NORTHWEST EMC

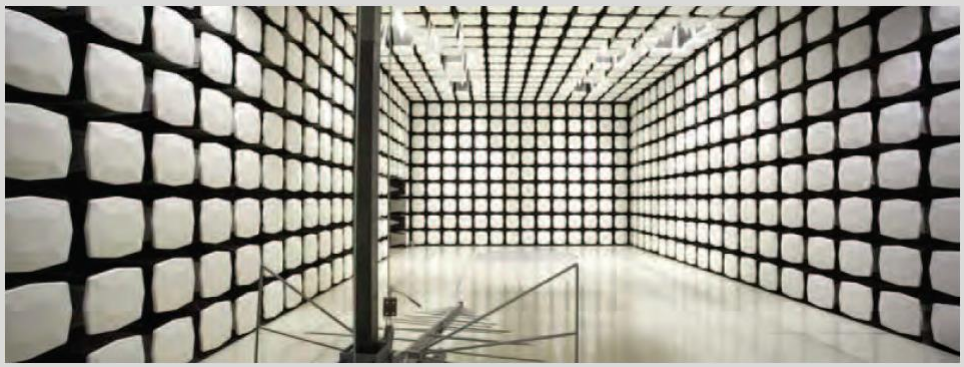
Impinj, Inc.

xSpan RFID reader system

FCC 15.207:2016
FCC 15.247:2016

902 – 928 MHz Transceiver

Report # IMPI0002.4



NVLAP TESTING

NVLAP Lab Code: 200629-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: July 13, 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	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.1	Output Power	Yes	Pass	
7.7.2	Channel Separation	Yes	Pass	
7.7.3	Number of Hopping Channels	Yes	Pass	
7.7.4	Dwell Time	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	Characterization of radio
7.7.9	Band Edge Compliance	Yes	Pass	
7.7.9	Band Edge Compliance - Hopping Mode	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.

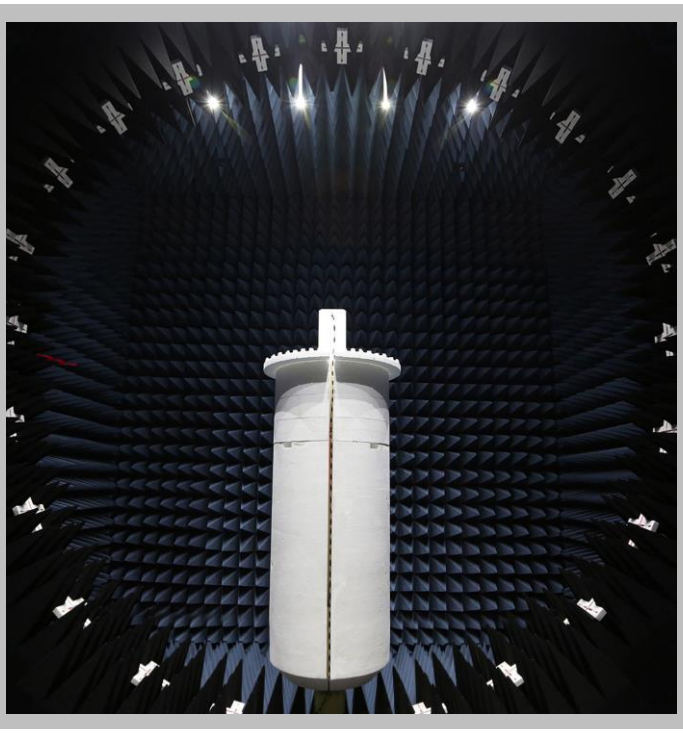
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

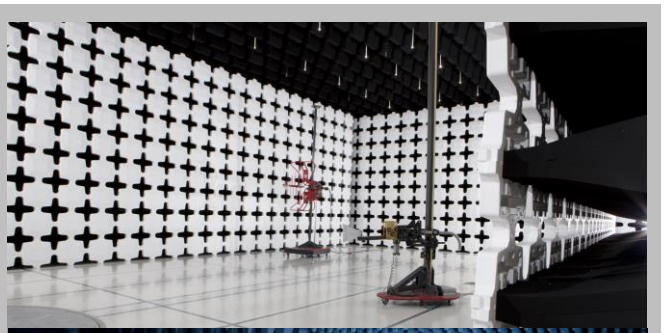
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

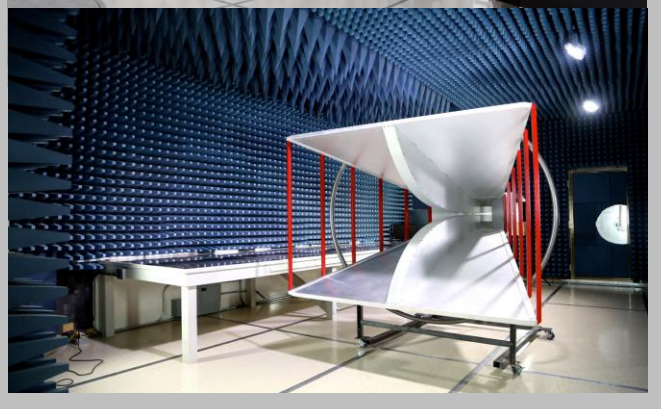
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 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 06, 2016
Last Date of Test:	July 13, 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:

UHF RFID reader gateway system with phased array antenna and Bluetooth radio.

The RFID radio controls maximum allowed transmit power per beam by using a formula of TX power = 36 - antenna gain. The antenna gain per beam is stored in non-volatile memory and is programed at time of manufacture and is not user accessible.

The system contains a console port which is for installation/engineering use only and USB which is not intended for customer use.

Testing Objective:

Seeking to demonstrate compliance of the FHSS UHF RFID radio under FCC 15.247:2016 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 1

Software/Firmware Running during test	
Description	**Version**
Item Test	v1.3.0.6

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
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

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 4

Software/Firmware Running during test	
Description	**Version**
Item Test	v1.3.0.6

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

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration IMPI0002- 5

Software/Firmware Running during test	
Description	**Version**
Item Test	v1.3.0.6

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**
AC Adapter (EUT)	CUI Inc	SD150-24-U	None

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**
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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

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/6/2016	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.
2	7/6/2016	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	7/6/2016	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	7/6/2016	Channel Separation	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	7/6/2016	Number of Hopping Channels	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	7/6/2016	Dwell Time	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	7/6/2016	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.
8	7/6/2016	Band Edge Compliance - Hopping Mode	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.
9	7/8/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
10	7/13/2016	AC – Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE

NORTHWEST EMC

#REF!

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018

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 test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

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
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

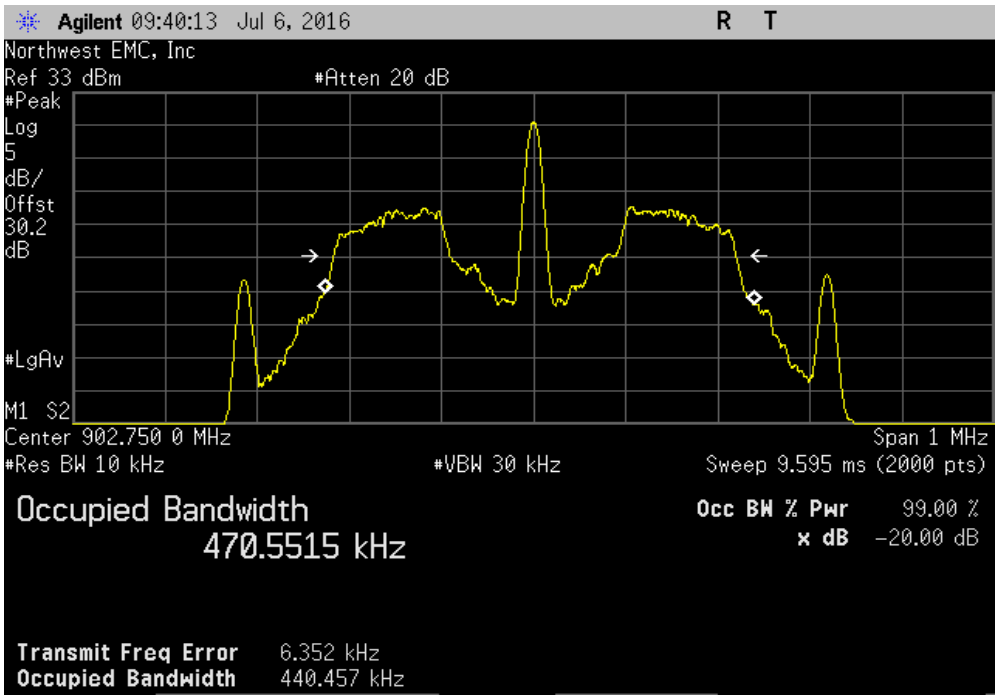
DEVIATIONS FROM TEST STANDARD

None

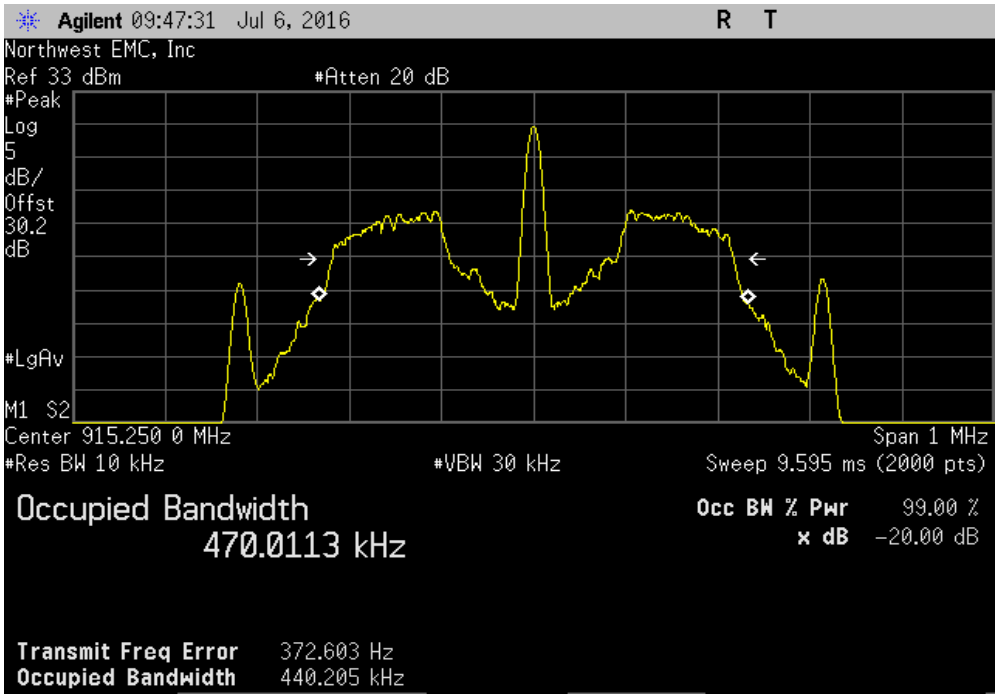
Configuration #	1	Signature

		Value	Limit (<)	Result
Max Thruput				
	DSB-ASK , 6.25us, FM0			
	Low Channel, 902.75 MHz	440.457 kHz	500 kHz	Pass
	Mid Channel, 915.25 MHz	440.205 kHz	500 kHz	Pass
	High Channel, 927.25 MHz	440.185 kHz	500 kHz	Pass
Max Miller				
	PR-ASK, 7.14us, M=4			
	Low Channel, 902.75 MHz	282.805 kHz	500 kHz	Pass
	Mid Channel, 915.25 MHz	282.649 kHz	500 kHz	Pass
	High Channel, 927.25 MHz	281.066 kHz	500 kHz	Pass
Dense Reader				
	PR-ASK, 20us, M=4			
	Low Channel, 902.75 MHz	79.686 kHz	500 kHz	Pass
	Mid Channel, 915.25 MHz	78.541 kHz	500 kHz	Pass
	High Channel, 927.25 MHz	79.181 kHz	500 kHz	Pass

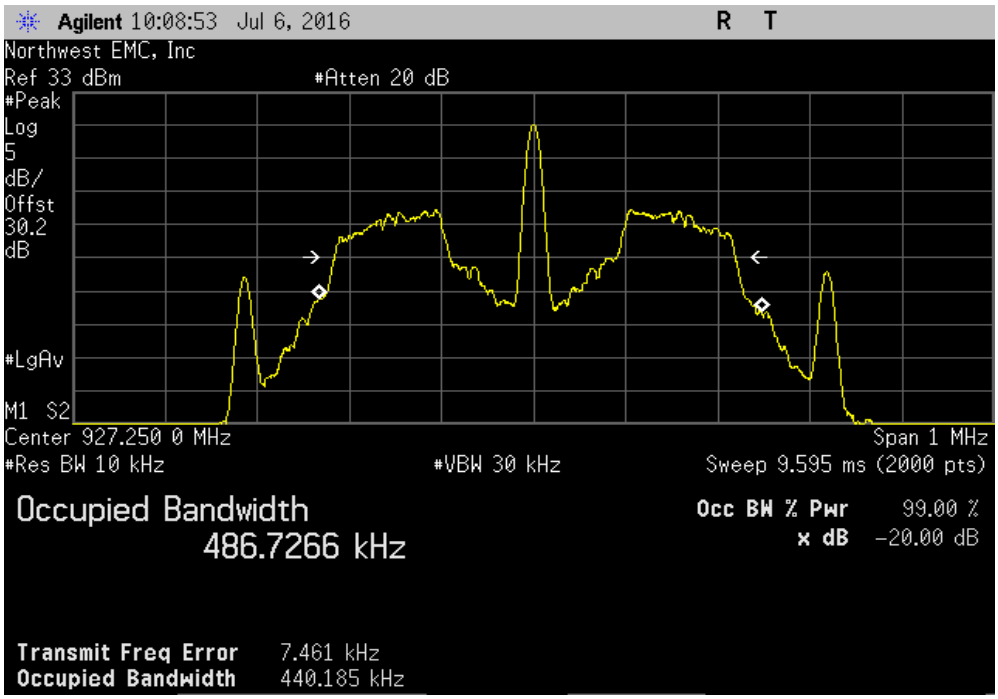
Max Thruput, DSB-ASK , 6.25us, FM0, Low Channel, 902.75 MHz						
				Value	Limit (<)	Result
				440.457 kHz	500 kHz	Pass



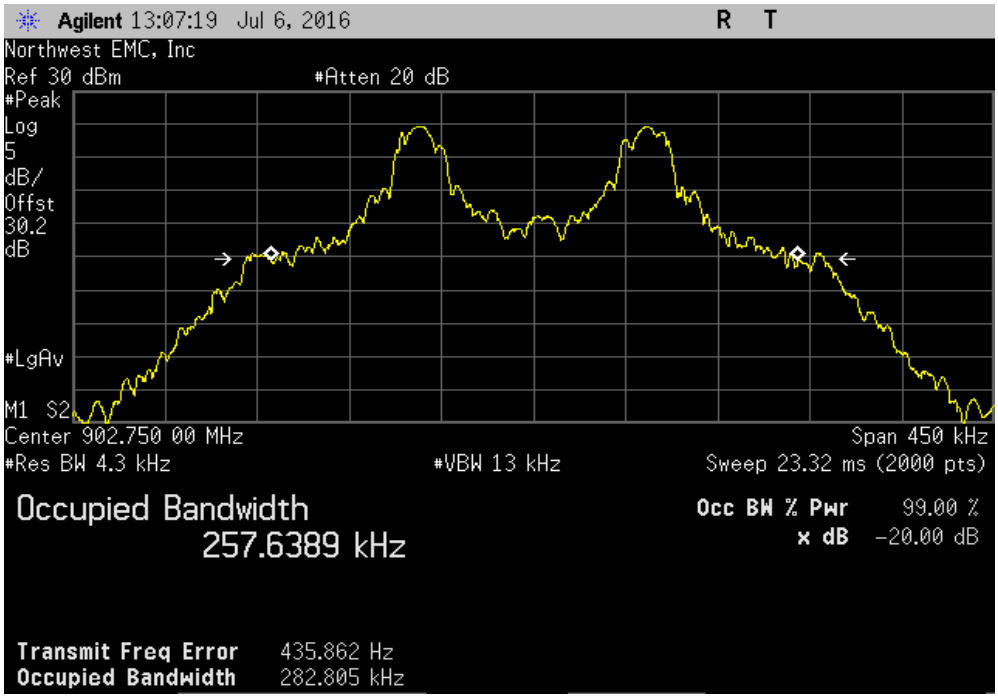
Max Thruput, DSB-ASK , 6.25us, FM0, Mid Channel, 915.25 MHz						
				Value	Limit (<)	Result
				440.205 kHz	500 kHz	Pass



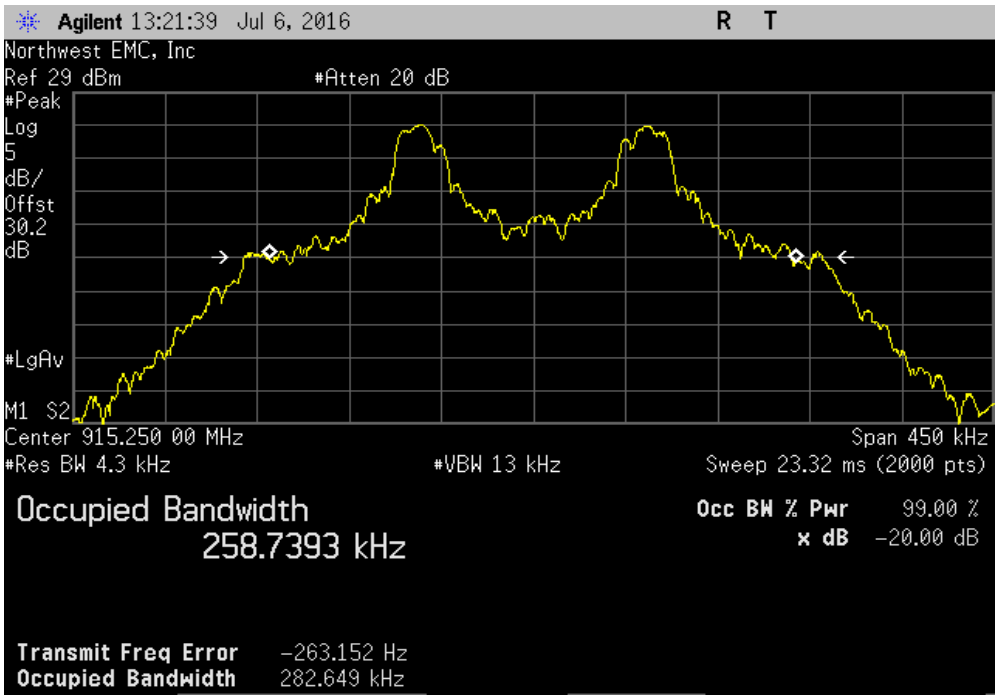
Max Thruput, DSB-ASK , 6.25us, FM0, High Channel, 927.25 MHz						
				Value	Limit (<)	Result
				440.185 kHz	500 kHz	Pass



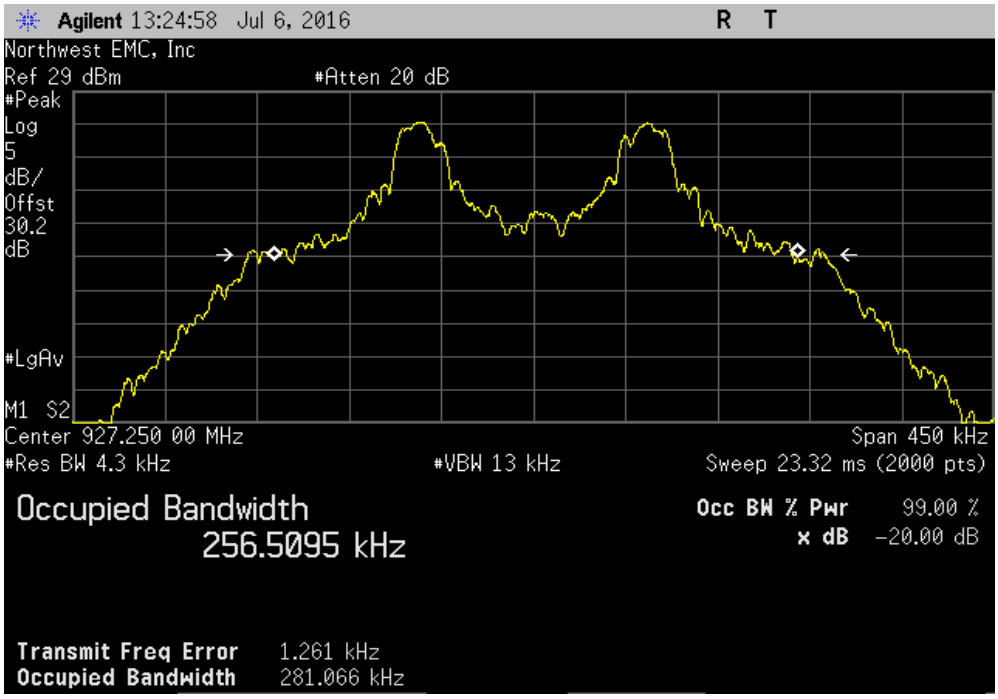
Max Miller, PR-ASK, 7.14us, M=4, Low Channel, 902.75 MHz						
				Value	Limit (<)	Result
				282.805 kHz	500 kHz	Pass



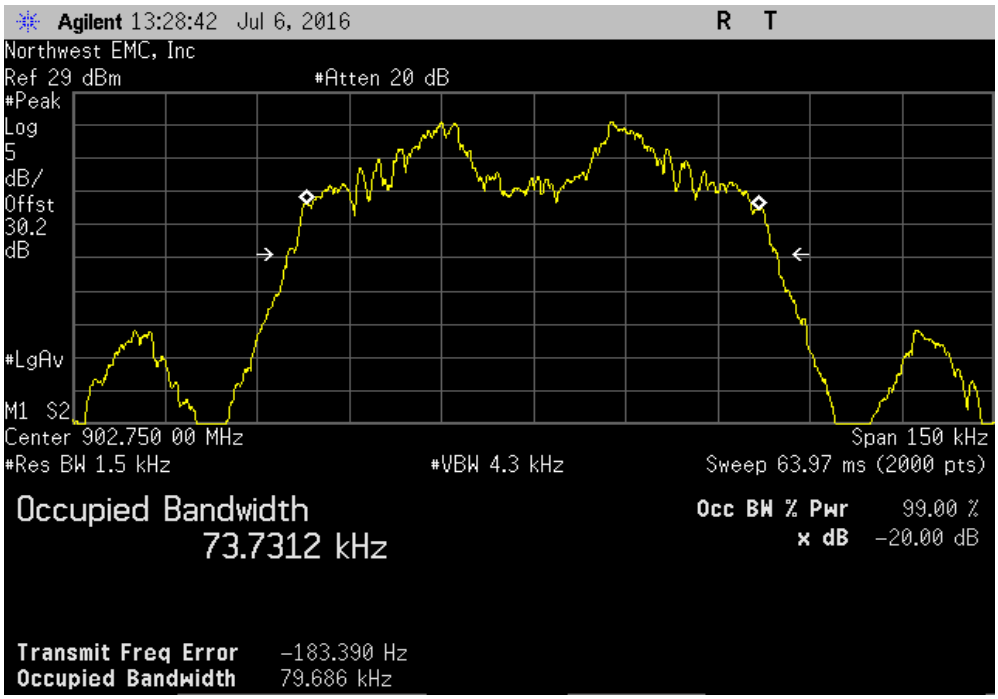
Max Miller, PR-ASK, 7.14us, M=4, Mid Channel, 915.25 MHz						
				Value	Limit (<)	Result
				282.649 kHz	500 kHz	Pass



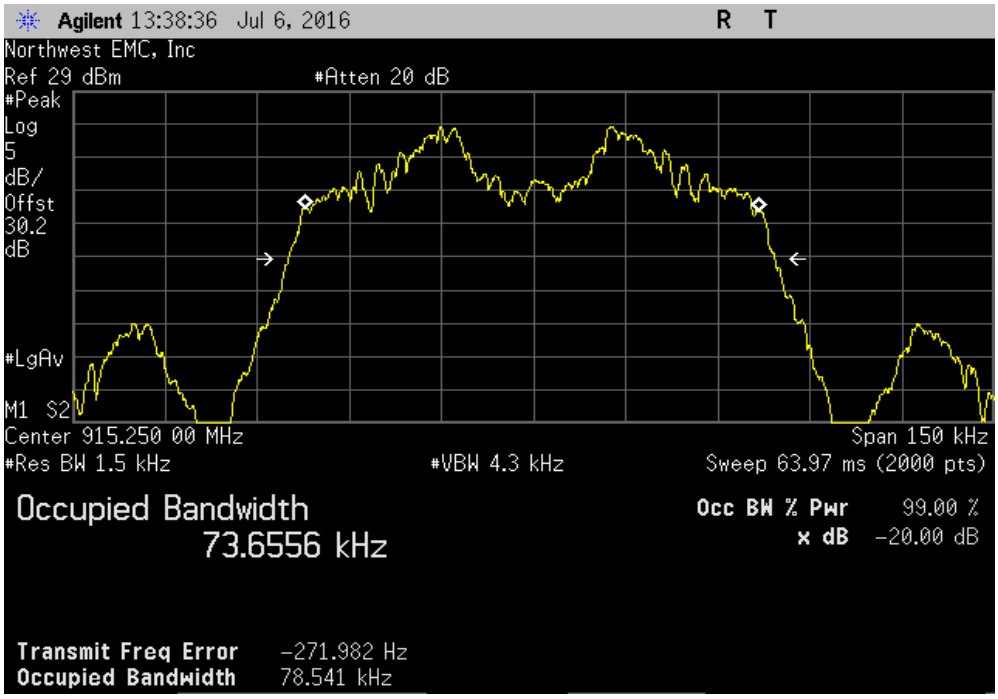
Max Miller, PR-ASK, 7.14us, M=4, High Channel, 927.25 MHz						
				Value	Limit (<)	Result
				281.066 kHz	500 kHz	Pass



Dense Reader, PR-ASK, 20us, M=4, Low Channel, 902.75 MHz							
					Value	Limit (<)	Result
					79.686 kHz	500 kHz	Pass



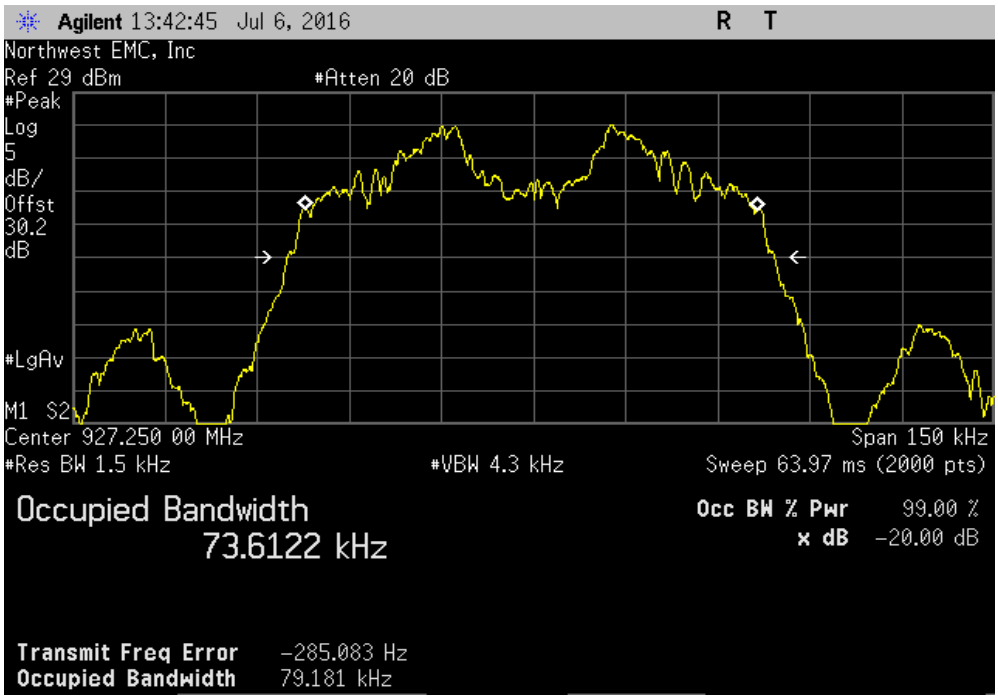
Dense Reader, PR-ASK, 20us, M=4, Mid Channel, 915.25 MHz							
					Value	Limit (<)	Result
					78.541 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2016.05.06

Dense Reader, PR-ASK, 20us, M=4, High Channel, 927.25 MHz						
				Value	Limit (<)	Result
				79.181 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
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

De Facto EIRP Limit: 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:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5 dBm. Client Specified Transmission Line PCB Loss of 3.0 dB between RF Output port and Antenna Input. The RFID radio controls maximum allowed transmit power per beam by using a formula of TX power = 36 - antenna gain. The antenna gain per beam is stored in non-volatile memory and is programed at time of manufacture and is not user accessible.

DEVIATIONS FROM TEST STANDARD

None

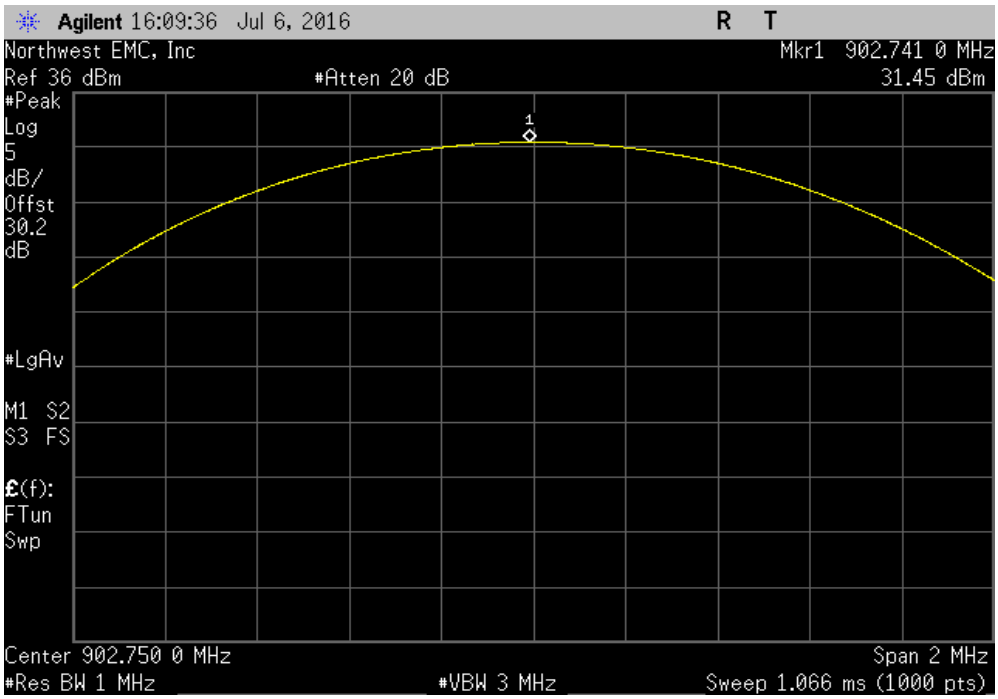
Configuration #	**1**	*Signature*

		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
Max Thruput						
	DSB-ASK , 6.25us, FM0					
	Low Channel, 902.75 MHz	31.45	3	28.45	30 dBm	Pass
	Mid Channel, 915.25 MHz	31.32	3	28.32	30 dBm	Pass
	High Channel, 927.25 MHz	31.32	3	28.32	30 dBm	Pass
Max Miller						
	PR-ASK, 7.14us, M=4					
	Low Channel, 902.75 MHz	31.33	3	28.33	30 dBm	Pass
	Mid Channel, 915.25 MHz	31.21	3	28.21	30 dBm	Pass
	High Channel, 927.25 MHz	31.17	3	28.17	30 dBm	Pass
Dense Reader						
	PR-ASK, 20us, M=4					
	Low Channel, 902.75 MHz	31.34	3	28.34	30 dBm	Pass
	Mid Channel, 915.25 MHz	31.28	3	28.28	30 dBm	Pass
	High Channel, 927.25 MHz	31.29	3	28.29	30 dBm	Pass

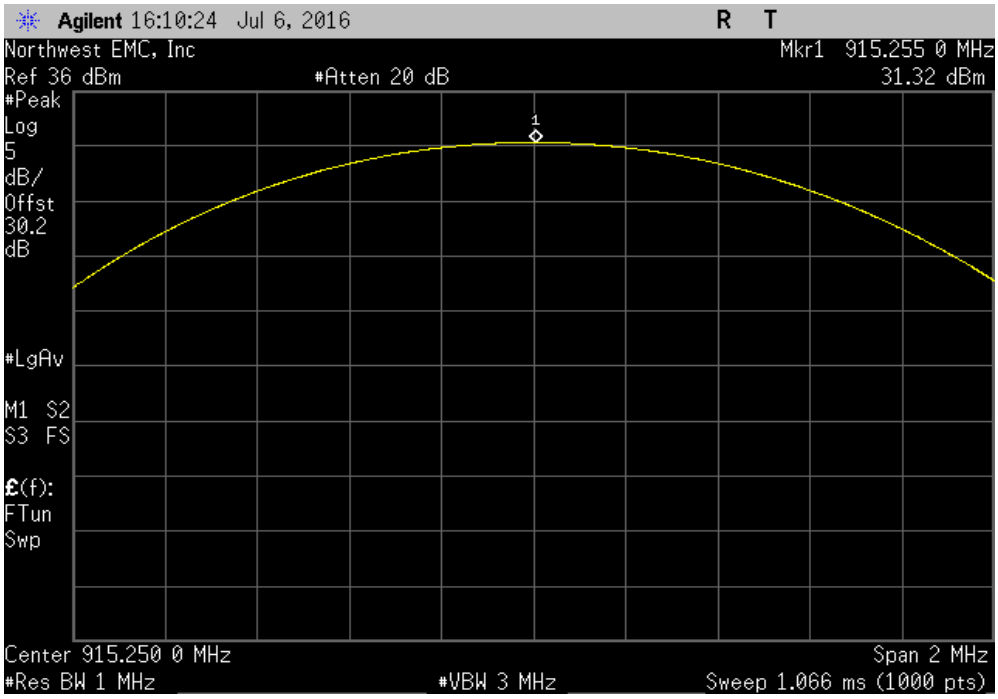
OUTPUT POWER

XMit 2016.05.06

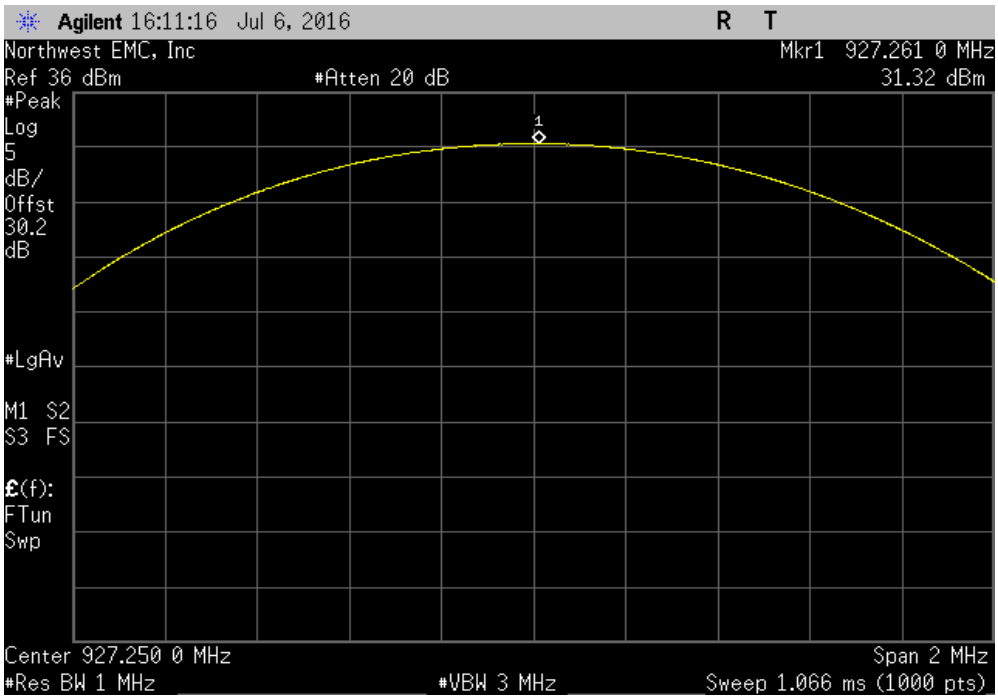
Max Thruput, DSB-ASK , 6.25us, FM0, Low Channel, 902.75 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.45	3	28.45	30 dBm	Pass



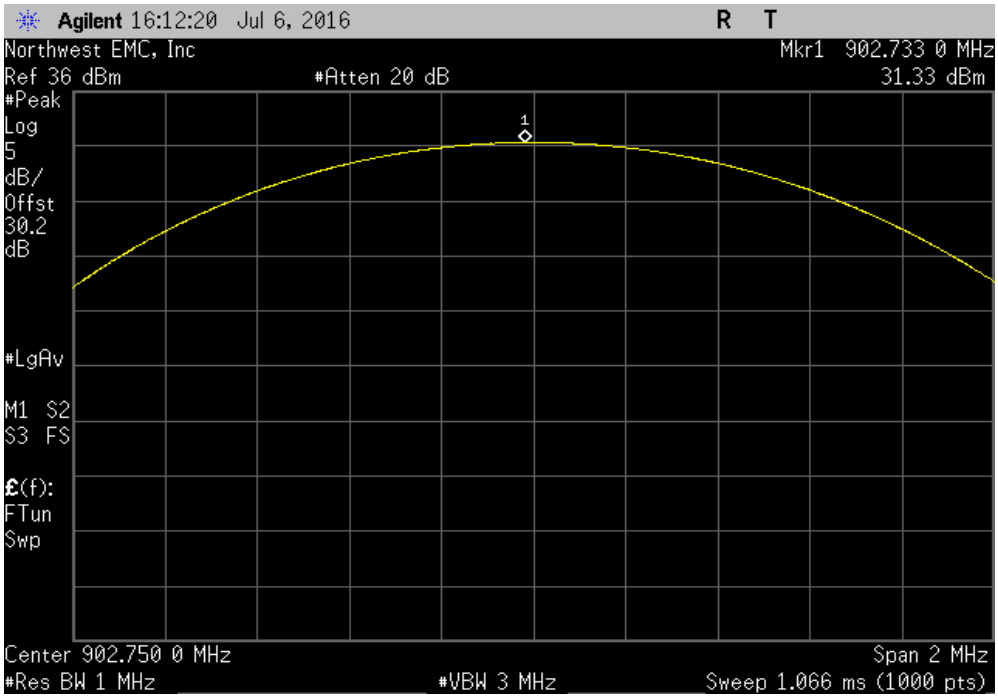
Max Thruput, DSB-ASK , 6.25us, FM0, Mid Channel, 915.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.32	3	28.32	30 dBm	Pass



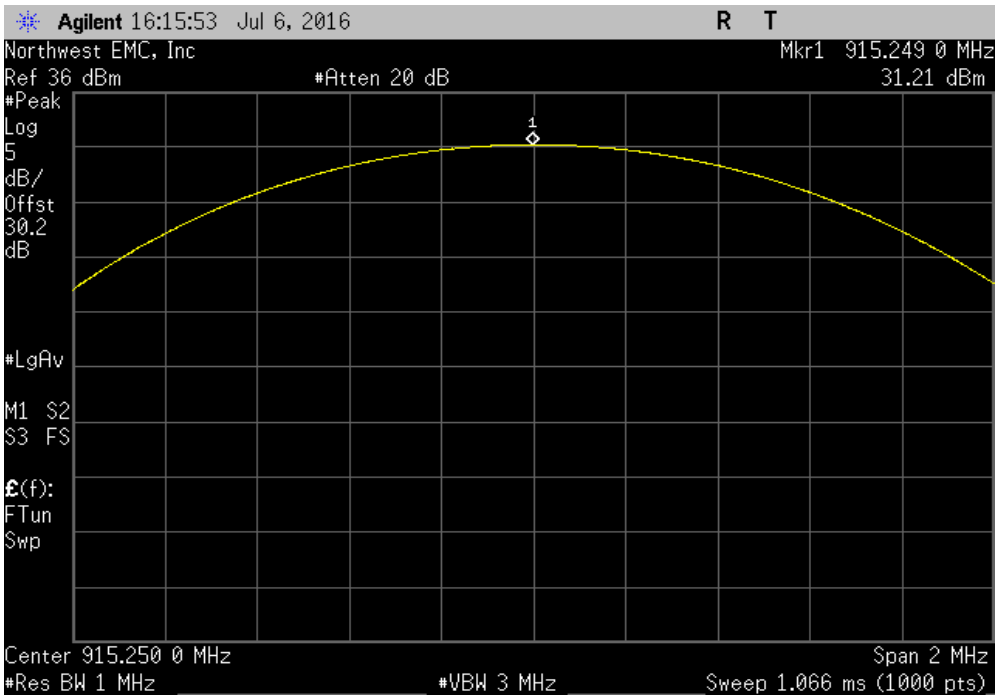
Max Thruput, DSB-ASK , 6.25us, FM0, High Channel, 927.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.32	3	28.32	30 dBm	Pass



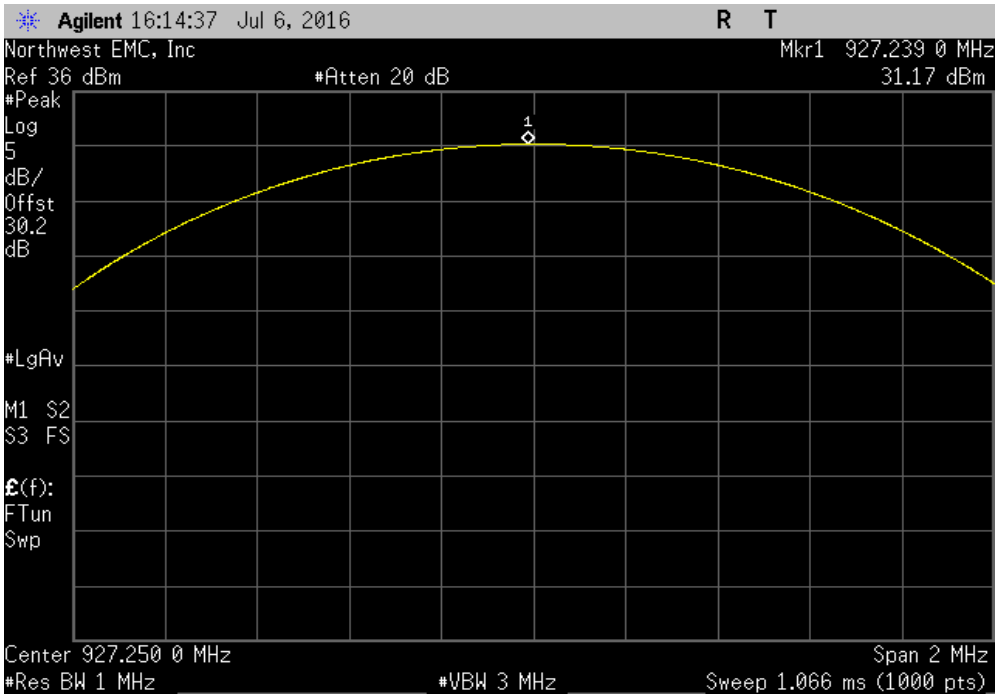
Max Miller, PR-ASK, 7.14us, M=4, Low Channel, 902.75 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.33	3	28.33	30 dBm	Pass



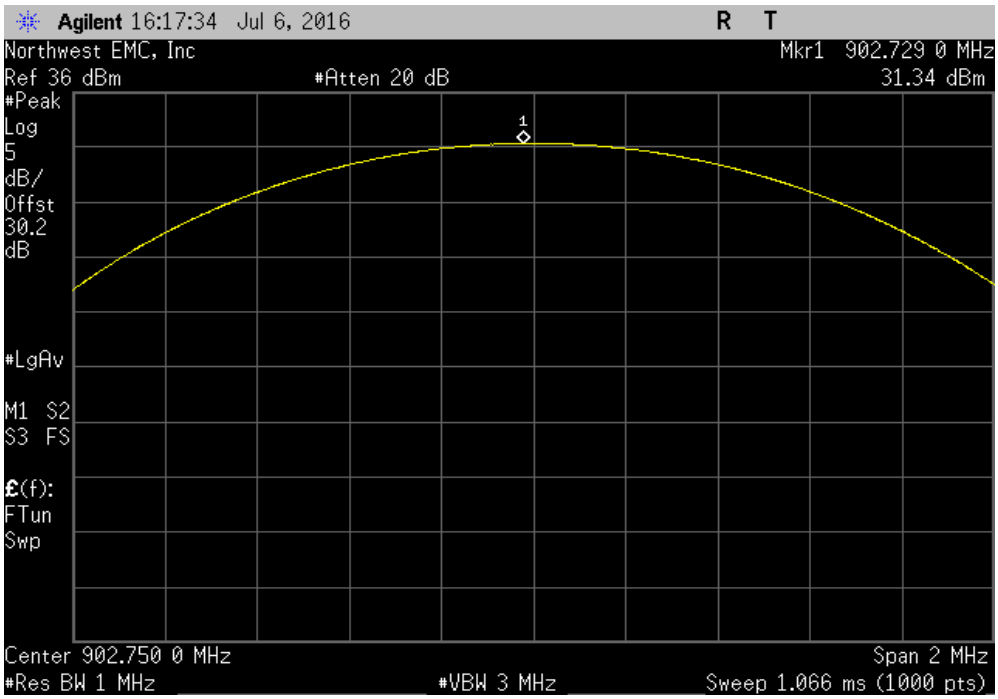
Max Miller, PR-ASK, 7.14us, M=4, Mid Channel, 915.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.21	3	28.21	30 dBm	Pass



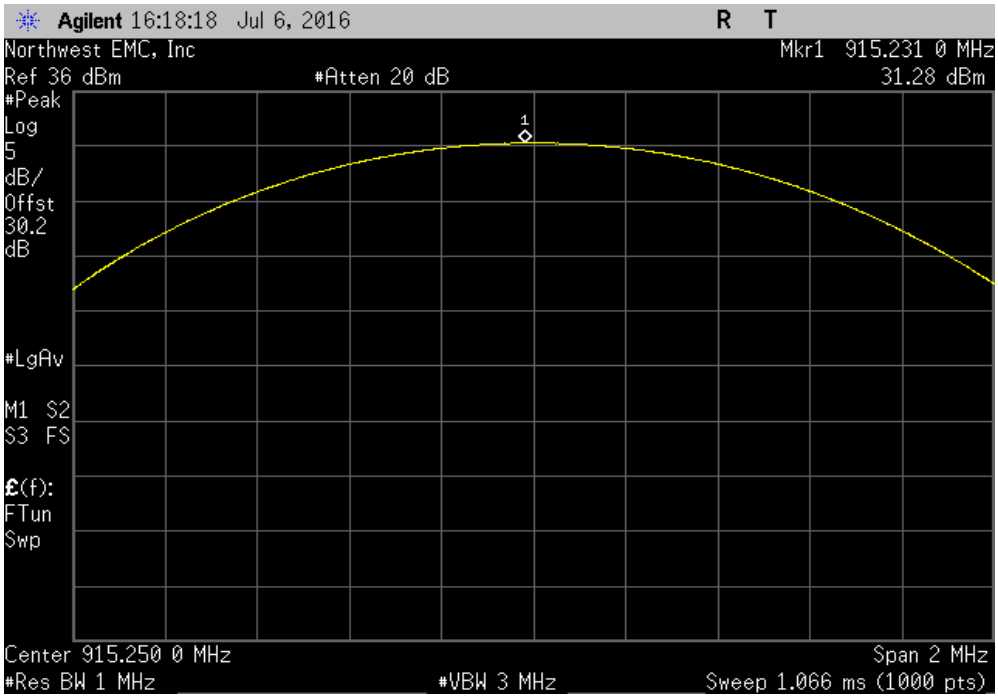
Max Miller, PR-ASK, 7.14us, M=4, High Channel, 927.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.17	3	28.17	30 dBm	Pass



Dense Reader, PR-ASK, 20us, M=4, Low Channel, 902.75 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.34	3	28.34	30 dBm	Pass



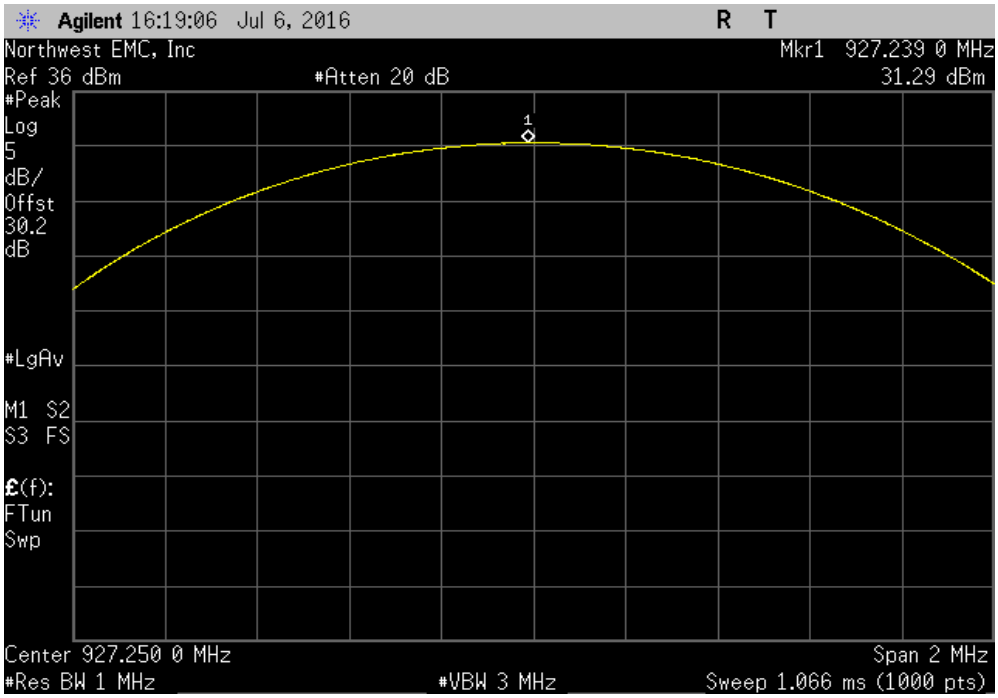
Dense Reader, PR-ASK, 20us, M=4, Mid Channel, 915.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.28	3	28.28	30 dBm	Pass



OUTPUT POWER

XMit 2016.05.06

Dense Reader, PR-ASK, 20us, M=4, High Channel, 927.25 MHz						
		Value (dBm)	PCB Loss (dB)	Adjusted Value (dBm)	Limit (<)	Result
		31.29	3	28.29	30 dBm	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
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018

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 in a no-hop mode. 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:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

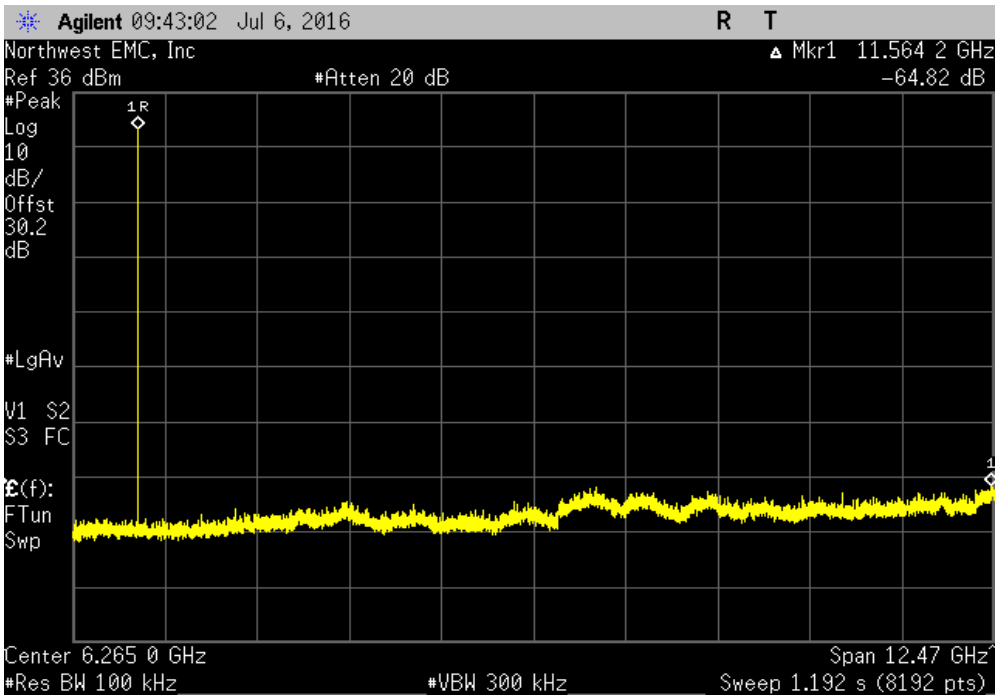
DEVIATIONS FROM TEST STANDARD

None

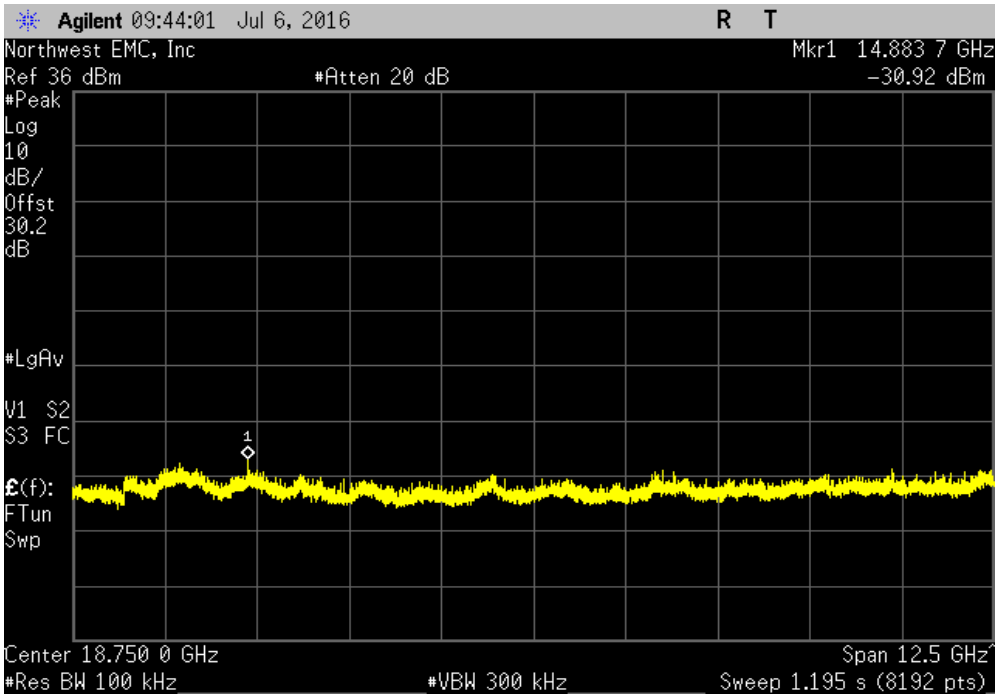
Configuration #	1	Signature

		Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
Max Thruput					
	DSB-ASK , 6.25us, FM0				
	Low Channel, 902.75 MHz	30 MHz - 12.5 GHz	-64.82	-20	Pass
	Low Channel, 902.75 MHz	12.5 GHz - 25 GHz	-60.21	-20	Pass
	Mid Channel, 915.25 MHz	30 MHz - 12.5 GHz	-64.13	-20	Pass
	Mid Channel, 915.25 MHz	12.5 GHz - 25 GHz	-59.53	-20	Pass
	High Channel, 927.25 MHz	30 MHz - 12.5 GHz	-63.94	-20	Pass
	High Channel, 927.25 MHz	12.5 GHz - 25 GHz	-60.39	-20	Pass
Max Miller					
	PR-ASK, 7.14us, M=4				
	Low Channel, 902.75 MHz	30 MHz - 12.5 GHz	-64.67	-20	Pass
	Low Channel, 902.75 MHz	12.5 GHz - 25 GHz	-61.38	-20	Pass
	Mid Channel, 915.25 MHz	30 MHz - 12.5 GHz	-64.54	-20	Pass
	Mid Channel, 915.25 MHz	12.5 GHz - 25 GHz	-61.23	-20	Pass
	High Channel, 927.25 MHz	30 MHz - 12.5 GHz	-64.13	-20	Pass
	High Channel, 927.25 MHz	12.5 GHz - 25 GHz	-60.81	-20	Pass
Dense Reader					
	PR-ASK, 20us, M=4				
	Low Channel, 902.75 MHz	30 MHz - 12.5 GHz	-66.36	-20	Pass
	Low Channel, 902.75 MHz	12.5 GHz - 25 GHz	-62.49	-20	Pass
	Mid Channel, 915.25 MHz	30 MHz - 12.5 GHz	-65.48	-20	Pass
	Mid Channel, 915.25 MHz	12.5 GHz - 25 GHz	-61.76	-20	Pass
	High Channel, 927.25 MHz	30 MHz - 12.5 GHz	-65.84	-20	Pass
	High Channel, 927.25 MHz	12.5 GHz - 25 GHz	-62.49	-20	Pass

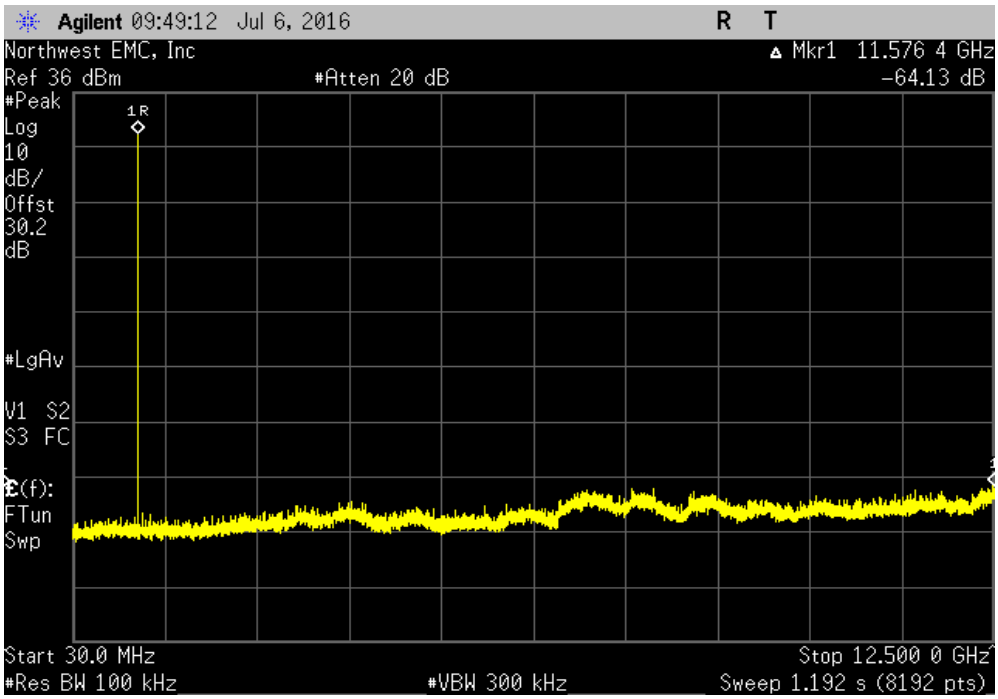
Max Thruput, DSB-ASK , 6.25us, FM0, Low Channel, 902.75 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-64.82	-20	Pass



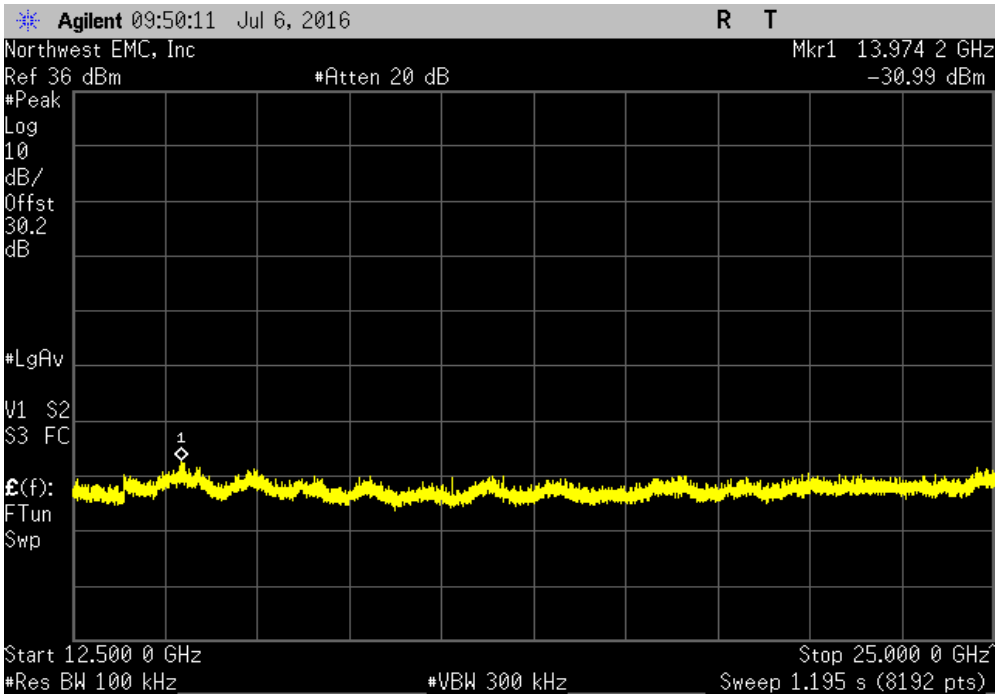
Max Thruput, DSB-ASK , 6.25us, FM0, Low Channel, 902.75 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-60.21	-20	Pass



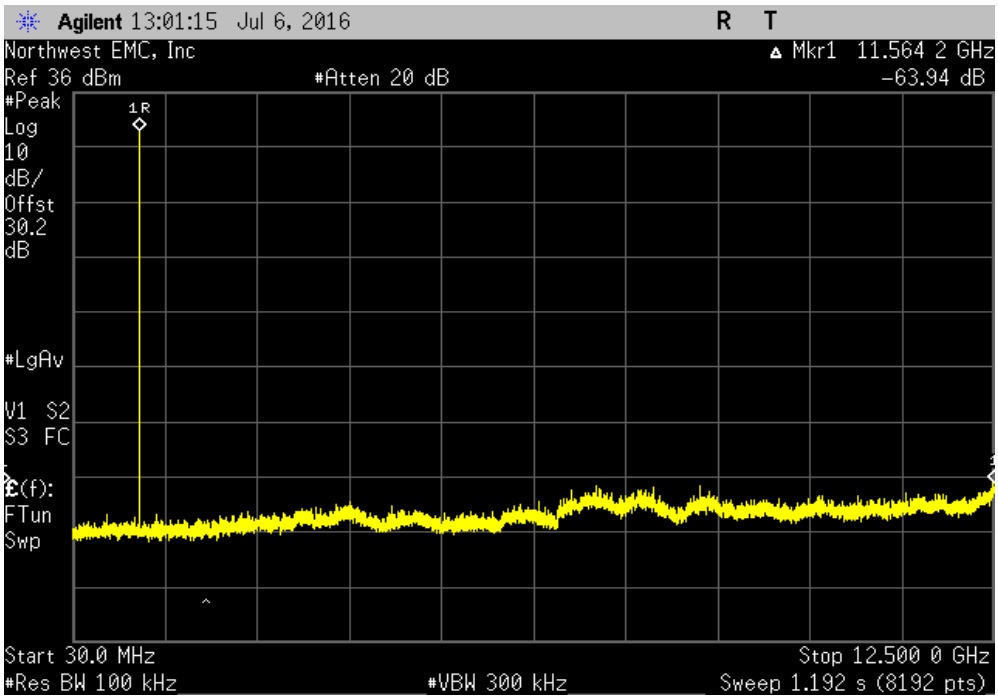
Max Thruput, DSB-ASK , 6.25us, FM0, Mid Channel, 915.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-64.13	-20	Pass



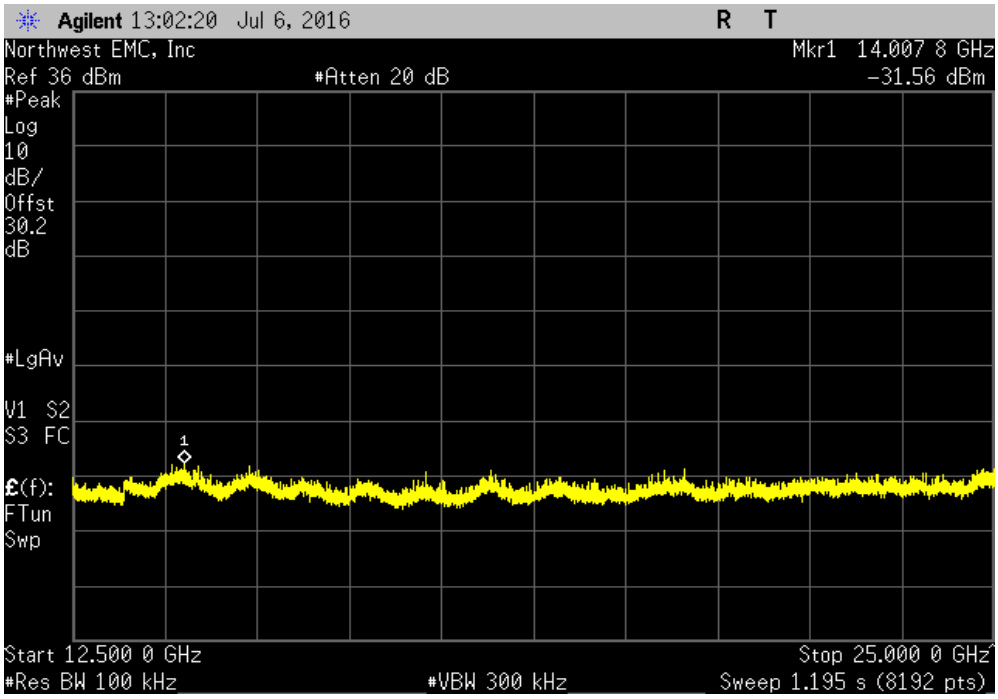
Max Thruput, DSB-ASK , 6.25us, FM0, Mid Channel, 915.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-59.53	-20	Pass



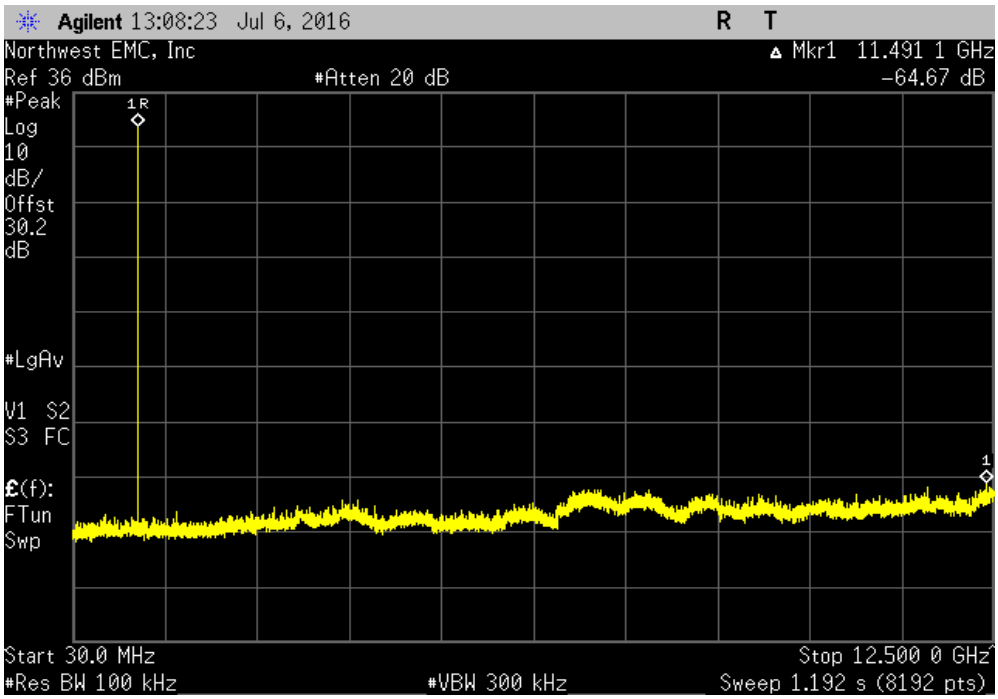
Max Thruput, DSB-ASK , 6.25us, FM0, High Channel, 927.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-63.94	-20	Pass



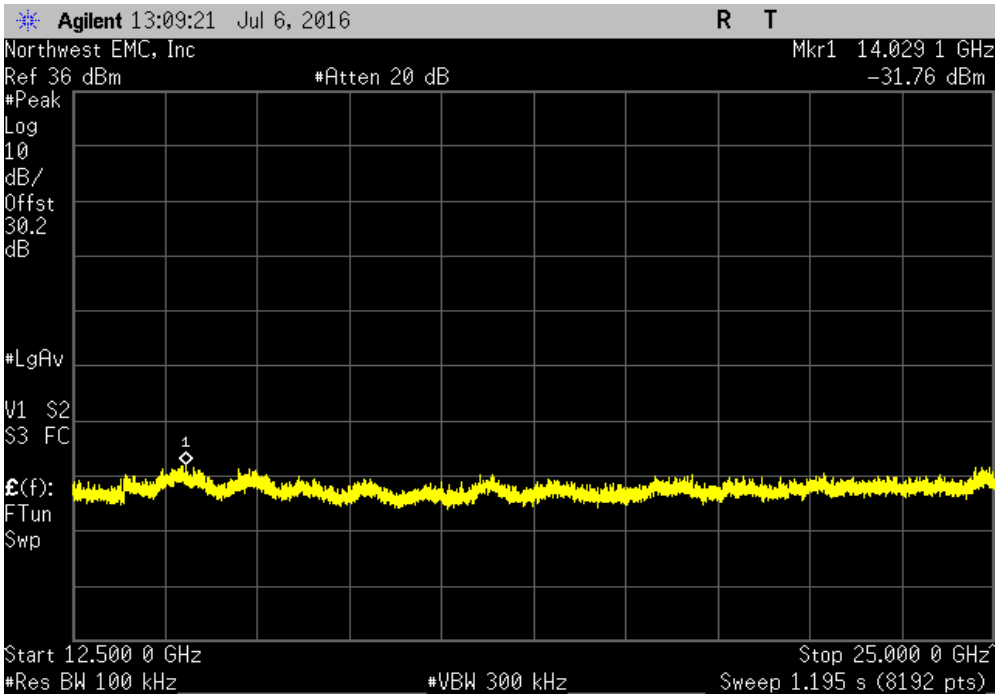
Max Thruput, DSB-ASK , 6.25us, FM0, High Channel, 927.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-60.39	-20	Pass



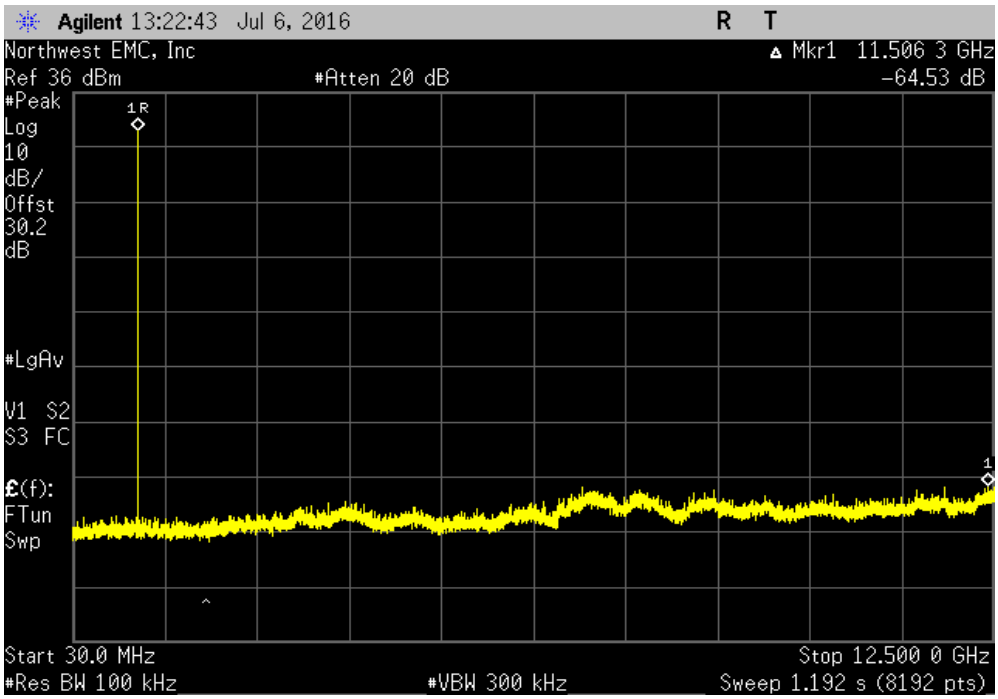
Max Miller, PR-ASK, 7.14us, M=4, Low Channel, 902.75 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-64.67	-20	Pass



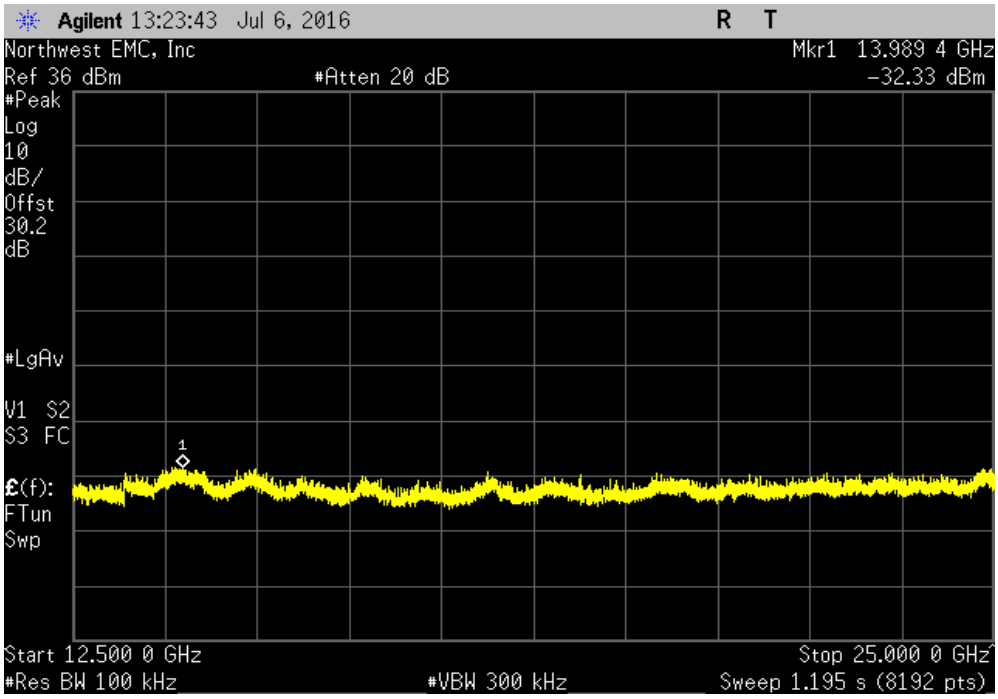
Max Miller, PR-ASK, 7.14us, M=4, Low Channel, 902.75 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-61.38	-20	Pass



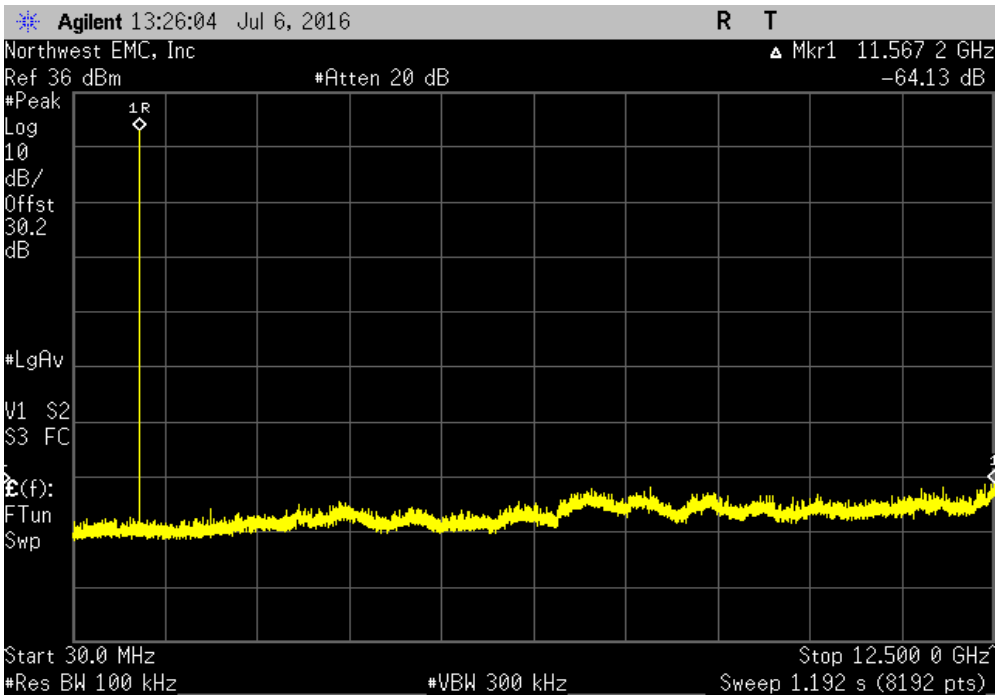
Max Miller, PR-ASK, 7.14us, M=4, Mid Channel, 915.25 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-64.54	-20	Pass



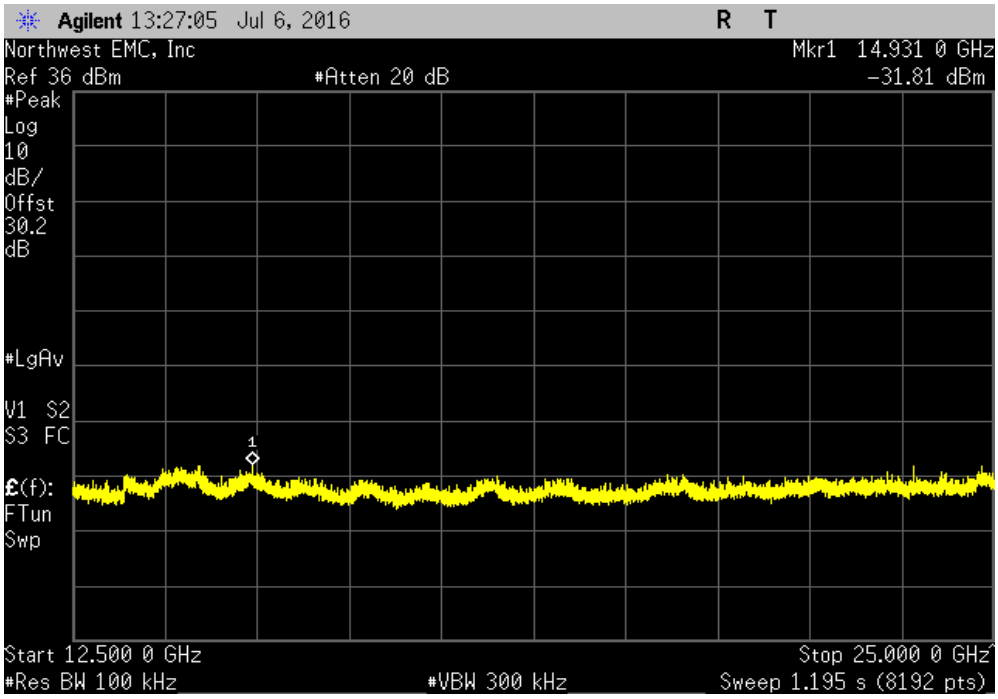
Max Miller, PR-ASK, 7.14us, M=4, Mid Channel, 915.25 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-61.23	-20	Pass



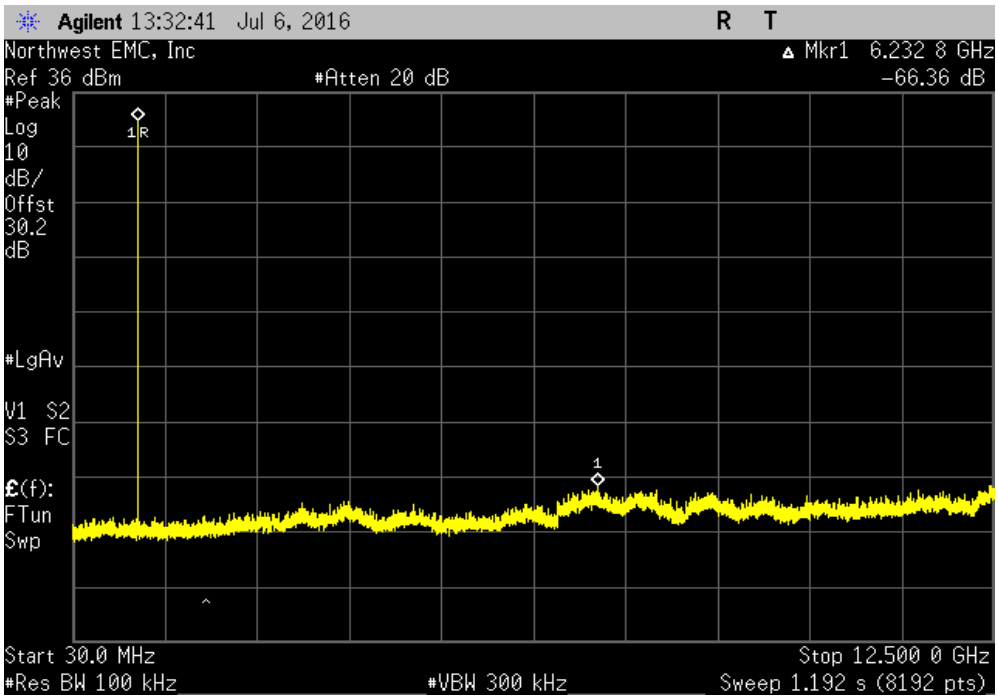
Max Miller, PR-ASK, 7.14us, M=4, High Channel, 927.25 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-64.13	-20	Pass



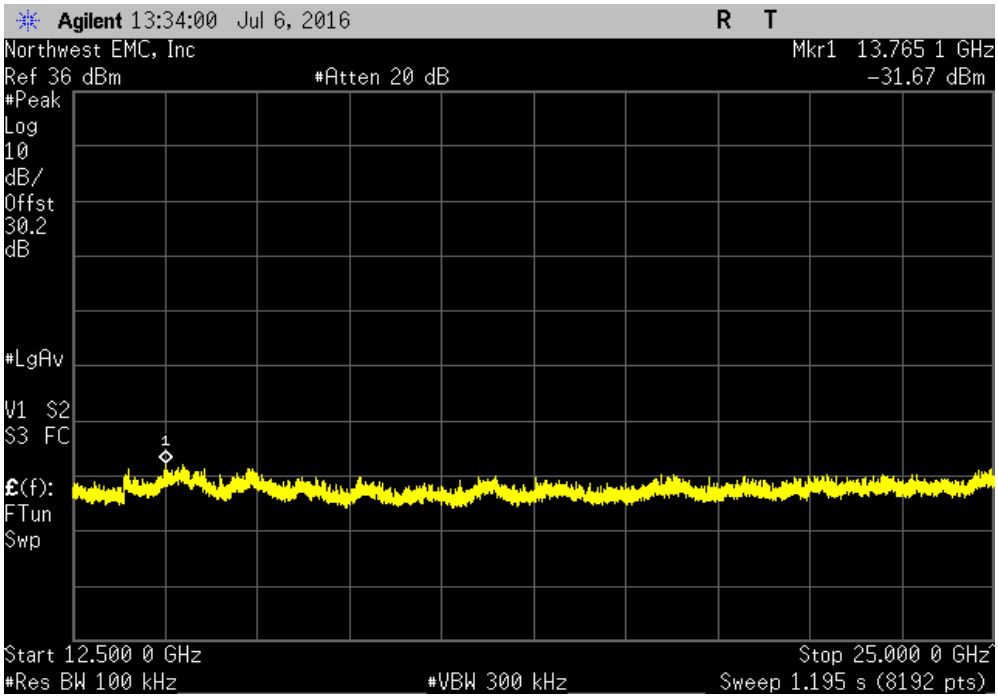
Max Miller, PR-ASK, 7.14us, M=4, High Channel, 927.25 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-60.81	-20	Pass



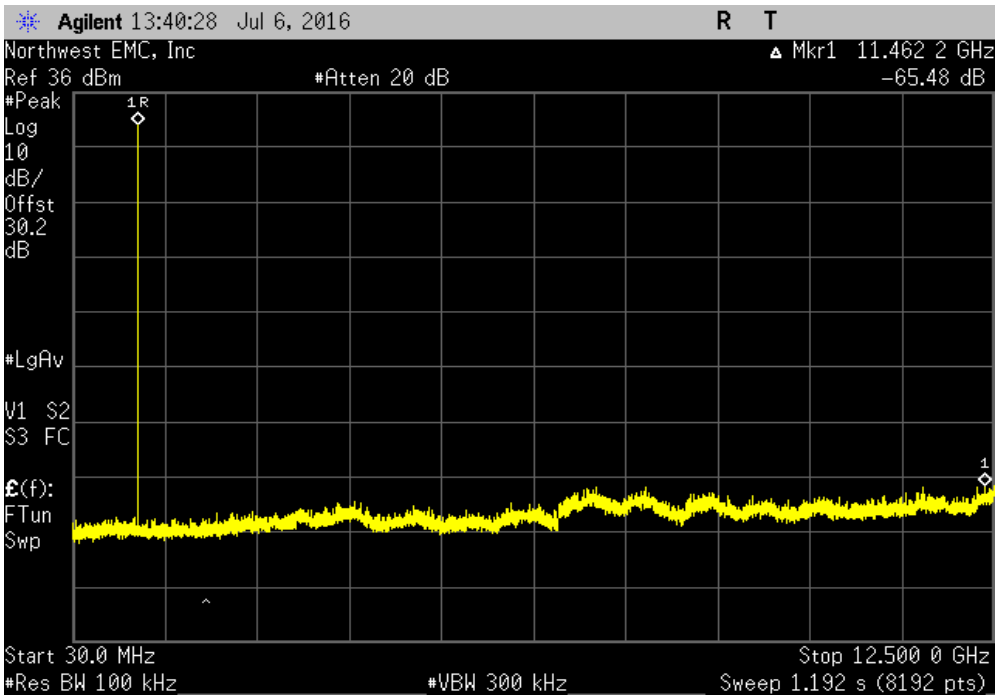
Dense Reader, PR-ASK, 20us, M=4, Low Channel, 902.75 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-66.36	-20	Pass



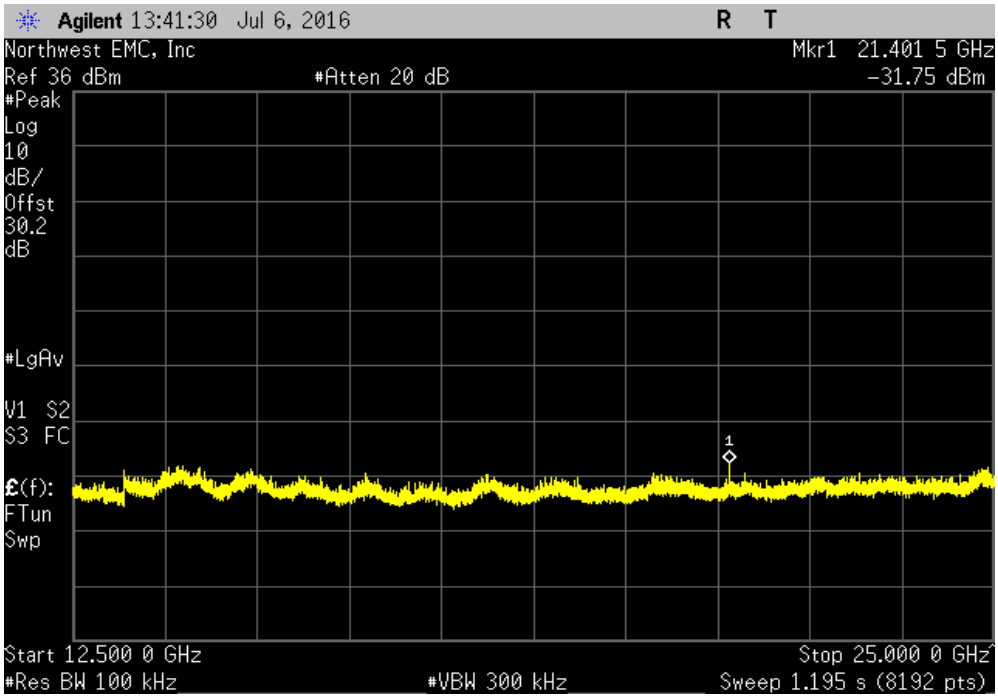
Dense Reader, PR-ASK, 20us, M=4, Low Channel, 902.75 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-62.49	-20	Pass



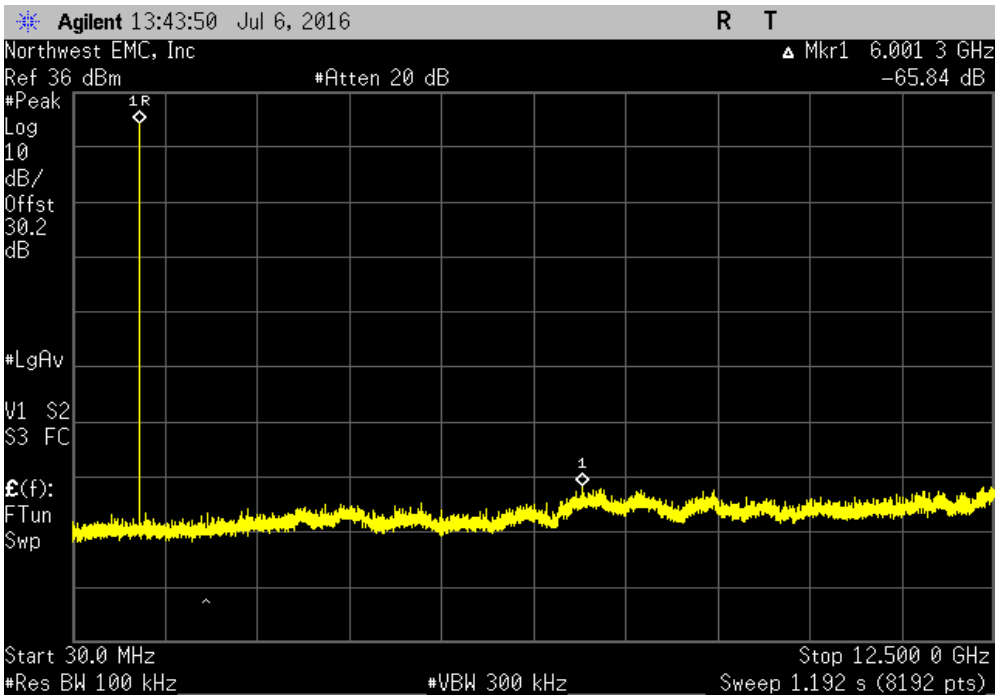
Dense Reader, PR-ASK, 20us, M=4, Mid Channel, 915.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-65.48	-20	Pass



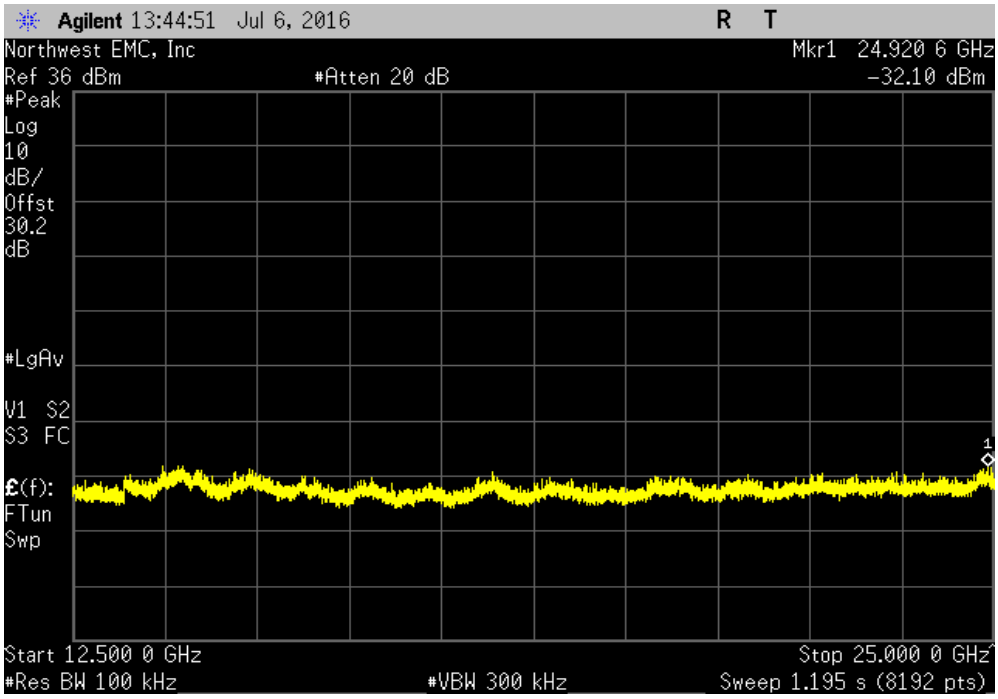
Dense Reader, PR-ASK, 20us, M=4, Mid Channel, 915.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-61.76	-20	Pass



Dense Reader, PR-ASK, 20us, M=4, High Channel, 927.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-65.84	-20	Pass



Dense Reader, PR-ASK, 20us, M=4, High Channel, 927.25 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-62.49	-20	Pass



BAND EDGE COMPLIANCE

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018

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 band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

BAND EDGE COMPLIANCE

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

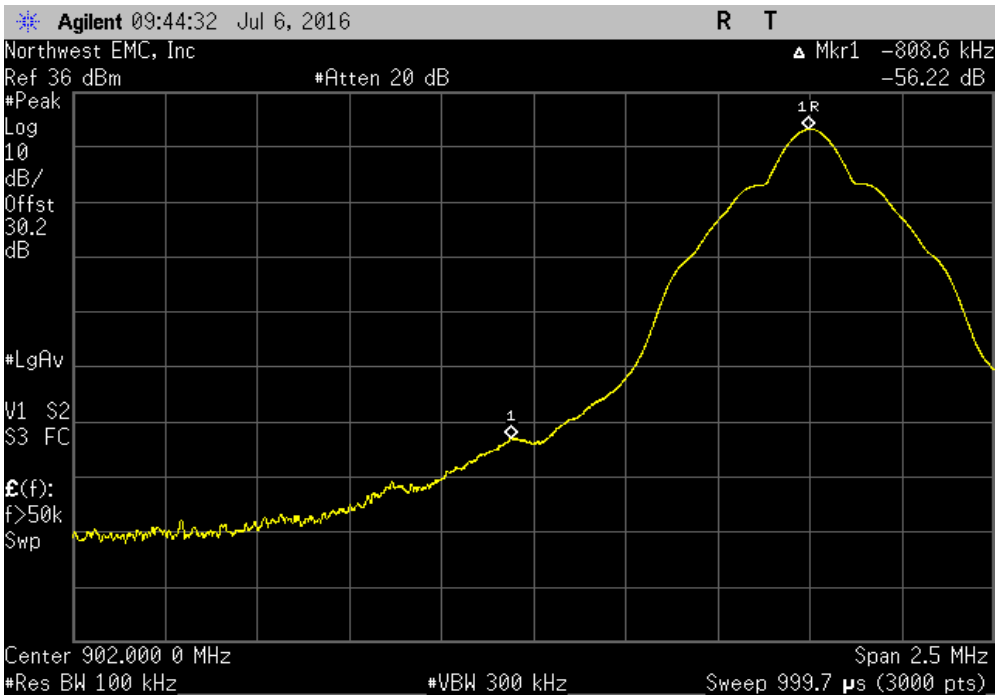
DEVIATIONS FROM TEST STANDARD

None

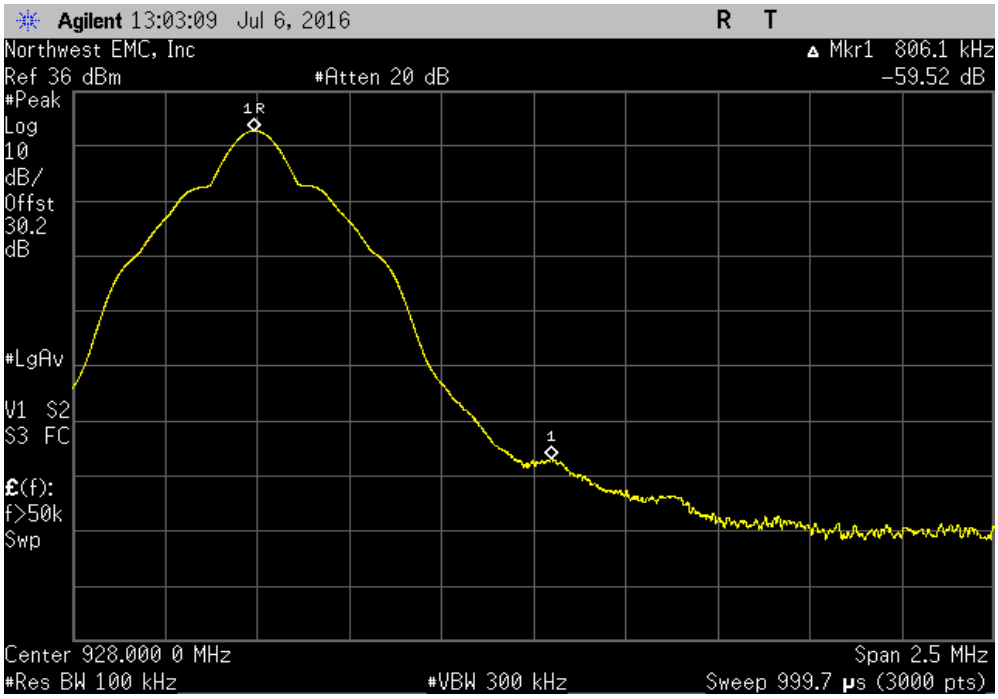
Configuration #	1	Signature

		Value (dBc)	Limit ≤ (dBc)	Result
Max Thruput				
	DSB-ASK , 6.25us, FM0			
	Low Channel, 902.75 MHz	-56.22	-20	Pass
	High Channel, 927.25 MHz	-59.52	-20	Pass
Max Miller				
	PR-ASK, 7.14us, M=4			
	Low Channel, 902.75 MHz	-68.23	-20	Pass
	High Channel, 927.25 MHz	-68.35	-20	Pass
Dense Reader				
	PR-ASK, 20us, M=4			
	Low Channel, 902.75 MHz	-72.22	-20	Pass
	High Channel, 927.25 MHz	-71.66	-20	Pass

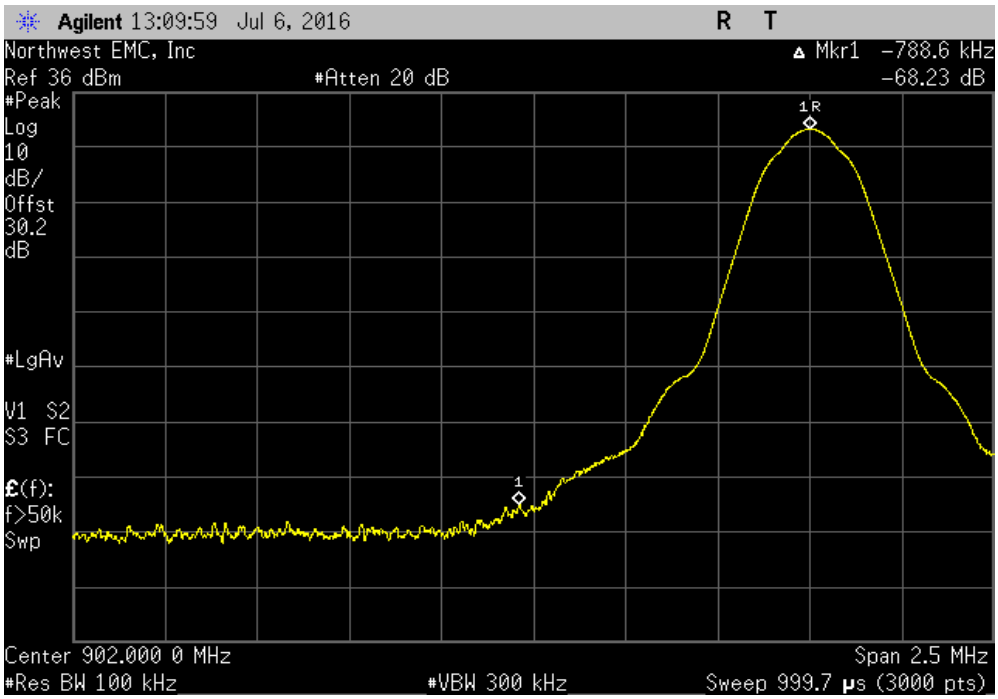
Max Thruput, DSB-ASK , 6.25us, FM0, Low Channel, 902.75 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.22	-20	Pass



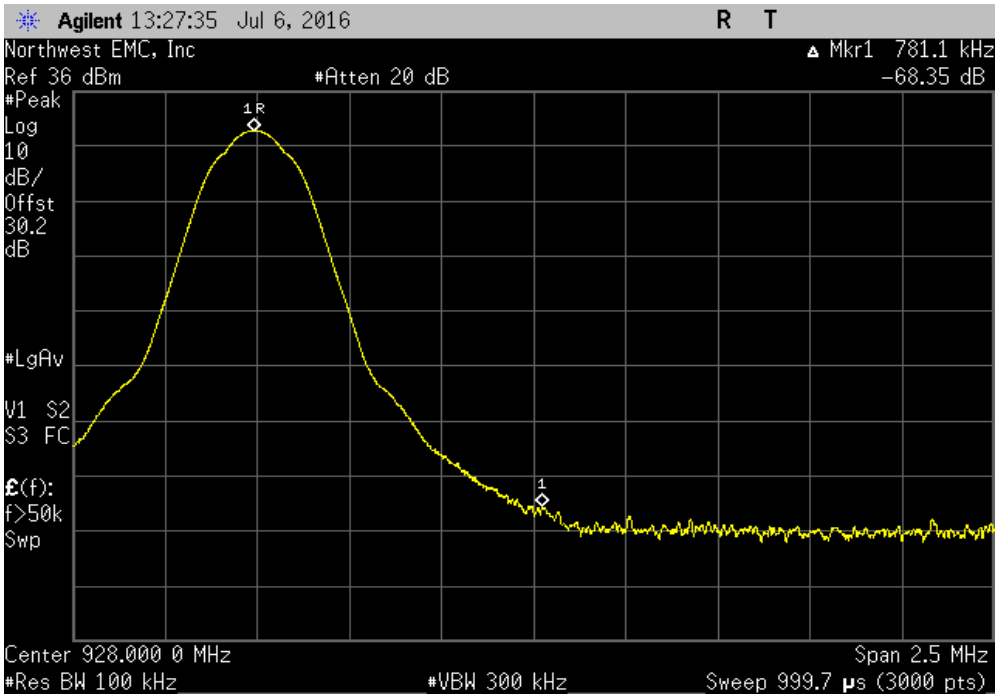
Max Thruput, DSB-ASK , 6.25us, FM0, High Channel, 927.25 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-59.52	-20	Pass



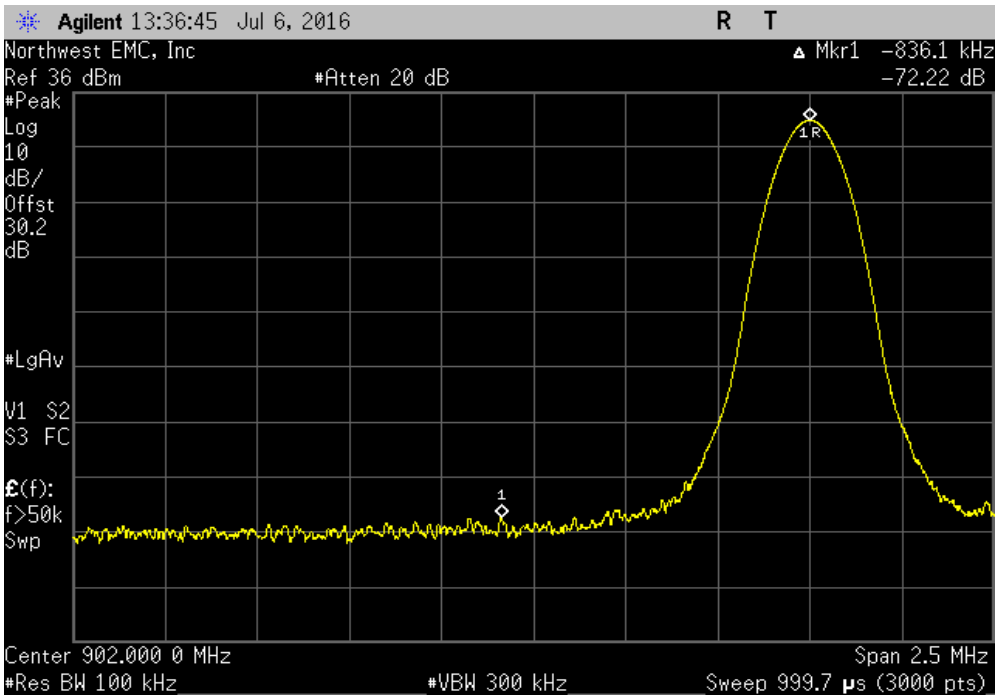
Max Miller, PR-ASK, 7.14us, M=4, Low Channel, 902.75 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-68.23	-20	Pass



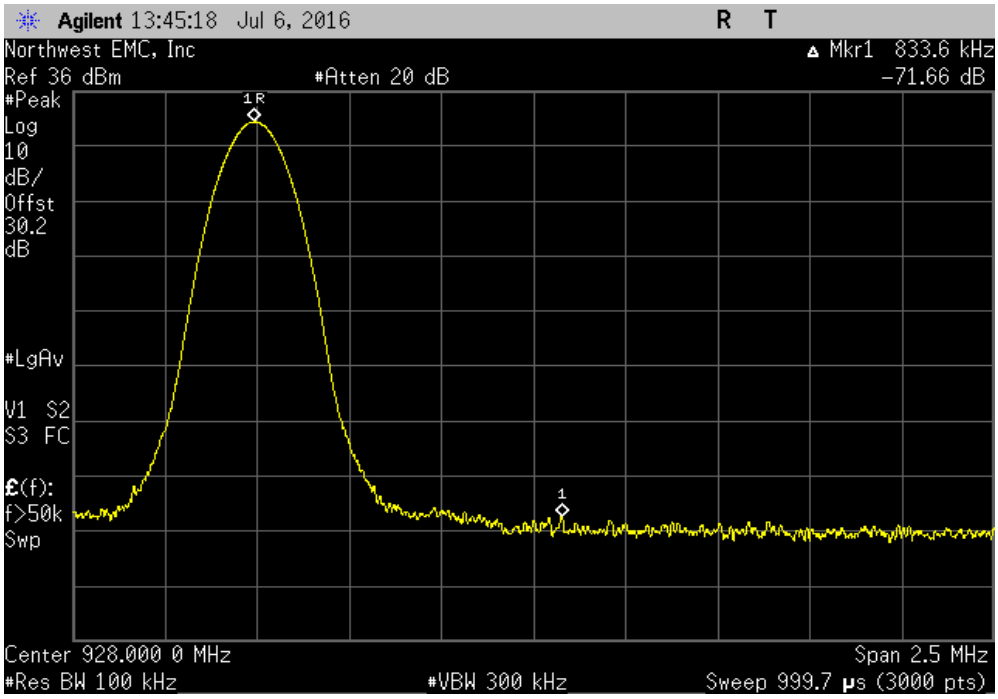
Max Miller, PR-ASK, 7.14us, M=4, High Channel, 927.25 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-68.35	-20	Pass



Dense Reader, PR-ASK, 20us, M=4, Low Channel, 902.75 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-72.22	-20	Pass



Dense Reader, PR-ASK, 20us, M=4, High Channel, 927.25 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-71.66	-20	Pass



BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017

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 band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 - HOPPING MODE

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

DEVIATIONS FROM TEST STANDARD

None

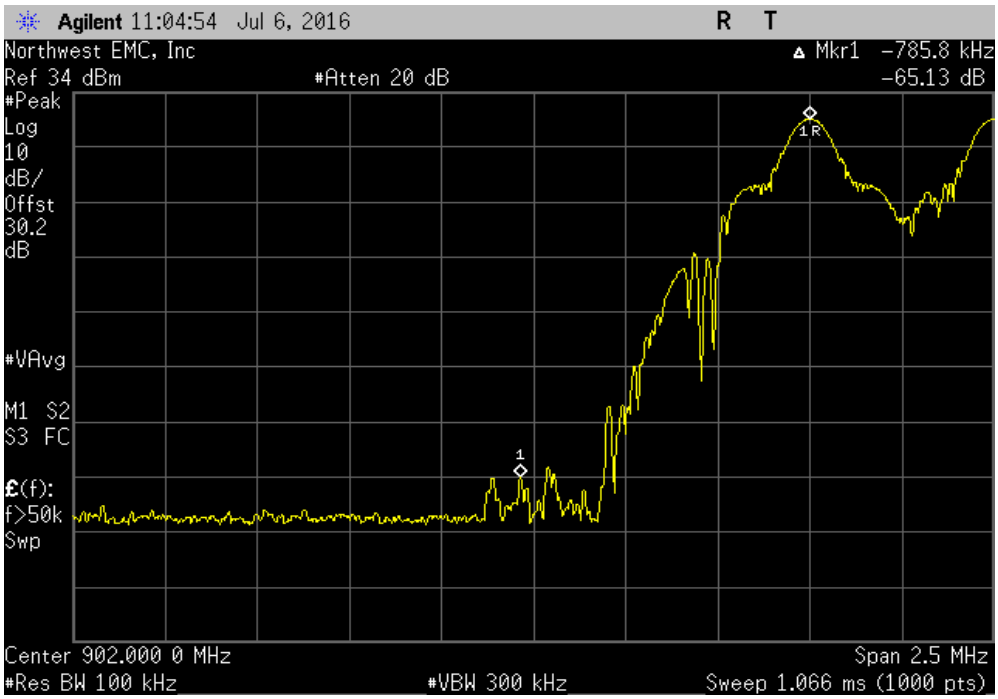
Configuration #	1	Signature

		Value (dBc)	Limit ≤ (dBc)	Result
Hopping Mode				
	Max Thruput. DSB-ASK , 6.25us, FM0			
	Mid Channel	-65.13	-20	Pass
	Mid Channel	-69.39	-20	Pass
	Max Miller. PR-ASK, 7.14us, M=4			
	Mid Channel	-65.06	-20	Pass
	Mid Channel	-64.22	-20	Pass
	Dense Reader. PR-ASK, 20us, M=4			
	Mid Channel	-67.05	-20	Pass
	Mid Channel	-70.32	-20	Pass

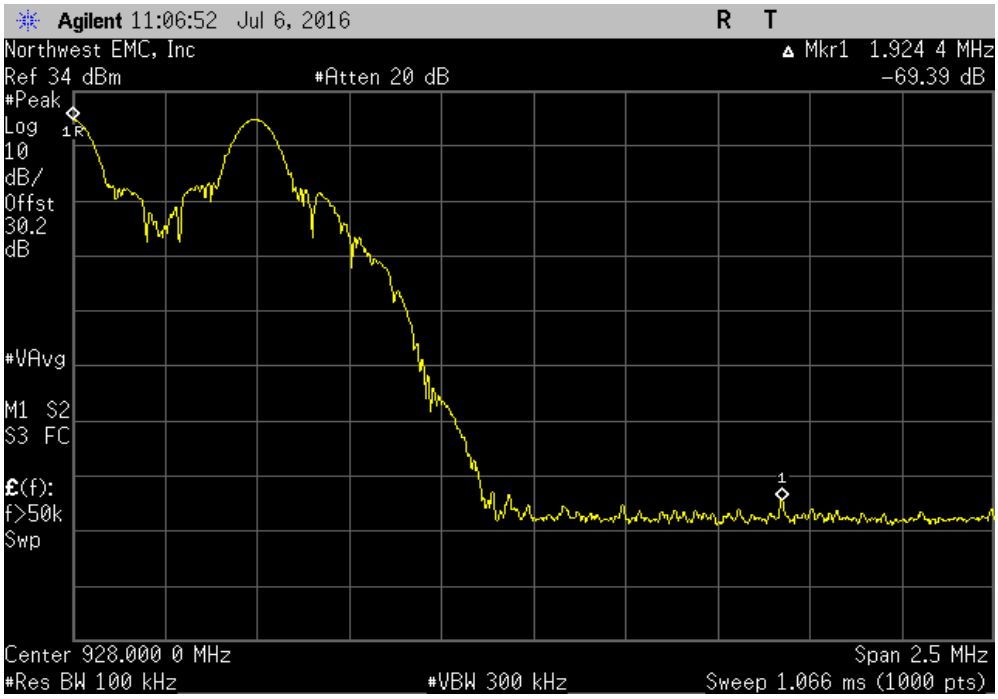
BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-65.13	-20	Pass



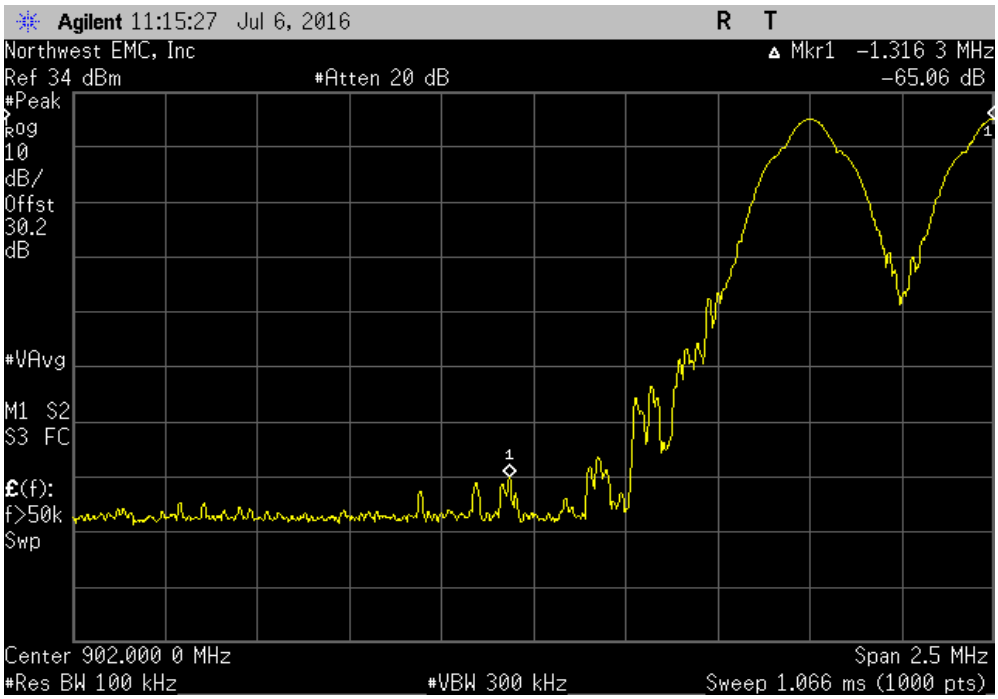
Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-69.39	-20	Pass



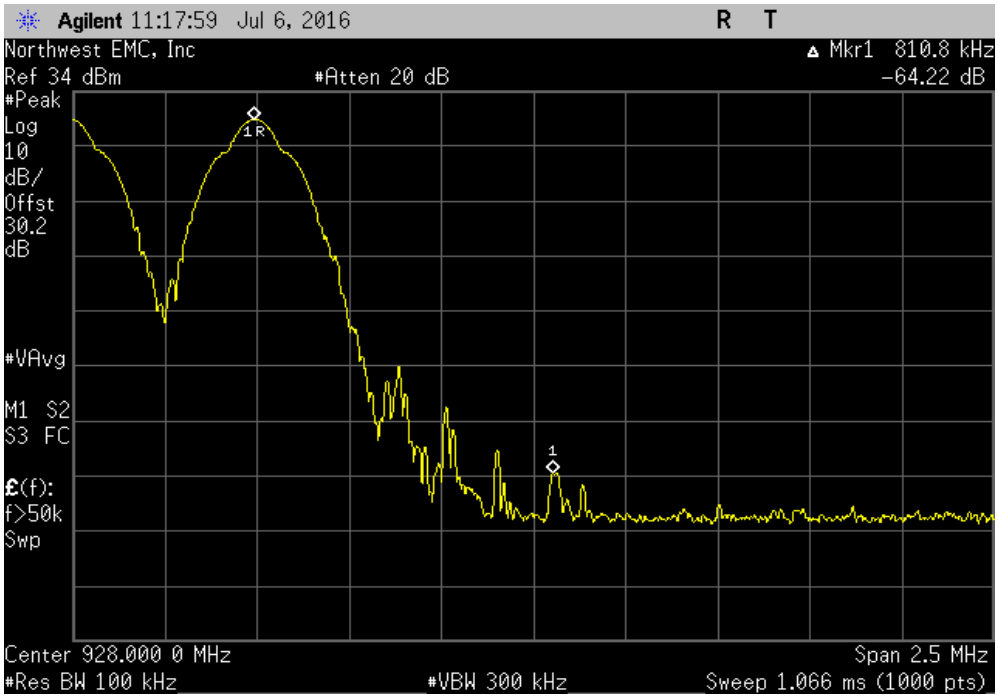
BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2016.05.06

Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-65.06	-20	Pass



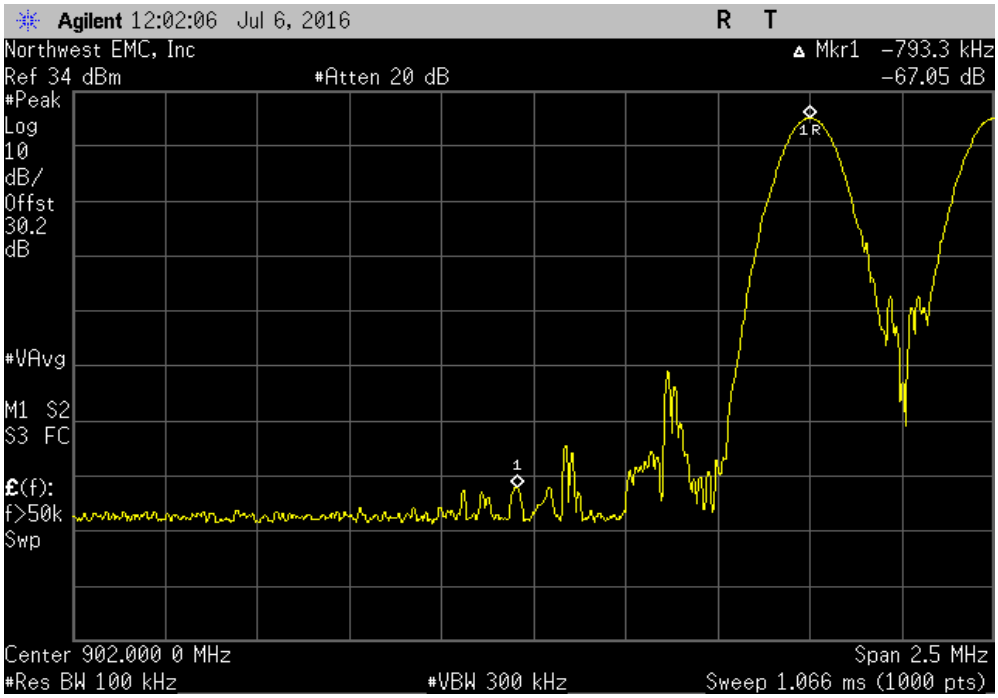
Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-64.22	-20	Pass



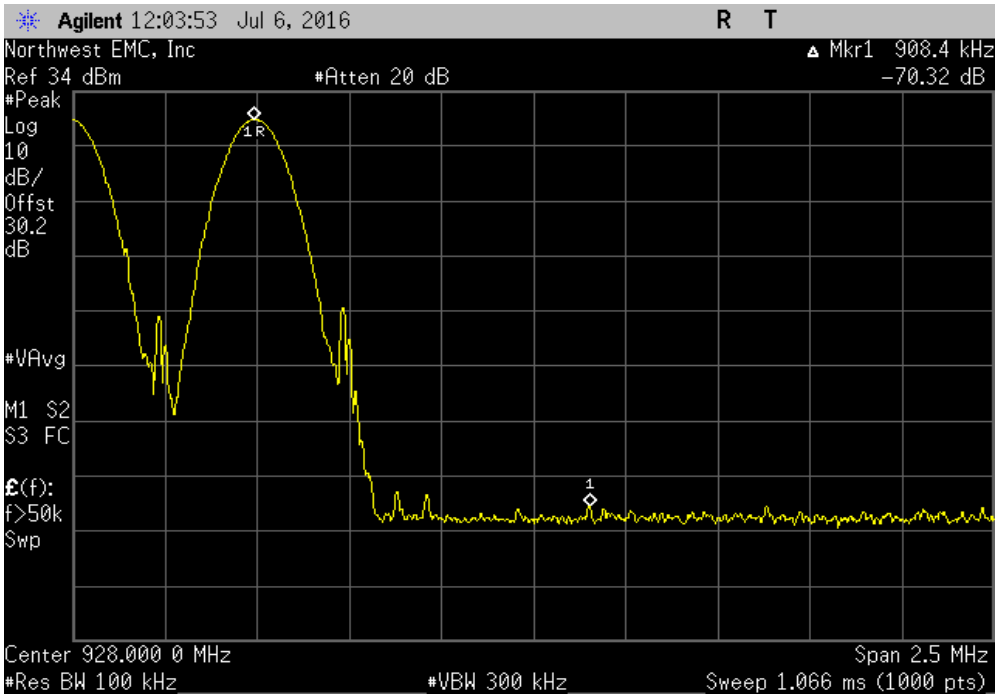
BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2016.05.06

Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-67.05	-20	Pass



Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-70.32	-20	Pass



CARRIER FREQUENCY SEPARATION

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

CARRIER FREQUENCY SEPARATION

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

DEVIATIONS FROM TEST STANDARD

None

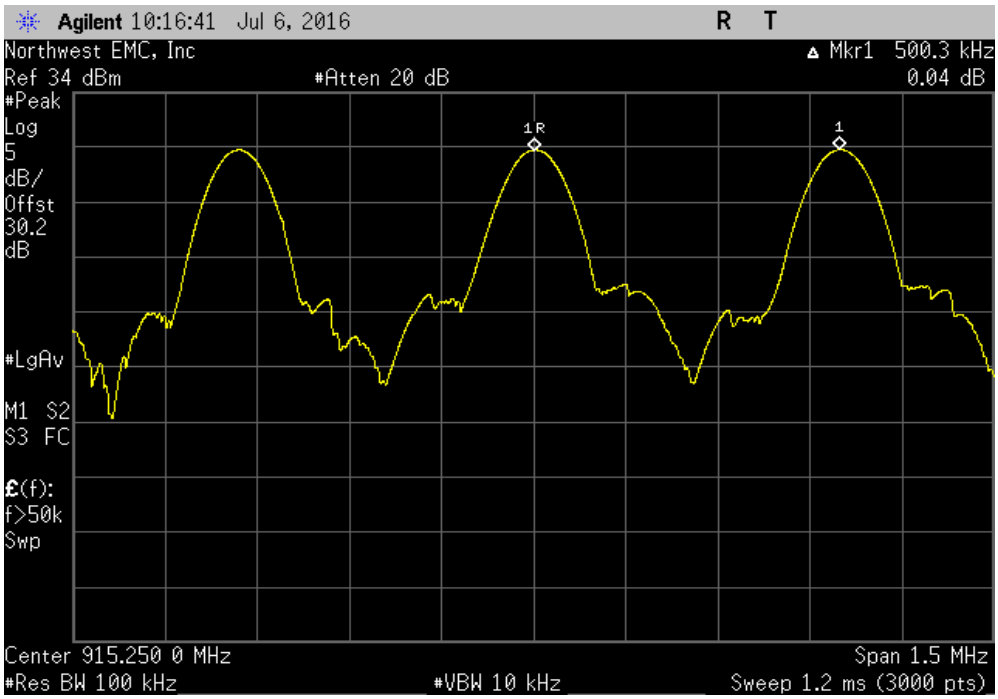
Configuration #	1	Signature

		Value	Limit (≥)	Results
Hopping Mode				
	Max Thruput. DSB-ASK , 6.25us, FM0			
	Mid Channel	500.3 kHz	440 kHz	Pass
	Max Miller. PR-ASK, 7.14us, M=4			
	Mid Channel	501.8 kHz	280 kHz	Pass
	Dense Reader. PR-ASK, 20us, M=4			
	Mid Channel	501.3 kHz	80 kHz	Pass

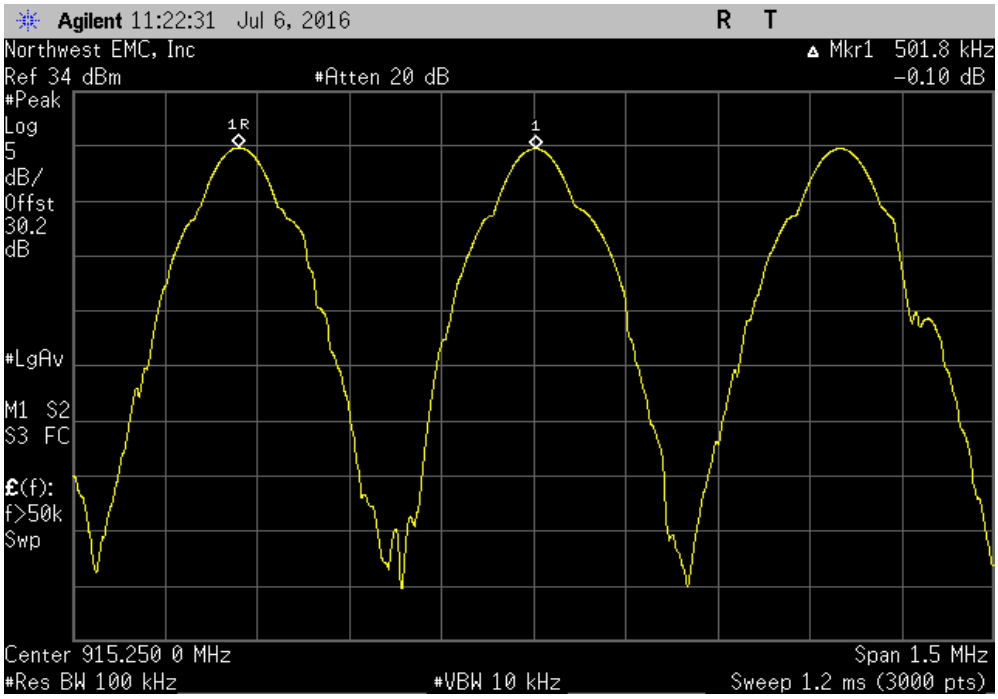
CARRIER FREQUENCY SEPARATION

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
				Value	Limit (≥)	Results
				500.3 kHz	440 kHz	Pass



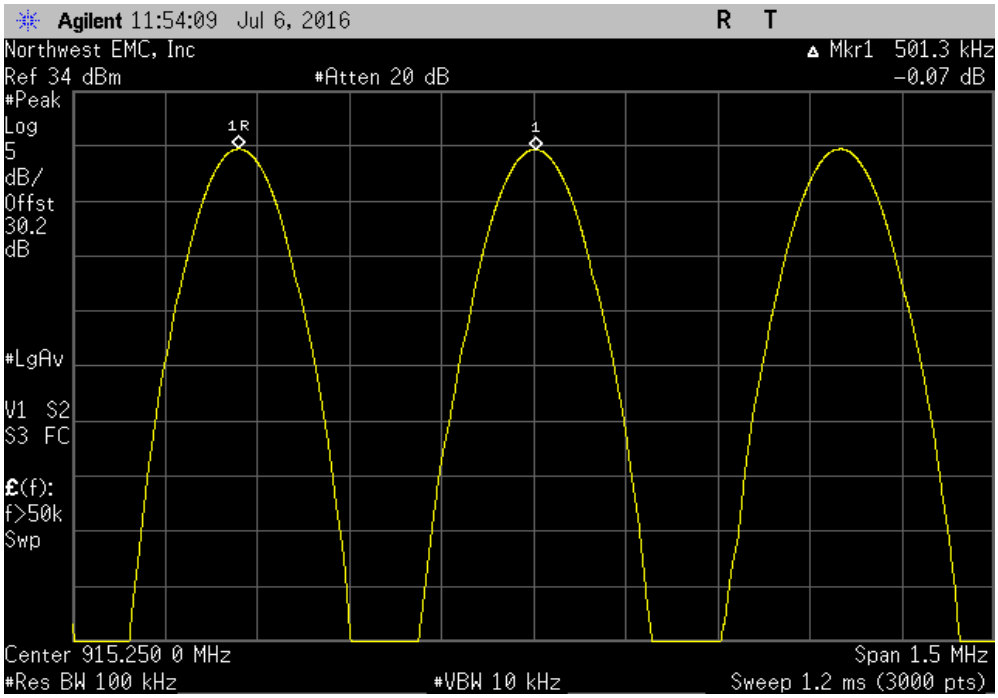
Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
				Value	Limit (≥)	Results
				501.8 kHz	280 kHz	Pass



CARRIER FREQUENCY SEPARATION

XMit 2016.05.06

Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
				Value	Limit (≥)	Results
				501.3 kHz	80 kHz	Pass



NUMBER OF HOPPING FREQUENCIES

NORTHWEST EMC

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

NUMBER OF HOPPING FREQUENCIES

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

DEVIATIONS FROM TEST STANDARD

None

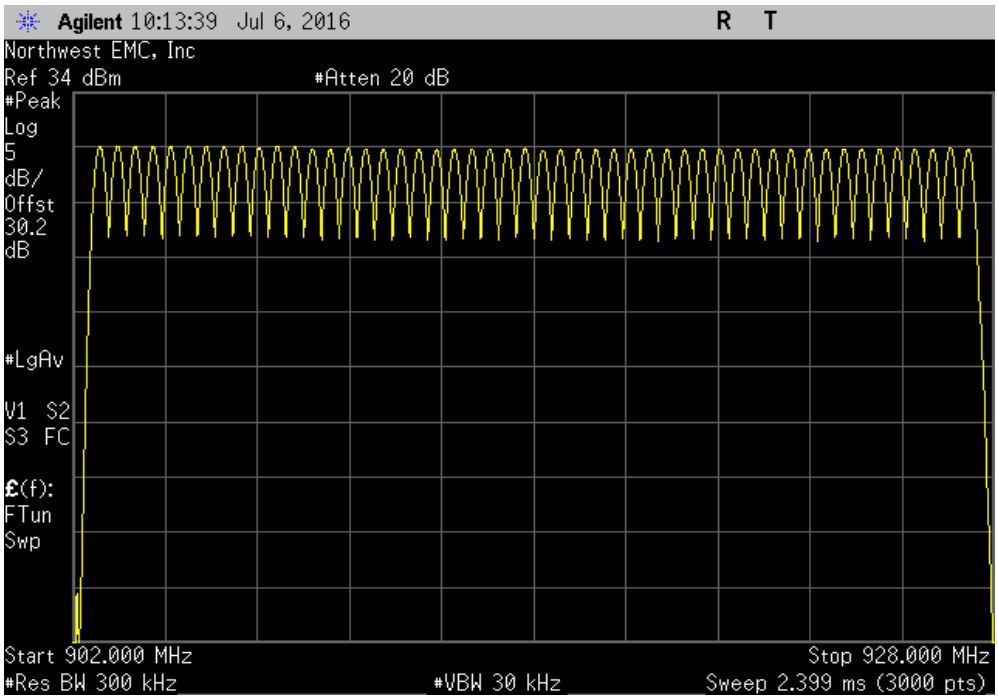
Configuration #	1	Signature

		Number of Channels	Limit (≥)	Results
Hopping Mode				
	Max Thruput. DSB-ASK , 6.25us, FM0			
	Mid Channel	50	50	Pass
	Max Miller. PR-ASK, 7.14us, M=4			
	Mid Channel	50	50	Pass
	Dense Reader. PR-ASK, 20us, M=4			
	Mid Channel	50	50	Pass

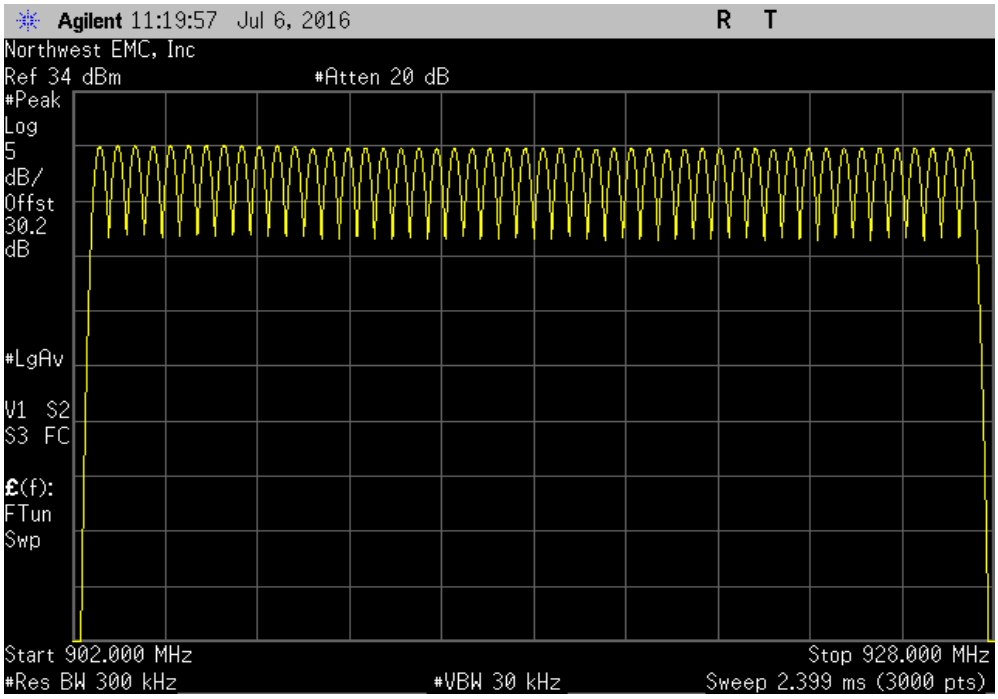
NUMBER OF HOPPING FREQUENCIES

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
				Number of Channels	Limit (≥)	Results
				50	50	Pass



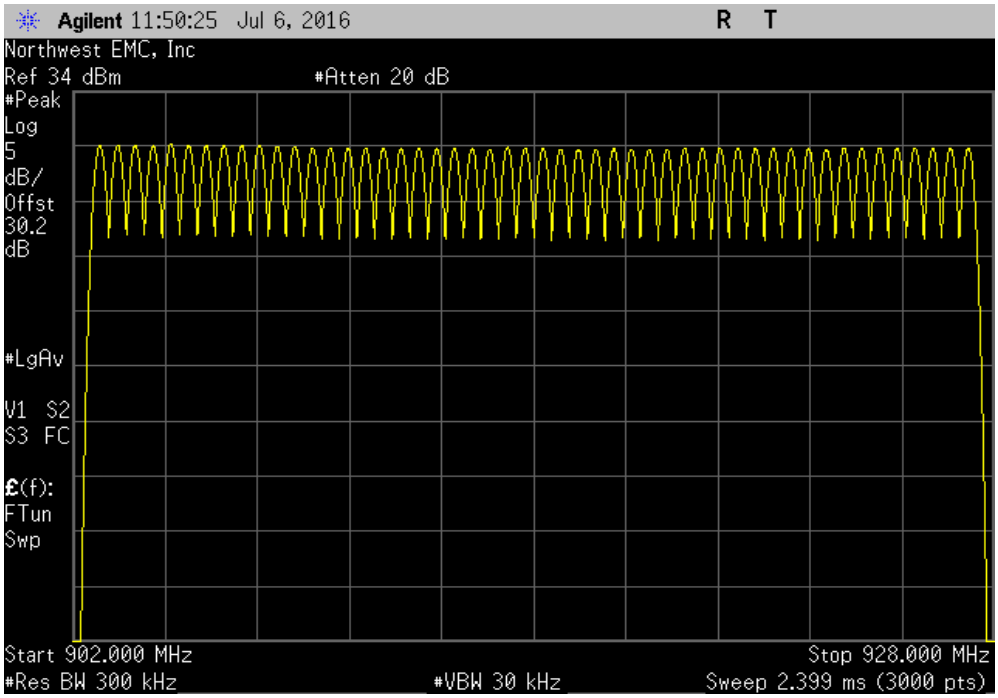
Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
				Number of Channels	Limit (≥)	Results
				50	50	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2016.05.06

Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
				Number of Channels	Limit (≥)	Results
				50	50	Pass



DWELL TIME

XMit 2016.05.06

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Weinschel Corp.	7006	AMS	11/3/2015	11/3/2016
Attenuator	Fairview Microwave	SA4014-20	TKV	3/4/2016	3/4/2017
Attenuator	S.M. Electronics	SA18H-10	REJ	9/18/2015	9/18/2016
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	6/7/2016	6/7/2017
Generator - Signal	Agilent	N5183A	TIA	4/6/2016	4/6/2018
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	6/15/2016	6/15/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

Per FCC 15.247(a)(i); If the 20dB bandwdith of the hopping channel is 250kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. If the 20dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

DWELL TIME

NORTHWEST EMC

XMit 2016.05.06

EUT:	xSpan RFID reader system			**Work Order:**	IMPI0002
Serial Number:	37011100011			**Date:**	07/06/16
Customer:	Impinj, Inc.			**Temperature:**	23 °C
Attendees:	Omer Onen			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Richard Mellroth	**Power:**	POE	**Job Site:**	NC02

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

COMMENTS

Power Settting at Maximum, 31.5dBm.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	Signature

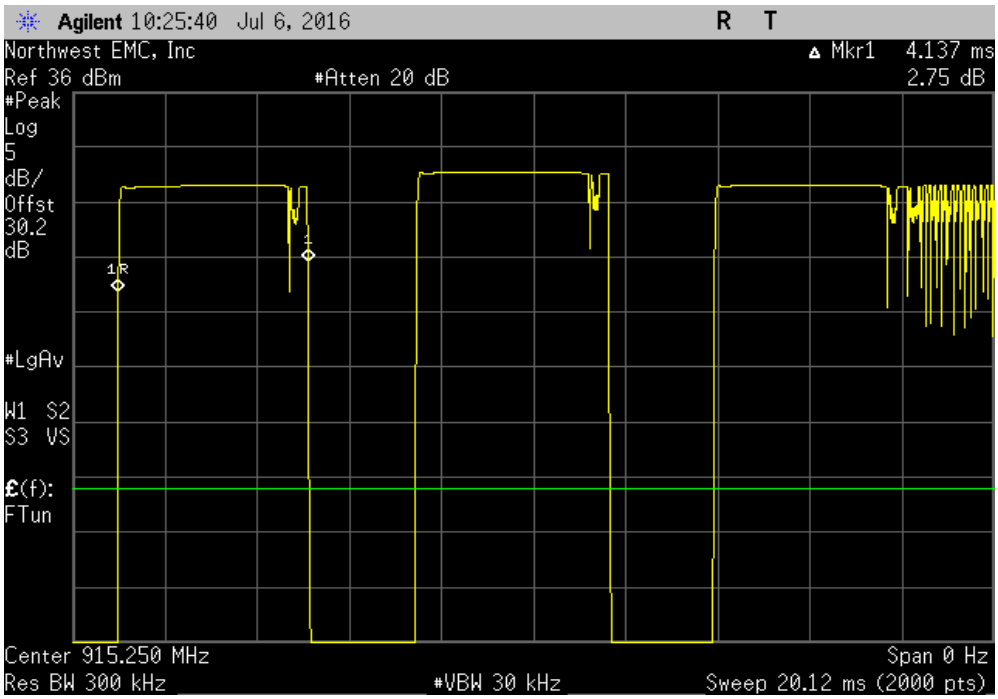
		Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
Hopping Mode								
	Max Thruput. DSB-ASK , 6.25us, FM0							
	Mid Channel, Pulse Width	4.137	N/A	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 250ms Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 1s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 5s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 10s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, Calculation	4.137	N/A	30	N/A	124.11	400	Pass
	Max Miller. PR-ASK, 7.14us, M=4							
	Mid Channel, Pulse Width	4.399	N/A	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 250ms Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 1s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 5s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 10s Sweep	N/A	30	N/A	N/A	N/A	N/A	N/A
	Mid Channel, Calculation	4.399	N/A	30	N/A	131.97	400	Pass
	Dense Reader. PR-ASK, 20us, M=4							
	Mid Channel, Pulse Width	5.194	N/A	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 250ms Sweep	N/A	27	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 1s Sweep	N/A	27	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 10s Sweep	N/A	27	N/A	N/A	N/A	N/A	N/A
	Mid Channel, 20s Sweep	N/A	54	N/A	N/A	N/A	N/A	N/A
	Mid Channel, Calculation	5.194	N/A	54	N/A	280.476	400	Pass

DWELL TIME

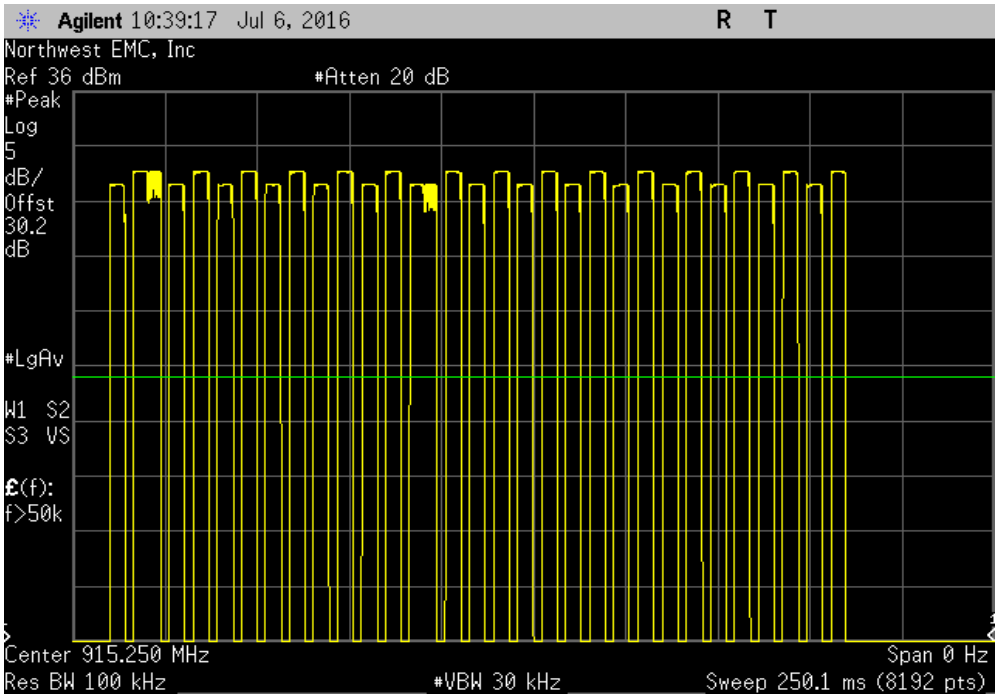
NORTHWEST EMC

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
4.137	N/A	N/A	N/A	N/A	N/A	N/A



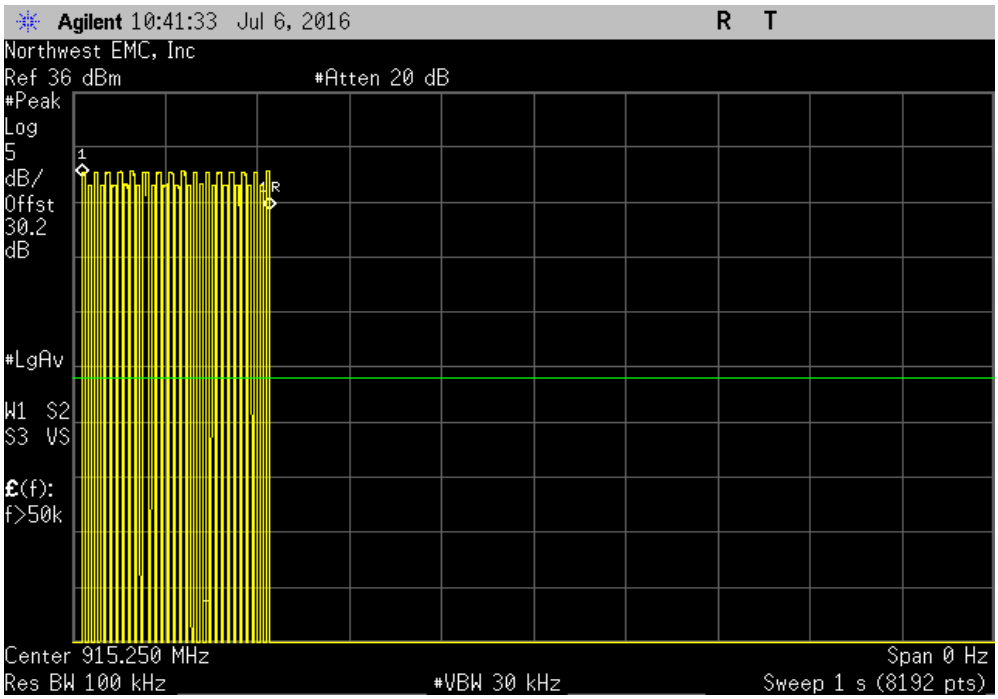
Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



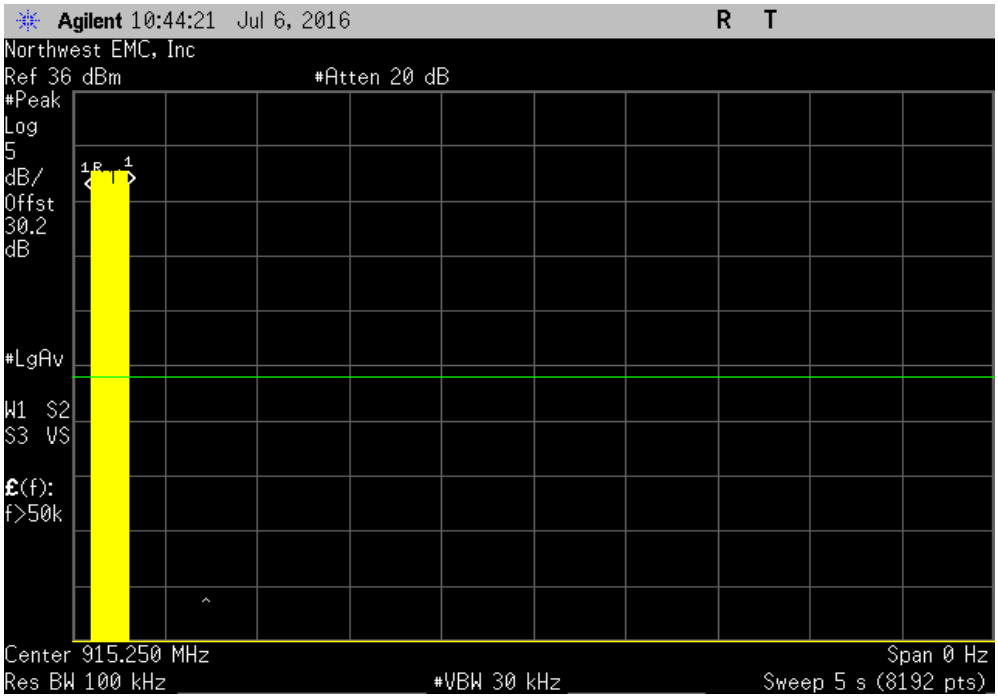
DWELL TIME

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



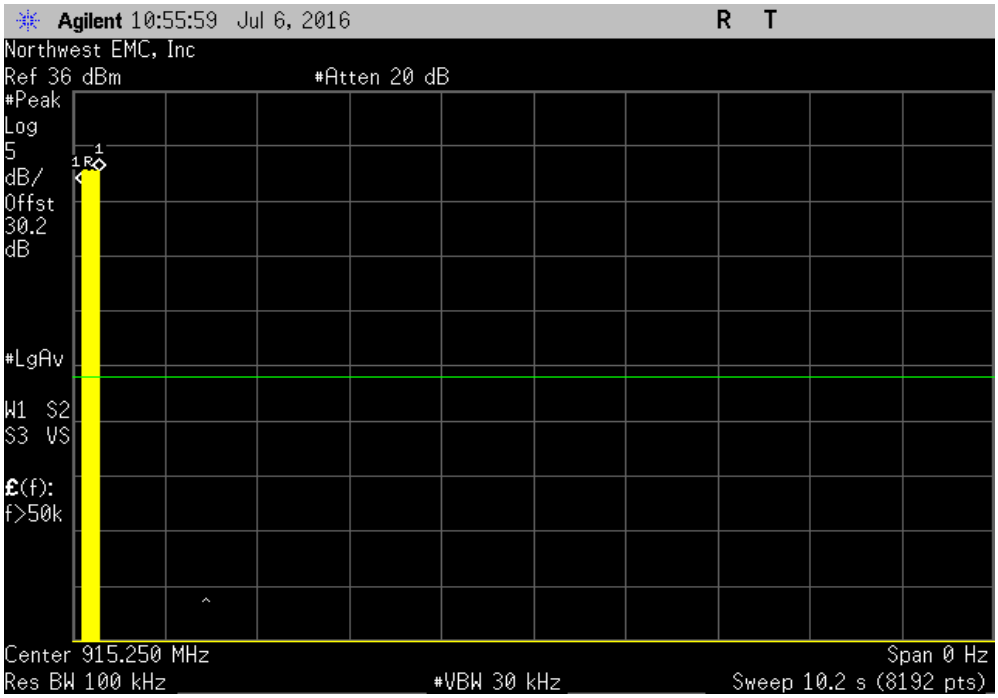
Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



DWELL TIME

XMit 2016.05.06

Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



Hopping Mode, Max Thruput. DSB-ASK , 6.25us, FM0, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
4.137	N/A	30	N/A	124.11	400	Pass

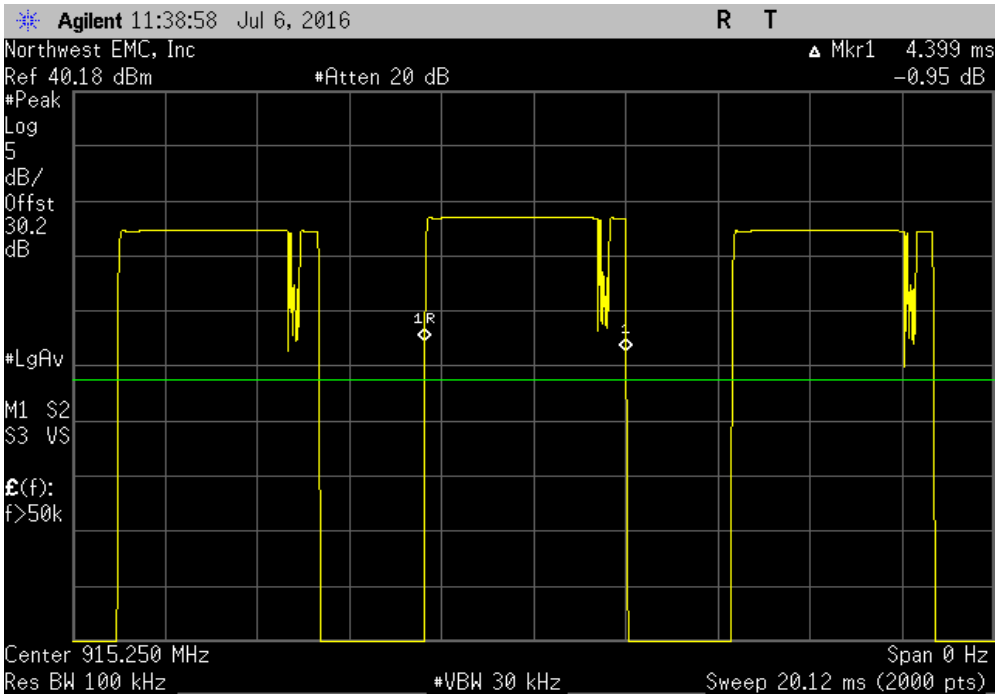
Calculation Only

No Screen Capture Required

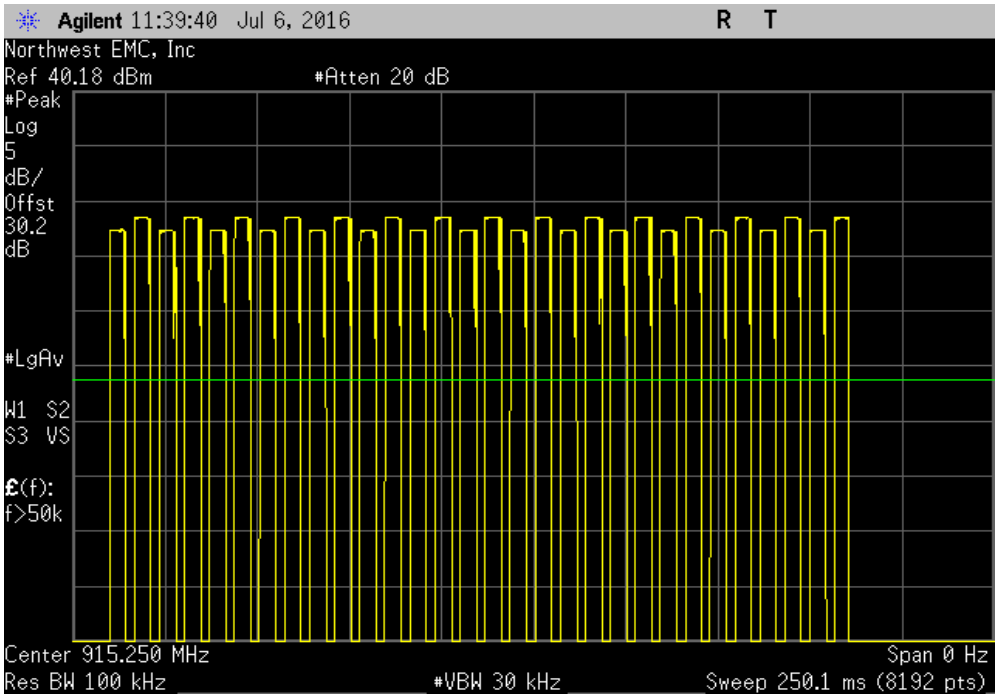
DWELL TIME

XMit 2016.05.06

Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
4.399	N/A	N/A	N/A	N/A	N/A	N/A



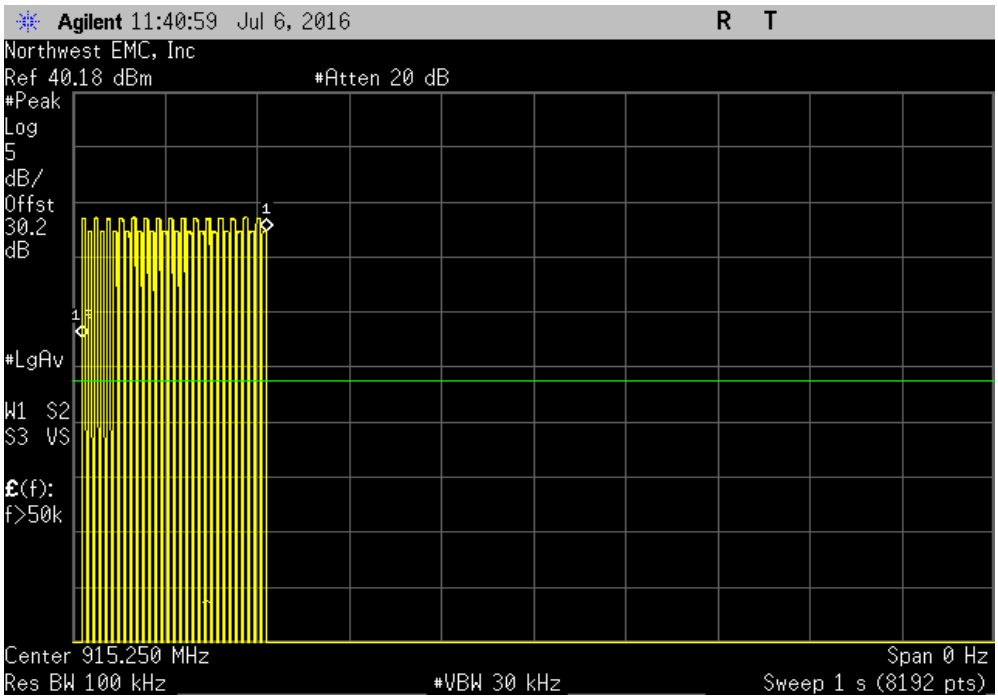
Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



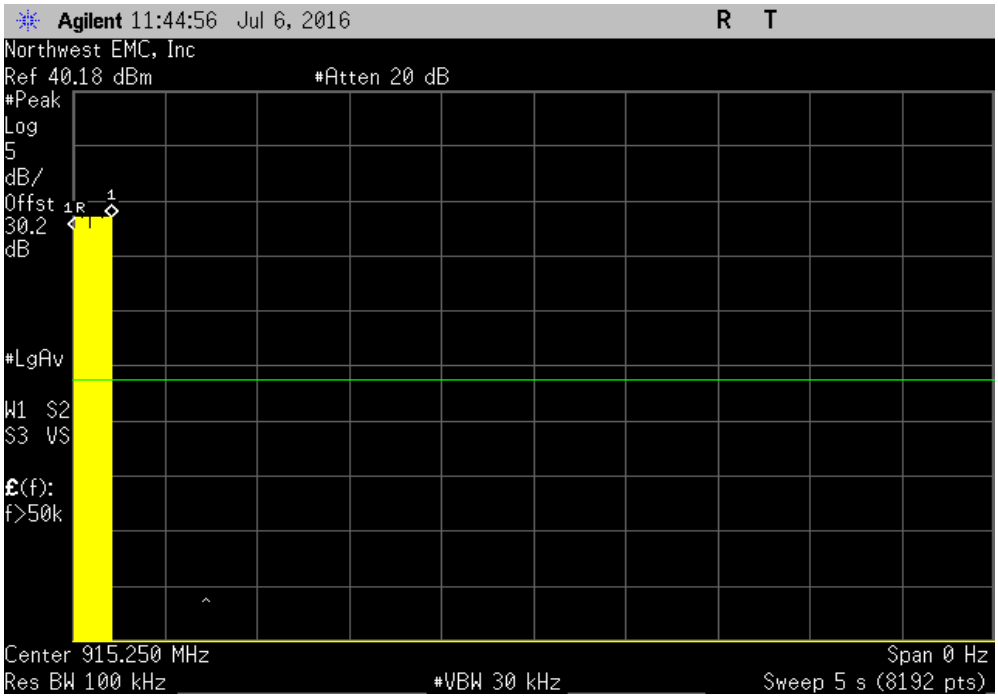
DWELL TIME

XMit 2016.05.06

Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



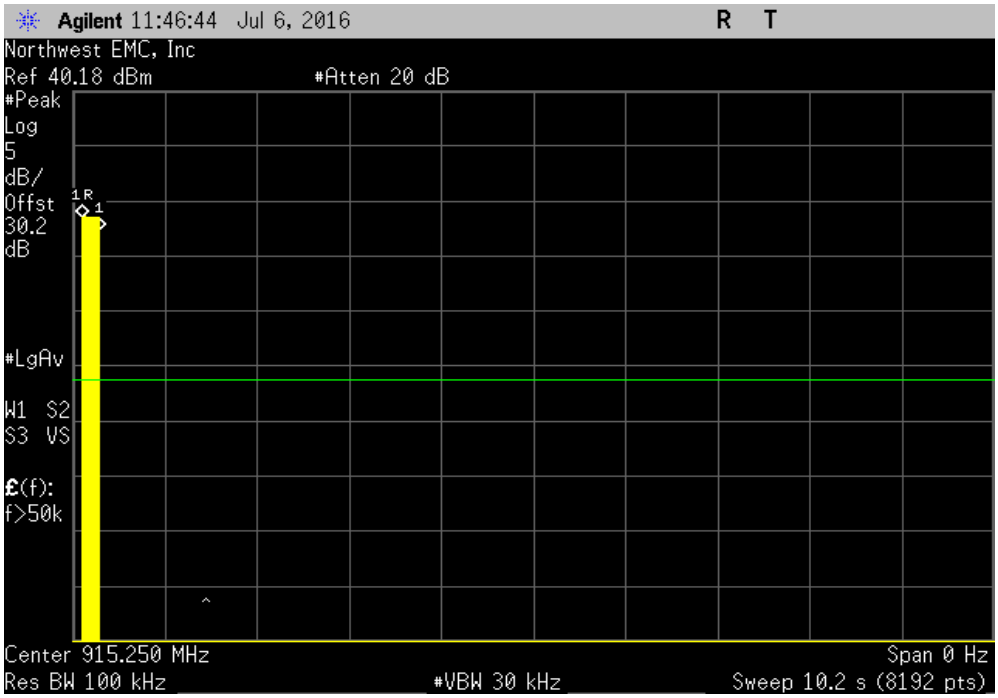
Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A



DWELL TIME

XMit 2016.05.06

Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	30	N/A	N/A	N/A	N/A	N/A

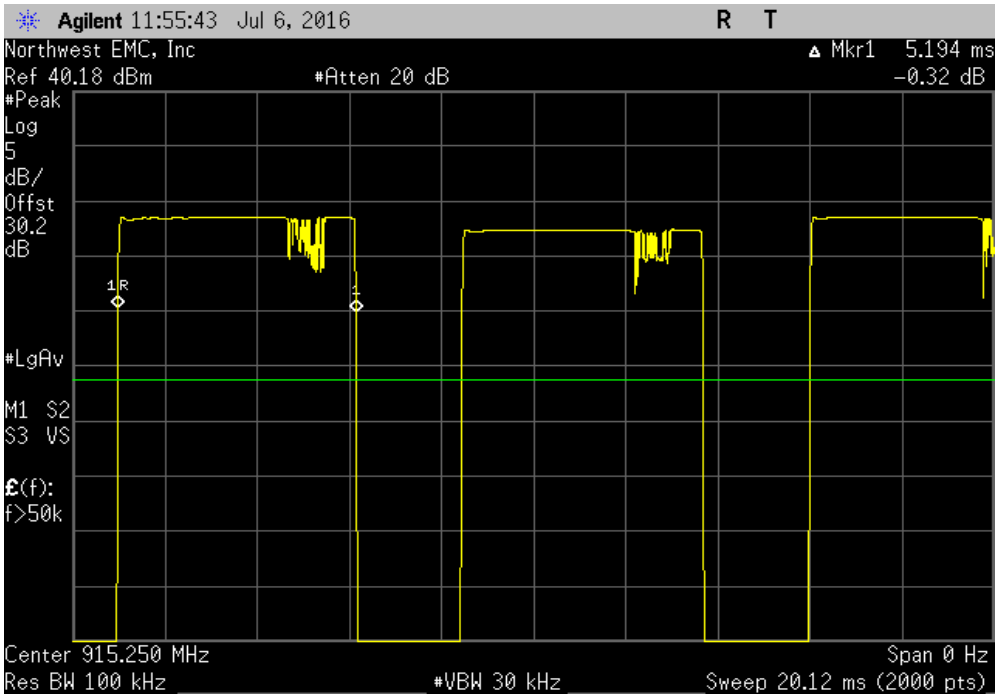


Hopping Mode, Max Miller. PR-ASK, 7.14us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
4.399	N/A	30	N/A	131.97	400	Pass

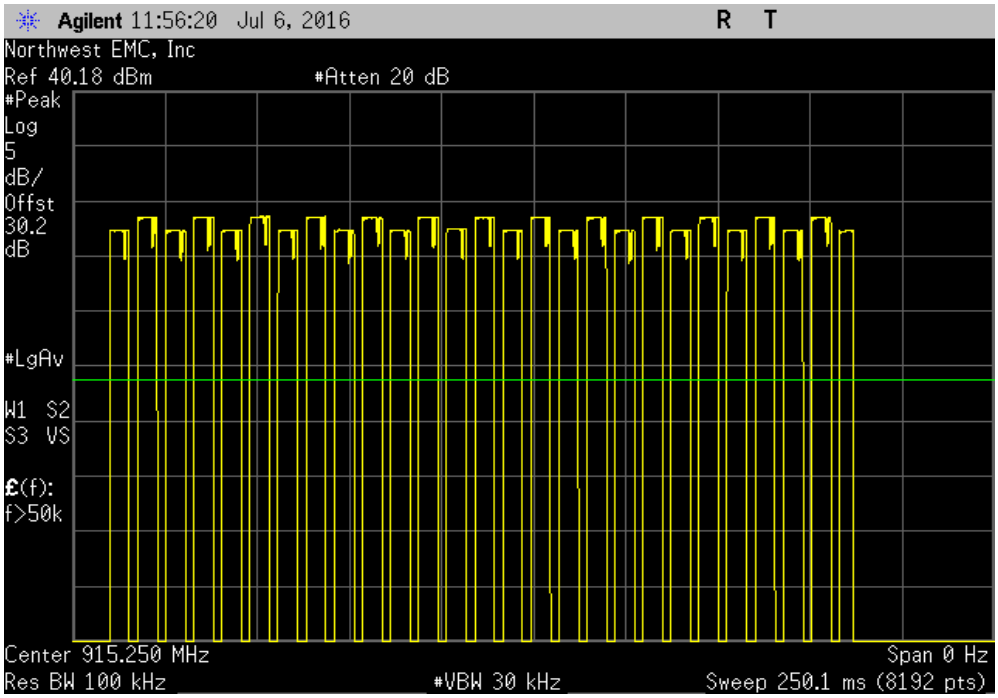
Calculation Only

No Screen Capture Required

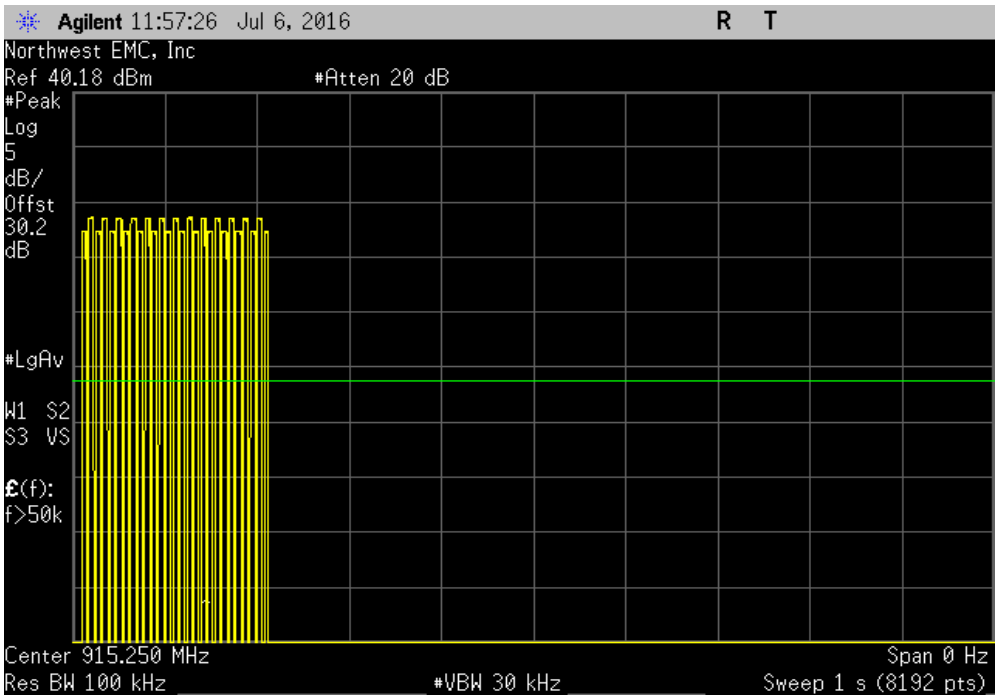
Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
5.194	N/A	N/A	N/A	N/A	N/A	N/A



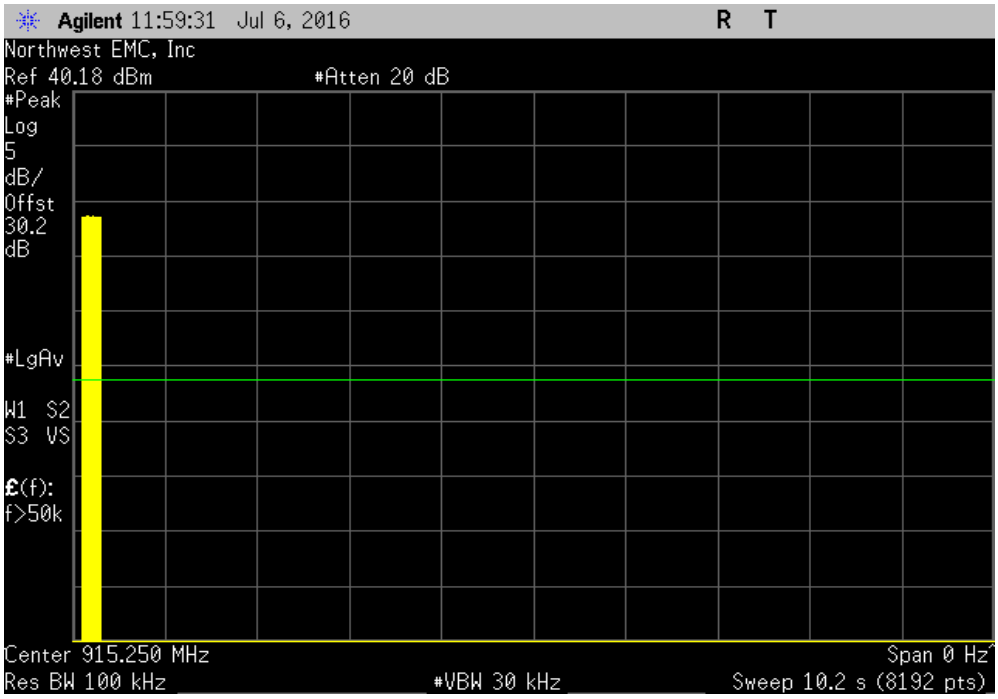
Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	27	N/A	N/A	N/A	N/A	N/A



Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	27	N/A	N/A	N/A	N/A	N/A



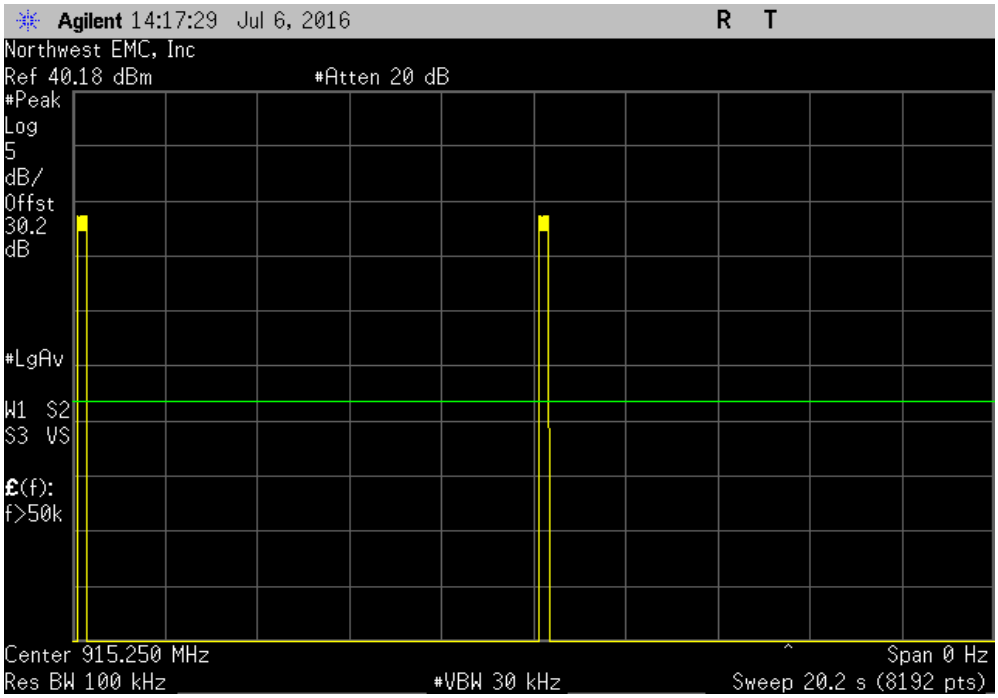
Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	27	N/A	N/A	N/A	N/A	N/A



DWELL TIME

XMit 2016.05.06

Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
N/A	54	N/A	N/A	N/A	N/A	N/A



Hopping Mode, Dense Reader. PR-ASK, 20us, M=4, Mid Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During Period	Limit (ms)	Results
5.194	N/A	54	N/A	280.476	400	Pass

Calculation Only

No Screen Capture Required

SPURIOUS RADIATED EMISSIONS

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

CHANNELS TESTED

Low Channel 1, 902.75 MHz
Mid Channel 26, 915.25 MHz
High Channel 50, 926.25 MHz

MODES OF OPERATION

Max Thruput, DSB-ASK , 6.25us, FM0
Max Miller, PR-ASK, 7.14us, M=4
Dense Reader, PR-ASK, 20us, M=4

POWER SETTINGS INVESTIGATED

POE
110VAC/60Hz

CONFIGURATIONS INVESTIGATED

IMPI0002 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12.4 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
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HHO	5/6/2016	12 mo
Filter - High Pass	Micro-Tronics	HPM50114	HFN	1/21/2016	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFE	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
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
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

TEST DESCRIPTION

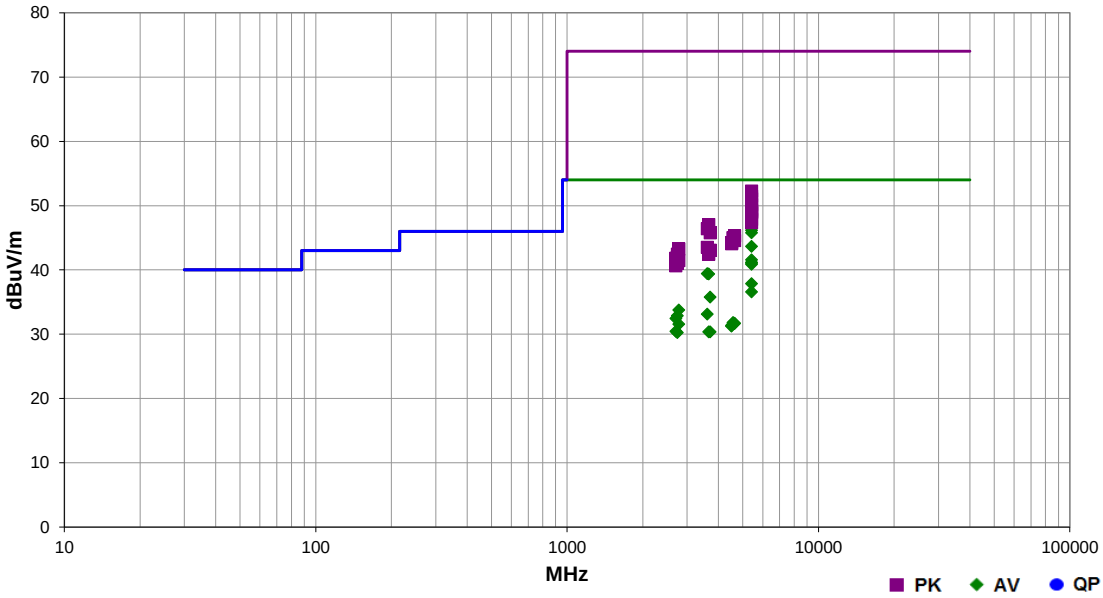
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify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

SPURIOUS RADIATED EMISSIONS

Work Order:	IMPI0002	**Date:**	07/08/16		
Project:	None	**Temperature:**	23 °C		
Job Site:	NC01	**Humidity:**	55% RH		
Serial Number:	37011100011	**Barometric Pres.:**	1015 mbar	**Tested by:**	Richard Mellroth
EUT:	xSpan RFID reader system				
Configuration:	4				
Customer:	Impinj, Inc.				
Attendees:	Omer Onen				
EUT Power:	POE				
Operating Mode:	Transmitting at 100% Duty Cycle, Power Settting at Maximum, 31.5dBm, Beam State at 12V. See comments next to data points for EUT channel, data rate, and orientation.				
Deviations:	None				
Comments:	Investigated POE and AC Power configurations. POE was found to be worst case for emissions.				

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

Run #	17	**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
5416.500	36.6	10.0	2.0	233.0	3.0	0.0	Horz	AV	0.0	46.6	54.0	-7.4	Low Ch 1, Dense Reader, EUT Horz
5416.500	36.2	10.0	2.2	237.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	Low Ch 1, Max Miller, EUT Horz
5416.495	35.8	10.0	1.2	235.0	3.0	0.0	Horz	AV	0.0	45.8	54.0	-8.2	Low Ch 1, Max Thruput, EUT Horz
5416.505	33.7	10.0	1.7	138.0	3.0	0.0	Vert	AV	0.0	43.7	54.0	-10.3	Low Ch 1, Max Thruput, EUT Horz
5416.495	31.6	10.0	2.5	133.0	3.0	0.0	Horz	AV	0.0	41.6	54.0	-12.4	Low Ch 1, Max Thruput, EUT Vert
5416.510	31.2	10.0	3.1	217.0	3.0	0.0	Vert	AV	0.0	41.2	54.0	-12.8	Low Ch 1, Max Thruput, EUT Vert
5416.505	31.1	10.0	1.2	284.0	3.0	0.0	Vert	AV	0.0	41.1	54.0	-12.9	Low Ch 1, Max Thruput, EUT Flat
5416.500	30.9	10.0	1.4	158.0	3.0	0.0	Vert	AV	0.0	40.9	54.0	-13.1	Low Ch 1, Max Miller, EUT Horz
3611.000	35.9	3.5	2.2	178.0	3.0	0.0	Horz	AV	0.0	39.4	54.0	-14.6	Low Ch 1, Max Thruput, EUT Horz
3661.000	35.4	4.0	1.7	183.0	3.0	0.0	Horz	AV	0.0	39.4	54.0	-14.6	Mid Ch 26, Max Thruput, EUT Horz
5416.517	27.9	10.0	1.5	172.0	3.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	Low Ch 1, Dense Reader, EUT Horz
5416.510	26.6	10.0	1.5	187.0	3.0	0.0	Horz	AV	0.0	36.6	54.0	-17.4	Low Ch 1, Max Thruput, EUT Flat
3709.000	31.5	4.3	1.6	184.0	3.0	0.0	Horz	AV	0.0	35.8	54.0	-18.2	High Ch 50, Max Thruput, EUT Horz
2781.758	34.1	-0.3	3.4	350.0	3.0	0.0	Horz	AV	0.0	33.8	54.0	-20.2	High Ch 50, Max Thruput, EUT Horz
3610.992	29.6	3.5	1.5	203.0	3.0	0.0	Vert	AV	0.0	33.1	54.0	-20.9	Low Ch 1, Max Thruput, EUT Horz
2745.742	33.3	-0.4	1.1	176.0	3.0	0.0	Vert	AV	0.0	32.9	54.0	-21.1	Mid Ch 26, Max Thruput, EUT Horz
2708.258	33.0	-0.5	3.1	219.0	3.0	0.0	Horz	AV	0.0	32.5	54.0	-21.5	Low Ch 1, Max Thruput, EUT Horz
5416.483	42.3	10.0	2.0	233.0	3.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	Low Ch 1, Dense Reader, EUT Horz
4576.150	24.4	7.4	1.5	300.0	3.0	0.0	Horz	AV	0.0	31.8	54.0	-22.2	Mid Ch 26, Max Thruput, EUT Horz
4578.500	24.3	7.4	1.5	288.0	3.0	0.0	Vert	AV	0.0	31.7	54.0	-22.3	Mid Ch 26, Max Thruput, EUT Horz
4634.358	24.0	7.7	1.5	230.0	3.0	0.0	Horz	AV	0.0	31.7	54.0	-22.3	High Ch 50, Max Thruput, EUT Horz
4633.575	24.0	7.7	1.5	306.0	3.0	0.0	Vert	AV	0.0	31.7	54.0	-22.3	High Ch 50, Max Thruput, EUT Horz
2781.750	31.9	-0.3	1.4	348.0	3.0	0.0	Vert	AV	0.0	31.6	54.0	-22.4	High Ch 50, Max Thruput, EUT Horz
5416.525	41.5	10.0	2.2	237.0	3.0	0.0	Horz	PK	0.0	51.5	74.0	-22.5	Low Ch 1, Max Miller, EUT Horz
4513.967	24.2	7.2	2.1	221.0	3.0	0.0	Vert	AV	0.0	31.4	54.0	-22.6	Low Ch 1, Max Thruput, EUT Horz
4511.500	24.1	7.2	1.5	133.0	3.0	0.0	Horz	AV	0.0	31.3	54.0	-22.7	Low Ch 1, Max Thruput, EUT Horz
5416.470	41.1	10.0	1.2	235.0	3.0	0.0	Horz	PK	0.0	51.1	74.0	-22.9	Low Ch 1, Max Thruput, EUT Horz
2708.267	31.0	-0.5	1.5	154.0	3.0	0.0	Vert	AV	0.0	30.5	54.0	-23.5	Low Ch 1, Max Thruput, 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
3660.983	26.4	4.0	1.5	138.0	3.0	0.0	Vert	AV	0.0	30.4	54.0	-23.6	Mid Ch 26, Max Thruput, EUT Horz
3709.000	26.1	4.3	1.5	152.0	3.0	0.0	Vert	AV	0.0	30.4	54.0	-23.6	High Ch 50, Max Thruput, EUT Horz
2745.758	30.7	-0.4	1.5	217.0	3.0	0.0	Horz	AV	0.0	30.3	54.0	-23.7	Mid Ch 26, Max Thruput, EUT Horz
5416.465	40.2	10.0	1.7	138.0	3.0	0.0	Vert	PK	0.0	50.2	74.0	-23.8	Low Ch 1, Max Thruput, EUT Horz
5416.440	39.4	10.0	2.5	133.0	3.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Ch 1, Max Thruput, EUT Vert
5416.458	39.2	10.0	1.4	158.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	Low Ch 1, Max Miller, EUT Horz
5416.485	39.1	10.0	1.2	284.0	3.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	Low Ch 1, Max Thruput, EUT Flat
5416.520	38.9	10.0	3.1	217.0	3.0	0.0	Vert	PK	0.0	48.9	74.0	-25.1	Low Ch 1, Max Thruput, EUT Vert
5416.292	37.9	10.0	1.5	172.0	3.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	Low Ch 1, Dense Reader, EUT Horz
5416.605	37.4	10.0	1.5	187.0	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	Low Ch 1, Max Thruput, EUT Flat
3660.958	43.1	4.0	1.7	183.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	Mid Ch 26, Max Thruput, EUT Horz
3610.983	42.9	3.5	2.2	178.0	3.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	Low Ch 1, Max Thruput, EUT Horz
3709.083	41.5	4.3	1.6	184.0	3.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2	High Ch 50, Max Thruput, EUT Horz
4635.767	37.6	7.7	1.5	230.0	3.0	0.0	Horz	PK	0.0	45.3	74.0	-28.7	High Ch 50, Max Thruput, EUT Horz
4578.008	37.6	7.4	1.5	288.0	3.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	Mid Ch 26, Max Thruput, EUT Horz
4573.733	37.6	7.4	1.5	300.0	3.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	Mid Ch 26, Max Thruput, EUT Horz
4634.067	36.9	7.7	1.5	306.0	3.0	0.0	Vert	PK	0.0	44.6	74.0	-29.4	High Ch 50, Max Thruput, EUT Horz
4515.367	37.1	7.2	2.1	221.0	3.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	Low Ch 1, Max Thruput, EUT Horz
4512.767	36.9	7.2	1.5	133.0	3.0	0.0	Horz	PK	0.0	44.1	74.0	-29.9	Low Ch 1, Max Thruput, EUT Horz
3611.083	40.0	3.5	1.5	203.0	3.0	0.0	Vert	PK	0.0	43.5	74.0	-30.5	Low Ch 1, Max Thruput, EUT Horz
2781.575	43.6	-0.3	3.4	350.0	3.0	0.0	Horz	PK	0.0	43.3	74.0	-30.7	High Ch 50, Max Thruput, EUT Horz
3709.042	38.8	4.3	1.5	152.0	3.0	0.0	Vert	PK	0.0	43.1	74.0	-30.9	High Ch 50, Max Thruput, EUT Horz
3660.908	38.5	4.0	1.5	138.0	3.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	Mid Ch 26, Max Thruput, EUT Horz
2745.783	42.9	-0.4	1.1	176.0	3.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	Mid Ch 26, Max Thruput, EUT Horz
2708.100	42.4	-0.5	3.1	219.0	3.0	0.0	Horz	PK	0.0	41.9	74.0	-32.1	Low Ch 1, Max Thruput, EUT Horz
2781.650	41.8	-0.3	1.4	348.0	3.0	0.0	Vert	PK	0.0	41.5	74.0	-32.5	High Ch 50, Max Thruput, EUT Horz
2745.675	41.5	-0.4	1.5	217.0	3.0	0.0	Horz	PK	0.0	41.1	74.0	-32.9	Mid Ch 26, Max Thruput, EUT Horz
2708.017	41.2	-0.6	1.5	154.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	Low Ch 1, Max Thruput, EUT Horz

AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2016.05.18

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-R-24-BNC	LIM	11/3/2015	11/3/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIK	11/3/2015	11/3/2017
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

IMPI0002-5

MODES INVESTIGATED

Transmitting Mid Channel, 915.25 MHz, Power Setting at Maximum, 31.5dBm, Max Thruput

AC - POWERLINE CONDUCTED EMISSIONS

EUT:	xSpan RFID reader system	Work Order:	IMPI0002
Serial Number:	37011100011	Date:	07/13/2016
Customer:	Impinj, Inc.	Temperature:	23°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	1027 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	IMPI0002-5

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	2	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

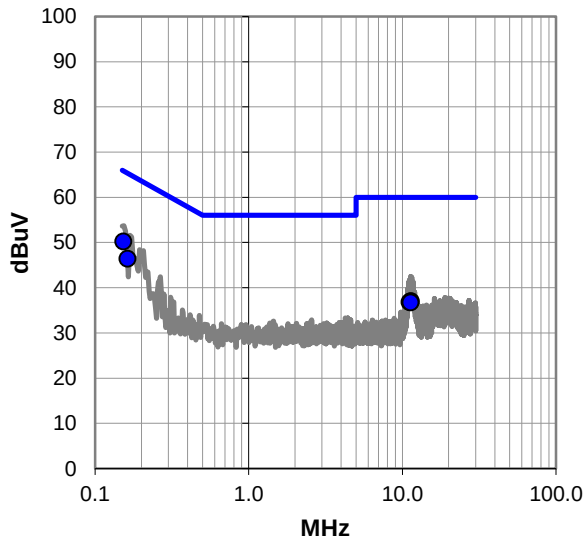
EUT OPERATING MODES

Transmitting Mid Channel, 915.25 MHz, Power Setting at Maximum, 31.5dBm, Max Thruput

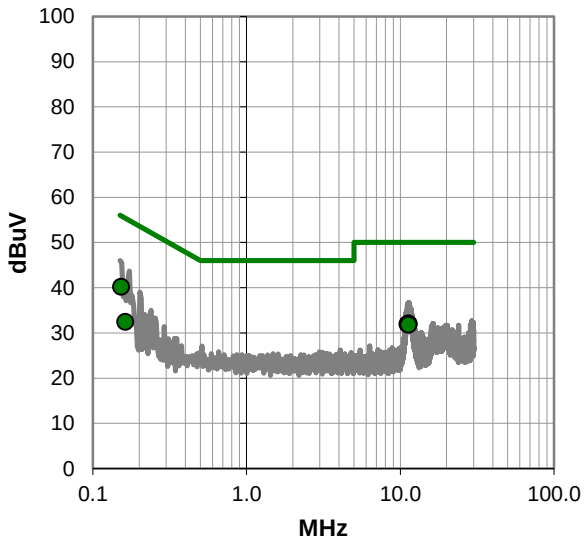
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

WTD.2016.05.18

RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	29.4	20.8	50.2	65.8	-15.6
0.163	25.6	20.8	46.4	65.3	-18.9
11.396	15.4	21.6	37.0	60.0	-23.0
11.255	15.4	21.5	36.9	60.0	-23.1
11.146	15.3	21.5	36.8	60.0	-23.2
11.300	15.2	21.5	36.7	60.0	-23.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	19.4	20.8	40.2	55.8	-15.6
11.255	10.6	21.5	32.1	50.0	-17.9
11.396	10.4	21.6	32.0	50.0	-18.0
11.146	10.4	21.5	31.9	50.0	-18.1
11.300	10.3	21.5	31.8	50.0	-18.2
0.163	11.6	20.8	32.4	55.3	-22.9

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:	23°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	1027 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	IMPI0002-5

TEST SPECIFICATIONS

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

TEST PARAMETERS

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

COMMENTS

None

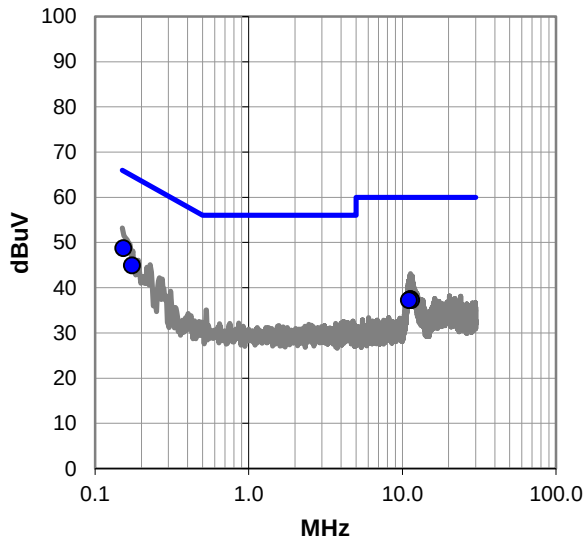
EUT OPERATING MODES

Transmitting Mid Channel, 915.25 MHz, Power Setting at Maximum, 31.5dBm, Max Thruput

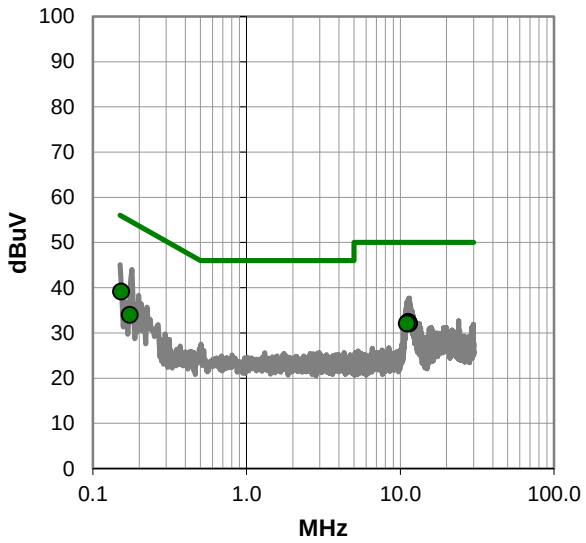
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

WTD.2016.05.18

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	27.9	20.8	48.7	65.9	-17.2
0.174	24.1	20.8	44.9	64.8	-19.9
11.311	15.9	21.5	37.4	60.0	-22.6
11.258	15.9	21.5	37.4	60.0	-22.6
11.444	15.6	21.6	37.2	60.0	-22.8
11.076	15.7	21.5	37.2	60.0	-22.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	18.3	20.8	39.1	55.9	-16.8
11.258	10.9	21.5	32.4	50.0	-17.6
11.311	10.8	21.5	32.3	50.0	-17.7
11.444	10.5	21.6	32.1	50.0	-17.9
11.076	10.6	21.5	32.1	50.0	-17.9
0.174	13.2	20.8	34.0	54.8	-20.8

CONCLUSION

Pass

Tested By