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HANDHELD MARINE RADIO
PER FCC PT 80
TEST REPORT

APPLICANT	MARINE RESCUE TECHNOLOGIES LTD.
ADDRESS	MARSHALL HOUSE 3 ZARYA COURT, GROVEHILL ROAD BEVERLY HU17 OJG
FCC ID	2AB4VSMRTV100
TESTED MODEL	SMRTV100
PRODUCT DESCRIPTION	SHORT RANGE PERSONAL LOCATING DEVICE
DATE SAMPLE RECEIVED	1/26/2015
DATE TESTED	2/9/2015
TESTED BY	Cory Leverett
APPROVED BY	Sid Sanders
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
197AUT15TestReport	Rev.1	Initial Issue	2/20/2015

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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ATTESTATION

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

The test results relate only to the items tested.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Cory Leverett

Signature:

Function: Project Manager

Date: 2/16/2015

A handwritten signature in black ink is written over a circular purple stamp. The stamp contains the text "TIMCO ENGINEERING, INC." around the perimeter and a small star in the center.

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Applicant: MARINE RESCUE TECHNOLOGIES

FCC ID: 2AB4VSMRTV100

Report: M\MARINE RESCUE TECHNOLOGIES\197AUT15\197AUT15TestReport.docx

REPORT SUMMARY

Disclaimer	The test results related only to the items tested.
Purpose of Test	To show the EUT in compliance with FCC CFR 47 Part 80 and Industry Canada RSS-182 requirements for handheld marine radio.
Test Procedures	ANSI/TIA 603-D: 2010, FCC CFR 47 Part 80, ANSI C63.4: 2003
Related Approval(s) / Report(s)	N/A

TEST ENVIRONMENT AND TEST SETUP

Test Facility	All tests were conducted by: Timco Engineering Inc. 849 NW State Road 45, Newberry, FL 32669 USA
Laboratory Test Condition	Temperature: 26°C Relative humidity: 50%.
Deviation from the standards	No deviation
Modification to the EUT	No physical modification was made. Software was used to manipulate the transmitter in the various test modes.
Test Exercise (software etc.)	sMRT V100 Programmer software, loads firmware into EUT
System Setup	No testing accessories. The EUT is a stand alone device.

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EUT DESCRIPTION

Manufactured by	MARINE RESCUE TECHNOLOGIES LTD.
Product Description	MARITIME SURVIVOR LOCATING DEVICE VHF Marine 156.025-157.425MHz
FCC ID	2AB4VSMRTV100
M/N	SMRTV100
Power Source	9 VDC Internal Battery
Accessories	IR programmer, Actisys IR Wireless Interface
Test Item	Preproduction
Type of EUT	Maritime Survivor Locating Device

EUT Test Software Description

Firmware Mode	Functions Installed
V150_RECEIVER_TEST.BIN	Rx only
V100_TEST V14.BIN	Tx with and without modulation(Tester selectable)
V100_APP V89.BIN	Normal working mode

TEST RESULTS SUMMARY

FCC Rule Part	Test	RESULTS
80.209	Frequency Stability	Pass
80.215	Power Output	Pass
80.211 (d)(f)	Unwanted Emissions Spectrum Mask	Pass
80.211 (d)(f)	Conducted Unwanted Emissions	Pass
80.211 (d)(f) 15.209, 15.205	Radiated Unwanted Emissions	Pass

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TECHNICAL SUMMARY

FCC Rule Part IC Rule Part	Item	Description
Pt 2.1033(c) (6) RSS-182	Operating Frequency	156.025 ~ 162.025 MHz
Pt 80.205 (a) RSS-182	Occupied Bandwidth	16 kHz
Pt 2.1033(c)(7) RSS-182	Power Range and Controls	The EUT has a Fixed power level, no external controls are available
Pt 2.1033(c)(8) RSS-182	DC Voltages and Current into Final Amplifier	<u>Not Applicable</u>
Pt 2.1046 Pt 80.215 (b)(2) RSS-182	Max. Output Pwr	DSC: .42W AIS: 1.2 W
Pt 80.205(a)	Modulation	FM
Pt 80.271(a)(6)	Antenna Socket	SMA
Pt 2.1033(c) Pt 80.205(a) (5)	Type of Emissions	G2B (DSC Channel), GXW (AIS Channels)
Pt 80.203 (b)	External Controls	<u>Not Applicable</u>

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FCC Rule Part IC Rule Part	Item	Description
Pt 80.203 (c)	Five minutes continuous transmission test.	<u>Not Applicable</u>
Pt 80.203 (n) Pt 80.225	DSC Capability	<u>Not Applicable</u>
Pt 80.873 Pt 80.956 Pt 80.911 (a)	G3E Transmissions	<u>Not Applicable</u>
Pt 80.911 (c)	Certified transmitting power	<u>Not Applicable</u>
Pt 80.911 (d)(2)	80.959	<u>Not Applicable</u>

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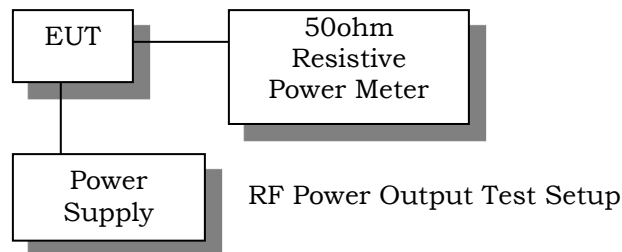
TEST PROCEDURE

Frequency Stability

The frequency stability was measured per ANSI/TIA 603-D: 2010.

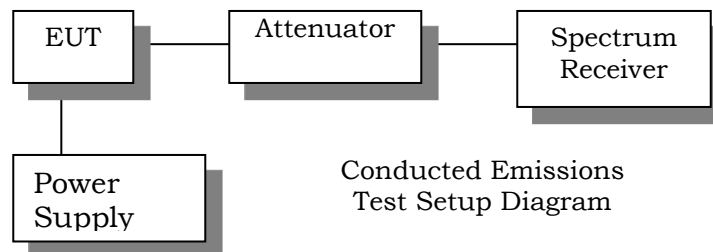
RF Power Output

The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



Conducted Unwanted Emissions At Antenna Terminals

The carrier was modulated 100%. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. The measurements were made in accordance with standard ANSI/TIA-603-D: 2010

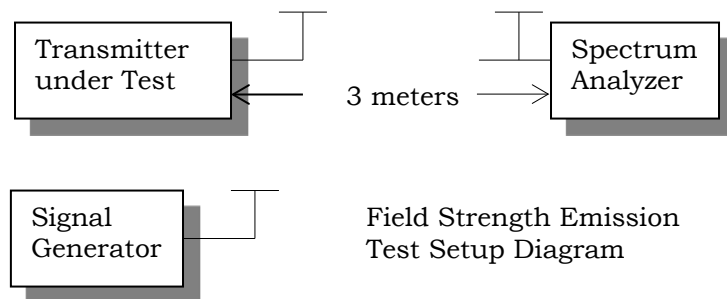


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TEST PROCEDURE

Radiation Unwanted Emissions The test procedure used was ANSI/TIA-603-D: 2010 and ANSI C63.4-2003 using a Rohde & Schwarz spectrum analyzer with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-D: 2010 using the substitution method.



RF POWER OUTPUT

Rule Part No.: Pt 2.1046(a), Pt 80.215

Requirements: Less than or equal to 10 W

Test Data:

Frequency (MHz)	Type of Channel	Conducted (Watts)
156.025	DSC	.42
161.975	AIS1	1.2
162.025	AIS2	1.1

Results Meet Requirements

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OCCUPIED BANDWIDTH

Rule Parts No: Pt 2.1049, Pt 80.213(b)

Test Data: Table of Measured Bandwidth, See Spectrum Mask plots For Measurements

Channel / Frequency (MHz)	Measured 99% Bandwidth (KHz)	Authorized Bandwidth (KHz)	Emission Designator
DSC 70 / 156.525	12.82	20	16K0G2B
AIS 1 / 161.975	9.93	20	16K0GXW
AIS 2 / 162.025	9.77	20	16K0GXW

Results Meet Requirements

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UNWANTED EMISSIONS SPECTRUM MASK

Rule Part: 80.211 (f)(1)(2)(3), 80.211 (d)(1)(2)

Requirement:

Mask f: (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB; (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

Mask d: (1) On any frequency removed from the assigned frequency by more than 50 percent, up to and including 100 percent of the authorized bandwidth: at least 25 dB; (2) On any frequency removed from the assigned frequency by more than 100 percent of the authorized bandwidth: at least 30 dB.

Test Data: See Plots on following pages

UNWANTED EMISSIONS SPECTRUM MASK

Test Data: DSC DOT Tone 16K0G2B / Emission Mask 80.211(f)



17.Feb 15 16:23

*RBW 300 Hz

Marker 1 [T2]

*VBW 1 kHz

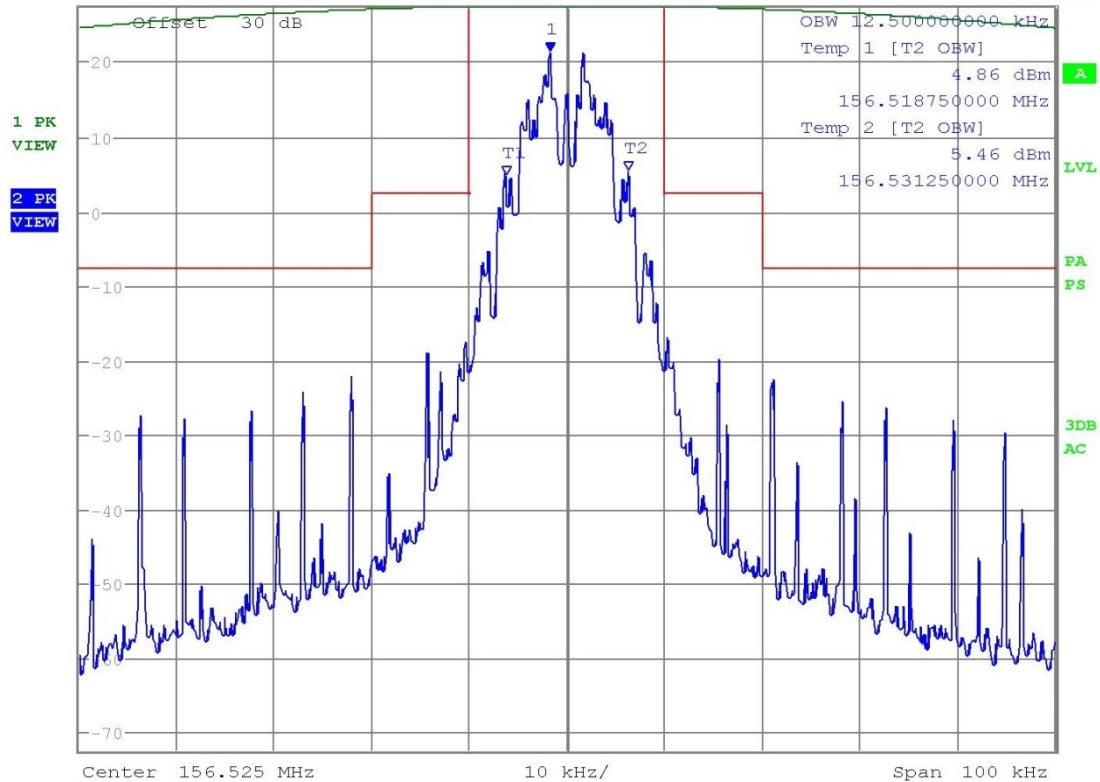
21.50 dBm

Ref 27.6 dBm

*Att 20 dB

SWT 1.15 s

156.523237179 MHz



Date: 17.FEB.2015 16:23:14

Results Meet Requirements

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UNWANTED EMISSIONS SPECTRUM MASK

Test Data: DSC 2100 Hz Tone 16K0G2B / Emission Mask 80.211(f)



17.Feb 15 16:27

*RBW 300 Hz

Marker 1 [T2]

*VBW 1 kHz

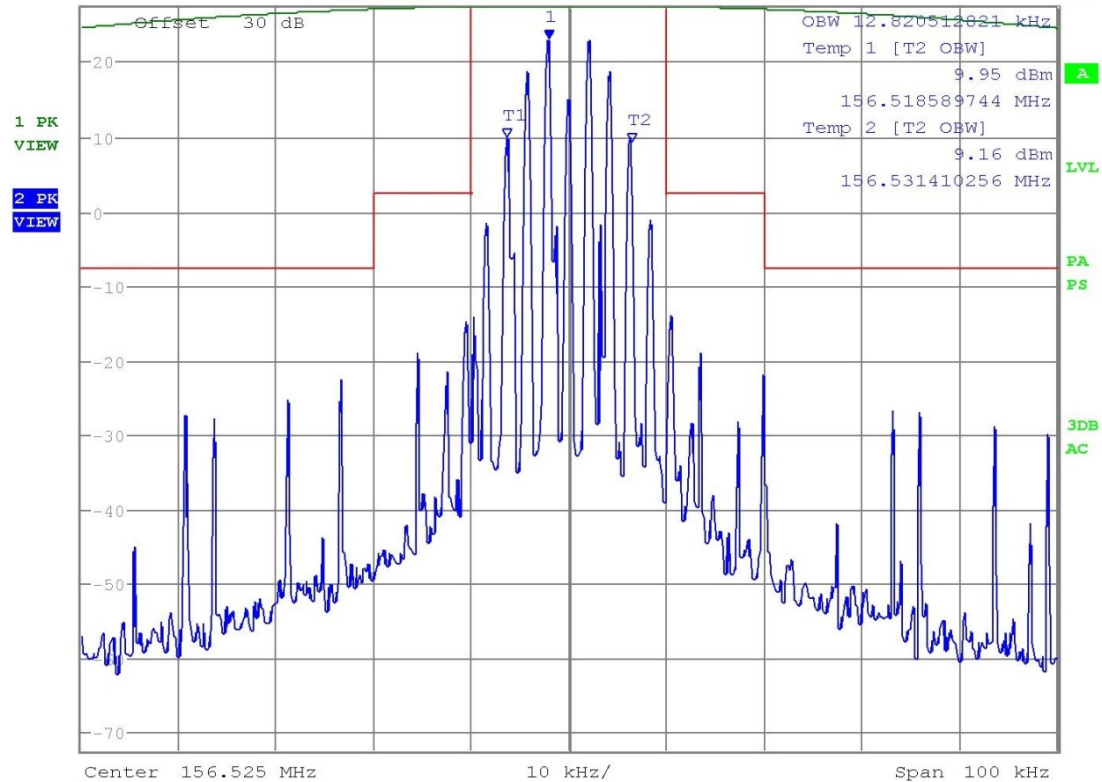
23.18 dBm

Ref 27.6 dBm

*Att 20 dB

SWT 1.15 s

156.522916667 MHz



Date: 17.FEB.2015 16:27:12

Results Meet Requirements

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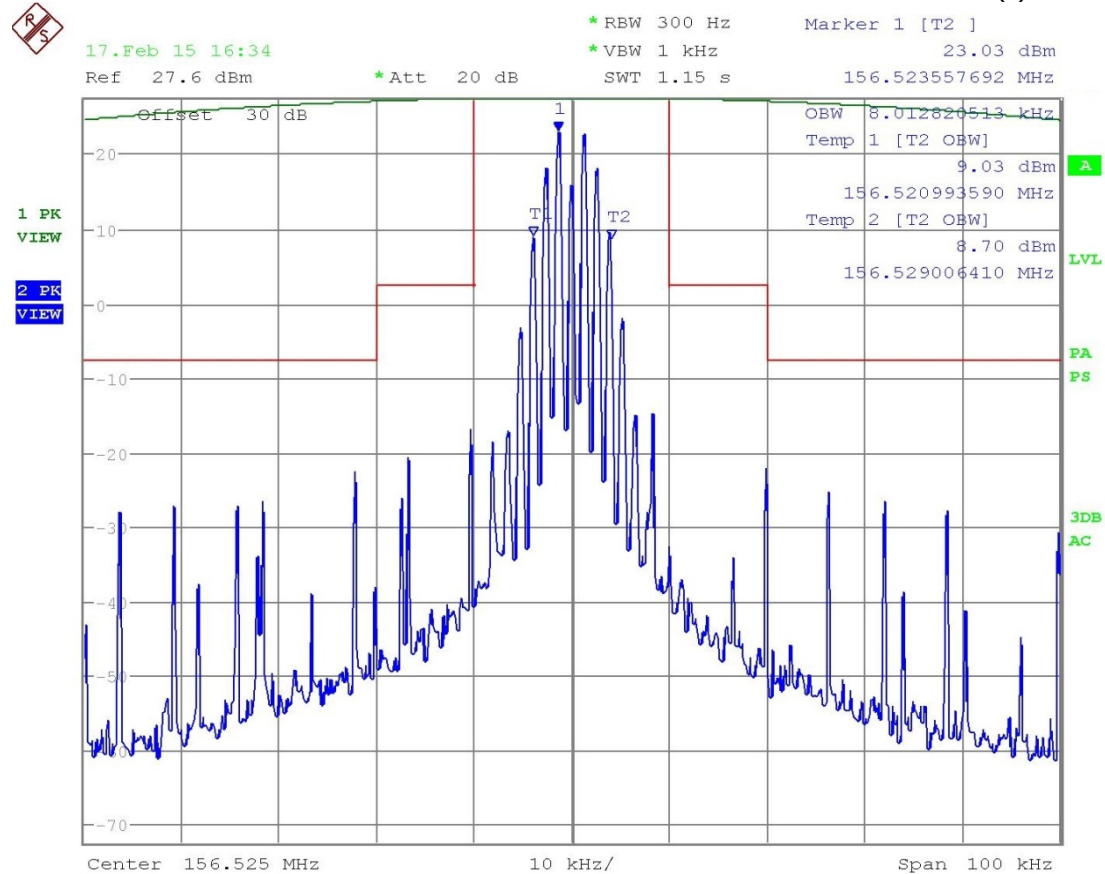
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UNWANTED EMISSIONS SPECTRUM MASK

Test Data: DSC 1300 Hz Tone 16K0G2B / Emission Mask 80.211(f)



Date: 17.FEB.2015 16:34:03

Results Meet Requirements

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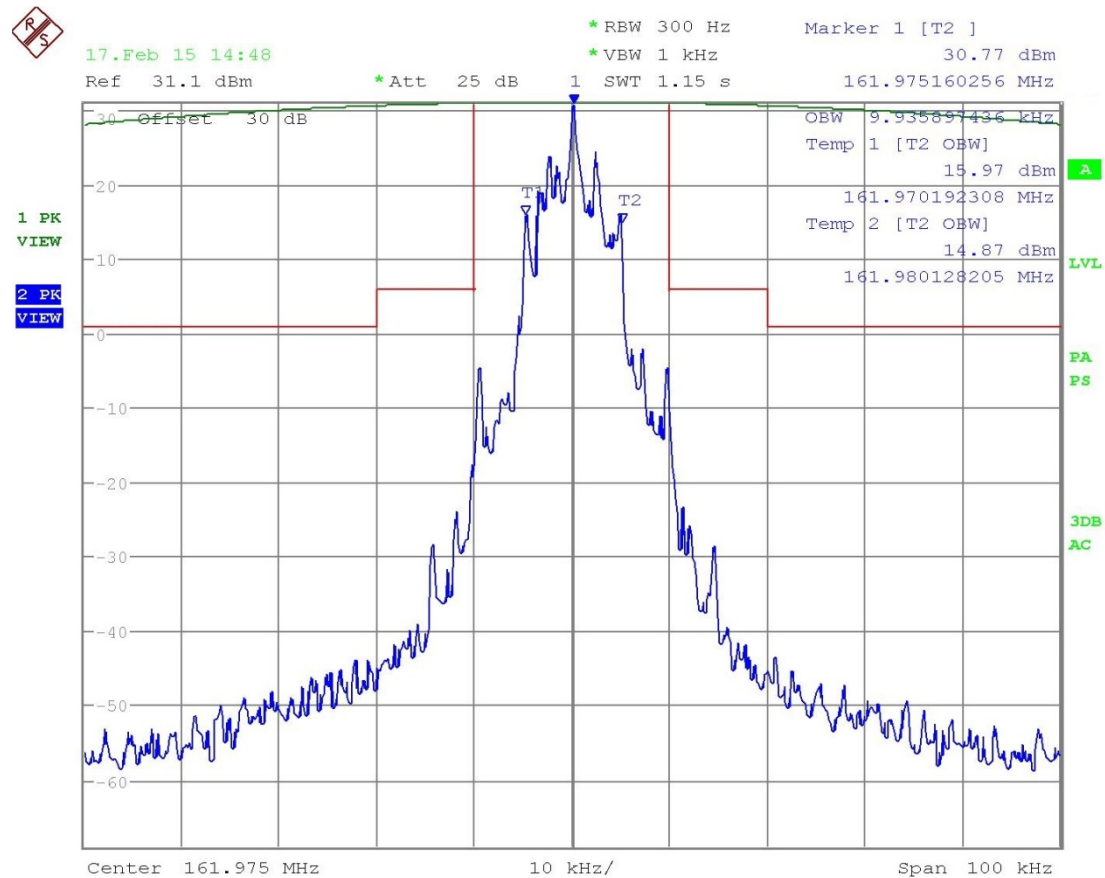
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UNWANTED EMISSIONS SPECTRUM MASK

Test Data: AIS CH 1 16K0GXW / Emission Mask 80.211(d)



Date: 17.FEB.2015 14:48:28

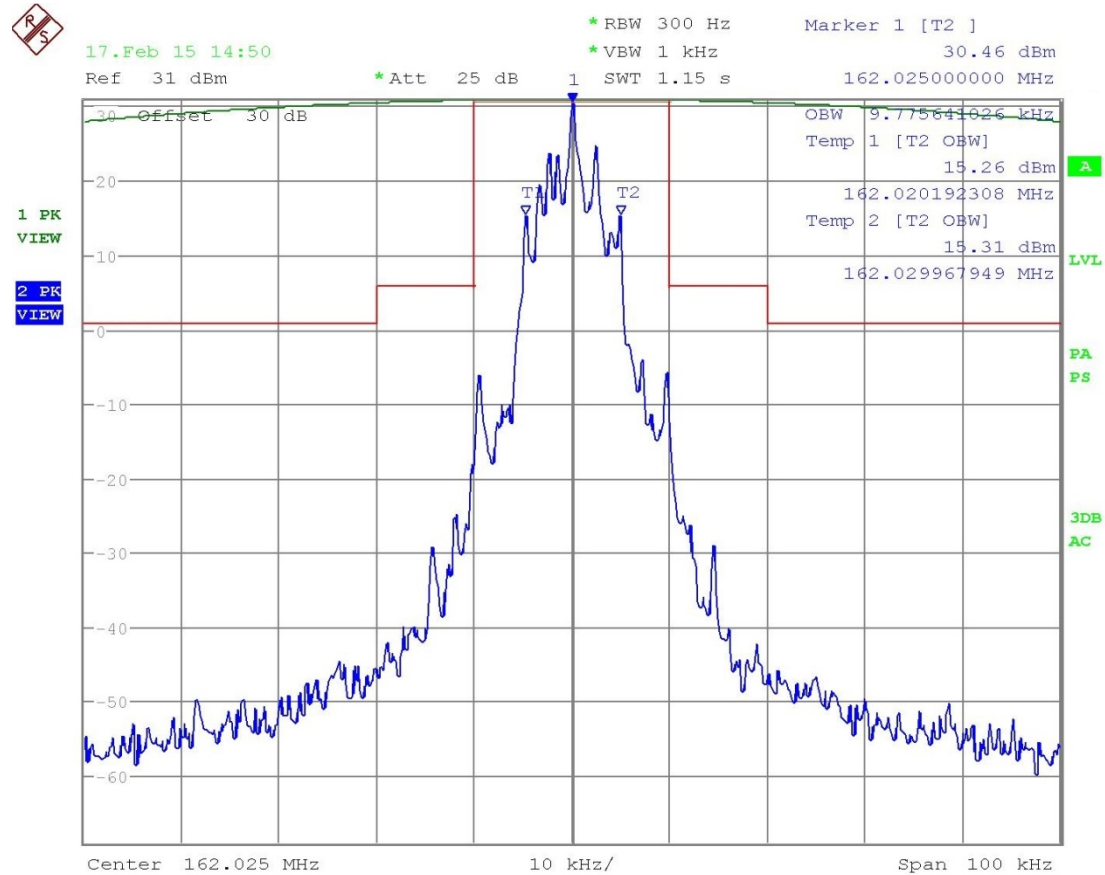
Results Meet Requirements

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UNWANTED EMISSIONS SPECTRUM MASK

Test Data: AIS CH 2 16K0GXW / Emission Mask 80.211(d)



Date: 17.FEB.2015 14:50:35

Results Meet Requirements

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CONDUCTED UNWANTED EMISSIONS AT ANTENNA TERMINALS

Rule Part No.: Pt 2.1051(a), Pt 15.209, Pt 80.211(d)(2), Pt 80.211(f)(3)

Requirements: On any frequency removed from the assigned frequency by more than 100 percent of the authorized bandwidth: at least 30 dB

Test Data: DSC - 156.525 MHz

dBm	Limit	Limit
28.1	43	43
Frequency	dBc	Margin
156.53	0	
313.05	74.9	31.9
469.58	99.1	56.1
626.10	104.3	61.3
782.63	111.4	68.4
939.15	133.4	90.4
1095.68	113.2	70.2
1252.20	113.2	70.2
1408.73	108.6	65.6
1565.25	110.6	67.6

Test Data: AIS – 162.025 MHz

dBm	Limit	Limit
30.6	30	30
Frequency	dBc	Margin
162.03	0	
324.05	68.9	38.9
486.08	93.4	63.4
648.10	108.2	78.2
810.13	109.5	79.5
972.15	132.7	102.7
1134.18	115.6	85.6
1296.20	115.4	85.4
1458.23	111.7	81.7
1620.25	114.3	84.3

Results Meet Requirements

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RADIATED UNWANTED EMISSIONS

Rule Parts. No.: Part 2.1053, 80.211 (d)(2), 80.211 (f)(3)

Requirements: 80.211 (d)(2) AIS 16K0GXW Emission

On any frequency removed from the assigned frequency by more than 100 percent of the authorized bandwidth: at least 30 dB.

DSC 16K0G2B Emission =

Test Data: 16K0GXW AIS CH 2 - 162.025MHz

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
162.02	Fixed	30.60	1.15	30	20
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
324.05	V	43.53		13.53	
486.08	V	43.47		13.47	
648.10	V	47.65		17.65	
810.13	V	49.05		19.05	
972.15	V	50.22		20.22	
1,134.18	V	43.85		13.85	
1,296.20	H	43.69		13.69	
1,458.23	V	45.72		15.72	
1,620.25	V	49.52		19.52	

All emissions not reported were more than 20 dB from the limit. Emissions were also checked for compliance to 15.209 limits in the restricted bands.

Results Meet Requirements

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RADIATED UNWANTED EMISSIONS

Requirements: 80.211 (f)(3) DSC 16K0G2B Emission

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB

Test Data: 16K0G2B DSC CH 70 – 156.025MHz

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
156.02	Fixed	26.30	0.43	39.30	20
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
312.05	V	84.85		45.55	
468.08	V	73.90		34.60	
624.10	V	79.91		40.61	
780.13	V	75.40		36.10	
936.15	V	80.76		41.46	
1,092.18	V	73.09		33.79	
1,248.20	H	73.28		33.98	
1,404.23	V	76.86		37.56	
1,560.25	V	76.05		36.75	

All emissions not reported were more than 40 dB from the limit. Emissions were also checked for compliance to 15.209 limits in the restricted bands.

Results Meet Requirements

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FREQUENCY STABILITY

Rule Parts. No.: Pt 2.1055, Pt 80.209(a)

Requirements: ± 10.0 PPM
Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%

Test Data:

Test Voltage (Vdc) Test Temperature (°C]	Frequency Stability	Unit [ppm]
-30	161.975019	0.65
-20	161.975036	0.75
-10	161.975051	0.85
0	161.975037	0.76
10	161.974962	0.3
20	161.974897	-0.1
30	161.974885	-0.18
40	161.974949	0.22
50	161.975061	0.91

115% Voltage, Frequency 156.400029 MHz

10.35 VDC	161.9749	-.04
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85% Voltage, Frequency 156.400029 MHz

7.65 VDC	161.9749	-.09
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Results Meet Requirements

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TEST EQUIPMENT

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
12 Volt Power Supply	Astron 50Amp.	VS-50M	9001191	12/12/99	12/12/99
DC Power Supply	HP	6286A	1744A03842	12/12/99	12/12/99
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	05/31/15
AC Voltmeter	HP	400FL	2213A14728	06/26/13	06/26/15
Frequency Counter Small Chamber	HP	5385A	3242A07460	06/16/13	06/16/15
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Ant: Double-Ridged Horn/ETS Horn 1 Ch	ETS-Lindgren Chamber	3117	00035923	06/13/14	06/13/16
Temperature Chamber Small	Thermotron Corp.	S1.2 Mini Max	25-1420-09	08/20/14	08/20/16
Software: Field Strength Program	Timco	N/A	Version 4.0	12/12/99	12/12/99
Hygro-Thermometer	Extech	445703	0602	06/20/13	06/20/15
30 dB Attenuator	Narda	769-30	10267	03/15/13	03/15/15
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16
Signal Generator HP 8648C	HP	8648C	3623A02898	08/29/13	08/29/15

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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