APANA Inc.

PK1276

FCC 15.207:2017

FCC 15.247:2018

902.3 – 914.9 MHz Transceiver

Report # APAN0004

NVLAP Lab Code: 200629-0
NVLAP Lab Code: 200630-0

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More: https://www.bis.doc.gov/index.php/forms-documents/regulations-docs/14-commerce-country-chart/fileT

CERTIFICATE OF TEST

Last Date of Test: January 16, 2018
APANA Inc.
Model: PK1276

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2017	ANSI C63.10:2013
FCC 15.247:2018	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
7.8.2	Carrier Frequency Separation	Yes	Pass	
7.8.3	Number of Hopping Frequencies	Yes	Pass	
7.8.4	Dwell Time	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	Characterization of radio operation.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2017.6.12

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

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.

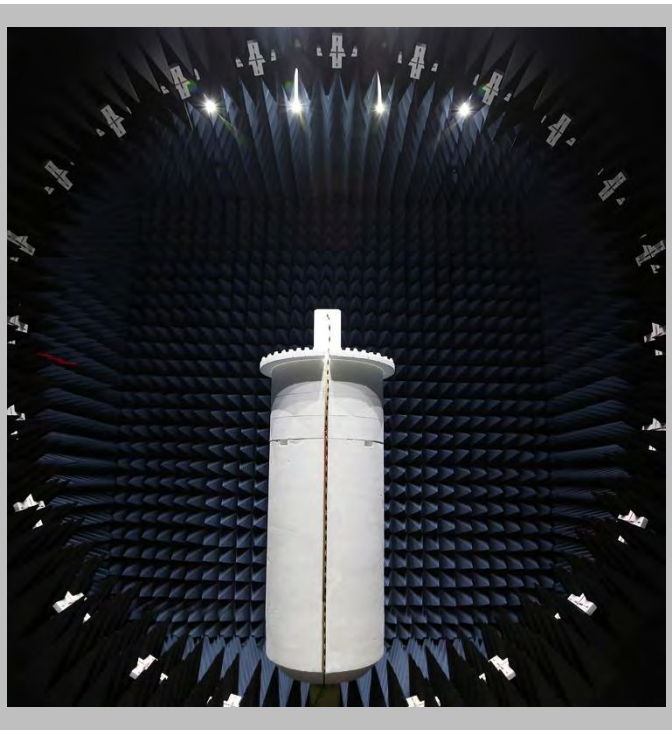
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

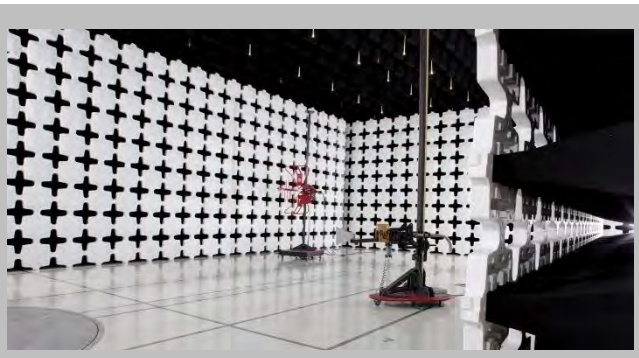
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

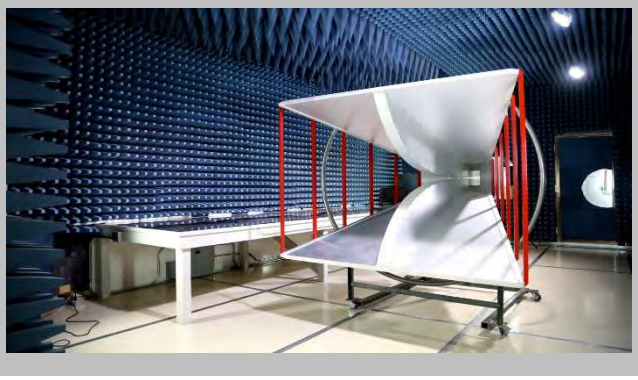
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (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
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

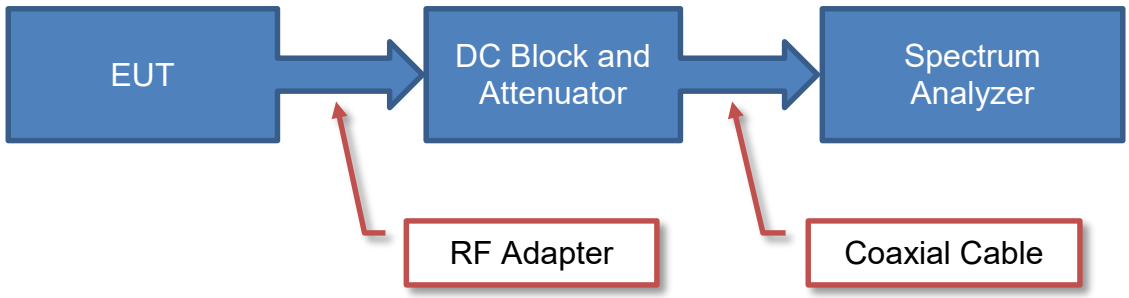




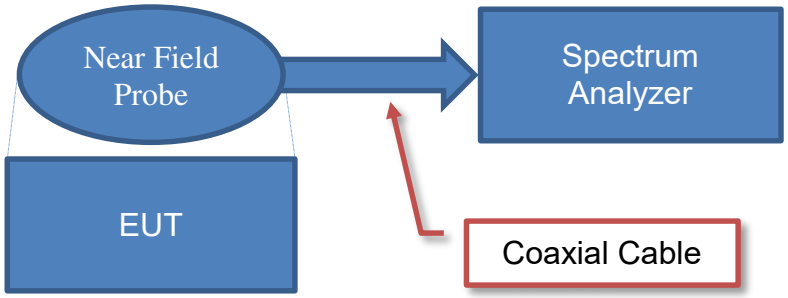


Test Setup Block Diagrams

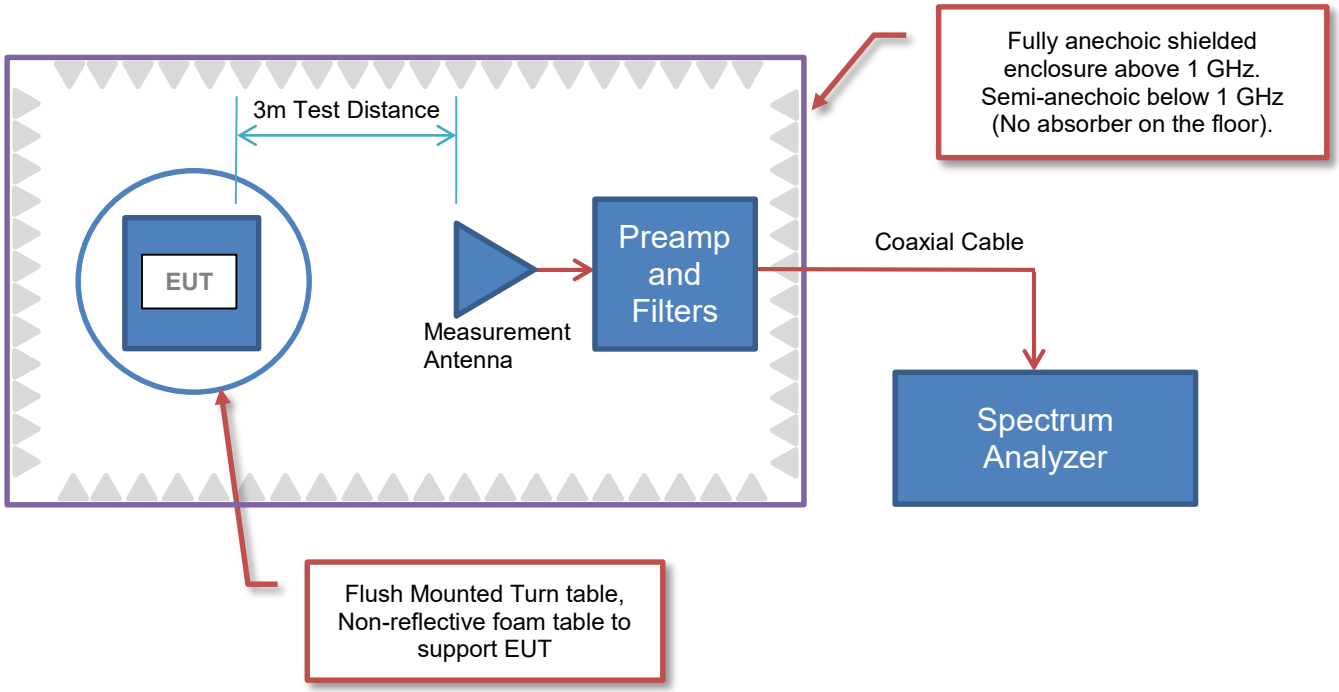
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	APANA Inc.
Address:	4290 Pacific Highway Ste A
City, State, Zip:	Bellingham, WA 98226
Test Requested By:	Matt W. Maher Peterson
Model:	PK1276
First Date of Test:	March 29, 2017
Last Date of Test:	January 16, 2018
Receipt Date of Samples:	March 2, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The PK1276 is a LoRa end node, which reads data from a water meter (once per 5 seconds is most frequent), and transmits the data at roughly 17 dBm in the 902 to 928 MHz range. The radio operates as a Hybrid radio. The PK1276 includes 3x Li-SOCL2 batteries size AA, and can operate for over 20 years on battery power (RF output +20dBm max). Alternatively, the device can be powered from wall power.

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2018 for Hybrid operation.

CONFIGURATIONS

Configuration PECK0001- 1

Software/Firmware Running during test	
Description	**Version**
RealTerm	3.0.0.30

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter (Puck) Unit 2	APANA Inc	PK1276	7
Internal Antenna Chip	Antenova	A10472	None
External Antenna Dipole	2J-Antenna USA	2J2024B-915	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB HUB	Sabrant	HB-UM43	60013224614621
AD/DC Adapter USB HUB	FLY Power	PS36A120K300UD	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Microsoft	Surface Pro 3	025613450653
AC/DC Adapter Laptop	Microsoft	1625	0D130C0WZSF51
DC Power Supply	TOPWARD Electronics	TPD	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	1.0m	No	USB HUB	PK1276 (Puck)
DC Power Cable USB HUB	No	1.52m	No	AC/DC Power Adapter	USB HUB
Antenna Cable	Unknown	5.1m	No	External Antenna	PK1276 (Puck)
Battery External DC Leads	No	9.1 m	Yes	DC Power Supply	PK1276 (Puck)
Nicor Cable	Yes	1.8 m	No	Unterminated	PK1276 (Puck)

CONFIGURATIONS

Configuration PECK0001- 8

Software/Firmware Running during test	
Description	**Version**
RealTerm	3.0.0.30

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter (Puck) Unit 3	APANA Inc	PK1276	12
Internal Antenna Chip	Antenova	A10472	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB HUB	Sabrant	HB-UM43	60013224614621
AD/DC Adapter USB HUB	FLY Power	PS36A120K300UD	None
50ohm load	None	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Microsoft	Surface Pro 3	025613450653
AC/DC Adapter Laptop	Microsoft	1625	0D130C0WZSF51
DC Power Supply	TOPWARD Electronics	TPD	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	1.0m	No	USB HUB	PK1276 (Puck)
DC Power Cable USB HUB	No	1.52m	No	AC/DC Power Adapter	USB HUB
Battery External DC Leads	No	9.1 m	Yes	DC Power Supply	PK1276 (Puck)
Nicor Cable	Yes	1.8 m	No	Unterminated	PK1276 (Puck)

CONFIGURATIONS

2017-1-25

Configuration PECK0001- 13

Software/Firmware Running during test	
Description	**Version**
RealTerm	3.0.0.30

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter (Puck) Unit 3	APANA Inc	PK1276	12
Internal Antenna Chip	Antenova	A10472	None
External Antenna Dipole	2J-Antenna USA	2J2024B-915	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter (Unit 1)	PHIHONG	PSA10F-050Q	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Microsoft	Surface Pro 3	025613450653
DC Power Supply	TOPWARD Electronics	TPD	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Antenna cable	Unknown	5.1m	No	External Antenna	PK1276 (Puck)
Nicor Cable	Yes	1.8 m	No	Unterminated	PK1276 (Puck)
USB Cable	Yes	1.0m	No	AC/DC Adapter	PK1276 (Puck)

CONFIGURATIONS

2017-1-25

Configuration PECK0001- 14

Software/Firmware Running during test	
Description	**Version**
RealTerm	3.0.0.30

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter (Puck) Unit 3	APANA Inc.	PK1276	12
Internal Antenna Chip	Antenova	A10472	None
External Antenna Dipole	2J-Antenna USA	2J2024B-915	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter (Unit 2)	Qualtek	QFAW-05-05	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Microsoft	Surface Pro 3	025613450653
DC Power Supply	TOPWARD Electronics	TPD	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Antenna cable	Unknown	5.1m	No	External Antenna	PK1276 (Puck)
Nicor Cable	Yes	1.8 m	No	Unterminated	PK1276 (Puck)
USB Cable	Yes	1.0m	No	AC/DC Adapter	PK1276 (Puck)

CONFIGURATIONS

Configuration APAN0004- 1

Software/Firmware Running during test	
Description	**Version**
RealTerm	3.0.0.33
Firmware	6.2.3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transmitter (Puck)	Peckham Technology Inc.	PK1276	18-9B-A5-90-02-7B

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Microsoft	Surface Pro 3	025613450653
USB HUB	Sabrant	HB-UM43	60013224614621
AD/DC Adapter USB HUB	FLY Power	PS36A120K300UD	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	1.0m	No	USB HUB	PK1276 (Puck)
DC Power Cable USB HUB	No	1.52m	No	AC/DC Power Adapter	USB HUB
Nicor Cable	Yes	1.8 m	No	Unterminated	PK1276 (Puck)
USB Cable	Yes	1.0m	Yes	USB HUB	Surface Pro 3

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/29/2017	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	4/14/2017	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client following the test.
3	1/16/2018	Dwell Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	1/16/2018	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 Element following the test.
5	1/16/2018	Carrier Frequency Separation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	1/16/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	1/16/2018	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	1/16/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	1/16/2018	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
10	1/16/2018	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	1/16/2018	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

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. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. 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 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-R-24-BNC	LIP	10/4/2016	10/4/2018
Cable - Conducted Cable Assembly	Element	EVG, HHD, RKA	EVGA	5/10/2016	5/10/2017
Receiver	Rohde & Schwarz	ESCI	ARH	3/27/2017	3/27/2018

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

PECK0001-13
PECK0001-14

MODES INVESTIGATED

Tx, FHSS Single Channel Mode 125 kHz BW, Ext Antenna, Mid Ch. 908.7 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	PK1276	Work Order:	PECK0001
Serial Number:	12	Date:	04/14/2017
Customer:	APANA Inc	Temperature:	23.2°C
Attendees:	Matt Maher Peterson	Relative Humidity:	34.5%
Customer Project:	None	Bar. Pressure:	1025 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	5 VDC Nominal via 120VAC/60Hz	Configuration:	PECK0001-14

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	9	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

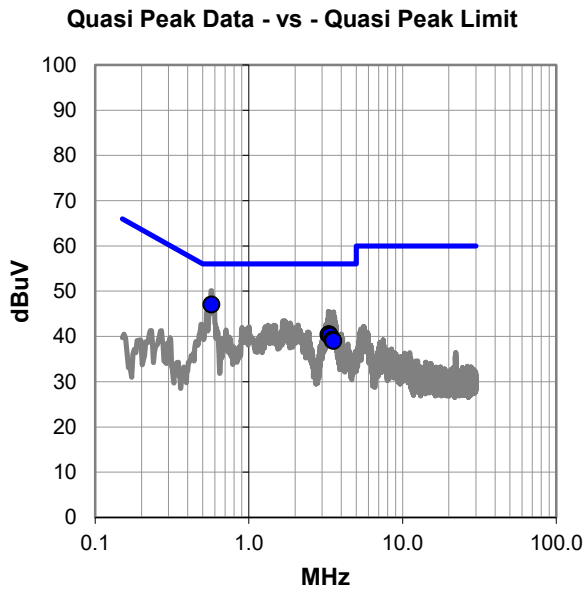
Customer provided software to control the radio Worst case antenna path was used for all measurements. An Attenuation setting of 10 was used for all measurements. Unit 2 power supply was used.

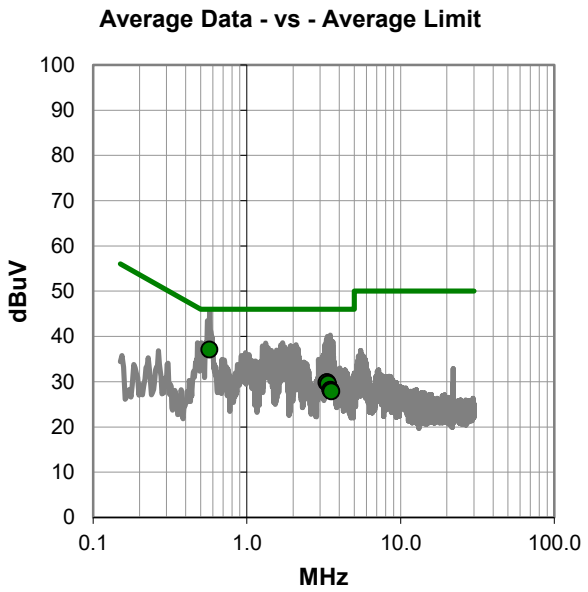
EUT OPERATING MODES

Tx, FHSS Single Channel Mode 125 kHz BW, Ext Antenna, Mid Ch. 908.7 MHz

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #9

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.571	27.5	19.5	47.0	56.0	-9.0
3.334	20.7	19.8	40.5	56.0	-15.5
3.307	20.6	19.8	40.4	56.0	-15.6
3.390	20.3	19.8	40.1	56.0	-15.9
3.494	19.5	19.8	39.3	56.0	-16.7
3.518	19.4	19.8	39.2	56.0	-16.8
3.550	19.2	19.8	39.0	56.0	-17.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.571	17.6	19.5	37.1	46.0	-8.9
3.334	10.1	19.8	29.9	46.0	-16.1
3.307	10.0	19.8	29.8	46.0	-16.2
3.390	9.7	19.8	29.5	46.0	-16.5
3.494	8.4	19.8	28.2	46.0	-17.8
3.518	8.3	19.8	28.1	46.0	-17.9
3.550	8.0	19.8	27.8	46.0	-18.2

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	PK1276	Work Order:	PECK0001
Serial Number:	12	Date:	04/14/2017
Customer:	APANA Inc	Temperature:	23.2°C
Attendees:	Matt Maher Peterson	Relative Humidity:	34.5%
Customer Project:	None	Bar. Pressure:	1025 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	5 VDC Nominal via 120VAC/60Hz	Configuration:	PECK0001-14

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	10	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

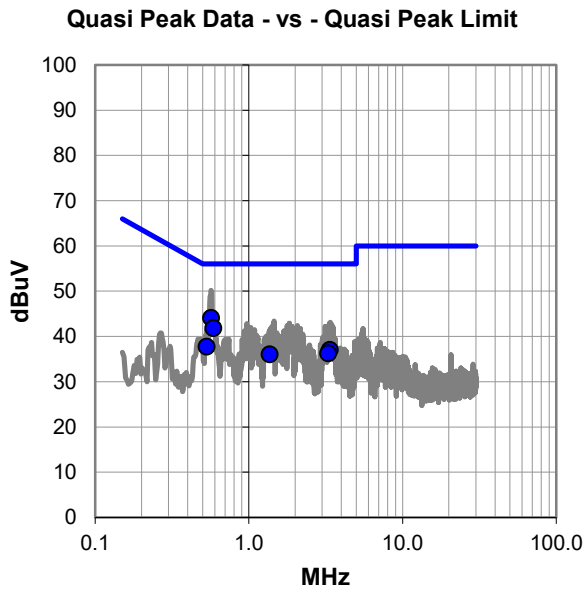
Customer provided software to control the radio Worst case antenna path was used for all measurements. An Attenuation setting of 10 was used for all measurements. Unit 2 power supply was used.

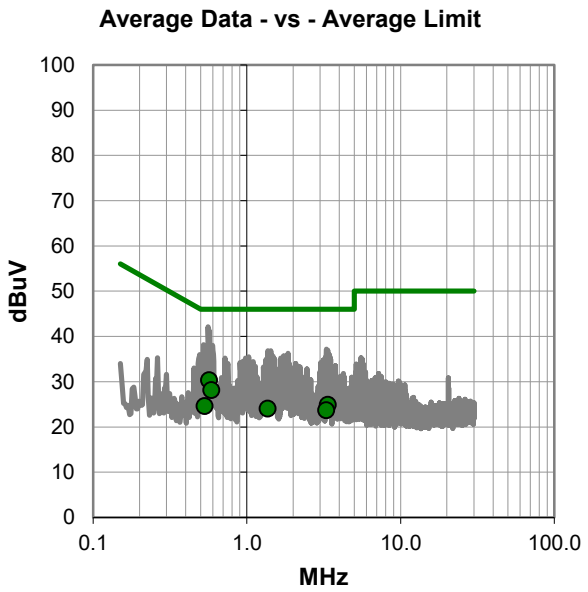
EUT OPERATING MODES

Tx, FHSS Single Channel Mode 125 kHz BW, Ext Antenna, Mid Ch. 908.7 MHz

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #10

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.569	24.6	19.5	44.1	56.0	-11.9
0.588	22.3	19.5	41.8	56.0	-14.2
0.532	18.2	19.5	37.7	56.0	-18.3
3.365	17.2	19.8	37.0	56.0	-19.0
3.285	16.4	19.8	36.2	56.0	-19.8
1.368	16.5	19.5	36.0	56.0	-20.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.569	10.8	19.5	30.3	46.0	-15.7
0.588	8.6	19.5	28.1	46.0	-17.9
3.365	5.1	19.8	24.9	46.0	-21.1
0.532	5.1	19.5	24.6	46.0	-21.4
1.368	4.5	19.5	24.0	46.0	-22.0
3.285	3.9	19.8	23.7	46.0	-22.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	PK1276	Work Order:	PECK0001
Serial Number:	12	Date:	04/14/2017
Customer:	APANA Inc	Temperature:	23.2°C
Attendees:	Matt Maher Peterson	Relative Humidity:	34.5%
Customer Project:	None	Bar. Pressure:	1025 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	5 VDC Nominal via 120VAC/60Hz	Configuration:	PECK0001-13

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	11	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

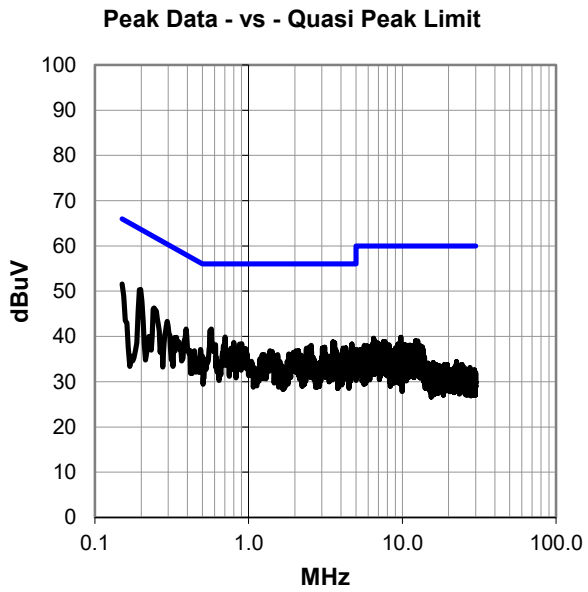
Customer provided software to control the radio Worst case antenna path was used for all measurements. An Attenuation setting of 10 was used for all measurements. Unit 1 power supply was used

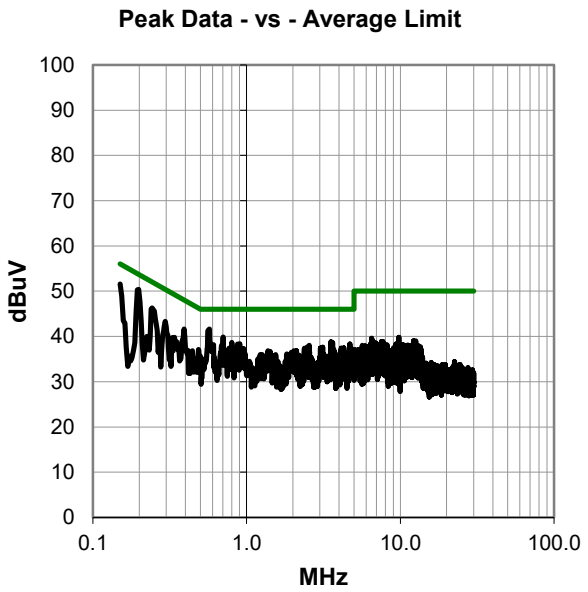
EUT OPERATING MODES

Tx, FHSS Single Channel Mode 125 kHz BW, Ext Antenna, Mid Ch. 908.7 MHz

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #11

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.199	30.8	19.6	50.4	63.7	-13.3
0.150	31.9	19.7	51.6	66.0	-14.4
0.572	22.1	19.5	41.6	56.0	-14.4
0.243	26.7	19.6	46.3	62.0	-15.7
0.702	20.4	19.5	39.9	56.0	-16.1
0.393	22.1	19.5	41.6	58.0	-16.4
0.296	23.7	19.6	43.3	60.4	-17.1
3.541	19.0	19.8	38.8	56.0	-17.2
0.803	19.2	19.5	38.7	56.0	-17.3
3.623	18.8	19.8	38.6	56.0	-17.4
0.904	18.9	19.5	38.4	56.0	-17.6
0.874	18.8	19.5	38.3	56.0	-17.7
4.694	18.5	19.8	38.3	56.0	-17.7
0.687	18.5	19.5	38.0	56.0	-18.0
2.553	18.3	19.7	38.0	56.0	-18.0
2.485	18.0	19.7	37.7	56.0	-18.3
3.123	17.8	19.8	37.6	56.0	-18.4
4.284	17.7	19.8	37.5	56.0	-18.5
0.766	17.9	19.5	37.4	56.0	-18.6
2.374	17.8	19.6	37.4	56.0	-18.6
3.023	17.6	19.8	37.4	56.0	-18.6
3.038	17.6	19.8	37.4	56.0	-18.6
4.127	17.6	19.8	37.4	56.0	-18.6
0.777	17.8	19.5	37.3	56.0	-18.7
4.836	17.4	19.8	37.2	56.0	-18.8
3.691	17.3	19.8	37.1	56.0	-18.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.199	30.8	19.6	50.4	53.7	-3.3
0.150	31.9	19.7	51.6	56.0	-4.4
0.572	22.1	19.5	41.6	46.0	-4.4
0.243	26.7	19.6	46.3	52.0	-5.7
0.702	20.4	19.5	39.9	46.0	-6.1
0.393	22.1	19.5	41.6	48.0	-6.4
0.296	23.7	19.6	43.3	50.4	-7.1
3.541	19.0	19.8	38.8	46.0	-7.2
0.803	19.2	19.5	38.7	46.0	-7.3
3.623	18.8	19.8	38.6	46.0	-7.4
0.904	18.9	19.5	38.4	46.0	-7.6
0.874	18.8	19.5	38.3	46.0	-7.7
4.694	18.5	19.8	38.3	46.0	-7.7
0.687	18.5	19.5	38.0	46.0	-8.0
2.553	18.3	19.7	38.0	46.0	-8.0
2.485	18.0	19.7	37.7	46.0	-8.3
3.123	17.8	19.8	37.6	46.0	-8.4
4.284	17.7	19.8	37.5	46.0	-8.5
0.766	17.9	19.5	37.4	46.0	-8.6
2.374	17.8	19.6	37.4	46.0	-8.6
3.023	17.6	19.8	37.4	46.0	-8.6
3.038	17.6	19.8	37.4	46.0	-8.6
4.127	17.6	19.8	37.4	46.0	-8.6
0.777	17.8	19.5	37.3	46.0	-8.7
4.836	17.4	19.8	37.2	46.0	-8.8
3.691	17.3	19.8	37.1	46.0	-8.9

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	PK1276	Work Order:	PECK0001
Serial Number:	12	Date:	04/14/2017
Customer:	APANA Inc	Temperature:	23.2°C
Attendees:	Matt Maher Peterson	Relative Humidity:	34.5%
Customer Project:	None	Bar. Pressure:	1025 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	5 VDC Nominal via 120VAC/60Hz	Configuration:	PECK0001-13

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	12	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

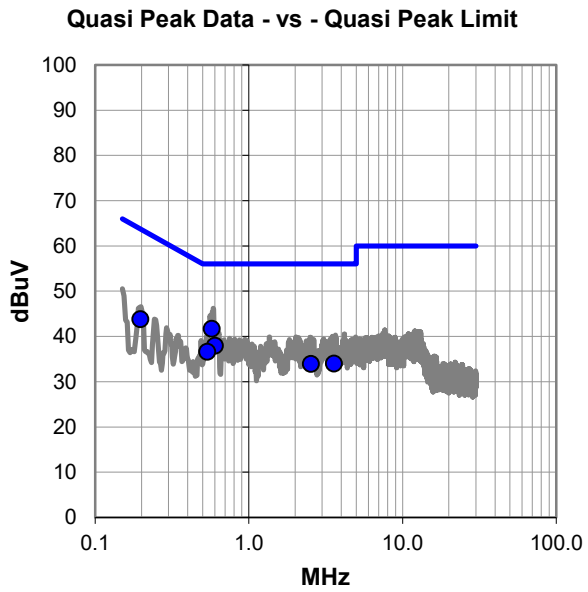
Customer provided software to control the radio Worst case antenna path was used for all measurements. An Attenuation setting of 10 was used for all measurements Unit 1 power supply was used

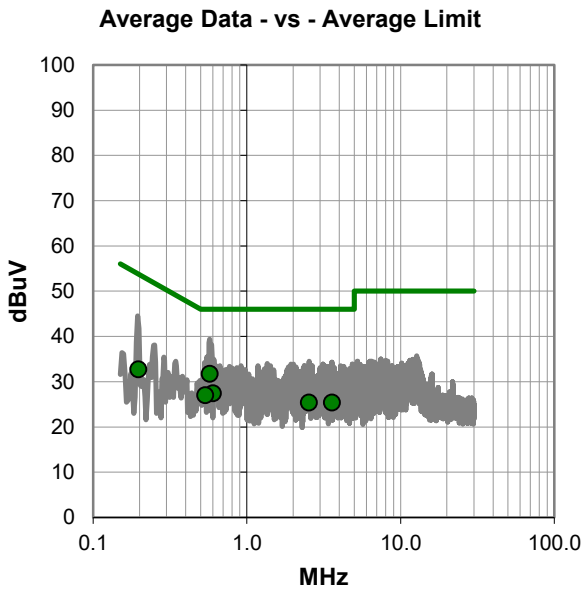
EUT OPERATING MODES

Tx, FHSS Single Channel Mode 125 kHz BW, Ext Antenna, Mid Ch. 908.7 MHz

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #12

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.574	22.2	19.5	41.7	56.0	-14.3
0.601	18.4	19.5	37.9	56.0	-18.1
0.536	17.1	19.5	36.6	56.0	-19.4
0.197	24.2	19.6	43.8	63.7	-19.9
3.583	14.2	19.8	34.0	56.0	-22.0
2.537	14.2	19.7	33.9	56.0	-22.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.574	12.2	19.5	31.7	46.0	-14.3
0.601	7.9	19.5	27.4	46.0	-18.6
0.536	7.5	19.5	27.0	46.0	-19.0
3.583	5.6	19.8	25.4	46.0	-20.6
2.537	5.7	19.7	25.4	46.0	-20.6
0.197	13.1	19.6	32.7	53.7	-21.0

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

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

Tx continuous FHSS 125 kHz BW, Spreading Factor 7

CHANNEL OF OPERATION

Low Ch. 902.3 MHz
Mid Ch. 908.7 MHz
High Ch. 914.9 MHz

ANTENNA TYPES

Internal Chip Antenna (P/N A10472) Peak 1.6 dBi
External Dipole Antenna (P/N 2J2024B-915) Peak 3.0 dBi

POWER SETTINGS INVESTIGATED

5 VDC Nominal via 120VAC/60Hz

CONFIGURATIONS INVESTIGATED

PECK0001 - 1
PECK0001 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz

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	None	Standard Gain Horns Cable	EVF	2/6/2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2/7/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Filter - High Pass	Micro-Tronics	HPM50108	HFV	2/6/2017	12 mo
Attenuator	Coaxicom	3910-20	AXZ	5/18/2016	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	2/6/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	2/6/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	5/18/2016	12 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	1/4/2017	12 mo
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/22/2016	12 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

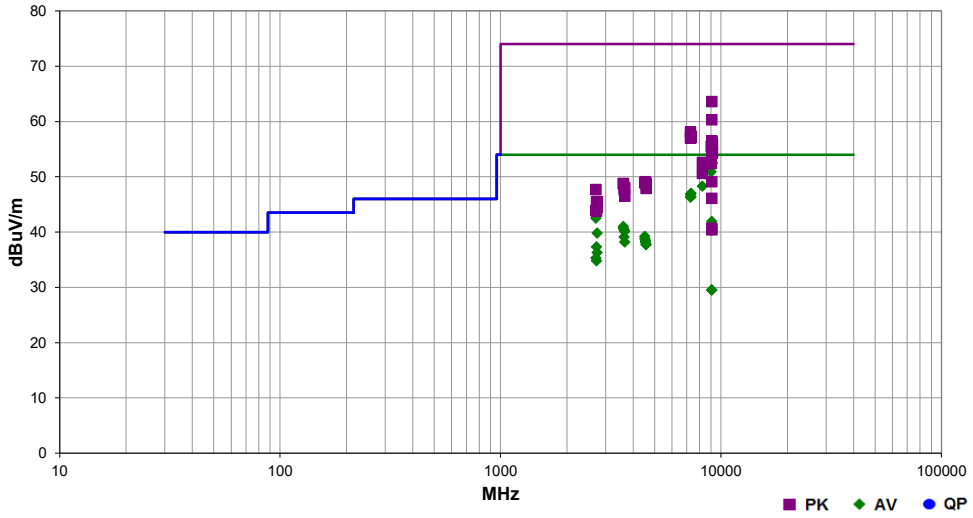
SPURIOUS RADIATED EMISSIONS

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	PECK0001	**Date:**	03/29/17		
Project:	None	**Temperature:**	22.3 °C		
Job Site:	EV01	**Humidity:**	43.6% RH		
Serial Number:	07	**Barometric Pres.:**	1018 mbar	**Tested by:**	Brandon Hobbs
EUT:	PK1276				
Configuration:	1				
Customer:	APANA Inc				
Attendees:	Canyon Peckam, Matt Maher-Peterson, David Humphrey				
EUT Power:	5 VDC Nominal via 120VAC/60Hz				
Operating Mode:	Tx continuous FHSS 125 kHz BW Please reference the data comments for additional operating mode conditions				
Deviations:	None				
Comments:	Please reference the data comments for EUT orientation, Antenna type, power applied and frequeny. Interanl Antenna completed need external antenna info now.				

Test Specifications	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

Run #	106	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
9149.085	54.3	-0.3	2.1	272.0	3.0	0.0	Horz	AV	0.0	54.0	54.0	0.0	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9086.700	53.4	-0.3	1.0	166.0	3.0	0.0	Vert	AV	0.0	53.1	54.0	-0.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT Vert
9086.970	52.8	-0.3	3.9	163.0	3.0	0.0	Vert	AV	0.0	52.5	54.0	-1.5	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT On Side
9148.645	52.8	-0.3	1.8	267.0	3.0	0.0	Vert	AV	0.0	52.5	54.0	-1.5	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
9022.535	51.2	-0.3	2.1	267.0	3.0	0.0	Horz	AV	0.0	50.9	54.0	-3.1	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
8233.705	53.8	-3.0	2.2	284.0	3.0	0.0	Horz	AV	0.0	50.8	54.0	-3.2	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9022.540	49.8	-0.3	1.8	276.0	3.0	0.0	Vert	AV	0.0	49.5	54.0	-4.5	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
8233.700	51.3	-3.0	1.9	303.0	3.0	0.0	Vert	AV	0.0	48.3	54.0	-5.7	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7319.045	28.2	18.8	1.0	243.0	3.0	0.0	Horz	AV	0.0	47.0	54.0	-7.0	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
7269.345	28.2	18.6	2.3	221.0	3.0	0.0	Horz	AV	0.0	46.8	54.0	-7.2	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
7318.867	27.6	18.8	1.0	341.0	3.0	0.0	Vert	AV	0.0	46.4	54.0	-7.6	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7269.640	27.7	18.6	1.0	220.0	3.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
9087.245	63.9	-0.3	2.0	265.0	3.0	0.0	Horz	PK	0.0	63.6	74.0	-10.4	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT On Side
2706.785	41.0	1.5	1.0	332.0	3.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
9086.975	42.2	-0.3	1.2	9.0	3.0	0.0	Horz	AV	0.0	41.9	54.0	-12.1	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3609.285	34.1	6.9	1.0	211.0	3.0	0.0	Horz	AV	0.0	41.0	54.0	-13.0	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3609.215	33.8	6.9	1.0	179.0	3.0	0.0	Vert	AV	0.0	40.7	54.0	-13.3	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
3634.700	33.3	7.1	1.0	219.0	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9086.410	60.6	-0.3	2.9	192.0	3.0	0.0	Vert	PK	0.0	60.3	74.0	-13.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT Horz
9087.010	40.6	-0.3	2.1	265.0	3.0	0.0	Horz	AV	0.0	40.3	54.0	-13.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3659.605	33.0	7.1	1.0	243.0	3.0	0.0	Horz	AV	0.0	40.1	54.0	-13.9	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2744.750	38.2	1.6	3.9	24.0	3.0	0.0	Vert	AV	0.0	39.8	54.0	-14.2	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4511.580	29.0	10.2	2.5	287.0	3.0	0.0	Horz	AV	0.0	39.2	54.0	-14.8	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3634.690	32.0	7.1	1.0	182.0	3.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4511.440	28.6	10.2	1.0	298.0	3.0	0.0	Vert	AV	0.0	38.8	54.0	-15.2	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4543.465	28.2	10.3	1.0	360.0	3.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3659.542	31.1	7.1	1.0	180.0	3.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4543.495	27.9	10.3	1.2	284.0	3.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7270.785	39.5	18.6	1.0	220.0	3.0	0.0	Vert	PK	0.0	58.1	74.0	-15.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4574.270	27.6	10.2	1.0	103.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
4574.908	27.5	10.2	1.0	118.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7319.330	38.5	18.8	1.0	243.0	3.0	0.0	Horz	PK	0.0	57.3	74.0	-16.7	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2726.010	35.7	1.6	1.0	15.0	3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7317.758	38.3	18.8	1.0	341.0	3.0	0.0	Vert	PK	0.0	57.1	74.0	-16.9	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
7268.845	38.4	18.6	2.3	221.0	3.0	0.0	Horz	PK	0.0	57.0	74.0	-17.0	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9087.015	56.8	-0.3	2.0	265.0	3.0	0.0	Horz	PK	0.0	56.5	74.0	-17.5	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 9, EUT On Side
9087.165	56.6	-0.3	2.3	329.0	3.0	0.0	Horz	PK	0.0	56.3	74.0	-17.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT Horz
9086.900	56.6	-0.3	2.1	265.0	3.0	0.0	Horz	PK	0.0	56.3	74.0	-17.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 9, EUT On Side
2744.630	34.7	1.6	1.0	241.0	3.0	0.0	Horz	AV	0.0	36.3	54.0	-17.7	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9087.480	56.3	-0.3	1.0	165.0	3.0	0.0	Horz	PK	0.0	56.0	74.0	-18.0	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT Vert
9148.290	56.1	-0.3	2.1	272.0	3.0	0.0	Horz	PK	0.0	55.8	74.0	-18.2	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
9022.215	55.8	-0.3	2.1	267.0	3.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2706.945	33.8	1.5	1.0	213.0	3.0	0.0	Horz	AV	0.0	35.3	54.0	-18.7	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9087.340	55.1	-0.3	1.0	166.0	3.0	0.0	Vert	PK	0.0	54.8	74.0	-19.2	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT Vert
2726.110	33.2	1.6	1.0	272.0	3.0	0.0	Horz	AV	0.0	34.8	54.0	-19.2	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9086.630	54.6	-0.3	3.9	163.0	3.0	0.0	Vert	PK	0.0	54.3	74.0	-19.7	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 8, EUT On Side
9149.285	54.6	-0.3	1.8	267.0	3.0	0.0	Vert	PK	0.0	54.3	74.0	-19.7	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
8233.845	55.6	-3.0	2.2	284.0	3.0	0.0	Horz	PK	0.0	52.6	74.0	-21.4	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9022.565	52.7	-0.3	1.8	276.0	3.0	0.0	Vert	PK	0.0	52.4	74.0	-21.6	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
8233.695	53.6	-3.0	1.9	303.0	3.0	0.0	Vert	PK	0.0	50.6	74.0	-23.4	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
9085.570	29.8	-0.3	1.0	173.0	3.0	0.0	Horz	AV	0.0	29.5	54.0	-24.5	Mid Ch.908.7 MHz, Ext Antenna, Battery, Attenuation 0, EUT On Side
9085.690	29.8	-0.3	2.6	310.0	3.0	0.0	Vert	AV	0.0	29.5	54.0	-24.5	Mid Ch.908.7 MHz, Ext Antenna, Battery, Attenuation 0, EUT Horz
9086.435	49.4	-0.3	2.1	265.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
4543.355	38.8	10.3	1.0	360.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
4510.640	38.8	10.2	1.0	298.0	3.0	0.0	Vert	PK	0.0	49.0	74.0	-25.0	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4542.635	38.6	10.3	1.2	284.0	3.0	0.0	Vert	PK	0.0	48.9	74.0	-25.1	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4511.700	38.7	10.2	2.5	287.0	3.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3609.260	41.9	6.9	1.0	179.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
4575.200	38.5	10.2	1.0	103.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3608.990	41.8	6.9	1.0	211.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3634.605	41.0	7.1	1.0	219.0	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
3659.130	40.9	7.1	1.0	243.0	3.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
4575.892	37.7	10.2	1.0	118.0	3.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
2707.090	46.2	1.5	1.0	332.0	3.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
3634.670	40.5	7.1	1.0	182.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
3659.583	39.4	7.1	1.0	180.0	3.0	0.0	Vert	PK	0.0	46.5	74.0	-27.5	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
9086.720	46.4	-0.3	1.2	9.0	3.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2744.583	43.9	1.6	3.9	24.0	3.0	0.0	Vert	PK	0.0	45.5	74.0	-28.5	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
2726.165	43.9	1.6	1.0	15.0	3.0	0.0	Vert	PK	0.0	45.5	74.0	-28.5	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT Horz
2744.595	42.9	1.6	1.0	241.0	3.0	0.0	Horz	PK	0.0	44.5	74.0	-29.5	High Ch.914.9 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2707.030	42.4	1.5	1.0	213.0	3.0	0.0	Horz	PK	0.0	43.9	74.0	-30.1	Low Ch.902.3 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
2725.910	42.2	1.6	1.0	272.0	3.0	0.0	Horz	PK	0.0	43.8	74.0	-30.2	Mid Ch.908.7 MHz, Ext Antenna, 5VDC, Attenuation 10, EUT On Side
9086.145	41.0	-0.3	1.0	173.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Mid Ch.908.7 MHz, Ext Antenna, Battery, Attenuation 0, EUT On Side
9086.945	40.7	-0.3	2.6	310.0	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Mid Ch.908.7 MHz, Ext Antenna, Battery, Attenuation 0, EUT Horz

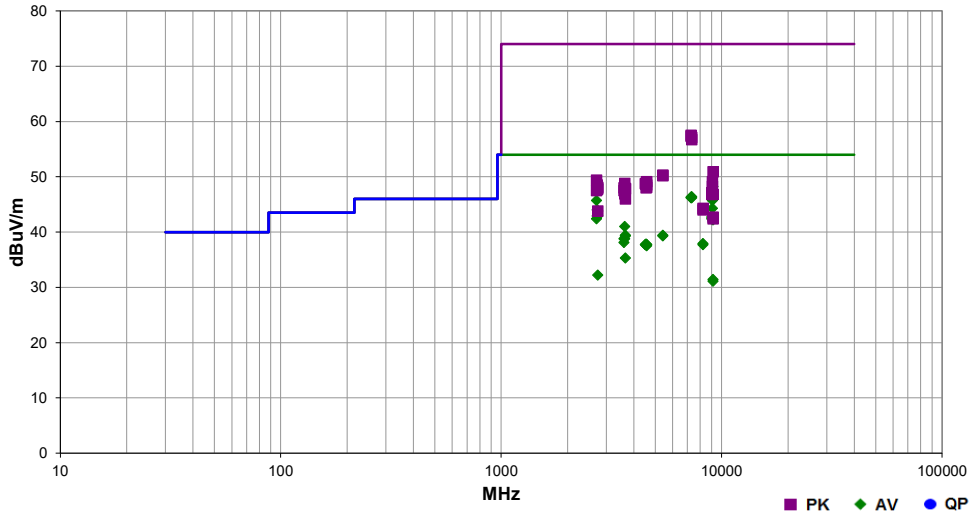
SPURIOUS RADIATED EMISSIONS

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	PECK0001	**Date:**	03/29/17		
Project:	None	**Temperature:**	22.4 °C		
Job Site:	EV01	**Humidity:**	34.8% RH		
Serial Number:	12	**Barometric Pres.:**	1021 mbar	**Tested by:**	Brandon Hobbs
EUT:	PK1276				
Configuration:	8				
Customer:	APANA Inc				
Attendees:	David Humphrey				
EUT Power:	5 VDC Nominal via 120VAC/60Hz				
Operating Mode:	Tx continuous FHSS 125 kHz BW Please reference the data comments for additional operating mode conditions				
Deviations:	None				
Comments:	Please reference the data comments for EUT orientation, Antenna type, power applied and frequeny. Interanl Antenna completed need external antenna info now.				

Test Specifications	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

Run #	114	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
9148.530	48.5	-0.3	2.1	240.0	3.0	0.0	Vert	AV	0.0	48.2	54.0	-5.8	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
7318.850	27.6	18.8	1.0	351.0	3.0	0.0	Vert	AV	0.0	46.4	54.0	-7.6	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
7269.500	27.7	18.6	1.2	273.0	3.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
7270.460	27.6	18.6	1.0	127.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
7319.325	27.4	18.8	1.0	215.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9086.965	46.0	-0.3	2.3	130.0	3.0	0.0	Horz	AV	0.0	45.7	54.0	-8.3	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Vert
2706.785	44.2	1.5	1.0	126.0	3.0	0.0	Vert	AV	0.0	45.7	54.0	-8.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
9086.735	44.6	-0.3	2.4	303.0	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2726.070	42.4	1.6	1.0	126.0	3.0	0.0	Vert	AV	0.0	44.0	54.0	-10.0	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2744.605	42.2	1.6	1.0	340.0	3.0	0.0	Vert	AV	0.0	43.8	54.0	-10.2	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2726.020	41.3	1.6	1.0	148.0	3.0	0.0	Horz	AV	0.0	42.9	54.0	-11.1	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2744.560	41.3	1.6	1.0	256.0	3.0	0.0	Horz	AV	0.0	42.9	54.0	-11.1	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9022.660	43.0	-0.3	2.0	301.0	3.0	0.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9022.865	42.7	-0.3	1.2	164.0	3.0	0.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2706.910	40.9	1.5	1.0	152.0	3.0	0.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9148.500	42.5	-0.3	1.0	154.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3634.670	33.9	7.1	1.0	304.0	3.0	0.0	Horz	AV	0.0	41.0	54.0	-13.0	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
5415.175	27.5	11.9	1.0	349.0	3.0	0.0	Horz	AV	0.0	39.4	54.0	-14.6	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3659.470	32.3	7.1	1.0	309.0	3.0	0.0	Vert	AV	0.0	39.4	54.0	-14.6	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
5413.835	27.4	11.9	1.0	278.0	3.0	0.0	Vert	AV	0.0	39.3	54.0	-14.7	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3659.535	32.2	7.1	1.0	320.0	3.0	0.0	Horz	AV	0.0	39.3	54.0	-14.7	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3609.020	31.9	6.9	1.0	275.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3634.780	31.7	7.1	1.0	230.0	3.0	0.0	Vert	AV	0.0	38.8	54.0	-15.2	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3609.020	31.2	6.9	1.0	245.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
8233.630	40.9	-3.0	1.1	192.0	3.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4543.520	27.5	10.3	1.0	142.0	3.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4544.375	27.5	10.3	1.0	0.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
8234.075	40.7	-3.0	2.2	257.0	3.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4575.615	27.5	10.2	1.0	0.0	3.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4511.215	27.5	10.2	3.2	211.0	3.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4512.390	27.5	10.2	1.0	298.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4574.805	27.5	10.2	2.0	295.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
7269.925	38.9	18.6	1.2	273.0	3.0	0.0	Vert	PK	0.0	57.5	74.0	-16.5	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4575.290	27.3	10.2	1.0	331.0	3.0	0.0	Horz	AV	0.0	37.5	54.0	-16.5	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
7269.725	38.7	18.6	1.0	127.0	3.0	0.0	Horz	PK	0.0	57.3	74.0	-16.7	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
7320.625	38.3	18.8	1.0	351.0	3.0	0.0	Vert	PK	0.0	57.1	74.0	-16.9	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
7318.025	37.9	18.8	1.0	215.0	3.0	0.0	Horz	PK	0.0	56.7	74.0	-17.3	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3659.990	28.2	7.1	1.0	131.0	3.0	0.0	Horz	AV	0.0	35.3	54.0	-18.7	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2743.320	30.6	1.6	1.2	260.0	3.0	0.0	Horz	AV	0.0	32.2	54.0	-21.8	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9148.825	31.7	-0.3	1.0	301.0	3.0	0.0	Vert	AV	0.0	31.4	54.0	-22.6	High Ch.914.9 MHz, Int Antenna, Battery, Attenuation 0, EUT Horz
9148.735	31.4	-0.3	1.0	32.0	3.0	0.0	Horz	AV	0.0	31.1	54.0	-22.9	High Ch.914.9 MHz, Int Antenna, Battery, Attenuation 0, EUT On Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
9148.325	51.2	-0.3	2.1	240.0	3.0	0.0	Vert	PK	0.0	50.9	74.0	-23.1	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
5415.040	38.4	11.9	1.0	349.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
5415.150	38.3	11.9	1.0	278.0	3.0	0.0	Vert	PK	0.0	50.2	74.0	-23.8	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2706.670	47.9	1.5	1.0	126.0	3.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
9086.655	49.4	-0.3	2.3	130.0	3.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Vert
4573.390	38.9	10.2	2.0	295.0	3.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4511.830	38.6	10.2	1.0	298.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3634.785	41.7	7.1	1.0	304.0	3.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4512.825	38.5	10.2	3.2	211.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4544.545	38.3	10.3	1.0	0.0	3.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2726.060	46.9	1.6	1.0	126.0	3.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4574.280	38.3	10.2	1.0	331.0	3.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9086.665	48.6	-0.3	2.4	303.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
4573.625	37.9	10.2	1.0	0.0	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2744.685	46.5	1.6	1.0	340.0	3.0	0.0	Vert	PK	0.0	48.1	74.0	-25.9	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3609.180	41.1	6.9	1.0	245.0	3.0	0.0	Vert	PK	0.0	48.0	74.0	-26.0	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
4544.375	37.7	10.3	1.0	142.0	3.0	0.0	Vert	PK	0.0	48.0	74.0	-26.0	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3659.485	40.8	7.1	1.0	309.0	3.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2744.555	46.2	1.6	1.0	256.0	3.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3659.735	40.7	7.1	1.0	320.0	3.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2725.950	46.1	1.6	1.0	148.0	3.0	0.0	Horz	PK	0.0	47.7	74.0	-26.3	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
2706.780	46.0	1.5	1.0	152.0	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3609.130	40.6	6.9	1.0	275.0	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9022.605	47.4	-0.3	1.2	164.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
3635.325	39.8	7.1	1.0	230.0	3.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1	Mid Ch.908.7 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
9148.380	47.1	-0.3	1.0	154.0	3.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9023.295	47.1	-0.3	2.0	301.0	3.0	0.0	Vert	PK	0.0	46.8	74.0	-27.2	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
3659.855	38.9	7.1	1.0	131.0	3.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
8234.235	47.3	-3.0	2.2	257.0	3.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
8233.445	47.0	-3.0	1.1	192.0	3.0	0.0	Vert	PK	0.0	44.0	74.0	-30.0	High Ch.914.9 MHz, Int Antenna, 5VDC, Attenuation 10, EUT Horz
2745.590	42.2	1.6	1.2	260.0	3.0	0.0	Horz	PK	0.0	43.8	74.0	-30.2	Low Ch.902.3 MHz, Int Antenna, 5VDC, Attenuation 10, EUT On Side
9148.940	43.0	-0.3	1.0	301.0	3.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	High Ch.914.9 MHz, Int Antenna, Battery, Attenuation 0, EUT Horz
9147.800	42.7	-0.3	1.0	32.0	3.0	0.0	Horz	PK	0.0	42.4	74.0	-31.6	High Ch.914.9 MHz, Int Antenna, Battery, Attenuation 0, EUT On Side

CARRIER FREQUENCY SEPARATION

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

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

CARRIER FREQUENCY SEPARATION

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276	Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B	Date:	16-Jan-18
Customer:	APANA Inc.	Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey	Humidity:	35% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power: USB	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

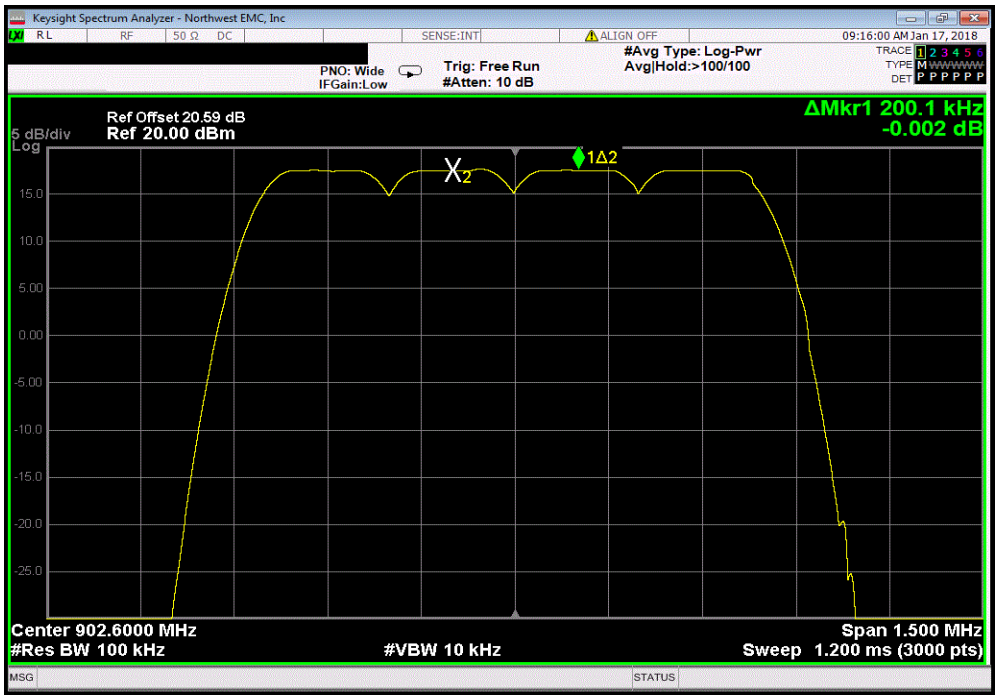
Configuration #	1	Signature

	Value	Limit (≥)	Results
Hopping Mode			
Spreading Factor 7			
Lower Channel Set (Ch 0 - Ch 3)	200.1 kHz	140 kHz	Pass
Upper Channel Set (Ch 4 - Ch 7)	200.6 kHz	140 kHz	Pass
Spreading Factor 10			
Lower Channel Set (Ch 0 - Ch 3)	185.1 kHz	140 kHz	Pass
Upper Channel Set (Ch 4 - Ch 7)	200.1 kHz	140 kHz	Pass

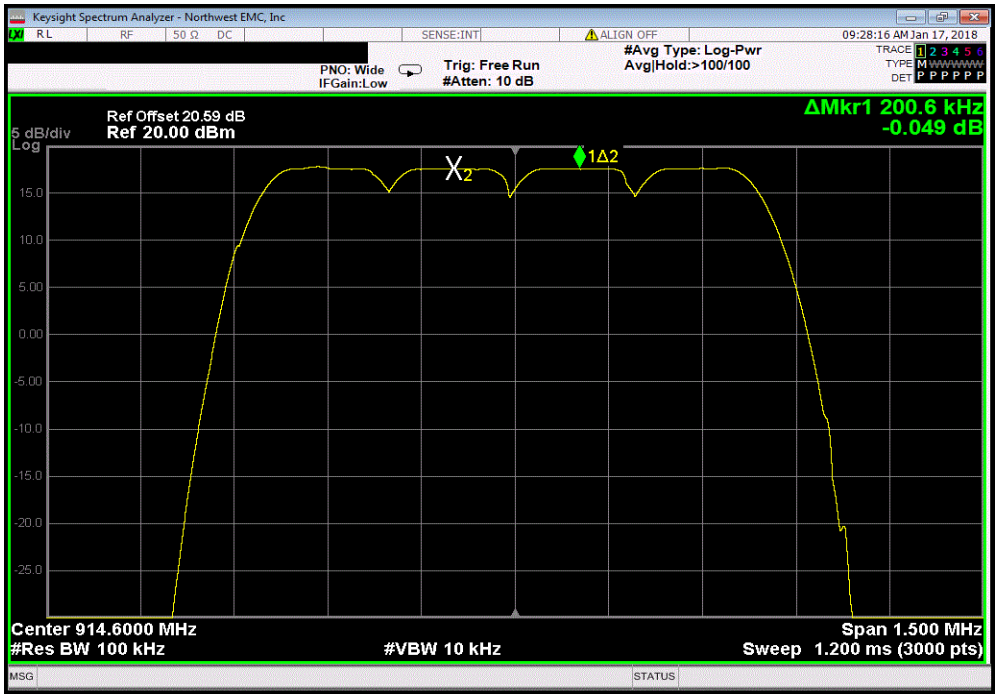
CARRIER FREQUENCY SEPARATION

NweTx 2016.09.14.2 XMit 2017.12.13

Hopping Mode, Spreading Factor 7, Lower Channel Set (Ch 0 - Ch 3)						
				Value	Limit (≥)	Results
				200.1 kHz	140 kHz	Pass



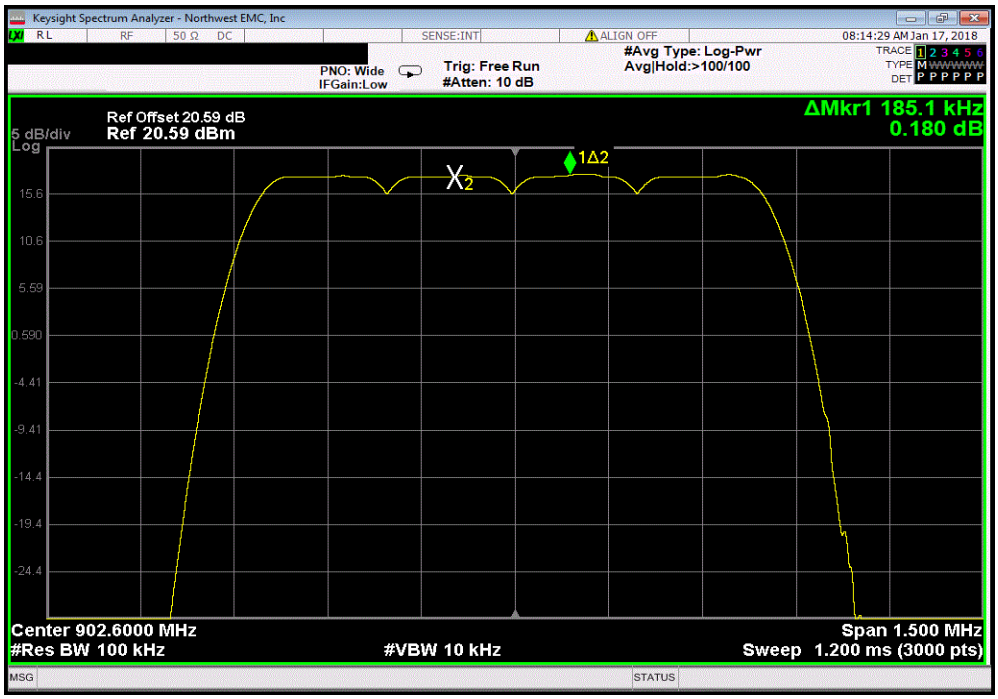
Hopping Mode, Spreading Factor 7, Upper Channel Set (Ch 4 - Ch 7)						
				Value	Limit (≥)	Results
				200.6 kHz	140 kHz	Pass



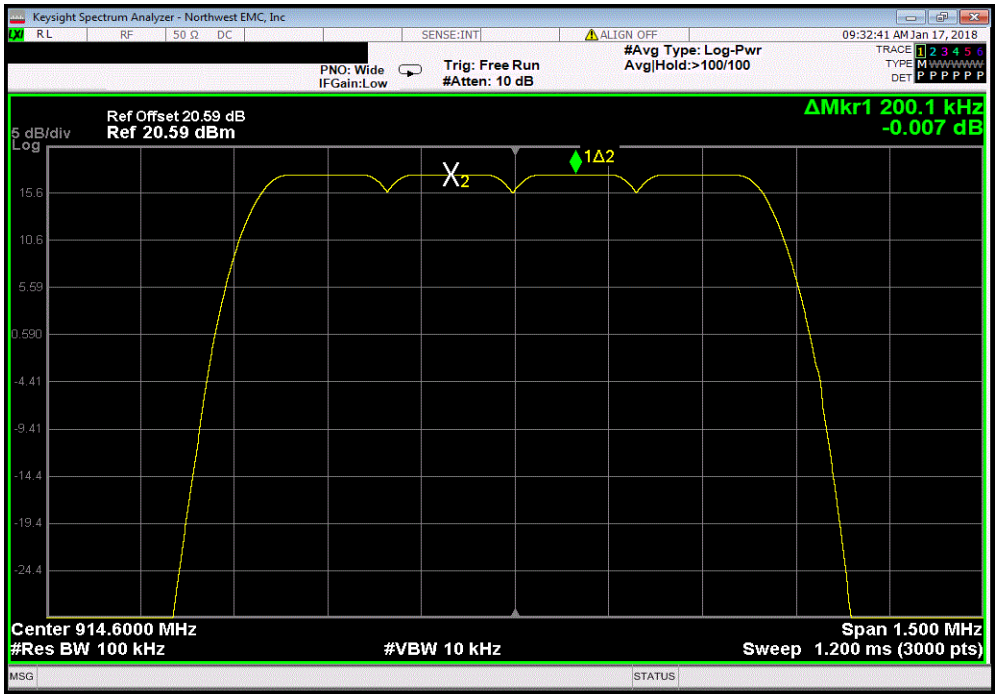
CARRIER FREQUENCY SEPARATION

NweTx 2016.09.14.2 XMit 2017.12.13

Hopping Mode, Spreading Factor 10, Lower Channel Set (Ch 0 - Ch 3)						
				Value	Limit (≥)	Results
				185.1 kHz	140 kHz	Pass



Hopping Mode, Spreading Factor 10, Upper Channel Set (Ch 4 - Ch 7)						
				Value	Limit (≥)	Results
				200.1 kHz	140 kHz	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

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

Per FCC publication 453039, for Hybrid systems using both digtal modulation and frequency hopping techniques at the same time on the same carrier, there is no requirement on the minimum number of channels associated with this type of hybrid system.

NUMBER OF HOPPING FREQUENCIES

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276	Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B	Date:	16-Jan-18
Customer:	APANA Inc.	Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey	Humidity:	35% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power: USB	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

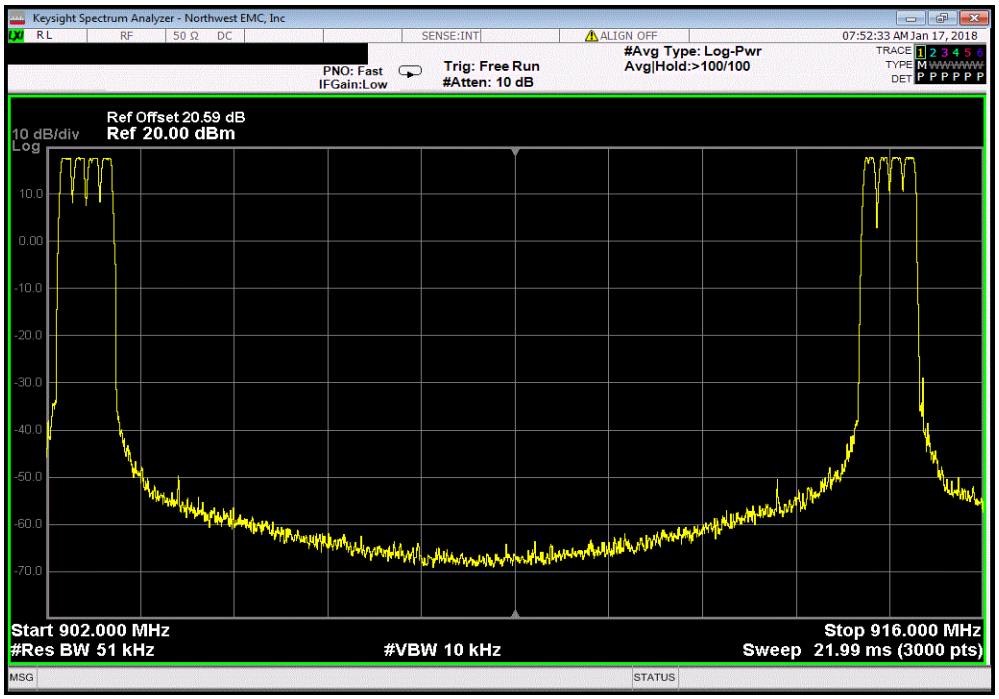
Configuration #	1	Signature

	Number of Channels	Limit	Results
Hopping Mode			
Spreading Factor 7			
Upper and Lower Channel Sets	8	N/A	N/A
Spreading Factor 10			
Upper and Lower Channel Sets	8	N/A	N/A

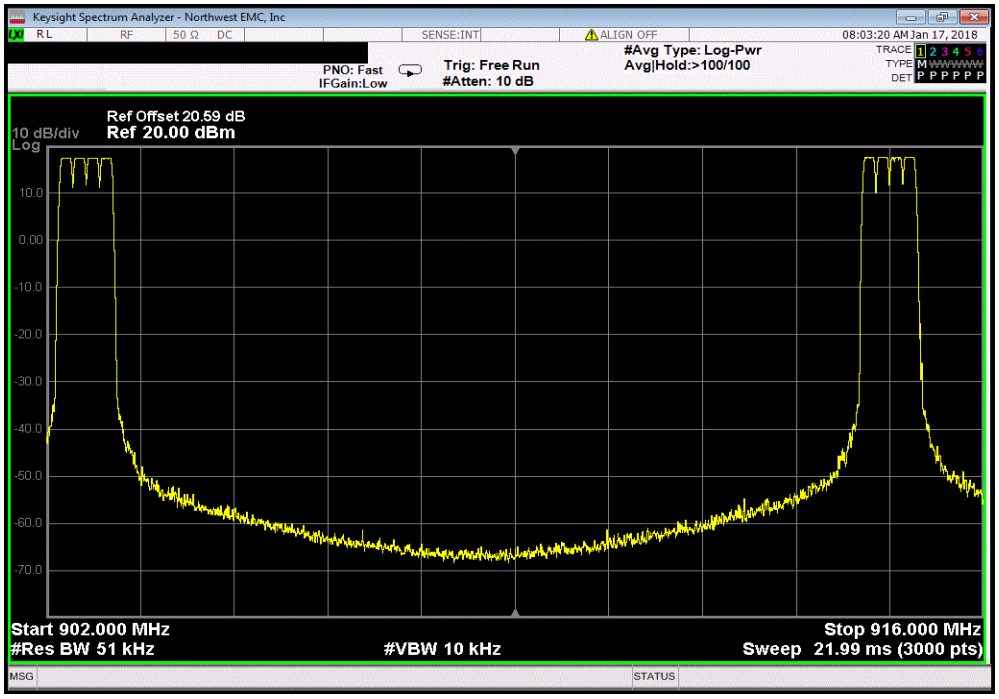
NUMBER OF HOPPING FREQUENCIES

NweTx 2016.09.14.2 XMit 2017.12.13

Hopping Mode, Spreading Factor 7, Upper and Lower Channel Sets						
				Number of Channels	Limit	Results
				8	N/A	N/A



Hopping Mode, Spreading Factor 10, Upper and Lower Channel Sets						
				Number of Channels	Limit	Results
				8	N/A	N/A



DWELL TIME

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

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

The dwell time limit for a hybrid system operating in the 902-928 MHz is based on the -20dB bandwidth of the hopping channel. For operating channels with -20dB bandwdiths less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

DWELL TIME

XMit 2017.12.13

EUT:	PK1276	Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B	Date:	16-Jan-18
Customer:	APANA Inc.	Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey	Humidity:	35% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Job Site:	NC02
Power:	USB		

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

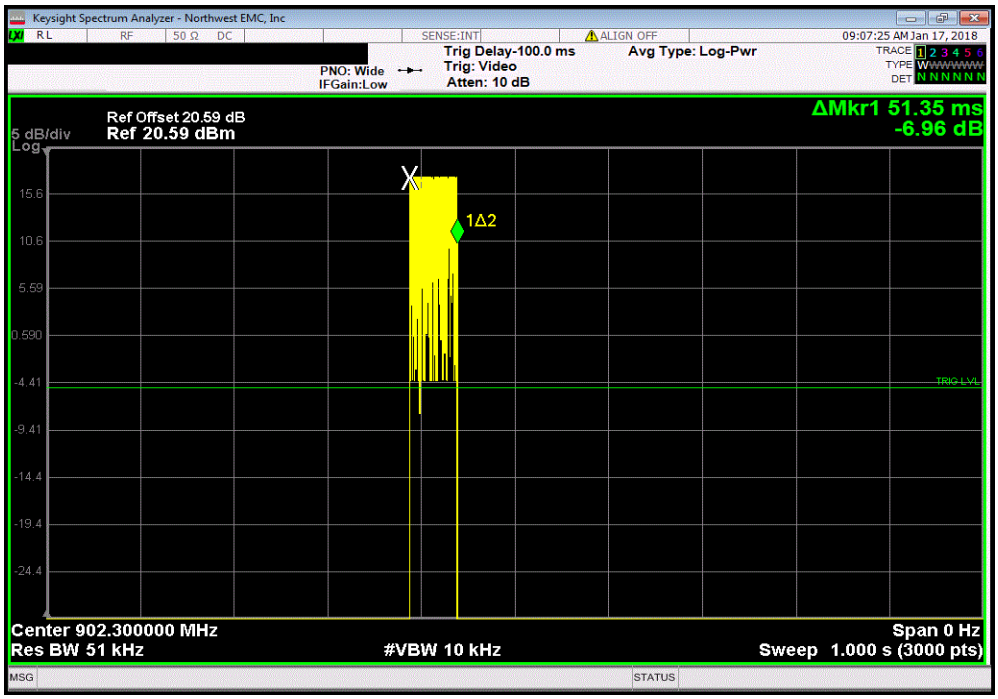
Configuration #	1	Signature

	Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
Hopping Mode					
Spreading Factor 7					
Low Channel 0, 902.3 MHz					
Pulse Width	51.35	N/A	N/A	N/A	N/A
60 second sweep (1)	N/A	1	51.35	400	Pass
60 second sweep (2)	N/A	1	51.35	400	Pass
60 second sweep (3)	N/A	1	51.35	400	Pass
High Channel 7, 914.9 MHz					
Pulse Width	51.69	N/A	N/A	N/A	N/A
60 second sweep (1)	N/A	1	51.69	400	Pass
60 second sweep (2)	N/A	2	51.69	400	Pass
60 second sweep (3)	N/A	2	103.38	400	Pass
Spreading Factor 10					
Low Channel 0, 902.3 MHz					
Pulse Width	329.8	N/A	N/A	N/A	N/A
60 second sweep (1)	N/A	1	329.8	400	Pass
60 second sweep (2)	N/A	1	329.8	400	Pass
60 second sweep (3)	N/A	1	329.8	400	Pass
High Channel 7, 914.9 MHz					
Pulse Width	329.8	N/A	N/A	N/A	N/A
60 second sweep (1)	N/A	1	329.8	400	Pass
60 second sweep (2)	N/A	1	329.8	400	Pass
60 second sweep (3)	N/A	1	329.8	400	Pass

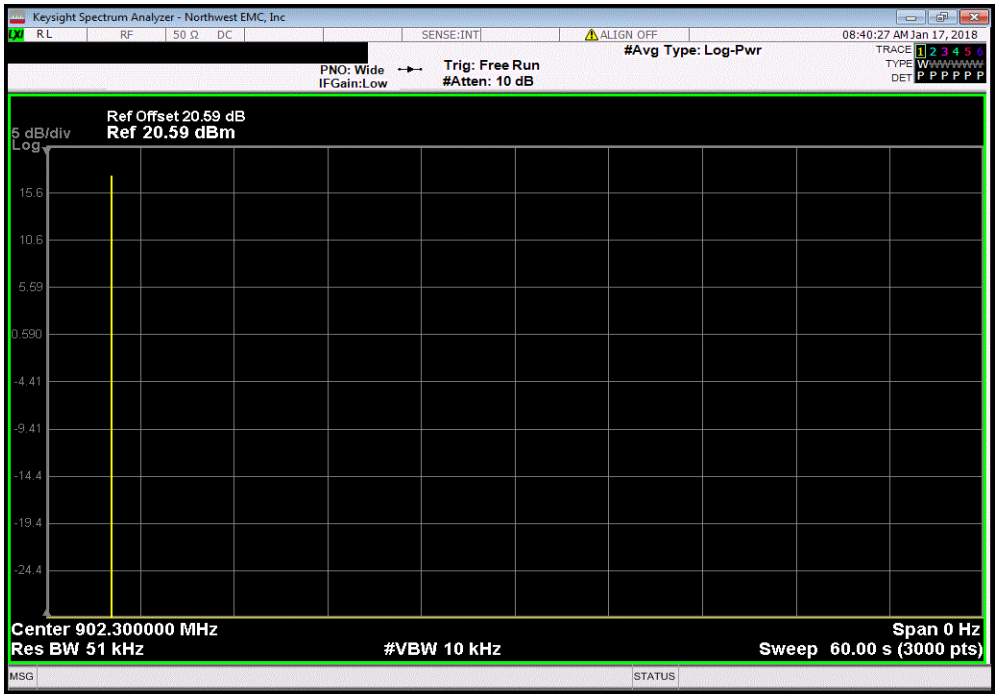
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 7, Low Channel 0, 902.3 MHz, Pulse Width						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		51.35	N/A	N/A	N/A	N/A



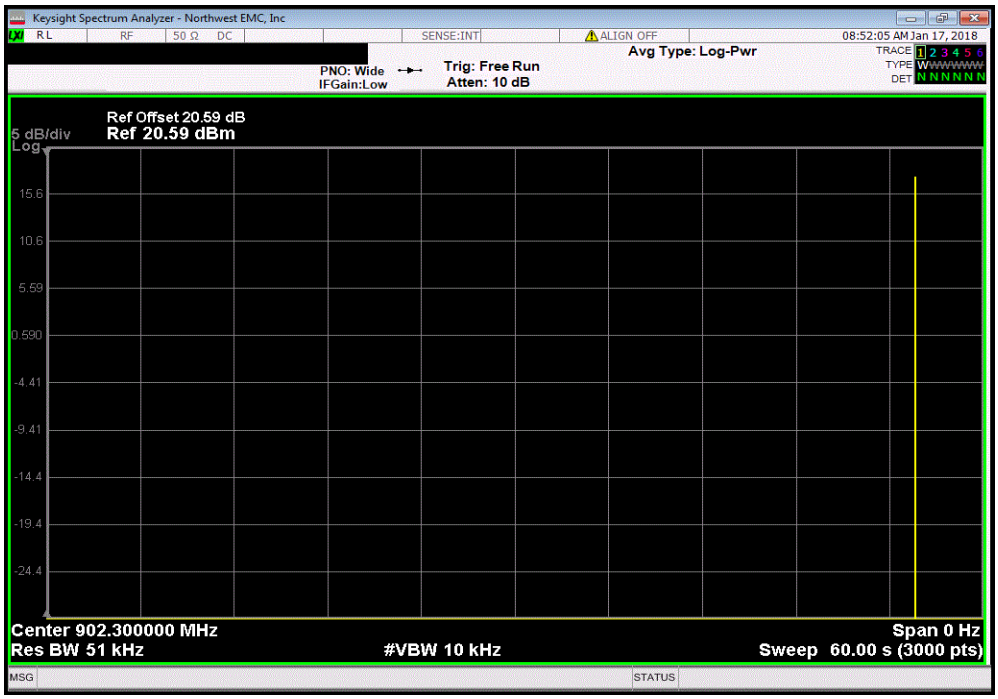
Hopping Mode, Spreading Factor 7, Low Channel 0, 902.3 MHz, 60 second sweep (1)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	51.35	400	Pass



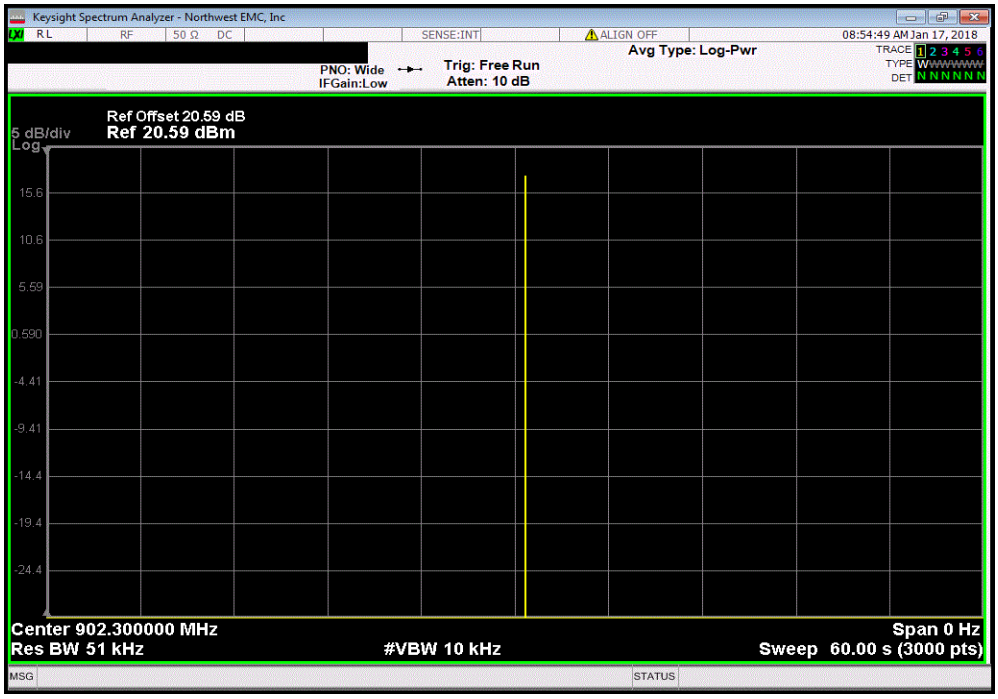
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 7, Low Channel 0, 902.3 MHz, 60 second sweep (2)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	51.35	400	Pass



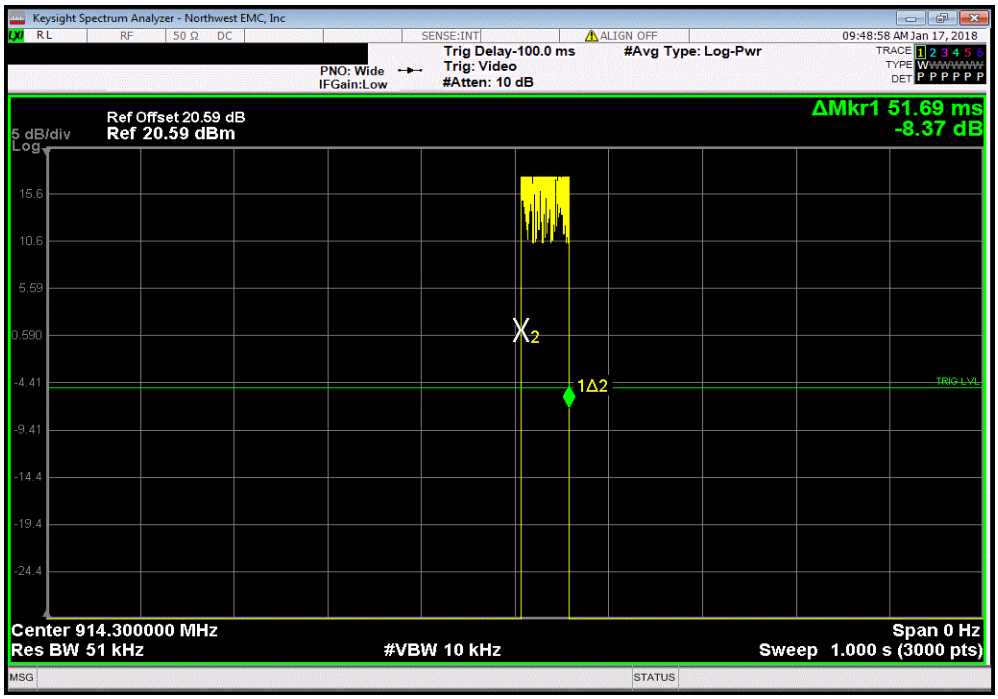
Hopping Mode, Spreading Factor 7, Low Channel 0, 902.3 MHz, 60 second sweep (3)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	51.35	400	Pass



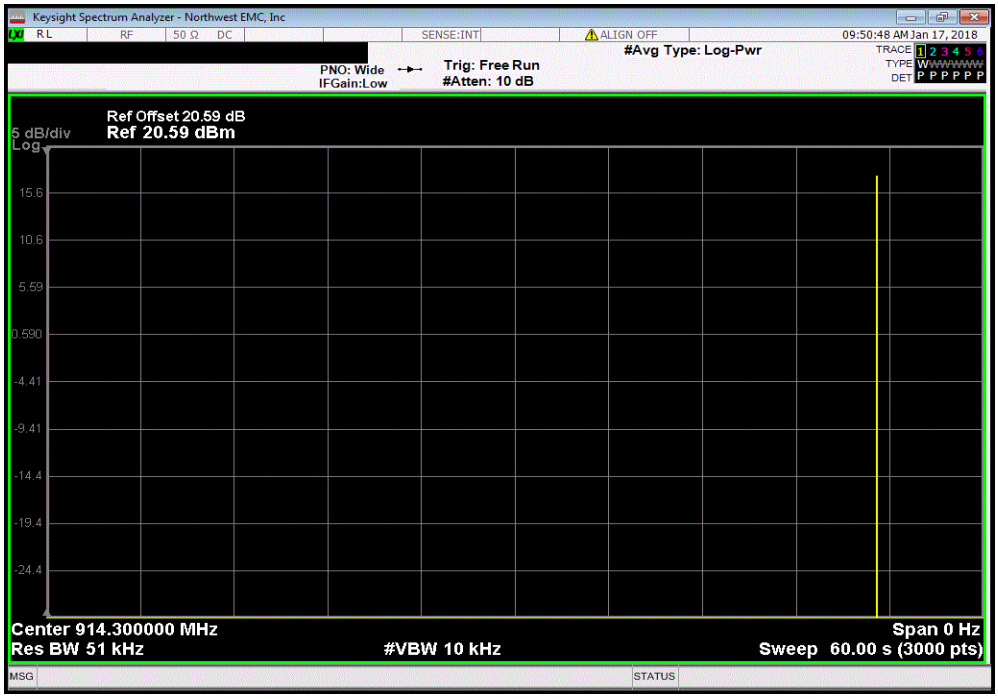
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 7, High Channel 7, 914.9 MHz, Pulse Width						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		51.69	N/A	N/A	N/A	N/A



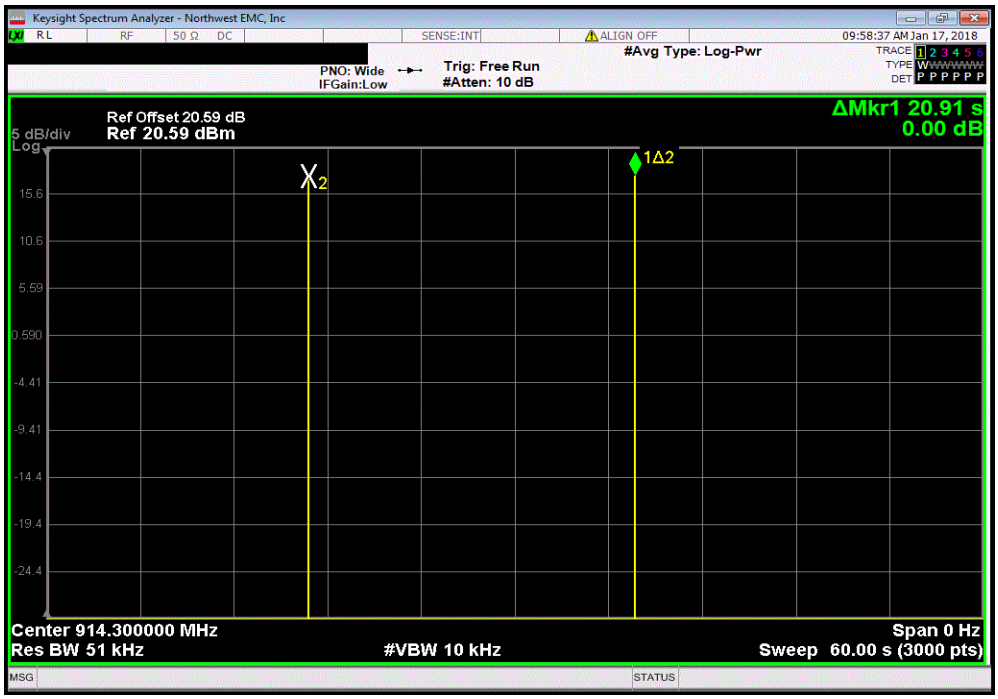
Hopping Mode, Spreading Factor 7, High Channel 7, 914.9 MHz, 60 second sweep (1)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	51.69	400	Pass



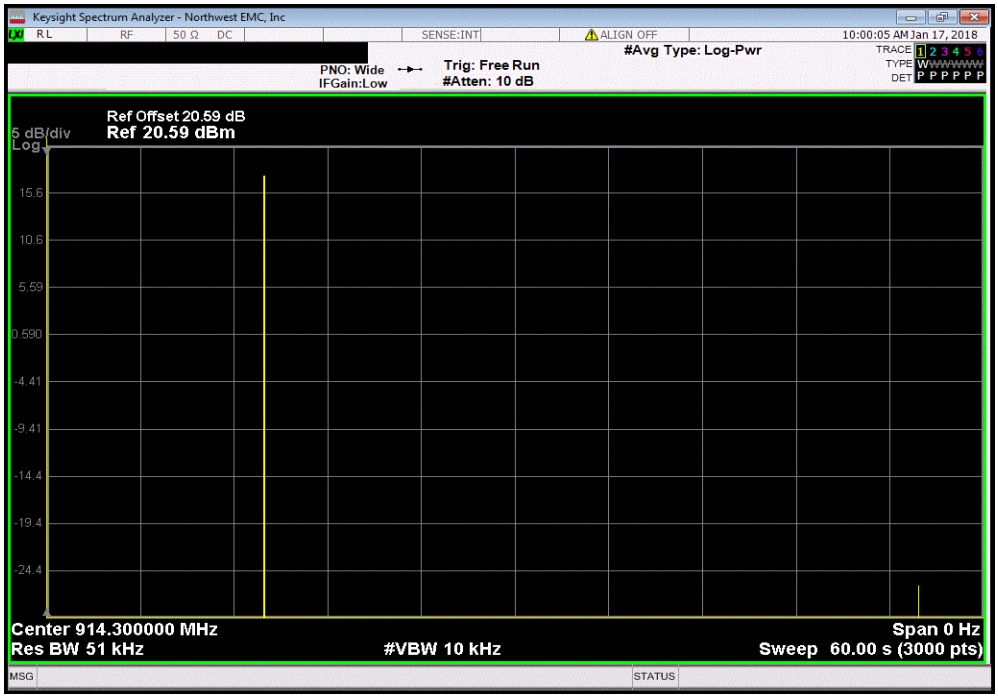
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 7, High Channel 7, 914.9 MHz, 60 second sweep (2)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	2	51.69	400	Pass



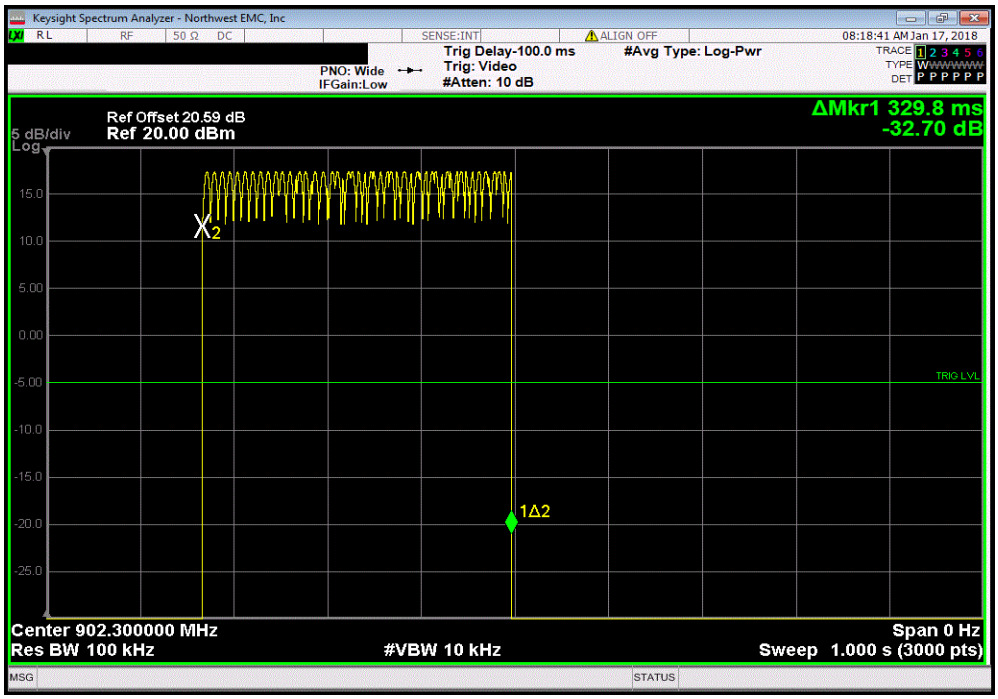
Hopping Mode, Spreading Factor 7, High Channel 7, 914.9 MHz, 60 second sweep (3)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	2	103.38	400	Pass



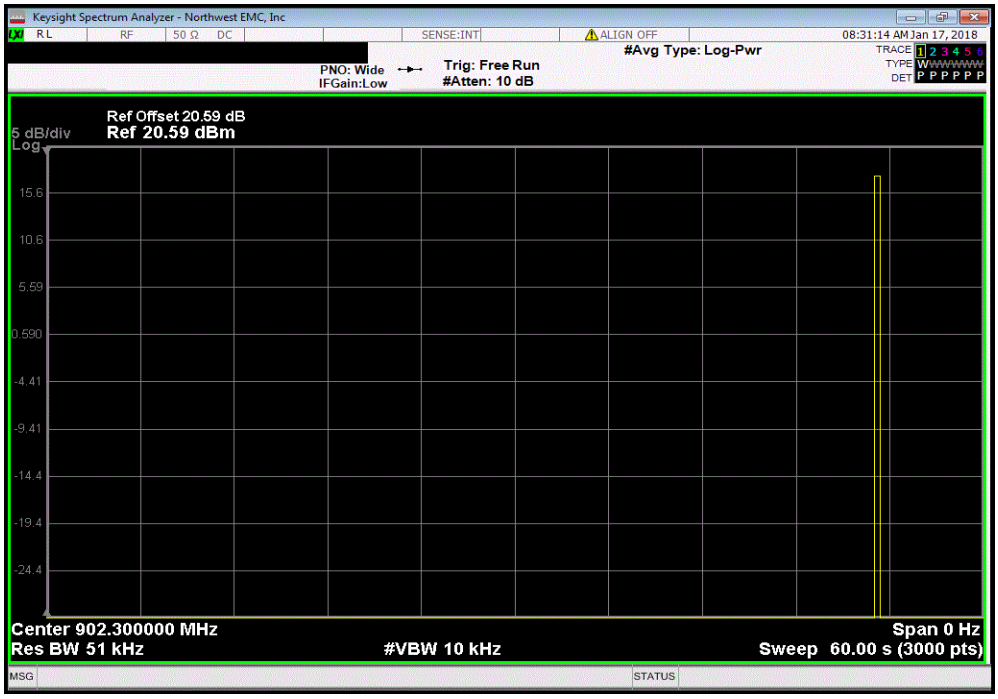
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 10, Low Channel 0, 902.3 MHz, Pulse Width						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		329.8	N/A	N/A	N/A	N/A



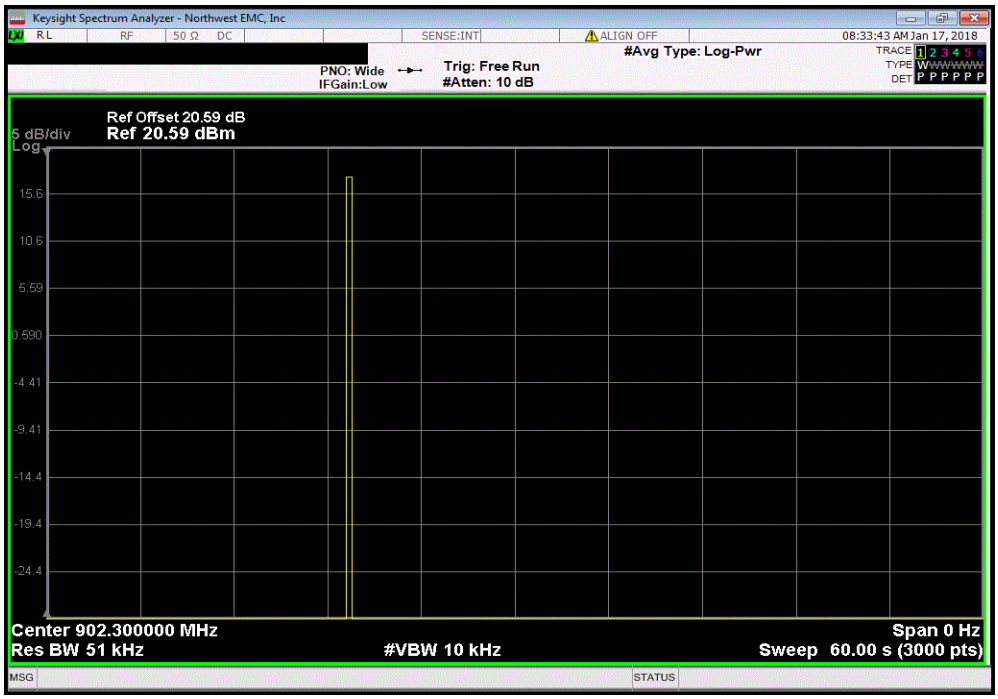
Hopping Mode, Spreading Factor 10, Low Channel 0, 902.3 MHz, 60 second sweep (1)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



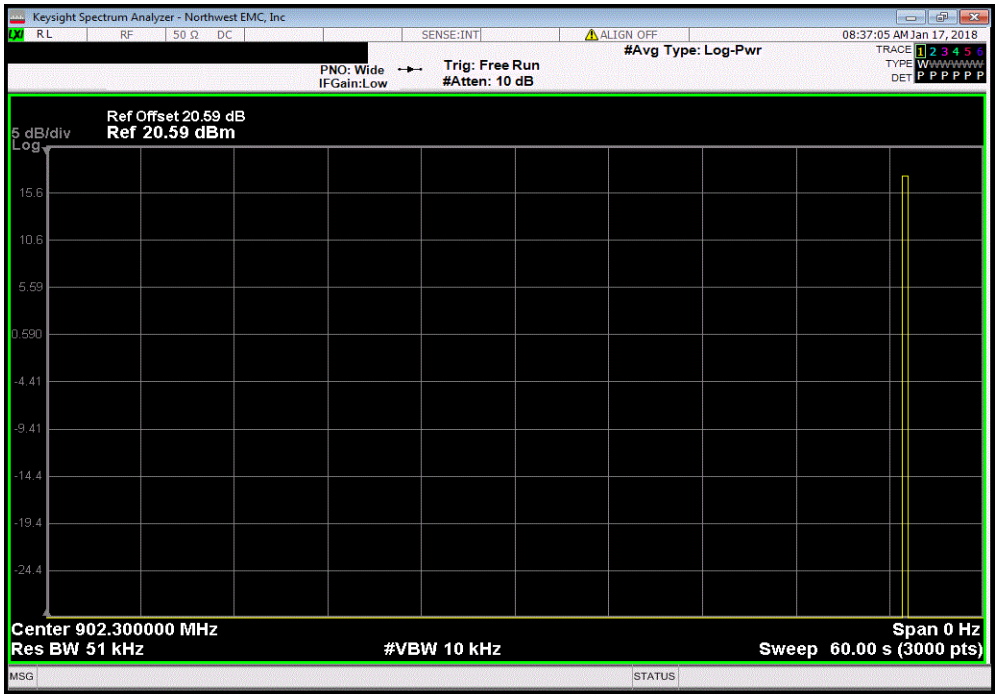
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 10, Low Channel 0, 902.3 MHz, 60 second sweep (2)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



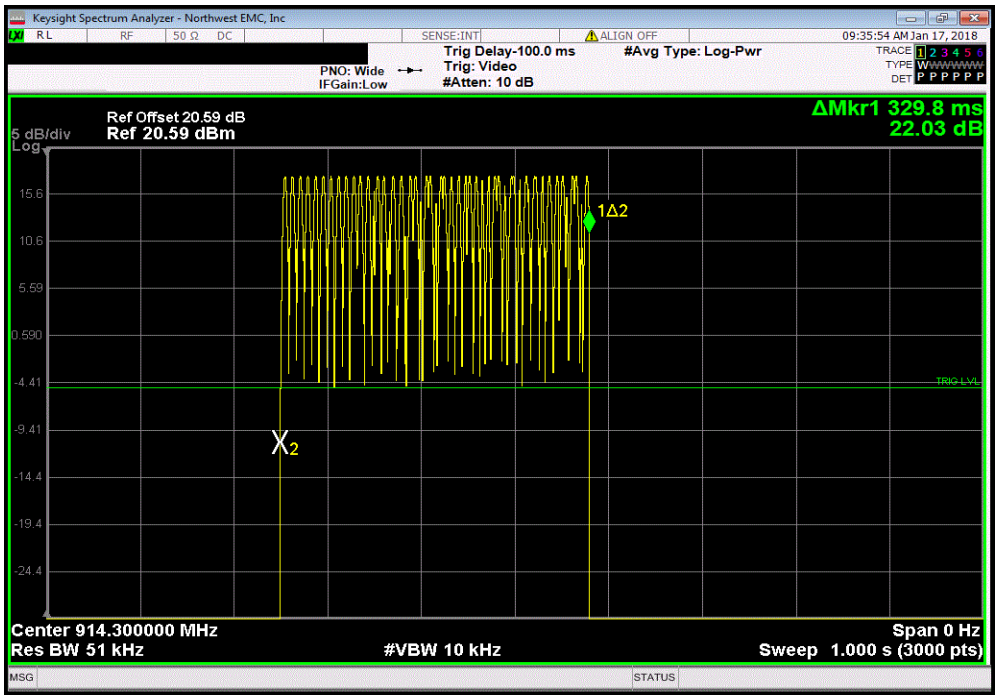
Hopping Mode, Spreading Factor 10, Low Channel 0, 902.3 MHz, 60 second sweep (3)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



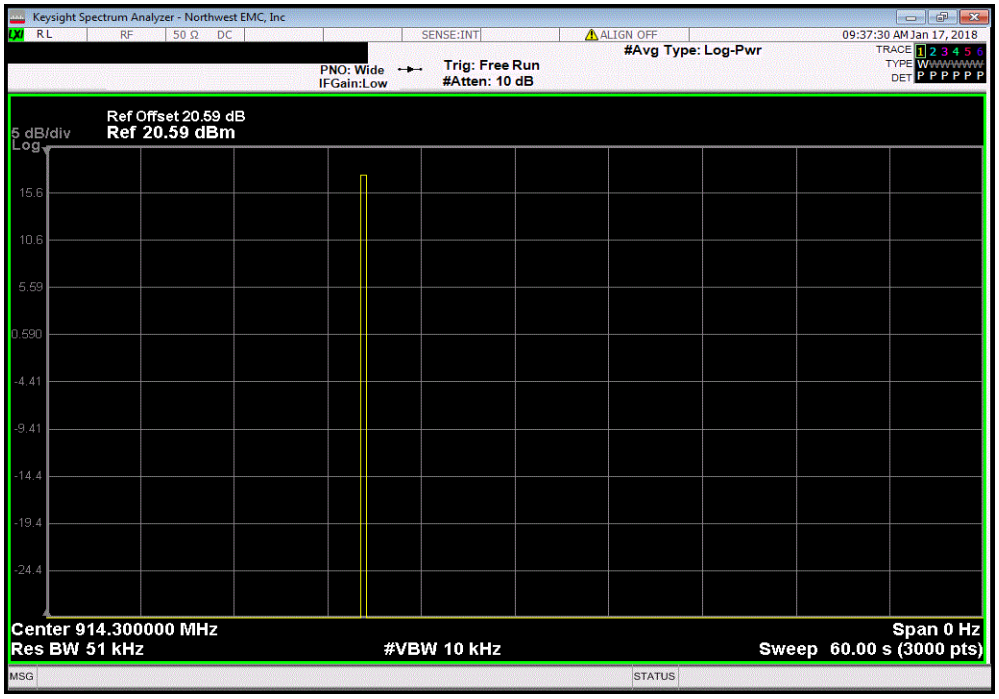
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 10, High Channel 7, 914.9 MHz, Pulse Width						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		329.8	N/A	N/A	N/A	N/A



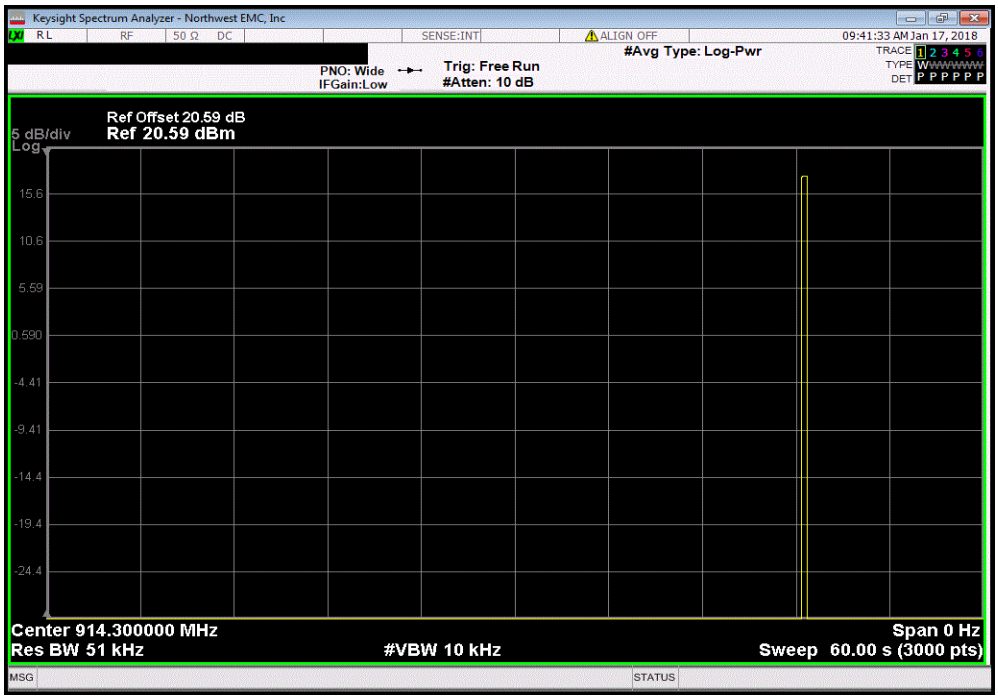
Hopping Mode, Spreading Factor 10, High Channel 7, 914.9 MHz, 60 second sweep (1)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



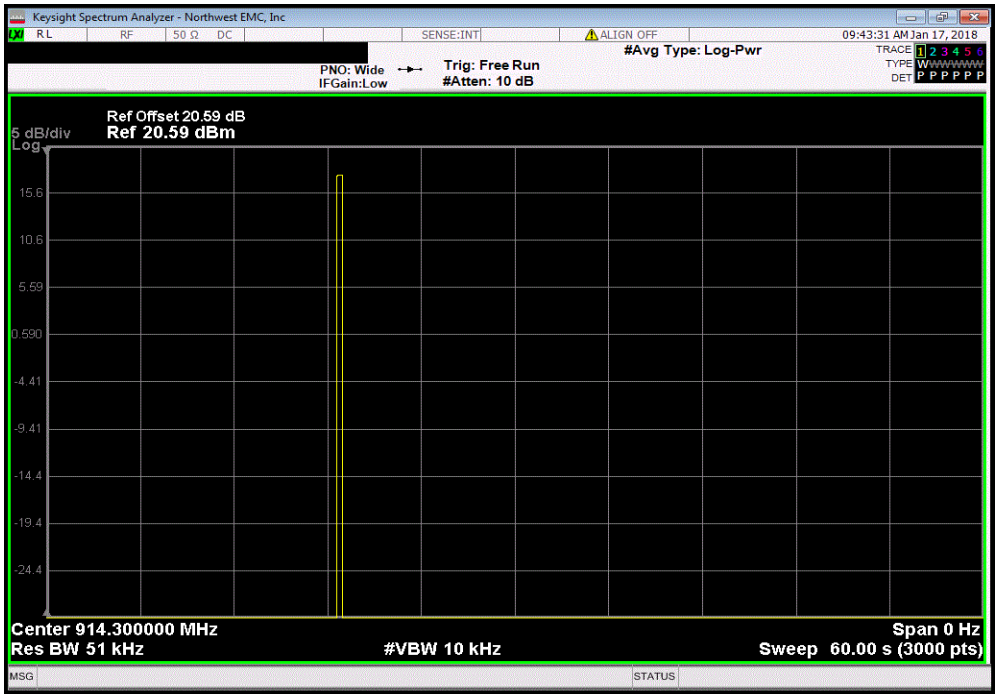
DWELL TIME

XMit 2017.12.13

Hopping Mode, Spreading Factor 10, High Channel 7, 914.9 MHz, 60 second sweep (2)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



Hopping Mode, Spreading Factor 10, High Channel 7, 914.9 MHz, 60 second sweep (3)						
		Pulse Width (mS)	Number of Pulses	On Time per 20 Sec (mS)	Limit (mS)	Result
		N/A	1	329.8	400	Pass



BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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 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

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276	Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B	Date:	16-Jan-18
Customer:	APANA Inc.	Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey	Humidity:	35% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power: USB	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

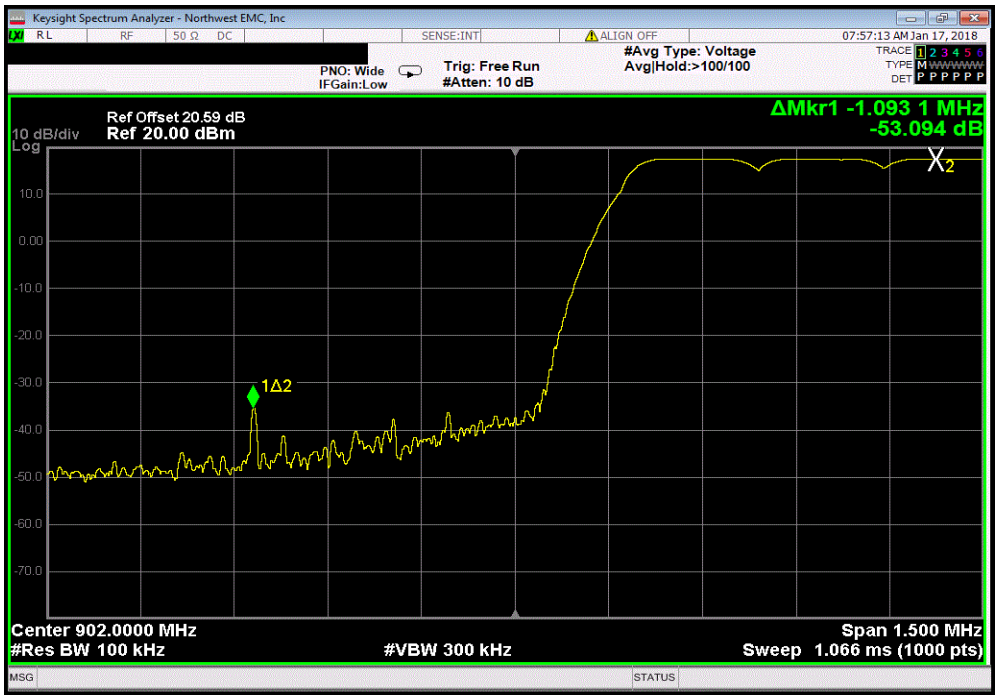
Configuration #	1	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
Hopping Mode			
Spreading Factor 7			
Lower Band Edge	-53.09	-30	Pass
Upper Band Edge	-78.51	-30	Pass
Spreading Factor 10			
Lower Band Edge	-48.96	-30	Pass
Upper Band Edge	-76.98	-30	Pass

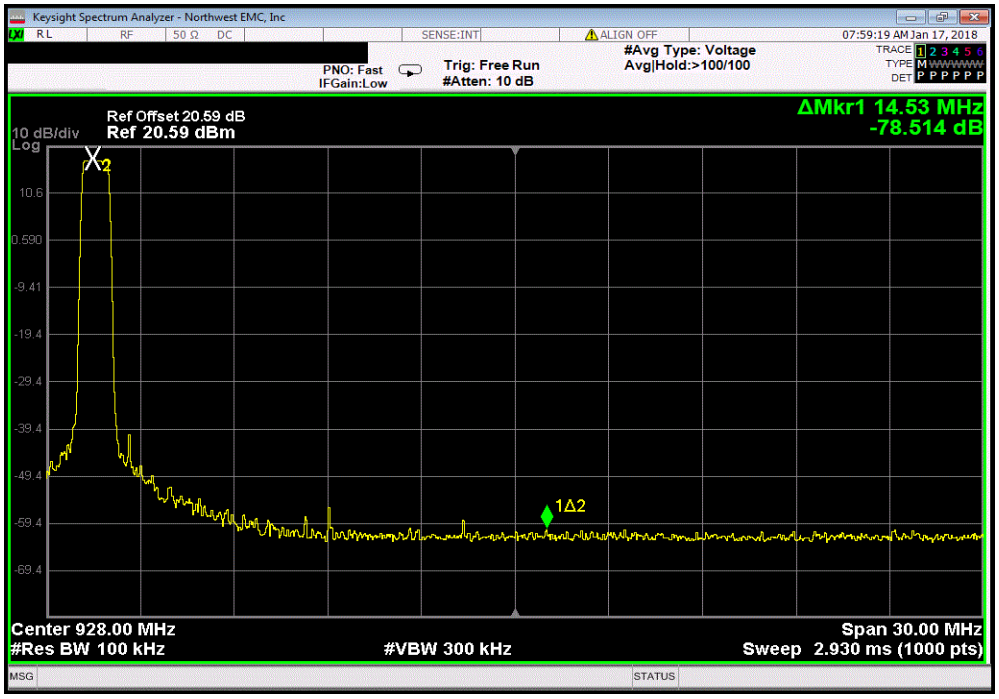
BAND EDGE COMPLIANCE - HOPPING MODE

NweTx 2016.09.14.2 XMit 2017.12.13

Hopping Mode, Spreading Factor 7, Lower Band Edge, 902 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-53.09	-30	Pass



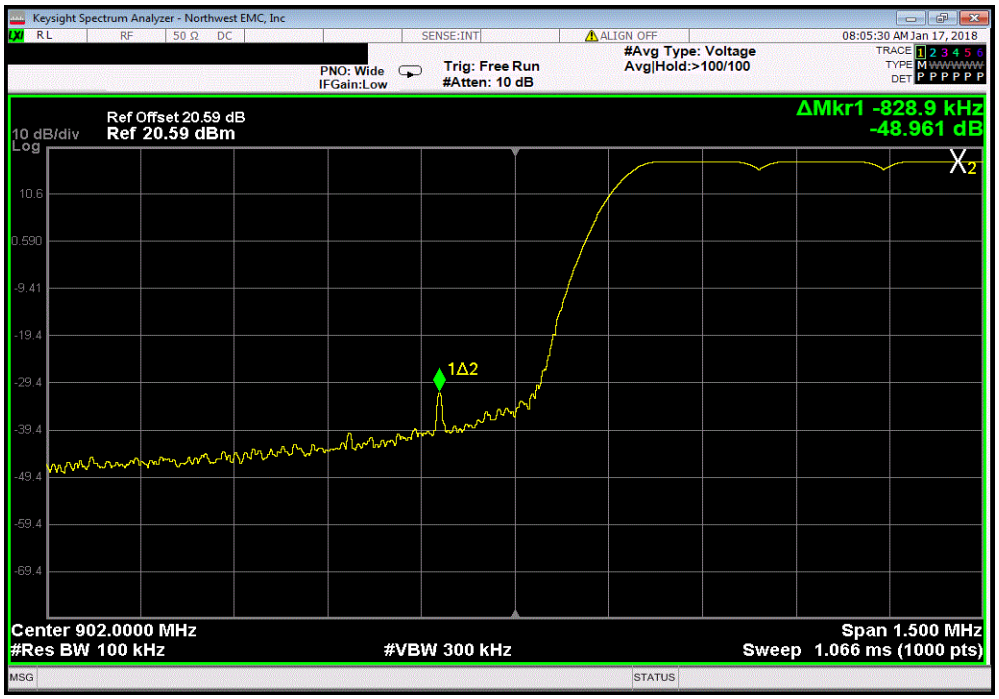
Hopping Mode, Spreading Factor 7, Upper Band Edge, 928 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-78.51	-30	Pass



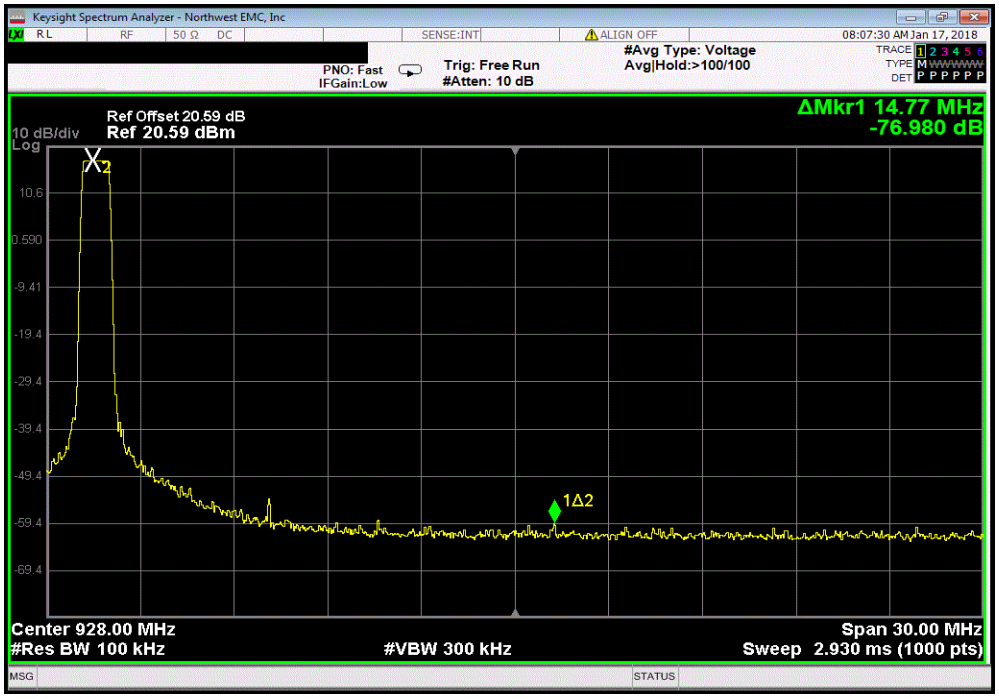
BAND EDGE COMPLIANCE - HOPPING MODE

NweTx 2016.09.14.2 XMit 2017.12.13

Hopping Mode, Spreading Factor 10, Lower Band Edge, 902 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-48.96	-30	Pass



Hopping Mode, Spreading Factor 10, Upper Band Edge, 928 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-76.98	-30	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.

OCCUPIED BANDWIDTH

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied bandwidth can be no greater than the channel separation which was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276	Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B	Date:	16-Jan-18
Customer:	APANA Inc.	Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey	Humidity:	35% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Job Site:	NC02
Power:	USB		

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

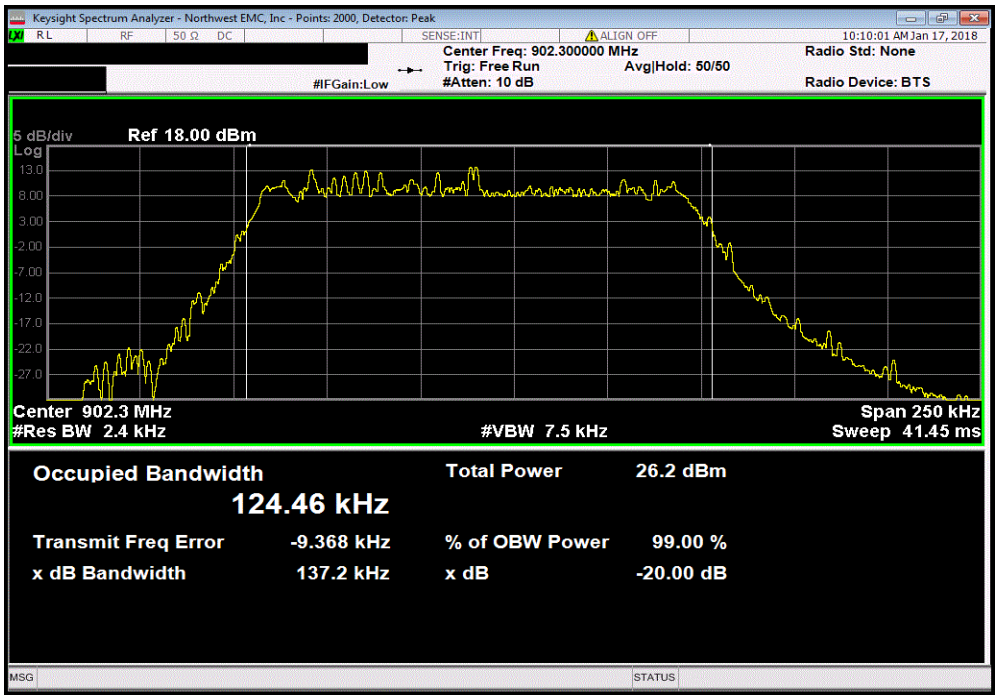
DEVIATIONS FROM TEST STANDARD

None

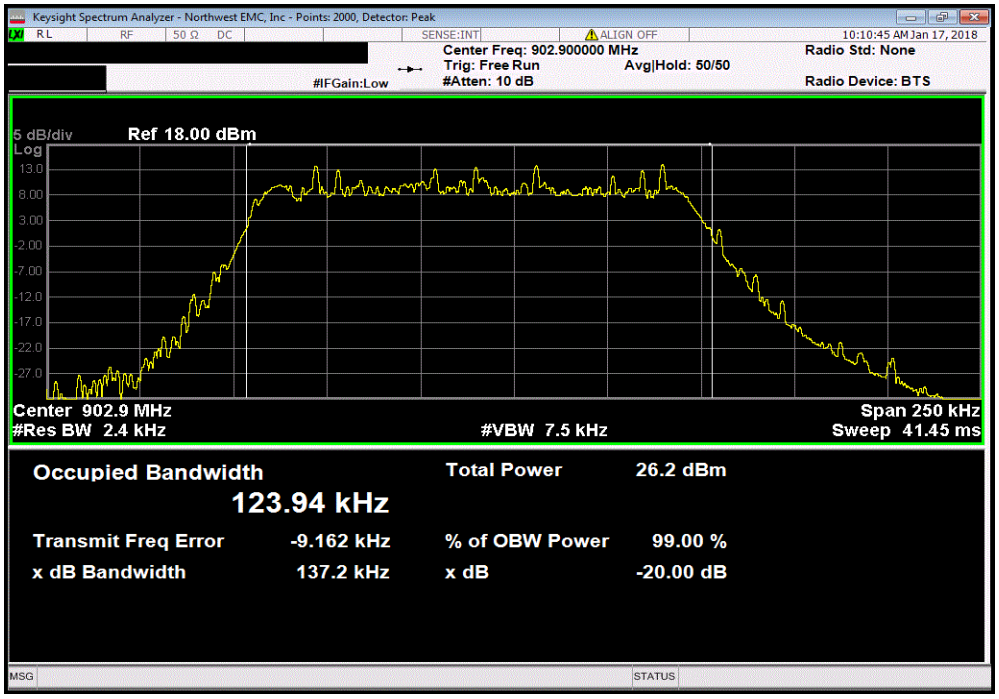
Configuration #	1	Signature

	Value	Limit < /= (ch separation)	Result
External Port			
125 kHz Bandwidth			
Spreading Factor 7			
Low Channel 0, 902.3 MHz	137.201 kHz	185.1 kHz	Pass
Mid Channel 3, 902.9 MHz	137.151 kHz	185.1 kHz	Pass
Mid Channel 4, 914.3 MHz	140.038 kHz	185.1 kHz	Pass
High Channel 7, 914.9 MHz	139.032 kHz	185.1 kHz	Pass
Spreading Factor 10			
Low Channel 0, 902.3 MHz	134.774 kHz	185.1 kHz	Pass
Mid Channel 3, 902.9 MHz	133.004 kHz	185.1 kHz	Pass
Mid Channel 4, 914.3 MHz	135.891 kHz	185.1 kHz	Pass
High Channel 7, 914.9 MHz	134.934 kHz	185.1 kHz	Pass

External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz						
				Value	Limit < /= (ch separation)	Result
				137.201 kHz	185.1 kHz	Pass



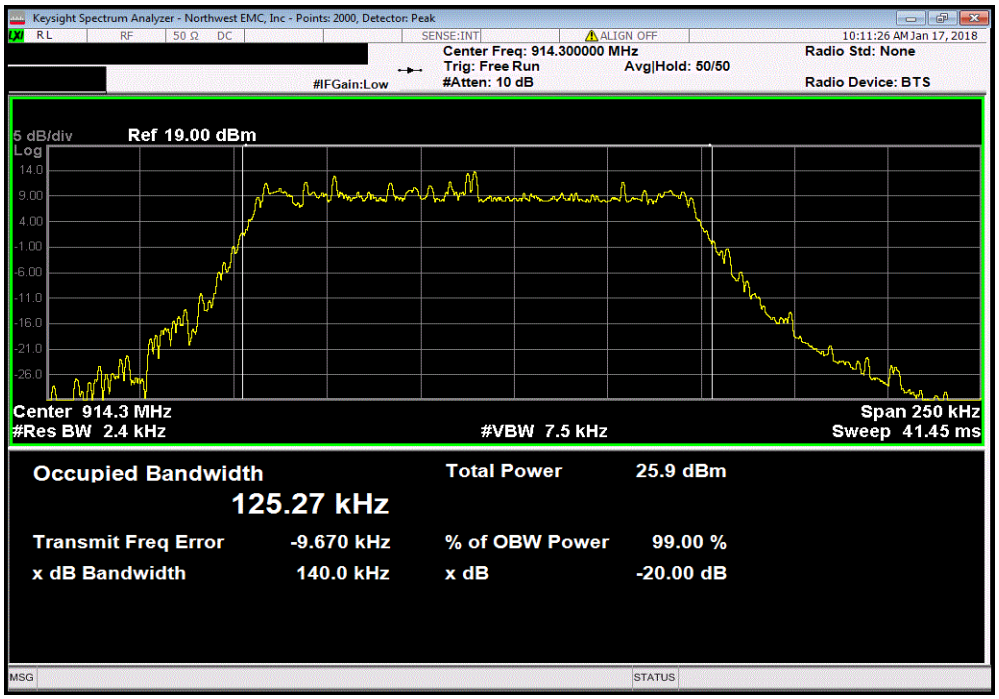
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz						
				Value	Limit < /= (ch separation)	Result
				137.151 kHz	185.1 kHz	Pass



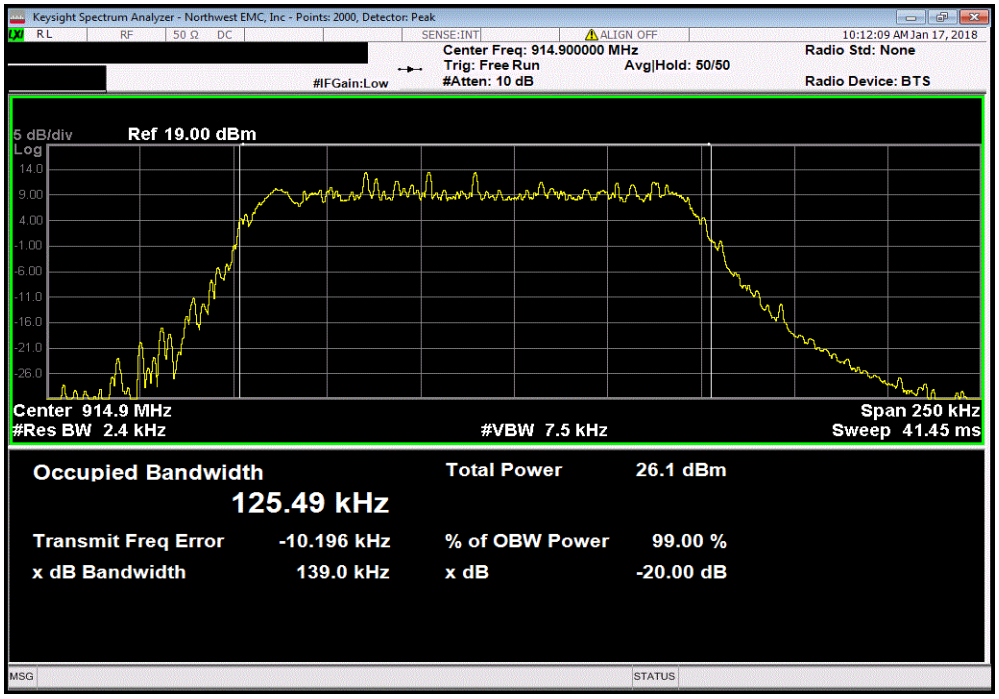
OCCUPIED BANDWIDTH

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz						
				Value	Limit < /= (ch separation)	Result
				140.038 kHz	185.1 kHz	Pass



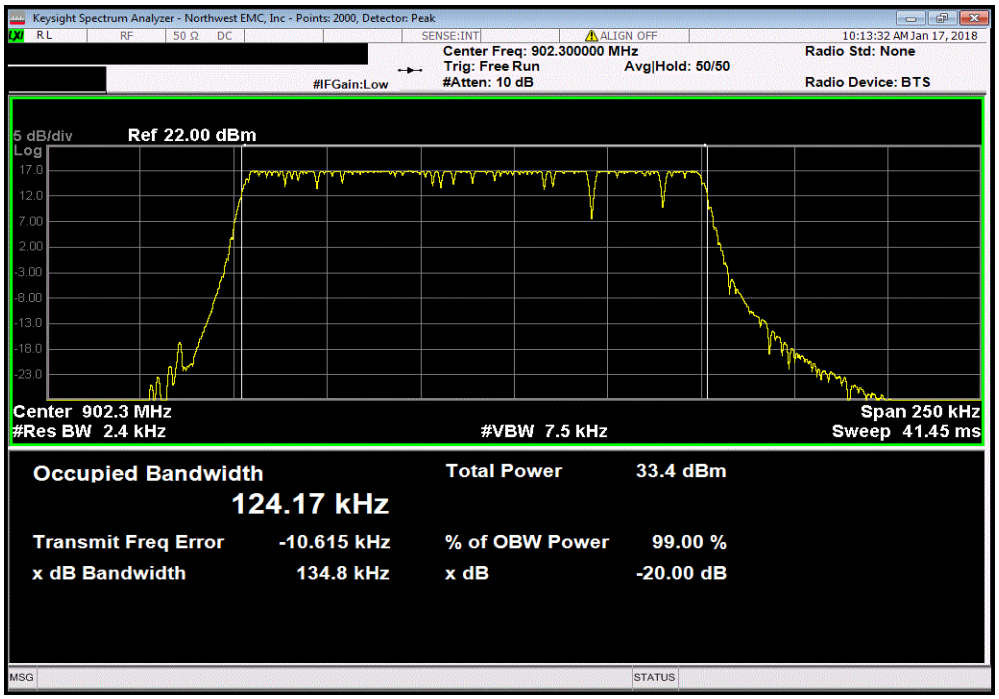
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz						
				Value	Limit < /= (ch separation)	Result
				139.032 kHz	185.1 kHz	Pass



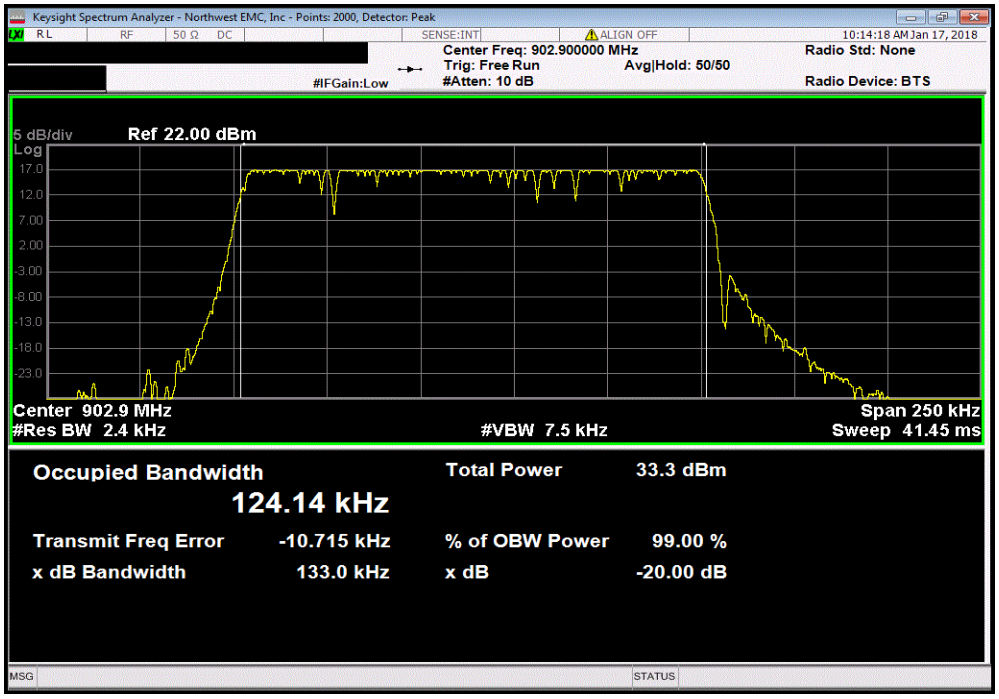
OCCUPIED BANDWIDTH

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz						
				Value	Limit < /= (ch separation)	Result
				134.774 kHz	185.1 kHz	Pass



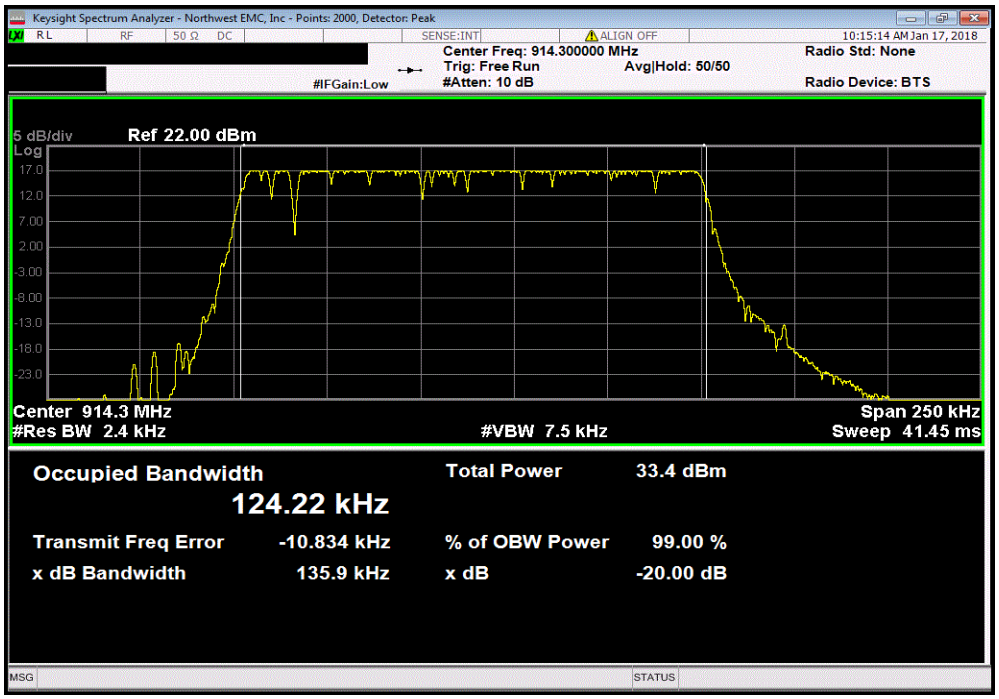
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz						
				Value	Limit < /= (ch separation)	Result
				133.004 kHz	185.1 kHz	Pass



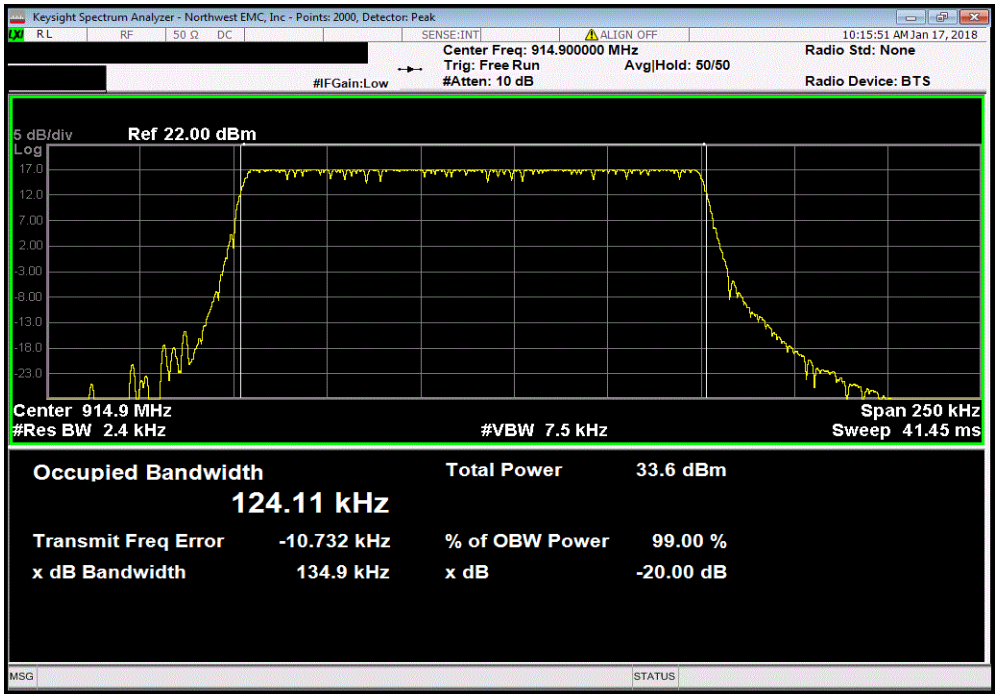
OCCUPIED BANDWIDTH

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz						
				Value	Limit < /= (ch separation)	Result
				135.891 kHz	185.1 kHz	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz						
				Value	Limit < /= (ch separation)	Result
				134.934 kHz	185.1 kHz	Pass



OUTPUT POWER

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output 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.

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276			Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B			Date:	16-Jan-18
Customer:	APANA Inc.			Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey			Humidity:	35% RH
Project:	None			Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power:	USB	Job Site:	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

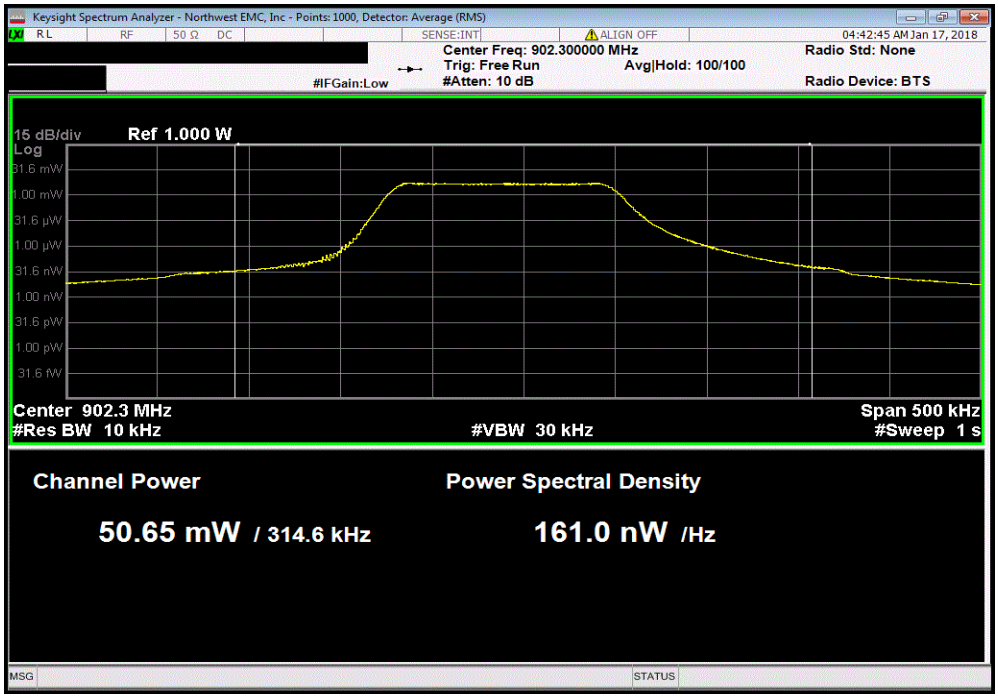
Configuration #	1	Signature

	Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
External Port					
125 kHz Bandwidth					
Spreading Factor 7					
Low Channel 0, 902.3 MHz	50.647	0	0.051	≤ 1	Pass
Mid Channel 3, 902.9 MHz	50.387	0	0.050	≤ 1	Pass
Mid Channel 4, 914.3 MHz	51.495	0	0.051	≤ 1	Pass
High Channel 7, 914.9 MHz	51.374	0	0.051	≤ 1	Pass
Spreading Factor 10					
Low Channel 0, 902.3 MHz	53.530	0	0.054	≤ 1	Pass
Mid Channel 3, 902.9 MHz	53.449	0	0.053	≤ 1	Pass
Mid Channel 4, 914.3 MHz	54.577	0	0.055	≤ 1	Pass
High Channel 7, 914.9 MHz	54.319	0	0.054	≤ 1	Pass

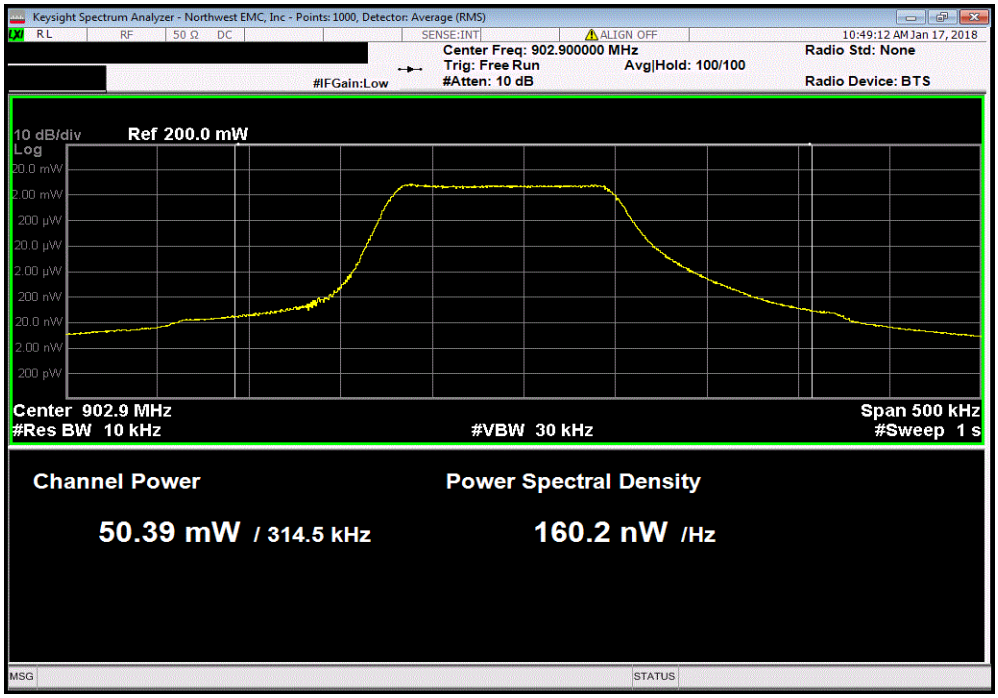
OUTPUT POWER

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		50.647	0	0.051	≤ 1	Pass



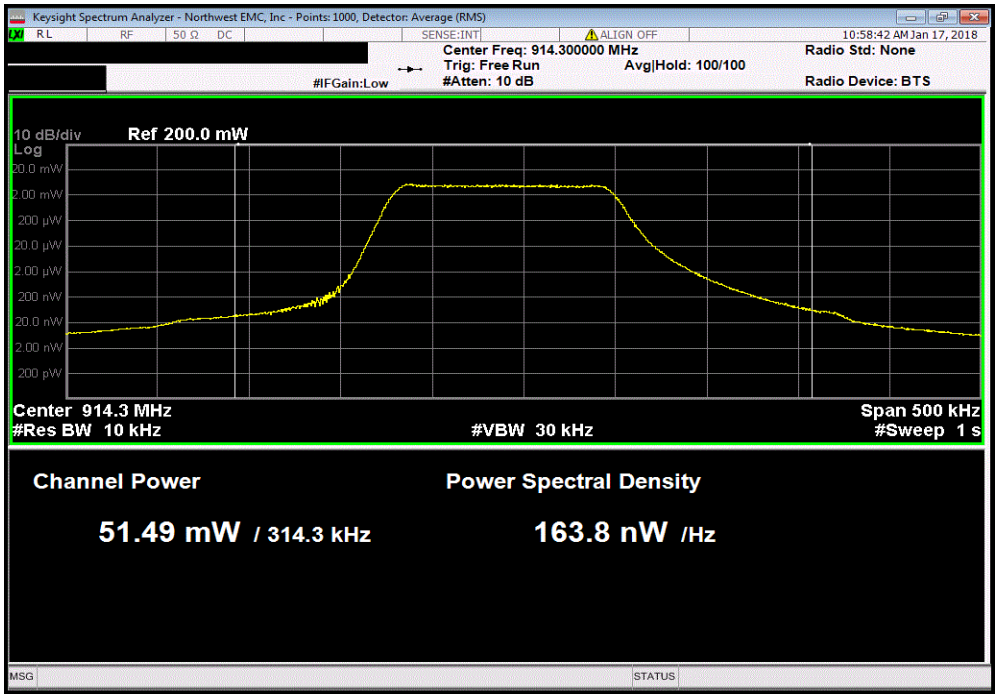
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		50.387	0	0.050	≤ 1	Pass



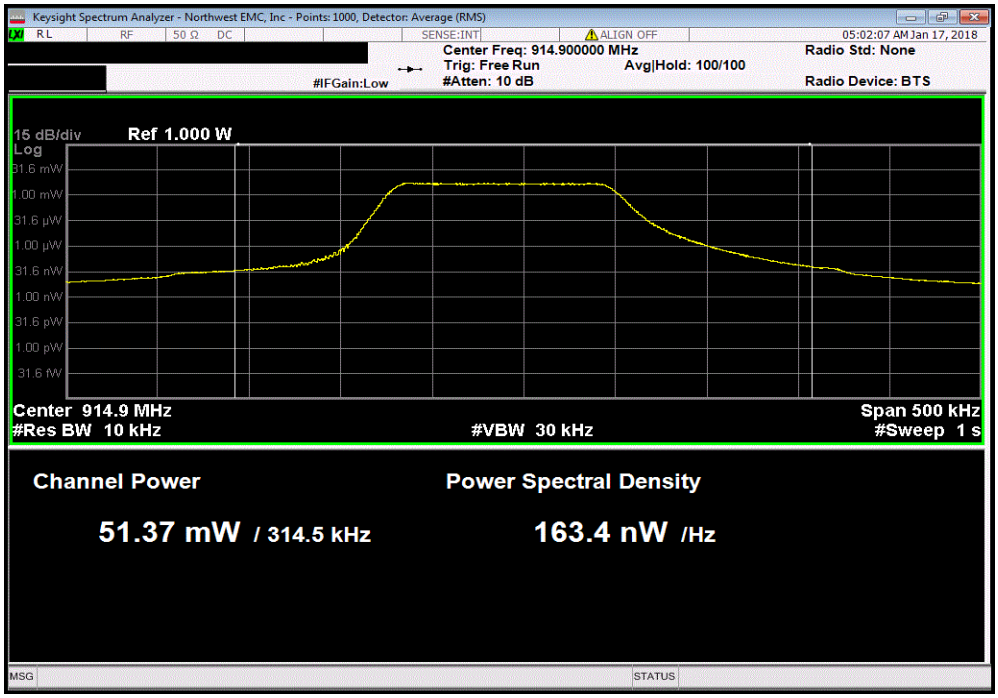
OUTPUT POWER

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		51.495	0	0.051	≤ 1	Pass



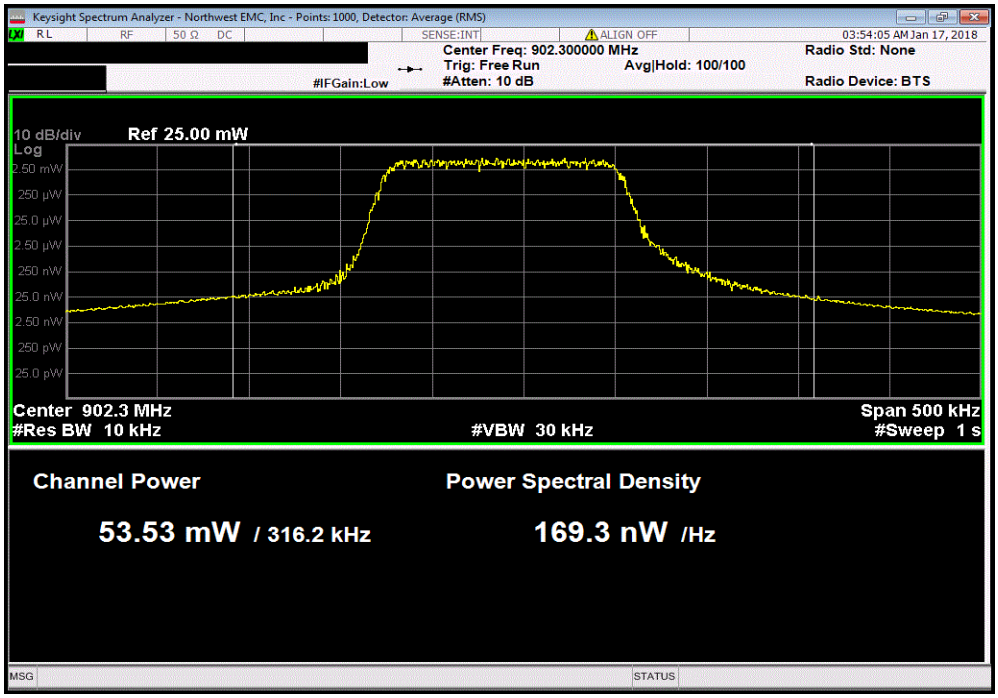
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		51.374	0	0.051	≤ 1	Pass



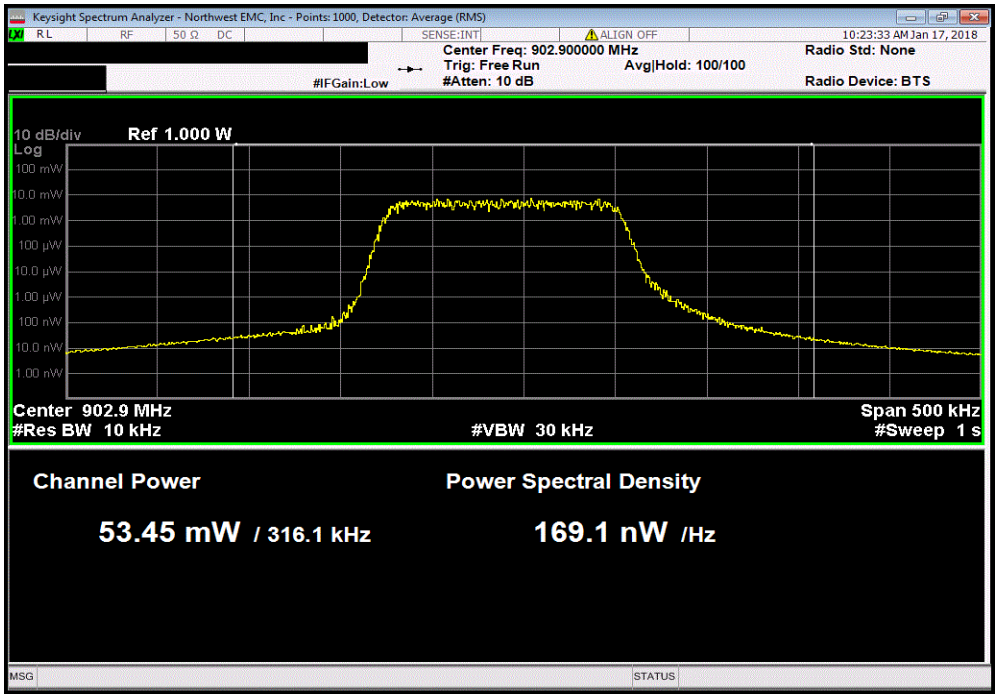
OUTPUT POWER

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		53.530	0	0.054	≤ 1	Pass



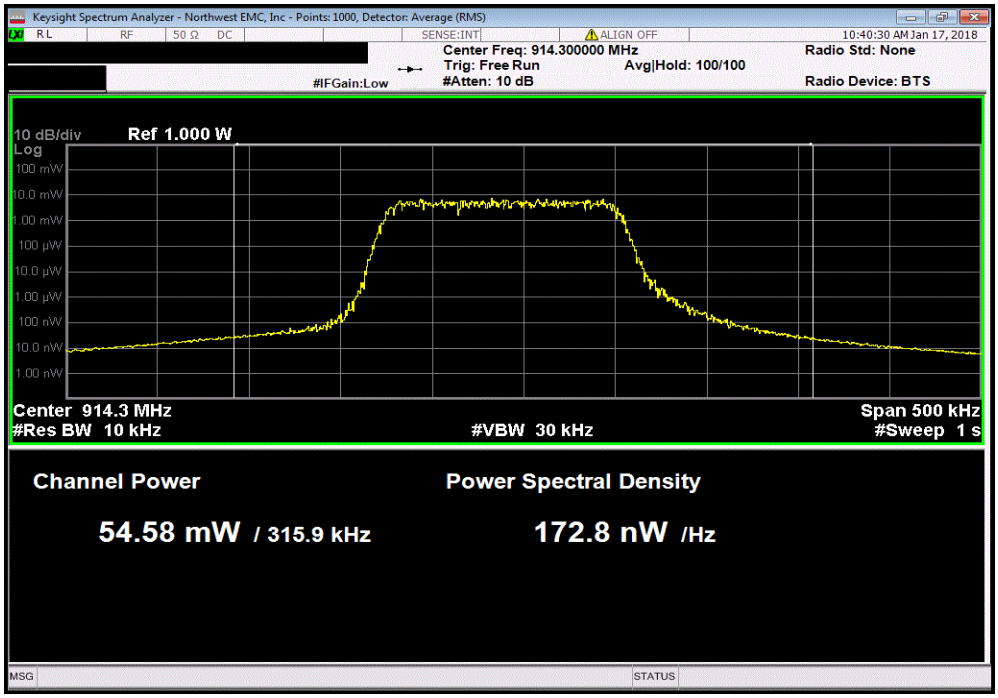
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		53.449	0	0.053	≤ 1	Pass



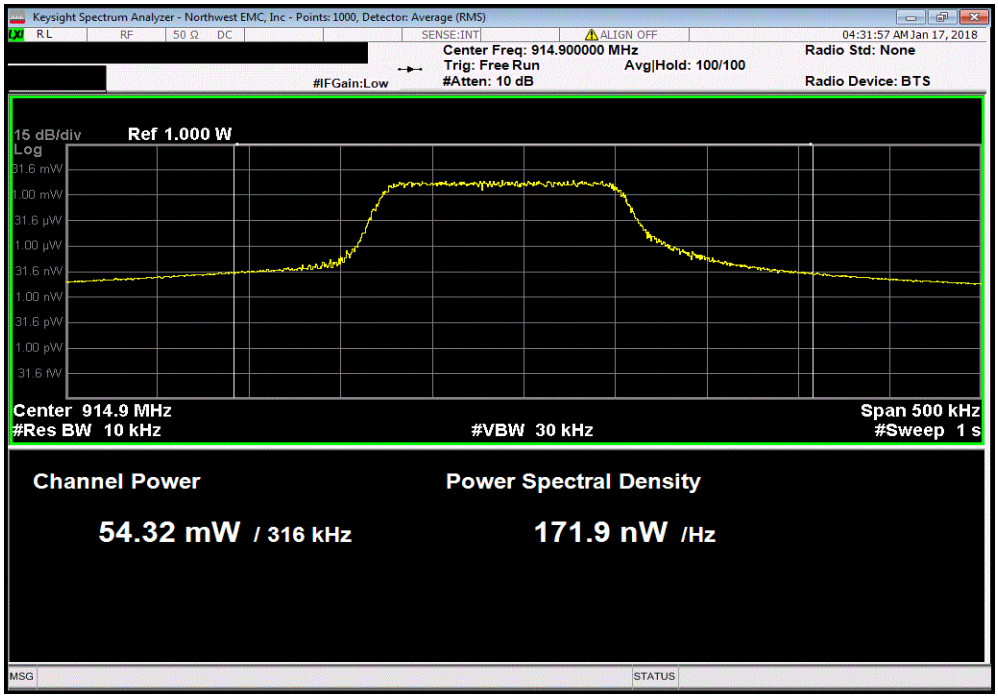
OUTPUT POWER

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		54.577	0	0.055	≤ 1	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz						
		Avg Cond Pwr (mW)	Duty Cycle Factor (dB)	Value (W)	Limit (W)	Results
		54.319	0	0.054	≤ 1	Pass



POWER SPECTRAL DENSITY

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The power spectral density was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method AVGPSD-1 in section 11.10.3 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the full power of the burst. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276			Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B			Date:	16-Jan-18
Customer:	APANA Inc.			Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey			Humidity:	35% RH
Project:	None			Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power:	USB	Job Site:	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

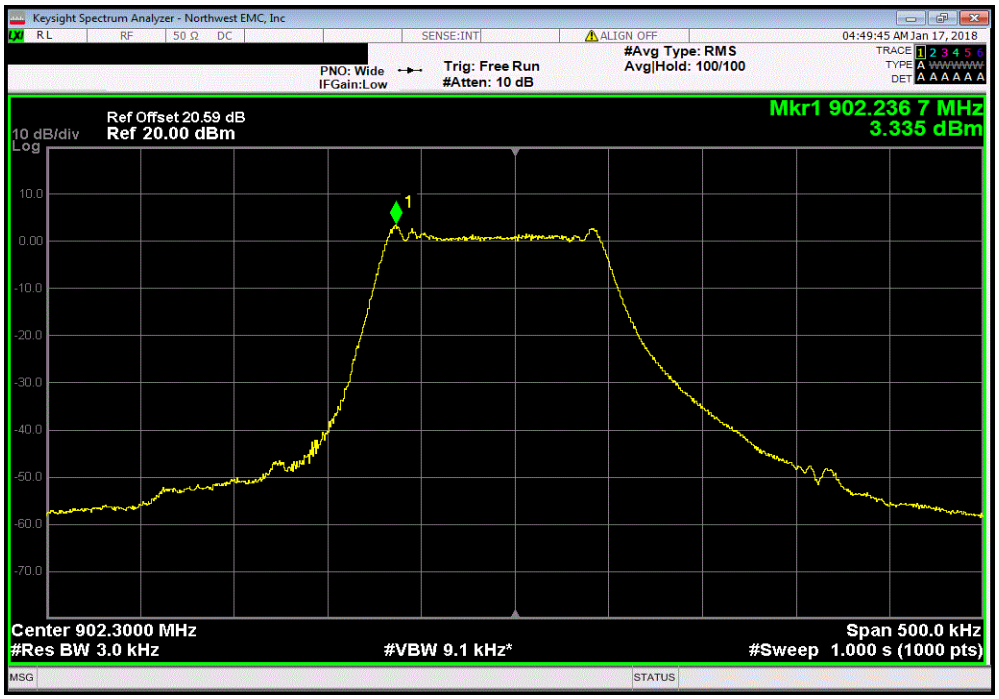
Configuration #	1	Signature

	Value dBm/3kHz	Limit < dBm/3kHz	Results
External Port			
125 kHz Bandwidth			
Spreading Factor 7			
Low Channel 0, 902.3 MHz	3.335	8	Pass
Mid Channel 3, 902.9 MHz	3.151	8	Pass
Mid Channel 4, 914.3 MHz	3.106	8	Pass
High Channel 7, 914.9 MHz	3.309	8	Pass
Spreading Factor 10			
Low Channel 0, 902.3 MHz	4.024	8	Pass
Mid Channel 3, 902.9 MHz	3.176	8	Pass
Mid Channel 4, 914.3 MHz	3.561	8	Pass
High Channel 7, 914.9 MHz	3.35	8	Pass

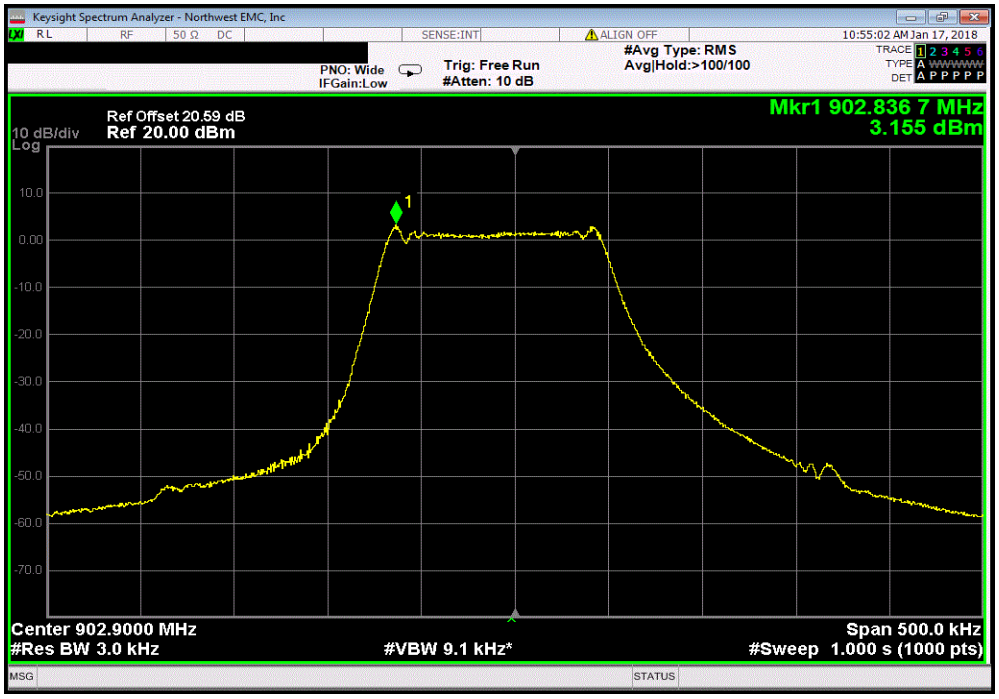
POWER SPECTRAL DENSITY

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.335	8	Pass



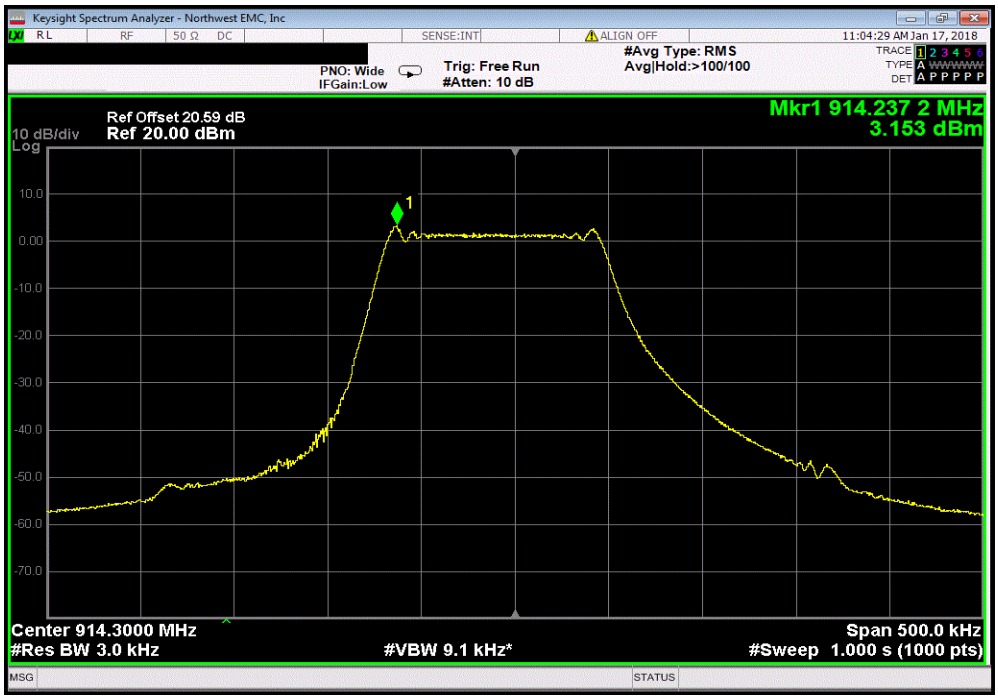
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.151	8	Pass



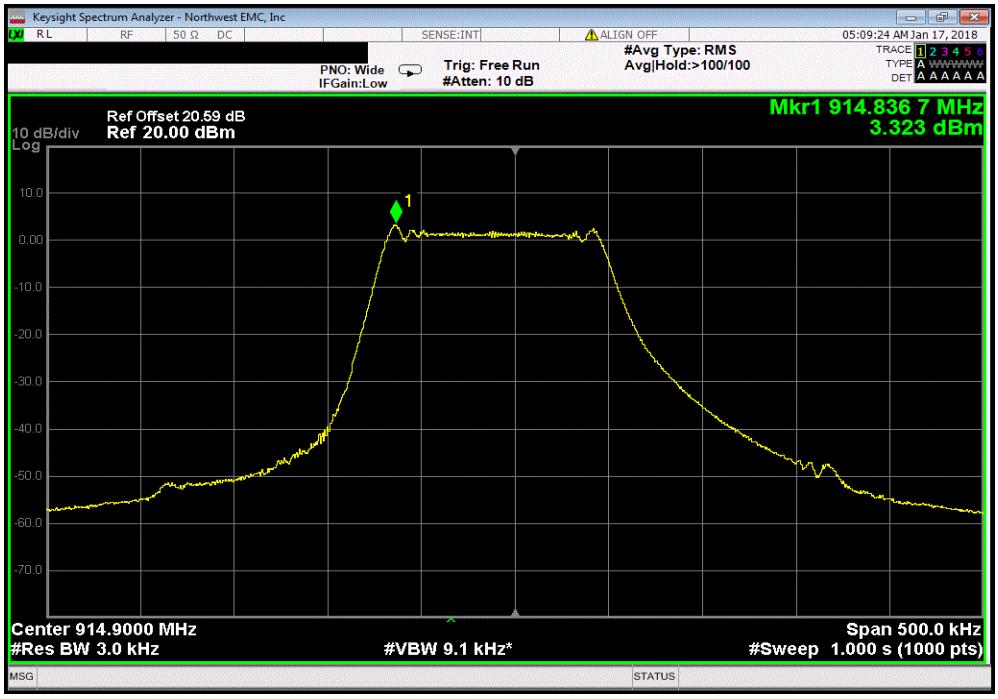
POWER SPECTRAL DENSITY

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.106	8	Pass



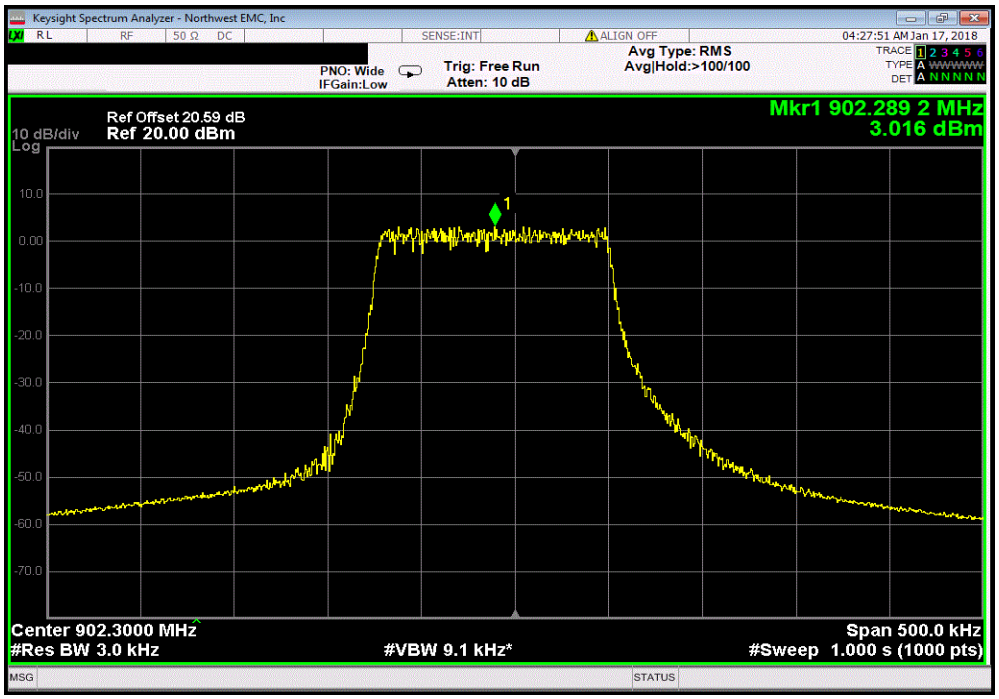
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.309	8	Pass



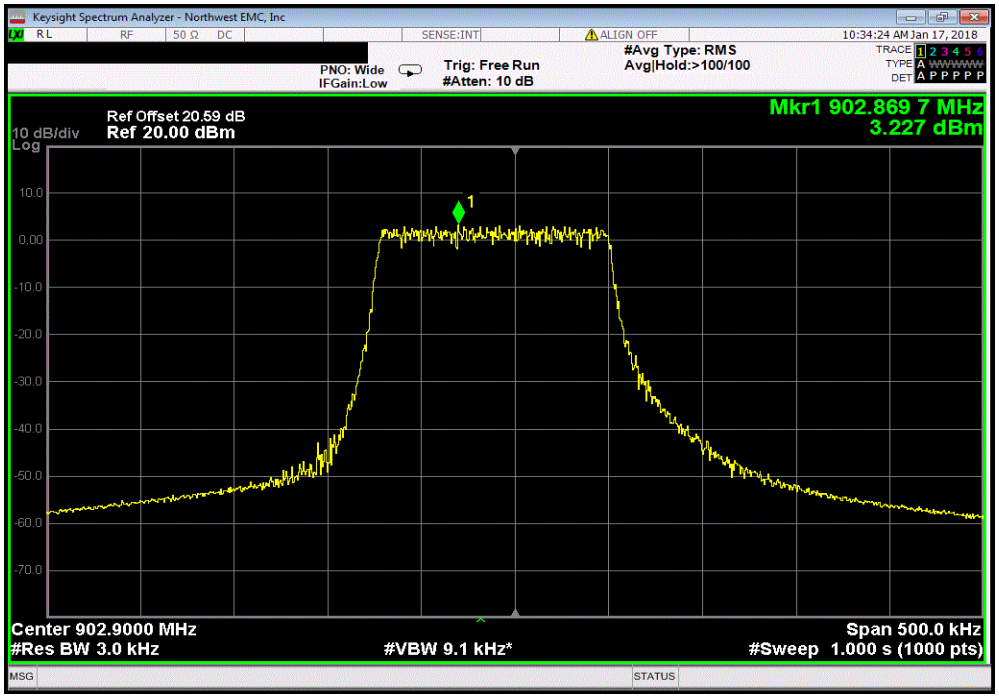
POWER SPECTRAL DENSITY

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				4.024	8	Pass



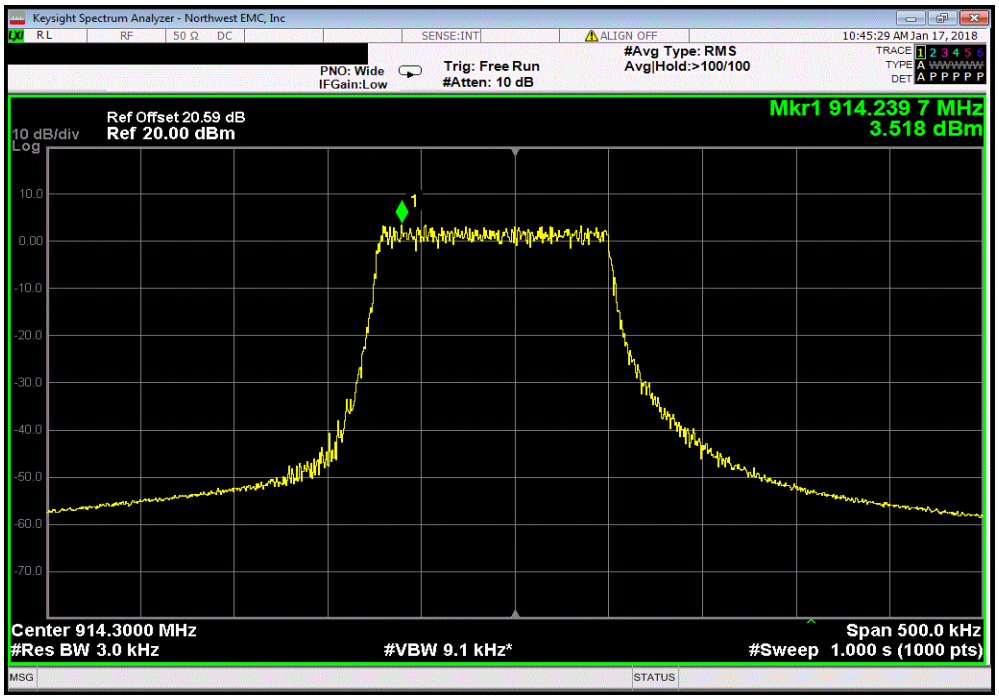
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.176	8	Pass



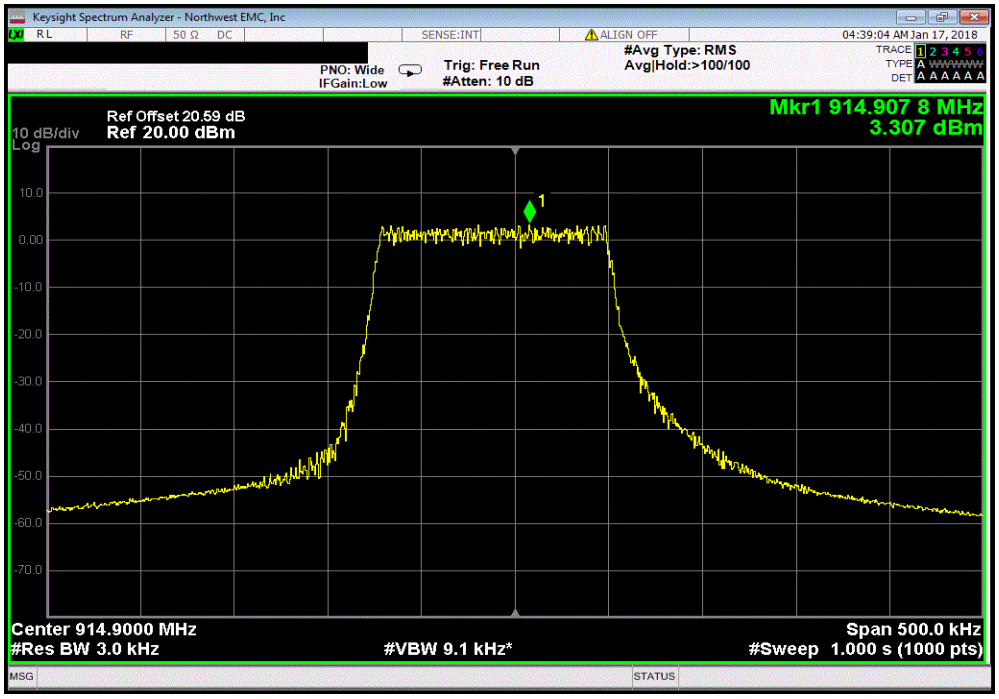
POWER SPECTRAL DENSITY

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.561	8	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				3.35	8	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. 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

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276			Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B			Date:	16-Jan-18
Customer:	APANA Inc.			Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey			Humidity:	35% RH
Project:	None			Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power:	USB	Job Site:	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

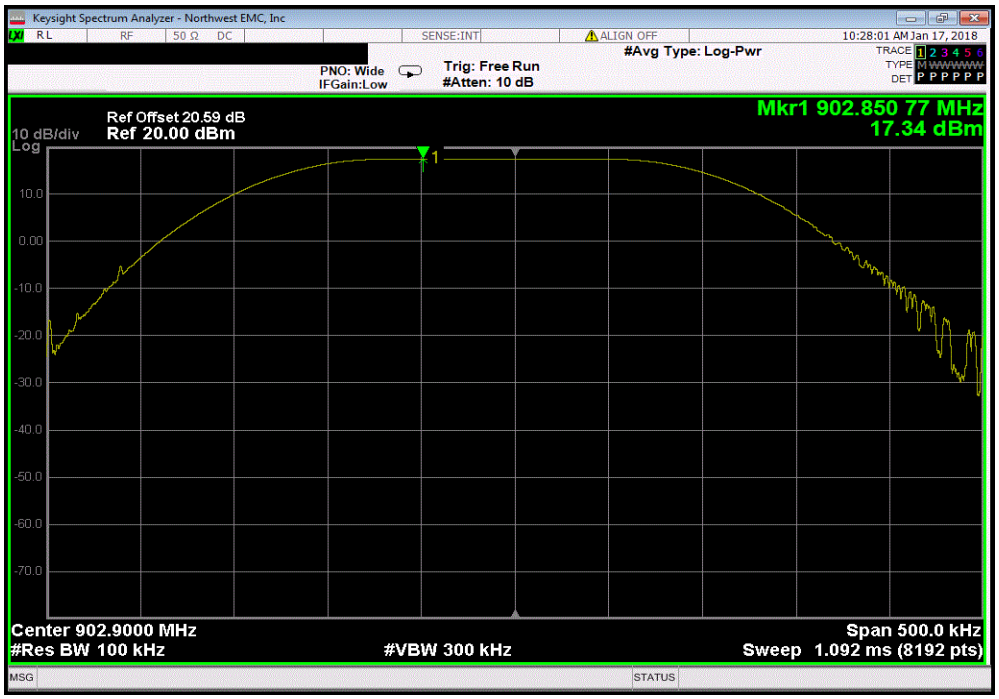
DEVIATIONS FROM TEST STANDARD

None

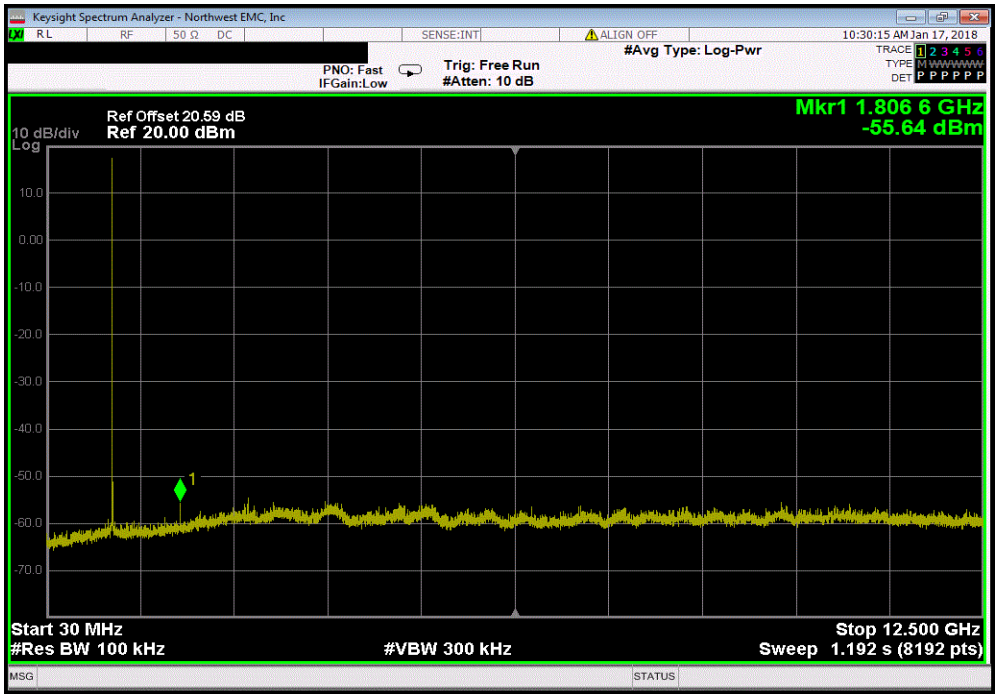
Configuration #	1	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
External Port				
125 kHz Bandwidth				
Spreading Factor 7				
Low Channel 0, 902.3 MHz	Fundamental	N/A	N/A	N/A
Low Channel 0, 902.3 MHz	30 MHz - 12.5 GHz	-72.98	-30	Pass
Low Channel 0, 902.3 MHz	12.5 GHz - 25 GHz	-69.71	-30	Pass
Mid Channel 3, 902.9 MHz	Fundamental	N/A	N/A	N/A
Mid Channel 3, 902.9 MHz	30 MHz - 12.5 GHz	-73.79	-30	Pass
Mid Channel 3, 902.9 MHz	12.5 GHz - 25 GHz	-69.22	-30	Pass
Mid Channel 4, 914.3 MHz	Fundamental	N/A	N/A	N/A
Mid Channel 4, 914.3 MHz	30 MHz - 12.5 GHz	-61.4	-30	Pass
Mid Channel 4, 914.3 MHz	12.5 GHz - 25 GHz	-70.19	-30	Pass
High Channel 7, 914.9 MHz	Fundamental	N/A	N/A	N/A
High Channel 7, 914.9 MHz	30 MHz - 12.5 GHz	-73.79	-30	Pass
High Channel 7, 914.9 MHz	12.5 GHz - 25 GHz	-69.22	-30	Pass
Spreading Factor 10				
Low Channel 0, 902.3 MHz	Fundamental	N/A	N/A	N/A
Low Channel 0, 902.3 MHz	30 MHz - 12.5 GHz	-61.77	-30	Pass
Low Channel 0, 902.3 MHz	12.5 GHz - 25 GHz	-69.82	-30	Pass
Mid Channel 3, 902.9 MHz	Fundamental	N/A	N/A	N/A
Mid Channel 3, 902.9 MHz	30 MHz - 12.5 GHz	-72.98	-30	Pass
Mid Channel 3, 902.9 MHz	12.5 GHz - 25 GHz	-69.71	-30	Pass
Mid Channel 4, 914.3 MHz	Fundamental	N/A	N/A	N/A
Mid Channel 4, 914.3 MHz	30 MHz - 12.5 GHz	-59.26	-30	Pass
Mid Channel 4, 914.3 MHz	12.5 GHz - 25 GHz	-70.55	-30	Pass
High Channel 7, 914.9 MHz	Fundamental	N/A	N/A	N/A
High Channel 7, 914.9 MHz	30 MHz - 12.5 GHz	-72.25	-30	Pass
High Channel 7, 914.9 MHz	12.5 GHz - 25 GHz	-69.49	-30	Pass

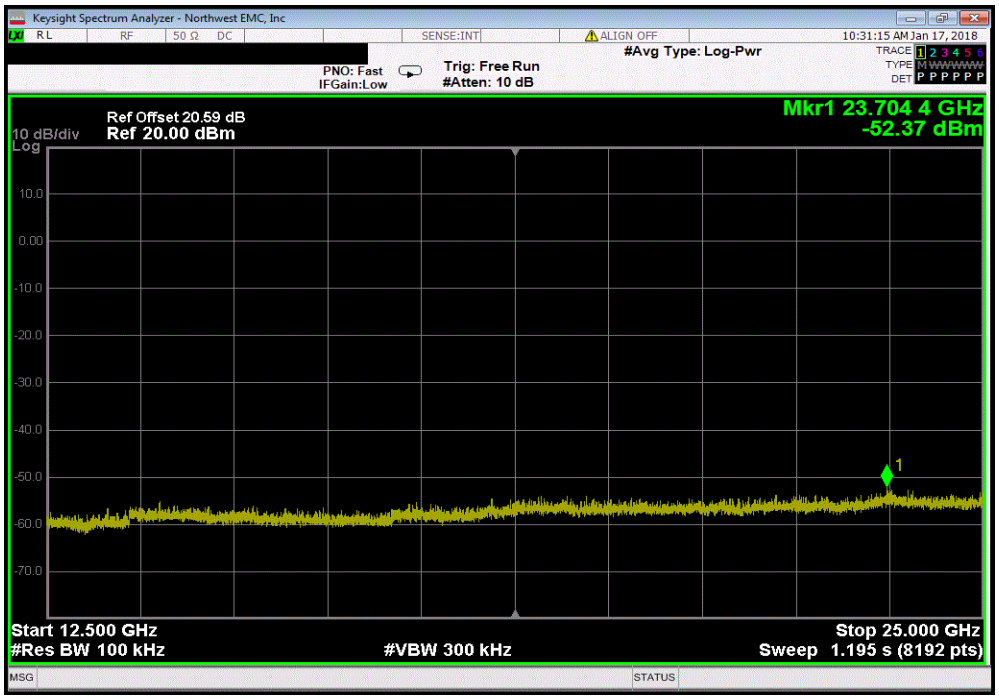
External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



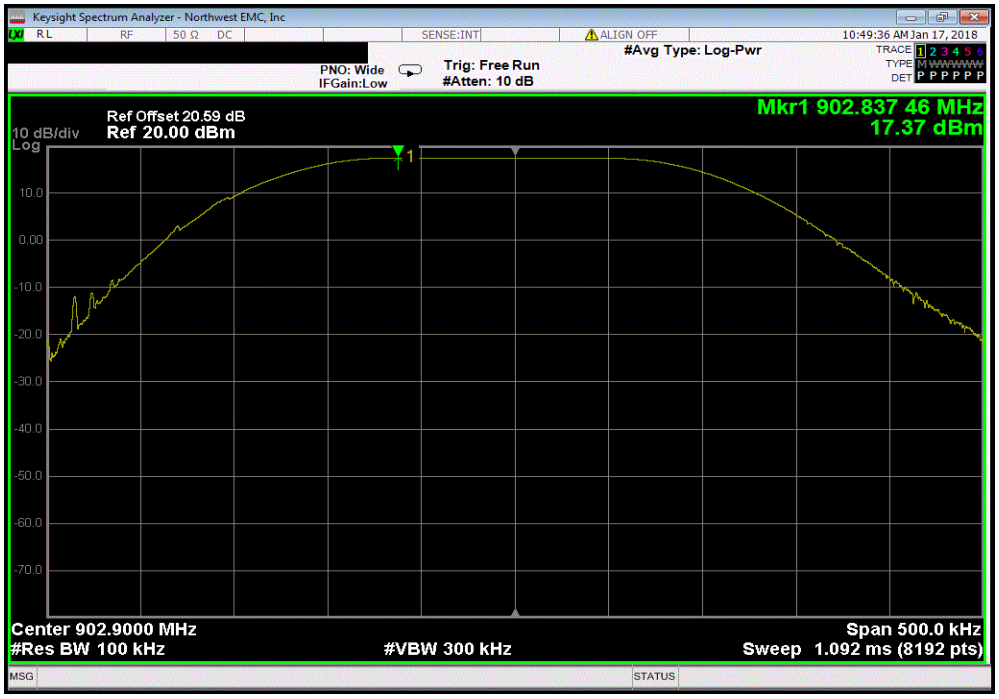
External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-72.98	-30	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-69.71	-30	Pass



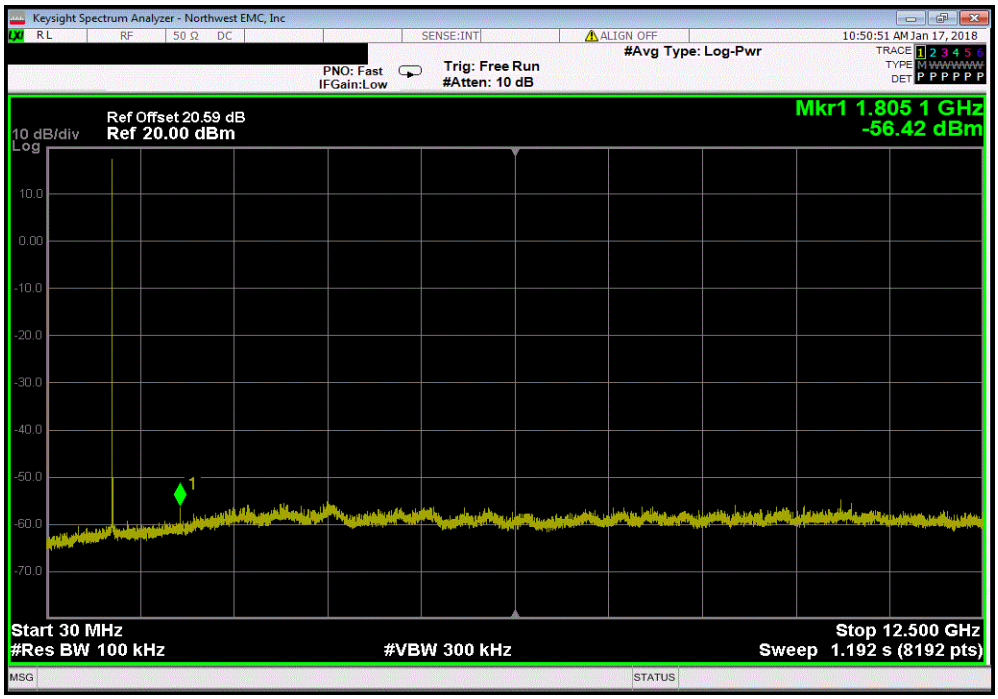
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



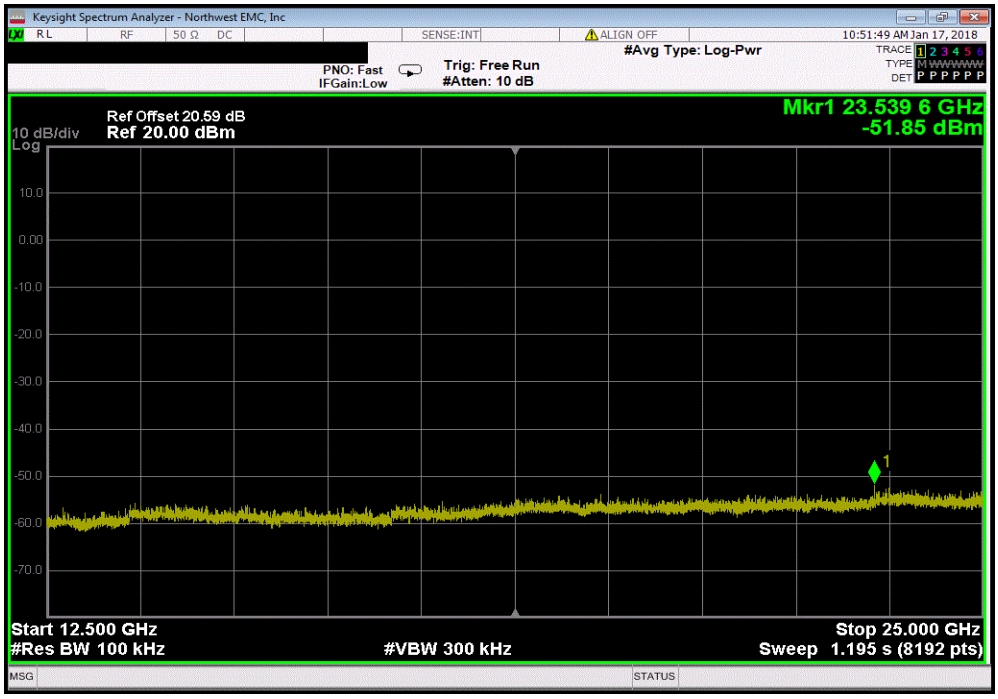
SPURIOUS CONDUCTED EMISSIONS

NweTx 2016.09.14.2 XMit 2017.12.13

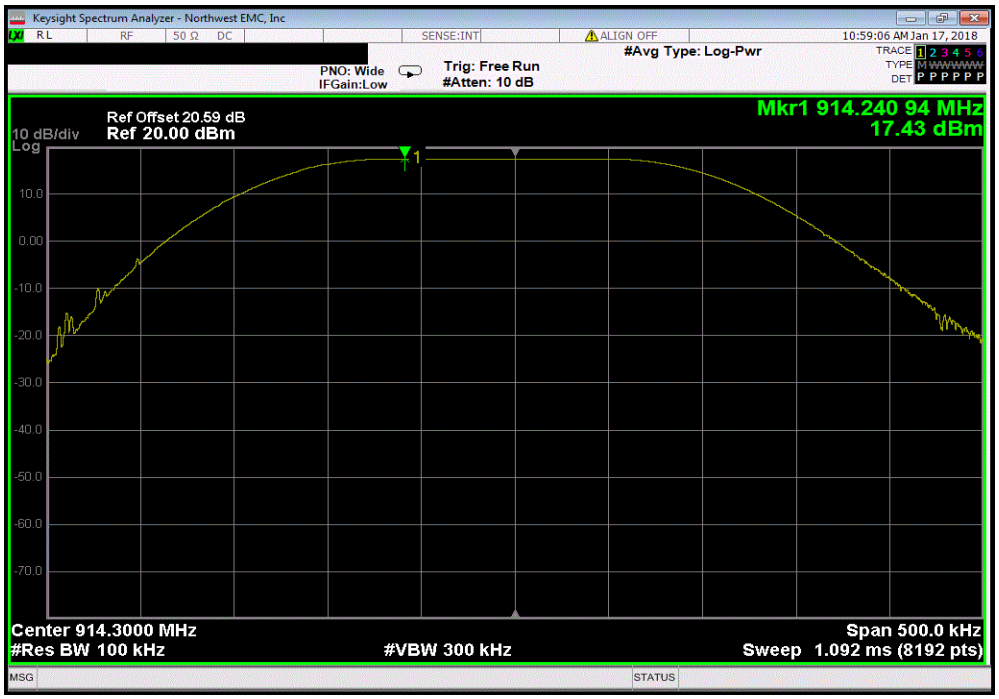
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-73.79	-30	Pass



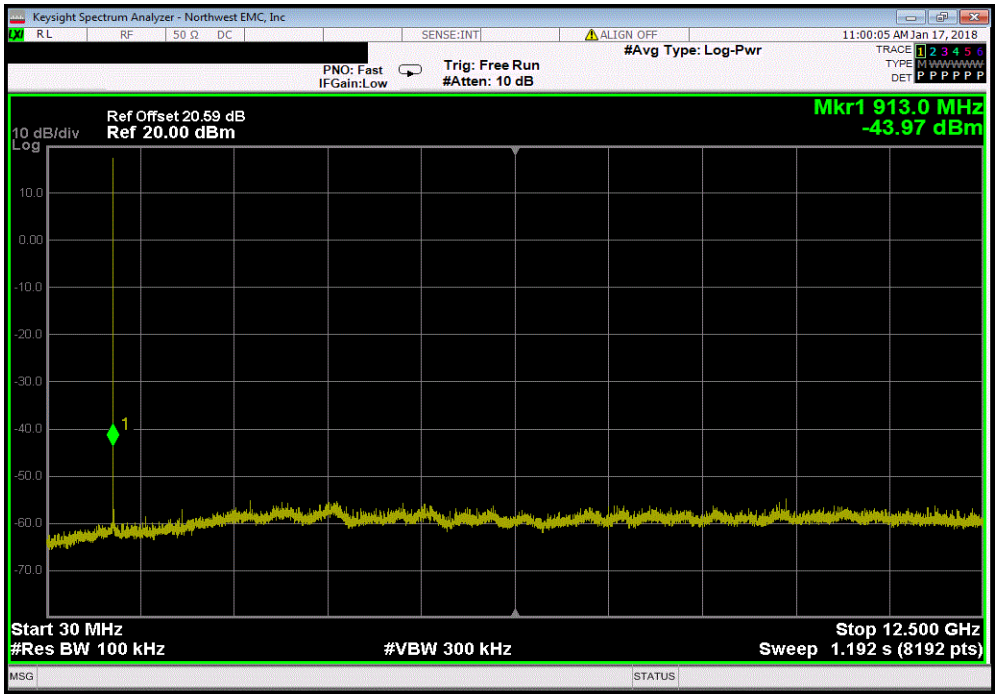
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 3, 902.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-69.22	-30	Pass



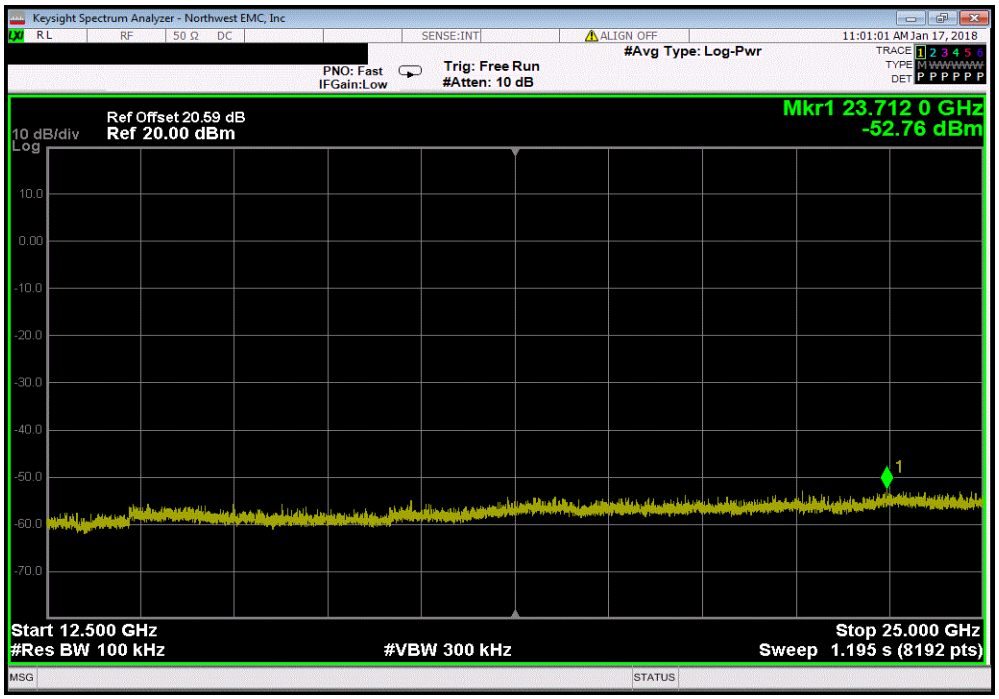
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



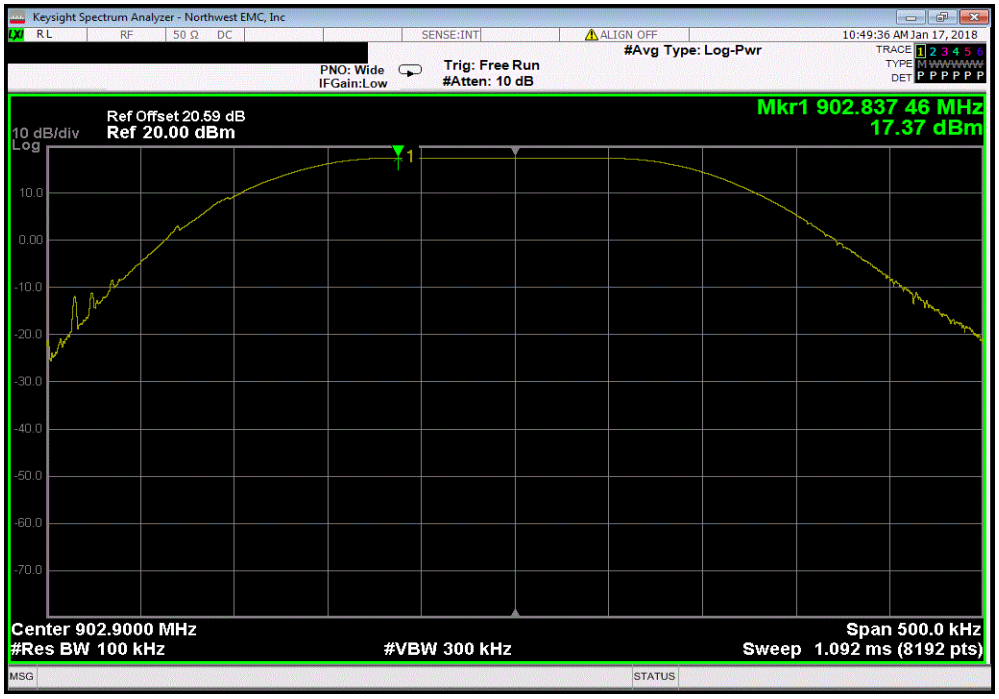
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-61.4	-30	Pass



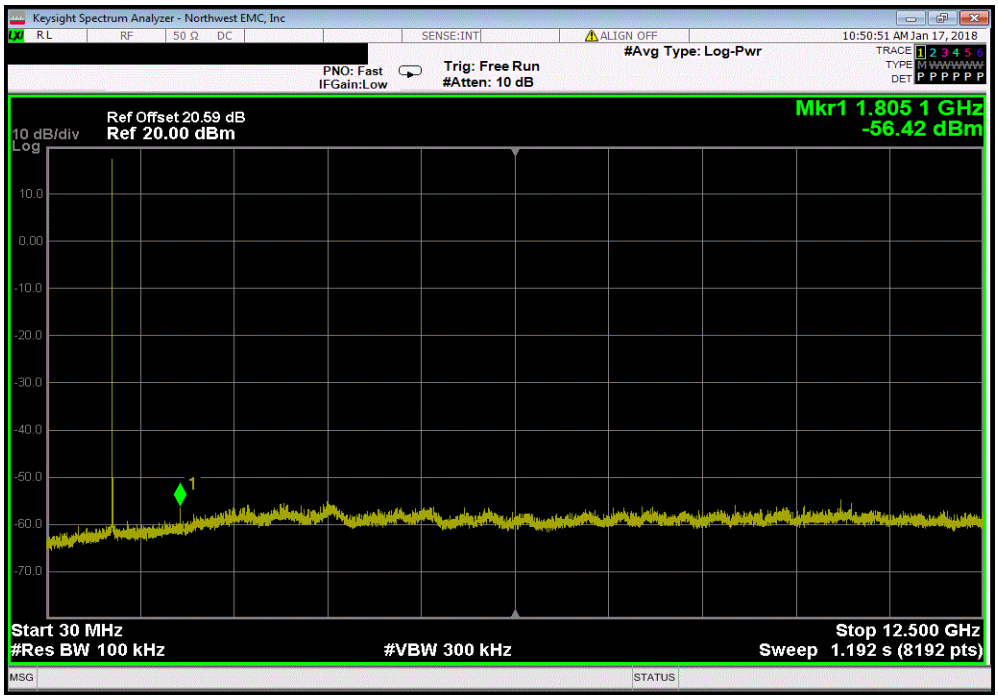
External Port, 125 kHz Bandwidth, Spreading Factor 7, Mid Channel 4, 914.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-70.19	-30	Pass



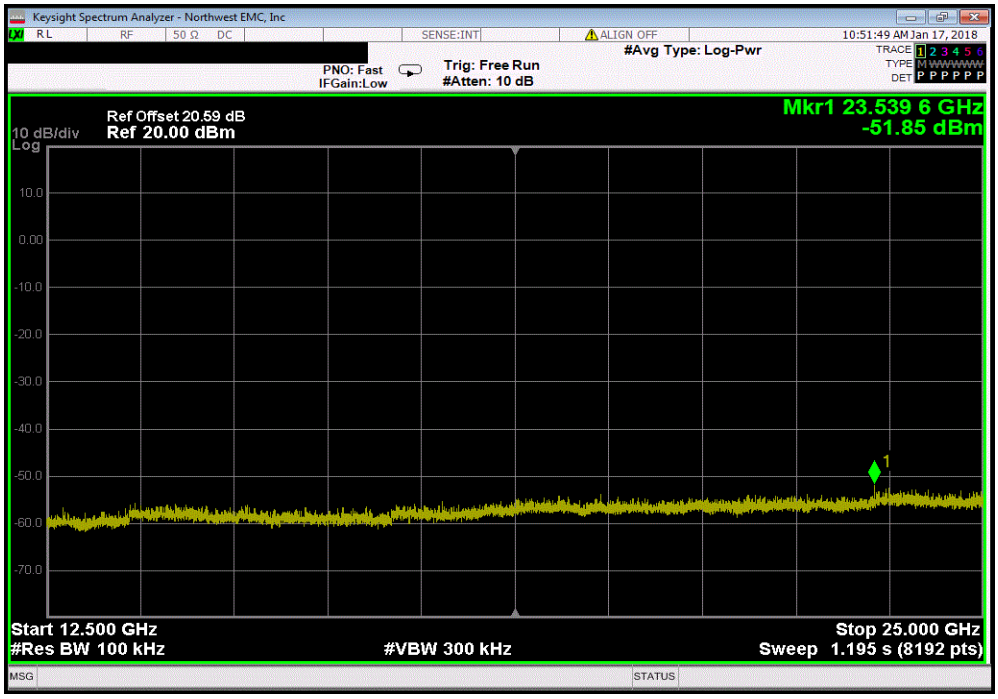
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



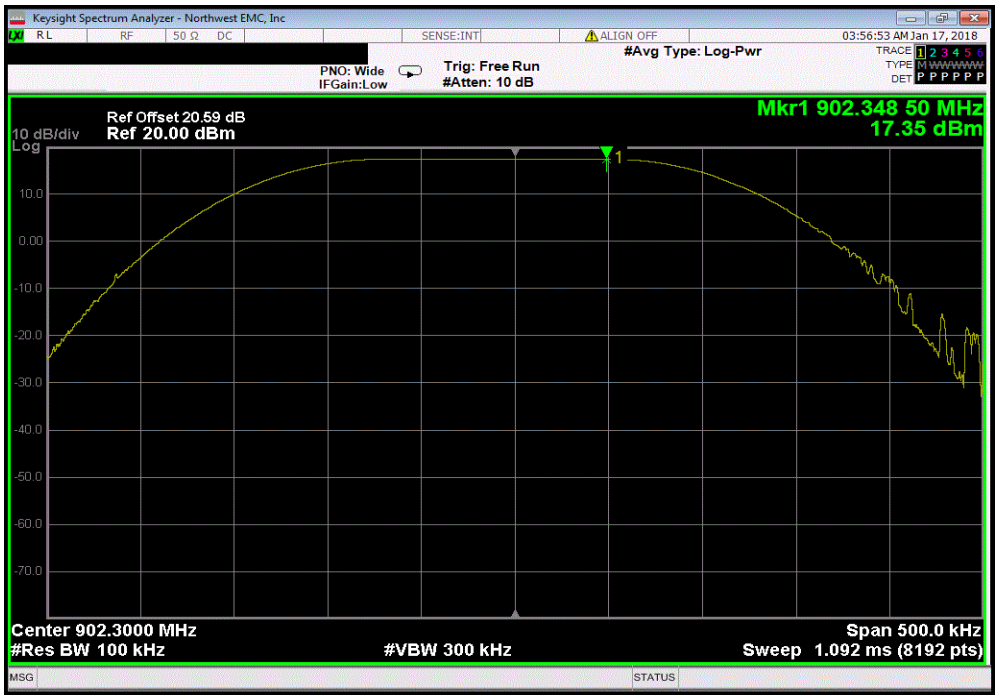
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-73.79	-30	Pass



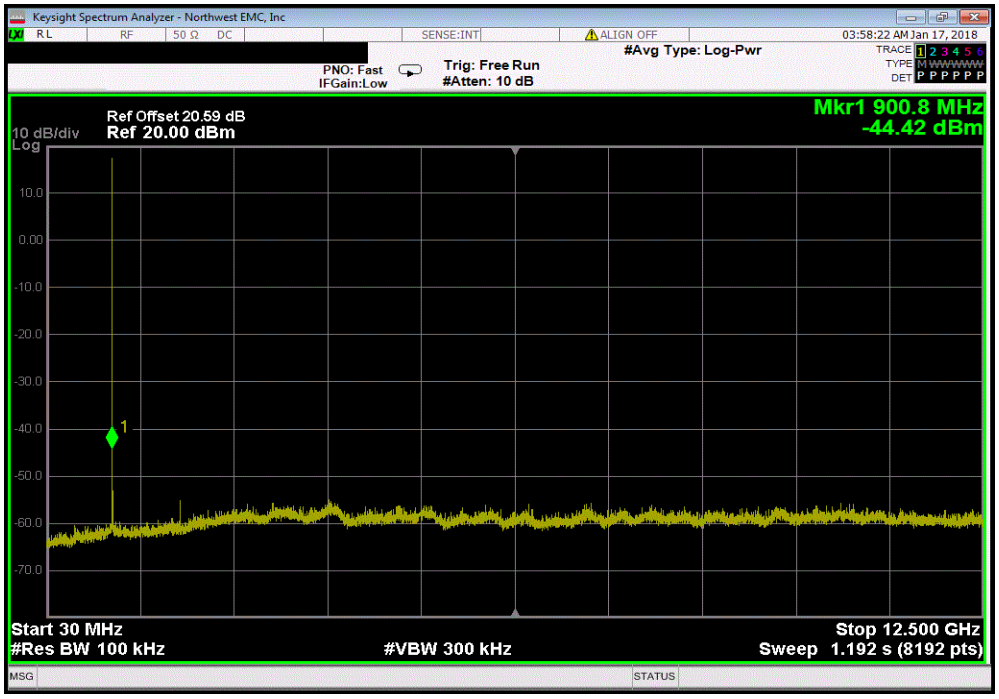
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-69.22	-30	Pass



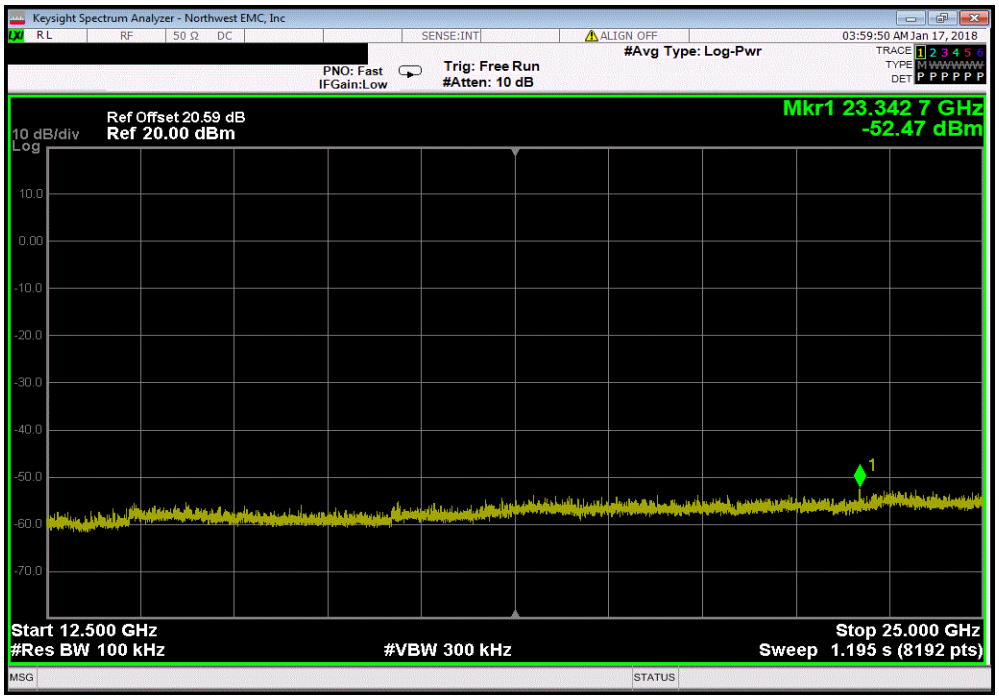
External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



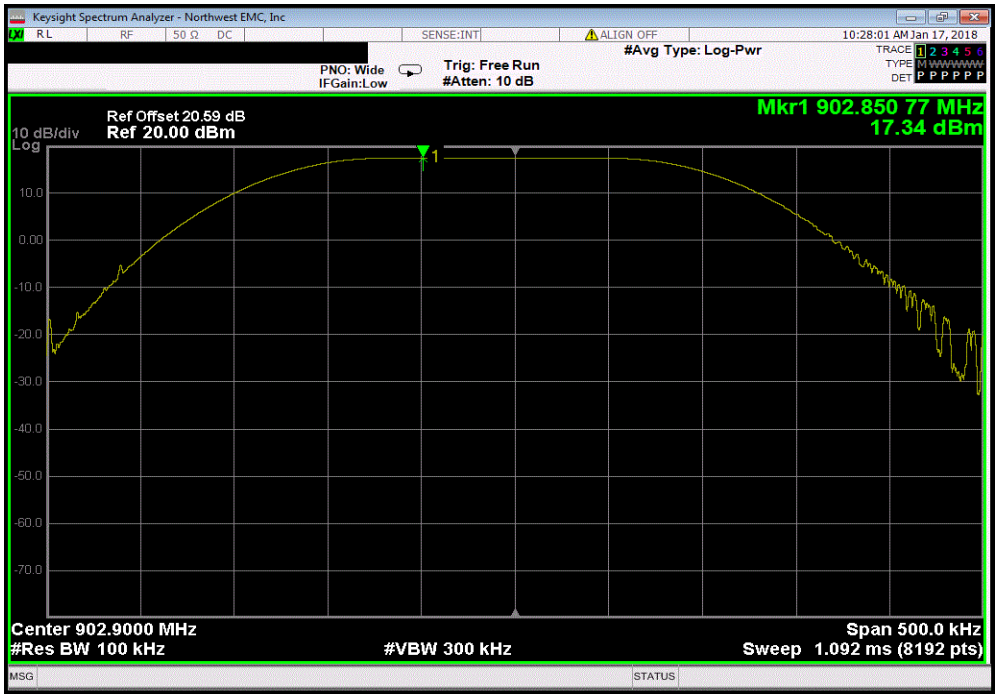
External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-61.77	-30	Pass



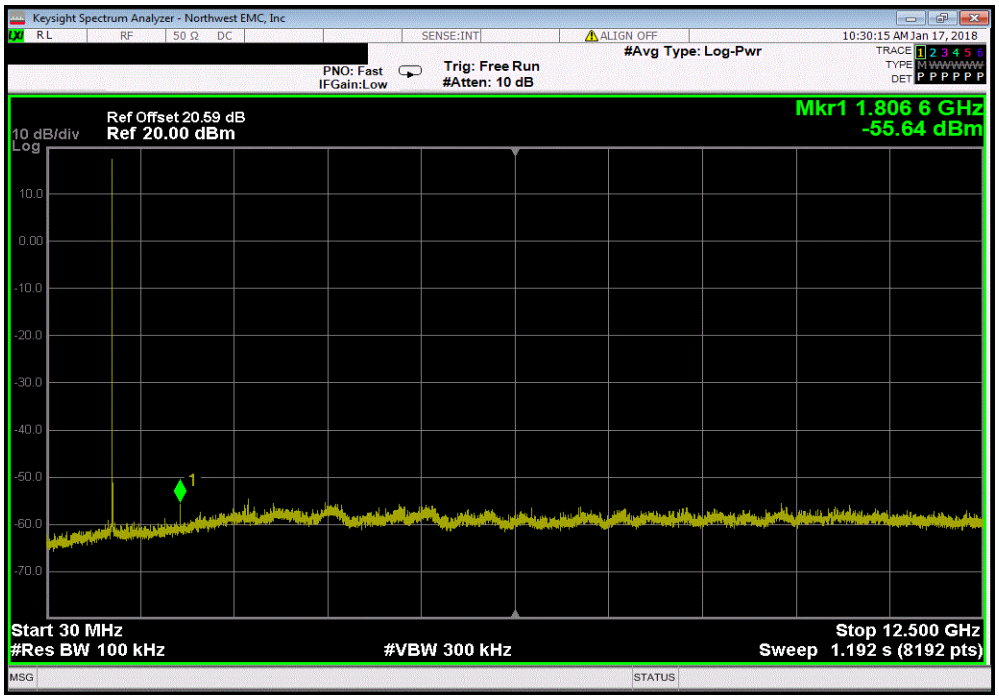
External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-69.82	-30	Pass



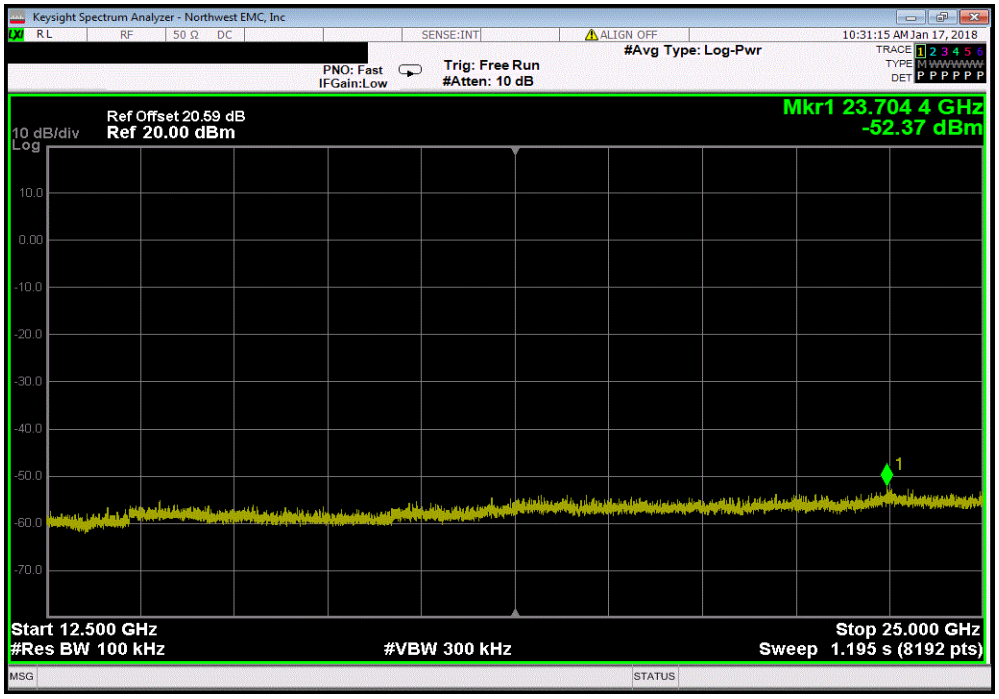
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-72.98	-30	Pass



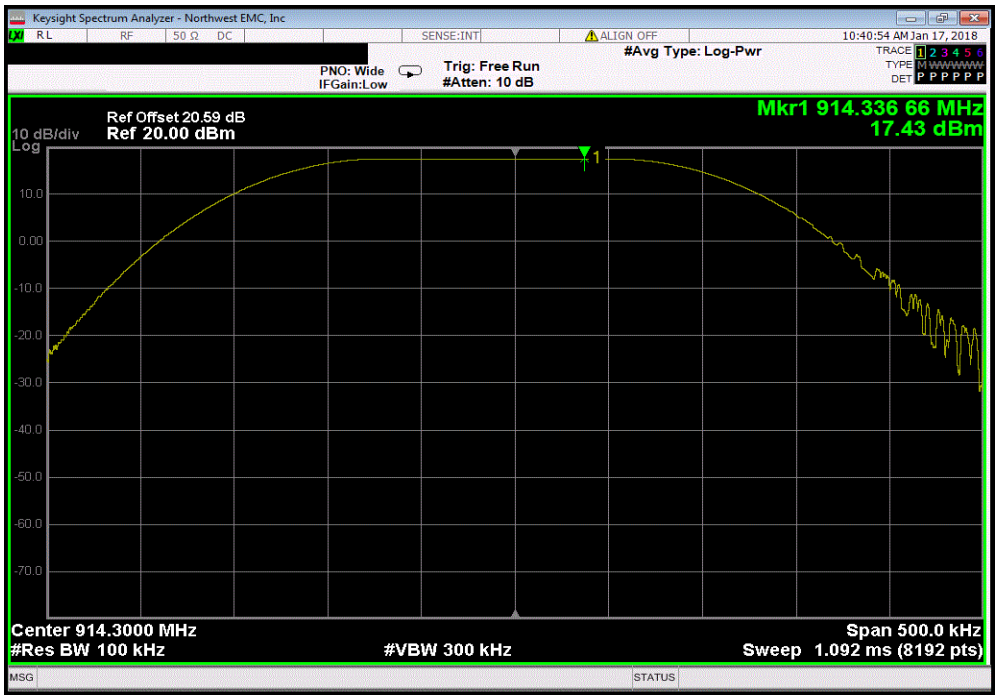
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 3, 902.9 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-69.71	-30	Pass



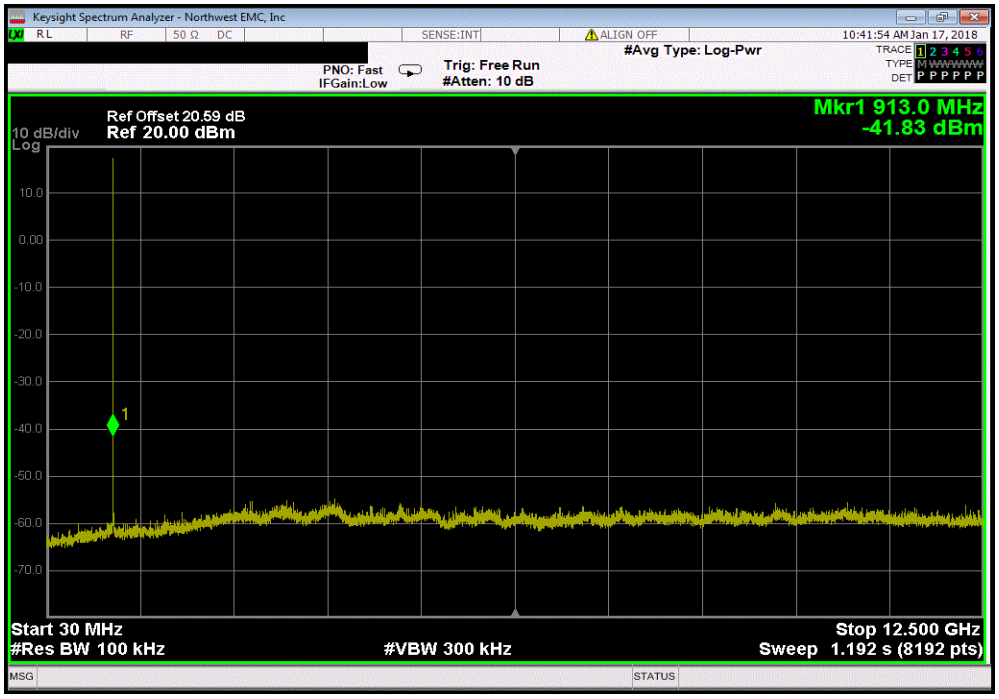
SPURIOUS CONDUCTED EMISSIONS

NweTx 2016.09.14.2 XMit 2017.12.13

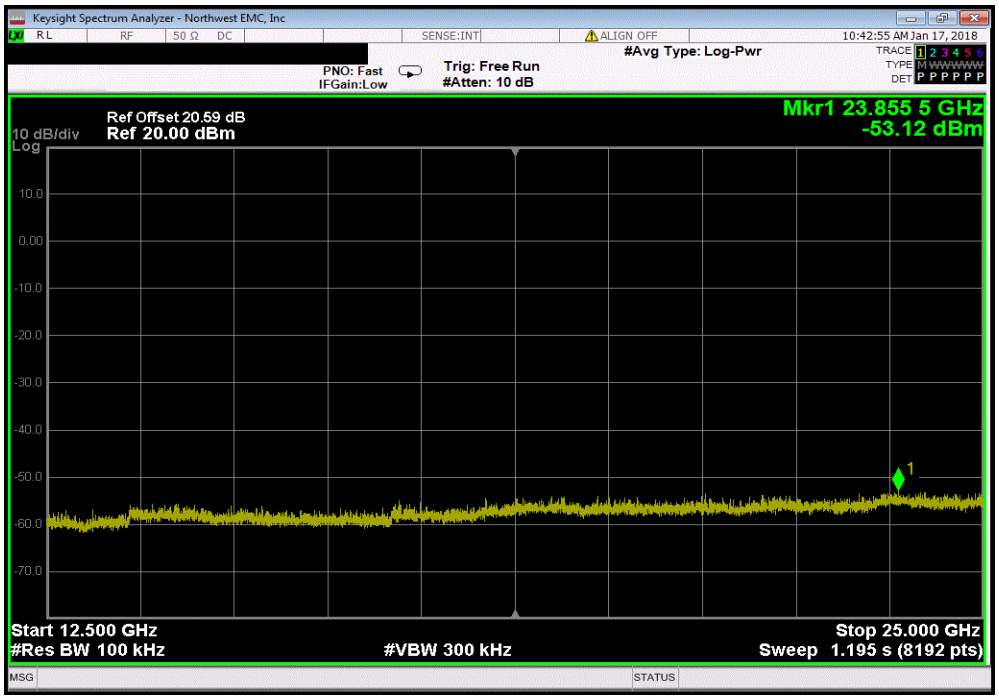
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



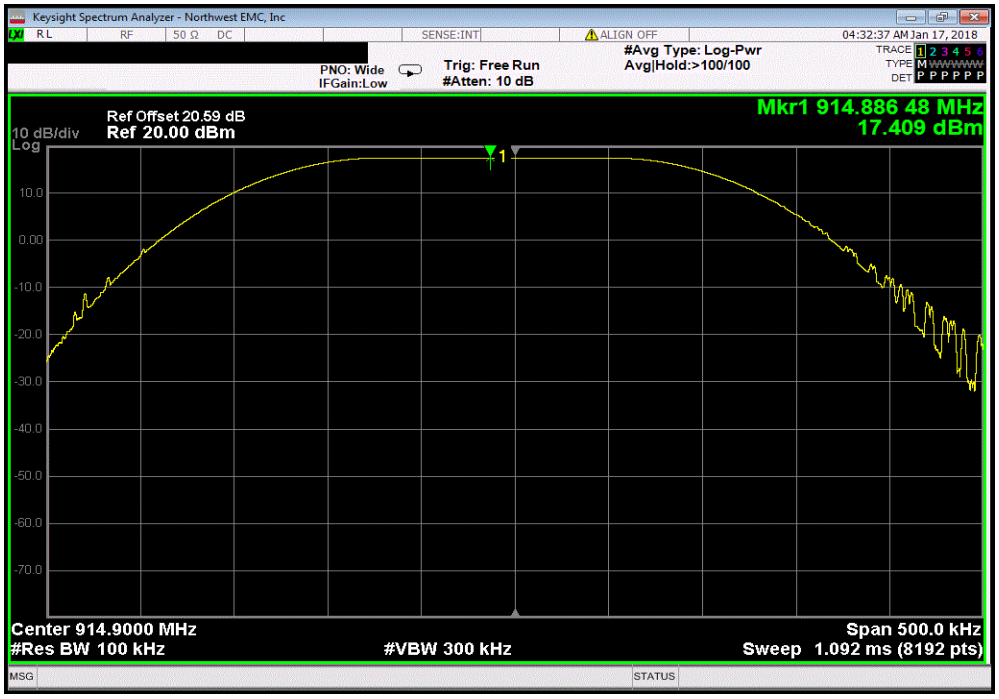
External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-59.26	-30	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, Mid Channel 4, 914.3 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-70.55	-30	Pass



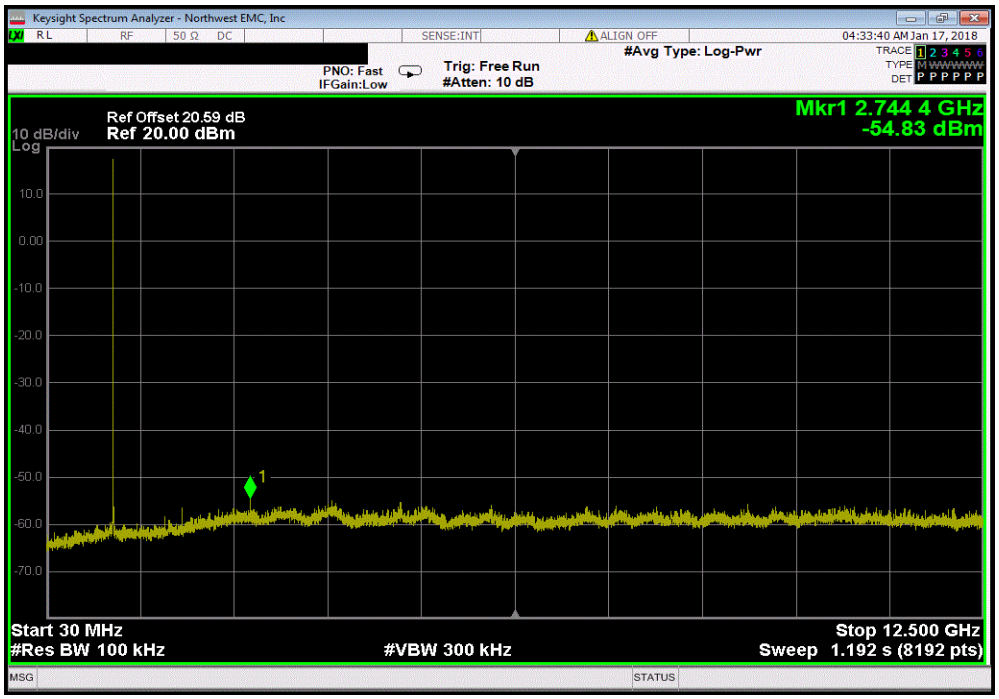
External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental		N/A	N/A	N/A



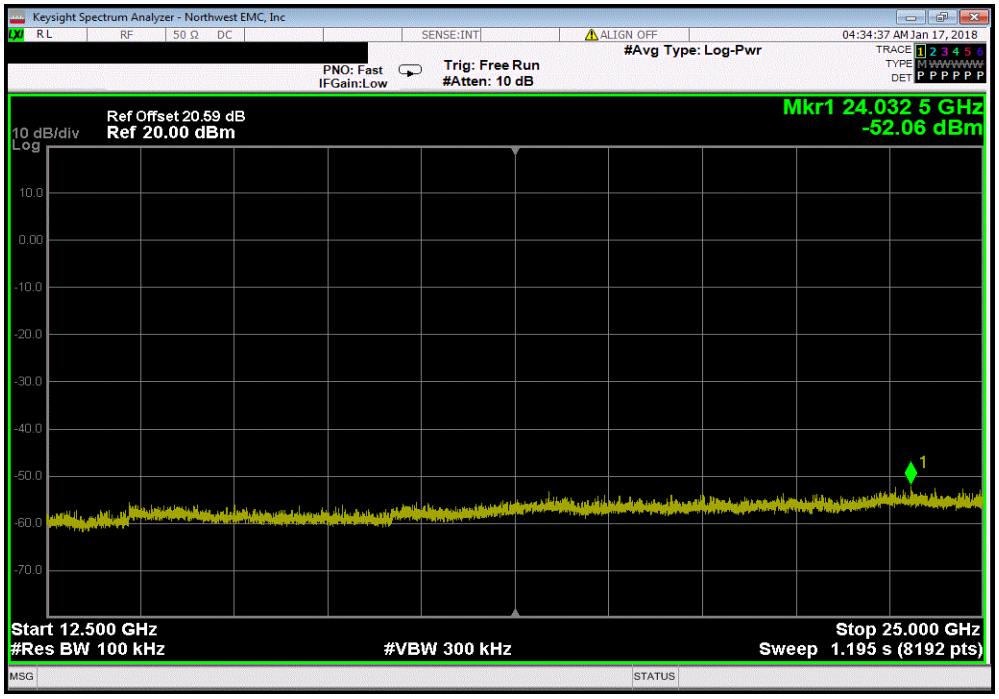
SPURIOUS CONDUCTED EMISSIONS

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-72.25	-30	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-69.49	-30	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	19-May-17	19-May-18
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	20-Apr-17	20-Apr-18
Attenuator	Fairview Microwave	SA4014-20	TKV	9-Mar-17	9-Mar-18
Block - DC	Fairview Microwave	SD3379	AMU	20-Apr-17	20-Apr-18
Generator - Signal	Agilent	N5183A	TIA	6-Apr-16	6-Apr-18

TEST DESCRIPTION

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

NweTx 2016.09.14.2 XMit 2017.12.13

EUT:	PK1276			Work Order:	APAN0004
Serial Number:	18-9B-A5-90-02-7B			Date:	16-Jan-18
Customer:	APANA Inc.			Temperature:	23 °C
Attendees:	Matt Maher Peterson, David Humphrey			Humidity:	35% RH
Project:	None			Barometric Pres.:	1025 mbar
Tested by:	Richard Mellroth	Power:	USB	Job Site:	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default = 10.

DEVIATIONS FROM TEST STANDARD

None

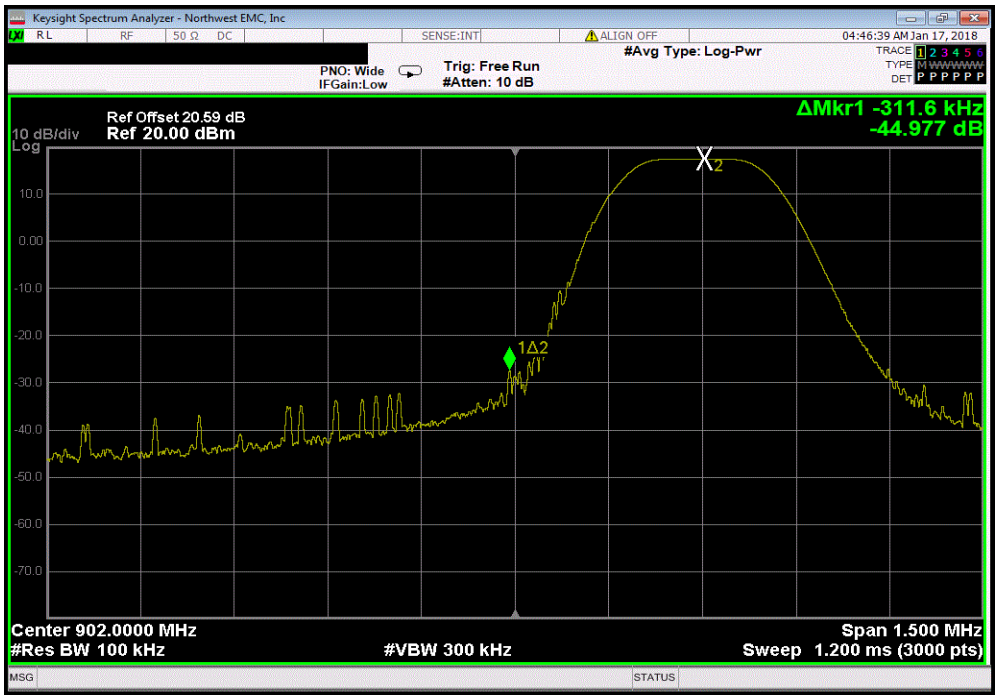
Configuration #	1	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
External Port			
125 kHz Bandwidth			
Spreading Factor 7			
Low Channel 0,	-44.98	-30	Pass
High Channel 7,	-78.06	-30	Pass
Spreading Factor 10			
Low Channel 0,	-45.59	-30	Pass
High Channel 7,	-77.98	-30	Pass

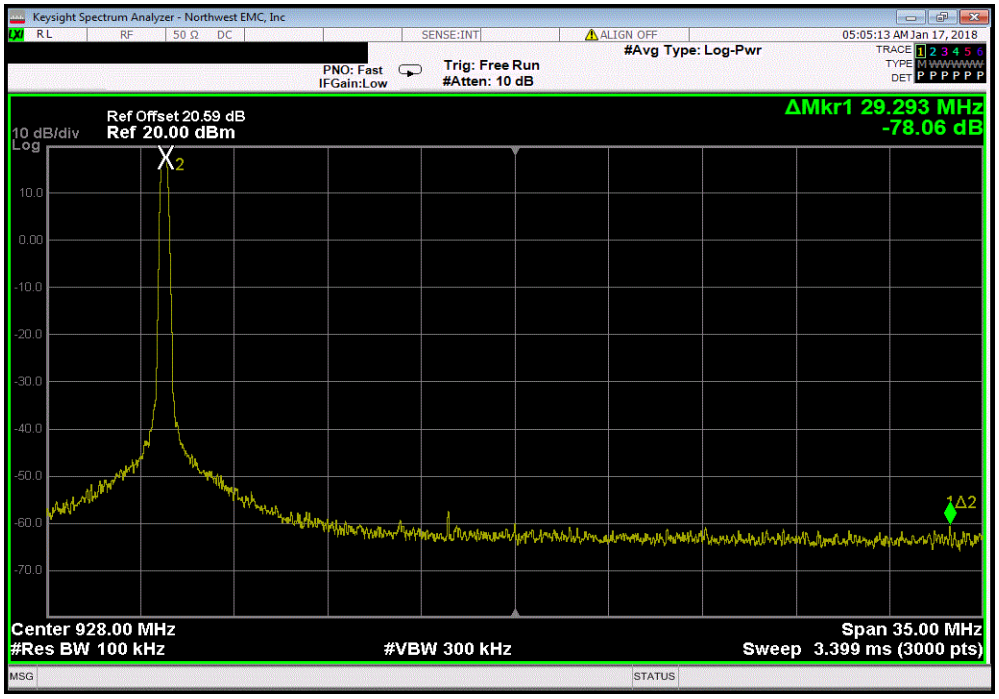
BAND EDGE COMPLIANCE

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 7, Low Channel 0, 902.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-44.98	-30	Pass



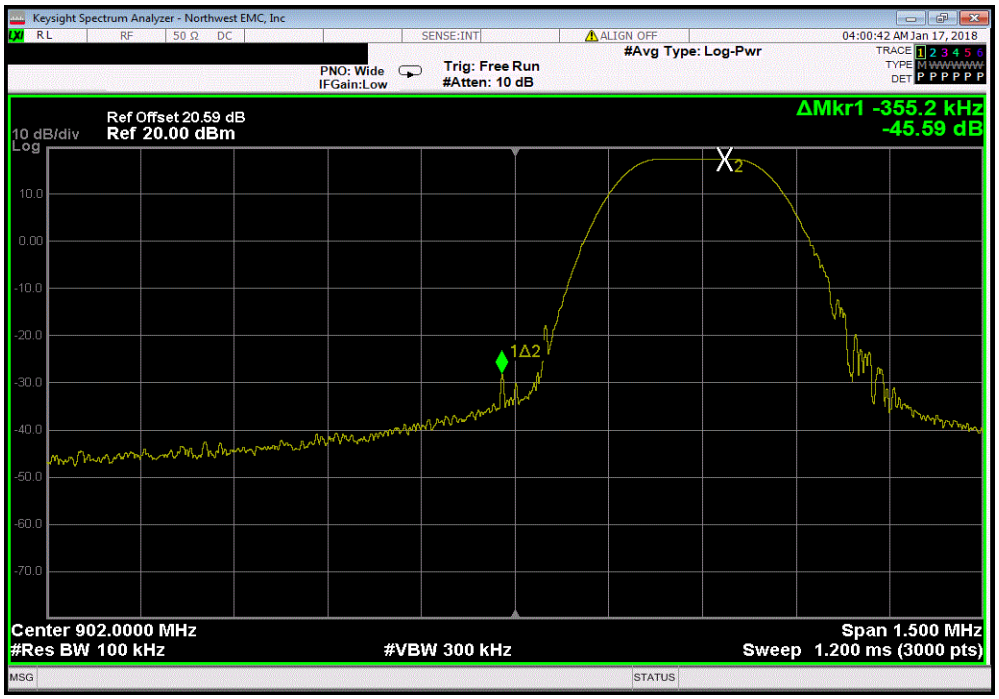
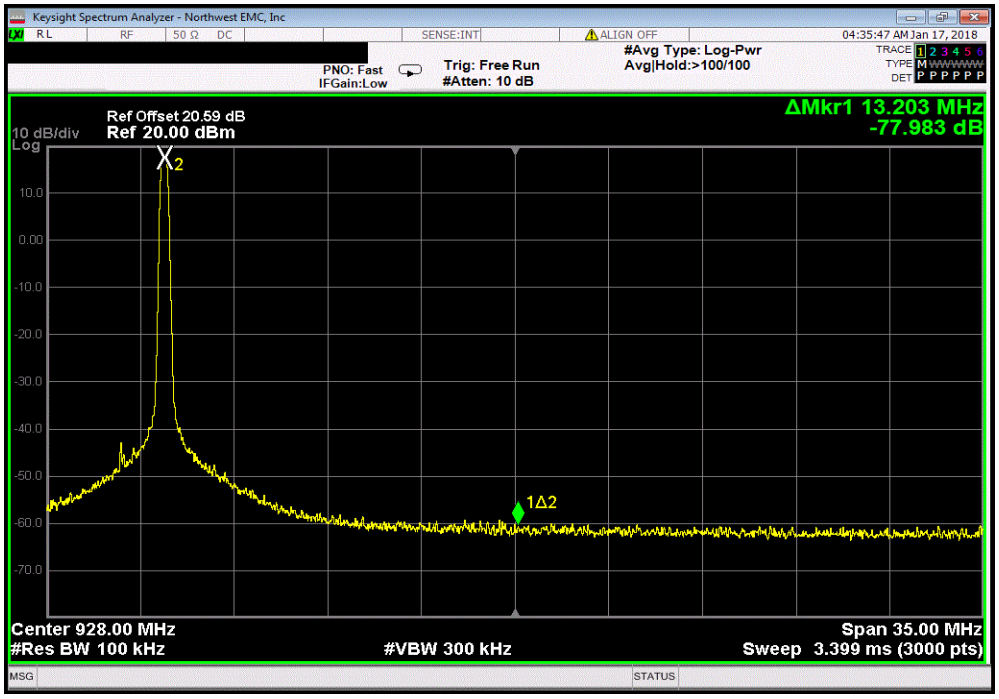
External Port, 125 kHz Bandwidth, Spreading Factor 7, High Channel 7, 914.9 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-78.06	-30	Pass



BAND EDGE COMPLIANCE

NweTx 2016.09.14.2 XMit 2017.12.13

External Port, 125 kHz Bandwidth, Spreading Factor 10, Low Channel 0, 902.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.59	-30	Pass



External Port, 125 kHz Bandwidth, Spreading Factor 10, High Channel 7, 914.9 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-77.98	-30	Pass