Report on the FCC and IC Testing of the SEW-EURODRIVE GmbH & Co KG

Model: MAXO-MS/M/SM-GIP/1

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: SEW-EURODRIVE GmbH & Co KG
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Germany

FCC ID: VEB-28279883
IC: 7177A-28279883

COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Alexander Deese	2024-06-11	SIGN-ID 925407
Authorised Signatory	Matthias Stumpe	2024-06-12	SIGN-ID 925441

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	Alexander Deese	2024-06-11	SIGN-ID 925407

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

ACCREDITATION
Our BNetzA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our BNetzA Accreditation.
Results of tests not covered by our BNetzA Accreditation Schedule are marked NBA (Not BNetzA Accredited).

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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	2024-01-26
1	FCC ID and IC corrected.	2024-04-24
2	Model Number changed.	2024-06-11

Table 1: Report of Modifications

1.2 Introduction

Applicant	SEW-EURODRIVE GmbH & Co KG
Manufacturer	SEW-EURODRIVE GmbH & Co KG
Model Number(s)	MAXO-MS/M/SM-GIP/1
Serial Number(s)	031.123456789.0001.23 031.123456789.0002.23
Hardware Version(s)	---
Software Version(s)	---
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	---
Order Number	61681889, 61872950
Date	---
Date of Receipt of EUT	2023-10-20
Start of Test	2023-10-24
Finish of Test	2024-01-24
Name of Engineer(s)	Alexander Deese
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*
	15.203	Antenna requirement	N/T
2.1	15.215(c)	Bandwidth of Signal	Pass
	15.207	Conducted Disturbance at Mains Terminal	N/T
2.2	15.209, 15.225	Radiated Disturbance	Pass
2.3	15.225(e)	Frequency Tolerance	Pass

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

Section	*Specification Clause*	*Test Description*	*Result*
2.2	7.3	Radiated Emissions	Pass
	7.3	AC Power Line Conducted Emissions	N/T
2.3	B.6 b.	Frequency Tolerance	Pass

Table 3: Results according to ISED RSS-210

Section	*Specification Clause*	*Test Description*	*Result*
2.1	6.7	Bandwidth of Signal	Pass
	8.8	AC Power Line Conducted Emissions	N/T
2.2	8.9, 8.10	Radiated Emissions	Pass
2.3	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:	11,810 MHz – 15,310 MHz
Center Frequency:	13,56 MHz
Power supply	
Supply Voltage:	18 – 30 V
Supply Frequency:	DC

1.5 Test Configuration

The EUT was 24 V power supplied.

1.6 Modes of Operation

RFID was continuously reading tag.

1.7 Deviations from Standard

Product Service

1.8 EUT Modifications Record

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

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

Table 5

1.9 Test Location

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

Test Name	Name of Engineer(s)
RFID continuously reading	
Bandwidth of Signal	Alexander Deese
Conducted Disturbance at Mains Terminal	Alexander Deese
Radiated Disturbance	Alexander Deese
Frequency Tolerance	Alexander Deese

Office Address:
Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

2 Test Details

2.1 Bandwidth of Signal

2.1.1 Specification Reference

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

2.1.2 Equipment under Test and Modification State

MAXO-MS/M/SM-GIP/1; S/N 031.123456789.0001.23; Modification state 0

2.1.3 Date of Test

2024-01-24

2.1.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	36 %

2.1.5 Specification Limits

No limitation – Bandwidth noted

2.1.6 Test Method

The test was performed according to ANSI C63.10, clauses 6.9
See section 2.2 of this test report for details.

Product Service

2.1.7 Test Results

Voltage	*Center frequency*	*20 dB Bandwidth (MHz)*
24 V	13.5595 MHz	0.13018

Table 6: 20 dB bandwidth

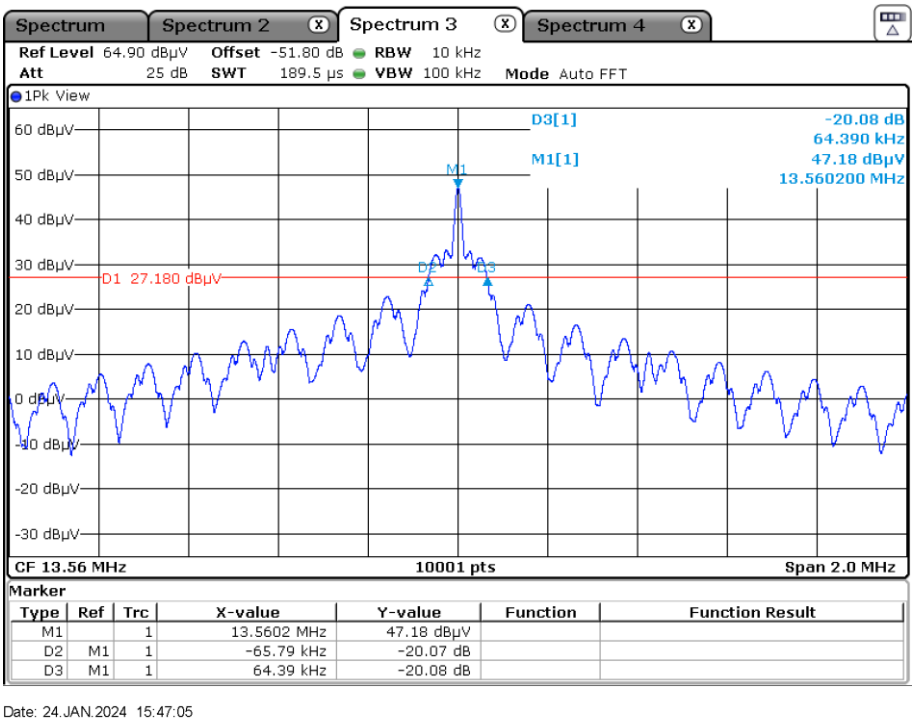


Figure 1 – 20 dB Bandwidth, 24 V

Voltage	*Centre Frequency*	*99% Bandwidth (MHz)*
24 V	13.56012944	0.00073463

Table 7: 99% bandwidth

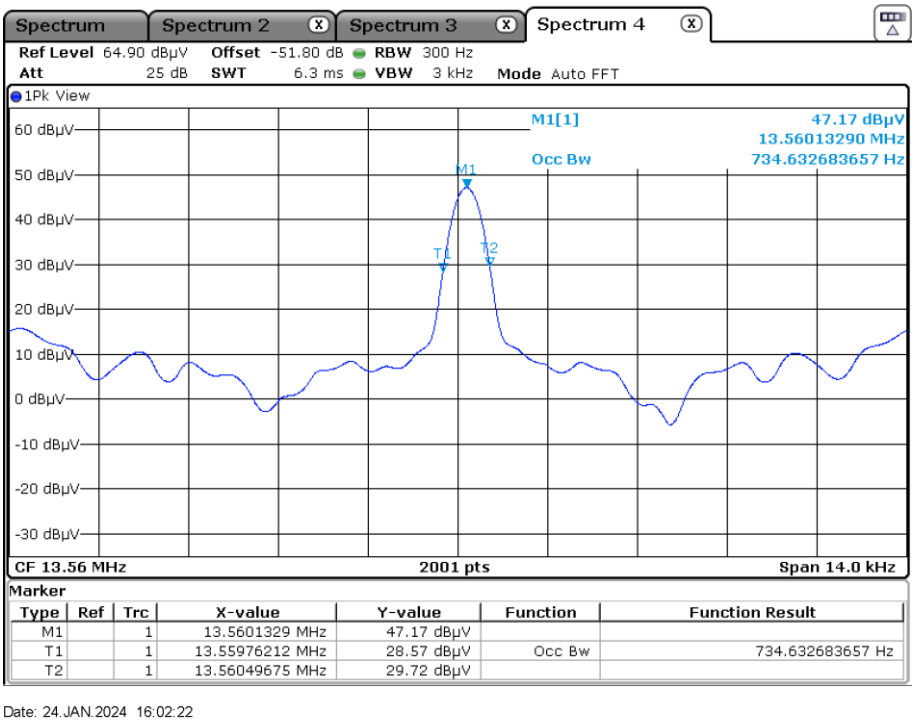


Figure 3 – 99 % Bandwidth, 24 V

Product Service

2.1.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2024-02-29
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2024-08-31

Table 8

Product Service

2.2 Radiated Emissions

2.2.1 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

2.2.2 Equipment under Test and Modification State

MAXO-MS/M/SM-GIP/1; S/N 031.123456789.0001.23; Modification state 0
MAXO-MS/M/SM-GIP/1; S/N 031.123456789.0002.23; Modification state 0

2.2.3 Date of Test

2023-10-24 and 2024-01-24

2.2.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	36 %

Product Service

2.2.5 Specification Limits

Radiated emission limits:					
Frequency Range	*Test distance*	*Field strength*		*Field strength*	
(MHz)	*(m)*	*(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 9 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).

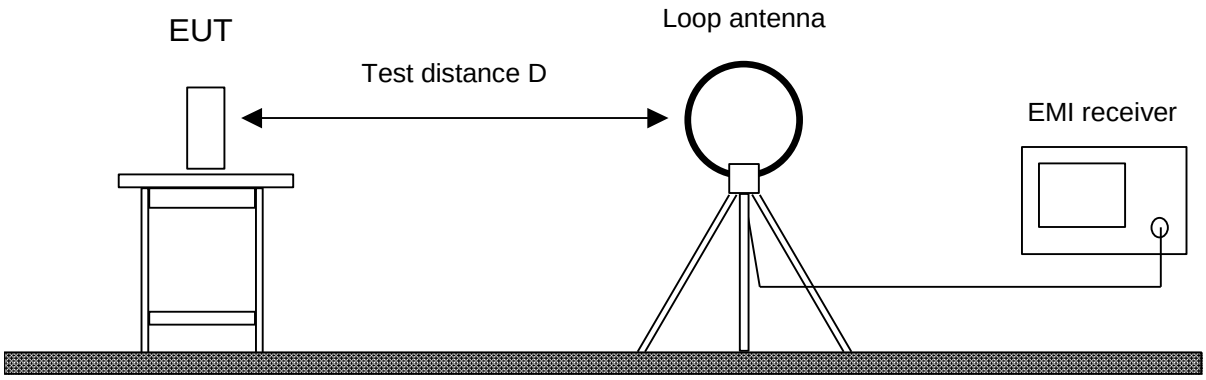
Product Service

2.2.6 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.

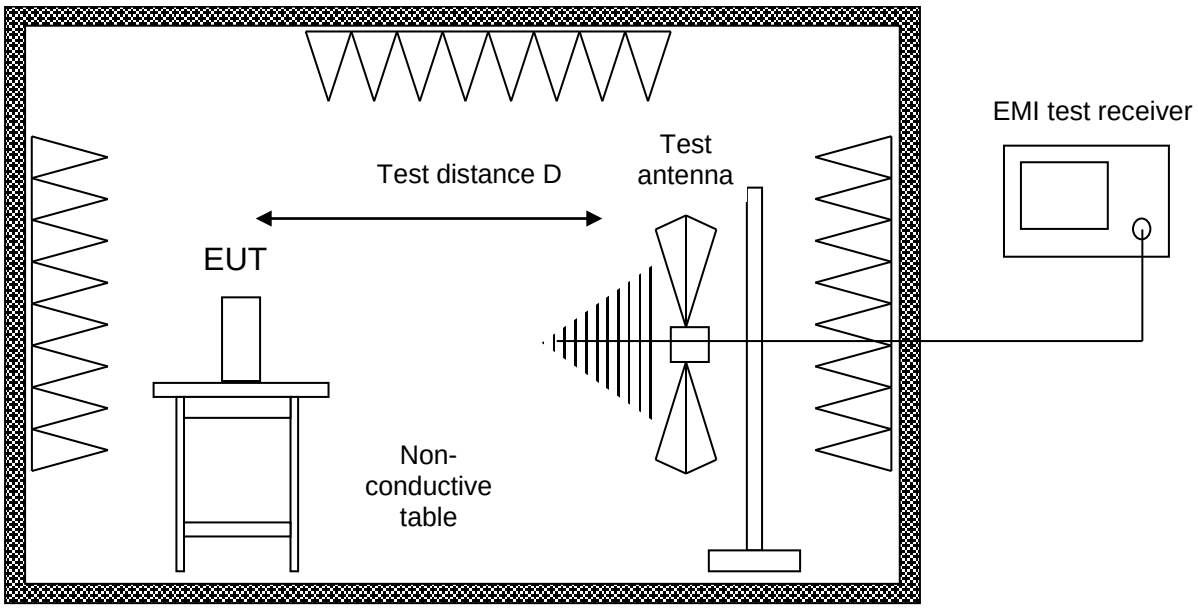
2.2.6.1 Frequency range 9 kHz – 30 MHz



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

2.2.6.2 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

2.2.7 Test Results

Frequency range	*Limit applied*	*Test distance*
9 kHz to 30 MHz	15.209	3 m
30 MHz to 1 GHz	15.209	3 m

Table 10

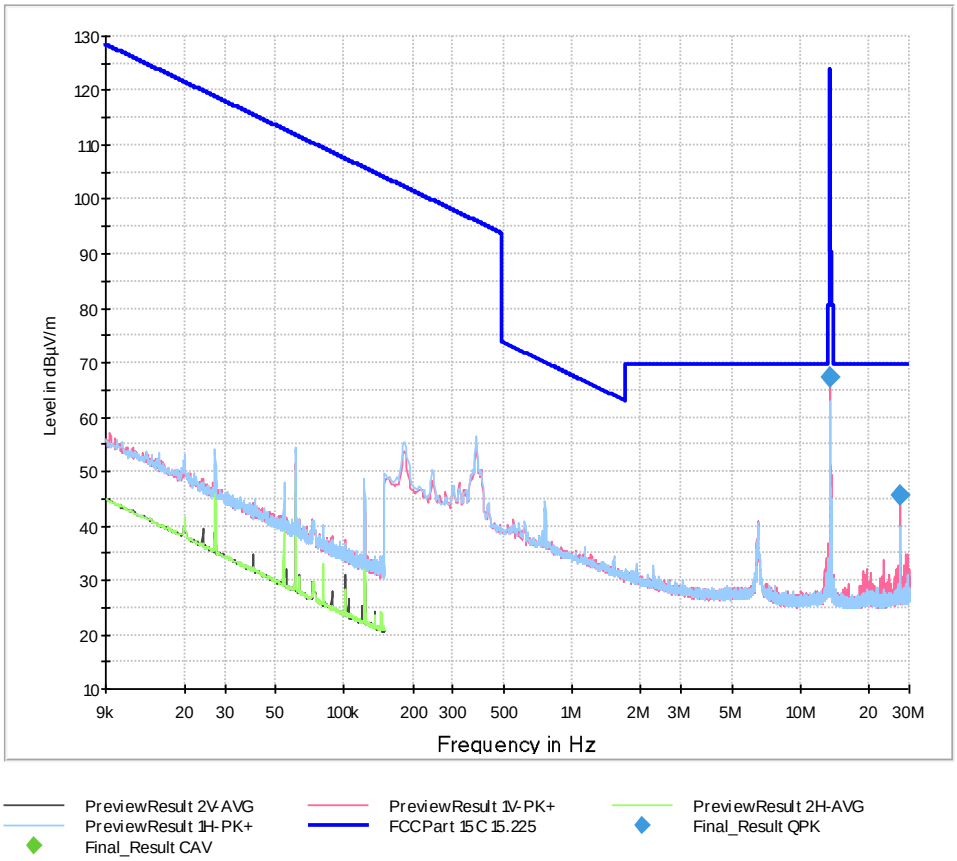
Sample calculation:

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

Product Service

Frequency range 9 kHz – 30 MHz:

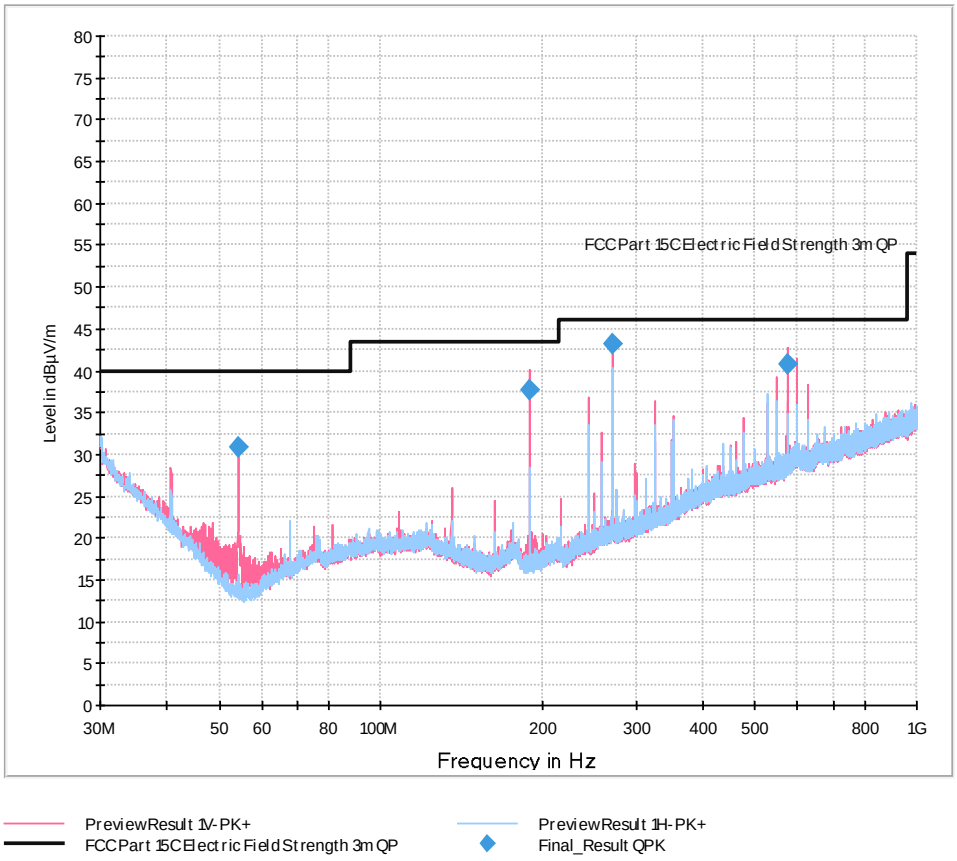


Final Results:

Frequency MHz	*QuasiPeak dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Height cm*	*Pol*	*Azimuth deg*	*Corr. dB/m*
13.560000	67.18	124.00	56.82	1000.0	9.000	100.0	V	112.0	19.2
27.120750	45.48	69.50	24.02	1000.0	9.000	100.0	V	111.0	19.9

Product Service

Frequency range 30 MHz – 1 GHz:



Final Results:

Frequency MHz	*QuasiPeak dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Height cm*	*Pol*	*Azimuth deg*	*Corr. dB/m*
54.240000	30.82	40.00	9.18	1000.0	120.000	114.0	V	148.0	11.0
189.840000	37.59	43.50	5.91	1000.0	120.000	103.0	V	7.0	14.9
271.200000	43.13	46.02	2.89	1000.0	120.000	104.0	V	-106.0	18.2
575.010000	40.84	46.02	5.18	1000.0	120.000	105.0	V	2.0	26.0

Product Service

2.2.8 Test Location and Test Equipment

The test was carried out in semi anechoic room – cabin no. 11.

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2024-04-30
Loop antenna	Schwarzbeck	FMZB 1519B	44334	36	2026-06-30
EMC measurement software	Rohde & Schwarz	EMC32 V10.60.20	42986	N/A	N/A
ULTRALOG Antenna	Rohde & Schwarz	HL562E	61486	36	2026-04-30
Fixed attenuator	Aeroflex	ATT 6dB	61491	36	2026-04-30

Table 11

Product Service

2.3 Temperature Stability

2.3.1 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

2.3.2 Equipment under Test and Modification State

MAXO-MS/M/SM-GIP/1; S/N 031.123456789.0001.23; Modification state 0

2.3.3 Date of Test

2024-01-24

2.3.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	36 %

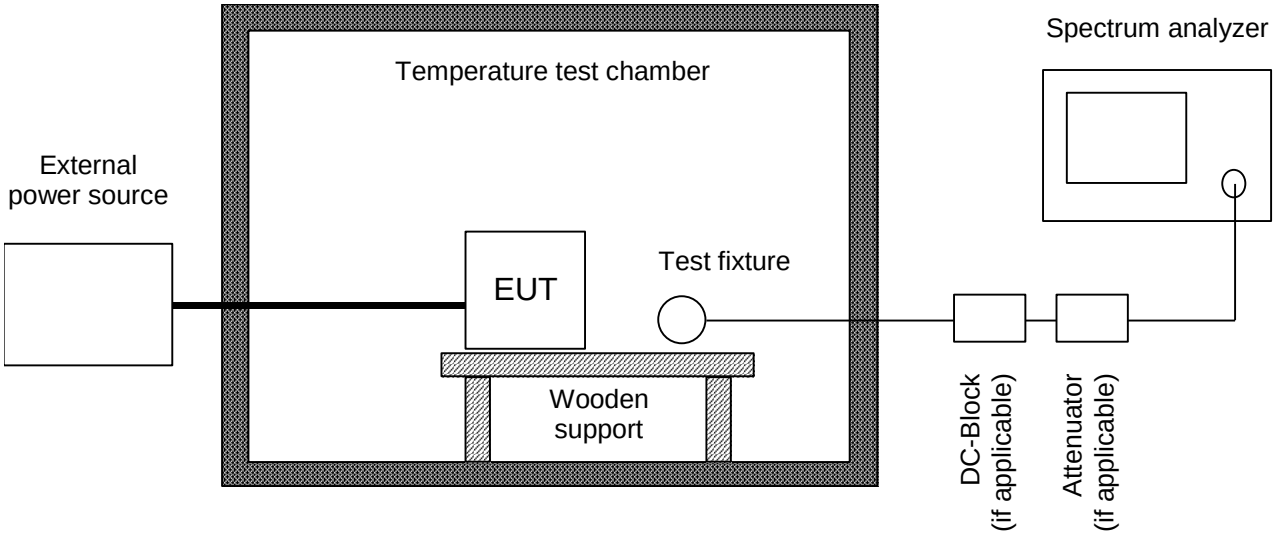
2.3.5 Specification Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01 % 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

2.3.6 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.

Product Service

2.3.7 Test Results

Temperature	*Supply Voltage*	*Frequency drift*	*Relative drift*
20 °C	24 V	129,435	0,000954535 %
20 °C	18 V	129,435	0,000954535 %
20 °C	30 V	104,945	0,000773931 %
- 20 °C	24 V	251,875	0,001857485 %
55 °C	24 V	122,44	0,00090295 %

Table 12

2.3.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2024-02-29
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2024-08-31

Table 13

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 14 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 15 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 16 Decision Rule: Maximum allowed measurement uncertainty