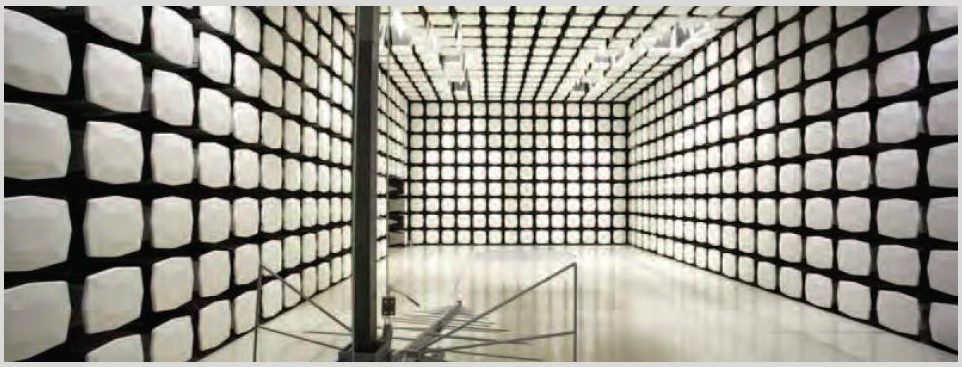
Garrett Metal Detectors

Wireless/LBC

FCC 15.247:2019

2400 – 2483.5 MHz Wideband DTS Transceiver

Report # GARR0041.1 Rev. 1



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: September 9, 2019
Garrett Metal Detectors
Model: Wireless/LBC

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2019	ANSI C63.10:2013
FCC 15.247:2019	

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	
11.6	Duty Cycle	Yes	N/A	Characterization of radio operation.
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.
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	No	N/A	Not required for DTS devices.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	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. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated Power Settings Table	2019-06-27	12
	Updated all data sheets	2019-06-27	13-52
	Updated last date of test and/or first date of test	2019-06-27	2 and 8
	Replaced configurations with configurations from GARR0058	2019-06-27	9 and 10
	Updated all dates in modifications	2019-06-27	11
	Updated standard dates	2019-06-27	1 and 2

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element 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 – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

MSIT / 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

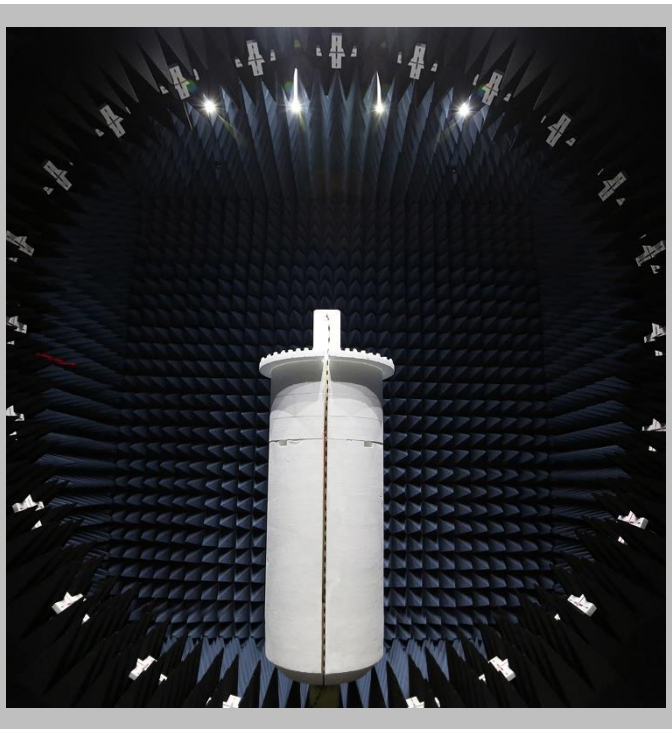
MIC – Recognized by MIC as a CAB for the acceptance of test data.

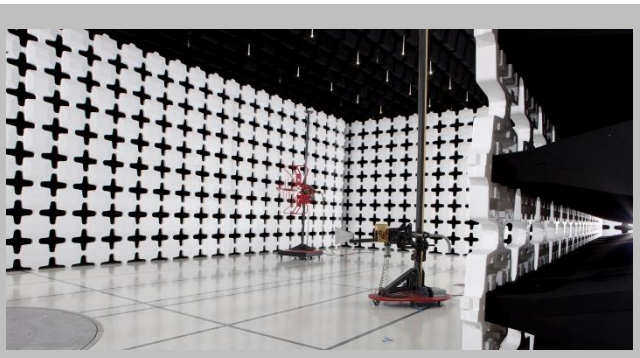
SCOPE

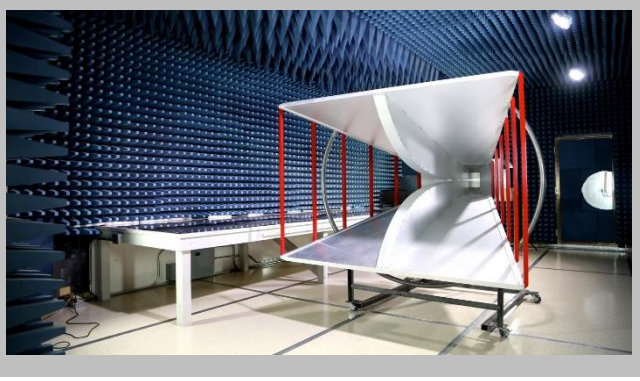
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 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 6775 NE Evergreen Pkwy #400 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, 2834E-3	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







MEASUREMENT UNCERTAINTY

element
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.

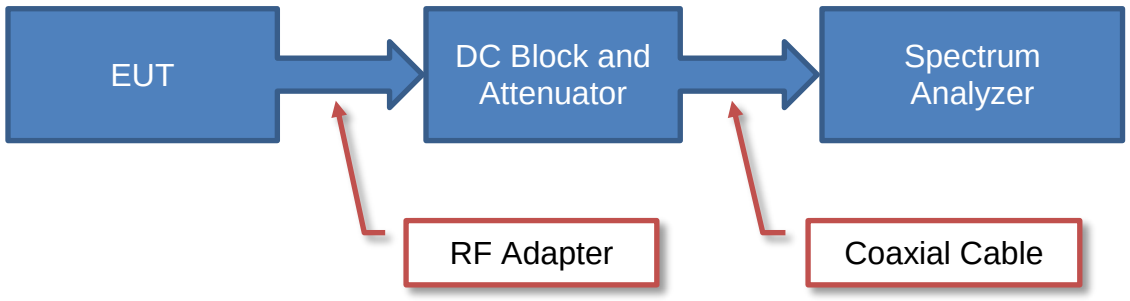
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

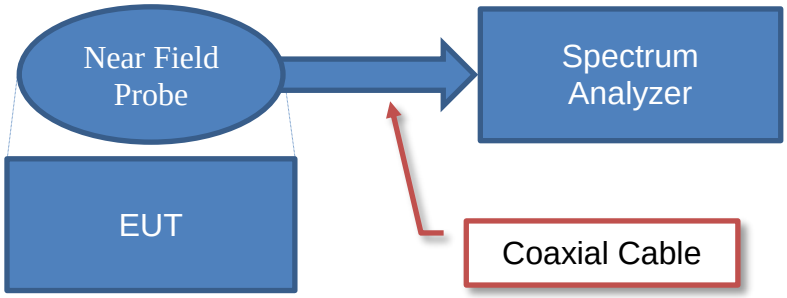
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

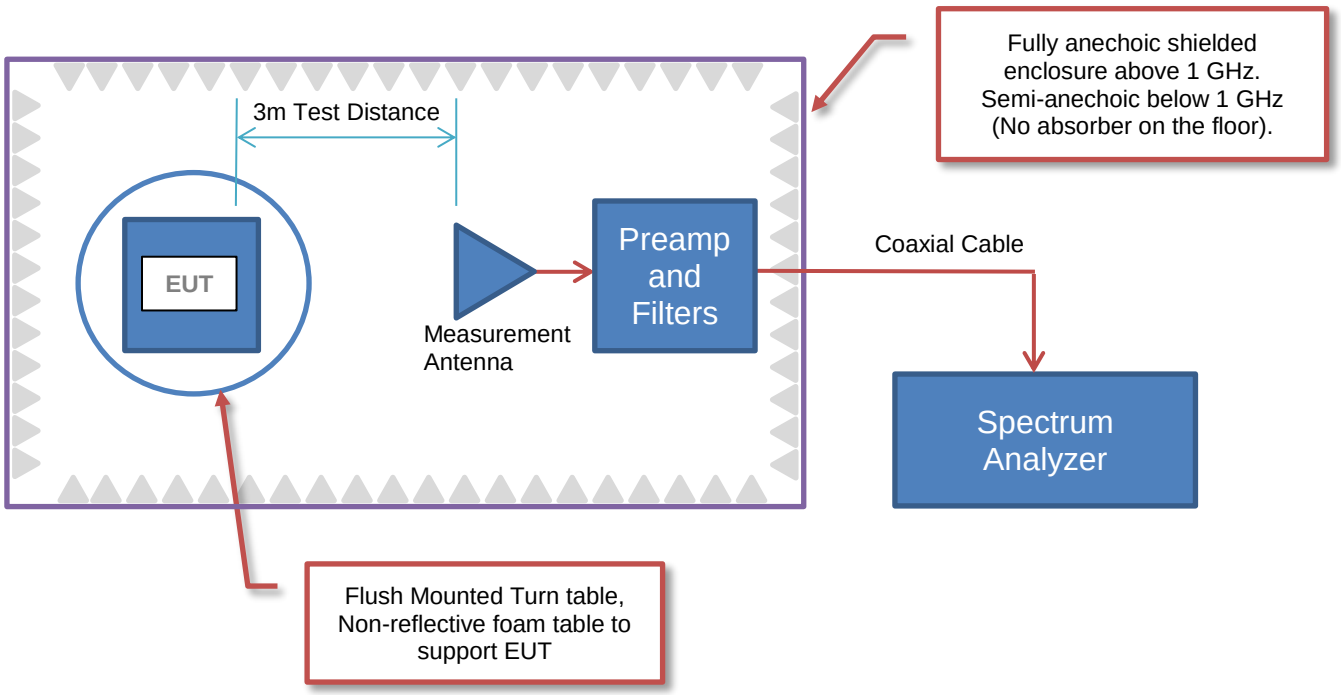
Antenna Port Conducted Measurements



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:	Wireless/LBC
First Date of Test:	June 19, 2019
Last Date of Test:	September 9, 2019
Receipt Date of Samples:	November 30, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Light Bar Controller with TI CC2520 Radio Module

Testing Objective:
Seeking to demonstrate compliance of the Wideband DTS Transceiver under FCC 15.247:2019 for operation in the 2400 - 2483.5 MHz Band.

CONFIGURATIONS

Configuration GARR0058- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2405)	Garrett Metal Detectors	Unknown	2405

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter	Netgear	MU05-J050100-A1	2613321821029100F9

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	No	1.5m	No	AC/DC Adapter	Light Bar Controller with TI CC2520 Radio Module

Configuration GARR0058- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2440)	Garrett Metal Detectors	Unknown	2440

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter	Netgear	MU05-J050100-A1	2613321821029100F9

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	No	1.5m	No	AC/DC Adapter	Light Bar Controller with TI CC2520 Radio Module

CONFIGURATIONS

Configuration GARR0058- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2480)	Garrett Metal Detectors	Unknown	2480

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter	Netgear	MU05-J050100-A1	2613321821029100F9

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	No	1.5m	No	AC/DC Adapter	Light Bar Controller with TI CC2520 Radio Module

Configuration GARR0058- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (SMA Transmit, 2405)	Garrett Metal Detectors	Unknown	2405

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter	Netgear	MU05-J050100-A1	2613321821029100F9

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	No	1.5m	No	AC/DC Adapter	Light Bar Controller with TI CC2520 Radio Module

CONFIGURATIONS

Configuration GARR0058- 14

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2405)	Garrett Metal Detectors	Unknown	2405

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power Leads	No	1.0m	No	DC Power Supply	Light Bar Controller with TI CC2520 Radio Module

Configuration GARR0058- 15

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2440)	Garrett Metal Detectors	Unknown	2440

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power Leads	No	1.0m	No	DC Power Supply	Light Bar Controller with TI CC2520 Radio Module

CONFIGURATIONS

Configuration GARR0058- 16

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Light Bar Controller with TI CC2520 Radio Module (Radiated Transmit, 2480)	Garrett Metal Detectors	Unknown	2480

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power Leads	No	1.0m	No	DC Power Supply	Light Bar Controller with TI CC2520 Radio Module

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-06-19	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2019-06-24	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-06-24	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-06-24	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2019-06-24	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-06-24	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2019-06-24	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2019-09-03	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS

The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Position	Frequency (MHz)	Power Setting
Low Channel	2405	Max
Mid Channel	2440	Max
High Channel	2480	Max

POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.4.24.1

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	2019-07-31	2020-07-31
Cable - Conducted Cable Assembly	Northwest EMC	TXA, HHZ, TQU	TXAA	2019-01-30	2020-01-30
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	2019-09-01	2020-09-01
DC Power Supply	Ametek Programmable Power, Inc.	Sorenson XEL30-30	TQE	NCR	NCR

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

GARR0058-15

MODES INVESTIGATED

Continuously Transmitting at Mid Channel 2440 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	Wireless/LBC	Work Order:	GARR0058
Serial Number:	See Configuration	Date:	2019-09-03
Customer:	Garrett Metal Detectors	Temperature:	22.1°C
Attendees:	None	Relative Humidity:	51.9%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	5 VDC	Configuration:	GARR0058-15

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

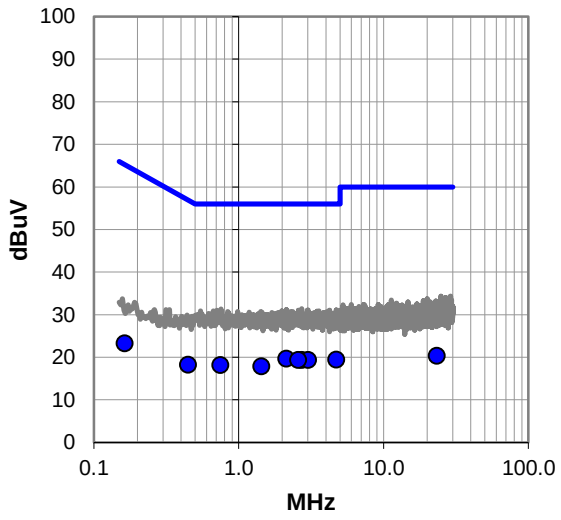
EUT OPERATING MODES

Continuously Transmitting at Mid Channel 2440 MHz

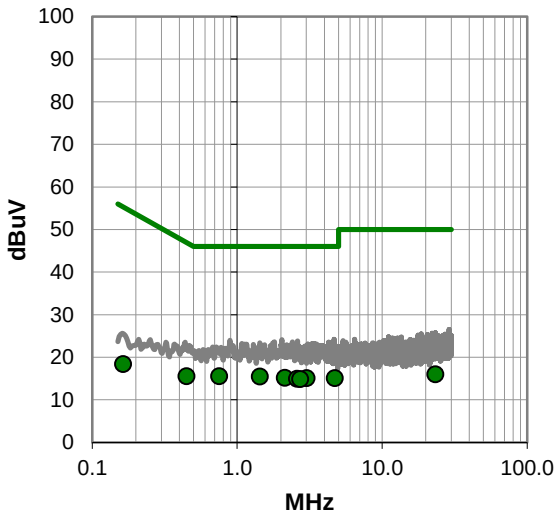
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.4.24.1

RESULTS - Run #22

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.126	-0.5	20.2	19.7	56.0	-36.3
4.711	-0.7	20.2	19.5	56.0	-36.5
2.720	-0.7	20.1	19.4	56.0	-36.6
3.014	-0.8	20.2	19.4	56.0	-36.6
2.579	-0.8	20.2	19.4	56.0	-36.6
0.748	-2.0	20.2	18.2	56.0	-37.8
1.432	-2.1	20.0	17.9	56.0	-38.1
0.446	-1.8	20.1	18.3	56.9	-38.6
23.246	-1.0	21.4	20.4	60.0	-39.6
0.163	3.0	20.3	23.3	65.3	-42.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.748	-4.6	20.2	15.6	46.0	-30.4
1.432	-4.5	20.0	15.5	46.0	-30.5
2.126	-5.0	20.2	15.2	46.0	-30.8
3.014	-5.1	20.2	15.1	46.0	-30.9
4.711	-5.1	20.2	15.1	46.0	-30.9
2.579	-5.2	20.2	15.0	46.0	-31.0
2.720	-5.2	20.1	14.9	46.0	-31.1
0.446	-4.5	20.1	15.6	46.9	-31.3
23.246	-5.4	21.4	16.0	50.0	-34.0
0.163	-1.9	20.3	18.4	55.3	-36.9

CONCLUSION

Pass

Jonathan Kiefer

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Wireless/LBC	Work Order:	GARR0058
Serial Number:	See Configuration	Date:	2019-09-03
Customer:	Garrett Metal Detectors	Temperature:	22.1°C
Attendees:	None	Relative Humidity:	51.9%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jonathan Kiefer	Job Site:	TX01
Power:	5 VDC	Configuration:	GARR0058-15

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

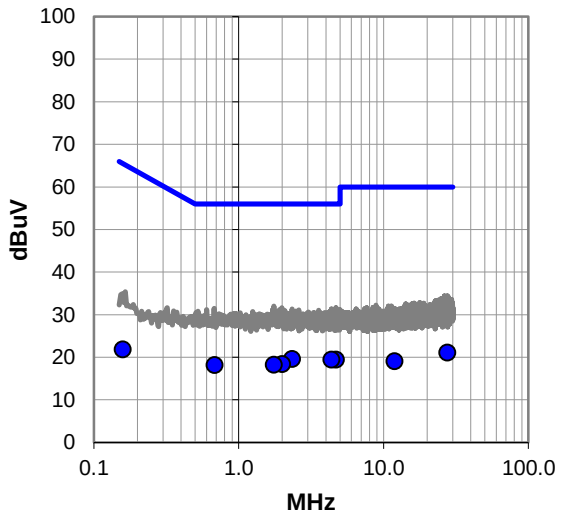
EUT OPERATING MODES

Continuously Transmitting at Mid Channel 2440 MHz

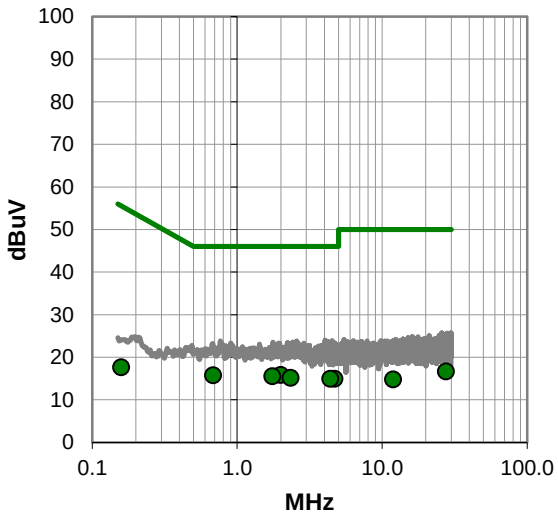
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.4.24.1

RESULTS - Run #23

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.334	-0.6	20.2	19.6	56.0	-36.4
4.685	-0.7	20.2	19.5	56.0	-36.5
4.374	-0.7	20.2	19.5	56.0	-36.5
1.990	-1.8	20.2	18.4	56.0	-37.6
1.750	-1.9	20.2	18.3	56.0	-37.7
0.682	-2.0	20.2	18.2	56.0	-37.8
27.591	-0.8	21.9	21.1	60.0	-38.9
11.899	-1.5	20.6	19.1	60.0	-40.9
0.158	1.6	20.3	21.9	65.6	-43.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
1.990	-4.3	20.2	15.9	46.0	-30.1
0.682	-4.4	20.2	15.8	46.0	-30.2
1.750	-4.6	20.2	15.6	46.0	-30.4
2.334	-5.0	20.2	15.2	46.0	-30.8
4.685	-5.2	20.2	15.0	46.0	-31.0
4.374	-5.2	20.2	15.0	46.0	-31.0
27.591	-5.2	21.9	16.7	50.0	-33.3
11.899	-5.8	20.6	14.8	50.0	-35.2
0.158	-2.6	20.3	17.7	55.6	-37.9

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2019.05.10

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

Continuously Transmitting at High Channel 2480 MHz
Continuously Transmitting at Mid Channel 2440 MHz
Continuously Transmitting at Low Channel 2405 MHz

POWER SETTINGS INVESTIGATED

5 VDC

CONFIGURATIONS INVESTIGATED

GARR0058 - 16
GARR0058 - 15
GARR0058 - 14

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	10-Oct-2018	12 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXW	21-Aug-2018	24 mo
Cable	Northwest EMC	18-40GHz	TXE	10-Oct-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	9-Oct-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	9-Oct-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Cable	Northwest EMC	8-18GHz	TXD	14-May-2019	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HGC	17-Mar-2019	12 mo
Attenuator	Weinschel Corp	4H-20	AWB	17-Mar-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	17-Mar-2019	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJL	11-Oct-2018	24 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	14-May-2019	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	3-Aug-2018	12 mo
Amplifier - Pre-Amplifier	Fairview Microwave	FMAM63001	PAS	24-Jan-2019	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	22-Aug-2018	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	10-May-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-2019	12 mo
DC Power Supply	Ametek Programmable	Sorenson XEL30-30	TQE	NCR	0 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc).

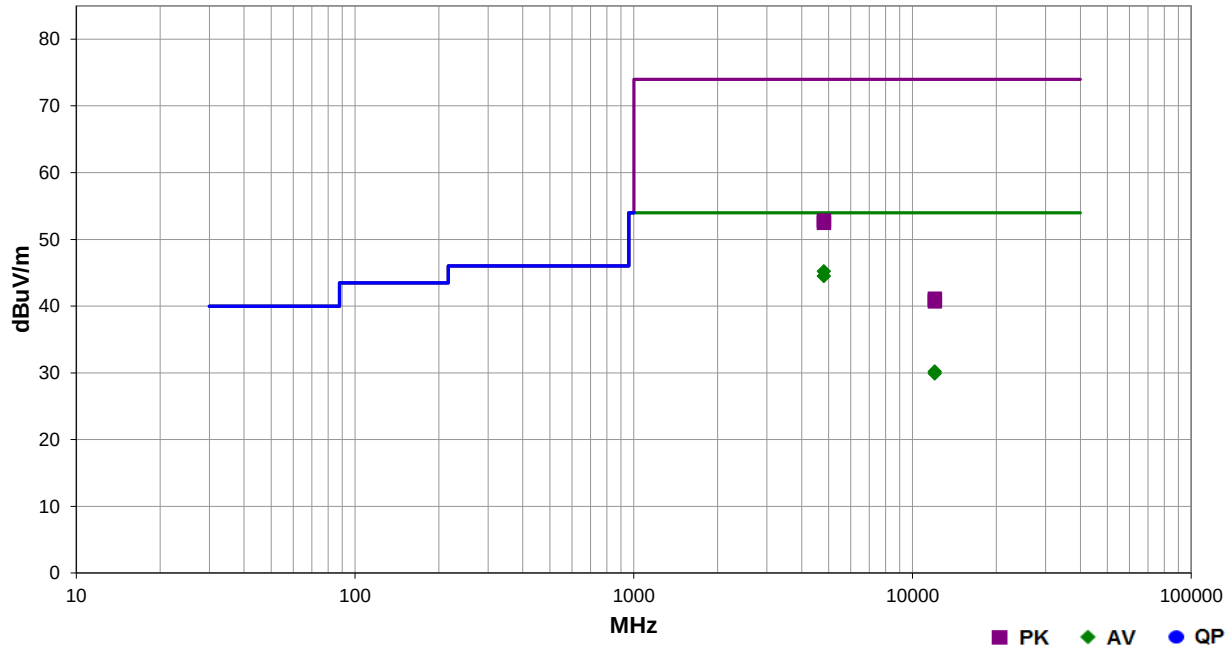
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	GARR0058	**Date:**	19-Jun-2019		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	TX02	**Humidity:**	55.1% RH		
Serial Number:	See Configuration	**Barometric Pres.:**	1010 mbar	**Tested by:**	Jonathan Kiefer
EUT:	Wireless/LBC				
Configuration:	14				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	5 VDC				
Operating Mode:	Continuously Transmitting at Low Channel 2405 MHz				
Deviations:	None				
Comments:	Low Ch harmonic spurious emissions. See table comments below for EUT channel and orientation.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	50	**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
4808.983	41.1	4.1	2.44	171.0	3.0	0.0	Horz	AV	0.0	45.2	54.0	-8.8	Low Ch, EUT Horz
4809.000	40.4	4.1	3.78	213.9	3.0	0.0	Vert	AV	0.0	44.5	54.0	-9.5	Low Ch, EUT Horz
4809.000	48.7	4.1	2.44	171.0	3.0	0.0	Horz	PK	0.0	52.8	74.0	-21.2	Low Ch, EUT Horz
4809.200	48.4	4.1	3.78	213.9	3.0	0.0	Vert	PK	0.0	52.5	74.0	-21.5	Low Ch, EUT Horz
12022.530	34.4	-4.2	1.91	352.9	3.0	0.0	Horz	AV	0.0	30.2	54.0	-23.8	Low Ch, EUT Horz
12022.570	34.1	-4.2	1.5	260.0	3.0	0.0	Vert	AV	0.0	29.9	54.0	-24.1	Low Ch, EUT Horz
12027.250	45.3	-4.2	1.91	352.9	3.0	0.0	Horz	PK	0.0	41.1	74.0	-32.9	Low Ch, EUT Horz
12023.080	44.9	-4.2	1.5	260.0	3.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	Low Ch, EUT Horz

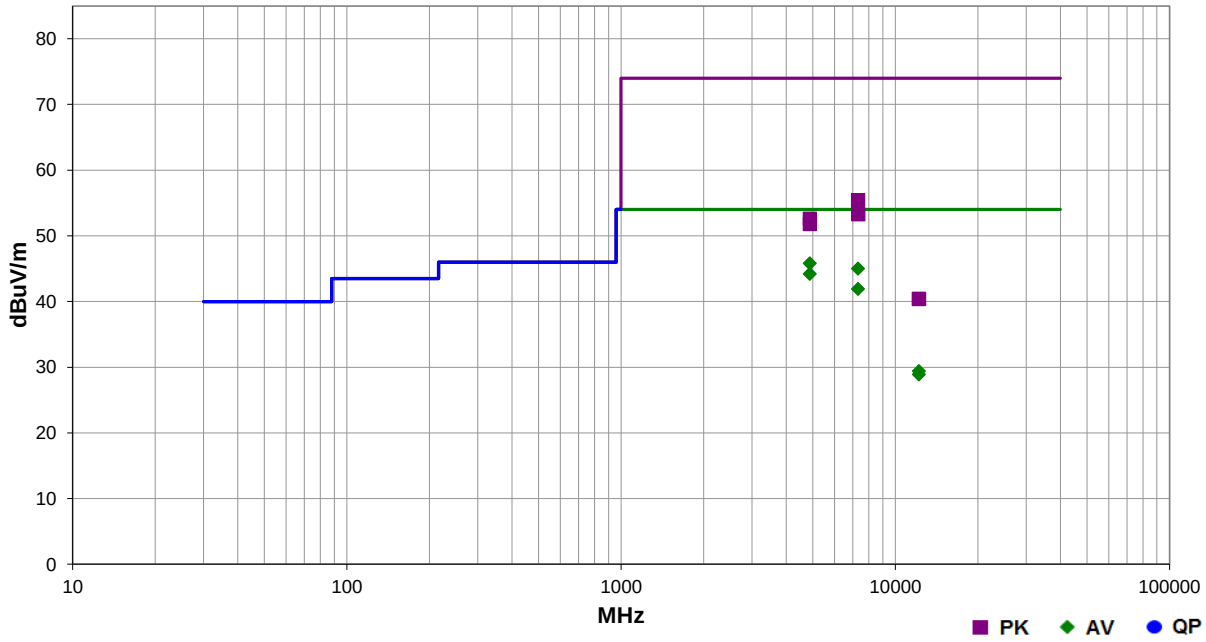
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	GARR0058	**Date:**	19-Jun-2019		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	TX02	**Humidity:**	55.1% RH		
Serial Number:	See Configuration	**Barometric Pres.:**	1010 mbar	**Tested by:**	Jonathan Kiefer
EUT:	Wireless/LBC				
Configuration:	15				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	5 VDC				
Operating Mode:	Continuously Transmitting at Mid Channel 2440 MHz				
Deviations:	None				
Comments:	Mid Ch harmonic spurious emissions. See table comments below for EUT channel and orientation.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	49	**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
4879.942	41.5	4.3	2.47	171.9	3.0	0.0	Horz	AV	0.0	45.8	54.0	-8.2	Mid Ch, EUT Horz
7321.242	33.3	11.7	1.5	224.0	3.0	0.0	Horz	AV	0.0	45.0	54.0	-9.0	Mid Ch, EUT Horz
4880.033	39.9	4.3	2.63	188.0	3.0	0.0	Vert	AV	0.0	44.2	54.0	-9.8	Mid Ch, EUT Horz
7320.875	30.2	11.7	1.5	73.0	3.0	0.0	Vert	AV	0.0	41.9	54.0	-12.1	Mid Ch, EUT Horz
7321.225	43.7	11.7	1.5	224.0	3.0	0.0	Horz	PK	0.0	55.4	74.0	-18.6	Mid Ch, EUT Horz
7321.850	41.6	11.7	1.5	73.0	3.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	Mid Ch, EUT Horz
4880.750	48.3	4.3	2.47	171.9	3.0	0.0	Horz	PK	0.0	52.6	74.0	-21.4	Mid Ch, EUT Horz
4879.667	47.5	4.3	2.63	188.0	3.0	0.0	Vert	PK	0.0	51.8	74.0	-22.2	Mid Ch, EUT Horz
12202.120	33.3	-3.9	1.5	207.9	3.0	0.0	Vert	AV	0.0	29.4	54.0	-24.6	Mid Ch, EUT Horz
12201.260	32.8	-3.9	1.5	91.0	3.0	0.0	Horz	AV	0.0	28.9	54.0	-25.1	Mid Ch, EUT Horz
12200.090	44.3	-3.9	1.5	91.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	Mid Ch, EUT Horz
12202.130	44.3	-3.9	1.5	207.9	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Mid Ch, EUT Horz

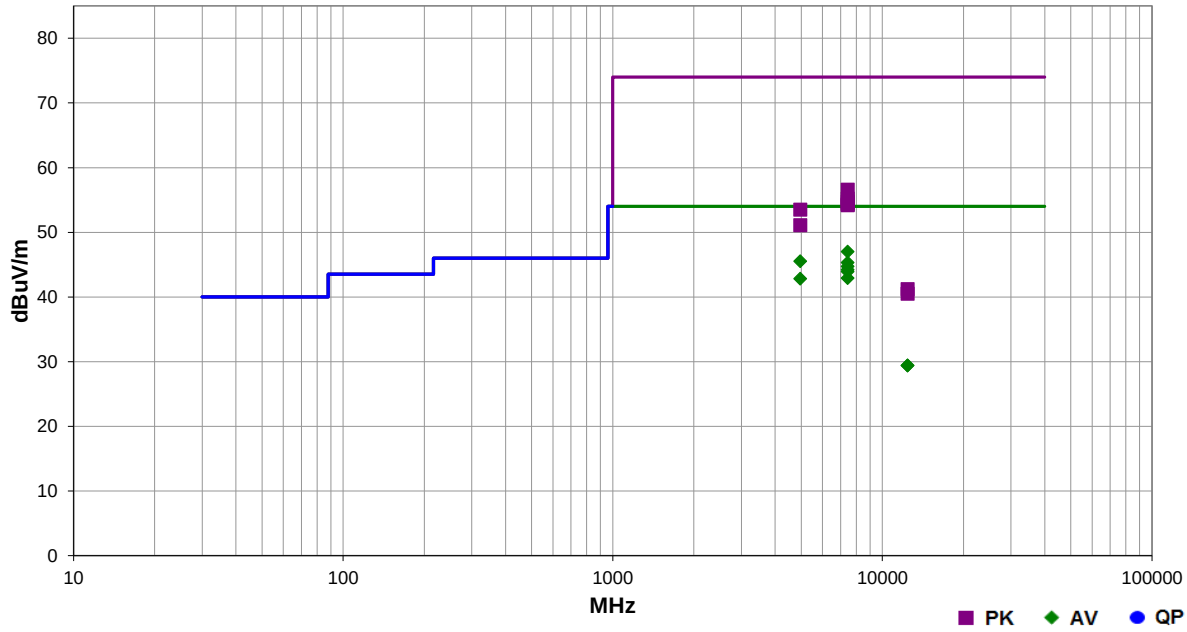
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	GARR0058	**Date:**	19-Jun-2019		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	TX02	**Humidity:**	55.1% RH		
Serial Number:	See Configuration	**Barometric Pres.:**	1010 mbar	**Tested by:**	Jonathan Kiefer
EUT:	Wireless/LBC				
Configuration:	16				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	5 VDC				
Operating Mode:	Continuously Transmitting at High Channel 2480 MHz				
Deviations:	None				
Comments:	High Ch harmonic spurious emissions. See table comments below for EUT channel and orientation.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	47	**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
7441.367	35.3	11.7	1.5	18.0	3.0	0.0	Horz	AV	0.0	47.0	54.0	-7.0	High Ch, EUT Horz
4959.983	40.8	4.7	2.37	177.0	3.0	0.0	Horz	AV	0.0	45.5	54.0	-8.5	High Ch, EUT Horz
7441.425	33.6	11.7	3.55	18.0	3.0	0.0	Vert	AV	0.0	45.3	54.0	-8.7	High Ch, EUT Horz
7441.325	33.0	11.7	1.5	124.9	3.0	0.0	Horz	AV	0.0	44.7	54.0	-9.3	High Ch, EUT On Side
7441.342	32.5	11.7	2.65	213.0	3.0	0.0	Vert	AV	0.0	44.2	54.0	-9.8	High Ch, EUT On Side
7441.275	32.2	11.7	1.92	271.0	3.0	0.0	Vert	AV	0.0	43.9	54.0	-10.1	High Ch, EUT Vert
7441.283	31.2	11.7	1.5	207.0	3.0	0.0	Horz	AV	0.0	42.9	54.0	-11.1	High Ch, EUT Vert
4959.933	38.1	4.7	2.38	162.0	3.0	0.0	Vert	AV	0.0	42.8	54.0	-11.2	High Ch, EUT Horz
7441.200	44.9	11.7	1.5	18.0	3.0	0.0	Horz	PK	0.0	56.6	74.0	-17.4	High Ch, EUT Horz
7441.233	43.5	11.7	3.55	18.0	3.0	0.0	Vert	PK	0.0	55.2	74.0	-18.8	High Ch, EUT Horz
7438.175	43.0	11.7	2.65	213.0	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	High Ch, EUT On Side
7441.575	42.8	11.7	1.5	124.9	3.0	0.0	Horz	PK	0.0	54.5	74.0	-19.5	High Ch, EUT On Side
7438.550	42.6	11.7	1.92	271.0	3.0	0.0	Vert	PK	0.0	54.3	74.0	-19.7	High Ch, EUT Vert
7441.375	42.5	11.7	1.5	207.0	3.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	High Ch, EUT Vert
4959.250	48.8	4.7	2.37	177.0	3.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	High Ch, EUT Horz
4960.433	46.4	4.7	2.38	162.0	3.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9	High Ch, EUT Horz
12397.740	32.4	-3.0	1.5	103.0	3.0	0.0	Horz	AV	0.0	29.4	54.0	-24.6	High Ch, EUT Horz
12397.570	32.4	-3.0	1.5	177.0	3.0	0.0	Vert	AV	0.0	29.4	54.0	-24.6	High Ch, EUT Horz

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
12398.800	44.2	-3.0	1.5	103.0	3.0	0.0	Horz	PK	0.0	41.2	74.0	-32.8	High Ch, EUT Horz
12399.700	43.5	-3.0	1.5	177.0	3.0	0.0	Vert	PK	0.0	40.5	74.0	-33.5	High Ch, EUT Horz

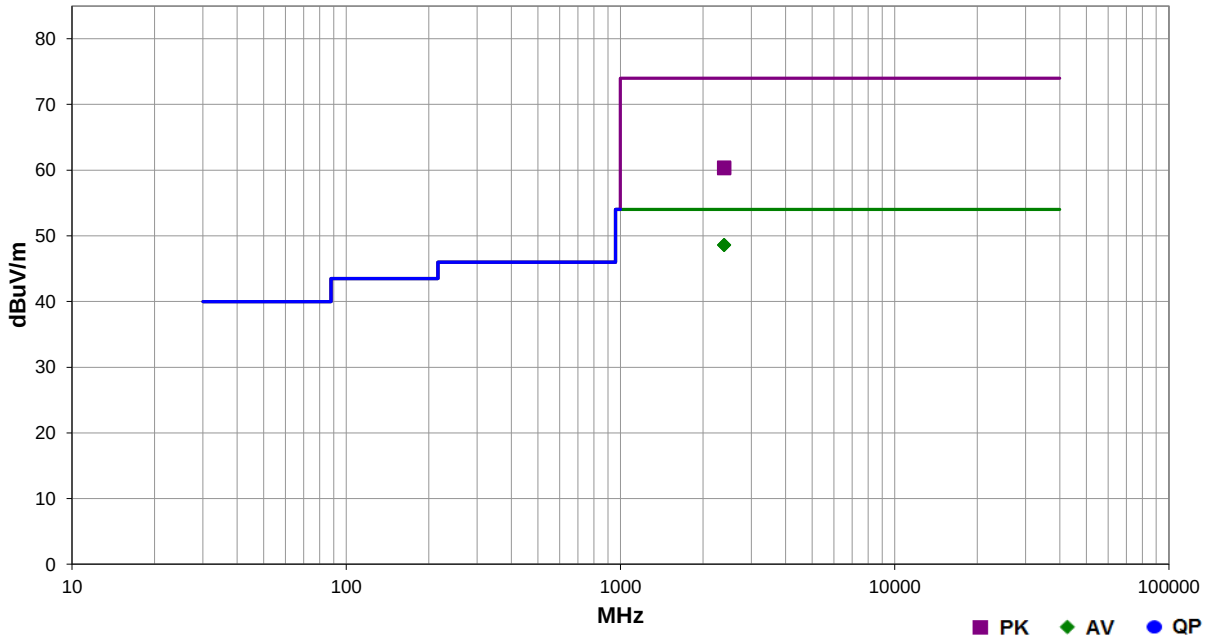
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	GARR0058	**Date:**	20-Jun-2019		
Project:	None	**Temperature:**	21.6 °C		
Job Site:	TX02	**Humidity:**	51.1% RH		
Serial Number:	See Configuration	**Barometric Pres.:**	1012 mbar	**Tested by:**	Jonathan Kiefer
EUT:	Wireless/LBC				
Configuration:	14				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	5 VDC				
Operating Mode:	Continuously Transmitting at Low Channel 2405 MHz				
Deviations:	None				
Comments:	Low Ch Transmit Band Edge. See table comments below for EUT channel and orientation.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	51	**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
2389.830	34.0	-5.4	1.5	51.9	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	Low Ch, EUT Horz
2389.603	34.0	-5.4	1.5	192.0	3.0	20.0	Vert	AV	0.0	48.6	54.0	-5.4	Low Ch, EUT Horz
2388.443	45.8	-5.4	1.5	51.9	3.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	Low Ch, EUT Horz
2389.563	45.7	-5.4	1.5	192.0	3.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	Low Ch, EUT Horz

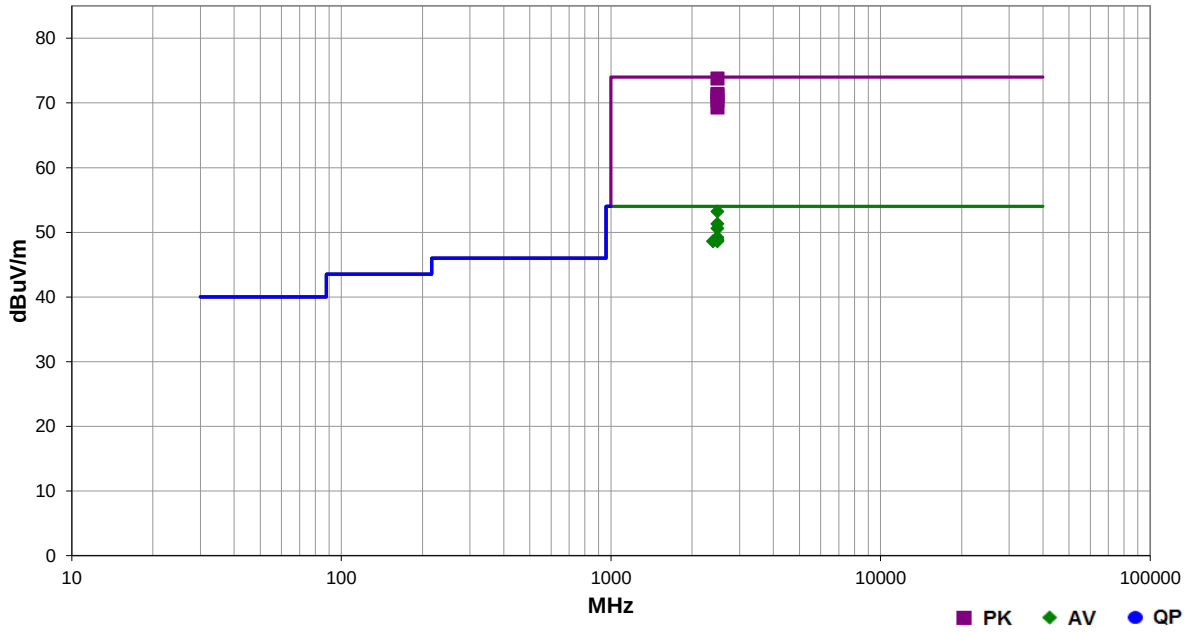
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	GARR0058	**Date:**	20-Jun-2019		
Project:	None	**Temperature:**	21.6 °C		
Job Site:	TX02	**Humidity:**	51.1% RH		
Serial Number:	See Configuration	**Barometric Pres.:**	1012 mbar	**Tested by:**	Jonathan Kiefer
EUT:	Wireless/LBC				
Configuration:	16				
Customer:	Garrett Metal Detectors				
Attendees:	None				
EUT Power:	5 VDC				
Operating Mode:	Continuously Transmitting at High Channel 2480 MHz				
Deviations:	None				
Comments:	High Ch Transmit Band Edge. See table comments below for EUT channel and orientation.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	51	**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
2483.500	58.8	-5.0	3.4	237.9	3.0	20.0	Horz	PK	0.0	73.8	74.0	-0.2	High Ch, EUT Horz
2484.500	38.2	-5.0	3.4	237.9	3.0	20.0	Horz	AV	0.0	53.2	54.0	-0.8	High Ch, EUT Horz.
2483.540	56.4	-5.0	3.9	28.9	3.0	20.0	Vert	PK	0.0	71.4	74.0	-2.6	High Ch, EUT Horz
2484.500	36.3	-5.0	1.0	249.9	3.0	20.0	Horz	AV	0.0	51.3	54.0	-2.7	High Ch, EUT On Side.
2483.503	56.2	-5.0	1.0	249.9	3.0	20.0	Horz	PK	0.0	71.2	74.0	-2.8	High Ch, EUT On Side
2484.500	35.6	-5.0	3.9	28.9	3.0	20.0	Vert	AV	0.0	50.6	54.0	-3.4	High Ch, EUT Horz.
2483.520	55.4	-5.0	1.6	226.9	3.0	20.0	Horz	PK	0.0	70.4	74.0	-3.6	High Ch, EUT Vert
2483.520	54.3	-5.0	3.4	260.0	3.0	20.0	Vert	PK	0.0	69.3	74.0	-4.7	High Ch, EUT On Side
2484.500	34.2	-5.0	4.0	100.9	3.0	20.0	Vert	AV	0.0	49.2	54.0	-4.8	High Ch, EUT Vert.
2484.500	33.9	-5.0	3.4	260.0	3.0	20.0	Vert	AV	0.0	48.9	54.0	-5.1	High Ch, EUT On Side.
2484.500	33.7	-5.0	2.3	157.0	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	High Ch, EUT Vert.
2389.830	34.0	-5.4	1.5	51.9	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	Low Ch, EUT Horz
2483.500	34.0	-5.4	1.5	192.0	3.0	20.0	Vert	AV	0.0	48.6	54.0	-5.4	Low Ch, EUT Horz
2483.500	52.5	-5.0	4.0	100.9	3.0	20.0	Vert	PK	0.0	67.5	74.0	-6.5	High Ch, EUT Vert

DUTY CYCLE

TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

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

The EUT operates at 100% Duty Cycle.

OUTPUT POWER

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission 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 AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

OUTPUT POWER

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	Wireless/LBC			**Work Order:**	GARR0058
Serial Number:	See Configuration			**Date:**	24-Jun-19
Customer:	Garrett Metal Detectors			**Temperature:**	22 °C
Attendees:	None			**Humidity:**	53.1% RH
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

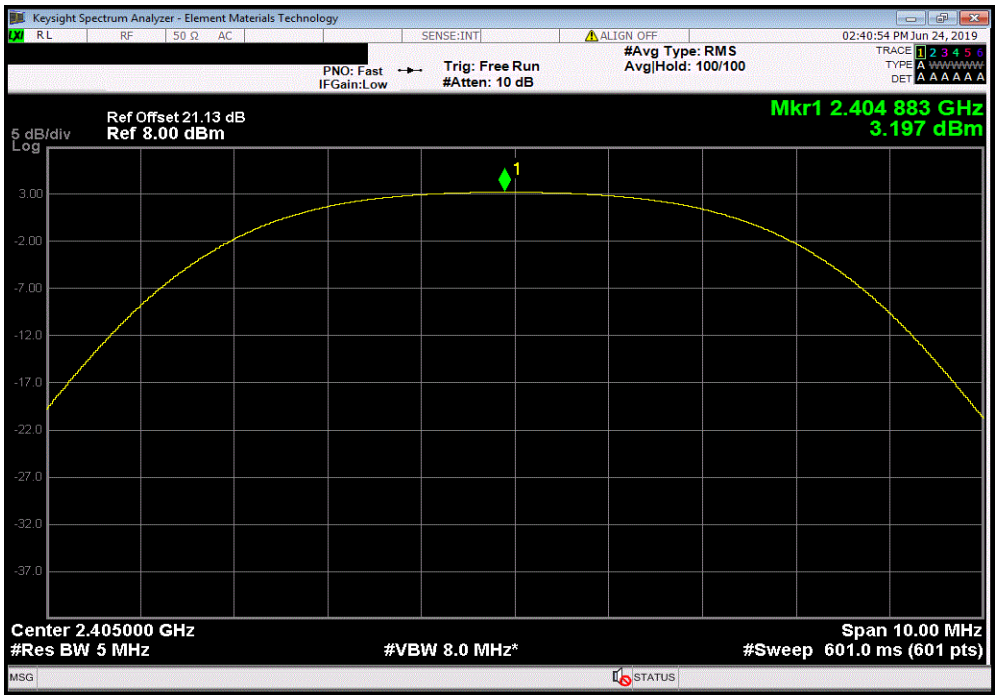
DEVIATIONS FROM TEST STANDARD

None

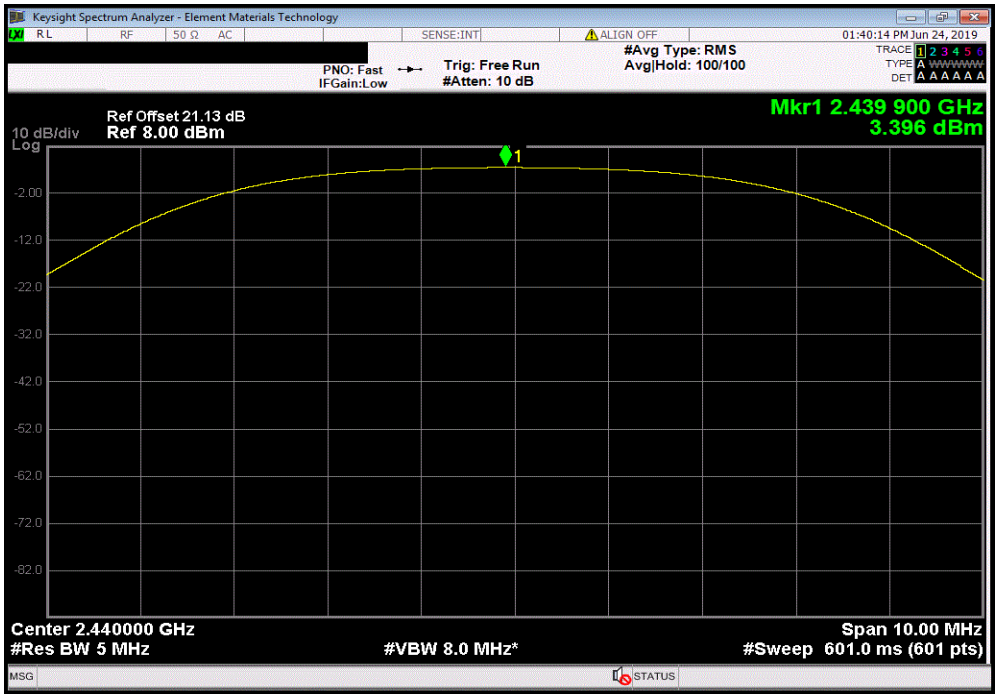
Configuration #	6	Signature	Jonathan Kiefer

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
Low Channel, 2405 MHz	3.197	0	3.2	30	Pass
Mid Channel, 2440 MHz	3.396	0	3.4	30	Pass
High Channel, 2480 MHz	3.187	0	3.2	30	Pass

Low Channel, 2405 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		3.197	0	3.2	30	Pass

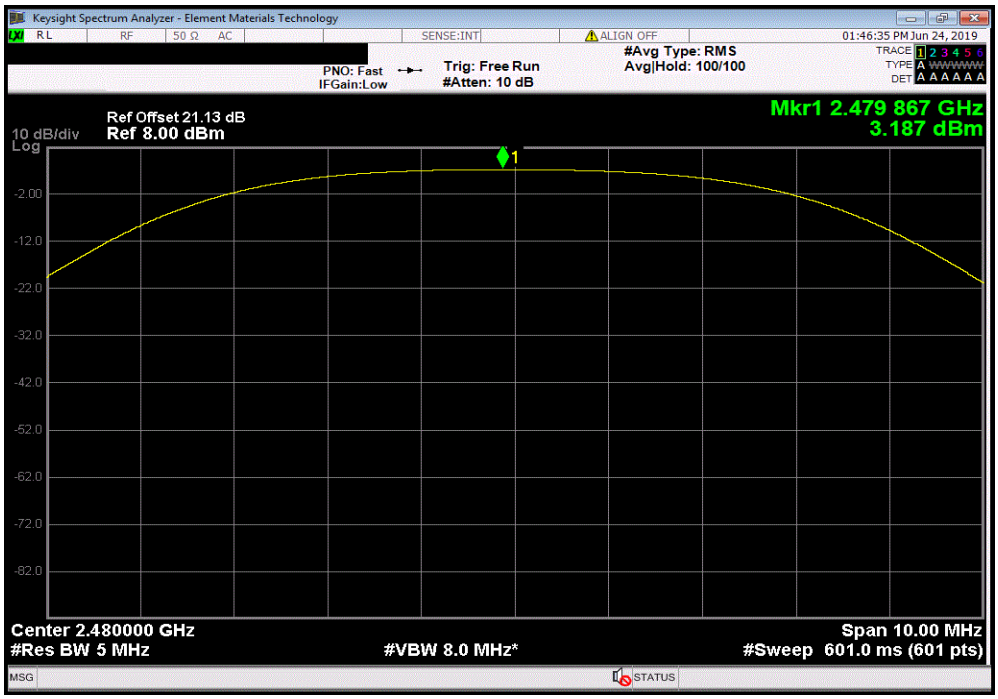


Mid Channel, 2440 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		3.396	0	3.4	30	Pass



OUTPUT POWER

High Channel, 2480 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		3.187	0	3.2	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission 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 AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	Wireless/LBC			**Work Order:**	GARR0058
Serial Number:	See Configuration			**Date:**	24-Jun-19
Customer:	Garrett Metal Detectors			**Temperature:**	22.2 °C
Attendees:	None			**Humidity:**	51.1% RH
Project:	None			**Barometric Pres.:**	1017 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	6	Signature	Jonathan Kiefer

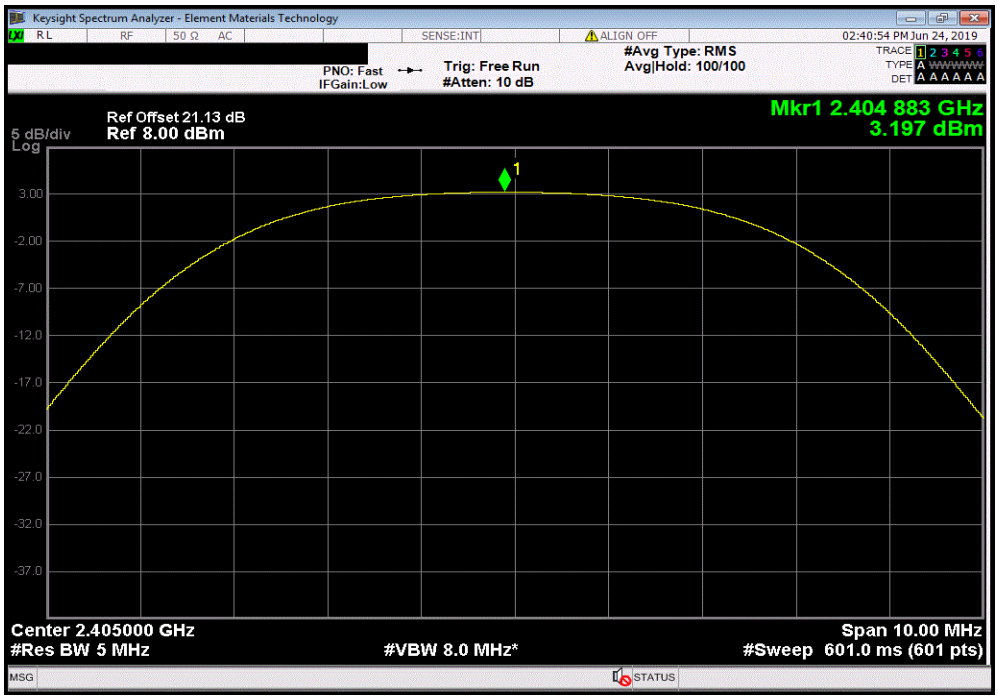
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Low Channel, 2405 MHz	3.197	0	3.2	5.44	8.6	36	Pass
Mid Channel, 2440 MHz	3.396	0	3.4	5.44	8.8	36	Pass
High Channel, 2480 MHz	3.187	0	3.2	5.44	8.6	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

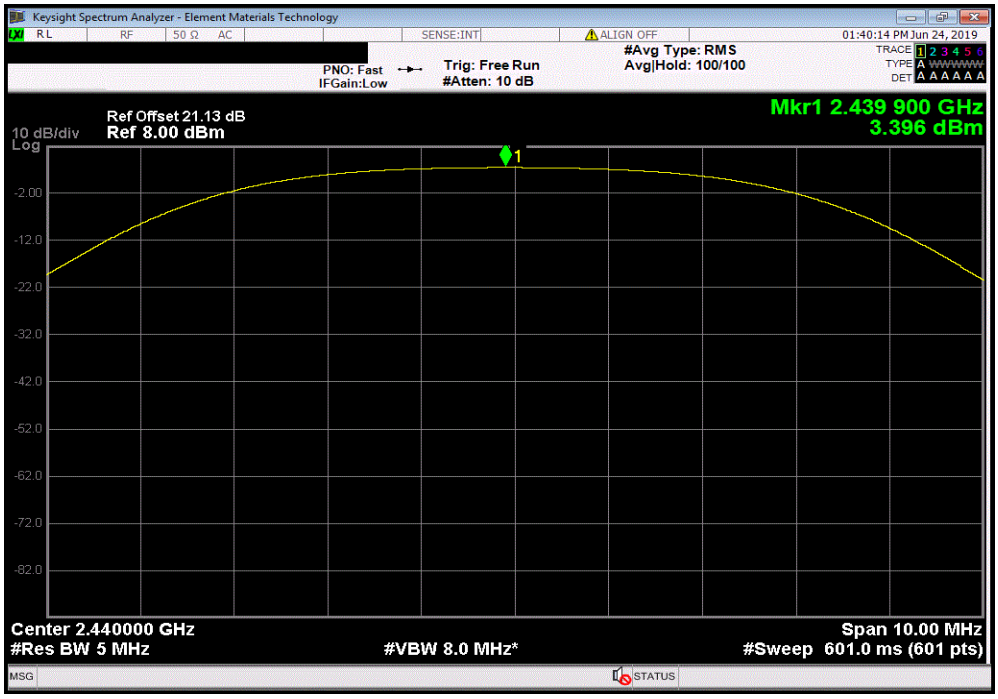
element

TbtTx 2018.09.13 XMit 2019.05.15

Low Channel, 2405 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
3.197	0	3.2	5.44	8.6	36	Pass



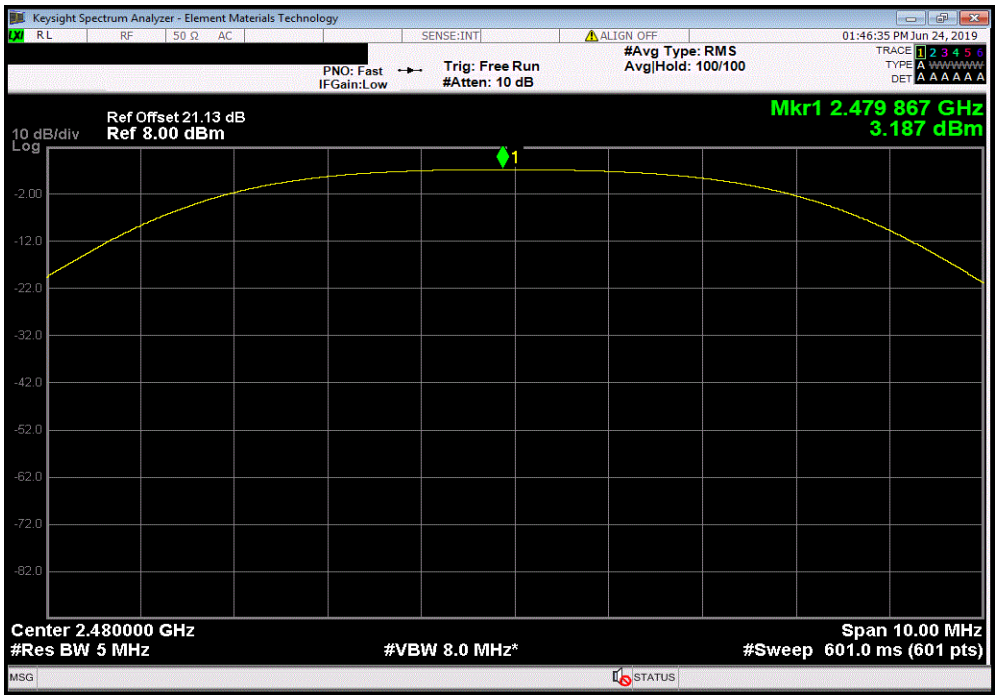
Mid Channel, 2440 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
3.396	0	3.4	5.44	8.8	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2018.09.13 XMit 2019.05.15

High Channel, 2480 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
3.187	0	3.2	5.44	8.6	36	Pass



BAND EDGE COMPLIANCE

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

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 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.

An RMS detector was used to match the method called out for Output Power. Because the reference level was taken with an RMS detector, the attenuation requirement is -30 dBc.

BAND EDGE COMPLIANCE

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	Wireless/LBC			Work Order:	GARR0058
Serial Number:	See Configuration			Date:	24-Jun-19
Customer:	Garrett Metal Detectors			Temperature:	22.2 °C
Attendees:	None			Humidity:	54.2% RH
Project:	None			Barometric Pres.:	1017 mbar
Tested by:	Jonathan Kiefer	Power:	110VAC/60Hz	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

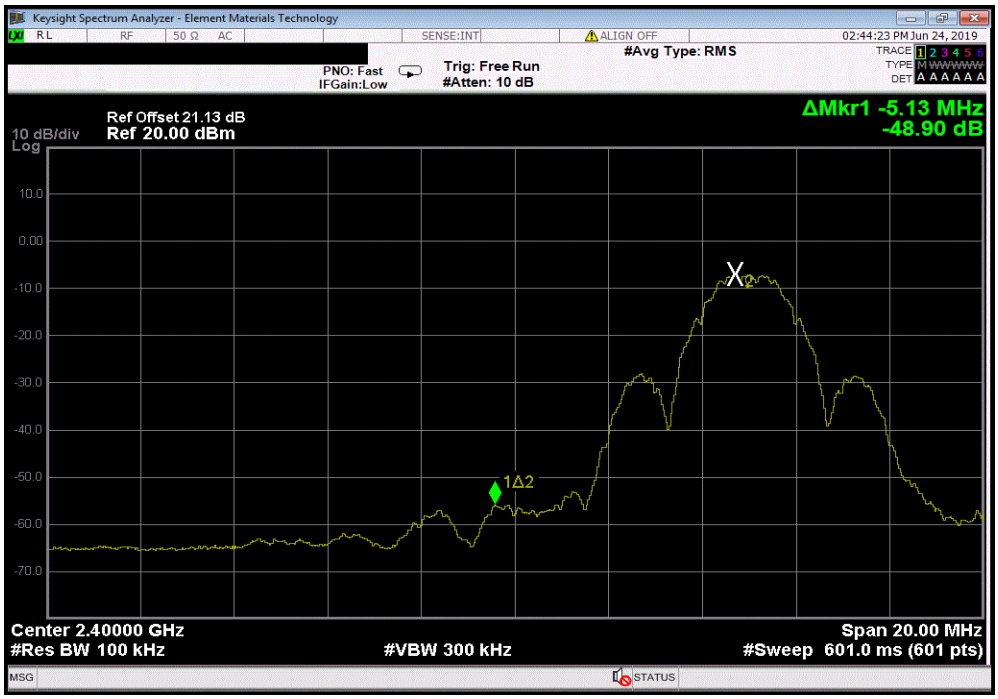
DEVIATIONS FROM TEST STANDARD

None

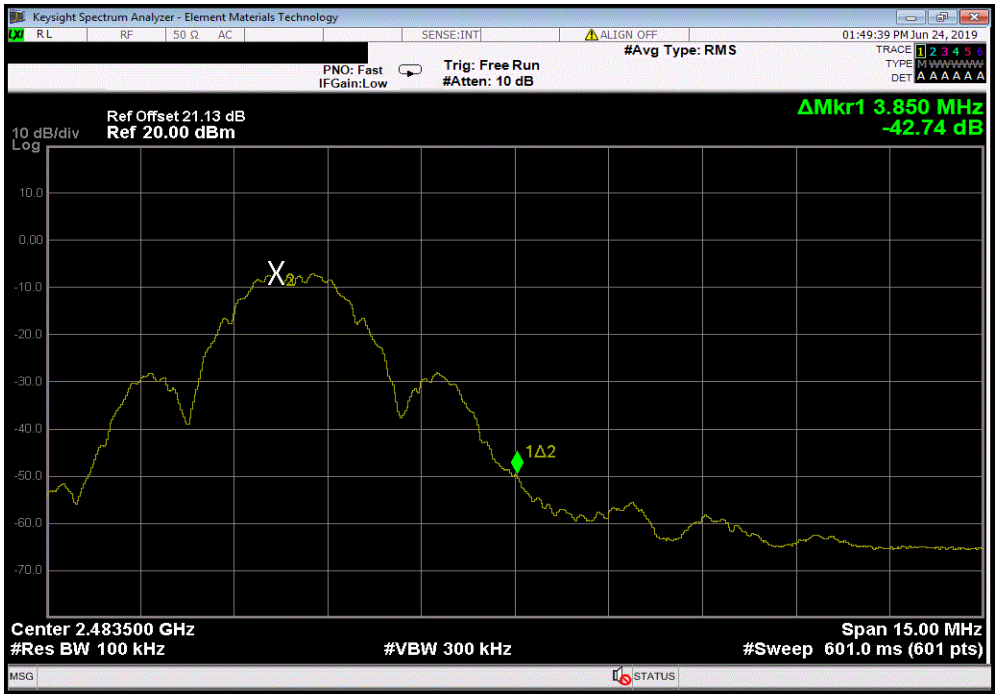
Configuration #	6	Signature Jonathan Kiefer

	Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2405 MHz	-48.9	-30	Pass
High Channel, 2480 MHz	-42.74	-30	Pass

Low Channel, 2405 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-48.9	-30	Pass



High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-42.74	-30	Pass



OCCUPIED BANDWIDTH

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	**Wireless/LBC**			**Work Order:**	**GARR0058**
Serial Number:	**See Configuration**			**Date:**	**24-Jun-19**
Customer:	**Garrett Metal Detectors**			**Temperature:**	**22.2 °C**
Attendees:	**None**			**Humidity:**	**54.2% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

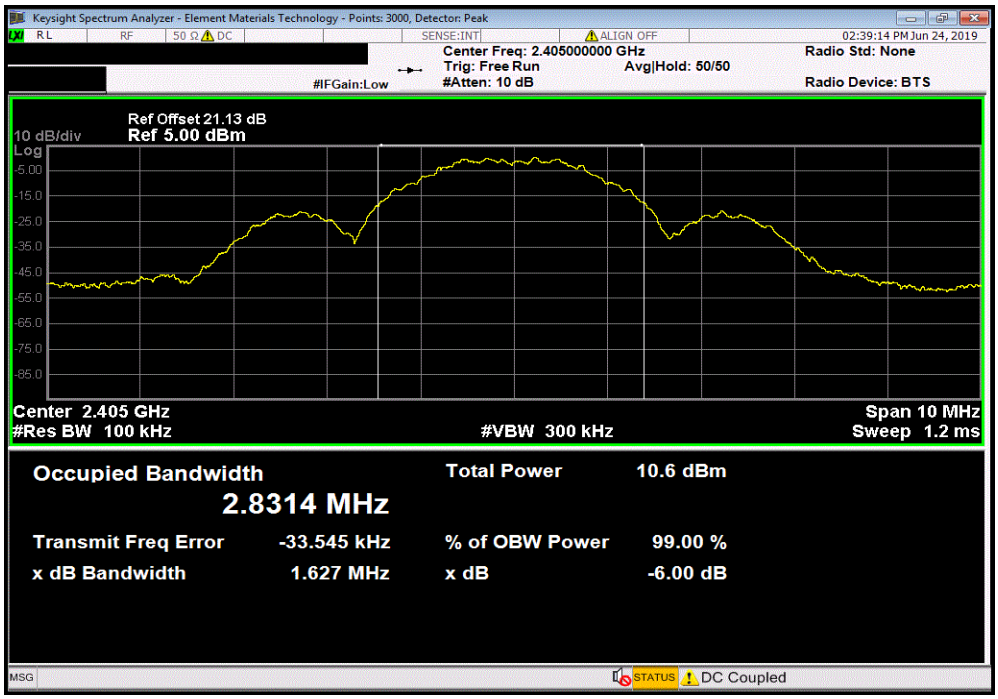
DEVIATIONS FROM TEST STANDARD

None

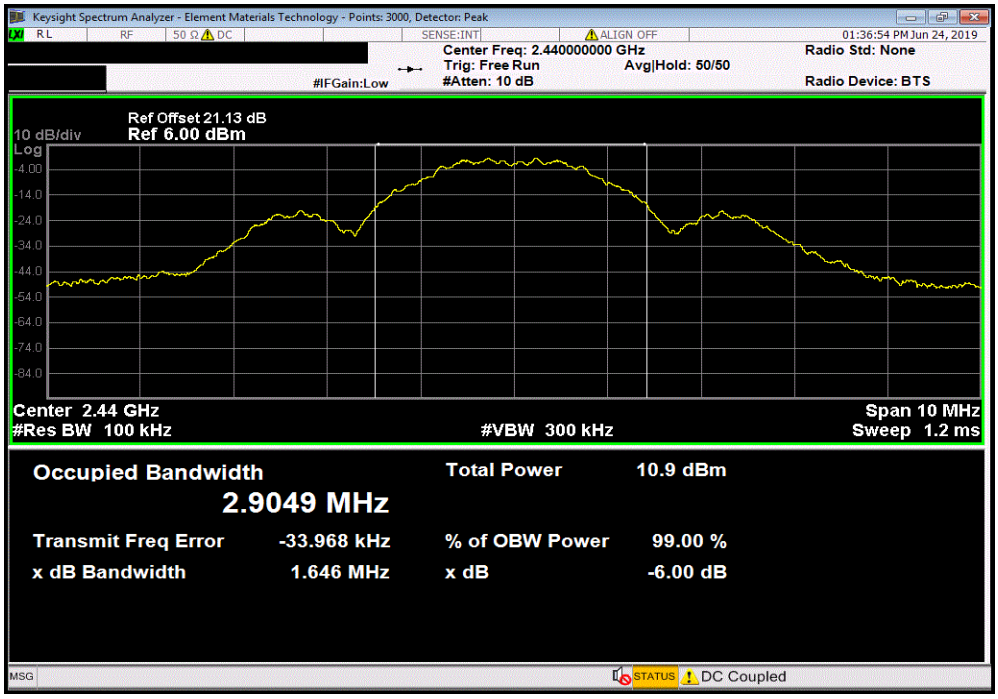
Configuration #	**6**	*Signature* Jonathan Kiefer

	Value	**Limit (>)**	**Result**
Low Channel, 2405 MHz	1.627 MHz	500 kHz	Pass
Mid Channel, 2440 MHz	1.646 MHz	500 kHz	Pass
High Channel, 2480 MHz	1.626 MHz	500 kHz	Pass

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

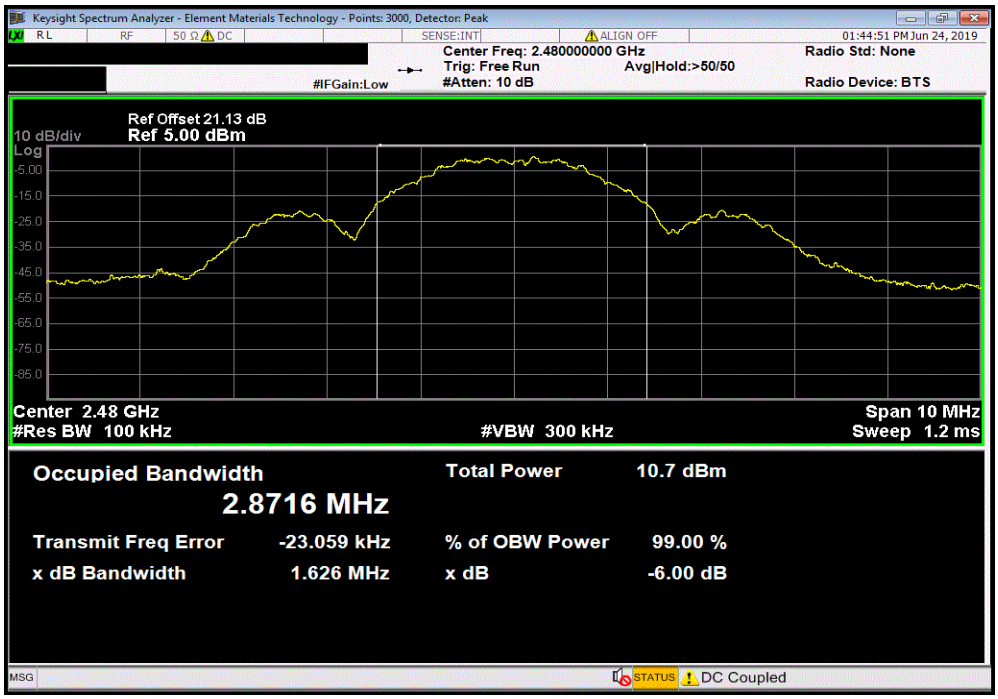


Mid Channel, 2440 MHz						
				Value	Limit (>)	Result
				1.646 MHz	500 kHz	Pass



OCCUPIED BANDWIDTH

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



SPURIOUS CONDUCTED EMISSIONS

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

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

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	**Wireless/LBC**			**Work Order:**	**GARR0058**
Serial Number:	**See Configuration**			**Date:**	**24-Jun-19**
Customer:	**Garrett Metal Detectors**			**Temperature:**	**22.2 °C**
Attendees:	**None**			**Humidity:**	**54.2% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

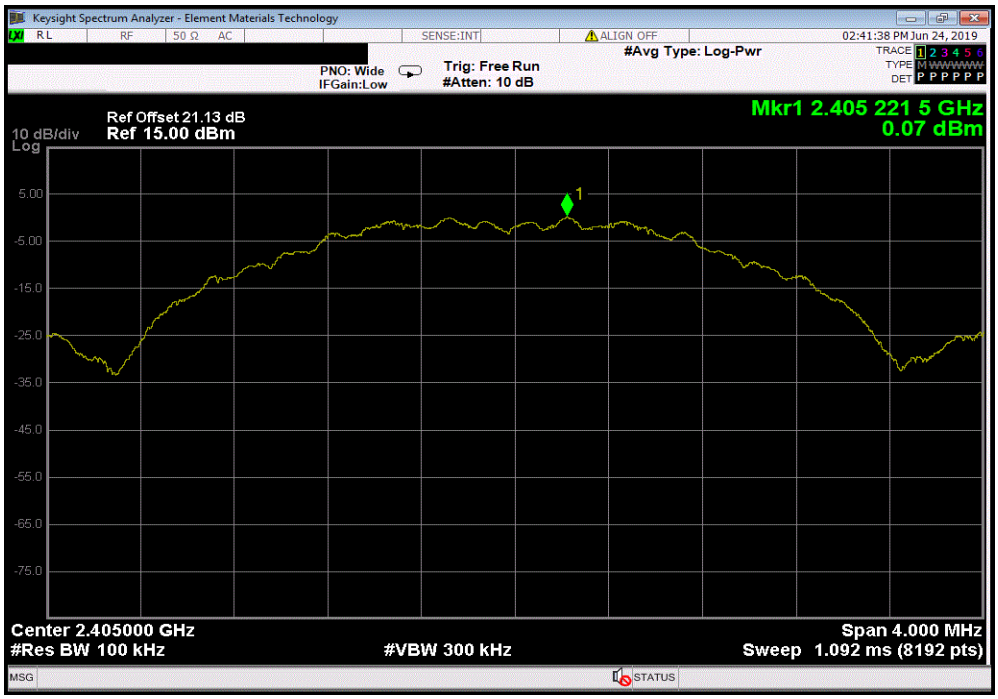
DEVIATIONS FROM TEST STANDARD

None

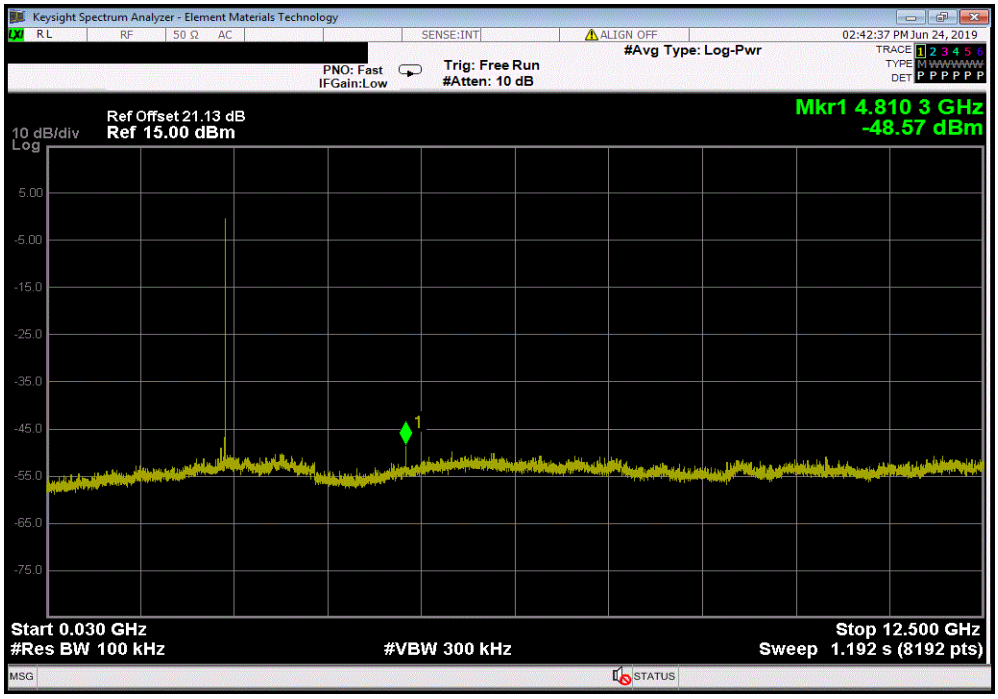
Configuration #	**6**	*Signature* Jonathan Kiefer

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2405 MHz	Fundamental	2405.22	N/A	N/A	N/A
Low Channel, 2405 MHz	30 MHz - 12.5 GHz	4810.34	-48.64	-30	Pass
Low Channel, 2405 MHz	12.5 GHz - 25 GHz	24998.47	-39.31	-30	Pass
Mid Channel, 2440 MHz	Fundamental	2439.71	N/A	N/A	N/A
Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	4880.37	-48.23	-30	Pass
Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	24946.59	-39.89	-30	Pass
High Channel, 2480 MHz	Fundamental	2480.2	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	4961.06	-47.32	-30	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	24870.28	-39.46	-30	Pass

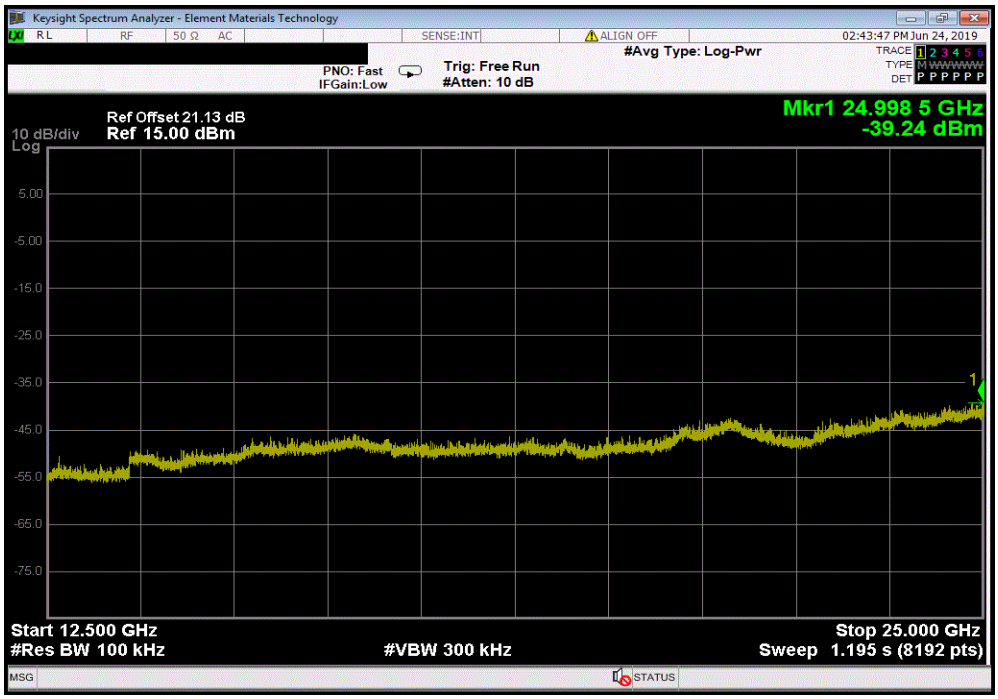
Low Channel, 2405 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2405.22	N/A	N/A	N/A



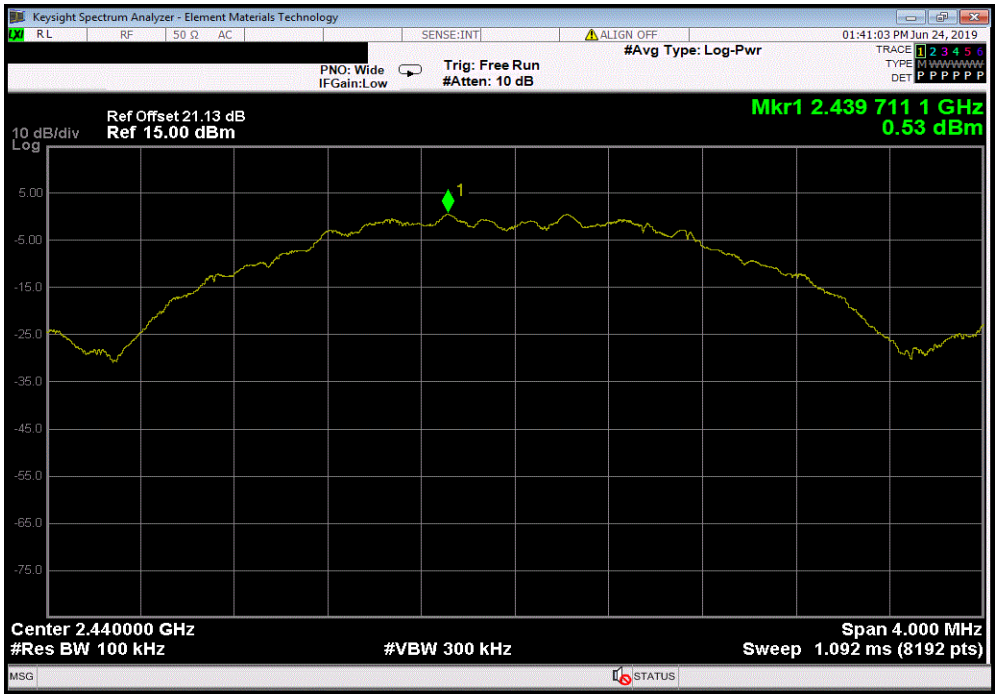
Low Channel, 2405 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4810.34	-48.64	-30	Pass



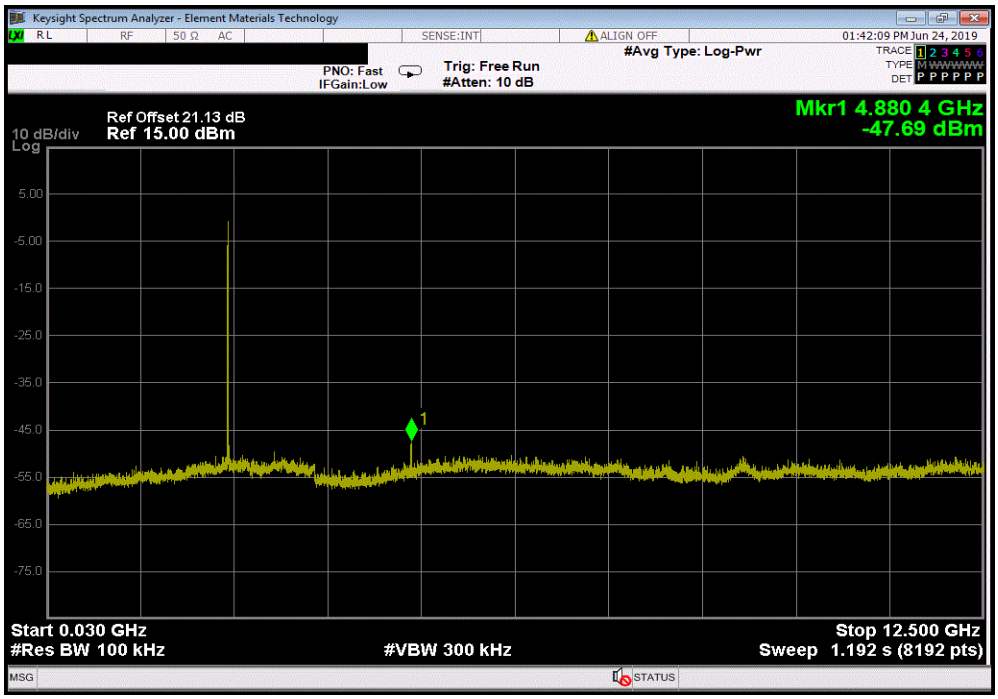
Low Channel, 2405 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24998.47	-39.31	-30	Pass



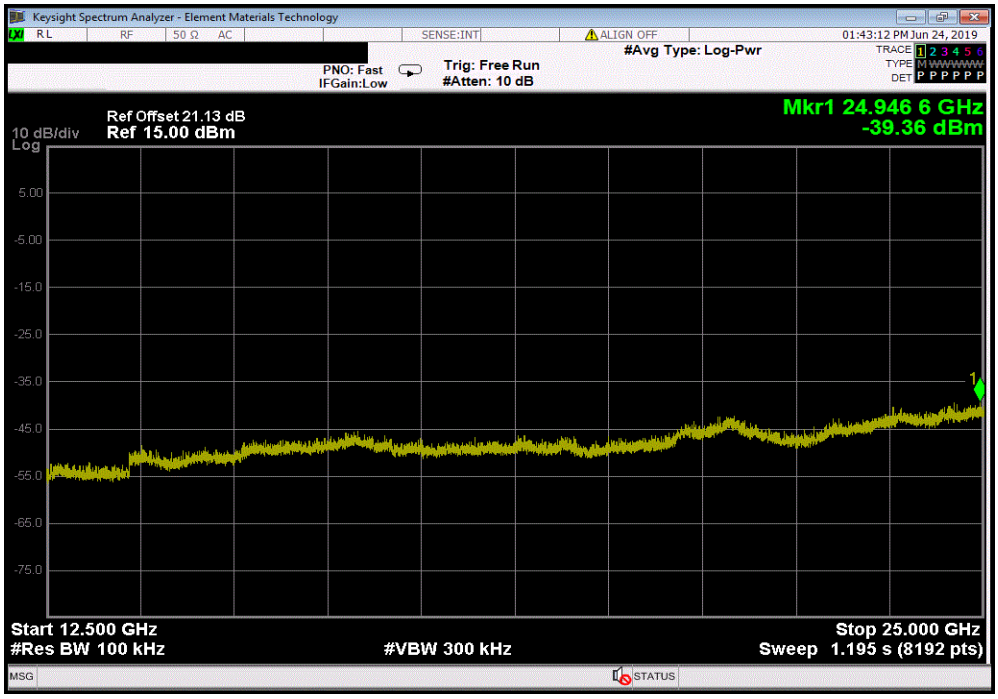
Mid Channel, 2440 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2439.71	N/A	N/A	N/A



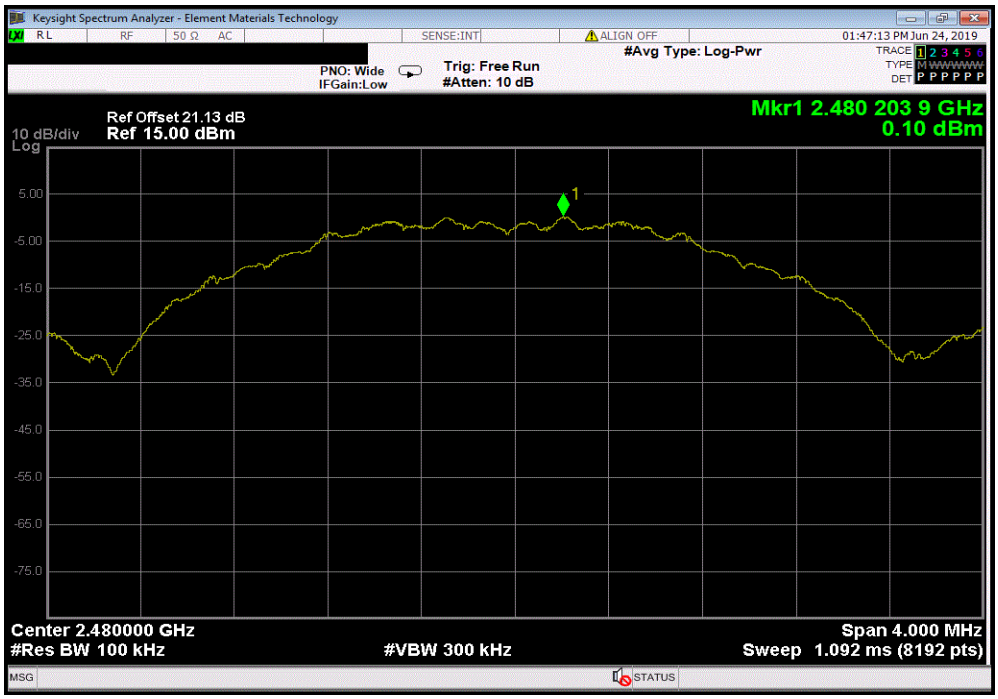
Mid Channel, 2440 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4880.37	-48.23	-30	Pass



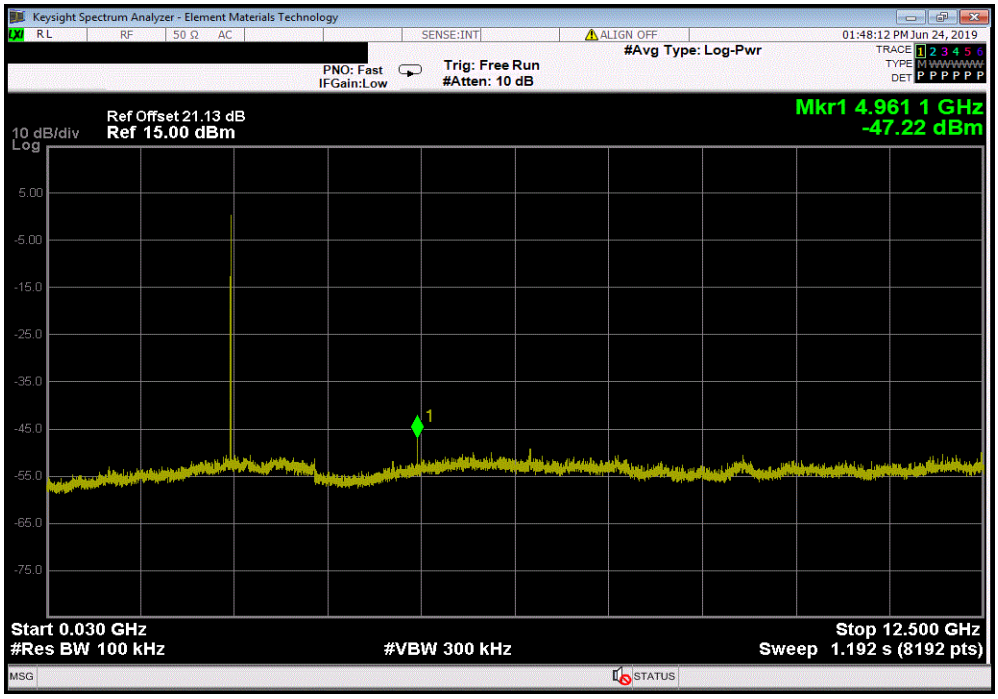
Mid Channel, 2440 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24946.59	-39.89	-30	Pass



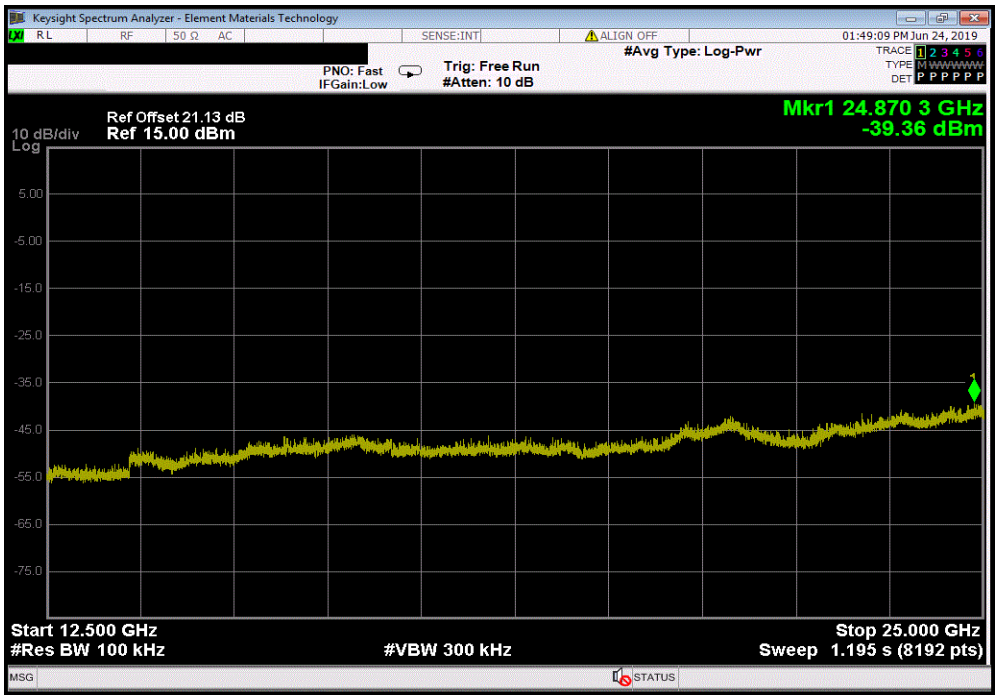
High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.2	N/A	N/A	N/A



High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4961.06	-47.32	-30	Pass



High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24870.28	-39.46	-30	Pass



POWER SPECTRAL DENSITY

XMit 2019.05.15

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	TYE	10-Oct-18	10-Oct-19
Block - DC	Fairview Microwave	SD3379	AMT	10-Oct-18	10-Oct-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	10-Oct-18	10-Oct-19
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

The method AVGPSD-1 in section 11.10.3 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the full power of the burst. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY

TbtTx 2018.09.13 XMit 2019.05.15

EUT:	**Wireless/LBC**			**Work Order:**	**GARR0058**
Serial Number:	**See Configuration**			**Date:**	**24-Jun-19**
Customer:	**Garrett Metal Detectors**			**Temperature:**	**22.2 °C**
Attendees:	**None**			**Humidity:**	**54.2% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference Offset 21.13 dB (20 dB attenuator + dc block + cable). EUT antenna gain is 5.44 dBi.

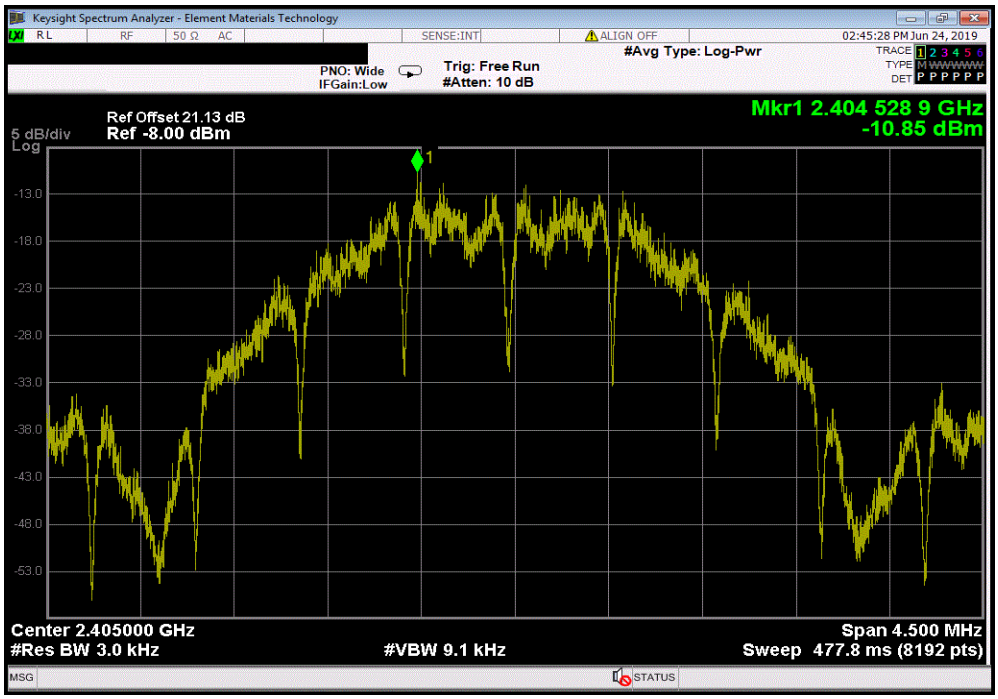
DEVIATIONS FROM TEST STANDARD

None

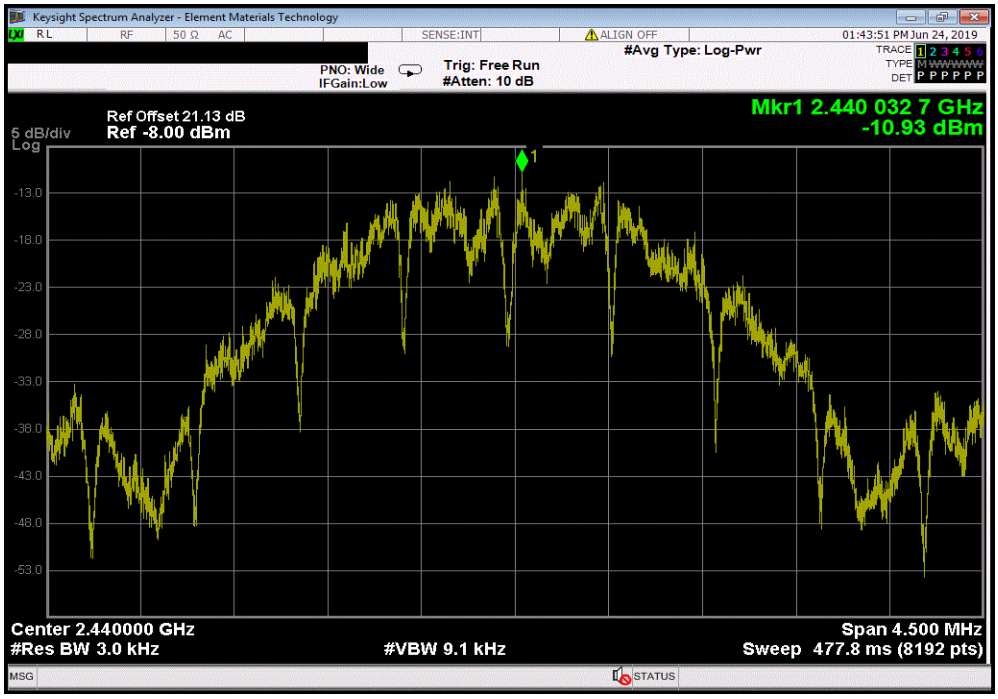
Configuration #	**6**	*Signature* Jonathan Kiefer

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
Low Channel, 2405 MHz	-10.846	8	Pass
Mid Channel, 2440 MHz	-10.929	8	Pass
High Channel, 2480 MHz	-11.957	8	Pass

Low Channel, 2405 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.846	8	Pass



Mid Channel, 2440 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.929	8	Pass



High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.957	8	Pass