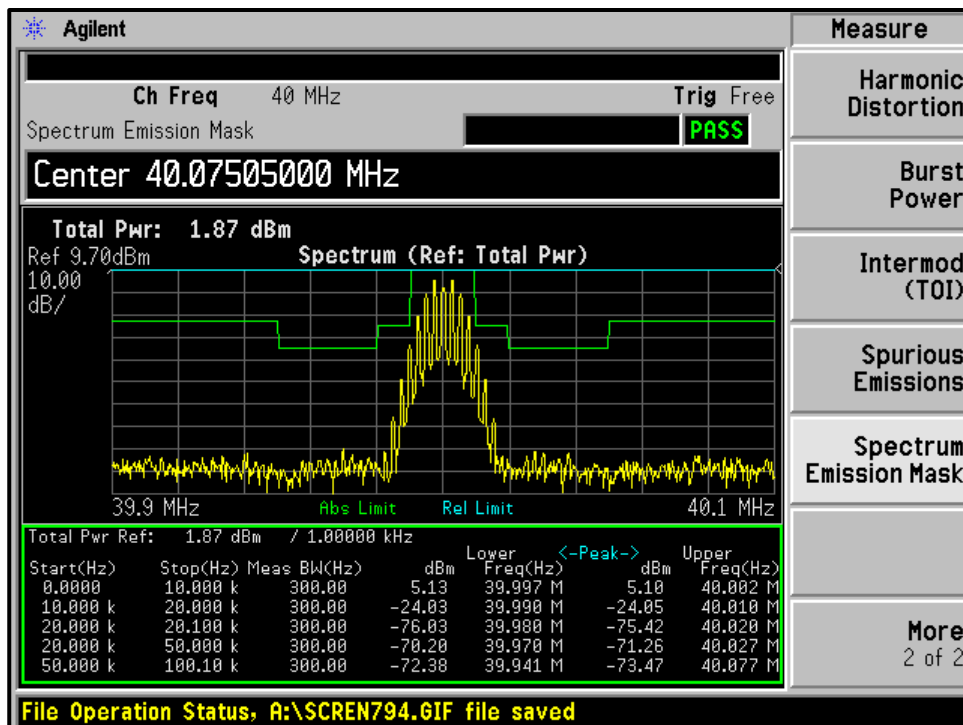
¹ Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
² Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask 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.

7.2 Test Data

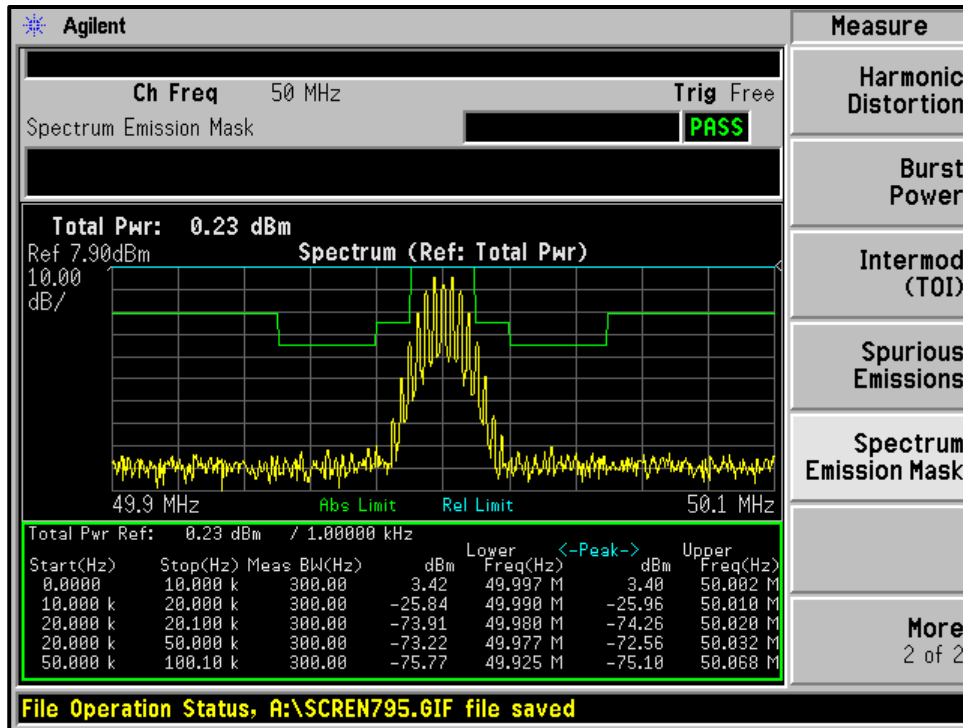
Plot 7-1: Occupied Bandwidth – 30 MHz; Wideband Analog; Mask B



Plot 7-2: Occupied Bandwidth – 40 MHz; Wideband Analog; Mask B



Plot 7-3: Occupied Bandwidth – 50 MHz; Wideband Analog; Mask B



Plot 7-4: Occupied Bandwidth – 156.8 MHz; Wideband Analog; Mask B

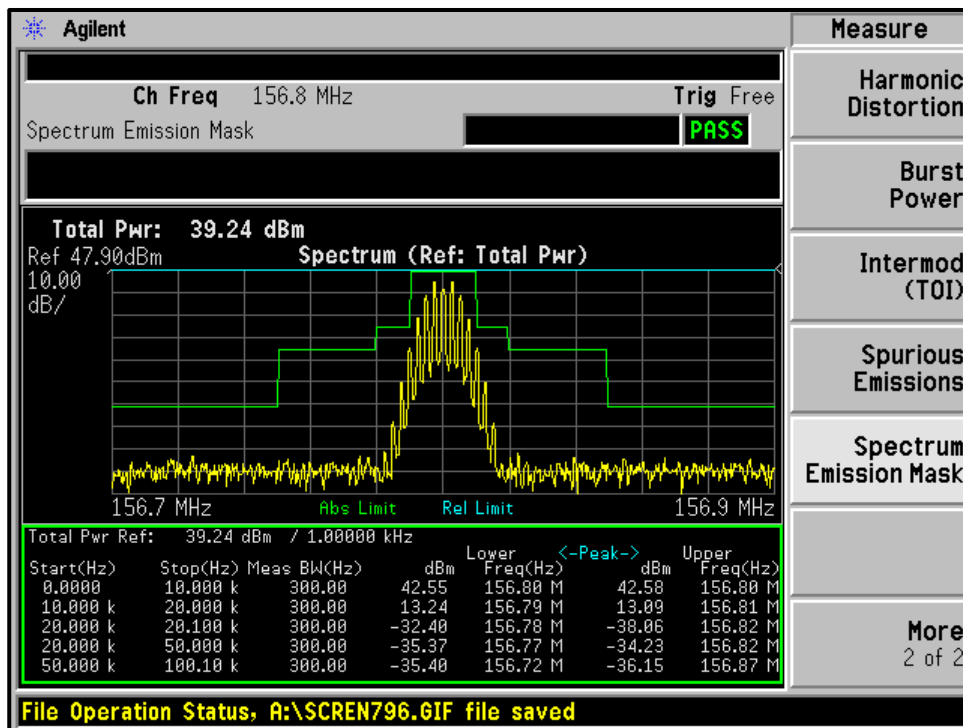
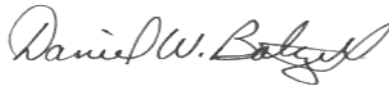


Table 7-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12
901339	MCE Weinschel	47-40-34	Attenuator, 40 dB, DC-18 GHz, 50 W	BM4864	7/15/12

Test Personnel:

Daniel Baltzell
Test Engineer



Signature

September 29, 2011
Date of Tests

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

Type of Emissions: F3E

Voice – 25 kHz channel separation

Calculation:

Max modulation (M) in kHz: 5.0

Max deviation (D) in kHz: 3

Constant factor (K): 1 (assumed)

$B_n = 2 \times M + 2 \times DK = 16.0 \text{ kHz}$

Emission designator: 16K0F3E

9 Conclusion

The data in this measurement report shows that the Harris Corporation Model XG-100M Unity Multiband Portable Radio, FCC ID: AQZ-XG-100M00, IC: 122D-XG100M00, complies with all the applicable requirements of Parts 2, 80 and 90 of the FCC Rules and Industry Canada RSS-119.