



Electromagnetic Compatibility Test Report

Tests Performed on an Aclara Technologies, LLC

Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Radiometrics Document RP-8351A

<i>Product Detail:</i>			
FCC ID: LLB9975T IC: 4546A-9975T Equipment type: 450-470 MHz Transceiver			
<i>Test Standards:</i>			
US CFR Title 47, Chapter I, FCC Part 2 and 90 FCC Parts 2, 15, and 90 CFR Title 47: 2015 IC RSS-119 Issue 12: 2015 IC RSS-GEN Issue 4: 2014			
<i>Tests Performed For:</i>		<i>Test Facility:</i>	
Aclara Technologies, LLC 30400 Solon Rd Solon, OH 44139		Radiometrics Midwest Corporation 12 East Devonwood Romeoville, IL 60446 Phone: (815) 293-0772	
<i>Test Date(s): (Month-Day-Year)</i>			
May 19 & 20, 2016			
Document RP-8351A Revisions:			
Rev.	Issue Date	Affected Sections	Revised By
0	July 13, 2016		
1	July 20, 2016	2, 5, 10.1	Joseph Strzelecki
2	August 1, 2016	Cover, 9, 10.2.1, 11	Joseph Strzelecki

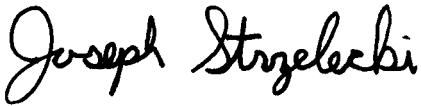
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Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i>	
An Aclara Technologies LLC. Synergize RF Network DCU XCVR Model: 101-9975T-SRFN; Serial Number: 00:00:01:00:44 This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i>	<i>Test Date(s): (Month-Day-Year)</i>
May 16, 2016	May 19 & 20, 2016
<i>Test Report Written By:</i>	<i>Test Witnessed By:</i>
Joseph Strzelecki Senior EMC Engineer	The tests were not witnessed by personnel from Aclara Technologies, LLC
<i>Radiometrics' Personnel Responsible for Test:</i>	<i>Test Report Approved By</i>
 07/20/2016 Date Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE Richard L. Tichgelaar EMC Technician	Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Synergize RF Network DCU XCVR, Model 101-9975T-SRFN, manufactured by Aclara Technologies, LLC. The detailed test results are presented in a separate section. The following is a summary of the test results.

Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	RSS 119 Section	Test Result
RF Power Output	450-470 MHz	2.1046 90.205	5.4	Pass
Occupied Bandwidth Test; Emissions Masks	450-470 MHz	2.1049 90.209	5.5	Pass
Spurious RF Conducted Emissions	1-4700 MHz	2.1051 90.210	5.8	Pass; Note1
Field Strength of Spurious Radiation	30-4700 MHz	2.1053	5.3	Pass; Note1
Frequency Vs. Temperature	450-470 MHz	2.1055 90.213	5.3	Pass; Note1
Frequency Vs. Voltage	450-470 MHz	2.1055 90.213	5.9	Pass; Note1
Transient Frequency Behavior	450-470 MHz	90.214	5.4	Pass; Note1
Radiated Emissions Receive Mode	30-2000 MHz	15	RSS-GEN	Pass; Note1

Note 1: Test not repeated since the only change is the data rate.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Synergize RF Network DCU XCVR, Model 101-9975T-SRFN, manufactured by Aclara Technologies, LLC. The RF communications link is encrypted in both directions. The EUT was in good working condition during the tests, with no known defects.

EUT Circuit Boards

EUT Circuit Board Description	Part Number	Serial Number
Processor Board	Y84051-1	00:00:01:00:44

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. The XCVR was tested as a stand alone device. The TX/RX Module was used to terminate the receiver ports only. The identification for all equipment, used in the tested system, is:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Synergize RF Network DCU XCVR	E	Aclara Technologies, LLC	101-9975T-SRFN	00:00:01:00:44
2	TX/RX Module	S	Mini-Circuits	ZX4SC-472LN-1+	None
3	AC-DC Power supply	S	Shenzhen Fujia	FKS308HSC-1201500E	None

* Type: E = EUT, S = Support Equipment

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Description of Permissive Change

The Model 101-9975T-SRFN being submitted for a permissive change has no hardware changes from the previously certified Model 101-9975T-SRFN. The only difference is that the currently submitted version has a firmware change that will permit the transceiver to transmit and receive data at a 7200 bps rate rather than the previous version's 9600 bps rate. The purpose of the change is to allow the Model 101-9975T-SRFN to communicate with the legacy products using the 7200 bps rate. The firmware number (FVIN) for the 7200 bps product will be 1.00

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2016	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 & 90 - Radio Frequency Devices
ANSI C63.4-2009	2009	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
TIA-603-D	2010	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
IC RSS-Gen Issue 4	2014	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
IC RSS-119 Issue 12	2015	Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber B: Is a shielded enclosure that measures 20' L X 12' W X 8' H. Erik A. Lindgren & Associates of Chicago, Illinois manufactured the enclosure.

Chamber C: Is a shielded enclosure that measures 17' L X 10' W X 8' H. Lindgren RF Enclosures Inc. of Addison, Illinois manufactured the enclosure.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
ATT-28	Narda	Attenuator(20dB)	757B-20	3131	DC - 6 GHz	24 Mo.	09/24/14
CDT-01	Wiltron	Crystal RF Detector	75N50	CDT-01	DC-18GHz	N/A	NCR
COM-01	Anaren	Coupler	10023-3	COM-01	250-1000MHz	N/A	NCR
DIR-07	Werlatone	Directional Coupler	C3908	6929	80-1000MHz	24 Mo.	06/10/15
DIR-19	Narda	Directional Coupler	3000-10	01174	200-500MHz	N/A	NCR
DMM-10	Keithley	DMM	2010	0773679	DC-10 kHz	24 Mo	11/22/14
REC-11	HP / Agilent	Spectrum Analyzer	E7405A	US39110103	9kHz-26.5GHz	12 Mo.	06/23/15
REC-43	Adventest	Spectrum Analyzer	U3772	150800305	9kHz-43GHz	12 Mo.	03/07/16
SCP-02	Tektronix	Oscilloscope	TDS784A	B040258	DC-1GHz	24 Mo.	11/15/14
SIG-30	Rohde & Schwarz	Signal Generator	SMC100A	102914	9k-3.2GHz	24 Mo.	10/07/15
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	12 Mo.	08/03/15

Note: All calibrated equipment is subject to periodic checks.

NCR – No Calibration Required. Device monitored by calibrated equipment. N/A: Not Applicable.

10 TEST SECTIONS**10.1 Peak Output Power**

The peak power was measured by connecting the EUT antenna port to the spectrum analyzer via a low loss coaxial cable and an appropriate power attenuator.

Model	101-9975T-SRFN	Specification	FCC part 90.205 RSS-119 Section 5.4
Serial Number	80010744	Test Date	May 19, 2016
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-11)		

TX freq MHz	Peak Power dBm	Peak Power Watts
450.0250	32.8	1.905
460.0000	33.0	1.995
469.9875	33.0	1.995

The FCC part 90.205 the ERP limit is 100 Watts since the HAAT is less than 15 meters and the service area radius is 8 km or greater. The ISSED RSS-119 section 5.4 power limit is 110 Watts

33 dBm with a 5 dBi antenna is a 38 dBm EIRP or a 35.85 dBm ERP. 35.85 dBm = 3.85 watts.
Calculation as per FCC KDB publication 412172

Judgement: Pass

10.2 Occupied Bandwidth; Emissions Masks; Spurious RF Conducted Emissions

Model	101-9975T-SRFN	Specification	FCC Part 90.209 RSS-119 Section 5.5
Serial Number	80010744	Test Date	May 19, 2016
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	Spectrum Analyzer (REC-11)		

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize. All Channels are 12.5 kHz

The emissions Mask D is from FCC part 90.210.

- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB.

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 09:08:26 May 19, 2016

R T

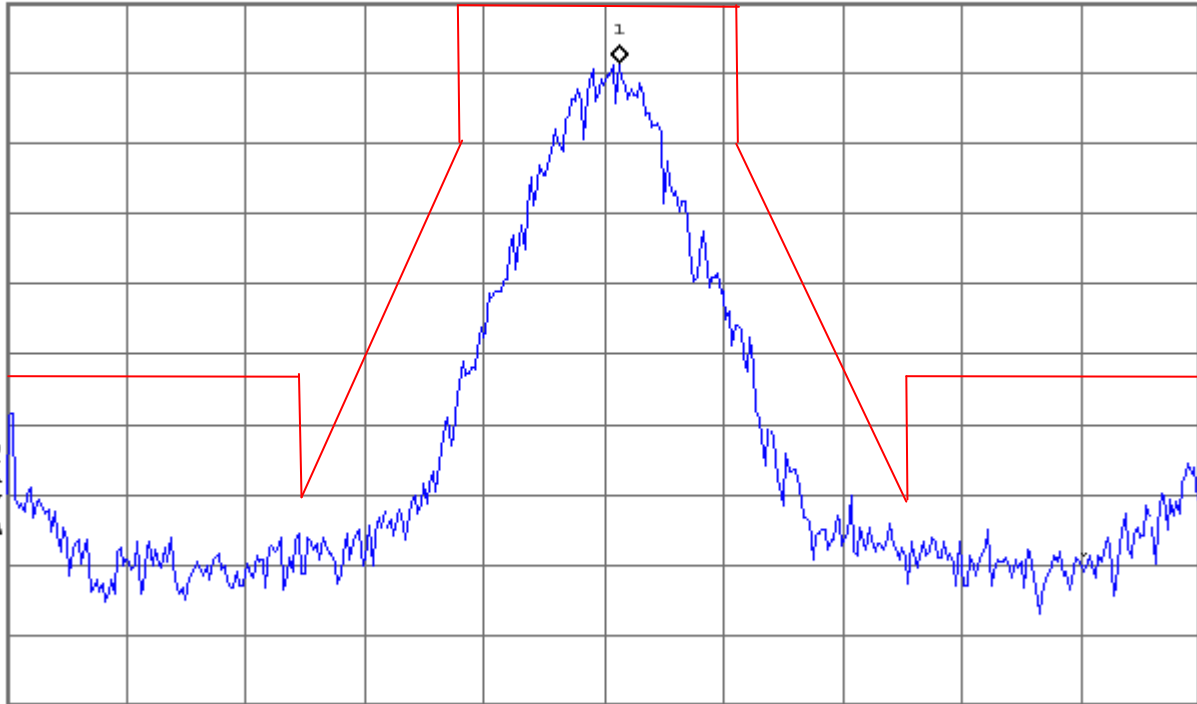
450.025MHz PN9 Mod D Mask w/20dB Ext. Atten.

Mkr1 450.025625 MHz

Ref 13.6 dBm

#Atten 25 dB

5.008 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 450 MHz

Span 50 kHz

#Res BW 100 Hz

#VBW 100 Hz

Sweep 2.86 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 09:24:26 May 19, 2016

R T

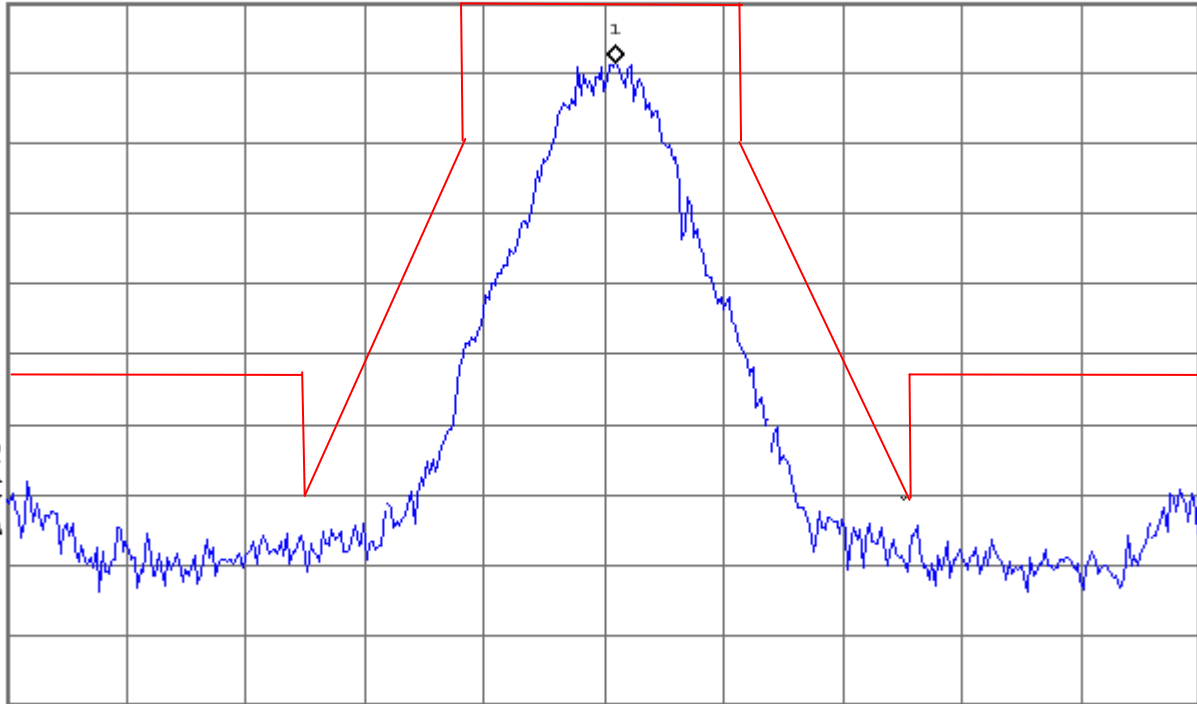
460.00MHz PN9 Mod D Mask w/20 dB Ext. Atten.

Mkr1 460.000500 MHz

Ref 13.6 dBm

#Atten 25 dB

4.889 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 460 MHz

Span 50 kHz

#Res BW 100 Hz

#VBW 100 Hz

Sweep 2.86 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 09:35:20 May 19, 2016

R T

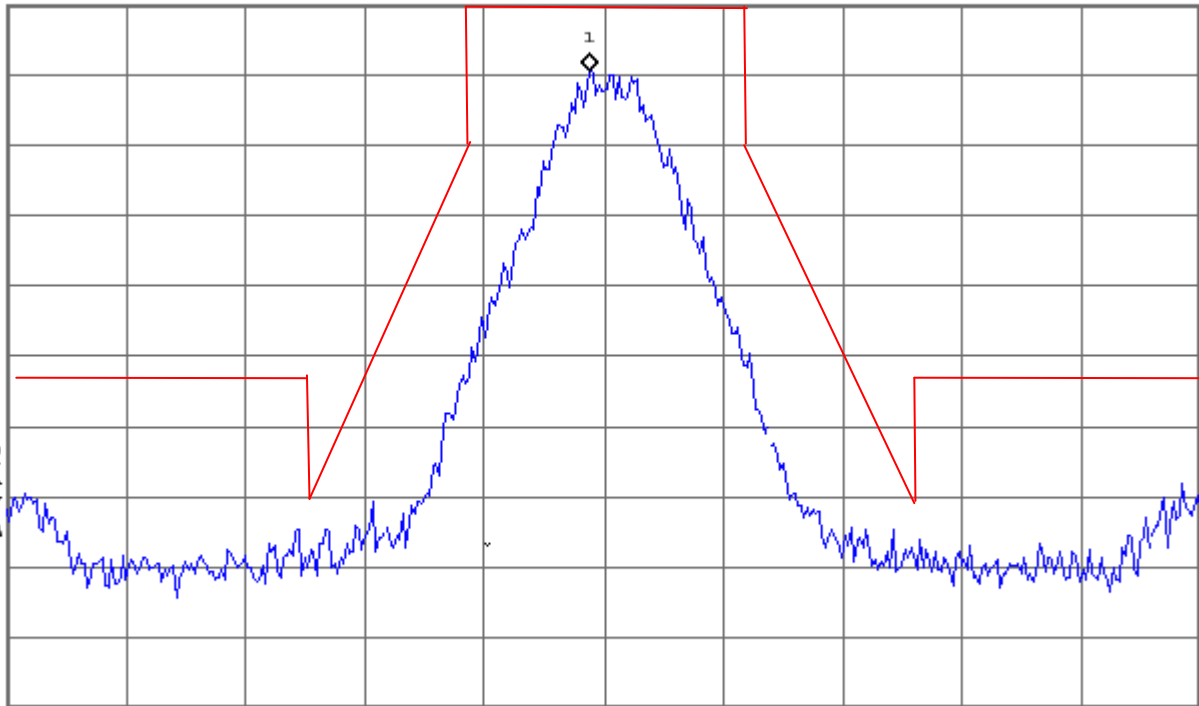
469.9875MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 469.986875 MHz

Ref 13.6 dBm

#Atten 25 dB

4.281 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 470 MHz

Span 50 kHz

#Res BW 100 Hz

#VBW 100 Hz

Sweep 2.86 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 10:23:28 May 19, 2016

R T

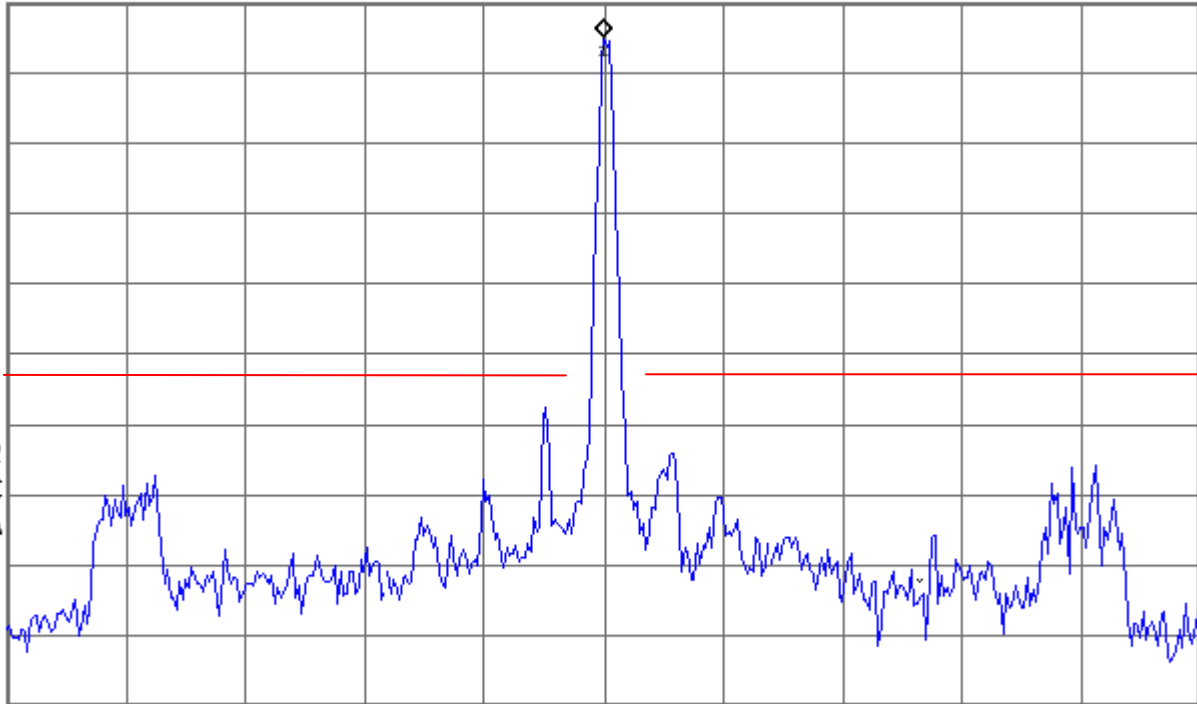
450.0250MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 450.02500 MHz

Ref 13.6 dBm

#Atten 25 dB

8.818 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 450 MHz

Span 500 kHz

#Res BW 300 Hz

#VBW 1 kHz

Sweep 22.26 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 10:27:41 May 19, 2016

R T

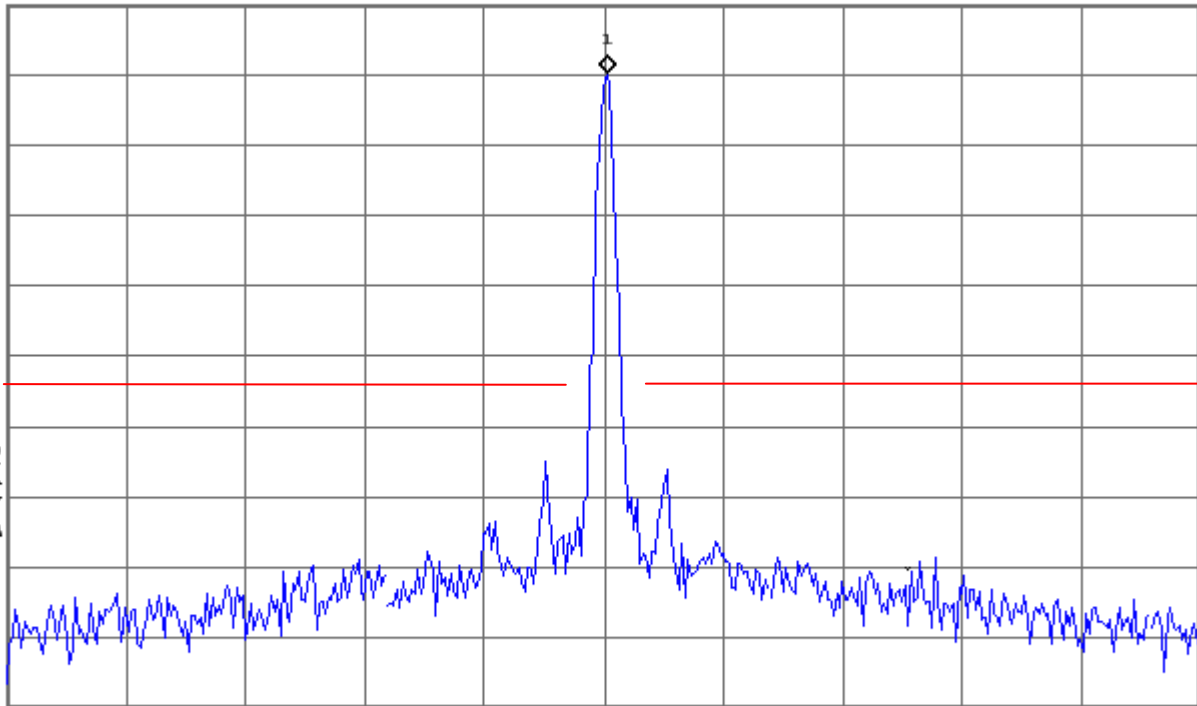
460.000 MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 460.00125 MHz

Ref 13.6 dBm

#Atten 25 dB

3.936 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 460 MHz

Span 500 kHz

#Res BW 300 Hz

#VBW 1 kHz

Sweep 22.26 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 10:03:48 May 19, 2016

R T

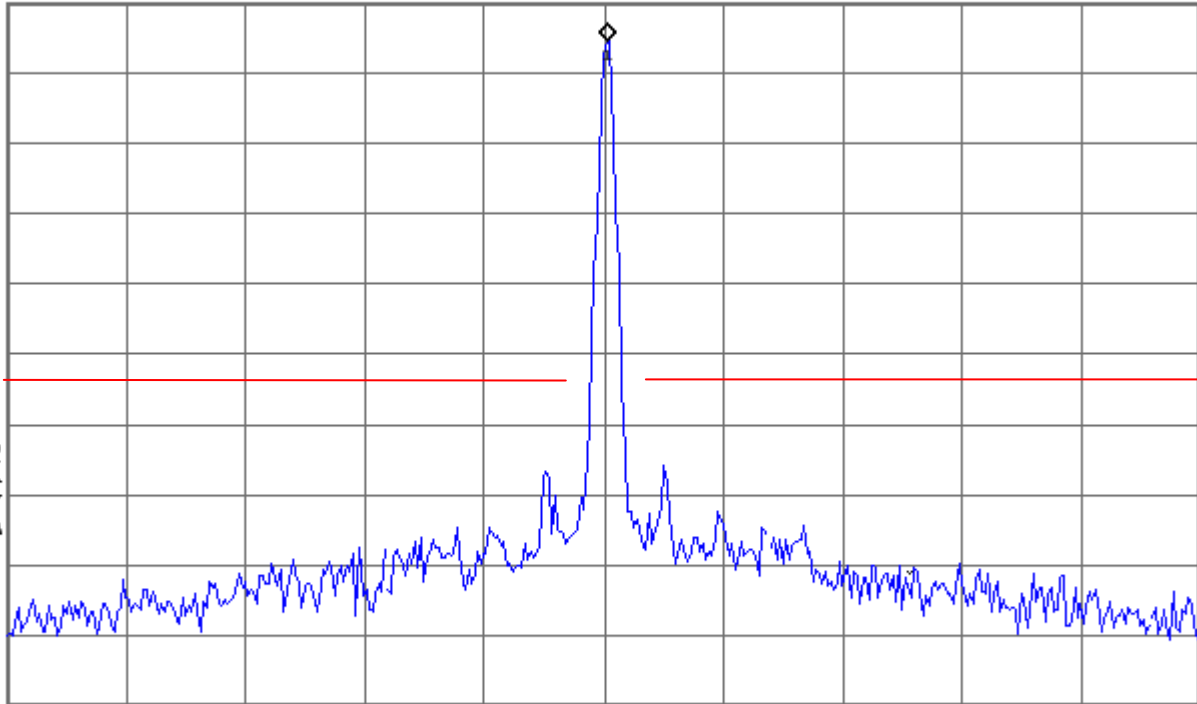
469.9875MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 469.98875 MHz

Ref 13.6 dBm

#Atten 25 dB

8.254 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Center 470 MHz

Span 500 kHz

#Res BW 300 Hz

#VBW 1 kHz

Sweep 22.26 s (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 12:36:05 May 19, 2016

R T

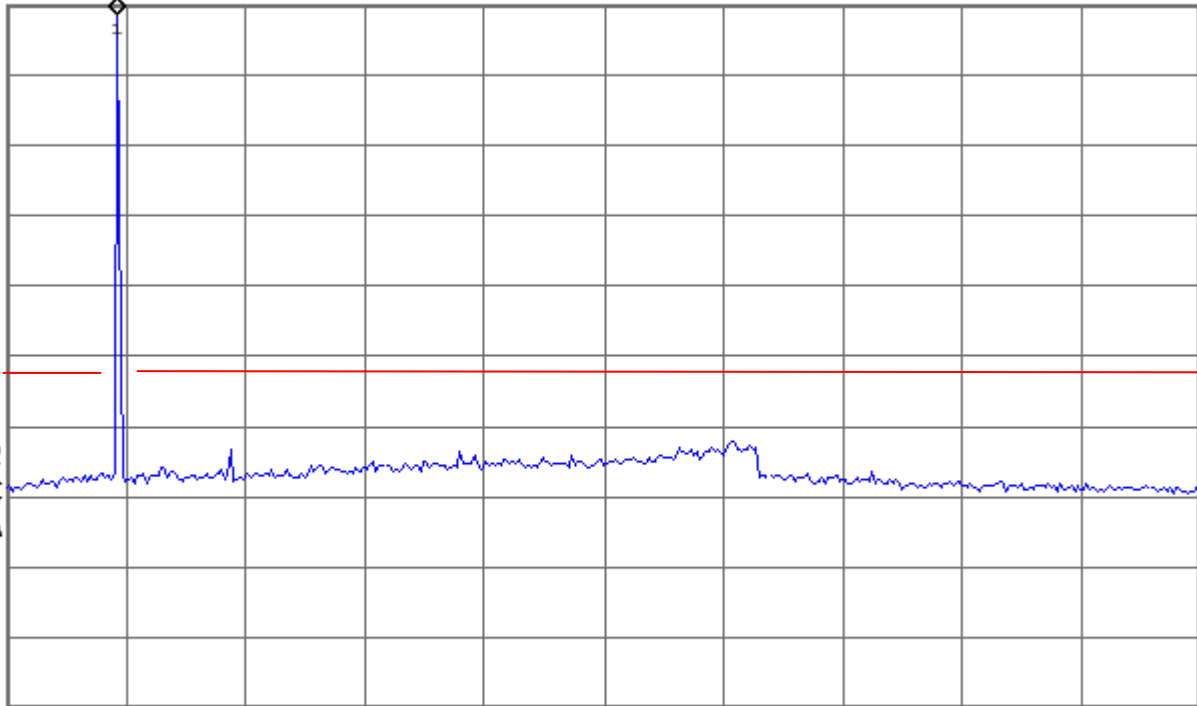
450.0250MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 446 MHz

Ref 15 dBm

#Atten 25 dB

13.62 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

#Res BW 100 kHz

#VBW 300 kHz

Sweep 491.4 ms (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 12:32:31 May 19, 2016

R T

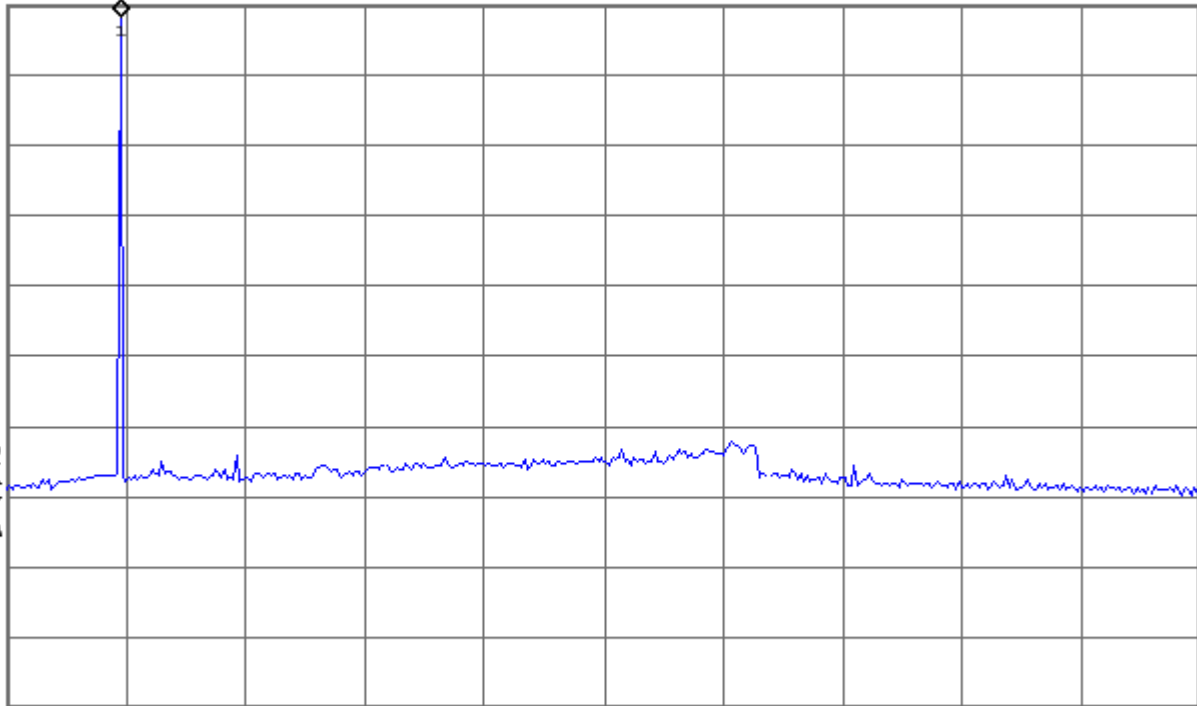
460.000 MHz PN9 Mod D Mask w/20dB Ext Atten.

Mkr1 458 MHz

Ref 15 dBm

#Atten 25 dB

13.19 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Start 7 MHz

Stop 4.75 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 491.4 ms (401 pts)

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

Agilent 12:49:04 May 19, 2016

R T

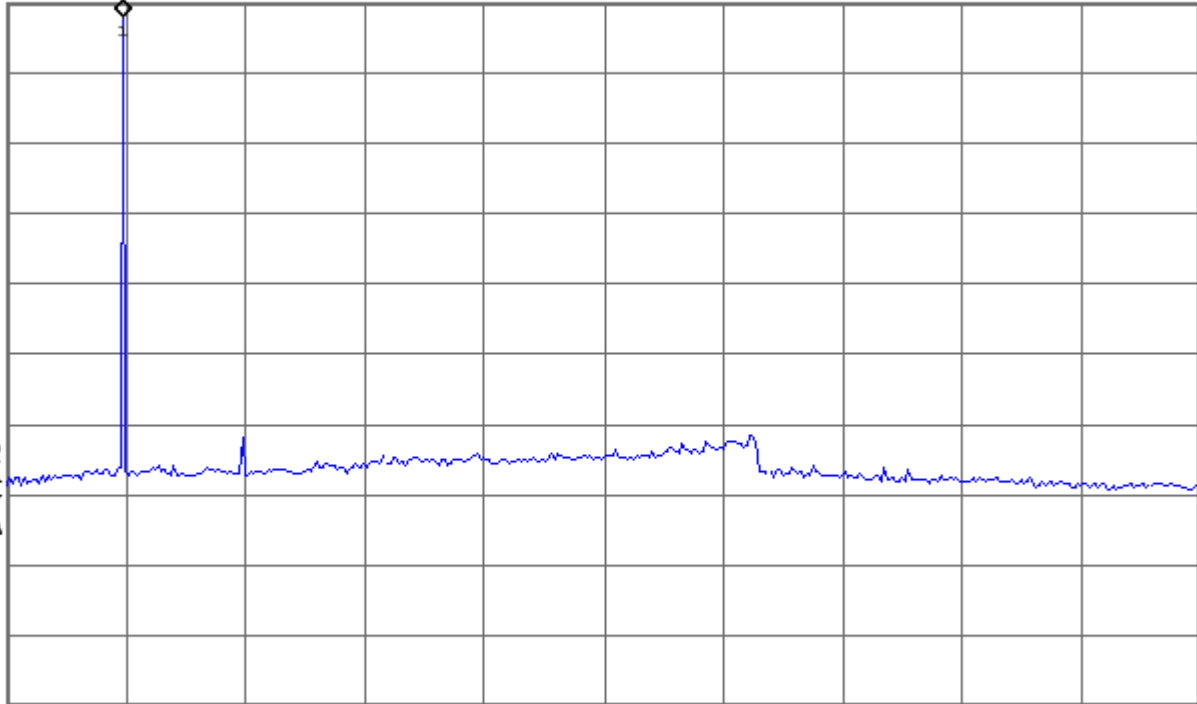
469.98750MHz PN9 Mod D Mask w/20dB Ext Atten

Mkr1 469 MHz

Ref 15 dBm

#Atten 25 dB

13.14 dBm

Peak
Log
10
dB/V1 S2
S3 FC
AA

Start 7 MHz

Stop 4.75 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 491.4 ms (401 pts)

Judgement: Pass

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

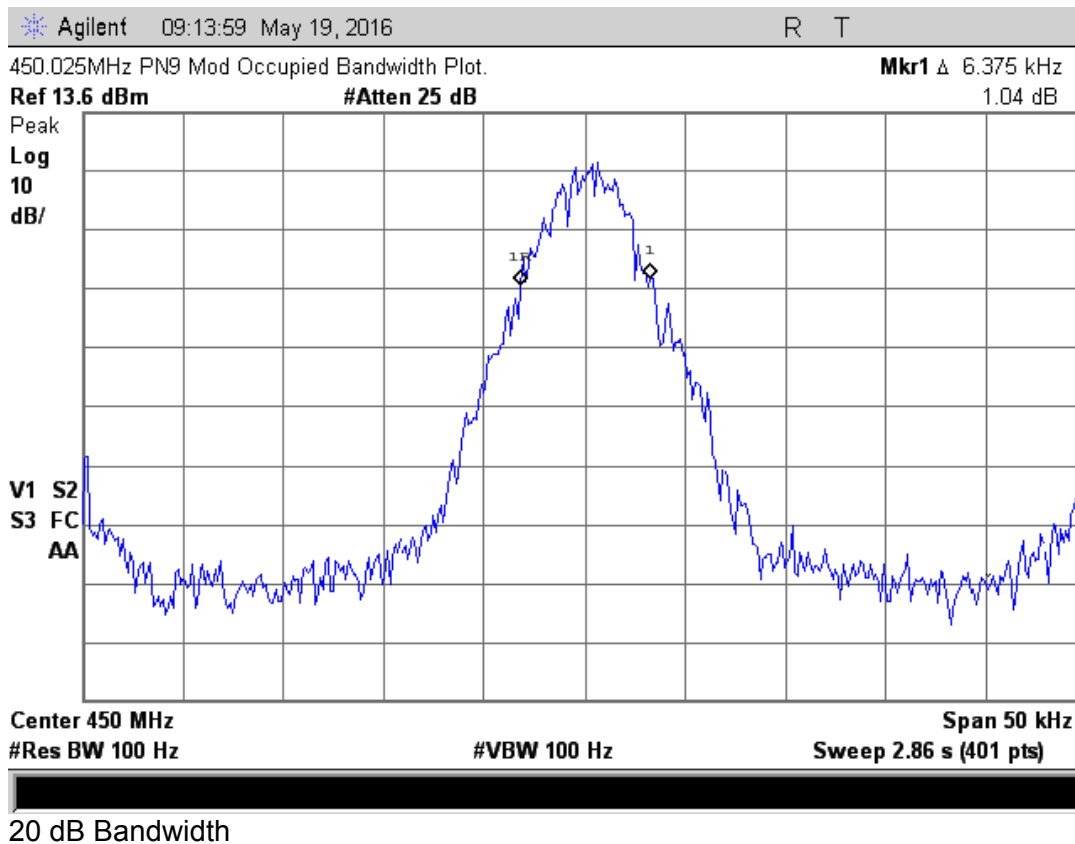
10.2.1 Occupied bandwidth

Model	101-9975T-SRFN	Specification	FCC Part 90.209 RSS-119 Section 5.5
Serial Number	80010744	Test Date	May 19, and August 1, 2016
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	Spectrum Analyzer (REC-11) 20 and 26 dB OBW Spectrum Analyzer (REC-43) 99% OBW		

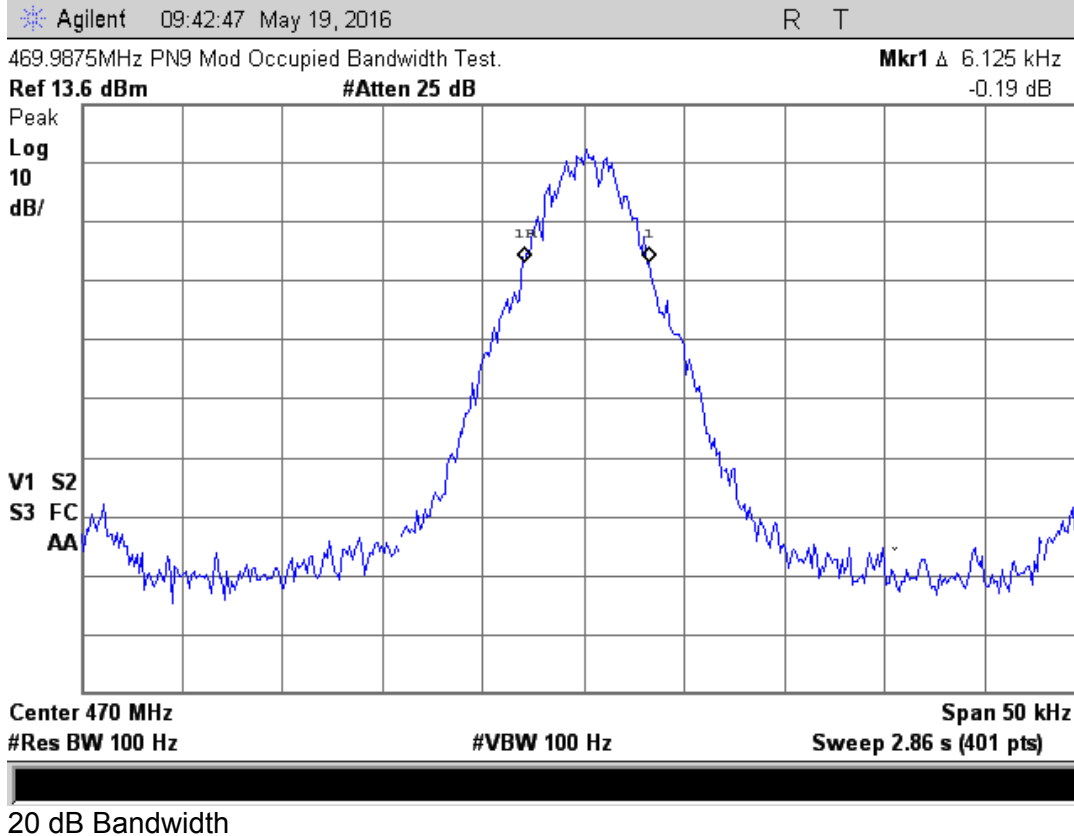
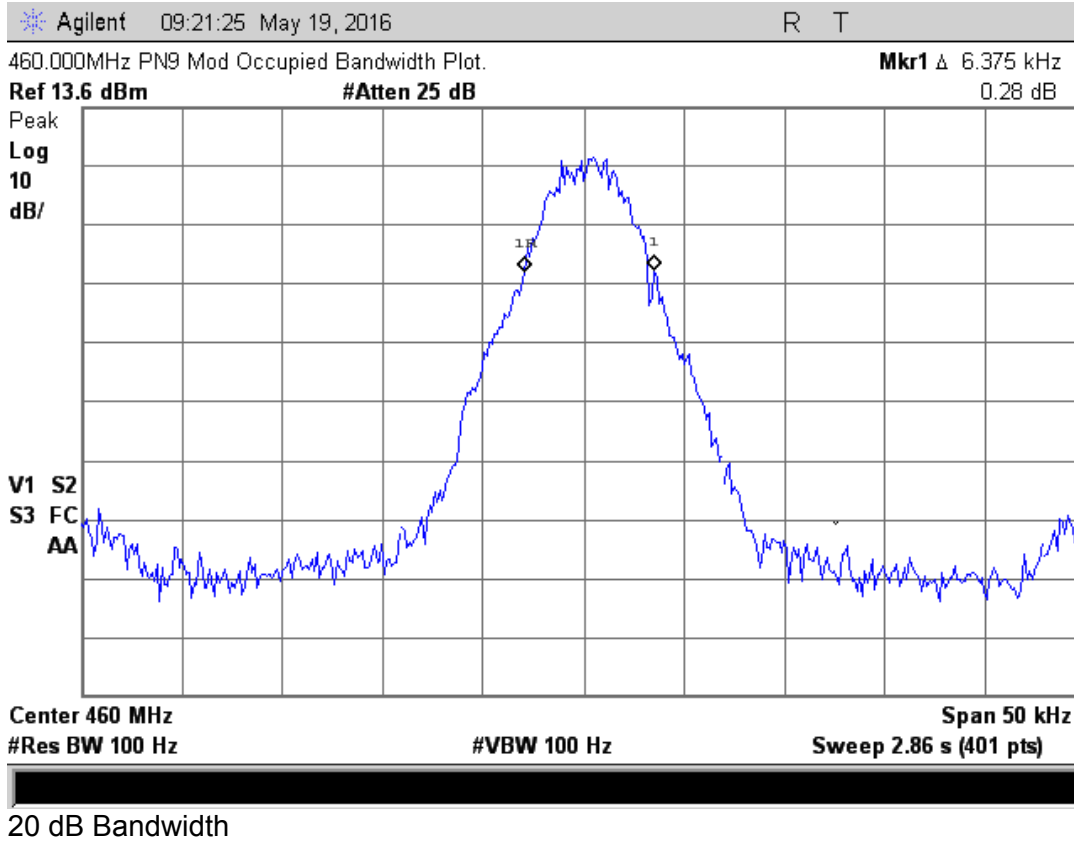
Test Results

Channel	20 dB OBW kHz	26 dB OBW kHz	99% OBW kHz
450.0250	6.375	8.125	5.56
460.0000	6.375	7.750	5.60
469.9875	6.125	8.125	5.58

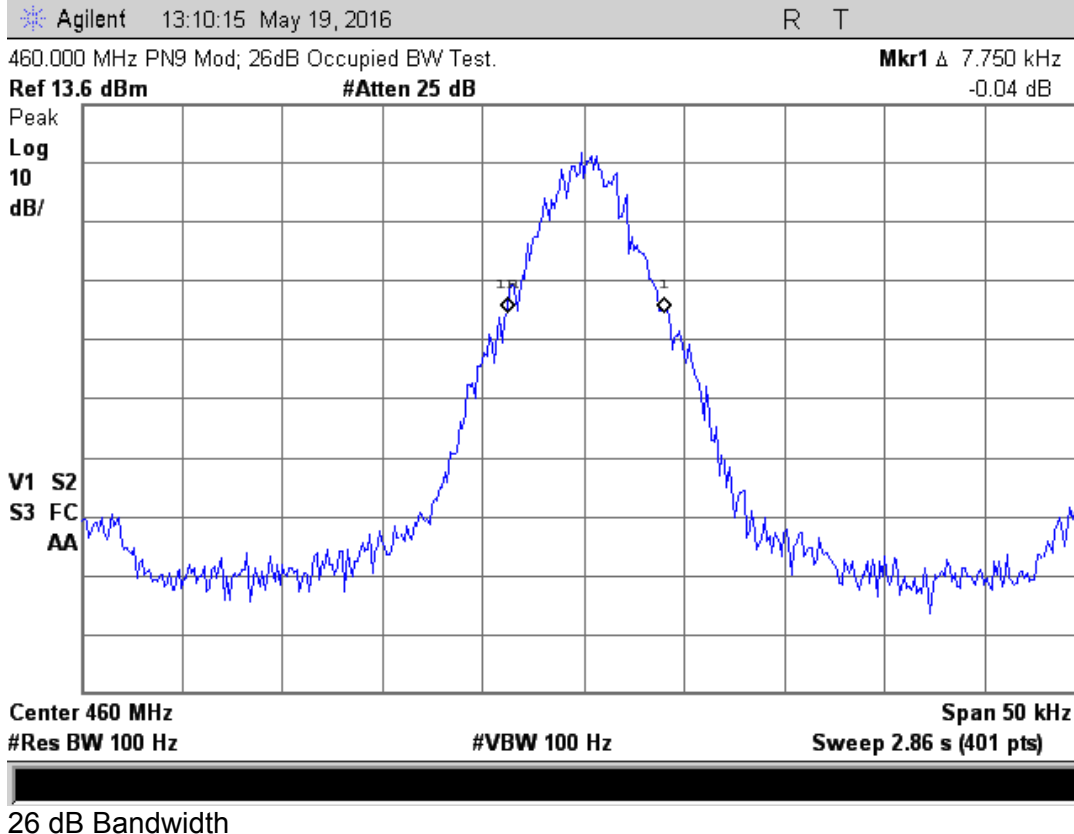
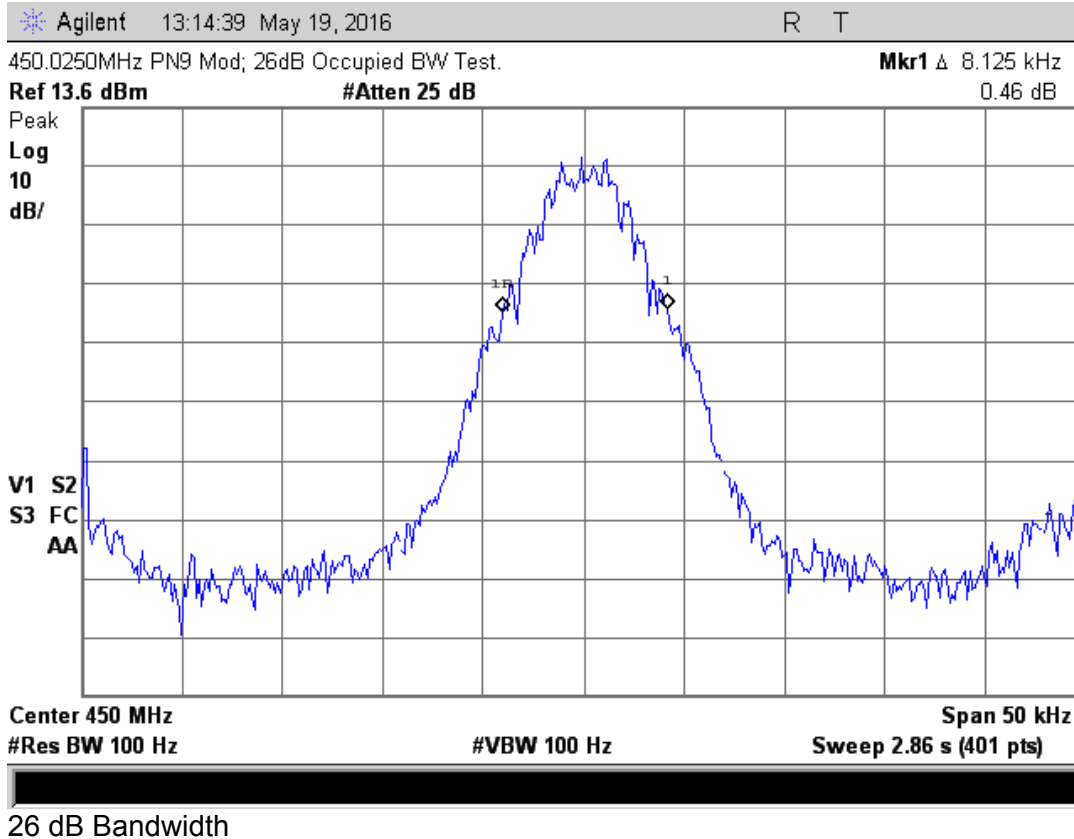
The 99% bandwidth was measured using the procedures of RSS-GEN section 6.6.



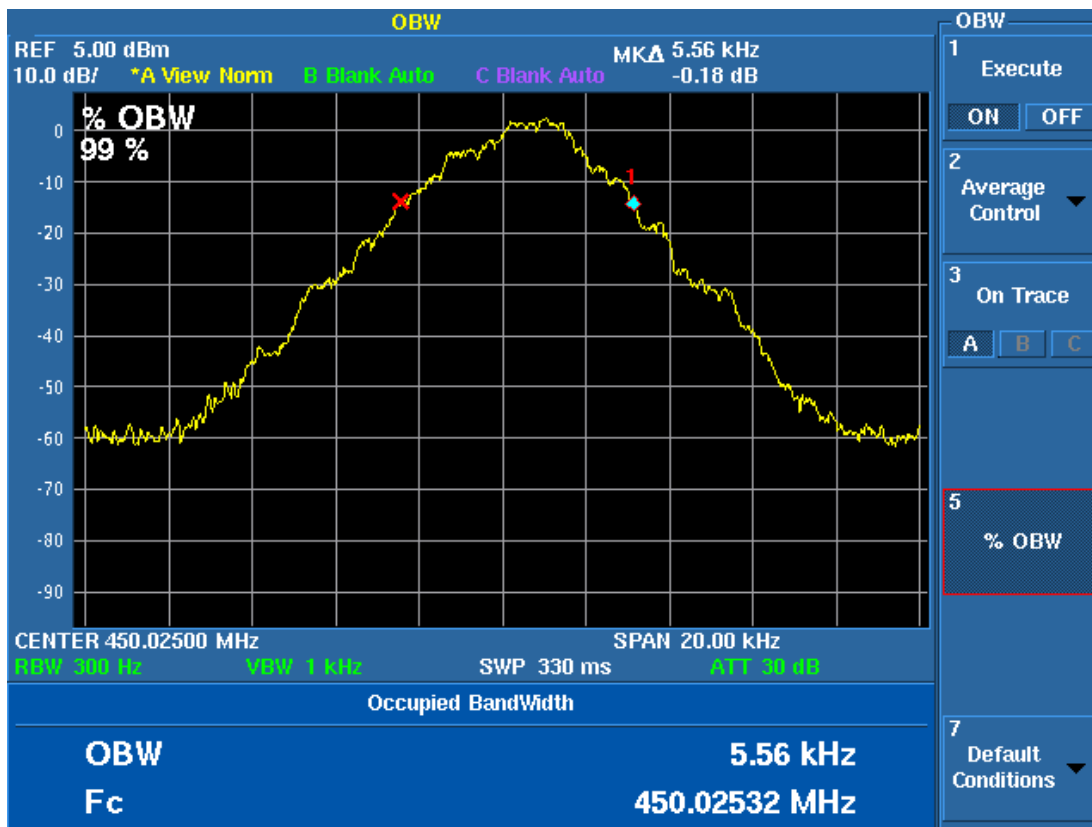
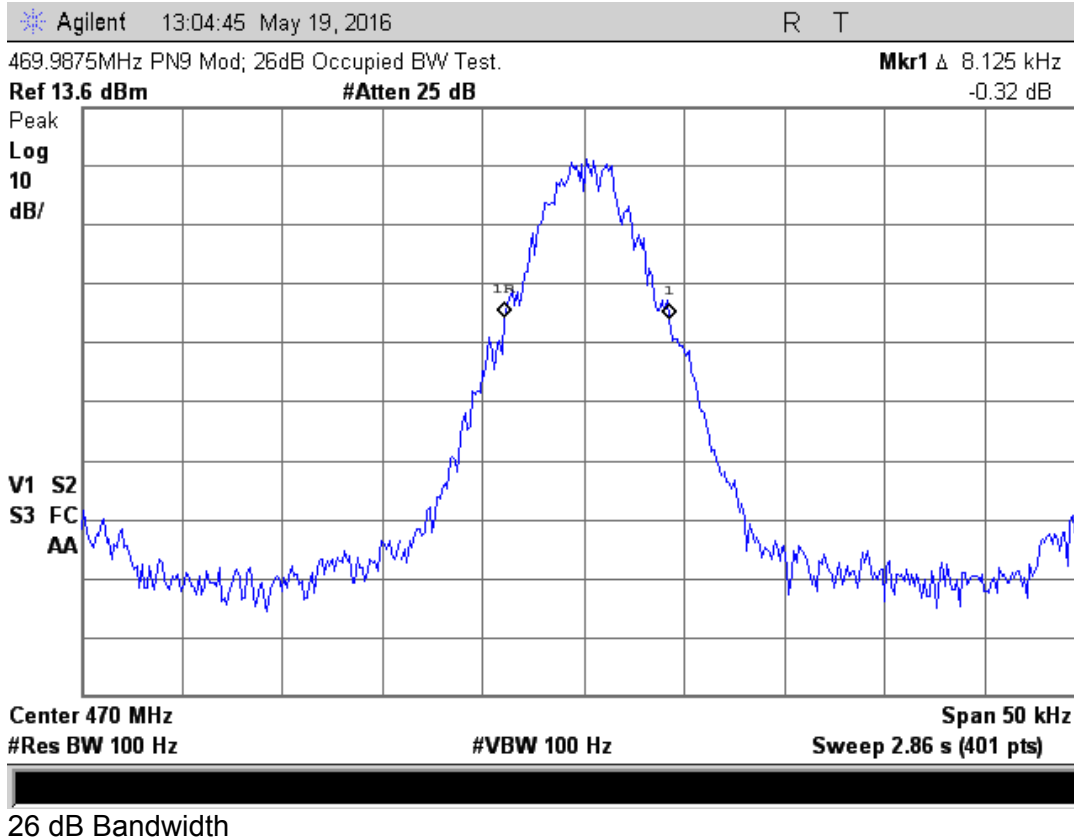
Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN



Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

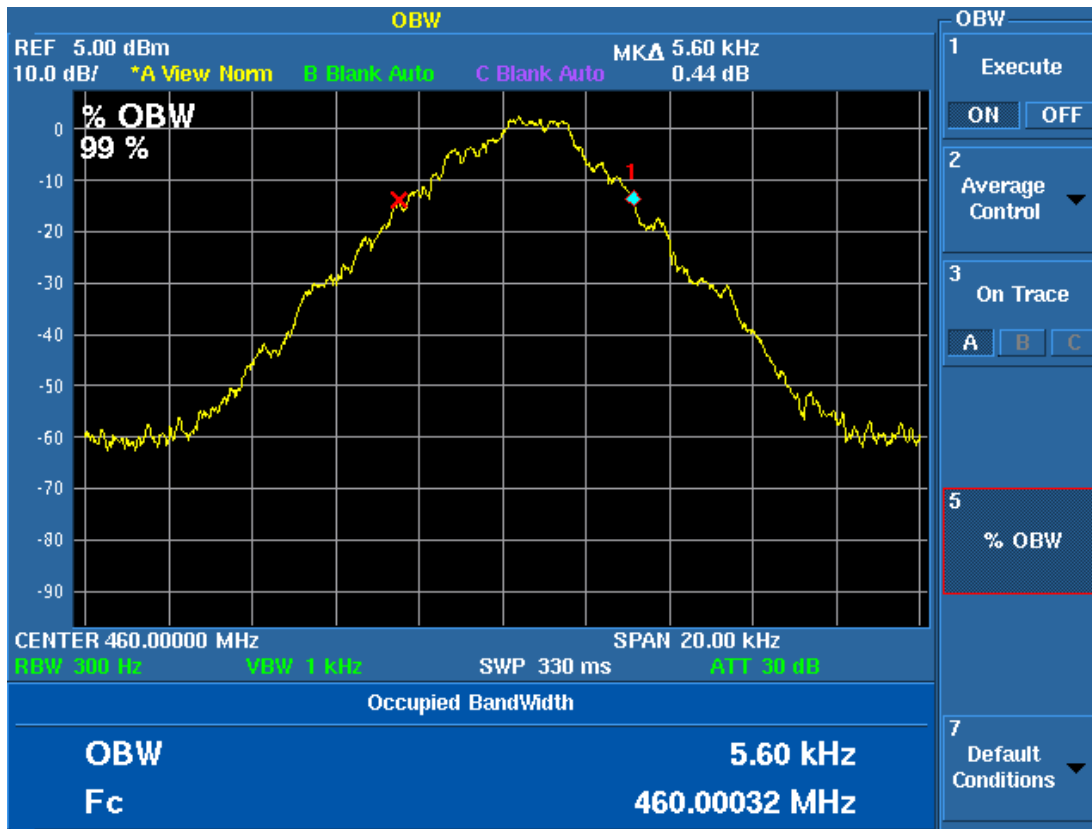


Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN

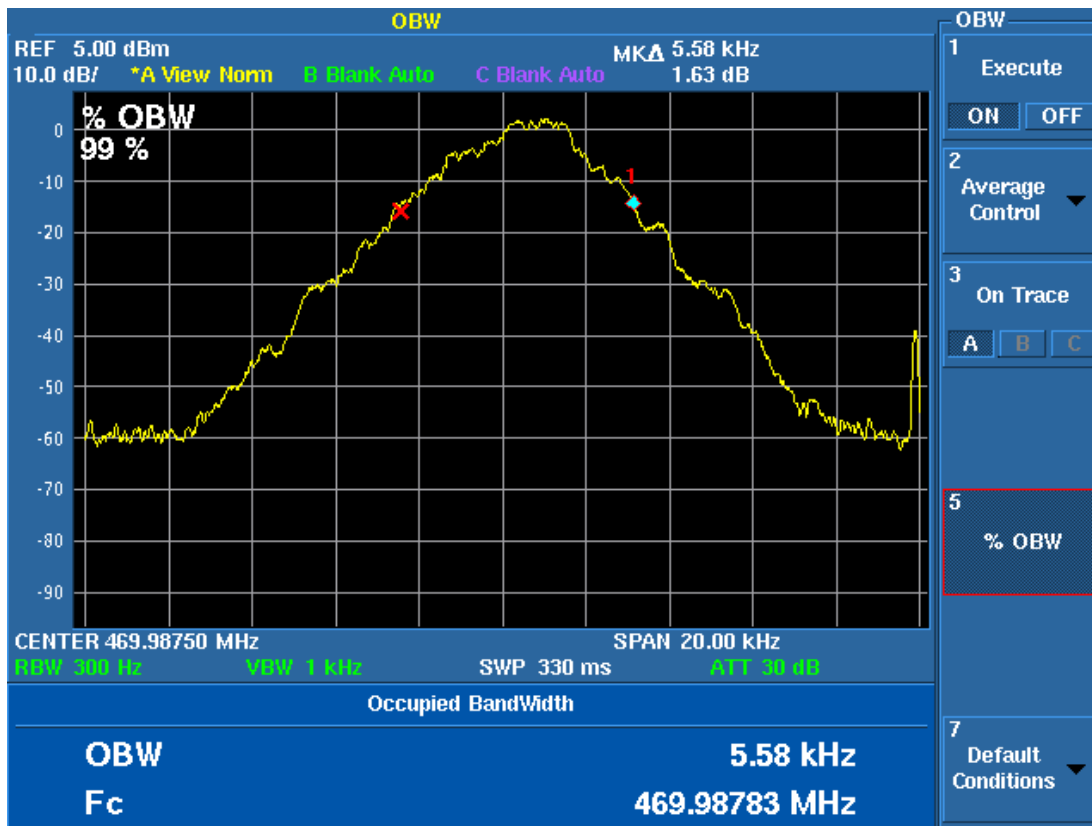


99% OBW

Test Report for the Aclara, Synergize RF Network DCU XCVR, Model 101-9975T-SRFN



99% OBW



99% OBW

11 MEASUREMENT INSTRUMENTATION UNCERTAINTY

Measurement	Uncertainty
Radiated Emissions, E-field, 3 meters, 30 to 200 MHz	3.3 dB
Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz	4.9 dB
Radiated Emissions, E-field, 3 meters, 1 to 18 GHz	4.8 dB
Bandwidth using marker delta method at a span of 50 kHz; REC-11	470 Hz
99% Occupied Bandwidth using REC-43	1% of frequency span
Conducted power REC-11 at 460 MHz	0.8 dB
Amplitude measurement 1-5000 MHz; REC-11	1.5 dB
Temperature THM-02	0.6 Deg C

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.