



EMC - TEST REPORT

Type / Model Name : Lely View

Product Description : Camera for monitoring of young stock in a barn environment

Applicant : Lely Industries NV

Address : Cornelis van der Lelylaan 1
3147 PB Maassluis The Netherlands

Manufacturer : Lely Industries NV

Address : Cornelis van der Lelylaan 1
3147 PB Maassluis The Netherlands

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
--	-----------------

Test Report No. :	80069850-01 Rev_2	01. June 2022
		Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04



BNetzA-CAB-13/21-07

Contents

1 TEST STANDARDS	3
2 SUMMARY	4
2.1 GENERAL REMARKS	4
2.2 SUMMARY FOR ALL EMC TESTS	5
2.3 FINAL ASSESSMENT	5
3 EQUIPMENT UNDER TEST	6
3.1 PHOTO DOCUMENTATION OF THE EUT	6
3.2 INFORMATION PROVIDED BY THE CLIENT	7
3.3 SAMPLING	8
3.4 POWER SUPPLY SYSTEM UTILISED	8
3.5 HIGHEST INTERNAL FREQUENCY	8
3.6 SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)	8
3.7 EUT OPERATION MODE	9
3.8 EUT CONFIGURATION	9
4 TEST ENVIRONMENT	10
4.1 ADDRESS OF THE TEST LABORATORY	10
4.2 ACCREDITATION AND RECOGNITION OF THE TEST LABORATORY	10
4.3 STATEMENT REGARDING THE USAGE OF LOGOS IN TEST REPORTS	10
4.4 ENVIRONMENTAL CONDITIONS	10
4.5 STATEMENT OF THE MEASUREMENT UNCERTAINTY	10
4.6 CONFORMITY DECISION RULE	11
4.7 MEASUREMENT PROTOCOL FOR FCC	12
5 TEST CONDITIONS AND RESULTS	14
5.1 CONDUCTED EMISSION	14
5.2 RADIATED EMISSION < 1 GHz (ELECTRIC FIELD)	19
5.3 RADIATED EMISSION > 1 GHz (ELECTRIC FIELD)	23
6 USED TEST EQUIPMENT AND ACCESSORIES	26
7 DETAILED MEASUREMENT UNCERTAINTY	27

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2021)

Part 15, Subpart B, Section 15.107

AC Line conducted emission

Class A device

Class B device

Part 15, Subpart B, Section 15.109

Radiated emission, general requirements

Class A device

Class B device

ANSI C63.4: 2014

Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

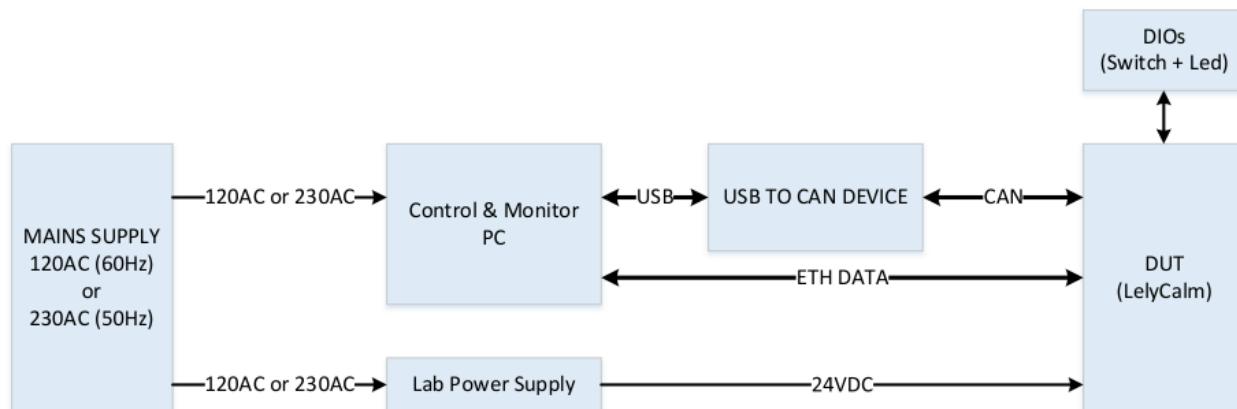
CISPR 16-4-2: 2011 + A1: 2014
EN 55016-4-2: 2011

Uncertainty in EMC measurement

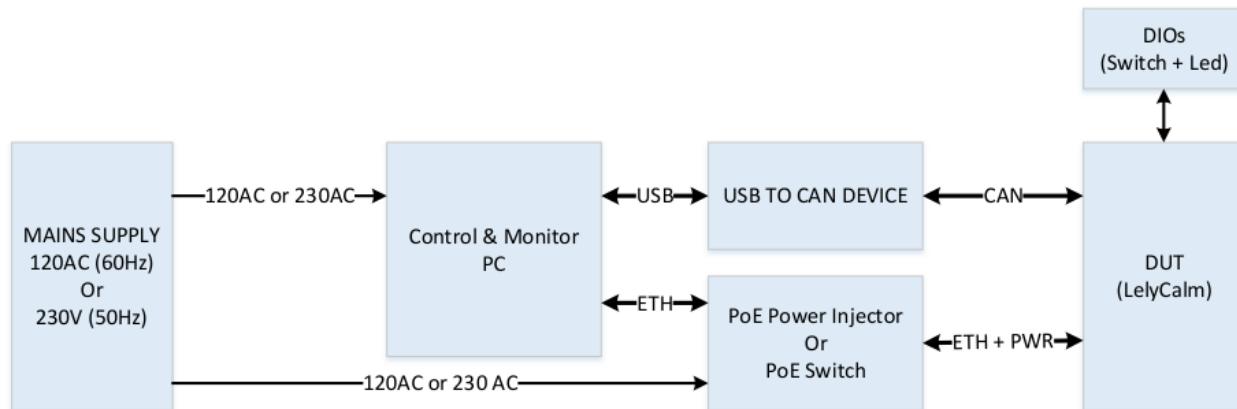
2 SUMMARY

2.1 General remarks

Note: The camera is considered as Digital Device and as Peripheral.



Test setup Configuration A



2.2 Summary for all EMC tests

Type of test	Test result
Emission:	
A4 Conducted emission (AC mains power / DC power)	Fulfilled
A5 Radiated emission (< 1 GHz)	Fulfilled
SER 3 Radiated emission (> 1 GHz)	Fulfilled

2.3 Final assessment

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records
Testing commenced on : 10. July 2021
Testing concluded on : 12. August 2021

Checked by:

Tested by:

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT



Periphery



3.3 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

3.4 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

3.5 Power supply system utilised

Power supply voltage : 24 / 48 V DC

All tests were carried out with a supply voltage of 120 V, 60 Hz unless otherwise stated.
Exceptions are described in the detailed test conditions.

3.6 Highest internal frequency

Highest internal frequency : 1.2 GHz

3.7 Short description of the Equipment under Test (EuT)

Monitoring of Youngstock in a barn environment.

Number of tested samples: 1
Serial number: 006296009

3.8 EuT operation mode

The equipment under test was operated during the measurement under the following conditions:

- Operation mode 1 Normal operation mode, 24 V DC power.

- Operation mode 2 Powered via PoE.

3.9 EuT configuration

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- USB-to-CAN
- Axis poe midspan 1-port
- Lifebook

Model : V2compact

Model : 0226-001

Model : E751

Port	Cable	Screening	Transmission	Status	Length
1	DC power line	unshielded	analogue	active	1.6 m
2	Ethernet	shielded	digital	active	2 m
3	CAN	shielded	digital	active	1 m
4	DIO	unshielded	digital	active	0.8 m

Modifications during the EMC test:

None

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Accreditation and Recognition of the test laboratory

Within the framework of the Mutual Recognition Agreement (MRA) between the European Community and the USA the EMC test laboratory listed above has been approved as a Conformity Assessment Body (CAB) designated by the EU member states through the conclusion of the MRA on the basis of Article 133 of the treaty

The site is accredited/registered by

- the German accreditation body DAkkS-Registration No.: D-PL-12030-01-04
- the Federal Communications Commission (FCC)
 - Identifier: DE0011
 - Test Firm Number: 963892
- the Bundesnetzagentur (German Federal Network Agency) as Conformity assessment body (CAB) Registration No: BnetzA-CAB-13/21-07

4.3 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.4 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

The environmental conditions are recorded by data logger in the test locations.
All data loggers used are regularly calibrated and verified.

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by

CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.6 Conformity Decision Rule

Field of EMC:

The field of EMC includes testing of EMF / EMCU, EMC in general, telecommunications, motor vehicles, maritime and aviation EMC. With respect to measurement uncertainty and decision rules, EMC is divided into the sub-sections emission and immunity. For standards where the measurement uncertainty is not taken into account, decisions on the measurements documented in this report are based on "simple acceptance" (acceptance limit = specification limit) in accordance with ILAC G8 and IEC Guide 115 in their respective editions valid at the time of issuing this report. In the case of standards where measurement uncertainty has been taken into account, these standards are used in decisions made regarding measurements documented in this report.

All equipment needed to determine results were calibrated at the time of their use and were therefore within the specified measurement uncertainty.

Sub-section Emission:

In accordance with the basic standard CISPR 16-4-2 in the version valid at the time of issuing this report, the measurement uncertainty was not taken into account in the conformity assessment as the measurement uncertainty of the laboratory Ulab is less than UCISPR.

Sub-section Immunity:

The decision rule of "simple acceptance" (acceptance limit = specification limit) is adopted.

4.7 Measurement protocol for FCC

4.7.1 General information

4.7.1.1 Test methodology

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4 procedures and using the CISPR 22 Limits.

4.7.1.2 Justification

The Equipment under Test (EuT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.7.2 Details of test procedures

4.7.2.1 General standard information

The test methods used comply with ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

4.7.3 Conducted emission

4.7.3.1 Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EuT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50Ω / $50 \mu\text{H}$ (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.7.4 Radiated emission (electrical field 30 MHz - 1 GHz)

4.7.4.1 Description of measurement

Spurious emission from the EuT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area.

The antenna is positioned 3, 10 or 30 metres horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with both horizontal and vertical antenna polarization planes and the EuT is rotated 360 degrees.

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver where the correction factors are stored. The FCC or CISPR limit is subtracted from this result in order to provide the limit margins listed in the measurement protocols.

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz: ResBW: 120 kHz

Example:

Frequency (MHz)	Reading level (dB μ V)	+	Correction Factor* (dB/m)	=	Level (dB μ V/m)	-	CISPR Limit (dB μ V/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

*Correction Factor = Antenna Factor + Cable Attenuation = 30 dB/m + 2.6 dB = 32.6 dB/m

4.7.4.2 Measurement Procedure

The test setup is prepared with the EUT at the desired EUT-Antenna separation.

The turntable is rotated 360° until the test receiver displays the maximum level at the observed frequency.

The antenna height is then adjusted from 1 m to 4 m maximizing the measured value.

The turntable is re-adjusted to re-affirm the maximum emission value which is then recorded.

This procedure is repeated for all frequencies of interest.

4.7.5 Radiated emission (electrical field 1 GHz - 30 GHz)

4.7.5.1 Description of measurement

Radiated emission from the EuT are measured in the frequency range of 1 GHz to the maximum frequency as specified in 47 CFR Part 15 Subpart A section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. Table top equipment is placed on a 0.65 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The turntable must be fully covered with the appropriate absorber (Type VHP-12).

Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4.

The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3 metres horizontally from the EuT.

Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to a peak detector function and a resolution and video bandwidth of 1 MHz. All tests are performed at a test distance of 3 metres. Hand-held or body-worn devices are rotated around three orthogonal axes in order to determine the position, angle and configuration having the maximum emission. The cables and equipment are placed and moved within the range of their likely positioning to find the maximum emission. These conditions will then be used for the final measurements. The antenna height is then adjusted from 1 m to 4 m maximizing the measured value. The antenna is mounted to a boresight axis so the antenna centre always points to the EuT.

Other devices are placed according to their general purpose. The turntable is rotated 360° until the spectrum analyser displays the maximum level at the observed frequency. The antenna height is then adjusted from 1 m to 4 m maximizing the measured value. The turntable is re-adjusted to re-affirm the maximum emission value which is then recorded. This procedure is repeated for all frequencies of interest.

When the EuT is larger than the beamwidth of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to demonstrate that emissions are under the limits at the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emission

For test instruments and accessories used see section 6 Part A 4.

Legend for tables:

QP-L ... QuasiPeak reading including correction factor

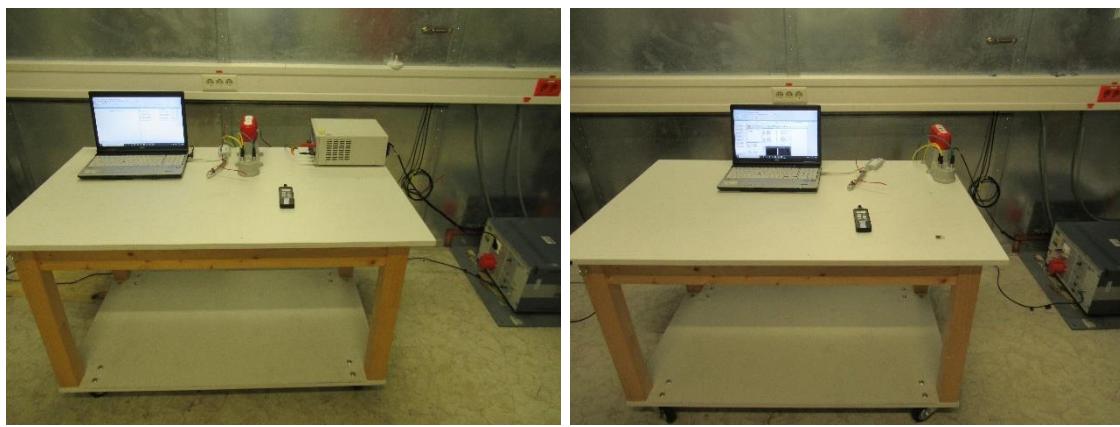
AV-L ... Average reading including correction factor

Margin... Measured value to limit delta (margin)

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test setup



5.1.3 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 5.12 dB at 6.847 MHz

The requirements are **FULFILLED**.

Remarks: For detailed results, please see the following page(s).

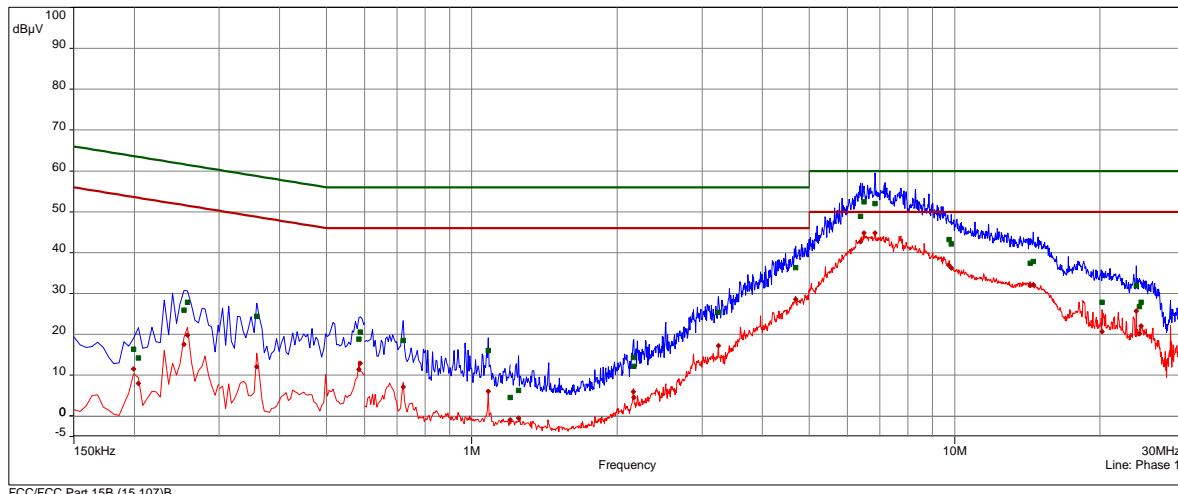
For description of the measurement see 4.7.3.

5.1.4 Test protocol

Test point: L1
 Operation mode: Operation mode 1 (see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

Result: Passed

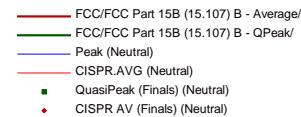


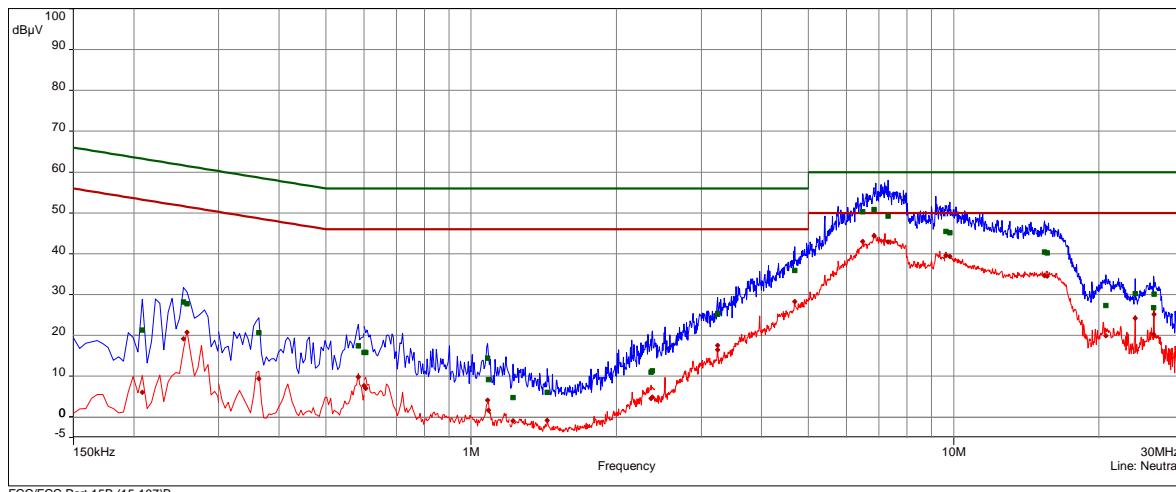


freq MHz	QP dBμV	margin dB	limit dBμV	AV dBμV	margin dB	limit dBμV	line	corr dB
0.1995	16.42	-47.21	63.63	11.53	-42.10	53.63	Phase 1	10.11
0.204	14.27	-49.18	63.45	8.05	-45.39	53.45	Phase 1	10.11
0.2535	25.88	-35.77	61.64	17.58	-34.06	51.64	Phase 1	10.12
0.258	27.84	-33.65	61.50	19.83	-31.67	51.50	Phase 1	10.12
0.3585	24.41	-34.36	58.76	12.12	-36.64	48.76	Phase 1	10.15
0.5835	18.83	-37.17	56.00	11.49	-34.51	46.00	Phase 1	10.17
0.588	20.60	-35.40	56.00	12.99	-33.01	46.00	Phase 1	10.17
0.7215	18.47	-37.53	56.00	7.19	-38.81	46.00	Phase 1	10.19
1.0815	16.08	-39.92	56.00	6.04	-39.96	46.00	Phase 1	10.21
1.2	4.57	-51.43	56.00	-0.92	-46.92	46.00	Phase 1	10.23
1.2495	6.28	-49.72	56.00	-0.45	-46.45	46.00	Phase 1	10.24
2.163	14.39	-41.61	56.00	5.96	-40.04	46.00	Phase 1	10.29
2.1675	12.19	-43.81	56.00	4.58	-41.42	46.00	Phase 1	10.29
3.246	25.35	-30.65	56.00	17.27	-28.73	46.00	Phase 1	10.35
4.6905	36.37	-19.63	56.00	28.60	-17.40	46.00	Phase 1	10.43
6.384	48.92	-11.08	60.00	42.72	-7.28	50.00	Phase 1	10.55
6.4965	52.49	-7.51	60.00	44.82	-5.18	50.00	Phase 1	10.56
6.8475	51.96	-8.04	60.00	44.88	-5.12	50.00	Phase 1	10.59
9.735	43.17	-16.83	60.00	36.84	-13.16	50.00	Phase 1	10.73
9.843	42.17	-17.83	60.00	36.26	-13.74	50.00	Phase 1	10.73
14.334	37.46	-22.54	60.00	31.94	-18.06	50.00	Phase 1	11.13
14.55	37.81	-22.19	60.00	32.10	-17.90	50.00	Phase 1	11.14
20.226	27.86	-32.14	60.00	20.70	-29.30	50.00	Phase 1	11.47
23.781	31.98	-28.02	60.00	25.71	-24.29	50.00	Phase 1	11.63
24.159	26.83	-33.17	60.00	20.15	-29.85	50.00	Phase 1	11.64
24.339	27.85	-32.15	60.00	22.11	-27.89	50.00	Phase 1	11.65

Test point: N
 Operation mode: Operation mode 1 (see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

Result: Passed

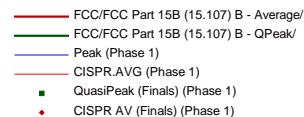


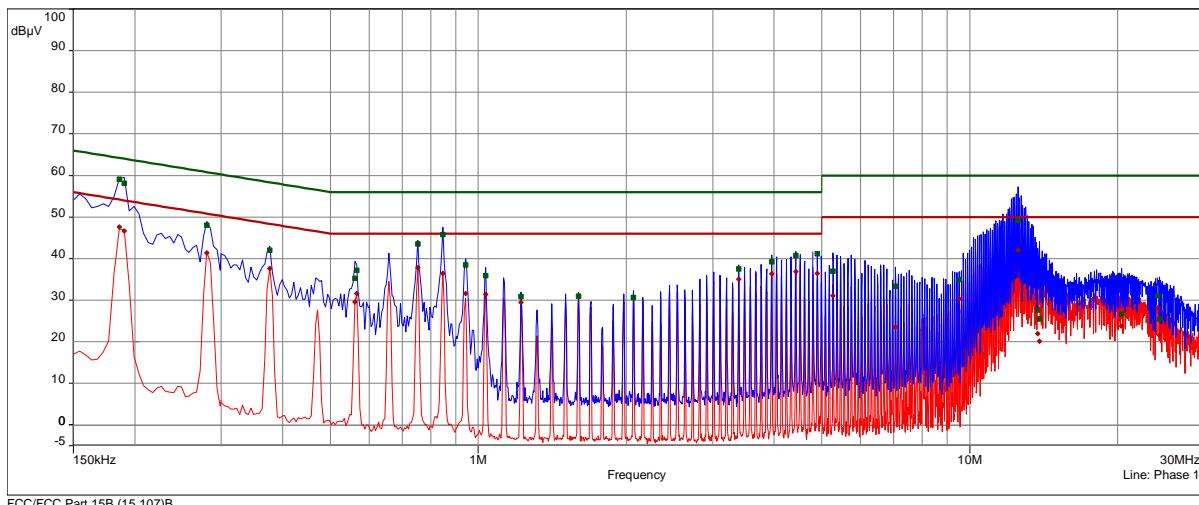


freq MHz	QP dBμV	margin dB	limit dBμV	AV dBμV	margin dB	limit dBμV	line	corr dB
0.2085	21.27	-42.00	63.26	6.11	-47.15	53.26	Neutral	10.13
0.2535	28.17	-33.47	61.64	19.13	-32.51	51.64	Neutral	10.13
0.258	27.79	-33.70	61.50	20.74	-30.75	51.50	Neutral	10.13
0.363	20.66	-38.00	58.66	9.36	-39.30	48.66	Neutral	10.15
0.5835	17.47	-38.53	56.00	9.78	-36.22	46.00	Neutral	10.17
0.6	15.88	-40.12	56.00	7.67	-38.33	46.00	Neutral	10.17
0.6045	15.82	-40.18	56.00	6.98	-39.02	46.00	Neutral	10.17
1.0815	14.39	-41.61	56.00	4.17	-41.83	46.00	Neutral	10.21
1.086	9.22	-46.78	56.00	1.65	-44.35	46.00	Neutral	10.22
1.2225	4.75	-51.25	56.00	-0.93	-46.93	46.00	Neutral	10.23
1.4385	6.08	-49.92	56.00	-0.81	-46.81	46.00	Neutral	10.26
2.361	11.06	-44.94	56.00	4.60	-41.40	46.00	Neutral	10.31
2.3745	11.30	-44.70	56.00	4.91	-41.09	46.00	Neutral	10.31
3.2415	25.44	-30.56	56.00	17.59	-28.41	46.00	Neutral	10.35
3.246	25.19	-30.81	56.00	16.47	-29.53	46.00	Neutral	10.35
4.686	35.90	-20.10	56.00	28.33	-17.67	46.00	Neutral	10.42
6.483	50.33	-9.67	60.00	43.04	-6.96	50.00	Neutral	10.54
6.8475	50.84	-9.16	60.00	44.40	-5.60	50.00	Neutral	10.56
7.3155	49.25	-10.75	60.00	42.92	-7.08	50.00	Neutral	10.58
9.6315	45.48	-14.52	60.00	39.60	-10.40	50.00	Neutral	10.66
9.8205	45.15	-14.85	60.00	39.40	-10.60	50.00	Neutral	10.66
15.414	40.41	-19.59	60.00	34.63	-15.37	50.00	Neutral	11.03
15.621	40.26	-19.74	60.00	34.48	-15.52	50.00	Neutral	11.04
20.6805	27.34	-32.66	60.00	19.90	-30.10	50.00	Neutral	11.25
23.7765	30.25	-29.75	60.00	24.25	-25.75	50.00	Neutral	11.26
25.9725	26.76	-33.24	60.00	20.23	-29.77	50.00	Neutral	11.22
26.004	30.11	-29.89	60.00	25.23	-24.77	50.00	Neutral	11.22

Test point: L1
 Operation mode: Operation mode 2(see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

Result: Passed





freq MHz	QP dBµV	margin dB	limit dBµV	AV dBµV	margin dB	limit dBµV	line	corr dB
0.186	59.07	-5.15	64.21	47.63	-6.59	54.21	Phase 1	10.10
0.1905	58.08	-5.93	64.01	46.62	-7.40	54.01	Phase 1	10.10
0.2805	48.04	-12.76	60.80	41.40	-9.40	50.80	Phase 1	10.13
0.3765	42.08	-16.28	58.36	37.64	-10.72	48.36	Phase 1	10.15
0.561	35.29	-20.71	56.00	29.53	-16.47	46.00	Phase 1	10.16
0.5655	37.19	-18.81	56.00	31.59	-14.41	46.00	Phase 1	10.17
0.753	43.51	-12.49	56.00	37.87	-8.13	46.00	Phase 1	10.19
0.8475	45.80	-10.20	56.00	36.43	-9.57	46.00	Phase 1	10.19
0.942	38.53	-17.47	56.00	31.67	-14.33	46.00	Phase 1	10.20
1.0365	35.91	-20.09	56.00	31.35	-14.65	46.00	Phase 1	10.21
1.2225	30.90	-25.10	56.00	29.46	-16.54	46.00	Phase 1	10.23
1.6005	30.98	-25.02	56.00	31.12	-14.88	46.00	Phase 1	10.27
2.0685	30.62	-25.38	56.00	30.71	-15.29	46.00	Phase 1	10.28
3.39	37.47	-18.53	56.00	35.00	-11.00	46.00	Phase 1	10.35
3.9525	39.25	-16.75	56.00	36.33	-9.67	46.00	Phase 1	10.39
4.4225	40.71	-15.29	56.00	36.89	-9.11	46.00	Phase 1	10.42
4.899	41.19	-14.81	56.00	36.47	-9.53	46.00	Phase 1	10.44
5.2725	37.03	-22.97	60.00	31.08	-18.92	50.00	Phase 1	10.47
7.0635	33.34	-26.66	60.00	23.54	-26.46	50.00	Phase 1	10.60
9.516	34.94	-25.06	60.00	30.29	-19.71	50.00	Phase 1	10.72
12.5385	49.20	-10.80	60.00	42.04	-7.96	50.00	Phase 1	10.98
13.7625	27.61	-32.39	60.00	21.97	-28.03	50.00	Phase 1	11.08
13.857	25.51	-34.49	60.00	20.12	-29.88	50.00	Phase 1	11.09
20.379	26.65	-33.35	60.00	23.83	-26.17	50.00	Phase 1	11.48
24.132	31.04	-28.96	60.00	28.18	-21.82	50.00	Phase 1	11.64
24.3525	25.48	-34.52	60.00	21.58	-28.42	50.00	Phase 1	11.66

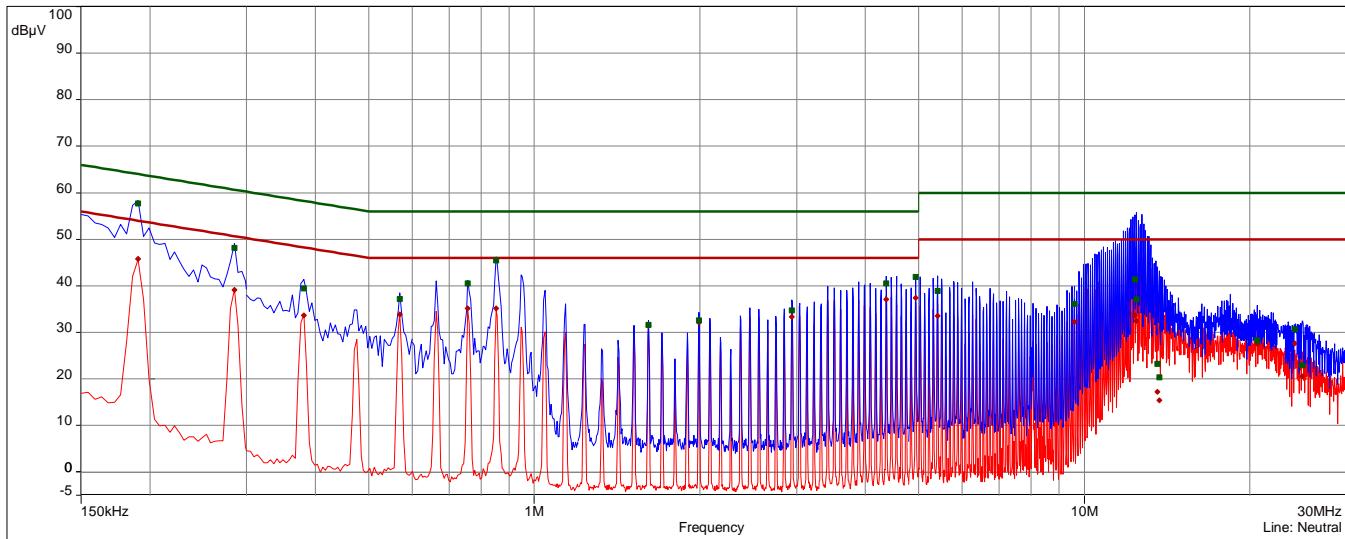
Test point: N
 Operation mode: Operation mode 2 (see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

Result: Passed







freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV		dB
0.1905	57.73	-6.29	64.01	45.76	-8.25	54.01	Neutral	10.12
0.285	48.17	-12.50	60.67	39.19	-11.48	50.67	Neutral	10.14
0.381	39.42	-18.83	58.26	33.65	-14.60	48.26	Neutral	10.15
0.57	37.25	-18.75	56.00	33.90	-12.10	46.00	Neutral	10.17
0.7575	40.48	-15.52	56.00	35.15	-10.85	46.00	Neutral	10.19
0.852	45.47	-10.53	56.00	35.11	-10.89	46.00	Neutral	10.19
1.614	31.64	-24.36	56.00	31.42	-14.58	46.00	Neutral	10.27
1.992	32.60	-23.40	56.00	32.14	-13.86	46.00	Neutral	10.27
2.94	34.77	-21.23	56.00	33.29	-12.71	46.00	Neutral	10.34
4.3665	40.51	-15.49	56.00	37.14	-8.86	46.00	Neutral	10.41
4.9395	41.90	-14.10	56.00	37.40	-8.60	46.00	Neutral	10.43
5.412	38.92	-21.08	60.00	33.55	-16.45	50.00	Neutral	10.47
9.5925	36.10	-23.90	60.00	32.25	-17.75	50.00	Neutral	10.66
12.354	41.42	-18.58	60.00	33.66	-16.34	50.00	Neutral	10.84
12.4485	37.07	-22.93	60.00	32.48	-17.52	50.00	Neutral	10.85
13.5915	23.30	-36.70	60.00	17.24	-32.76	50.00	Neutral	10.92
13.686	20.38	-39.62	60.00	15.38	-34.62	50.00	Neutral	10.93
20.6445	28.32	-31.68	60.00	27.54	-22.46	50.00	Neutral	11.25
24.132	30.64	-29.36	60.00	27.63	-22.37	50.00	Neutral	11.26
24.933	22.97	-37.03	60.00	20.54	-29.46	50.00	Neutral	11.25

5.2 Radiated emission < 1 GHz (electric field)

For test instruments and accessories used see section 6 Part A 5.

Legend for tables:

Level vert. QuasiPeak reading including correction factor for vertically polarised antenna
Level hor. QuasiPeak reading including correction factor for horizontally polarised antenna
Limit Limit referred to the appropriate standard
DLimit... Delta between limit and result (margin)
Noise Characteristic of disturbance (narrowband or broadband)

5.2.1 Description of the test location

Test location: OATS 1

Test distance: 10 metres

Distance of 10 m was applied in according to the CISPR 22 (Third Edition)

5.2.2 Photo documentation of the test setup



5.2.3 Test result

Frequency range: 30 MHz - 1000 MHz

Min. limit margin 5.2 dB at 236.70 MHz

The requirements are **FULFILLED**.

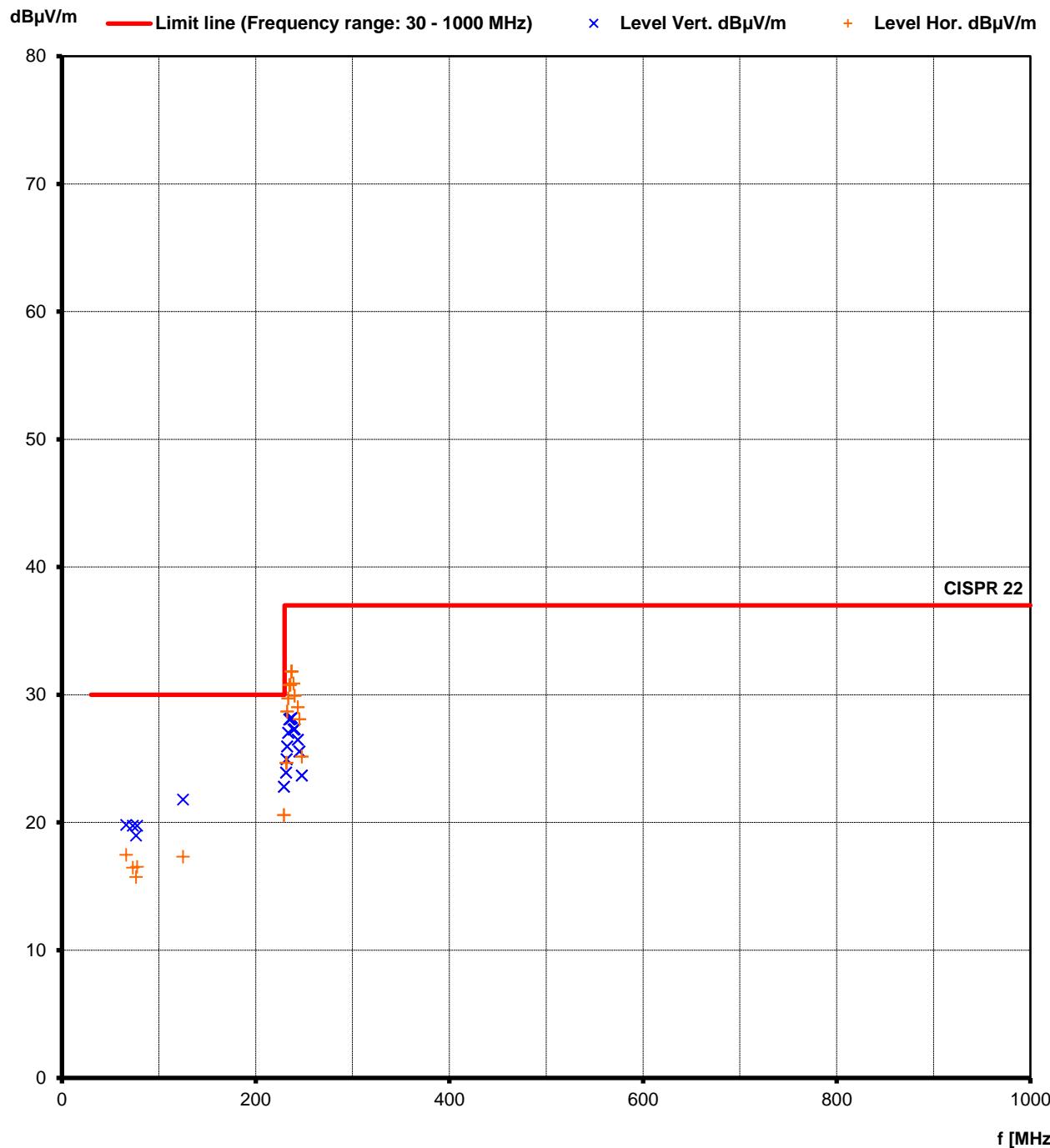
Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.7.4.

5.2.4 Test protocol

Operation mode: Operation mode 1(see 3.8) Result: **Passed**
 Remarks: None
 Date: 20.07.2021
 Tested by: LB/BE

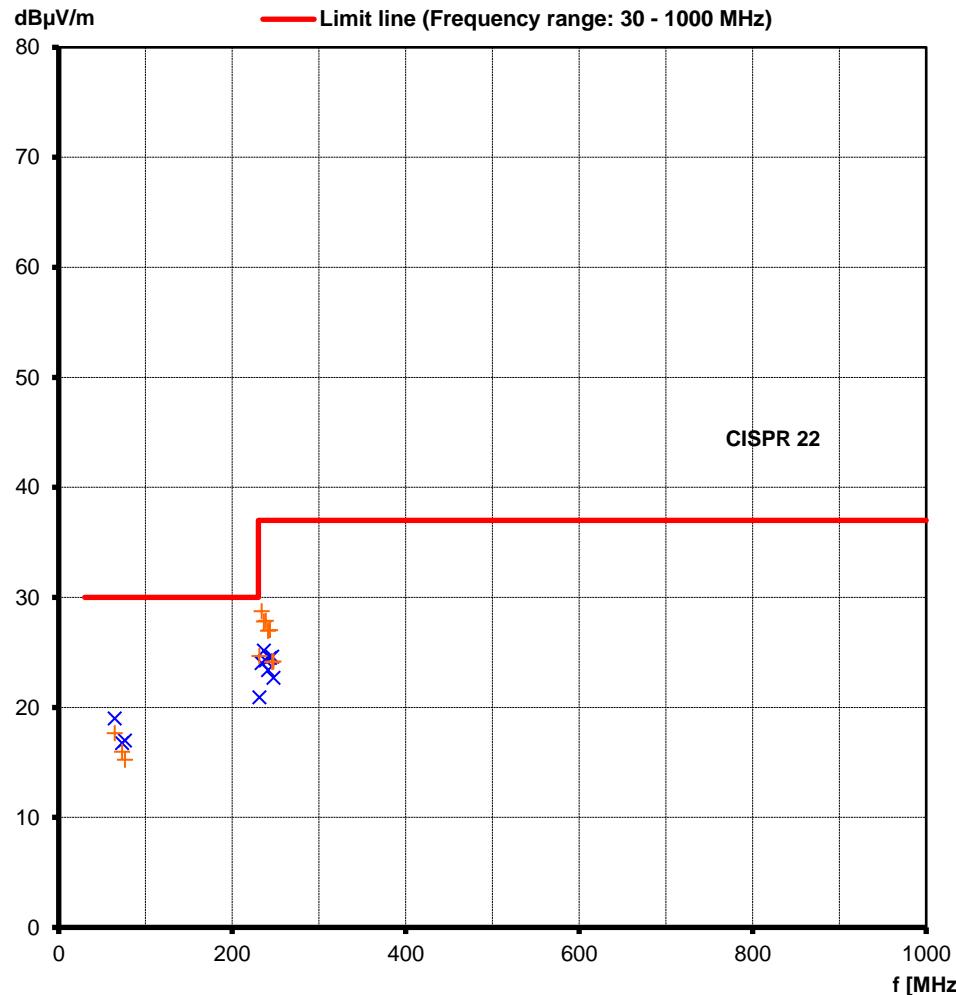
Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB/m)	Correct. Hor. (dB/m)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
66.10	3.0	1.0	16.8	16.5	19.8	17.5	30.0	-10.2
73.00	4.0	1.0	15.8	15.5	19.8	16.5	30.0	-10.2
76.47	4.0	1.0	15.0	14.8	19.0	15.8	30.0	-11.0
77.50	5.0	2.0	14.8	14.5	19.8	16.5	30.0	-10.2
124.99	5.0	1.0	16.8	16.3	21.8	17.3	30.0	-8.2
228.98	6.0	3.0	16.8	17.6	22.8	20.6	30.0	-7.2
231.21	7.0	7.0	16.9	17.7	23.9	24.7	37.0	-12.3
231.94	8.0	7.0	17.0	17.7	25.0	24.7	37.0	-12.0
232.32	9.0	11.0	17.0	17.7	26.0	28.7	37.0	-8.3
233.42	10.0	12.0	17.0	17.7	27.0	29.7	37.0	-7.3
234.51	11.0	13.0	17.1	17.8	28.1	30.8	37.0	-6.2
235.60	11.0	13.0	17.1	17.8	28.1	30.8	37.0	-6.2
236.70	11.0	14.0	17.2	17.8	28.2	31.8	37.0	-5.2
237.06	11.0	14.0	17.2	17.8	28.2	31.8	37.0	-5.2
238.90	10.0	13.0	17.3	17.9	27.3	30.9	37.0	-6.1
240.00	10.0	12.0	17.3	17.9	27.3	29.9	37.0	-7.1
243.29	9.0	11.0	17.5	18.0	26.5	29.0	37.0	-8.0
245.12	8.0	10.0	17.6	18.1	25.6	28.1	37.0	-8.9
247.68	6.0	7.0	17.7	18.2	23.7	25.2	37.0	-11.8



Operation mode: Operation mode 2(see 3.8)
 Remarks: None
 Date: 20.07.2021
 Tested by: LB/BE

Result: Passed

Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB/m)	Correct. Hor. (dB/m)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
64.33	2.0	1.0	17.0	16.7	19.0	17.7	30.0	-11.0
73.00	1.0	0.5	15.8	15.5	16.8	16.0	30.0	-13.2
76.47	2.0	0.5	15.0	14.8	17.0	15.3	30.0	-13.0
231.20	4.0	7.0	16.9	17.7	20.9	24.7	37.0	-12.3
233.78	7.0	11.0	17.0	17.7	24.0	28.7	37.0	-8.3
236.33	8.0	10.0	17.2	17.8	25.2	27.8	37.0	-9.2
238.53	7.0	10.0	17.3	17.9	24.3	27.9	37.0	-9.1
241.09	6.0	9.0	17.4	18.0	23.4	27.0	37.0	-10.0
243.29	7.0	9.0	17.5	18.0	24.5	27.0	37.0	-10.0
246.20	7.0	6.0	17.6	18.1	24.6	24.1	37.0	-12.4
247.67	5.0	6.0	17.7	18.2	22.7	24.2	37.0	-12.8



5.3 Radiated emission > 1 GHz (electric field)

For test instruments and accessories used see section 6 Part **SER 3**.

5.3.1 Description of the test location

Test location: Anechoic chamber A 1

Test distance: 3 metres

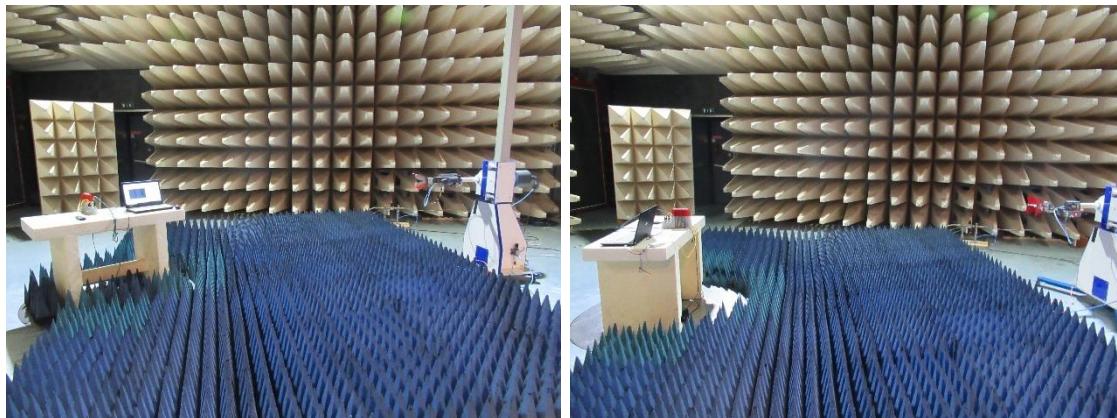
ETS Lindgren 3117:

Dimension of the line tangent to the EUT according to CISPR 16-2-3:2010

Note: The Θ 3dB min values were given by the antenna manufacturer

Frequency GHz	Θ 3 dB min	Measurement distance	w min
1	88	3 m	5.79 m
2	67	3 m	3.97 m
4	69	3 m	4.12 m
6	53	3 m	2.99 m
10	40	3 m	2.18 m
18	36	3 m	1.95 m

5.3.2 Photo documentation of the test setup



5.3.3 Test result

Frequency range: 1 GHz - 18 GHz

Min. limit margin 4.48 dB at 5999 MHz

The requirements are **FULFILLED**.

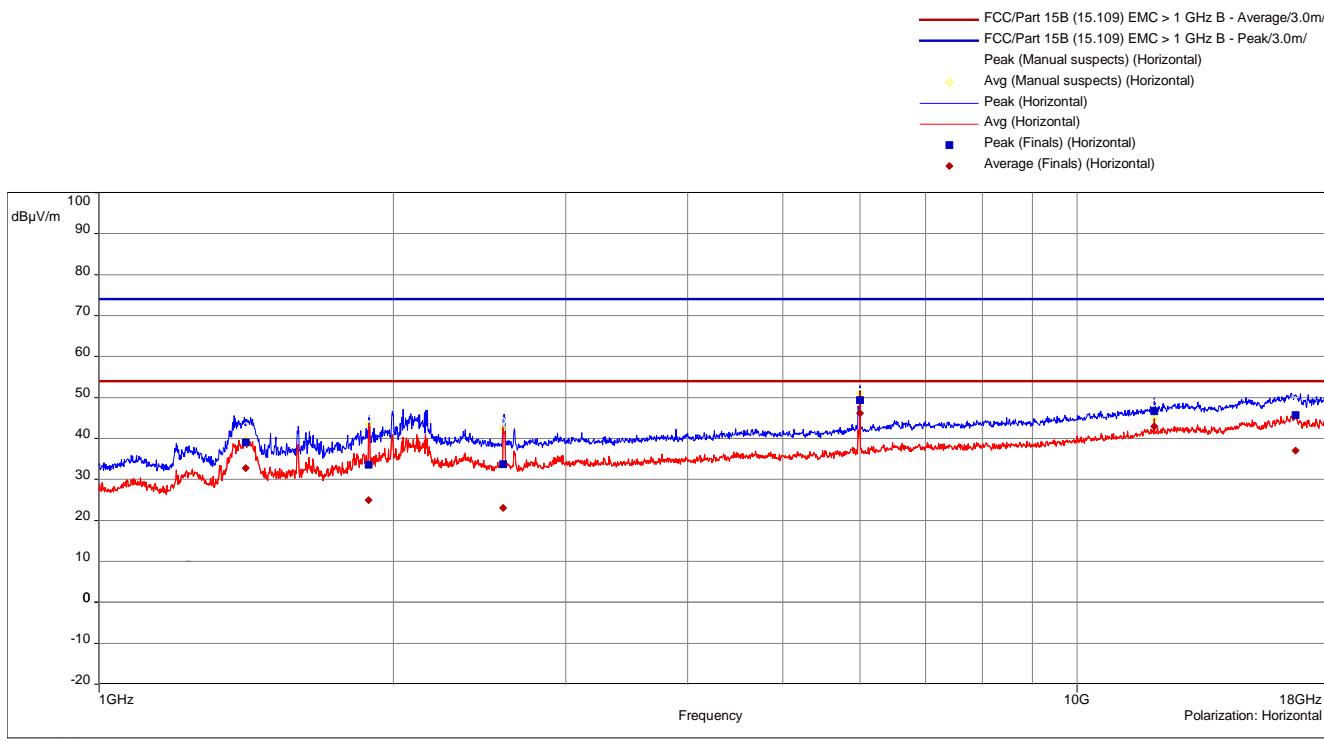
Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.7.5.

5.3.4 Test protocol

Operation mode: Operation mode 1(see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

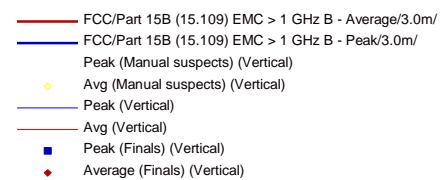
Result: Passed



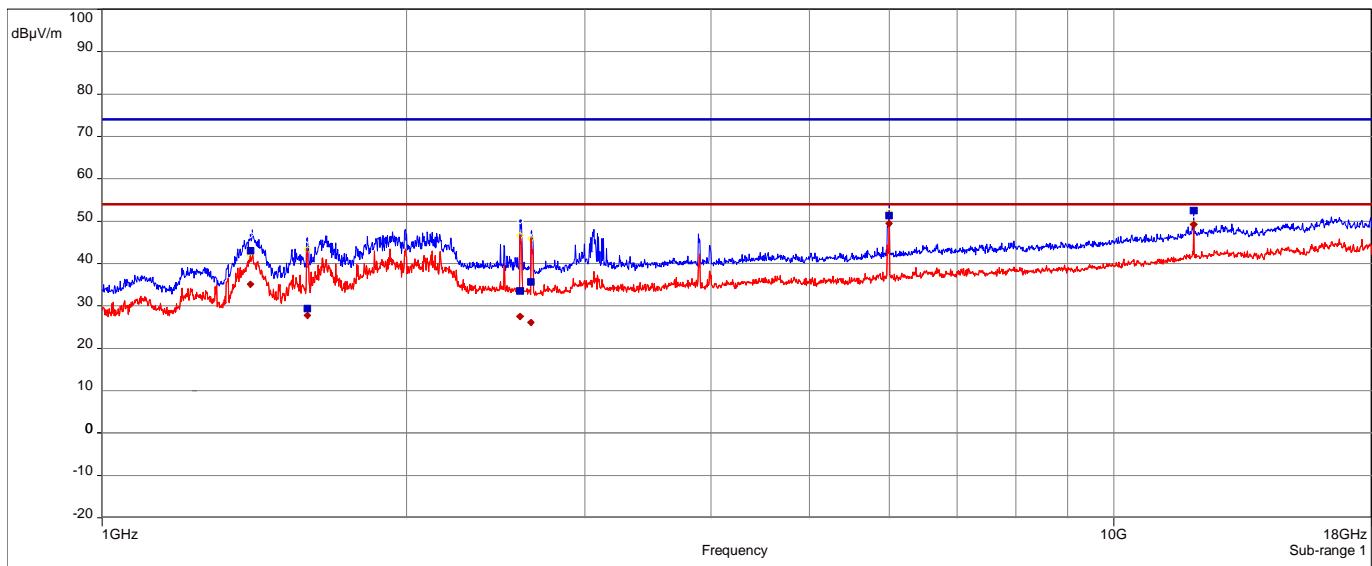
Frequency (MHz)	Peak (dB μ V/m)	Peak Margin (dB)	Peak Limit (dB μ V/m)	Average (dB μ V/m)	AV margin (dB)	AV limit (dB μ V/m)	angle	height	polarisation	Correction (dB)
1420.93291	37.53	-36.47	74.00	33.42	-20.58	54.00	11.50	1.81	Horizontal	-11.49
1598.44956	31.31	-42.69	74.00	25.46	-28.54	54.00	14.80	2.31	Horizontal	-11.62
1996.62159	32.22	-41.78	74.00	23.45	-30.55	54.00	119.40	2.34	Horizontal	-7.98
2599.20848	34.07	-39.93	74.00	25.51	-28.49	54.00	178.10	2.22	Horizontal	-7.15
5999.73513	51.21	-22.79	74.00	47.86	-6.14	54.00	52.70	3.22	Horizontal	-2.96
11999.91746	49.45	-24.55	74.00	47.80	-6.20	54.00	89.10	3.83	Horizontal	3.54

Operation mode: Operation mode 2(see 3.8)
 Remarks: None
 Date: 19.07.2021
 Tested by: LB/BE

Result: Passed



 FCC/Part 15B (15.109) EMC > 1 GHz B - Average/3.0m/
 FCC/Part 15B (15.109) EMC > 1 GHz B - Peak/3.0m/
 Peak (Manual suspects) (Vertical)
 Avg (Manual suspects) (Vertical)
 Peak (Vertical)
 Avg (Vertical)
 Peak (Finals) (Vertical)
 Average (Finals) (Vertical)



Date:07/19/2021 19:43 Operator: Operation mode:

Frequency (MHz)	Peak (dB μ V/m)	Peak Margin (dB)	Peak Limit (dB μ V/m)	Average (dB μ V/m)	AV margin (dB)	AV limit (dB μ V/m)	angle	height	polarisation	Correction (dB)
1400.78222	43.14	-30.86	74.00	35.16	-18.84	54.00	99.20	1.57	Vertical	-11.60
1595.32112	29.51	-44.49	74.00	27.80	-26.20	54.00	10.50	2.20	Vertical	-11.63
2589.47935	33.59	-40.41	74.00	27.56	-26.44	54.00	238.70	3.23	Vertical	-7.15
2654.9521	35.77	-38.23	74.00	26.11	-27.89	54.00	38.40	3.06	Vertical	-7.08
5999.78502	51.43	-22.57	74.00	49.52	-4.48	54.00	291.10	3.60	Vertical	-2.96
11999.90571	52.52	-21.48	74.00	49.24	-4.76	54.00	359.00	3.84	Vertical	3.54

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Following software was used: Nexion BAT EMC (Version 3.20.0.23)

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.	Next Calib.	Last Calib.
A 4	BAT-EMC 3.20.0.23	Nexion Software	EMCO Elektronik GmbH	01-02/68-13-001		
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-15-001	21/06/2022	21/06/2021
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004	31/10/2021	31/10/2019
	N-4000-BNC	RF Cable	CSA Group Bayern GmbH	02-02/50-05-138		
	N-1500-N	RF Cable	CSA Group Bayern GmbH	02-02/50-05-140		
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155	13/11/2022	13/11/2019
A 5	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006	09/07/2022	09/07/2021
	VULB 9168	Trilog Broadband Antenna	Schwarzbeck Mess-Elektronik	02-02/24-05-005	18/12/2021	18/12/2020
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113		
	KK-EF393/U-16N-21N20 m	RF Cable 20m	Huber + Suhner	02-02/50-12-018		
	KK-SD_7/8-2X21N-33,0M	RF Cable 33 m	Huber + Suhner AG	02-02/50-15-028		
	50F-003 N 3dB		Tactron Elektronik	02-02/50-21-010		
SER 3	AMF-6D-01002000-22-10P	RF Amplifier	MITEQ, Inc.	02-02/17-15-004		
	3117	Horn Antenna 1 - 18 GHz	EMCO Elektronik GmbH	02-02/24-05-009	28/06/2022	28/06/2021
	BAM 4.5-P	Antenna Mast	maturo GmbH	02-02/50-17-024		
	NCD	Controller for Antenna Mast	maturo GmbH	02-02/50-17-025		
	KK-SF106-2X11N-6,5M	RF Cable	Huber + Suhner	02-02/50-18-016		
	BAT-EMC 3.20.0.23	Nexion Software	EMCO Elektronik GmbH	02-02/68-13-001		

7 Detailed measurement uncertainty

Note: The following table provides an overview of all uncertainties for CSA Group Bayern GmbH

Measurement	Ucispr [dB]	Ulab comb. + [dB]	Ulab comb. - [dB]	Ulab exp. + [dB]	Ulab exp. - [dB]
EMISSION					
Conducted disturbance at AC mains and other port power using a V-AMN (150 kHz to 30 MHz)	3,4	1,48	1,58	2,96	3,16
Conducted disturbance at AC mains port using a voltage probe - 1500 Ohm (9 kHz - 30 MHz)	2,9	1,15	1,15	2,31	2,31
Conducted disturbance at telecommunication port using CP (9 kHz - 30 MHz)	2,9	1,08	1,09	2,17	2,18
Conducted disturbance at telecommunication port using CVP (150 kHz - 30 MHz)	3,9	1,57	1,57	3,13	3,13
Disturbance power (30 MHz to 300 MHz)	4,5	1,74	1,74	3,48	3,48
Radiated disturbance (disturbance current in a LLAS)	3,3	1,35	1,35	2,69	2,69
Radiated disturbance (disturbance current in a Loop antenna 10 kHz to 30 MHz)	na	0,00	0,00	0,00	0,00
Radiated disturbance (electrical field strength at an OATS / SAC; 30 MHz - 200 MHz; biconical antenna; 3 m or 10 m)	6,3	1,74	1,76	3,47	3,53
Radiated disturbance (electrical field strength at an OATS / SAC; 200 MHz - 1000 MHz; LPDA antenna; 3 m or 10 m)	6,3	2,14	2,14	4,29	4,28
Radiated disturbance (electrical field strength at an OATS / SAC; 30 MHz - 1000 MHz; Hybrid antenna; 3 m or 10 m)	6,3	2,08	2,07	4,17	4,13
Radiated disturbance (electrical field strength in a FAR; 1 GHz - 6 GHz)	5,2	2,54	1,87	5,07	3,73
Radiated disturbance (electrical field strength in a FAR; 6 GHz - 18 GHz)	5,5	2,70	2,15	5,40	4,30
Radiated disturbance (in a GTEM; 30 MHz - 1000 MHz)	6,3	1,44	1,47	2,87	2,94

Measurement	Influence factor	$U(xi) (+- \%)$
Harmonic current emissions	Class I	
	Voltage $U_m \geq 1\% U_{nom}$	5 % U_m
	Voltage $U_m < 1\% U_{nom}$	0,05 % U_{nom}
	Current $I_m \geq 3\% I_{nom}$	5 % I_m
	Current $I_m < 3\% I_{nom}$	0,15 % I_{nom}
	Power $P_m \geq 150 \text{ W}$	1 % P_m
	Power $P_m < 150 \text{ W}$	1,5 W
	Phase shift (h=number of harmonic)	$< h^*1^\circ$
	Class II	
	Voltage $U_m \geq 3\% U_{nom}$	5 % U_m
	Voltage $U_m < 3\% U_{nom}$	0,15 % U_{nom}
	Current $I_m \geq 10\% I_{nom}$	5 % I_m
	Current $I_m < 10\% I_{nom}$	0,5 % I_{nom}
Flicker	Current	
	Magnitude (active or reactive current)	$< (1\% I_m + 10\text{mA})$
	Magnitude (if phase angle used)	2°
	Direct measured parameters (clause 3 and 4) of limit or measured value whichever is higher	< 8%

Measurement	$U_{cispr}[\text{dB}]$	$U_{lab \text{ comb.}} +[\text{dB}]$	$U_{lab \text{ comb. -}} [\text{dB}]$	$U_{lab \text{ exp.}} +[\text{dB}]$	$U_{lab \text{ exp. -}} [\text{dB}]$
IMMUNITY					
Radiated immunity (20 MHz to 6 GHz)	na	0,79	0,51	1,59	1,03
Conducted immunity (0,15 MHz - 230 GHz)	na	0,74	0,65	1,47	1,30
Power frequency magnetic field (50 Hz / 60 Hz)	na	2,69	2,69	5,39	5,39
Conducted, common mode disturbances	na	1,80	1,51	3,60	3,02
Transverse electromagnetic waveguides (IEC 61000-4-20)	na	0,51	0,51	1,03	1,03