Anywave Communication Technologies Inc.

EMC TEST REPORT FOR

LPTV Digital ATSC Transmitter
Model: TRN-VI-500-C
(See Equipment Under Test for details)

Tested to The Following Standards:
FCC Part 74 Subpart G

Report No.: 102474-12

Date of issue: June 17, 2019

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Test Certificate # 803.01

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Anywave Communication Technologies Inc.
300 Knightsbridge Parkway, Suite 150
Lincolnshire IL, 60069

Representative:
Erin Littell - F-Squared Labs
Ted Karam - Anywave Communication Technologies, Inc.
Customer Reference Number: 4530

REPORT PREPARED BY:

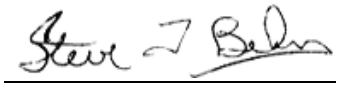
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102474

DATE OF EQUIPMENT RECEIPT: May 23, 2019
DATE(S) OF TESTING: May 23-28, 2019

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.
.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

SUMMARY OF RESULTS

Standard / Specification: FCC Part 74 Subpart G

Test Procedure	Description	Modifications	Results
74.735(b)(1)	Power Limitations	NA	Pass
74.794(a)(2)(ii)	Occupied Bandwidth / Stringent Mask	NA	Pass
74.794(b)(1)	Radio Navigation Satellite Service Bands (GPS)	NA	NA1
74.794(a)(2)(ii)	Spurious Emissions at Antenna Terminal	NA	Pass
74.794(a)(2)(ii)	Field Strength of Spurious Radiation	NA	Pass
74.761(a)/74.761(b)	Frequency Tolerance – Voltage	NA	Pass
74.761(a)/74.761(b)	Frequency Tolerance - Temperature	NA	Pass

NA = Not Applicable

NA1 = Not applicable because the EUT does not operate on TV channels 22-24 (518-536 MHz), 32-36 (578-608 MHz), 38 (614-620 MHz), or 65-69 (776-806 MHz)

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

The 500W V1 ATSC Transmitter System, Model: TRN-VI-500-C consists of the following components under test.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
5X+ Exciter	Anywave Communication Technologies Inc.	EXC-5X+C	1812144015970
Controller Module	Anywave Communication Technologies Inc.	CTL-V-C	1811100030202
500W VHF Band I PA - ATSC	Anywave Communication Technologies Inc.	AMP-VI-16-M-C	1809100010101
700W 6-pole VHF Band I CH5 (76-82MHz) BPF	COM-TECH	A-HR6PP110A-A005	1846-212030

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	8VSB (ATSC)
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	NA. Device is not sold with antenna.
Antenna Connection Type:	External Connector 7/16 DIN
Nominal Input Voltage:	Exciter and Controller, 120Vac 60Hz Power Amplifier, 240Vac 60Hz
Firmware / Software used for Test:	Controller code revision: MCU: V2.4-181110 Exciter code revisions: MCU: V5.2AW_180608, FPGA:V2.2A_I_161107

General Test Setup

Test Conditions / Notes
The equipment under test (EUT) consists of an exciter, controller, power amplifier and band-pass filter. The connections are as follows: Power amplifier and controller LAN port to Ethernet switch via cat 5E UTP. Exciter Remote2 port to Ethernet switch via cat 5E UTP. RS-232 to RS-485 adapter to RS-485 cable connected from exciter REMOTE 1 to controller ERS485 A. RS-485 cable connected from controller PRS4851 to power amplifier RS485. Exciter RF OUT to controller RF IN A via coaxial cable. Exciter Feedback RF IN A to BPF Output directional coupler fwd port via coaxial cable. Exciter Feedback RF IN B to BPF Input directional coupler fwd port via coaxial cable. Controller RF OUT 2 to power amplifier RF IN via coaxial cable. Controller REFL IN port to power amplifier output directional coupler refl port via coaxial cable. Controller FWD IN port to power amplifier output directional coupler fwd port via coaxial cable. Power amplifier directional coupler output to directional coupler at input of BPF via coaxial cable. BPF directional coupler output to high power attenuator via coaxial cable. The exciter is setup on channel 5 (79MHz).

FCC Part 74 Subpart G

74.735(b)(1) Power Limitations

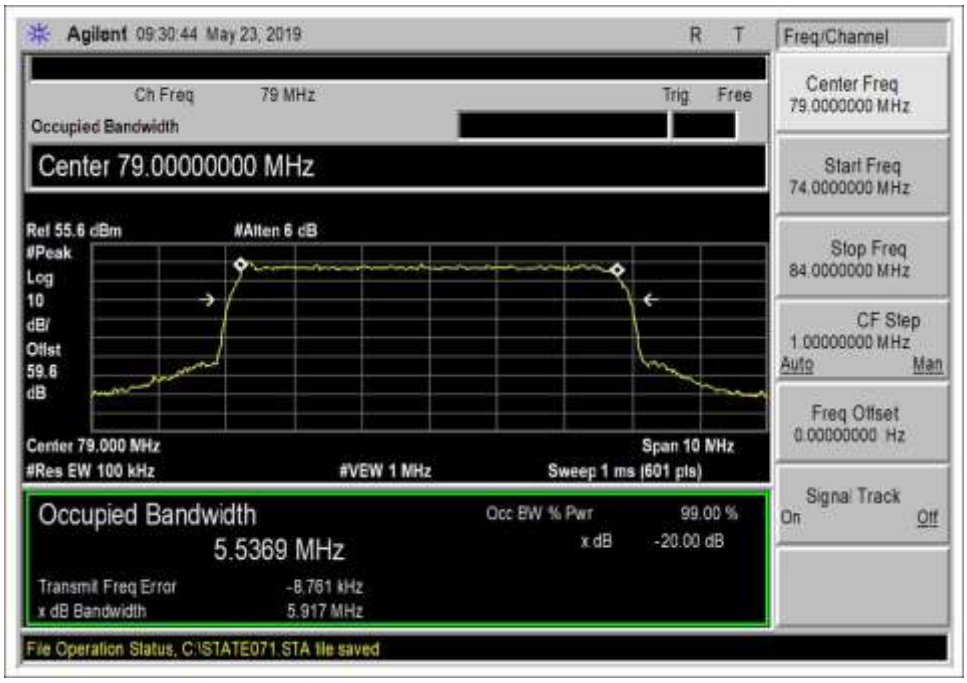
Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.26-2015 5.2.4.4	Test Date(s):	5/23/2019
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	54

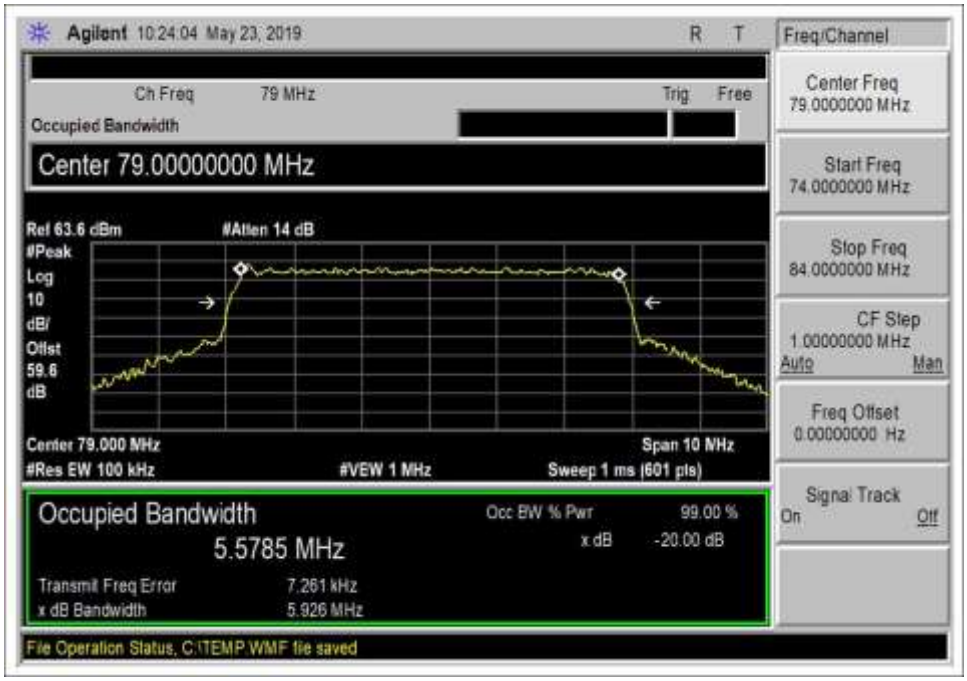
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
P06978	Cable	Huber & Suhner Inc.	Sucoflex 104A	3/31/2018	3/31/2020
03719	Attenuator	Weinschel	82-30-34	4/23/2019	4/23/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019

Test Data Summary					
Frequency (MHz)	**Modulation**	**Rated Power (dBm)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
79	8VSB	50.0	50.0	≤64.8	Pass
79	8VSB	57.0	57.0	≤64.8	Pass

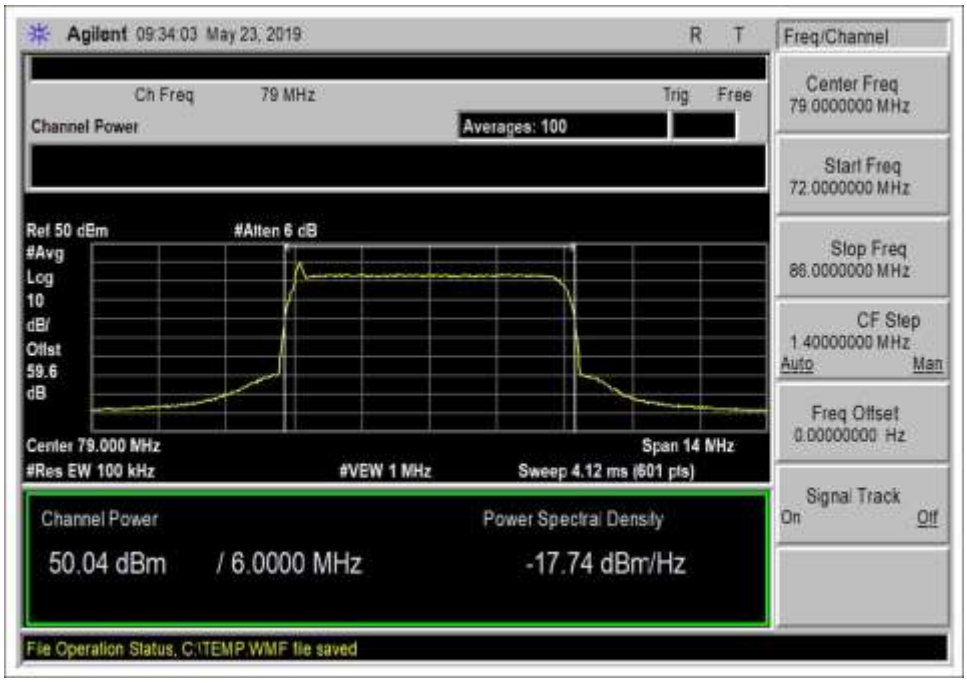
Plots



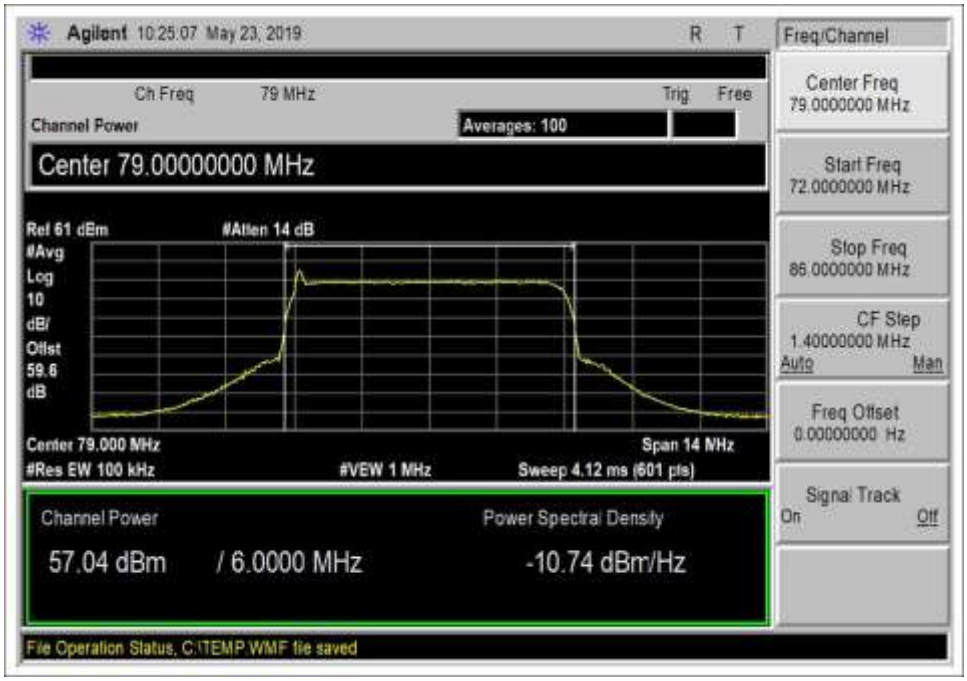
99% 100W



99% 500W



RF Power Out 100W



RF Power Out 500W

Test Setup Photo(s)

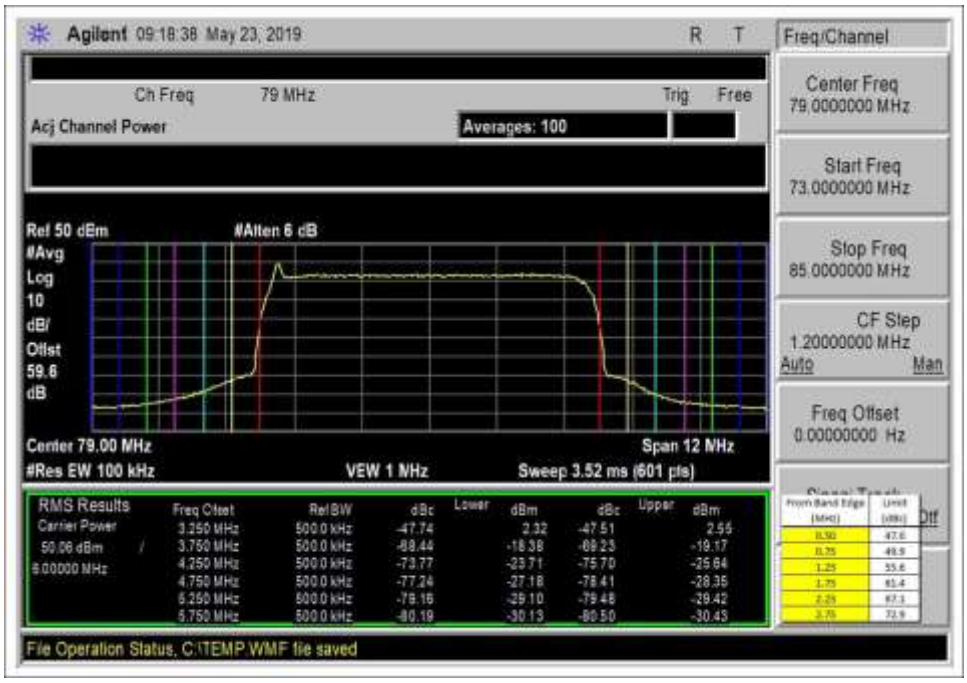
74.794(a)(2)(ii) Occupied Bandwidth / Stringent Mask

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.26-2015 5.4.4 DA 05-1321-2005	Test Date(s):	5/23/2019
Configuration:	1		
Limit:	(ii) Stringent mask. In the first 500 kHz from the channel edges, emissions must be attenuated no less than 47 dB. More than 3 MHz from the channel edges, emissions must be attenuated no less than 76 dB. At any frequency between 0.5 and 3 MHz from the channel edges, emissions must be attenuated no less than the value determined by the following formula: A(dB) = 47 + 11.5 (Δf-0.5)		

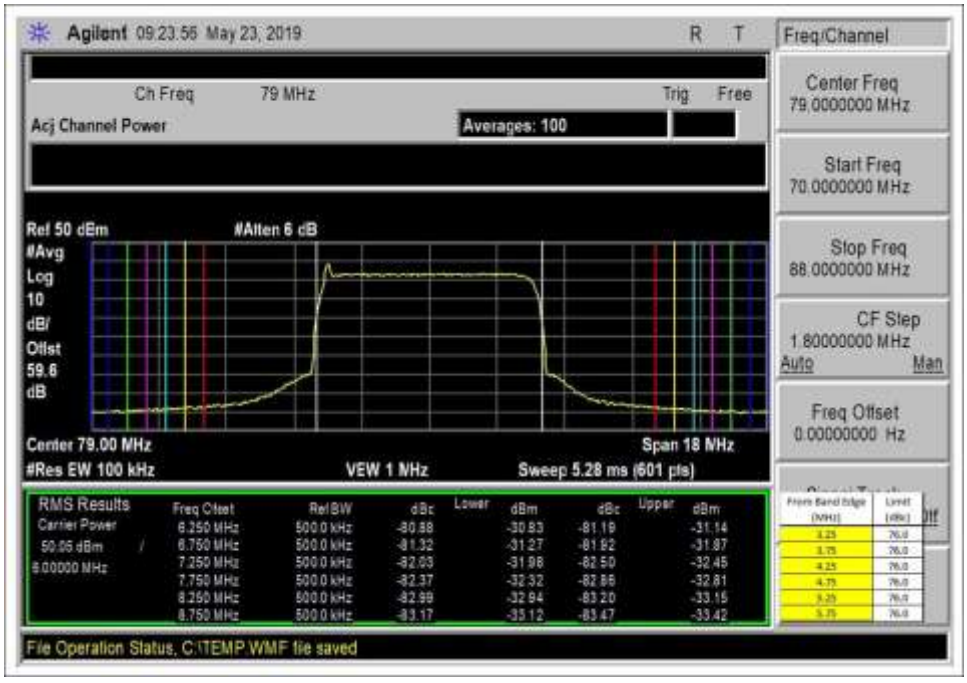
Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	54

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
P06978	Cable	Huber & Suhner Inc.	Sucoflex 104A	3/31/2018	3/31/2020
03719	Attenuator	Weinschel	82-30-34	4/23/2019	4/23/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019

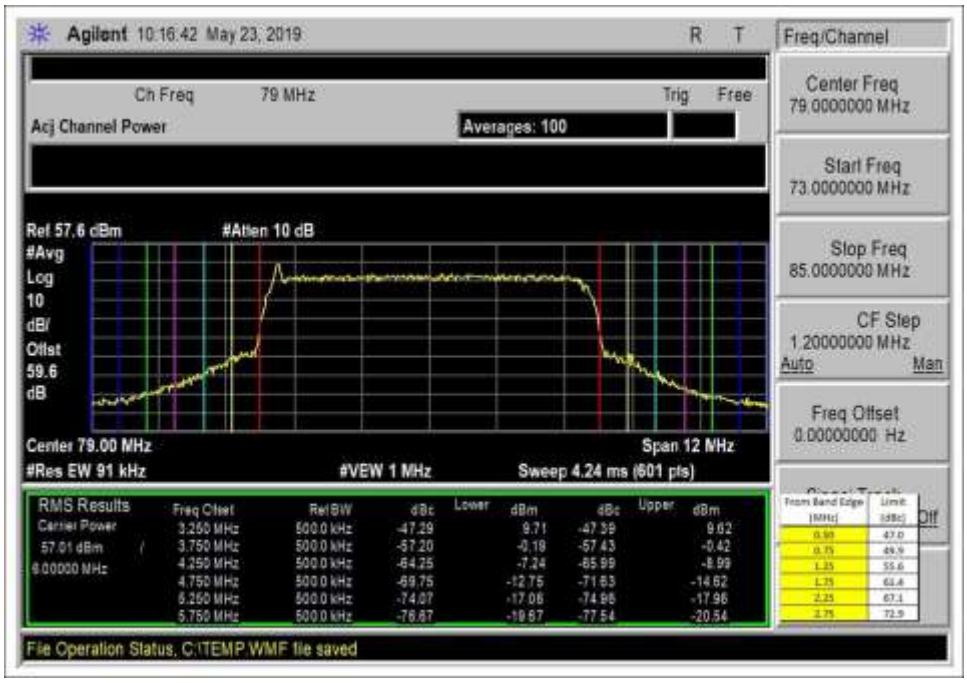
Emissions Mask



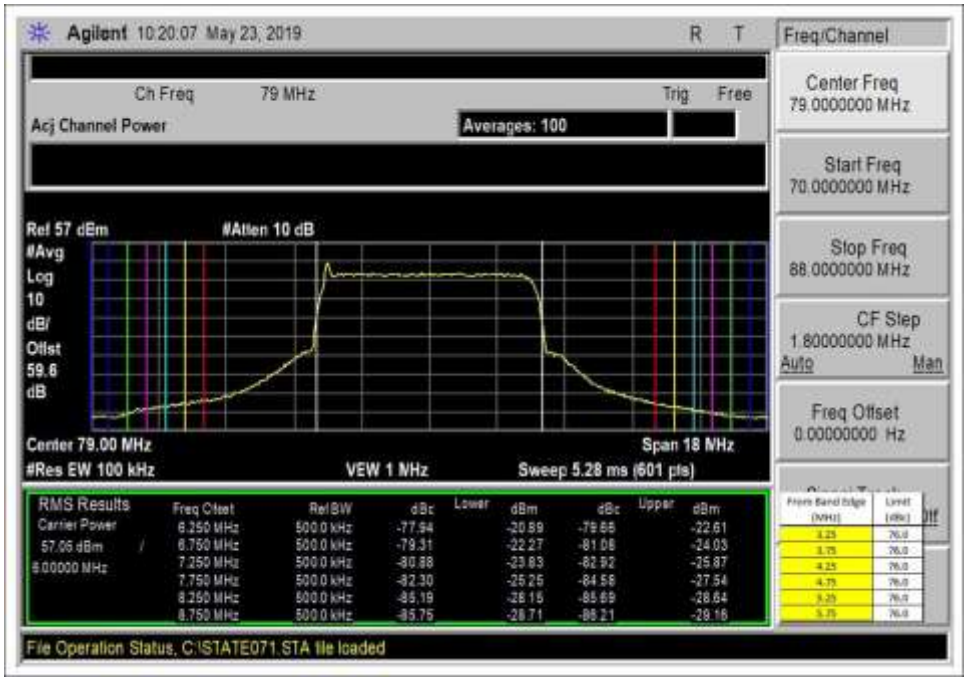
100W 100kHz_3-6MHz



100W 100kHz_6-9MHz



500W 91kHz_3-6MHz



500W 100kHz_6-9MHz

Test Setup Photo(s)

74.794(a)(2)(ii) Spurious Emissions at Antenna Terminal

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.26-2015 5.7 DA 05-1321-2005	Test Date(s):	5/23/2019
Configuration:	1		
Limit Line Calculation:	74.794(a)(2)(ii) Digital emissions. Stringent Mask. Stringent mask. Emissions more than 3 MHz from the channel edges, emissions must be attenuated no less than 76 dB. dBm = 10 Log (P) where P is in mW 100 Watts = 50.0 dBm 500 Watts = 57.0 dBm 100 Watts limit line = 50.0 – 76 = -26 dBm 500 Watts limit line = 57.0 – 76 = -19 dBm		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	54

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
P06978	Cable	Huber & Suhner Inc.	Sucoflex 104A	3/31/2018	3/31/2020
03719	Attenuator	Weinschel	82-30-34	4/23/2019	4/23/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019
C00138	VHF B.I-II Bandpass Filter	COM-TECH	A-HR6P110A-A005	5/22/2019	5/22/2021
C00136	79MHz DC/Cable	Generic	NA	5/20/2019	5/20/2021

Test Data

Test Location:	CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714 993-6112		
Customer:	**Anywave Communication Technologies Inc.**		
Specification:	**FCC 74.794(a)(2)(ii)**		
Work Order #:	**102474**	Date:	5/23/2019
Test Type:	**Conducted Emissions**	Time:	15:42:23
Tested By:	S. Yamamoto	Sequence#:	5
Software:	EMITest 5.03.12		120Vac 60Hz/240Vac 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) consists of an exciter, controller, power amplifier and band-pass filter. The connections are as follows:

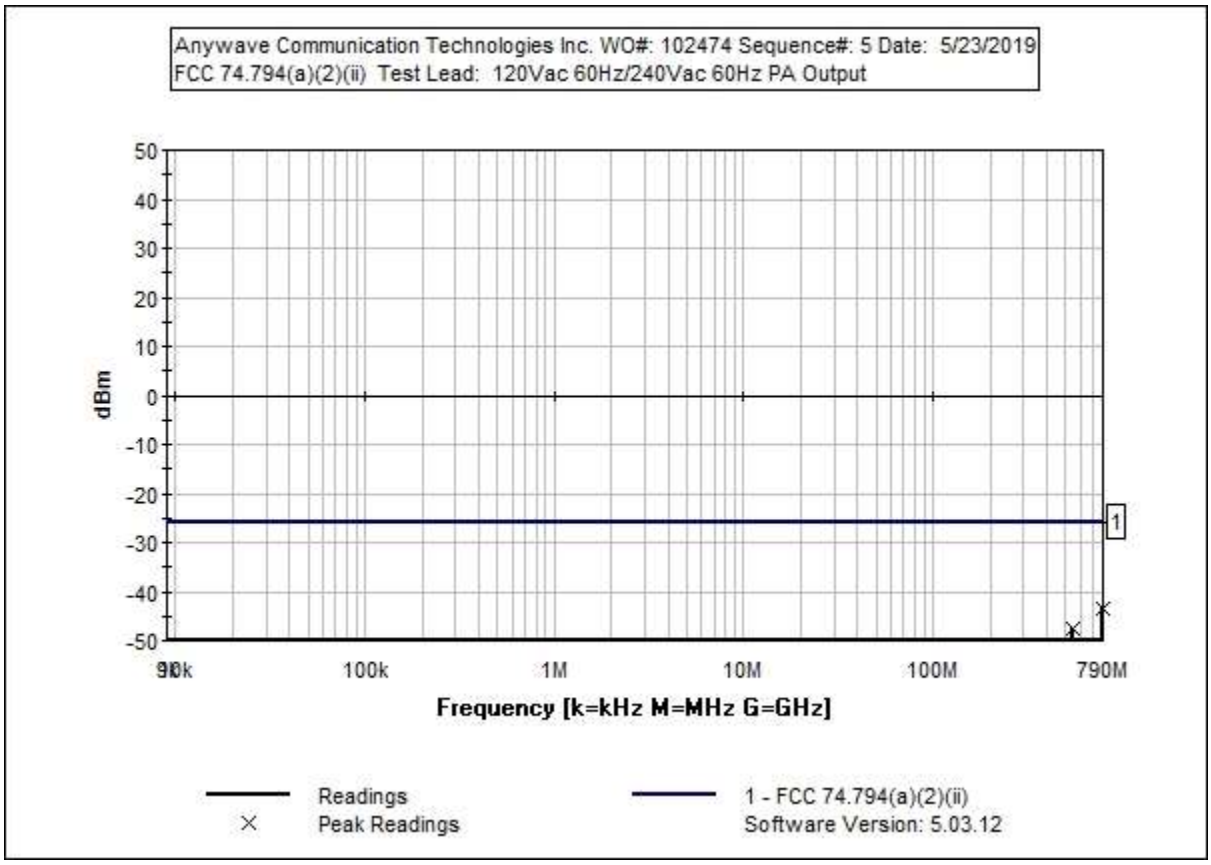
RS-232 to RS-485 adapter to RS-485 cable connected from exciter REMOTE 1 to controller ERS485 A.
RS-485 cable connected from controller PRS4851 to power amplifier RS485.
Exciter RF OUT to controller RF IN A via coaxial cable.
Exciter Feedback RF IN A to BPF Output directional coupler fwd port via coaxial cable.
Exciter Feedback RF IN B to BPF Input directional coupler fwd port via coaxial cable.
Controller RF OUT 2 to power amplifier RF IN via coaxial cable.
Controller REFL IN port to power amplifier output directional coupler refl port via coaxial cable.
Controller FWD IN port to power amplifier output directional coupler fwd port via coaxial cable.
Power amplifier directional coupler output to directional coupler at input of BPF via coaxial cable.
BPF directional coupler output to high power attenuator via coaxial cable.
The exciter is setup on channel 5 (79MHz). Test levels are both 100W and 500W output.

The RF OUT of the amplifier is connected to the spectrum analyzer via two high power attenuators. (note the band pass filter is NOT installed for this measurement,)

Recoded measurement is corrected with respect to attenuation of the Band Pass Filter as determined from separate insertion loss measurement.

Frequency range of test 9kHz to 800MHz.
Measurement bandwidth = 500kHz
Voltage to the exciter and controller 120Vac 60Hz.
Voltage to the power amplifier 240Vac 60Hz.

This data sheet is for **100W output power.**
Temperature: 20°C, Humidity: 54%, Pressure: 99kPa.
Site D.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T1	ANP06978	Cable	Sucoflex 104A	3/31/2018	3/31/2020
T2	AN03719	Attenuator	82-30-34	4/23/2019	4/23/2021
T3	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019
T4	ANC00138	Band Pass Filter	LDF-50	5/22/2019	5/22/2021
T5	ANC00136	Cable	RG-142	5/20/2019	5/20/2021

Measurement Data: Reading listed by margin. Test Lead: PA Output

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBm	dBm	dB	Ant
1	790.000M	-92.4	+0.3 +0.3	+29.7	+29.6	-10.8	+0.0	-43.3	-26.0 PA Output with BPF correction factors added	-17.3	PA Ou
2	553.000M	-92.3	+0.2 +0.2	+29.8	+29.6	-15.0	+0.0	-47.5	-26.0 PA Output with BPF correction factors added	-21.5	PA Ou

Test Location:	CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714 993-6112		
Customer:	**Anywave Communication Technologies Inc.**		
Specification:	**FCC 74.794(a)(2)(ii)**		
Work Order #:	**102474**	Date:	5/23/2019
Test Type:	**Conducted Emissions**	Time:	14:37:21
Tested By:	S. Yamamoto	Sequence#:	3
Software:	EMITest 5.03.12		120Vac 60Hz/240Vac 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) consists of an exciter, controller, power amplifier and band-pass filter. The connections are as follows:

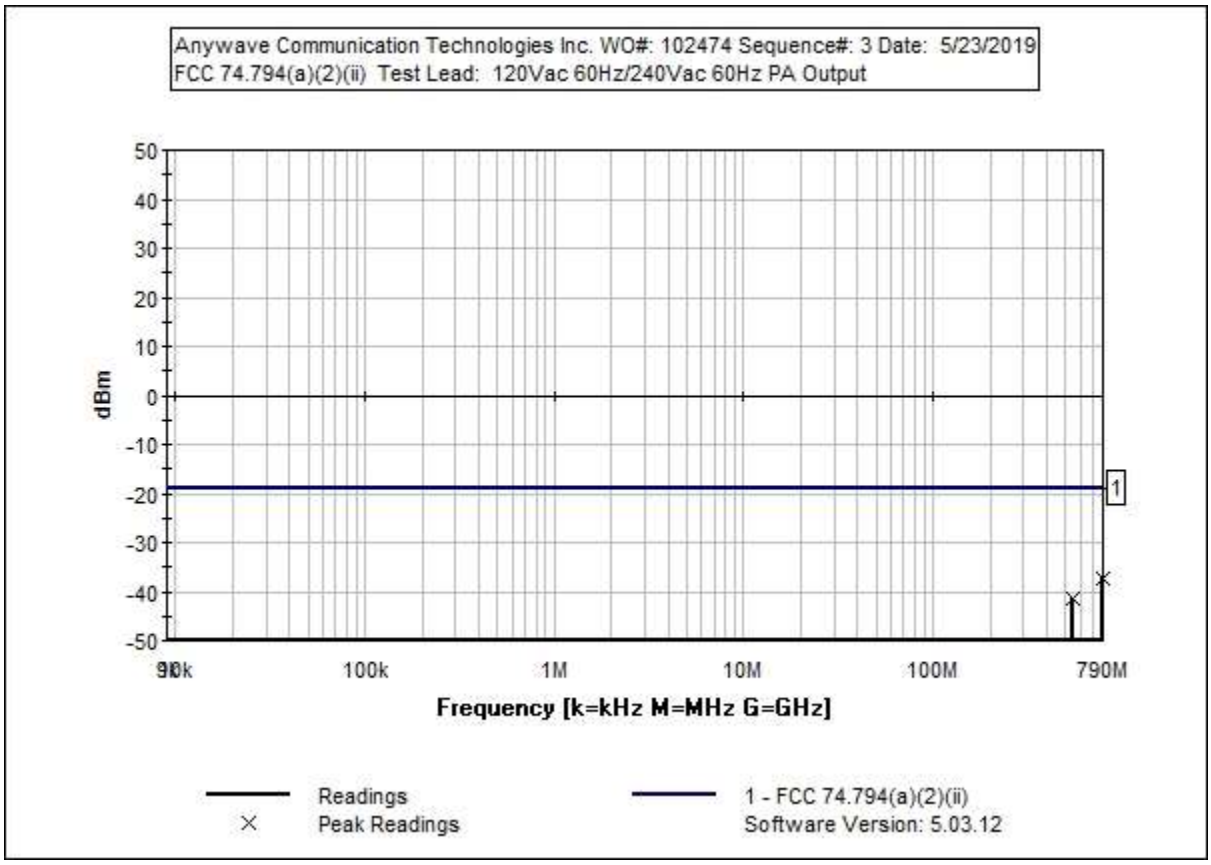
RS-232 to RS-485 adapter to RS-485 cable connected from exciter REMOTE 1 to controller ERS485 A.
RS-485 cable connected from controller PRS4851 to power amplifier RS485.
Exciter RF OUT to controller RF IN A via coaxial cable.
Exciter Feedback RF IN A to BPF Output directional coupler fwd port via coaxial cable.
Exciter Feedback RF IN B to BPF Input directional coupler fwd port via coaxial cable.
Controller RF OUT 2 to power amplifier RF IN via coaxial cable.
Controller REFL IN port to power amplifier output directional coupler refl port via coaxial cable.
Controller FWD IN port to power amplifier output directional coupler fwd port via coaxial cable.
Power amplifier directional coupler output to directional coupler at input of BPF via coaxial cable.
BPF directional coupler output to high power attenuator via coaxial cable.
The exciter is setup on channel 5 (79MHz). Test levels are both 100W and 500W output.

The RF OUT of the amplifier is connected to the spectrum analyzer via two high power attenuators. (note the band pass filter is NOT installed for this measurement,)

Recoded measurement is corrected with respect to attenuation of the Band Pass Filter as determined from separate insertion loss measurement.

Frequency range of test 9kHz to 800MHz.
Measurement bandwidth = 500kHz
Voltage to the exciter and controller 120Vac 60Hz.
Voltage to the power amplifier 240Vac 60Hz.

This data sheet is for **500W output power.**
Temperature: 20°C, Humidity: 54%, Pressure: 99kPa.
Site D.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T1	ANP06978	Cable	Sucoflex 104A	3/31/2018	3/31/2020
T2	AN03719	Attenuator	82-30-34	4/23/2019	4/23/2021
T3	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019
T4	ANC00138	Band Pass Filter	LDF-50	5/22/2019	5/22/2021
T5	ANC00136	Cable	RG-142	5/20/2019	5/20/2021

Measurement Data: Reading listed by margin. Test Lead: PA Output

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBm	dBm	dB	Ant
1	790.000M	-86.3	+0.3 +0.3	+29.7	+29.6	-10.8	+0.0	-37.2	-19.0 PA Output with BPF correction factors added	-18.2	PA Ou
2	553.000M	-86.2	+0.2 +0.2	+29.8	+29.6	-15.0	+0.0	-41.4	-19.0 PA Output with BPF correction factors added	-22.4	PA Ou

Test Setup Photo(s)

74.794(a)(2)(ii) Field Strength of Spurious Radiation

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.26-2015 5.5 DA 05-1321-2005	Test Date(s):	5/28/2019
Configuration:	1		
Limit Line Calculation	74.794(a)(2)(ii) Digital emissions. Stringent Mask. *Stringent mask.* Emissions more than 3 MHz from the channel edges, emissions must be attenuated no less than 76 dB. dBuV/m = 20 Log ($1x10^6$(SQRT(30P))/d)) where P is in watts and d is in meters 100 Watts at a test distance of three meters = 145.2 dBuV/m 500 Watts at a test distance of three meters = 152.2 dBuV/m 100 Watts limit line for a test distance of three meters = 145.2 – 76 = 69.2 dBuV/m 500 Watts limit line for a test distance of three meters = 152.2 – 76 = 76.2 dBuV/m		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	42

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
P06978	Cable	Huber & Suhner Inc.	Sucoflex 104A	3/31/2018	3/31/2020
00010	Preamp	HP	8447D	2/19/2018	2/19/2020
P04382	Cable	Andrew	LDF-50	6/2/2018	6/2/2020
P05569	Cable	Pasternack	RG-214/U	12/24/2018	12/24/2020
P05283	Attenuator	Midwest Microwave	ATT-0218-06-NNN-02	4/5/2018	4/5/2020
00314	Loop Antenna	EMCO	6502	5/13/2018	5/13/2020
01994	Biconilog Antenna	Chase	CBL6111C	4/23/2018	4/23/2020

Test Data

Test Location:	CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714 993-6112		
Customer:	**Anywave Communication Technologies Inc.**		
Specification:	**74.794(a)(2)(ii) Radiated Spurious Emissions**		
Work Order #:	**102474**	Date:	5/28/2019
Test Type:	**Maximized Emissions**	Time:	17:53:18
Tested By:	S. Yamamoto	Sequence#:	19
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) consists of an exciter, controller, power amplifier and band-pass filter. The connections are as follows:

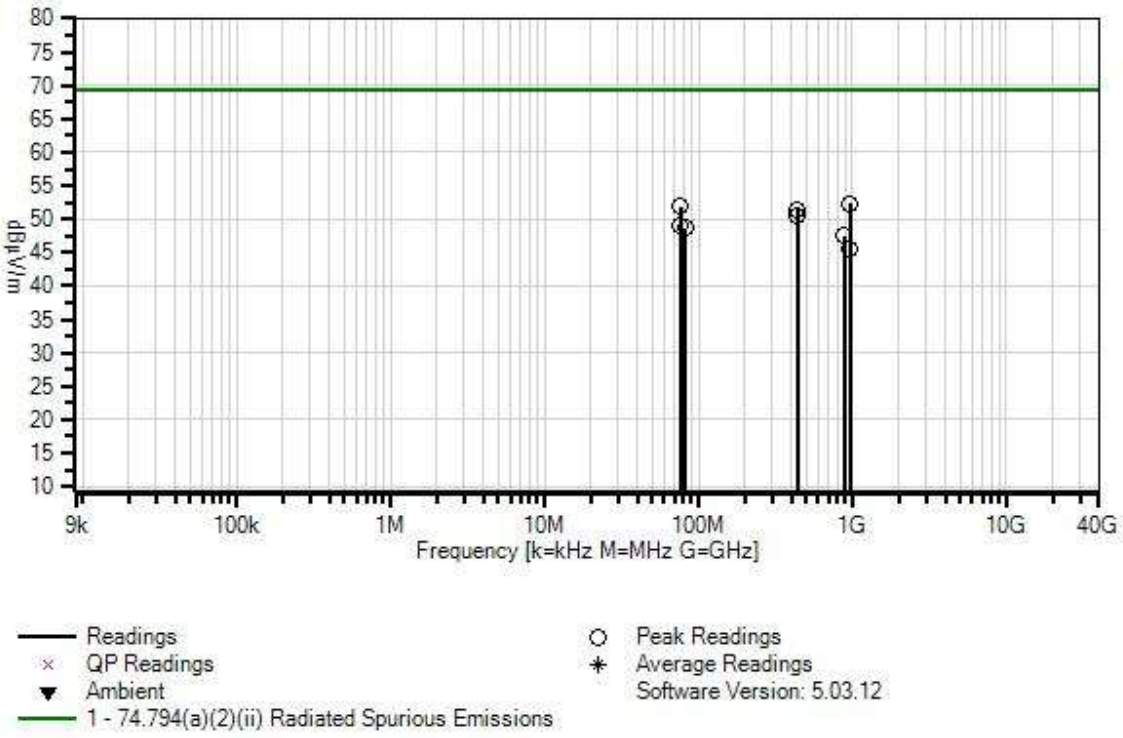
Power amplifier and controller LAN port to Ethernet switch via cat 5E UTP.
Exciter Remote2 port to Ethernet switch via cat 5E UTP.
RS-232 to RS-485 adapter to RS-485 cable connected from exciter REMOTE 1 to controller ERS485 A.
RS-485 cable connected from controller PRS4851 to power amplifier RS485.
Exciter RF OUT to controller RF IN A via coaxial cable.
Exciter Feedback RF IN A to BPF Output directional coupler fwd port via coaxial cable.
Exciter Feedback RF IN B to BPF Input directional coupler fwd port via coaxial cable.
Controller RF OUT 2 to power amplifier RF IN via coaxial cable.
Controller REFL IN port to power amplifier output directional coupler refl port via coaxial cable.
Controller FWD IN port to power amplifier output directional coupler fwd port via coaxial cable.
Power amplifier directional coupler output to directional coupler at input of BPF via coaxial cable.
BPF directional coupler output to high power attenuator via coaxial cable.
The exciter is setup on channel 5 (79MHz).

Frequency range of test 9kHz to 1000MHz. 9kHz to 150kHz, RBW=200Hz, VBW=1kHz.150kHz to 30MHz, RBW=9kHz, VBW=30kHz .30M-1000MHz, RBW=120kHz, VBW=1.2MHz.
Test data adjustment is for 120kHz reference bandwidth to 500kHz reference bandwidth
Voltage to the exciter and controller 120Vac 60Hz.
Voltage to the power amplifier 240Vac 60Hz.

Test method ANSI C63.4 2014.
Temperature: 20°C, Humidity: 42%, Pressure: 99kPa. Site D.

Channel 5. Center Frequency 79MHz.
100 Watt Output.

Anywave Communication Technologies Inc. WO#: 102474 Sequence#: 19 Date: 5/28/2019
74.794(a)(2)(ii) Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T1	ANP06978	Cable	Sucoflex 104A	3/31/2018	3/31/2020
T2	AN00010	Preamp	8447D	2/19/2018	2/19/2020
T3	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T4	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/24/2018	12/24/2020
T5	ANP05283	Attenuator	ATT-0218-06-NNN-02	4/5/2018	4/5/2020
T6	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T7	AN74.794 (a)(3)	Test Data Adjustment	NA	5/22/2019	5/22/2023

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	959.999M	42.2	+0.3 +5.9	-27.4 +24.1	+3.4 +6.2	+3.8	+0.0	58.5	69.2	-10.7	Vert
2	76.310M	64.5	+0.1 +5.8	-27.0 +6.8	+0.8 +6.2	+0.9	+0.0	58.1	69.2	-11.1	Vert
3	440.002M	51.4	+0.2 +5.8	-27.5 +16.9	+2.2 +6.2	+2.4	+0.0	57.6	69.2	-11.6	Horiz
4	440.000M	50.4	+0.2 +5.8	-27.5 +16.9	+2.2 +6.2	+2.4	+0.0	56.6	69.2	-12.6	Vert
5	76.310M	61.8	+0.1 +5.8	-27.0 +6.8	+0.8 +6.2	+0.9	+0.0	55.4	69.2	-13.8	Horiz
6	81.700M	60.6	+0.1 +5.8	-27.0 +7.5	+0.8 +6.2	+0.9	+0.0	54.9	69.2	-14.3	Vert
7	880.000M	38.8	+0.3 +5.9	-27.5 +23.2	+3.2 +6.2	+3.6	+0.0	53.7	69.2	-15.5	Vert
8	959.999M	35.3	+0.3 +5.9	-27.4 +24.1	+3.4 +6.2	+3.8	+0.0	51.6	69.2	-17.6	Horiz

Test Location:	CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714 993-6112		
Customer:	**Anywave Communication Technologies Inc.**		
Specification:	**74.794(a)(2)(ii) Radiated Spurious Emissions**		
Work Order #:	**102474**	Date:	5/28/2019
Test Type:	**Maximized Emissions**	Time:	17:33:41
Tested By:	S. Yamamoto	Sequence#:	20
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) consists of an exciter, controller, power amplifier and band-pass filter. The connections are as follows:

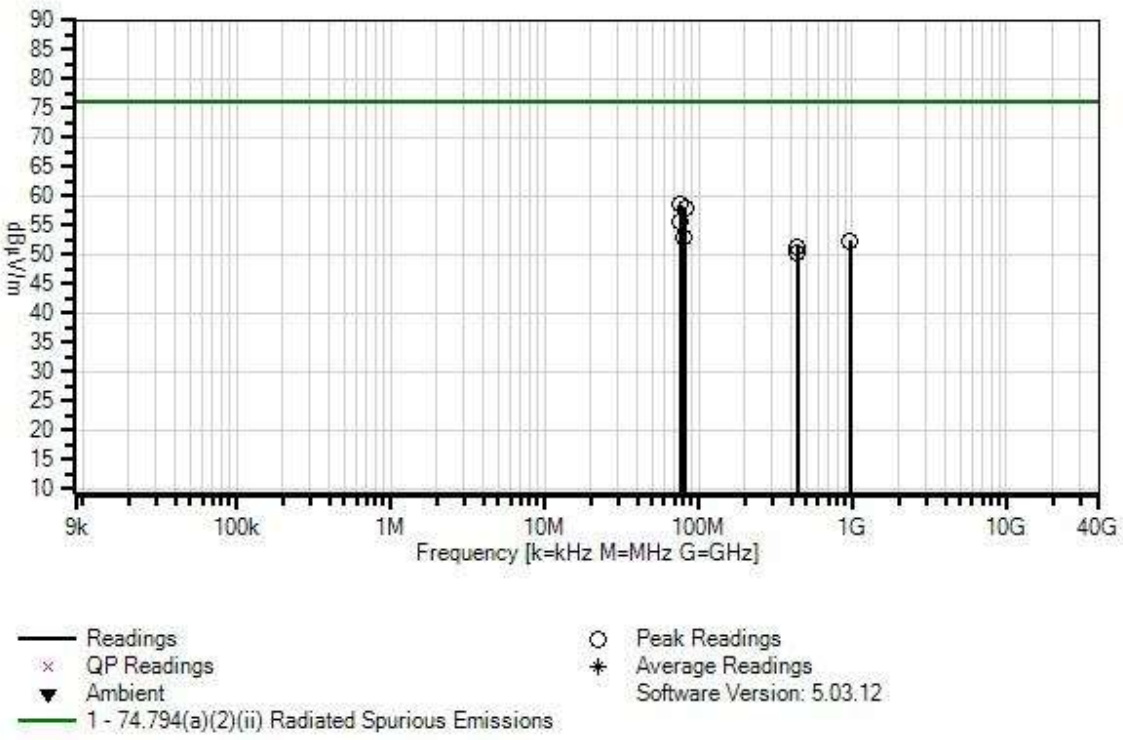
Power amplifier and controller LAN port to Ethernet switch via cat 5E UTP.
Exciter Remote2 port to Ethernet switch via cat 5E UTP.
RS-232 to RS-485 adapter to RS-485 cable connected from exciter REMOTE 1 to controller ERS485 A.
RS-485 cable connected from controller PRS4851 to power amplifier RS485.
Exciter RF OUT to controller RF IN A via coaxial cable.
Exciter Feedback RF IN A to BPF Output directional coupler fwd port via coaxial cable.
Exciter Feedback RF IN B to BPF Input directional coupler fwd port via coaxial cable.
Controller RF OUT 2 to power amplifier RF IN via coaxial cable.
Controller REFL IN port to power amplifier output directional coupler refl port via coaxial cable.
Controller FWD IN port to power amplifier output directional coupler fwd port via coaxial cable.
Power amplifier directional coupler output to directional coupler at input of BPF via coaxial cable.
BPF directional coupler output to high power attenuator via coaxial cable.
The exciter is setup on channel 5 (79MHz).

Frequency range of test 9kHz to 1000MHz. 9kHz to 150kHz, RBW=200Hz, VBW=1kHz.150kHz to 30MHz, RBW=9kHz, VBW=30kHz .30M-1000MHz, RBW=120kHz, VBW=1.2MHz.
Test data adjustment is for 120kHz reference bandwidth to 500kHz reference bandwidth
Voltage to the exciter and controller 120Vac 60Hz.
Voltage to the power amplifier 240Vac 60Hz.

Test method ANSI C63.4 2014.
Temperature: 21C, Humidity: 45%, Pressure: 99kPa. Site D.

Channel 5. Center Frequency 79MHz.
500 Watt Output.

Anywave Communication Technologies Inc. WO#: 102474 Sequence#: 20 Date: 5/28/2019
74.794(a)(2)(ii) Radiated Spurious Emissions Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T1	ANP06978	Cable	Sucoflex 104A	3/31/2018	3/31/2020
T2	AN00010	Preamp	8447D	2/19/2018	2/19/2020
T3	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T4	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/24/2018	12/24/2020
T5	ANP05283	Attenuator	ATT-0218-06-NNN-02	4/5/2018	4/5/2020
T6	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T7	AN74.794 (a)(3)	Test Data Adjustment	NA	5/22/2019	5/22/2023

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	76.309M	71.2	+0.1 +5.8	-27.0 +6.8	+0.8 +6.2	+0.9	+0.0	64.8	76.2	-11.4	Vert
2	81.680M	70.0	+0.1 +5.8	-27.0 +7.5	+0.8 +6.2	+0.9	+0.0	64.3	76.2	-11.9	Vert
3	76.309M	68.4	+0.1 +5.8	-27.0 +6.8	+0.8 +6.2	+0.9	+0.0	62.0	76.2	-14.2	Horiz
4	79.660M	65.3	+0.1 +5.8	-27.0 +7.2	+0.8 +6.2	+0.9	+0.0	59.3	76.2	-16.9	Horiz
5	959.999M	42.2	+0.3 +5.9	-27.4 +24.1	+3.4 +6.2	+3.8	+0.0	58.5	76.2	-17.7	Vert
6	440.002M	51.4	+0.2 +5.8	-27.5 +16.9	+2.2 +6.2	+2.4	+0.0	57.6	76.2	-18.6	Horiz
7	440.000M	50.4	+0.2 +5.8	-27.5 +16.9	+2.2 +6.2	+2.4	+0.0	56.6	76.2	-19.6	Vert

Test Setup Photo(s)

74.761(a)/74.761(b) Frequency Tolerance

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto/E. Wong
Test Method:	Part 74.761(a)/ Part 74.761(b) Part 2.1055	Test Date(s):	5/24/2019
Configuration:	1		
Limit:	74.761 (a) The visual carrier shall be maintained to within 0.02 percent of the assigned visual carrier frequency for transmitters rated at not more than 100 watts peak visual power. 74.761 (b) The visual carrier shall be maintained to within 0.002 percent of the assigned visual carrier frequency for transmitters rated at more than 100 watts peak visual power.		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	45

Test Equipment - Voltage					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
07164	Multimeter	Fluke	8845A/G	7/27/2017	7/27/2019
03640	AC Power Source	PPS	360-AMX	2/22/2019	2/22/2020
P06664	Cable	Gore	PHASEFLEX FJR01N01036.0	3/31/2018	3/31/2020

Test Equipment - Temperature					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
P05947*	Thermometer	Fluke	51	5/11/2018	5/11/2020
NA	Temperature chamber	Thermaltron	MK8	NA	NA
NA	Temperature chamber	Cincinnati Sub Zero	ZH-32-22-H/AC	NA	NA

*Note: Temperature measurement recorded with CKC property AN05947

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	120 VAC
$V_{Minimum}$:	102.00 VAC
$V_{Maximum}$:	138.00 VAC

Measurements performed according to manufacturer specification.

Parameter	Value
$T_{Nominal}$:	+20C
$T_{Minimum}$:	-10C
$T_{Maximum}$:	+50C

Test Data - Voltage and Temperature

Temperature Variations			
Channel Frequency*:		(MHz)	Dev (%)
		76.308674000	
Temp (C)	Voltage		
-10	120	76.308690000	-0.00002
0	120	76.308657000	0.00002
10	120	76.308691000	-0.00002
20	120	76.308674000	0.00000
30	120	76.308691000	-0.00002
40	120	76.308674000	0.00000
50	120	76.308691000	-0.00002

* Frequency measurement taken at -6dB point of the pilot tone signal. Evaluation performed at the RF monitor port of the Exciter (signal source)

Voltage Variations (±15%)			
Temp (C)	Voltage	Channel 1 (MHz)	Dev (%)
20	102.0	76.308674000	0.00000
20	120.0	76.308674000	0.00000
20	138.0	76.308674000	0.00000

Max Deviation (ppm)	**+**	0.00002
Max Deviation (ppm)	**-**	0.00002
		PASS

Test Setup Photo(s)

Voltage Test Setup

Temperature Chamber Test Setup

Temperature Chamber

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.