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

Model: KeTop CB410-SE2

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

Product Service

Add value.
Inspire trust.

Prepared for: KEBA Industrial Automation GmbH
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COMMERCIAL-IN-CONFIDENCE

Date: 2022-05-23
Document Number: TR-76967-36510-16 | Issue 3

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Michael Ingerl	2022-05-23	SIGN-ID 653255
Authorised Signatory	Markus Biberger	2022-05-23	SIGN-ID 653302

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 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 653256

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 partly compilant 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

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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.

Issue	*Description of changes*	*Date of Issue*
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 CB410-SE2
Serial Number(s)	---
Number of Samples Tested	1
Test Specification(s) /	FCC 47 CFR Parts 15 C: 2019 and
Issue / Date	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

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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

Product Service

1.4 Product Information

1.4.1 Technical Description

Equipment characteristics			
Type designation: Type of equipment:	KeTop CB410-SE2 KeTop Safe wireless system		
Application[1]: Equipment class: Kind of equipment	Inductive Applications, Wideband transmission systems Equipment for fixed use Transceiver		
Frequency band[1]: Frequency range:	9 j 13,553 - 13,567 MHz (Only a RFID tag)	3 b 2400 – 2483,5 MHz	14 e1 and e2 5150-5350 MHz and 5470-5725 MHz
Antenna:	Integrated Antenna		
Standby mode:	Not Applicable		

[1] Classification according to CEPT/ERC Recommendation 70-03

Product Service

1.5 Modes of Operation

24 V DC power supply – 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

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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 CB410-SE2; S/N ---; 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 %

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2.1.5 Specification Limits

General 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 - 30	30	0.08	20*lg(0.08 / *f*)	30	20*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

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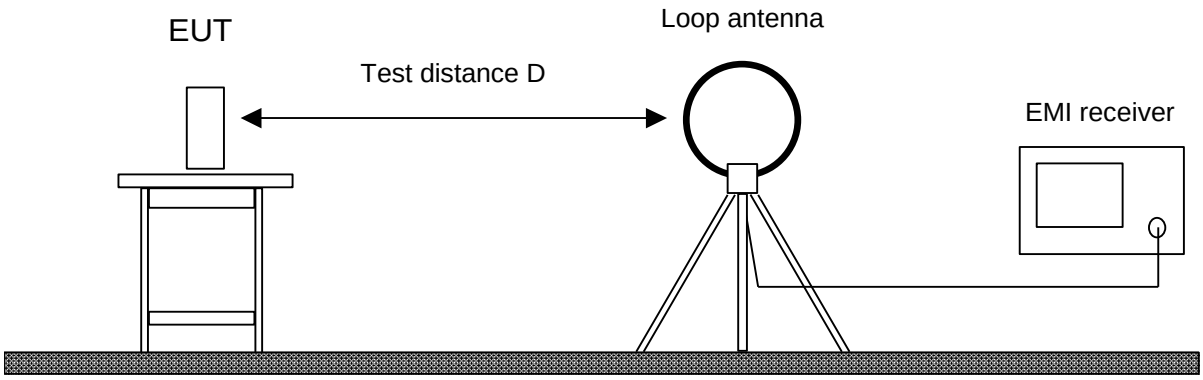
2.1.6 Test Method

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.

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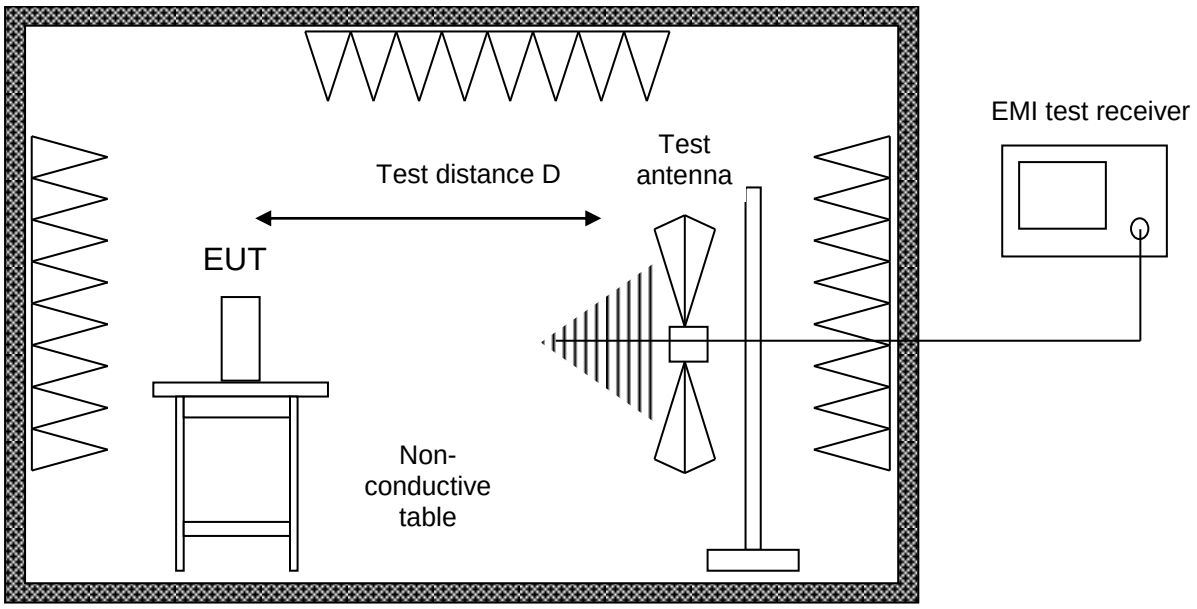
2.1.6.2 Frequency range 30 MHz – 1 GHz



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.

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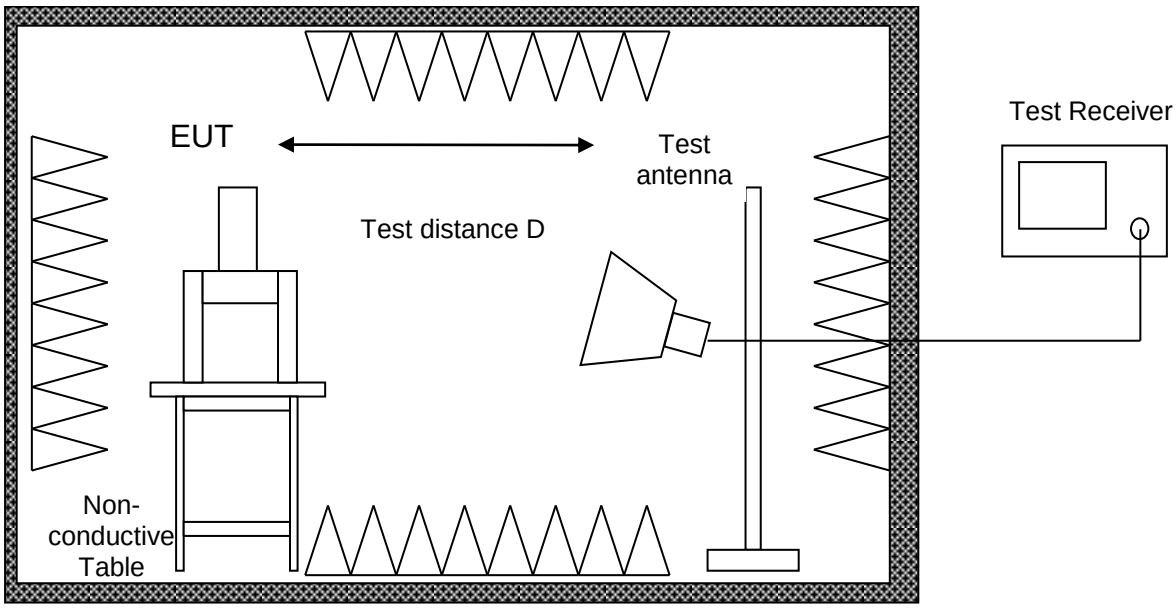
2.1.6.3 Frequency range above 1 GHz



Fully anechoic room

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.

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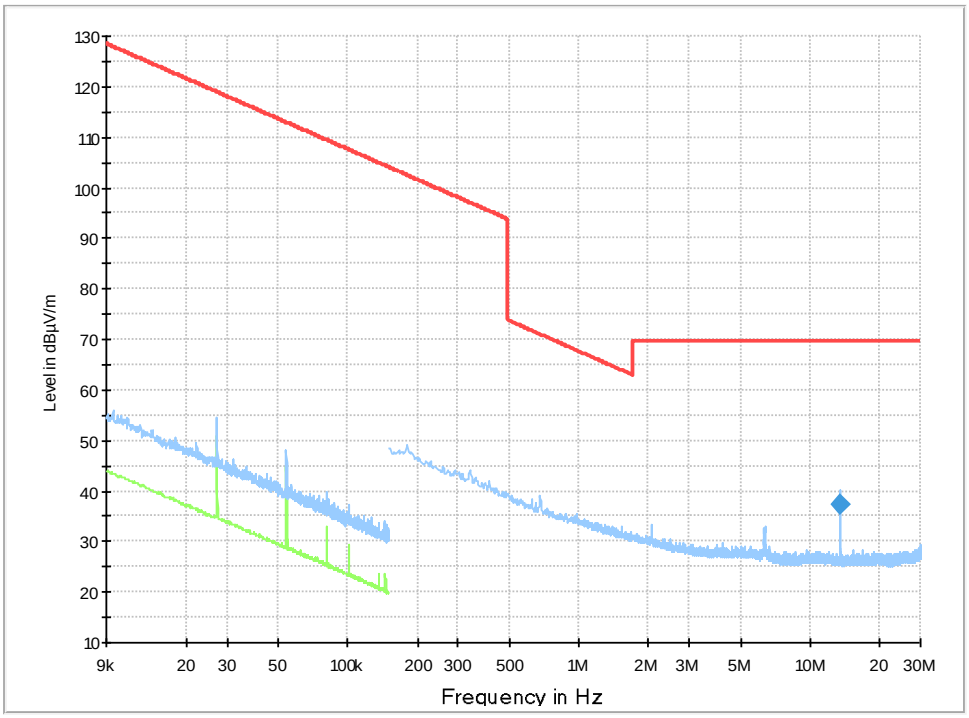
2.1.7 Test Results

Frequency range	*Limit applied*	*Test distance*
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

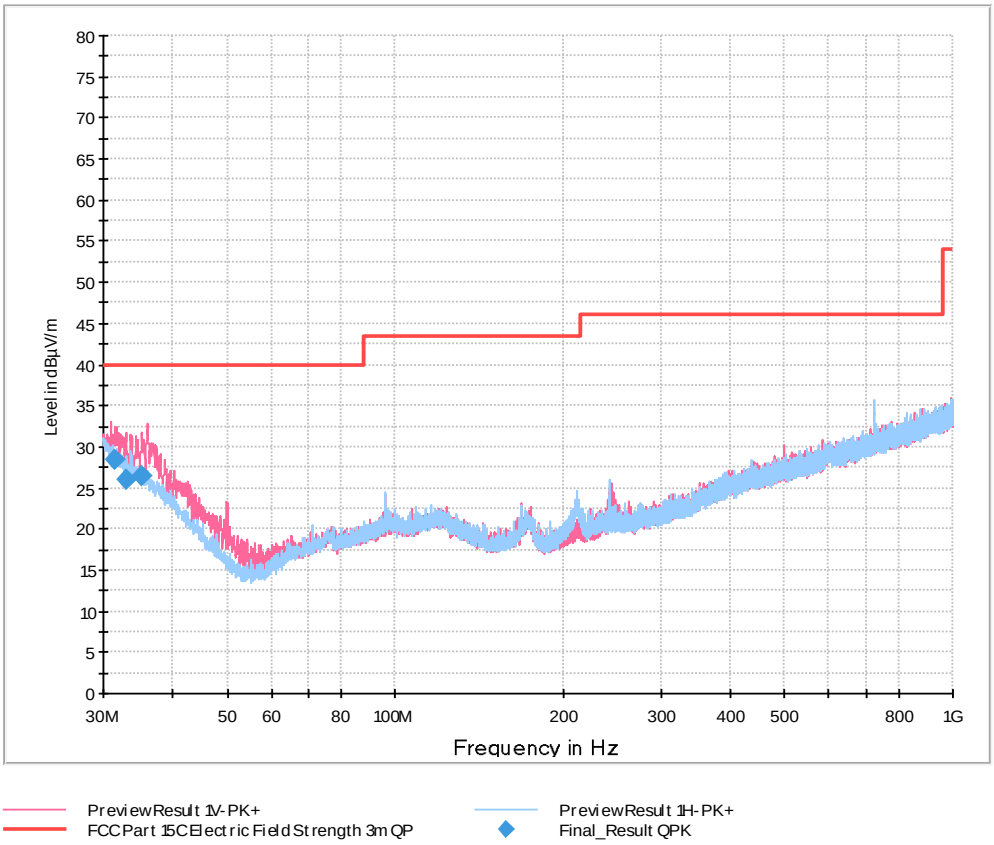
Sample calculation:

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



Final Results 1:

Frequency MHz	*Qua-siPeak dBµV/m*	*Limit dBµV/m*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. dB/m*
13.560000	37.20	69.54	32.34	1000.0	9.000	100.0	H	-55.0	18.9



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*
31.500000	28.53	40.00	11.47	1000.0	120.000	104.0	V	205.0	25.1
33.090000	25.94	40.00	14.06	1000.0	120.000	100.0	V	65.0	24.3
35.220000	26.43	40.00	13.57	1000.0	120.000	100.0	V	115.0	23.2

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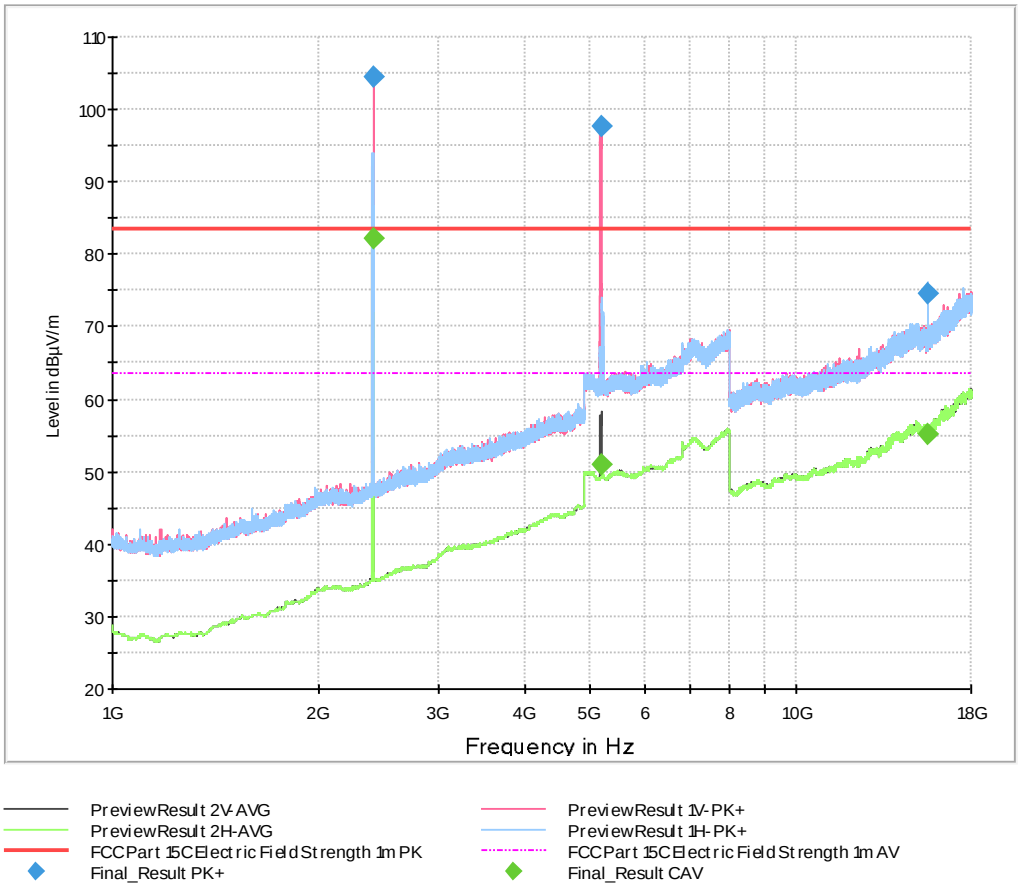
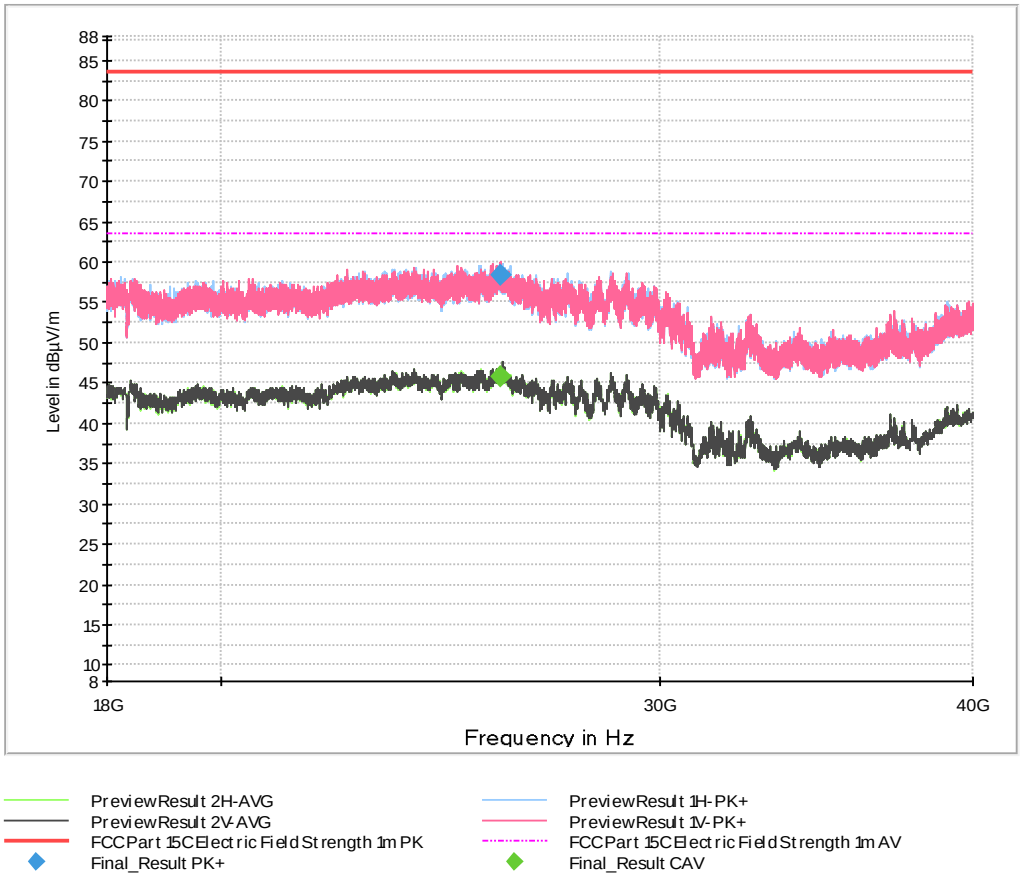


Final Results 1:

Frequency MHz	*Max-Peak dBµV/m*	*CAver-age dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. dB*
2405.500000	104.50	---	*	*	1000.0	1000.000	150.0	V	0.0	34.0
2405.500000	---	82.29	*	*	1000.0	1000.000	150.0	V	0.0	34.0
5186.500000	97.54	---	*	*	1000.0	1000.000	300.0	V	180.0	41.8
5186.500000	---	50.94	*	*	1000.0	1000.000	300.0	V	180.0	41.8
15545.750000	---	55.26	63.50	8.24	1000.0	1000.000	150.0	H	0.0	54.3
15545.750000	74.65	---	83.50	8.85	1000.0	1000.000	150.0	H	0.0	54.3

*: Carrier frequency – not evaluated as spurious emission

Product Service



Final Results 1:

Frequency MHz	*Max-Peak dBµV/m*	*CAver-age dBµV/m*	*Limit dBµV/m*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. dB*
25857.000000	---	45.81	63.50	17.69	1000.0	1000.000	150.0	V	0.0	30.9
25857.000000	58.44	---	83.50	25.06	1000.0	1000.000	150.0	V	0.0	30.9

Product Service

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 ridget 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

Product Service

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.

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 10 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		
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