

NORTHWEST EMC

Logic PD

DM3730 Torpedo + Wireless SOM -32

FCC 15.207:2015

FCC 15.247:2015

Report # LGPD0151.9



NVLAP Lab Code: 200881-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: May 08, 2015
Logic PD
Model: DM3730 Torpedo + Wireless SOM -32

Radio Equipment Testing

Standards

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

Results

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

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

<http://www.nwemc.com/accreditations/>
<http://gsi.nist.gov/global/docs/cabs/designations.html>

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

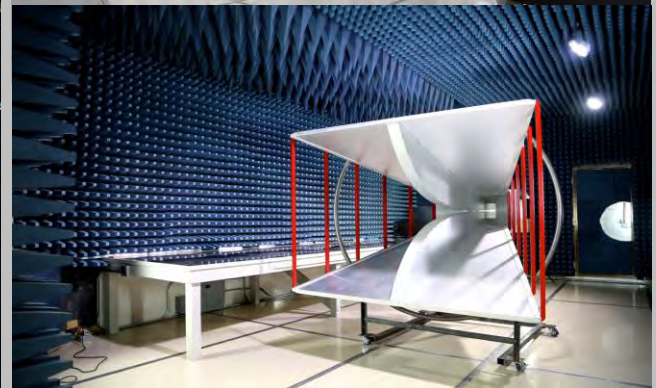
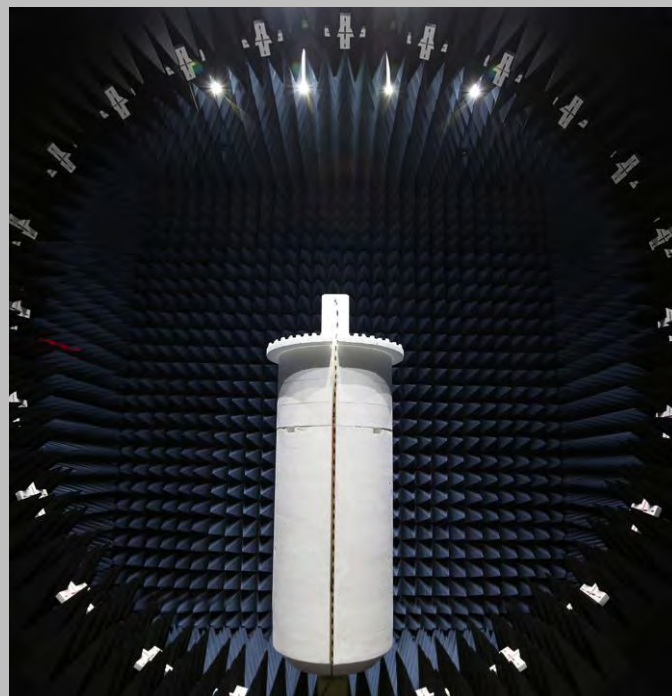
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Logic PD
Address:	6201 Bury Drive
City, State, Zip:	Eden Prairie, MN 55346
Test Requested By:	Adam Ford
Model:	DM3730 Torpedo + Wireless SOM -32
First Date of Test:	May 01, 2015
Last Date of Test:	May 08, 2015
Receipt Date of Samples:	April 22, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
A system module with an ARM processor, wireless module that includes Wifi (802.11 a,b,g,n) module, GPS and Bluetooth.
Testing Objective:
To demonstrate compliance of the Bluetooth Low Energy DTS radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration LGPD0151- 3

Software/Firmware Running during test	
Description	Version
TeraTerm	None

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
SOM 2	Logic PD	None	1215M00013
Dev Board	Logic PD	DM3730 Torpedo	2012M00624

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Brick	Sceptre	PS2D-5038APL6A	None
Laptop	Lenovo	ThinkPad T400	001C25968CA1
Laptop Supply	Lenovo	92P1160	11S92P1160Z1ZBGH9338XW
GPS Antenna	Unknown	None	None
Chip Antennas (x2)	Pulse	W3006	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Serial	Yes	> 3m	No	Dev Board	Laptop
Coax	Yes	3.0m	No	Dev Board	GPS Antenna
DC Power	No	1.5m	Yes	Dev Board	DC Brick
AC Power	No	1.8m	No	DC Brick	AC Mains
DC Power	No	1.8m	Yes	Laptop	Laptop Supply
AC Power	No	0.95m	No	Laptop Supply	AC Mains
Chip Antenna Cables (x2)	No	0.05m	No	Chip Antennas	Wireless SOM

CONFIGURATIONS

Configuration LGPD0151- 4

Software/Firmware Running during test	
Description	Version
TeraTerm	None

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
SOM 2	Logic PD	None	1215M00013
Dev Board	Logic PD	DM3730 Torpedo	2012M00624

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Brick	Sceptre	PS2D-5038APL6A	None
Laptop	Lenovo	ThinkPad T400	001C25968CA1
Laptop Supply	Lenovo	92P1160	11S92P1160Z1ZBGH9338XW
GPS Antenna	Unknown	None	None
Isolated Magnetic Dipole Antennas (x2)	Ethertronics, Inc.	1000418	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Serial	Yes	> 3m	No	Dev Board	Laptop
Coax	Yes	3.0m	No	Dev Board	GPS Antenna
DC Power	No	1.5m	Yes	Dev Board	DC Brick
AC Power	No	1.8m	No	DC Brick	AC Mains
DC Power	No	1.8m	Yes	Laptop	Laptop Supply
AC Power	No	0.95m	No	Laptop Supply	AC Mains
Dipole Antenna Cables (x2)	No	0.1m	No	Isolated Magnetic Dipole Antennas	Wireless SOM

CONFIGURATIONS

Configuration LGPD0151- 5

Software/Firmware Running during test					
Description				Version	
TeraTerm				None	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
SOM 2	Logic PD	None	1215M00013
Dev Board	Logic PD	DM3730 Torpedo	2012M00624

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Brick	Sceptre	PS2D-5038APL6A	None
Laptop	Lenovo	ThinkPad T400	001C25968CA1
Laptop Supply	Lenovo	92P1160	11S92P1160Z1ZBGH9338XW
GPS Antenna	Unknown	None	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Coax	Yes	3.0m	No	Dev Board	GPS Antenna
DC Power	No	1.5m	Yes	Dev Board	DC Brick
AC Power	No	1.8m	No	DC Brick	AC Mains
DC Power	No	1.8m	Yes	Laptop	Laptop Supply
AC Power	No	0.95m	No	Laptop Supply	AC Mains
Serial	Yes	2m	No	Dev Board	USB to Serial Adapter
USB to Serial Adapter	Unknown	.2m	No	Serial	Laptop

CONFIGURATIONS

Configuration LGPD0151- 8

Software/Firmware Running during test					
Description				Version	
TeraTerm				None	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
SOM 2	Logic PD	None	1215M00013
Dev Board	Logic PD	DM3730 Torpedo	2012M00624

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
GPS Antenna	Unknown	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Lenovo	ThinkPad T400	001C25968CA1
Laptop Supply	Lenovo	92P1160	11S92P1160Z1ZBGH9338XW

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Coax	Yes	3.0m	No	Dev Board	GPS Antenna
Serial	Yes	2m	No	Dev Board	USB to Serial Adapter
USB to Serial Adapter	Unknown	.2m	No	Serial	Laptop
DC Leads	No	1.2m	No	Dev Board	DC power supply
AC Power	No	1.5m	No	DC power Supply	AC mains

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/1/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	5/8/2015	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.
3	5/8/2015	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	5/8/2015	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	5/8/2015	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	5/8/2015	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	5/8/2015	Power Spectral Density	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

TEST DESCRIPTION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Spectrum Analyzer	Agilent	E4443A	AAS	3/24/2015	03/24/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/23/2015	03/23/2016
MN03 Cables	ESM Cable Corp.	Conducted Cables	MNC	11/20/2014	11/20/2015
Attenuator 20dB, BNC	Fairview Microwave	SA01B-20	AQP	7/22/2014	07/22/2015
High Pass Filter	TTE	H97-100K-50-720B	HGN	5/23/2014	05/23/2015
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	NCR

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

LGPD0151-8

MODES INVESTIGATED

On, Tx Continuous High Channel 2480MHz BTLE
On, Tx Continuous Low Channel 2402MHz BTLE
On, Tx Continuous Mid Channel 2426MHz BTLE

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	27	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

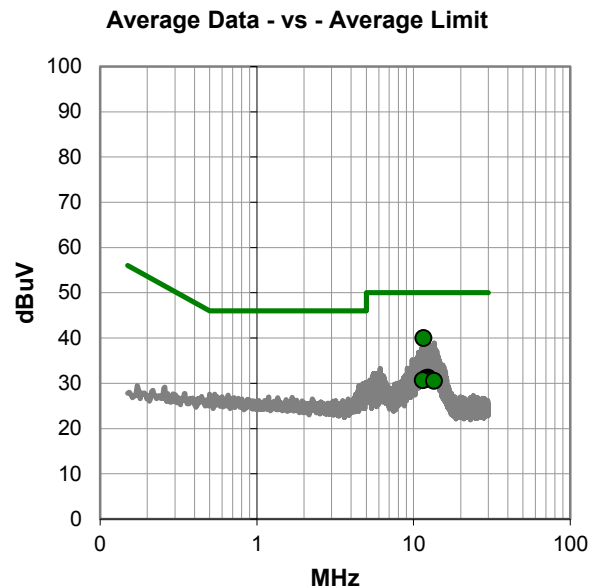
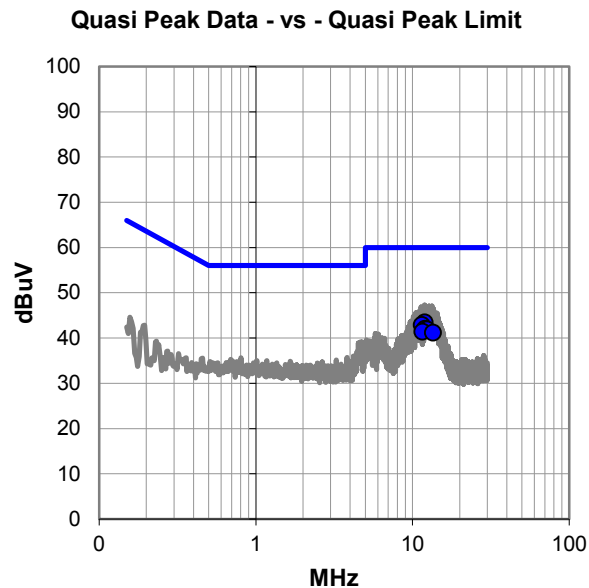
None

EUT OPERATING MODES

On, Tx Continuous Low Channel 2402MHz BTLE
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DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #27

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.989	22.5	20.9	43.4	60.0	-16.6
11.482	22.0	20.9	42.9	60.0	-17.1
12.050	21.1	20.9	42.0	60.0	-18.0
12.375	21.0	20.9	41.9	60.0	-18.1
11.601	20.5	20.9	41.4	60.0	-18.6
13.564	20.3	20.9	41.2	60.0	-18.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.601	19.1	20.9	40.0	50.0	-10.0
12.375	10.3	20.9	31.2	50.0	-18.8
12.050	10.2	20.9	31.1	50.0	-18.9
11.989	10.0	20.9	30.9	50.0	-19.1
11.482	9.8	20.9	30.7	50.0	-19.3
13.564	9.6	20.9	30.5	50.0	-19.5

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	28	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

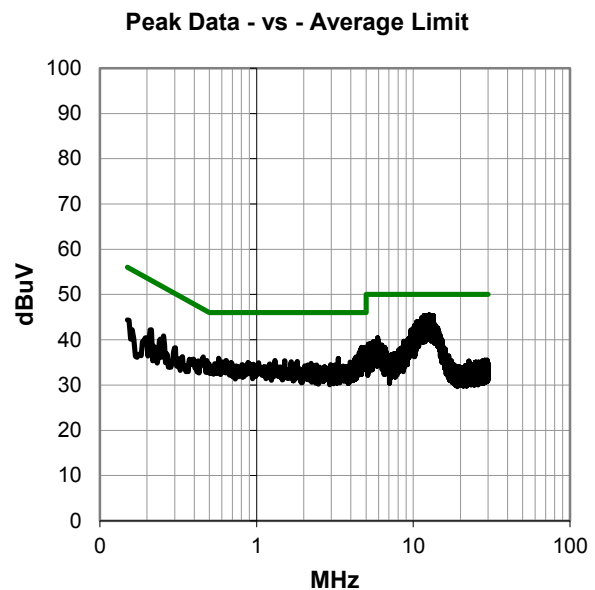
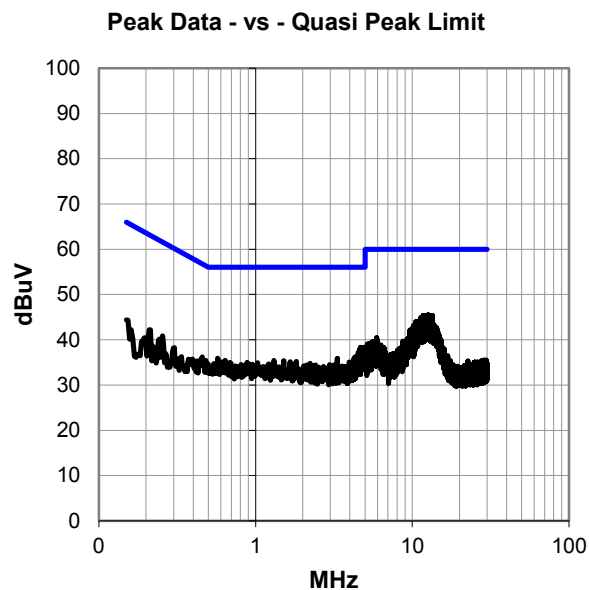
None

EUT OPERATING MODES

On, Tx Continuous Low Channel 2402MHz BTLE
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DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #28

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.637	24.6	20.9	45.5	60.0	-14.5
12.059	24.5	20.9	45.4	60.0	-14.6
13.443	24.5	20.9	45.4	60.0	-14.6
11.734	24.5	20.9	45.4	60.0	-14.6
12.574	24.4	20.9	45.3	60.0	-14.7
12.868	24.3	20.9	45.2	60.0	-14.8
12.891	24.2	20.9	45.1	60.0	-14.9
11.861	24.2	20.9	45.1	60.0	-14.9
12.305	24.1	20.9	45.0	60.0	-15.0
12.238	24.0	20.9	44.9	60.0	-15.1
11.346	24.0	20.9	44.9	60.0	-15.1
11.977	23.9	20.9	44.8	60.0	-15.2
11.469	23.7	20.9	44.6	60.0	-15.4
12.174	23.6	20.9	44.5	60.0	-15.5
13.144	23.6	20.9	44.5	60.0	-15.5
11.674	23.5	20.9	44.4	60.0	-15.6
11.421	23.5	20.9	44.4	60.0	-15.6
13.286	23.4	20.9	44.3	60.0	-15.7
11.615	23.3	20.9	44.2	60.0	-15.8
11.921	23.2	20.9	44.1	60.0	-15.9
10.727	23.2	20.8	44.0	60.0	-16.0
12.969	23.1	20.9	44.0	60.0	-16.0
11.809	23.1	20.9	44.0	60.0	-16.0
10.518	23.2	20.8	44.0	60.0	-16.0
13.066	23.0	20.9	43.9	60.0	-16.1
11.025	23.0	20.8	43.8	60.0	-16.2

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.637	24.6	20.9	45.5	50.0	-4.5
12.059	24.5	20.9	45.4	50.0	-4.6
13.443	24.5	20.9	45.4	50.0	-4.6
11.734	24.5	20.9	45.4	50.0	-4.6
12.574	24.4	20.9	45.3	50.0	-4.7
12.868	24.3	20.9	45.2	50.0	-4.8
12.891	24.2	20.9	45.1	50.0	-4.9
11.861	24.2	20.9	45.1	50.0	-4.9
12.305	24.1	20.9	45.0	50.0	-5.0
12.238	24.0	20.9	44.9	50.0	-5.1
11.346	24.0	20.9	44.9	50.0	-5.1
11.977	23.9	20.9	44.8	50.0	-5.2
11.469	23.7	20.9	44.6	50.0	-5.4
12.174	23.6	20.9	44.5	50.0	-5.5
13.144	23.6	20.9	44.5	50.0	-5.5
11.674	23.5	20.9	44.4	50.0	-5.6
11.421	23.5	20.9	44.4	50.0	-5.6
13.286	23.4	20.9	44.3	50.0	-5.7
11.615	23.3	20.9	44.2	50.0	-5.8
11.921	23.2	20.9	44.1	50.0	-5.9
10.727	23.2	20.8	44.0	50.0	-6.0
12.969	23.1	20.9	44.0	50.0	-6.0
11.809	23.1	20.9	44.0	50.0	-6.0
10.518	23.2	20.8	44.0	50.0	-6.0
13.066	23.0	20.9	43.9	50.0	-6.1
11.025	23.0	20.8	43.8	50.0	-6.2

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	29	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

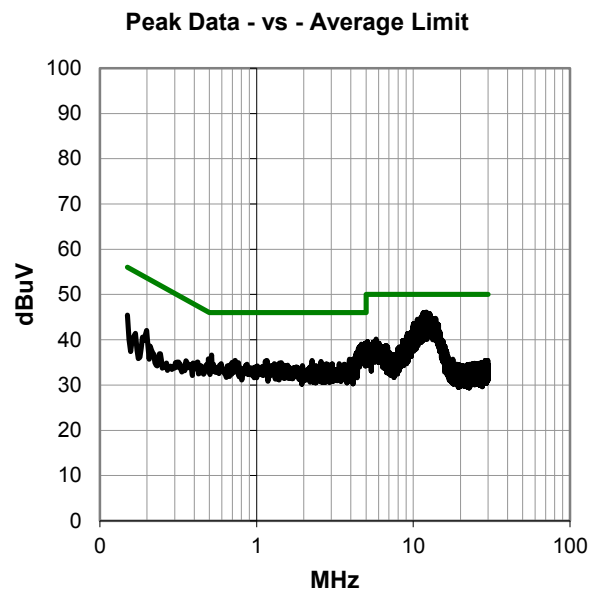
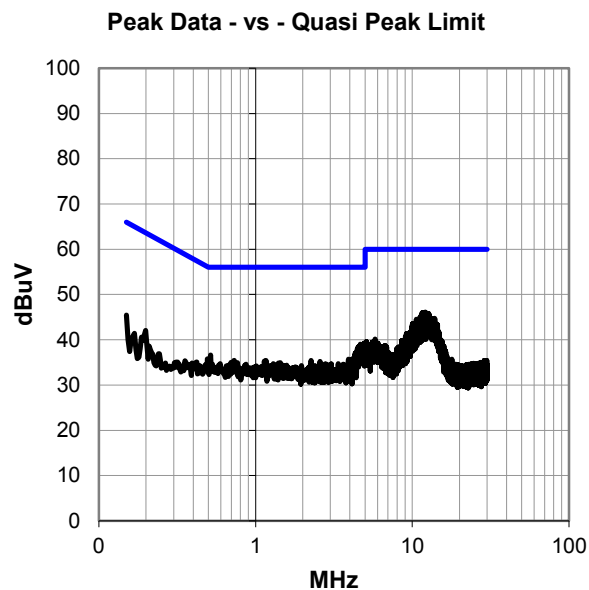
None

EUT OPERATING MODES

On, Tx Continuous Mid Channel 2426MHz BTLE
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DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #29

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.118	25.2	20.9	46.1	60.0	-13.9
11.548	25.1	20.9	46.0	60.0	-14.0
12.719	24.9	20.9	45.8	60.0	-14.2
12.443	24.8	20.9	45.7	60.0	-14.3
12.182	24.6	20.9	45.5	60.0	-14.5
12.835	24.6	20.9	45.5	60.0	-14.5
11.850	24.5	20.9	45.4	60.0	-14.6
11.421	24.5	20.9	45.4	60.0	-14.6
11.484	24.4	20.9	45.3	60.0	-14.7
12.006	24.3	20.9	45.2	60.0	-14.8
12.312	24.2	20.9	45.1	60.0	-14.9
12.473	24.2	20.9	45.1	60.0	-14.9
11.727	24.1	20.9	45.0	60.0	-15.0
12.999	24.0	20.9	44.9	60.0	-15.1
11.160	24.0	20.8	44.8	60.0	-15.2
11.924	23.9	20.9	44.8	60.0	-15.2
13.920	23.8	20.9	44.7	60.0	-15.3
13.294	23.8	20.9	44.7	60.0	-15.3
11.686	23.8	20.9	44.7	60.0	-15.3
11.107	23.8	20.8	44.6	60.0	-15.4
12.238	23.6	20.9	44.5	60.0	-15.5
10.604	23.7	20.8	44.5	60.0	-15.5
11.357	23.6	20.9	44.5	60.0	-15.5
11.271	23.6	20.8	44.4	60.0	-15.6
11.223	23.6	20.8	44.4	60.0	-15.6
10.947	23.6	20.8	44.4	60.0	-15.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.118	25.2	20.9	46.1	50.0	-3.9
11.548	25.1	20.9	46.0	50.0	-4.0
12.719	24.9	20.9	45.8	50.0	-4.2
12.443	24.8	20.9	45.7	50.0	-4.3
12.182	24.6	20.9	45.5	50.0	-4.5
12.835	24.6	20.9	45.5	50.0	-4.5
11.850	24.5	20.9	45.4	50.0	-4.6
11.421	24.5	20.9	45.4	50.0	-4.6
11.484	24.4	20.9	45.3	50.0	-4.7
12.006	24.3	20.9	45.2	50.0	-4.8
12.312	24.2	20.9	45.1	50.0	-4.9
12.473	24.2	20.9	45.1	50.0	-4.9
11.727	24.1	20.9	45.0	50.0	-5.0
12.999	24.0	20.9	44.9	50.0	-5.1
11.160	24.0	20.8	44.8	50.0	-5.2
11.924	23.9	20.9	44.8	50.0	-5.2
13.920	23.8	20.9	44.7	50.0	-5.3
13.294	23.8	20.9	44.7	50.0	-5.3
11.686	23.8	20.9	44.7	50.0	-5.3
11.107	23.8	20.8	44.6	50.0	-5.4
12.238	23.6	20.9	44.5	50.0	-5.5
10.604	23.7	20.8	44.5	50.0	-5.5
11.357	23.6	20.9	44.5	50.0	-5.5
11.271	23.6	20.8	44.4	50.0	-5.6
11.223	23.6	20.8	44.4	50.0	-5.6
10.947	23.6	20.8	44.4	50.0	-5.6

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	30	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

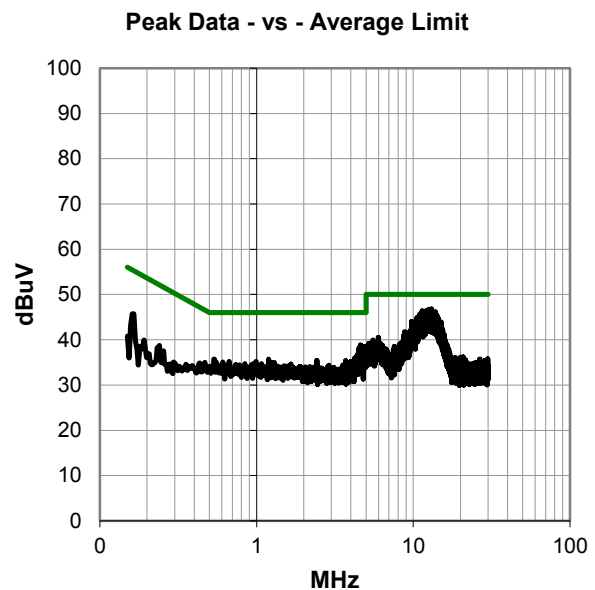
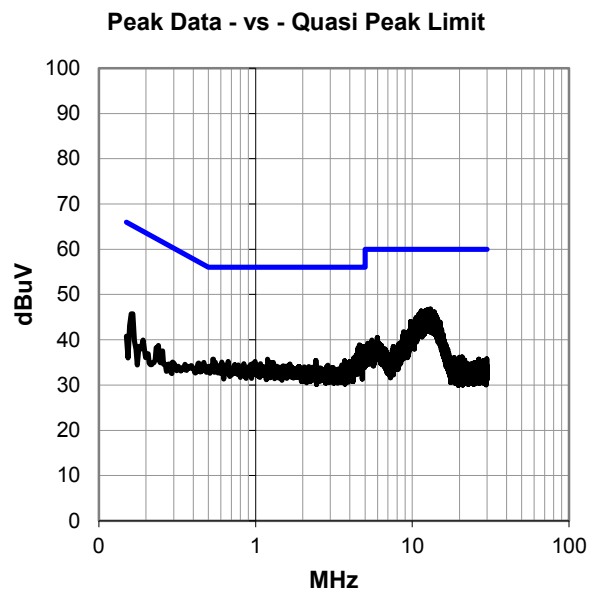
None

EUT OPERATING MODES

On, Tx Continuous Mid Channel 2426MHz BTLE
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DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #30

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.066	25.9	20.9	46.8	60.0	-13.2
12.618	25.8	20.9	46.7	60.0	-13.3
12.230	25.6	20.9	46.5	60.0	-13.5
12.491	25.5	20.9	46.4	60.0	-13.6
12.954	25.5	20.9	46.4	60.0	-13.6
11.421	25.5	20.9	46.4	60.0	-13.6
11.924	25.4	20.9	46.3	60.0	-13.7
11.984	25.3	20.9	46.2	60.0	-13.8
13.812	25.2	20.9	46.1	60.0	-13.9
13.148	25.2	20.9	46.1	60.0	-13.9
12.085	25.1	20.9	46.0	60.0	-14.0
11.794	25.1	20.9	46.0	60.0	-14.0
11.667	25.1	20.9	46.0	60.0	-14.0
11.480	25.1	20.9	46.0	60.0	-14.0
13.122	25.0	20.9	45.9	60.0	-14.1
13.312	25.0	20.9	45.9	60.0	-14.1
13.566	25.0	20.9	45.9	60.0	-14.1
11.868	25.0	20.9	45.9	60.0	-14.1
12.719	24.9	20.9	45.8	60.0	-14.2
12.809	24.9	20.9	45.8	60.0	-14.2
12.118	24.8	20.9	45.7	60.0	-14.3
11.022	24.8	20.8	45.6	60.0	-14.4
14.025	24.6	20.9	45.5	60.0	-14.5
11.548	24.6	20.9	45.5	60.0	-14.5
11.290	24.6	20.8	45.4	60.0	-14.6
13.793	24.5	20.9	45.4	60.0	-14.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.066	25.9	20.9	46.8	50.0	-3.2
12.618	25.8	20.9	46.7	50.0	-3.3
12.230	25.6	20.9	46.5	50.0	-3.5
12.491	25.5	20.9	46.4	50.0	-3.6
12.954	25.5	20.9	46.4	50.0	-3.6
11.421	25.5	20.9	46.4	50.0	-3.6
11.924	25.4	20.9	46.3	50.0	-3.7
11.984	25.3	20.9	46.2	50.0	-3.8
13.812	25.2	20.9	46.1	50.0	-3.9
13.148	25.2	20.9	46.1	50.0	-3.9
12.085	25.1	20.9	46.0	50.0	-4.0
11.794	25.1	20.9	46.0	50.0	-4.0
11.667	25.1	20.9	46.0	50.0	-4.0
11.480	25.1	20.9	46.0	50.0	-4.0
13.122	25.0	20.9	45.9	50.0	-4.1
13.312	25.0	20.9	45.9	50.0	-4.1
13.566	25.0	20.9	45.9	50.0	-4.1
11.868	25.0	20.9	45.9	50.0	-4.1
12.719	24.9	20.9	45.8	50.0	-4.2
12.809	24.9	20.9	45.8	50.0	-4.2
12.118	24.8	20.9	45.7	50.0	-4.3
11.022	24.8	20.8	45.6	50.0	-4.4
14.025	24.6	20.9	45.5	50.0	-4.5
11.548	24.6	20.9	45.5	50.0	-4.5
11.290	24.6	20.8	45.4	50.0	-4.6
13.793	24.5	20.9	45.4	50.0	-4.6

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	31	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

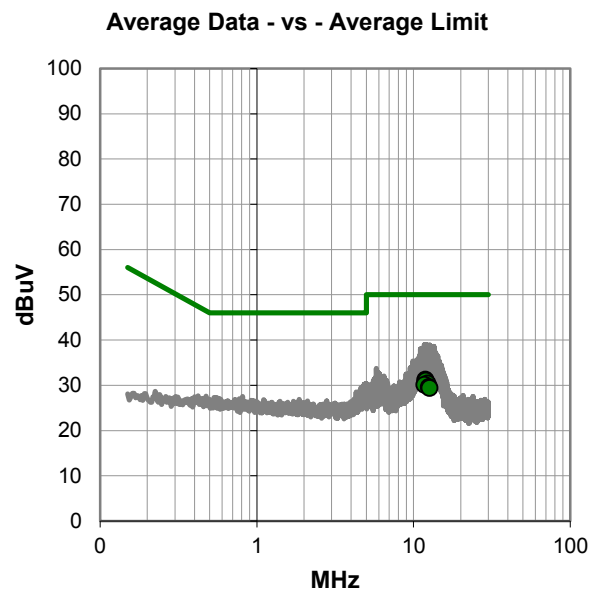
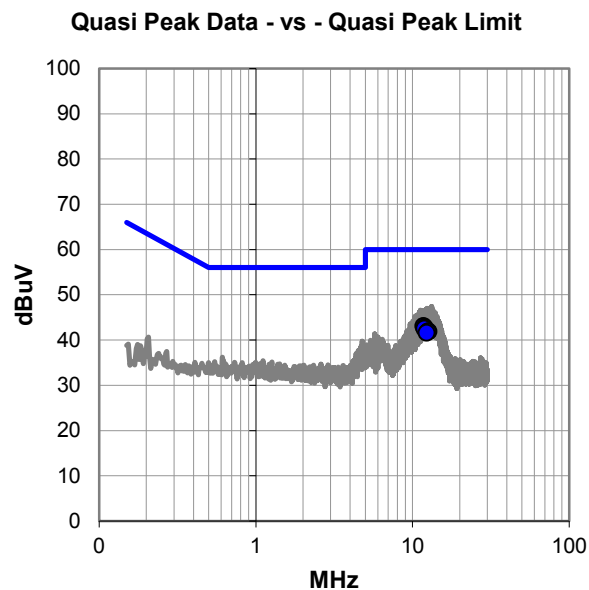
None

EUT OPERATING MODES

On, Tx Continuous High Channel 2480MHz BTLE

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #31

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.731	22.2	20.9	43.1	60.0	-16.9
11.992	21.9	20.9	42.8	60.0	-17.2
11.927	21.6	20.9	42.5	60.0	-17.5
12.685	21.0	20.9	41.9	60.0	-18.1
12.549	21.0	20.9	41.9	60.0	-18.1
12.304	20.7	20.9	41.6	60.0	-18.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.927	10.3	20.9	31.2	50.0	-18.8
11.992	10.1	20.9	31.0	50.0	-19.0
12.304	9.5	20.9	30.4	50.0	-19.6
11.731	9.2	20.9	30.1	50.0	-19.9
12.549	8.7	20.9	29.6	50.0	-20.4
12.685	8.5	20.9	29.4	50.0	-20.6

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	DM3730 Torpedo + Wireless SOM -32	Work Order:	LGPD0151
Serial Number:	See configuration	Date:	05/08/2015
Customer:	Logic PD	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure:	1015.6 mb
Tested By:	Brandon Hobbs	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	LGPD0151-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	32	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

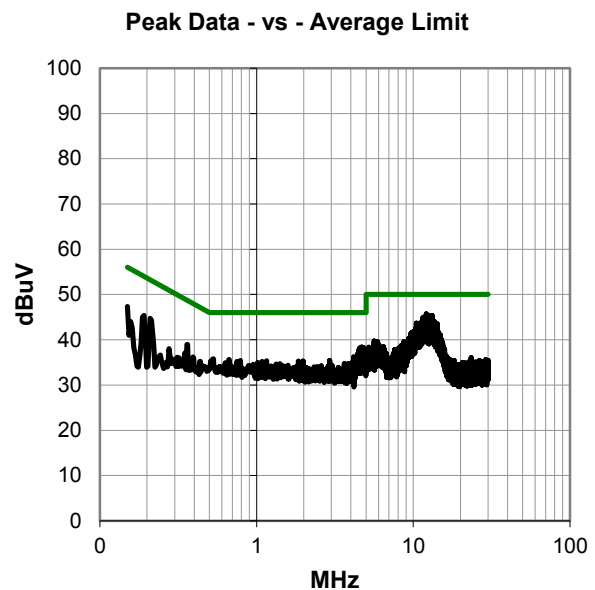
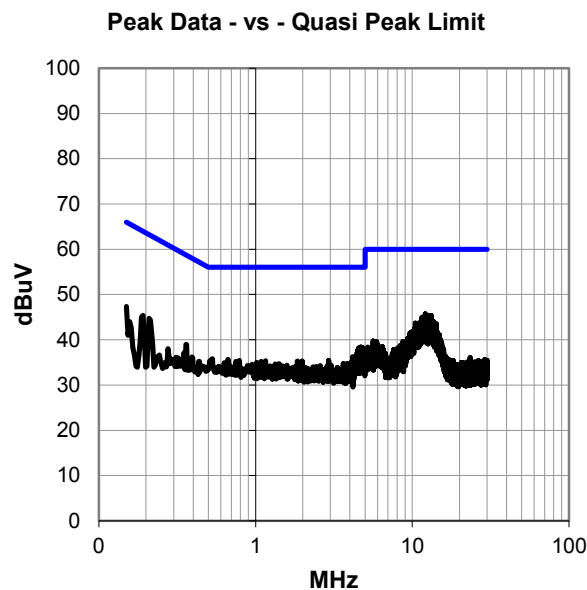
None

EUT OPERATING MODES

On, Tx Continuous High Channel 2480MHz BTLE

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #32

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.126	24.8	20.9	45.7	60.0	-14.3
13.189	24.5	20.9	45.4	60.0	-14.6
12.059	24.4	20.9	45.3	60.0	-14.7
12.510	24.4	20.9	45.3	60.0	-14.7
13.126	24.1	20.9	45.0	60.0	-15.0
11.484	24.1	20.9	45.0	60.0	-15.0
12.305	24.0	20.9	44.9	60.0	-15.1
12.365	23.9	20.9	44.8	60.0	-15.2
12.447	23.9	20.9	44.8	60.0	-15.2
12.723	23.9	20.9	44.8	60.0	-15.2
11.723	23.9	20.9	44.8	60.0	-15.2
11.652	23.8	20.9	44.7	60.0	-15.3
11.984	23.7	20.9	44.6	60.0	-15.4
11.566	23.7	20.9	44.6	60.0	-15.4
12.615	23.6	20.9	44.5	60.0	-15.5
13.040	23.6	20.9	44.5	60.0	-15.5
11.939	23.6	20.9	44.5	60.0	-15.5
12.268	23.5	20.9	44.4	60.0	-15.6
12.782	23.5	20.9	44.4	60.0	-15.6
12.148	23.3	20.9	44.2	60.0	-15.8
11.865	23.3	20.9	44.2	60.0	-15.8
13.614	23.1	20.9	44.0	60.0	-16.0
12.182	23.1	20.9	44.0	60.0	-16.0
12.812	23.1	20.9	44.0	60.0	-16.0
11.398	23.0	20.9	43.9	60.0	-16.1
11.260	23.0	20.8	43.8	60.0	-16.2

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.126	24.8	20.9	45.7	50.0	-4.3
13.189	24.5	20.9	45.4	50.0	-4.6
12.059	24.4	20.9	45.3	50.0	-4.7
12.510	24.4	20.9	45.3	50.0	-4.7
13.126	24.1	20.9	45.0	50.0	-5.0
11.484	24.1	20.9	45.0	50.0	-5.0
12.305	24.0	20.9	44.9	50.0	-5.1
12.365	23.9	20.9	44.8	50.0	-5.2
12.447	23.9	20.9	44.8	50.0	-5.2
12.723	23.9	20.9	44.8	50.0	-5.2
11.723	23.9	20.9	44.8	50.0	-5.2
11.652	23.8	20.9	44.7	50.0	-5.3
11.984	23.7	20.9	44.6	50.0	-5.4
11.566	23.7	20.9	44.6	50.0	-5.4
12.615	23.6	20.9	44.5	50.0	-5.5
13.040	23.6	20.9	44.5	50.0	-5.5
11.939	23.6	20.9	44.5	50.0	-5.5
12.268	23.5	20.9	44.4	50.0	-5.6
12.782	23.5	20.9	44.4	50.0	-5.6
12.148	23.3	20.9	44.2	50.0	-5.8
11.865	23.3	20.9	44.2	50.0	-5.8
13.614	23.1	20.9	44.0	50.0	-6.0
12.182	23.1	20.9	44.0	50.0	-6.0
12.812	23.1	20.9	44.0	50.0	-6.0
11.398	23.0	20.9	43.9	50.0	-6.1
11.260	23.0	20.8	43.8	50.0	-6.2

CONCLUSION

Pass



Tested By

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 - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz).

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0151 - 3

LGPD0151 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency

26500 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Low Pass Filter, 0 - 1000 MHz	Micro-Tronics	LPM50004	HGK	3/2/2015	12 mo
High Pass Filter, 2.8 - 18 GHz	Micro-Tronics	HPM50111	HGQ	3/2/2015	12 mo
Attenuator, 20 dB, 'SMA'	SM Electronics	SA6-20	REO	3/2/2015	12 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/3/2014	12 mo
MN05 Cable	N/A	18-26GHz Standard Gain Horn Cable	MNP	10/3/2014	12 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/2/2015	12 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	3/30/2015	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/2/2015	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	3/30/2015	12 mo
Antenna, Horn	ETS	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	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

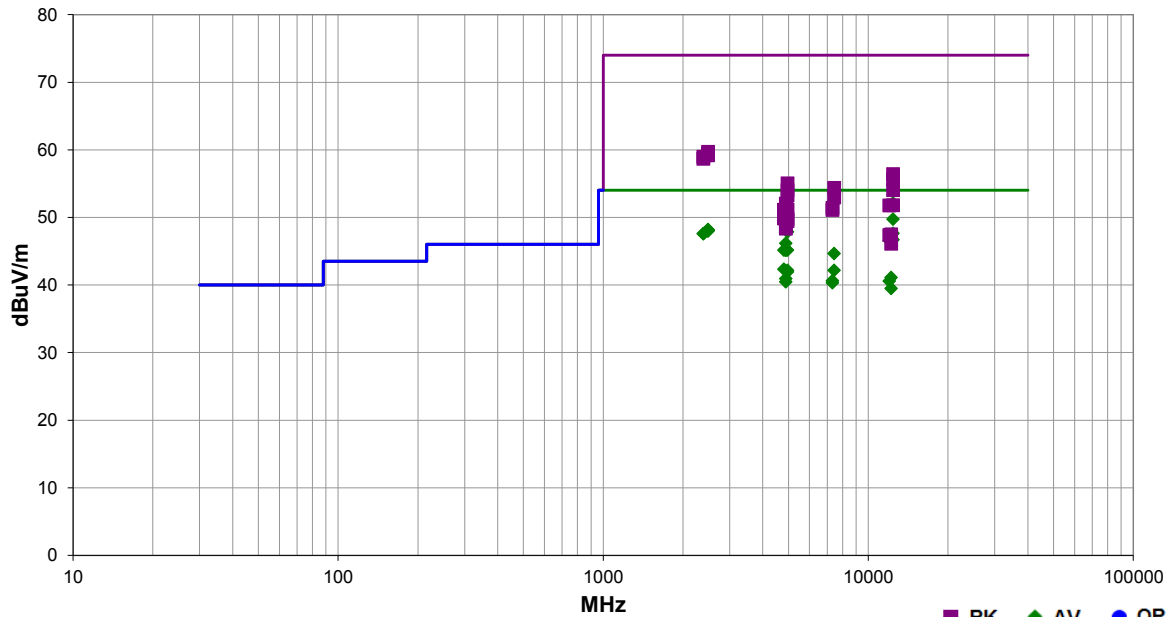
TEST DESCRIPTION

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.

Work Order:	LGPD0151	Date:	05/01/15	<i>Dustin Sparks</i>
Project:	None	Temperature:	24.2 °C	
Job Site:	MN05	Humidity:	23.7% RH	
Serial Number:	See configuration	Barometric Pres.:	1018.7 mbar	
EUT:	DM3730 Torpedo + Wireless SOM -32			Tested by: Dustin Sparks
Configuration:	3			
Customer:	Logic PD			
Attendees:	None			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting Bluetooth low energy - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz).			
Deviations:	None			
Comments:	Chip antenna			

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

Run #	210	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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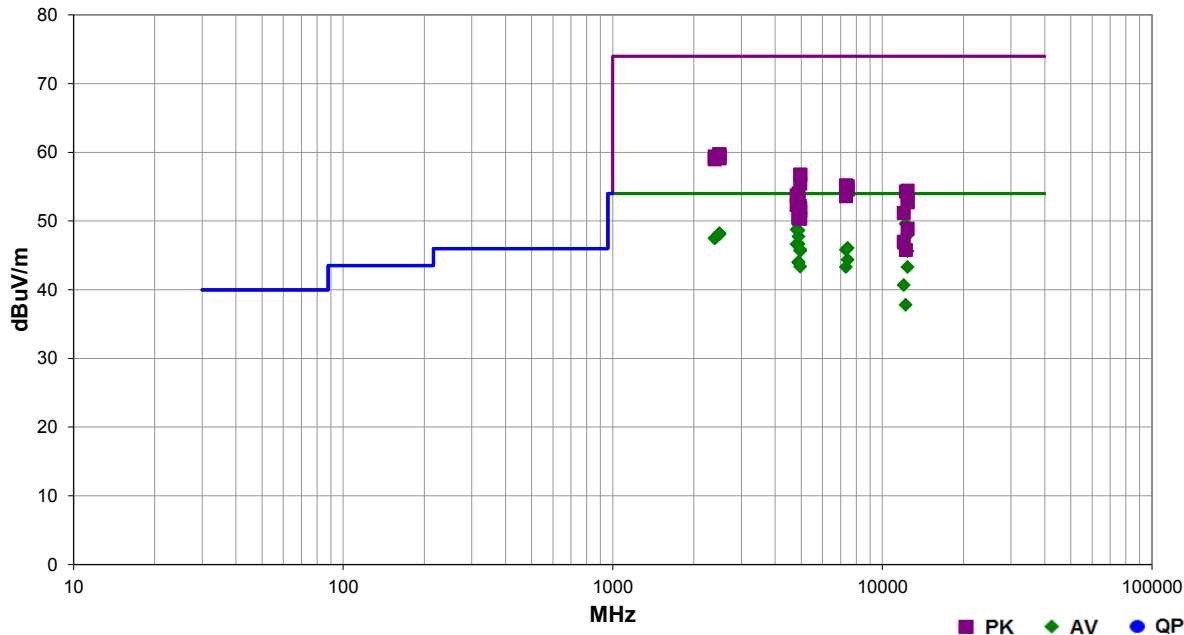
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12398.880	56.8	-4.7	1.0	0.0	3.0	0.0	Vert	AV	0.0	52.1	54.0	-1.9	BLE, high ch, EUT on side
4960.050	45.6	5.2	1.0	350.0	3.0	0.0	Vert	AV	0.0	50.8	54.0	-3.2	BLE, high ch, EUT on side
12400.980	49.5	0.2	1.0	2.0	3.0	0.0	Vert	AV	0.0	49.7	54.0	-4.3	BLE, high ch, EUT on side
4959.950	44.5	5.1	1.0	79.0	3.0	0.0	Horz	AV	0.0	49.6	54.0	-4.4	BLE, high ch, EUT vert
2484.325	31.1	-2.9	1.0	162.0	3.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	BLE, high ch, EUT horz
2487.133	31.0	-2.9	1.0	257.0	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT horz
2484.617	31.0	-2.9	2.0	263.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT on side
2486.767	30.9	-2.9	1.0	100.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	BLE, high ch, EUT vert
2485.758	30.9	-2.9	3.7	336.9	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	BLE, high ch, EUT on side
2483.933	30.9	-2.9	2.5	157.0	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	BLE, high ch, EUT vert
4960.108	42.7	5.2	1.0	80.1	3.0	0.0	Vert	AV	0.0	47.9	54.0	-6.1	BLE, high ch, EUT horz
12401.130	47.4	0.2	1.0	344.9	3.0	0.0	Horz	AV	0.0	47.6	54.0	-6.4	BLE, high ch, EUT vert
2387.458	30.8	-3.2	3.1	135.0	3.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	BLE, high ch, EUT horz
2389.925	30.8	-3.2	1.0	206.1	3.0	20.0	Vert	AV	0.0	47.6	54.0	-6.4	BLE, high ch, EUT horz
12398.900	51.4	-4.7	1.0	17.0	3.0	0.0	Horz	AV	0.0	46.7	54.0	-7.3	BLE, high ch, EUT vert
12008.810	51.9	-5.3	1.0	360.0	3.0	0.0	Vert	AV	0.0	46.6	54.0	-7.4	BLE, low ch, EUT on side
4883.675	41.2	4.9	1.0	243.9	3.0	0.0	Horz	AV	0.0	46.1	54.0	-7.9	BLE, mid ch, EUT horz
4883.608	40.3	4.9	1.3	131.1	3.0	0.0	Vert	AV	0.0	45.2	54.0	-8.8	BLE, mid ch, EUT horz
4960.050	40.0	5.2	1.0	147.0	3.0	0.0	Horz	AV	0.0	45.2	54.0	-8.8	BLE, high ch, EUT horz
4883.642	40.2	4.9	1.0	300.0	3.0	0.0	Horz	AV	0.0	45.1	54.0	-8.9	BLE, mid ch, EUT vert
4883.683	40.2	4.9	1.0	360.0	3.0	0.0	Vert	AV	0.0	45.1	54.0	-8.9	BLE, mid ch, EUT on side
4803.942	40.0	5.1	1.1	348.9	3.0	0.0	Vert	AV	0.0	45.1	54.0	-8.9	BLE, low ch, EUT on side
7439.308	31.4	13.3	1.7	59.1	3.0	0.0	Vert	AV	0.0	44.7	54.0	-9.3	BLE, high ch, EUT on side
4804.075	37.2	5.1	1.0	33.1	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	BLE, low ch, EUT vert

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
7439.342	28.9	13.3	1.0	347.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	BLE, high ch, EUT vert
4959.925	37.0	5.1	1.2	69.1	3.0	0.0	Vert	AV	0.0	42.1	54.0	-11.9	BLE, high ch, EUT vert
4960.150	36.8	5.2	1.0	300.0	3.0	0.0	Horz	AV	0.0	42.0	54.0	-12.0	BLE, high ch, EUT on side
12208.810	45.8	-4.7	1.0	221.1	3.0	0.0	Horz	AV	0.0	41.1	54.0	-12.9	BLE, mid ch, EUT horz
4884.325	36.0	4.9	1.0	69.1	3.0	0.0	Vert	AV	0.0	40.9	54.0	-13.1	BLE, mid ch, EUT vert
7326.675	27.8	12.8	1.0	304.9	3.0	0.0	Vert	AV	0.0	40.6	54.0	-13.4	BLE, mid ch, EUT horz
12008.930	45.9	-5.3	1.0	8.1	3.0	0.0	Horz	AV	0.0	40.6	54.0	-13.4	BLE, low ch, EUT vert
4883.575	35.5	4.9	1.0	264.9	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	BLE, mid ch, EUT on side
7325.200	27.5	12.8	1.0	271.0	3.0	0.0	Horz	AV	0.0	40.3	54.0	-13.7	BLE, mid ch, EUT horz
2484.625	42.6	-2.9	1.0	257.0	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	BLE, high ch, EUT horz
12208.790	44.2	-4.7	1.0	318.9	3.0	0.0	Vert	AV	0.0	39.5	54.0	-14.5	BLE, mid ch, EUT horz
2487.167	42.3	-2.9	2.5	157.0	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	BLE, high ch, EUT vert
2486.292	42.3	-2.9	2.0	263.0	3.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6	BLE, high ch, EUT on side
2485.725	42.2	-2.9	1.0	162.0	3.0	20.0	Vert	PK	0.0	59.3	74.0	-14.7	BLE, high ch, EUT horz
2484.908	42.1	-2.9	1.0	100.0	3.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	BLE, high ch, EUT vert
2483.758	42.1	-2.9	3.7	336.9	3.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	BLE, high ch, EUT on side
2386.225	42.2	-3.2	3.1	135.0	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	BLE, high ch, EUT horz
2387.883	41.9	-3.2	1.0	206.1	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	BLE, high ch, EUT horz
12398.770	61.1	-4.7	1.0	0.0	3.0	0.0	Vert	PK	0.0	56.4	74.0	-17.6	BLE, high ch, EUT on side
12401.160	55.4	0.2	1.0	2.0	3.0	0.0	Vert	PK	0.0	55.6	74.0	-18.4	BLE, high ch, EUT on side
4960.383	49.9	5.2	1.0	350.0	3.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	BLE, high ch, EUT on side
7440.692	41.1	13.3	1.7	59.1	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	BLE, high ch, EUT on side
4959.450	48.9	5.1	1.0	79.0	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	BLE, high ch, EUT vert
12401.270	53.8	0.2	1.0	344.9	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	BLE, high ch, EUT vert
4959.558	48.1	5.1	1.0	80.1	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	BLE, high ch, EUT horz
7437.525	39.7	13.3	1.0	347.0	3.0	0.0	Horz	PK	0.0	53.0	74.0	-21.0	BLE, high ch, EUT vert
4883.517	47.1	4.9	1.0	243.9	3.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	BLE, mid ch, EUT horz
12398.920	56.5	-4.7	1.0	17.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	BLE, high ch, EUT vert
12011.250	57.1	-5.3	1.0	360.0	3.0	0.0	Vert	PK	0.0	51.8	74.0	-22.2	BLE, low ch, EUT on side
7327.683	38.6	12.8	1.0	304.9	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	BLE, mid ch, EUT horz
4884.442	46.3	4.9	1.0	360.0	3.0	0.0	Vert	PK	0.0	51.2	74.0	-22.8	BLE, mid ch, EUT on side
4884.592	46.3	4.9	1.0	300.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8	BLE, mid ch, EUT vert
4960.450	46.0	5.2	1.0	147.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8	BLE, high ch, EUT horz
4883.475	46.2	4.9	1.3	131.1	3.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9	BLE, mid ch, EUT horz
4803.500	46.0	5.1	1.1	348.9	3.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9	BLE, low ch, EUT on side
7326.650	38.3	12.8	1.0	271.0	3.0	0.0	Horz	PK	0.0	51.1	74.0	-22.9	BLE, mid ch, EUT horz
4803.517	44.7	5.1	1.0	33.1	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	BLE, low ch, EUT vert
4960.367	44.6	5.2	1.0	300.0	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	BLE, high ch, EUT on side
4959.433	44.3	5.1	1.2	69.1	3.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	BLE, high ch, EUT vert
4884.392	43.7	4.9	1.0	69.1	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	BLE, mid ch, EUT vert
4883.625	43.4	4.9	1.0	264.9	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	BLE, mid ch, EUT on side
12208.880	52.2	-4.7	1.0	221.1	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	BLE, mid ch, EUT horz
12011.230	52.7	-5.3	1.0	8.1	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	BLE, low ch, EUT vert
12208.640	50.8	-4.7	1.0	318.9	3.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	BLE, mid ch, EUT horz

Work Order:	LGPD0151	Date:	05/01/15	
Project:	None	Temperature:	24.2 °C	
Job Site:	MN05	Humidity:	23.7% RH	
Serial Number:	See configuration	Barometric Pres.:	1018.7 mbar	
EUT:	DM3730 Torpedo + Wireless SOM -32			
Configuration:	4			
Customer:	Logic PD			
Attendees:	None			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting Bluetooth low energy - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz).			
Deviations:	None			
Comments:	Isolated magnetic dipole antenna			

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

Run #	218	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4960.175	47.9	5.2	1.0	12.1	3.0	0.0	Horz	AV	0.0	53.1	54.0	-0.9	BLE, high ch, EUT vert
4960.083	47.7	5.2	1.0	5.1	3.0	0.0	Vert	AV	0.0	52.9	54.0	-1.1	BLE, high ch, EUT on side
4960.125	46.0	5.2	1.0	188.1	3.0	0.0	Horz	AV	0.0	51.2	54.0	-2.8	BLE, high ch, EUT horz
12208.840	54.3	-4.7	1.0	360.0	3.0	0.0	Vert	AV	0.0	49.6	54.0	-4.4	BLE, mid ch, EUT on side
4804.058	43.6	5.1	1.0	53.0	3.0	0.0	Horz	AV	0.0	48.7	54.0	-5.3	BLE, low ch, EUT vert
4883.675	43.7	4.9	1.0	30.1	3.0	0.0	Horz	AV	0.0	48.6	54.0	-5.4	BLE, mid ch, EUT vert
2487.600	31.1	-2.9	1.6	208.0	3.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	BLE, high ch, EUT vert
2486.833	31.0	-2.9	1.0	69.1	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT vert
2486.583	31.0	-2.9	1.0	149.1	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT on side
2486.267	31.0	-2.9	3.8	351.9	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT horz
2485.600	31.0	-2.9	4.0	223.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT horz
2484.575	31.0	-2.9	2.1	81.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT on side
12398.920	52.8	-4.7	1.0	351.0	3.0	0.0	Vert	AV	0.0	48.1	54.0	-5.9	BLE, high ch, EUT on side
12401.150	47.7	0.2	1.8	360.0	3.0	0.0	Vert	AV	0.0	47.9	54.0	-6.1	BLE, high ch, EUT on side
4883.633	42.8	4.9	1.2	50.0	3.0	0.0	Vert	AV	0.0	47.7	54.0	-6.3	BLE, mid ch, EUT on side
2386.892	30.7	-3.2	1.0	0.0	3.0	20.0	Vert	AV	0.0	47.5	54.0	-6.5	BLE, low ch, EUT vert
2389.542	30.7	-3.2	2.9	265.9	3.0	20.0	Horz	AV	0.0	47.5	54.0	-6.5	BLE, low ch, EUT vert
4883.642	41.7	4.9	1.1	63.0	3.0	0.0	Horz	AV	0.0	46.6	54.0	-7.4	BLE, mid ch, EUT horz
4803.992	41.5	5.1	1.3	14.0	3.0	0.0	Vert	AV	0.0	46.6	54.0	-7.4	BLE, low ch, EUT on side
12008.810	51.4	-5.3	1.0	358.0	3.0	0.0	Vert	AV	0.0	46.1	54.0	-7.9	BLE, low ch, EUT on side
7439.367	32.8	13.3	1.4	307.0	3.0	0.0	Horz	AV	0.0	46.1	54.0	-7.9	BLE, high ch, EUT vert
4960.150	40.7	5.2	1.0	286.0	3.0	0.0	Vert	AV	0.0	45.9	54.0	-8.1	BLE, 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
7325.467	33.0	12.8	1.5	311.9	3.0	0.0	Horz	AV	0.0	45.8	54.0	-8.2	BLE, mid ch, EUT vert
4960.092	40.5	5.2	1.0	292.1	3.0	0.0	Horz	AV	0.0	45.7	54.0	-8.3	BLE, high ch, EUT on side
12401.000	45.4	0.2	1.0	318.9	3.0	0.0	Horz	AV	0.0	45.6	54.0	-8.4	BLE, high ch, EUT vert
7439.400	31.1	13.3	1.0	336.0	3.0	0.0	Vert	AV	0.0	44.4	54.0	-9.6	BLE, high ch, EUT on side
4883.675	39.1	4.9	1.2	304.0	3.0	0.0	Vert	AV	0.0	44.0	54.0	-10.0	BLE, mid ch, EUT horz
4883.542	39.0	4.9	1.0	308.9	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	BLE, mid ch, EUT on side
4883.650	39.0	4.9	1.3	66.1	3.0	0.0	Vert	AV	0.0	43.9	54.0	-10.1	BLE, mid ch, EUT vert
4960.033	38.2	5.2	3.3	50.1	3.0	0.0	Vert	AV	0.0	43.4	54.0	-10.6	BLE, high ch, EUT vert
7326.633	30.5	12.8	1.0	326.9	3.0	0.0	Vert	AV	0.0	43.3	54.0	-10.7	BLE, mid ch, EUT on side
12398.850	48.0	-4.7	1.0	45.0	3.0	0.0	Horz	AV	0.0	43.3	54.0	-10.7	BLE, high ch, EUT vert
12008.850	46.0	-5.3	1.0	314.0	3.0	0.0	Horz	AV	0.0	40.7	54.0	-13.3	BLE, low ch, EUT vert
2488.200	42.6	-2.9	2.1	81.0	3.0	20.0	Vert	PK	0.0	59.7	74.0	-14.3	BLE, high ch, EUT on side
2483.817	42.6	-2.9	1.0	69.1	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	BLE, high ch, EUT vert
2486.767	42.3	-2.9	3.8	351.9	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	BLE, high ch, EUT horz
2484.925	42.3	-2.9	1.0	149.1	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	BLE, high ch, EUT on side
2385.908	42.6	-3.2	2.9	265.9	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	BLE, low ch, EUT vert
2487.008	42.1	-2.9	4.0	223.0	3.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	BLE, high ch, EUT horz
2487.942	42.0	-2.9	1.6	208.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	BLE, high ch, EUT vert
2388.583	42.2	-3.2	1.0	0.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	BLE, low ch, EUT vert
12208.870	42.5	-4.7	1.0	0.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	BLE, mid ch, EUT vert
4960.575	51.6	5.2	1.0	12.1	3.0	0.0	Horz	PK	0.0	56.8	74.0	-17.2	BLE, high ch, EUT vert
4959.583	51.6	5.1	1.0	5.1	3.0	0.0	Vert	PK	0.0	56.7	74.0	-17.3	BLE, high ch, EUT on side
4960.650	50.3	5.2	1.0	188.1	3.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	BLE, high ch, EUT horz
7325.567	42.4	12.8	1.5	311.9	3.0	0.0	Horz	PK	0.0	55.2	74.0	-18.8	BLE, mid ch, EUT vert
7439.992	41.8	13.3	1.4	307.0	3.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	BLE, high ch, EUT vert
7441.000	41.3	13.3	1.0	336.0	3.0	0.0	Vert	PK	0.0	54.6	74.0	-19.4	BLE, high ch, EUT on side
12401.340	54.2	0.2	1.8	360.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	BLE, high ch, EUT on side
12211.230	59.0	-4.7	1.0	360.0	3.0	0.0	Vert	PK	0.0	54.3	74.0	-19.7	BLE, mid ch, EUT on side
4884.467	49.1	4.9	1.0	30.1	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	BLE, mid ch, EUT vert
4803.625	48.6	5.1	1.0	53.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	BLE, low ch, EUT vert
7325.058	40.8	12.8	1.0	326.9	3.0	0.0	Vert	PK	0.0	53.6	74.0	-20.4	BLE, mid ch, EUT on side
12398.600	57.6	-4.7	1.0	351.0	3.0	0.0	Vert	PK	0.0	52.9	74.0	-21.1	BLE, high ch, EUT on side
4883.683	47.9	4.9	1.2	50.0	3.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	BLE, mid ch, EUT on side
12401.220	52.5	0.2	1.0	318.9	3.0	0.0	Horz	PK	0.0	52.7	74.0	-21.3	BLE, high ch, EUT vert
4803.508	47.2	5.1	1.3	14.0	3.0	0.0	Vert	PK	0.0	52.3	74.0	-21.7	BLE, low ch, EUT on side
4883.500	47.3	4.9	1.1	63.0	3.0	0.0	Horz	PK	0.0	52.2	74.0	-21.8	BLE, mid ch, EUT horz
4960.508	46.8	5.2	1.0	286.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	BLE, high ch, EUT horz
4959.850	46.3	5.1	1.0	292.1	3.0	0.0	Horz	PK	0.0	51.4	74.0	-22.6	BLE, high ch, EUT on side
12011.220	56.5	-5.3	1.0	358.0	3.0	0.0	Vert	PK	0.0	51.2	74.0	-22.8	BLE, low ch, EUT on side
4883.667	45.6	4.9	1.0	308.9	3.0	0.0	Horz	PK	0.0	50.5	74.0	-23.5	BLE, mid ch, EUT on side
4884.342	45.6	4.9	1.2	304.0	3.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	BLE, mid ch, EUT horz
4960.400	45.2	5.2	3.3	50.1	3.0	0.0	Vert	PK	0.0	50.4	74.0	-23.6	BLE, high ch, EUT vert
4883.567	45.4	4.9	1.3	66.1	3.0	0.0	Vert	PK	0.0	50.3	74.0	-23.7	BLE, mid ch, EUT vert
12399.110	53.6	-4.7	1.0	45.0	3.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	BLE, high ch, EUT vert
12008.710	52.3	-5.3	1.0	314.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	BLE, low ch, EUT vert
12211.130	50.5	-4.7	1.0	0.0	3.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2	BLE, mid ch, EUT vert

BAND EDGE COMPLIANCE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Attenuator, 20db, 'SMA'	SM Electronics	SA26B-20	RFW	3/10/2015	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate listed in the datasheet.

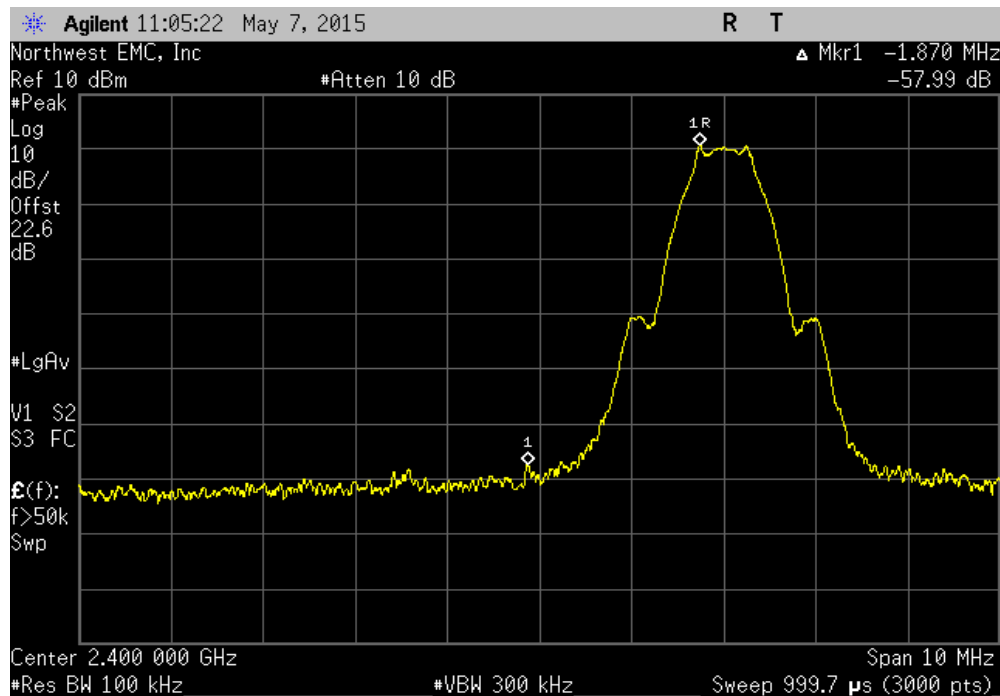
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

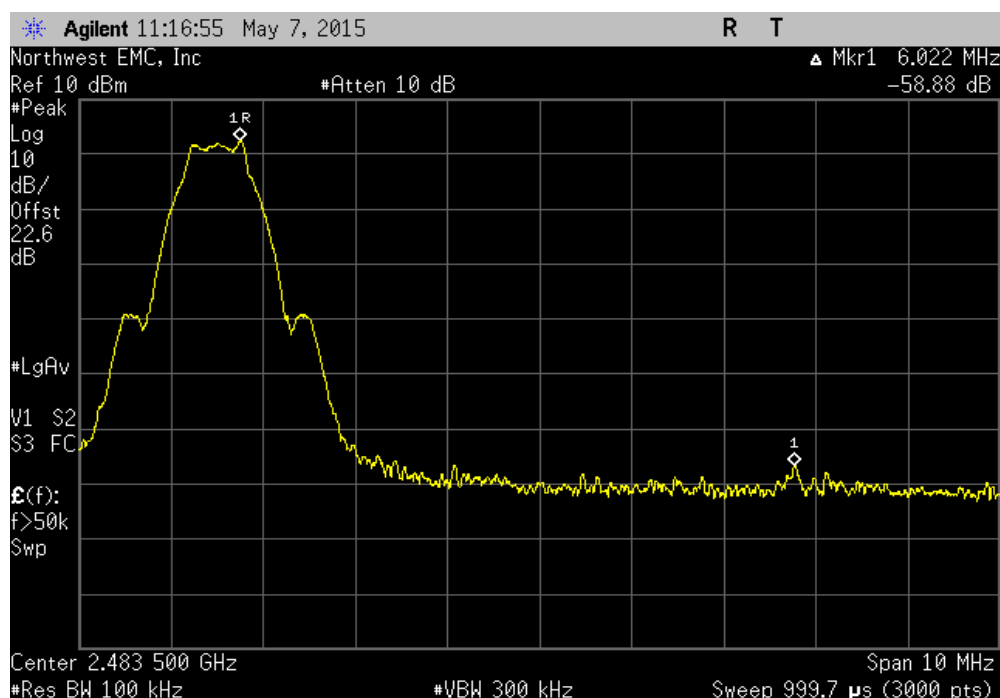
EUT: DM3730 Torpedo + Wireless SOM -32		Work Order: LGPD0151	
Serial Number: See configuration		Date: 05/08/15	
Customer: Logic PD		Temperature: 22.1°C	
Attendees: Adam Ford		Humidity: 41%	
Project: None		Barometric Pres.: 1014.5	
Tested by: Brandon Hobbs		Power: 110VAC/60Hz	Job Site: MN08
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
The EUT was tested with the fundamental modulated while under test. All caBluetooth LE losses were accounted for.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Bluetooth LE			
Low Channel, 2402 MHz		-57.99	-20 Pass
High Channel, 2480 MHz		-58.88	-20 Pass

BAND EDGE COMPLIANCE

Bluetooth LE, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-57.99	-20	Pass



Bluetooth LE, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-58.88	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Attenuator, 20db, 'SMA'	SM Electronics	SA26B-20	RFW	3/10/2015	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

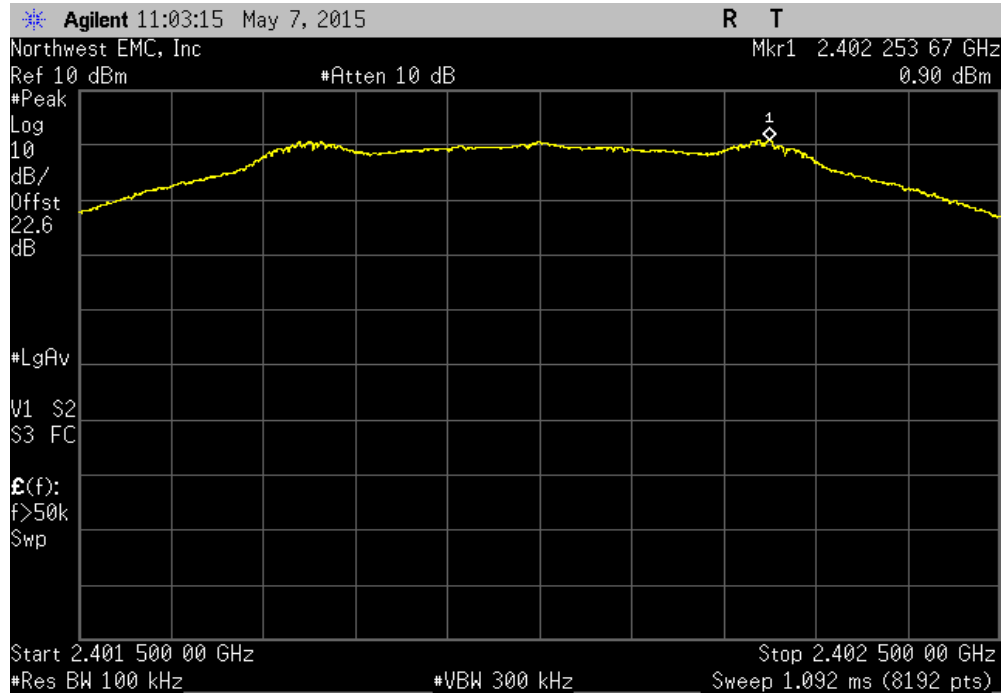
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

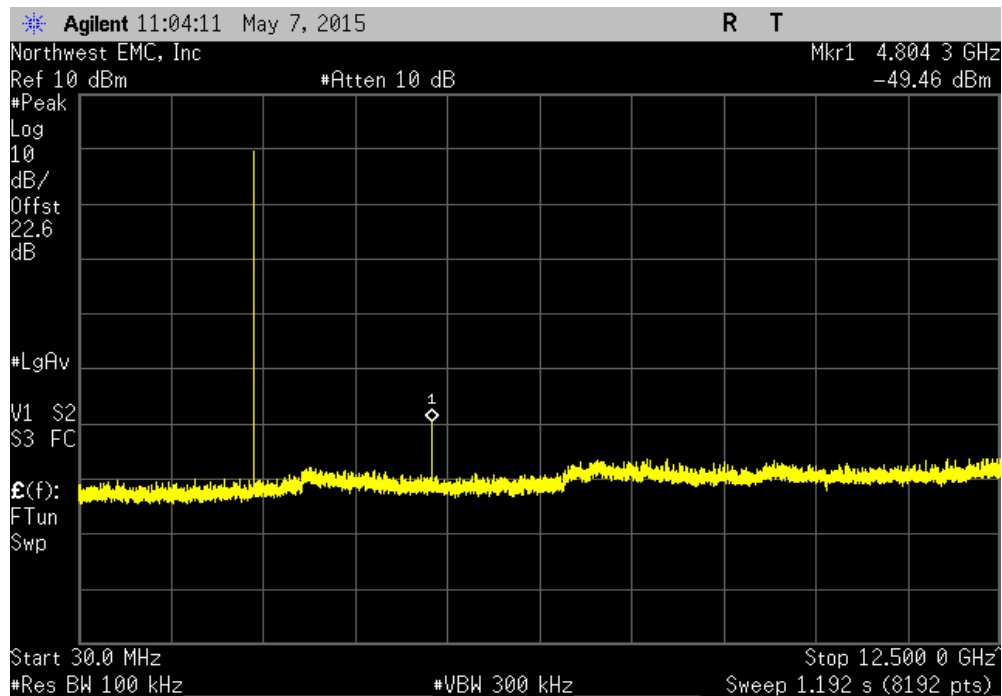
EUT: DM3730 Torpedo + Wireless SOM -32		Work Order: LGPD0151	
Serial Number: See configuration		Date: 05/08/15	
Customer: Logic PD		Temperature: 22.1°C	
Attendees: Adam Ford		Humidity: 41%	
Project: None		Barometric Pres.: 1014.5	
Tested by: Brandon Hobbs		Power: 110VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
The EUT was tested with the fundamental modulated while under test. All cable losses were accounted for.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Frequency Range	Value (dBc)
			Limit ≤ (dBc)
			Result
Bluetooth LE			
Low Channel, 2402 MHz		Fundamental	N/A
Low Channel, 2402 MHz		30 MHz - 12.5 GHz	-50.36
Low Channel, 2402 MHz		12.5 GHz - 25 GHz	-52.72
Mid Channel, 2426 MHz		Fundamental	N/A
Mid Channel, 2426 MHz		30 MHz - 12.5 GHz	-51.05
Mid Channel, 2426 MHz		12.5 GHz - 25 GHz	-53.53
High Channel, 2480 MHz		Fundamental	N/A
High Channel, 2480 MHz		30 MHz - 12.5 GHz	-49.78
High Channel, 2480 MHz		12.5 GHz - 25 GHz	-53.98
			Pass

SPURIOUS CONDUCTED EMISSIONS

Bluetooth LE, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

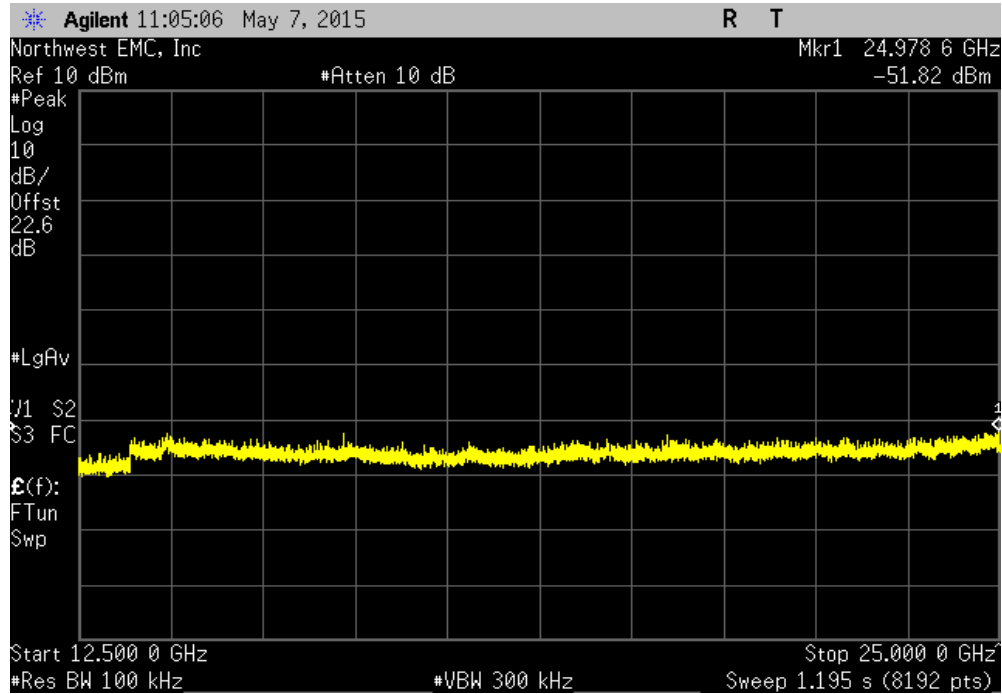


Bluetooth LE, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-50.36	-20	Pass		

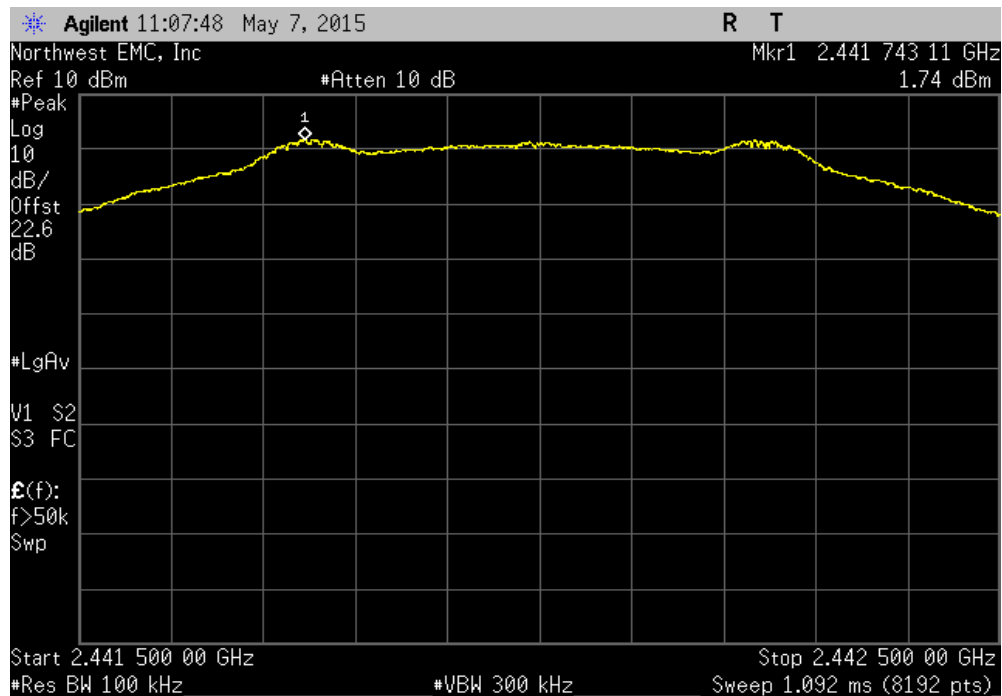


SPURIOUS CONDUCTED EMISSIONS

Bluetooth LE, Low Channel, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-52.72	-20	Pass	

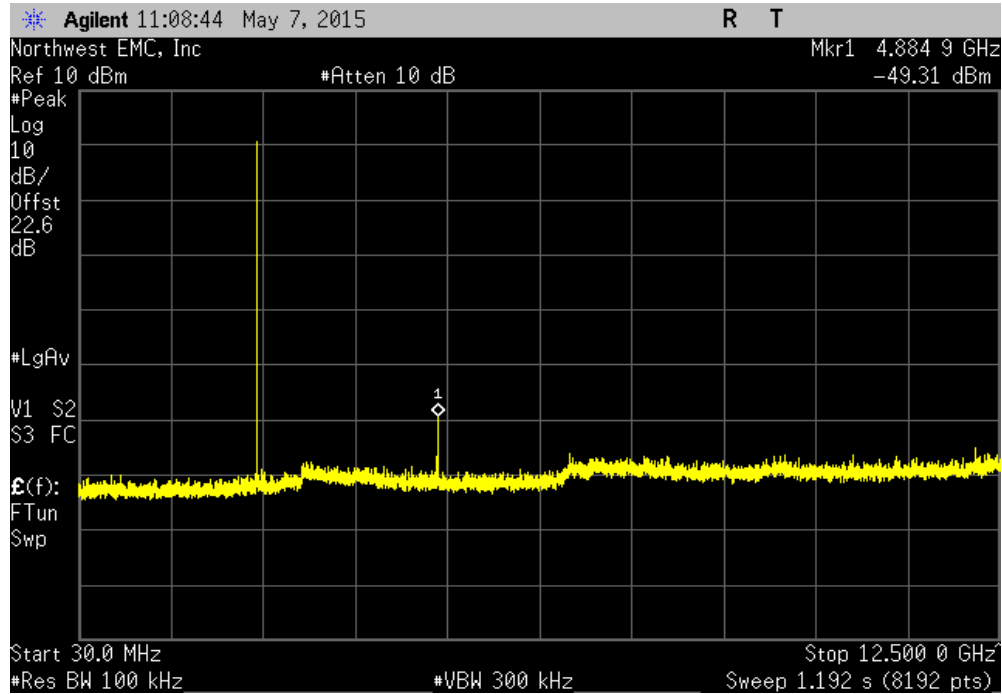


Bluetooth LE, Mid Channel, 2426 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

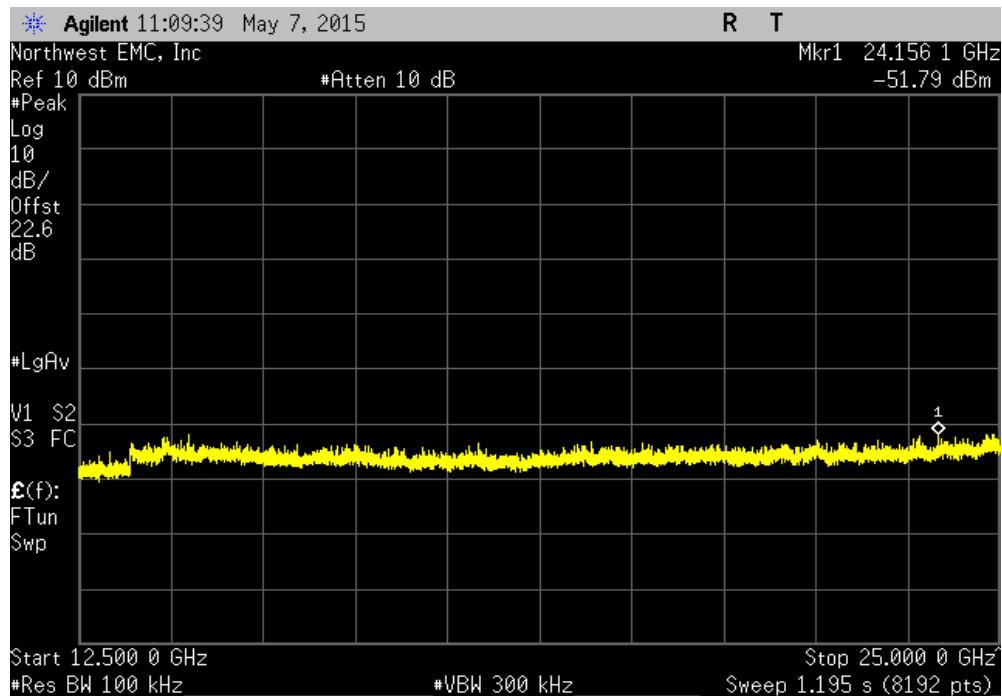


SPURIOUS CONDUCTED EMISSIONS

Bluetooth LE, Mid Channel, 2426 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-51.05	-20	Pass	

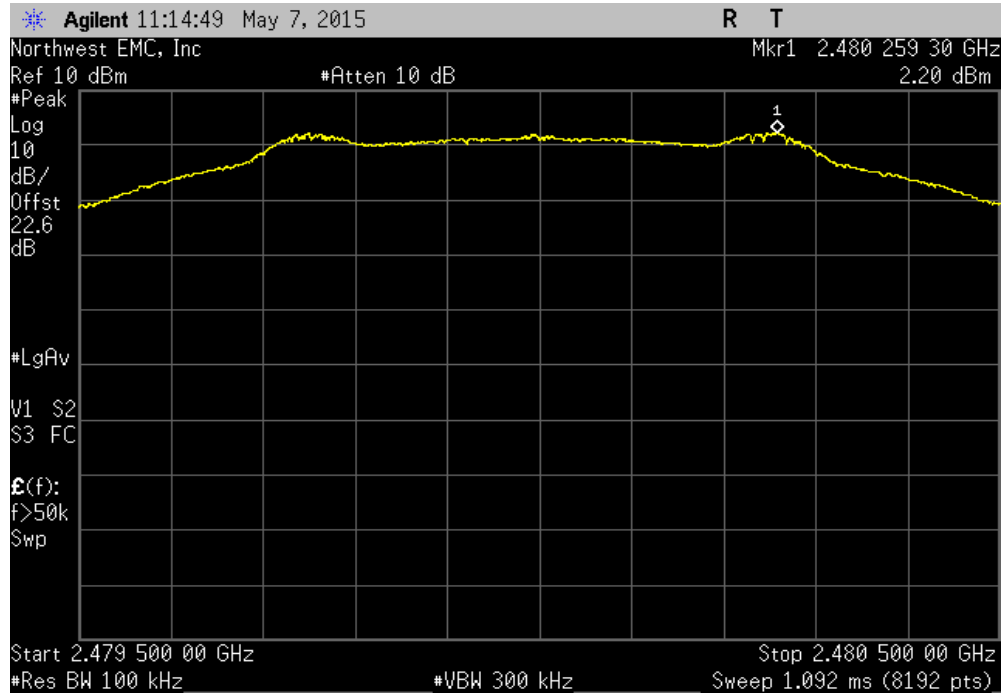


Bluetooth LE, Mid Channel, 2426 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-53.53	-20	Pass	

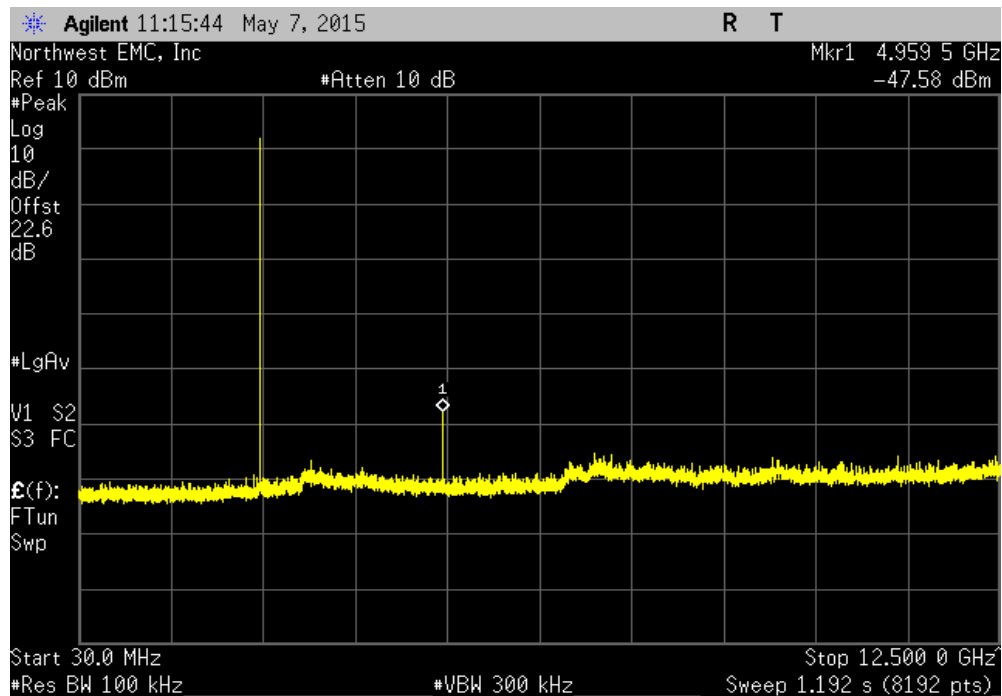


SPURIOUS CONDUCTED EMISSIONS

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

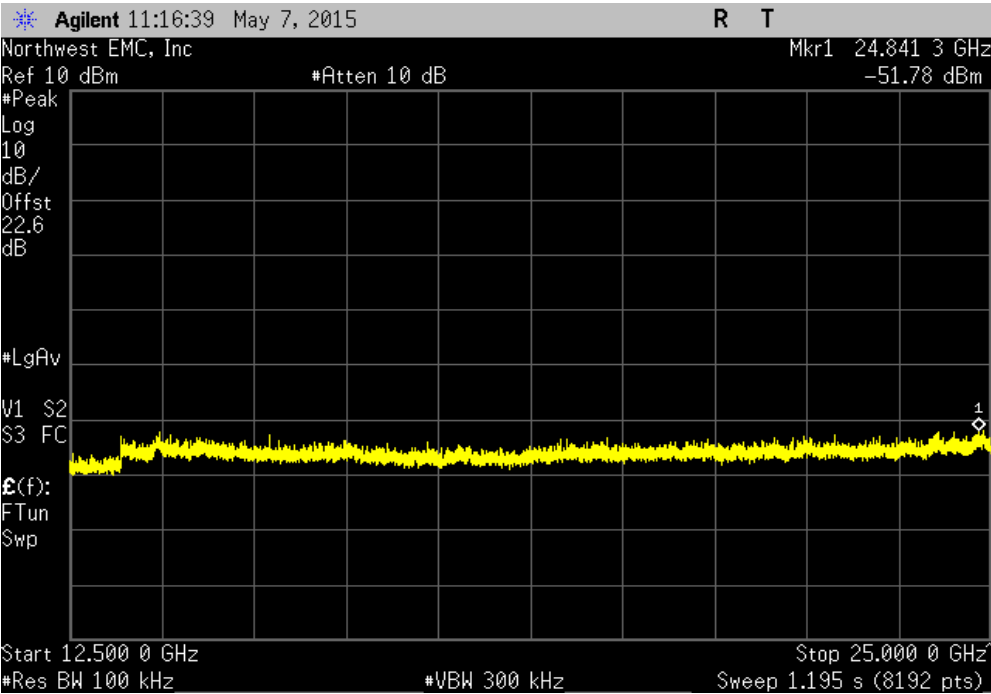


Bluetooth LE, High Channel, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-49.78	-20	Pass		



SPURIOUS CONDUCTED EMISSIONS

Bluetooth LE, High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-53.98	-20	Pass	



OCCUPIED BANDWIDTH

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Attenuator, 20db, 'SMA'	SM Electronics	SA26B-20	RFW	3/10/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

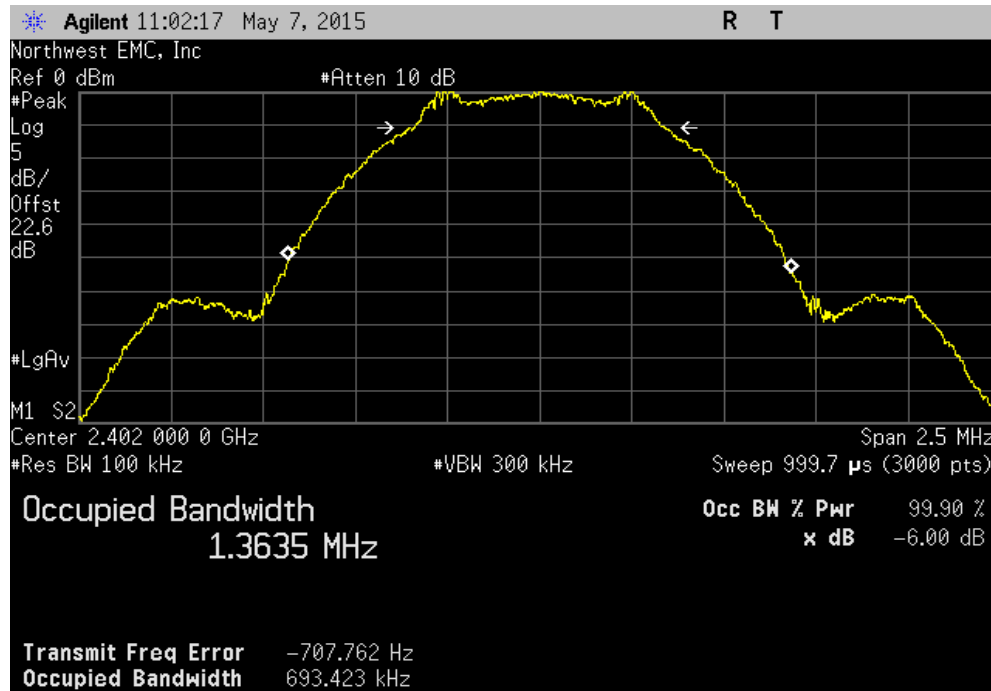
The EUT was set to the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer.

OCCUPIED BANDWIDTH

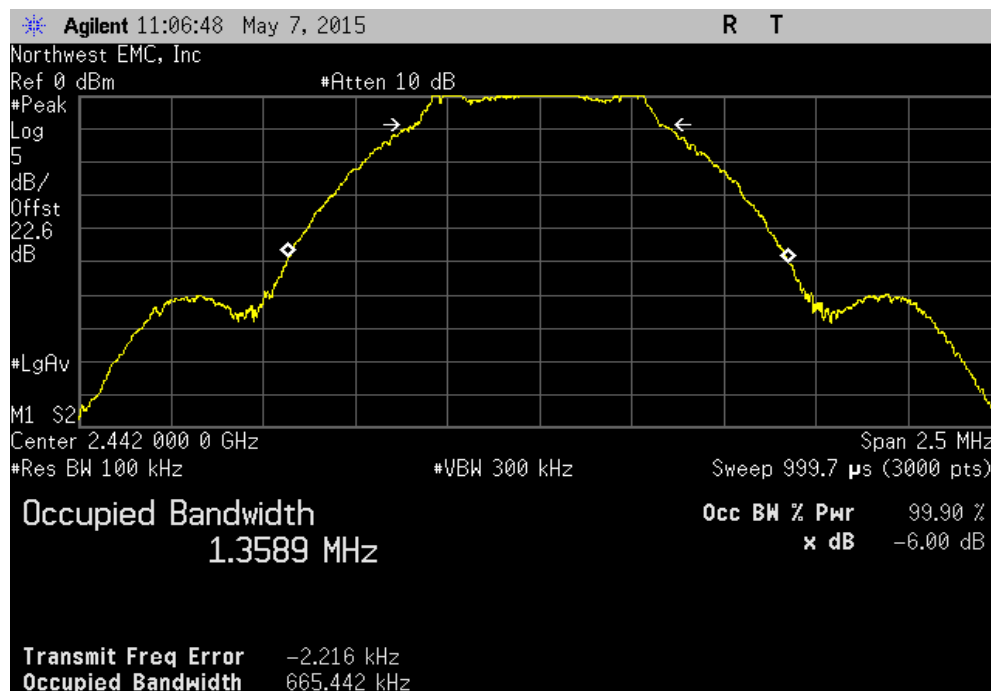
EUT: DM3730 Torpedo + Wireless SOM -32		Work Order: LGPD0151	
Serial Number: See configuration		Date: 05/08/15	
Customer: Logic PD		Temperature: 22.1°C	
Attendees: Adam Ford		Humidity: 41%	
Project: None		Barometric Pres.: 1014.5	
Tested by: Brandon Hobbs		Power: 110VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
The EUT was tested with the fundamental modulated while under test. All cable losses were accounted for.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Value	Limit (±) Result
Bluetooth LE			
	Low Channel, 2402 MHz	693.424 kHz	500 kHz Pass
	Mid Channel, 2426 MHz	665.442 kHz	500 kHz Pass
	High Channel, 2480 MHz	679.568 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

Bluetooth LE, Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				693.424 kHz	500 kHz	Pass

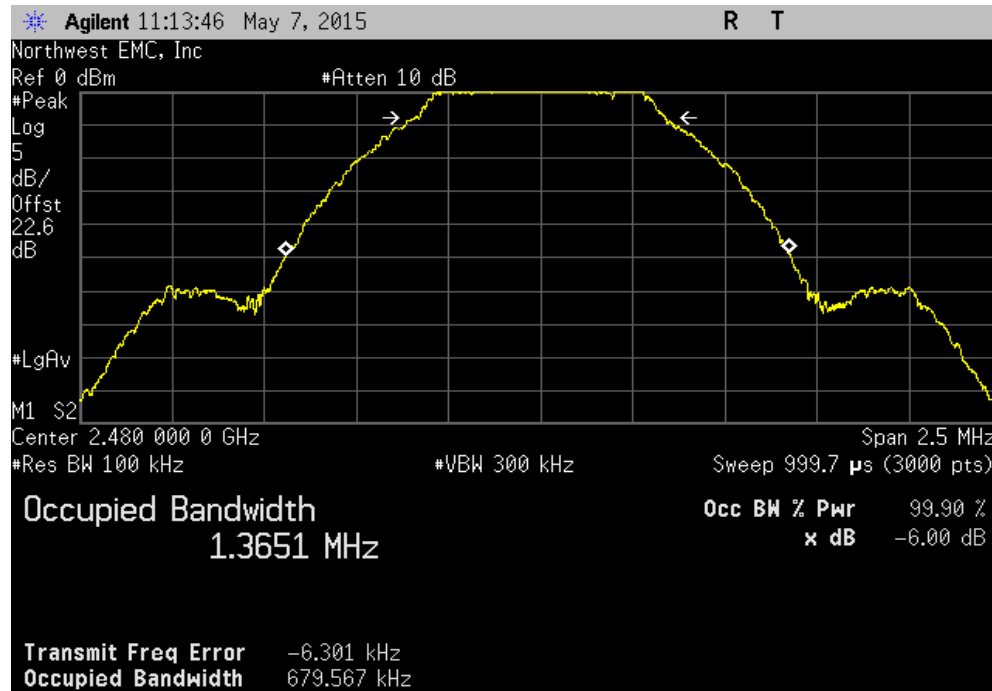


Bluetooth LE, Mid Channel, 2426 MHz						
				Value	Limit (≥)	Result
				665.442 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

Bluetooth LE, High Channel, 2480 MHz						
Value				Limit (≥)	Result	
679.568 kHz				500 kHz	Pass	



OUTPUT POWER

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Attenuator, 20db, 'SMA'	SM Electronics	SA26B-20	RFW	3/10/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

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

The method found in KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

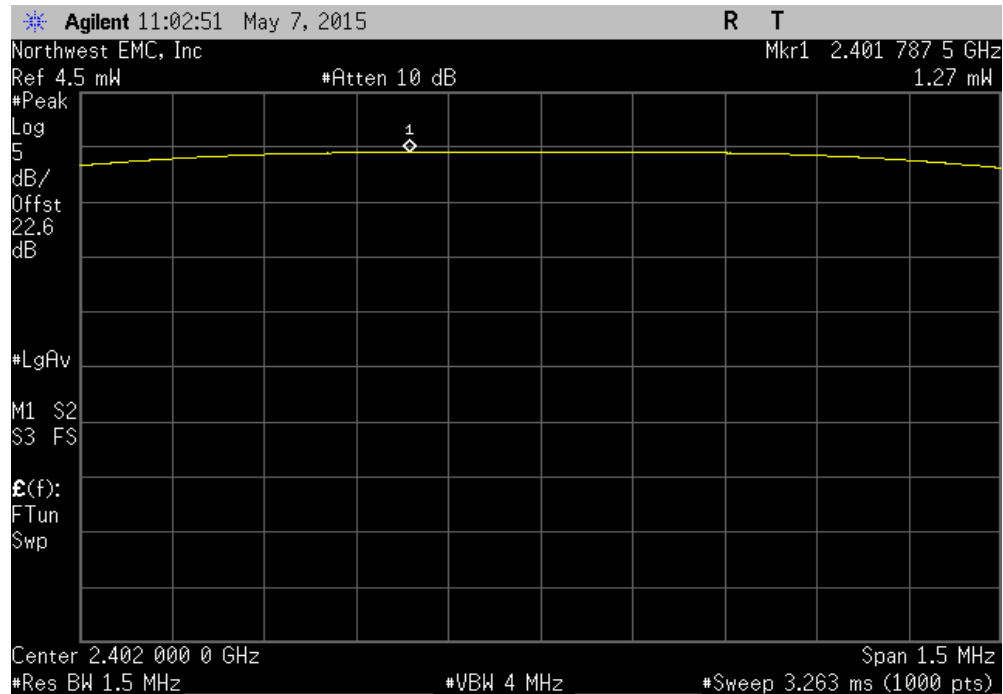
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

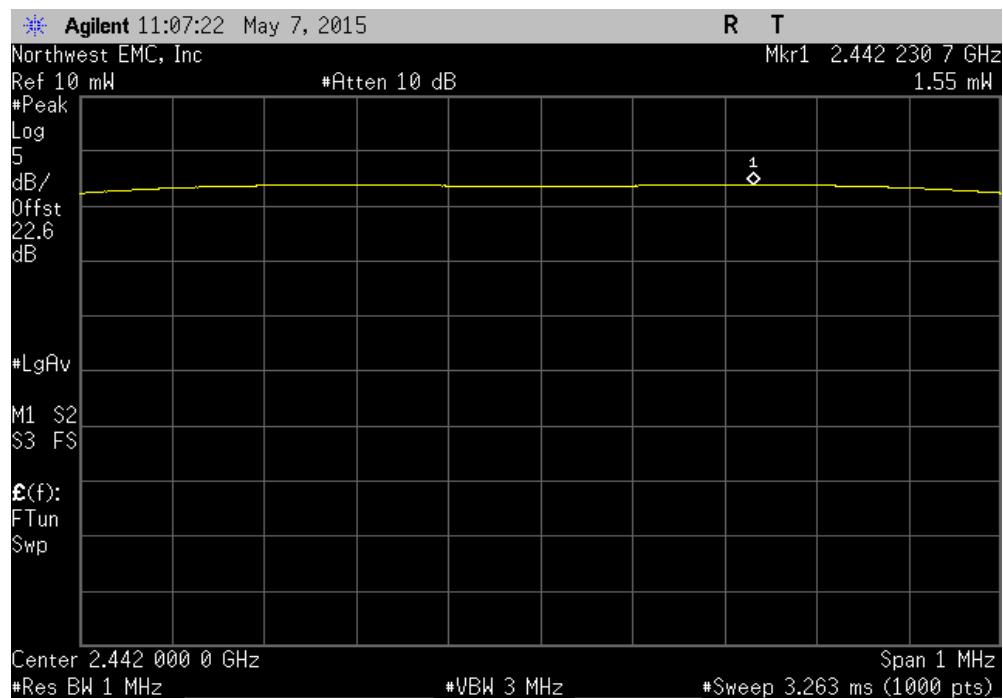
EUT: DM3730 Torpedo + Wireless SOM -32		Work Order: LGPD0151	
Serial Number: See configuration		Date: 05/08/15	
Customer: Logic PD		Temperature: 22.1°C	
Attendees: Adam Ford		Humidity: 41%	
Project: None		Barometric Pres.: 1014.5	
Tested by: Brandon Hobbs		Power: 110VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
The EUT was tested with the fundamental modulated while under test. All cable losses were accounted for.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Value	Limit (<) Result
Bluetooth LE			
	Low Channel, 2402 MHz	1.265 mW	1 W Pass
	Mid Channel, 2426 MHz	1.549 mW	1 W Pass
	High Channel, 2480 MHz	1.755 mW	1 W Pass

OUTPUT POWER

Bluetooth LE, Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				1.265 mW	1 W	Pass

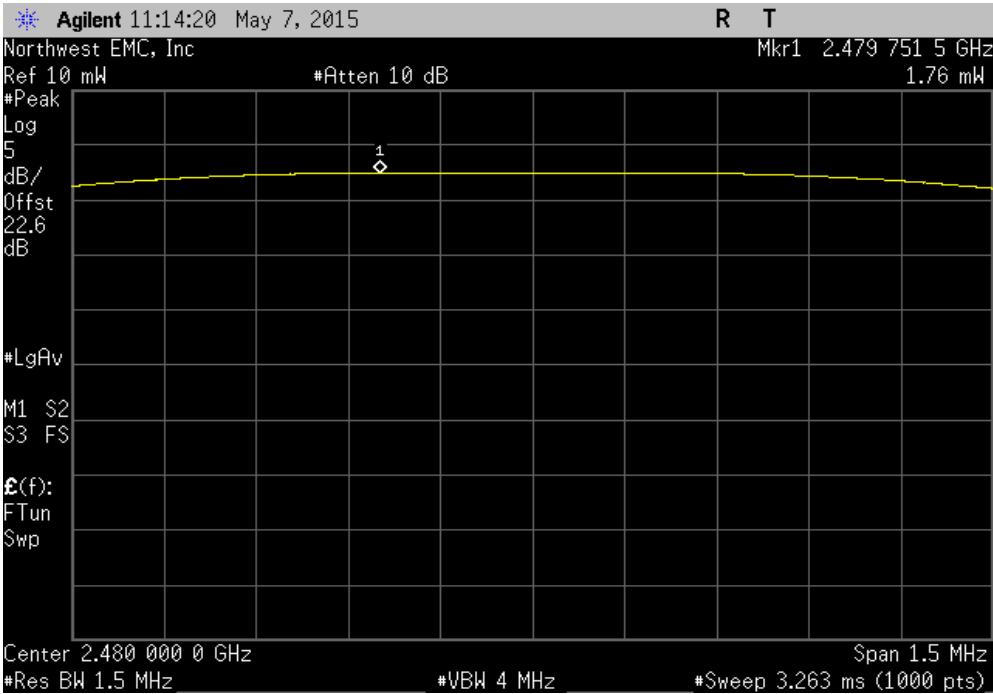


Bluetooth LE, Mid Channel, 2426 MHz						
				Value	Limit (<)	Result
				1.549 mW	1 W	Pass



OUTPUT POWER

Bluetooth LE, High Channel, 2480 MHz						
				Value	Limit (<)	Result
				1.755 mW	1 W	Pass



POWER SPECTRAL DENSITY

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Attenuator, 20db, 'SMA'	SM Electronics	SA26B-20	RFW	3/10/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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

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

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

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

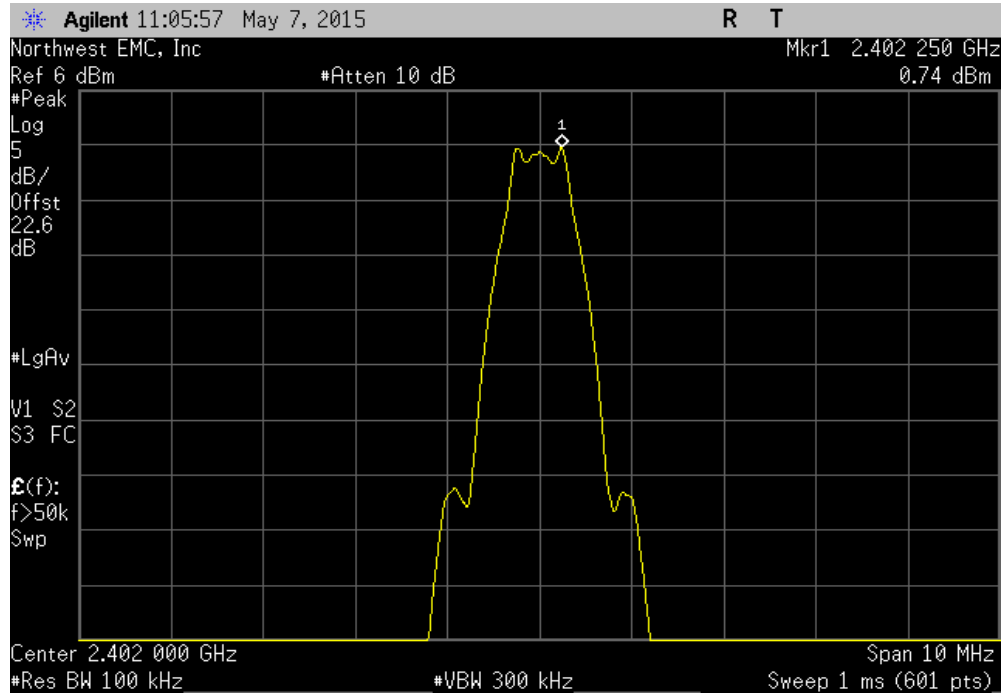
$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

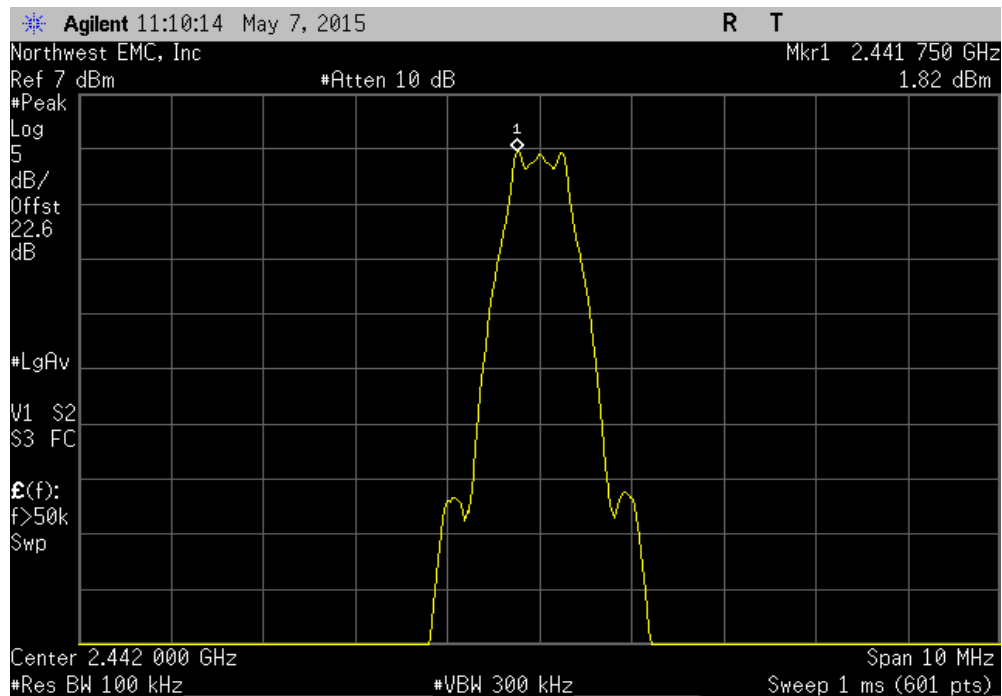
EUT: DM3730 Torpedo + Wireless SOM -32		Work Order: LGPD0151	
Serial Number: See configuration		Date: 05/08/15	
Customer: Logic PD		Temperature: 22.1°C	
Attendees: Adam Ford		Humidity: 41%	
Project: None		Barometric Pres.: 1014.5	
Tested by: Brandon Hobbs		Power: 110VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
The EUT was tested with the fundamental modulated while under test. All cable losses were accounted for.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
Bluetooth LE			
	Low Channel, 2402 MHz	0.744	-15.2
	Mid Channel, 2426 MHz	1.817	-15.2
	High Channel, 2480 MHz	2.298	-15.2
		-14.456	8
		-13.383	8
		-12.902	8
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

Bluetooth LE, Low Channel, 2402 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	0.744	-15.2	-14.456	8	Pass	

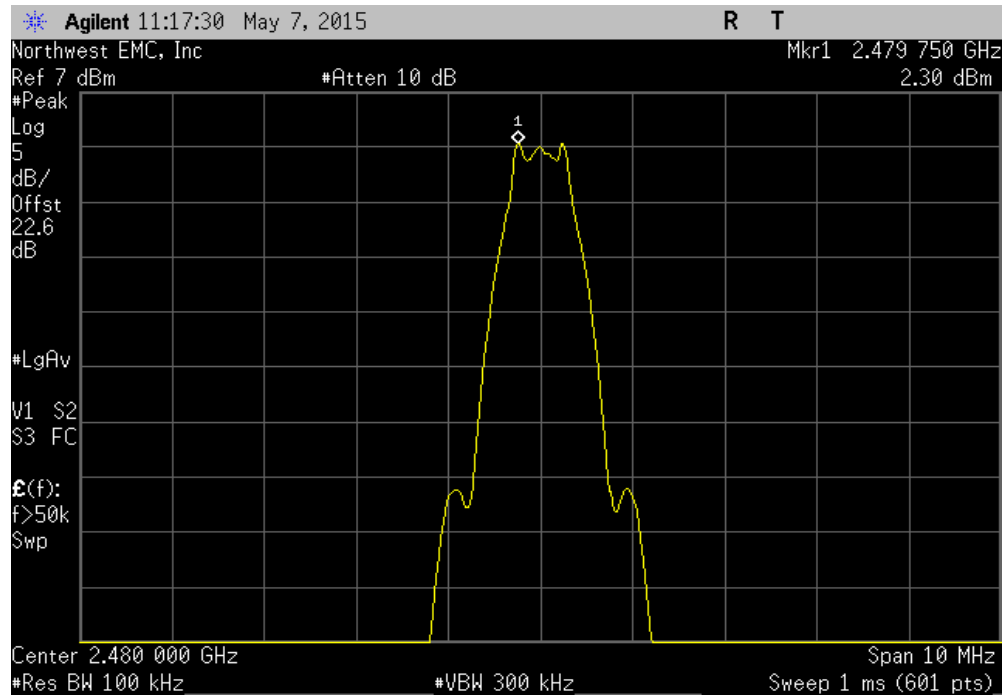


Bluetooth LE, Mid Channel, 2426 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	1.817	-15.2	-13.383	8	Pass	



POWER SPECTRAL DENSITY

Bluetooth LE, High Channel, 2480 MHz							
Value		dBm/100kHz		Value		Limit	Results
dBm/100kHz		To dBm/3kHz		dBm/3kHz		dBm/3kHz	
		2.298	-15.2	-12.902		8	Pass



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.