ThinkEco, Inc.

ThinkEco USB Receiver
Model: TE1001

EMC Test Report

Report No. THKE0001 Rev 01

Report Prepared By

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: January 21, 2011
ThinkEco, Inc.
Model: TE1001

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Occupied Bandwidth	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Output Power	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Band Edge Compliance	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Spurious Conducted Emissions	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Power Spectral Density	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Spurious Radiated Emissions	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
AC Powerline Conducted Emissions	FCC 15.207:2011	ANSI C63.10:2009	**Pass**
Duty Cycle	FCC 15.247:2011	ANSI C63.10:2009	**Pass**

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

Test Facility

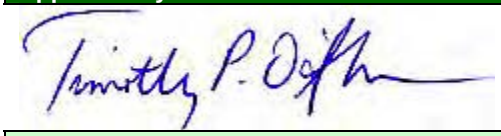
The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

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:



Tim O'Shea, Operations 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
01	Corrected Duty Cycle Correction Factor value in Spurious Radiated Emissions data	1/30/12	31-32
01	Corrected numbering of Samples in Duty Cycle data	1/30/12	41

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 National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. 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.

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.

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).

Accreditations and Authorizations

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, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-1784, and T-1511, Brooklyn Park: R-3125, G-86, G-141, 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).

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, Brooklyn Park: US0175)*

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

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

Northwest EMC Locations

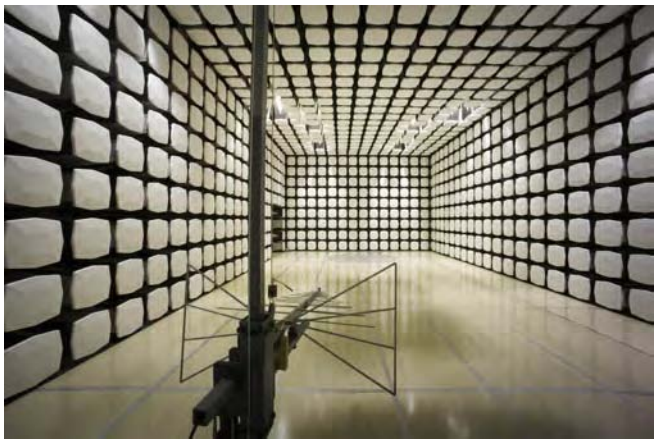
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

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:	ThinkEco, Inc.
Address:	148 Madison Avenue, 8th Floor
City, State, Zip:	New York, NY 10016
Test Requested By:	Ben Burns
Model:	TE1001
First Date of Test:	December 21, 2010
Last Date of Test:	January 21, 2011
Receipt Date of Samples:	December 21, 2010
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
2.4 GHz ISM radio, 802.15.4

Testing Objective:
To demonstrate compliance to FCC 15.247 requirements

CONFIGURATION 1 THKE0001

Software/Firmware Running during test	
Description	**Version**
Test Tool	11.2.4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
ThinkEco USB Receiver	ThinkEco, Inc.	TE1001	0040

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Host PC	Dell	Vostro 3500	6J13OCL1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB	Yes	3.0m	No	USB Dongle	Host PC
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 1 THKE0008

Software/Firmware Running during test	
Description	**Version**
Test Tool	11.2.4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
ThinkEco USB Receiver	ThinkEco, Inc.	TE1001	0042

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Host PC	Dell	Vostro 3500	6J13OCL1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB	Yes	3.0m	No	USB Dongle	Host 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	12/21/2010	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.
2	12/21/2010	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.
3	12/23/2010	AC Powerline 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.
4	1/3/2011	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.
5	1/5/2011	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.
6	1/5/2011	Power Spectral Density	Tested as delivered to Test Station	No EMI suppression devices were added or modified during this test	Scheduled testing was completed.
7	1/19/2011	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.
8	1/21/2011	Duty Cycle	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.

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	24
Attenuator 6 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-6	AUX	8/6/2010	13
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

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 2010.11.03

EUT:	TE1001			**Work Order:**	THKE0001
Serial Number:	0040			**Date:**	01/03/11
Customer:	ThinkEco, Inc.			**Temperature:**	22.1°C
Attendees:	none			**Humidity:**	31%
Project:	None			**Barometric Pres.:**	1003
Tested by:	Rod Peloquin	**Power:**	USB	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

COMMENTS

Power setting to 11

DEVIATIONS FROM TEST STANDARD

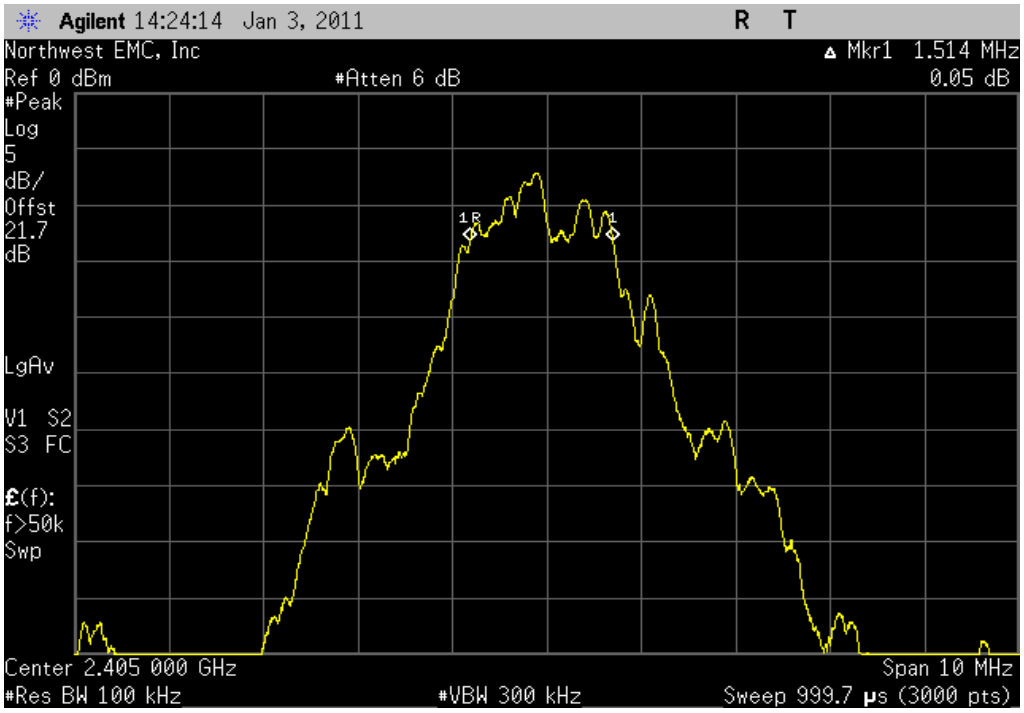
No Deviations

Configuration #	1	Signature

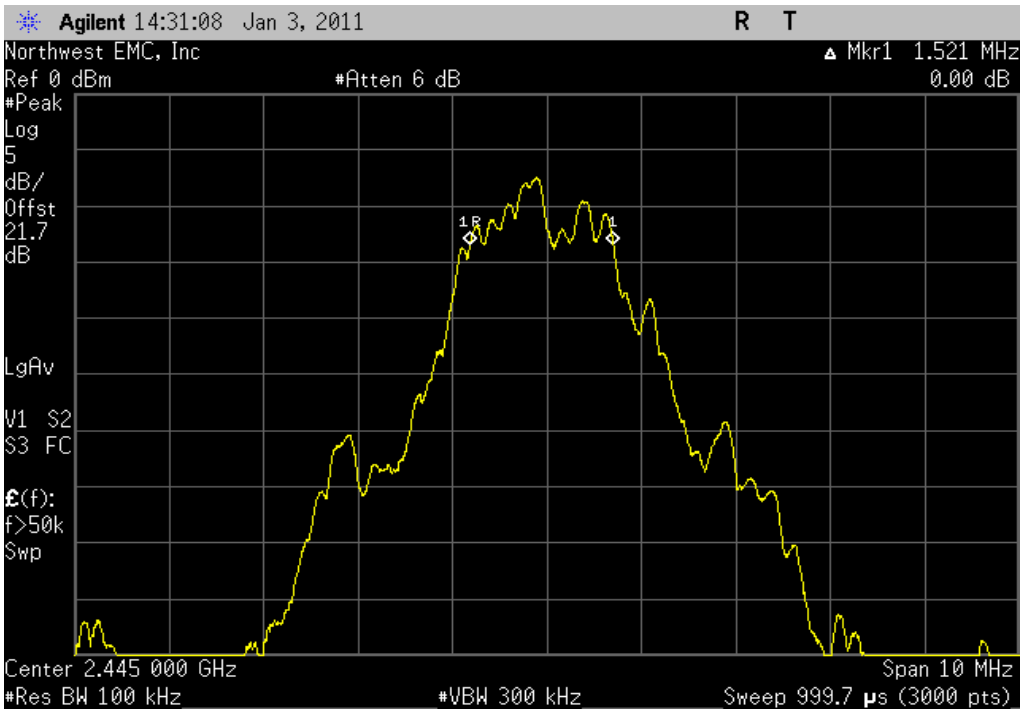
	Value	Limit	Results
Low Channel	1.514 MHz	≥ 500 kHz	Pass
Mid Channel	1.521 MHz	≥ 500 kHz	Pass
High Channel	1.517 MHz	≥ 500 kHz	Pass

OCCUPIED BANDWIDTH

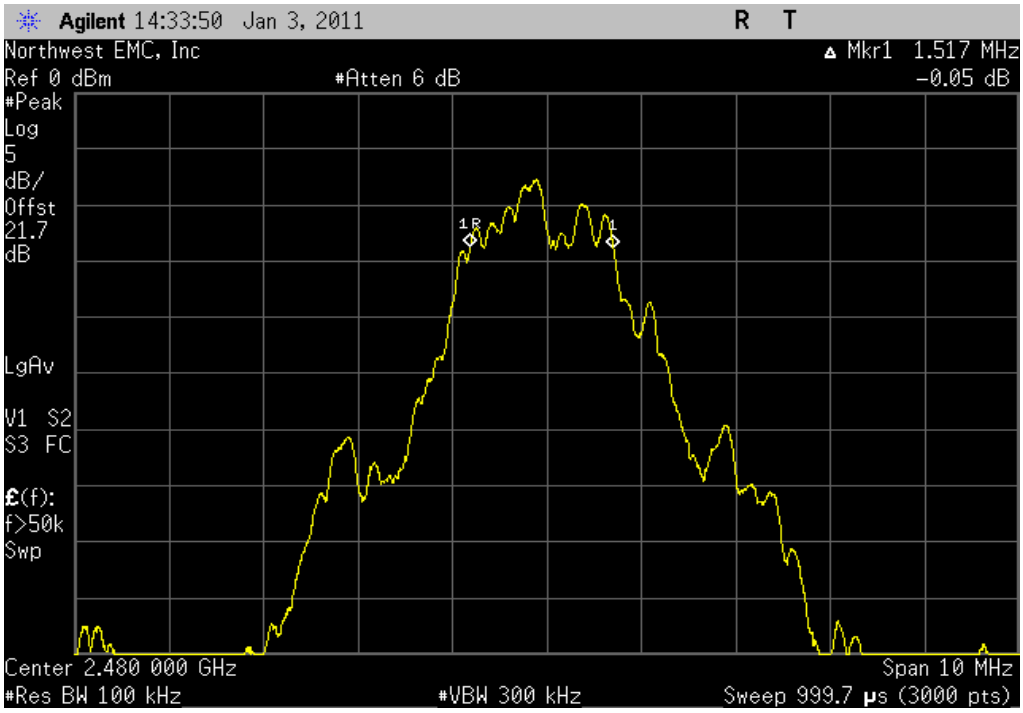
Low Channel					
Result:	Pass	**Value:**	1.514 MHz	**Limit:**	≥ 500 kHz



Mid Channel					
Result:	Pass	**Value:**	1.521 MHz	**Limit:**	≥ 500 kHz



High Channel					
Result:	Pass	**Value:**	1.517 MHz	**Limit:**	≥ 500 kHz



OUTPUT POWER

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	24
Power Meter	Gigatronics	8651A	SPM	1/7/2010	13
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	13
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	4/1/2010	13
Signal Generator	Agilent	E8257D	TGX	12/10/2008	25

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 2010.11.03

EUT:	TE1001			**Work Order:**	THKE0001
Serial Number:	0040			**Date:**	01/05/11
Customer:	ThinkEco, Inc.			**Temperature:**	21.9°C
Attendees:	none			**Humidity:**	27%
Project:	None			**Barometric Pres.:**	1027.5 mb
Tested by:	Rod Peloquin	**Power:**	USB	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

COMMENTS

Power setting to 11

DEVIATIONS FROM TEST STANDARD

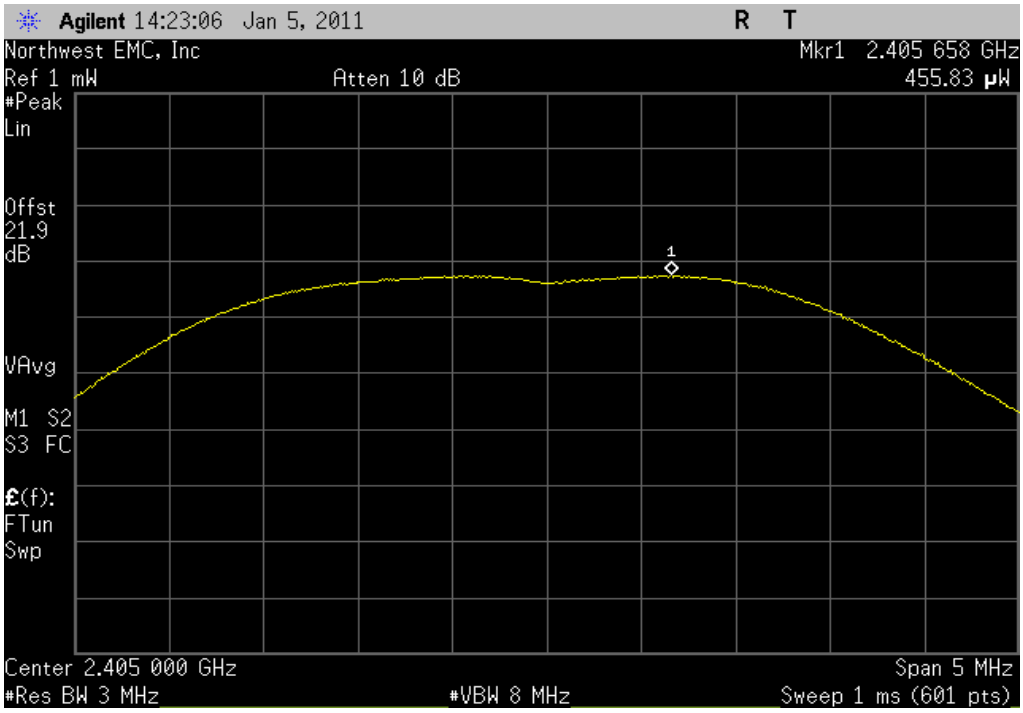
No Deviations

Configuration #	1	Signature

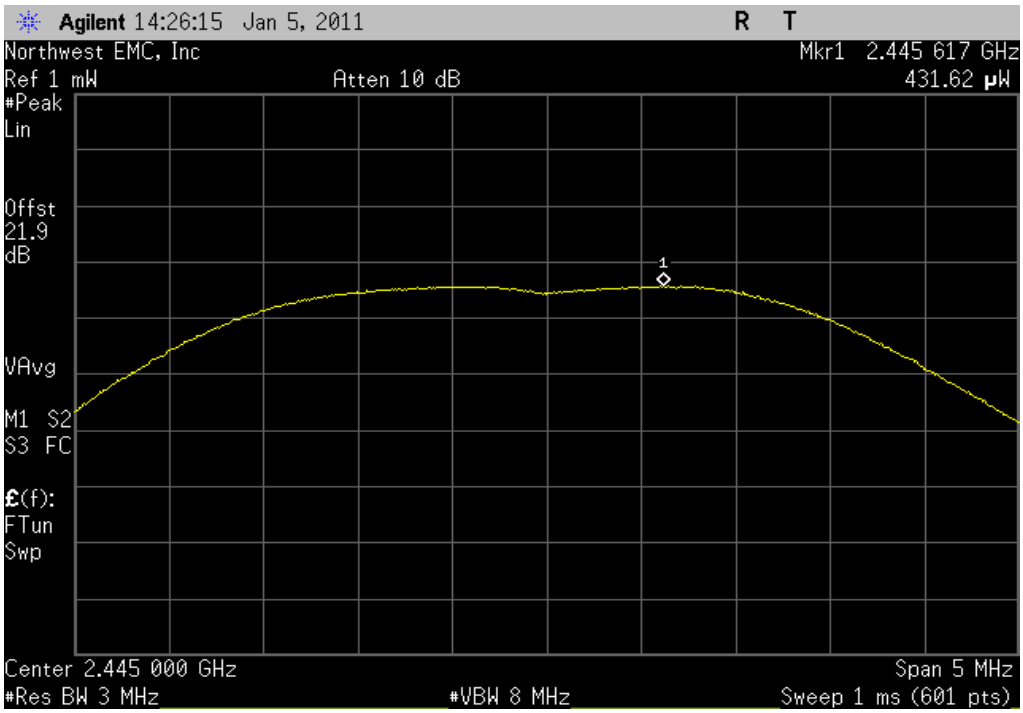
	Value	Limit	Results
Low Channel	0.456 mW	1 W	Pass
Mid Channel	0.432 mW	1 W	Pass
High Channel	0.416 mW	1 W	Pass

OUTPUT POWER

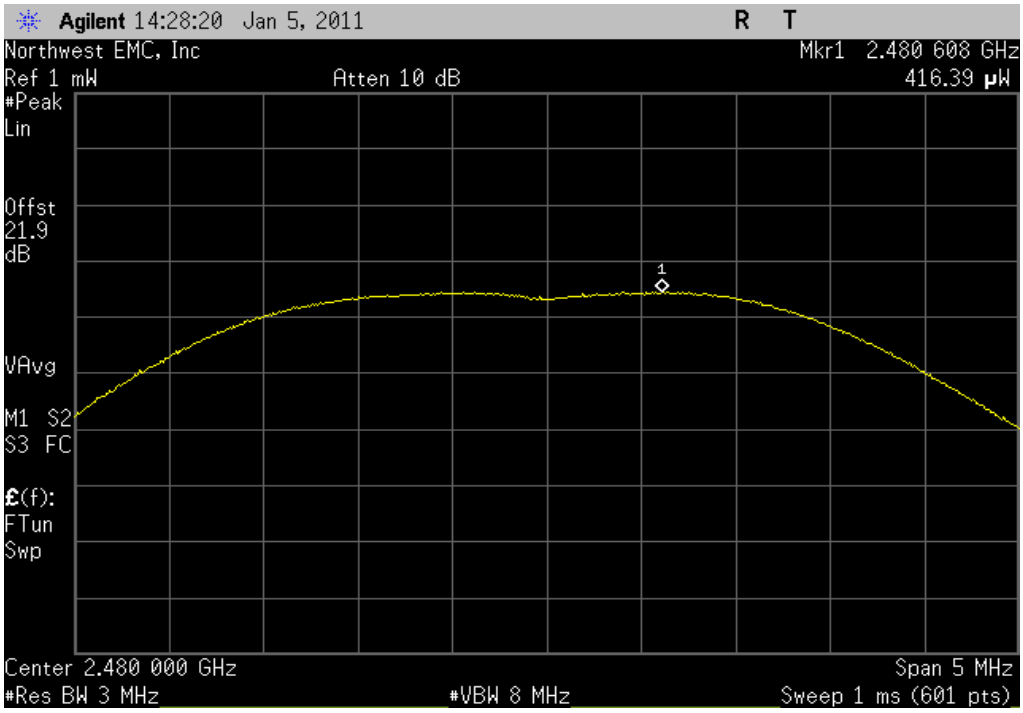
Low Channel					
Result:	Pass	**Value:**	0.456 mW	**Limit:**	1 W



Mid Channel					
Result:	Pass	**Value:**	0.432 mW	**Limit:**	1 W



High Channel					
Result:	Pass	**Value:**	0.416 mW	**Limit:**	1 W



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
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	4/1/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Signal Generator	Agilent	E8257D	TGX	12/10/2008	25
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	13
Power Meter	Gigatronics	8651A	SPM	1/7/2010	13
Attenuator, 26db SMA	Fairview Microwave	18B5W-26	RFZ	11/17/2010	13
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24

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 2010.11.03

EUT:	TE1001			**Work Order:**	THKE0001
Serial Number:	0040			**Date:**	12/21/10
Customer:	ThinkEco, Inc.			**Temperature:**	22.7°C
Attendees:	Bryan Takata			**Humidity:**	31%
Project:	None			**Barometric Pres.:**	1003
Tested by:	Ethan Schoonover	**Power:**	5VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

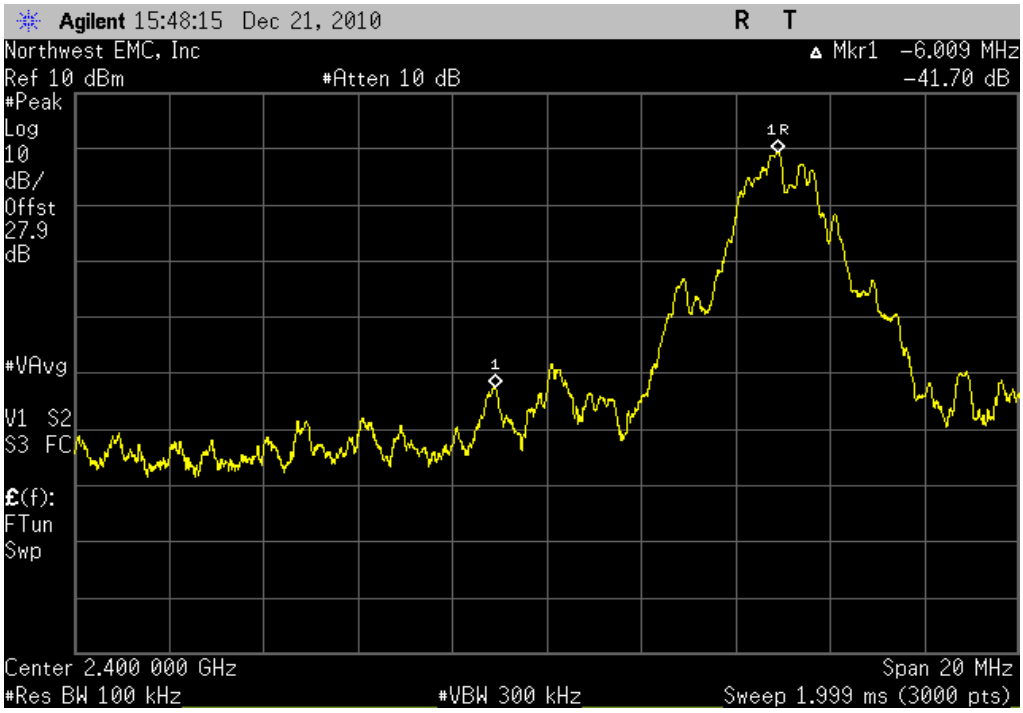
No Deviations

Configuration #	1	Signature

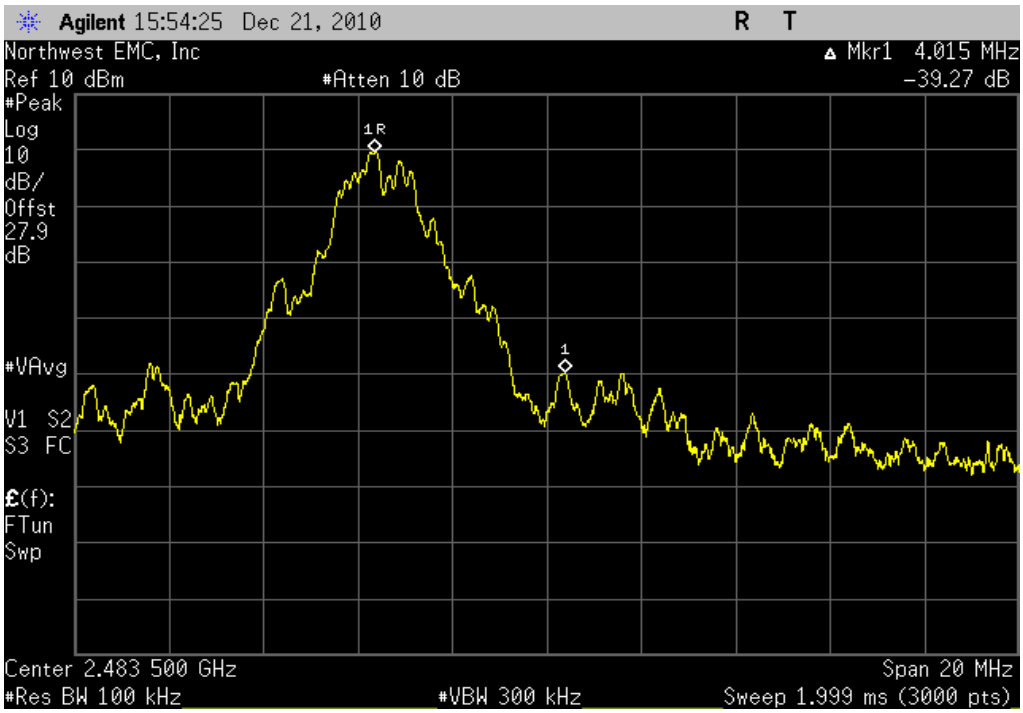
	Value	Limit	Results
Low Channel	-41.70	≤ -20 dBc	Pass
High Channel	-39.27	≤ -20 dBc	Pass

BAND EDGE COMPLIANCE

Low Channel					
Result:	Pass	**Value:**	-41.70	**Limit:**	≤ -20 dBc



High Channel					
Result:	Pass	**Value:**	-39.27	**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
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	4/1/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Signal Generator	Agilent	E8257D	TGX	12/10/2008	25
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	13
Power Meter	Gigatronics	8651A	SPM	1/7/2010	13
Attenuator, 26db SMA	Fairview Microwave	18B5W-26	RFZ	11/17/2010	13
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24

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 2010.11.03

EUT:	TE1001			**Work Order:**	THKE0001
Serial Number:	0040			**Date:**	12/21/10
Customer:	ThinkEco, Inc.			**Temperature:**	22.7°C
Attendees:	Bryan Takata			**Humidity:**	31%
Project:	None			**Barometric Pres.:**	1003
Tested by:	Ethan Schoonover	**Power:**	5VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

COMMENTS

None

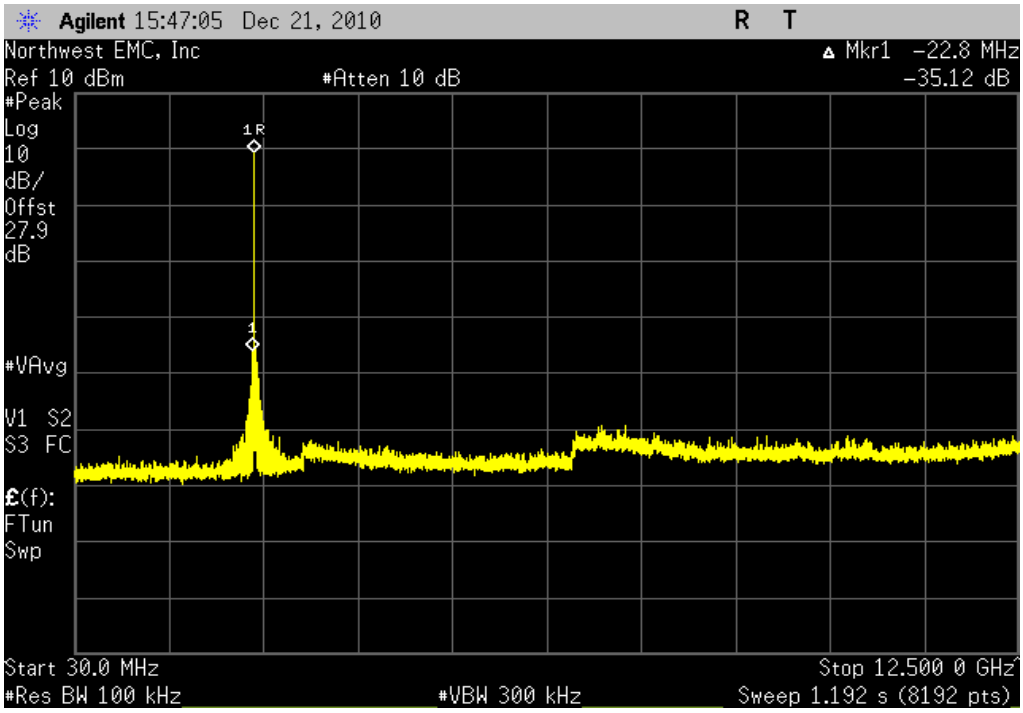
DEVIATIONS FROM TEST STANDARD

No Deviations

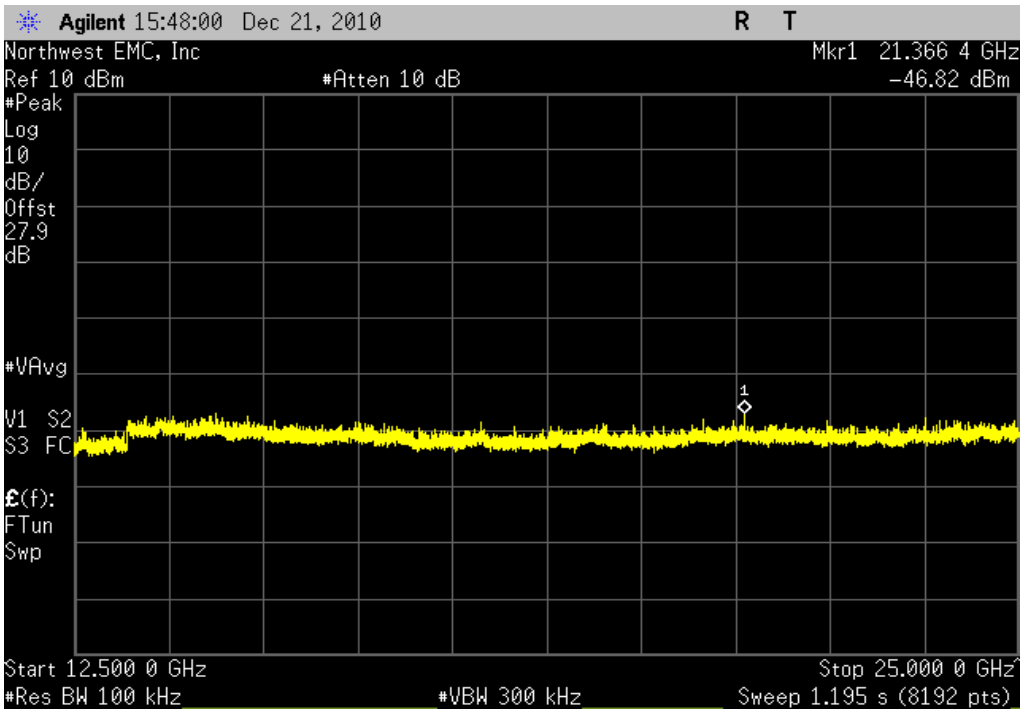
Configuration #	1	Signature

		Value	Limit	Results
Low Channel				
	30MHz - 12.5GHz	-35.12 dBc	≤-20 dBc	Pass
	12.4GHz - 25GHz	≤ -30dBc	≤-20 dBc	Pass
Mid Channel				
	30MHz - 12.5GHz	-40.09	≤-20 dBc	Pass
	12.4GHz - 25GHz	≤ -30dBc	≤-20 dBc	Pass
High Channel				
	30MHz - 12.5GHz	-35.19 dBc	≤-20 dBc	Pass
	12.4GHz - 25GHz	≤ -30dBc	≤-20 dBc	Pass

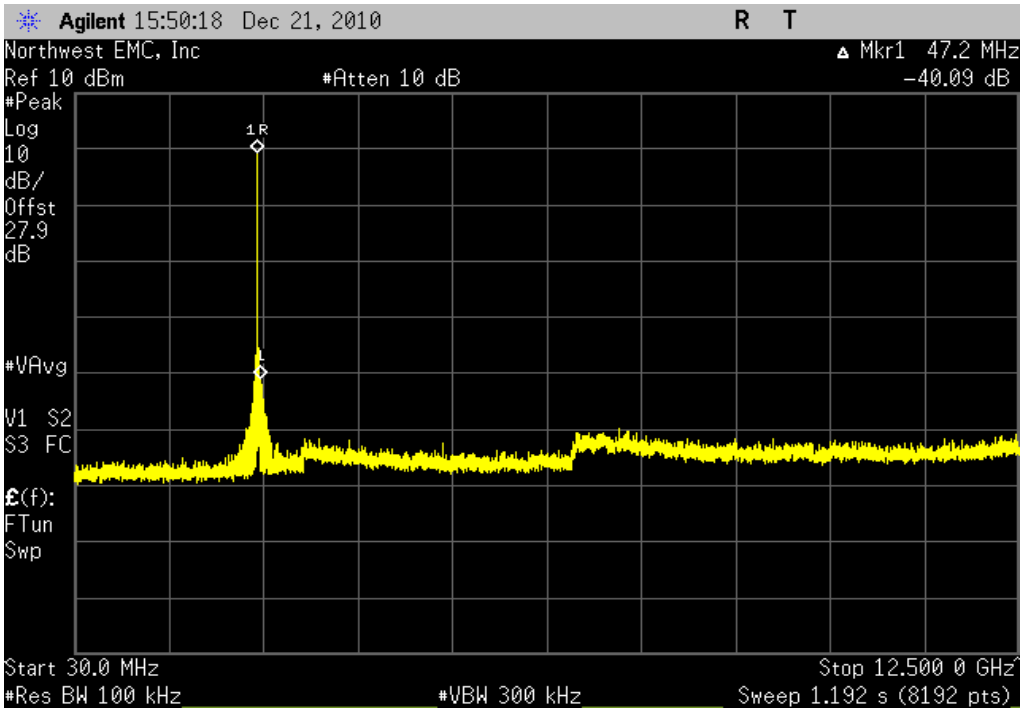
Low Channel, 0MHz - 12.5GHz					
Result:	Pass	**Value:**	-35.12 dBc	**Limit:**	≤-20 dBc



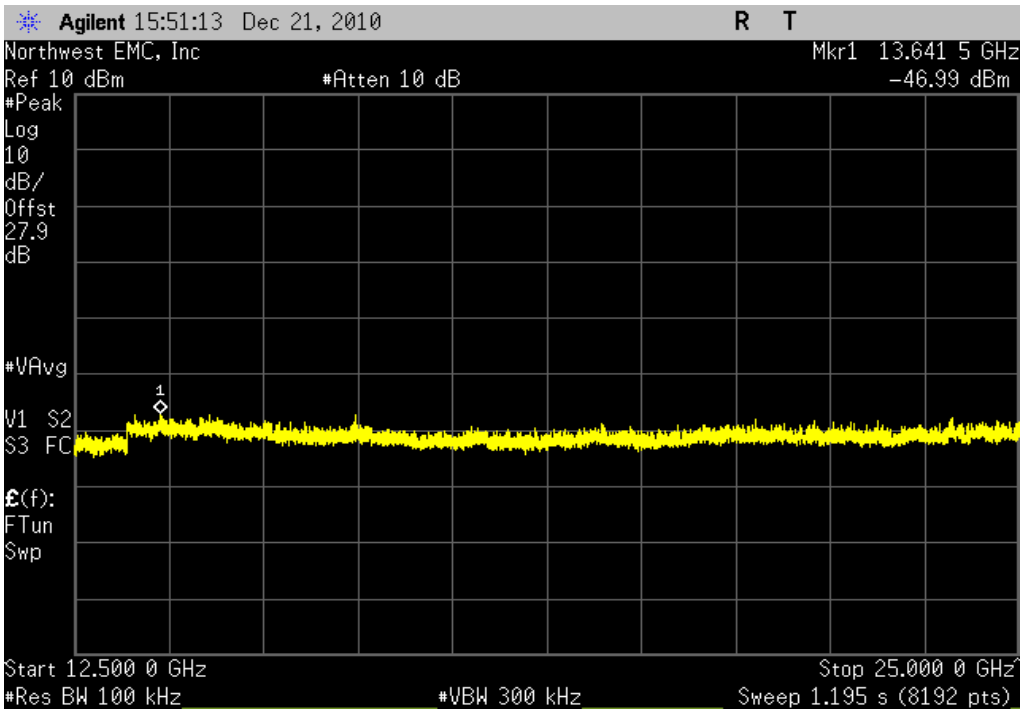
Low Channel, 12.4GHz - 25GHz					
Result:	Pass	**Value:**	≤ -30dBc	**Limit:**	≤-20 dBc



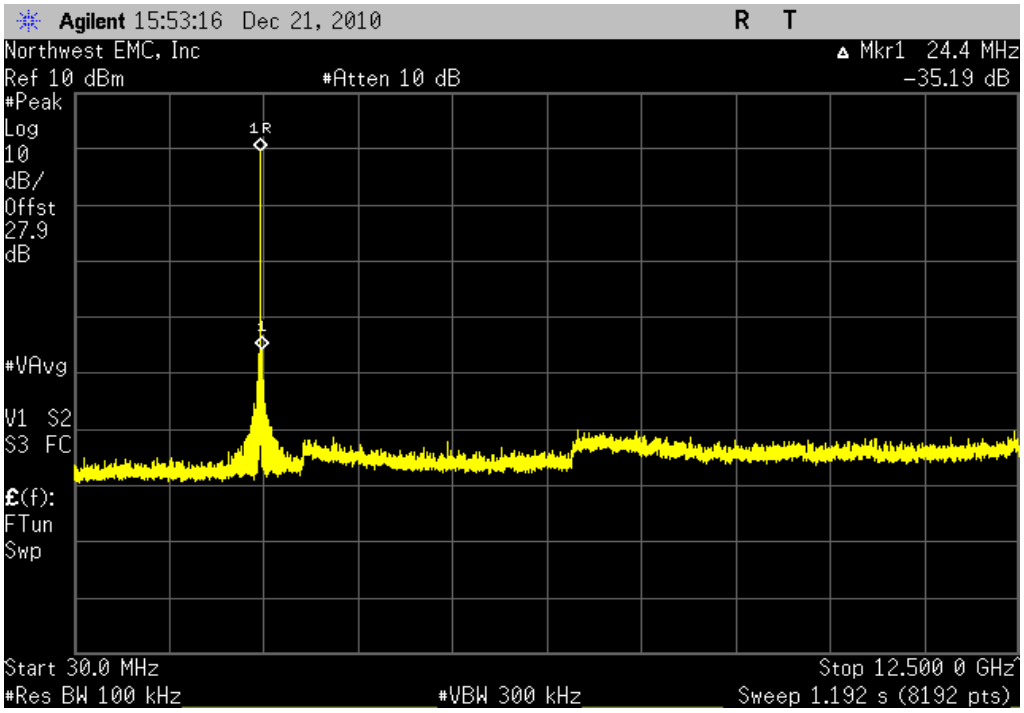
Mid Channel, 0MHz - 12.5GHz					
Result:	Pass	**Value:**	-40.09	**Limit:**	≤-20 dBc



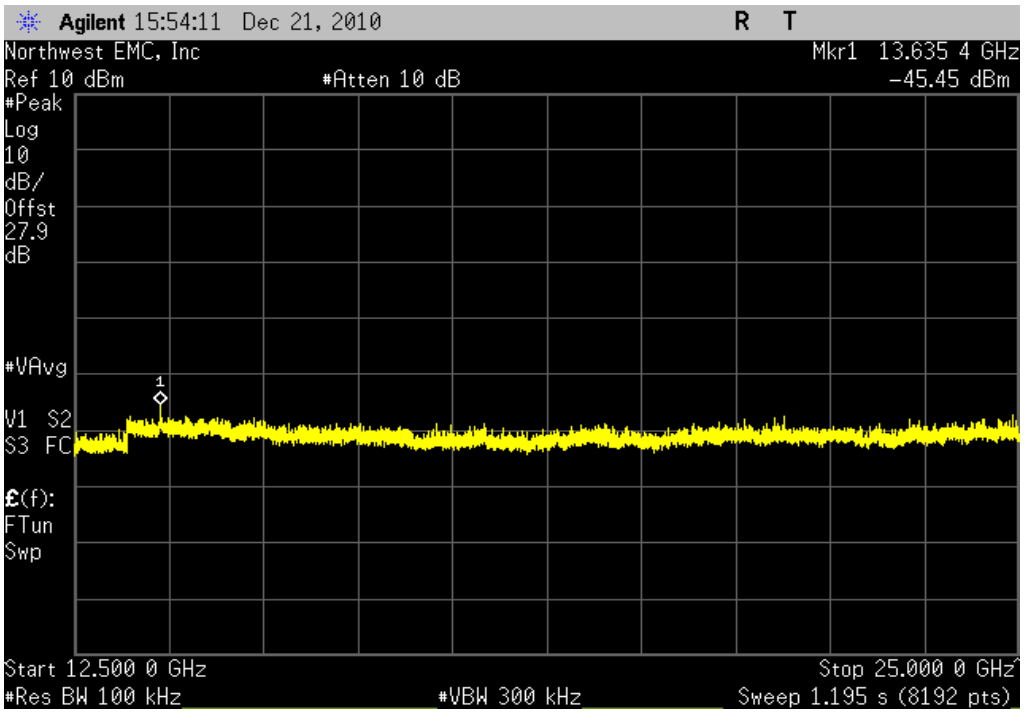
Mid Channel, 12.4GHz - 25GHz					
Result:	Pass	**Value:**	≤ -30dBc	**Limit:**	≤-20 dBc



High Channel, 0MHz - 12.5GHz					
Result:	Pass	**Value:**	-35.19 dBc	**Limit:**	≤-20 dBc



High Channel, 12.4GHz - 25GHz					
Result:	Pass	**Value:**	≤ -30dBc	**Limit:**	≤-20 dBc



POWER SPECTRAL DENSITY

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	24
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	13
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	4/1/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/7/2010	13
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	13
Signal Generator	Agilent	E8257D	TGX	12/10/2008	25

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 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. While the average output power was measured as defined in section ANSI C63.10:2009, Section 6.11.2.3 was followed.

The spectrum analyzer was set as follows:

The emission peak was located and zoomed in on within the passband.

a) RBW = 3 kHz

b) VBW = 10 kHz

c) Span = 300 kHz

d) Sweep time = 100s

e) Trace set to MAX

f) The 1 hz Marker Noise function on the analyzer was used. The data was corrected to 3 kHz by adding 34.8 dB to the reading.

NORTHWEST EMC

POWER SPECTRAL DENSITY

XMit 2010.11.03

EUT:	TE1001			Work Order:	THKE0001
Serial Number:	0040			Date:	01/05/11
Customer:	ThinkEco, Inc.			Temperature:	21.9°C
Attendees:	none			Humidity:	27%
Project:	None			Barometric Pres.:	1027.5 mb
Tested by:	Rod Peloquin	Power:	USB	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

COMMENTS

Power setting to 11

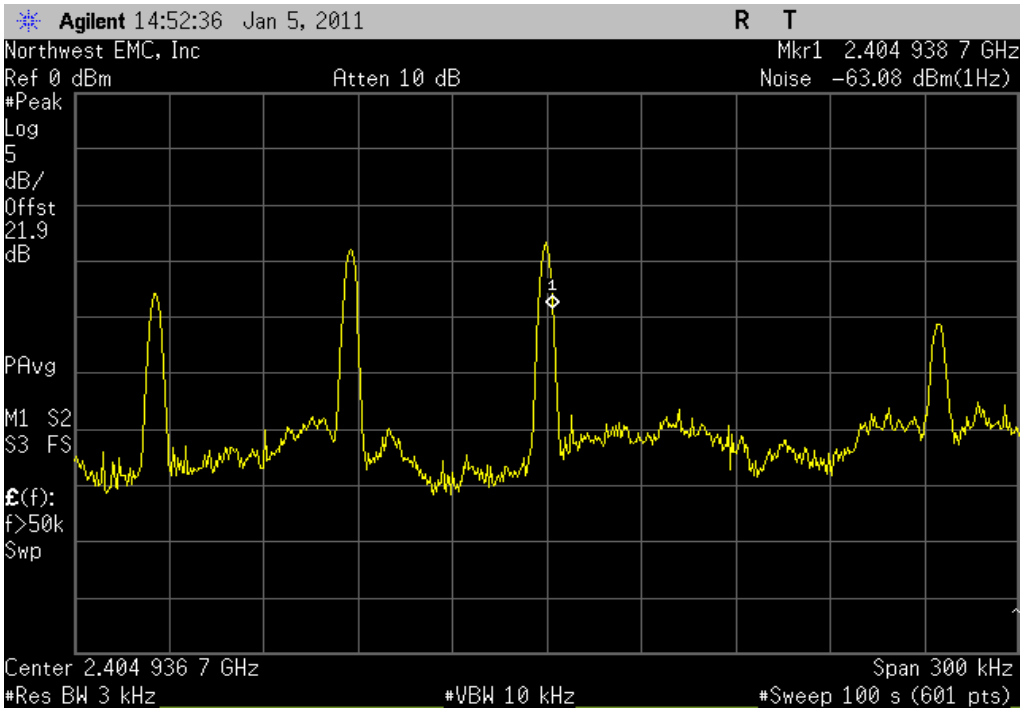
DEVIATIONS FROM TEST STANDARD

No Deviations

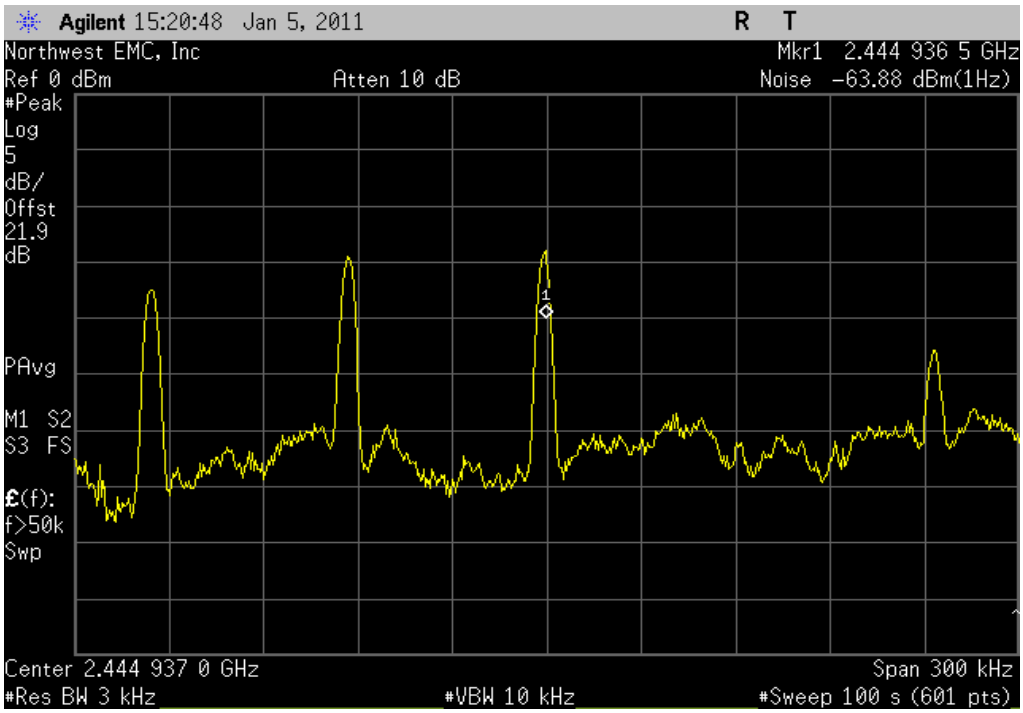
Configuration #	1	Signature

	Value	Limit	Results
Low Channel	-28.3 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Mid Channel	-29.0 dBm / 3 kHz	8 dBm / 3 kHz	Pass
High Channel	-28.6 dBm / 3 kHz	8 dBm / 3 kHz	Pass

Low Channel					
Result:	Pass	**Value:**	-28.3 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz

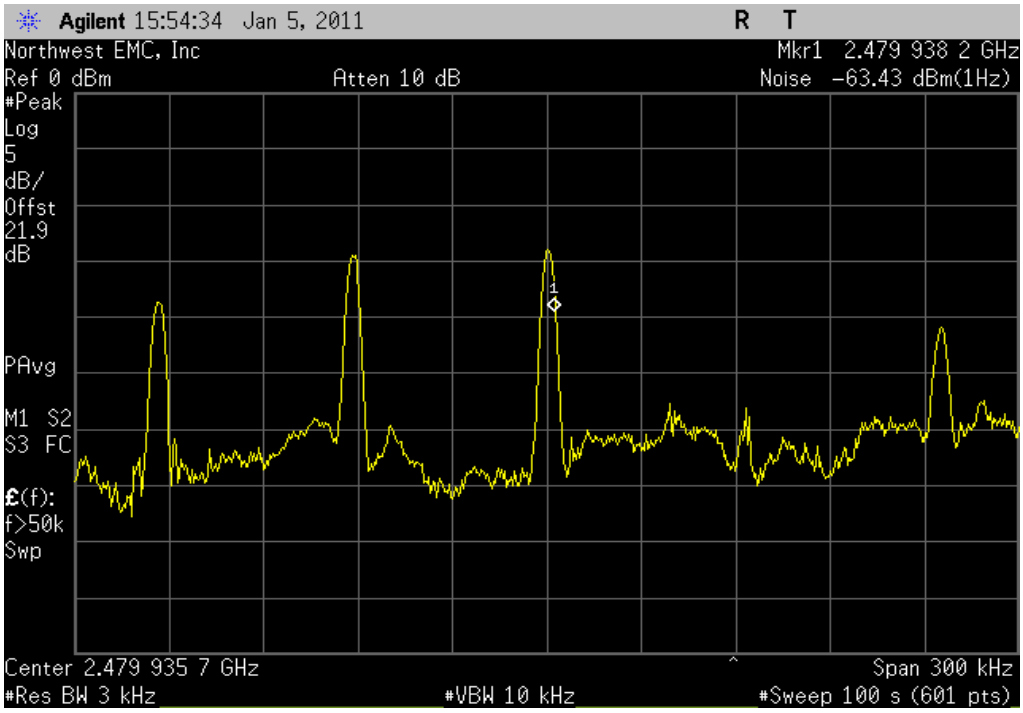


Mid Channel					
Result:	Pass	**Value:**	-29.0 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



POWER SPECTRAL DENSITY

High Channel					
Result:	Pass	**Value:**	-28.6 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.

MODES OF OPERATION

Continuous Tx, power level 11.

POWER SETTINGS INVESTIGATED

5VDC via USB

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 + Duty Cycle Correction Factor + Distance Adjustment Factor + Ext Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAQ	1/6/2010	12
High Pass Filter	Micro-Tronics	HPM50111	HFO	7/9/2010	13
Pre-Amplifier	Miteq	AM-1616-1000	AOL	7/9/2010	13
Antenna, Biconilog	EMCO	3141	AXE	1/14/2010	13
EV01 Cables	N/A	Bilog Cables	EVA	7/9/2010	13
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	7/9/2010	13
Antenna, Horn	EMCO	3115	AHC	7/8/2010	24
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	7/9/2010	13
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	8/25/2010	13
Antenna, Horn	ETS	3160-07	AHU	NCR	0
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	8/25/2010	13
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	8/25/2010	13
Antenna, Horn	ETS	3160-08	AHV	NCR	0
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	8/25/2010	13
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/19/2010	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 C63.10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS DATA SHEET

PSA 2008.07.21
EMI 2008.1.9

EUT:	TE1001	Work Order:	THKE0008
Serial Number:	0042	Date:	01/19/11
Customer:	ThinkEco, Inc.	Temperature:	21.3 °C
Attendees:	none	Humidity:	34%
Project:	None	Barometric Pres.:	1031.8 mb
Tested by:	Dan Haas	Power: 5VDC via USB	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009

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

COMMENTS

See notes for channel and EUT orientation.

EUT OPERATING MODES

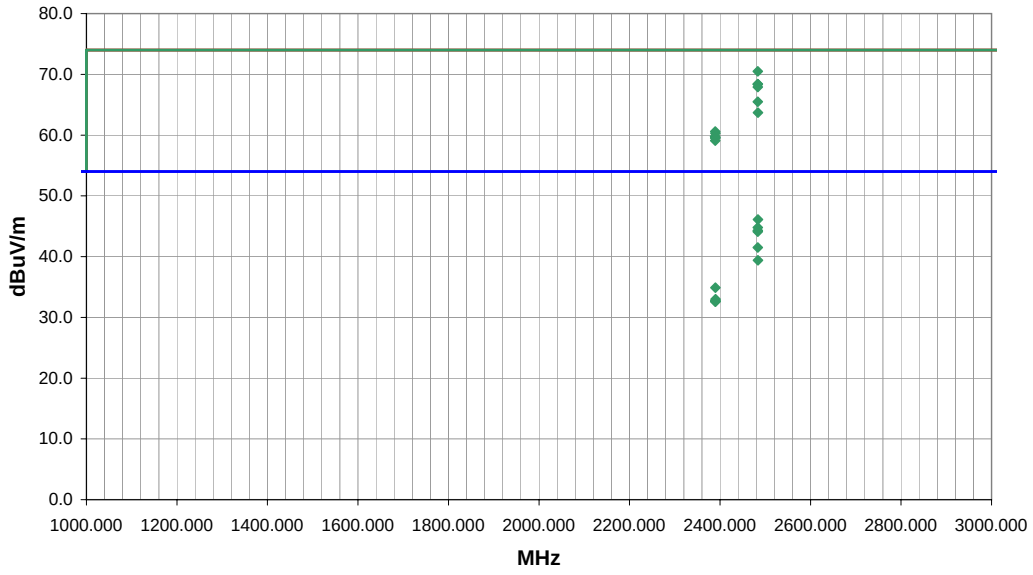
Continuous Tx, power level 11.

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2483.529	48.2	2.3	175.0	1.0	0.0	20.0	H-Horn	PK	0.0	70.5	74.0	-3.5	Ch. 26, EUT horizontal
2483.522	46.1	2.3	212.0	1.1	0.0	20.0	H-Horn	PK	0.0	68.4	74.0	-5.6	Ch. 26, EUT on edge
2483.648	46.1	2.3	167.0	1.0	0.0	20.0	H-Horn	PK	0.0	68.4	74.0	-5.6	Ch. 26, EUT vertical
2483.510	45.6	2.3	39.0	1.0	0.0	20.0	V-Horn	PK	0.0	67.9	74.0	-6.1	Ch. 26, EUT vertical
2483.755	37.4	2.3	175.0	1.0	-13.6	20.0	H-Horn	AV	0.0	46.1	54.0	-7.9	Ch. 26, EUT horizontal
2483.517	43.2	2.3	133.0	1.0	0.0	20.0	V-Horn	PK	0.0	65.5	74.0	-8.5	Ch. 26, EUT on edge
2483.500	36.1	2.3	212.0	1.1	-13.6	20.0	H-Horn	AV	0.0	44.8	54.0	-9.2	Ch. 26, EUT on edge
2483.510	35.6	2.3	39.0	1.0	-13.6	20.0	V-Horn	AV	0.0	44.3	54.0	-9.7	Ch. 26, EUT vertical
2483.500	35.4	2.3	167.0	1.0	-13.6	20.0	H-Horn	AV	0.0	44.1	54.0	-9.9	Ch. 26, EUT vertical
2483.762	41.4	2.3	331.0	1.0	0.0	20.0	V-Horn	PK	0.0	63.7	74.0	-10.3	Ch. 26, EUT horizontal
2483.500	32.8	2.3	133.0	1.0	-13.6	20.0	V-Horn	AV	0.0	41.5	54.0	-12.5	Ch. 26, EUT on edge
2389.572	38.6	2.0	173.0	1.2	0.0	20.0	H-Horn	PK	0.0	60.6	74.0	-13.4	Ch. 11, EUT on edge
2389.728	38.3	2.0	47.0	1.0	0.0	20.0	H-Horn	PK	0.0	60.3	74.0	-13.7	Ch. 11, EUT horizontal
2389.207	37.8	2.0	117.0	2.1	0.0	20.0	V-Horn	PK	0.0	59.8	74.0	-14.2	Ch. 11, EUT on edge
2389.673	37.6	2.0	305.0	2.0	0.0	20.0	V-Horn	PK	0.0	59.6	74.0	-14.4	Ch. 11, EUT vertical
2389.438	37.5	2.0	24.0	1.0	0.0	20.0	V-Horn	PK	0.0	59.5	74.0	-14.5	Ch. 11, EUT horizontal
2389.275	37.1	2.0	2.0	1.2	0.0	20.0	H-Horn	PK	0.0	59.1	74.0	-14.9	Ch. 11, EUT vertical
2483.750	30.7	2.3	331.0	1.0	-13.6	20.0	V-Horn	AV	0.0	39.4	54.0	-14.6	Ch. 26, EUT horizontal
2389.858	26.5	2.0	173.0	1.2	-13.6	20.0	H-Horn	AV	0.0	34.9	54.0	-19.1	Ch. 11, EUT on edge
2389.983	24.6	2.0	24.0	1.0	-13.6	20.0	V-Horn	AV	0.0	33.0	54.0	-21.0	Ch. 11, EUT horizontal
2389.828	24.3	2.0	47.0	1.0	-13.6	20.0	H-Horn	AV	0.0	32.7	54.0	-21.3	Ch. 11, EUT horizontal
2389.910	24.3	2.0	2.0	1.2	-13.6	20.0	H-Horn	AV	0.0	32.7	54.0	-21.3	Ch. 11, EUT vertical
2389.847	24.2	2.0	117.0	2.1	-13.6	20.0	V-Horn	AV	0.0	32.6	54.0	-21.4	Ch. 11, EUT on edge
2389.952	24.2	2.0	305.0	2.0	-13.6	20.0	V-Horn	AV	0.0	32.6	54.0	-21.4	Ch. 11, EUT vertical

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS DATA SHEET

PSA 2008.07.21
EMI 2008.1.9

EUT:	TE1001	**Work Order:**	THKE0008
Serial Number:	0042	**Date:**	01/19/11
Customer:	ThinkEco, Inc.	**Temperature:**	21.3 °C
Attendees:	none	**Humidity:**	34%
Project:	None	**Barometric Pres.:**	1031.8 mb
Tested by:	Dan Haas	**Power:** 5VDC via USB	**Job Site:** EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009

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

COMMENTS

See notes for channel and EUT orientation.

EUT OPERATING MODES

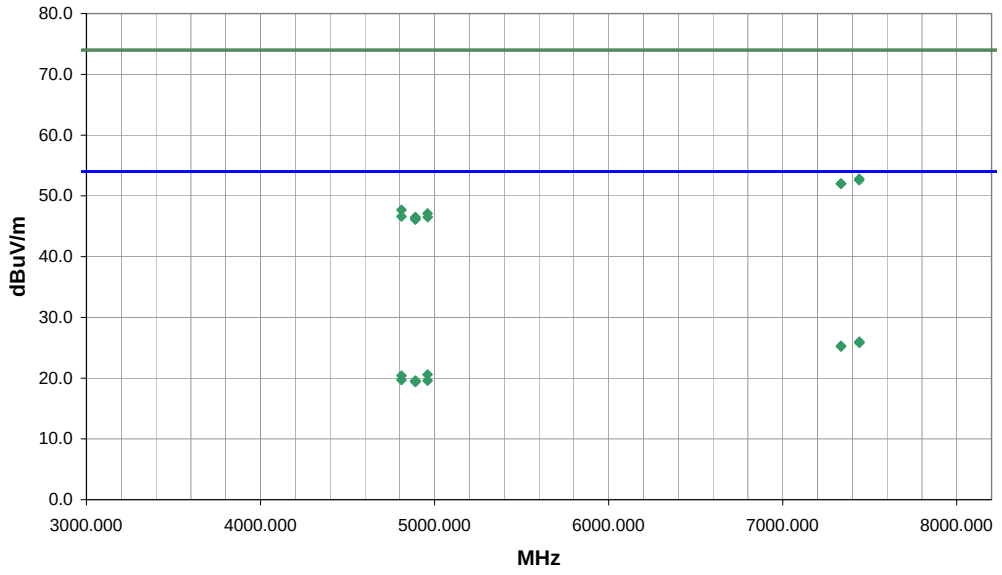
Continuous Tx, power level 11.

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7439.865	36.7	16.1	117.0	1.0	0.0	0.0	H-Horn	PK	0.0	52.8	74.0	-21.2	Ch. 26, EUT horizontal
7440.192	36.5	16.1	225.0	1.0	0.0	0.0	V-Horn	PK	0.0	52.6	74.0	-21.4	Ch. 26, EUT horizontal
7334.625	36.3	15.7	194.0	1.0	0.0	0.0	V-Horn	PK	0.0	52.0	74.0	-22.0	Ch. 19, EUT horizontal
7335.317	36.3	15.7	360.0	1.7	0.0	0.0	H-Horn	PK	0.0	52.0	74.0	-22.0	Ch. 19, EUT horizontal
4810.198	38.2	9.5	236.0	1.0	0.0	0.0	V-Horn	PK	0.0	47.7	74.0	-26.3	Ch. 11, EUT on edge
4960.030	37.0	10.1	10.0	1.0	0.0	0.0	V-Horn	PK	0.0	47.1	74.0	-26.9	Ch. 26, EUT horizontal
4810.008	37.1	9.5	148.0	1.3	0.0	0.0	H-Horn	PK	0.0	46.6	74.0	-27.4	Ch. 11, EUT on edge
4889.847	36.8	9.7	167.0	1.3	0.0	0.0	H-Horn	PK	0.0	46.5	74.0	-27.5	Ch. 19, EUT horizontal
4960.492	36.4	10.1	9.0	1.0	0.0	0.0	H-Horn	PK	0.0	46.5	74.0	-27.5	Ch. 26, EUT horizontal
4890.305	36.7	9.7	341.0	1.3	0.0	0.0	H-Horn	PK	0.0	46.4	74.0	-27.6	Ch. 19, EUT on edge
4889.582	36.5	9.7	199.0	1.0	0.0	0.0	V-Horn	PK	0.0	46.2	74.0	-27.8	Ch. 19, EUT horizontal
4889.815	36.4	9.7	85.0	1.0	0.0	0.0	V-Horn	PK	0.0	46.1	74.0	-27.9	Ch. 19, EUT on edge
7440.560	23.9	16.1	225.0	1.0	-13.6	0.0	V-Horn	AV	0.0	26.0	54.0	-28.0	Ch. 26, EUT horizontal
7440.855	23.7	16.1	117.0	1.0	-13.6	0.0	H-Horn	AV	0.0	25.8	54.0	-28.2	Ch. 26, EUT horizontal
7334.765	23.6	15.7	194.0	1.0	-13.6	0.0	V-Horn	AV	0.0	25.3	54.0	-28.7	Ch. 19, EUT horizontal
7334.615	23.5	15.7	360.0	1.7	-13.6	0.0	H-Horn	AV	0.0	25.2	54.0	-28.8	Ch. 19, EUT horizontal
4959.977	24.5	10.1	10.0	1.0	-13.6	0.0	V-Horn	AV	0.0	20.6	54.0	-33.4	Ch. 26, EUT horizontal
4810.067	24.9	9.5	236.0	1.0	-13.6	0.0	V-Horn	AV	0.0	20.4	54.0	-33.6	Ch. 11, EUT on edge
4809.902	24.2	9.5	148.0	1.3	-13.6	0.0	H-Horn	AV	0.0	19.7	54.0	-34.3	Ch. 11, EUT on edge
4959.987	23.5	10.1	9.0	1.0	-13.6	0.0	H-Horn	AV	0.0	19.6	54.0	-34.4	Ch. 26, EUT horizontal
4889.982	23.8	9.7	85.0	1.0	-13.6	0.0	V-Horn	AV	0.0	19.5	54.0	-34.5	Ch. 19, EUT on edge
4890.015	23.7	9.7	199.0	1.0	-13.6	0.0	V-Horn	AV	0.0	19.4	54.0	-34.6	Ch. 19, EUT horizontal
4890.140	23.7	9.7	167.0	1.3	-13.6	0.0	H-Horn	AV	0.0	19.4	54.0	-34.6	Ch. 19, EUT horizontal
4889.925	23.5	9.7	341.0	1.3	-13.6	0.0	H-Horn	AV	0.0	19.6	54.0	-34.4	Ch. 19, EUT on edge

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
Tx High Channel, 2480
tx Mid Channel, 2445
tx Low Channel, 2405

POWER SETTINGS INVESTIGATED
5VDC

CONFIGURATIONS INVESTIGATED
THKE0001 - 1

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	ARE	4/29/2010	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HFX	2/16/2010	13 mo
Attenuator	Coaxicom	66702 2910-20	ATO	8/6/2010	13 mo
EV07 Cables	N/A	Conducted Cables	EVG	6/21/2010	13 mo
LISN	Solar	9252-50-R-24-BNC	LIN	5/27/2010	12 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

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

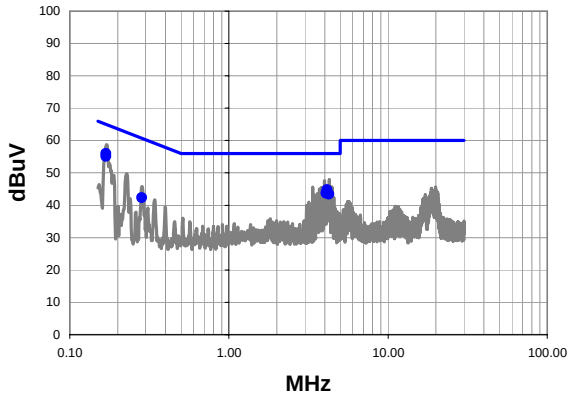
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	tx Low Channel, 2405				
Deviations:	No deviations.				
Comments:	None				

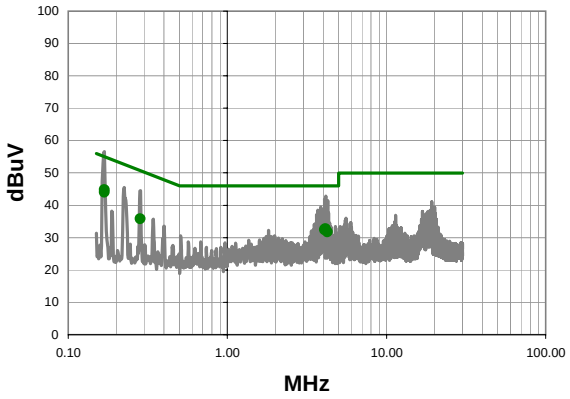
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

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

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.169	35.8	20.2	56.0	65.0	-9.0
0.169	34.9	20.2	55.1	65.0	-9.9
4.140	24.6	20.2	44.8	56.0	-11.2
4.080	23.5	20.2	43.7	56.0	-12.3
4.252	23.2	20.2	43.4	56.0	-12.6
0.284	22.2	20.2	42.4	60.7	-18.3

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.169	24.6	20.2	44.8	55.0	-10.2
0.169	23.9	20.2	44.1	55.0	-10.9
4.140	12.5	20.2	32.7	46.0	-13.3
4.080	12.2	20.2	32.4	46.0	-13.6
4.252	11.5	20.2	31.7	46.0	-14.3
0.284	15.6	20.2	35.8	50.7	-14.9

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

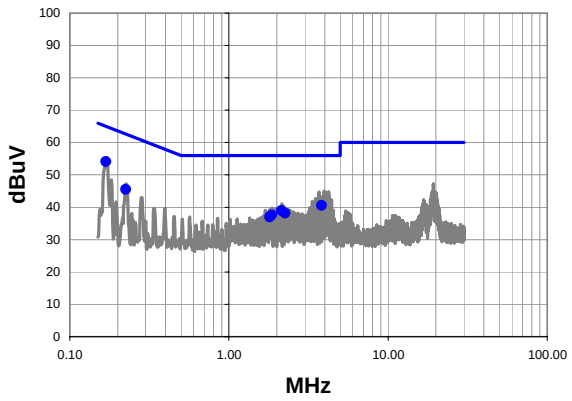
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	tx Low Channel, 2405				
Deviations:	No deviations.				
Comments:	None				

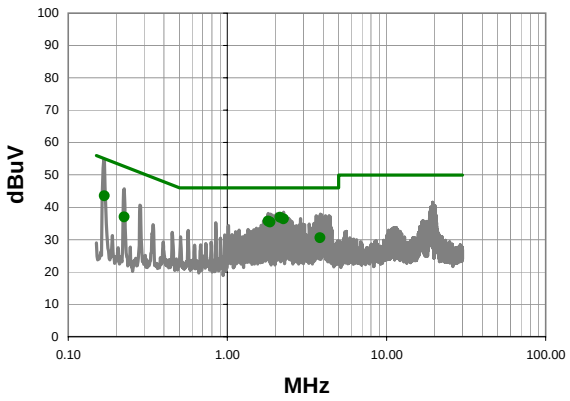
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

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

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.169	33.9	20.2	54.1	65.0	-10.9
3.832	20.3	20.2	40.5	56.0	-15.5
2.140	18.8	20.2	39.0	56.0	-17.0
0.225	25.3	20.2	45.5	62.6	-17.2
2.256	18.0	20.2	38.2	56.0	-17.8
1.860	17.4	20.2	37.6	56.0	-18.4
1.804	16.8	20.2	37.0	56.0	-19.0

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
2.140	16.7	20.2	36.9	46.0	-9.1
2.256	16.2	20.2	36.4	46.0	-9.6
1.804	15.5	20.2	35.7	46.0	-10.3
1.860	15.2	20.2	35.4	46.0	-10.6
0.169	23.4	20.2	43.6	55.0	-11.4
3.832	10.3	20.2	30.5	46.0	-15.5
0.225	16.8	20.2	37.0	52.6	-15.7

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

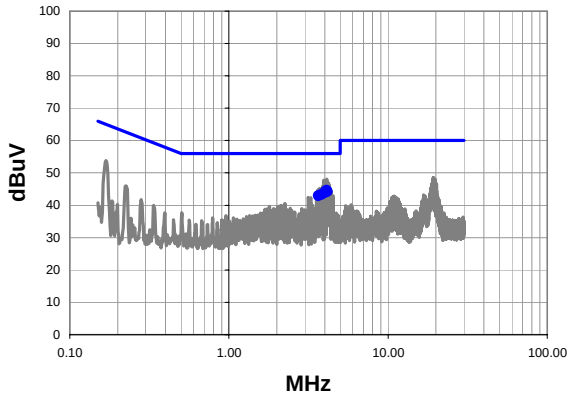
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	tx Mid Channel, 2445				
Deviations:	No deviations.				
Comments:	None				

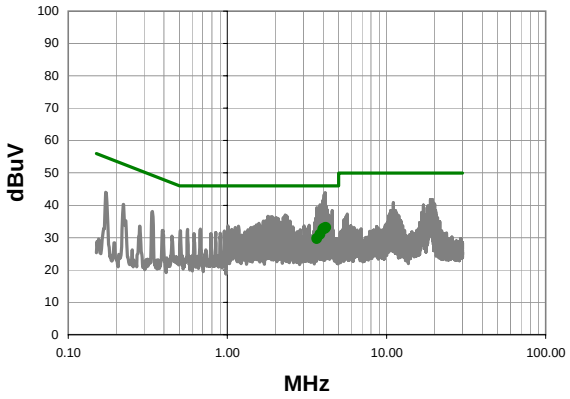
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

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

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
4.108	24.4	20.2	44.6	56.0	-11.4
4.160	24.0	20.2	44.2	56.0	-11.8
4.048	24.0	20.2	44.2	56.0	-11.8
3.992	23.6	20.2	43.8	56.0	-12.2
3.824	23.1	20.2	43.3	56.0	-12.7
3.652	22.7	20.2	42.9	56.0	-13.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
4.160	12.9	20.2	33.1	46.0	-12.9
4.108	12.6	20.2	32.8	46.0	-13.2
4.048	12.6	20.2	32.8	46.0	-13.2
3.992	12.3	20.2	32.5	46.0	-13.5
3.824	10.7	20.2	30.9	46.0	-15.1
3.652	9.4	20.2	29.6	46.0	-16.4

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

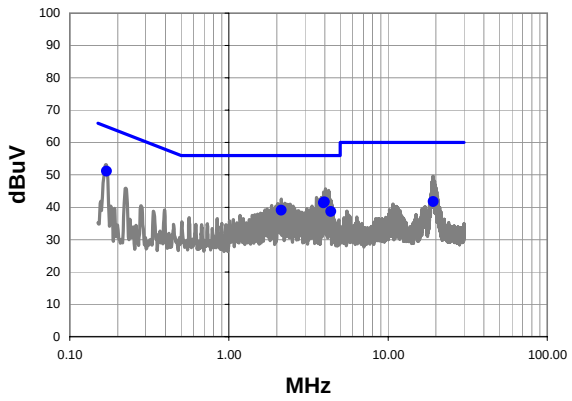
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	tx Mid Channel, 2445				
Deviations:	No deviations.				
Comments:	None				

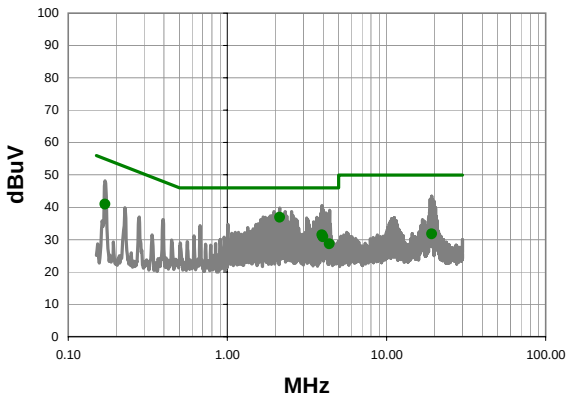
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

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

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.170	31.0	20.2	51.2	65.0	-13.8
3.984	21.4	20.2	41.6	56.0	-14.4
3.928	21.1	20.2	41.3	56.0	-14.7
2.132	18.9	20.2	39.1	56.0	-16.9
4.376	18.4	20.2	38.6	56.0	-17.4
19.208	20.9	20.9	41.8	60.0	-18.2

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
2.132	16.7	20.2	36.9	46.0	-9.1
0.170	20.8	20.2	41.0	55.0	-14.0
3.928	11.2	20.2	31.4	46.0	-14.6
3.984	10.6	20.2	30.8	46.0	-15.2
4.376	8.4	20.2	28.6	46.0	-17.4
19.208	10.9	20.9	31.8	50.0	-18.2

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

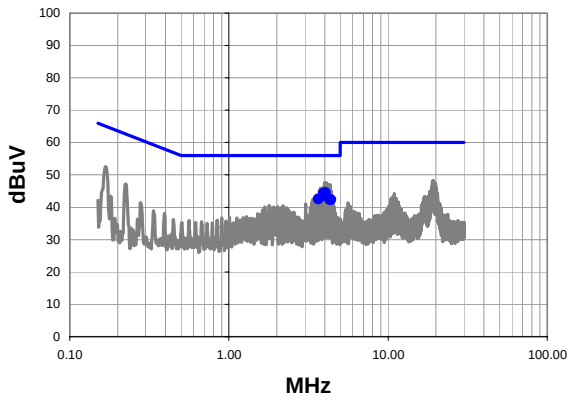
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	Tx High Channel, 2480				
Deviations:	No deviations.				
Comments:	None				

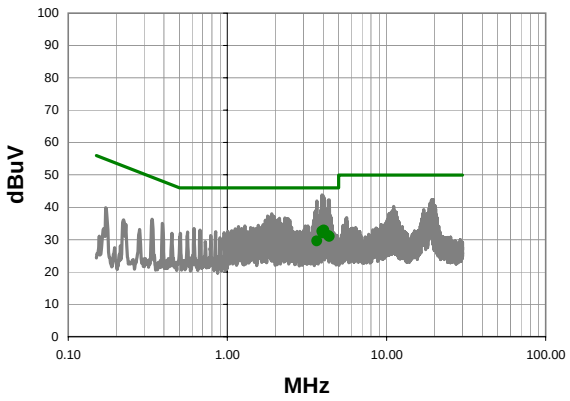
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

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

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
4.040	24.3	20.2	44.5	56.0	-11.5
3.928	24.1	20.2	44.3	56.0	-11.7
3.984	23.3	20.2	43.5	56.0	-12.5
3.644	22.3	20.2	42.5	56.0	-13.5
4.376	22.1	20.2	42.3	56.0	-13.7
4.320	22.1	20.2	42.3	56.0	-13.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
4.040	12.7	20.2	32.9	46.0	-13.1
3.928	12.3	20.2	32.5	46.0	-13.5
3.984	11.8	20.2	32.0	46.0	-14.0
4.320	11.0	20.2	31.2	46.0	-14.8
4.376	10.7	20.2	30.9	46.0	-15.1
3.644	9.3	20.2	29.5	46.0	-16.5

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

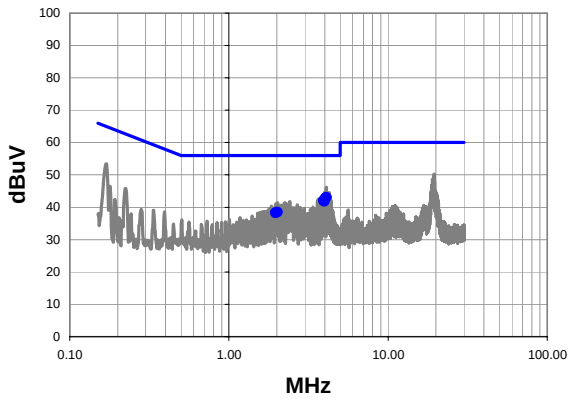
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	THKE0001	**Date:**	12/23/10		
Project:	None	**Temperature:**	22.1		
Job Site:	EV07	**Humidity:**	31		
Serial Number:	43	**Barometric Pres.:**	1003	**Tested by:**	Travis Rychener
EUT:	TE1001				
Configuration:	1				
Customer:	ThinkEco, Inc.				
Attendees:	none				
EUT Power:	5VDC				
Operating Mode:	Tx High Channel, 2480				
Deviations:	No deviations.				
Comments:	None				

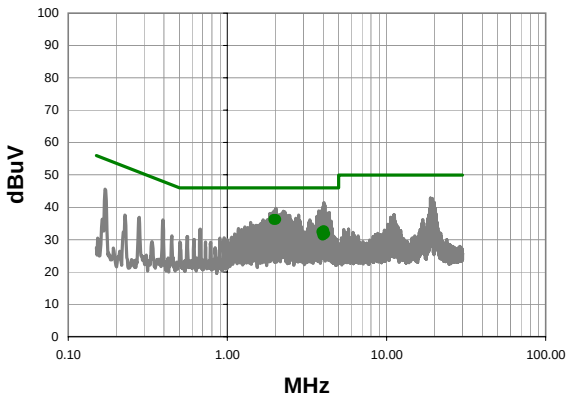
Test Specifications	**Test Method**
FCC 15.207:2010	ANSI C63.10:2009

Run #	6	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
4.092	22.8	20.2	43.0	56.0	-13.0
4.036	22.6	20.2	42.8	56.0	-13.2
3.924	21.8	20.2	42.0	56.0	-14.0
3.980	21.6	20.2	41.8	56.0	-14.2
2.016	18.3	20.2	38.5	56.0	-17.5
1.960	18.1	20.2	38.3	56.0	-17.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
2.016	16.0	20.2	36.2	46.0	-9.8
1.960	16.0	20.2	36.2	46.0	-9.8
4.036	12.5	20.2	32.7	46.0	-13.3
3.924	12.1	20.2	32.3	46.0	-13.7
4.092	11.5	20.2	31.7	46.0	-14.3
3.980	11.1	20.2	31.3	46.0	-14.7

DUTY CYCLE

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	24
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	13
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

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

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds

Where “On time” = N1L1 +N2L2 +….

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS

The measured values for the EUT’s pulse train are as follows:

Period = 100 mSec

Pulsewidth of Pulse= 2.61 mSec

Number of Pulses = 8

Duty Cycle = 20 log [(8)(2.61)/100]= -13.6 dB

The duty cycle correction factor of –13.6 dB was added to the Average measurements from Radiated Spurious Emissions

NORTHWEST EMC

DUTY CYCLE

XMit 2010.11.03

EUT:	TE1001			**Work Order:**	THKE0008
Serial Number:	0040			**Date:**	01/21/11
Customer:	ThinkEco, Inc.			**Temperature:**	21.9°C
Attendees:	none			**Humidity:**	35%
Project:	None			**Barometric Pres.:**	30.21 in
Tested by:	Rod Peloquin	**Power:**	5VDC via USB	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009

COMMENTS

Operating with maximum final duty cycle. 8 pulses of 2.61 ms in 100 ms period = 20*LOG(20.88/100) = -13.6 dB

DEVIATIONS FROM TEST STANDARD

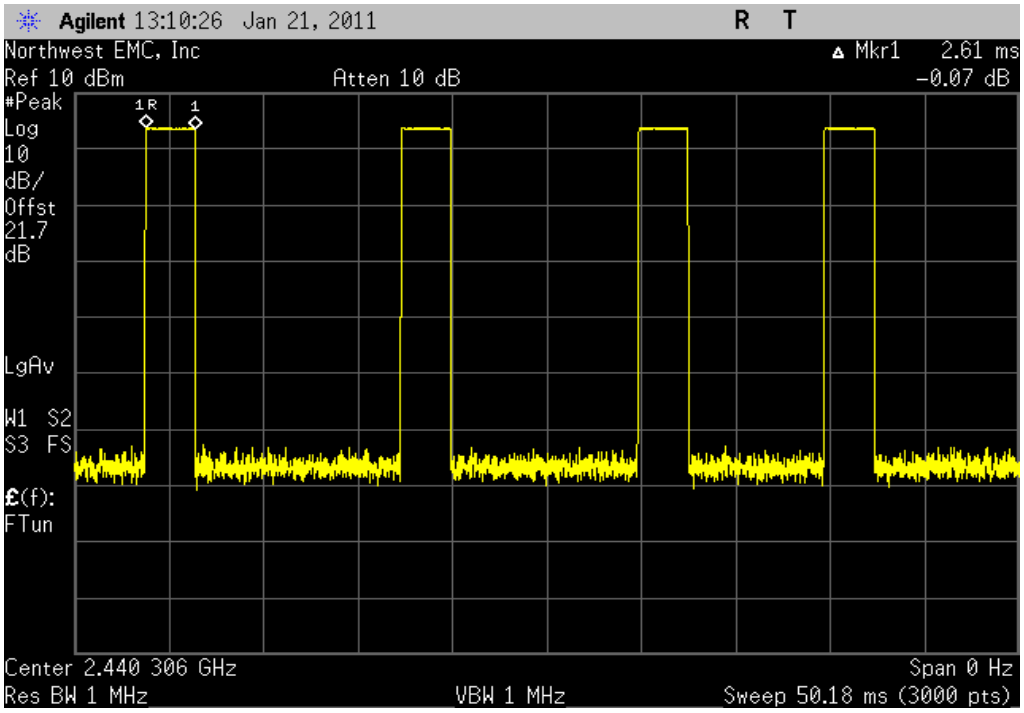
No Deviations

Configuration #	2	Signature

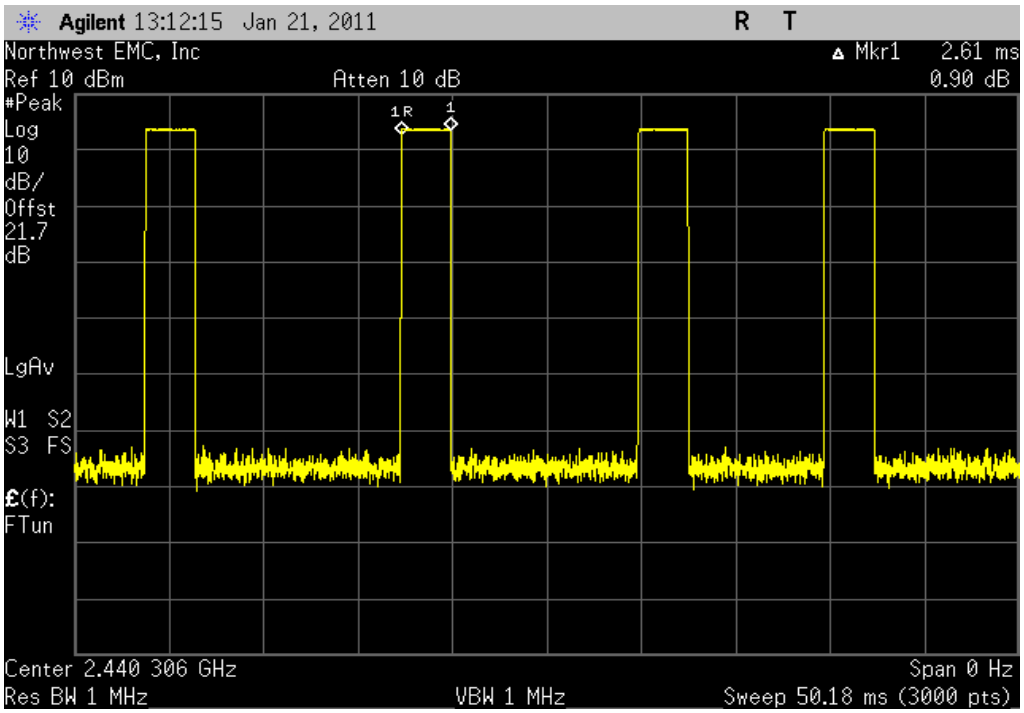
	Value	Limit	Results
Pulse Width Sample #1	2.61ms	100 ms	20.88%
Pulse Width Sample #2	2.61 ms	100 ms	20.88%
Pulse Width Sample #3	2.61 ms	100 ms	20.88%
Pulse Width Sample #4	2.61 ms	100 ms	20.88%
100ms Period Sample #1	8 pulses	100 ms	20.88%
100ms Period Sample #2	8 pulses	100 ms	20.88%
100ms Period Sample #3	8 pulses	100 ms	20.88%
100ms Period Sample #4	8 pulses	100 ms	20.88%

DUTY CYCLE

Pulse Width Sample #1					
Result:	20.88%	**Value:**	2.61ms	**Limit:**	100 ms

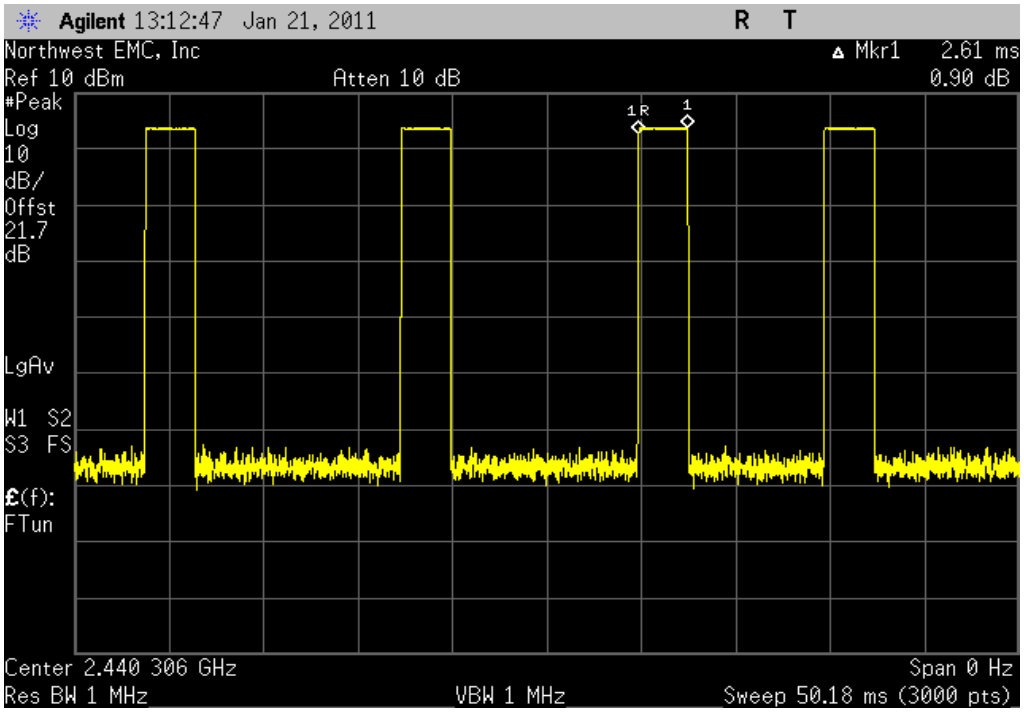


Pulse Width Sample #2					
Result:	20.88%	**Value:**	2.61 ms	**Limit:**	100 ms

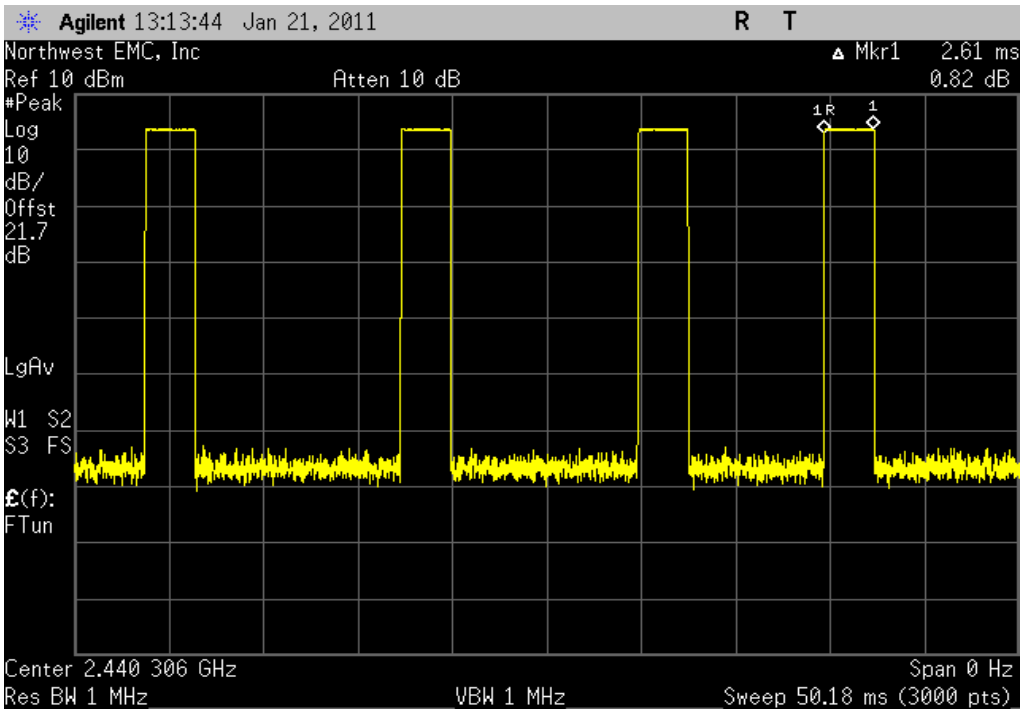


DUTY CYCLE

Pulse Width Sample #3					
Result:	20.88%	**Value:**	2.61 ms	**Limit:**	100 ms

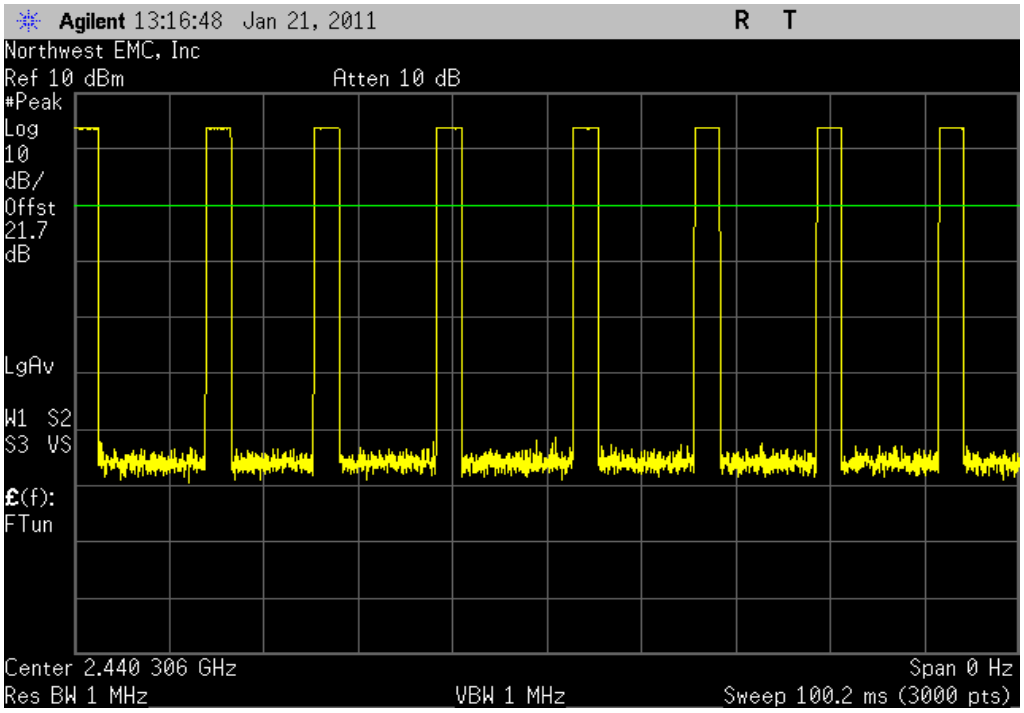


Pulse Width Sample #3					
Result:	20.88%	**Value:**	2.61 ms	**Limit:**	100 ms

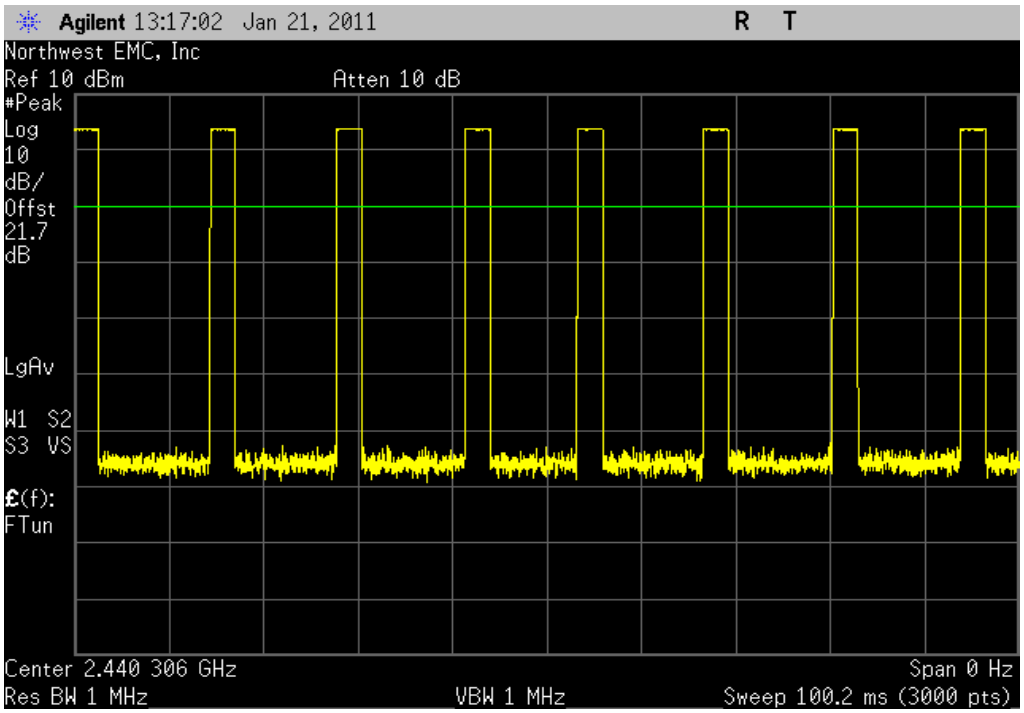


DUTY CYCLE

100ms Period Sample #1					
Result:	20.88%	**Value:**	8 pulses	**Limit:**	100 ms

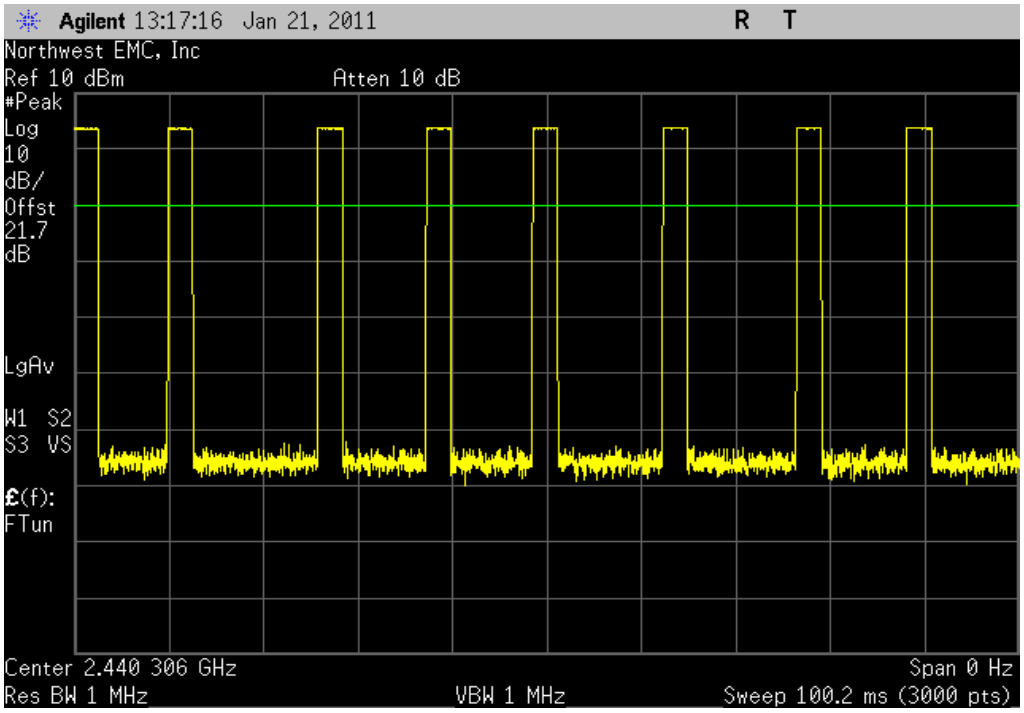


100ms Period Sample #2					
Result:	20.88%	**Value:**	8 pulses	**Limit:**	100 ms



DUTY CYCLE

100ms Period Sample #3					
Result:	20.88%	**Value:**	8 pulses	**Limit:**	100 ms



100ms Period Sample #4					
Result:	20.88%	**Value:**	8 pulses	**Limit:**	100 ms