Test Report – Products
Prüfbericht – Produkte

Certificate # 3331.02

Test Repot No. *Prüfbericht-Nr.:*	**US2457BO.001 Rev. 1**	**Order No.** Auftrags-Nr.:	P01270408 234197092	Page **1** of **53** *Seite **1** von **53***
Client Reference No.: *Kunden-Referenz-Nr.:*	2519046	**Order date:** *Auftragsdatum:*	09/13/2023	
Client: *Auftraggeber:*	It's Electric Inc.			
Identification/ Type No.: *Bezeichnung / Typ-Nr*	Brooklyn 718			
Order content: *Auftrags-Inhalt:*	RFID Radio Report for Level 2 EVSE FCC ID: 2BE2P-BROOKLYN			
Test specification: *Prüfgrundlage*	CFR Title 47 Subchapter A §Part 15.225 ISED RSS-2010 Issue 10			
Date of sample receipt: *Wareneingangsdatum:*	1/3/2024			
Test sample No: *Prüfmuster-Nr.:*	N/A			
Testing period: *Prüfzeitraum*	2/29/2024 - 3/20/2024			
Place of testing: *Ort der Prüfung:*	TUV Rheinland of North America Inc. 5015 Brandin Ct Fremont CA 94538 USA			
Testing laboratory: *Prüflaboratorium*	TUV Rheinland of North America, Inc.			
Test result*: *Prüfergebnis*:*	Pass			

Tested by: *geprüft von:*	Isaac Agular	**Authorized by:** *genehmigt von:*	Rachana Khanduri
Date: 3/22/2024 *Datum:*	Isaac Agular	**Issue Date:** 3/22/2024 *Ausstellungsdatum:*	Rkhanduri
Position / Stellung:	Test Engineer	**Position** / Stellung:	Expert

Others /
Sonstiges:

Condition of the test item at delivery:
Zustand des Prüfgegenstandes bei Anlieferung:

* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
** Legende:*	*P(ass) = entspricht o.g. Prüfgrundlage(n)*	*F(ail) = entspricht nicht o.g. Prüfgrundlage(n)*	*N/A = nicht anwendbar*	*N/T = nicht getestet*

This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

Remarks
Anmerkungen

1	The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request. *Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.* *Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report. *Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.* *Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.*
4	Electromagnetic Compatibility Test Report. The above product was found to be Compliant to the above test standard(s).

Product description
Produktbeschreibung

1	**Product details:** *Produktdetails:*	Level 2 EVSE
2	**Dimensions / Weight:** *Maße / Gewicht:*	111.76 cm x 17.78 cm x 14.78 cm/45 kg
3	**Operating elements:** *Bedienelemente:*	Nominal 208 Vac, 50-60 Hz, 32 A
4	**Equipment / Accessories:** *Ausstattung / Zubehör:*	--
5	**Used materials:** *Verwendete Materialien:*	--
6	**Other:** *Sonstiges:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
7	**Test sample obtaining:** *Prüfmusterbereitstellung:*	☒Sending by customer ☐Sampling by TÜV Rheinland Group ☐ others:

Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
1	03/22/2024	Original Report	Isaac Aguilar

Note: Latest revision report will replace all previous reports.

Table of Contents

1 Executive Summary 8

1.1 Scope 8

1.2 Purpose 8

1.3 Summary of Test Results 8

1.4 Special Accessories 8

1.5 Equipment Modifications 8

2 Laboratory Information 9

2.1 Accreditations & Endorsements 9

2.1.1 US Federal Communications Commission, US1131 9
2.1.2 NIST / A2LA, Testing Cert #3331.02 9
2.1.3 Canada – Innovation, Science and Economic Development (ISED), 2932D 9
2.1.4 Japan – VCCI 9
2.1.5 Acceptance by Mutual Recognition Arrangement 10

2.2 Test Facilities 10

2.2.1 Emission Test Facility 10

2.3 Measurement Uncertainty 10

2.3.1 Sample Calculation – radiated & conducted emissions 11
2.3.2 Measurement Uncertainty 11
2.3.3 Measurement Uncertainty Immunity 12

2.4 Calibration Traceability 12

3 EMC Test Plan 13

3.1 Introduction 13

3.2 Customer 13

3.3 Equipment Under Test (EUT) 14

4 Product Information 16

4.1 Product Description 16

4.2 Equipment Configuration 16

4.3 Operating Mode 16

4.4 Unique Antenna Connector 16

4.4.1 Results 16

5 Measurement Results 17

5.1 Duty Cycle 18

5.2 Results 18

5.3 Fundamental Field Strength 19

5.3.1 Test Methodology 19
5.3.2 Results 19

5.4 Occupied Bandwidth 20

5.4.1 Test Methodology 20
5.4.2 Results 20

5.5 Carrier Frequency Stability 21
5.5.1 Test Methodology 21
5.5.2 Results 21

5.6 Radiated Spurious Emissions 23
5.6.1 Test Methodology 23
5.6.2 Transmitter Spurious Emission Limit 24
5.6.3 Test Results 25
5.6.4 Emission Mask 25
5.6.5 Spurious Emissions 30

5.7 AC Mains Condcuted Emisisons 36
5.7.1 Test Methodology 36
5.7.2 Conducted Emission Limits 36
5.7.3 Test Results 36
5.7.4 Test Data 37

6 Test Equipment List 40

6.1 Equipment List 40

6.2 Testing Software 40

7 Appendix: Test Setup Photos 42

7.1 Radiated Emissions 9 kHz to 30 MHz 42

7.2 Radiated Emissions 30 to 150 MHz 45

7.3 AC Mains Conducted Emissions 46

7.4 Frequency Stability 47

8 EUT Photos 48

8.1 External Photos 48

Table 1: Summary of Test Results 8
Table 2: Customer Information 13
Table 3: Technical Contact Information 13
Table 4: EUT Specifications 14
Table 5: EUT Test Samples 15
Table 6: Channerl Power Settting/Specifcation 15
Table 7: General Product Infromation 15
Table 8: Electrical Power Type 15
Table 9: EUT Interface/Port Specifications 15
Table 10: Duty Cycle 18
Table 11: Fundamental Field Strength 19
Table 12: Fundamental Field Strength 20
Table 13: Frequency Stability Over Temp (%) 21
Table 14: Frequency Stability Over Temp (PPM) 21
Table 15: Frequency Stability Over Voltage (%) 22
Table 16: Frequency Stability Over Voltage (PPM) 22
Table 17: Emissions Mask – X-Axis 25
Table 18: Emissions Mask – Y-Axis 26
Table 19: Emissions Mask – Z-Axis 27
Table 20: 9 kHz – 30 MHz Spurious Emissions on X-Axis 30
Table 21: 9 kHz – 30 MHz Spurious Emissions on Y-Axis 31
Table 22: 9 kHz – 30 MHz Spurious Emissions on Z-Axis 32
Table 23: 30 – 150 MHz Spurious Emissions 33
Table 24: AC Conducted Emission limits 36
Table 25: 9 kHz – 30 MHz Conducted Emissions – Line 37
Table 26: 9 kHz – 30 MHz Conducted Emissions – Neutral 38
Table 27: Equipment List 40
Table 28: Testing Software 40

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the *CFR Title 47 Subchapter A §Part 15.225 ISED RSS-2010 Issue 10*, based on the results of testing performed on 2/29/2024 to 3/20/2024 on EUT manufactured by It's Electric Inc. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT with the integration of a certified radio module in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

13.56 MHz RFID radio was examined in this report.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Regulatory Rule	Result
Unique Antenna Connector	47 CFR §15.203	**Complied**
Occupied Bandwidth	47 CFR §2.1049 RSS-Gen Section 6.7	**Complied**
Fundamental Field Strength	47 CFR §15.225(a) RSS-210 Annex B.6	**Complied**
Carrier Frequency Stability	47 CFR §2.1055 47 CFR §15.225(e) RSS-210 Annex B.6 RSS-Gen Section 6.11	**Complied**
Radiated Spurious Emissions	47 CFR §2.1053 47 CFR §15.225 (b), (c), (d) RSS-Gen Section 7.3 RSS-210 Annex B.6	**Complied**
AC Power Conducted Emissions	47 CFR §15.207 RSS-Gen Section 7.2	**Complied**

1.4 Special Accessories

None

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission, US1131

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA. 94538, are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Pleasanton Registration No. US1131, Fremont Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 NIST / A2LA, Testing Cert #3331.02

TUV Rheinland of North America EMC test facilities are accredited by the American Association for Laboratory Accreditation (A2LA). The laboratories have been assessed and accredited by A2LA in accordance with ISO Standard 17025:2017 (Testing Certificate #3331.02). The Scope of Laboratory Accreditation includes emission and immunity testing. The accreditations are updated annually.

2.1.3 Canada – Innovation, Science and Economic Development (ISED), 2932D

Innovation, Science and Economic Development Canada | Innovation, Sciences et Développement économique Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5051 Brandin Ct, Fremont, CA. 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Fremont: A-409

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TÜV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

Test facilities are located at 5015 Brandin Ct, Fremont, California, 94538, USA and 1279 Quarry Lane, Pleasanton, California 94566, USA (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement and the fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement + Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	1.09 dB	2.18 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2 Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 0.70 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 2.06 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

3 EMC Test Plan

3.1 Introduction

Section 3 provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer (information supplied can affect validity of the results) so that the test laboratory may perform the requested testing.

3.2 Customer

Table 2: Customer Information

Client	It's Electric Inc
Address	19 Brooklyn Navy yard, Bldg 128, Morris Ave Brooklyn NY 11205
Contact Person	Nathan King
Telephone	+1 (646) 203 6604
Fax	N/A

Table 3: Technical Contact Information

Contact Person	Nathan King
Telephone	+1 (646) 203 6604
E-Mail	nathan@itselectric.us

3.3 Equipment Under Test (EUT)

Table 4: EUT Specifications

EUT Specifications	
Dimensions	111.76 cm x 17.78 cm x 14.78 cm
Power Input	Nominal 208 Vac, 50-60 Hz, 32 A
Operating Temperature Range:	-20 ºC to 50 ºC
Multiple Feeds:	N/A
Hardware Version/Model	Brooklyn 718
Firmware Version	--
RF Software Version	R1951.01
Product Marketing Name	Brooklyn 718
Operating Mode	RFID
Transmitter Frequency Band	RFID: 13.110 – 14.010 MHz
Antenna Type	Integrated Antenna
Antenna Gain	0 dBi
Modulation Type	Pulse Modulated
Data Rate	--
Supported Bandwidths	--
TX/RX Chain (s)	1 Tx
Directional Gain Type	☐ Uncorrelated ☐ Beam-Forming ☒ Other describe: N/A
Type of Equipment	☐ Table Top ☐ Wall-mount ☒ Floor standing cabinet ☐ Other: Indoor/Residential
Note: 1. All EUT specifications provided by manufacturer or TUV direct customer. 2. Information supplied by the customer and can affect the validity of the results.	

Table 5: EUT Test Samples

Equipment	Manufacturer	Model	Serial	Used for
Post	It's Electric Inc.	Brooklyn 718	N/A	All
Note: None.				

Table 6: Channerl Power Settting/Specifcation

Freq. (MHz)	--	--	--	--	--	--	--	--
Note: 1. No power level setting available. EUT is set to transmit at set power in firmware.								

Table 7: General Product Infromation

Dimensions	Length:	111.76 cm	Width:	17.78 cm	Height:	14.78 cm
Weight	45 kg		**Fork-lift Needed:**		No	
Note: None						

Table 8: Electrical Power Type

Name	Type	Voltage		Frequency (Hz)	Current (A)
		Min	Max		
208 – 240	AC	197	264	50 – 60	32
Note: None					

Table 9: EUT Interface/Port Specifications

EUT Port	Connect To	Location	Length	Shielded/ Unshielded
Base J2 connector	Post Free-hanging 4-position connector	Base unit interface PCBA	100' max	Shielded, grounded at post
Base J5 connector, Base Output signal terminal blocks	Post Free-hanging 8-position connector, Post input signal terminal blocks	Base unit interface PCBA	100' max	Unshielded
Base Input terminal blocks	Supply Voltage	-		Unshielded
Base Output power terminal blocks	Post Input power terminal blocks	-	100' max	Unshielded
Post J3068 Socket	EVSE Charge port	Post	-	-

4 Product Information

4.1 Product Description

This device is a Level 2 EVSE designed to be installed in an urban environment. The Base/Home unit (Support Equipment) is intended to be installed inside a building and the Post (EUT) is intended to be installed at the curb. A charge session will be initiated by a RFID swipe at the Post to be approved by a backend. An end user will need to bring their own EVSE charge cable to use the product with their vehicle.

4.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst-case radiation for emissions testing.

4.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

4.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.4.1 Results

The product is professionally installed, and the end user has no access to the antenna or antenna port.

5 Measurement Results

Testing was performed in accordance with CFR Title 47 Subchapter A §Part 15.225 & ISED RSS-2010 Issue 10. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 5 of ANSI C63.10:2013 were employed.

Emission measurements below 30 MHz were performed at a 3-meter distance. The following is the correction factor that was applied to emissions which were subject to limits beyond 3 meters.

Correction factor, ΔFS, calculation (3 meter to 30 meter):

Equation (1) ANSI C63.10:2013 Section 6.4.4.1

$d_{near\ field} = 47.77/f_{MHz}$

Equation (2) ANSI C63.10:2013 Section 6.4.4.1

$FS_{limit} - FS_{max} = -40 \log(d_{near\ field}/d_{measure}) - 20 \log(d_{limit}/ d_{near\ field})$

Where:

FS_{limit} ≡ Field strength of the emission at the distance defined by regulator (calculated value).

FS_{max} ≡ Measured filed strength of the emission of interest (measured value).

$d_{near\ field}$ ≡ the $\lambda/2\pi$ distance (3.52m).

$d_{measure}$ ≡ measurement distance (3m).

d_{limit} ≡ reference limit distance (30m).

$FS_{limit} - FS_{max}$ ≡ ΔFS, correction factor to be applied to measured value in dB

5.1 Duty Cycle

The duty cycle of the device was determined before testing was performed in order to choose the appropriate test methodology. Duty cycle was measured with a spectrum analyzer in zero span and calculated as the percentage between the transmitters on time over the signal period.

Duty cycle % = (Transmitter on time/Signal Period) *100

5.2 Results

Table 10: Duty Cycle

Test Condition:	Radiated, Normal Temperature	**Date:**	02/29/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.1 ºC	**Relative Humidity:**	1014.3%
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar
Signal State: Modulated			
1Mbps			
Frequency (MHz)	**On-Time (ms)**	**Signal Period (ms)**	**Duty Cycle (%)**
13.56	22.8	404.4	5.64
Note: 1. This value will be used to apply duty cycle correction throughout this report. 2. Duty cycle correction: 20 Log(1/0.0564) = 24.97 dB			

Duty Cycle

5.3 Fundamental Field Strength

The field strength of any emissions shall not exceed the following limits:

15.848 µV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz;

334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;

106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.

5.3.1 Test Methodology

The testing performed according to ANSI C63.10:2013 section 6.4. The measurements made were at 3-meter distance and the correction factor in section 5 was calculate and applied to the applicable emissions in this section.

5.3.2 Results

As originally tested the EUT was found to be compliant with the applicable requirements.

Table 11: Fundamental Field Strength

Test Condition:	Radiated, Normal Temperature	**Date:**	3/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.1 ºC	**Relative Humidity:**	1014.3 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	ΔFS (dB)	Corrected Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	BW (kHz)	Height (cm)	Pol	Azimuth (deg)
13.56	44.87	-21.39	23.48	84	60.52	9	100	X-Axis	224
13.56	50.91	-21.39	29.52	84	54.48	9	100	Y-Axis	356
13.56	47.92	-21.39	26.53	84	57.47	9	100	Z-Axis	42

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. Measurement system losses have been put into the measurement reported (10.4 dB)
3. Final Corrected value: Quasi-Peak + Duty Cycle correction + ΔFS
4. Trace data can be found in section 5.4

5.4 Occupied Bandwidth

The occupied bandwidth is the bandwidth in which 99% of the transmitted power is present.

5.4.1 Test Methodology

The testing was performed according to ANSI C63.10:2013 section 6.9.3.

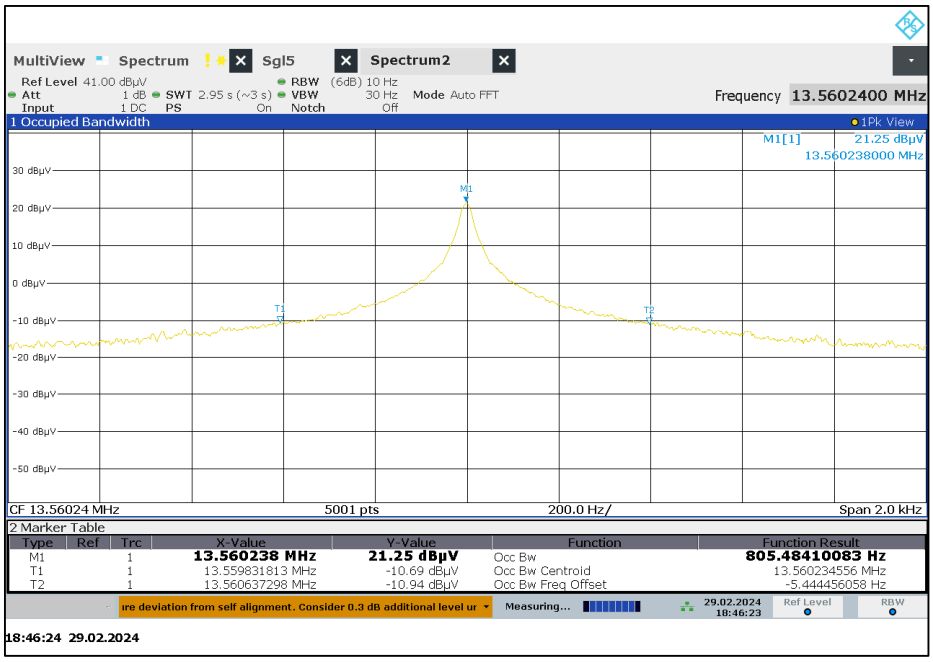
5.4.2 Results

Table 12: Fundamental Field Strength

Test Condition:	Radiated, Normal Temperature	**Date:**	2/29/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.1 ºC	**Relative Humidity:**	1014.3%
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar
Signal State: Pulsed			

Frequency (MHz)	**99% Occupied Bandwidth (Hz)**
13.56	805.5

Note: None



99% Occupied Bandwidth

5.5 Carrier Frequency Stability

Carrier frequency stability is a measure of the amount of drift the center of the transmit signal is from the nominal center frequency. The frequency stability is typically assessed in part per million (ppm) or percent (%).

5.5.1 Test Methodology

Testing was performed according to ANSI C63.10:2013 section 6.8. Temperature range assessed form -20 °C to +50 °C with a nominal supply voltage. The supply voltage is set from 85% to 115% of the nominal supply voltage at 20 °C.

5.5.2 Results

Table 13: Frequency Stability Over Temp (%)

Voltage	Temperature	Nominal Frequency	Frequency Stability (Hz)				Limit (%)
	°C	(MHz)	0min	2min	5min	10min	
Nominal (208 V)	50	13.56	13560150	13560151	13560151	13560151	± 0.01
	40	13.56	13560151	13560152	13560152	13560152	
	30	13.56	13560161	13560160	13560159	13560160	
	20	13.56	13560176	13560177	13560177	13560176	
	10	13.56	13560212	13560212	13560212	13560212	
	0	13.56	13560224	13560224	13560224	13560227	
	-10	13.56	13560223	13560223	13560218	13560217	
	-20	13.56	13560183	13560182	13560177	13560177	
Note: None							

Table 14: Frequency Stability Over Temp (PPM)

Voltage	Temperature	Nominal Frequency	Frequency Stability				Limit (PPM)
	°C	(MHz)	0min	2min	5min	10min	
Nominal (208 V)	50	13.56	11.1	11.1	11.1	11.1	± 100
	40	13.56	11.1	11.2	11.2	11.2	
	30	13.56	11.9	11.8	11.7	11.8	
	20	13.56	13.0	13.1	13.1	13.0	
	10	13.56	15.6	15.6	15.6	15.6	
	0	13.56	16.5	16.5	16.5	16.7	
	-10	13.56	16.4	16.4	16.1	16.0	
	-20	13.56	13.5	13.4	13.1	13.1	
Note: None							

Table 15: Frequency Stability Over Voltage (%)

Voltage	Temperature	Nominal Frequency	Frequency Stability (Hz)				Limit
Volts	**°C**	**(MHz)**	**0min**	**2min**	**5min**	**10min**	**%**
85% Vo	Ambient	13.56	13560150	13560151	13560151	13560151	± 0.01%
115% Vo	Ambient	13.56	13560151	13560152	13560152	13560152	

Note:
1. Vo = 208 V

Table 16: Frequency Stability Over Voltage (PPM)

Voltage	Temperature	Nominal Frequency	Frequency Stability				Limit
Volts	**°C**	**(MHz)**	**0min**	**2min**	**5min**	**10min**	**%**
85% Vo	Ambient	13.56	14.5	14.4	14.4	14.4	± 0.01%
115% Vo	Ambient	13.56	14.4	14.3	14.2	14.2	

Note:
1. Vo = 208 V

5.6 Radiated Spurious Emissions

The field strength of any emissions shall not exceed the following limits:

15.848 µV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz;

334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;

106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz

The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209 or RSS-Gen Section 7.3.

5.6.1 Test Methodology

5.6.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pre-scans were performed to determine the worst data rate/chain.

5.6.1.2 Final Test

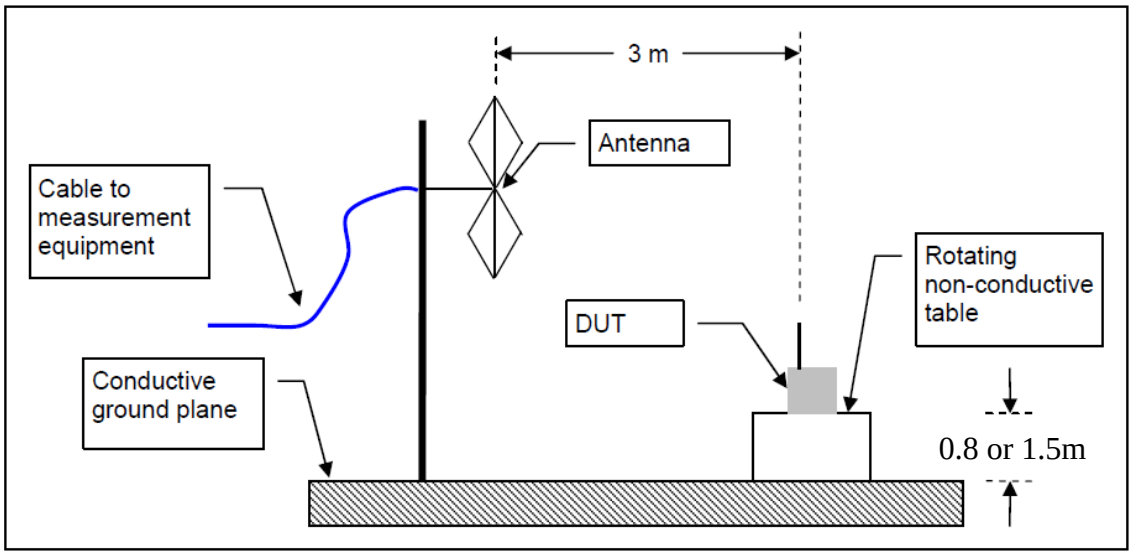
For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

5.6.1.3 Deviations

None.

5.6.1.4 Test Setup:



5.6.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the limits required by the applicable rule parts as described in section 5.5 and below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (Meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30.0 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.6.3 Test Results

The final measurement data was taken under the worst-case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan. As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

5.6.4 Emission Mask

Table 17: Emissions Mask – X-Axis

Test Condition:	Radiated, Normal Temperature	**Date:**	03/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
13.36	16.7	---	40.51	23.81	1000	9	100	X-Pol	4	10.4
13.43	16.61	---	50.47	33.86	1000	9	100	X-Pol	224	10.4
13.56	23.48	---	84	60.52	1000	9	100	X-Pol	224	10.4
13.69	16.44	---	50.47	34.03	1000	9	100	X-Pol	348	10.4
13.77	16.57	---	40.51	23.94	1000	9	100	X-Pol	318	10.4
13.93	16.32	---	40.51	24.19	1000	9	100	X-Pol	318	10.4
13.36	16.7	---	40.51	23.81	1000	9	100	X-Pol	4	10.4

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. ΔFS correction has been added to the fundamental emissions (-21.39 dB)
3. Measurement system losses have been put into the measurement reported (Corr.)
4. Final Corrected value: Quasi-Peak + Duty Cycle correction + ΔFS + Corr

Table 18: Emissions Mask – Y-Axis

Test Condition:	Radiated, Normal Temperature	**Date:**	03/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
13.24	16.61	---	40.51	23.9	1000	9	100	Y-pol	236	10.4
13.35	16.76	---	40.51	23.75	1000	9	100	Y-pol	264	10.4
13.40	16.52	---	40.51	23.99	1000	9	100	Y-pol	251	10.4
13.56	29.52	---	84	54.48	1000	9	100	Y-pol	356	10.4
13.71	16.33	---	40.51	24.18	1000	9	100	Y-pol	28	10.4
13.81	16.29	---	40.51	24.22	1000	9	100	Y-pol	302	10.4
13.24	16.61	---	40.51	23.9	1000	9	100	Y-pol	236	10.4

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. ΔFS correction has been added to the fundamental emissions (-21.39 dB)
3. Measurement system losses have been put into the measurement reported (Corr.)
4. Final Corrected value: Quasi-Peak + Duty Cycle correction + ΔFS + Corr

Table 19: Emissions Mask – Z-Axis

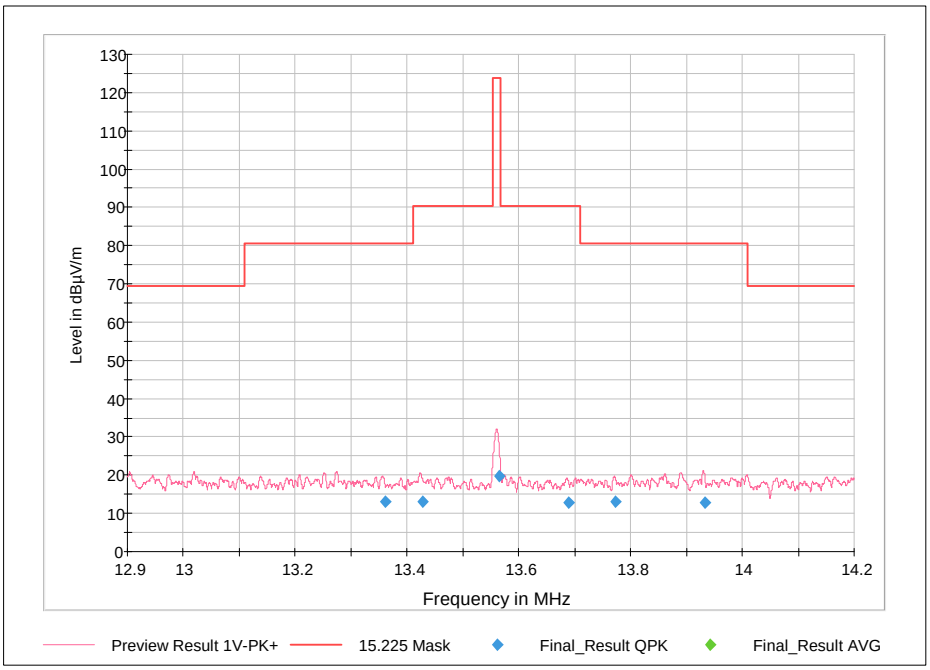
Test Condition:	Radiated, Normal Temperature	**Date:**	03/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

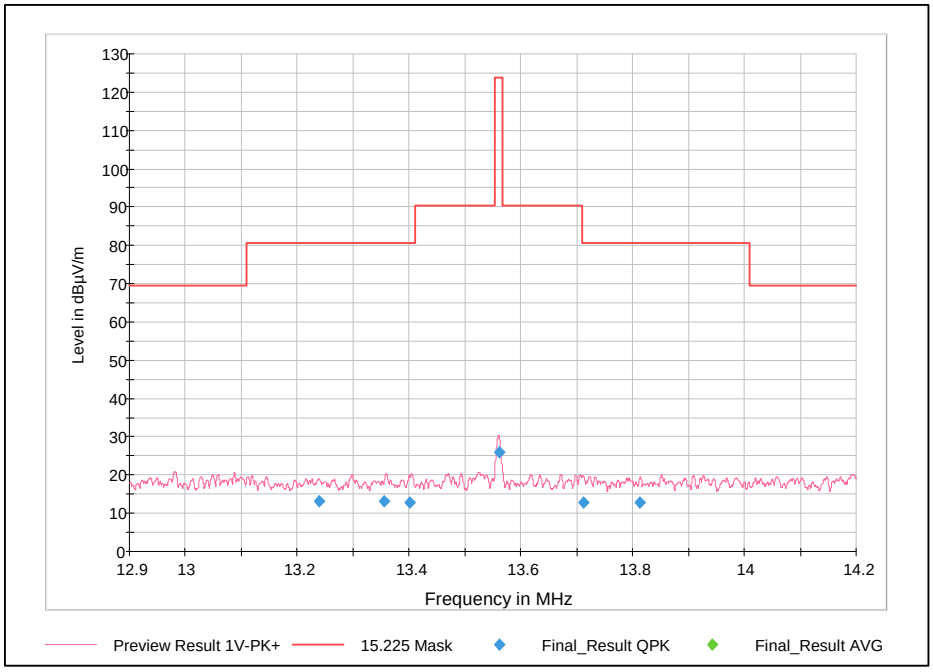
Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
13.21	16.58	---	40.51	23.93	1000	9	100	Z-Pol	228	10.5
13.38	16.73	---	40.51	23.78	1000	9	100	Z-Pol	259	10.4
13.41	16.7	---	50.47	33.77	1000	9	100	Z-Pol	26	10.4
13.56	26.53	---	84	57.47	1000	9	100	Z-Pol	42	10.4
13.60	16.69	---	50.47	33.78	1000	9	100	Z-Pol	69	10.4
13.73	16.57	---	40.51	23.94	1000	9	100	Z-Pol	54	10.4
13.21	16.58	---	40.51	23.93	1000	9	100	Z-Pol	228	10.5

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. ΔFS correction has been added to the fundamental emissions (-21.39 dB)
3. Measurement system losses have been put into the measurement reported (Corr.)
4. Final Corrected value: Quasi-Peak + Duty Cycle correction + ΔFS + Corr

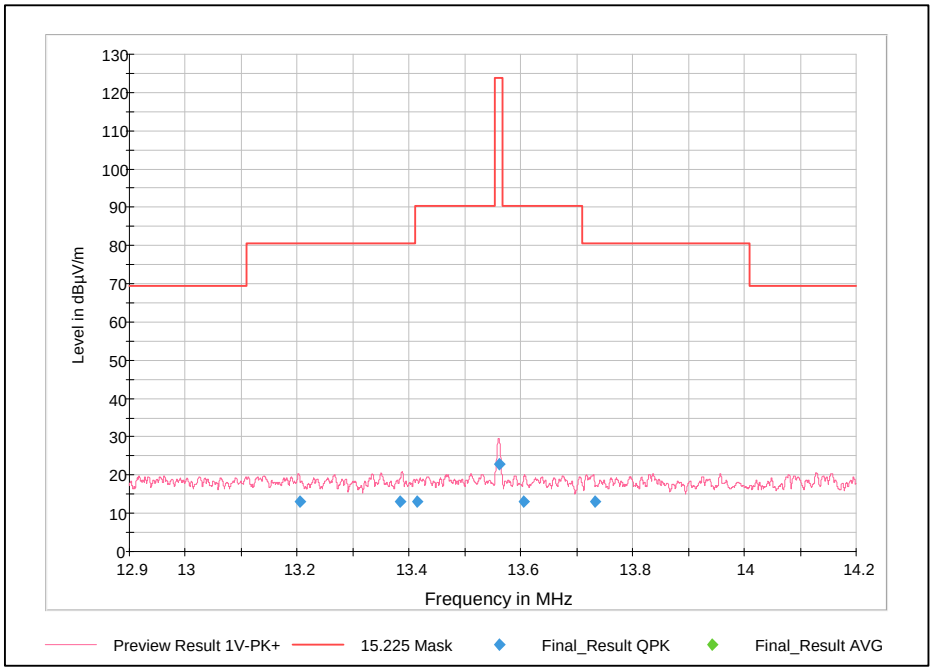
5.6.4.1 Emission Mask Trace Data



Emissions Mask – X-Axis



Emission Mask – Y-Axis



Emission Mask – Z-Axis

5.6.5 Spurious Emissions

Table 20: 9 kHz – 30 MHz Spurious Emissions on X-Axis

Test Condition:	Radiated, Normal Temperature	**Date:**	02/29/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol (V/H)	Azimuth (deg)	Corr. (dB)
0.51	66.17	---	73.42	7.25	1000	9	100	X-Pol	10	11.6
0.73	62.83	---	70.33	7.5	1000	9	100	X-Pol	202	11.7
1.55	54.73	---	63.79	9.06	1000	9	100	X-Pol	193	11.7
2.49	49.92	---	69.54	19.62	1000	9	100	X-Pol	332	11.7
16.41	37.15	---	69.54	32.39	1000	9	100	X-Pol	255	10.1
24.60	36.29	---	69.54	33.25	1000	9	100	X-Pol	185	9

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. Limit has been adjusted for 3-meter measurement

Table 21: 9 kHz – 30 MHz Spurious Emissions on Y-Axis

Test Condition:	Radiated, Normal Temperature	**Date:**	02/29/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol (V/H)	Azimuth (deg)	Corr. (dB)
0.03	---	67.81	117.13	49.32	1000	0.2	100	Y-Pol	33	13.3
0.10	62.13	---	107.89	45.76	1000	0.2	100	Y-Pol	120	11.7
0.18	---	69.49	102.36	32.87	1000	9	100	Y-Pol	93	11.5
0.63	64.42	---	71.68	7.26	1000	9	100	Y-Pol	198	11.6
6.60	42.03	---	69.54	27.51	1000	9	100	Y-Pol	86	11.1
13.56	44.11	---	69.54	25.43	1000	9	100	Y-Pol	140	10.4

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)
2. Limit has been adjusted for 3-meter measurement

Table 22: 9 kHz – 30 MHz Spurious Emissions on Z-Axis

Test Condition:	Radiated, Normal Temperature	**Date:**	02/29/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol (V/H)	Azimuth (deg)	Corr. (dB)
2.96	48.56	---	69.54	20.98	1000	9	100	Z-Pol	318	11.7
6.12	42.41	---	69.54	27.13	1000	9	100	Z-Pol	222	11.2
6.68	46.31	---	69.54	23.23	1000	9	100	Z-Pol	254	11.1
13.56	45.15	---	69.54	24.39	1000	9	100	Z-Pol	4	10.4
20.76	46.97	---	69.54	22.57	1000	9	100	Z-Pol	247	9.6
27.13	40.31	---	69.54	29.23	1000	9	100	Z-Pol	322	8.4

Note:
1. Duty cycle correction has been added to the fundamental emission (24.97 dB)

Table 23: 30 – 150 MHz Spurious Emissions

Test Condition:	Radiated, Normal Temperature	**Date:**	03/01/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	22.7 ºC	**Relative Humidity:**	36.3 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

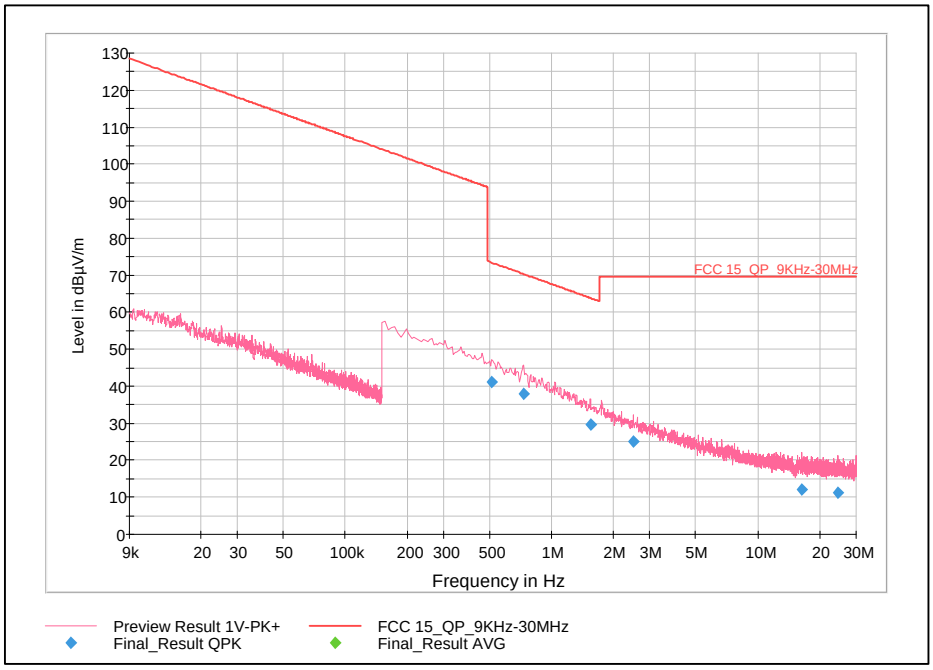
Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV/m)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Meas. Time (ms)	BW (kHz)	Height (cm)	Pol (V/H)	Azimuth (deg)	Corr. (dB)
58.85	---	22.28	---	---	10000	120	100	H	248	-11.3
58.85	11.3	---	40	28.7	10000	120	100	H	248	-11.3
68.84	7.92	---	40	32.08	10000	120	105	V	161	-16.1
68.84	---	20.54	---	---	10000	120	105	V	161	-16.1
79.38	6.62	---	40	33.38	10000	120	155	V	25	-17.3
79.38	---	19.02	---	---	10000	120	155	V	25	-17.3
79.98	---	19.89	---	---	10000	120	156	V	25	-17.3
79.98	7.33	---	40	32.67	10000	120	156	V	25	-17.3
119.25	9.24	---	43.52	34.28	10000	120	100	V	129	-13.9
119.25	---	19.84	---	---	10000	120	100	V	129	-13.9
149.98	15.16	---	43.52	28.36	10000	120	100	V	5	-16.2
149.98	---	22.29	---	---	10000	120	100	V	5	-16.2

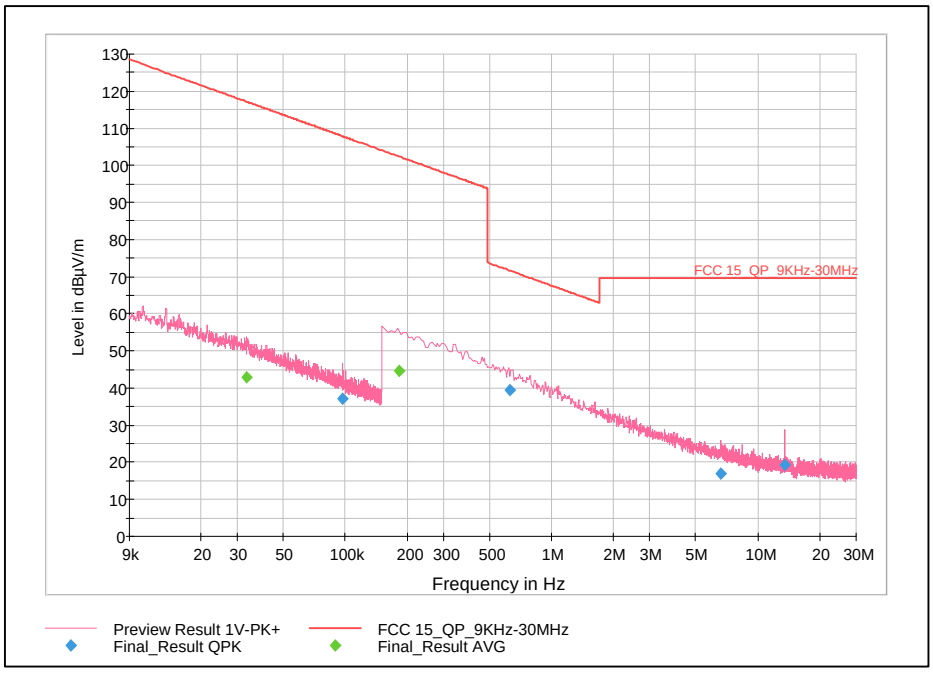
Note:

1. All margins for emissions are greater than the duty cycle correction (24.97 dB) so emission correction has been omitted.

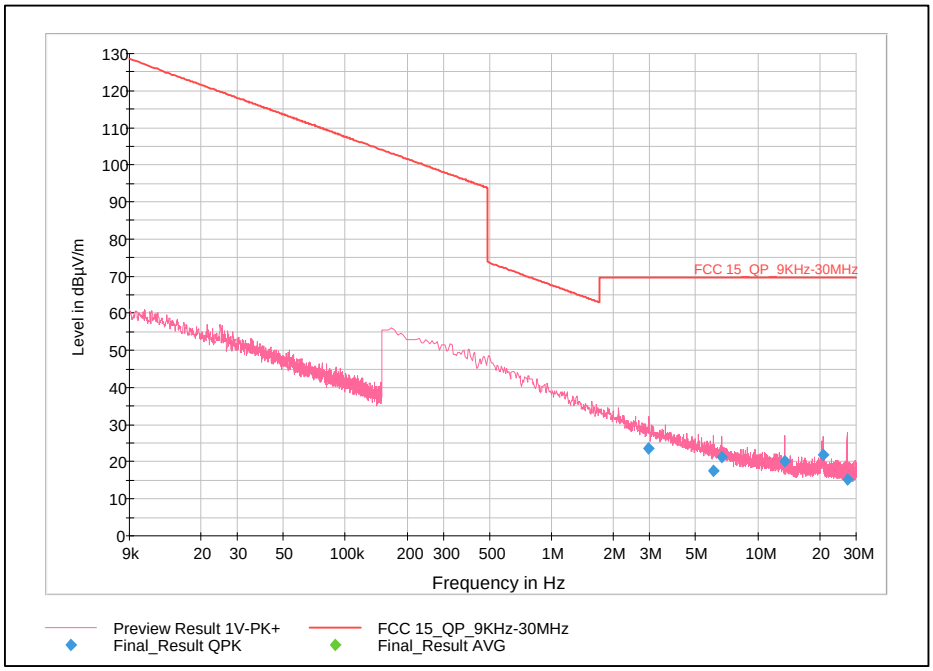
5.6.5.1 Spurious Emission Trace Data



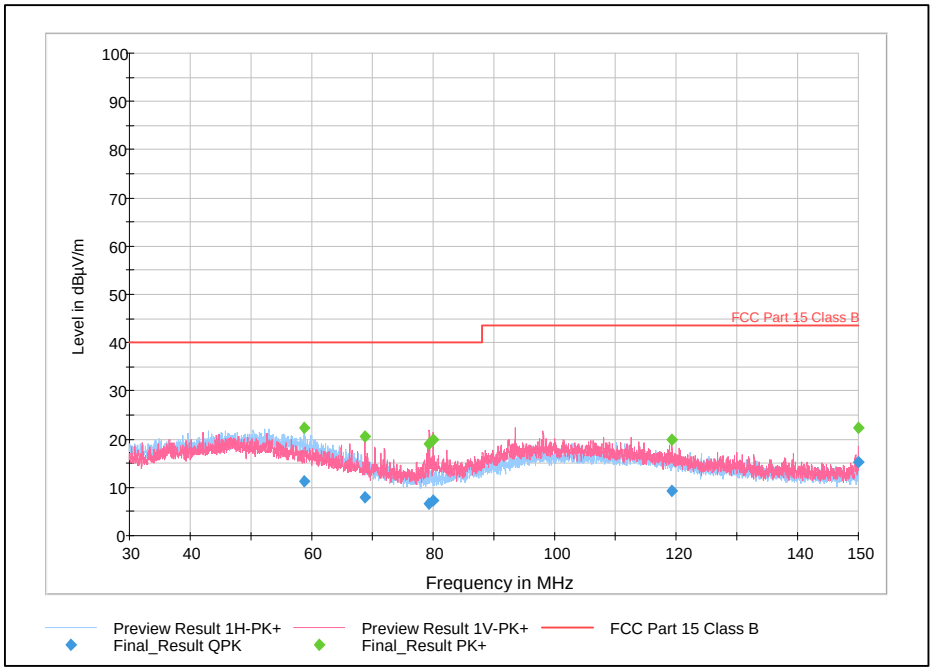
9 kHz to 30 MHz Radiated Emissions – X-Axis



9 kHz to 30 MHz Radiated Emissions – Y-Axis



9 kHz to 30 MHz Radiated Emissions – Z-Axis



30 – 150 MHz Radiated Emisions

5.7 AC Mains Condcuted Emisisons

This test measures RF emissions emanating from the EUT's AC input port

5.7.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase, line and neutral, of the AC power line were measured with respect to ground. Measurements were performed using a 50µH / 50Ω Line Impedance Stabilization Network (LISN).

The testing methodology of section 6.2 of ANSI C63.10:2013 was used.

5.7.2 Conducted Emission Limits

The emissions of the EUT shall not exceed the limits required by the applicable rule parts as described below.

Table 24: AC Conducted Emission limits

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

Note:
1. Decreases with the logarithm of the frequency.

5.7.3 Test Results

As originally tested the EUT was found to be compliant to the applicable requirements. It should be noted that as per CFR §15.207 (b) the limits in section 5.6.2 shall not apply to carrier current systems operating as intentional radiator on frequencies below 30 MHz The EUT's fundamental operating frequency is 13.56 MHz as such is 13.56 MHz emission is not subject to the limits of section 5.6.2.

5.7.4 Test Data

Table 25: 9 kHz – 30 MHz Conducted Emissions – Line

Test Condition:	Normal Temperature	**Date:**	03/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

Freq. (MHz)	Quasi-Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dBµV)	Meas. Time (ms)	Line	PE	Corr (dB)
0.554759	---	36.83	46	9.17	10000	L1	GND	10
0.554759	48.8	---	56	7.2	10000	L1	GND	10
0.937125	---	28.97	46	17.04	10000	L1	GND	10
0.937125	43.05	---	56	12.95	10000	L1	GND	10
2.083016	---	28.66	46	17.34	10000	L1	GND	10
2.083016	43.11	---	56	12.89	10000	L1	GND	10
2.188527	---	26.85	46	19.15	10000	L1	GND	10
2.188527	42.14	---	56	13.86	10000	L1	GND	10
5.65997	---	44.66	50	5.34	10000	L1	GND	10.1
5.65997	48.37	---	60	11.63	10000	L1	GND	10.1
6.076202	---	44	50	6	10000	L1	GND	10.1
6.076202	46.95	---	60	13.05	10000	L1	GND	10.1
6.170592	---	47.87	50	2.13	10000	L1	GND	10.1
6.170592	50.17	---	60	9.83	10000	L1	GND	10.1
6.583918	---	44.14	50	5.86	10000	L1	GND	10.1
6.583918	48.43	---	60	11.57	10000	L1	GND	10.1
6.682716	---	49.02	50	0.98	10000	L1	GND	10.1
6.682716	50.56	---	60	9.44	10000	L1	GND	10.1
7.089028	---	44.18	50	5.82	10000	L1	GND	10.1
7.089028	47.38	---	60	12.62	10000	L1	GND	10.1
17.707064	---	19.61	50	30.39	10000	L1	GND	10
17.707064	31.4	---	60	28.6	10000	L1	GND	10

Note: None

Table 26: 9 kHz – 30 MHz Conducted Emissions – Neutral

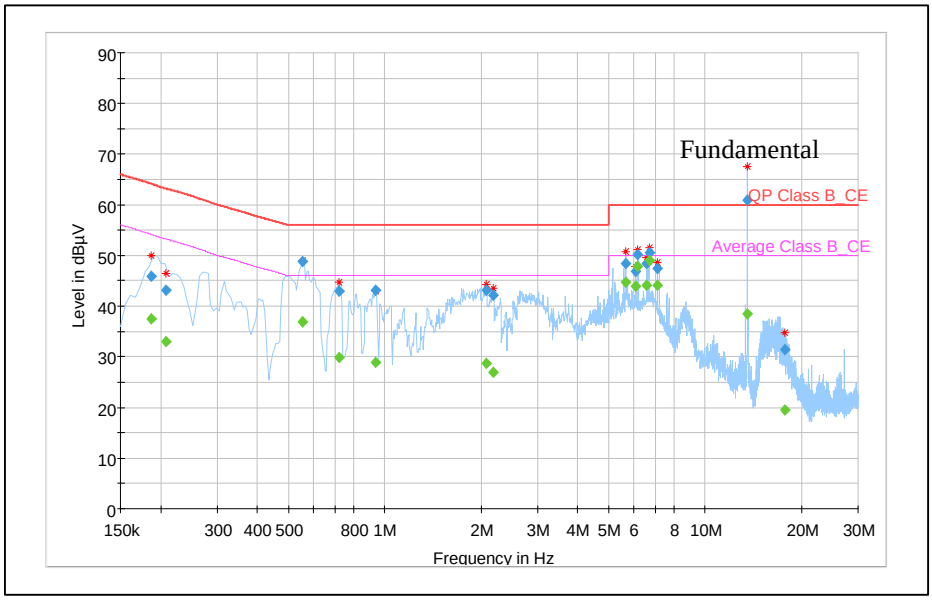
Test Condition:	Normal Temperature	**Date:**	03/20/2024
Antenna Type:	Integrated	**Power Level:**	See Table 9
Ambient Temperature:	23.9 ºC	**Relative Humidity:**	33.8 %
Max. Antenna Gain:	0 dBi	**Test Engineer**	Isaac Aguilar

Signal State: Pulsed

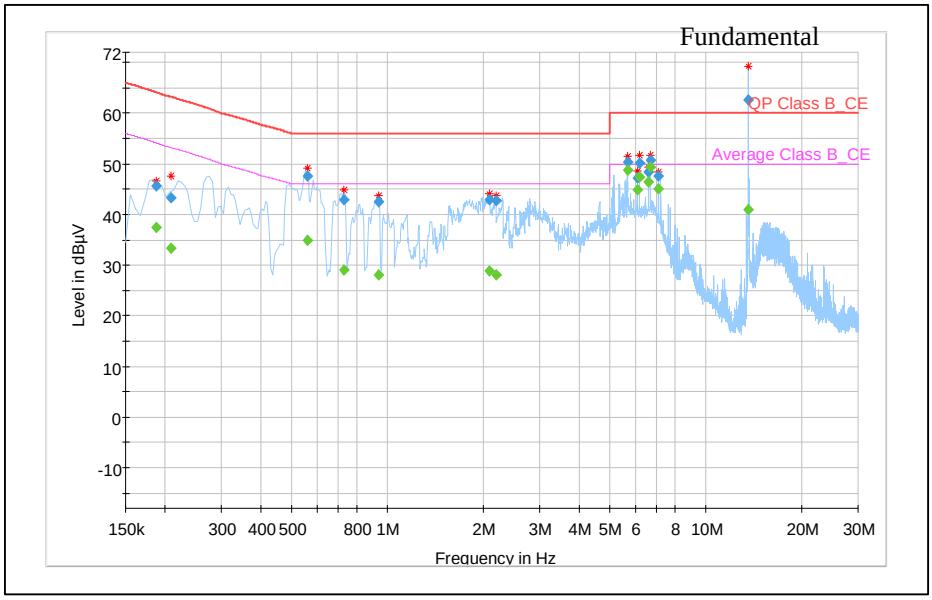
Freq. (MHz)	Quasi-Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dBµV)	Meas. Time (ms)	Line	PE	Corr (dB)
0.187394	---	37.51	54.13	16.62	10000	N	GND	10
0.187394	45.59	---	64.13	18.54	10000	N	GND	10
0.557164	---	34.83	46	11.17	10000	N	GND	10
0.557164	47.64	---	56	8.36	10000	N	GND	10
0.72971	---	29.05	46	16.95	10000	N	GND	10
0.72971	42.87	---	56	13.13	10000	N	GND	10
0.936823	---	28.01	46	17.99	10000	N	GND	10
0.936823	42.55	---	56	13.45	10000	N	GND	10
2.080912	---	28.87	46	17.13	10000	N	GND	10
2.080912	42.99	---	56	13.01	10000	N	GND	10
2.184619	---	28.05	46	17.95	10000	N	GND	10
2.184619	42.73	---	56	13.27	10000	N	GND	10
5.657265	---	48.74	50	1.26	10000	N	GND	10.1
5.657265	50.37	---	60	9.63	10000	N	GND	10.1
6.075902	---	44.77	50	5.23	10000	N	GND	10.1
6.075902	47.18	---	60	12.82	10000	N	GND	10.1
6.172395	---	47.31	50	2.69	10000	N	GND	10.1
6.172395	50.23	---	60	9.77	10000	N	GND	10.1
6.580611	---	46.37	50	3.63	10000	N	GND	10.1
6.580611	48.39	---	60	11.61	10000	N	GND	10.1
6.683016	---	49.27	50	0.73	10000	N	GND	10.1
6.683016	50.77	---	60	9.23	10000	N	GND	10.1
7.087725	---	45.1	50	4.9	10000	N	GND	10.1
7.087725	47.57	---	60	12.43	10000	N	GND	10.1

Note: None

5.7.4.1 Conducted Emissions Trace Data



Conducted Emissions – Line



Conducted Emissions – Neutral

6 Test Equipment List

6.1 Equipment List

Table 27: Equipment List

Equipment	Description	Manufacturer	Model	Last calibration	Calibration due date
Radiated Emissions					
9017639	Preamplifier, 30 MHz - 8 GHz	Rohde & Schwarz	TS-PR8	02/21/2024	02/21/2025
9018108	ESW44 EMI Test Receiver 2 Hz to 44 GHz	Rohde & Schwarz	ESW44	02/21/2024	02/21/2025
9017943	Trilog Antenna 30 - 7000 MHz; Attenuator	Schwarzbeck; Huber+Suhner	VULB 9162; 6804.17.A	03/24/2023	03/24/2025
G1700997	Active Loop Antenna, 10 kHz - 30 MHz	EMCO	6502	04/27/2022	04/27/2024
G1700312	Signal Spectrum Analyzer 2 Hz to 67 GHz	Rohde & schwarz	FSW67	02/27/2024	02/27/2025
G1703473	Thermometer	Fluke	52 II	02/23/2024	02/23/2025
--	Environmental Chamber	Espec	BTZ-133	--	--
G1700882	Receiver EMI 20 Hz – 40 GHz	Rohde & Schwarz	ESIB40	02/21/2024	02/21/2025
G1700229	LISN 10 kHz – 30 MHz	Com-Power	LI-215A	02/21/2024	02/21/2025
G1701026	Transient Limiter, 10 dB 9 kHz – 200 MHz	Agilent	1194A	02/22/2024	02/22/2025
Note: None					

6.2 Testing Software

Table 28: Testing Software

Manufacturer	Name	Version	Test
Rohde & Schwarz	EMC 32	3m – 10.60.10	Radiated Emissions

--- Ende des Prüfberichts / *End of Test Report* ---