NORTHWEST EMC

Garrett Metal Detectors

SM 100

FCC 15.207:2015

FCC 15.247:2015

Report # GARR0004.2

NVLAP Lab Code: 201049-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: July 31, 2015
Garrett Metal Detectors
Model: SM 100

Radio Equipment Testing

Standards

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

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.7	Spurious Conducted Emissions	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:

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.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2015.2.19

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

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

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.2014.12.03

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.

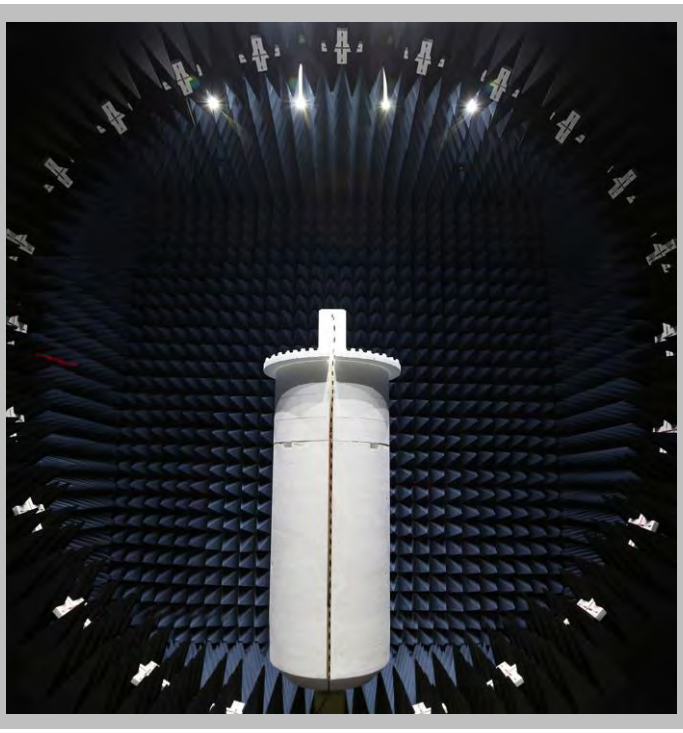
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

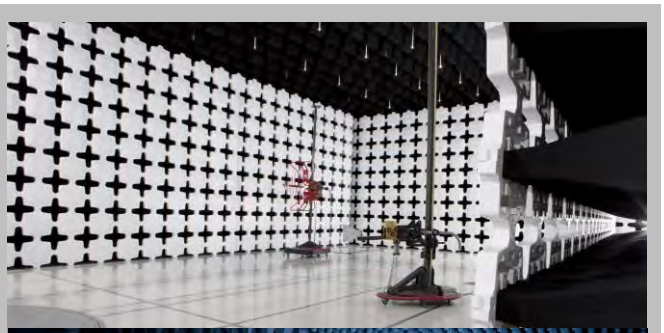
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

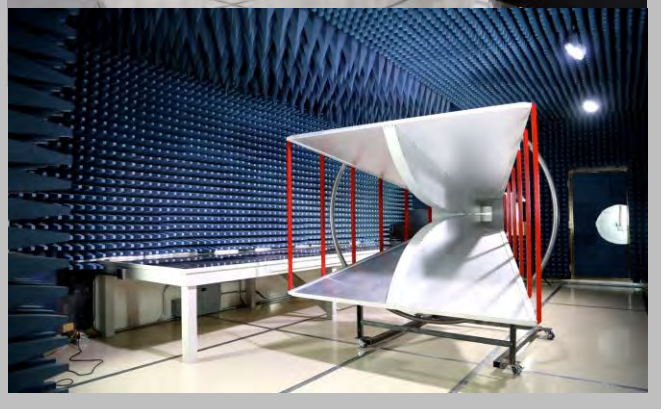
FACILITIES

NORTHWEST EMC
REV 2015.2.19

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 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
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







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:	SM 100
First Date of Test:	June 02, 2015
Last Date of Test:	July 31, 2015
Receipt Date of Samples:	June 01, 2015
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Wireless radio operating in the 2402-2483.5MHz ranged that is used for timing in a multi-unit installation of Garrett detectors.

Testing Objective:
To demonstrate compliance of the 2.4 GHz ISM radio to FCC 15.247 requirements for a limited modular approval.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration GARR0004- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Radio (Direct Connect) - EUT2	Garrett Metal Detectors	SM 100	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Walkthrough Header	Garrett Metal Detectors	PD 6500i	55202749

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	Unknown	5.0 m	No	AC Mains	Walkthrough Header
DC Power	Unknown	0.2 m	No	Walkthrough Header	Wireless Radio (Direct Connect) - EUT2
Ethernet Cable	Unknown	0.2 m	No	Walkthrough Header	Wireless Radio (Direct Connect) - EUT2

Configuration GARR0008- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Radio - EUT3	Garrett Metal Detectors	SM 100	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Walkthrough Header	Garrett Metal Detectors	PD 6500i	55202749

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	Unknown	5.0 m	No	Walkthrough Header	AC Mains
DC Power	Unknown	0.2 m	No	Wireless Radio	Walkthrough Header
Ethernet Cable	Unknown	0.2 m	No	Wireless Radio	Walkthrough Header

MODIFICATIONS

NORTHWEST EMC 2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/2/2015	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	6/2/2015	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.
3	6/2/2015	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.
4	6/2/2015	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.
5	6/2/2015	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.
6	6/2/2015	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.
7	7/30/2015	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.
8	7/31/2015	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

NORTHWEST EMC

WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

TEST DESCRIPTION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Conducted Emissions Cable Assembly	Northwest EMC	TXA, HHZ, TQR	TXAA	5/27/2015	05/27/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	9/14/2014	09/14/2015
Receiver	Rohde & Schwarz	ESCI	ARF	6/9/2015	06/09/2016

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

GARR0008-1

MODES INVESTIGATED

Transmitting OQPSK at High Channel @ 2405 MHz
Transmitting OQPSK at Low Channel @ 2440 MHz
Transmitting OQPSK at Mid Channel @ 2480 MHz

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	5	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

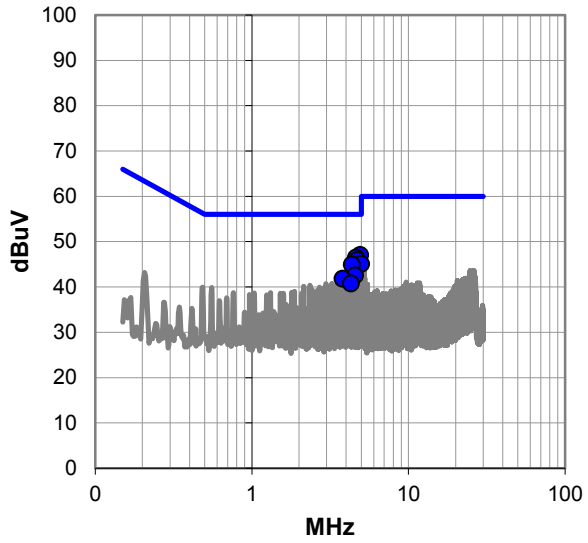
EUT OPERATING MODES

Transmitting OQPSK at Low Channel

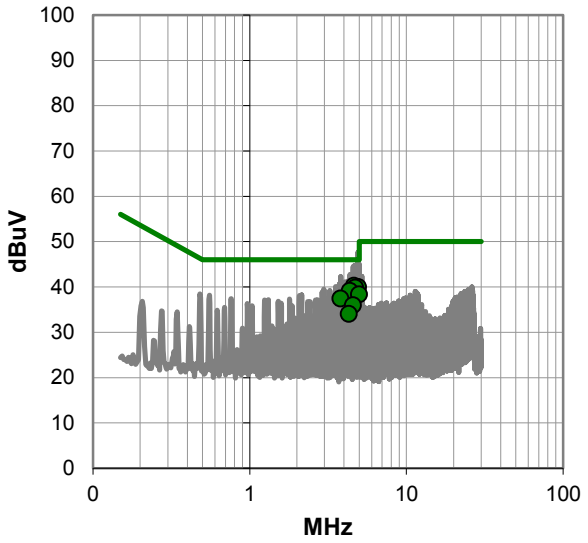
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.917	27.1	19.9	47.0	56.0	-9.0
4.641	26.5	19.9	46.4	56.0	-9.6
4.712	26.0	19.9	45.9	56.0	-10.1
4.987	25.1	20.0	45.1	56.0	-10.9
4.365	25.0	19.9	44.9	56.0	-11.1
4.572	22.6	19.9	42.5	56.0	-13.5
3.810	21.9	19.9	41.8	56.0	-14.2
4.296	20.8	19.9	40.7	56.0	-15.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.641	20.3	19.9	40.2	46.0	-5.8
4.917	20.0	19.9	39.9	46.0	-6.1
4.712	19.9	19.9	39.8	46.0	-6.2
4.365	19.2	19.9	39.1	46.0	-6.9
4.987	18.4	20.0	38.4	46.0	-7.6
3.810	17.5	19.9	37.4	46.0	-8.6
4.572	16.0	19.9	35.9	46.0	-10.1
4.296	14.1	19.9	34.0	46.0	-12.0

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	6	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

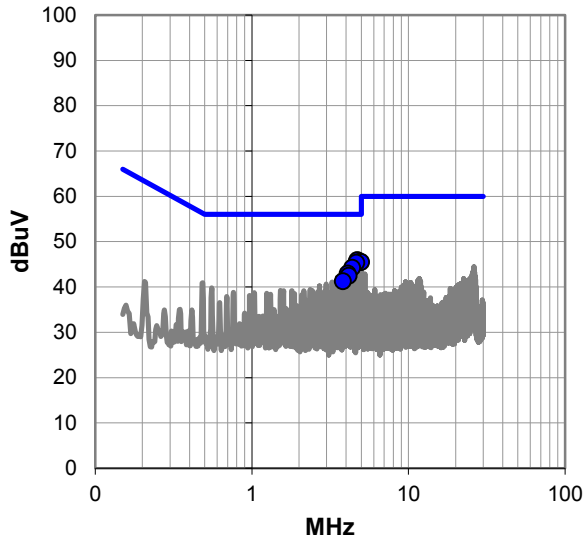
EUT OPERATING MODES

Transmitting OQPSK at Low Channel

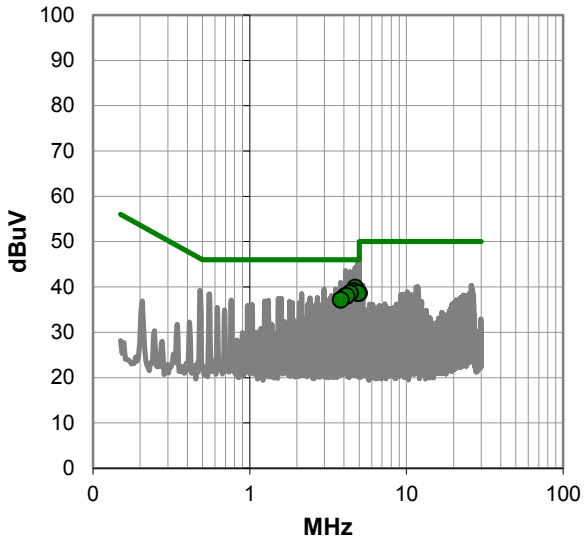
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.715	26.0	19.9	45.9	56.0	-10.1
4.924	25.6	19.9	45.5	56.0	-10.5
4.992	25.5	20.0	45.5	56.0	-10.5
4.647	25.4	19.9	45.3	56.0	-10.7
4.369	24.3	19.9	44.2	56.0	-11.8
4.091	23.0	19.9	42.9	56.0	-13.1
4.162	22.5	19.9	42.4	56.0	-13.6
3.816	21.3	19.9	41.2	56.0	-14.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.715	19.9	19.9	39.8	46.0	-6.2
4.647	19.1	19.9	39.0	46.0	-7.0
4.992	18.7	20.0	38.7	46.0	-7.3
4.924	18.7	19.9	38.6	46.0	-7.4
4.369	18.7	19.9	38.6	46.0	-7.4
4.091	18.1	19.9	38.0	46.0	-8.0
4.162	18.1	19.9	38.0	46.0	-8.0
3.816	17.2	19.9	37.1	46.0	-8.9

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	7	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

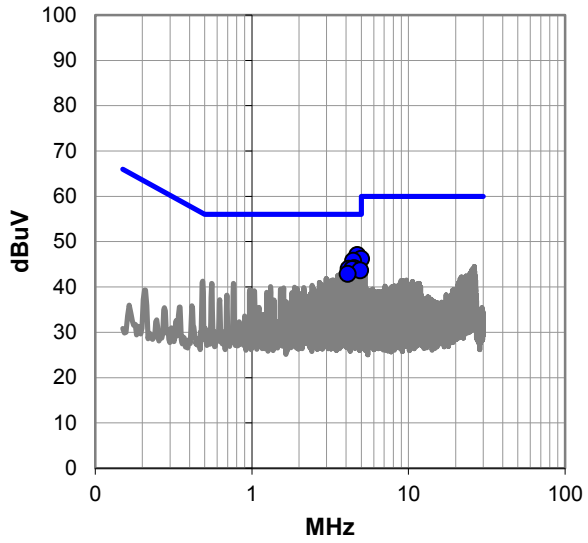
EUT OPERATING MODES

Transmitting OQPSK at Mid Channel

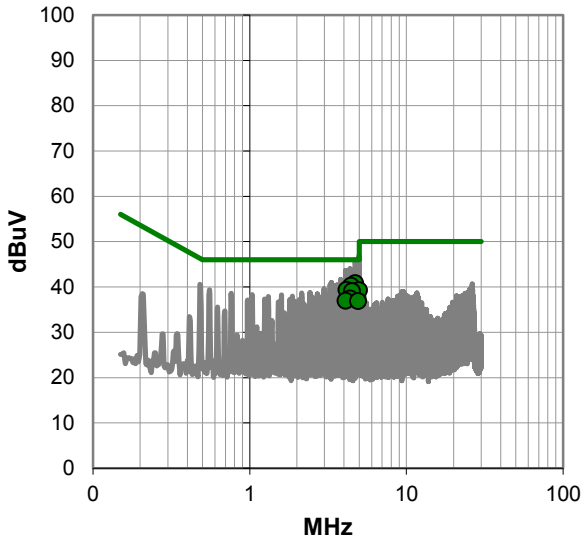
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.720	27.1	19.9	47.0	56.0	-9.0
4.998	26.2	20.0	46.2	56.0	-9.8
4.442	25.8	19.9	45.7	56.0	-10.3
4.512	24.2	19.9	44.1	56.0	-11.9
4.164	24.1	19.9	44.0	56.0	-12.0
4.372	24.0	19.9	43.9	56.0	-12.1
4.929	23.7	19.9	43.6	56.0	-12.4
4.095	22.9	19.9	42.8	56.0	-13.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.720	20.9	19.9	40.8	46.0	-5.2
4.442	20.3	19.9	40.2	46.0	-5.8
4.164	19.4	19.9	39.3	46.0	-6.7
4.998	19.3	20.0	39.3	46.0	-6.7
4.512	19.1	19.9	39.0	46.0	-7.0
4.372	17.5	19.9	37.4	46.0	-8.6
4.095	17.0	19.9	36.9	46.0	-9.1
4.929	16.9	19.9	36.8	46.0	-9.2

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	8	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

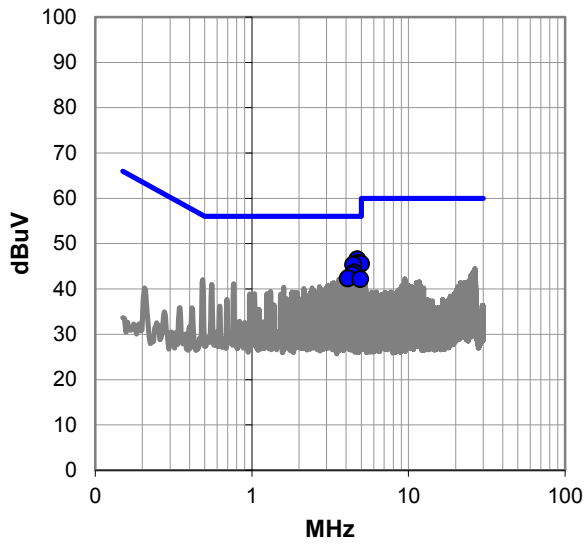
EUT OPERATING MODES

Transmitting OQPSK at Mid Channel

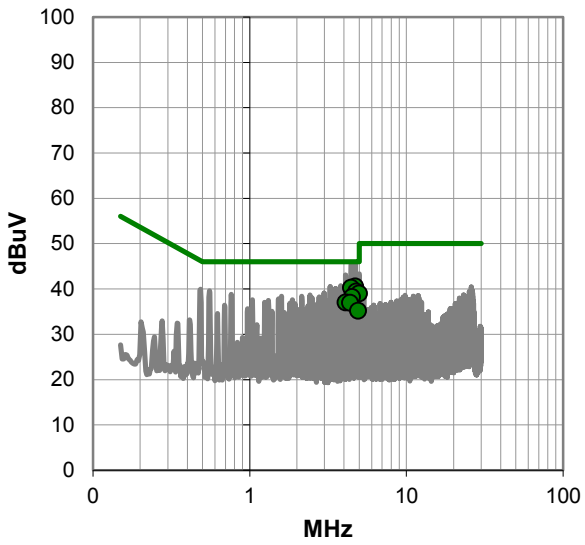
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.721	26.6	19.9	46.5	56.0	-9.5
4.791	25.8	19.9	45.7	56.0	-10.3
5.000	25.6	20.0	45.6	56.0	-10.4
4.444	25.4	19.9	45.3	56.0	-10.7
4.513	23.7	19.9	43.6	56.0	-12.4
4.375	23.2	19.9	43.1	56.0	-12.9
4.096	22.4	19.9	42.3	56.0	-13.7
4.930	22.2	19.9	42.1	56.0	-13.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.721	20.6	19.9	40.5	46.0	-5.5
4.444	20.3	19.9	40.2	46.0	-5.8
4.791	19.5	19.9	39.4	46.0	-6.6
5.000	19.0	20.0	39.0	46.0	-7.0
4.513	18.3	19.9	38.2	46.0	-7.8
4.096	17.1	19.9	37.0	46.0	-9.0
4.375	17.0	19.9	36.9	46.0	-9.1
4.930	15.2	19.9	35.1	46.0	-10.9

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	9	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

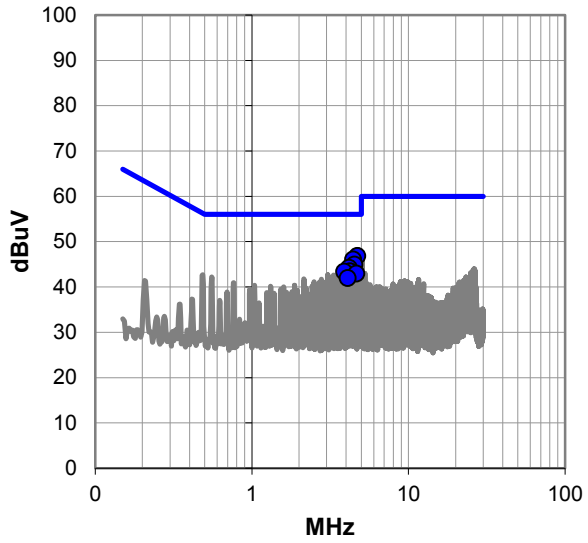
EUT OPERATING MODES

Transmitting OQPSK at High Channel

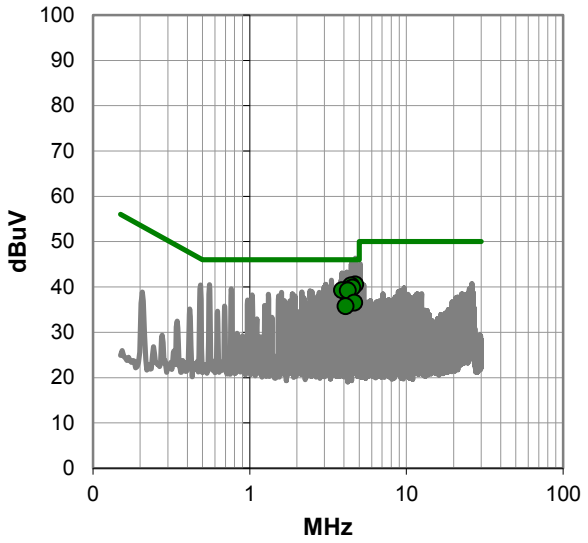
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #9

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.723	26.9	19.9	46.8	56.0	-9.2
4.445	26.1	19.9	46.0	56.0	-10.0
4.514	25.0	19.9	44.9	56.0	-11.1
4.167	24.3	19.9	44.2	56.0	-11.8
4.237	23.5	19.9	43.4	56.0	-12.6
3.890	23.4	19.9	43.3	56.0	-12.7
4.654	23.0	19.9	42.9	56.0	-13.1
4.098	22.0	19.9	41.9	56.0	-14.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.723	20.6	19.9	40.5	46.0	-5.5
4.445	20.4	19.9	40.3	46.0	-5.7
4.514	19.9	19.9	39.8	46.0	-6.2
4.167	19.4	19.9	39.3	46.0	-6.7
3.890	19.3	19.9	39.2	46.0	-6.8
4.237	19.3	19.9	39.2	46.0	-6.8
4.654	16.6	19.9	36.5	46.0	-9.5
4.098	15.8	19.9	35.7	46.0	-10.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

EUT:	SM 100	Work Order:	GARR0008
Serial Number:	None	Date:	07/31/2015
Customer:	Garrett Metal Detectors	Temperature:	24.5°C
Attendees:	None	Relative Humidity:	47.8%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	GARR0008-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	10	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

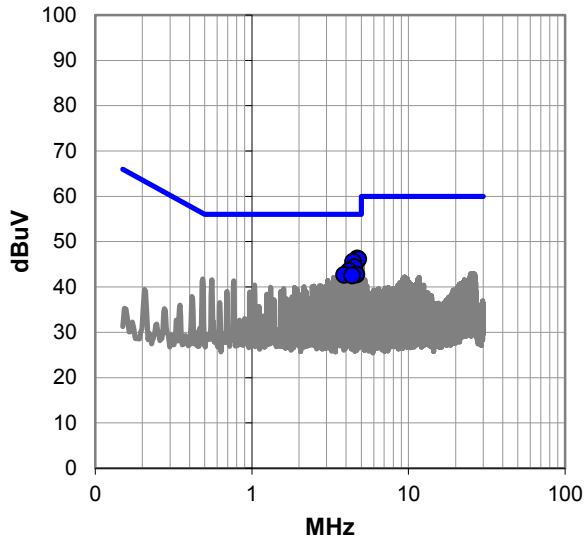
EUT OPERATING MODES

Transmitting OQPSK at High Channel

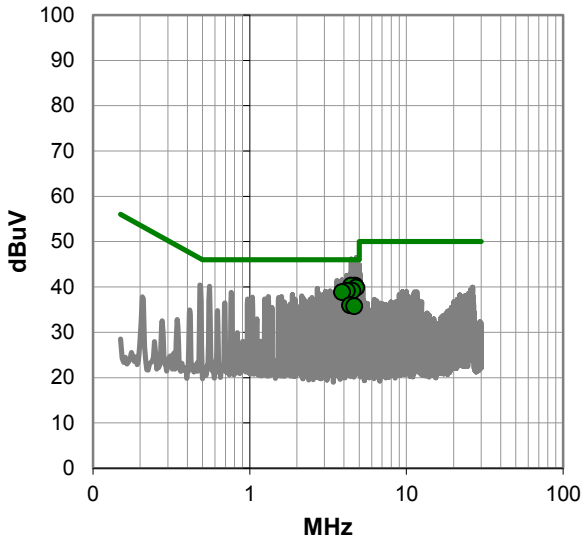
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.05.26
PSA-ESCI 2015.03.03, EmiR5 2015.05.29

RESULTS - Run #10

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.724	26.3	19.9	46.2	56.0	-9.8
4.793	26.2	19.9	46.1	56.0	-9.9
4.446	25.6	19.9	45.5	56.0	-10.5
4.516	24.4	19.9	44.3	56.0	-11.7
4.168	23.6	19.9	43.5	56.0	-12.5
4.654	22.8	19.9	42.7	56.0	-13.3
3.890	22.7	19.9	42.6	56.0	-13.4
4.376	22.6	19.9	42.5	56.0	-13.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.724	20.3	19.9	40.2	46.0	-5.8
4.446	20.3	19.9	40.2	46.0	-5.8
4.793	19.9	19.9	39.8	46.0	-6.2
4.516	19.2	19.9	39.1	46.0	-6.9
4.168	19.2	19.9	39.1	46.0	-6.9
3.890	18.9	19.9	38.8	46.0	-7.2
4.376	16.0	19.9	35.9	46.0	-10.1
4.654	15.8	19.9	35.7	46.0	-10.3

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.

CHANNELS OF OPERATION

Low Channel, 2405 MHz
Mid Channel, 2440 MHz
High Channel, 2480 MHz

MODES OF OPERATION

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GARR0008 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 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 (mo)
Pre-Amplifier	Miteq	JSDQK42-18004000-60-5P	PAM	11/21/2014	12
Cable	Northwest EMC	18-40GHz	TXE	11/21/2014	12
Antenna, Double Ridge Guide Horn	A.H. Systems, Inc.	SAS-574	AXW	4/23/2014	24
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	10/27/2014	12
Antenna, Horn	ETS Lindgren	3160-08	AJG	NCR	0
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	10/27/2014	12
TX02 Cable	Northwest EMC	8-18GHz	TXD	10/27/2014	12
Antenna, Horn	ETS Lindgren	3160-07	AJF	NCR	0
High Pass Filter, 2.8 - 18 GHz	Micro-Tronics	HPM50111	HHX	8/18/2014	12
Attenuator	Fairview Microwave	SA18H-20	TKQ	NCR	0
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	9/22/2014	12
TX02 Cable	Northwest EMC	1-8.2 GHz	TXC	9/22/2014	12
Antenna, Horn	ETS Lindgren	3115	AJL	9/15/2014	24
Low Pass Filter, 0 - 1000 MHz	Micro-Tronics	LPM50004	HHV	8/18/2014	12
Spectrum Analyzer	Agilent	N9010A	AFM	1/28/2015	12
TX02 Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	9/22/2014	12
Pre-Amplifier	Miteq	AM-1551	PAH	9/13/2014	12
Antenna, Biconilog	ETS Lindgren	3143B	AYF	4/7/2014	24

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.

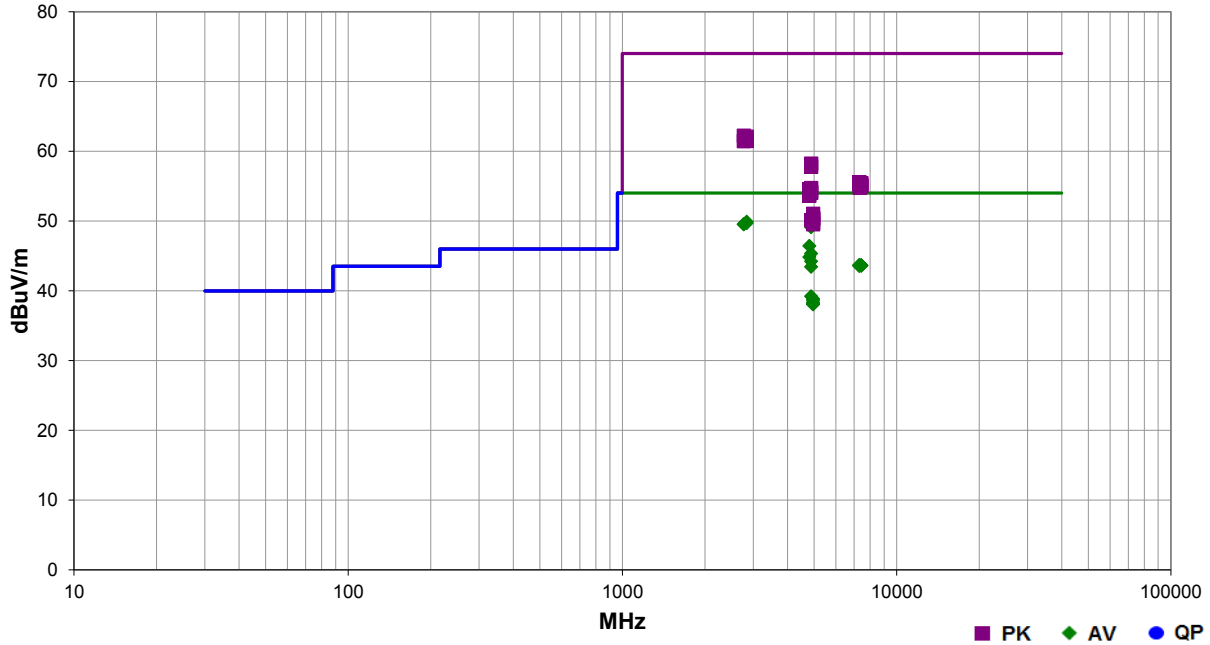
While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

SPURIOUS RADIATED EMISSIONS

Work Order:	GARR0008	**Date:**	07/30/15		
Project:	None	**Temperature:**	24.5 °C		
Job Site:	TX02	**Humidity:**	46.8% RH		
Serial Number:	None	**Barometric Pres.:**	1021 mbar	**Tested by:**	Frank Sun
EUT:	SM 100				
Configuration:	1				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting OQPSK Low, Mid, High Channel @ 2405, 2440, 2480 MHz				
Deviations:	None				
Comments:	None				

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

Run #	10	**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
2839.150	32.7	-2.8	1.0	108.0	3.0	20.0	Horz	AV	0.0	49.9	54.0	-4.1	High Ch, EUT On Side
2841.792	32.5	-2.8	1.0	349.0	3.0	20.0	Vert	AV	0.0	49.7	54.0	-4.3	High Ch, EUT On Side
2772.008	32.6	-3.1	1.2	242.0	3.0	20.0	Horz	AV	0.0	49.5	54.0	-4.5	Mid Ch, EUT On Side
2771.992	32.6	-3.1	1.0	72.0	3.0	20.0	Vert	AV	0.0	49.5	54.0	-4.5	Mid Ch, EUT On Side
4880.042	41.3	8.0	1.0	21.9	3.0	0.0	Vert	AV	0.0	49.3	54.0	-4.7	Mid Ch, EUT On Side
4879.992	41.1	8.0	1.2	214.9	3.0	0.0	Horz	AV	0.0	49.1	54.0	-4.9	Mid Ch, EUT Vert
4810.092	38.6	7.8	1.0	344.0	3.0	0.0	Vert	AV	0.0	46.4	54.0	-7.6	Low Ch, EUT On Side
4879.975	37.3	8.0	1.0	231.0	3.0	0.0	Vert	AV	0.0	45.3	54.0	-8.7	Mid Ch, EUT Vert
4810.067	37.0	7.8	2.9	1.0	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	Low Ch, EUT On Side
4879.950	36.2	8.0	1.0	27.9	3.0	0.0	Horz	AV	0.0	44.2	54.0	-9.8	Mid Ch, EUT Horz
7322.117	30.3	13.4	1.0	108.0	3.0	0.0	Vert	AV	0.0	43.7	54.0	-10.3	Mid Ch, EUT On Side
7319.742	30.3	13.4	1.0	223.0	3.0	0.0	Horz	AV	0.0	43.7	54.0	-10.3	Mid Ch, EUT Vert
7318.483	30.3	13.4	1.0	229.0	3.0	0.0	Horz	AV	0.0	43.7	54.0	-10.3	Mid Ch, EUT On Side
7442.442	30.2	13.4	1.0	54.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	High Ch, EUT Horz
7442.067	30.2	13.4	1.0	210.0	3.0	0.0	Vert	AV	0.0	43.6	54.0	-10.4	High Ch, EUT Vert
7441.483	30.2	13.4	1.0	9.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	High Ch, EUT Vert
7441.000	30.2	13.4	1.0	28.9	3.0	0.0	Vert	AV	0.0	43.6	54.0	-10.4	High Ch, EUT Horz
7320.150	30.2	13.4	1.0	259.0	3.0	0.0	Vert	AV	0.0	43.6	54.0	-10.4	Mid Ch, EUT Vert
4879.958	35.4	8.0	2.9	351.9	3.0	0.0	Horz	AV	0.0	43.4	54.0	-10.6	Mid Ch, EUT On Side
2770.117	45.3	-3.1	1.2	242.0	3.0	20.0	Horz	PK	0.0	62.2	74.0	-11.8	Mid Ch, EUT On Side

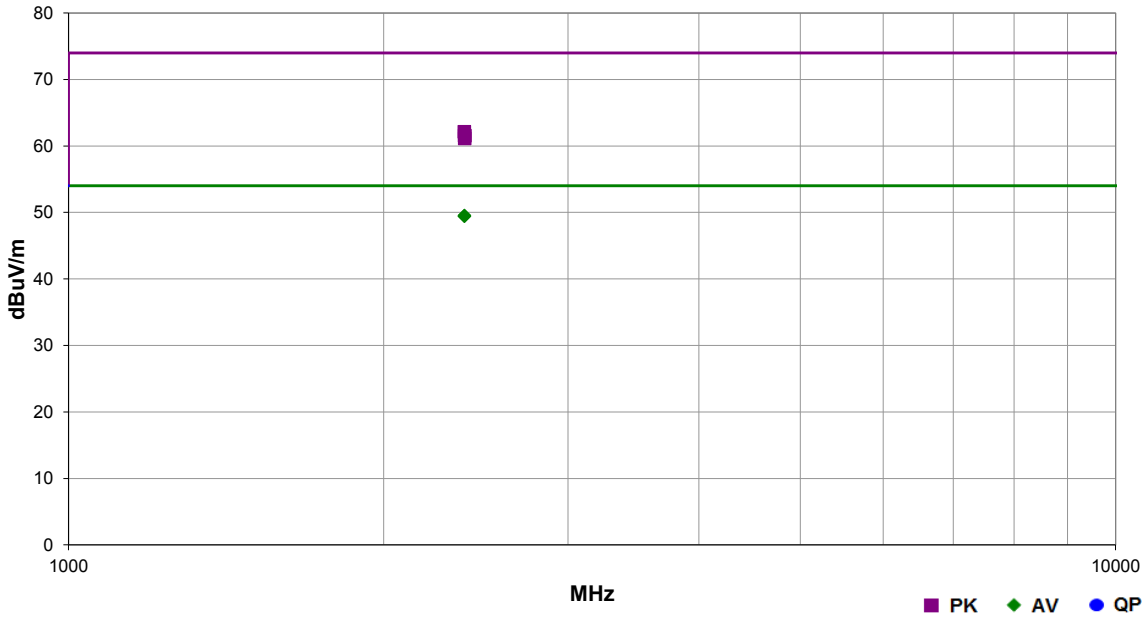
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2839.700	44.9	-2.8	1.0	108.0	3.0	20.0	Horz	PK	0.0	62.1	74.0	-11.9	High Ch, EUT On Side
2838.183	44.3	-2.8	1.0	349.0	3.0	20.0	Vert	PK	0.0	61.5	74.0	-12.5	High Ch, EUT On Side
2772.067	44.5	-3.1	1.0	72.0	3.0	20.0	Vert	PK	0.0	61.4	74.0	-12.6	Mid Ch, EUT On Side
4879.967	31.2	8.0	1.0	208.9	3.0	0.0	Vert	AV	0.0	39.2	54.0	-14.8	Mid Ch, EUT Horz
4960.100	30.6	8.2	2.2	225.9	3.0	0.0	Vert	AV	0.0	38.8	54.0	-15.2	High Ch, EUT Vert
4960.292	30.4	8.2	1.0	243.9	3.0	0.0	Horz	AV	0.0	38.6	54.0	-15.4	High Ch, EUT Vert
4960.292	30.1	8.2	1.0	177.0	3.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	High Ch, EUT Horz
4879.092	50.2	8.0	1.0	21.9	3.0	0.0	Vert	PK	0.0	58.2	74.0	-15.8	Mid Ch, EUT On Side
4960.617	29.9	8.2	1.6	80.0	3.0	0.0	Horz	AV	0.0	38.1	54.0	-15.9	High Ch, EUT On Side
4960.017	29.9	8.2	1.6	278.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	High Ch, EUT On Side
4960.950	29.8	8.2	1.0	134.0	3.0	0.0	Vert	AV	0.0	38.0	54.0	-16.0	High Ch, EUT Horz
4879.242	49.8	8.0	1.2	214.9	3.0	0.0	Horz	PK	0.0	57.8	74.0	-16.2	Mid Ch, EUT Vert
7318.342	42.2	13.4	1.0	259.0	3.0	0.0	Vert	PK	0.0	55.6	74.0	-18.4	Mid Ch, EUT Vert
7441.133	42.0	13.4	1.0	28.9	3.0	0.0	Vert	PK	0.0	55.4	74.0	-18.6	High Ch, EUT Horz
7319.417	42.0	13.4	1.0	223.0	3.0	0.0	Horz	PK	0.0	55.4	74.0	-18.6	Mid Ch, EUT Vert
7440.675	41.8	13.4	1.0	210.0	3.0	0.0	Vert	PK	0.0	55.2	74.0	-18.8	High Ch, EUT Vert
7322.367	41.7	13.4	1.0	229.0	3.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	Mid Ch, EUT On Side
7441.150	41.6	13.4	1.0	54.0	3.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	High Ch, EUT Horz
7439.308	41.6	13.4	1.0	9.0	3.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	High Ch, EUT Vert
7321.708	41.4	13.4	1.0	108.0	3.0	0.0	Vert	PK	0.0	54.8	74.0	-19.2	Mid Ch, EUT On Side
4879.767	46.7	8.0	1.0	231.0	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	Mid Ch, EUT Vert
4810.192	46.7	7.8	1.0	344.0	3.0	0.0	Vert	PK	0.0	54.5	74.0	-19.5	Low Ch, EUT On Side
4879.000	46.2	8.0	1.0	27.9	3.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	Mid Ch, EUT Horz
4880.292	46.0	8.0	2.9	351.9	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	Mid Ch, EUT On Side
4810.158	45.8	7.8	2.9	1.0	3.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	Low Ch, EUT On Side
4960.325	42.8	8.2	2.2	225.9	3.0	0.0	Vert	PK	0.0	51.0	74.0	-23.0	High Ch, EUT Vert
4961.600	42.2	8.2	1.0	243.9	3.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	High Ch, EUT Vert
4962.425	42.1	8.2	1.0	177.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	High Ch, EUT Horz
4960.742	42.1	8.2	1.6	80.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	High Ch, EUT On Side
4880.358	42.1	8.0	1.0	208.9	3.0	0.0	Vert	PK	0.0	50.1	74.0	-23.9	Mid Ch, EUT Horz
4960.733	41.5	8.2	1.0	134.0	3.0	0.0	Vert	PK	0.0	49.7	74.0	-24.3	High Ch, EUT Horz
4961.917	41.3	8.2	1.6	278.0	3.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	High Ch, EUT On Side

SPURIOUS RADIATED EMISSIONS

Work Order:	GARR0008	**Date:**	07/29/15		
Project:	None	**Temperature:**	24.6 °C		
Job Site:	TX02	**Humidity:**	46.8% RH		
Serial Number:	None	**Barometric Pres.:**	1020 mbar	**Tested by:**	Frank Sun
EUT:	SM 100				
Configuration:	1				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting OQPSK at Low Channel @ 2405MHz				
Deviations:	None				
Comments:	Band Edge				

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

Run #	5	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



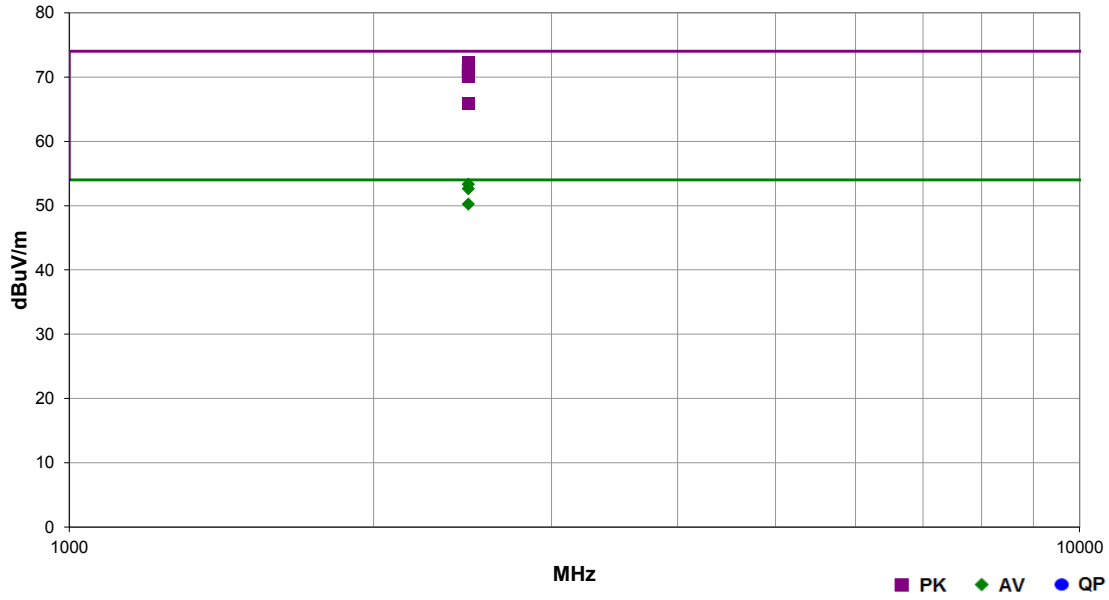
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2388.853	34.3	-4.8	1.0	316.9	3.0	20.0	Vert	AV	0.0	49.5	54.0	-4.5	Low Channel, EUT Horz
2389.453	34.2	-4.8	1.0	357.0	3.0	20.0	Vert	AV	0.0	49.4	54.0	-4.6	Low Channel, EUT On Side
2388.837	34.2	-4.8	1.5	169.0	3.0	20.0	Horz	AV	0.0	49.4	54.0	-4.6	Low Channel, EUT Horz
2388.070	34.2	-4.8	1.0	201.0	3.0	20.0	Horz	AV	0.0	49.4	54.0	-4.6	Low Channel, EUT On Side
2388.027	46.9	-4.8	1.0	357.0	3.0	20.0	Vert	PK	0.0	62.1	74.0	-11.9	Low Channel, EUT On Side
2389.767	46.3	-4.8	1.5	169.0	3.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	Low Channel, EUT Horz
2389.700	46.3	-4.8	1.0	201.0	3.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	Low Channel, EUT On Side
2389.143	45.9	-4.8	1.0	316.9	3.0	20.0	Vert	PK	0.0	61.1	74.0	-12.9	Low Channel, EUT Horz

SPURIOUS RADIATED EMISSIONS

Work Order:	GARR0008	**Date:**	07/29/15		
Project:	None	**Temperature:**	24.6 °C		
Job Site:	TX02	**Humidity:**	46.8% RH		
Serial Number:	None	**Barometric Pres.:**	1020 mbar	**Tested by:**	Frank Sun
EUT:	SM 100				
Configuration:	1				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting OQPSK at High Channel @ 2480MHz				
Deviations:	None				
Comments:	Band Edge. Multiple points require measurement using Marker Delta method, which are presented in tabular data only.				

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

Run #	7	**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
2480.070	74.4	-4.7	1.0	238.9	3.0	20.0	Horz	AV	0.0	89.7			Fundamental, High Ch EUT Vert
2483.500			1.2	201.0	3.0	20.0	Horz	AV	0.0	49.6	54.0	-4.4	High Ch EUT Vert, Marker Delta Method: Peak 89.7 + -40.13 dBc = 49.6
2480.060	77.0	-4.7	1.0	223.0	3.0	20.0	Vert	AV	0.0	92.3			Fundamental, High Ch EUT On Side
2483.500			1.4	223.0	3.0	20.0	Vert	AV	0.0	53.5	54.0	-0.5	High Ch EUT On Side, Marker Delta Method: Peak 92.3 + -38.8 dBc = 53.5
2480.645	79.1	-4.7	1.0	238.9	3.0	20.0	Horz	PK	0.0	94.4			Fundamental, High Ch EUT Vert
2483.500			1.2	201.0	3.0	20.0	Horz	PK	0.0	54.3	74.0	-19.7	High Ch EUT Vert, Marker Delta Method: Peak 94.4 + -40.13 dBc = 54.3
2480.070	70.2	-4.7	1.0	220.9	3.0	20.0	Horz	AV	0.0	85.5			Fundamental, High Ch EUT Horz
2483.500			1.0	205.0	3.0	20.0	Horz	AV	0.0	51.0	54.0	-3.0	High Ch EUT Horz, Marker Delta Method: Peak 85.5 + -34.55 dBc = 51.0
2479.745	81.7	-4.7	1.0	223.0	3.0	20.0	Vert	PK	0.0	97.0			Fundamental, High Ch EUT On Side
2483.500			1.4	223.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	High Ch EUT On Side, Marker Delta Method: Peak 97.0 + -38.8 dBc = 58.2
2483.500	38.0	-4.7	1.0	253.0	3.0	20.0	Horz	AV	0.0	53.3	54.0	-0.7	High Ch EUT On Side
2483.507	37.3	-4.7	3.2	25.0	3.0	20.0	Vert	AV	0.0	52.6	54.0	-1.4	High Ch EUT Vert
2483.580	56.9	-4.7	1.0	205.0	3.0	20.0	Horz	PK	0.0	72.2	74.0	-1.8	High Ch EUT Horz
2483.663	55.8	-4.7	1.0	253.0	3.0	20.0	Horz	PK	0.0	71.1	74.0	-2.9	High Ch EUT On Side
2483.500	34.9	-4.7	1.0	289.0	3.0	20.0	Vert	AV	0.0	50.2	54.0	-3.8	High Ch EUT Horz
2483.530	54.8	-4.7	3.2	25.0	3.0	20.0	Vert	PK	0.0	70.1	74.0	-3.9	High Ch EUT Vert
2483.843	50.6	-4.7	1.0	289.0	3.0	20.0	Vert	PK	0.0	65.9	74.0	-8.1	High Ch EUT Horz

SPURIOUS RADIATED EMISSIONS

High Ch, EUT Horz, DET Horz, Marker Delta Method

High Ch, EUT Vert, DET Horz , Marker Delta Method

SPURIOUS RADIATED EMISSIONS

High Ch EUT On Side DET Vert, Marker Delta Method

SPURIOUS CONDUCTED EMISSIONS

XMit 2015.01.14

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)
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	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.

SPURIOUS CONDUCTED EMISSIONS

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			**Work Order:**	GARR0004
Serial Number:	None			**Date:**	06/02/15
Customer:	Garrett Metal Detectors			**Temperature:**	24.6°C
Attendees:	None			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz.

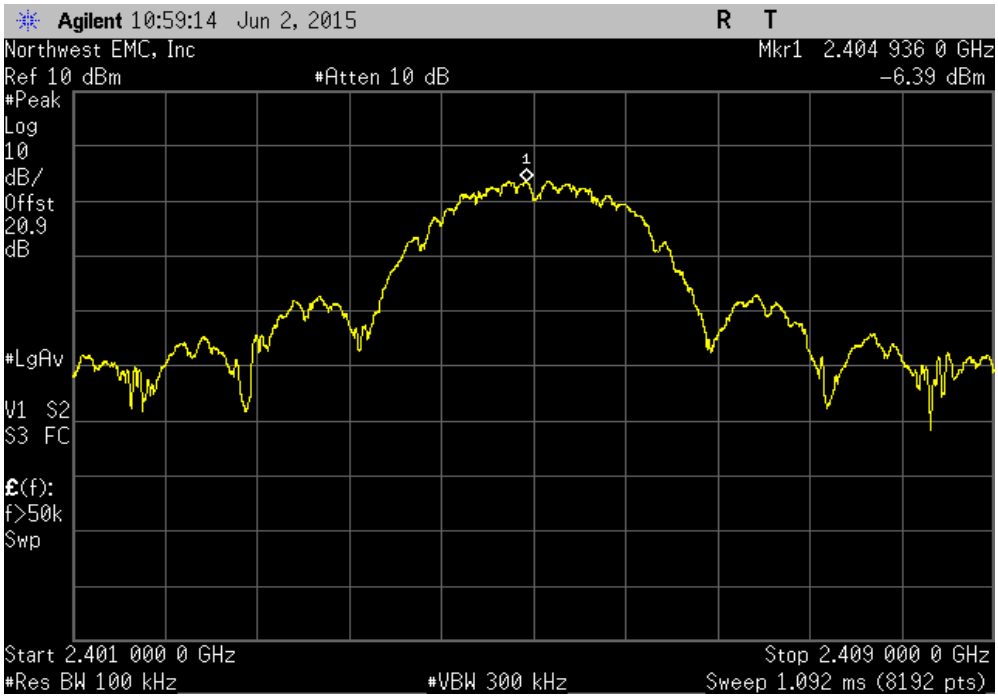
DEVIATIONS FROM TEST STANDARD

None

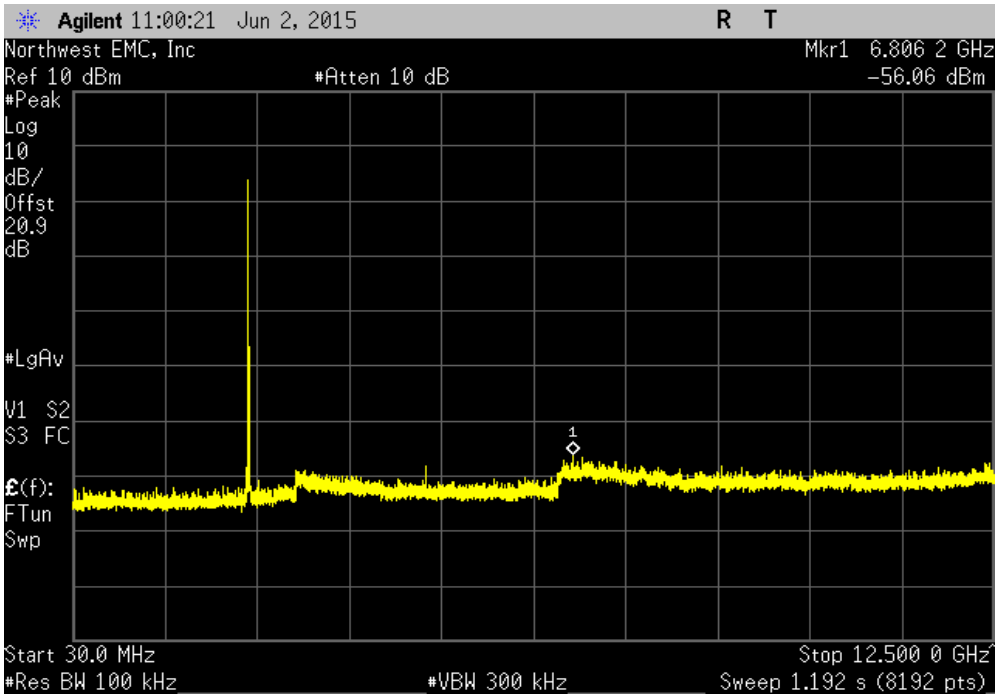
Configuration #	2	*Signature*

	Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result
OQPSK				
Low Channel, 2405 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 2405 MHz	30 MHz - 12.5 GHz	-49.67	-20	Pass
Low Channel, 2405 MHz	12.5 GHz - 25 GHz	-47.42	-20	Pass
Mid Channel, 2440 MHz	Fundamental	N/A	N/A	N/A
Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	-50.63	-20	Pass
Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	-48.65	-20	Pass
High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	-44.2	-20	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	-48.09	-20	Pass

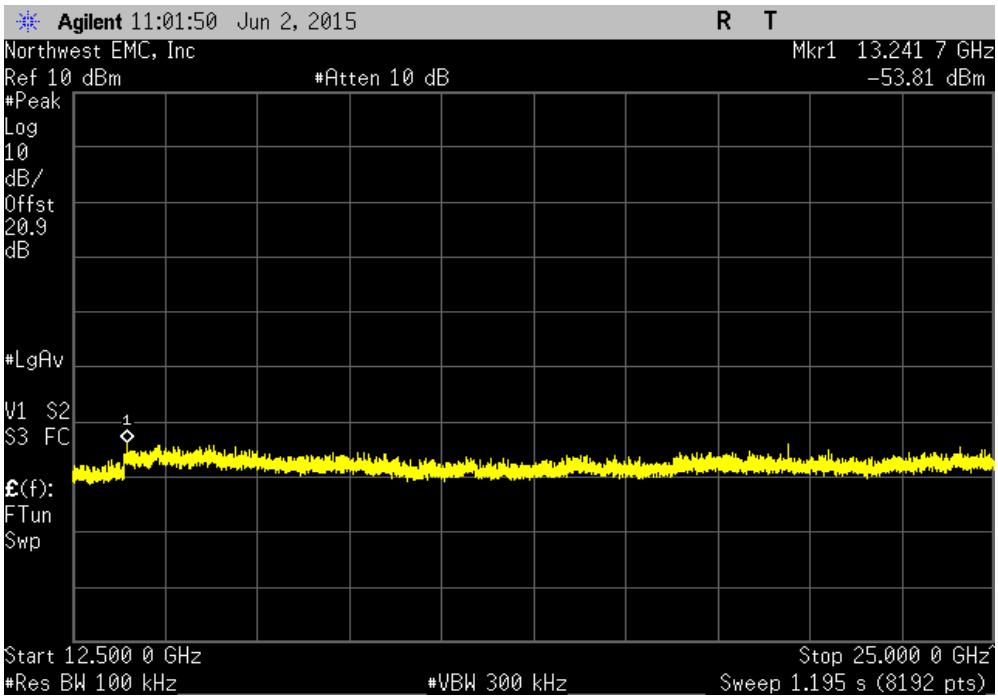
OQPSK, Low Channel, 2405 MHz						
	Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



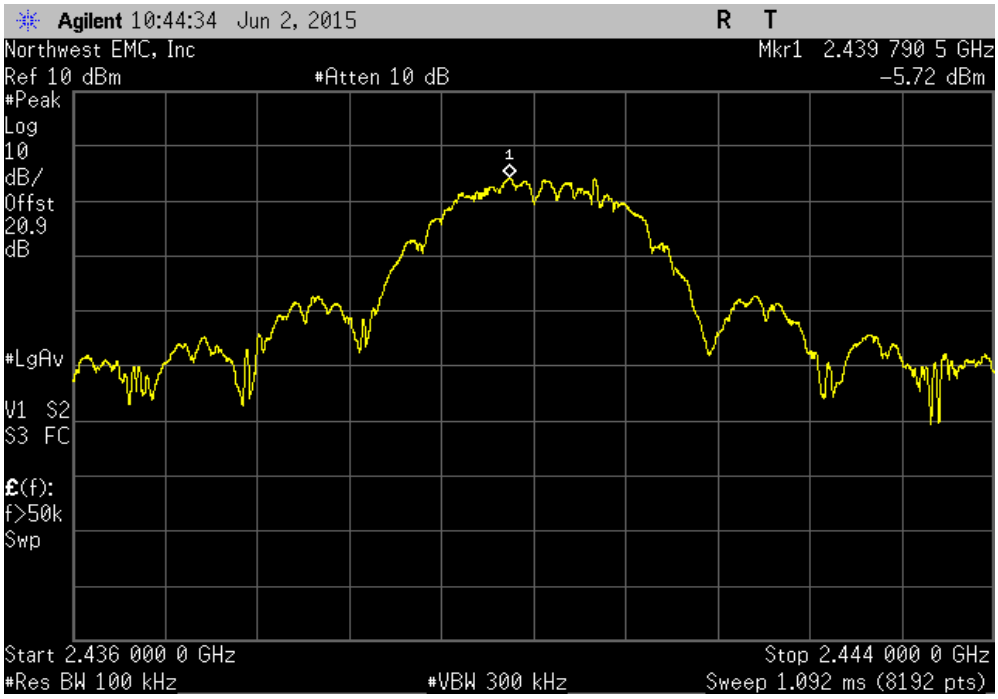
OQPSK, Low Channel, 2405 MHz					
Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-49.67	-20	Pass



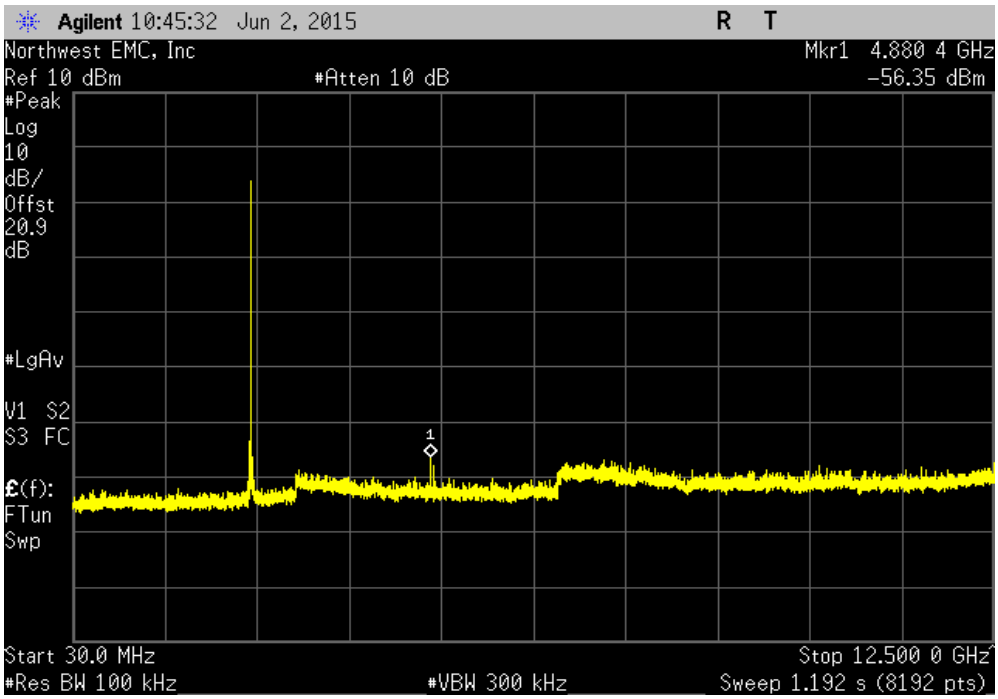
OQPSK, Low Channel, 2405 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-47.42	-20	Pass



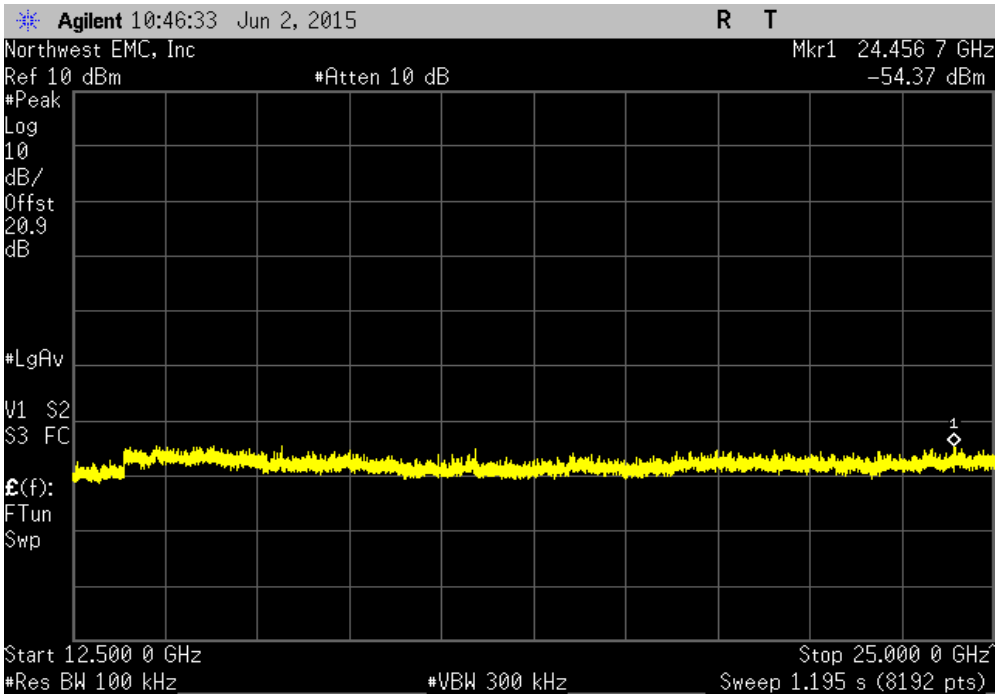
OQPSK, Mid Channel, 2440 MHz						
	Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



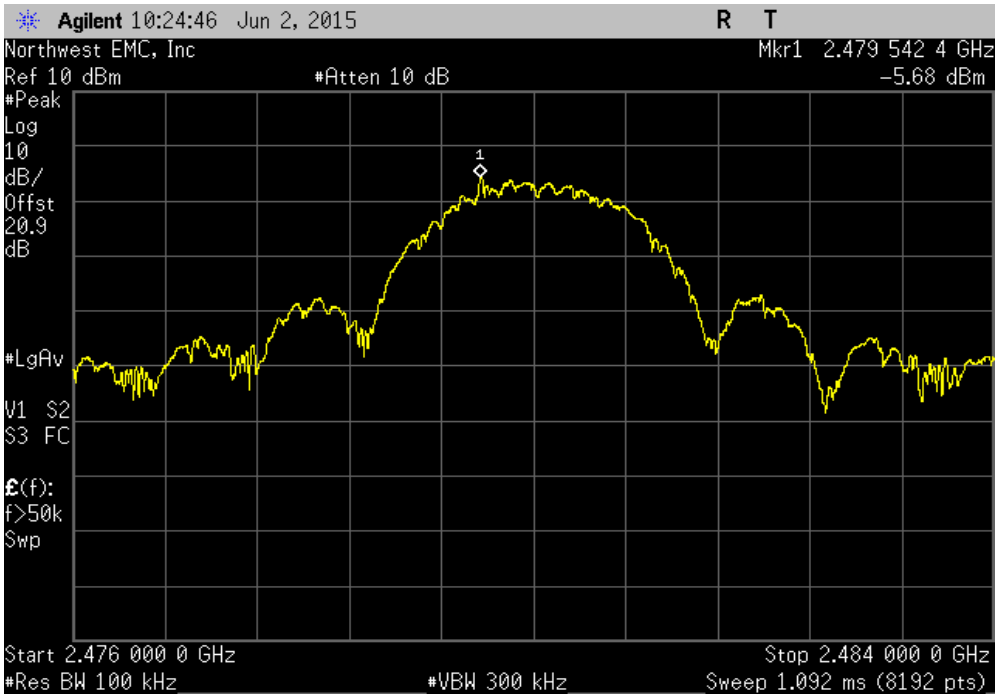
OQPSK, Mid Channel, 2440 MHz				
Frequency Range		**Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-50.63	-20	Pass



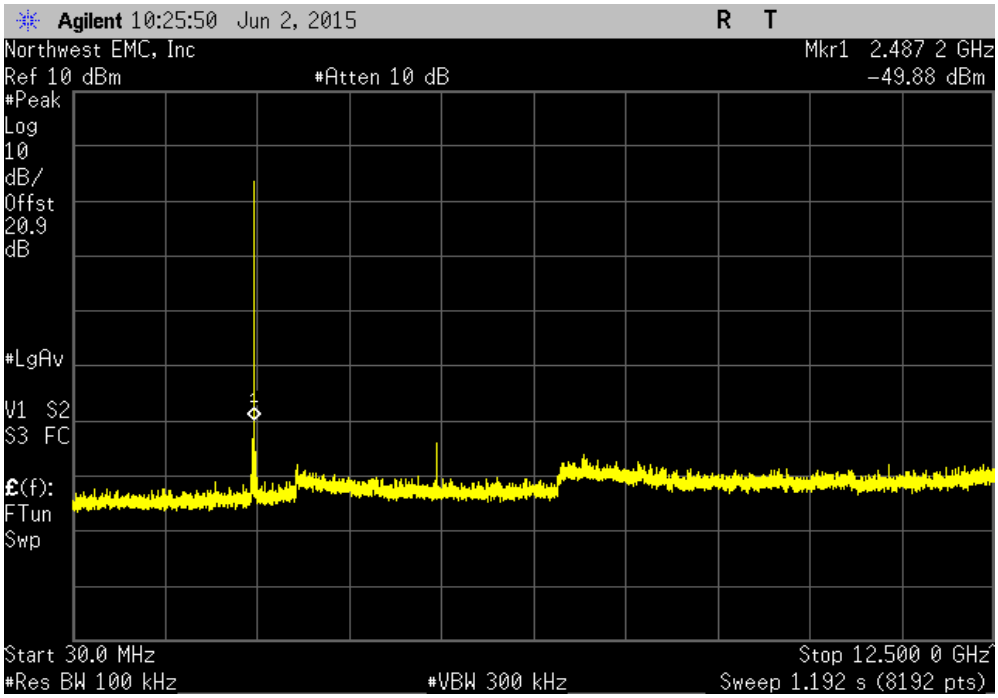
OQPSK, Mid Channel, 2440 MHz				
Frequency Range		**Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-48.65	-20	Pass



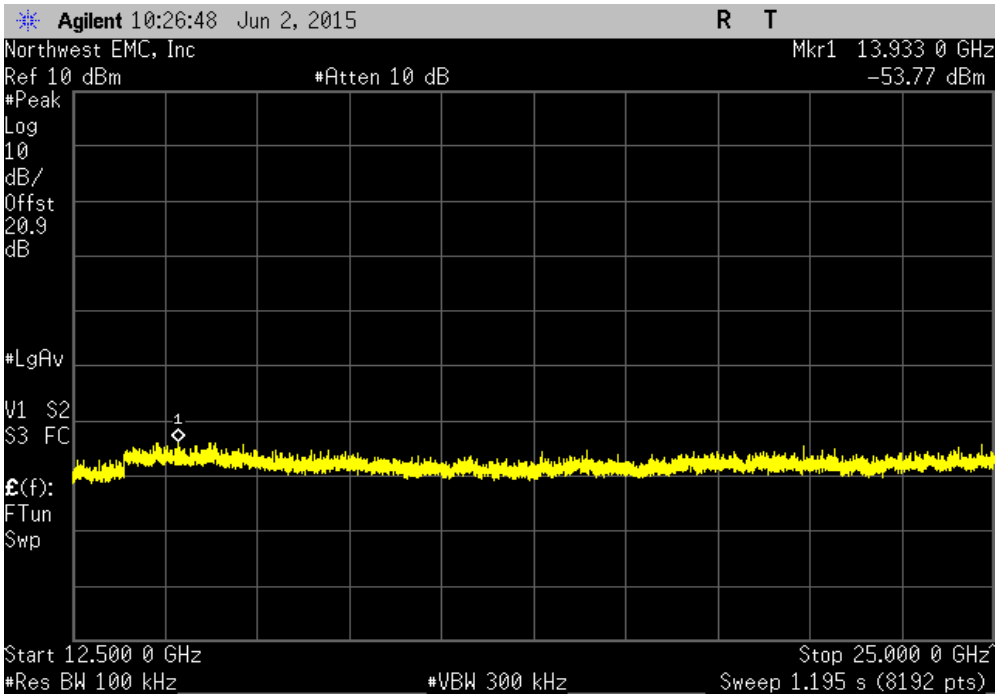
OQPSK, High Channel, 2480 MHz						
	Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



OQPSK, High Channel, 2480 MHz					
Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-44.2	-20	Pass



OQPSK, High Channel, 2480 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-48.09	-20	Pass



BAND EDGE COMPLIANCE

NORTHWEST EMC

XMit 2015.01.14

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)
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	12

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

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			**Work Order:**	GARR0004
Serial Number:	None			**Date:**	06/02/15
Customer:	Garrett Metal Detectors			**Temperature:**	24.6°C
Attendees:	None			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, High Channel @ 2405, 2480 MHz.

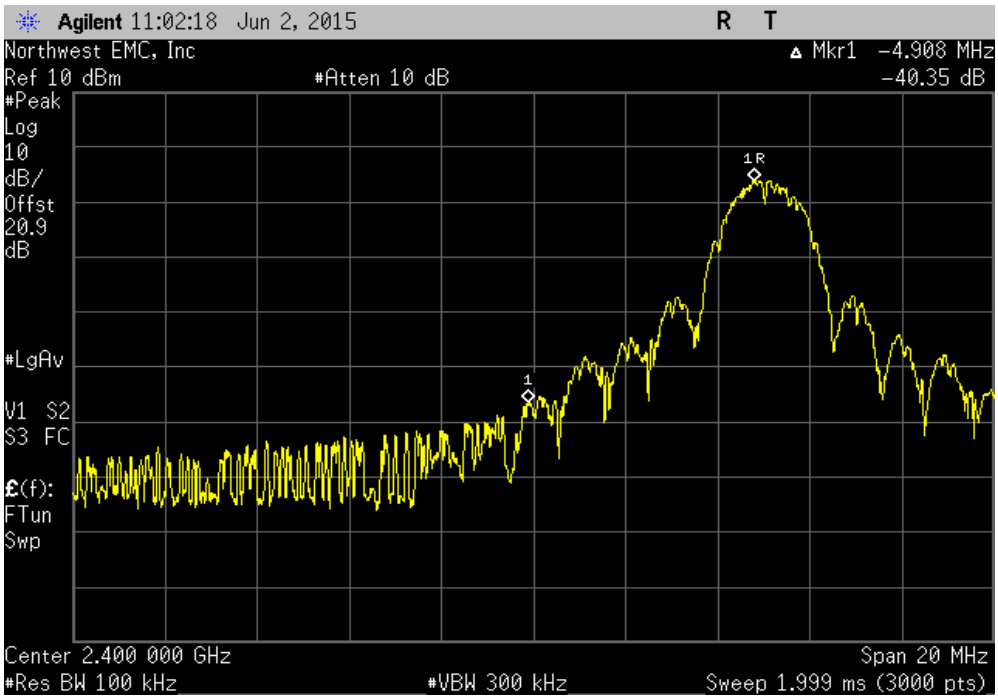
DEVIATIONS FROM TEST STANDARD

None

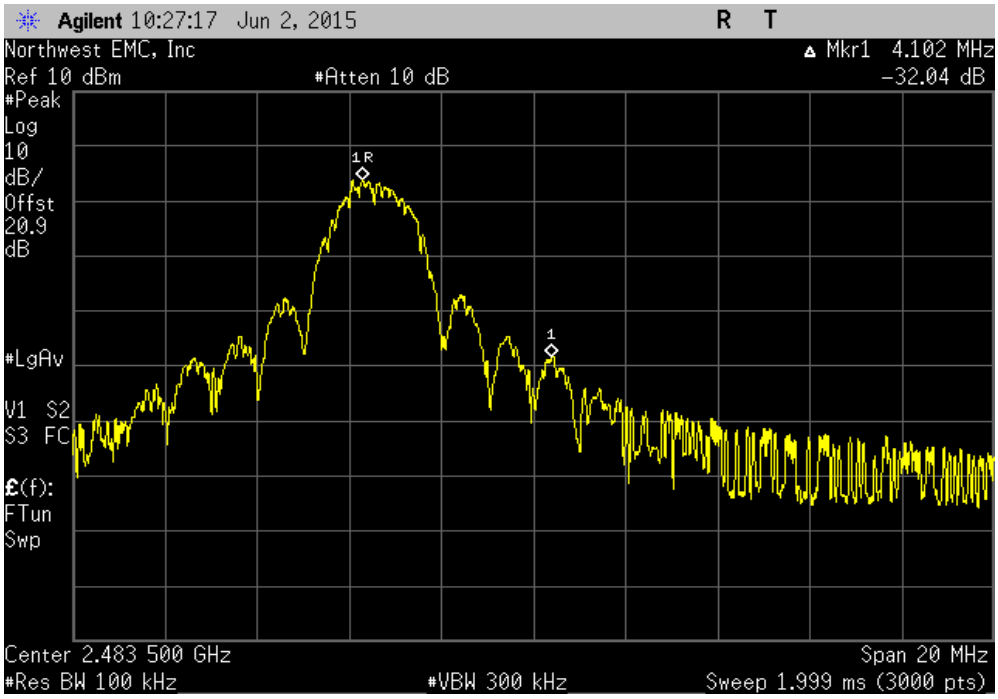
Configuration #	2	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
OQPSK			
Low Channel, 2405 MHz	-40.35	-20	Pass
High Channel, 2480 MHz	-32.04	-20	Pass

OQPSK, Low Channel, 2405 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-40.35	-20	Pass



OQPSK, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-32.04	-20	Pass



OCCUPIED BANDWIDTH

XMit 2015.01.14

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)
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	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.

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			**Work Order:**	GARR0004
Serial Number:	None			**Date:**	06/02/15
Customer:	Garrett Metal Detectors			**Temperature:**	24.6°C
Attendees:	None			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1017
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz.

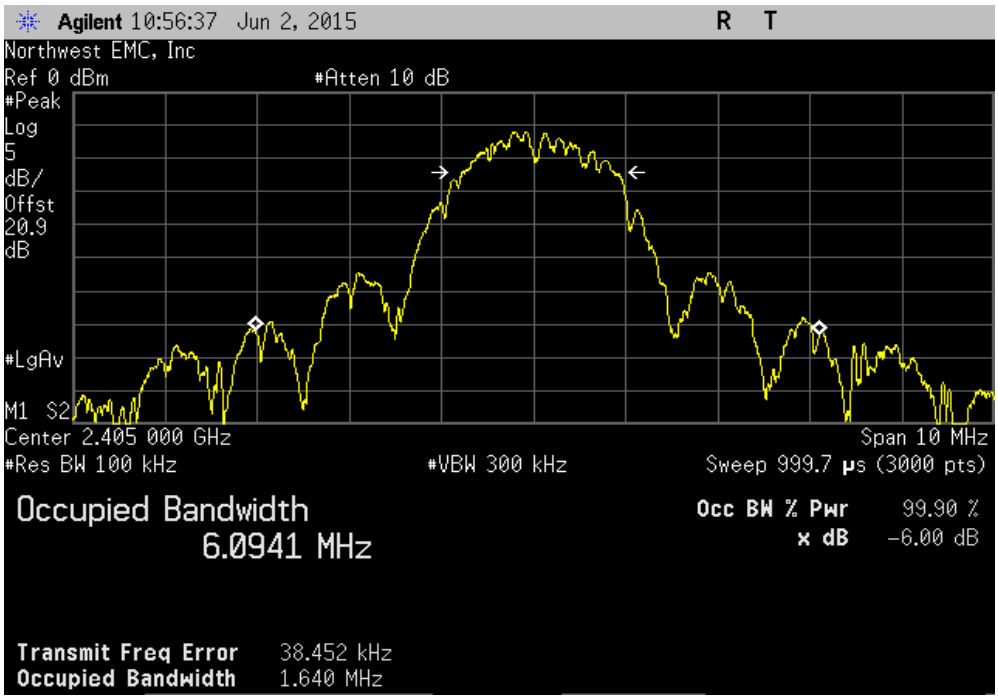
DEVIATIONS FROM TEST STANDARD

None

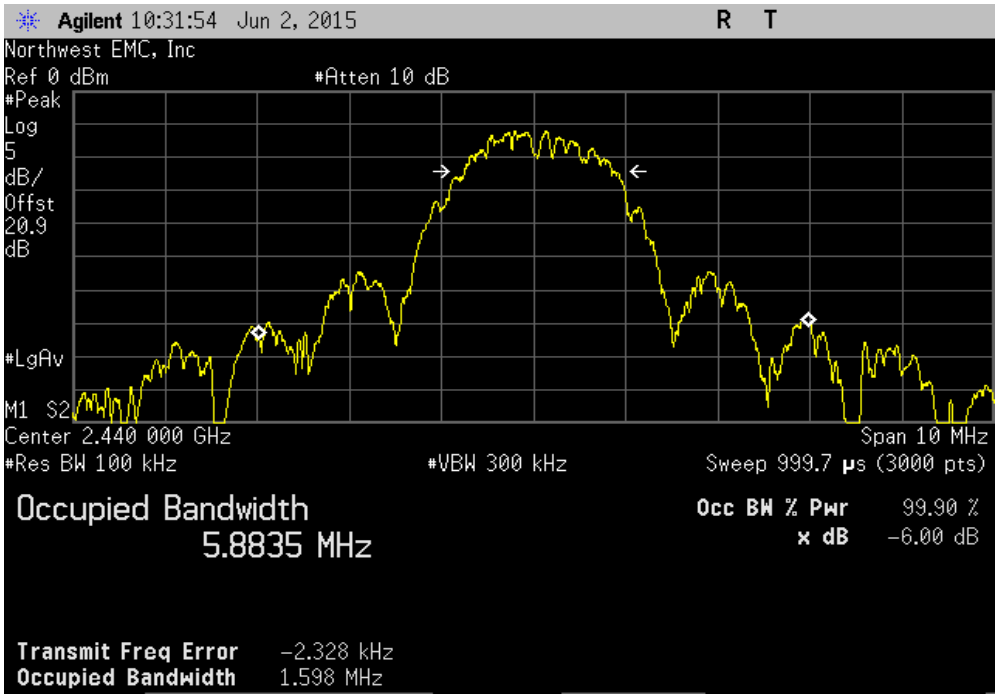
Configuration #	2	Signature

	Value	Limit (>)	Result
OQPSK			
Low Channel, 2405 MHz	1.64 MHz	500 kHz	Pass
Mid Channel, 2440 MHz	1.598 MHz	500 kHz	Pass
High Channel, 2480 MHz	1.604 MHz	500 kHz	Pass

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



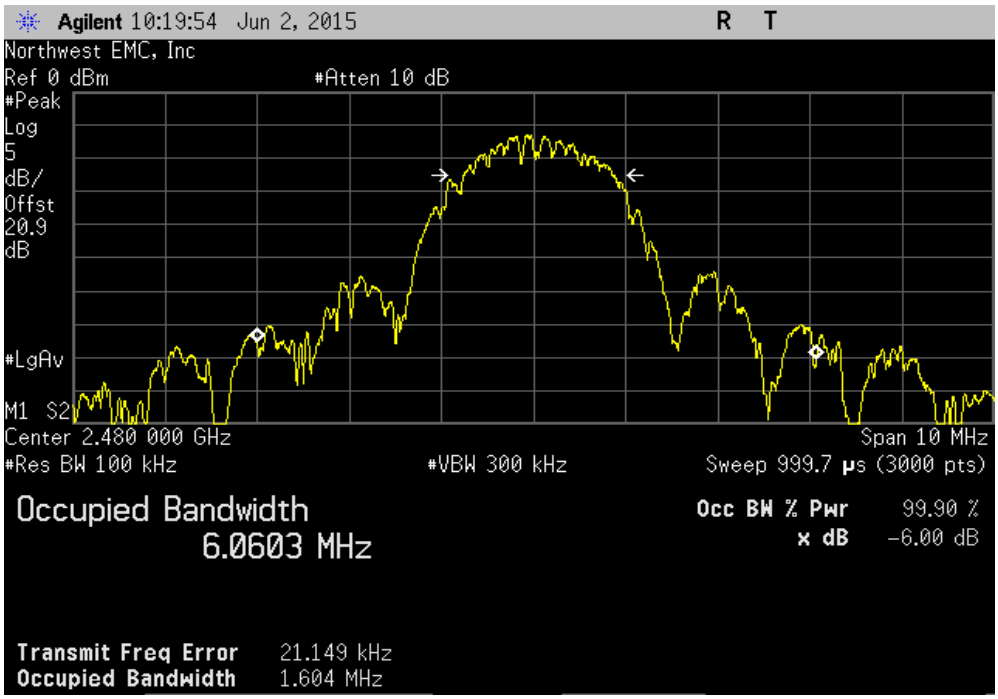
OQPSK, Mid Channel, 2440 MHz						
				Value	Limit (>)	Result
				1.598 MHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2015.01.14

OQPSK, High Channel, 2480 MHz						
				Value	Limit (>)	Result
				1.604 MHz	500 kHz	Pass



OUTPUT POWER

XMit 2015.01.14

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)
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	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.

OUTPUT POWER

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			**Work Order:**	GARR0004
Serial Number:	None			**Date:**	06/02/15
Customer:	Garrett Metal Detectors			**Temperature:**	24.6°C
Attendees:	None			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz.

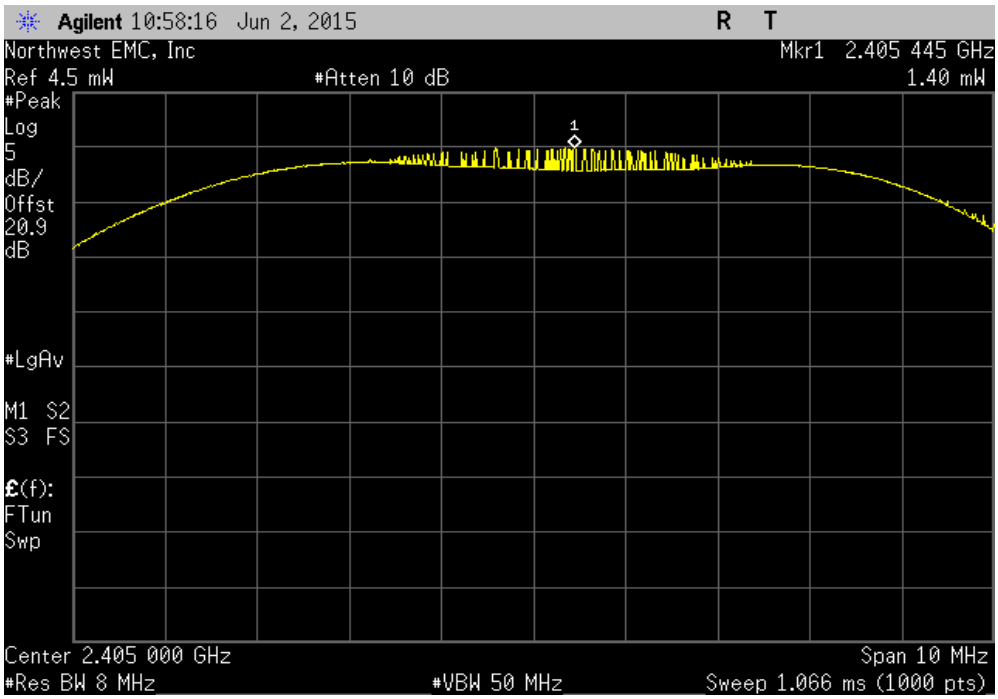
DEVIATIONS FROM TEST STANDARD

None

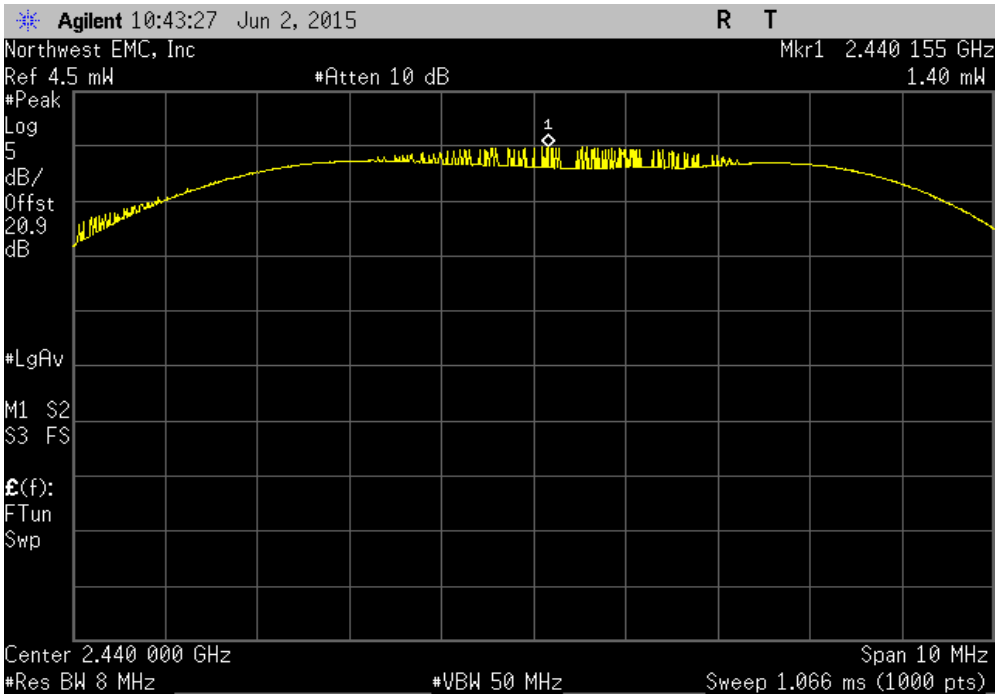
Configuration #	2	Signature

	Value	Limit (<)	Result
OQPSK			
Low Channel, 2405 MHz	1.396 mW	1 W	Pass
Mid Channel, 2440 MHz	1.4 mW	1 W	Pass
High Channel, 2480 MHz	1.289 mW	1 W	Pass

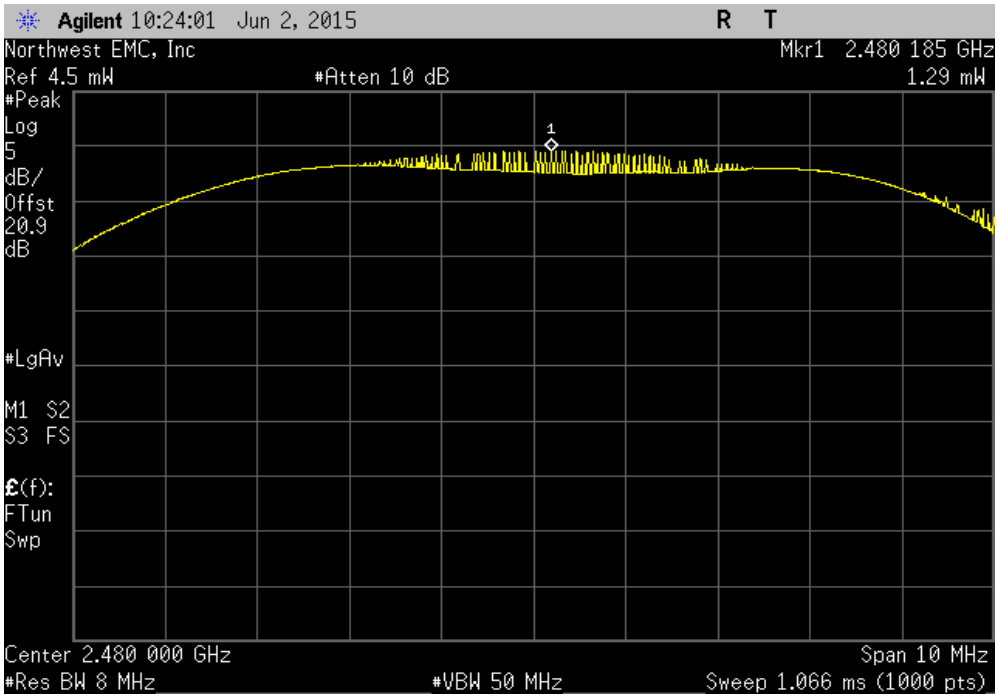
OQPSK, Low Channel, 2405 MHz						
				Value	Limit (<)	Result
				1.396 mW	1 W	Pass



OQPSK, Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				1.4 mW	1 W	Pass



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



POWER SPECTRAL DENSITY

XMit 2015.01.14

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)
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	12

TEST DESCRIPTION

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

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

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

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

BWCF = 10*LOG (3 kHz / 100 kHz) = -15.2 dB

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			Work Order:	GARR0004
Serial Number:	None			Date:	06/02/15
Customer:	Garrett Metal Detectors			Temperature:	24.6°C
Attendees:	None			Humidity:	46%
Project:	None			Barometric Pres.:	1017 mbar
Tested by:	Jonathan Kiefer	Power:	110VAC/60Hz	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz.

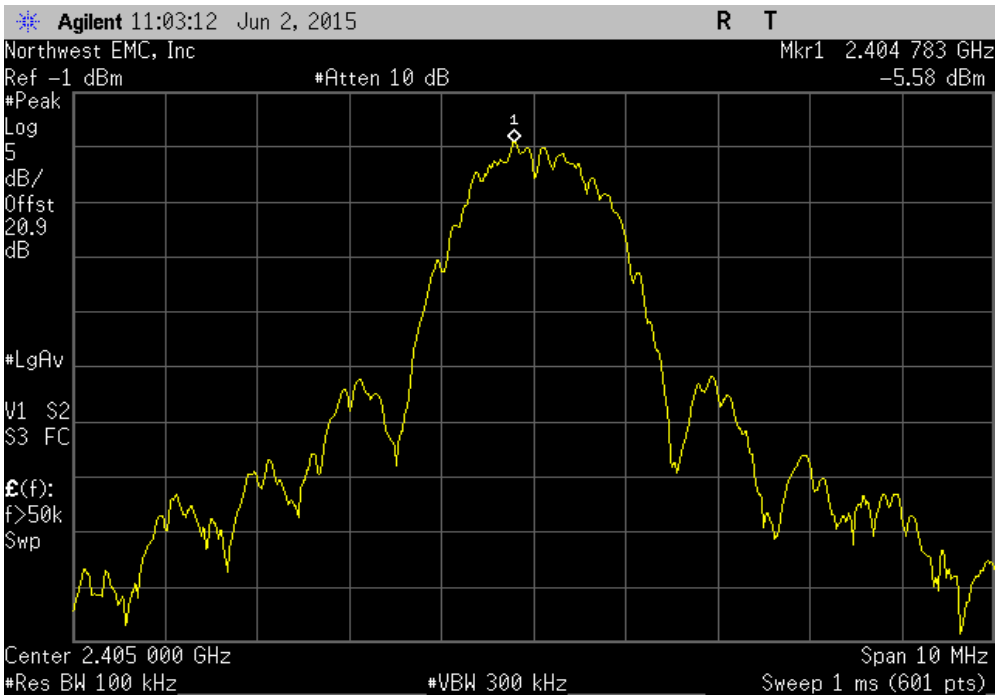
DEVIATIONS FROM TEST STANDARD

None

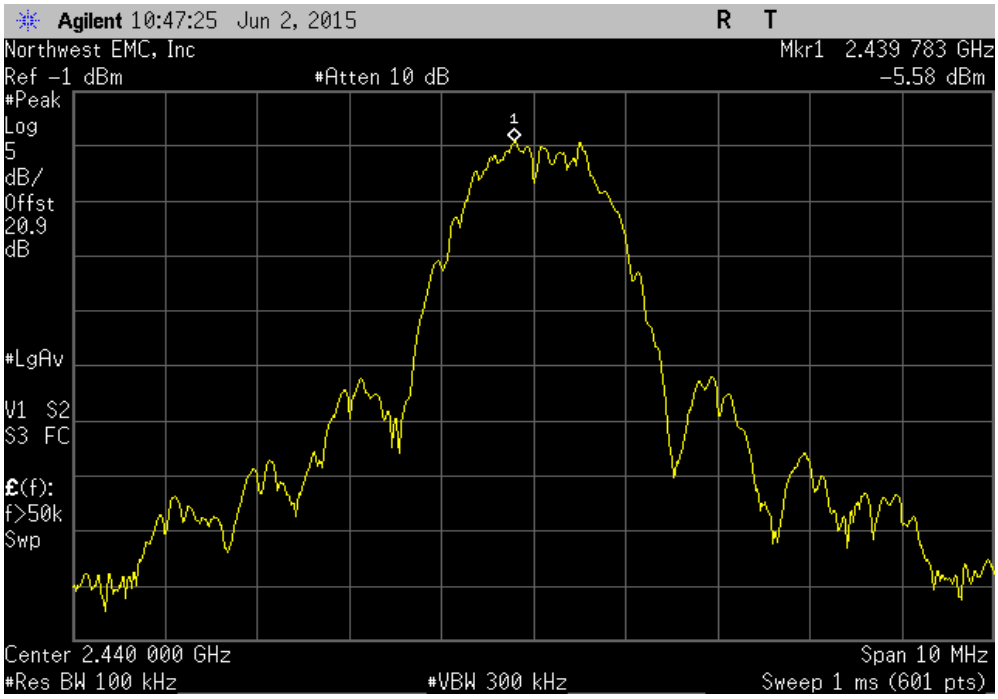
Configuration #	2	Signature

	Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
OQPSK					
Low Channel, 2405 MHz	-5.58	-15.2	-20.78	8	Pass
Mid Channel, 2440 MHz	-5.582	-15.2	-20.782	8	Pass
High Channel, 2480 MHz	-6.025	-15.2	-21.225	8	Pass

OQPSK, Low Channel, 2405 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-5.58	-15.2	-20.78	8	Pass



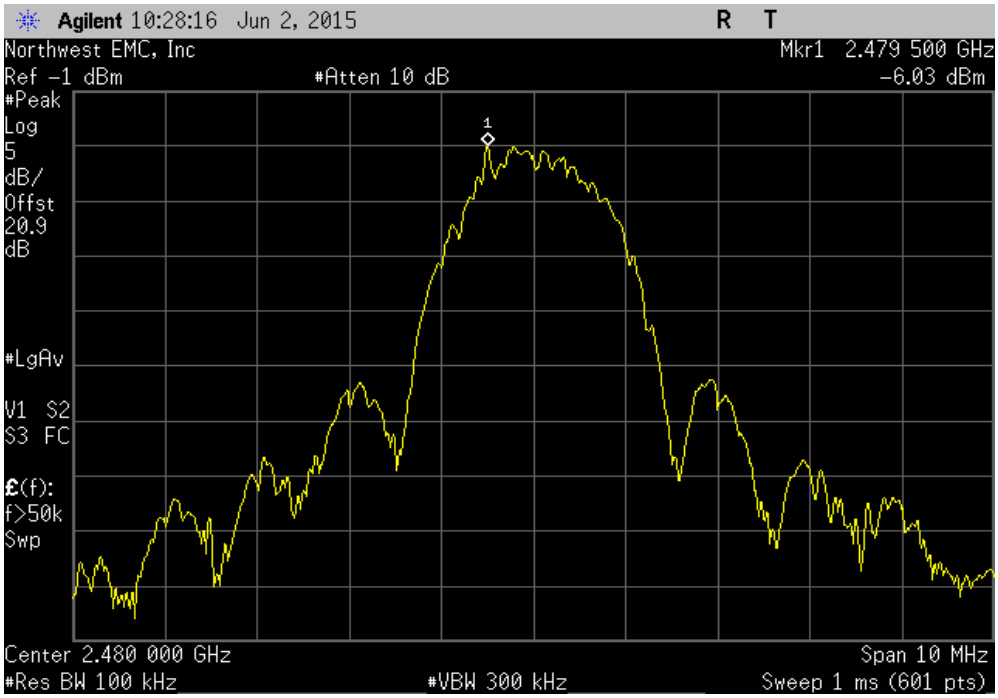
OQPSK, Mid Channel, 2440 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-5.582	-15.2	-20.782	8	Pass



POWER SPECTRAL DENSITY

XMit 2015.01.14

OQPSK, High Channel, 2480 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-6.025	-15.2	-21.225	8	Pass



DUTY CYCLE

XMit 2015.01.14

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)
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	12

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was 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.

If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.

DUTY CYCLE

NORTHWEST EMC

XMit 2015.01.14

EUT:	SM 100			**Work Order:**	GARR0004
Serial Number:	None			**Date:**	06/02/15
Customer:	Garrett Metal Detectors			**Temperature:**	24.6°C
Attendees:	None			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting OQPSK at Low, Mid, High Channel @ 2405, 2440, 2480 MHz.

DEVIATIONS FROM TEST STANDARD

None

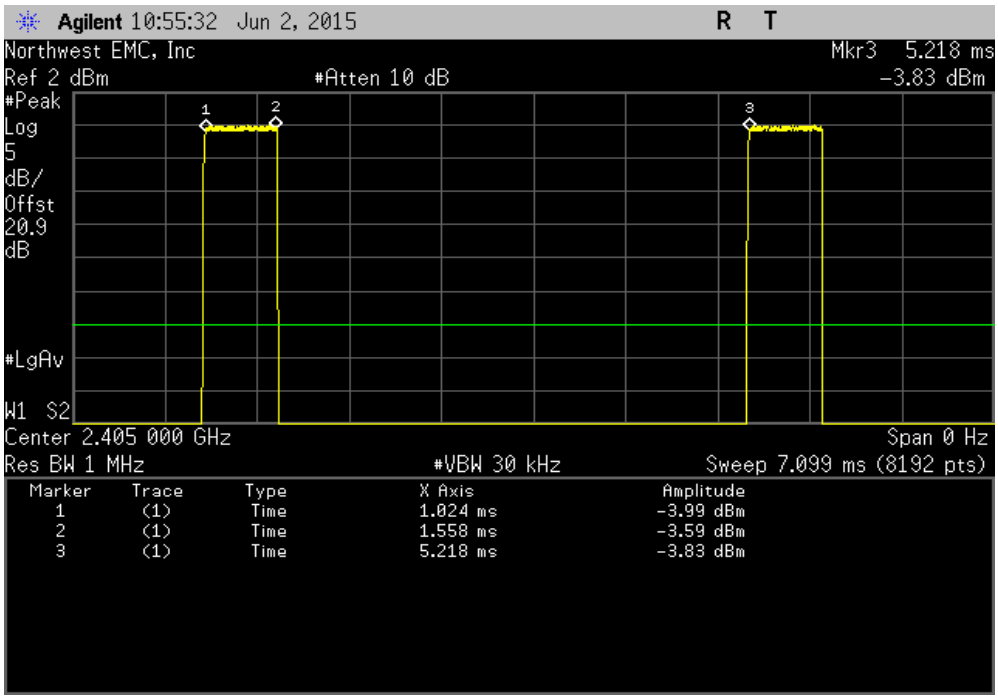
Configuration #	2	*Signature*

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
OQPSK						
Low Channel, 2405 MHz	534.767 us	4.195 ms	1	12.7	N/A	N/A
Low Channel, 2405 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2440 MHz	547.033 us	3.846 ms	1	14.2	N/A	N/A
Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2480 MHz	549.931 us	3.449 ms	1	15.9	N/A	N/A
High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

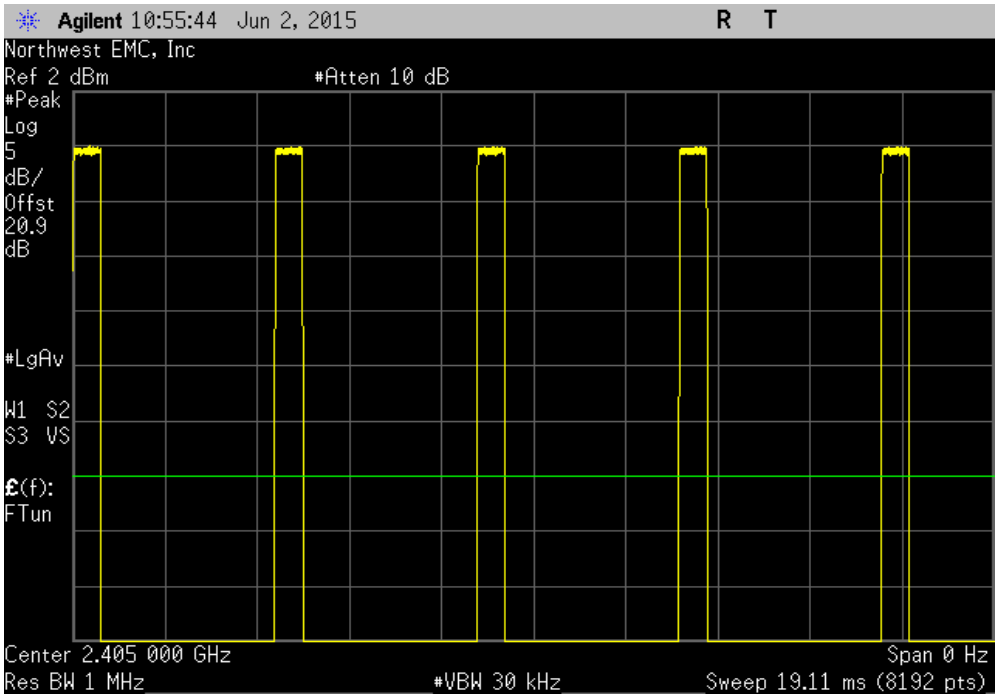
DUTY CYCLE

XMit 2015.01.14

OQPSK, Low Channel, 2405 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	534.767 us	4.195 ms	1	12.7	N/A	N/A



OQPSK, Low Channel, 2405 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

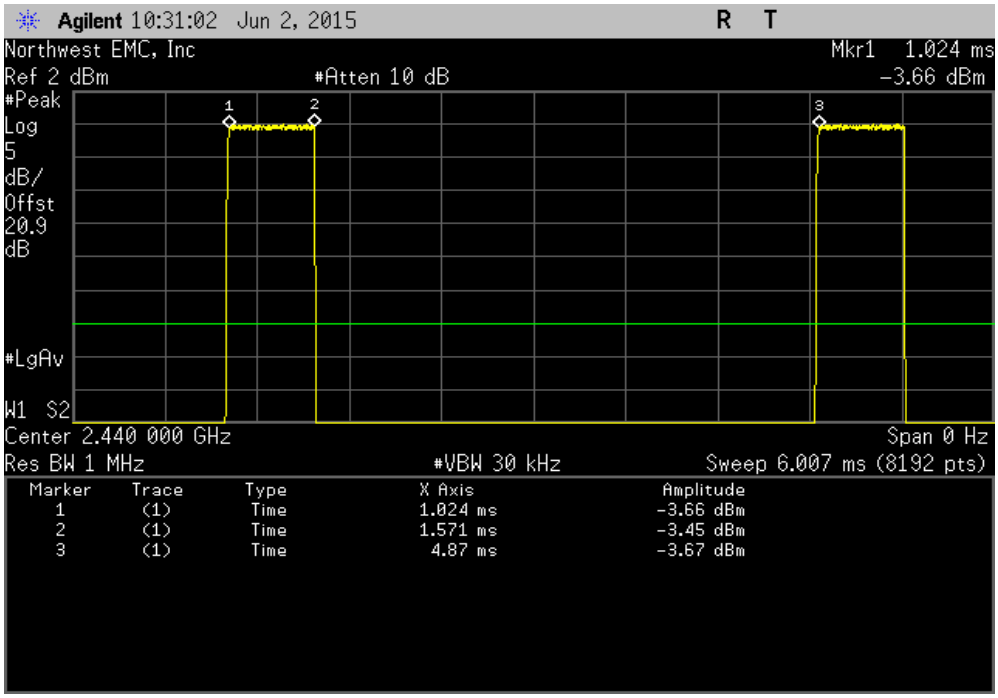


DUTY CYCLE

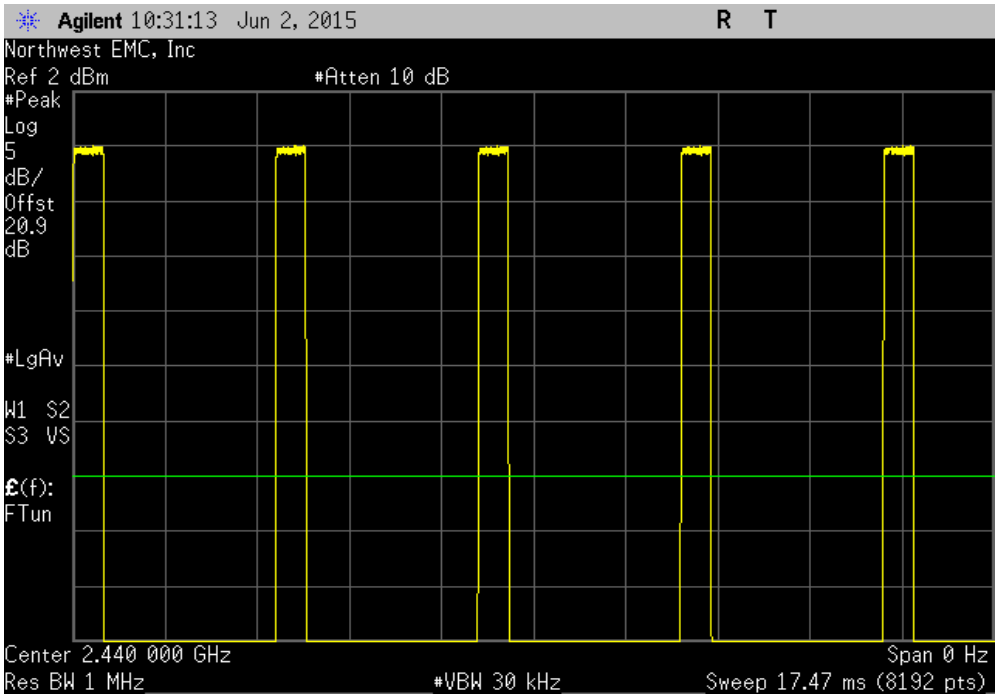
NORTHWEST EMC

XMit 2015.01.14

OQPSK, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	547.033 us	3.846 ms	1	14.2	N/A	N/A



OQPSK, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

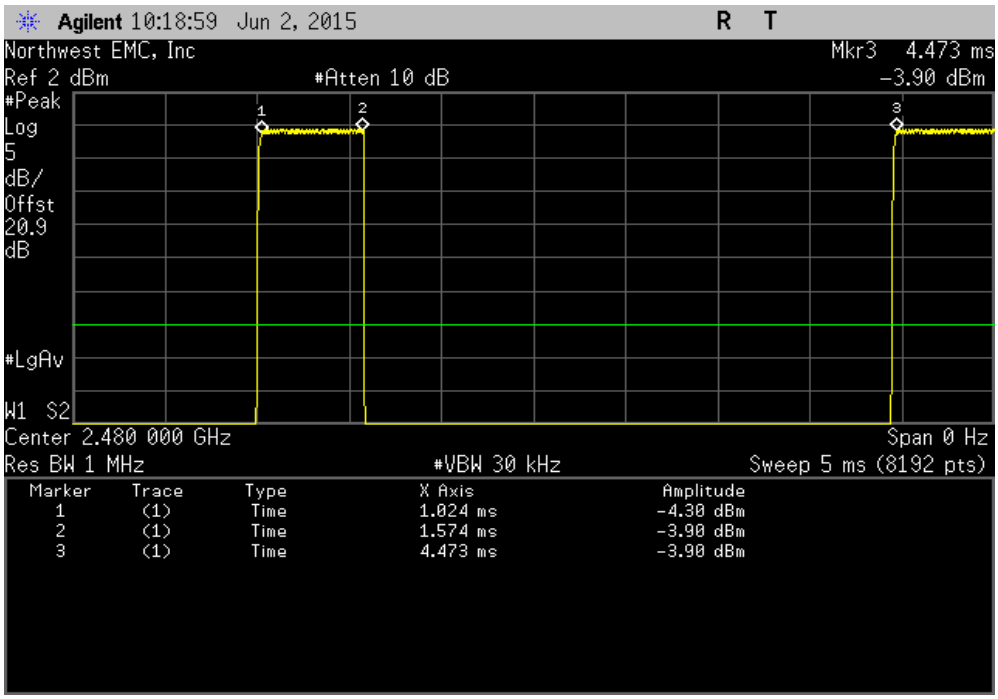


DUTY CYCLE

NORTHWEST EMC

XMit 2015.01.14

OQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	549.931 us	3.449 ms	1	15.9	N/A	N/A



OQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A