



ThinkEco Inc.

Modlet BN WiFi

FCC 15.207:2014

FCC 15.247:2014

2.4 GHz ISM Radio

Report #: THKE0023.1



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: April 25, 2014
ThinkEco Inc.
Model: Modlet BN WiFi

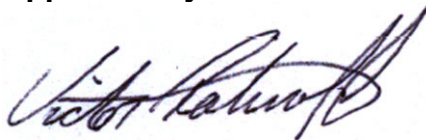
Emissions

Test Description	Specification	Test Method	Pass/Fail
Occupied Bandwidth	FCC 15.247:2014	ANSI C63.10:2009	Pass
Output Power	FCC 15.247:2014	ANSI C63.10:2009	Pass
Power Spectral Density	FCC 15.247:2014	ANSI C63.10:2009	Pass
Band Edge Compliance	FCC 15.247:2014	ANSI C63.10:2009	Pass
Spurious Conducted Emissions	FCC 15.247:2014	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.247:2014	ANSI C63.10:2009	Pass
Powerline Conducted Emissions	FCC 15.207:2014	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:



Victor Ratinoff, Operations Manager



NVLAP Lab Code: 200676-0

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 HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

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

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.

SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

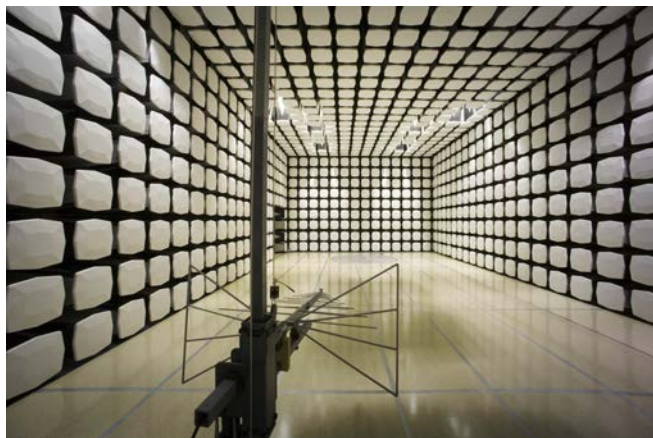
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is listed below. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94



Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05, SU02, SU07 19201 120 th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834F-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	ThinkEco Inc.
Address:	494 Eighth Avenue, 24th Floor
City, State, Zip:	New York, NY 10001
Test Requested By:	Luca Cozza
Model:	Modlet BN WiFi
First Date of Test:	April 24, 2014
Last Date of Test:	April 25, 2014
Receipt Date of Samples:	April 24, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
The modlet BN measures minute-level power use and can be programmed to turn on and off. It contains an embedded Zigbee with a previously certified Wi-Fi module.
Testing Objective:
To demonstrate compliance to FCC 15.247 requirements.

Configuration THKE0023- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Zigbee Radio (open)	ThinkEco Inc.	Modlet BN WiFi	20F85EA11DE3

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Zigbee Radio	DC Power
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration THKE0023- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Zigbee Radio (enclosure)	ThinkEco Inc.	Modlet BN WiFi	20F85EA11DDA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	1.8m	No	Zigbee Radio	AC Mains
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	4/24/2014	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.
2	4/24/2014	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.
3	4/24/2014	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.
4	4/24/2014	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	4/24/2014	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.
6	4/24/2014	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.
7	4/25/2014	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

TEST DESCRIPTION

The Duty Cycle was measured for each of the EUT operating modes. The measurement was made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its maximum setting. Using a near field probe connected to the spectrum analyzer and secured to the EUT where the highest amplitude was found.

The Duty Cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and off time.

➤The EUT operates at 100% Duty Cycle.

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
Multimeter	Fluke	111	MMY	NCR	0
DC Power Supply	Hewlett-Packard	6654A	TPC	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2013	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
Spectrum Analyzer	Agilent	E4446A	AAY	2/22/2013	24

TEST DESCRIPTION


The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

The EUT was 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 the data rate(s) listed in the datasheet.



OCCUPIED BANDWIDTH

XMit 2013.08.15
PsaTx 2014.04.01

EUT: Modlet BN WIFI		Work Order: THKE0023	
Serial Number: 20F85EA11DE3		Date: 04/24/14	
Customer: ThinkEco Inc.		Temperature: 23.1 C° C	
Attendees: None		Humidity: 48%	
Project: None		Barometric Pres.: 1014	
Tested by: Johnny Candelas		Power: 12VDC	
		Job Site: OC13	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
DC Block/20dB Attenuator (20.3dB) + coax cable (1.9dB) = 22.2dB total offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit
Zigbee			Result
Low Channel 11, 2405 MHz		1.425 MHz	≥ 500 kHz Pass
Mid Channel 18, 2440 MHz		1.459 MHz	≥ 500 kHz Pass
High Channel 26, 2480 MHz		1.461 MHz	≥ 500 kHz Pass

Zigbee, Low Channel 11, 2405 MHz

Value	Limit	Result
1.425 MHz	≥ 500 kHz	Pass



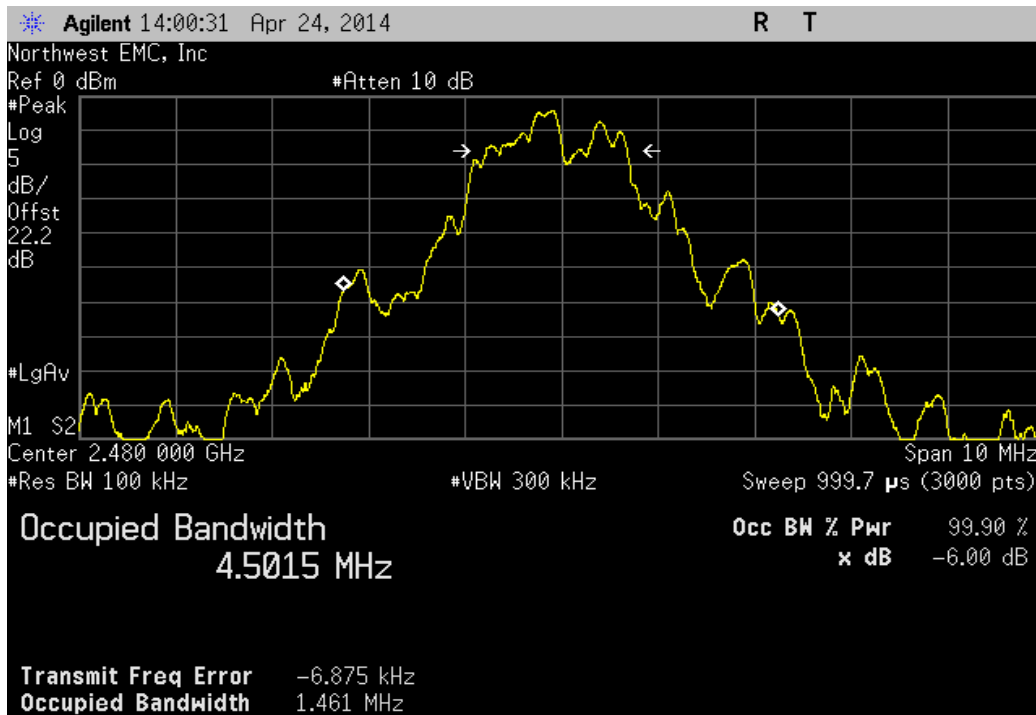
Zigbee, Mid Channel 18, 2440 MHz

Value	Limit	Result
1.459 MHz	≥ 500 kHz	Pass



Zigbee, High Channel 26, 2480 MHz

Value	Limit	Result
1.461 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
Multimeter	Fluke	111	MMY	NCR	0
DC Power Supply	Hewlett-Packard	6654A	TPC	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2013	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
Spectrum Analyzer	Agilent	E4446A	AAY	2/22/2013	24

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Prior to measuring peak transmit power; the DTS bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.


The method found in KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the Emission Bandwidth of the radio.

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



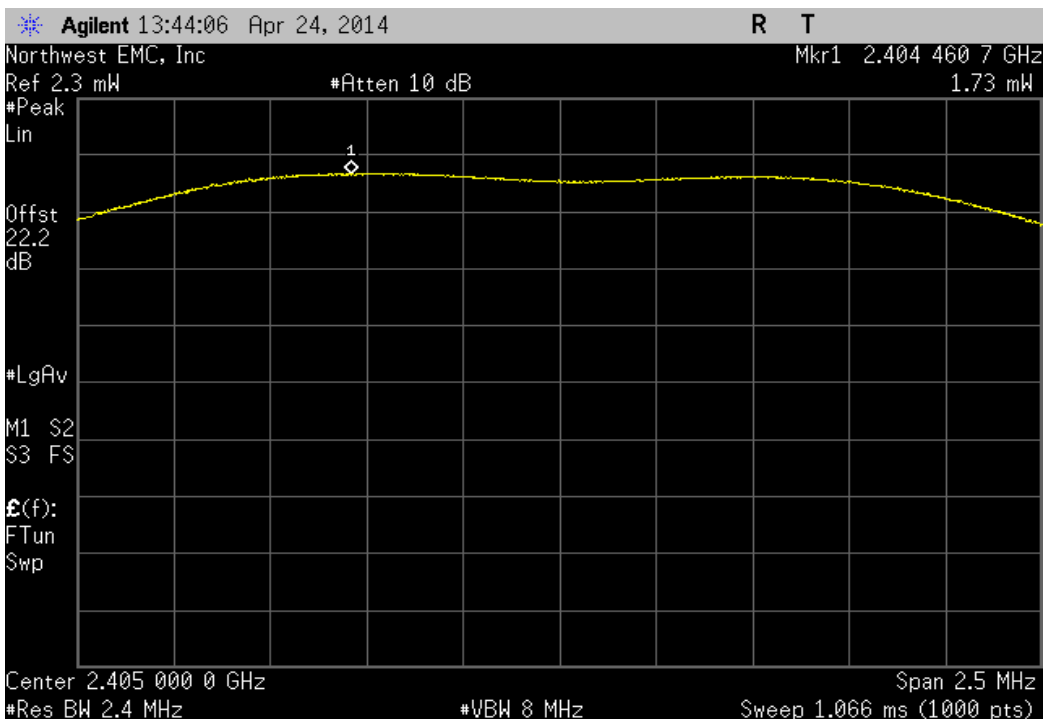
OUTPUT POWER

XMit 2013.08.15
PsaTx 2014.04.01

EUT: Modlet BN WIFI		Work Order: THKE0023	
Serial Number: 20F85EA11DE3		Date: 04/24/14	
Customer: ThinkEco Inc.		Temperature: 23.1 C° C	
Attendees: None		Humidity: 48%	
Project: None		Barometric Pres.: 1014	
Tested by: Johnny Candelas		Power: 12VDC	
		Job Site: OC13	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
DC Block/20dB Attenuator (20.3dB) + coax cable (1.9dB) = 22.2dB total offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit
Zigbee			Result
Low Channel 11, 2405 MHz		1.73 mW	< 1 W
Mid Channel 18, 2440 MHz		1.735 mW	< 1 W
High Channel 26, 2480 MHz		1.686 mW	< 1 W

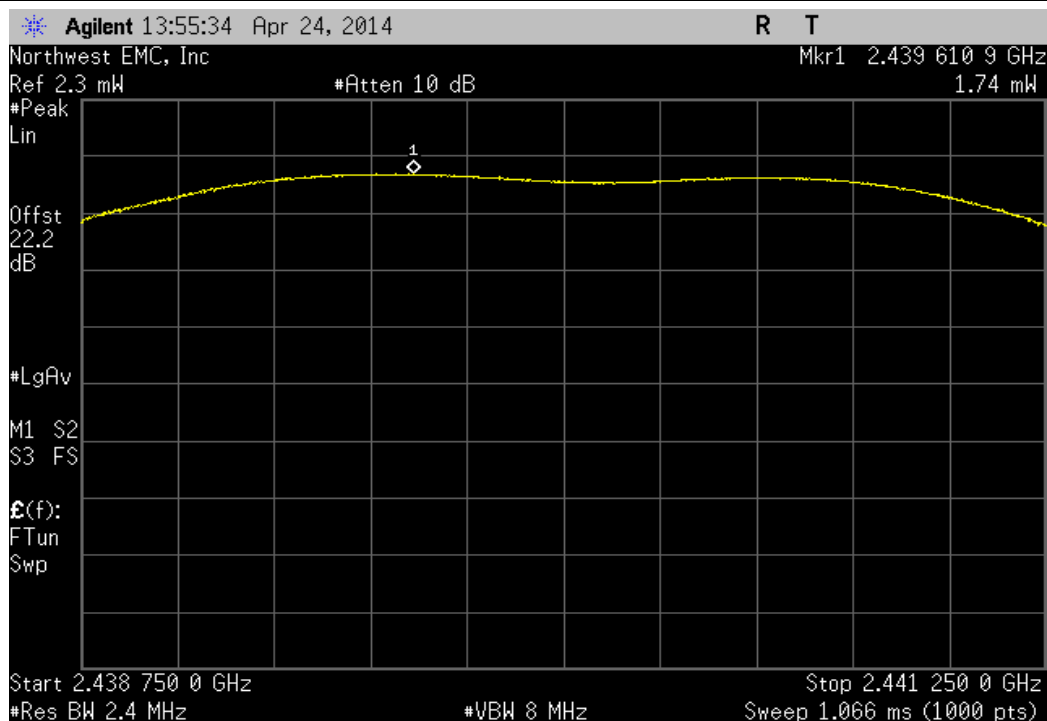
Zigbee, Low Channel 11, 2405 MHz

Value	Limit	Result
1.73 mW	< 1 W	Pass



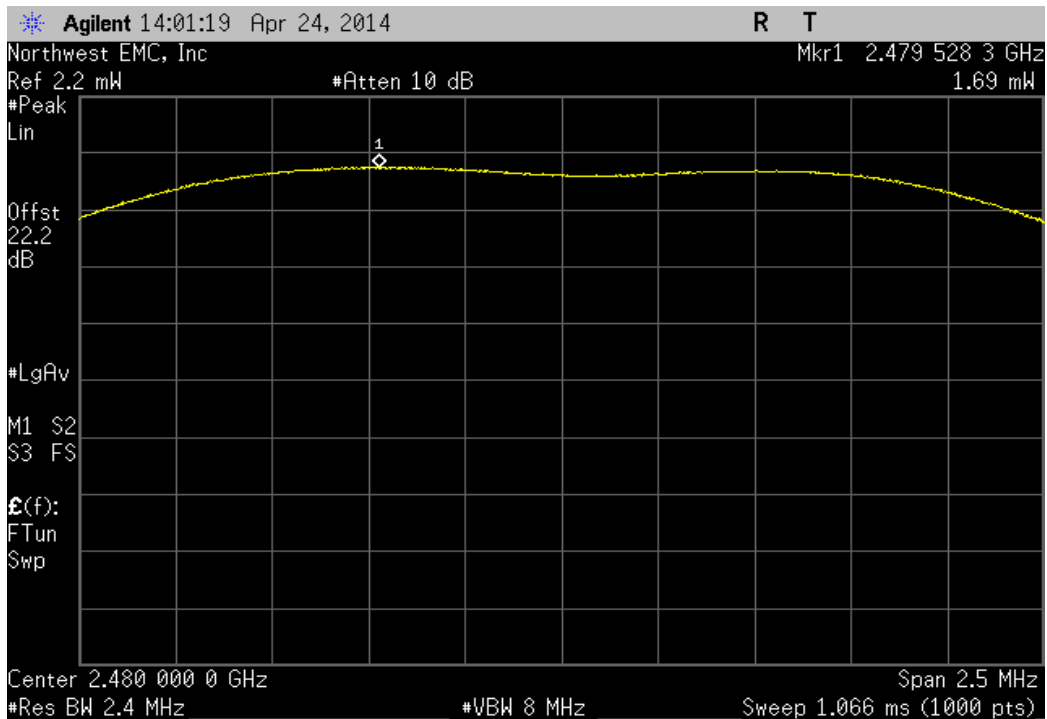
Zigbee, Mid Channel 18, 2440 MHz

Value	Limit	Result
1.735 mW	< 1 W	Pass



Zigbee, High Channel 26, 2480 MHz

Value	Limit	Result
1.686 mW	< 1 W	Pass



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
Multimeter	Fluke	111	MMY	NCR	0
DC Power Supply	Hewlett-Packard	6654A	TPC	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2013	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
Spectrum Analyzer	Agilent	E4446A	AAY	2/22/2013	24

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold


The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

$$BWCF = 10 \cdot \log(3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

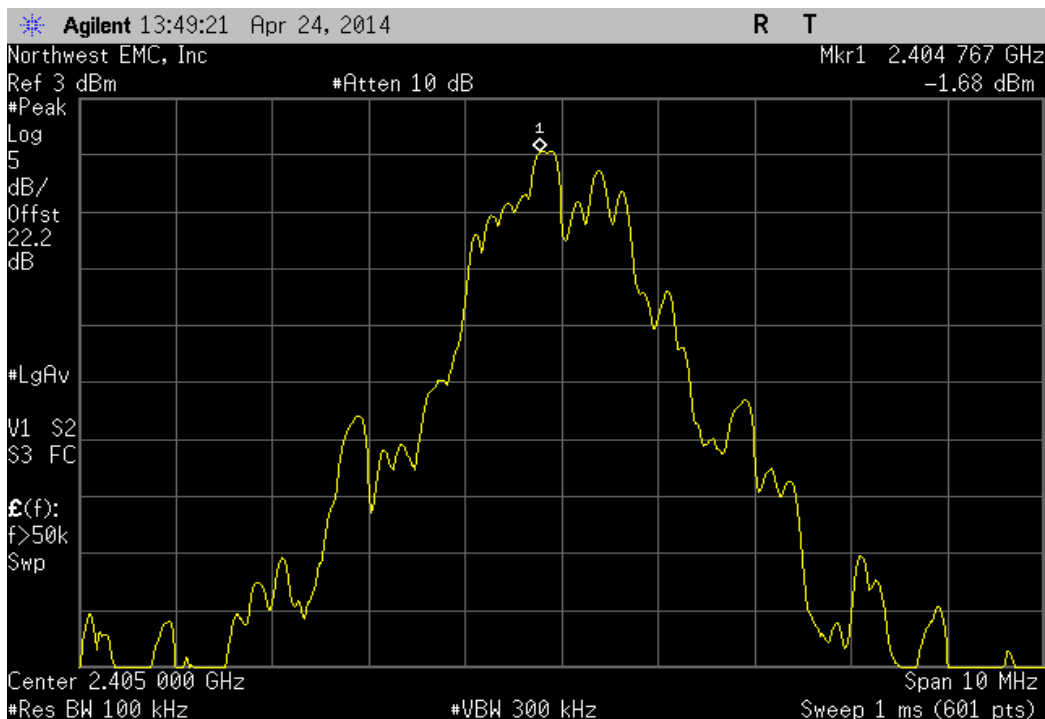


POWER SPECTRAL DENSITY

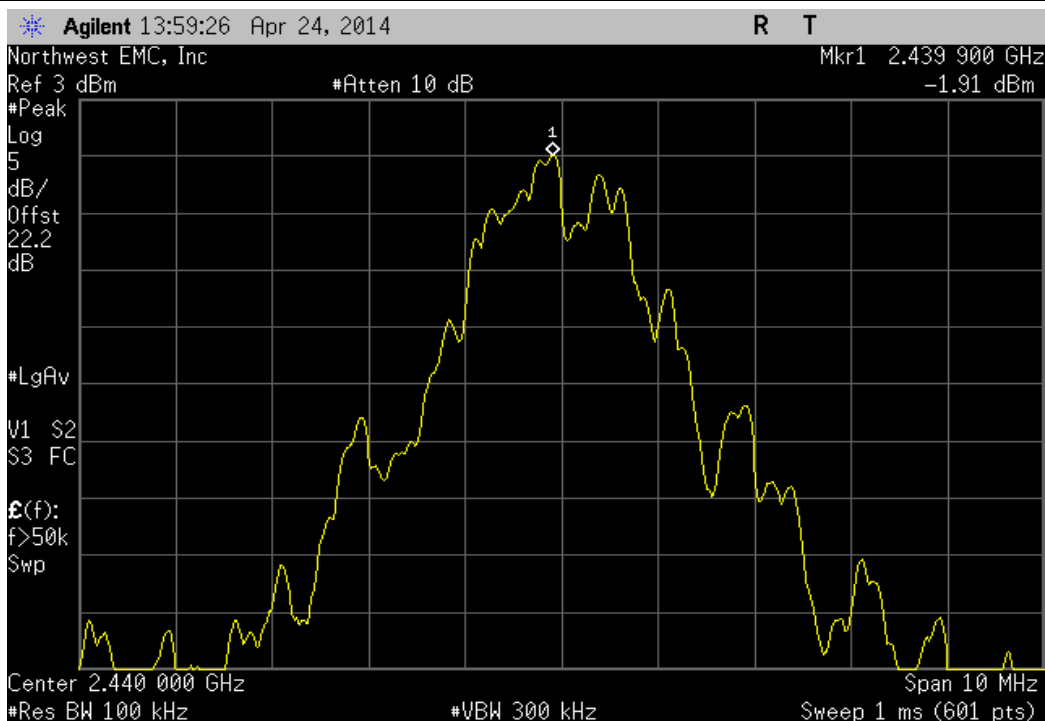
XMit 2013.08.15
PsaTx 2014.04.01

EUT: Modlet BN WIFI		Work Order: THKE0023				
Serial Number: 20F85EA11DE3		Date: 04/24/14				
Customer: ThinkEco Inc.		Temperature: 23.1 C°C				
Attendees: None		Humidity: 48%				
Project: None		Barometric Pres.: 1014				
Tested by: Johnny Candelas		Power: 12VDC				
		Job Site: OC13				
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2014		ANSI C63.10:2009				
COMMENTS						
DC Block/20dB Attenuator (20.3dB) + coax cable (1.9dB) = 22.2dB total offset						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature 				
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
Zigbee						
Low Channel 11, 2405 MHz		-1.676	-15.2	-16.876	8	Pass
Mid Channel 18, 2440 MHz		-1.91	-15.2	-17.11	8	Pass
High Channel 26, 2480 MHz		-1.998	-15.2	-17.198	8	Pass

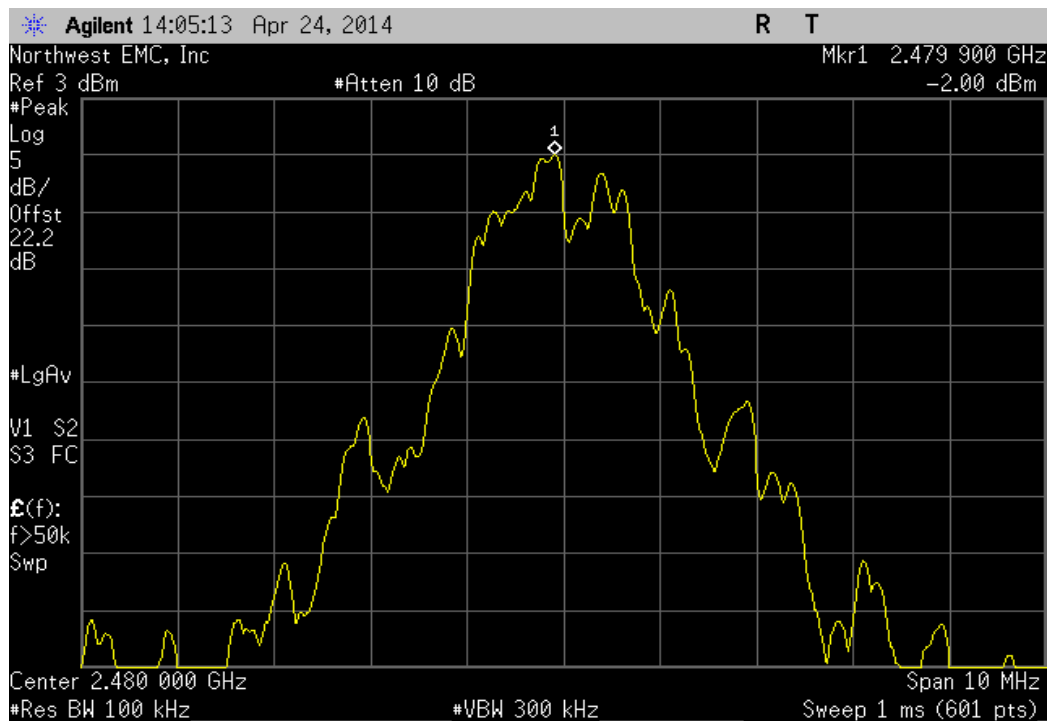
Zigbee, Low Channel 11, 2405 MHz					
	Value	dBm/100kHz	Value	Limit	Result
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	-1.676	-15.2	-16.876	8	Pass



Zigbee, Mid Channel 18, 2440 MHz					
	Value	dBm/100kHz	Value	Limit	Result
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	-1.91	-15.2	-17.11	8	Pass



Zigbee, High Channel 26, 2480 MHz					
	Value	dBm/100kHz	Value	Limit	Result
			To dBm/3kHz		
	-1.998	-15.2	-17.198	8	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
Multimeter	Fluke	111	MMY	NCR	0
DC Power Supply	Hewlett-Packard	6654A	TPC	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2013	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
Spectrum Analyzer	Agilent	E4446A	AAY	2/22/2013	24

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 the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.



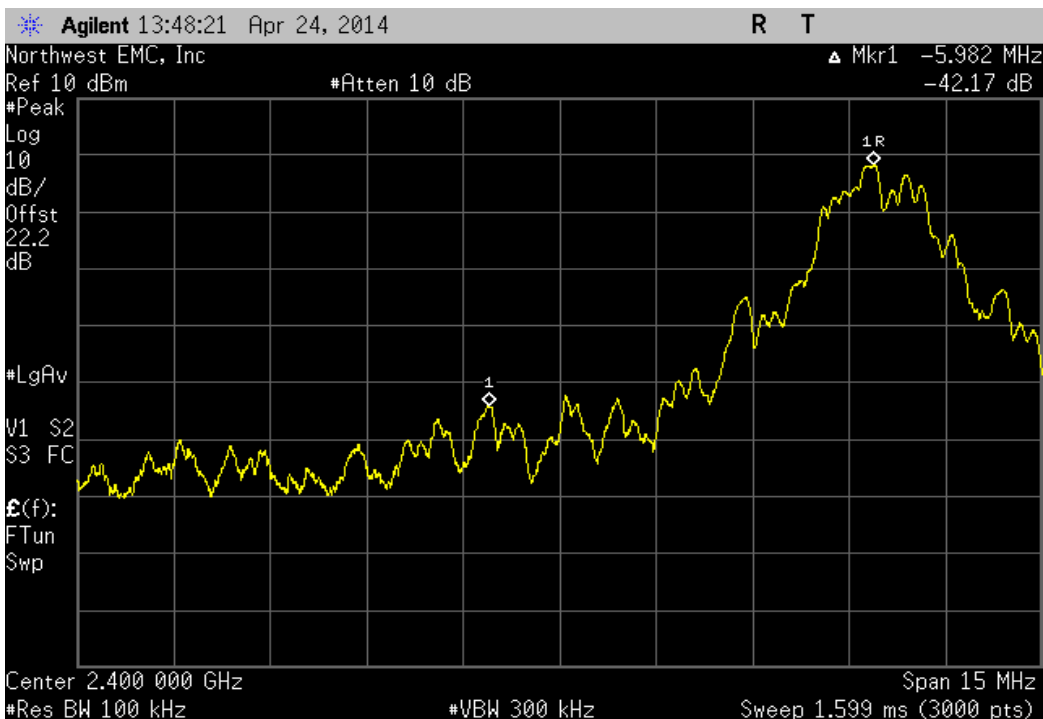
BAND EDGE COMPLIANCE

XMit 2013.08.15
PsaTx 2014.04.01

EUT: Modlet BN WIFI		Work Order: THKE0023	
Serial Number: 20F85EA11DE3		Date: 04/24/14	
Customer: ThinkEco Inc.		Temperature: 23.1 C° C	
Attendees: None		Humidity: 48%	
Project: None		Barometric Pres.: 1014	
Tested by: Johnny Candelas		Power: 12VDC	
		Job Site: OC13	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
DC Block/20dB Attenuator (20.3dB) + coax cable (1.9dB) = 22.2dB total offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit
Zigbee			Result
Low Channel 11, 2405 MHz		-42.18 dBc	≤ -20 dBc
High Channel 26, 2480 MHz		-40.97 dBc	≤ -20 dBc
			Pass
			Pass

Zigbee, Low Channel 11, 2405 MHz

Value	Limit	Result
-42.18 dBc	≤ -20 dBc	Pass



Zigbee, High Channel 26, 2480 MHz

Value	Limit	Result
-40.97 dBc	≤ -20 dBc	Pass





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
Multimeter	Fluke	111	MMY	NCR	0
DC Power Supply	Hewlett-Packard	6654A	TPC	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2013	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
Spectrum Analyzer	Agilent	E4446A	AAY	2/22/2013	24


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 the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

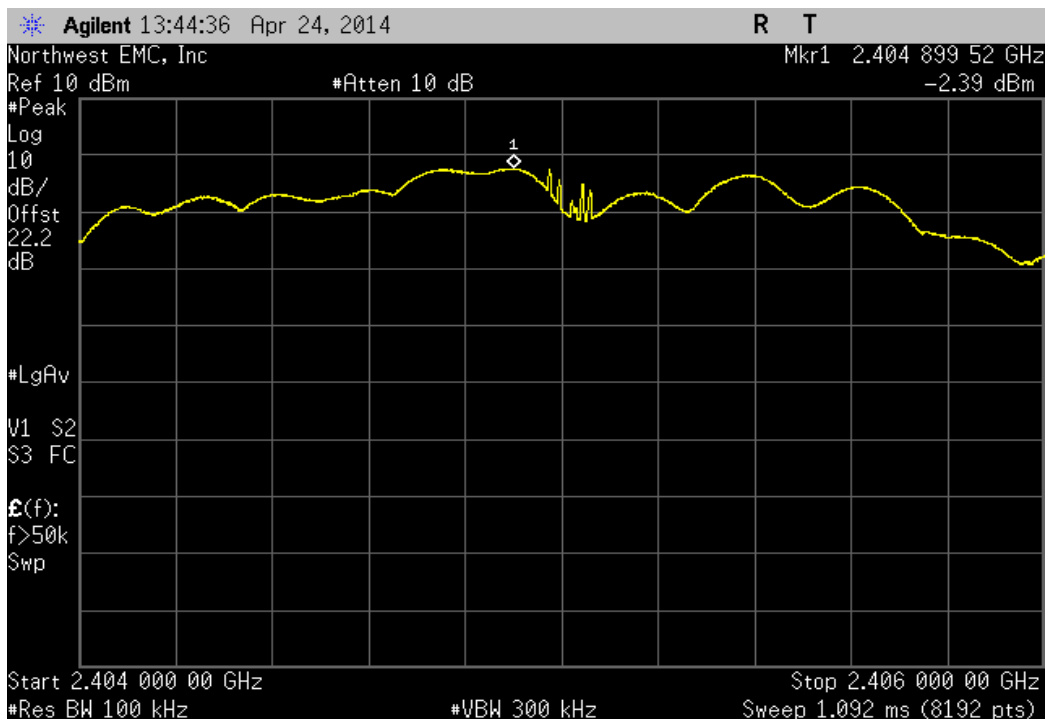


SPURIOUS CONDUCTED EMISSIONS

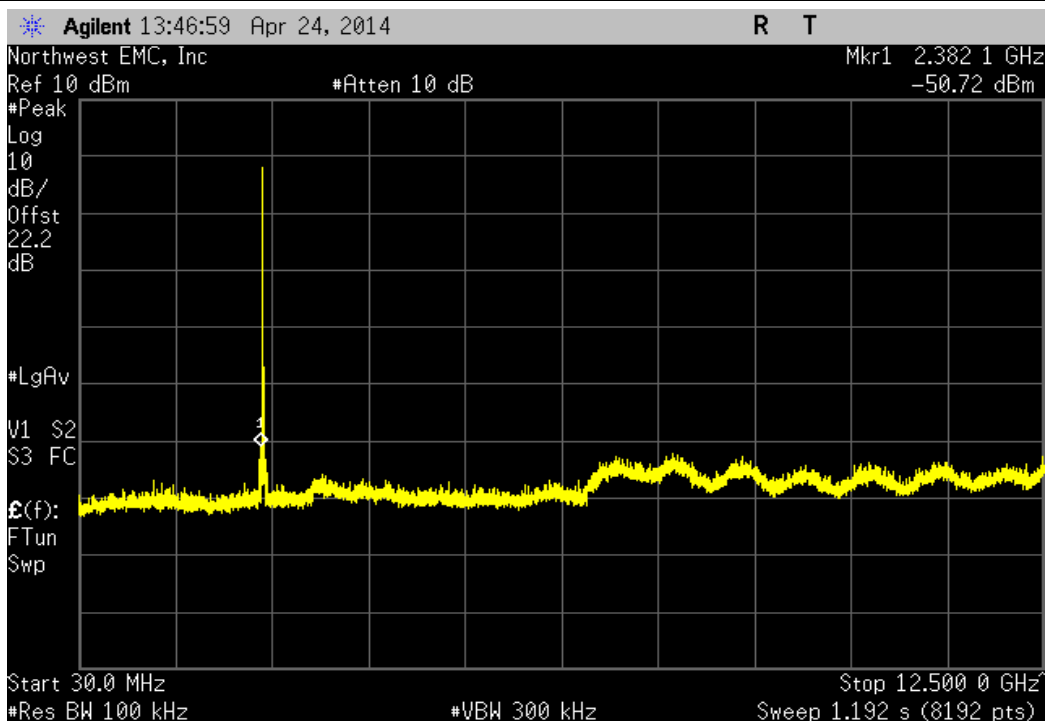
XMit 2013.08.15
PsaTx 2014.04.01

EUT: Modlet BN WIFI		Work Order: THKE0023			
Serial Number: 20F85EA11DE3		Date: 04/24/14			
Customer: ThinkEco Inc.		Temperature: 23.1 C°C			
Attendees: None		Humidity: 48%			
Project: None		Barometric Pres.: 1014			
Tested by: Johnny Candelas		Power: 12VDC			
		Job Site: OC13			
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2014		ANSI C63.10:2009			
COMMENTS					
DC Block/20dB Attenuator (20.3dB) + coax cable (1.9dB) = 22.2dB total offset					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature 			
		Frequency Range	Value	Limit	Result
Zigbee					
Low Channel 11, 2405 MHz		Fundamental	N/A	N/A	N/A
Low Channel 11, 2405 MHz		30 MHz - 12.5 GHz	-48.33 dBc	≤ -20 dBc	Pass
Low Channel 11, 2405 MHz		12.5 GHz - 25 GHz	-44.7 dBc	≤ -20 dBc	Pass
Mid Channel 18, 2440 MHz		Fundamental	N/A	N/A	N/A
Mid Channel 18, 2440 MHz		30 MHz - 12.5 GHz	-50.09 dBc	≤ -20 dBc	Pass
Mid Channel 18, 2440 MHz		12.5 GHz - 25 GHz	-45.01 dBc	≤ -20 dBc	Pass
High Channel 26, 2480 MHz		Fundamental	N/A	N/A	N/A
High Channel 26, 2480 MHz		30 MHz - 12.5 GHz	-44.37 dBc	≤ -20 dBc	Pass
High Channel 26, 2480 MHz		12.5 GHz - 25 GHz	-44.44 dBc	≤ -20 dBc	Pass

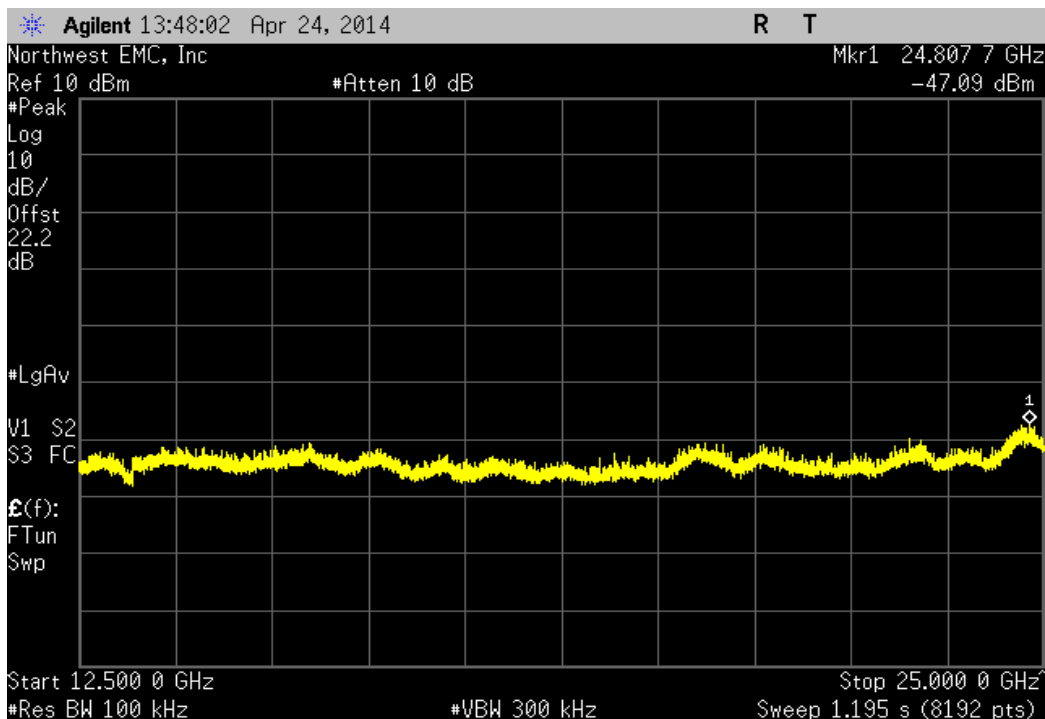
Zigbee, Low Channel 11, 2405 MHz				
Frequency Range		Value	Limit	Result
Fundamental		N/A	N/A	N/A



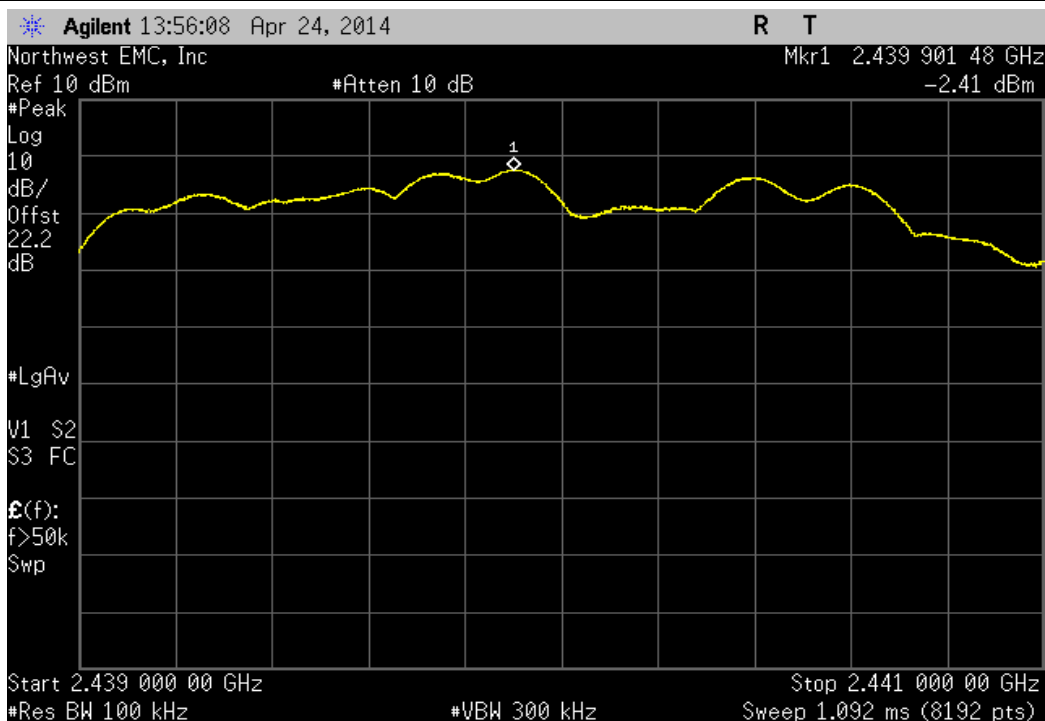
Zigbee, Low Channel 11, 2405 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-48.33 dBc	≤ -20 dBc	Pass



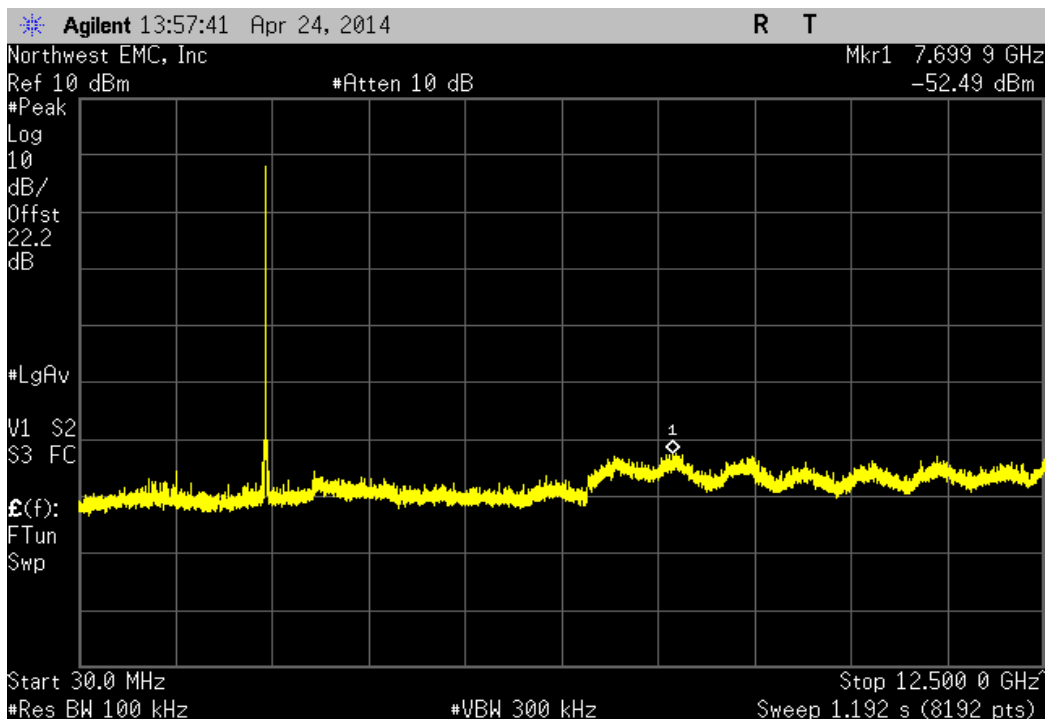
Zigbee, Low Channel 11, 2405 MHz			
Frequency Range	Value	Limit	Result
12.5 GHz - 25 GHz	-44.7 dBc	≤ -20 dBc	Pass



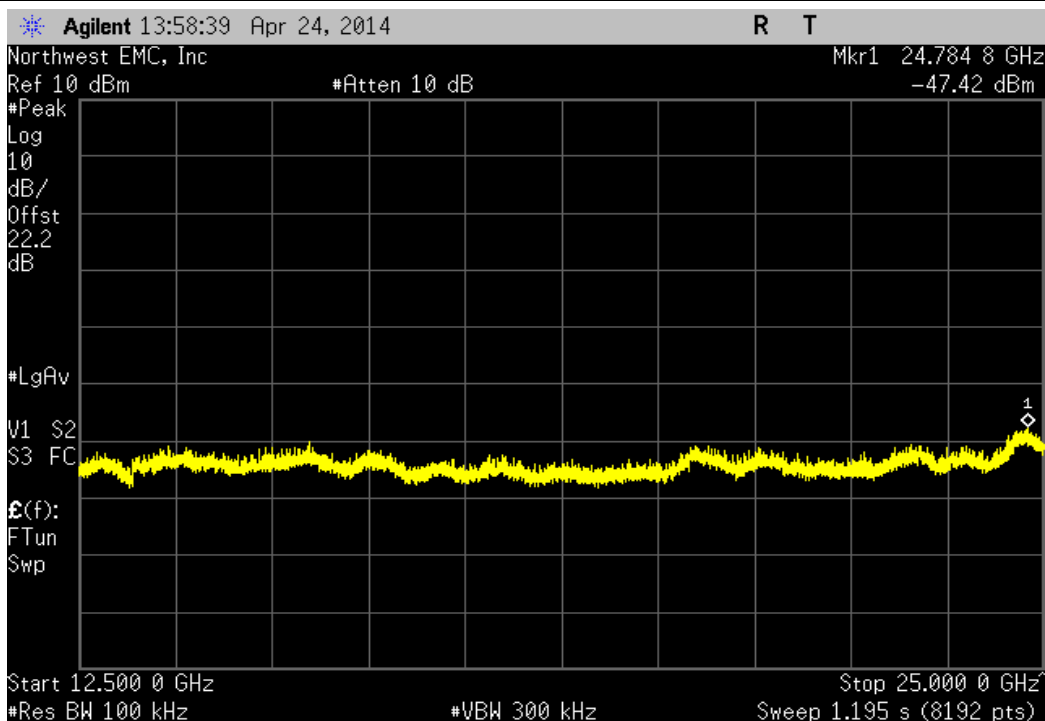
Zigbee, Mid Channel 18, 2440 MHz			
Frequency Range	Value	Limit	Result
Fundamental	N/A	N/A	N/A



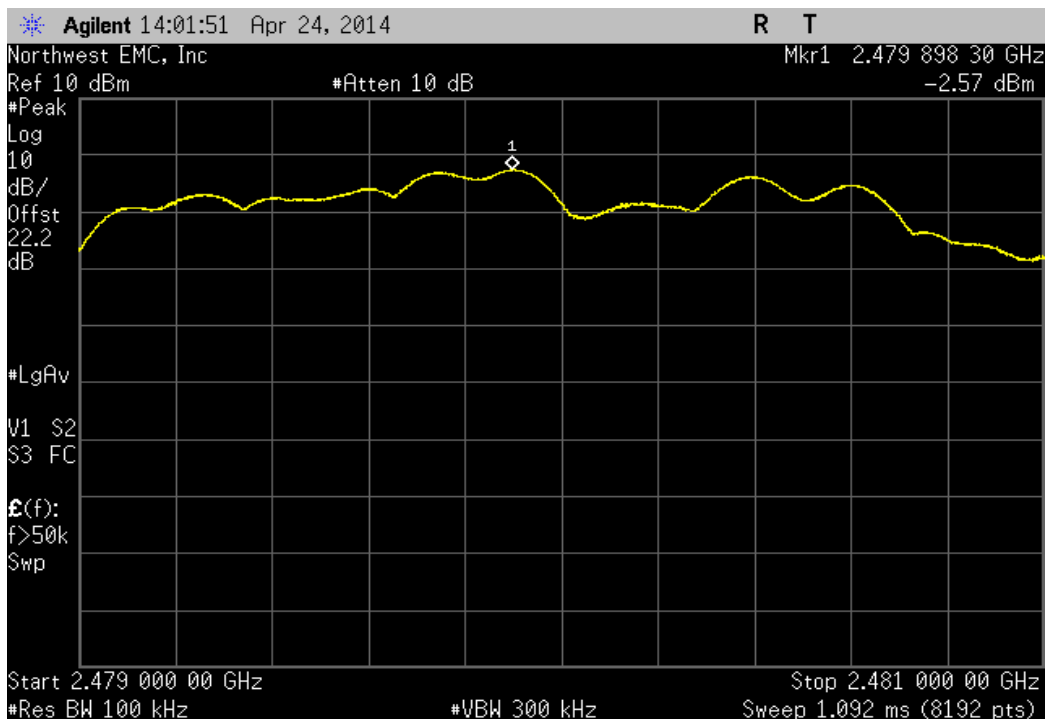
Zigbee, Mid Channel 18, 2440 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-50.09 dBc	≤ -20 dBc	Pass	



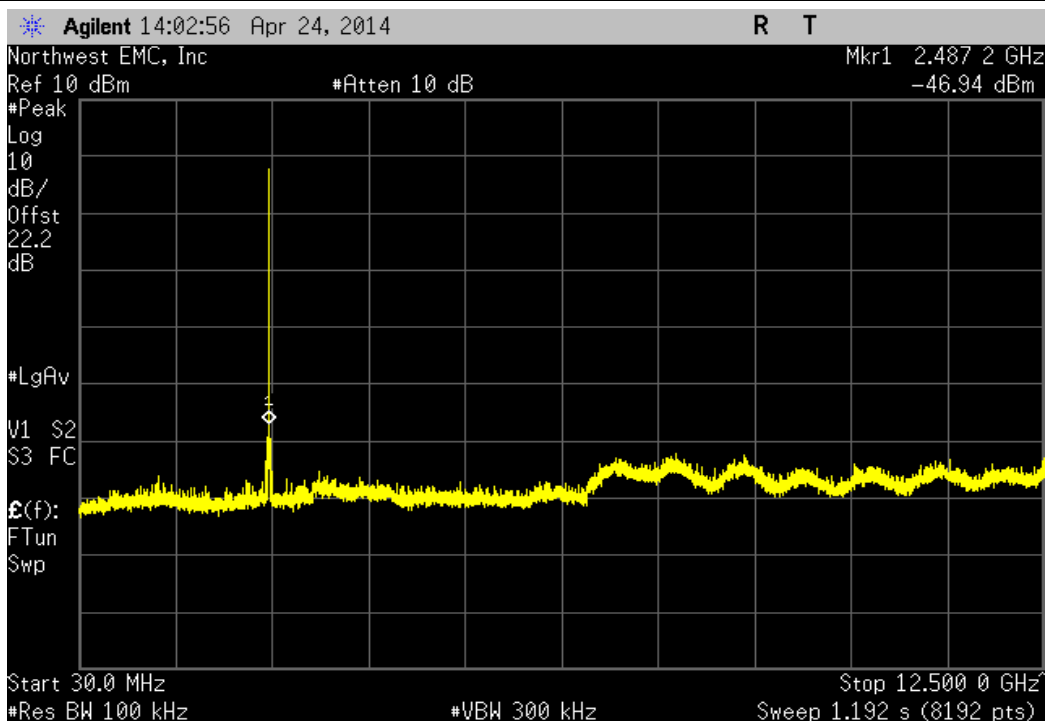
Zigbee, Mid Channel 18, 2440 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-45.01 dBc	≤ -20 dBc	Pass	



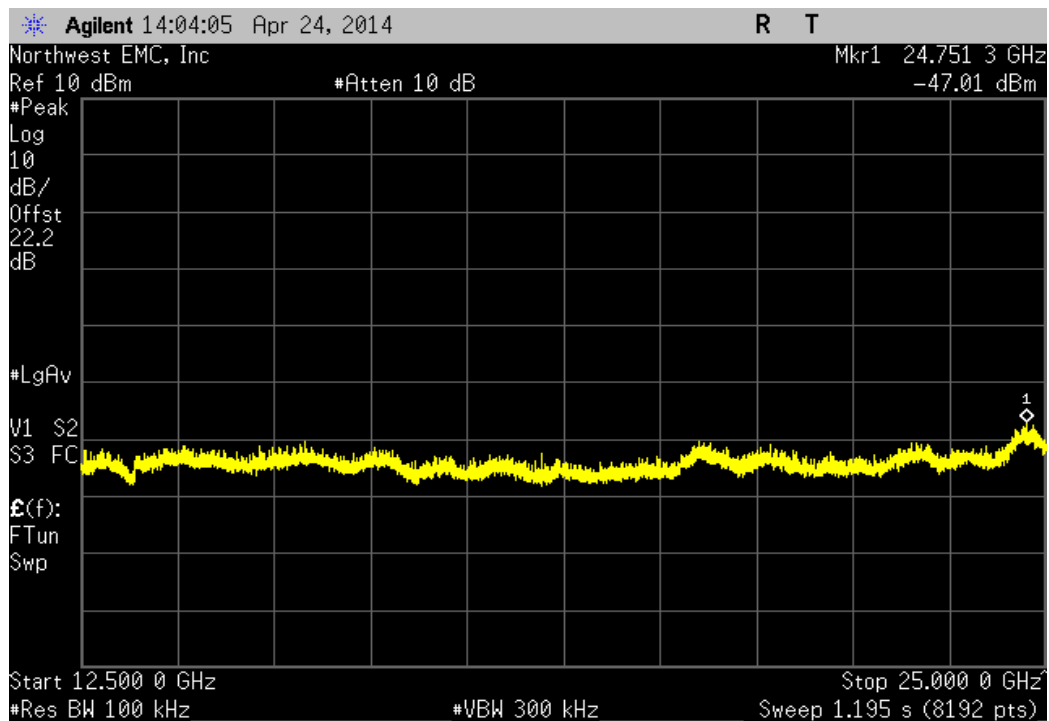
Zigbee, High Channel 26, 2480 MHz				
Frequency Range		Value	Limit	Result
Fundamental		N/A	N/A	N/A



Zigbee, High Channel 26, 2480 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-44.37 dBc	≤ -20 dBc	Pass



Zigbee, High Channel 26, 2480 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-44.44 dBc	≤ -20 dBc	Pass	



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 on Low, Mid, & High Channels (2405, 2440, & 2480 MHz)

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

THKE0023 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz
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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
Low Pass Filter 0-1000 MHz	Micro-Tronics	LPM50004	LFC	11/27/2012	24 mo
Attenuator	Coaxicom	66702 3910AF-20	TKI	6/6/2013	12 mo
HP Filter	Micro-Tronics	HPM50111	HFM	4/2/2012	36 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	1/10/2014	12 mo
OC floating Cable	N/A	18-26GHz RE Cables	OCK	2/6/2014	12 mo
Antenna, Horn	EMCO	3160-09	AHN	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	10/24/2013	12 mo
Antenna, Horn	ETS	3160-08	AHT	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	10/24/2013	12 mo
OC 10 Cables	N/A	8-18GHz RE Cables	OCO	10/24/2013	12 mo
Antenna, Horn	ETS	3160-07	AHR	NCR	0 mo
Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6/6/2013	12 mo
OC10 Cables	N/A	1-8GHz RE Cables	OCJ	10/24/2013	12 mo
Antenna, Horn	EMCO	3115	AHB	3/10/2014	36 mo
Antenna, Biconilog	EMCO	3142	AXB	6/2/2013	36 mo
OC10 Cables	N/A	10kHz-1GHz RE Cables	OCH	6/6/2013	12 mo
Pre-Amplifier	Miteq	AM-1064-9079	AOO	6/6/2013	12 mo
Spectrum Analyzer	Agilent	E4440A	AFA	6/15/2012	24 mo

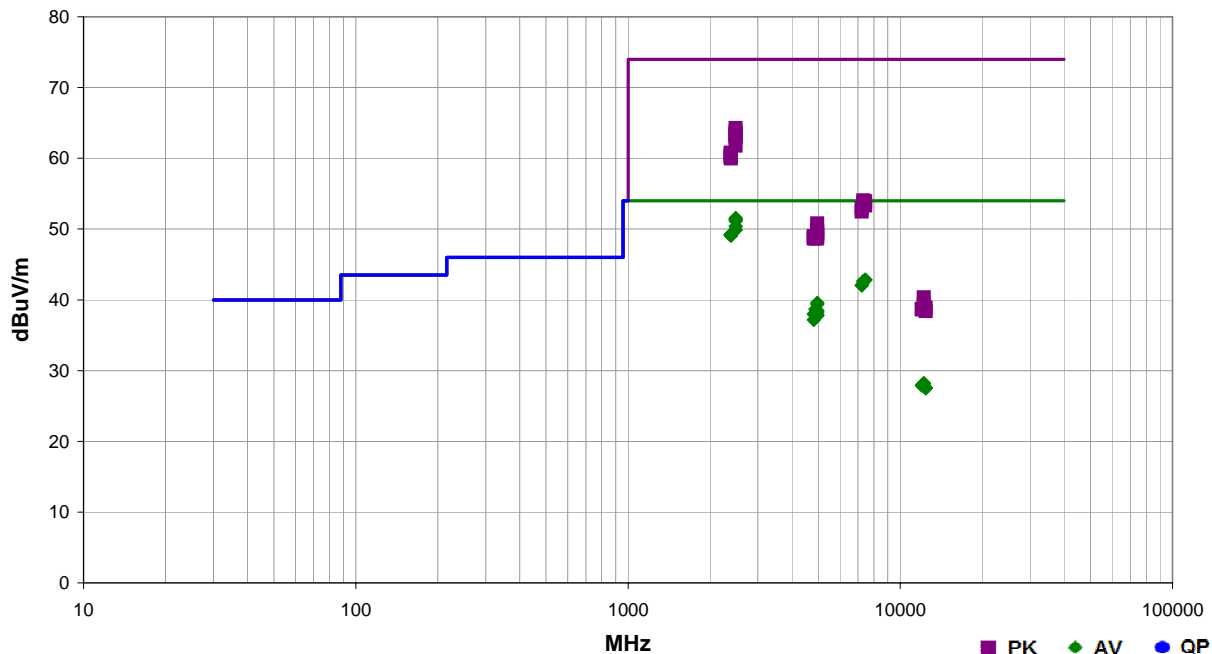
TEST DESCRIPTION

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. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Work Order:	THKE0023	Date:	04/25/14	
Project:	None	Temperature:	23 °C	
Job Site:	OC10	Humidity:	45.4% RH	
Serial Number:	20F85EA11DDA	Barometric Pres.:	1012 mbar	
EUT:		Modlet BN WiFi		
Configuration:	2			
Customer:	ThinkEco Inc.			
Attendees:	None			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting on Low, Mid, & High Channels (2405, 2440, & 2480 MHz)			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.247:2014	ANSI C63.10:2009

Run #	9	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.510	29.8	1.8	1.2	172.0	3.0	20.0	Horz	AV	0.0	51.6	54.0	-2.4	EUT Horiz, High Ch
2483.500	29.6	1.8	2.2	44.0	3.0	20.0	Horz	AV	0.0	51.4	54.0	-2.6	EUT on Side, High Ch
2483.504	29.5	1.8	1.2	12.0	3.0	20.0	Horz	AV	0.0	51.3	54.0	-2.7	EUT Vert, High Ch
2483.500	29.4	1.8	1.0	194.0	3.0	20.0	Vert	AV	0.0	51.2	54.0	-2.8	EUT Vert, High Ch
2483.547	28.6	1.8	1.2	0.0	3.0	20.0	Vert	AV	0.0	50.4	54.0	-3.6	EUT on Side, High Ch
2483.650	28.1	1.8	1.2	293.0	3.0	20.0	Vert	AV	0.0	49.9	54.0	-4.1	EUT Horiz, High Ch
2389.983	27.9	1.4	1.2	309.0	3.0	20.0	Vert	AV	0.0	49.3	54.0	-4.7	EUT Horiz, Low Ch
2390.000	27.8	1.4	1.2	232.0	3.0	20.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT on Side, Low Ch
2390.000	27.8	1.4	1.2	140.0	3.0	20.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT Vert, Low Ch
2389.974	27.8	1.4	1.2	127.0	3.0	20.0	Horz	AV	0.0	49.2	54.0	-4.8	EUT Horiz, Low Ch
2389.953	27.8	1.4	1.3	95.0	3.0	20.0	Horz	AV	0.0	49.2	54.0	-4.8	EUT on Side, Low Ch
2389.957	27.7	1.4	3.1	104.0	3.0	20.0	Horz	AV	0.0	49.1	54.0	-4.9	EUT Vert, Low Ch
2483.550	42.5	1.8	2.2	44.0	3.0	20.0	Horz	PK	0.0	64.3	74.0	-9.7	EUT on Side, High Ch
2483.500	41.9	1.8	1.0	194.0	3.0	20.0	Vert	PK	0.0	63.7	74.0	-10.3	EUT Vert, High Ch
2483.501	41.6	1.8	1.2	172.0	3.0	20.0	Horz	PK	0.0	63.4	74.0	-10.6	EUT Horiz, High Ch
2483.500	41.6	1.8	1.2	0.0	3.0	20.0	Vert	PK	0.0	63.4	74.0	-10.6	EUT on Side, High Ch
2483.500	41.2	1.8	1.2	12.0	3.0	20.0	Horz	PK	0.0	63.0	74.0	-11.0	EUT Vert, High Ch
7440.083	26.8	16.0	1.2	160.0	3.0	0.0	Vert	AV	0.0	42.8	54.0	-11.2	EUT on Side, High Ch
7439.732	26.8	16.0	1.2	100.0	3.0	0.0	Horz	AV	0.0	42.8	54.0	-11.2	EUT Vert, High Ch

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7319.715	26.8	15.8	1.2	216.0	3.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	EUT on Side, Mid Ch
7319.723	26.7	15.8	2.9	194.0	3.0	0.0	Horz	AV	0.0	42.5	54.0	-11.5	EUT Vert, Mid Ch
7215.043	26.7	15.3	3.2	60.0	3.0	0.0	Horz	AV	0.0	42.0	54.0	-12.0	EUT Vert, Low Ch
7214.855	26.7	15.3	1.2	182.0	3.0	0.0	Vert	AV	0.0	42.0	54.0	-12.0	EUT on Side, Low Ch
2483.608	40.0	1.8	1.2	293.0	3.0	20.0	Vert	PK	0.0	61.8	74.0	-12.2	EUT Horiz, High Ch
2389.955	39.4	1.4	1.2	140.0	3.0	20.0	Vert	PK	0.0	60.8	74.0	-13.2	EUT Vert, Low Ch
2390.000	39.3	1.4	1.2	127.0	3.0	20.0	Horz	PK	0.0	60.7	74.0	-13.3	EUT Horiz, Low Ch
2389.996	38.9	1.4	1.2	232.0	3.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	EUT on Side, Low Ch
2389.952	38.9	1.4	1.2	309.0	3.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	EUT Horiz, Low Ch
2389.970	38.8	1.4	1.3	95.0	3.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	EUT on Side, Low Ch
2389.972	38.6	1.4	3.1	104.0	3.0	20.0	Horz	PK	0.0	60.0	74.0	-14.0	EUT Vert, Low Ch
4960.077	28.6	11.0	1.2	0.0	3.0	0.0	Horz	AV	0.0	39.6	54.0	-14.4	EUT Vert, High Ch 1
4959.973	28.4	11.0	1.2	47.0	3.0	0.0	Vert	AV	0.0	39.4	54.0	-14.6	EUT on Side, High Ch 1
4880.063	27.9	10.8	1.2	0.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	EUT Vert, Mid Ch
4959.895	27.5	11.0	1.2	72.0	3.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5	EUT on Side, High Ch
4959.942	27.3	11.0	1.2	149.0	3.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	EUT Horiz, High Ch
4880.000	27.4	10.8	1.2	359.0	3.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8	EUT on Side, Mid Ch
4810.073	27.4	10.6	1.2	360.0	3.0	0.0	Vert	AV	0.0	38.0	54.0	-16.0	EUT on Side, Low Ch
4960.058	26.9	11.0	1.2	312.0	3.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	EUT Vert, High Ch
4960.042	26.8	11.0	1.2	279.0	3.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	EUT Horiz, High Ch
4809.765	26.6	10.6	3.9	346.0	3.0	0.0	Horz	AV	0.0	37.2	54.0	-16.8	EUT Vert, Low Ch
7320.153	38.2	15.8	1.2	216.0	3.0	0.0	Vert	PK	0.0	54.0	74.0	-20.0	EUT on Side, Mid Ch
7439.697	37.9	16.0	1.2	160.0	3.0	0.0	Vert	PK	0.0	53.9	74.0	-20.1	EUT on Side, High Ch
7320.418	37.8	15.8	2.9	194.0	3.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	EUT Vert, Mid Ch
7439.568	37.3	16.0	1.2	100.0	3.0	0.0	Horz	PK	0.0	53.3	74.0	-20.7	EUT Vert, High Ch
7214.795	37.6	15.3	1.2	182.0	3.0	0.0	Vert	PK	0.0	52.9	74.0	-21.1	EUT on Side, Low Ch
7214.765	37.1	15.3	3.2	60.0	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	EUT Vert, Low Ch
4960.448	39.8	11.0	1.2	47.0	3.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	EUT on Side, High Ch
4960.177	38.8	11.0	1.2	72.0	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	EUT on Side, High Ch
4960.223	38.5	11.0	1.2	0.0	3.0	0.0	Horz	PK	0.0	49.5	74.0	-24.5	EUT Vert, High Ch
4960.113	38.1	11.0	1.2	149.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	EUT Horiz, High Ch
4959.672	38.1	11.0	1.2	312.0	3.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	EUT Vert, High Ch
4880.093	38.2	10.8	1.2	0.0	3.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	EUT Vert, Mid Ch
4810.253	38.4	10.6	3.9	346.0	3.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	EUT Vert, Low Ch
4960.355	37.7	11.0	1.2	279.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	EUT Horiz, High Ch
4879.788	37.9	10.8	1.2	359.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	EUT on Side, Mid Ch
4809.945	38.1	10.6	1.2	360.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	EUT on Side, Low Ch
12199.700	37.5	-9.3	1.2	119.0	3.0	0.0	Horz	AV	0.0	28.2	54.0	-25.8	EUT Vert, Mid Ch
12199.860	37.4	-9.3	1.2	179.0	3.0	0.0	Vert	AV	0.0	28.1	54.0	-25.9	EUT on Side, Mid Ch
12024.710	37.4	-9.5	1.2	220.0	3.0	0.0	Horz	AV	0.0	27.9	54.0	-26.1	EUT Vert, Low Ch
12024.540	37.4	-9.5	1.2	235.0	3.0	0.0	Vert	AV	0.0	27.9	54.0	-26.1	EUT on Side, Low Ch
12399.560	36.6	-9.0	1.2	165.0	3.0	0.0	Horz	AV	0.0	27.6	54.0	-26.4	EUT Vert, High Ch
12399.880	36.5	-9.0	1.2	122.0	3.0	0.0	Vert	AV	0.0	27.5	54.0	-26.5	EUT on Side, High Ch
12199.860	49.6	-9.3	1.2	179.0	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	EUT on Side, Mid Ch
12200.270	48.7	-9.3	1.2	119.0	3.0	0.0	Horz	PK	0.0	39.4	74.0	-34.6	EUT Vert, Mid Ch
12399.910	47.9	-9.0	1.2	165.0	3.0	0.0	Horz	PK	0.0	38.9	74.0	-35.1	EUT Vert, High Ch
12024.990	48.2	-9.5	1.2	235.0	3.0	0.0	Vert	PK	0.0	38.7	74.0	-35.3	EUT on Side, Low Ch
12024.650	48.1	-9.5	1.2	220.0	3.0	0.0	Horz	PK	0.0	38.6	74.0	-35.4	EUT Vert, Low Ch
12399.960	47.4	-9.0	1.2	122.0	3.0	0.0	Vert	PK	0.0	38.4	74.0	-35.6	EUT on Side, High Ch

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

MODES OF OPERATION

Transmitting on Low Channel 2405 MHz

Transmitting on Mid Channel 2440 MHz

Transmitting on High Channel 2480 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

THKE0023 - 2

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
LISN	Solar	9252-50-24-BNC	LIA	6/3/2013	12 mo
Attenuator	Pasternack	6N10W-20	AWC	1/3/2014	12 mo
HP Filter	TTE	H97-100K-50-720B	HFP	3/1/2012	36 mo
OC06 Cables	N/A	Telecom Cables	OCP	10/8/2013	12 mo
Receiver	Rohde & Schwarz	ESCI	ARF	5/21/2013	12 mo


MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	BW (kHz)
0.15 - 30.0	1.0
30.0 - 400.0	10.0
400.0 - 1000.0	100.0
1000.0 - 6000.0	1000.0

TEST DESCRIPTION

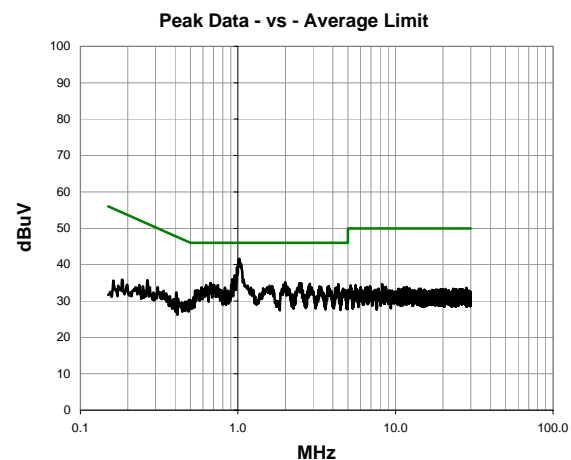
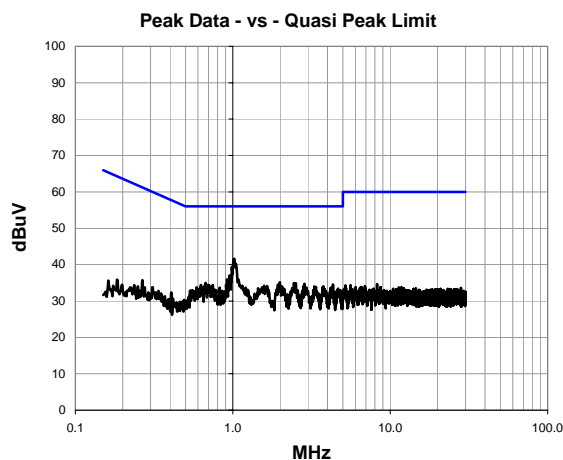
The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT.

The 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.

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on Low Channel 2405 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	1	Line:	High Line	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	21.5	20.1	41.6	56.0	-14.4
0.954	16.9	20.1	37.0	56.0	-19.0
0.918	15.9	20.1	36.0	56.0	-20.0
1.992	15.1	20.1	35.2	56.0	-20.8
0.672	14.9	20.1	35.0	56.0	-21.0
2.448	14.8	20.1	34.9	56.0	-21.1
2.856	14.6	20.1	34.7	56.0	-21.3
4.336	14.4	20.2	34.6	56.0	-21.4
0.696	14.4	20.1	34.5	56.0	-21.5
0.628	14.3	20.1	34.4	56.0	-21.6
0.747	14.3	20.1	34.4	56.0	-21.6
1.584	14.1	20.1	34.2	56.0	-21.8
3.296	13.8	20.2	34.0	56.0	-22.0
3.768	13.8	20.2	34.0	56.0	-22.0
0.589	13.7	20.1	33.8	56.0	-22.2
0.827	13.6	20.1	33.7	56.0	-22.3
4.656	13.2	20.2	33.4	56.0	-22.6
0.855	12.7	20.1	32.8	56.0	-23.2
4.512	12.0	20.2	32.2	56.0	-23.8
2.224	11.7	20.1	31.8	56.0	-24.2


Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	20.5	20.1	40.6	46.0	-5.4
0.954	16.9	20.1	37.0	46.0	-9.0
0.918	15.9	20.1	36.0	46.0	-10.0
1.992	15.1	20.1	35.2	46.0	-10.8
0.672	14.9	20.1	35.0	46.0	-11.0
2.448	14.8	20.1	34.9	46.0	-11.1
2.856	14.6	20.1	34.7	46.0	-11.3
4.336	14.4	20.2	34.6	46.0	-11.4
0.696	14.4	20.1	34.5	46.0	-11.5
0.628	14.3	20.1	34.4	46.0	-11.6
0.747	14.3	20.1	34.4	46.0	-11.6
1.584	14.1	20.1	34.2	46.0	-11.8
3.296	13.8	20.2	34.0	46.0	-12.0
3.768	13.8	20.2	34.0	46.0	-12.0
0.589	13.7	20.1	33.8	46.0	-12.2
0.827	13.6	20.1	33.7	46.0	-12.3
4.656	13.2	20.2	33.4	46.0	-12.6
0.855	12.7	20.1	32.8	46.0	-13.2
4.512	12.0	20.2	32.2	46.0	-13.8
2.224	11.7	20.1	31.8	46.0	-14.2



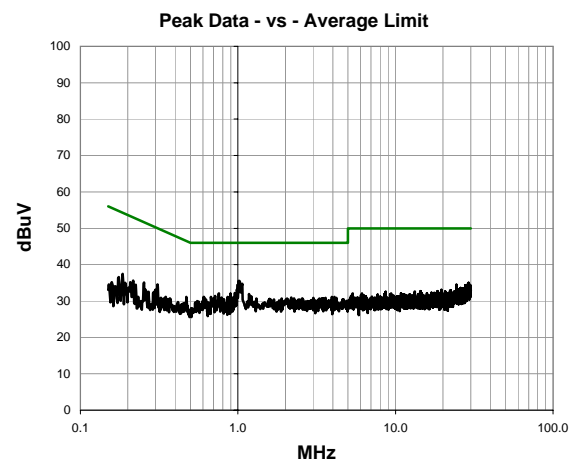
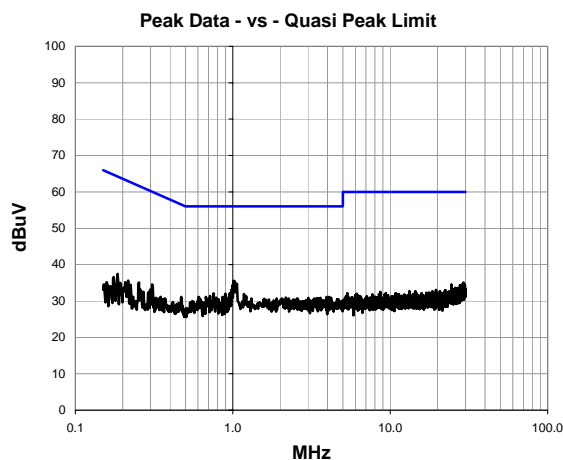
POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2014.02.19
PSA-ESCI Version 2013.2.20

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on Low Channel 2405 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	2	Line:	Neutral	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.008	15.4	20.1	35.5	56.0	-20.5
0.998	14.4	20.1	34.5	56.0	-21.5
0.957	12.1	20.1	32.2	56.0	-23.8
0.757	12.0	20.1	32.1	56.0	-23.9
0.896	11.9	20.1	32.0	56.0	-24.0
0.964	11.8	20.1	31.9	56.0	-24.1
1.176	11.8	20.1	31.9	56.0	-24.1
0.716	11.3	20.1	31.4	56.0	-24.6
0.606	11.0	20.1	31.1	56.0	-24.9
0.675	11.0	20.1	31.1	56.0	-24.9
0.861	11.0	20.1	31.1	56.0	-24.9
3.944	10.9	20.2	31.1	56.0	-24.9
4.096	10.9	20.2	31.1	56.0	-24.9
29.110	13.2	21.8	35.0	60.0	-25.0
0.786	10.9	20.1	31.0	56.0	-25.0
2.176	10.9	20.1	31.0	56.0	-25.0
0.869	10.8	20.1	30.9	56.0	-25.1
0.927	10.8	20.1	30.9	56.0	-25.1
3.600	10.7	20.2	30.9	56.0	-25.1
4.208	10.7	20.2	30.9	56.0	-25.1

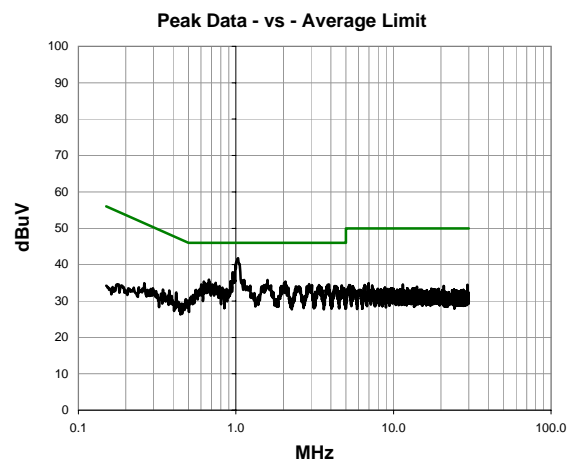
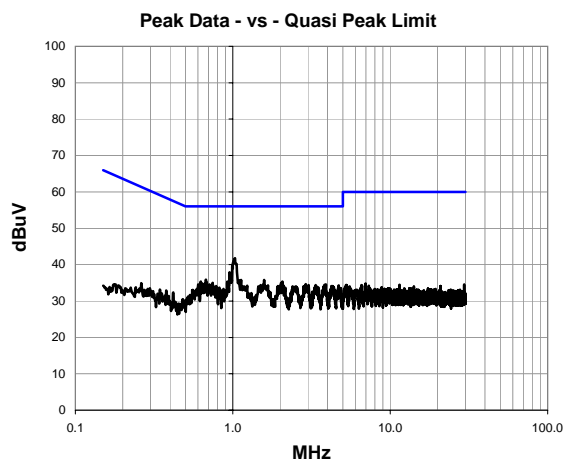
Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.008	15.4	20.1	35.5	46.0	-10.5
0.998	14.4	20.1	34.5	46.0	-11.5
0.957	12.1	20.1	32.2	46.0	-13.8
0.757	12.0	20.1	32.1	46.0	-13.9
0.896	11.9	20.1	32.0	46.0	-14.0
0.964	11.8	20.1	31.9	46.0	-14.1
1.176	11.8	20.1	31.9	46.0	-14.1
0.716	11.3	20.1	31.4	46.0	-14.6
0.606	11.0	20.1	31.1	46.0	-14.9
0.675	11.0	20.1	31.1	46.0	-14.9
0.861	11.0	20.1	31.1	46.0	-14.9
3.944	10.9	20.2	31.1	46.0	-14.9
4.096	10.9	20.2	31.1	46.0	-14.9
29.110	13.2	21.8	35.0	50.0	-15.0
0.786	10.9	20.1	31.0	46.0	-15.0
2.176	10.9	20.1	31.0	46.0	-15.0
0.869	10.8	20.1	30.9	46.0	-15.1
0.927	10.8	20.1	30.9	46.0	-15.1
3.600	10.7	20.2	30.9	46.0	-15.1
4.208	10.7	20.2	30.9	46.0	-15.1

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on Mid Channel 2440 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	3	Line:	High Line	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.032	21.7	20.1	41.8	56.0	-14.2
0.674	15.8	20.1	35.9	56.0	-20.1
1.584	15.7	20.1	35.8	56.0	-20.2
0.626	15.3	20.1	35.4	56.0	-20.6
2.064	15.3	20.1	35.4	56.0	-20.6
0.745	14.9	20.1	35.0	56.0	-21.0
2.912	14.5	20.1	34.6	56.0	-21.4
0.602	14.5	20.1	34.6	56.0	-21.4
0.711	14.5	20.1	34.6	56.0	-21.4
3.896	14.4	20.2	34.6	56.0	-21.4
3.368	14.2	20.2	34.4	56.0	-21.6
4.704	14.1	20.2	34.3	56.0	-21.7
0.786	14.0	20.1	34.1	56.0	-21.9
4.224	13.9	20.2	34.1	56.0	-21.9
2.400	13.9	20.1	34.0	56.0	-22.0
0.820	13.6	20.1	33.7	56.0	-22.3
0.872	13.2	20.1	33.3	56.0	-22.7
3.192	12.3	20.2	32.5	56.0	-23.5
5.000	10.9	20.2	31.1	56.0	-24.9
0.419	12.3	20.1	32.4	57.5	-25.1

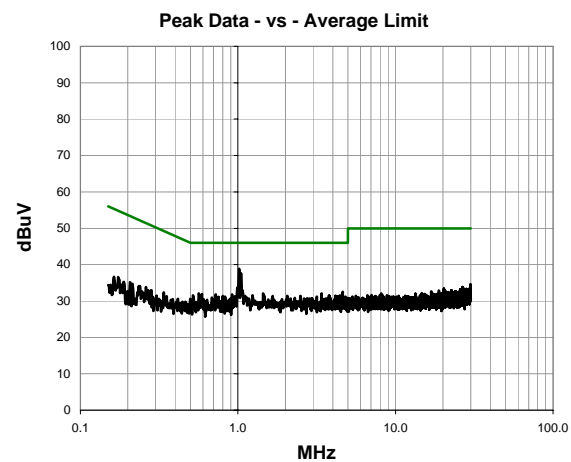
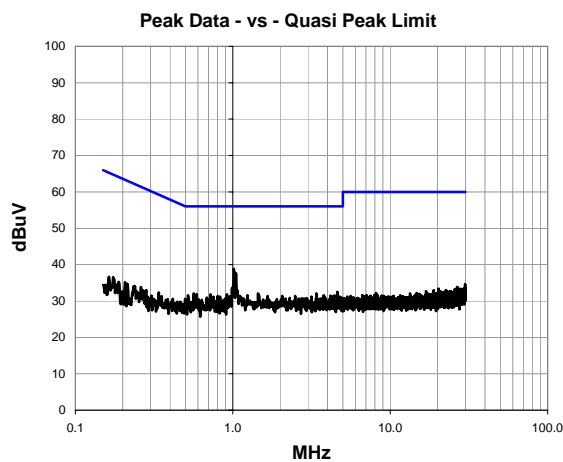
Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.032	20.7	20.1	40.8	46.0	-5.2
0.674	15.8	20.1	35.9	46.0	-10.1
1.584	15.7	20.1	35.8	46.0	-10.2
0.626	15.3	20.1	35.4	46.0	-10.6
2.064	15.3	20.1	35.4	46.0	-10.6
0.745	14.9	20.1	35.0	46.0	-11.0
2.912	14.5	20.1	34.6	46.0	-11.4
0.602	14.5	20.1	34.6	46.0	-11.4
0.711	14.5	20.1	34.6	46.0	-11.4
3.896	14.4	20.2	34.6	46.0	-11.4
3.368	14.2	20.2	34.4	46.0	-11.6
4.704	14.1	20.2	34.3	46.0	-11.7
0.786	14.0	20.1	34.1	46.0	-11.9
4.224	13.9	20.2	34.1	46.0	-11.9
2.400	13.9	20.1	34.0	46.0	-12.0
0.820	13.6	20.1	33.7	46.0	-12.3
0.872	13.2	20.1	33.3	46.0	-12.7
3.192	12.3	20.2	32.5	46.0	-13.5
5.000	10.9	20.2	31.1	46.0	-14.9
0.419	12.3	20.1	32.4	47.5	-15.1

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on Mid Channel 2440 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	4	Line:	Neutral	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	18.8	20.1	38.9	56.0	-17.1
1.048	17.5	20.1	37.6	56.0	-18.4
4.624	12.3	20.2	32.5	56.0	-23.5
0.565	12.0	20.1	32.1	56.0	-23.9
1.448	12.0	20.1	32.1	56.0	-23.9
3.400	11.9	20.2	32.1	56.0	-23.9
0.590	11.8	20.1	31.9	56.0	-24.1
0.723	11.7	20.1	31.8	56.0	-24.2
0.918	11.7	20.1	31.8	56.0	-24.2
0.519	11.5	20.1	31.6	56.0	-24.4
1.240	11.5	20.1	31.6	56.0	-24.4
3.784	11.4	20.2	31.6	56.0	-24.4
4.432	11.4	20.2	31.6	56.0	-24.4
4.160	11.3	20.2	31.5	56.0	-24.5
0.801	11.3	20.1	31.4	56.0	-24.6
1.664	11.3	20.1	31.4	56.0	-24.6
2.056	11.3	20.1	31.4	56.0	-24.6
2.488	11.3	20.1	31.4	56.0	-24.6
3.816	11.2	20.2	31.4	56.0	-24.6
4.336	11.1	20.2	31.3	56.0	-24.7


Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	18.8	20.1	38.9	46.0	-7.1
1.048	17.5	20.1	37.6	46.0	-8.4
4.624	12.3	20.2	32.5	46.0	-13.5
0.565	12.0	20.1	32.1	46.0	-13.9
1.448	12.0	20.1	32.1	46.0	-13.9
3.400	11.9	20.2	32.1	46.0	-13.9
0.590	11.8	20.1	31.9	46.0	-14.1
0.723	11.7	20.1	31.8	46.0	-14.2
0.918	11.7	20.1	31.8	46.0	-14.2
0.519	11.5	20.1	31.6	46.0	-14.4
1.240	11.5	20.1	31.6	46.0	-14.4
3.784	11.4	20.2	31.6	46.0	-14.4
4.432	11.4	20.2	31.6	46.0	-14.4
4.160	11.3	20.2	31.5	46.0	-14.5
0.801	11.3	20.1	31.4	46.0	-14.6
1.664	11.3	20.1	31.4	46.0	-14.6
2.056	11.3	20.1	31.4	46.0	-14.6
2.488	11.3	20.1	31.4	46.0	-14.6
3.816	11.2	20.2	31.4	46.0	-14.6
4.336	11.1	20.2	31.3	46.0	-14.7



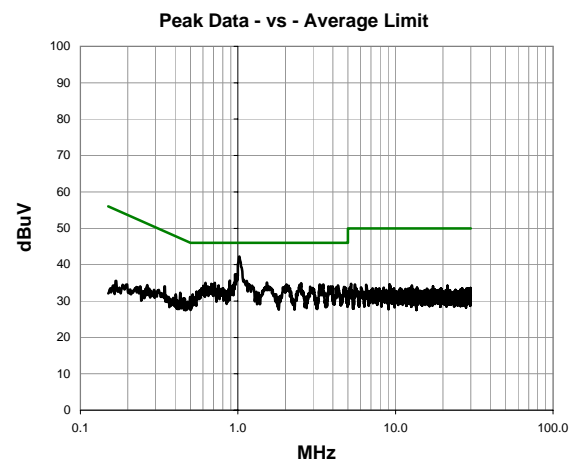
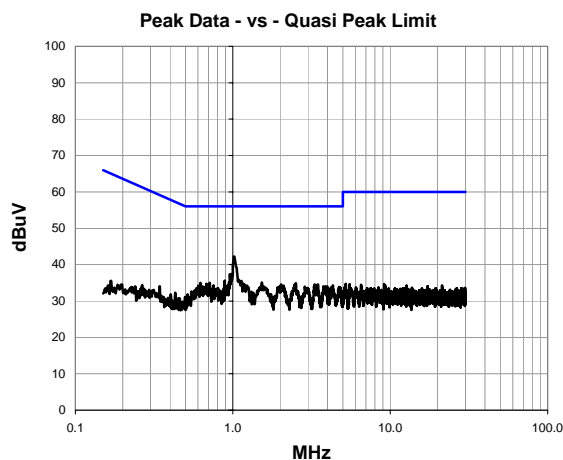
POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2014.02.19
PSA-ESCI Version 2013.2.20

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on High Channel 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	5	Line:	High Line	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	22.1	20.1	42.2	56.0	-13.8
0.888	15.5	20.1	35.6	56.0	-20.4
1.528	15.0	20.1	35.1	56.0	-20.9
0.623	14.9	20.1	35.0	56.0	-21.0
0.713	14.9	20.1	35.0	56.0	-21.0
2.520	14.8	20.1	34.9	56.0	-21.1
0.679	14.6	20.1	34.7	56.0	-21.3
2.032	14.5	20.1	34.6	56.0	-21.4
3.312	14.4	20.2	34.6	56.0	-21.4
3.480	14.4	20.2	34.6	56.0	-21.4
0.753	14.2	20.1	34.3	56.0	-21.7
4.320	14.1	20.2	34.3	56.0	-21.7
0.604	14.1	20.1	34.2	56.0	-21.8
3.752	13.8	20.2	34.0	56.0	-22.0
2.872	13.8	20.1	33.9	56.0	-22.1
4.720	13.7	20.2	33.9	56.0	-22.1
0.874	13.3	20.1	33.4	56.0	-22.6
5.000	12.5	20.2	32.7	56.0	-23.3
1.352	12.2	20.1	32.3	56.0	-23.7
0.517	11.7	20.1	31.8	56.0	-24.2


Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.016	21.1	20.1	41.2	46.0	-4.8
0.888	15.5	20.1	35.6	46.0	-10.4
1.528	15.0	20.1	35.1	46.0	-10.9
0.623	14.9	20.1	35.0	46.0	-11.0
0.713	14.9	20.1	35.0	46.0	-11.0
2.520	14.8	20.1	34.9	46.0	-11.1
0.679	14.6	20.1	34.7	46.0	-11.3
2.032	14.5	20.1	34.6	46.0	-11.4
3.312	14.4	20.2	34.6	46.0	-11.4
3.480	14.4	20.2	34.6	46.0	-11.4
0.753	14.2	20.1	34.3	46.0	-11.7
4.320	14.1	20.2	34.3	46.0	-11.7
0.604	14.1	20.1	34.2	46.0	-11.8
3.752	13.8	20.2	34.0	46.0	-12.0
2.872	13.8	20.1	33.9	46.0	-12.1
4.720	13.7	20.2	33.9	46.0	-12.1
0.874	13.3	20.1	33.4	46.0	-12.6
5.000	12.5	20.2	32.7	46.0	-13.3
1.352	12.2	20.1	32.3	46.0	-13.7
0.517	11.7	20.1	31.8	46.0	-14.2



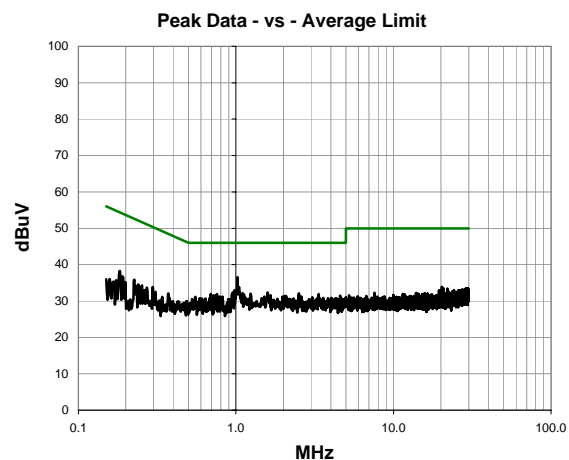
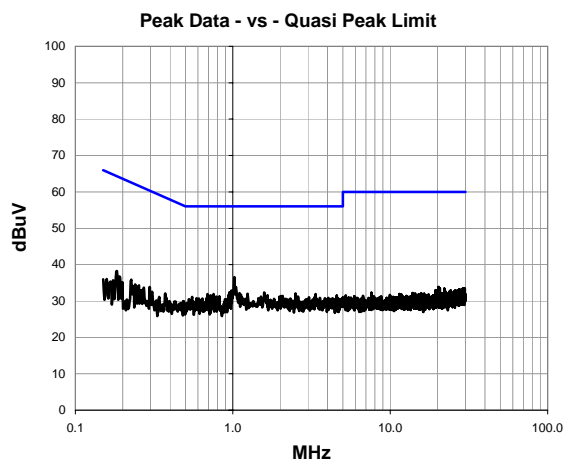
POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2014.02.19
PSA-ESCI Version 2013.2.20

Work Order:	THKE0023	Date:	04/24/14		
Project:	None	Temperature:	24.8 °C		
Job Site:	OC06	Humidity:	39.1% RH		
Serial Number:	20F85EA11DDA	Barometric Pres.:	1013 mbar	Tested by:	Johnny Candelas
EUT:	Modlet BN WiFi				
Configuration:	2				
Customer:	ThinkEco Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting on High Channel 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.207:2014	ANSI C63.10:2009

Run #	6	Line:	Neutral	Ext. Attenuation:	20	Results	Pass
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Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.024	16.5	20.1	36.6	56.0	-19.4
0.980	12.8	20.1	32.9	56.0	-23.1
0.954	12.3	20.1	32.4	56.0	-23.6
1.584	12.3	20.1	32.4	56.0	-23.6
0.961	12.1	20.1	32.2	56.0	-23.8
2.504	12.0	20.1	32.1	56.0	-23.9
1.240	11.9	20.1	32.0	56.0	-24.0
0.692	11.8	20.1	31.9	56.0	-24.1
0.757	11.8	20.1	31.9	56.0	-24.1
3.360	11.7	20.2	31.9	56.0	-24.1
1.120	11.7	20.1	31.8	56.0	-24.2
0.719	11.5	20.1	31.6	56.0	-24.4
1.664	11.5	20.1	31.6	56.0	-24.4
4.576	11.3	20.2	31.5	56.0	-24.5
2.032	11.3	20.1	31.4	56.0	-24.6
0.787	11.1	20.1	31.2	56.0	-24.8
0.821	11.1	20.1	31.2	56.0	-24.8
1.976	11.1	20.1	31.2	56.0	-24.8
0.551	11.0	20.1	31.1	56.0	-24.9
3.048	10.9	20.2	31.1	56.0	-24.9

Peak Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
1.024	16.5	20.1	36.6	46.0	-9.4
0.980	12.8	20.1	32.9	46.0	-13.1
0.954	12.3	20.1	32.4	46.0	-13.6
1.584	12.3	20.1	32.4	46.0	-13.6
0.961	12.1	20.1	32.2	46.0	-13.8
2.504	12.0	20.1	32.1	46.0	-13.9
1.240	11.9	20.1	32.0	46.0	-14.0
0.692	11.8	20.1	31.9	46.0	-14.1
0.757	11.8	20.1	31.9	46.0	-14.1
3.360	11.7	20.2	31.9	46.0	-14.1
1.120	11.7	20.1	31.8	46.0	-14.2
0.719	11.5	20.1	31.6	46.0	-14.4
1.664	11.5	20.1	31.6	46.0	-14.4
4.576	11.3	20.2	31.5	46.0	-14.5
2.032	11.3	20.1	31.4	46.0	-14.6
0.787	11.1	20.1	31.2	46.0	-14.8
0.821	11.1	20.1	31.2	46.0	-14.8
1.976	11.1	20.1	31.2	46.0	-14.8
0.551	11.0	20.1	31.1	46.0	-14.9
3.048	10.9	20.2	31.1	46.0	-14.9