Report on the FCC and IC Testing of the Sartorius Stedim Switzerland AG RFID Module for Sterile Connection Device Model: RFID Read-Writer In accordance with FCC 47 CFR Part 15 C and ISED RSS-210 and ISED RSS-Gen

Product Service

Add value.
Inspire trust.

Prepared for: Sartorius Stedim Switzerland AG
Ringstrasse 24A
8317 Tagelswangen, Switzerland

FCC ID: 2BHAB-SSSTAGBWS0010
IC: 32845-SSSTAGBWS

COMMERCIAL-IN-CONFIDENCE

Date: 2024-12-16
Document Number: TR-713306888-05 | Revision 2

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Martin Steindl	2024-12-16	Steindl Martin *SIGN-ID 999824*
Authorised Signatory	Matthias Stumpe	2024-12-17	Stumpe *SIGN-ID 1000238*

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Engineering Statement:
This measurement shown in this report were made in accordance with the procedures described on test pages.
All reporded testing was carried out on a sample equipment to demonstrate limited compilance with with FCC 47 CFR Part 15 C and ISED RSS-210 and RSS-GEN.
The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Martin Steindl	2024-12-16	Steindl Martin *SIGN-ID 999825*

Laboratory Accreditation	Laboratory recognition	Industry Canada test site registration
DAkkS Reg. No. D-PL-11321-11-02 DAkkS Reg. No. D-PL-11321-11-03	Registration No. BNetzA-CAB-16/21-15	3050A-2

Executive Statement:
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2021 and ISED RSS210:2019 and ISED RSSGen:2019

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Product Service

Content

Product Service

1 Report Summary

1.1 Modification Report

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

Revision	*Description of changes*	*Date of Issue*
0	First Issue	2024-04-10
1	Added FCC-ID and IC-ID on title page.	2024-10-01
2	Corrected frequency band to 13.56 MHz in section 1.4.1 Correction of FCC grantee code on title page.	2024-12-16

Table 1: Report of Modifications

1.2 Introduction

Applicant	Sartorius Stedim Switzerland AG Ringstrasse 24A 8317 Tagelswangen, Switzerland
Manufacturer	REED Electronics AG Gewerbering 2 6105 Schachen, Switzerland
Model Number(s)	RFID Read-Writer
Reference Number(s)	49585
Serial Number(s)	N/A
Hardware Version(s)	Product Version 50000v002
Software Version(s)	Product Version 50000v002
Number of Samples Tested	1
Test Specification(s) / Issue / Date	FCC 47 CFR Part 15 C : 2019 and ISED RSS-210, Issue 10, Amd. 1 : 2019 ISED RSS-Gen, Issue 5, Amd. 1 : 2019
Test Plan/Issue/Date	2023-11-08
Order Number	2123626
Date	2023-07-26
Date of Receipt of EUT	2023-08-07; 2024-03-22
Start of Test	2023-11-10
Finish of Test	2024-04-04
Name of Engineer(s)	M. Steindl
Related Document(s)	ANSI C63.10:2013

Product Service

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15 C and ISED RSS-210 and RSS-Gen is shown below.

Section	*Specification Clause*	*Test Description*	*Result*
2.1	15.203	Antenna requirement	Pass
2.2	15.215(c)	Bandwidth of Signal	Pass
2.3	15.207	Conducted Disturbance at Mains Terminal	Pass
2.4	15.209, 15.225	Radiated Disturbance	Pass
2.5	15.225(e)	Frequency Tolerance	Pass

Table 2: Results according to FCC 47 CFR Part 15 C

Section	*Specification Clause*	*Test Description*	*Result*
2.3	7.3	Radiated Emissions	Pass
2.4	7.3	AC Power Line Conducted Emissions	Pass
2.5	B.6 b.	Frequency Tolerance	Pass

Table 3: Results according to ISED RSS-210

Section	*Specification Clause*	*Test Description*	*Result*
2.2	6.7	Bandwidth of Signal	Pass
2.4	8.8	AC Power Line Conducted Emissions	Pass
2.3	8.9, 8.10	Radiated Emissions	Pass
2.5	6.11	Frequency Tolerance	Pass

Table 4: Results according to ISED RSS-Gen

Product Service

1.4 Product Information

1.4.1 Technical Description

Frequency Band: 13.56 MHz

Supply Voltage: 120 V
Supply Frequency: 60 Hz

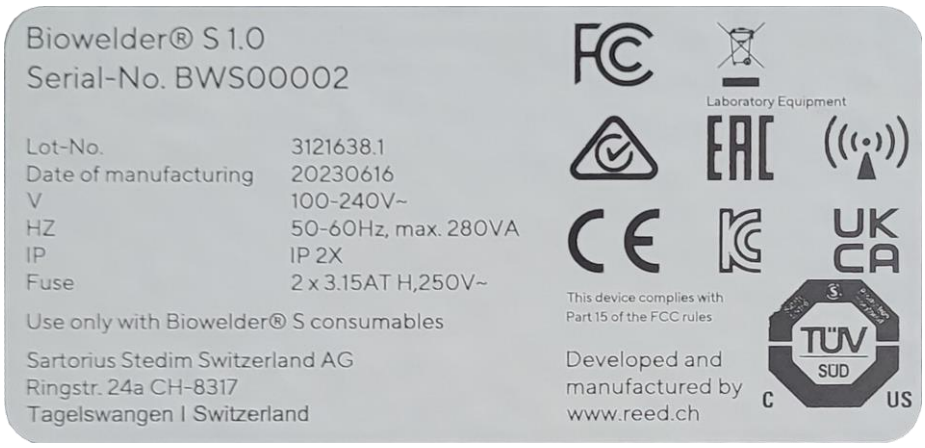
1.4.2 EUT Ports / Cables identification

Description	*Classification*	*Screened*	*Length (used)*	*Length (max. specified)*
Mains power port	AC power port	No	3 m	3 m
Ethernet	Signal / Control port	Yes	3m	> 30 m

Table 5

Product Service

1.4.3 Identification labels



EUT

Disposal

1.5 Test Configuration

The RFID module was installed in a Biowelder® S.

1.6 Modes of Operation

The EUT transmitted continuously.

Product Service

1.7 EUT Modifications Record

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable
1	Modified by applicant for radio test	Applicant	2023-02

Table 6

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	Name of Engineer(s)
Conducted Disturbance at Mains Terminal	M. Steindl
Radiated Distubance	M. Steindl

Office Address:
Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

2 Test Details

2.1 Antenna requirement

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clauses 15.203

2.1.2 Equipment under Test and Modification State

RFID Read-Writer; S/N N/A; Modification State 1

2.1.3 Date of Test

2024-04-04

2.1.4 Specification Limits

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 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. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some fields disturbance sensors, or to other intentional radiators which 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 are not exceeded.

2.1.5 Test Results

The EUT uses an integrated antenna.
See photos for test setup for details.

Product Service

2.2 Bandwidth of Signal

2.2.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.215(c)
ISED RSS-Gen, Clause 6.7

2.2.2 Equipment under Test and Modification State

RFID Read-Writer; S/N N/A; Modification State 0
RFID Read-Writer; S/N N/A; Modification State 1

2.2.3 Date of Test

2023-11-14; 2024-04-04

2.2.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	39 %

2.2.5 Specification Limits

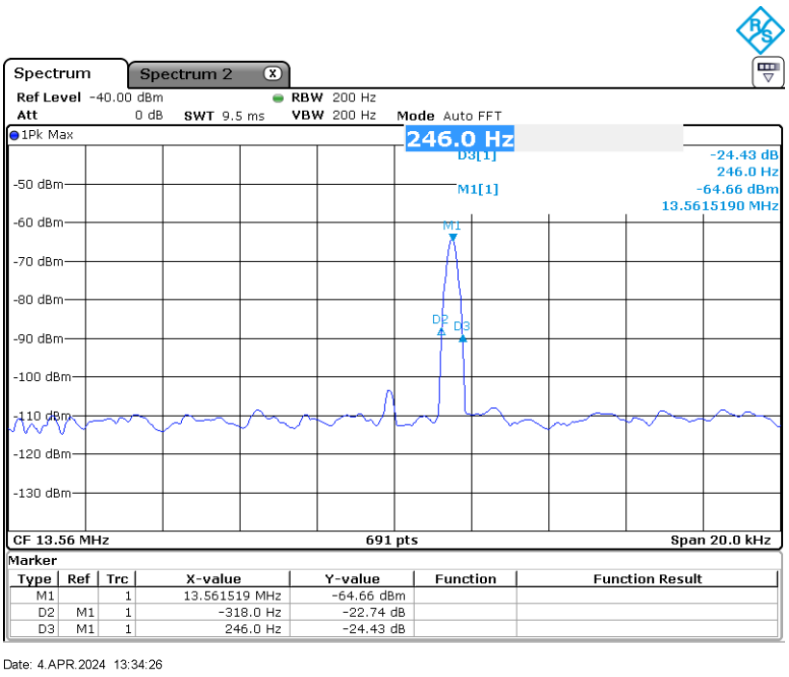
No limitation – Bandwidth noted

2.2.6 Test Method

The test was performed according to ANSI C63.10, clauses 6.9
See section 2.3 of this test report for details.

Product Service

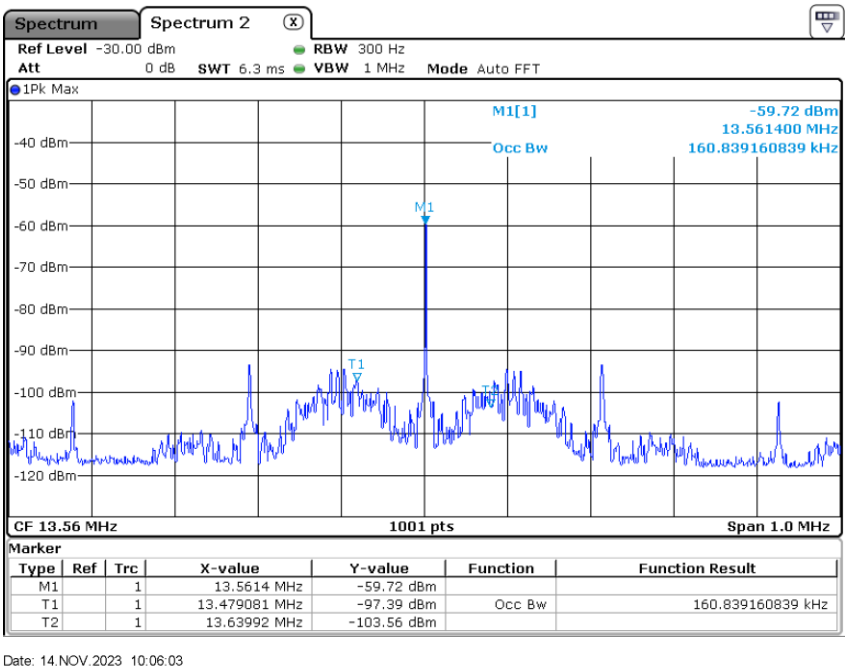
2.2.7 Test Results



Center frequency	*20 dB Bandwidth*
13.5615 MHz	564 Hz

Table 7: 20 dB bandwidth

Product Service



Centre Frequency	*99% Bandwidth*
13.5614 MHz	160.83916 kHz

Table 8: 99% bandwidth

2.2.8 Test Location and Test Equipment

The test was carried out in radio test laboratory.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Temperature test chamber	Feutron	KPK200-2	19868	36	2024-08-31
AC/DC Source	Elettrotest	TPS/M	33080	---	---

Table 9

Product Service

2.3 Radiated Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 15 C, Clauses 15.205, 15.209 and 15.225
ISED RSS-210, Clause 7.7 and B.6
ISED RSS-Gen, Clauses 8.9 and 8.10

2.3.2 Equipment under Test and Modification State

RFID Read-Writer; S/N N/A; Modification State 1

2.3.3 Date of Test

2024-04-02

2.3.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	35 %

Product Service

2.3.5 Specification Limits

Radiated emission limits:					
Frequency Range (MHz)	*Test distance (m)*	*Field strength*		*Field strength*	
		(µA/m)	*(dBµA/m)*	*(µV/m)*	*(dBµV/m)*
0.009 – 0.49	300	6.37 / *f*	20*lg(6.37 / *f*)	2400 / *f*	20*lg(2400 / *f*)
0.49 – 1.705	30	63.7 / *f*	20*lg(63.7 / *f*)	24000 / *f*	20*lg(24000 / *f*)
1.705 – 13.110	30	0.08	-21.94	30	29.54
13.110 – 13.410	30	0.283	-11.0	106	40.5
13.410 – 13.553	30	0.891	-1.0	334	50.5
13.553 – 13.567	30	42.26	32.5	15848	84
13.567 – 13.710	30	0.891	-1.0	334	50.5
13.710 – 14.010	30	0.283	-11.0	106	40.5
14.010 - 30	30	0.08	-21.94	30	29.54
30 – 88	3	---	---	100	40
88 – 216	3	--	---	150	43.5
126 – 960	3	--	---	200	46
above 960	3	--	---	500	54
Note 1: *f* in kHz					

Table 10 Radiated emission limits

At frequencies at or above 30 MHz, measurements may be performed at distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements.

At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempts should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

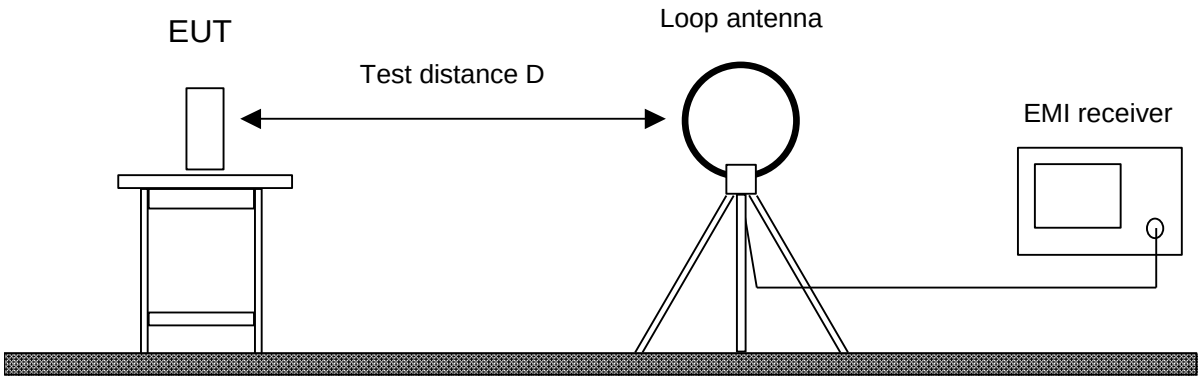
Product Service

2.3.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12

Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB or exceeding the limit using subranges and limited number of maximums.
Further maximisation for adjusting the maximum position is following.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

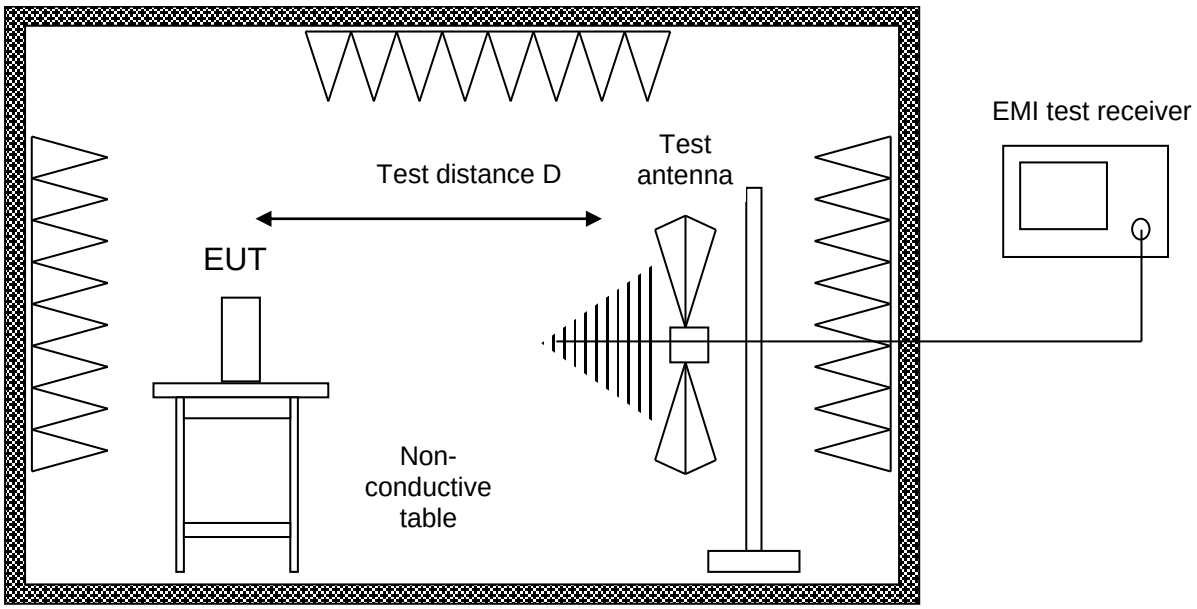
2.3.6.1 Frequency range 9 kHz – 30 MHz



The EUT was placed on a non-conductive table, 0.8 m above the ground.
Radiated emissions in the frequency 9 kHz – 30 MHz is measured within a semi-anechoic room with an active loop antenna with the measurement detector set to peak. In addition in the frequency range 9 kHz to 490 kHz also an average detector was used. The measurement bandwidth of the receiver was set to 300 Hz in the frequency range 9 kHz to 150 kHz and 10 kHz in the frequency range 150 kHz to 30 MHz. Prescans were performed in six positions of the EUT.
For final measurements the detector was set to CISPR quasi-peak and in addition to CISPR average in the frequency range 9 kHz to 490 kHz with a resolution bandwidth 200 Hz in the frequency range 9 kHz to 150 kHz and 9 kHz in the frequency range 150 kHz to 30 MHz. Final tests were performed immediately after a final frequency and zoom (for drifting disturbances) and maximum adjustment.

Product Service

2.3.6.2 Frequency range 30 MHz – 1 GHz



Alternate test site (semi anechoic room)

The EUT was placed on a non-conductive table, 0.8 m above the ground plane
Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole (“Trilog broadband antenna”) is used.
For prescan tests the test receiver is set to peak-detector with a bandwidth of 120 kHz.
With the measurement bandwidth of the test receiver set to 120 kHz CISPR quasi-peak detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

Product Service

2.3.7 Test Results

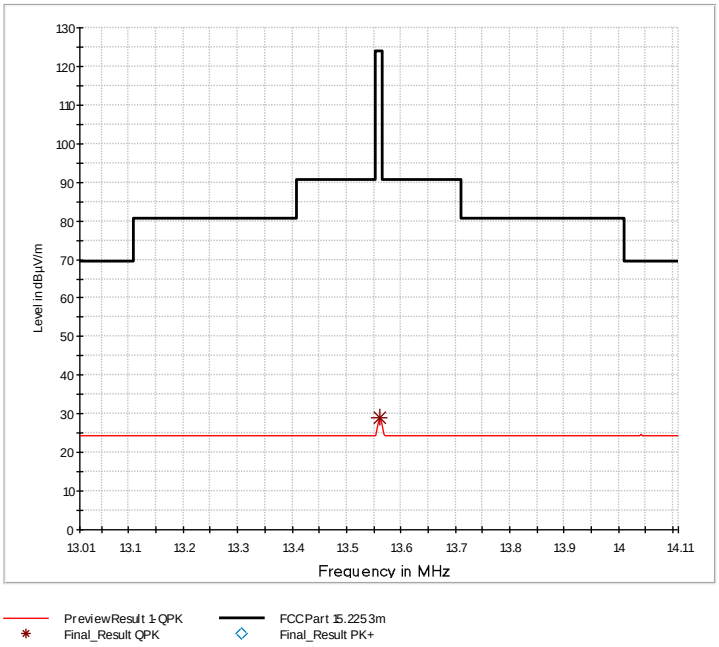
Frequency range	*Limit applied*	*Test distance*
9 kHz – 30 MHz	15.225, 15.209	10 m
Spectrum Mask 13.56 MHz	15.225	3 m
30 MHz – 1 GHz	15.209	3 m

Table 11

Sample calculation:
Final Value (dBµV/m) = Reading Value (dBµV) + (Cable attenuation (dB) + Antenna Transducer (dB(1/m)))

Additional correction of limit in the frequency range 9 – 490 kHz (300 m to 3 m): +80.0 dB
Additional correction of limit in the frequency range 490 kHz – 30 MHz (30 m to 3 m): +40.0 dB
Additional correction of limit in the frequency ranges above 1 GHz (3 m to 1 m): +9.54 dB

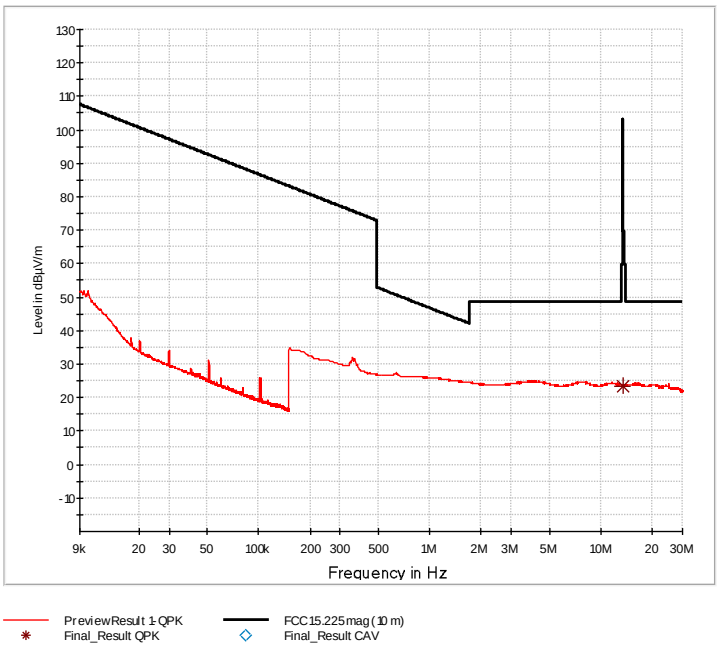
Frequency range 13.01 MHz – 14.11 MHz (Spectrum Mask acc. 15.225(a)-(c)):



Frequency *MHz*	*QuasiPeak* *dBµV/m*	*Limit* *dBµV/m*	*Margin* *dB*	*Meas. Time* *ms*	*Bandwidth* *kHz*	*Azimuth* *deg*	*Corr.* *dB/m*
13.560250	29.09	124.00	94.91	1000	9	107.0	19.7

Product Service

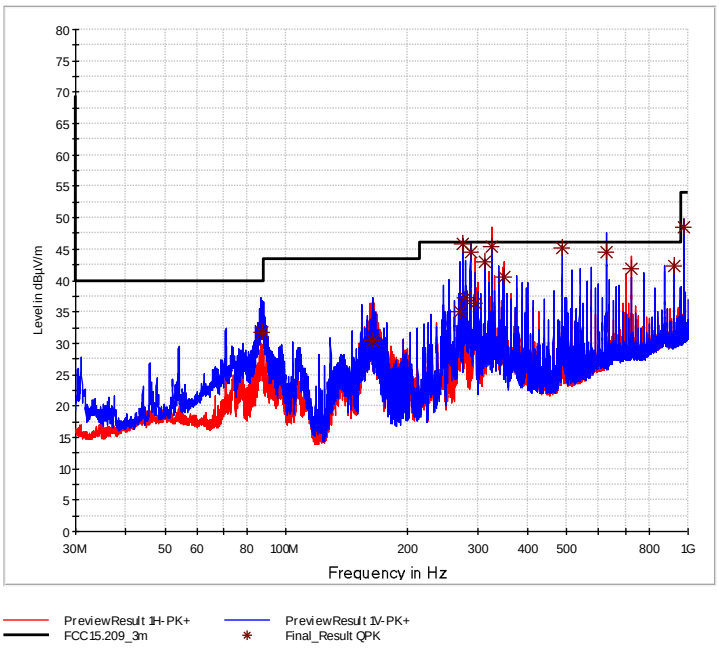
Frequency range 9 kHz – 30 MHz:



Frequency *MHz*	*QuasiPeak* *dBµV/m*	*Limit* *dBµV/m*	*Margin* *dB*	*Meas. Time* *ms*	*Bandwidth* *kHz*	*Azimuth* *deg*	*Corr.* *dB/m*
13.582500	23.59	69.60	46.01	1000	9	77.0	19.2

Product Service

Frequency range 30 MHz – 1 GHz:



Frequency MHz	*QuasiPeak dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Height cm*	*Pol*	*Azimuth deg*	*Corr. dB/m*
87.480000	31.84	40.00	8.16	1000	120	121.0	V	90.0	13.4
163.890000	30.51	43.50	12.99	1000	120	106.0	V	39.0	13.8
270.840000	35.14	46.00	10.86	1000	120	212.0	V	-45.0	18.4
275.010000	45.95	46.00	0.05	1000	120	186.0	V	-54.0	18.5
279.150000	37.33	46.00	8.67	1000	120	174.0	V	-71.0	18.6
287.490000	44.58	46.00	1.42	1000	120	175.0	V	-112.0	18.7
295.830000	36.29	46.00	9.71	1000	120	100.0	H	-29.0	18.8
312.510000	43.05	46.00	2.95	1000	120	157.0	V	-122.0	19.1
324.990000	45.43	46.00	0.57	1000	120	100.0	H	177.0	19.7
350.010000	40.49	46.00	5.51	1000	120	106.0	H	-31.0	20.8
487.500000	45.24	46.00	0.76	1000	120	178.0	V	-159.0	23.3
624.990000	44.60	46.00	1.40	1000	120	103.0	V	27.0	25.2
724.980000	41.88	46.00	4.12	1000	120	103.0	H	-32.0	27.0
924.990000	42.26	46.00	3.74	1000	120	103.0	H	101.0	29.4
975.000000	48.39	54.00	5.61	1000	120	100.0	V	-87.0	29.8

Product Service

2.3.8 Test Location and Test Equipment

The test was carried out in semi anechoic room, Cabin No. 8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESR7	61814	12	2024-06-30
Loop antenna	Rohde & Schwarz	HFH2-Z2	18876	36	2026-04-30
TRILOG broadband antenna	Schwarzbeck	VULB 9162	20116	36	2025-01-31
AC Source	Elettrotest	TPS/T90K	20155	---	---
EMC measurement software	Rohde & Schwarz	EMC32 Emission – V10.60.20	19927	---	---
Semi anechoic room	Albatross Projects	Cabin No. 8	19917	---	---

Table 12

Product Service

2.4 Conducted Emissions on Mains Terminals

2.4.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.207
ISED RSS-Gen, Clause 8.8

2.4.2 Equipment under Test and Modification State

RFID Read-Writer; S/N N/A; Modification State 0

2.4.3 Date of Test

2023-11-14

2.4.4 Environmental Conditions

Ambient Temperature	22 °C
Relative Humidity	40 %

2.4.5 Specification Limits

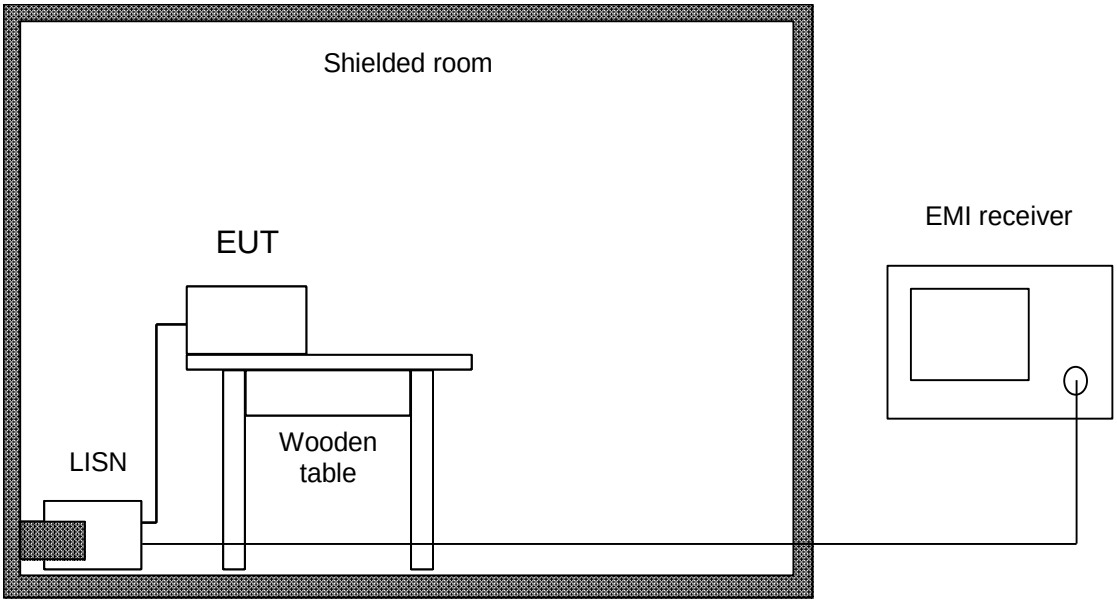
Required Specification Limits			
Line Under Test	*Frequency Range (MHz)*	*Quasi-peak (dBµV)*	*Average (dBµV)*
AC Power Port	0.15 to 0.5	66 to 56*	56 to 46*
	0.5 to 5	56	46
	5 to 30	60	50
Supplementary information: *Decreases with the logarithm of the frequency.			

Table 13 Emission limits

Product Service

2.4.6 Test Method

The test was performed according to ANSI C63.10, section 6.2.



The EUT was placed on a non-conductive table 0.8 m above a reference ground plane and 0.4 m away from a vertical coupling plane
All power was connected to the EUT through an Line Impedance Stabilization Network (LISN). Conducted disturbance voltage measurements on mains lines were made at the output of the LISN. The LISN was placed 0.8 m from the boundary of the EUT and bounded to the reference ground plane. To simplify testing with quasi-peak and linear average (cispr-average) detector the following procedure is used:
First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with the detectors set to peak and average using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with the detectors set to quasi-peak and average. If the average limit is kept with quasi-peak levels measurement with average detector is optional. In cases of emission levels between quasi-peak and average limit an additional measurement with average detector has to be performed.

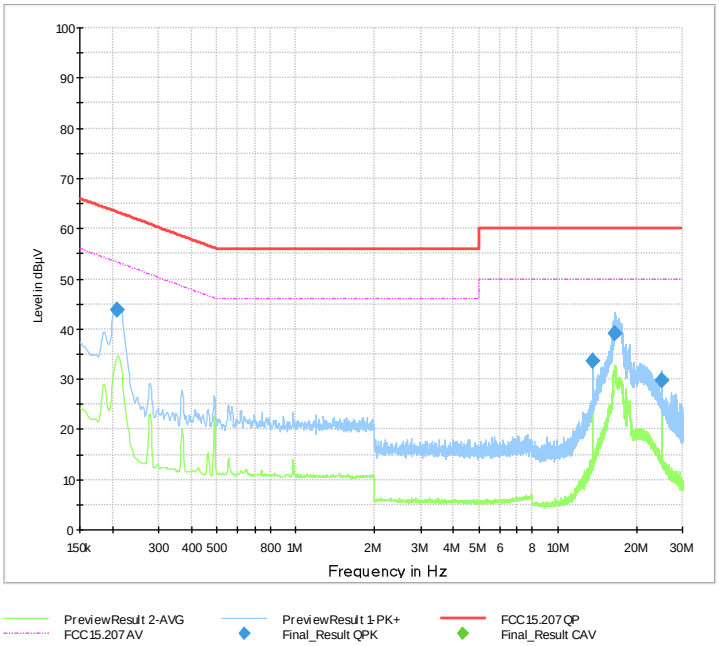
Product Service

2.4.7 Test Results

Sample calculation:

Final Value (dBµV) = Reading Value (dBµV) + (Cable attenuation (dB) + LISN Transducer (dB))

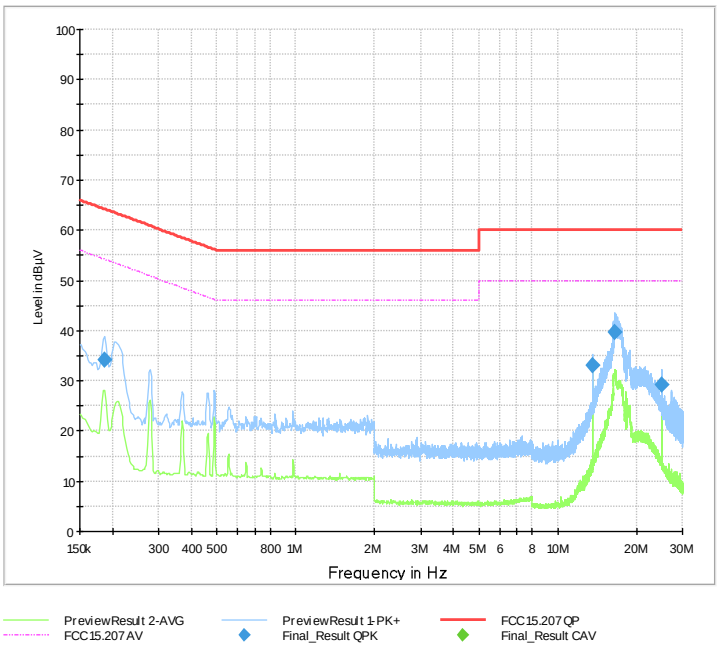
Line L1:



Frequency MHz	*QuasiPeak dBµV*	*CAverage dBµV*	*Limit dBµV*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Corr. dB*
0.208500	43.89		63.27	19.37	1000	9	10.1
13.562250	33.58		60.00	26.42	1000	9	10.3
16.489500	39.19		60.00	20.81	1000	9	10.2
24.999000	29.68		60.00	30.32	1000	9	10.3

Product Service

Line N:



Frequency MHz	*QuasiPeak dBµV*	*CAverage dBµV*	*Limit dBµV*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Corr. dB*
0.186000	34.17		64.21	30.04	1000	9	10.1
13.560000	33.00		60.00	27.00	1000	9	10.3
16.552500	39.71		60.00	20.29	1000	9	10.2
24.999000	29.31		60.00	30.69	1000	9	10.3

2.4.8 Test Location and Test Equipment

The test was carried out in shielded room, Cabin No. 9

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESR7	61814	12	2024-06-30
V-network	Rohde & Schwarz	ENV216	39908	12	2024-05-31
AC Source	Elettrotest	TPS/T20K	20154		
EMI test software	Rohde & Schwarz	EMC32 Emission – V10.60.20	20090		
Shielded room	Albatross Projects	Cabin No. 9	21083		

Table 14

Product Service

2.5 Temperature Stability

2.5.1 Specification Reference

FCC 47 CFR Part 15 E, Clause 15.225(e)
ISSED RSS-210, Clause B.6 b.
ISED RSS-Gen, Clause 6.11

2.5.2 Equipment under Test and Modification State

RFID Read-Writer; S/N N/A; Modification State 0

2.5.3 Date of Test

2023-11-14

2.5.4 Environmental Conditions

Ambient Temperature	22 °C
Relative Humidity	40 %

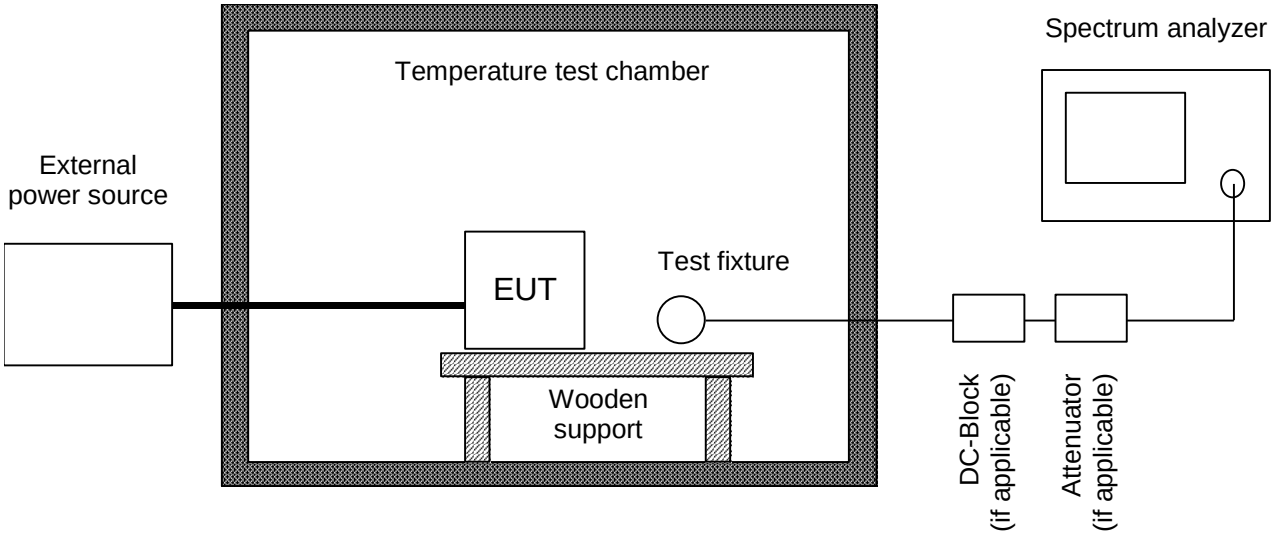
2.5.5 Specification Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01 % (±100 ppm) of the operating frequency over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 “C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Product Service

2.5.6 Test Method

The test was performed according to ANSI C63.10, section 6.8.



The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rates supply voltage at a temperature of 20 °C. Temperature and voltage range may vary if the manufacturer states another temperature or voltage range.
If the EUT provides an antenna connector the spectrum analyzer is connected to this port. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as a DC block and appropriate (50 Ω) attenuators. In case where the EUT does not provide an antenna connector or a test fixture is used.
For battery operated equipment, the test is performed using a new battery. Alternatively, an external supply voltage can be used and is at least set to:

- The maximum battery voltage as delivered by a new battery or 115 % of the battery nominal voltage;
- The battery nominal voltage
- 85 % of the battery nominal voltage
- The battery operating end point voltage which shall be specified by the equipment manufacturer.

The EUT is operating providing an unmodulated carrier for frequency error tests. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.
If an unmodulated carrier is not available a significant and stable point of the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1 % of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance is larger than the uncertainty of the measured frequency tolerance.

The temperature range was narrowed to 5 °C to 40 °C by the applicant.

Product Service

2.5.7 Test Results

Temperature	*Supply Voltage*	*Frequency*	*Frequency drift*
5 °C	120 V	13.56050 MHz	73.68 ppm
10 °C	120 V	13.56000 MHz	36.84 ppm
20 °C	102 V	13.56050 MHz	73.68 ppm
20 °C	120 V	13.55950 MHz	0.00 ppm
20 °C	138 V	13.56000 MHz	36.84 ppm
30 °C	120 V	13.56050 MHz	73.68 ppm
40 °C	120 V	13.56050 MHz	73.68 ppm

Table 15

2.5.8 Test Location and Test Equipment

The test was carried out in radio test laboratory.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Temperature test chamber	Feutron	KPK200-2	19868	36	2024-08-31
AC/DC Source	Elettrotest	TPS/M	33080	---	---

Table 16

Product Service

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 17 Measurement uncertainty based on CISPR 16-4-2

Product Service

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Occupied Bandwdith	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
25 MHz – 6 GHz	1.96	±4.4 dB
1 GHz – 18 GHz	1.96	±4.7 dB
18 GHz – 40 GHz	1.96	±4.9 dB
40 GHz – 325 GHz	1.96	±6.1 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10^{-7}
The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 18 Measurement uncertainty based on ETSI TR 100 028

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}) and as specified in the test report below. This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

Test Name	*Expanded Uncertainty*
Occupied Bandwidth	±5 %
Conducted Power	
9 kHz ≤ f < 30 MHz	±1.0 dB
30 MHz ≤ f < 1 GHz	±1.5 dB
1 GHz ≤ f ≤ 40 GHz	±2.5 dB
1 MS/s power sensor (2.4 / 5 GHz band)	±1.5 dB
Power Spectral Density	±3.0 dB
Radiated Power	
25 MHz – 26.5 GHz	±6.0 dB
26.5 GHz – 66 GHz	±8.0 dB
40 GHz – 325 GHz	±10.0 dB
Conducted Spurious Emissions	±3.0 dB
Radiated Field Strength 9 kHz – 40 GHz	±6.0 dB
Voltage	
DC	± 1.0 %
AC	± 2.0 %
Time (automatic)	± 5 %
Frequency	± 10^{-7}

Table 19 Decision Rule: Maximum allowed measurement uncertainty