ThinkEco, Inc.
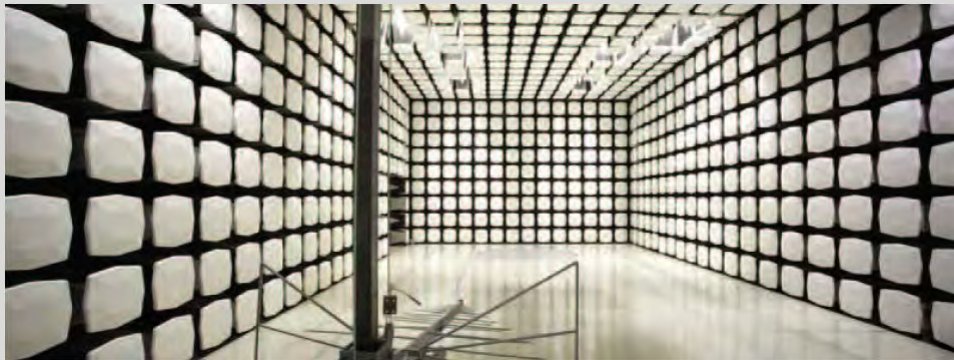## modlet smartAC thermostat Model TE1310

Report #: THKE0016

Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California **–** Minnesota **–** Oregon **–** New York **–** Washington

Certificate of Test
Last Date of Test: March 27, 2012
ThinkEco, Inc.
Model: modlet smartAC thermostat Model TE1310

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**
Duty Cycle	FCC 15.247:2011	ANSI C63.10:2009	**Pass**

Deviations From Test Standards
None

Approved By:

Tim O'Shea, Operations Manager

NVLAP Lab Code: 200630-0

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).

Revision History

Revision Number	Description	Date	Page Number
00	None		

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025. The scope includes radio, ITE, and medical standards from around the world. See: http://www.nwemc.com/accreditations/

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

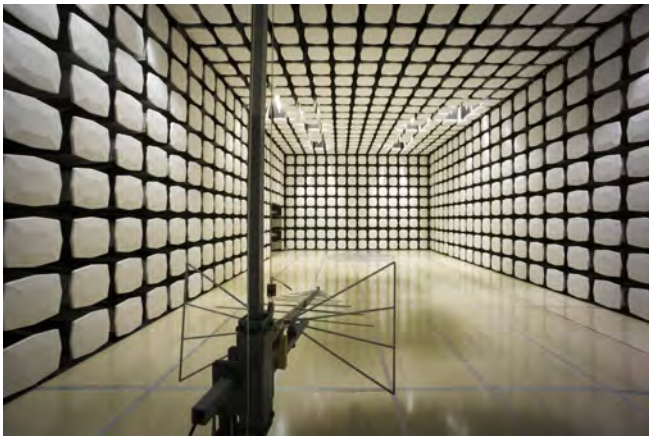**MIC –** Recognized by MIC as a CAB for the acceptance of test data.

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards**.**

NORTHWEST EMC

Locations

Oregon	**California**	**New York**	**Minnesota**	**Washington**
Labs EV01-EV12	Labs OC01-OC13	Labs WA01-WA04	Labs MN01-MN08	Labs SU01-SU07
22975 NW Evergreen Pkwy, #400	41 Tesla	4939 Jordan Rd.	9349 W Broadway Ave.	14128 339th Ave. SE
Hillsboro, OR 97124	Irvine, CA 92618	Elbridge, NY 13060	Brooklyn Park, MN 55445	Sultan, WA 98294
(503) 844-4066	(949) 861-8918	(315) 685-0796	(763) 425-2281	(360) 793-8675
VCCI				
C-1071, R-1025, G-84, C-2687, T-1658, R-2318	R-1943, G-85, C-2766, T-1659, G-548		R-3125, G-86, G-141, C-3464, T-1634	R-871, G-83, C-3265, T-1511
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1

Product Description

Client and Equipment Under Test (EUT) Information

Company Name:	ThinkEco, Inc.
Address:	148 Madison Avenue, 8th Floor
City, State, Zip:	New York, NY 10016
Test Requested By:	Max Rosenblatt
Model:	modlet smartAC thermostat Model TE1310
First Date of Test:	March 26, 2012
Last Date of Test:	March 27, 2012
Receipt Date of Samples:	March 26, 2012
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, handheld, battery powered.

Testing Objective:
To demonstrate compliance to FCC 15.247 requirements

NORTHWEST EMC   **Configurations**

Configuration 1 THKE0016

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Thermostat	ThinkEco, Inc.	modlet smartAC thermostat	FCC RMT2

Configuration 3 THKE0016

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Thermostat	ThinkEco, Inc.	modlet smartAC thermostat	FCC RMT1

Modifications

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/26/2012	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	3/26/2012	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.
3	3/26/2012	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.
4	3/26/2012	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.
5	3/26/2012	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	3/26/2012	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	3/27/2012	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

NORTHWEST EMC

Occupied Bandwidth

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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 only data rate available.
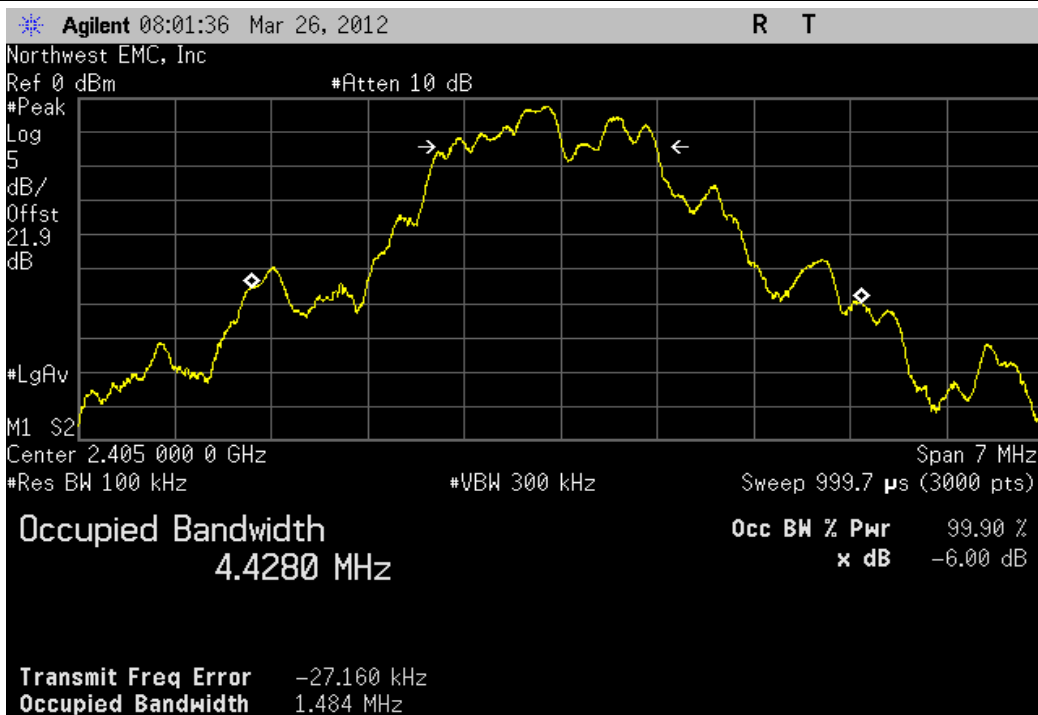
NORTHWEST EMC

Occupied Bandwidth

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT2	**Date:**	03/26/12
Customer:	ThinkEco, Inc.	**Temperature:**	22.5c°C
Attendees:	Ward Ramsdell	**Humidity:**	32%
Project:	None	**Barometric Pres.:**	1011
Tested by:	Ethan Schoonover	**Power:** Battery	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009

COMMENTS

Tx at 100% Duty Cycle

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1		
		Signature	

Channel	Value	Limit	Result
Low	1.484 MHz	> 500 kHz	Pass
High	1.494 MHz	> 500 kHz	Pass
Mid	1.51 MHz	> 500 kHz	Pass

Occupied Bandwidth

				Value	Limit	Result
Low						
				1.484 MHz	> 500 kHz	Pass

				Value	Limit	Result
High						
				1.494 MHz	> 500 kHz	Pass

Occupied Bandwidth

				Value	Limit	Result	
			Mid				
				1.51 MHz	> 500 kHz	Pass	
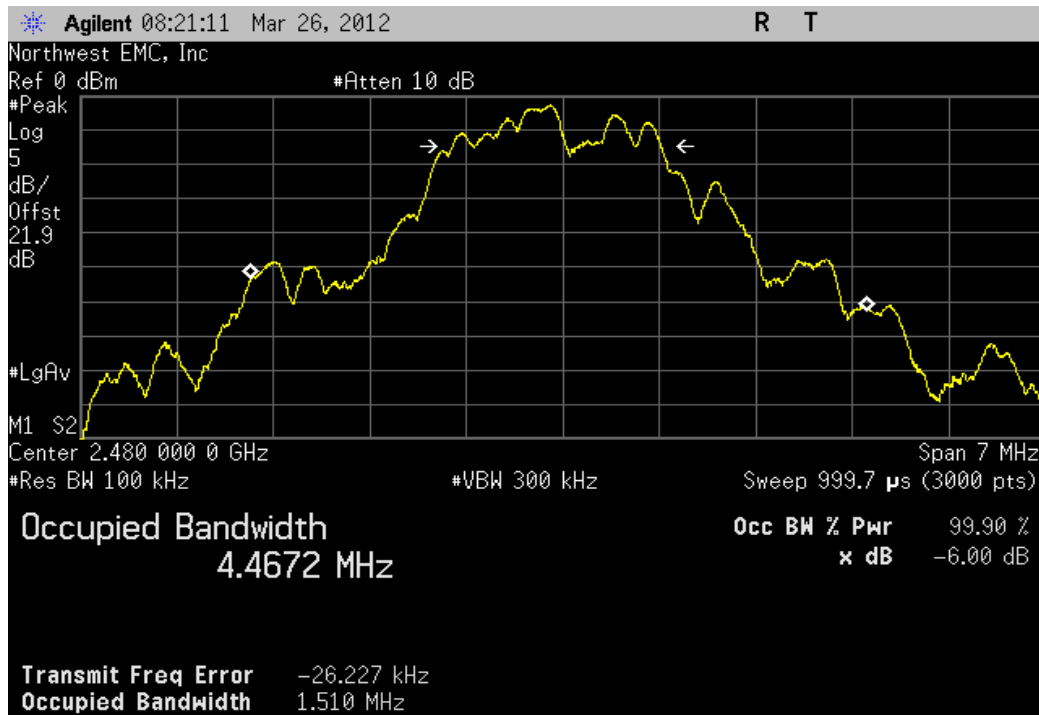
Output Power

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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 only data rate available.

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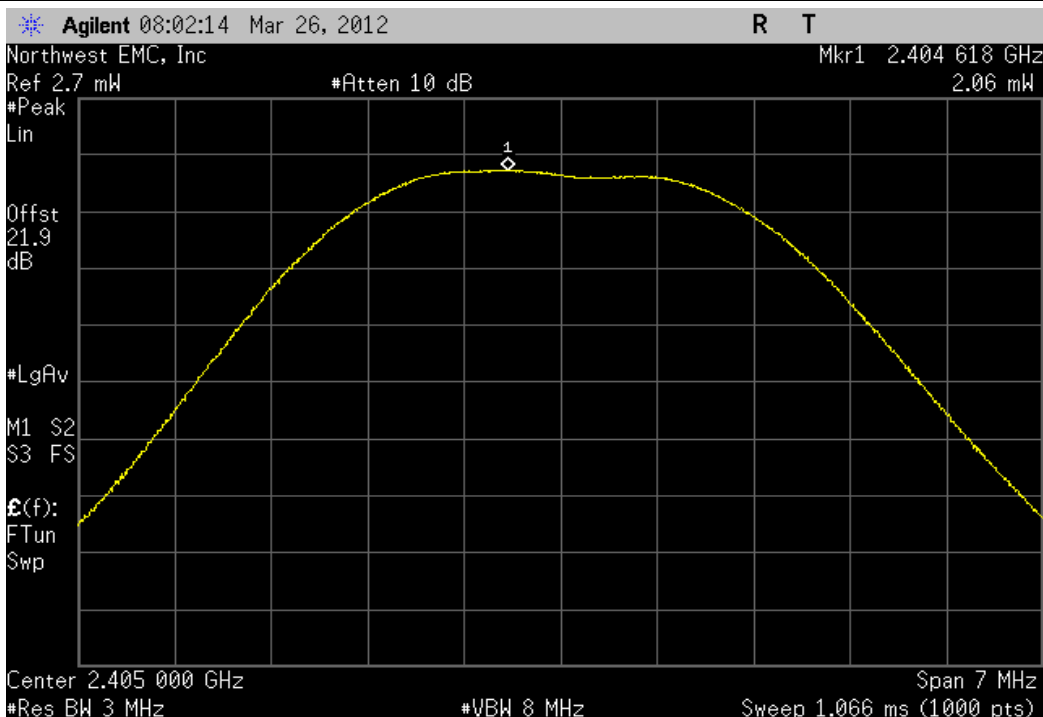
NORTHWEST EMC

Output Power

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT2	**Date:**	03/26/12
Customer:	ThinkEco, Inc.	**Temperature:**	22.5c°C
Attendees:	Ward Ramsdell	**Humidity:**	32%
Project:	None	**Barometric Pres.:**	1011
Tested by:	Ethan Schoonover	**Power:** Battery	**Job Site:** EV06

TEST SPECIFICATIONS | **Test Method**
FCC 15.247:2012 | ANSI C63.10:2009

COMMENTS
Tx at 100% Duty Cycle

DEVIATIONS FROM TEST STANDARD
None

Configuration #	1		*Signature*

Channel	Value	Limit	Result
Low	2.056 mW	< 1 W	Pass
High	2.085 mW	< 1 W	Pass
Mid	2.036 mW	< 1 W	Pass

Output Power

Low				Value	Limit	Result
				2.056 mW	< 1 W	Pass


```
Agilent 08:02:14  Mar 26, 2012              R  T
Northwest EMC, Inc                      Mkr1  2.404 618 GHz
Ref 2.7 mW              #Atten 10 dB            2.06 mW
#Peak
Lin
                                    1

Offst
21.9
dB

#LgAv

M1  S2
S3  FS

£(f):
FTun
Swp

Center 2.405 000 GHz                       Span 7 MHz
#Res BW 3 MHz           #VBW 8 MHz    Sweep 1.066 ms (1000 pts)
```

High				Value	Limit	Result
				2.085 mW	< 1 W	Pass


```
Agilent 08:12:31  Mar 26, 2012              R  T
Northwest EMC, Inc                      Mkr1  2.444 639 GHz
Ref 2.7 mW              #Atten 10 dB            2.08 mW
#Peak
Lin
                                    1

Offst
21.9
dB

#LgAv

M1  S2
S3  FS

£(f):
FTun
Swp

Center 2.445 000 GHz                       Span 7 MHz
#Res BW 3 MHz           #VBW 8 MHz    Sweep 1.066 ms (1000 pts)
```

Output Power
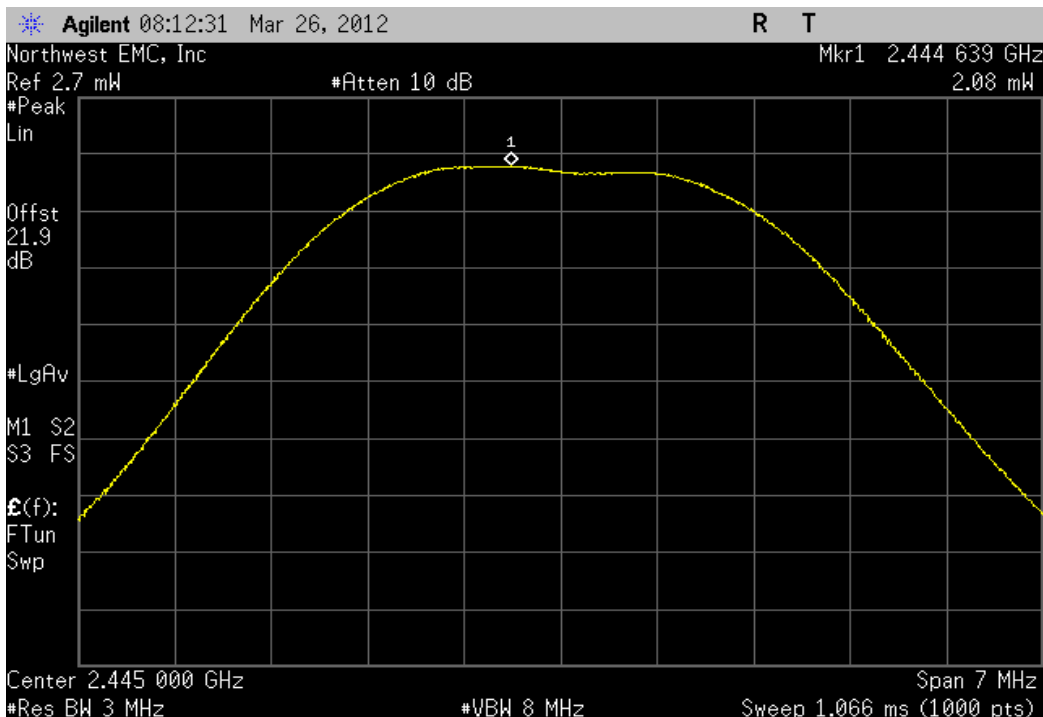
				Value	Limit	Result
Mid						
				2.036 mW	< 1 W	Pass
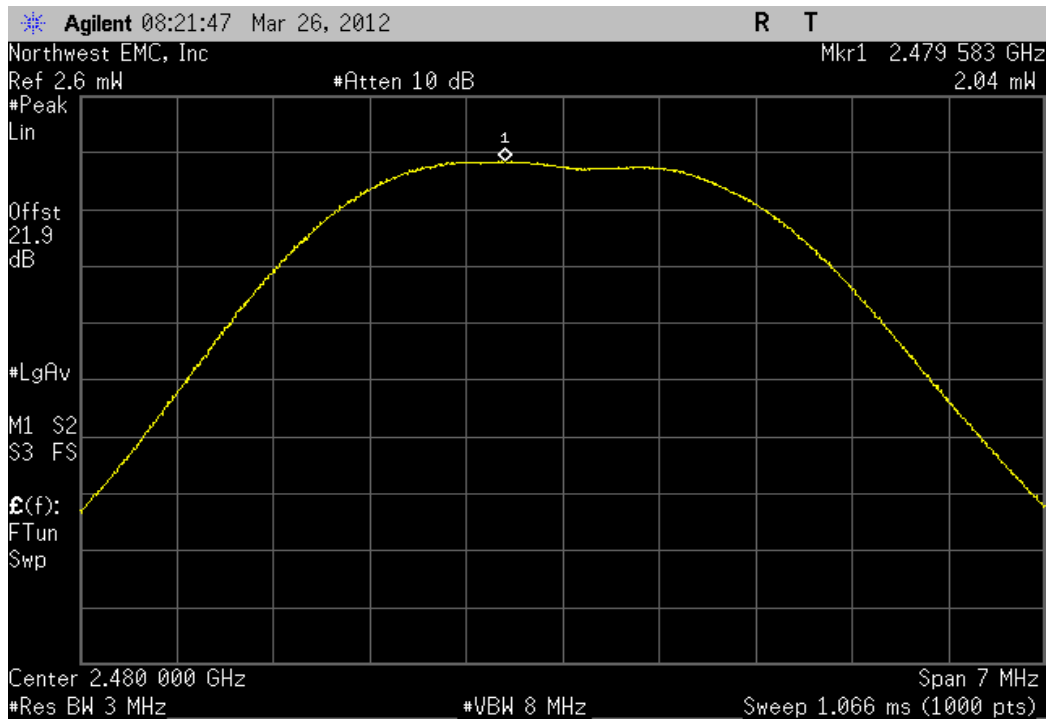
Band Edge Compliance

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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.
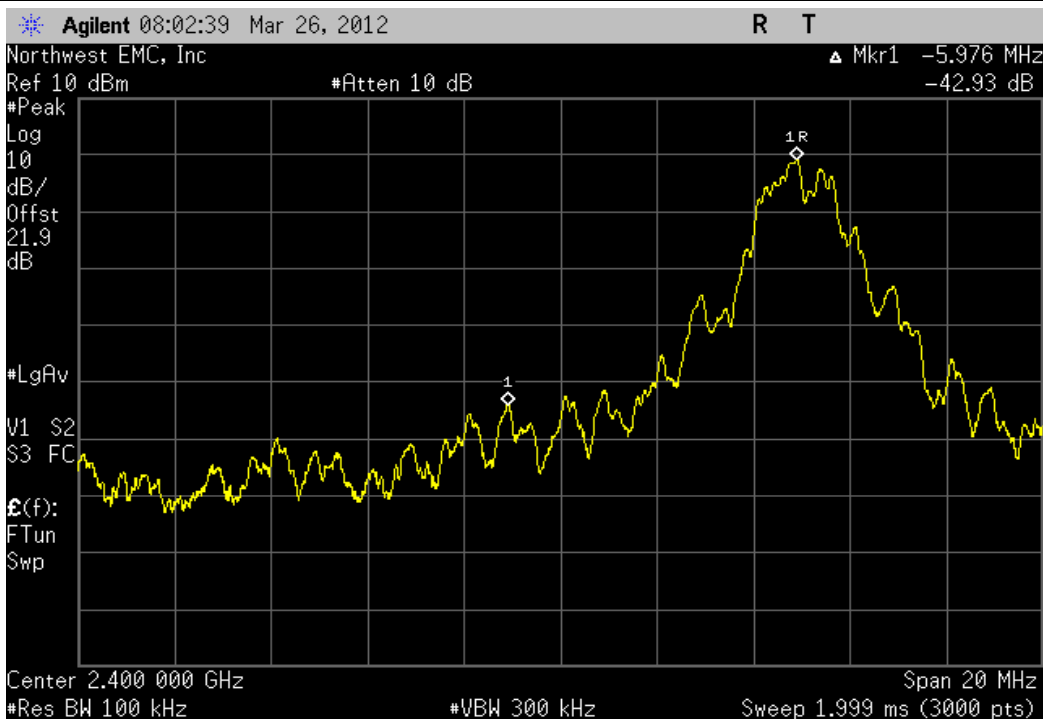
NORTHWEST EMC

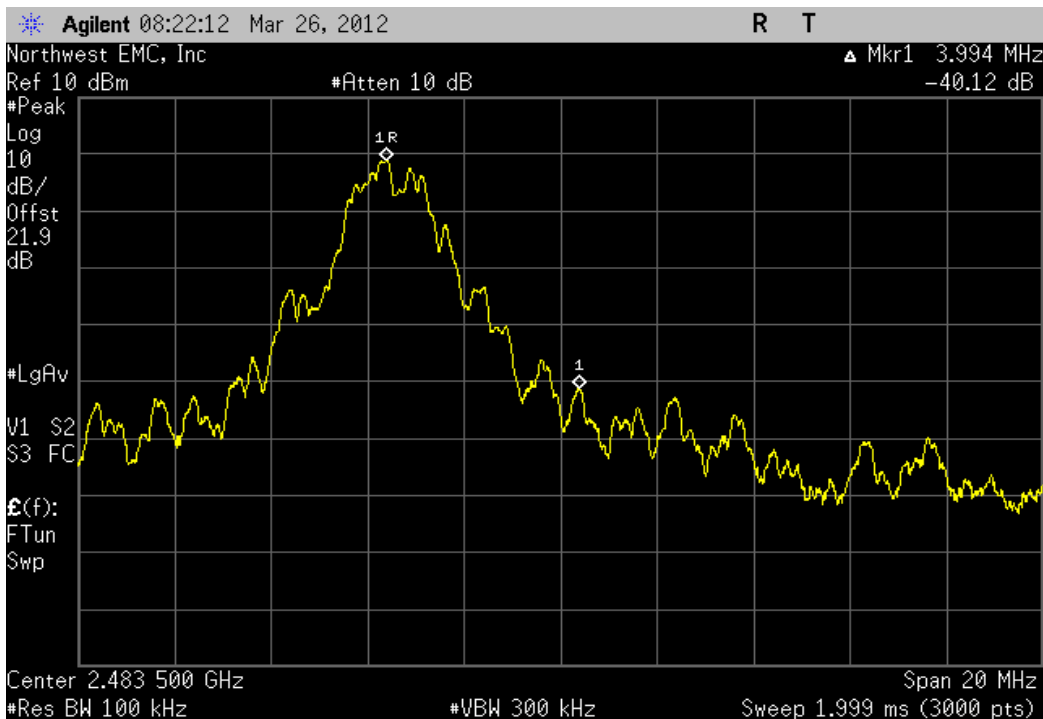## Band Edge Compliance

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT2	**Date:**	03/26/12
Customer:	ThinkEco, Inc.	**Temperature:**	22.5c°C
Attendees:	Ward Ramsdell	**Humidity:**	32%
Project:	None	**Barometric Pres.:**	1011
Tested by:	Ethan Schoonover	**Power:** Battery	**Job Site:** EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009

COMMENTS

Tx at 100% Duty Cycle

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	Signature	

Channel	Value	Limit	Result
Low	-42.93 dBc	≤ -20 dBc	Pass
High	-40.12 dBc	≤ -20 dBc	Pass

				Value	Limit	Result
Low						
				-42.93 dBc	≤ -20 dBc	Pass

				Value	Limit	Result
High						
				-40.12 dBc	≤ -20 dBc	Pass

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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 only data rate available. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

NORTHWEST EMC

Spurious Conducted Emissions

EUT: modlet smartAC thermostat		**Work Order:** THKE0016	
Serial Number: FCC RMT2		**Date:** 03/26/12	
Customer: ThinkEco, Inc.		**Temperature:** 22.5c°C	
Attendees: Ward Ramsdell		**Humidity:** 32%	
Project: None		**Barometric Pres.:** 1011	
Tested by: Ethan Schoonover	**Power:** Battery	**Job Site:** EV06	

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009

COMMENTS

Tx at 100% Duty Cycle

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	*Signature*		

Channel	Frequency Range	Value	Limit	Result
Low	30 MHz - 12.5 GHz	-46.3 dBc	≤ -20 dBc	Pass
Low	12.5 GHz - 25 GHz	-51.6 dBc	≤ -20 dBc	Pass
High	30 MHz - 12.5 GHz	-53.76 dBc	≤ -20 dBc	Pass
High	12.5 GHz - 25 GHz	-51.78 dBc	≤ -20 dBc	Pass
Mid	30 MHz - 12.5 GHz	-45.24 dBc	≤ -20 dBc	Pass
Mid	12.5 GHz - 25 GHz	-52.09 dBc	≤ -20 dBc	Pass

Low				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-46.3 dBc	≤ -20 dBc	Pass

Low				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-51.6 dBc	≤ -20 dBc	Pass

Spurious Conducted Emissions
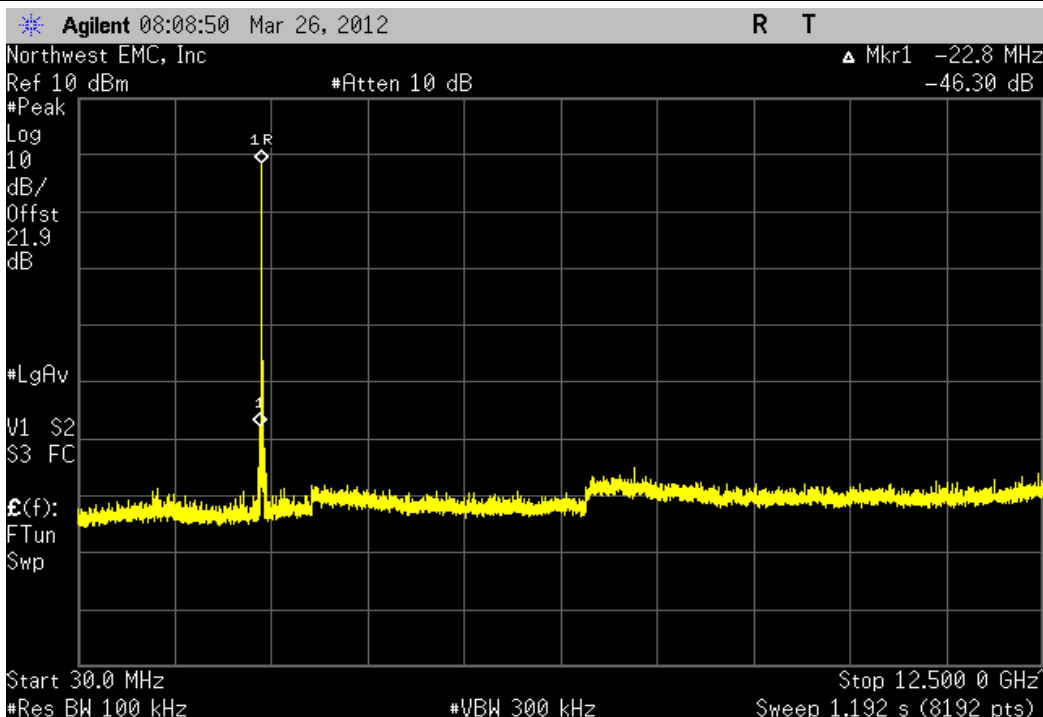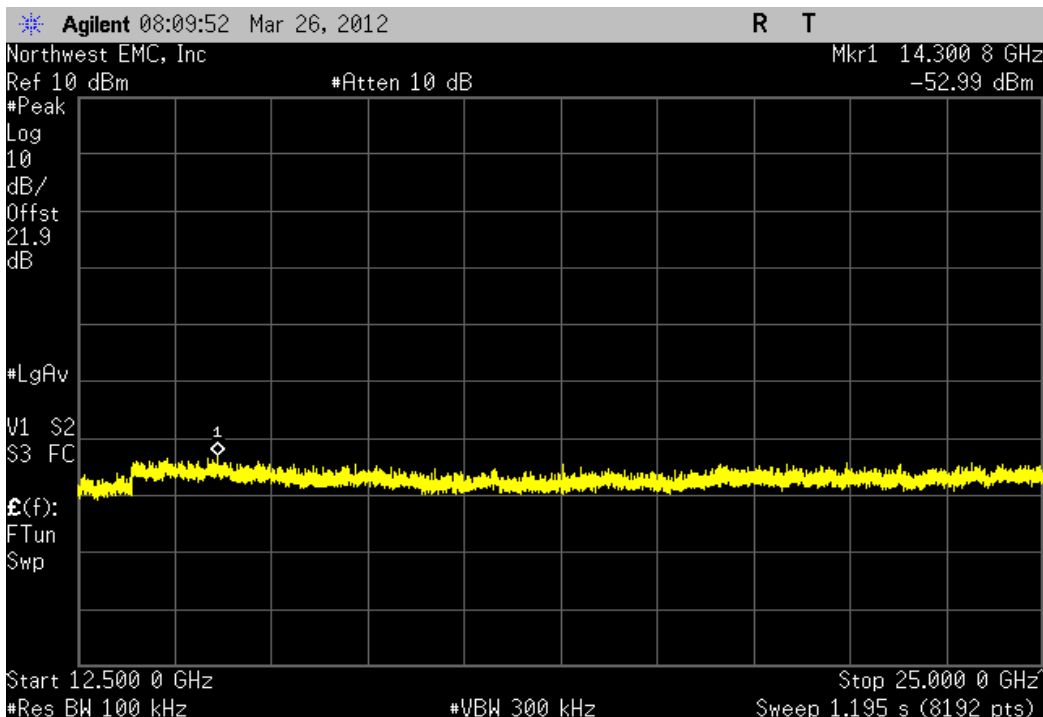
High				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-53.76 dBc	≤ -20 dBc	Pass

High				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-51.78 dBc	≤ -20 dBc	Pass

Spurious Conducted Emissions
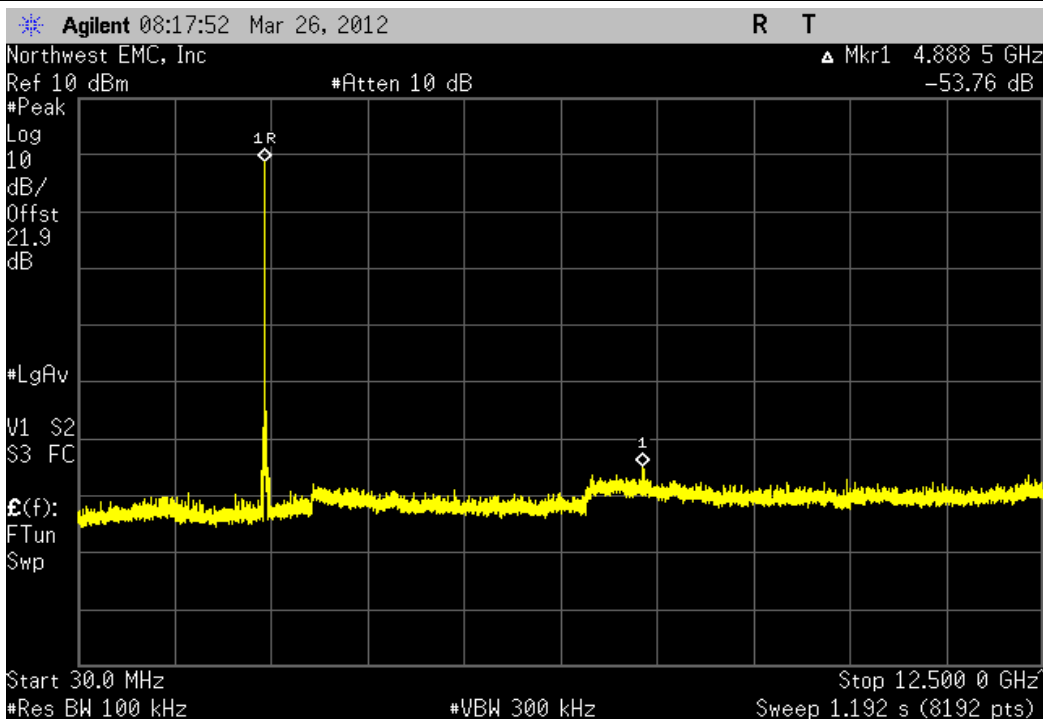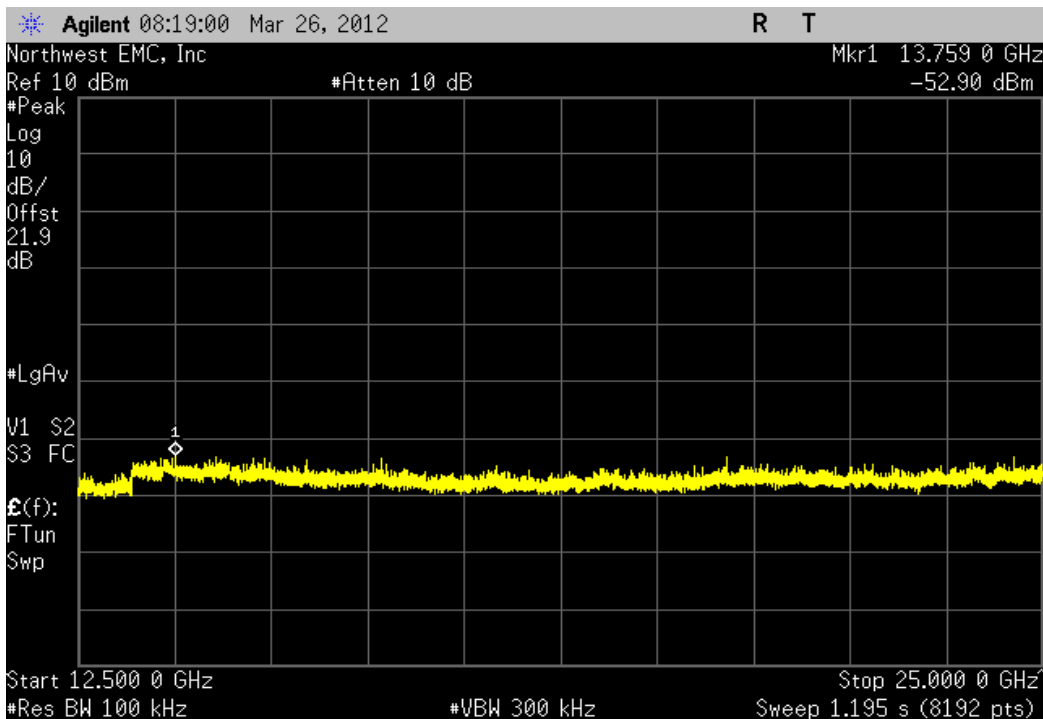
Mid				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-45.24 dBc	≤ -20 dBc	Pass
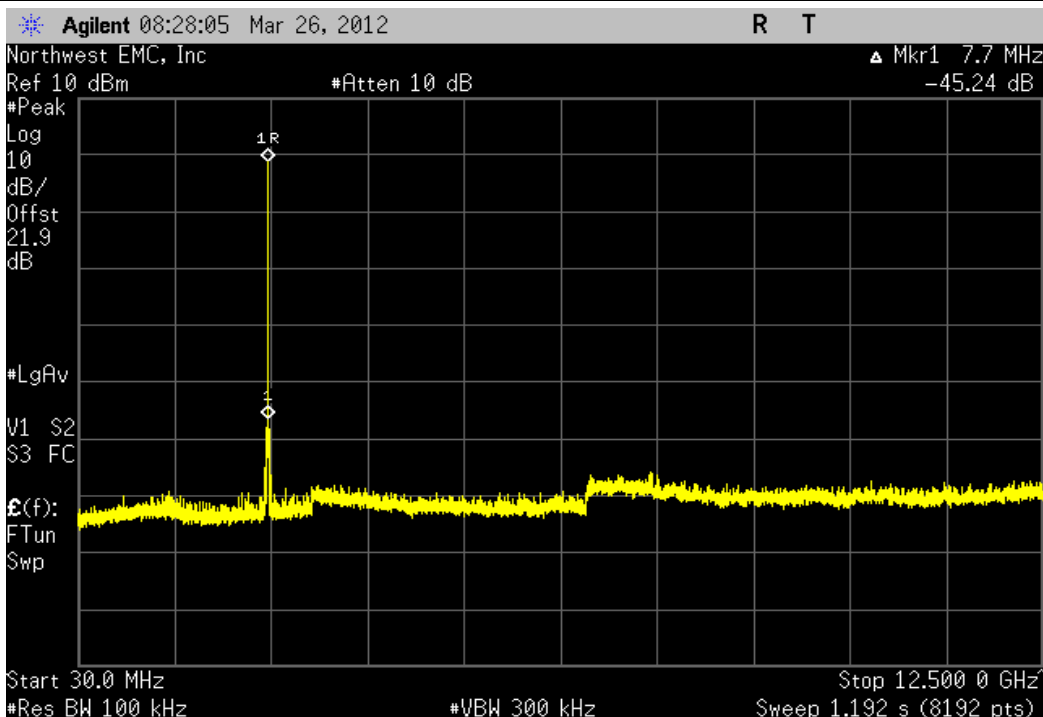
Mid				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-52.09 dBc	≤ -20 dBc	Pass

XMit 2012.03.23
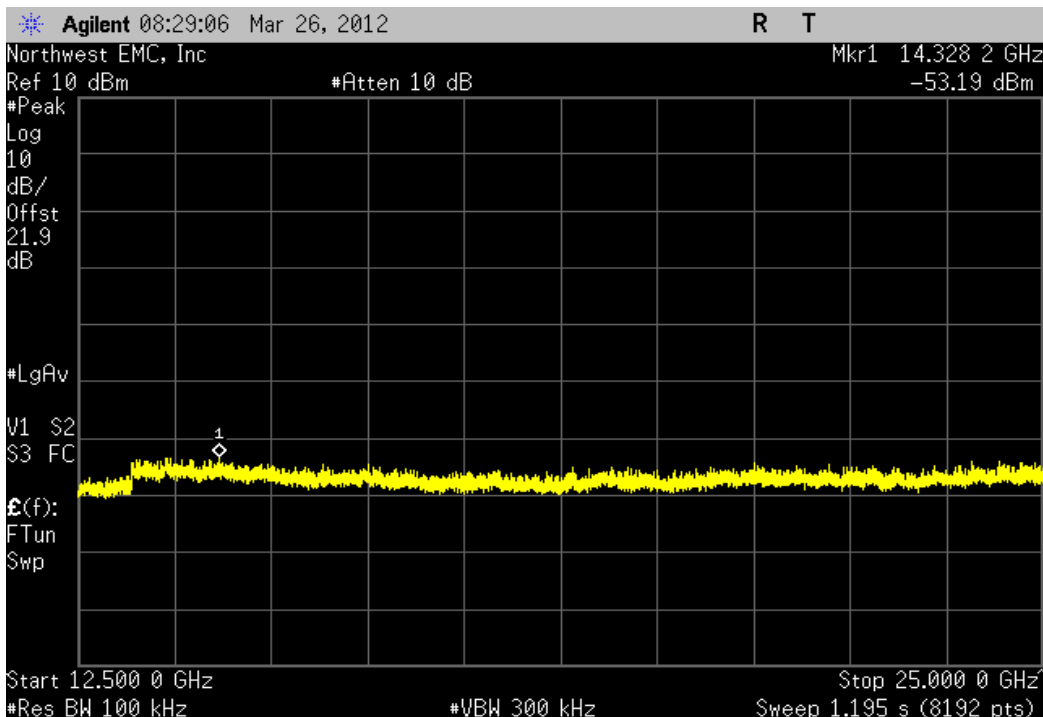
Power Spectral Density

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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 only data rate available. Since the average output power was measured as defined in section ANSI C63.10:2009, section 6.10.2.2, the procedure outlined in section 6.11.2.4 was used. The spectrum analyzer was set as follows:

Locate and zoom in on emission peak(s) within the passband.

a) Set RBW = 3 kHz

b) Set VBW = 9 kHz

c) Set Sweep time to Automatic

d) Use a peak detector. A sample detector mode can be used only if the following conditions can be achieved with automatic sweep time and adjusting the bin width.

1) Bin width (i.e., span/number of points in spectrum display) < 0.5 RBW.

2) The transmission pulse or sequence of pulses remains at maximum transmit power throughout each of the 100 sweeps of averaging and that the interval between pulses is not included in any of the sweeps.

e) Use a video trigger (or RF gating) with the trigger level set to enable the sweep only during full power pulses. Transmitter shall operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run."

f) Trace average 100 traces in power averaging mode. Do not use video averaging mode.
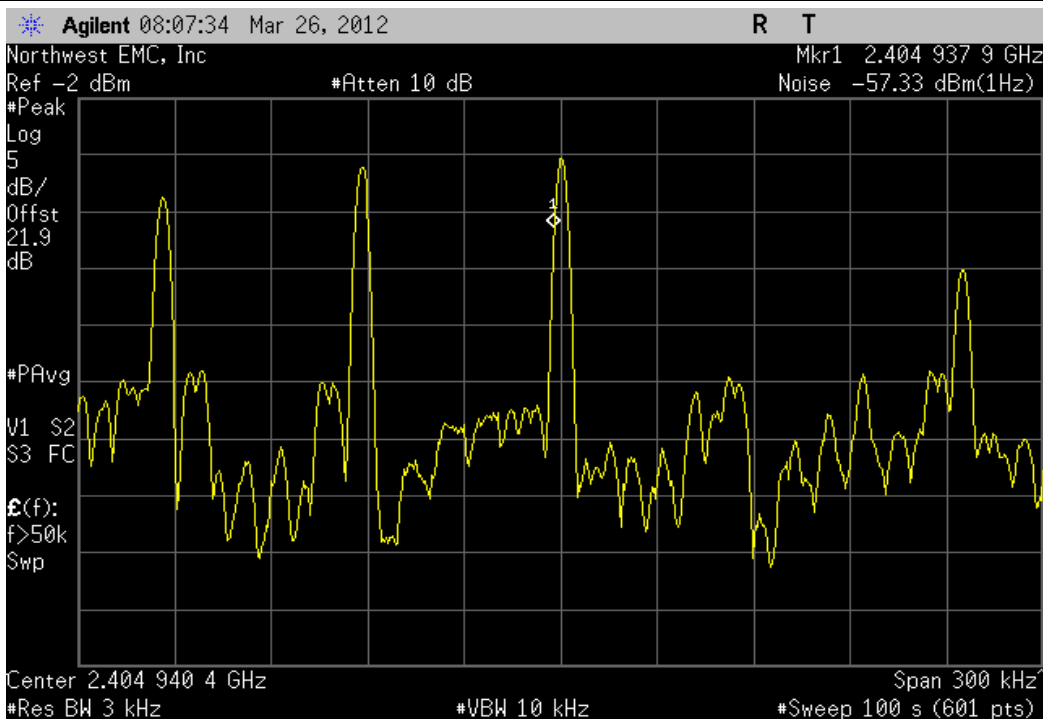
NORTHWEST EMC

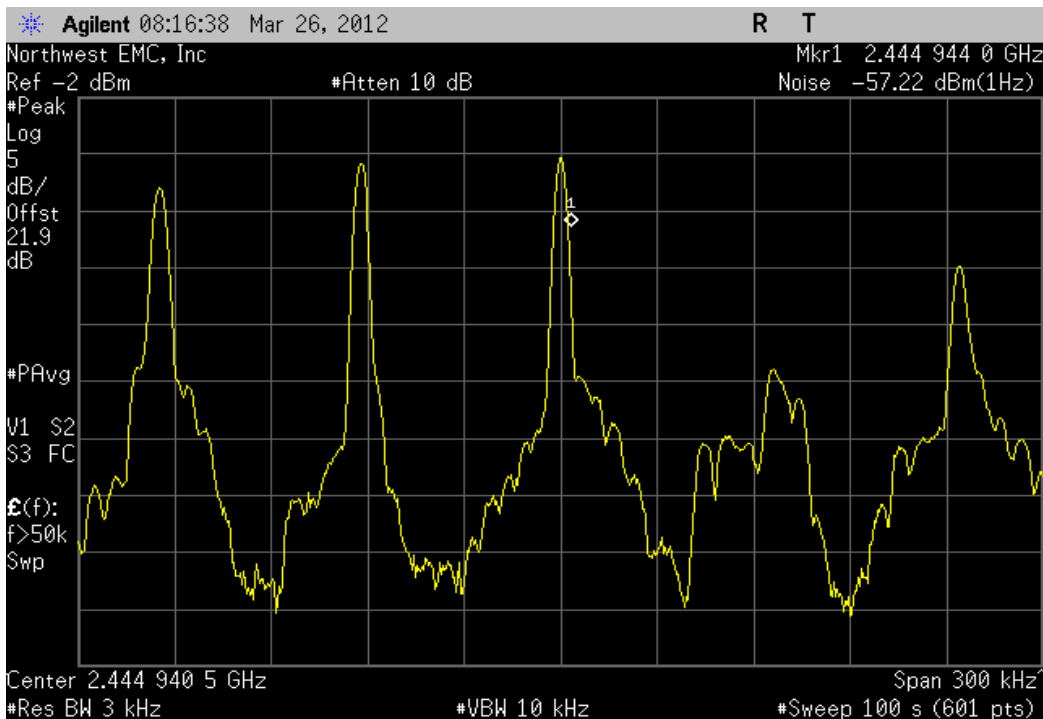# Power Spectral Density

EUT: modlet smartAC thermostat	
Serial Number: FCC RMT2	
Customer: ThinkEco, Inc.	
Attendees: Ward Ramsdell	
Project: None	
Tested by: Ethan Schoonover	**Power:** Battery

Work Order: THKE0016
Date: 03/26/12
Temperature: 22.5c°C
Humidity: 32%
Barometric Pres.: 1011
Job Site: EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009

COMMENTS

Tx at 100% Duty Cycle

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	Signature	

Channel	Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
Low	-57.333	34.8	-22.533	8	Pass
High	-57.217	34.8	-22.417	8	Pass
Mid	-57.286	34.8	-22.486	8	Pass

Power Spectral Density

		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
Low						
		-57.333	34.8	-22.533	8	Pass

		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
High						
		-57.217	34.8	-22.417	8	Pass

Power Spectral Density

			Mid			
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-57.286	34.8	-22.486	8	Pass

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 100% duty cycle, High Channel
Transmitting 100% duty cycle, Mid Channel
Transmitting 100% duty cycle, Low Channel

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

THKE0016 - 3

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	AAQ	2/7/2012	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12
Antenna, Biconilog	EMCO	3142	AXJ	5/17/2011	12
High Pass Filter	Micro-Tronics	HPM50111	HFO	8/9/2010	24
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/28/2011	12
Antenna, Horn	ETS	3115	AIZ	1/24/2011	24
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/28/2011	12
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/28/2012	12
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/28/2012	12
Antenna, Horn	ETS	3160-07	AHU	NCR	0
Antenna, Horn	ETS	3160-08	AHV	NCR	0
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/28/2012	12
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	9/12/2011	12
Cable	ESM Cable Corp.	KMKM-72	EVY	9/12/2011	12

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 IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth 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 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

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT1	**Date:**	03/27/12
Customer:	ThinkEco, Inc.	**Temperature:**	23
Attendees:	None	**Humidity:**	36%
Project:	None	**Barometric Pres.:**	29.68
Tested by:	Rod Peloquin	**Power:** Battery	**Job Site:**	EV01

TEST SPECIFICATIONS

FCC 15.247:2012

Test Method

ANSI C63.10:2009

TEST PARAMETERS

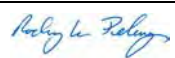| Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

None

EUT OPERATING MODES

Transmitting 100% duty cycle, High Channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	3
Results	**Pass**
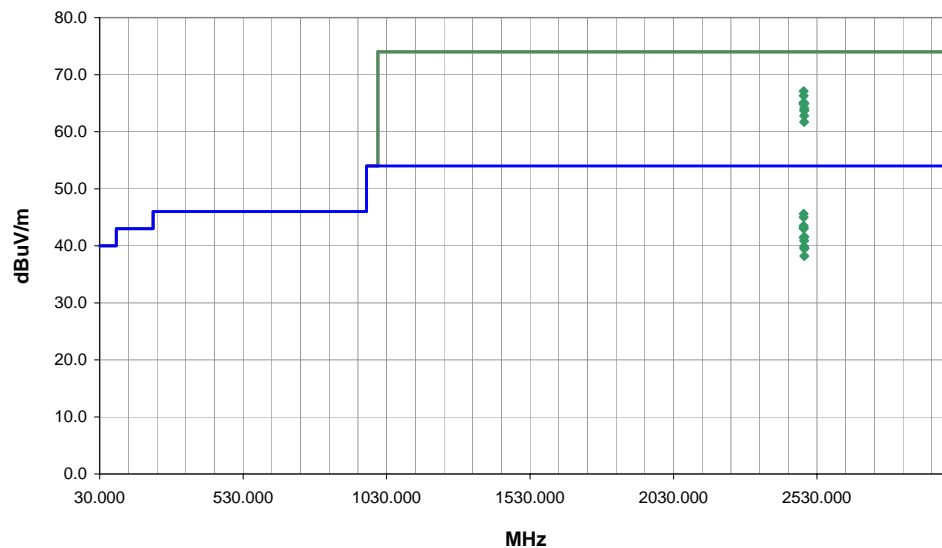
Signature

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
2483.510	44.8	2.3	140.0	1.1	0.0	20.0	H-Horn	PK	0.0	67.1	74.0	-6.9	High Channel, EUT on side
2483.542	44.0	2.3	309.0	1.0	0.0	20.0	H-Horn	PK	0.0	66.3	74.0	-7.7	High Channel, EUT Horizontal
2483.500	36.9	2.3	147.0	1.1	-13.6	20.0	H-Horn	AV	0.0	45.6	54.0	-8.4	High Channel, EUT on side
2483.503	42.8	2.3	204.0	1.5	0.0	20.0	H-Horn	PK	0.0	65.1	74.0	-8.9	High Channel, EUT vertical
2483.563	42.7	2.3	350.0	1.1	0.0	20.0	V-Horn	PK	0.0	65.0	74.0	-9.0	High Channel, EUT on side
2485.603	42.7	2.3	307.0	1.0	0.0	20.0	H-Horn	PK	0.0	65.0	74.0	-9.0	High Channel, EUT Horizontal
2483.500	36.3	2.3	309.0	1.0	-13.6	20.0	H-Horn	AV	0.0	45.0	54.0	-9.0	High Channel, EUT Horizontal
2483.523	42.6	2.3	283.0	1.0	0.0	20.0	V-Horn	PK	0.0	64.9	74.0	-9.1	High Channel, EUT vertical
2483.533	42.5	2.3	205.0	2.1	0.0	20.0	V-Horn	PK	0.0	64.8	74.0	-9.2	High Channel, EUT Horizontal
2485.748	41.8	2.3	203.0	1.5	0.0	20.0	H-Horn	PK	0.0	64.1	74.0	-9.9	High Channel, EUT vertical
2485.278	41.4	2.3	283.0	1.0	0.0	20.0	V-Horn	PK	0.0	63.7	74.0	-10.3	High Channel, EUT vertical
2485.585	41.4	2.3	350.0	1.1	0.0	20.0	V-Horn	PK	0.0	63.7	74.0	-10.3	High Channel, EUT on side
2483.507	34.8	2.3	204.0	1.5	-13.6	20.0	H-Horn	AV	0.0	43.5	54.0	-10.5	High Channel, EUT vertical
2483.502	34.5	2.3	350.0	1.1	-13.6	20.0	V-Horn	AV	0.0	43.2	54.0	-10.8	High Channel, EUT on side
2483.502	34.3	2.3	283.0	1.0	-13.6	20.0	V-Horn	AV	0.0	43.0	54.0	-11.0	High Channel, EUT vertical
2485.223	40.5	2.3	205.0	2.1	0.0	20.0	V-Horn	PK	0.0	62.8	74.0	-11.2	High Channel, EUT Horizontal
2485.278	39.4	2.3	147.0	1.1	0.0	20.0	H-Horn	PK	0.0	61.7	74.0	-12.3	High Channel, EUT on side
2485.657	32.9	2.3	147.0	1.1	-13.6	20.0	H-Horn	AV	0.0	41.6	54.0	-12.4	High Channel, EUT on side
2483.500	32.7	2.3	205.0	2.1	-13.6	20.0	V-Horn	AV	0.0	41.4	54.0	-12.6	High Channel, EUT Horizontal
2485.573	32.2	2.3	307.0	1.0	-13.6	20.0	H-Horn	AV	0.0	40.9	54.0	-13.1	High Channel, EUT Horizontal

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT1	**Date:**	03/27/12
Customer:	ThinkEco, Inc.	**Temperature:**	23
Attendees:	None	**Humidity:**	36%
Project:	None	**Barometric Pres.:**	29.68
Tested by:	Rod Peloquin	**Power:** Battery	**Job Site:**	EV01

TEST SPECIFICATIONS

FCC 15.247:2012

Test Method

ANSI C63.10:2009

TEST PARAMETERS

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

COMMENTS

None

EUT OPERATING MODES

Transmitting 100% duty cycle

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2	
Configuration #	3	
Results	Pass	*Signature*
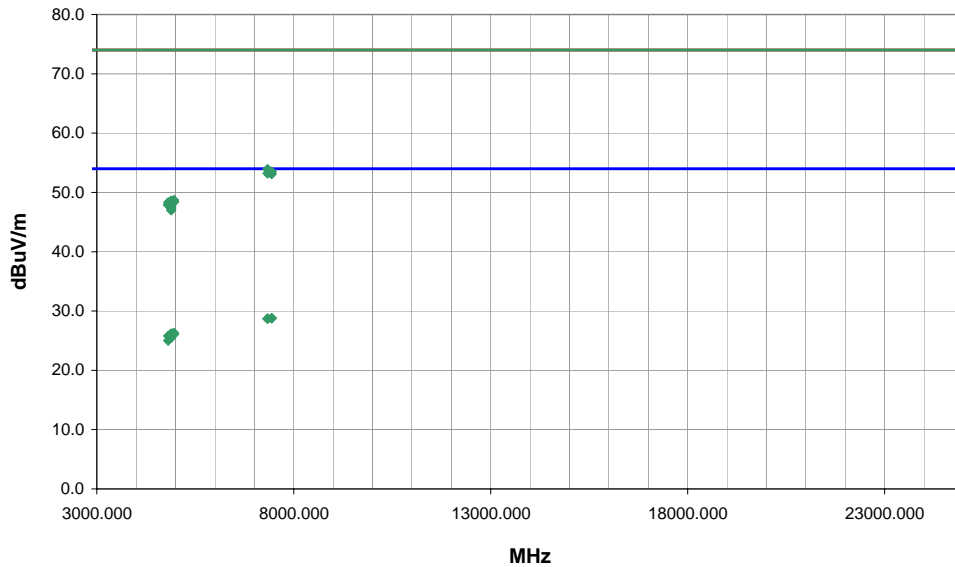
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7334.982	37.3	16.6	138.0	1.0	0.0	0.0	H-Horn	PK	0.0	53.9	74.0	-20.1	Mid Channel, EUT vertical
7439.910	36.8	16.7	342.0	1.0	0.0	0.0	H-Horn	PK	0.0	53.5	74.0	-20.5	High Channel, EUT vertical
7334.973	36.6	16.6	194.0	1.0	0.0	0.0	V-Horn	PK	0.0	53.2	74.0	-20.8	Mid Channel, EUT on side
7440.465	36.4	16.7	12.0	2.1	0.0	0.0	V-Horn	PK	0.0	53.1	74.0	-20.9	High Channel, EUT on side
7439.328	25.7	16.7	342.0	1.0	-13.6	0.0	H-Horn	AV	0.0	28.8	54.0	-25.2	High Channel, EUT vertical
7440.085	25.7	16.7	12.0	2.1	-13.6	0.0	V-Horn	AV	0.0	28.8	54.0	-25.2	High Channel, EUT on side
7334.982	25.7	16.6	138.0	1.0	-13.6	0.0	H-Horn	AV	0.0	28.7	54.0	-25.3	Mid Channel, EUT vertical
7335.315	25.7	16.6	194.0	1.0	-13.6	0.0	V-Horn	AV	0.0	28.7	54.0	-25.3	Mid Channel, EUT on side
4959.857	39.2	9.5	207.0	1.0	0.0	0.0	H-Horn	PK	0.0	48.7	74.0	-25.3	High Channel, EUT vertical
4890.002	39.2	9.4	177.0	1.0	0.0	0.0	H-Horn	PK	0.0	48.6	74.0	-25.4	Mid Channel, EUT vertical
4960.072	38.9	9.5	91.0	1.8	0.0	0.0	V-Horn	PK	0.0	48.4	74.0	-25.6	High Channel, EUT on side
4809.783	38.9	9.4	204.0	1.0	0.0	0.0	H-Horn	PK	0.0	48.3	74.0	-25.7	Low Channel, EUT vertical
4890.228	38.8	9.4	270.0	1.7	0.0	0.0	V-Horn	PK	0.0	48.2	74.0	-25.8	Mid Channel, EUT on side
4809.292	38.5	9.4	101.0	1.0	0.0	0.0	V-Horn	PK	0.0	47.9	74.0	-26.1	Low Channel, EUT on side
4889.942	38.3	9.4	166.0	1.0	0.0	0.0	V-Horn	PK	0.0	47.7	74.0	-26.3	Mid Channel, EUT vertical
4890.038	38.2	9.4	229.0	1.3	0.0	0.0	V-Horn	PK	0.0	47.6	74.0	-26.4	Mid Channel, EUT horizontal
4889.780	37.9	9.4	190.0	1.6	0.0	0.0	H-Horn	PK	0.0	47.3	74.0	-26.7	Mid Channel, EUT horizontal
4889.710	37.6	9.4	175.0	1.0	0.0	0.0	H-Horn	PK	0.0	47.0	74.0	-27.0	Mid Channel, EUT vertical
4959.857	30.4	9.5	206.0	1.0	-13.6	0.0	H-Horn	AV	0.0	26.3	54.0	-27.7	High Channel, EUT vertical
4889.917	30.4	9.4	189.0	1.0	-13.6	0.0	H-Horn	AV	0.0	26.2	54.0	-27.8	Mid Channel, EUT vertical

![Northwest EMC logo]

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
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12

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

EUT:	modlet smartAC thermostat	**Work Order:**	THKE0016
Serial Number:	FCC RMT2	**Date:**	03/26/12
Customer:	ThinkEco, Inc.	**Temperature:**	22.5c°C
Attendees:	Ward Ramsdell	**Humidity:**	32%
Project:	None	**Barometric Pres.:**	1011
Tested by:	Ethan Schoonover	**Power:** Battery	**Job Site:** EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009

COMMENTS

Tx at typical Duty Cycle

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	*Signature*

Channel	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
Low	2.618 mS	12.751 mS	1	0.205	N/A	N/A
Low			5		N/A	N/A
High	2.622 mS	13.379 mS	1	0.196	N/A	N/A
High			5		N/A	N/A
Mid	2.614 mS	11.775 mS	1	0.222	N/A	N/A
Mid			5		N/A	N/A

Duty Cycle

		Low				
	Pulse Width	**Period**	**Number of Pulses**	**Value (%)**	**Limit**	**Result**
	2.618 mS	12.751 mS	1	20.50%	N/A	N/A
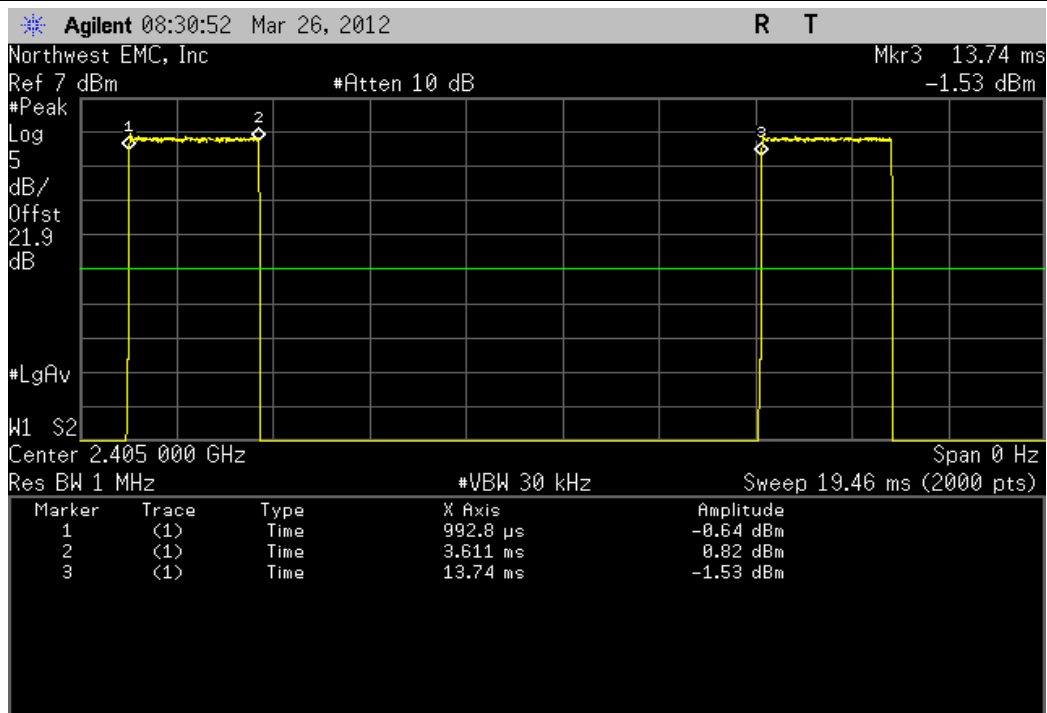
		Low				
	Pulse Width	**Period**	**Number of Pulses**	**Value (%)**	**Limit**	**Result**
			5		N/A	N/A

Duty Cycle
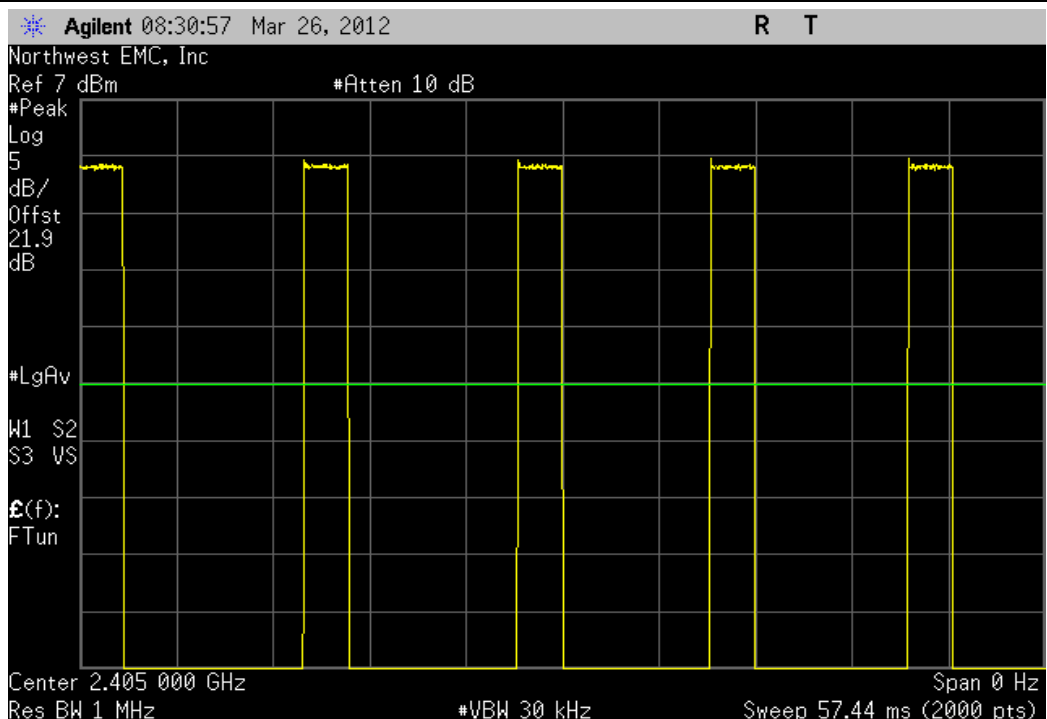
			High			
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.622 mS	13.379 mS	1	19.60%	N/A	N/A
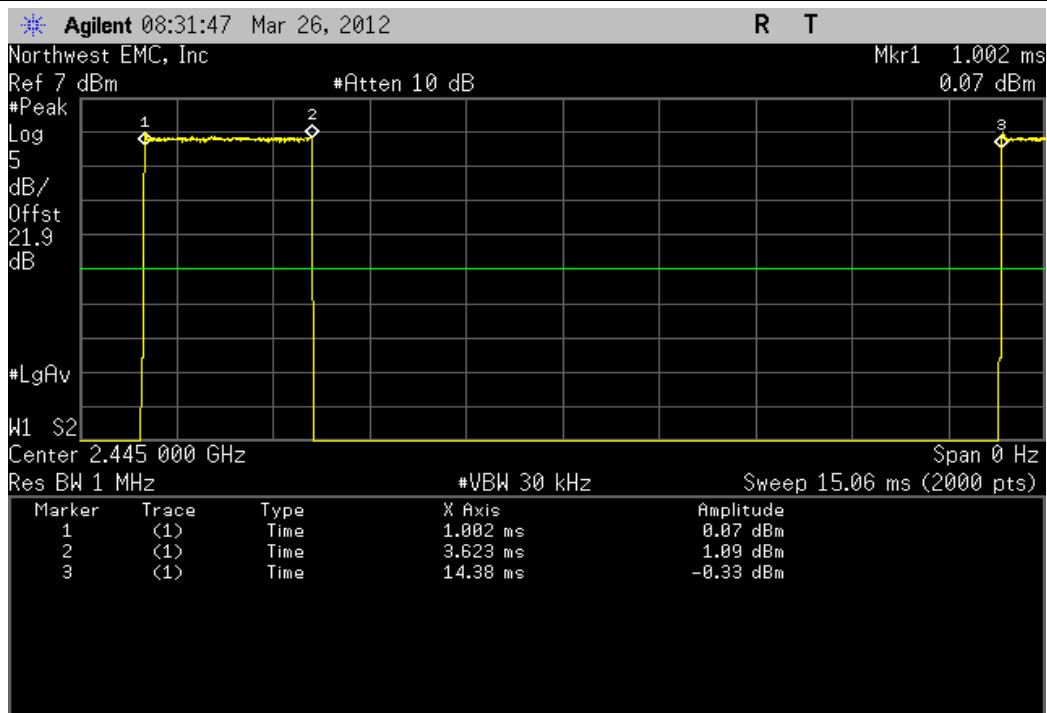
			High			
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
			5		N/A	N/A

Duty Cycle
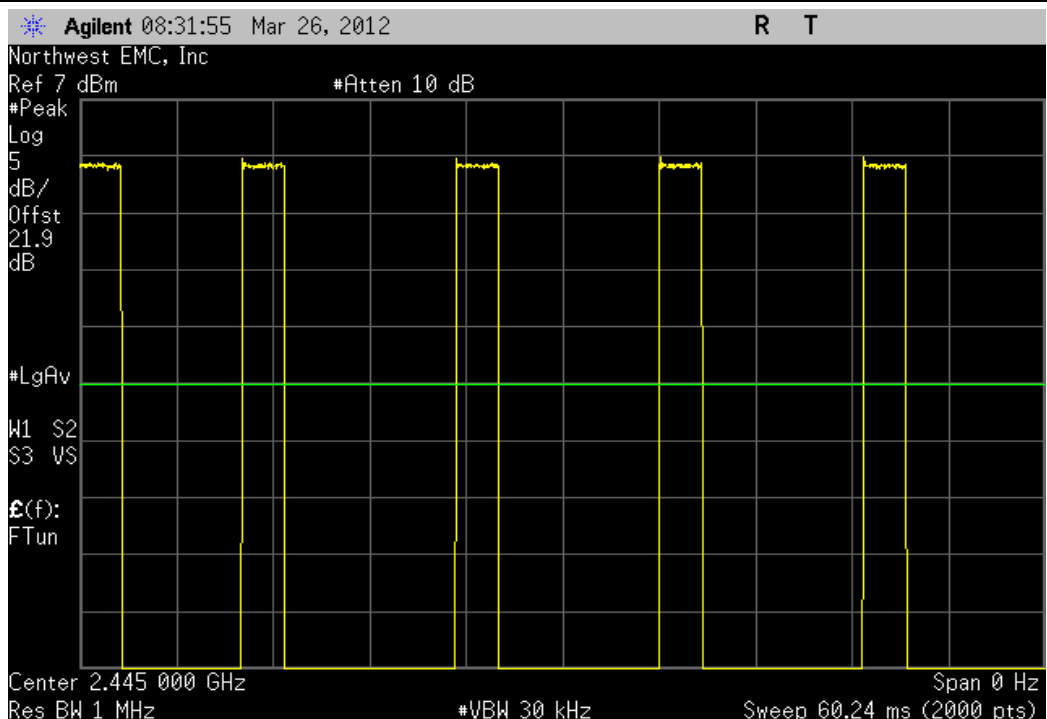
		Mid				
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.614 mS	11.775 mS	1	22.20%	N/A	N/A

		Mid				
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
			5		N/A	N/A