

Meteorcomm LLC.

EMC TEST REPORT FOR

AR220DB
Model: 70010

Tested to The Following Standards:

FCC Part 80 Subpart E

217.6125-219.9875MHz

Report No.: 111224-1

Date of issue: May 15, 2025



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:

Meteorcomm LLC.
1201 SW 7th Street
Renton, WA 98057

Representative: George Stults
Customer Reference Number: 33031

REPORT PREPARED BY:

Lisa Bevington
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 111224

DATE OF EQUIPMENT RECEIPT:

May 2, 2025

DATE(S) OF TESTING:

May 2, 7, 8, 2025

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.
22116 23rd Drive SE, Suite A
Bothell, WA 98021

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 80 Subpart E

Test Procedure	Description	Modifications	Results
80.215 (c)(1), 80215 (h) (5), 2.1046	Power Output	NA	Pass
2.1049	Occupied Bandwidth	NA	Pass
80.209	Frequency Stability	NA	Pass
80.211 (f)	Conducted Spurious Emissions and Mask	NA	Pass
80.211 (f)	Radiated Spurious Emissions	Mod. #1	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

Mod. #1: Changed powder coated plate with bare metal plate. Manufacturer declares this is representative of final product.

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.

Configuration 1

Equipment Under Test:

Device	Manufacturer	Model #	S/N
AR220DB	Meteorcomm, LLC	70010	70DB001030NG

Support Equipment:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR000083BK
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Laptop	Dell	Latitude	8X7DMH2
Prosafe 8-Port Gigabit	Netgear	GS108Tv2	29SE4C5302E60
Smart Switch	NA	NA	NA
5-port Switch (outside C3)	Dlink	DES-1105	DRL72A3014749

Configuration 2

Equipment Under Test:

Device	Manufacturer	Model #	S/N
AR220DB	Meteorcomm, LLC	70010	70DB001003NG

Support Equipment:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR000083BK
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Laptop	Dell	Latitude	8X7DMH2
Prosafe 8-Port Gigabit	Netgear	GS108Tv2	29SE4C5302E60
Smart Switch	NA	NA	NA
5-port Switch (outside C3)	Dlink	DES-1105	DRL72A3014749

General Product Information:

Description of EUT	
Transceiver for railroad application	
Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Transmission System:	Proprietary for Locomotive
Operating Frequency Range(s):	217.6125-219.9875MHz
Modulation Type(s):	Full Rate 2 bits/symbol (DQPSK)
Maximum Duty Cycle:	10%, but may be increased for testing
Number of TX Chains:	1
Antenna Type(s) and Gain:	Not specified by manufacturer
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	13.6VDC
Firmware / Software used for Test:	S/W Part Number P65000-A01-0.1.90.01 ITC-ROOT gec12a0f (dev) 2024-05-14 16:16:14 S/W Part Number P65000-M01-0.1.135.01 ITC-APP g4a81412a6 2024-05-14 19:09:07 S/W Part Number P65000-R01-0.0.80.0 Baseband-0 g6da029fdf 2024-05-14 14:04:26 S/W Part Number P65000-R01-0.0.80.0 Baseband-1 g6da029fdf 2024-05-14 14:05:06 S/W Part Number P65000-F01-00.00.48.00 FPGA ge45a0e8f 2024-04-09 12:35:12 S/W Part Number P65000-B01-0.1.92.01 Bootloader g5c50125 2024-06-25 19:24:32 S/W Part Number P65000-S01-0.1.92.01 Failsafe g5c50125 2024-06-25 19:24:32
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT and Accessory Photo(s)



Support Equipment Photo(s)



Ethernet Switch



Laptop



Attenuators

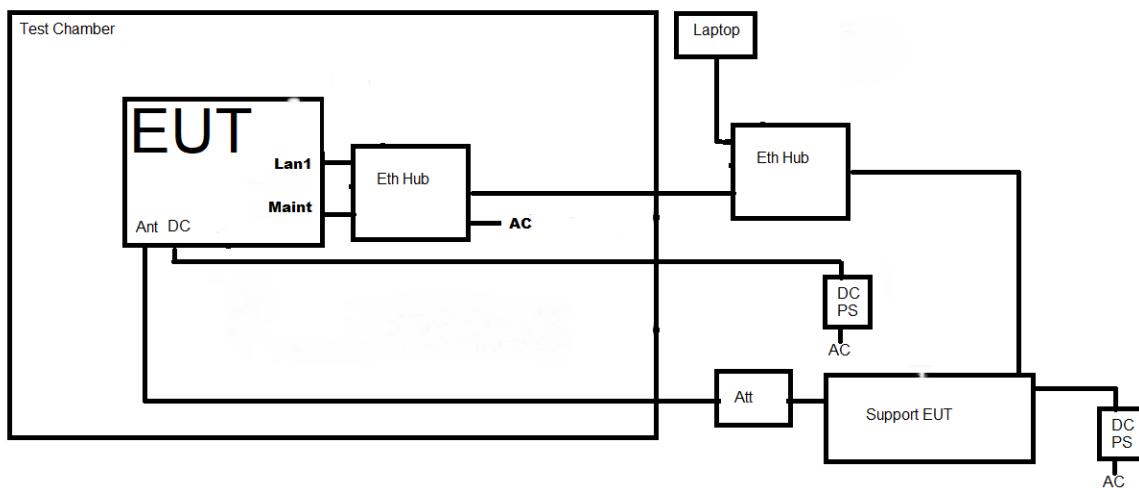


Power Supply

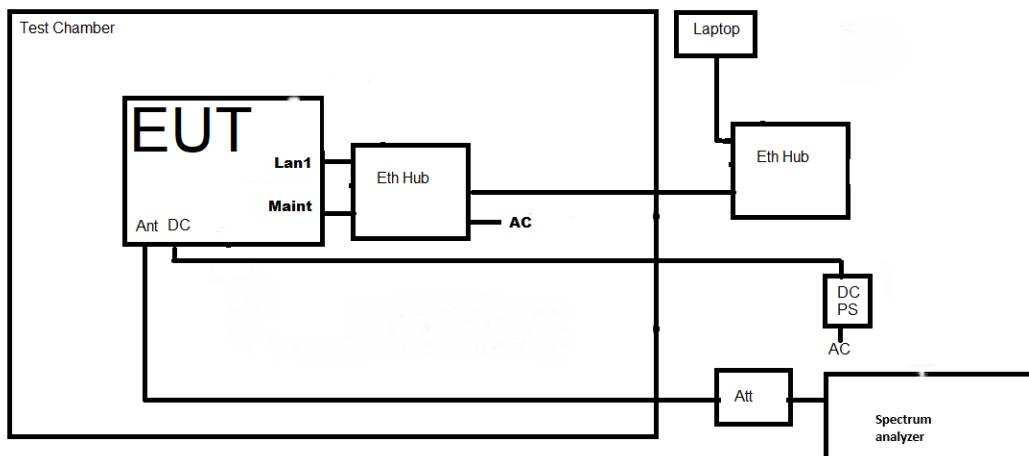
Block Diagram of Test Setup(s)

Config#	Setup Description of Block Diagram
Radiated	Powered by DC powered supply. Ethernet ports connected to Ethernet hub, laptop, and support EUT located outside chamber. TX/RX port connected to attenuators then Spectrum analyzer for conducted measurements.
Conducted	Powered by DC powered supply. Ethernet ports connected to Ethernet hub, laptop, and support EUT. TX/RX port connected to attenuators then support EUT.

Radiated



Conducted



FCC PART 80 SUBPART E

80.215 (c)(1), 80.215 (h) (5), 2.1046 Power Output

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	5/7/2025
Configuration:	1		
Test Setup:	<p>The unit is in a temperature chamber for temperature variation. The voltage is varied. The EUT's RF port is connected to a Spectrum analyzer with appropriate attenuation. The bandwidth settings are low enough to resolve the center frequency of the emission. Once the EUT transmitter is turned on, it is transmitting continuously with 100% duty cycle, full rate.</p> <p>For testing purposes, the limit is 50W per 80.215 (h) (5).</p>		

Environmental Conditions			
Temperature (°C)	22.9	Relative Humidity (%):	34

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03829	Spectrum Analyzer	Agilent	E4440A	2/13/2025	2/13/2027
03029	Thermometer, Digital Infrared	Fluke	566	4/4/2025	4/4/2027
02757	Temperature Chamber	Bemco	F100/350-8	11/1/2024	11/1/2026
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026

Test Data Summary - RF Conducted Measurement (Ch1)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
217.6125	-30	V _{Nom}	Full Rate	44.82	30.34	Pass
217.6125	-20	V _{Nom}	Full Rate	44.85	30.55	Pass
217.6125	-10	V _{Nom}	Full Rate	44.87	30.69	Pass
217.6125	0	V _{Nom}	Full Rate	44.86	30.62	Pass
217.6125	10	V _{Nom}	Full Rate	44.91	30.97	Pass
217.6125	20	V _{Nom}	Full Rate	44.96	31.33	Pass
217.6125	30	V _{Nom}	Full Rate	44.98	31.48	Pass
217.6125	40	V _{Nom}	Full Rate	45.01	31.70	Pass
217.6125	50	V _{Nom}	Full Rate	45.00	31.62	Pass
217.6125	20	V _{Min}	Full Rate	44.99	31.55	Pass
217.6125	20	V _{Max}	Full Rate	44.97	31.41	Pass

Test Data Summary - RF Conducted Measurement (Ch96)

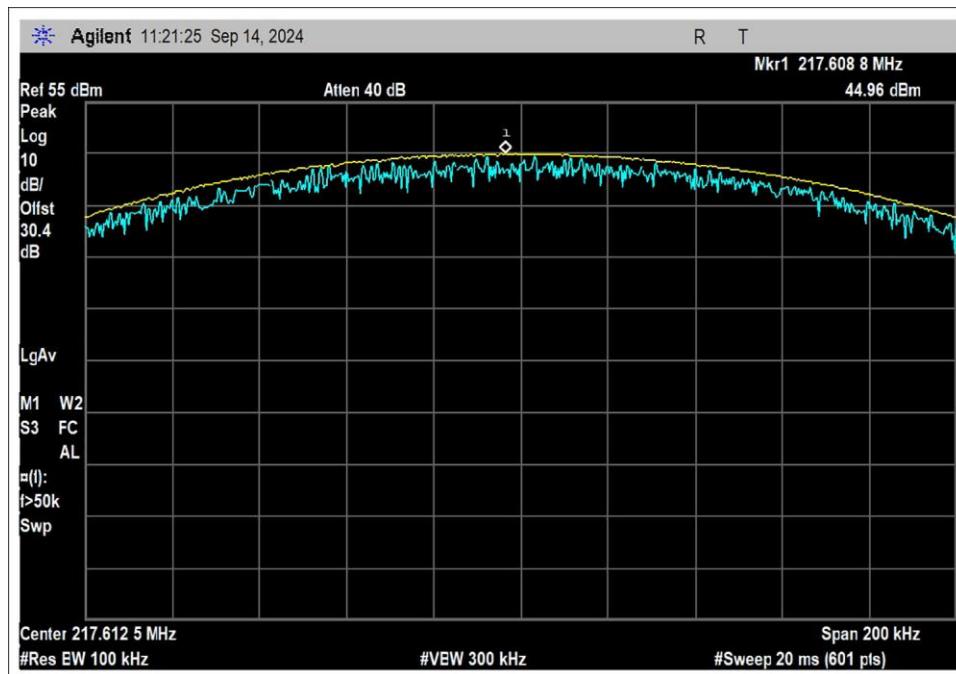
Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
219.9875	-30	V _{Nom}	Full Rate	44.69	29.44	Pass
219.9875	-20	V _{Nom}	Full Rate	44.73	29.72	Pass
219.9875	-10	V _{Nom}	Full Rate	44.73	29.72	Pass
219.9875	0	V _{Nom}	Full Rate	44.73	29.72	Pass
219.9875	10	V _{Nom}	Full Rate	44.76	29.92	Pass
219.9875	20	V _{Nom}	Full Rate	44.84	30.48	Pass
219.9875	30	V _{Nom}	Full Rate	44.86	30.62	Pass
219.9875	40	V _{Nom}	Full Rate	44.88	30.76	Pass
219.9875	50	V _{Nom}	Full Rate	44.89	30.83	Pass
219.9875	20	V _{Min}	Full Rate	44.87	30.69	Pass
219.9875	20	V _{Max}	Full Rate	44.87	30.69	Pass

Parameter Definitions:

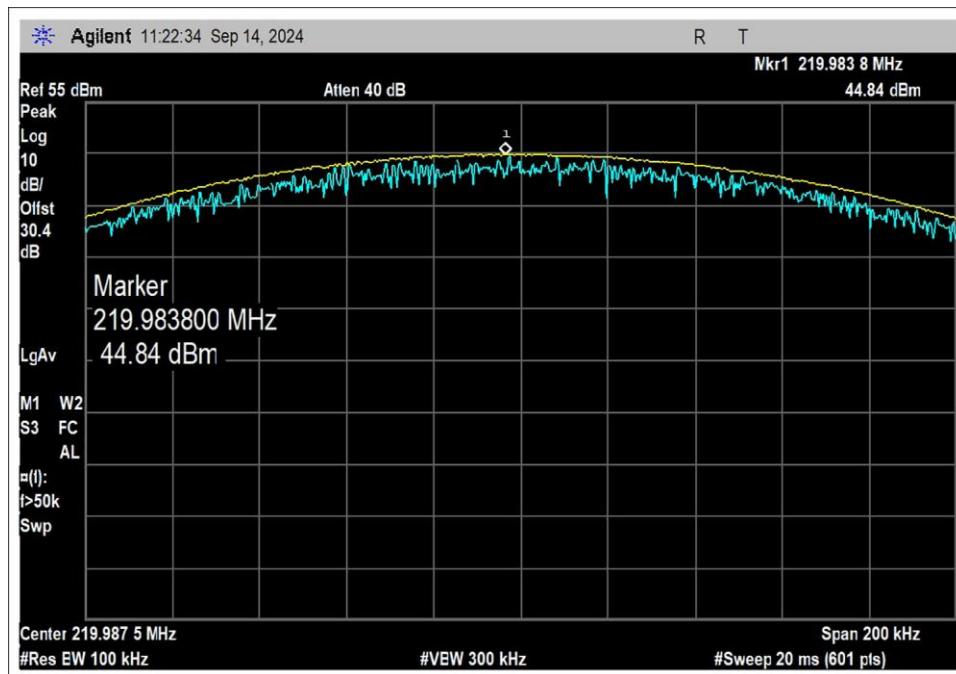
Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nom} :	13.6VDC
V _{Min} :	10.5VDC
V _{Max} :	15.5VDC

Plot(s)



Channel 1



Channel 96

Test Setup Photo(s)



View 1



View 2

2.1049 Occupied Bandwidth

Test Setup/Conditions

Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	5/2/2025
Configuration:	1		
Test Setup:	Per the manufacturer the manufacturer declares a 20kHz per 80.205, the bandwidth limitations are outside the scope of Part 80 based on the emission designator for this equipment, it will be up to the licensee to ensure the bandwidth/designator is used as appropriately licensed.		

Environmental Conditions

Temperature (°C)	21.9	Relative Humidity (%):	32
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Test Equipment

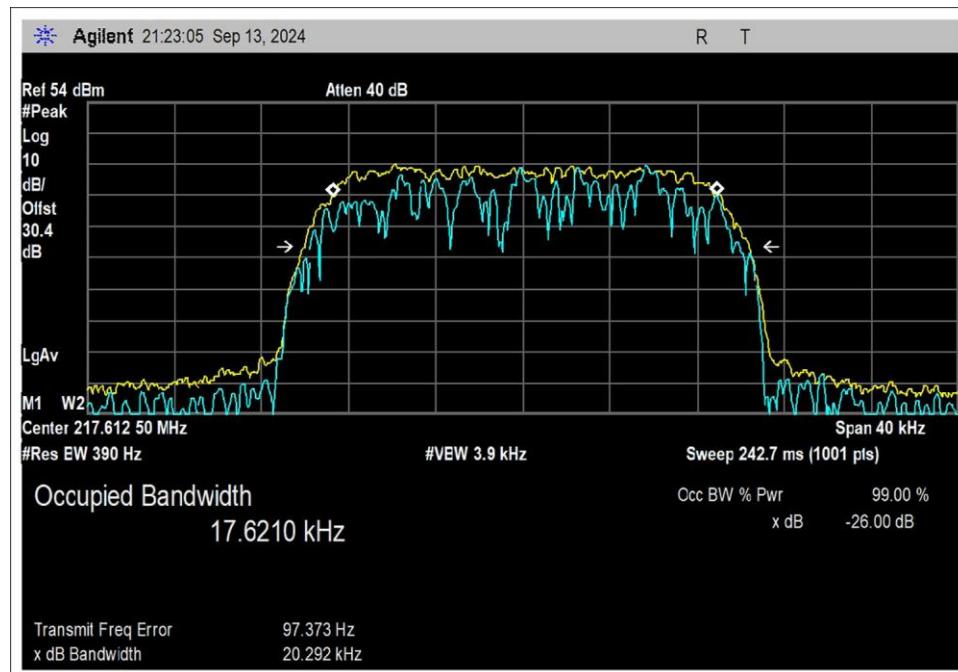
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03829	Spectrum Analyzer	Agilent	E4440A	2/13/2025	2/13/2027
P05541	Cable	Andrews	Heliax	4/2/2025	4/2/2027
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026

99% Occupied Bandwidth

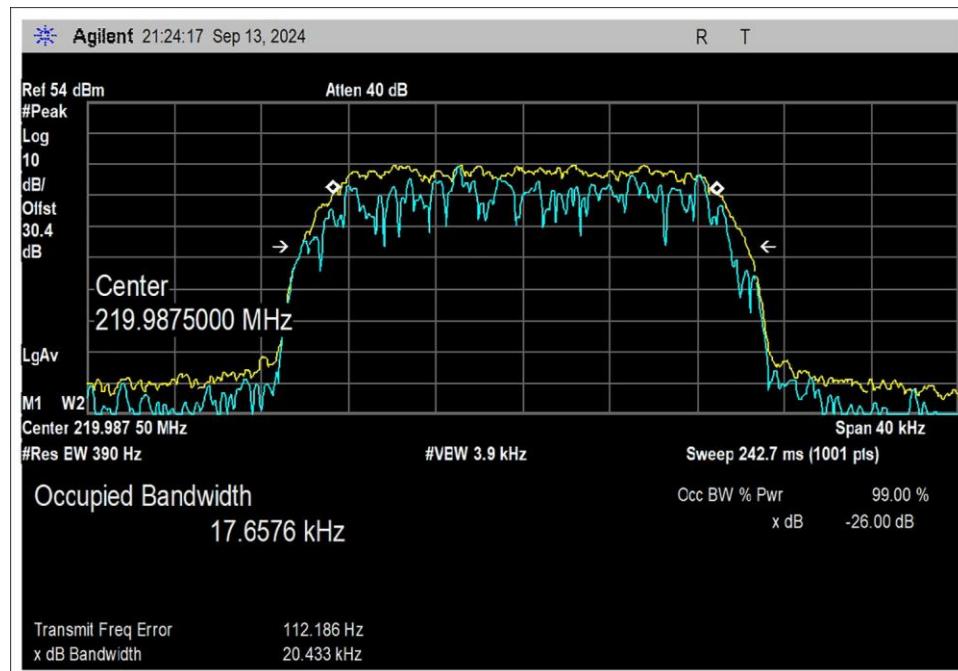
Test Data Summary

Frequency (MHz)	Modulation	Measured (kHz)	Limit (kHz)	Results
217.6125	Full Rate	17.6210	≤20	Pass
219.9875	Full Rate	17.6576	≤20	Pass

Plot(s)



Channel 1 Full Rate



Channel 96 Full Rate

Test Setup Photo(s)



80.209 Frequency Stability

Test Setup/Conditions				
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore	
Test Method:	ANSI C63.26 (2015)	Test Date(s):	5/7/2025	
Configuration:	1			
Test Setup:	<p>The unit is in a temperature chamber for temperature variation. The voltage is varied. The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The bandwidth settings are low enough to resolve the center frequency of the emission. Once the EUT transmitter is turned on, it is transmitting continuously with a CW signal</p> <p>The limit is 5ppm from 80.209 (6) Band 216-220MHz.</p>			

Environmental Conditions			
Temperature (°C)	24.9	Relative Humidity (%):	34

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03829	Spectrum Analyzer	Agilent	E4440A	2/13/2025	2/13/2027
03029	Thermometer, Digital Infrared	Fluke	566	4/4/2025	4/4/2027
02757	Temperature Chamber	Bemco	F100/350-8	11/1/2024	11/1/2026
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026

Test Data Summary

Modulation: CW

Temp (°C)	Voltage	Ch 1 (PPM)	Ch 96 (PPM)	Results
-30	V _{Nom}	0.28951	0.24092	Pass
-20	V _{Nom}	0.29410	0.24547	
-10	V _{Nom}	0.31248	0.28183	
0	V _{Nom}	0.39060	0.35002	
10	V _{Nom}	0.54684	0.55003	
20	V _{Nom}	0.71687	0.71368	
30	V _{Nom}	0.75363	0.72731	
40	V _{Nom}	0.70768	0.70913	
50	V _{Nom}	0.71228	0.75004	
20	V _{Min}	0.69849	0.70004	
20	V _{Max}	0.72606	0.73641	
Maximum Deviation		0.75363	0.75004	

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nom} :	13.6VDC
V _{Min} :	10.5VDC
V _{Max} :	15.5VDC

Test Setup Photo(s)



View 1



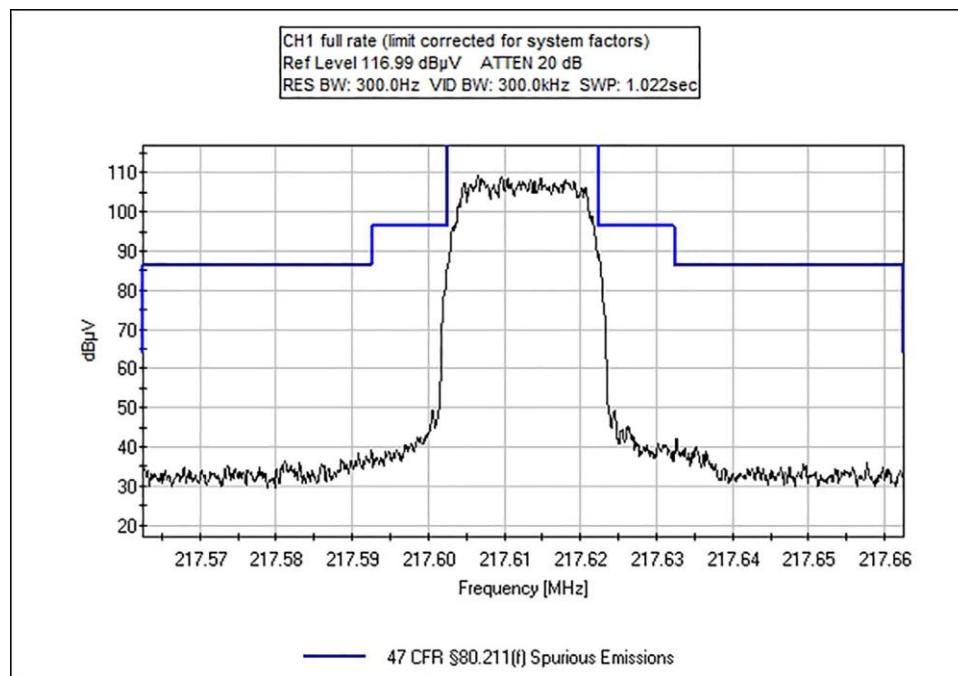
View 2

80.211 (f) Conducted Emission Mask and Spurs

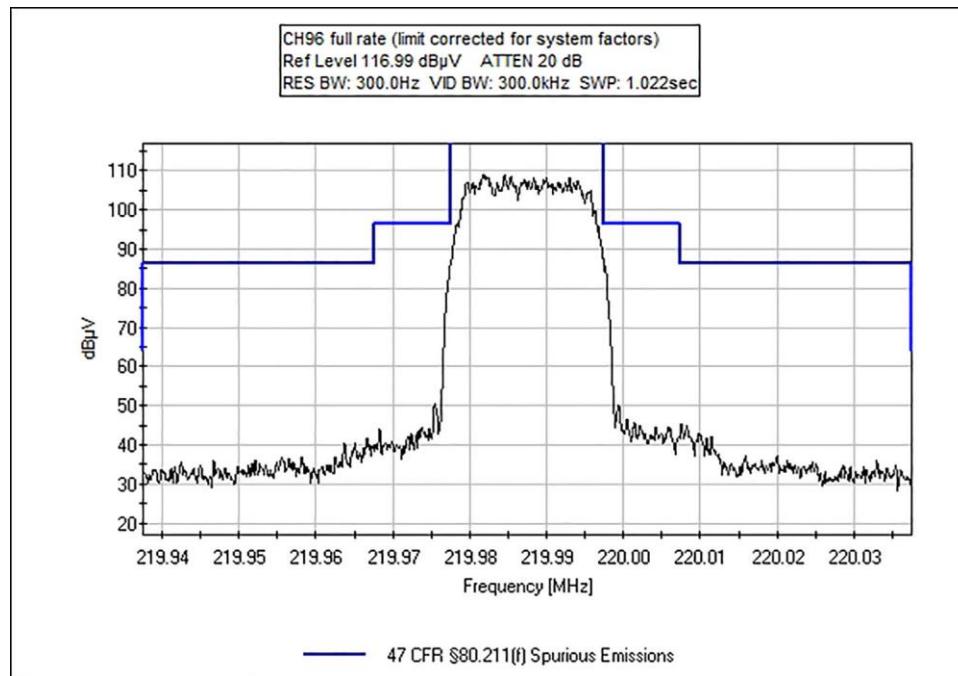
Test Setup/Conditions											
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore								
Test Method:	ANSI C63.26 (2015)	Test Date(s):	5/2/2025								
Configuration:	1										
Test Setup:	<p>The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The EUT is transmitting continuously at 100% duty cycle with the full rate modulation.</p> <p>The emission mask was built with Peak measurement of the fundamental, with the lowest value selected from an investigation on Ch1 and Ch96.</p> <p>Outside of the span shown in the emission mask plots, the following bandwidths were used:</p> <table> <tr> <td>9kHz-150kHz:</td> <td>200Hz RBW</td> </tr> <tr> <td>150kHz-30MHz:</td> <td>9kHz RBW</td> </tr> <tr> <td>30-1000MHz:</td> <td>100kHz RBW</td> </tr> <tr> <td>1000MHz and above:</td> <td>1MHz RBW</td> </tr> </table> <p>Average values as indicated on datasheet are Peak measurements.</p> <p>Per the manufacturer the masks are built with 80.211(f), 20kHz ABW for Full Rate, it will be the responsibility of the licensee to ensure mask applicability.</p>			9kHz-150kHz:	200Hz RBW	150kHz-30MHz:	9kHz RBW	30-1000MHz:	100kHz RBW	1000MHz and above:	1MHz RBW
9kHz-150kHz:	200Hz RBW										
150kHz-30MHz:	9kHz RBW										
30-1000MHz:	100kHz RBW										
1000MHz and above:	1MHz RBW										

Environmental Conditions			
Temperature (°C)	24.2	Relative Humidity (%):	40

Plot(s)



Channel 1 Full Rate



Channel 96 Full Rate

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Meteorcomm LLC**
 Specification: **47 CFR §80.211(f) Spurious Emissions**
 Work Order #: **111224** Date: **5/2/2025**
 Test Type: **Conducted Emissions** Time: **14:24:56**
 Tested By: C. Plumadore Sequence#: **1**
 Software: EMITest 5.03.20 13.6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 40%
Temperature: 24.2°C
Pressure: 101.0 kPa
Frequency: 9kHz-2.5GHz
Test Method: ANSI C63.26
Test set: EUT set up on table connected directionally to spectrum analyzer through a 30db attenuator. Running full rate modulation at 100% duty cycle.

Meteorcomm LLC, WO#: 111224 Sequence#: 1 Date: 5/2/2025
 47 CFR §80.211(f) Spurious Emissions Test Lead: 13.6VDC antenna port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANC00194	Attenuator	SA3N1007-30	9/26/2024	9/26/2026
T2	ANP05541	Cable	Heliax	4/2/2025	4/2/2027
	AN03829	Spectrum Analyzer	E4440A	2/13/2025	2/13/2027

Measurement Data:

Reading listed by margin.

Test Lead: antenna port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	439.978M Ave	40.9	+30.0	+0.6		+0.0	71.5	94.0	-22.5	anten
								CH96		
^	439.978M	48.9	+30.0	+0.6		+0.0	79.5	94.0	-14.5	anten
								CH96		
3	435.223M Ave	40.6	+30.0	+0.6		+0.0	71.2	94.0	-22.8	anten
								CH1		
^	435.223M	49.9	+30.0	+0.6		+0.0	80.5	94.0	-13.5	anten
								CH1		
5	389.000k	37.5	+29.9	+0.0		+0.0	67.4	94.0	-26.6	anten
								CH96		
6	38.187k	35.2	+29.9	+0.0		+0.0	65.1	94.0	-28.9	anten
								CH1		

Test Setup Photo(s)



80.211 (f) Radiated Emissions

Test Setup/Conditions				
Test Location:	Bothell Lab C3	Test Engineer:	C. Plumadore	
Test Method:	ANSI C63.26 (2015)	Test Date(s):	5/8/2025	
Configuration:	2			
Test Setup:	<p>The emission mask was built with Peak measurement of the fundamental, Outside of the span shown in the emission mask plots, the following bandwidths were used:</p> <p>9kHz-150kHz: 200Hz RBW 150kHz-30MHz: 9kHz RBW 30-1000MHz: 100kHz RBW 1000MHz and above: 1MHz RBW</p> <p>For the final tabular converted to dBm uses equation (d) from ANSI C63.26 (2015) 5.2.7:</p> <p>$EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.</p> <p>Per 80.211f:</p> <ul style="list-style-type: none"> (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB; (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB. <p>Limit = Power – Required Attenuation = $10 \log P - (43 + 10 \log P)$ = $10 \log P - 43 - 10 \log P$ = -43 dBW = 0.00005W (0.05mW) = $10 \log 0.00005/0.001$ = -13dBm (94dB\mu V) at any power level.</p> <p>Mod. #1 was in place during testing.</p>			

Test Data

Test Data Summary (9kHz-30MHz) Peak readings

Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
0.015	60.8	-34.428	-13	Pass
0.024	58	-37.228	-13	Pass
0.024	57.4	-37.828	-13	Pass
0.051	54.4	-40.828	-13	Pass
0.07	49.5	-45.728	-13	Pass
0.061	48.6	-46.628	-13	Pass
21.612	47.9	-47.328	-13	Pass
21.612	46.8	-48.428	-13	Pass
0.115	45.1	-50.128	-13	Pass
0.116	45	-50.228	-13	Pass
0.118	44.8	-50.428	-13	Pass
21.612	39	-56.228	-13	Pass
21.254	37.8	-57.428	-13	Pass
23.821	37.7	-57.528	-13	Pass
20.926	36.4	-58.828	-13	Pass
21.075	36	-59.228	-13	Pass
6.956	35.8	-59.428	-13	Pass
6.926	34.7	-60.528	-13	Pass
7.015	33.8	-61.428	-13	Pass
7.045	31	-64.228	-13	Pass
6.926	30.5	-64.728	-13	Pass

Test Data Summary (30-1000MHz) Average readings

Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
652.825	60.6	-34.628	-13	Pass
659.955	65	-30.228	-13	Pass
870.451	62.4	-32.828	-13	Pass
879.949	60.3	-34.928	-13	Pass

Test Data Summary (1-2.5GHz) Peak readings

Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
1305.765	55.3	-39.9	-13	Pass
1523.292	52.9	-42.3	-13	Pass
1319.93	51.9	-43.3	-13	Pass
1759.715	51.7	-43.5	-13	Pass
2200.055	50.3	-44.9	-13	Pass
1740.985	50	-45.2	-13	Pass
1539.628	48.3	-46.9	-13	Pass
1100.218	47.7	-47.5	-13	Pass
1958.358	44.9	-50.3	-13	Pass
1400.5	44.1	-51.1	-13	Pass
2175.975	43.1	-52.1	-13	Pass
1088.202	43	-52.2	-13	Pass
1979.708	42.6	-52.6	-13	Pass
1201	41.8	-53.4	-13	Pass

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Meteorcomm LLC**
 Specification: **47 CFR §80.211(f) Spurious Emissions**
 Work Order #: **111224** Date: 5/6/2025
 Test Type: **Radiated Scan** Time: 14:50:33
 Tested By: C. Plumadore/M. Atkinson Sequence#: 21
 Software: EMITest 5.03.20

Equipment Tested:

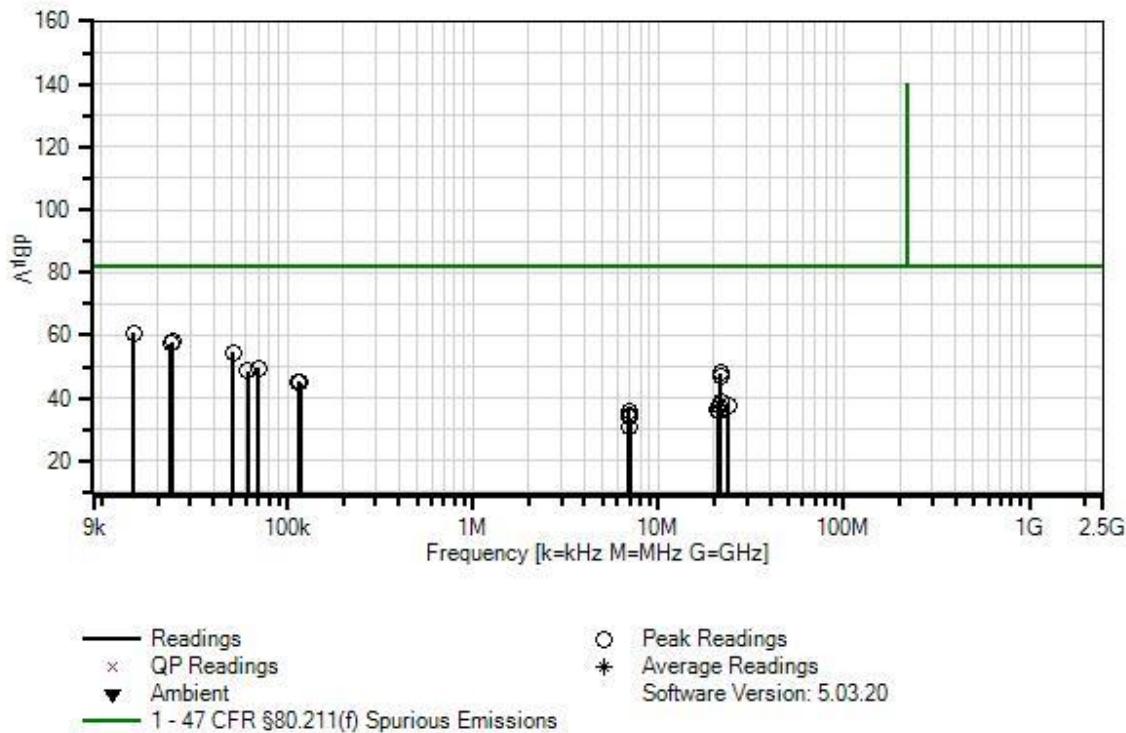
Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions: Humidity: 36.8% Temperature: 21.4°C Pressure: 102.4 kPa Frequency: 9kHz-30MHz Test Method: ANSI C63.26 Test set up: EUT set up on foam table 80cm high. Data traffic on ethernet lines uploading and downloading 10Mb files. Transmitting. Mod. #1 was in place during testing.

Meteorcomm LLC. WO#: 111224 Sequence#: 21 Date: 5/6/2025
 47 CFR §80.211(f) Spurious Emissions Test Distance: 3 Meters Vert

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	9/19/2024	9/19/2026
T1	AN00052	Loop Antenna	6502	4/19/2024	4/19/2026
T2	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T3	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027

Measurement Data:			Reading listed by margin.			Test Distance: 3 Meters				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	14.780k	45.9	+14.9	+0.0	+0.0	+0.0	60.8	82.2	-21.4	perp
2	24.090k	45.7	+12.3	+0.0	+0.0	+0.0	58.0	82.2	-24.2	paral
3	23.660k	45.0	+12.4	+0.0	+0.0	+0.0	57.4	82.2	-24.8	flat
4	51.160k	44.2	+10.2	+0.0	+0.0	+0.0	54.4	82.2	-27.8	paral
5	70.050k	39.7	+9.8	+0.0	+0.0	+0.0	49.5	82.2	-32.7	flat
6	61.450k	38.7	+9.9	+0.0	+0.0	+0.0	48.6	82.2	-33.6	flat
7	21.612M	39.4	+8.3	+0.2	+0.0	+0.0	47.9	82.2	-34.3	flat
8	21.612M	38.3	+8.3	+0.2	+0.0	+0.0	46.8	82.2	-35.4	flat
9	114.750k	35.5	+9.6	+0.0	+0.0	+0.0	45.1	82.2	-37.1	paral
10	115.880k	35.3	+9.7	+0.0	+0.0	+0.0	45.0	82.2	-37.2	perp
11	117.710k	35.1	+9.7	+0.0	+0.0	+0.0	44.8	82.2	-37.4	flat
12	21.612M	30.5	+8.3	+0.2	+0.0	+0.0	39.0	82.2	-43.2	paral
13	21.254M	29.4	+8.2	+0.2	+0.0	+0.0	37.8	82.2	-44.4	paral
14	23.821M	28.7	+8.6	+0.3	+0.1	+0.0	37.7	82.2	-44.5	flat
15	20.926M	28.0	+8.2	+0.2	+0.0	+0.0	36.4	82.2	-45.8	perp
16	21.075M	27.6	+8.2	+0.2	+0.0	+0.0	36.0	82.2	-46.2	perp
17	6.956M	26.0	+9.6	+0.1	+0.1	+0.0	35.8	82.2	-46.4	flat
18	6.926M	24.9	+9.6	+0.1	+0.1	+0.0	34.7	82.2	-47.5	flat
19	7.015M	24.0	+9.6	+0.1	+0.1	+0.0	33.8	82.2	-48.4	perp
20	7.045M	21.2	+9.6	+0.1	+0.1	+0.0	31.0	82.2	-51.2	perp
21	6.926M	20.7	+9.6	+0.1	+0.1	+0.0	30.5	82.2	-51.7	paral

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Meteorcomm LLC.**
 Specification: **47 CFR §80.211(f) Spurious Emissions**
 Work Order #: **111224** Date: **5/8/2025**
 Test Type: **Radiated Scan** Time: **09:33:24**
 Tested By: C. Plumadore/M. Atkinson Sequence#: **25**
 Software: EMITest 5.03.20

Equipment Tested:

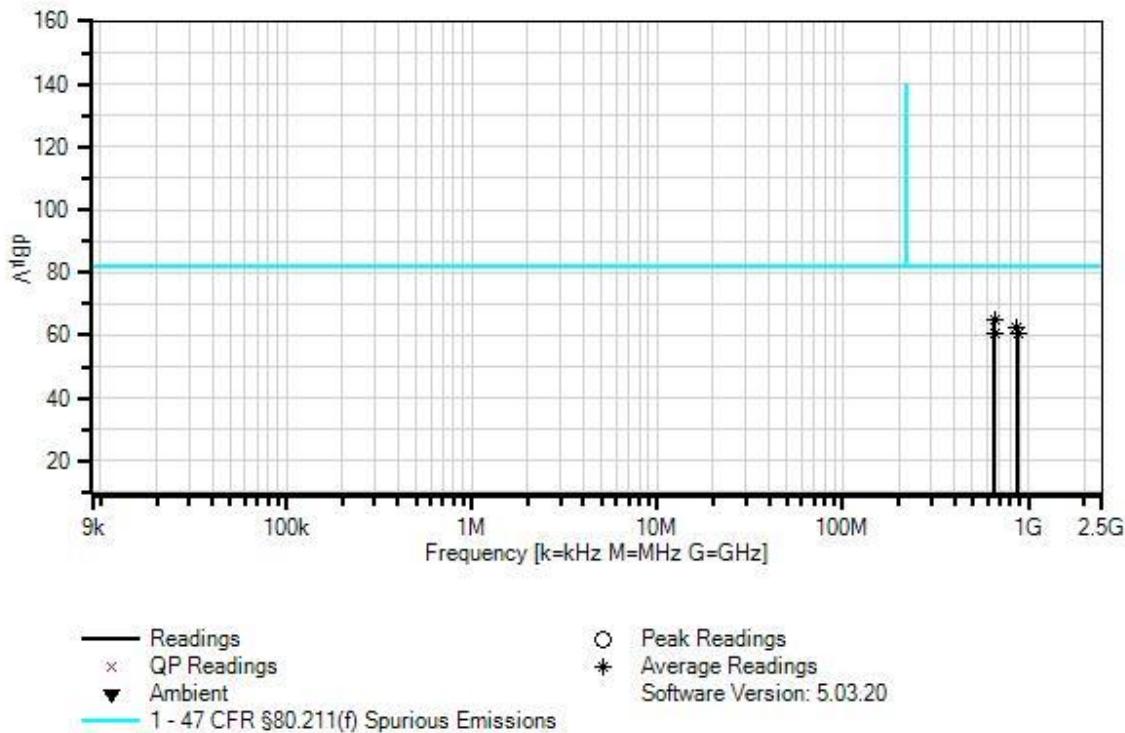
Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 36.8%
Temperature: 21.4°C
Pressure: 102.4 kPa
Frequency: 30-1000MHz
Test Method: ANSI C63.26
Test set up: EUT set up on foam table 80cm high. Data traffic on ethernet lines uploading and downloading 10Mb files. Transmitting.
Averages are Peak measurements with a 2 second sweep with a 1MHz span.
Mod. #1 was in place during testing.

Meteorcomm LLC, WO#: 111224 Sequence#: 25 Date: 5/8/2025
 47 CFR §80.211(f) Spurious Emissions Test Distance: 3 Meters Horiz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03863	Biconilog Antenna	3142E	1/15/2025	1/15/2027
T2	ANP08256	Attenuator	WA1/6-6-0403	3/18/2025	3/18/2027
T3	ANP05333	Cable	Heliax	1/8/2025	1/8/2027
T4	ANP05360	Cable	RG214	1/7/2025	1/7/2027
T5	ANP08205	Cable	CBL-6FT- NMNM+	1/22/2025	1/22/2027
T6	AN02871	Spectrum Analyzer	E4440A	9/19/2024	9/19/2026
T7	AN01316	Preamp	8447D	5/25/2024	5/25/2026

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7		Table	dB μ V	dB μ V		
	MHz	dB μ V	dB	dB	dB		Table	dB μ V	dB μ V		Ant
1	659.955M	62.3	+21.7	+6.1	+1.2	+2.5	+0.0	65.0	82.2	-17.2	Horiz
	Ave		+0.8	+0.0	-29.6						CH96
2	870.451M	57.1	+23.3	+6.1	+1.4	+2.6	+0.0	62.4	82.2	-19.8	Horiz
	Ave		+0.8	+0.0	-28.9						CH1
3	652.825M	57.8	+21.8	+6.1	+1.2	+2.5	+0.0	60.6	82.2	-21.6	Horiz
	Ave		+0.8	+0.0	-29.6						CH1
4	879.949M	55.1	+23.2	+6.1	+1.4	+2.6	+0.0	60.3	82.2	-21.9	Horiz
	Ave		+0.8	+0.0	-28.9						CH96

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Meteorcomm LLC.**
 Specification: **47 CFR §80.211(f) Spurious Emissions**
 Work Order #: **111224** Date: **5/8/2025**
 Test Type: **Radiated Scan** Time: **11:56:02**
 Tested By: C. Plumadore Sequence#: **30**
 Software: EMITest 5.03.20

Equipment Tested:

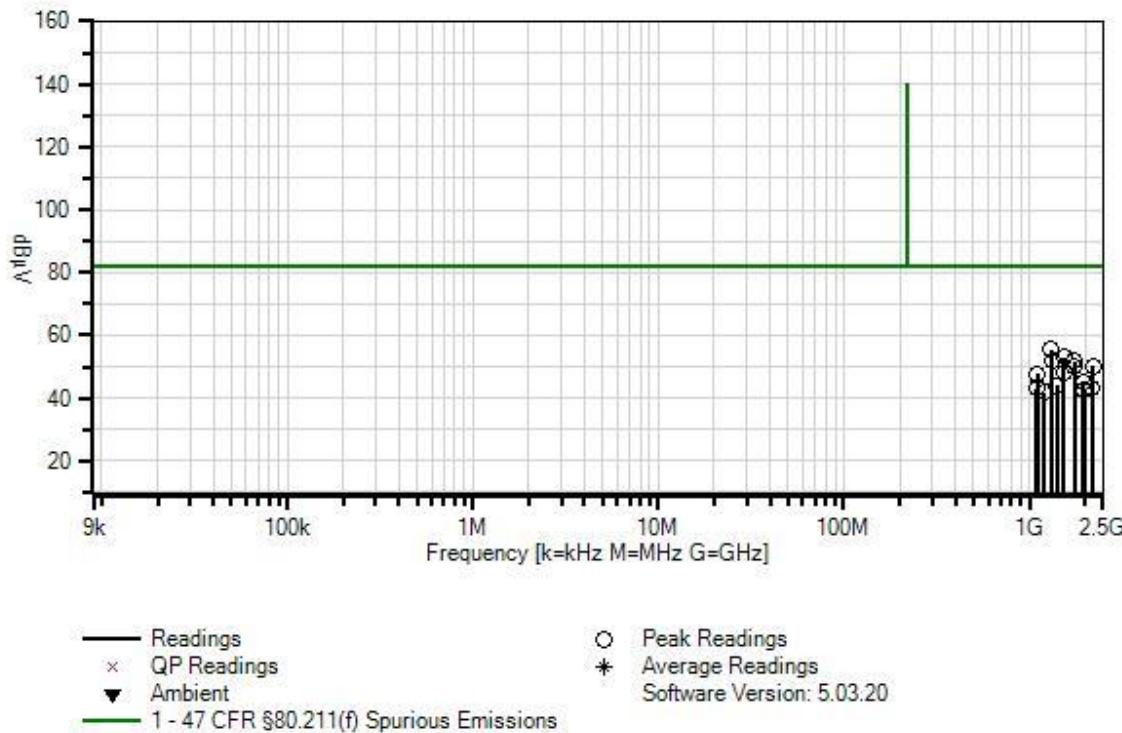
Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 36.8%
Temperature: 21.4°C
Pressure: 102.4 kPa
Frequency: 1-2.5GHz
Test Method: ANSI C63.26
Test set up: EUT set up on foam table 1.5m high. Data traffic on ethernet lines uploading and downloading 10Mb files.
Mod. #1 was in place during testing.

Meteorcomm LLC. WO#: 111224 Sequence#: 30 Date: 5/8/2025
 47 CFR §80.211(f) Spurious Emissions Test Distance: 3 Meters Vert

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	1/7/2025	1/7/2027
T2	AN02374ANSI	Horn Antenna	RGA-60	1/8/2025	1/8/2027
T3	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T4	ANP07504	Cable	CLU40-KMFM-02.00F	1/7/2025	1/7/2027
T5	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027
	AN02871	Spectrum Analyzer	E4440A	9/19/2024	9/19/2026

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5				Table	dB μ V	dB μ V		
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	1305.765M	63.1	-36.1 +0.7	+25.4	+1.8	+0.4	+0.0	55.3	82.2	-26.9	Vert
									CH1		
2	1523.292M	59.8	-35.5 +0.7	+25.4	+2.0	+0.5	+0.0	52.9	82.2	-29.3	Vert
									CH1		
3	1319.930M	59.6	-36.1 +0.7	+25.5	+1.8	+0.4	+0.0	51.9	82.2	-30.3	Vert
									CH96		
4	1759.715M	56.6	-35.2 +0.8	+26.9	+2.2	+0.4	+0.0	51.7	82.2	-30.5	Vert
									CH96		
5	2200.055M	53.0	-34.8 +1.0	+28.1	+2.4	+0.6	+0.0	50.3	82.2	-31.9	Vert
									CH96		
6	1740.985M	55.3	-35.2 +0.8	+26.5	+2.2	+0.4	+0.0	50.0	82.2	-32.2	Vert
									CH1		
7	1539.628M	55.1	-35.5 +0.7	+25.5	+2.0	+0.5	+0.0	48.3	82.2	-33.9	Vert
									CH96		
8	1100.218M	57.6	-37.0 +0.6	+24.5	+1.6	+0.4	+0.0	47.7	82.2	-34.5	Vert
									CH96		
9	1958.358M	48.3	-35.0 +0.9	+27.8	+2.4	+0.5	+0.0	44.9	82.2	-37.3	Vert
									CH1		
10	1400.500M	51.7	-35.9 +0.7	+25.2	+1.9	+0.5	+0.0	44.1	82.2	-38.1	Vert
11	2175.975M	46.1	-34.9 +1.0	+27.9	+2.4	+0.6	+0.0	43.1	82.2	-39.1	Vert
									CH1		
12	1088.202M	53.1	-37.1 +0.6	+24.4	+1.6	+0.4	+0.0	43.0	82.2	-39.2	Vert
									CH1		
13	1979.708M	46.0	-35.0 +0.9	+27.8	+2.4	+0.5	+0.0	42.6	82.2	-39.6	Vert
									CH96		
14	1201.000M	50.4	-36.5 +0.7	+25.1	+1.7	+0.4	+0.0	41.8	82.2	-40.4	Vert

Test Setup Photo(s)



Below 1GHz



Above 1GHz, View 1



Above 1GHz, View 2

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 dB μ V/m, the spectrum analyzer reading in dB μ V 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	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ V/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