



Microsoft Corporation

1601

FCC 15.207:2013

FCC 15.247:2013

Report #: MCSO1668



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

Last Date of Test: July 8, 2013
Microsoft Corporation
Model: 1601

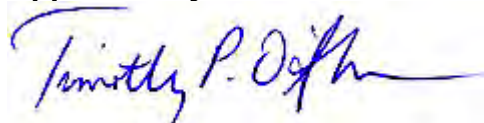
Emissions

Test Description	Specification	Test Method	Pass/Fail
Duty Cycle	FCC 15.247:2013	ANSI C63.10:2009	Pass
Output Power	FCC 15.247:2013	ANSI C63.10:2009	Pass
Spurious Conducted Emissions	FCC 15.247:2013	ANSI C63.10:2009	Pass
Occupied Bandwidth	FCC 15.247:2013	ANSI C63.10:2009	Pass
Band Edge Compliance	FCC 15.247:2013	ANSI C63.10:2009	Pass
Channel Separation	FCC 15.247:2013	ANSI C63.10:2009	Pass
Number of Hopping Channels	FCC 15.247:2013	ANSI C63.10:2009	Pass
Dwell Time	FCC 15.247:2013	ANSI C63.10:2009	Pass
Band Edge Compliance-Hopping Mode	FCC 15.247:2013	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.247:2013	ANSI C63.10:2009	Pass
Powerline Conducted Emissions	FCC 15.207:2013	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager



NVLAP Lab Code: 200629-0

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
 19201 120th Avenue NE, Suite 104
 Bothell, WA 98011

Phone: (425) 984-6600 Fax: 984-6602

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834C-1).

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.

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. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

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 Guide 65 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

KCC / 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.

Hong Kong

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

Vietnam

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

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

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

<http://www.nwemc.com/accreditations/>

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.

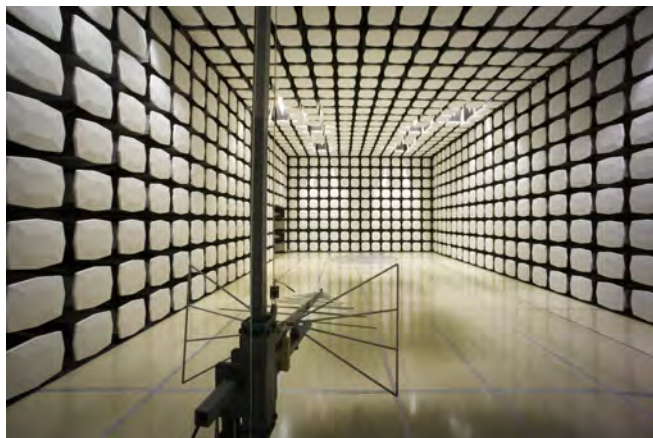
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is listed below. Our measurement 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 16-4-1 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)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94



Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05, SU02, SU07 19201 120 th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052-6399
Test Requested By:	Mike Boucher
Model:	1601
First Date of Test:	July 2, 2013
Last Date of Test:	July 8, 2013
Receipt Date of Samples:	July 2, 2013
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
A hand held computing device with 802.11 a/g/b/n and Bluetooth radios.
Testing Objective:
To demonstrate compliance to FCC 15.247 for a Bluetooth transmitter in the hand held computing device.

Configuration MCSO1668- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Handheld Computing Device	Microsoft Corporation	1601	006079632553

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC Adapter	Microsoft Corporation	X865587-001	0D130T053ZA34
USB Ethernet Adapter	LinkSys	USB300M	CU906M715622

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Laptop	Lenovo	4171-53U	R9-N8A80 12/04

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	0.5m	No	AC Adapter	AC Mains
DC Power	No	1.5m	No	AC Adapter	Handheld Computing Device
USB	Yes	0.1m	No	USB Ethernet Adapter	Handheld Computing Device
Ethernet	No	0.8m	No	Remote Laptop	USB Ethernet Adapter
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration MCSO1668- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Handheld Computing Device	Microsoft Corporation	1601	006079632553

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC Adapter	Microsoft Corporation	X865587-001	0D130T053ZA34
USB Ethernet Adapter	LinkSys	USB300M	CU906M715622
Detachable Keyboard	Microsoft Corporation	X865049-001	016967623751

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Headphone	No	1.2m	No	Handheld Computing Device	Ear Buds
AC Power	No	0.5m	No	AC Adapter	AC Mains
DC Power	No	1.5m	No	AC Adapter	Handheld Computing Device
USB	Yes	0.1m	No	USB Ethernet Adapter	Handheld Computing Device
Ethernet	No	0.8m	No	Remote Laptop	USB Ethernet Adapter
Display Port	Yes	2.0m	No	Handheld Computing Device	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration MCSO1668- 3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Handheld Computing Device	Microsoft Corporation	1601	006079632553

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC Adapter	Microsoft Corporation	X865587-001	0D130T053ZA34
USB Ethernet Adapter	LinkSys	USB300M	CU906M715622
Detachable Keyboard	Microsoft Corporation	X865049-001	016967623751

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Headphone	No	1.2m	No	Handheld Computing Device	Ear Buds
AC Power	No	0.5m	No	AC Adapter	AC Mains
DC Power	No	1.5m	No	AC Adapter	Handheld Computing Device
USB	Yes	0.1m	No	USB Ethernet Adapter	Handheld Computing Device
Ethernet	No	0.8m	No	Remote Laptop	USB Ethernet Adapter
Display Port	Yes	2.0m	No	Handheld Computing Device	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/2/2013	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	7/2/2013	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.
3	7/2/2013	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	7/2/2013	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	7/2/2013	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.
6	7/2/2013	Channel Separation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.
7	7/2/2013	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.
8	7/2/2013	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.
9	7/2/2013	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.
10	7/5/2013	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.
11	7/8/2013	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

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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

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

This test is used to document the operating mode of the supplied radio test software. There is no pass/fail criteria.

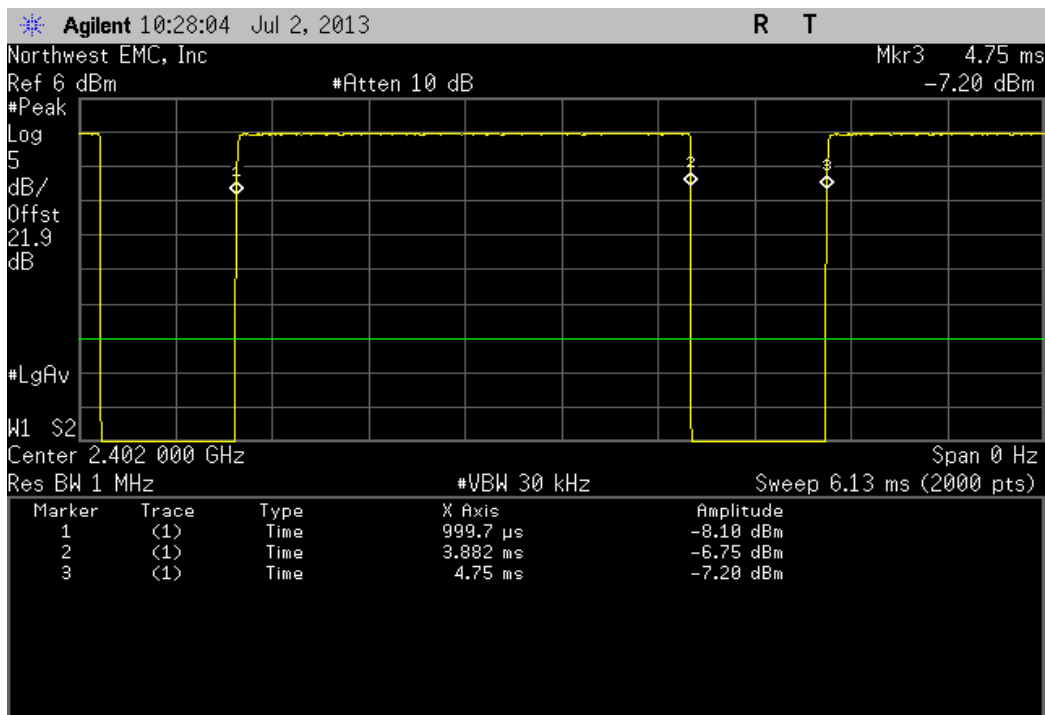


Duty Cycle

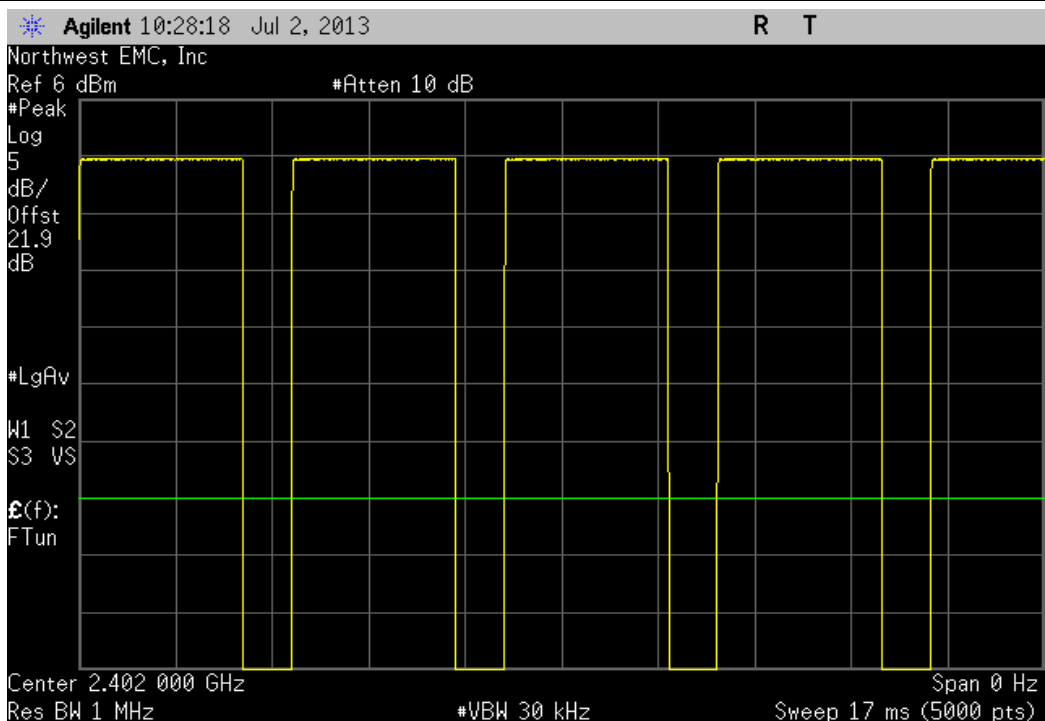
XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCSO1668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS			
FCC 15.247:2013		Test Method	
		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rod Peloquin</i>	
		Pulse Width	Period
		Number of Pulses	Value (%)
		Limit	Result
DHS, GFSK			
	Low Channel, 2402 MHz	2.883 mS	3.751 mS
	Low Channel, 2402 MHz	N/A	N/A
	Mid Channel, 2441 MHz	2.883 mS	3.751 mS
	Mid Channel, 2441 MHz	N/A	N/A
	High Channel, 2480 MHz	2.883 mS	3.75 mS
	High Channel, 2480 MHz	N/A	N/A
2DHS, pi/4-DQPSK			
	Low Channel, 2402 MHz	2.883 mS	3.75 mS
	Low Channel, 2402 MHz	N/A	N/A
	Mid Channel, 2441 MHz	2.883 mS	3.751 mS
	Mid Channel, 2441 MHz	N/A	N/A
	High Channel, 2480 MHz	2.883 mS	3.751 mS
	High Channel, 2480 MHz	N/A	N/A
3DHS, 8-DPSK			
	Low Channel, 2402 MHz	2.886 mS	3.751 mS
	Low Channel, 2402 MHz	N/A	N/A
	Mid Channel, 2441 MHz	2.883 mS	3.75 mS
	Mid Channel, 2441 MHz	N/A	N/A
	High Channel, 2480 MHz	2.883 mS	3.75 mS
	High Channel, 2480 MHz	N/A	N/A

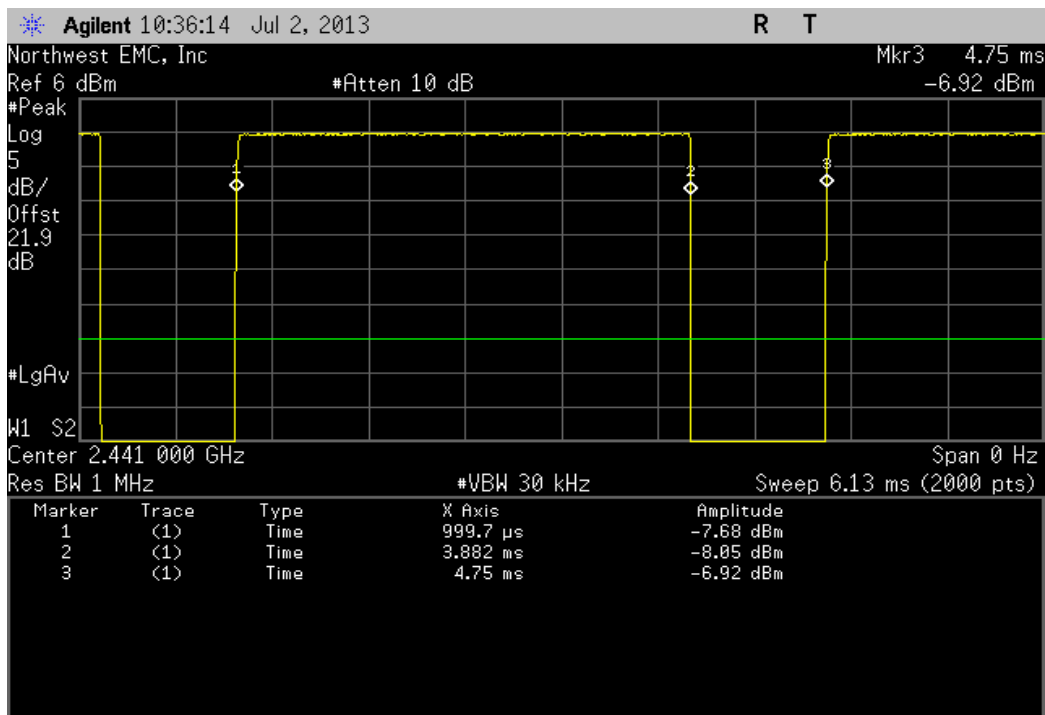
DH5, GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.751 mS	1	76.9	N/A	N/A



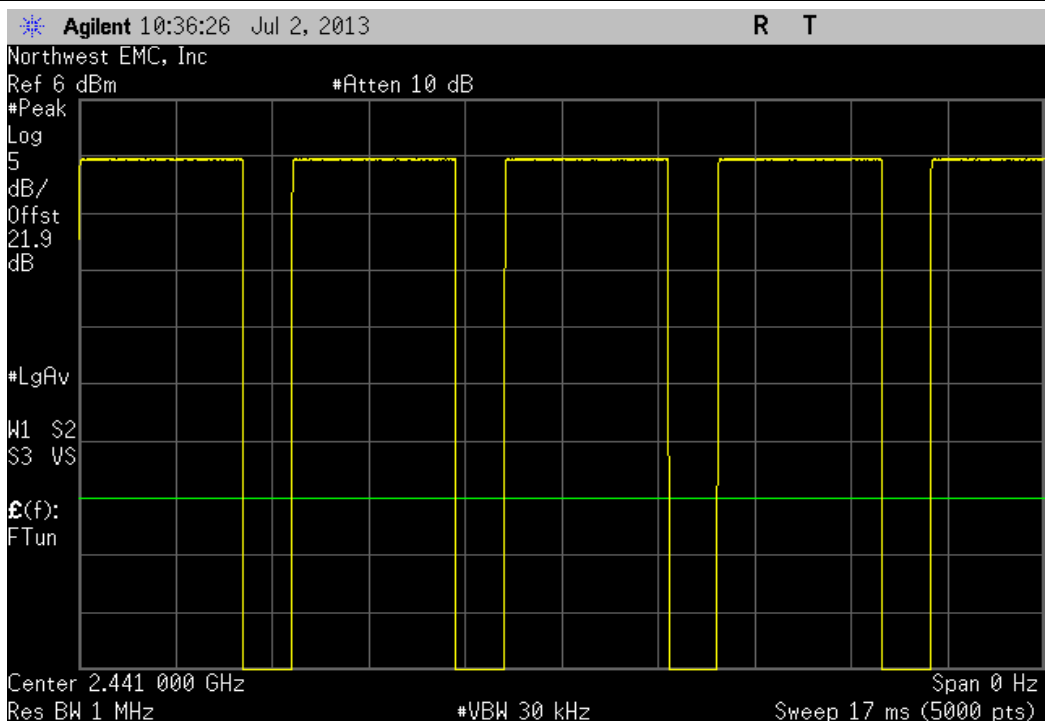
DH5, GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



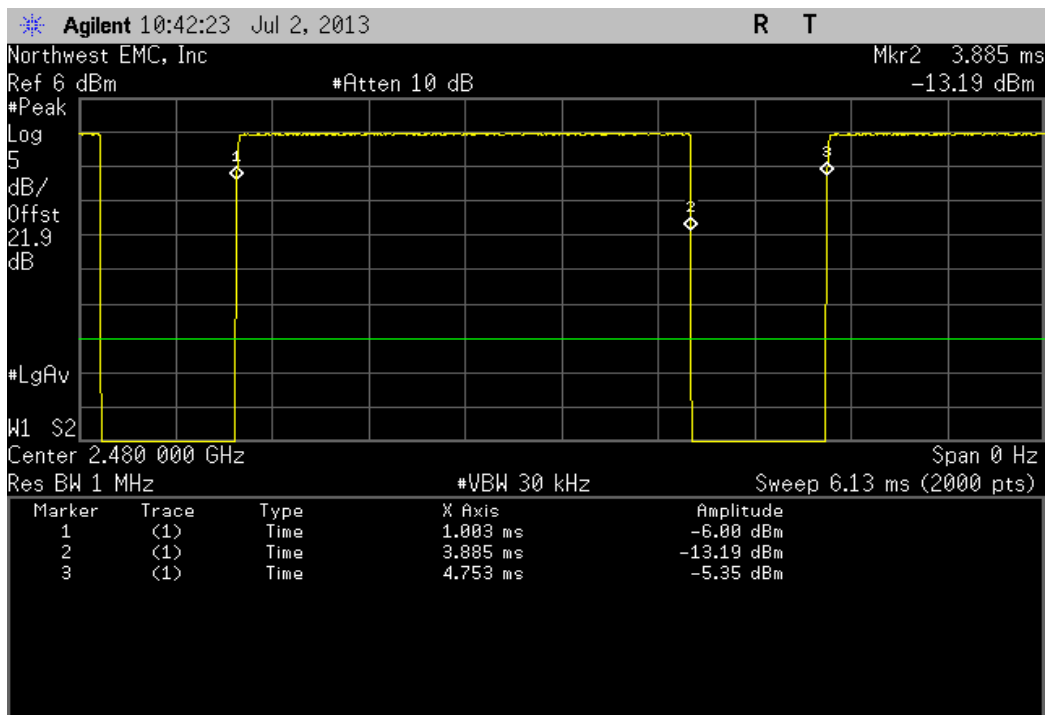
DH5, GFSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.751 mS	1	76.9	N/A	N/A



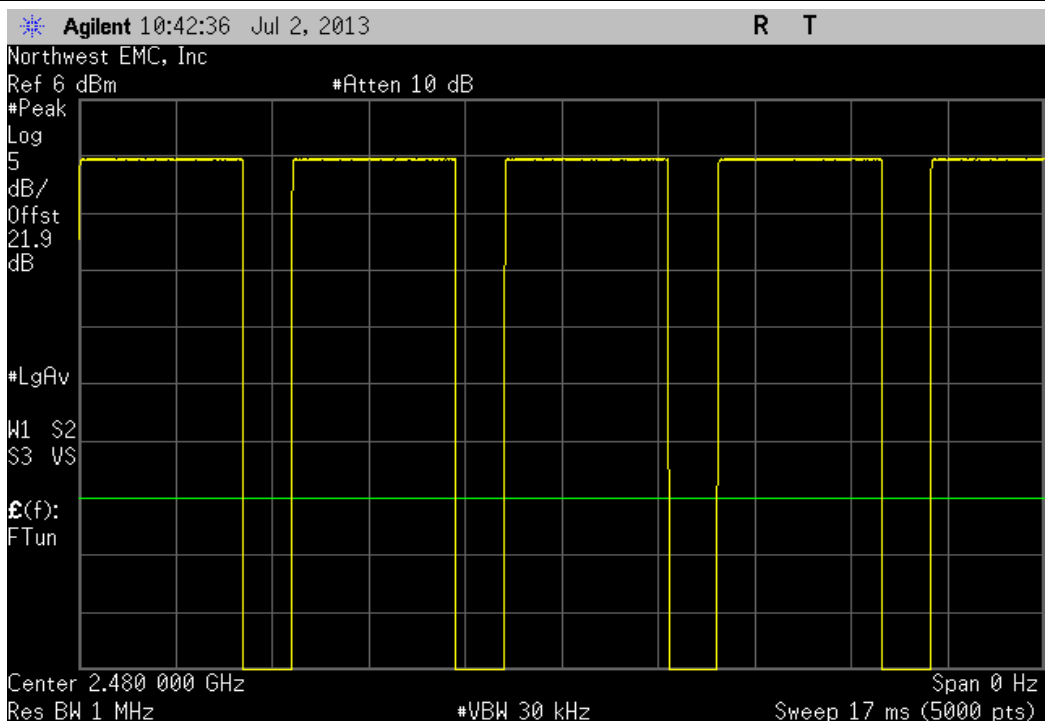
DH5, GFSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



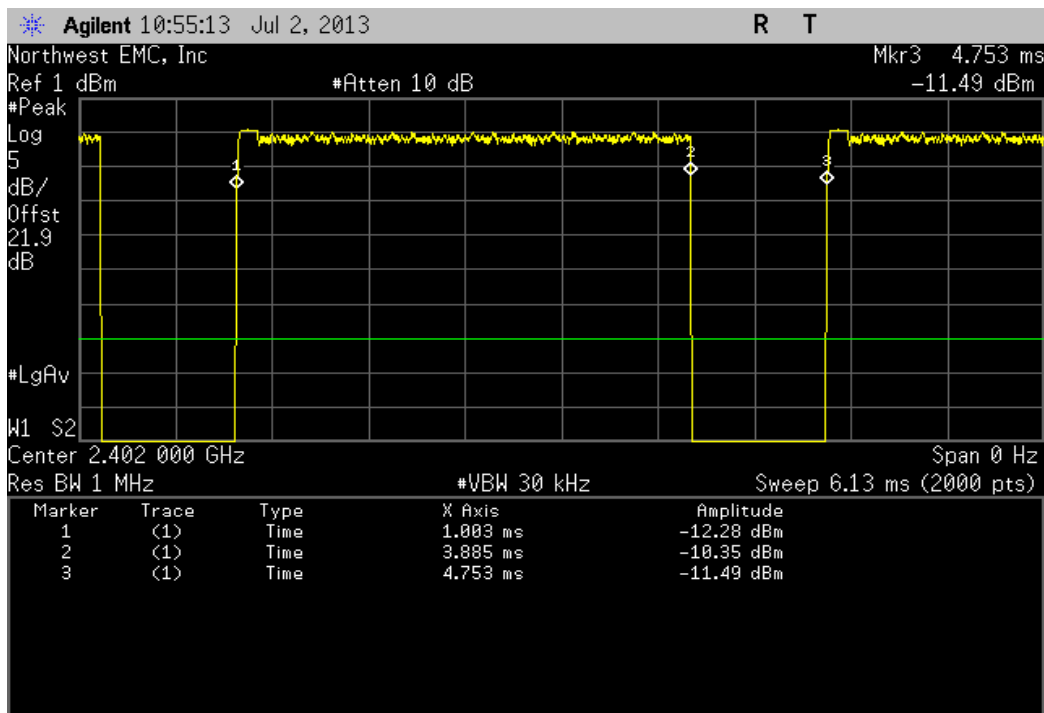
DH5, GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.75 mS	1	76.9	N/A	N/A



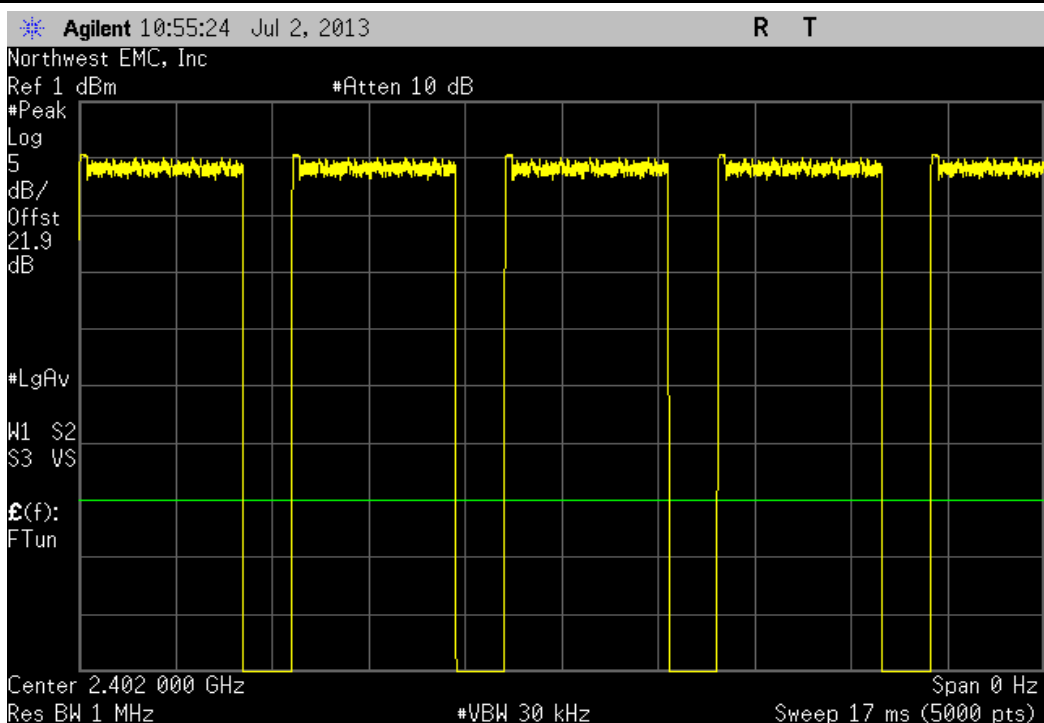
DH5, GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



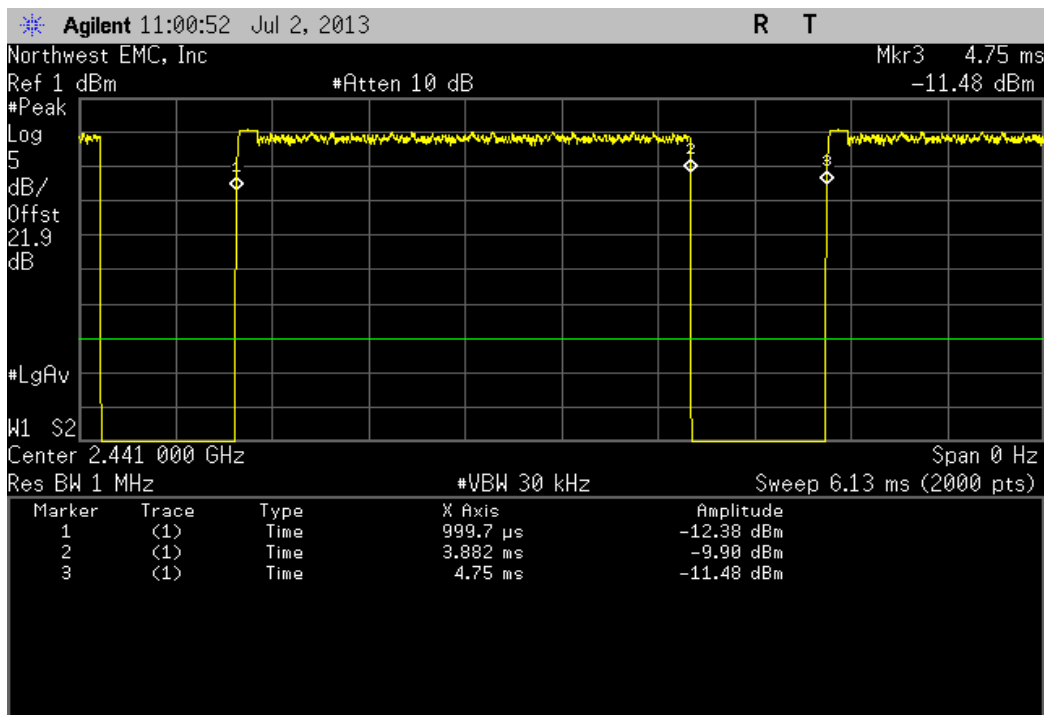
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.75 mS	1	76.9	N/A	N/A



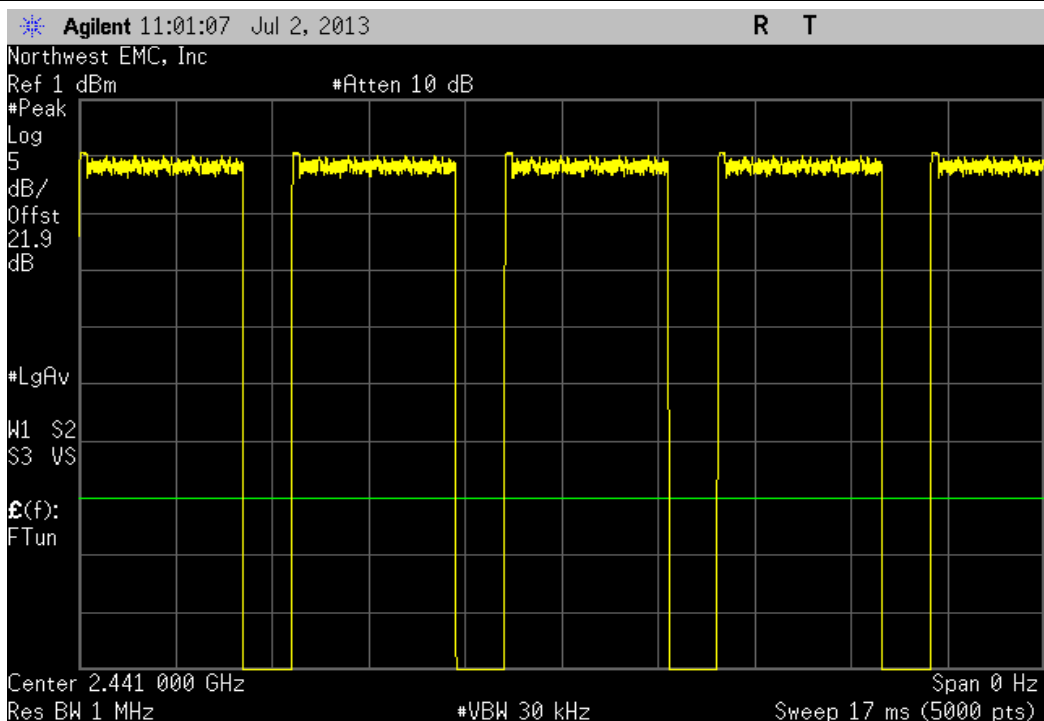
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



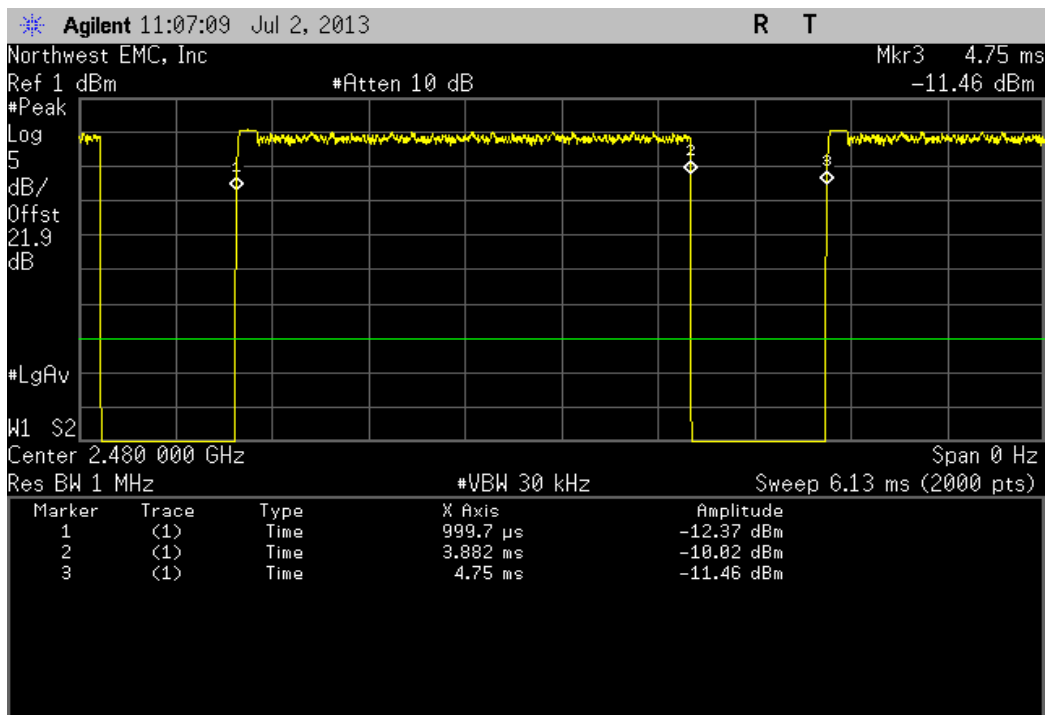
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.751 mS	1	76.9	N/A	N/A



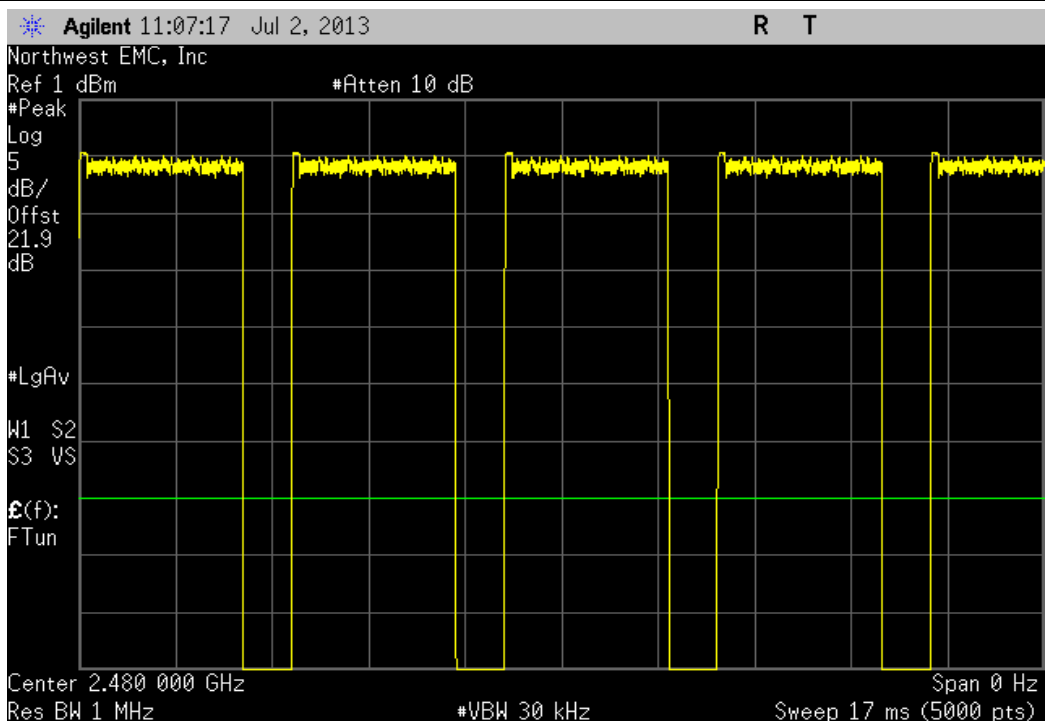
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



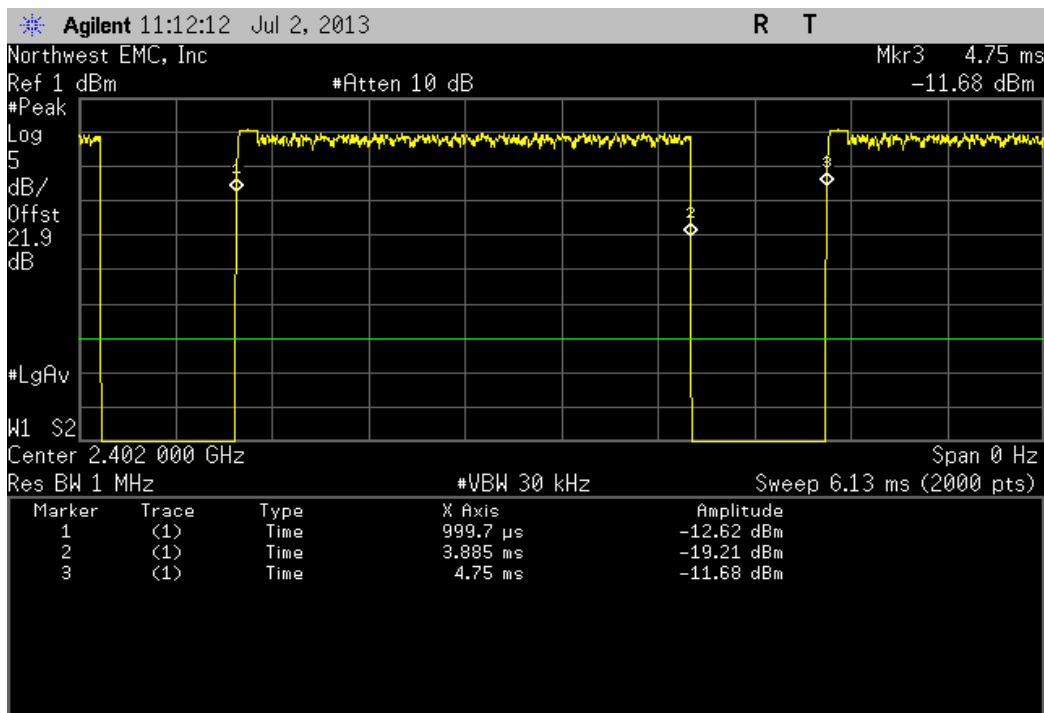
2DH5, pi/4-DQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.751 mS	1	76.9	N/A	N/A



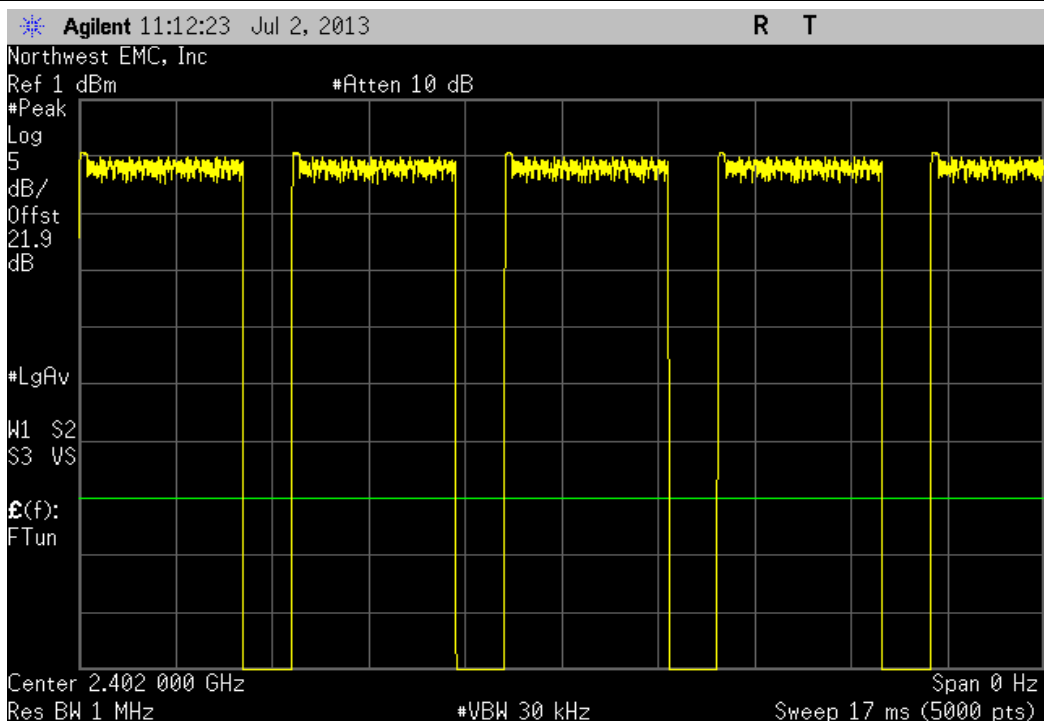
2DH5, pi/4-DQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



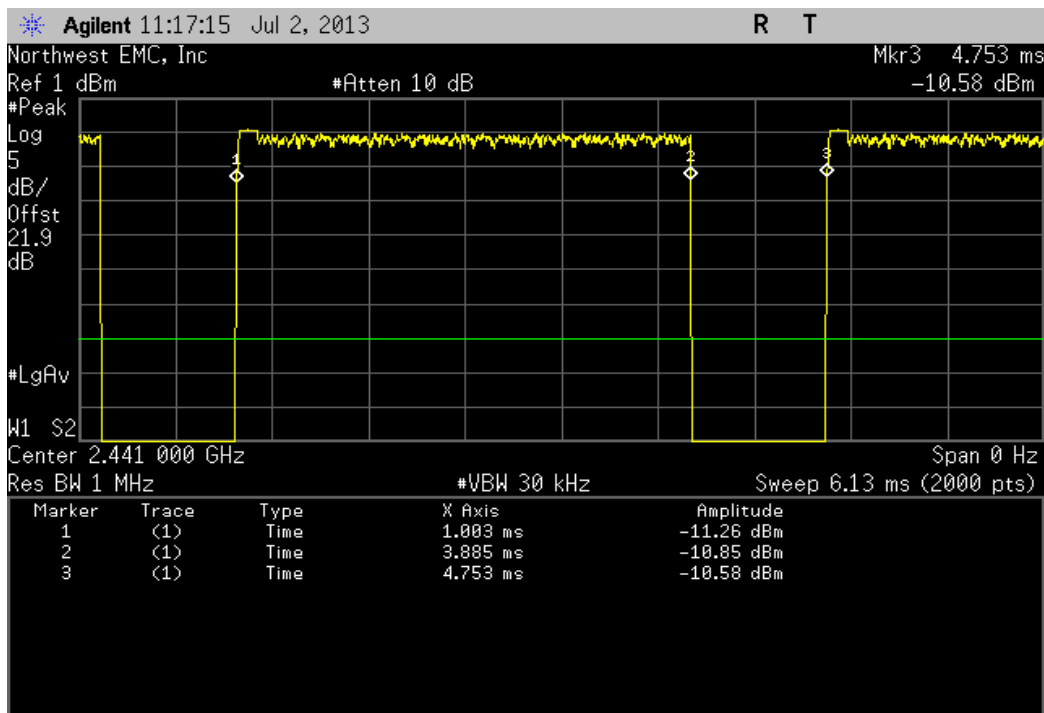
3DH5, 8-DPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.886 mS	3.751 mS	1	76.9	N/A	N/A



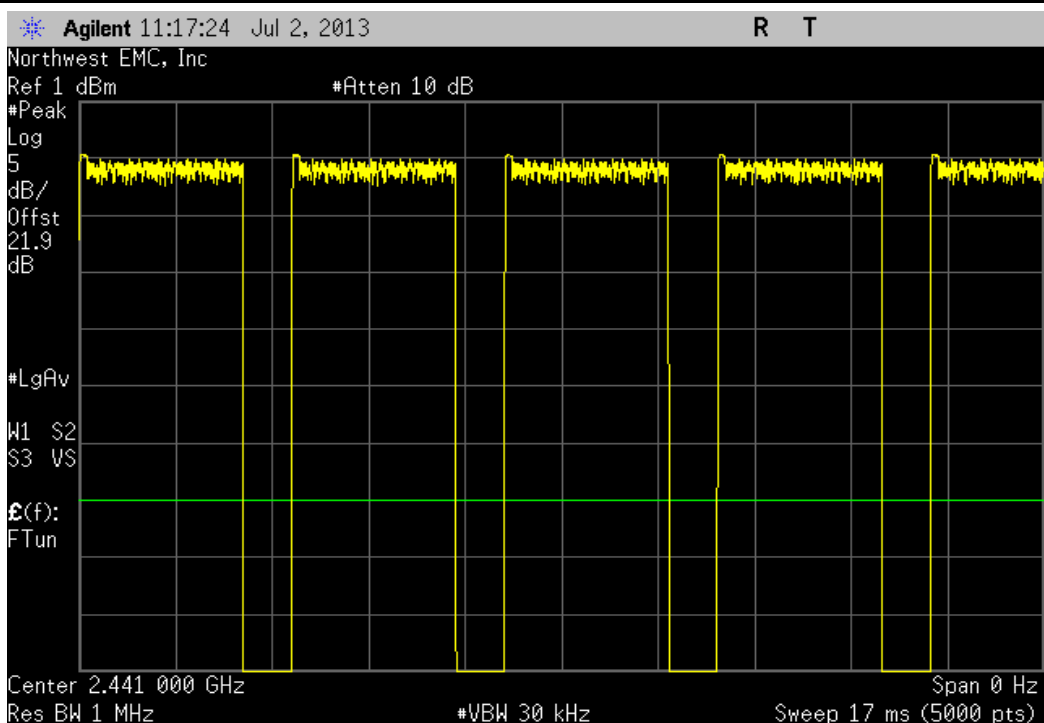
3DH5, 8-DPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



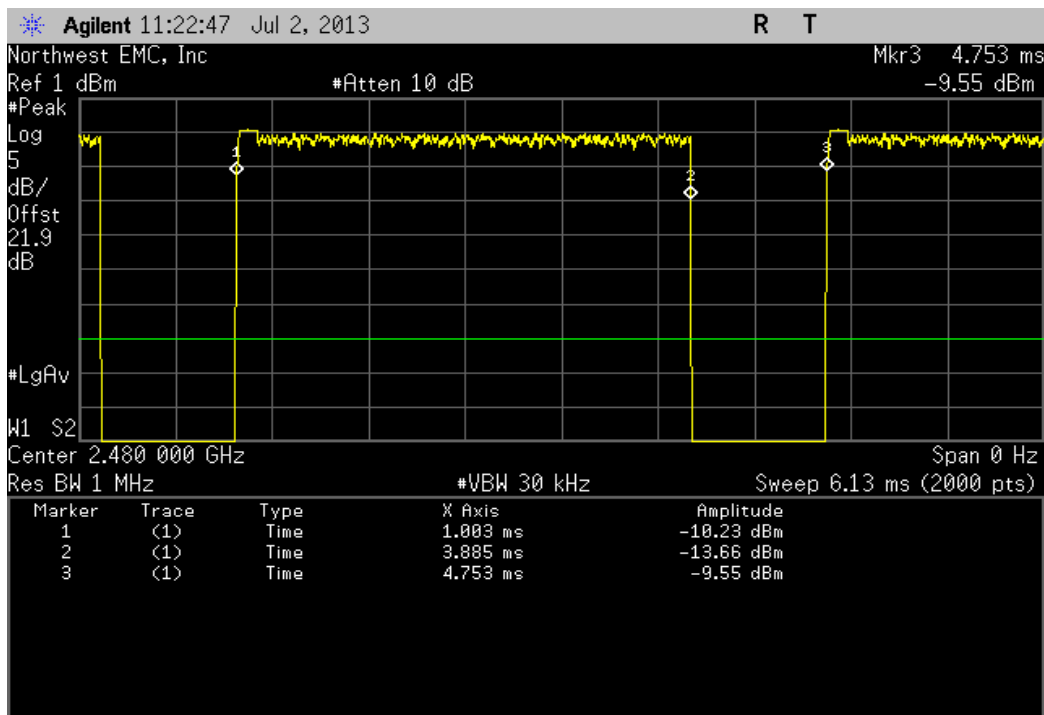
3DH5, 8-DPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.75 mS	1	76.9	N/A	N/A



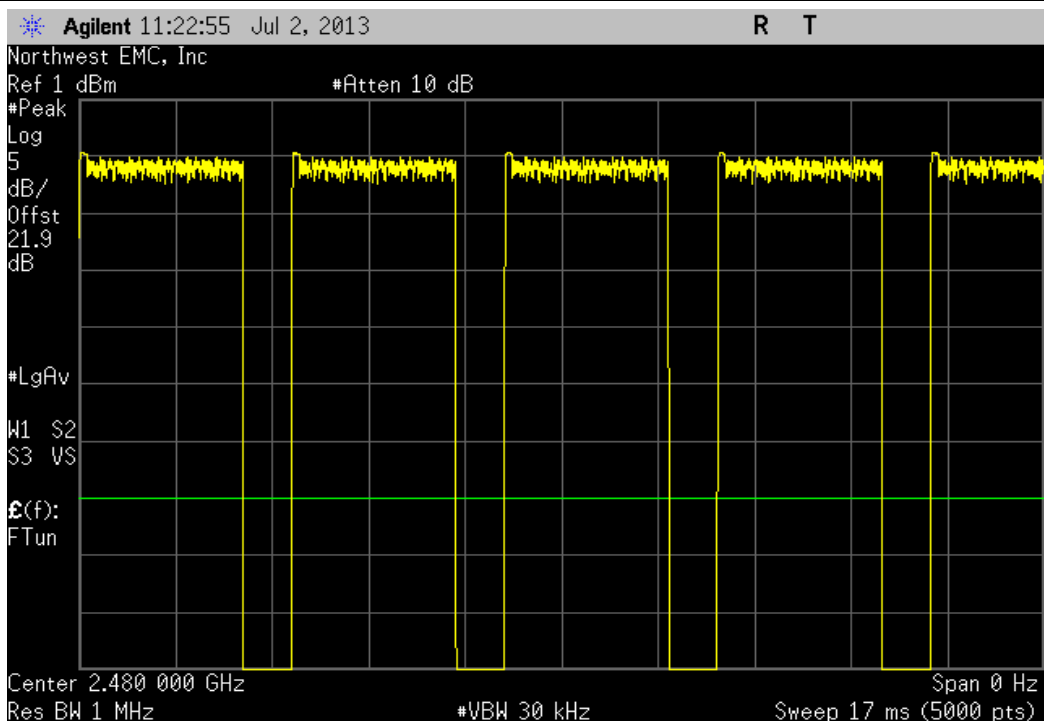
3DH5, 8-DPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



3DH5, 8-DPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	2.883 mS	3.75 mS	1	76.9	N/A	N/A



3DH5, 8-DPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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 +27dBm.



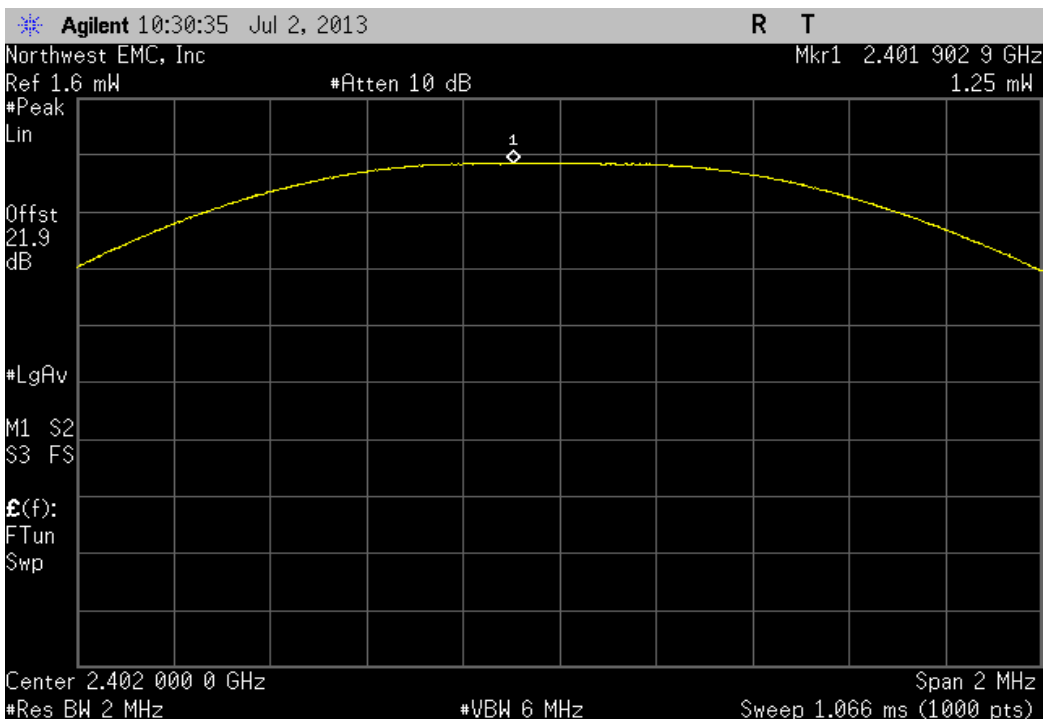
Output Power

XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCS01668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2013		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Value	Limit
DH5, GFSK			Result
Low Channel, 2402 MHz		1.255 mW	< 125 mW
Mid Channel, 2441 MHz		1.255 mW	< 125 mW
High Channel, 2480 MHz		1.255 mW	< 125 mW
2DH5, pi/4-DQPSK			
Low Channel, 2402 MHz		773.037 uW	< 125 mW
Mid Channel, 2441 MHz		772.147 uW	< 125 mW
High Channel, 2480 MHz		768.953 uW	< 125 mW
3DH5, 8-DPSK			
Low Channel, 2402 MHz		874.178 uW	< 125 mW
Mid Channel, 2441 MHz		872.168 uW	< 125 mW
High Channel, 2480 MHz		871.565 uW	< 125 mW

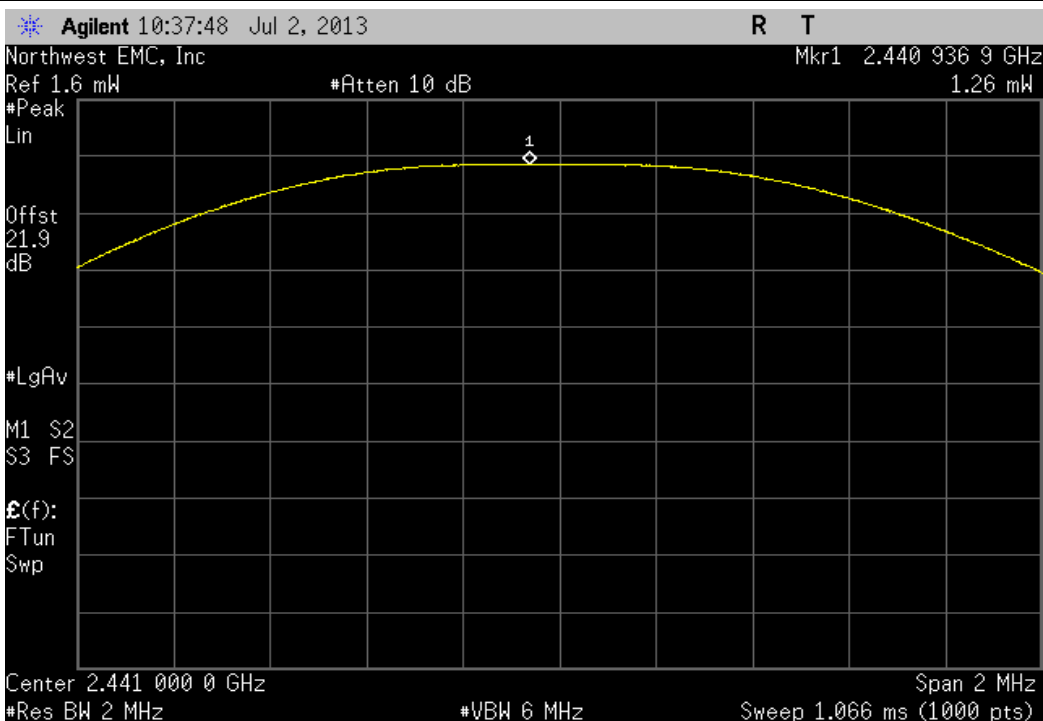
DH5, GFSK, Low Channel, 2402 MHz

Value	Limit	Result
1.255 mW	< 125 mW	Pass



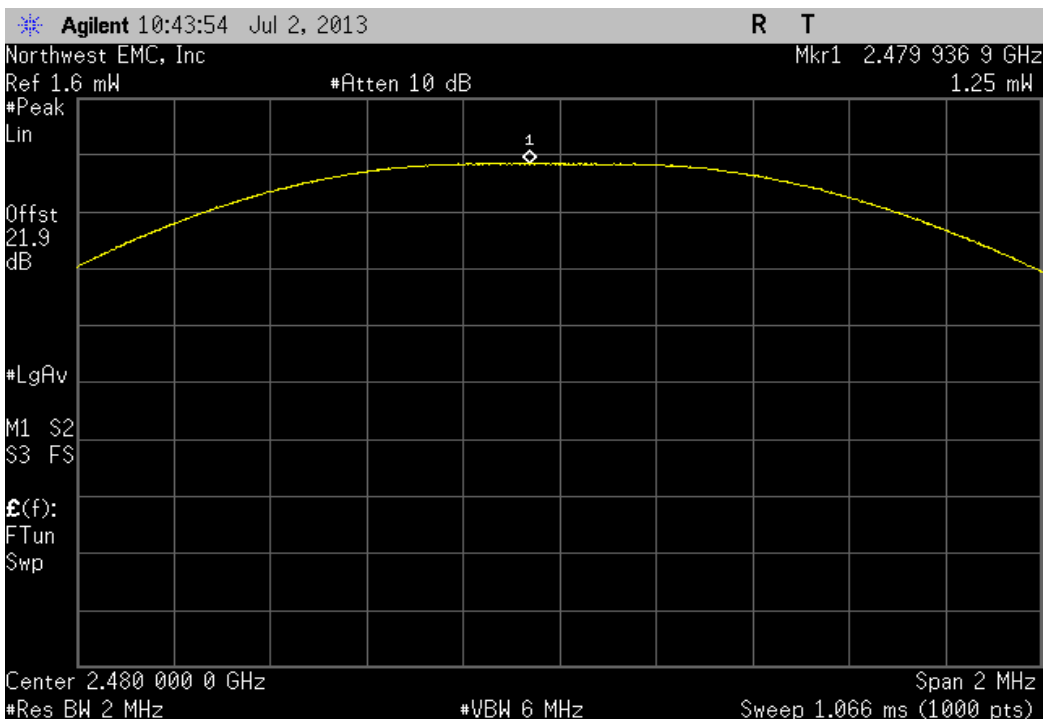
DH5, GFSK, Mid Channel, 2441 MHz

Value	Limit	Result
1.255 mW	< 125 mW	Pass



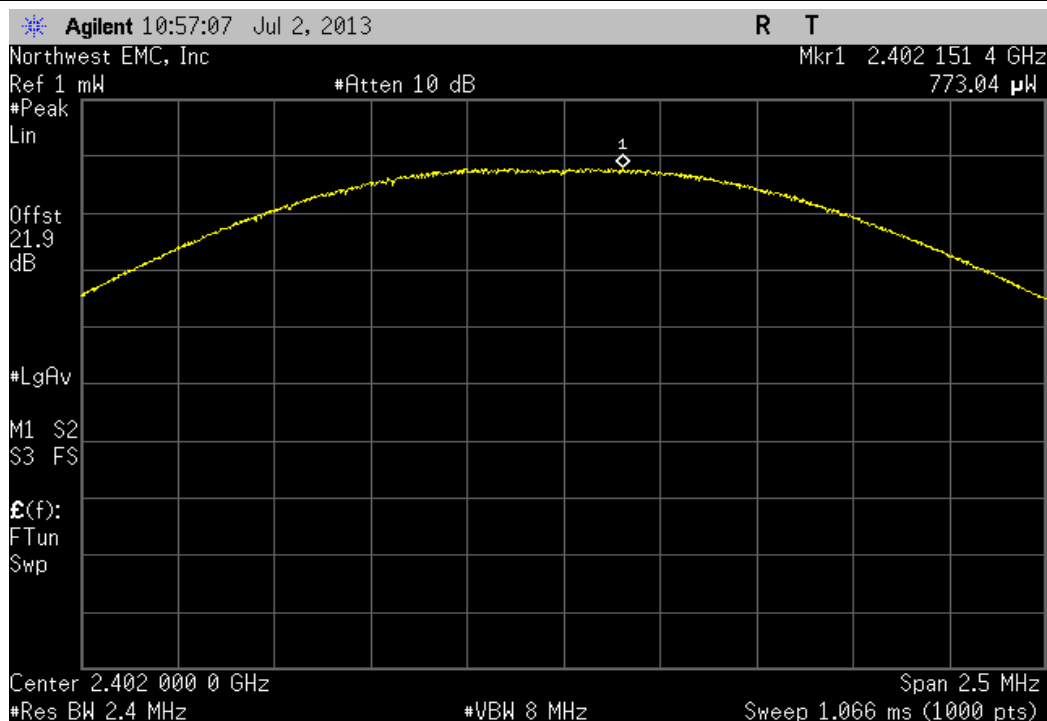
DH5, GFSK, High Channel, 2480 MHz

Value	Limit	Result
1.255 mW	< 125 mW	Pass



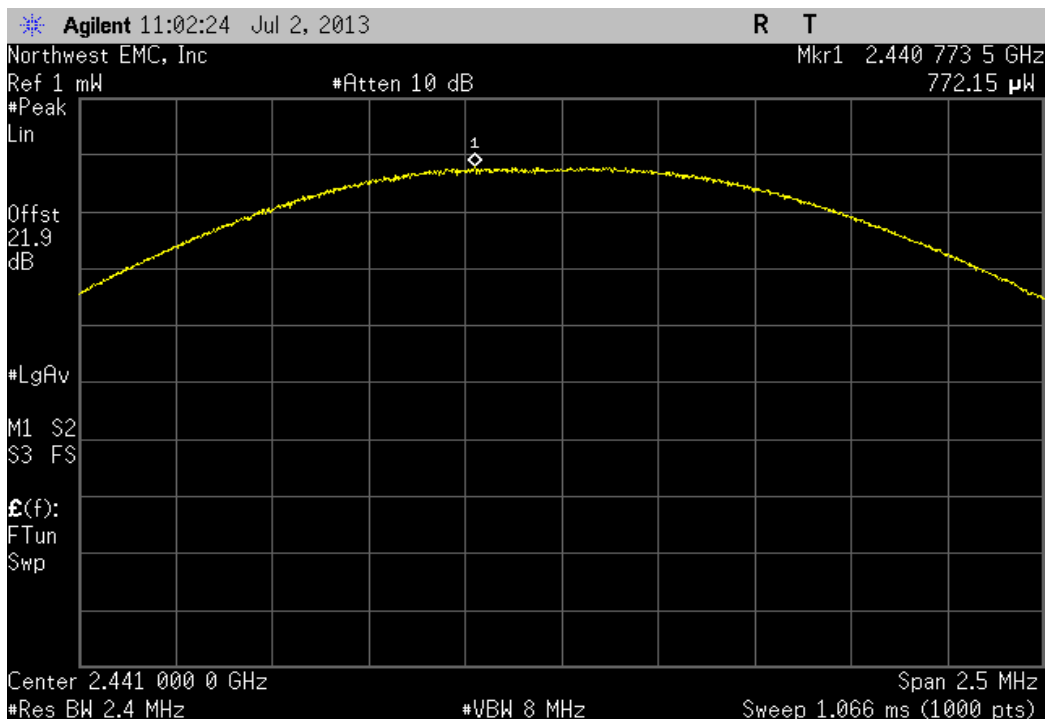
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz

Value	Limit	Result
773.037 uW	< 125 mW	Pass



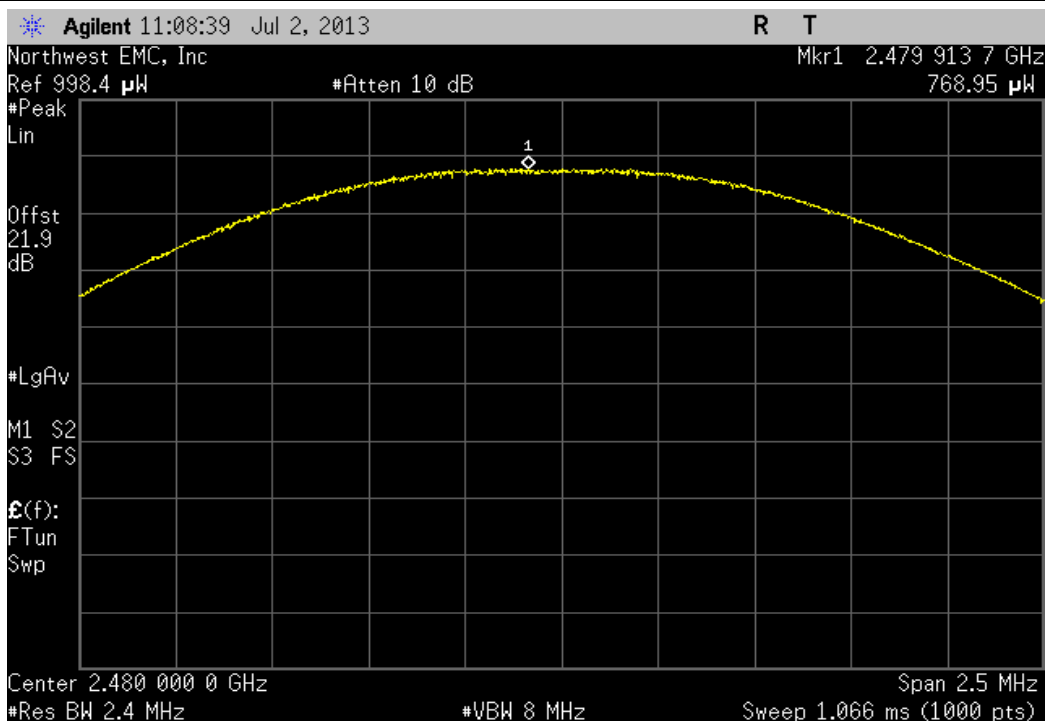
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz

Value	Limit	Result
772.147 uW	< 125 mW	Pass



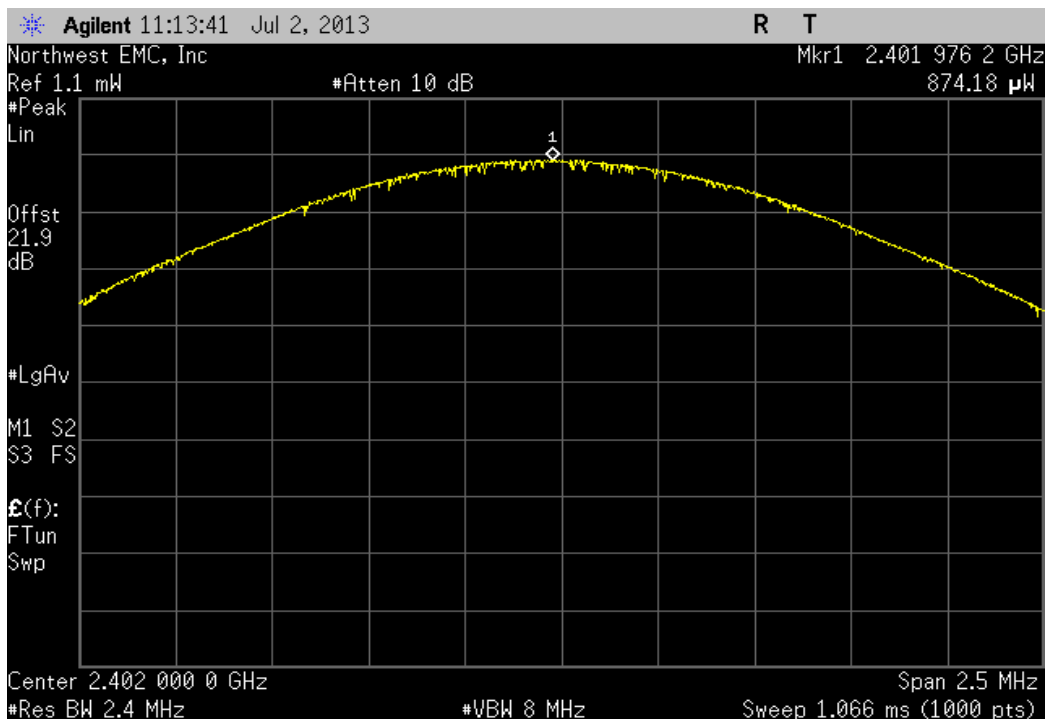
2DH5, pi/4-DQPSK, High Channel, 2480 MHz

Value	Limit	Result
768.953 uW	< 125 mW	Pass



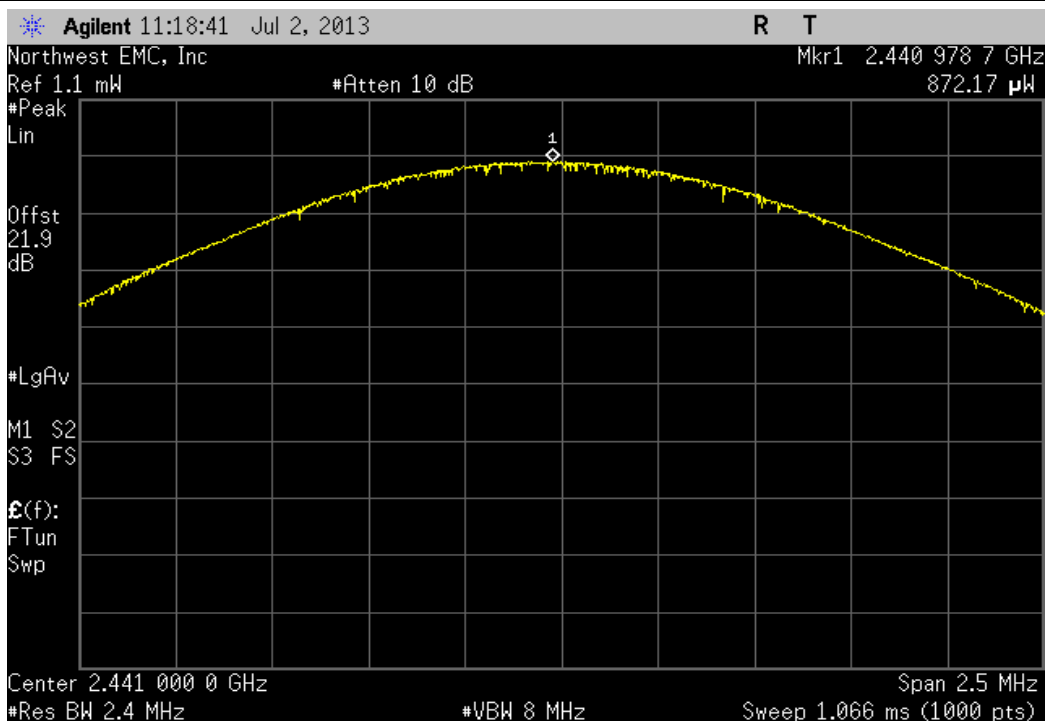
3DH5, 8-DPSK, Low Channel, 2402 MHz

Value	Limit	Result
874.178 μ W	< 125 mW	Pass



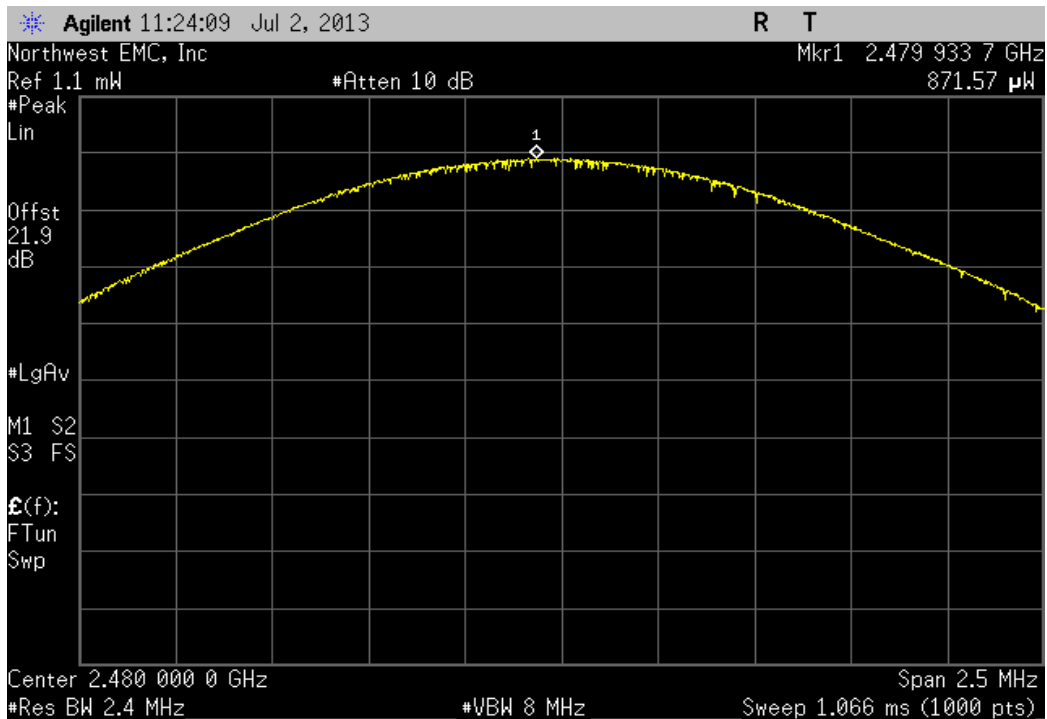
3DH5, 8-DPSK, Mid Channel, 2441 MHz

Value	Limit	Result
872.168 μ W	< 125 mW	Pass



3DH5, 8-DPSK, High Channel, 2480 MHz

Value	Limit	Result
871.565 μ W	< 125 mW	Pass



Spurious Conducted Emissions

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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 in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

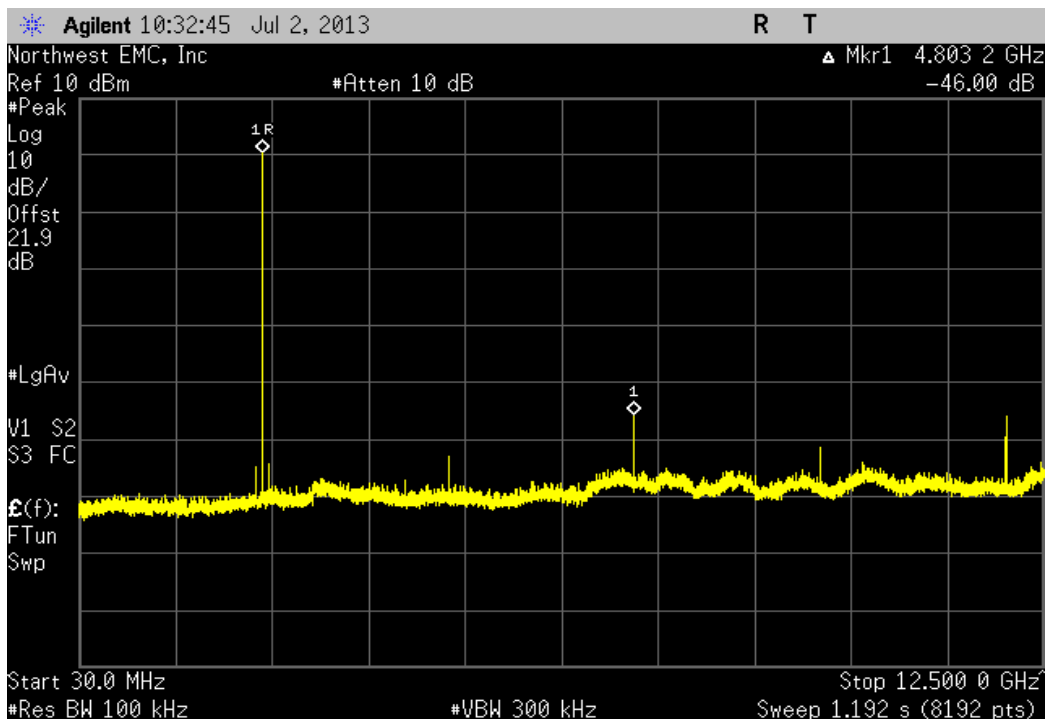


Spurious Conducted Emissions

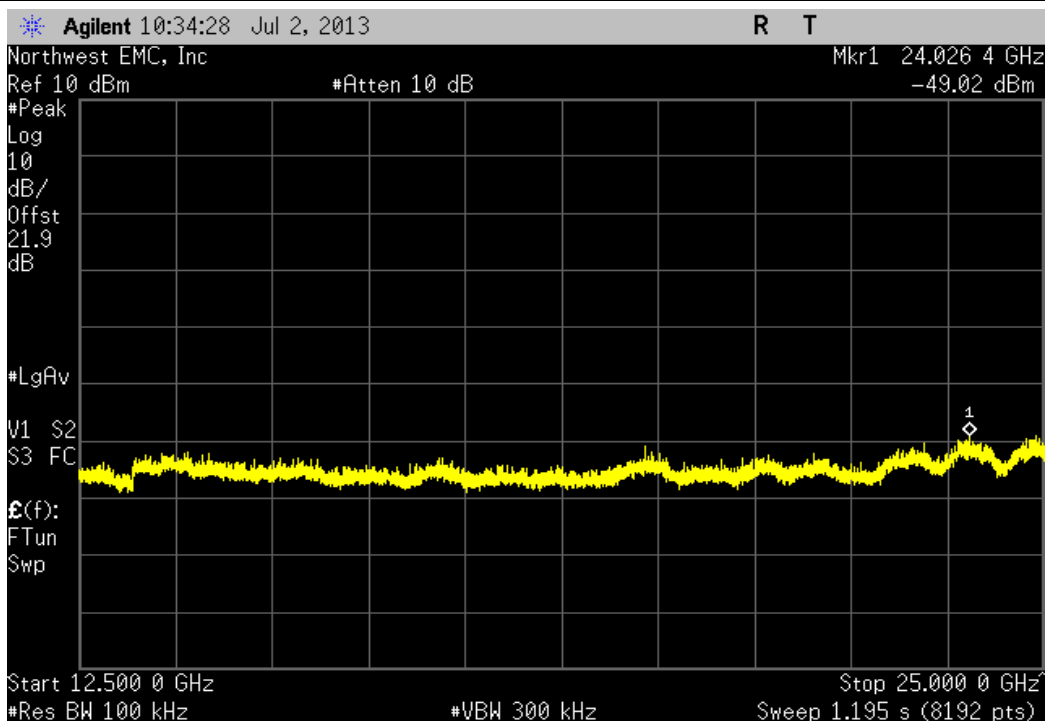
XMit 2013.02.28
PsaTx 2013.06.07

EUT:	1601	Work Order:	MCSO1668
Serial Number:	006079632553	Date:	07/02/13
Customer:	Microsoft Corporation	Temperature:	26°C
Attendees:	None	Humidity:	46%
Project:	None	Barometric Pres.:	1020 mb
Tested by:	Richard Mellroth, Rod Peloquin	Power:	120 VAC / 60Hz
		Job Site:	NC02
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2013		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Frequency Range	Value Limit Result
DH5, GFSK			
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-46 dBc ≤ -20 dBc Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-49.46 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	30 MHz - 12.5 GHz	-45.56 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	12.5 GHz - 25 GHz	-49.71 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-48.01 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-49.48 dBc ≤ -20 dBc Pass
2DH5, pi/4-DQPSK			
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-41.43 dBc ≤ -20 dBc Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-43.48 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	30 MHz - 12.5 GHz	-42.48 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	12.5 GHz - 25 GHz	-44.56 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-42.72 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-43.03 dBc ≤ -20 dBc Pass
3DH5, 8-DPSK			
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-44.86 dBc ≤ -20 dBc Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-45.79 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	30 MHz - 12.5 GHz	-40.8 dBc ≤ -20 dBc Pass
	Mid Channel, 2441 MHz	12.5 GHz - 25 GHz	-43.81 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-43.81 dBc ≤ -20 dBc Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-43.87 dBc ≤ -20 dBc Pass

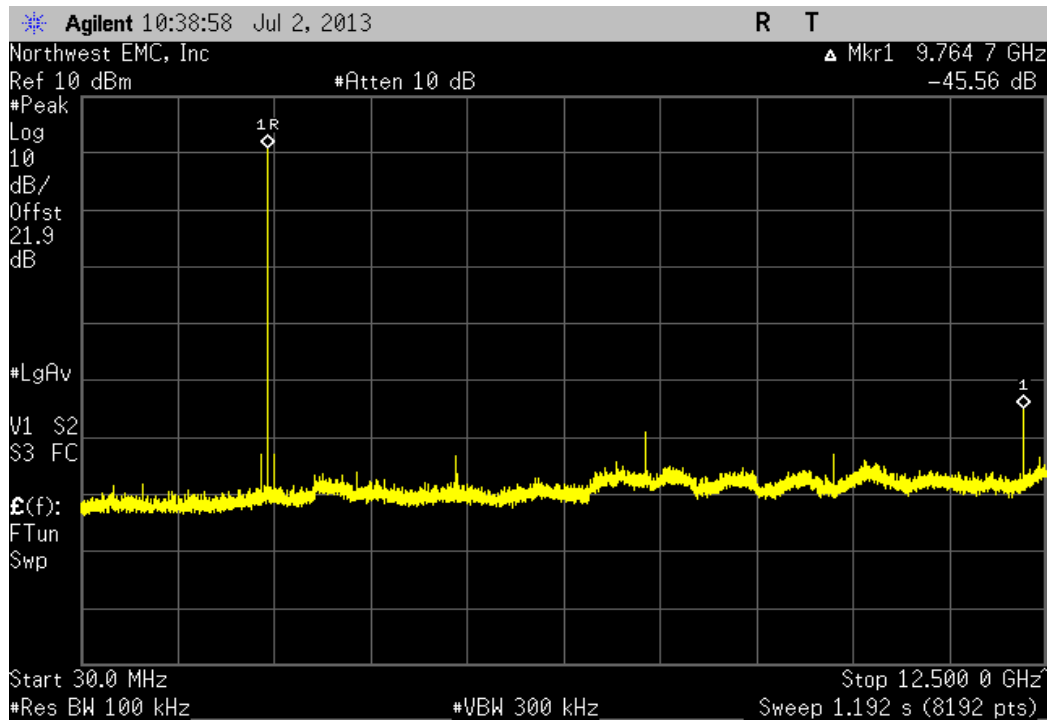
DH5, GFSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-46 dBc	≤ -20 dBc	Pass	



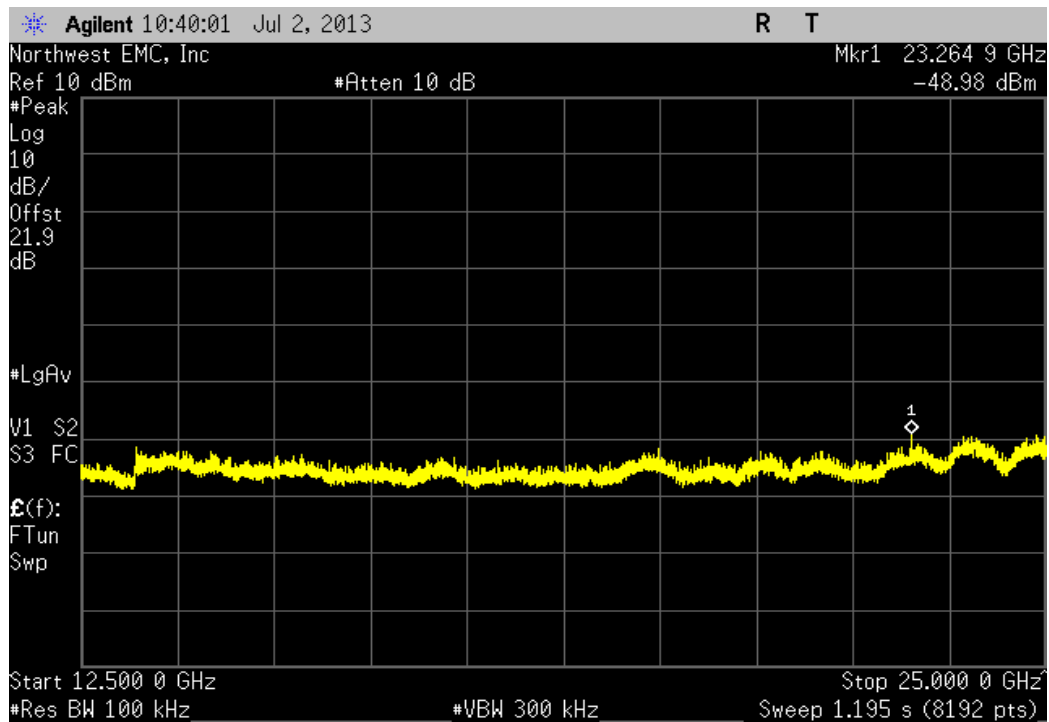
DH5, GFSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-49.46 dBc	≤ -20 dBc	Pass	



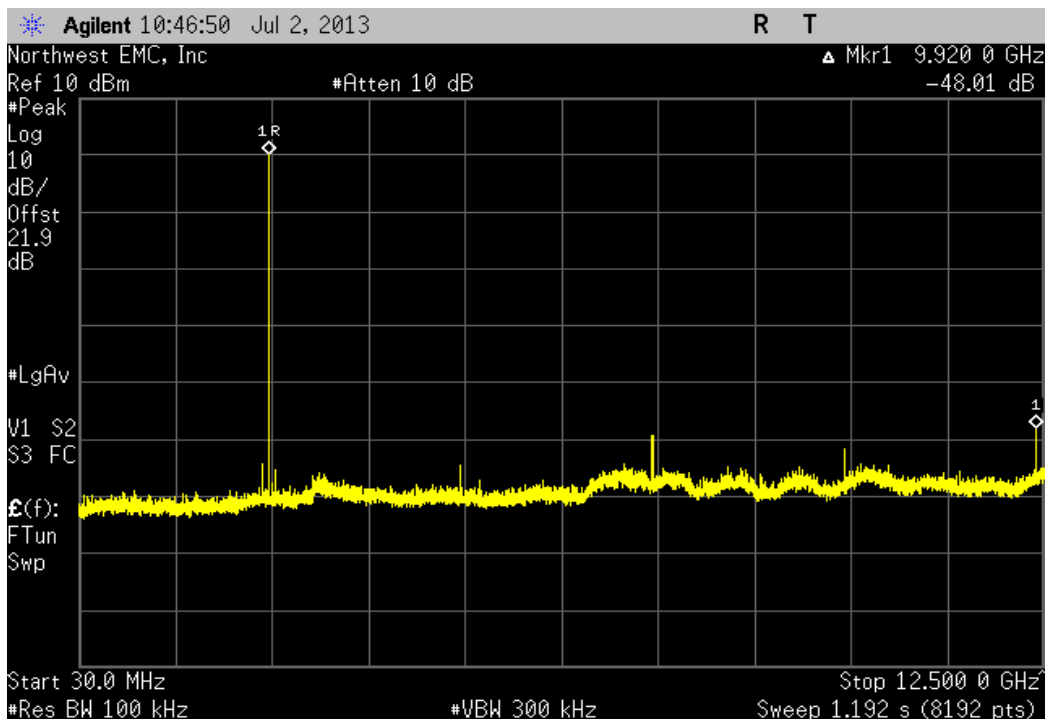
DH5, GFSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-45.56 dBc	≤ -20 dBc	Pass	



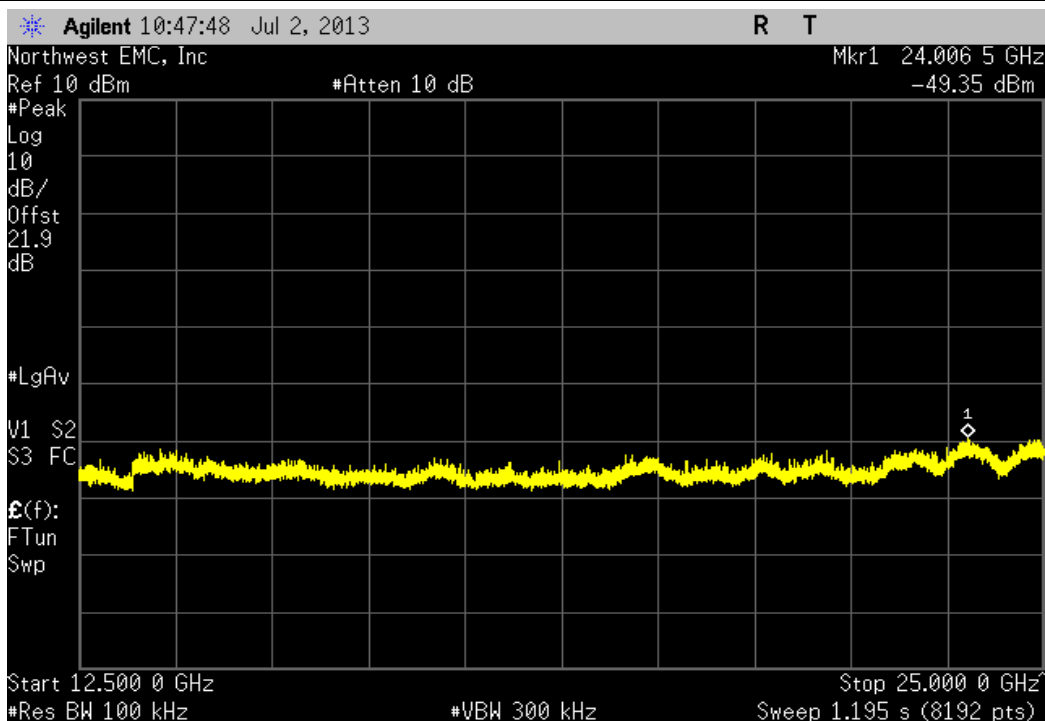
DH5, GFSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-49.71 dBc	≤ -20 dBc	Pass	



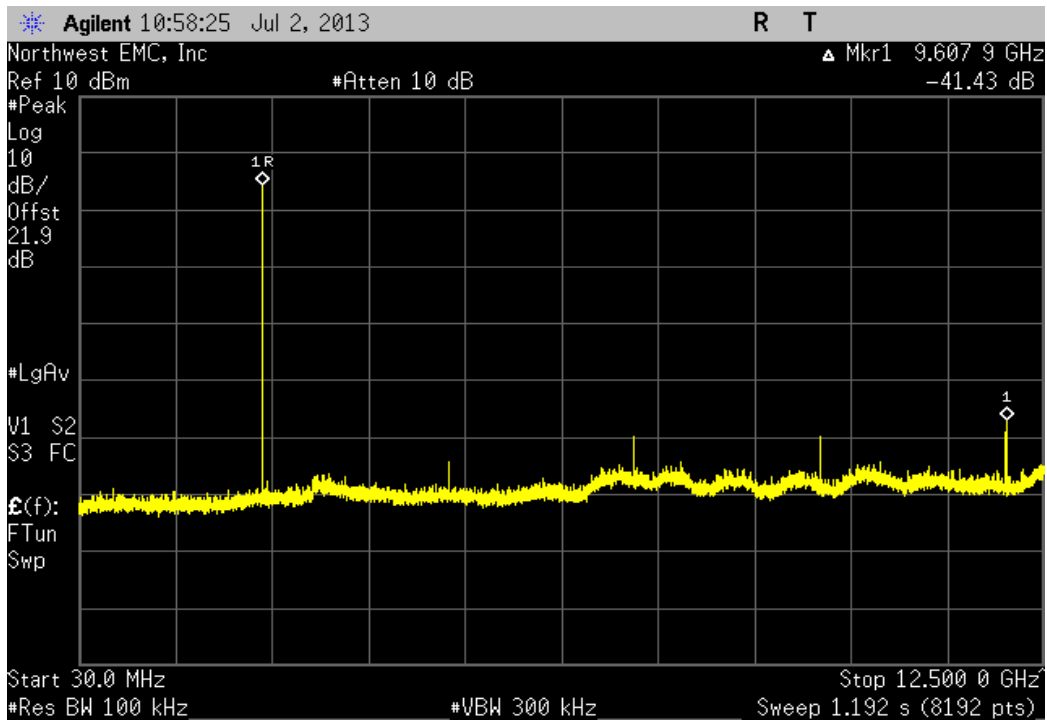
DH5, GFSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-48.01 dBc	≤ -20 dBc	Pass	



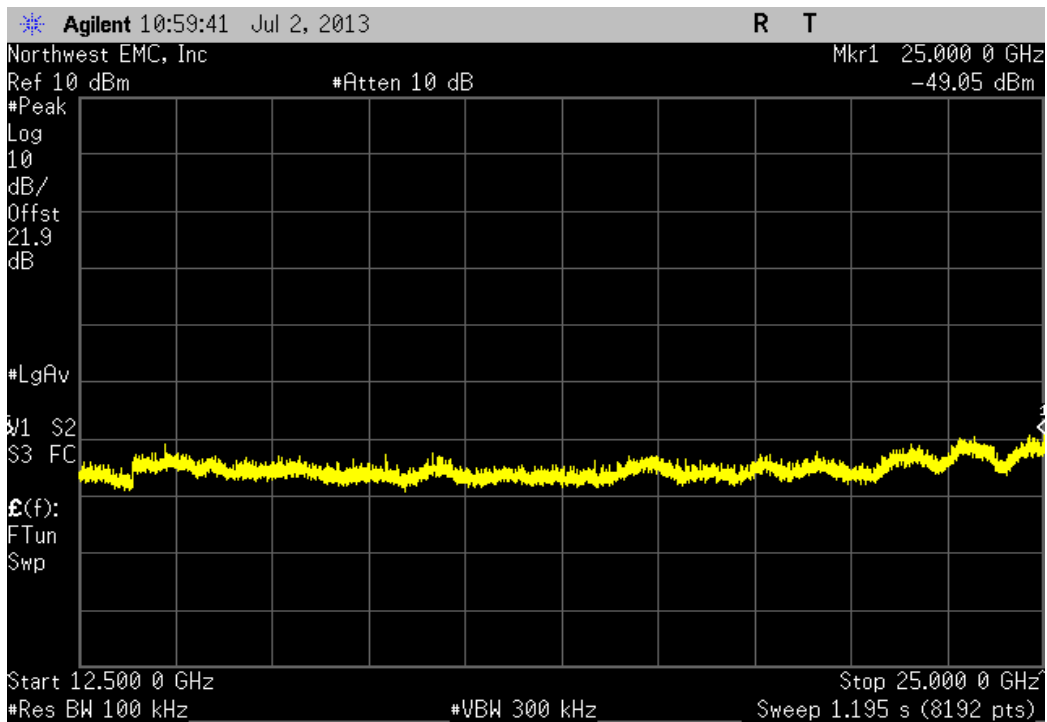
DH5, GFSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-49.48 dBc	≤ -20 dBc	Pass	



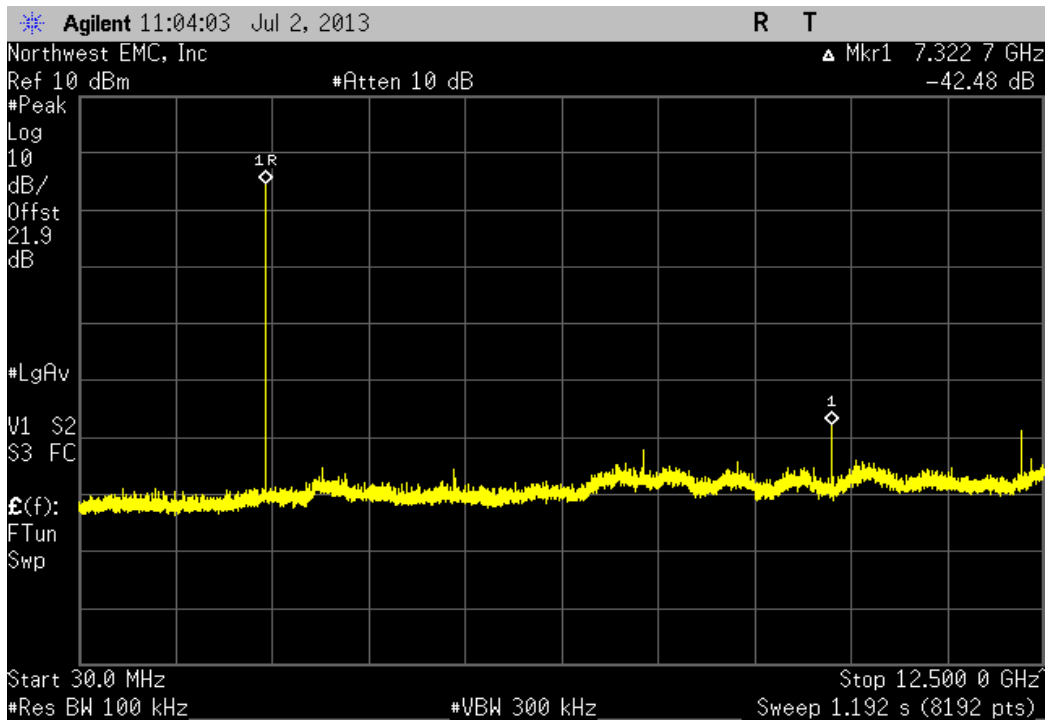
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-41.43 dBc	≤ -20 dBc	Pass	



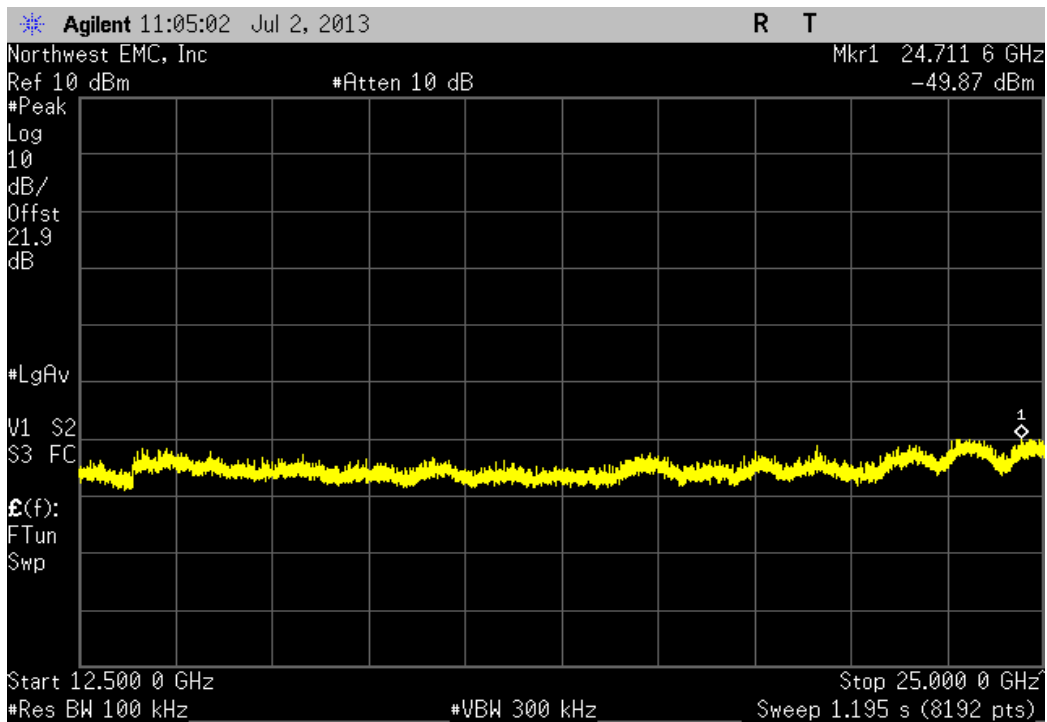
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-43.48 dBc	≤ -20 dBc	Pass	



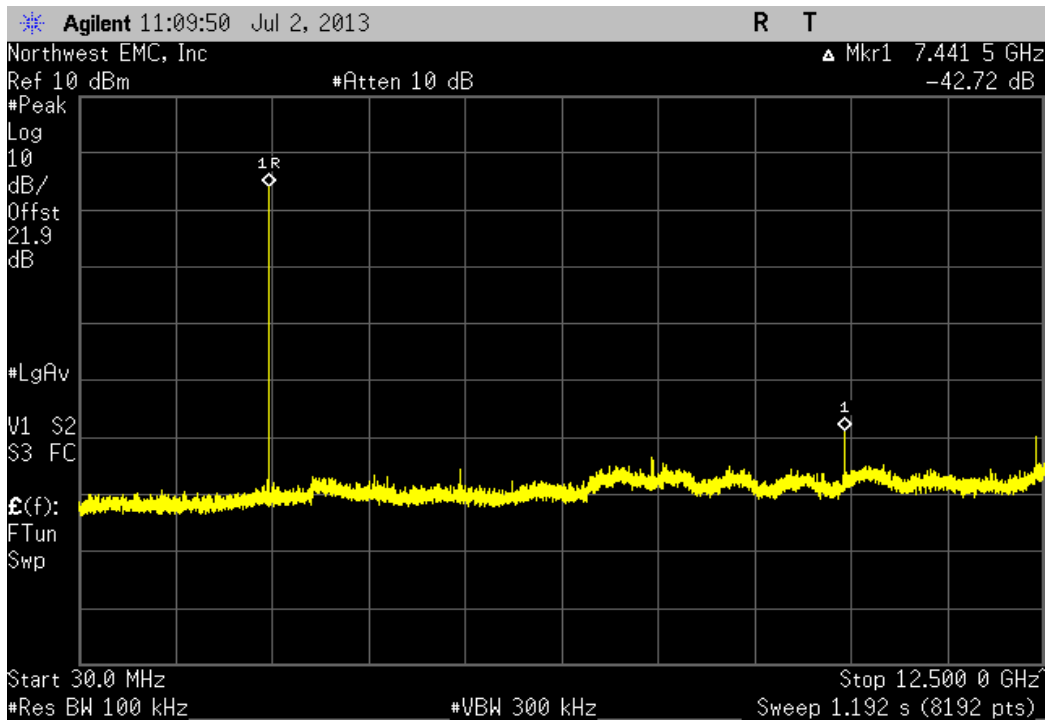
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-42.48 dBc	≤ -20 dBc	Pass	



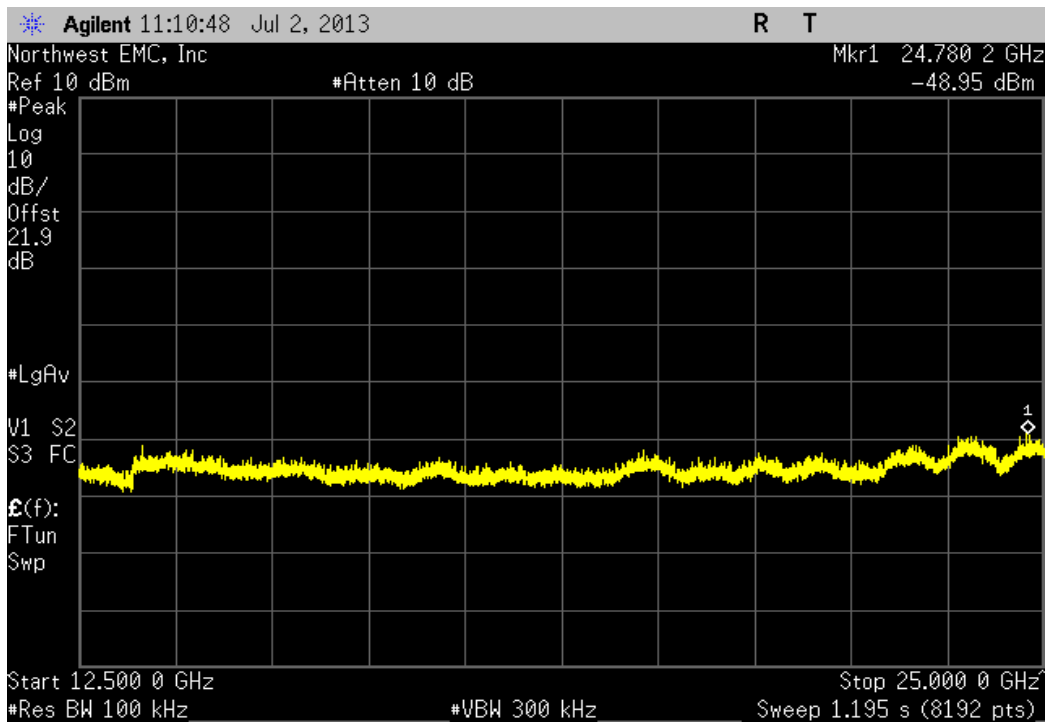
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-44.56 dBc	≤ -20 dBc	Pass	



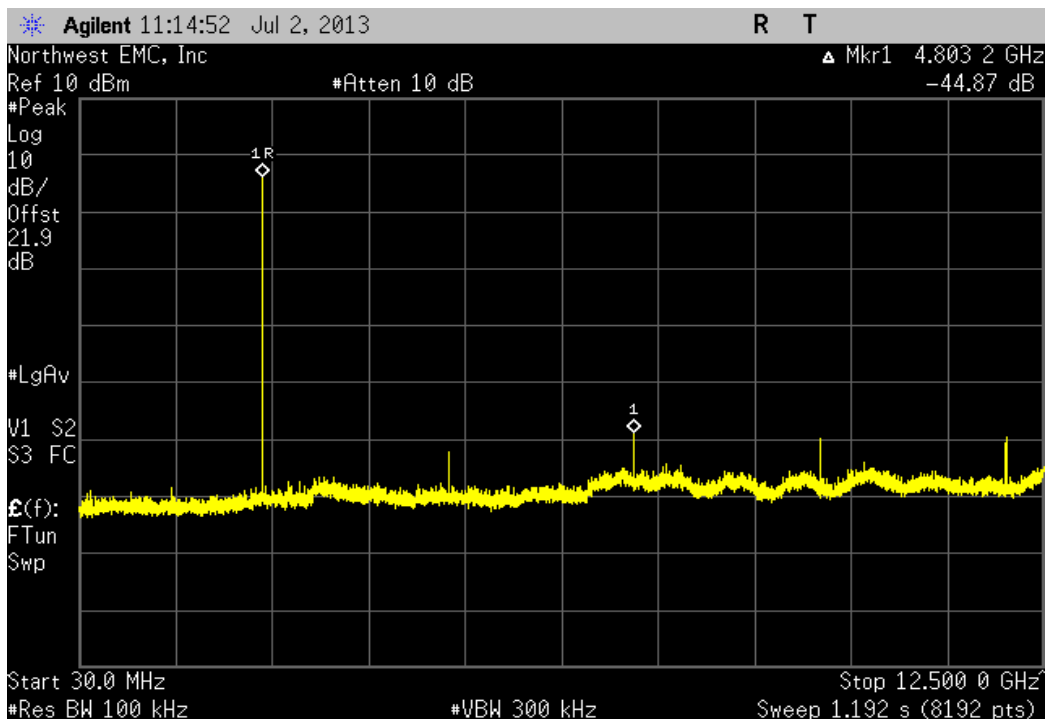
2DH5, pi/4-DQPSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-42.72 dBc	≤ -20 dBc	Pass	



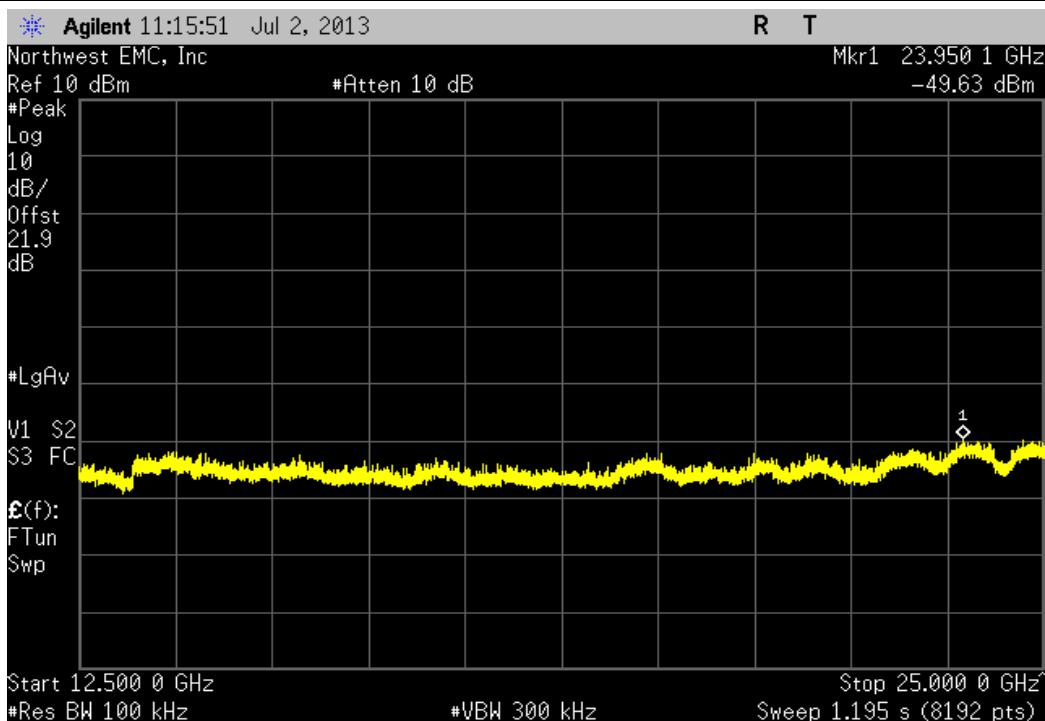
2DH5, pi/4-DQPSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-43.03 dBc	≤ -20 dBc	Pass	



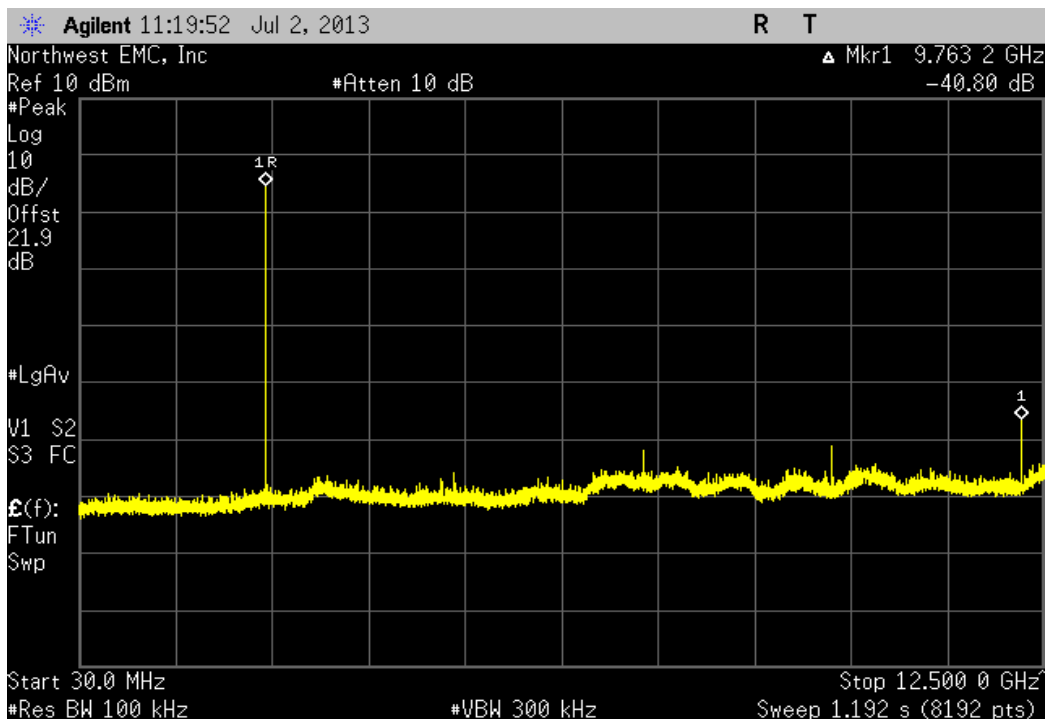
3DH5, 8-DPSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-44.86 dBc	≤ -20 dBc	Pass	



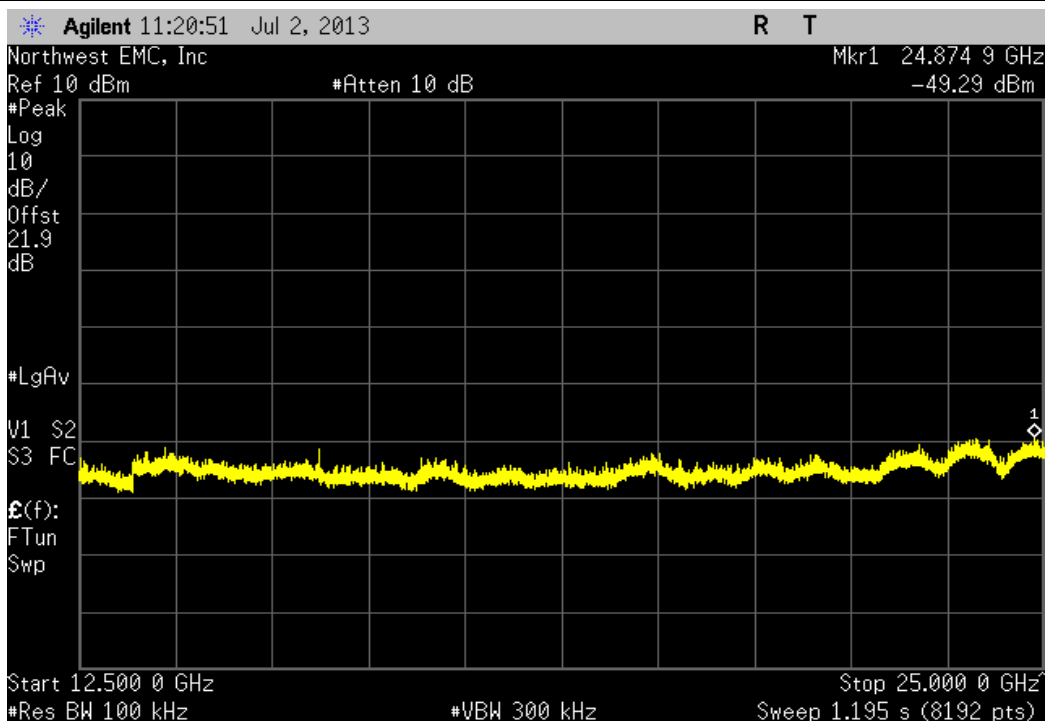
3DH5, 8-DPSK, Low Channel, 2402 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-45.79 dBc	≤ -20 dBc	Pass	



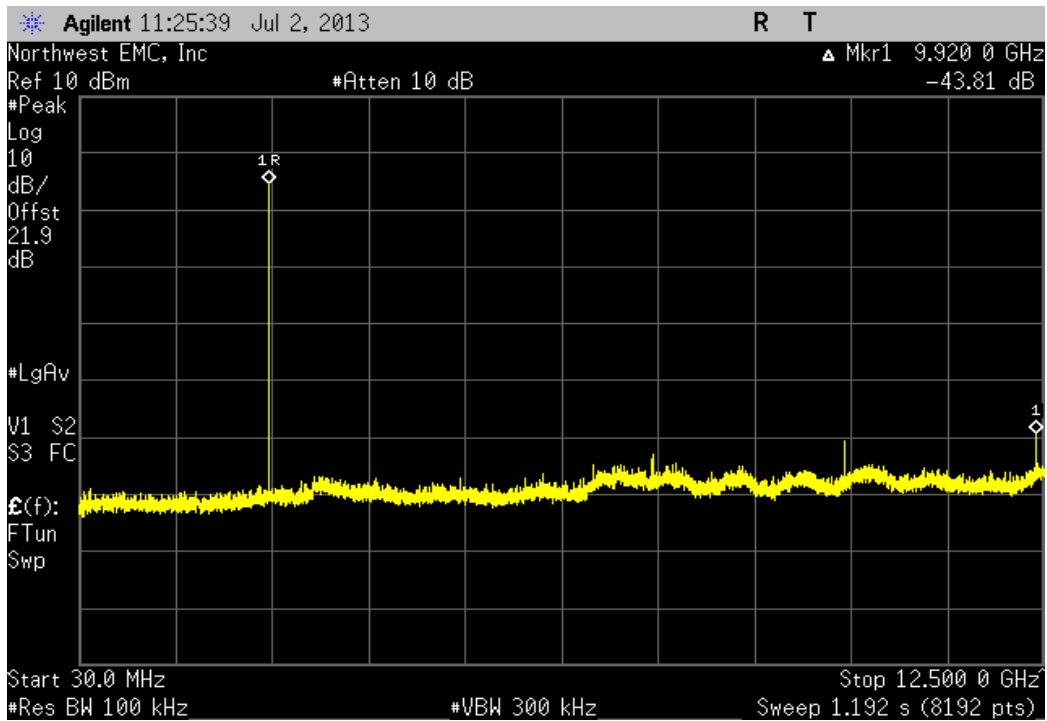
3DH5, 8-DPSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-40.8 dBc	≤ -20 dBc	Pass	



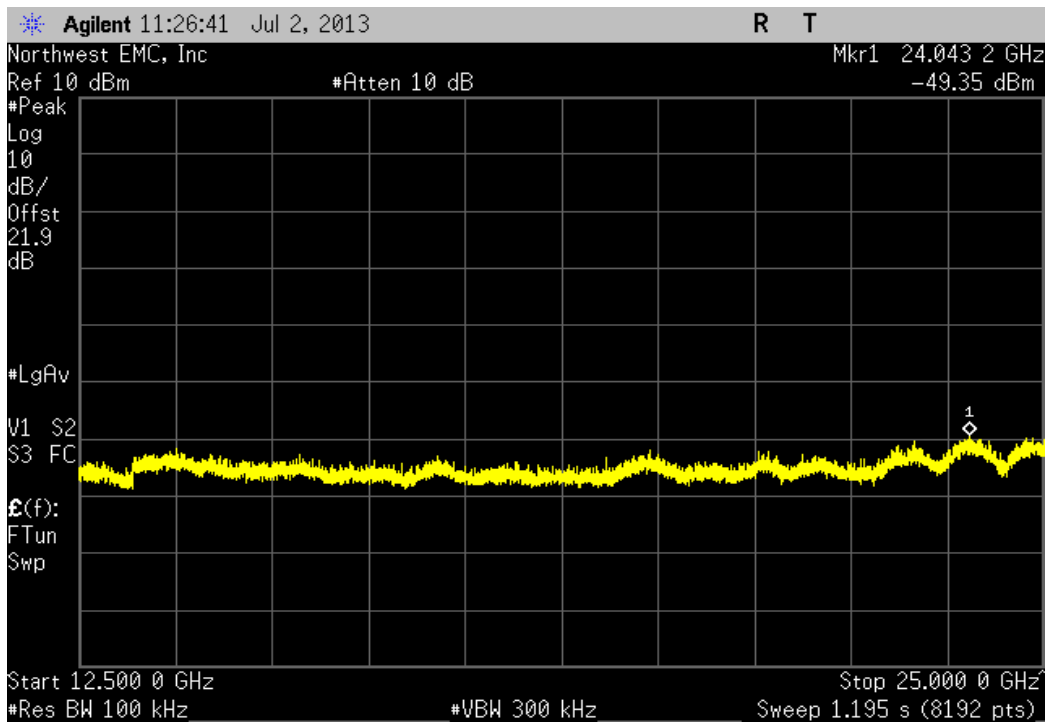
3DH5, 8-DPSK, Mid Channel, 2441 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-43.81 dBc	≤ -20 dBc	Pass	



3DH5, 8-DPSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-43.81 dBc	≤ -20 dBc	Pass	



3DH5, 8-DPSK, High Channel, 2480 MHz				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-43.87 dBc	≤ -20 dBc	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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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.



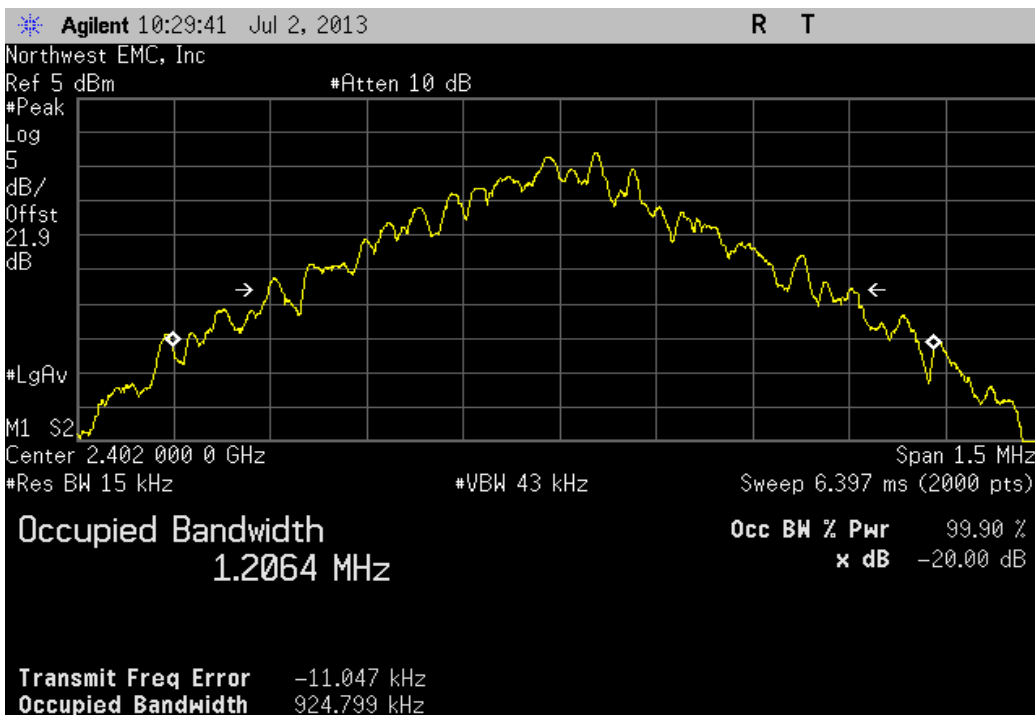
Occupied Bandwidth

XMit 2013.02.28
PsaTx 2013.06.07

EUT:	1601	Work Order:	MCSO1668
Serial Number:	006079632553	Date:	07/02/13
Customer:	Microsoft Corporation	Temperature:	26°C
Attendees:	None	Humidity:	46%
Project:	None	Barometric Pres.:	1020 mb
Tested by:	Richard Mellroth, Rod Peloquin	Power:	120 VAC / 60Hz
TEST SPECIFICATIONS		Job Site: NC02	
FCC 15.247:2013		Test Method	
		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Value	Limit
			Result
DH5, GFSK			
Low Channel, 2402 MHz		924.799 kHz	< 1.5 MHz
Mid Channel, 2441 MHz		914.15 kHz	< 1.5 MHz
High Channel, 2480 MHz		926.052 kHz	< 1.5 MHz
2DH5, pi/4-DQPSK			
Low Channel, 2402 MHz		1.325 MHz	< 1.5 MHz
Mid Channel, 2441 MHz		1.321 MHz	< 1.5 MHz
High Channel, 2480 MHz		1.325 MHz	< 1.5 MHz
3DH5, 8-DPSK			
Low Channel, 2402 MHz		1.293 MHz	< 1.5 MHz
Mid Channel, 2441 MHz		1.305 MHz	< 1.5 MHz
High Channel, 2480 MHz		1.304 MHz	< 1.5 MHz

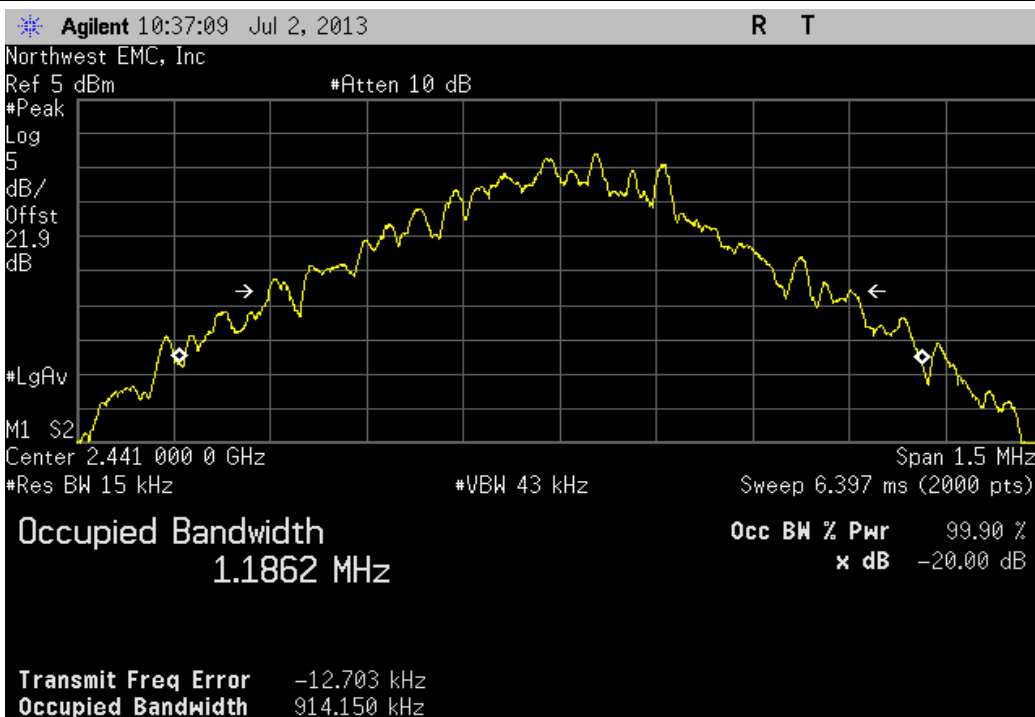
DH5, GFSK, Low Channel, 2402 MHz

Value	Limit	Result
924.799 kHz	< 1.5 MHz	Pass



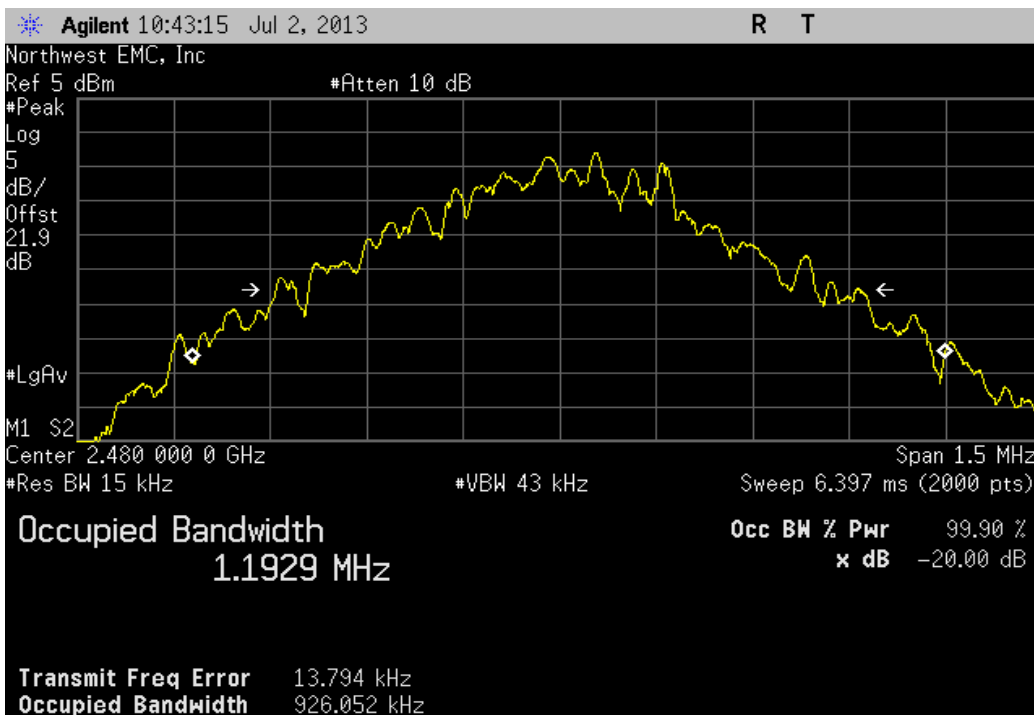
DH5, GFSK, Mid Channel, 2441 MHz

Value	Limit	Result
914.15 kHz	< 1.5 MHz	Pass



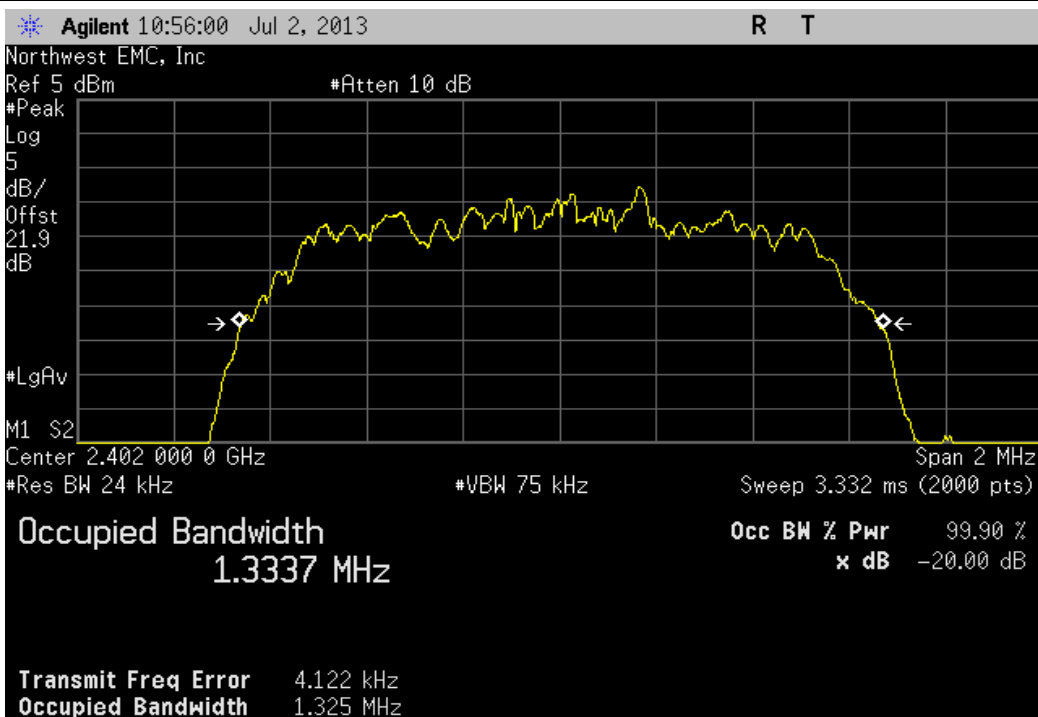
DH5, GFSK, High Channel, 2480 MHz

Value	Limit	Result
926.052 kHz	< 1.5 MHz	Pass



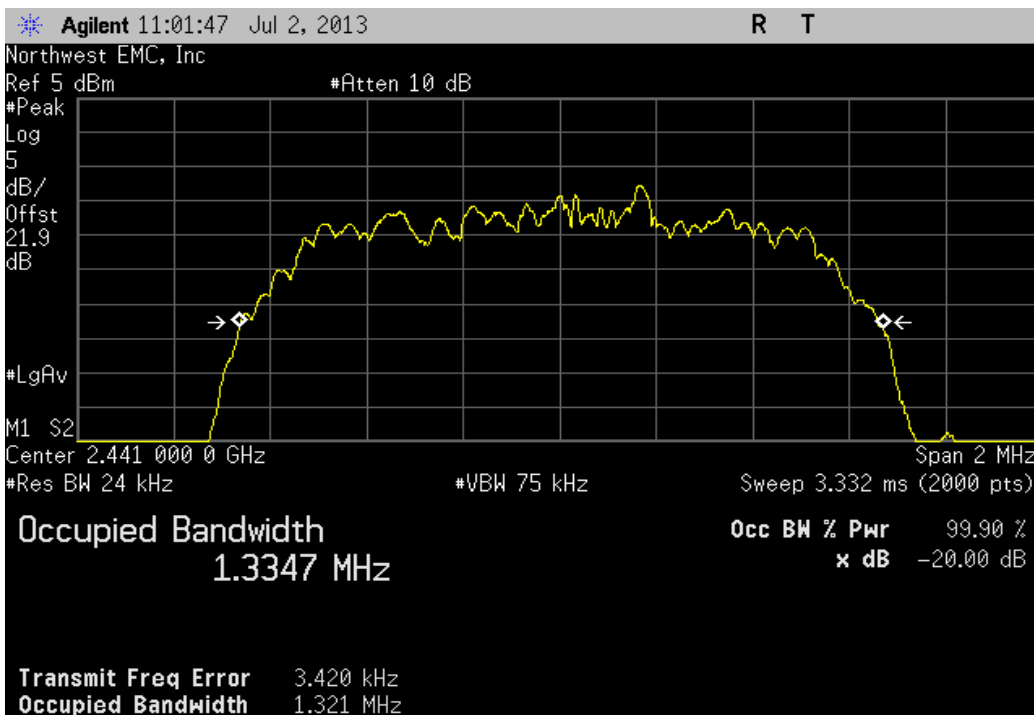
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz

Value	Limit	Result
1.325 MHz	< 1.5 MHz	Pass



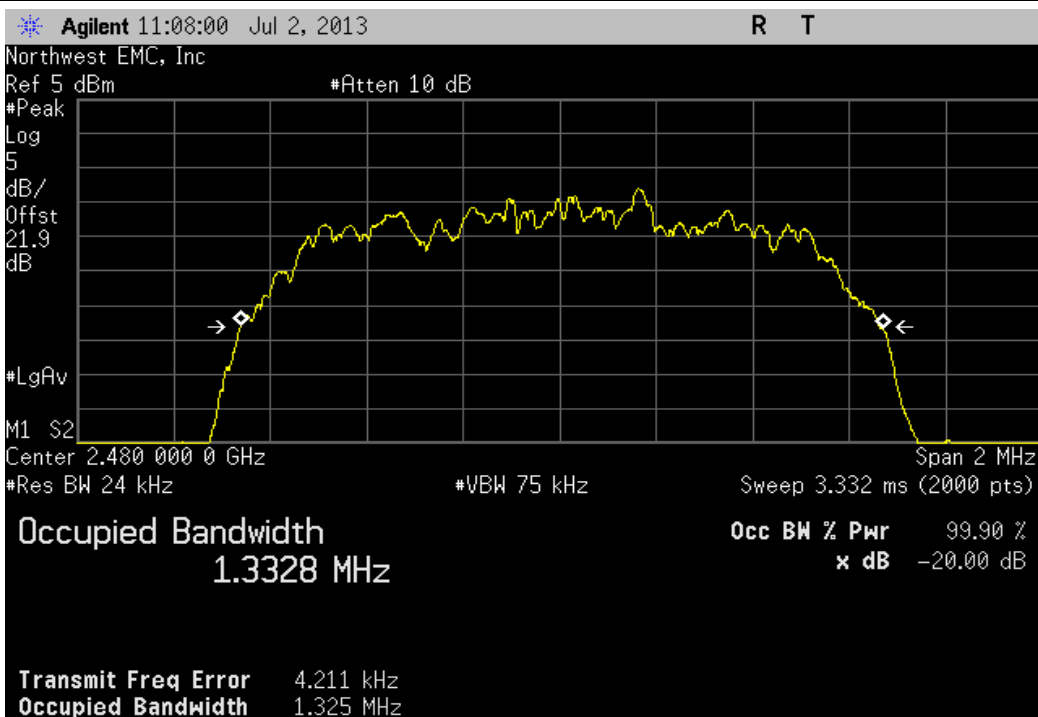
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz

Value	Limit	Result
1.321 MHz	< 1.5 MHz	Pass



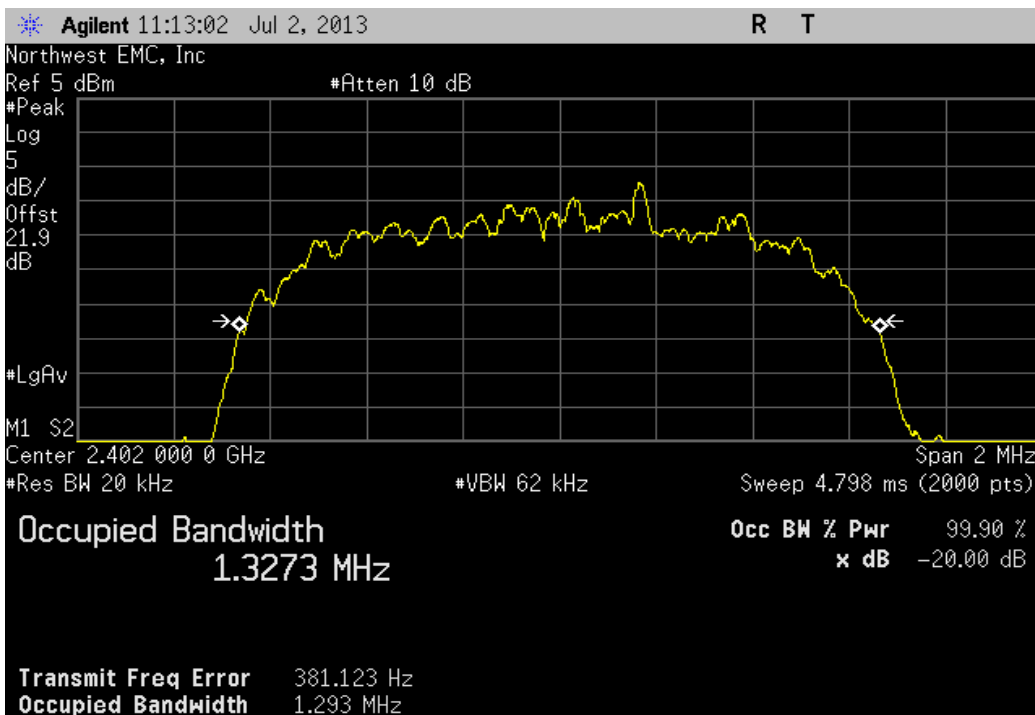
2DH5, pi/4-DQPSK, High Channel, 2480 MHz

Value	Limit	Result
1.325 MHz	< 1.5 MHz	Pass



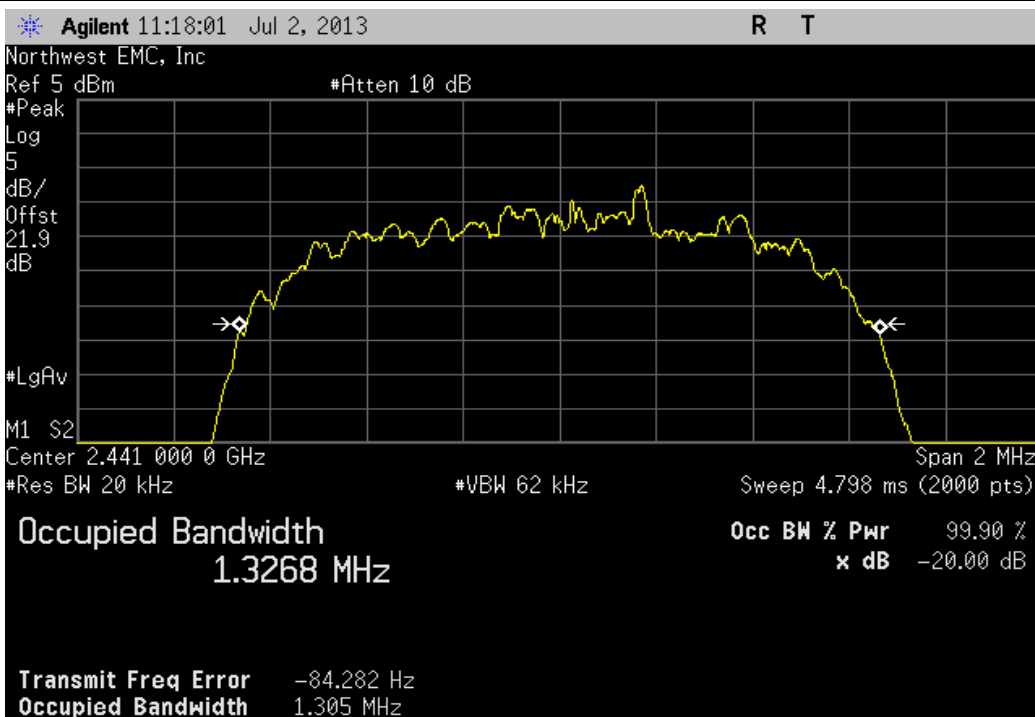
3DH5, 8-DPSK, Low Channel, 2402 MHz

Value	Limit	Result
1.293 MHz	< 1.5 MHz	Pass



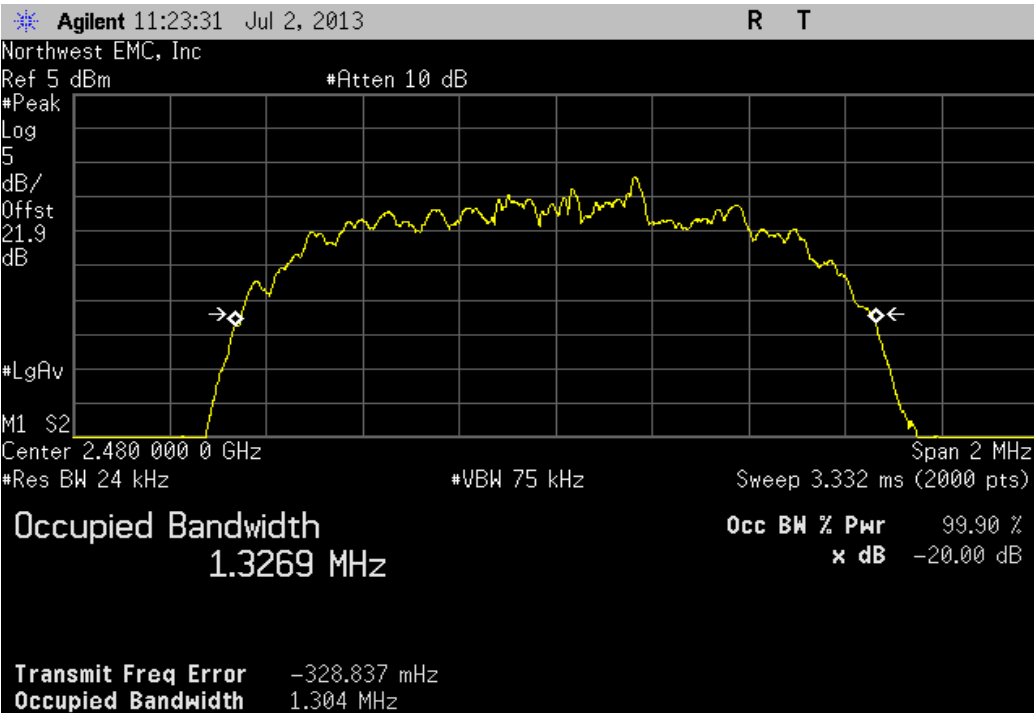
3DH5, 8-DPSK, Mid Channel, 2441 MHz

Value	Limit	Result
1.305 MHz	< 1.5 MHz	Pass



3DH5, 8-DPSK, High Channel, 2480 MHz

Value	Limit	Result
1.304 MHz	< 1.5 MHz	Pass



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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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.

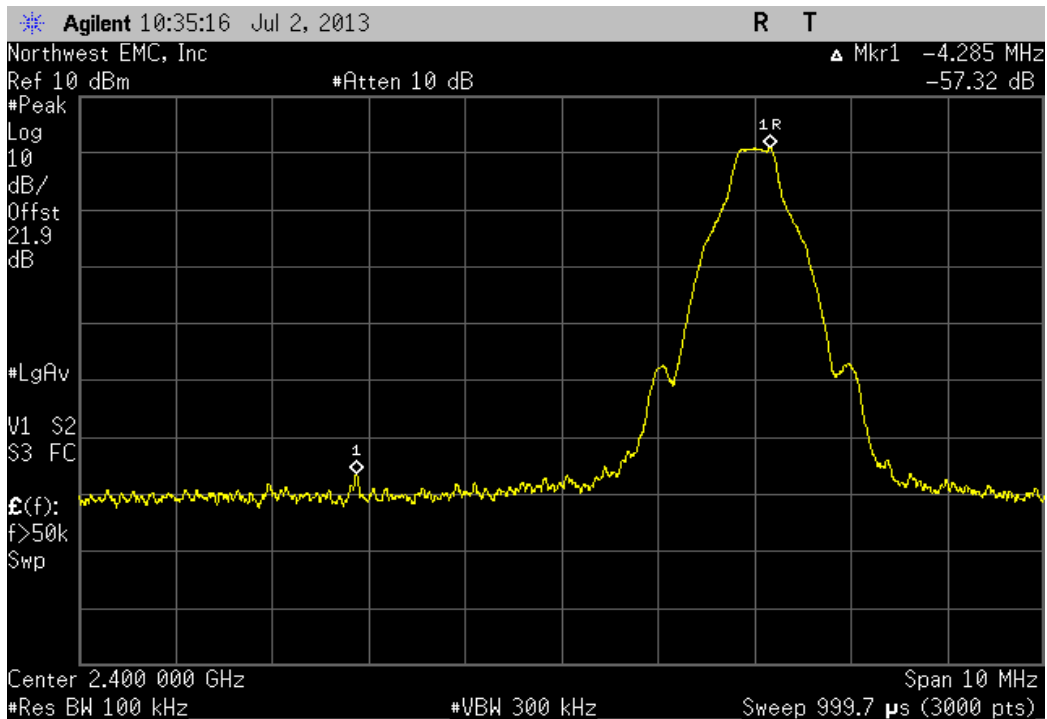


Band Edge Compliance

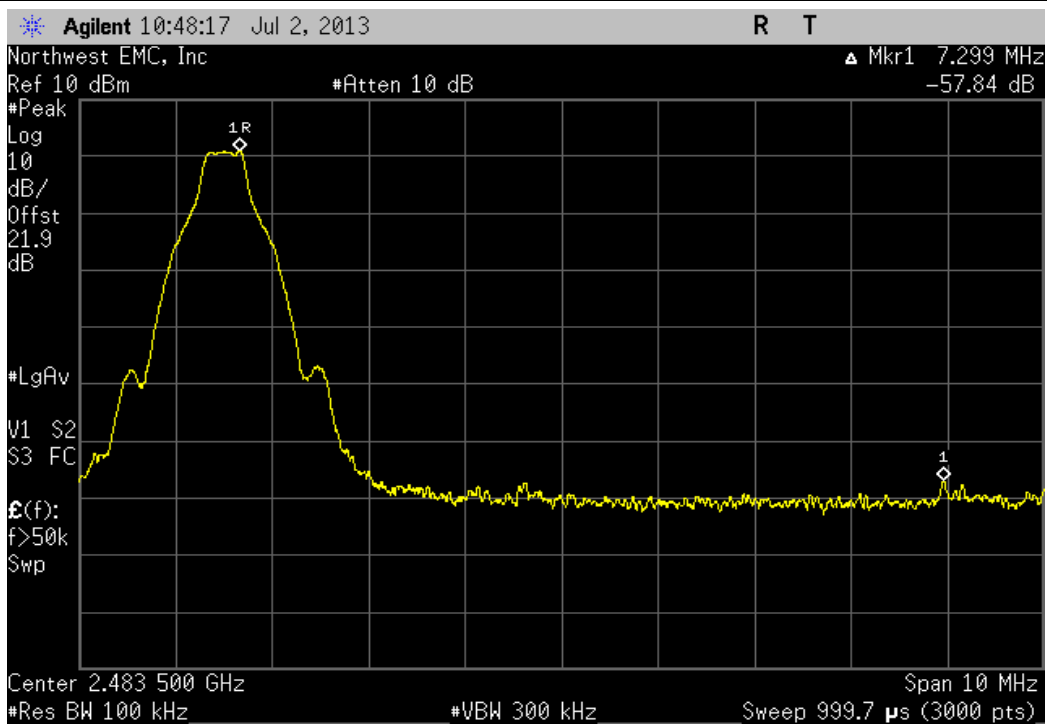
XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCSO1668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2013		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Value	Limit
DH5, GFSK			Result
Low Channel, 2402 MHz		-57.32 dBc	≤ -20 dBc
High Channel, 2480 MHz		-57.84 dBc	≤ -20 dBc
2DH5, pi/4-DQPSK			
Low Channel, 2402 MHz		-48.6 dBc	≤ -20 dBc
High Channel, 2480 MHz		-54.74 dBc	≤ -20 dBc
3DH5, 8-DPSK			
Low Channel, 2402 MHz		-47.89 dBc	≤ -20 dBc
High Channel, 2480 MHz		-53.21 dBc	≤ -20 dBc

DH5, GFSK, Low Channel, 2402 MHz						
				Value	Limit	Result
				-57.32 dBc	≤ -20 dBc	Pass

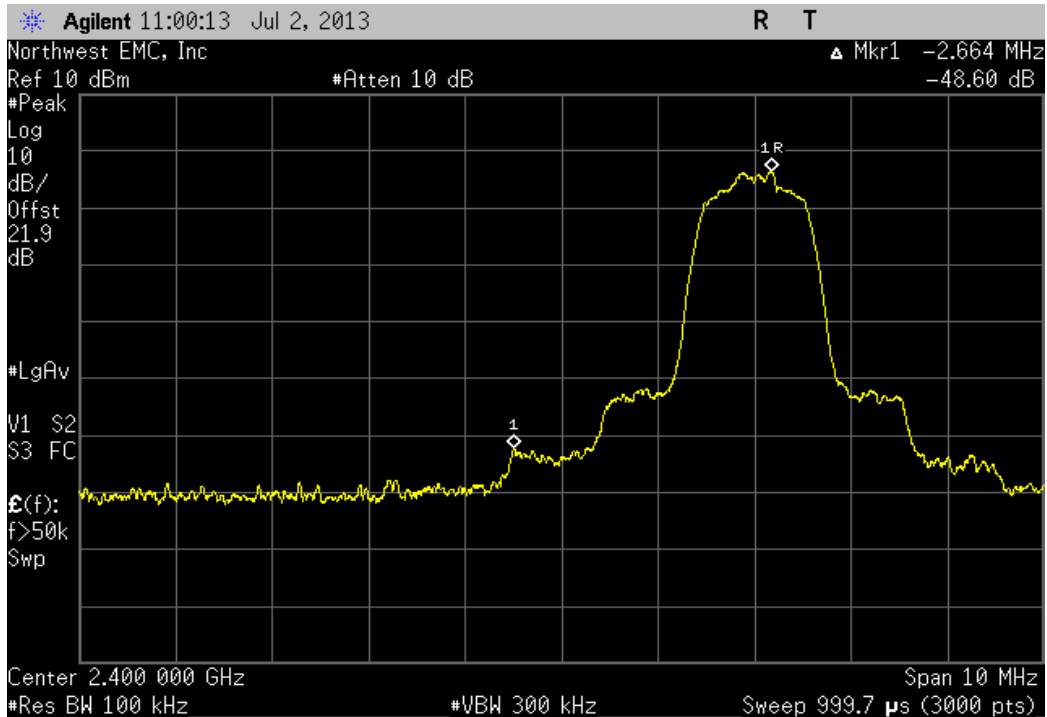


DH5, GFSK, High Channel, 2480 MHz						
				Value	Limit	Result
				-57.84 dBc	≤ -20 dBc	Pass



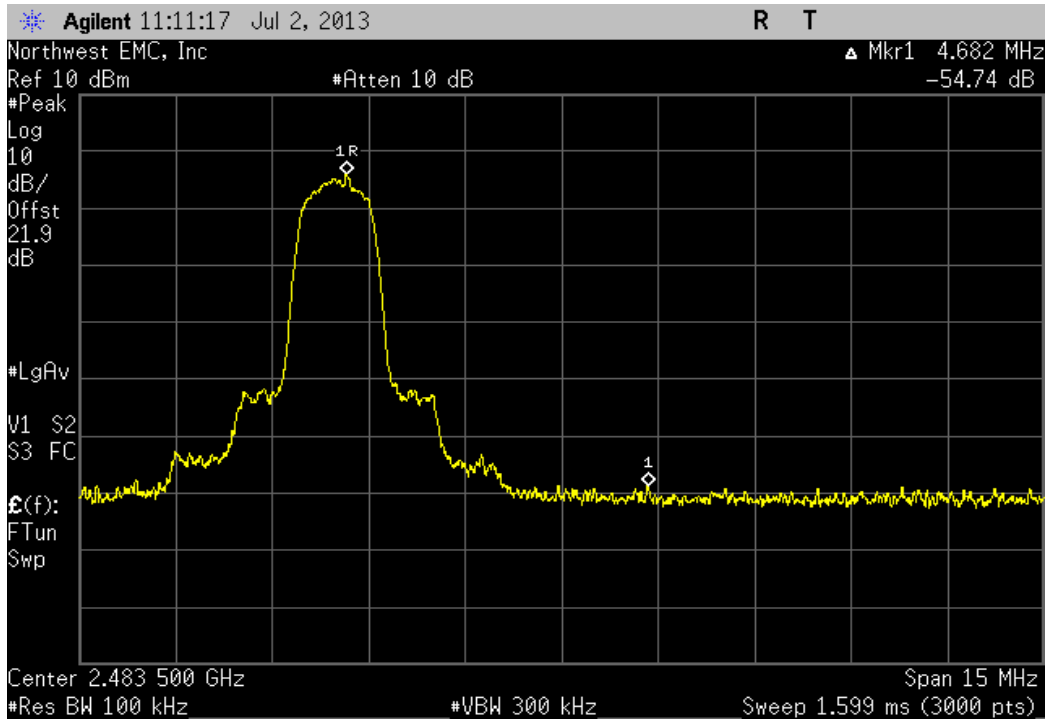
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz

Value	Limit	Result
-48.6 dBc	≤ -20 dBc	Pass



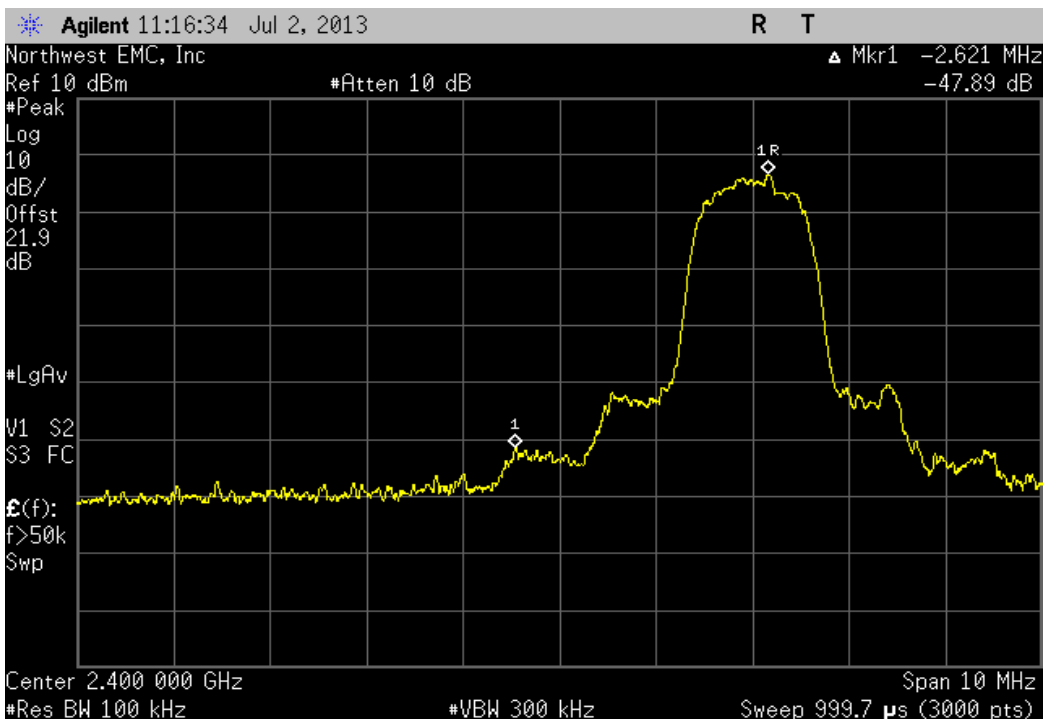
2DH5, pi/4-DQPSK, High Channel, 2480 MHz

Value	Limit	Result
-54.74 dBc	≤ -20 dBc	Pass



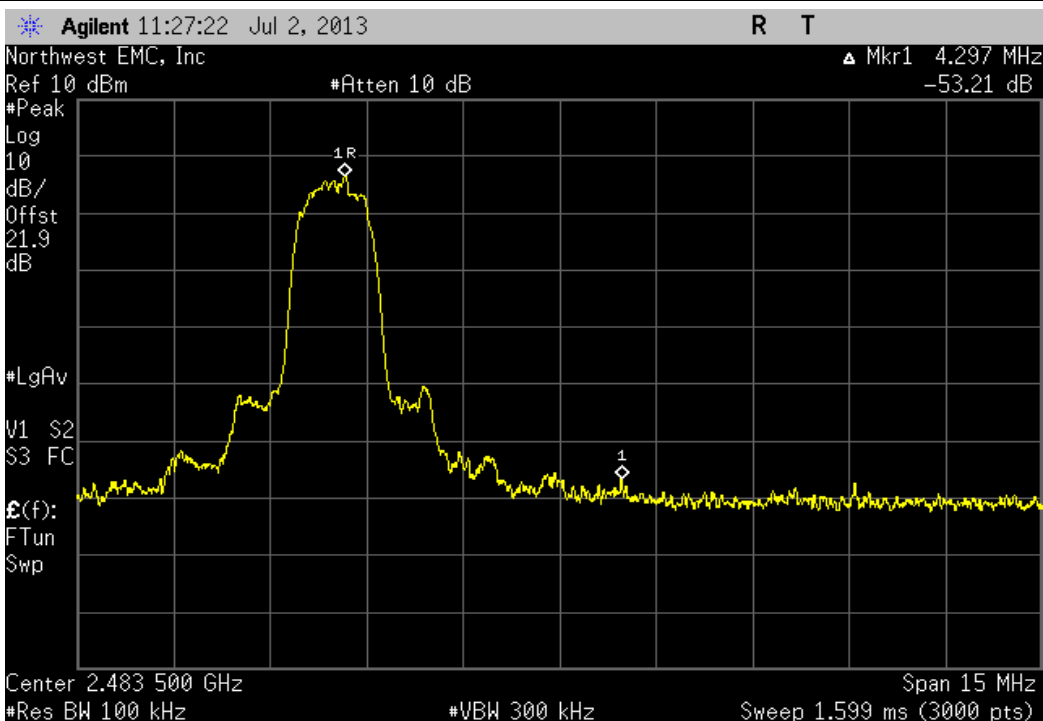
3DH5, 8-DPSK, Low Channel, 2402 MHz

Value	Limit	Result
-47.89 dBc	≤ -20 dBc	Pass



3DH5, 8-DPSK, High Channel, 2480 MHz

Value	Limit	Result
-53.21 dBc	≤ -20 dBc	Pass



Channel 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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

TEST DESCRIPTION

The carrier frequency separation was measured between each of 5 hopping channels 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.



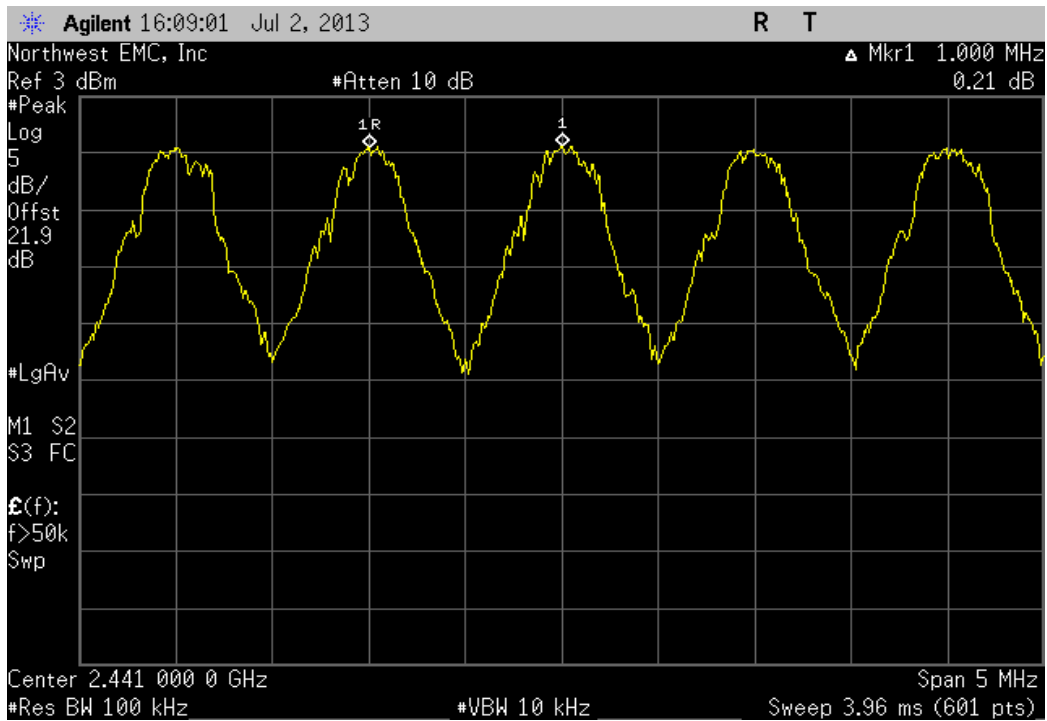
Channel Separation

XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCSO1668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2013		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Value	Limit
Hopping Mode		1.0 MHz	≥ 1 MHz
			Result
			Pass

Hopping Mode

Value	Limit	Result
1.0 MHz	≥ 1 MHz	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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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.

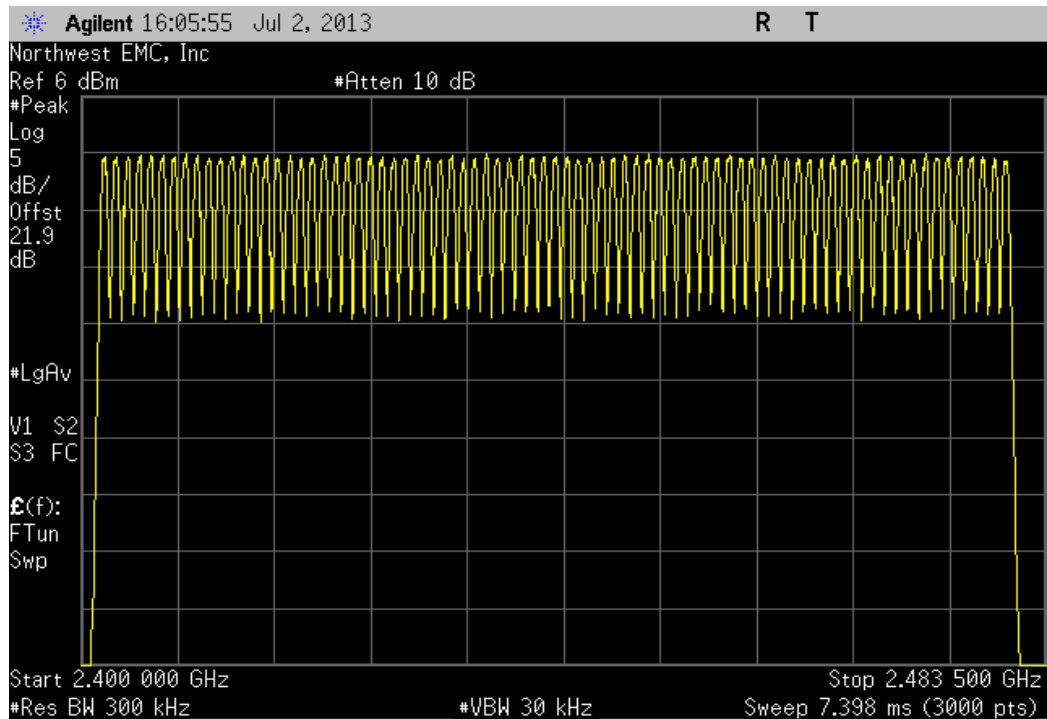


Number of Hopping Frequencies

XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCS01668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2013		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Number of Channels	Limit
Hopping Mode		79	≥ 15
			Result
			Pass

Hopping Mode				Number of Channels	Limit	Result
				79	≥ 15	Pass



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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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. For Bluetooth this would be 79 Channels * 400mS = 31.6 Sec.

On Time During 31.6 Sec = Pulse Width * Average Number of Pulses * Scale Factor

➤ Average Number of Pulses is based on 4 samples.

➤ Scale Factor = 31.6 Sec / Screen Capture Sweep Time = 31.6 Sec / 6.32 Sec = 5

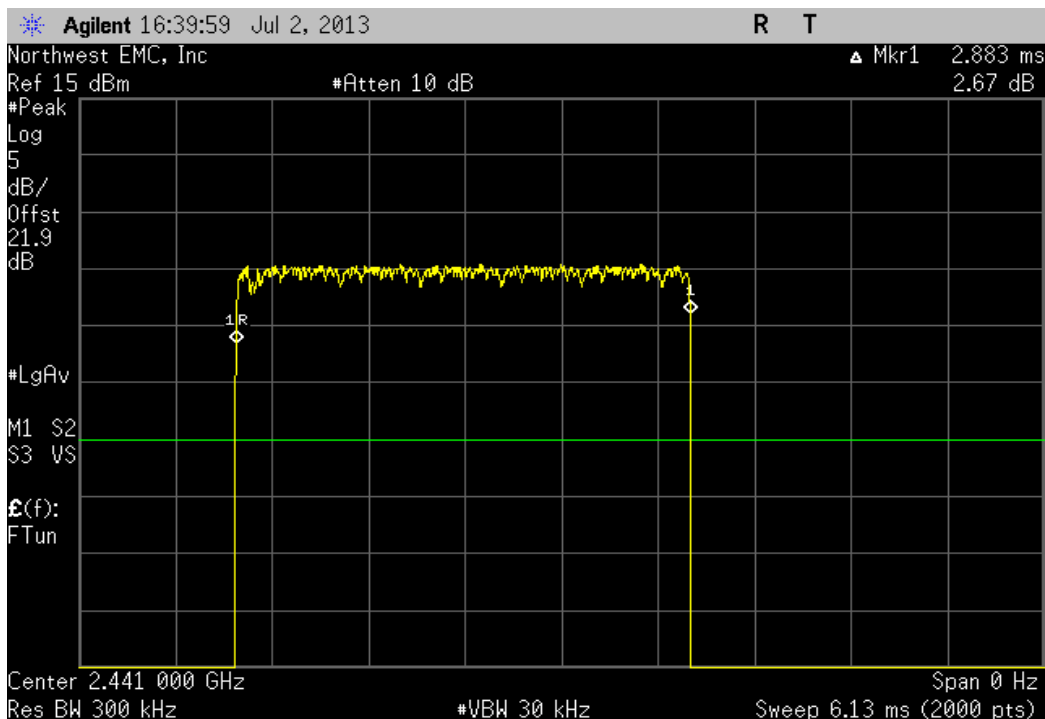


Dwell Time

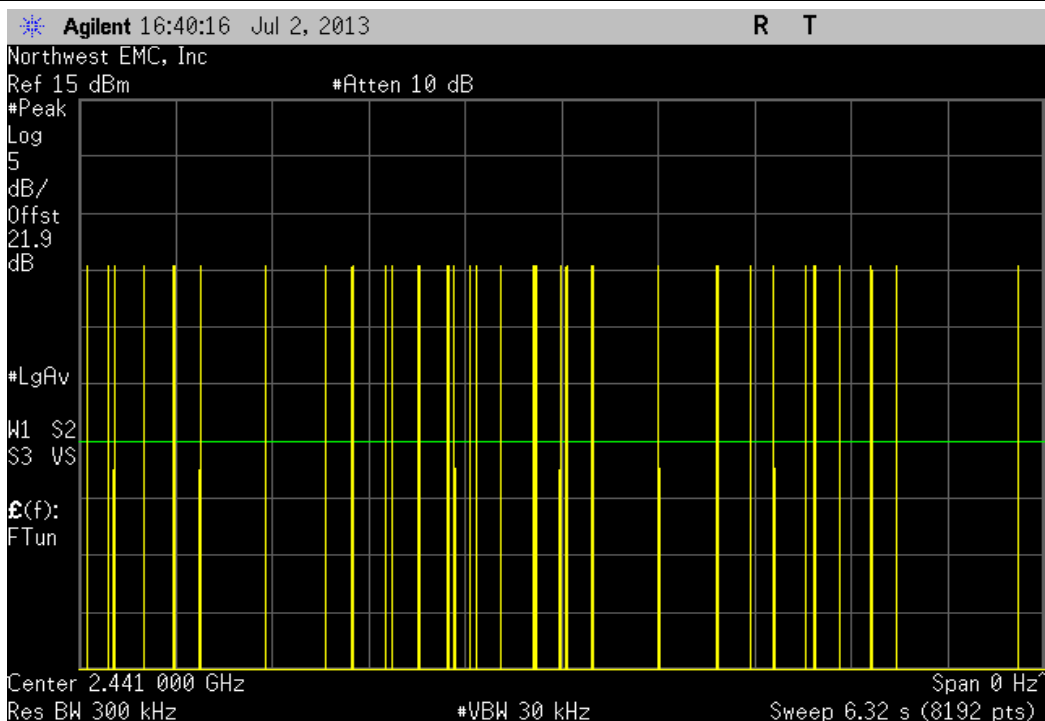
XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCSO1668						
Serial Number: 006079632553		Date: 07/02/13						
Customer: Microsoft Corporation		Temperature: 26°C						
Attendees: None		Humidity: 46%						
Project: None		Barometric Pres.: 1020 mb						
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz						
		Job Site: NC02						
TEST SPECIFICATIONS		Test Method						
FCC 15.247:2013		ANSI C63.10:2009						
COMMENTS								
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4								
DEVIATIONS FROM TEST STANDARD								
None								
Configuration #	1	Signature <i>Rod Peloquin</i>						
		Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
Hopping Mode								
DH5, GFSK								
Mid Channel, 2441 MHz								
2.883 N/A N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 32 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 27 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 21 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 17 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
2.883 N/A 24.25 5 349.56 400 Pass								
2DH5, pi/4-DQPSK								
Mid Channel, 2441 MHz								
2.883 N/A N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 28 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 22 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 19 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 22 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
2.883 N/A 22.75 5 327.94 400 Pass								
3DH5, 8-DPSK								
Mid Channel, 2441 MHz								
2.886 N/A N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 22 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 17 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 22 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
N/A 17 N/A N/A N/A N/A N/A N/A								
Mid Channel, 2441 MHz								
2.886 N/A 19.5 5 281.38 400 Pass								

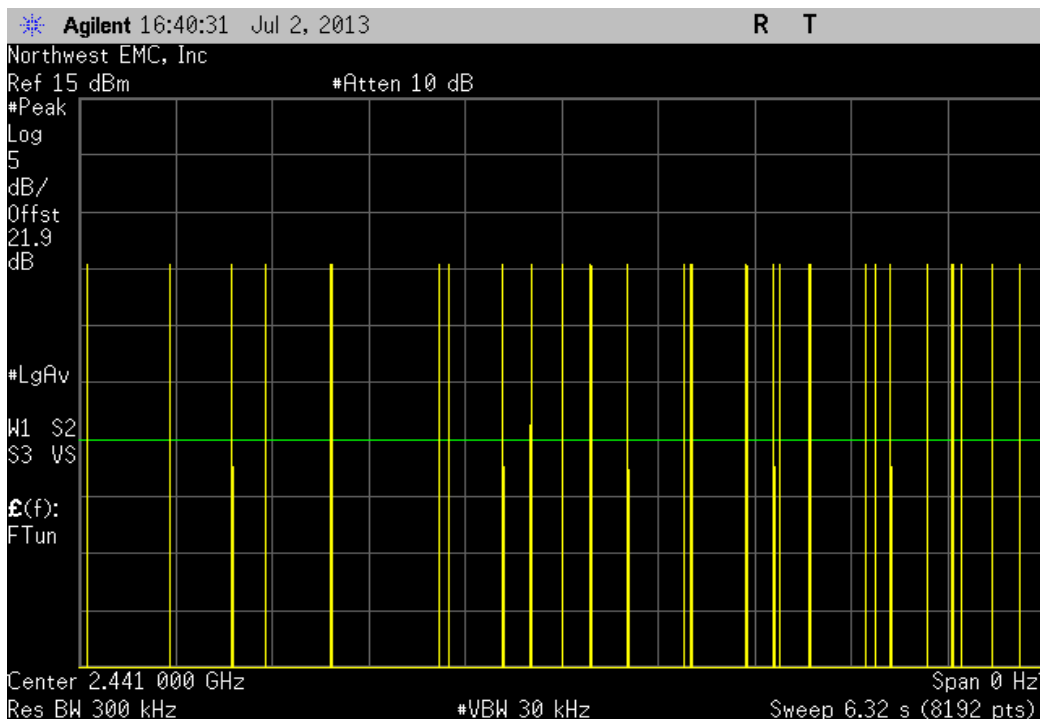
Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.883	N/A	N/A	N/A	N/A	N/A	N/A



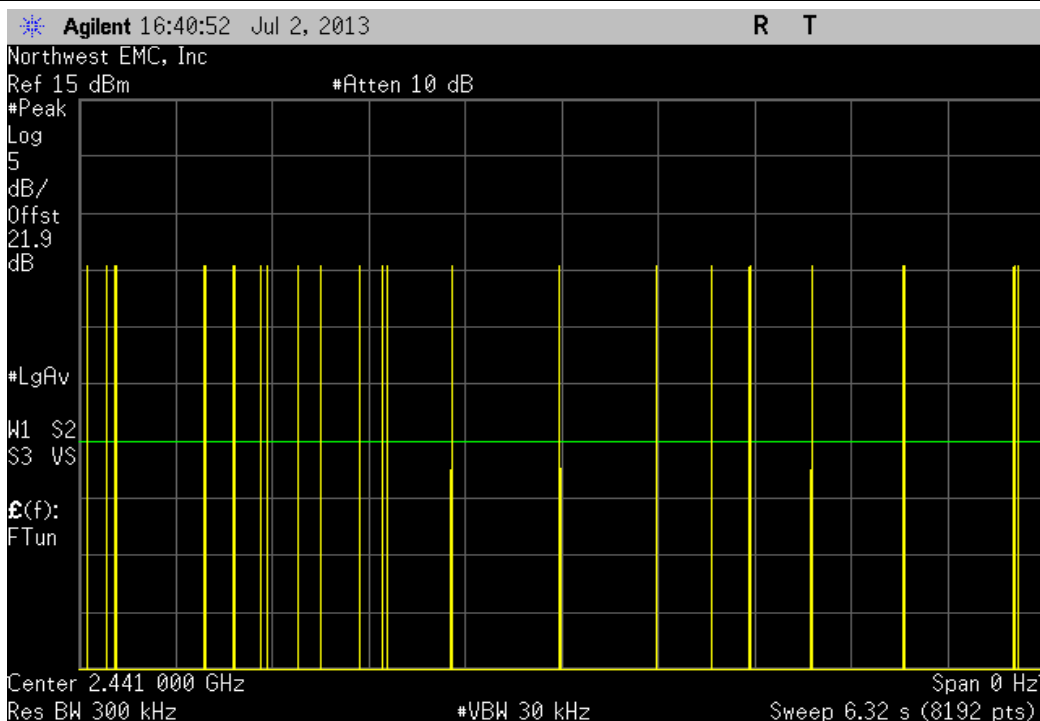
Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	32	N/A	N/A	N/A	N/A	N/A



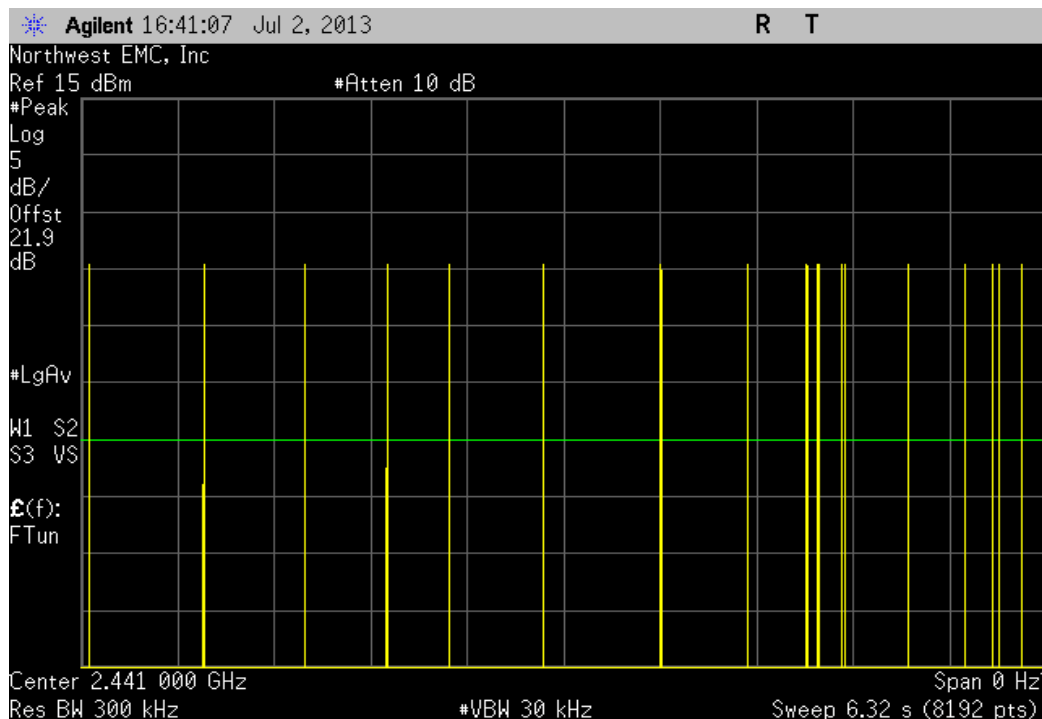
Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	27	N/A	N/A	N/A	N/A	N/A



Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	21	N/A	N/A	N/A	N/A	N/A



Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	17	N/A	N/A	N/A	N/A	N/A

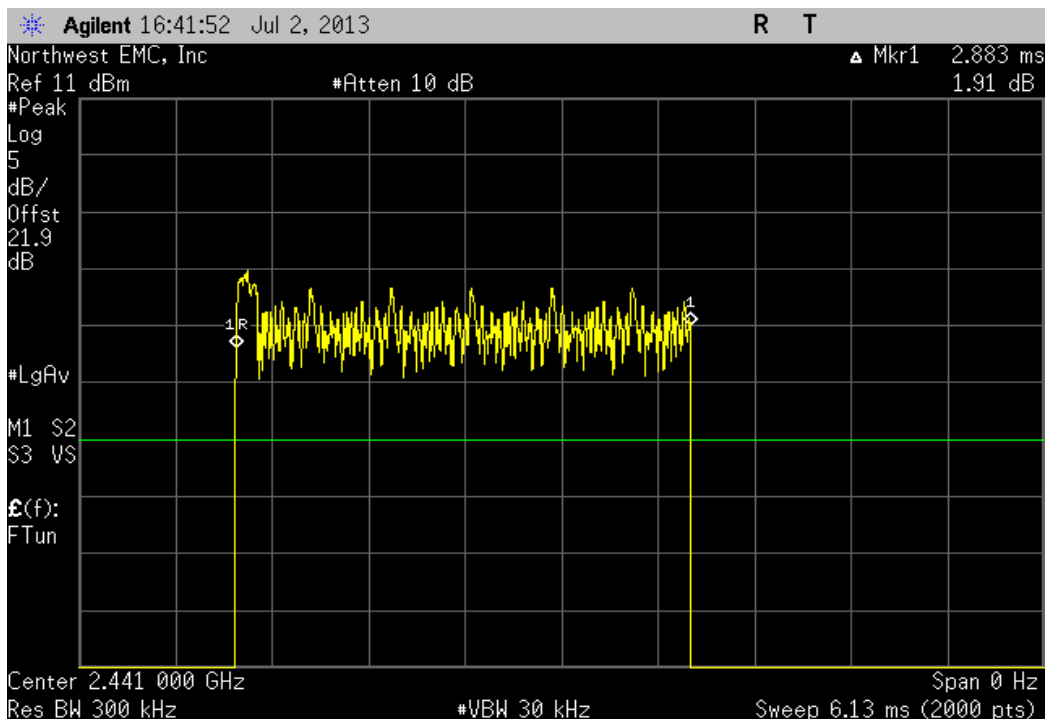


Hopping Mode, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.883	N/A	24.25	5	349.56	400	Pass

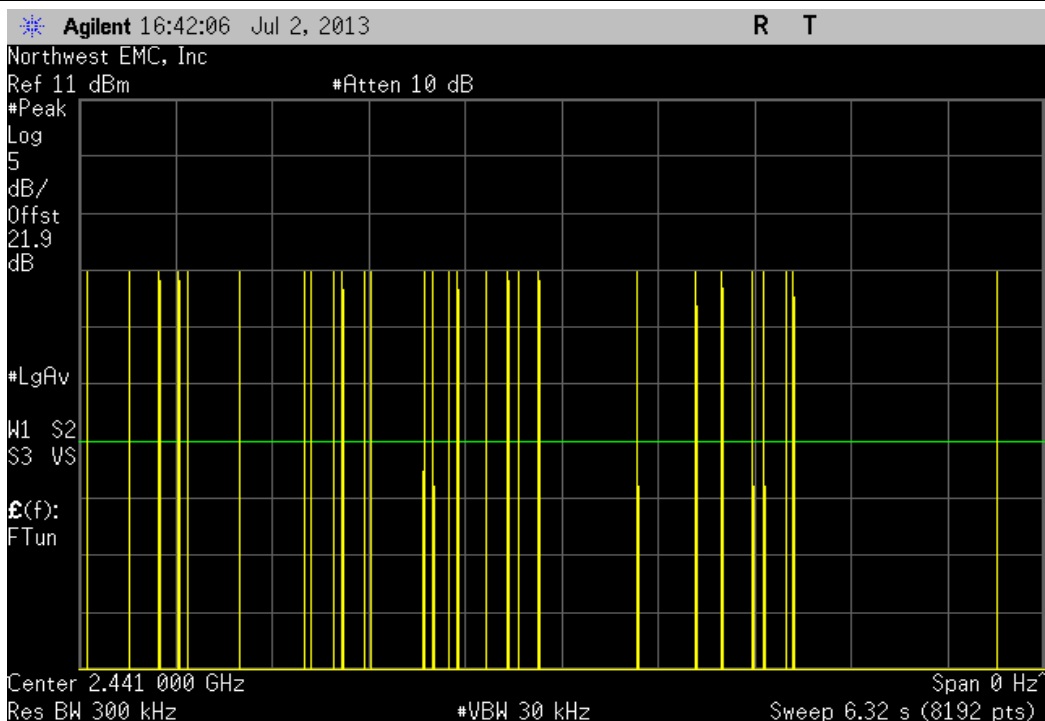
Calculation Only

No Screen Capture Required

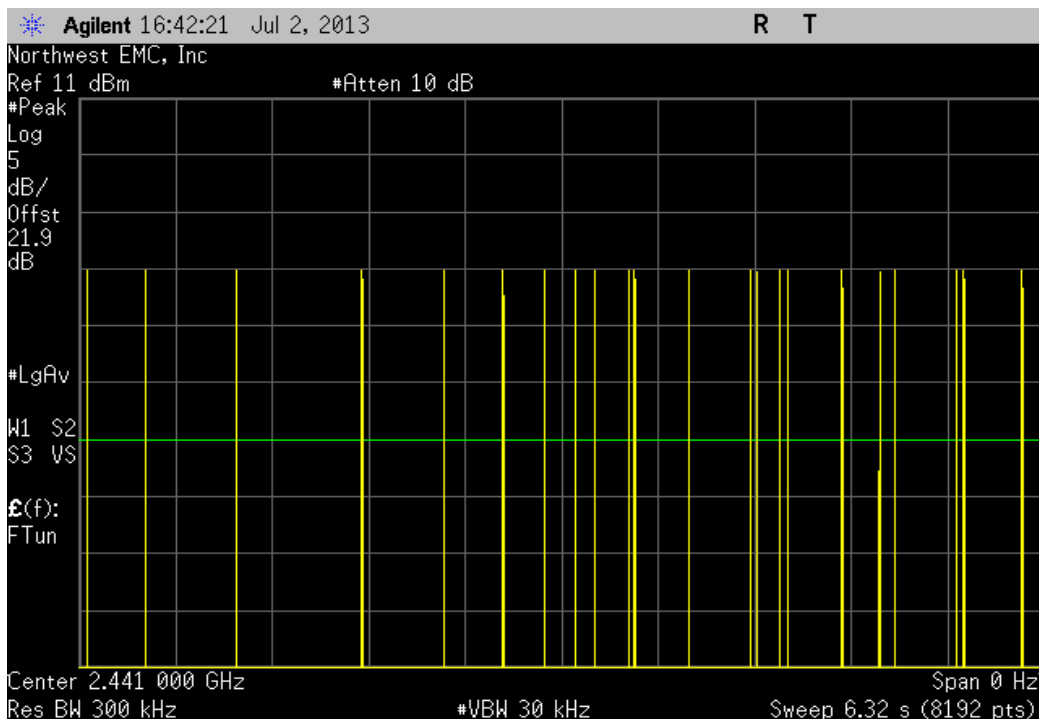
Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.883	N/A	N/A	N/A	N/A	N/A	N/A



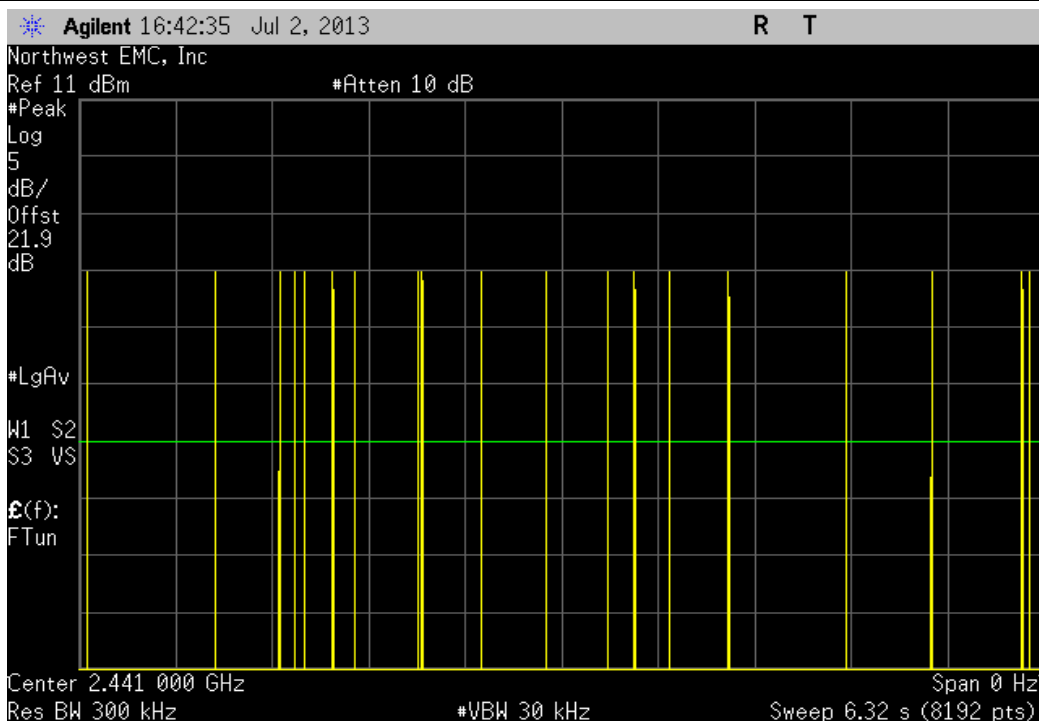
Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	28	N/A	N/A	N/A	N/A	N/A



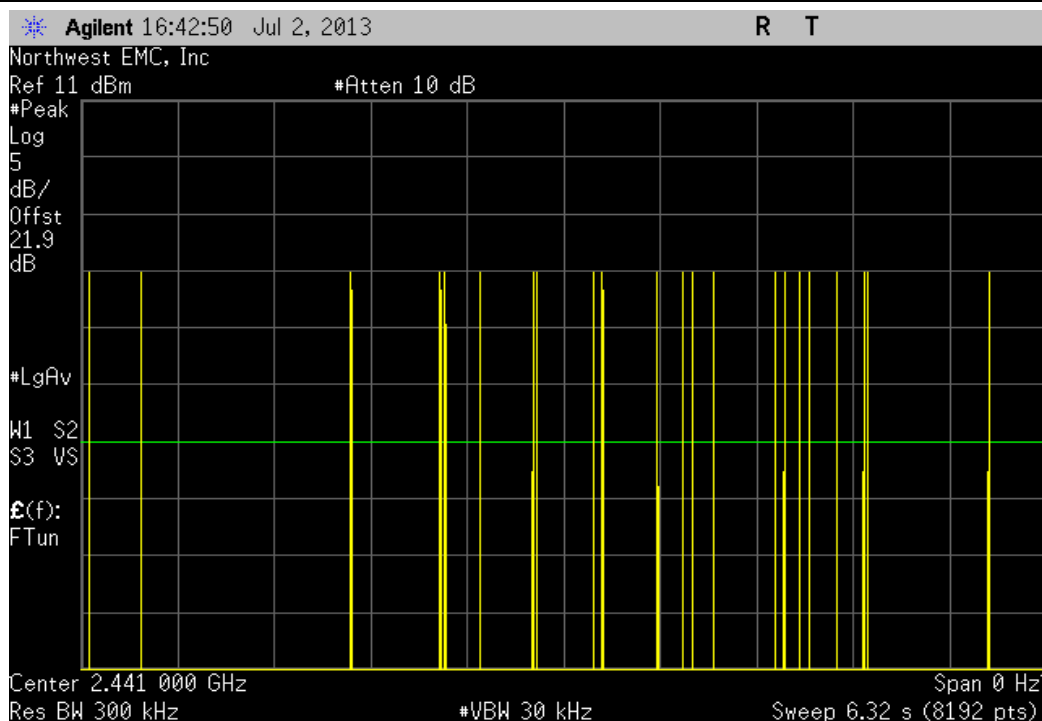
Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	22	N/A	N/A	N/A	N/A	N/A



Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	19	N/A	N/A	N/A	N/A	N/A



Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	22	N/A	N/A	N/A	N/A	N/A

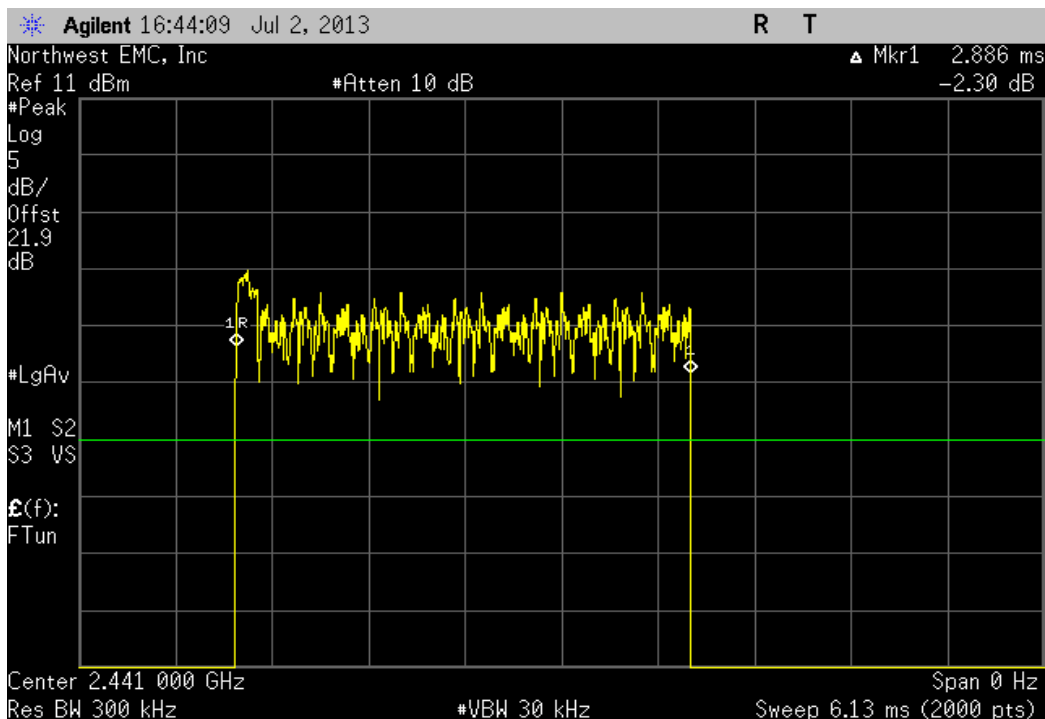


Hopping Mode, 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.883	N/A	22.75	5	327.94	400	Pass

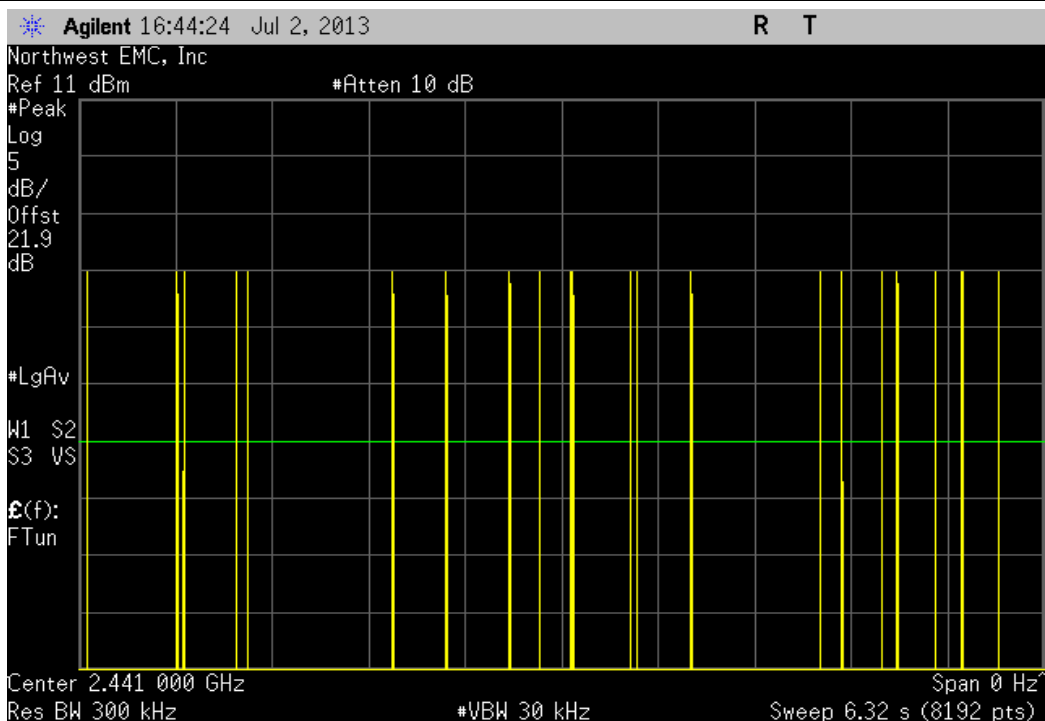
Calculation Only

No Screen Capture Required

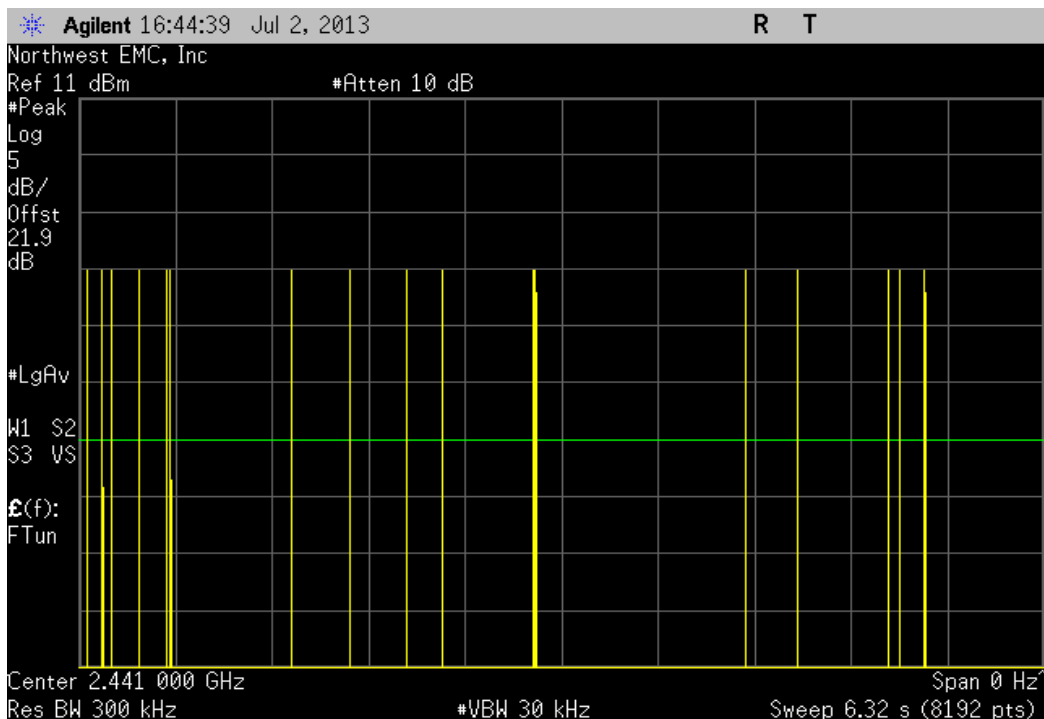
Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.886	N/A	N/A	N/A	N/A	N/A	N/A



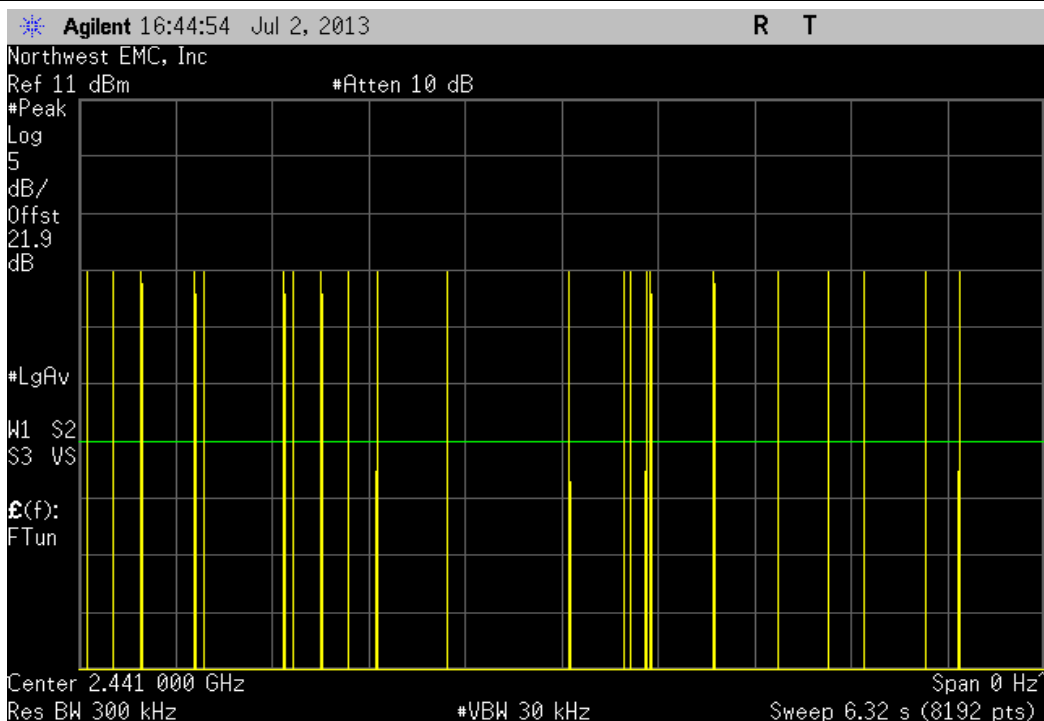
Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	22	N/A	N/A	N/A	N/A	N/A



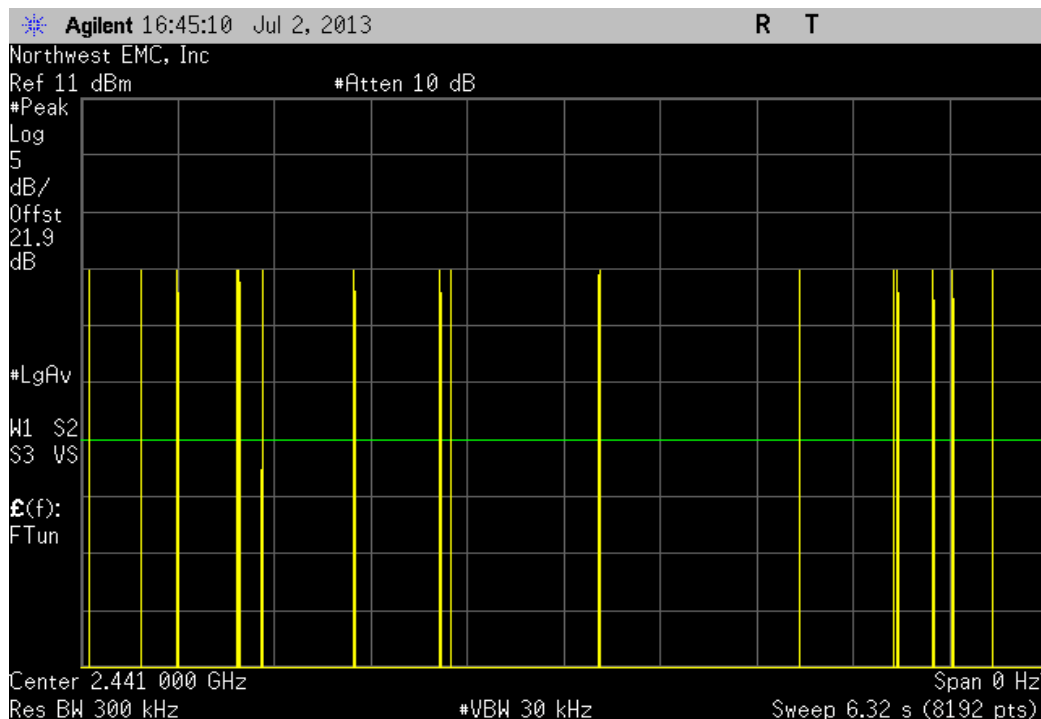
Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	17	N/A	N/A	N/A	N/A	N/A



Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	22	N/A	N/A	N/A	N/A	N/A



Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
N/A	17	N/A	N/A	N/A	N/A	N/A



Hopping Mode, 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (mS)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.886	N/A	19.5	5	281.38	400	Pass

Calculation Only

No Screen Capture Required



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
Signal Generator	Agilent	N5183A	TID	9/19/2011	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/12/2013	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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.



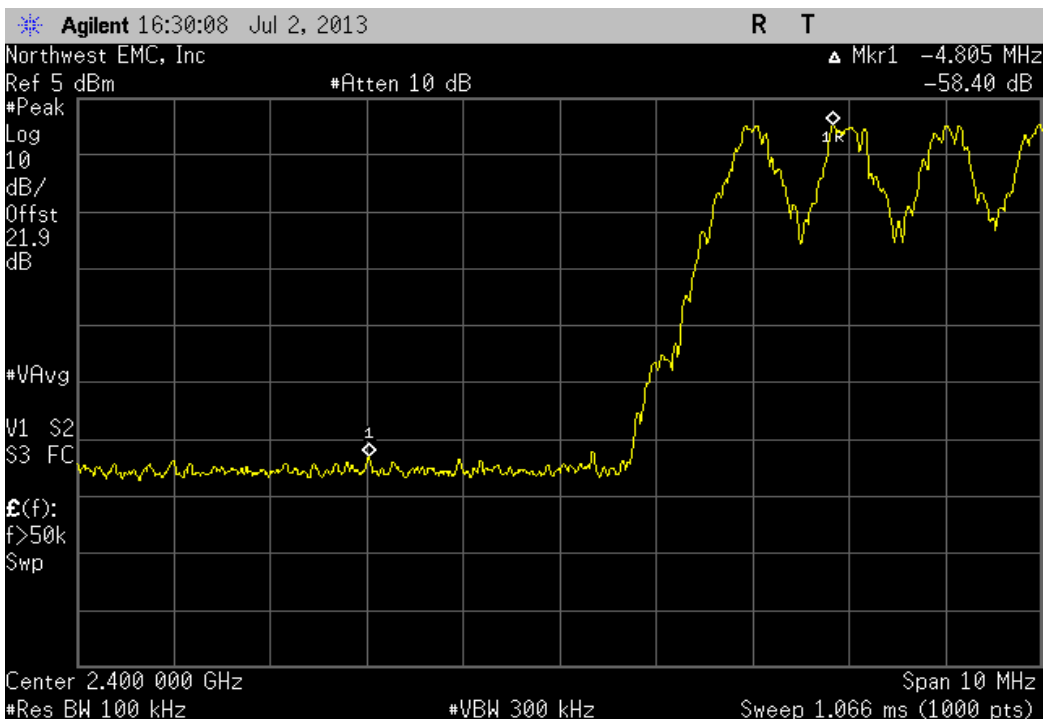
Band Edge Compliance-Hopping Mode

XMit 2013.02.28
PsaTx 2013.06.07

EUT: 1601		Work Order: MCS01668	
Serial Number: 006079632553		Date: 07/02/13	
Customer: Microsoft Corporation		Temperature: 26°C	
Attendees: None		Humidity: 46%	
Project: None		Barometric Pres.: 1020 mb	
Tested by: Richard Mellroth, Rod Peloquin		Power: 120 VAC / 60Hz	
		Job Site: NC02	
TEST SPECIFICATIONS			
FCC 15.247:2013		Test Method	
		ANSI C63.10:2009	
COMMENTS			
Adapter cable loss of 0.75dB added to analyzer reference level offset. EUT power setting in control software were set to Power Class: 2, and Power Level: 4			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Richard Mellroth</i>	
		Value	Limit
Hopping Mode			Result
DH5, GFSK			
Low Channel, 2402 MHz		-58.4 dBc	≤ -20 dBc
High Channel, 2480 MHz		-54.57 dBc	≤ -20 dBc
2DH5, pi/4-DQPSK			
Low Channel, 2402 MHz		-51.64 dBc	≤ -20 dBc
High Channel, 2480 MHz		-53.62 dBc	≤ -20 dBc
3DH5, 8-DPSK			
Low Channel, 2402 MHz		-48.15 dBc	≤ -20 dBc
High Channel, 2480 MHz		-53.68 dBc	≤ -20 dBc

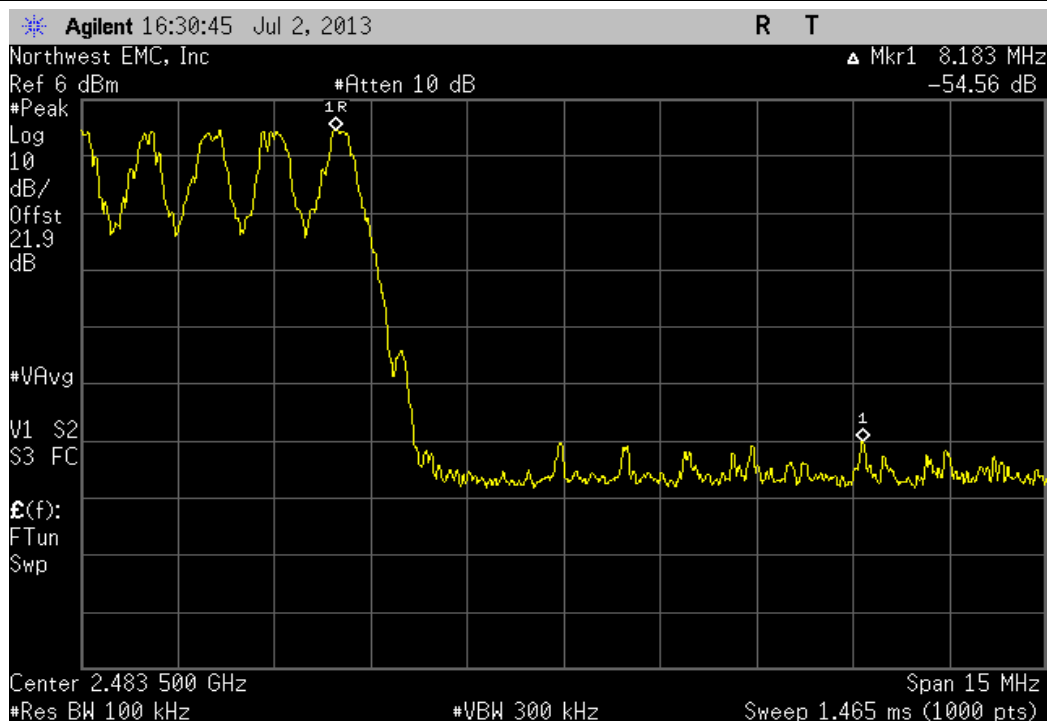
Hopping Mode, DH5, GFSK, Low Channel, 2402 MHz

Value	Limit	Result
-58.4 dBc	≤ -20 dBc	Pass



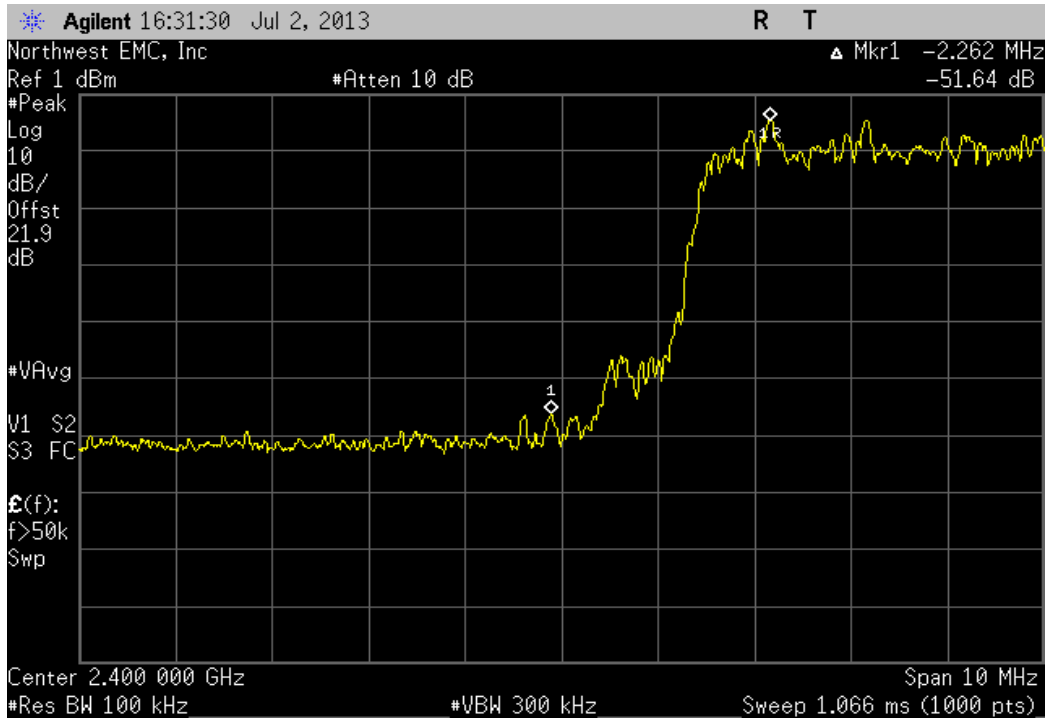
Hopping Mode, DH5, GFSK, High Channel, 2480 MHz

Value	Limit	Result
-54.57 dBc	≤ -20 dBc	Pass



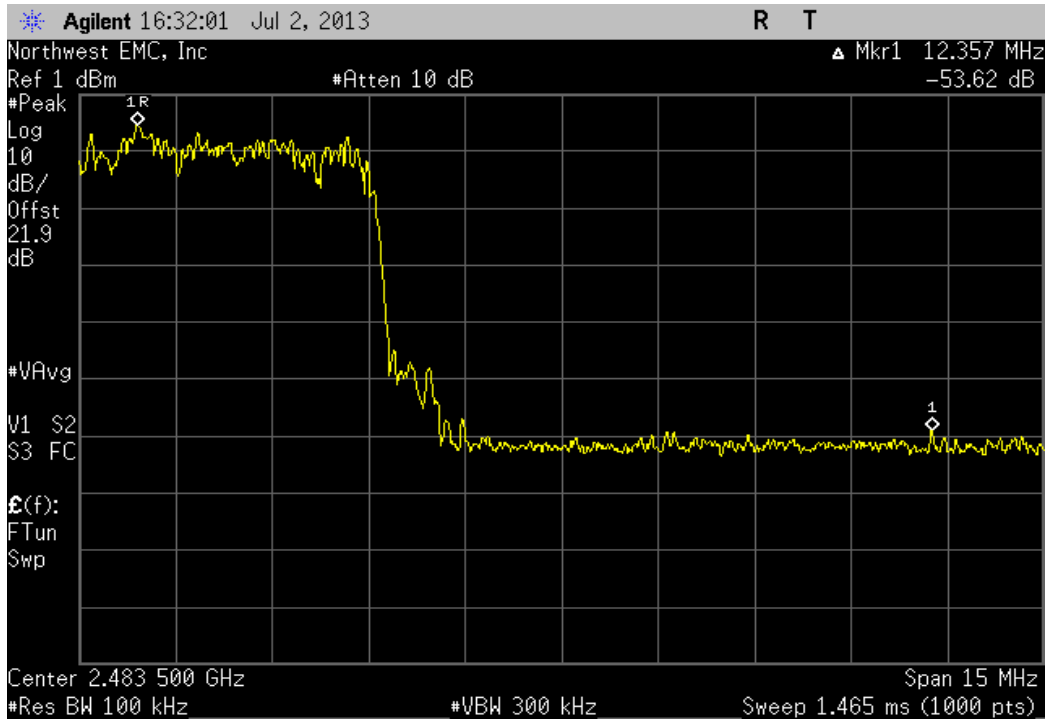
Hopping Mode, 2DH5, pi/4-DQPSK, Low Channel, 2402 MHz

Value	Limit	Result
-51.64 dBc	≤ -20 dBc	Pass



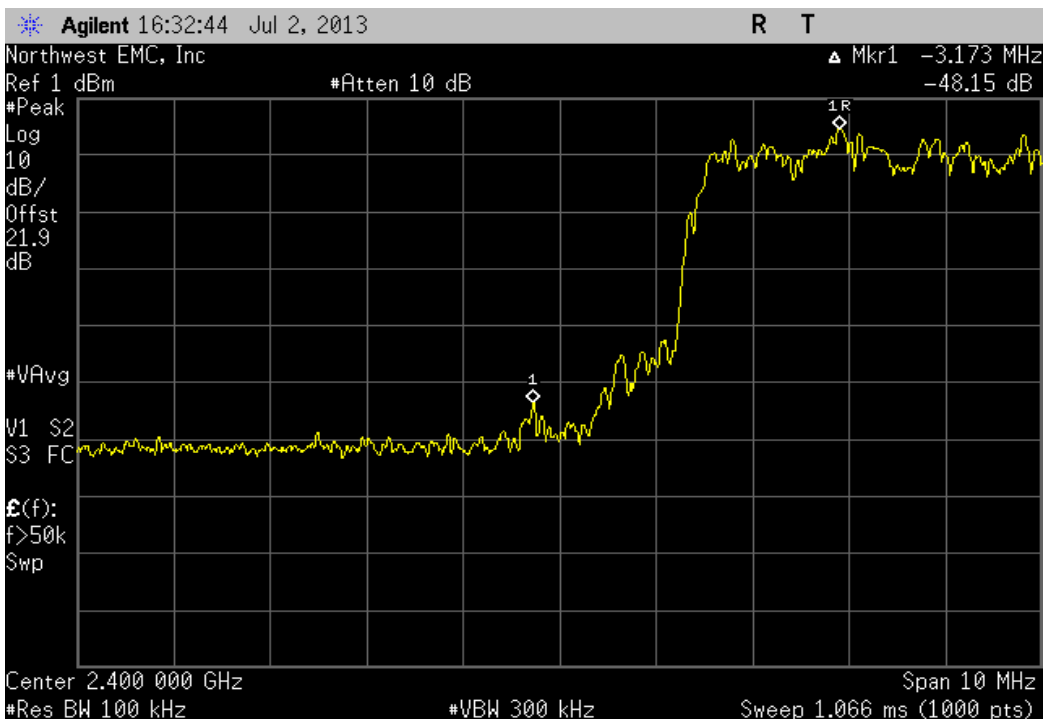
Hopping Mode, 2DH5, pi/4-DQPSK, High Channel, 2480 MHz

Value	Limit	Result
-53.62 dBc	≤ -20 dBc	Pass



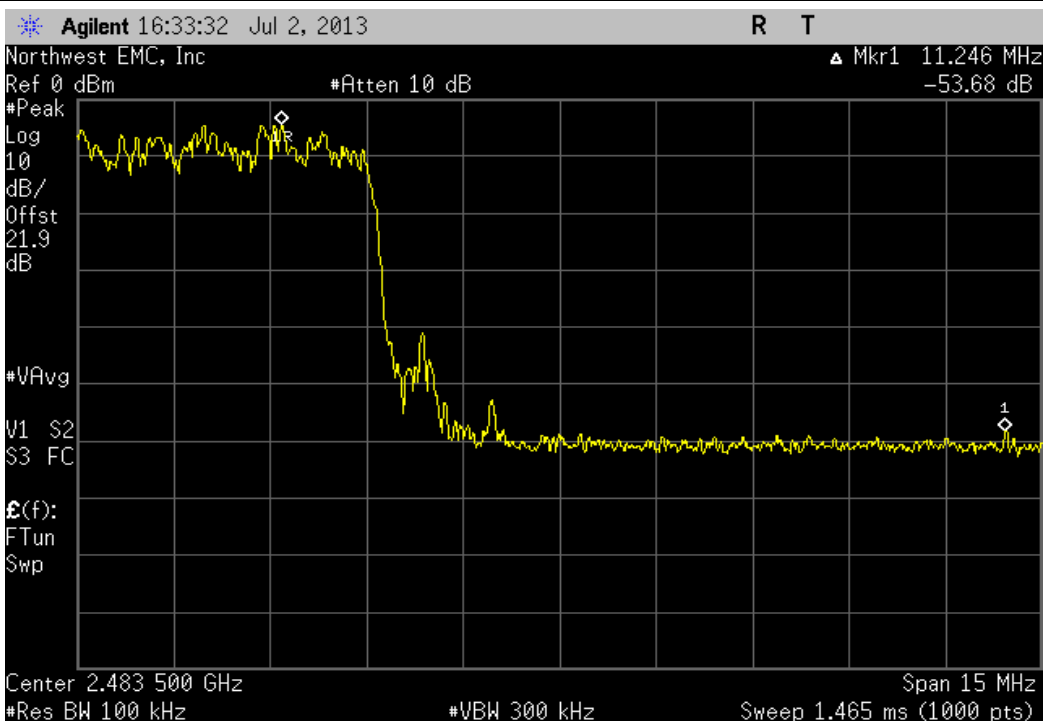
Hopping Mode, 3DH5, 8-DPSK, Low Channel, 2402 MHz

				Value	Limit	Result
				-48.15 dBc	≤ -20 dBc	Pass



Hopping Mode, 3DH5, 8-DPSK, High Channel, 2480 MHz

				Value	Limit	Result
				-53.68 dBc	≤ -20 dBc	Pass



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.

MODES OF OPERATION

Low Channel, DH5, 1Mbit
Mid Channel, DH5, 1Mbit
High Channel, DH5, 1Mbit
Low Channel, 2DH5, 2Mbit
Mid Channel, 2DH5, 2Mbit
High Channel, 2DH5, 2Mbit
Low Channel, 3DH5, 3Mbit
Mid Channel, 3DH5, 3Mbit
High Channel, 3DH5, 3Mbit

POWER SETTINGS INVESTIGATED

120 VAC / 60Hz

CONFIGURATIONS INVESTIGATED

MCSO1668 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	25 GHz
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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
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	12/14/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	12/14/2012	12 mo
HP Filter	Micro-Tronics	HPM50111	HHI	1/18/2013	24 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	1/18/2013	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	12/13/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	12/13/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	7/10/2013	12 mo
Attenuator, 'N'	S.M. Electronics	SA3N-20	REG	1/17/2013	12 mo
NC01 Cables	N/A	Standard Gain Horn Cable	NC3	12/14/2012	12 mo
NC01 Cables	N/A	3115 Horn Cable	NC2	12/13/2012	12 mo
NC01 Cables	N/A	Bilog Cables	NC1	12/13/2012	12 mo
Cable I	N/A	Standard Gain Horn Cable	SUM	7/10/2013	12 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	0 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Antenna, Horn	EMCO	3115	AHM	6/19/2012	24 mo
Antenna, Horn	ETS	3160-09	AIY	NCR	0 mo
Antenna, Biconilog	EMCO	3142	AXJ	5/16/2012	36 mo
Spectrum Analyzer	Agilent	E4440A	AAW	2/21/2013	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

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



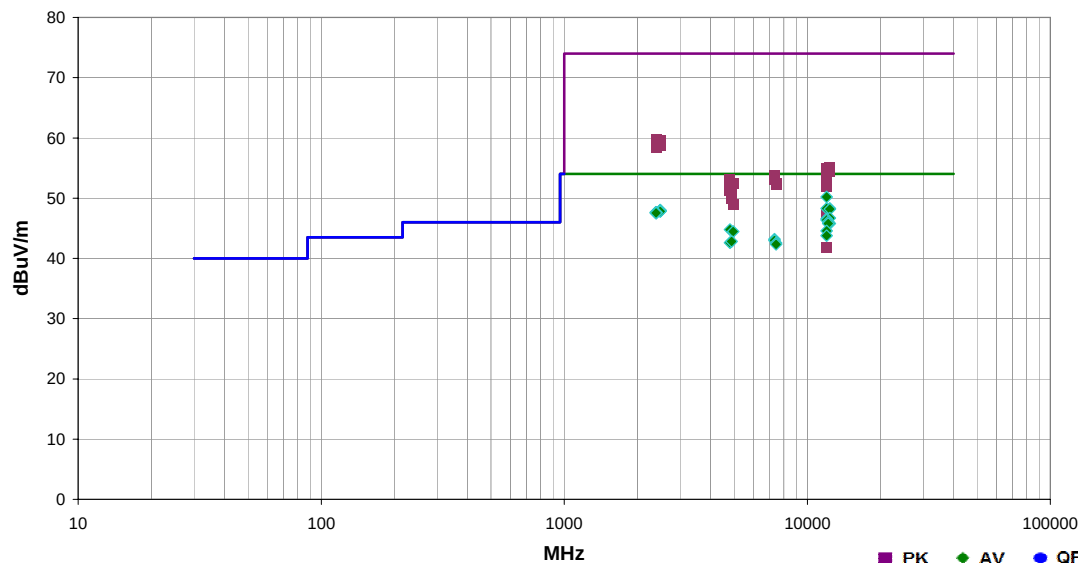
SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2012.12.14
EmiRS 2013.05.31

Work Order:	MCSO1668	Date:	07/05/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC01	Humidity:	47% RH		
Serial Number:	6079632553	Barometric Pres.:	1017 mbar		
EUT:				1601	Tested by: Richard Mellroth, Rod Peloquin
Configuration:				2	
Customer:				Microsoft Corporation	
Attendees:				None	
EUT Power:				120 VAC / 60Hz	
Operating Mode:				Continuous transmit, Bluetooth EDR	
Deviations:				None	
Comments:				See comments in the below table for transmit channel, frequency, data rate, and EUT orientation information.	

Test Specifications	Test Method
FCC 15.247:2013	ANSI C63.10:2009

Run #	15	Test Distance (m)	3	Antenna Height(s)	1-4m	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
12009.360	53.4	-3.2	1.2	316.0	3.0	0.0	Vert	AV	0.0	50.2	54.0	-3.8	Low Ch. (2402 MHz), DH5, EUT Side
12399.640	51.2	-2.9	1.2	322.0	3.0	0.0	Vert	AV	0.0	48.3	54.0	-5.7	High Ch. (2480 MHz), 3DH5, EUT Side
12009.390	51.5	-3.2	1.2	277.0	3.0	0.0	Horz	AV	0.0	48.3	54.0	-5.7	Low Ch. (2402 MHz), DH5, EUT Side
12400.700	51.1	-2.9	1.2	321.0	3.0	0.0	Vert	AV	0.0	48.2	54.0	-5.8	High Ch. (2480 MHz), 2DH5, EUT Side
2485.237	29.5	-1.5	1.2	359.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	High Ch. (2480 MHz), 2DH5, EUT Flat
2485.383	29.4	-1.5	1.2	125.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	High Ch. (2480 MHz), DH5, EUT Flat
2485.303	29.4	-1.5	1.2	282.0	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	High Ch. (2480 MHz), DH5, EUT Flat
2484.300	29.4	-1.5	1.2	201.0	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	High Ch. (2480 MHz), 3DH5, EUT Flat
2483.967	29.4	-1.5	1.2	327.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	High Ch. (2480 MHz), DH5, EUT Vert
2483.923	29.4	-1.5	1.2	326.0	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	High Ch. (2480 MHz), DH5, EUT Vert
2485.433	29.3	-1.5	1.2	198.0	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	High Ch. (2480 MHz), DH5, EUT Side
2485.300	29.3	-1.5	2.3	325.0	3.0	20.0	Horz	AV	0.0	47.8	54.0	-6.2	High Ch. (2480 MHz), DH5, EUT Side
2389.613	29.4	-1.8	1.2	146.0	3.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	Low Ch. (2402 MHz), 2DH5, EUT Vert
2389.330	29.4	-1.8	1.2	233.0	3.0	20.0	Vert	AV	0.0	47.6	54.0	-6.4	Low Ch. (2402 MHz), DH5, EUT Side
2389.020	29.4	-1.8	1.2	182.0	3.0	20.0	Vert	AV	0.0	47.6	54.0	-6.4	Low Ch. (2402 MHz), DH5, EUT Vert
2388.063	29.4	-1.8	1.2	85.0	3.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	Low Ch. (2402 MHz), DH5, EUT Vert
2389.977	29.3	-1.8	1.2	339.0	3.0	20.0	Vert	AV	0.0	47.5	54.0	-6.5	Low Ch. (2402 MHz), DH5, EUT Flat
2389.793	29.3	-1.8	1.2	299.0	3.0	20.0	Horz	AV	0.0	47.5	54.0	-6.5	Low Ch. (2402 MHz), DH5, EUT Flat
2388.410	29.3	-1.8	4.0	98.0	3.0	20.0	Horz	AV	0.0	47.5	54.0	-6.5	Low Ch. (2402 MHz), 3DH5, EUT Vert
2388.163	29.3	-1.8	1.2	346.0	3.0	20.0	Horz	AV	0.0	47.5	54.0	-6.5	Low Ch. (2402 MHz), DH5, EUT Side
12399.280	49.6	-2.9	1.2	322.0	3.0	0.0	Vert	AV	0.0	46.7	54.0	-7.3	High Ch. (2480 MHz), DH5, EUT Side
12009.390	49.8	-3.2	1.2	292.0	3.0	0.0	Vert	AV	0.0	46.6	54.0	-7.4	Low Ch. (2402 MHz), DH5, EUT Vert
12010.640	49.6	-3.2	1.2	143.0	3.0	0.0	Vert	AV	0.0	46.4	54.0	-7.6	Low Ch. (2402 MHz), DH5, EUT Flat
12204.360	49.2	-3.1	1.2	311.0	3.0	0.0	Vert	AV	0.0	46.1	54.0	-7.9	Mid Ch. (2480 MHz), DH5, EUT Side
12399.370	48.7	-2.9	1.3	271.0	3.0	0.0	Horz	AV	0.0	45.8	54.0	-8.2	High Ch. (2480 MHz), DH5, EUT Side
12204.330	48.9	-3.1	1.2	275.0	3.0	0.0	Horz	AV	0.0	45.8	54.0	-8.2	Mid Ch. (2480 MHz), DH5, EUT Side
4803.955	36.6	8.2	1.4	40.0	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	Low Ch. (2480 MHz), DH5, EUT Side
12009.320	47.8	-3.2	1.2	311.0	3.0	0.0	Vert	AV	0.0	44.6	54.0	-9.4	Low Ch. (2480 MHz), DH5, EUT Side
4960.000	35.9	8.6	1.5	30.0	3.0	0.0	Horz	AV	0.0	44.5	54.0	-9.5	High Ch. (2480 MHz), DH5, EUT Side
12009.360	47.0	-3.2	1.2	277.0	3.0	0.0	Horz	AV	0.0	43.8	54.0	-10.2	Low Ch. (2480 MHz), DH5, EUT Side
7322.967	30.8	12.4	1.2	271.0	3.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	Mid Ch. (2480 MHz), DH5, EUT Side
7322.933	30.6	12.4	1.2	12.0	3.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	Mid Ch. (2480 MHz), DH5, EUT Side
4803.915	34.4	8.2	1.2	293.0	3.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	Low Ch. (2480 MHz), DH5, EUT Side
7439.908	29.6	12.9	1.2	352.0	3.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	High Ch. (2480 MHz), DH5, EUT 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
7439.925	29.4	12.9	1.1	295.0	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	High Ch. (2480 MHz), DH5, EUT Side
4881.917	34.5	8.3	1.4	25.0	3.0	0.0	Horz	AV	0.0	42.8	54.0	-12.2	Mid Ch. (2480 MHz), DH5, EUT Side
12009.370	44.3	-3.2	1.3	253.0	3.0	0.0	Horz	AV	0.0	41.1	54.0	-12.9	Low Ch. (2402 MHz), DH5, EUT Flat
2389.683	41.4	-1.8	1.2	85.0	3.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	Low Ch. (2402 MHz), DH5, EUT Vert
4960.025	31.0	8.6	1.2	297.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	High Ch. (2480 MHz), DH5, EUT Side
2485.300	41.0	-1.5	1.2	282.0	3.0	20.0	Vert	PK	0.0	59.5	74.0	-14.5	High Ch. (2480 MHz), DH5, EUT Flat
4882.042	32.2	8.3	1.2	291.0	3.0	0.0	Vert	AV	0.0	40.5	54.0	-14.5	Mid Ch. (2480 MHz), DH5, EUT Side
2483.740	40.9	-1.5	2.3	325.0	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	High Ch. (2480 MHz), DH5, EUT Side
2484.530	40.7	-1.5	1.2	198.0	3.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	High Ch. (2480 MHz), DH5, EUT Side
2485.273	40.6	-1.5	1.2	326.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	High Ch. (2480 MHz), DH5, EUT Vert
2389.620	40.8	-1.8	1.2	182.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	Low Ch. (2402 MHz), DH5, EUT Vert
2485.110	40.5	-1.5	1.2	125.0	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	High Ch. (2480 MHz), DH5, EUT Flat
2485.033	40.5	-1.5	1.2	327.0	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	High Ch. (2480 MHz), DH5, EUT Vert
2484.403	40.4	-1.5	1.2	201.0	3.0	20.0	Vert	PK	0.0	58.9	74.0	-15.1	High Ch. (2480 MHz), 3DH5, EUT Flat
2485.263	40.3	-1.5	1.2	359.0	3.0	20.0	Vert	PK	0.0	58.8	74.0	-15.2	High Ch. (2480 MHz), 2DH5, EUT Flat
2389.223	40.5	-1.8	1.2	339.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	Low Ch. (2402 MHz), DH5, EUT Flat
2388.857	40.4	-1.8	1.2	299.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Low Ch. (2402 MHz), DH5, EUT Flat
2388.697	40.4	-1.8	1.2	146.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Low Ch. (2402 MHz), 2DH5, EUT Vert
2389.137	40.3	-1.8	1.2	346.0	3.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	Low Ch. (2402 MHz), DH5, EUT Side
2389.560	40.2	-1.8	4.0	98.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	Low Ch. (2402 MHz), 3DH5, EUT Vert
2388.520	40.2	-1.8	1.2	233.0	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	Low Ch. (2402 MHz), DH5, EUT Side
12399.350	58.0	-2.9	1.2	322.0	3.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	High Ch. (2480 MHz), DH5, EUT Side
12010.800	58.2	-3.2	1.2	316.0	3.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	Low Ch. (2402 MHz), DH5, EUT Side
12399.270	57.6	-2.9	1.2	322.0	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	High Ch. (2480 MHz), 3DH5, EUT Side
12399.250	57.5	-2.9	1.3	271.0	3.0	0.0	Horz	PK	0.0	54.6	74.0	-19.4	High Ch. (2480 MHz), DH5, EUT Side
12205.860	57.6	-3.1	1.2	311.0	3.0	0.0	Vert	PK	0.0	54.5	74.0	-19.5	Mid Ch. (2480 MHz), DH5, EUT Side
12399.400	57.3	-2.9	1.2	321.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	High Ch. (2480 MHz), 2DH5, EUT Side
12204.170	57.5	-3.1	1.2	275.0	3.0	0.0	Horz	PK	0.0	54.4	74.0	-19.6	Mid Ch. (2480 MHz), DH5, EUT Side
7322.567	41.3	12.4	1.2	271.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Mid Ch. (2480 MHz), DH5, EUT Side
12009.470	56.6	-3.2	1.2	277.0	3.0	0.0	Horz	PK	0.0	53.4	74.0	-20.6	Low Ch. (2402 MHz), DH5, EUT Side
12009.410	56.5	-3.2	1.2	311.0	3.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	Low Ch. (2480 MHz), DH5, EUT Side
4803.740	44.9	8.2	1.4	40.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	Low Ch. (2480 MHz), DH5, EUT Side
7323.758	40.6	12.4	1.2	12.0	3.0	0.0	Vert	PK	0.0	53.0	74.0	-21.0	Mid Ch. (2480 MHz), DH5, EUT Side
12009.230	56.1	-3.2	1.2	277.0	3.0	0.0	Horz	PK	0.0	52.9	74.0	-21.1	Low Ch. (2480 MHz), DH5, EUT Side
7439.758	39.5	12.9	1.1	295.0	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	High Ch. (2480 MHz), DH5, EUT Side
4960.483	43.8	8.6	1.5	30.0	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	High Ch. (2480 MHz), DH5, EUT Side
7440.625	39.3	12.9	1.2	352.0	3.0	0.0	Vert	PK	0.0	52.2	74.0	-21.8	High Ch. (2480 MHz), DH5, EUT Side
12009.220	55.2	-3.2	1.2	143.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Low Ch. (2402 MHz), DH5, EUT Flat
12009.180	55.2	-3.2	1.2	292.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Low Ch. (2402 MHz), DH5, EUT Vert
12010.530	34.8	-3.2	1.2	346.0	3.0	0.0	Horz	AV	0.0	31.6	54.0	-22.4	Low Ch. (2402 MHz), DH5, EUT Vert
4804.160	43.1	8.2	1.2	293.0	3.0	0.0	Vert	PK	0.0	51.3	74.0	-22.7	Low Ch. (2480 MHz), DH5, EUT Side
4881.783	42.9	8.3	1.4	25.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8	Mid Ch. (2480 MHz), DH5, EUT Side
4881.775	41.6	8.3	1.2	291.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	Mid Ch. (2480 MHz), DH5, EUT Side
4960.233	40.4	8.6	1.2	297.0	3.0	0.0	Vert	PK	0.0	49.0	74.0	-25.0	High Ch. (2480 MHz), DH5, EUT Side
12009.150	50.6	-3.2	1.3	253.0	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	Low Ch. (2402 MHz), DH5, EUT Flat
12010.850	45.0	-3.2	1.2	346.0	3.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	Low Ch. (2402 MHz), DH5, EUT Vert

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.

MODES OF OPERATION

Transmitting Bluetooth FHSS

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MCSO1668 - 3

SAMPLE CALCULATIONS

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
NC01 Cables	N/A	Conducted / NF Probe	NC4	12/14/2012	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHF	2/1/2012	24 mo
LISN	Solar	9252-50-R-24-BNC	LIM	1/16/2013	12 mo
Receiver	Rohde & Schwarz	ESCI	ARE	5/30/2013	12 mo

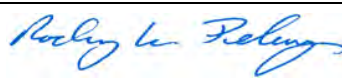
MEASUREMENT BANDWIDTHS

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

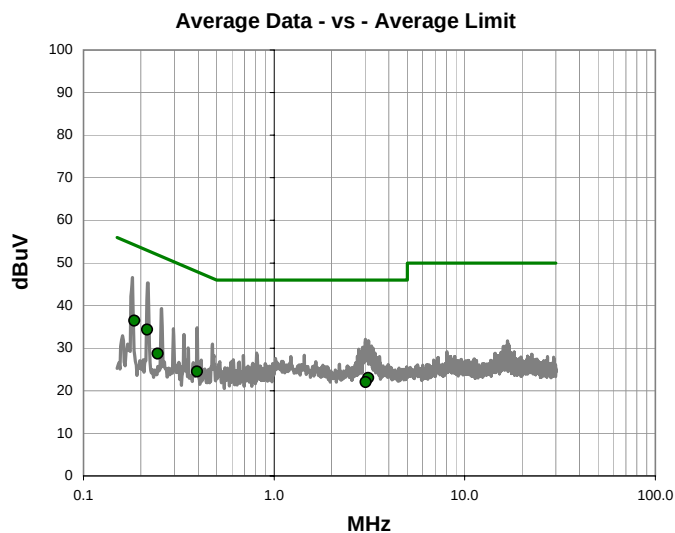
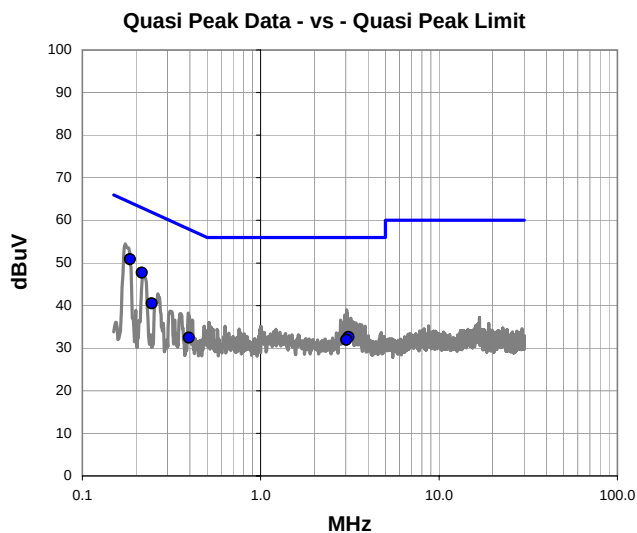
Measurements were made using the bandwidths and detectors specified. No video filter was used.

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.

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	47% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, Low Channel 2402 MHz				

Test Specifications		Test Method					
FCC 15.207:2013		ANSI C63.10:2009					
Run #	46	Line:	High Line	Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.185	30.5	20.4	50.9	64.3	-13.4
0.216	27.4	20.3	47.7	63.0	-15.3
0.245	20.3	20.2	40.5	61.9	-21.4
3.116	12.2	20.4	32.6	56.0	-23.4
3.028	11.5	20.4	31.9	56.0	-24.1
0.395	12.2	20.3	32.5	58.0	-25.5

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.185	16.1	20.4	36.5	54.3	-17.8
0.216	14.0	20.3	34.3	53.0	-18.7
3.116	2.6	20.4	23.0	46.0	-23.0
0.245	8.5	20.2	28.7	51.9	-23.2
0.395	4.2	20.3	24.5	48.0	-23.5
3.028	1.6	20.4	22.0	46.0	-24.0

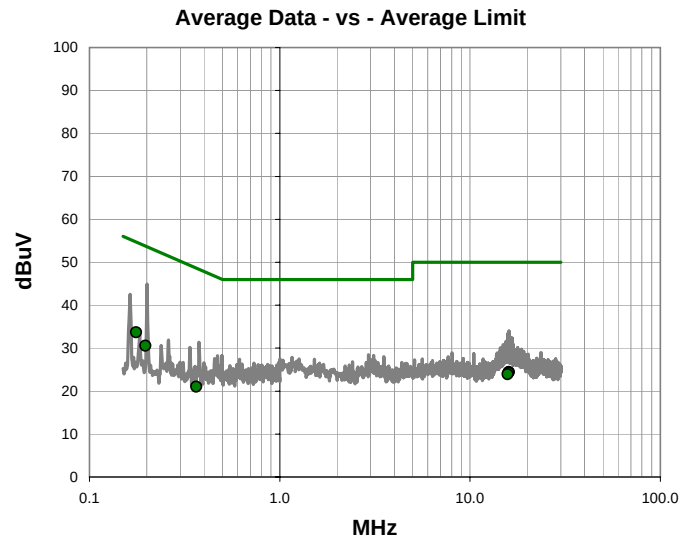
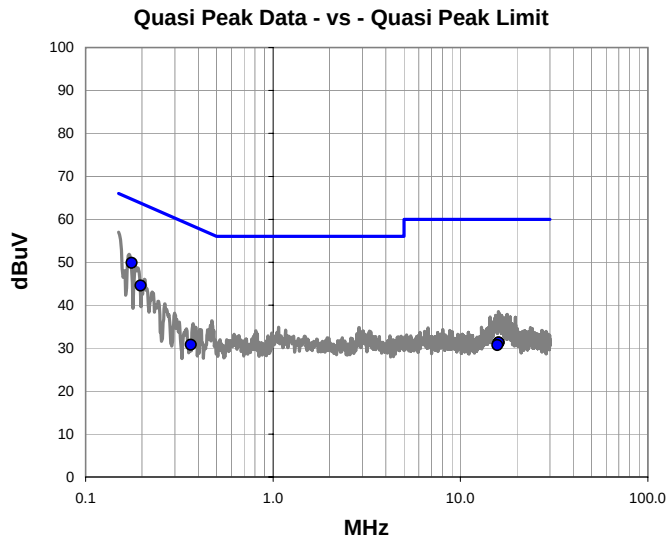


POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.2.20

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	47% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, Low Channel 2402 MHz				

Test Specifications				Test Method			
FCC 15.207:2013				ANSI C63.10:2009			
Run #	47	Line:	Neutral	Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.176	29.5	20.4	49.9	64.7	-14.8
0.197	24.2	20.4	44.6	63.7	-19.2
0.364	10.5	20.3	30.8	58.6	-27.9
16.008	10.2	21.1	31.3	60.0	-28.7
15.982	10.2	21.1	31.3	60.0	-28.7
15.782	9.6	21.1	30.7	60.0	-29.3

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.176	13.3	20.4	33.7	54.7	-21.0
0.197	10.2	20.4	30.6	53.7	-23.2
16.008	3.3	21.1	24.4	50.0	-25.6
15.982	3.2	21.1	24.3	50.0	-25.7
15.782	2.8	21.1	23.9	50.0	-26.1
0.364	0.7	20.3	21.0	48.6	-27.7

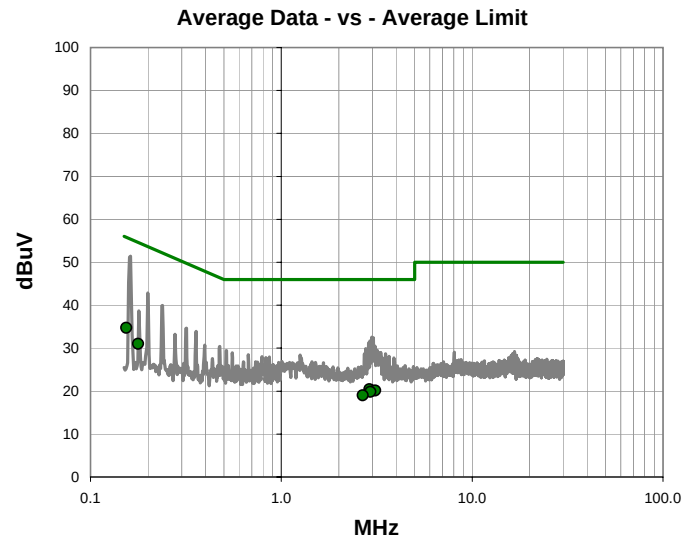
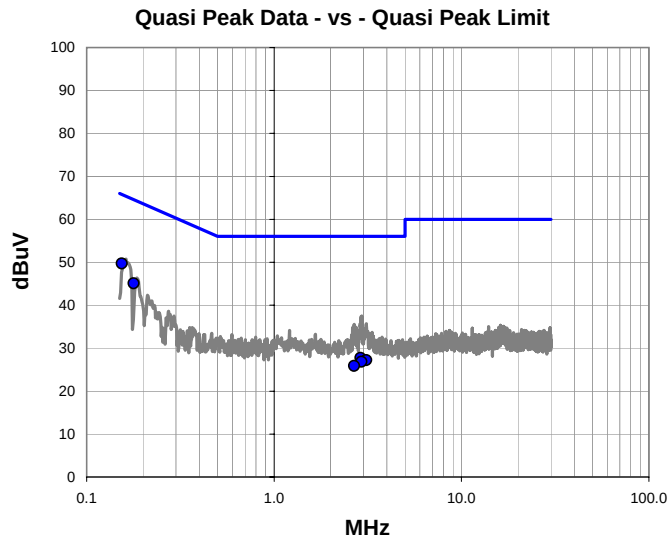


POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.2.20

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	49% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, Mid Channel 2441 MHz				

Test Specifications		Test Method	
FCC 15.207:2013		ANSI C63.10:2009	
Run #	48	Line:	High Line
Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.154	29.4	20.3	49.7	65.8	-16.1
0.178	24.7	20.4	45.1	64.6	-19.5
2.900	7.3	20.4	27.7	56.0	-28.3
3.108	6.8	20.4	27.2	56.0	-28.8
2.932	6.4	20.4	26.8	56.0	-29.2
2.672	5.5	20.4	25.9	56.0	-30.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.154	14.4	20.3	34.7	55.8	-21.1
0.178	10.6	20.4	31.0	54.6	-23.6
2.900	0.0	20.4	20.4	46.0	-25.6
3.108	-0.3	20.4	20.1	46.0	-25.9
2.932	-0.6	20.4	19.8	46.0	-26.2
2.672	-1.4	20.4	19.0	46.0	-27.0

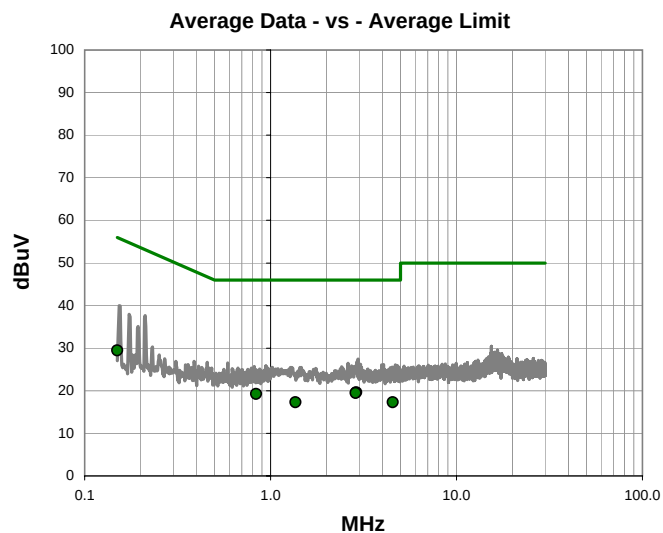
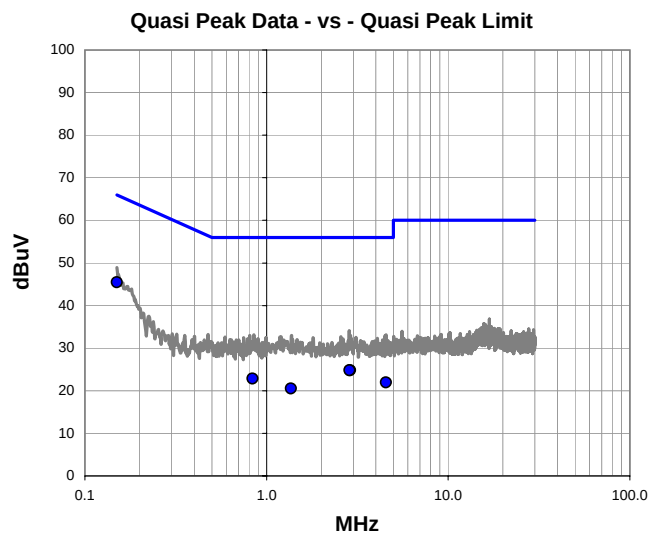


POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.2.20

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	49% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, Mid Channel 2441 MHz				

Test Specifications		Test Method					
FCC 15.207:2013		ANSI C63.10:2009					
Run #	49	Line:	Neutral	Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.150	25.2	20.3	45.5	66.0	-20.5
2.888	4.4	20.4	24.8	56.0	-31.2
2.868	4.4	20.4	24.8	56.0	-31.2
0.838	2.6	20.3	22.9	56.0	-33.1
4.540	1.4	20.5	21.9	56.0	-34.1
1.364	0.2	20.3	20.5	56.0	-35.5

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
2.888	-0.8	20.4	19.6	46.0	-26.4
2.868	-0.9	20.4	19.5	46.0	-26.5
0.150	9.2	20.3	29.5	56.0	-26.5
0.838	-1.0	20.3	19.3	46.0	-26.7
1.364	-3.0	20.3	17.3	46.0	-28.7
4.540	-3.3	20.5	17.2	46.0	-28.8

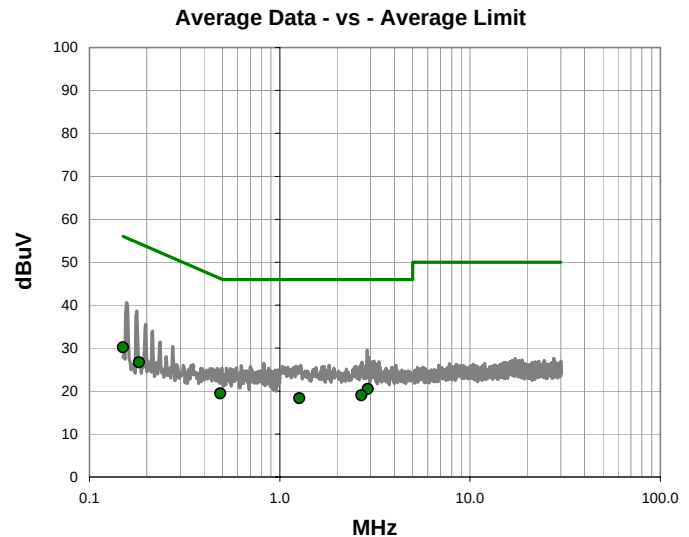
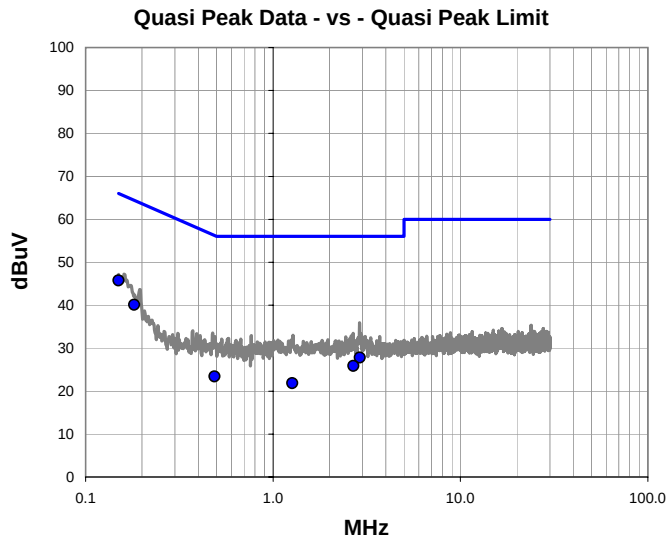


POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.2.20

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	49% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, High Channel 2480 MHz				

Test Specifications		Test Method	
FCC 15.207:2013		ANSI C63.10:2009	
Run #	50	Line:	High Line
Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.150	25.5	20.3	45.8	66.0	-20.2
0.182	19.7	20.4	40.1	64.4	-24.3
2.908	7.4	20.4	27.8	56.0	-28.2
2.688	5.5	20.4	25.9	56.0	-30.1
0.488	3.2	20.2	23.4	56.2	-32.8
1.268	1.5	20.3	21.8	56.0	-34.2

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
2.908	0.1	20.4	20.5	46.0	-25.5
0.150	9.9	20.3	30.2	56.0	-25.8
0.488	-0.8	20.2	19.4	46.2	-26.8
2.688	-1.4	20.4	19.0	46.0	-27.0
1.268	-2.0	20.3	18.3	46.0	-27.7
0.182	6.3	20.4	26.7	54.4	-27.7

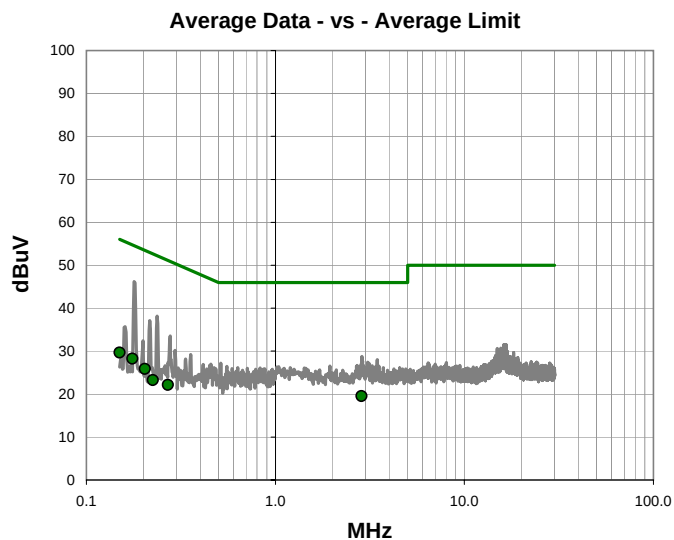
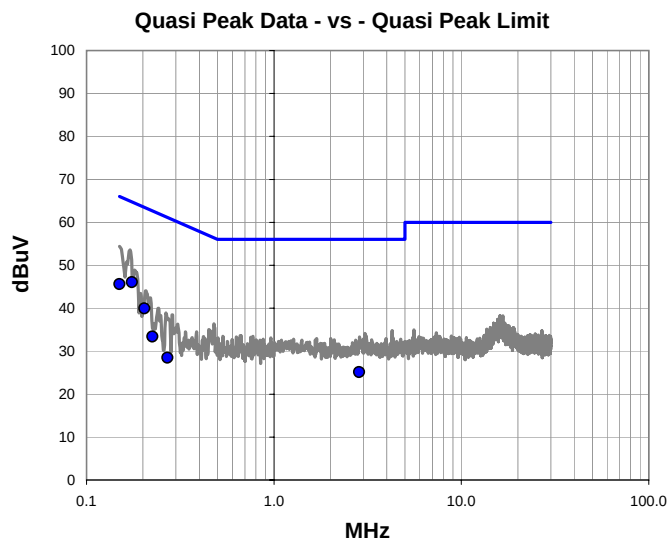


POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.2.20

Work Order:	MCSO1668	Date:	07/08/13		
Project:	None	Temperature:	23 °C		
Job Site:	NC05	Humidity:	49% RH		
Serial Number:	6079632553	Barometric Pres.:	1018 mbar	Tested by:	Richard Mellroth, Rod Peloquin
EUT:	1601				
Configuration:	3				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting Bluetooth FHSS				
Deviations:	None				
Comments:	DH5, High Channel 2480 MHz				

Test Specifications		FCC 15.207:2013		Test Method		ANSI C63.10:2009	
Run #	51	Line:	Neutral	Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.175	25.7	20.4	46.1	64.7	-18.7
0.150	25.3	20.3	45.6	66.0	-20.4
0.204	19.6	20.3	39.9	63.4	-23.5
0.225	13.1	20.3	33.4	62.6	-29.2
2.852	4.7	20.4	25.1	56.0	-30.9
0.270	8.2	20.2	28.4	61.1	-32.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.150	9.4	20.3	29.7	56.0	-26.3
0.175	7.9	20.4	28.3	54.7	-26.5
2.852	-0.9	20.4	19.5	46.0	-26.5
0.204	5.5	20.3	25.8	53.4	-27.6
0.270	1.9	20.2	22.1	51.1	-29.0
0.225	3.0	20.3	23.3	52.6	-29.3