Test Report

Prepared for: Honeywell

Model: HSD Phase 4-CA

Description: Aircraft Earth Station

FCC ID: K6KHSD-PHASE4

Serial Number: 0020

Project No: p2420009

Test Result: PASS

To

FCC Part 87

Date of Issue: June 26, 2025

On the behalf of the applicant:	**EMS Technologies Canada, LTD** **400 Maple Grove Road** **Ottawa, ON, Canada** **K2V 1B8**
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Prepared By:

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ANAB Cert#: AT-2901
FCC Site Reg. #750616
ISED Site Reg. #2044A-2

Greg Corbin

Project Test Engineer

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
87.131 2.1046	Conducted Output Power	Pass	
87.135(a) 2.1049	Bandwidth of Emission (OCC BW)	Pass	
87.139(a) 87.139(i)(1) 87.139(i)(2)(3) 2.1051 2.1053	Emission Limitations	Pass	
87.131 87.137(a)	Types of Emission	Pass	
87.141(j)	Modulation Requirements	Pass	
87.133(a)(7) 2.1055	Frequency Stability Frequency vs Temperature	Pass	
87.133(a)(7) 2.1055	Frequency Stability Frequency vs Voltage	Pass	

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	6/26/2025	Greg Corbin	Original Document

Table of Contents

Table of Annexes

Acronyms and Abbreviations

Acronyms	Description
AES	Aircraft Earth Station
GUI	Graphical User Interface
HGA	High Gain Antenna
SDU	Satellite Data Unit
SBB	Swift Broadband
DNLA	Diplexer and Low Noise Amplifier

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

FCC Site Reg. #750616

IC Site Reg. #2044A-2

Standard Test Conditions and Engineering Practices

Unless otherwise indicated, the procedures contained in FCC Part 87, ANSI C63.26-2015, were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10º to 40ºC (50º to 104ºF) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions		
Temperature (°C)	**Humidity (%)**	**Pressure (mbar)**
25.5 – 31.3	17.4 – 39.6	957.9 - 966

EUT Description

Model:	HSD Phase 4-CA
Serial:	0020 (used for all tests except frequency stability) 0018 (used for frequency stability, refer to page 29 for details)
Firmware:	N/A
Software:	LI-g0412671 ver:B00
Description:	Aircraft Earth Station
Additional Information:	High-speed data, satellite communications terminals that provide world-wide voice and data services to aircraft through high-speed communication links with the Inmarsat Satellite Network.
Receipt of Sample(s):	4/16/2025
EUT Condition:	**Visual Damage** No **State of Development** Production/Production Equivalent

FCC Test Requirements

The HSD Phase 4 CA system operates within the frequency range of 1626.5 – 1660.5 MHz, requiring compliance with FCC Parts 25 and 87.

FCC Part 87 regulates the frequency range of 1646.5 to 1660.5 MHz for Mobile Earth Stations (MES) in the Mobile Satellite Service (MSS), which covers a portion of the required operational frequencies. To cover the full frequency range of 1626.5 to 1660.5 MHz, FCC Part 25 for Aircraft Earth Stations (AES) in the Aeronautical Mobile-Satellite Service and Aeronautical Mobile Service must also be considered.

The HSD Phase 4 CA SDU contains two channel cards: channel card #1, supports two SBB communication channels, while channel card #2 supports three Classic Aero communication channels and one SBB communication channel. The SBB services provide non-safety voice and data in the cabin, whereas the Classic Aero services are designated for safety classified voice and packet data. These services are enabled through separate RF transceiver ICs dedicated to each communication channel.

According to 47CFR 25.109(c), earth stations in the AMS(R)S service are subject to licensing under 47CFR Part 87. The "(R)" in AMS(R)S indicates that the spectrum is used for aeronautical communications related to the safety and regularity of flights. Due to the safety nature of Classic Aero service, Honeywell considers the SBB non-safety AMSS service to fall under the scope of FCC Part 25, while the Classic Aero AMS(R)S safety service is subject to both FCC Parts 87 and Part 25, as the Classic Aero operating frequency range is from 1626.5 to 1660.5 MHz.

This report shows compliance to the 47CFR Part 87 regulations for the HSD Phase 4 CA Classic Aero service operated from 1646.5 – 1660.5 MHz using G1D and G1E emission designators in the AMS(R)S service.

There is a separate CTL test report (p2490002_Part 25_rev 1.0) showing compliance to Part 25 for the SBB service from 1626.5 – 1660.5 MHz and the Classic Aero service from 1626.5 - 1646.5 MHz.

The following table contains Part 87 frequency allocation and the emission designator information Classic Aero service.

Table 1 – Frequency Allocation and Emission Designators

Frequency Range	Bearer	Service	Modulation	Symbol Rate	Data Rate	Necessary Bandwidth	FCC Designator	Authorized Bandwidth
MHz				ksym/s	kb/s	kHz		kHz
1646.5 – 1660.5	R/T600	Classic R/T	π/2 BPSK	0.6	0.6	0.84	840HG1D	25
	R/T1200	Classic R/T	π/2 BPSK	1.2	1.2	1.68	1K68G1D	25
	R/T10500	Classic R/T	Aviation QPSK	5.25	10.5	10.5	10K5G1D	25
	C8400	Classic C	Aviation QPSK	4.2	8.4	6.8	6K80G1E	25

Antenna Gain

The manufacturer lists 2 types of antennas with the gain specified from 12 - 17 dBi.
The manufacturer states the minimum cable loss from the SDU RF output to the Antenna RF input is 2.5 dB. This cable loss will be used in the final EIRP calculation

Unit Assembly	Part Number	Gain - dBi
AMT 700 HGA	1428-A-1010-02	12 - 17
AMT-3800 HGA	1242-A-0101-xx	12 - 17

EUT Operation during Tests

The HSD was mounted in a test tray with several multi-conductor cables interfacing it to the computer.
There was an RF cable as part of the tray cable bundle that provided the out for the modems.
The cable loss for the RF tray cable was characterized and the insertion loss was included in all measurements.
The manufacturer provided a GUI to control the channel parameters and turn the output on.

The HSD system can be powered by either 115 vac or 28 vdc.
For all tests except frequency stability the tests were performed using 28 vdc.
Frequency Stability was performed with 115 vac and 28 vdc as required.

Classic Aero Test Frequencies

Test Frequency MHz	Bearer
1646.5	RTS600
1646.5	RTS1200
1646.5	RTS10500
1646.5	C8400
1653.5	RTS600
1653.5	RTS1200
1653.5	RTS10500
1653.5	C8400
1660.5	RTS600
1660.5	RTS1200
1660.5	RTS10500
1660.5	C8400

The Test Frequency and Bearer will be used to uniquely identify the test results.

Accessories:				
Qty	**Description**	**Manufacturer**	**P/N**	**S/N**
1	HSD test tray	Honeywell	200-91171-102	N/A
1	Computer	Comark	TCS-025-02022-001	T18114398

Cables:					
Qty	**Description**	**Length (M)**	**Shielding Y/N**	**Shielded Hood Y/N**	**Termination**
1	Multi-conductor cable bundle	8	Y	Y	EUT or computer

Modifications:	
	None

Conducted Output Power

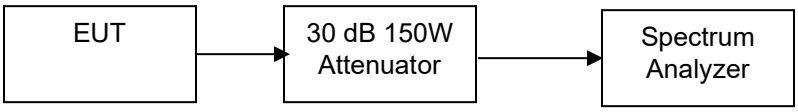
Engineer: Greg Corbin

Test Date: 4/28/2025

Test Procedure

EUT was connected as shown in the test set-up below.
The power level was set to maximum using the GUI provided.
The GUI power level setting was recorded in the table below.
Peak Envelope Power (PEP) was recorded for each modulation.
RBW = 1 MHz
Detector = Peak, max hold
Antenna Gain = max antenna gain (+17 dBi) + RF cable loss (-2.5 dB) = 17 – 2.5 = 14.5 dBi.
The final EIRP (dBm) = final conducted power (dBm) + antenna gain(dB).

Output Power Test Setup



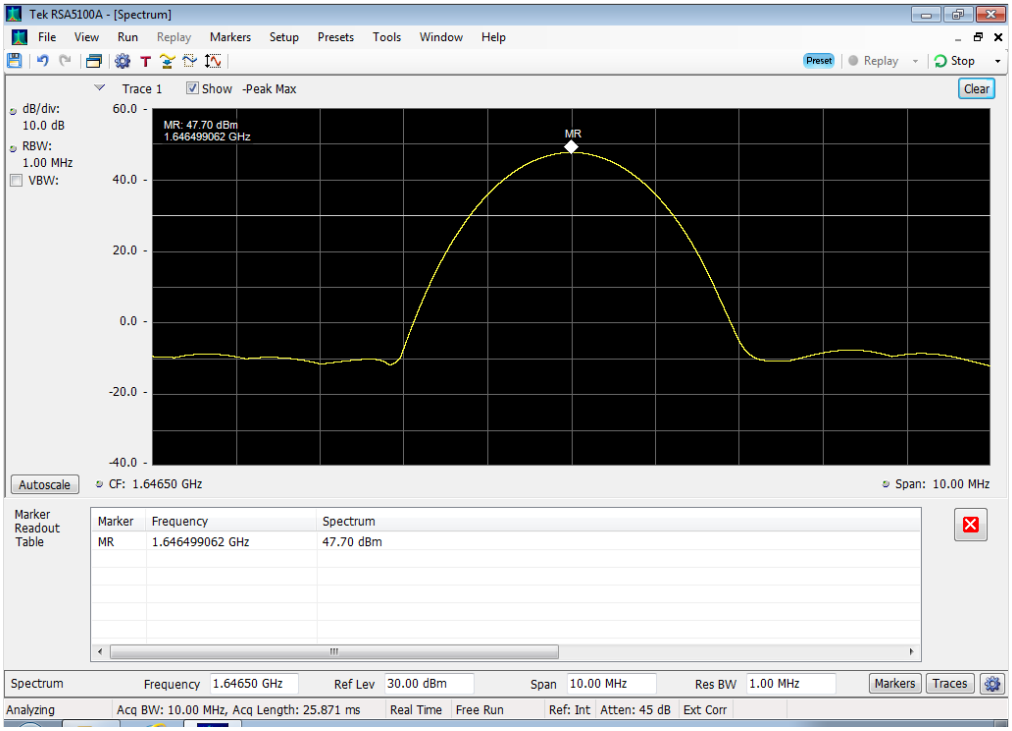
Output Power test results

Tuned Frequency	Modulation	GUI Power Level setting	Conducted Output Power		Conducted Limit	Antenna Gain	EIRP Output Power		EIRP Limit	Pass / Fail
MHz			dBm	Watts	watts	dBi	dBm	watts	watts	
1646.5	C8400	24.7	47.7	58.884	60	14.5	62.2	1659.59	2000	Pass
1646.5	RTS600	25.2	47.71	59.020	60	14.5	62.21	1663.41	2000	Pass
1646.5	RTS1200	24.8	47.5	56.234	60	14.5	62	1584.89	2000	Pass
1646.5	RTS10500	25.2	47.57	57.148	60	14.5	62.07	1610.65	2000	Pass
1653.5	C8400	24	47.55	56.885	60	14.5	62.05	1603.25	2000	Pass
1653.5	RTS600	24.6	47.49	56.105	60	14.5	61.99	1581.25	2000	Pass
1653.5	RTS1200	24.5	47.53	56.624	60	14.5	62.03	1595.88	2000	Pass
1653.5	RTS10500	25	47.67	58.479	60	14.5	62.17	1648.16	2000	Pass
1660.5	C8400	24	47.51	56.364	60	14.5	62.01	1588.55	2000	Pass
1660.5	RTS600	24.8	47.76	59.704	60	14.5	62.26	1682.67	2000	Pass
1660.5	RTS1200	24.5	47.6	57.544	60	14.5	62.1	1621.81	2000	Pass
1660.5	RTS10500	25	47.78	59.979	60	14.5	62.28	1690.44	2000	Pass

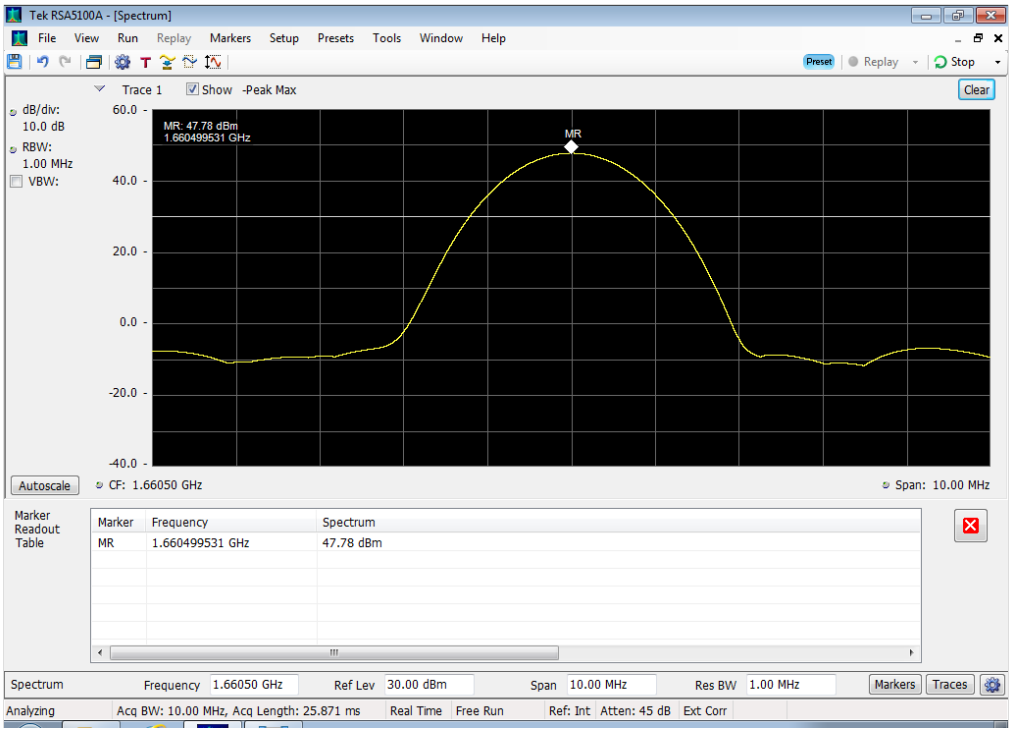
The final EIRP (dBm) = final conducted power (dBm) + antenna gain(dB).

Sample output power plots

PEP_C8400_1646.5 MHz_ TX Pwr set to 24.7



PEP_RTS10500_1660.5 MHz_ TX Pwr set to 25



Emissions Limitations – Conducted per 87.139(i)(1)

Engineer: Greg Corbin

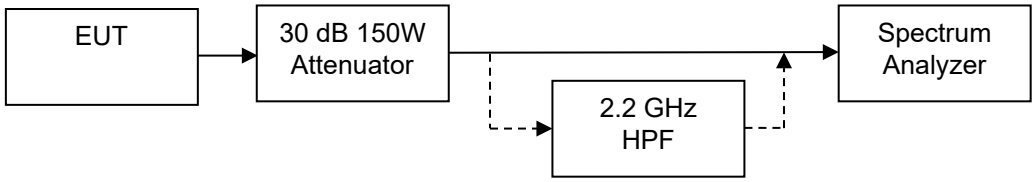
Test Dates:5/10/2025

Test Procedure

The EUT was connected as shown in the test set-up below.
The attenuator and cable losses were input into the analyzer as a reference level offset to ensure that accurate measurements were obtained.
The emissions were investigated up to the 10th harmonic.
A 2.2 GHz Highpass filter was used for 3250 – 18 GHz.

The EUT needs to meet the emission requirements of Part 87.139(i)(1) for aircraft earth stations using G1D, G1E, or G1W emissions in the 1646.5-1660.5 MHz frequency band.
In order to meet the emission requirements of Part 87.139(i)(1), DNLA Type F or Type J diplexers are used between the SDU output and the antenna input.
The DNLA diplexers provide additional loss that is included in the final spurious calculations.
The DNLA Type F and Type J diplexers have the same insertion loss for each frequency range.

Conducted Spurious Emissions Test Setup



DNLA diplexer Type F and Type J rejection

Freq Range	Rejection
MHz	dB
.010 to 1525	80
1525 to 1559	120
1559 to 1585	111
1585 to 1605	95
1605 to1610	62
1610 to 1610.6	40
1610.6 to 1613.8	40
1613.8 to 1614	40
1614 to 1620	30
1620 to 1624.5	20
1624.5 to 1625.5	10
1625.5 to 1626.5	Decreases
1626.5 to 1633	1.3
1633 to 1660.5	0.8
1660.5 to 1735	Increases
1735 to 1865	50
1865 to 3250	20
3250 to 3330	50
3330 to 4000	40
4000 to 12000	50
12000 to 18000	15

Conducted Emissions Limitations Summary Tables

R/T600_ Pi/2 BPSK 840HG1D								
Specifications				1646.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-50.35	-43.06	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-46.57	-11.28	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.3	-28.01	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.72	-36.43	Pass
1605 to1610	-117	1	62	47.71	-7.29	-22.16	-14.87	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.27	-9.98	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-15.93	-54.64	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-17.87	-10.58	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-37.36	-45.07	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-35.12	-32.83	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-35.54	-23.25	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-45.29	-24.30	Pass
1626.5 to 1646.465	-70	0.004	0.8	47.71	-21.49	-22.92	-1.43	Pass
1646.535 to 1660	-70	0.004	0.8	47.71	-21.49	-21.8	-0.31	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-22.23	-51.24	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-36.58	-25.09	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.19	-39.90	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.33	-11.04	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-45.16	-37.87	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.49	-30.20	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-33.61	-26.32	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-27.59	-20.30	Pass

R/T600_ Pi/2 BPSK 840HG1D								
Specifications				1653.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-50.45	-43.16	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-47.1	-11.81	Pass
1559 to 1585	-155	1	111	47.71	3.71	-22.49	-26.20	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.54	-36.25	Pass
1605 to1610	-117	1	62	47.71	-7.29	-22.4	-15.11	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.33	-10.04	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-17.03	-55.74	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-18.55	-11.26	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-38.92	-46.63	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-33.71	-31.42	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-34.71	-22.42	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-35.44	-14.45	Pass
1626.5 to 1653.465	-70	0.004	0.8	47.71	-21.49	-21.84	-0.35	Pass
1653.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.68	-1.19	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-22.48	-51.49	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-38.1	-26.61	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-46.78	-39.49	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-47.91	-10.62	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-46.3	-39.01	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-48.23	-30.94	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-33.98	-26.69	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-28.36	-21.07	Pass

R/T600_ Pi/2 BPSK 840HG1D								
Specifications				1660.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.24	-7.76	-47.45	-39.69	Pass
1525 to 1559	-203	0.004	120	47.24	-35.76	-47.33	-11.57	Pass
1559 to 1585	-155	1	111	47.24	3.24	-24.23	-27.47	Pass
1585 to 1605	-143	1	95	47.24	-0.76	-34.24	-33.48	Pass
1605 to1610	-117	1	62	47.24	-7.76	-22.76	-15.00	Pass
1610 to 1610.6	-95	1	40	47.24	-7.76	-17.28	-9.52	Pass
1610.6 to 1613.8	-49	1	40	47.24	38.24	-15.85	-54.09	Pass
1613.8 to 1614	-95	1	40	47.24	-7.76	-16.1	-8.34	Pass
1614 to 1620	-70	0.004	30	47.24	7.24	-35.81	-43.05	Pass
1620 to 1624.5	-70	0.004	20	47.24	-2.76	-34.6	-31.84	Pass
1624.5 to 1625.5	-70	0.004	10	47.24	-12.76	-35.25	-22.49	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.24	-21.46	-47.26	-25.80	Pass
1626.5 to 1660.465	-70	0.004	0.8	47.24	-21.96	-22.25	-0.29	Pass
1660.535 to 1670	-19.5	0.02	0.8	47.24	28.54	3.1	-25.44	Pass
1670 to 1735	-60	0.004	0.8	47.24	-11.96	-36.6	-24.64	Pass
1735 to 1865	-105	0.004	50	47.24	-7.76	-47.97	-40.21	Pass
1865 to 3250	-105	0.004	20	47.24	-37.76	-48.21	-10.45	Pass
3250 to 3330	-105	0.004	50	47.24	-7.76	-43.81	-36.05	Pass
3330 to 4000	-105	0.004	40	47.24	-17.76	-47.67	-29.91	Pass
4000 to 12000	-105	0.004	50	47.24	-7.76	-34.4	-26.64	Pass
12000 to 18000	-70	0.004	15	47.24	-7.76	-28.45	-20.69	Pass

R/T1200_ Pi/2 BPSK 1K68G1D								
Specifications				1646.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-49.21	-41.92	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-45.27	-9.98	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.51	-28.22	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.56	-36.27	Pass
1605 to1610	-117	1	62	47.71	-7.29	-22.71	-15.42	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.19	-9.90	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-17.3	-56.01	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-18.54	-11.25	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-36.99	-44.70	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-34.4	-32.11	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-35.21	-22.92	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-45.3	-24.31	Pass
1626.5 to 1646.465	-70	0.004	0.8	47.71	-21.49	-22.96	-1.47	Pass
1646.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.68	-1.19	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-21.69	-50.70	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-37.24	-25.75	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.45	-40.16	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.33	-11.04	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-47.62	-40.33	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-48.23	-30.94	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.44	-27.15	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-28.45	-21.16	Pass

R/T1200_ Pi/2 BPSK 1K68G1D								
Specifications				1653.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-49.83	-42.54	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-46.94	-11.65	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.3	-28.01	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-35.9	-35.61	Pass
1605 to1610	-117	1	62	47.71	-7.29	-21.97	-14.68	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-19.99	-12.70	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-16.56	-55.27	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-17.81	-10.52	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-37.98	-45.69	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-33.93	-31.64	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-34.56	-22.27	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-45.27	-24.28	Pass
1626.5 to 1653.465	-70	0.004	0.8	47.71	-21.49	-22.1	-0.61	Pass
1653.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.3	-0.81	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-22.25	-51.26	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-38.47	-26.98	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.98	-40.69	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.88	-11.59	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-46.72	-39.43	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.65	-30.36	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.39	-27.10	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-28.09	-20.80	Pass

R/T1200_ Pi/2 BPSK 1K68G1D								
Specifications				1660.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.24	-7.76	-47.9	-40.14	Pass
1525 to 1559	-203	0.004	120	47.24	-35.76	-47.83	-12.07	Pass
1559 to 1585	-155	1	111	47.24	3.24	-22.85	-26.09	Pass
1585 to 1605	-143	1	95	47.24	-0.76	-32.73	-31.97	Pass
1605 to1610	-117	1	62	47.24	-7.76	-22.52	-14.76	Pass
1610 to 1610.6	-95	1	40	47.24	-7.76	-17.14	-9.38	Pass
1610.6 to 1613.8	-49	1	40	47.24	38.24	-16.8	-55.04	Pass
1613.8 to 1614	-95	1	40	47.24	-7.76	-18.25	-10.49	Pass
1614 to 1620	-70	0.004	30	47.24	7.24	-36.08	-43.32	Pass
1620 to 1624.5	-70	0.004	20	47.24	-2.76	-35.28	-32.52	Pass
1624.5 to 1625.5	-70	0.004	10	47.24	-12.76	-34.55	-21.79	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.24	-21.46	-46.16	-24.70	Pass
1626.5 to 1660.465	-70	0.004	0.8	47.24	-21.96	-22.23	-0.27	Pass
1660.535 to 1670	-19.5	0.02	0.8	47.24	28.54	-28.87	-57.41	Pass
1670 to 1735	-60	0.004	0.8	47.24	-11.96	-37.51	-25.55	Pass
1735 to 1865	-105	0.004	50	47.24	-7.76	-46.68	-38.92	Pass
1865 to 3250	-105	0.004	20	47.24	-37.76	-48.12	-10.36	Pass
3250 to 3330	-105	0.004	50	47.24	-7.76	-44.06	-36.30	Pass
3330 to 4000	-105	0.004	40	47.24	-17.76	-47.24	-29.48	Pass
4000 to 12000	-105	0.004	50	47.24	-7.76	-35.02	-27.26	Pass
12000 to 18000	-70	0.004	15	47.24	-7.76	-27.95	-20.19	Pass

R/T10500_ Aviation QPSK 10K5G1D								
Specifications				1646.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-48.61	-41.32	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-47.66	-12.37	Pass
1559 to 1585	-155	1	111	47.71	3.71	-23.98	-27.69	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.82	-36.53	Pass
1605 to1610	-117	1	62	47.71	-7.29	-21.84	-14.55	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.64	-10.35	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-16.86	-55.57	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-16.96	-9.67	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-37.12	-44.83	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-34.77	-32.48	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-34.98	-22.69	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-45.08	-24.09	Pass
1626.5 to 1646.465	-70	0.004	0.8	47.71	-21.49	-22.28	-0.79	Pass
1646.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.01	-0.52	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-21.52	-50.53	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-38	-26.51	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.68	-40.39	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.47	-11.18	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-47.03	-39.74	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.81	-30.52	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.69	-27.40	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-27.64	-20.35	Pass

R/T10500_ Aviation QPSK 10K5G1D								
Specifications				1653.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-50.43	-43.14	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-48.21	-12.92	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.8	-28.51	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-37.07	-36.78	Pass
1605 to1610	-117	1	62	47.71	-7.29	-20.98	-13.69	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.98	-10.69	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-16.12	-54.83	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-19.32	-12.03	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-38.73	-46.44	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-34.24	-31.95	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-35.11	-22.82	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-43.46	-22.47	Pass
1626.5 to 1653.465	-70	0.004	0.8	47.71	-21.49	-21.94	-0.45	Pass
1653.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.17	-0.68	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-23.05	-52.06	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-38.6	-27.11	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-48.12	-40.83	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-49.2	-11.91	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-46.6	-39.31	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.17	-29.88	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.6	-27.31	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-28.48	-21.19	Pass

R/T10500_ Aviation QPSK 10K5G1D								
Specifications				1660.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.24	-7.76	-47.36	-39.60	Pass
1525 to 1559	-203	0.004	120	47.24	-35.76	-46.74	-10.98	Pass
1559 to 1585	-155	1	111	47.24	3.24	-24.23	-27.47	Pass
1585 to 1605	-143	1	95	47.24	-0.76	-36.45	-35.69	Pass
1605 to1610	-117	1	62	47.24	-7.76	-20.95	-13.19	Pass
1610 to 1610.6	-95	1	40	47.24	-7.76	-20.12	-12.36	Pass
1610.6 to 1613.8	-49	1	40	47.24	38.24	-17.58	-55.82	Pass
1613.8 to 1614	-95	1	40	47.24	-7.76	-18.24	-10.48	Pass
1614 to 1620	-70	0.004	30	47.24	7.24	-35.09	-42.33	Pass
1620 to 1624.5	-70	0.004	20	47.24	-2.76	-34.85	-32.09	Pass
1624.5 to 1625.5	-70	0.004	10	47.24	-12.76	-35.6	-22.84	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.24	-21.46	-46.09	-24.63	Pass
1626.5 to 1660.465	-70	0.004	0.8	47.24	-21.96	-22.34	-0.38	Pass
1660.535 to 1670	-19.5	0.02	0.8	47.24	28.54	-21.12	-49.66	Pass
1670 to 1735	-60	0.004	0.8	47.24	-11.96	-21.12	-9.16	Pass
1735 to 1865	-105	0.004	50	47.24	-7.76	-47.07	-39.31	Pass
1865 to 3250	-105	0.004	20	47.24	-37.76	-48.56	-10.80	Pass
3250 to 3330	-105	0.004	50	47.24	-7.76	-44.96	-37.20	Pass
3330 to 4000	-105	0.004	40	47.24	-17.76	-47.76	-30.00	Pass
4000 to 12000	-105	0.004	50	47.24	-7.76	-34.47	-26.71	Pass
12000 to 18000	-70	0.004	15	47.24	-7.76	-27.29	-19.53	Pass

C8400_ Aviation QPSK_ 6K80G1E								
Specifications				1646.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-50.14	-42.85	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-47.02	-11.73	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.53	-28.24	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.7	-36.41	Pass
1605 to1610	-117	1	62	47.71	-7.29	-22.02	-14.73	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-18.9	-11.61	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-16.36	-55.07	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-18.72	-11.43	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-36.9	-44.61	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-35.18	-32.89	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-34.37	-22.08	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-45.31	-24.32	Pass
1626.5 to 1646.465	-70	0.004	0.8	47.71	-21.49	-23.28	-1.79	Pass
1646.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.37	-0.88	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-22.18	-51.19	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-36.72	-25.23	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.2	-39.91	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.29	-11.00	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-44.45	-37.16	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.67	-30.38	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.21	-26.92	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-27.87	-20.58	Pass

C8400_ Aviation QPSK_ 6K80G1E								
Specifications				1653.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.71	-7.29	-50.14	-42.85	Pass
1525 to 1559	-203	0.004	120	47.71	-35.29	-47.99	-12.70	Pass
1559 to 1585	-155	1	111	47.71	3.71	-24.88	-28.59	Pass
1585 to 1605	-143	1	95	47.71	-0.29	-36.64	-36.35	Pass
1605 to1610	-117	1	62	47.71	-7.29	-22.06	-14.77	Pass
1610 to 1610.6	-95	1	40	47.71	-7.29	-17.66	-10.37	Pass
1610.6 to 1613.8	-49	1	40	47.71	38.71	-16.44	-55.15	Pass
1613.8 to 1614	-95	1	40	47.71	-7.29	-17.1	-9.81	Pass
1614 to 1620	-70	0.004	30	47.71	7.71	-38.07	-45.78	Pass
1620 to 1624.5	-70	0.004	20	47.71	-2.29	-34.32	-32.03	Pass
1624.5 to 1625.5	-70	0.004	10	47.71	-12.29	-35.34	-23.05	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.71	-20.99	-46.54	-25.55	Pass
1626.5 to 1653.465	-70	0.004	0.8	47.71	-21.49	-23	-1.51	Pass
1653.535 to 1660	-70	0.004	0.8	47.71	-21.49	-22.66	-1.17	Pass
1660 to 1670	-19.5	0.02	0.8	47.71	29.01	-20.95	-49.96	Pass
1670 to 1735	-60	0.004	0.8	47.71	-11.49	-38.69	-27.20	Pass
1735 to 1865	-105	0.004	50	47.71	-7.29	-47.65	-40.36	Pass
1865 to 3250	-105	0.004	20	47.71	-37.29	-48.09	-10.80	Pass
3250 to 3330	-105	0.004	50	47.71	-7.29	-48.08	-40.79	Pass
3330 to 4000	-105	0.004	40	47.71	-17.29	-47.09	-29.80	Pass
4000 to 12000	-105	0.004	50	47.71	-7.29	-34.64	-27.35	Pass
12000 to 18000	-70	0.004	15	47.71	-7.29	-28.26	-20.97	Pass

C8400_ Aviation QPSK_ 6K80G1E								
Specifications				1660.5 MHz				
Frequency Range	FCC Limit 87.139(i)(1)	RBW (MHz)	DLNA Type F Rejection	Output Power	Calculated Limit	Spurious Level at EUT TX Port	Margin	Pass / Fail
MHz	dBc	MHz	dB	dBm	dBm	dBm	dB	
.010 to 1525	-135	0.004	80	47.24	-7.76	-48.97	-41.21	Pass
1525 to 1559	-203	0.004	120	47.24	-35.76	-47.13	-11.37	Pass
1559 to 1585	-155	1	111	47.24	3.24	-25.03	-28.27	Pass
1585 to 1605	-143	1	95	47.24	-0.76	-33.96	-33.20	Pass
1605 to1610	-117	1	62	47.24	-7.76	-22.55	-14.79	Pass
1610 to 1610.6	-95	1	40	47.24	-7.76	-18.16	-10.40	Pass
1610.6 to 1613.8	-49	1	40	47.24	38.24	-17.51	-55.75	Pass
1613.8 to 1614	-95	1	40	47.24	-7.76	-17.83	-10.07	Pass
1614 to 1620	-70	0.004	30	47.24	7.24	-35.79	-43.03	Pass
1620 to 1624.5	-70	0.004	20	47.24	-2.76	-34.53	-31.77	Pass
1624.5 to 1625.5	-70	0.004	10	47.24	-12.76	-35.79	-23.03	Pass
1625.5 to 1626.5	-70	0.004	1.3	47.24	-21.46	-46.97	-25.51	Pass
1626.5 to 1660.465	-70	0.004	0.8	47.24	-21.96	-23.09	-1.13	Pass
1660.535 to 1670	-19.5	0.02	0.8	47.24	28.54	3.52	-25.02	Pass
1670 to 1735	-60	0.004	0.8	47.24	-11.96	-38.09	-26.13	Pass
1735 to 1865	-105	0.004	50	47.24	-7.76	-46.79	-39.03	Pass
1865 to 3250	-105	0.004	20	47.24	-37.76	-48.52	-10.76	Pass
3250 to 3330	-105	0.004	50	47.24	-7.76	-42.33	-34.57	Pass
3330 to 4000	-105	0.004	40	47.24	-17.76	-47.54	-29.78	Pass
4000 to 12000	-105	0.004	50	47.24	-7.76	-34.32	-26.56	Pass
12000 to 18000	-70	0.004	15	47.24	-7.76	-27.08	-19.32	Pass

Annex A.1 – thru A.4 – Conducted Emissions Limitations per 87.139(i)(1).

Refer to Annex A1 thru A.4 for Conducted Emission Limitations plots per 87.139(i)(1).

Emissions Limitations – Conducted per 87.139(i)(2)(3)

Engineer: Greg Corbin

Test Dates:5/2/2025

Test Procedure

The EUT was connected as shown in the test set-up below.
The attenuator and cable losses were input into the analyzer as a reference level offset to ensure that accurate measurements were obtained.

The EUT needs to meet the emission requirements of Part 87.139(i)(2)(3) for aircraft earth stations using G1D, G1E, or G1W emissions in the 1646.5-1660.5 MHz frequency band.

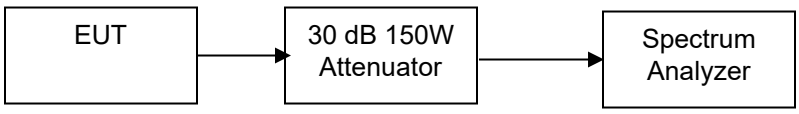
87.139(i)
(2) The transmitter emission limit is a function of the modulation type and symbol rate (SR). Symbol Rate is expressed in symbols per second.
(3) While transmitting a single modulated signal at the rated output power of the transmitter, the emissions must be attenuated below the maximum emission level by at least:

Frequency Offset (normalized to SR)	**Attenuation (dB)**
±0.75 × SR	0
±1.40 × SR	20
±2.95 × SR	40

Where:
SR = Symbol Rate,
SR = 1 × channel rate for BPSK,
SR = 0.5 × channel rate for QPSK.
The mask shall be defined by drawing straight lines through the above points.

87.139(i)(2)(3)									
Bearer	R/T600		R/T1200		R/T10500		C8400		Attenuation
Modulation	BPSK		BPSK		QPSK		QPSK		
ksym/s	0.6		1.2		5.25		4.2		
Frequency Offset (normalized to SR)	+	-	+	-	+	-	+	-	dB
±0.75 × SR	0.45	0.45	0.9	0.9	3.9375	3.9375	3.15	3.15	0
±1.40 × SR	0.84	0.84	1.68	1.68	7.35	7.35	5.88	5.88	20
±2.95 × SR	1.77	1.77	3.54	3.54	15.4875	15.4875	12.39	12.39	40

Conducted Spurious Emissions Test Setup



Annex B – Conducted Emissions Limitations per 87.139(i)(2)(3).

Refer to Annex B for Conducted Emission Limitations plots per 87.139(i)(2)(3)**.**

Emissions Limitations _ Radiated

Engineer: Greg Corbin

Test Dates: 5/7/2025

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm.

The frequency of investigation was from 30 MHz to the 10th Harmonic.

This test is used to verify the emissions from cabinet radiation, as such only a sample of modulations and frequencies were used to verify the emissions produced by cabinet radiations.

The EUT was set to transmit at maximum power with the RF output terminated into 50-ohm 150w terminations.

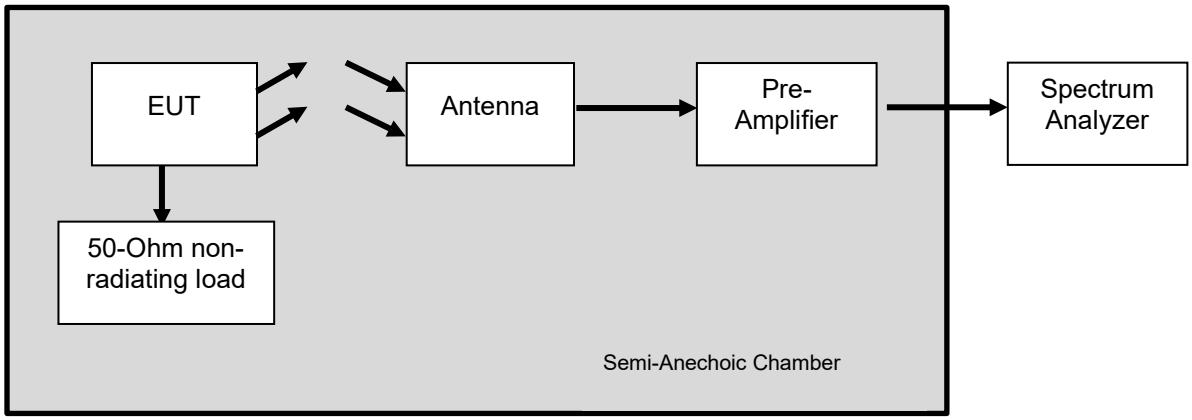
The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.
Pre-scans were performed with a peak detector set to max hold.
Additional measurements for any emissions near or over the limit were measured with an average detector.
There were no peak emissions within 10 dB of the limit, so no average emission data was recorded.

The Radiated Emission measurements were compared to the 87.139(a)(3) limit

Limit in dB=43+10log10pY(transmitter power in Watts)

For 1 – 17 GHz measurements, Marker 1 (M1) in the graphs is the fundamental transmit frequency and is excluded from the measurements.

Radiated Spurious Emissions Test Setup



Radiated Emissions Limitations Summary Table

Modulation and Channel	Frequency Range	Freq	Power	Limit	Margin	Pass / Fail
		MHz	dBm	dBm	dB	
RT1200, 1646.5 MHz	30 - 1000 MHz	136.54	-53.5	-13	-40.5	P
RT1200, 1646.5 MHz	1.0 - 17 GHz	14646.1	-39.4	-13	-26.4	P
RT10500, 1653.5 MHz	30 - 1000 MHz	249.24	-49.9	-13	-36.9	P
RT10500, 1653.5 MHz	1.0 - 17 GHz	14651.1	-38.0	-13	-25	P
C8400, 1660.5 MHz	30 - 1000 MHz	360.12	-54.0	-13	-41	P
C8400, 1660.5 MHz	1.0 - 17 GHz	14751.6	-37.7	-13	-24.7	P

Annex C– Radiated Emissions Limitations

Refer to Annex C for Radiated Emission Limitations plots.

Occupied Bandwidth

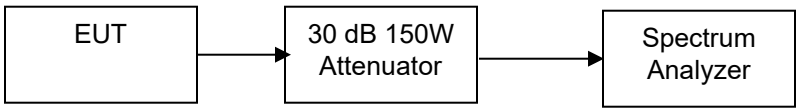
Engineer: Greg Corbin

Test Date:4/28/2025

Test Procedure

The EUT was connected directly to a spectrum analyzer. The 99% and -26 dB occupied bandwidth of the modulated output was measured and plotted.

Occupied Bandwidth Test Set-up



Occupied Bandwidth Test Results

Modulation	Frequency (MHz)	Measured Bandwidth (kHz)	
		99%	-26 dB
RT600	1646.5	0.771	0.948
RT1200	1646.5	1.46	1.73
RT10500	1646.5	8.52	9.99
C8400	1646.5	5.61	6.56

Annex D – Occupied Bandwidth

Refer to Annex D for Occupied Bandwidth plots.

Frequency Tolerance (Temperature Variation)

Test Engineer: Greg Corbin

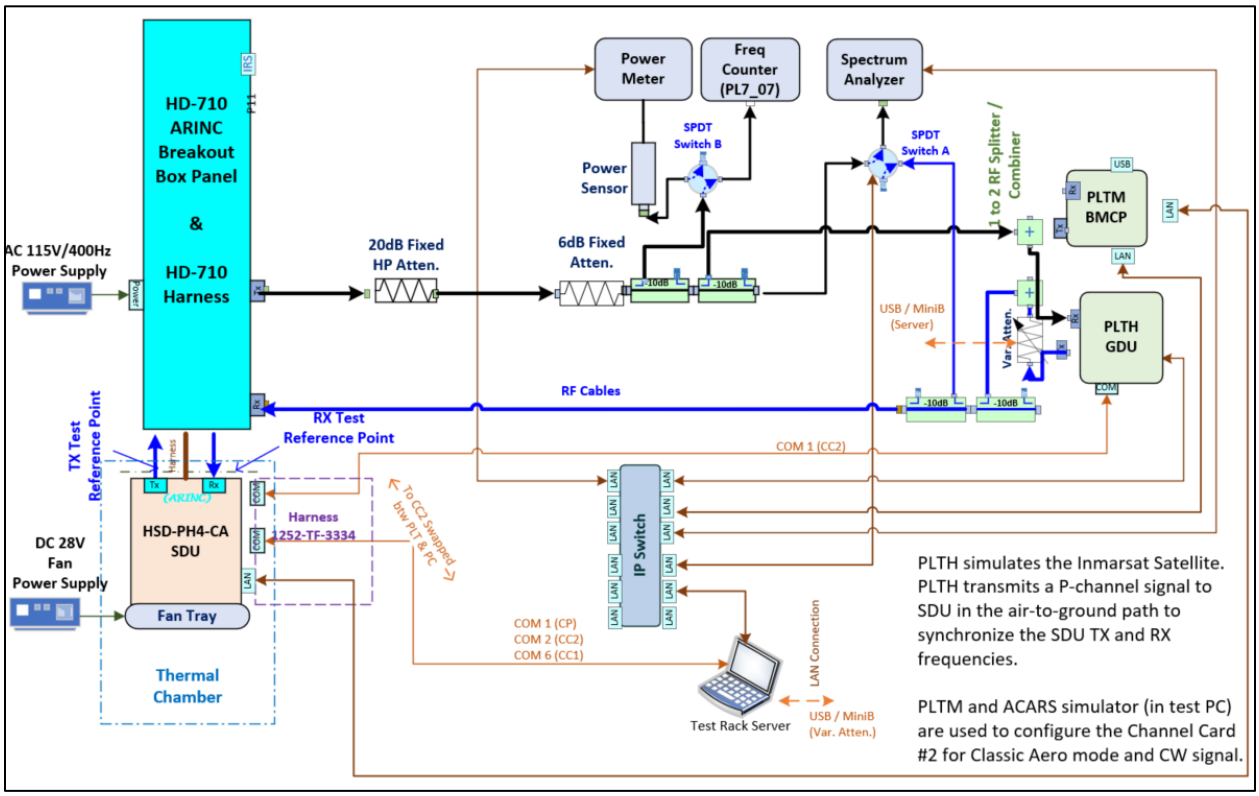
Test Date: 6/24/2025

Test Procedure

In normal operation the EUT has the transmit frequency locked to the ground station network control equipment to control the frequency of the transmit signal.
The frequency stability test was performed at the manufacturer's facility since the network control equipment could not be sent to the CTL test lab.
CTL provided the equipment required to measure the frequency (spectrum analyzer), monitor the temperature (data logger) and to set the AC and DC voltage for the voltage variation test (DMM).
The EUT was placed in an environmental test chamber and the temperature was raised from -30°C to 50°C in 10°C increments.
FCC limit = 320 Hz

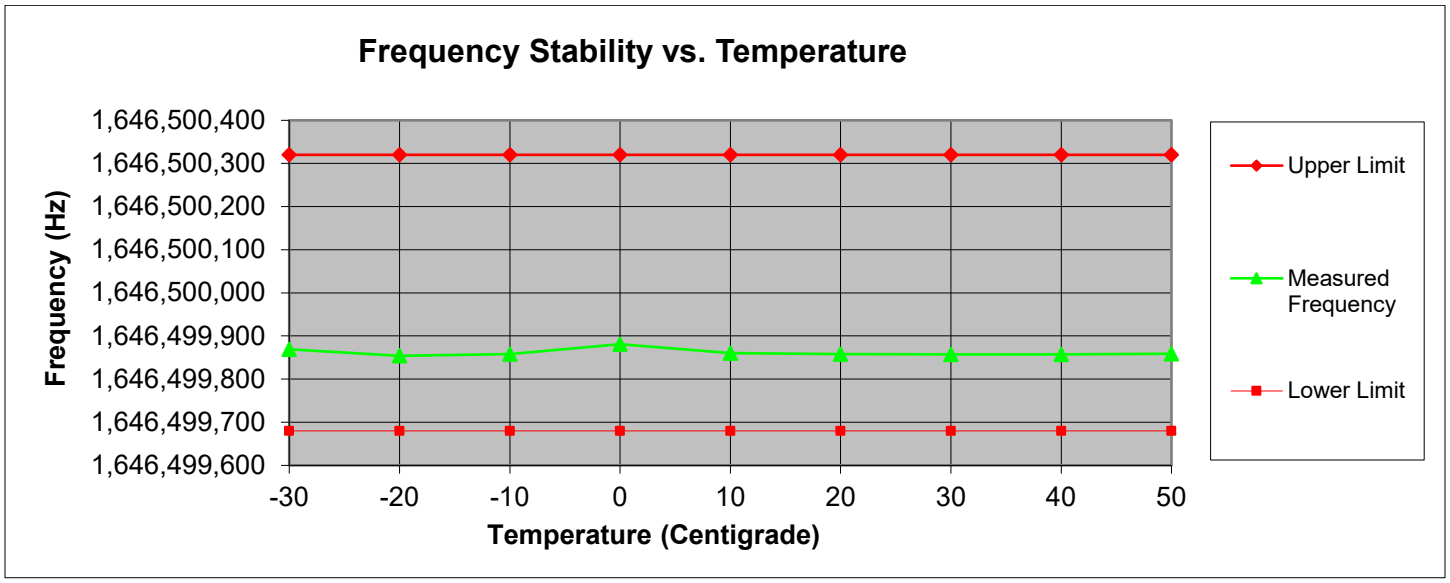
The test-set-up block diagram shown below was provided by the manufacturer to show the network control equipment.
The manufacturer's test equipment does not have a ISO 17025 calibration so the spectrum analyzer, data logger, and DMM were provided by CTL with ISO 17025 calibrations to record the frequency, monitor the temperature and vary the input voltage.
CTL monitored the entire test remotely via video cameras.
A different SDU (SN:0018) was used for the frequency Stability test.
The EUT can be powered with either +28 vdc or 115 vac.
For the temperature variation test the input voltage was set to 115 vac.

Frequency Stability Test Set-up



Frequency vs Temperature test results

Tuned Frequency (Hz)	Frequency Tolerance Hz	Upper Limit (Hz)	Lower Limit (Hz)	Temperature centigrade	Measured Frequency (Hz)	Upper Margin (Hz)	Lower Margin (Hz)
1,646,500,000	320	1,646,500,320	1,646,499,680	-30	1,646,499,869	-451	189
1,646,500,000	320	1,646,500,320	1,646,499,680	-20	1,646,499,854	-466	174
1,646,500,000	320	1,646,500,320	1,646,499,680	-10	1,646,499,858	-462	178
1,646,500,000	320	1,646,500,320	1,646,499,680	0	1,646,499,881	-439	201
1,646,500,000	320	1,646,500,320	1,646,499,680	10	1,646,499,860	-460	180
1,646,500,000	320	1,646,500,320	1,646,499,680	20	1,646,499,858	-462	178
1,646,500,000	320	1,646,500,320	1,646,499,680	30	1,646,499,857	-463	177
1,646,500,000	320	1,646,500,320	1,646,499,680	40	1,646,499,857	-463	177
1,646,500,000	320	1,646,500,320	1,646,499,680	50	1,646,499,859	-461	179



Frequency Tolerance (Voltage Variation)

Engineer: Greg Corbin

Test Date: 6/24/2025

Test Procedure

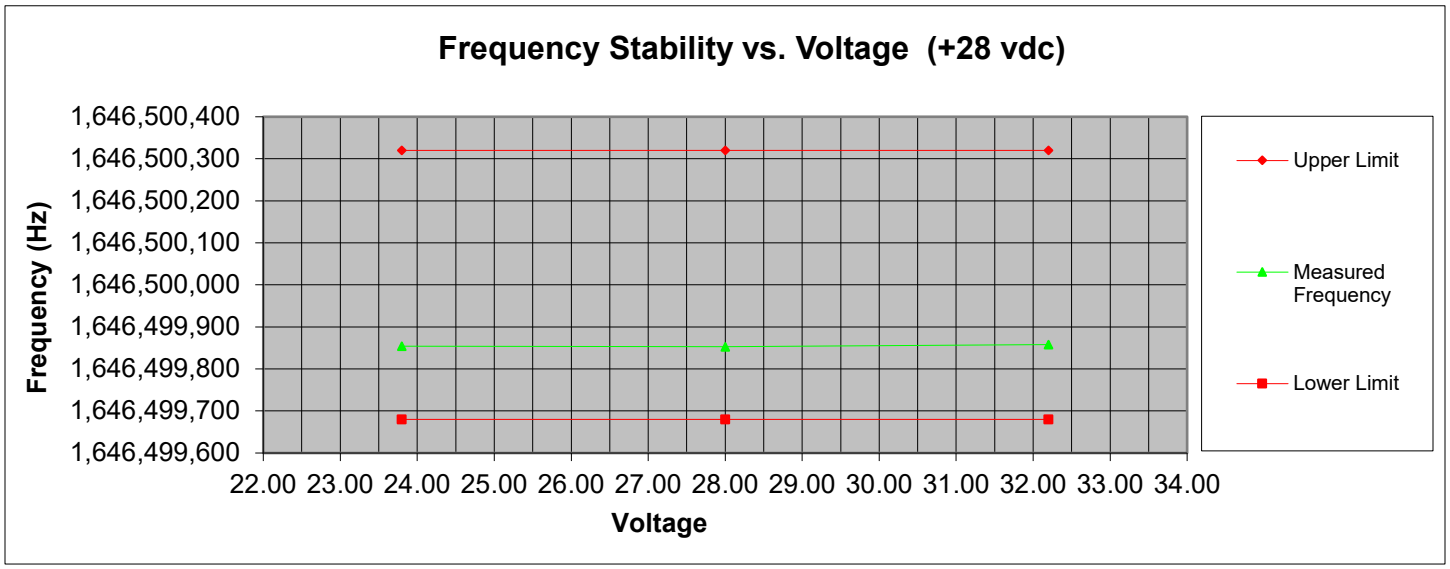
The EUT was tested as described in the Frequency Tolerance Temperature Variation test in this report.

The EUT can be powered with either +28 vdc or 115 vac.
At 20 deg C, the EUT output frequency was measured at the nominal voltage (28 vdc and 115 vac) and at the ± 15% voltage levels for the EUT.

FCC limit = 320 Hz

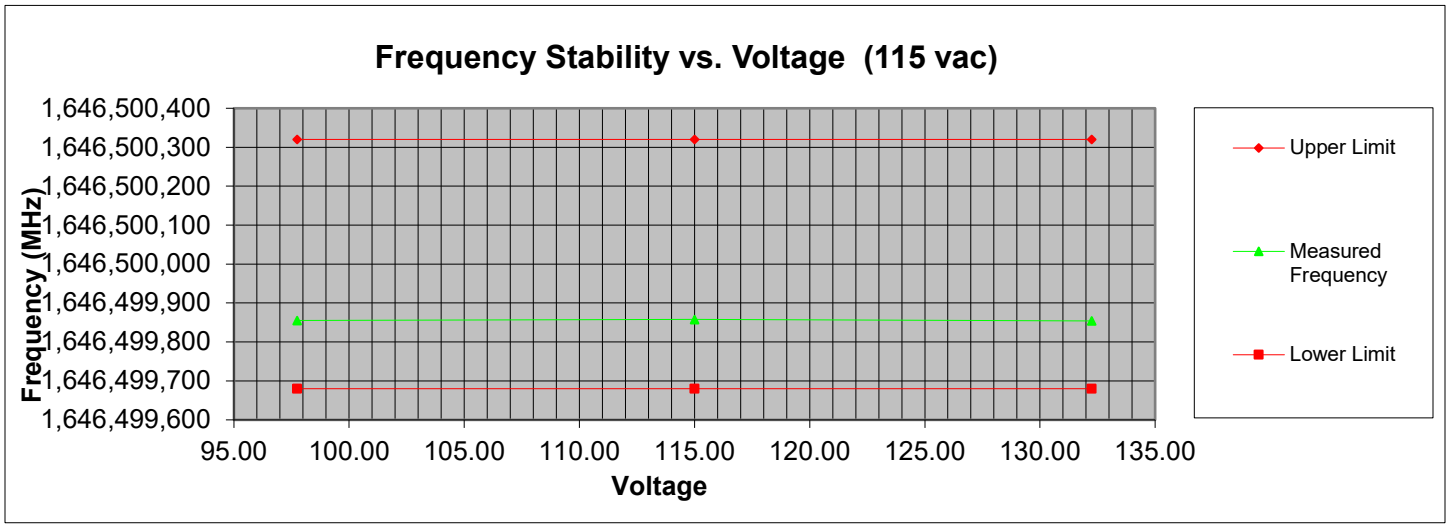
Voltage vs Temperature test results (+28 vdc)

Tuned Frequency (Hz)	Frequency Tolerance Hz	Upper Limit (Hz)	Lower Limit (Hz)	Nominal Voltage (vdc)	Voltage (vdc)	Measured Frequency (Hz)	Upper Margin (Hz)	Lower Margin (Hz)
1646500000	320	1,646,500,320	1,646,499,680	28.00	23.80	1646499854	-466	174
1646500000	320	1,646,500,320	1,646,499,680	28.00	28.00	1646499853	-467	173
1646500000	320	1,646,500,320	1,646,499,680	28.00	32.20	1646499858	-462	178



Voltage vs Temperature test results (115 vac)

Tuned Frequency (Hz)	Frequency Tolerance Hz	Upper Limit (Hz)	Lower Limit (Hz)	Nominal Voltage (vac)	Voltage (vac)	Measured Frequency (Hz)	Upper Margin (Hz)	Lower Margin (Hz)
1646500000	320	1,646,500,320	1,646,499,680	115	97.75	1,646,499,855	-465	175
1646500000	320	1,646,500,320	1,646,499,680	115	115.00	1,646,499,858	-462	178
1646500000	320	1,646,500,320	1,646,499,680	115	132.25	1,646,499,854	-466	174



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	ARA	DRG-118/A	i00271	8/9/2024	8/9/26
Data Logger	Fluke	Hydra Data Bucket	i00343	6/19/2024	6/19/25 **
Attenuator, 30 dB, 150W	Narda	769-30	i00347	Verified on: 4/28/25	
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	2/27/25	2/27/27
Tunable Notch Filter	Trilithic	3VNF1500/25090-50-KK	i00410	Verified on: 5/6/25	
Spectrum Analyzer	Textronix	RSA5126A	i00424	6/25/2024	6/25/25 **
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
Voltmeter	Fluke	79III	i00499	10/15/24	10/15/25
MXE EMI receiver	Keysight	N9038A	i00552	3/17/25	3/17/26
Spectrum analyzer	Agilent	E4402B	i00580	6/9/25	6/9/26
High Pass Filter (2.2 GHz)	Wainwright	WHKX2.2/12.75G-10SS	I00677	Verified on: 5/6/25	
Temp./humidity/pressure monitor	Omega Engineering	iBTHX-W-5	i00686	1/25/25	1/25/26
Preamplifier	Eravant	SBB-0115034019-2F2F-E3	i00722	Verified on: 12/4/24	
Preamplifier	COM-Power	PAM-103	i00734	Verified on: 6/27/24	

** 30 day calibration extension approved by quality manager.

In addition to the above-listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions	± 4.5 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)

U_{lab} is less than or equal to U_{ETSI} therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

Honeywell Network Support Equipment
(for reference only)
Honeywell Network support equipment as described on page 30 for the frequency stability test.
Frequency stability test was monitored with CTL 17025 calibrated equipment as described on page 30 and listed on page 34.

Description	Manufacturer / Model / Part Number	QTY	Serial Number / Asset Number
Test Rack	Honeywell	1	Rack 0057/ Asset #7698
20dB High Power Fixed Attenuator	Centric RF 100W C18N1005-20 N Attenuator 18GHz 100W 20dB Bidirectional	1	S/N: 3075
6 dB Fixed Attenuator, DC - 18000 MHz, 50Ω	Mini Circuits BW-S6W20+	1	N/A
DIR COUPLER, 0.5-18.5 GHz, 10 dB, SMA(F)	Krytar 1851	2	SN: 214149, 215241
2 Ways Power Splitter, 10 - 2000 MHz, 50Ω	Mini-Circuits ZFSC-2-11-S+	2	N/A
RF Switch	Mini-Circuits RF-2CSPDT-A18 DC to 18GHz	1	S/N 11703270091
Directional 10dB Coupler	Pasternack NB DIR Coupler PE2242-10	2	NA
Variable Attenuator	Vaunix LDA-602EH	1	S/N: 17465
Power Meter	Keysight N1914A EPM Series Power Meter	1	Asset /#06738 / TEA156436
Power Sensor	Agilent E4413A E Series CW Power Sensor	1	Assest #NC0674 TEA156222
Test PC	COMARK ETL ID 06-ETL50-001 P/N TCS-025-02022-001	1	S/N T17264835 Asset #7700
Physical Layer tester for SBB MTRs	Squarepeg PLTM_02033	1	PLTM_02033 / Asset #7466
Physical Layer Tester for Classic tests - RFU	Squarepeg PLTH_106 FRU	1	PLTH_106 / Asset #05926
Physical Layer Tester for Classic tests - CU	Squarepeg PLTH_106 CU	1	PLTH_106 / Asset #05925
ARINC Fan Tray 8MCU with 28VDC fan	ECS P/N 6100-101	1	LOT# 962211501
DC Fan	EG&G ROTRON FSCM-82877 P/N 011097	1	S/N ACE473
HSD-MK2 Cable Assembly	EMS-1252-TF-3801 Rev B	1	S/N 002-2024
Breakout Panel	Honeywell 1252-TF-3497 Rev 02	1	N/A
Maintenance Cable	Honeywell 1252-TF-3334 Rev.1.0	1	N/A
AC Power Suppler	apt Associated Power Technologies 7000 Series Programmable AC power source	1	Asset #06936
DC Power Supply	XANTREX XFR 35-35	1	EMS asset 01854

DC Power Suppler	Sorensen DLM- 40-15	1	Asset #7011 / TEA156391
Thermal Chamber	ESPEC	1	CHMB0005 / Asset #04844 / TEA153615
ARINC Fan Tray 8MCU with 28VDC fan	ECS P/N200-91117-102	1	LOT# 213224352123
DC Fan	ECS P/N S0085-138 / AETECK ROTRON 011858000	1	S/N I15250093
DC Fan	ECS P/N S0085-138 / AETECK ROTRON 011858000	1	S/N I23030253

END OF TEST REPORT