

NORTHWEST EMC

i1 Biometrics, Inc.

Sideline Receiver

FCC 15.207:2014

FCC 15.247:2014

Report # I1BM0002.1



NVLAP Lab Code: 200629-0

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

CERTIFICATE OF TEST

Last Date of Test: December 23, 2014
i1 Biometrics, Inc.
Model: Sideline Receiver

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207: 2014	ANSI C63.10:2009
FCC 15.247:2014	ANSI C63.10:2009

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.1	Output Power	Yes	Pass	
7.7.2	Channel Separation	Yes	Pass	
7.7.3	Number of Hopping Channels	Yes	Pass	
7.7.4	Dwell Time	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
7.7.9	Band Edge Compliance	Yes	Pass	
7.7.9	Band Edge Compliance - Hopping Mode	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Rod Munro, Operations Manager

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

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

A2LA - Accredited by A2LA to ISO / IEC 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

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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.

SCOPE

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

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

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

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

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

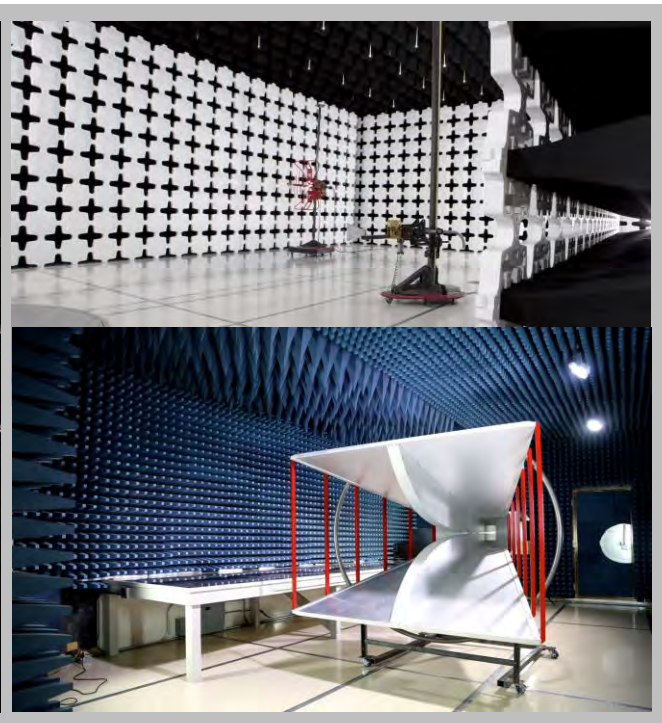
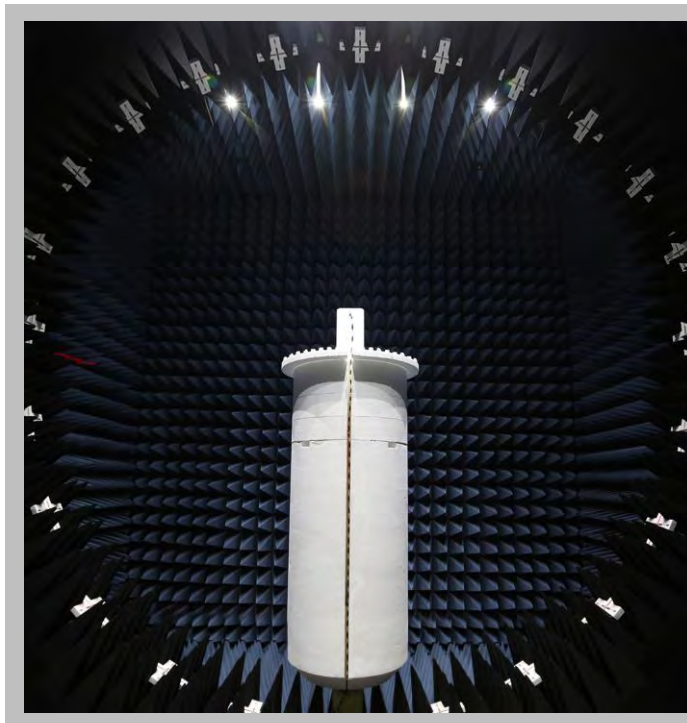
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.5 dB	-4.5 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	In Process	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	i1 Biometrics, Inc.
Address:	12020 113th Avenue NE Suite 210
City, State, Zip:	Kirkland, WA 98034
Test Requested By:	David Brown
Model:	Sideline Receiver
First Date of Test:	December 17, 2014
Last Date of Test:	December 23, 2014
Receipt Date of Samples:	December 17, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Frequency Hopping Spread Spectrum transceiver
Testing Objective:
To demonstrate compliance of the 902-928MHz FHSS radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration I1BM0002- 1

Software/Firmware Running during test	
Description	Version
FCC Firmware v4	BDF299D6

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Sideline Receiver	i1 Biometrics, Inc.	S0001	405

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	Yoga 2 Pro	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB	No	4.8m	No	Laptop PC	Sideline Receiver

Configuration I1BM0002- 2

Software/Firmware Running during test	
Description	Version
FCC Firmware v4	BDF299D6

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Sideline Receiver	i1 Biometrics, Inc.	S0001	401

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	Yoga 2 Pro	None
AC Adapter	Lenovo	ADLX65SLC2A	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB	No	4.8m	No	Laptop PC	Sideline Receiver
AC Power	No	1.0m	No	AC Mains	AC Adapter
DC Power	No	1.8m	Yes	AC Adapter	Laptop PC

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	12/17/2014	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.
2	12/17/2014	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.
3	12/17/2014	Channel Separation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	12/17/2014	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.
5	12/17/2014	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.
6	12/17/2014	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.
7	12/17/2014	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.
8	12/17/2014	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.
9	12/17/2014	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.
10	12/19/2014	AC Power Line 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.
11	12/23/2014	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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 50 Ω .

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARE	06/06/2014	12 mo
NC05 Cables	N/A	Conducted / NF Probe Cable	NC4	10/14/2014	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHF	12/08/2014	12 mo
Attenuator	Fairview Microwave	SA03B-20	RKD	10/14/2014	12 mo
LISN	Solar	9252-50-R-24-BNC	LIM	12/09/2014	12 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

I1BM0002-2

MODES INVESTIGATED

Transmitting Low Channel 2
Transmitting Mid Channel 63
Transmitting High Channel 126

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	3	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

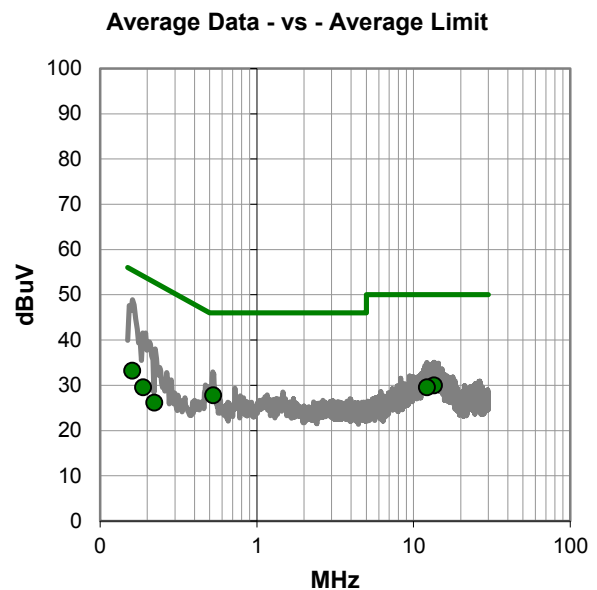
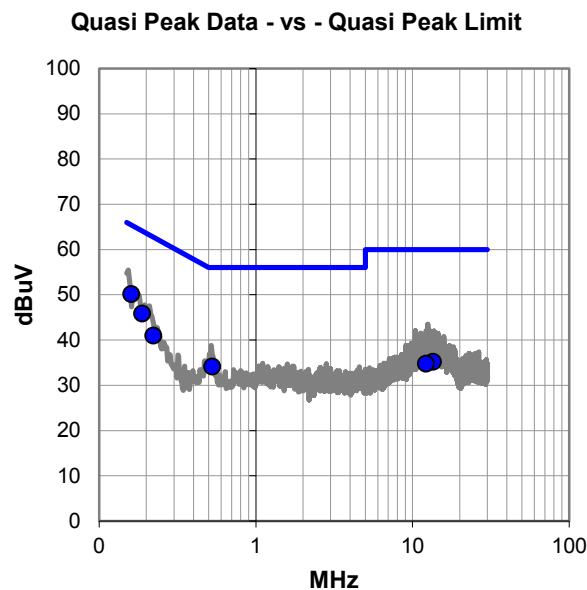
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EUT OPERATING MODES

Transmitting Low Channel 2 at Maximum Duty Cycle, 902.399871 MHz, Power Level at 28dBm.

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.160	29.6	20.5	50.1	65.4	-15.3
0.188	25.4	20.5	45.9	64.1	-18.3
0.222	20.6	20.4	41.0	62.8	-21.8
0.528	13.8	20.3	34.1	56.0	-21.9
13.559	13.5	21.6	35.1	60.0	-24.9
12.177	13.2	21.5	34.7	60.0	-25.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.528	7.5	20.3	27.8	46.0	-18.2
13.559	8.3	21.6	29.9	50.0	-20.1
12.177	8.0	21.5	29.5	50.0	-20.5
0.160	12.7	20.5	33.2	55.4	-22.2
0.188	9.1	20.5	29.6	54.1	-24.6
0.222	5.8	20.4	26.2	52.8	-26.6

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	4	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

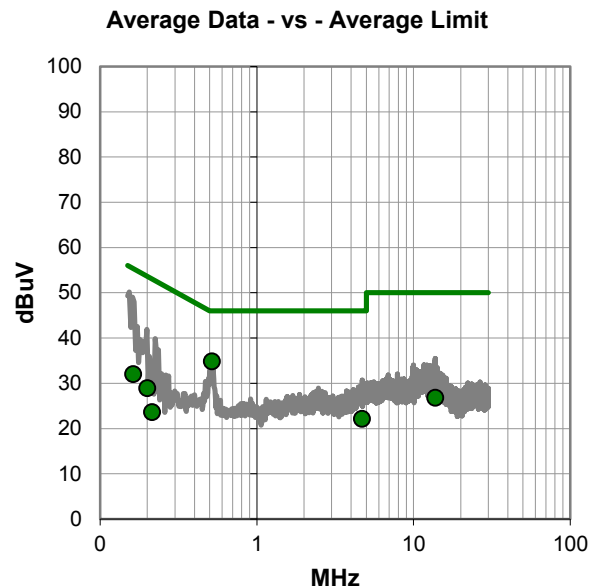
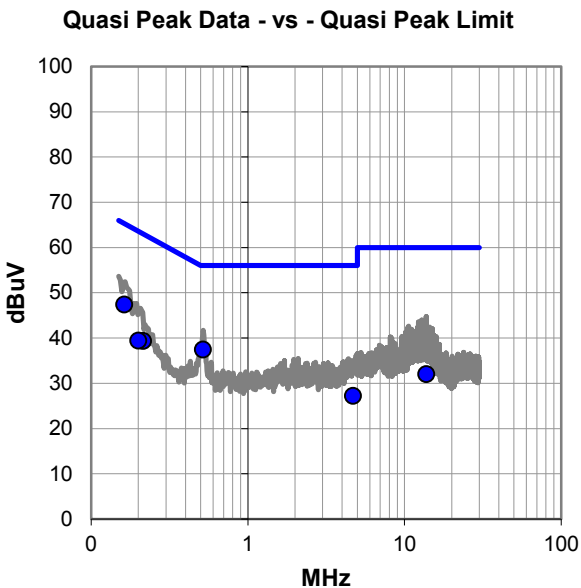
None

EUT OPERATING MODES

Transmitting Low Channel 2 at Maximum Duty Cycle, 902.399871 MHz, Power Level at 28dBm.

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.163	26.9	20.5	47.4	65.3	-17.9
0.518	17.2	20.2	37.4	56.0	-18.6
0.215	19.0	20.4	39.4	63.0	-23.7
0.200	19.0	20.4	39.4	63.6	-24.2
13.768	10.3	21.7	32.0	60.0	-28.0
4.707	6.5	20.7	27.2	56.0	-28.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.518	14.6	20.2	34.8	46.0	-11.2
13.768	5.1	21.7	26.8	50.0	-23.2
0.163	11.5	20.5	32.0	55.3	-23.3
4.707	1.4	20.7	22.1	46.0	-23.9
0.200	8.5	20.4	28.9	53.6	-24.7
0.215	3.2	20.4	23.6	53.0	-29.5

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	5	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

None

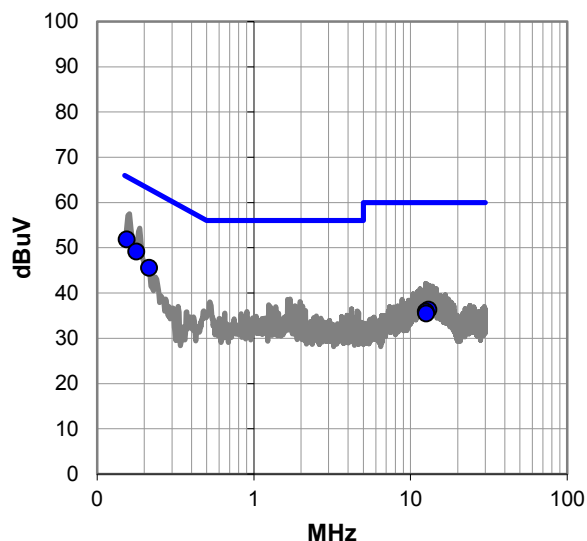
EUT OPERATING MODES

Transmitting Mid Channel 63 at Maximum Duty Cycle, 914.596882 MHz, Power Level at 28dBm.

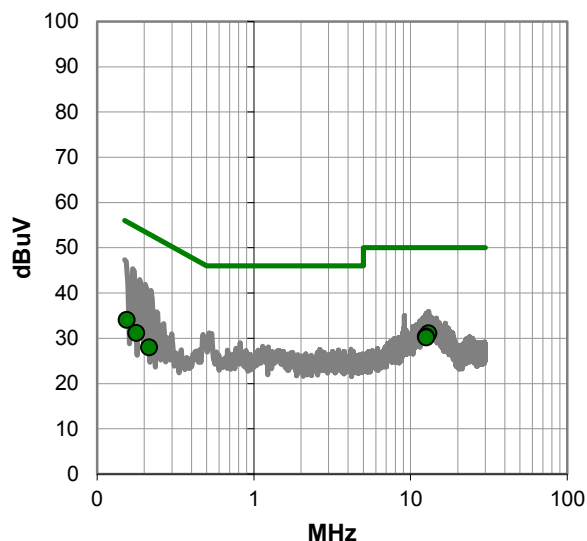
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.155	31.3	20.5	51.8	65.8	-13.9
0.178	28.7	20.5	49.2	64.6	-15.4
0.215	25.2	20.4	45.6	63.0	-17.4
13.056	14.7	21.6	36.3	60.0	-23.7
12.527	14.3	21.6	35.9	60.0	-24.1
12.643	13.9	21.6	35.5	60.0	-24.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.056	9.5	21.6	31.1	50.0	-18.9
12.527	8.8	21.6	30.4	50.0	-19.6
12.643	8.6	21.6	30.2	50.0	-19.8
0.155	13.5	20.5	34.0	55.8	-21.7
0.178	10.7	20.5	31.2	54.6	-23.4
0.215	7.6	20.4	28.0	53.0	-25.0

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	6	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

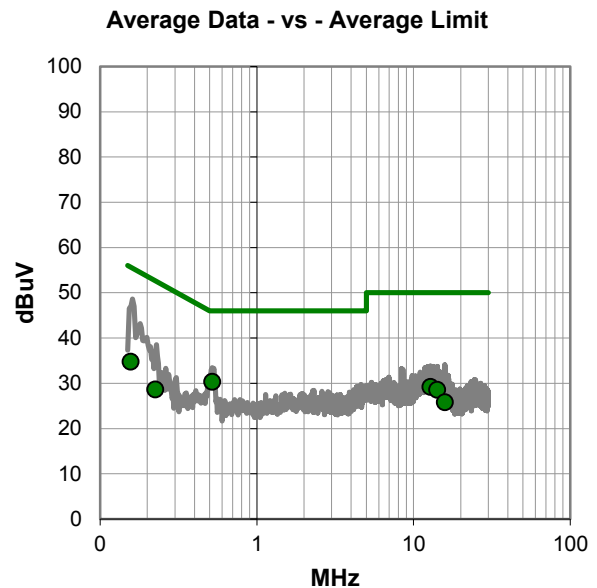
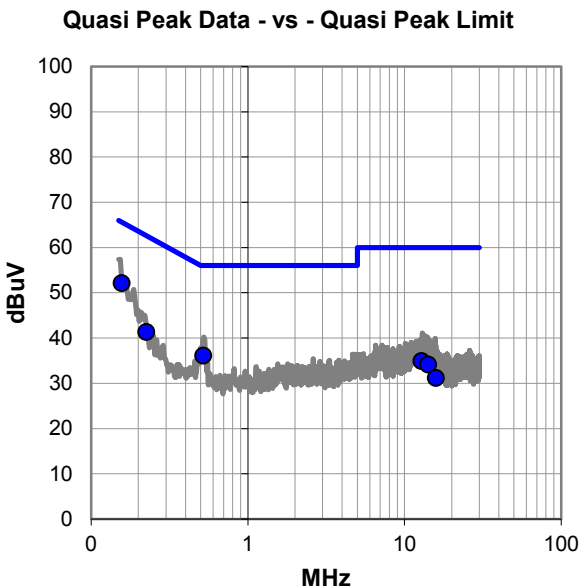
None

EUT OPERATING MODES

Transmitting Mid Channel 63 at Maximum Duty Cycle, 914.596882 MHz, Power Level at 28dBm.

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	31.6	20.5	52.1	65.6	-13.5
0.521	15.9	20.2	36.1	56.0	-19.9
0.226	21.0	20.3	41.3	62.6	-21.3
12.855	13.3	21.6	34.9	60.0	-25.1
14.206	12.4	21.7	34.1	60.0	-25.9
15.860	9.2	22.0	31.2	60.0	-28.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.521	10.1	20.2	30.3	46.0	-15.7
12.855	7.6	21.6	29.2	50.0	-20.8
0.157	14.2	20.5	34.7	55.6	-20.9
14.206	6.8	21.7	28.5	50.0	-21.5
0.226	8.3	20.3	28.6	52.6	-24.0
15.860	3.8	22.0	25.8	50.0	-24.2

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	7	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

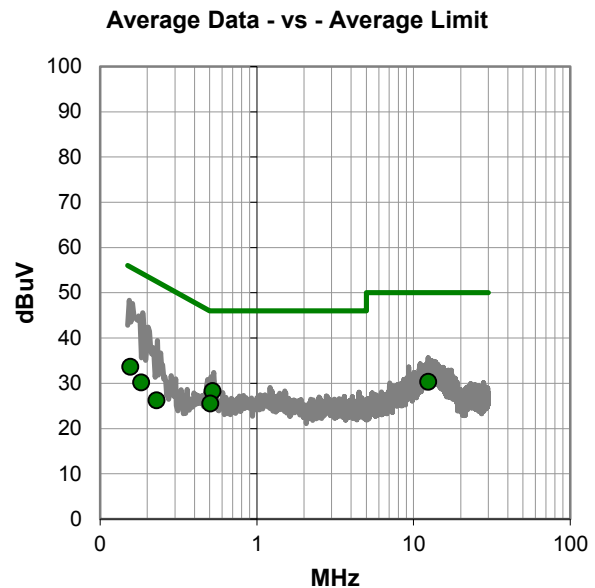
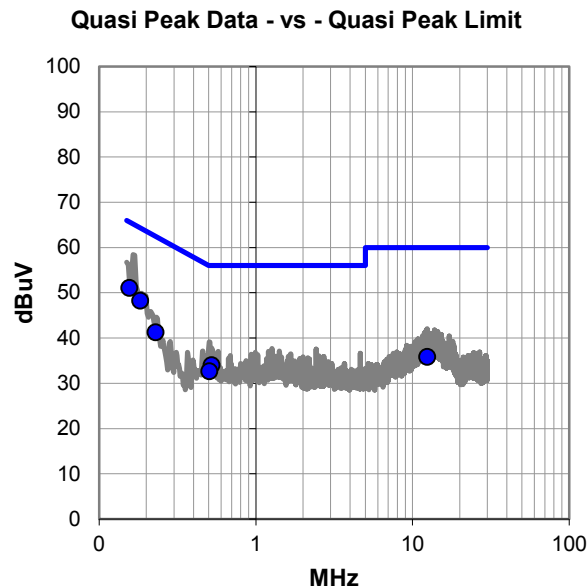
None

EUT OPERATING MODES

Transmitting High Channel 126 at Maximum Duty Cycle, 927.193795 MHz, Power Level at 28dBm.

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.156	30.5	20.5	51.0	65.7	-14.6
0.183	27.8	20.5	48.3	64.4	-16.1
0.229	20.9	20.3	41.2	62.5	-21.2
0.523	13.7	20.2	33.9	56.0	-22.1
0.505	12.4	20.2	32.6	56.0	-23.4
12.423	14.3	21.5	35.8	60.0	-24.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.523	8.0	20.2	28.2	46.0	-17.8
12.423	8.8	21.5	30.3	50.0	-19.7
0.505	5.3	20.2	25.5	46.0	-20.5
0.156	13.1	20.5	33.6	55.7	-22.0
0.183	9.7	20.5	30.2	54.4	-24.2
0.229	5.9	20.3	26.2	52.5	-26.2

CONCLUSION

Pass



Tested By

AC POWERLINE CONDUCTED EMISSIONS

EUT:	Sideline Receiver	Work Order:	I1BM0002
Serial Number:	401	Date:	12/19/2014
Customer:	i1 Biometrics, Inc.	Temperature:	24°C
Attendees:	David Brown, Rob Phibbs	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1011 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	I1BM0002-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	8	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

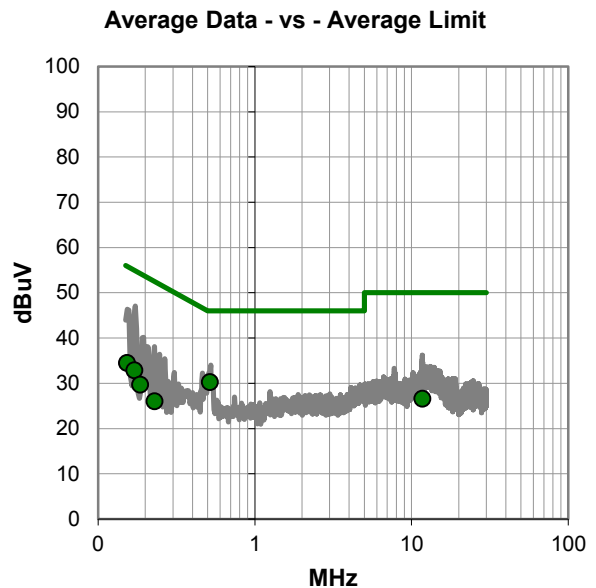
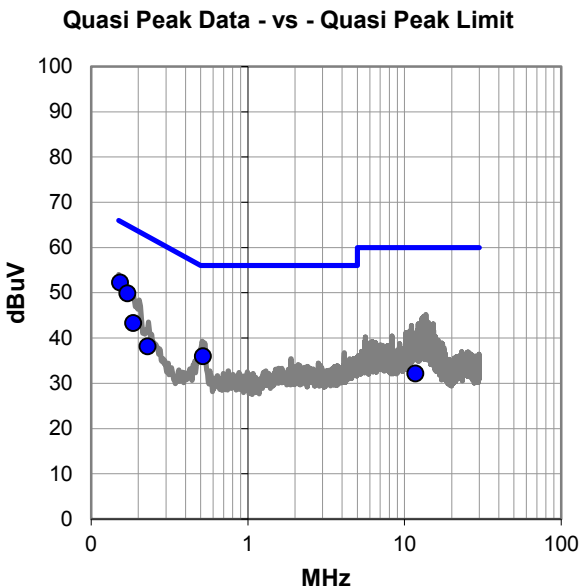
None

EUT OPERATING MODES

Transmitting High Channel 126 at Maximum Duty Cycle, 927.193795 MHz, Power Level at 28dBm.

DEVIATIONS FROM TEST STANDARD

None



AC POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	31.7	20.5	52.2	65.8	-13.6
0.171	29.4	20.5	49.9	64.9	-15.0
0.519	15.7	20.2	35.9	56.0	-20.1
0.185	22.8	20.5	43.3	64.2	-21.0
0.229	17.8	20.3	38.1	62.5	-24.4
11.746	10.7	21.5	32.2	60.0	-27.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.519	10.0	20.2	30.2	46.0	-15.8
0.153	13.9	20.5	34.4	55.8	-21.4
0.171	12.4	20.5	32.9	54.9	-22.0
11.746	5.1	21.5	26.6	50.0	-23.4
0.185	9.2	20.5	29.7	54.2	-24.6
0.229	5.7	20.3	26.0	52.5	-26.5

CONCLUSION

Pass



Tested By

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

MODES OF OPERATION

GFSK, 61.44 kb/s

CHANNELS TESTED

Low Channel 2, 902.399871 MHz

Mid Channel 63, 914.596882 MHz

High Channel 126, 927.193795 MHz

POWER SETTINGS INVESTIGATED

USB

CONFIGURATIONS INVESTIGATED

I1BM0002 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz
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SAMPLE CALCULATIONS


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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Notch Filter	K&L Microwave	3TNF-500/1000-N/N	HHO	7/8/2014	12 mo
HP Filter	Micro-Tronics	HPM50114	HFN	1/18/2013	36 mo
Low Pass Filter	Micro-Tronics	LPM50004	LFF	11/14/2013	24 mo
Low Pass Filter	Micro-Tronics	LPM50003	LFE	12/9/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	10/13/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	9/8/2014	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	9/8/2014	12 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Antenna, Horn	EMCO	3115	AHM	6/3/2014	24 mo
Antenna, Biconilog	EMCO	3142B	AXJ	5/16/2012	36 mo
NC01 Cables	N/A	Standard Gain Horn Cable	NC3	10/13/2014	12 mo
NC01 Cables	N/A	3115 Horn Cable	NC2	10/13/2014	12 mo
NC01 Cables	N/A	Bilog Cables	NC1	9/8/2014	12 mo
Spectrum Analyzer	Agilent	E4440A	AFE	10/28/2014	12 mo

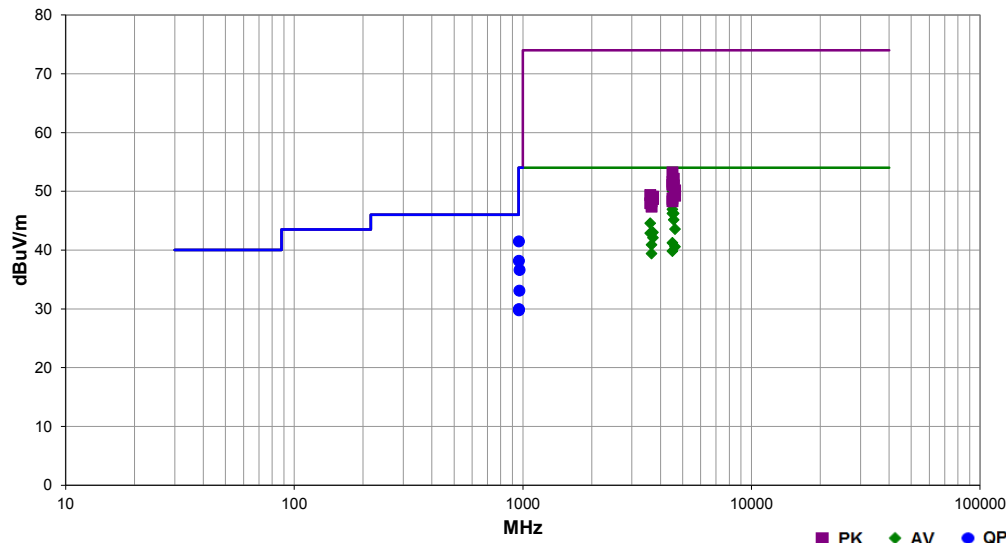
TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity. For devices employing FHSS, a duty cycle correction factor (DCCF) may be applied to the peak pulse amplitude to calculate average measurements. If applied, the DCCF shall be noted on the corresponding data sheet.

Work Order:	I1BM0002	Date:	12/23/14	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	36% RH	
Serial Number:	401	Barometric Pres.:	1026 mbar	
EUT:	Sideline Receiver			
Configuration:	2			
Customer:	i1 Biometrics, Inc.			
Attendees:	David Brown, Rob Phibbs			
EUT Power:	USB			
Operating Mode:	Transmitting at Maximum Duty Cycle, 61.44 kb/s, Power Level at 28dBm. See comments next to data points for EUT channel information and EUT orientation.			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.247:2014	ANSI C63.10:2009

Run #	28-29	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4512.040	43.9	6.1	1.2	319.0	3.0	0.0	Vert	AV	0.0	50.0	54.0	-4.0	Low Ch 2, 902 MHz, EUT on Side
960.000	28.6	12.9	1.5	332.0	3.0	0.0	Horz	QP	0.0	41.5	46.0	-4.5	High Ch 126, 927 MHz, EUT Normal
4512.045	41.6	6.1	2.2	353.0	3.0	0.0	Horz	AV	0.0	47.7	54.0	-6.3	Low Ch 2, 902 MHz, EUT Normal
4512.055	40.8	6.1	1.5	319.0	3.0	0.0	Vert	AV	0.0	46.9	54.0	-7.1	Low Ch 2, 902 MHz, EUT Normal
4572.990	39.6	6.6	1.5	17.0	3.0	0.0	Vert	AV	0.0	46.2	54.0	-7.8	Mid Ch 63, 914 MHz, EUT on Side
4512.055	40.1	6.1	1.5	345.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	Low Ch 2, 902 MHz, EUT on Side
960.000	25.3	12.9	1.5	37.0	3.0	0.0	Vert	QP	0.0	38.2	46.0	-7.8	High Ch 126, 927 MHz, EUT on Side
4572.995	38.5	6.6	1.3	0.0	3.0	0.0	Horz	AV	0.0	45.1	54.0	-8.9	Mid Ch 63, 914 MHz, EUT Normal
3609.640	41.9	2.7	1.5	11.0	3.0	0.0	Horz	AV	0.0	44.6	54.0	-9.4	Low Ch 2, 902 MHz, EUT Normal
4636.005	36.4	7.2	1.1	344.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	High Ch 126, 927 MHz, EUT Normal
3708.810	39.3	3.7	1.9	6.0	3.0	0.0	Horz	AV	0.0	43.0	54.0	-11.0	High Ch 126, 927 MHz, EUT Normal
3609.650	40.2	2.7	1.8	345.0	3.0	0.0	Vert	AV	0.0	42.9	54.0	-11.1	Low Ch 2, 902 MHz, EUT on Side
3708.850	38.4	3.7	1.2	333.0	3.0	0.0	Vert	AV	0.0	42.1	54.0	-11.9	High Ch 126, 927 MHz, EUT on Side
4512.065	35.1	6.1	1.4	274.0	3.0	0.0	Vert	AV	0.0	41.2	54.0	-12.8	Low Ch 2, 902 MHz, EUT Up
3658.465	37.6	3.3	1.5	10.0	3.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	Mid Ch 63, 914 MHz, EUT Normal
4636.025	33.4	7.2	1.5	346.0	3.0	0.0	Vert	AV	0.0	40.6	54.0	-13.4	High Ch 126, 927 MHz, EUT on Side
4512.030	33.7	6.1	1.7	270.0	3.0	0.0	Horz	AV	0.0	39.8	54.0	-14.2	Low Ch 2, 902 MHz, EUT Up
3658.435	36.1	3.3	1.7	335.0	3.0	0.0	Vert	AV	0.0	39.4	54.0	-14.6	Mid Ch 63, 914 MHz, EUT on Side
960.000	17.1	12.9	1.5	69.0	3.0	0.0	Horz	QP	0.0	30.0	46.0	-16.0	Low Ch 2, 902 MHz, EUT Normal
966.611	23.8	12.8	1.3	332.0	3.0	0.0	Horz	QP	0.0	36.6	54.0	-17.4	Mid Ch 63, 914 MHz, EUT Normal
4511.740	47.1	6.1	1.2	319.0	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	Low Ch 2, 902 MHz, EUT on Side
965.905	20.3	12.8	1.8	345.0	3.0	0.0	Vert	QP	0.0	33.1	54.0	-20.9	Mid Ch 63, 914 MHz, EUT on Side
4572.760	45.5	6.6	1.5	17.0	3.0	0.0	Vert	PK	0.0	52.1	74.0	-21.9	Mid Ch 63, 914 MHz, EUT on Side
4511.890	45.5	6.1	2.2	353.0	3.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4	Low Ch 2, 902 MHz, EUT Normal
4512.075	45.1	6.1	1.5	319.0	3.0	0.0	Vert	PK	0.0	51.2	74.0	-22.8	Low Ch 2, 902 MHz, EUT Normal
4511.830	45.0	6.1	1.5	345.0	3.0	0.0	Horz	PK	0.0	51.1	74.0	-22.9	Low Ch 2, 902 MHz, EUT on Side
4572.990	44.4	6.6	1.3	0.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	Mid Ch 63, 914 MHz, EUT Normal
4635.885	43.0	7.2	1.1	344.0	3.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	High Ch 126, 927 MHz, EUT Normal
960.133	16.9	12.9	1.5	30.0	3.0	0.0	Vert	QP	0.0	29.8	54.0	-24.2	Low Ch 2, 902 MHz, EUT on Side
3609.650	46.7	2.7	1.5	11.0	3.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Ch 2, 902 MHz, EUT Normal
4636.210	42.1	7.2	1.5	346.0	3.0	0.0	Vert	PK	0.0	49.3	74.0	-24.7	High Ch 126, 927 MHz, EUT on Side
3708.805	45.4	3.7	1.9	6.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	High Ch 126, 927 MHz, EUT Normal
4512.035	42.7	6.1	1.7	270.0	3.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	Low Ch 2, 902 MHz, EUT Up
3708.710	45.0	3.7	1.2	333.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	High Ch 126, 927 MHz, EUT on Side
4512.195	42.2	6.1	1.4	274.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Low Ch 2, 902 MHz, EUT Up
3658.640	45.0	3.3	1.5	10.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	Mid Ch 63, 914 MHz, EUT Normal
3609.515	45.3	2.7	1.8	345.0	3.0	0.0	Vert	PK	0.0	48.0	74.0	-26.0	Low Ch 2, 902 MHz, EUT on Side
3658.550	44.1	3.3	1.7	335.0	3.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6	Mid Ch 63, 914 MHz, EUT on Side

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12


TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

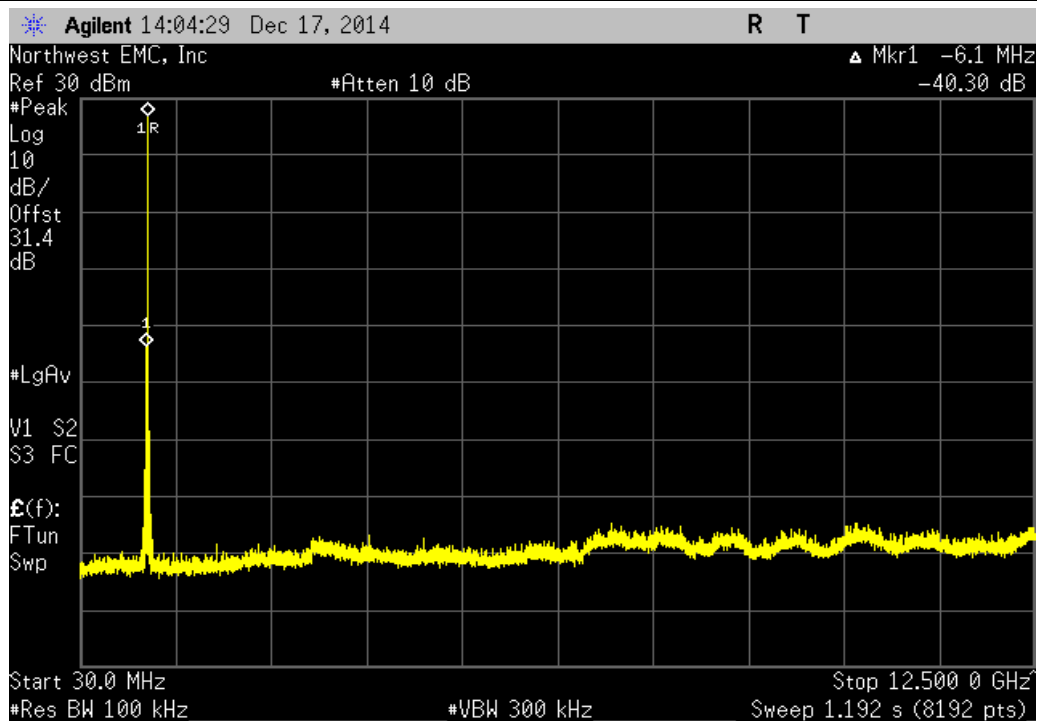


SPURIOUS CONDUCTED EMISSIONS

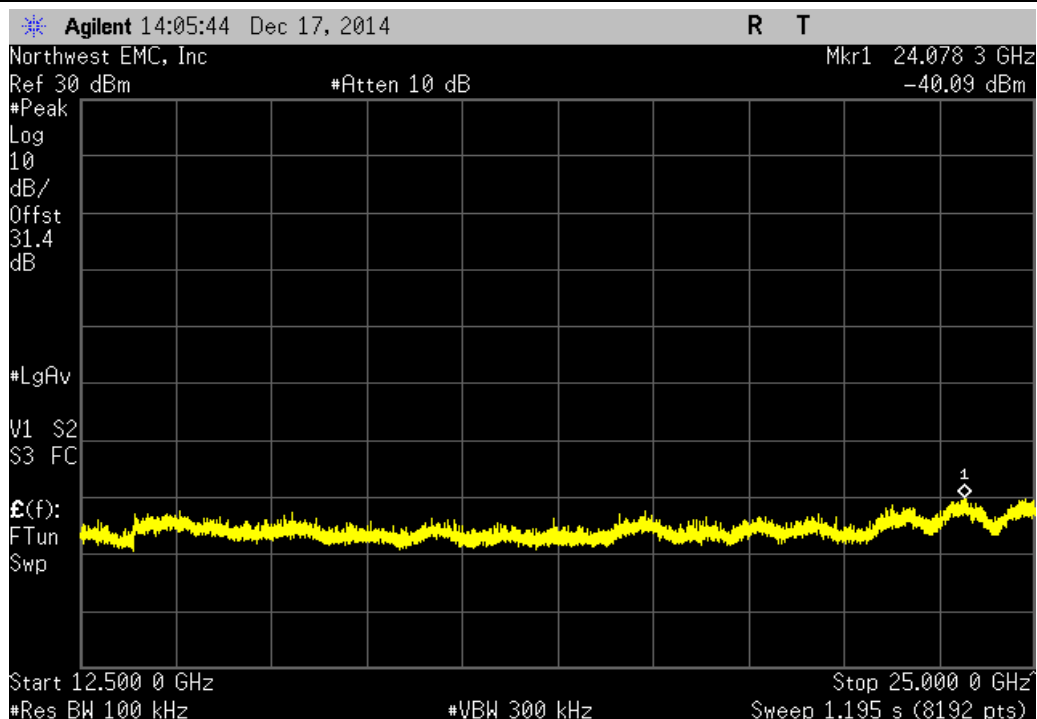
XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm. Transmitting at maximum duty cycle.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Frequency Range	Value (dBc) Limit ≤ (dBc) Result
Single Channel Mode			
61.44 Kb/s, GFSK			
Low Channel 2, 902.399871 MHz		30 MHz - 12.5 GHz	-40.3 -20 Pass
Low Channel 2, 902.399871 MHz		12.5 GHz - 25 GHz	-66.84 -20 Pass
Mid Channel 63, 914.596882 MHz		30 MHz - 12.5 GHz	-63.62 -20 Pass
Mid Channel 63, 914.596882 MHz		12.5 GHz - 25 GHz	-66.34 -20 Pass
High Channel 126, 927.193795 MHz		30 MHz - 12.5 GHz	-39.64 -20 Pass
High Channel 126, 927.193795 MHz		12.5 GHz - 25 GHz	-65.05 -20 Pass

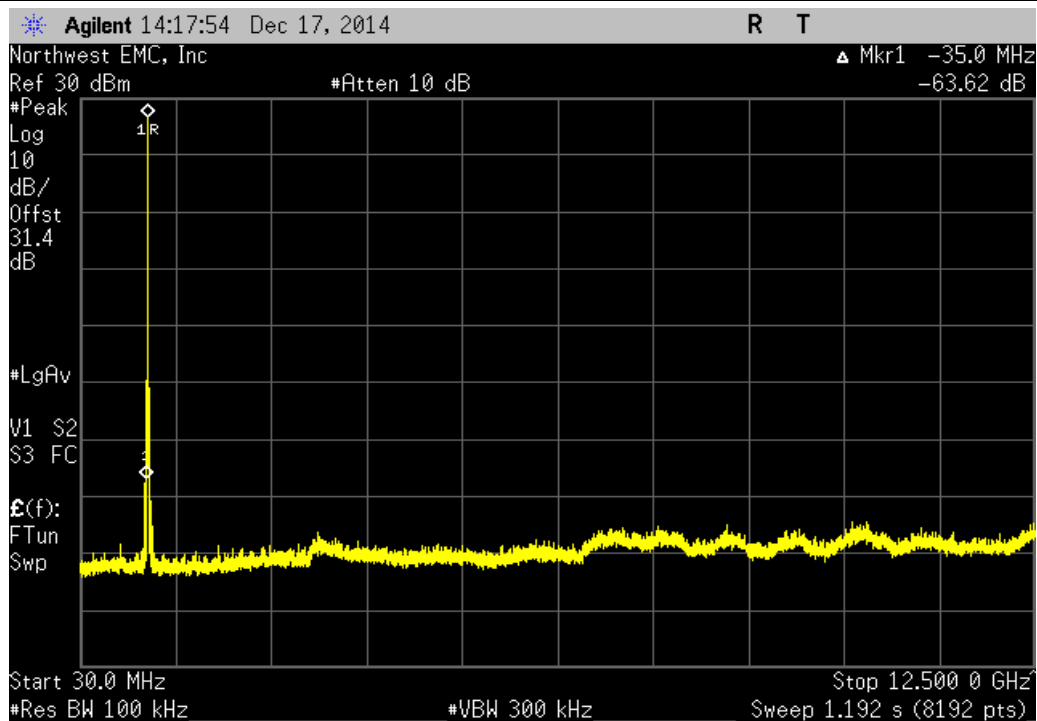
Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-40.3	-20	Pass	



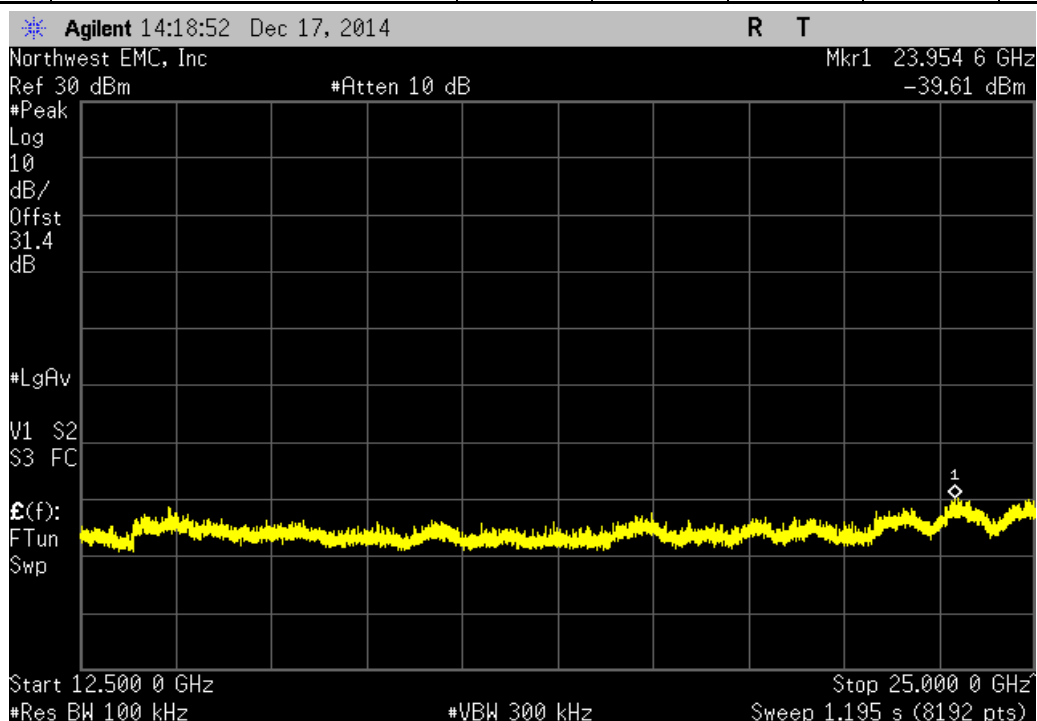
Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-66.84	-20	Pass	



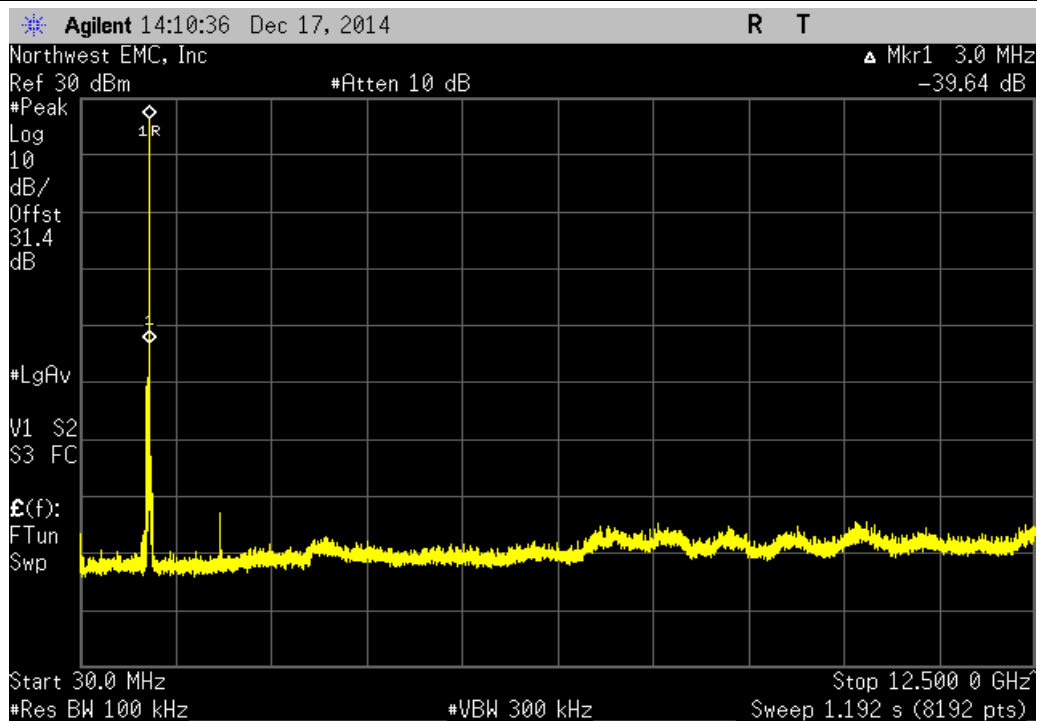
Single Channel Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-63.62	-20	Pass	



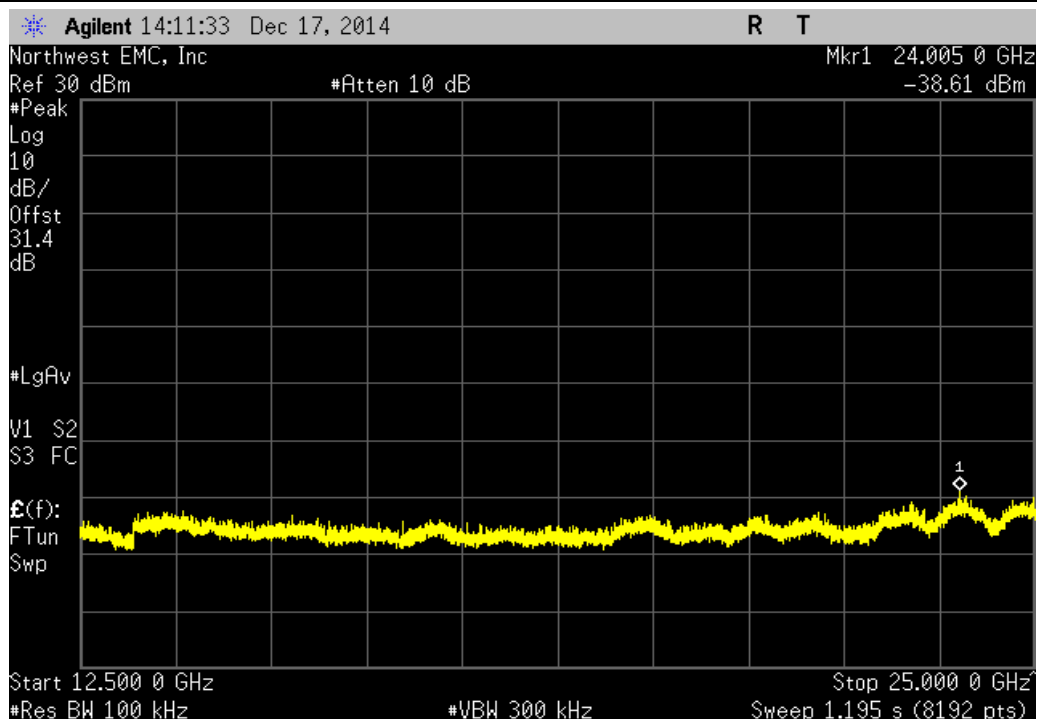
Single Channel Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-66.34	-20	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, High Channel 126, 927.193795 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-39.64	-20	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, High Channel 126, 927.193795 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-65.05	-20	Pass	



OCCUPIED BANDWIDTH

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12


TEST DESCRIPTION

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

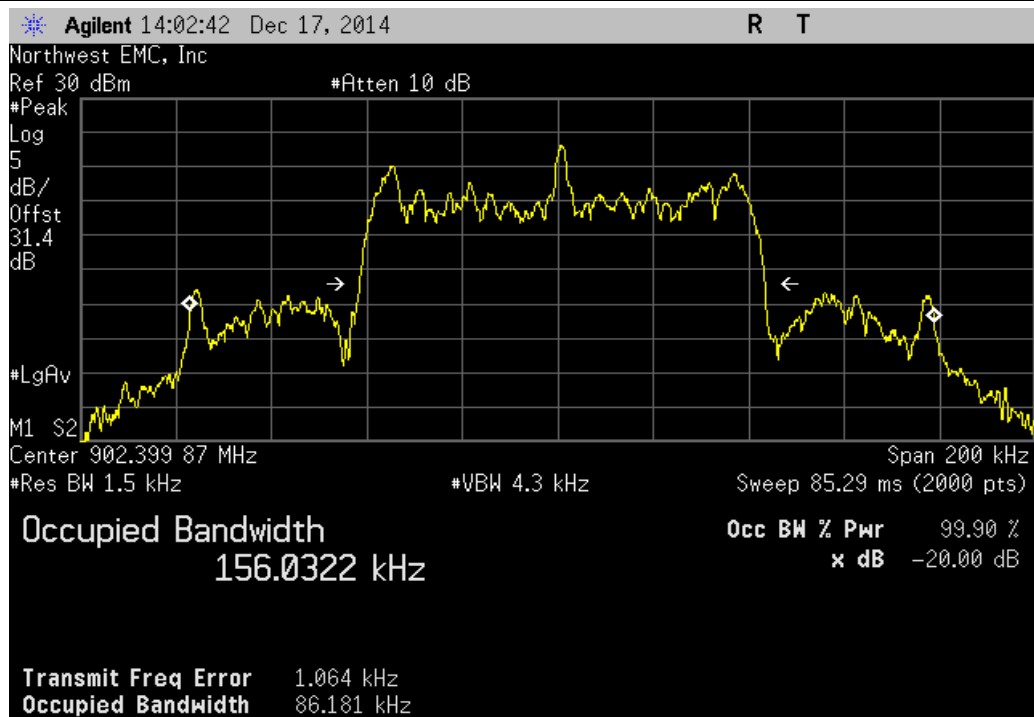


OCCUPIED BANDWIDTH

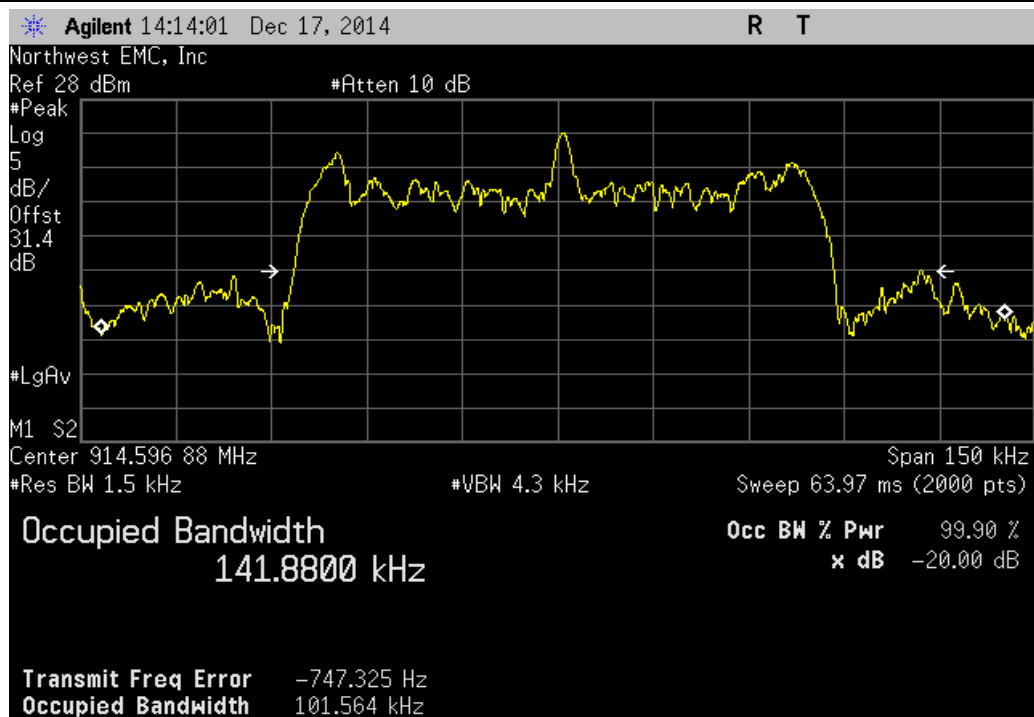
XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm. Transmitting at maximum duty cycle.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<)
Single Channel Mode			Result
61.44 Kb/s, GFSK			
Low Channel 2, 902.399871 MHz		86.181 kHz	250 kHz
Mid Channel 63, 914.596882 MHz		101.564 kHz	250 kHz
High Channel 126, 927.193795 MHz		84.859 kHz	250 kHz
			Pass
			Pass
			Pass

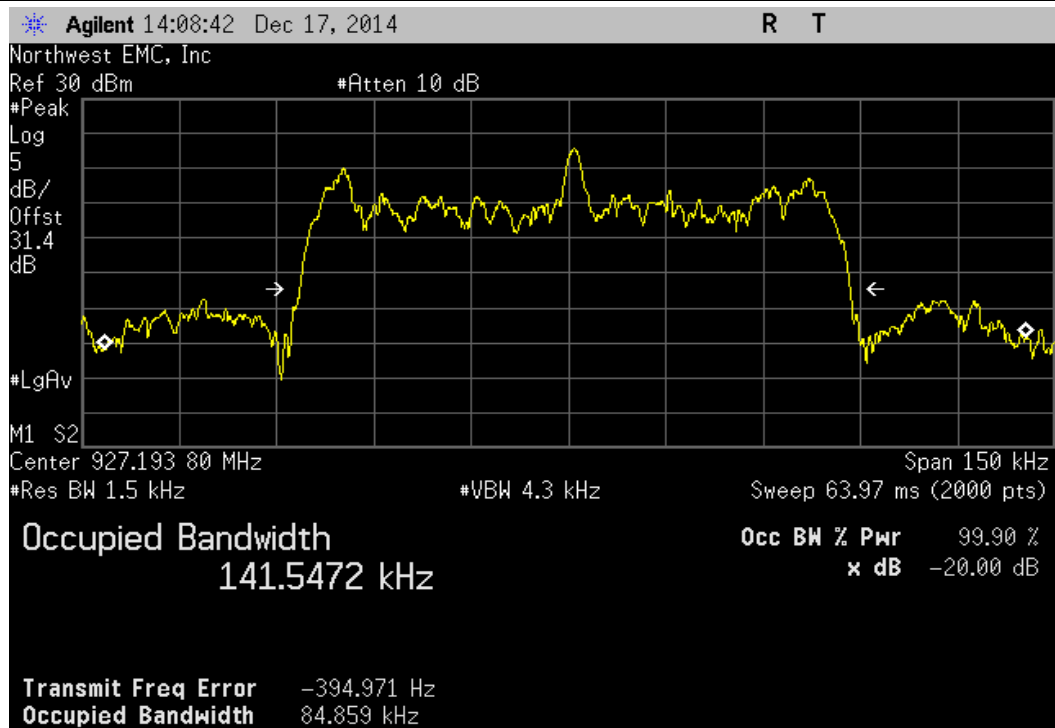
Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz				
	Value	Limit (<)	Result	
	86.181 kHz	250 kHz	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz				
	Value	Limit (<)	Result	
	101.564 kHz	250 kHz	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, High Channel 126, 927.193795 MHz						
				Value	Limit	Result
				84.859 kHz	250 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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12

TEST DESCRIPTION


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

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

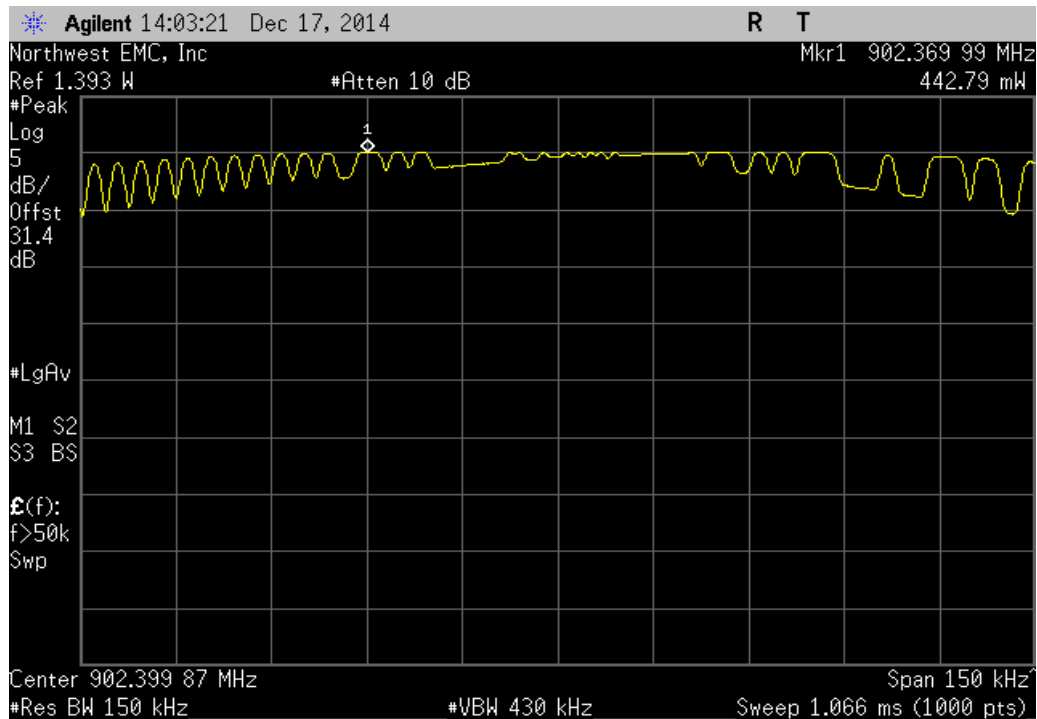


OUTPUT POWER

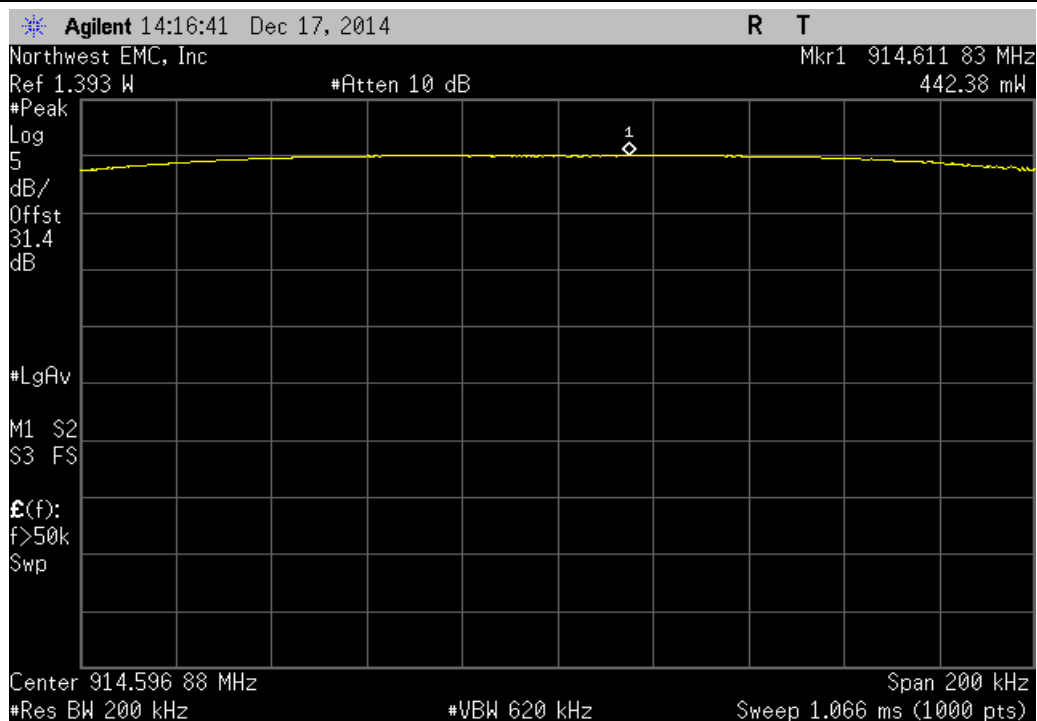
XMit 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm. Transmitting at maximum duty cycle.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<)
Single Channel Mode			Result
61.44 Kb/s, GFSK			
Low Channel 2, 902.399871 MHz		442.792 mW	1 W Pass
Mid Channel 63, 914.596882 MHz		442.385 mW	1 W Pass
High Channel 126, 927.193795 MHz		422.28 mW	1 W Pass

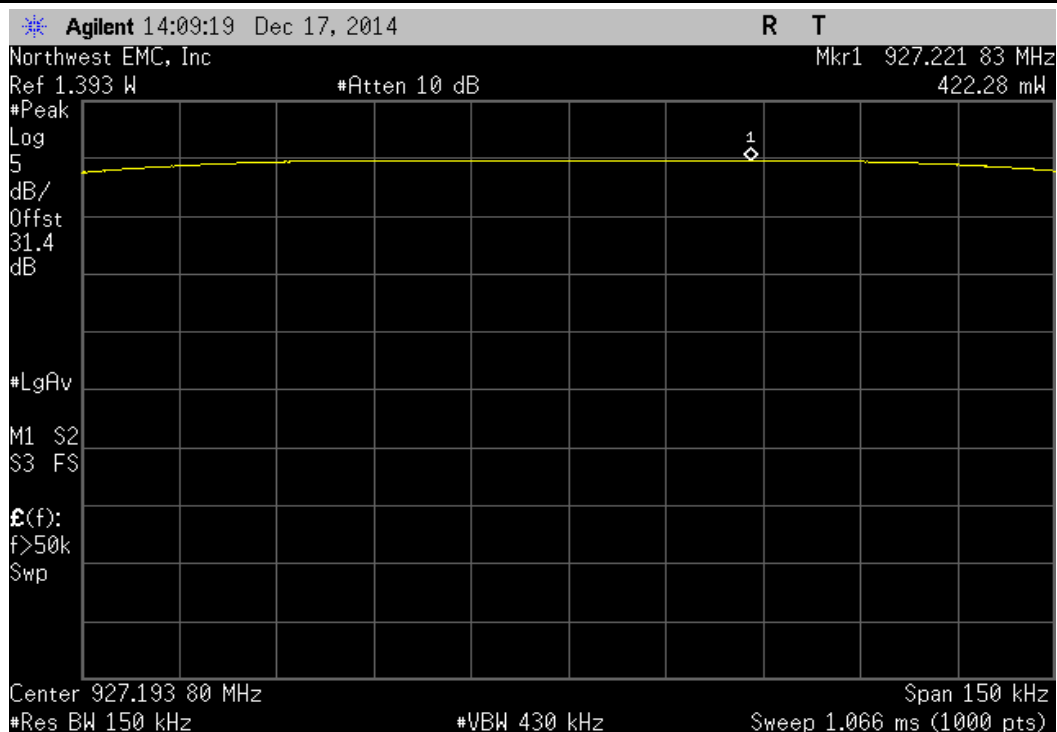
Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz				
	Value	Limit (<)	Result	
	442.792 mW	1 W	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz				
	Value	Limit (<)	Result	
	442.385 mW	1 W	Pass	



Single Channel Mode, 61.44 Kb/s, GFSK, High Channel 126, 927.193795 MHz						
	Value	Limit	Result			
	422.28 mW	1 W	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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12


TEST DESCRIPTION

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

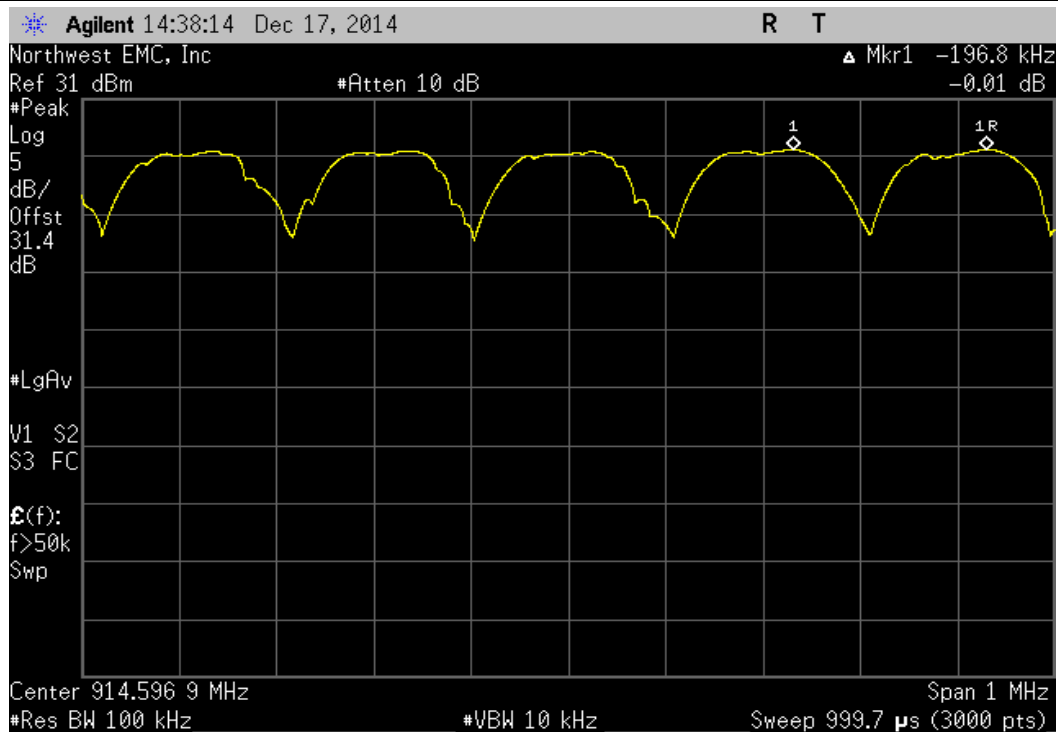


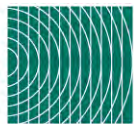
CHANNEL SEPARATION

XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (≥) Results
Hopping Mode, Application Mode			
61.44 Kb/s, GFSK			
Mid Channel 63, 914.596882 MHz		196.8 kHz	100 kHz Pass

Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Value	Limit (≥)	Results			
	196.8 kHz	100 kHz	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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12


TEST DESCRIPTION

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

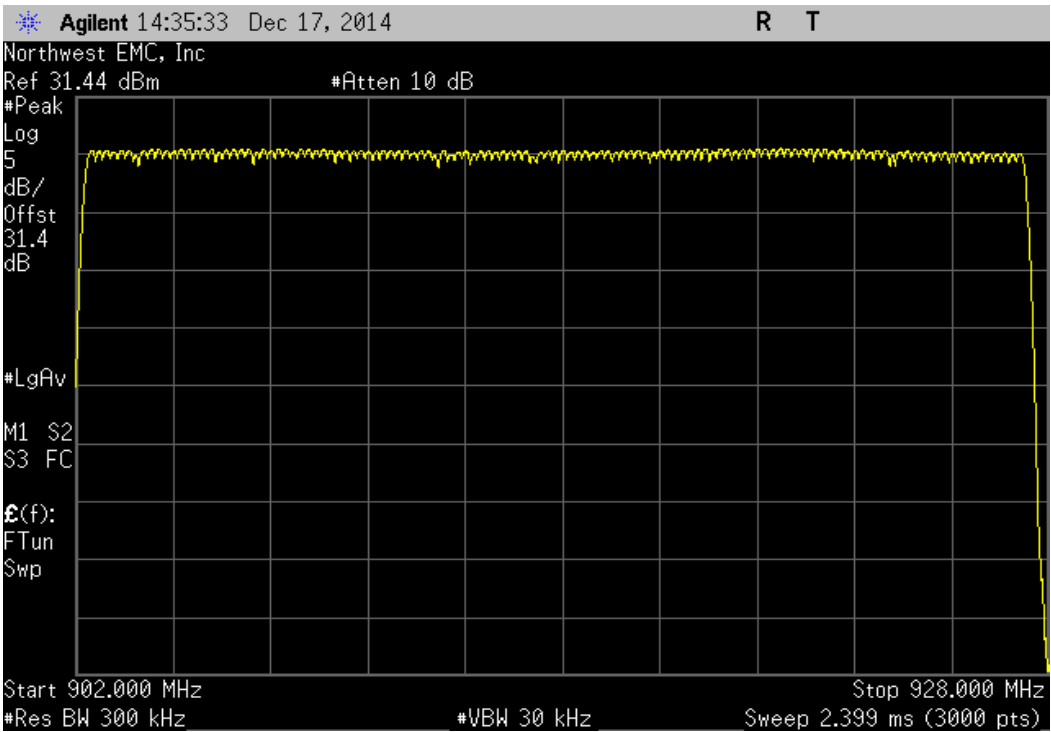


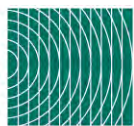
NUMBER OF HOPPING CHANNELS

XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Number of Channels	Limit Results
Hopping Mode, Application Mode			
61.44 Kb/s, GFSK			
Mid Channel 63, 914.596882 MHz		125	> 50 Pass

Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
				Number of Channels	Limit	Results
				125	> 50	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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12


TEST DESCRIPTION

The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled. The dwell time limit for a transmitter operating in the 902-928MHz band employing at least 50 channels is specified at a maximum of 0.4s in a 20s period. The measurement was repeated 4 times.

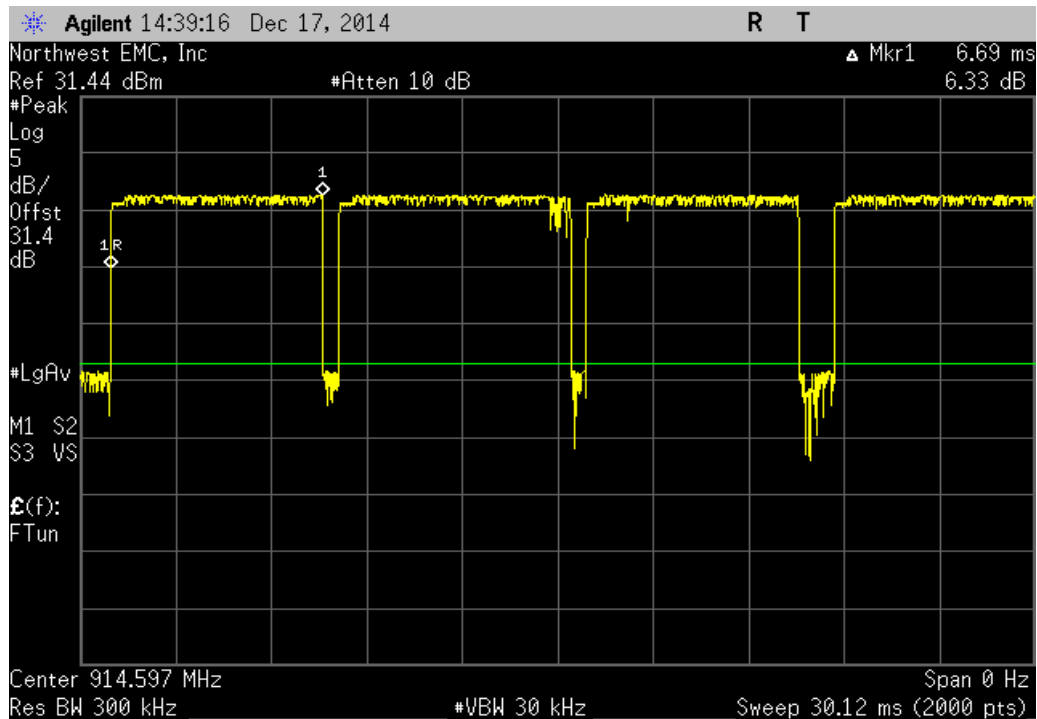


DWELL TIME

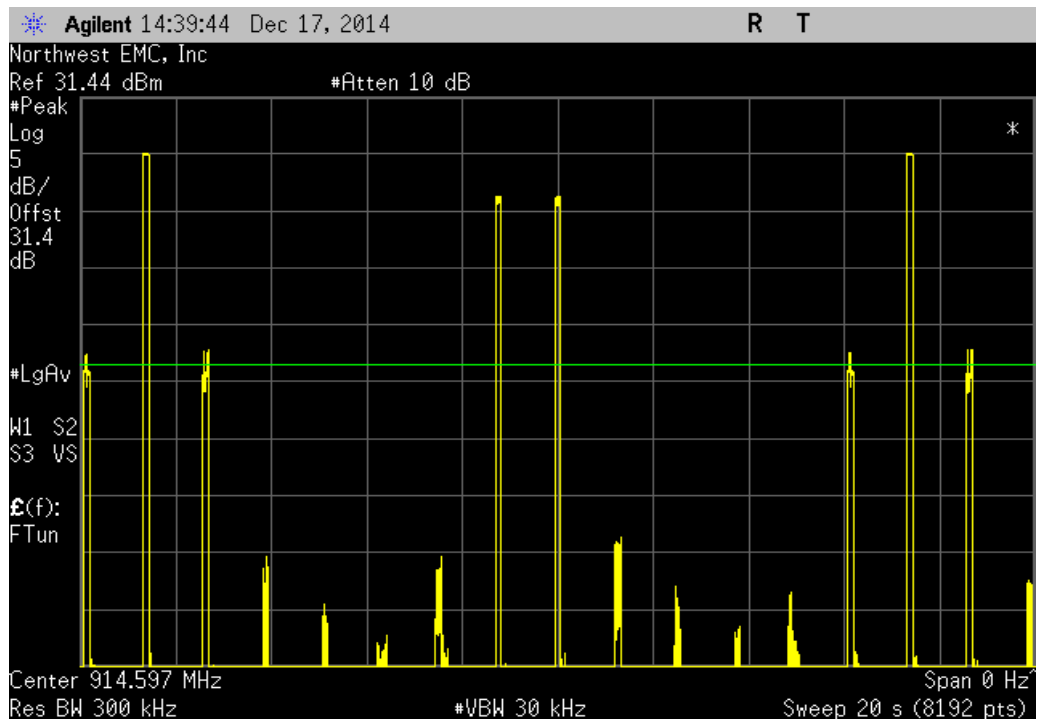
XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002				
Serial Number: 405		Date: 12/17/14				
Customer: I1 Biometrics, Inc.		Temperature: 24°C				
Attendees: David Brown, Rob Phibbs		Humidity: 32%				
Project: None		Barometric Pres.: 1011				
Tested by: Richard Mellroth		Power: Power Over USB				
		Job Site: NC02				
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2014		ANSI C63.10:2009				
COMMENTS						
Power Level set at 28dBm.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature 				
		Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results
Hopping Mode, Application Mode						
61.44 Kb/s, GFSK						
Mid Channel 63, 914.596882 MHz						
6.69 N/A N/A N/A N/A						
Mid Channel 63, 914.596882 MHz						
6.69 4 26.76 400 Pass						
Mid Channel 63, 914.596882 MHz						
6.69 8 53.52 400 Pass						
Mid Channel 63, 914.596882 MHz						
6.69 8 53.52 400 Pass						
Mid Channel 63, 914.596882 MHz						
6.69 7 46.83 400 Pass						

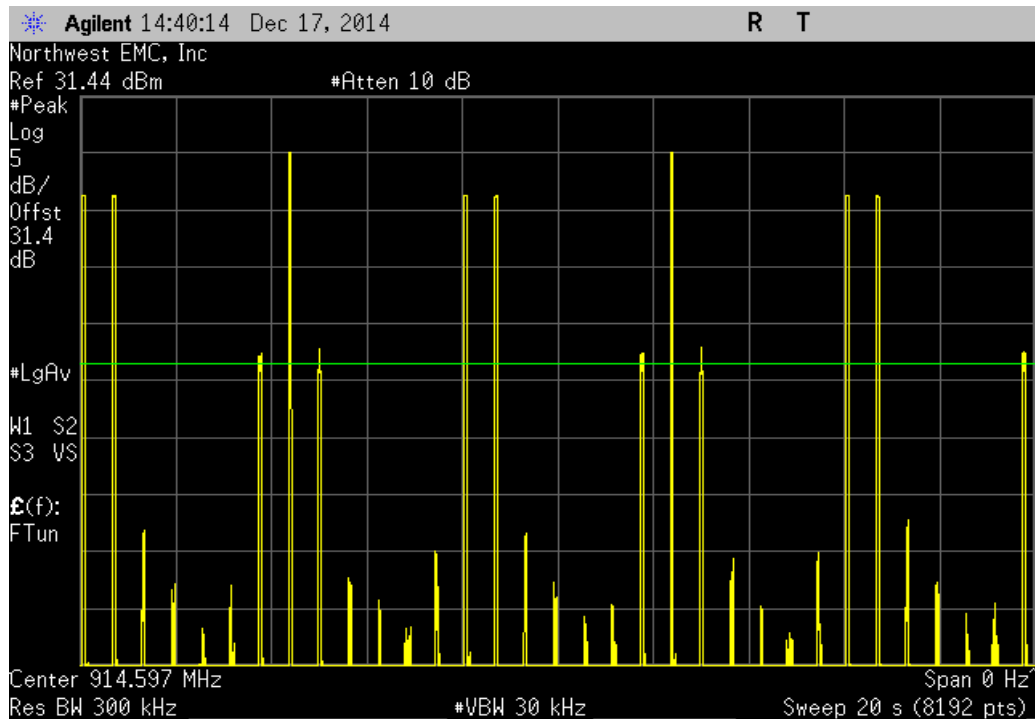
Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results	
	6.69	N/A	N/A	N/A	N/A	



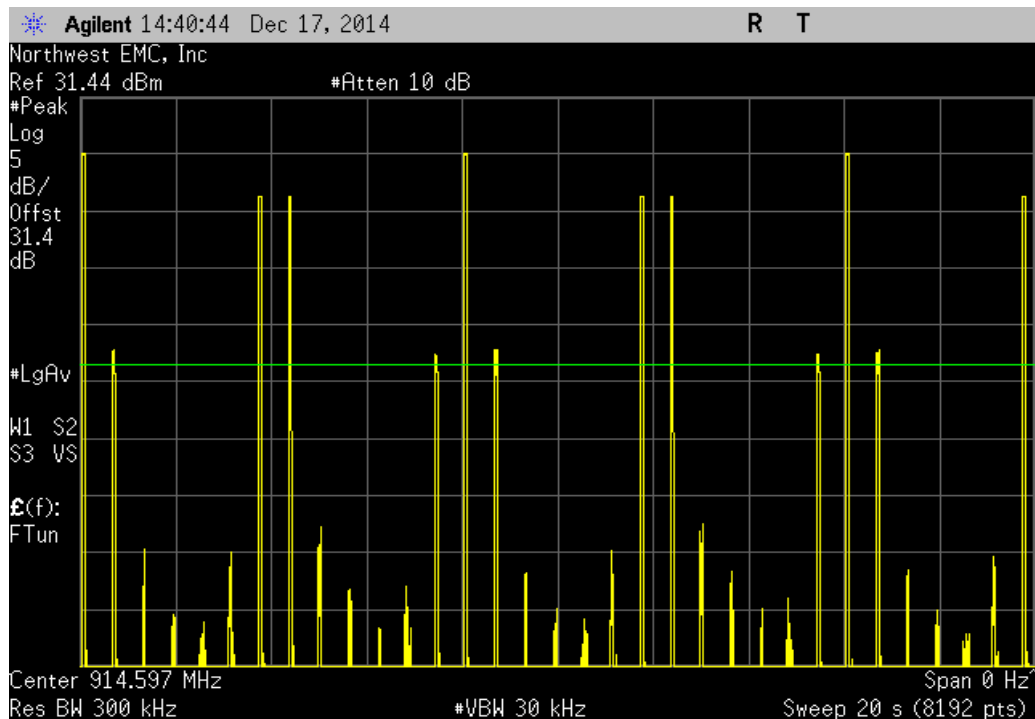
Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results	
	6.69	4	26.76	400	Pass	



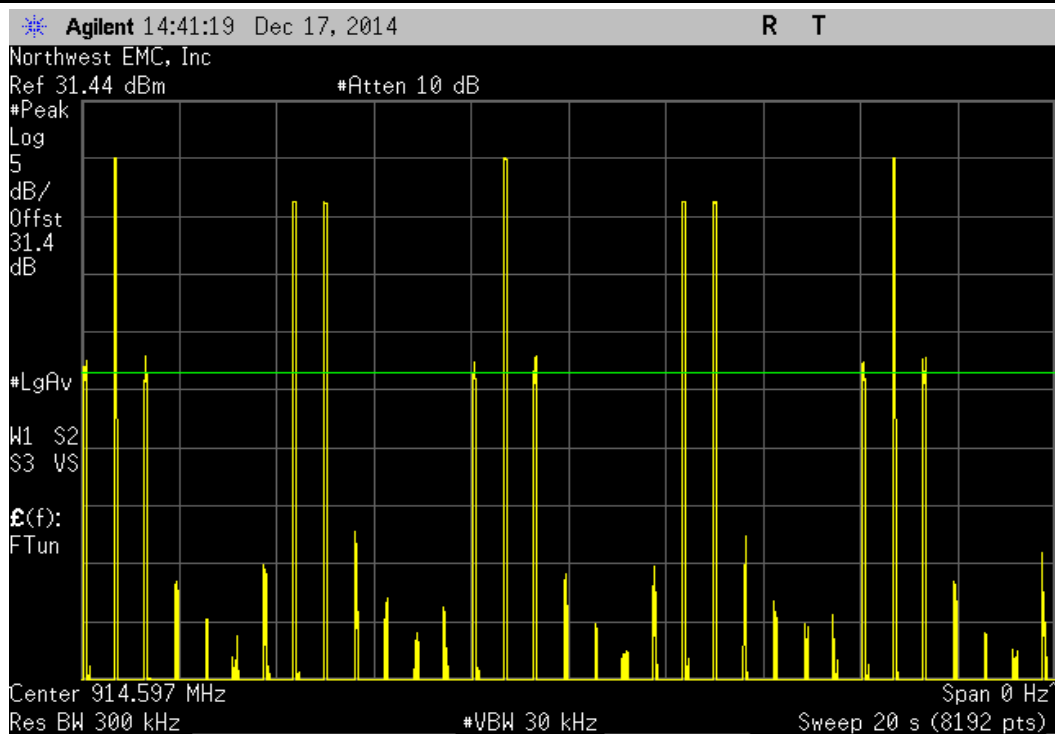
Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results	
	6.69	8	53.52	400	Pass	



Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results	
	6.69	8	53.52	400	Pass	



Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Mid Channel 63, 914.596882 MHz						
	Pulse Width (ms)	Number of Pulses	On Time (ms) During 20 s	Limit (ms)	Results	
	6.69	7	46.83	400	Pass	



DUTY CYCLE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

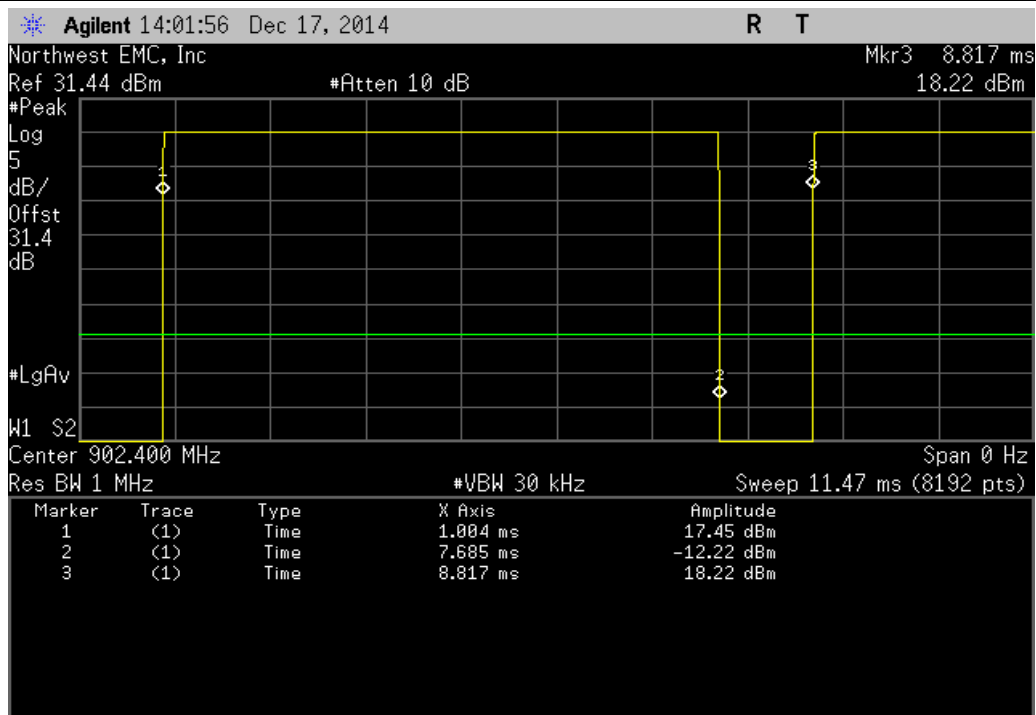
The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used.

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

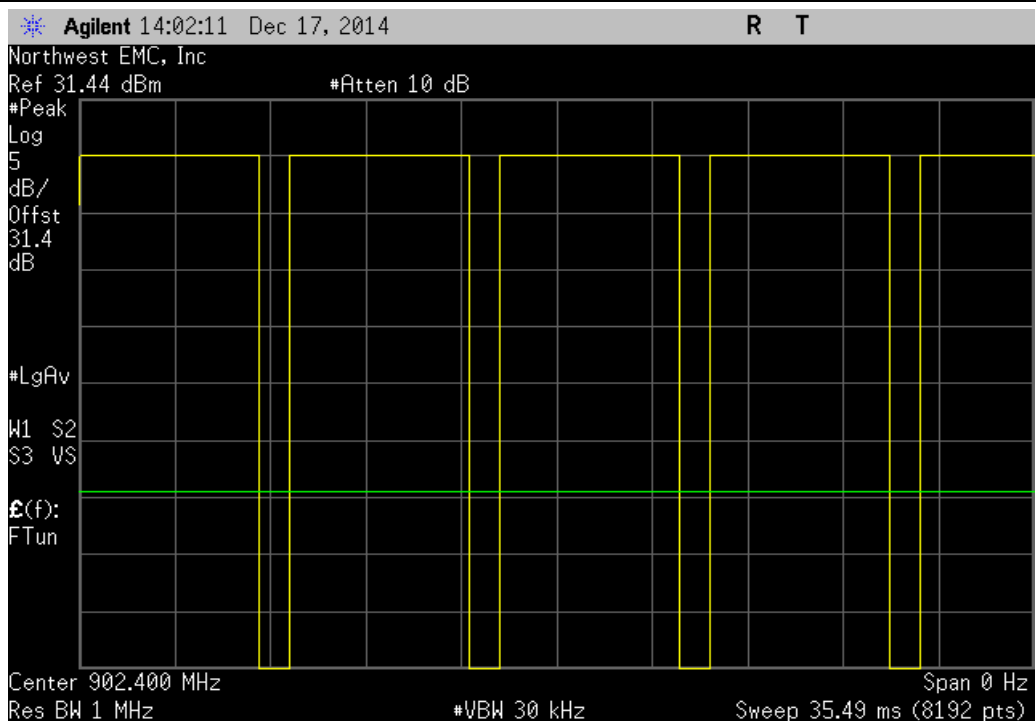
If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.

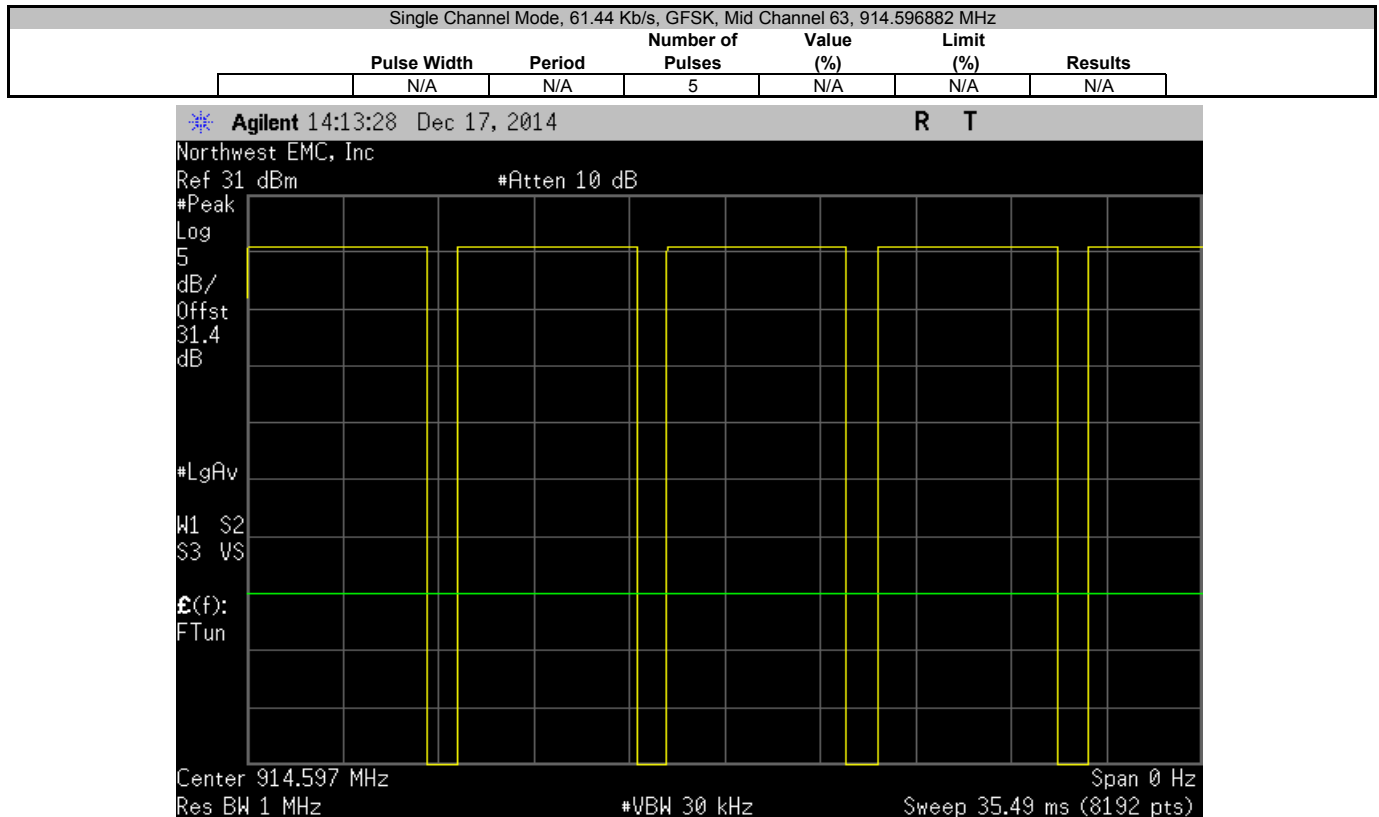
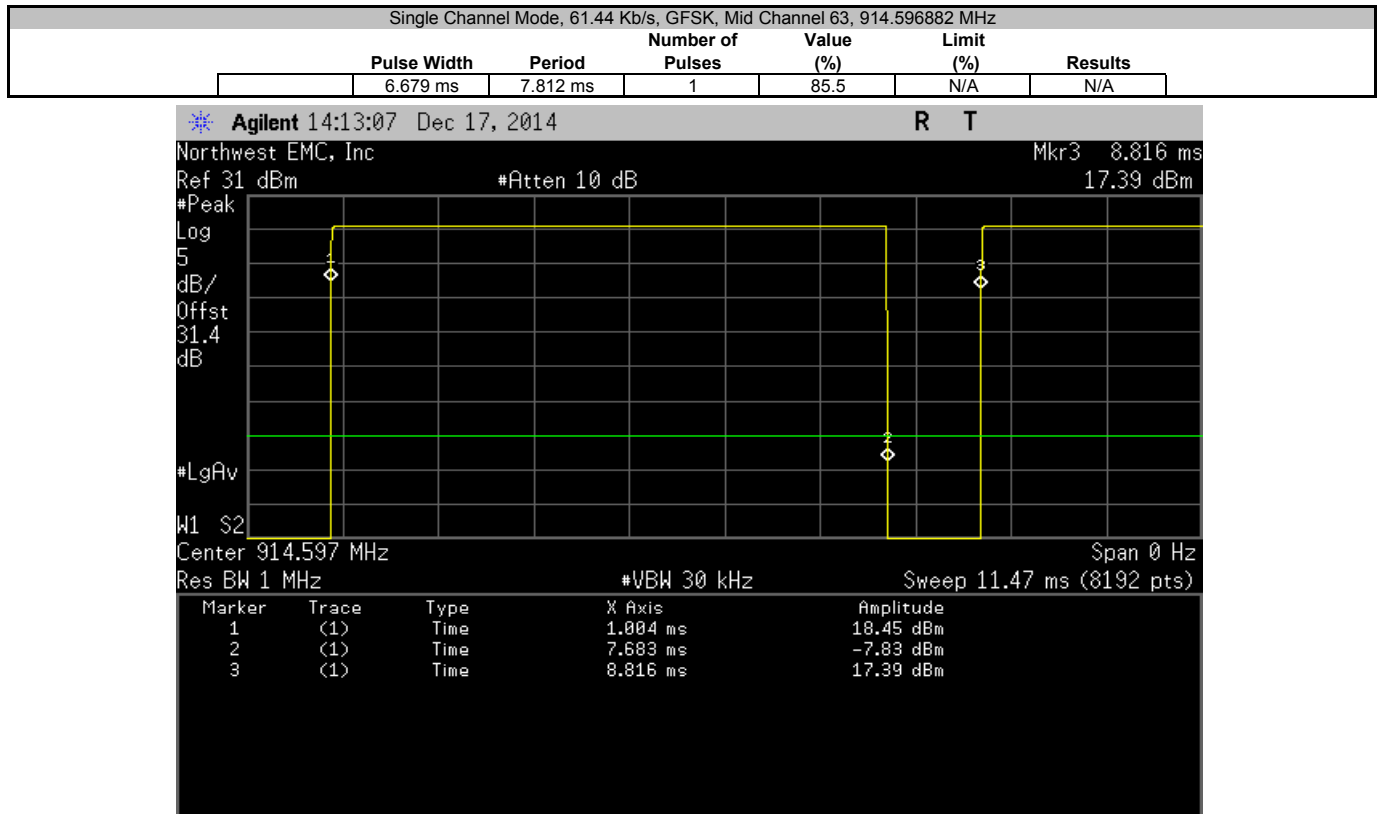
Report No. I1BM0002.1

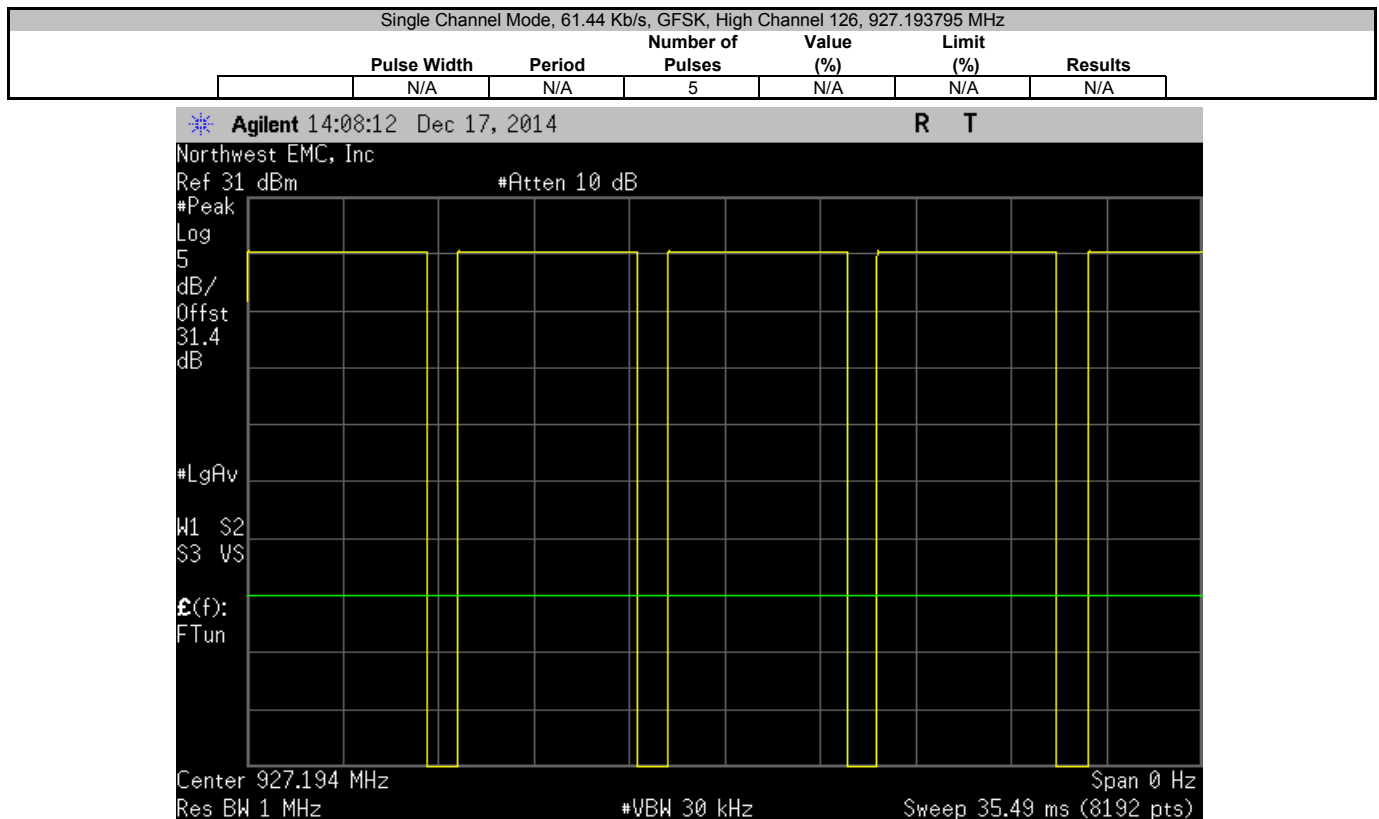
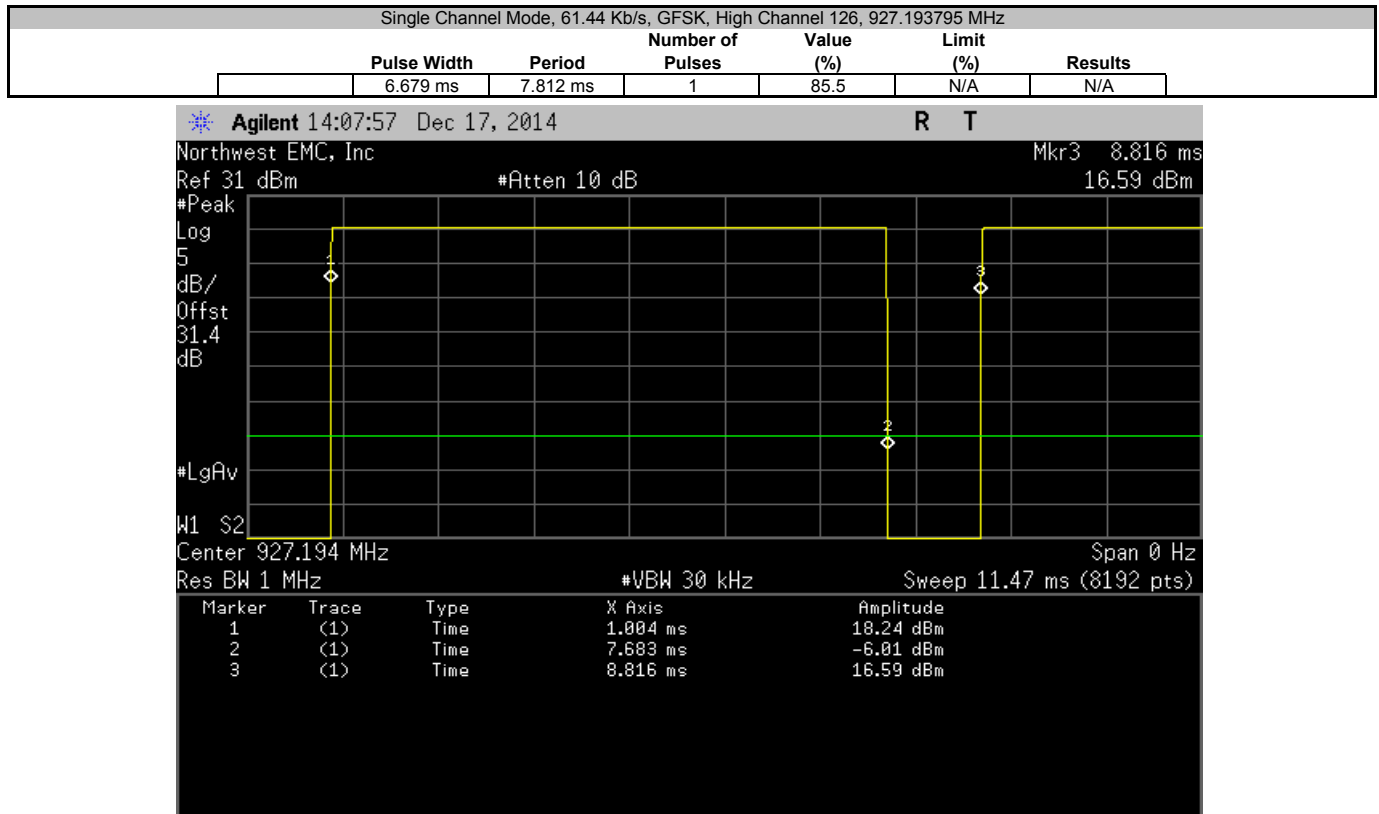
Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
6.681 ms	7.813 ms	1	85.5	N/A	N/A	



Single Channel Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	







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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12

TEST DESCRIPTION


The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

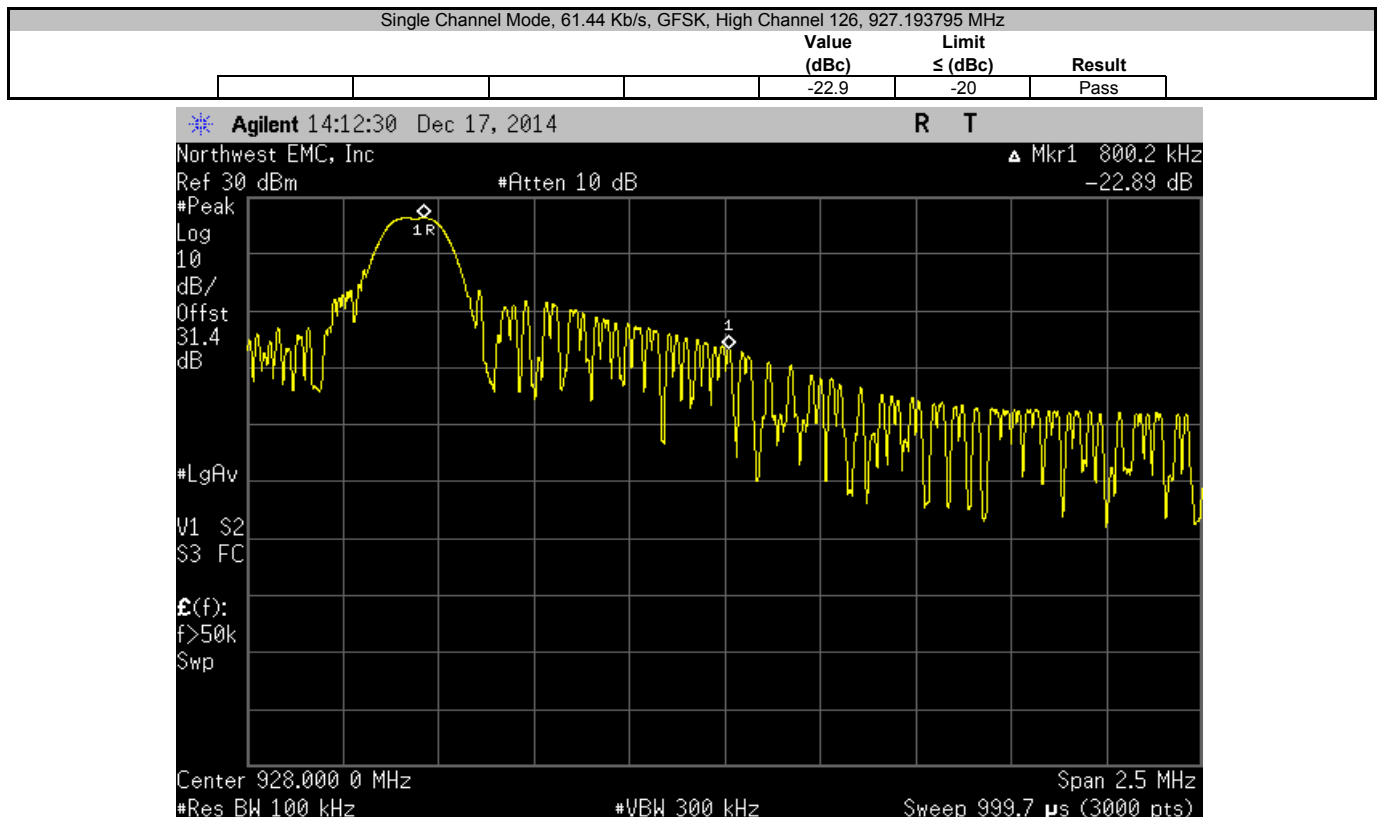
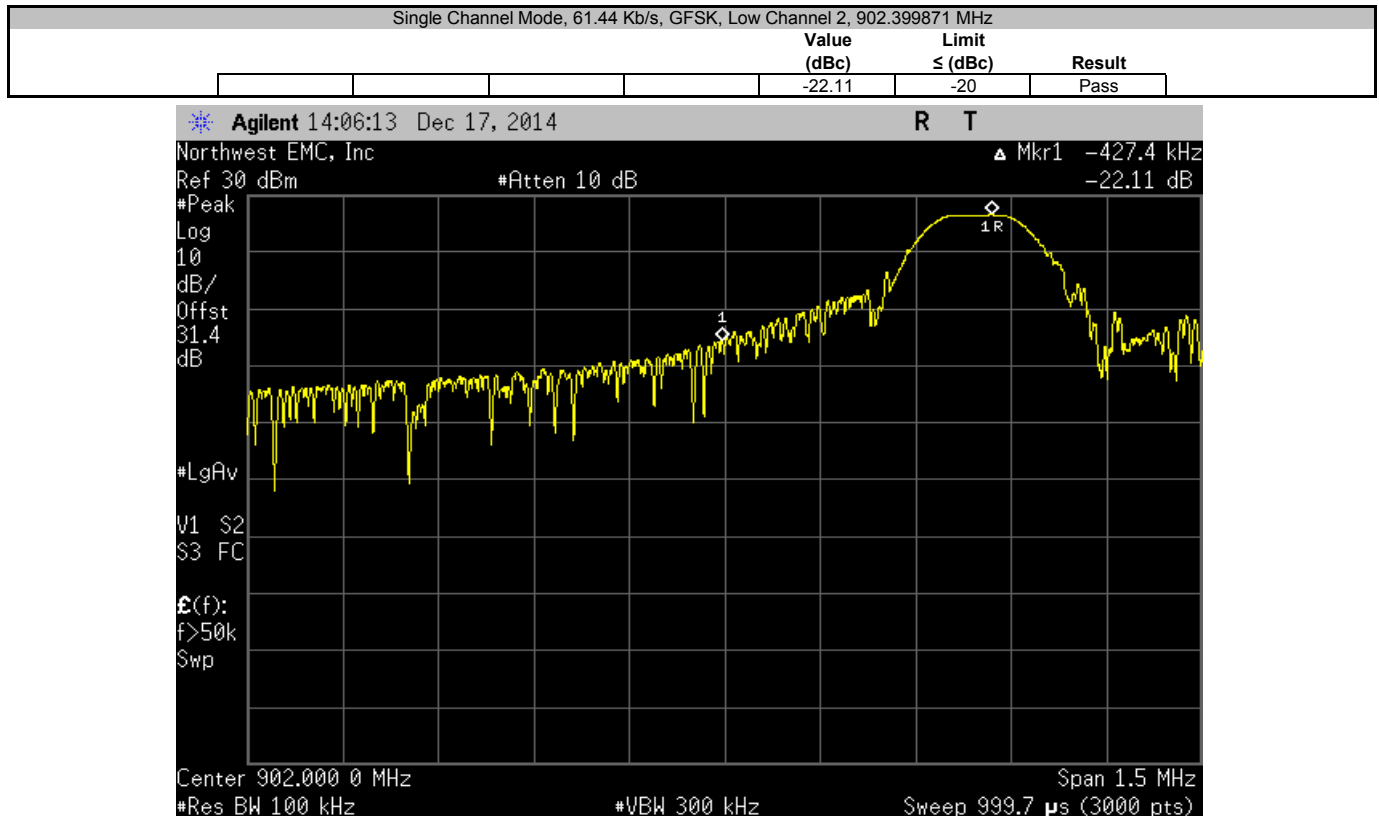
The spectrum was scanned below the lower band edge and above the higher band edge.

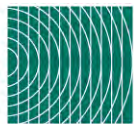


BAND EDGE COMPLIANCE

XMit 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm. Transmitting at maximum duty cycle.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Single Channel Mode			
61.44 Kb/s, GFSK			
Low Channel 2, 902.399871 MHz		-22.11	-20 Pass
High Channel 126, 927.193795 MHz		-22.9	-20 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REJ	10/14/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12

TEST DESCRIPTION


The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

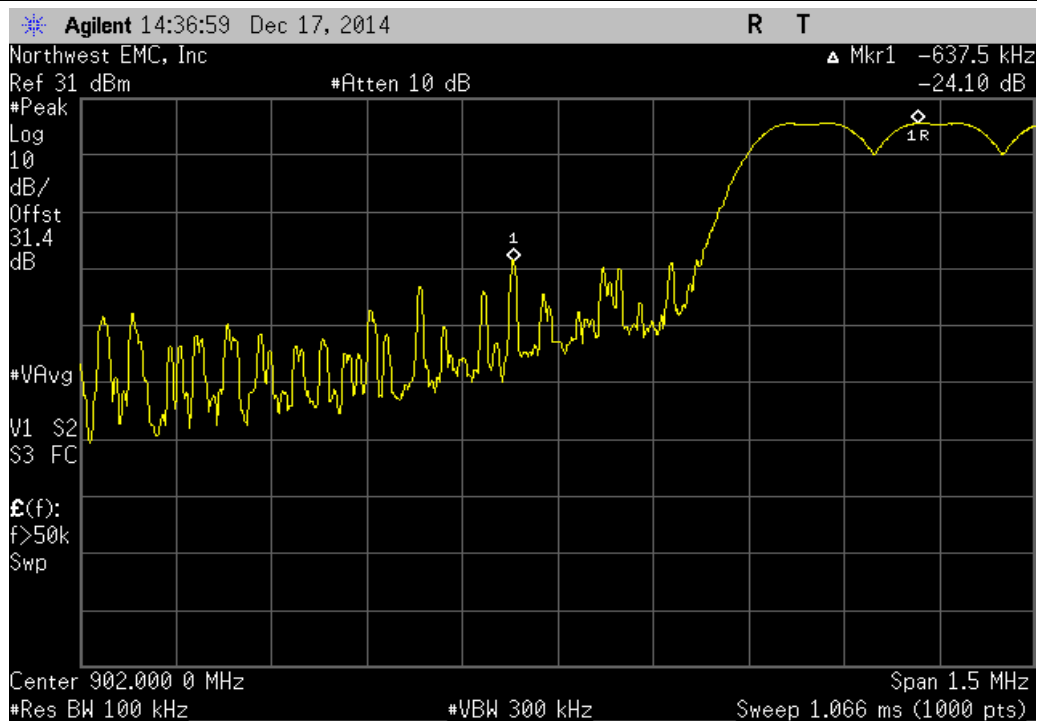


BAND EDGE COMPLIANCE -HOPPING MODE

XMIT 2014.02.07
NweTx 2014.11.06

EUT: Sideline Receiver		Work Order: I1BM0002	
Serial Number: 405		Date: 12/17/14	
Customer: I1 Biometrics, Inc.		Temperature: 24°C	
Attendees: David Brown, Rob Phibbs		Humidity: 32%	
Project: None		Barometric Pres.: 1011	
Tested by: Richard Mellroth		Power: Power Over USB	
		Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2014		ANSI C63.10:2009	
COMMENTS			
Power Level set at 28dBm.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc)
Hopping Mode, Application Mode			Result
61.44 Kb/s, GFSK			
Low Channel 2, 902.399871 MHz		-24.1	-20
High Channel 126, 927.193795 MHz		-34.51	-20
			Pass
			Pass

Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, Low Channel 2, 902.399871 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.1	-20	Pass



Hopping Mode, Application Mode, 61.44 Kb/s, GFSK, High Channel 126, 927.193795 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-34.51	-20	Pass

