Meteorcomm LLC.

EMC TEST REPORT FOR

ITCR-NG Wayside
Model: 65010

Tested to The Following Standards:

FCC Part 80 Subpart E

217.6125-219.9875MHz

Report No.: 108416-2

Date of issue: November 16, 2023

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

Testing the Future
CKC LABORATORIES, INC.

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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: PO30478

REPORT PREPARED BY:

Viviana Prado
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 108416

DATE OF EQUIPMENT RECEIPT: September 15, 2023
DATE(S) OF TESTING: September 15-22, 2023

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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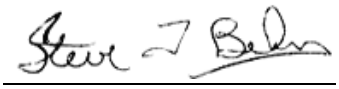


Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

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.
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
2.1046/80.215 (c)(1)/80215 (h) (5)	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	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
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.

Configuration 1 (Meanwell DC Supply)

Equipment Tested:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR001056MC

Support Equipment:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR000002HW
AC/DC Switching Adaptor	Mean Well	GST280A12-C6P	EC051B7718
AC/DC Switching Adaptor	Mean Well	GST280A12-C6P	EB96422312
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Vector Signal Generator	Rhode & Schwarz	SMBV100B	1423.1003K02-102044-an
Laptop	Panasonic	CF-30	T1260Z
Laptop	Dell	Latitude	8X7DMH2
GPS 4-way Splitter	GPSS	S14-SF	NA
USB Thumb Drive	Micro Center	64GB	NA
Prosafe 8-Port Gigabit Smart Switch	Netgear	GS108Tv2	29SE4C5302E60

Configuration 3 (BK DC Supply, No Receiver Support Unit)

Equipment Tested:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR001056MC

Support Equipment:

Device	Manufacturer	Model #	S/N
Programmable DC Power Supply	BK Precision	XLN8018	351EL1073
AC/DC Switching Adaptor	Mean Well	GST280A12-C6P	EB96422312
Vector Signal Generator	Rhode & Schwarz	SMBV100B	1423.1003K02-102044-an
Laptop	Panasonic	CF-30	T1260Z
Laptop	Dell	Latitude	8X7DMH2
GPS 4-way Splitter	GPSS	S14-SF	NA
USB Thumb Drive	Micro Center	64GB	NA
Prosafe 8-Port Gigabit Smart Switch	Netgear	GS108Tv2	29SE4C5302E60

General Product Information:

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):	DQPSK Full Rate and Half Rate
Maximum Duty Cycle:	10%, but may be increased for testing
Number of TX Chains:	1
Antenna Type(s) and Gain:	Not specified by manufacturer, but typical railroad antenna 4.55dBi (1/2 wave dipole)
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	13.6VDC
Firmware / Software used for Test:	0.1.76 Linux 0.1.121 FPGA MobaXterm v23.2
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)


MODEL NUMBER:
SERIAL NUMBER
PART NUMBER
MADE IN USA
METEORCOMM
ANT
13.6 VDC
GNSS
GPIO OUTPUT NON-VITAL
GPIO INPUT NON-VITAL

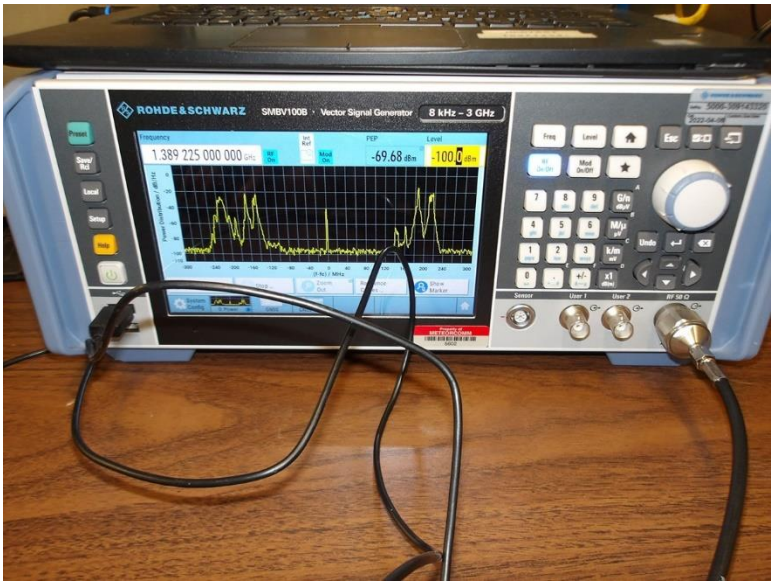
Support Equipment Photo(s)

Support EUT

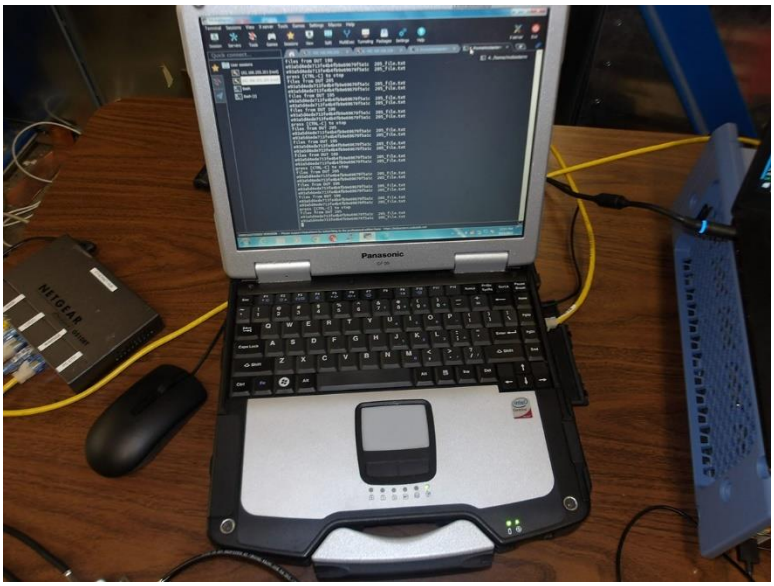
DC Power Supply 1

DC Power Supply 2

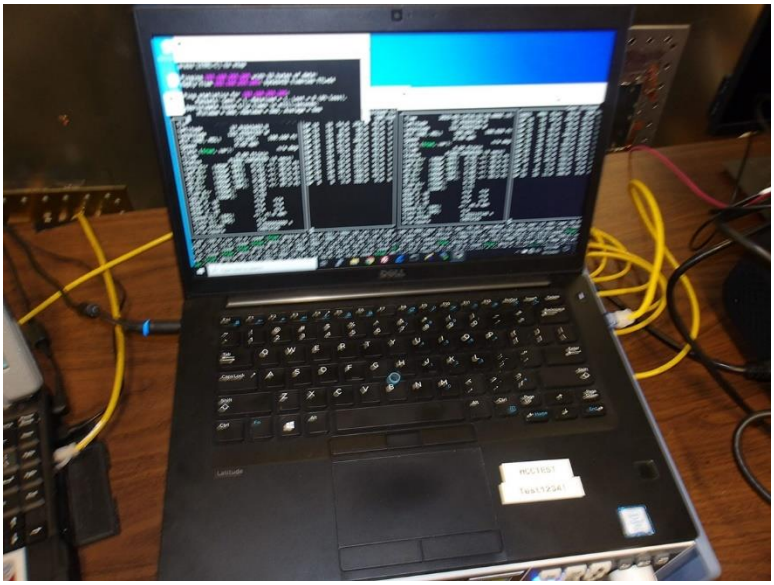
Attenuators



Signal Generator

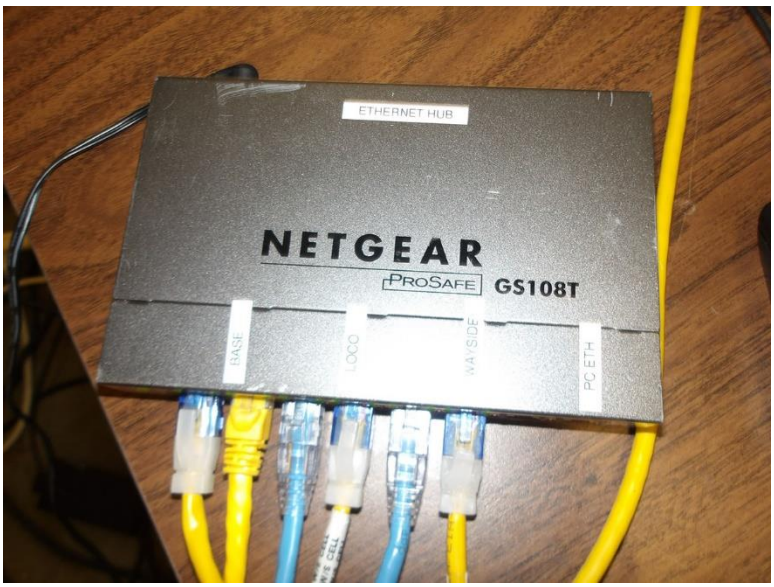


Laptop 1



Laptop 2

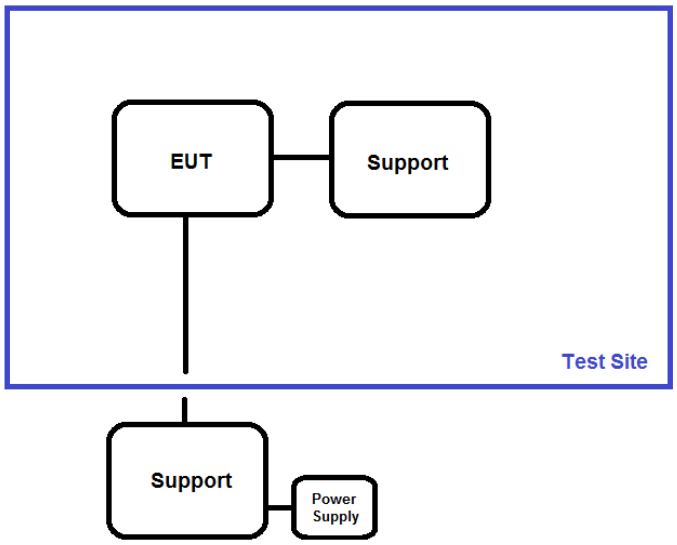
GPS Splitter



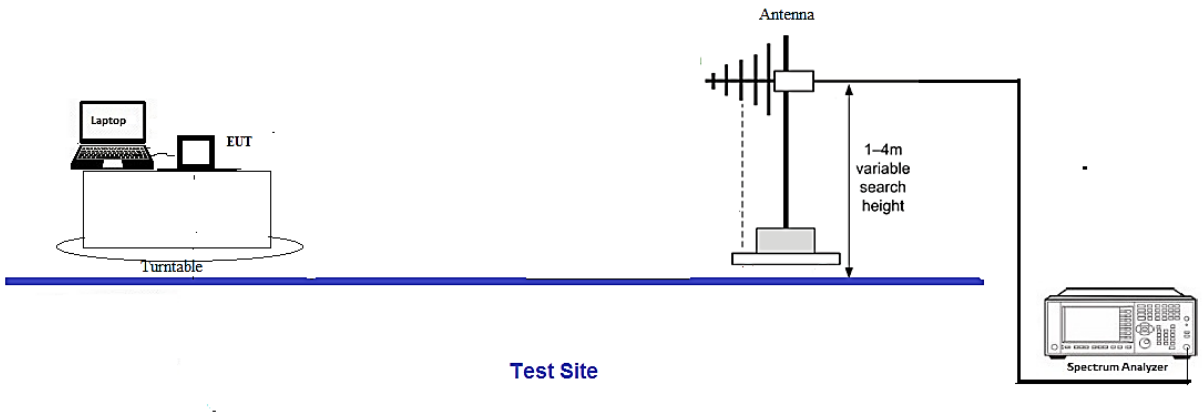
Ethernet Hub

Block Diagram(s) of Test Setup

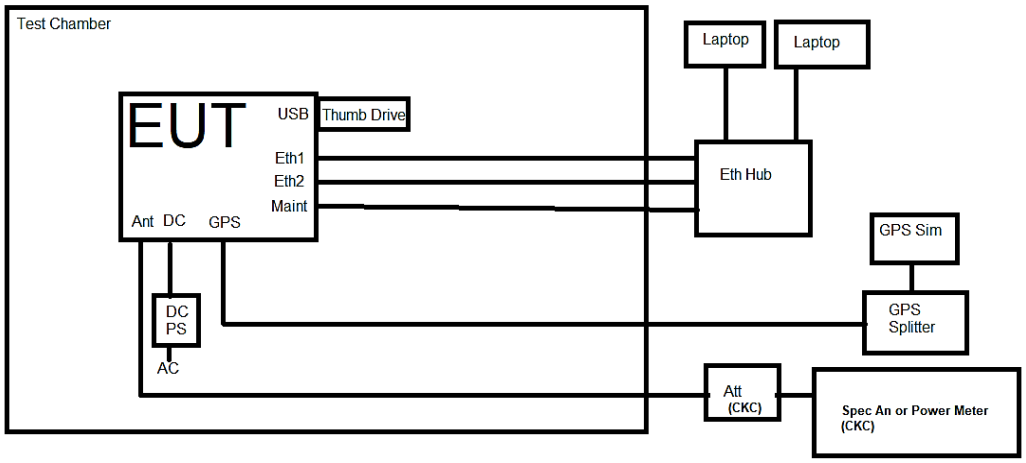
Test Setup Block Diagram



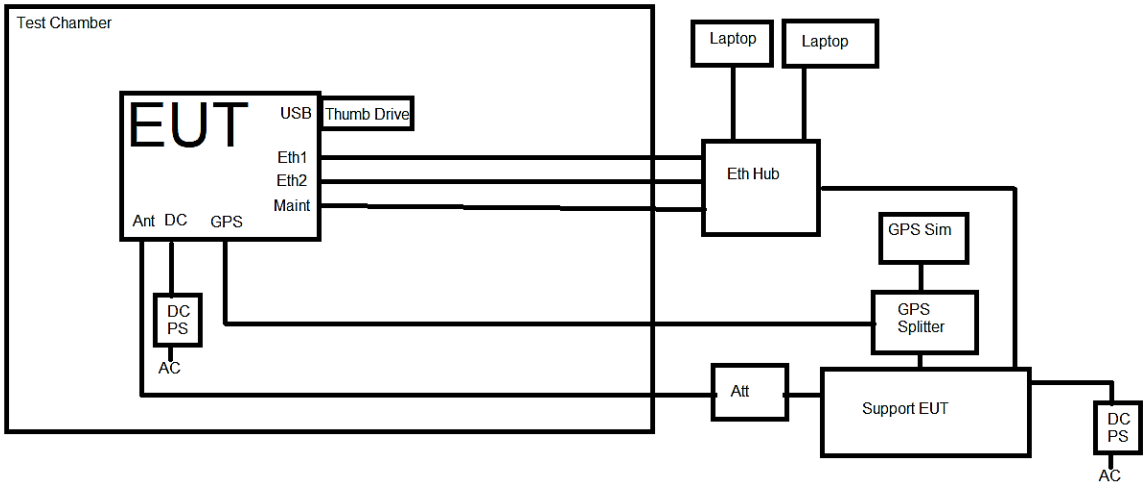
Radiated test setup



RF Conducted Setup



Radiated Setup



FCC PART 80 SUBPART E

80.215 (c)(1), 80215 (h) (5), 2.1046 Power Output

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	9/18/2023 to 9/19/2023
Configuration:	3		
Test Setup:	The unit is in a temperature chamber for temperature variation. The voltage is varied and measured with a DMM. The EUT's RF port is connected to a peak power meter 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 its normal duty cycle, full rate and half rate modulations investigated. Per the manufacturer, the fundamental power limit will change depending on the licensee and installation. For testing purposes, the limit is assumed to be 50W. The following channels were selected for testing: Ch1 = 217.6125MHz Ch96 = 219.9875MHz		

Environmental Conditions			
Temperature (ºC)	23-26	Relative Humidity (%):	42-46

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03478	Power Sensor	Rohde & Schwarz	NRP-Z81	5/8/2023	5/8/2025
P07623	Attenuator	API Weinschel	47-20-34	3/16/2022	3/16/2024
P07628	Low Pass Filter	Mini-Circuits	NLP-90+	4/27/2022	4/27/2024
P06452	Cable	Andrews	Heliax	2/8/2023	2/8/2025
02757	Temperature Chamber	Bemco	F100/350-8	12/8/2022	12/8/2024
03029	Thermometer, Digital Infrared	Fluke	566	4/14/2023	4/14/2025
03514	Multimeter	Fluke	87	10/20/2022	10/20/2024

Test Data Summary - RF Conducted Measurement (Ch1)					
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (Watts)**	**Results**
217.6125	-30	V_{Nom}	Full Rate	25.88	Pass
217.6125	-20	V_{Nom}	Full Rate	27.93	Pass
217.6125	-10	V_{Nom}	Full Rate	28.58	Pass
217.6125	0	V_{Nom}	Full Rate	25.00	Pass
217.6125	10	V_{Nom}	Full Rate	25.41	Pass
217.6125	20	V_{Nom}	Full Rate	26.12	Pass
217.6125	30	V_{Nom}	Full Rate	26.49	Pass
217.6125	40	V_{Nom}	Full Rate	26.79	Pass
217.6125	50	V_{Nom}	Full Rate	27.23	Pass
217.6125	20	V_{Min}	Full Rate	26.12	Pass
217.6125	20	V_{Max}	Full Rate	26.18	Pass

Test Data Summary - RF Conducted Measurement (Ch96)					
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (Watts)**	**Results**
219.9875	-30	V_{Nom}	Full Rate	23.71	Pass
219.9875	-20	V_{Nom}	Full Rate	24.15	Pass
219.9875	-10	V_{Nom}	Full Rate	24.27	Pass
219.9875	0	V_{Nom}	Full Rate	24.89	Pass
219.9875	10	V_{Nom}	Full Rate	25.23	Pass
219.9875	20	V_{Nom}	Full Rate	26.06	Pass
219.9875	30	V_{Nom}	Full Rate	26.24	Pass
219.9875	40	V_{Nom}	Full Rate	26.49	Pass
219.9875	50	V_{Nom}	Full Rate	26.98	Pass
219.9875	20	V_{Min}	Full Rate	26.12	Pass
219.9875	20	V_{Max}	Full Rate	25.88	Pass

Test Data Summary - RF Conducted Measurement (Ch1)					
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (Watts)**	**Results**
217.6125	-30	V_{Nom}	Half Rate	25.76	Pass
217.6125	-20	V_{Nom}	Half Rate	27.61	Pass
217.6125	-10	V_{Nom}	Half Rate	28.31	Pass
217.6125	0	V_{Nom}	Half Rate	25.18	Pass
217.6125	10	V_{Nom}	Half Rate	25.64	Pass
217.6125	20	V_{Nom}	Half Rate	26.98	Pass
217.6125	30	V_{Nom}	Half Rate	26.61	Pass
217.6125	40	V_{Nom}	Half Rate	26.73	Pass
217.6125	50	V_{Nom}	Half Rate	27.04	Pass
217.6125	20	V_{Min}	Half Rate	26.18	Pass
217.6125	20	V_{Max}	Half Rate	26.18	Pass

Test Data Summary - RF Conducted Measurement (Ch96)					
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (Watts)**	**Results**
219.9875	-30	V_{Nom}	Half Rate	20.94	Pass
219.9875	-20	V_{Nom}	Half Rate	22.44	Pass
219.9875	-10	V_{Nom}	Half Rate	23.50	Pass
219.9875	0	V_{Nom}	Half Rate	25.06	Pass
219.9875	10	V_{Nom}	Half Rate	25.53	Pass
219.9875	20	V_{Nom}	Half Rate	26.92	Pass
219.9875	30	V_{Nom}	Half Rate	26.00	Pass
219.9875	40	V_{Nom}	Half Rate	26.36	Pass
219.9875	50	V_{Nom}	Half Rate	26.79	Pass
219.9875	20	V_{Min}	Half Rate	25.76	Pass
219.9875	20	V_{Max}	Half Rate	25.82	Pass

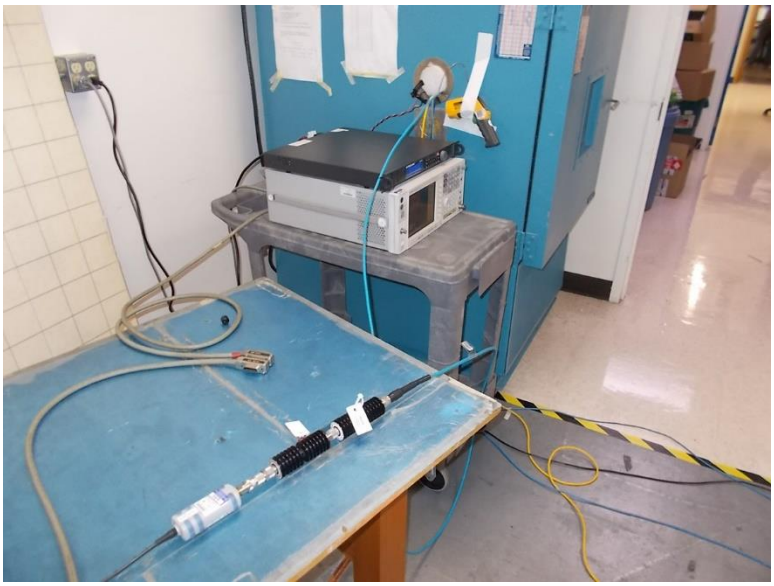
Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
V_{Nom}:	13.6VDC
V_{Min}:	11.56VDC
V_{Max}:	15.64VDC

Test Data Summary - RF Conducted Measurement (Lowest Power Setting)					
Additionally, the power was measured with a 20dB lower setting					
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (Watts)**	**Results**
217.6125	20	V_{Nom}	Full Rate	0.26	Pass
219.9875	20	V_{Nom}	Full Rate	0.26	Pass
217.6125	20	V_{Nom}	Half Rate	0.31	Pass
219.9875	20	V_{Nom}	Half Rate	0.31	Pass

Test Setup Photo(s)



Temperature Chamber Power Meter

Conducted RF In Temperature Chamber

2.1049 Occupied Bandwidth

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	9/20/2023
Configuration:	3		
Test Setup:	The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The EUT is transmitting continuously with its normal duty cycle, full rate and half rate modulations investigated. Per the manufacturer, 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 (ºC)	25	Relative Humidity (%):	44

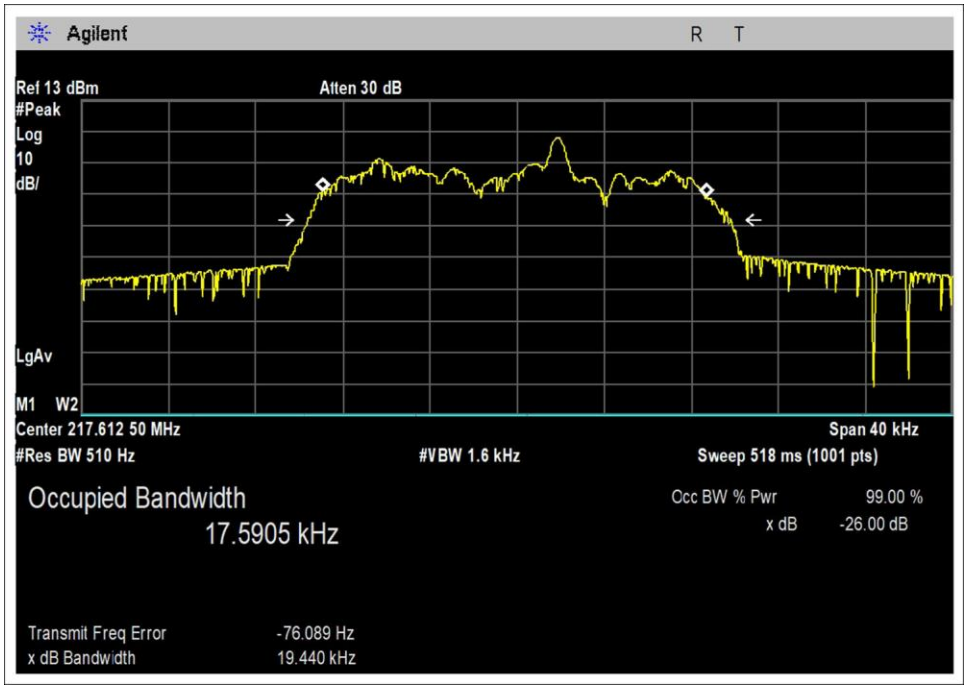
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03803	Spectrum Analyzer	Agilent	E4440A	2/23/2022	2/23/2024
P07623	Attenuator	API Weinschel	47-20-34	3/16/2022	3/16/2024
P07628	Low Pass Filter	Mini-Circuits	NLP-90+	4/27/2022	4/27/2024
P06452	Cable	Andrews	Heliax	2/8/2023	2/8/2025

Occupied Bandwidth

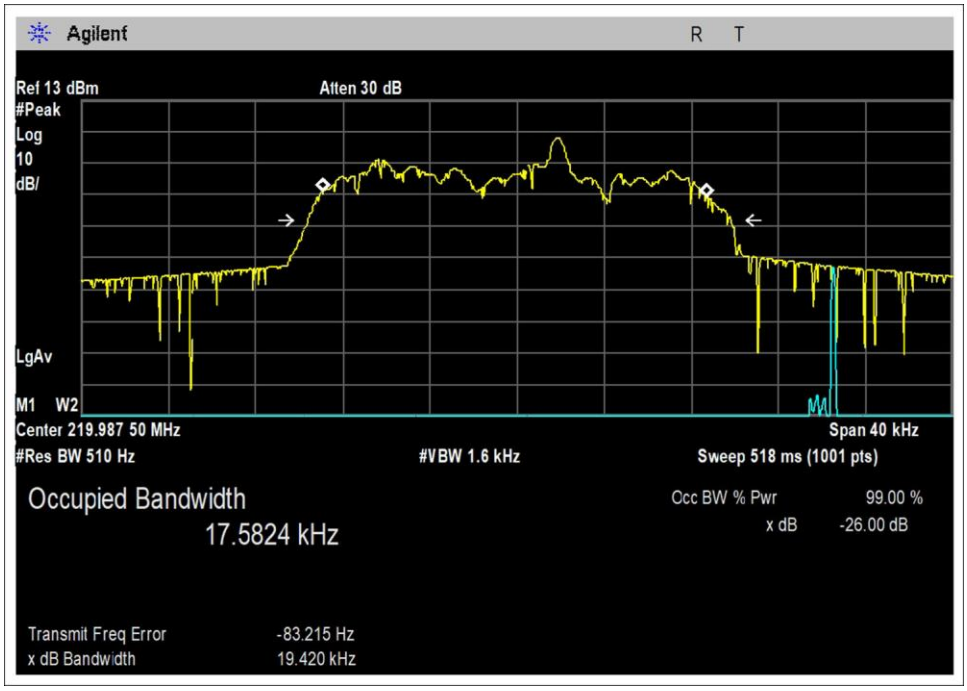
Test Data Summary				
Frequency (MHz)	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
217.6125	Full Rate	17.5905	20kHz	Pass
219.9875	Full Rate	17.5824	20kHz	Pass
217.6125	Half Rate	8.8603	11.25kHz	Pass
219.9875	Half Rate	8.7975	11.25kHz	Pass

Plot(s)

Full Rate

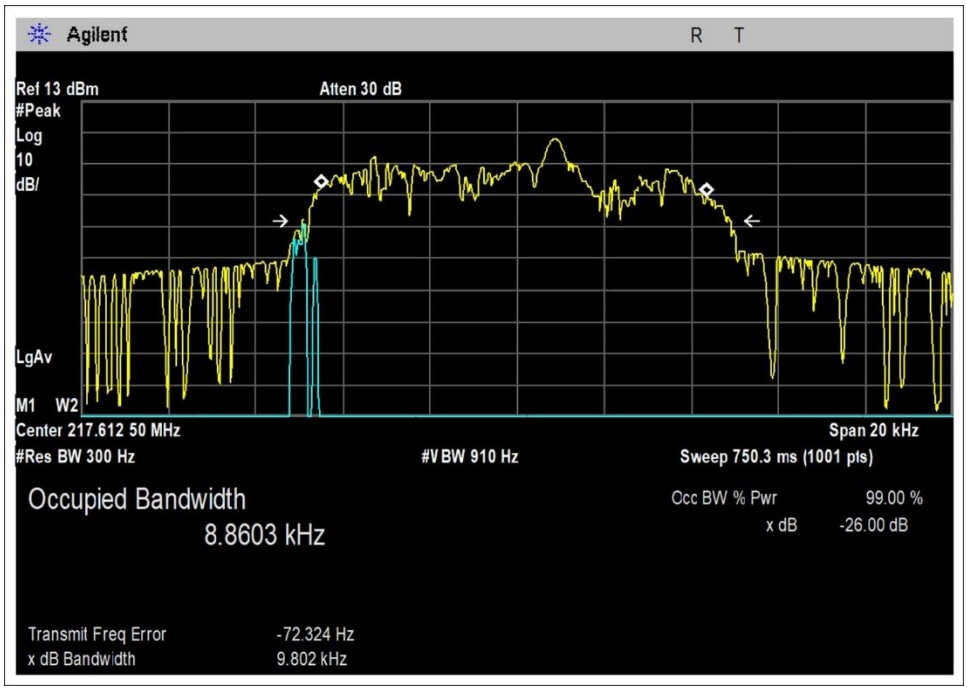


Channel 1

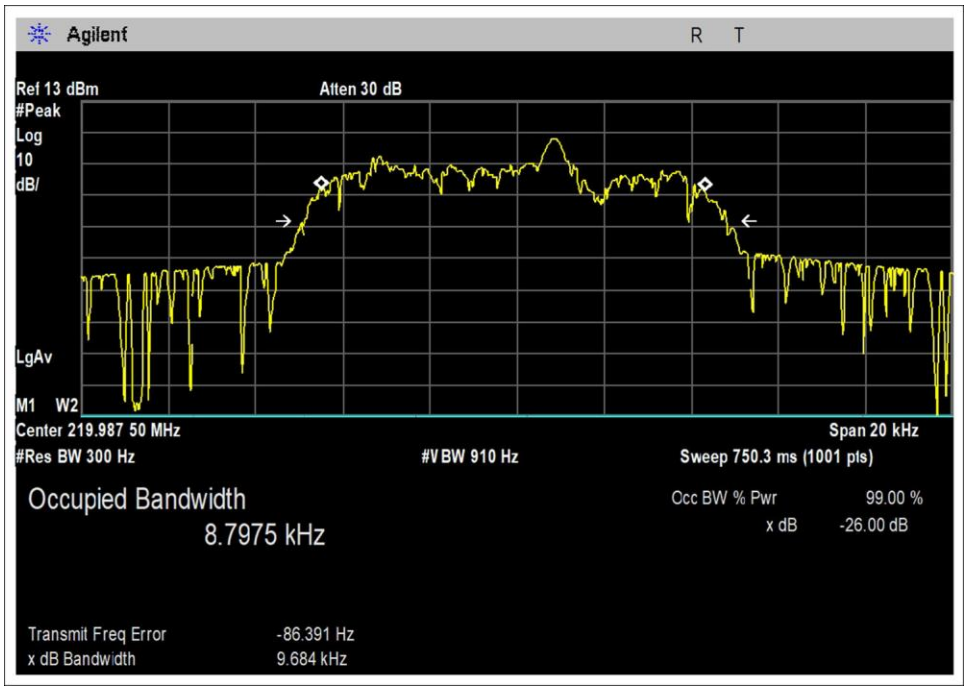


Channel 96

Half Rate



Channel 1



Channel 96

Test Setup Photo(s)

Temperature Chamber Spectrum Analyzer

Conducted RF In Temperature Chamber

80.209 Frequency Stability

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	9/18/2023 to 9/19/2023
Configuration:	3		
Test Setup:	The unit is in a temperature chamber for temperature variation. The voltage is varied and measured with a DMM. 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 its normal duty cycle, full rate and half rate modulations investigated. The limit is assumed as 5ppm from 80.209 (6) Band 216-220MHz.		

Environmental Conditions			
Temperature (ºC)	23-26	Relative Humidity (%):	42-46

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03803	Spectrum Analyzer	Agilent	E4440A	2/23/2022	2/23/2024
P07623	Attenuator	API Weinschel	47-20-34	3/16/2022	3/16/2024
P07628	Low Pass Filter	Mini-Circuits	NLP-90+	4/27/2022	4/27/2024
P06452	Cable	Andrews	Heliax	2/8/2023	2/8/2025
02757	Temperature Chamber	Bemco	F100/350-8	12/8/2022	12/8/2024
03029	Thermometer, Digital Infrared	Fluke	566	4/14/2023	4/14/2025
03514	Multimeter	Fluke	87	10/20/2022	10/20/2024

Test Data Summary				
Modulation: Full Rate				
Temp (ºC)	**Voltage**	**Ch 1 (PPM)**	**Ch 96 (PPM)**	**Results**
-30	V_{Nom}	0.68929	0.68185	Pass
-20	V_{Nom}	0.41358	0.40911	
-10	V_{Nom}	0.32167	0.31820	
0	V_{Nom}	0.55143	0.68185	
10	V_{Nom}	0.55143	0.54548	
20	V_{Nom}	0.00000	0.00000	
30	V_{Nom}	0.00000	0.13637	
40	V_{Nom}	0.00000	0.00000	
50	V_{Nom}	0.18381	0.18183	
20	V_{Min}	0.03217	0.02727	
20	V_{Max}	0.01838	0.01364	
Maximum Deviation		0.68929	0.68185	

Test Data Summary				
Modulation: Half Rate				
Temp (ºC)	**Voltage**	**Ch 1 (PPM)**	**Ch 96 (PPM)**	**Results**
-30	V_{Nom}	0.73525	0.72731	Pass
-20	V_{Nom}	0.41358	0.40911	
-10	V_{Nom}	0.32167	0.31820	
0	V_{Nom}	0.55144	0.59094	
10	V_{Nom}	0.55144	0.54548	
20	V_{Nom}	0.00000	0.00000	
30	V_{Nom}	0.09191	0.09091	
40	V_{Nom}	0.09191	0.04546	
50	V_{Nom}	0.09191	0.09091	
20	V_{Min}	0.22977	0.31820	
20	V_{Max}	0.00002	0.18183	
Maximum Deviation		0.73525	0.72731	

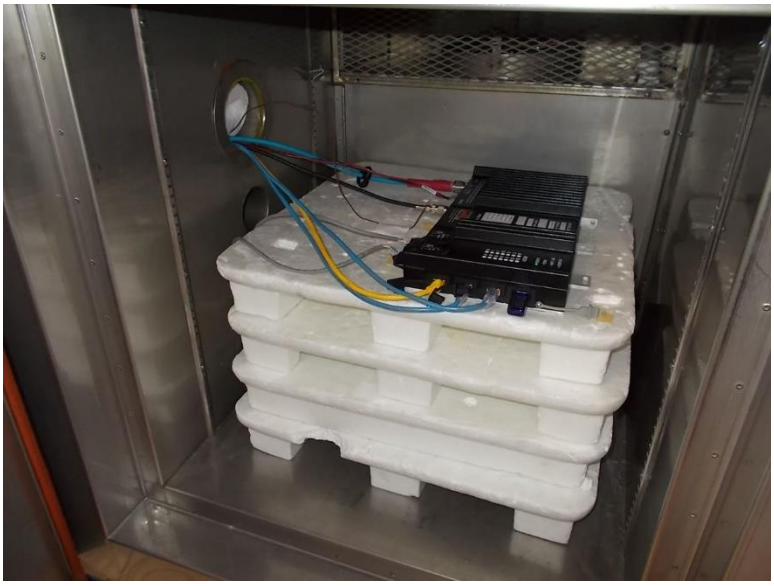
Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
V_{Nom}:	13.6VDC
V_{Min}:	11.56VDC
V_{Max}:	15.64VDC

Test Setup Photo(s)

Temperature Chamber Spectrum Analyzer



Conducted RF In Temperature Chamber

80.211 (f) Conducted Spurious Emissions and Mask

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	9/22/2023
Configuration:	3		
Test Setup:	The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The EUT is transmitting continuously with its normal duty cycle, full rate and half rate modulations investigated in separate datasheets. The emission mask was built with an RMS Average measurement of the fundamental, with the lowest value selected from an investigation on Ch1 and Ch96. The worst-case low RMS average for full rate was 26.1W, half rate was 26.3W. Outside of the span shown in the emission mask plots, the following bandwidths were used: 9kHz-150kHz: 200Hz RBW 150kHz-30MHz: 9kHz RBW 30-1000MHz: 100kHz RBW 1000MHz and above: 1MHz RBW Average values as indicated on datasheet are RMS. Per the manufacturer the masks are built with 80.211(f), with an assumed 20kHz ABW for Full Rate and 11.25kHz ABW for Half Rate, it will be the responsibility of the licensee to ensure mask applicability. Conducted spurious emissions performed at ambient temperature and nominal voltage using the same setup also used for temperature testing.		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	46

Test Conditions / Setup

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Meteorcomm LLC**		
Specification:	**47 CFR §80.211(f) Spurious Emissions**		
Work Order #:	**108416**	Date:	9/21/2023
Test Type:	**Conducted Emissions**	Time:	15:59:10
Tested By:	Michael Atkinson	Sequence#:	53
Software:	EMITest 5.03.20		13.6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

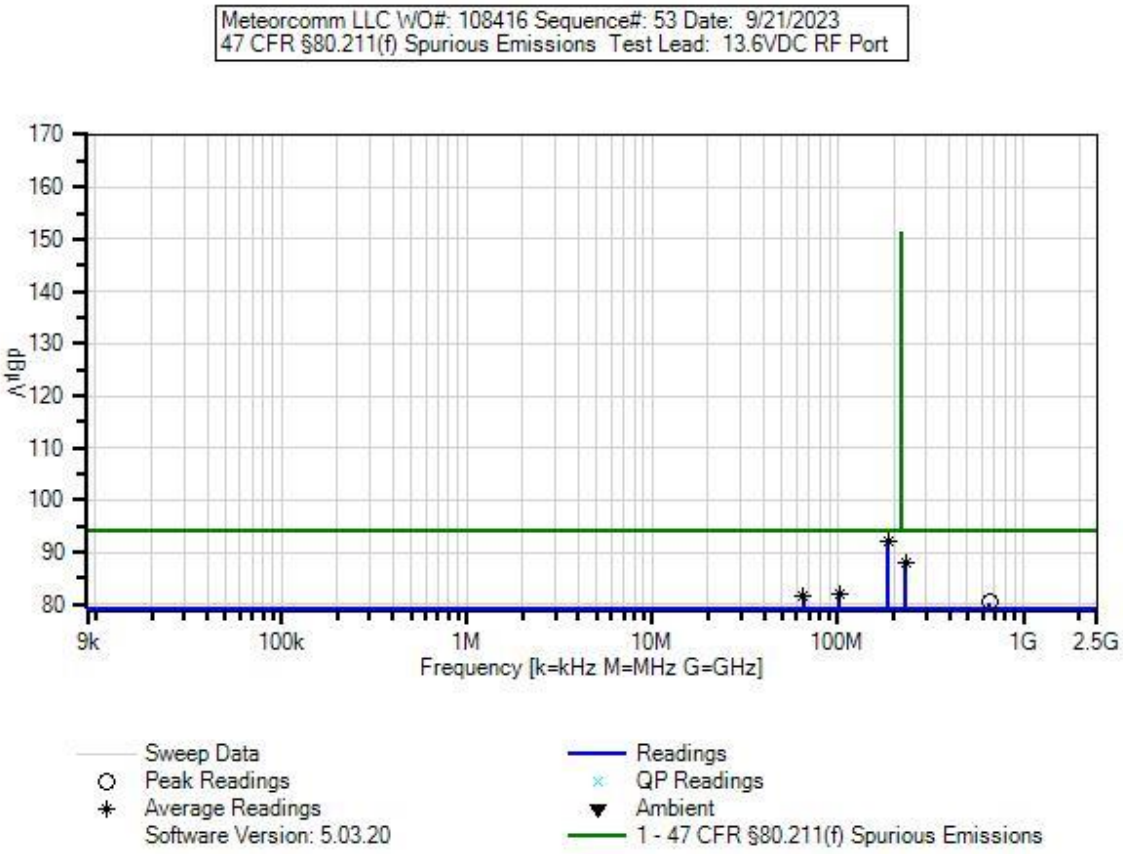
Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Humidity: 51%
Pressure: 101.5kPa

Test Method: ANSI C63.26 (2015)

Frequency Range: 9kHz-2.5GHz

Full Rate



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03803	Spectrum Analyzer	E4440A	2/23/2022	2/23/2024
T2	ANP07623	Attenuator	47-20-34	3/16/2022	3/16/2024
T3	ANP07638	Attenuator	47-20-34	5/3/2022	5/3/2024
T4	ANP06452	Cable	Heliax	2/8/2023	2/8/2025

Measurement Data: Reading listed by margin. Test Lead: RF Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	186.070M Ave	52.4	+0.0	+19.6	+19.7	+0.4	+0.0	92.1	94.0	-1.9	RF Po
2	233.200M Ave	48.5	+0.0	+19.6	+19.6	+0.4	+0.0	88.1	94.0	-5.9	RF Po
3	102.092M Ave	42.7	+0.0	+19.6	+19.6	+0.2	+0.0	82.1	94.0	-11.9	RF Po
4	65.078M Ave	42.4	+0.0	+19.6	+19.6	+0.2	+0.0	81.8	94.0	-12.2	RF Po
5	660.050M	40.3	+0.0	+19.7	+19.7	+0.7	+0.0	80.4	94.0 220.0125	-13.6	RF Po
6	2296.000M	36.9	+0.0	+19.9	+19.8	+1.3	+0.0	77.9	94.0 noisefloor	-16.1	RF Po
7	440.040M	38.1	+0.0	+19.6	+19.6	+0.5	+0.0	77.8	94.0 220.0125	-16.2	RF Po
8	439.960M	35.9	+0.0	+19.6	+19.6	+0.5	+0.0	75.6	94.0 219.9875	-18.4	RF Po
9	443.980M	34.7	+0.0	+19.6	+19.6	+0.5	+0.0	74.4	94.0 221.9875	-19.6	RF Po
10	435.260M	34.5	+0.0	+19.6	+19.6	+0.5	+0.0	74.2	94.0 217.6125	-19.8	RF Po
11	652.850M	33.7	+0.0	+19.7	+19.7	+0.7	+0.0	73.8	94.0 217.6125	-20.2	RF Po
12	665.950M	33.2	+0.0	+19.7	+19.7	+0.7	+0.0	73.3	94.0 221.9875	-20.7	RF Po
13	659.940M	32.7	+0.0	+19.7	+19.7	+0.7	+0.0	72.8	94.0 219.9875	-21.2	RF Po

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Meteorcomm LLC**		
Specification:	**47 CFR §80.211(f) Spurious Emissions**		
Work Order #:	**108416**	Date:	9/21/2023
Test Type:	**Conducted Emissions**	Time:	16:25:41
Tested By:	Michael Atkinson	Sequence#:	54
Software:	EMITest 5.03.20		13.6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

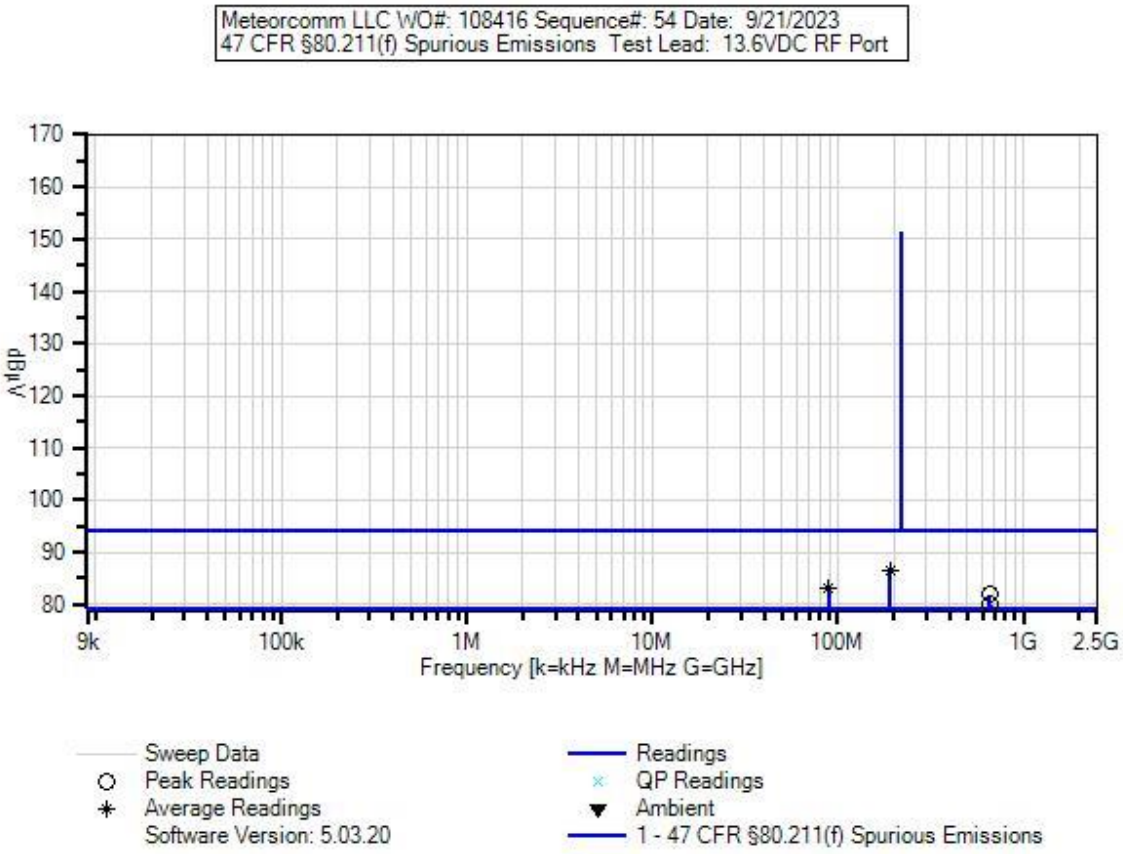
Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Humidity: 51%
Pressure: 101.5kPa

Test Method: ANSI C63.26 (2015)

Frequency Range: 9kHz-2.5GHz

Half Rate



Test Equipment:

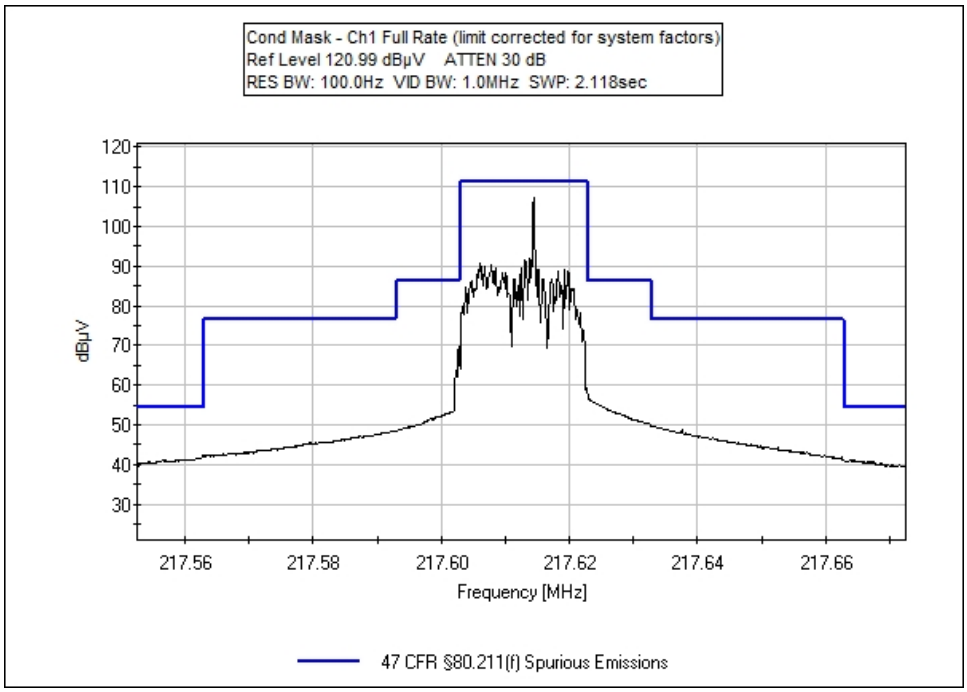
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03803	Spectrum Analyzer	E4440A	2/23/2022	2/23/2024
T2	ANP07623	Attenuator	47-20-34	3/16/2022	3/16/2024
T3	ANP07638	Attenuator	47-20-34	5/3/2022	5/3/2024
T4	ANP06452	Cable	Heliax	2/8/2023	2/8/2025

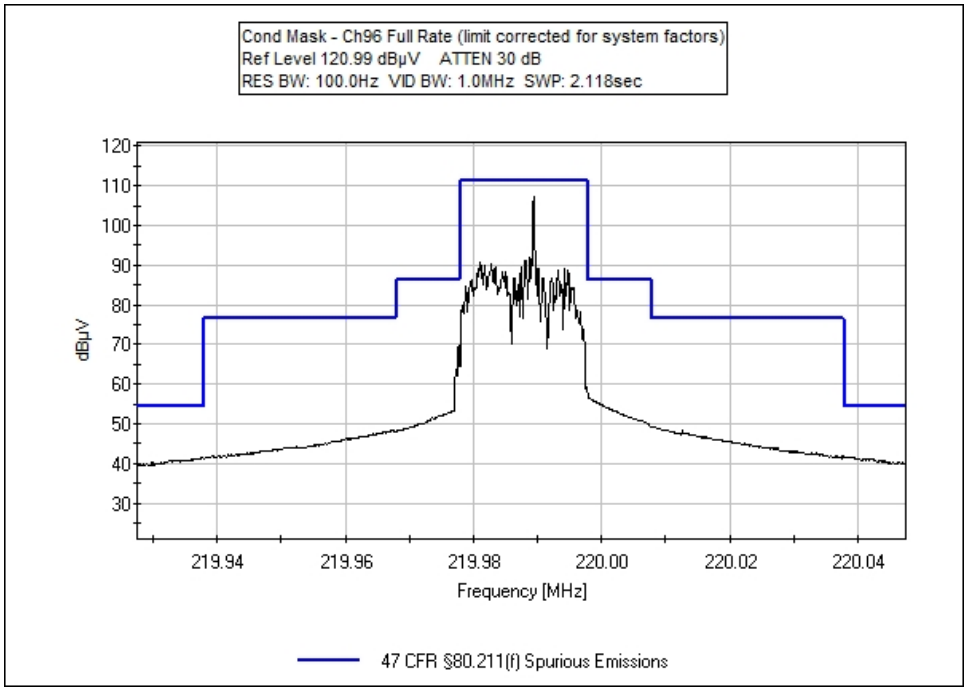
Measurement Data: Reading listed by margin. Test Lead: RF Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	190.846M Ave	46.8	+0.0	+19.6	+19.7	+0.4	+0.0	86.5	94.0	-7.5	RF Po
2	89.157M Ave	43.8	+0.0	+19.6	+19.6	+0.2	+0.0	83.2	94.0	-10.8	RF Po
3	652.858M	41.8	+0.0	+19.7	+19.7	+0.7	+0.0	81.9	94.0 217.6125	-12.1	RF Po
4	660.018M	40.0	+0.0	+19.7	+19.7	+0.7	+0.0	80.1	94.0 219.9875	-13.9	RF Po
5	665.970M	40.0	+0.0	+19.7	+19.7	+0.7	+0.0	80.1	94.0 221.9875	-13.9	RF Po
6	435.240M	39.3	+0.0	+19.6	+19.6	+0.5	+0.0	79.0	94.0 217.6125	-15.0	RF Po
7	660.083M	38.1	+0.0	+19.7	+19.7	+0.7	+0.0	78.2	94.0 220.0125	-15.8	RF Po
8	439.970M	38.2	+0.0	+19.6	+19.6	+0.5	+0.0	77.9	94.0 219.9875	-16.1	RF Po
9	440.035M	38.0	+0.0	+19.6	+19.6	+0.5	+0.0	77.7	94.0 220.0125	-16.3	RF Po
10	2260.000M	36.2	+0.0	+19.9	+19.8	+1.3	+0.0	77.2	94.0 noisefloor	-16.8	RF Po
11	443.953M	36.3	+0.0	+19.6	+19.6	+0.5	+0.0	76.0	94.0 221.9875	-18.0	RF Po
12	319.200M	32.9	+0.0	+19.6	+19.6	+0.4	+0.0	72.5	94.0	-21.5	RF Po

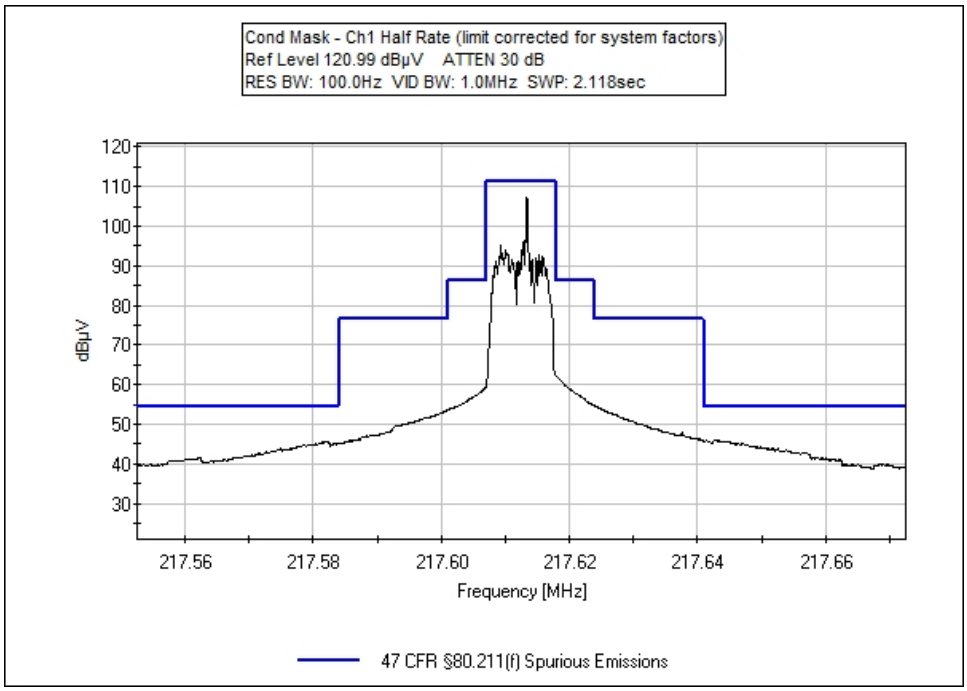
Plot(s)

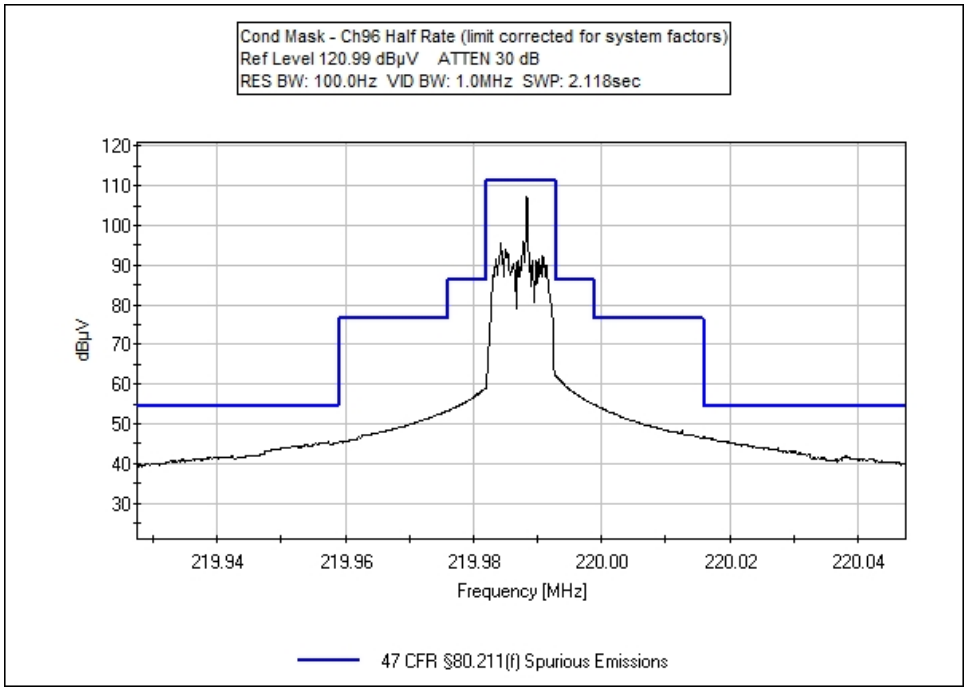
Full Rate



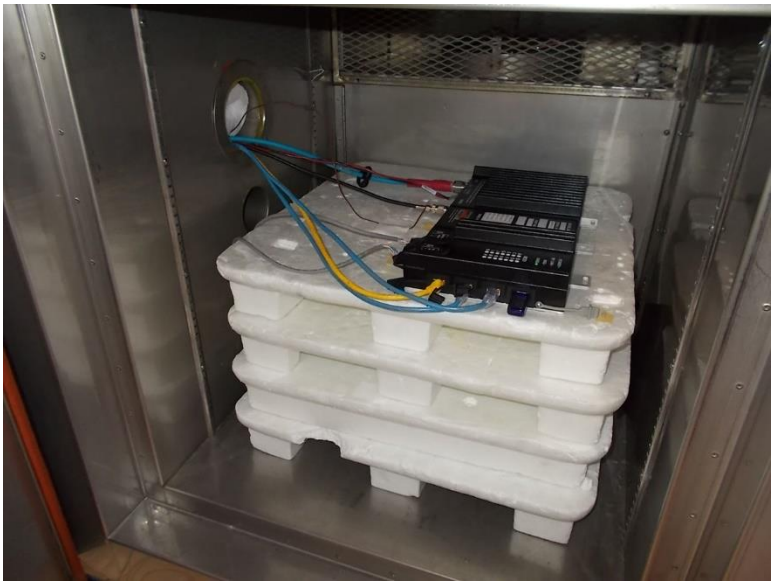


Half Rate


Cond Mask - Ch1 Half Rate (limit corrected for system factors)
Ref Level 120.99 dBµV ATTEN 30 dB
RES BW: 100.0Hz VID BW: 1.0MHz SWP: 2.118sec
dBµV
120
110
100
90
80
70
60
50
40
30
217.56
217.58
217.60
217.62
217.64
217.66
Frequency [MHz]
47 CFR §80.211(f) Spurious Emissions


Cond Mask - Ch96 Half Rate (limit corrected for system factors)
Ref Level 120.99 dBµV ATTEN 30 dB
RES BW: 100.0Hz VID BW: 1.0MHz SWP: 2.118sec
dBµV
120
110
100
90
80
70
60
50
40
30
219.94
219.96
219.98
220.00
220.02
220.04
Frequency [MHz]
47 CFR §80.211(f) Spurious Emissions

Test Setup Photo(s)



Conducted RF In Temperature Chamber

80.211 (f) Radiated Spurious Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford/M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	9/15/23 to 9/18/23
Configuration:	1		
Test Setup:	The emission mask was built with an RMS Average measurement of the fundamental, with the lowest value selected from an investigation on Ch1 and Ch96. The mask was then converted in terms of field strength for a 3m measurement in the plotted datasheets. Outside of the span shown in the emission mask plots, the following bandwidths were used: 9kHz-150kHz: 200Hz RBW 150kHz-30MHz: 9kHz RBW 30-1000MHz: 100kHz RBW 1000MHz and above: 1MHz RBW For the final tabular converted to dBm uses equation (d) from ANSI C63.26 (2015) 5.2.7: EIRP (dBm) = E (dBµV/m) + 20log(D) − 104.8; where D is the measurement distance (in the far field region) in m. Per 80.211f: (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. Limit = Power – Required Attenuation = 10 Log P – (43 +10Log P) = 10 Log P – 43 – 10Log P = -43 dBW = 0.00005W (0.05mW) = 10 Log 0.00005/0.001 = -13dBm (94dBµV) at any power level.		

Test Data Summary (Above 1GHz)				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
1886.0	56.8	-38.5	-13	Pass
1894.0	55.2	-40.1	-13	Pass
1894.0	51.0	-44.3	-13	Pass
1500.0	47.8	-47.5	-13	Pass
2498.0	46.9	-48.4	-13	Pass
1500.0	46.9	-48.4	-13	Pass
2199.8	46.8	-48.5	-13	Pass
2199.8	46.7	-48.6	-13	Pass
2402.0	46.7	-48.6	-13	Pass
1740.9	45.0	-50.3	-13	Pass
2176.0	44.8	-50.5	-13	Pass
2370.0	44.7	-50.6	-13	Pass
2176.1	44.5	-50.8	-13	Pass
1740.9	44.0	-51.3	-13	Pass
1759.9	44.0	-51.3	-13	Pass
2200.0	43.6	-51.7	-13	Pass
1700.0	43.3	-52.0	-13	Pass
1400.0	42.0	-53.3	-13	Pass
1399.0	41.9	-53.4	-13	Pass
1202.0	41.5	-53.8	-13	Pass
1300.0	41.0	-54.3	-13	Pass
1759.8	41.0	-54.3	-13	Pass
1300.0	40.6	-54.7	-13	Pass
1201.0	40.4	-54.9	-13	Pass
1600.0	39.8	-55.5	-13	Pass
1100.0	35.3	-60.0	-13	Pass

Test Data Summary (30-1000MHz)				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
220.0	74.2	-21.1	-13	Pass
870.5	52.9	-42.4	-13	Pass
879.9	51.5	-43.8	-13	Pass
880.0	48.3	-47.0	-13	Pass
652.8	46.6	-48.7	-13	Pass
659.9	44.9	-50.4	-13	Pass
250.1	41.4	-53.9	-13	Pass
43.0	41.4	-53.9	-13	Pass
55.1	41.3	-54.0	-13	Pass
250.1	40.7	-54.6	-13	Pass
92.6	39.7	-55.6	-13	Pass
125.0	37.8	-57.5	-13	Pass
440.0	35.7	-59.6	-13	Pass
125.0	34.0	-61.3	-13	Pass
143.4	33.4	-61.9	-13	Pass
435.2	31.5	-63.8	-13	Pass

Test Data Summary (9kHz-30MHz)				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
0.066	51.2	-44.1	-13	Pass
28.687	22.2	-73.1	-13	Pass
0.180	54.9	-40.4	-13	Pass

Test Conditions / Setup

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Meteorcomm LLC**		
Specification:	**47 CFR §80.211(f) Spurious Emissions**		
Work Order #:	**108416**	Date:	9/18/2023
Test Type:	**Radiated Scan**	Time:	10:46:35
Tested By:	Michael Atkinson	Sequence#:	9
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:

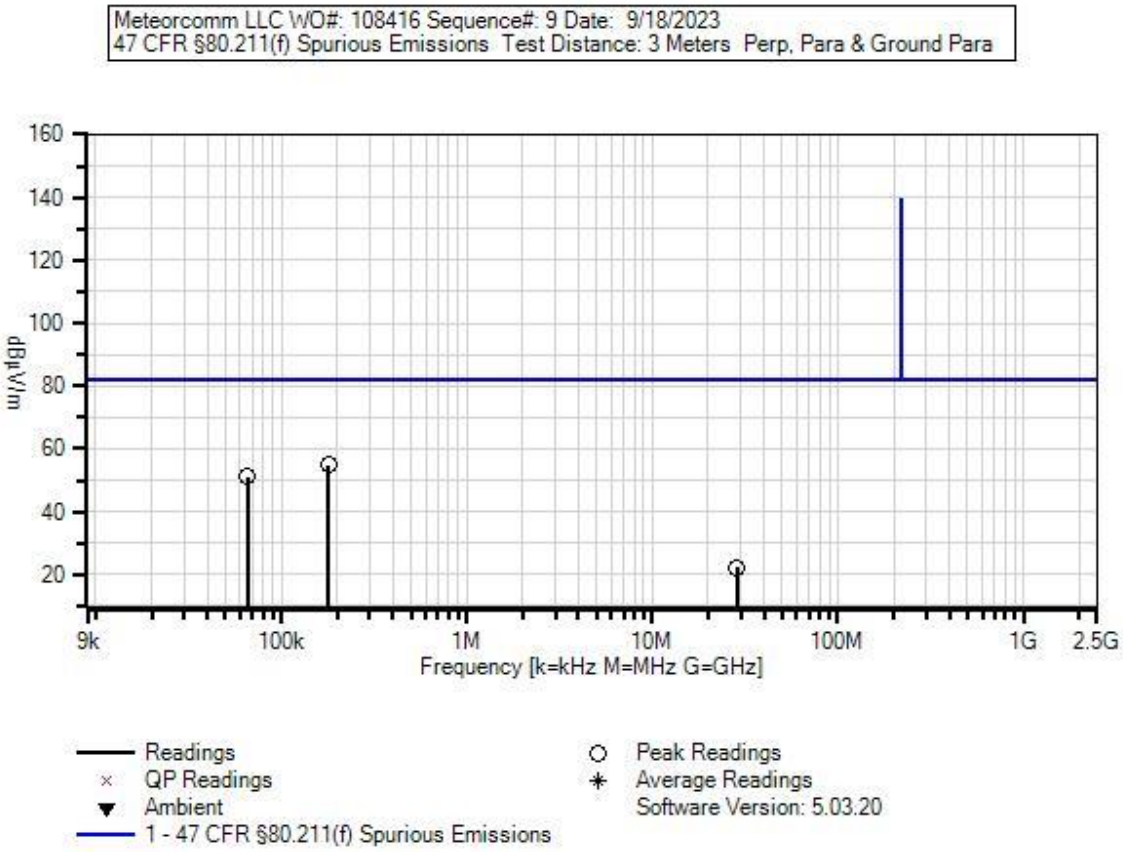
Test Environment Conditions:
Temperature: 23°C
Humidity: 48%
Pressure: 101.3kPa

Test Method: ANSI C63.26 (2015)

Frequency Range: 9k-30MHz

Test Setup:
EUT is transmitting, full rate and half rate data rate/modulation investigated, worst case reported. Ch1 and Ch96 investigated. EUT transmitting at max power and additionally investigated a 20dB lower power setting. Highest power setting data collected is representative of worst case. The unit is terminated into a 50ohm load (attenuators and receiver).

3 unshielded Ethernet cables are run to support ethernet hubs outside the chamber.
The antenna out is connected to a support unit via coax cable and attenuators.
GPS is run from the unit to a GPS splitter and simulated GPS signal.
EUT is DC powered and is powered by a DC supply located under the turntable.
USB Port terminated into a USB thumb drive.
IO ports terminated into open circuit.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	ANP06454	Cable	Heliax	1/25/2022	1/25/2024
T2	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T3	ANP06515	Cable	Heliax	3/1/2023	3/1/2025

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	180.000k	45.6	+0.0	+9.3	+0.0		+0.0	54.9	82.2	-27.3	Perp, 136
2	65.793k	41.7	+0.0	+9.5	+0.0		+0.0	51.2	82.2	-31.0	Perp, 136
3	28.687M	17.6	+0.1	+4.2	+0.3		+0.0	22.2	82.2	-60.0	Perp, 136

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Meteorcomm LLC**		
Specification:	**47 CFR §80.211(f) Spurious Emissions**		
Work Order #:	**108416**	Date:	9/18/2023
Test Type:	**Radiated Scan**	Time:	10:19:20
Tested By:	Michael Atkinson	Sequence#:	8
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:

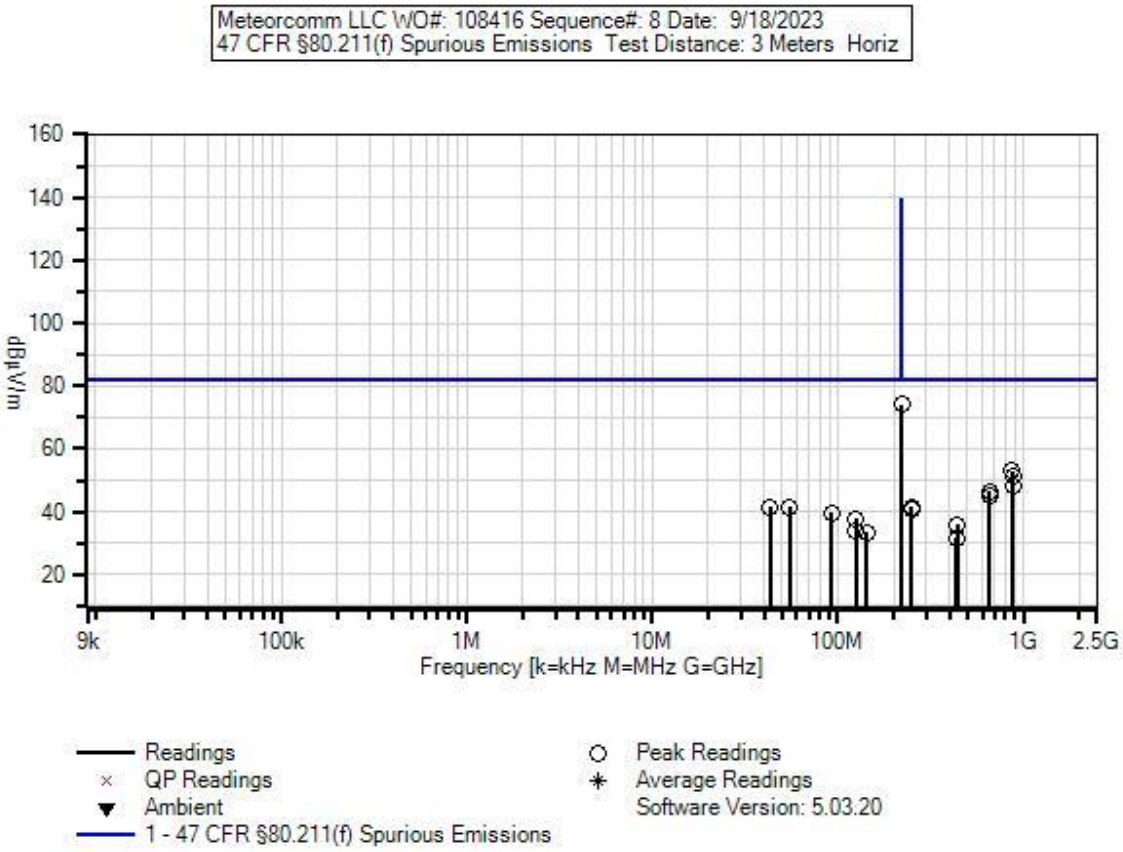
Test Environment Conditions:
Temperature: 23°C
Humidity: 48%
Pressure: 101.3kPa

Test Method: ANSI C63.26 (2015)

Frequency Range: 30-1000MHz

Test Setup:
EUT is transmitting, full rate and half rate data rate/modulation investigated, worst case reported. Ch1 and Ch96 investigated. EUT transmitting at max power and additionally investigated a 20dB lower power setting. Highest power setting data collected is representative of worst case. The unit is terminated into a 50ohm load (attenuators and receiver).

3 unshielded Ethernet cables are run to support ethernet hubs outside the chamber.
The antenna out is connected to a support unit via coax cable and attenuators.
GPS is run from the unit to a GPS splitter and simulated GPS signal.
EUT is DC powered and is powered by a DC supply located under the turntable.
USB Port terminated into a USB thumb drive.
IO ports terminated into open circuit.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T2	ANP06454	Cable	Heliax	1/25/2022	1/25/2024
T3	AN02307	Preamp	8447D	8/9/2023	8/9/2025
T4	ANP05333	Cable	Heliax	8/8/2023	8/8/2025
T5	ANP05360	Cable	RG214	8/8/2023	8/8/2025
T6	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	219.986M	82.4	+0.0 +1.1	+0.3 +16.6	-26.9	+0.7	+0.0	74.2	82.2 219.9875	-8.0	Vert 99
2	870.468M	46.4	+0.0 +2.5	+0.7 +29.0	-27.2	+1.5	+0.0	52.9	82.2 217.6125	-29.3	Vert 112
3	879.929M	45.1	+0.0 +2.5	+0.7 +28.9	-27.2	+1.5	+0.0	51.5	82.2 219.9875	-30.7	Vert 112
4	879.952M	41.9	+0.0 +2.5	+0.7 +28.9	-27.2	+1.5	+0.0	48.3	82.2 219.9875	-33.9	Vert 99
5	652.841M	42.6	+0.0 +2.4	+0.6 +27.6	-27.9	+1.3	+0.0	46.6	82.2 217.6125	-35.6	Vert 112
6	659.946M	40.8	+0.0 +2.4	+0.6 +27.7	-27.9	+1.3	+0.0	44.9	82.2 219.9875	-37.3	Vert 112
7	250.050M	47.6	+0.0 +1.2	+0.4 +18.2	-26.8	+0.8	+0.0	41.4	82.2	-40.8	Horiz 127
8	42.960M	53.4	+0.0 +0.4	+0.2 +14.8	-27.7	+0.3	+0.0	41.4	82.2	-40.8	Vert 178
9	55.110M	55.8	+0.0 +0.5	+0.2 +12.2	-27.7	+0.3	+0.0	41.3	82.2	-40.9	Vert 178
10	250.050M	46.9	+0.0 +1.2	+0.4 +18.2	-26.8	+0.8	+0.0	40.7	82.2	-41.5	Vert 178
11	92.640M	52.9	+0.0 +0.7	+0.2 +12.9	-27.5	+0.5	+0.0	39.7	82.2	-42.5	Vert 178
12	125.040M	50.3	+0.0 +0.8	+0.3 +13.3	-27.4	+0.5	+0.0	37.8	82.2	-44.4	Vert 178
13	439.975M	37.1	+0.0 +1.7	+0.5 +23.0	-27.6	+1.0	+0.0	35.7	82.2 219.9875	-46.5	Vert 112
14	125.040M	46.5	+0.0 +0.8	+0.3 +13.3	-27.4	+0.5	+0.0	34.0	82.2	-48.2	Horiz 127
15	143.400M	45.1	+0.0 +0.8	+0.3 +14.0	-27.3	+0.5	+0.0	33.4	82.2	-48.8	Vert 178
16	435.228M	32.8	+0.0 +1.7	+0.5 +23.1	-27.6	+1.0	+0.0	31.5	82.2 217.6125	-50.7	Vert 112

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Meteorcomm LLC**		
Specification:	**47 CFR §80.211(f) Spurious Emissions**		
Work Order #:	**108416**	Date:	9/15/2023
Test Type:	**Radiated Scan**	Time:	18:23:57
Tested By:	Michael Atkinson	Sequence#:	8
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 Environment Conditions:
Temperature: 23°C
Humidity: 48%
Pressure: 101.3kPa

Test Method: ANSI C63.26 (2015)

Frequency Range: 1-2.5GHz

Test Setup:
EUT is transmitting, full rate and half rate data rate/modulation investigated, worst case reported. Ch1 and Ch96 investigated. EUT transmitting at max power and additionally investigated a 20dB lower power setting. Highest power setting data collected is representative of worst case. The unit is terminated into a 50ohm load (attenuators and receiver).

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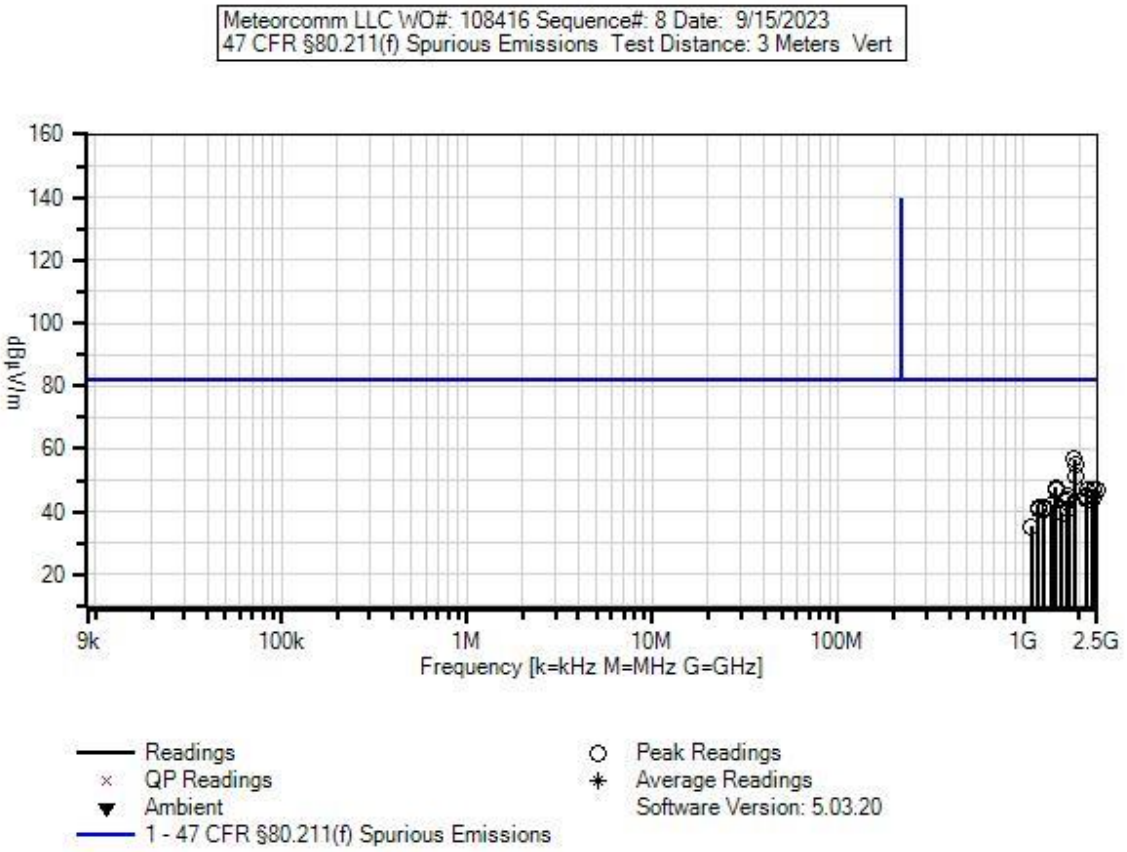
EUT is DC powered and is powered by a DC supply located under the turntable.
USB Port terminated into a USB thumb drive.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T2	ANP06454	Cable	Heliax	1/25/2022	1/25/2024
T3	AN03540	Preamp	83017A	3/24/2023	3/24/2025
T4	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T5	ANP06515	Cable	Heliax	3/1/2023	3/1/2025
T6	ANP07504	Cable	CLU40-KMKM-02.00F	1/24/2023	1/24/2025

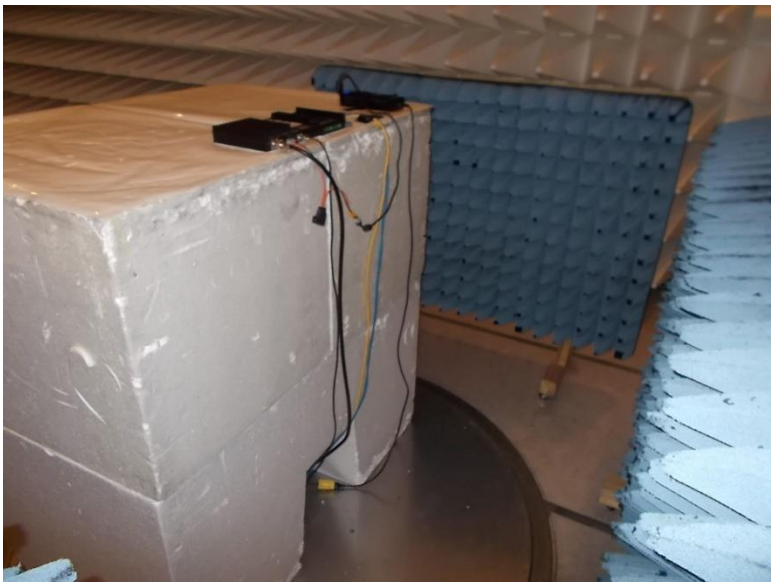
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1886.000M	60.0	+0.0 +2.3	+1.0 +0.5	-35.0	+28.0	+0.0	56.8	82.2	-25.4	Vert
2	1894.000M	58.4	+0.0 +2.3	+1.0 +0.5	-35.0	+28.0	+0.0	55.2	82.2	-27.0	Vert
3	1894.000M	54.2	+0.0 +2.3	+1.0 +0.5	-35.0	+28.0	+0.0	51.0	82.2	-31.2	Horiz
4	1500.000M	54.6	+0.0 +2.1	+0.9 +0.4	-35.5	+25.3	+0.0	47.8	82.2	-34.4	Vert
5	2498.000M	47.9	+0.0 +2.9	+1.1 +0.5	-34.6	+29.1	+0.0	46.9	82.2	-35.3	Horiz
6	1500.000M	53.7	+0.0 +2.1	+0.9 +0.4	-35.5	+25.3	+0.0	46.9	82.2	-35.3	Horiz
7	2199.760M	49.2	+0.0 +2.6	+1.1 +0.5	-34.7	+28.1	+0.0	46.8	82.2 219.9875	-35.4	Vert
8	2199.840M	49.1	+0.0 +2.6	+1.1 +0.5	-34.7	+28.1	+0.0	46.7	82.2 219.9875	-35.5	Horiz
9	2402.000M	48.3	+0.0 +2.8	+1.1 +0.5	-34.6	+28.6	+0.0	46.7	82.2	-35.5	Vert
10	1740.940M	50.1	+0.0 +2.2	+1.0 +0.4	-35.2	+26.5	+0.0	45.0	82.2 217.6125	-37.2	Vert
11	2176.020M	47.6	+0.0 +2.5	+1.0 +0.5	-34.8	+28.0	+0.0	44.8	82.2 217.6125	-37.4	Vert
12	2370.000M	46.5	+0.0 +2.7	+1.1 +0.5	-34.6	+28.5	+0.0	44.7	82.2	-37.5	Horiz
13	2176.100M	47.3	+0.0 +2.5	+1.0 +0.5	-34.8	+28.0	+0.0	44.5	82.2 217.6125	-37.7	Horiz
14	1740.900M	49.1	+0.0 +2.2	+1.0 +0.4	-35.2	+26.5	+0.0	44.0	82.2 217.6125	-38.2	Horiz
15	1759.860M	48.7	+0.0 +2.2	+1.0 +0.4	-35.1	+26.8	+0.0	44.0	82.2 219.9875	-38.2	Horiz
16	2200.000M	46.0	+0.0 +2.6	+1.1 +0.5	-34.7	+28.1	+0.0	43.6	82.2 219.9875	-38.6	Vert
17	1700.000M	48.9	+0.0 +2.2	+1.0 +0.4	-35.2	+26.0	+0.0	43.3	82.2	-38.9	Vert
18	1400.000M	49.2	+0.0 +2.0	+0.9 +0.4	-35.8	+25.3	+0.0	42.0	82.2	-40.2	Vert
19	1399.000M	49.1	+0.0 +2.0	+0.9 +0.4	-35.8	+25.3	+0.0	41.9	82.2	-40.3	Horiz
20	1202.000M	49.6	+0.0 +1.9	+0.8 +0.4	-36.4	+25.2	+0.0	41.5	82.2	-40.7	Vert
21	1300.000M	48.6	+0.0 +1.9	+0.8 +0.4	-36.1	+25.4	+0.0	41.0	82.2	-41.2	Vert
22	1759.840M	45.7	+0.0 +2.2	+1.0 +0.4	-35.1	+26.8	+0.0	41.0	82.2 219.9785	-41.2	Vert
23	1300.000M	48.2	+0.0 +1.9	+0.8 +0.4	-36.1	+25.4	+0.0	40.6	82.2	-41.6	Horiz

24	1201.000M	48.5	+0.0 +1.9	+0.8 +0.4	-36.4	+25.2	+0.0	40.4	82.2	-41.8	Horiz
25	1600.000M	46.3	+0.0 +2.1	+0.9 +0.4	-35.4	+25.5	+0.0	39.8	82.2	-42.4	Vert
26	1099.960M	44.6	+0.0 +1.8	+0.8 +0.3	-36.9	+24.7	+0.0	35.3	82.2 219.9875	-46.9	Vert

Test Setup Photo(s)

Below 1GHz



Above 1GHz

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. 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.