



**Synapse Strategic Product Development LLC
MB-R1G1**

FCC 15.247:2012

Report #: SYNA0080 Rev 01



Report Prepared By Northwest EMC Inc.

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

California – Minnesota – Oregon – New York – Washington

Last Date of Test: June 14, 2012
Synapse Strategic Product Development LLC
Model: MB-R1G1

Emissions

Test Description	Specification	Test Method	Pass/Fail
Duty Cycle – Direct Connect	FCC 15.247:2012	ANSI C63.10:2009	Pass
Occupied Bandwidth	FCC 15.247:2012	ANSI C63.10:2009	Pass
Output Power	FCC 15.247:2012	ANSI C63.10:2009	Pass
Band Edge Compliance	FCC 15.247:2012	ANSI C63.10:2009	Pass
Spurious Conducted Emissions	FCC 15.247:2012	ANSI C63.10:2009	Pass
Power Spectral Density	FCC 15.247:2012	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.247:2012	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager



NVLAP Lab Code: 200630-0

Test Facility

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

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-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
01	Correct model name of Base Station	10/1/12	7

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.

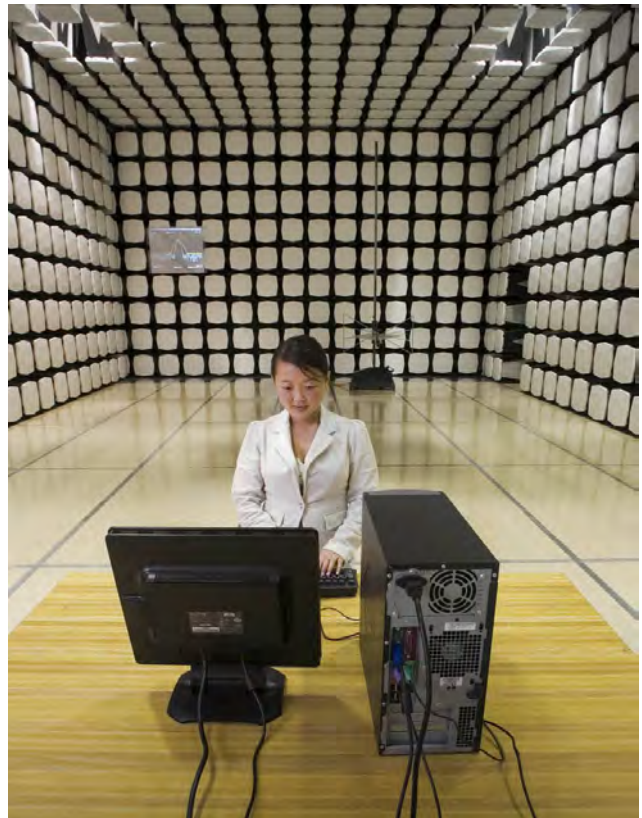
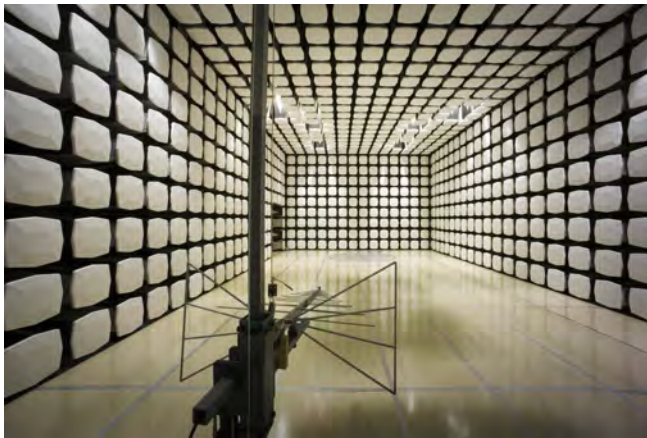
SCOPE

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

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



<p>Oregon Labs EV01-EV12 22975 NW Evergreen Pkwy, #400 Hillsboro, OR 97124 (503) 844-4066</p>	<p>California Labs OC01-OC13 41 Tesla Irvine, CA 92618 (949) 861-8918</p>	<p>New York Labs WA01-WA04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796</p>	<p>Minnesota Labs MN01-MN08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281</p>	<p>Washington Labs SU01-SU07 14128 339th Ave. SE Sultan, WA 98294 (360) 793-8675</p>
VCCI				
<p>EV01: C-1071, R-1025, G-84 EV07: C-2687, T-1658 EV11: R-2318</p>	<p>OC06: C-2766, T-1659 OC07: G-548 OC08: R-1943, G-85 OC10: A-0029</p>		<p>MN03: C-3464, T-1634 MN04: R-3125 MN05: G-141</p>	<p>SU01: C-3265, T-1511 SU02: R-871, G-83</p>
Industry Canada				
<p>2834D-1, 2834D-2</p>	<p>2834B-1, 2834B-2, 2834B-3</p>		<p>2834E-1</p>	<p>2834C-1</p>





WTD 12.5.23

PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Synapse Strategic Product Development LLC
Address:	1511 6th Ave. 4th Floor
City, State, Zip:	Seattle, WA 98101
Test Requested By:	Bert Buxton
Model:	MB-R1G1
First Date of Test:	June 13, 2012
Last Date of Test:	June 14, 2012
Receipt Date of Samples:	June 13, 2012
Equipment Design Stage:	Preproduction
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
2.4 GHz ISM Radio
Testing Objective:
To demonstrate compliance to FCC 15.247 requirements.

Configuration 1 SYNA0080

Software/Firmware Running during test	
Description	Version
Band	0.60P
Base Station	mfg.12

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Identity Band - direct connect	Synapse Strategic Product Development LLC	MB-R1G1	2501L1 / 00 00 1f 40 78

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Base Station	Synapse Strategic Product Development LLC	tx100	SN08

Configuration 2 SYNA0080

Software/Firmware Running during test	
Description	Version
Band	0.60P
Base Station	mfg.12

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Identity Band - radiated	Synapse Strategic Product Development LLC	MB-R1G1	2503Q0 / 00 00 1f 42 7e

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Base Station	Synapse Strategic Product Development LLC	tx100	SN08

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/13/2012	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.
2	6/13/2012	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	6/13/2012	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	6/13/2012	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	6/13/2012	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	6/13/2012	Duty Cycle – Direct Connect	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	6/14/2012	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Duty Cycle - Direct Connect

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
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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.

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



Duty Cycle - Direct Connect

XMit 2012.05.09
PsaTx 2012.05.24

EUT: MB-R1G1		Work Order: SYNA0080	
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C	
Attendees: Skip Kaczynski		Humidity: 41%	
Project: None		Barometric Pres.: 1021.8	
Tested by: Rod Peloquin		Power: Battery	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	

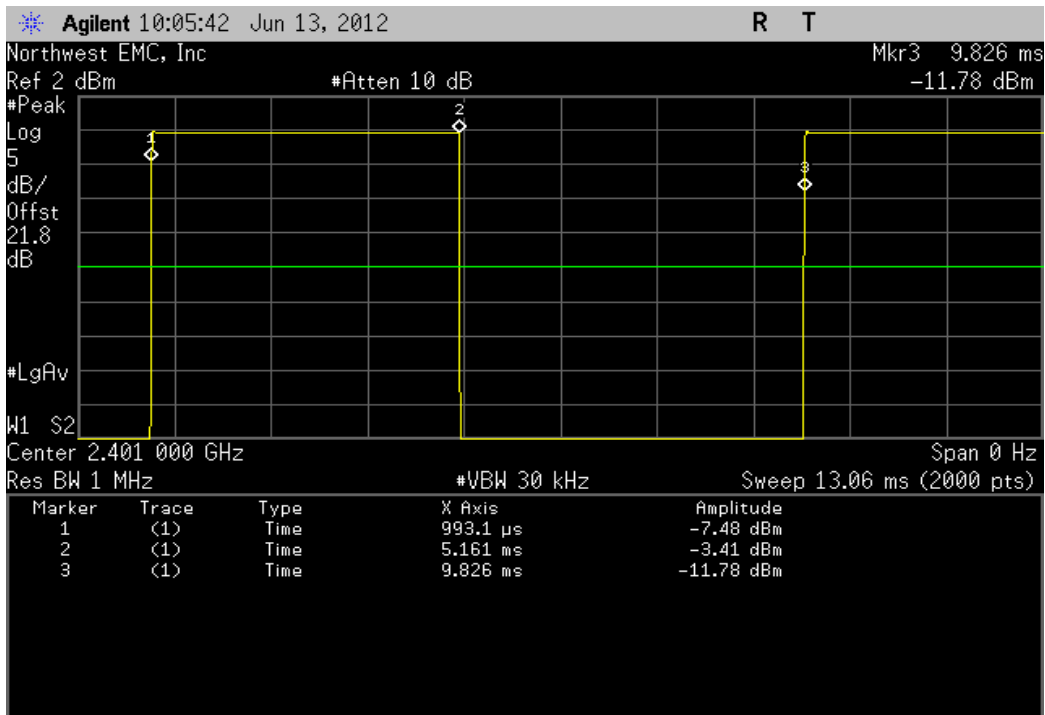
COMMENTS
Transmitting in 4ms bursts in duty cycle for direct connect testing

DEVIATIONS FROM TEST STANDARD
None

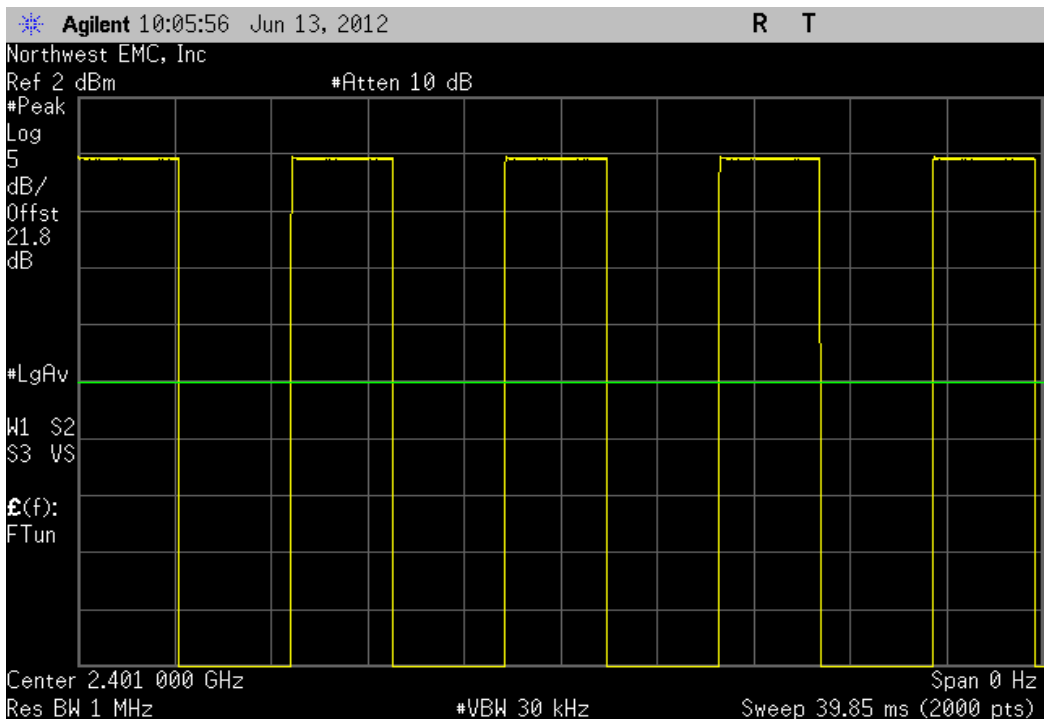
Configuration #	1	Signature <i>Rod Peloquin</i>
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	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
FSK Modulation						
Low Channel, 2401 MHz	4.168 mS	8.833 mS	1	47.2	N/A	N/A
Low Channel, 2401 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2450 MHz	4.168 mS	8.833 mS	1	47.2	N/A	N/A
Mid Channel, 2450 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2476 MHz	4.168 mS	8.833 mS	1	47.2	N/A	N/A
High Channel, 2476 MHz	N/A	N/A	5	N/A	N/A	N/A

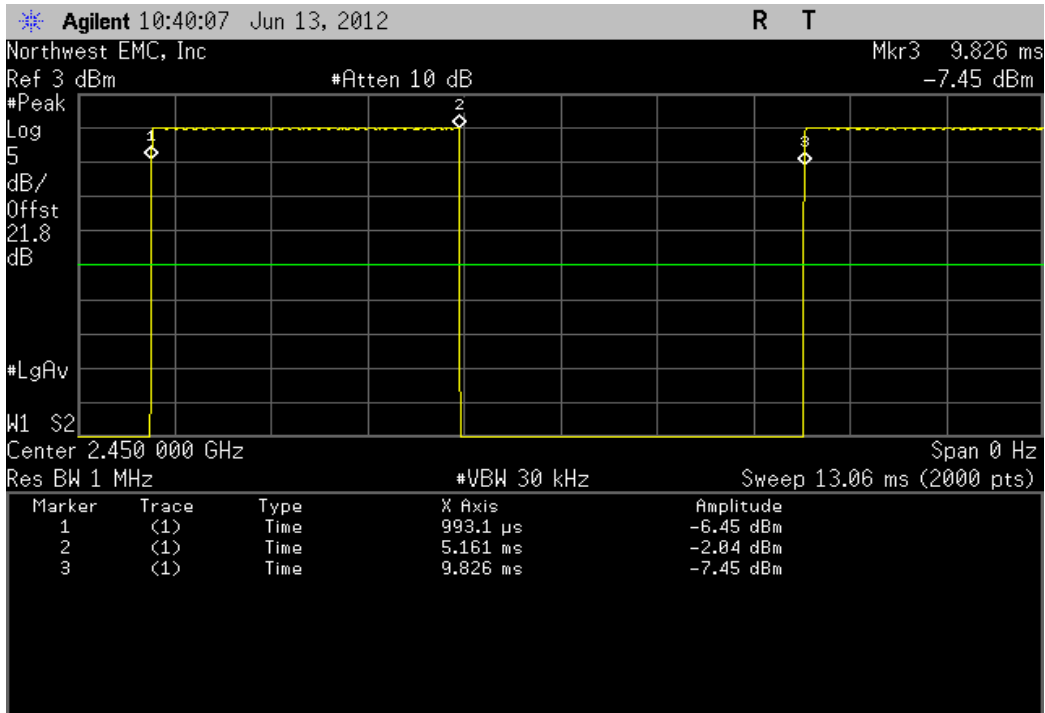
FSK Modulation, Low Channel, 2401 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	4.168 mS	8.833 mS	1	47.2	N/A	N/A



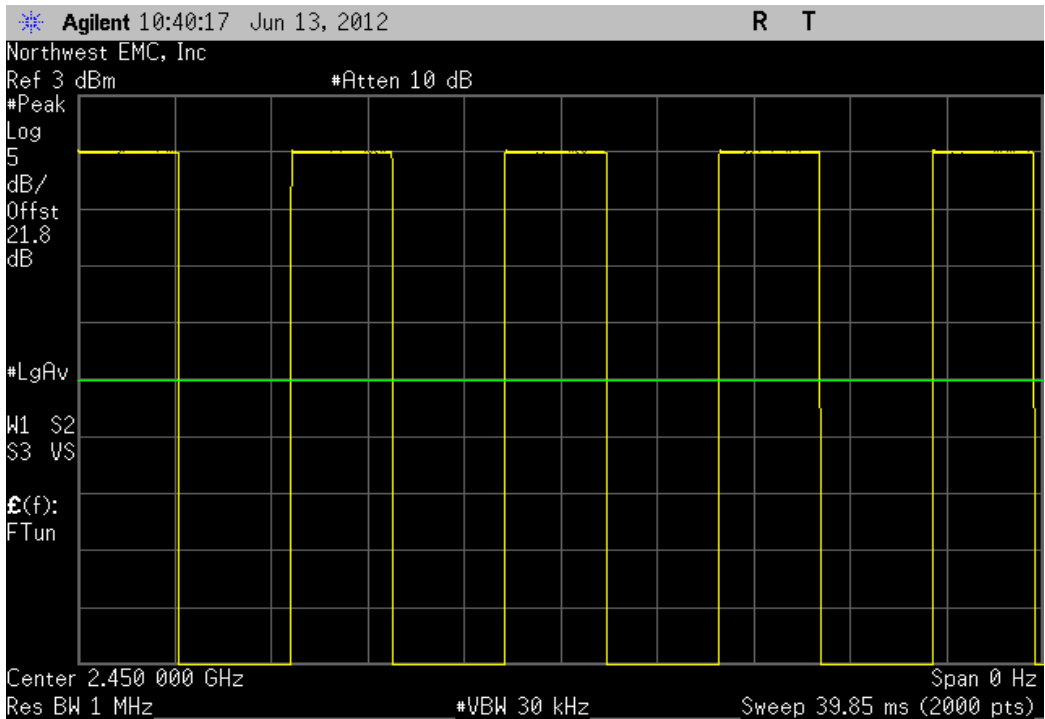
FSK Modulation, Low Channel, 2401 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



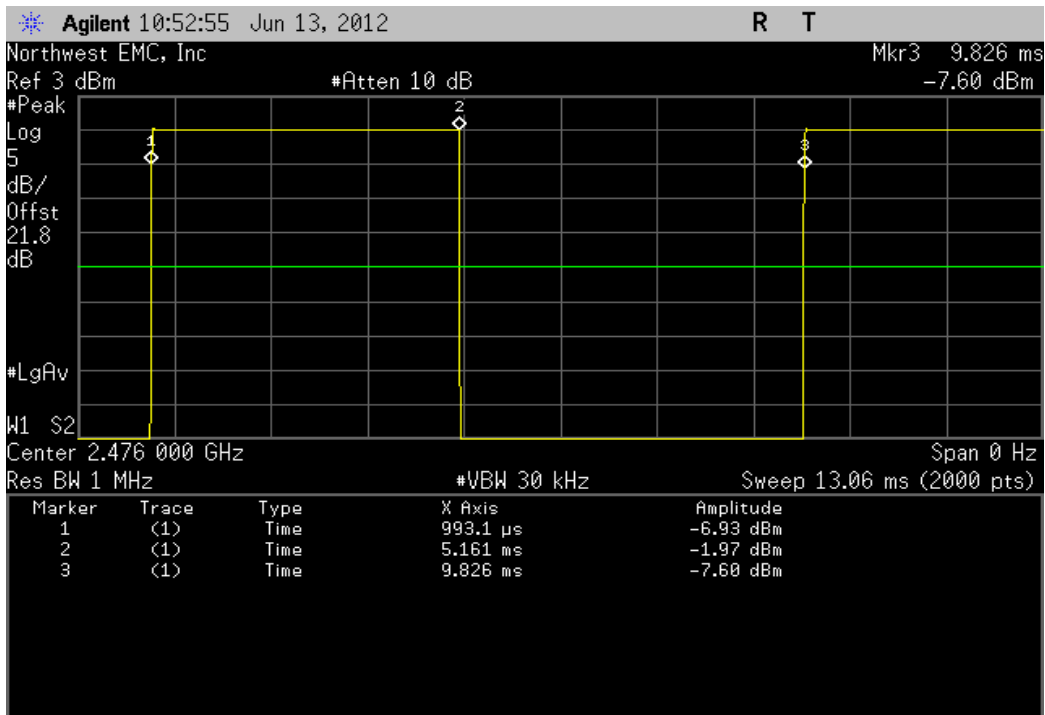
FSK Modulation, Mid Channel, 2450 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result	
4.168 mS	8.833 mS	1	47.2	N/A	N/A	



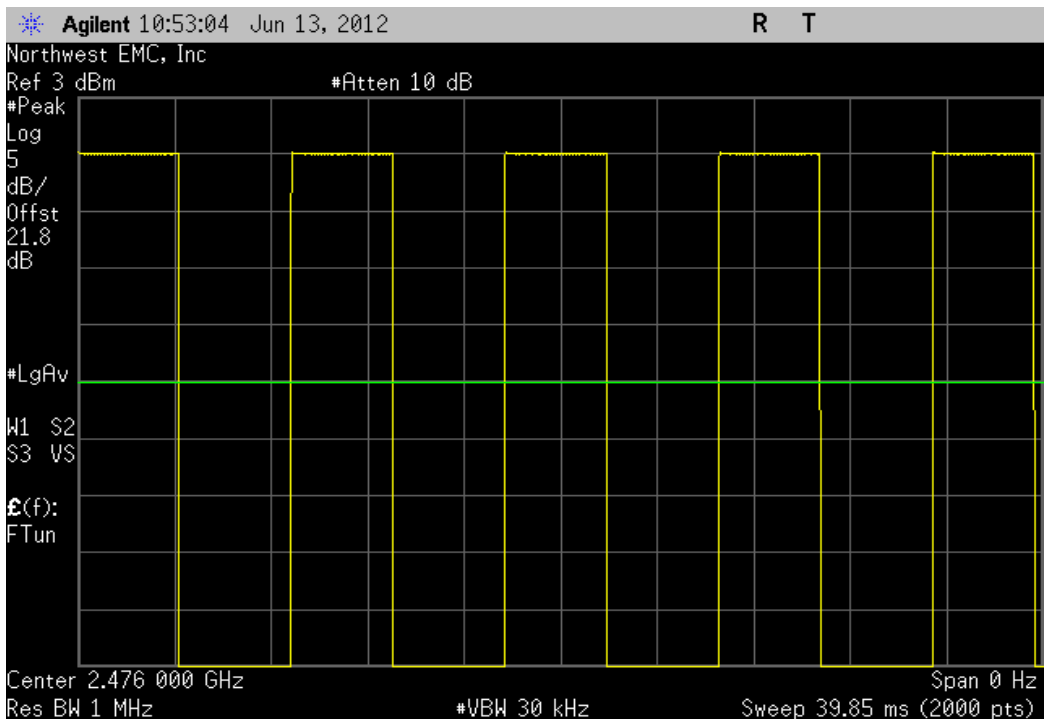
FSK Modulation, Mid Channel, 2450 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result	
N/A	N/A	5	N/A	N/A	N/A	



FSK Modulation, High Channel, 2476 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	4.168 mS	8.833 mS	1	47.2	N/A	N/A



FSK Modulation, High Channel, 2476 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



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
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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.



OCCUPIED BANDWIDTH

EUT: MB-R1G1		Work Order: SYNA0080
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C
Attendees: Skip Kaczynski		Humidity: 41%
Project: None		Barometric Pres.: 1021.8
Tested by: Rod Peloquin		Power: Battery
		Job Site: EV06

TEST SPECIFICATIONS		Test Method
FCC 15.247:2012		ANSI C63.10:2009

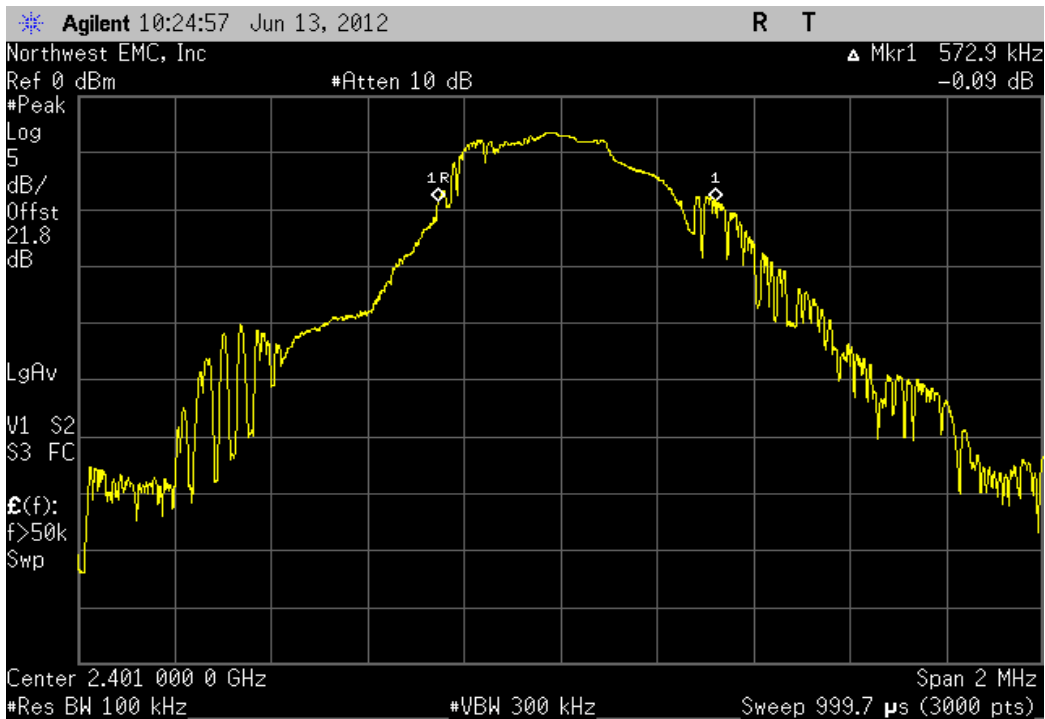
COMMENTS
 Transmitting in 4ms bursts at 47.2 % duty cycle. See Duty Cycle module elsewhere in this report.

DEVIATIONS FROM TEST STANDARD
 None

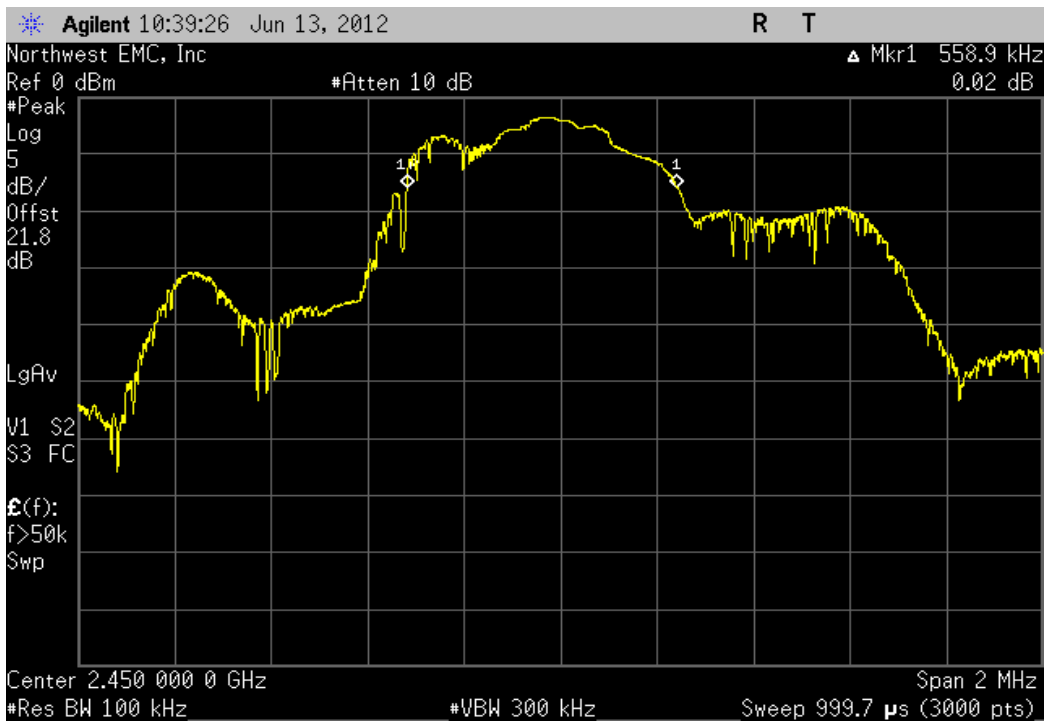
Configuration #	1	Signature <i>Rod Peloquin</i>
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	Value	Limit	Result
Low Channel, 2401 MHz	572.9 kHz	≥ 500 kHz	Pass
Mid Channel, 2450 MHz	558.9 kHz	≥ 500 kHz	Pass
High Channel, 2476 MHz	610.2 kHz	≥ 500 kHz	Pass

Low Channel, 2401 MHz			
	Value	Limit	Result
	572.9 kHz	≥ 500 kHz	Pass

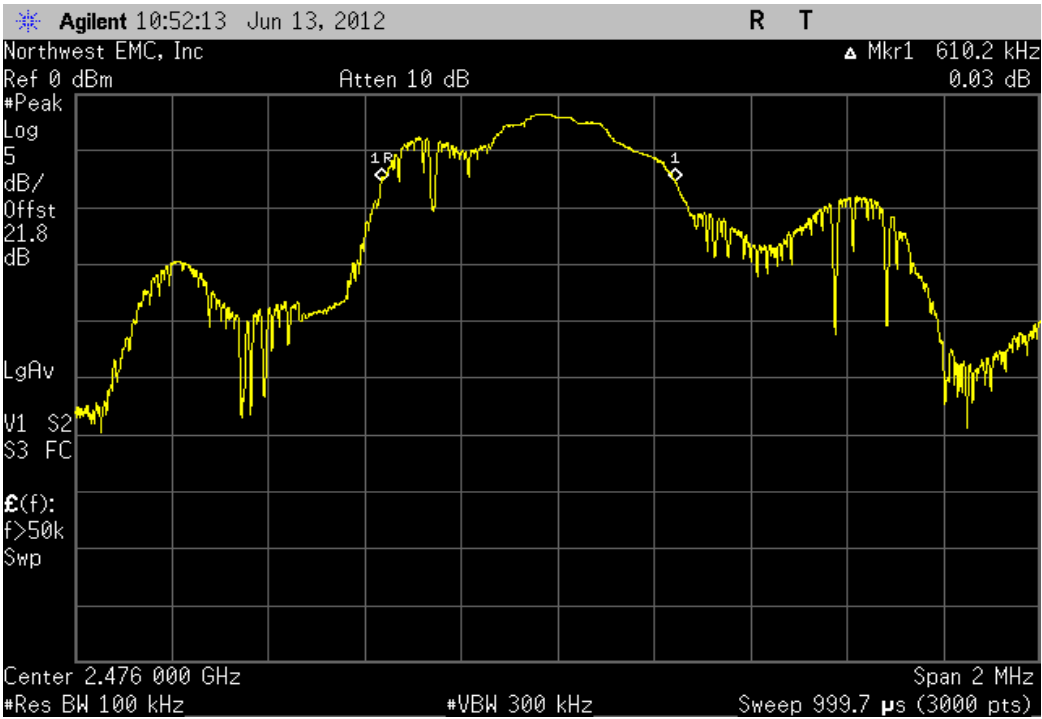


Mid Channel, 2450 MHz			
	Value	Limit	Result
	558.9 kHz	≥ 500 kHz	Pass



High Channel, 2476 MHz

Value	Limit	Result
610.2 kHz	≥ 500 kHz	Pass



Output Power

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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 at its only data rate.



Output Power

XMit 2012.05.09
PsaTx 2012.05.24

EUT: MB-R1G1		Work Order: SYNA0080
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C
Attendees: Skip Kaczynski		Humidity: 41%
Project: None		Barometric Pres.: 1021.8
Tested by: Rod Peloquin		Power: Battery
		Job Site: EV06
TEST SPECIFICATIONS		Test Method
FCC 15.247:2012		ANSI C63.10:2009

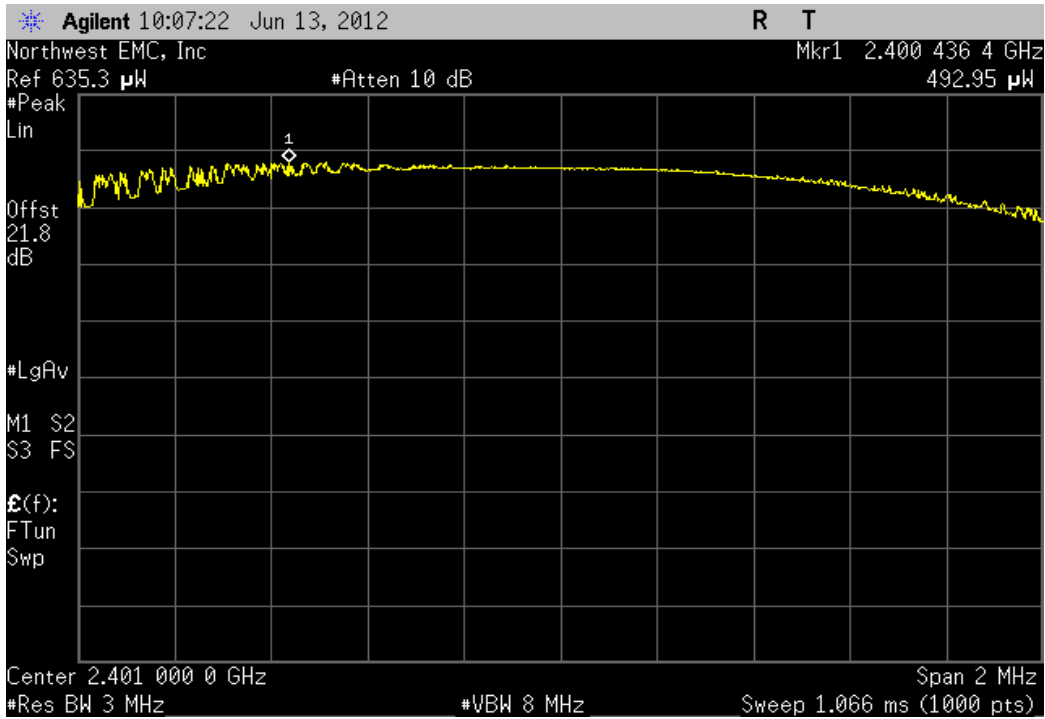
COMMENTS
Transmitting in 4ms bursts at 47.2 % duty cycle. See Duty Cycle module elsewhere in this report.

DEVIATIONS FROM TEST STANDARD
None

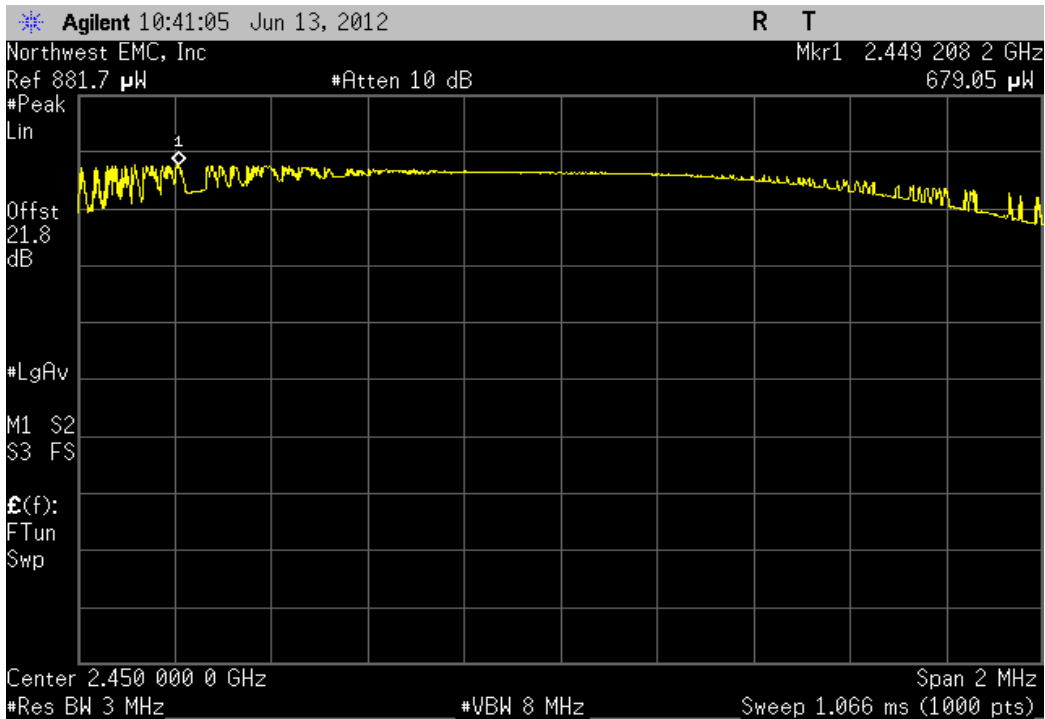
Configuration #	1	Signature <i>Rod Peloquin</i>
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	Value	Limit	Result
FSK Modulation			
Low Channel, 2401 MHz	492.947 uW	< 1 W	Pass
Mid Channel, 2450 MHz	679.047 uW	< 1 W	Pass
High Channel, 2476 MHz	686.91 uW	< 1 W	Pass

FSK Modulation, Low Channel, 2401 MHz			
	Value	Limit	Result
	492.947 uW	< 1 W	Pass

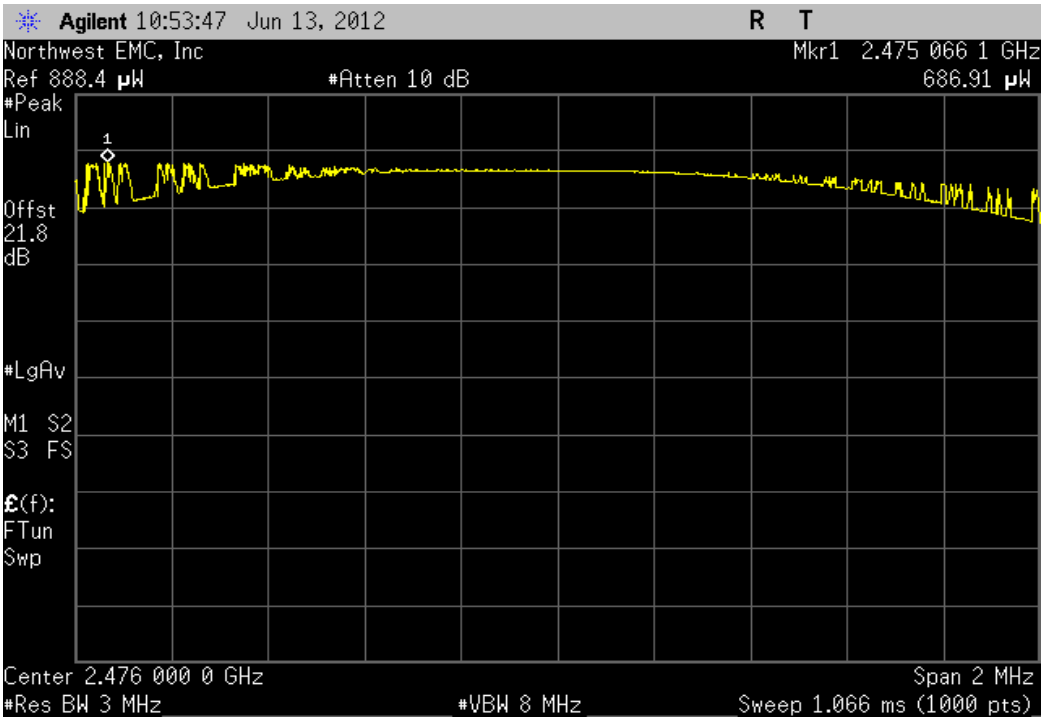


FSK Modulation, Mid Channel, 2450 MHz			
	Value	Limit	Result
	679.047 uW	< 1 W	Pass



FSK Modulation, High Channel, 2476 MHz

Value	Limit	Result
686.91 uW	< 1 W	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
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

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

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

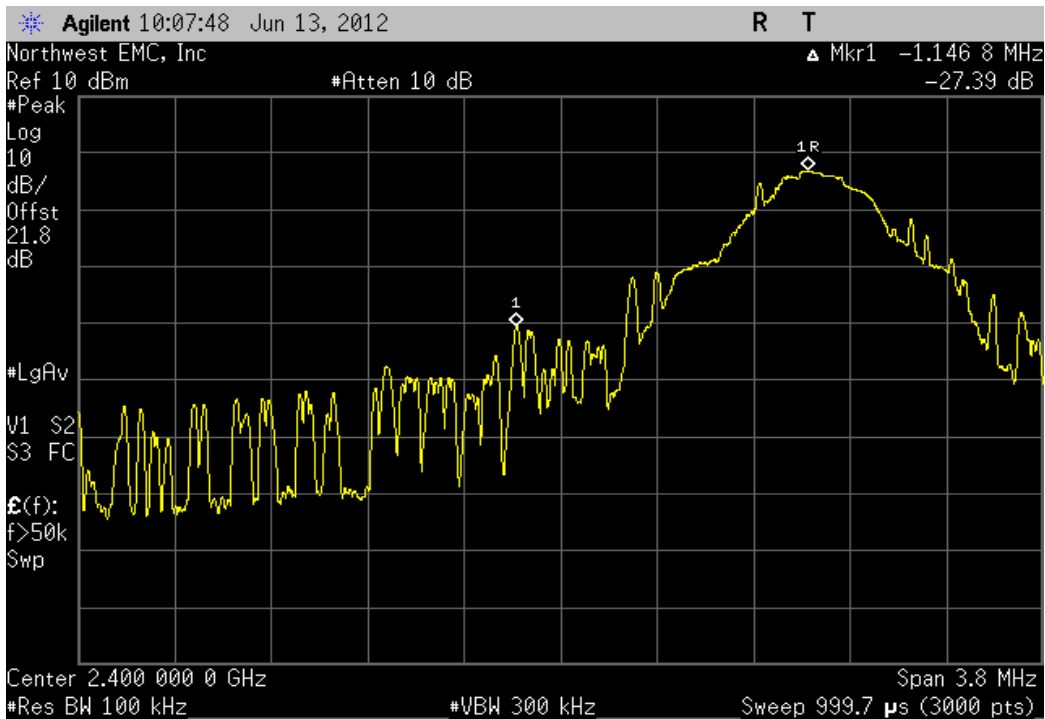


Band Edge Compliance

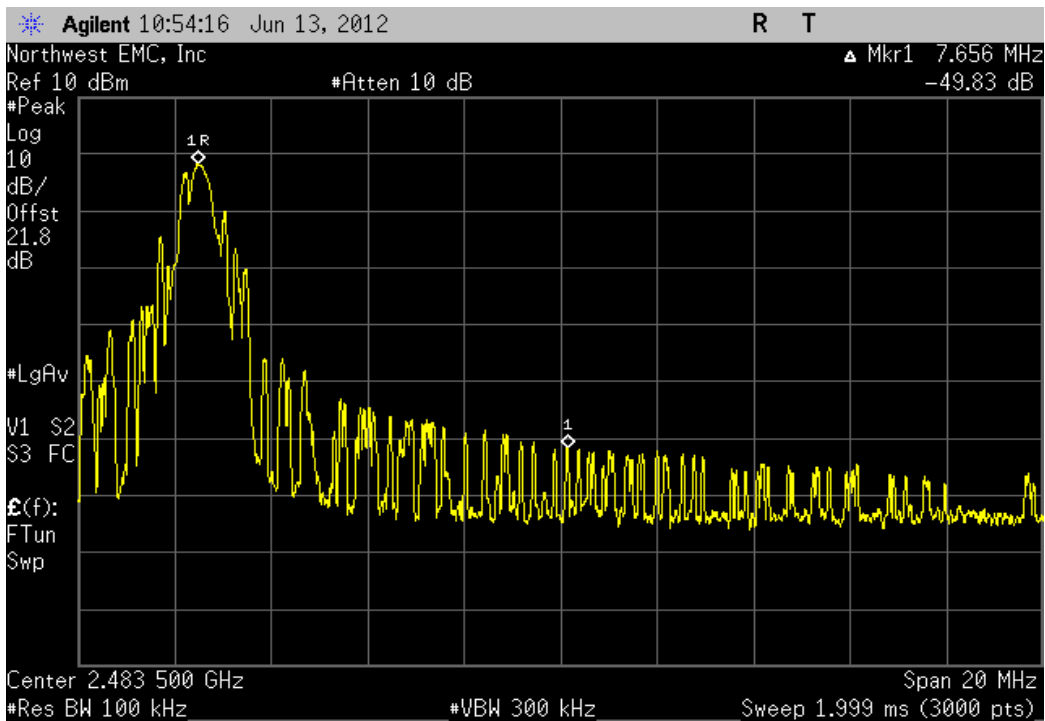
XMit 2012.05.09
PsaTx 2012.05.24

EUT: MB-R1G1		Work Order: SYNA0080	
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C	
Attendees: Skip Kaczynski		Humidity: 41%	
Project: None		Barometric Pres.: 1021.8	
Tested by: Rod Peloquin		Power: Battery	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	
COMMENTS			
Transmitting in 4ms bursts at 47.2 % duty cycle. See Duty Cycle module elsewhere in this report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rod Peloquin</i>	
		Value	Limit
FSK Modulation			Result
Low Channel, 2401 MHz		-27.39 dBc	≤ -20 dBc Pass
High Channel, 2476 MHz		-49.83 dBc	≤ -20 dBc Pass

FSK Modulation, Low Channel, 2401 MHz			
	Value	Limit	Result
	-27.39 dBc	≤ -20 dBc	Pass



FSK Modulation, High Channel, 2476 MHz			
	Value	Limit	Result
	-49.83 dBc	≤ -20 dBc	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
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/12/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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

XMit 2012.05.09
PsaTx 2012.05.24

EUT: MB-R1G1		Work Order: SYNA0080	
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C	
Attendees: Skip Kaczynski		Humidity: 41%	
Project: None		Barometric Pres.: 1021.8	
Tested by: Rod Peloquin		Power: Battery	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	

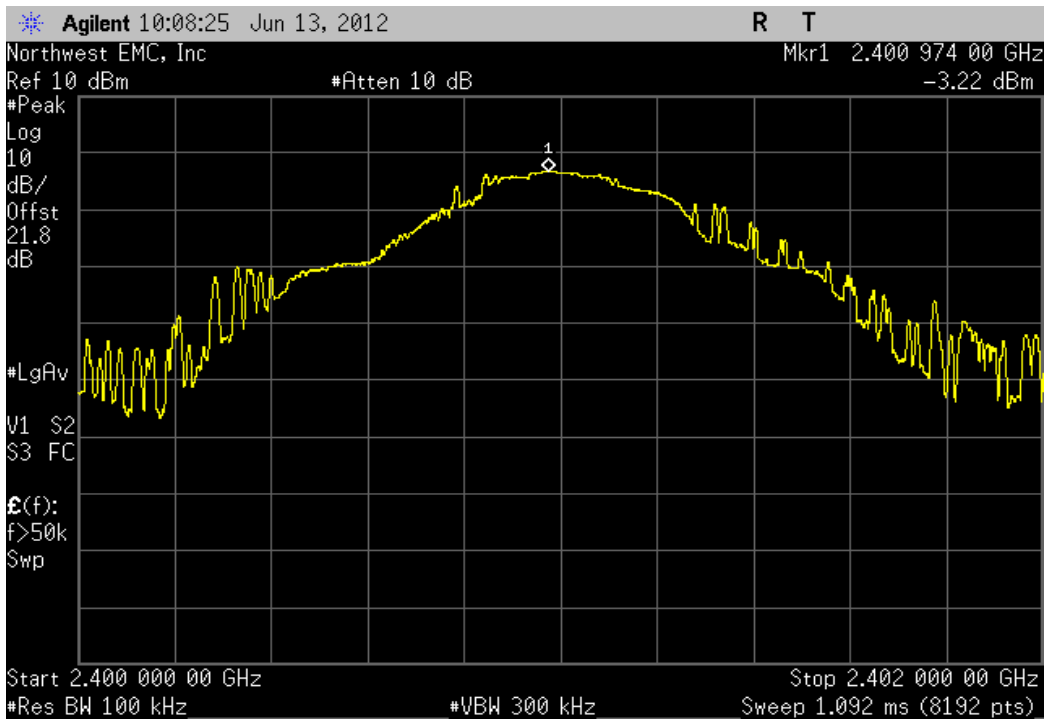
COMMENTS
Transmitting in 4ms bursts at 47.2 % duty cycle. See Duty Cycle module elsewhere in this report.

DEVIATIONS FROM TEST STANDARD
None

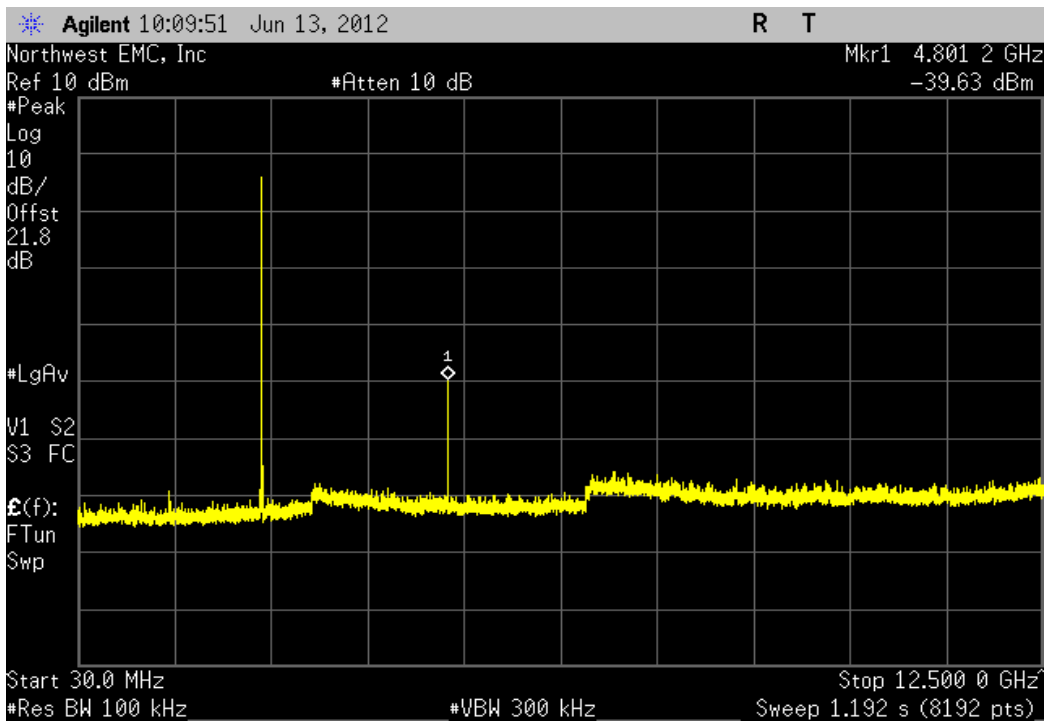
Configuration #	1	<i>Signature</i> 
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	Frequency Range	Value	Limit	Result
FSK Modulation				
Low Channel, 2401 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 2401 MHz	30 MHz - 12.5 GHz	-36.41 dBc	≤ -20 dBc	Pass
Low Channel, 2401 MHz	12.5 GHz - 25 GHz	-49.92 dBc	≤ -20 dBc	Pass
Mid Channel, 2450 MHz	Fundamental	N/A	N/A	N/A
Mid Channel, 2450 MHz	30 MHz - 12.5 GHz	-43.94 dBc	≤ -20 dBc	Pass
Mid Channel, 2450 MHz	12.5 GHz - 25 GHz	-50.68 dBc	≤ -20 dBc	Pass
High Channel, 2476 MHz	Fundamental	N/A	N/A	N/A
High Channel, 2476 MHz	30 MHz - 12.5 GHz	-42.96 dBc	≤ -20 dBc	Pass
High Channel, 2476 MHz	12.5 GHz - 25 GHz	-51.01 dBc	≤ -20 dBc	Pass

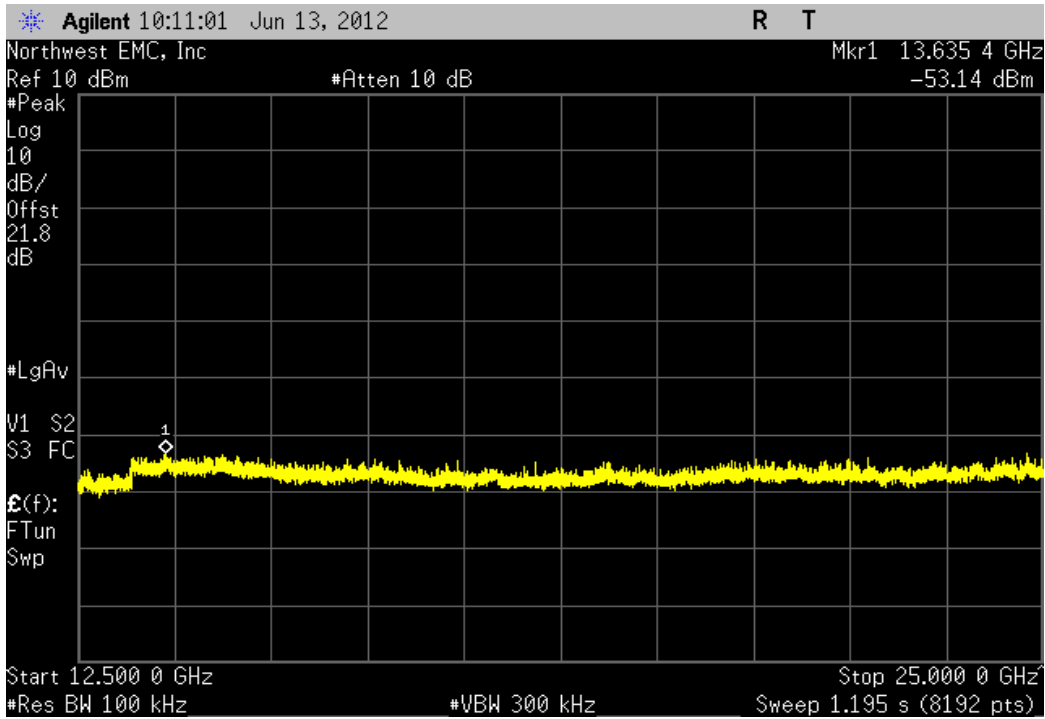
FSK Modulation, Low Channel, 2401 MHz				
Frequency Range	Value	Limit	Result	
Fundamental	N/A	N/A	N/A	



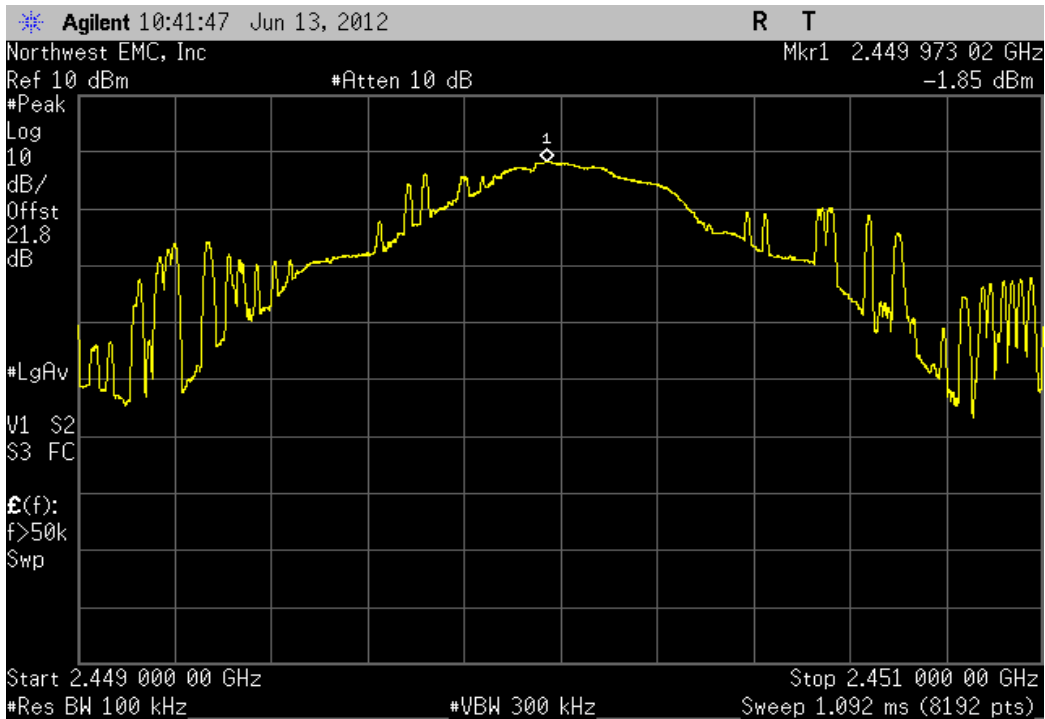
FSK Modulation, Low Channel, 2401 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-36.41 dBc	≤ -20 dBc	Pass	



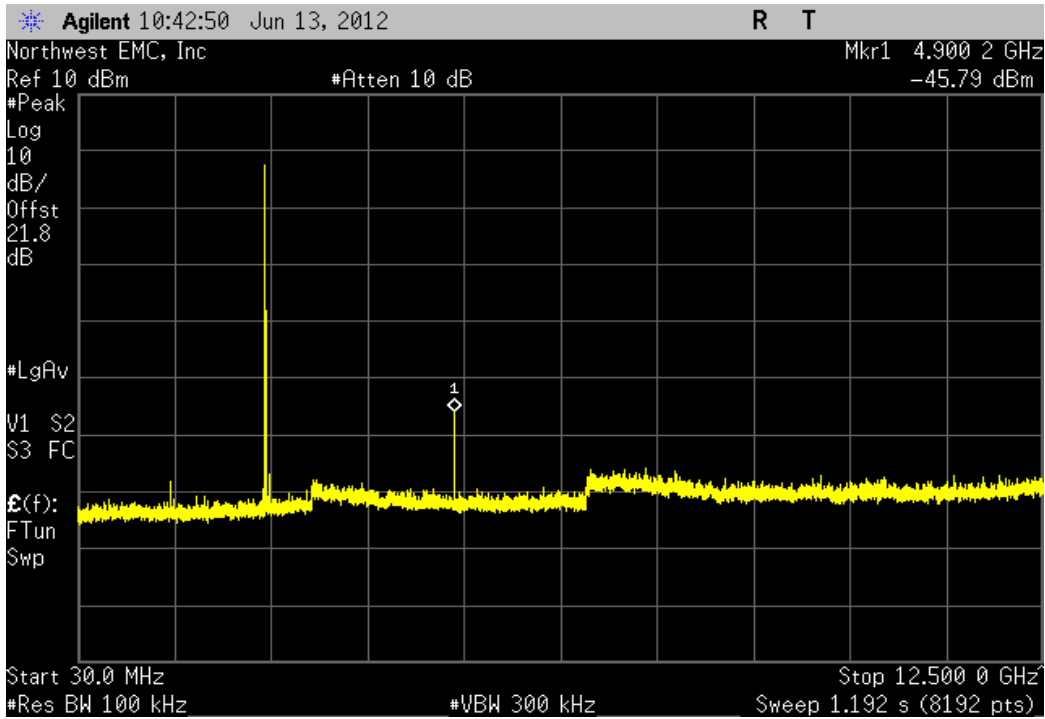
FSK Modulation, Low Channel, 2401 MHz			
Frequency Range	Value	Limit	Result
12.5 GHz - 25 GHz	-49.92 dBc	≤ -20 dBc	Pass



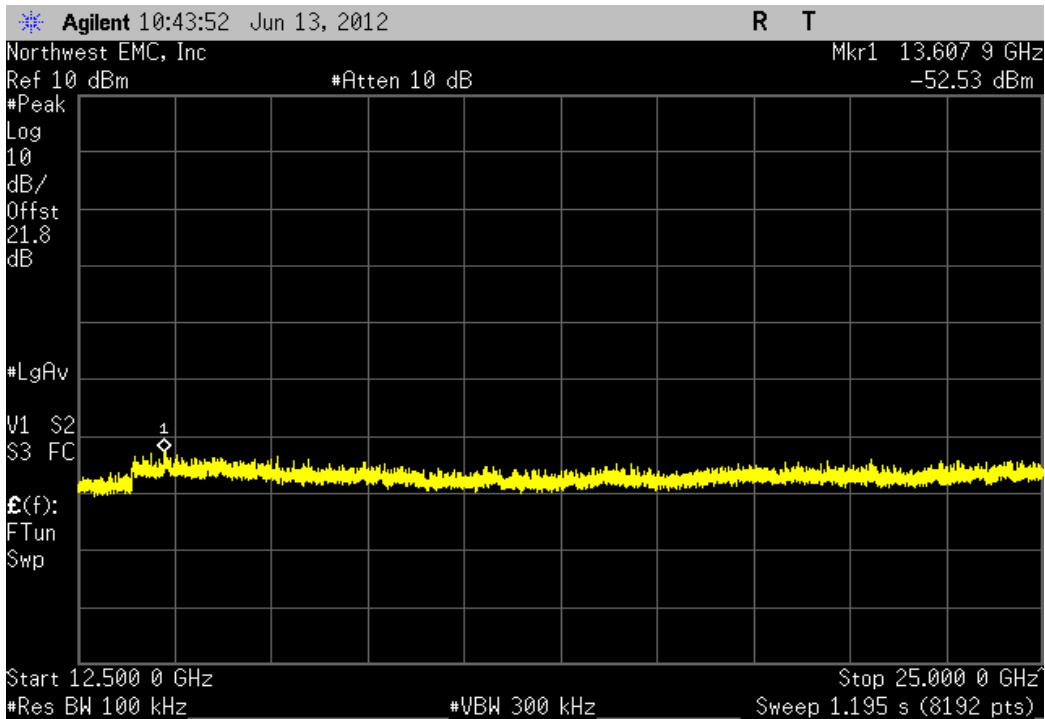
FSK Modulation, Mid Channel, 2450 MHz			
Frequency Range	Value	Limit	Result
Fundamental	N/A	N/A	N/A



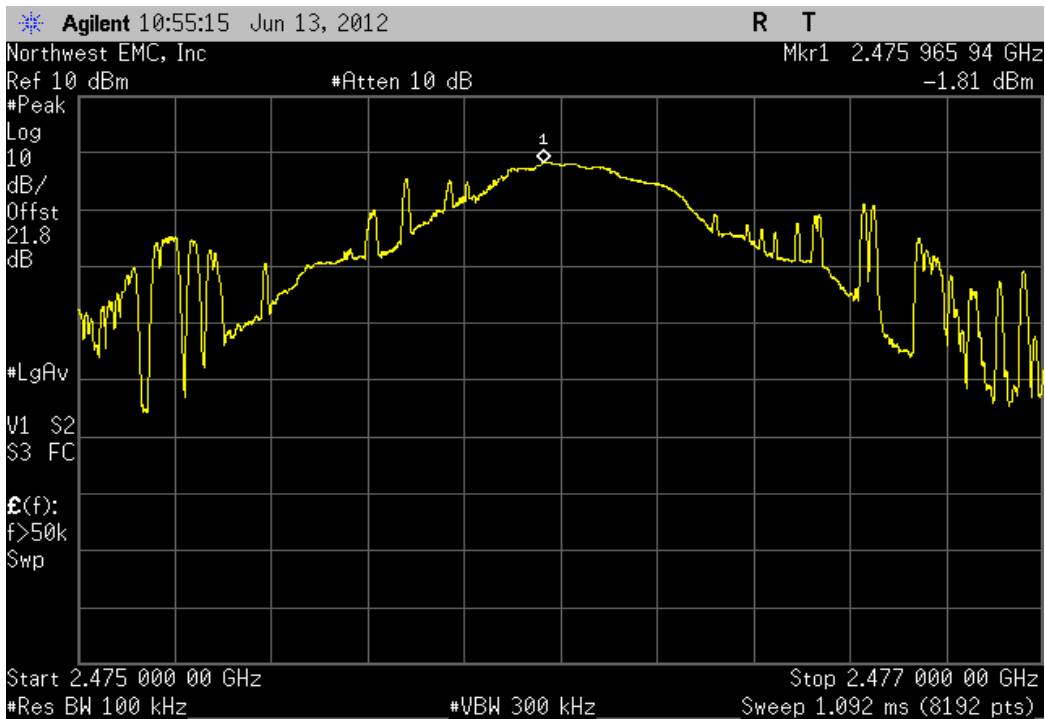
FSK Modulation, Mid Channel, 2450 MHz			
Frequency Range	Value	Limit	Result
30 MHz - 12.5 GHz	-43.94 dBc	≤ -20 dBc	Pass



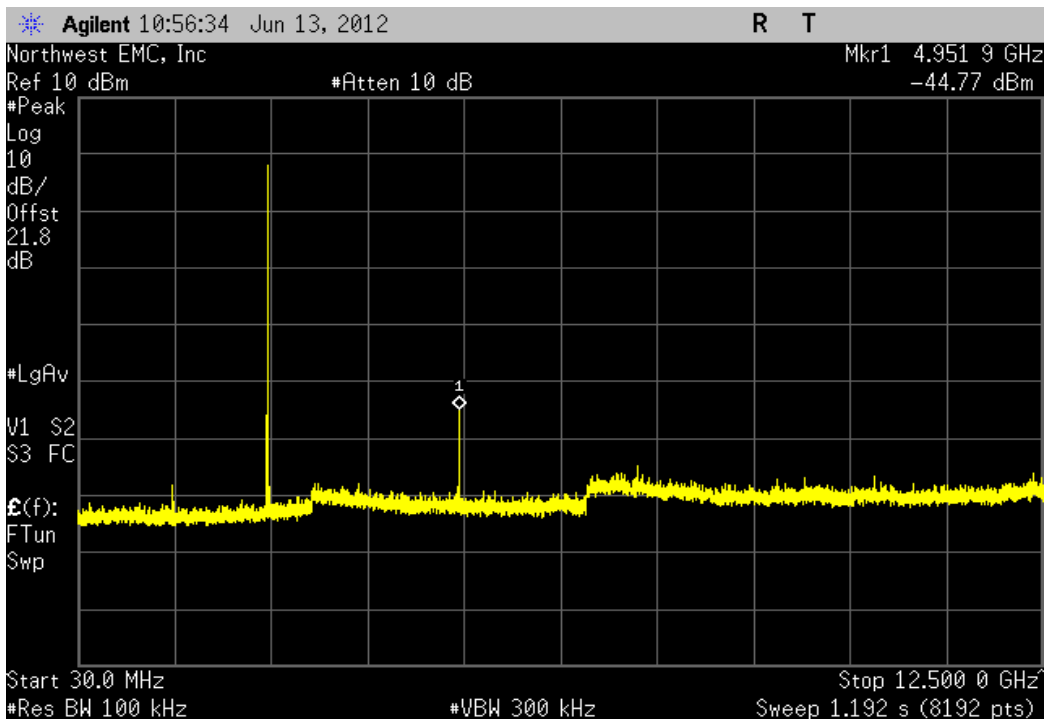
FSK Modulation, Mid Channel, 2450 MHz			
Frequency Range	Value	Limit	Result
12.5 GHz - 25 GHz	-50.68 dBc	≤ -20 dBc	Pass



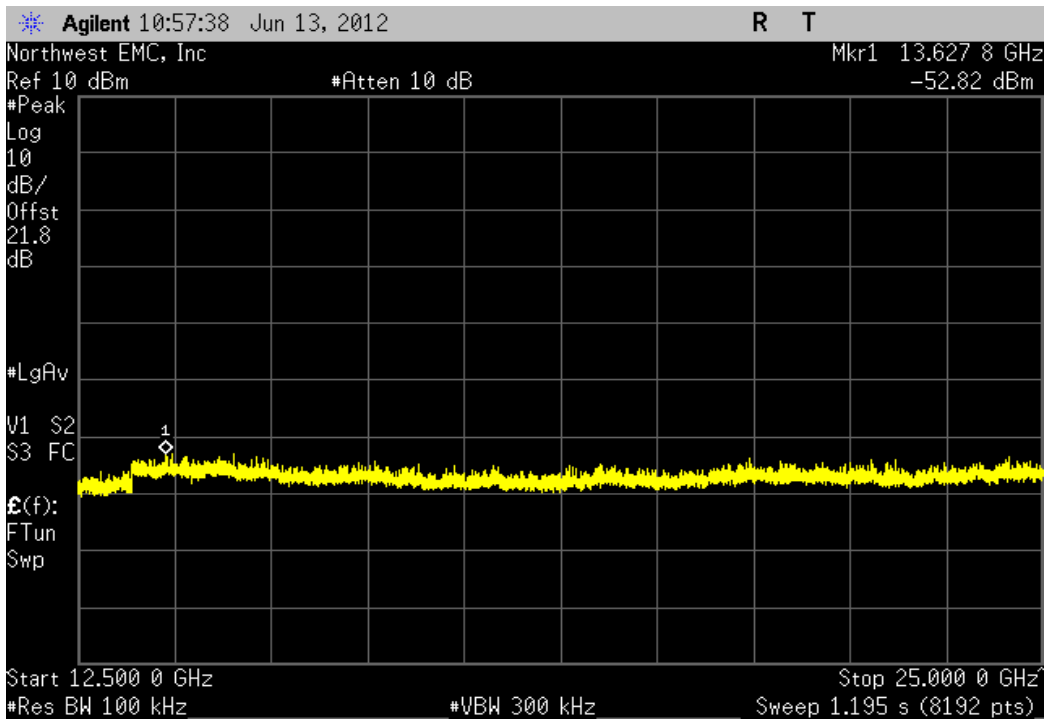
FSK Modulation, High Channel, 2476 MHz				
Frequency Range	Value	Limit	Result	
Fundamental	N/A	N/A	N/A	



FSK Modulation, High Channel, 2476 MHz				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-42.96 dBc	≤ -20 dBc	Pass	



FSK Modulation, High Channel, 2476 MHz			
Frequency Range	Value	Limit	Result
12.5 GHz - 25 GHz	-51.01 dBc	≤ -20 dBc	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
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The peak power spectral density measurements were measured with the EUT set to low, mid, 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 its maximum data rate for each modulation type available. Per the procedure outlined in FCC KDB 558074, March 23, 2005, the spectrum analyzer was used as follows:

The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 = 500$ seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 35 dB for correction to 3 kHz."

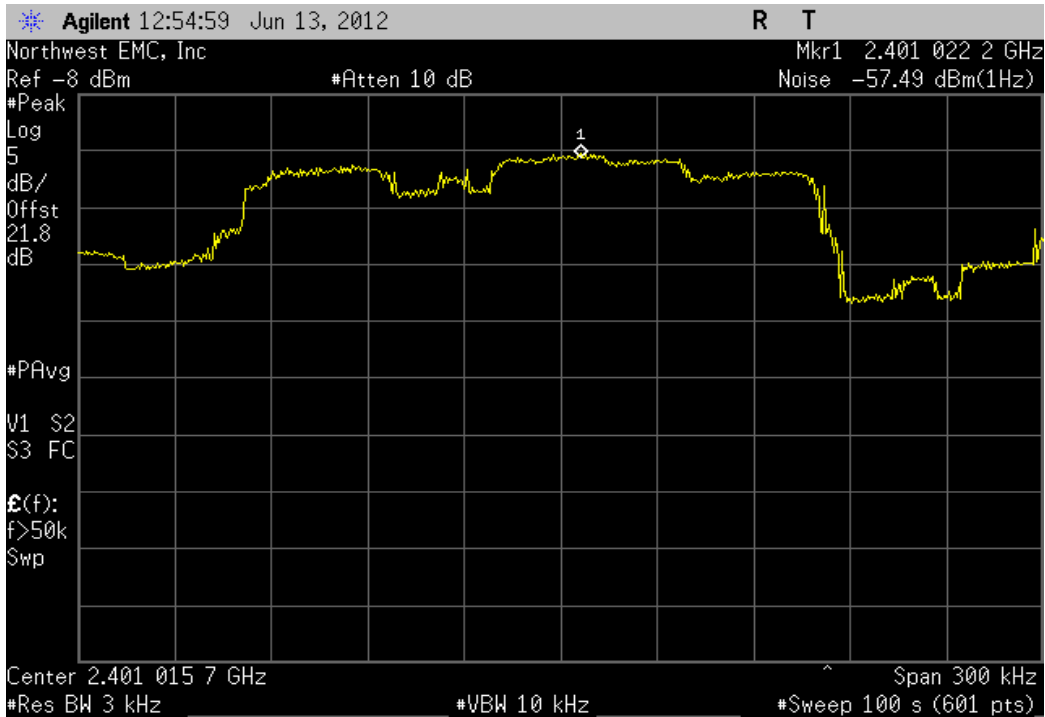


Power Spectral Density

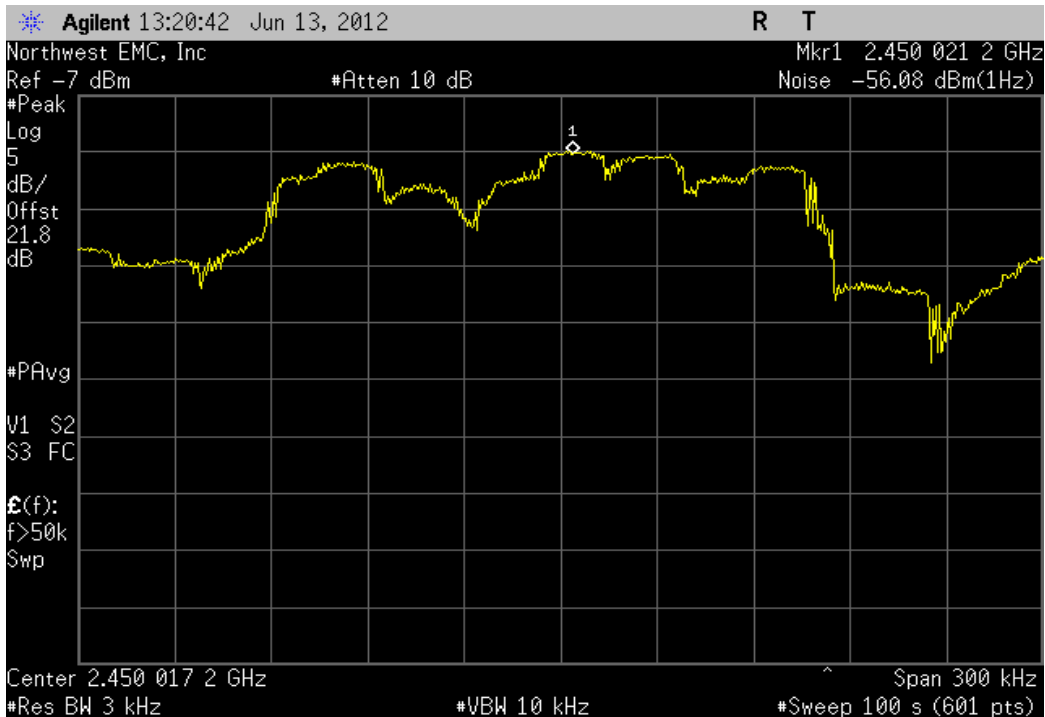
XMit 2012.05.09
PsaTx 2012.01.25

EUT: MB-R1G1		Work Order: SYNA0080	
Serial Number: 2501L1 / 00 00 1F 40 78		Date: 06/13/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23°C	
Attendees: Skip Kaczynski		Humidity: 41%	
Project: None		Barometric Pres.: 1021.8	
Tested by: Rod Peloquin		Power: Battery	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	
COMMENTS			
Transmitting in 4ms bursts at 47.2% duty cycle. See Duty Cycle module elsewhere in this report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rod Peloquin</i>	
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)
		Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)
			Result
FSK Modulation			
	Low Channel, 2401 MHz	-57.486	34.8
	Mid Channel, 2450 MHz	-56.083	34.8
	High Channel, 2476 MHz	-55.876	34.8
		-22.686	8
		-21.283	8
		-21.076	8
			Pass
			Pass
			Pass

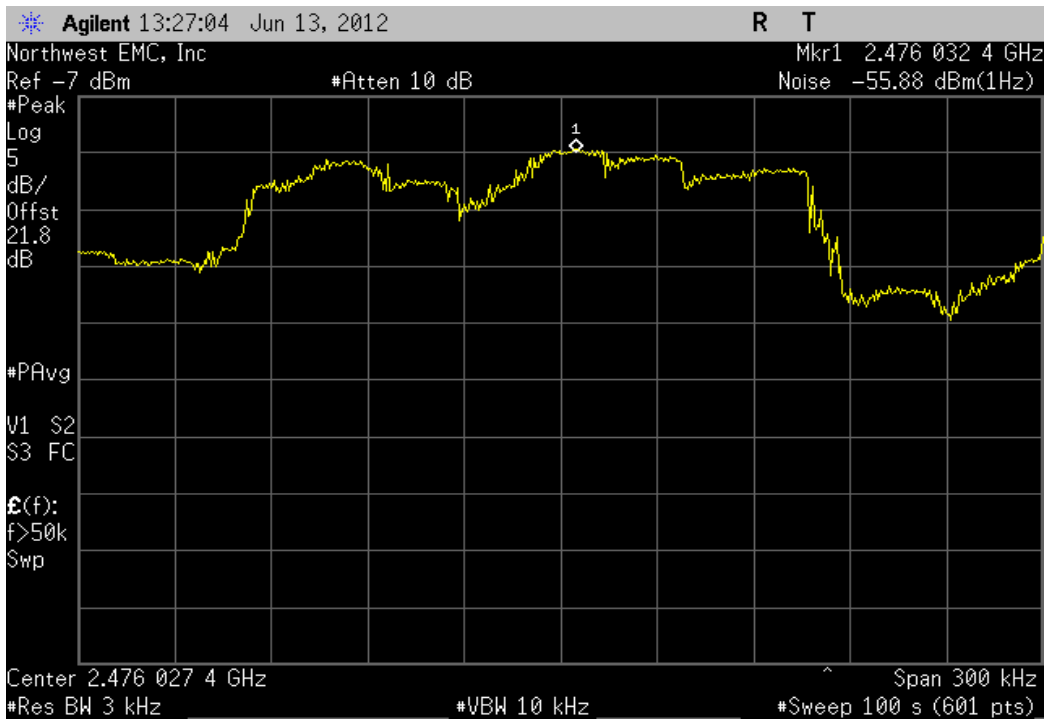
FSK Modulation, Low Channel, 2401 MHz						
	Value	(dBm / Hz)	To	Value	Limit	Result
	(dBm / Hz)	(dBm / 3 kHz)		(dBm / 3 kHz)	(dBm / 3 kHz)	
	-57.486		34.8	-22.686	8	Pass



FSK Modulation, Mid Channel, 2450 MHz						
	Value	(dBm / Hz)	To	Value	Limit	Result
	(dBm / Hz)	(dBm / 3 kHz)		(dBm / 3 kHz)	(dBm / 3 kHz)	
	-56.083		34.8	-21.283	8	Pass



FSK Modulation, High Channel, 2476 MHz					
	Value	(dBm / Hz) To	Value	Limit	
	(dBm / Hz)	(dBm / 3 kHz)	(dBm / 3 kHz)	(dBm / 3 kHz)	Result
	-55.876	34.8	-21.076	8	Pass



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 5% duty cycle

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

SYNA0080 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 25 GHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12 mo
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	8/9/2010	24 mo
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/28/2011	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2011	24 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/28/2011	12 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/28/2012	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
Antenna, Horn	ETS	3160-07	AHU	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/28/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/28/2012	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	9/12/2011	12 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	9/12/2011	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

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.



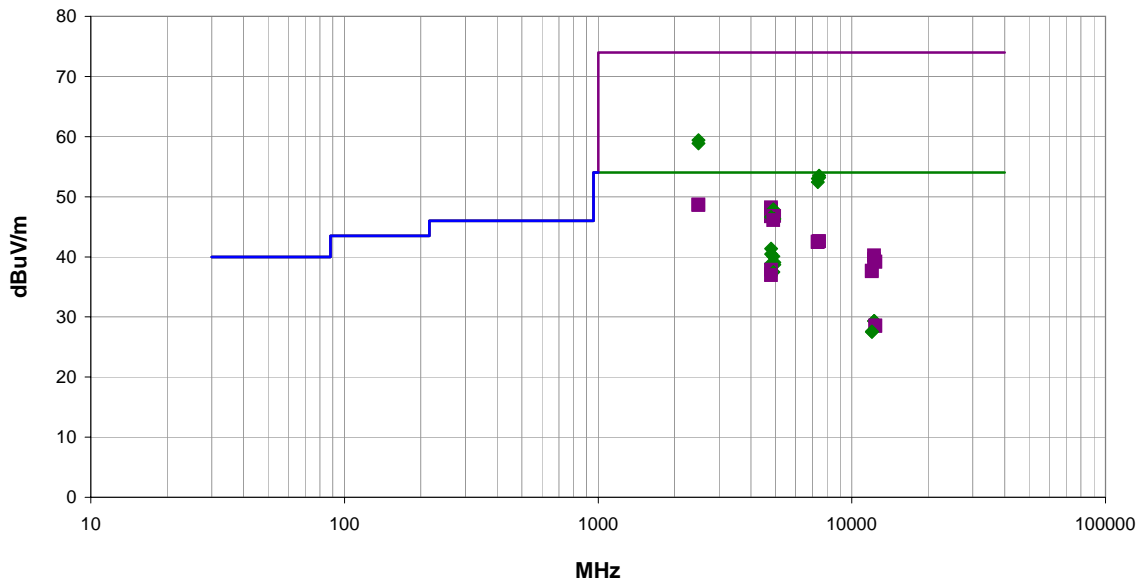
SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2012.05.07
PSA-ESCI Version 2011.12.21

Work Order:	SYNA0080	Date:	06/14/12	<i>Rod Pelouin</i>
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	42% RH	
Serial Number:	2503Q0/00001f427e	Barometric Pres.:	1021.5 mbar	
EUT:	MB-R1G1			
Configuration:	2			
Customer:	Synapse Strategic Product Development LLC			
Attendees:	Skip Kaczynski			
EUT Power:	Battery			
Operating Mode:	Transmitting 5% duty cycle			
Deviations:	None			
Comments:	None			

Test Specifications	FCC 15.247:2012	Test Method	ANSI C63.10:2009
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Run #	15	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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■ PK ◆ AV ● QP

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
2484.430	26.4	2.3	1.0	284.0	3.0	20.0	Vert	AV	0.0	48.7	54.0	-5.3	High Channel, EUT horizontal
2484.100	26.3	2.3	1.0	159.0	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	High Channel, EUT vertical
7426.825	25.9	16.7	1.9	192.0	3.0	0.0	Horz	AV	0.0	42.6	54.0	-11.4	High Channel, EUT vertical
7426.908	25.9	16.7	1.0	170.0	3.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	High Channel, EUT on side
7349.058	25.9	16.6	1.0	237.0	3.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	Mid Channel, EUT on side
7348.946	25.8	16.6	1.0	126.0	3.0	0.0	Horz	AV	0.0	42.4	54.0	-11.6	Mid Channel, EUT vertical
4802.000	32.0	9.3	1.0	26.0	3.0	0.0	Vert	AV	0.0	41.3	54.0	-12.7	Low Channel, EUT on side
4802.021	31.1	9.3	1.0	173.0	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Low Channel, EUT vertical
4900.004	30.6	9.5	1.9	178.0	3.0	0.0	Horz	AV	0.0	40.1	54.0	-13.9	Mid Channel, EUT vertical
2483.647	37.1	2.3	1.0	159.0	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	High Channel, EUT vertical
4952.100	29.5	9.6	1.0	238.0	3.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9	High Channel, EUT on side
2484.285	36.6	2.3	1.0	284.0	3.0	20.0	Vert	PK	0.0	58.9	74.0	-15.1	High Channel, EUT horizontal
4802.054	29.5	9.3	1.3	94.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	Low Channel, EUT on side
4951.938	29.1	9.6	1.0	359.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	High Channel, EUT vertical
4802.033	28.8	9.3	1.0	164.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	Low Channel, EUT horizontal
4801.896	28.5	9.3	1.0	333.0	3.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Low Channel, EUT vertical
4899.908	28.0	9.5	1.6	210.0	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	Mid Channel, EUT on side
4801.950	27.6	9.3	1.3	73.0	3.0	0.0	Horz	AV	0.0	36.9	54.0	-17.1	Low Channel, EUT horizontal
7428.308	36.8	16.7	1.0	170.0	3.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	High Channel, EUT on side
7429.004	36.5	16.7	1.9	192.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	High Channel, EUT vertical
7350.367	36.4	16.6	1.0	237.0	3.0	0.0	Vert	PK	0.0	53.0	74.0	-21.0	Mid Channel, EUT on side
7350.800	35.8	16.6	1.0	126.0	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	Mid Channel, EUT vertical

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
12248.510	33.2	-3.9	1.0	32.0	3.0	0.0	Vert	AV	0.0	29.3	54.0	-24.7	Mid Channel, EUT on side
12248.410	33.2	-3.9	1.0	205.0	3.0	0.0	Horz	AV	0.0	29.3	54.0	-24.7	Mid Channel, EUT vertical
12378.030	31.6	-3.0	1.0	329.0	3.0	0.0	Vert	AV	0.0	28.6	54.0	-25.4	High Channel, EUT on side
12378.130	31.5	-3.0	1.0	149.0	3.0	0.0	Horz	AV	0.0	28.5	54.0	-25.5	High Channel, EUT vertical
4802.000	38.9	9.3	1.0	173.0	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	Low Channel, EUT vertical
4801.840	38.6	9.3	1.0	26.0	3.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	Low Channel, EUT on side
4899.675	38.4	9.5	1.9	178.0	3.0	0.0	Horz	PK	0.0	47.9	74.0	-26.1	Mid Channel, EUT vertical
12003.960	33.1	-5.5	1.0	347.0	3.0	0.0	Vert	AV	0.0	27.6	54.0	-26.4	Low Channel, EUT on side
12006.850	33.0	-5.5	1.0	205.0	3.0	0.0	Horz	AV	0.0	27.5	54.0	-26.5	Low Channel, EUT vertical
4801.550	38.0	9.3	1.3	94.0	3.0	0.0	Horz	PK	0.0	47.3	74.0	-26.7	Low Channel, EUT on side
4952.042	37.2	9.6	1.0	359.0	3.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	High Channel, EUT vertical
4802.383	37.4	9.3	1.0	333.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	Low Channel, EUT vertical
4802.192	37.4	9.3	1.0	164.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	Low Channel, EUT horizontal
4802.492	37.3	9.3	1.3	73.0	3.0	0.0	Horz	PK	0.0	46.6	74.0	-27.4	Low Channel, EUT horizontal
4951.808	36.7	9.6	1.0	238.0	3.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7	High Channel, EUT on side
4900.238	36.6	9.5	1.6	210.0	3.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	Mid Channel, EUT on side
12250.220	44.1	-3.9	1.0	32.0	3.0	0.0	Vert	PK	0.0	40.2	74.0	-33.8	Mid Channel, EUT on side
12249.620	43.5	-3.9	1.0	205.0	3.0	0.0	Horz	PK	0.0	39.6	74.0	-34.4	Mid Channel, EUT vertical
12378.770	42.2	-3.0	1.0	329.0	3.0	0.0	Vert	PK	0.0	39.2	74.0	-34.8	High Channel, EUT on side
12378.220	42.2	-3.0	1.0	149.0	3.0	0.0	Horz	PK	0.0	39.2	74.0	-34.8	High Channel, EUT vertical
12003.430	43.2	-5.5	1.0	347.0	3.0	0.0	Vert	PK	0.0	37.7	74.0	-36.3	Low Channel, EUT on side
12005.140	43.1	-5.5	1.0	205.0	3.0	0.0	Horz	PK	0.0	37.6	74.0	-36.4	Low Channel, EUT vertical