

Königswinkel 10
32825 Blomberg, Germany
Phone: +49 (0) 52 35 / 95 00-0
Fax: +49 (0) 52 35 / 95 00-10
office@phoenix-testlab.de
www.phoenix-testlab.de

Test Report

Report Number:

E212507E1

Equipment under Test (EUT):

AL900

Applicant:

EKF Elektronik GmbH

Manufacturer:

EKF Elektronik GmbH



Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

Family standards / generic standards:

- [1] **ANSI C63.4:2014** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- [2] **FCC 47 CFR Part 2:** General Rules and Regulations
- [3] **FCC 47 CFR Part 15:** Radio Frequency Devices (Subpart B)
- [4] **ICES-003 Issue 7: (October 2020)** Spectrum Management and Telecommunications. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement

Note on the release status

The officially published CFR version, which is updated annually, may not reflect recent CFR changes. For this reason, the version of the eCFR valid at the start of the test period is taken into account. For more information see: [eCFR :: Title 47 of the CFR -- Telecommunication](#)

Test result

The requirements of the standards listed under the section "product (-family) standard(s) / generic standard(s)" on page 2 of this test report were fulfilled by the EUT. Restrictions for the use of the EUT in certain environments and / or under special conditions of use are defined in chapter 3, if applicable. Details are shown in the following pages.

tested by:

Signature

tested, written and
approved by:

Signature

reviewed by:

Signature

The measurement uncertainty for all measurement and test procedures of the laboratory have been determined and can be viewed if required. With regard to the emission measurement method according to CISPR 16-4-2 (EN 55016-4-2), the measurement uncertainty of the test laboratory (U_{Lab}) is less than the CISPR-defined measurement uncertainty (U_{CISPR}). This means that if the measured values for emitted interference fall below the limit value, the requirements of the relevant standard are met. For disturbance immunity, the decision rule of "simple acceptance" is applied with respect to the disturbance level.

If the customer requires an individual decision rule for conformity to the standard or the standard does not specify a decision rule, the measurement uncertainty and the decision rule are explicitly stated in the test report.

This test report is only valid in its original form.

Any reproduction of its contents in extracts without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents:

		Page
	References	2
	Test result	3
	Contents:	4
1	Identification	5
1.1	Applicant	5
1.2	Manufacturer	5
1.3	Test Laboratory	5
1.4	EUT (Equipment under Test)	6
1.5	Technical Data of Equipment	6
1.6	Dates	6
2	Operational States and Test Setup	7
3	Additional Information	13
4	Overview	14
5	Results	17
5.1	Conducted emissions on power supply lines	17
5.1.1	Test method	17
5.2	Conducted emission measurement on AC mains according to FCC 47 CFR Part 15 section 15.107 and ICES-003 Issue 7 section 3.2.1 Frequency range 150 kHz to 30 MHz	18
5.3	Radiated emissions	22
5.3.1	Test method	22
5.4	Radiated radio disturbance Frequency range 30 MHz to 1 GHz according to FCC 47 CFR Part 15 section 15.109 and ICES-003 Issue 7 section 3.2.2	26
5.5	Radiated radio disturbance according to FCC 47 CFR Part 15 section 15.109 and ICES-003 Issue 7 section 3.2. Frequency range 1 GHz up to 40 GHz	29
6	Report History	35
7	List of Annexes	35

1 Identification

1.1 Applicant

Name:	EKF Elektronik GmbH
Address:	Philipp-Reis-Str. 4 59065 Hamm
Country:	Germany
Applicant represented during the test by the following person:	Mr. Jahnke 09.05.2022

1.2 Manufacturer

Name:	EKF Elektronik GmbH
Address:	Philipp-Reis-Str. 4 59065 Hamm
Country:	Germany
Applicant represented during the test by the following person:	Mr. Jahnke 09.05.2022

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06 and D-PL-17186-01-05, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

Type of equipment: *	AL900
Serial number: *	52050306 marked with DUT
PCB identifier: *	M4 94V – 0 2213
Hardware version: *	AL900-0100
Software version: *	---
FCC ID: *	2A36S-AL900
Product description: *	9port PoE+ Gigabit Ethernet Switch with AVB/TSN support

* Declared by the applicant

Note: Phoenix Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

Power supply:	$U_{\text{nom}} =$ Input range 48 VDC, 54 VDC, 3A
Supply voltage:	$U_{\text{min}} = 48 \text{ VDC}$
	$U_{\text{max}} = 54 \text{ VDC}$
highest internal frequency: *	2,5 GHz

* Declared by the applicant

1.6 Dates

Date of receipt of test sample:	09.05.2022
Start of test:	09.05.2022
End of test:	13.05.2022

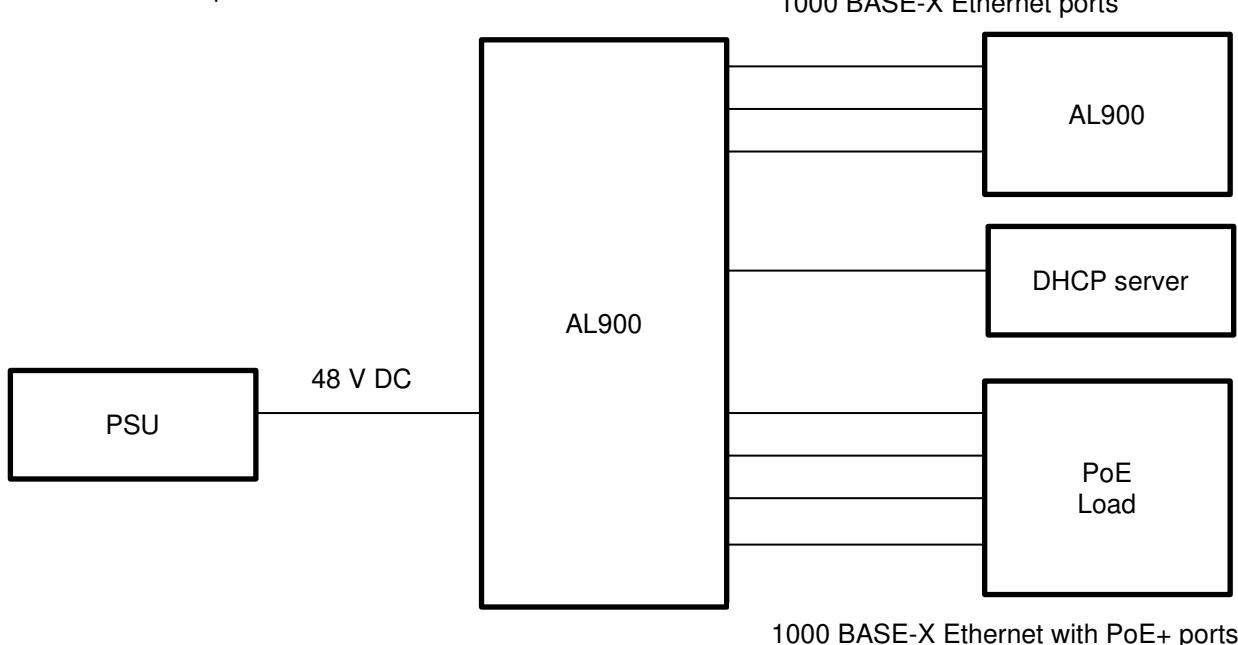
2 Operational States and Test Setup

Description of function of the EUT:

1	Introduction	
-	The AL900-0100 is a self managed network switch. It has 8 Ports (port 1- port 8) with AVB capability). No user configuration is needed.	
-	1000BASE-T Ethernet switch, 9 + 1 ports.	
-	PoE+ support up to 120W in total (ports 5 – port 8). 4x PoE+ (802.3at PoE+). Up to 25W / port.	
-	SFP rear connector (25000BASE-X) for cascading two switches (over SGMII).	
-	Nominal 48VDC / 54 VDC power input	

The system was setup as follows:

AL900 Test setup



2 I/O ports and connectors

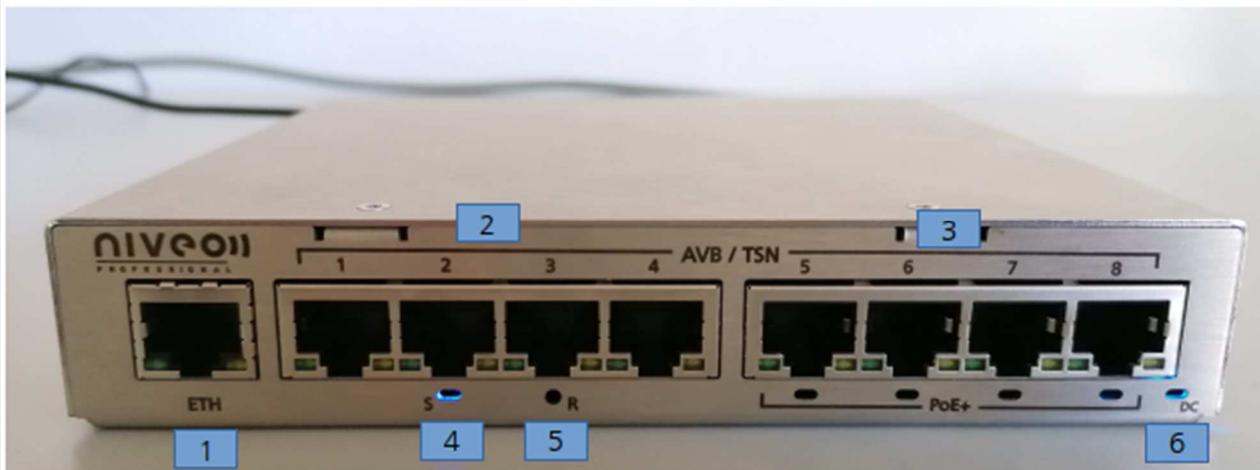


photo: front connections (photo similar)

1: Ethernet VLAN Port (not AVB applicable)

2: Port 1 – Port 4 are 1000 BASE-X Ethernet ports which are AVB applicable

3: Port 5 – Port 8 are 1000 BASE-X Ethernet ports which are AVB applicable.
4x PoE+ (802.3at PoE+). Up to 25W / port. 120W in total.

4: System LED. Normal State at booting is on.

5: Reset function. A reset will reboot the system. Power will be on.

6: DC LED: This LED is a tricolor LED. Normal state is :

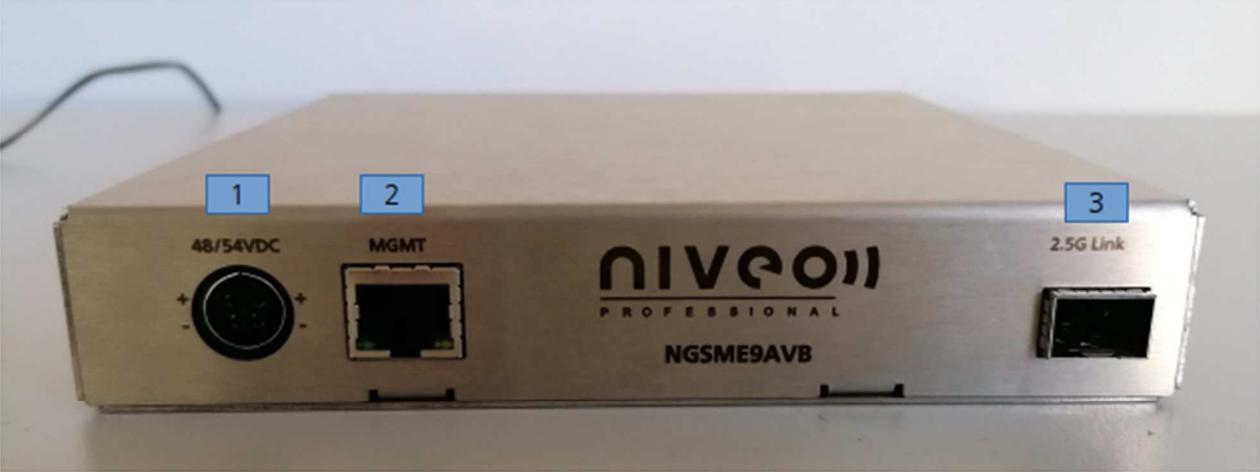
- Green on
- Blue on

This signals that the power is OK.

Port No.	Name	Type*	Cable Max. >3m	Cable Shielded	Comments (Sip/Sop lines must include description of use)
1	VLAN	TP	10 m	Yes	
2	LAN	TP	10m	Yes	
3	POE	TP	10 m	Yes	

Supplementary information:

TP = Telecommunication Ports

2	I/O ports and connectors	
 <p>photo: back connections (photo similar)</p> <p>1: Power input connector. DC Input range 48 VDC, 54 VDC, 3A max.</p> <p>2: Management Ethernet Port without AVB applicable. This 1000 BASE-X Ethernet port is for service only. Not usable for customer.</p> <p>3: SFP 2500 BASE-X port for cascading two AL900-0100 switches. It is a SGMII connection and not hipot resistant!</p>		

Port No.	Name	Type*	Cable Max. >3m	Cable Shielded	Comments (Sip/Sop lines must include description of use)
0	Enclosure	N/E	—	—	None
1	<input checked="" type="checkbox"/> DC Power Ports	DC	1 m	No	
2	MGMT	TP	-	-	Service Port – not used during test
3	SFP	TP	10 m	Yes	

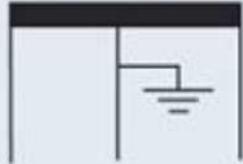
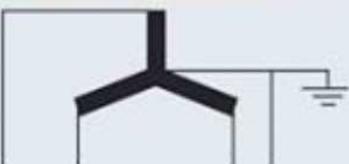
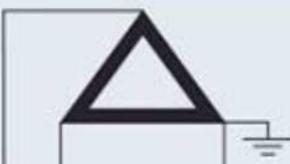
Supplementary information:

*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
Batt=Battery

Sip/Sop= Signal Input/output Port

TP = Telecommunication Ports

The following states were defined as the operating conditions:

Rated voltage for all tests and measurements:		
1 Single Phase, 3 wire (Residential), grounded midpoint		
	Conducted emission tests	Radiated emission tests
$U_B = 120 \text{ V}$ (against ground)	X	X
$U_B = 240 \text{ V}$ (Phase conductors)		
3 Phase, 4 wire (Industrial and Commercial), solidly grounded wye		
	Conducted emission tests	Radiated emission tests
$U_B = 208Y/120 \text{ V}$		
$U_B = 240Y/131 \text{ V}$		
$U_B = 480Y/277 \text{ V}$		
$U_B = 600Y/347 \text{ V}$		
3 Phase, 3 wire (Industrial and Commercial), corner grounded delta		
	Conducted emission tests	Radiated emission tests
$U_B = 240 \text{ V}$		
$U_B = 480 \text{ V}$		
$U_B = 600 \text{ V}$		

Ancillary equipment provided by the customer

	AL900: SN: 52050305	
PoE Load	3 X LTC4269IDKD-2	
PoE Load	1 X LTC4269IDKD-2	

Ancillary equipment provided by the customer

DHCP server	FRITZ!Box SN: F422.382.00.030.808	 A white and red FRITZ!Box 7290 router. It has a red front panel with the FRITZ!Box logo and several status LEDs. The back panel is white with various ports and a power button.
PSU:	MEAN WELL NDR-120-48	 A blue Mean Well NDR-120-48 power supply unit. It has a label with the model number and a power rating of 120W. It has two output cables, one red and one black, connected to a metal surface.

3 Additional Information

General information:

- none

Classification of cables:

- none

Maximum length of cables, declared by the manufacturer:

- no maximum length declared

Type of cables, declared by the manufacturer:

- no special type of cable declared

Deviation of the standard or test plan:

- none

Special EMC measures, as a result of the tests:

- none

4 Overview

Conducted emissions FCC 47 CFR Part 15 section 15.107 (a),(b) [3] ICES-003 Issue 7 section 3.2.1[4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
AC supply line Class A	0.15 to 0.5 MHz 0.5 to 30 MHz	79 dB(µV) QP 66 dB(µV) AV 73 dB(µV) QP 60 dB(µV) AV	ANSI C63.4		---
AC supply line Class B	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dB(µV) QP* 56 to 46 dB(µV) AV* 56 dB(µV) QP 46 dB(µV) AV 60 dB(µV) QP 50 dB(µV) AV	ANSI C63.4	1	Passed

*: Decreases with the logarithm of the frequency

Radiated emissions FCC 47 CFR Part 15 section 15.109 (a),(b) [3]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	39.0 dB(μ V/m) QP at 10 m 43.5 dB(μ V/m) QP at 10 m 46.5 dB(μ V/m) QP at 10 m 49.5 dB(μ V/m) QP at 10 m 49.5 dB(μ V/m) AV at 10 m and 69.5 dB(μ V/m) PK at 10 m	ANSI C63.4	- ---	--- ---
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	50.0 dB(μ V/m) QP at 3 m 53.5 dB(μ V/m) QP at 3 m 56.0 dB(μ V/m) QP at 3 m 64.0 dB(μ V/m) QP at 3 m 64.0 dB(μ V/m) AV at 3 m and 84.0 dB(μ V/m) PK at 3 m	ANSI C63.4	- ---	--- ---
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(μ V/m) QP at 3 m 43.5 dB(μ V/m) QP at 3 m 46.0 dB(μ V/m) QP at 3 m 54.0 dB(μ V/m) QP at 3 m 54.0 dB(μ V/m) AV at 3 m and 74.0 dB(μ V/m) PK at 3 m	ANSI C63.4	1	Passed Passed

Radiated emissions ICES-003 Issue 7 section 3.2.2 [4]

Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 10 m 43.5 dB(µV/m) QP at 10 m 46.4 dB(µV/m) QP at 10 m 47.0 dB(µV/m) QP at 10 m 49.5 dB(µV/m) QP at 10 m No limit available for 10 m	ANSI C63.4	-	---
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	50.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 56.9 dB(µV/m) QP at 3 m 57.0 dB(µV/m) QP at 3 m 60.0 dB(µV/m) QP at 3 m 60 dB(µV/m) AV at 3 m 80 dB(µV/m) PK at 3 m	ANSI C63.4	-	---
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	30.0 dB(µV/m) QP at 10 m 33.1 dB(µV/m) QP at 10 m 35.6 dB(µV/m) QP at 10 m 37.0 dB(µV/m) QP at 10 m 43.5 dB(µV/m) QP at 10 m No limit available for 10 m	ANSI C63.4	-	---
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 3 m 43.5 dB(µV/m) QP at 3 m 46.0 dB(µV/m) QP at 3 m 47.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 54 dB(µV/m) AV at 3 m 74 dB(µV/m) PK at 3 m	ANSI C63.4	1	Passed Passed

Remark: As declared by the applicant the highest internal clock frequency is 2,5 GHz.

Therefore the radiated emission measurement must be carried out up to 5th of the highest internal clock frequency in this case 12,5 GHz.

The EUT was classified by the applicant as CLASS B equipment.

5 Results

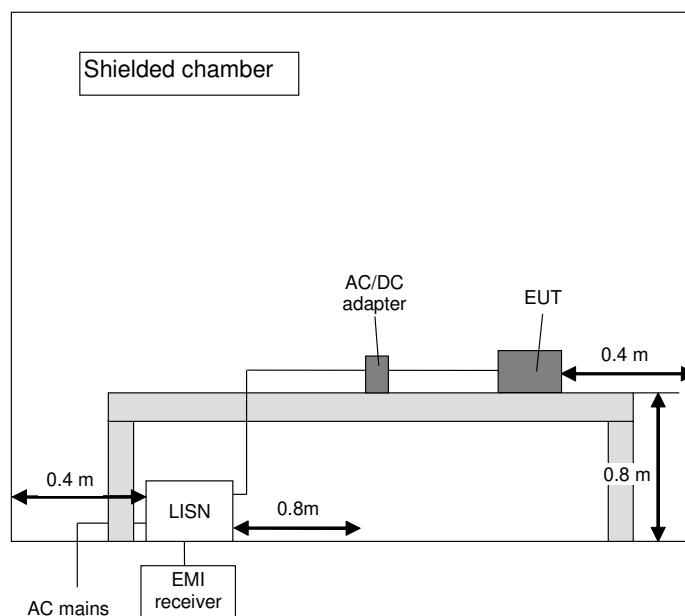
5.1 Conducted emissions on power supply lines

5.1.1 Test method

The test is carried out in a shielded chamber. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices are placed directly on the ground plane. In case of DC powered equipment, which is not exclusively powered by a battery, it is connected to the LISN via a suitable AC/DC adaptor. The setup of the equipment under test is in accordance to [1].

The frequency range 150 kHz to 30 MHz is measured with an EMI receiver set to MAX hold mode with Peak and Average detectors and a resolution bandwidth of 9 kHz. A scan is carried out on the phase and neutral line of the AC mains network. If emissions less than 10 dB below the appropriate limit are detected, these emissions are measured with an Average and Quasi-Peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz

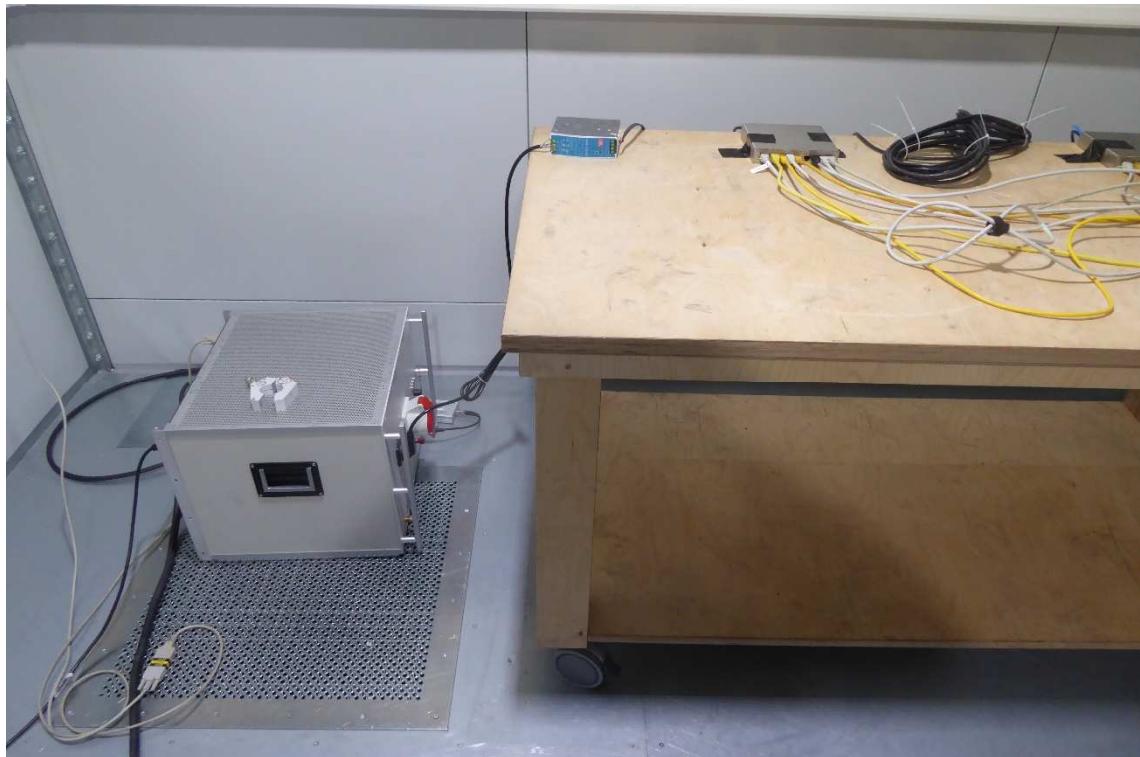


5.2 Conducted emission measurement on AC mains according to FCC 47 CFR Part 15 section 15.107 and ICES-003 Issue 7 section 3.2.1 Frequency range 150 kHz to 30 MHz

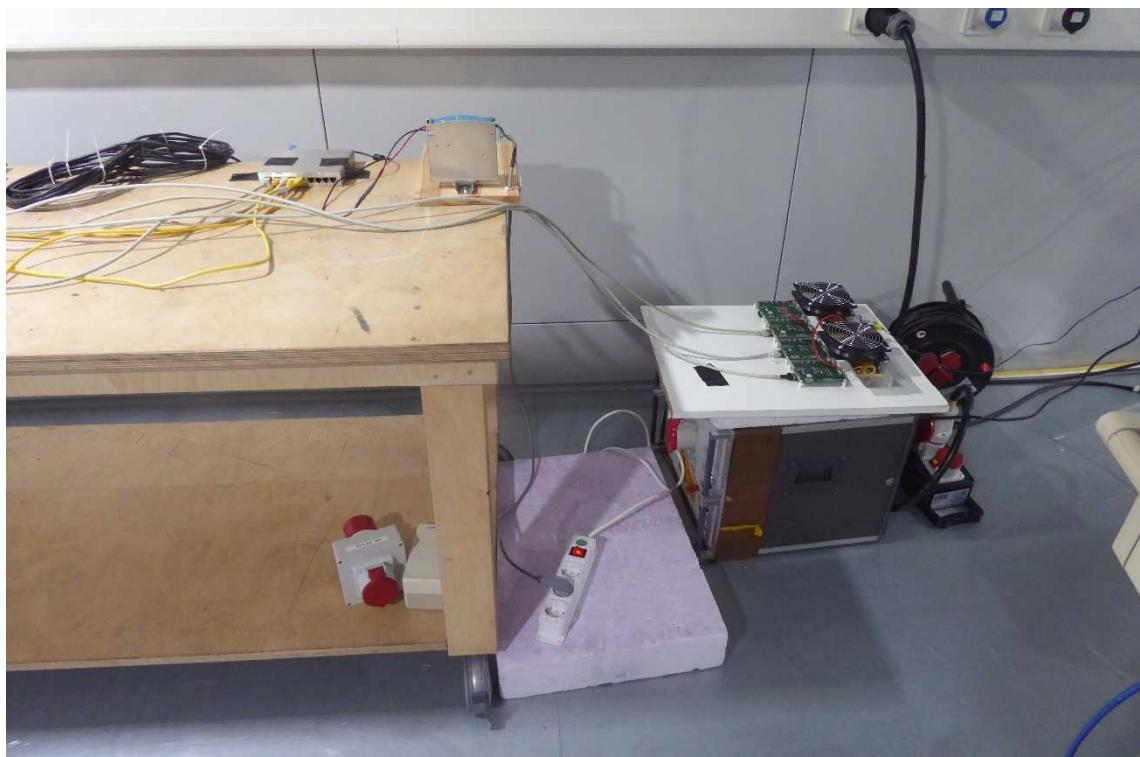
Measuring setup: -Table setup
 -Photo(s) of the test setup is shown below



Test setup 1: Conducted Emission/Overview



Test setup 2: Conducted Emission/Test point AC



Test setup 3: Conducted Emission/ Ancillary equipment

Measuring record: The measuring records are presented on the following pages.

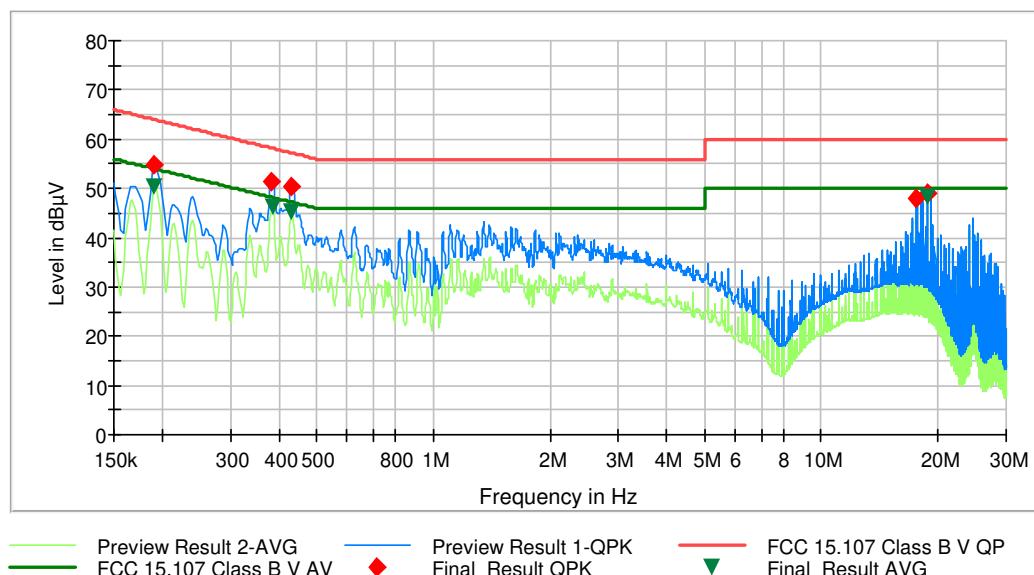
Measuring result: The requirements Class B made in the test documents were passed.

Time	13.05.2022 09:25:55
------	---------------------

EUT Info

Test site:	shielded room M155
Setup:	table setup
Operator:	U.Kracht
EUT:	AL900
Manufacturer:	EKF Elektronik
Operating conditions:	active
Comment:	120 V 60 Hz

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by “♦” and the average measured points by “▼”.



Graphic 1: 212507_120V_PSU1_01_Graphics_Full Spectrum

Frequency [MHz]	QuasiPeak [dBμV/m]	Average [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Meas. Time [ms]	Band width [kHz]	Line	PE	Corr. [dB]
0,1905	---	50,38	54,01	3,64	15000,	9,00	N	GND	9,80
0,1905	54,74	---	64,01	9,27	15000,	9,00	N	GND	9,80
0,3818	51,38	---	58,24	6,86	15000,	9,00	L1	GND	9,80
0,3863	---	46,45	48,14	1,70	15000,	9,00	L1	GND	9,80
0,4290	50,46	---	57,27	6,81	15000,	9,00	N	GND	9,80
0,4313	---	45,26	47,23	1,97	15000,	9,00	N	GND	9,80
17,6258	47,85	---	60,00	12,15	15000,	9,00	L1	GND	10,70
18,7553	---	48,43	50,00	1,57	15000,	9,00	L1	GND	10,80
18,7553	48,96	---	60,00	11,04	15000,	9,00	L1	GND	10,80

Table 1: 212507_120V_PSU1_01_Final_Result

Measuring equipment:

Test site and Type		Manufacturer	Serial No.	PM. No.	Val. Date	Val Due
M155 Shielded chamber		Albatross Projects		482786	*	*
Type of validation: GND-Plane according to: ANSI C63.4-2014					25.09.2020	09.2022
Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
Systemsoftware EMC32 M155	EMC32	Rohde & Schwarz	100619	483182	*	*
LISN	NSLK8128RC	Schwarzbeck	0412	483186	15.02.2022	02.2024
LISN	NSLK8128	Schwarzbeck	8128155	480058	14.02.2022	02.2024
Transient Limiter	CFL9206A	Ametek CTS Europe	56222	483263	14.02.2022	02.2024
EMI Testreceiver ESR7	ESR7	Rohde & Schwarz	101939	482558	15.02.2022	02.2024

(*) Calibration not necessary

time stamp: 24.03.2022 used: 18.05.2022

5.3 Radiated emissions

5.3.1 Test method

The radiated emission measurement is subdivided into two stages.

- A measurement carried out in a semi anechoic chamber with reflecting ground plane and various antenna heights in the frequency range 30 MHz to 1 GHz.
- A measurement carried out in a fully anechoic chamber and various antenna heights of 100 to 400 cm at a distance of 3 m to the EUT position in the frequency range 1 GHz to 40 GHz.

Preliminary and final measurement 30 MHz to 1 GHz

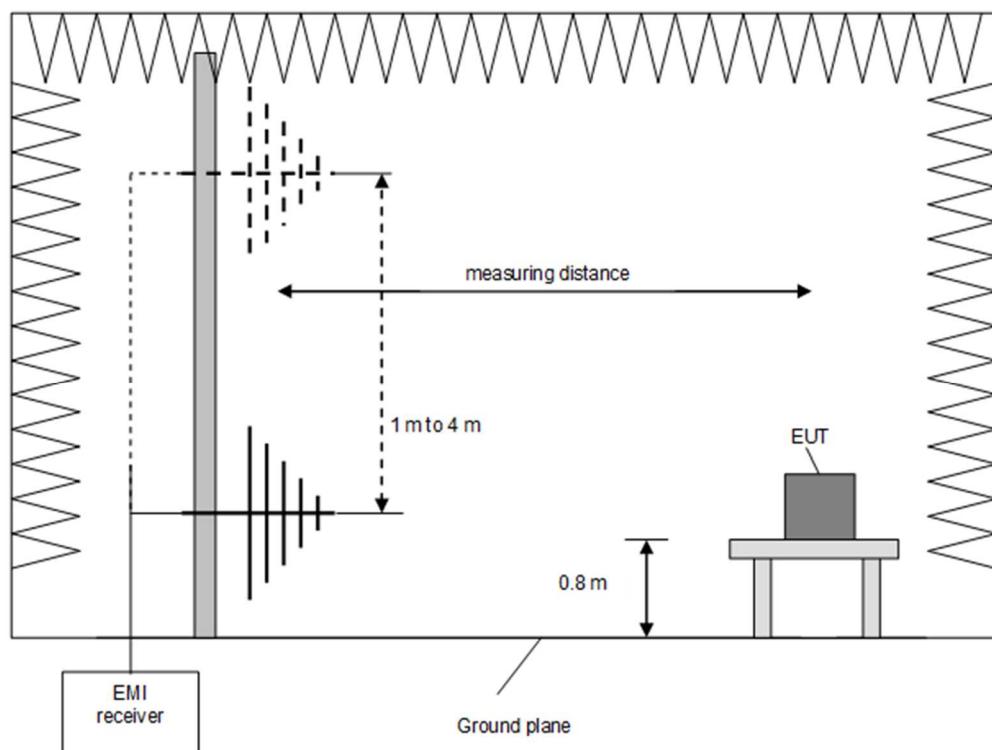
The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane in a 3 m distance.

Tabletop devices will set up on a non-conducting support with a height of 80 cm

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver is set to the following values:

Test	Frequency range	Resolution bandwidth
Preliminary measurement	30 MHz to 1 GHz	100 kHz
Frequency peak search	+ / - 1 MHz	10 kHz
Final measurement	30 MHz to 1 GHz	120 kHz



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarisation of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 3) Rotate the EUT by 360° to maximize the detected signals.
- 4) Repeat steps 2 to 3 with the vertical polarisation of the measuring antenna.
- 5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
- 6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced RBW with +/- 10 times the RBW of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

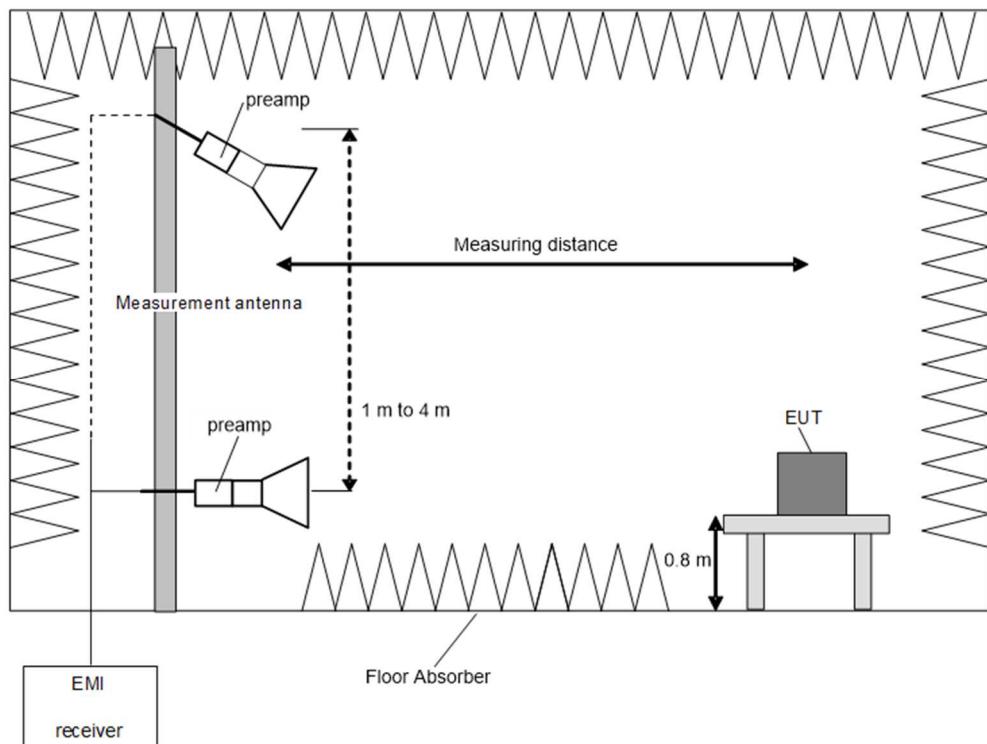
Preliminary and final measurement > 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with floor absorbers between EUT and measuring antenna. The measuring distance is 3 m.

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions. While changing the height, the measuring antenna gets tilted so that it is always aiming at the EUT.

The resolution bandwidth of the EMI Receiver is set to the following values:

Test	Frequency range	Resolution bandwidth
Preliminary measurement	1 - 40 GHz	1 MHz
Frequency peak search	+ / - 10 MHz	100 kHz
Final measurement	1 - 40 GHz	1 MHz



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarisation of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 3) Rotate the EUT by 360° to maximize the detected signals.
- 4) Repeat steps 2 to 3 with the vertical polarisation of the measuring antenna.
- 5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
- 6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

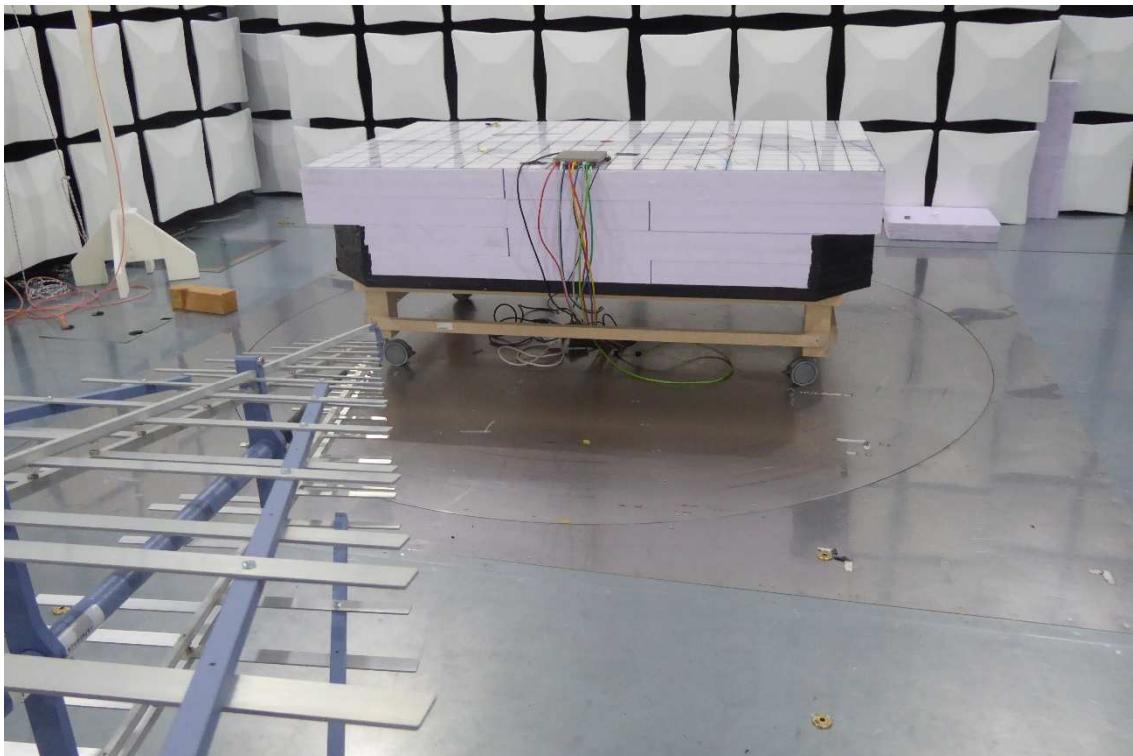
The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced RBW with +/- 10 times the RBW of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.4 Radiated radio disturbance Frequency range 30 MHz to 1 GHz according to FCC 47 CFR Part 15 section 15.109 and ICES-003 Issue 7 section 3.2.2

Measuring setup:

- Table setup
- Photo(s) of the test setup is shown below



Test setup 4: Radiated Emission/Turntable position 0

Measuring procedure SAC: The interfering field strength is measured in a semi anechoic chamber. Here the equipment under test is measured from various sides in normal fitted position. The antenna is adjusting in height whether the test object is emitting interference at certain frequencies. This procedure makes it possible to ascertain without the effect of external interference sources. If measuring above 1 GHz, the ground of the SAC shall be covered with ground absorber. The measuring procedure above 1 GHz is performed according to the above mentioned standard.

Measuring record: The measuring records are presented on the following pages.

Measuring result: The requirements Class B made in the test documents were passed.

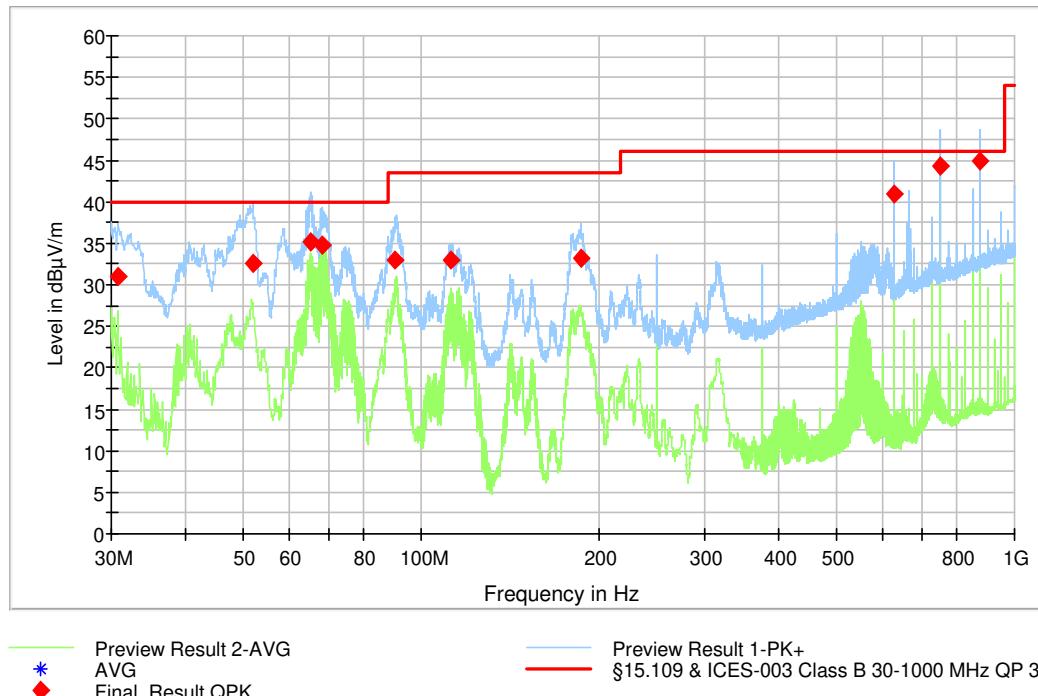
Measurement result 212507FCC01

Test Time

Time	10.05.2022 13:18:33
------	---------------------

EUT Info

Test site:	PHOENIX TESTLAB GmbH, Semi Anechoic Chamber M153
Setup:	Table setup
Operator:	J. Hanselle
EUT:	AL900
Manufacturer:	EKF
Operating conditions:	120 V 60 Hz, ETH 1Gbit/s, POE 20 W, 12,5 W
Comment:	



Graphic 2: 212507FCC01_Graphics_Full Spectrum

Frequency [MHz]	QuasiPeak [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Meas. Time [ms]	Band width [kHz]	Height [cm]	Pol []	Azimuth [deg]	Corr. [dB]
30,6900	31,01	40,00	8,99	1000,0	120,0	274,00	V	-5,00	25,20
51,8580	32,59	40,00	7,41	1000,0	120,0	100,00	V	337,00	12,70
65,1060	35,20	40,00	4,80	1000,0	120,0	133,00	V	18,00	13,20
68,1900	34,73	40,00	5,27	1000,0	120,0	142,00	V	37,00	14,10
90,4380	32,95	43,52	10,57	1000,0	120,0	102,00	V	265,00	16,90
112,2180	32,97	43,52	10,55	1000,0	120,0	109,00	V	18,00	17,50
185,2740	33,12	43,52	10,40	1000,0	120,0	102,00	V	15,00	14,90
624,9900	40,92	46,02	5,10	1000,0	120,0	143,00	H	203,00	25,90
875,0100	44,83	46,02	1,19	1000,0	120,0	109,00	H	241,00	29,10
749,9940	44,32	46,02	1,70	1000,0	120,0	109,00	H	-14,00	27,50

Table 2: 212507FCC01_Final_Result

Measuring equipment:

Test site and Type		Manufacturer	Serial No.	PM. No.	Val. Date	Val Due
M153 Semi Anechoic Chamber		Albatross Projects		482784	-	-
Type of validation: NSA according to: ANSI C63.4a-2017 CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017				22.02.2022	02.2023	
Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
Ultralog Antenna	HL562E	Rohde & Schwarz	101061	483152	18.05.2021	05.2024
Attenuator 6 dB	WA2-6	Weinschel		482794	*	*
Systemsoftware EMC32 M153	EMC32	Rohde & Schwarz	100622	483150	*	*
RF Switch Matrix	OSP 220	Rohde & Schwarz	101376	483141	*	*
RF Switch Matrix	OSP 220	Rohde & Schwarz	101367	483142	*	*
RF Switch Matrix	OSP 220	Rohde & Schwarz	101423	483143	*	*
EMI Testreceiver ESW	ESW	Rohde & Schwarz	101819	483149	18.02.2022	02.2024

(*) Calibration not necessary

time stamp: 24.03.2022 used: 18.05.2022

5.5 Radiated radio disturbance according to FCC 47 CFR Part 15 section 15.109 and ICES-003 Issue 7 section 3.2. Frequency range 1 GHz up to 40 GHz

Measuring setup:

- Table setup
- Photo(s) of the test setup is shown below



Test setup 5: Radiated Emission/1 GHz - 12 GHz



Test setup 6: Radiated Emission/12 GHz - 18 GHz

Measuring procedure SAC: The interfering field strength is measured in a semi anechoic chamber. The ground of the SAC is covered with floor absorber. Here the equipment under test is measured from various sides in normal fitted position. This procedure makes it possible to ascertain without the effect of external interference sources and without adjusting the antenna in height whether the test object is emitting interference at certain frequencies. The measuring procedure above 1 GHz is performed according to the above mentioned standard.

Measuring record: The measuring records are presented on the following pages.

Measuring result: The requirements Class B made in the test documents were passed.

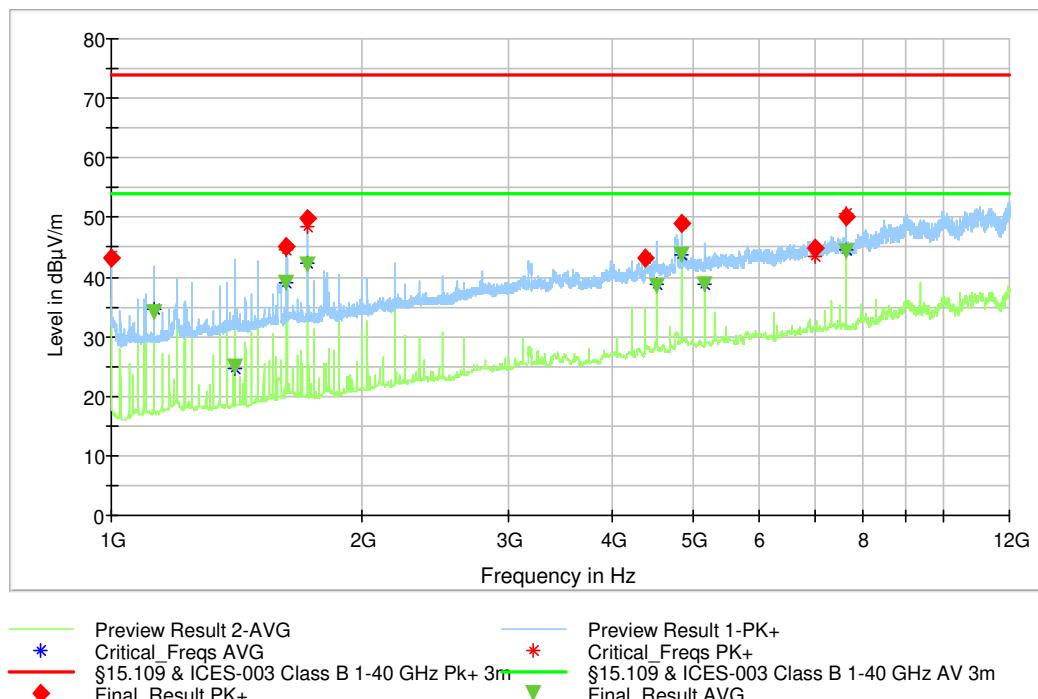
Measurement result 212507FCC02

Test Time

Time	10.05.2022 09:21:54
------	---------------------

EUT Info

Test site:	PHOENIX TESTLAB GmbH, Semi Anechoic Chamber M153
Setup:	Table setup
Operator:	J. Hanselle
EUT:	AL900
Manufacturer:	EKF
Operating conditions:	120 V 60 Hz, ETH 1Gbit/s
Comment:	



Graphic 3: 212507FCC02_Graphics_Full Spectrum

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Meas. Time [ms]	Band width [kHz]	Height [cm]	Pol []	Azimuth [deg]	Corr. [dB]
1000,0000	43,29	---	74,00	30,71	1000,0	1000,	103,00	H	103,00	-12,70
1124,9000	---	34,03	54,00	19,97	1000,0	1000,	112,00	H	12,00	-12,20
1406,7500	---	24,99	54,00	29,01	1000,0	1000,	149,00	H	-7,00	-9,70
1624,9000	45,01	---	74,00	28,99	1000,0	1000,	301,00	H	233,00	-7,70
1625,0000	---	39,06	54,00	14,94	1000,0	1000,	301,00	H	233,00	-7,70
1718,7500	---	42,01	54,00	11,99	1000,0	1000,	296,00	V	347,00	-7,40
1718,7500	49,75	---	74,00	24,25	1000,0	1000,	304,00	V	344,00	-7,40
4375,0000	43,27	---	74,00	30,73	1000,0	1000,	162,00	V	10,00	3,10
4531,2500	---	38,60	54,00	15,40	1000,0	1000,	146,00	H	321,00	3,80
4843,7500	---	43,73	54,00	10,27	1000,0	1000,	112,00	V	8,00	5,00
4843,9500	49,11	---	74,00	24,89	1000,0	1000,	148,00	V	10,00	5,00
5156,2500	---	38,76	54,00	15,24	1000,0	1000,	101,00	H	22,00	5,70
7011,5500	44,93	---	74,00	29,07	1000,0	1000,	388,00	H	135,00	8,30
7656,2500	---	44,29	54,00	9,71	1000,0	1000,	108,00	V	-2,00	8,50
7656,2500	50,09	---	74,00	23,91	1000,0	1000,	112,00	V	2,00	8,50

Table 3: 212507FCC02_Final_Result

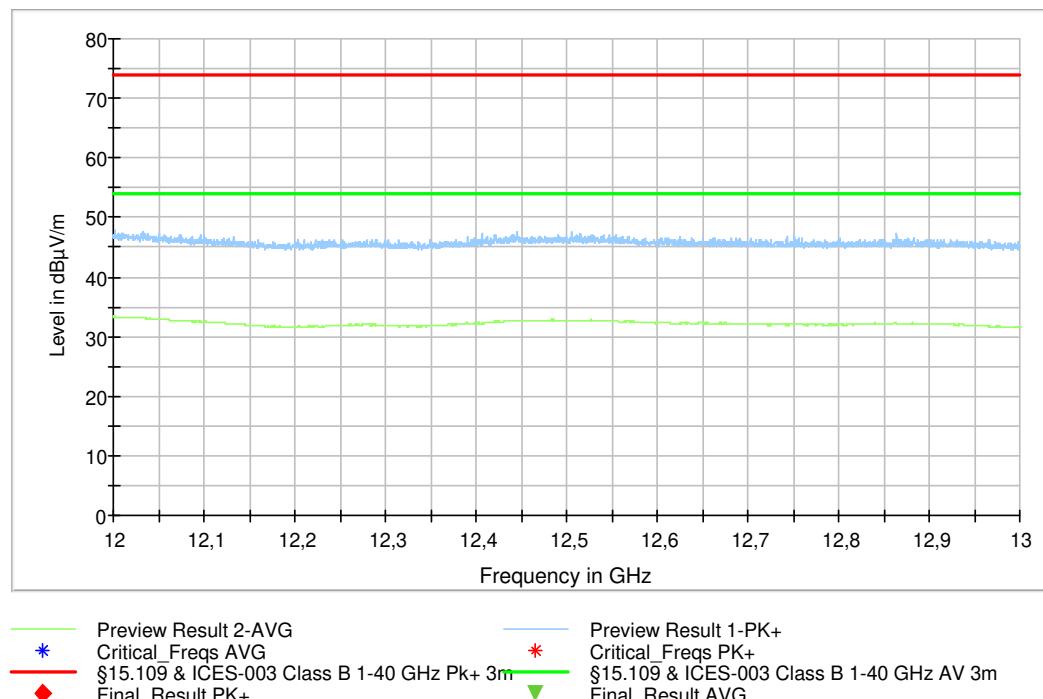
Measurement result 212507FCC03

Test Time

Time	10.05.2022 11:17:21
------	---------------------

EUT Info

Test site:	Phoenix TESTLAB GmbH, Semi Anechoic Chamber M153
Setup:	Table setup
Operator:	J. Hanselle
EUT:	al900
Manufacturer:	EKF
Operating conditions:	120 V 60 Hz, ETH 1Gbit/s
Comment:	



Graphic 4: 212507FCC03_Graphics_Full Spectrum

Measuring equipment:

Test site	Type	Manufacturer	Serial No.	PM. No.	Val. Date	Val Due
M154 Fully Anechoic Chamber		Albatross Projects		482785	-	-
Type of validation: SVSWR according to: ANSI C63.4a-2017 CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017					22.04.2022	04.2023
Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
Antenna (Log.Per.)	HL050	Rohde & Schwarz	100908	482977	13.08.2019	08.2022
standard gain horn antenna	18240-20	Flann Microwave	483	480294	*	*
standard gain horn antenna	20240-20	Flann Microwave	411	480297	*	*
standard gain horn antenna	22240-20	Flann Microwave	469	480299	*	*
Preamplifier 100 MHz - 13 GHz	JS3-00101200-23-5A	MITEQ Hauppauge N.Y.	681851	480337	17.02.2022	02.2024
Preamplifier 18 GHz - 26 GHz	JS4-18002600-20-5A	MITEQ Hauppauge N.Y.	658697	480342	17.02.2022	02.2024
Preamplifier 12 GHz - 18 GHz	JS3-12001800-16-5A	MITEQ Hauppauge N.Y.	571667	480343	17.02.2022	02.2024
Preamplifier 26 GHz - 40 GHz	JS4-26004000-25-5A	MITEQ Hauppauge N.Y.	563593	480344	*	*
standard gain horn antenna	18240-20	Pro Nova	269813	483215	*	*
standard gain horn antenna	20240-20	Flann	266399	483026	*	*
standard gain horn antenna	22240-20	Flann	266405	483027	*	*
Preamplifier 1 GHz -18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2022	02.2024
Preamplifier 12 GHz -18 GHz	LNA-30-12001800-13-10P	Narda-Miteq	2089798	482968	*	*
Preamplifier 18 GHz - 26 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	482969	18.02.2022	02.2024
Preamplifier 26 GHz - 40 GHz	LNA-30-26004000-27-10P	Narda-Miteq	2110293	482970	18.02.2022	02.2024
EMI Receiver / Spectrum Analyser	ESW	Rohde & Schwarz	101819	483149	18.02.2022	02.2024
Systemsoftware EMC32 M154	EMC32	Rohde & Schwarz	100638	483173	*	*

(*) Calibration not necessary

time stamp: 24.03.2022 used: 28.06.2022

6 Report History

Report Number	Date	Comment
E212507E1	10.08.2022	Initial Test Report
-	-	-
-	-	-

7 List of Annexes

Annex A	Test Setup Photos	4 pages
Annex B	EUT external Photos	5 pages
Annex C	EUT internal Photos	4 pages