

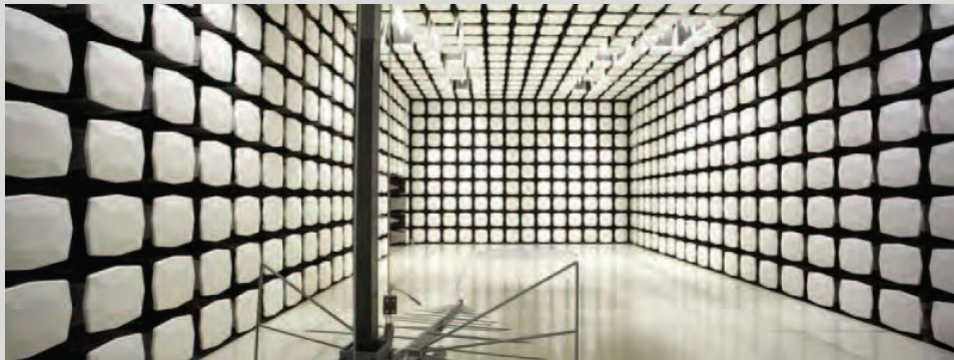


Synapse Strategic Product Development LLC

xBR V3

FCC 15.247:2012

Report #: SYNA0096



Report Prepared By Northwest EMC Inc.

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

California – Minnesota – Oregon – New York – Washington

Last Date of Test: September 19, 2012
Synapse Strategic Product Development LLC
Model: xBR V3

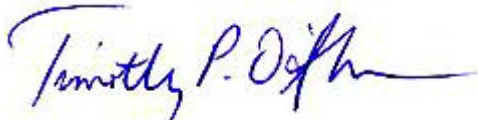
Emissions

Test Description	Specification	Test Method	Pass/Fail
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
AC Powerline Conducted Emissions	FCC 15.207:2012	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
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.

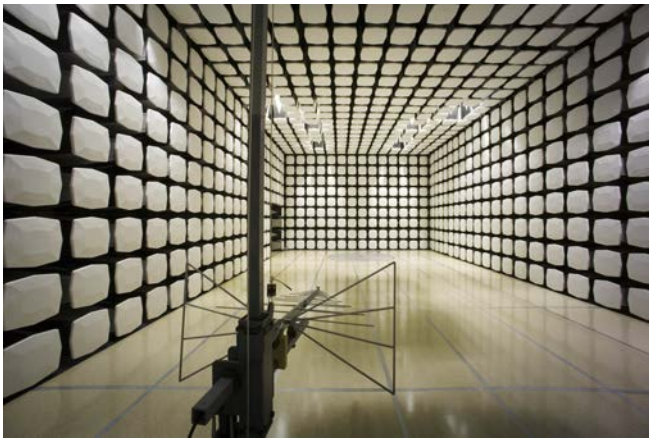
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 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)	4.00	-4.00
AC Powerline Conducted Emissions (dB)	2.70	-2.70



<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				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1





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:	Eric Anderson
Model:	xBR V3
First Date of Test:	September 12, 2012
Last Date of Test:	September 19, 2012
Receipt Date of Samples:	September 12, 2012
Equipment Design Stage:	Production
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 module, 802.15.4 compliant with 1 antenna
Testing Objective:
To demonstrate compliance to FCC 15.247 requirements.

Configuration SYNA0096- 1

Software/Firmware Running during test	
Description	Version
PuTTY	Release 0.62

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter	Synapse Strategic Product Development LLC	xBR V3	321

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply	Netgear	NU60-F480125-I1NN	24113818110290065W
8-Port PoE Switch	Netgear	GS108PE	2LS11A3700331

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.8m	No	Power Supply	AC Mains
DC Power	No	1.8m	PA	Power Supply	8-Port PoE Switch
CAT-5e	No	2.1m	No	8-Port PoE Switch	Transmitter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Configuration SYNA0096- 2

Software/Firmware Running during test	
Description	Version
PuTTY	Release 0.62

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter	Synapse Strategic Product Development LLC	xBR V3	321

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply	Netgear	NU60-F480125-I1NN	24113818110290065W
8-Port PoE Switch	Netgear	GS108PE	2LS11A3700331

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.8m	No	Power Supply	AC Mains
DC Power	No	1.8m	PA	Power Supply	8-Port PoE Switch
CAT-5e	No	4.2m	No	8-Port PoE Switch	Transmitter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Configuration SYNA0096- 3

Software/Firmware Running during test	
Description	Version
PuTTY	Release 0.62

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter	Synapse Strategic Product Development LLC	xBR V3	321

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
24 port 10/100 switch	Cisco	SFE2000P	DNI1612B20G

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply	Netgear	NU60-F480125-I1NN	24113818110290065W

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.8m	No	Power Supply	AC Mains
DC Power	No	1.8m	PA	Power Supply	8-Port PoE Switch
CAT-5e	No	2.1m	No	8-Port PoE Switch	Transmitter

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	9/12/2012	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.
2	9/12/2012	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.
3	9/12/2012	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	9/12/2012	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.
5	9/12/2012	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.
6	9/12/2012	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.
7	9/19/2012	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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	7/5/2012	12
40GHz DC Block	Miteq	DCB4000	AMD	6/25/2012	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Attenuator, 'Precision N'	S.M. Electronics	SA18N-06/SM4032	REE	12/15/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 26 dB (99.9%) emission bandwidth (EBW) was also measured at the same time.

The EUT was set to a single transmit frequency. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting using the GFSK modulation type listed in the datasheet.



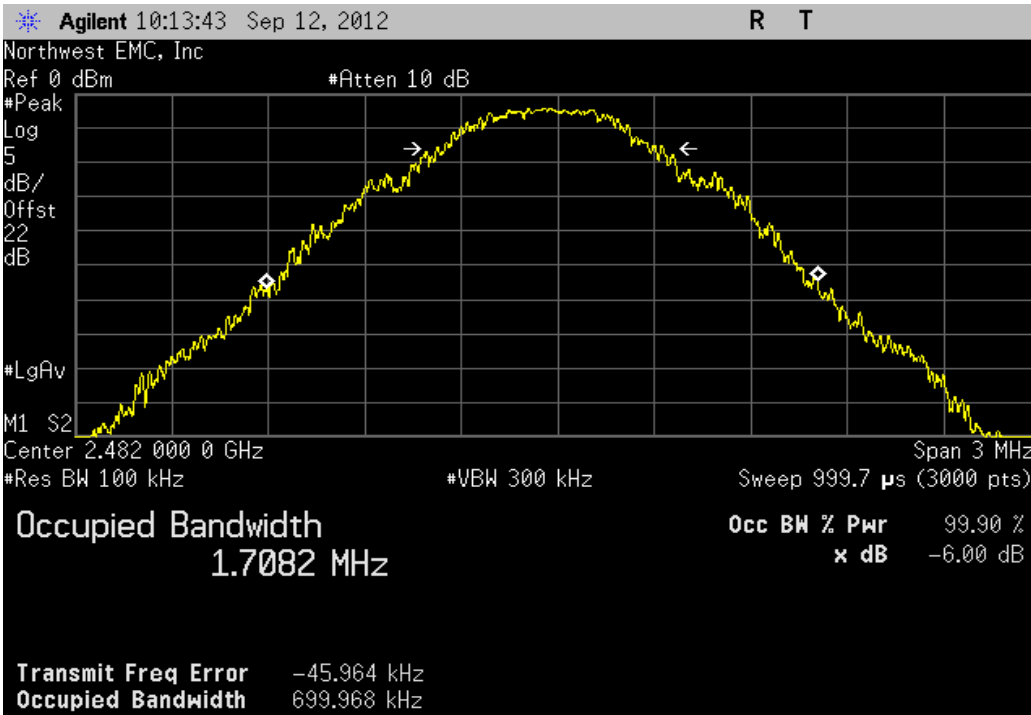
Occupied Bandwidth

XMit 2012.07.31
PsaTx 2012.09.10

EUT: xBR V3		Work Order: SYNA0096	
Serial Number: 321		Date: 09/12/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23.7°C	
Attendees: None		Humidity: 31%	
Project: None		Barometric Pres.: 1023.7	
Tested by: Brandon Hobbs, Carl Engholm, and Rod Peloquin		Power: PoE	
Job Site: EV06		Test Method	
TEST SPECIFICATIONS		ANSI C63.10:2009	
FCC 15.247:2012			
COMMENTS			
Transmitting at 100% duty cycle. Two 50 Ohm terminating antennas on receive ports.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rodney W. Pelroy</i>	
		Value	Limit
Ant A	GFSK, 20MHz		
	Channel 2482	699.968 kHz	> 500 kHz
			Pass

Ant A, 20MHz, Channel 2482

Value	Limit	Result
699.968 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	7/5/2012	12
40GHz DC Block	Miteq	DCB4000	AMD	6/25/2012	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Attenuator, 'Precision N'	S.M. Electronics	SA18N-06/SM4032	REE	12/15/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

TEST DESCRIPTION

The transmit frequency was set to the required channel in the band. 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 reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

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

Method PK1 found in KDB 558074 DTS D01 Measurement Section 5.2.1.1 was used because the Emission Bandwidth was less than the RBW on the analyzer.



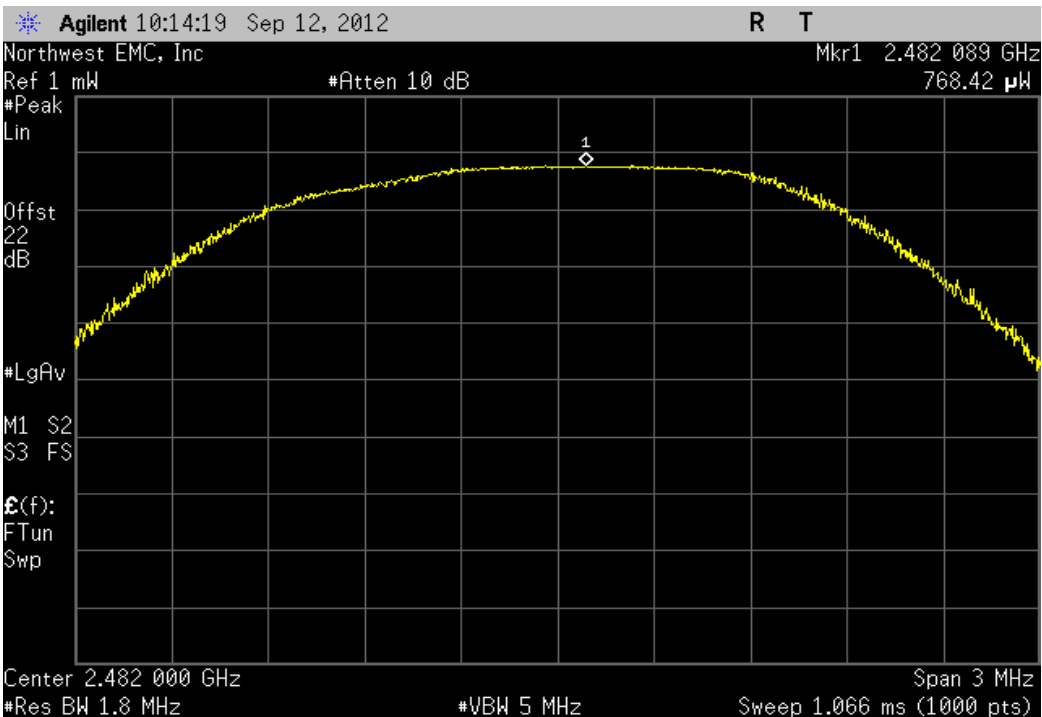
Output Power

XMit 2012.07.31
PsaTx 2012.09.10

EUT: xBR V3		Work Order: SYNA0096	
Serial Number: 321		Date: 09/12/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23.7°C	
Attendees: None		Humidity: 31%	
Project: None		Barometric Pres.: 1023.7	
Tested by: Brandon Hobbs, Carl Engholm, and Rod Peloquin		Power: PoE	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	
COMMENTS			
Transmitting at 100% duty cycle. Two 50 Ohm terminating antennas on receive ports.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rodney W. Pelroy</i>	
		Value	Limit
Ant A	GFSK, 20MHz Channel 2482	768.422 uW	< 1 W
			Pass

Ant A, 20MHz, Channel 2482

Value	Limit	Result
768.422 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
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator, 'Precision N'	S.M. Electronics	SA18N-06/SM4032	REE	12/15/2011	12
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
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2012	12
40GHz DC Block	Miteq	DCB4000	AMD	6/25/2012	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2012	12

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to 2482 MHz transmit frequency in the band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting using the GFSK modulation type listed in the datasheet.

The spectrum was scanned above the higher band edge.



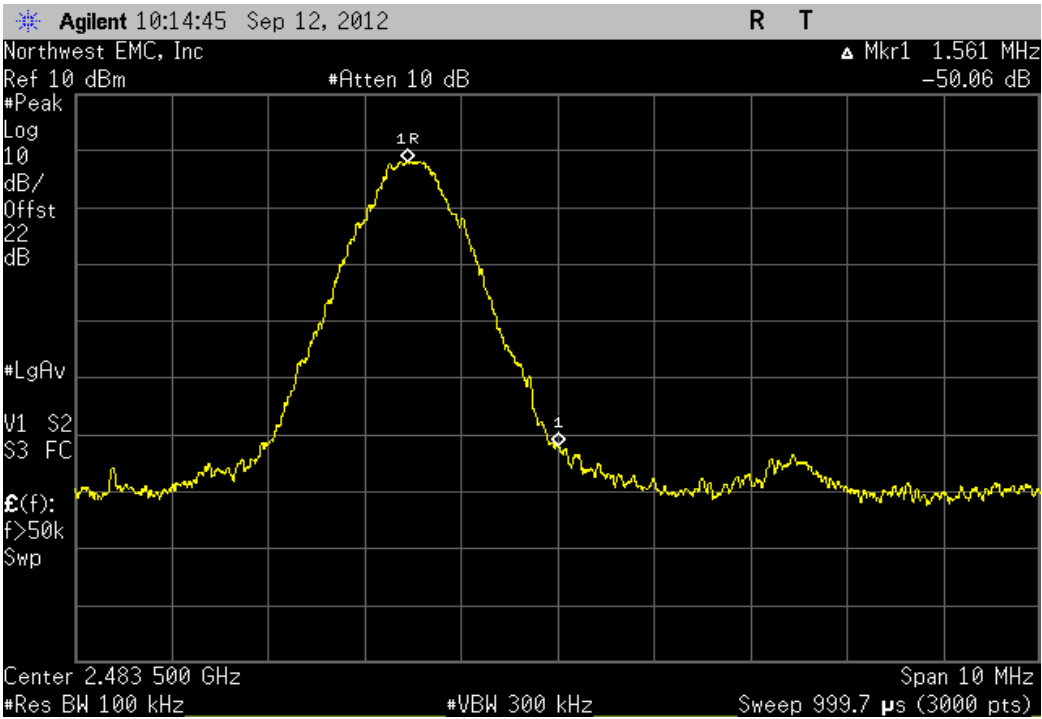
Band Edge Compliance

XMit 2012.07.31
PsaTx 2012.09.10

EUT: xBR V3		Work Order: SYNA0096	
Serial Number: 321		Date: 09/12/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23.7°C	
Attendees: None		Humidity: 31%	
Project: None		Barometric Pres.: 1023.7	
Tested by: Brandon Hobbs, Carl Engholm, and Rod Peloquin		Power: PoE	
Job Site: EV06		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	
COMMENTS			
Transmitting at 100% duty cycle. Two 50 Ohm terminating antennas on receive ports.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rodney W. Pelroy</i>	
		Value	Limit
Ant A	GFSK, 20MHz Channel 2482	-50.07 dBc	≤ -20 dBc
			Pass

Ant A, 20MHz, Channel 2482

Value	Limit	Result
-50.07 dBc	≤ -20 dBc	Pass



Duty Cycle

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.

The EUT operates at 100% Duty Cycle.

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	7/5/2012	12
40GHz DC Block	Miteq	DCB4000	AMD	6/25/2012	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Attenuator, 'Precision N'	S.M. Electronics	SA18N-06/SM4032	REE	12/15/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to the single transmit frequency. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. For the transmit frequency, the spectrum was scanned throughout the specified frequency range.

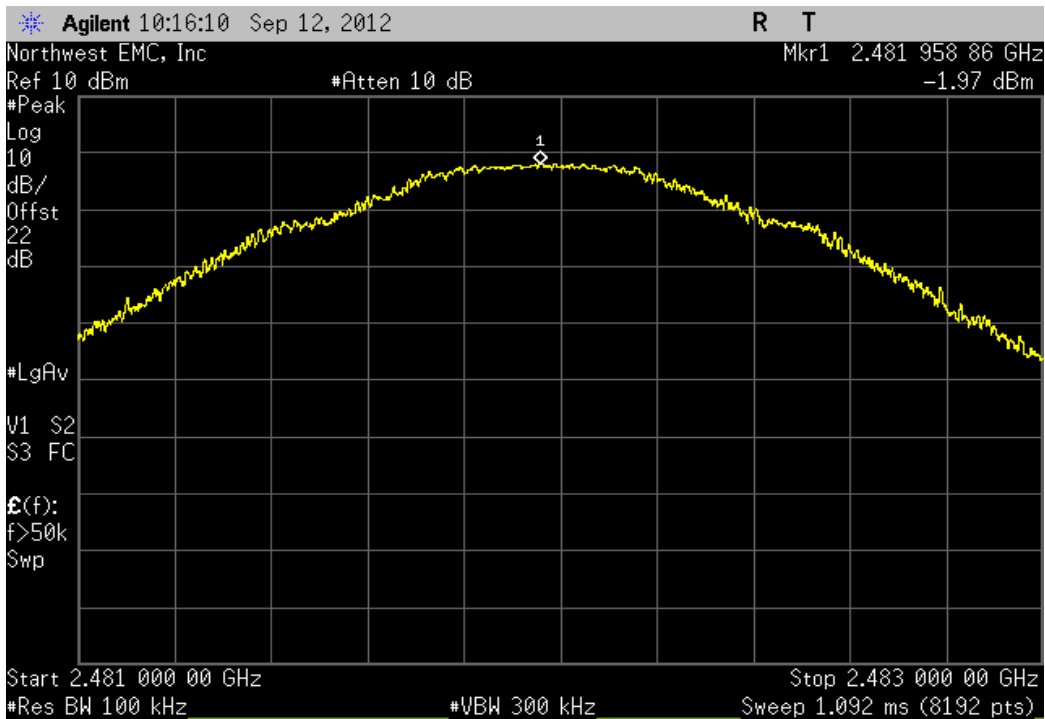


Spurious Conducted Emissions

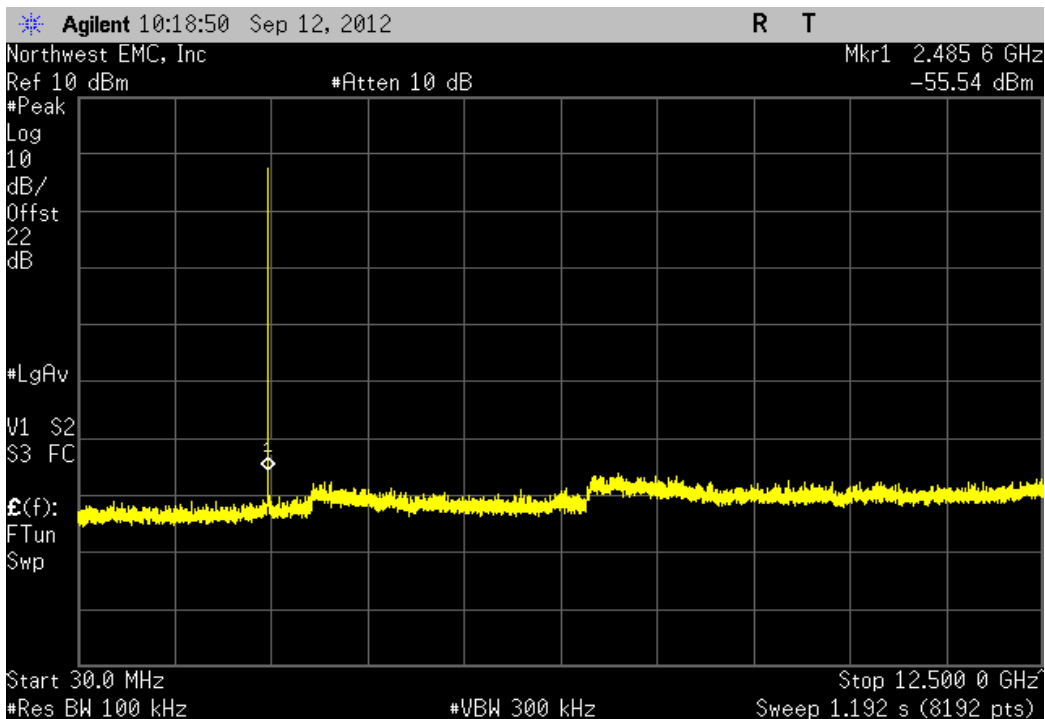
XMit 2012.07.31
PsaTx 2012.09.10

EUT: xBR V3		Work Order: SYNA0096	
Serial Number: 321		Date: 09/12/12	
Customer: Synapse Strategic Product Development LLC		Temperature: 23.7°C	
Attendees: None		Humidity: 31%	
Project: None		Barometric Pres.: 1023.7	
Tested by: Brandon Hobbs, Carl Engholm, and Rod Peloquin		Power: PoE	
Job Site: EV06		Test Method	
FCC 15.247:2012		ANSI C63.10:2009	
COMMENTS			
Transmitting at 100% duty cycle. Two 50 Ohm terminating antennas on receive ports.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Rodney W. Peloquin</i>	
		Frequency Range	Value Limit Result
Ant A	GFSK, 20MHz	Fundamental	N/A N/A N/A
	Channel 2482	30 MHz - 12.5 GHz	-53.57 dBc ≤ -20 dBc Pass
	Channel 2482	12.5 GHz - 25 GHz	-51.05 dBc ≤ -20 dBc Pass

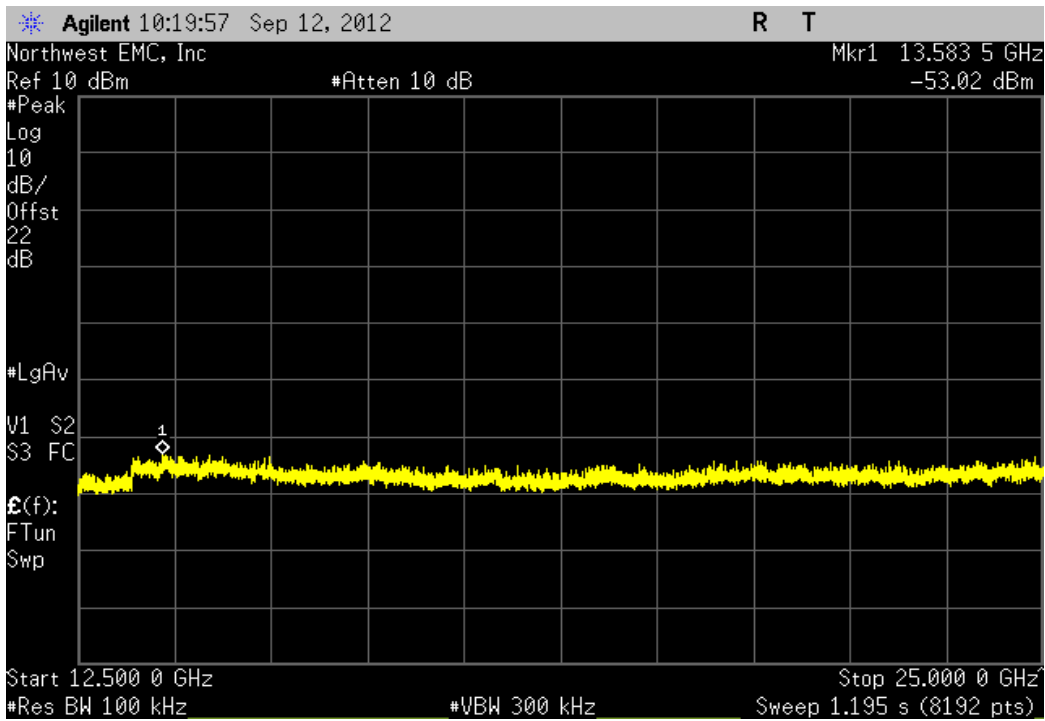
Ant A, 20MHz, Channel 2482				
Frequency Range	Value	Limit	Result	
Fundamental	N/A	N/A	N/A	



Ant A, 20MHz, Channel 2482				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-53.57 dBc	≤ -20 dBc	Pass	



Ant A, 20MHz, Channel 2482			
Frequency Range	Value	Limit	Result
12.5 GHz - 25 GHz	-51.05 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	7/5/2012	12
40GHz DC Block	Miteq	DCB4000	AMD	6/25/2012	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/2/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Attenuator, 'Precision N'	S.M. Electronics	SA18N-06/SM4032	REE	12/15/2011	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequency in the band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting using the GFSK modulation type.

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

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


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

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

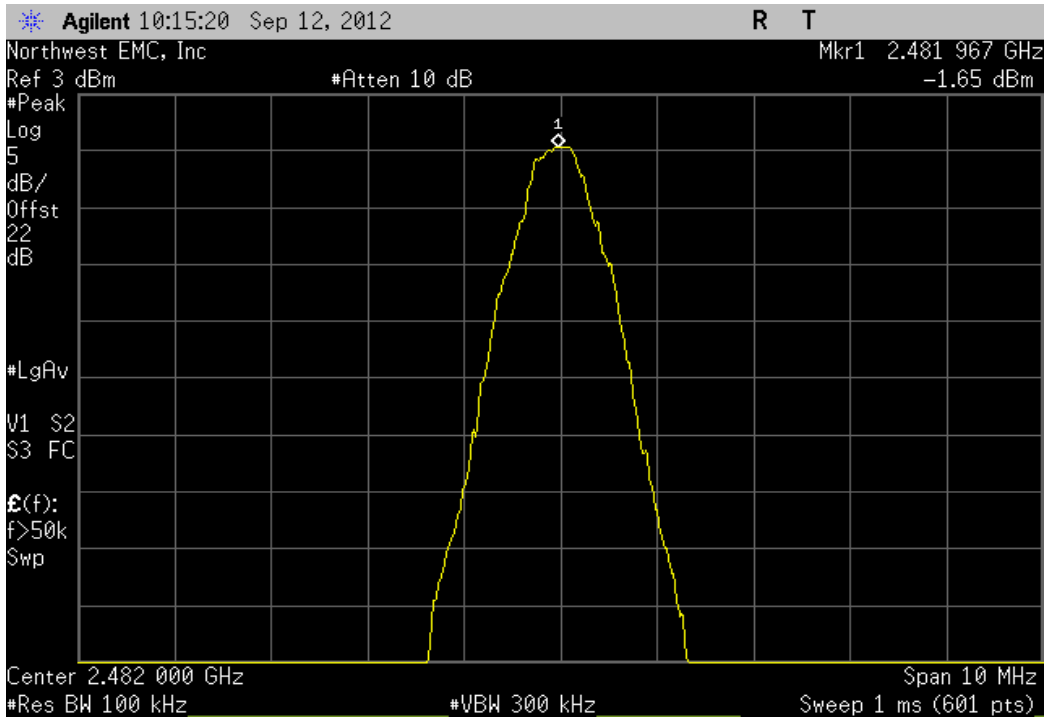


Power Spectral Density

XMit 2012.07.31
PsaTx 2012.09.10

EUT: xBR V3		Work Order: SYNA0096			
Serial Number: 321		Date: 09/12/12			
Customer: Synapse Strategic Product Development LLC		Temperature: 23.7°C			
Attendees: None		Humidity: 31%			
Project: None		Barometric Pres.: 1023.7			
Tested by: Brandon Hobbs, Carl Engholm, and Rod Peloquin		Power: PoE		Job Site: EV06	
TEST SPECIFICATIONS			Test Method		
FCC 15.247:2012			ANSI C63.10:2009		
COMMENTS					
Transmitting at 100% duty cycle. Two 50 Ohm terminating antennas on receive ports.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	<i>Signature</i> 			
		Value	dBm/100kHz	Value	Limit
		dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz
Ant A	GFSK, 20MHz				
	Channel 2482	-1.651	-15.2	-16.851	8
					Pass

Ant A, 20MHz, Channel 2482					
	Value	dBm/100kHz	Value	Limit	Result
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	-1.651	-15.2	-16.851	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 GFSK at 2482 MHz, 100% duty cycle

POWER SETTINGS INVESTIGATED

PoE

CONFIGURATIONS INVESTIGATED

SYNA0096 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz
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SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	ESM Cable Corp.	KMKM-72	EVY	9/11/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	9/11/2012	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/28/2012	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/28/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/28/2012	12 mo
Antenna, Horn	ETS	3160-07	AHU	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/27/2012	12 mo
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/27/2012	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2011	24 mo
EV01 Cables	N/A	Bilog Cables	EVA	6/26/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/26/2012	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

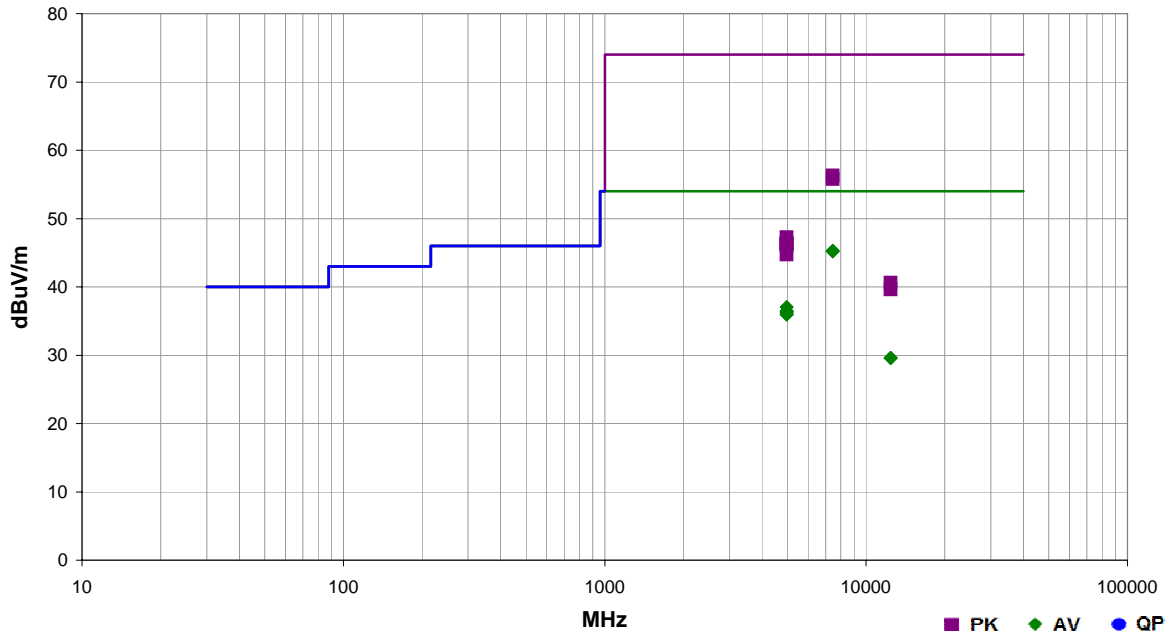
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for a single transmit frequency. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While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

SPURIOUS RADIATED EMISSIONS

Work Order:	SYNA0096	Date:	09/12/12	<i>Carl Engholm</i>
Project:	None	Temperature:	23.6 °C	
Job Site:	EV01	Humidity:	33% RH	
Serial Number:	321	Barometric Pres.:	1022.2 mbar	
EUT: xBR V3			Tested by:	
Configuration:	2			
Customer:	Synapse Strategic Product Development LLC			
Attendees:	None			
EUT Power:	PoE			
Operating Mode:	Transmitting GFSK at 2482 MHz, 100% duty cycle			
Deviations:	None			
Comments:	None			

Test Specifications	FCC 15.247:2012	Test Method	ANSI C63.10:2009
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Run #	6	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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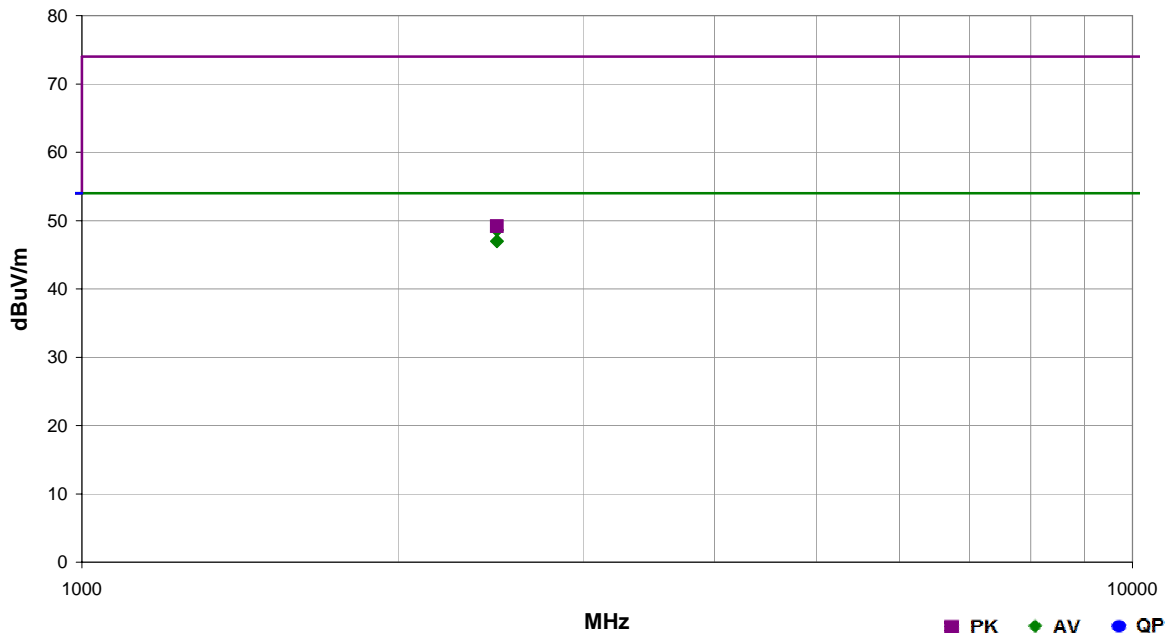
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (m)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dB)	Spec. Limit (dB)	Compared to Spec. (dB)
7445.120	25.8	19.5	1.0	128.0	3.0	0.0	Horz	AV	0.0	45.3	54.0	-8.7
7445.400	25.7	19.5	1.0	206.0	3.0	0.0	Vert	AV	0.0	45.2	54.0	-8.8
4963.940	26.3	10.8	1.0	86.0	3.0	0.0	Horz	AV	0.0	37.1	54.0	-16.9
4964.020	25.7	10.8	1.0	6.0	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5
4963.867	25.7	10.8	1.0	353.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5
7445.320	36.8	19.5	1.0	128.0	3.0	0.0	Horz	PK	0.0	56.3	74.0	-17.7
4963.907	25.5	10.8	1.0	203.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7
4964.033	25.2	10.8	1.0	263.0	3.0	0.0	Vert	AV	0.0	36.0	54.0	-18.0
4963.793	25.2	10.8	1.0	21.0	3.0	0.0	Horz	AV	0.0	36.0	54.0	-18.0
7446.513	36.3	19.5	1.0	206.0	3.0	0.0	Vert	PK	0.0	55.8	74.0	-18.2
12408.990	32.0	-2.4	1.0	176.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4
12408.360	32.0	-2.4	3.8	281.0	3.0	0.0	Horz	AV	0.0	29.6	54.0	-24.4
4964.013	36.5	10.8	1.0	86.0	3.0	0.0	Horz	PK	0.0	47.3	74.0	-26.7
4964.567	35.7	10.8	1.0	21.0	3.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5
4965.533	35.5	10.8	1.0	203.0	3.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7
4963.407	35.5	10.8	1.0	263.0	3.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7
4963.900	35.3	10.8	1.0	353.0	3.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9
4963.453	34.0	10.8	1.0	6.0	3.0	0.0	Vert	PK	0.0	44.8	74.0	-29.2
12410.590	43.0	-2.4	1.0	176.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4
12409.280	42.0	-2.4	3.8	281.0	3.0	0.0	Horz	PK	0.0	39.6	74.0	-34.4

SPURIOUS RADIATED EMISSIONS

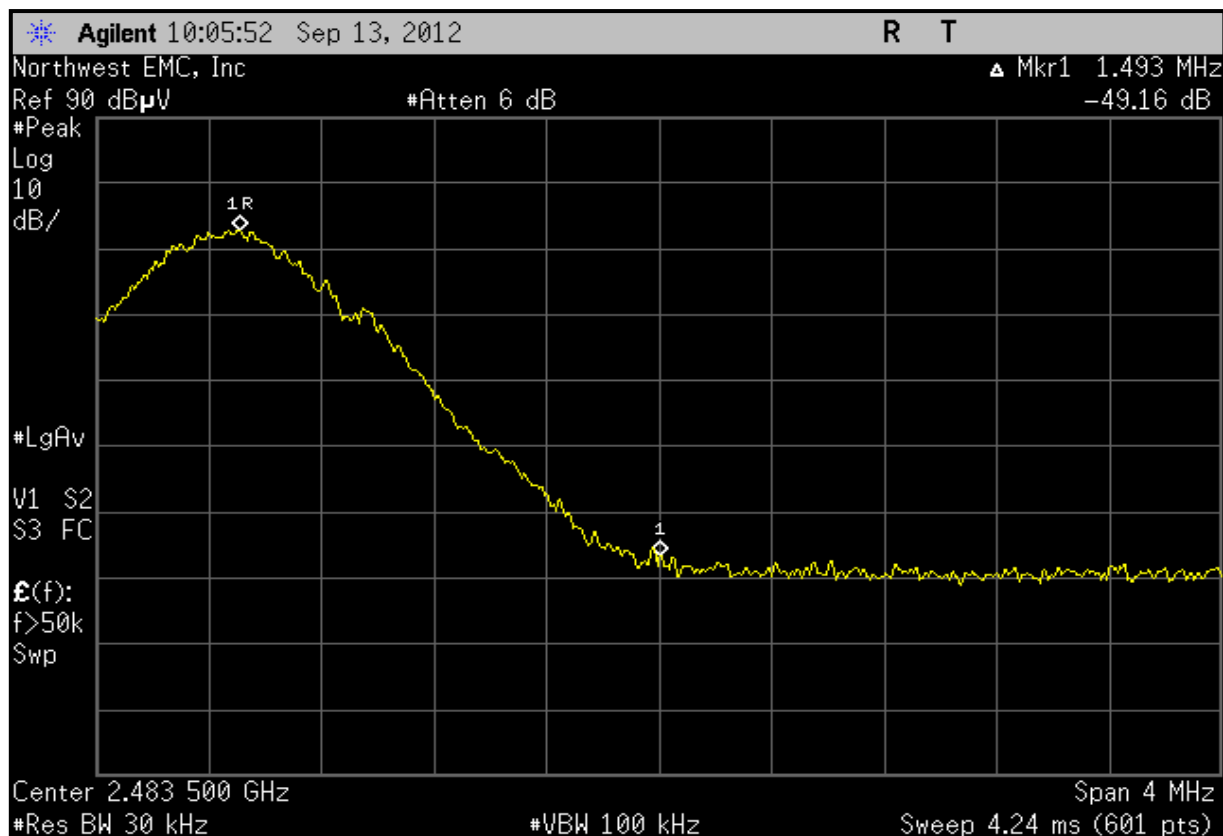
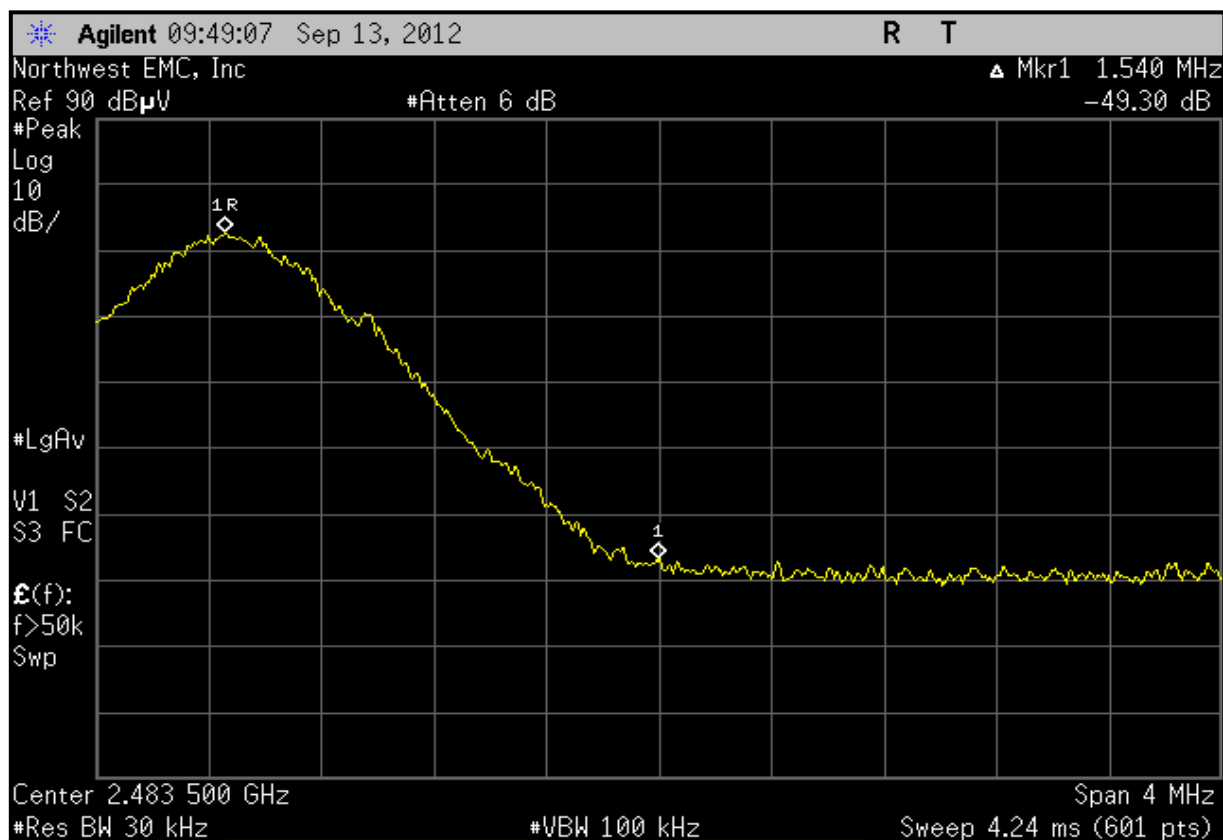
Work Order:	SYNA0096	Date:	09/13/12	<i>Carl Engholm</i>
Project:	None	Temperature:	23.1 °C	
Job Site:	EV01	Humidity:	30% RH	
Serial Number:	321	Barometric Pres.:	1020 mbar	
EUT:	xBR V3			
Configuration:	2			
Customer:	Synapse Strategic Product Development LLC			
Attendees:	None			
EUT Power:	PoE			
Operating Mode:	Transmitting GFSK at 2482 MHz, 100% duty cycle			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.247:2012	ANSI C63.10:2009

Run #	7	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
2481.993	74.9	1.9	1.0	2.0	3.0	20.0	Horz	AV	0.0	96.8			Fundamental, EUT On Side Marker-Delta Method: AV 96.8 + (-48.2 dBc) = 48.6
2482.160	75.5	1.9	1.0	2.0	3.0	20.0	Horz	PK	0.0	97.4			Fundamental, EUT On Side Marker-Delta Method: PK 97.4 + (-48.2 dBc) = 49.2
2481.967	74.4	1.9	1.0	335.0	3.0	20.0	Vert	AV	0.0	96.3	74.0	-24.8	Fundamental, EUT Horizontal Marker-Delta Method: AV 96.3 + (-49.3 dBc) = 47.0
2482.060	75.0	1.9	1.0	335.0	3.0	20.0	Vert	PK	0.0	96.9	74.0	-22.9	Fundamental, EUT Horizontal Marker-Delta Method: PK 96.9 + (-49.3 dBc) = 47.6
2483.500			1.0	2.0	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	
2483.500			1.0	2.0	3.0	20.0	Horz	PK	0.0	49.2	74.0	-24.8	
2483.500			1.0	335.0	3.0	20.0	Vert	AV	0.0	47.0	54.0	-7.0	
2483.500			1.0	335.0	3.0	20.0	Vert	PK	0.0	47.6	74.0	-26.4	



AC POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50Ω.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
EV07 Cables	N/A	Conducted Cables	EVG	04/27/2012	12 mo
Attenuator	Coaxicom	66702 2910-20	RBR	08/07/2012	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHD	02/01/2012	24 mo
Receiver	Rohde & Schwarz	ESCI	ARH	03/29/2012	12 mo
LISN	Solar	9252-50-R-24-BNC	LIR	11/04/2011	12 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.94 dB	-2.94 dB

CONFIGURATIONS INVESTIGATED

SYNA0096-3

MODES INVESTIGATED

Receive mode
Transmitting GFSK at 2482 MHz, 100% duty cycle

EUT:	xBR V3	Work Order:	SYNA0096
Serial Number:	321	Date:	09/19/2012
Customer:	Synapse Strategic Product Development LLC	Temperature:	23.9°C
Attendees:	None	Relative Humidity:	43.2%
Customer Project:	None	Bar. Pressure:	1019.7 mb
Tested By:	Kyle Holgate	Job Site:	EV07
Power:	PoE	Configuration:	SYNA0096-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2012	ANSI C63.10:2009

TEST PARAMETERS

Run #:	14	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

None

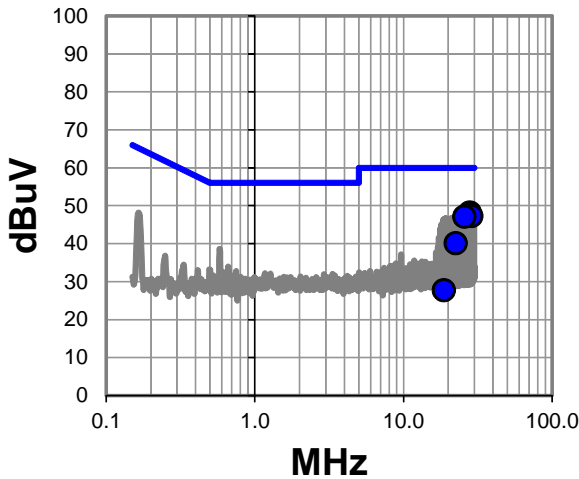
EUT OPERATING MODES

Transmitting GFSK at 2482 MHz, 100% duty cycle

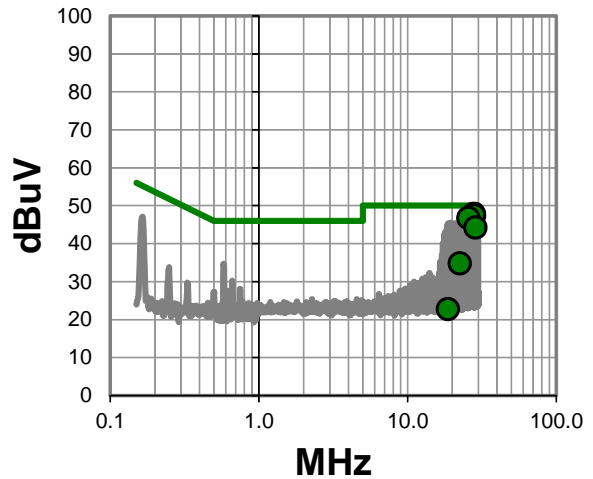
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #14

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
27.842	26.2	22.0	48.2	60.0	-11.8
28.088	25.6	22.1	47.7	60.0	-12.3
28.588	25.2	22.1	47.3	60.0	-12.7
25.622	25.2	21.9	47.1	60.0	-12.9
22.412	18.4	21.7	40.1	60.0	-19.9
18.712	6.2	21.5	27.7	60.0	-32.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
27.842	25.9	22.0	47.9	50.0	-2.1
28.088	25.4	22.1	47.5	50.0	-2.5
25.622	24.9	21.9	46.8	50.0	-3.2
28.588	22.2	22.1	44.3	50.0	-5.7
22.412	13.1	21.7	34.8	50.0	-15.2
18.712	1.3	21.5	22.8	50.0	-27.2

CONCLUSION

Pass



Tested By

EUT:	xBR V3	Work Order:	SYNA0096
Serial Number:	321	Date:	09/19/2012
Customer:	Synapse Strategic Product Development LLC	Temperature:	23.9°C
Attendees:	None	Relative Humidity:	43.2%
Customer Project:	None	Bar. Pressure:	1019.7 mb
Tested By:	Kyle Holgate	Job Site:	EV07
Power:	PoE	Configuration:	SYNA0096-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2012	ANSI C63.10:2009

TEST PARAMETERS

Run #:	15	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

None

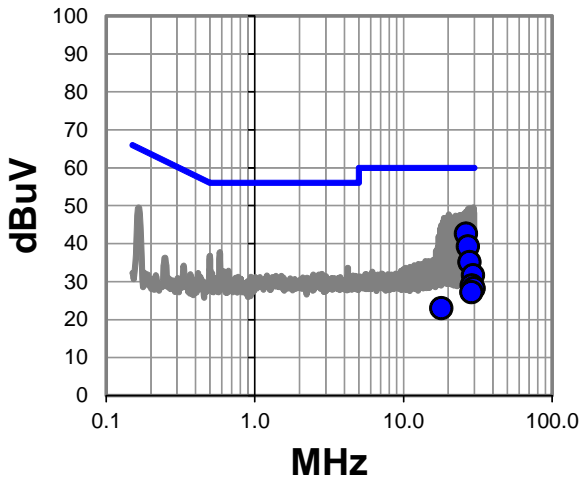
EUT OPERATING MODES

Transmitting GFSK at 2482 MHz, 100% duty cycle

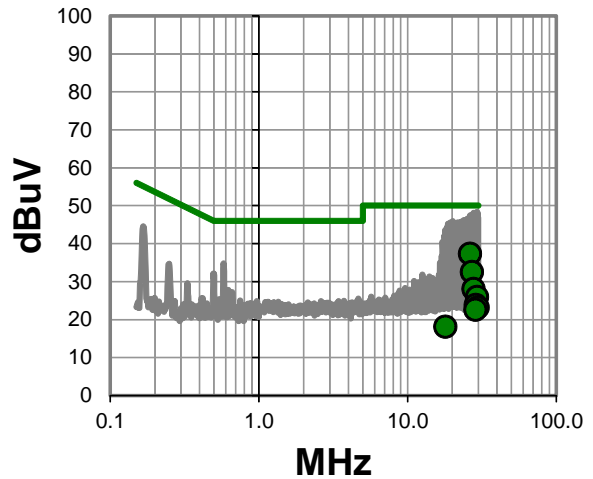
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #15

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
26.338	20.7	21.9	42.6	60.0	-17.4
27.078	17.3	22.0	39.3	60.0	-20.7
27.818	13.1	22.0	35.1	60.0	-24.9
29.298	9.6	22.1	31.7	60.0	-28.3
28.808	6.9	22.1	29.0	60.0	-31.0
29.548	6.1	22.2	28.3	60.0	-31.7
28.568	5.2	22.1	27.3	60.0	-32.7
17.988	1.6	21.5	23.1	60.0	-36.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
26.338	15.4	21.9	37.3	50.0	-12.7
27.078	10.6	22.0	32.6	50.0	-17.4
27.818	6.1	22.0	28.1	50.0	-21.9
29.298	3.8	22.1	25.9	50.0	-24.1
28.808	1.8	22.1	23.9	50.0	-26.1
29.548	1.0	22.2	23.2	50.0	-26.8
28.568	0.5	22.1	22.6	50.0	-27.4
17.988	-3.3	21.5	18.2	50.0	-31.8

CONCLUSION

Pass



Tested By