NORTHWEST EMC

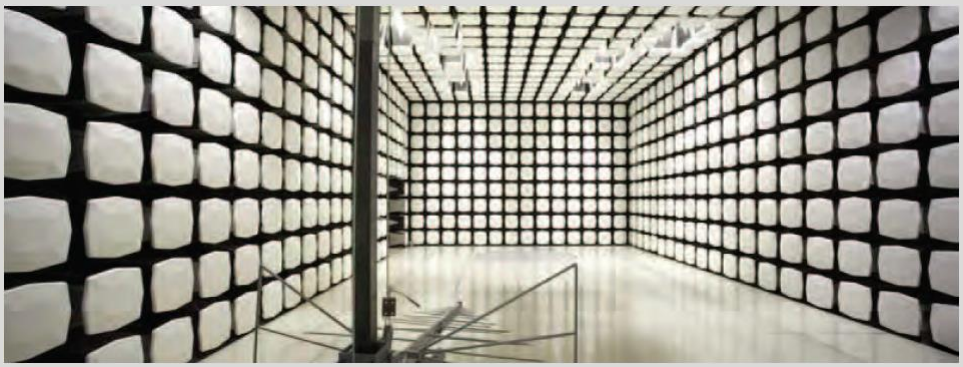
Impinj, Inc.

xSpan RFID reader system

FCC 15.207:2016
FCC 15.247:2016

Bluetooth Low Energy Module

Report # IMPI0002.1



NVLAP TESTING

NVLAP Lab Code: 200629-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: July 14, 2016
Impinj, Inc.
Model: xSpan RFID reader system

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	
11.9.2.2.4	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:

Rod Munro, Operations Manager

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

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2016.3.22

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 Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

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

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

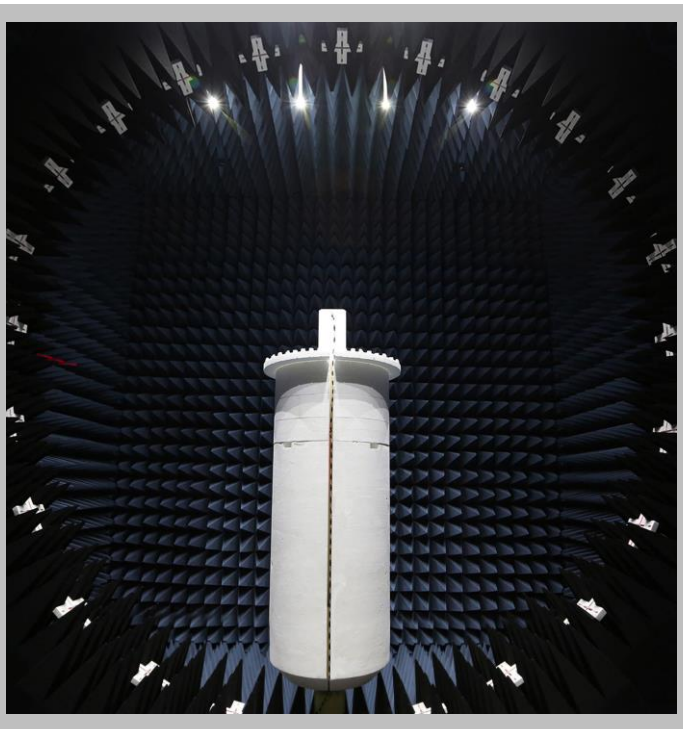
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

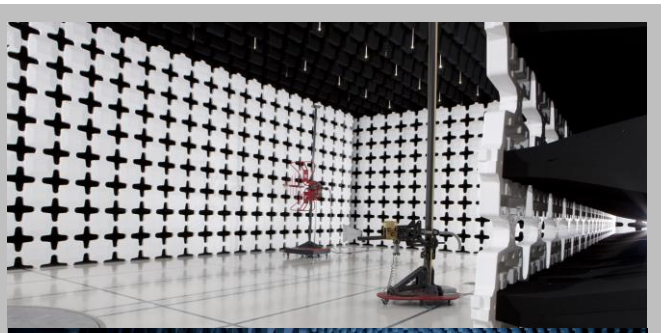
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.0 dB	-5.0 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

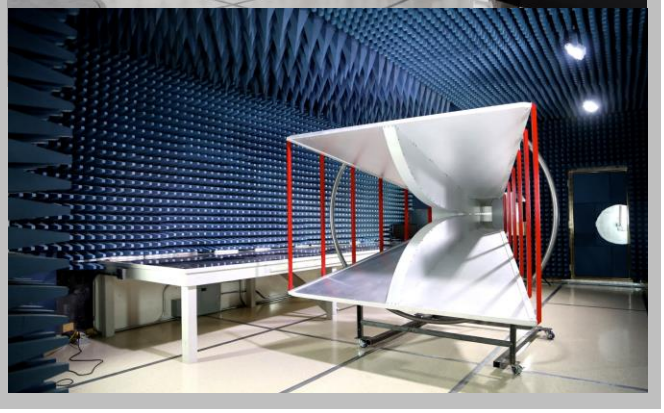
FACILITIES

REV 2015.2.19

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







PRODUCT DESCRIPTION

2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Impinj, Inc.
Address:	400 Fairview Avenue North, Suite 1200
City, State, Zip:	Seattle, WA 98109
Test Requested By:	John Moran
Model:	xSpan RFID reader system
First Date of Test:	July 13, 2016
Last Date of Test:	July 14, 2016
Receipt Date of Samples:	July 06, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
915 MHz RFID reader system with Bluetooth low energy radio.

Testing Objective:
Seeking to demonstrate compliance of the Bluetooth Low Energy radio under FCC 15.247 for the 2.4 GHz band.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 10

Software/Firmware Running during test	
Description	**Version**
MBT.exe	None

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
xSpan	Impinj, Inc.	IPJ-REV-R660	37011100006

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop PC	Lenovo	X61s	LV-B1N3D 09/03
Wireless Router	Belkin	FSD7230-4	20828723009696
POE Ethernet Switch	Netgear	FS108P	3BN161778060A
AC Adapter (Switch)	Netgear	332-10771-01	None
AC Adapter (Router)	CUI Inc	TESA9B-0501800-A	None
AC Adapter (Laptop)	Lenovo	42T4418	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet	No	3m	No	Wireless Router	POE Ethernet Switch
Ethernet	No	3m	No	Laptop PC	Wireless Router
AC Power (Switch)	No	1.8m	No	AC Mains	AC Adapter (Switch)
DC Power (Switch)	No	2.0m	No	AC Adapter (Switch)	POE Ethernet Switch
DC Power (Router)	No	2.0m	No	AC Adapter (Router)	Wireless Router
AC Power (Laptop)	No	0.8m	No	AC Mains	AC Adapter (Laptop)
DC Power (Laptop)	No	1.7m	Yes	AC Adapter (Laptop)	Laptop PC
Ethernet	No	3m	No	POE Ethernet Switch	xSpan
USB Cable	No	0.8m	No	Laptop PC	xSpan

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 11

Software/Firmware Running during test	
Description	**Version**
MBT.exe	None

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
xSpan	Impinj, Inc.	IPJ-REV-R660	37011100011

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop PC	Lenovo	X61s	LV-B1N3D 09/03
AC Adapter (Laptop)	Lenovo	42T4418	None
AC Adapter (EUT)	CUI Inc	SD150-24-U	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Router	Belkin	FSD7230-4	20828723009696
POE Ethernet Switch	Netgear	FS108P	3BN161778060A
AC Adapter (Switch)	Netgear	332-10771-01	None
AC Adapter (Router)	CUI Inc	TESA9B-0501800-A	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet	No	3m	No	Wireless Router	POE Ethernet Switch
Ethernet	No	3m	No	Laptop PC	Wireless Router
AC Power (Switch)	No	1.8m	No	AC Mains	AC Adapter (Switch)
DC Power (Switch)	No	2.0m	No	AC Adapter (Switch)	POE Ethernet Switch
DC Power (Router)	No	2.0m	No	AC Adapter (Router)	Wireless Router
AC Power (Laptop)	No	0.8m	No	AC Mains	AC Adapter (Laptop)
DC Power (Laptop)	No	1.7m	Yes	AC Adapter (Laptop)	Laptop PC
AC Power (EUT)	No	1.8m	Yes	AC Mains	AC Adapter (EUT)
DC Power (EUT)	No	2.0m	Yes	AC Adapter (EUT)	xSpan
Ethernet	No	3m	No	POE Ethernet Switch	xSpan
USB Cable	No	0.8m	No	Laptop PC	xSpan

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 12

Software/Firmware Running during test	
Description	**Version**
MBT.exe	None

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
xSpan	Impinj, Inc.	IPJ-REV-R660	37011100011

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop PC	Lenovo	X61s	LV-B1N3D 09/03
Wireless Router	Belkin	FSD7230-4	20828723009696
POE Ethernet Switch	Netgear	FS108P	3BN161778060A
AC Adapter (Switch)	Netgear	332-10771-01	None
AC Adapter (Router)	CUI Inc	TESA9B-0501800-A	None
AC Adapter (Laptop)	Lenovo	42T4418	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet	Yes	10m	No	POE Ethernet Switch	xSpan
Ethernet	No	3m	No	Wireless Router	POE Ethernet Switch
Ethernet	No	3m	No	Laptop PC	Wireless Router
AC Power (Switch)	No	1.8m	No	AC Mains	AC Adapter (Switch)
DC Power (Switch)	No	2.0m	No	AC Adapter (Switch)	POE Ethernet Switch
DC Power (Router)	No	2.0m	No	AC Adapter (Router)	Wireless Router
AC Power (Laptop)	No	0.8m	No	AC Mains	AC Adapter (Laptop)
DC Power (Laptop)	No	1.7m	Yes	AC Adapter (Laptop)	Laptop PC
USB Cable	No	0.8m	No	xSpan	Unterminated

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/13/2016	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.
2	7/13/2016	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	7/13/2016	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	7/13/2016	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	7/13/2016	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	7/13/2016	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	7/13/2016	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.
8	7/14/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a 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:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

DEVIATIONS FROM TEST STANDARD

None

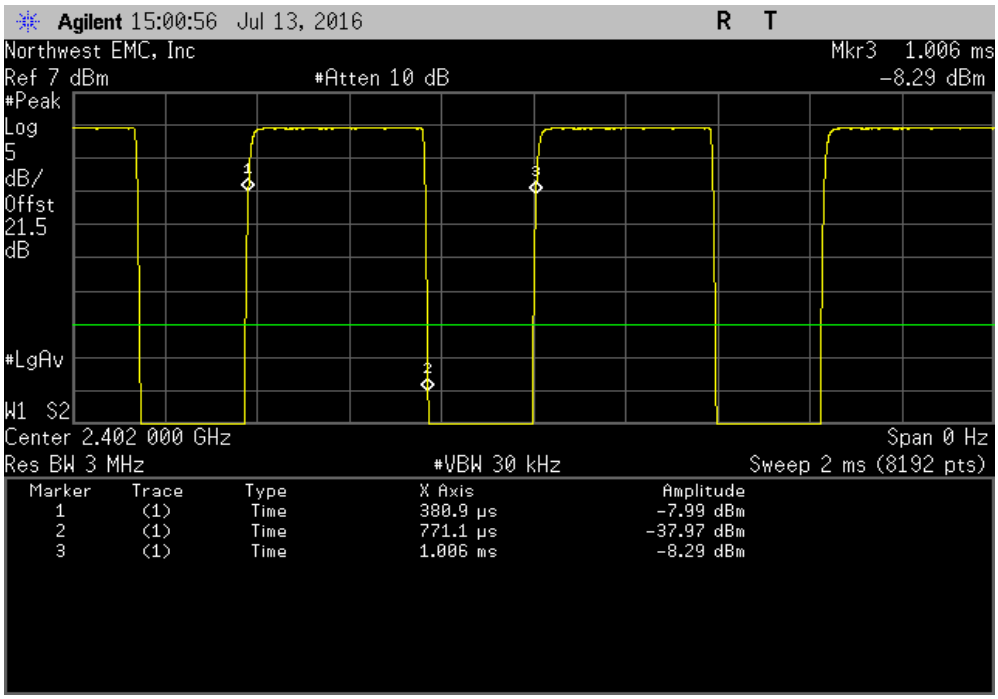
Configuration #	10	Signature

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	390.2 us	624.8 us	1	62.5	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, 2442 MHz	390.2 us	624.8 us	1	62.5	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	390.4 us	624.8 us	1	62.5	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

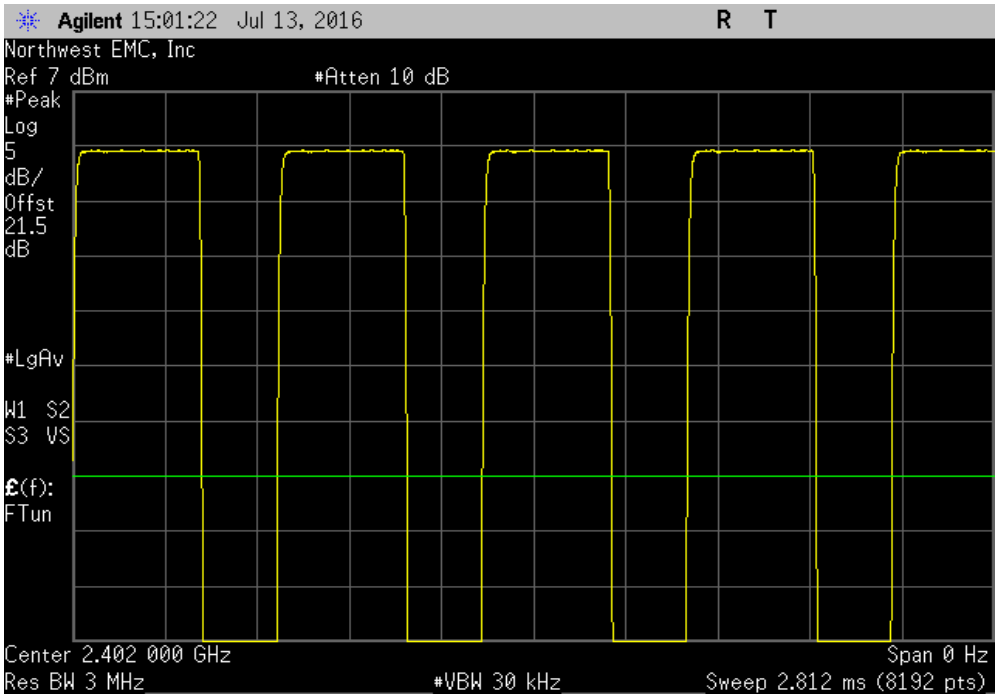
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	390.2 us	624.8 us	1	62.5	N/A	N/A



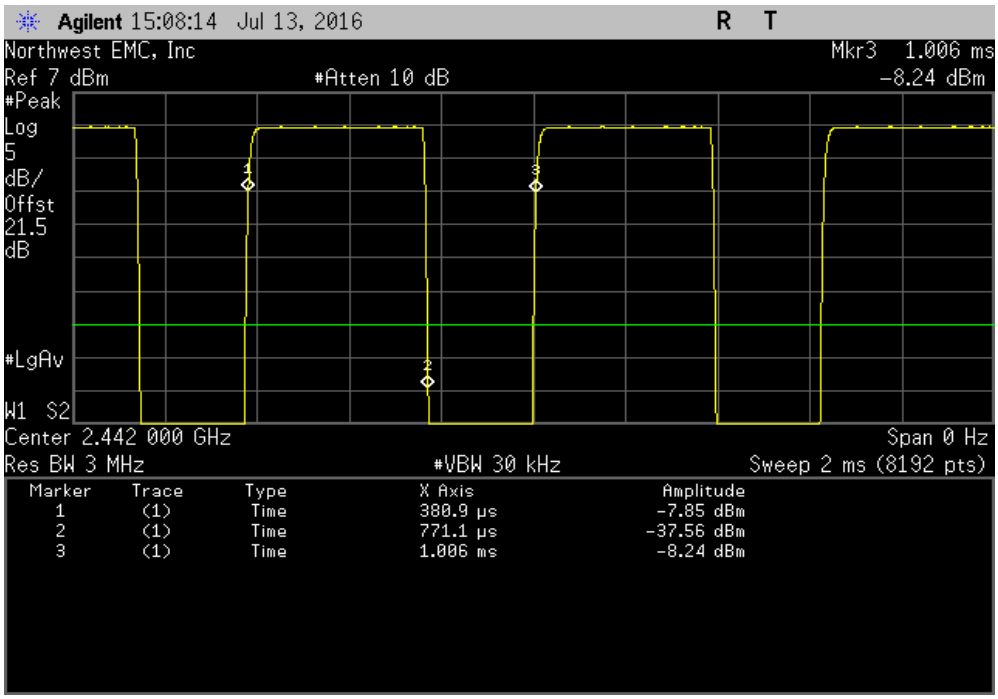
BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



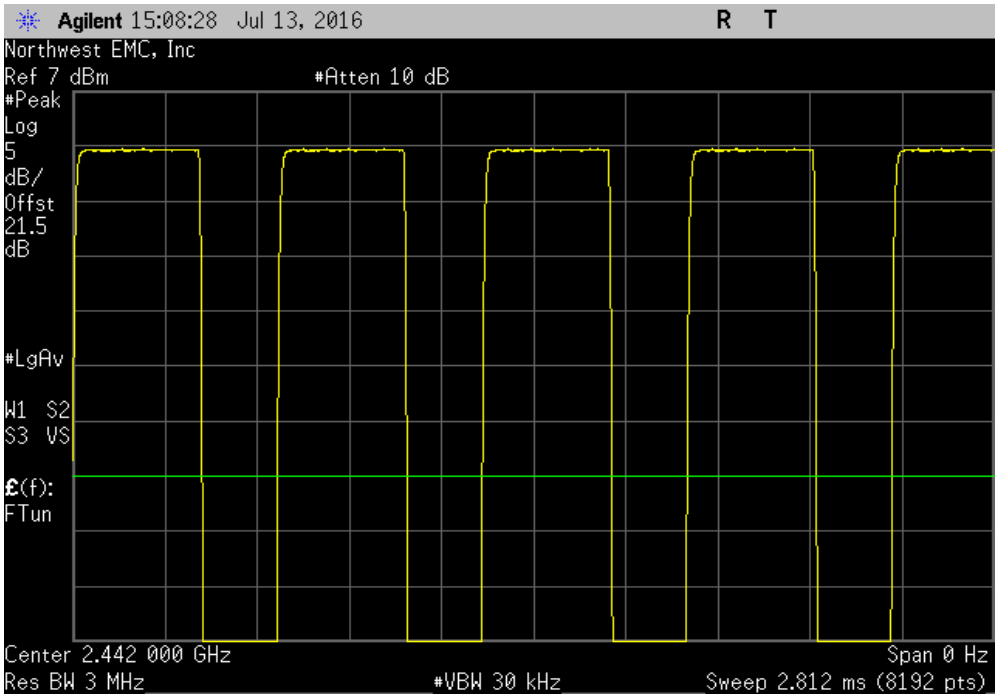
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	390.2 us	624.8 us	1	62.5	N/A	N/A



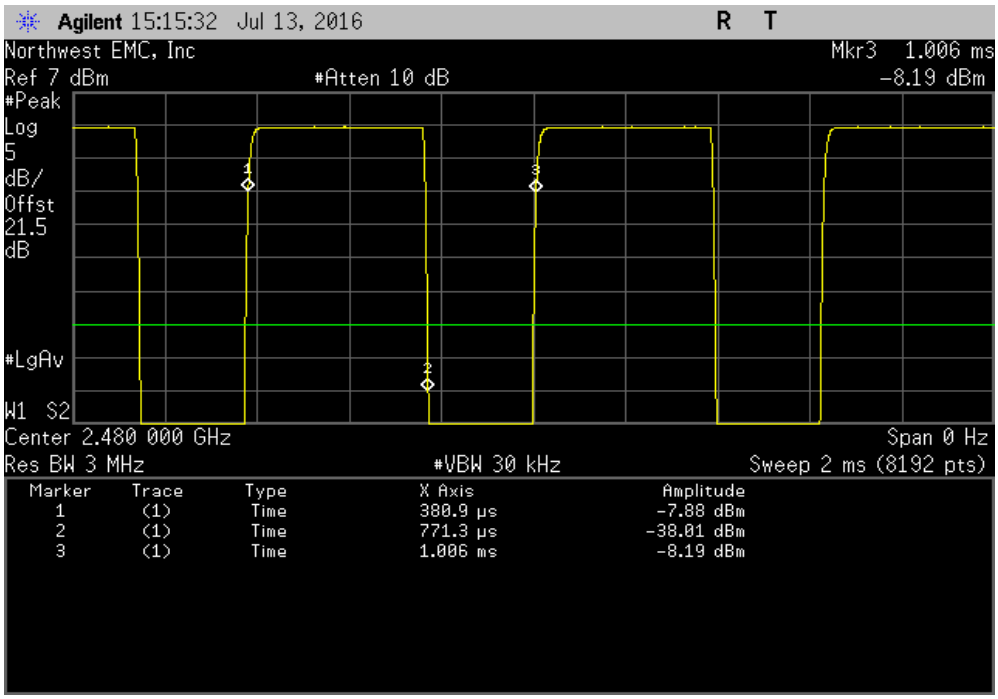
BLE/GFSK Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



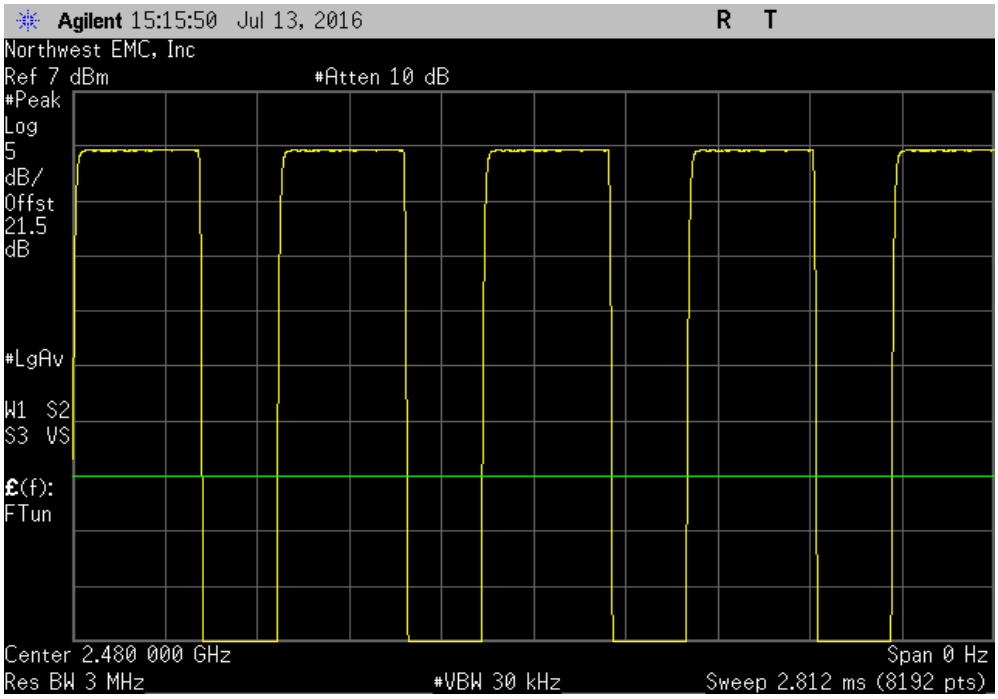
DUTY CYCLE

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	390.4 us	624.8 us	1	62.5	N/A	N/A



BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

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

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

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

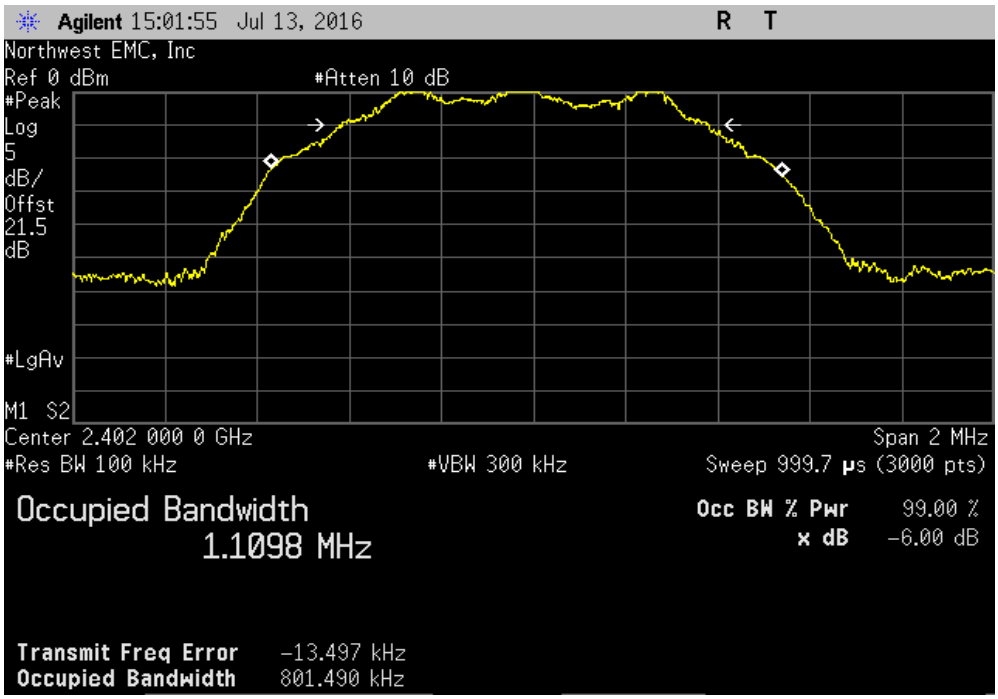
DEVIATIONS FROM TEST STANDARD

None

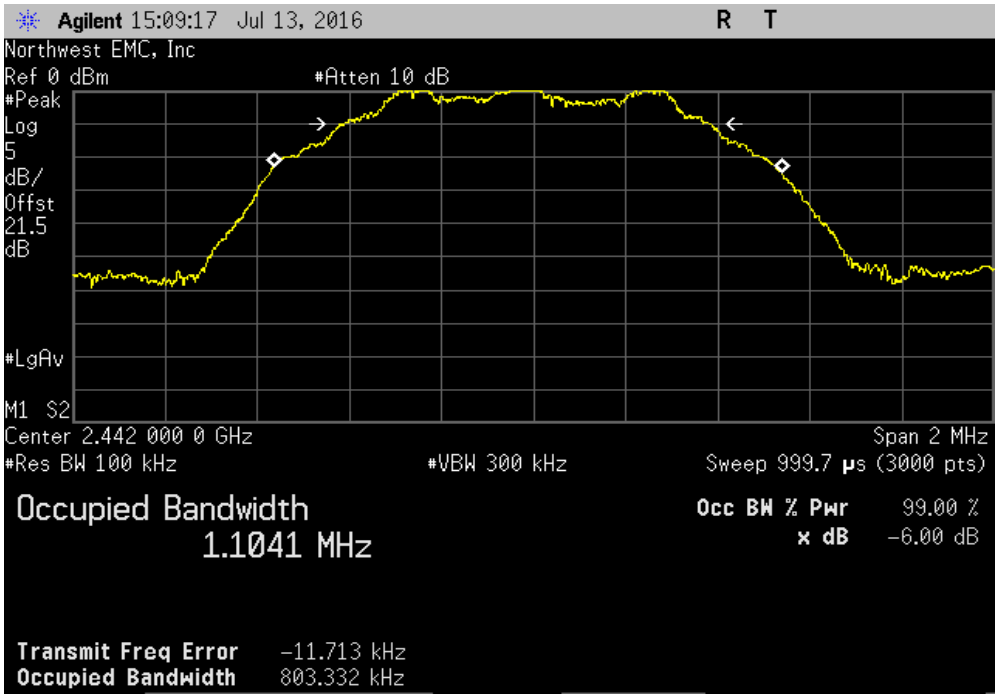
Configuration #	10	Signature

	Value	Limit (≥)	Result
BLE/GFSK Low Channel, 2402 MHz	801.49 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	803.332 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	783.653 kHz	500 kHz	Pass

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



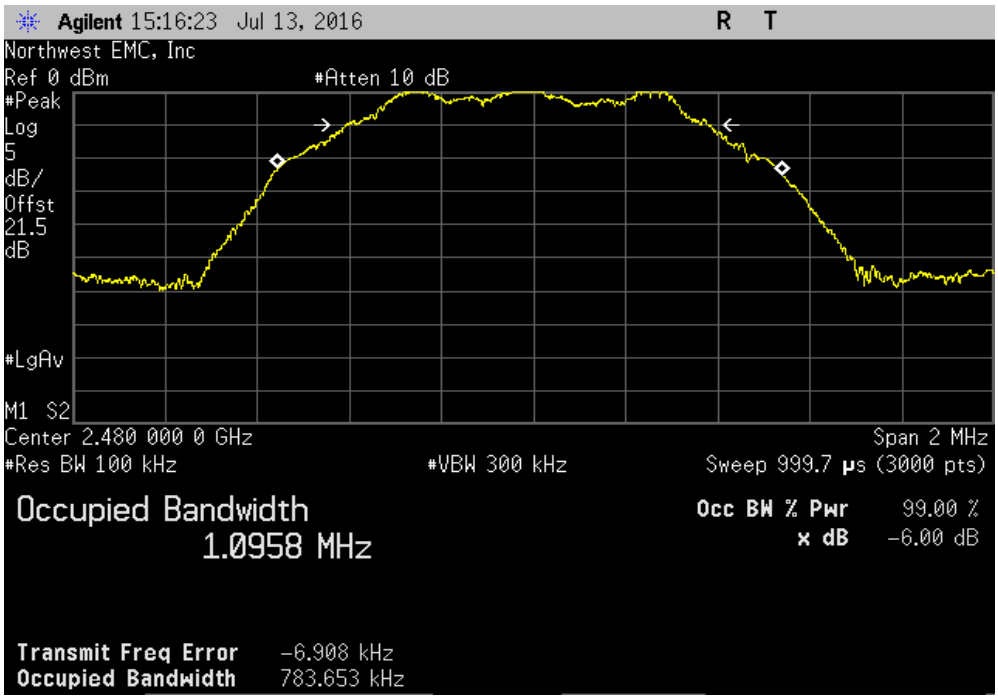
BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				803.332 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2016.05.06

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



OUTPUT POWER

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

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

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

The method found in ANSI C63.10:2013 Section 11.10.2 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

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

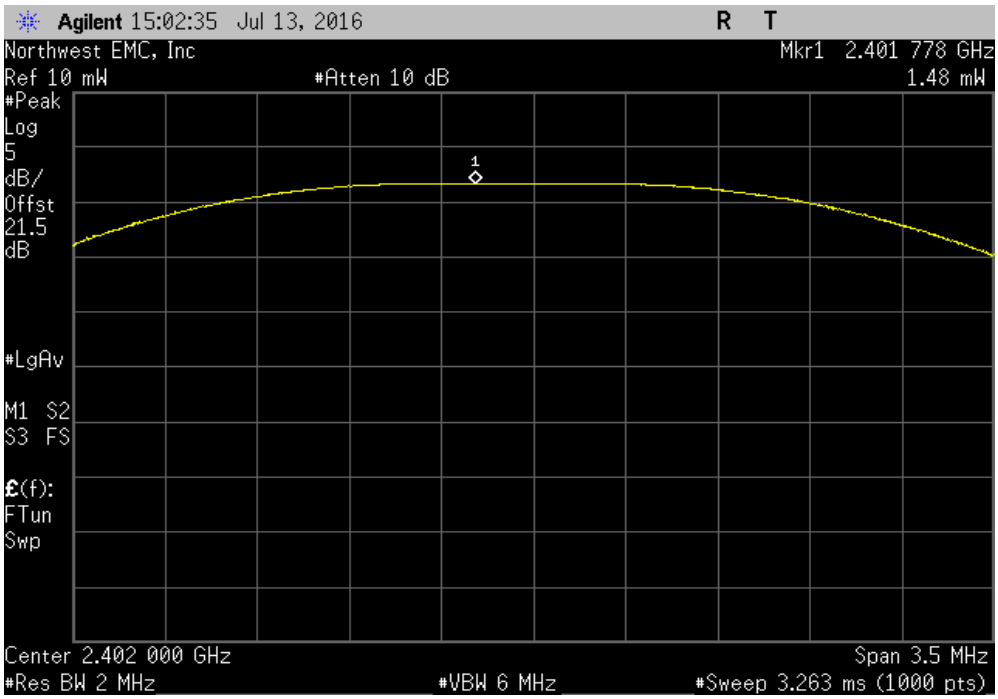
DEVIATIONS FROM TEST STANDARD

None

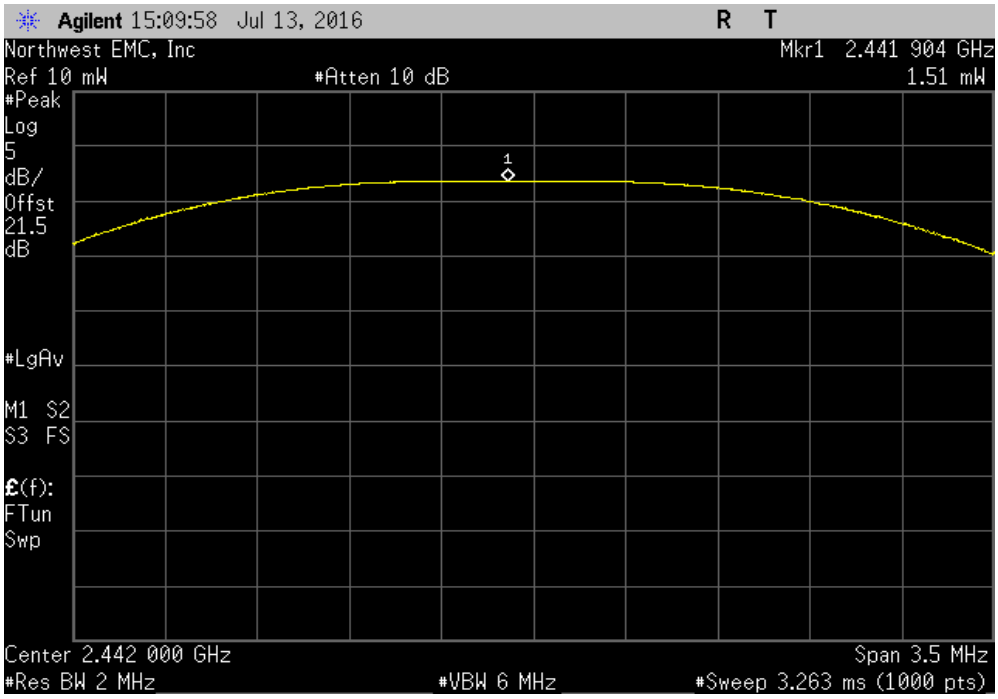
Configuration #	10	Signature

	Value	Limit (<)	Result
BLE/GFSK Low Channel, 2402 MHz	1.478 mW	1 W	Pass
BLE/GFSK Mid Channel, 2442 MHz	1.511 mW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	1.506 mW	1 W	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				1.478 mW	1 W	Pass



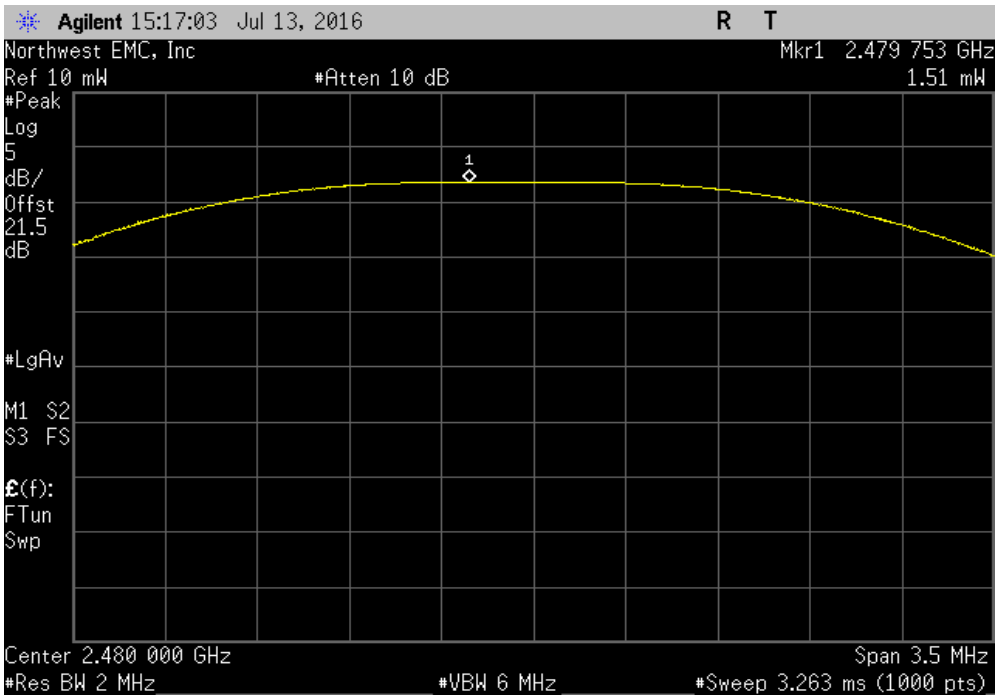
BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (<)	Result
				1.511 mW	1 W	Pass



OUTPUT POWER

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (<)	Result
				1.506 mW	1 W	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

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

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

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

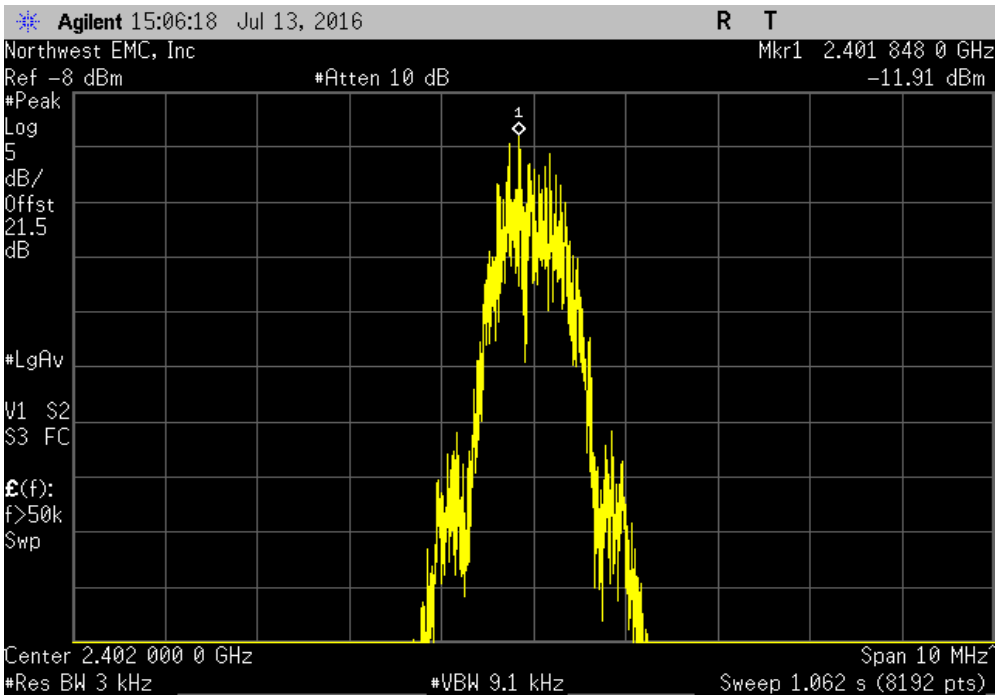
DEVIATIONS FROM TEST STANDARD

None

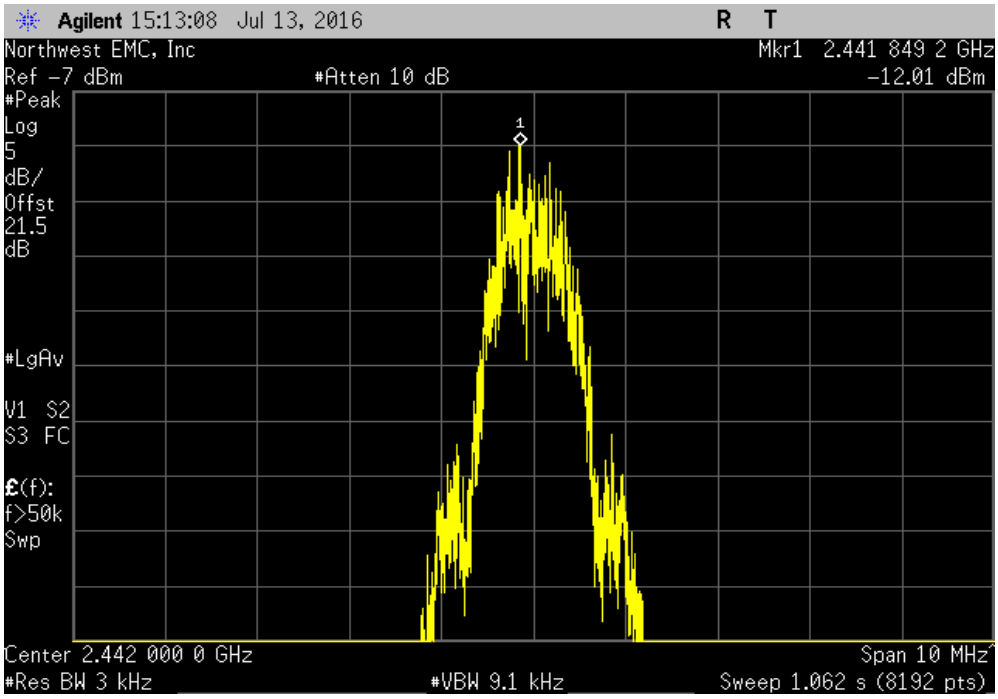
Configuration #	10	Signature

	Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK Low Channel, 2402 MHz	-11.907	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-12.007	8	Pass
BLE/GFSK High Channel, 2480 MHz	-11.81	8	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.907	8	Pass



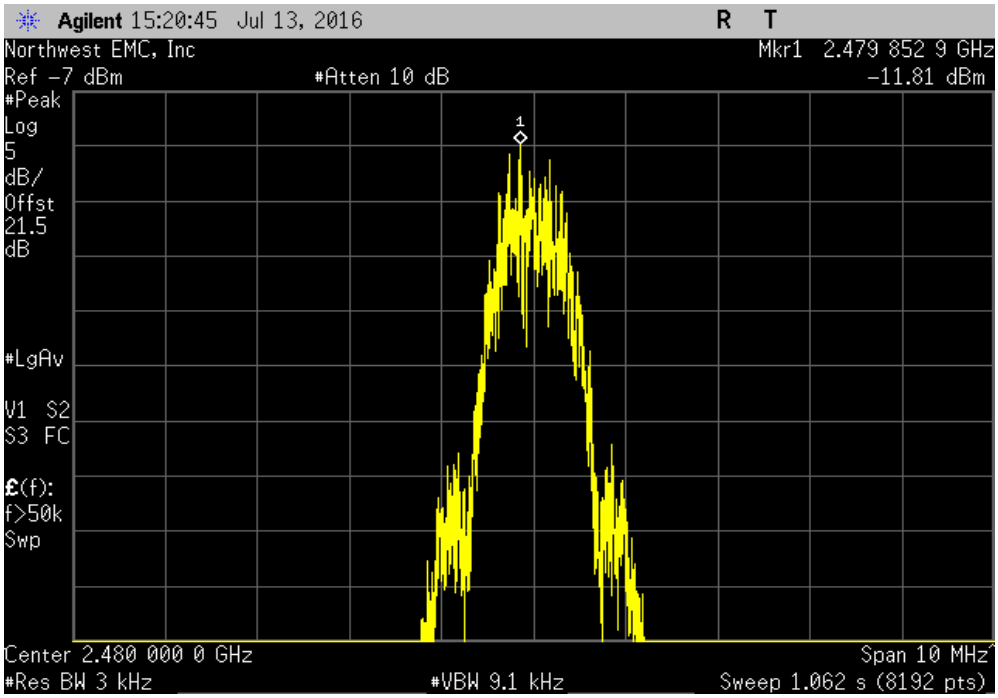
BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.007	8	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.81	8	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

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

SPURIOUS CONDUCTED EMISSIONS

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

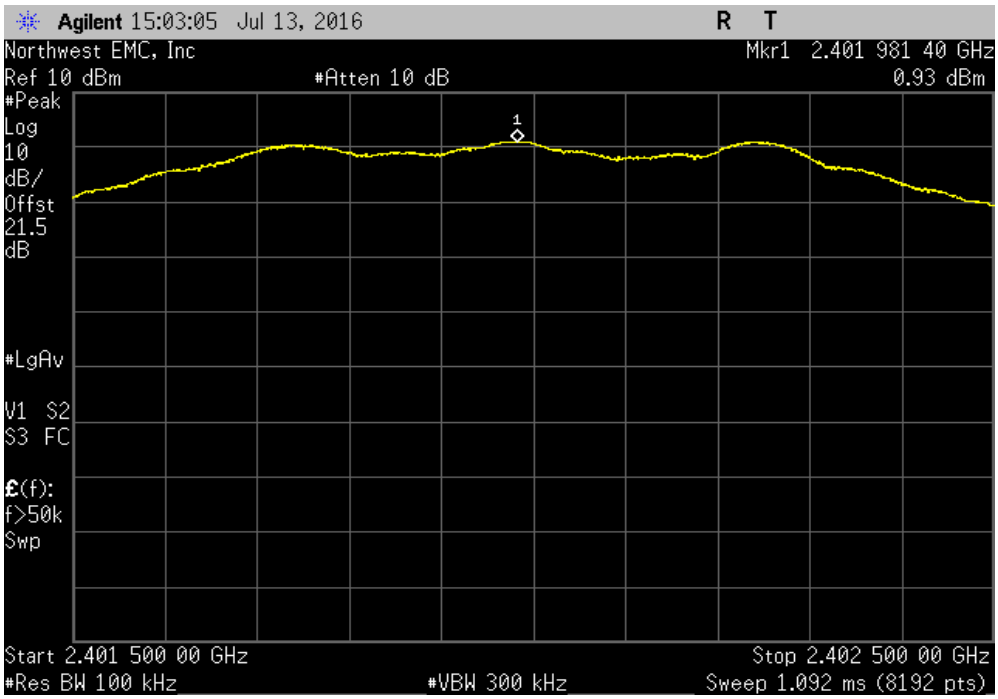
DEVIATIONS FROM TEST STANDARD

None

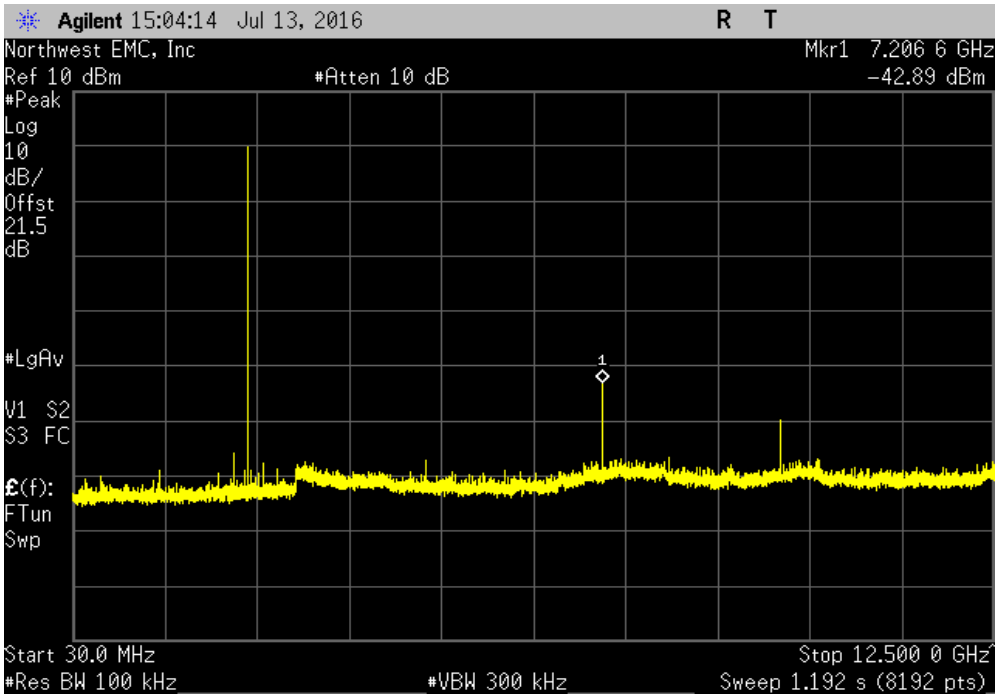
Configuration #	10	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-43.82	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-48.23	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	-42.37	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	-49.46	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	-43.24	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	-52.35	-20	Pass

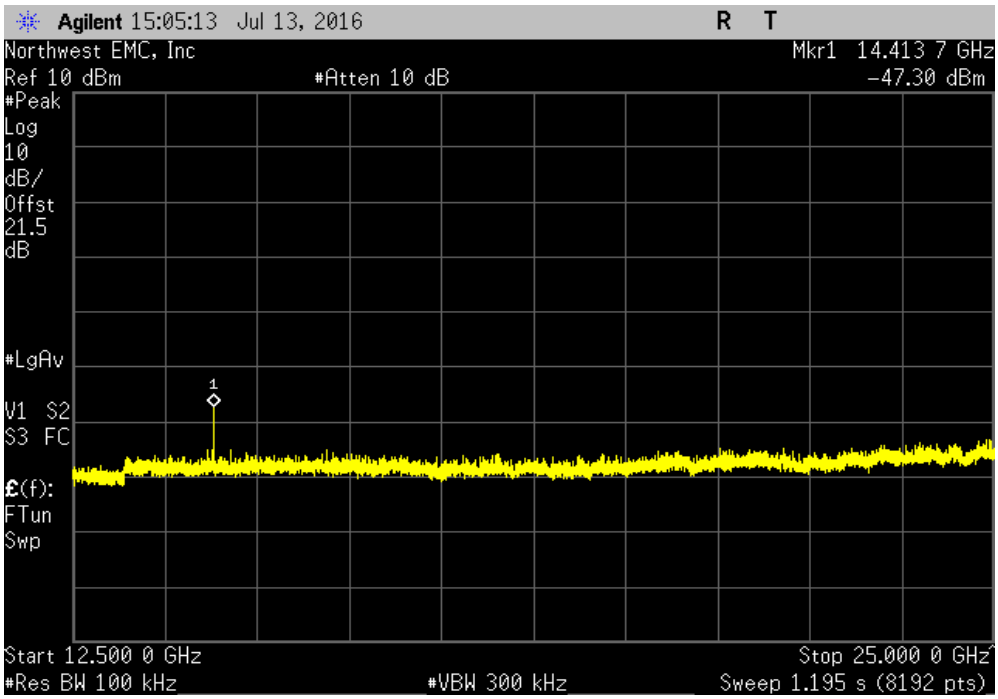
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



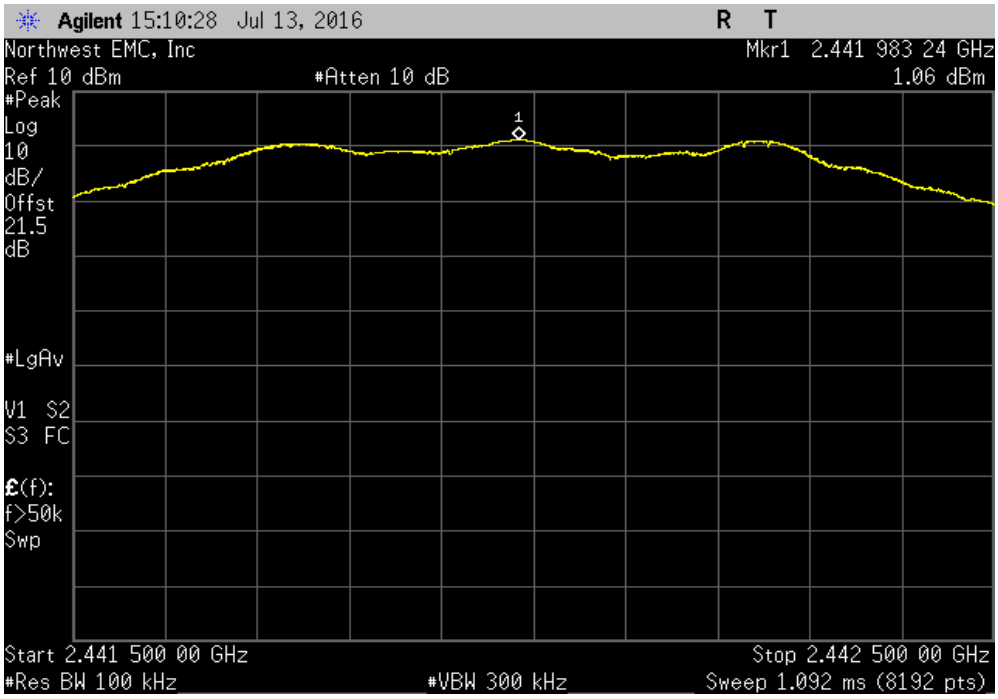
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-43.82	-20	Pass



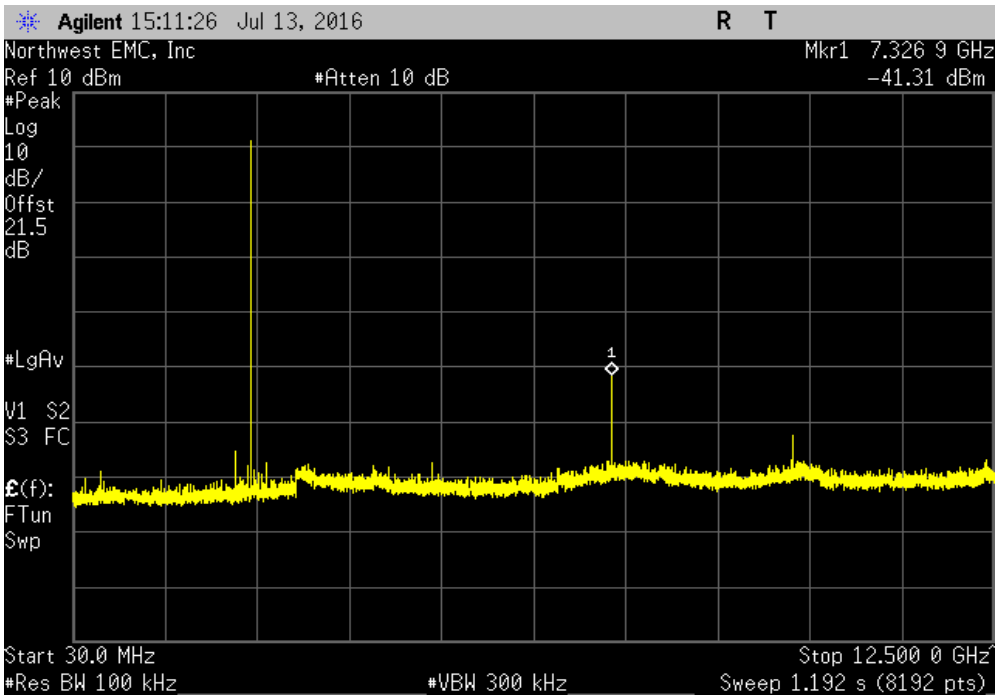
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-48.23	-20	Pass



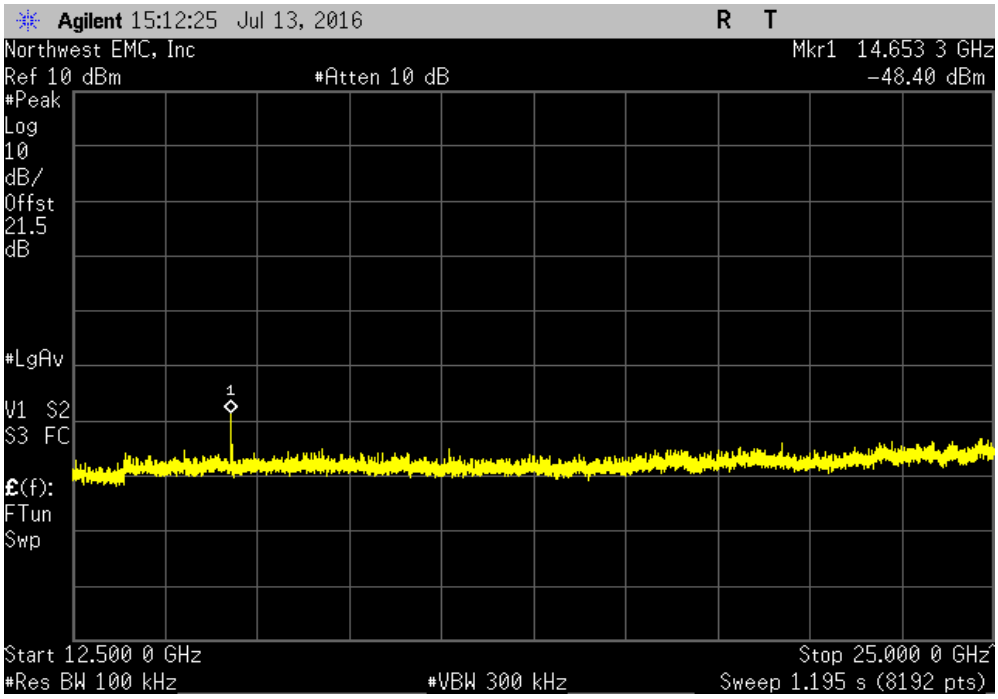
BLE/GFSK Mid Channel, 2442 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



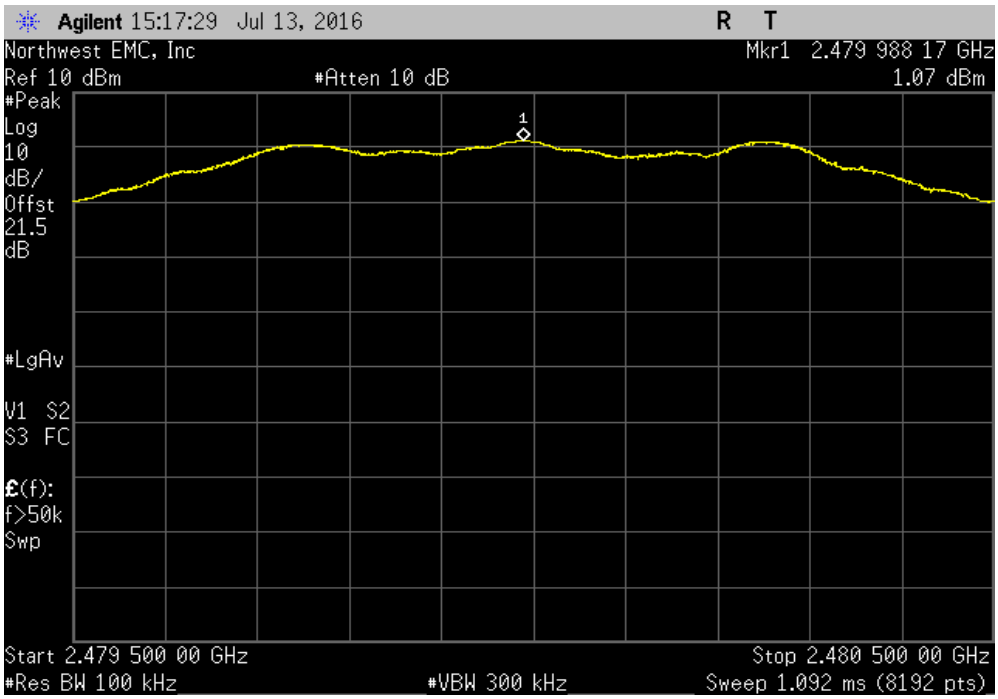
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-42.37	-20	Pass



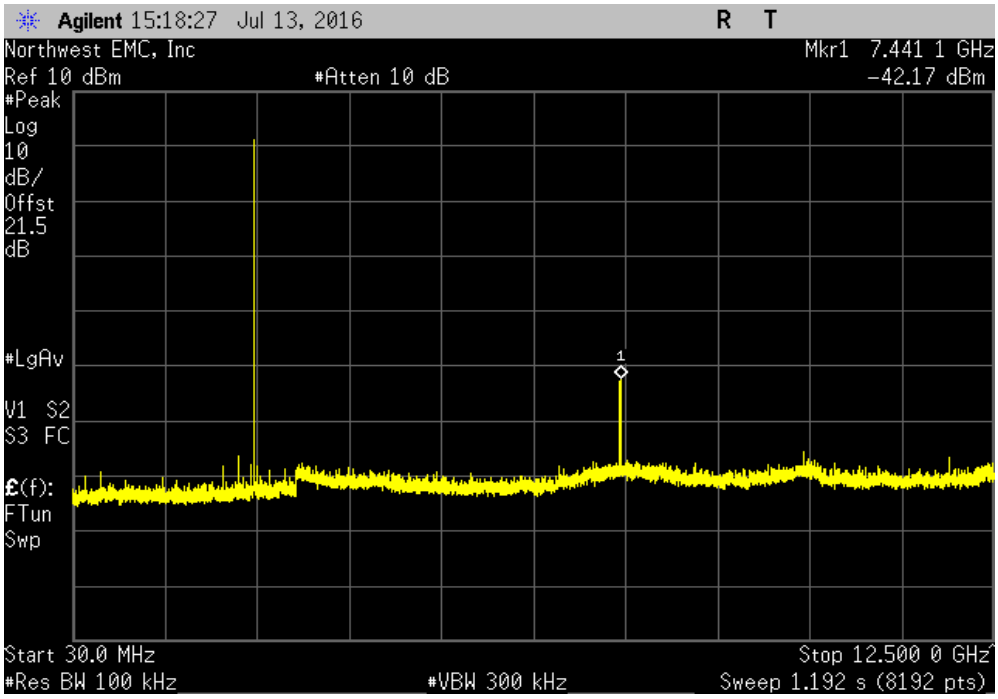
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-49.46	-20	Pass



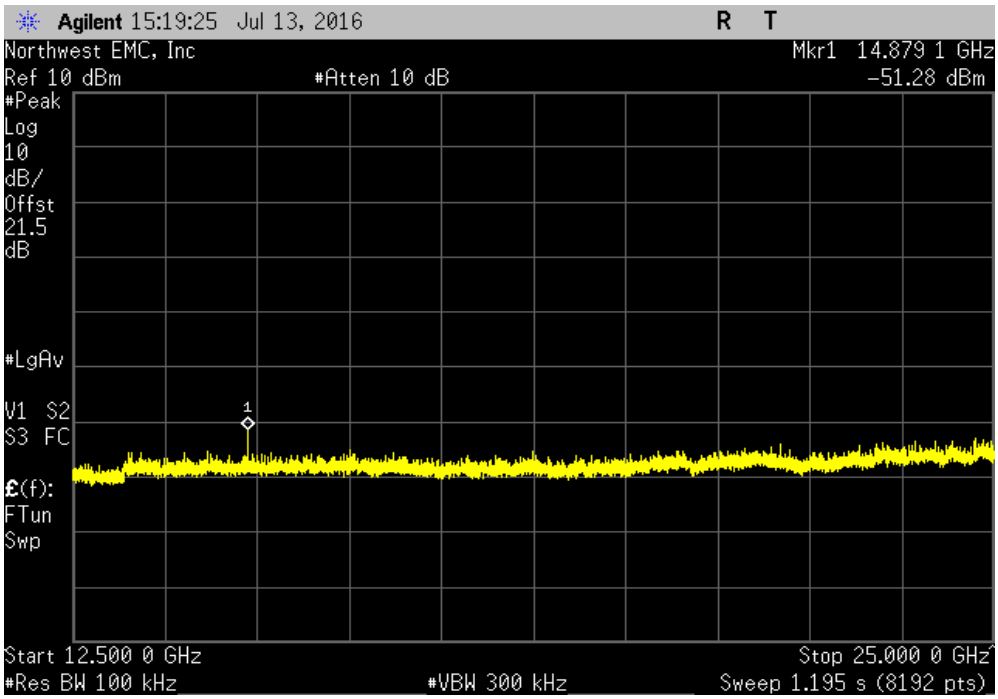
BLE/GFSK High Channel, 2480 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



BLE/GFSK High Channel, 2480 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-43.24	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-52.35	-20	Pass



BAND EDGE COMPLIANCE

XMit 2016.05.06

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/23/2016	6/23/2017
Cable	ESM Cable Corp.	TTBJ-141 KMKM-7	NC5	5/6/2016	5/6/2017
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Generator - Signal	Keysight	N5182B	TFY	4/16/2015	4/16/2018

TEST DESCRIPTION

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

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

BAND EDGE COMPLIANCE

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100006			**Date:**	07/13/16
Customer:	Impinj, Inc.			**Temperature:**	24 °C
Attendees:	Joe Tarantino			**Humidity:**	42% RH
Project:	None			**Barometric Pres.:**	1027 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC05

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

COMMENTS

Default Power Setting

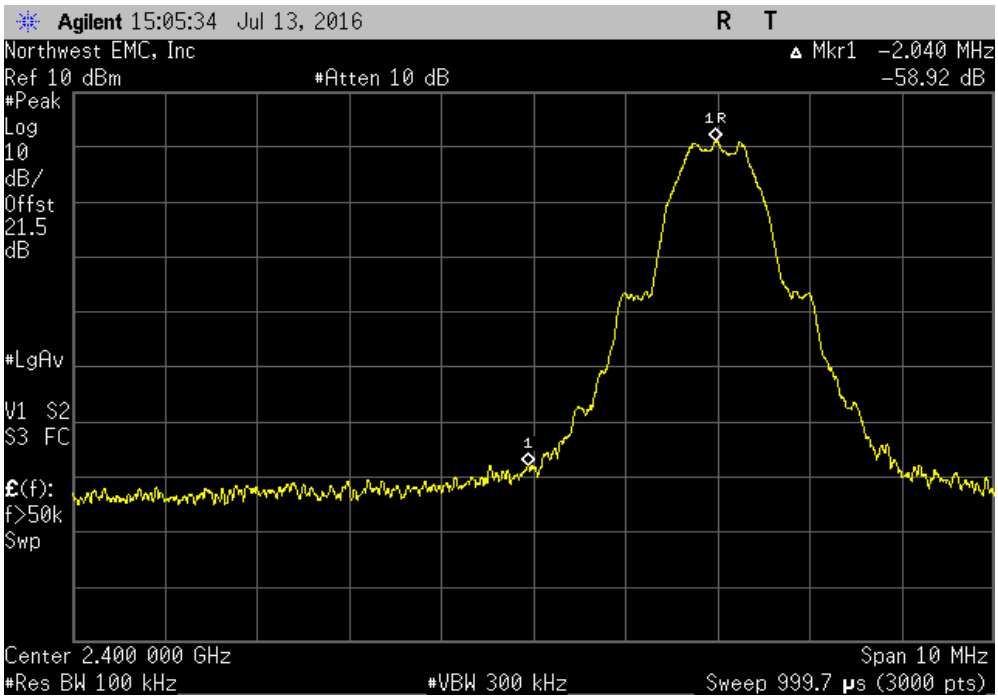
DEVIATIONS FROM TEST STANDARD

None

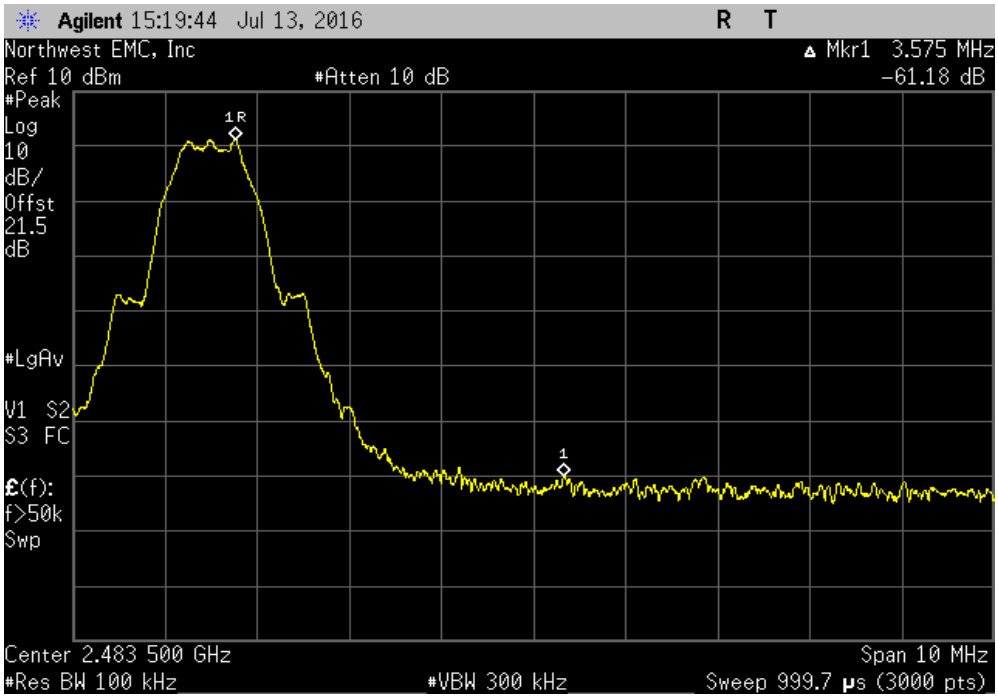
Configuration #	10	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	-58.92	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-61.18	-20	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-58.92	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-61.18	-20	Pass



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, Default Power Setting

CHANNELS TESTED

Low Channel 0, 2402 MHz
Mid Channel 20, 2442 MHz
High Channel 39, 2480 MHz

POWER SETTINGS INVESTIGATED

POE

CONFIGURATIONS INVESTIGATED

IMPI0002 - 12

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26 GHz

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
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	6/8/2016	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	9/28/2015	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHI	10/30/2015	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFF	1/21/2016	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYL	7/30/2015	24 mo
Antenna - Double Ridge	EMCO	3115	AHM	6/10/2016	24 mo
Antenna - Standard Gain	EMCO	3160-07	AHP	NCR	0 mo
Antenna - Standard Gain	EMCO	3160-08	AHO	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIY	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAB	7/31/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	6/6/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	9/21/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	9/21/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	5/10/2016	12 mo
Cable	Northwest EMC	Bilog Cables	NC1	8/27/2015	12 mo
Cable	Northwest EMC	3115 Horn Cable	NC2	5/23/2016	12 mo
Cable	Northwest EMC	Standard Gain Horn Cable	NC3	5/23/2016	12 mo
Cable	Northwest EMC	N/A	NC8	5/10/2016	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

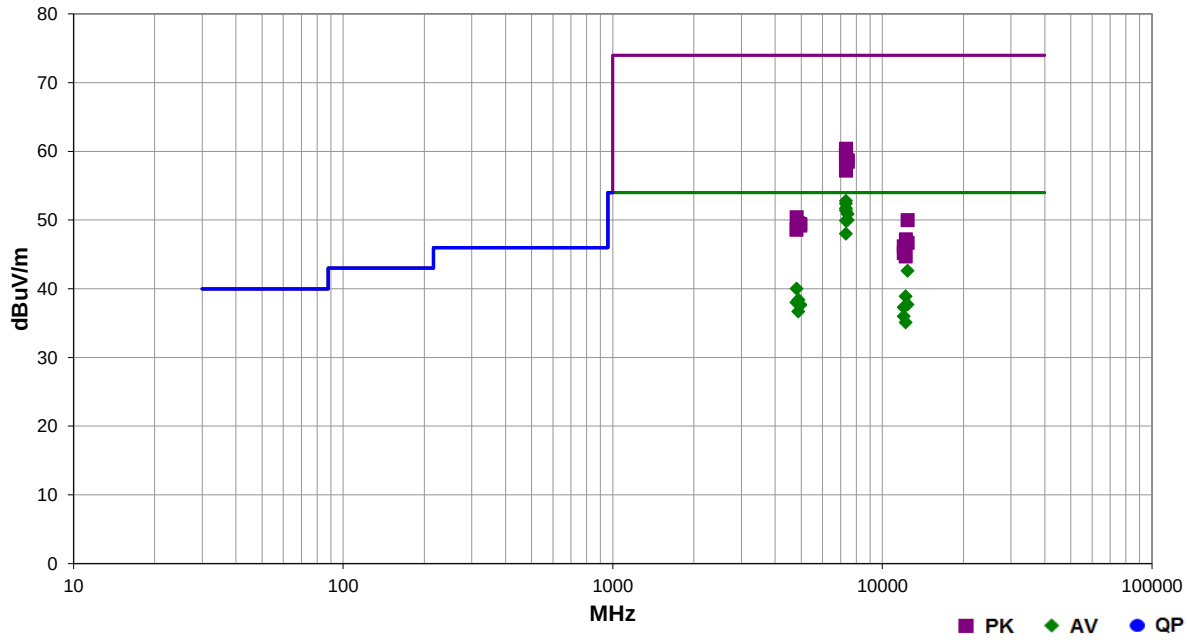
PSA-ESCI 2016.04.26.1

EmiR5 2016.04.26.1

Work Order:	IMPI0002	**Date:**	07/14/16		
Project:	None	**Temperature:**	23 °C		
Job Site:	NC01	**Humidity:**	45% RH		
Serial Number:	37011100011	**Barometric Pres.:**	1028 mbar	**Tested by:**	Richard Mellroth
EUT:	xSpan RFID reader system				
Configuration:	12				
Customer:	Impinj, Inc.				
Attendees:	None				
EUT Power:	POE				
Operating Mode:	Transmitting BLE, Default Power Setting. See comments next to data points for EUT channel and orientation.				
Deviations:	None				
Comments:	None				

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

Run #	82,83	**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
7325.233	39.4	13.4	1.5	12.0	3.0	0.0	Vert	AV	0.0	52.8	54.0	-1.2	Mid Ch 20, EUT Flat
7325.275	39.0	13.4	1.5	98.0	3.0	0.0	Horz	AV	0.0	52.4	54.0	-1.6	Mid Ch 20, EUT Horz
7325.250	38.3	13.4	1.5	179.0	3.0	0.0	Horz	AV	0.0	51.7	54.0	-2.3	Mid Ch 20, EUT Vert
7325.208	38.0	13.4	1.6	143.0	3.0	0.0	Vert	AV	0.0	51.4	54.0	-2.6	Mid Ch 20, EUT Horz
7439.242	37.0	13.9	1.5	188.0	3.0	0.0	Horz	AV	0.0	50.9	54.0	-3.1	High Ch 39, EUT Horz
7439.217	36.1	13.9	1.7	17.0	3.0	0.0	Vert	AV	0.0	50.0	54.0	-4.0	High Ch 39, EUT Flat
7325.200	36.5	13.4	1.5	131.0	3.0	0.0	Vert	AV	0.0	49.9	54.0	-4.1	Mid Ch 20, EUT Vert
7325.200	34.6	13.4	1.3	198.0	3.0	0.0	Horz	AV	0.0	48.0	54.0	-6.0	Mid Ch 20, EUT Flat
12398.700	45.2	-2.6	1.5	111.0	3.0	0.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Horz
7326.792	47.0	13.4	1.5	12.0	3.0	0.0	Vert	PK	0.0	60.4	74.0	-13.6	Mid Ch 20, EUT Flat
4803.717	31.3	8.7	1.6	78.0	3.0	0.0	Horz	AV	0.0	40.0	54.0	-14.0	Low Ch 0, EUT Horz
7325.075	46.5	13.4	1.5	98.0	3.0	0.0	Horz	PK	0.0	59.9	74.0	-14.1	Mid Ch 20, EUT Horz
7326.750	46.2	13.4	1.5	179.0	3.0	0.0	Horz	PK	0.0	59.6	74.0	-14.4	Mid Ch 20, EUT Vert
7326.775	46.0	13.4	1.6	143.0	3.0	0.0	Vert	PK	0.0	59.4	74.0	-14.6	Mid Ch 20, EUT Horz
12208.640	41.8	-2.9	1.5	111.0	3.0	0.0	Horz	AV	0.0	38.9	54.0	-15.1	Mid Ch 20, EUT Horz
7440.850	44.8	13.9	1.5	188.0	3.0	0.0	Horz	PK	0.0	58.7	74.0	-15.3	High Ch 39, EUT Horz
7440.933	44.6	13.9	1.7	17.0	3.0	0.0	Vert	PK	0.0	58.5	74.0	-15.5	High Ch 39, EUT Flat
4883.700	29.3	9.1	2.4	70.0	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	Mid Ch 20, EUT Flat

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
7326.883	44.9	13.4	1.5	131.0	3.0	0.0	Vert	PK	0.0	58.3	74.0	-15.7	Mid Ch 20, EUT Vert
4803.450	29.3	8.7	1.2	65.0	3.0	0.0	Vert	AV	0.0	38.0	54.0	-16.0	Low Ch 0, EUT Flat
4959.700	28.6	9.1	1.5	214.0	3.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3	High Ch 39, EUT Horz
12398.680	40.3	-2.6	1.5	39.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	High Ch 39, EUT Flat
4959.700	28.5	9.1	1.5	68.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	High Ch 39, EUT Flat
12008.610	40.2	-2.9	1.3	143.0	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	Low Ch 0, EUT Horz
7327.000	43.8	13.4	1.3	198.0	3.0	0.0	Horz	PK	0.0	57.2	74.0	-16.8	Mid Ch 20, EUT Flat
4882.017	27.6	9.1	1.4	169.0	3.0	0.0	Horz	AV	0.0	36.7	54.0	-17.3	Mid Ch 20, EUT Horz
12008.610	38.9	-2.9	1.0	67.0	3.0	0.0	Vert	AV	0.0	36.0	54.0	-18.0	Low Ch 0, EUT Flat
12208.650	38.0	-2.9	1.4	94.0	3.0	0.0	Vert	AV	0.0	35.1	54.0	-18.9	Mid Ch 20, EUT Flat
4804.375	41.7	8.7	1.6	78.0	3.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	Low Ch 0, EUT Horz
12398.250	52.6	-2.6	1.5	111.0	3.0	0.0	Horz	PK	0.0	50.0	74.0	-24.0	High Ch 39, EUT Horz
4882.633	40.4	9.1	1.4	169.0	3.0	0.0	Horz	PK	0.0	49.5	74.0	-24.5	Mid Ch 20, EUT Horz
4884.225	40.4	9.1	2.4	70.0	3.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	Mid Ch 20, EUT Flat
4960.217	40.3	9.1	1.5	214.0	3.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	High Ch 39, EUT Horz
4959.558	40.1	9.1	1.5	68.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	High Ch 39, EUT Flat
4803.375	39.9	8.7	1.2	65.0	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	Low Ch 0, EUT Flat
12211.240	50.2	-3.0	1.5	111.0	3.0	0.0	Horz	PK	0.0	47.2	74.0	-26.8	Mid Ch 20, EUT Horz
12398.620	49.3	-2.6	1.5	39.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	High Ch 39, EUT Flat
12008.630	49.1	-2.9	1.3	143.0	3.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	Low Ch 0, EUT Horz
12008.380	48.1	-2.9	1.0	67.0	3.0	0.0	Vert	PK	0.0	45.2	74.0	-28.8	Low Ch 0, EUT Flat
12208.830	47.6	-2.9	1.4	94.0	3.0	0.0	Vert	PK	0.0	44.7	74.0	-29.3	Mid Ch 20, EUT Flat

SPURIOUS RADIATED EMISSIONS

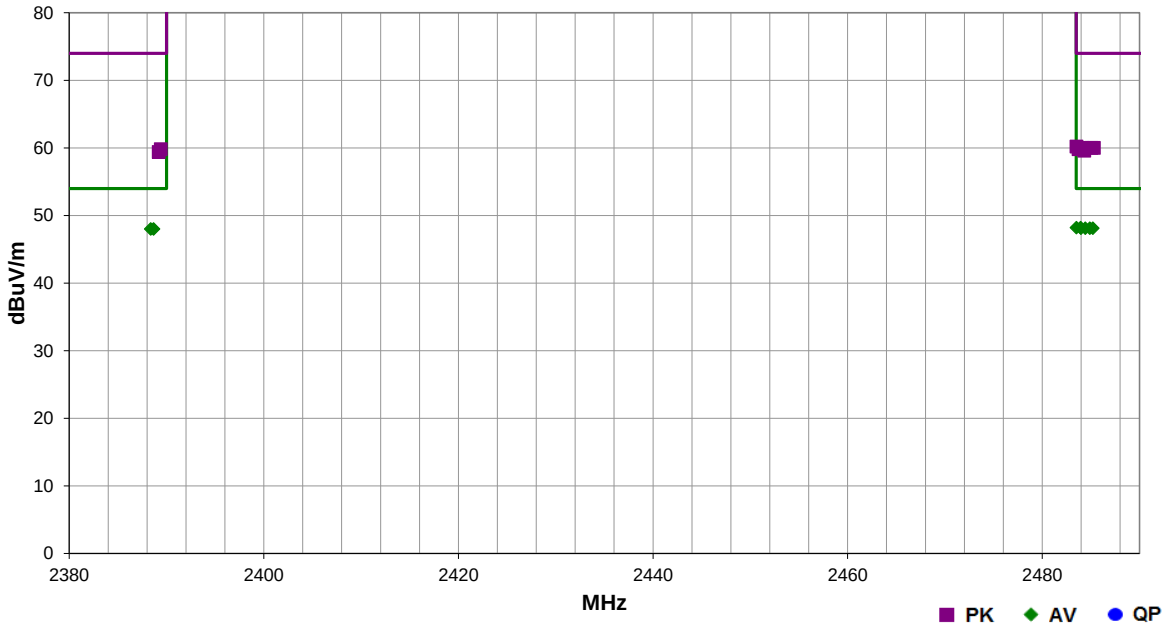
NORTHWEST EMC

PSA-ESCI 2016.04.26.1
EmiR5 2016.04.26.1

Work Order:	IMPI0002	**Date:**	07/14/16		
Project:	None	**Temperature:**	23 °C		
Job Site:	NC01	**Humidity:**	45% RH		
Serial Number:	37011100011	**Barometric Pres.:**	1028 mbar	**Tested by:**	Richard Mellroth
EUT:	xSpan RFID reader system				
Configuration:	12				
Customer:	Impinj, Inc.				
Attendees:	None				
EUT Power:	POE				
Operating Mode:	Transmitting BLE, Default Power Setting. See comments next to data points for EUT channel and orientation.				
Deviations:	None				
Comments:	Measuring Emissions at Band Edge				

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

Run #	84	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.953	29.4	-1.2	1.5	181.0	3.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	High Ch 39, EUT Horz
2483.520	29.4	-1.2	1.5	29.0	3.0	20.0	Horz	AV	0.0	48.2	54.0	-5.8	High Ch 39, EUT Flat
2484.440	29.3	-1.2	1.5	132.0	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	High Ch 39, EUT Horz
2483.983	29.3	-1.2	1.8	285.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	High Ch 39, EUT Flat
2484.903	29.3	-1.2	1.5	204.0	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	High Ch 39, EUT Vert
2485.217	29.3	-1.2	1.5	46.0	3.0	20.0	Vert	AV	0.0	48.1	54.0	-5.9	High Ch 39, EUT Vert
2388.390	29.3	-1.3	1.5	116.0	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	Low Ch 0, EUT Horz
2388.673	29.3	-1.3	1.7	212.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	Low Ch 0, EUT Flat
2483.513	41.4	-1.2	1.5	181.0	3.0	20.0	Vert	PK	0.0	60.2	74.0	-13.8	High Ch 39, EUT Horz
2485.300	41.2	-1.2	1.5	132.0	3.0	20.0	Horz	PK	0.0	60.0	74.0	-14.0	High Ch 39, EUT Horz
2485.063	41.2	-1.2	1.8	285.0	3.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	High Ch 39, EUT Flat
2484.107	41.2	-1.2	1.5	46.0	3.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	High Ch 39, EUT Vert
2483.743	41.0	-1.2	1.5	204.0	3.0	20.0	Horz	PK	0.0	59.8	74.0	-14.2	High Ch 39, EUT Vert
2389.413	41.1	-1.3	1.5	116.0	3.0	20.0	Horz	PK	0.0	59.8	74.0	-14.2	Low Ch 0, EUT Horz
2484.320	40.8	-1.2	1.5	29.0	3.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	High Ch 39, EUT Flat
2389.207	40.7	-1.3	1.7	212.0	3.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6	Low Ch 0, EUT Flat

AC - POWERLINE CONDUCTED EMISSIONS

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	LIK	11/3/2015	11/3/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LIM	11/3/2015	11/3/2016
Receiver	Rohde & Schwarz	ESCI	ARE	8/5/2015	8/5/2016
Cable - Conducted Cable Assembly	Northwest EMC	NC4, HHF, TYL	NC4A	5/6/2016	5/6/2017

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

IMPI0002-11

MODES INVESTIGATED

Transmitting BLE, Mid Channel, 2442 MHz

AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

EUT:	xSpan RFID reader system	Work Order:	IMPI0002
Serial Number:	37011100011	Date:	07/13/2016
Customer:	Impinj, Inc.	Temperature:	24.9°C
Attendees:	Joe Tarantino	Relative Humidity:	40.6%
Customer Project:	None	Bar. Pressure:	1027 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	IMPI0002-11

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	16	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

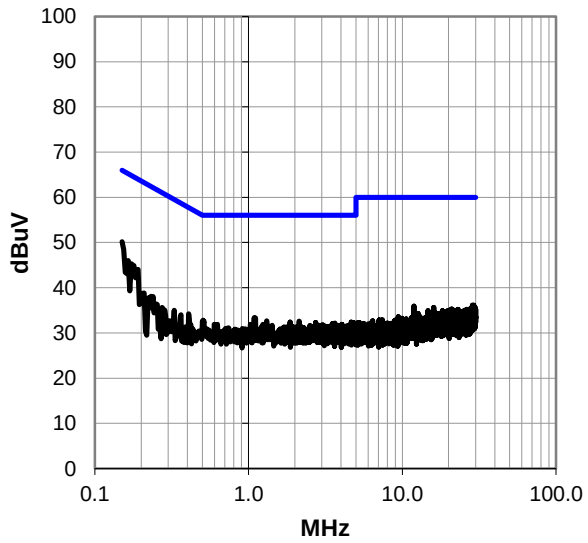
EUT OPERATING MODES

Transmitting BLE, Mid Channel, 2442 MHz

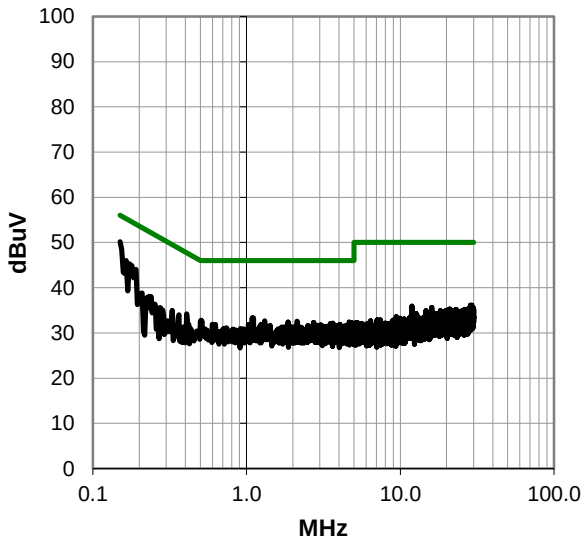
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

RESULTS - Run #16

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	29.4	20.8	50.2	66.0	-15.8
0.172	24.5	20.8	45.3	64.8	-19.5
1.086	12.8	20.6	33.4	56.0	-22.6
1.109	12.7	20.6	33.3	56.0	-22.7
0.504	12.2	20.6	32.8	56.0	-23.2
1.310	12.0	20.7	32.7	56.0	-23.3
2.135	11.9	20.7	32.6	56.0	-23.4
0.407	13.6	20.6	34.2	57.7	-23.5
1.862	11.7	20.7	32.4	56.0	-23.6
4.657	11.5	20.9	32.4	56.0	-23.6
2.735	11.5	20.8	32.3	56.0	-23.7
4.795	11.4	20.9	32.3	56.0	-23.7
3.646	11.4	20.8	32.2	56.0	-23.8
28.567	12.1	24.0	36.1	60.0	-23.9
29.231	11.9	24.2	36.1	60.0	-23.9
3.508	11.3	20.7	32.0	56.0	-24.0
3.620	11.3	20.7	32.0	56.0	-24.0
0.598	11.3	20.6	31.9	56.0	-24.1
0.628	11.2	20.7	31.9	56.0	-24.1
1.027	11.3	20.6	31.9	56.0	-24.1
1.239	11.2	20.7	31.9	56.0	-24.1
4.045	11.0	20.9	31.9	56.0	-24.1
11.891	14.3	21.6	35.9	60.0	-24.1
3.019	11.0	20.8	31.8	56.0	-24.2
0.232	17.5	20.6	38.1	62.4	-24.3
1.426	11.0	20.7	31.7	56.0	-24.3

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	29.4	20.8	50.2	56.0	-5.8
0.172	24.5	20.8	45.3	54.8	-9.5
1.086	12.8	20.6	33.4	46.0	-12.6
1.109	12.7	20.6	33.3	46.0	-12.7
0.504	12.2	20.6	32.8	46.0	-13.2
1.310	12.0	20.7	32.7	46.0	-13.3
2.135	11.9	20.7	32.6	46.0	-13.4
0.407	13.6	20.6	34.2	47.7	-13.5
1.862	11.7	20.7	32.4	46.0	-13.6
4.657	11.5	20.9	32.4	46.0	-13.6
2.735	11.5	20.8	32.3	46.0	-13.7
4.795	11.4	20.9	32.3	46.0	-13.7
3.646	11.4	20.8	32.2	46.0	-13.8
28.567	12.1	24.0	36.1	50.0	-13.9
29.231	11.9	24.2	36.1	50.0	-13.9
3.508	11.3	20.7	32.0	46.0	-14.0
3.620	11.3	20.7	32.0	46.0	-14.0
0.598	11.3	20.6	31.9	46.0	-14.1
0.628	11.2	20.7	31.9	46.0	-14.1
1.027	11.3	20.6	31.9	46.0	-14.1
1.239	11.2	20.7	31.9	46.0	-14.1
4.045	11.0	20.9	31.9	46.0	-14.1
11.891	14.3	21.6	35.9	50.0	-14.1
3.019	11.0	20.8	31.8	46.0	-14.2
0.232	17.5	20.6	38.1	52.4	-14.3
1.426	11.0	20.7	31.7	46.0	-14.3

CONCLUSION

Pass

Tested By

AC - POWERLINE CONDUCTED EMISSIONS

EUT:	xSpan RFID reader system	Work Order:	IMPI0002
Serial Number:	37011100011	Date:	07/13/2016
Customer:	Impinj, Inc.	Temperature:	24.9°C
Attendees:	Joe Tarantino	Relative Humidity:	40.6%
Customer Project:	None	Bar. Pressure:	1027 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	IMPI0002-11

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	17	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

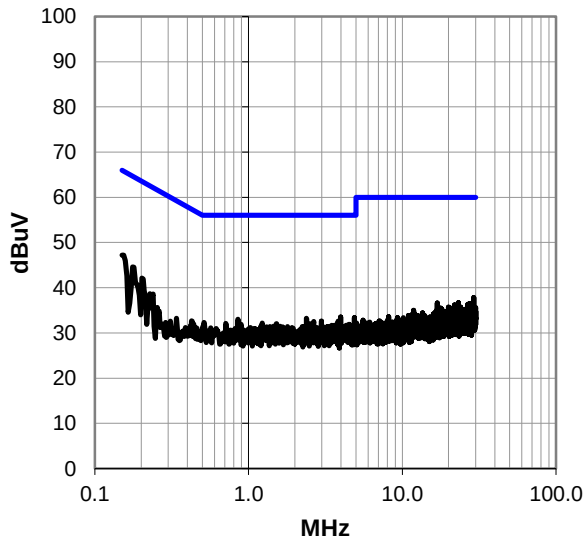
EUT OPERATING MODES

Transmitting BLE, Mid Channel, 2442 MHz

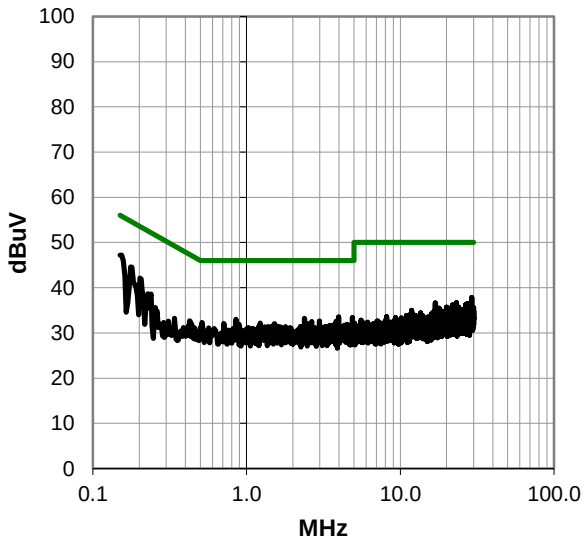
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

RESULTS - Run #17

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	26.4	20.8	47.2	66.0	-18.8
0.176	23.9	20.7	44.6	64.7	-20.1
0.202	21.4	20.7	42.1	63.5	-21.4
29.231	13.6	24.2	37.8	60.0	-22.2
3.974	12.6	20.9	33.5	56.0	-22.5
4.877	12.5	20.9	33.4	56.0	-22.6
2.381	12.5	20.7	33.2	56.0	-22.8
0.851	12.3	20.7	33.0	56.0	-23.0
23.147	13.7	23.0	36.7	60.0	-23.3
2.978	11.8	20.8	32.6	56.0	-23.4
3.829	11.8	20.8	32.6	56.0	-23.4
16.897	14.2	22.4	36.6	60.0	-23.4
2.650	11.8	20.7	32.5	56.0	-23.5
27.306	12.7	23.8	36.5	60.0	-23.5
0.512	11.7	20.6	32.3	56.0	-23.7
26.687	12.6	23.7	36.3	60.0	-23.7
0.228	18.1	20.6	38.7	62.5	-23.8
1.224	11.5	20.7	32.2	56.0	-23.8
21.908	13.4	22.8	36.2	60.0	-23.8
0.710	11.4	20.7	32.1	56.0	-23.9
1.515	11.3	20.7	32.0	56.0	-24.0
2.489	11.3	20.7	32.0	56.0	-24.0
0.889	11.3	20.6	31.9	56.0	-24.1
4.522	11.0	20.9	31.9	56.0	-24.1
28.683	11.9	24.0	35.9	60.0	-24.1
19.990	13.1	22.6	35.7	60.0	-24.3

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	26.4	20.8	47.2	56.0	-8.8
0.176	23.9	20.7	44.6	54.7	-10.1
0.202	21.4	20.7	42.1	53.5	-11.4
29.231	13.6	24.2	37.8	50.0	-12.2
3.974	12.6	20.9	33.5	46.0	-12.5
4.877	12.5	20.9	33.4	46.0	-12.6
2.381	12.5	20.7	33.2	46.0	-12.8
0.851	12.3	20.7	33.0	46.0	-13.0
23.147	13.7	23.0	36.7	50.0	-13.3
2.978	11.8	20.8	32.6	46.0	-13.4
3.829	11.8	20.8	32.6	46.0	-13.4
16.897	14.2	22.4	36.6	50.0	-13.4
2.650	11.8	20.7	32.5	46.0	-13.5
27.306	12.7	23.8	36.5	50.0	-13.5
0.512	11.7	20.6	32.3	46.0	-13.7
26.687	12.6	23.7	36.3	50.0	-13.7
0.228	18.1	20.6	38.7	52.5	-13.8
1.224	11.5	20.7	32.2	46.0	-13.8
21.908	13.4	22.8	36.2	50.0	-13.8
0.710	11.4	20.7	32.1	46.0	-13.9
1.515	11.3	20.7	32.0	46.0	-14.0
2.489	11.3	20.7	32.0	46.0	-14.0
0.889	11.3	20.6	31.9	46.0	-14.1
4.522	11.0	20.9	31.9	46.0	-14.1
28.683	11.9	24.0	35.9	50.0	-14.1
19.990	13.1	22.6	35.7	50.0	-14.3

CONCLUSION

Pass

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