

Report on the FCC and IC Testing of the KEBA Industrial Automation GmbH

Model: KeTop T150WL-R10-NN1-W10E

Partly in accordance with FCC 47 CFR
Parts 15 C and ISED RSS-247 and ISED
RSS-Gen and ISED ICES-003

Prepared for: KEBA Industrial Automation GmbH
Reindlstrasse 51
4040 Linz
Austria



Product Service

**Add value.
Inspire trust.**

COMMERCIAL-IN-CONFIDENCE

Date: 2022-05-23

Document Number: TR-76967-36510-18 | Issue 3

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|----------------------|-----------------|------------|--------------------|
| Project Management | Michael Ingerl | 2022-05-23 | SIGN-ID 653258 |
| Authorised Signatory | Markus Biberger | 2022-05-23 | SIGN-ID 653304 |

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 reported testing was carried out on a sample equipment to demonstrate limited compliance with with FCC 47 CFR
Parts 15 C and ISED RSS-247 and RSS-GEN and ISED ICES-003.

The sample tested was found to comply partly with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|-----------------|----------------|------------|--------------------|
| Testing | Michael Ingerl | 2022-05-23 | SIGN-ID 653259 |

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

Executive Statement:

A sample of this product was tested and found to be partly compliant with FCC 47 CFR Part 15 C:2019 and
ISED RSS-247:2017 and ISED RSS-Gen:2019 and ISED RSS-003 Issue 6.

Only partly tested in accordance with applicant.

Contains FCC ID: U870009 and IC: 20800-WALR1MOD

DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD Product Service with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD Product Service. No part of this document may be reproduced without the prior written approval of TÜV SÜD Product Service. © 2022 TÜV SÜD Product Service.

Trade Register Munich
HRB 85742
VAT ID No. DE129484267
Information pursuant to Section 2(1)
DL-InfoV (Germany) at
www.tuev-sued.com/imprint

Managing Directors:
Walter Reithmaier (Sprecher / CEO)
Dr. Jens Butenandt
Patrick van Welij

Phone: +49 (0) 9421 55 22-0
Fax: +49 (0) 9421 55 22-99
www.tuev-sued.de

TÜV SÜD Product Service GmbH
Äußere Frühlingsstraße 45
94315 Straubing
Germany



Content

| | | |
|---------|----------------------------------|----|
| 1 | Report Summary..... | 2 |
| 1.1 | Modification Report..... | 2 |
| 1.2 | Introduction | 2 |
| 1.3 | Brief Summary of Results..... | 3 |
| 1.4 | Product Information | 4 |
| 1.5 | Modes of Operation | 5 |
| 1.6 | Deviations from Standard | 5 |
| 1.7 | EUT Modifications Record | 5 |
| 1.8 | Test Location | 5 |
| 2 | Test Details..... | 6 |
| 2.1 | Radiated Emissions | 6 |
| 3 | Measurement Uncertainty | 17 |
| Annex A | Photographs of test setups | |



1 Report Summary

1.1 Modification Report

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

| <i>Issue</i> | <i>Description of changes</i> | <i>Date of Issue</i> |
|--------------|---|----------------------|
| 1 | First Issue | 2022-03-15 |
| 2 | Changed ISED RSS-210 in ISED RSS-247 (Typing Error) | 2022-05-10 |
| 3 | Added FCC ID and IC at front page | 2022-05-23 |

Table 1: Report of Modifications

1.2 Introduction

| | |
|---|---|
| Applicant | KEBA Industrial Automation GmbH |
| Manufacturer | KEBA Industrial Automation GmbH |
| Model Number(s) | KeTop T150WL-R10-NN1-W10E |
| Serial Number(s) | 22274109 |
| Number of Samples Tested | 1 |
| Test Specification(s) / Issue / Date | FCC 47 CFR Parts 15 C: 2019 and ISED RSS-247, Issue 3 : 2017 ISED RSS-Gen, Issue 5, Amd. 1 : 2019 ISED ICES-003, Issue 6 |
| Test Plan/Issue/Date | --- |
| Order Number | 5487767 |
| Date of Receipt of EUT | 2022-01-19 |
| Start of Test | 2022-01-26 |
| Finish of Test | 2022-02-10 |
| Name of Engineer(s) | Michael Ingerl |
| Related Document(s) | ANSI C63.4:2014 ANSI C63.10:2013 |



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Parts 15 C and ISED RSS-247 and RSS-Gen and ISED ICES-003 is shown below.

| Section | Specification Clause | Test Description | Result |
|---------|----------------------|---|---------------------|
| | 15.203 | Antenna requirement | Integrated antennas |
| | 15.215(c) | Bandwidth of Signal | Not performed |
| | 15.207 | Conducted Disturbance at Mains Terminal | Not performed |
| 2.1 | 15.209 | Radiated Disturbance | Pass |

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

| Section | Specification Clause | Test Description | Result |
|---------|----------------------|--------------------|--------|
| 2.1 | 5.5 | Spurious Emissions | Pass |

Table 3: Results according to ISED RSS-247

| Section | Specification Clause | Test Description | Result |
|---------|----------------------|-----------------------------------|---------------|
| | 6.7 | Bandwidth of Signal | Not performed |
| | 8.11 | Temperature Stability | Not performed |
| | 8.8 | AC Power Line Conducted Emissions | Not performed |
| 2.1 | 8.9, 8.10 | Radiated Emissions | Pass |

Table 4: Results according to ISED RSS-Gen

| Section | Specification Clause | Test Description | Result |
|---------|----------------------|-----------------------------------|---------------|
| | 6.1 | AC Power Line Conducted Emissions | Not performed |
| 2.1 | 6.2 | Radiated Emissions | Pass |

Table 5: Results according to ISED ICES-003



1.4 Product Information

1.4.1 Technical Description

| Equipment characteristics | | | |
|-------------------------------|---|-------------------|---------------------------------|
| Type designation: | KeTop T150WL-R10-NN1-W10E | | |
| Type of equipment: | KeTop Safe wireless system | | |
| Application ¹ : | Inductive Applications, Wideband transmission systems | | |
| Equipment class: | Equipment for portable use | | |
| Kind of equipment | Transceiver | | |
| Frequency band ¹ : | 9 j | 3 b | 14 e1 and e2 |
| Frequency range: | 13,553 - 13,567 MHz | 2400 – 2483,5 MHz | 5150-5350 MHz and 5470-5725 MHz |
| Antenna: | Integrated Antenna | | |
| Standby mode: | Not Applicable | | |

¹ Classification according to CEPT/ERC Recommendation 70-03



1.5 Modes of Operation

Battery supplied – Transmitting continuously on RFID, Wifi 2,4GHz, Wifi 5GHz, WAL and Bluetooth.

1.6 Deviations from Standard

none

1.7 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 6

1.8 Test Location

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

| Test Name | Name of Engineer(s) |
|----------------------|---------------------|
| Radiated Disturbance | Michael Ingerl |

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



Product Service

2 Test Details

2.1 Radiated Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clauses 15.205 and 15.209
ISED RSS-247, Clause 5.5 and 6.2.4.2
ISED RSS-Gen, Clauses 8.9 and 8.10
ISED ICES-003, Clause 6.2

2.1.2 Equipment under Test and Modification State

KeTop T150WL-R10-NN1-W10E; S/N 22274109; Modification State 0

2.1.3 Date of Test

2022-01-26 – 2022-02-10

2.1.4 Environmental Conditions

| | |
|---------------------|-------|
| Ambient Temperature | 21 °C |
| Relative Humidity | 36 % |



2.1.5 Specification Limits

| General radiated emission limits: | | | | | |
|-----------------------------------|----------------------|---------------------|------------------------------|---------------------|------------------------------|
| Frequency Range (MHz) | Test distance (m) | Field strength | | Field strength | |
| | | ($\mu\text{A/m}$) | ($\text{dB}\mu\text{A/m}$) | ($\mu\text{V/m}$) | ($\text{dB}\mu\text{V/m}$) |
| 0.009 – 0.49 | 300 | $6.37 / f$ | $20 \cdot \lg(6.37 / f)$ | $2400 / f$ | $20 \cdot \lg(2400 / f)$ |
| 0.49 – 1.705 | 30 | $63.7 / f$ | $20 \cdot \lg(63.7 / f)$ | $24000 / f$ | $20 \cdot \lg(24000 / f)$ |
| 1.705 - 30 | 30 | 0.08 | $20 \cdot \lg(0.08 / f)$ | 30 | $20 \cdot \lg(30 / f)$ |
| 30 – 88 | 3 | --- | --- | 100 | 40 |
| 88 – 216 | 3 | -- | --- | 150 | 43.5 |
| 216 – 960 | 3 | -- | --- | 200 | 46 |
| above 960 | 3 | -- | --- | 500 | 54 |
| Note 1: f in kHz | | | | | |

Table 7 General radiated emission limits according to § 15.209

2.1.6 Test Method

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

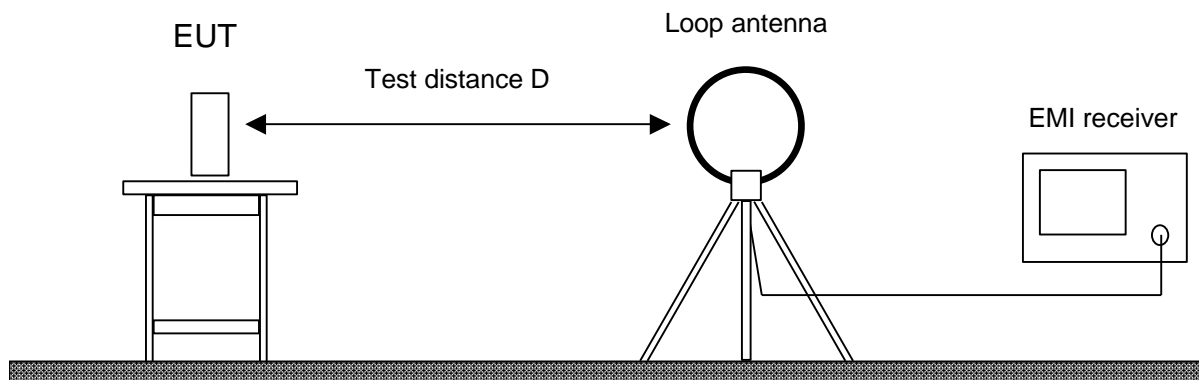
Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the 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.

2.1.6.1 Frequency range 9 kHz – 30 MHz

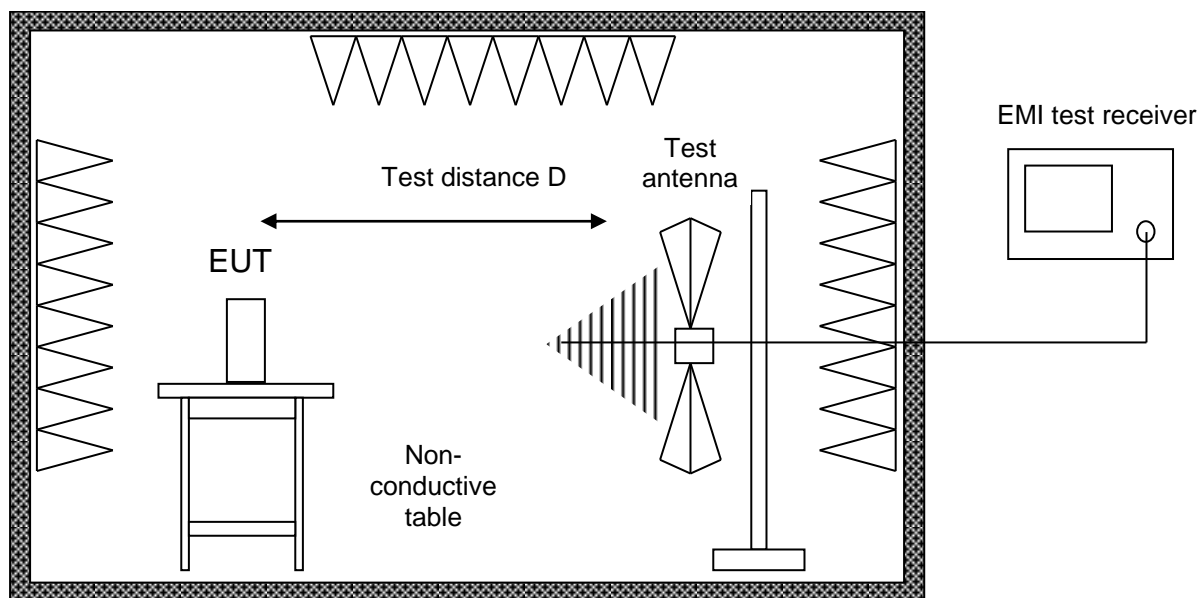


The EUT was placed on a non-conductive table, 0.8 m above the ground.

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.

2.1.6.2 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

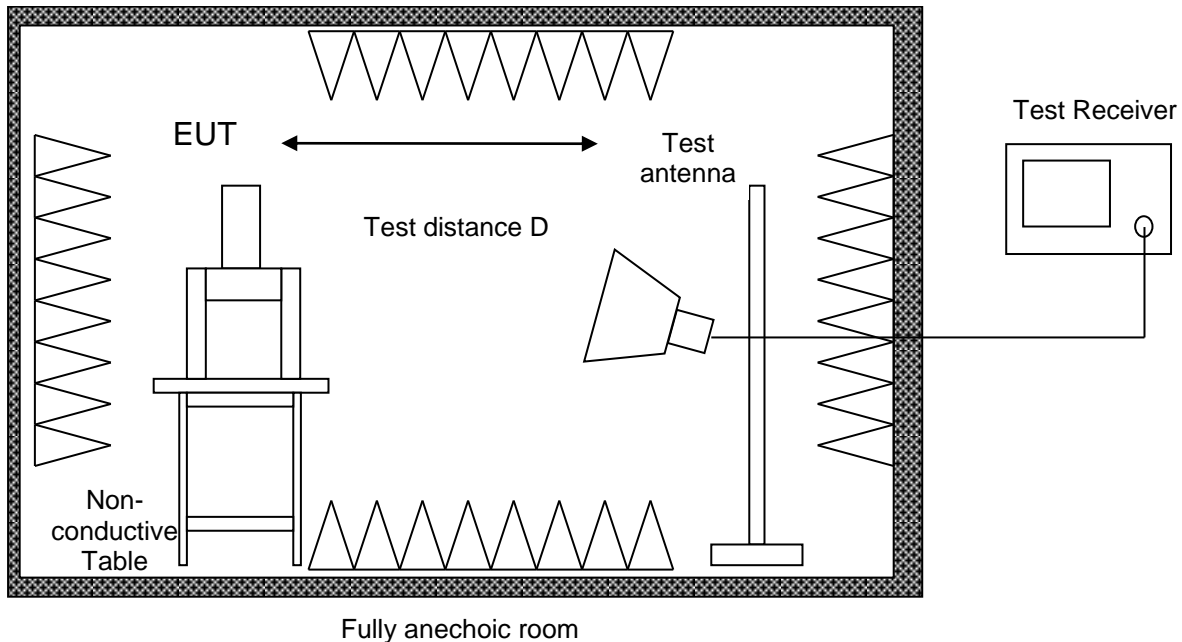
Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") 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.

Digital emissions in the frequency range 30 MHz to 1 GHz were evaluated according to the Class A limit.

2.1.6.3 Frequency range above 1 GHz



The EUT was placed on a non-conductive table, 1.5 m above the ground plane. Radiated emission tests above 1 GHz are performed in a fully anechoic room with the S_{VSWR} requirements of ANSI C63.4. Measurements are performed both in the horizontal and vertical planes of polarisation using a test receiver with the detector function set to peak and average and the resolution bandwidth set to 1 MHz. Testing above 1 GHz is performed with horn antennas with the EUT in boresight of the antenna. For prescan tests the test receiver is set to peak- and average-detector with a bandwidth of 1 MHz. With the measurement bandwidth of the test receiver set to 1 MHz and peak- and CISPR average-detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

Carrier frequencies were excluded from evaluated to the spurious emission limits.



2.1.7 Test Results

| <i>Frequency range</i> | <i>Limit applied</i> | <i>Test distance</i> |
|------------------------|--|----------------------|
| 9 kHz – 30 MHz | § 15.209; § 15.225; RSS-GEN; RSS-247, Annex B, B3 | 3 m |
| 30 MHz – 1 GHz | § 15.209; RSS-GEN | 3 m |
| 1 GHz – 18 GHz | § 15.209; RSS-GEN | 1 m |
| 18 GHz – 40 GHz | § 15.209; RSS-GEN | 1 m |

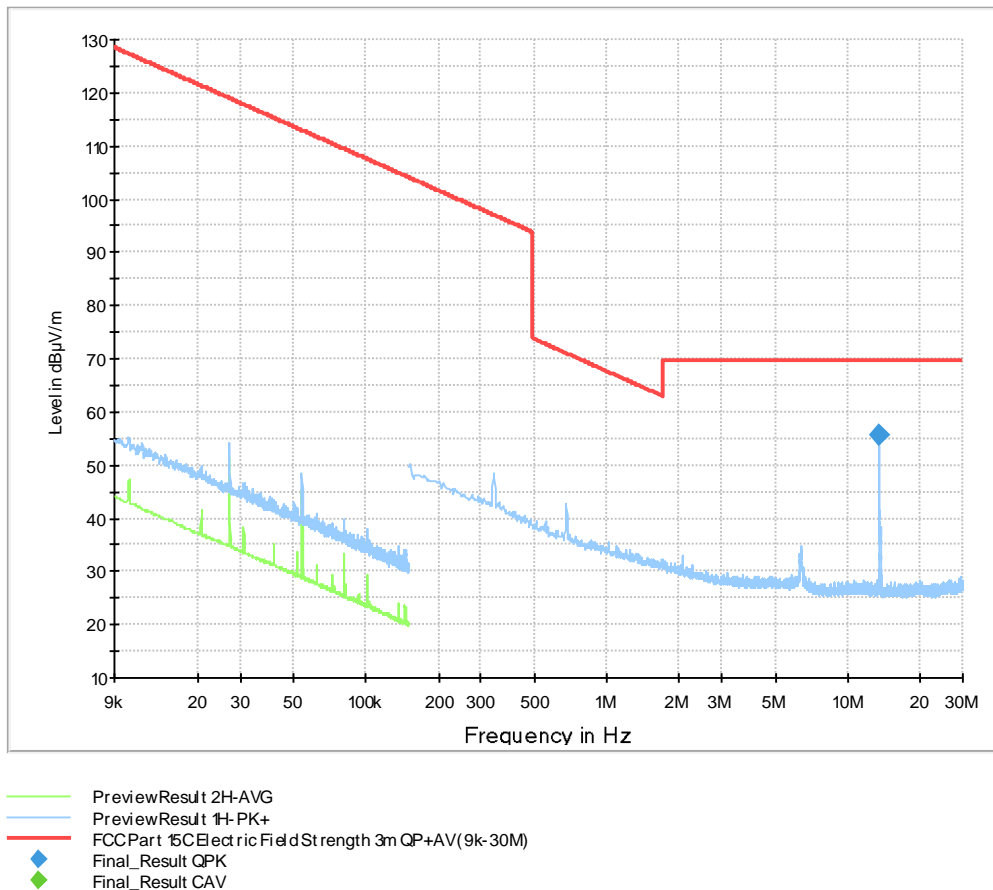
Table 8

Sample calculation:

Final Value (dB μ V/m) = Reading Value (dB μ V) + (Cable attenuation (dB)
+ Antenna Transducer (dB(1/m)))

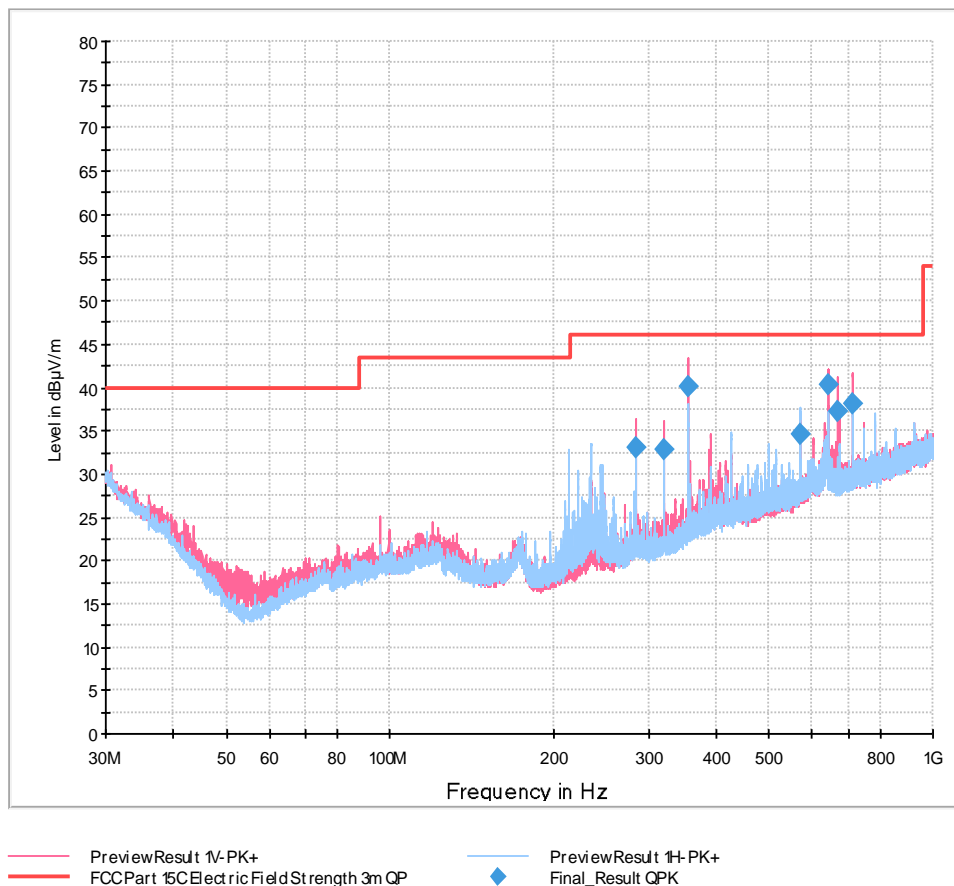


Product Service



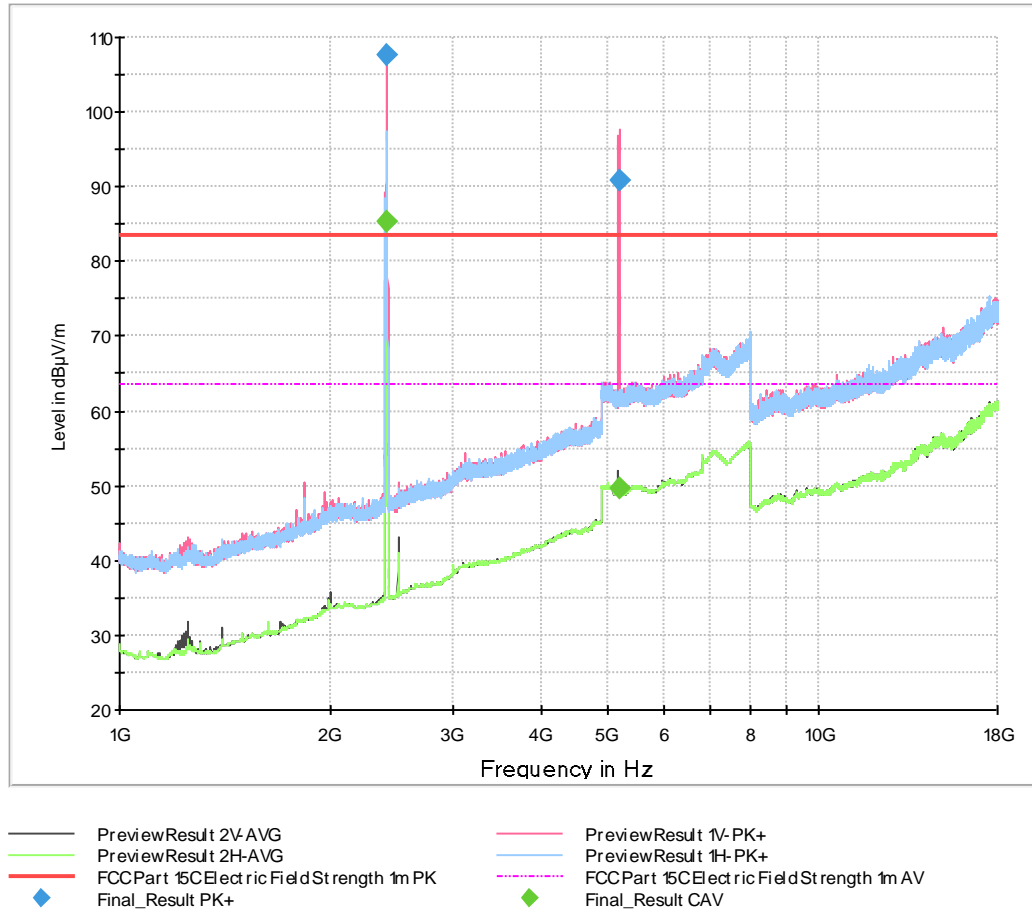
Final Results 1:

| 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 | 55.68 | 69.54 | 13.86 | 1000.0 | 9.000 | 100.0 | H | 185.0 | 18.9 |



Final Results 1:

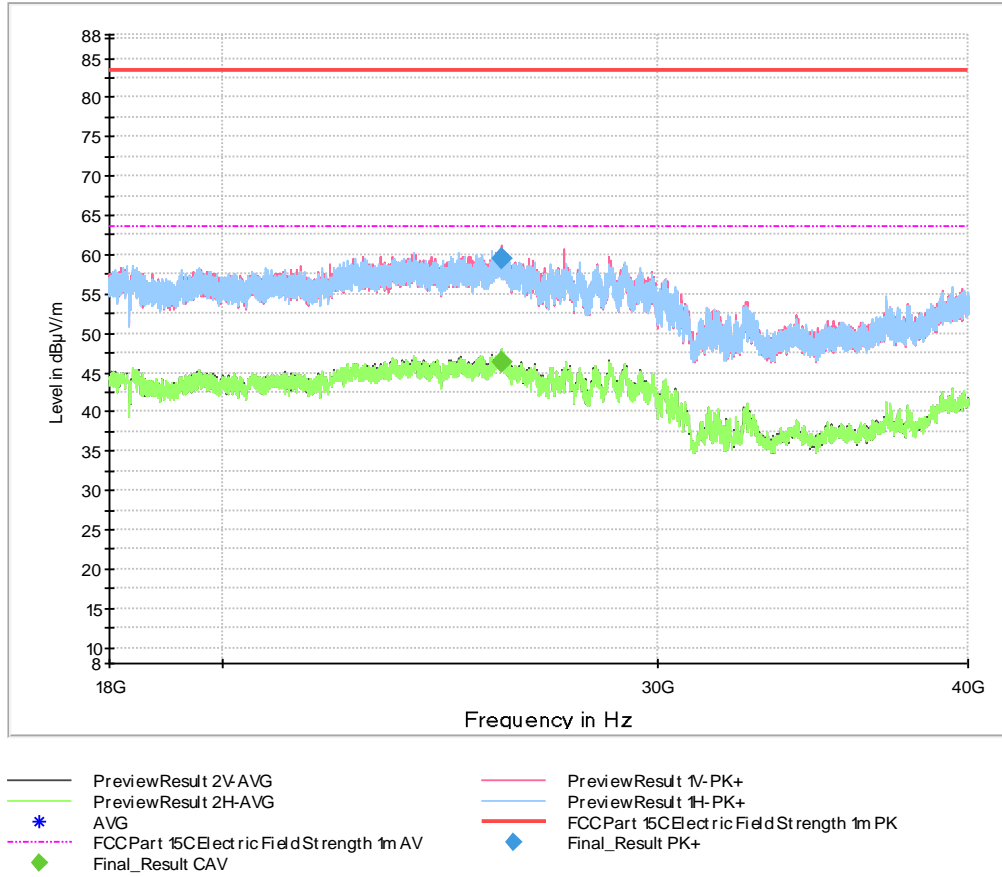
| Frequency MHz | QuasiPeak dBµV/m | Limit dBµV/m | Margin dB | Meas. Time ms | Band- width kHz | Height cm | Pol | Azi- muth deg | Corr. dB |
|------------------|---------------------|-----------------|--------------|---------------------|-----------------------|--------------|-----|---------------------|-------------|
| 284.400000 | 33.07 | 46.02 | 12.95 | 1000.0 | 120.000 | 100.0 | V | -10.0 | 19.1 |
| 319.980000 | 32.84 | 46.02 | 13.18 | 1000.0 | 120.000 | 102.0 | V | -6.0 | 20.2 |
| 355.530000 | 40.17 | 46.02 | 5.85 | 1000.0 | 120.000 | 102.0 | V | -10.0 | 21.1 |
| 568.770000 | 34.68 | 46.02 | 11.34 | 1000.0 | 120.000 | 102.0 | H | 172.0 | 25.3 |
| 639.840000 | 40.39 | 46.02 | 5.63 | 1000.0 | 120.000 | 102.0 | V | 172.0 | 26.3 |
| 666.660000 | 37.32 | 46.02 | 8.70 | 1000.0 | 120.000 | 102.0 | V | -98.0 | 26.7 |
| 710.940000 | 38.14 | 46.02 | 7.88 | 1000.0 | 120.000 | 102.0 | V | 190.0 | 27.3 |



Final Results 1:

| Frequency MHz | Max-Peak dBµV/m | CAverage dBµV/m | Limit dBµV/m | Margin dB | Meas. Time ms | Band-width kHz | Height cm | Pol | Azi-muth deg | Corr. dB |
|------------------|--------------------|--------------------|-----------------|--------------|------------------|-------------------|--------------|-----|-----------------|-------------|
| 2404.500000 | --- | 85.32 | * | * | 1000.0 | 1000.000 | 150.0 | V | 180.0 | 34.0 |
| 2404.500000 | 107.75 | --- | * | * | 1000.0 | 1000.000 | 150.0 | V | 180.0 | 34.0 |
| 5185.500000 | --- | 49.76 | * | * | 1000.0 | 1000.000 | 150.0 | H | 0.0 | 41.8 |
| 5185.500000 | 90.92 | --- | * | * | 1000.0 | 1000.000 | 150.0 | H | 0.0 | 41.8 |

*: Carrier frequency – not evaluated as spurious emission



Final Results 1:

| Frequency MHz | Max-Peak dBµV/m | CAverage dBµV/m | Limit dBµV/m | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB/m |
|------------------|--------------------|--------------------|-----------------|--------------|------------------|------------------|--------------|-----|----------------|---------------|
| 25910.250000 | --- | 46.39 | 63.50 | 17.11 | 1000.0 | 1000.000 | 150.0 | V | 90.0 | 31.1 |
| 25910.250000 | 59.57 | --- | 83.50 | 23.93 | 1000.0 | 1000.000 | 150.0 | V | 90.0 | 31.1 |



2.1.8 Test Location and Test Equipment

The test was carried out in Semi anechoic room No. 11

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------------|----------------------|-------------------------|-------|-----------------------------|-----------------|
| ULTRALOG Antenna | Rohde & Schwarz | HL562E | 39969 | 36 | 2022-11-30 |
| Fixed attenuator | Aeroflex / Weinschel | 6 dB | 39632 | 36 | 2022-11-30 |
| Double ridged horn antenna | Rohde & Schwarz | HF907 | 40089 | 24 | 2023-02-28 |
| Horn antenna with preamplifier | Rohde & Schwarz | LB-180400H + TS-LNA1840 | 43661 | 24 | 2022-12-31 |
| Loop antenna | Schwarzbeck | FMZB 1519B | 44334 | 36 | 2023-01-31 |
| EMI test receiver | Rohde&Schwarz | ESW44 | 39897 | 12 | 2022-04-30 |

Table 9



3 Measurement Uncertainty

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

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}). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

| <i>Radio Interference Emission Testing</i> | | |
|--|-----------|-----------------------------|
| <i>Test Name</i> | <i>kp</i> | <i>Expanded Uncertainty</i> |
| 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 CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$ | | |

Table 10 Measurement uncertainty based on CISPR 16-4-2



| <i>Radio Interference Emission Testing</i> | | |
|--|-----------|-----------------------------|
| <i>Test Name</i> | <i>kp</i> | <i>Expanded Uncertainty</i> |
| Occupied Bandwidth | 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 | | |
| 9 kHz ≤ f < 26.5 GHz | 2 | ± 6.5 dB |
| 26.5 GHz ≤ f < 60 GHz | 2 | ± 8.0 dB |
| 60 GHz ≤ f < 325 GHz | 2 | ± 10 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 11 Measurement uncertainty based on ETSI TR 100 028