NORTHWEST EMC

Medamonitor

LEVL Device

FCC 15.207:2016

FCC 15.247:2016

Bluetooth Low Energy Radio

Report # LGPD0209.2

NVLAP TESTING

NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: August 11, 2016
Medamonitor
Model: LEVL Device

Radio Equipment Testing

Standards

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

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC 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	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

NORTHWEST EMC
REV 2016.7.25

United States

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

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

European Commission – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

NORTHWEST EMC
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.

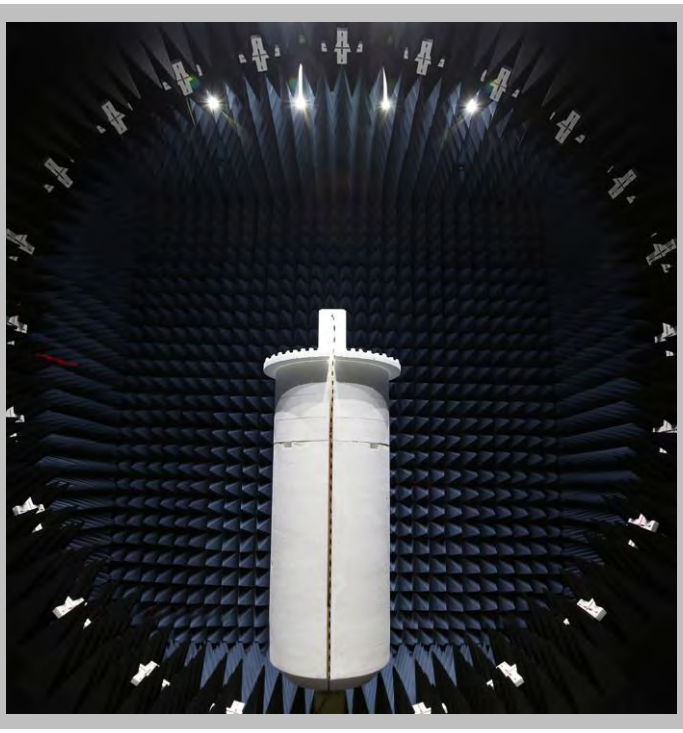
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

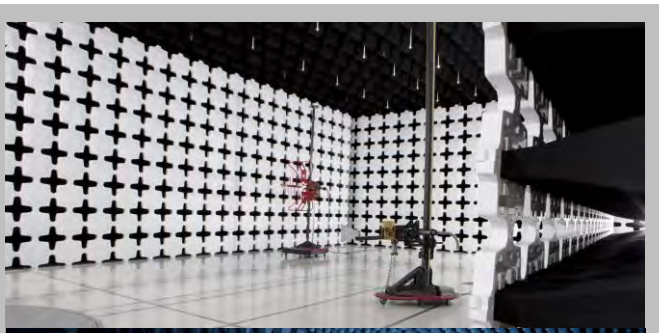
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

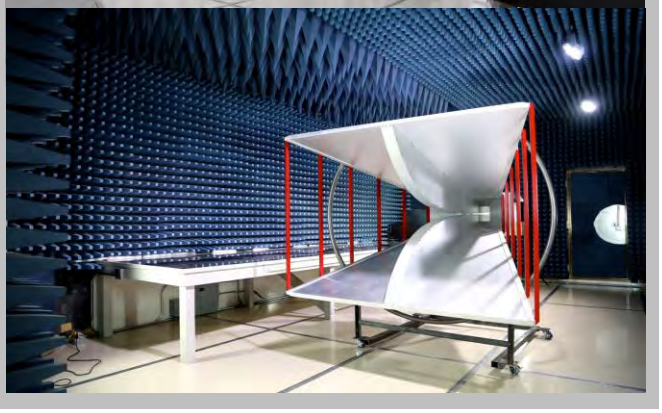
FACILITIES

NORTHWEST EMC
REV 2016.7.25

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







PRODUCT DESCRIPTION

NORTHWEST EMC
2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Medamonitor
Address:	2040 15th Avenue West
City, State, Zip:	Seattle, WA 98119
Test Requested By:	Jarrod Eliason from Logic PD, Inc.
Model:	LEVL Device
First Date of Test:	August 8, 2016
Last Date of Test:	August 11, 2016
Receipt Date of Samples:	August 8, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
This product is a Class 1 510K Exempt Medical device for home healthcare. It will initially be US only. The product communicates to iOS devices over a BLE interface. The BLE is implemented using the nRF8001 IC plus a custom PCB antenna.

Testing Objective:
To demonstrate compliance of the system with a Bluetooth low energy radio to FCC 15.247 requirements.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration LGPD0199- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LEVL Device	Logic PD, Inc.	2151-1028391	3116M00003

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Power Cable	No	1.9m	No	LEVL Device	AC Mains

Configuration LGPD0199- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LEVL Device	Logic PD, Inc.	2151-1028391	3116M00003

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
iPhone 4s	Apple	A1387	DNQHR255DT9V

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Power Cable	No	1.9m	No	LEVL Device	AC Mains

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	8/8/2016	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	8/10/2016	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.
3	8/10/2016	Output Power - Radiated	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	8/11/2016	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	8/11/2016	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	8/11/2016	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	8/11/2016	Duty Cycle	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	8/11/2016	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

AC POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

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
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/21/2016	3/21/2017
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	1/29/2016	1/29/2017
Receiver	Rohde & Schwarz	ESR7	ARI	6/14/2016	6/14/2017

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

LGPD0199-3

MODES INVESTIGATED

EMC test loop, BT_test mode. nRFgo studio used to place nRF8001 into direct test mode.

AC POWERLINE CONDUCTED EMISSIONS

EUT:	LEVL Device	Work Order:	LGPD0199
Serial Number:	3116M00003	Date:	08/08/2016
Customer:	Medamonitor	Temperature:	23.5°C
Attendees:	Jarrod Eliason	Relative Humidity:	54.1%
Customer Project:	LEVL Beta	Bar. Pressure:	1019 mb
Tested By:	Cole Ghizzone, Kyle McMullan	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0199-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Constant carrier on channel 19. Cover on bottom removed for test point access. Transmission confirmed with near field probe.

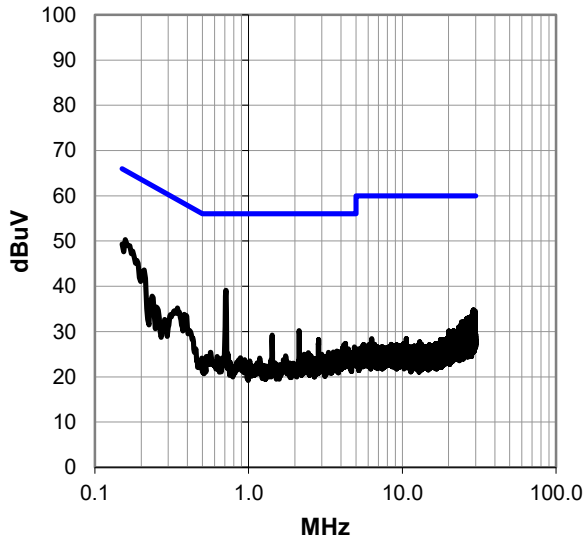
EUT OPERATING MODES

EMC test loop, BT_test mode. nRFgo studio used to place nRF8001 into direct test mode.

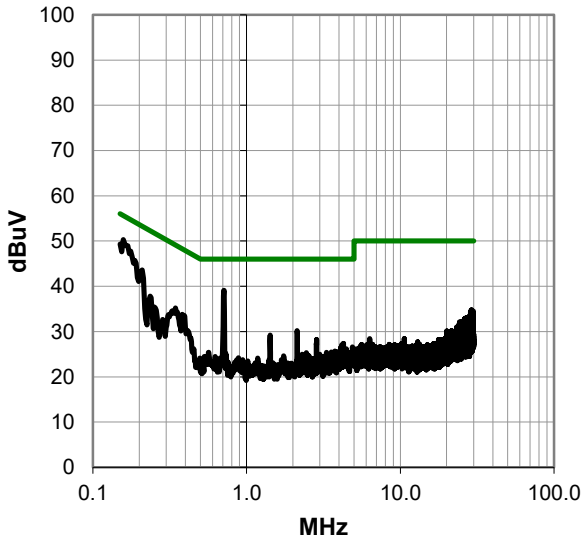
DEVIATIONS FROM TEST STANDARD

None.

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

RESULTS - Run #3

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	29.9	20.4	50.3	65.6	-15.3
0.710	19.0	20.1	39.1	56.0	-16.9
0.344	15.0	20.2	35.2	59.1	-23.9
0.236	17.5	20.3	37.8	62.2	-24.4
0.381	13.6	20.2	33.8	58.3	-24.5
29.015	12.3	22.5	34.8	60.0	-25.2
28.702	12.2	22.4	34.6	60.0	-25.4
29.821	11.9	22.6	34.5	60.0	-25.5
2.135	10.0	20.2	30.2	56.0	-25.8
29.120	11.4	22.5	33.9	60.0	-26.1
29.217	11.4	22.5	33.9	60.0	-26.1
29.929	11.3	22.6	33.9	60.0	-26.1
28.597	11.4	22.4	33.8	60.0	-26.2
28.500	11.3	22.4	33.7	60.0	-26.3
29.623	11.1	22.6	33.7	60.0	-26.3
29.720	11.1	22.6	33.7	60.0	-26.3
0.251	15.2	20.2	35.4	61.7	-26.3
29.522	11.0	22.5	33.5	60.0	-26.5
28.295	11.0	22.4	33.4	60.0	-26.6
28.097	10.8	22.4	33.2	60.0	-26.8
1.422	9.1	20.1	29.2	56.0	-26.8
27.176	10.9	22.2	33.1	60.0	-26.9
28.191	10.7	22.4	33.1	60.0	-26.9
28.399	10.7	22.4	33.1	60.0	-26.9
29.418	10.6	22.5	33.1	60.0	-26.9
26.765	10.8	22.2	33.0	60.0	-27.0

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	29.9	20.4	50.3	55.6	-5.3
0.710	19.0	20.1	39.1	46.0	-6.9
0.344	15.0	20.2	35.2	49.1	-13.9
0.236	17.5	20.3	37.8	52.2	-14.4
0.381	13.6	20.2	33.8	48.3	-14.5
29.015	12.3	22.5	34.8	50.0	-15.2
28.702	12.2	22.4	34.6	50.0	-15.4
29.821	11.9	22.6	34.5	50.0	-15.5
2.135	10.0	20.2	30.2	46.0	-15.8
29.120	11.4	22.5	33.9	50.0	-16.1
29.217	11.4	22.5	33.9	50.0	-16.1
29.929	11.3	22.6	33.9	50.0	-16.1
28.597	11.4	22.4	33.8	50.0	-16.2
28.500	11.3	22.4	33.7	50.0	-16.3
29.623	11.1	22.6	33.7	50.0	-16.3
29.720	11.1	22.6	33.7	50.0	-16.3
0.251	15.2	20.2	35.4	51.7	-16.3
29.522	11.0	22.5	33.5	50.0	-16.5
28.295	11.0	22.4	33.4	50.0	-16.6
28.097	10.8	22.4	33.2	50.0	-16.8
1.422	9.1	20.1	29.2	46.0	-16.8
27.176	10.9	22.2	33.1	50.0	-16.9
28.191	10.7	22.4	33.1	50.0	-16.9
28.399	10.7	22.4	33.1	50.0	-16.9
29.418	10.6	22.5	33.1	50.0	-16.9
26.765	10.8	22.2	33.0	50.0	-17.0

CONCLUSION

Pass

Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	LEVL Device	Work Order:	LGPD0199
Serial Number:	3116M00003	Date:	08/08/2016
Customer:	Medamonitor	Temperature:	23.5°C
Attendees:	Jarrod Eliason	Relative Humidity:	54.1%
Customer Project:	LEVL Beta	Bar. Pressure:	1019 mb
Tested By:	Cole Ghizzone, Kyle McMullan	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0199-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Constant carrier on channel 19. Cover on bottom removed for test point access. Transmission confirmed with near field probe.

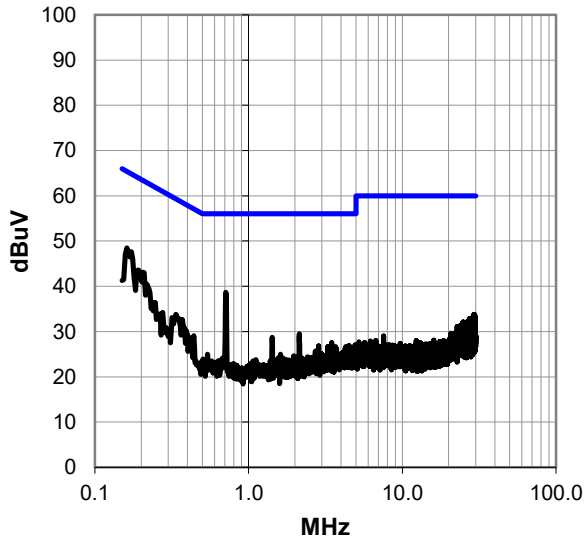
EUT OPERATING MODES

EMC test loop, BT_test mode. nRFgo studio used to place nRF8001 into direct test mode.

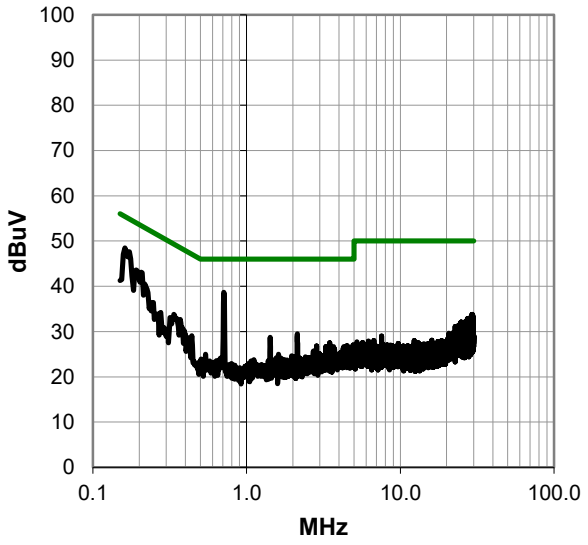
DEVIATIONS FROM TEST STANDARD

None.

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.161	28.1	20.4	48.5	65.4	-16.9
0.710	18.6	20.1	38.7	56.0	-17.3
0.191	23.3	20.3	43.6	64.0	-20.4
0.337	13.6	20.2	33.8	59.3	-25.5
0.370	12.5	20.2	32.7	58.5	-25.8
29.534	11.3	22.5	33.8	60.0	-26.2
29.217	11.2	22.5	33.7	60.0	-26.3
29.623	11.0	22.6	33.6	60.0	-26.4
2.139	9.3	20.2	29.5	56.0	-26.5
28.918	10.9	22.5	33.4	60.0	-26.6
0.277	14.0	20.2	34.2	60.9	-26.7
29.836	10.4	22.6	33.0	60.0	-27.0
27.377	10.7	22.2	32.9	60.0	-27.1
29.019	10.4	22.5	32.9	60.0	-27.1
28.198	10.4	22.4	32.8	60.0	-27.2
27.791	10.4	22.3	32.7	60.0	-27.3
1.426	8.6	20.1	28.7	56.0	-27.3
29.944	10.0	22.6	32.6	60.0	-27.4
28.605	10.1	22.4	32.5	60.0	-27.5
26.874	10.2	22.2	32.4	60.0	-27.6
27.180	10.2	22.2	32.4	60.0	-27.6
27.280	10.2	22.2	32.4	60.0	-27.6
28.705	10.0	22.4	32.4	60.0	-27.6
28.407	9.9	22.4	32.3	60.0	-27.7
29.325	9.8	22.5	32.3	60.0	-27.7
29.731	9.7	22.6	32.3	60.0	-27.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.161	28.1	20.4	48.5	55.4	-6.9
0.710	18.6	20.1	38.7	46.0	-7.3
0.191	23.3	20.3	43.6	54.0	-10.4
0.337	13.6	20.2	33.8	49.3	-15.5
0.370	12.5	20.2	32.7	48.5	-15.8
29.534	11.3	22.5	33.8	50.0	-16.2
29.217	11.2	22.5	33.7	50.0	-16.3
29.623	11.0	22.6	33.6	50.0	-16.4
2.139	9.3	20.2	29.5	46.0	-16.5
28.918	10.9	22.5	33.4	50.0	-16.6
0.277	14.0	20.2	34.2	50.9	-16.7
29.836	10.4	22.6	33.0	50.0	-17.0
27.377	10.7	22.2	32.9	50.0	-17.1
29.019	10.4	22.5	32.9	50.0	-17.1
28.198	10.4	22.4	32.8	50.0	-17.2
27.791	10.4	22.3	32.7	50.0	-17.3
1.426	8.6	20.1	28.7	46.0	-17.3
29.944	10.0	22.6	32.6	50.0	-17.4
28.605	10.1	22.4	32.5	50.0	-17.5
26.874	10.2	22.2	32.4	50.0	-17.6
27.180	10.2	22.2	32.4	50.0	-17.6
27.280	10.2	22.2	32.4	50.0	-17.6
28.705	10.0	22.4	32.4	50.0	-17.6
28.407	9.9	22.4	32.3	50.0	-17.7
29.325	9.8	22.5	32.3	50.0	-17.7
29.731	9.7	22.6	32.3	50.0	-17.7

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2016.04.26.1

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

MODES OF OPERATION

Transmitting Bluetooth low energy at low, mid and high channel at 2402, 2440, and 2480 MHz. EMC test loop running.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0199 - 1

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
Attenuator	Fairview Microwave	SA18E-20	TWZ	10/21/2015	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	10/21/2015	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	LFN	10/21/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	9/18/2015	12 mo
Cable	Northwest EMC	18-26GHz Standard Gain Horn Cable	MNP	9/18/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/10/2015	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/29/2016	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIB	8/12/2014	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

SPURIOUS RADIATED EMISSIONS

NORTHWEST EMC

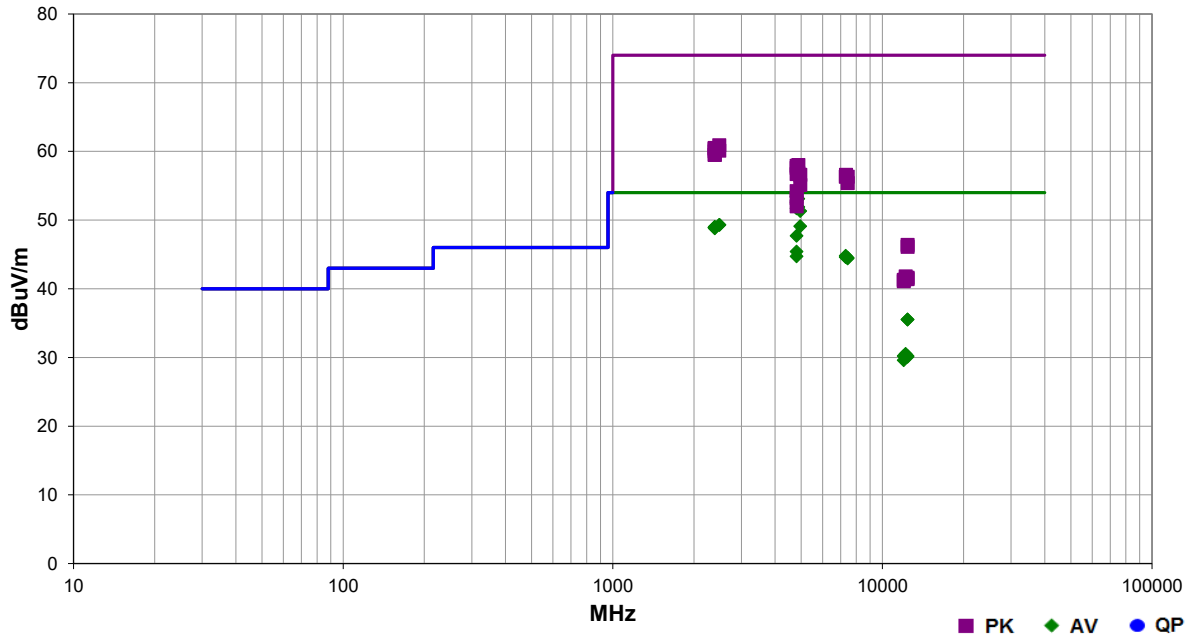
PSA-ESCI 2016.04.26.1

EmiR5 2016.04.26.1

Work Order:	LGPD0199	**Date:**	08/10/16	Trevor Buls	
Project:	LEVL Beta	**Temperature:**	23.5 °C		
Job Site:	MN05	**Humidity:**	61.6% RH		
Serial Number:	3116M00003	**Barometric Pres.:**	1020 mbar	**Tested by:**	Trevor Buls, Kyle McMullan
EUT:	LEVL Device				
Configuration:	1				
Customer:	Medamonitor				
Attendees:	Jarrod Eliason				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth low energy at low, mid and high channel at 2402, 2440, and 2480 MHz. EMC test loop running.				
Deviations:	None.				
Comments:	Cover on bottom removed for test point access. Running firmware version 0.16.				

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

Run #	12	**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
4803.920	48.5	4.9	1.0	300.9	3.0	0.0	Horz	AV	0.0	53.4	54.0	-0.6	Low Ch, EUT Horz
4879.975	47.9	5.2	1.0	297.0	3.0	0.0	Horz	AV	0.0	53.1	54.0	-0.9	Mid Ch, EUT Horz
4803.955	47.7	4.9	2.5	268.9	3.0	0.0	Horz	AV	0.0	52.6	54.0	-1.4	Low Ch, EUT Vertical
4880.015	46.7	5.2	1.0	268.9	3.0	0.0	Vert	AV	0.0	51.9	54.0	-2.1	Mid Ch, EUT On Side
4803.940	46.8	4.9	1.0	321.0	3.0	0.0	Vert	AV	0.0	51.7	54.0	-2.3	Low Ch, EUT On Side
4959.985	46.0	5.3	1.0	300.9	3.0	0.0	Horz	AV	0.0	51.3	54.0	-2.7	High Ch, EUT Horz
2485.685	32.9	-3.6	1.6	275.0	3.0	20.0	Horz	AV	0.0	49.3	54.0	-4.7	High Ch, EUT Horz
2486.055	32.9	-3.6	1.0	360.0	3.0	20.0	Vert	AV	0.0	49.3	54.0	-4.7	High Ch, EUT Horz
4959.975	43.8	5.3	1.0	315.9	3.0	0.0	Vert	AV	0.0	49.1	54.0	-4.9	High Ch, EUT On Side
2389.940	32.8	-3.8	1.0	220.1	3.0	20.0	Horz	AV	0.0	49.0	54.0	-5.0	Low Ch, EUT Horz
2387.665	32.7	-3.8	1.0	41.1	3.0	20.0	Vert	AV	0.0	48.9	54.0	-5.1	Low Ch, EUT Horz
2389.020	32.7	-3.8	1.0	88.1	3.0	20.0	Horz	AV	0.0	48.9	54.0	-5.1	Low Ch, EUT Vert
2389.860	32.7	-3.8	1.0	246.9	3.0	20.0	Vert	AV	0.0	48.9	54.0	-5.1	Low Ch, EUT Vert
2388.875	32.7	-3.8	1.0	351.0	3.0	20.0	Horz	AV	0.0	48.9	54.0	-5.1	Low Ch, EUT On Side
2389.945	32.6	-3.8	2.4	182.0	3.0	20.0	Vert	AV	0.0	48.8	54.0	-5.2	Low Ch, EUT On Side
4803.900	42.8	4.9	2.6	351.9	3.0	0.0	Horz	AV	0.0	47.7	54.0	-6.3	Low Ch, EUT On Side
4804.000	40.5	4.9	2.4	163.1	3.0	0.0	Vert	AV	0.0	45.4	54.0	-8.6	Low Ch, EUT Vertical
7320.505	31.6	13.2	1.0	290.9	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	Mid 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
4803.930	39.8	4.9	1.0	199.1	3.0	0.0	Vert	AV	0.0	44.7	54.0	-9.3	Low Ch, EUT Horz
7319.850	31.4	13.2	1.0	200.0	3.0	0.0	Vert	AV	0.0	44.6	54.0	-9.4	Mid Ch, EUT On Side
7439.790	31.2	13.3	1.9	271.0	3.0	0.0	Vert	AV	0.0	44.5	54.0	-9.5	High Ch, EUT On Side
7440.400	31.1	13.3	1.2	347.9	3.0	0.0	Horz	AV	0.0	44.4	54.0	-9.6	High Ch, EUT Horz
2484.155	44.5	-3.6	1.0	360.0	3.0	20.0	Vert	PK	0.0	60.9	74.0	-13.1	High Ch, EUT Horz
2388.545	44.3	-3.8	1.0	246.9	3.0	20.0	Vert	PK	0.0	60.5	74.0	-13.5	Low Ch, EUT Vert
2388.770	44.2	-3.8	1.0	220.1	3.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	Low Ch, EUT Horz
2389.980	44.0	-3.8	1.0	88.1	3.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	Low Ch, EUT Vert
2484.150	43.7	-3.6	1.6	275.0	3.0	20.0	Horz	PK	0.0	60.1	74.0	-13.9	High Ch, EUT Horz
2387.330	43.8	-3.8	1.0	41.1	3.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	Low Ch, EUT Horz
2388.590	43.3	-3.8	1.0	351.0	3.0	20.0	Horz	PK	0.0	59.5	74.0	-14.5	Low Ch, EUT On Side
2389.925	43.3	-3.8	2.4	182.0	3.0	20.0	Vert	PK	0.0	59.5	74.0	-14.5	Low Ch, EUT On Side
4879.595	52.8	5.2	1.0	297.0	3.0	0.0	Horz	PK	0.0	58.0	74.0	-16.0	Mid Ch, EUT Horz
4803.600	53.0	4.9	1.0	300.9	3.0	0.0	Horz	PK	0.0	57.9	74.0	-16.1	Low Ch, EUT Horz
4803.490	52.7	4.9	2.5	268.9	3.0	0.0	Horz	PK	0.0	57.6	74.0	-16.4	Low Ch, EUT Vertical
4880.555	51.6	5.2	1.0	268.9	3.0	0.0	Vert	PK	0.0	56.8	74.0	-17.2	Mid Ch, EUT On Side
4804.095	51.8	4.9	1.0	321.0	3.0	0.0	Vert	PK	0.0	56.7	74.0	-17.3	Low Ch, EUT On Side
4960.550	51.3	5.3	1.0	300.9	3.0	0.0	Horz	PK	0.0	56.6	74.0	-17.4	High Ch, EUT Horz
7321.425	43.4	13.2	1.0	290.9	3.0	0.0	Horz	PK	0.0	56.6	74.0	-17.4	Mid Ch, EUT Horz
7439.235	43.0	13.3	1.9	271.0	3.0	0.0	Vert	PK	0.0	56.3	74.0	-17.7	High Ch, EUT On Side
7320.050	43.1	13.2	1.0	200.0	3.0	0.0	Vert	PK	0.0	56.3	74.0	-17.7	Mid Ch, EUT On Side
12400.980	29.3	6.2	1.0	221.1	3.0	0.0	Horz	AV	0.0	35.5	54.0	-18.5	High Ch, EUT Horz
12400.720	29.3	6.2	1.0	18.0	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	High Ch, EUT On Side
7440.265	42.1	13.3	1.2	347.9	3.0	0.0	Horz	PK	0.0	55.4	74.0	-18.6	High Ch, EUT Horz
4959.380	49.8	5.3	1.0	315.9	3.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	High Ch, EUT On Side
4803.765	49.3	4.9	2.6	351.9	3.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	Low Ch, EUT On Side
4803.560	48.3	4.9	2.4	163.1	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	Low Ch, EUT Vertical
4804.075	47.1	4.9	1.0	199.1	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Low Ch, EUT Horz
12198.770	31.0	-0.5	1.0	336.0	3.0	0.0	Horz	AV	0.0	30.5	54.0	-23.5	Mid Ch, EUT Horz
12008.900	31.3	-1.1	1.0	252.0	3.0	0.0	Horz	AV	0.0	30.2	54.0	-23.8	Low Ch, EUT Horz
12399.210	29.5	0.7	1.0	61.0	3.0	0.0	Horz	AV	0.0	30.2	54.0	-23.8	High Ch, EUT Horz
12398.770	29.4	0.7	1.0	80.1	3.0	0.0	Vert	AV	0.0	30.1	54.0	-23.9	High Ch, EUT On Side
12198.610	30.6	-0.5	1.0	360.0	3.0	0.0	Vert	AV	0.0	30.1	54.0	-23.9	Mid Ch, EUT On Side
12008.590	30.7	-1.1	1.0	215.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4	Low Ch, EUT On Side
12400.880	40.2	6.2	1.0	221.1	3.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	High Ch, EUT Horz
12401.140	39.9	6.2	1.0	18.0	3.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	High Ch, EUT On Side
12201.400	42.3	-0.5	1.0	336.0	3.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	Mid Ch, EUT Horz
12399.710	40.9	0.7	1.0	61.0	3.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	High Ch, EUT Horz
12398.710	40.7	0.7	1.0	80.1	3.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	High Ch, EUT On Side
12198.780	41.9	-0.5	1.0	360.0	3.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	Mid Ch, EUT On Side
12008.810	42.4	-1.1	1.0	252.0	3.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Low Ch, EUT Horz
12008.690	42.2	-1.1	1.0	215.0	3.0	0.0	Vert	PK	0.0	41.1	74.0	-32.9	Low Ch, EUT On Side

DUTY CYCLE

NORTHWEST EMC

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12/7/2016
Attenuator	S.M. Electronics	SA26B-20	RFW	2/26/2016	2/26/2017
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	9/18/2016
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/24/2016	3/24/2017

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. 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.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

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.

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 may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

NORTHWEST EMC

XMit 2016.05.06

EUT:	LEVL Device			**Work Order:**	LGPD0199
Serial Number:	3116M00003			**Date:**	08/11/16
Customer:	Medamonitor			**Temperature:**	23.6 °C
Attendees:	Jarrod Eliason			**Humidity:**	57.8% RH
Project:	LEVL Beta			**Barometric Pres.:**	1012 mbar
Tested by:	Trevor Buls, Kyle McMullan	**Power:**	110VAC/60Hz	**Job Site:**	MN08

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

COMMENTS

Cover on bottom removed for test point access. Running firmware 0.16.

DEVIATIONS FROM TEST STANDARD

None

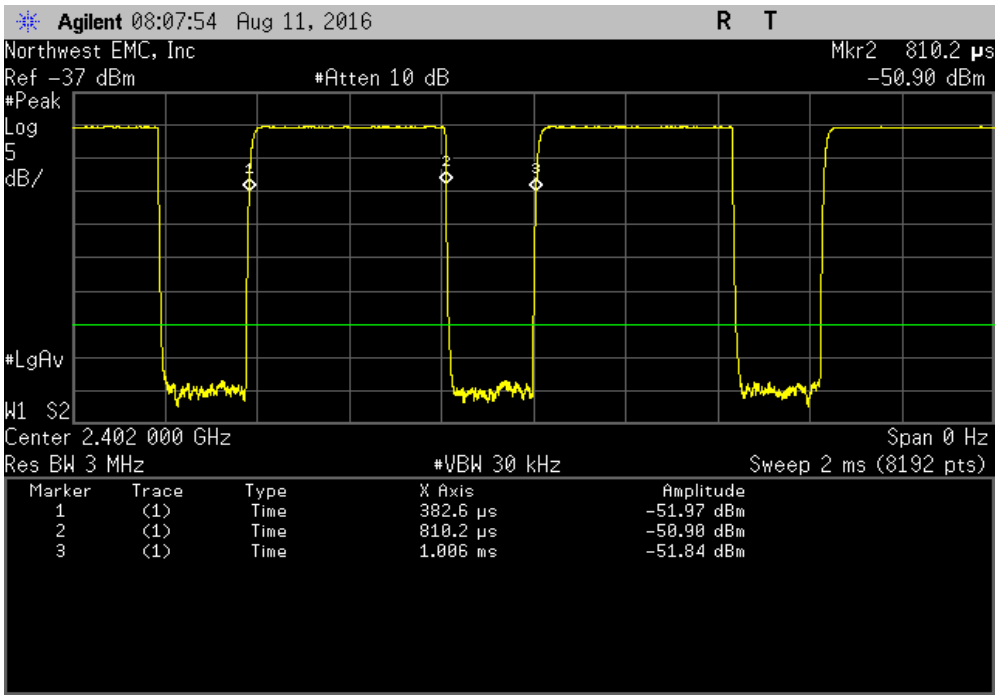
Configuration #	1	*Signature* Trevor Buls

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	427.596 us	623.1 us	1	68.6	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	428.802 us	623.161 us	1	68.8	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	428.994 us	625.795 us	1	68.6	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	6	N/A	N/A	N/A

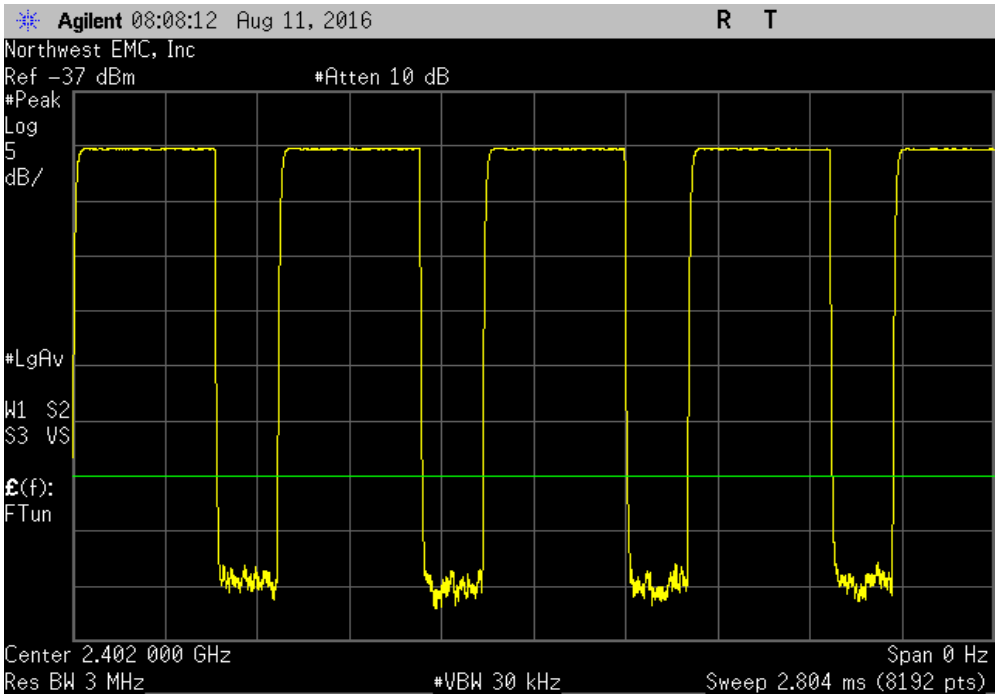
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	427.596 us	623.1 us	1	68.6	N/A	N/A



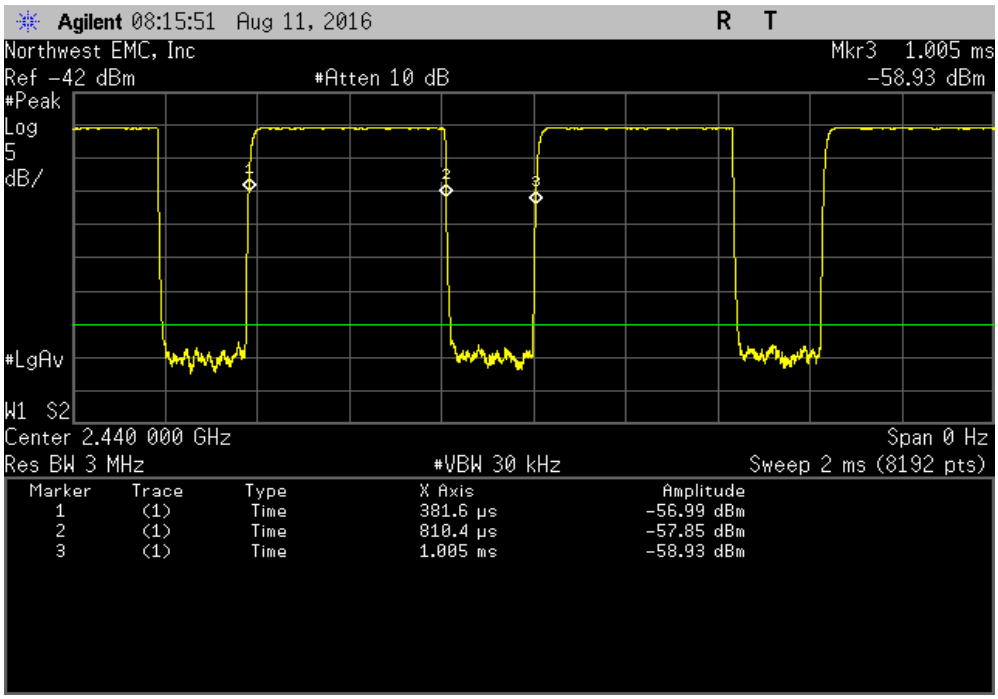
BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



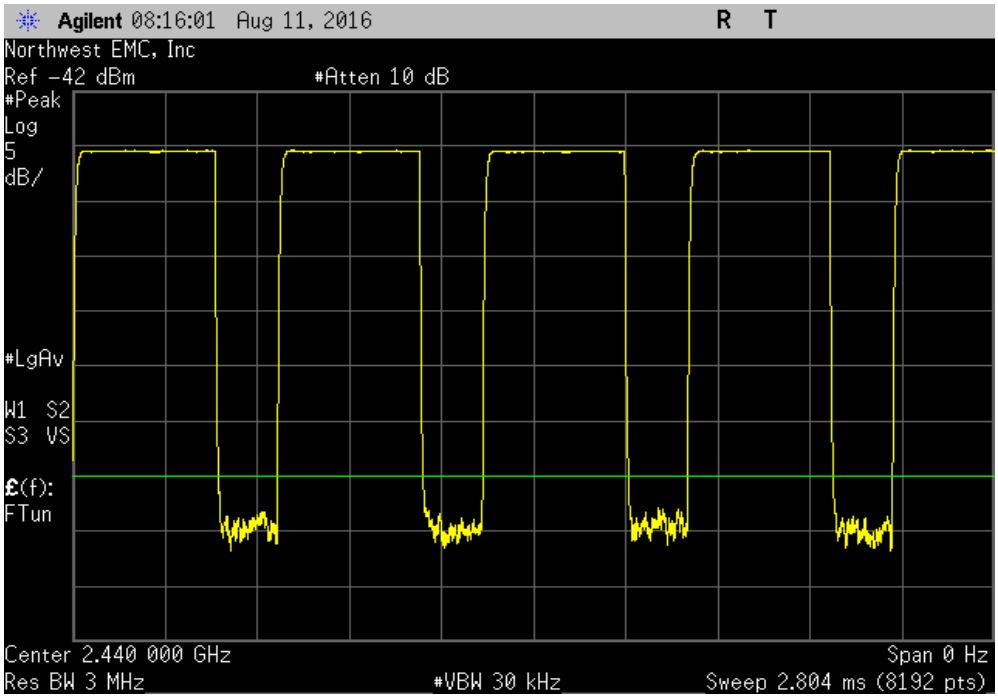
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	428.802 us	623.161 us	1	68.8	N/A	N/A



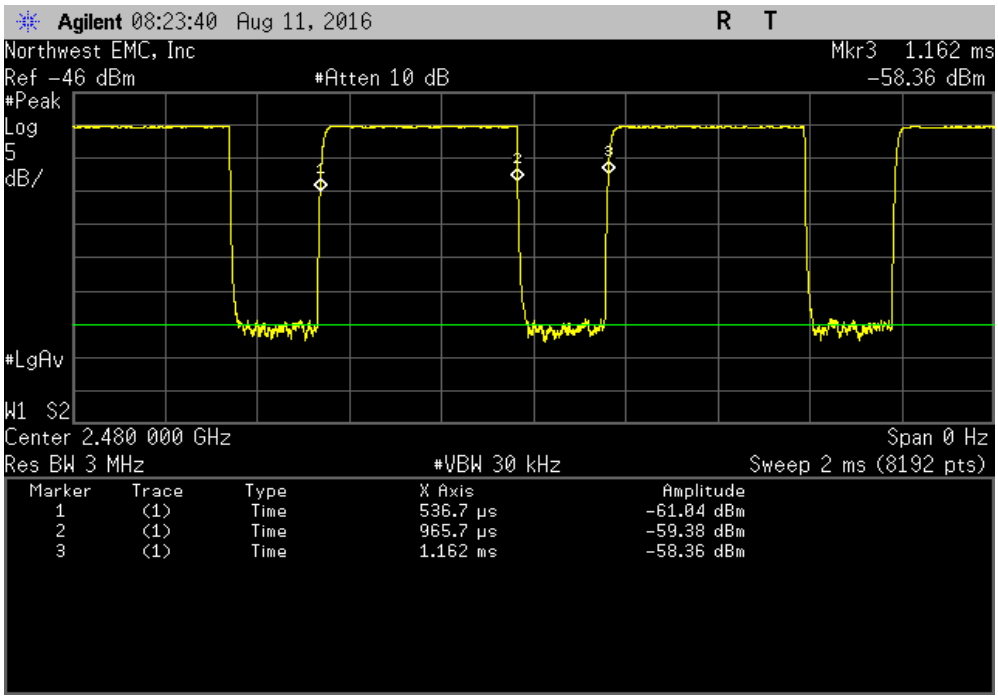
BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



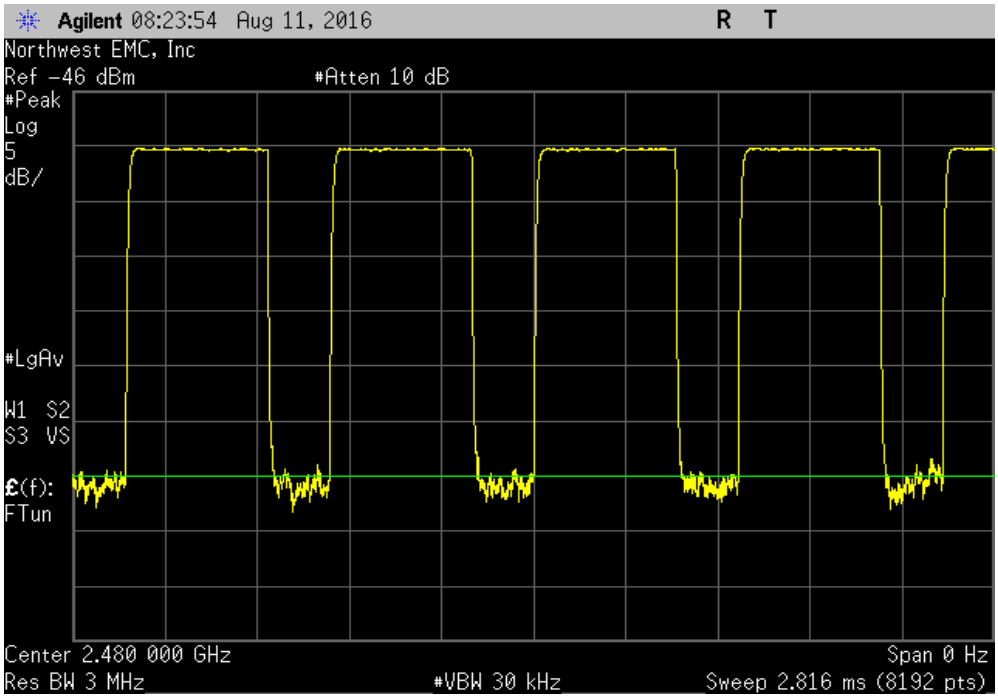
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	428.994 us	625.795 us	1	68.6	N/A	N/A



BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	6	N/A	N/A	N/A



OCCUPIED BANDWIDTH

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12/7/2016
Attenuator	Fairview Microwave	SA18N - 20	RFM	12/23/2015	12/23/2016
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	9/18/2016
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/24/2016	3/24/2017

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

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

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2016.05.06

EUT:	LEVL Device			**Work Order:**	LGPD0199
Serial Number:	3116M00003			**Date:**	08/11/16
Customer:	Medamonitor			**Temperature:**	23.6 °C
Attendees:	Jarrod Eliason			**Humidity:**	57.8% RH
Project:	LEVL Beta			**Barometric Pres.:**	1012 mbar
Tested by:	Trevor Buls, Kyle McMullan	**Power:**	110VAC/60Hz	**Job Site:**	MN08

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

COMMENTS

Cover on bottom removed for test point access. Running firmware 0.16.

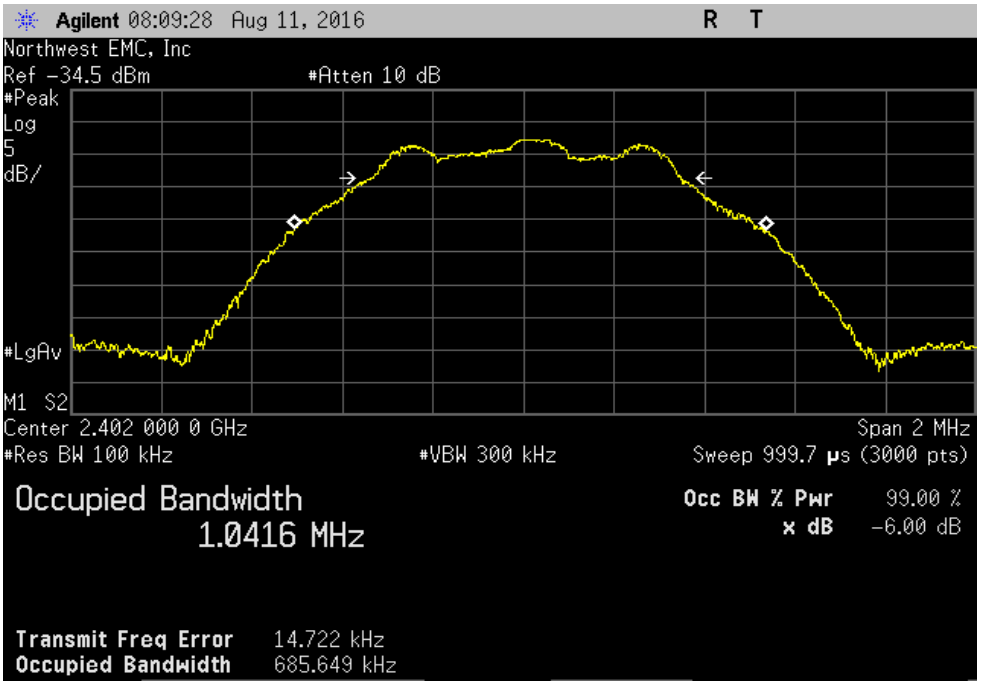
DEVIATIONS FROM TEST STANDARD

None

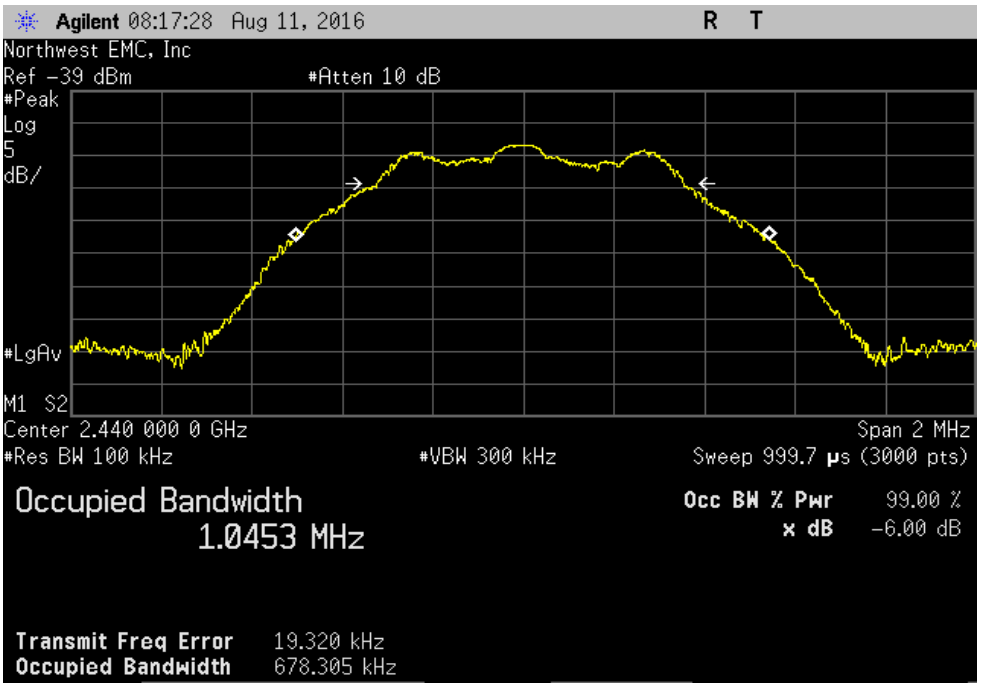
Configuration #	1	Signature	Trevor Buls

	Value	Limit (≥)	Result
BLE/GFSK Low Channel, 2402 MHz	685.649 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2440 MHz	678.305 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	679.822 kHz	500 kHz	Pass

BLE/GFSK Low Channel, 2402 MHz							
					Value	Limit (≥)	Result
					685.649 kHz	500 kHz	Pass



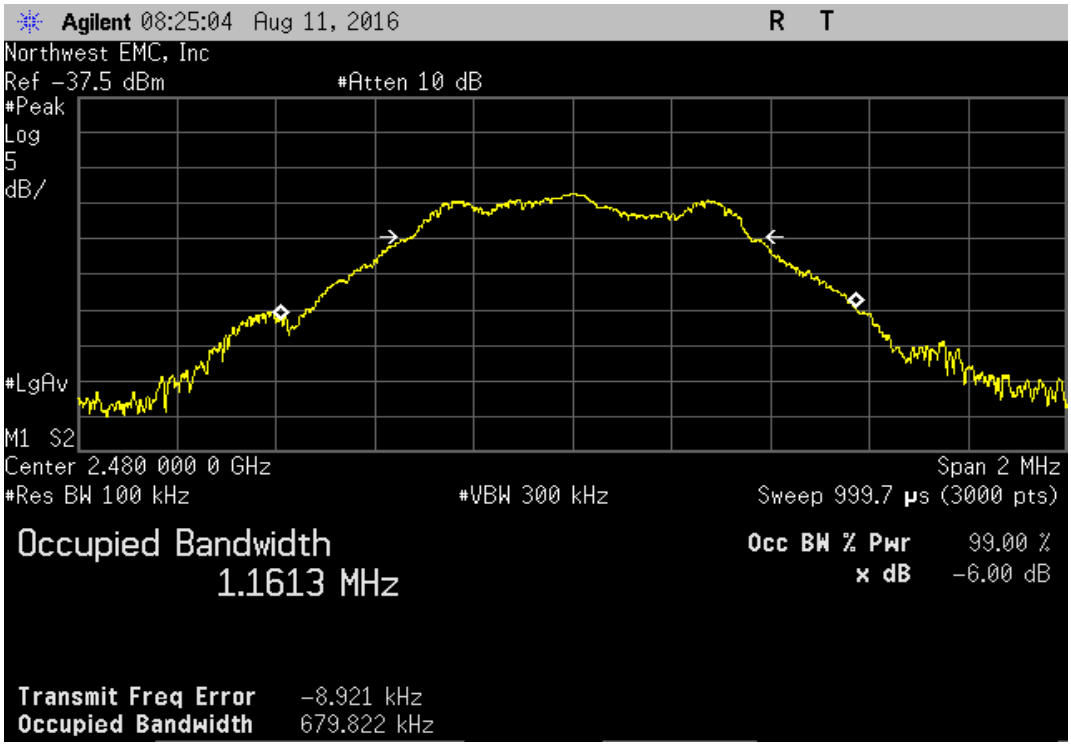
BLE/GFSK Mid Channel, 2440 MHz							
					Value	Limit (≥)	Result
					678.305 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz							
					Value	Limit (≥)	Result
					679.822 kHz	500 kHz	Pass



OUTPUT POWER

PSA-ESCI 2016.04.26.1

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

MODES OF OPERATION

Transmitting Bluetooth low energy on low, mid, and high at 2402, 2440, and 2480 MHz. EMC test loop running.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0199 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	2400 MHz	Stop Frequency	2483.5 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
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIB	8/12/2014	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. A field strength measurement was made of the fundamental with the carrier fully maximized for its highest radiated power.

The final data was converted from field strength to a radiated power value using equations found in ANSI C63.10:2013 Annex G.2

OUTPUT POWER

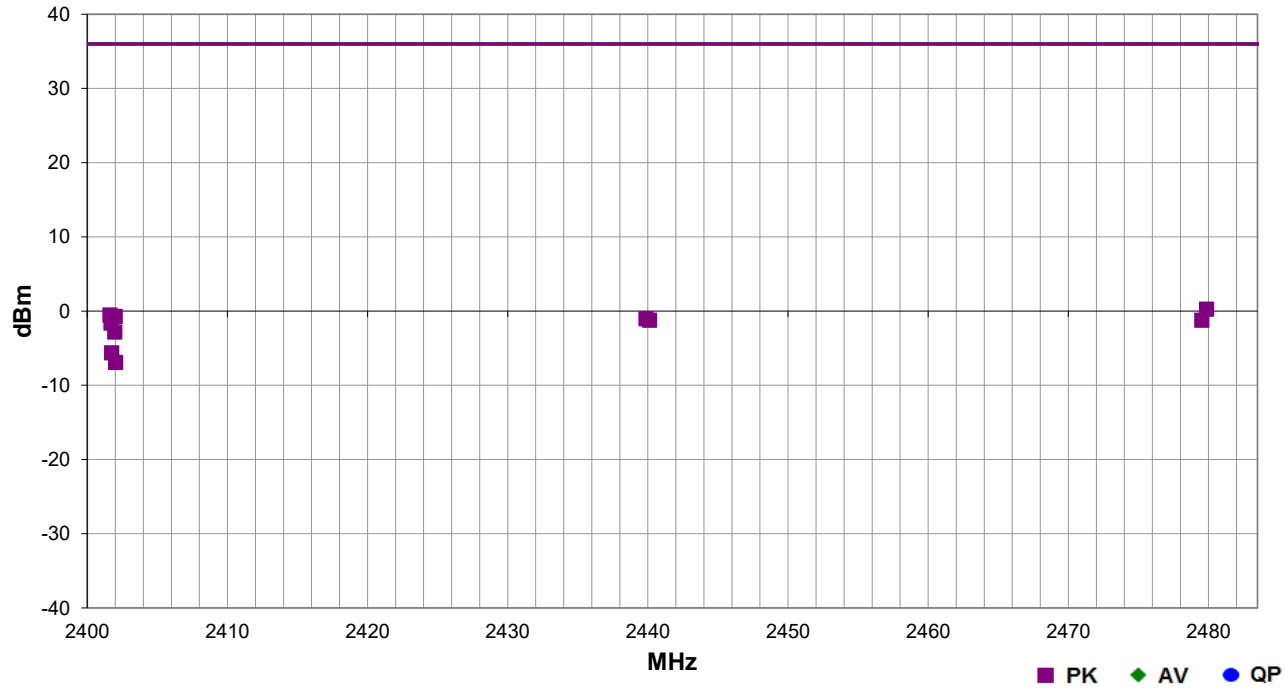
NORTHWEST EMC

PSA-ESCI 2016.04.26.1
EmiR5 2016.04.26.1

Work Order:	LGPD0199	**Date:**	08/10/16	Trevor Buls	
Project:	LEVL Beta	**Temperature:**	23.6 °C		
Job Site:	MN05	**Humidity:**	63.6% RH		
Serial Number:	3116M00003	**Barometric Pres.:**	1017 mbar	**Tested by:**	Trevor Buls, Kyle McMullan
EUT:	LEVL Device				
Configuration:	1				
Customer:	Medamonitor				
Attendees:	Jarrod Eliason				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth low energy. EMC test loop running.				
Deviations:	None.				
Comments:	Cover on bottom removed for test point access. Running firmware version 0.16.				

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

Run #	26	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	2479.870	1.0	98.1	Vert	PK	1.06E-03	0.3	36.0	-35.7	High Ch EUT Horz
	2401.615	1.2	296.0	Horz	PK	8.85E-04	-0.5	36.0	-36.5	Low Ch EUT On Side
	2401.990	1.0	101.1	Vert	PK	8.46E-04	-0.7	36.0	-36.7	Low Ch EUT Horz
	2439.865	1.0	116.1	Vert	PK	7.89E-04	-1.0	36.0	-37.0	Mid Ch EUT Horz
	2440.125	1.0	106.1	Horz	PK	7.54E-04	-1.2	36.0	-37.2	Mid Ch EUT On Side
	2479.525	1.0	118.0	Horz	PK	7.54E-04	-1.2	36.0	-37.2	High Ch EUT On Side
	2401.700	1.0	146.0	Horz	PK	6.87E-04	-1.6	36.0	-37.6	Low Ch EUT Horz
	2401.965	1.0	246.0	Vert	PK	5.21E-04	-2.8	36.0	-38.8	Low Ch EUT On Side
	2401.740	1.0	69.1	Vert	PK	2.74E-04	-5.6	36.0	-41.6	Low Ch EUT Vert
	2402.020	1.0	28.0	Horz	PK	2.03E-04	-6.9	36.0	-42.9	Low Ch EUT Vert

POWER SPECTRAL DENSITY

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12/7/2016
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	6/23/2018
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	1/27/2017

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

The final data was converted from a field strength to a radiated power value. The equations in section 9.5 of ANSI C63.10:2013, were used to derive this conversion formula:

dBm/m (field strength) + 11.77 = dBm EIRP

Per the procedure outlined in ANSI C63.10:2013 Section 11.10.2, the peak power spectral density was measured.

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2016.05.06

EUT:	LEVL Device			**Work Order:**	LGPD0199
Serial Number:	3116M00003			**Date:**	08/11/16
Customer:	Medamonitor			**Temperature:**	23.9 °C
Attendees:	None			**Humidity:**	59.7% RH
Project:	LEVL Beta			**Barometric Pres.:**	1014 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN05

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

COMMENTS

None

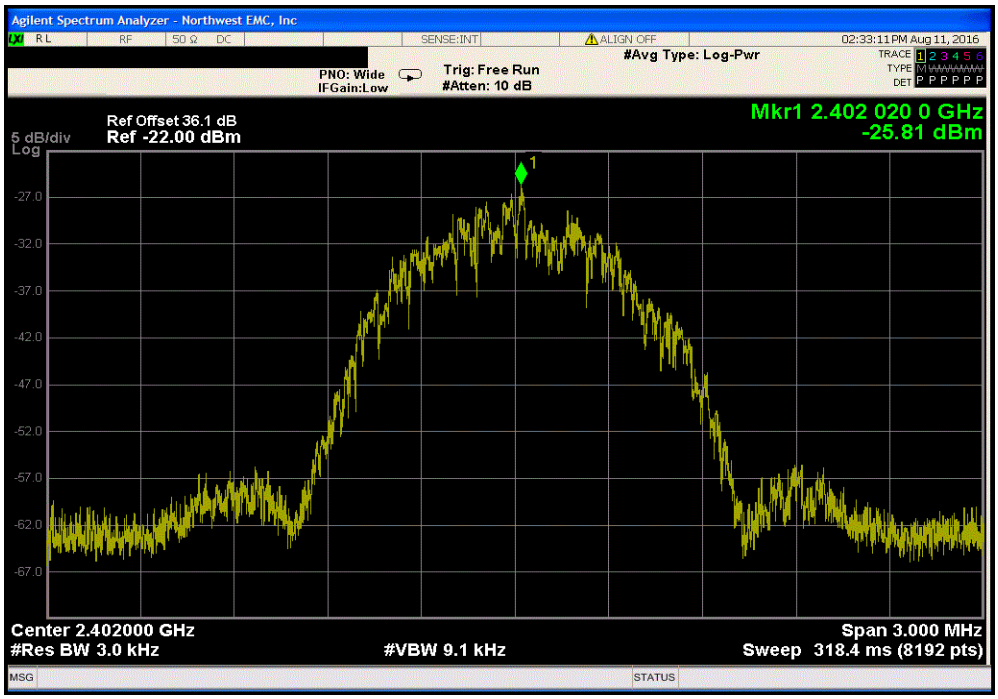
DEVIATIONS FROM TEST STANDARD

None

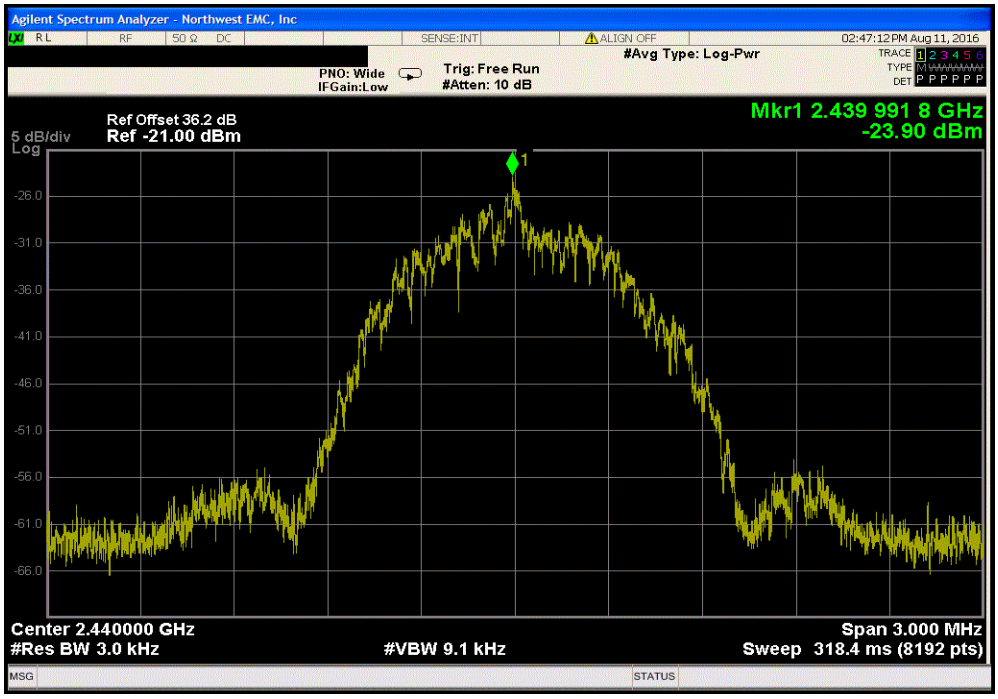
Configuration #	1	*Signature* Dustin Sparks

	Value dBm/m/3 kHz	dBm/m to dBm	Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK Low Channel, 2402 MHz	-25.81	11.77	-14.04	8	Pass
BLE/GFSK Mid Channel, 2440 MHz	-23.903	11.77	-12.13	8	Pass
BLE/GFSK High Channel, 2480 MHz	-27.928	11.77	-16.16	8	Pass

BLE/GFSK Low Channel, 2402 MHz						
		Value dBm/m/3 kHz	dBm/m to dBm	Value dBm/3kHz	Limit < dBm/3kHz	Results
		-25.81	11.77	-14.04	8	Pass



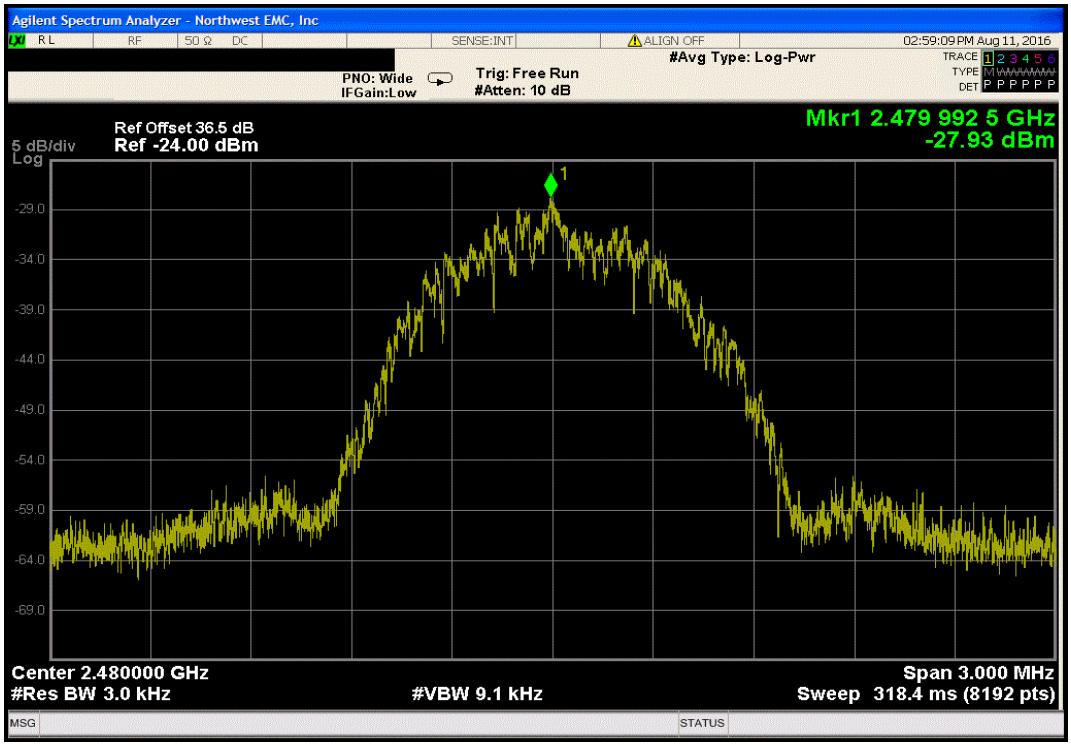
BLE/GFSK Mid Channel, 2440 MHz						
		Value dBm/m/3 kHz	dBm/m to dBm	Value dBm/3kHz	Limit < dBm/3kHz	Results
		-23.903	11.77	-12.13	8	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
		Value dBm/m/3 kHz	dBm/m to dBm	Value dBm/3kHz	Limit < dBm/3kHz	Results
		-27.928	11.77	-16.16	8	Pass



BAND EDGE COMPLIANCE

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	9/18/2016
Attenuator	S.M. Electronics	SA26B-20	RFW	2/26/2016	2/26/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	9/18/2016
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/24/2016	3/24/2017
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

BAND EDGE COMPLIANCE

NORTHWEST EMC

XMit 2016.05.06

EUT:	LEVL Device			Work Order:	LGPD0199
Serial Number:	3116M00003			Date:	08/11/16
Customer:	Medamonitor			Temperature:	23.8 °C
Attendees:	Jarrod Eliason			Humidity:	57.1% RH
Project:	LEVL Beta			Barometric Pres.:	1012 mbar
Tested by:	Trevor Buls, Kyle McMullan	Power:	110VAC/60Hz	Job Site:	MN08

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

COMMENTS

Cover on bottom removed for test point access. Running firmware 0.16.

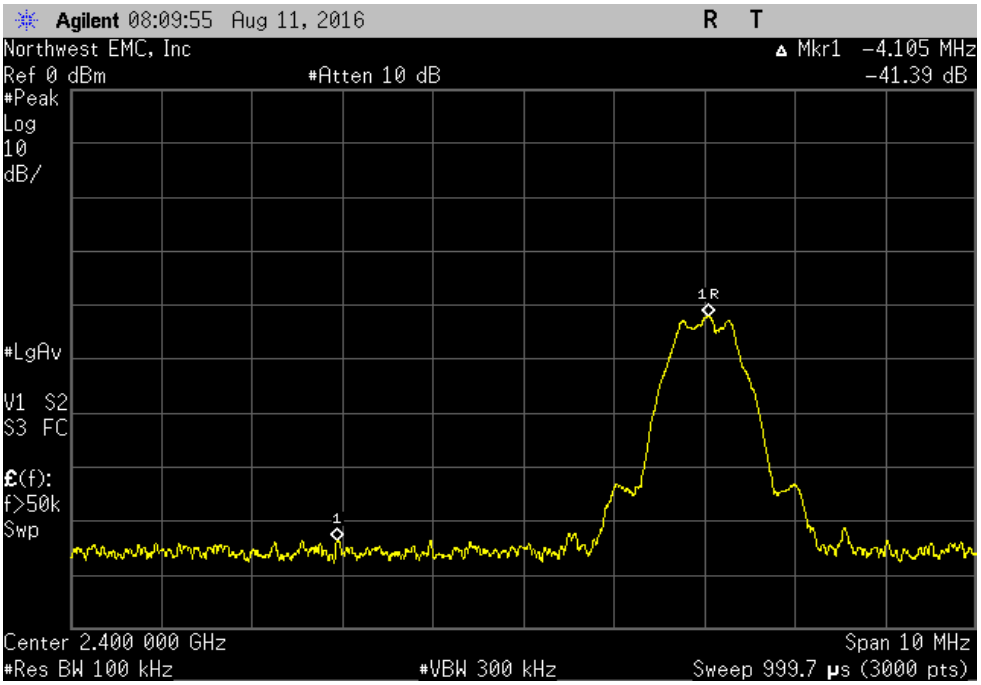
DEVIATIONS FROM TEST STANDARD

None

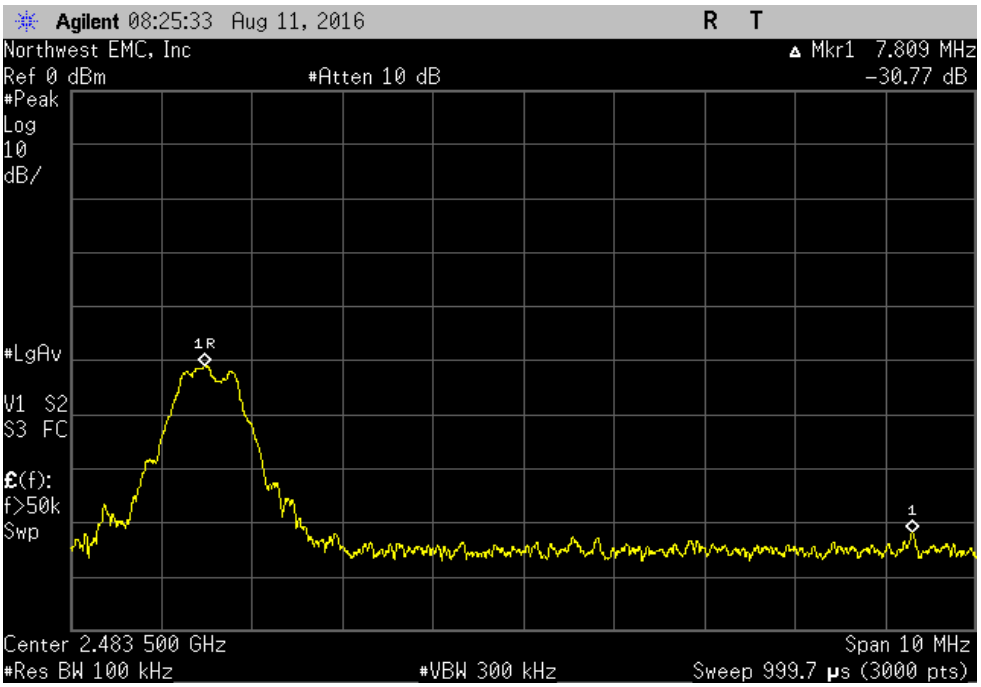
Configuration #	1	Signature Trevor Buls

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	-41.39	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-30.77	-20	Pass

BLE/GFSK Low Channel, 2402 MHz							
					Value (dBc)	Limit ≤ (dBc)	Result
					-41.39	-20	Pass



BLE/GFSK High Channel, 2480 MHz							
					Value (dBc)	Limit ≤ (dBc)	Result
					-30.77	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

PSA-ESCI 2016.04.26.1

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

MODES OF OPERATION

Transmitting BLE low channel (2402 MHz), mid channel (2440 MHz), and high channel (2480 MHz)

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0199 - 1

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
Attenuator	Fairview Microwave	SA18E-20	TWZ	10/21/2015	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	10/21/2015	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	LFN	10/21/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	9/18/2015	12 mo
Cable	Northwest EMC	18-26GHz Standard Gain Horn Cable	MNP	9/18/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/10/2015	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/29/2016	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIB	8/12/2014	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. 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. A comparison was made between the fundamental emission and the highest spurious emission.

SPURIOUS CONDUCTED EMISSIONS

NORTHWEST EMC

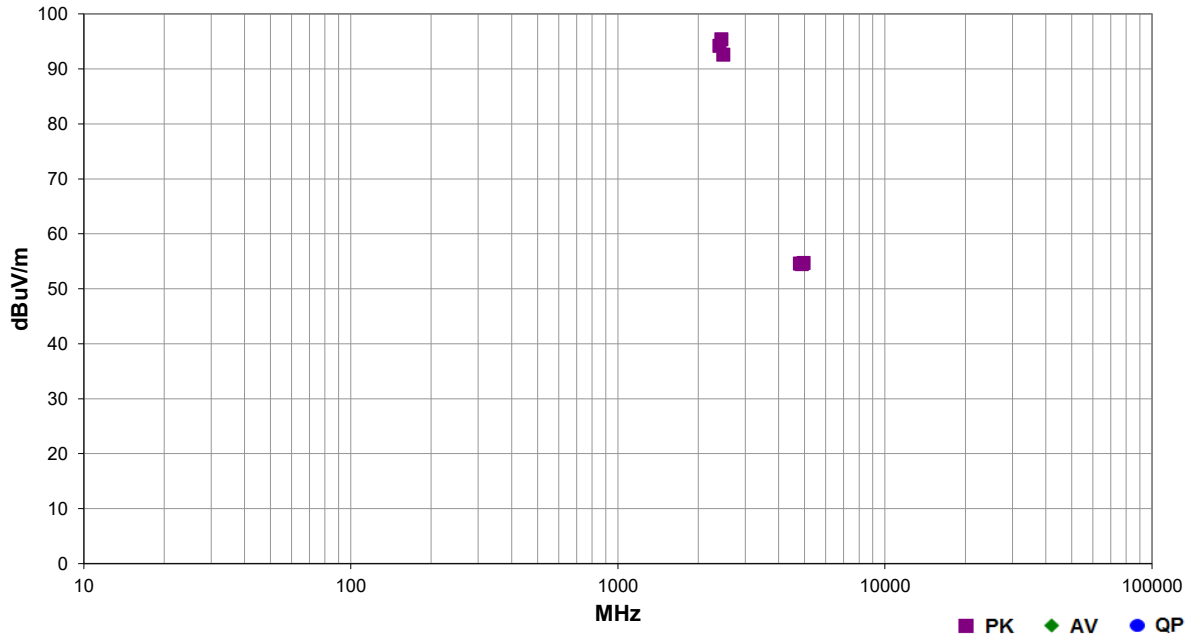
PSA-ESCI 2016.04.26.1

EmiR5 2016.04.26.1

Work Order:	LGPD0199	**Date:**	08/11/16		
Project:	LEVL Beta	**Temperature:**	23.8 °C		
Job Site:	MN05	**Humidity:**	60.5% RH		
Serial Number:	3116M00003	**Barometric Pres.:**	1014 mbar	**Tested by:**	Dustin Sparks
EUT:	LEVL Device				
Configuration:	1				
Customer:	Medamonitor				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE low channel (2402 MHz), mid channel (2440 MHz), and high channel (2480 MHz)				
Deviations:	None				
Comments:	Measurements below are worst case radiated measurements.				

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

Run #	27	**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 (dBc)	Compared to Spec. (dB)	Comments
2402.017	57.6	36.6	1.0	112.1	3.0	0.0	Vert	PK	0.0	94.2			Low ch, EUT horz
4804.008	49.5	5.1	1.0	279.9	3.0	0.0	Horz	PK	0.0	54.6	-20.0	-39.6	Low ch, EUT horz
2440.008	58.8	36.6	1.0	128.0	3.0	0.0	Vert	PK	0.0	95.4			Mid ch, EUT horz
4879.958	49.1	5.4	1.0	318.9	3.0	0.0	Horz	PK	0.0	54.5	-20.0	-40.9	Mid ch, EUT horz
2480.008	55.9	36.7	1.1	134.1	3.0	0.0	Vert	PK	0.0	92.6			High ch, EUT horz
4960.017	49.2	5.5	1.0	317.0	3.0	0.0	Horz	PK	0.0	54.7	-20.0	-37.9	High ch, EUT horz