Report on the Testing of the

Cobham Satcom

Model: Yahsat T-TAC Maritime Part Number: 408065A-41000

FCC ID:ROJ-8065A

In accordance with: FCC 47 CFR Part 25

Prepared for: Cobham Satcom Lundtoftegaardsvej 93 D DK-2800, Kgs. Lyngby, Denmark

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JOB TITLE		RESPONSIBLE FOR	ISSUE DATE
Sr. EMC Engineer		Authorized Signatory	03 December 2024
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FCC Accreditation Innovation, Science, and Economic Development Canada Designation Number US1148 New Brighton, MN Test Accreditation Laboratory Site Number 4512A New Brighton, MN Test Laboratory			elopment Canada Fest Laboratory
EXECUTIVE SUMMARY A sample of this product was tested and found to be compliant with the standards listed above and the tests shown in Table 1.3.1 of this report.			
	JOB TITLE Sr. EMC Engineer ave checked this document in line with the 48 New Brighton, MN Test uct was tested and found to of this report.	JOB TITLE Sr. EMC Engineer ave checked this document in line with the requirements of TÜV Innovation, Sci Ave checked this document in line with the requirements of TÜV 48 New Brighton, MN Test Innovation, Sci 48 New Brighton, MN Test Accreditation Site Number 4 uct was tested and found to be compliant word this report.	JOB TITLE RESPONSIBLE FOR Sr. EMC Engineer Authorized Signatory ave checked this document in line with the requirements of TÜV SÜD America, Inc. document c 48 New Brighton, MN Test Innovation, Science, and Economic Dev 48 New Brighton, MN Test Accreditation Site Number 4512A New Brighton, MN Site Number 4512A New Brighton, MN uct was tested and found to be compliant with the standards list of this report.

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	04 December 2024
2	 Corrected frequency typo in Section 1.5.2 Updated verbiage in all test section's Environmental Conditions description Added a statement in the Test Results section of Occupied Bandwidth to better reflect that the signal characteristics are taken using a Viper signal generator and that the data dose not limit the use of devices with 5kHz and 25kHz channels Testing was redone for Frequency Stability and this section was updated with those results. 	06 December 2024
3	Updated data in Section 2.5Updated standard references in Section 1.2	15 January 2025
4	 Add statement to Section 2.5.4 mentioning that a GPS signal was not present during testing. 	22 January 2025
5	 Updated data in section 2.1 RF output power with data from the TUV SUD San Diego lab Updated data in section 2.3 conducted spurious emissions Add TUV SUD San Diego lab's address to section 1.8 Test Locations 	12 February 2025
6	 Updated data in section 2.1 RF output power with data from the TUV SUD San Diego lab 	13 February 2025
7	 Update Technical description in section 1.5.1 and data in section 2.1 RD output Power 	14 February 2025

Table 1.1-1 – Modification Record

1.2 Introduction

Applicant	Cobham Satcom
Applicant's Email Address	reetika.bishnoi@cobhamsatcom.com
Model Number(s)	Yahsat T-TAC Maritime
Part Number(s)	408065A-41000
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15.25
Order Number	721001137

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Date of Receipt of EUT	07 October 2024
Start of Test	07 October 2024
Finish of Test	14 February 2025
Related Document(s)	ANSI C63.26 2015

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1.3 Scope of Testing

To perform certification testing to confirm that the wireless device(s) meet the requirements of the applicable standards and guidance documents.

1.4 Summary of Results

A summary of the tests carried out in accordance with the specifications shown below.

Section	Specification Clause	Test Description	Accreditation	Base Standard
2.1	25.204(a) / 2.1046	RF Output Power	A2LA	ANSI C63.26:2015
2.2	25.1049	Occupied Bandwidth	A2LA	ANSI C63.26:2015
2.3	25.202(f) / 2.1051	Conducted Spurious Emissions	A2LA	ANSI C63.26:2015
2.4	25.202(f) / 2.1053	Radiated Spurious Emissions	A2LA	ANSI C63.26:2015
2.5	25.202(d) / 2.1055	Frequency Stability	A2LA	ANSI C63.26:2015
2.6	25.216(c)(h)(i)	Protection of Aeronautical Radio Navigation Satellite Service	A2LA	ANSI C63.26:2015

Table 1.4-1 – Summary of Results

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Test Name	Name of Tester(s)	Results / Comments
RF Output Power	Miguel Rabago	Pass
Occupied Bandwidth	Sean Sellergren	Pass
Conducted Spurious Emissions	Miguel Rabago	Pass
Radiated Spurious Emissions	Sean Sellergren	Pass
Frequency Stability	Sean Sellergren	Pass
Protection of Aeronautical Radio Navigation Satellite Service	Sean Sellergren	Pass

Table 1.4-2 – Test Accreditation

1.5 **Product Information**

1.5.1 Technical Description

Table 1.5-1 – Wireless Module Technical Information

Detail	Description
FCC ID	ROJ-8065A
Transceiver Model #	408065A-41000
Operating Frequency	1626.5 MHz – 1660.5 MHz
Modulation Format	N/A
Antenna Type / Gain:	1dBi

Note: The EUT receives a signal from another source in the 400MHz range and upconverts the signal to the appropriate 1626.5 – 1660.5MHz signal, the modulation and other signal characteristics are all derived from the source transmitter that is not part of the EUT system.

A full description and detailed product specification details are available from the manufacturer.

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1.5.2 Modes of Operation

The tested mode of operation was:

Low Channel / Mode	1626.5 MHz
Mid Channel / Mode	1643.5 MHz
High Channel / Mode	1660.5 MHz

Note: all transmitted frequencies were derived using an external transmitter source connected via RF cable to the EUT. The following frequencies were used by the source transmitter: low ch 448MHz, mid ch 440MHz and high ch 453MHz.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Table 1.7-1 – Modification Record

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State		

1.8 Test Location

For tests in sections 2.2 & 2.4 - 2.6:

TÜV SÜD conducted the following tests at our New Brighton, MN Test Laboratory.

Office address:

TÜV SÜD America 141 14th Street NW New Brighton, MN 55112 USA

For tests in sections 2.1 & 2.3:

TÜV SÜD America Inc. (Mira Mesa) 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: (858) 678 1400 Fax: (858) 546 0364.

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2 Test Details

- 2.1 RF Output Power
- 2.1.1 Specification Reference

FCC 47 CFR Part 25.204(a) / 2.1046

2.1.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.1.3 Date of Test

14 February 2025

2.1.4 Test Method

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

- + 40 dBW in any 4 kHz band for $\theta \leq 0^{\circ}$
- + 40 + 30 dBW in any 4 kHz band for $0^{\circ} < \theta \le 5^{\circ}$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

2.1.5 Environmental Conditions

All tests are performed within the ambient climatic conditions of the laboratory.

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2.1.6 Test Results

Frequency (MHz)	Measured Output Power EIRP (dBm)	Antenna Gain dBi	Output Power Limit (dBm)	Result
1626.5	35.23	0.6	70	Pass
1643.5	34.79	0.6	70	Pass
1660.5	35.21	06	70	Pass

Table 2.1-1 – Peak Conducted Output Power Results

Test Note: Measured output power includes the antenna gain of 1.8dBi, more stringent limit of +40dbW converted to dBm was used (70 dBm) instead of + 40 + 30 dBW

Test Summary: An RF attenuator was used between the EUT output and the measurement receiver during testing. All measurement correction factors were entered into the receiver as an offset to provide corrected measurement results. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

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13:49:10 14.02.2025



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112





13:51:16 14.02.2025



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112





13:56:10 14.02.2025



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2.1.7 **Test Location and Test Equipment Used**

The tests were carried out in San Deigo CA.

Table 2.1-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
SDGE07611	Rohde & Schwarz	Signal & Spectrum Analyzer	FSW26	102017	G	02/16/2024	02/16/2025
SDGE53504	Micro-Coax Utiflex	RF Cable	UFA210A	503070-C	В	04/07/2023	04/07/2025
	Cables						

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally. Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

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2.2 Occupied Bandwidth

2.2.1 Specification Reference

FCC 47 CFR Part 2.1049

2.2.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.2.3 Date of Test

08 October 2024

2.2.4 Test Method

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth value. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The RBW to 1-5% of the occupied bandwidth and the VBW set to \geq 3 times the RBW.

2.2.5 Environmental Conditions

All tests are performed within the ambient climatic conditions of the laboratory.

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2.2.6 Test Results

Frequency (MHz)	Occupied Bandwidth (kHz)
1626.5	17.887
1643.5	17.783
1660.5	17.799

Table 2.2-1 – Occupied Bandwidth Results

Test Summary: The EUT does not supply its own transmit signal but performs upconversion and downconversion on a signal from an outside source. For testing the signal used was a Viper generator that was provided for the purposes of testing. The occupied bandwidth is not limiting the operation of devices with the use of 5kHz 25kHz channels. and The EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

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10:39:36 AM 10/08/2024



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112





10:42:20 AM 10/08/2024



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112





10:44:07 AM 10/08/2024



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2.2.7 **Test Location and Test Equipment Used**

The tests were carried out in New Brighton, MN. Test Area: 3mSAC

Table 2.2-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
NBLE11088	Inmet	Attenuator, 20 dB	18N50W-20dB	11088	В	07/20/2024	07/20/2025
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44 (SAP 21006053)	101537	G	01/26/2024	01/26/2025

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Cal Code B = Calibration verification performed internally. Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

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2.3 Conducted Spurious Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 25.202(f) / 2.1051

2.3.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.3.3 Date of Test

12 February 2025

2.3.4 Test Method

The maximum peak conducted output power was measured in accordance with the ANSI C63.26. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The RBW of the spectrum analyzer was set to 4kHz and the VBW was set to \geq 3 times the RBW. The spectrum analyzer span was set to cover the entire frequency range of 9kHz to 20GHz and the trace was set to max hold using the average detector to provide the mean output power.

The limit used for the entire frequency range is -13dBm which is equal to 43 dB plus 10*log(transmit power in W).

2.3.5 Environmental Conditions

All tests are performed within the ambient climatic conditions of the laboratory.

2.3.6 Test Results

Test Summary: An RF attenuator was used between the EUT output and the measurement receiver during testing. All measurement correction factors were entered into the receiver as an offset to provide corrected measurement results. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

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MultiView 📰 Spectru	m X Sj	pectrum 4	× Spec	trum 3	×			•
Ref Level 55.60 dBm Offse	et 35.60 dB Co	mpatible R&S FSV	Mode Swe	ер			5	GL
							c	ount 100/100
1 Spectrum Emission Mask								○1Av AvgPwr
Limit Check		PAS	s				M1[1]	33.08 dBm
50 dBm							1.626	499 458 0 GHz
40 dBm-				M1				
			ىر_	m na .				
30 dBm			www	- Water				
			يتر الم	n ny				
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-30 dBm	A Marine					M.		
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					10.51			
CF 1.626 498 75 GHz		1500 pts			12.5 kHz/		S	pan 125.0 kHz
2 Result Summary		1 (2 0)						
Sub Block A	Center	1.63 GHz		I x Power	 2		RBW 5.00	JU KHZ
Range Low	Range Un	RBW	Ere		Power_Abs	Pow	er Rel	ALimit
-62,500 kHz2	25.000 kHz	5.000 kHz	1.62	5 47 GHz	-14.49 dB	m -53.	32 d B	14.99 dB
-25.000 kHz -1	.2.500 kHz	5.000 kHz	1.62	5 49 GHz	10.45 dB	m -28.	38 d B	-0.05 dB
12.500 kHz 2	25.000 kHz	5.000 kHz	1.62	5 51 GHz	9.32 dBi	m -29.	51 dB	-1.18 dB
25.000 kHz 6	52.500 kHz	5.000 kHz	1.62	552 GHZ	-15.60 dBi	m -54.	43 ab -	16.10 dB
~					~	Ready		12.02.2025 10:03:32

10:03:32 12.02.2025

Figure 2-7 – Emission Mask – Low Channel

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10:05:25 12.02.2025



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112





10:07:44 12.02.2025

Figure 2-9 – Emission Mask – Mid Channel

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Ref Level 29.30 dBm Offset 35.60 dB RBW 5 kHz Compatible RBS FSV SGL a Att 30 dB SWT 80 s VBW 50 kHz Mode Auto Sweep +1Rm Max 02Rm Chw I Frequency Sweep M2[1] -45.69 dBm 443.21 MHz -45.69 dBm a dm 443.21 MHz a dm 443.21 MHz a dm 443.21 MHz a dm 443.21 MHz a dm 443.21 MHz a dm 443.21 MHz a dm	MultiView	Spectrum	1 ×	Spectru	um 4	×	Spectr	um 3	×			*
• Att 30 dll • SWT 80 s VBW 50 kHz Mode Auto Sweep 1 Frequency Sweep • 1Rm Max • 2Rm Clrw 20 dlm M2[1] -45.69 dlm 20 dlm -11 1 -11 10 dlm -11 1 -11 -20 dlm -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -11 -11 -11 -30 dlm -11 -11 -11 -11 -11 -11 -11 -11	Ref Level 29.	30 dBm Offe	et 35.60 dE	e RBW	5 kHz C	ompati	ble R&	S FSV				SGL
1 Frequency Sweep • 1 Fm Max • 2 Em Clav 20 dbm 435.69 dbm 0 dbm -45.70 dbm 0 dbm -10 dbm -10 dbm -11 - 3.000 dbm -20 dbm -11 - 3.000 dbm </td <td>Att</td> <td>30 dB 单 SW</td> <td>r 80 s</td> <td>VBW 5</td> <td>50 kHz 🛛 N</td> <td>1ode</td> <td>Auto S</td> <td>Sweep</td> <td></td> <td></td> <td></td> <td></td>	Att	30 dB 单 SW	r 80 s	VBW 5	50 kHz 🛛 N	1ode	Auto S	Sweep				
20 dim 20 dim 0 dim -10 dim -10 dim -10 dim -10 dim -10 dim -10 dim -10 dim -20 dim	1 Frequency Sy	weep									o 1Rm Ma	x •2Rm Clrw
20 dBm M1[1] 443.21 MHz -45.70 dBm 19.603 51 GHz 0 dBm											M2[1]	-45.69 dBm
20 dan												443.21 MHz
10 d6m 0 d6m -10 d6m -10 d6m -20 d7 -20	20 dBm										M1[1]	-45.70 dBm
10 dem -10 dem -20 dem -20 dem -20 dem -30 dem -30 dem -40												19.60351 GHz
10 dBm -10 dBm -10 dBm -20 dBm -30 dBm -60 dBm -60 dBm -20 Lttz -20 Lttz												
0 d6m -10 d8m -20 d8m -30 d8m -60 d8m -60 d8m -60 d8m -20 Lttz -20 Lttz	10 dBm											
0 dBm -10 dBm -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -0 dBm -0 dBm -10 dBm -20 dBm												
-10 dBm -10 dBm -20 dBm -20 dBm -30 dBm -40	0 dBm-											
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	60 JB											
	-00 UBIU											
9.0.kHz 20.0.GHz 20.0.GHz 20.0.GHz												
5001 pts 2.0 GhZ 200 GHZ	9.0 kHz				3001 p	ts			2.0 GHz/			20.0 GHz
✓ Ready										Ready		12.02.2025

10:09:52 12.02.2025



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10:15:28 12.02.2025

Figure 2-11 – Emission Mask – High Channel

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10:17:17 12.02.2025



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2.3.7 Test Location and Test Equipment Used

The tests were carried out in San Deigo CA.

	Table 2.3-1 – 0	Conducted	Emissions	Test E	aui	pment	List
--	-----------------	-----------	-----------	--------	-----	-------	------

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
SDGE07611	Rohde & Schwarz	Signal & Spectrum Analyzer	FSW26	102017	G	02/16/2024	02/16/2025
SDGE08825	Weinschel Corp	20dB Attenuator	bk 5773	46-20-34	В	07/19/2024	07/19/2025

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Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment

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2.4 Radiated Spurious Emissions

2.4.1 Specification Reference

FCC 47 CFR Part 25.205(f) / 2.1053

2.4.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.4.3 Date of Test

22 – 25 October 2024

2.4.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8 m above a reference ground plane for 30-1000 MHz and 1.5m above the ground plane for above 1 GHz.

For 30-1000 MHz a pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using an average detector; measurements were taken at a 3m distance.

For above 1 GHz a pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using average detectors; measurements were taken at a 3m distance.

For all frequency ranges the final readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification. Final measurements were remeasured with an average detector.

The EUT was assessed against the limits specified in FCC 47 CFR Part 25.205(f).

2.4.5 Environmental Conditions

All tests are performed within the ambient climatic conditions of the laboratory.

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2.4.6 Additional Observations

The highest frequency to which the DUT was measured in accordance with §15.33(a)(1).

Automated measurements used BAT-EMC (v3.18) software. Measurements were done at a 3m distance. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.4.7 Sample Computation (Radiated Emissions)

Measuring equipment raw meas	20.0			
Correction Factor (dB)	Cable 2	0.24		
	TEMC00011 (antenna)	18.70		
		18.94		
Reported Quasi-peak Final Mea	38.94			

2.4.8 Test Results

Test Summary: An RF attenuator was used at the input to the RF pre-amp during testing. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

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Spurious Emissions 30M-1GHz - Low Channel 1626.5MHz - MannPack

Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
30 MHz - 1 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
30 MHz - 1 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto



Limit: Test Date: Test Results: FCC Part 25/FCC Part 25 10/22/2024 Pass

Test Notes: Low Channel 1626.5M, Aux Viper Equipment at 448M

Figure 2-13 – RE Spurious Emissions 30-1000 MHz – Low Channel

Table 2.4-1 – RE Sp	ourious Emissions	30-1000 MHz -	Low Channel
---------------------	-------------------	---------------	-------------

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
86.044	-87.27	-13.00	-74.27	109.00	1.12	Vertical	Pass
299.876	-91.83	-13.00	-78.83	109.00	1.12	Vertical	Pass
849.973	-68.83	-13.00	-55.83	54.00	1.12	Vertical	Pass

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Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto

Spurious Emissions 1 - 18GHz - Low Channel 1626.5MHz



Limit: Test Date: Test Results: FCC Part 25/FCC Part 25 10/18/2024 Pass

Test Notes: Low Channel 1626.5M, 1-2 GHz has 30dB Attenuator, 2-18 GHz has 2GHz High Pass Filter

Figure 2-14 – RE Spurious Emissions 1-18 GHz – Low Channel

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Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
1309.278	-60.69	-13.00	-47.69	12.00	2.23	Vertical	Pass
3252.444	-84.64	-13.00	-71.64	125.00	4.00	Vertical	Pass
6505.778	-77.87	-13.00	-64.87	125.00	1.00	Vertical	Pass
4879.111	-81.07	-13.00	-68.07	252.00	3.94	Horizontal	Pass

Table 2.4-2 – RE Spurious Emissions 1-18 GHz – Low Channel

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Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
30 MHz - 1 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
30 MHz - 1 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto

Spurious Emissions 30M-1GHz - Mid Channel 1643.5MHz



Limit: Test Date: Test Results: FCC Part 25/FCC Part 25 10/22/2024 Pass

Test Notes: Mid Channel 1643.5M, Aux Viper Equipment at 440M

Figure 2-15 – RE Spurious Emissions 30-1000 MHz – Mid Channel

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
64.704	-92.80	-13.00	-79.80	303.00	1.12	Vertical	Pass
299.983	-86.20	-13.00	-73.20	98.00	1.12	Vertical	Pass
879.989	-73.00	-13.00	-60.00	220.00	1.12	Vertical	Pass

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Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto

Spurious Emissions 1 - 18GHz - Mid Channel 1643.5MHz



Limit:	Test Date:	Test Results:
FCC Part 25/FCC Part 25	10/18/2024	Pass

Test Notes: Mid Channel 1643.5M, 1-2 GHz has 30dB Attenuator, 2-18 GHz has 2GHz High Pass Filter

Figure 2-16 – RE Spurious Emissions 1-18 GHz – Mid Channel

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Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
1317.722	-60.84	-13.00	-47.84	252.00	2.67	Vertical	Pass
3024.000	-84.75	-13.00	-71.75	252.00	1.00	Vertical	Pass
3286.222	-84.48	-13.00	-71.48	0.00	3.94	Vertical	Pass
13451.556	-69.76	-13.00	-56.76	360.00	1.00	Vertical	Pass
3286.222	-84.42	-13.00	-71.42	0.00	3.94	Horizontal	Pass

Table 2.4-4	- RE Spurious	Emissions 1-18	GHz – Mid Channel
	ILL OPALIONS		

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Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
30 MHz - 1 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
30 MHz - 1 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto

Spurious Emissions 30M-1GHz - High Channel 1660.5MHz



Limit: Test Date: Test Results: FCC Part 25/FCC Part 25 10/22/2024 Pass

Test Notes: High Channel 1660.5M, Aux Viper Equipment at 453M

Figure 2-17 – RE Spurious Emissions 30-1000 MHz – High Channel

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Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
83.134	-94.55	-13.00	-81.55	234.00	1.33	Vertical	Pass
166.716	-101.97	-13.00	-88.97	167.00	1.12	Vertical	Pass
799.964	-75.42	-13.00	-62.42	12.00	1.00	Vertical	Pass

Table 2.4-5 – RE Spurious Emissions 30-1000 MHz – High Chann
--

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Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Vertical	100 kHz	18001 Pts	Auto
1 GHz - 18 GHz	3m	Horizontal	100 kHz	18001 Pts	Auto

Spurious Emissions 1 - 18GHz - High Channel 1660.5MHz



Limit:	Test Date:	Test Results:
FCC Part 25/FCC Part 25	10/18/2024	Pass

Test Notes: High Channel 1660.5M, 1-2 GHz has 30dB Attenuator, 2-18 GHz has 2GHz High Pass Filter

Figure 2-18 – RE Spurious Emissions 1-18 GHz – High Channel

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Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
1494.833	-61.52	-13.00	-48.52	238.00	2.89	Vertical	Pass
1577.833	-62.13	-13.00	-49.13	221.00	1.57	Vertical	Pass
1577.556	-61.85	-13.00	-48.85	192.00	2.89	Horizontal	Pass
3320.889	-74.54	-13.00	-61.54	252.00	3.94	Vertical	Pass
6641.778	-78.23	-13.00	-65.23	360.00	4.00	Vertical	Pass
6641.778	-78.21	-13.00	-65.21	360.00	1.00	Horizontal	Pass

Table 2.4-6 – RE Spurious Emissions 1-18 GHz – High Channel

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2.4.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN. Test Area: 3mSAC

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300	8447D	2727A05370	В	09/23/2024	09/23/2025
		MHz					
NBLE11460	ETS-Lindgren	Antenna, Horn 1-18 GHz	3117	155005	G	02/09/2023	02/09/2025
WRLE11119	RF Precision	Attenuator, 30 dB	ATX3396-30	11119	В	01/02/2024	01/02/2025
	Cables						
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18	PAM-118A	18040002	В	02/05/2024	02/05/2025
		GHz					
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44 (SAP	101537	G	01/26/2024	01/26/2025
			21006053)				
NBLE11645	Schwarzbeck	Antenna, Trilog, 30 MHz-7	VULB 9162	0254	G	04/25/2023	04/25/2025
		GHz					

Table 2.4-7 – Radiated Emissions Equipment List

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

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2.5 Frequency Stability

2.5.1 Specification Reference

FCC Part 2.1055

2.5.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.5.3 Date of Test

17 - 18 October 2024

2.5.4 Test Method

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled to the input of the measurement equipment and a power supply is attached to the primary supply voltage.

Frequency measurements were made at the extremes of the of temperature range -20° C to +50° C and at intervals of 10° C at normal supply voltage. Sufficient time to stabilize all components of the equipment was allowed at each frequency measurement. The maximum variation of frequency was recorded.

The data collected during testing was collected without a GPS signal present.

2.5.5 Environmental Conditions

Ambient Temperature 22.3°C

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2.5.6 Test Results

Degrees C	Frequency (MHz)	ppm	Percent age (%)	pm upper limpn	n lover lim	Percentag e Upper Limit (%)	Percentag e Lover Limit (%)	Reference Frequency (MHz)
50	1626.498933000	-0.567	0.000057	10	-10	0.001	-0.001	1626.49985600
40	1626.499944000	0.054	-0.000005	10	-10	0.001	-0.001	1626.49985600
30	1626.499989000	0.082	-0.000008	10	-10	0.001	-0.001	1626.49985600
20	1626.499556000	-0.184	0.000018	10	-10	0.001	-0.001	1626.49985600
10	1626.500378000	0.321	-0.000032	10	-10	0.001	-0.001	1626.49985600
0	1626.500044000	0.116	-0.000012	10	-10	0.001	-0.001	1626.49985600
-10	1626.499378000	-0.294	0.000029	10	-10	0.001	-0.001	1626.49985600
-20	1626.500222000	0.225	-0.000023	10	-10	0.001	-0.001	1626.49985600
			Frquency	y Stability vs Ter	nperature			
0.002000								
0.001000								
0.000500								
0.000000	• •		•	•	•	•	•	•
-0.000 500								
-0.001.000								



Figure 2.6.6-1: Frequency Stability at Various Temperatures – Low Channel

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-0.001 500



Voltage	Vdc	Degrees C	Frequency (MHz)	ppm	Percent age (%)	pm upper lin	ıpm lover lim	Percentag e Upper Limit (%)	Percentag e Lover Limit (%)	Reference Frequency (MHz)
nominal	12.00) 20	1626.499856000	0.000	0.000000	10	-10	0.001	-0.001	1626.499856000
85%	10.20) 20	1626.499556000	-0.184	0.000018	10	-10	0.001	-0.001	1626.499856000
115%	13.80) 20	1626.500278000	0.259	-0.000026	10	-10	0.001	-0.001	1626.499856000
			Fro	quency S	stability vs	Temperature	2			
	0.002000									
	0.001500									
	€ 0.001000									
	e 0.000500									-
	0.000000		•			•		· ·		
	-0.000 500									-
	-0.001000									
	-0.001500									
	0.001.000									
	-0.002.000									
			20			20		20		
				1	remperature	(Degrees Celsiu	is)			

Figure 2.6.6-2: Frequency Stability at Extreme Voltages – Low Channel

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Figure 2.6.6-3: Frequency Stability at Various Temperatures – Mid Channel

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Voltage	Vdc	Degrees C	Frequency (MHz)	ppm	Percentage (%)	ppm upper limit	ppm lover limit	Percentage Upper Limit (%)	Percentage Lover Limit (%)	Reference Frequency (MHz)
nominal	12.00	20	1643.500311000	0.000	0.000000	10	-10	0.001	-0.001	1643.500311000
85%	10.20	20	1643.500367000	0.034	-0.000003	10	-10	0.001	-0.001	1643.500311000
115%	13.80	20	1643.499478000	-0.507	0.000051	10	-10	0.001	-0.001	1643.500311000
				Fr	quency Stabilit	ty vs Temperature				
	0.002000									
	0.001500									
	x 0.001000									
	0.000500									
	5 0.000000		•			•				
	-0.000 S00									
	£ .0.001000									
	+0.001 500									
	-0.002.000									
			20			20		20		
					Temper	ature (Degrees Celsius	5)			

Figure 2.6.6-4: Frequency Stability at Extreme Voltages – Mid Channel

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D	egrees C	Frequency (MHz)	ppm	Percentage (%)	ppm upper limit	ppm lover limit	Percentage Upper Limit (%)	Percentage Lover Limit (%)	Reference Frequency (MHz)
	50	1660.500633000	-0.013	0.000001	10	-10	0.001	-0.001	1660.500655000
	40	1660.499556000	-0.662	0.000066	10	-10	0.001	-0.001	1660.500655000
	30	1660.499878000	-0.468	0.000047	10	-10	0.001	-0.001	1660.500655000
	20	1660.500655000	0.000	0.000000	10	-10	0.001	-0.001	1660.500655000
	10	1660.499522000	-0.682	0.000068	10	-10	0.001	-0.001	1660.500655000
	0	1660.500744000	0.054	-0.000005	10	-10	0.001	-0.001	1660.500655000
	-10	1660.500678000	0.014	-0.000001	10	-10	0.001	-0.001	1660.500655000
	-20	1660.499556000	-0.662	0.000066	10	-10	0.001	-0.001	1660.500655000
Frequency Change (%)	0.002000 0.001500 0.001000 0.000500 0.000000 -0.000500 -0.001500 -0.001500	•	•	Fro	uency Stability vs	Temperature		•	•
		50	40	30	20	10	o	-10	-20

Figure 2.6.6-5: Frequency Stability at Various Temperatures – High Channel

Temperature (Degrees Celsius)

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U-h	VJ.	D C	Frequency		Percentage	1::-		Percentage Upper Limit	Percentage	Reference Frequency
voitage	Vac 10.00	Degrees C	(MITZ)	ppm 0.000	(2)	ppm upper limit	ppm lower limit	[7]	Lover Limit (7.)	(MITZ)
nominal	12.00	20	1660.500655000	0.000	0.000000	10	-10	0.001	-0.001	1660.500655000
85%	10.20	20	1660.500667000	0.007	-0.000001	10	-10	0.001	-0.001	1660.500655000
115%	13.80	20	1660.499278000	-0.829	0.000083	10	-10	0.001	-0.001	1660.500655000
					Frquency Stabi	lity vs Temperatur	e			
	0.002000									_
	0.001500									
	- 0.001000									
	- K									
	- E 0.000500									
									1	
	- A									
	B -0.000 500									
	-0.001.000									
	-0.001500									
	0.003.000									
	-0.002.000		20			20		21)	
					Temp	erature (Degrees Celsi	us)			
						(B, ees eess				

Figure 2.6.6-6: Frequency Stability at Extreme Voltages – High Channel

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2.5.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN. Test Area: 3mSAC

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
NBLE02238	Envirotronics	Chamber, 27 Cu Ft	SH27	09963482-S	G	07/29/2024	07/29/2025
		Temp/Humidity					
WRLE11119	RF Precision	Attenuator, 30 dB	ATX3396-30	11119	В	01/02/2024	01/02/2025
	Cables						
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44 (SAP 21006053)	101537	G	01/26/2024	01/26/2025
0.10.10		11 PA 1 A 11					

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

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2.6 Protection of Aeronautical Radio Navigation Satellite Service

2.6.1 Specification Reference

FCC 47 CFR Part 25.216(c)(h)(i)

2.6.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.6.3 Date of Test

15 October 2024

2.6.4 Test Method

The maximum peak conducted output power was measured in accordance with the ANSI C63.26. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The RBW of the spectrum analyzer was set to 1MHz and the VBW was set to \geq 3 times the RBW. The spectrum analyzer span was set to cover the entire frequency range per the applicable section of the standard and the trace was set to max hold using the average detector to provide the mean output power.

The limit used for the entire frequency range is in dBW/MHz and was converted to dBm on the receiver using the formula: dBm = dBW + 30

2.6.5 Environmental Conditions

All tests are performed within the ambient climatic conditions of the laboratory.

2.6.6 Test Results

Test Summary: An RF attenuator was used between the EUT output and the measurement receiver during testing. All measurement correction factors were entered into the receiver as an offset to provide corrected measurement results. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

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MultiView	Receiver	×	Spectrum	×					
Ref Level -18 Att Input	3.00 dBm Offse 10 dB • SWT 1 AC PS	t 30.43 dB: 1 s Or	B RBW 1 MHz VBW 3 MHz Notch Off	Mode Auto Swee	ep		Fre	quency 1.58	20000 GHz
1 Frequency S	weep								1Av MaxLog
-20 dBm								M1[1]	-59.37 dBm
								1	50007/190 6Hz
								1.	3 <i>3337</i> 400 0112
-30 dBm-									
-40 d8m	H1 -40 000 d8m								
HE GEIN									
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								M1	
ALCO HONS			the second second second		the second second second second second				ويتعارب والأحفاد والترجي
		and the second				and the second in the local division of the second s		and a second	
-70 dBm-									
ro abiii									
00 40									
-80 UBM-									
00.10									
-90 aвт									
-100 dBm-									
-110 dBm-									
1 550 GHz			18001	nte	4				1 605 CHz
1.559 012			18001	pts			- 2024-10-	15 Pof Louis	PRW
	~				 Measuring 		14:47:	37 O	0

02:47:37 PM 10/15/2024

Figure 2-19 - FCC 25.216(c) - Low Channel

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MultiView 🎫 Receiv	er X	Spectrum	×					
RefLevel 4.00 dBm Of Att 10 dB • SV Input 1 AC PS	ffset 30.43 dB NT 1 s S Or	B • RBW 1 MHz • VBW 3 MHz • Notch Off	Mode Auto Sweep			Free	quency 1.6	075000 GHz
1 Frequency Sweep								1Av MaxLog
						M1[1]	-59.30 dBm
0 dBm							. 1.6	07836370 GHz
-10 dBm-								
00 10-								
-20 dBm-								
-30 dBm								
30 dBm								
-40 dBm-								
FCC PART 25_216H								
-50 dBm								
				M1				
righGartBritts-relation the content of the second								
-70 dBm-								
-80 dBm-								
-90 UBM								
		1000						1.61.01
1.605 GHz		1800	1 pts	50	0.0 kHz/			1.61 GHz
~				✓ Measuring		2024-10-	15 Ref Level	RBW

02:54:08 PM 10/15/2024

Figure 2-20 - FCC 25.216(h) - Low Channel

TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112



MultiView	Receiver	×	Spectrum	×					
Ref Level -18. Att Input	.00 dBm Offs 10 dB • SW1 1 AC PS	et 30.43 dB 1 s Or	■ RBW 1 MHz ■ VBW 3 MHz ■ Notch Off	Mode Auto Swee	p		Fre	equency 1.5	820000 GHz
1 Frequency Sv	veep								1Av MaxLog
-20 dBm-								M1[1]	-58.06 dBm
								1	.56946310 GHz
-30 dBm									
-40 dBm-									
TO HOW									
-50 dBm									
		M1							
station of Smothersdin street the	11. J. S	and the second s	والمروم ومتعارضه والمتعالم والمتعارض والمتعار	deleter and the second sector processing			adated style and an administration of the		ter for a collection of the other back
-70 dBm									
-80 dBm									
-90 dBm									
-100 dBm									
100 0011									
-110 dBm-									
1.559 GHz			18001	pts	4	1.6 MHz/			1.605 GHz
	~				✓ Measuring		2024-10 14:44)-15 Ref Leve 1:58 O	I RBW

02:44:58 PM 10/15/2024



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112



MultiView	Receiver	×	Spectrum	×				
Ref Level 4.0 Att Input	00 dBm Offset 10 dB • SWT 1 AC PS	t 30.43 dB 4 1 s 4 On	 RBW 1 MHz VBW 3 MHz Notch Off 	Mode Auto Sweep			Frequen	cy 1.6075000 GHz
1 Frequency S	weep							1Av MaxLog
							M1[1]	-59.26 dBm
0 dBm								1.609047970 GHz
-10 dBm								
00.40.0								
-20 dBm								
-20 dBm								
So abiii								
-40 dBm								
FCC PART 25_216H								
-50 dBm								
							M1	
Antiphedikistra and a				a di senten de la desta de				
-70 dBm-								
-90 dpm-								
-90 dBm								
1.605 CHz			1800	1 pts	50			1.61.CHz
1.005 GH2			1800	1 pts		0.0 KHZ/	2024-10-15	Ref Level RBW
	~				 Measuring 		14:57:01	

02:57:01 PM 10/15/2024



TÜV SÜD America Inc 141 14th Street NW New Brighton, MN 55112



MultiView	Receiver	X Sp	ectrum	×							
Ref Level -18 Att Toput	3.00 dBm Offse 10 dB • SWT 1 AC PS	t 30.43 dB ● 1 s ● On	RBW 1 MHz VBW 3 MHz 1 Notch Off	Mode Auto Sweep			Fre	equency	1.58	20000	GHz
1 Frequency S	weep								(1Av Ma	xLoq
-20 dBm								M1[1]		-58.30	6 dBm
									1.5	865435	0 GHz
								M2[1]		-59.7	2 dBm
-30 dBm									1.5	925309	0 GHz
										520005	0.0112
-40 dBm											
FO dow											
-50 dBm											
					M	11	M2				
Mile So Balancia State and a strengt and	in an interstation of the second	Al and the state of a state of a state of	and sented or defined on the	i na stata di stata ka sta sta dati	ومعافد والفارة ويدخوه فالمعاهد ودومواج	And the second s	and the second second second				la subparativisai
-70 dBm											
-80 dBm											
-00 dbm											
-90 UBIII											
-100 dBm											
-110 dBm											
1 550 611-			10001							1 (0)	
1.559 GHz			18001 p	ts	4	-6 MHZ/	2024-4		i Laura I	1.603	5 GHZ
	~				✓ Measuring		2024-10	-15 Ref 8:08	o	R	0 0

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MultiView	Receiver	×	Spectrum	×					
Ref Level 4.0 Att Input	0 dBm Offset 10 dB • SWT 1 AC PS	t 30.43 dB 1 s On	 RBW 1 MHz VBW 3 MHz Notch Off 	Mode Auto Sweep			Freq	uency 1.60	75000 GHz
1 Frequency S	weep							(o1Av MaxLog
							M1[1	1	-59.09 dBm
0 dBm								1.60	19490440 GHz
								1100	
-10 dBm									
00.10									
-20 aBm									
-30 dBm									
oo dom									
-10 dPm									
FUU PART 25_216H									
-50 dBm									
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and the state of the second state			And a large strange in the second						
70.10									
-70 aBm									
-80 dBm									
00 0011									
-90 dBm									
1.605 GHz			1800	1 pts	50	0.0 kHz/			1.61 GHz
			1000		- Measuring.		2024-10-1	5 Ref Level	RBW
							14:58:1	J V	

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2.6.7 **Test Location and Test Equipment Used**

The tests were carried out in New Brighton, MN. Test Area: 3mSAC

Table 2.6-1 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal	Cal Date	Cal Due
					Code		
WRLE11119	RF Precision Cables	Attenuator, 30 dB	ATX3396-30	11119	В	01/02/2024	01/02/2025
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44 (SAP 21006053)	101537	G	01/26/2024	01/26/2025

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally. Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

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3 Diagram of Test Setups





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STATEMENT OF MEASUREMENT UNCERTAINTY - Emissions

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. This test system has a measurement uncertainty of ±3.30 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. This test system for 30 MHz-1000 MHz has a measurement uncertainty of ±5.88 dB and above 1 GHz a measurement uncertainty of ±4.47 dB. The measurement uncertainty values for conducted and radiated emissions meet the requirements as expressed in CISPR 16-4-2. The equipment comprising the test systems is calibrated on an annual basis.

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications

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