Jinmyung Communications

REVISED EMC TEST REPORT TO 109281-12

Low Power Television Transmitter
Model: Sky3000L*

***(See Appendix A for Manufacturer Declaration)**

Tested to The Following Standards:

SpecLimit

FCC Part 74 Subpart G

Report No.: 109281-12A

Date of issue: June 18, 2024

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

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Administrative Information

Test Report Information

REPORT PREPARED FOR:

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Representative (s):
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Customer Reference Number: ACH 2-7-24

REPORT PREPARED BY:

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Project Number: 109281

DATE OF EQUIPMENT RECEIPT: March 11, 2024
DATE(S) OF TESTING: March 11-16 & 18-21, 2024

Revision History

Original: Testing of Low Power Television Transmitter, Model: Sky3000L to FCC Part 74 Subpart G.
Revision A: Update General Product Information Nominal Input Voltage. Moved the 99% BW plot to correct section page 17. Updated the Spurious Emissions at Antenna Terminal and Field Strength of Spurious Radiation Test Condition Notes. Added *****Transmit frequency note to page 39.

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.
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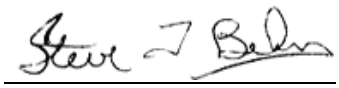


Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

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 N. Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	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(s) 74 Subpart G

Test Procedure	Description	Modifications	Results
74.735(b)(2)	Power Limitations	NA	PASS
74.794(a)(2)(ii)	Occupied Bandwidth / Stringent Mask	NA	PASS
74.794(a)(2)(ii)	Spurious Emissions at Antenna Terminal	NA	PASS
74.794(a)(2)(ii)	Field Strength of Spurious Radiation	**Mod. # 1**	Pass
74.794(b)(1)	Radio Navigation Satellite Service Bands (GPS)	NA	PASS
74.795(b)(4)	Frequency Tolerance – Voltage & Temperature	NA	PASS

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration 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
Modification 1: 480 and 240 Vac cable wrapped in aluminum foil to simulate actual installation of power cable in conduit. Copper tape added to back vent area of the amplifier module. Copper tape the cover of the amplifier module. Copper Screen added to front panel of amplifier module. Aluminum door installed on the enclosure. Enhance contact area on the seams of the aluminum door with copper tape.
See Appendix B for the photos of the modifications.

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
Test Condition 1: The EUT is placed on the turn table. Set in normal operating mode, ground bus is connected to ground. The Output of the EUT is terminated to a RF load. All I/O ports are left unpopulated as intended. Fundamental Freq: 599 MHz CH 35 The EUT is tested IAW FCC KDB 754507, maximum number of identical amplifier modules installed and operate at highest power:3000 watt/64.8dBm Conducted measurement. Frequency range of measurement = 9 kHz- 6GHz. 9kHz- 6000 MHz; RBW=510kHz, VBW=1.5 MHz Radiated measurement. Frequency range of measurement = 9 kHz- 6 GHz. 9 kH -150 kHz;RBW=200 Hz,VBW=600 Hz; 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz; 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz, 1000 MHz-6 000 MHz;RBW=510kHz,VBW=1.5MHz. Note: Bandwidth correction per 74.794 (a)(3) is applied to readings below 1GHz. 10 log (BWalternate/500) = 10 log (120/500) = 6.2dB Site D: ANSI C63.26-2015, DA 05-1321-2005 Frequency stability measured at RF out port of the Exciter.

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.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Low Power Television Transmitter	Jinmyung Communications	Sky3000L	D2308430

Support Equipment:

Device	Manufacturer	Model #	S/N
10kW Oil Cooled Test Load	Bird Electronics	8936-115	082200288

General Product Information:

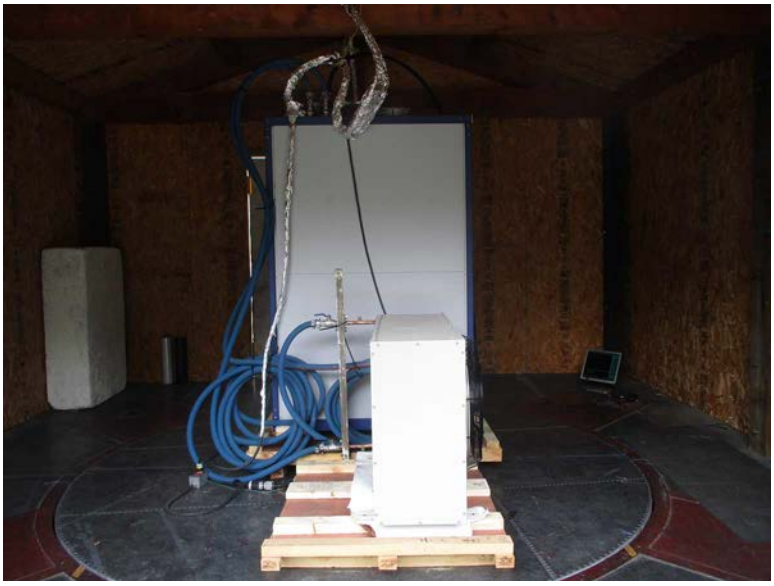
Description of EUT
Low Power Television Transmitter

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	8VSB (ATSC 1.0)
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	NA. Device is not sold with antenna.
Antenna Connection Type:	External Connector
Nominal Input Voltage:	RF section 480VAC 3 Phase Exciter 240VAC
Firmware / Software used for Test:	Controller = JM Version 3.5.6.11 Exciter = Tarball-PL3-PTTATSCMH_P3_1_02_38 HPA = JM Version HPA_FW_20210726_V3.1
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)

Sky3000L, Front View

Sky3000L, Back View



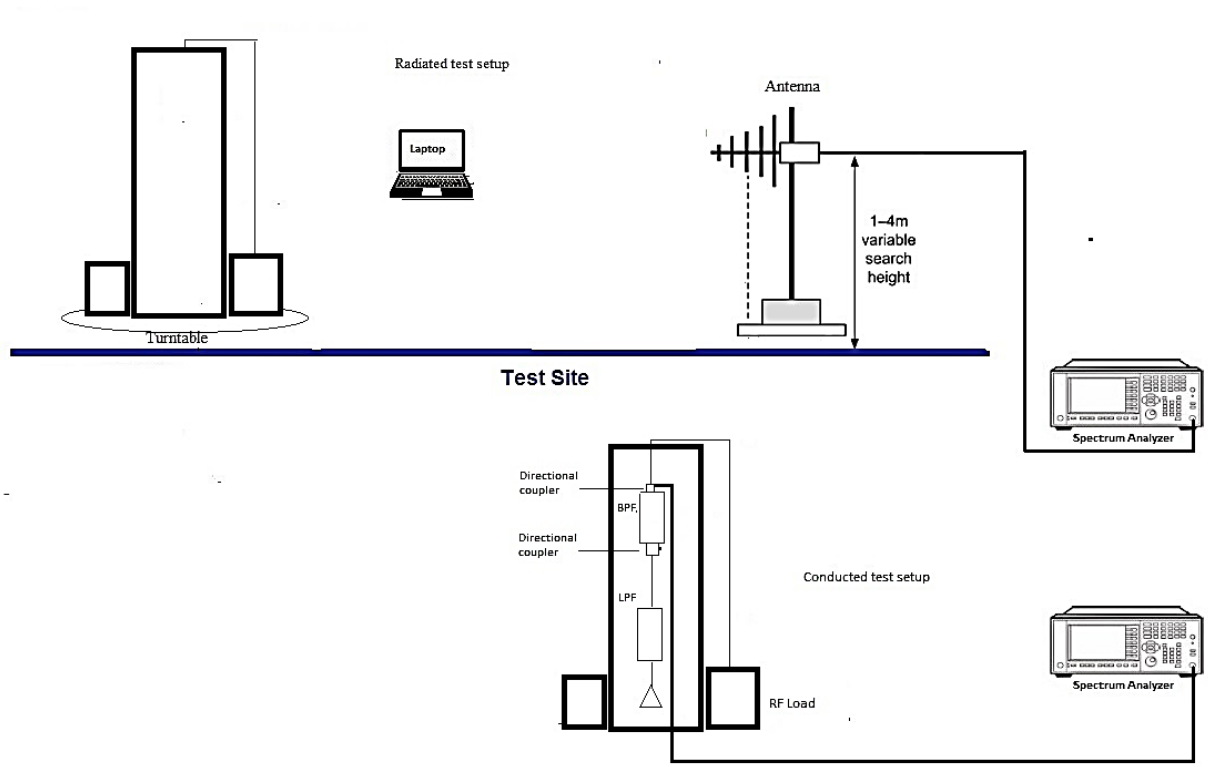
Sky3000L, Side View 1

Sky3000L, Side View 2

Support Equipment Photo(s)

Block Diagram(s) of Test Setup

Config#	Setup Description of Block Diagram
1	The EUT is placed on the turn table. Set in normal operating mode, ground bus is connected to ground. The Output of the EUT is terminated to a RF load. All I/O ports are left unpopulated as intended.



FCC PART 74 SUBPART G

74.735(b)(2) Power Limitation

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.26-2015 5.2.4.4	Test Date(s):	3/12/2024
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	17	Relative Humidity (%):	49

Test Equipment					
Asset #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	12/13/2022	12/13/2023
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	02/29/2024	02/29/2026
P08088	Cable 40 GHz	Astrolab	32022-29094K-29094K-120TC	12/01/2023	12/01/2025

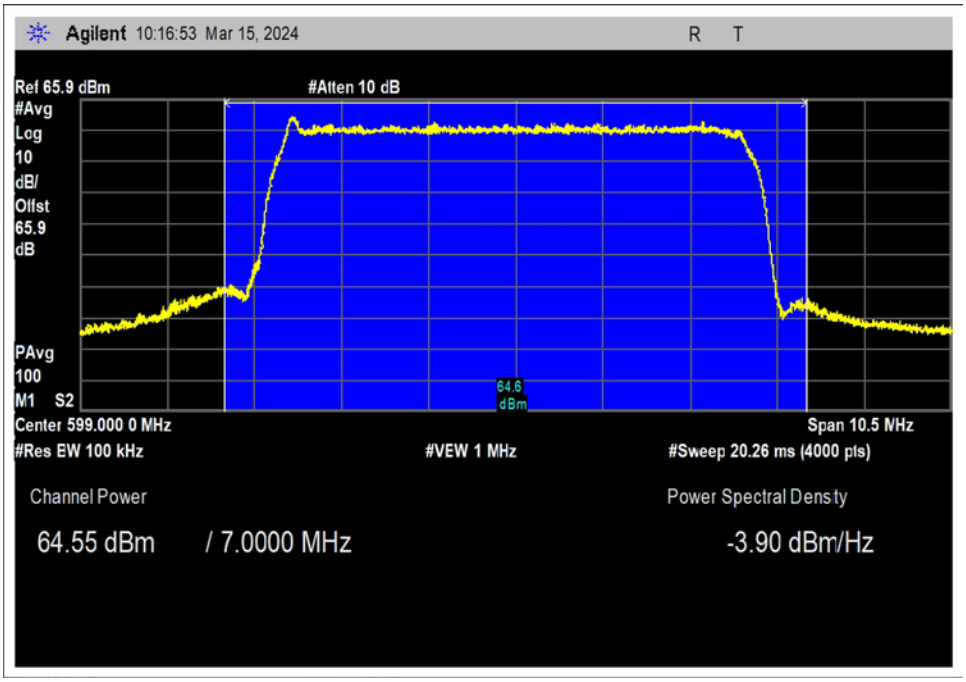
Test Data Summary					
Frequency (MHz)	**Modulation**	**Rated Power (W/ dBm)**	**Measured (W/ dBm)**	**Limit (W/dBm)**	**Results**
599 (CH35)	8VSB (ATSC 1.0)	3000 / 64.8	2884/ 64.6	≤15000 /71.8	Pass

Reported power was measured at the 55dB RF output sampling port of the band pass filter using channel power function of a spectrum analyzer. Attenuation of 55 dB sampling port at fundamental: 55.2dB.
Total correction 55.2dB+9.9dB+0.8dB= 65.9 dB

(Note: 0.5dB insertion loss of Emission mask filter is removed from the path loss factor of the Directional coupler port since the coupling port was characterized with the filter in the path.)

(b) The maximum ERP of a digital low power TV, TV translator, or TV booster station (average power) shall not exceed:
(1) 3 kW for VHF channels 2-13; and
(2) 15 kW for UHF channels 14-69.

Plot Data



RF Power

Test Setup Photo(s)

Test Setup, View 1

Test Setup, View 2

Test Setup, View 3

Output of BPF

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

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.26-2015 5.4.4 DA 05-1321-2005	Test Date(s):	3/12/2024
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	17	Relative Humidity (%):	49

Test Equipment					
Asset #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	12/13/2022	12/13/2023
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	02/29/2024	02/29/2026
P08088	Cable 40 GHz	Astrolab	32022-29094K-29094K-120TC	12/01/2023	12/01/2025

Test Data Summary

Reported occupied bandwidth/ mask was measured at the 55dB RF output sampling port of the band pass filter using channel power function of a spectrum analyzer. Attenuation of 55 dB sampling port at fundamental :55.2dB. total 55.2dB+9.9dB+0.8dB= 65.9 dB

(Note: 0.5dB insertion loss of Emission mask filter is removed from the path loss factor of the Directional coupler port since the coupling port was characterized with the filter in the path)

Two plots were presented to cover the frequency range of investigation, 0.5-2.75MHz and 3.25-5.75MHz from the channel edge. (3.25-5.75MHz, 6.25-8.75MHz from center of transmit frequency band to center of 500kHz integration bandwidth).

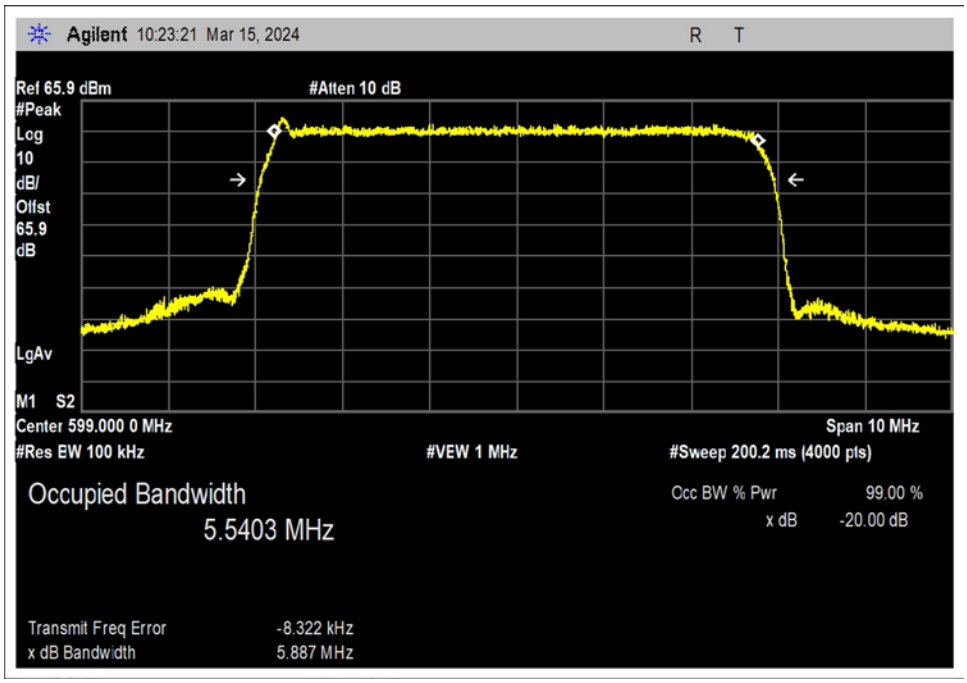
Per §74.794 Digital emissions.

(a)(1) An applicant for a digital LPTV or TV translator station construction permit shall specify that the station will be constructed to confine out-of-channel emissions within one of the following emission masks: Simple, stringent, or full service.

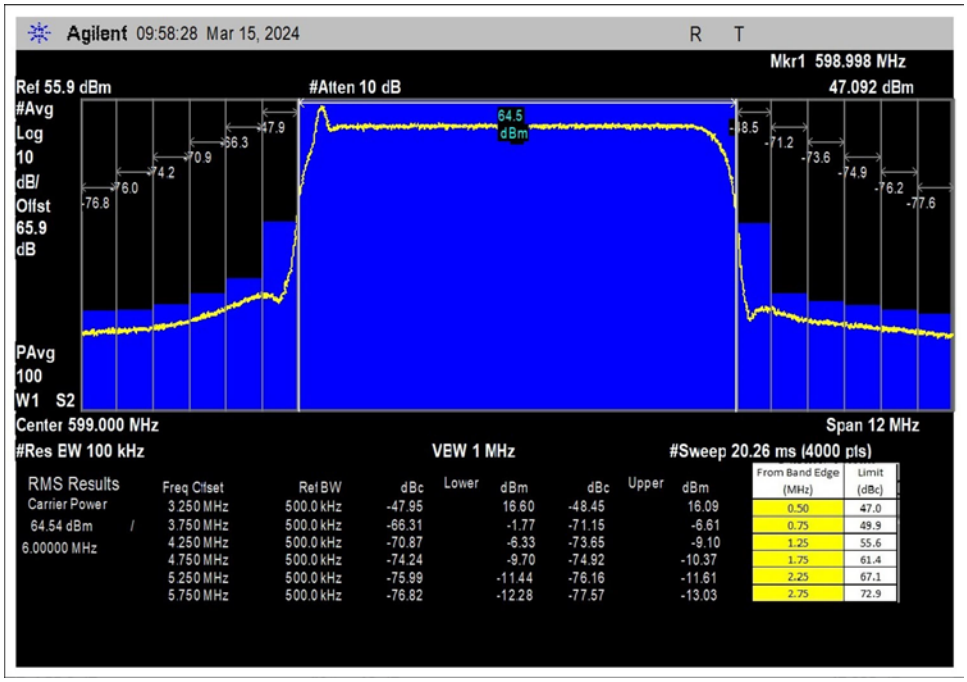
For this test, the provided plots show compliance to Stringent mask.

Test 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:
$A(dB) = 47 + 11.5 (\Delta f-0.5)$

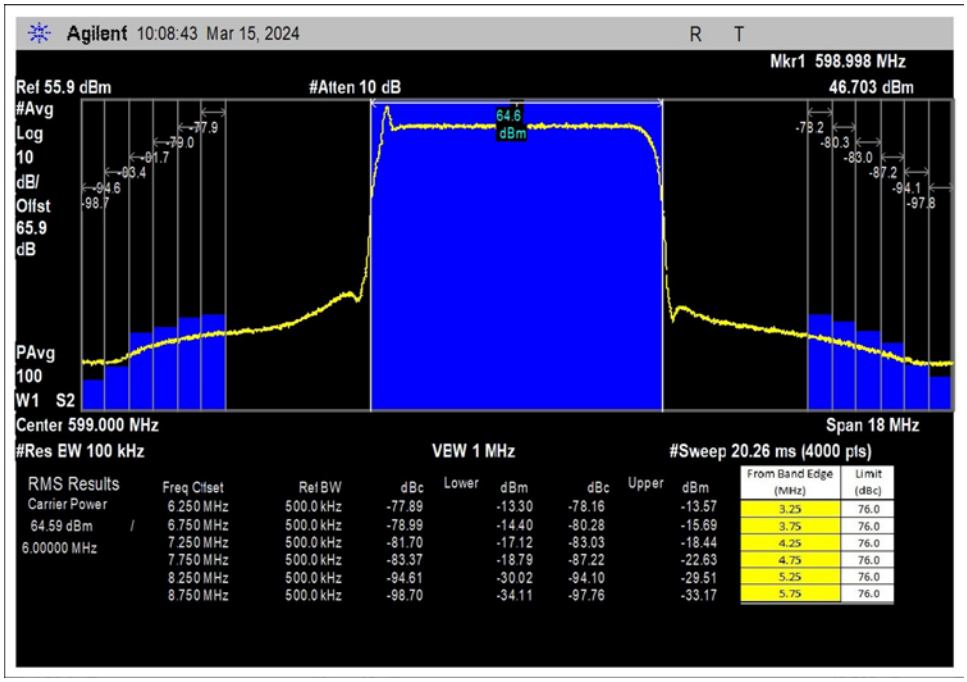
Plot(s)



99% Bandwidth



A Stringent Mask



B Stringent Mask

Test Setup Photo(s)

Test Setup, View 1

Test Setup, View 2

Test Setup, View 3

Output of BPF

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

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.26-2015 5.7 DA 05-1321-2005	Test Date(s):	3/11/2024
Configuration:	1		

Test Equipment

Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	12/13/2022	12/13/2023
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	02/29/2024	02/29/2026
P08088	Cable 40 GHz	Astrolab	32022-29094K-29094K-120TC	12/01/2023	12/01/2025
02749	High Pass Filter	K & L	9SH10-1000/T10000-O/O	8/29/2023	8/29/2025
ANC00179*	Bandpass Filter	Comtech	7429-1	03/13/2024	03/13/2026
ANC00180*	Bandpass Filter	Comtech	C-DC6A39/4C-A67	03/13/2024	03/13/2026

*Customer equipment, entered in list as transducer file.

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 76dB.

Conducted Spurious Emissions limit:
dBm = 10 Log (P) where P is in mW
dBuV = dBm + 107

1500 Watts = 61.8 dBm
3000 Watts = 64.8 dBm

1500 Watts limit line = 61.8dBm – 76dB = - 14.2 dBm = 92.8 dBuV
3000 Watts limit line = 64.8 dBm– 76dB = - 11.2dBm = 95.8 dBuV

Test Data

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA • (714) 993-6112		
Customer:	**Jinmyung Communications**		
Specification:	**47 CFR §74.794(A)(2)(ii) Spurious Emissions**		
Work Order #:	**109281**	Date:	3/15/2024
Test Type:	**Conducted Emissions**	Time:	13:27:56
Tested By:	E. Wong	Sequence#:	1
Software:	EMITest 5.03.20		480V 3 phase/60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Condition #1

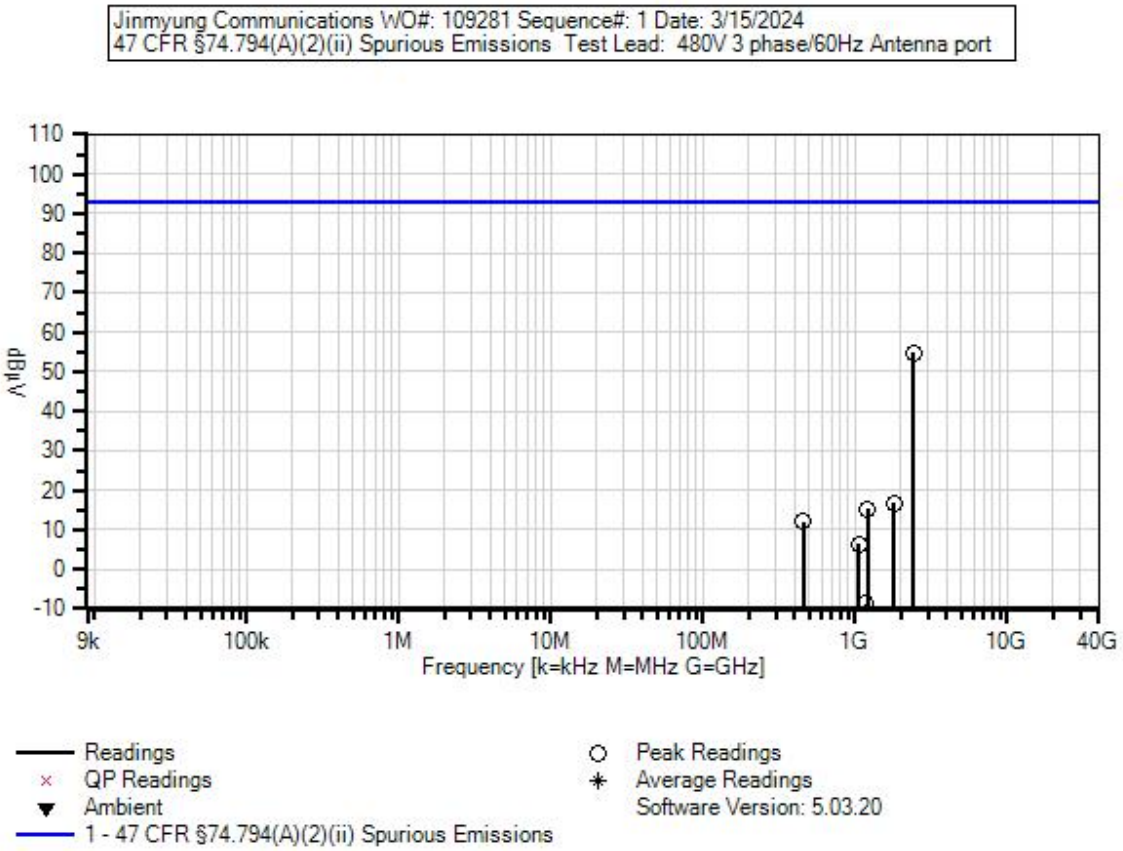
The 55dB sampling port of the directional coupler at the input end of the band pass filter of the amplifier is connected to the spectrum analyzer.

Note: The band pass filter is NOT in the measurement path for this measurement, however Recorded measurement is corrected with respect to attenuation of the Band Pass Filter as determined from separate insertion loss measurement.

All measurement at the sampling port of the band pass filter has been corrected for coupling loss.

Test Environment Conditions:
Temperature:18.7°C
Humidity: 46%
Pressure: 99.5kPa

The product series include products with output power ranging from 1500W to 3000W. The emission limit is 76dBc from the output power. For worse case scenarios to cover the range of output power, the most stringent Emission limit is used for this measurement: 76dBc from lowest rated output power of the product series, ie 1500W while the product is transmitting at 3000W.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/17/2024	1/17/2025
T2	ANP08088	Cable	32022-29094K-29094K-120TC	12/1/2023	12/1/2025
T3	AN03430	Attenuator	75A-10-12	2/29/2024	2/28/2026
T4	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	8/29/2023	8/29/2025
T5	ANC00180	Band Pass Filter	C-DC6A39/4C-A067	3/13/2024	3/13/2026
T6	AN00179	Band Pass Filter	A-TF8D120C-A027	3/13/2024	3/13/2026

Measurement Data: Reading listed by margin. Test Lead: Antenna port

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2395.830M	24.2	+0.0 +61.9	+1.7 -43.7	+10.1	+0.6	+0.0	54.8	92.8	-38.0	Anten
2	1794.830M	19.2	+0.0 +54.7	+1.5 -69.0	+10.1	+0.4	+0.0	16.9	92.8	-75.9	Anten
3	1197.870M	33.2	+0.0 +54.3	+1.2 -84.0	+10.0	+0.7	+0.0	15.4	92.8	-77.4	Anten
4	453.340M	56.4	+0.0 +55.1	+0.7 -110.1	+9.9	+0.0	+0.0	12.0	92.8	-80.8	Anten
5	1062.100M	39.4	+0.0 +55.5	+1.1 -100.5	+10.0	+1.0	+0.0	6.5	92.8	-86.3	Anten
6	1164.000M	11.2	+0.0 +54.8	+1.2 -86.5	+10.0	+0.7	+0.0	-8.6	92.8	-101.4	Anten

Test Setup Photo(s)

Test Setup, View 1

Test Setup, View 2

Test Setup, View 3

Output of BPF

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

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.26-2015 5.5 DA 05-1321-2005	Test Date(s):	3/18/2024
Configuration:	1		

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 76dB.

Radiated Spurious Emissions limit:
Per Annex C of ANSI 63.26, Clause C.2

$$\text{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t transmitter output power in W
g_t numeric gain of the transmitting antenna (dimensionless)
E electric field strength in V/m
d measurement distance in m

Electric field at 3 meters with numeric gain of 1
$P_t \times 1 = (E \times 3)^2 / 30$
$E = (30 \times P_t) / 3$
$E = \sqrt{30 \; x \; pt \;)} \; / \; 3$

At 1500W
E = $\sqrt{30 \; x \; 1500 \;)}$ / 3 = 70.7V/m@3m = 20 Log (70.7 /1x 10^{-6}) = 156.9dBuV/m@3m

At 3000W
E = $\sqrt{30 \; x \; 3000 \;)}$ / 3 = 100V/m@3m = 20 Log (100 /1x 10^{-6}) = 160dBuV/m@3m

1500 Watts radiated spurious limit at test distance of 3 meter
= 156.9dBuV/m@3m – 76dB = **80.9dBuV/m @3m**

3000 Watts radiated spurious limit at test distance of 3 meter
= 160dBuV/m@3m – 76dB = **84.0dBuV/m @3m**

Test Data

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA • (714) 993-6112		
Customer:	**Jinmyung Communications**		
Specification:	**74.794(a)(2)(ii) Radiated Spurious Emissions**		
Work Order #:	**109281**	Date:	3/18/2024
Test Type:	**Radiated Scan**	Time:	11:02:33
Tested By:	E. Wong	Sequence#:	2
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Condition #1

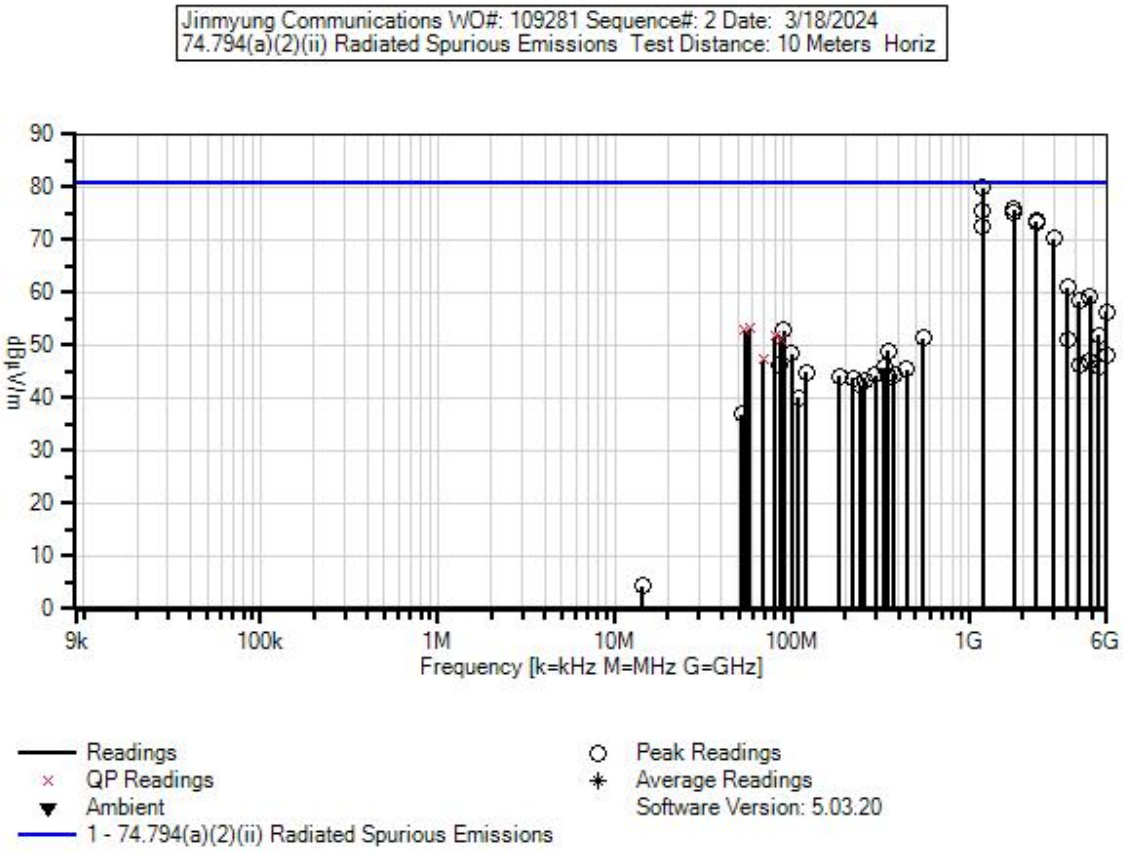
Test Environment Conditions:
Temperature: 18.7°C
Humidity: 59%
Pressure: 99.5kPa

The product series include products with output power ranging from 1500W to 3000W. The emission limit is 76dBc from the output power. For worse case scenarios to cover the range of output power, the most stringent Emission limit is used for this measurement: 76dBc from lowest rated output power of the product series, ie 1500W while the product is transmitting at 3000W.

9kHz-30MHz, no emission was detected. noise floor level recorded.

Part 74 RBW=510kHz, RMS detector.

Modification 1 was in place during test.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/17/2024	1/17/2025
T2	AN01994	Biconilog Antenna	CBL6111C	6/1/2022	6/1/2024
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/31/2022	12/31/2024
T4	ANP04382	Cable	LDF-50	5/18/2022	5/18/2024
T5	AN00010	Preamp	8447D	1/2/2024	1/2/2026
T6	ANP06662	Cable	PHASEFLEX EJR01N01024.0	3/25/2022	3/25/2024
T7	ANC00011	Bandwidth Correction Factor		3/13/2024	3/13/2026
	AN00314	Loop Antenna	6502	3/29/2022	3/29/2024
T8	AN02113	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T9	ANP07657	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024
T10	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	8/29/2023	8/29/2025
T11	AN00787	Preamp	83017A	6/27/2023	6/27/2025
T12	ANP07691	Cable	LDF1-50	9/9/2022	9/9/2024

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1193.417M	77.9	+0.0 +0.0 +0.3	+0.0 +0.0 +0.7	+0.0 +0.0 -40.5	+3.9 +24.6 +2.5	+10.5	79.9	80.9 100 sample	-1.0	Vert
2	1795.250M	68.5	+0.0 +0.0 +0.4	+0.0 +0.0 +0.4	+0.0 +0.0 -39.6	+5.0 +27.6 +3.1	+10.5	75.9	80.9	-5.0	Vert
3	1193.183M	73.6	+0.0 +0.0 +0.3	+0.0 +0.0 +0.7	+0.0 +0.0 -40.5	+3.9 +24.6 +2.5	+10.5	75.6	80.9	-5.3	Horiz
4	1797.520M	67.7	+0.0 +0.0 +0.4	+0.0 +0.0 +0.4	+0.0 +0.0 -39.6	+5.0 +27.6 +3.1	+10.5	75.1	80.9	-5.8	Horiz
5	2391.417M	64.2	+0.0 +0.0 +0.5	+0.0 +0.0 +0.6	+0.0 +0.0 -39.9	+5.6 +28.6 +3.6	+10.5	73.7	80.9 100 sample	-7.2	Vert
6	2391.183M	64.0	+0.0 +0.0 +0.5	+0.0 +0.0 +0.6	+0.0 +0.0 -39.9	+5.6 +28.6 +3.6	+10.5	73.5	80.9	-7.4	Horiz
7	1193.183M	70.4	+0.0 +0.0 +0.3	+0.0 +0.0 +0.7	+0.0 +0.0 -40.5	+3.9 +24.6 +2.5	+10.5	72.4	80.9	-8.5	Horiz
8	2992.420M	57.8	+0.0 +0.0 +0.5	+0.0 +0.0 +0.7	+0.0 +0.0 -39.9	+6.4 +30.2 +4.1	+10.5	70.3	80.9	-10.6	Vert
9	3597.080M	46.3	+0.0 +0.0 +0.5	+0.0 +0.0 +0.2	+0.0 +0.0 -39.9	+7.2 +31.6 +4.5	+10.5	60.9	80.9	-20.0	Vert
10	4795.080M	40.7	+0.0 +0.0 +0.7	+0.0 +0.0 +0.3	+0.0 +0.0 -39.5	+8.3 +33.0 +5.3	+10.5	59.3	80.9	-21.6	Vert
11	4196.080M	42.2	+0.0 +0.0 +0.5	+0.0 +0.0 +0.3	+0.0 +0.0 -39.6	+7.8 +31.7 +4.9	+10.5	58.3	80.9	-22.6	Vert
12	5985.750M	33.4	+0.0 +0.0 +0.8	+0.0 +0.0 +0.2	+0.0 +0.0 -39.3	+9.5 +35.1 +6.2	+10.5	56.4	80.9	-24.5	Vert
13	57.500M QP	49.1	+0.0 -27.1 +0.0	+12.6 +0.1 +0.0	+0.8 +6.2 +0.0	+1.0 +0.0 +0.0	+10.5	53.2	80.9	-27.7	Vert
^	57.500M	53.8	+0.0 -27.1 +0.0	+12.6 +0.1 +0.0	+0.8 +6.2 +0.0	+1.0 +0.0 +0.0	+10.5	57.9	80.9	-23.0	Vert

15	54.400M	48.6	+0.0	+12.9	+0.7	+0.9	+10.5	52.8	80.9	-28.1	Vert
	QP		-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	54.400M	54.9	+0.0	+12.9	+0.7	+0.9	+10.5	59.1	80.9	-21.8	Vert
			-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
17	89.750M	46.2	+0.0	+14.7	+0.9	+1.2	+10.5	52.8	80.9	-28.1	Vert
			-27.0	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
18	5390.420M	31.2	+0.0	+0.0	+0.0	+8.8	+10.5	52.0	80.9	-28.9	Vert
			+0.0	+0.0	+0.0	+34.2					
			+0.7	+0.2	-39.4	+5.8					
19	79.850M	46.4	+0.0	+13.5	+0.9	+1.2	+10.5	51.7	80.9	-29.2	Vert
	QP		-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	79.850M	50.6	+0.0	+13.5	+0.9	+1.2	+10.5	55.9	80.9	-25.0	Vert
			-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
21	550.000M	32.4	+0.0	+24.6	+2.7	+2.7	+10.5	51.3	80.9	-29.6	Vert
			-28.0	+0.2	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
22	86.200M	45.2	+0.0	+14.2	+0.9	+1.2	+10.5	51.3	80.9	-29.6	Vert
	QP		-27.0	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	86.200M	51.7	+0.0	+14.2	+0.9	+1.2	+10.5	57.8	80.9	-23.1	Vert
			-27.0	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
24	3589.850M	36.4	+0.0	+0.0	+0.0	+7.2	+10.5	51.0	80.9	-29.9	Horiz
			+0.0	+0.0	+0.0	+31.6					
			+0.5	+0.2	-39.9	+4.5					
25	350.200M	34.6	+0.0	+20.3	+2.1	+2.1	+10.5	49.0	80.9	-31.9	Horiz
			-26.9	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
26	99.150M	40.6	+0.0	+15.8	+1.0	+1.2	+10.5	48.4	80.9	-32.5	Vert
			-27.0	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
27	5985.850M	25.3	+0.0	+0.0	+0.0	+9.5	+10.5	48.3	80.9	-32.6	Horiz
			+0.0	+0.0	+0.0	+35.1					
			+0.8	+0.2	-39.3	+6.2					
28	68.883M	43.3	+0.0	+12.4	+0.8	+1.1	+10.5	47.3	80.9	-33.6	Vert
	QP		-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	68.883M	46.7	+0.0	+12.4	+0.8	+1.1	+10.5	50.7	80.9	-30.2	Vert
			-27.1	+0.1	+6.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
30	4787.850M	28.5	+0.0	+0.0	+0.0	+8.3	+10.5	47.1	80.9	-33.8	Horiz
			+0.0	+0.0	+0.0	+33.0					
			+0.7	+0.3	-39.5	+5.3					
31	4188.850M	30.2	+0.0	+0.0	+0.0	+7.8	+10.5	46.3	80.9	-34.6	Horiz
			+0.0	+0.0	+0.0	+31.7					
			+0.5	+0.3	-39.6	+4.9					

32	84.930M	40.2	+0.0 -27.0 +0.0	+14.1 +0.1 +0.0	+0.9 +6.2 +0.0	+1.2 +0.0 +0.0	+10.5	46.2	80.9	-34.7	Horiz
33	5386.850M	25.3	+0.0 +0.0 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -39.5	+8.8 +34.1 +5.8	+10.5	45.9	80.9	-35.0	Horiz
34	331.770M	32.0	+0.0 -26.8 +0.0	+19.7 +0.1 +0.0	+2.0 +6.2 +0.0	+2.1 +0.0 +0.0	+10.5	45.8	80.9	-35.1	Horiz
35	446.070M	28.9	+0.0 -27.7 +0.0	+22.7 +0.1 +0.0	+2.4 +6.2 +0.0	+2.4 +0.0 +0.0	+10.5	45.5	80.9	-35.4	Horiz
36	119.970M	35.4	+0.0 -27.0 +0.0	+17.3 +0.1 +0.0	+1.1 +6.2 +0.0	+1.2 +0.0 +0.0	+10.5	44.8	80.9	-36.1	Horiz
37	375.000M	29.6	+0.0 -27.1 +0.0	+20.8 +0.1 +0.0	+2.2 +6.2 +0.0	+2.2 +0.0 +0.0	+10.5	44.5	80.9	-36.4	Horiz
38	294.883M	31.1	+0.0 -26.5 +0.0	+19.0 +0.1 +0.0	+1.9 +6.2 +0.0	+2.0 +0.0 +0.0	+10.5	44.3	80.9	-36.6	Horiz
39	350.150M	29.8	+0.0 -26.9 +0.0	+20.3 +0.1 +0.0	+2.1 +6.2 +0.0	+2.1 +0.0 +0.0	+10.5	44.2	80.9	-36.7	Vert
40	184.300M	36.7	+0.0 -26.8 +0.0	+14.6 +0.1 +0.0	+1.4 +6.2 +0.0	+1.5 +0.0 +0.0	+10.5	44.2	80.9	-36.7	Vert
41	221.200M	35.1	+0.0 -26.6 +0.0	+15.2 +0.1 +0.0	+1.6 +6.2 +0.0	+1.7 +0.0 +0.0	+10.5	43.8	80.9	-37.1	Vert
42	257.983M	29.9	+0.0 -26.5 +0.0	+19.6 +0.1 +0.0	+1.7 +6.2 +0.0	+1.9 +0.0 +0.0	+10.5	43.4	80.9	-37.5	Horiz
43	240.000M	31.5	+0.0 -26.5 +0.0	+17.1 +0.1 +0.0	+1.7 +6.2 +0.0	+1.8 +0.0 +0.0	+10.5	42.4	80.9	-38.5	Vert
44	108.917M	31.3	+0.0 -27.0 +0.0	+16.7 +0.1 +0.0	+1.0 +6.2 +0.0	+1.2 +0.0 +0.0	+10.5	40.0	80.9	-40.9	Vert
45	51.830M	32.1	+0.0 -27.1 +0.0	+13.6 +0.1 +0.0	+0.7 +6.2 +0.0	+0.9 +0.0 +0.0	+10.5	37.0	80.9	-43.9	Horiz
46	14.213M	9.6	+0.0 -27.2 +0.0	+0.0 +0.1 +0.0	+0.4 +0.0 +0.0	+0.5 +0.0 +0.0	+20.9	4.3	80.9	-76.6	Paral

Test Setup Photo(s)

Below 1GHz, Front View

Below 1GHz, Back View

Above 1GHz, View 1

Above 1GHz, View 2

74.794(b)(1) Radio Navigation Satellite Service Bands (GPS)

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.26-2015 5.2.4.4	Test Date(s):	3/13/2024
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	50

Test Equipment					
Asset #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	12/13/2022	12/13/2023
P08088	Cable 40 GHz	Astrolab	32022-29094K-29094K-120TC	12/01/2023	12/01/2025
P08087	Cable 40 GHz	Astrolab	32022-29094K-29094K-120TC	12/01/2023	12/01/2025
03669	Signal Generator	Anritsu	68369B	2/26/2024	2/26/2024

Insertion loss in Radio Navigation Satellite Service Bands (GPS) band L1, L2, L5 was measured with Low Pass filter and Emission Mask filter in series.

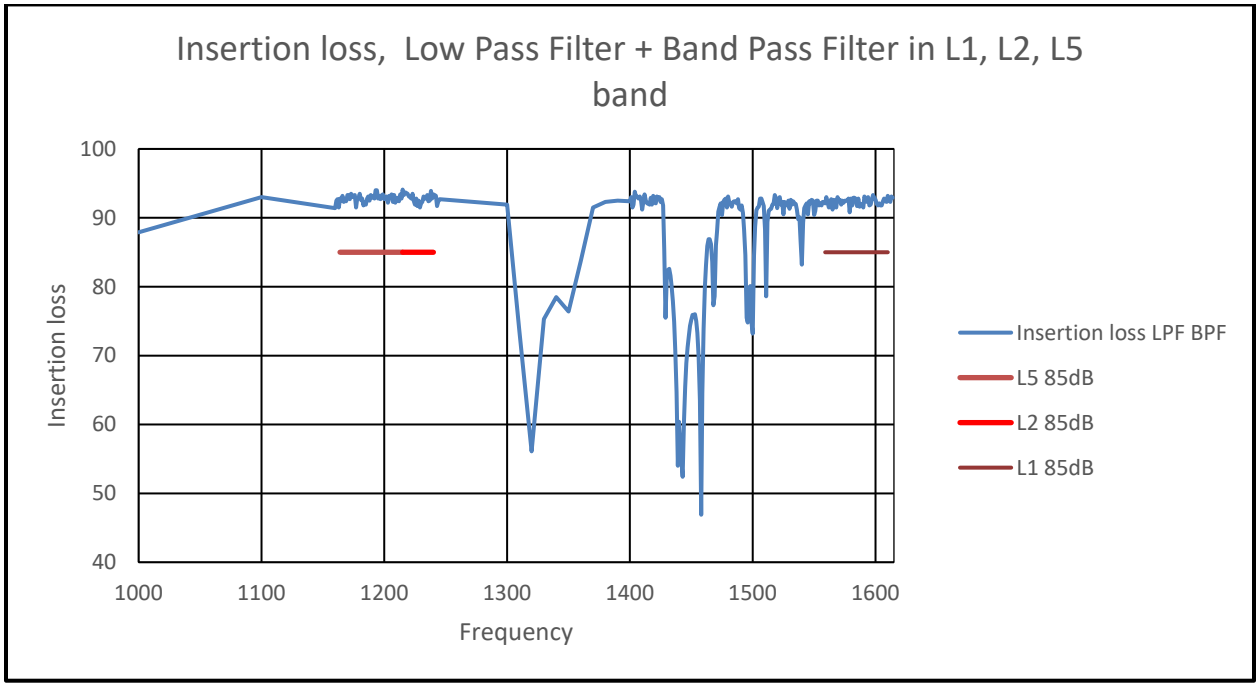
Test Data Summary				
Frequency (MHz)	**Modulation**	**Measured filter Attenuation (dB)**	**Limit (dB)**	**Results**
1164-1215MHz	8VSB (ATSC 1.0)	91.5	≥85	Pass
1215-1240MHz	8VSB (ATSC 1.0)	91.5	≥85	Pass
1559-1610MHz	8VSB (ATSC 1.0)	91.5	≥85	Pass

*RBW of 100kHz for chracterization.

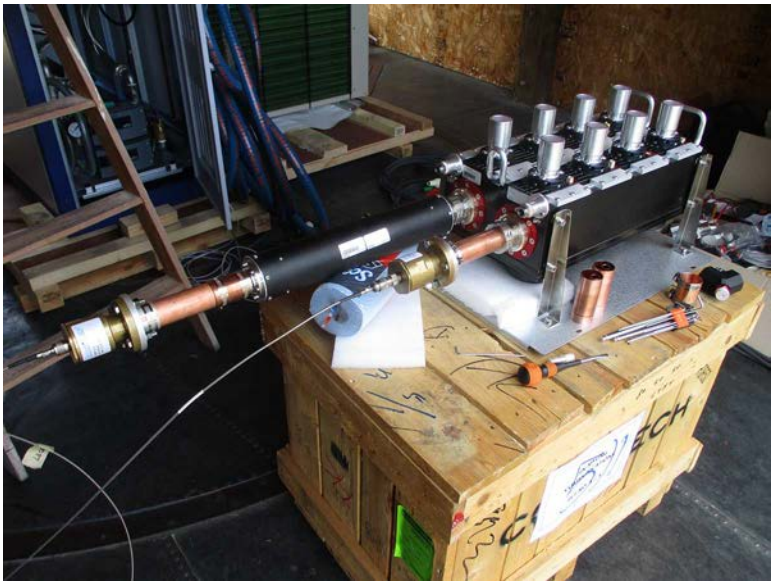
(b) In addition to meeting the emission attenuation requirements of the simple or stringent mask (including attenuation of radio frequency harmonics), digital low power TV and TV translator stations authorized to operate on TV channels 22-24, (518-536 MHz), 32-36 (578-608 MHz), 38 (614-620 MHz), and 65-69 (776-806 MHz) must provide specific “out of band” protection to Radio Navigation Satellite Services in the bands: L5 (1164-1215 MHz); L2 (1215-1240 MHz) and L1 (1559-1610 MHz).

(1) An FCC-certificated transmitter specifically certified for use on one or more of the above channels must include filtering with an attenuation of not less than 85 dB in the GPS bands, which will have the effect of reducing harmonics in the GPS bands from what is produced by the digital transmitter, and this attenuation must be demonstrated as part of the certification application to the Commission.

Plot Data


Insertion loss, Low Pass Filter + Band Pass Filter in L1, L2, L5 band
Insertion loss
100
90
80
70
60
50
40
1000
1100
1200
1300
1400
1500
1600
Frequency
Insertion loss LPF BPF
L5 85dB
L2 85dB
L1 85dB

Test Setup Photo(s)



Test Setup, View 1

Test Setup, View 2

74.95(b)(4) Frequency Tolerance

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	Part 74.795 (b)(4) Part 2.1055	Test Date(s):	3/20-21/2024
Configuration:	1		

	Environmental Conditions			
3/20/24	Temperature (ºC)	21	Relative Humidity (%):	49
3/21/24	Temperature (ºC)	21.8	Relative Humidity (%):	55

Test Equipment - Voltage					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	01/17/2024	01/17/2025
07164	Multimeter	Fluke	8845A/G	8/21/2023	8/21/2025
03759	AC Power Supply	GoHz	HZ-60-1005	8/14/2023	8/14/2025
01379	Variac	Superior Electric	1256D	02/01/2024	02/01/2026

Test Equipment - Temperature					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	01/17/2024	01/17/2025
05947	Thermometer	Fluke	51	5/19/2022	5/19/2024

*Note: Temperature measurement made in chamber Test Equity Model: 1016H SN180110 was recorded with CKC property AN05947.

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	240
$V_{Minimum}$:	276
$V_{Maximum}$:	204

Note the Frequency determining exciter operates at 240VAC.

Test Data – Voltage and Temperature

Temperature Variations

Channel Frequency:		**Channel 1 (MHz)** 596.308621*	Dev kHz
Temp (C)	Voltage		
0	240	596.308688	0.06700
10	240	596.308688	0.06700
20	240	596.308621	0.00000
30	240	596.308655	0.03400
40	240	596.308588	0.03300

Voltage Variations (±15%)

Temp (C)	Voltage	**Channel 1 (MHz) 596.308666**	Dev kHz
20	204.0	596.308666	0.00000
20	240.0	596.308666	0.00000
20	276.0	596.308650	0.01600

Max Deviation (kHz)	**0.06700**
	PASS

Limit:

74.796 (b) The following requirements must be met before low power TV and TV translator transmitter will be certificated by the FCC:
(4) When subjected to variations in ambient temperature between 0 and 40 degrees Centigrade and variations in power main voltage between 85% and 115% of the rated power supply voltage, the frequency stability of the local oscillator in the RF channel upconverter shall be maintained within 10 kHz of the nominal value.

*Transmit frequency set at 599MHz, the frequency measurement was taken at -6dB point of the pilot tone signal. Evaluation performed at the RF monitor port of the Exciter (signal source).

Test Setup Photo(s)

Frequency Stability, View 1

Frequency Stability, View 2

Voltage Stability

APPENDIX A: Manufacturer Declaration

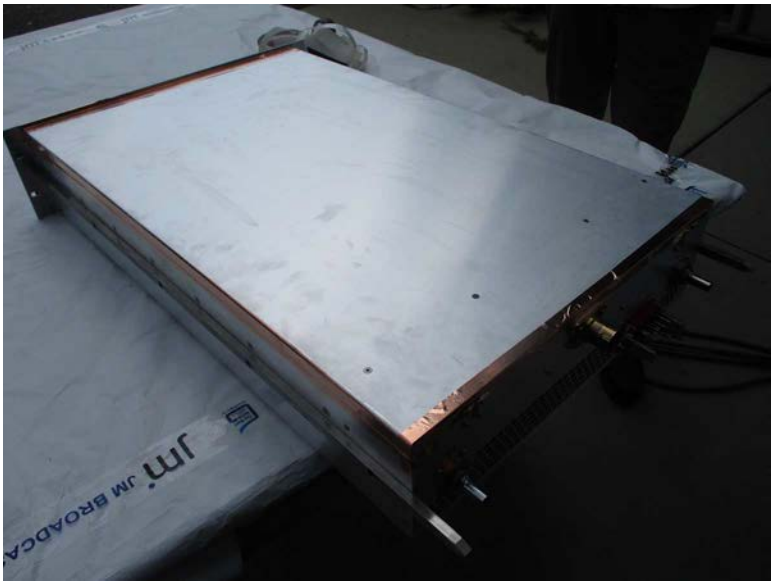
The following model has been tested by CKC Laboratories:
Device: Low Power Television Transmitter
Model: Sky3000L

The manufacturer declares that the following additional model is identical electrically or any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested model.

Device: Low Power Television Transmitter
Model: Sky1500L

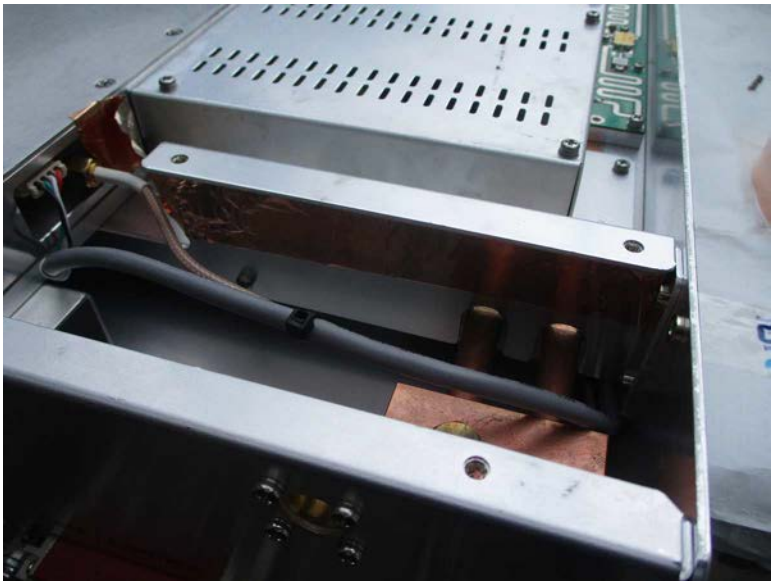
Appendix B: Modifications Made During Testing

Mod #1, Copper Tape, Amplifier, View 1

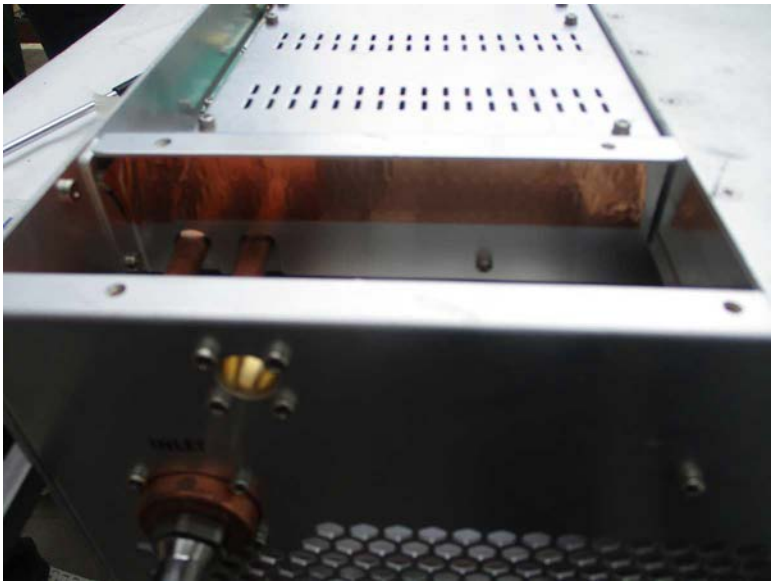


Mod #1, Copper Tape, Amplifier, View 2

Mod #1, Copper Tape, Amplifier, View 3

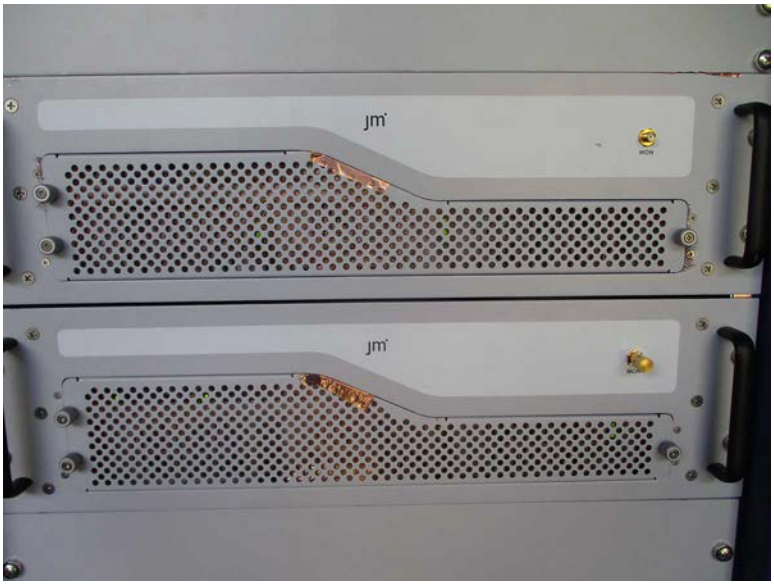


Mod #1, Copper Tape, Amplifier, View 4



Mod #1, Copper Tape, Amplifier, View 5

Copper Screen, View 1



Copper Screen, View 2

Aluminum Door, View 1

Aluminum Door, View 2

Copper Tape on Aluminum Door

Supplemental Information

Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
5.77×10^{-10}	Frequency Deviation
0.00005 s	Time Deviation
3.18 dB	Mains Conducted Emissions

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. Compliance is deemed to occur provided measurements are below the specified limits.

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.

End of Report