

NORTHWEST EMC

Multi-Tech Systems, Inc.

MultiConnect® mDot™

FCC 15.207:2015

FCC 15.247:2015

Report # MLTI0045



NVLAP Lab Code: 200881-0

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

CERTIFICATE OF TEST

Last Date of Test: June 29, 2015
Multi-Tech Systems, Inc.
Model: MultiConnect® mDot™

Radio Equipment Testing

Standards

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

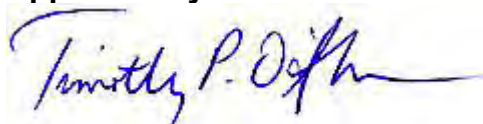
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	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	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
7.7.2	Carrier Frequency Separation	Yes	Pass	
7.7.3	Number of Hopping Frequencies	Yes	Pass	
7.7.4	Dwell Time	Yes	Pass	
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:



Tim O'Shea, Operations Manager

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

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

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

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

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

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

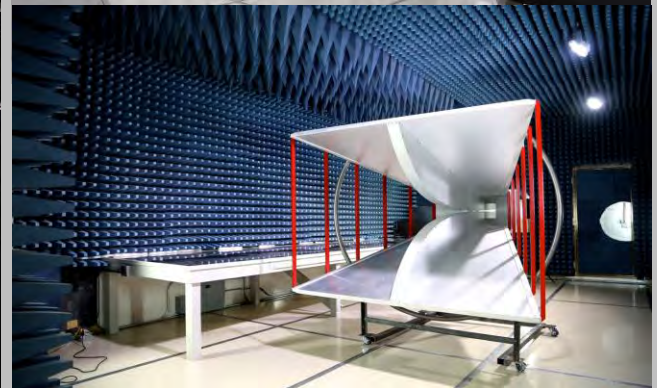
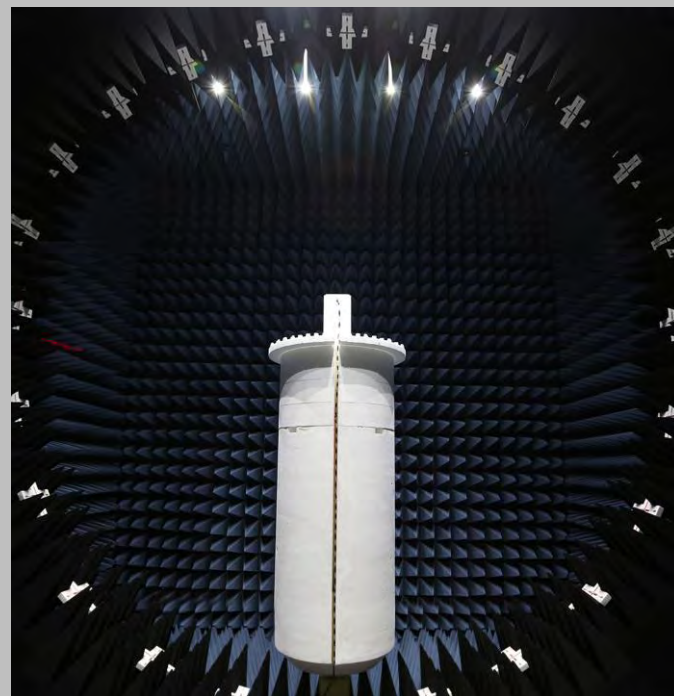
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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

FACILITIES



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



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Multi-Tech Systems, Inc.
Address:	2205 Woodale Drive
City, State, Zip:	Mounds View, MN 55102
Test Requested By:	Mike Lynch
Model:	MultiConnect® mDot™
First Date of Test:	June 26, 2015
Last Date of Test:	June 29, 2015
Receipt Date of Samples:	June 26, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Long Range 868/915 MHz ISM Radio Module
Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2015 as a hybrid for operation in the 902 - 928 MHz Band.

CONFIGURATIONS

Configuration MLTI0045- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
ISM Radio Module	Multi-Tech Systems, Inc.	MultiConnect® mDot™	5142067554-0009

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Multi-Tech Systems, Inc.	MTDK2 rev B	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Cable	No	1.85m	Yes	AC Adapter	Development Board

Configuration MLTI0045- 3

Software/Firmware Running during test	
Description	Version
Tera Term	4.85

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
ISM Radio Module	Multi-Tech Systems, Inc.	MultiConnect® mDot™	5142067554-0009

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Multi-Tech Systems, Inc.	MTDK2 rev B	None
Laptop	Acer	Aspire One	LUS050B5228909167FF2547
Laptop Adapter	Delta Electronics	ADP-30JH B	202W91D09JG

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Cable	No	1.85m	Yes	AC Adapter	Development Board
USB-Serial	Yes	1.8m	No	Laptop	Development Board
AC Power	No	1.8m	No	AC Mains	Laptop Adapter
DC Power	No	1.5m	Yes	Laptop Adapter	Laptop

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/26/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	6/29/2015	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	6/29/2015	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	6/29/2015	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	6/29/2015	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	6/29/2015	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.
7	6/29/2015	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	6/29/2015	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.
9	6/29/2015	Carrier Frequency 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.
10	6/29/2015	Number of Hopping Frequencies	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.
11	6/29/2015	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.
12	6/29/2015	Band Edge Compliance - Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
High Pass Filter	TTE	H97-100K-50-720B	HGN	5/11/2015	05/11/2016
Attenuator 20dB, BNC	Fairview Microwave	SA01B-20	AQP	7/22/2014	07/22/2015
Cable	ESM Cable Corp.	Conducted Cables	MNC	5/13/2015	05/13/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/23/2015	03/23/2016
Receiver	Rohde & Schwarz	ESR7	ARI	5/21/2015	05/21/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIQ	11/6/2014	11/06/2015

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MLTI0045-3

MODES INVESTIGATED

Transmitting High Channel
Transmitting Low Channel
Transmitting Mid Channel

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

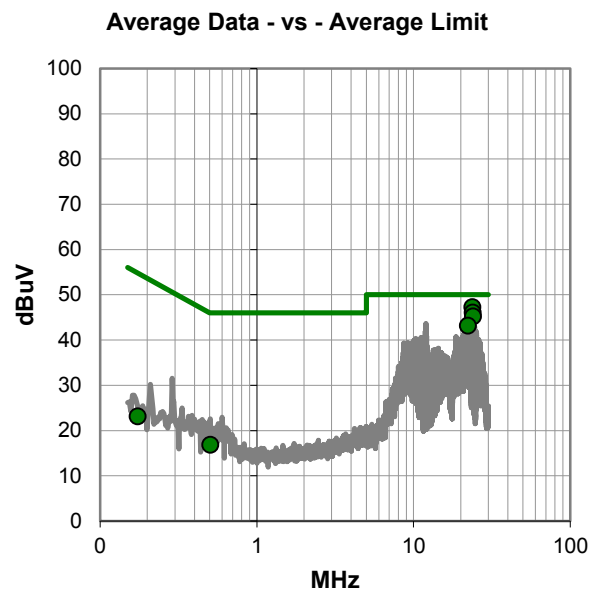
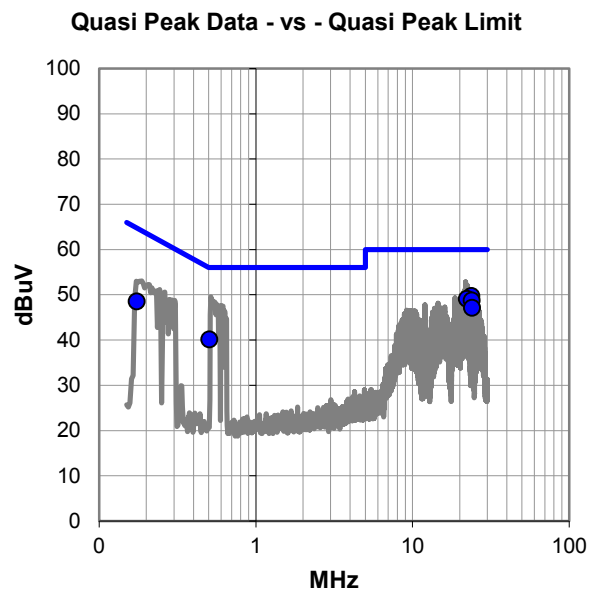
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EUT OPERATING MODES

Transmitting Low Channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #1

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.806	27.8	21.9	49.7	60.0	-10.3
22.245	27.3	21.8	49.1	60.0	-10.9
23.903	26.8	21.9	48.7	60.0	-11.3
24.003	25.2	21.9	47.1	60.0	-12.9
0.506	19.9	20.2	40.1	56.0	-15.9
0.174	28.1	20.4	48.5	64.8	-16.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.806	25.3	21.9	47.2	50.0	-2.8
23.903	24.1	21.9	46.0	50.0	-4.0
24.003	23.3	21.9	45.2	50.0	-4.8
22.245	21.4	21.8	43.2	50.0	-6.8
0.506	-3.4	20.2	16.8	46.0	-29.2
0.174	2.7	20.4	23.1	54.8	-31.7

CONCLUSION

Pass

Trevor Buls

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

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

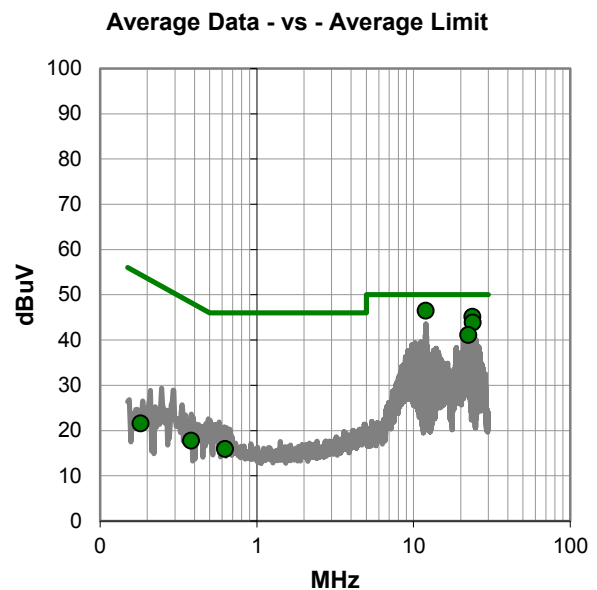
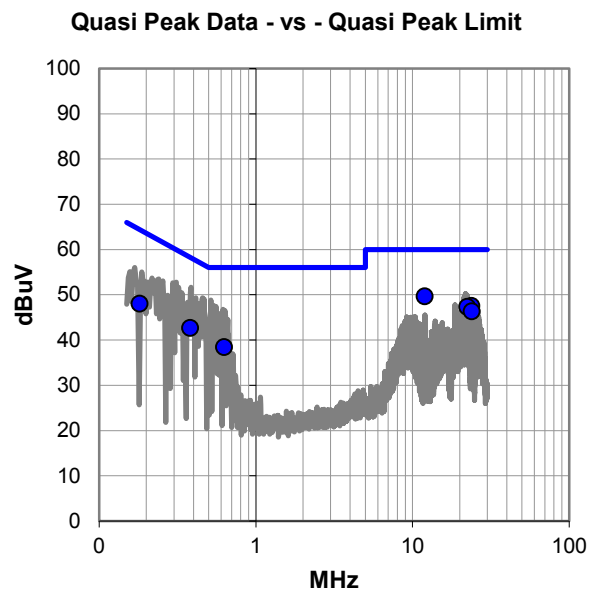
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EUT OPERATING MODES

Transmitting Low Channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	28.7	20.9	49.6	60.0	-10.4
23.807	25.6	21.9	47.5	60.0	-12.5
22.437	25.5	21.8	47.3	60.0	-12.7
23.905	24.4	21.9	46.3	60.0	-13.7
0.381	22.4	20.2	42.6	58.3	-15.6
0.181	27.6	20.4	48.0	64.4	-16.4
0.628	18.2	20.2	38.4	56.0	-17.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
12.000	25.5	20.9	46.4	50.0	-3.6
23.807	23.2	21.9	45.1	50.0	-4.9
23.905	21.9	21.9	43.8	50.0	-6.2
22.437	19.3	21.8	41.1	50.0	-8.9
0.628	-4.3	20.2	15.9	46.0	-30.1
0.381	-2.5	20.2	17.7	48.3	-30.5
0.181	1.2	20.4	21.6	54.4	-32.8

CONCLUSION

Pass

Trevor Buls

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

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

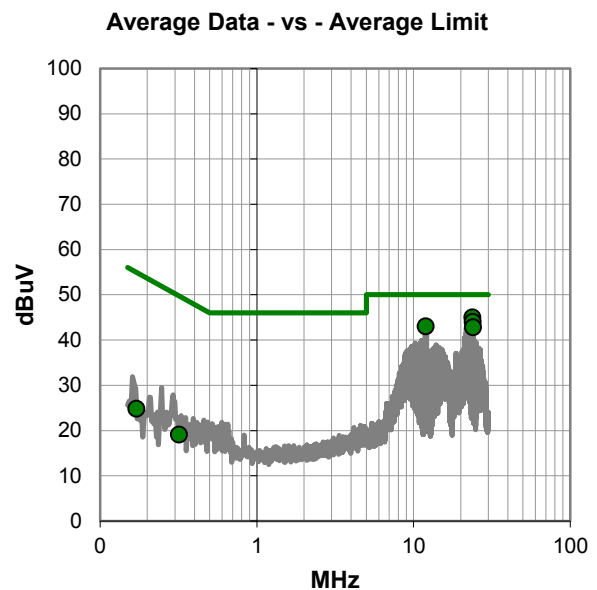
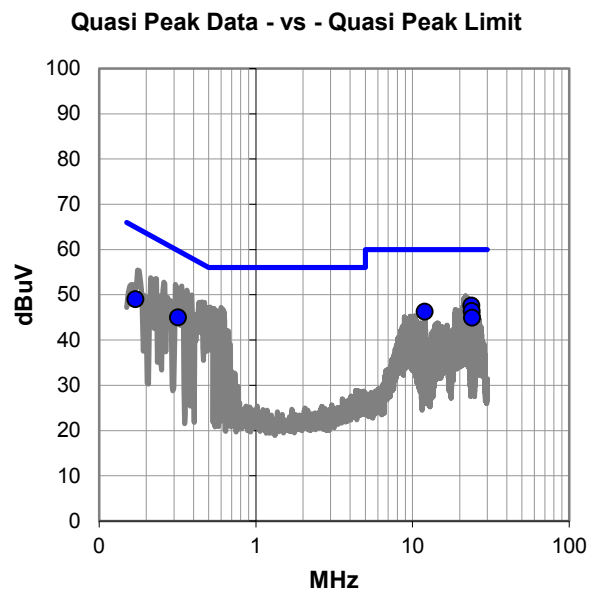
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EUT OPERATING MODES

Transmitting Mid Channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.807	25.7	21.9	47.6	60.0	-12.4
23.905	24.5	21.9	46.4	60.0	-13.6
12.001	25.3	20.9	46.2	60.0	-13.8
0.318	24.7	20.3	45.0	59.8	-14.8
24.002	23.0	21.9	44.9	60.0	-15.1
0.171	28.6	20.4	49.0	64.9	-15.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.807	23.1	21.9	45.0	50.0	-5.0
23.905	22.1	21.9	44.0	50.0	-6.0
12.001	22.1	20.9	43.0	50.0	-7.0
24.002	20.9	21.9	42.8	50.0	-7.2
0.171	4.4	20.4	24.8	54.9	-30.1
0.318	-1.2	20.3	19.1	49.8	-30.7

CONCLUSION

Pass

Trevor Buls

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

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

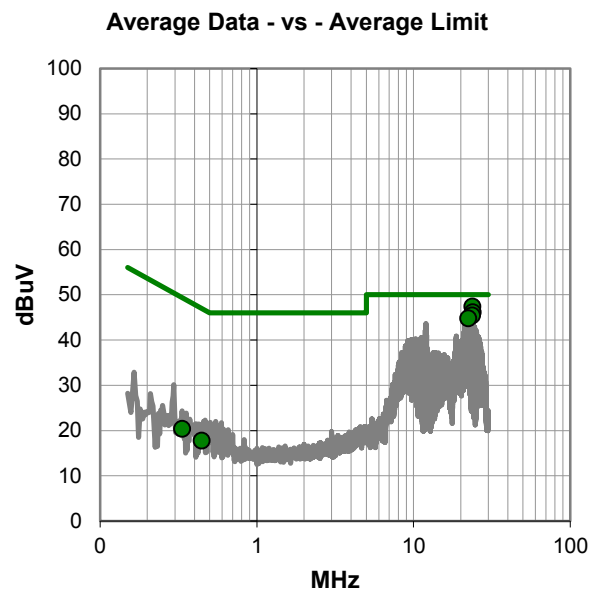
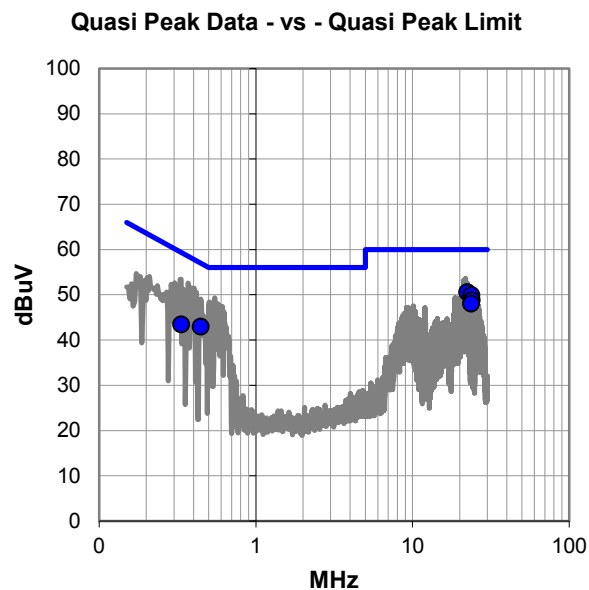
None

EUT OPERATING MODES

Transmitting Mid Channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
22.441	28.8	21.8	50.6	60.0	-9.4
23.807	28.0	21.9	49.9	60.0	-10.1
23.904	26.9	21.9	48.8	60.0	-11.2
23.711	26.1	21.9	48.0	60.0	-12.0
0.445	22.7	20.2	42.9	57.0	-14.0
0.335	23.2	20.2	43.4	59.3	-15.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.807	25.5	21.9	47.4	50.0	-2.6
23.904	24.2	21.9	46.1	50.0	-3.9
23.711	23.5	21.9	45.4	50.0	-4.6
22.441	23.0	21.8	44.8	50.0	-5.2
0.335	0.1	20.2	20.3	49.3	-29.0
0.445	-2.5	20.2	17.7	47.0	-29.2

CONCLUSION

Pass

Trevor Buls

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	5	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

None

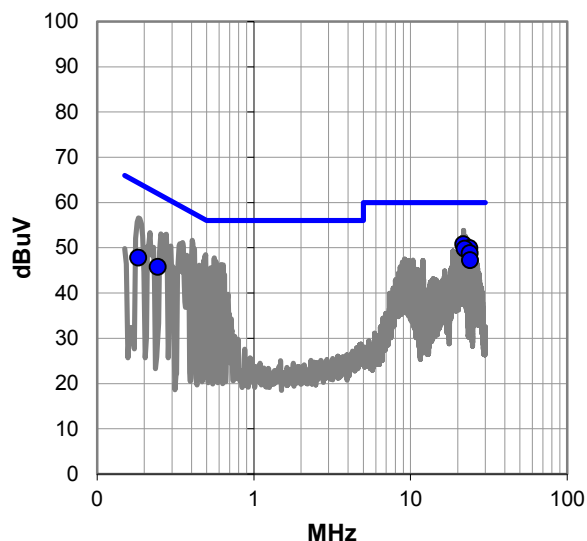
EUT OPERATING MODES

Transmitting High Channel

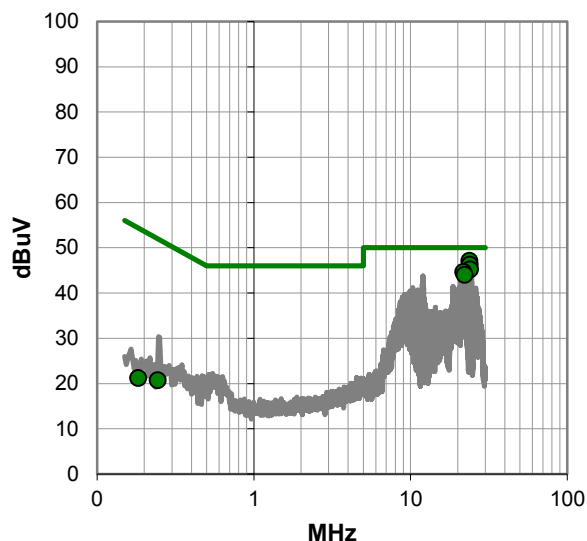
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
21.772	29.0	21.7	50.7	60.0	-9.3
23.808	28.0	21.9	49.9	60.0	-10.1
22.159	28.0	21.8	49.8	60.0	-10.2
23.904	26.9	21.9	48.8	60.0	-11.2
24.003	25.3	21.9	47.2	60.0	-12.8
0.244	25.5	20.3	45.8	61.9	-16.2
0.183	27.4	20.4	47.8	64.3	-16.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.808	25.2	21.9	47.1	50.0	-2.9
23.904	24.3	21.9	46.2	50.0	-3.8
24.003	23.3	21.9	45.2	50.0	-4.8
21.772	22.9	21.7	44.6	50.0	-5.4
22.159	22.2	21.8	44.0	50.0	-6.0
0.244	0.4	20.3	20.7	51.9	-31.3
0.183	0.8	20.4	21.2	54.3	-33.2

CONCLUSION

Pass

Trevor Buls

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MultiConnect® mDot™	Work Order:	MLTI0045
Serial Number:	5142067554-0009	Date:	06/29/2015
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Jim Asp	Relative Humidity:	58.9%
Customer Project:	None	Bar. Pressure:	978.8 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0045-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	6	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

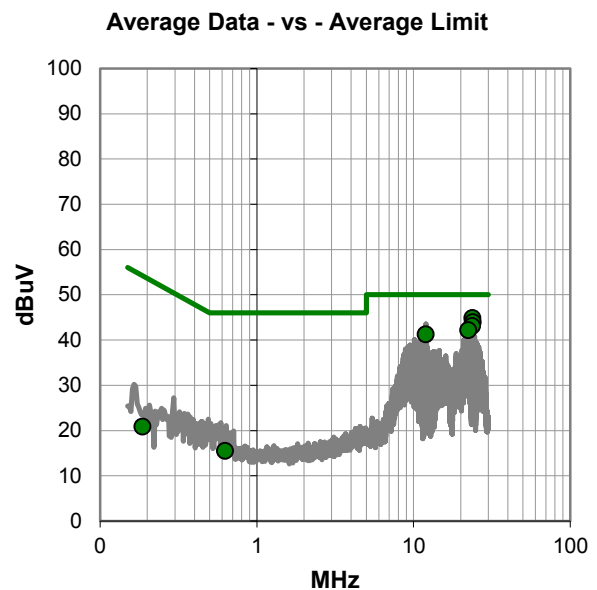
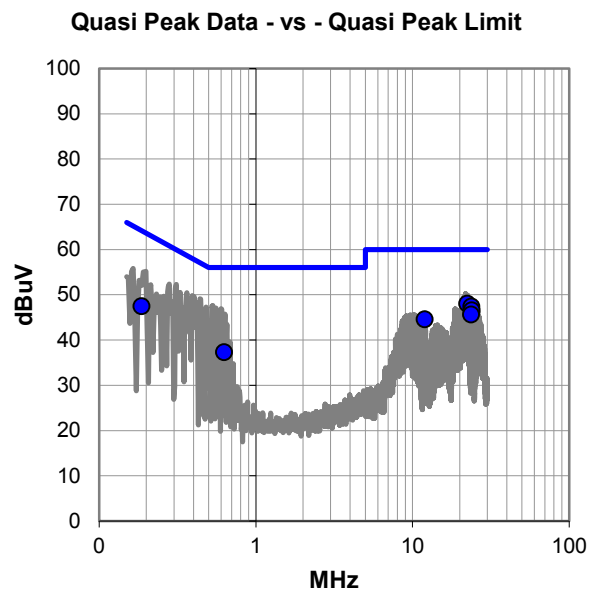
None

EUT OPERATING MODES

Transmitting High Channel

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
22.441	26.2	21.8	48.0	60.0	-12.0
23.807	25.5	21.9	47.4	60.0	-12.6
23.905	24.6	21.9	46.5	60.0	-13.5
23.711	23.7	21.9	45.6	60.0	-14.4
12.001	23.6	20.9	44.5	60.0	-15.5
0.186	27.1	20.4	47.5	64.2	-16.7
0.626	17.1	20.2	37.3	56.0	-18.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
23.807	22.9	21.9	44.8	50.0	-5.2
23.905	22.0	21.9	43.9	50.0	-6.1
23.711	21.2	21.9	43.1	50.0	-6.9
22.441	20.4	21.8	42.2	50.0	-7.8
12.001	20.3	20.9	41.2	50.0	-8.8
0.626	-4.7	20.2	15.5	46.0	-30.5
0.186	0.5	20.4	20.9	54.2	-33.3

CONCLUSION

Pass

Trevor Buls

Tested By

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

MODES OF OPERATION

Transmitting modulated 914.9 MHz (high channel), 908.7 MHz (mid channel), and 902.3 MHz (low channel).

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MLTI0045 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz
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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
.5-1 GHz Notch Filter	K&L Microwave	3TNF-500/1000-N/N	HGS	9/4/2014	12 mo
Low Pass Filter, 0 - 425 MHz	Micro-Tronics	LPM50003	HGO	3/2/2015	12 mo
High Pass Filter, 1.2 - 18 GHz	Micro-Tronics	HPM50108	HGP	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	5/5/2015	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/2/2015	12 mo
Antenna, Horn	ETS Lindgren	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	5/5/2015	12 mo
Antenna, Horn	ETS Lindgren	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12 mo

MEASUREMENT BANDWIDTHS

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

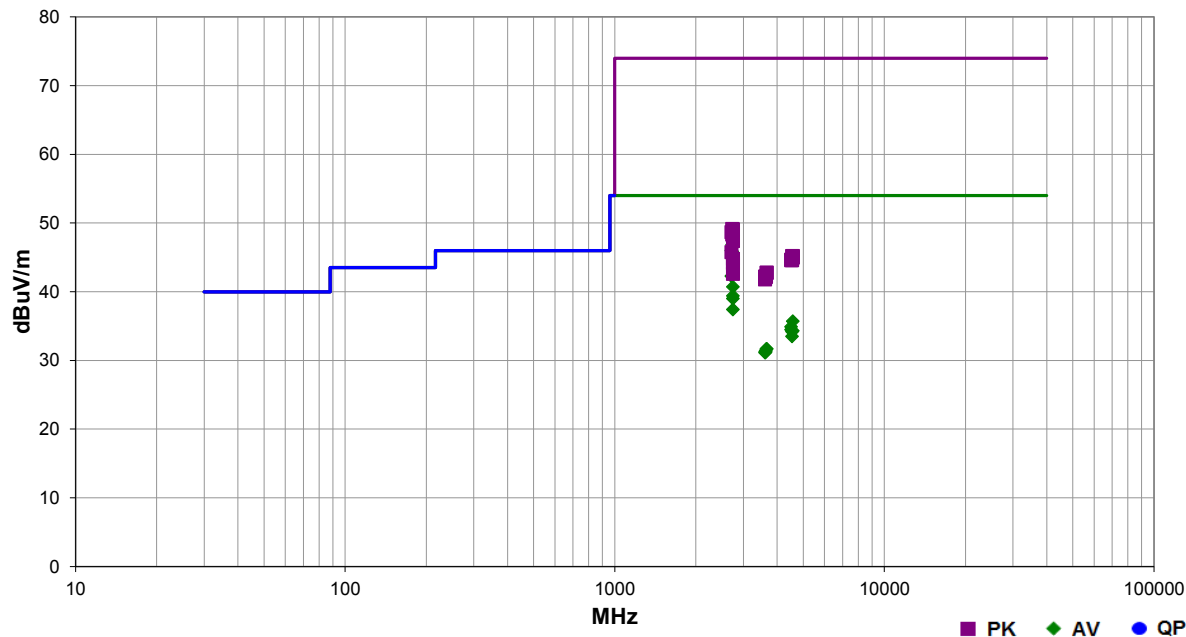
TEST DESCRIPTION

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

Work Order:	MLTI0045	Date:	06/26/15		
Project:	None	Temperature:	22.6 °C		
Job Site:	MN05	Humidity:	52.5% RH		
Serial Number:	5142067554-0009	Barometric Pres.:	988.2 mbar	Tested by:	Dustin Sparks
EUT:	MultiConnect mDot				
Configuration:	1				
Customer:	Multi-Tech Systems, Inc.				
Attendees:	Jim Asp				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting modulated 914.9 MHz (high channel), 908.7 MHz (mid channel), and 902.3 MHz (low channel).				
Deviations:	None				
Comments:	None				

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

Run #	6	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2744.550	48.3	-1.4	1.6	154.0	3.0	0.0	Horz	AV	0.0	46.9	54.0	-7.1	High ch, EUT on side
2726.200	48.2	-1.4	1.5	155.1	3.0	0.0	Horz	AV	0.0	46.8	54.0	-7.2	Mid ch, EUT on side
2706.842	47.3	-1.3	1.4	243.0	3.0	0.0	Horz	AV	0.0	46.0	54.0	-8.0	Low ch, EUT on side
2726.208	47.2	-1.4	2.6	178.1	3.0	0.0	Vert	AV	0.0	45.8	54.0	-8.2	Mid ch, EUT vert
2744.650	45.7	-1.4	1.8	174.1	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	High ch, EUT vert
2706.733	43.6	-1.3	1.0	163.1	3.0	0.0	Vert	AV	0.0	42.3	54.0	-11.7	Low ch, EUT vert
2744.767	42.1	-1.4	3.3	38.0	3.0	0.0	Horz	AV	0.0	40.7	54.0	-13.3	High ch, EUT vert
2744.550	40.8	-1.4	2.1	163.1	3.0	0.0	Vert	AV	0.0	39.4	54.0	-14.6	High ch, EUT horz
2744.592	40.4	-1.4	1.5	176.0	3.0	0.0	Horz	AV	0.0	39.0	54.0	-15.0	High ch, EUT horz
2744.558	38.8	-1.4	1.0	146.0	3.0	0.0	Vert	AV	0.0	37.4	54.0	-16.6	High ch, EUT on side
4574.550	30.5	5.2	1.0	139.0	3.0	0.0	Horz	AV	0.0	35.7	54.0	-18.3	High ch, EUT on side
4511.275	29.9	5.0	1.0	120.1	3.0	0.0	Horz	AV	0.0	34.9	54.0	-19.1	Low ch, EUT on side
4511.292	29.5	5.0	1.0	206.1	3.0	0.0	Vert	AV	0.0	34.5	54.0	-19.5	Low ch, EUT vert
4574.467	29.1	5.2	2.4	187.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	High ch, EUT vert
4543.425	29.1	5.1	1.0	113.1	3.0	0.0	Horz	AV	0.0	34.2	54.0	-19.8	Mid ch, EUT on side
4543.658	28.4	5.1	1.6	300.9	3.0	0.0	Vert	AV	0.0	33.5	54.0	-20.5	Mid ch, EUT vert
3660.600	29.7	2.0	1.0	3.0	3.0	0.0	Vert	AV	0.0	31.7	54.0	-22.3	High ch, EUT vert
3657.225	29.7	2.0	3.8	46.0	3.0	0.0	Horz	AV	0.0	31.7	54.0	-22.3	High ch, EUT on side
3633.250	29.6	1.8	1.0	82.0	3.0	0.0	Vert	AV	0.0	31.4	54.0	-22.6	Mid ch, EUT vert
3634.608	29.4	1.8	1.0	231.0	3.0	0.0	Horz	AV	0.0	31.2	54.0	-22.8	Mid ch, EUT on side
3611.683	29.5	1.7	1.0	232.9	3.0	0.0	Vert	AV	0.0	31.2	54.0	-22.8	Low ch, EUT vert
3611.600	29.4	1.7	3.1	272.9	3.0	0.0	Horz	AV	0.0	31.1	54.0	-22.9	Low ch, EUT on side

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
2726.033	50.5	-1.4	1.5	155.1	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	Mid ch, EUT on side
2744.475	50.5	-1.4	1.6	154.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	High ch, EUT on side
2706.975	50.0	-1.3	1.4	243.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low ch, EUT on side
2726.275	49.7	-1.4	2.6	178.1	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Mid ch, EUT vert
2744.367	48.8	-1.4	1.8	174.1	3.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6	High ch, EUT vert
2706.825	47.1	-1.3	1.0	163.1	3.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	Low ch, EUT vert
4575.533	40.0	5.2	2.4	187.0	3.0	0.0	Vert	PK	0.0	45.2	74.0	-28.8	High ch, EUT vert
4545.842	40.1	5.1	1.0	113.1	3.0	0.0	Horz	PK	0.0	45.2	74.0	-28.8	Mid ch, EUT on side
4574.208	39.8	5.2	1.0	139.0	3.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	High ch, EUT on side
2744.750	46.2	-1.4	3.3	38.0	3.0	0.0	Horz	PK	0.0	44.8	74.0	-29.2	High ch, EUT vert
4511.050	39.7	5.0	1.0	206.1	3.0	0.0	Vert	PK	0.0	44.7	74.0	-29.3	Low ch, EUT vert
4545.858	39.5	5.1	1.6	300.9	3.0	0.0	Vert	PK	0.0	44.6	74.0	-29.4	Mid ch, EUT vert
4511.883	39.6	5.0	1.0	120.1	3.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	Low ch, EUT on side
2744.433	45.7	-1.4	1.5	176.0	3.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	High ch, EUT horz
2744.683	45.5	-1.4	2.1	163.1	3.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	High ch, EUT horz
3660.142	40.8	2.0	1.0	3.0	3.0	0.0	Vert	PK	0.0	42.8	74.0	-31.2	High ch, EUT vert
3657.608	40.8	2.0	3.8	46.0	3.0	0.0	Horz	PK	0.0	42.8	74.0	-31.2	High ch, EUT on side
2744.467	44.0	-1.4	1.0	146.0	3.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	High ch, EUT on side
3635.317	40.4	1.8	1.0	82.0	3.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	Mid ch, EUT vert
3610.917	40.5	1.7	1.0	232.9	3.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	Low ch, EUT vert
3634.667	40.3	1.8	1.0	231.0	3.0	0.0	Horz	PK	0.0	42.1	74.0	-31.9	Mid ch, EUT on side
3606.858	40.1	1.7	3.1	272.9	3.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	Low ch, EUT on side

SPURIOUS CONDUCTED EMISSIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

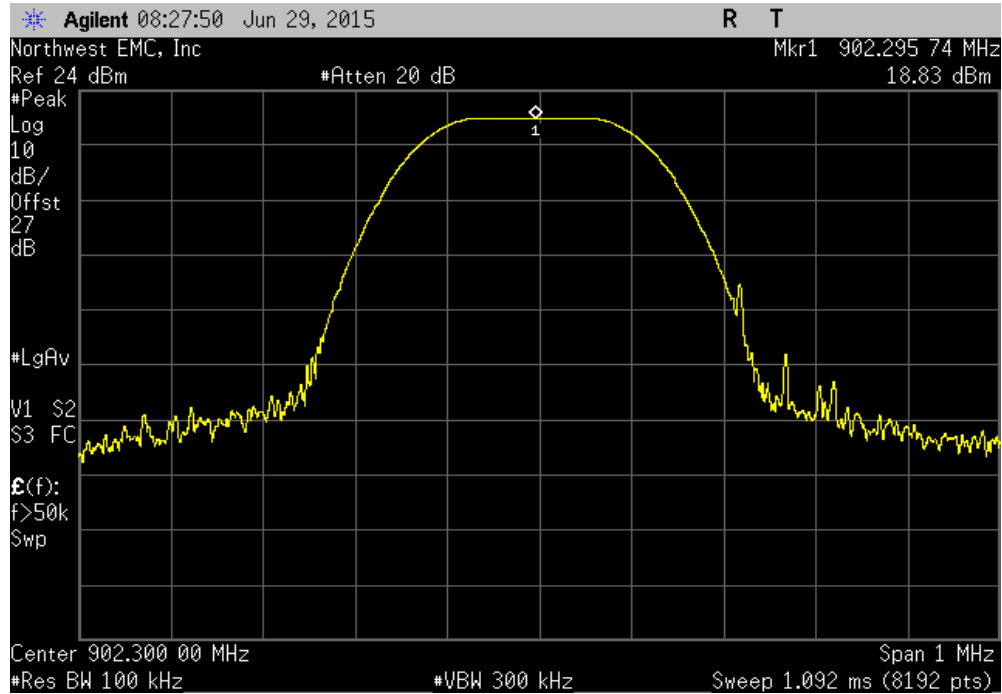
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each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

SPURIOUS CONDUCTED EMISSIONS

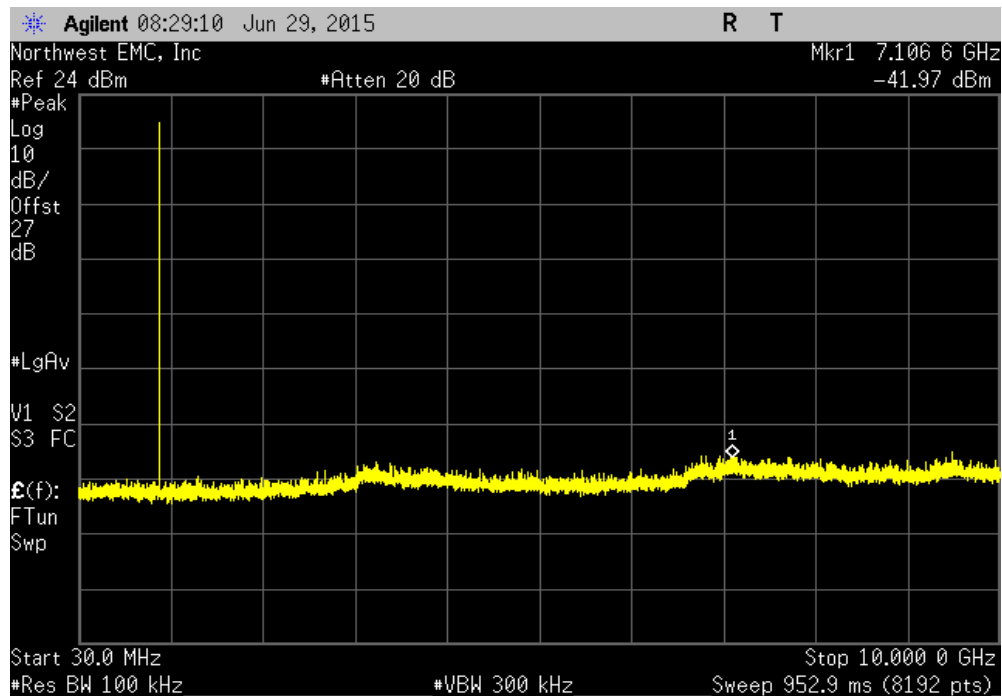
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method: ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature: <i>Trevor Buls</i>	
		Frequency Range	Value (dBc) Limit ≤ (dBc) Result
Low Channel 902.3 MHz		Fundamental	N/A N/A N/A
Low Channel 902.3 MHz		30 MHz - 10 GHz	-60.8 -20 Pass
Mid Channel 908.7 MHz		Fundamental	N/A N/A N/A
Mid Channel 908.7 MHz		30 MHz - 10 GHz	-59.12 -20 Pass
High Channel 914.9 MHz		Fundamental	N/A N/A N/A
High Channel 914.9 MHz		30 MHz - 10 GHz	-60.82 -20 Pass

SPURIOUS CONDUCTED EMISSIONS

Low Channel 902.3 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental		N/A	N/A	N/A	

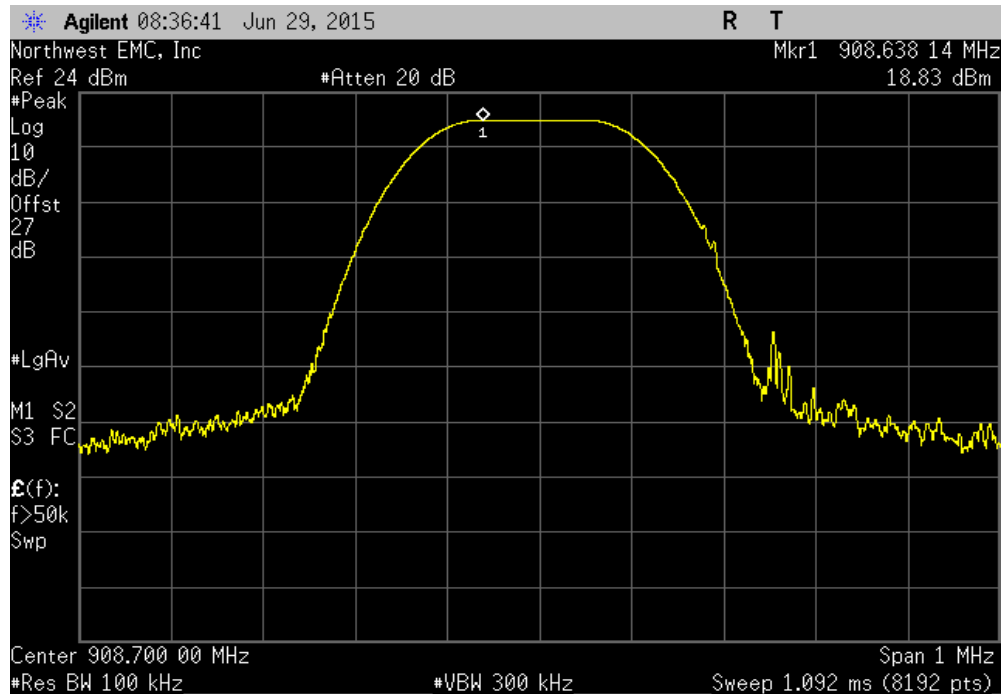


Low Channel 902.3 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz		-60.8	-20	Pass	

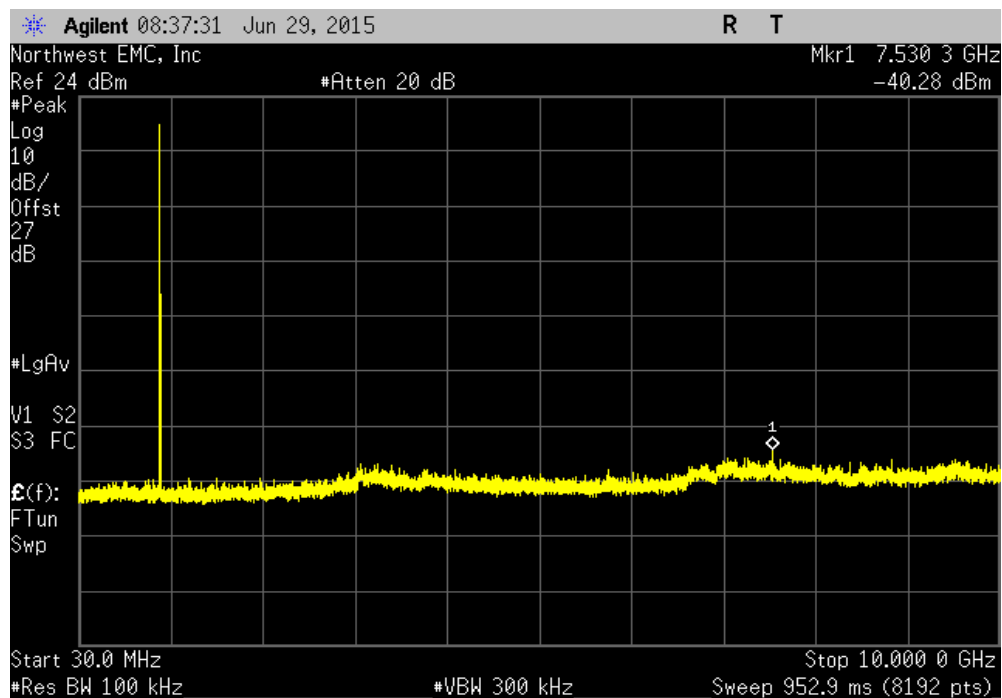


SPURIOUS CONDUCTED EMISSIONS

Mid Channel 908.7 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental		N/A	N/A	N/A	

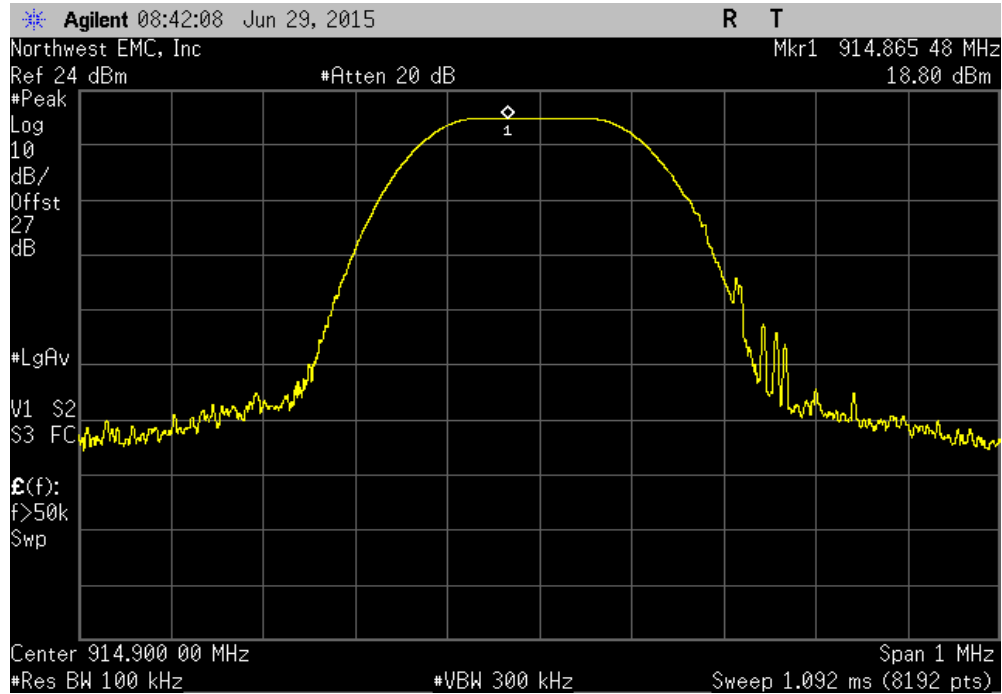


Mid Channel 908.7 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz		-59.12	-20	Pass	

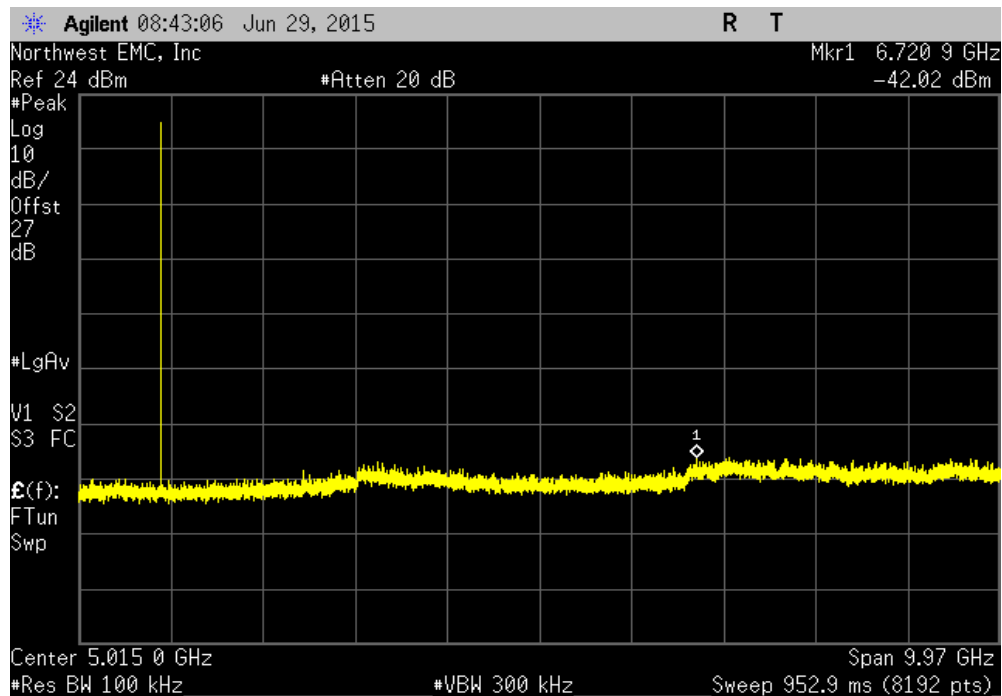


SPURIOUS CONDUCTED EMISSIONS

High Channel 914.9 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental		N/A	N/A	N/A	



High Channel 914.9 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz		-60.82	-20	Pass	



OCCUPIED BANDWIDTH

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

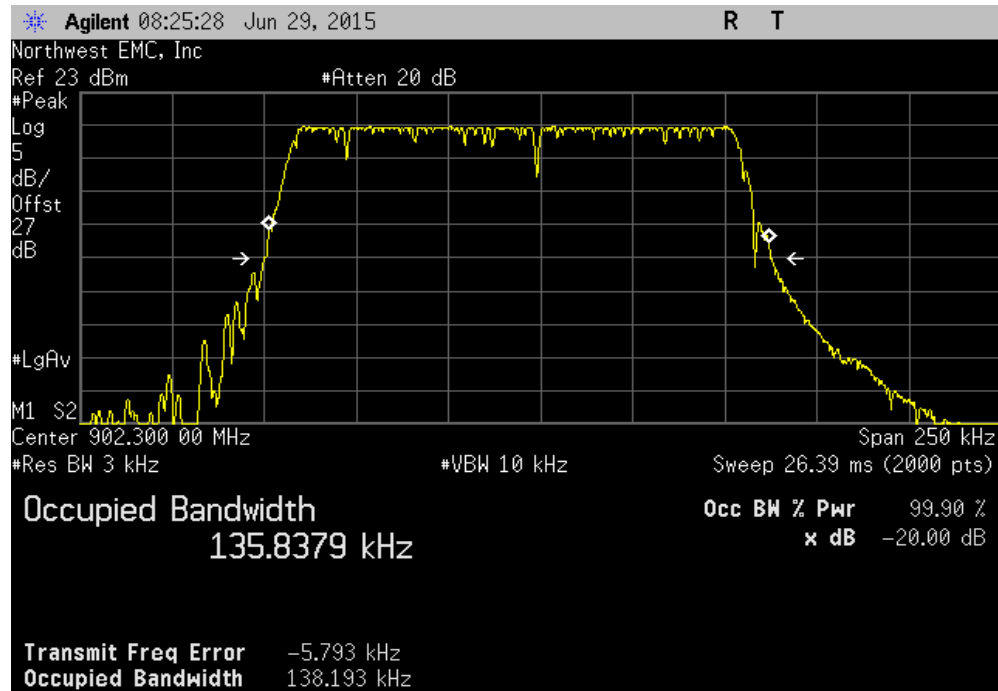
The occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

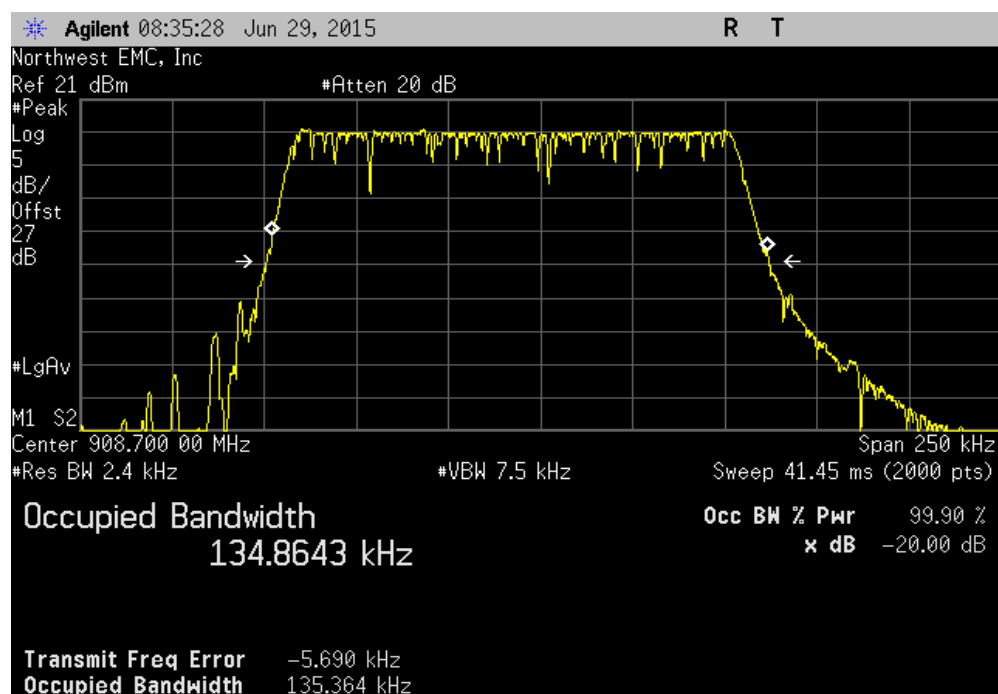
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value	Limit
Low Channel 902.3 MHz		138.193 kHz	N/A
Mid Channel 908.7 MHz		135.364 kHz	N/A
High Channel 914.9 MHz		135.14 kHz	N/A
		Result	
		N/A	
		N/A	
		N/A	

OCCUPIED BANDWIDTH

Low Channel 902.3 MHz						
				Value	Limit	Result
				138.193 kHz	N/A	N/A

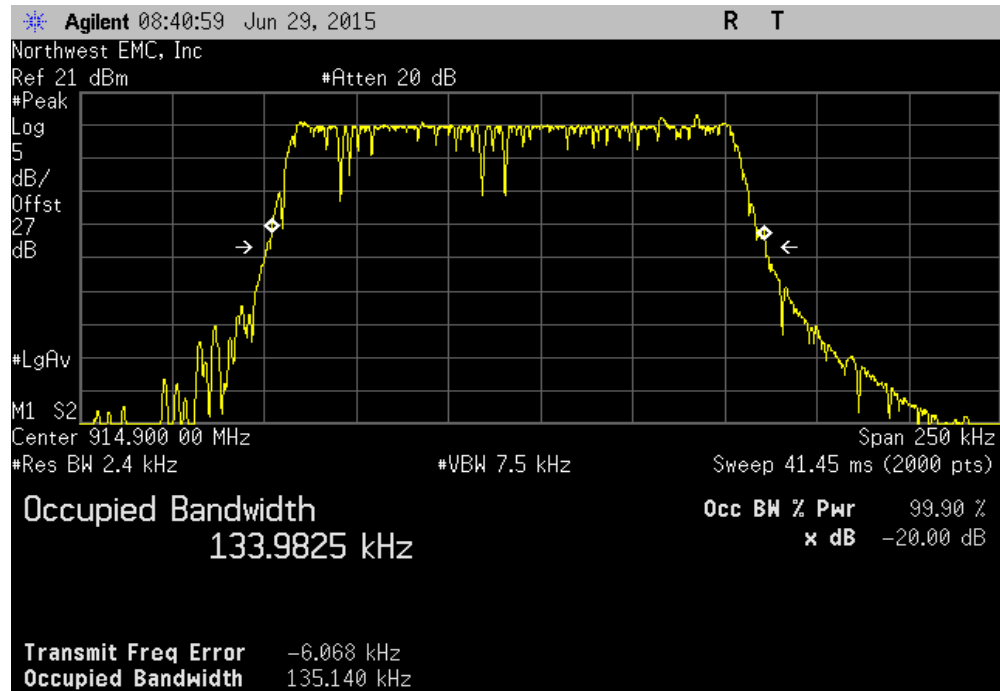


Mid Channel 908.7 MHz						
				Value	Limit	Result
				135.364 kHz	N/A	N/A



OCCUPIED BANDWIDTH

High Channel 914.9 MHz						
				Value	Limit	Result
				135.14 kHz	N/A	N/A



OUTPUT POWER

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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

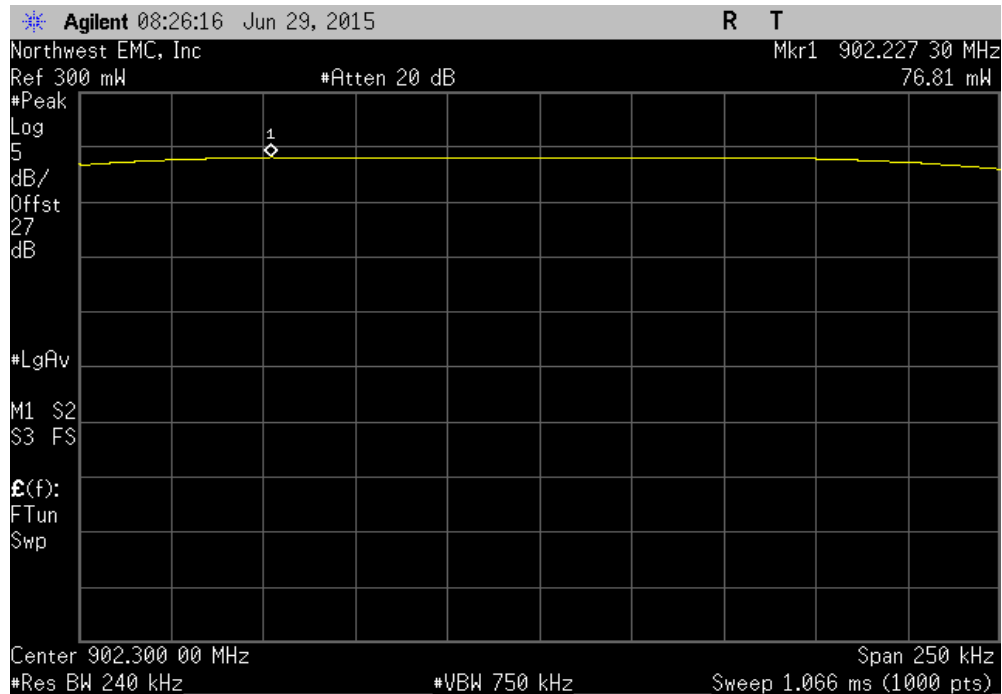
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

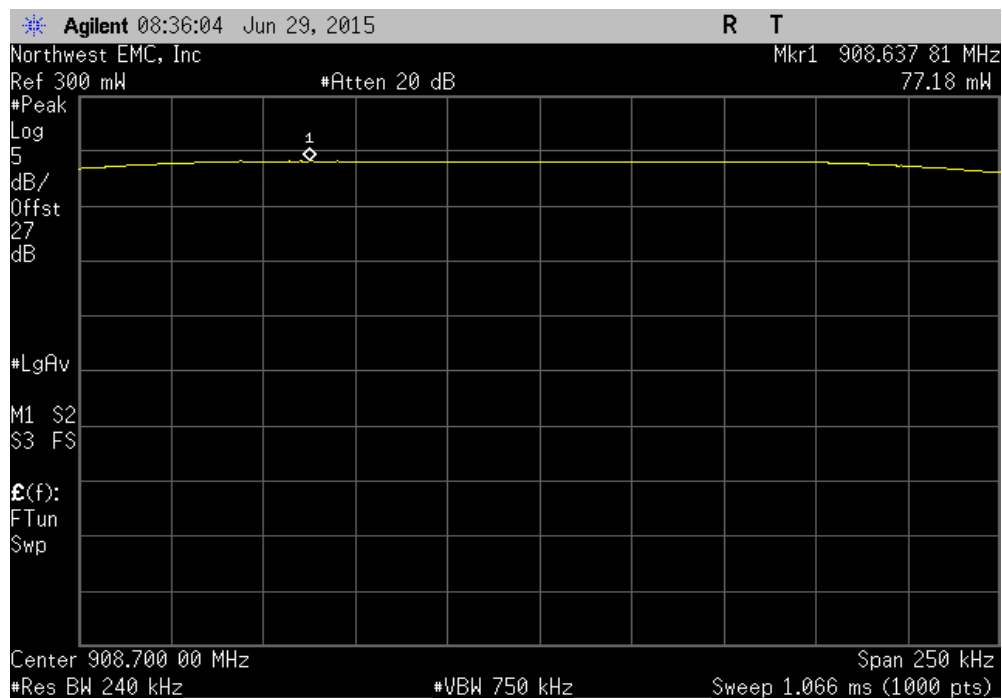
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value	Limit (<) Result
Low Channel 902.3 MHz		76.807 mW	1 W Pass
Mid Channel 908.7 MHz		77.179 mW	1 W Pass
High Channel 914.9 MHz		75.963 mW	1 W Pass

OUTPUT POWER

Low Channel 902.3 MHz						
				Value	Limit (<)	Result
				76.807 mW	1 W	Pass

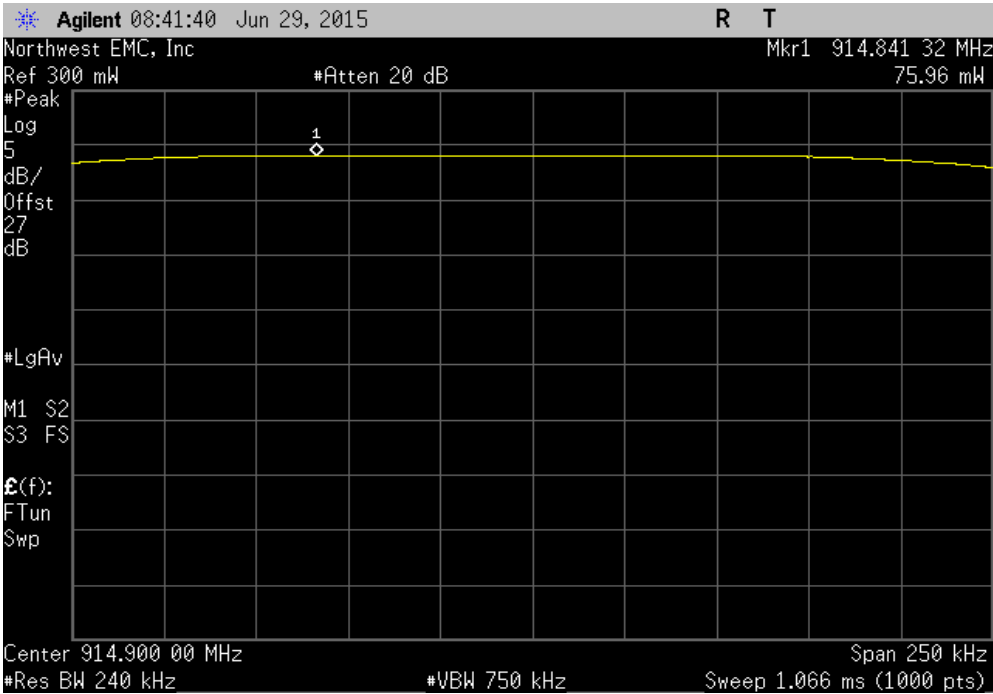


Mid Channel 908.7 MHz						
				Value	Limit (<)	Result
				77.179 mW	1 W	Pass



OUTPUT POWER

High Channel 914.9 MHz						
				Value	Limit (<)	Result
				75.963 mW	1 W	Pass



POWER SPECTRAL DENSITY

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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

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

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

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

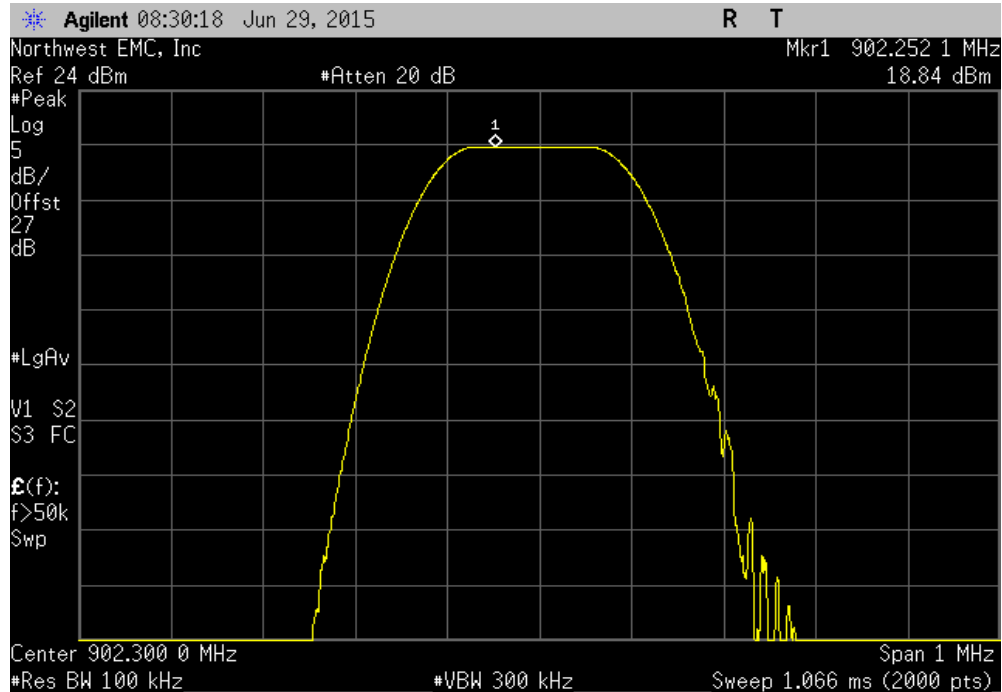
$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

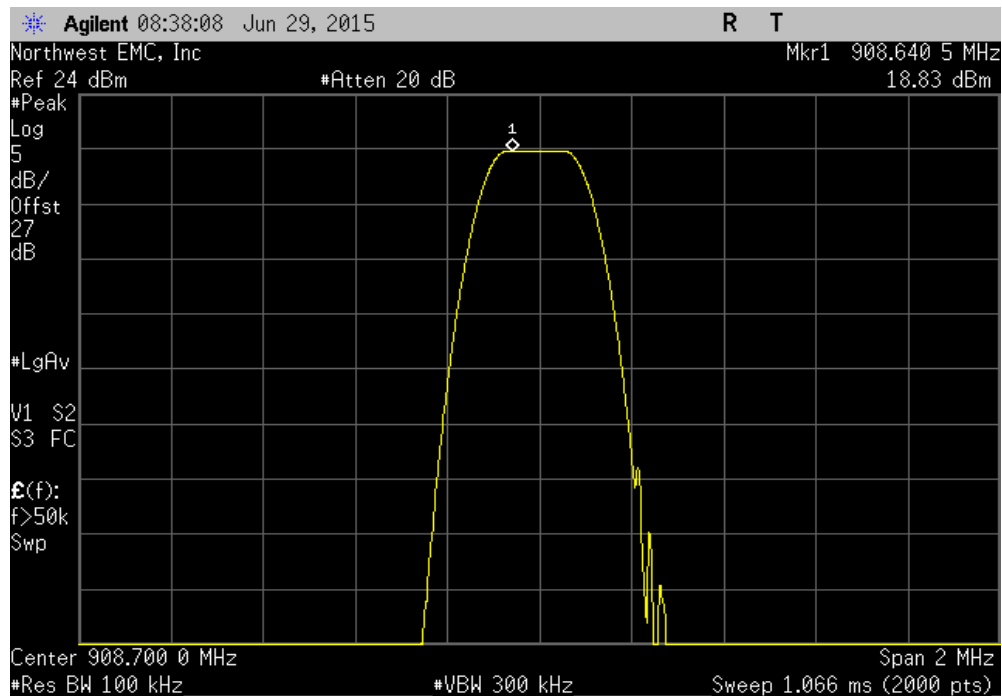
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
Low Channel 902.3 MHz		18.843	-15.2
Mid Channel 908.7 MHz		18.83	-15.2
High Channel 914.9 MHz		18.805	-15.2
		Value dBm/3kHz	Limit dBm/3kHz
		3.643	8
		3.63	8
		3.605	8
			Results
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

Low Channel 902.3 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	18.843	-15.2	3.643	8	Pass

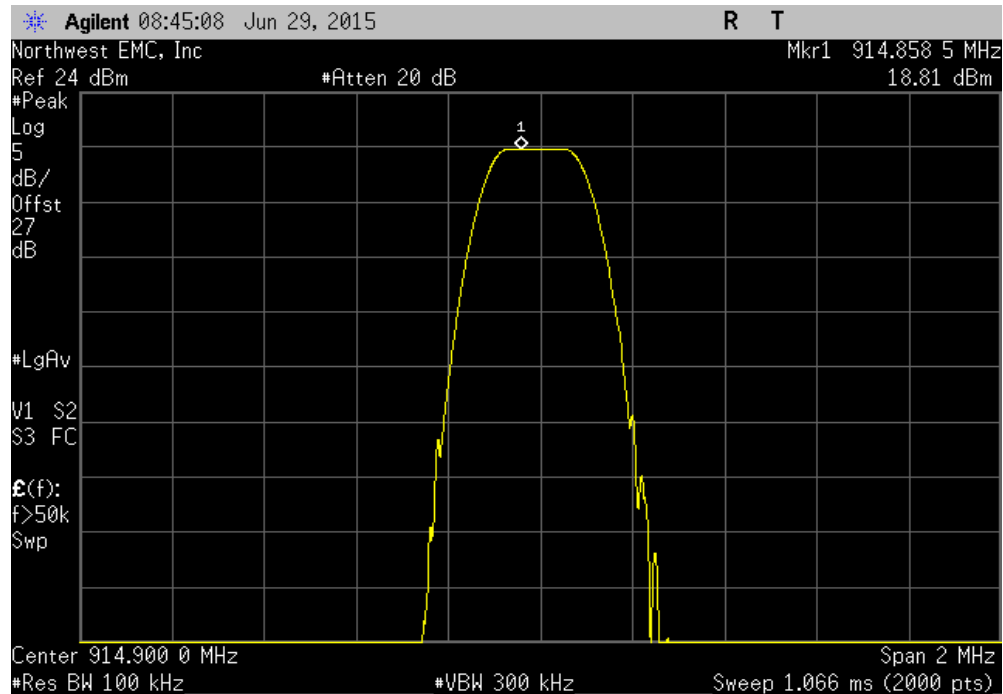


Mid Channel 908.7 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	18.83	-15.2	3.63	8	Pass



POWER SPECTRAL DENSITY

High Channel 914.9 MHz					
	Value		Value	Limit	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	Results
	18.805	-15.2	3.605	8	Pass



DUTY CYCLE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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.


The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used.

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

If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.

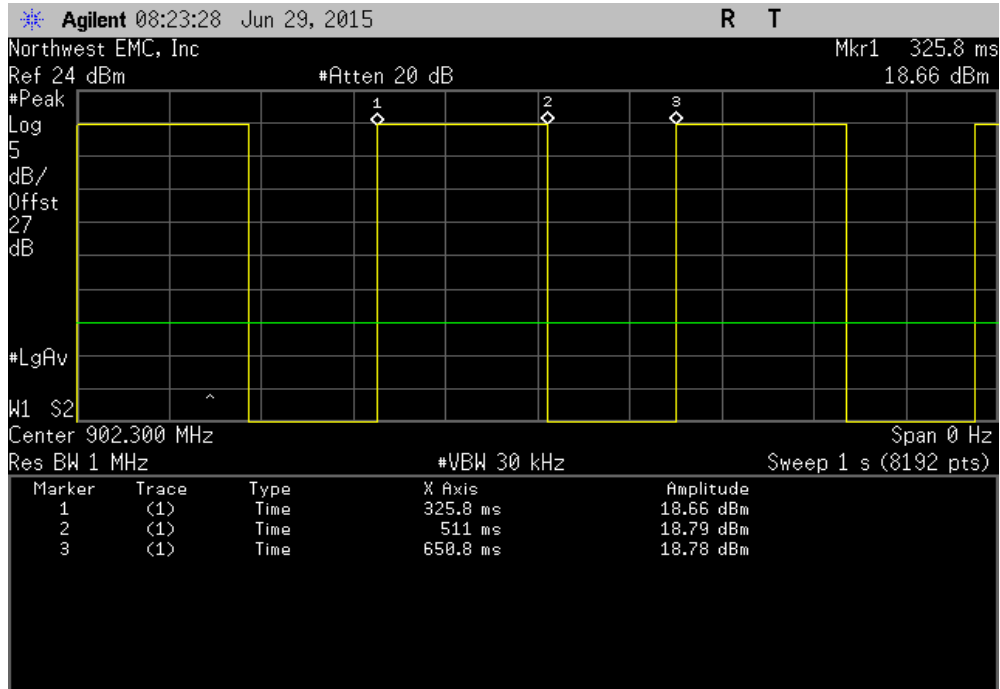
DUTY CYCLE

XMIT 2015 01 14

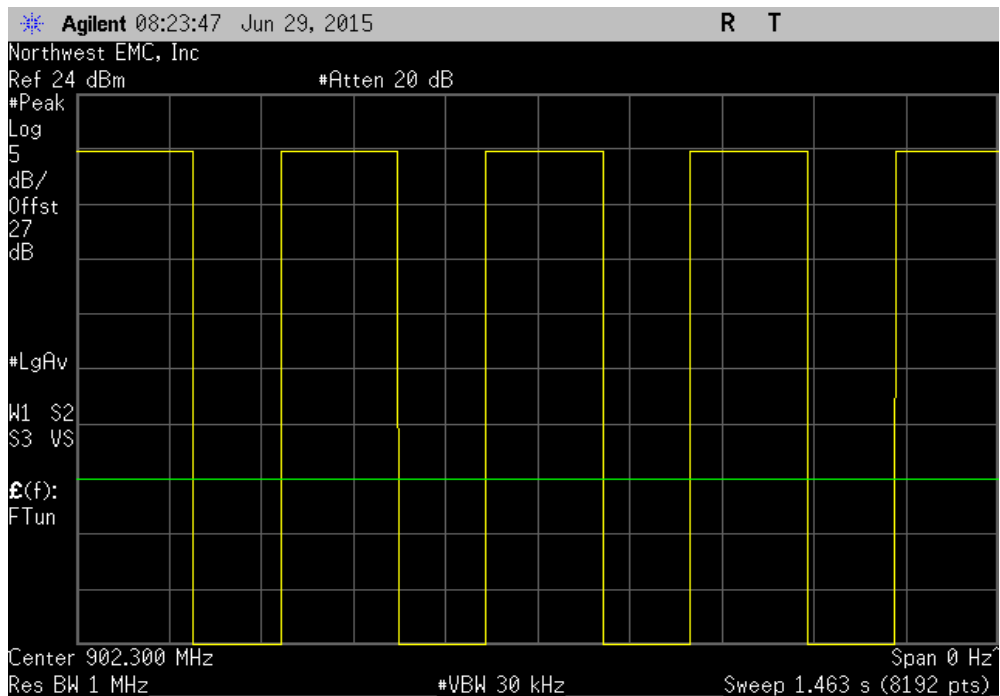
EUT: MultiConnect® mDot™		Work Order: MLT10045				
Serial Number: 5142067554-0009		Date: 06/29/15				
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C				
Attendees: Jim Asp		Humidity: 57%				
Project: None		Barometric Pres.: 980.1				
Tested by: Trevor Buls		Job Site: MN08				
Power: 110VAC/60Hz						
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2015		ANSI C63.10:2009				
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	3	Signature 				
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Low Channel 902.3 MHz	185.222 ms	325.078 ms	1	57	N/A	N/A
Low Channel 902.3 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel 908.7 MHz	185.317 ms	324.956 ms	1	57	N/A	N/A
Mid Channel 908.7 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel 914.9 MHz	185.222 ms	324.935 ms	1	57	N/A	N/A
High Channel 914.9 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

Low Channel 902.3 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	185.222 ms	325.078 ms	1	57	N/A	N/A

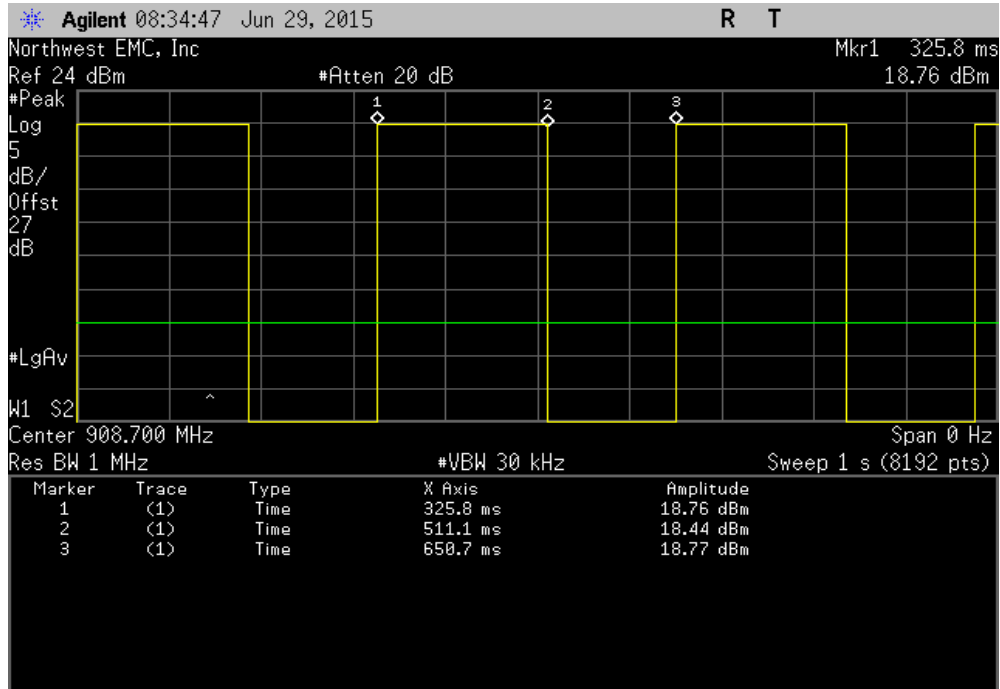


Low Channel 902.3 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

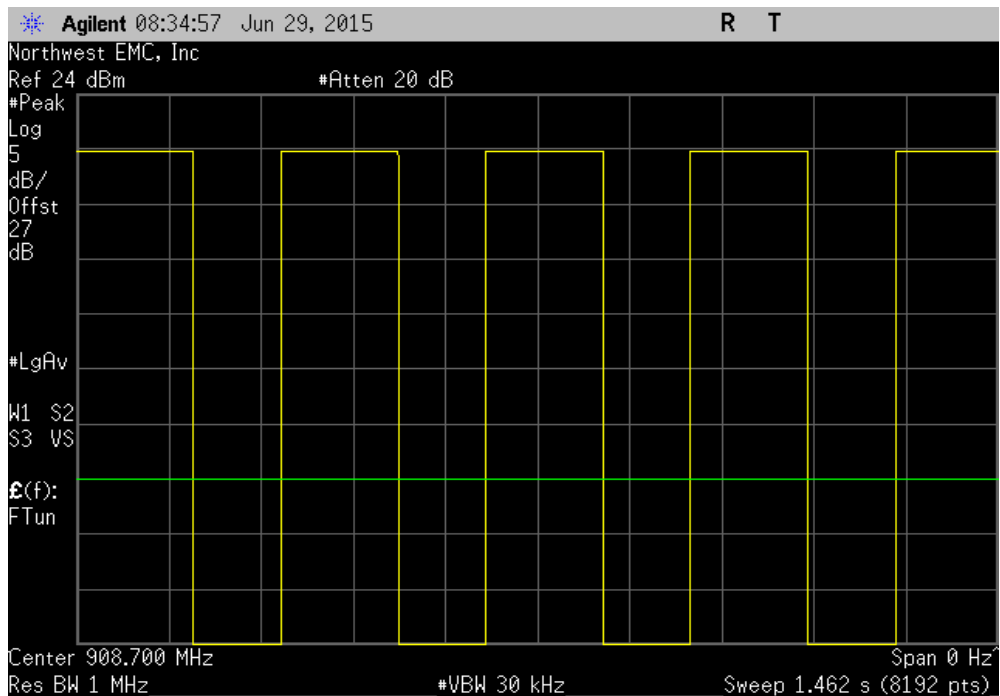


DUTY CYCLE

Mid Channel 908.7 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	185.317 ms	324.956 ms	1	57	N/A	N/A

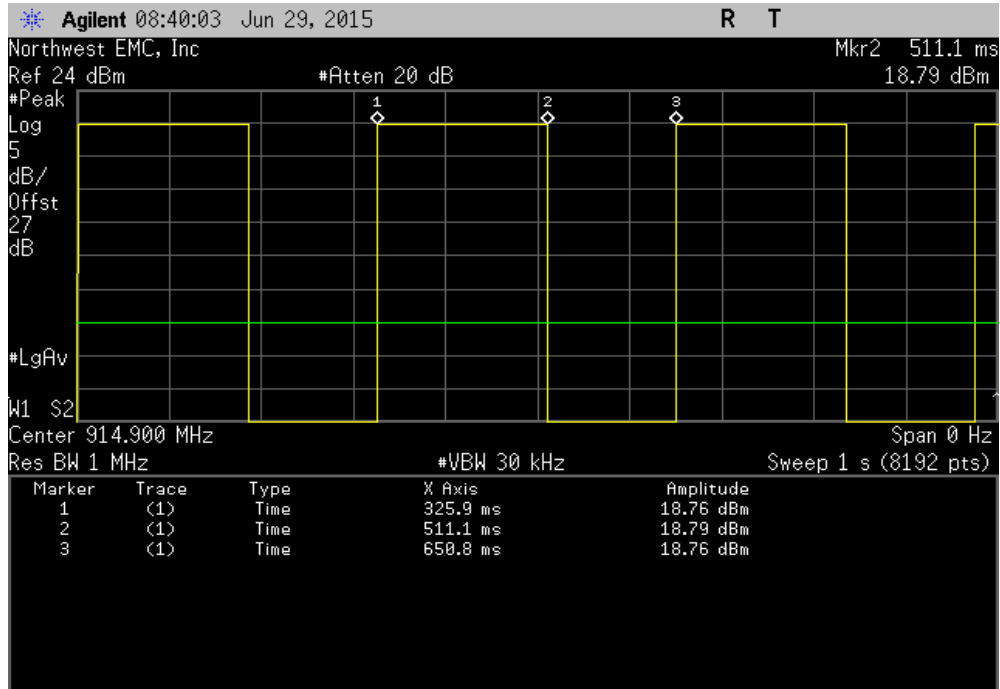


Mid Channel 908.7 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

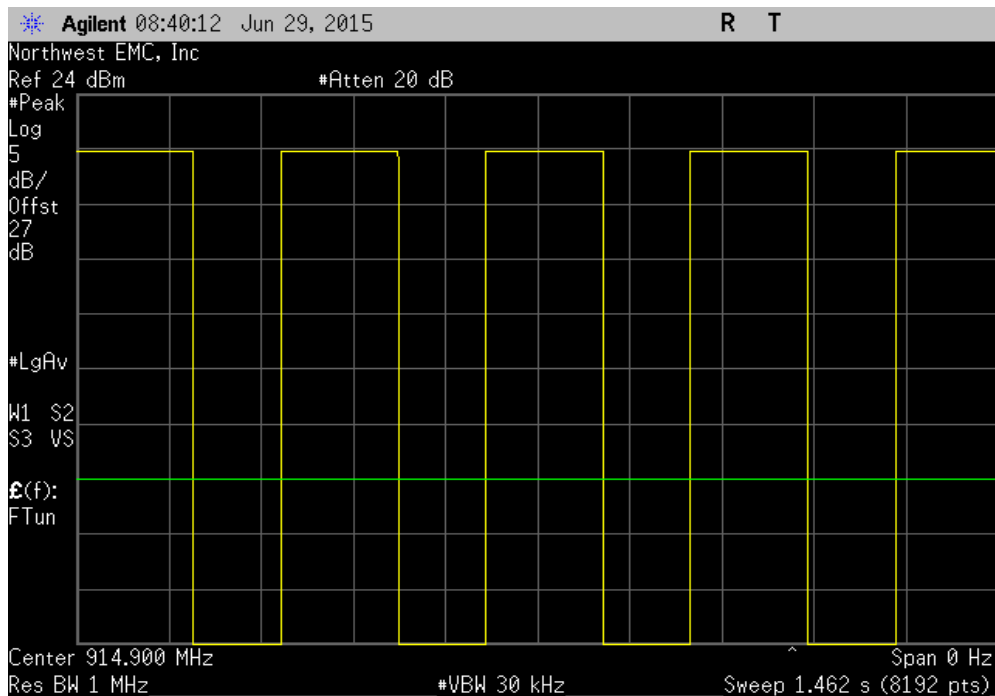


DUTY CYCLE

High Channel 914.9 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	185.222 ms	324.935 ms	1	57	N/A	N/A



High Channel 914.9 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



CARRIER FREQUENCY SEPARATION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

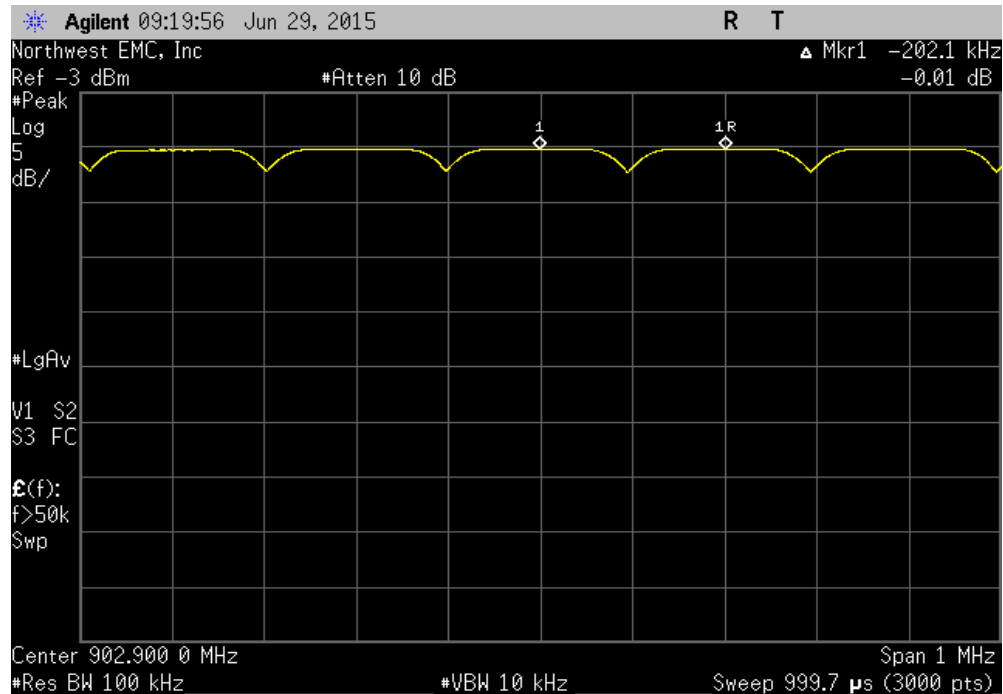
The channel carrier frequencies in the 902-928MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels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

CARRIER FREQUENCY SEPARATION

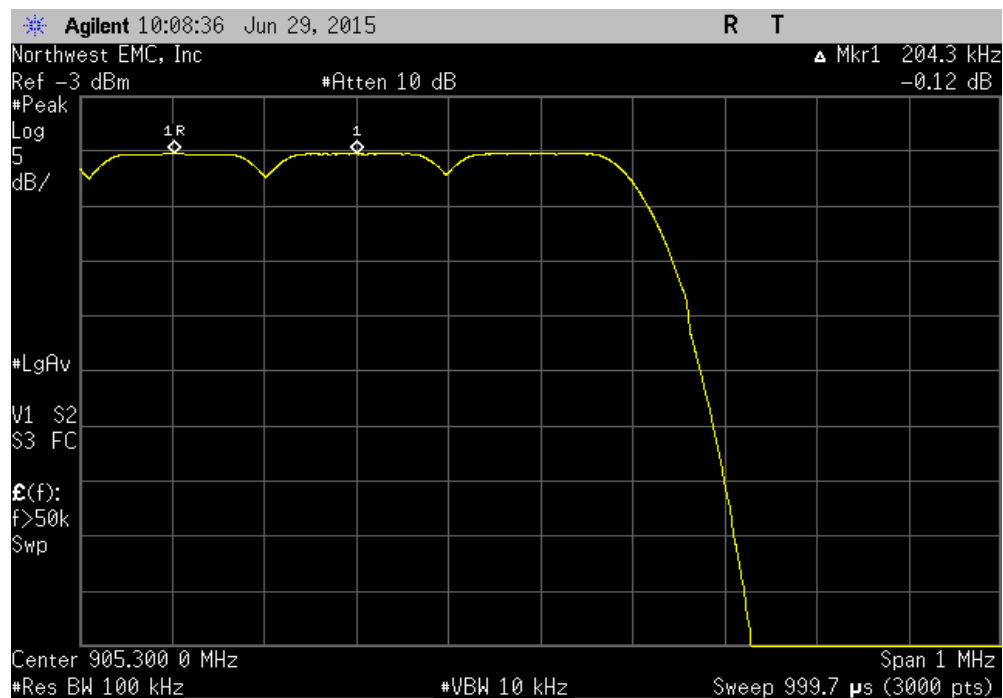
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
Limit is based on occupied bandwidth of the transmitter.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value (kHz)	Limit (≥) (kHz)
Hopping Mode 1		202.1	138.2
Hopping Mode 2		204.3	138.2
Hopping Mode 3		202.9	138.2
Hopping Mode 4		200.9	138.2
Hopping Mode 5		200.7	138.2
Hopping Mode 6		204.2	138.2
Hopping Mode 7		203.3	138.2
Hopping Mode 8		203.1	138.2
			Results
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

CARRIER FREQUENCY SEPARATION

Hopping Mode 1						
				Value (kHz)	Limit (≥) (kHz)	Results
				202.1	138.2	Pass

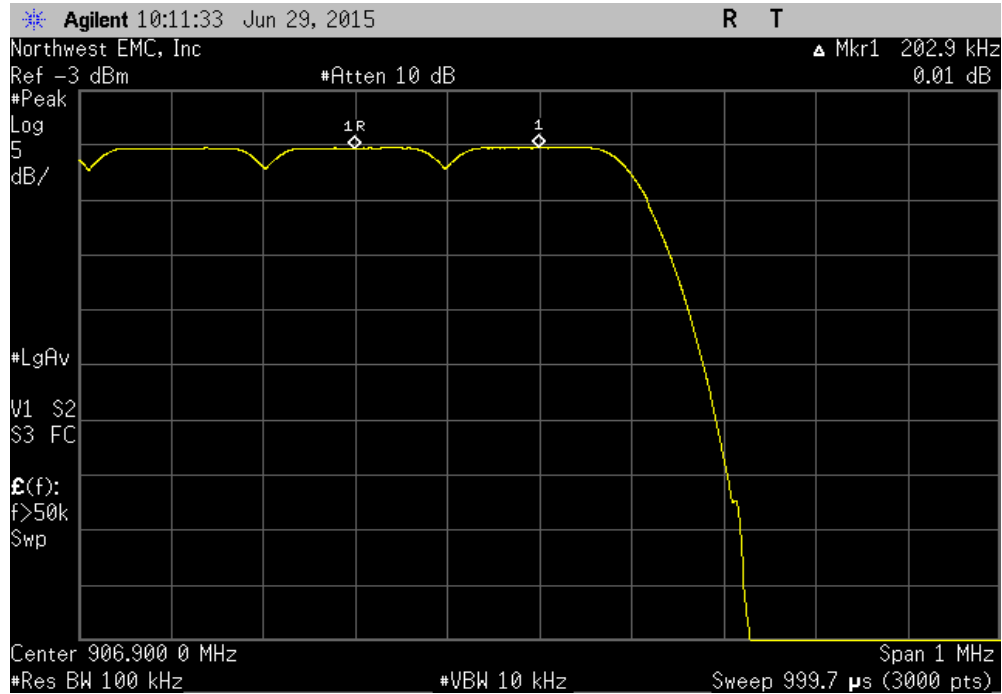


Hopping Mode 2						
				Value (kHz)	Limit (≥) (kHz)	Results
				204.3	138.2	Pass

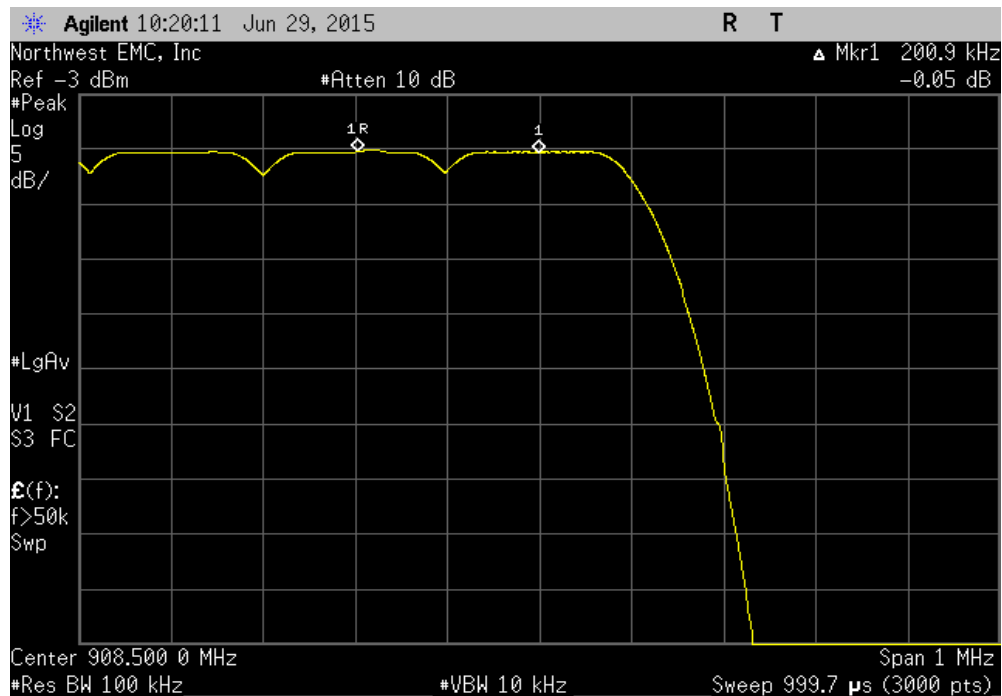


CARRIER FREQUENCY SEPARATION

Hopping Mode 3						
				Value (kHz)	Limit (≥) (kHz)	Results
				202.9	138.2	Pass

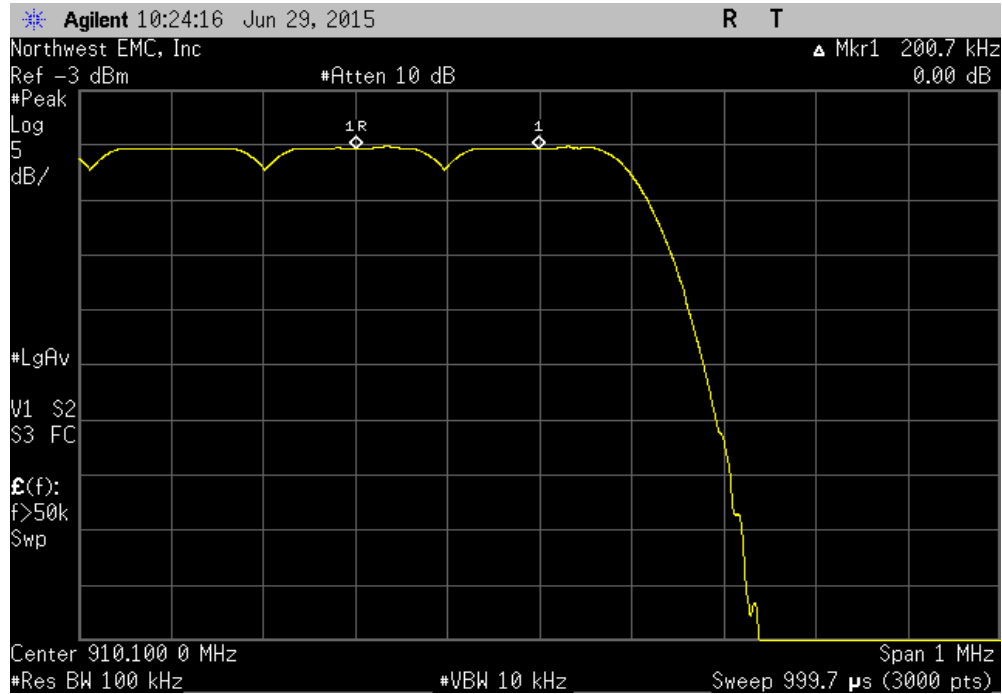


Hopping Mode 4						
				Value (kHz)	Limit (≥) (kHz)	Results
				200.9	138.2	Pass

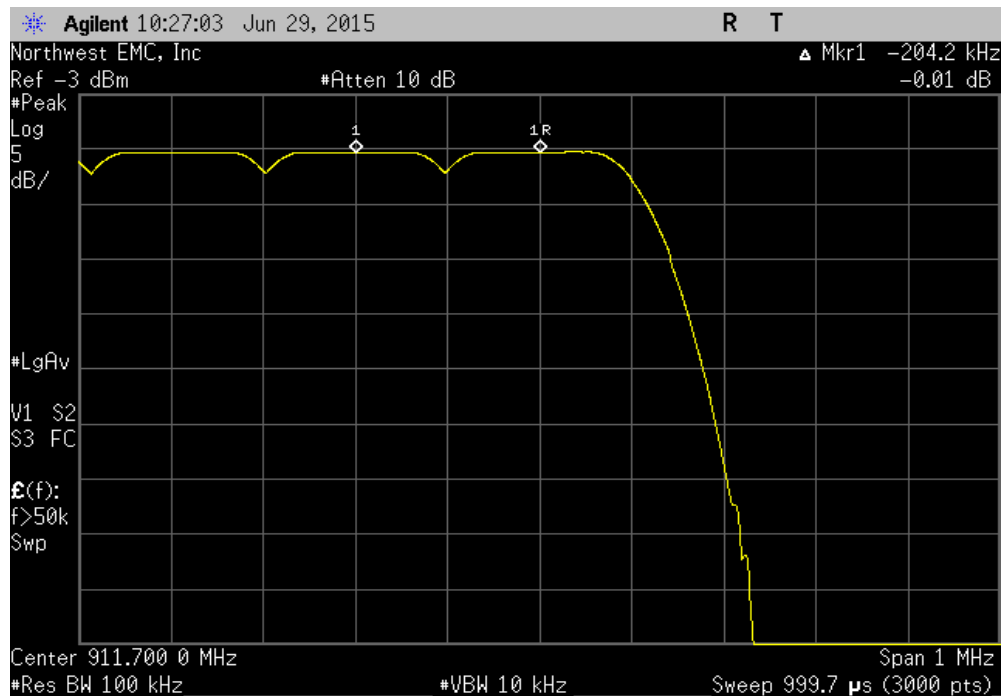


CARRIER FREQUENCY SEPARATION

Hopping Mode 5						
				Value (kHz)	Limit (≥) (kHz)	Results
				200.7	138.2	Pass

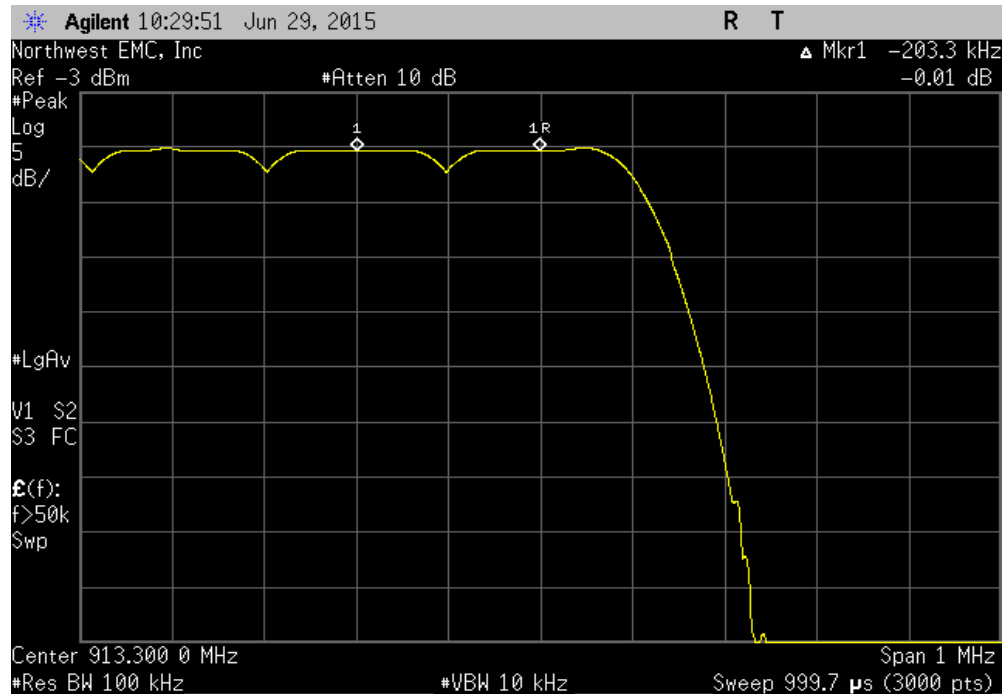


Hopping Mode 6						
				Value (kHz)	Limit (≥) (kHz)	Results
				204.2	138.2	Pass

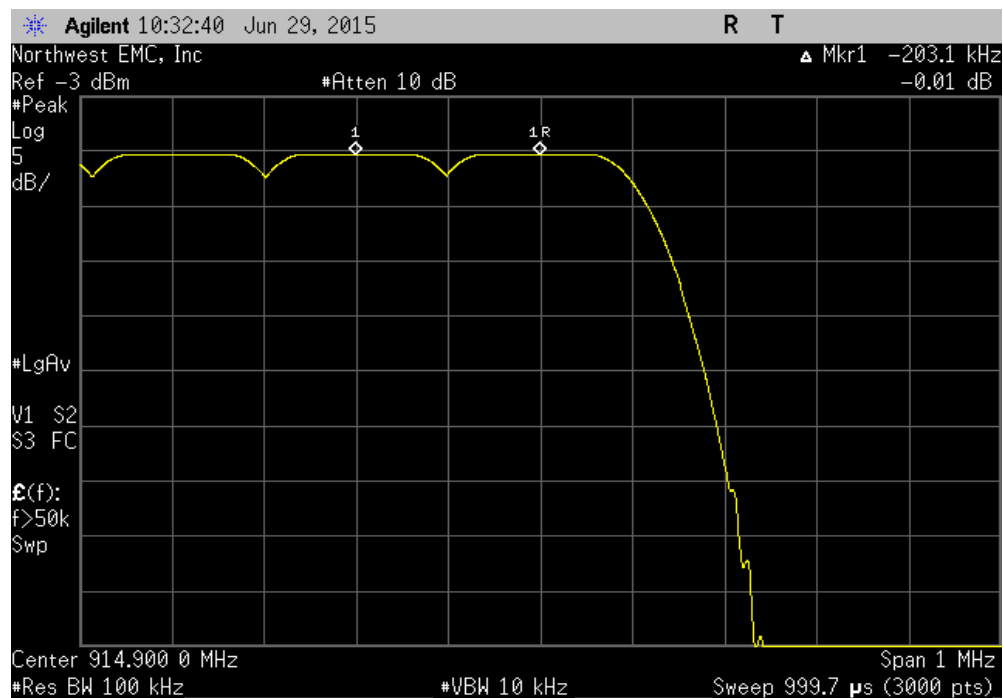


CARRIER FREQUENCY SEPARATION

Hopping Mode 7						
				Value (kHz)	Limit (≥) (kHz)	Results
				203.3	138.2	Pass



Hopping Mode 8						
				Value (kHz)	Limit (≥) (kHz)	Results
				203.1	138.2	Pass



NUMBER OF HOPPING FREQUENCIES

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

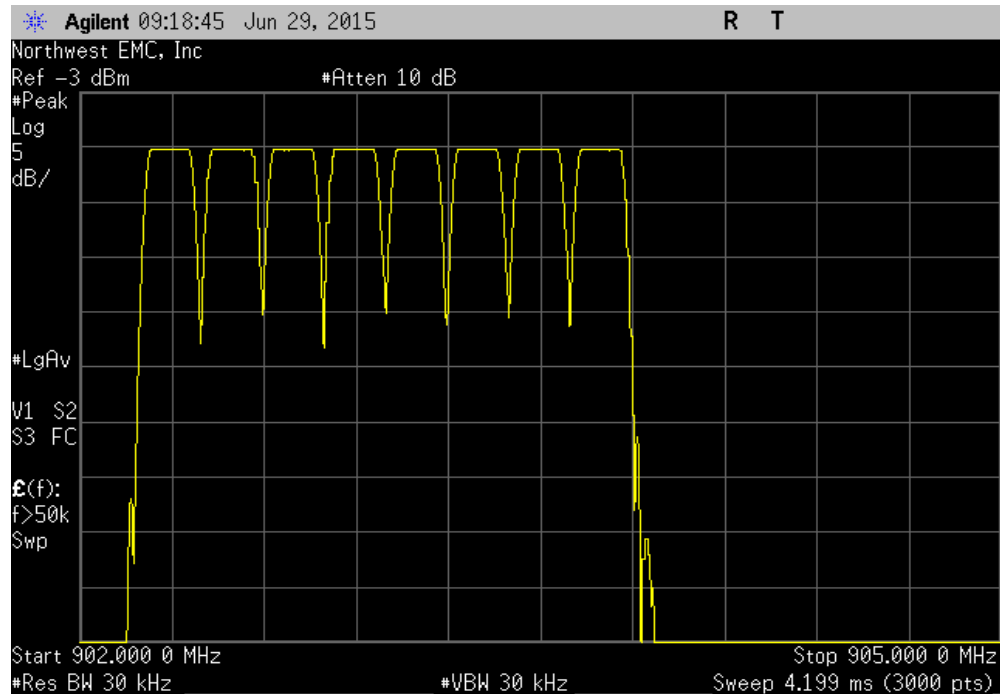
The number of hopping frequencies was measured across the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled.

NUMBER OF HOPPING FREQUENCIES

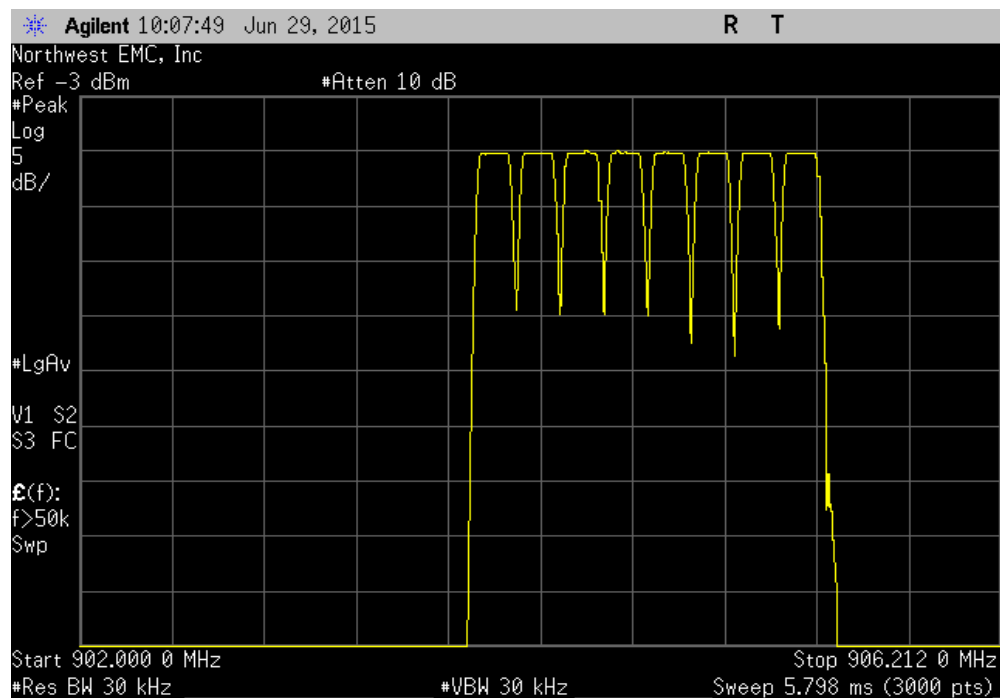
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
No limit for Hybrid devices.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Number of Channels	Limit
Hopping Mode 1		8	N/A
Hopping Mode 2		8	N/A
Hopping Mode 3		8	N/A
Hopping Mode 4		8	N/A
Hopping Mode 5		8	N/A
Hopping Mode 6		8	N/A
Hopping Mode 7		8	N/A
Hopping Mode 8		8	N/A
			Results
Hopping Mode 1			N/A
Hopping Mode 2			N/A
Hopping Mode 3			N/A
Hopping Mode 4			N/A
Hopping Mode 5			N/A
Hopping Mode 6			N/A
Hopping Mode 7			N/A
Hopping Mode 8			N/A

NUMBER OF HOPPING FREQUENCIES

Hopping Mode 1						
				Number of Channels	Limit	Results
				8	N/A	N/A

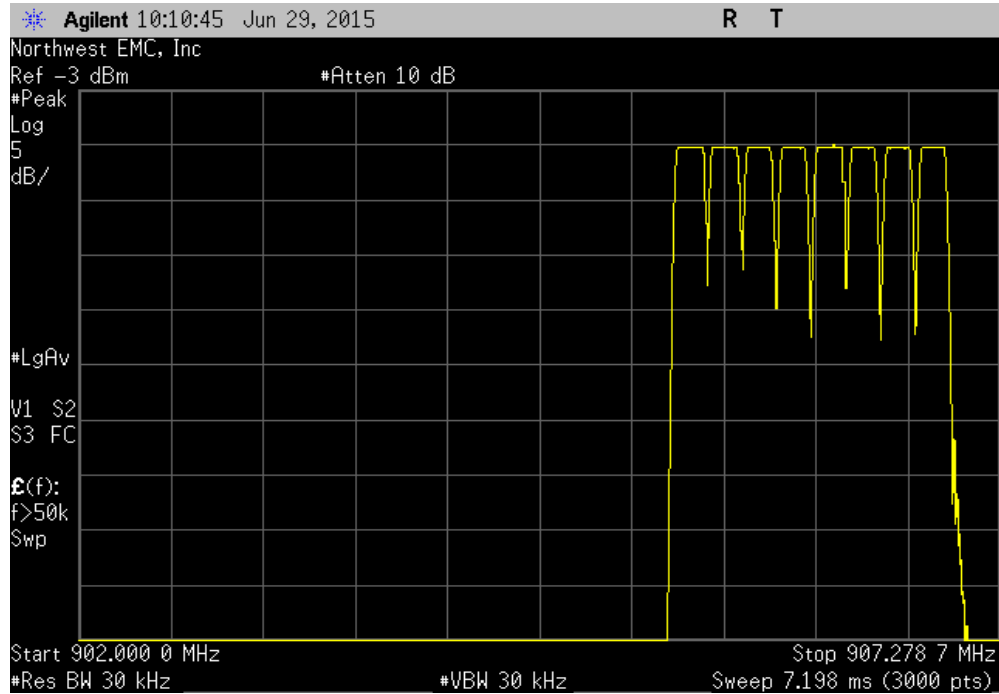


Hopping Mode 2						
				Number of Channels	Limit	Results
				8	N/A	N/A

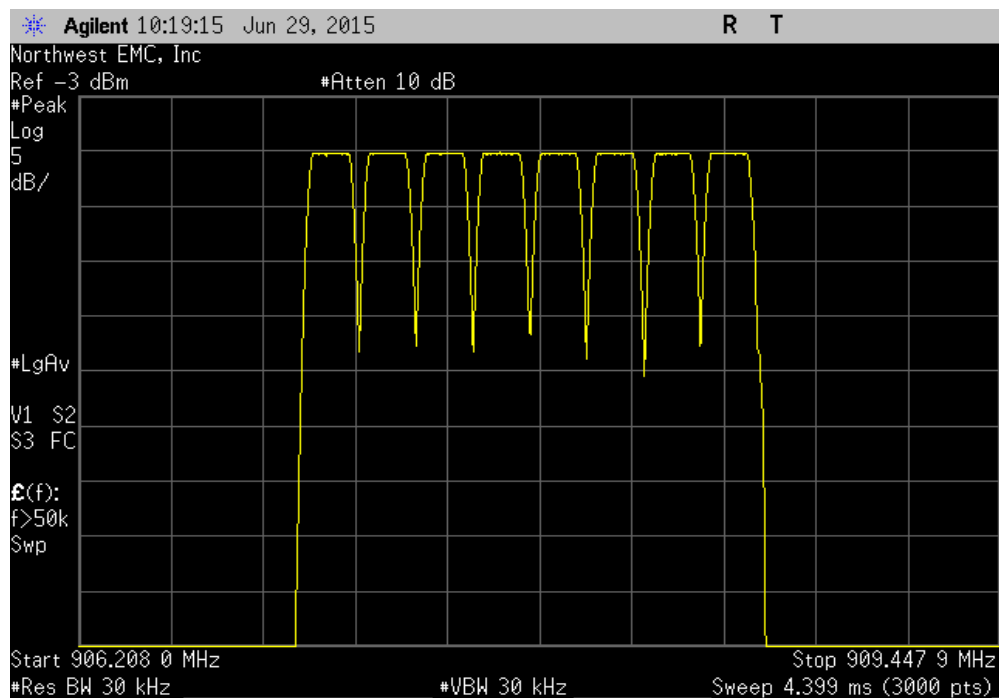


NUMBER OF HOPPING FREQUENCIES

Hopping Mode 3						
				Number of Channels	Limit	Results
				8	N/A	N/A

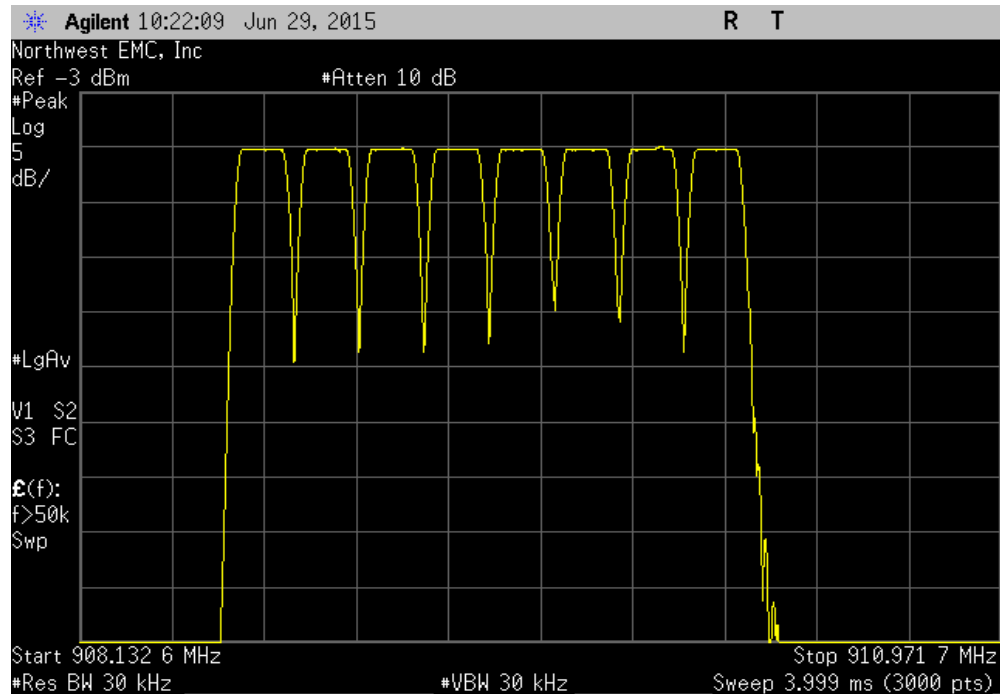


Hopping Mode 4						
				Number of Channels	Limit	Results
				8	N/A	N/A

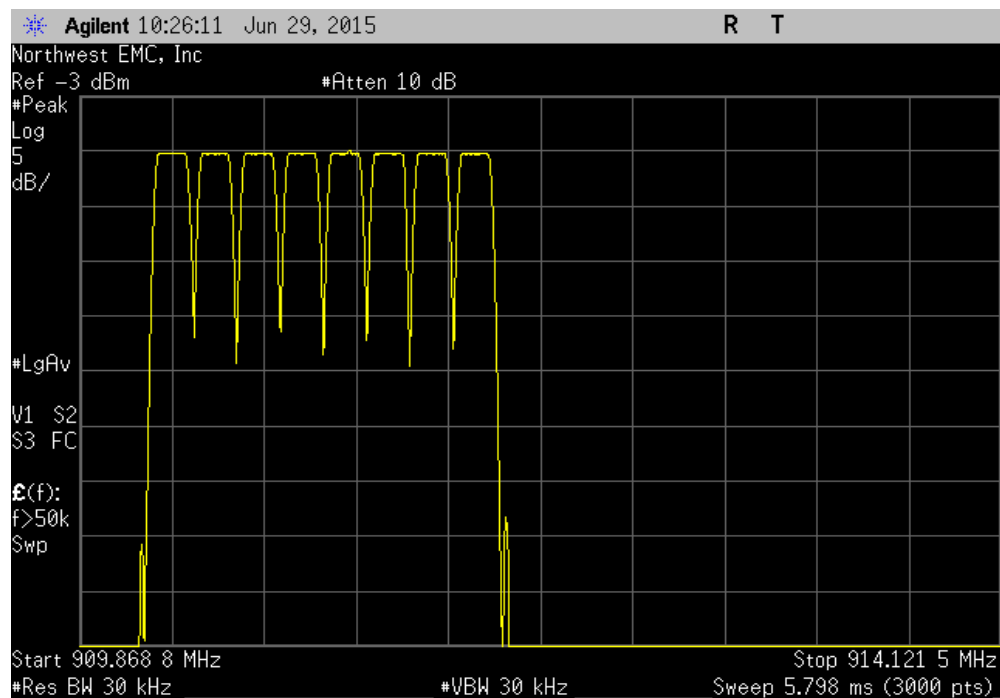


NUMBER OF HOPPING FREQUENCIES

Hopping Mode 5						
				Number of Channels	Limit	Results
				8	N/A	N/A

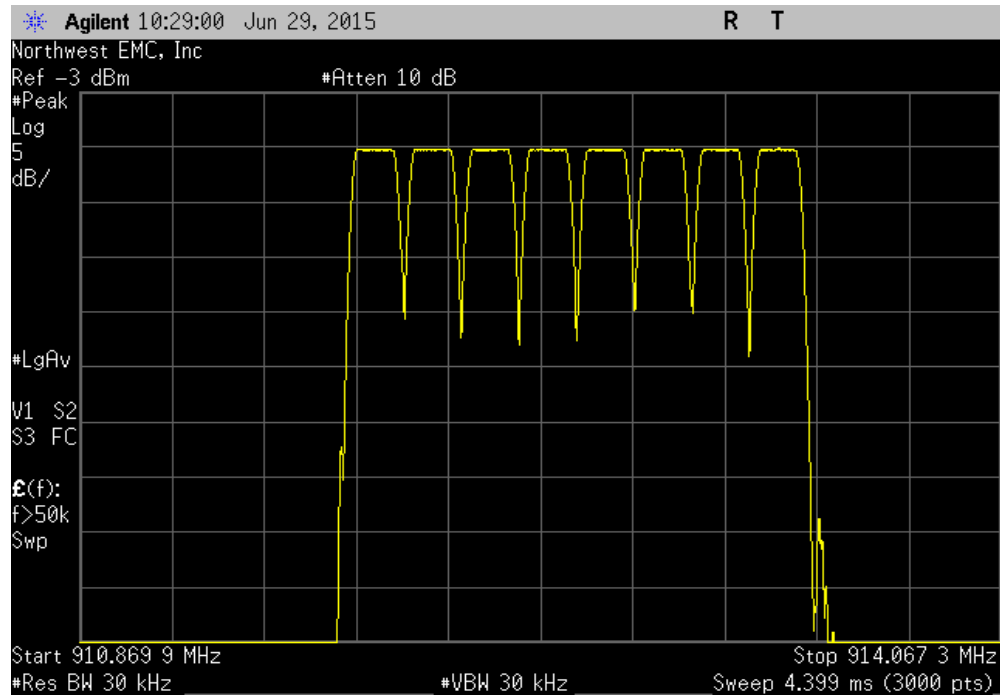


Hopping Mode 6						
				Number of Channels	Limit	Results
				8	N/A	N/A

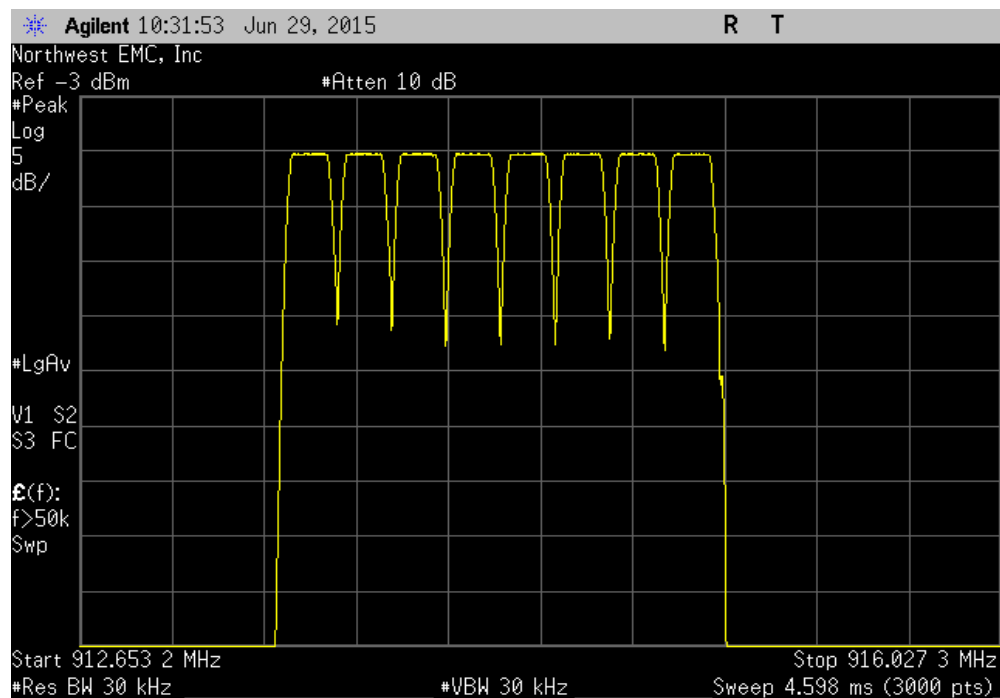


NUMBER OF HOPPING FREQUENCIES

Hopping Mode 7						
				Number of Channels	Limit	Results
				8	N/A	N/A



Hopping Mode 8						
				Number of Channels	Limit	Results
				8	N/A	N/A



DWELL TIME

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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

The dwell time limit is based on the Number of Hopping Channels * 400 mS. This would be 8 Channels * 400mS = 3.2 Sec.

On Time During 3.2 Sec = Pulse Width * Average Number of Pulses

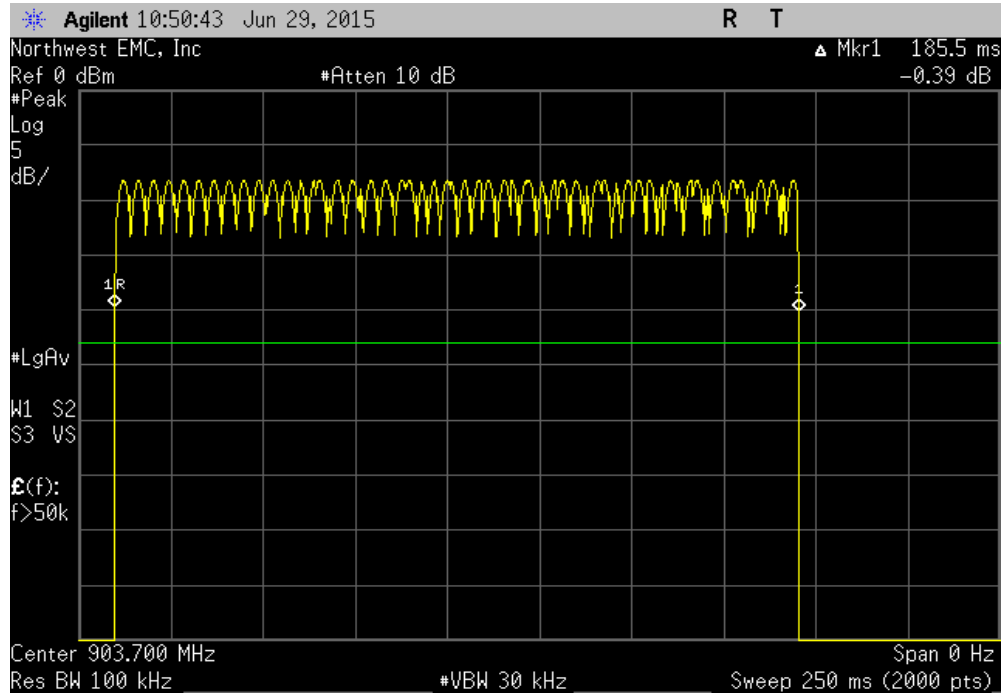
➤Average Number of Pulses is based on 4 samples.

DWELL TIME

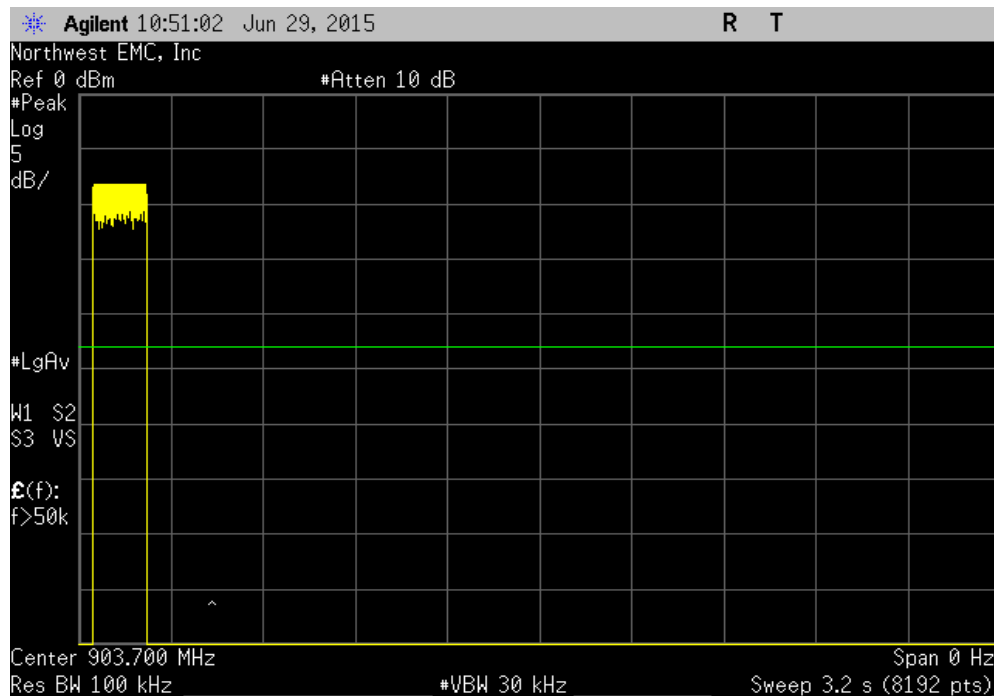
EUT: MultiConnect® mDot™		Work Order: MLTI0045				
Serial Number: 5142067554-0009		Date: 06/29/15				
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C				
Attendees: Jim Asp		Humidity: 57%				
Project: None		Barometric Pres.: 980.1				
Tested by: Trevor Buls		Power: 110VAC/60Hz				
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2015		ANSI C63.10:2009				
COMMENTS						
Limit ant measurement window based on 15.247(f) because device is a Hybrid. Delay between pulses set to 200ms.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	3	Signature <i>Trevor Buls</i>				
	Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results
Hopping Mode 1						
Measurement on Single Channel	185.503	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.503	N/A	1.25	231.87875	400	Pass
Hopping Mode 2						
Measurement on Single Channel	185.378	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.378	N/A	1.5	278.067	400	Pass
Hopping Mode 3						
Measurement on Single Channel	185.378	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.378	N/A	1.25	231.7225	400	Pass
Hopping Mode 4						
Measurement on Single Channel	185.378	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.378	N/A	1.75	324.4115	400	Pass
Hopping Mode 5						
Measurement on Single Channel	185.503	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.503	N/A	1.5	278.2545	400	Pass
Hopping Mode 6						
Measurement on Single Channel	185.503	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.503	N/A	1.5	278.2545	400	Pass
Hopping Mode 7						
Measurement on Single Channel	185.378	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.378	N/A	1.75	324.4115	400	Pass
Hopping Mode 8						
Measurement on Single Channel	185.38	N/A	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	1	N/A	N/A	N/A	N/A
Measurement on Single Channel	N/A	2	N/A	N/A	N/A	N/A
Measurement on Single Channel	185.38	N/A	1.75	324.415	400	Pass

DWELL TIME

Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	N/A	N/A	N/A	N/A	

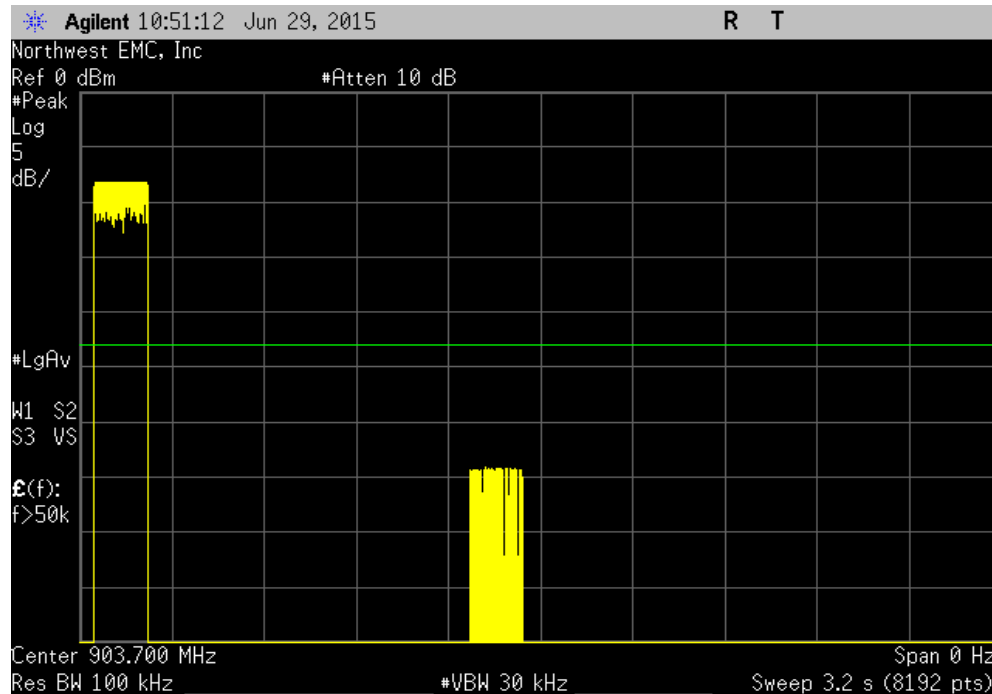


Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

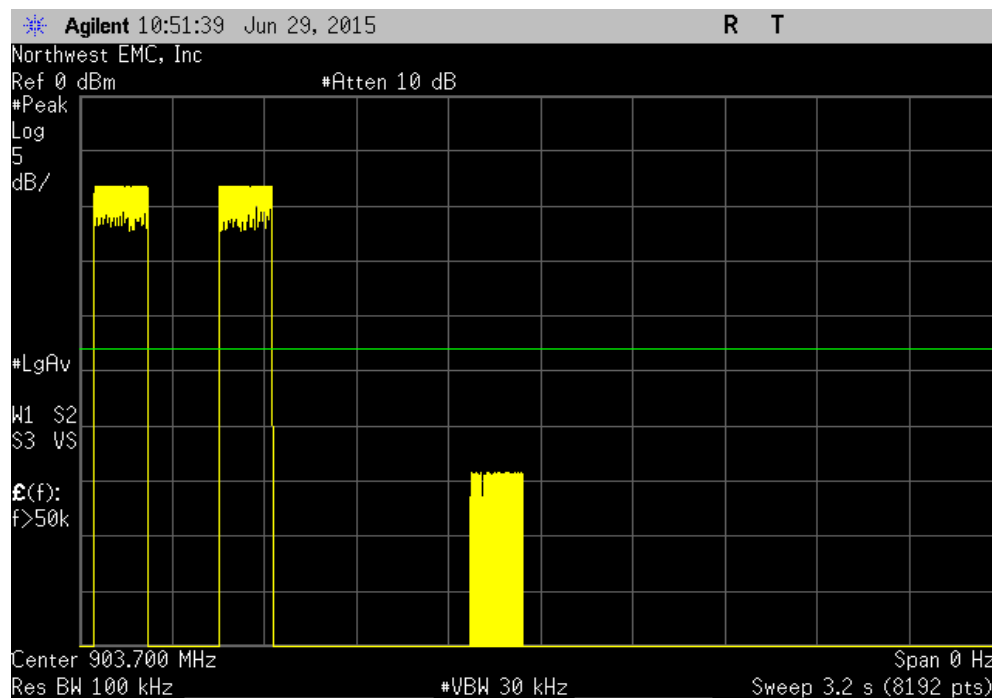


DWELL TIME

Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

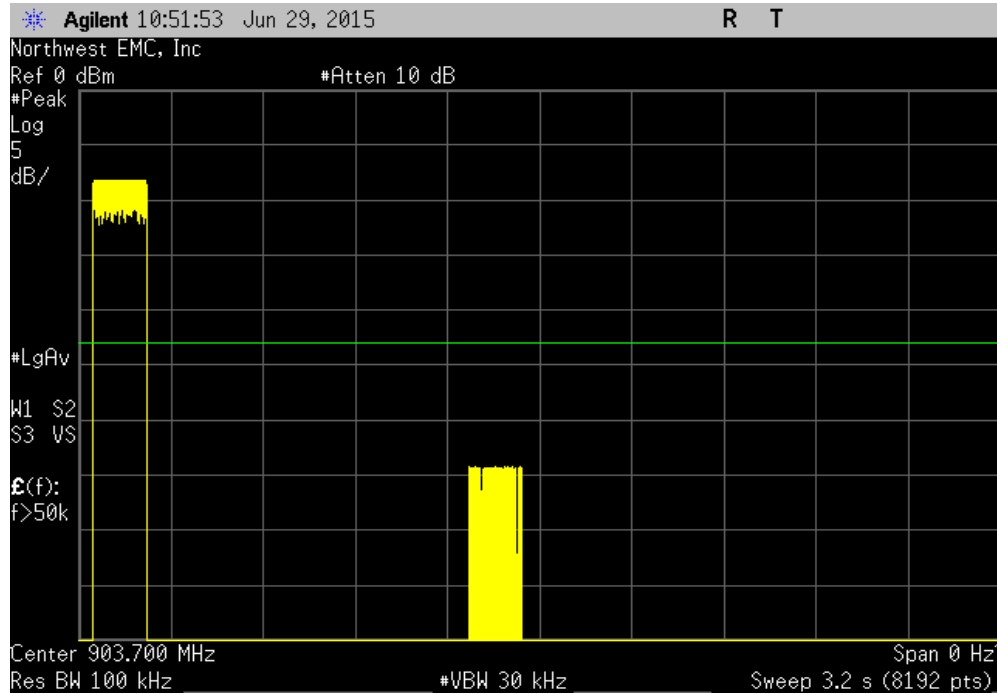


Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	



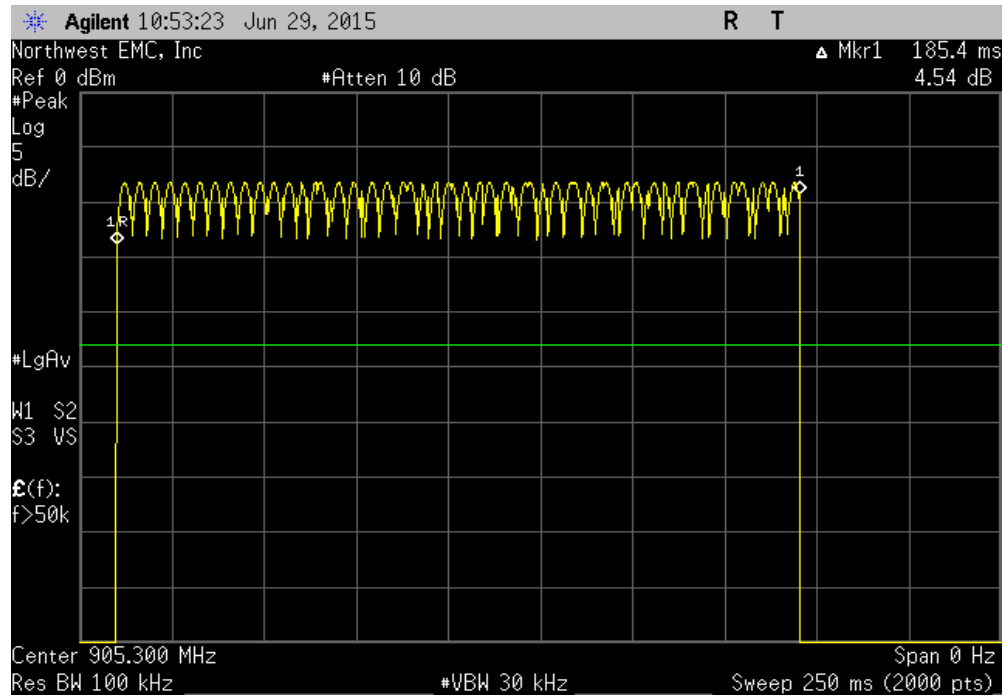
Hopping Mode 1, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	1.25	231.9	400	Pass	

Calculation Only

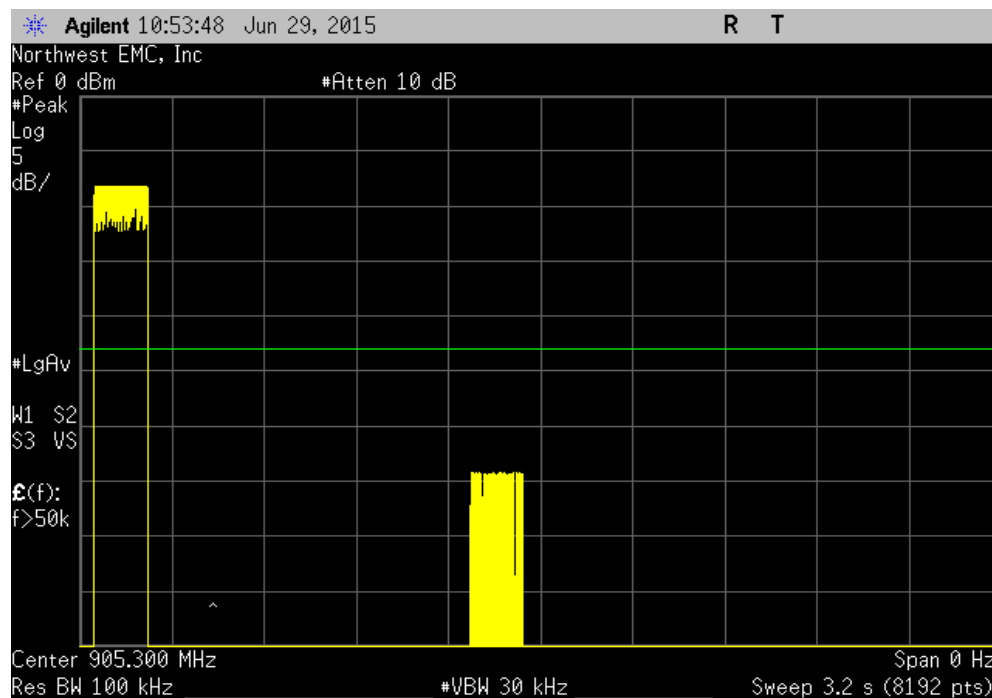
No Screen Capture Required

DWELL TIME

Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	N/A	N/A	N/A	N/A	

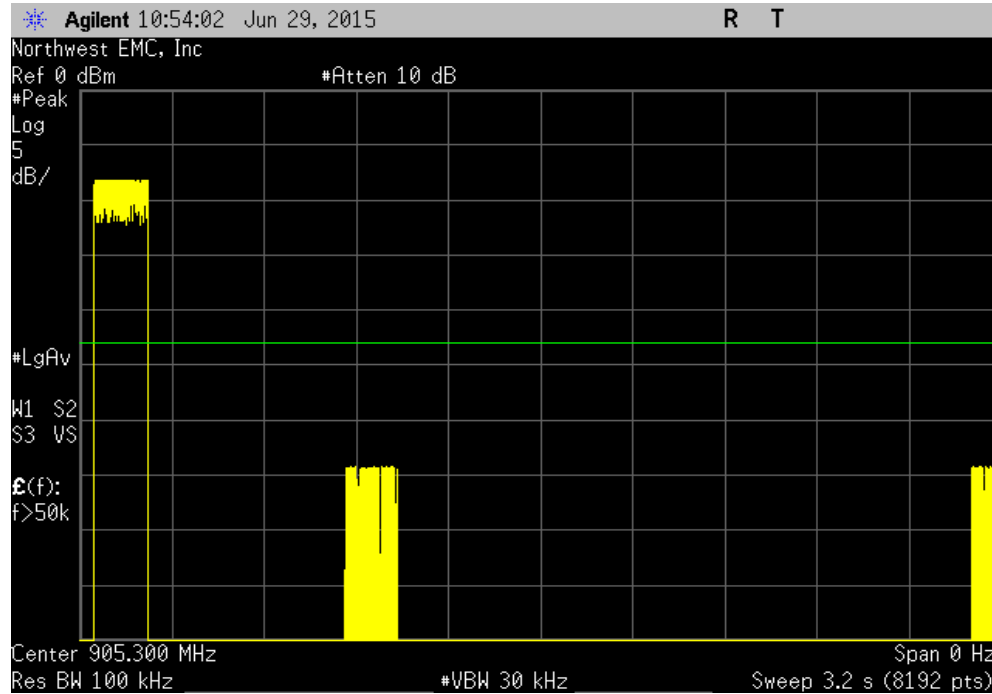


Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

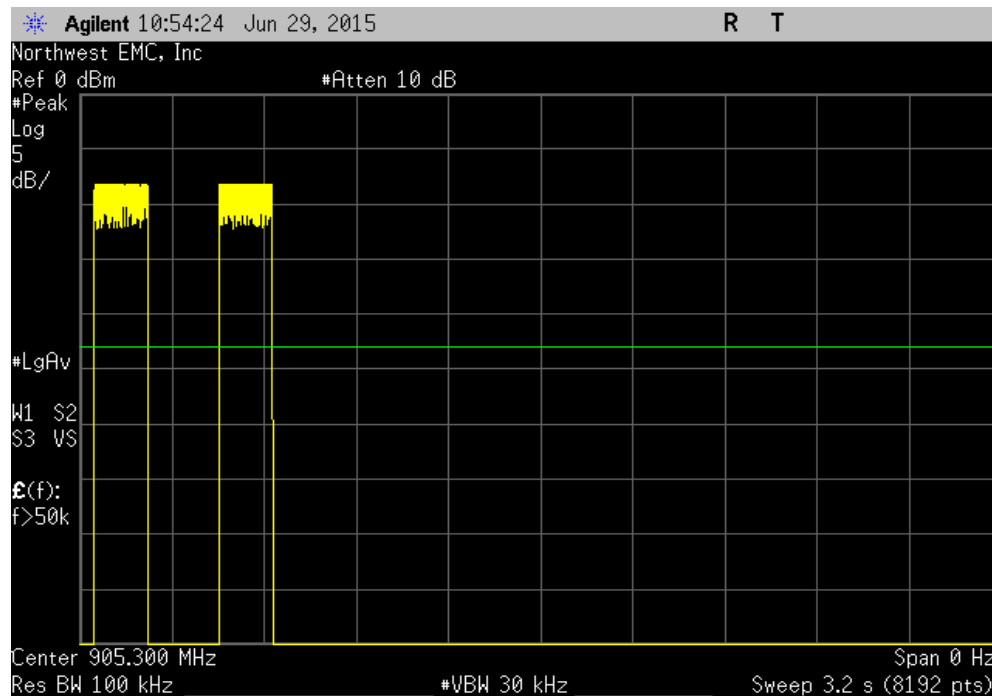


DWELL TIME

Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

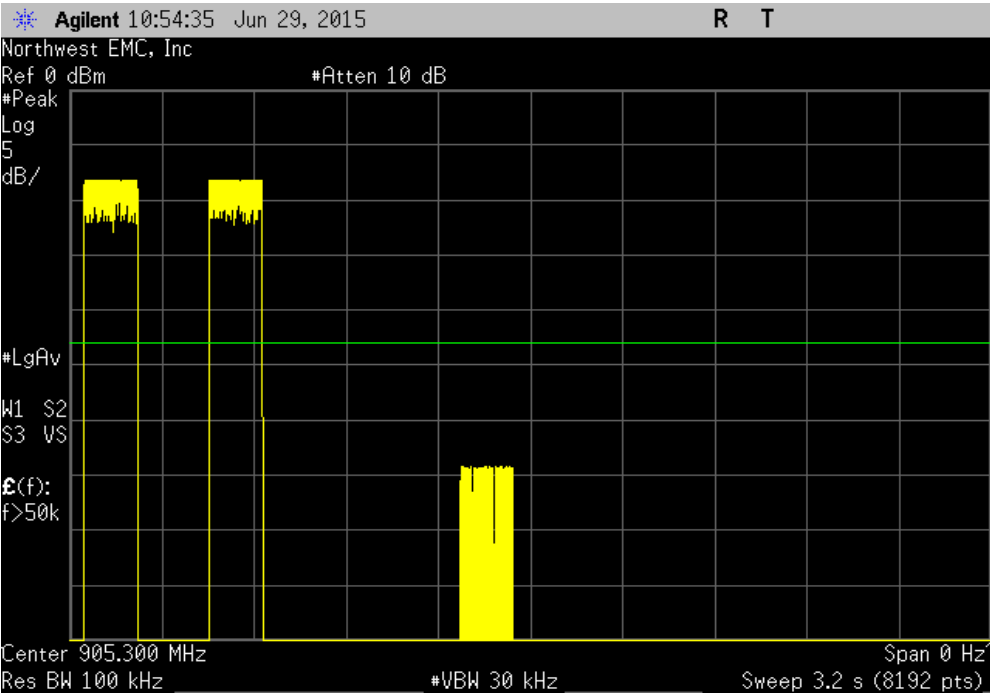


Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



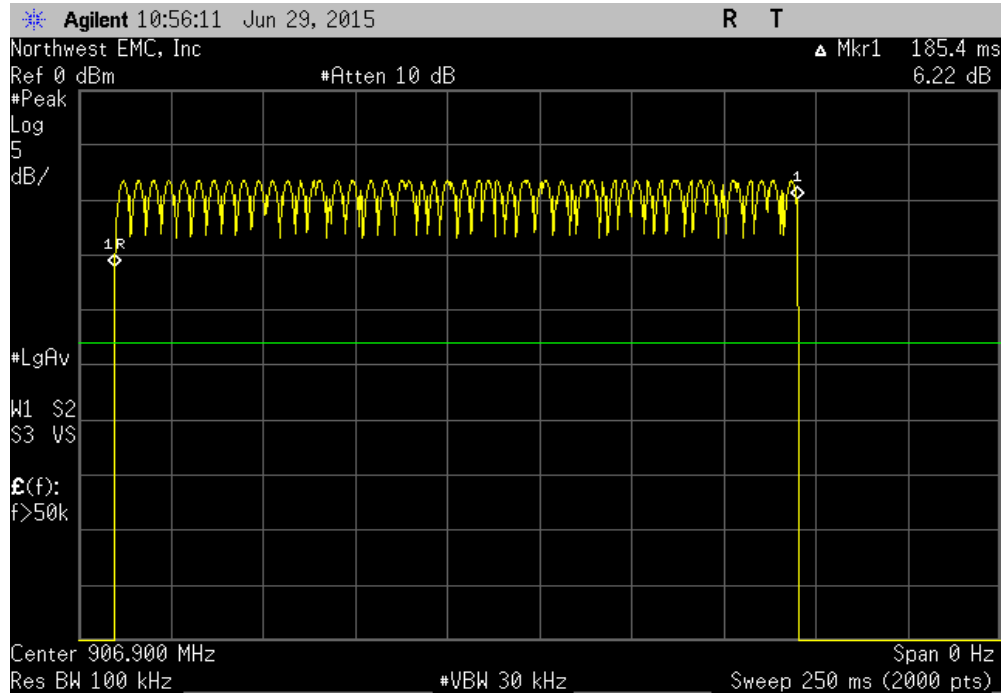
Hopping Mode 2, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	1.5	278.1	400	Pass	

Calculation Only

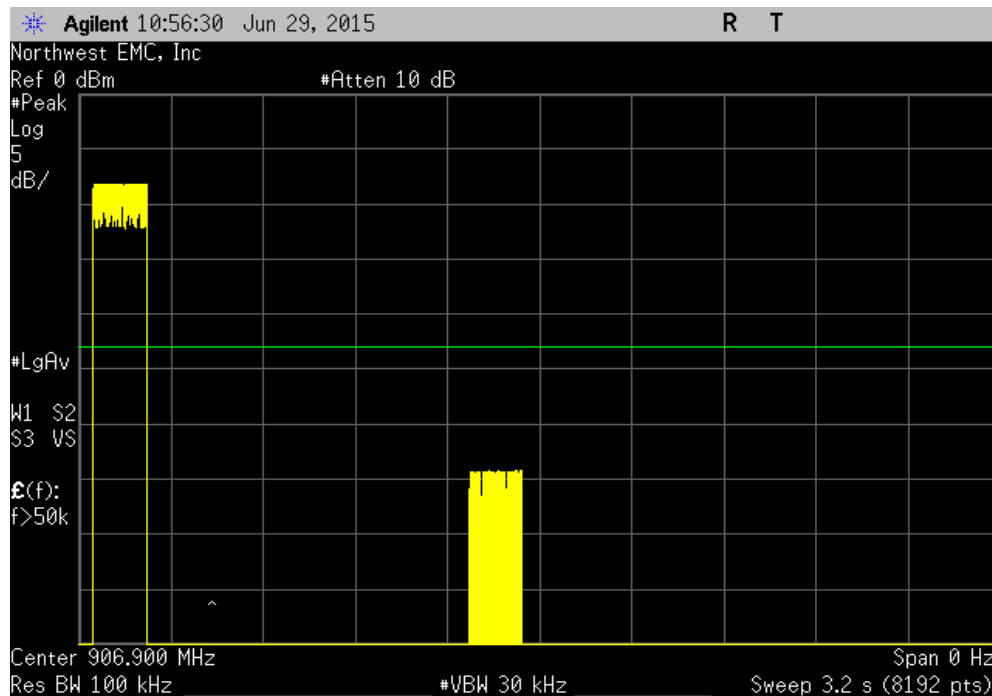
No Screen Capture Required

DWELL TIME

Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	N/A	N/A	N/A	N/A	

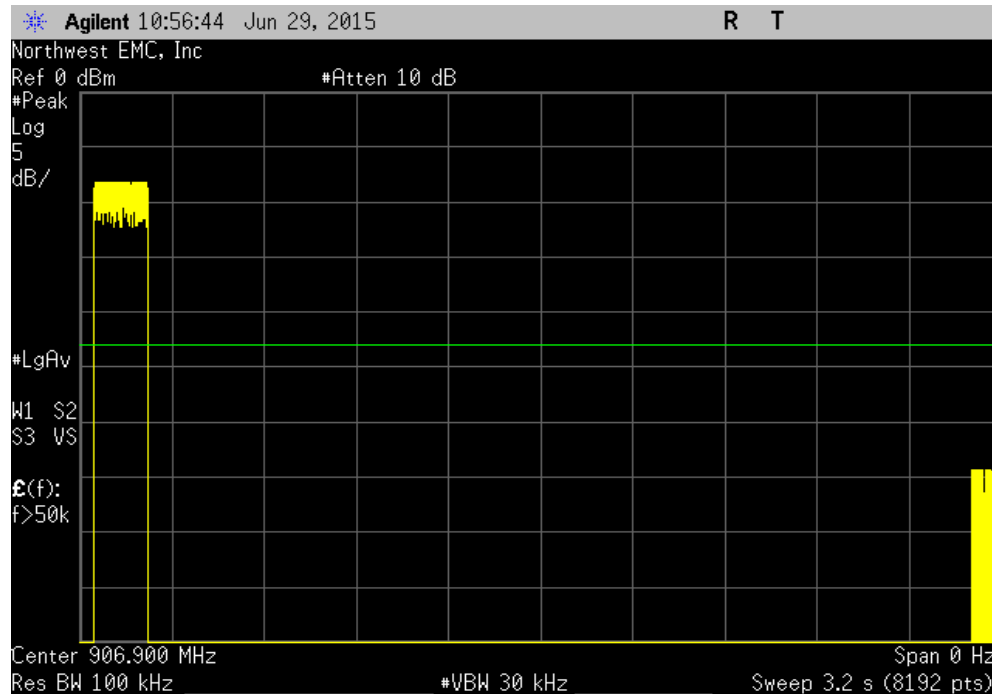


Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

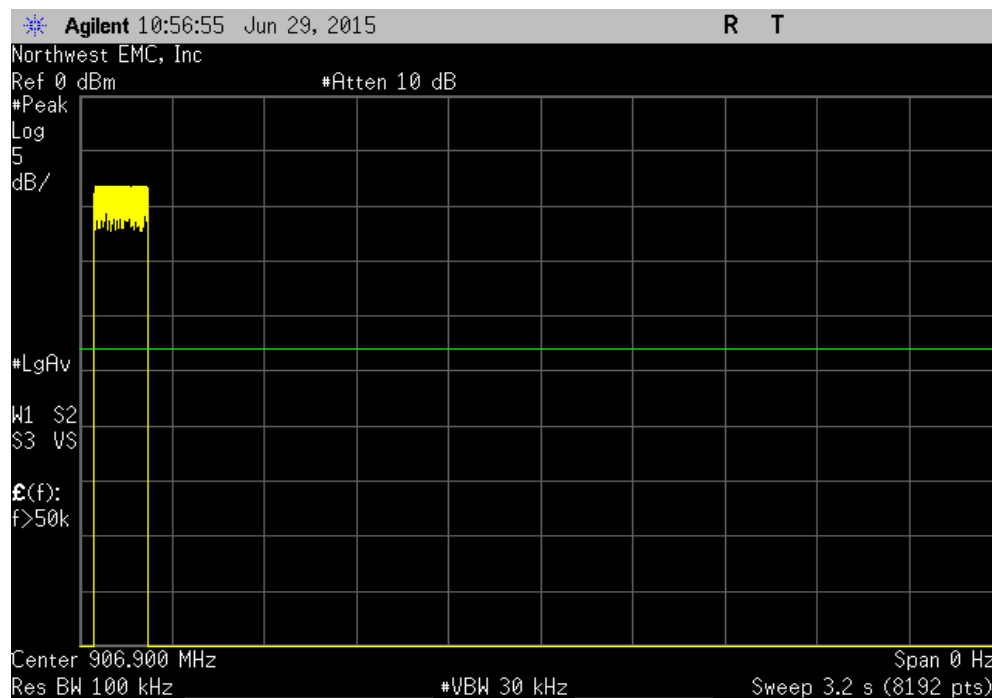


DWELL TIME

Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

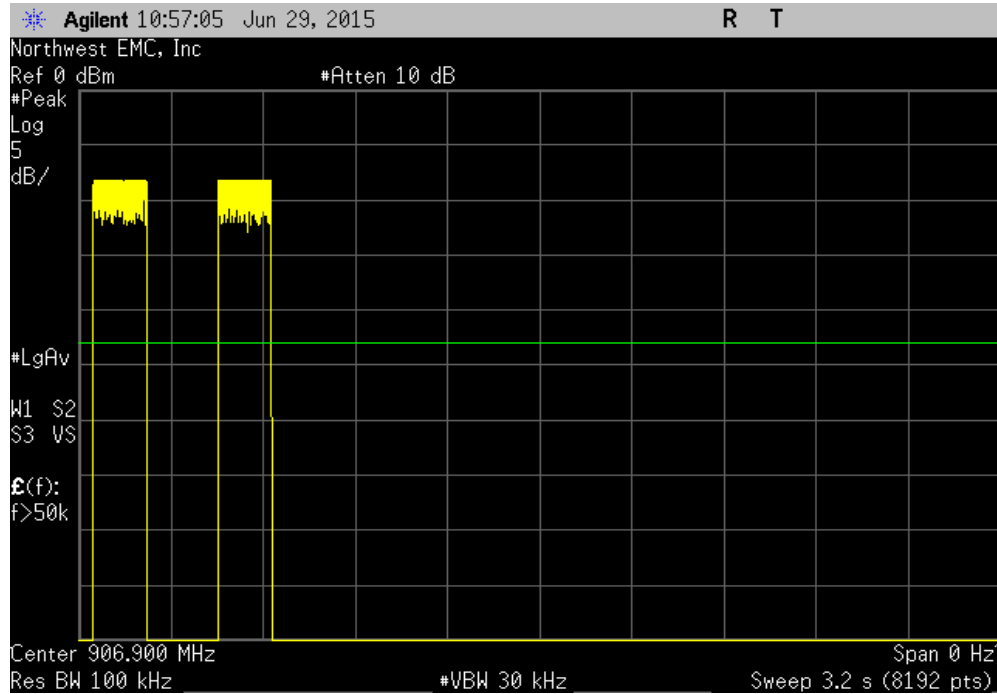


Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



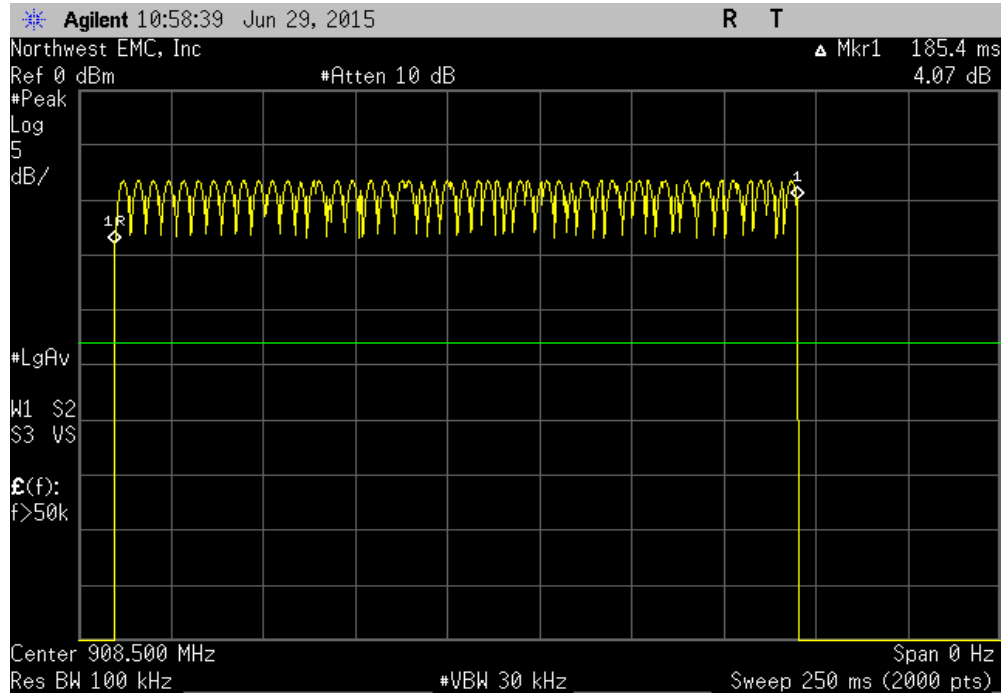
Hopping Mode 3, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	1.25	231.7	400	Pass	

Calculation Only

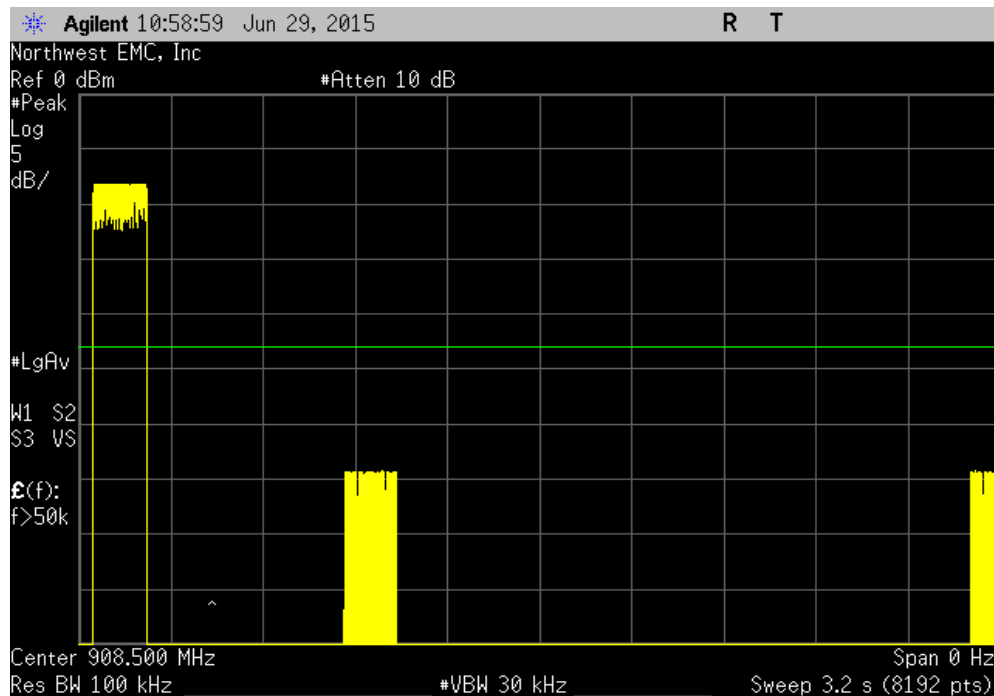
No Screen Capture Required

DWELL TIME

Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	N/A	N/A	N/A	N/A	

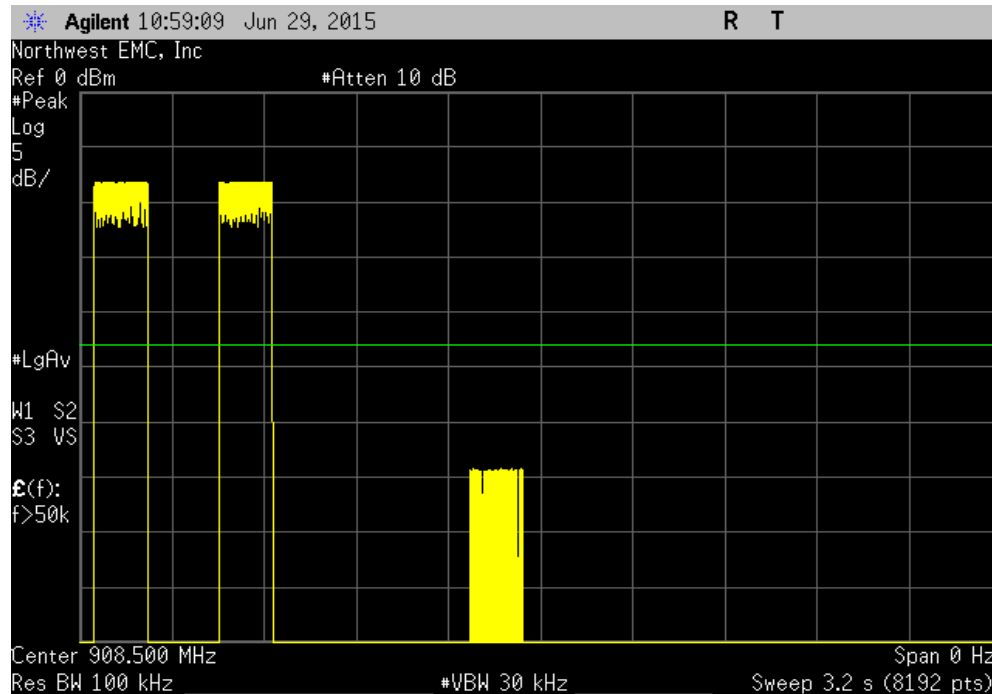


Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

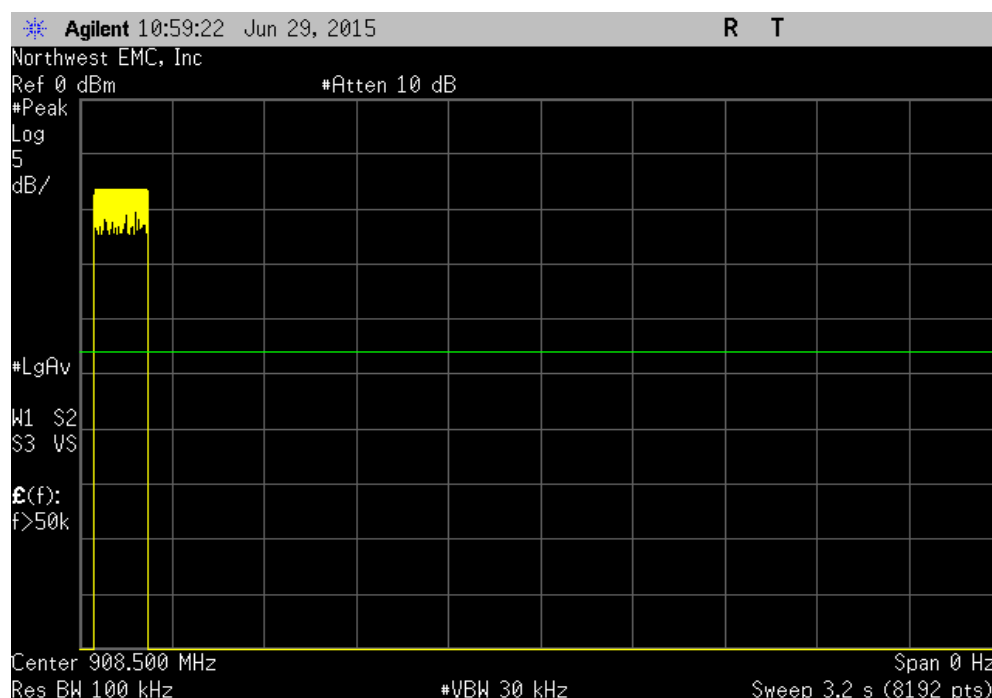


DWELL TIME

Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	

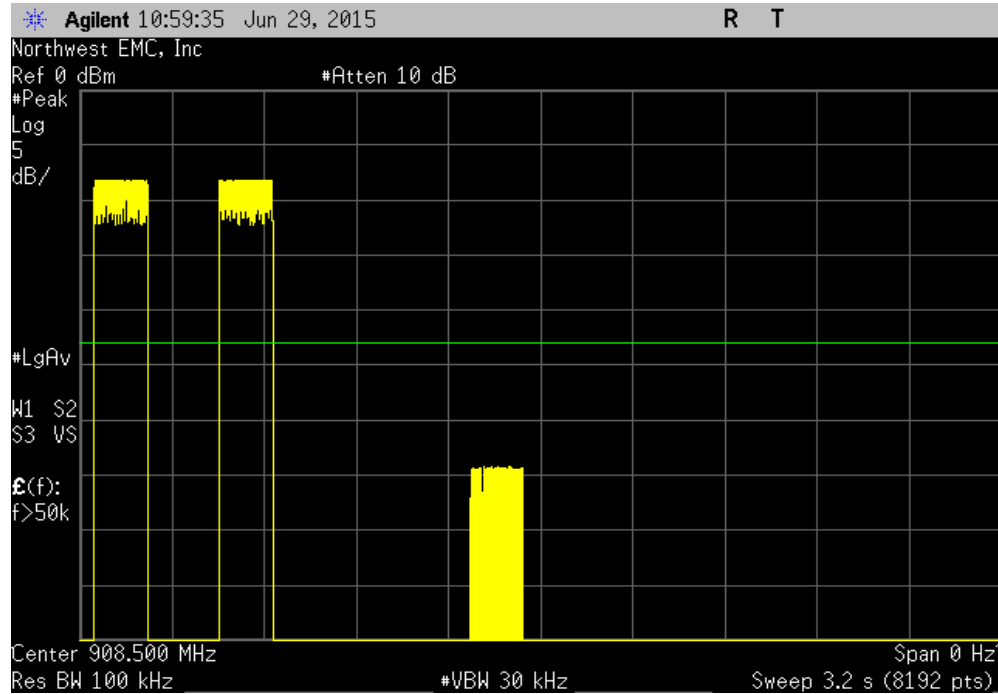


Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



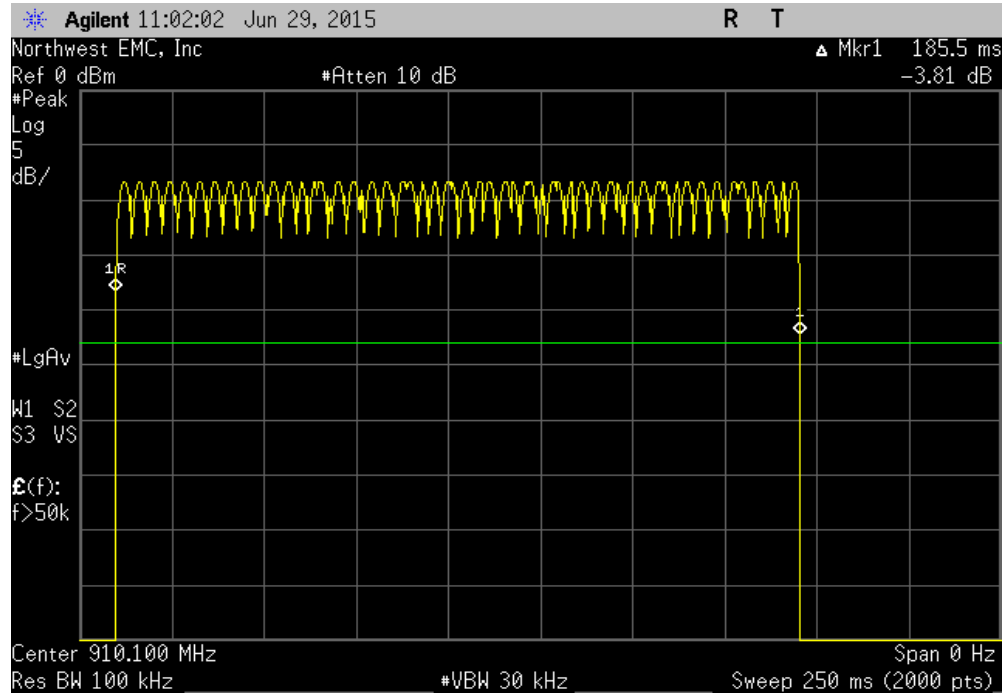
Hopping Mode 4, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	1.75	324.4	400	Pass	

Calculation Only

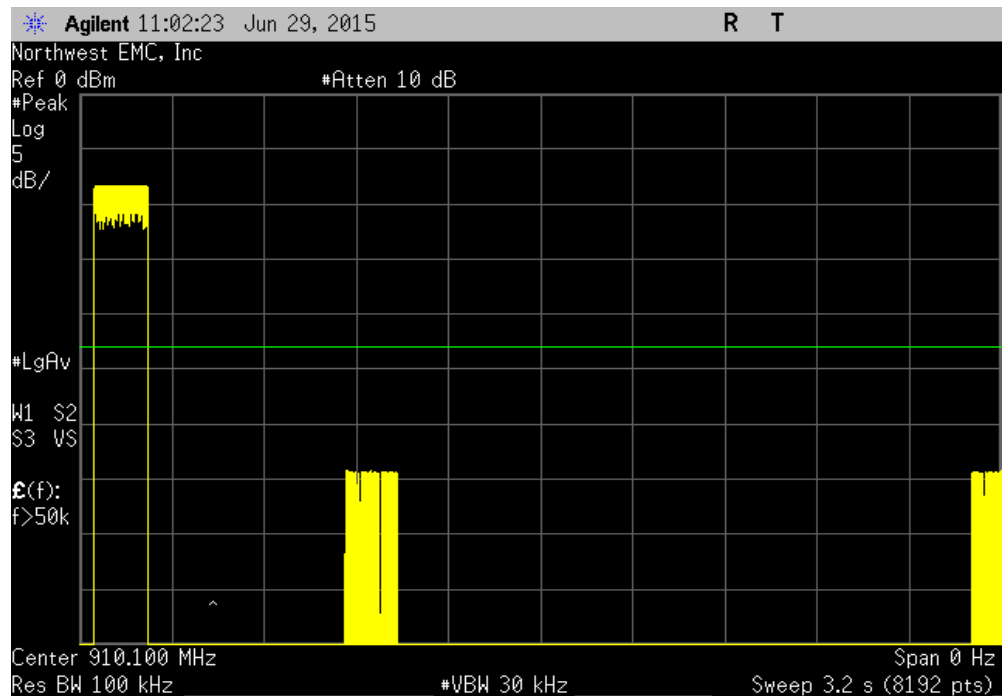
No Screen Capture Required

DWELL TIME

Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	N/A	N/A	N/A	N/A	

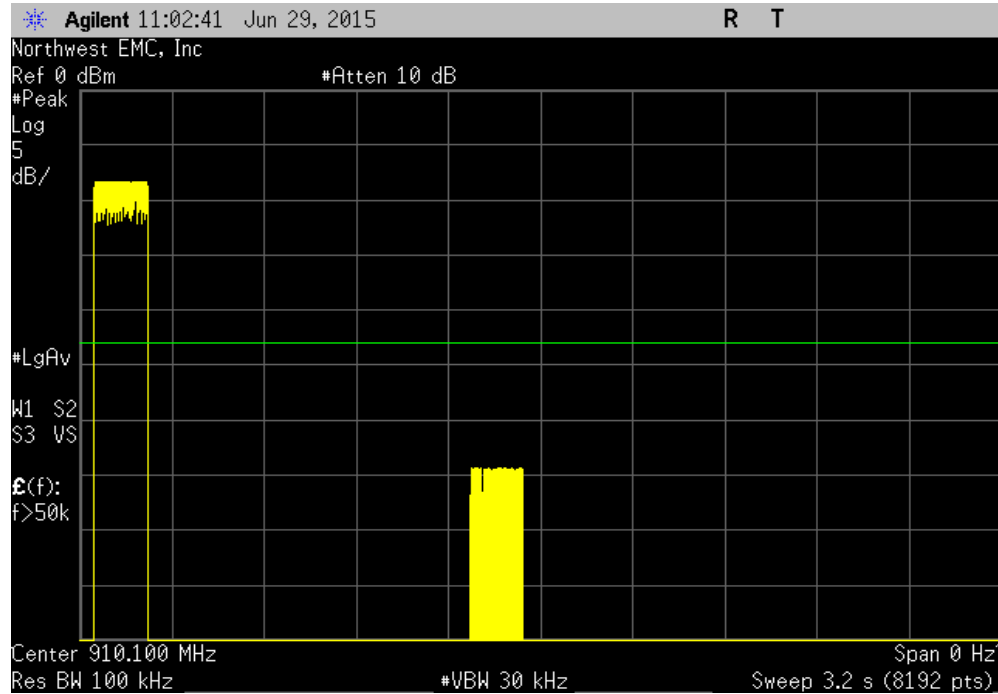


Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

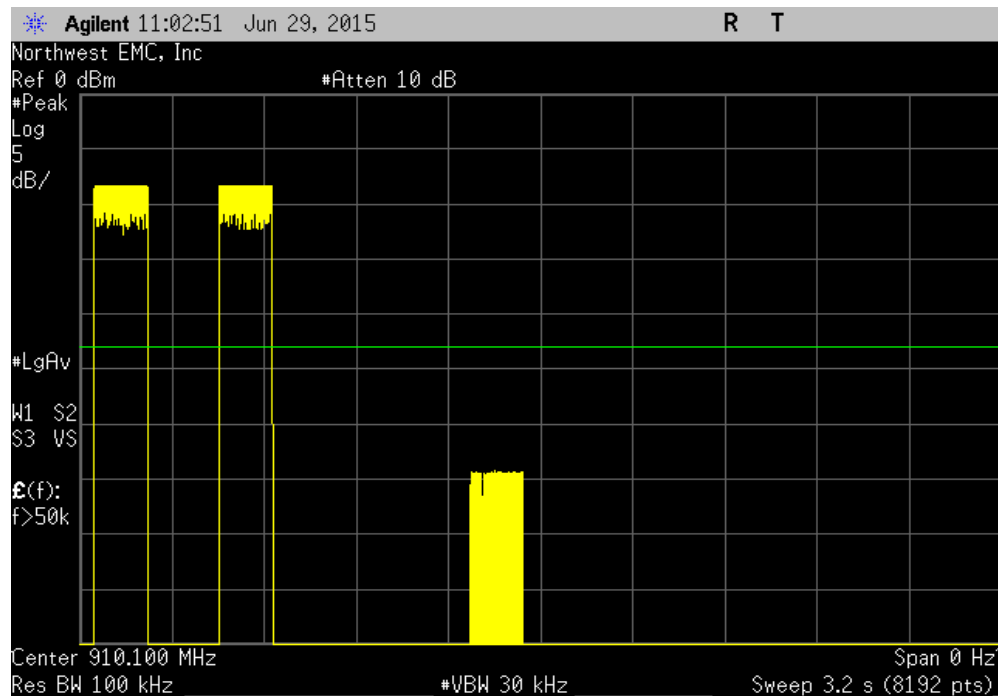


DWELL TIME

Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

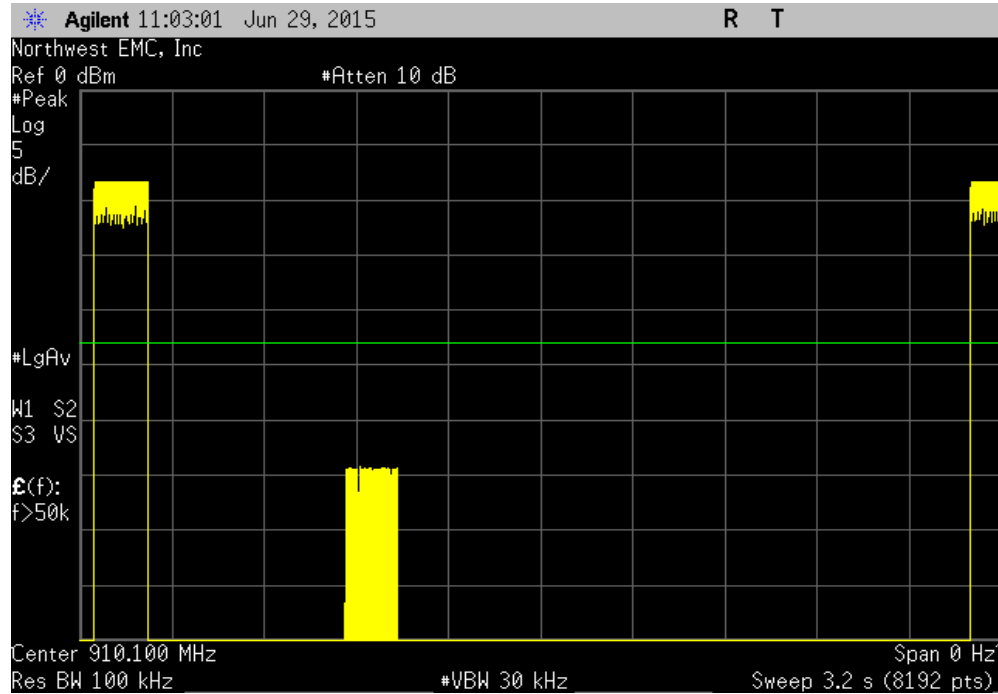


Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



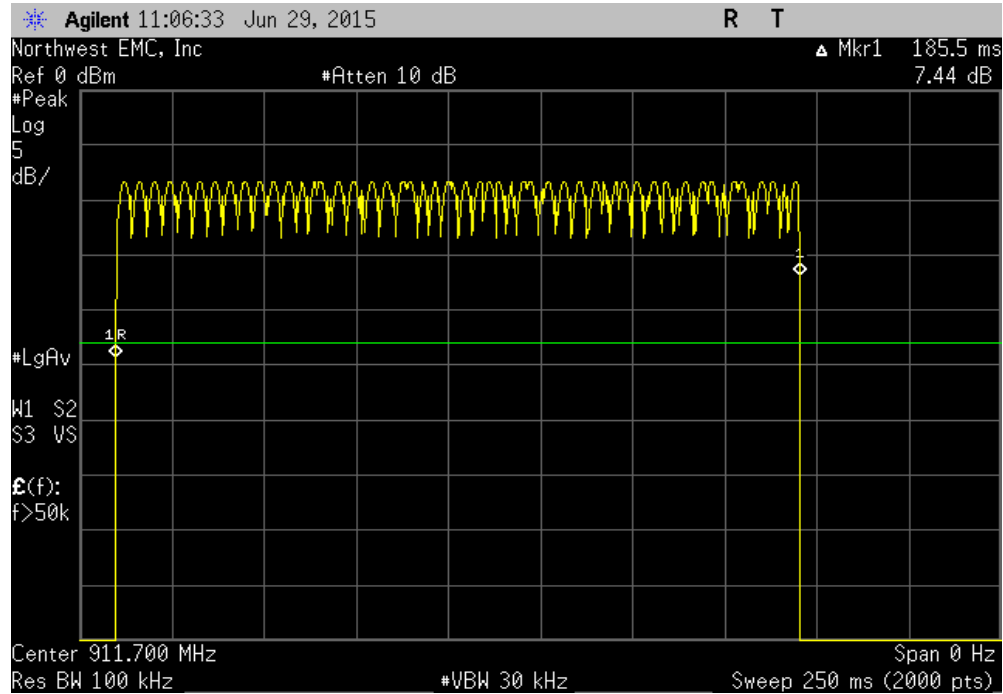
Hopping Mode 5, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	1.5	278.3	400	Pass	

Calculation Only

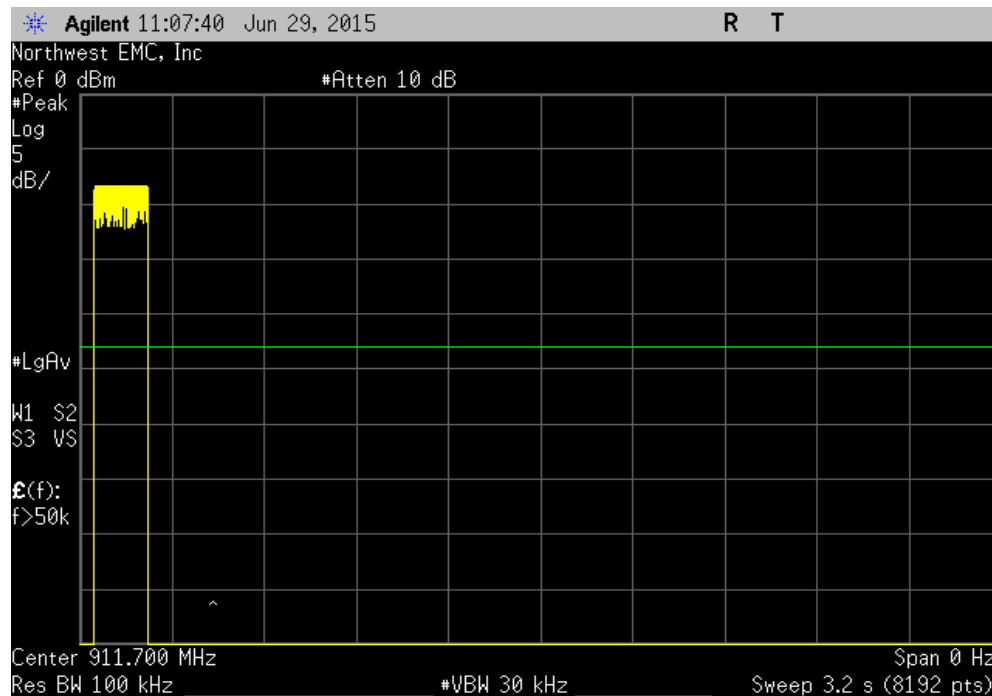
No Screen Capture Required

DWELL TIME

Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	N/A	N/A	N/A	N/A	

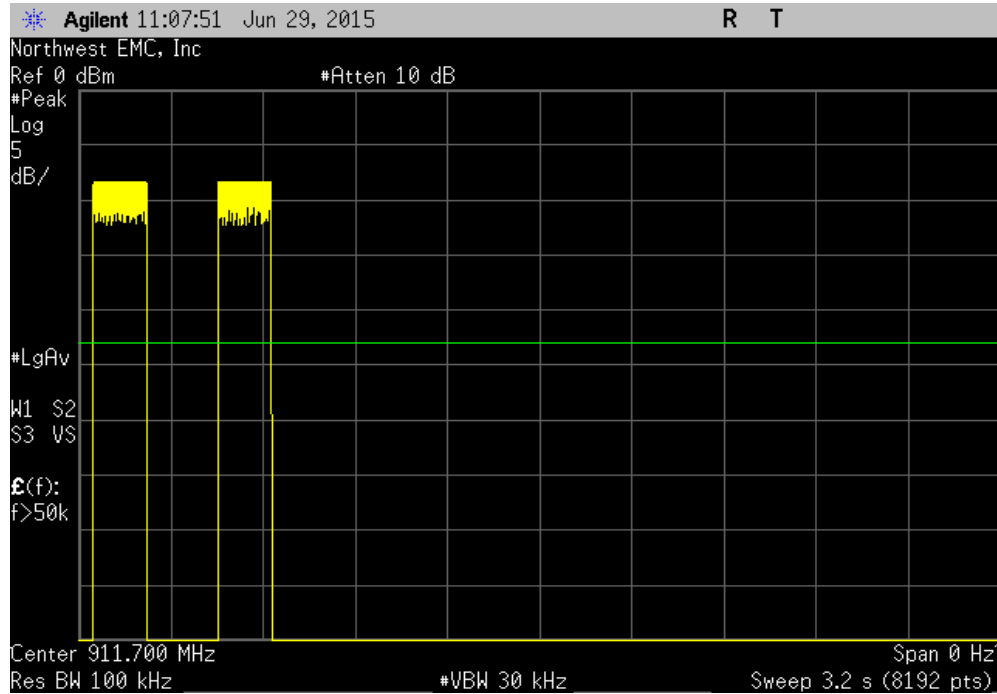


Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	

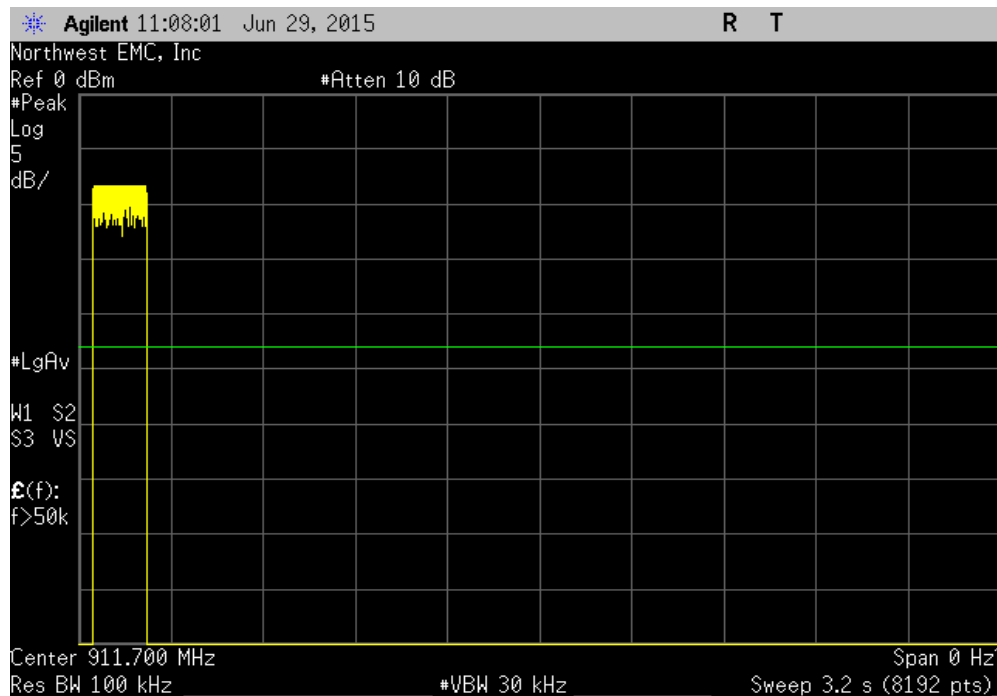


DWELL TIME

Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	

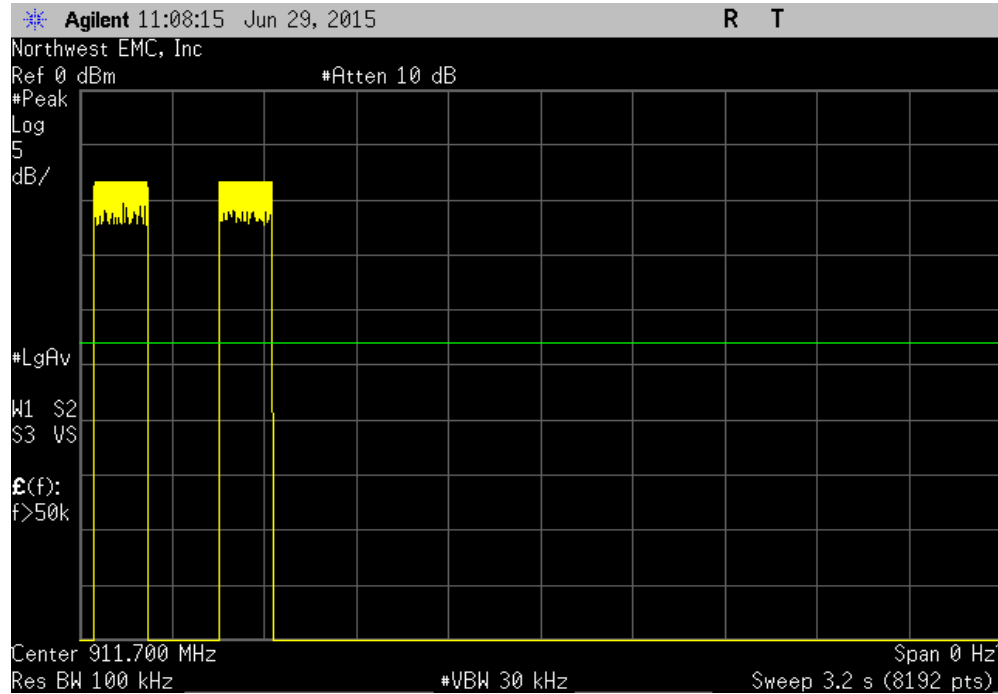


Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



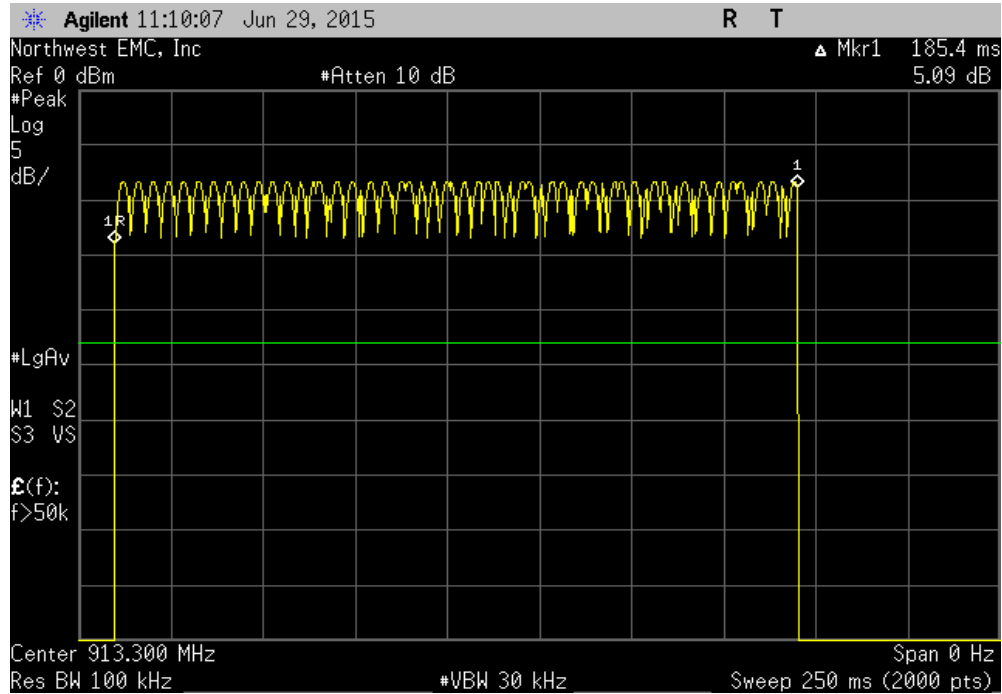
Hopping Mode 6, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.503	N/A	1.5	278.3	400	Pass	

Calculation Only

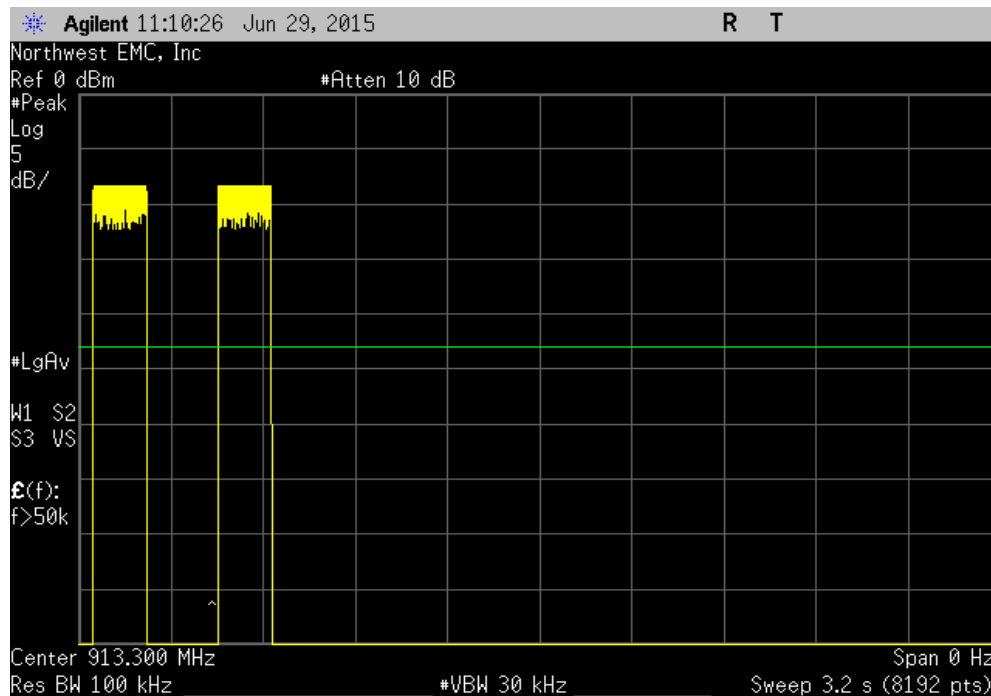
No Screen Capture Required

DWELL TIME

Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	N/A	N/A	N/A	N/A	

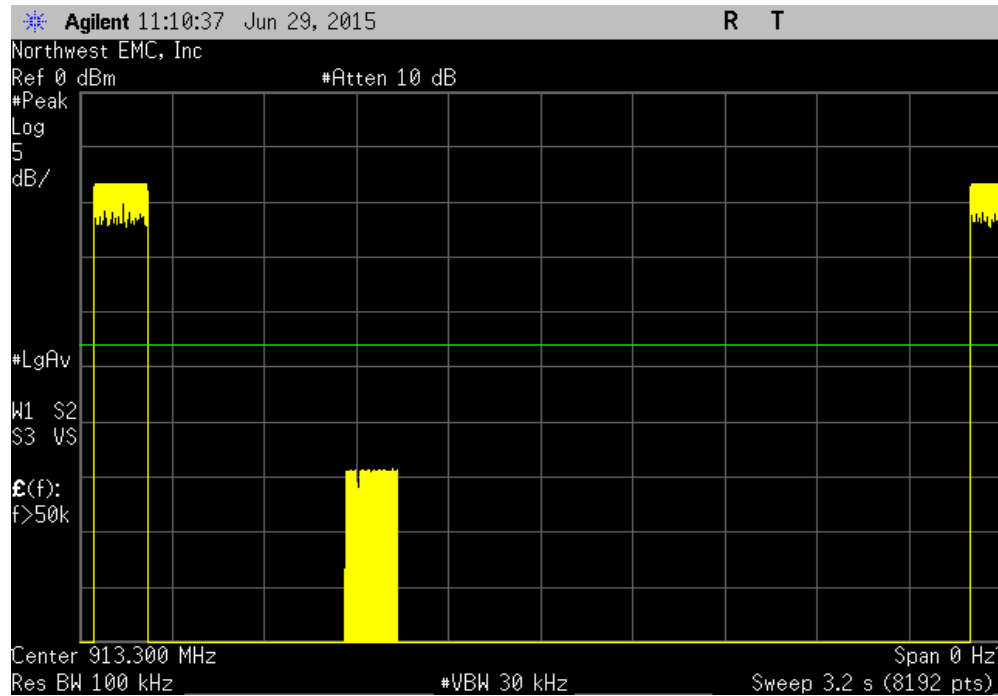


Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	

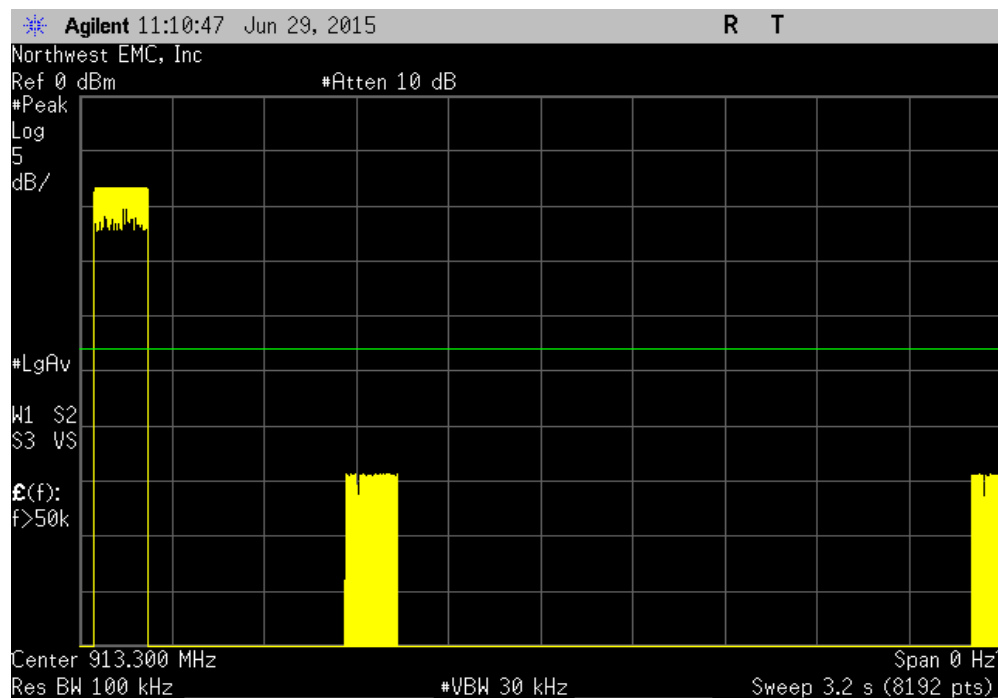


DWELL TIME

Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	

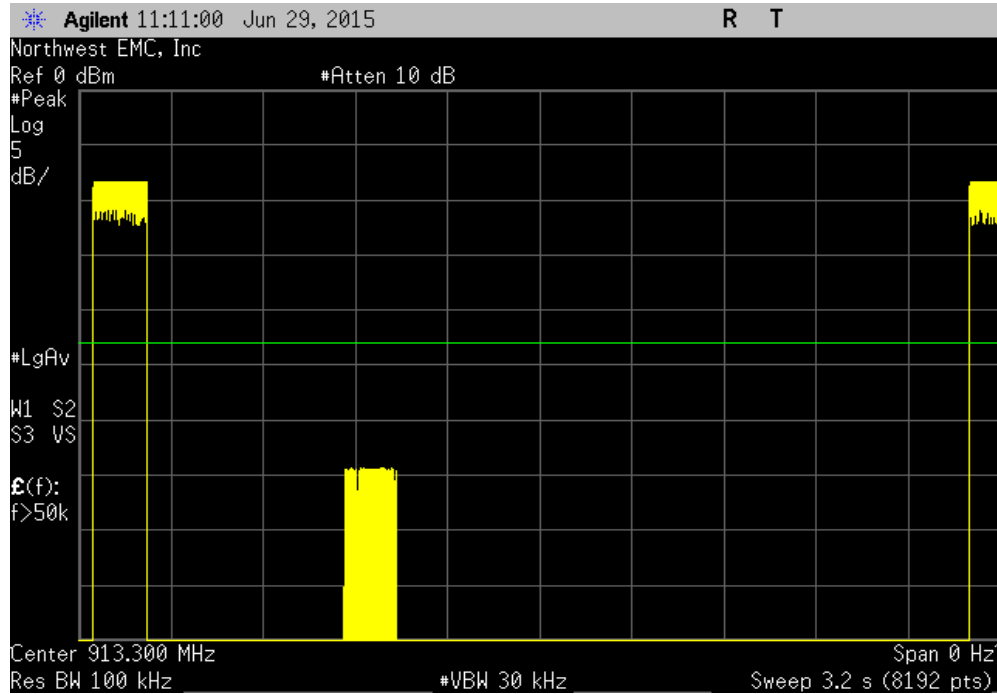


Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



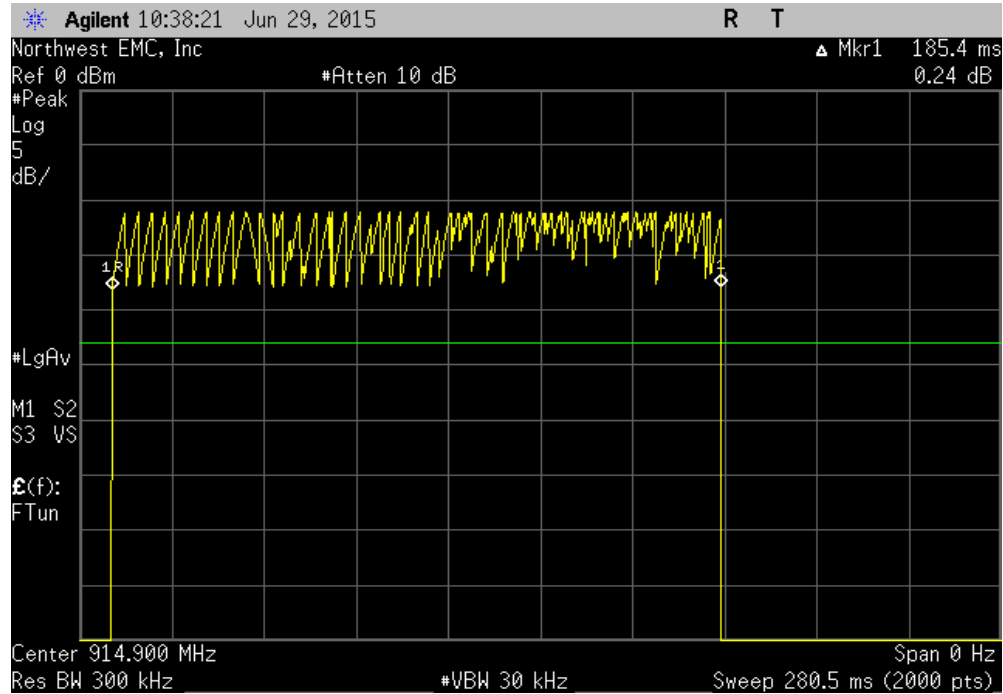
Hopping Mode 7, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.378	N/A	1.75	324.4	400	Pass	

Calculation Only

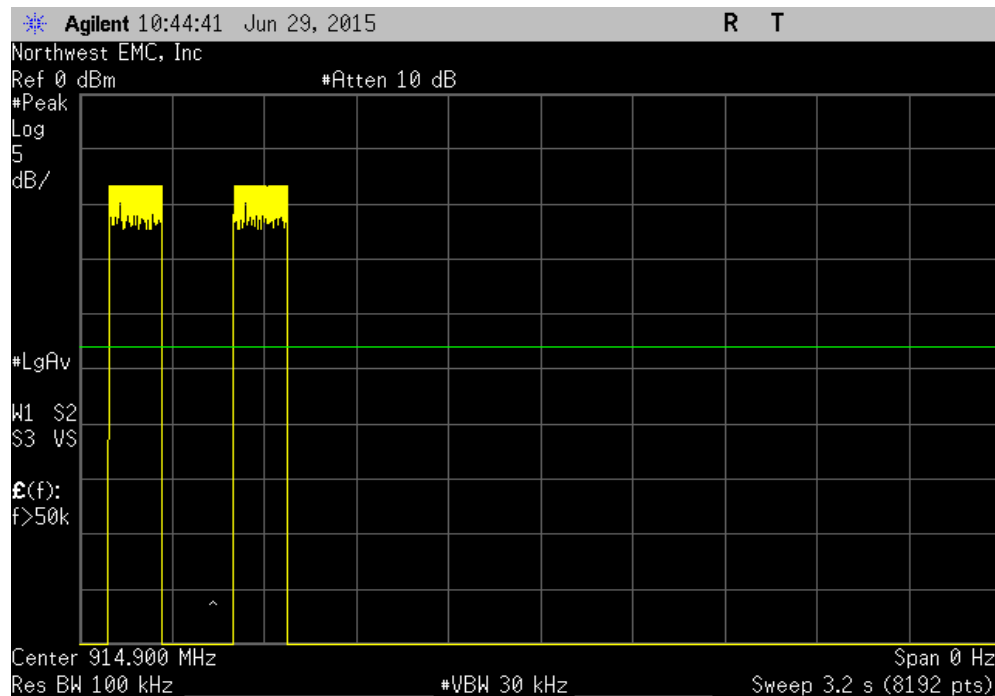
No Screen Capture Required

DWELL TIME

Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.38	N/A	N/A	N/A	N/A	N/A	N/A

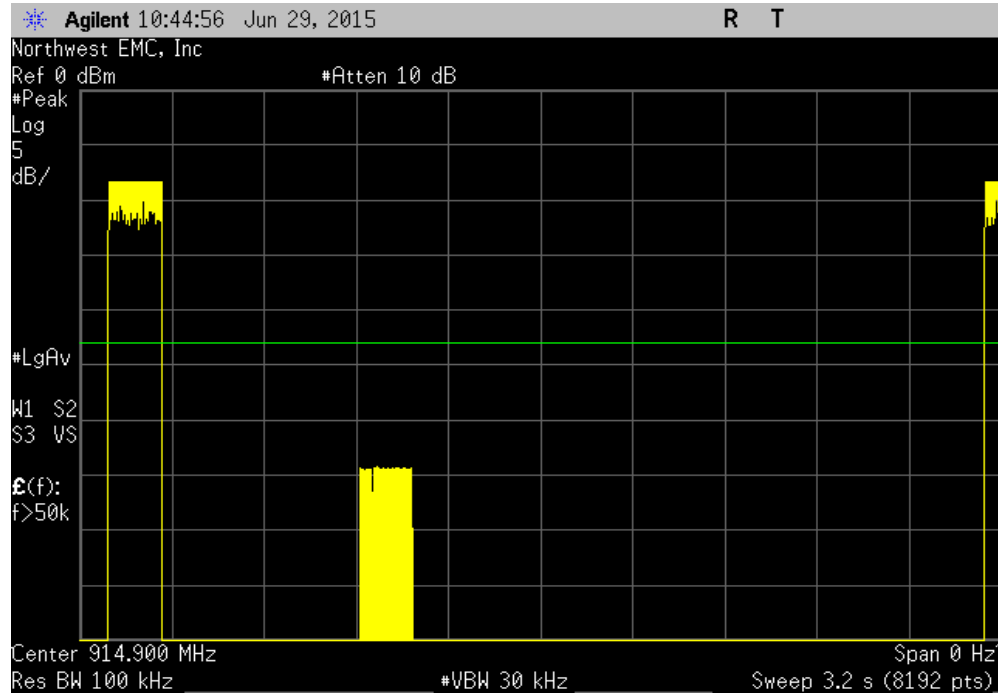


Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	N/A

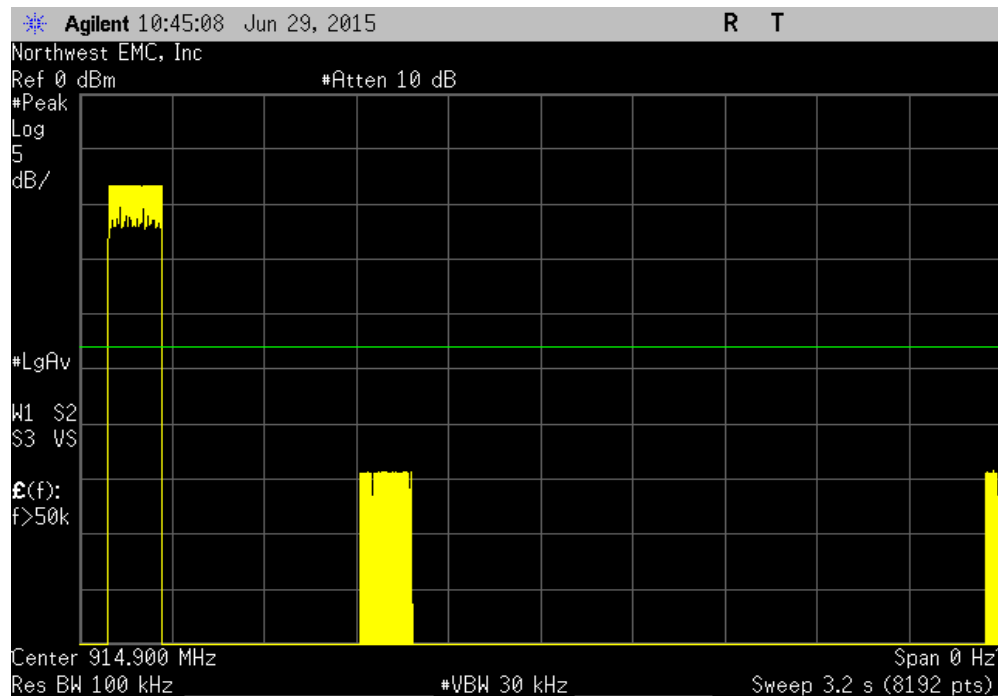


DWELL TIME

Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	

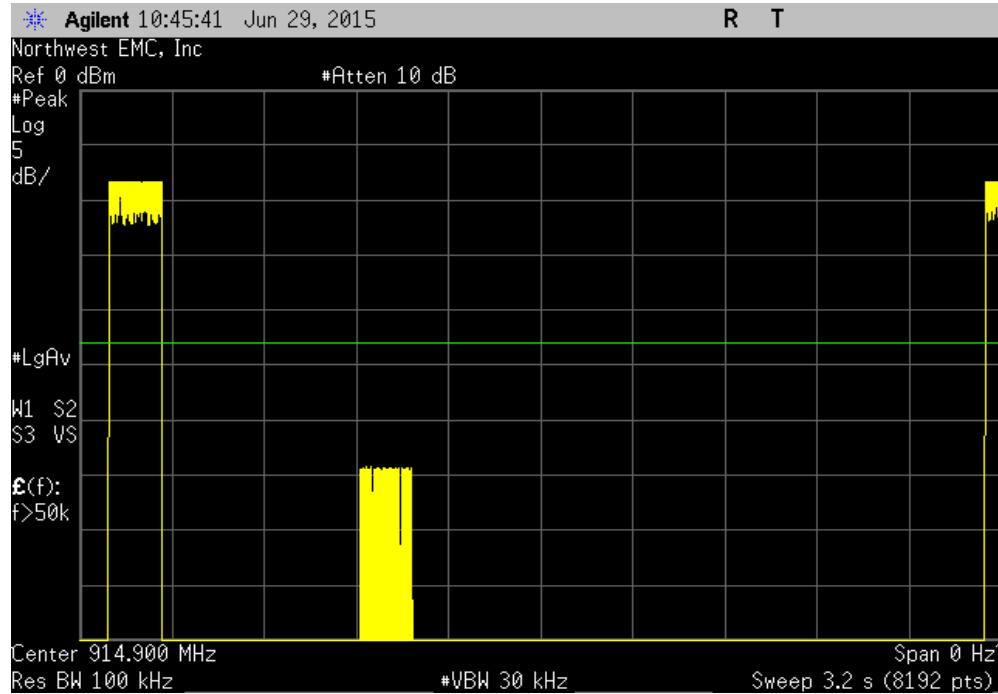


Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	1	N/A	N/A	N/A	N/A	



DWELL TIME

Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
N/A	2	N/A	N/A	N/A	N/A	



Hopping Mode 8, Measurement on Single Channel						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	On Time (ms) During 3.2 s	Limit (ms)	Results	
185.38	N/A	1.75	324.4	400	Pass	

Calculation Only

No Screen Capture Required

BAND EDGE COMPLIANCE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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 measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

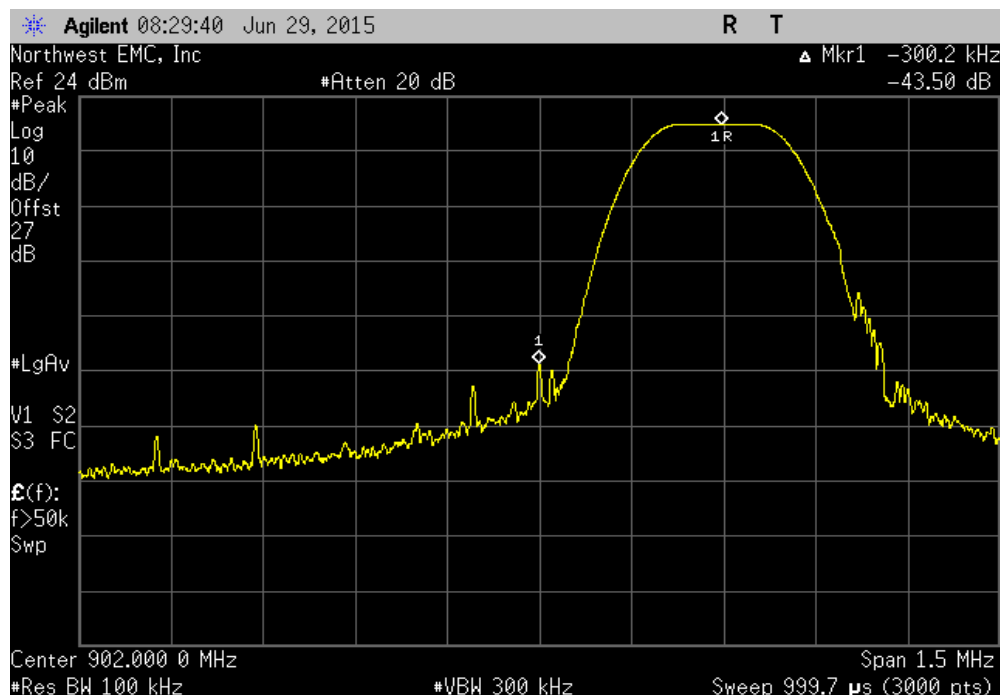
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

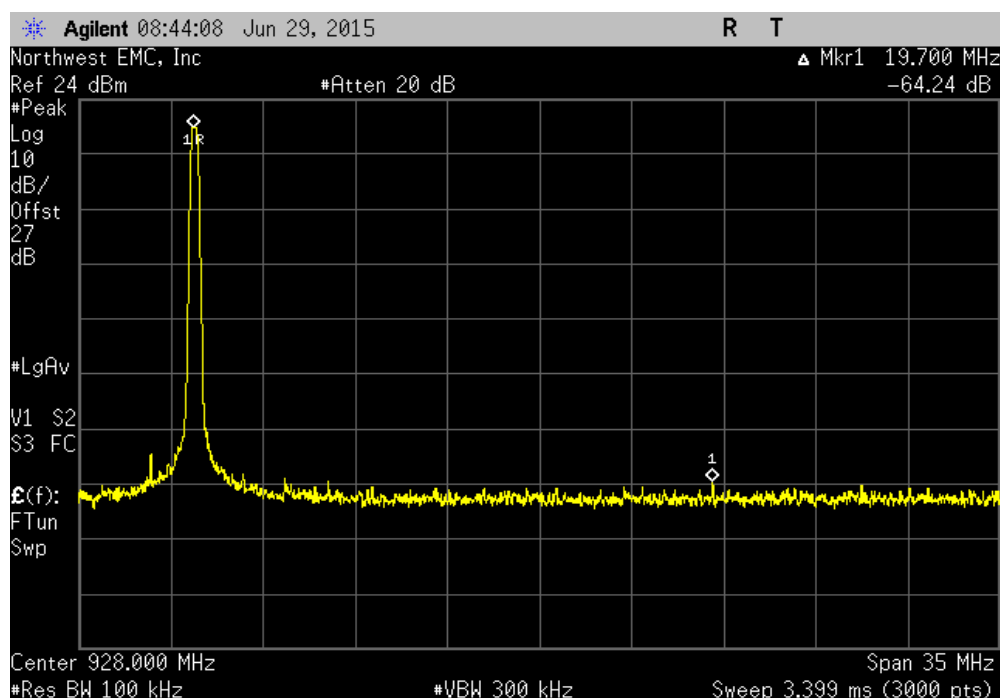
EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value (dBc)	Limit ≤ (dBc) Result
Low Channel 902.3 MHz		-43.5	-20 Pass
High Channel 914.9 MHz		-64.24	-20 Pass

BAND EDGE COMPLIANCE

Low Channel 902.3 MHz					Value (dBc)	Limit ≤ (dBc)	Result
					-43.5	-20	Pass



High Channel 914.9 MHz					Value (dBc)	Limit ≤ (dBc)	Result
					-64.24	-20	Pass



BAND EDGE COMPLIANCE - HOPPING MODE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
MN08 Direct Connect Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	10/2/2014	12
Attenuator - 26dB SMA	Fairview Microwave	18B5W-26	RFY	7/22/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMI	10/2/2014	12
Signal Generator MXG	Agilent	N5183A	TIK	10/17/2014	36
Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

TEST DESCRIPTION

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 measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

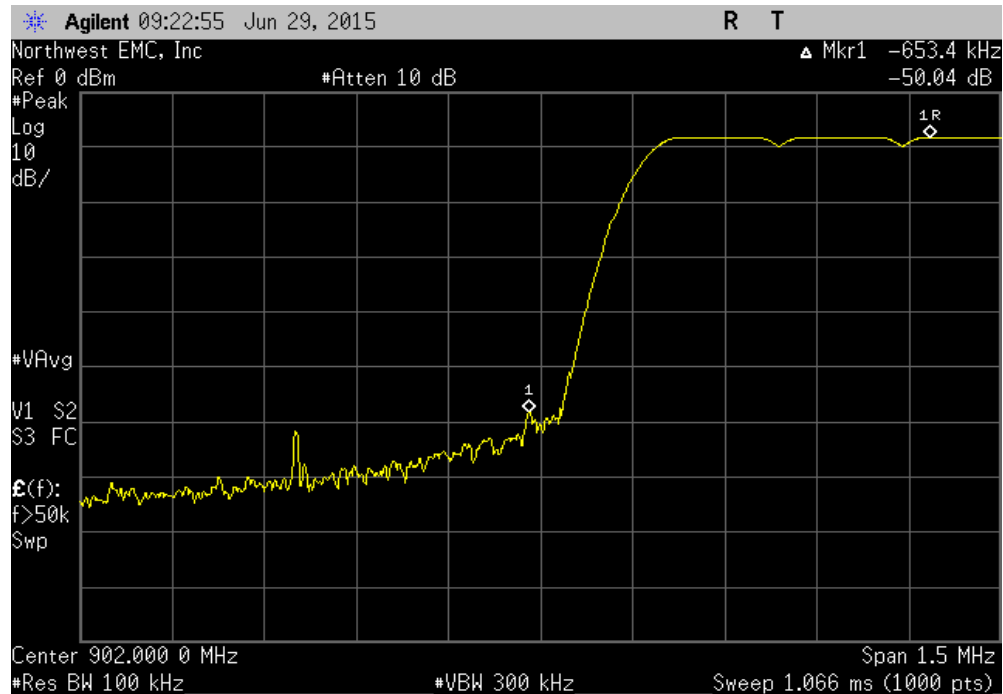
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE - HOPPING MODE

EUT: MultiConnect® mDot™		Work Order: MLTI0045	
Serial Number: 5142067554-0009		Date: 06/29/15	
Customer: Multi-Tech Systems, Inc.		Temperature: 22.4°C	
Attendees: Jim Asp		Humidity: 57%	
Project: None		Barometric Pres.: 980.1	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
Low Channel taken on lowest sequential hopping sequence. High Channel taken on highest sequential hopping sequence.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Trevor Buls</i>	
		Value (dBc)	Limit ≤ (dBc) Result
Hopping Mode 1	Low Channel	-50.04	-20 Pass
Hopping Mode 8	High Channel	-74.42	-20 Pass

BAND EDGE COMPLIANCE - HOPPING MODE

Hopping Mode 1, Low Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-50.04	-20	Pass



Hopping Mode 8, High Channel						
				Value (dBc)	Limit ≤ (dBc)	Result
				-74.42	-20	Pass

