

NORTHWEST EMC

Remote Technologies, Inc.
TXB-ZBM Mini-Zigbee Transceiver Module
FCC 15.247:2015

Report # REMT0002.1



NVLAP Lab Code: 200881-0

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. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: January 07, 2015
Remote Technologies, Inc.
Model: TXB-ZBM Mini-Zigbee Transceiver Module

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2015	ANSI C63.10:2009
FCC 15.247:2015	ANSI C63.10:2009 KDB 558074 V3

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Kyle Holgate, Operations Manager

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. 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		

ACCREDITATIONS AND AUTHORIZATIONS

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

MSIP / 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.

Israel

MOC – Recognized by MOC 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.

SCOPE

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

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

MEASUREMENT UNCERTAINTY

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 on each data sheet. 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 16-4-2 as applicable), and are available upon request.

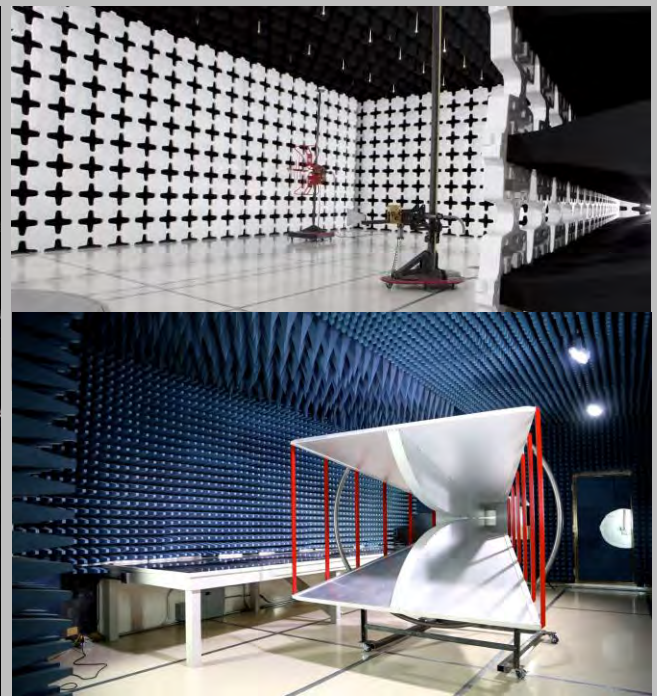
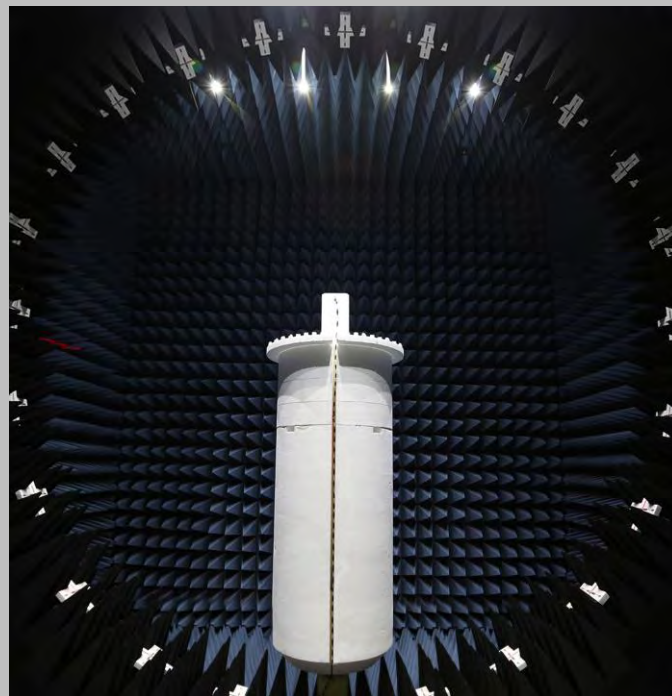
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Remote Technologies, Inc.
Address:	5775 12th Avenue East, Suite 180
City, State, Zip:	Shakopee, MN 55379
Test Requested By:	Mark Melville
Model:	TXB-ZBM Mini-Zigbee Transceiver Module
First Date of Test:	January 05, 2015
Last Date of Test:	January 07, 2015
Receipt Date of Samples:	January 05, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Zigbee radio module operating in the 2.4 GHz band.
Testing Objective:
To demonstrate compliance of the 2.4 GHz Zigbee radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration REMT0002- 1

Software/Firmware Running during test	
Description	Version
Test Software	None

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Mini-Zigbee Transceiver Module	Remote Technologies, Inc.	TXB-ZBM	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Remote Technologies, Inc.	KX2	None
Power Supply	RTI/Netbit	KSAS0101200100M2	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.0m	No	AC Mains	Power Supply
DC Power	No	2.6m	Yes	Power Supply	Development Board

CONFIGURATIONS

Configuration REMT0002- 2

Software/Firmware Running during test	
Description	Version
Test Software	None

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Mini-Zigbee Transceiver Module	Remote Technologies, Inc.	TXB-ZBM	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Remote Technologies, Inc.	KX2	None
Power Supply	RTI/Netbit	KSAS0101200100M2	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.0m	No	AC Mains	Power Supply
DC Power	No	2.6m	Yes	Power Supply	Development Board
DC Power Cable	No	2.15m	No	Zigbee Module	DC Power Supply TPY

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	1/05/2015	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	1/05/2015	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	1/05/2015	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	1/05/2015	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.
5	1/05/2015	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	1/06/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	1/07/2015	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESR7	ARI	05/06/2014	12 mo
Attenuator 20dB, BNC	Fairview Microwave	SA01B-20	AQP	07/22/2014	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HGN	05/23/2014	12 mo
LISN	Solar	9252-50-R-24-BNC	LIQ	11/06/2014	12 mo
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	05/15/2014	12 mo
MN03 Cables	ESM Cable Corp.	Conducted Cables	MNC	11/20/2014	12 mo
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

REMT0002-2

MODES INVESTIGATED

Transmitting Zigbee high channel
Transmitting Zigbee low channel
Transmitting Zigbee mid channel

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	6	Line:	Negative Lead	Ext. Attenuation (dB):	20
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COMMENTS

None

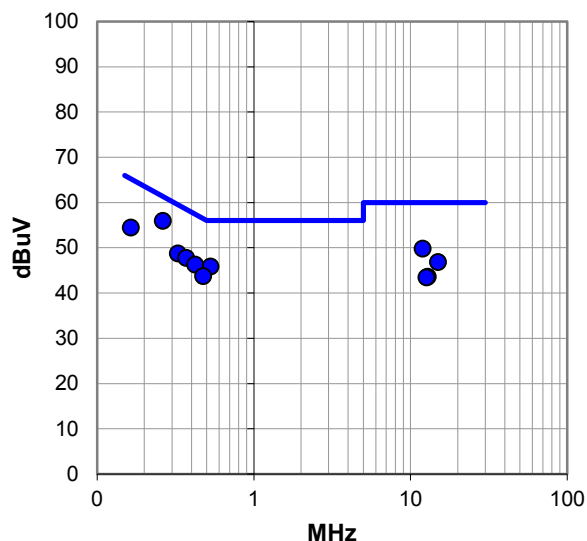
EUT OPERATING MODES

Transmitting Zigbee low channel

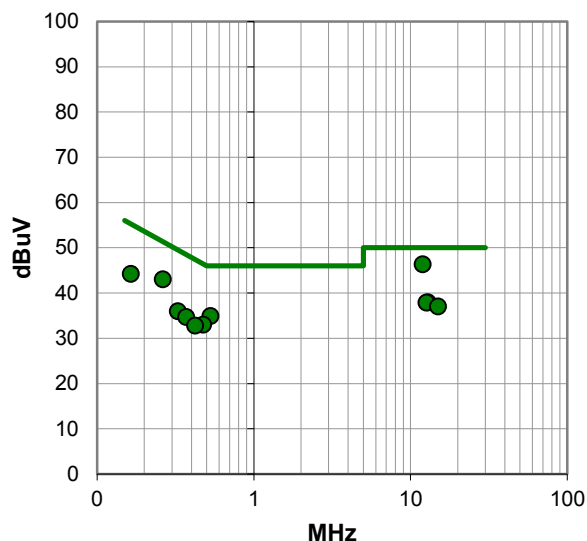
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.263	35.8	20.1	55.9	61.3	-5.4
12.000	29.0	20.8	49.8	60.0	-10.2
0.529	25.6	20.2	45.8	56.0	-10.2
0.329	28.6	20.2	48.8	59.5	-10.7
0.370	27.6	20.2	47.8	58.5	-10.7
0.164	34.2	20.2	54.4	65.3	-10.8
0.422	26.1	20.2	46.3	57.4	-11.1
0.476	23.5	20.2	43.7	56.4	-12.7
15.000	25.8	21.0	46.8	60.0	-13.2
12.921	22.7	20.9	43.6	60.0	-16.4
12.650	22.6	20.8	43.4	60.0	-16.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	25.5	20.8	46.3	50.0	-3.7
0.263	22.9	20.1	43.0	51.3	-8.3
0.164	24.0	20.2	44.2	55.3	-11.0
0.529	14.7	20.2	34.9	46.0	-11.1
12.921	17.1	20.9	38.0	50.0	-12.0
12.650	17.0	20.8	37.8	50.0	-12.2
15.000	16.0	21.0	37.0	50.0	-13.0
0.476	12.8	20.2	33.0	46.4	-13.4
0.329	15.8	20.2	36.0	49.5	-13.5
0.370	14.5	20.2	34.7	48.5	-13.8
0.422	12.6	20.2	32.8	47.4	-14.6

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	7	Line:	Positive Lead	Ext. Attenuation (dB):	20
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COMMENTS

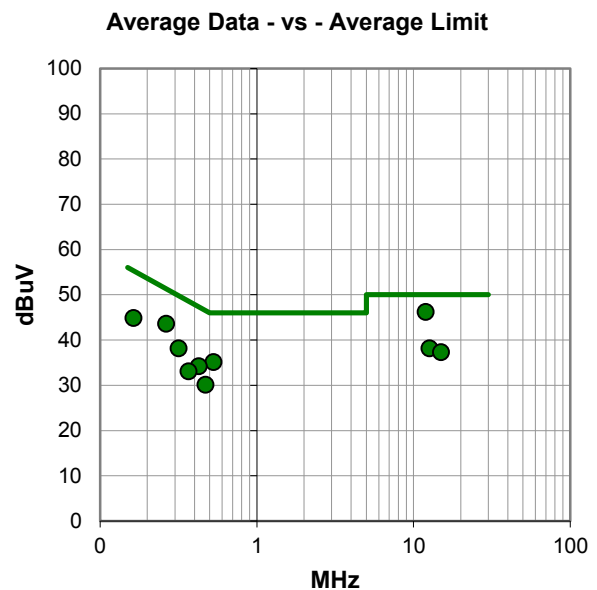
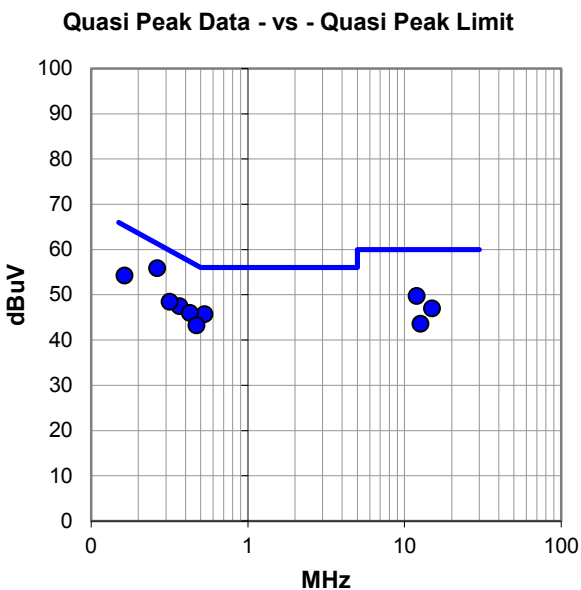
None

EUT OPERATING MODES

Transmitting Zigbee low channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.264	35.7	20.1	55.8	61.3	-5.5
12.001	28.9	20.8	49.7	60.0	-10.3
0.529	25.5	20.2	45.7	56.0	-10.3
0.163	34.0	20.2	54.2	65.3	-11.1
0.368	27.3	20.2	47.5	58.6	-11.1
0.318	28.3	20.2	48.5	59.8	-11.3
0.426	25.8	20.2	46.0	57.3	-11.3
15.000	26.0	21.0	47.0	60.0	-13.0
0.471	23.0	20.2	43.2	56.5	-13.3
12.672	22.7	20.8	43.5	60.0	-16.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.001	25.4	20.8	46.2	50.0	-3.8
0.264	23.4	20.1	43.5	51.3	-7.8
0.163	24.6	20.2	44.8	55.3	-10.5
0.529	14.9	20.2	35.1	46.0	-10.9
0.318	18.0	20.2	38.2	49.8	-11.6
12.672	17.3	20.8	38.1	50.0	-11.9
15.000	16.3	21.0	37.3	50.0	-12.7
0.426	14.0	20.2	34.2	47.3	-13.1
0.368	12.9	20.2	33.1	48.6	-15.5
0.471	9.9	20.2	30.1	46.5	-16.4

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	8	Line:	Positive Lead	Ext. Attenuation (dB):	20
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COMMENTS

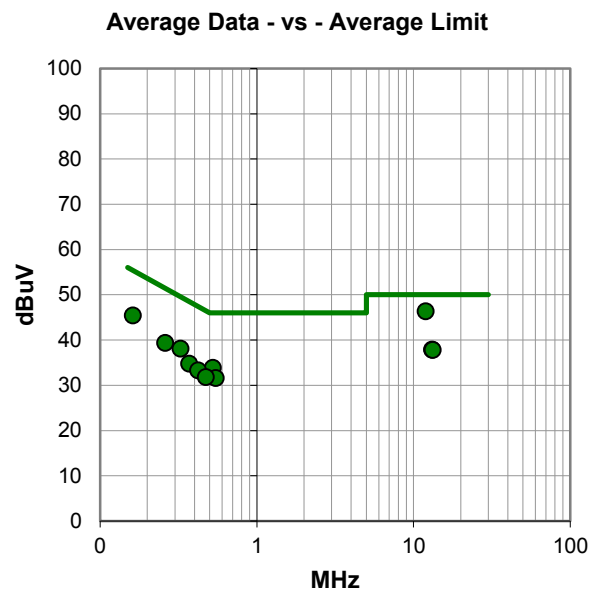
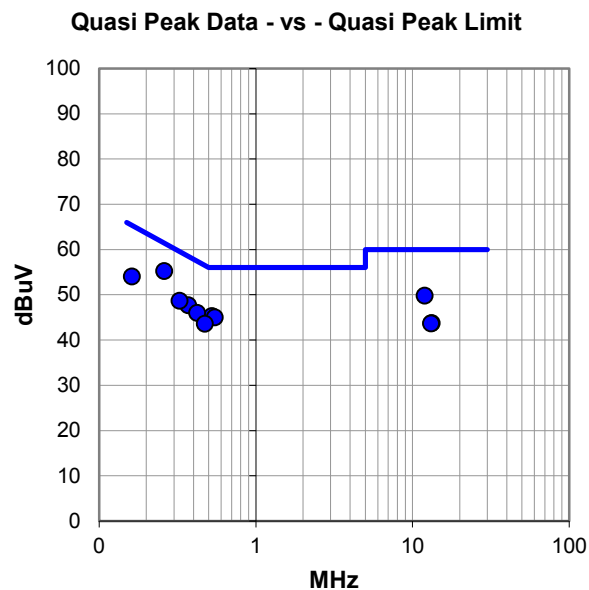
None

EUT OPERATING MODES

Transmitting Zigbee mid channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.260	35.1	20.1	55.2	61.4	-6.2
12.000	29.0	20.8	49.8	60.0	-10.2
0.526	25.1	20.2	45.3	56.0	-10.7
0.370	27.5	20.2	47.7	58.5	-10.8
0.326	28.5	20.2	48.7	59.5	-10.9
0.549	24.8	20.2	45.0	56.0	-11.0
0.162	33.8	20.2	54.0	65.4	-11.3
0.423	25.8	20.2	46.0	57.4	-11.4
0.474	23.4	20.2	43.6	56.4	-12.8
13.264	22.8	20.9	43.7	60.0	-16.3
13.178	22.8	20.9	43.7	60.0	-16.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	25.5	20.8	46.3	50.0	-3.7
0.162	25.2	20.2	45.4	55.4	-9.9
0.326	17.9	20.2	38.1	49.5	-11.5
0.260	19.2	20.1	39.3	51.4	-12.1
13.178	17.0	20.9	37.9	50.0	-12.1
0.526	13.6	20.2	33.8	46.0	-12.2
13.264	16.9	20.9	37.8	50.0	-12.2
0.370	14.6	20.2	34.8	48.5	-13.7
0.423	13.1	20.2	33.3	47.4	-14.1
0.549	11.4	20.2	31.6	46.0	-14.4
0.474	11.6	20.2	31.8	46.4	-14.6

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	9	Line:	Negative Lead	Ext. Attenuation (dB):	20
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COMMENTS

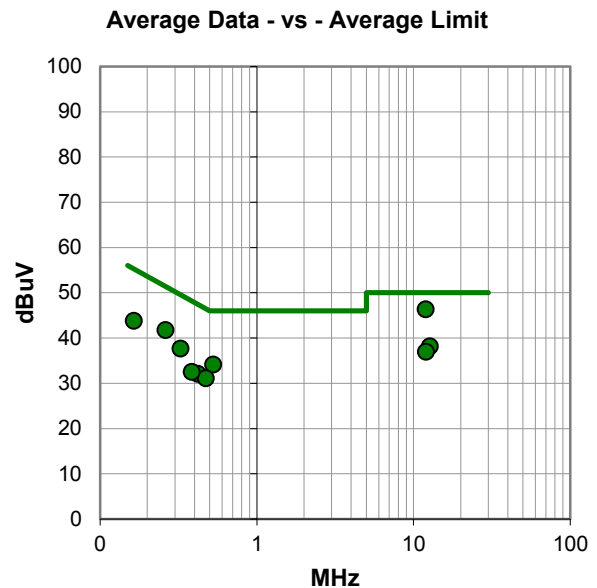
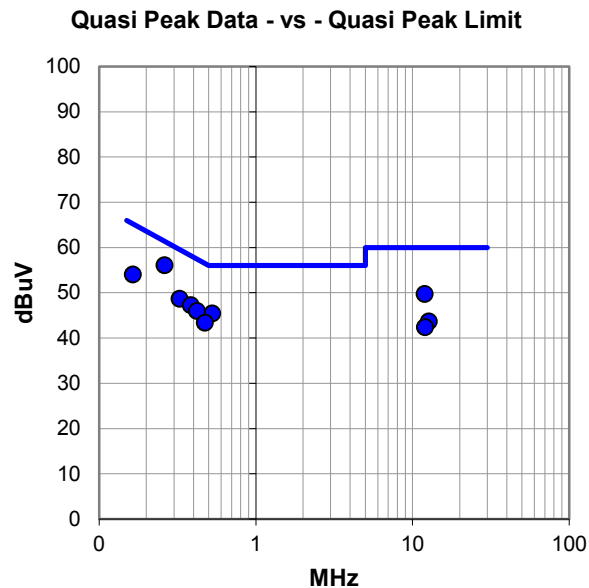
None

EUT OPERATING MODES

Transmitting Zigbee mid channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #9

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.262	35.9	20.1	56.0	61.4	-5.3
12.001	28.9	20.8	49.7	60.0	-10.3
0.526	25.2	20.2	45.4	56.0	-10.6
0.327	28.5	20.2	48.7	59.5	-10.9
0.384	27.1	20.2	47.3	58.2	-10.9
0.164	33.8	20.2	54.0	65.3	-11.2
0.421	25.8	20.2	46.0	57.4	-11.5
0.473	23.2	20.2	43.4	56.5	-13.1
12.753	22.8	20.8	43.6	60.0	-16.4
12.011	21.6	20.8	42.4	60.0	-17.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.001	25.5	20.8	46.3	50.0	-3.7
0.262	21.6	20.1	41.7	51.4	-9.6
0.164	23.6	20.2	43.8	55.3	-11.4
12.753	17.3	20.8	38.1	50.0	-11.9
0.327	17.5	20.2	37.7	49.5	-11.9
0.526	13.9	20.2	34.1	46.0	-11.9
12.011	16.1	20.8	36.9	50.0	-13.1
0.421	11.9	20.2	32.1	47.4	-15.4
0.473	10.9	20.2	31.1	46.5	-15.4
0.384	12.3	20.2	32.5	48.2	-15.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	11	Line:	Negative Lead	Ext. Attenuation (dB):	20
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COMMENTS

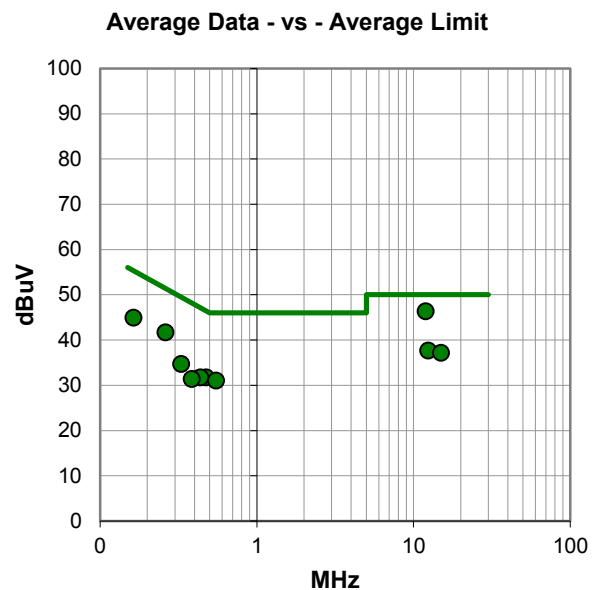
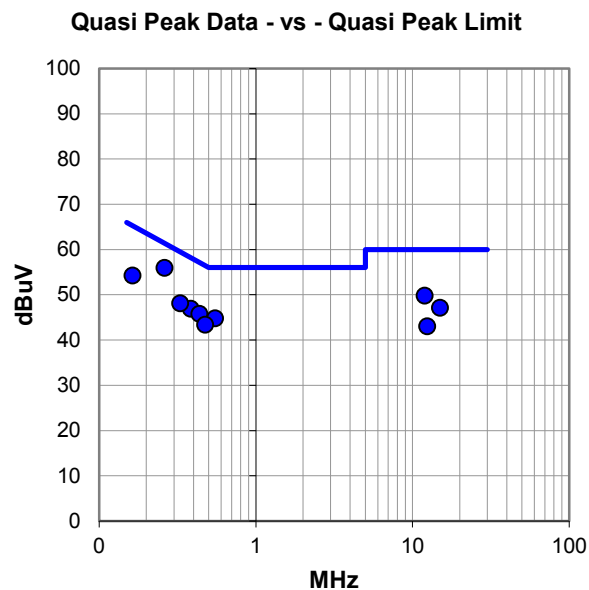
None

EUT OPERATING MODES

Transmitting Zigbee high channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #11

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.262	35.8	20.1	55.9	61.4	-5.4
12.000	29.0	20.8	49.8	60.0	-10.2
0.163	34.0	20.2	54.2	65.3	-11.1
0.549	24.6	20.2	44.8	56.0	-11.2
0.385	26.7	20.2	46.9	58.2	-11.3
0.438	25.6	20.2	45.8	57.1	-11.3
0.330	27.9	20.2	48.1	59.5	-11.4
15.000	26.1	21.0	47.1	60.0	-12.9
0.474	23.2	20.2	43.4	56.4	-13.0
12.434	22.2	20.8	43.0	60.0	-17.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	25.5	20.8	46.3	50.0	-3.7
0.262	21.5	20.1	41.6	51.4	-9.7
0.163	24.7	20.2	44.9	55.3	-10.4
12.434	16.8	20.8	37.6	50.0	-12.4
15.000	16.2	21.0	37.2	50.0	-12.8
0.474	11.5	20.2	31.7	46.4	-14.7
0.330	14.5	20.2	34.7	49.5	-14.8
0.549	10.8	20.2	31.0	46.0	-15.0
0.438	11.5	20.2	31.7	47.1	-15.4
0.385	11.2	20.2	31.4	48.2	-16.8

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	TXB-ZBM Mini-Zigbee Transceiver Module	Work Order:	REMT0002
Serial Number:	None	Date:	01/07/2015
Customer:	Remote Technologies, Inc.	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	10.8%
Customer Project:	None	Bar. Pressure:	1047.8 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	3.3VDC	Configuration:	REMT0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	12	Line:	Positive Lead	Ext. Attenuation (dB):	20
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COMMENTS

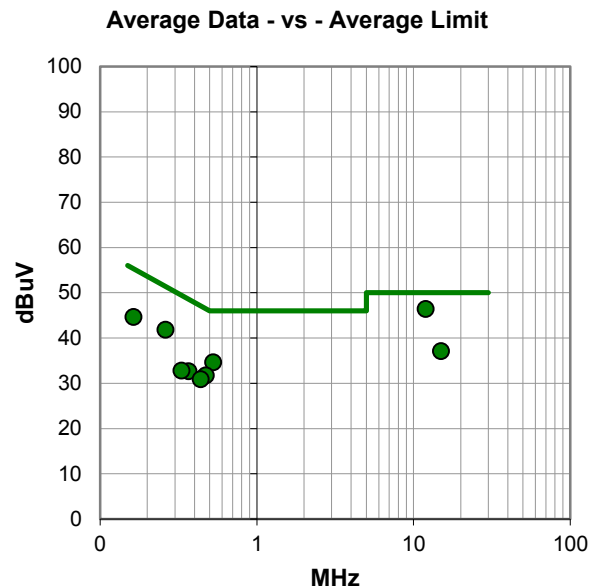
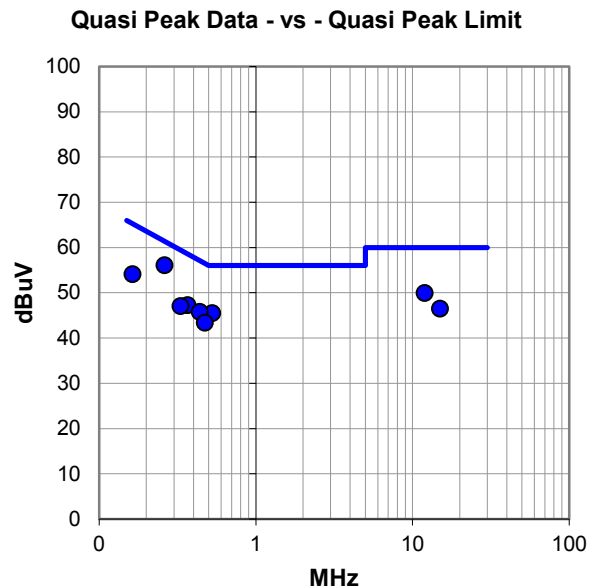
None

EUT OPERATING MODES

Transmitting Zigbee high channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #12

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.262	35.9	20.1	56.0	61.4	-5.3
12.000	29.1	20.8	49.9	60.0	-10.1
0.528	25.3	20.2	45.5	56.0	-10.5
0.163	33.9	20.2	54.1	65.3	-11.2
0.367	27.1	20.2	47.3	58.6	-11.3
0.439	25.6	20.2	45.8	57.1	-11.3
0.331	26.9	20.2	47.1	59.4	-12.4
0.474	23.2	20.2	43.4	56.4	-13.1
15.000	25.5	21.0	46.5	60.0	-13.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	25.6	20.8	46.4	50.0	-3.6
0.262	21.7	20.1	41.8	51.4	-9.5
0.163	24.4	20.2	44.6	55.3	-10.7
0.528	14.4	20.2	34.6	46.0	-11.4
15.000	16.1	21.0	37.1	50.0	-12.9
0.474	11.5	20.2	31.7	46.4	-14.8
0.367	12.5	20.2	32.7	48.6	-15.9
0.439	10.7	20.2	30.9	47.1	-16.2
0.331	12.6	20.2	32.8	49.4	-16.7

CONCLUSION

Pass



Tested By

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 Zigbee low channel, mid channel, and high channel (2405 MHz, 2440 MHz, and 2480 MHz.)

POWER SETTINGS INVESTIGATED

3.3VDC

CONFIGURATIONS INVESTIGATED

REMT0002 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 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	Micro-Tronics	LPM50004	HGK	5/15/2014	12 mo
High Pass Filter	Micro-Tronics	HPM50111	HGQ	5/15/2014	12 mo
Attenuator, 20 dB, 'SMA'	SM Electronics	SA6-20	REO	5/15/2014	12 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/3/2014	12 mo
MN05 Cable	N/A	18-26GHz Standard Gain Horn	MNP	10/3/2014	12 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/14/2014	12 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	3/14/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/14/2014	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/14/2014	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	3/14/2014	12 mo
Antenna, Horn	ETS	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/14/2014	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/14/2014	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

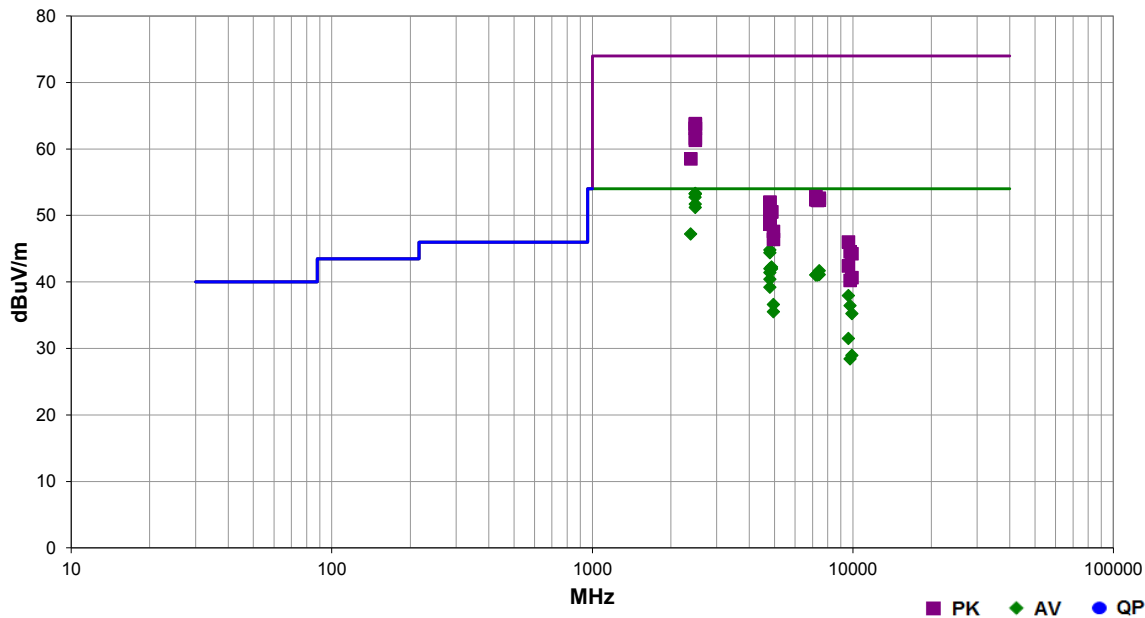
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify 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.

SPURIOUS RADIATED EMISSIONS

Work Order:	REMT0002	Date:	01/06/15	<i>Dustin Sparks</i>
Project:	None	Temperature:	22 °C	
Job Site:	MN05	Humidity:	12% RH	
Serial Number:	None	Barometric Pres.:	1030.1 mbar	
EUT:	TXB-ZBM Mini-Zigbee Transceiver Module			
Configuration:	1			
Customer:	Remote Technologies, Inc.			
Attendees:	None			
EUT Power:	3.3VDC			
Operating Mode:	Transmitting Zigbee low channel, mid channel, and high channel (2405 MHz, 2440 MHz, and 2480 MHz.)			
Deviations:	None			
Comments:	None			

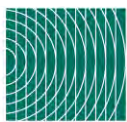
Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	46	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	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
2483.500	36.3	-3.0	1.0	47.1	3.0	20.0	Vert	AV	0.0	53.3	54.0	-0.7	High channel, EUT on side
2483.500	36.3	-3.0	1.0	221.1	3.0	20.0	Horz	AV	0.0	53.3	54.0	-0.7	High channel, EUT vert
2483.500	36.2	-3.0	1.0	189.0	3.0	20.0	Vert	AV	0.0	53.2	54.0	-0.8	High channel, EUT horz
2479.950	70.5	-3.0	1.7	69.1	3.0	20.0	Horz	AV	0.0	52.7	54.0	-1.3	High channel, EUT on side, MD
2483.508	34.7	-3.0	1.0	99.0	3.0	20.0	Vert	AV	0.0	51.7	54.0	-2.3	High channel, EUT vert
2483.517	34.2	-3.0	1.0	335.0	3.0	20.0	Horz	AV	0.0	51.2	54.0	-2.8	High channel, EUT horz
2386.450	30.5	-3.3	2.9	132.0	3.0	20.0	Vert	AV	0.0	47.2	54.0	-6.8	High channel, EUT on side
4809.017	39.3	5.5	1.4	73.1	3.0	0.0	Vert	AV	0.0	44.8	54.0	-9.2	Low channel, EUT on side
4808.967	38.9	5.5	1.1	275.9	3.0	0.0	Horz	AV	0.0	44.4	54.0	-9.6	Low channel, EUT on side
2483.592	46.8	-3.0	1.6	330.9	3.0	20.0	Horz	PK	0.0	63.8	74.0	-10.2	High channel, EUT on side
2483.592	46.7	-3.0	1.0	47.1	3.0	20.0	Vert	PK	0.0	63.7	74.0	-10.3	High channel, EUT on side
2483.617	46.1	-3.0	1.0	189.0	3.0	20.0	Vert	PK	0.0	63.1	74.0	-10.9	High channel, EUT horz
2483.533	46.1	-3.0	1.0	221.1	3.0	20.0	Horz	PK	0.0	63.1	74.0	-10.9	High channel, EUT vert
4880.783	37.2	5.0	1.3	288.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	Mid channel, EUT on side
4808.967	36.5	5.5	1.5	238.0	3.0	0.0	Vert	AV	0.0	42.0	54.0	-12.0	Low channel, EUT horz
4879.033	36.9	5.0	1.3	71.0	3.0	0.0	Vert	AV	0.0	41.9	54.0	-12.1	Mid channel, EUT on side
7438.233	28.7	13.0	1.0	24.0	3.0	0.0	Vert	AV	0.0	41.7	54.0	-12.3	High channel, EUT on side
2483.508	44.6	-3.0	1.0	99.0	3.0	20.0	Vert	PK	0.0	61.6	74.0	-12.4	High channel, EUT vert
4808.983	35.9	5.5	1.2	22.1	3.0	0.0	Horz	AV	0.0	41.4	54.0	-12.6	Low channel, EUT horz
2483.733	44.3	-3.0	1.0	335.0	3.0	20.0	Horz	PK	0.0	61.3	74.0	-12.7	High channel, EUT horz
7437.767	28.1	13.0	1.0	222.0	3.0	0.0	Horz	AV	0.0	41.1	54.0	-12.9	High channel, EUT on side
7321.392	28.7	12.4	1.0	236.9	3.0	0.0	Horz	AV	0.0	41.1	54.0	-12.9	Mid channel, EUT on side
7320.892	28.7	12.4	1.0	37.1	3.0	0.0	Vert	AV	0.0	41.1	54.0	-12.9	Mid channel, EUT on side
7216.308	29.3	11.8	1.0	333.0	3.0	0.0	Vert	AV	0.0	41.1	54.0	-12.9	Low channel, EUT on side
7215.400	29.3	11.7	2.5	203.1	3.0	0.0	Horz	AV	0.0	41.0	54.0	-13.0	Low channel, EUT on side

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
4808.967	34.9	5.5	1.0	62.1	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Low channel, EUT vert
4808.958	33.7	5.5	1.0	250.9	3.0	0.0	Vert	AV	0.0	39.2	54.0	-14.8	Low channel, EUT vert
2387.958	41.8	-3.3	2.9	132.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	High channel, EUT on side
9617.842	45.4	-7.5	1.5	44.1	3.0	0.0	Horz	AV	0.0	37.9	54.0	-16.1	Low channel, EUT on side
4960.842	31.7	4.9	1.2	283.9	3.0	0.0	Horz	AV	0.0	36.6	54.0	-17.4	High channel, EUT on side
9757.942	44.3	-7.9	1.1	26.1	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid channel, EUT on side
4960.875	30.6	4.9	1.0	35.0	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	High channel, EUT on side
9917.867	42.9	-7.7	1.3	52.1	3.0	0.0	Horz	AV	0.0	35.2	54.0	-18.8	High channel, EUT on side
7217.008	41.1	11.8	1.0	333.0	3.0	0.0	Vert	PK	0.0	52.9	74.0	-21.1	Low channel, EUT on side
7438.308	39.6	13.0	1.0	24.0	3.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4	High channel, EUT on side
7318.450	40.1	12.3	1.0	236.9	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	Mid channel, EUT on side
7216.658	40.6	11.8	2.5	203.1	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	Low channel, EUT on side
7438.775	39.3	13.0	1.0	222.0	3.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	High channel, EUT on side
7322.342	39.9	12.4	1.0	37.1	3.0	0.0	Vert	PK	0.0	52.3	74.0	-21.7	Mid channel, EUT on side
4809.033	46.5	5.5	1.1	275.9	3.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	Low channel, EUT on side
4809.183	46.5	5.5	1.4	73.1	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Low channel, EUT on side
9621.667	39.0	-7.5	1.5	307.0	3.0	0.0	Vert	AV	0.0	31.5	54.0	-22.5	Low channel, EUT on side
4879.083	45.5	5.0	1.3	71.0	3.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	Mid channel, EUT on side
4880.942	45.5	5.0	1.3	288.0	3.0	0.0	Horz	PK	0.0	50.5	74.0	-23.5	Mid channel, EUT on side
4808.958	44.9	5.5	1.5	238.0	3.0	0.0	Vert	PK	0.0	50.4	74.0	-23.6	Low channel, EUT horz
4808.767	44.6	5.5	1.2	22.1	3.0	0.0	Horz	PK	0.0	50.1	74.0	-23.9	Low channel, EUT horz
4810.975	44.1	5.5	1.0	62.1	3.0	0.0	Horz	PK	0.0	49.6	74.0	-24.4	Low channel, EUT vert
9917.867	36.6	-7.7	1.0	39.0	3.0	0.0	Vert	AV	0.0	28.9	54.0	-25.1	High channel, EUT on side
4809.000	43.2	5.5	1.0	250.9	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	Low channel, EUT vert
9757.900	36.3	-7.9	1.0	3.0	3.0	0.0	Vert	AV	0.0	28.4	54.0	-25.6	Mid channel, EUT on side
4958.850	42.7	4.9	1.2	283.9	3.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	High channel, EUT on side
4961.192	41.5	4.9	1.0	35.0	3.0	0.0	Vert	PK	0.0	46.4	74.0	-27.6	High channel, EUT on side
9621.792	53.5	-7.5	1.5	44.1	3.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	Low channel, EUT on side
9757.933	52.4	-7.9	1.1	26.1	3.0	0.0	Horz	PK	0.0	44.5	74.0	-29.5	Mid channel, EUT on side
9917.733	51.9	-7.7	1.3	52.1	3.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8	High channel, EUT on side
9621.608	49.9	-7.5	1.5	307.0	3.0	0.0	Vert	PK	0.0	42.4	74.0	-31.6	Low channel, EUT on side
9917.867	48.3	-7.7	1.0	39.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	High channel, EUT on side
9759.850	48.1	-7.9	1.0	3.0	3.0	0.0	Vert	PK	0.0	40.2	74.0	-33.8	Mid channel, EUT on side



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.

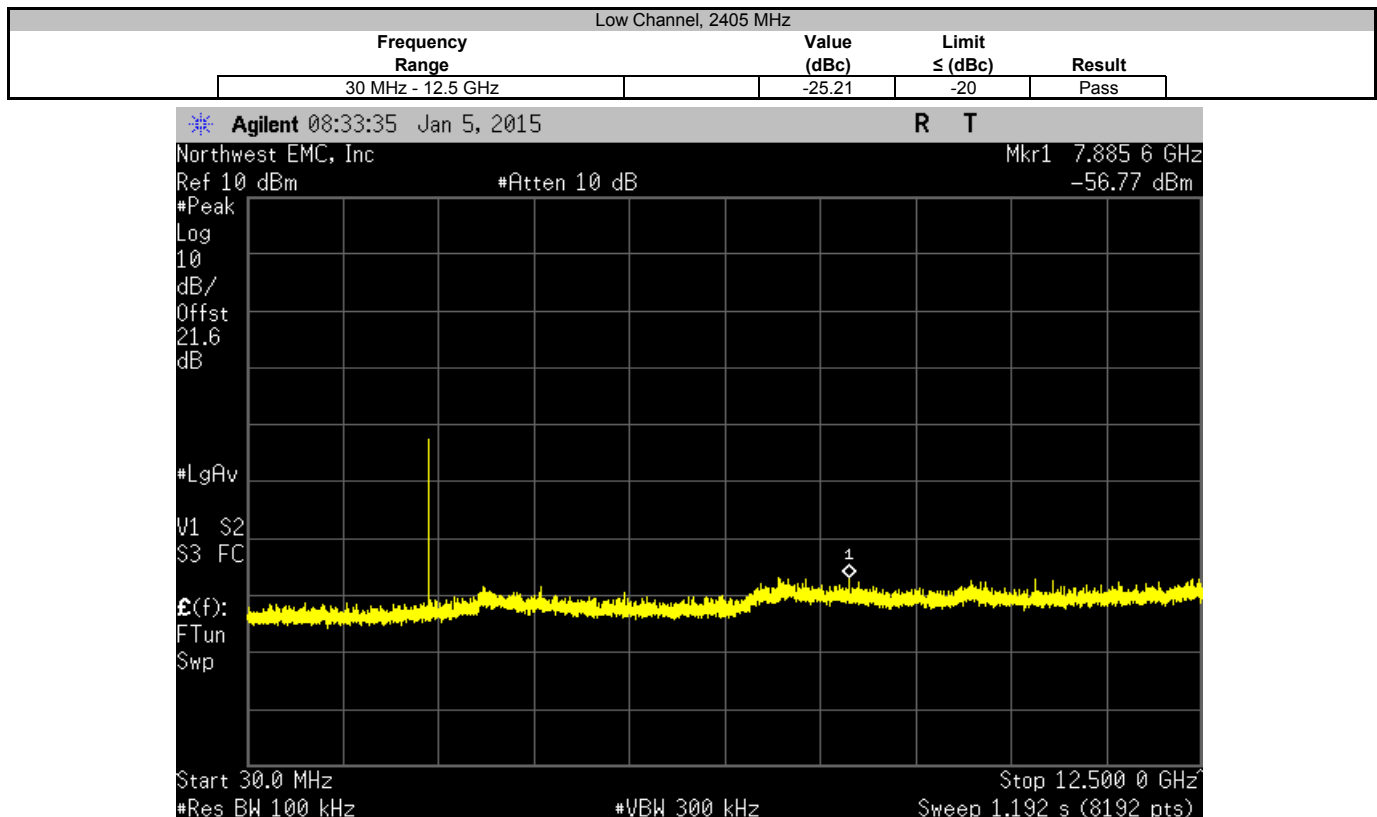
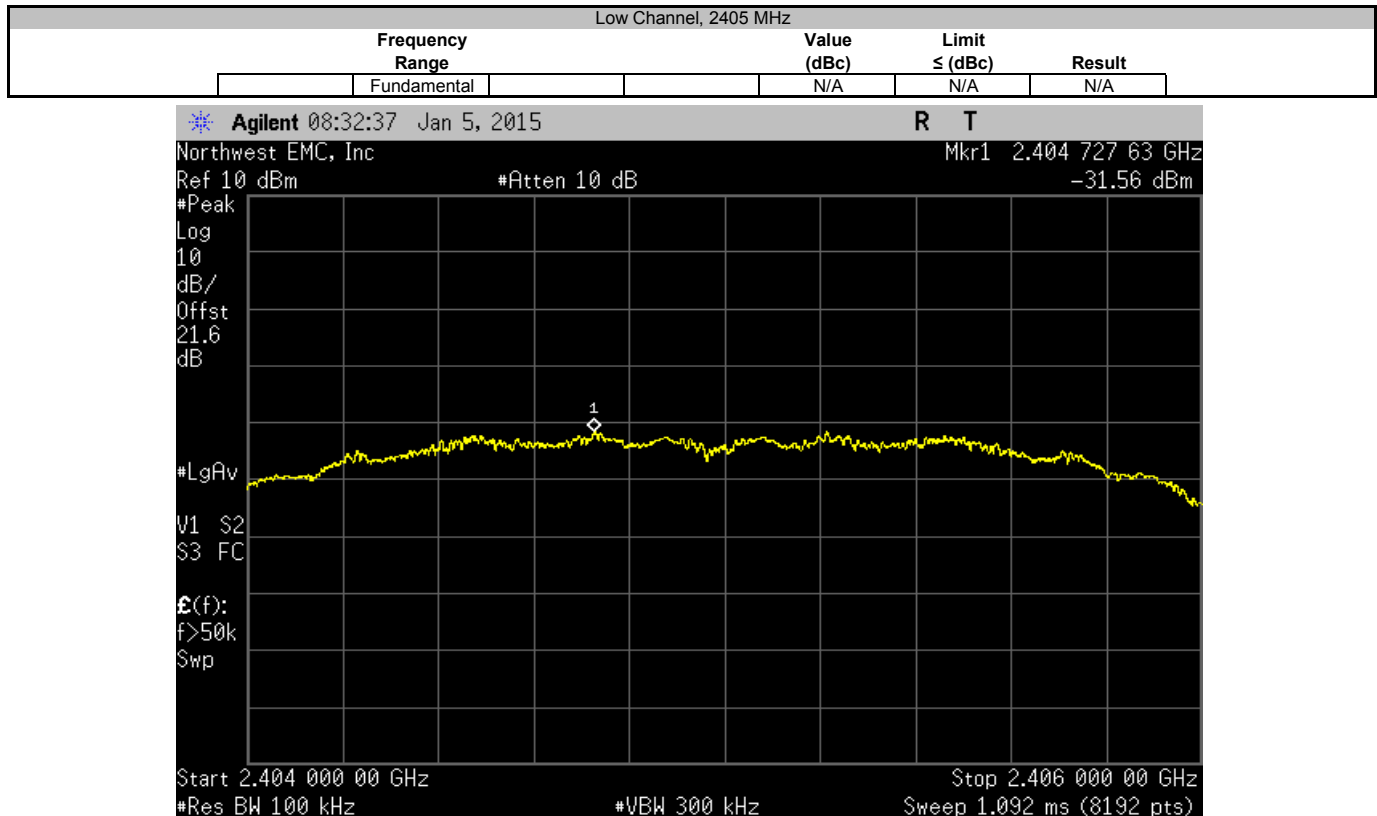
TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MXG Vector Signal Generator	Agilent	N5182A	TIF	8/12/2014	36
40 GHz DC Block	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	4/3/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/28/2014	12

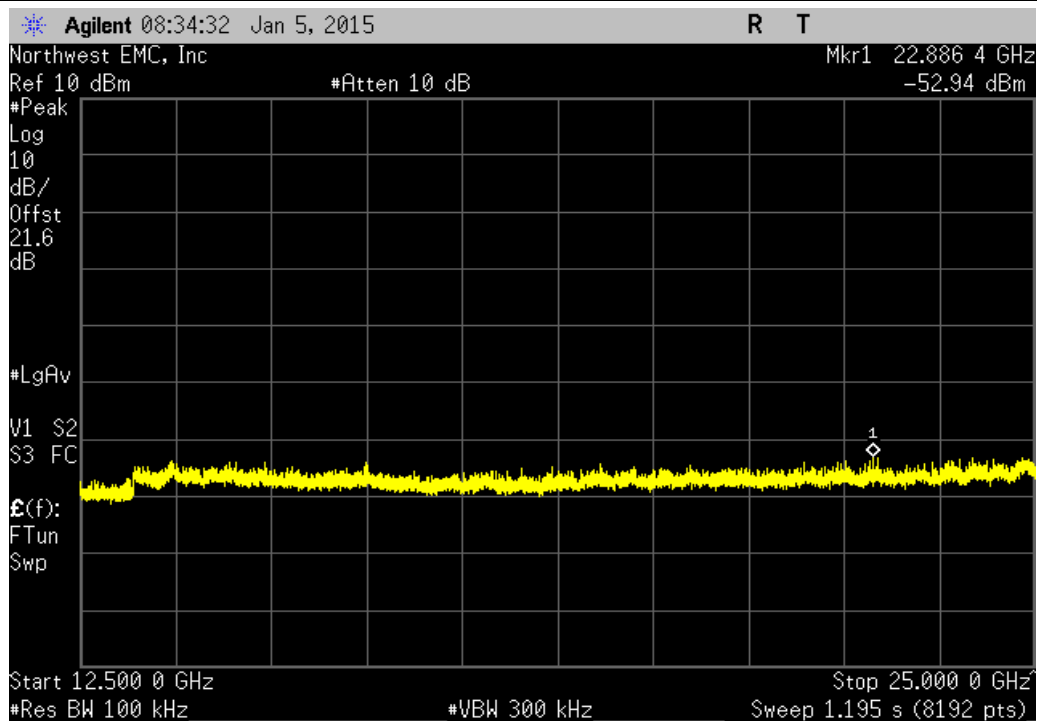
TEST DESCRIPTION

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.

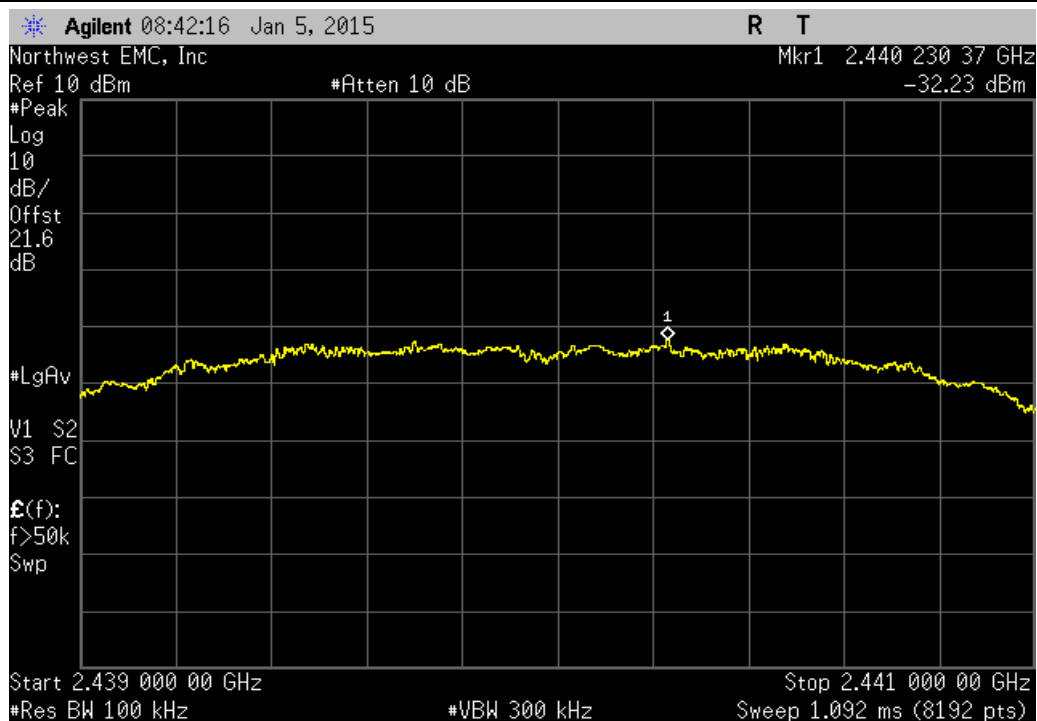
EUT: TXB-ZBM Mini-Zigbee Transceiver Module		Work Order: REMT0002	
Serial Number: None		Date: 01/05/15	
Customer: Remote Technologies, Inc.		Temperature: 23.1°C	
Attendees: Paul Weichelt		Humidity: 11%	
Project: None		Barometric Pres.: 1035.9	
Tested by: Trevor Buls, Dustin Sparks		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
	Frequency Range	Value (dBc)	Limit ≤ (dBc)
Low Channel, 2405 MHz	Fundamental	N/A	N/A
Low Channel, 2405 MHz	30 MHz - 12.5 GHz	-25.21	-20
Low Channel, 2405 MHz	12.5 GHz - 25 GHz	-21.38	-20
Mid Channel, 2441 MHz	Fundamental	N/A	N/A
Mid Channel, 2441 MHz	30 MHz - 12.5 GHz	-24.4	-20
Mid Channel, 2441 MHz	12.5 GHz - 25 GHz	-20.76	-20
High Channel, 2480 MHz	Fundamental	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	-27.33	-20
High Channel, 2480 MHz	12.5 GHz - 25 GHz	-22.3	-20
			Result
			N/A
			Pass
			Pass
			N/A
			Pass
			N/A
			Pass
			Pass

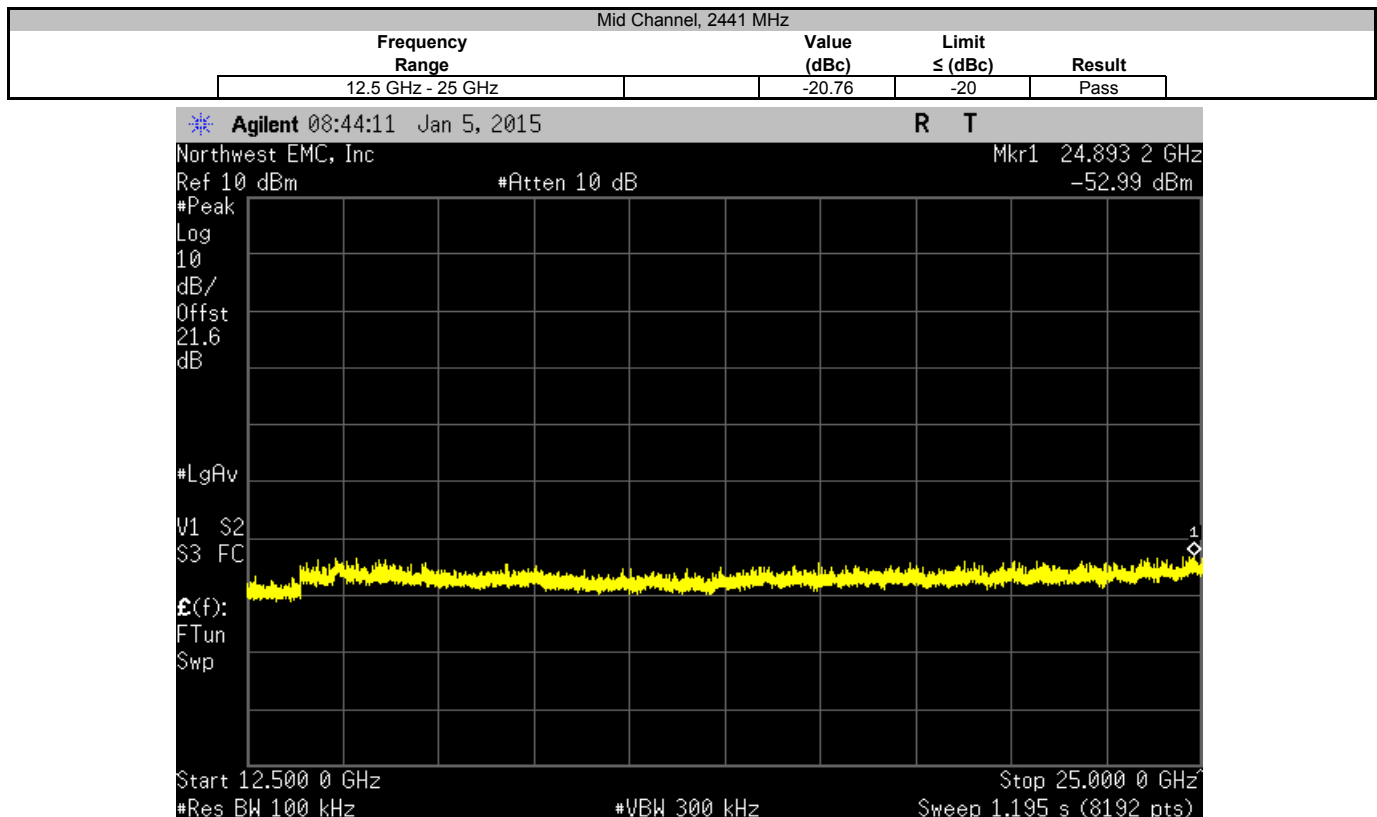
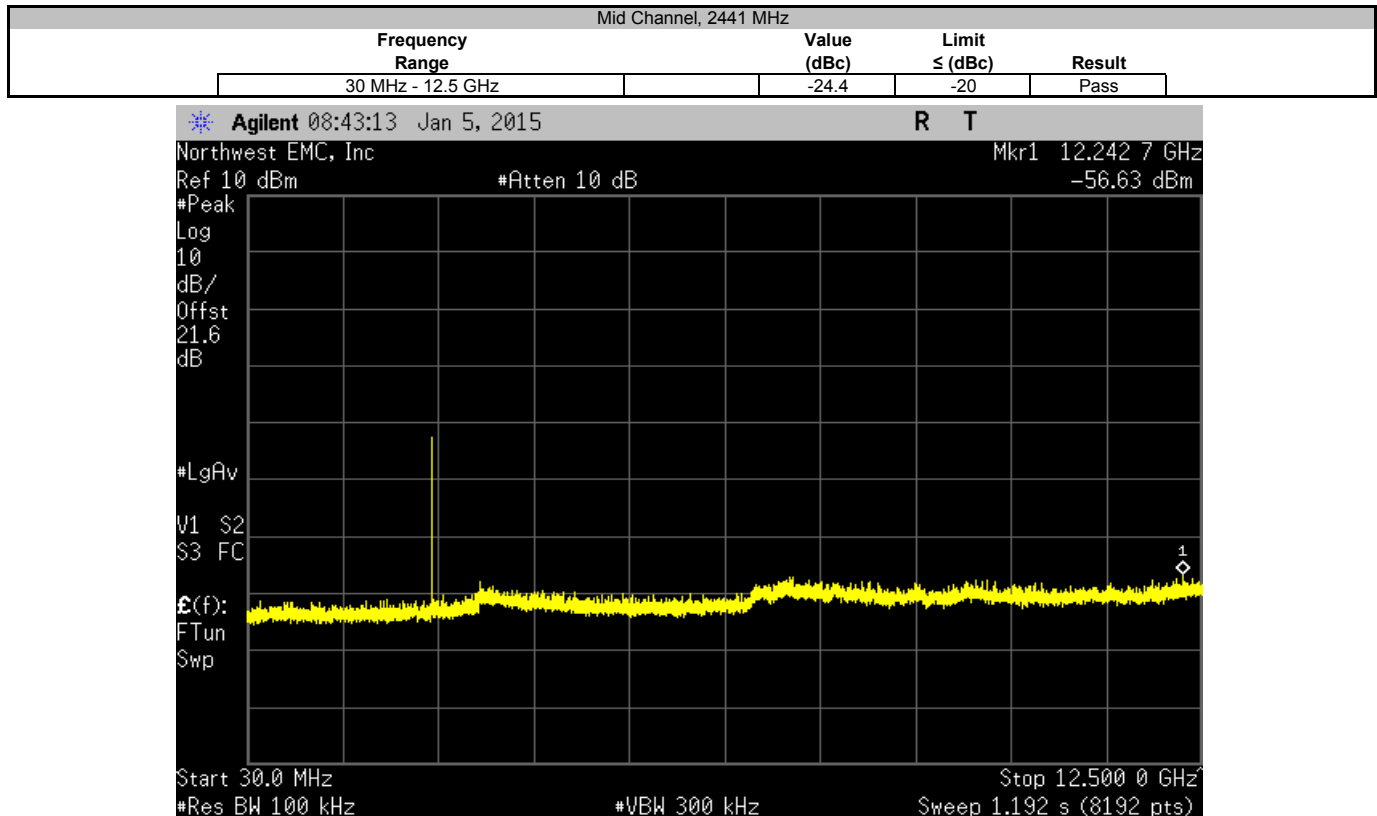


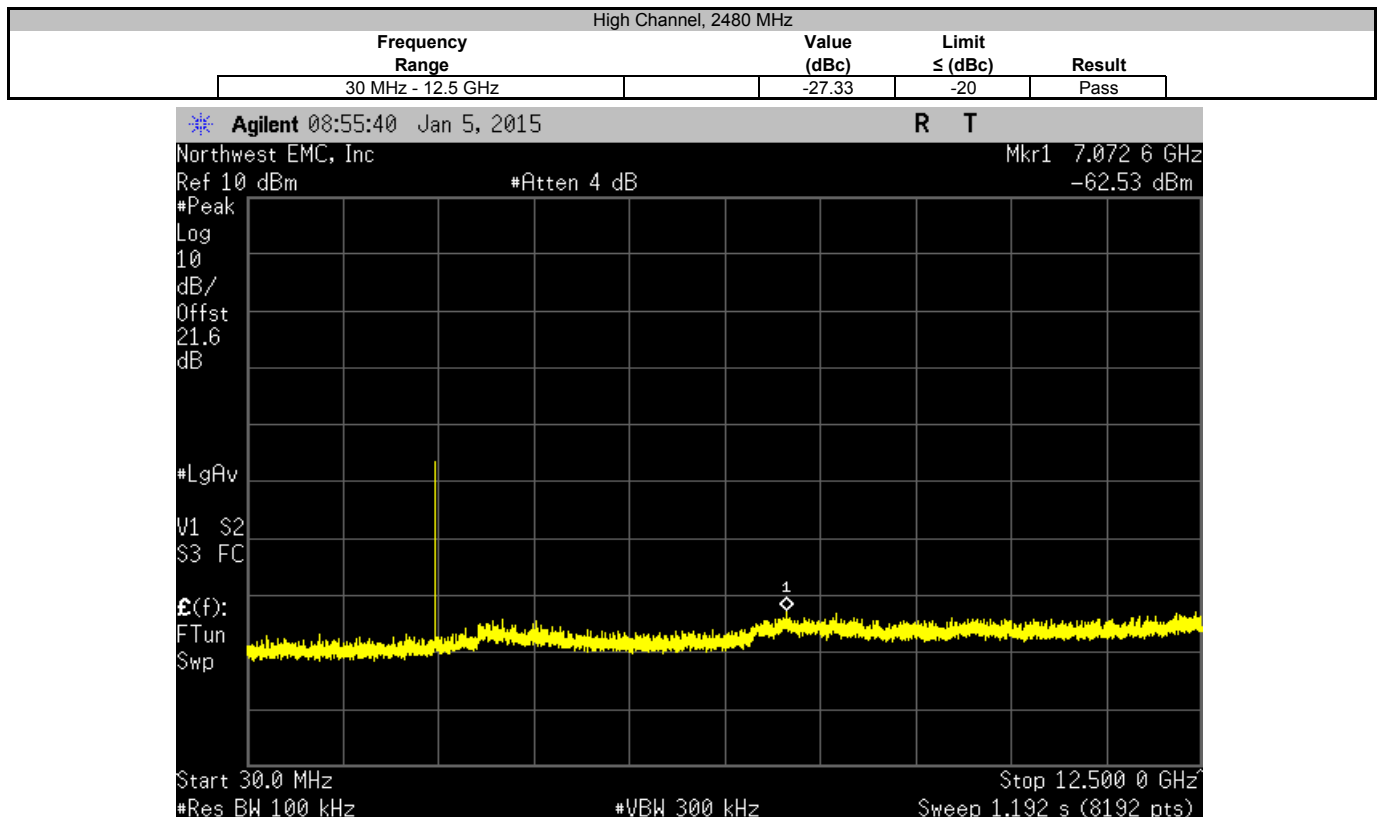
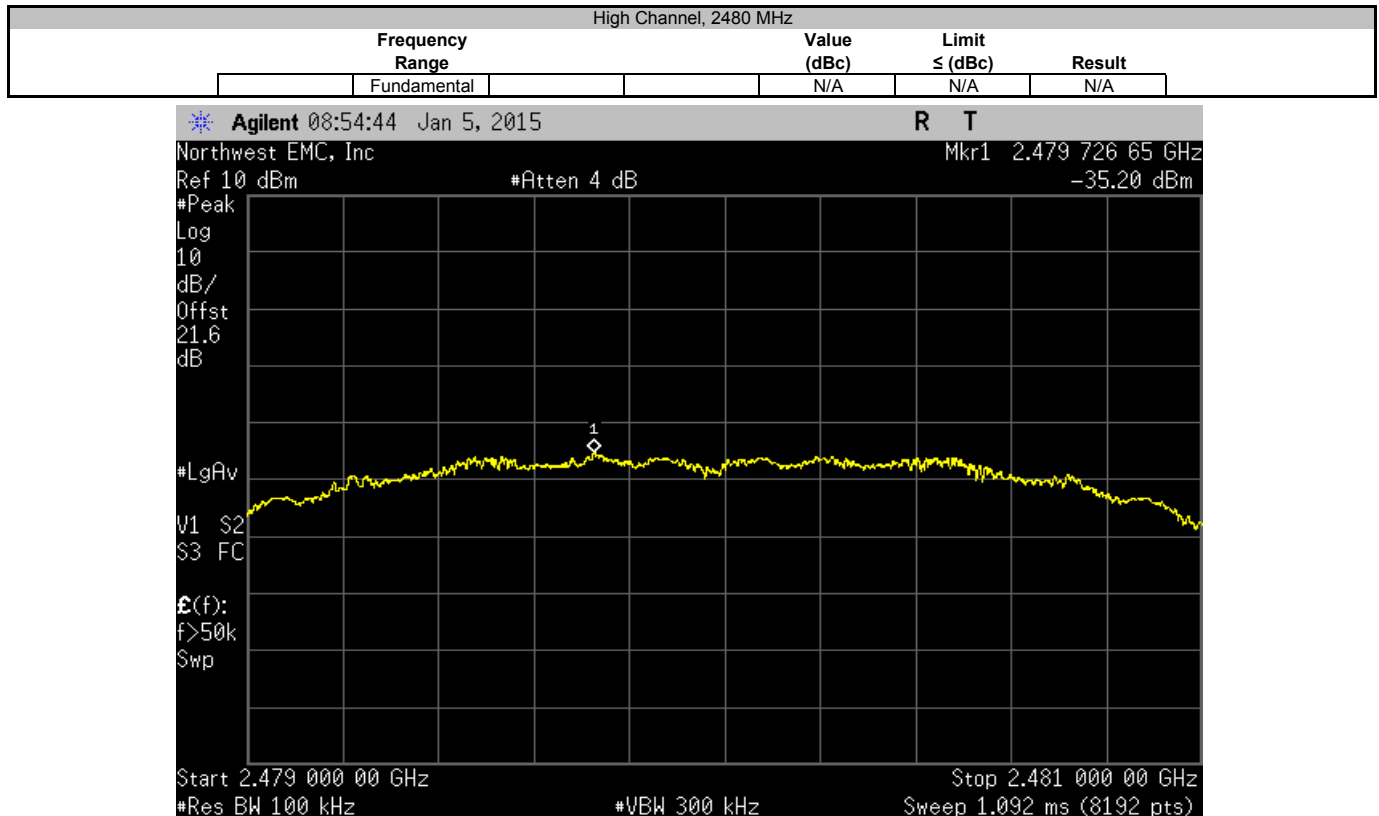
Low Channel, 2405 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-21.38	-20	Pass	



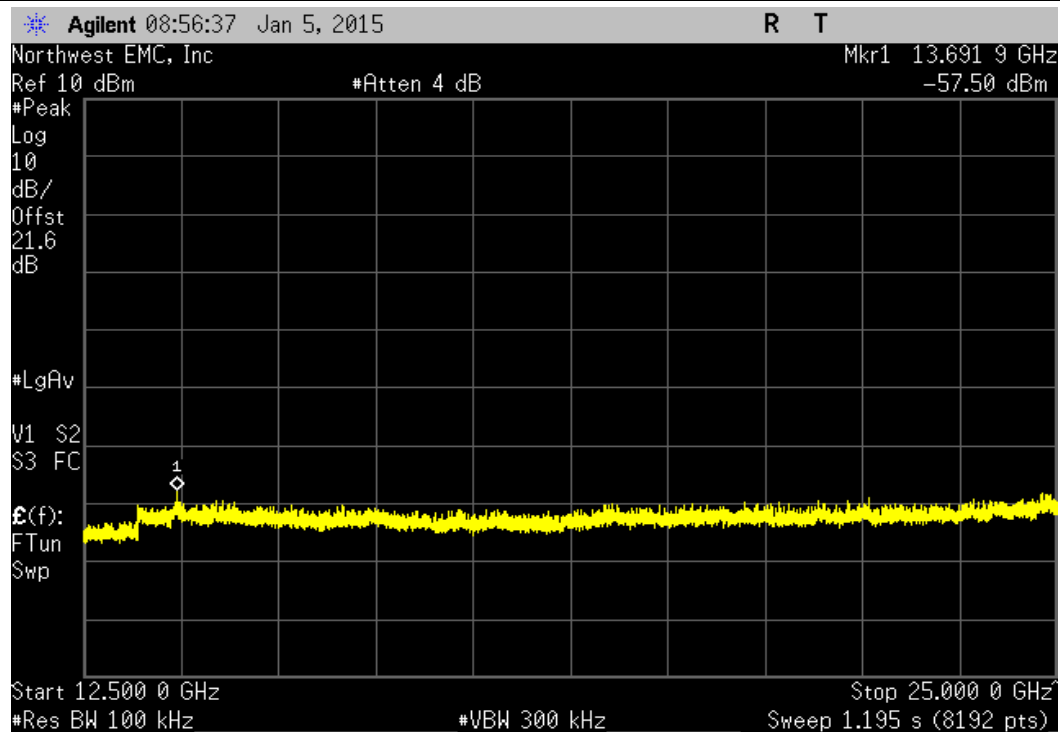
Mid Channel, 2441 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	







High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-22.3	-20	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 (mo)
40 GHz DC Block	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	4/3/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/28/2014	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	8/12/2014	36

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.

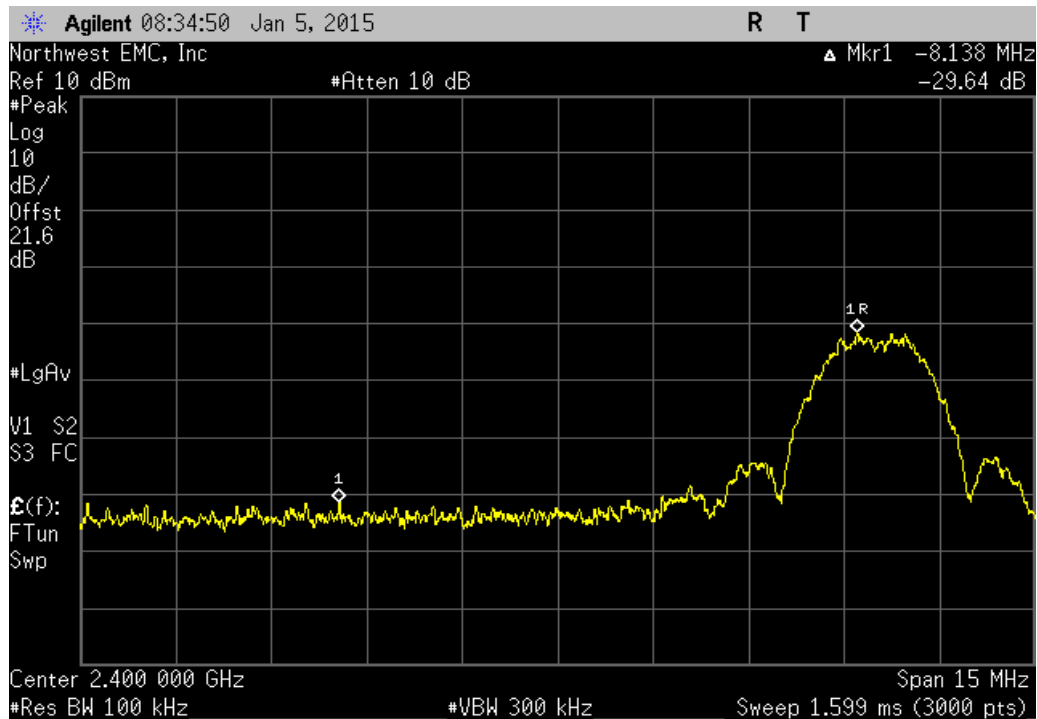


BAND EDGE COMPLIANCE

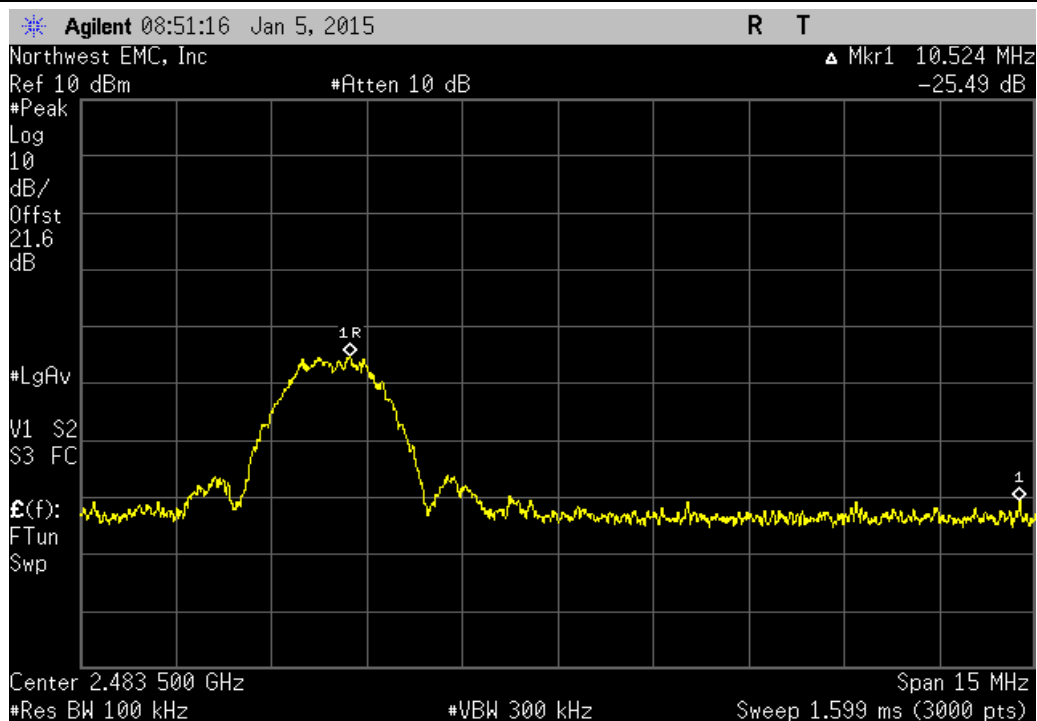
XMIT 2014.02.07
NweTx 2014.11.06

EUT: TXB-ZBM Mini-Zigbee Transceiver Module		Work Order: REMT0002	
Serial Number: None		Date: 01/05/15	
Customer: Remote Technologies, Inc.		Temperature: 23.1°C	
Attendees: Paul Weichelt		Humidity: 11%	
Project: None		Barometric Pres.: 1035.9	
Tested by: Trevor Buls/Dustin Sparks		Power: 3.3VDC	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Trevor Buls</i>	
		Value (dBc)	Limit ≤ (dBc) Result
Low Channel, 2405 MHz		-29.64	-20 Pass
High Channel, 2480 MHz		-25.49	-20 Pass

Low Channel, 2405 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-29.64	-20	Pass



High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.49	-20	Pass



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 (mo)
40 GHz DC Block	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	4/3/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	8/12/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/28/2014	12

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 the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. listed in the datasheet.



OCCUPIED BANDWIDTH

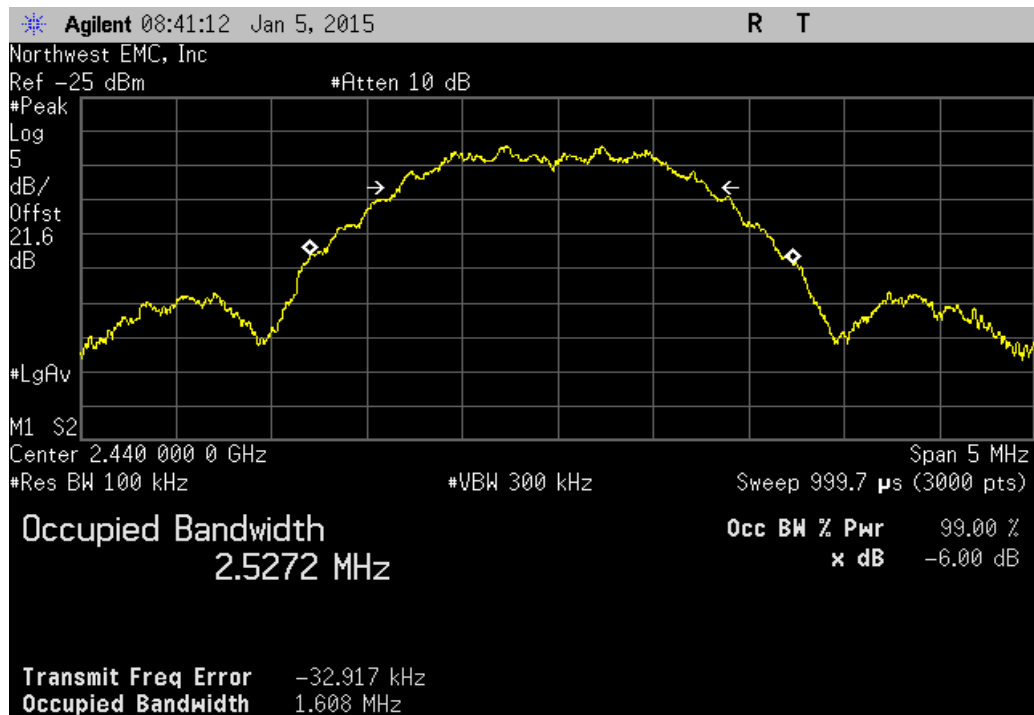
XMit 2014.02.07
NweTx 2014.11.06

EUT: TXB-ZBM Mini-Zigbee Transceiver Module		Work Order: REMT0002	
Serial Number: None		Date: 01/05/15	
Customer: Remote Technologies, Inc.		Temperature: 23.1°C	
Attendees: Paul Weichelt		Humidity: 11%	
Project: None		Barometric Pres.: 1035.9	
Tested by: Trevor Buls/Dustin Sparks		Power: 3.3VDC	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Trevor Buls</i>	
		Value	Limit (>)
Low Channel, 2405 MHz		1.606 MHz	500 kHz
Mid Channel, 2441 MHz		1.608 MHz	500 kHz
High Channel, 2480 MHz		1.59 MHz	500 kHz
			Result
			Pass
			Pass
			Pass

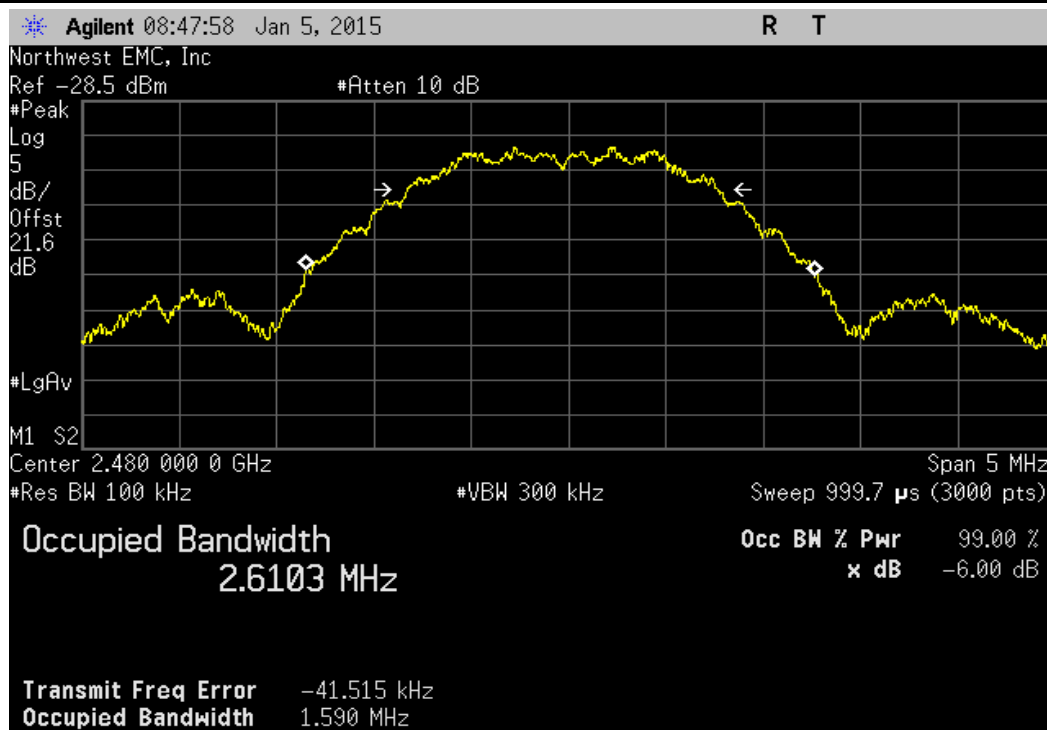
Low Channel, 2405 MHz						
				Value	Limit (>)	Result
				1.606 MHz	500 kHz	Pass



Mid Channel, 2441 MHz						
				Value	Limit (>)	Result
				1.608 MHz	500 kHz	Pass



High Channel, 2480 MHz						
				Value	Limit (>)	Result
				1.59 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 (mo)
MXG Vector Signal Generator	Agilent	N5182A	TIF	8/12/2014	36
40 GHz DC Block	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	4/3/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/28/2014	12

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.

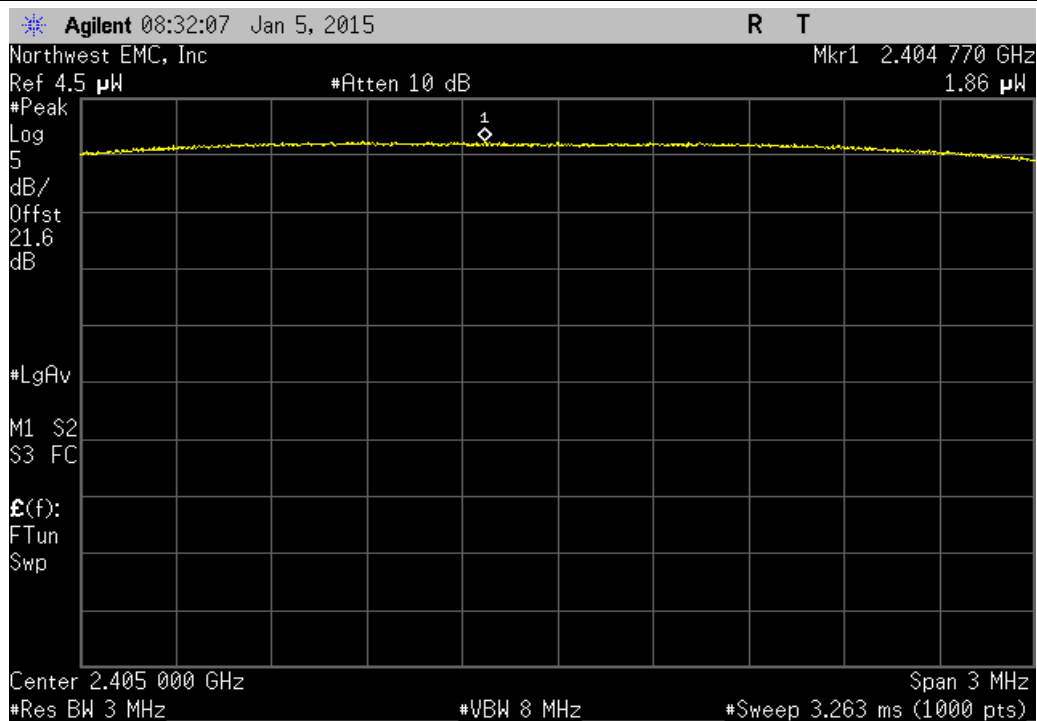
Prior to measuring peak transmit power the DTS bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see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

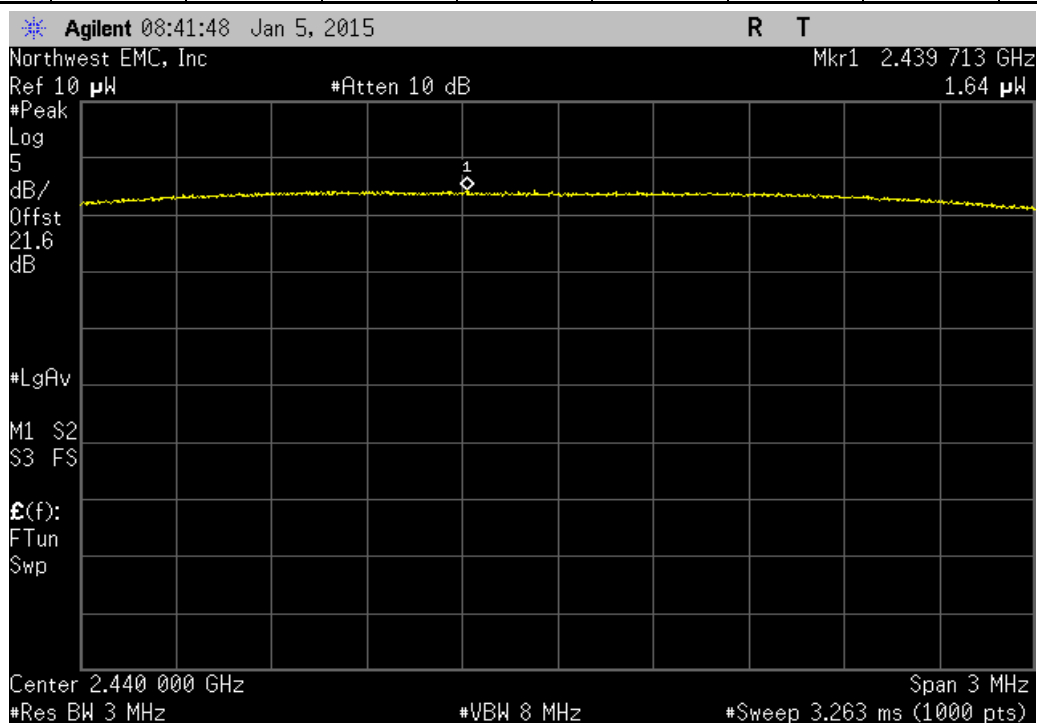
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

EUT: TXB-ZBM Mini-Zigbee Transceiver Module		Work Order: REMT0002	
Serial Number: None		Date: 01/05/15	
Customer: Remote Technologies, Inc.		Temperature: 23.1°C	
Attendees: Paul Weichert		Humidity: 11%	
Project: None		Barometric Pres.: 1035.9	
Tested by: Trevor Buls/Dustin Sparks	Power: 3.3VDC	Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	Trevor Buls
		Value	Limit (<)
Low Channel, 2405 MHz		1.859 uW	1 W
Mid Channel, 2441 MHz		1.637 uW	1 W
High Channel, 2480 MHz		847.227 nW	1 W
			Result
			Pass
			Pass
			Pass

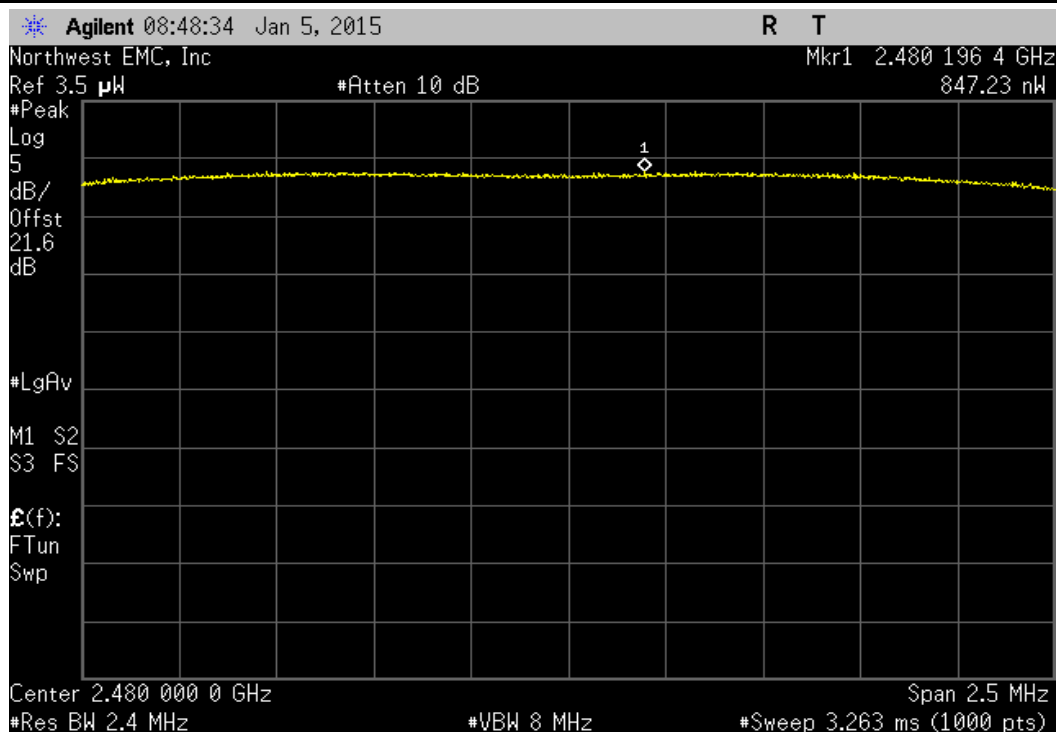
Low Channel, 2405 MHz						
				Value	Limit (<)	Result
				1.859 uW	1 W	Pass



Mid Channel, 2441 MHz						
				Value	Limit (<)	Result
				1.637 uW	1 W	Pass



High Channel, 2480 MHz						
				Value	Limit (<)	Result
				847.227 nW	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 (mo)
40 GHz DC Block	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	4/3/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/28/2014	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	8/12/2014	36

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:

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

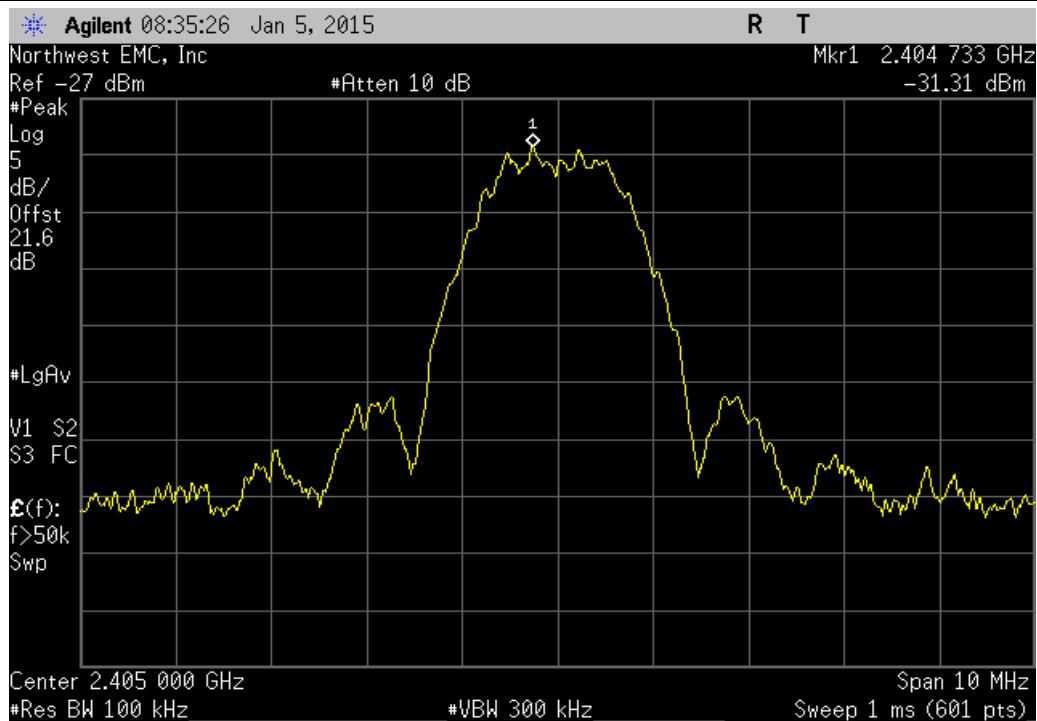


POWER SPECTRAL DENSITY

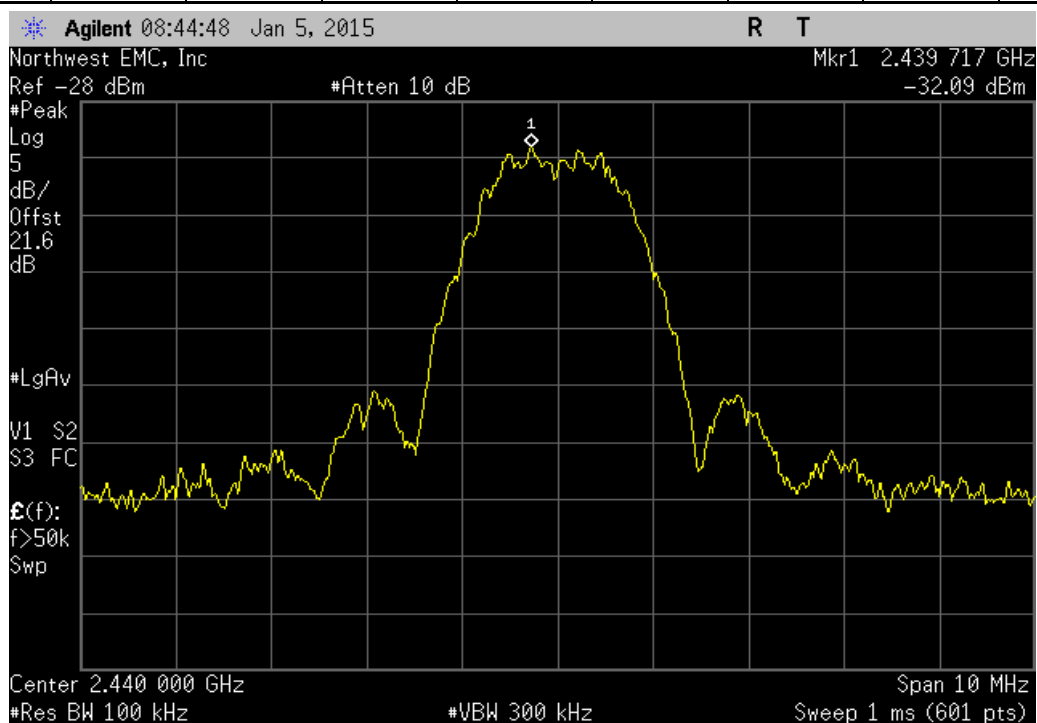
XMit 2014.02.07
NweTx 2014.11.06

EUT: TXB-ZBM Mini-Zigbee Transceiver Module		Work Order: REMT0002				
Serial Number: None		Date: 01/05/15				
Customer: Remote Technologies, Inc.		Temperature: 23.1°C				
Attendees: Paul Weichelt		Humidity: 11%				
Project: None		Barometric Pres.: 1035.9				
Tested by: Trevor Buls/Dustin Sparks		Power: 3.3VDC				
		Job Site: MN08				
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2015		ANSI C63.10:2009				
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature <i>Trevor Buls</i>				
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
Low Channel, 2405 MHz		-31.312	-15.2	-46.512	8	Pass
Mid Channel, 2441 MHz		-32.086	-15.2	-47.286	8	Pass
High Channel, 2480 MHz		-34.957	-15.2	-50.157	8	Pass

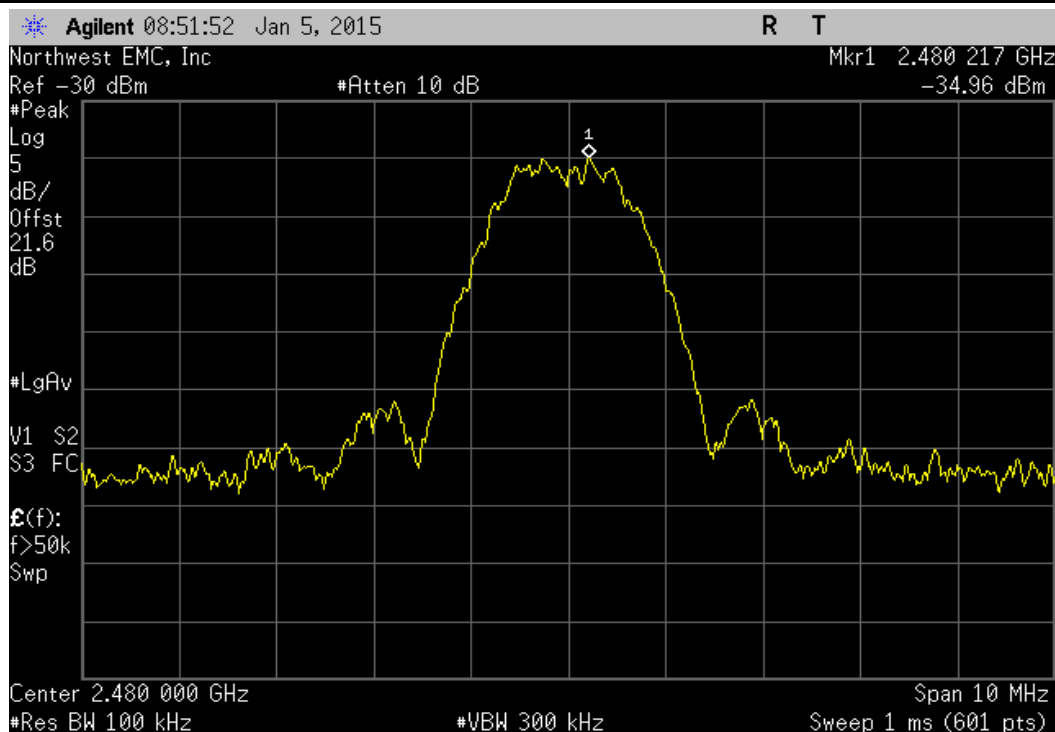
Low Channel, 2405 MHz					
	Value	dBm/100kHz	Value	Limit	Results
		To dBm/3kHz			
	-31.312	-15.2	-46.512	8	Pass



Mid Channel, 2441 MHz					
	Value	dBm/100kHz	Value	Limit	Results
		To dBm/3kHz			
	-32.086	-15.2	-47.286	8	Pass



High Channel, 2480 MHz					
	Value	dBm/100kHz	Value	Limit	Results
		To dBm/3kHz			
	-34.957	-15.2	-50.157	8	Pass



TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. 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 duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

The EUT operates at 100% Duty Cycle.