Test Report

Prepared for: Rivian Automotive, LLC.

Model: PT00590065-D
Serial Number: 000152

FCC ID: 2AW3A-2WWG23CC / IC ID: 26958-2NAT23AXM

Project No: p2410006

Test Results: Pass

To

FCC Part 15.225/15.209: 2024
And
RSS 210: Issue 10
(December 2019) / RSS Gen: Issue 5
(April 2018)

Date of Issue: February 9, 2024

On the behalf of the applicant:	**Rivian Automotive, LLC.** **14600 Myford Rd** **Irvine CA, 92606.**
Attention of:	**Sep Zaker, Senior Manager, Range, Wireless & Material Compliance Ph: 1-888-784-4261** **E-Mail: sepzaker@rivian.com**
Prepared By:	**Compliance Testing, LLC** **Mesa, AZ 85204** **(480) 926-3100 phone / (480) 926-3598 fax** **www.compliancetesting.com** **ANAB Cert#: AT-2901** **FCC Site Reg. #US2901** **ISED Site Reg. #2044A-2**

Reviewed / Authorized By:

Jeremiah Darden, Principal Engineer

Test Results Summary

Specification		Test Name	Pass, Fail, N/A	Comments	Test Date
FCC	RSS				
FCC 15.207	RSS-210	A/C Powerline Conducted Emissions	N/A	EUT is battery powered. Test N/A	N/A
FCC 15.225(a)	RSS-210	Field Strength of Fundamental Radiated Emissions	Pass	None	February 2, 2024
FCC 15.225(b)(c)(d)	RSS-210	Radiated Emissions	Pass	None	February 2, 2024
FCC 15.225(e)	RSS-210	Frequency Stability	Pass	None	February 8, 2024
N/A	RSS-Gen	99% Occupied Bandwidth	Pass	None	February 6, 2024

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*.

References/Methods	Description
ANSI C63.4-2014	Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz.
ANSI C63.10:2020	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CFR47, Part 15, Subpart C	Intentional Radiators
RSS-210: Issue 10	Licence-Exempt Radio Apparatus: Category I Equipment
RSS-GEN: Issue 5	General Requirements for Compliance of Radio Apparatus
ISO/IEC 17025:2017	General requirements for the Competence of Testing and Calibrations Laboratories

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	February 9, 2024	Jeremiah Darden	Original Document

Current revision of the test report replaces any prior versions. Only the current version of the test report is valid.

EUT Description

Model:	**PT00590065-D**
Serial:	**000152**
Firmware:	**Version 42**
Software:	**SW:23.41.01/00/04.37**
Description:	**DUT receives commands over the CAN bus, relating to NFC tag detection, and enabling Wireless Power Charging. DUT is powered by LV nominal 13.5VDC from Vehicle Battery. NFC operating at 13.56MHz**
Additional Information:	**Labeling:** **FCC ID: 2AW3A-2WWG23CC** **IC ID: 26958-2NAT23AXM** **15.203: Antenna Requirement**: X The antenna is permanently attached to the EUT ___ The antenna uses a unique coupling ___ The EUT must be professionally installed ___ The antenna requirement does not apply
Receipt of Sample(s):	**February 1, 2024**
EUT Condition:	**Visual Damage** No **State of Development** Production/Production Equivalent

The applicant has been cautioned as to the following:

15.21 Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator the responsible part may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with methods and standards listed on the test summary of this report.

Specification		Test Name	Method Deviations/Additions
FCC	RSS		
FCC 15.225(a)	RSS-210	Field Strength of Fundamental Radiated Emissions	No
FCC 15.225(b)(c)(d)	RSS-210	Radiated Emissions	No
FCC 15.225(e)	RSS-210	Frequency Stability	No
N/A	RSS-Gen	99% Occupied Bandwidth	No

Standard Engineering Practices

Unless otherwise indicated, the procedures contained in ANSI C63.10, RSS-210/RSS-Gen 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.

Standard Test Conditions and Engineering Practices

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 (ºC)	Humidity (%)	Barometric Pressure (mbar)
23.28 – 22.95	34.3 – 35.9	967.1 – 974.9

Test Setup and Modes of Operation

EUT Operation during Tests
The EUT was powered by a DC vehicle/car battery and operating in a normal operating mode where it is receiving CAN bus signals and all digital functions were exercised.

EUT:

Qty	Description	Manufacturer	Model	S/N
1	NFC/WPT/CAN Dock	Rivian Automotive, LLC.	PT00590065-D	000152

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Marine Battery (Nominal 12VDC)	Super Start	27D0MJ	I00724

Cables:

Qty	Description	Length (M)	Ferrites (Y/N)	Shielding Y/N	Shielded Hood Y/N	Termination / Connection
1	DC Cable	2.6	N	N	N	EUT to Marine Battery
1	CAN Bus Cable	1.6	N	N	N	EUT to Resistor

Software/Firmware:

Name	Description	Version	Installation Info
WPT Version	EUT Software	SW:23.41.01/00/04.37	Installed on EUT

Modifications to EUT(s) (Y/N): N

Field Strength of Fundamental Radiated Emissions

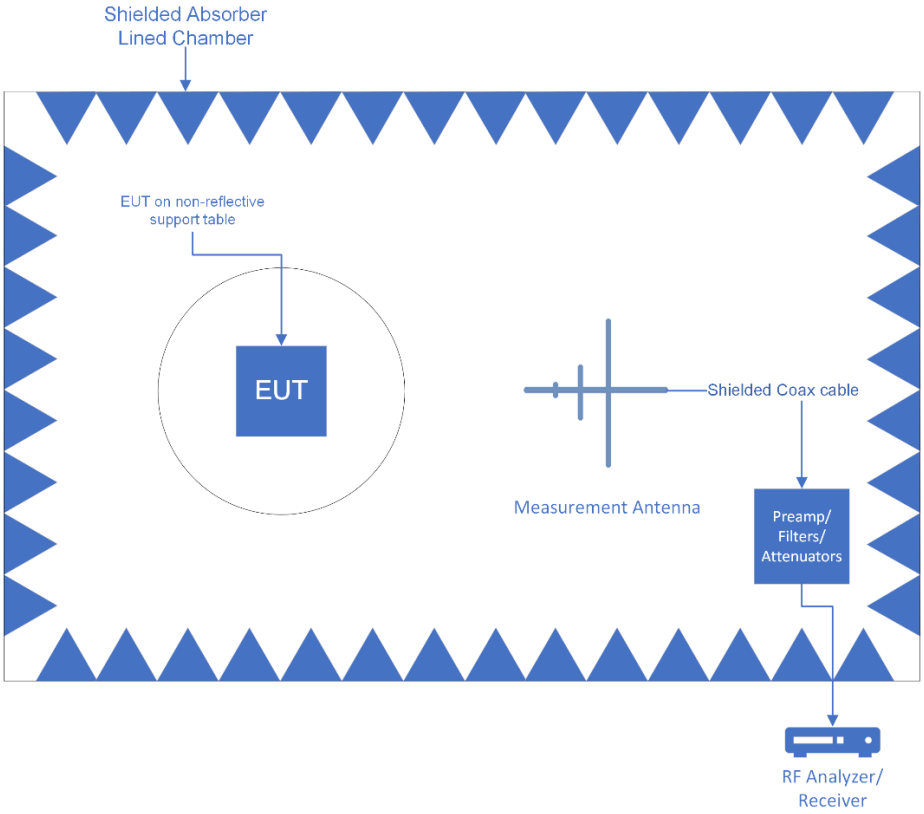
Engineer: Jeremiah Darden

Test Date: February 2, 2024

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving loop 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 3 different axis. Final measurements were taken using the worse case loop as found by multiple scans (loop parallel to EUT, perpendicular to EUT, and Parallel to ground). Correction factors for distance extrapolate for 300m and/or 30m limits were applied where appropriate using a 40dB/decade adjustment.

Basic Test Setup



	Settings 9kHz-150kHz	Settings 150kHz-30MHz	Settings Below 1GHz	Settings Above 1GHz
RBW	200Hz	9kHz	120 kHz	1 MHz
VBW	1kHz	30kHz	300 kHz	3 MHz
Detector	PK, QP or AVG	PK, QP or AVG	Quasi Peak	Peak / Average

Sample Calculations

Corrected Value = Measured Value + Correction factor

Correction factor = Antenna Correction Factor + Cable loss + Preamp/Attenuator Factor

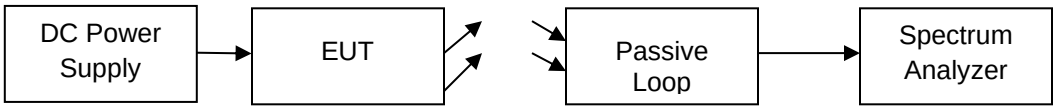
Frequency Stability

Engineer: Jeremiah Darden
Test Date: February 7, 2024

Test Procedure

The EUT was placed in an environmental test chamber and a frequency counter was utilized to verify that the frequency stability met the requirement for frequency stability across the temperature range from -20°C to +50°C. A variable DC power supply was used to vary the voltage from 85% to 115% of the rated voltage. Measurements were taken at startup, 2min, 5min and 10min per the standard. Worse case results were reported

Test Setup



FREQUENCY STABILITY RESULTS

Voltage (%)	Power (VDC)	Temp ©	Frequency (Hz)	Freq Deviation (Hz)	Deviation (%)	Deviation (PPM)	Limit
100	13.5	20	13560000	0	0.0000%	0	.01% / 100ppm
115	15.5	20	13560100	100	0.0007%	7	.01% / 100ppm
85	11.5	20	13560100	100	0.0007%	7	.01% / 100ppm
100	13.5	50	13559866	-134	-0.0010%	10	.01% / 100ppm
100	13.5	40	13559833	-167	-0.0012%	12	.01% / 100ppm
100	13.5	30	13559666	-334	-0.0025%	25	.01% / 100ppm
100	13.5	20	13560200	200	0.0015%	15	.01% / 100ppm
100	13.5	10	13560166	166	0.0012%	12	.01% / 100ppm
100	13.5	0	13560333	333	0.0025%	25	.01% / 100ppm
100	13.5	-10	13560366	366	0.0027%	27	. .01% / 100ppm
100	13.5	-20	13560333	333	0.0025%	25	.01% / 100ppm
Results = Pass							

See Annex A for Captures

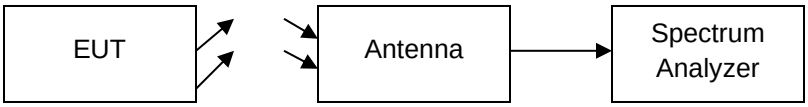
Radiated Emissions

Engineer: Jeremiah Darden
Test Date: February 2, 2024

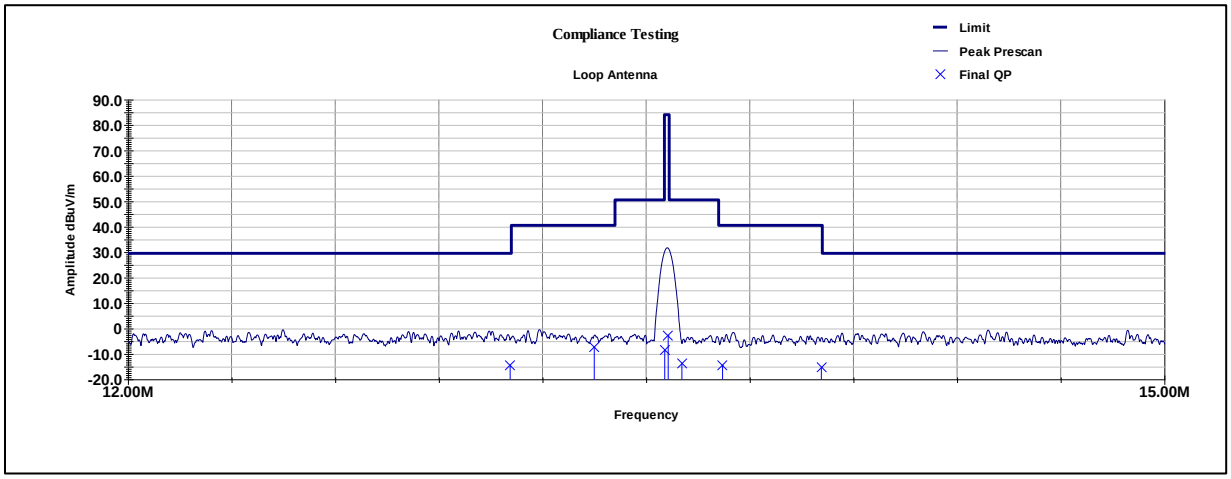
Test Procedure

The EUT was tested in a semi-anechoic chamber at a distance of 3 meters from the receiving antenna. A spectrum analyzer was used to verify that the UUT met the requirements for Radiated Emissions. The spectrum for each tuned frequency was examined beyond the 10th harmonic. The EUT was tested by rotating it 360 degrees with the antenna in 3 different axis. Final measurements were taken using the worse case loop as found by multiple scans. Correction factors for distance extrapolate for 300m and/or 30m limits were applied where appropriate using a 40dB/decade adjustment.

Test Setup



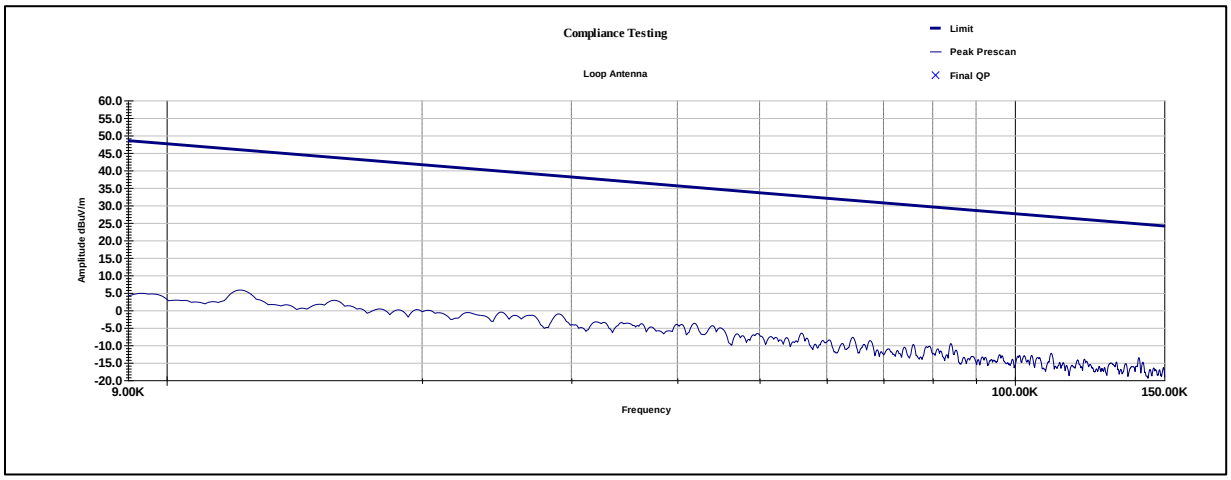
Radiated Emissions of Fundamental

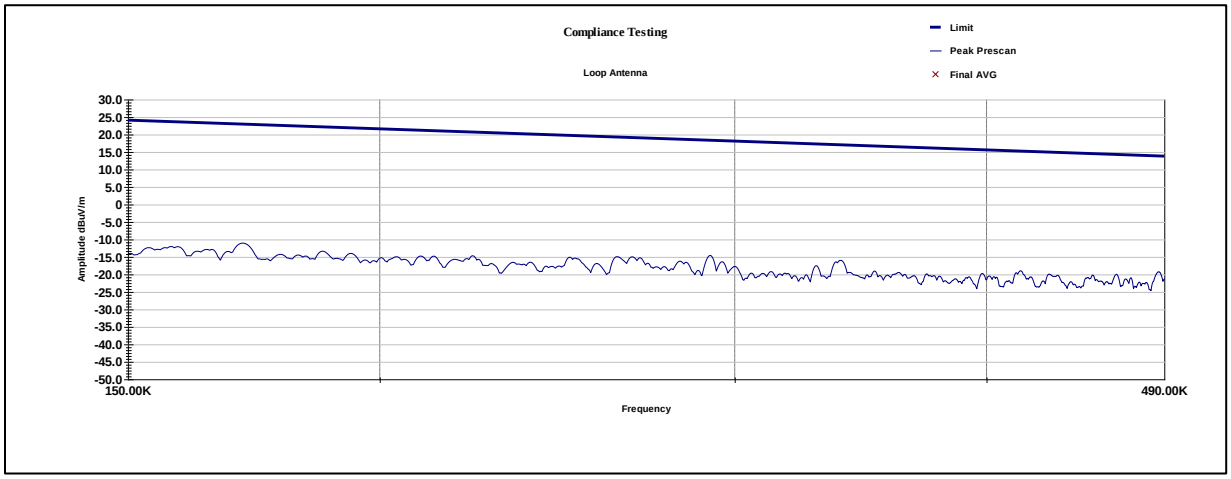


Frequency	Azimuth	Height	Raw QP	Correction	Final QP	Limit	QP Margin
	deg	cm	dBuV	dB	dBuV/m	dBuV/m	dB
13.106	220.00	230.00	7.45	-22.03	-14.60	29.50	-44.10
13.35	265.00	143.00	14.78	-22.03	-7.30	40.50	-47.80
13.554	267.00	130.00	13.35	-22.03	-8.70	84.00	-92.70
13.564	267.00	130.00	19.34	-22.03	-2.70	84.00	-86.70
13.604	236.00	130.00	8.34	-22.03	-13.70	50.50	-64.20
13.721	262.00	169.00	7.65	-22.03	-14.40	40.50	-54.90
14.007	353.00	188.00	6.77	-22.03	-15.30	40.50	-55.80
Final = Raw + Path Loss							
Margin = Final - Limit							

Radiated Emissions 9kHz-490kHz

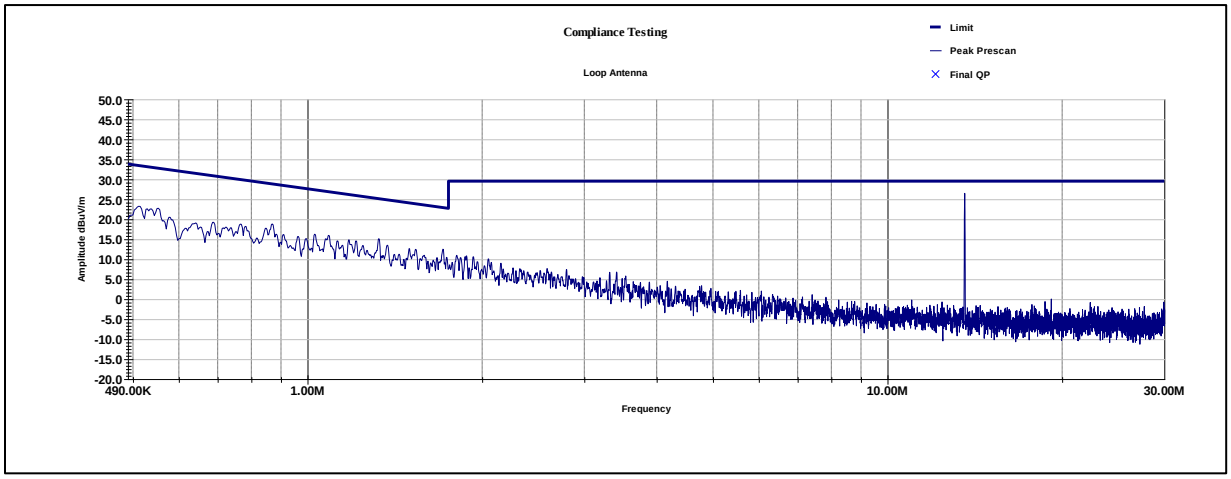
(No emissions within 20dB of limit to measure)

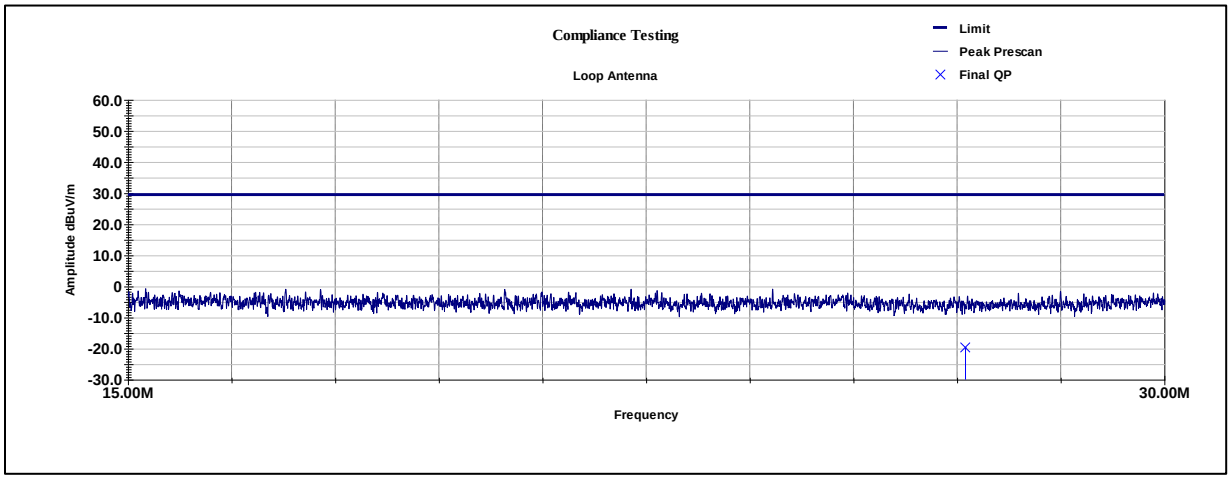




Radiated Emissions 490kHz-30MHz

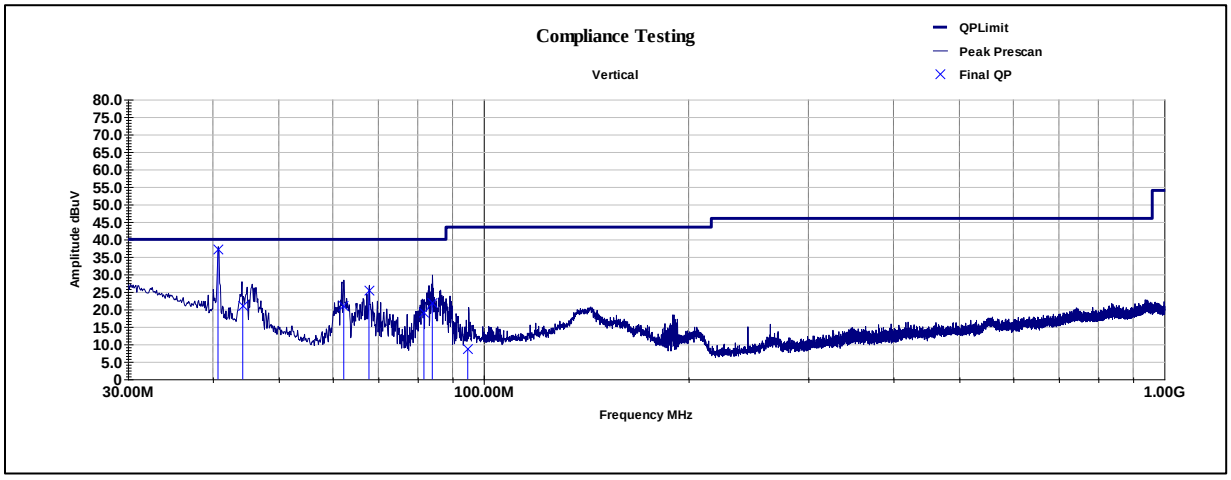
(No emissions outside of fundamental to measure.)



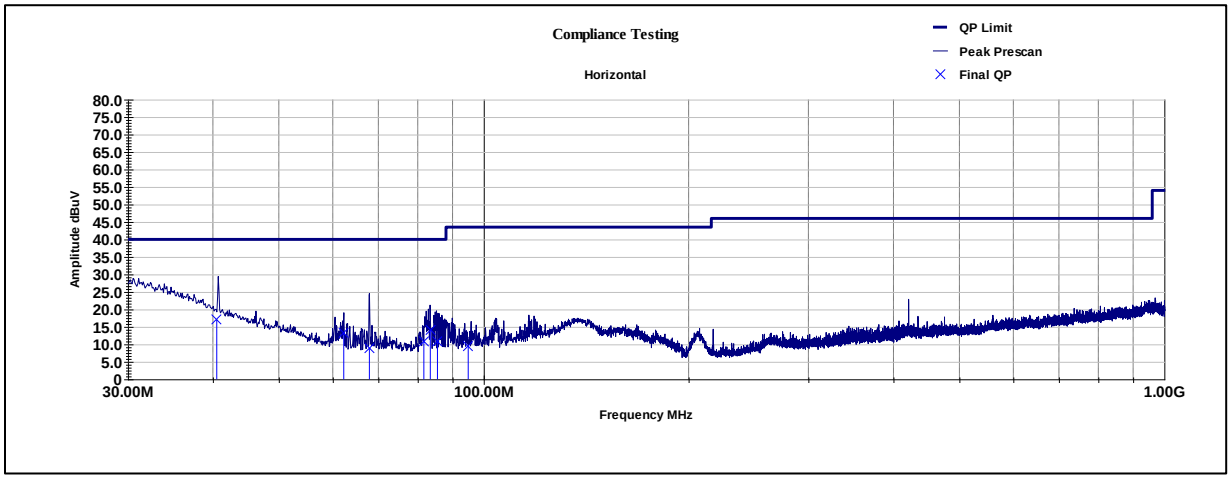


Frequency	Azimuth	Height	Raw QP	Correction	Final QP	Limit	QP Margin
	deg	cm	dBuV	dB	dBuV/m	dBuV/m	dB
27.123	237.00	242.00	2.81	-22.41	-19.60	29.50	-49.10
Final = Raw + Path Loss							
Margin = Final - Limit							

Radiated Emissions 30-1000MHz



Frequency	Azimuth	Height	Raw QP	Correction	Final QP	Limit	QP Margin
MHz	deg	cm	dBuV	dB	dBuV/m	dBuV/m	dB
40.684	315.00	105.00	74.41	-37.33	37.10	40.00	-2.90
44.253	77.00	105.00	59.18	-38.34	20.80	40.00	-19.20
62.275	225.00	100.00	62.35	-41.51	20.80	40.00	-19.20
67.831	230.00	201.00	66.36	-40.97	25.40	40.00	-14.60
81.686	175.00	100.00	58.34	-39.31	19.00	40.00	-21.00
84.012	171.00	100.00	60.61	-38.92	21.70	40.00	-18.30
94.726	0.00	270.00	45.07	-36.33	8.70	43.50	-34.80
Final = Raw + Path Loss							
Margin = Final - Limit							



Frequency	Azimuth	Height	Raw QP	Correction	Final QP	Limit	QP Margin
MHz	deg	cm	dBuV	dB	dBuV/m	dBuV/m	dB
40.525	237.00	325.00	52.76	-35.74	17.00	40.00	-23.00
62.283	204.00	327.00	54.62	-41.41	13.20	40.00	-26.80
67.912	167.00	352.00	49.89	-40.94	8.90	40.00	-31.10
81.667	275.00	191.00	49.72	-39.02	10.70	40.00	-29.30
83.462	257.00	175.00	53.08	-38.88	14.20	40.00	-25.80
85.496	292.00	394.00	49.57	-38.65	10.90	40.00	-29.10
94.869	73.00	318.00	46.62	-37.18	9.40	43.50	-34.10
Final = Raw + Path Loss							
Margin = Final - Limit							

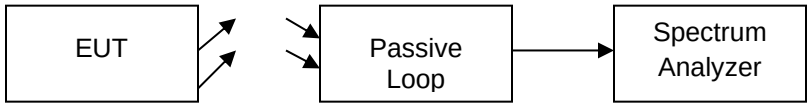
99% Occupied Bandwidth

Engineer: Jeremiah Darden
Test Date: February 6, 2024

Test Procedure

A spectrum analyzer and passive loop antenna was used was used to measure the 99% and 20dB occupied bandwidth. RBW was set within the range of 1-5% of the OBW. Max Peak setting on the analyzer was used and the highest power was adjusted to match the worse case field strength fundamental measurement.

Test Setup

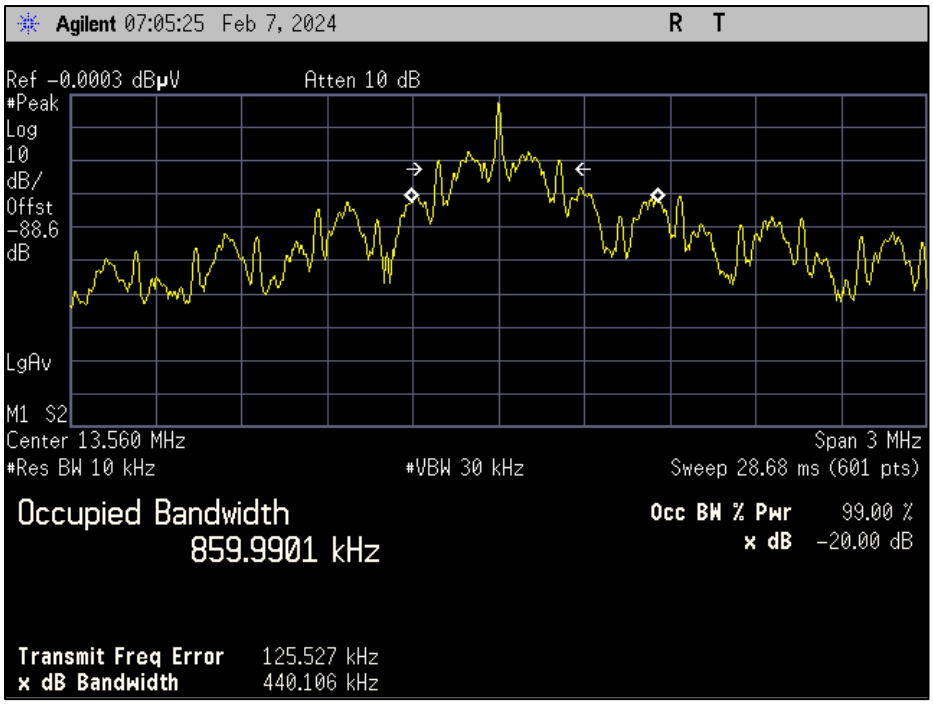


99% Bandwidth Summary

Frequency (MHz)	Recorded Measurement	Result
13.56	860 kHz	Pass

20dB Bandwidth Summary

Frequency (MHz)	Recorded Measurement	Result
13.56	440.1 kHz	Pass



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Bilog Antenna 0.030-1.0GHz	Schaffner	CBL6111C	i00349	02/07/23	02/06/25
Active Loop Antenna 1 kHz - 30 MHz	EMCO	6507	I00326	11/21/23	11/21/25
RF Amplifier 10MHz-50GHz, 40dB gain amp.	Eravant	SBB-0115034018-2F2F-E3	i00646	Verified on 07/28/23	Next Verification 07/28/24
9kHz-44GHz CISPR comp. receiver	Keysight/Agilent	N9038A	i00552	02/23/23	02/23/24
temperature/humidity/pressure probe	Omega Engineering, Inc.	iBTHX-W-5	i00630	02/14/23	02/14/24
temperature/humidity/pressure probe	Omega Engineering, Inc.	iBTHX-W-5	i00631	02/14/23	02/14/24
Multimeter	Fluke	179	i00488	06/19/23	06/19/24
Temperature chamber	Tenney Manufacturing	Tenney Jr.	i00027	NCR	
Hydra data bucket	Fluke	2635A	i00343	6/28/23	6/28/24
Digital multimeter	Fluke	87-III	i00319	5/8/23	5/8/24
DC power supply (0-20V, 0-1.5A; 0-35V, 0- .85A)	HP	E3611A	i00582	NCR	
Magnetic field pickup coil (20Hz – 500kHz)	EMCO	7604	i00081	NCR	
Traceable stopwatch	Thomas Scientific	1235C26	i00587	5/19/22	5/19/24

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 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

Measurement	U_{lab}
Radiated Emissions 9kHz-30MHz	± 3.6 dB
Radiated Emissions 30MHz-1000MHz	± 4.25 dB
Radiated Emissions – 1GHz-18GHz	± 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_{EMC} 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.

Annex A (Screen Captures for Frequency Stability)

See Separate Annex A for screen captures related to Frequency Stability

END OF TEST REPORT