

Meteorcomm LLC.

EMC TEST REPORT FOR

**ITCR-NG Loco
Model: 65020**

Tested to The Following Standards:

FCC Part 90 Subpart T and Subpart K

**217.6125-219.9875MHz
AND
220.0125-221.9875MHz**

Report No.: 111163-4

Date of issue: May 30, 2025

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

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

Test Certificate # 803.01

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Administrative Information

Test Report Information

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Project Number: 111163

DATE OF EQUIPMENT RECEIPT:

April 21, 2025

DATE(S) OF TESTING:

April 22-25, 2025

Report Authorization

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



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

Test Facility Information



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

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive SE, Suite A
Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

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

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

Summary of Results

Standard / Specification: FCC Part 90 Subpart T and Subpart K

Test Procedure	Description	Modifications	Results
90.205, 90.723, 90.729, 90.259	Power Output	Mod. #1	*
90.209, 90.733 (d)	Occupied Bandwidth	Mod. #1	PASS
90.213	Frequency Stability	Mod. #1	PASS
90.210	Conducted Spurious Emissions and Mask	Mod. #1	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

Modification #1: a. 0.47uF caps from power supply input block to chassis.

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

Device	Manufacturer	Model #	S/N
ITCR-NG Loco	Meteorcomm LLC.	65020	65KR002001MC

Support Equipment:

Device	Manufacturer	Model #	S/N
Programmable DC Power Supply	BK Precision	XLN8018	351EL1073
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Attenuator	Fairview Microwave	SA3N1007-30	NA
Vector Signal Generator	Rhode & Schwarz	SMBVIOOB	1423.1003K02-102044-an
Laptop	Dell	Latitude	8X7DMH2
Prosafe 8-Port Switch	Netgear	GS108Tv2	29SE4C5302E60
5-port Switch (outside)	Dlink	DES-1105	DRL72A3014749
ITCR-NG Wayside	Meteorcomm, LLC.	65010	65WR000083BK
50 Ohm Terminator	Mini Circuits	KARN 50+	NA

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):	Full Rate DQPSK 2 bits / symbol Half Rate DQPSK 2 bits / symbol PI/8 DQPSK 3 bits / symbol PI/8 16APSK 4 bits /symbol
Maximum Duty Cycle:	30%, 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:	74VDC
Firmware / Software used for Test:	S/W Part Number P65000-A01-0.1.90.01 ITC-ROOT gec12a0f (dev) 2024-05-14 16:16:14 S/W Part Number P65000-M01-0.1.135.01 ITC-APP g4a81412a6 2024-05-14 19:09:07 S/W Part Number P65000-R01-0.0.80.0 Baseband-0 g6da029fdf 2024-05-14 14:04:26 S/W Part Number P65000-R01-0.0.80.0 Baseband-1 g6da029fdf 2024-05-14 14:05:06 S/W Part Number P65000-F01-00.00.48.00 FPGA ge45a0e8f 2024-04-09 12:35:12 S/W Part Number P65000-B01-0.1.92.01 Bootloader g5c50125 2024-06-25 19:24:32 S/W Part Number P65000-S01-0.1.92.01 Failsafe g5c50125 2024-06-25 19:24:32 Attenuator settings HALF_RATE PI/4 DQPSK 0.0dB FULL_RATE PI/4 DQPSK 0.0 dB PI/8-DQPSK -0.4 dB PI/8-16APSK -1.3 dB
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)



Support Equipment Photo(s)



Ethernet Switch



Laptop



Support Unit



GNSS



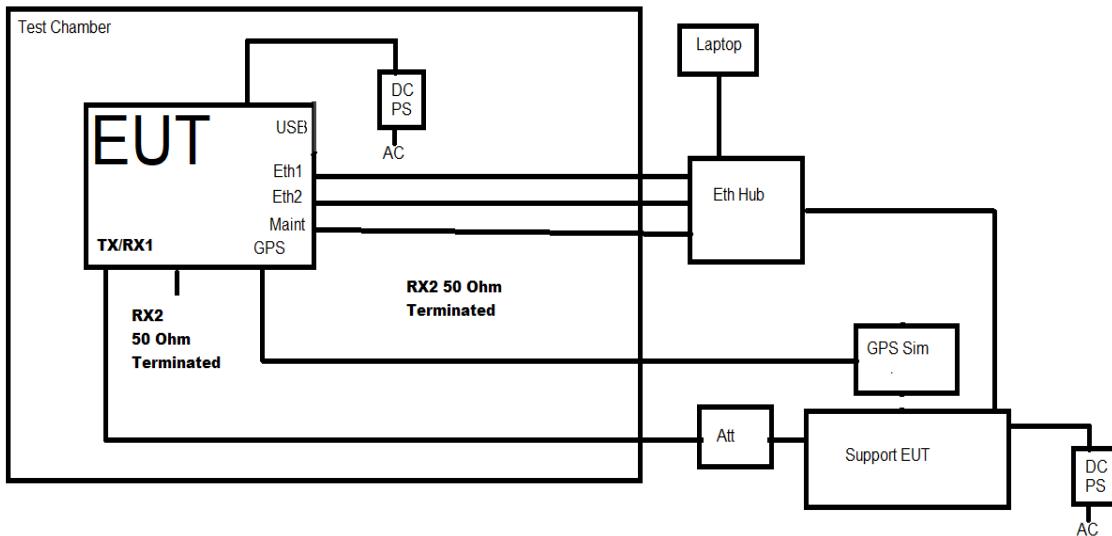
Attenuators



Power Supply

Block Diagram(s) of Test Setup

Config#	Setup Description of Block Diagram
Rad	<p>Powered by DC powered supply.</p> <p>Ethernet ports connected to Ethernet hub, laptop, and support EUT located outside chamber.</p> <p>GPS port connected to GPS signal located outside chamber.</p> <p>RX ports terminated into 50Ω.</p> <p>TX port connected to attenuators then Spectrum analyzer for conducted measurements.</p>
Cond	<p>Powered by DC powered supply.</p> <p>Ethernet ports connected to Ethernet hub, laptop, and support EUT.</p> <p>GPS port connected to GPS signal.</p> <p>RX ports terminated into 50Ω.</p> <p>TX port connected to attenuators then support EUT</p>



FCC PART 90 SUBPART T AND K

90.205, 90.723, 90.729, 90.259 Power Output

Test Setup/Conditions				
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore	
Test Method:	ANSI C63.26 (2015)	Test Date(s):	4/25/2025	
Configuration:	1			
Test Setup:	<p>The unit is in a temperature chamber for temperature variation. The voltage is varied. The EUT's RF port is connected to a spectrum analyzer with appropriate attenuation. Once the EUT transmitter is turned on, it is transmitting continuously with a 100% duty cycle, full rate, half rate, pi/8, and pi/8-16 modulations investigated.</p> <p>The applicable limits are:</p> <ol style="list-style-type: none"> 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 <p>Per the manufacturer, the max power is recorded for all channels tested and the licensee must consider these limitations.</p> <p>Note for all Power results:</p> <p>*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) or with the 50W power limit in accordance with 90.729 (b). Operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.</p> <p>Modification #1 was in place for testing.</p>			

Environmental Conditions					
Temperature (°C)	22.9	Relative Humidity (%):	33		

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

Test Data Summary - RF Conducted Measurement (Ch1)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
217.6125	-30	V _{Nom}	Full Rate	47.68	58.61	*
217.6125	-20	V _{Nom}	Full Rate	47.70	58.88	*
217.6125	-10	V _{Nom}	Full Rate	47.73	59.29	*
217.6125	0	V _{Nom}	Full Rate	47.72	59.16	*
217.6125	10	V _{Nom}	Full Rate	47.69	58.75	*
217.6125	20	V _{Nom}	Full Rate	47.69	58.75	*
217.6125	30	V _{Nom}	Full Rate	47.69	58.75	*
217.6125	40	V _{Nom}	Full Rate	47.41	55.08	*
217.6125	50	V _{Nom}	Full Rate	47.70	58.88	*
217.6125	20	V _{Min}	Full Rate	47.68	58.61	*
217.6125	20	V _{Max}	Full Rate	47.71	59.02	*

*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}	Full Rate	47.51	56.36	*
219.9875	-20	V _{Nom}	Full Rate	47.48	55.98	*
219.9875	-10	V _{Nom}	Full Rate	47.51	56.36	*
219.9875	0	V _{Nom}	Full Rate	47.52	56.49	*
219.9875	10	V _{Nom}	Full Rate	47.47	55.85	*
219.9875	20	V _{Nom}	Full Rate	47.51	56.36	*
219.9875	30	V _{Nom}	Full Rate	47.52	56.49	*
219.9875	40	V _{Nom}	Full Rate	47.58	57.28	*
219.9875	50	V _{Nom}	Full Rate	47.59	57.41	*
219.9875	20	V _{Min}	Full Rate	47.48	55.98	*
219.9875	20	V _{Max}	Full Rate	47.51	56.36	*

*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}	Full Rate	47.49	56.10	*
220.0125	-20	V _{Nom}	Full Rate	47.50	56.23	*
220.0125	-10	V _{Nom}	Full Rate	47.50	56.23	*
220.0125	0	V _{Nom}	Full Rate	47.50	56.23	*
220.0125	10	V _{Nom}	Full Rate	47.48	55.98	*
220.0125	20	V _{Nom}	Full Rate	47.50	56.23	*
220.0125	30	V _{Nom}	Full Rate	47.53	56.62	*
220.0125	40	V _{Nom}	Full Rate	47.57	57.15	*
220.0125	50	V _{Nom}	Full Rate	47.60	57.54	*
220.0125	20	V _{Min}	Full Rate	47.46	55.72	*
220.0125	20	V _{Max}	Full Rate	47.53	56.62	*

*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 (Ch176)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
221.9875	-30	V _{Nom}	Full Rate	47.29	53.58	*
221.9875	-20	V _{Nom}	Full Rate	47.29	53.58	*
221.9875	-10	V _{Nom}	Full Rate	47.29	53.58	*
221.9875	0	V _{Nom}	Full Rate	47.28	53.46	*
221.9875	10	V _{Nom}	Full Rate	47.26	53.21	*
221.9875	20	V _{Nom}	Full Rate	47.30	53.70	*
221.9875	30	V _{Nom}	Full Rate	47.31	53.83	*
221.9875	40	V _{Nom}	Full Rate	47.37	54.58	*
221.9875	50	V _{Nom}	Full Rate	47.41	55.01	*
221.9875	20	V _{Min}	Full Rate	47.27	53.33	*
221.9875	20	V _{Max}	Full Rate	47.29	53.58	*

*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 (Ch1)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
217.6125	-30	V _{Nom}	Half Rate	47.75	59.57	*
217.6125	-20	V _{Nom}	Half Rate	47.72	59.16	*
217.6125	-10	V _{Nom}	Half Rate	47.76	59.70	*
217.6125	0	V _{Nom}	Half Rate	47.77	59.84	*
217.6125	10	V _{Nom}	Half Rate	47.75	59.57	*
217.6125	20	V _{Nom}	Half Rate	47.74	59.43	*
217.6125	30	V _{Nom}	Half Rate	47.74	59.43	*
217.6125	40	V _{Nom}	Half Rate	47.83	60.67	*
217.6125	50	V _{Nom}	Half Rate	47.80	60.26	*
217.6125	20	V _{Min}	Half Rate	47.74	59.43	*
217.6125	20	V _{Max}	Half Rate	47.77	59.84	*

*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}	Half Rate	47.55	56.89	*
219.9875	-20	V _{Nom}	Half Rate	47.56	57.02	*
219.9875	-10	V _{Nom}	Half Rate	47.56	57.02	*
219.9875	0	V _{Nom}	Half Rate	47.56	57.02	*
219.9875	10	V _{Nom}	Half Rate	47.51	56.36	*
219.9875	20	V _{Nom}	Half Rate	47.55	56.89	*
219.9875	30	V _{Nom}	Half Rate	47.58	57.28	*
219.9875	40	V _{Nom}	Half Rate	47.61	57.68	*
219.9875	50	V _{Nom}	Half Rate	47.65	58.21	*
219.9875	20	V _{Min}	Half Rate	47.52	56.49	*
219.9875	20	V _{Max}	Half Rate	47.54	56.75	*

*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}	Half Rate	47.54	56.75	*
220.0125	-20	V _{Nom}	Half Rate	47.57	57.15	*
220.0125	-10	V _{Nom}	Half Rate	47.52	56.49	*
220.0125	0	V _{Nom}	Half Rate	47.53	56.62	*
220.0125	10	V _{Nom}	Half Rate	47.51	56.36	*
220.0125	20	V _{Nom}	Half Rate	47.53	56.62	*
220.0125	30	V _{Nom}	Half Rate	47.59	57.41	*
220.0125	40	V _{Nom}	Half Rate	47.64	58.08	*
220.0125	50	V _{Nom}	Half Rate	47.65	58.21	*
220.0125	20	V _{Min}	Half Rate	47.52	56.49	*
220.0125	20	V _{Max}	Half Rate	47.53	56.62	*

*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 (Ch176)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
221.9875	-30	V _{Nom}	Half Rate	47.33	54.08	*
221.9875	-20	V _{Nom}	Half Rate	47.31	53.83	*
221.9875	-10	V _{Nom}	Half Rate	47.30	53.70	*
221.9875	0	V _{Nom}	Half Rate	47.33	54.08	*
221.9875	10	V _{Nom}	Half Rate	47.31	53.83	*
221.9875	20	V _{Nom}	Half Rate	47.34	54.20	*
221.9875	30	V _{Nom}	Half Rate	47.36	54.45	*
221.9875	40	V _{Nom}	Half Rate	47.43	55.33	*
221.9875	50	V _{Nom}	Half Rate	47.46	55.72	*
221.9875	20	V _{Min}	Half Rate	47.32	53.95	*
221.9875	20	V _{Max}	Half Rate	47.32	53.95	*

*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 (Ch1)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
217.6125	-30	V _{Nom}	Pi/8	47.67	58.48	*
217.6125	-20	V _{Nom}	Pi/8	47.69	58.75	*
217.6125	-10	V _{Nom}	Pi/8	47.69	58.75	*
217.6125	0	V _{Nom}	Pi/8	47.68	58.61	*
217.6125	10	V _{Nom}	Pi/8	47.65	58.21	*
217.6125	20	V _{Nom}	Pi/8	47.69	58.75	*
217.6125	30	V _{Nom}	Pi/8	47.74	59.43	*
217.6125	40	V _{Nom}	Pi/8	47.79	60.12	*
217.6125	50	V _{Nom}	Pi/8	47.79	60.12	*
217.6125	20	V _{Min}	Pi/8	47.70	58.88	*
217.6125	20	V _{Max}	Pi/8	47.70	58.88	*

*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	47.49	56.10	*
219.9875	-20	V _{Nom}	Pi/8	47.49	56.10	*
219.9875	-10	V _{Nom}	Pi/8	47.50	56.23	*
219.9875	0	V _{Nom}	Pi/8	47.47	55.85	*
219.9875	10	V _{Nom}	Pi/8	47.47	55.85	*
219.9875	20	V _{Nom}	Pi/8	47.49	56.10	*
219.9875	30	V _{Nom}	Pi/8	47.54	56.75	*
219.9875	40	V _{Nom}	Pi/8	47.59	57.41	*
219.9875	50	V _{Nom}	Pi/8	47.60	57.54	*
219.9875	20	V _{Min}	Pi/8	47.50	56.23	*
219.9875	20	V _{Max}	Pi/8	47.52	56.49	*

*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	47.52	56.49	*
220.0125	-20	V _{Nom}	Pi/8	47.51	56.36	*
220.0125	-10	V _{Nom}	Pi/8	47.49	56.10	*
220.0125	0	V _{Nom}	Pi/8	47.48	55.98	*
220.0125	10	V _{Nom}	Pi/8	47.48	55.98	*
220.0125	20	V _{Nom}	Pi/8	47.50	56.23	*
220.0125	30	V _{Nom}	Pi/8	47.55	56.89	*
220.0125	40	V _{Nom}	Pi/8	47.60	57.54	*
220.0125	50	V _{Nom}	Pi/8	47.63	57.94	*
220.0125	20	V _{Min}	Pi/8	47.49	56.10	*
220.0125	20	V _{Max}	Pi/8	47.50	56.23	*

*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 (Ch176)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
221.9875	-30	V _{Nom}	Pi/8	47.29	53.58	*
221.9875	-20	V _{Nom}	Pi/8	47.31	53.83	*
221.9875	-10	V _{Nom}	Pi/8	47.29	53.58	*
221.9875	0	V _{Nom}	Pi/8	47.28	53.46	*
221.9875	10	V _{Nom}	Pi/8	47.25	53.09	*
221.9875	20	V _{Nom}	Pi/8	47.29	53.58	*
221.9875	30	V _{Nom}	Pi/8	47.33	54.08	*
221.9875	40	V _{Nom}	Pi/8	47.37	54.58	*
221.9875	50	V _{Nom}	Pi/8	47.42	55.21	*
221.9875	20	V _{Min}	Pi/8	47.25	53.09	*
221.9875	20	V _{Max}	Pi/8	47.29	53.58	*

*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 (Ch1)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
217.6125	-30	V _{Nom}	Pi/8-16	47.68	58.61	*
217.6125	-20	V _{Nom}	Pi/8-16	47.69	58.75	*
217.6125	-10	V _{Nom}	Pi/8-16	47.69	58.75	*
217.6125	0	V _{Nom}	Pi/8-16	47.68	58.61	*
217.6125	10	V _{Nom}	Pi/8-16	47.66	58.34	*
217.6125	20	V _{Nom}	Pi/8-16	47.68	58.61	*
217.6125	30	V _{Nom}	Pi/8-16	47.76	59.70	*
217.6125	40	V _{Nom}	Pi/8-16	47.79	60.12	*
217.6125	50	V _{Nom}	Pi/8-16	47.80	60.26	*
217.6125	20	V _{Min}	Pi/8-16	47.68	58.61	*
217.6125	20	V _{Max}	Pi/8-16	47.70	58.88	*

*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	47.49	56.10	*
219.9875	-20	V _{Nom}	Pi/8-16	47.47	55.85	*
219.9875	-10	V _{Nom}	Pi/8-16	47.48	55.98	*
219.9875	0	V _{Nom}	Pi/8-16	47.46	55.72	*
219.9875	10	V _{Nom}	Pi/8-16	47.46	55.72	*
219.9875	20	V _{Nom}	Pi/8-16	47.51	56.36	*
219.9875	30	V _{Nom}	Pi/8-16	47.54	56.75	*
219.9875	40	V _{Nom}	Pi/8-16	47.61	57.68	*
219.9875	50	V _{Nom}	Pi/8-16	47.60	57.54	*
219.9875	20	V _{Min}	Pi/8-16	47.49	56.10	*
219.9875	20	V _{Max}	Pi/8-16	47.52	56.49	*

*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	47.47	55.85	*
220.0125	-20	V _{Nom}	Pi/8-16	47.48	55.98	*
220.0125	-10	V _{Nom}	Pi/8-16	47.47	55.85	*
220.0125	0	V _{Nom}	Pi/8-16	47.46	55.72	*
220.0125	10	V _{Nom}	Pi/8-16	47.46	55.72	*
220.0125	20	V _{Nom}	Pi/8-16	47.51	56.36	*
220.0125	30	V _{Nom}	Pi/8-16	47.54	56.75	*
220.0125	40	V _{Nom}	Pi/8-16	47.58	57.28	*
220.0125	50	V _{Nom}	Pi/8-16	47.62	57.81	*
220.0125	20	V _{Min}	Pi/8-16	47.49	56.10	*
220.0125	20	V _{Max}	Pi/8-16	47.49	56.10	*

*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 (Ch176)

Frequency (MHz)	Temperature (°C)	Voltage	Modulation	Conducted Power (dBm)	Conducted Power (Watts)	Results
221.9875	-30	V _{Nom}	Pi/8-16	47.26	53.21	*
221.9875	-20	V _{Nom}	Pi/8-16	47.27	53.33	*
221.9875	-10	V _{Nom}	Pi/8-16	47.27	53.33	*
221.9875	0	V _{Nom}	Pi/8-16	47.24	52.97	*
221.9875	10	V _{Nom}	Pi/8-16	47.26	53.21	*
221.9875	20	V _{Nom}	Pi/8-16	47.29	53.58	*
221.9875	30	V _{Nom}	Pi/8-16	47.33	54.08	*
221.9875	40	V _{Nom}	Pi/8-16	47.37	54.58	*
221.9875	50	V _{Nom}	Pi/8-16	47.41	55.08	*
221.9875	20	V _{Min}	Pi/8-16	47.29	53.58	*
221.9875	20	V _{Max}	Pi/8-16	47.26	53.21	*

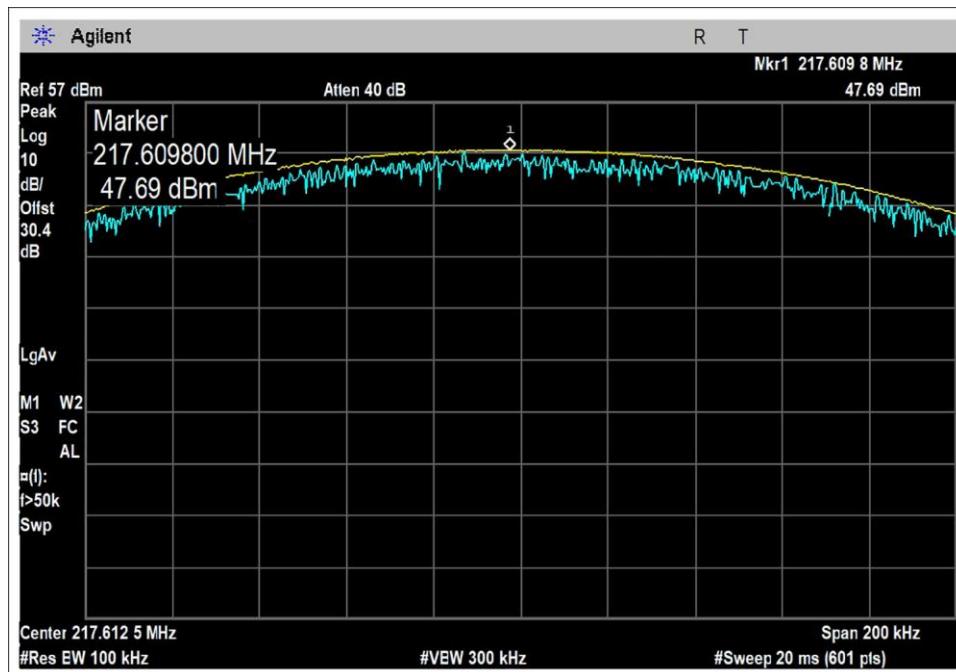
*Max output power measured from the EUT. The manufacturer declares that The EUT can be set to comply with 2W power limit where applicable in accordance with 90.259(a)(4), operation at higher power is permitted only when licensee has obtained appropriate spectrum authorization.

Parameter Definitions:

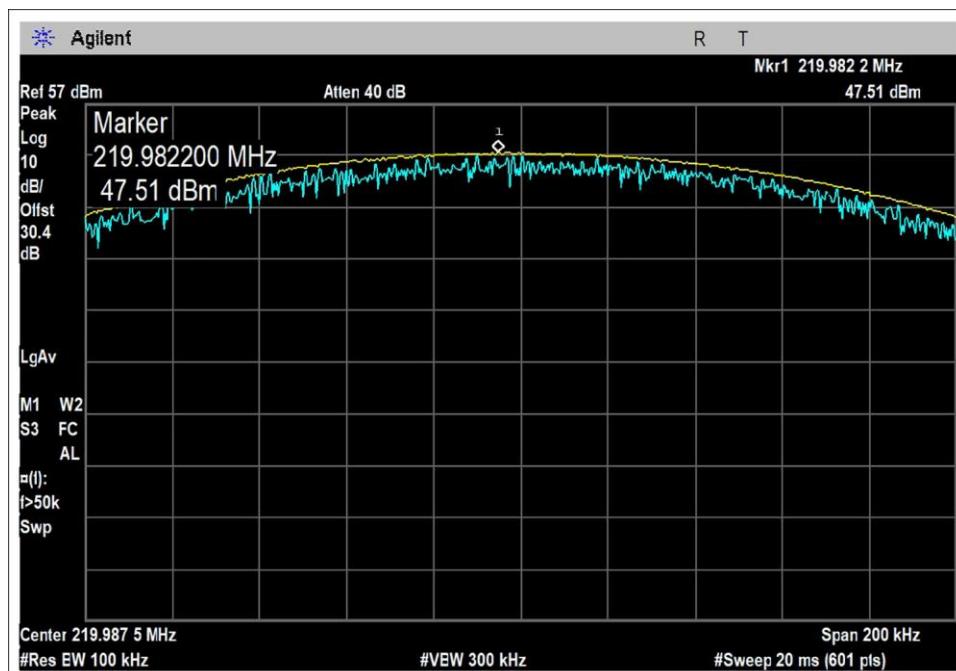
Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nom} :	74VDC
V _{Min} :	50VDC
V _{Max} :	100VDC

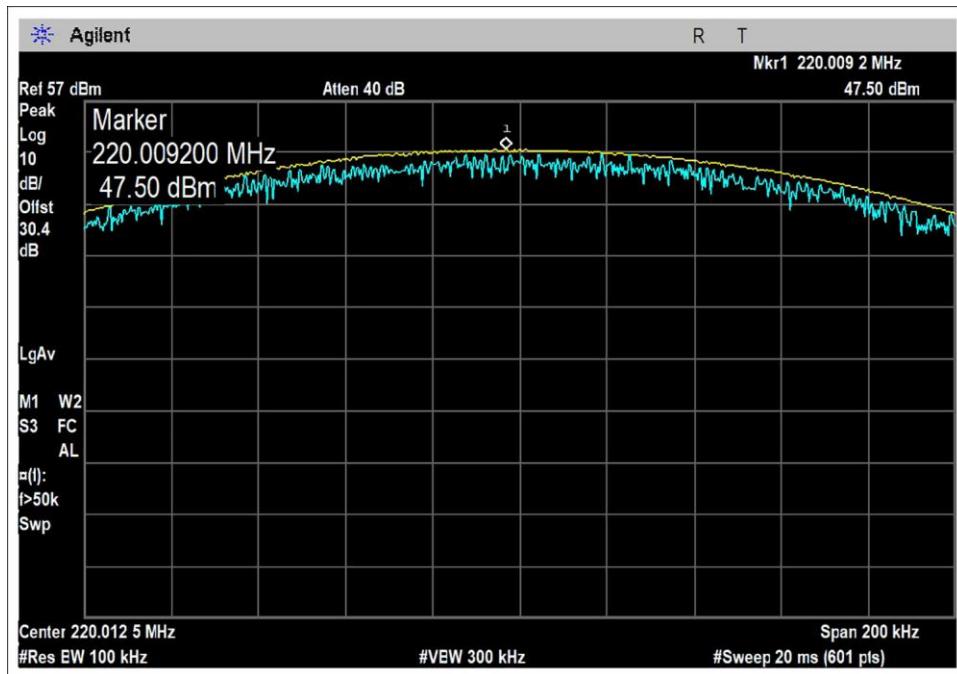
Test Plots



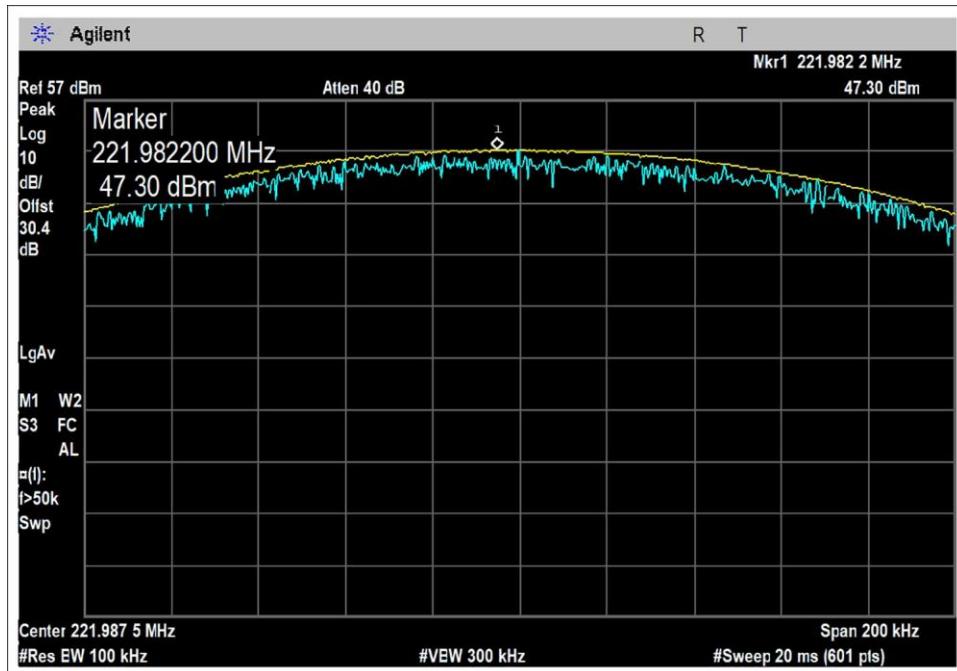
Channel 1, Full Rate



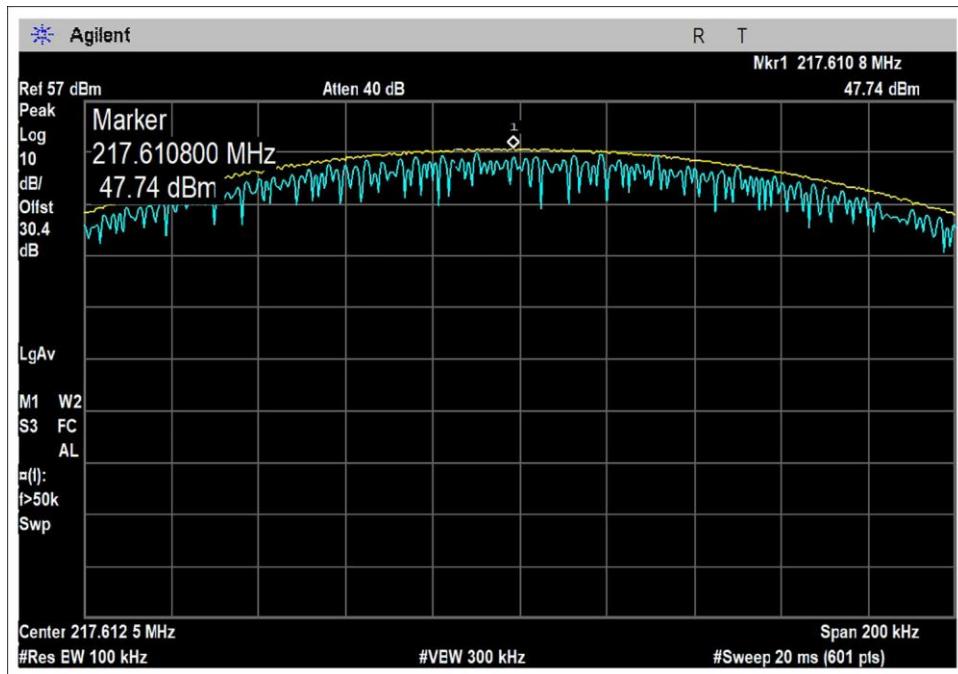
Channel 96, Full Rate



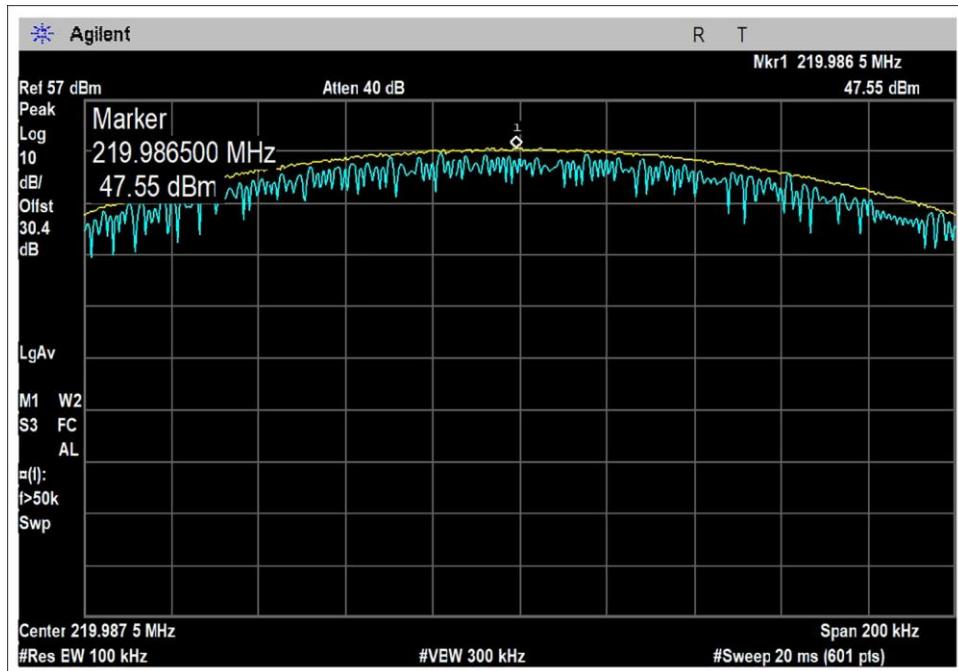
Channel 97, Full Rate



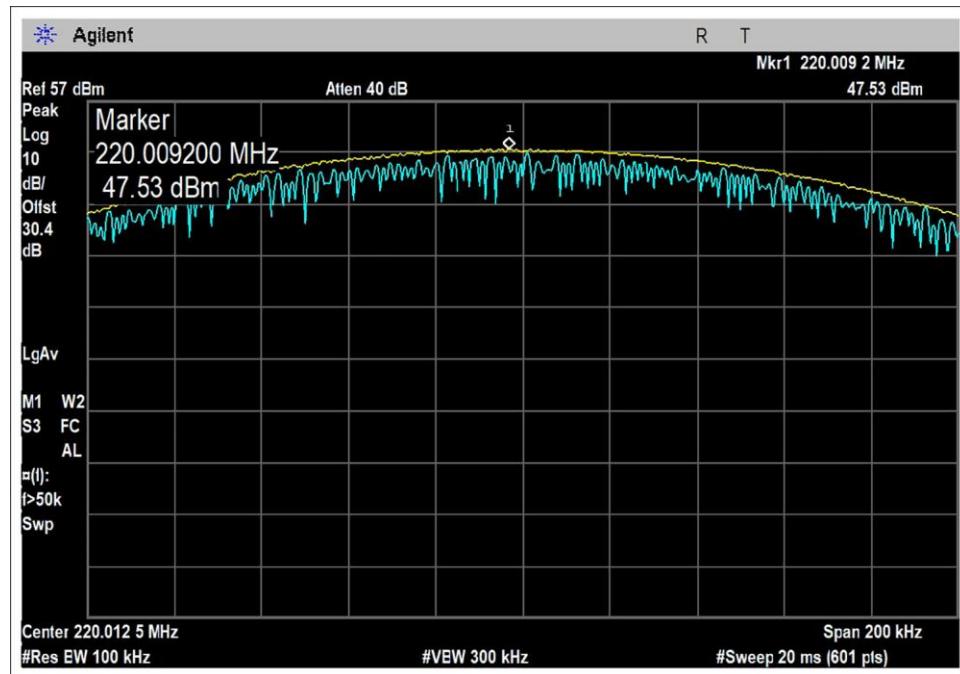
Channel 176, Full Rate



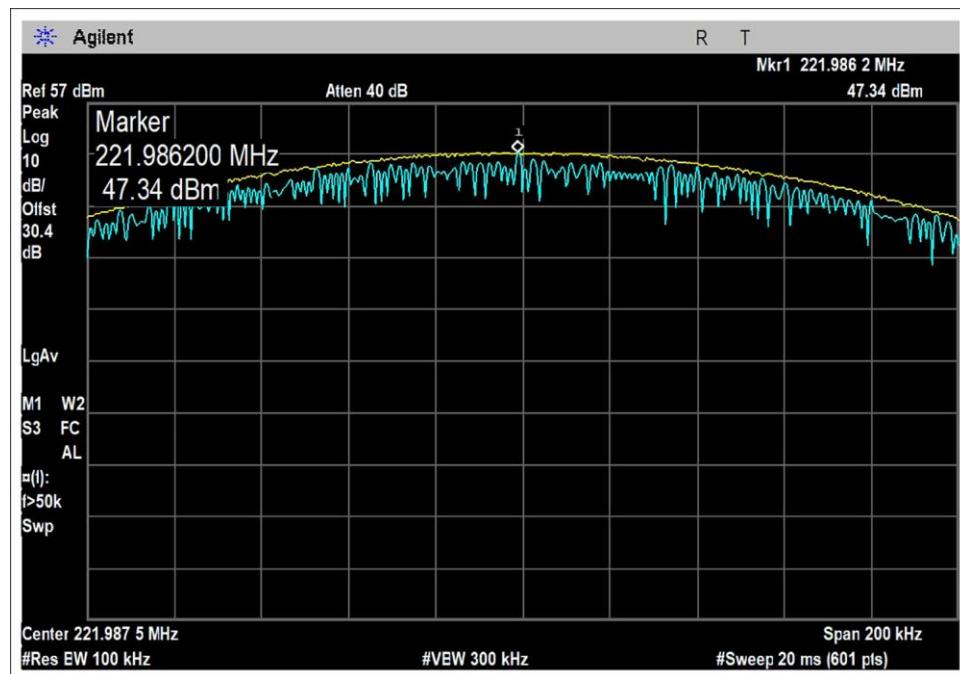
Channel 1, Half Rate



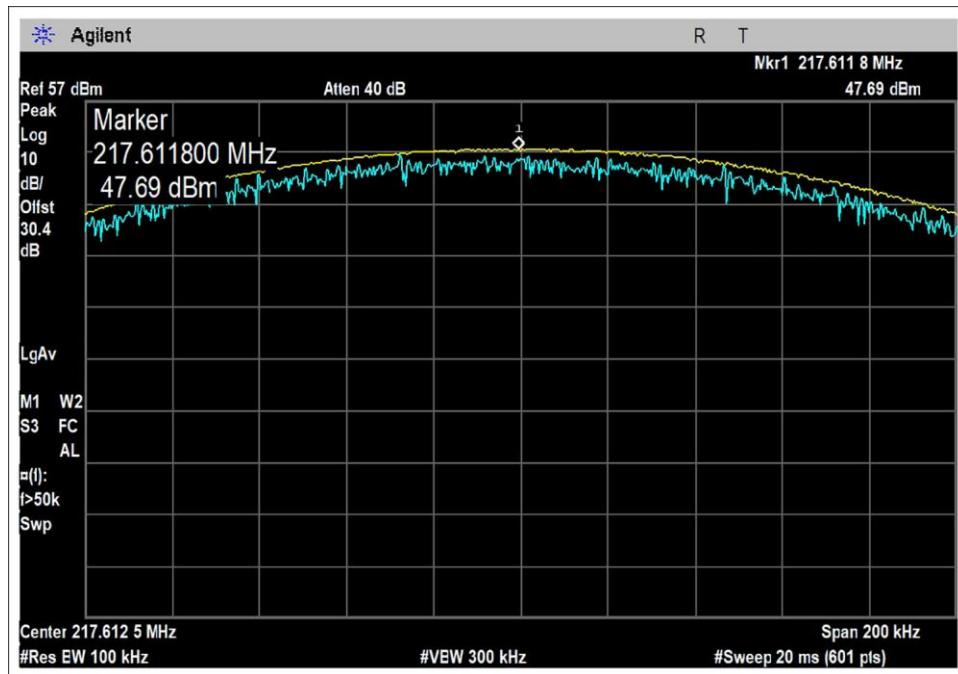
Channel 96, Half Rate



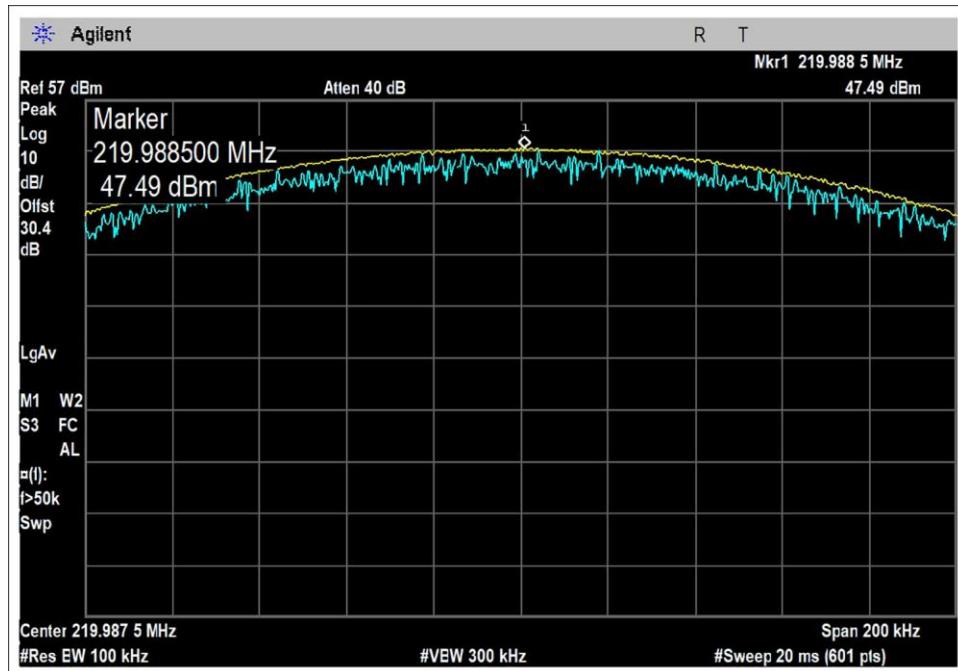
Channel 97, Half Rate



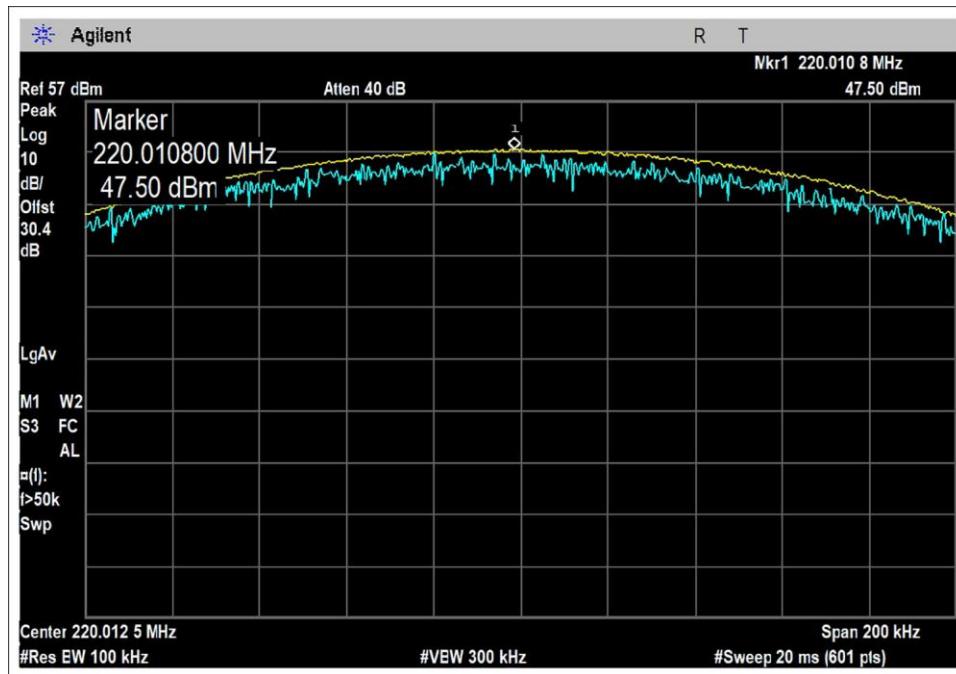
Channel 176, Half Rate



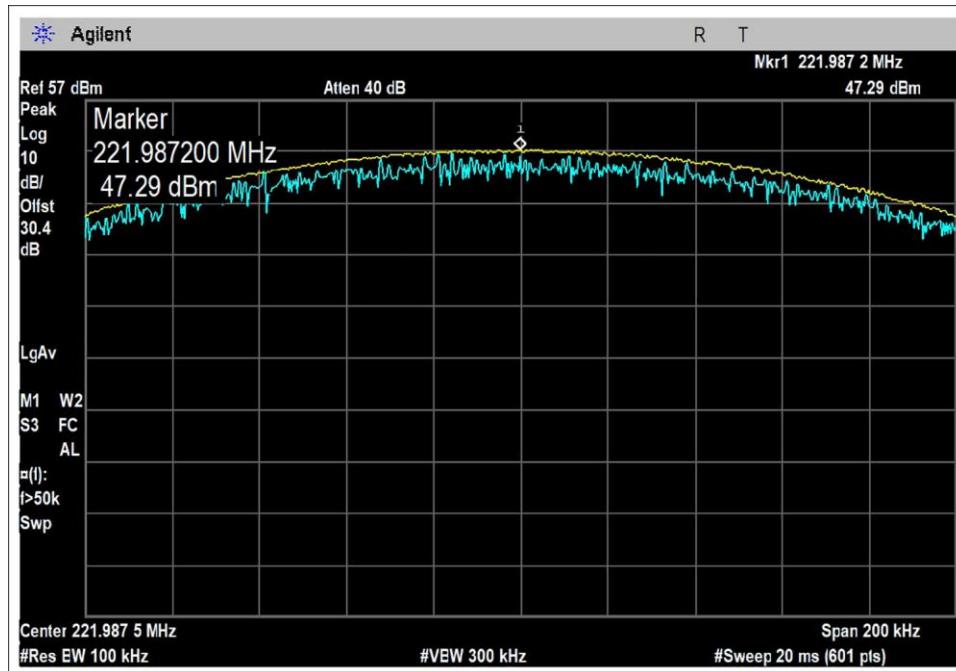
Channel 1, Pi/8



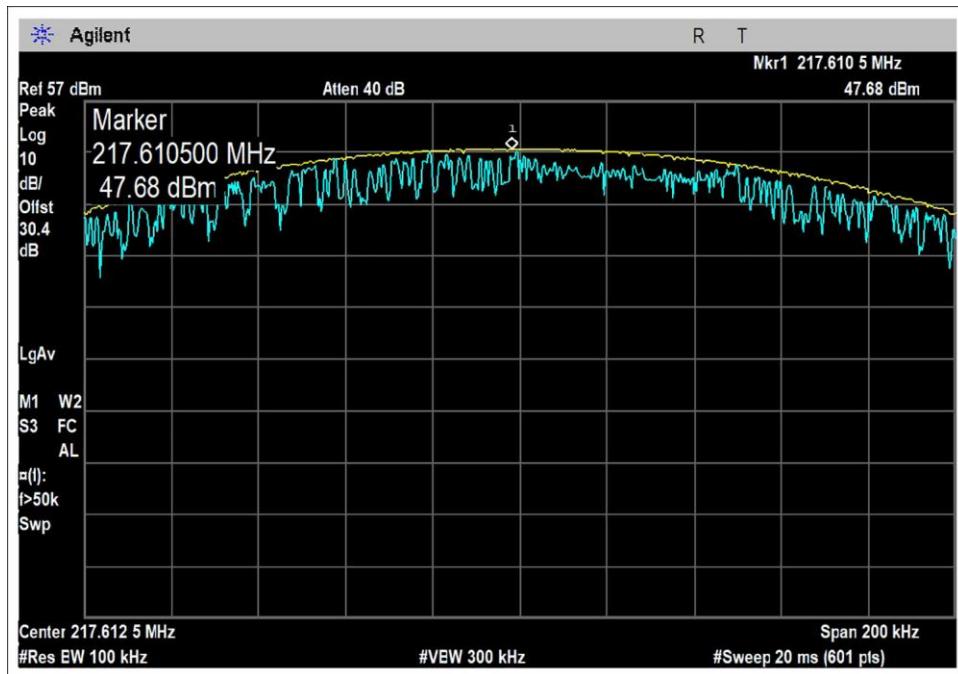
Channel 96, Pi/8



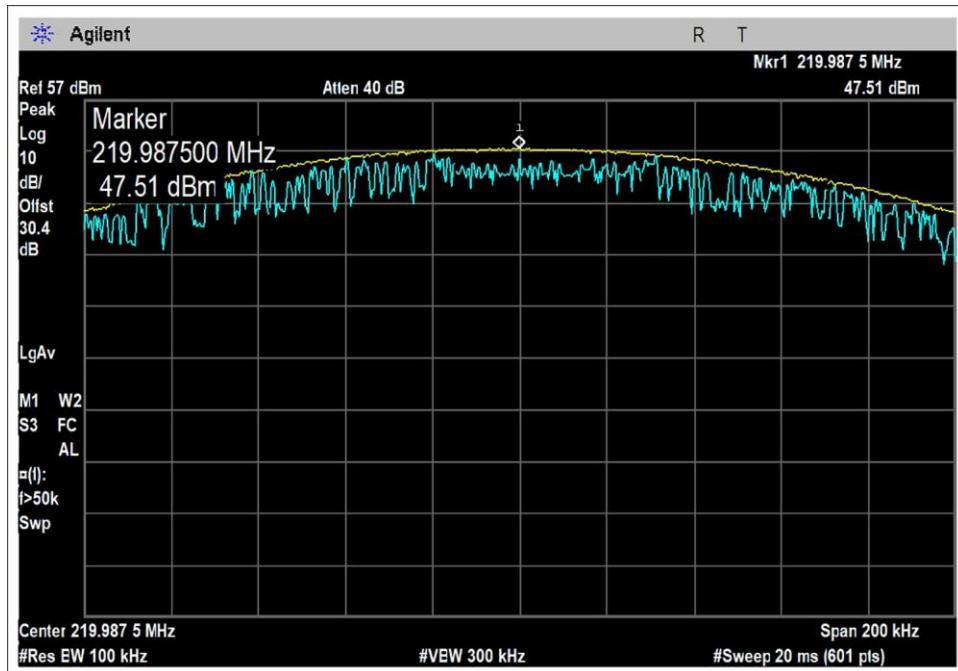
Channel 97, Pi/8



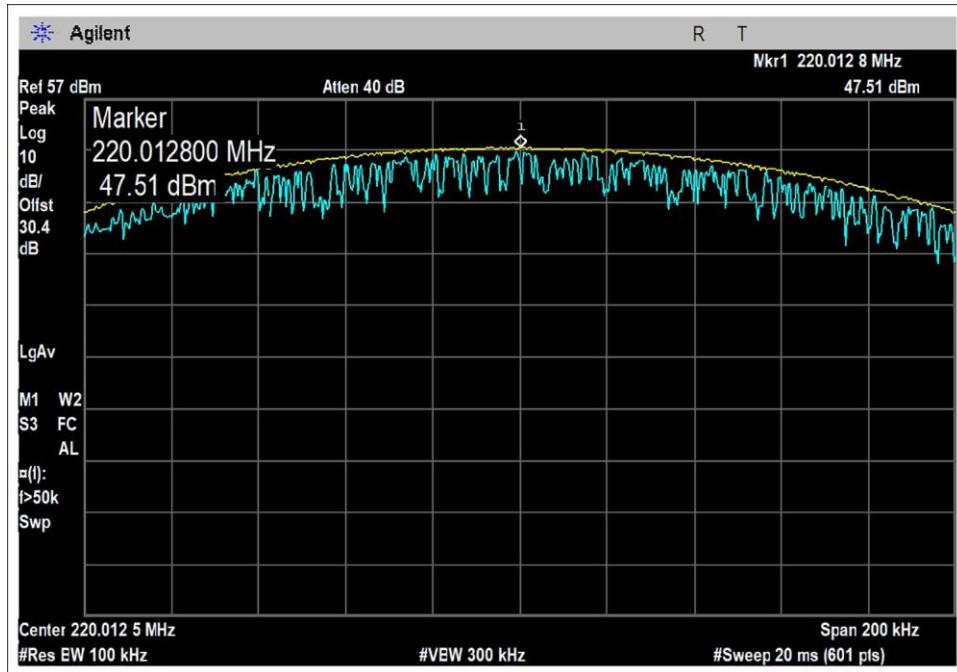
Channel 176, Pi/8



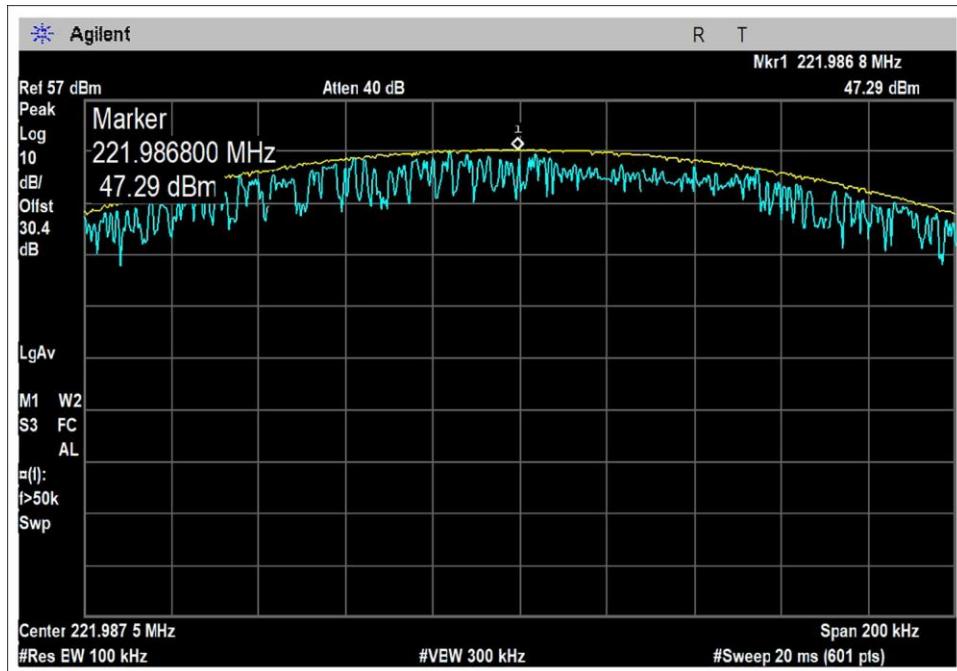
Channel 1, Pi/8-16



Channel 96, Pi/8-16



Channel 97, Pi/8-16



Channel 176, Pi/8-16

Test Setup Photo(s)



View 1



View 2

90.209, 90.733 (d) Occupied Bandwidth

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	4/23/2025
Configuration:	1		
Test Setup: The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The EUT is transmitting continuously with a 100% duty cycle, full rate, half rate, 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 assumed to be 20kHz for the Full Rate modulation, pi/8, and pi/8-16 and 11.25kHz for the Half Rate modulation. Modification #1 was in place for testing.			

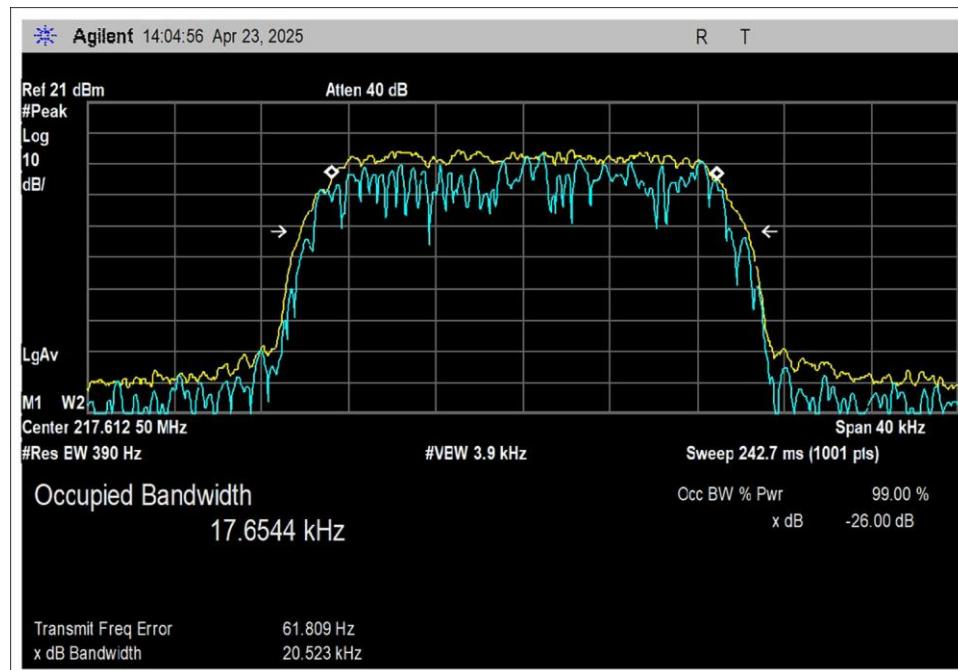
Environmental Conditions			
Temperature (°C)	21.9	Relative Humidity (%):	32

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02871	Spectrum Analyzer	Agilent	E4440A	9/19/2024	9/19/2026
P07006	Cable	Andrews	FSJ1-50A	2/21/2025	2/21/2027
C00194	30db Attenuator	Fairview Microwave	SA3N1007-30	9/26/2024	9/26/2026

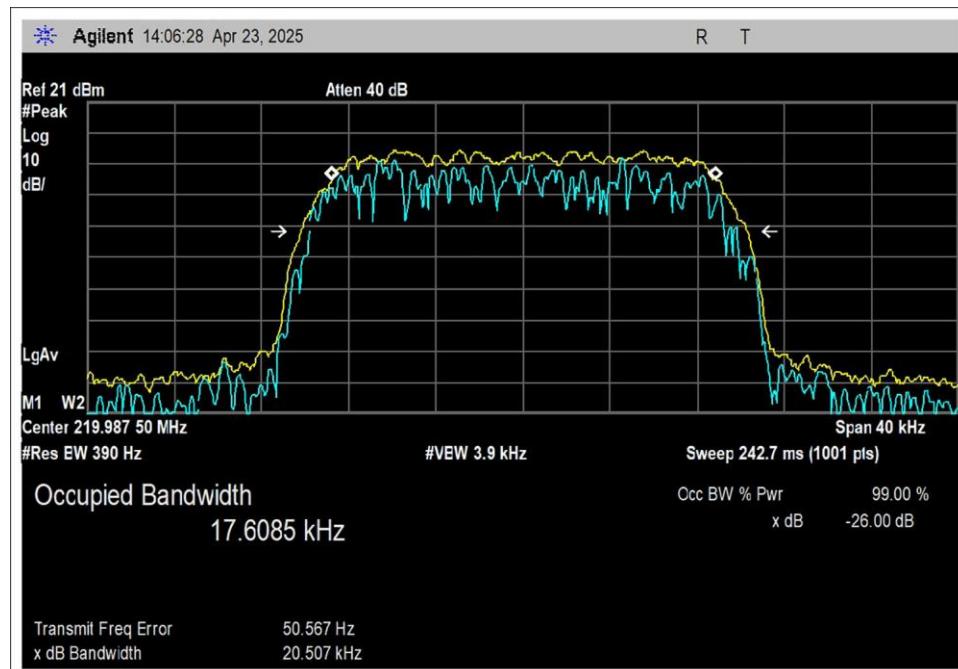
99% Occupied Bandwidth

Test Data Summary				
Frequency (MHz)	Modulation	Measured (kHz)	Limit (kHz)	Results
217.6125	Full Rate	17.6544	20kHz	Pass
219.9875	Full Rate	17.6085	20kHz	Pass
220.0125	Full Rate	17.6578	20kHz	Pass
221.9875	Full Rate	17.6213	20kHz	Pass
217.6125	Half Rate	8.8818	11.25kHz	Pass
219.9875	Half Rate	8.8846	11.25kHz	Pass
220.0125	Half Rate	8.8524	11.25kHz	Pass
221.9875	Half Rate	8.8843	11.25kHz	Pass
217.6125	Pi/8	17.4502	20kHz	Pass
219.9875	Pi/8	17.4462	20kHz	Pass
220.0125	Pi/8	17.4144	20kHz	Pass
221.9875	Pi/8	17.4294	20kHz	Pass
217.6125	Pi/8-16	17.6363	20kHz	Pass
219.9875	Pi/8-16	17.6294	20kHz	Pass
220.0125	Pi/8-16	17.6593	20kHz	Pass
221.9875	Pi/8-16	17.6235	20kHz	Pass

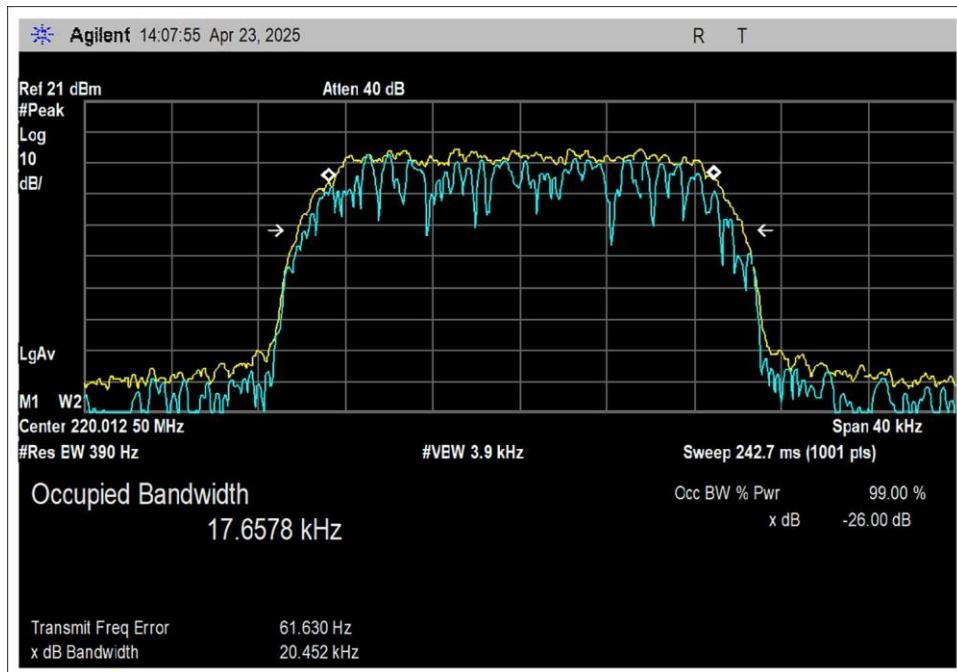
Plot(s)



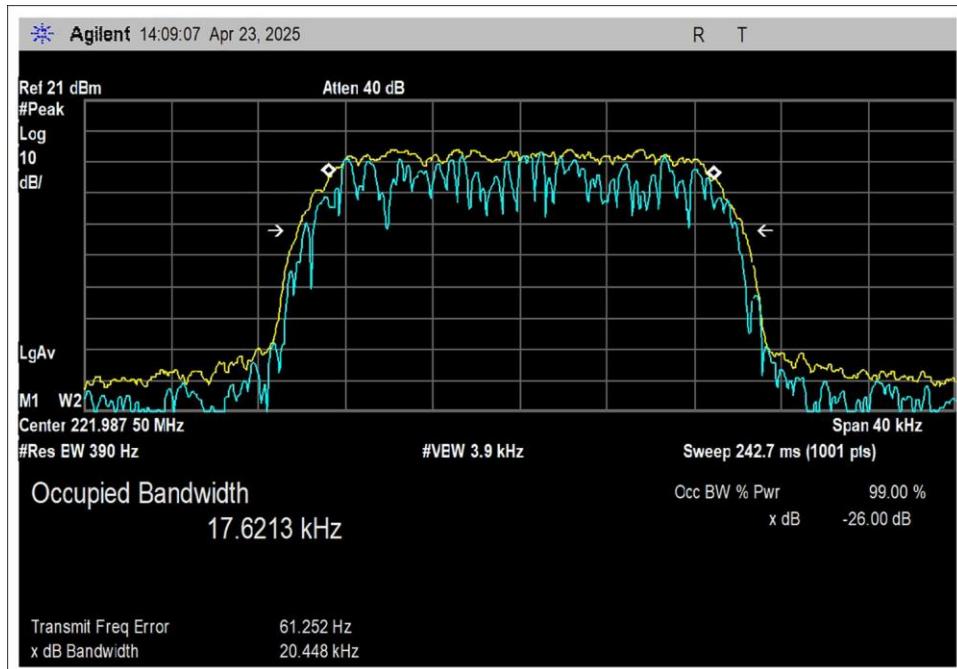
Channel 1, Full Rate



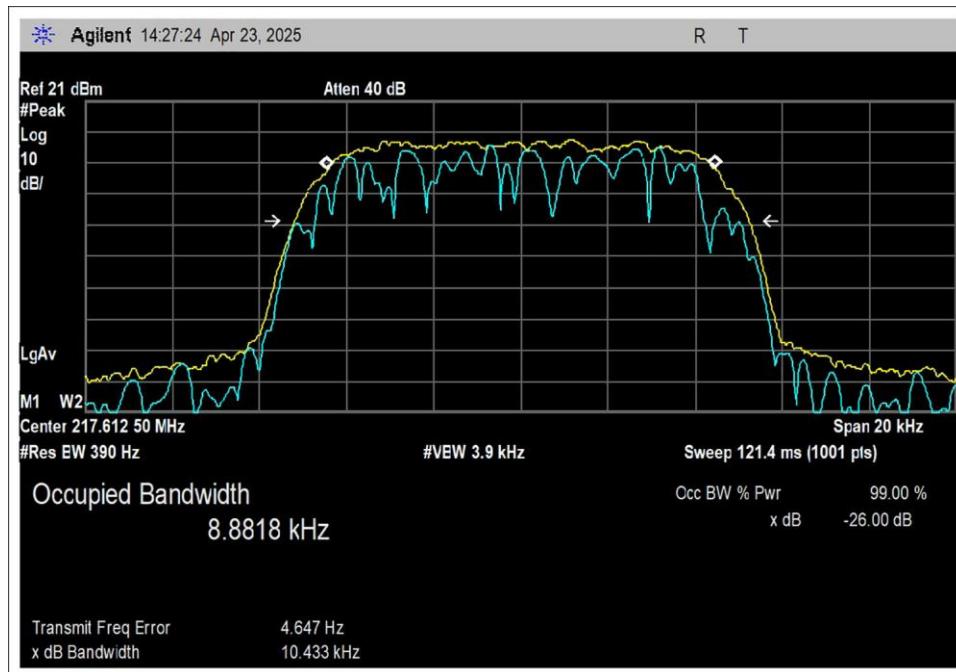
Channel 96, Full Rate



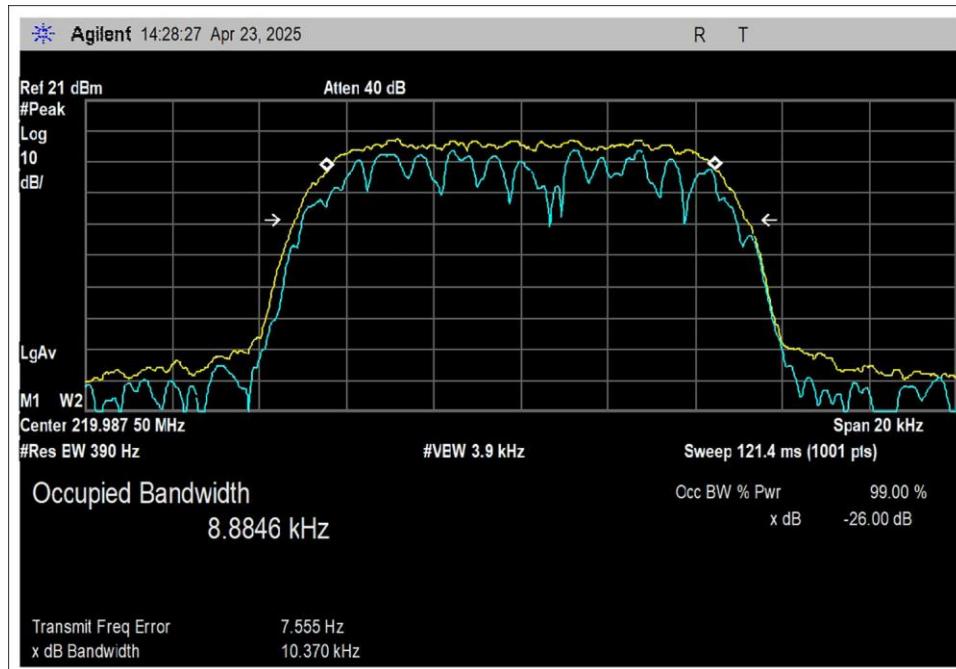
Channel 97, Full Rate



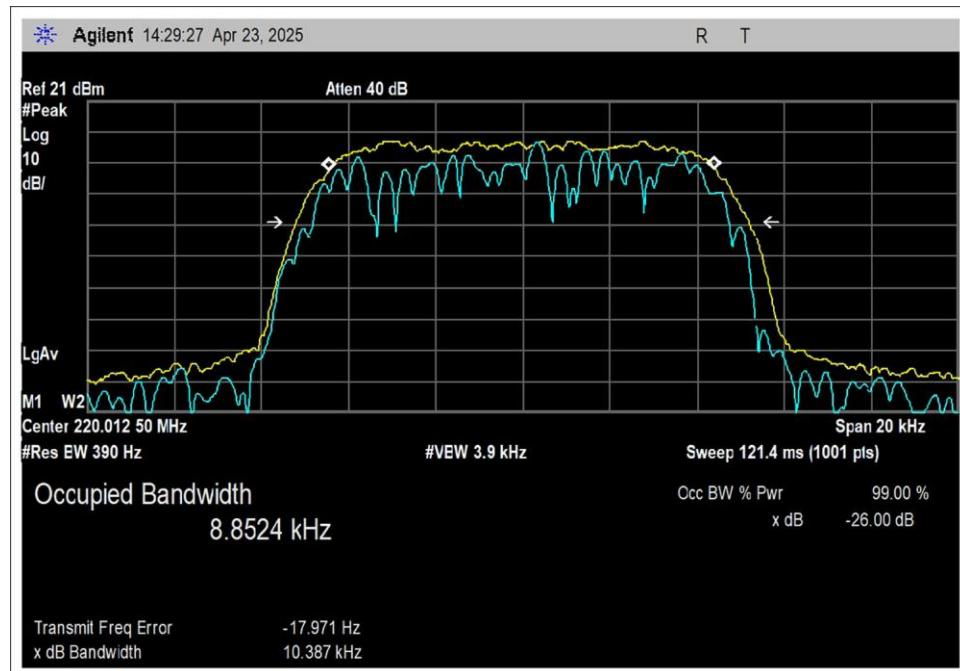
Channel 176, Full Rate



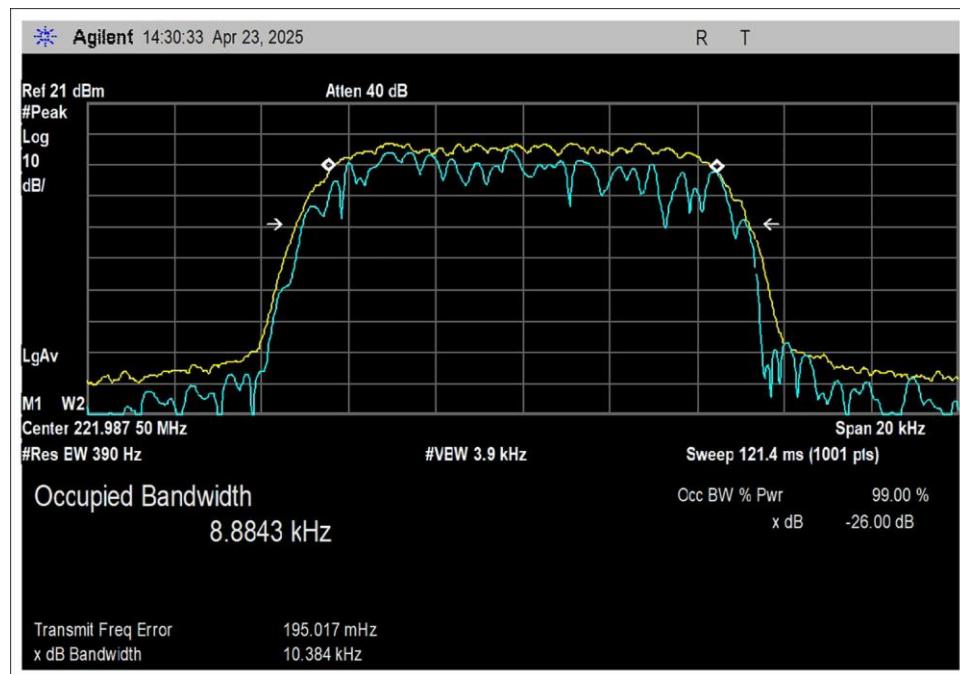
Channel 1, Half Rate



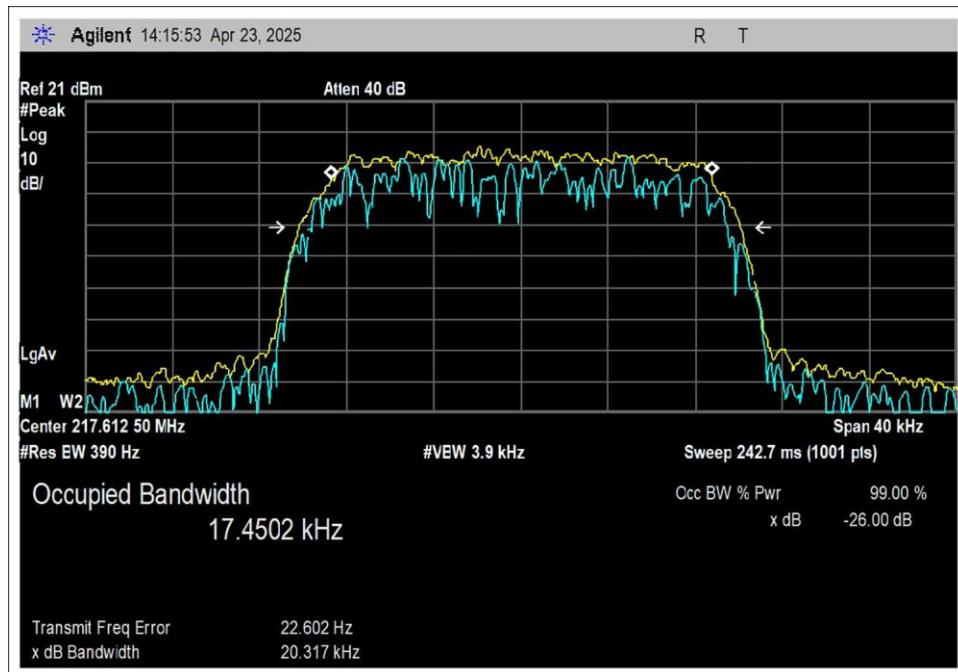
Channel 96, Half Rate



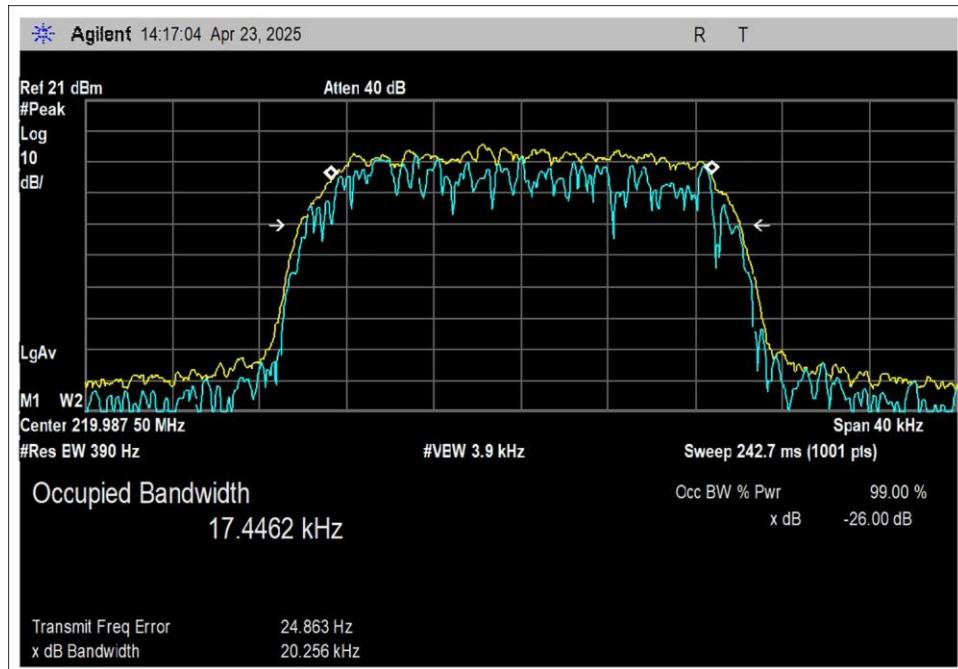
Channel 97, Half Rate



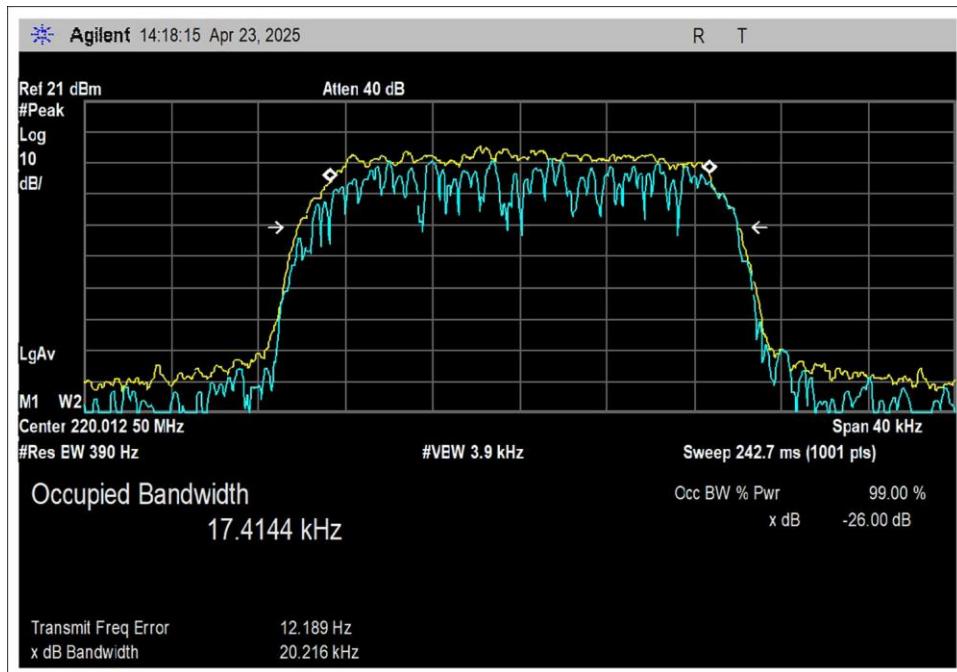
Channel 176, Half Rate



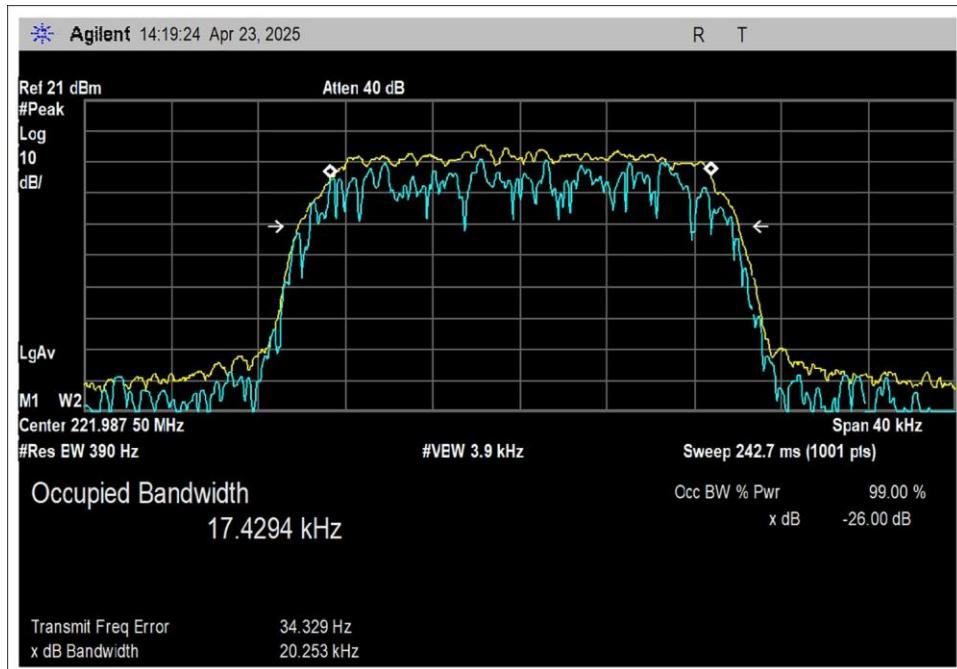
Channel 1, Pi/8



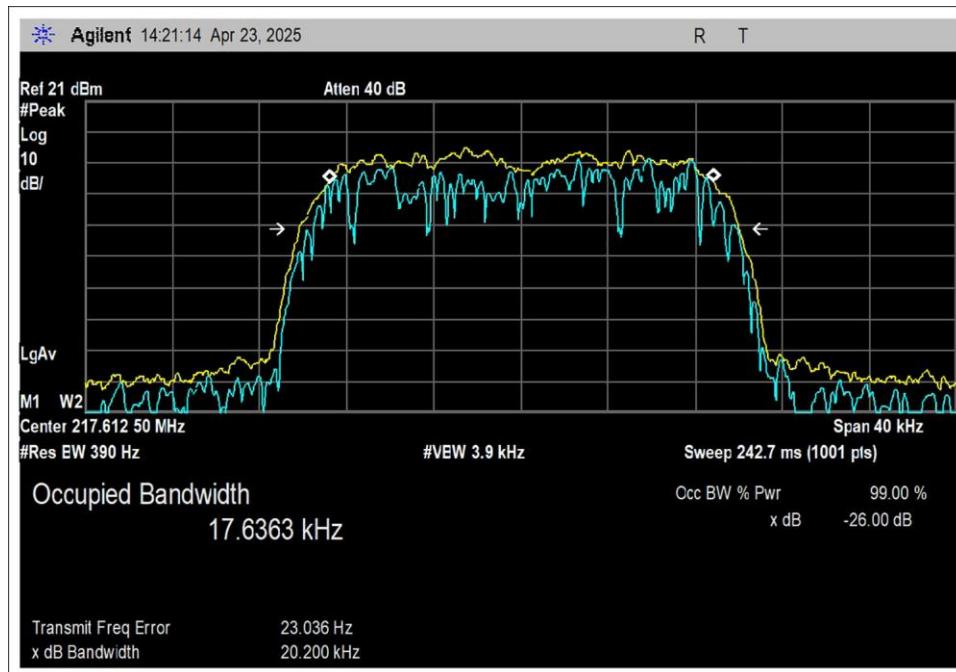
Channel 96, Pi/8



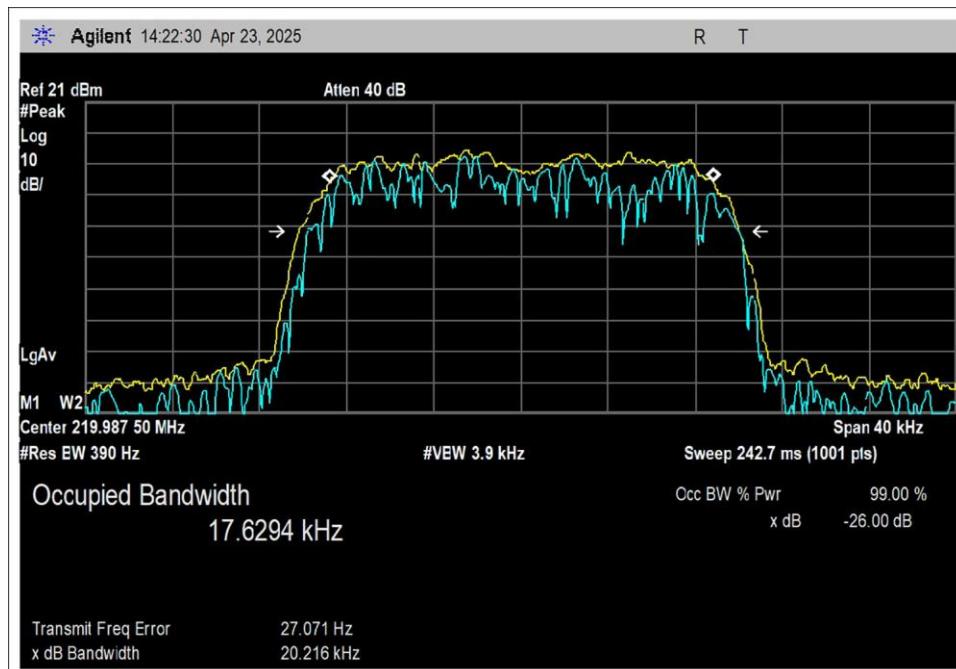
Channel 97, Pi/8



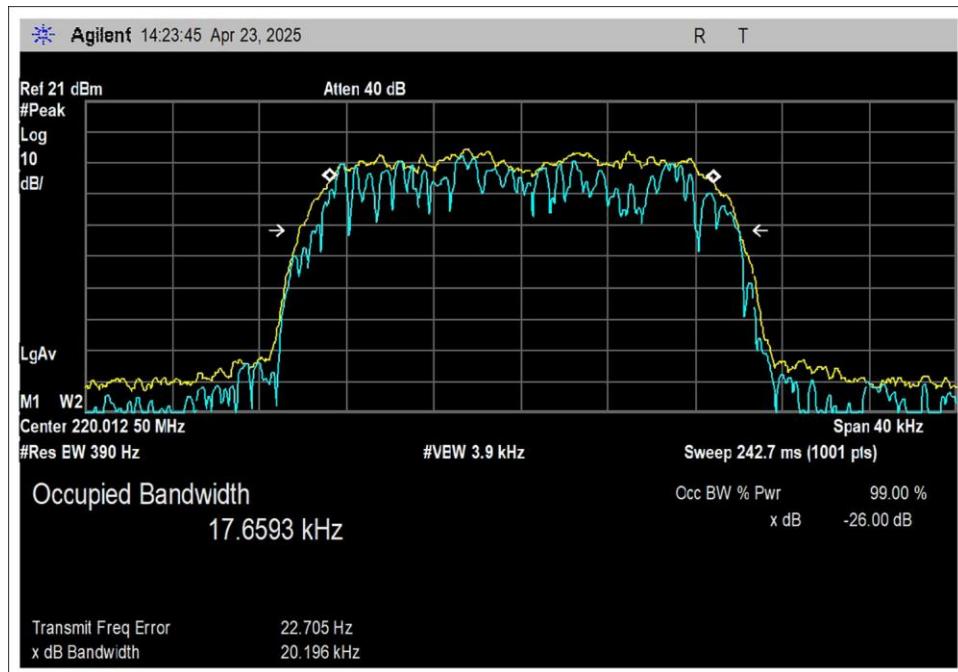
Channel 176, Pi/8



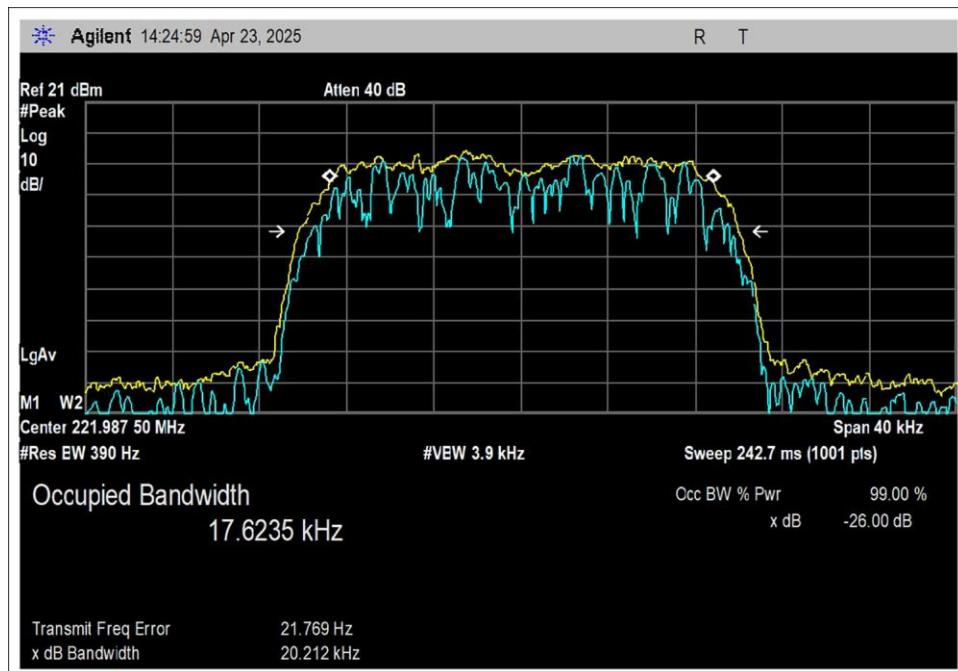
Channel 1, Pi/8-16



Channel 96, Pi/8-16



Channel 97, Pi/8-16



Channel 176, Pi/8-16

Test Setup Photo(s)



View 1



View 2

90.213 Frequency Stability

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore
Test Method:	ANSI C63.26 (2015)	Test Date(s):	4/25/2025
Configuration:	1		
Test Setup:	<p>The unit is in a temperature chamber for temperature variation. The voltage is varied. The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The bandwidth settings are low enough to resolve the center frequency of the emission. Once the EUT transmitter is turned on, it is transmitting continuously with a 100% duty cycle, CW mode investigated.</p> <p>Per 90.213, the manufacturer declares the EUT is a mobile station, 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.</p> <p>Modification #1 was in place for testing.</p>		

Environmental Conditions			
Temperature (°C)	22.9	Relative Humidity (%):	33

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

Test Data Summary						
Modulation: CW						
Temp (°C)	Voltage	Ch 1 (PPM)	Ch 96 (PPM)	Ch 97 (PPM)	Ch176 (PPM)	Results
-30	V _{Nom}	0.05055	0.05455	0.05454	0.05406	Pass
-20	V _{Nom}	0.17922	0.17728	0.17726	0.18019	
-10	V _{Nom}	0.60199	0.60003	0.59997	0.59913	
0	V _{Nom}	0.67092	0.67277	0.66814	0.67121	
10	V _{Nom}	0.50549	0.50003	0.49543	0.49552	
20	V _{Nom}	0.25734	0.25456	0.24999	0.24776	
30	V _{Nom}	0.09191	0.08637	0.08636	0.08559	
40	V _{Nom}	0.13786	0.13637	0.13636	0.13965	
50	V _{Nom}	0.28031	0.21819	0.22726	0.22524	
20	V _{Min}	0.22517	0.22729	0.22271	0.22524	
20	V _{Max}	0.22517	0.22729	0.22726	0.22524	
Maximum Deviation		0.67092	0.67277	0.66814	0.67121	

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nom} :	50VDC
V _{Min} :	74VDC
V _{Max} :	100VDC

Test Setup Photo(s)



View 1



View 2

90.210 Conducted Emission Mask and Spurs

Test Setup/Conditions												
Test Location:	Bothell Lab Bench	Test Engineer:	C. Plumadore									
Test Method:	ANSI C63.26 (2015)	Test Date(s):	4/24/2025									
Configuration:	1											
Test Setup:	<p>The EUT's RF port is connected to a spectrum analyzer directly with appropriate attenuation. The EUT is transmitting continuously with a 100% duty cycle, full rate and half rate, pi/8 and pi/8-16 modulations investigated in separate datasheets.</p> <p>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.</p> <p>Outside of the span shown in the emission mask plots, the following bandwidths were used:</p> <table> <tbody> <tr> <td>9kHz-150kHz:</td> <td>200Hz RBW</td> </tr> <tr> <td>150kHz-30MHz:</td> <td>9kHz RBW</td> </tr> <tr> <td>30-1000MHz:</td> <td>100kHz RBW</td> </tr> <tr> <td>1000MHz and above:</td> <td>1MHz RBW</td> </tr> </tbody> </table> <p>Average values as indicated on datasheet are RMS.</p> <p>Per the manufacturer, a 20kHz ABW for Full Rate, pi/8, and pi/8-16 and 11.25kHz ABW for Half Rate was used to build 90.210B masks accordingly, it will be up the licensee to ensure the mask applicability.</p> <p>Modification #1 was in place for testing.</p>				9kHz-150kHz:	200Hz RBW	150kHz-30MHz:	9kHz RBW	30-1000MHz:	100kHz RBW	1000MHz and above:	1MHz RBW
9kHz-150kHz:	200Hz RBW											
150kHz-30MHz:	9kHz RBW											
30-1000MHz:	100kHz RBW											
1000MHz and above:	1MHz RBW											

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	38.3

Test 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(f) Spurious Emissions**
 Work Order #: **111163** Date: 4/24/2025
 Test Type: **Conducted Emissions** Time: 11:20:52
 Tested By: C. Plumadore Sequence#: 21
 Software: EMITest 5.03.20 74VDC

Equipment Tested:

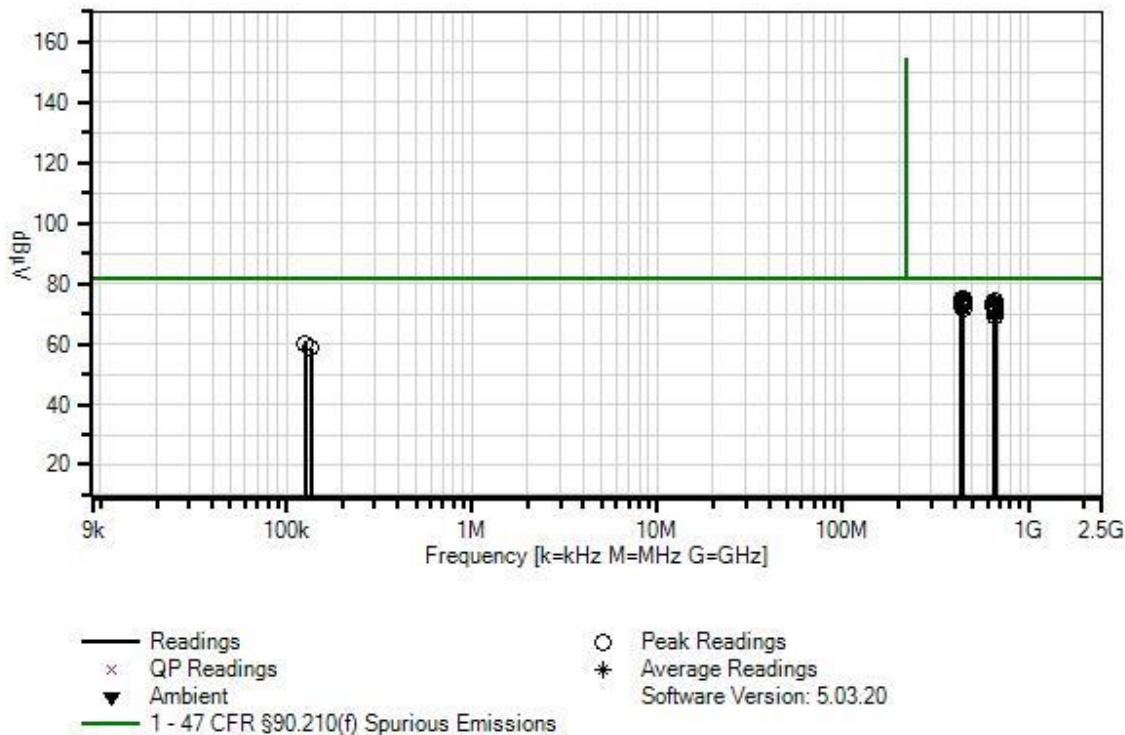
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 38.3%
Temperature: 22°C
Pressure: 102.1kPa
Frequency: 9kHz-2.5GHz
Test Method: ANSI C63.26
Test set up:
EUT is tabletop uploading and downloading files over ethernet
EUT connected to laptop outside of chamber
Receiving GNSS
Input voltage at 74VDC
Caps added across power supply
Modification #1 was in place for testing.

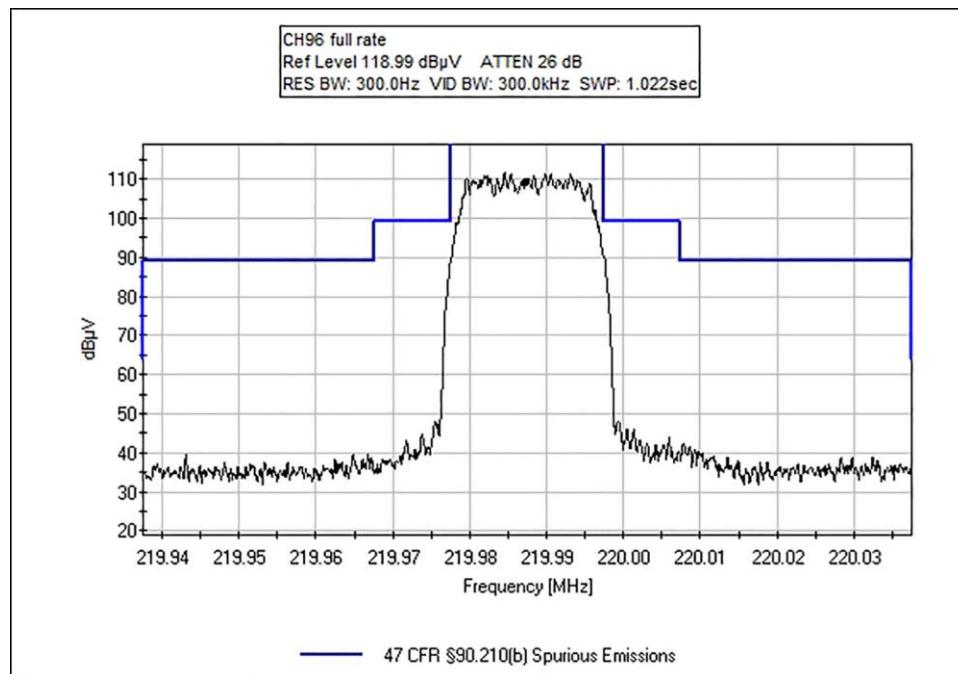
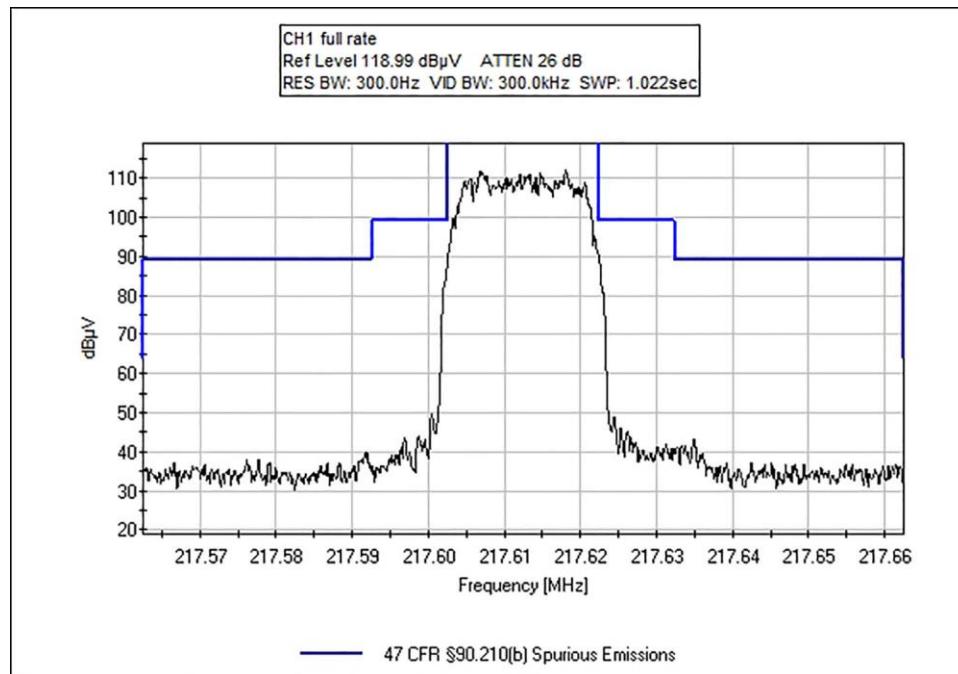
Meteorcomm LLC, WO#: 111163 Sequence#: 21 Date: 4/24/2025
 47 CFR §90.210(f) Spurious Emissions Test Lead: 74VDC antenna port

Test Equipment:

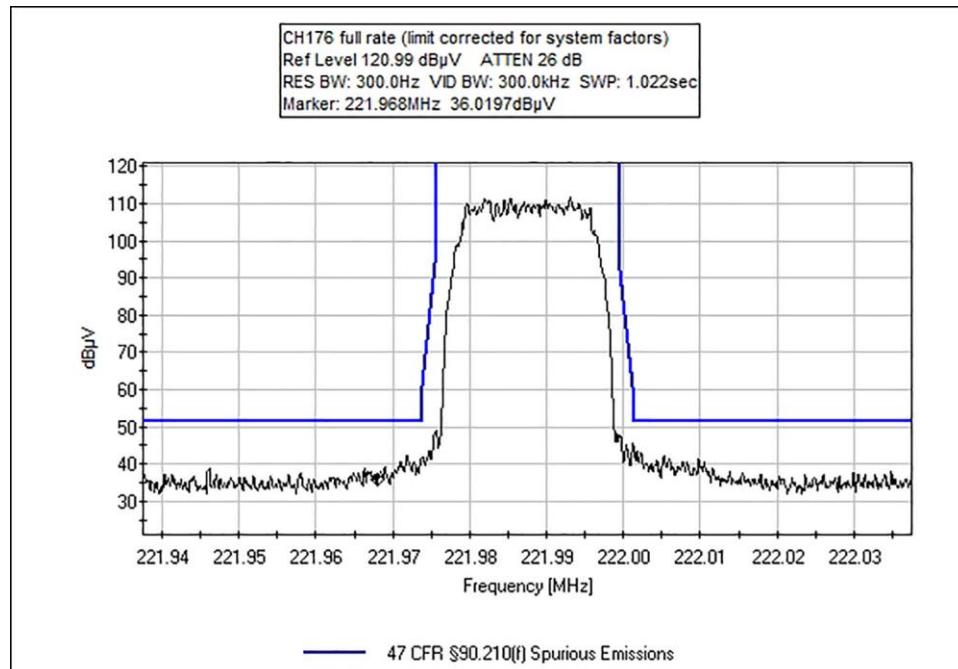
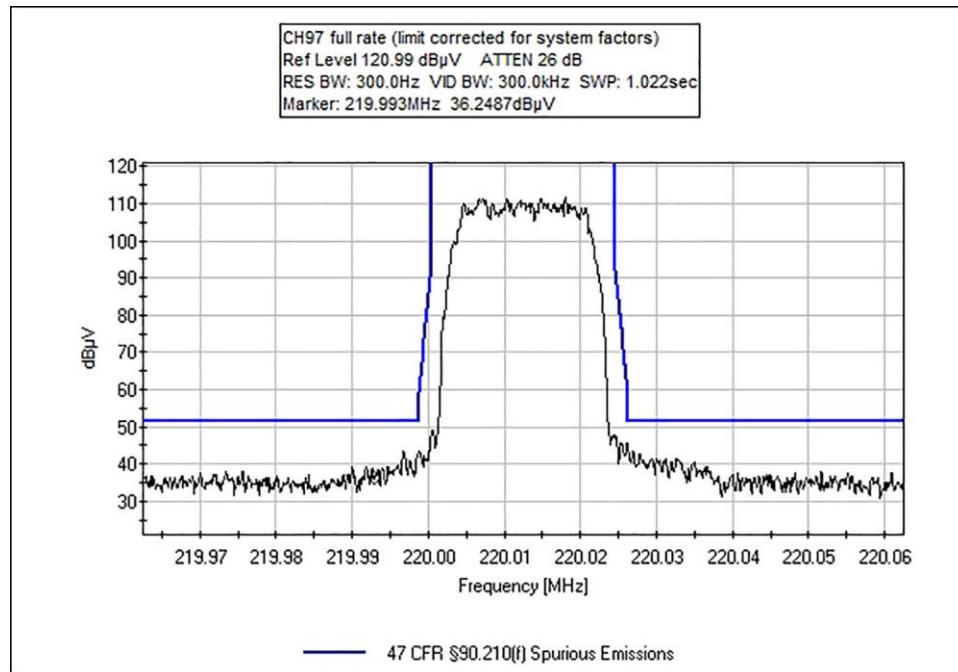
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANC00194	Attenuator	SA3N1007-30	9/26/2024	9/26/2026
	AN02872	Spectrum Analyzer	E4440A	10/11/2023	10/11/2025
T2	ANP05541	Cable	Heliax	4/2/2025	4/2/2027

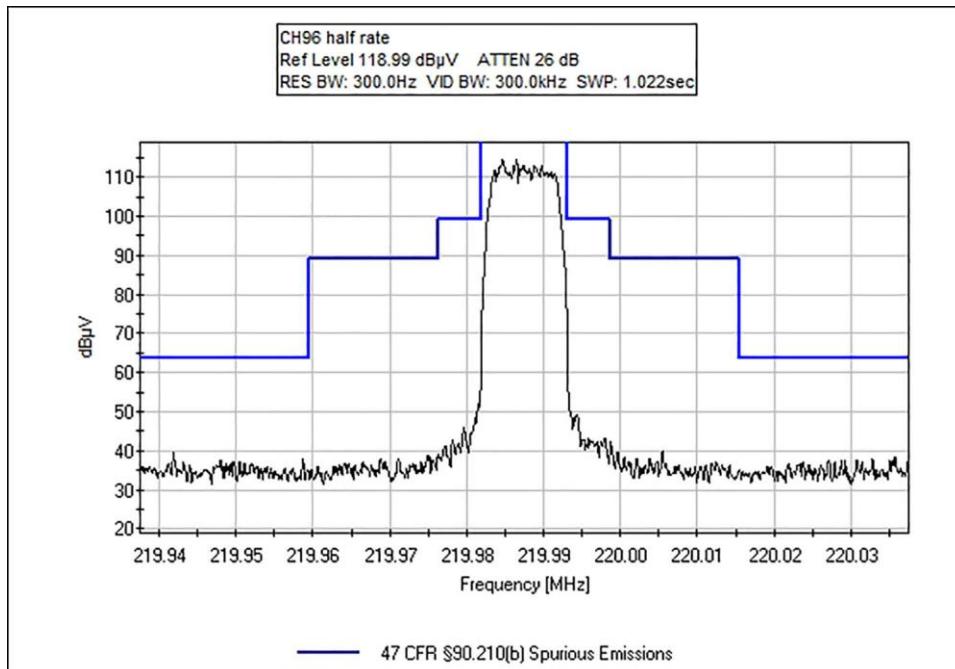
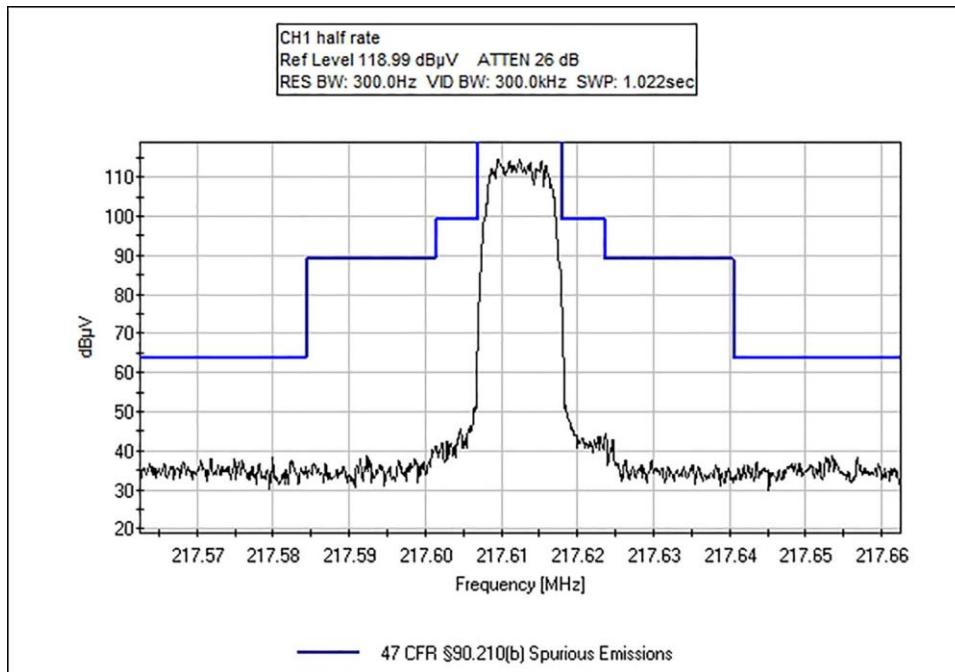
Measurement Data:			Reading listed by margin.			Test Lead: antenna port				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	435.400M	44.6	+30.0	+0.6		+0.0	75.2	82.0	-6.8	anten CH1 half rate
2	435.400M	44.6	+30.0	+0.6		+0.0	75.2	82.0	-6.8	anten CH1 pi-8-16
3	444.000M	44.4	+30.0	+0.6		+0.0	75.0	82.0	-7.0	anten CH176 pi-8-16
4	435.400M	44.2	+30.0	+0.6		+0.0	74.8	82.0	-7.2	anten CH1 full rate
5	665.600M	43.7	+30.0	+0.8		+0.0	74.5	82.0	-7.5	anten CH176 pi-8-16
6	444.000M	43.8	+30.0	+0.6		+0.0	74.4	82.0	-7.6	anten CH176 full rate
7	665.600M	43.5	+30.0	+0.8		+0.0	74.3	82.0	-7.7	anten CH176 half rate
8	440.000M	43.3	+30.0	+0.6		+0.0	73.9	82.0	-8.1	anten CH 96 half rate
9	440.000M	43.1	+30.0	+0.6		+0.0	73.7	82.0	-8.3	anten CH96 full rate
10	444.000M	43.0	+30.0	+0.6		+0.0	73.6	82.0	-8.4	anten CH176 half rate
11	652.600M	42.8	+30.0	+0.8		+0.0	73.6	82.0	-8.4	anten CH1 pi-8-16
12	440.000M	42.9	+30.0	+0.6		+0.0	73.5	82.0	-8.5	anten CH96 pi-8-16
13	440.000M	42.8	+30.0	+0.6		+0.0	73.4	82.0	-8.6	anten CH96 pi-8
14	440.000M	42.7	+30.0	+0.6		+0.0	73.3	82.0	-8.7	anten CH97 full rate
15	440.000M	42.6	+30.0	+0.6		+0.0	73.2	82.0	-8.8	anten CH97 pi-8-16
16	440.000M	42.5	+30.0	+0.6		+0.0	73.1	82.0	-8.9	anten CH97 pi-8
17	652.600M	42.1	+30.0	+0.8		+0.0	72.9	82.0	-9.1	anten CH1 half rate
18	440.000M	42.3	+30.0	+0.6		+0.0	72.9	82.0	-9.1	anten CH97 half rate
19	665.600M	41.9	+30.0	+0.8		+0.0	72.7	82.0	-9.3	anten CH176 pi-8
20	652.600M	41.6	+30.0	+0.8		+0.0	72.4	82.0	-9.6	anten CH1 full rate
21	435.500M	41.6	+30.0	+0.6		+0.0	72.2	82.0	-9.8	anten CH1 pi-8
22	660.000M	41.3	+30.0	+0.8		+0.0	72.1	82.0	-9.9	anten CH96 pi-8-16
23	444.000M	41.4	+30.0	+0.6		+0.0	72.0	82.0	-10.0	anten CH176 pi-8
24	660.000M	41.2	+30.0	+0.8		+0.0	72.0	82.0	-10.0	anten CH 96 half rate

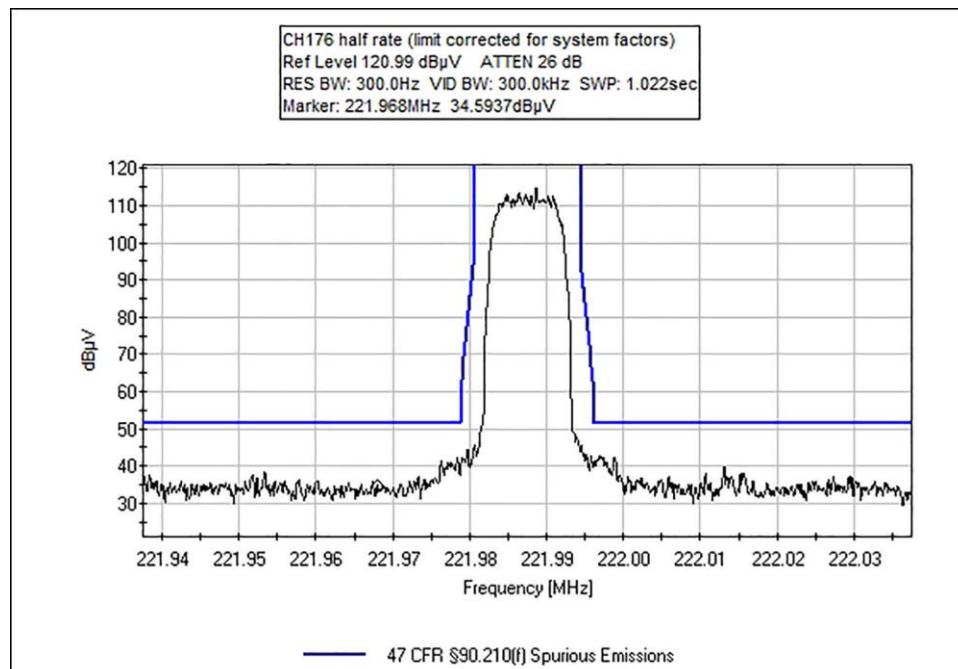
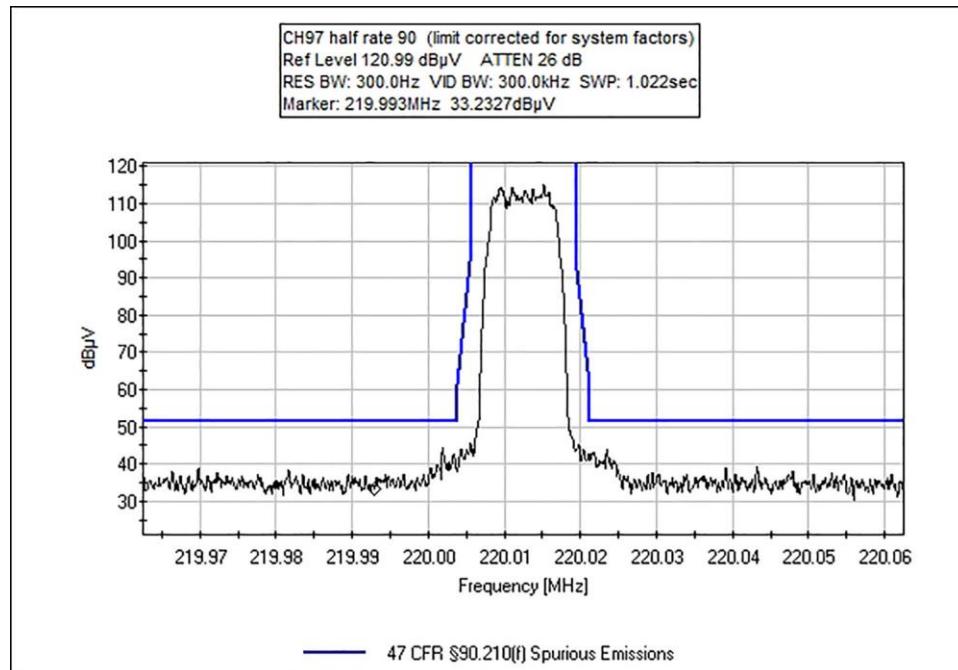
25	665.600M	41.0	+30.0	+0.8	+0.0	71.8	82.0	-10.2	anten
							CH176 full rate		
26	652.800M	40.5	+30.0	+0.8	+0.0	71.3	82.0	-10.7	anten
							CH1 pi-8		
27	660.000M	40.3	+30.0	+0.8	+0.0	71.1	82.0	-10.9	anten
							CH97 half rate		
28	660.000M	40.2	+30.0	+0.8	+0.0	71.0	82.0	-11.0	anten
							CH97 full rate		
29	660.000M	39.7	+30.0	+0.8	+0.0	70.5	82.0	-11.5	anten
							CH97 pi-8-16		
30	660.000M	39.7	+30.0	+0.8	+0.0	70.5	82.0	-11.5	anten
							CH96 full rate		
31	660.000M	38.5	+30.0	+0.8	+0.0	69.3	82.0	-12.7	anten
							CH97 pi-8		
32	660.000M	38.3	+30.0	+0.8	+0.0	69.1	82.0	-12.9	anten
							CH96 pi-8		
33	127.017k	30.2	+29.9	+0.0	+0.0	60.1	82.0	-21.9	anten
							CH1 pi-8-16		
34	136.041k	28.6	+29.9	+0.0	+0.0	58.5	82.0	-23.5	anten
							CH1 pi-8-16		

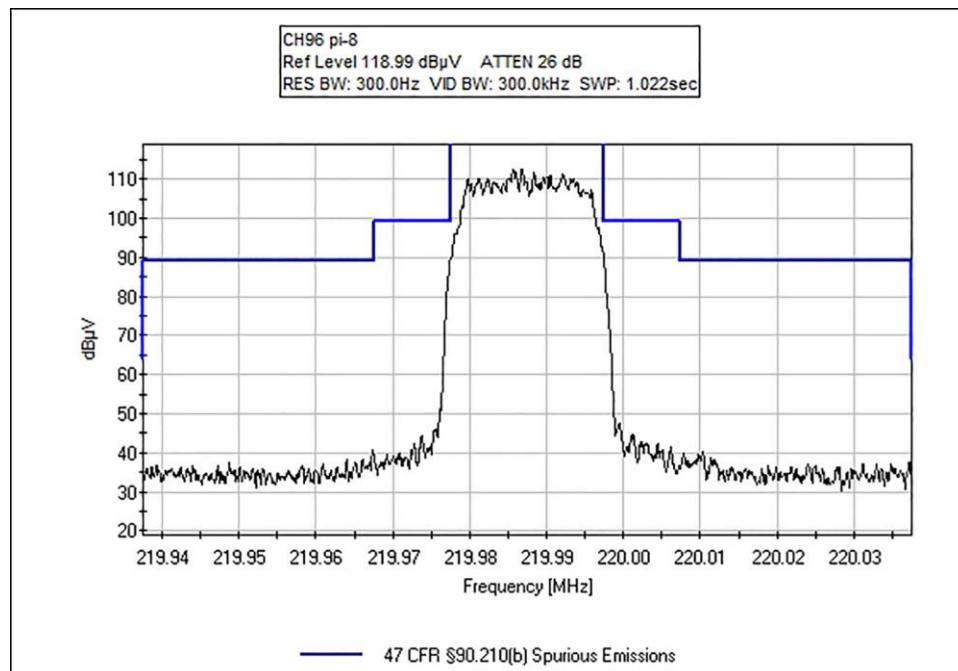
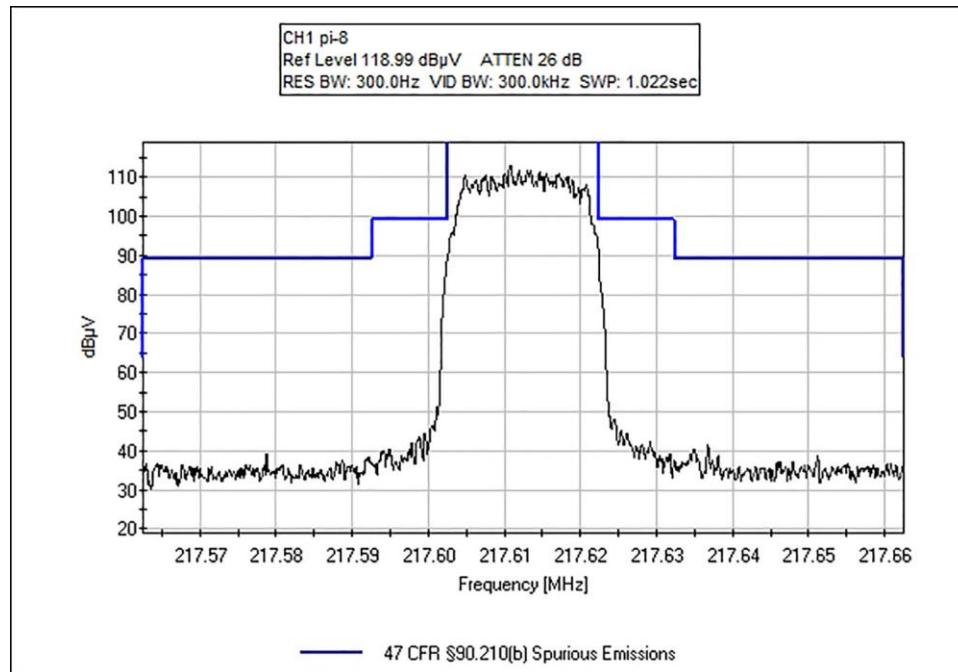
Test Plots

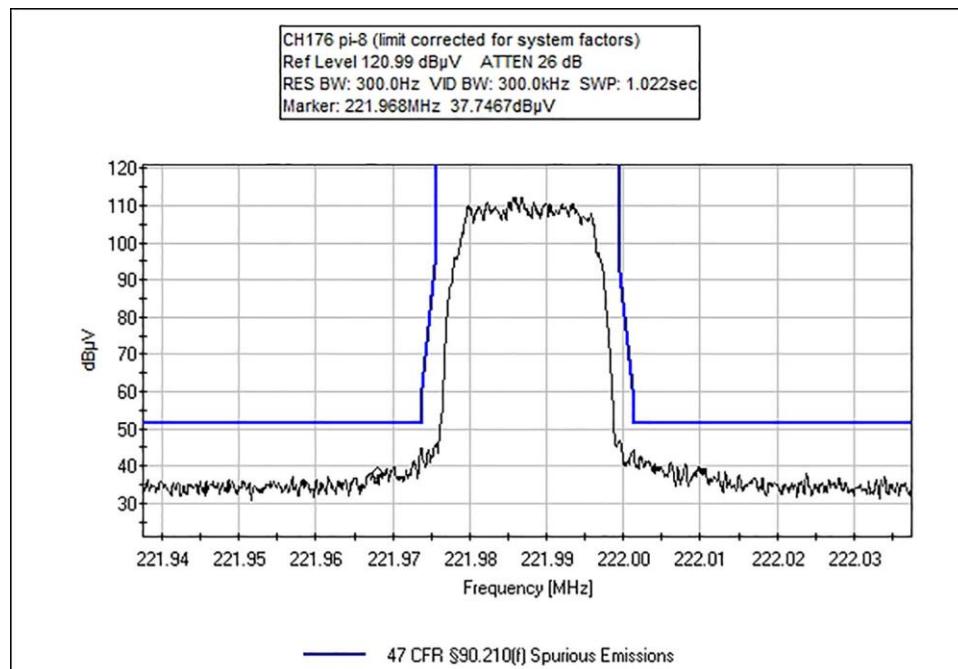
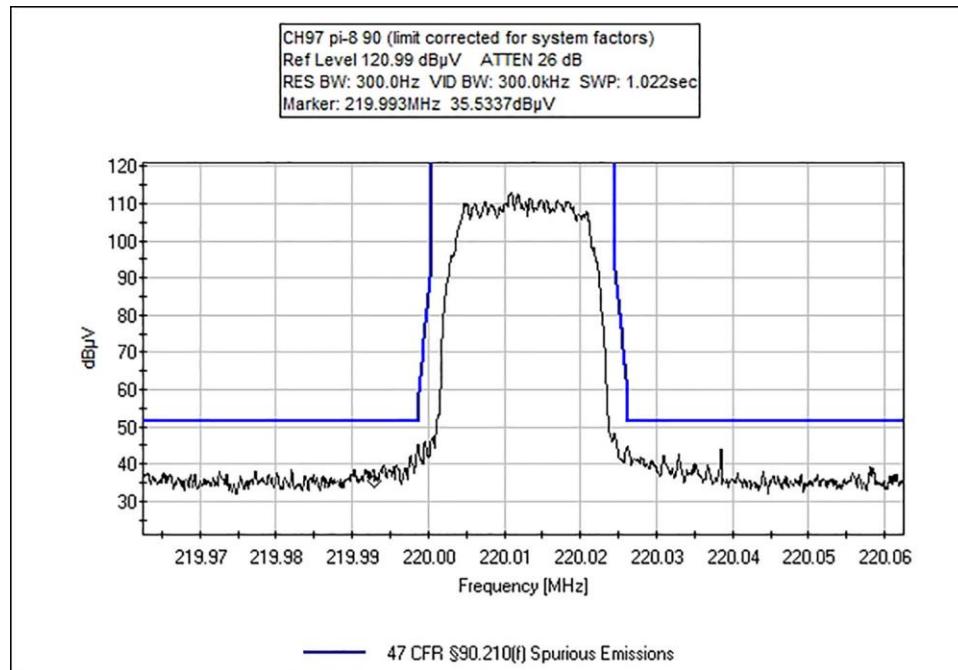


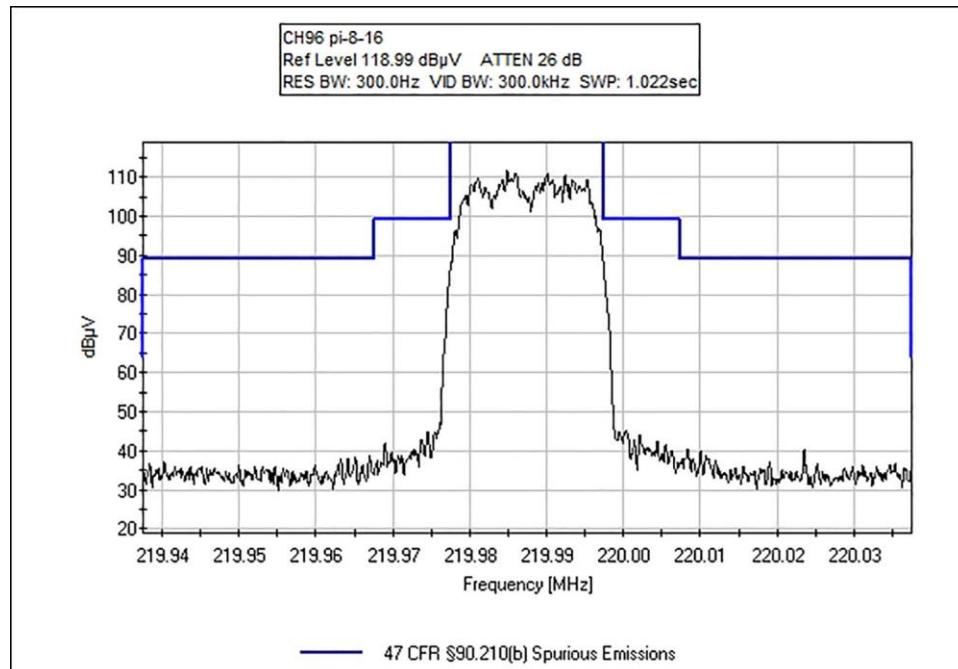
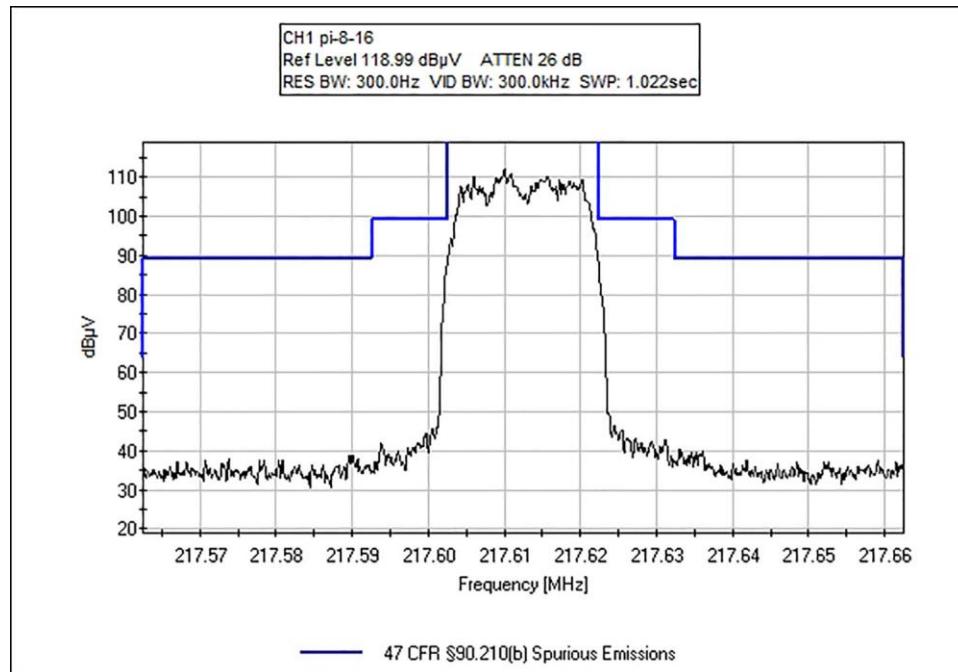


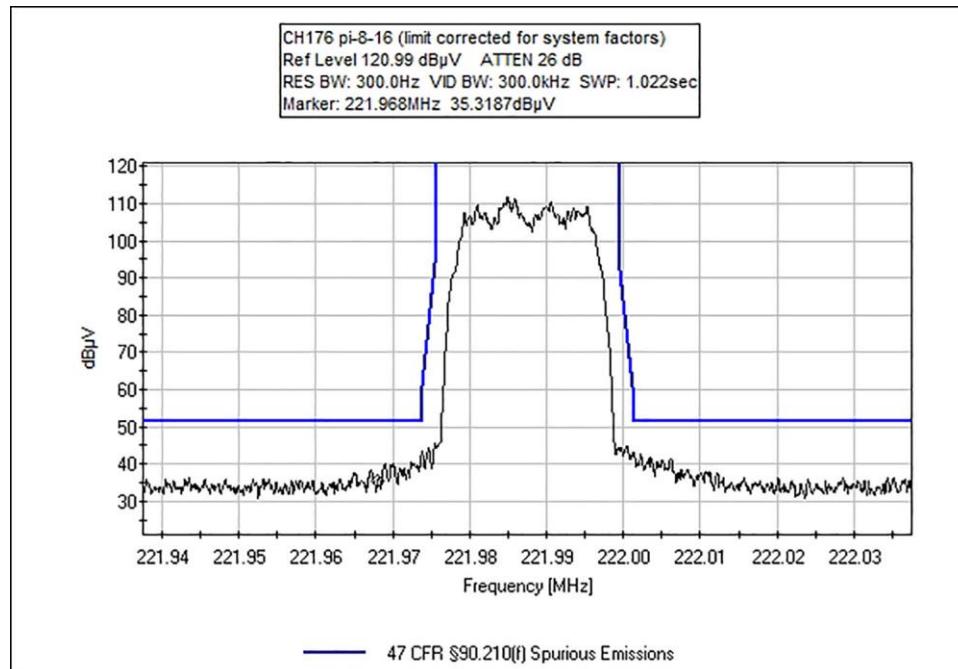
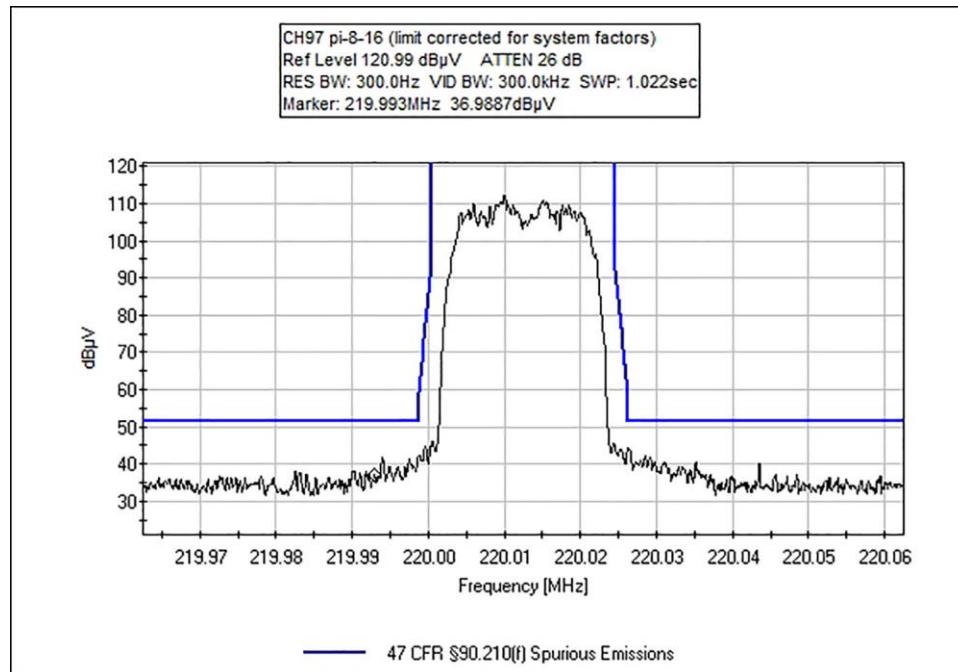












Test Setup Photo(s)



View 1



View 2

90.210 Radiated Spurious Emissions

Test Setup/Conditions											
Test Location:	Bothell Lab C3	Test Engineer:	C. Plumadore								
Test Method:	ANSI C63.26 (2015)	Test Date(s):	4/22/2025								
Configuration:	1										
Test Setup:	<p>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.</p> <p>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.</p> <p>Outside of the span shown in the emission mask plots, the following bandwidths were used:</p> <table> <tbody> <tr> <td>9kHz-150kHz:</td><td>200Hz RBW</td></tr> <tr> <td>150kHz-30MHz:</td><td>9kHz RBW</td></tr> <tr> <td>30-1000MHz:</td><td>120kHz RBW</td></tr> <tr> <td>1000MHz and above:</td><td>1MHz RBW</td></tr> </tbody> </table> <p>For the final tabular converted to dBm uses equation (d) from ANSI C63.26 (2015) 5.2.7:</p> <p>EIRP (dBm) = $E (\text{dB}\mu\text{V}/\text{m}) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.</p> <p>Per 90.210b:</p> <ul style="list-style-type: none"> (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB; (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB. <p>Limit = Power – Required Attenuation</p> $ \begin{aligned} &= 10 \log P - (43 + 10 \log P) \\ &= 10 \log P - 43 - 10 \log P \\ &= -43 \text{ dBW} \\ &= 0.00005 \text{W (0.05mW)} \\ &= 10 \log 0.00005 / 0.001 \\ &= -13 \text{dBm (94dB}\mu\text{V) at any power level.} \end{aligned} $			9kHz-150kHz:	200Hz RBW	150kHz-30MHz:	9kHz RBW	30-1000MHz:	120kHz RBW	1000MHz and above:	1MHz RBW
9kHz-150kHz:	200Hz RBW										
150kHz-30MHz:	9kHz RBW										
30-1000MHz:	120kHz RBW										
1000MHz and above:	1MHz RBW										

<p>Per 90.210f:</p> <ol style="list-style-type: none"> (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. <p>Limit</p> <li data-bbox="430 340 1302 1020"> $\begin{aligned} &= \text{Power} - \text{Required Attenuation} \\ &= 10 \log P - (55 + 10 \log P) \\ &= 10 \log P - 55 - 10 \log P \\ &= -55 \text{ dBW} \\ &= 0.000003 \text{W (0.03mW)} \\ &= 10 \log 0.000003 / 0.001 \\ &= -25 \text{dBm (82dB}\mu\text{V) at any power level.} \end{aligned}$ <p>Therefore, the most stringent limit from Mask F will be applied to all radiated emissions. Where $-25 \text{dBm}/82 \text{dB}\mu\text{V}$ conducted limit = $70.2 \text{ dB}\mu\text{V/m} @ 3\text{m}$ using ANSI C63.26 (2015)</p> <p>5.2.7</p>
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Test Data Summary (9kHz-30MHz)				
Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
0.013	62.7	-32.528	-25	Pass
0.018	59.3	-35.928	-25	Pass
21.284	58.8	-36.428	-25	Pass
20.657	55.8	-39.428	-25	Pass
0.036	54.2	-41.028	-25	Pass
0.033	53.5	-41.728	-25	Pass
0.058	50.4	-44.828	-25	Pass
22.149	48.7	-46.528	-25	Pass
0.07	48.6	-46.628	-25	Pass
23.045	46.7	-48.528	-25	Pass
0.113	46	-49.228	-25	Pass
0.134	44.3	-50.928	-25	Pass
28.119	41.3	-53.928	-25	Pass
1.374	41.1	-54.128	-25	Pass
23.94	41	-54.228	-25	Pass

Test Data Summary (30-1000MHz)				
Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
139.6	49.5	-45.728	-25	Pass
407.3	38	-57.228	-25	Pass
435.216	53.9	-41.328	-25	Pass
439.975	63.7	-31.528	-25	Pass
440.034	62.3	-32.928	-25	Pass
443.978	67.6	-27.628	-25	Pass
443.978	66	-29.228	-25	Pass
652.839	51.6	-43.628	-25	Pass
659.974	48.9	-46.328	-25	Pass
660.011	57.1	-38.128	-25	Pass
665.979	47.8	-47.428	-25	Pass

Test Data Summary (1-2.5GHz)				
Frequency (MHz)	Measured (dB μ V/m) @ 3m	Convert to EIRP (dBm)	Limit (dBm)	Results
1000	40.8	-54.428	-25	Pass
1087.912	37	-58.228	-25	Pass
1100.5	40.4	-54.828	-25	Pass
1110.052	35.9	-59.328	-25	Pass
1199.5	41.2	-54.028	-25	Pass
1304.48	37.9	-57.328	-25	Pass
1332.17	38.2	-57.028	-25	Pass
1523.358	43.7	-51.528	-25	Pass
1539.978	50.1	-45.128	-25	Pass
1540.002	49.8	-45.428	-25	Pass
1553.798	53	-42.228	-25	Pass
1554.118	52.4	-42.828	-25	Pass
1741.17	38.8	-56.428	-25	Pass
1773.655	40.1	-55.128	-25	Pass
1956.378	41.3	-53.928	-25	Pass
1995.638	39.6	-55.628	-25	Pass
2175.97	42.5	-52.728	-25	Pass
2220.04	41.3	-53.928	-25	Pass

Test 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(f) Spurious Emissions**
 Work Order #: **111163** Date: 4/23/2025
 Test Type: **Radiated Scan** Time: 09:15:49
 Tested By: C. Plumadore Sequence#: 11
 Software: EMITest 5.03.20

Equipment Tested:

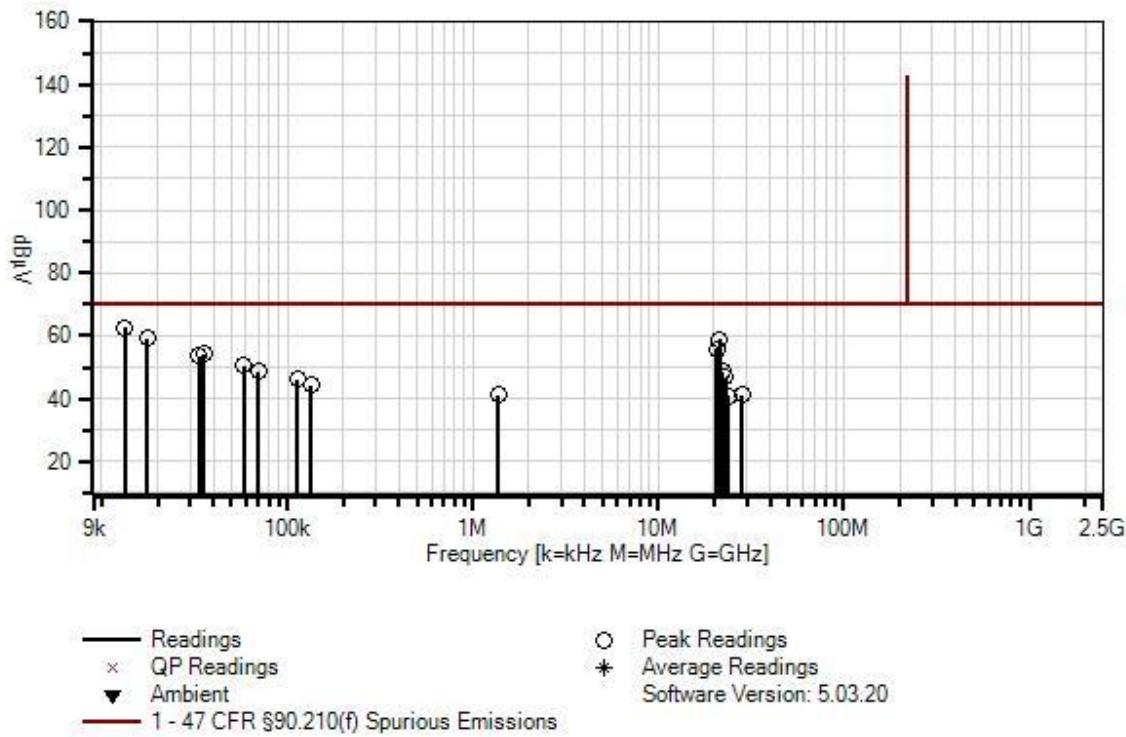
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 38.3%
Temperature: 22°C
Pressure: 102.1kPa
Frequency: 9kHz-30MHz
Test Method: ANSI C63.26
Test set up:
EUT is tabletop uploading and downloading files over ethernet
EUT connected to laptop outside of chamber
Receiving GNSS
Input voltage at 74VDC

Meteorcomm LLC. WO#: 111163 Sequence#: 11 Date: 4/23/2025
 47 CFR §90.210(f) Spurious Emissions Test Distance: 3 Meters parallel

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	4/7/2025	4/7/2027
T2	AN00052	Loop Antenna	6502	4/19/2024	4/19/2026
T3	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T4	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	13.371k	47.2	+0.0	+15.5	+0.0	+0.0	+0.0	62.7	70.2	-7.5	paral
									CH176 pi/8-16		
2	17.601k	45.5	+0.0	+13.8	+0.0	+0.0	+0.0	59.3	70.2	-10.9	perp
									CH176 pi/8-16		
3	21.284M	50.4	+0.0	+8.2	+0.2	+0.0	+0.0	58.8	70.2	-11.4	flat
4	20.657M	47.5	+0.0	+8.1	+0.2	+0.0	+0.0	55.8	70.2	-14.4	paral
5	35.508k	43.3	+0.0	+10.9	+0.0	+0.0	+0.0	54.2	70.2	-16.0	paral
6	33.393k	42.4	+0.0	+11.1	+0.0	+0.0	+0.0	53.5	70.2	-16.7	flat
									CH176 pi/8-16		
7	58.068k	40.4	+0.0	+10.0	+0.0	+0.0	+0.0	50.4	70.2	-19.8	perp
8	22.149M	40.1	+0.0	+8.4	+0.2	+0.0	+0.0	48.7	70.2	-21.5	paral
9	70.053k	38.8	+0.0	+9.8	+0.0	+0.0	+0.0	48.6	70.2	-21.6	perp
10	23.045M	37.8	+0.0	+8.5	+0.3	+0.1	+0.0	46.7	70.2	-23.5	perp
11	113.340k	36.4	+0.0	+9.6	+0.0	+0.0	+0.0	46.0	70.2	-24.2	flat
12	134.490k	34.8	+0.0	+9.5	+0.0	+0.0	+0.0	44.3	70.2	-25.9	paral
									CH176 pi/8-16		
13	28.119M	34.1	+0.0	+6.8	+0.3	+0.1	+0.0	41.3	70.2	-28.9	perp
14	1.374M	31.3	+0.0	+9.7	+0.1	+0.0	+0.0	41.1	70.2	-29.1	paral
15	23.940M	32.0	+0.0	+8.6	+0.3	+0.1	+0.0	41.0	70.2	-29.2	flat



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 #: **111163** Date: 4/22/2025
Test Type: **Radiated Scan** Time: 15:05:50
Tested By: C. Plumadore Sequence#: 6
Software: EMITest 5.03.20

Equipment Tested:

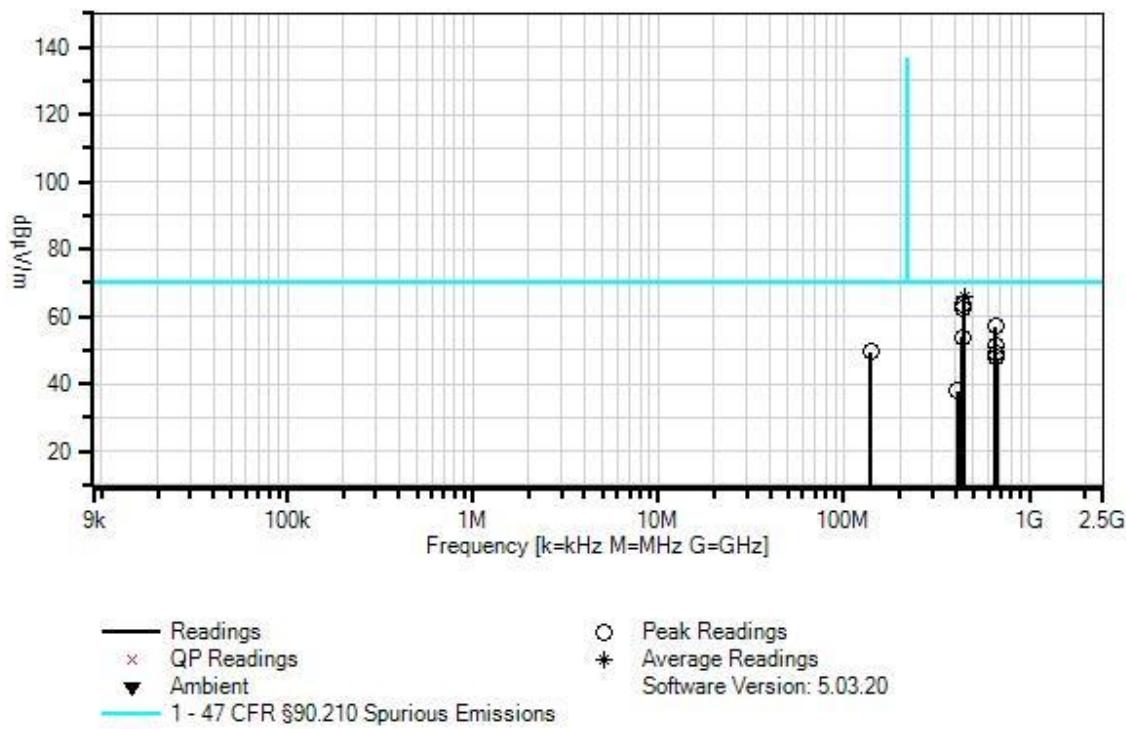
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Humidity: 38.3%
Temperature: 22°C
Pressure: 102.1kPa
Frequency: 30-1000MHz
Test Method: ANSI C63.26
Test set up:
EUT is tabletop uploading and downloading files over ethernet
EUT connected to laptop outside of chamber
Receiving GNSS
Input voltage at 74VDC

Meteorcomm LLC, WO#: 111163 Sequence#: 6 Date: 4/22/2025
 47 CFR §90.210 Spurious Emissions Test Distance: 3 Meters Horiz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01316	Preamp	8447D	5/25/2024	5/25/2026
T2	AN03863	Biconilog Antenna	3142E	1/15/2025	1/15/2027
T3	ANP08256	Attenuator	WA1/6-6-0403	3/18/2025	3/18/2027
T4	ANP05333	Cable	Heliax	1/8/2025	1/8/2027
T5	ANP05360	Cable	RG214	1/7/2025	1/7/2027
T6	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027
T7	AN02673	Spectrum Analyzer	E4446A	4/7/2025	4/7/2027

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7		Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m		Ant
1	443.978M	68.5	-29.2	+17.3	+6.1	+1.0	+0.0	66.0	70.2	-4.2	Horiz
	Ave		+1.5	+0.8	+0.0						CH 176 half rate
^	443.978M	70.1	-29.2	+17.3	+6.1	+1.0	+0.0	67.6	70.2	-2.6	Horiz
			+1.5	+0.8	+0.0						CH 176 half rate
3	439.975M	66.4	-29.2	+17.1	+6.1	+1.0	+0.0	63.7	70.2	-6.5	Horiz
			+1.5	+0.8	+0.0						CH96 pi/8-16
4	440.034M	65.0	-29.2	+17.1	+6.1	+1.0	+0.0	62.3	70.2	-7.9	Horiz
			+1.5	+0.8	+0.0						CH97 pi/8-16
5	660.011M	54.4	-29.6	+21.7	+6.1	+1.2	+0.0	57.1	70.2	-13.1	Horiz
			+2.5	+0.8	+0.0						CH97 pi/8-16
6	435.216M	56.7	-29.1	+17.0	+6.1	+1.0	+0.0	53.9	70.2	-16.3	Horiz
			+1.5	+0.7	+0.0						CH1 pi/8-16
7	652.839M	48.8	-29.6	+21.8	+6.1	+1.2	+0.0	51.6	70.2	-18.6	Horiz
			+2.5	+0.8	+0.0						CH1 pi/8-16
8	139.600M	62.7	-29.0	+8.1	+6.1	+0.5	+0.0	49.5	70.2	-20.7	Horiz
			+0.7	+0.4	+0.0						
9	659.974M	46.2	-29.6	+21.7	+6.1	+1.2	+0.0	48.9	70.2	-21.3	Horiz
			+2.5	+0.8	+0.0						CH96 pi/8
10	665.979M	45.0	-29.6	+21.8	+6.1	+1.2	+0.0	47.8	70.2	-22.4	Horiz
			+2.5	+0.8	+0.0						CH176 pi/8-16
11	407.300M	40.0	-29.1	+17.9	+6.1	+1.0	+0.0	38.0	70.2	-32.2	Horiz
			+1.4	+0.7	+0.0						



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 #: **111163** Date: 4/22/2025
Test Type: **Radiated Scan** Time: 13:21:53
Tested By: C. Plumadore 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:
Humidity: 38.3%
Temperature: 22°C
Pressure: 102.1kPa
Frequency: 1-6GHz
Test Method: ANSI C63.26
Test set up:
EUT is tabletop uploading and downloading files over ethernet
EUT connected to laptop outside of chamber
Receiving GNSS
Input voltage at 74VDC
Power set to >50W

Meteorcomm LLC. WO#: 111163 Sequence#: 9 Date: 4/22/2025
 47 CFR §90.210 Spurious Emissions Test Distance: 3 Meters Vert

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	1/7/2025	1/7/2027
T2	AN02374ANSI	Horn Antenna	RGA-60	1/8/2025	1/8/2027
T3	ANP06515	Cable	Heliax	1/8/2025	1/8/2027
T4	ANP07504	Cable	CLU40-KMFM-02.00F	1/7/2025	1/7/2027
T5	ANP08205	Cable	CBL-6FT-NMNM+	1/22/2025	1/22/2027
T6	AN02673	Spectrum Analyzer	E4446A	4/7/2025	4/7/2027

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6			Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m		Ant
1	1553.798M	59.8	-35.5 +0.7	+25.5 +0.0	+2.0	+0.5	+0.0	53.0	70.2	-17.2	Vert
										CH176 pi/8-16	
2	1554.118M	59.2	-35.5 +0.7	+25.5 +0.0	+2.0	+0.5	+0.0	52.4	70.2	-17.8	Vert
										CH176 half rate	
3	1539.978M	56.9	-35.5 +0.7	+25.5 +0.0	+2.0	+0.5	+0.0	50.1	70.2	-20.1	Vert
										CH96 full rate	
4	1540.002M	56.6	-35.5 +0.7	+25.5 +0.0	+2.0	+0.5	+0.0	49.8	70.2	-20.4	Vert
										CH97 full rate	
5	1523.358M	50.6	-35.5 +0.7	+25.4 +0.0	+2.0	+0.5	+0.0	43.7	70.2	-26.5	Vert
										CH1 full rate	
6	2175.970M	45.5	-34.9 +1.0	+27.9 +0.0	+2.4	+0.6	+0.0	42.5	70.2	-27.7	Vert
										CH1 full rate	
7	2220.040M	44.0	-34.8 +1.0	+28.1 +0.0	+2.4	+0.6	+0.0	41.3	70.2	-28.9	Vert
										CH176 pi/8-16	
8	1956.378M	44.7	-35.0 +0.9	+27.8 +0.0	+2.4	+0.5	+0.0	41.3	70.2	-28.9	Vert
										CH1 full rate	
9	1199.500M	49.8	-36.5 +0.7	+25.1 +0.0	+1.7	+0.4	+0.0	41.2	70.2	-29.0	Vert
10	1000.000M	51.5	-37.5 +0.6	+24.2 +0.0	+1.6	+0.4	+0.0	40.8	70.2	-29.4	Vert
11	1100.500M	50.3	-37.0 +0.6	+24.5 +0.0	+1.6	+0.4	+0.0	40.4	70.2	-29.8	Vert
12	1773.655M	44.6	-35.2 +0.8	+27.3 +0.0	+2.2	+0.4	+0.0	40.1	70.2	-30.1	Vert
										CH176 pi/8-16	
13	1995.638M	43.0	-35.0 +0.9	+27.8 +0.0	+2.4	+0.5	+0.0	39.6	70.2	-30.6	Vert
										CH176 pi/8-16	
14	1741.170M	44.1	-35.2 +0.8	+26.5 +0.0	+2.2	+0.4	+0.0	38.8	70.2	-31.4	Vert
										CH1 full rate	
15	1332.170M	45.9	-36.1 +0.7	+25.5 +0.0	+1.8	+0.4	+0.0	38.2	70.2	-32.0	Vert
										CH176 pi/8-16	
16	1304.480M	45.7	-36.1 +0.7	+25.4 +0.0	+1.8	+0.4	+0.0	37.9	70.2	-32.3	Vert
										CH1 full rate	
17	1087.912M	47.1	-37.1 +0.6	+24.4 +0.0	+1.6	+0.4	+0.0	37.0	70.2	-33.2	Vert
										CH1 half rate	
18	1110.052M	45.7	-37.0 +0.6	+24.6 +0.0	+1.6	+0.4	+0.0	35.9	70.2	-34.3	Vert
										CH176 pi/8-16	

Test Setup Photo(s)



Below 1GHz, View 1



Below 1GHz, View 2



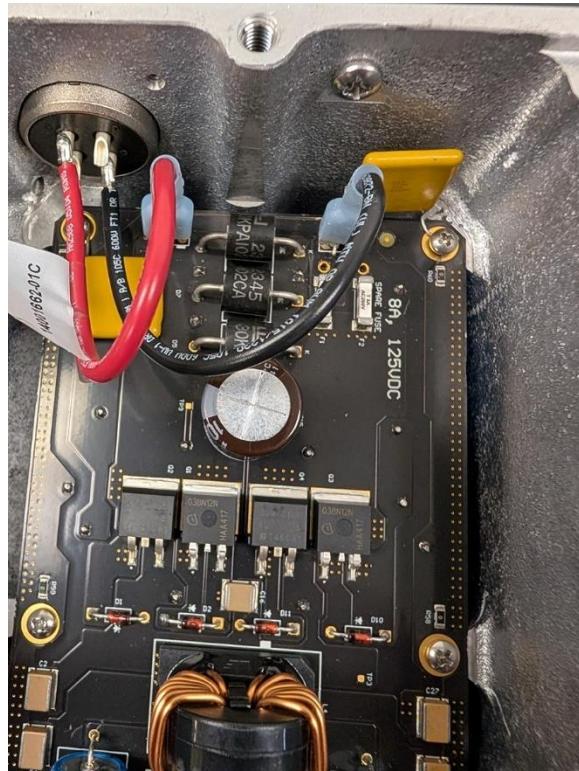
Above 1GHz, 1.5m

Appendix A: Modification Information

1) Modification

- a. 0.47uF caps from power supply input block to chassis

Modification in place for bench testing in order to comply with standard outside the scope of this standard.



Modification

Supplemental Information

Measurement Uncertainty

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

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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

End of Report