Meteorcomm LLC.

REVISED EMC TEST REPORT TO 111001-5

ITCR-NG Wayside
Model: 65010

Tested to The Following Standards:

FCC Part 90 Subpart T and Subpart K

217.6125-219.9875MHz
AND
220.0125-221.9875MHz

Report No.: 111001-5A

Date of issue: April 21, 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

Testing the Future
CKC LABORATORIES, INC.

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Administrative Information

Test Report Information

REPORT PREPARED FOR:

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Renton, WA 98057

Representative: George Stults
Customer Reference Number: PO32730

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Project Number: 111001

DATE OF EQUIPMENT RECEIPT: February 13, 2025
DATE(S) OF TESTING: February 13, 2025 to April 7, 2025

Revision History

Original: Testing of the ITCR-NG Wayside, Model: 65010 to FCC Part 90 Subpart T and Subpart K, 217.6125-219.9875MHz and 220.0125-221.9875MHz.
Revision A: To update the 9kHz-30MHz for PI/8 modulation limit.

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 90 Subpart T and Subpart K

Test Procedure	Description	Modifications	Results
90.205, 90.723, 90.729, 90.259	Power Output	NA	*
90.209, 90.733 (d)	Occupied Bandwidth	NA	Pass
90.213	Frequency Stability	NA	Pass
90.210	Conducted Spurious Emissions and Mask	NA	Pass
90.210	Radiated Spurious Emissions	NA	Pass

NA = Not applicable.

*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

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

Equipment Tested:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR002010MC

Support Equipment:

Device	Manufacturer	Model #	S/N
AC/DC Switching Adaptor	Mean Well	GST280A12-C6P	EC08104020
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Laptop	Dell	Latitude	8X7DMH2
USB Thumb Drive	Micro Center	64GB	NA
Support Radio	Meteorcomm, LLC	65010	65WR002008MC
Prosafe 8-Port Gigabit	Netgear	GS108Tv2	29SE4C5302E60

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
ITCR-NG Wayside	Meteorcomm, LLC	65010	65WR002010MC

Support Equipment:

Device	Manufacturer	Model #	S/N
Programable DC PS	BK Precision	XNL8010	80180058EL1073
Laptop	Dell	Latitude	8X7DMH2

General Product Information:

Description of EUT
Railway transceiver

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 AND 220.0125-221.9875MHz
Modulation Type(s):	PI/8 D8PSK 3 bits / symbol PI/8 D16 APSK 4 bits / symbol
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:	1.1 Linux 1.1 FPGA MobaXterm v23.2 Attenuator settings PI/8 D8PSK 0 dB PI/8 D16 APSK 0 dB
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)

Attenuators

Laptop

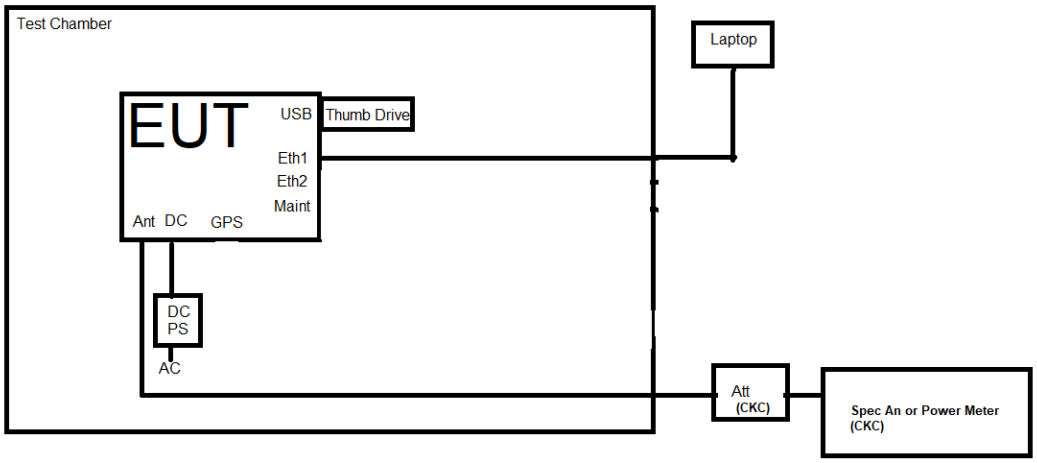
Ethernet Hub

Power Supply

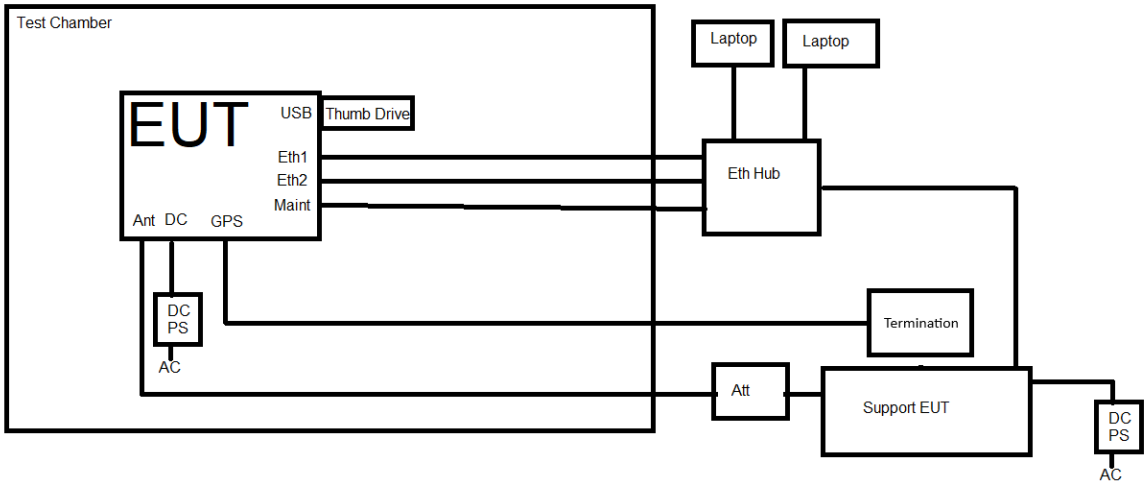
Block Diagram(s) of Test Setup

Config#	Setup Description of Block Diagram
1 & 2	RF Conducted: • EUT USB connected to thumb drive • EUT Eth1 connected to laptop • EUT DC port connect to DCPS connected to AC • EUT ANT connected to attenuator connected to spectrum analyzer Radiated: • EUT USB connected to thumb drive • EUT Eth1 connected to ethernet hub connected to laptop ethernet hub connected to support EUT connected to DCPS connected to AC • EUT Eth2 connected to ethernet hub connected to laptop ethernet hub connected to support EUT connected to DCPS connected to AC • EUT maint connected to ethernet hub connected to laptop ethernet hub connected to support EUT connected to DCPS connected to AC • EUT GPS connected to termination • EUT DC port connect to DCPS connected to AC • EUT ANT connected to attenuator connected to support EUT connected to DCPS connected to AC

Conducted



Radiated


Test Chamber
EUT
USB
Thumb Drive
Eth1
Eth2
Maint
Ant
DC
GPS
DC PS
AC
Laptop
Laptop
Eth Hub
Termination
Att
Support EUT
DC PS
AC

FCC Part 90 Subpart T and K

Power Output

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	2/18/2025
Configuration:	2		
Test Setup:	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 its normal duty cycle, pi/8, and pi/8-16 modulations investigated. The applicable limits are: 1) 217-220MHz: up to 2W according to 90.259 2) 220-221MHz: up to 50W according to 90.729 3) 221-222MHz: up to 500W according to 90.723 Per the manufacturer, the max power is recorded for all channels tested and the licensee must consider these limitations.		

Environmental Conditions			
Temperature (ºC)	21.3	Relative Humidity (%):	37

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03803	Spectrum Analyzer	Agilent	E4440A	2/12/2024	2/12/2026
P07486	Cable	Andrews	FSJ1	7/1/2024	7/1/2026
02757	Temperature Chamber	Bemco	F100/350-8	12/8/2022	12/8/2024
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026
03029	Thermometer, Digital Infrared	Fluke	566	4/14/2023	4/14/2025

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}	Pi/8	44.60	28.8	*
217.6125	-20	V_{Nom}	Pi/8	44.69	29.4	*
217.6125	-10	V_{Nom}	Pi/8	44.72	29.6	*
217.6125	0	V_{Nom}	Pi/8	44.74	29.8	*
217.6125	10	V_{Nom}	Pi/8	44.75	29.9	*
217.6125	20	V_{Nom}	Pi/8	44.85	30.5	*
217.6125	30	V_{Nom}	Pi/8	44.83	30.4	*
217.6125	40	V_{Nom}	Pi/8	44.86	30.6	*
217.6125	50	V_{Nom}	Pi/8	44.89	30.8	*
217.6125	20	V_{Min}	Pi/8	44.83	30.4	*
217.6125	20	V_{Max}	Pi/8	44.81	30.3	*

*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

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}	Pi/8	44.58	28.7	*
219.9875	-20	V_{Nom}	Pi/8	44.66	29.2	*
219.9875	-10	V_{Nom}	Pi/8	44.69	29.4	*
219.9875	0	V_{Nom}	Pi/8	44.72	29.6	*
219.9875	10	V_{Nom}	Pi/8	44.73	29.7	*
219.9875	20	V_{Nom}	Pi/8	44.82	30.3	*
219.9875	30	V_{Nom}	Pi/8	44.79	30.1	*
219.9875	40	V_{Nom}	Pi/8	44.84	30.5	*
219.9875	50	V_{Nom}	Pi/8	44.85	30.5	*
219.9875	20	V_{Min}	Pi/8	44.80	30.2	*
219.9875	20	V_{Max}	Pi/8	44.82	30.3	*

*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

Test Data Summary - RF Conducted Measurement (Ch97)						
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (dBm)**	**Conducted Power (Watts)**	**Results**
220.0125	-30	V_{Nom}	Pi/8	44.58	28.7	Pass
220.0125	-20	V_{Nom}	Pi/8	44.66	29.2	Pass
220.0125	-10	V_{Nom}	Pi/8	44.70	29.5	Pass
220.0125	0	V_{Nom}	Pi/8	44.71	29.6	Pass
220.0125	10	V_{Nom}	Pi/8	44.73	29.7	Pass
220.0125	20	V_{Nom}	Pi/8	44.81	30.3	Pass
220.0125	30	V_{Nom}	Pi/8	44.80	30.2	Pass
220.0125	40	V_{Nom}	Pi/8	44.84	30.5	Pass
220.0125	50	V_{Nom}	Pi/8	44.84	30.5	Pass
220.0125	20	V_{Min}	Pi/8	44.79	30.1	Pass
220.0125	20	V_{Max}	Pi/8	44.82	30.3	Pass

Test Data Summary - RF Conducted Measurement (Ch176)						
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (dBm)**	**Conducted Power (Watts)**	**Results**
221.9875	-30	V_{Nom}	Pi/8	44.55	28.5	Pass
221.9875	-20	V_{Nom}	Pi/8	44.61	28.9	Pass
221.9875	-10	V_{Nom}	Pi/8	44.66	29.2	Pass
221.9875	0	V_{Nom}	Pi/8	44.67	29.3	Pass
221.9875	10	V_{Nom}	Pi/8	44.69	29.4	Pass
221.9875	20	V_{Nom}	Pi/8	44.78	30.1	Pass
221.9875	30	V_{Nom}	Pi/8	44.76	29.9	Pass
221.9875	40	V_{Nom}	Pi/8	44.81	30.3	Pass
221.9875	50	V_{Nom}	Pi/8	44.81	30.3	Pass
221.9875	20	V_{Min}	Pi/8	44.76	29.9	Pass
221.9875	20	V_{Max}	Pi/8	44.78	30.1	Pass

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}	Pi/8-16	44.19	26.2	*
217.6125	-20	V_{Nom}	Pi/8-16	44.31	27.0	*
217.6125	-10	V_{Nom}	Pi/8-16	44.43	27.7	*
217.6125	0	V_{Nom}	Pi/8-16	44.49	28.1	*
217.6125	10	V_{Nom}	Pi/8-16	44.58	28.7	*
217.6125	20	V_{Nom}	Pi/8-16	44.64	29.1	*
217.6125	30	V_{Nom}	Pi/8-16	44.78	30.1	*
217.6125	40	V_{Nom}	Pi/8-16	44.89	30.8	*
217.6125	50	V_{Nom}	Pi/8-16	44.94	31.2	*
217.6125	20	V_{Min}	Pi/8-16	44.70	29.5	*
217.6125	20	V_{Max}	Pi/8-16	44.73	29.7	*

*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

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}	Pi/8-16	44.13	25.9	*
219.9875	-20	V_{Nom}	Pi/8-16	44.24	26.5	*
219.9875	-10	V_{Nom}	Pi/8-16	44.36	27.3	*
219.9875	0	V_{Nom}	Pi/8-16	44.43	27.7	*
219.9875	10	V_{Nom}	Pi/8-16	44.51	28.2	*
219.9875	20	V_{Nom}	Pi/8-16	44.56	28.6	*
219.9875	30	V_{Nom}	Pi/8-16	44.69	29.4	*
219.9875	40	V_{Nom}	Pi/8-16	44.82	30.3	*
219.9875	50	V_{Nom}	Pi/8-16	44.87	30.7	*
219.9875	20	V_{Min}	Pi/8-16	44.63	29.04	*
219.9875	20	V_{Max}	Pi/8-16	44.66	29.2	*

*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

Test Data Summary - RF Conducted Measurement (Ch97)						
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (dBm)**	**Conducted Power (Watts)**	**Results**
220.0125	-30	V_{Nom}	Pi/8-16	44.13	25.9	Pass
220.0125	-20	V_{Nom}	Pi/8-16	44.24	26.5	Pass
220.0125	-10	Vmax	Pi/8-16	44.36	27.3	Pass
220.0125	0	Vmax	Pi/8-16	44.43	27.7	Pass
220.0125	10	V_{Nom}	Pi/8-16	44.52	28.3	Pass
220.0125	20	V_{Nom}	Pi/8-16	44.59	28.8	Pass
220.0125	30	V_{Nom}	Pi/8-16	44.69	29.4	Pass
220.0125	40	V_{Nom}	Pi/8-16	44.82	30.3	Pass
220.0125	50	V_{Nom}	Pi/8-16	44.88	30.8	Pass
220.0125	20	V_{Min}	Pi/8-16	44.62	29.0	Pass
220.0125	20	V_{Max}	Pi/8-16	44.66	29.2	Pass

Test Data Summary - RF Conducted Measurement (Ch176)						
Frequency (MHz)	**Temperature (°C)**	**Voltage**	**Modulation**	**Conducted Power (dBm)**	**Conducted Power (Watts)**	**Results**
221.9875	-30	V_{Nom}	Pi/8-16	44.10	25.7	Pass
221.9875	-20	V_{Nom}	Pi/8-16	44.19	26.2	Pass
221.9875	-10	V_{Nom}	Pi/8-16	44.31	27.0	Pass
221.9875	0	Vmax	Pi/8-16	44.38	27.4	Pass
221.9875	10	Vmax	Pi/8-16	44.47	28.0	Pass
221.9875	20	V_{Nom}	Pi/8-16	44.54	28.4	Pass
221.9875	30	V_{Nom}	Pi/8-16	44.64	29.1	Pass
221.9875	40	V_{Nom}	Pi/8-16	44.77	30.0	Pass
221.9875	50	V_{Nom}	Pi/8-16	44.83	30.4	Pass
221.9875	20	V_{Min}	Pi/8-16	44.57	28.6	Pass
221.9875	20	V_{Max}	Pi/8-16	44.61	28.9	Pass

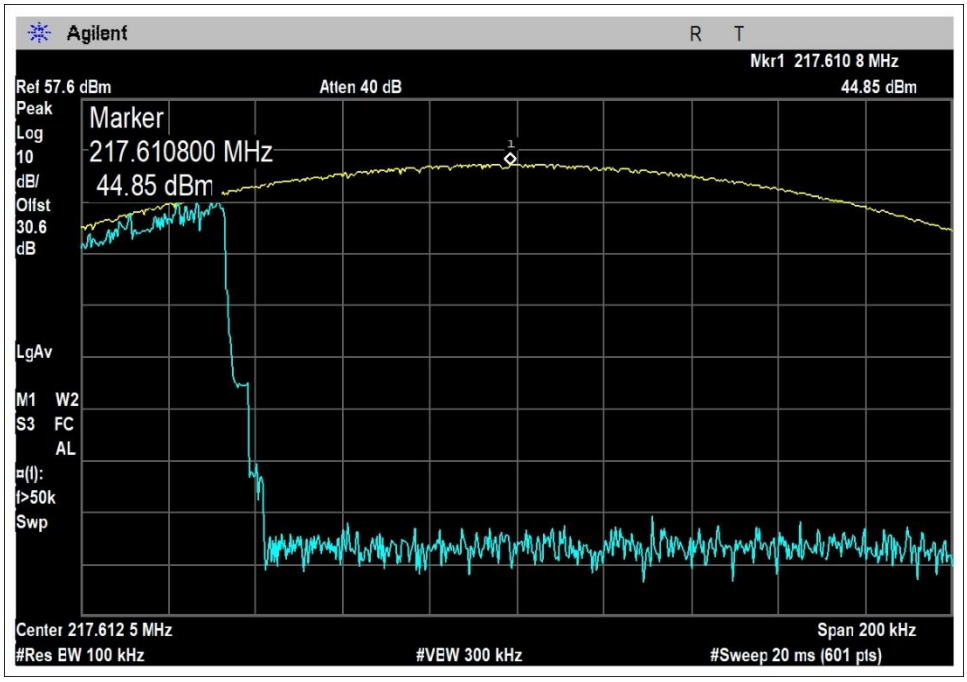
Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

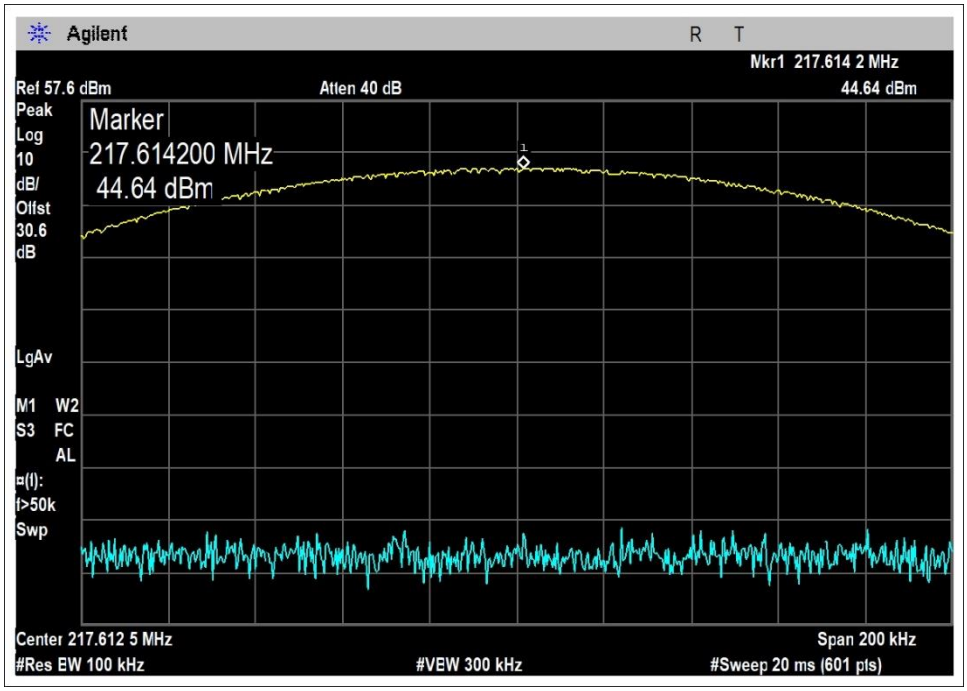
Parameter	Value
V_{Nom}:	10.9VDC
V_{Min}:	13.6VDC
V_{Max}:	15.5VDC

Test Plot(s)

Channel 1

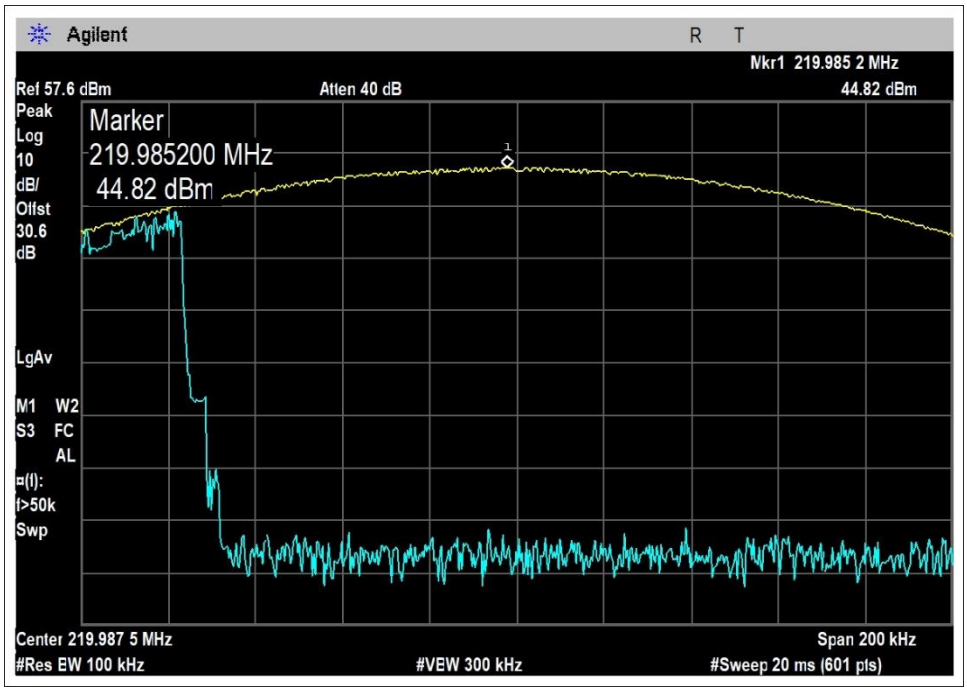


Pi/8

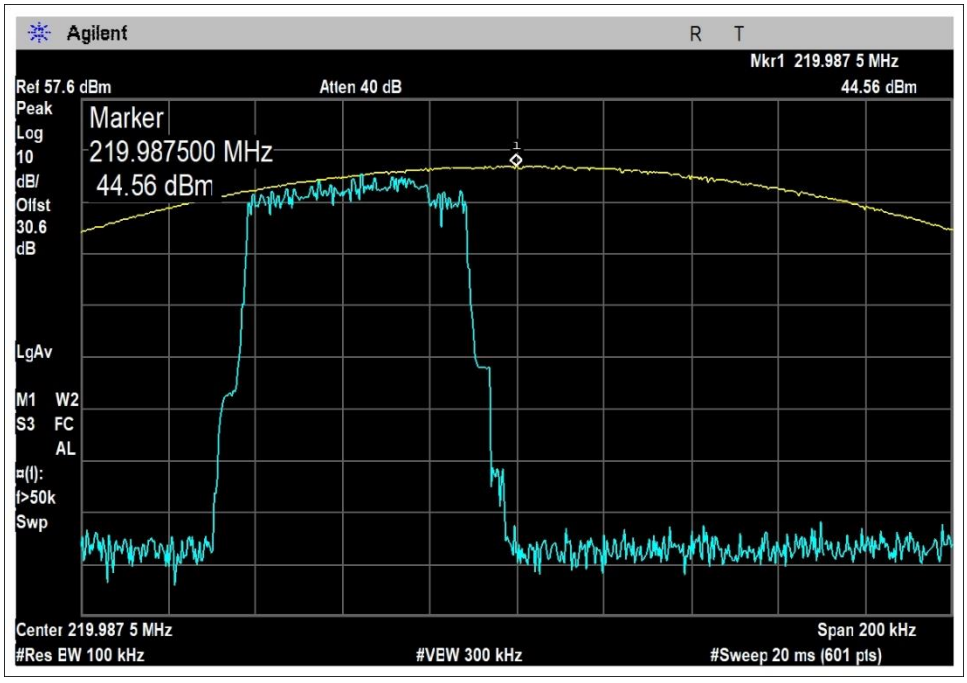


Pi/8-16

Channel 96

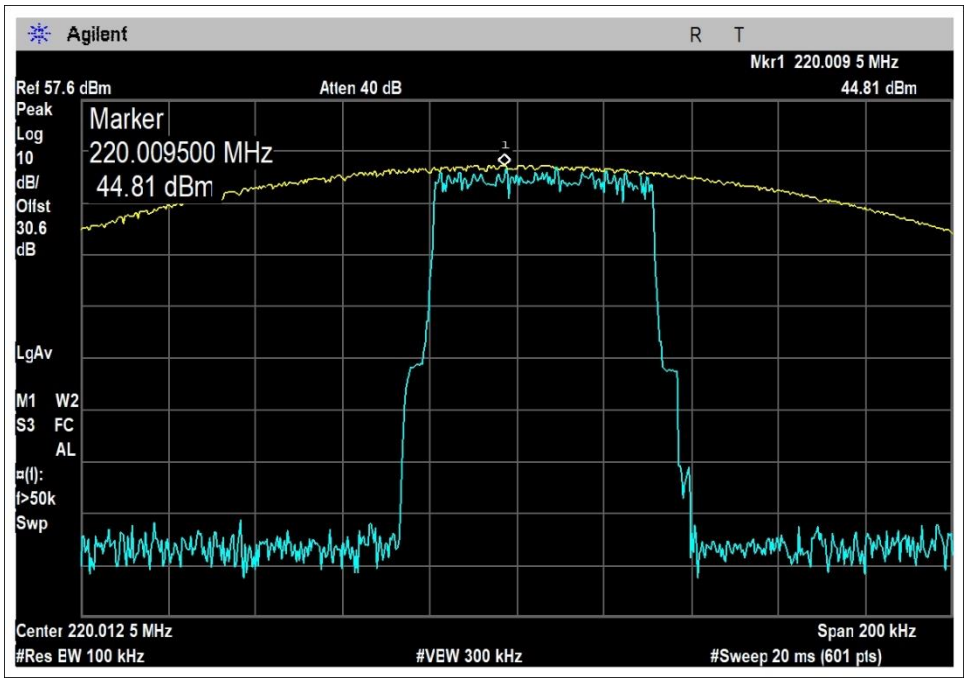


Pi/8

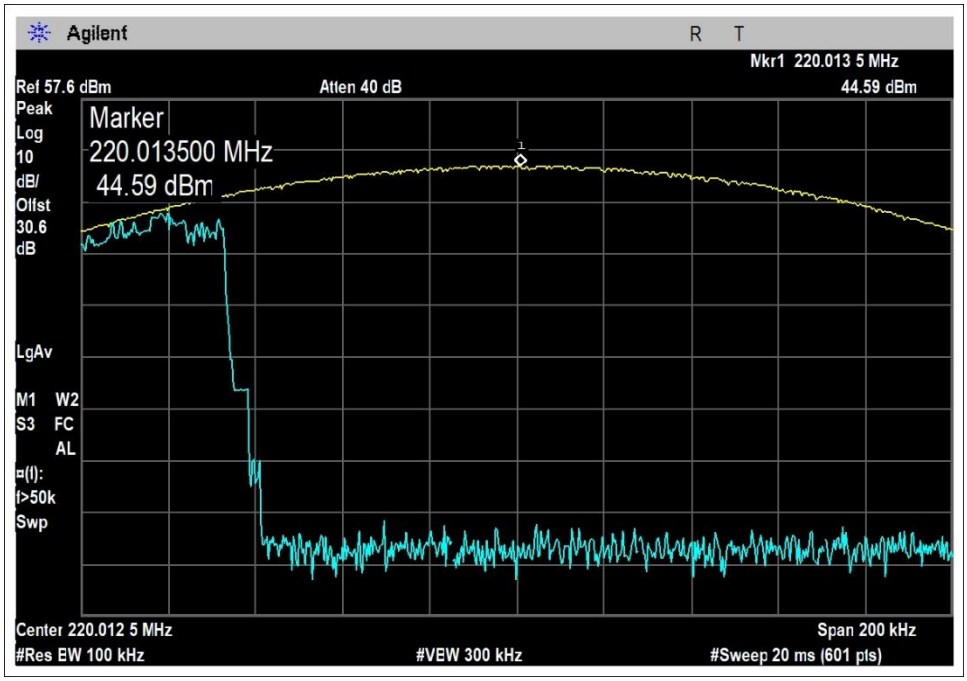


Pi/8-16

Channel 97

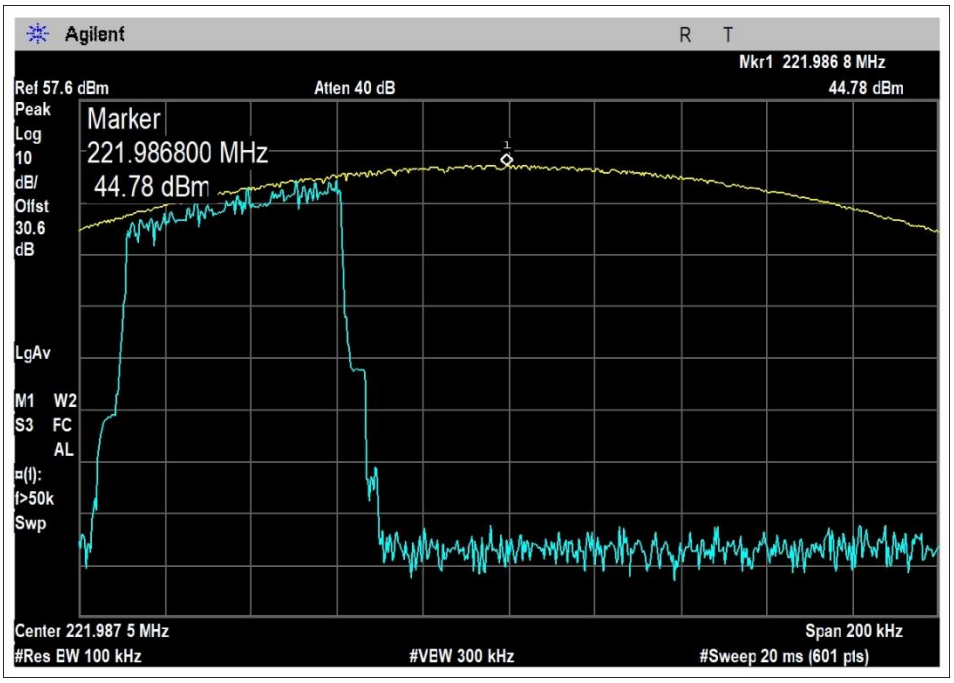


Pi/8

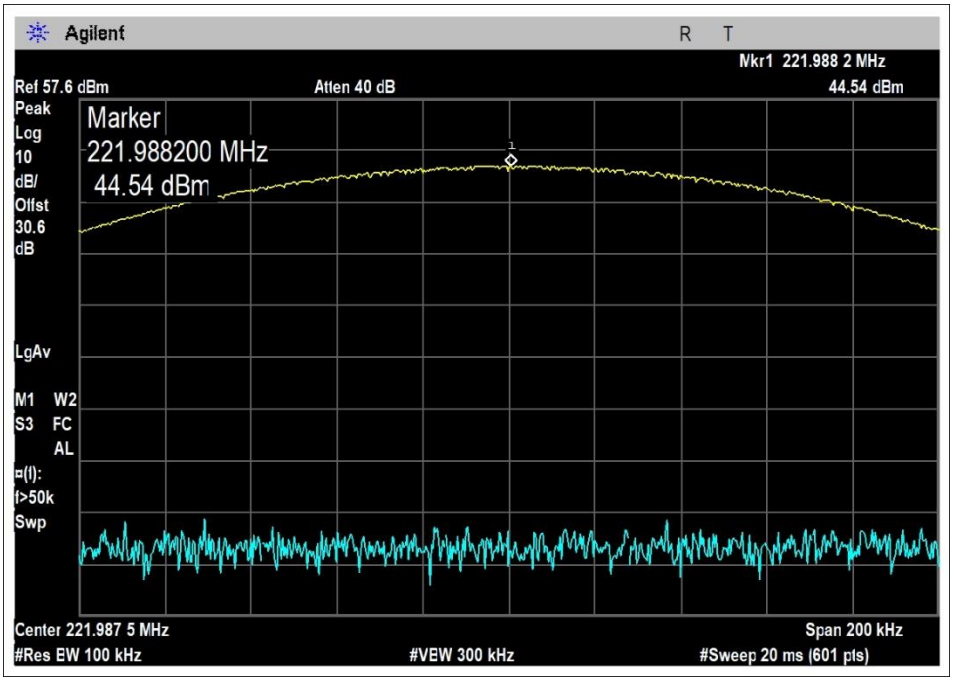


Pi/8-16

Channel 176



Pi/8



Pi/8-16

Test Setup Photo(s)

View 1

View 2

Occupied Bandwidth

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	2/13/25
Configuration:	2		
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 pi/8, and pi/8-16 modulations investigated. The bandwidth limitations are considered in 90.209 as well as 90.733 where channel aggregation would be used, the authorized bandwidth is to be 20kHz for the pi/8, and pi/8-16.		

Environmental Conditions			
Temperature (ºC)	21.4	Relative Humidity (%):	18

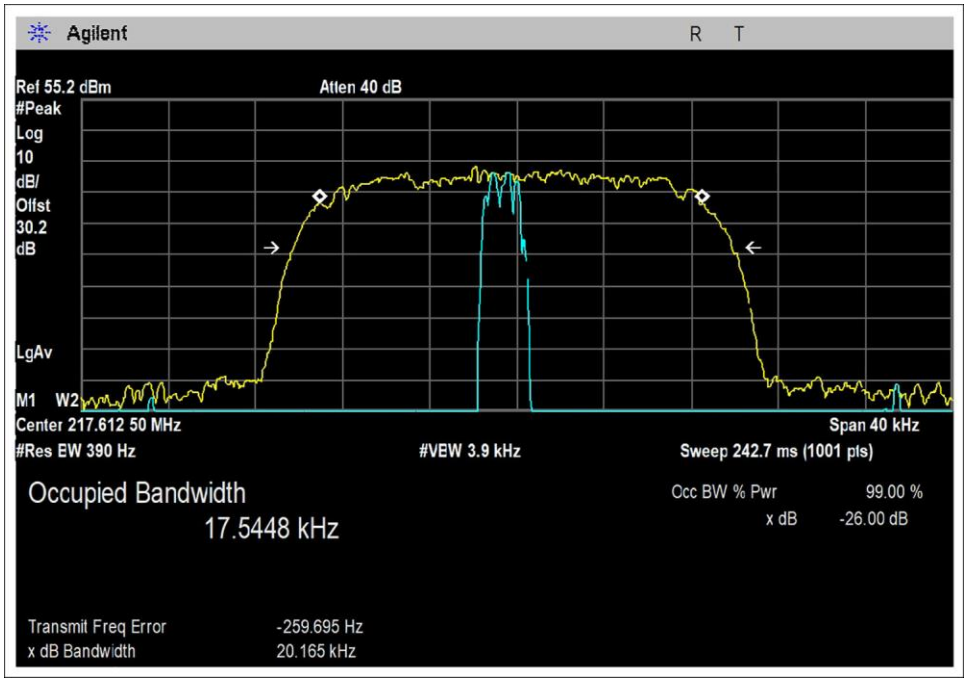
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03807	Spectrum Analyzer	Agilent	E4440A	10/10/2023	10/10/2025
P06452	Cable	Andrews	Heliax	1/27/2025	1/27/2027
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026

99% Occupied Bandwidth

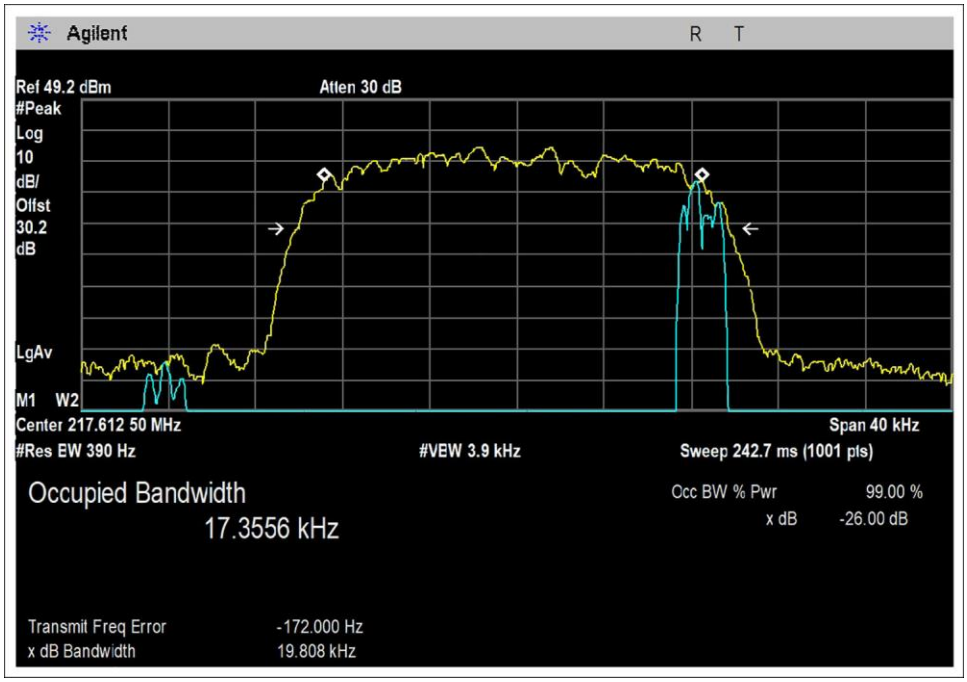
Test Data Summary				
Frequency (MHz)	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
217.6125	Pi/8	17.54	20kHz	Pass
219.9875	Pi/8	17.44	20kHz	Pass
220.0125	Pi/8	17.43	20kHz	Pass
221.9875	Pi/8	17.52	20kHz	Pass
217.6125	Pi/8-16	17.36	20kHz	Pass
219.9875	Pi/8-16	17.37	20kHz	Pass
220.0125	Pi/8-16	17.36	20kHz	Pass
221.9875	Pi/8-16	17.40	20kHz	Pass

Test Plot(s)

Channel 1

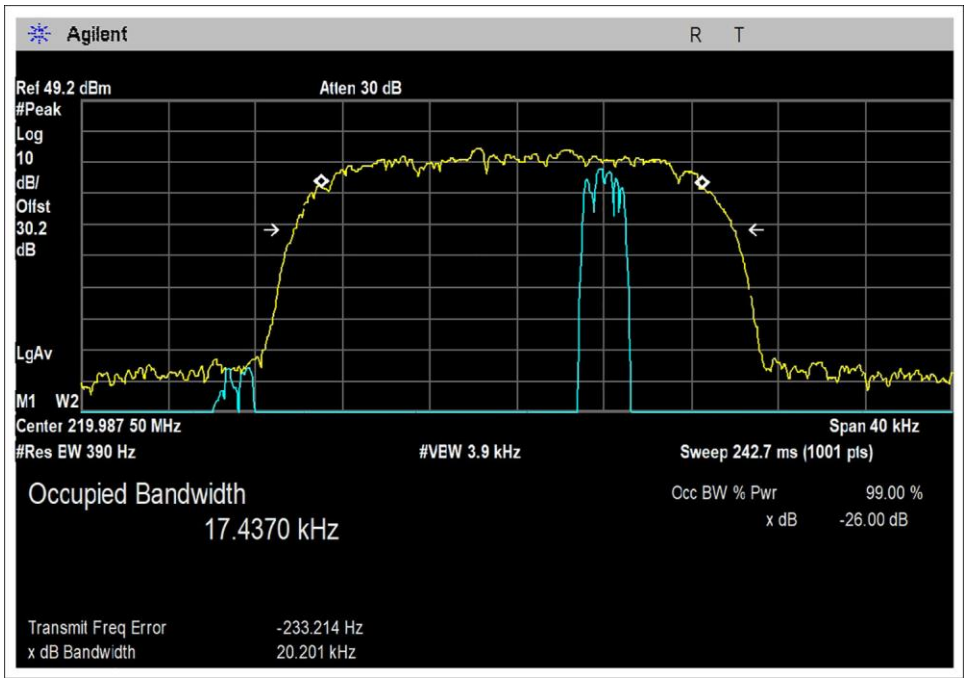


Pi/8

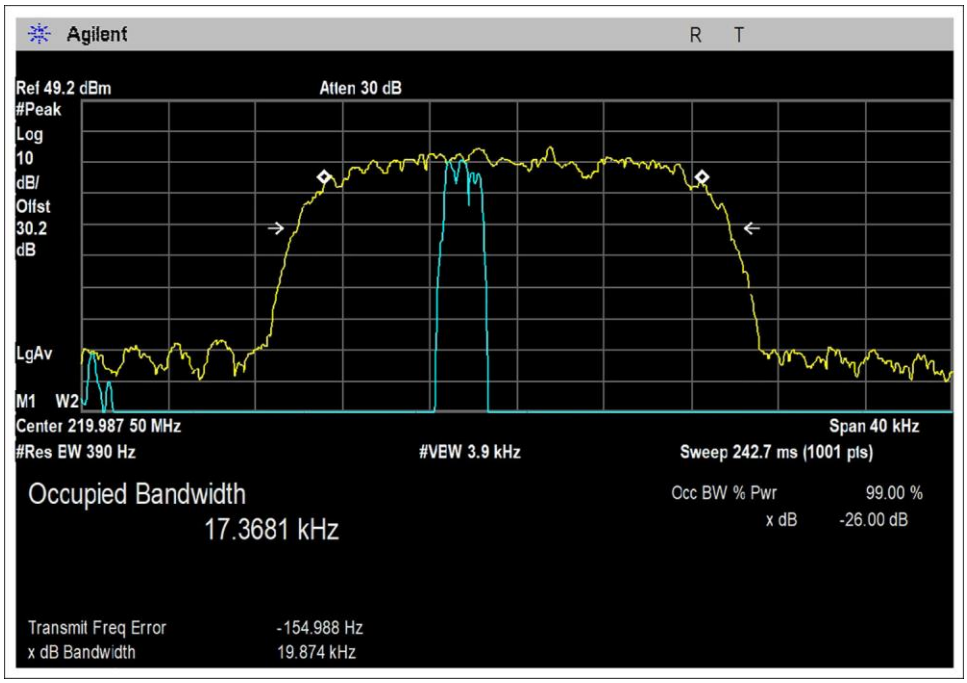


Pi/8-16

Channel 96

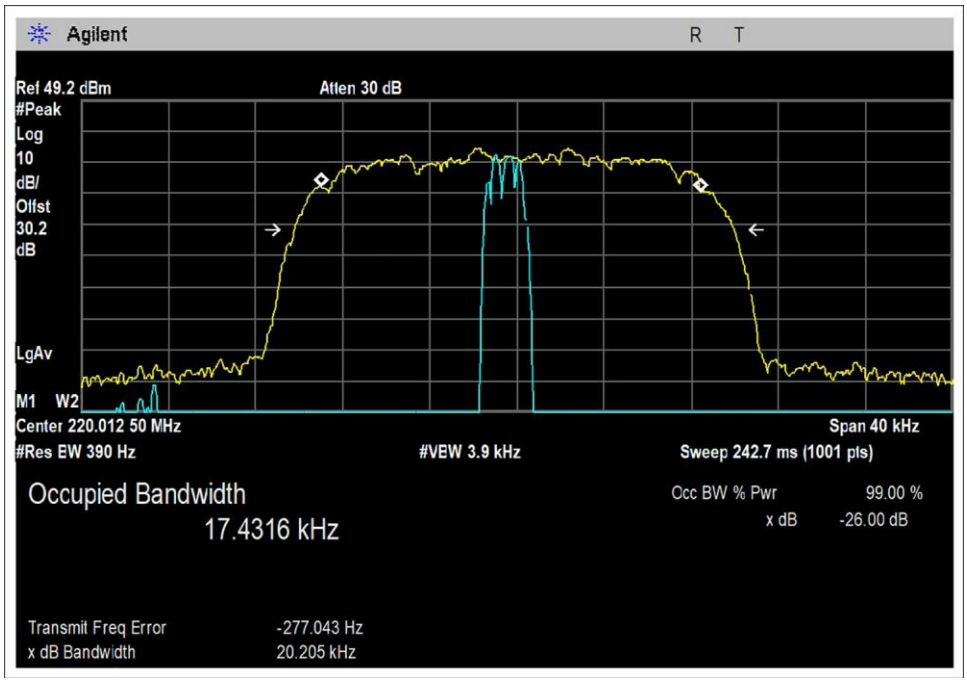


Pi/8

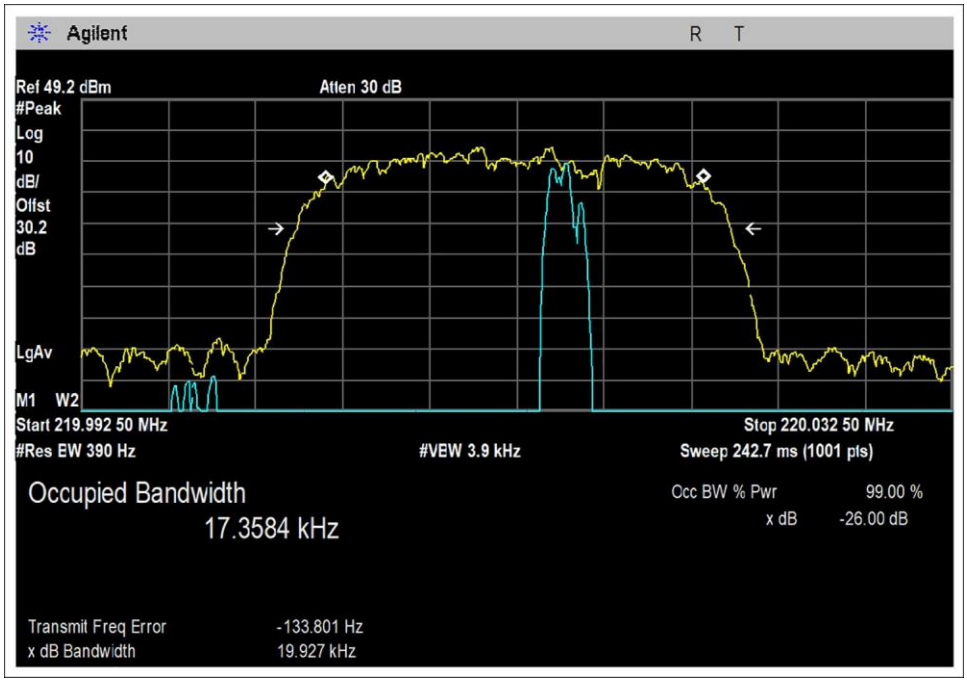


Pi/8-16

Channel 97

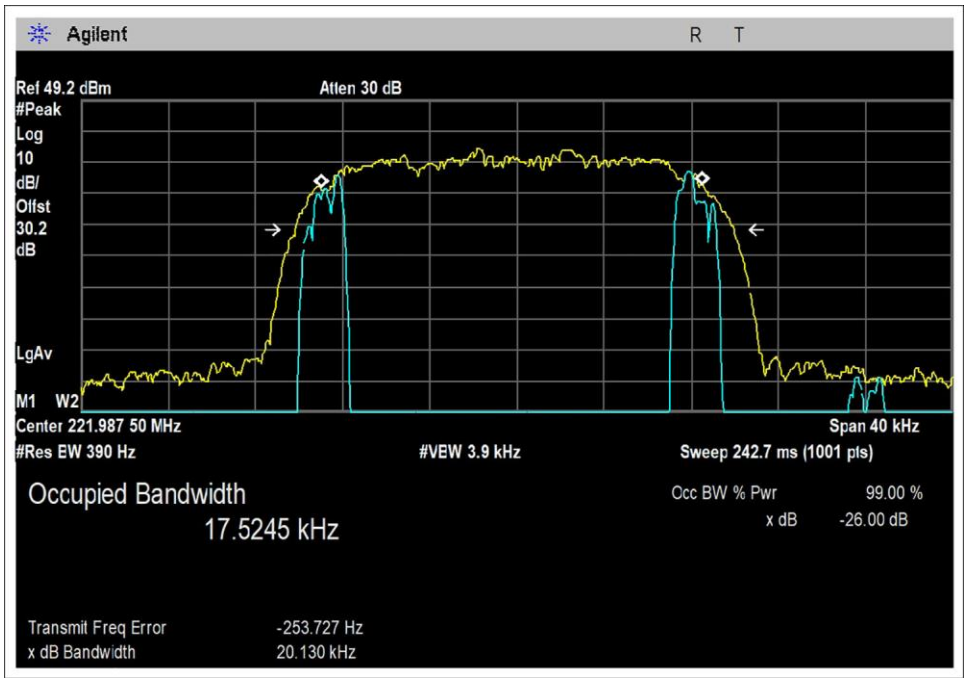


Pi/8

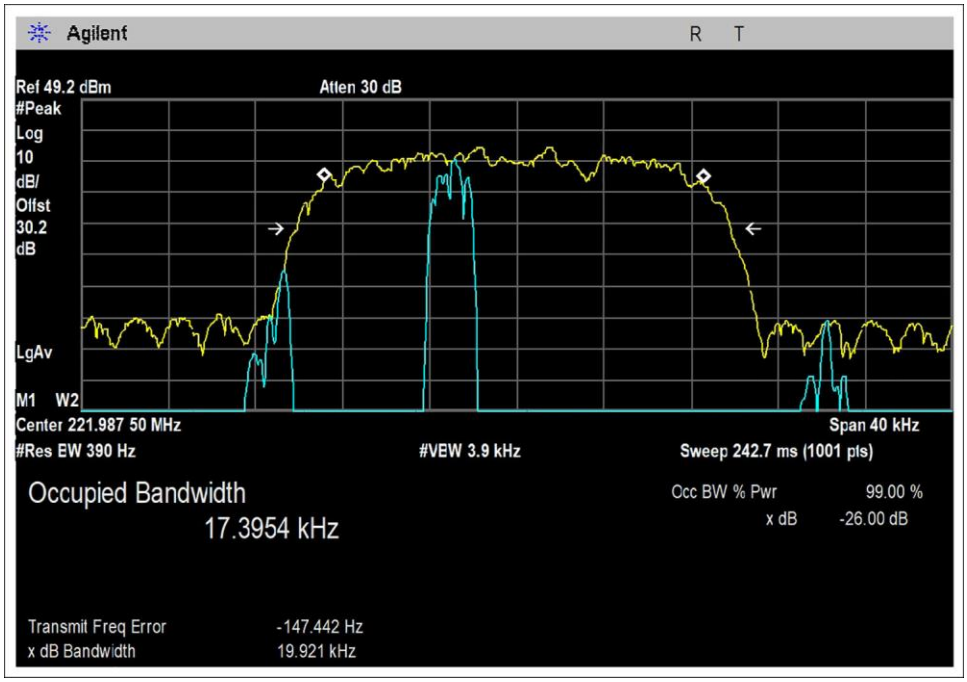


Pi/8-16

Channel 176



Pi/8



Pi/8-16

Test Setup Photo(s)

Frequency Stability

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	2/18/2025
Configuration:	2		
Test Setup:	The unit is in a temperature chamber for temperature variation. 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, pi/8 and pi/8-16 modulations investigated. Per 90.213, the manufacturer declares the mobile station limit applies, the limit in the table for frequencies falling in the band 216-220MHz is 1.0ppm, for band 220-222 MHz the limit is 1.5ppm.		

Environmental Conditions			
Temperature (ºC)	21.3	Relative Humidity (%):	37

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03803	Spectrum Analyzer	Agilent	E4440A	2/12/2024	2/12/2026
P07486	Cable	Andrews	FSJ1	7/1/2024	7/1/2026
02757	Temperature Chamber	Bemco	F100/350-8	12/8/2022	12/8/2024
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026
03029	Thermometer, Digital Infrared	Fluke	566	4/14/2023	4/14/2025

Test Data Summary						
Modulation: CW						
Temp (ºC)	**Voltage**	**Ch 1 (PPM)**	**Ch 96 (PPM)**	**Ch 97 (PPM)**	**Ch176 (PPM)**	**Results**
-30	**V_{Nom}**	0.59739	0.60003	0.60451	0.60814	Pass
-20	V_{Nom}	0.42737	0.43184	0.43634	0.43696	
-10	V_{Nom}	0.28031	0.28183	0.28635	0.28830	
0	V_{Nom}	0.21598	0.21819	0.22271	0.22524	
10	V_{Nom}	0.21598	0.21819	0.22271	0.22524	
20	V_{Nom}	0.34465	0.34547	0.34998	0.36038	
30	V_{Nom}	0.40898	0.41366	0.41816	0.41894	
40	V_{Nom}	0.59280	0.64095	0.67723	0.68472	
50	V_{Nom}	0.84094	0.78641	0.78632	0.78833	
20	V_{Min}	0.37222	0.37275	0.37271	0.37840	
20	V_{Max}	0.39520	0.40002	0.40452	0.40993	
Maximum Deviation		**0.84094**	**0.78641**	**0.78632**	**0.78833**	

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)

View 1

View 2

Conducted Emission Mask and Spurs

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore, M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	2/13/2025 to 4/7/2025
Configuration:	2		
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, pi/8 and pi/8-16 modulations investigated. The emission mask was built with an RMS Average measurement of the fundamental. Conducted spurs was run on the 4 channels selected, mask data shown for Ch1,96,97 and Ch176. 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, for Channels 1 and 96 the 90.210 (b) mask was selected to be consistent with 80.211(f) with a 20kHz ABW. Per the manufacturer, for channels 97 and 176 the 90.210 (F) the mask was selected assuming 5 aggregate channels. It will be up the licensee to ensure the mask applicability. The most stringent spurs limit from Mask F will be applied to all emissions outside of mask regions.		

Environmental Conditions			
Temperature (ºC)	22.1	Relative Humidity (%):	48.7

Test Conditions / Setup / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90 Spurious Emissions**		
Work Order #:	**111001**	Date:	4/7/2025
Test Type:	**Conducted Emissions**	Time:	10:15:39
Tested By:	M. Atkinson	Sequence#:	3
Software:	EMITest 5.03.20		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 21-22°C
Humidity: 40-47%
Pressure: 100.5-101.5kPa

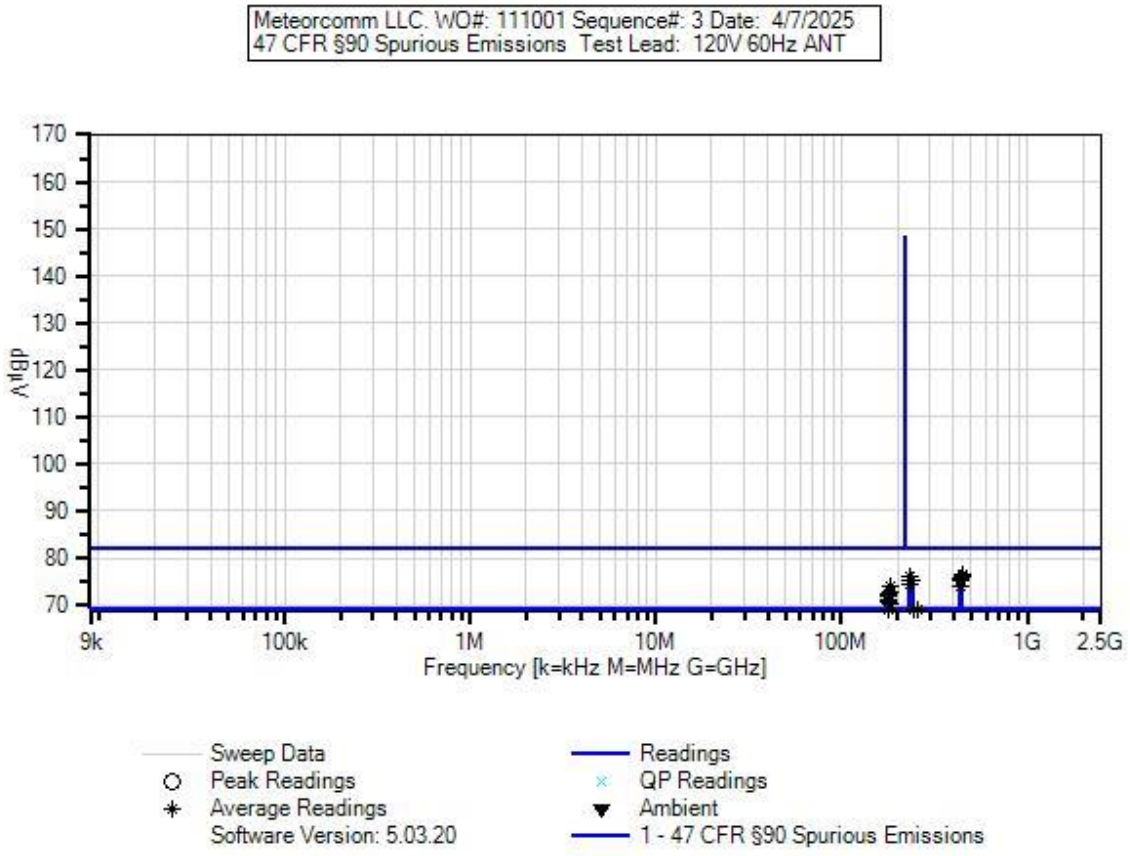
Frequency: 9kHz-2.5GHz

Test Method: ANSI 63.26

Test Setup:
EUT set up on test bench connected directly to spectrum analyzer with 30db attenuator.

EUT running 10% duty cycle.

RMS detector data collected with max hold and 10 second sweep.



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
T3	AN03829	Spectrum Analyzer	E4440A	2/13/2025	2/13/2027

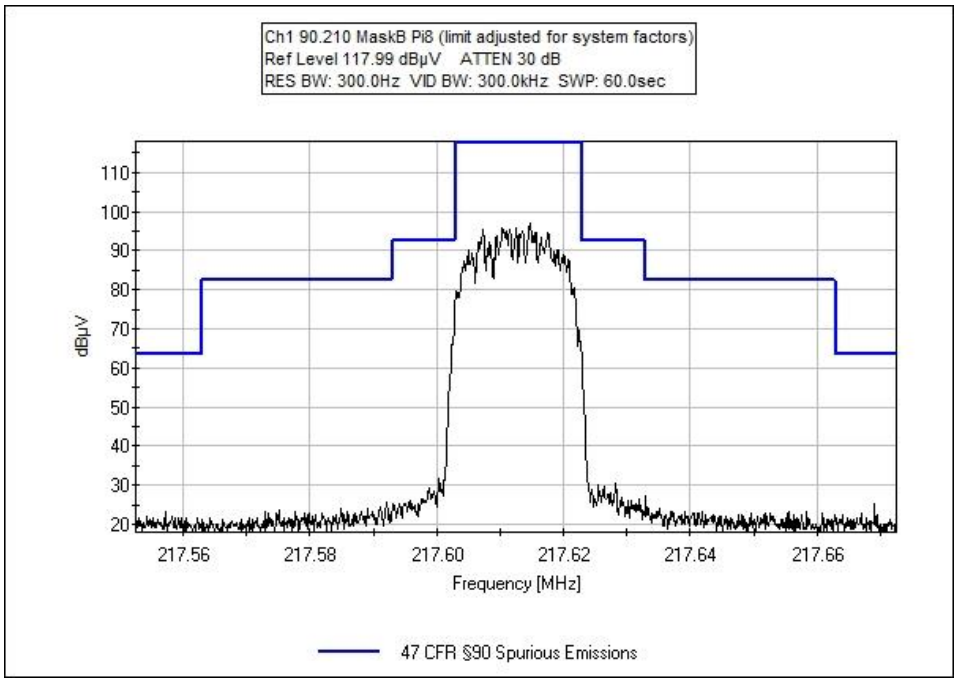
Measurement Data: Reading listed by margin. Test Lead: ANT

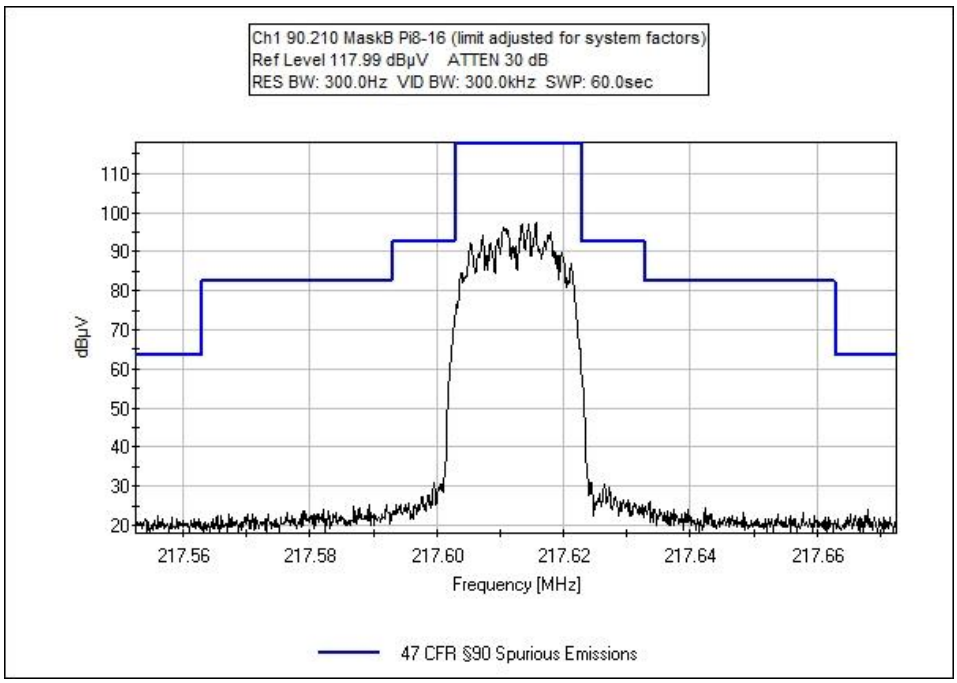
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	443.977M Ave	45.9	+30.0	+0.6	+0.0		+0.0	76.5	82.0 Ch176 Pi8	-5.5	ANT
2	232.500M Ave	45.7	+29.9	+0.5	+0.0		+0.0	76.1	82.0 Ch97 Pi8-16	-5.9	ANT
3	443.980M Ave	45.3	+30.0	+0.6	+0.0		+0.0	75.9	82.0 Ch176 Pi8-16	-6.1	ANT
4	440.022M Ave	45.2	+30.0	+0.6	+0.0		+0.0	75.8	82.0 Ch97 Pi8	-6.2	ANT
5	439.973M Ave	45.1	+30.0	+0.6	+0.0		+0.0	75.7	82.0 Ch96 Pi8	-6.3	ANT
6	440.022M Ave	44.8	+30.0	+0.6	+0.0		+0.0	75.4	82.0 Ch97 Pi8-16	-6.6	ANT
7	439.975M Ave	44.8	+30.0	+0.6	+0.0		+0.0	75.4	82.0 Ch96 Pi8-16	-6.6	ANT
8	241.730M Ave	44.8	+29.9	+0.5	+0.0		+0.0	75.2	82.0 Ch1 Pi8-16	-6.8	ANT
9	232.200M Ave	44.8	+29.9	+0.5	+0.0		+0.0	75.2	82.0 Ch176 Pi8-16	-6.8	ANT
10	232.160M Ave	44.1	+29.9	+0.5	+0.0		+0.0	74.5	82.0 Ch96 Pi8-16	-7.5	ANT
11	435.226M Ave	43.5	+30.0	+0.6	+0.0		+0.0	74.1	82.0 Ch1 Pi8-16	-7.9	ANT
12	182.440M Ave	43.7	+29.9	+0.4	+0.0		+0.0	74.0	82.0 Ch97 Pi8-16	-8.0	ANT
13	435.227M Ave	43.3	+30.0	+0.6	+0.0		+0.0	73.9	82.0 Ch1 Pi8	-8.1	ANT
14	182.110M Ave	42.3	+29.9	+0.4	+0.0		+0.0	72.6	82.0 Ch96 Pi8-16	-9.4	ANT
15	179.400M Ave	42.0	+29.9	+0.4	+0.0		+0.0	72.3	82.0 Ch96 Pi8	-9.7	ANT
16	179.250M Ave	41.7	+29.9	+0.4	+0.0		+0.0	72.0	82.0 Ch176 Pi8	-10.0	ANT
17	180.900M Ave	40.7	+29.9	+0.4	+0.0		+0.0	71.0	82.0 Ch1 Pi8-16	-11.0	ANT
18	178.200M Ave	40.4	+29.9	+0.4	+0.0		+0.0	70.7	82.0 Ch1 Pi8	-11.3	ANT
19	182.200M Ave	40.1	+29.9	+0.4	+0.0		+0.0	70.4	82.0 Ch176 Pi8-16	-11.6	ANT
20	179.850M Ave	38.9	+29.9	+0.4	+0.0		+0.0	69.2	82.0 Ch97 Pi8	-12.8	ANT
21	256.350M Ave	38.8	+29.9	+0.5	+0.0		+0.0	69.2	82.0 Ch97 Pi8	-12.8	ANT
22	246.300M Ave	38.7	+29.9	+0.5	+0.0		+0.0	69.1	82.0 Ch1 Pi8	-12.9	ANT
23	256.500M Ave	38.3	+29.9	+0.5	+0.0		+0.0	68.7	82.0 Ch96 Pi8	-13.3	ANT
24	256.650M Ave	37.7	+29.9	+0.5	+0.0		+0.0	68.1	82.0 Ch176 Pi8	-13.9	ANT

25	660.042M Ave	36.6	+30.0	+0.8	+0.0	+0.0	67.4	82.0 Ch97 Pi8	-14.6	ANT
26	652.833M Ave	36.5	+30.0	+0.8	+0.0	+0.0	67.3	82.0 Ch1 Pi8	-14.7	ANT
27	665.967M Ave	36.3	+30.0	+0.8	+0.0	+0.0	67.1	82.0 Ch176 Pi8	-14.9	ANT
28	659.971M Ave	36.2	+30.0	+0.8	+0.0	+0.0	67.0	82.0 Ch96 Pi8	-15.0	ANT
29	652.830M Ave	35.8	+30.0	+0.8	+0.0	+0.0	66.6	82.0 Ch1 Pi8-16	-15.4	ANT
30	659.963M Ave	35.6	+30.0	+0.8	+0.0	+0.0	66.4	82.0 Ch96 Pi8-16	-15.6	ANT
31	660.024M Ave	35.5	+30.0	+0.8	+0.0	+0.0	66.3	82.0 Ch97 Pi8-16	-15.7	ANT
32	665.967M Ave	35.2	+30.0	+0.8	+0.0	+0.0	66.0	82.0 Ch176 Pi8-16	-16.0	ANT

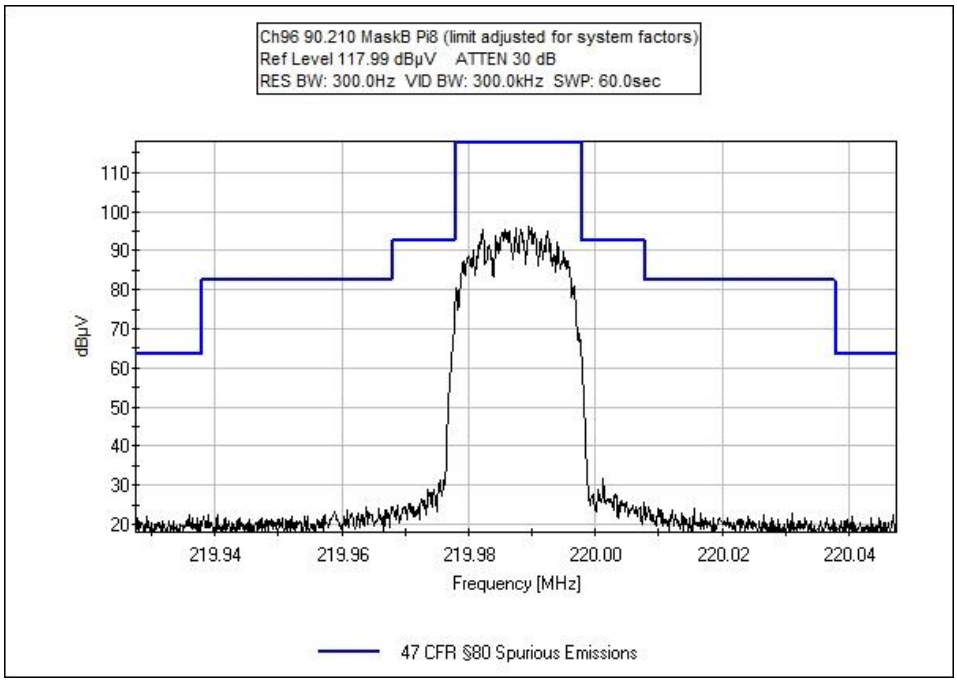
Test Plot(s)

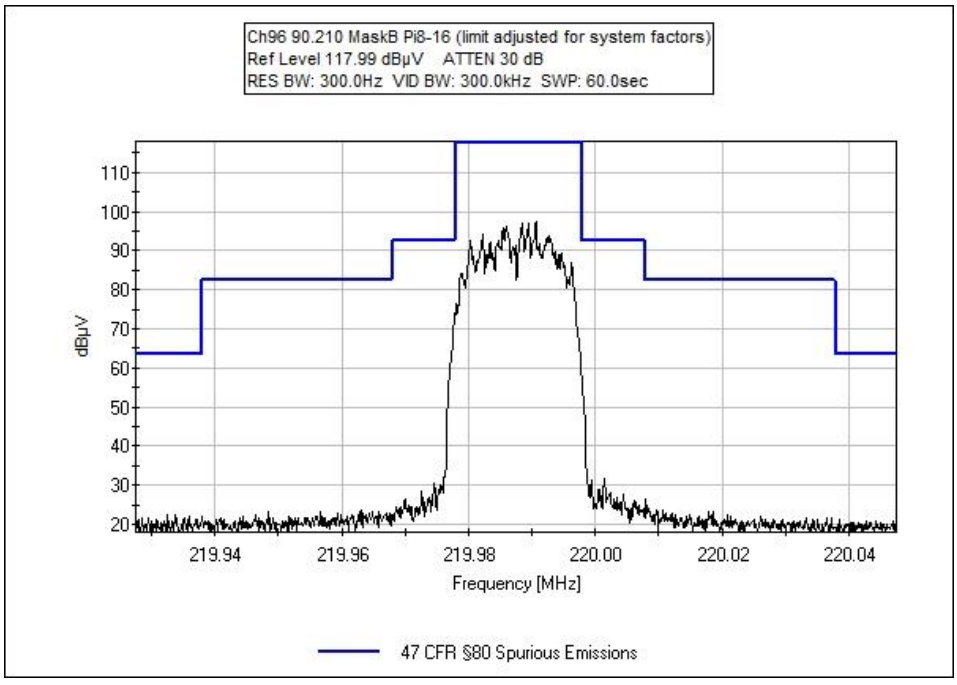
Channel 1



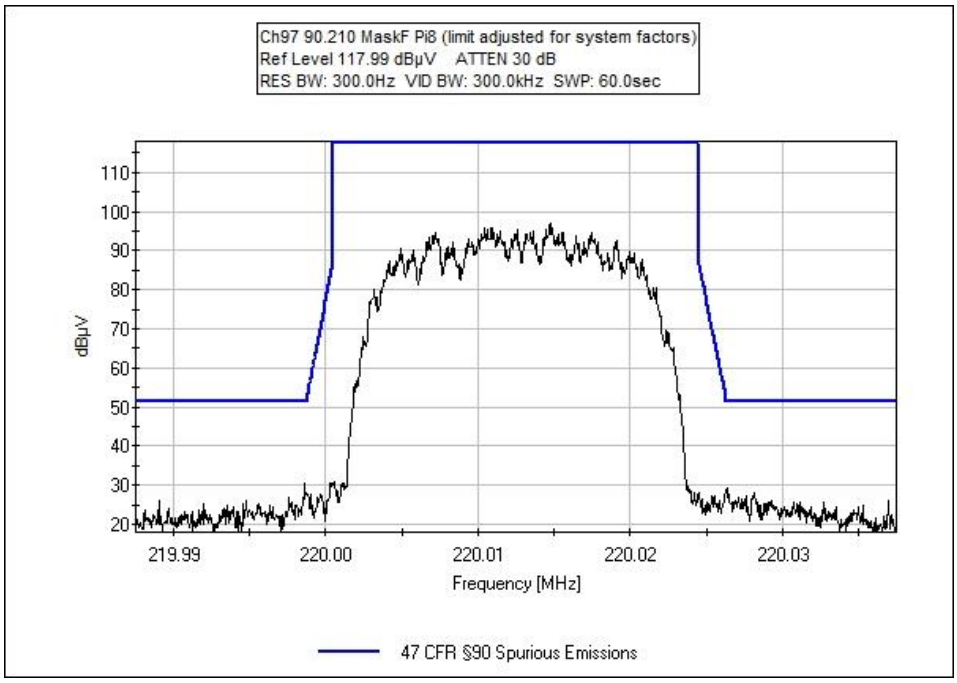


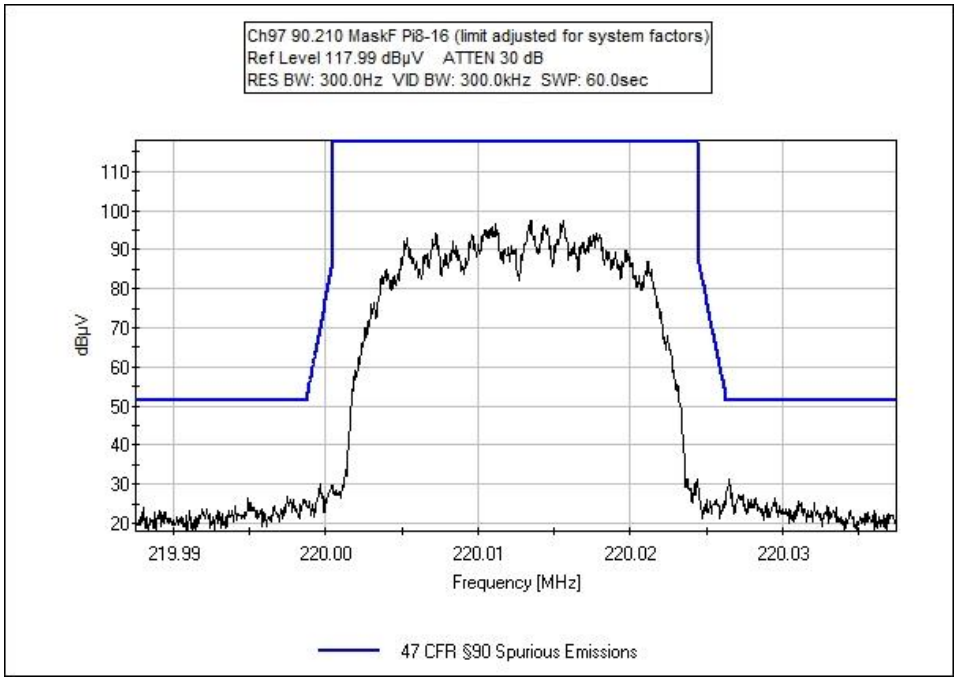
Channel 96


Ch96 90.210 MaskB Pi8 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
219.94
219.96
219.98
220.00
220.02
220.04
Frequency [MHz]
47 CFR §80 Spurious Emissions

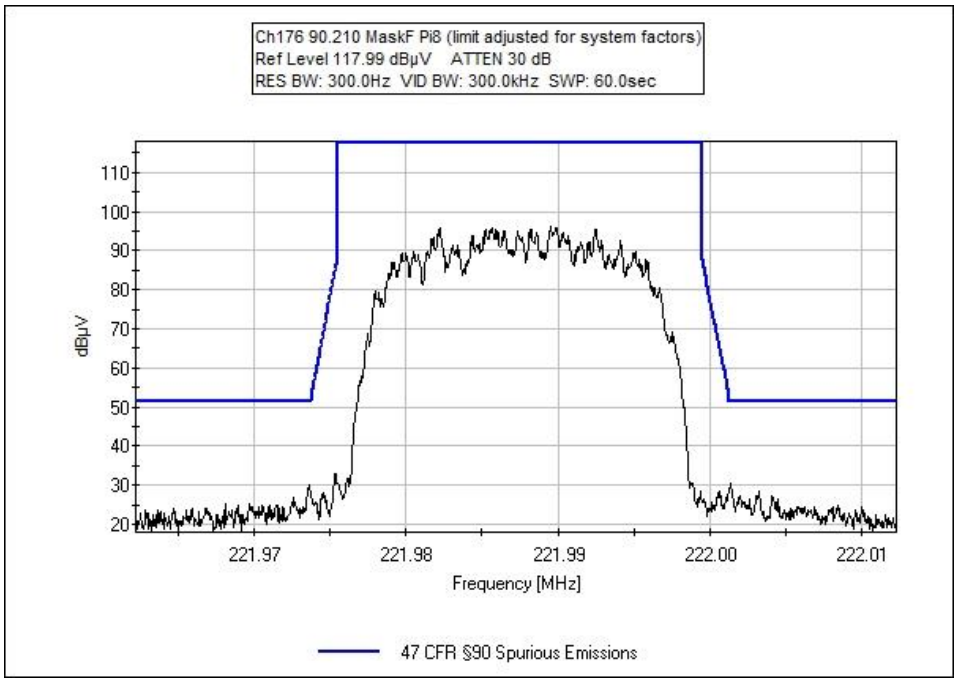

Ch96 90.210 MaskB Pi8-16 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
219.94
219.96
219.98
220.00
220.02
220.04
Frequency [MHz]
47 CFR §80 Spurious Emissions

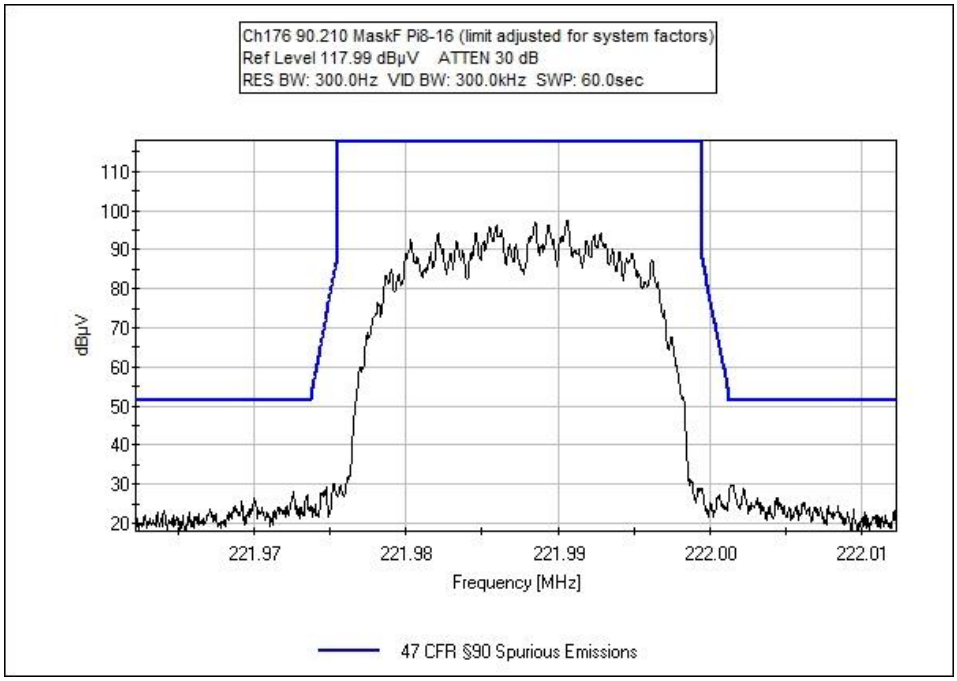
Channel 97


Ch97 90.210 MaskF Pi8 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
219.99
220.00
220.01
220.02
220.03
Frequency [MHz]
47 CFR §90 Spurious Emissions

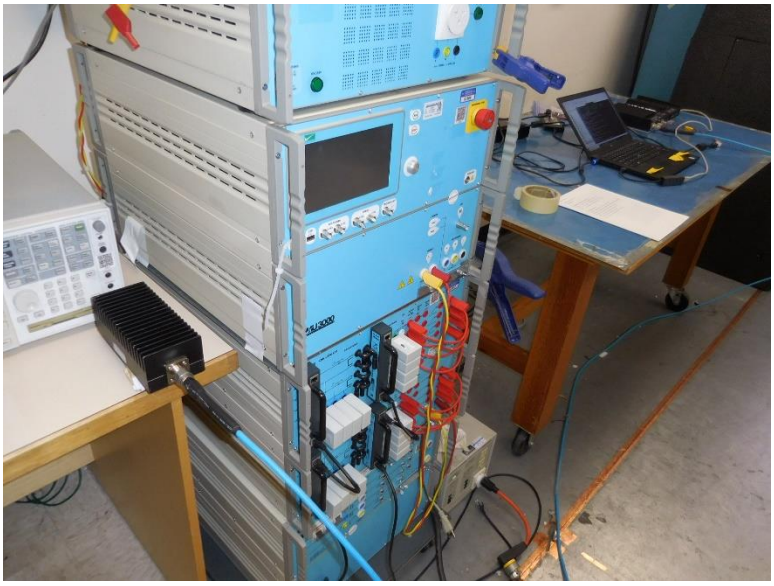

Ch97 90.210 MaskF Pi8-16 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
219.99
220.00
220.01
220.02
220.03
Frequency [MHz]
47 CFR §90 Spurious Emissions

Channel 176


Ch176 90.210 MaskF Pi8 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
221.97
221.98
221.99
222.00
222.01
Frequency [MHz]
47 CFR §90 Spurious Emissions


Ch176 90.210 MaskF Pi8-16 (limit adjusted for system factors)
Ref Level 117.99 dBµV ATTEN 30 dB
RES BW: 300.0Hz VID BW: 300.0kHz SWP: 60.0sec
dBµV
110
100
90
80
70
60
50
40
30
20
221.97
221.98
221.99
222.00
222.01
Frequency [MHz]
47 CFR §90 Spurious Emissions

Test Setup Photo(s)



Radiated Spurious Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.26 (2015)	Test Date(s):	2/17/2025
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, Ch96, Ch97, and Ch176 on both modulations investigated in this report. The mask was then converted in terms of field strength for a 3m measurement.

All data recorded are peak values as worst case. 3 x orthogonal antenna axes investigated below 30MHz, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported.

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:	120kHz 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 90.210b:

(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.

Per 90.210f:

(1) On any frequency from the center of the authorized bandwidth f_o to the edge of the authorized bandwidth f_e: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 2 kHz up to and including 3.75 kHz: 30 + 20(f_d – 2) dB or 55 + 10 log (P), or 65 dB, whichever is the lesser attenuation.

(3) On any frequency beyond 3.75 kHz removed from the center of the authorized bandwidth f_d: At least 55 + 10 log (P) dB.

Limit = Power – Required Attenuation
= 10 Log P – (55 +10Log P)
= 10 Log P – 55 – 10Log P
= -55 dBW
= 0.000003W (0.03mW)
= 10 Log 0.000003/0.001
= -25dBm (82dBµV) at any power level.

Therefore, the most stringent limit from Mask F will be applied to all radiated emissions. Where -25dBm/82dBµV conducted limit = 70.2 dBµV/m @ 3m using ANSI C63.26 (2015) 5.2.7

Environmental Conditions			
Temperature (ºC)	21-22	Relative Humidity (%):	35-36

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02673	Spectrum Analyzer	Agilent	E4446A	3/8/2024	3/8/2026
P05546	Cable	Andrews	Heliax	5/9/2024	5/9/2026
P05360	Cable	Belden	RG214	1/7/2025	1/7/2027
03824	Biconilog Antenna	ETS-Lindgren	3142E	5/9/2023	5/9/2025
01316	Preamp	HP	8447D2	5/25/2024	5/25/2026
P05333	Cable	Andrews	Heliax	1/8/2025	1/8/2027
P06515	Cable	Andrews	Heliax	1/8/2025	1/8/2027
00052	Loop Antenna	EMCO	6502	4/19/2024	4/19/2026
02374ANSI	Horn Antenna	Electrometrics	RGA-60	1/8/2025	1/8/2027
03540	Preamp	HP	83017A	1/7/2025	1/7/2027
P08205	Flex Cable	Mini-Circuits	CBL-6FT-NMNM+	1/22/2025	1/22/2027

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	12:20:30
Tested By:	M. Atkinson	Sequence#:	4
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:

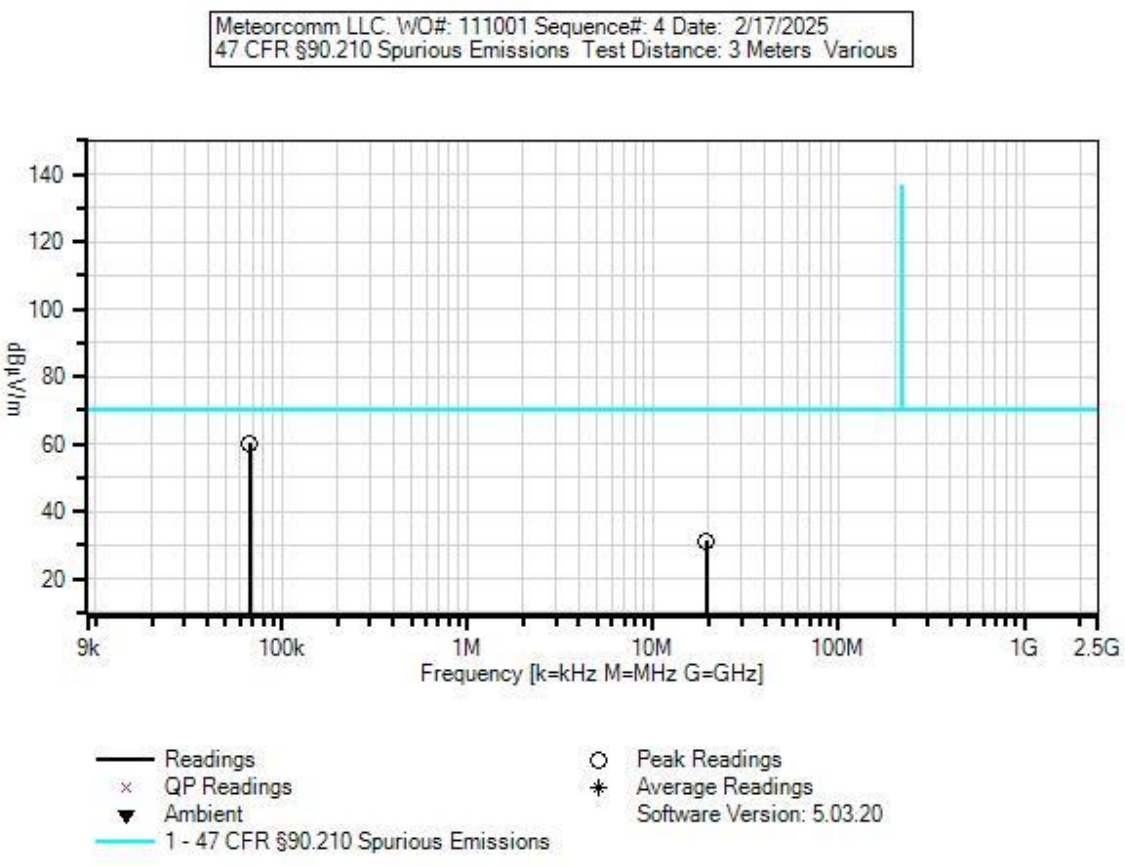
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 9kHz-30MHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T1	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T2	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T3	AN00052	Loop Antenna	6502	4/19/2024	4/19/2026

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	67.092k	50.4	+0.0	+0.0	+9.8		+0.0	60.2	70.2	-10.0	Perp
2	19.400M	22.8	+0.1	+0.2	+8.2		+0.0	31.3	70.2	-38.9	GndPe

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	12:29:01
Tested By:	M. Atkinson	Sequence#:	5
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:

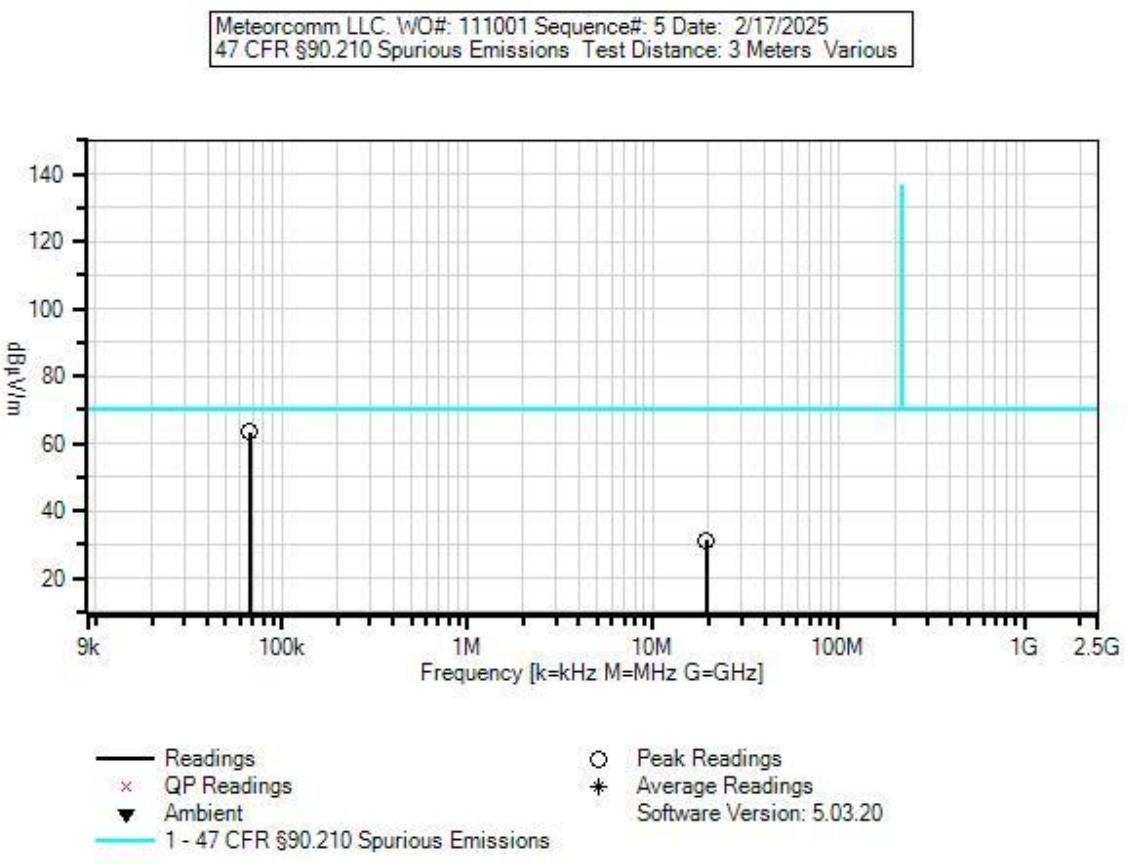
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 9kHz-30MHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8-16 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T1	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T2	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T3	AN00052	Loop Antenna	6502	4/19/2024	4/19/2026

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	67.233k	53.7	+0.0	+0.0	+9.8		+0.0	63.5	70.2	-6.7	Para
2	19.380M	22.7	+0.1	+0.2	+8.2		+0.0	31.2	70.2	-39.0	GndPe

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	10:51:16
Tested By:	M. Atkinson	Sequence#:	1
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:

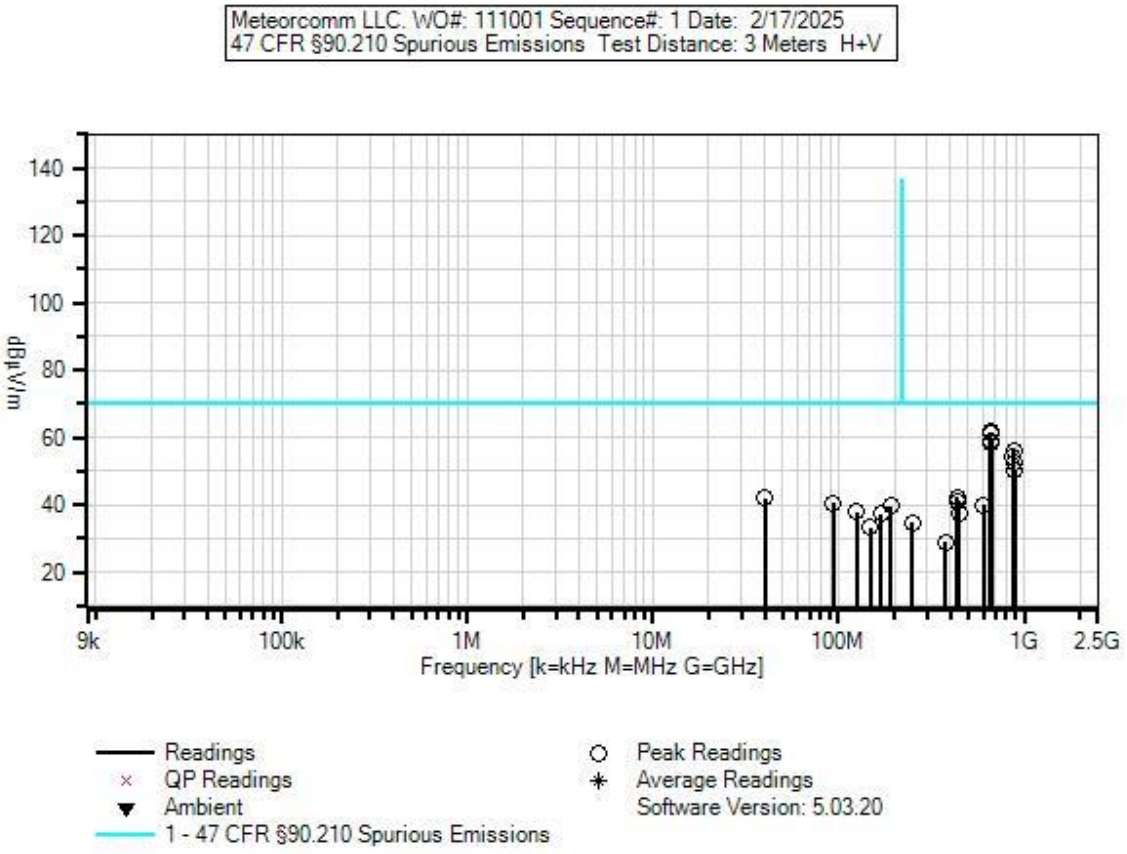
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 30-1000MHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T2	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T3	ANP05360	Cable	RG214	1/7/2025	1/7/2027
T4	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T5	AN01316	Preamp	8447D	5/25/2024	5/25/2026
T6	ANP05333	Cable	Heliax	1/8/2025	1/8/2027

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	660.024M	59.3	+0.0 -29.6	+0.5 +1.2	+2.5	+27.7	+0.0	61.6	70.2 Ch97	-8.6	Vert
2	659.968M	58.7	+0.0 -29.6	+0.5 +1.2	+2.5	+27.7	+0.0	61.0	70.2 Ch96	-9.2	Vert
3	665.920M	56.4	+0.0 -29.6	+0.5 +1.2	+2.5	+27.8	+0.0	58.8	70.2 Ch176	-11.4	Vert
4	652.850M	56.0	+0.0 -29.6	+0.5 +1.2	+2.5	+27.6	+0.0	58.2	70.2 Ch1	-12.0	Vert
5	879.976M	51.6	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	56.2	70.2 Ch96	-14.0	Vert
6	870.450M	49.6	+0.0 -28.9	+0.6 +1.4	+2.6	+29.0	+0.0	54.3	70.2 Ch1	-15.9	Horiz
7	880.068M	48.0	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	52.6	70.2 Ch97	-17.6	Horiz
8	887.948M	45.6	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	50.2	70.2 Ch176	-20.0	Horiz
9	435.200M	45.3	+0.0 -29.1	+0.4 +1.0	+1.5	+23.1	+0.0	42.2	70.2 Ch1	-28.0	Horiz
10	39.900M	53.9	+0.0 -29.2	+0.2 +0.3	+0.3	+16.3	+0.0	41.8	70.2	-28.4	Vert
11	439.981M	44.4	+0.0 -29.2	+0.4 +1.0	+1.5	+23.0	+0.0	41.1	70.2 Ch96	-29.1	Horiz
12	440.045M	44.2	+0.0 -29.2	+0.4 +1.0	+1.5	+23.0	+0.0	40.9	70.2 Ch97	-29.3	Horiz
13	93.900M	55.2	+0.0 -29.2	+0.2 +0.5	+0.6	+13.1	+0.0	40.4	70.2 Ch1	-29.8	Vert
14	600.000M	38.5	+0.0 -29.5	+0.5 +1.2	+2.2	+26.9	+0.0	39.8	70.2	-30.4	Vert
15	190.740M	51.1	+0.0 -28.7	+0.3 +0.7	+0.9	+15.3	+0.0	39.6	70.2	-30.6	Horiz
16	124.940M	52.0	+0.0 -29.0	+0.3 +0.5	+0.6	+13.3	+0.0	37.7	70.2	-32.5	Horiz
17	170.100M	49.2	+0.0 -28.9	+0.3 +0.6	+0.8	+15.3	+0.0	37.3	70.2	-32.9	Vert
18	443.965M	40.5	+0.0 -29.2	+0.4 +1.0	+1.5	+23.1	+0.0	37.3	70.2 Ch176	-32.9	Horiz
19	249.960M	42.7	+0.0 -28.4	+0.4 +0.8	+1.0	+18.2	+0.0	34.7	70.2	-35.5	Horiz
20	148.400M	45.9	+0.0 -28.9	+0.3 +0.6	+0.7	+14.8	+0.0	33.4	70.2	-36.8	Vert
21	375.000M	33.3	+0.0 -28.9	+0.4 +1.0	+1.3	+21.9	+0.0	29.0	70.2	-41.2	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	14:14:10
Tested By:	M. Atkinson	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:

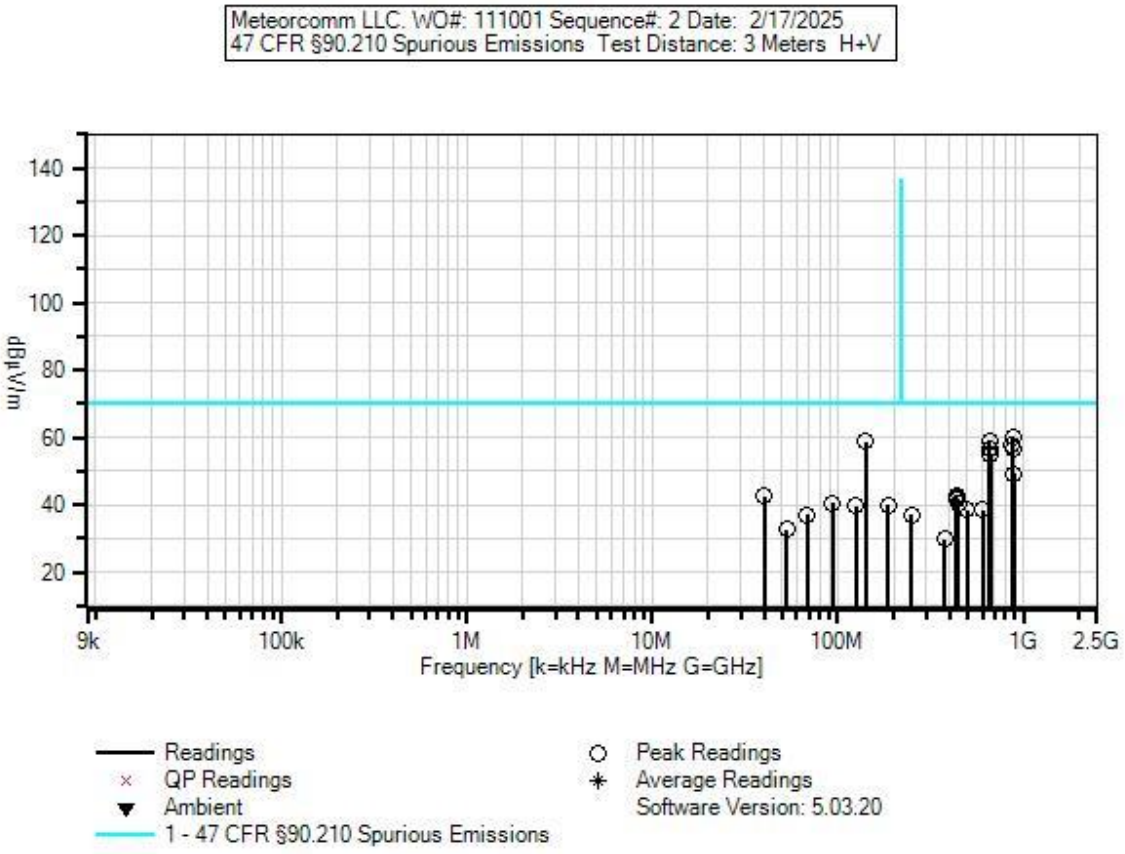
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 30-1000MHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8-16 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T2	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T3	ANP05360	Cable	RG214	1/7/2025	1/7/2027
T4	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T5	AN01316	Preamp	8447D	5/25/2024	5/25/2026
T6	ANP05333	Cable	Heliax	1/8/2025	1/8/2027

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	879.882M	55.6	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	60.2	70.2 Ch96	-10.0	Vert
2	652.856M	56.9	+0.0 -29.6	+0.5 +1.2	+2.5	+27.6	+0.0	59.1	70.2 Ch1	-11.1	Vert
3	141.860M	72.3	+0.0 -29.0	+0.3 +0.5	+0.7	+13.9	+0.0	58.7	70.2	-11.5	Vert
4	870.448M	52.8	+0.0 -28.9	+0.6 +1.4	+2.6	+29.0	+0.0	57.5	70.2 Ch1	-12.7	Vert
5	880.030M	52.2	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	56.8	70.2 Ch 97	-13.4	Horiz
6	659.940M	54.3	+0.0 -29.6	+0.5 +1.2	+2.5	+27.7	+0.0	56.6	70.2 Ch96	-13.6	Vert
7	660.056M	54.2	+0.0 -29.6	+0.5 +1.2	+2.5	+27.7	+0.0	56.5	70.2 Ch 97	-13.7	Horiz
8	665.972M	52.6	+0.0 -29.6	+0.5 +1.2	+2.5	+27.8	+0.0	55.0	70.2 Ch 176	-15.2	Vert
9	887.946M	44.5	+0.0 -28.9	+0.6 +1.4	+2.6	+28.9	+0.0	49.1	70.2 Ch 176	-21.1	Horiz
10	435.219M	46.0	+0.0 -29.1	+0.4 +1.0	+1.5	+23.1	+0.0	42.9	70.2 Ch1	-27.3	Horiz
11	40.340M	54.8	+0.0 -29.2	+0.2 +0.3	+0.3	+16.1	+0.0	42.5	70.2	-27.7	Vert
12	439.967M	45.2	+0.0 -29.2	+0.4 +1.0	+1.5	+23.0	+0.0	41.9	70.2 Ch 96	-28.3	Horiz
13	440.017M	44.7	+0.0 -29.2	+0.4 +1.0	+1.5	+23.0	+0.0	41.4	70.2 Ch 97	-28.8	Horiz
14	93.920M	55.4	+0.0 -29.2	+0.2 +0.5	+0.6	+13.1	+0.0	40.6	70.2	-29.6	Vert
15	443.999M	43.6	+0.0 -29.2	+0.4 +1.0	+1.5	+23.1	+0.0	40.4	70.2 Ch 176	-29.8	Horiz
16	186.510M	51.0	+0.0 -28.7	+0.3 +0.7	+0.9	+15.6	+0.0	39.8	70.2	-30.4	Horiz
17	124.940M	53.9	+0.0 -29.0	+0.3 +0.5	+0.6	+13.3	+0.0	39.6	70.2	-30.6	Vert
18	600.000M	37.2	+0.0 -29.5	+0.5 +1.2	+2.2	+26.9	+0.0	38.5	70.2	-31.7	Vert
19	500.000M	39.8	+0.0 -29.3	+0.5 +1.1	+1.7	+24.5	+0.0	38.3	70.2	-31.9	Vert
20	68.540M	52.3	+0.0 -29.3	+0.2 +0.4	+0.4	+13.0	+0.0	37.0	70.2	-33.2	Vert
21	249.960M	44.9	+0.0 -28.4	+0.4 +0.8	+1.0	+18.2	+0.0	36.9	70.2	-33.3	Horiz
22	53.030M	48.7	+0.0 -29.2	+0.2 +0.3	+0.4	+12.2	+0.0	32.6	70.2	-37.6	Vert
23	374.980M	34.2	+0.0 -28.9	+0.4 +1.0	+1.3	+21.9	+0.0	29.9	70.2	-40.3	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	14:11:52
Tested By:	M. Atkinson	Sequence#:	7
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:

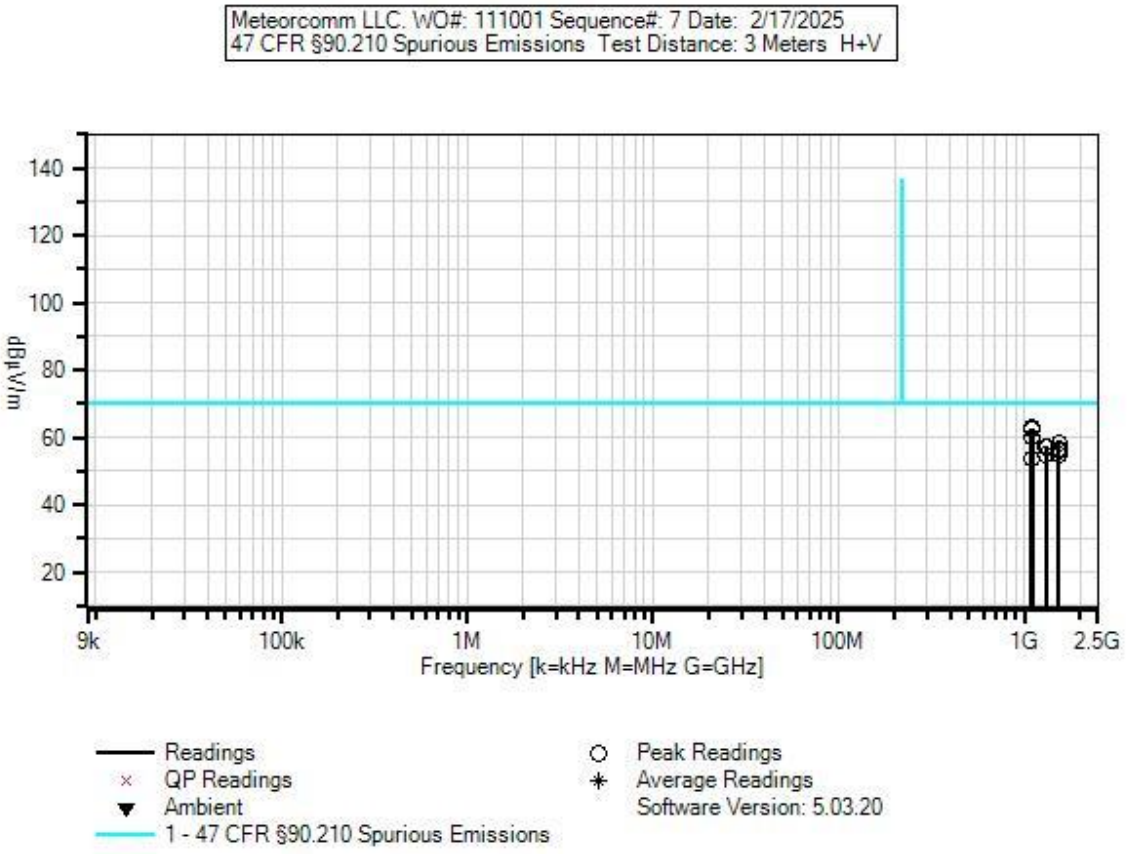
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 1-2.5GHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T2	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T3	ANP05333	Cable	Heliax	1/8/2025	1/8/2027
T4	AN02374ANSI	Horn Antenna	RGA-60	1/8/2025	1/8/2027
T5	AN03540	Preamp	83017A	1/7/2025	1/7/2027
T6	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027

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	1099.994M	72.3	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	62.7	70.2 Ch96	-7.5	Vert
2	1088.076M	72.1	+0.0 -37.1	+0.7 +0.6	+1.6	+24.4	+0.0	62.3	70.2 Ch1	-7.9	Vert
3	1100.042M	69.4	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	59.8	70.2 Ch97	-10.4	Vert
4	1523.132M	65.0	+0.0 -35.5	+0.9 +0.7	+1.9	+25.4	+0.0	58.4	70.2 Ch1	-11.8	Horiz
5	1319.933M	64.6	+0.0 -36.1	+0.8 +0.7	+1.8	+25.5	+0.0	57.3	70.2 Ch97	-12.9	Vert
6	1305.723M	64.6	+0.0 -36.1	+0.8 +0.7	+1.7	+25.4	+0.0	57.1	70.2 Ch1	-13.1	Vert
7	1540.250M	62.9	+0.0 -35.5	+0.9 +0.7	+1.9	+25.5	+0.0	56.4	70.2 Ch97	-13.8	Horiz
8	1539.786M	62.3	+0.0 -35.5	+0.9 +0.7	+1.9	+25.5	+0.0	55.8	70.2 Ch96	-14.4	Horiz
9	1305.000M	62.5	+0.0 -36.1	+0.8 +0.7	+1.7	+25.4	+0.0	55.0	70.2 Ch1	-15.2	Horiz
10	1540.010M	61.2	+0.0 -35.5	+0.9 +0.7	+1.9	+25.5	+0.0	54.7	70.2 Ch96	-15.5	Vert
11	1104.167M	63.4	+0.0 -37.0	+0.7 +0.6	+1.6	+24.6	+0.0	53.9	70.2 Ch 176 (not harm)	-16.3	Vert
12	1107.340M	63.2	+0.0 -37.0	+0.7 +0.6	+1.6	+24.6	+0.0	53.7	70.2 Ch1 (not harm)	-16.5	Vert
13	1105.930M	63.2	+0.0 -37.0	+0.7 +0.6	+1.6	+24.6	+0.0	53.7	70.2 Ch96 (not harm)	-16.5	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Meteorcomm LLC.**		
Specification:	**47 CFR §90.210 Spurious Emissions**		
Work Order #:	**111001**	Date:	2/17/2025
Test Type:	**Maximized Emissions**	Time:	14:58:59
Tested By:	M. 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:

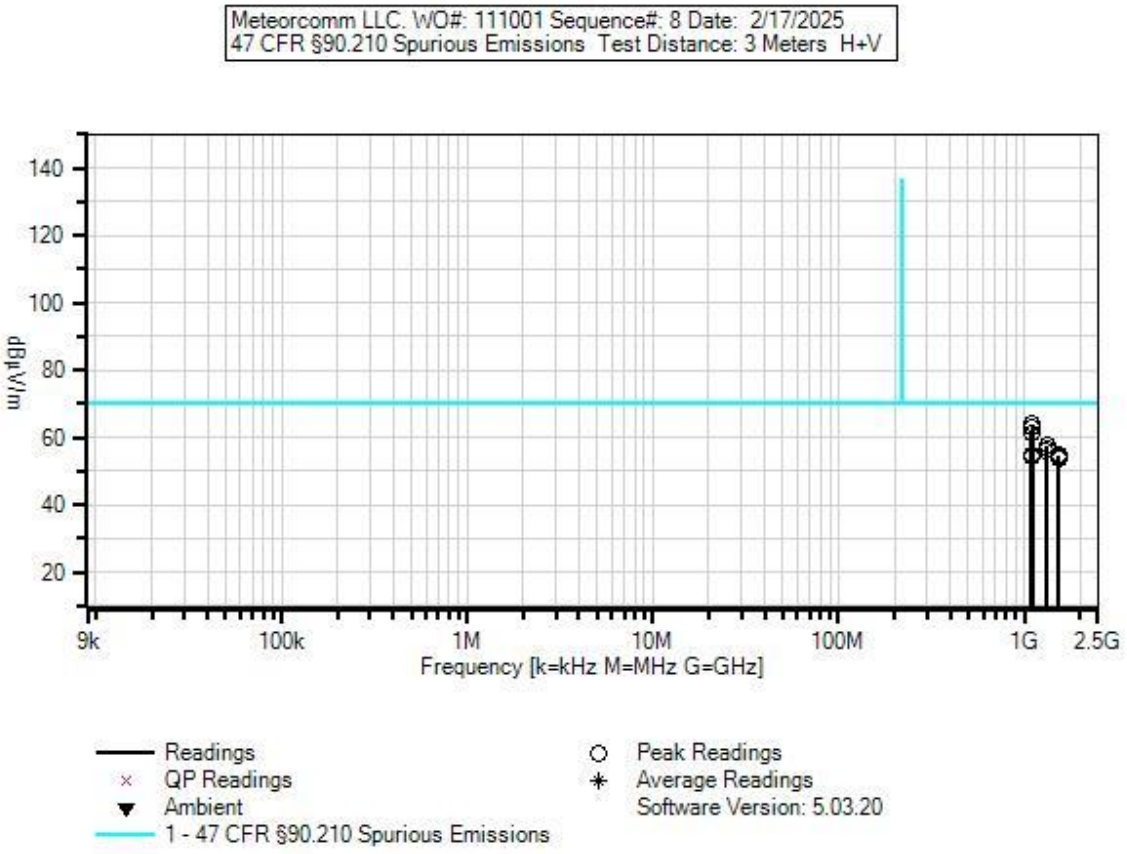
Test Environment Conditions:
Temperature: 21.5°C
Humidity: 36.0%
Pressure: 102.0kPa:

Frequency: 1-2.5GHz

Test Method: ANSI C63.26(2015)

Test Setup:
Transmit mode, antenna terminated.

Pi/8-16 Modulation



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T2	ANP05546	Cable	Heliax	5/9/2024	5/9/2026
T3	ANP05333	Cable	Heliax	1/8/2025	1/8/2027
T4	AN02374ANSI	Horn Antenna	RGA-60	1/8/2025	1/8/2027
T5	AN03540	Preamp	83017A	1/7/2025	1/7/2027
T6	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027

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	1100.140M	73.5	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	63.9	70.2 Ch97	-6.3	Vert
2	1100.140M	72.5	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	62.9	70.2 Ch96	-7.3	Vert
3	1087.810M	71.2	+0.0 -37.1	+0.7 +0.6	+1.6	+24.4	+0.0	61.4	70.2 Ch1	-8.8	Vert
4	1319.980M	64.9	+0.0 -36.1	+0.8 +0.7	+1.8	+25.5	+0.0	57.6	70.2 Ch96	-12.6	Vert
5	1320.200M	63.7	+0.0 -36.1	+0.8 +0.7	+1.8	+25.5	+0.0	56.4	70.2 Ch97	-13.8	Vert
6	1305.620M	63.7	+0.0 -36.1	+0.8 +0.7	+1.7	+25.4	+0.0	56.2	70.2 Ch1	-14.0	Vert
7	1523.440M	61.3	+0.0 -35.5	+0.9 +0.7	+1.9	+25.4	+0.0	54.7	70.2 Ch1	-15.5	Horiz
8	1099.900M	64.2	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	54.6	70.2 Ch96	-15.6	Horiz
9	1102.580M	64.2	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	54.6	70.2 Ch97 (not harm)	-15.6	Horiz
10	1103.280M	64.1	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	54.5	70.2 Ch176	-15.7	Vert
11	1539.950M	61.0	+0.0 -35.5	+0.9 +0.7	+1.9	+25.5	+0.0	54.5	70.2 Ch97	-15.7	Horiz
12	1103.420M	63.8	+0.0 -37.0	+0.7 +0.6	+1.6	+24.5	+0.0	54.2	70.2 Ch96 (not harm)	-16.0	Vert
13	1539.570M	60.0	+0.0 -35.5	+0.9 +0.7	+1.9	+25.5	+0.0	53.5	70.2 Ch96	-16.7	Horiz

Test Data Summary (9kHz-30MHz) PI/8 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
0.067	60.2	-35.0	-25	Pass
19.4	31.3	-63.9	-25	Pass

Test Data Summary (30-1000MHz) PI/8 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
39.9	41.8	-53.4	-25	Pass
93.9	40.4	-54.8	-25	Pass
124.94	37.7	-57.5	-25	Pass
148.4	33.4	-61.8	-25	Pass
170.1	37.3	-57.9	-25	Pass
190.74	39.6	-55.6	-25	Pass
249.96	34.7	-60.5	-25	Pass
375.0	29.0	-66.2	-25	Pass
435.2	42.2	-53.0	-25	Pass
439.981	41.1	-54.1	-25	Pass
440.045	40.9	-54.3	-25	Pass
443.965	37.3	-57.9	-25	Pass
600.0	39.8	-55.4	-25	Pass
652.85	58.2	-37.0	-25	Pass
659.968	61.0	-34.2	-25	Pass
660.024	61.6	-33.6	-25	Pass
665.92	58.8	-36.4	-25	Pass
870.45	54.3	-40.9	-25	Pass
879.976	56.2	-39.0	-25	Pass
880.068	52.6	-42.6	-25	Pass
887.948	50.2	-45.0	-25	Pass

Test Data Summary (Above 1GHz) PI/8 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
1088.076	62.3	-32.9	-25	Pass
1099.994	62.7	-32.5	-25	Pass
1100.042	59.8	-35.4	-25	Pass
1104.167	53.9	-41.3	-25	Pass
1105.93	53.7	-41.5	-25	Pass
1107.34	53.7	-41.5	-25	Pass
1305.0	55.0	-40.2	-25	Pass
1305.723	57.1	-38.1	-25	Pass
1319.933	57.3	-37.9	-25	Pass
1523.132	58.4	-36.8	-25	Pass
1539.786	55.8	-39.4	-25	Pass
1540.01	54.7	-40.5	-25	Pass
1540.25	56.4	-38.8	-25	Pass

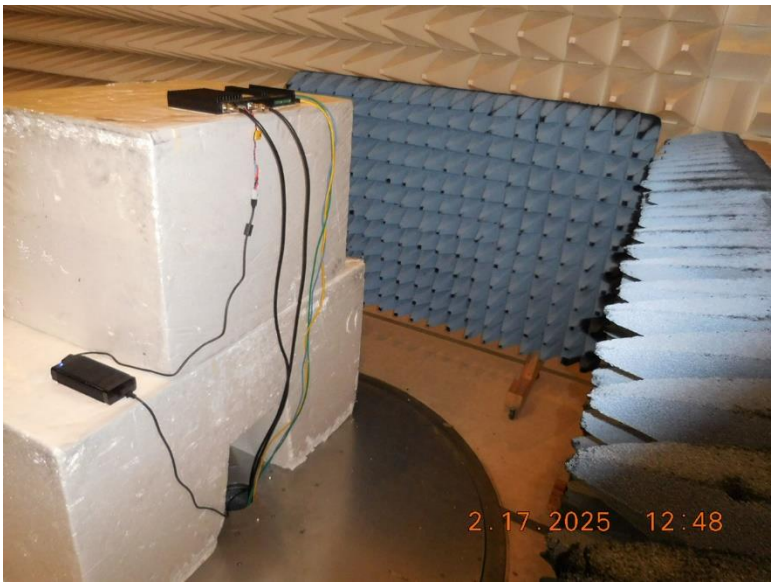
Test Data Summary (9kHz-30MHz) PI/8-16 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
0.067	63.5	-31.7	-25	Pass
19.38	31.2	-64.0	-25	Pass

Test Data Summary (30-1000MHz) PI/8-16 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
40.34	42.5	-52.7	-25	Pass
53.03	32.6	-62.6	-25	Pass
68.54	37.0	-58.2	-25	Pass
93.92	40.6	-54.6	-25	Pass
124.94	39.6	-55.6	-25	Pass
141.86	58.7	-36.5	-25	Pass
186.51	39.8	-55.4	-25	Pass
249.96	36.9	-58.3	-25	Pass
374.98	29.9	-65.3	-25	Pass
435.22	42.9	-52.3	-25	Pass
439.97	41.9	-53.3	-25	Pass
440.02	41.4	-53.8	-25	Pass
444.00	40.4	-54.8	-25	Pass
500.00	38.3	-56.9	-25	Pass
600.00	38.5	-56.7	-25	Pass
652.86	59.1	-36.1	-25	Pass
659.94	56.6	-38.6	-25	Pass
660.06	56.5	-38.7	-25	Pass
665.97	55.0	-40.2	-25	Pass
870.45	57.5	-37.7	-25	Pass
879.88	60.2	-35.0	-25	Pass
880.03	56.8	-38.4	-25	Pass
887.95	49.1	-46.1	-25	Pass

Test Data Summary (Above 1GHz) PI/8-16 Modulation				
Frequency (MHz)	Measured (dBµV/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
1087.81	61.4	-33.8	-25	Pass
1099.9	54.6	-40.6	-25	Pass
1100.14	62.9	-32.3	-25	Pass
1100.14	63.9	-31.3	-25	Pass
1102.58	54.6	-40.6	-25	Pass
1103.28	54.5	-40.7	-25	Pass
1103.42	54.2	-41.0	-25	Pass
1305.62	56.2	-39.0	-25	Pass
1319.98	57.6	-37.6	-25	Pass
1320.2	56.4	-38.8	-25	Pass
1523.44	54.7	-40.5	-25	Pass
1539.57	53.5	-41.7	-25	Pass
1539.95	54.5	-40.7	-25	Pass

Test Setup Photo(s)

Below 1GHz



Above 1GHz

Supplemental Information

Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
5.77 x 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