NORTHWEST EMC

Garrett Metal Detectors

WR-1

FCC 15.207:2016

FCC 15.247:2016

2400-2483.5 MHz Transceiver

Report # GARR0027.8

NVLAP TESTING

NVLAP Lab Code: 201049-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: November 4, 2016
Garrett Metal Detectors
Model: WR-1

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2016 FCC 15.247:2016	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
7.8.2	Carrier Frequency Separation	No	N/A	Not required for DTS devices.
7.8.3	Number of Hopping Frequencies	No	N/A	Not required for DTS devices.
7.8.4	Dwell Time	No	N/A	Not required for DTS devices.
7.8.6	Band Edge Compliance - Hopping Mode	No	N/A	Not required for DTS devices.
11.6	Duty Cycle	Yes	N/A	Characterization of radio operation.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Jeremiah Darden, 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2016.7.25

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 17065 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

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Validated by the European Commission 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

OFCA – Recognized by OFCA 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/
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

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 QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

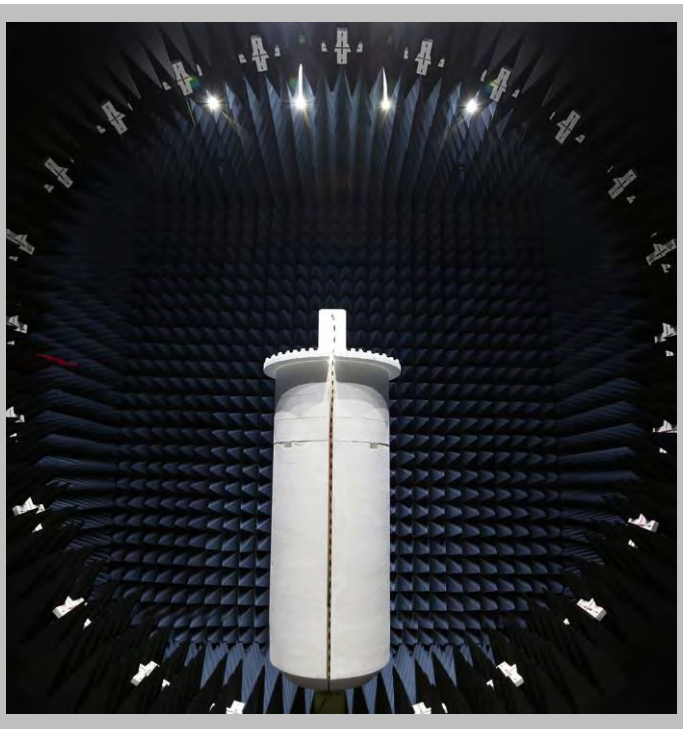
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

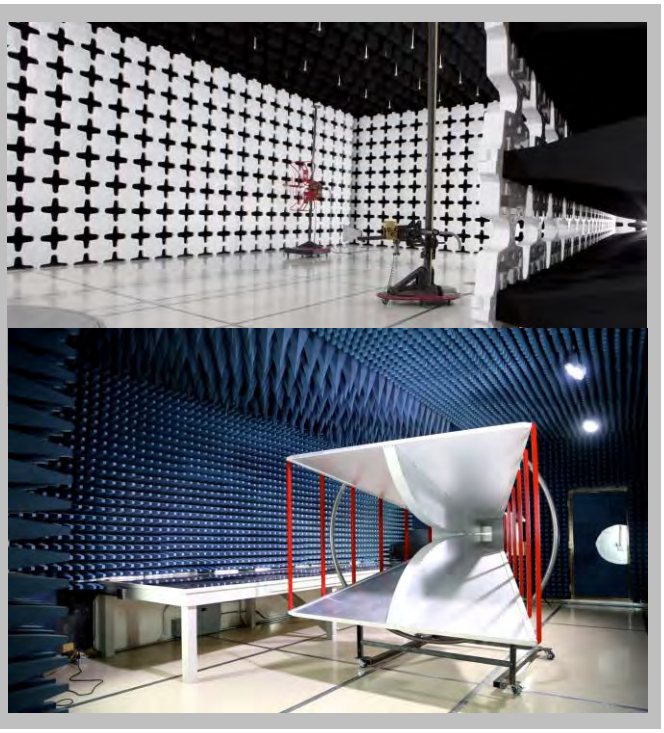
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.9 dB	-4.9 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

FACILITIES

NORTHWEST EMC
REV 2016.7.25

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (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
Innovation, Science and Economic Development 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
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

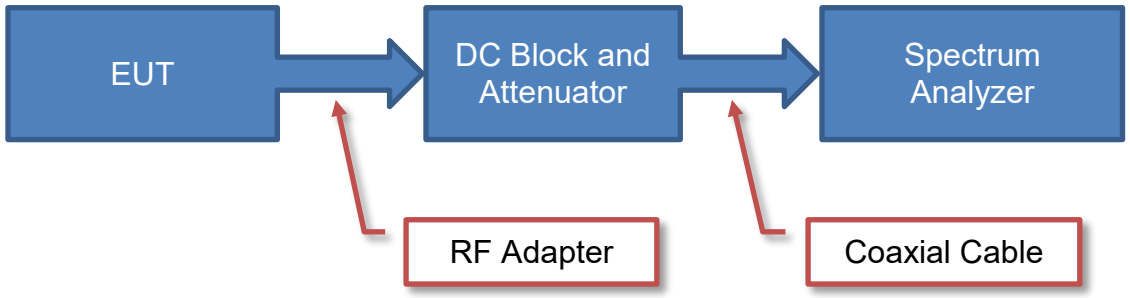




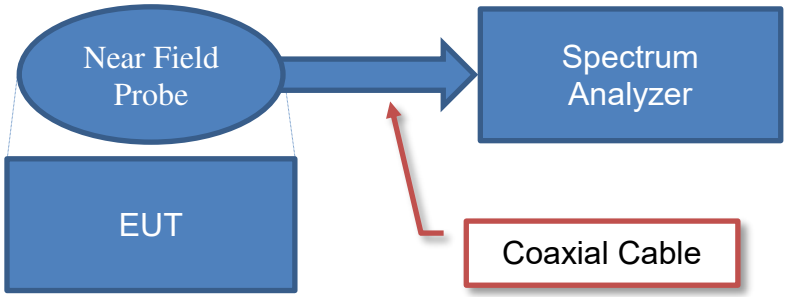
Test Setup Block Diagrams

NORTHWEST EMC
REV 2016.10.04

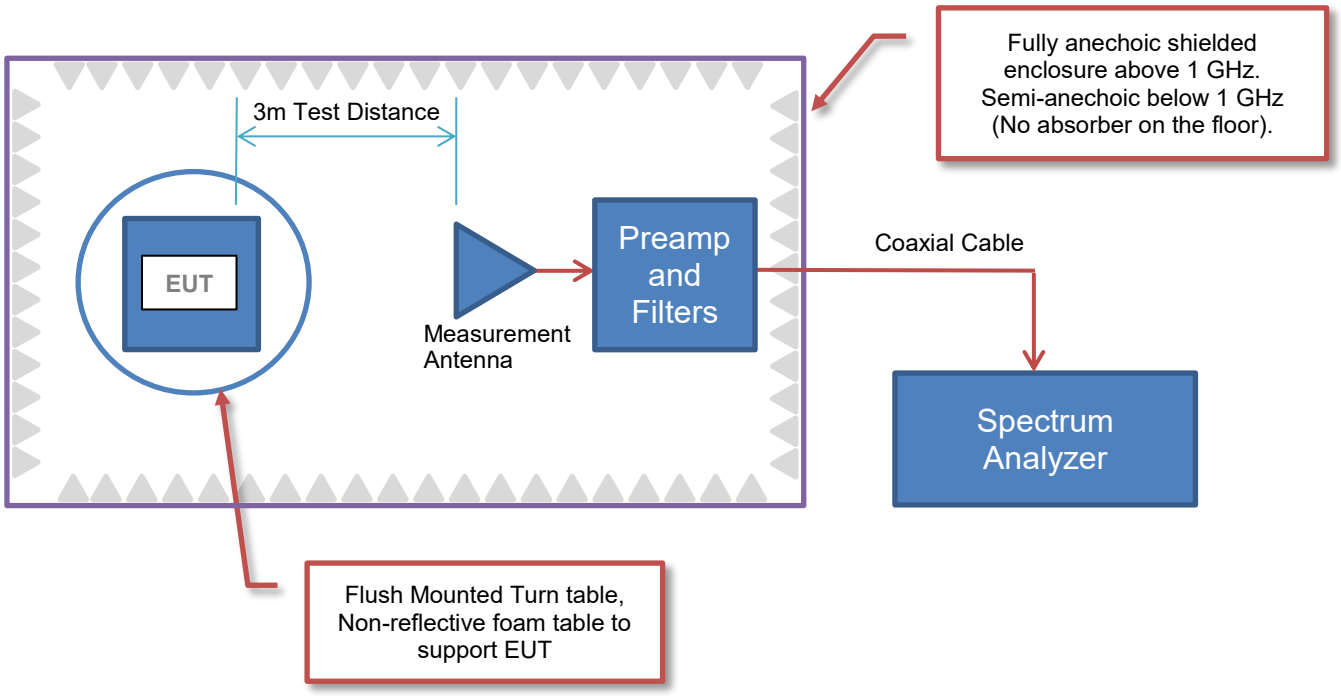
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Garrett Metal Detectors
Address:	1881 W. State Street
City, State, Zip:	Garland, TX 75042
Test Requested By:	Weldon Sanders
Model:	WR-1
First Date of Test:	October 26, 2016
Last Date of Test:	November 4, 2016
Receipt Date of Samples:	October 18, 2016
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Wireless Headphone pack using a 2.4 GHz radio that allows user to connect their own headphones to a wireless module. Wireless Headphone system consists of Model WT-1 transceiver and Model WR-1 transceiver which use the identical radio and antenna. All radiated and conducted emissions, and output power were done on the WR-1 radio. Other antenna port direct connect tests were done on the WT-1 radio.

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247 for operation in the 2400 - 2483.5 MHz Band.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration GARR0027- 1

Software/Firmware Running during test	
Description	**Version**
PurePath Wireless Commander - Texas Instruments	1.0.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter Radio Module (Direct Connect)	Garrett Metal Detectors	WT-1	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Acer	ZG5	LUS360B171909157F02547
AC/DC Power Supply (Laptop)	Delta Electronics, Inc.	ADP-30JH B	202W91502BN
CC Debugger	Texas Instruments	Unknown	8484
Microprocessor Box	P&E Microcomputer Systems, Inc.	CYCLONE_ACP	15-065
AC/DC Power Supply (Microprocessor)	Freescale Semiconductor Japan Ltd.	3A-154WP06	None
Battery	Minamoto	LI-14500	None
Test Fixture	Unknown	None	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power (Laptop)	No	1.8m	No	AC Mains	AC/DC Power Supply (Laptop)
DC Power (Laptop)	No	1.5m	Yes	AC/DC Power Supply (Laptop)	Laptop Computer
DC Power (Microprocessor)	No	1.0m	Yes	AC/DC Power Supply (Microprocessor)	Microprocessor Box
USB (CC Debugger)	No	1.5m	No	Laptop Computer	CC Debugger
Ribbon Cable (Processor)	No	0.5m	No	Test Fixture	Microprocessor Box
Ribbon Cable (Transmitter)	No	0.5m	No	Test Fixture	CC Debugger
Battery Power	No	0.1m	No	Battery	Radio Module

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration GARR0027- 2

Software/Firmware Running during test	
Description	**Version**
PurePath Wireless Commander - Texas Instruments	1.0.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Receiver Radio Module (Direct Connect)	Garrett Metal Detectors	WR-1	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Acer	ZG5	LUS360B171909157F02547
AC/DC Power Supply (Laptop)	Delta Electronics, Inc.	ADP-30JH B	202W91502BN
CC Debugger	Texas Instruments	Unknown	8484
Battery	Minamoto	LI-14500	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power (Laptop)	No	1.8m	No	AC Mains	AC/DC Power Supply (Laptop)
DC Power (Laptop)	No	1.5m	Yes	AC/DC Power Supply (Laptop)	Laptop Computer
USB (CC Debugger)	No	1.5m	No	Laptop Computer	CC Debugger
Ribbon Cable (Receiver)	No	0.5m	No	CC Debugger	Radio Module
Battery Power	No	0.1m	No	Battery	Radio Module

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration GARR0027- 4

Software/Firmware Running during test	
Description	**Version**
PurePath Wireless Commander - Texas Instruments	1.0.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Receiver Radio Module (Radiated)	Garrett Metal Detectors	WR-1	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
CC Debugger	Texas Instruments	Unknown	8484
Battery	Minamoto	LI-14500	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Acer	ZG5	LUS360B171909157F02547
AC/DC Power Supply (Laptop)	Delta Electronics, Inc.	ADP-30JH B	202W91502BN

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power (Laptop)	No	1.8m	No	AC Mains	AC/DC Power Supply (Laptop)
DC Power (Laptop)	No	1.5m	Yes	AC/DC Power Supply (Laptop)	Laptop Computer
USB (CC Debugger)	No	1.5m	No	Laptop Computer	CC Debugger
Ribbon Cable (Receiver)	No	0.5m	No	CC Debugger	Radio Module
Battery Power	No	0.1m	No	Battery	Radio Module
USB Extension	No	5.0m	No	USB (CC Debugger)	Laptop Computer

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	10/26/2016	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	10/26/2016	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	10/26/2016	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	10/26/2016	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	10/26/2016	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	11/3/2016	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	11/4/2016	Spurious Radiated 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

NORTHWEST EMC
WTD.2016.09.09

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. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARF	6/22/2016	6/22/2017
Cable - Conducted Cable Assembly	Northwest EMC	TXA, HHZ, TQR	TXAA	5/17/2016	5/17/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	9/21/2016	9/21/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LJL	9/21/2016	9/21/2017

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

GARR0027-4

MODES INVESTIGATED

Transmitting at Mid Channel 2445 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 230VAC/50Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	20	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

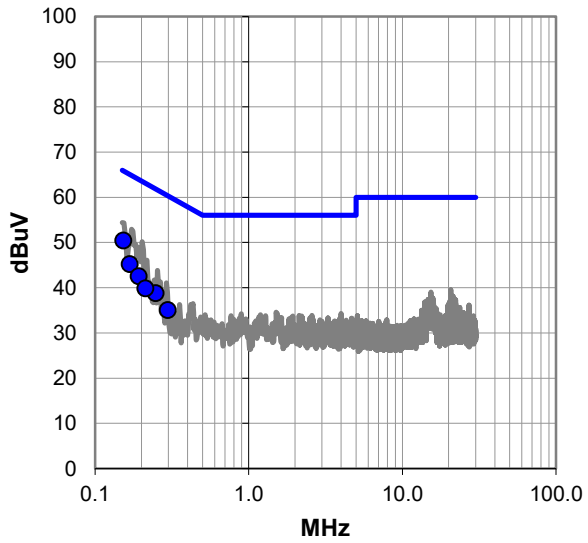
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

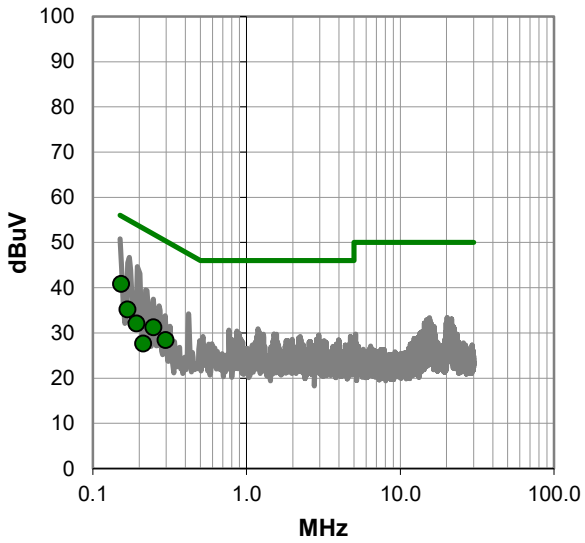
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #20

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.153	30.5	19.9	50.4	65.9	-15.5
0.168	25.3	19.9	45.2	65.0	-19.8
0.192	22.6	19.9	42.5	63.9	-21.4
0.248	18.9	19.9	38.8	61.8	-23.0
0.213	19.9	19.9	39.8	63.1	-23.3
0.298	15.1	19.9	35.0	60.3	-25.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.153	20.9	19.9	40.8	55.9	-15.1
0.168	15.3	19.9	35.2	55.0	-19.8
0.248	11.3	19.9	31.2	51.8	-20.6
0.192	12.2	19.9	32.1	53.9	-21.8
0.298	8.5	19.9	28.4	50.3	-21.9
0.213	7.7	19.9	27.6	53.1	-25.5

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 230VAC/50Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	21	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

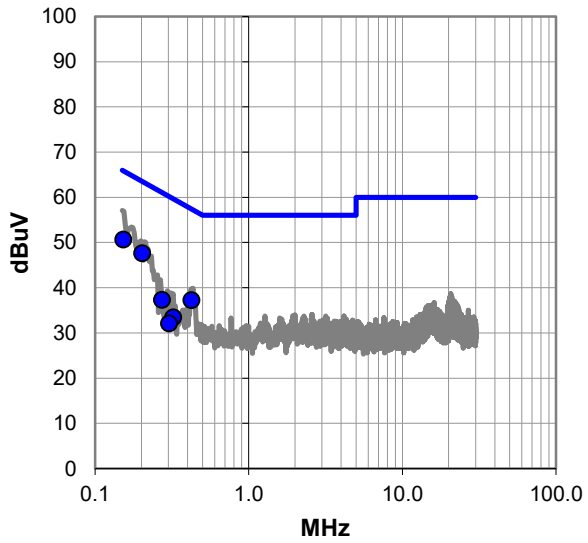
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

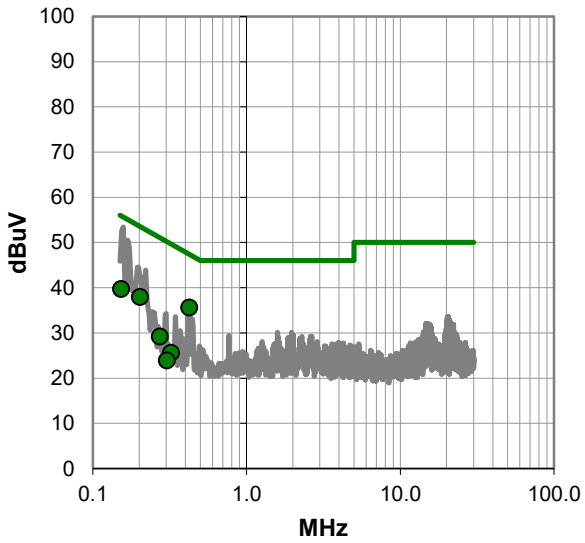
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #21

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.153	30.7	19.9	50.6	65.9	-15.3
0.203	27.7	19.9	47.6	63.5	-15.9
0.424	17.3	19.9	37.2	57.4	-20.2
0.273	17.5	19.8	37.3	61.0	-23.7
0.322	13.6	19.8	33.4	59.6	-26.2
0.303	12.2	19.9	32.1	60.2	-28.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.424	15.7	19.9	35.6	47.4	-11.8
0.203	18.0	19.9	37.9	53.5	-15.6
0.153	19.8	19.9	39.7	55.9	-16.2
0.273	9.4	19.8	29.2	51.0	-21.8
0.322	5.8	19.8	25.6	49.6	-24.0
0.303	4.0	19.9	23.9	50.2	-26.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 100VAC/50Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	22	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

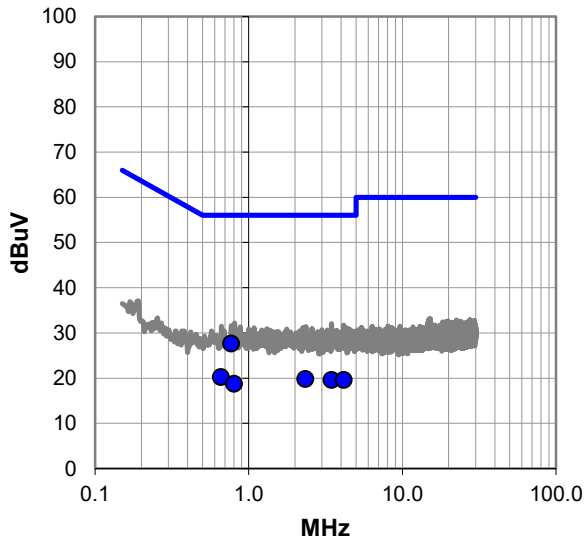
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

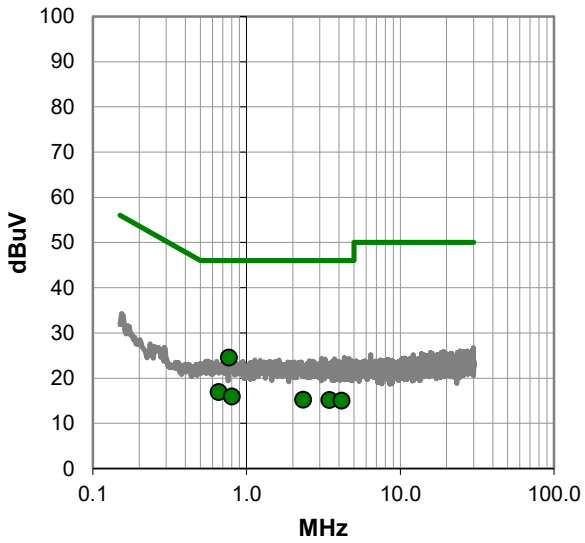
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #22

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.769	7.7	19.9	27.6	56.0	-28.4
0.661	0.3	19.9	20.2	56.0	-35.8
2.341	0.1	19.7	19.8	56.0	-36.2
3.468	-0.2	19.8	19.6	56.0	-36.4
4.156	-0.2	19.8	19.6	56.0	-36.4
0.801	-1.2	19.9	18.7	56.0	-37.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.769	4.6	19.9	24.5	46.0	-21.5
0.661	-3.0	19.9	16.9	46.0	-29.1
0.801	-4.0	19.9	15.9	46.0	-30.1
2.341	-4.5	19.7	15.2	46.0	-30.8
3.468	-4.7	19.8	15.1	46.0	-30.9
4.156	-4.8	19.8	15.0	46.0	-31.0

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 100VAC/50Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	23	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

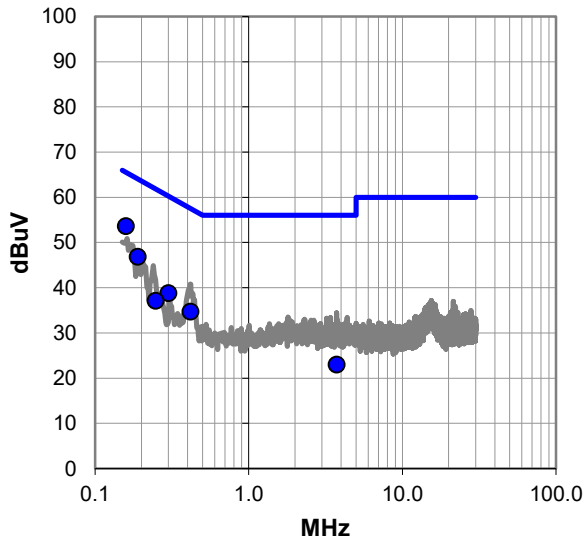
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

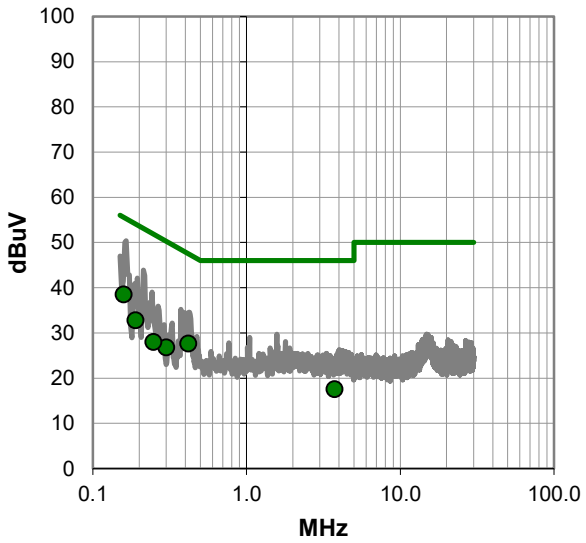
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #23

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.159	33.7	19.9	53.6	65.5	-11.9
0.190	26.9	19.9	46.8	64.0	-17.2
0.301	18.9	19.9	38.8	60.2	-21.4
0.419	14.8	19.9	34.7	57.5	-22.8
0.248	17.2	19.9	37.1	61.8	-24.7
3.734	3.3	19.7	23.0	56.0	-33.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.159	18.6	19.9	38.5	55.5	-17.0
0.419	7.7	19.9	27.6	47.5	-19.9
0.190	12.9	19.9	32.8	54.0	-21.2
0.301	6.9	19.9	26.8	50.2	-23.4
0.248	8.1	19.9	28.0	51.8	-23.8
3.734	-2.2	19.7	17.5	46.0	-28.5

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 110VAC/60Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	24	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

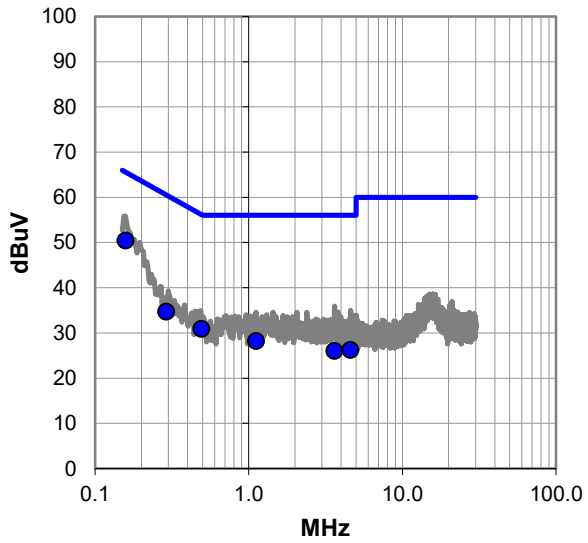
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

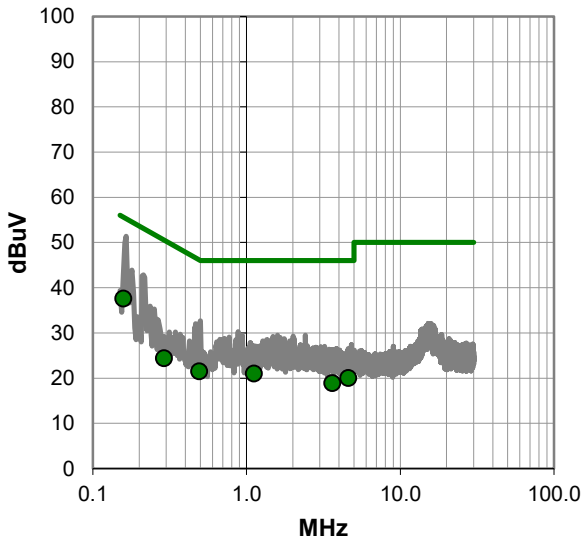
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #24

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.158	30.5	19.9	50.4	65.6	-15.2
0.493	11.1	19.8	30.9	56.1	-25.2
0.290	14.9	19.8	34.7	60.5	-25.8
1.118	8.5	19.7	28.2	56.0	-27.8
4.606	6.4	19.8	26.2	56.0	-29.8
3.610	6.2	19.8	26.0	56.0	-30.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.158	17.7	19.9	37.6	55.6	-18.0
0.493	1.7	19.8	21.5	46.1	-24.6
1.118	1.3	19.7	21.0	46.0	-25.0
4.606	0.2	19.8	20.0	46.0	-26.0
0.290	4.6	19.8	24.4	50.5	-26.1
3.610	-0.9	19.8	18.9	46.0	-27.1

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

EUT:	WR-1	Work Order:	GARR0027
Serial Number:	None	Date:	11/03/2016
Customer:	Garrett Metal Detectors	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1026 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	USB via 110VAC/60Hz	Configuration:	GARR0027-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	25	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Testing the Receiver unit in Transmit Mode with TX Power setting of 5dBm.

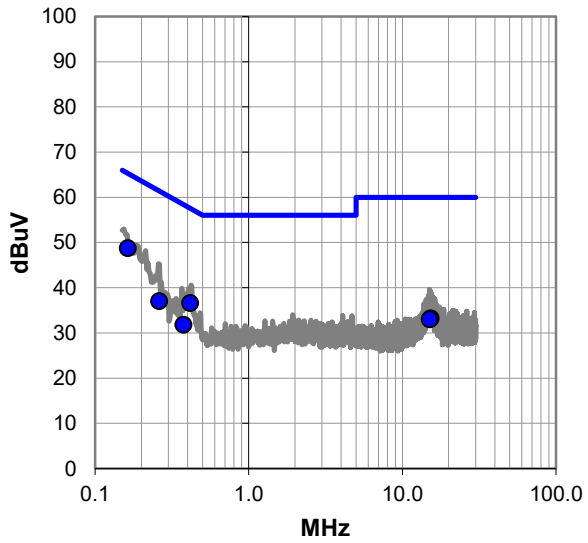
EUT OPERATING MODES

Transmitting at Mid Channel 2445 MHz

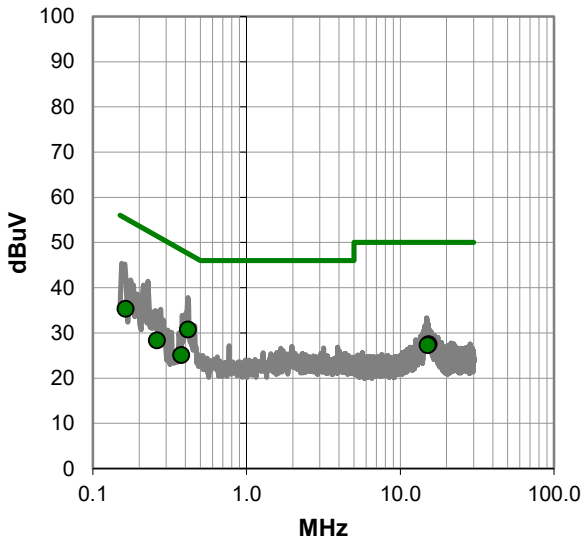
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.09.09

RESULTS - Run #25

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.163	28.8	19.9	48.7	65.3	-16.6
0.417	16.7	19.9	36.6	57.5	-20.9
0.261	17.1	19.9	37.0	61.4	-24.4
0.376	12.0	19.8	31.8	58.4	-26.6
15.313	12.9	20.3	33.2	60.0	-26.8
15.069	12.7	20.3	33.0	60.0	-27.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (()	Spec. Limit (()	Margin (dB)
0.417	10.8	19.9	30.7	47.5	-16.8
0.163	15.4	19.9	35.3	55.3	-20.0
15.313	7.2	20.3	27.5	50.0	-22.5
15.069	7.0	20.3	27.3	50.0	-22.7
0.261	8.4	19.9	28.3	51.4	-23.1
0.376	5.3	19.8	25.1	48.4	-23.3

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2016.07.22

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 at Low Channel 2405 MHz, Mid Channel 2445 MHz, High Channel 2480 MHz
Transmitting at Low Channel 2405, High Channel 2480 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

GARR0027 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz

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
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAM	11/20/2015	12 mo
Cable	Northwest EMC	18-40GHz	TXE	11/20/2015	12 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXW	8/5/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	10/12/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	10/18/2016	12 mo
Cable	Northwest EMC	8-18GHz	TXD	5/31/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Filter - High Pass	Micro-Tronics	HPM50111	HGC	3/4/2016	12 mo
Attenuator	Weinschel Corp	4H-20	AWB	3/9/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	5/31/2016	12 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	5/31/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJN	9/15/2016	24 mo
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	8/5/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAH	9/12/2016	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	5/31/2016	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	4/13/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	10/4/2016	12 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.

SPURIOUS RADIATED EMISSIONS

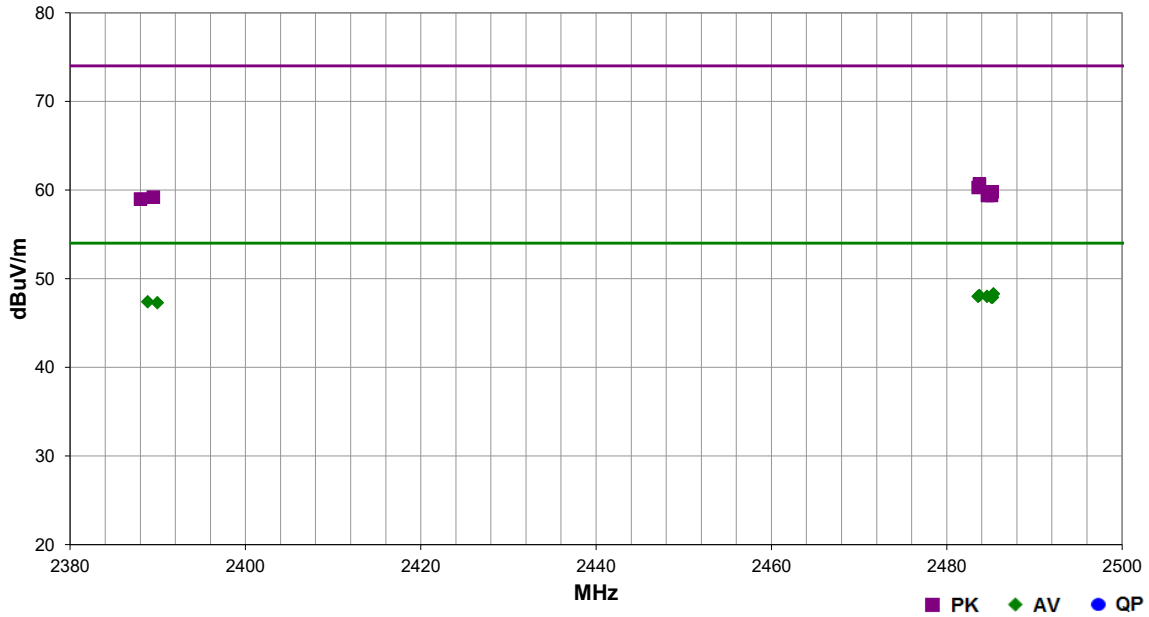
NORTHWEST EMC

PSA-ESCI 2016.07.22
EmiR5 2016.08.26

Work Order:	GARR0027	**Date:**	11/04/16		
Project:	None	**Temperature:**	23.2 °C		
Job Site:	TX02	**Humidity:**	48% RH		
Serial Number:	None	**Barometric Pres.:**	1028 mbar	**Tested by:**	Jonathan Kiefer
EUT:	WR-1				
Configuration:	4				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting at Low Channel 2405, High Channel 2480 MHz				
Deviations:	None				
Comments:	Band Edge. Testing the Receiver Unit in Transmit Mode with a TX Power setting of 5dBm. Customer has stated that the EUT does not transmit while it is charging.				

Test Specifications	**Test Method**
FCC 15.247:2016	ANSI C63.10:2013

Run #	105	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
2485.340	33.0	-4.7	1.3	0.0	3.0	20.0	Horz	AV	0.0	48.3	54.0	-5.7	High Ch, EUT Horizontal, 5dBm
2483.730	32.8	-4.7	1.2	266.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	High Ch, EUT Horizontal, 5dBm
2484.590	32.7	-4.7	1.2	243.9	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	High Ch, EUT Vertical, 5dBm
2483.577	32.7	-4.7	1.2	340.9	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	High Ch, EUT On Side, 5dBm
2485.110	32.6	-4.7	3.9	134.0	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	High Ch, EUT Vertical, 5dBm
2485.227	32.6	-4.7	1.3	177.9	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	High Ch, EUT On Side, 5dBm
2388.860	32.8	-5.4	1.3	178.9	3.0	20.0	Horz	AV	0.0	47.4	54.0	-6.6	Low Ch, EUT Horizontal, 5dBm
2389.953	32.7	-5.4	1.3	61.0	3.0	20.0	Vert	AV	0.0	47.3	54.0	-6.7	Low Ch, EUT Horizontal, 5dBm
2483.730	45.4	-4.7	1.3	0.0	3.0	20.0	Horz	PK	0.0	60.7	74.0	-13.3	High Ch, EUT Horizontal, 5dBm
2483.580	45.0	-4.7	1.3	177.9	3.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	High Ch, EUT On Side, 5dBm
2485.173	44.5	-4.7	1.2	340.9	3.0	20.0	Horz	PK	0.0	59.8	74.0	-14.2	High Ch, EUT On Side, 5dBm
2485.033	44.4	-4.7	1.2	243.9	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	High Ch, EUT Vertical, 5dBm
2485.103	44.1	-4.7	1.2	266.0	3.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6	High Ch, EUT Horizontal, 5dBm
2484.643	44.1	-4.7	3.9	134.0	3.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6	High Ch, EUT Vertical, 5dBm
2389.497	44.6	-5.4	1.3	61.0	3.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	Low Ch, EUT Horizontal, 5dBm
2388.020	44.4	-5.4	1.3	178.9	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	Low Ch, EUT Horizontal, 5dBm

SPURIOUS RADIATED EMISSIONS

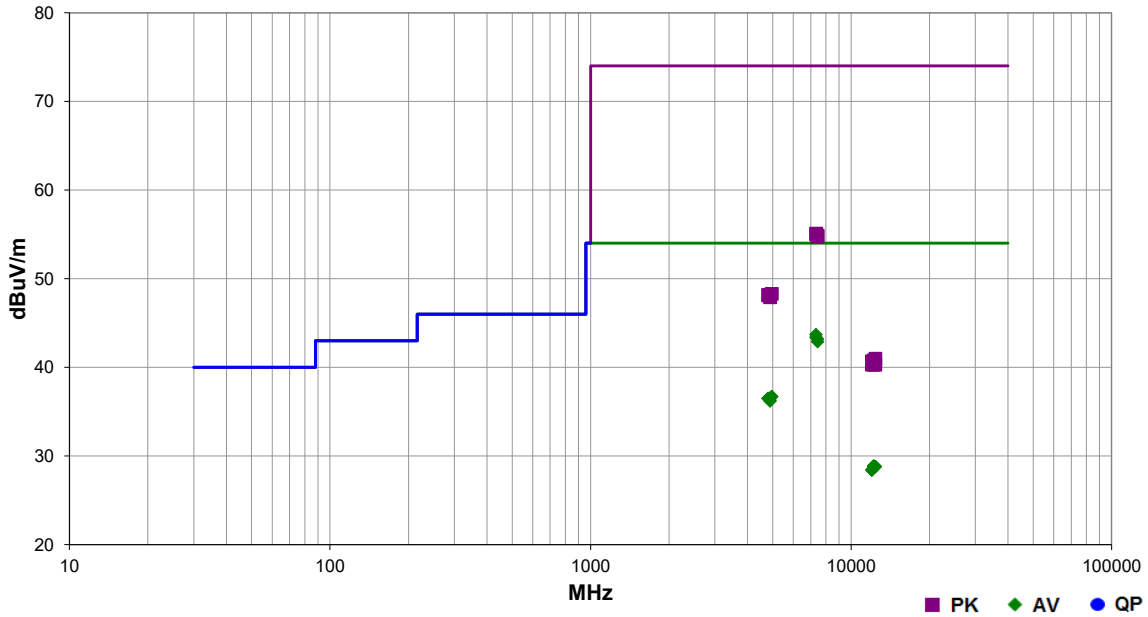
NORTHWEST EMC

PSA-ESCI 2016.07.22
EmiR5 2016.08.26

Work Order:	GARR0027	**Date:**	11/04/16		
Project:	None	**Temperature:**	23.2 °C		
Job Site:	TX02	**Humidity:**	48% RH		
Serial Number:	None	**Barometric Pres.:**	1028 mbar	**Tested by:**	Jonathan Kiefer
EUT:	WR-1				
Configuration:	4				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting at Low Channel 2405 MHz, Mid Channel 2445 MHz, High Channel 2480 MHz				
Deviations:	None				
Comments:	Harmonics. Testing the Receiver Unit in Transmit Mode with a TX Power setting of 5dBm. Customer has stated that the EUT does not transmit while it is charging.				

Test Specifications	**Test Method**
FCC 15.247:2016	ANSI C63.10:2013

Run #	106	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
7334.850	30.0	13.7	1.3	0.0	3.0	0.0	Horz	AV	0.0	43.7	54.0	-10.3	Mid Ch, EUT Horizontal, 5dBm
7336.942	29.7	13.7	1.2	268.9	3.0	0.0	Vert	AV	0.0	43.4	54.0	-10.6	Mid Ch, EUT Horizontal, 5dBm
7439.683	29.6	13.6	1.3	339.0	3.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	High Ch, EUT Horizontal, 5dBm
7442.267	29.3	13.6	1.2	4.9	3.0	0.0	Vert	AV	0.0	42.9	54.0	-11.1	High Ch, EUT Horizontal, 5dBm
4959.900	30.3	6.4	2.6	182.0	3.0	0.0	Horz	AV	0.0	36.7	54.0	-17.3	High Ch, EUT Horizontal, 5dBm
4962.475	30.3	6.4	1.2	158.0	3.0	0.0	Vert	AV	0.0	36.7	54.0	-17.3	High Ch, EUT Horizontal, 5dBm
4807.550	30.3	6.2	2.8	43.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	Low Ch, EUT Horizontal, 5dBm
4807.567	30.3	6.2	1.3	42.0	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5	Low Ch, EUT Horizontal, 5dBm
4889.275	29.9	6.4	1.3	84.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7	Mid Ch, EUT Horizontal, 5dBm
4889.750	29.8	6.4	1.3	45.0	3.0	0.0	Horz	AV	0.0	36.2	54.0	-17.8	Mid Ch, EUT Horizontal, 5dBm
7334.142	41.4	13.7	1.3	0.0	3.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	Mid Ch, EUT Horizontal, 5dBm
7335.308	41.3	13.7	1.2	268.9	3.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	Mid Ch, EUT Horizontal, 5dBm
7442.300	41.3	13.6	1.3	339.0	3.0	0.0	Horz	PK	0.0	54.9	74.0	-19.1	High Ch, EUT Horizontal, 5dBm
7439.900	41.1	13.6	1.2	4.9	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	High Ch, EUT Horizontal, 5dBm
12224.160	30.7	-1.8	1.2	357.0	3.0	0.0	Vert	AV	0.0	28.9	54.0	-25.1	Mid Ch, EUT Horizontal, 5dBm
12397.840	29.9	-1.1	1.3	100.9	3.0	0.0	Horz	AV	0.0	28.8	54.0	-25.2	High Ch, EUT Horizontal, 5dBm
12397.750	29.9	-1.1	1.2	64.9	3.0	0.0	Vert	AV	0.0	28.8	54.0	-25.2	High Ch, EUT Horizontal, 5dBm
12223.190	30.6	-1.8	1.3	114.0	3.0	0.0	Horz	AV	0.0	28.8	54.0	-25.2	Mid Ch, EUT Horizontal, 5dBm
12024.870	30.7	-2.3	1.3	321.0	3.0	0.0	Horz	AV	0.0	28.4	54.0	-25.6	Low Ch, EUT Horizontal, 5dBm
12026.290	30.7	-2.3	3.0	138.0	3.0	0.0	Vert	AV	0.0	28.4	54.0	-25.6	Low Ch, EUT Horizontal, 5dBm
4961.100	41.9	6.4	2.6	182.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	High Ch, EUT Horizontal, 5dBm
4959.175	41.9	6.4	1.2	158.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	High Ch, EUT Horizontal, 5dBm

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
4809.783	42.0	6.2	1.3	42.0	3.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Low Ch, EUT Horizontal, 5dBm
4891.167	41.8	6.4	1.3	84.0	3.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Mid Ch, EUT Horizontal, 5dBm
4807.808	41.9	6.2	2.8	43.0	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	Low Ch, EUT Horizontal, 5dBm
4887.617	41.5	6.4	1.3	45.0	3.0	0.0	Horz	PK	0.0	47.9	74.0	-26.1	Mid Ch, EUT Horizontal, 5dBm
12399.860	42.1	-1.1	1.3	100.9	3.0	0.0	Horz	PK	0.0	41.0	74.0	-33.0	High Ch, EUT Horizontal, 5dBm
12226.540	42.6	-1.8	1.3	114.0	3.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	Mid Ch, EUT Horizontal, 5dBm
12023.220	43.0	-2.3	1.3	321.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Low Ch, EUT Horizontal, 5dBm
12398.010	41.4	-1.1	1.2	64.9	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	High Ch, EUT Horizontal, 5dBm
12222.690	42.1	-1.8	1.2	357.0	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	Mid Ch, EUT Horizontal, 5dBm
12025.090	42.6	-2.3	3.0	138.0	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	Low Ch, EUT Horizontal, 5dBm

DUTY CYCLE

NORTHWEST EMC

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 output level as specified in the datasheet.

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.

OCCUPIED BANDWIDTH

XMit 2016.05.06

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.	Cal. Due
Cable	Fairview Microwave	SCK0963-60	TXF	10/24/2016	10/24/2017
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Generator - Signal	Agilent	E4422B	TGS	3/27/2015	3/27/2018

TEST DESCRIPTION

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

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2016.05.06

EUT:	WT-1			**Work Order:**	GARR0027
Serial Number:	None			**Date:**	10/26/16
Customer:	Garrett Metal Detectors			**Temperature:**	23.3 °C
Attendees:	None			**Humidity:**	44.9% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Jonathan Kiefer	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Testing the Transmitter Unit in Transmit Mode with TX Power setting of 5 dBm. This test was ran on a unit that had a similar radio as that of the receiver.

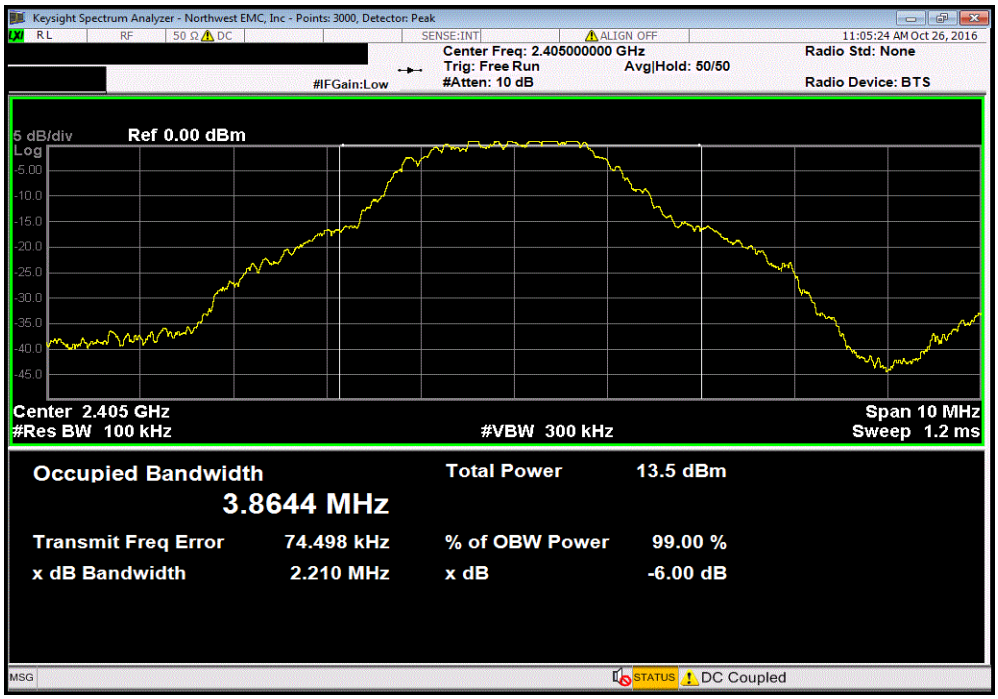
DEVIATIONS FROM TEST STANDARD

None

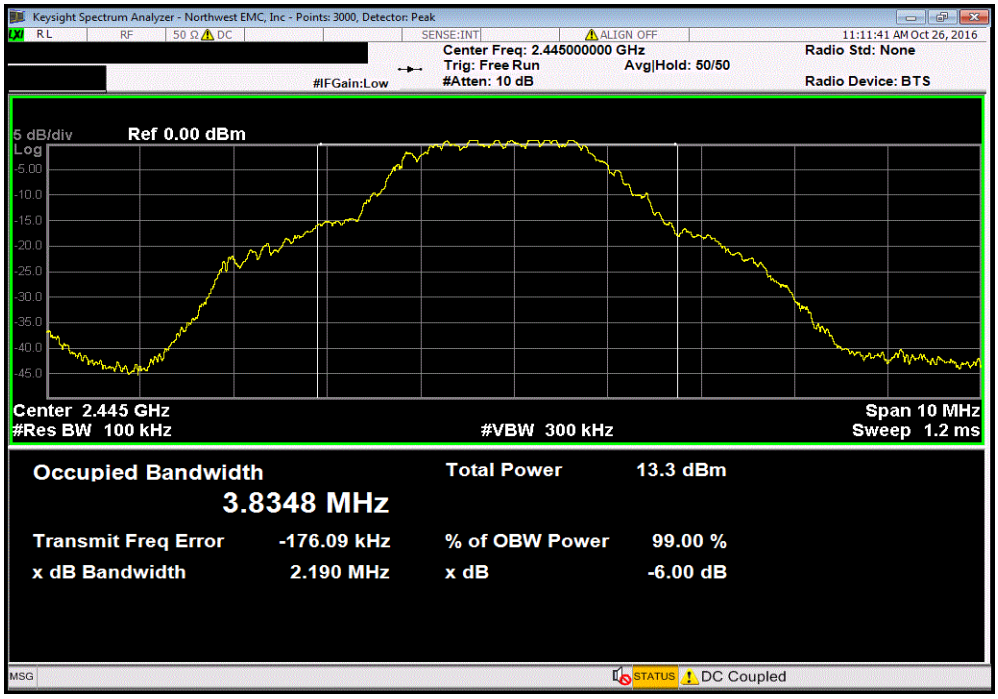
Configuration #	1	Signature Jonathan Kiefer

	Value	Limit (≥)	Result
Low Channel, 2405 MHz	2.21 MHz	500 kHz	Pass
Mid Channel, 2445 MHz	2.19 MHz	500 kHz	Pass
High Channel, 2480 MHz	2.205 MHz	500 kHz	Pass

Low Channel, 2405 MHz						
				Value	Limit (≥)	Result
				2.21 MHz	500 kHz	Pass



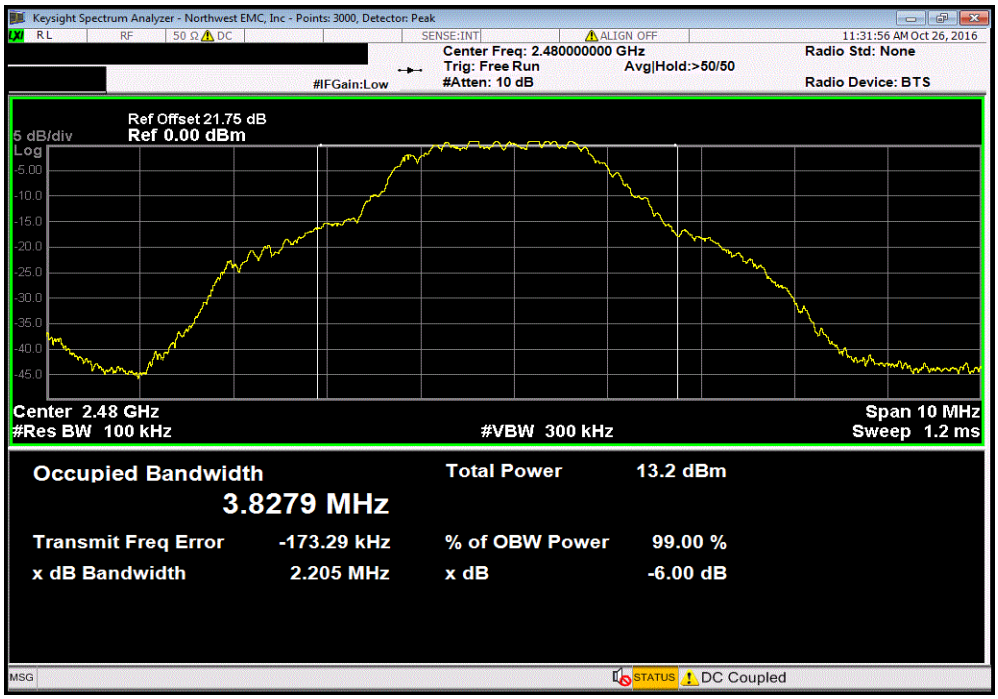
Mid Channel, 2445 MHz						
				Value	Limit (≥)	Result
				2.19 MHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2016.05.06

High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				2.205 MHz	500 kHz	Pass



OUTPUT POWER

XMit 2016.05.06

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.	Cal. Due
Cable	Fairview Microwave	SCK0963-60	TXF	10/24/2016	10/24/2017
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Generator - Signal	Agilent	E4422B	TGS	3/27/2015	3/27/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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 ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio..

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

NORTHWEST EMC

XMit 2016.05.06

EUT:	WR-1			**Work Order:**	GARR0027
Serial Number:	None			**Date:**	10/26/16
Customer:	Garrett Metal Detectors			**Temperature:**	23.4 °C
Attendees:	None			**Humidity:**	44.4% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Jonathan Kiefer	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Testing the Receiver Unit in Transmit Mode with TX Power setting of 5 dBm.

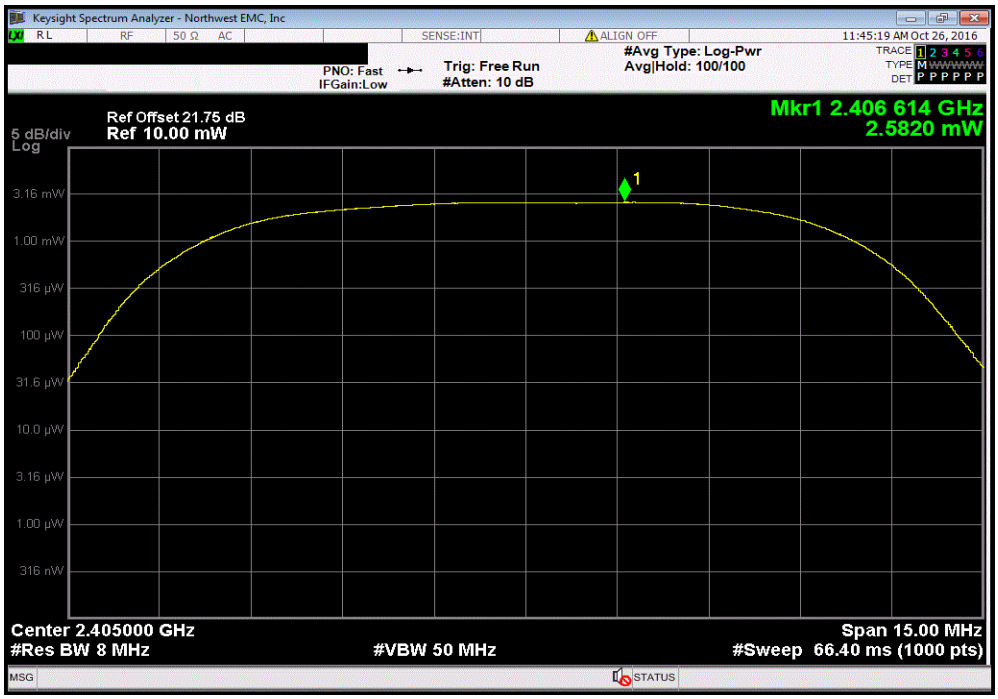
DEVIATIONS FROM TEST STANDARD

None

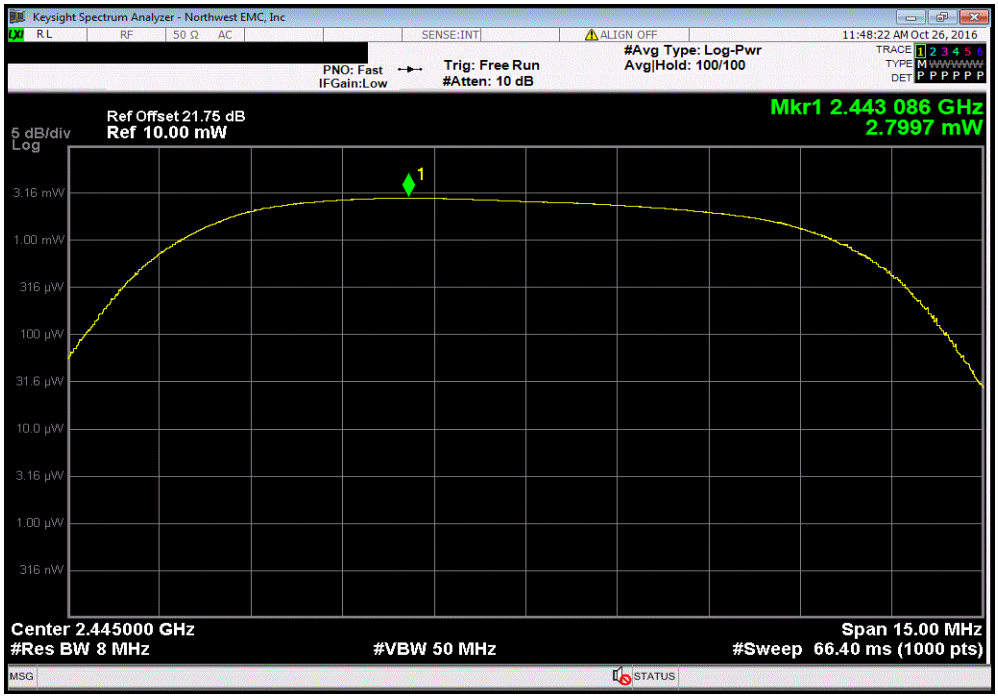
Configuration #	2	Signature Jonathan Kiefer

	Value	Limit (<)	Result
Low Channel, 2405 MHz	2.582 mW	1 W	Pass
Mid Channel, 2445 MHz	2.8 mW	1 W	Pass
High Channel, 2480 MHz	2.806 mW	1 W	Pass

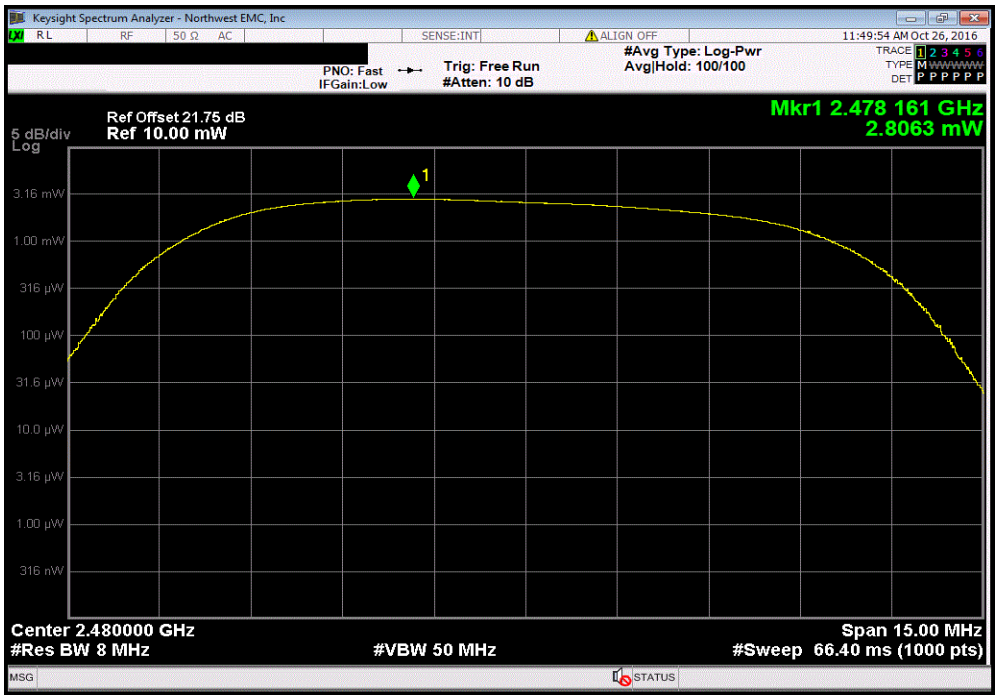
Low Channel, 2405 MHz						
				Value	Limit (<)	Result
				2.582 mW	1 W	Pass



Mid Channel, 2445 MHz						
				Value	Limit (<)	Result
				2.8 mW	1 W	Pass



High Channel, 2480 MHz						
				Value	Limit (<)	Result
				2.806 mW	1 W	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

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.	Cal. Due
Cable	Fairview Microwave	SCK0963-60	TXF	10/24/2016	10/24/2017
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Generator - Signal	Agilent	E4422B	TGS	3/27/2015	3/27/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2016.05.06

EUT:	WT-1			**Work Order:**	GARR0027
Serial Number:	None			**Date:**	10/26/16
Customer:	Garrett Metal Detectors			**Temperature:**	23.6 °C
Attendees:	None			**Humidity:**	44.9% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Jonathan Kiefer	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Testing the Transmitter Unit in Transmit Mode with TX Power setting of 5 dBm.

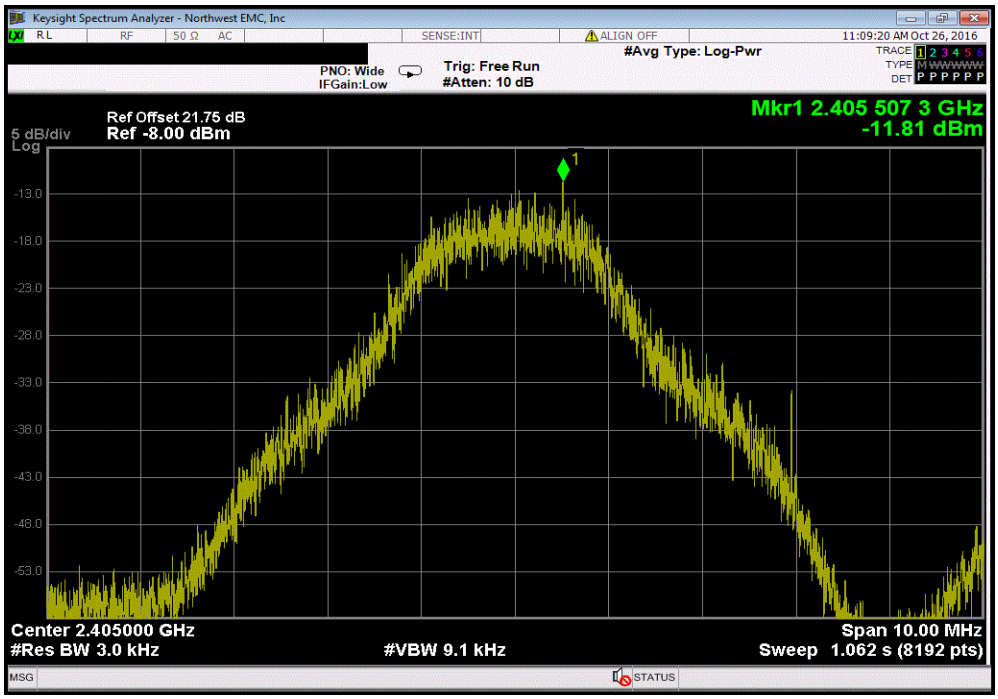
DEVIATIONS FROM TEST STANDARD

None

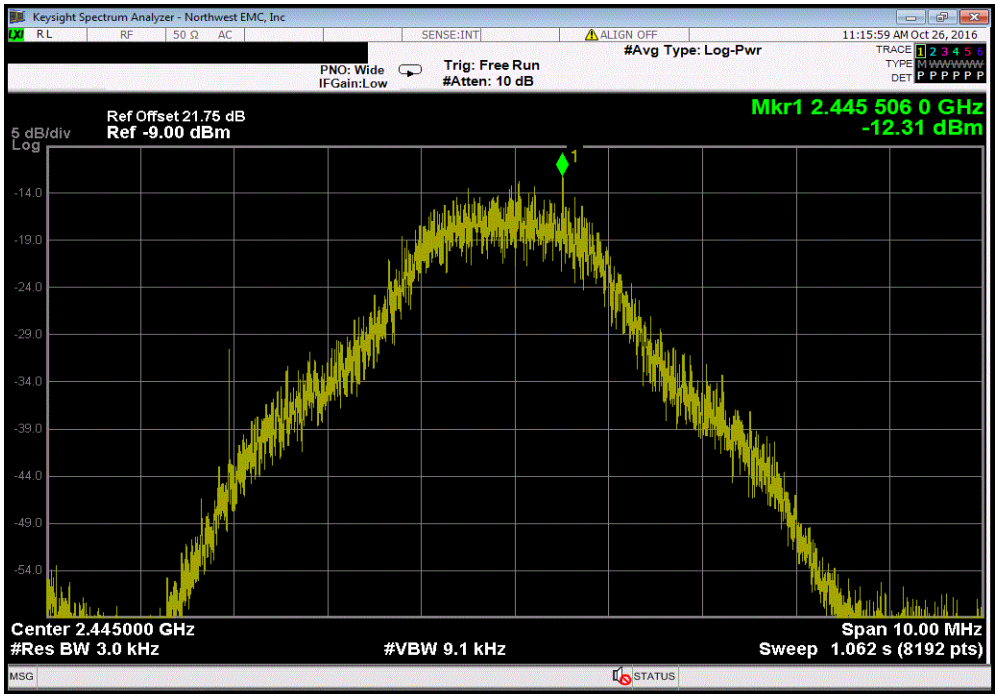
Configuration #	1	Signature Jonathan Kiefer

	Value dBm/3kHz	Limit < dBm/3kHz	Results
Low Channel, 2405 MHz	-11.808	8	Pass
Mid Channel, 2445 MHz	-12.312	8	Pass
High Channel, 2480 MHz	-12.54	8	Pass

Low Channel, 2405 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.808	8	Pass



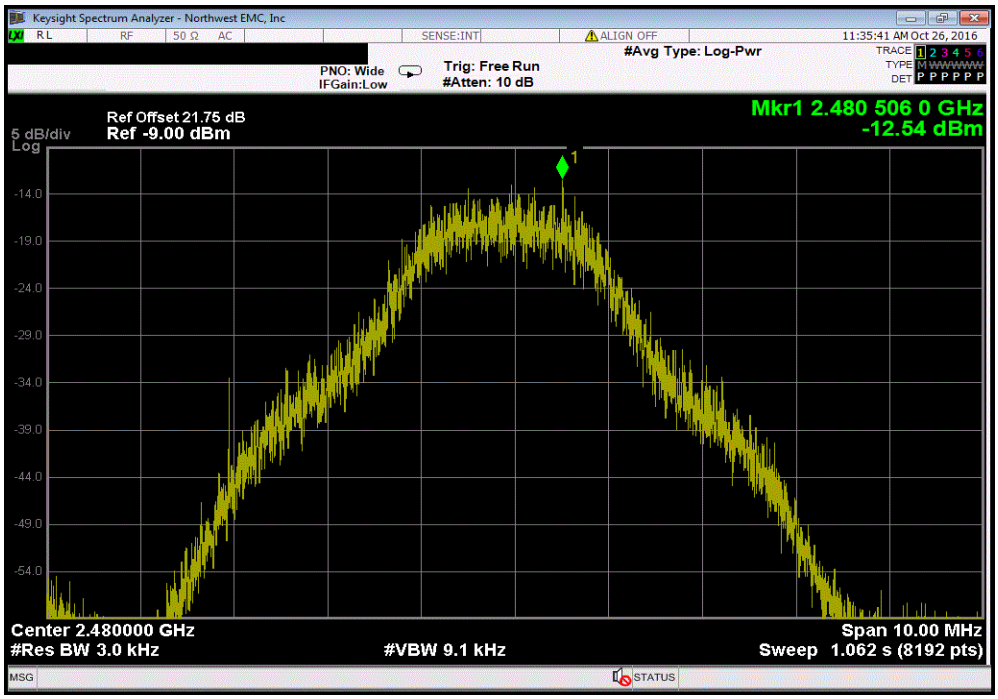
Mid Channel, 2445 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.312	8	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.54	8	Pass



BAND EDGE COMPLIANCE

XMit 2016.05.06

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.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Cable	Fairview Microwave	SCK0963-60	TXF	10/24/2016	10/24/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Generator - Signal	Agilent	E4422B	TGS	3/27/2015	3/27/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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 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

NORTHWEST EMC

XMit 2016.05.06

EUT:	WT-1			Work Order:	GARR0027
Serial Number:	None			Date:	10/26/16
Customer:	Garrett Metal Detectors			Temperature:	23.1 °C
Attendees:	None			Humidity:	44.5% RH
Project:	None			Barometric Pres.:	1024 mbar
Tested by:	Jonathan Kiefer	Power:	Battery	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Testing the Transmitter Unit in Transmit Mode with TX Power setting of 5 dBm.

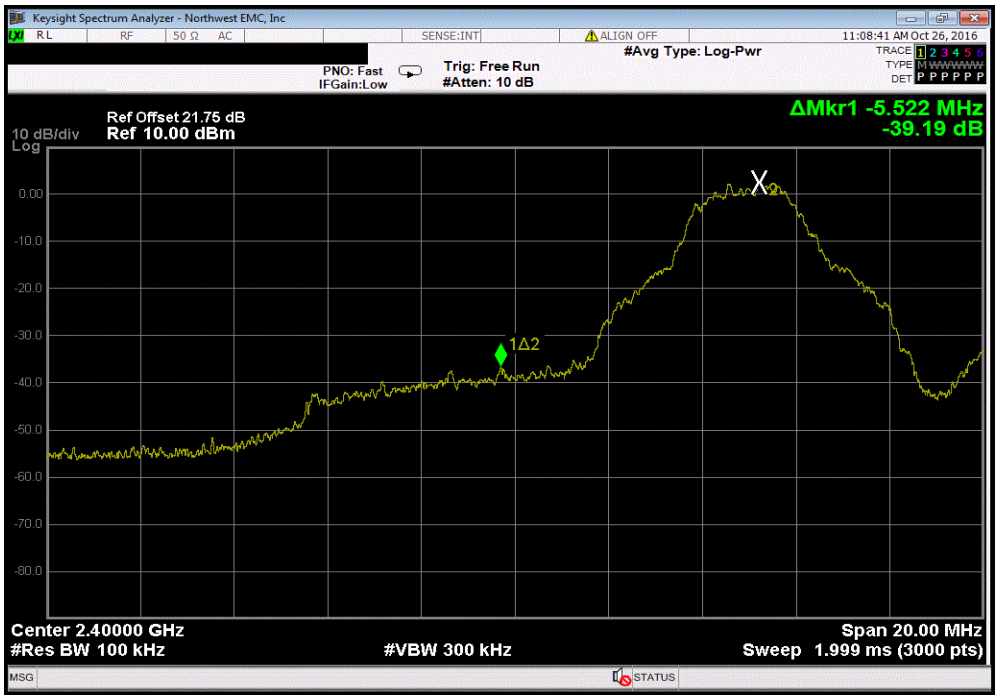
DEVIATIONS FROM TEST STANDARD

None

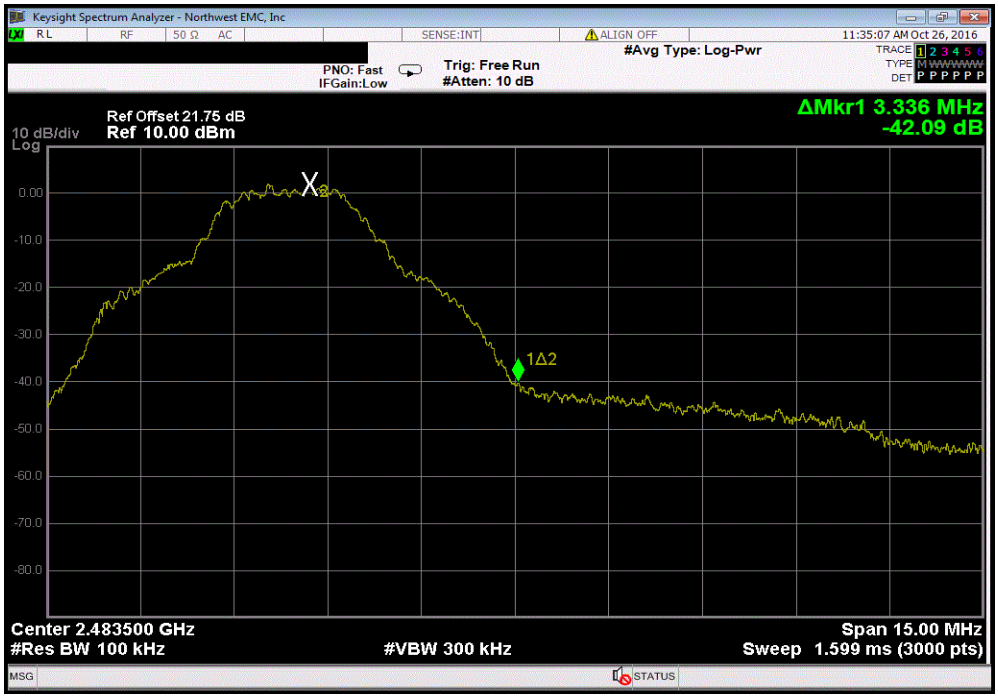
Configuration #	1	Signature Jonathan Kiefer

	Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2405 MHz	-39.19	-20	Pass
High Channel, 2480 MHz	-42.1	-20	Pass

Low Channel, 2405 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-39.19	-20	Pass



High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-42.1	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2016.05.06

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.	Cal. Due
Cable	Fairview Microwave	SCK0963-60	TXF	10/24/2016	10/24/2017
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Generator - Signal	Agilent	E4422B	TGS	3/27/2015	3/27/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. 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

NORTHWEST EMC

XMit 2016.05.06

EUT:	WT-1			**Work Order:**	GARR0027
Serial Number:	None			**Date:**	10/26/16
Customer:	Garrett Metal Detectors			**Temperature:**	23.7 °C
Attendees:	None			**Humidity:**	44.6% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Jonathan Kiefer	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Testing the Transmitter Unit in Transmit Mode with TX Power setting of 5 dBm.

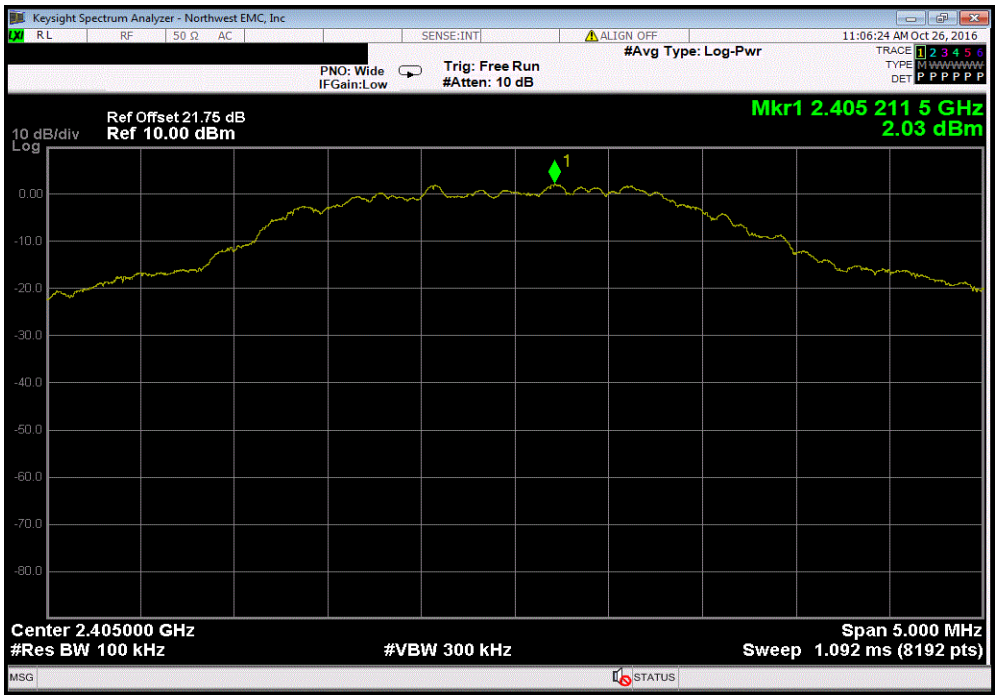
DEVIATIONS FROM TEST STANDARD

None

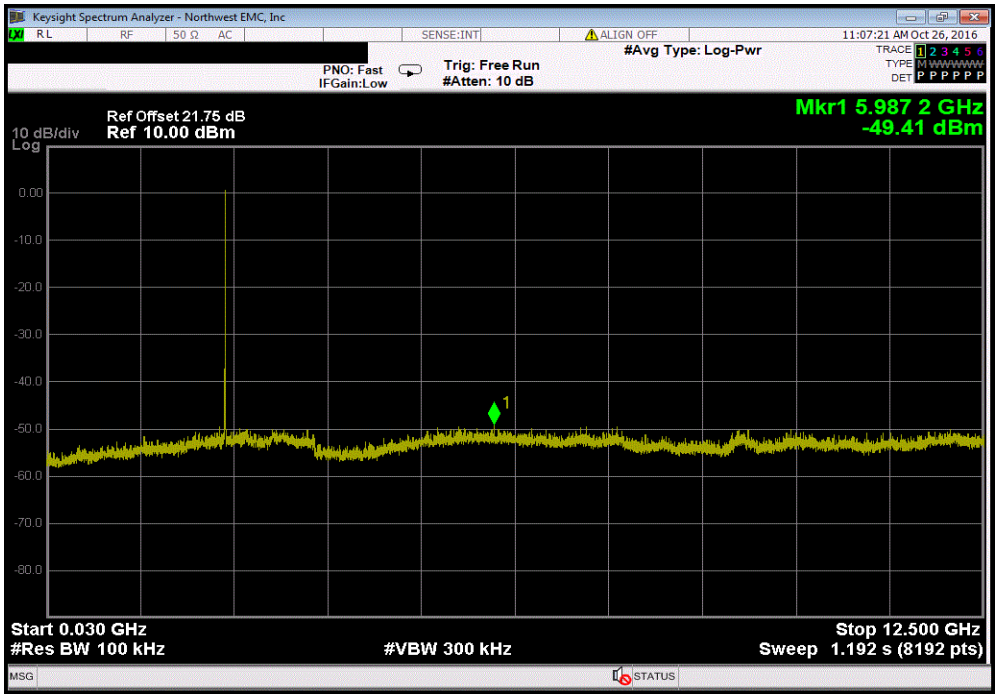
Configuration #	1	Signature Jonathan Kiefer

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2405 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 2405 MHz	30 MHz - 12.5 GHz	-51.44	-20	Pass
Low Channel, 2405 MHz	12.5 GHz - 25 GHz	-40.41	-20	Pass
Mid Channel, 2445 MHz	Fundamental	N/A	N/A	N/A
Mid Channel, 2445 MHz	30 MHz - 12.5 GHz	-51.45	-20	Pass
Mid Channel, 2445 MHz	12.5 GHz - 25 GHz	-40.71	-20	Pass
High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	-47.29	-20	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	-40.59	-20	Pass

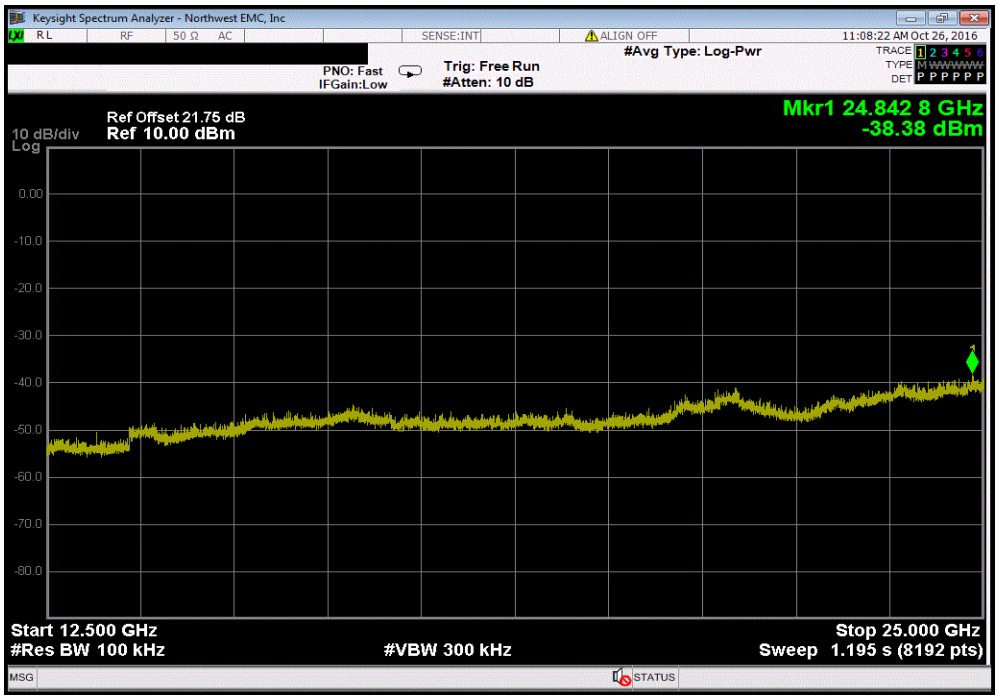
Low Channel, 2405 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



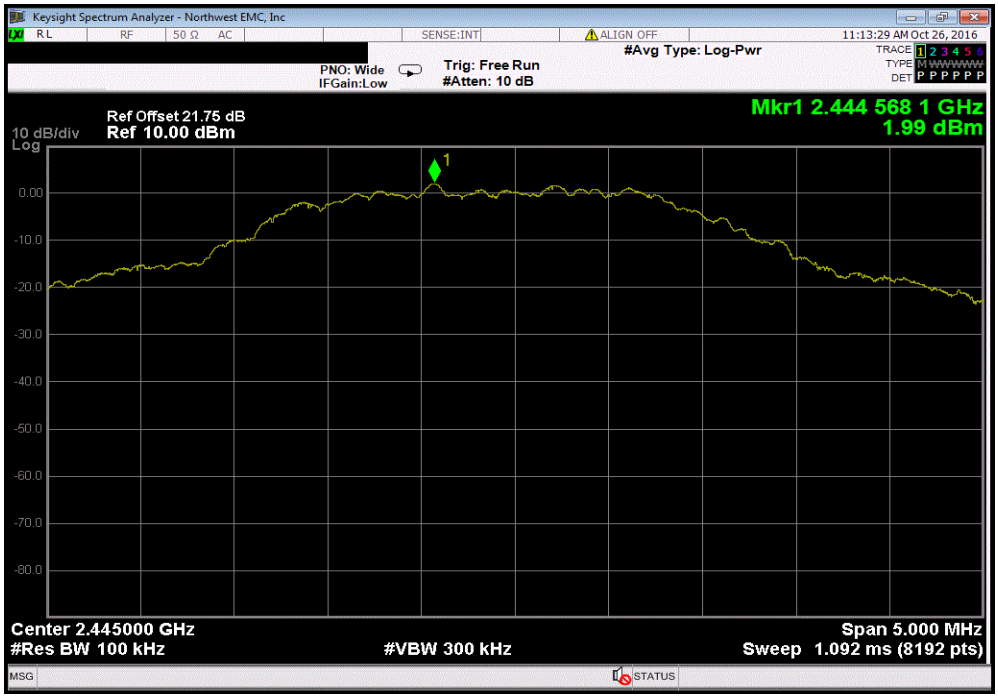
Low Channel, 2405 MHz					
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-51.44	-20	Pass



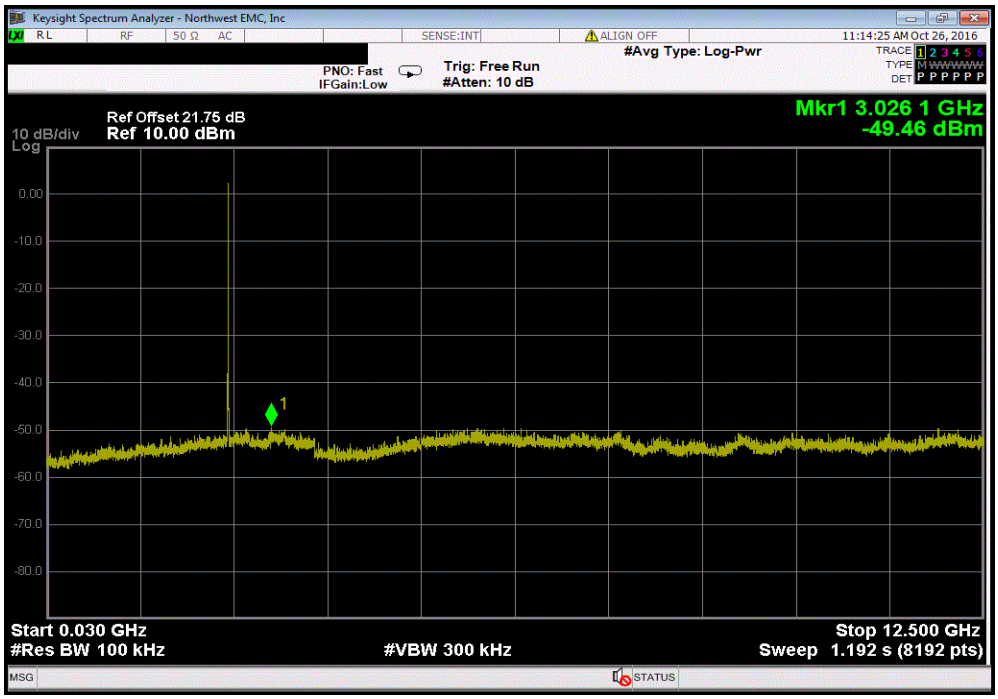
Low Channel, 2405 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-40.41	-20	Pass



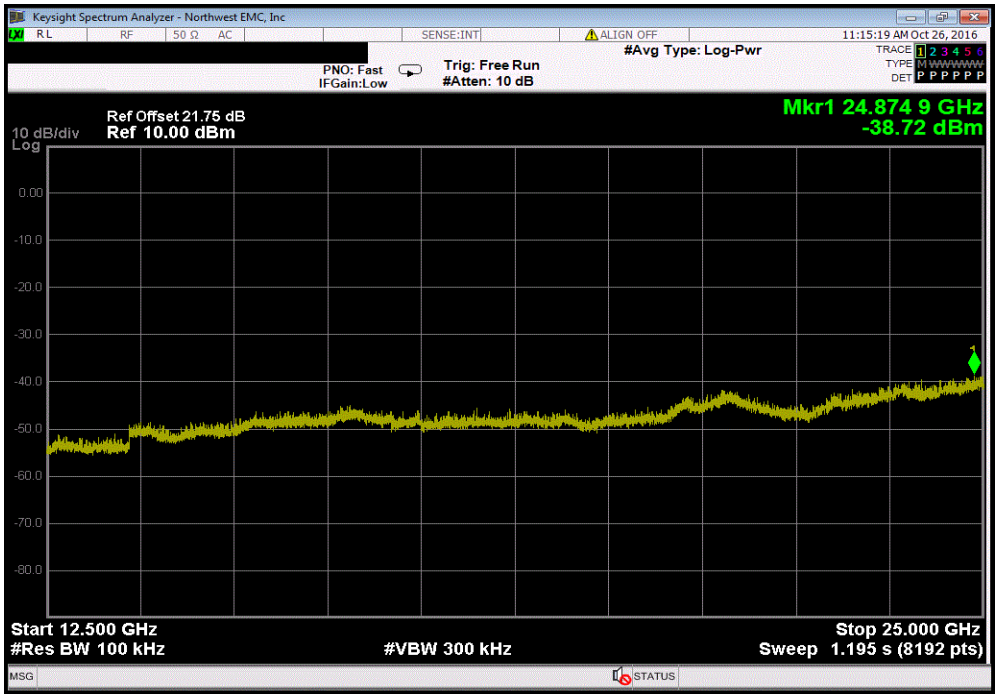
Mid Channel, 2445 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



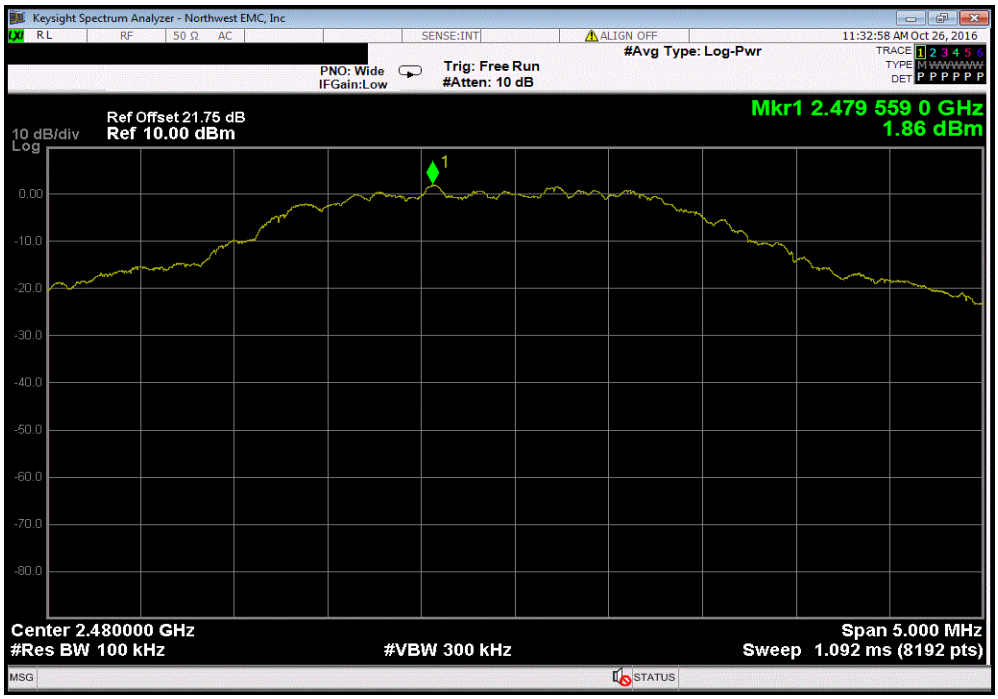
Mid Channel, 2445 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-51.45	-20	Pass



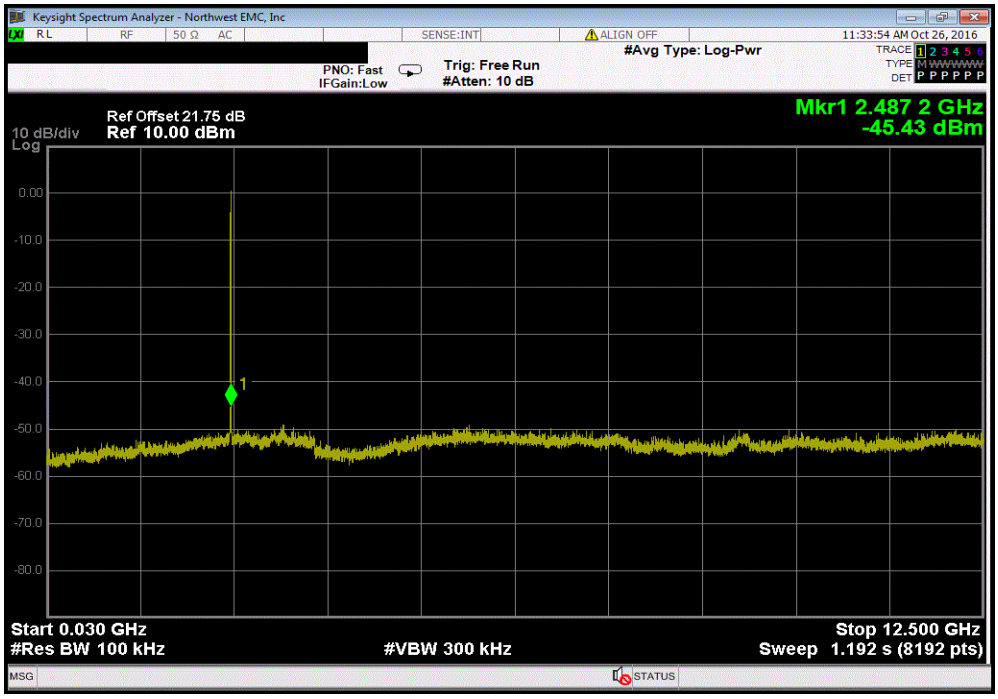
Mid Channel, 2445 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-40.71	-20	Pass



High Channel, 2480 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



High Channel, 2480 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-47.29	-20	Pass



High Channel, 2480 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-40.59	-20	Pass