EcoTech Marine

RF Module 10169

EMC Test Report

Report No. ECTE0002

Report Prepared By

NORTHWEST EMC

www.nwemc.com
1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: October 08, 2009
EcoTech Marine
Model: RF Module 10169

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Spurious Radiated Emissions	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
Spurious Conducted Emissions	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
Occupied Bandwidth	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
Output Power	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
Band Edge Compliance	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
Power Spectral Density	FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074	**Pass**
AC Powerline Conducted Emissions	FCC 15.207:2009	ANSI C63.4:2003	**Pass**

Modifications made to the product
See the Modifications section of this report

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR

Phone: (763) 425-2281 Fax: (763) 424-3469

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-1).

Approved By:

Don Facteau, IS Manager

NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

NVLAP LAB CODE 200629-0
NVLAP LAB CODE 200630-0
NVLAP LAB CODE 200676-0
NVLAP LAB CODE 200761-0
NVLAP LAB CODE 200881-0

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1)*

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

NEMKO

Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Accreditations and Authorizations

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, C-2687, T-289, and R-2318, Irvine: R-1943, C-2766, and T-298, Sultan: R-871, C-1784, and T-294, Brooklyn Park: R-3125, C-3464, and T-1634).*

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017). License No.SL2-IN-E-1017.

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157)*

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

Northwest EMC Locations

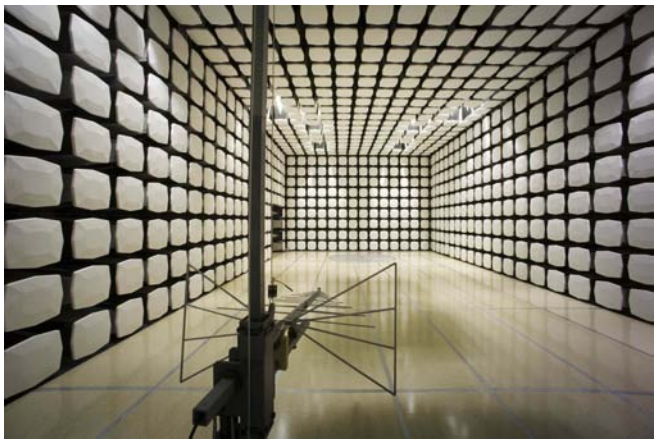
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

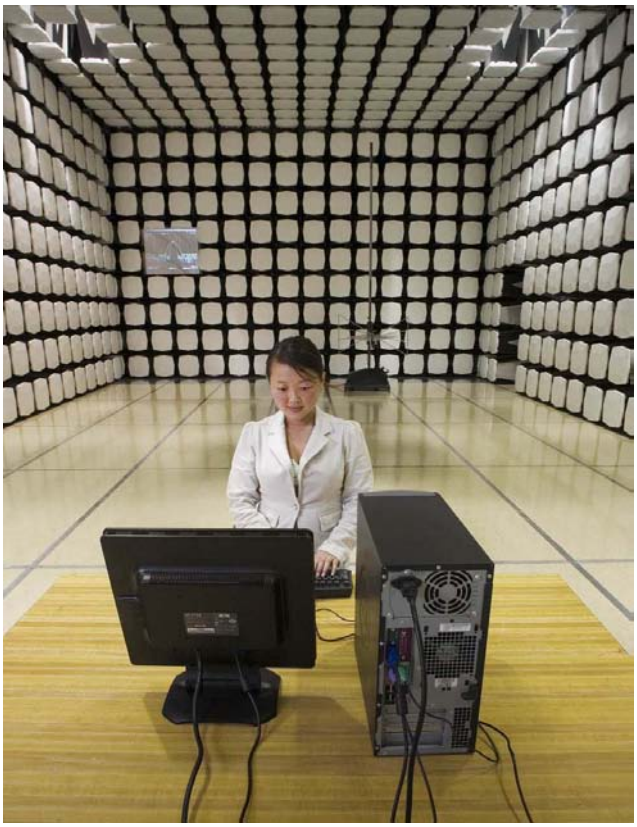
California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796





Party Requesting the Test

Company Name:	EcoTech Marine
Address:	1349 Lynn Ave.
City, State, Zip:	Bethlehem, PA 18015
Test Requested By:	Justin Lawyer
Model:	RF Module 10169
First Date of Test:	October 7, 2009
Last Date of Test:	October 8, 2009
Receipt Date of Samples:	October 6, 2009
Equipment Design Stage:	Preproduction
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
2.4 GHz DTS transceiver module

Testing Objective:
Seeking to demonstrate compliance with FCC 15.247 requirements for full modular approval.

CONFIGURATION 1 ECTE0002

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF Module	EcoTech Marine	10169	FCC #1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Test Board	EcoTech Marine	Unknown	None
AC Adapter	Triad Magnetics	Unknown	0819

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Remote PC	Dell	Mini 9	779HGJ1
USB Adapter	Trendnet	TU-85	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	PA	1.5m	PA	Test Board	AC Adapter
Serial	Yes	1.2m	No	Test Board	USB Adapter
USB Adapter	PA	0.2m	PA	USB Adapter	Remote PC
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 3 ECTE0002

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF Module	EcoTech Marine	10169	FCC #5

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Test Board	EcoTech Marine	Unknown	None
AC Adapter	Triad Magnetics	Unknown	0819

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Remote PC	Dell	Mini 9	779HGJ1
USB Adapter	Trendnet	TU-85	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	PA	1.5m	PA	Test Board	AC Adapter
Serial	Yes	1.2m	No	Test Board	USB Adapter
USB Adapter	PA	0.2m	PA	USB Adapter	Remote PC
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 4 ECTE0002

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF Module	EcoTech Marine	10169	FCC #2

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Test Board	EcoTech Marine	Unknown	None
AC Adapter	Triad Magnetics	Unknown	0819
Linear AC Adapter	CUI Stack	DTR050100-P1	None
Remote PC	Dell	Mini 9	779HGJ1
USB Adapter	Trendnet	TU-85	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	PA	1.5m	PA	Test Board	AC Adapter
DC Power	PA	1.5m	PA	Test Board	Linear AC Adapter
Serial	Yes	1.2m	No	Test Board	USB Adapter
USB Adapter	PA	0.2m	PA	USB Adapter	Remote PC
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	10/7/2009	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	10/8/2009	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	10/8/2009	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	10/8/2009	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	10/8/2009	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	10/8/2009	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	10/8/2009	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/21/2009	13
Power Meter	Gigatronics	8651A	SPM	12/10/2008	13
Power Sensor	Gigatronics	80701A	SPL	12/10/2008	13
Signal Generator	Hewlett-Packard	8648D	TGC	12/9/2008	13

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate with the typical modulation.

NORTHWEST EMC

OCCUPIED BANDWIDTH

XMit 2009.03.05

EUT:	**RF Module 10169**			**Work Order:**	**ECTE0002**
Serial Number:	**FCC #5**			**Date:**	**10/08/09**
Customer:	**EcoTech Marine**			**Temperature:**	**22°C**
Attendees:	**None**			**Humidity:**	**43%**
Project:	**None**			**Barometric Pres.:**	**30.15**
Tested by:	**Rod Peloquin**	**Power:**	**120VAC/60Hz**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074

COMMENTS

Default power as programmed by customer.

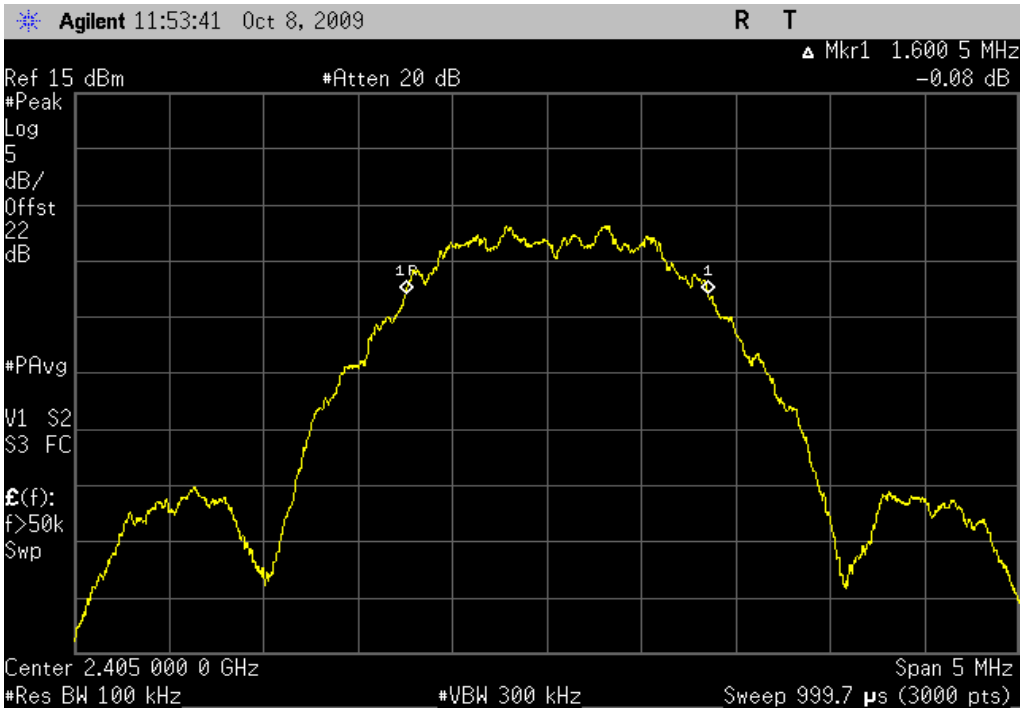
DEVIATIONS FROM TEST STANDARD

No Deviations

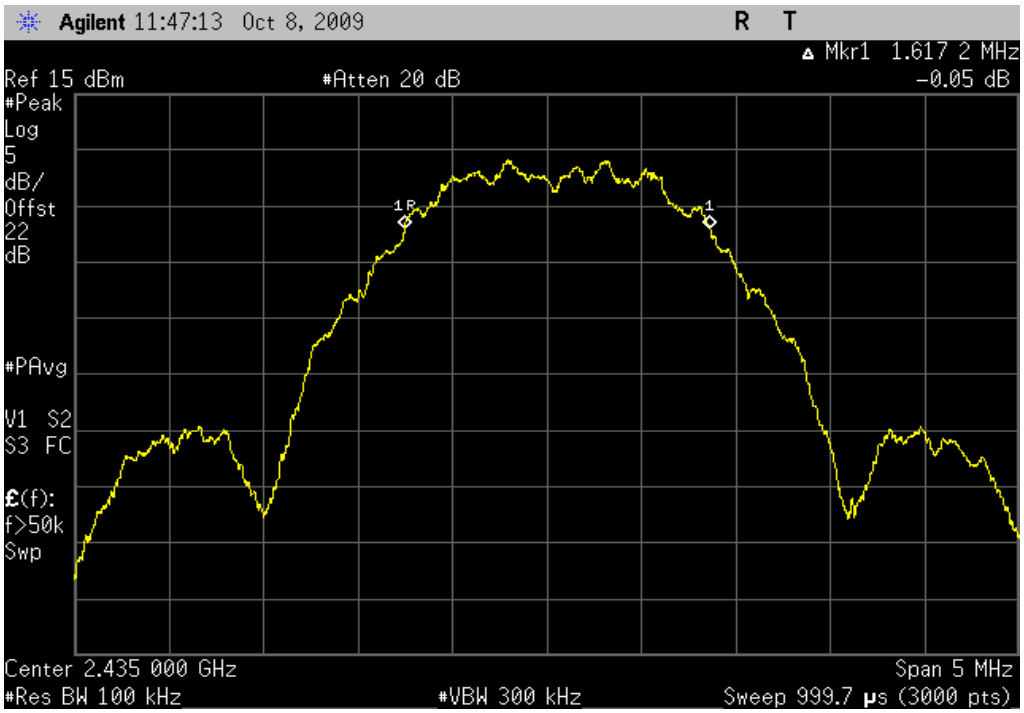
Configuration #	**3**	*Signature*

	Value	**Limit**	**Results**
Low Channel	1.601 MHz	> 500 kHz	Pass
Mid Channel	1.617 MHz	> 500 kHz	Pass
High Channel	1.601 MHz	> 500 kHz	Pass

Low Channel					
Result:	Pass	**Value:**	1.601 MHz	**Limit:**	> 500 kHz

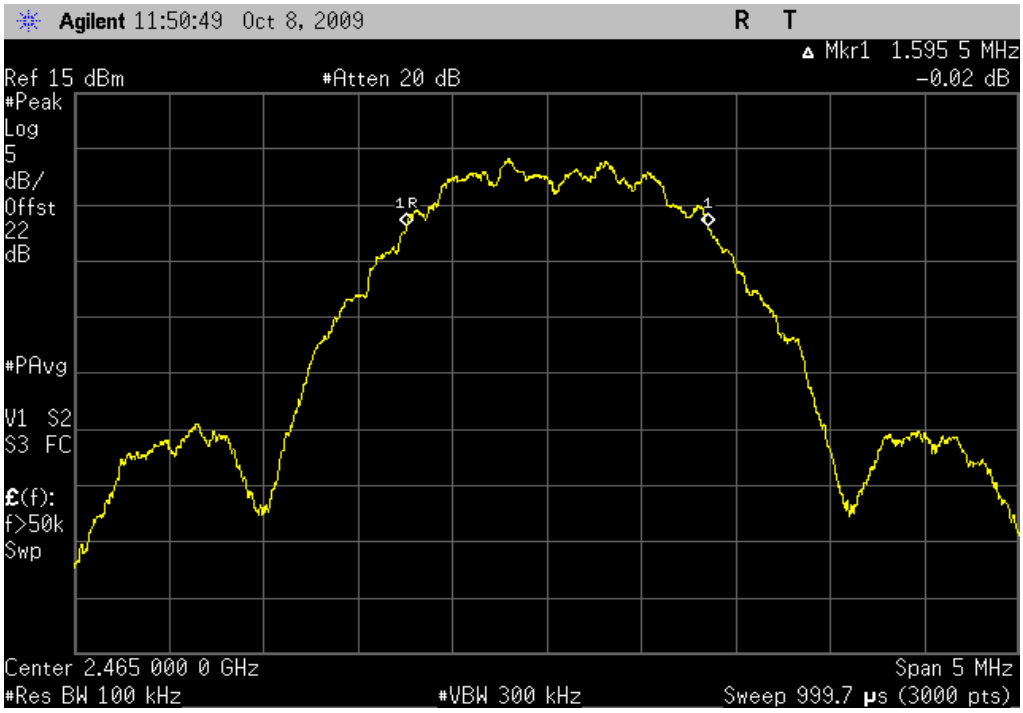


Mid Channel					
Result:	Pass	**Value:**	1.617 MHz	**Limit:**	> 500 kHz



OCCUPIED BANDWIDTH

High Channel					
Result:	Pass	**Value:**	1.601 MHz	**Limit:**	> 500 kHz



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/21/2009	13
Power Meter	Gigatronics	8651A	SPM	12/10/2008	13
Power Sensor	Gigatronics	80701A	SPL	12/10/2008	13
Signal Generator	Hewlett-Packard	8648D	TGC	12/9/2008	13

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.

NORTHWEST EMC

OUTPUT POWER

XMit 2009.03.05

EUT:	**RF Module 10169**			**Work Order:**	**ECTE0002**
Serial Number:	**FCC #5**			**Date:**	**10/08/09**
Customer:	**EcoTech Marine**			**Temperature:**	**22°C**
Attendees:	**None**			**Humidity:**	**43%**
Project:	**None**			**Barometric Pres.:**	**30.15**
Tested by:	**Rod Peloquin**	**Power:**	**120VAC/60Hz**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074

COMMENTS

Default power as programmed by customer.

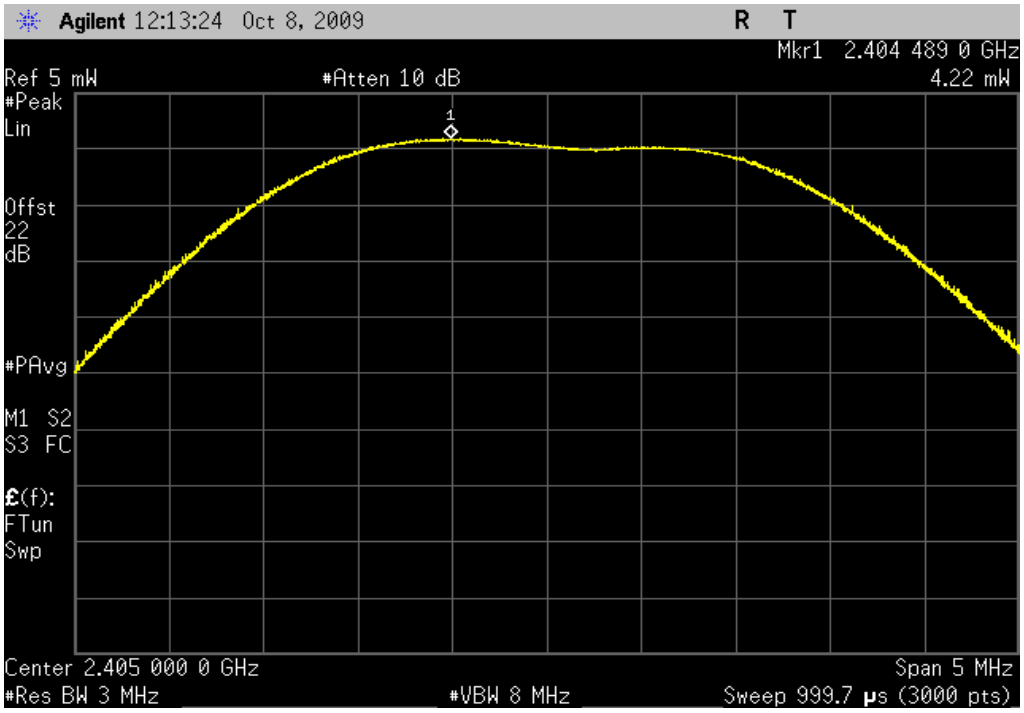
DEVIATIONS FROM TEST STANDARD

No Deviations

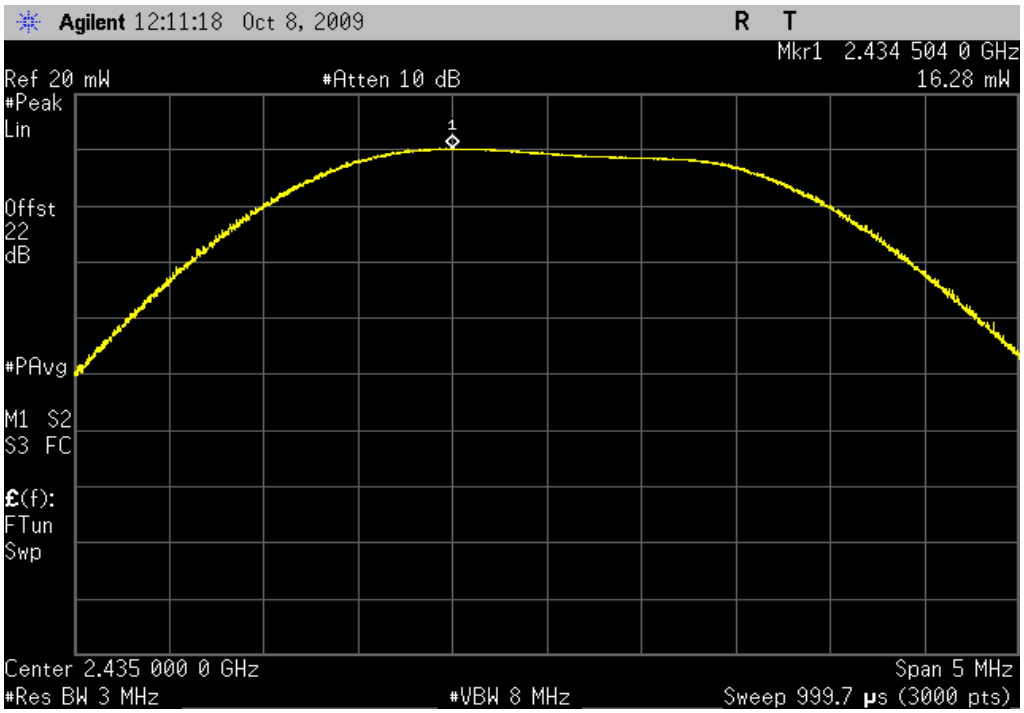
Configuration #	**3**	*Signature*

	Value	**Limit**	**Results**
Low Channel	4.2 mW	1 Watt	Pass
Mid Channel	16.3 mW	1 Watt	Pass
High Channel	16.1 mW	1 Watt	Pass

Low Channel					
Result:	Pass	**Value:**	4.2 mW	**Limit:**	1 Watt

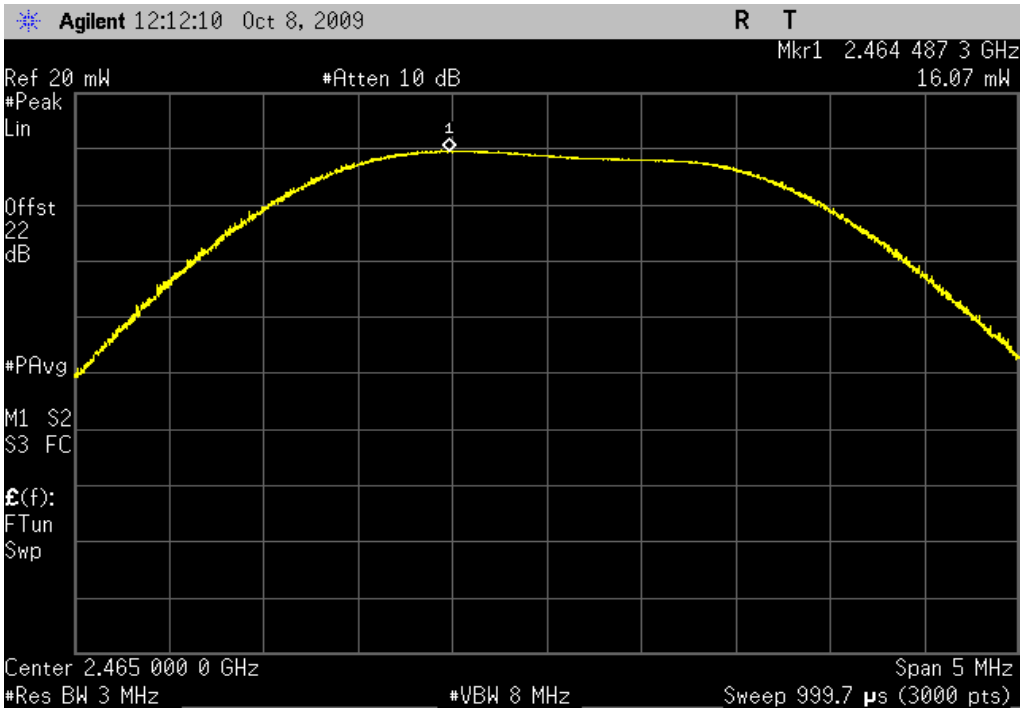


Mid Channel					
Result:	Pass	**Value:**	16.3 mW	**Limit:**	1 Watt



OUTPUT POWER

High Channel					
Result:	Pass	**Value:**	16.1 mW	**Limit:**	1 Watt



BAND EDGE COMPLIANCE

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/21/2009	13
Power Meter	Gigatronics	8651A	SPM	12/10/2008	13
Power Sensor	Gigatronics	80701A	SPL	12/10/2008	13
Signal Generator	Hewlett-Packard	8648D	TGC	12/9/2008	13

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its only data rate available.

The spectrum was scanned across each band edge from at least 10 MHz below the band edge to 10 MHz above the band edge.

NORTHWEST EMC

BAND EDGE COMPLIANCE

XMit 2009.03.05

EUT:	RF Module 10169			Work Order:	ECTE0002
Serial Number:	FCC #5			Date:	10/08/09
Customer:	EcoTech Marine			Temperature:	22°C
Attendees:	None			Humidity:	43%
Project:	None			Barometric Pres.:	30.15
Tested by:	Rod Peloquin	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074

COMMENTS

Default power as programmed by customer.

DEVIATIONS FROM TEST STANDARD

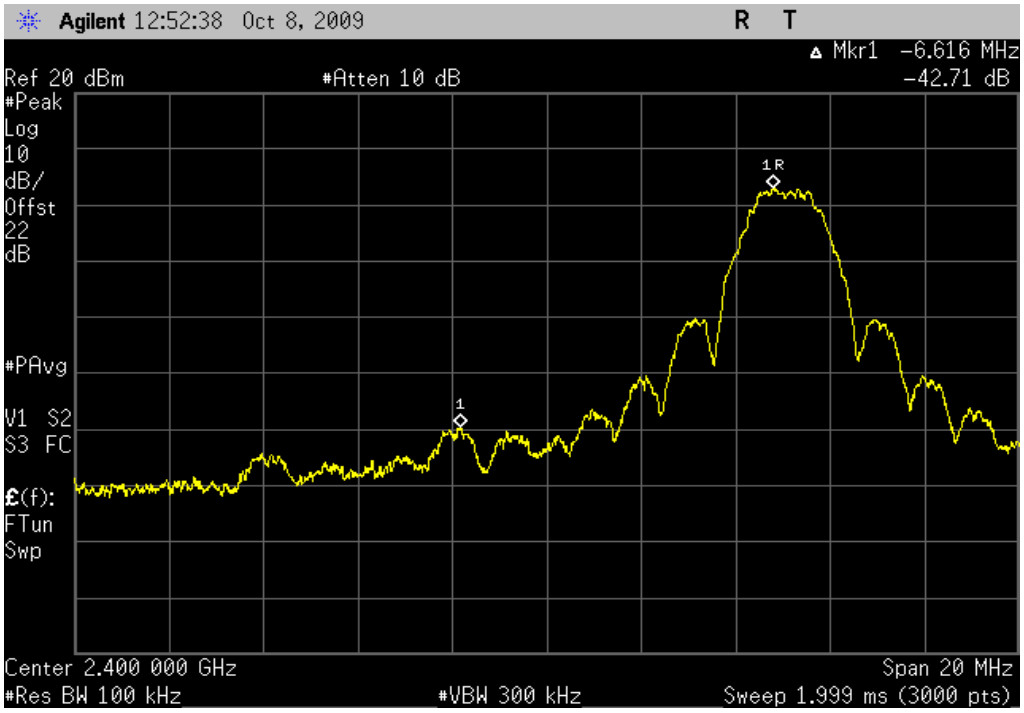
No Deviations

Configuration #	3	Signature

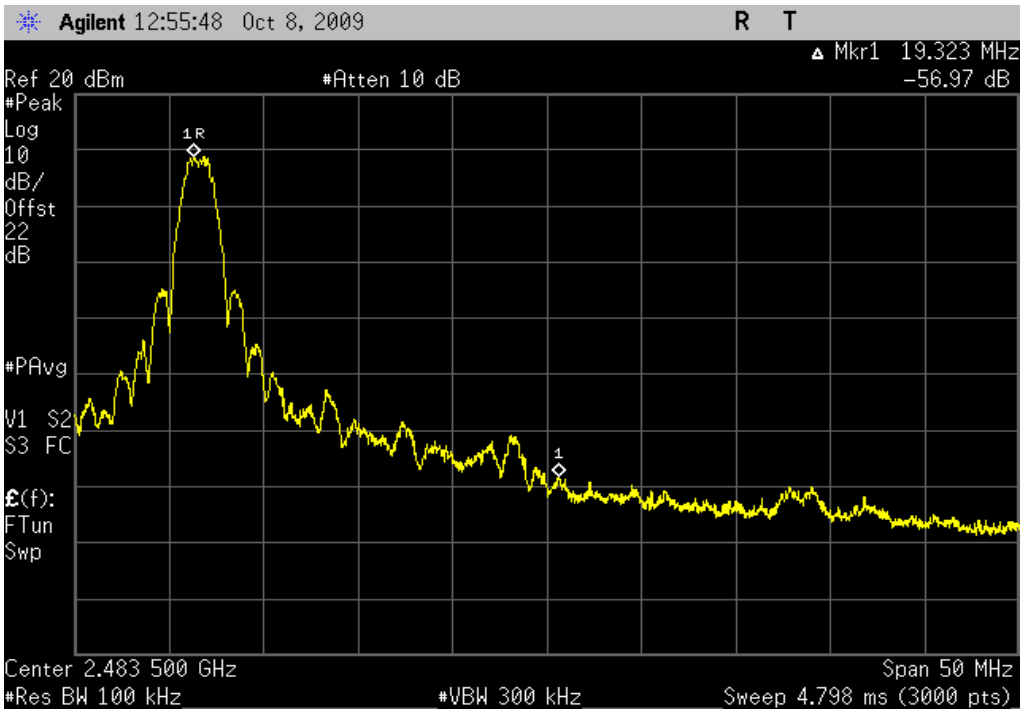
	Value	Limit	Results
Low Channel	-42.7 dBc	≤ -20 dBc	Pass
High Channel	-56.9 dBc	≤ -20 dBc	Pass

BAND EDGE COMPLIANCE

Low Channel					
Result:	Pass	**Value:**	-42.7 dBc	**Limit:**	≤ -20 dBc



High Channel					
Result:	Pass	**Value:**	-56.9 dBc	**Limit:**	≤ -20 dBc



SPURIOUS CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/21/2009	13
Power Meter	Gigatronics	8651A	SPM	12/10/2008	13
Power Sensor	Gigatronics	80701A	SPL	12/10/2008	13
Signal Generator	Hewlett-Packard	8648D	TGC	12/9/2008	13

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

NORTHWEST EMC

SPURIOUS CONDUCTED EMISSIONS

XMit 2009.03.05

EUT:	RF Module 10169			**Work Order:**	ECTE0002
Serial Number:	FCC #5			**Date:**	10/08/09
Customer:	EcoTech Marine			**Temperature:**	22°C
Attendees:	None			**Humidity:**	43%
Project:	None			**Barometric Pres.:**	30.15
Tested by:	Rod Peloquin	**Power:**	120VAC/60Hz	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074

COMMENTS

Default power as programmed by customer.

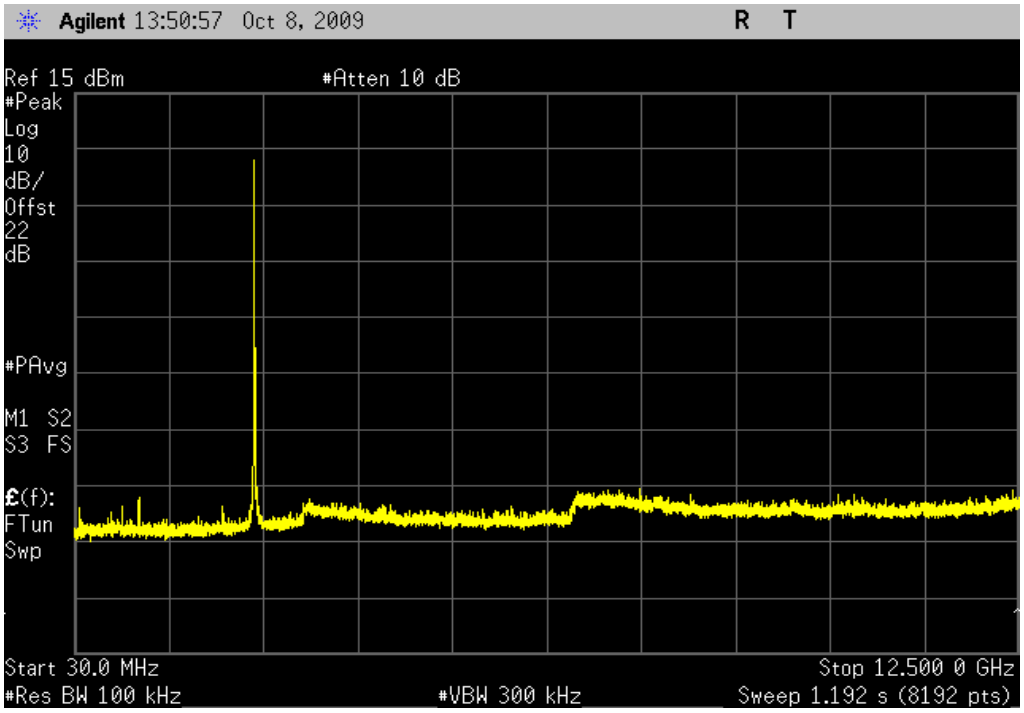
DEVIATIONS FROM TEST STANDARD

No Deviations

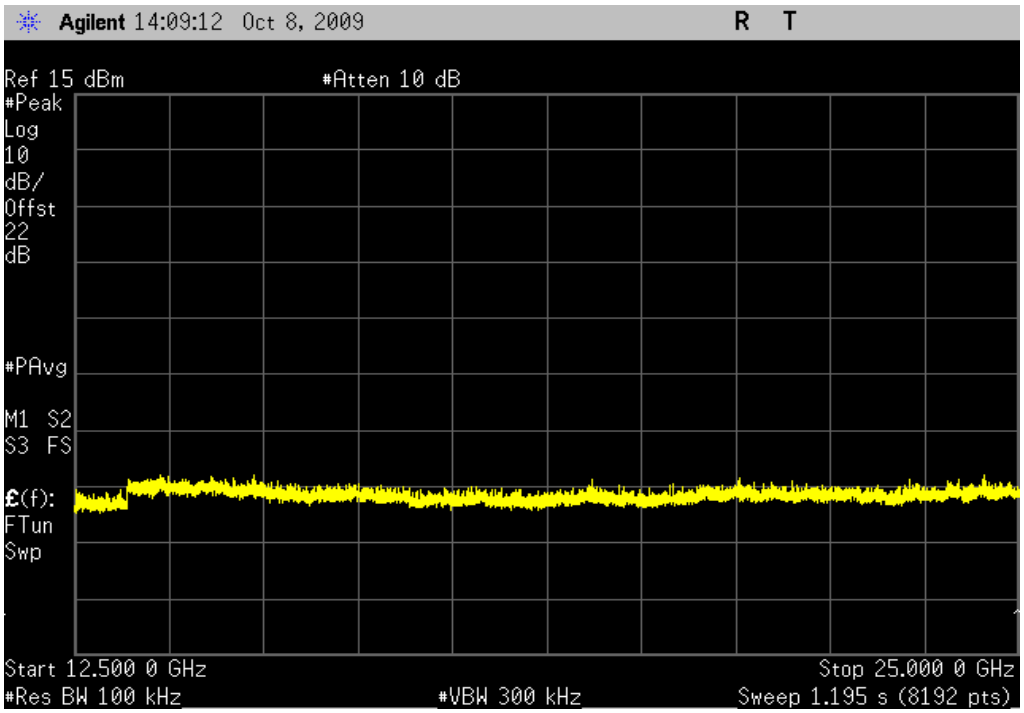
Configuration #	3	Signature

		Value	Limit	Results
Low Channel				
	30 MHz - 12.5 GHz	< -40 dBc	≤ -20 dBc	Pass
	12.5 GHz - 25 GHz	< -40 dBc	≤ -20 dBc	Pass
Mid Channel				
	30 MHz - 12.5 GHz	< -40 dBc	≤ -20 dBc	Pass
	12.5 GHz - 25 GHz	< -40 dBc	≤ -20 dBc	Pass
High Channel				
	30 MHz - 12.5 GHz	< -40 dBc	≤ -20 dBc	Pass
	12.5 GHz - 25 GHz	< -40 dBc	≤ -20 dBc	Pass

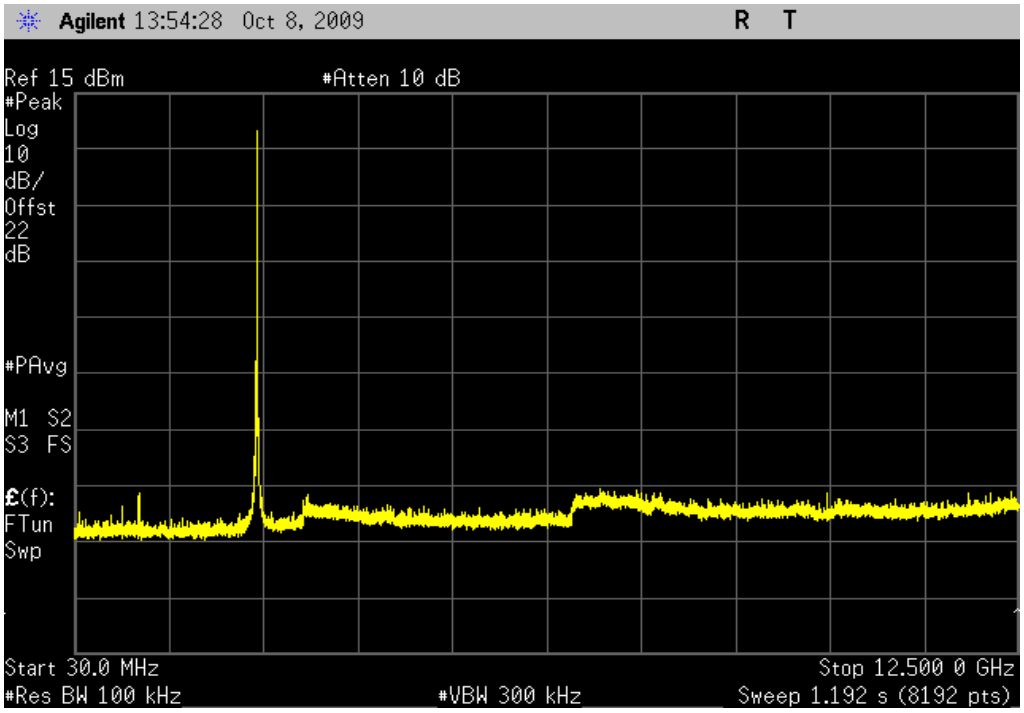
Low Channel, 30 MHz - 12.5 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



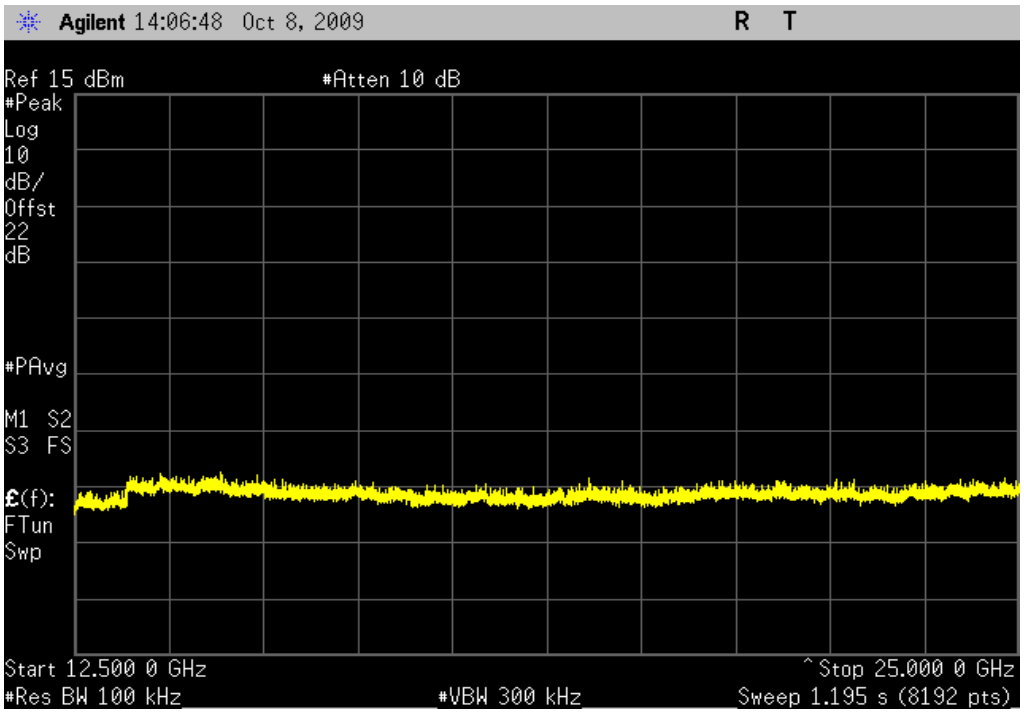
Low Channel, 12.5 GHz - 25 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



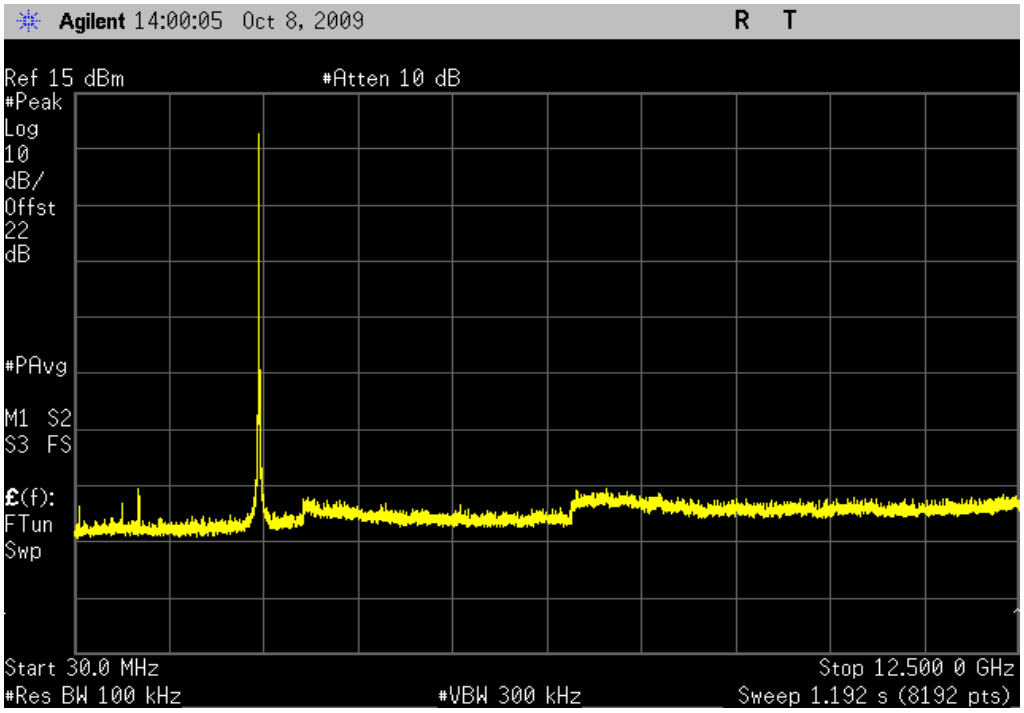
Mid Channel, 30 MHz - 12.5 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



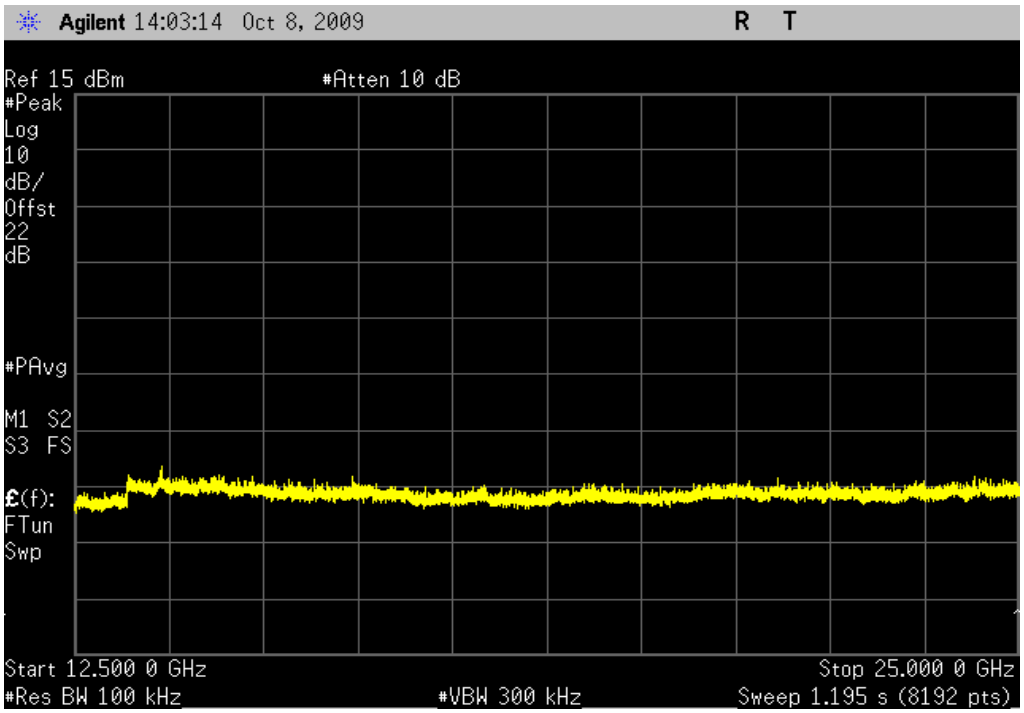
Mid Channel, 12.5 GHz - 25 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



High Channel, 30 MHz - 12.5 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



High Channel, 12.5 GHz - 25 GHz					
Result:	Pass	**Value:**	< -40 dBc	**Limit:**	≤ -20 dBc



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/21/2009	13
Power Meter	Gigatronics	8651A	SPM	12/10/2008	13
Power Sensor	Gigatronics	80701A	SPL	12/10/2008	13
Signal Generator	Hewlett-Packard	8648D	TGC	12/9/2008	13

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate for each modulation type available. Per the procedure outlined in FCC KDB 558074, March 23, 2005, the spectrum analyzer was used as follows:

> The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be 1.5 x 10^6 ÷ 3 x 10^3 = 500 seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 35 dB for correction to 3 kHz."

NORTHWEST EMC

POWER SPECTRAL DENSITY

XMit 2007.06.13

EUT:	**RF Module 10169**			**Work Order:**	**ECTE0002**
Serial Number:	**FCC #5**			**Date:**	**10/08/09**
Customer:	**EcoTech Marine**			**Temperature:**	**22°C**
Attendees:	**None**			**Humidity:**	**43%**
Project:	**None**			**Barometric Pres.:**	**30.15**
Tested by:	**Rod Peloquin**	**Power:**	**120VAC/60Hz**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003 KDB No. 558074

COMMENTS

Default power as programmed by customer.

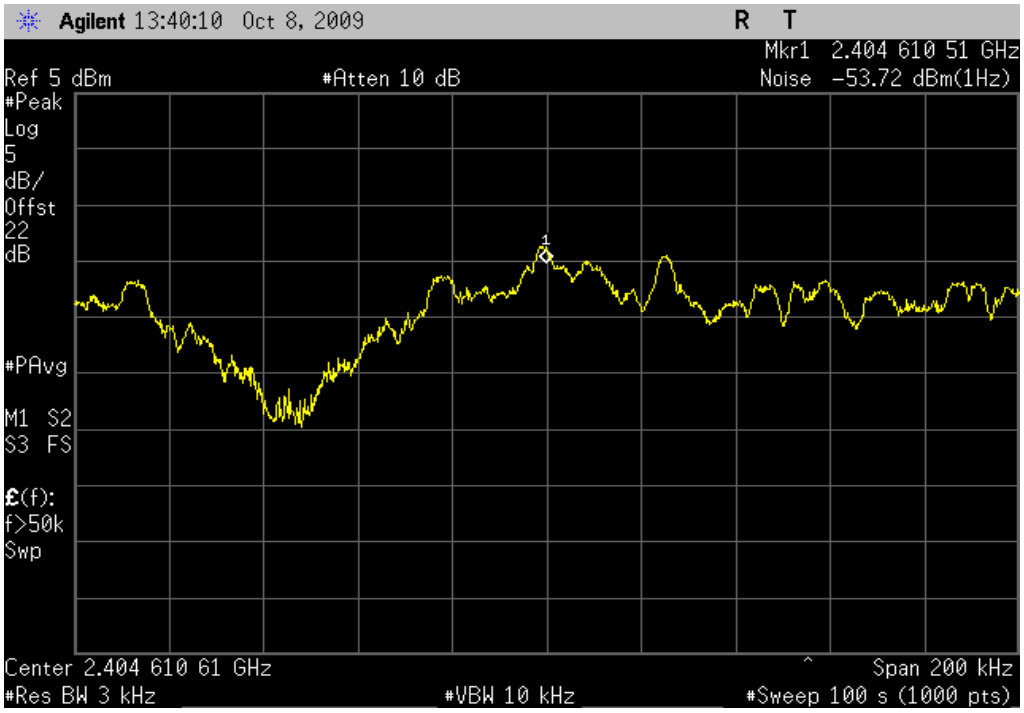
DEVIATIONS FROM TEST STANDARD

No Deviations

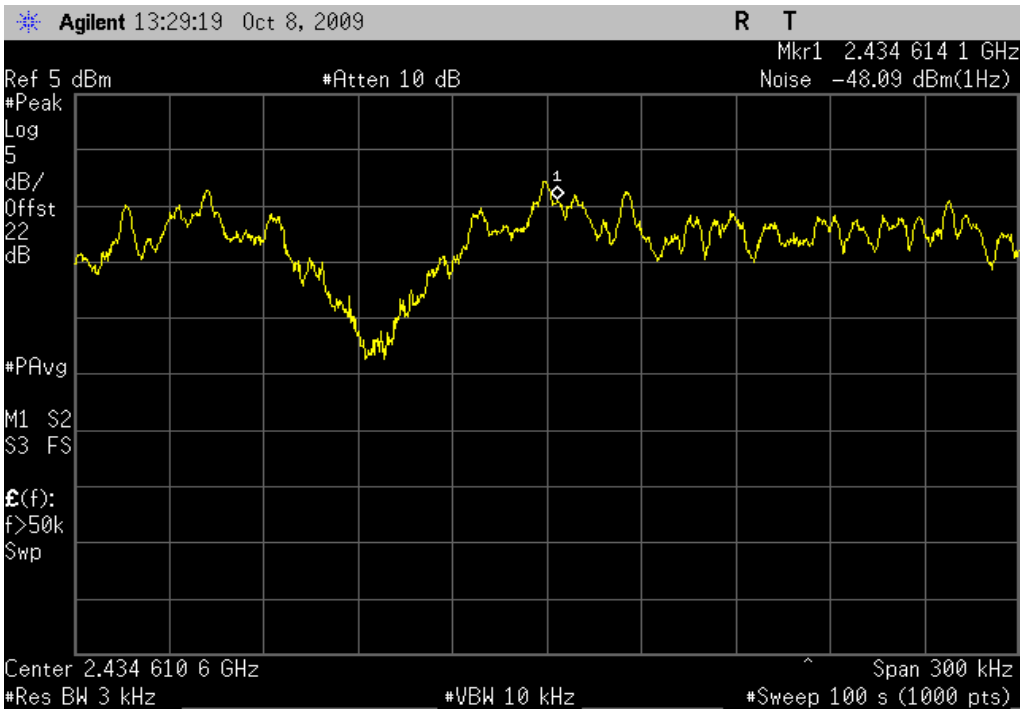
Configuration #	**3**	*Signature*

	Value	**Limit**	**Results**
Low Channel	-18.9 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Mid Channel	-13.3 dBm / 3 kHz	8 dBm / 3 kHz	Pass
High Channel	-13.4 dBm / 3 kHz	8 dBm / 3 kHz	Pass

Low Channel					
Result:	Pass	**Value:**	-18.9 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz

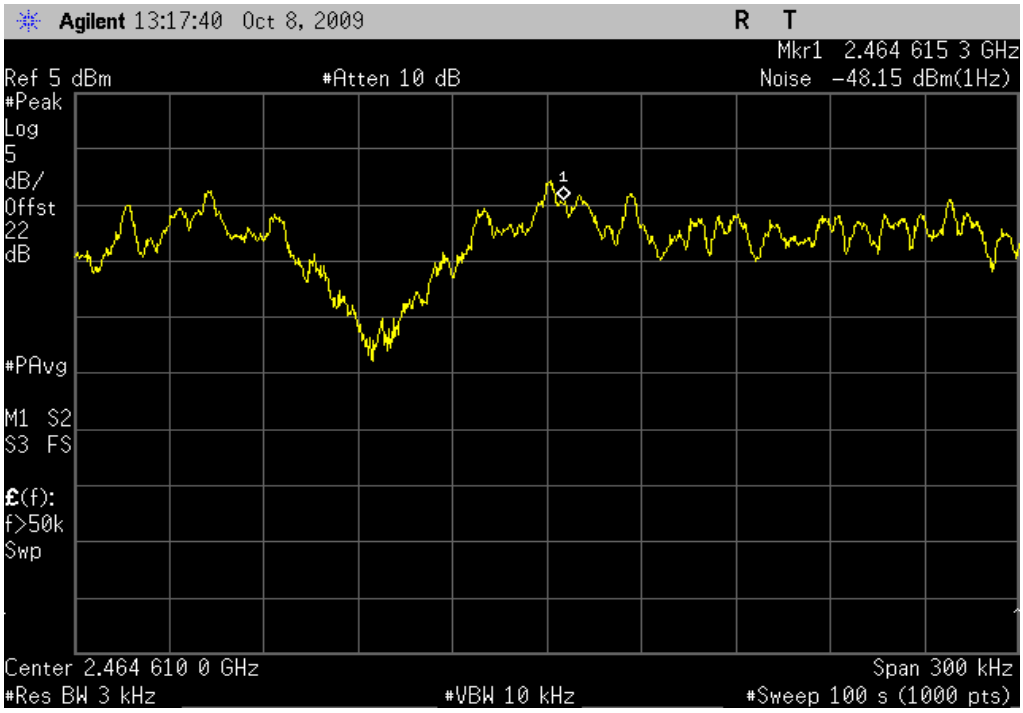


Mid Channel					
Result:	Pass	**Value:**	-13.3 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



POWER SPECTRAL DENSITY

High Channel					
Result:	Pass	**Value:**	-13.4 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



SPURIOUS RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

CHANNELS TESTED
Low, Channel 0 (0x00)
Mid, Channel 6 (0x06)
High, Channel 12 (0x0C)

MODES OF OPERATION
Low channel: typical modulation, power setting register 12: 0067
Mid channel: typical modulation, power setting register 12: 007F
High channel: typical modulation, power setting register 12: 007F

POWER SETTINGS INVESTIGATED
120VAC/60Hz

FREQUENCY RANGE INVESTIGATED			
Start Frequency	30 MHz	Stop Frequency	25 GHz

SAMPLE CALCULATIONS
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAY	12/11/2008	13
Low Pass Filter 0-1000 MHz	Micro-Tronics	LPM50004	LFD	7/10/2009	13
Pre-Amplifier	Miteq	AM-1616-1000	AOL	7/10/2009	13
Antenna, Biconilog	EMCO	3141	AXE	1/15/2008	24
EV01 Cables		Bilog Cables	EVA	7/10/2009	13
High Pass Filter	Micro-Tronics	HPM50111	HFO	7/10/2009	13
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	7/10/2009	13
Antenna, Horn	EMCO	3115	AHC	8/12/2008	24
EV01 Cables		Double Ridge Horn Cables	EVB	7/10/2009	13
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	7/10/2009	13
Antenna, Horn	ETS	3160-07	AHU	NCR	0
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	7/10/2009	13
Antenna, Horn	ETS	3160-08	AHV	NCR	0
EV01 Cables		Standard Gain Horns Cables	EVF	11/13/2008	13
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	12/2/2008	13
Antenna, Horn	ETS	3160-09	AHG	NCR	0
EV01 Cables		18-26GHz Standard Gain Horn Cable	EVD	12/2/2008	13

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.				

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

PSA 2008.07.21
EMI 2009.4.13

EUT:	RF Module 10169	Work Order:	ECTE0002
Serial Number:	FCC #1	Date:	10/07/09
Customer:	EcoTech Marine	Temperature:	22
Attendees:	None	Humidity:	43%
Project:	None	Barometric Pres.:	30.15
Tested by:	Rod Peloquin	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003, KDB No. 558074

TEST PARAMETERS

Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

PC remote (serial and power only to test board)

EUT OPERATING MODES

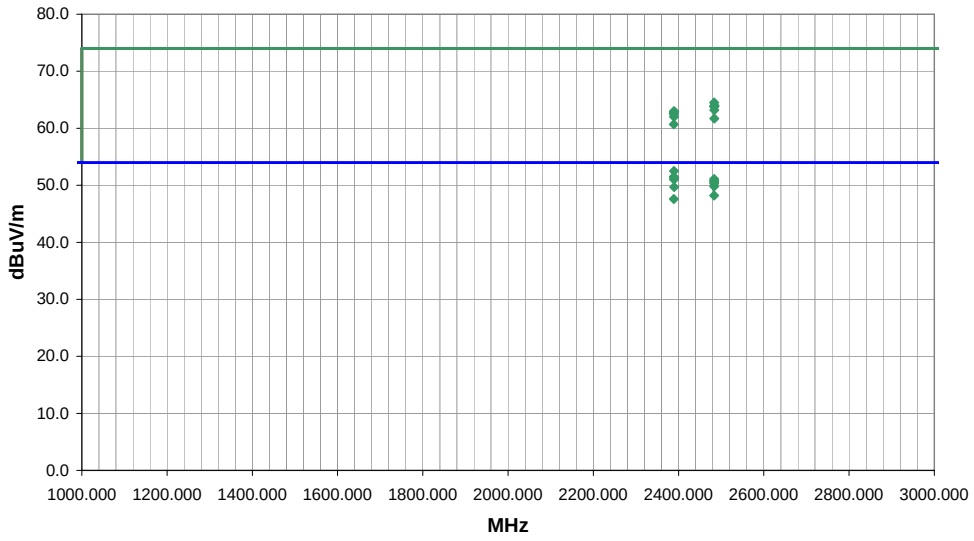
Transmitting default power, see comments for channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2389.427	30.4	2.1	274.0	1.7	3.0	20.0	H-Horn	AV	0.0	52.5	54.0	-1.5	Low Channel, EUT on end
2389.000	29.4	2.1	-1.0	1.0	3.0	20.0	H-Horn	AV	0.0	51.5	54.0	-2.5	Low Channel, EUT horizontal
2389.453	29.2	2.1	8.0	1.3	3.0	20.0	V-Horn	AV	0.0	51.3	54.0	-2.7	Low Channel, EUT on side
2483.500	28.4	2.7	17.0	1.0	3.0	20.0	V-Horn	AV	0.0	51.1	54.0	-2.9	High Channel, EUT on side
2389.437	28.9	2.1	142.0	1.1	3.0	20.0	H-Horn	AV	0.0	51.0	54.0	-3.0	Low Channel, EUT on side
2483.502	28.1	2.7	258.0	1.6	3.0	20.0	H-Horn	AV	0.0	50.8	54.0	-3.2	High Channel, EUT on end
2483.522	27.9	2.7	132.0	1.6	3.0	20.0	H-Horn	AV	0.0	50.6	54.0	-3.4	High Channel, EUT on side
2483.500	27.6	2.7	13.0	1.6	3.0	20.0	H-Horn	AV	0.0	50.3	54.0	-3.7	High Channel, EUT horizontal
2483.500	27.1	2.7	26.0	1.0	3.0	20.0	V-Horn	AV	0.0	49.8	54.0	-4.2	High Channel, EUT on end
2389.493	27.6	2.1	122.0	2.0	3.0	20.0	V-Horn	AV	0.0	49.7	54.0	-4.3	Low Channel, EUT on end
2483.633	25.5	2.7	15.0	1.2	3.0	20.0	V-Horn	AV	0.0	48.2	54.0	-5.8	High Channel, EUT horizontal
2388.703	25.5	2.1	31.0	1.6	3.0	20.0	V-Horn	AV	0.0	47.6	54.0	-6.4	Low Channel, EUT horizontal
2483.603	41.8	2.7	17.0	1.0	3.0	20.0	V-Horn	PK	0.0	64.5	74.0	-9.5	High Channel, EUT on side
2484.227	41.3	2.7	258.0	1.6	3.0	20.0	H-Horn	PK	0.0	64.0	74.0	-10.0	High Channel, EUT on end
2483.622	41.1	2.7	13.0	1.6	3.0	20.0	H-Horn	PK	0.0	63.8	74.0	-10.2	High Channel, EUT horizontal
2483.953	41.1	2.7	132.0	1.6	3.0	20.0	H-Horn	PK	0.0	63.8	74.0	-10.2	High Channel, EUT on side
2483.855	40.5	2.7	26.0	1.0	3.0	20.0	V-Horn	PK	0.0	63.2	74.0	-10.8	High Channel, EUT on end
2389.437	40.9	2.1	142.0	1.1	3.0	20.0	H-Horn	PK	0.0	63.0	74.0	-11.0	Low Channel, EUT on side
2389.780	40.8	2.1	8.0	1.3	3.0	20.0	V-Horn	PK	0.0	62.9	74.0	-11.1	Low Channel, EUT on side
2388.810	40.6	2.1	-1.0	1.0	3.0	20.0	H-Horn	PK	0.0	62.7	74.0	-11.3	Low Channel, EUT horizontal
2388.950	40.4	2.1	273.0	1.7	3.0	20.0	H-Horn	PK	0.0	62.5	74.0	-11.5	Low Channel, EUT on end
2389.263	39.9	2.1	122.0	2.0	3.0	20.0	V-Horn	PK	0.0	62.0	74.0	-12.0	Low Channel, EUT on end
2483.745	39.0	2.7	15.0	1.2	3.0	20.0	V-Horn	PK	0.0	61.7	74.0	-12.3	High Channel, EUT horizontal
2388.933	38.6	2.1	31.0	1.6	3.0	20.0	V-Horn	PK	0.0	60.7	74.0	-13.3	Low Channel, EUT horizontal

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

PSA 2008.07.21
EMI 2009.4.13

EUT:	RF Module 10169	Work Order:	ECTE0002
Serial Number:	FCC #1	Date:	10/07/09
Customer:	EcoTech Marine	Temperature:	22
Attendees:	None	Humidity:	43%
Project:	None	Barometric Pres.:	30.15
Tested by:	Rod Peloquin	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003, KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

PC remote (serial and power only to test board)

EUT OPERATING MODES

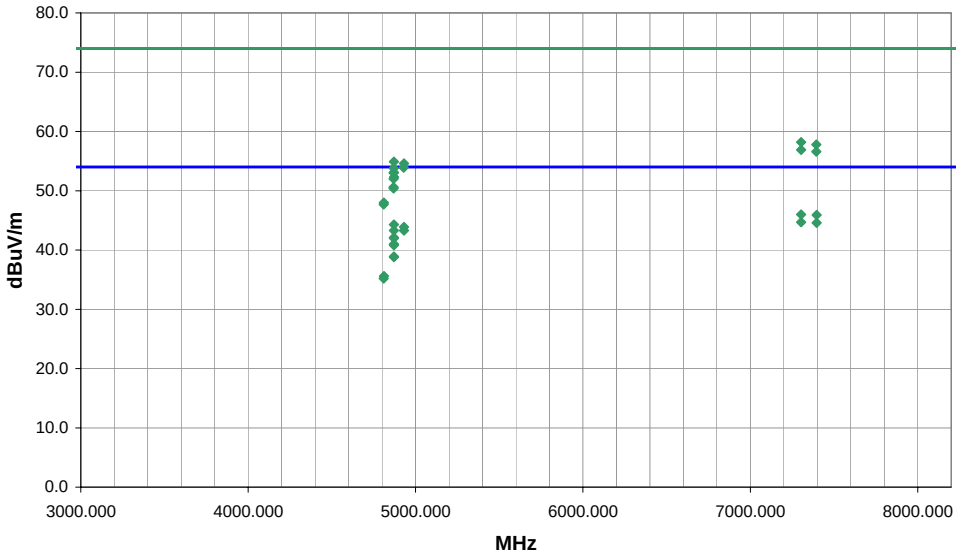
Transmitting default power, See comments for channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7303.858	29.9	16.1	279.0	1.0	3.0	0.0	V-Horn	AV	0.0	46.0	54.0	-8.0	Mid Channel, EUT on side
7396.483	29.3	16.6	276.0	1.4	3.0	0.0	V-Horn	AV	0.0	45.9	54.0	-8.1	High Channel, EUT on side
7303.783	28.6	16.1	261.0	1.1	3.0	0.0	H-Horn	AV	0.0	44.7	54.0	-9.3	Mid Channel, EUT on end
7396.558	28.0	16.6	217.0	1.4	3.0	0.0	H-Horn	AV	0.0	44.6	54.0	-9.4	High Channel, EUT on end
4871.073	34.6	9.7	161.0	1.2	3.0	0.0	H-Horn	AV	0.0	44.3	54.0	-9.7	Mid Channel, EUT on end
4931.042	34.0	9.9	39.0	1.3	3.0	0.0	H-Horn	AV	0.0	43.9	54.0	-10.1	High Channel, EUT on end
4931.067	33.4	9.9	87.0	1.3	3.0	0.0	V-Horn	AV	0.0	43.3	54.0	-10.7	High Channel, EUT on side
4871.033	33.6	9.7	265.0	1.1	3.0	0.0	V-Horn	AV	0.0	43.3	54.0	-10.7	Mid Channel, EUT on side
4870.933	32.4	9.7	133.0	1.2	3.0	0.0	V-Horn	AV	0.0	42.1	54.0	-11.9	Mid Channel, EUT horizontal
4871.067	32.3	9.7	38.0	1.0	3.0	0.0	H-Horn	AV	0.0	42.0	54.0	-12.0	Mid Channel, EUT on side
4870.980	31.3	9.7	170.0	1.3	3.0	0.0	H-Horn	AV	0.0	41.0	54.0	-13.0	Mid Channel, EUT on side
4871.060	31.1	9.7	62.0	1.2	3.0	0.0	V-Horn	AV	0.0	40.8	54.0	-13.2	Mid Channel, EUT on side
4871.027	29.2	9.7	135.0	1.6	3.0	0.0	V-Horn	AV	0.0	38.9	54.0	-15.1	Mid Channel, EUT on end
4871.000	29.1	9.7	207.0	1.2	3.0	0.0	H-Horn	AV	0.0	38.8	54.0	-15.2	Mid Channel, EUT horizontal
7303.833	42.1	16.1	279.0	1.0	3.0	0.0	V-Horn	PK	0.0	58.2	74.0	-15.8	Mid Channel, EUT on side
7393.733	41.2	16.6	276.0	1.4	3.0	0.0	V-Horn	PK	0.0	57.8	74.0	-16.2	High Channel, EUT on side
7303.383	40.8	16.1	261.0	1.1	3.0	0.0	H-Horn	PK	0.0	56.9	74.0	-17.1	Mid Channel, EUT on end
7393.725	40.0	16.6	217.0	1.4	3.0	0.0	H-Horn	PK	0.0	56.6	74.0	-17.4	High Channel, EUT on end
4811.025	26.1	9.5	264.0	1.0	3.0	0.0	V-Horn	AV	0.0	35.6	54.0	-18.4	Low Channel, EUT on side
4809.242	25.7	9.5	37.0	1.0	3.0	0.0	H-Horn	AV	0.0	35.2	54.0	-18.8	Low Channel, EUT on end

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

PSA 2008.07.21
EMI 2009.4.13

EUT:	RF Module 10169	Work Order:	ECTE0002
Serial Number:	FCC #1	Date:	10/07/09
Customer:	EcoTech Marine	Temperature:	22
Attendees:	None	Humidity:	43%
Project:	None	Barometric Pres.:	30.15
Tested by:	Rod Peloquin	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2009	ANSI C63.4:2003, KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

PC remote (serial and power only to test board)

EUT OPERATING MODES

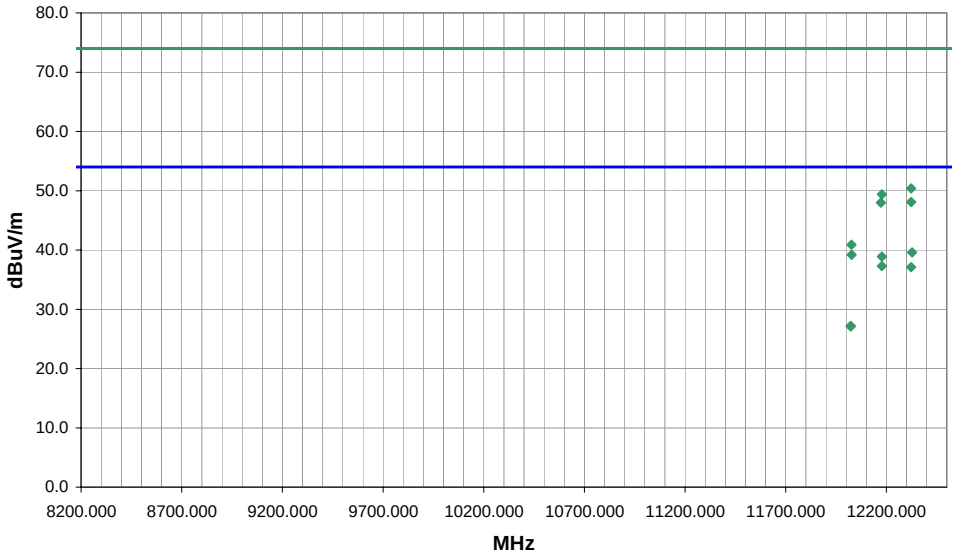
Transmitting default power, See comments for channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	3
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
12327.630	42.3	-2.7	59.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.6	54.0	-14.4	High Channel, EUT on side
12177.610	42.3	-3.4	60.0	1.1	3.0	0.0	H-Horn	AV	0.0	38.9	54.0	-15.1	Mid Channel, EUT on side
12177.650	40.7	-3.4	18.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.3	54.0	-16.7	Mid Channel, EUT on end
12322.960	39.8	-2.7	150.0	1.0	3.0	0.0	V-Horn	AV	0.0	37.1	54.0	-16.9	High Channel, EUT on end
12322.960	53.1	-2.7	59.0	1.0	3.0	0.0	H-Horn	PK	0.0	50.4	74.0	-23.6	High Channel, EUT on side
12177.680	52.8	-3.4	60.0	1.1	3.0	0.0	H-Horn	PK	0.0	49.4	74.0	-24.6	Mid Channel, EUT on side
12322.850	50.8	-2.7	150.0	1.0	3.0	0.0	V-Horn	PK	0.0	48.1	74.0	-25.9	High Channel, EUT on end
12172.890	51.4	-3.4	18.0	1.1	3.0	0.0	V-Horn	PK	0.0	48.0	74.0	-26.0	Mid Channel, EUT on end
12022.130	31.3	-4.1	211.0	1.0	3.0	0.0	H-Horn	AV	0.0	27.2	54.0	-26.8	Low Channel, EUT on side
12022.160	31.2	-4.1	100.0	1.0	3.0	0.0	V-Horn	AV	0.0	27.1	54.0	-26.9	Low Channel, EUT on end
12026.480	45.0	-4.1	211.0	1.0	3.0	0.0	H-Horn	PK	0.0	40.9	74.0	-33.1	Low Channel, EUT on side
12026.830	43.3	-4.1	100.0	1.0	3.0	0.0	V-Horn	PK	0.0	39.2	74.0	-34.8	Low Channel, EUT on end

AC POWERLINE CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION
Transmitting high channel
Transmitting mid channel
Transmitting low channel

POWER SETTINGS INVESTIGATED
120VAC/60Hz

CONFIGURATIONS INVESTIGATED
ECTE0002 - 4

SAMPLE CALCULATIONS
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARH	9/25/2009	24 mo
High Pass Filter	TTE	H97-100K-50-720B	HFX	5/27/2009	13 mo
Attenuator	Coaxicom	66702 2910-20	ATO	7/21/2009	13 mo
EV07 Cables		Conducted Cables	EVG	6/1/2009	13 mo
LISN	Solar	9252-50-R-24-BNC	LIP	2/4/2009	13 mo
LISN	Solar	9252-50-R-24-BNC	LIR	2/4/2009	13 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm.

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

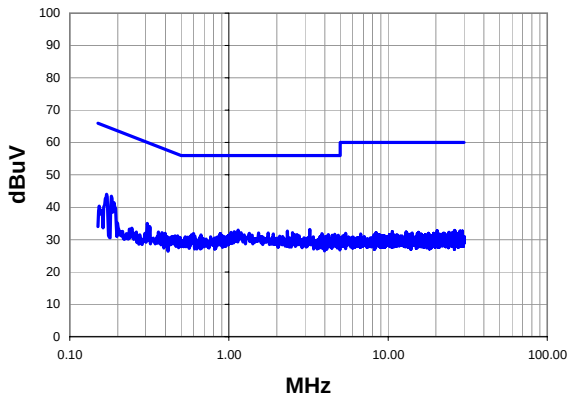
PSA-ESCI 2009.06.09
Version 2009.5.18

Work Order:	ECTE0002	**Date:**	10/08/09	
Project:	None	**Temperature:**	22	
Job Site:	EV01	**Humidity:**	43	
Serial Number:	FCC #2	**Barometric Pres.:**	30.15	**Tested by:** Rod Peloquin
EUT:	RF Module 10169			
Configuration:	4 - AC Powerline Conducted Emissions			
Customer:	EcoTech Marine			
Attendees:	none			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmitting low channel			
Deviations:	No deviations.			
Comments:	None			

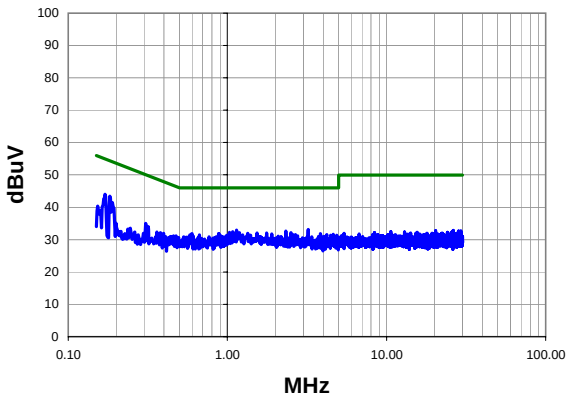
Test Specifications	**Test Method**
FCC 15.207:2009	ANSI C63.4:2003

Run #	1	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.170	22.7	21.4	44.1	64.9	-20.9
0.182	22.2	21.3	43.5	64.4	-20.9
3.216	12.7	20.4	33.1	56.0	-22.9
1.144	12.5	20.4	32.9	56.0	-23.1
2.328	12.2	20.4	32.6	56.0	-23.4
1.080	12.1	20.4	32.5	56.0	-23.5
1.032	11.9	20.4	32.3	56.0	-23.7
2.512	11.7	20.4	32.1	56.0	-23.9
1.536	11.7	20.4	32.1	56.0	-23.9
1.768	11.6	20.4	32.0	56.0	-24.0
1.344	11.6	20.4	32.0	56.0	-24.0
0.597	11.4	20.5	31.9	56.0	-24.1
0.879	11.5	20.4	31.9	56.0	-24.1
3.848	11.5	20.3	31.8	56.0	-24.2
1.896	11.4	20.4	31.8	56.0	-24.2
4.632	11.3	20.4	31.7	56.0	-24.4
4.208	11.2	20.3	31.5	56.0	-24.5
2.680	11.1	20.4	31.5	56.0	-24.5
0.667	11.0	20.5	31.5	56.0	-24.5
4.448	11.0	20.3	31.3	56.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.170	22.7	21.4	44.1	54.9	-10.9
0.182	22.2	21.3	43.5	54.4	-10.9
3.216	12.7	20.4	33.1	46.0	-12.9
1.144	12.5	20.4	32.9	46.0	-13.1
2.328	12.2	20.4	32.6	46.0	-13.4
1.080	12.1	20.4	32.5	46.0	-13.5
1.032	11.9	20.4	32.3	46.0	-13.7
2.512	11.7	20.4	32.1	46.0	-13.9
1.536	11.7	20.4	32.1	46.0	-13.9
1.768	11.6	20.4	32.0	46.0	-14.0
1.344	11.6	20.4	32.0	46.0	-14.0
0.597	11.4	20.5	31.9	46.0	-14.1
0.879	11.5	20.4	31.9	46.0	-14.1
3.848	11.5	20.3	31.8	46.0	-14.2
1.896	11.4	20.4	31.8	46.0	-14.2
4.632	11.3	20.4	31.7	46.0	-14.4
4.208	11.2	20.3	31.5	46.0	-14.5
2.680	11.1	20.4	31.5	46.0	-14.5
0.667	11.0	20.5	31.5	46.0	-14.5
4.448	11.0	20.3	31.3	46.0	-14.7

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

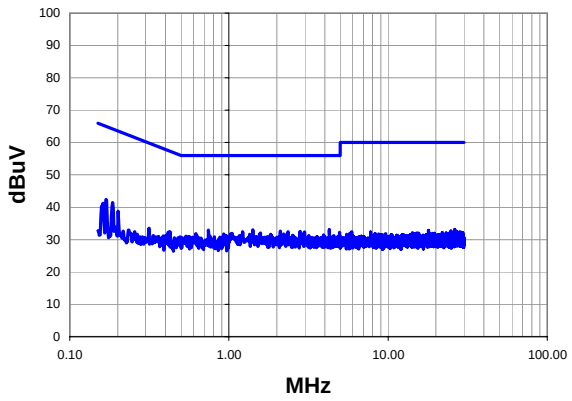
PSA-ESCI 2009.06.09
Version 2009.5.18

Work Order:	ECTE0002	**Date:**	10/08/09		
Project:	None	**Temperature:**	22		
Job Site:	EV01	**Humidity:**	43		
Serial Number:	FCC #2	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	RF Module 10169				
Configuration:	4 - AC Powerline Conducted Emissions				
Customer:	EcoTech Marine				
Attendees:	none				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting low channel				
Deviations:	No deviations.				
Comments:	None				

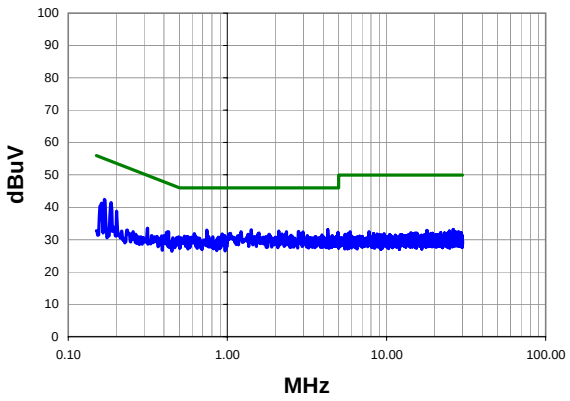
Test Specifications	**Test Method**
FCC 15.207:2009	ANSI C63.4:2003

Run #	2	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.169	21.0	21.4	42.4	65.0	-22.6
0.186	20.2	21.3	41.5	64.2	-22.8
4.272	12.7	20.3	33.0	56.0	-23.0
1.416	12.6	20.4	33.0	56.0	-23.0
0.743	12.6	20.4	33.0	56.0	-23.0
2.104	12.2	20.4	32.6	56.0	-23.4
2.800	12.1	20.4	32.5	56.0	-23.5
1.216	12.1	20.4	32.5	56.0	-23.5
2.352	12.0	20.4	32.4	56.0	-23.6
2.984	11.9	20.4	32.3	56.0	-23.7
4.944	11.8	20.5	32.3	56.0	-23.7
1.576	11.7	20.4	32.1	56.0	-23.9
1.048	11.6	20.4	32.0	56.0	-24.0
0.619	11.4	20.5	31.9	56.0	-24.1
0.162	19.7	21.5	41.2	65.4	-24.1
2.208	11.4	20.4	31.8	56.0	-24.2
0.927	11.4	20.4	31.8	56.0	-24.2
1.832	11.3	20.4	31.7	56.0	-24.3
3.928	11.1	20.3	31.4	56.0	-24.6
2.512	10.9	20.4	31.3	56.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.169	21.0	21.4	42.4	55.0	-12.6
0.186	20.2	21.3	41.5	54.2	-12.8
4.272	12.7	20.3	33.0	46.0	-13.0
1.416	12.6	20.4	33.0	46.0	-13.0
0.743	12.6	20.4	33.0	46.0	-13.0
2.104	12.2	20.4	32.6	46.0	-13.4
2.800	12.1	20.4	32.5	46.0	-13.5
1.216	12.1	20.4	32.5	46.0	-13.5
2.352	12.0	20.4	32.4	46.0	-13.6
2.984	11.9	20.4	32.3	46.0	-13.7
4.944	11.8	20.5	32.3	46.0	-13.7
1.576	11.7	20.4	32.1	46.0	-13.9
1.048	11.6	20.4	32.0	46.0	-14.0
0.619	11.4	20.5	31.9	46.0	-14.1
0.162	19.7	21.5	41.2	55.4	-14.1
2.208	11.4	20.4	31.8	46.0	-14.2
0.927	11.4	20.4	31.8	46.0	-14.2
1.832	11.3	20.4	31.7	46.0	-14.3
3.928	11.1	20.3	31.4	46.0	-14.6
2.512	10.9	20.4	31.3	46.0	-14.7

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

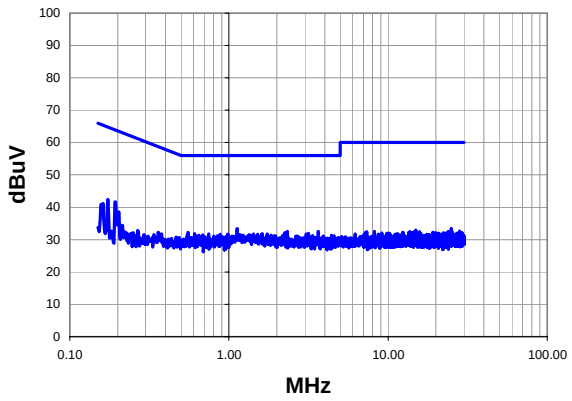
PSA-ESCI 2009.06.09
Version 2009.5.18

Work Order:	ECTE0002	**Date:**	10/08/09		
Project:	None	**Temperature:**	22		
Job Site:	EV01	**Humidity:**	43		
Serial Number:	FCC #2	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	RF Module 10169				
Configuration:	4 - AC Powerline Conducted Emissions				
Customer:	EcoTech Marine				
Attendees:	none				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting mid channel				
Deviations:	No deviations.				
Comments:	None				

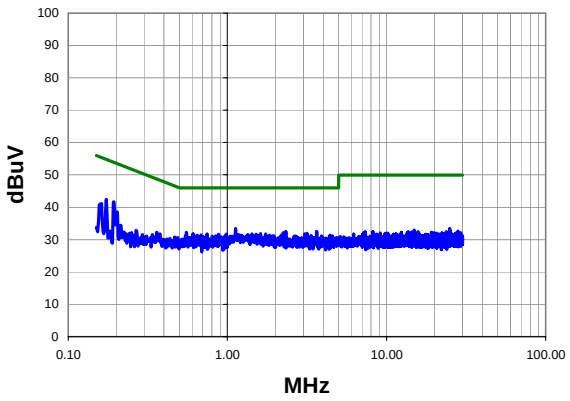
Test Specifications	**Test Method**
FCC 15.207:2009	ANSI C63.4:2003

Run #	3	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.193	20.4	21.2	41.6	63.9	-22.3
0.174	21.1	21.3	42.4	64.8	-22.4
1.128	13.0	20.4	33.4	56.0	-22.6
3.640	12.2	20.3	32.5	56.0	-23.5
2.328	12.1	20.4	32.5	56.0	-23.5
0.553	11.8	20.5	32.3	56.0	-23.7
2.240	11.7	20.4	32.1	56.0	-23.9
3.160	11.5	20.4	31.9	56.0	-24.1
1.616	11.5	20.4	31.9	56.0	-24.1
0.607	11.4	20.5	31.9	56.0	-24.1
1.744	11.4	20.4	31.8	56.0	-24.2
1.424	11.4	20.4	31.8	56.0	-24.2
0.745	11.4	20.4	31.8	56.0	-24.2
0.162	19.6	21.5	41.1	65.4	-24.2
3.056	11.3	20.4	31.7	56.0	-24.3
0.985	11.3	20.4	31.7	56.0	-24.3
0.879	11.3	20.4	31.7	56.0	-24.3
0.684	11.0	20.4	31.4	56.0	-24.6
1.840	11.0	20.4	31.4	56.0	-24.6
0.645	10.9	20.5	31.4	56.0	-24.6

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.193	20.4	21.2	41.6	53.9	-12.3
0.174	21.1	21.3	42.4	54.8	-12.4
1.128	13.0	20.4	33.4	46.0	-12.6
3.640	12.2	20.3	32.5	46.0	-13.5
2.328	12.1	20.4	32.5	46.0	-13.5
0.553	11.8	20.5	32.3	46.0	-13.7
2.240	11.7	20.4	32.1	46.0	-13.9
3.160	11.5	20.4	31.9	46.0	-14.1
1.616	11.5	20.4	31.9	46.0	-14.1
0.607	11.4	20.5	31.9	46.0	-14.1
1.744	11.4	20.4	31.8	46.0	-14.2
1.424	11.4	20.4	31.8	46.0	-14.2
0.745	11.4	20.4	31.8	46.0	-14.2
0.162	19.6	21.5	41.1	55.4	-14.2
3.056	11.3	20.4	31.7	46.0	-14.3
0.985	11.3	20.4	31.7	46.0	-14.3
0.879	11.3	20.4	31.7	46.0	-14.3
0.684	11.0	20.4	31.4	46.0	-14.6
1.840	11.0	20.4	31.4	46.0	-14.6
0.645	10.9	20.5	31.4	46.0	-14.6

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

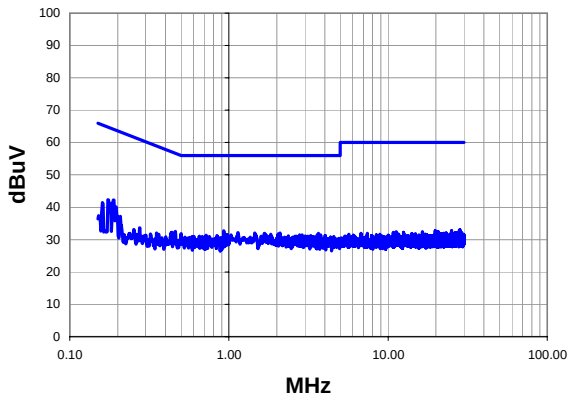
PSA-ESCI 2009.06.09
Version 2009.5.18

Work Order:	ECTE0002	**Date:**	10/08/09		
Project:	None	**Temperature:**	22		
Job Site:	EV01	**Humidity:**	43		
Serial Number:	FCC #2	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	RF Module 10169				
Configuration:	4 - AC Powerline Conducted Emissions				
Customer:	EcoTech Marine				
Attendees:	none				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting mid channel				
Deviations:	No deviations.				
Comments:	None				

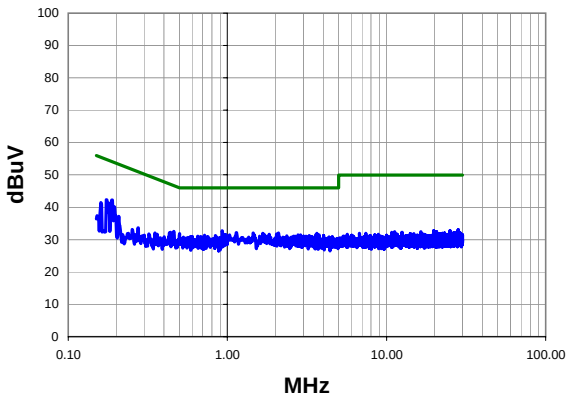
Test Specifications	**Test Method**
FCC 15.207:2009	ANSI C63.4:2003

Run #	4	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.187	21.0	21.3	42.3	64.2	-21.9
0.174	21.0	21.3	42.3	64.8	-22.5
0.929	12.4	20.4	32.8	56.0	-23.2
0.194	18.9	21.2	40.1	63.9	-23.7
1.136	11.8	20.4	32.2	56.0	-23.8
1.456	11.7	20.4	32.1	56.0	-23.9
0.160	19.9	21.6	41.5	65.5	-24.0
2.096	11.6	20.4	32.0	56.0	-24.0
1.672	11.6	20.4	32.0	56.0	-24.0
3.648	11.6	20.3	31.9	56.0	-24.1
0.461	12.1	20.5	32.6	56.7	-24.1
0.500	11.4	20.5	31.9	56.0	-24.1
2.040	11.4	20.4	31.8	56.0	-24.2
0.978	11.2	20.4	31.6	56.0	-24.4
0.964	11.2	20.4	31.6	56.0	-24.4
3.768	11.1	20.3	31.4	56.0	-24.6
2.888	11.0	20.4	31.4	56.0	-24.6
2.784	11.0	20.4	31.4	56.0	-24.6
0.719	11.0	20.4	31.4	56.0	-24.6
0.842	10.9	20.4	31.3	56.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.187	21.0	21.3	42.3	54.2	-11.9
0.174	21.0	21.3	42.3	54.8	-12.5
0.929	12.4	20.4	32.8	46.0	-13.2
0.194	18.9	21.2	40.1	53.9	-13.7
1.136	11.8	20.4	32.2	46.0	-13.8
1.456	11.7	20.4	32.1	46.0	-13.9
0.160	19.9	21.6	41.5	55.5	-14.0
2.096	11.6	20.4	32.0	46.0	-14.0
1.672	11.6	20.4	32.0	46.0	-14.0
3.648	11.6	20.3	31.9	46.0	-14.1
0.461	12.1	20.5	32.6	46.7	-14.1
0.500	11.4	20.5	31.9	46.0	-14.1
2.040	11.4	20.4	31.8	46.0	-14.2
0.978	11.2	20.4	31.6	46.0	-14.4
0.964	11.2	20.4	31.6	46.0	-14.4
3.768	11.1	20.3	31.4	46.0	-14.6
2.888	11.0	20.4	31.4	46.0	-14.6
2.784	11.0	20.4	31.4	46.0	-14.6
0.719	11.0	20.4	31.4	46.0	-14.6
0.842	10.9	20.4	31.3	46.0	-14.7

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

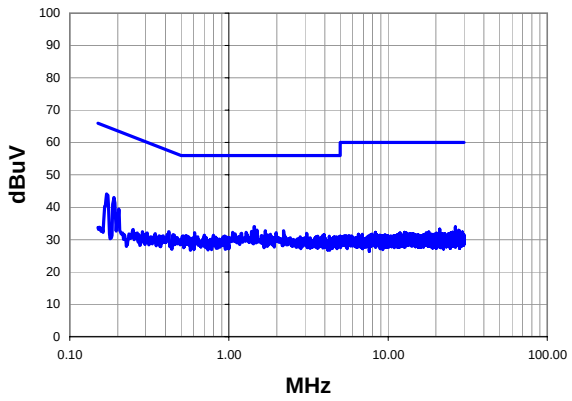
PSA-ESCI 2009.06.09
Version 2009.5.18

Work Order:	ECTE0002	**Date:**	10/08/09		
Project:	None	**Temperature:**	22		
Job Site:	EV01	**Humidity:**	43		
Serial Number:	FCC #2	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	RF Module 10169				
Configuration:	4 - AC Powerline Conducted Emissions				
Customer:	EcoTech Marine				
Attendees:	none				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting high channel				
Deviations:	No deviations.				
Comments:	None				

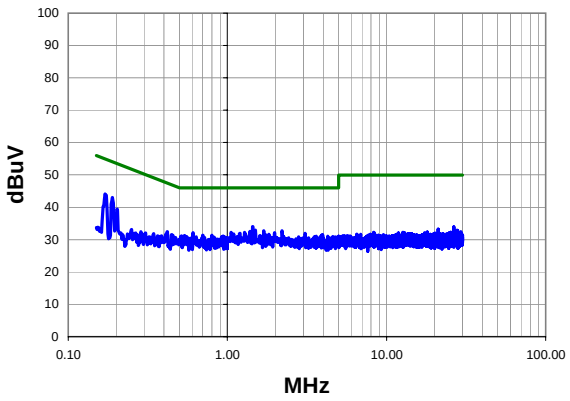
Test Specifications	**Test Method**
FCC 15.207:2009	ANSI C63.4:2003

Run #	5	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.170	22.8	21.4	44.2	64.9	-20.8
0.189	21.8	21.3	43.1	64.1	-21.0
1.440	13.6	20.4	34.0	56.0	-22.0
1.504	12.5	20.4	32.9	56.0	-23.1
2.208	12.3	20.4	32.7	56.0	-23.3
1.696	12.3	20.4	32.7	56.0	-23.3
1.384	12.2	20.4	32.6	56.0	-23.4
1.280	11.9	20.4	32.3	56.0	-23.7
1.056	11.9	20.4	32.3	56.0	-23.7
0.607	11.7	20.5	32.2	56.0	-23.8
1.984	11.7	20.4	32.1	56.0	-23.9
0.203	18.3	21.1	39.4	63.5	-24.1
3.080	11.5	20.4	31.9	56.0	-24.1
1.824	11.3	20.4	31.7	56.0	-24.3
1.752	11.1	20.4	31.5	56.0	-24.5
3.968	11.1	20.3	31.4	56.0	-24.6
0.699	11.0	20.4	31.4	56.0	-24.6
0.798	11.0	20.4	31.4	56.0	-24.6
3.928	11.0	20.3	31.3	56.0	-24.7
0.538	10.8	20.5	31.3	56.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.170	22.8	21.4	44.2	54.9	-10.8
0.189	21.8	21.3	43.1	54.1	-11.0
1.440	13.6	20.4	34.0	46.0	-12.0
1.504	12.5	20.4	32.9	46.0	-13.1
2.208	12.3	20.4	32.7	46.0	-13.3
1.696	12.3	20.4	32.7	46.0	-13.3
1.384	12.2	20.4	32.6	46.0	-13.4
1.280	11.9	20.4	32.3	46.0	-13.7
1.056	11.9	20.4	32.3	46.0	-13.7
0.607	11.7	20.5	32.2	46.0	-13.8
1.984	11.7	20.4	32.1	46.0	-13.9
0.203	18.3	21.1	39.4	53.5	-14.1
3.080	11.5	20.4	31.9	46.0	-14.1
1.824	11.3	20.4	31.7	46.0	-14.3
1.752	11.1	20.4	31.5	46.0	-14.5
3.968	11.1	20.3	31.4	46.0	-14.6
0.699	11.0	20.4	31.4	46.0	-14.6
0.798	11.0	20.4	31.4	46.0	-14.6
3.928	11.0	20.3	31.3	46.0	-14.7
0.538	10.8	20.5	31.3	46.0	-14.7