



EMC - TEST REPORT

Type / Model Name : ULR01

Product Description : RFID Reader

Applicant : Dürr Dental SE

Address : Höfigheimer Str. 17

74321 Bietigheim-Bissingen, GERMANY

Manufacturer : Dürr Dental SE

Address : Höfigheimer Str. 17

74321 Bietigheim-Bissingen, GERMANY

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

POSITIVE

Test Report No. :

80115209-01 Rev_0

30. March 2022

Date of issue



Bundesnetzagentur

BNetzA-CAB-13/21-07

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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: insert informative statements in User Manual!

The measurement for radio was recorded in the test report 80115209-03 Rev_0.

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) | Not applicable* |

* Not applicable, according to the customer, the highest internal frequency is < 108 MHz.

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 : 08. March 2022

Testing concluded on : 08. March 2022

Checked by:

Tested by:

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT





3.2 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.

3.3 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.

3.4 Power supply system utilised

Power supply voltage : 5V DC Connection via USB to Laptop

All tests were carried out with a supply voltage of 5V DC unless otherwise stated.
Exceptions are described in the detailed test conditions.

3.5 Highest internal frequency

According to the manufacturer's statement, the highest internally used frequency is less than 108 MHz.

3.6 Short description of the Equipment under Test (EuT)

ULR01 is a RFID reader, which can be connected via USB cable to a computer. It reads RFID tags (e.g. of image plates) and transfers that data to a software on the connected computer.

The Reader uses the NFC controller NXP PN7150 to communicate with RFID-Tags. Tags complying to standard ISO15693 are supported. The modulation on PN7150 side is 100% Amplitude Shift Keying (ASK) pulse position coded. The RFID-Tag uses subcarrier load modulation with manchester bit coding.

Number of tested samples : 1
Serial number : P464875006

3.7 EuT operation mode

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

- Continuous Tag reading

3.8 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:

- Laptop _____ Model : Fujitsu, CSA Group Bayern GmbH
- _____ Model : _____
- _____ Model : _____

| Port | Cable | Screening | Transmission | Status | Length |
|------|----------------|-----------|--------------|--------|--------|
| 1 | Power over USB | shielded | analogue | active | 2 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) Registration Number: 0013864798
- 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 $\text{dB}\mu\text{V}$, 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 $\text{dB}\mu\text{V}$ and μV , 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 $50 \Omega / 50 \mu\text{H}$ (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 10.93 dB at 0.222 MHz

The requirements are **FULFILLED**.

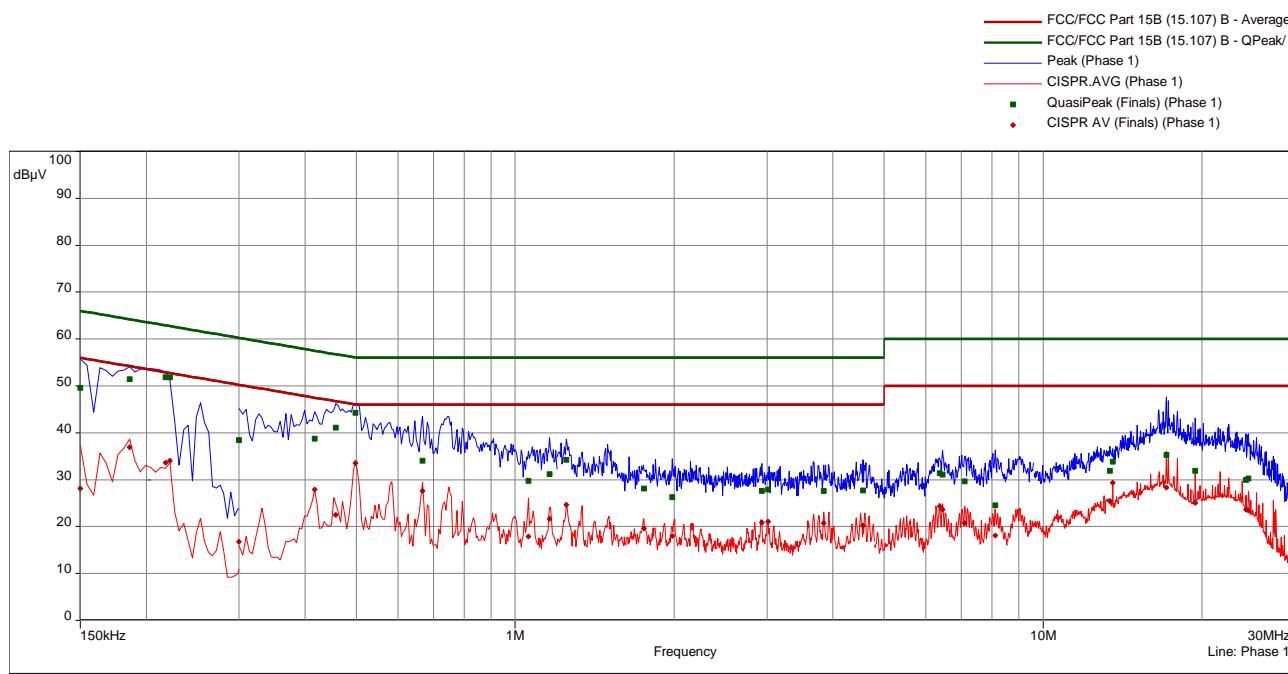
Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.7.3.

5.1.4 Test protocol

Test point: L1
 Operation mode: Continuous Tag reading
 Remarks: FCC Class B
 Date: 08. March 2022
 Tested by: Johannes Müller

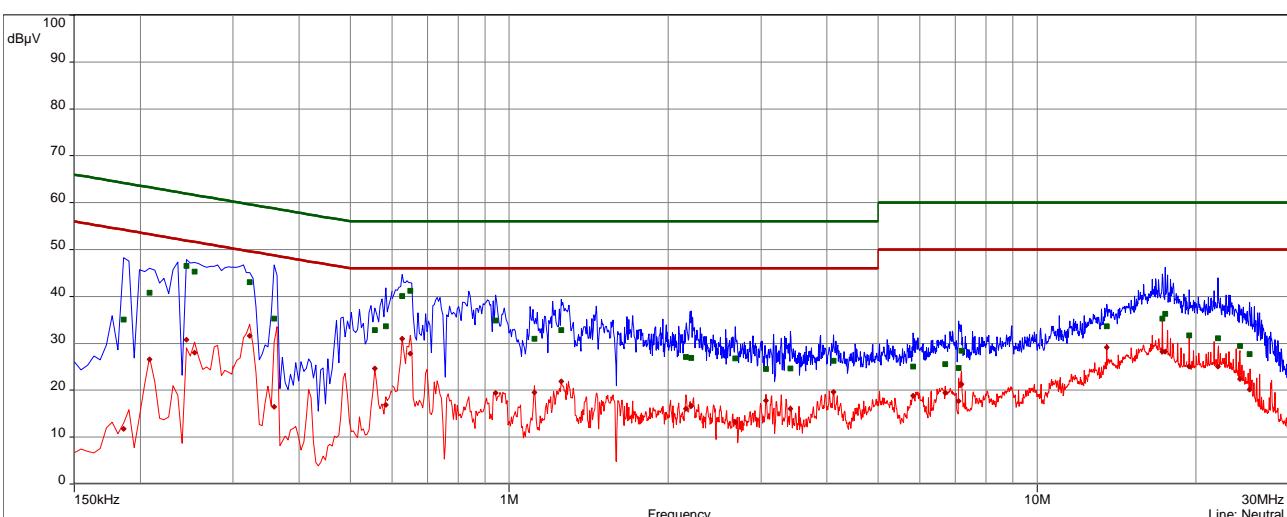
Result: PASSED



| freq MHz | SR | QP dB μ V | margin dB | limit dB μ V | AV dB μ V | margin dB | limit dB μ V | line | corr dB |
|-------------|----|------------------|--------------|---------------------|------------------|--------------|---------------------|---------|------------|
| 0.15 | 1 | 49.58 | -16.42 | 66.00 | 28.14 | -27.86 | 56.00 | Phase 1 | 10.09 |
| 0.186 | 1 | 51.40 | -12.81 | 64.21 | 36.92 | -17.30 | 54.21 | Phase 1 | 10.10 |
| 0.2175 | 1 | 51.81 | -11.10 | 62.91 | 33.69 | -19.23 | 52.91 | Phase 1 | 10.11 |
| 0.222 | 1 | 51.81 | -10.93 | 62.74 | 34.04 | -18.70 | 52.74 | Phase 1 | 10.11 |
| 0.3 | 2 | 38.48 | -21.76 | 60.24 | 16.77 | -33.47 | 50.24 | Phase 1 | 10.14 |
| 0.417 | 2 | 38.80 | -18.71 | 57.51 | 27.92 | -19.59 | 47.51 | Phase 1 | 10.16 |
| 0.4575 | 2 | 41.13 | -15.61 | 56.74 | 22.50 | -24.24 | 46.74 | Phase 1 | 10.16 |
| 0.498 | 2 | 44.27 | -11.76 | 56.03 | 33.57 | -12.46 | 46.03 | Phase 1 | 10.16 |
| 0.6675 | 3 | 34.06 | -21.94 | 56.00 | 27.58 | -18.42 | 46.00 | Phase 1 | 10.18 |
| 1.059 | 3 | 29.80 | -26.20 | 56.00 | 17.90 | -28.10 | 46.00 | Phase 1 | 10.21 |
| 1.1625 | 3 | 31.15 | -24.85 | 56.00 | 21.66 | -24.34 | 46.00 | Phase 1 | 10.23 |
| 1.2495 | 4 | 34.25 | -21.75 | 56.00 | 24.61 | -21.39 | 46.00 | Phase 1 | 10.24 |
| 1.7535 | 4 | 28.15 | -27.85 | 56.00 | 19.59 | -26.41 | 46.00 | Phase 1 | 10.28 |
| 1.983 | 4 | 26.32 | -29.68 | 56.00 | 17.99 | -28.01 | 46.00 | Phase 1 | 10.27 |
| 2.931 | 5 | 27.57 | -28.43 | 56.00 | 20.90 | -25.10 | 46.00 | Phase 1 | 10.34 |
| 3.012 | 5 | 27.91 | -28.09 | 56.00 | 21.09 | -24.91 | 46.00 | Phase 1 | 10.35 |
| 3.84 | 5 | 27.64 | -28.36 | 56.00 | 20.74 | -25.26 | 46.00 | Phase 1 | 10.38 |
| 4.5645 | 5 | 27.76 | -28.24 | 56.00 | 20.26 | -25.74 | 46.00 | Phase 1 | 10.43 |
| 6.366 | 6 | 31.43 | -28.57 | 60.00 | 24.34 | -25.66 | 50.00 | Phase 1 | 10.55 |
| 6.456 | 6 | 31.12 | -28.88 | 60.00 | 23.59 | -26.41 | 50.00 | Phase 1 | 10.56 |
| 7.1085 | 6 | 29.64 | -30.36 | 60.00 | 20.77 | -29.23 | 50.00 | Phase 1 | 10.61 |
| 8.1165 | 6 | 24.54 | -35.46 | 60.00 | 18.09 | -31.91 | 50.00 | Phase 1 | 10.66 |
| 13.3845 | 7 | 31.91 | -28.09 | 60.00 | 25.51 | -24.49 | 50.00 | Phase 1 | 11.05 |
| 13.56 | 7 | 33.85 | -26.15 | 60.00 | 29.38 | -20.62 | 50.00 | Phase 1 | 11.07 |
| 17.142 | 7 | 35.32 | -24.68 | 60.00 | 28.30 | -21.70 | 50.00 | Phase 1 | 11.32 |
| 19.4385 | 8 | 31.93 | -28.07 | 60.00 | 25.04 | -24.96 | 50.00 | Phase 1 | 11.44 |
| 24.2625 | 8 | 29.96 | -30.04 | 60.00 | 23.58 | -26.42 | 50.00 | Phase 1 | 11.65 |
| 24.51 | 8 | 30.24 | -29.76 | 60.00 | 23.40 | -26.60 | 50.00 | Phase 1 | 11.66 |

Test point: N
 Operation mode: Continuous Tag reading
 Remarks: FCC Class B
 Date: 08. March 2022
 Tested by: Johannes Müller

Result: PASSED



 FCC/FCC Part 15B (15.107) B - Average/
 FCC/FCC Part 15B (15.107) B - QPeak/
 Peak (Neutral)
 CISPR.AVG (Neutral)
 QuasiPeak (Finals) (Neutral)
 CISPR AV (Finals) (Neutral)

FCC/FCC Part 15B (15.107)B

| freq MHz | SR | QP dB μ V | margin dB | limit dB μ V | AV dB μ V | margin dB | limit dB μ V | line | corr dB |
|-------------|----|------------------|--------------|---------------------|------------------|--------------|---------------------|---------|------------|
| 0.186 | 9 | 35.10 | -29.11 | 64.21 | 11.79 | -42.42 | 54.21 | Neutral | 10.12 |
| 0.2085 | 9 | 40.77 | -22.50 | 63.26 | 26.55 | -26.72 | 53.26 | Neutral | 10.13 |
| 0.2445 | 9 | 46.55 | -15.39 | 61.94 | 30.81 | -21.14 | 51.94 | Neutral | 10.13 |
| 0.2535 | 9 | 45.35 | -16.29 | 61.64 | 28.03 | -23.62 | 51.64 | Neutral | 10.13 |
| 0.3225 | 10 | 43.10 | -16.55 | 59.64 | 31.63 | -18.01 | 49.64 | Neutral | 10.14 |
| 0.3585 | 10 | 35.26 | -23.51 | 58.76 | 16.50 | -32.27 | 48.76 | Neutral | 10.15 |
| 0.5565 | 10 | 32.82 | -23.18 | 56.00 | 24.66 | -21.34 | 46.00 | Neutral | 10.16 |
| 0.5835 | 10 | 33.63 | -22.37 | 56.00 | 16.91 | -29.09 | 46.00 | Neutral | 10.17 |
| 0.627 | 11 | 40.05 | -15.95 | 56.00 | 30.97 | -15.03 | 46.00 | Neutral | 10.18 |
| 0.6495 | 11 | 41.24 | -14.76 | 56.00 | 27.82 | -18.18 | 46.00 | Neutral | 10.18 |
| 0.942 | 11 | 34.90 | -21.10 | 56.00 | 19.41 | -26.59 | 46.00 | Neutral | 10.20 |
| 1.1175 | 11 | 31.02 | -24.98 | 56.00 | 19.51 | -26.49 | 46.00 | Neutral | 10.22 |
| 1.254 | 12 | 32.78 | -23.22 | 56.00 | 21.88 | -24.12 | 46.00 | Neutral | 10.24 |
| 2.163 | 12 | 27.12 | -28.88 | 56.00 | 16.05 | -29.95 | 46.00 | Neutral | 10.29 |
| 2.2125 | 12 | 26.85 | -29.15 | 56.00 | 16.63 | -29.37 | 46.00 | Neutral | 10.29 |
| 2.6835 | 13 | 26.75 | -29.25 | 56.00 | 13.17 | -32.83 | 46.00 | Neutral | 10.33 |
| 3.066 | 13 | 24.52 | -31.48 | 56.00 | 17.80 | -28.20 | 46.00 | Neutral | 10.35 |
| 3.4125 | 13 | 24.64 | -31.36 | 56.00 | 16.10 | -29.90 | 46.00 | Neutral | 10.35 |
| 4.119 | 13 | 26.29 | -29.71 | 56.00 | 19.67 | -26.33 | 46.00 | Neutral | 10.40 |
| 5.8215 | 14 | 25.03 | -34.97 | 60.00 | 18.86 | -31.14 | 50.00 | Neutral | 10.49 |
| 6.6945 | 14 | 25.58 | -34.42 | 60.00 | 19.42 | -30.58 | 50.00 | Neutral | 10.55 |
| 7.1085 | 14 | 24.73 | -35.27 | 60.00 | 17.70 | -32.30 | 50.00 | Neutral | 10.57 |
| 7.1985 | 14 | 28.39 | -31.61 | 60.00 | 21.26 | -28.74 | 50.00 | Neutral | 10.58 |
| 13.56 | 15 | 33.63 | -26.37 | 60.00 | 29.13 | -20.87 | 50.00 | Neutral | 10.92 |
| 17.2905 | 15 | 35.31 | -24.69 | 60.00 | 28.23 | -21.77 | 50.00 | Neutral | 11.13 |
| 17.511 | 15 | 36.35 | -23.65 | 60.00 | 28.28 | -21.72 | 50.00 | Neutral | 11.15 |
| 19.4295 | 16 | 31.65 | -28.35 | 60.00 | 25.05 | -24.95 | 50.00 | Neutral | 11.23 |
| 21.9945 | 16 | 31.09 | -28.91 | 60.00 | 25.10 | -24.90 | 50.00 | Neutral | 11.26 |
| 24.2535 | 16 | 29.46 | -30.54 | 60.00 | 22.44 | -27.56 | 50.00 | Neutral | 11.26 |
| 25.284 | 16 | 27.70 | -32.30 | 60.00 | 20.17 | -29.83 | 50.00 | Neutral | 11.24 |

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)

5.2.1 Description of the test location

Test location: Open Area Test Site 1

Test distance: 10 metres

5.2.2 Photo documentation of the test setup



5.2.3 Test result

Frequency range: 30 MHz - 1000 MHz

Min. limit margin 1.7 dB at 84.00 MHz

The requirements are **FULFILLED**.

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

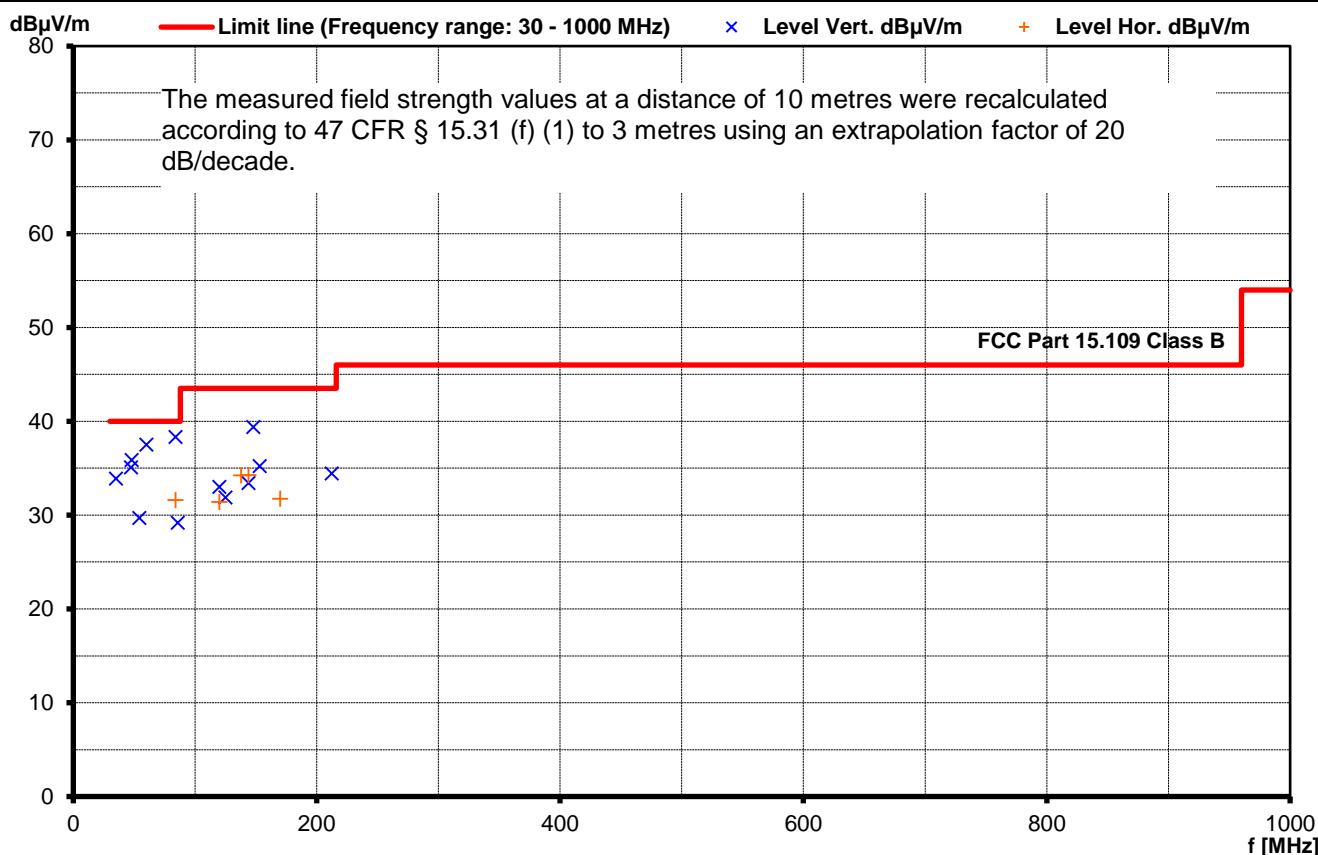
For description of the measurement see 4.7.4.

5.2.4 Test protocol

Operation mode: Continuous Tag reading
 Remarks: FCC Class B
 Date: 08. March 2022
 Tested by: Johannes Müller

Result: **PASSED**

| Frequency (MHz) | Reading Vert. (dB μ V) | Reading Hor. (dB μ V) | Correct. Vert. (dB) | Correct. Hor. (dB) | Level Vert. (dB μ V/m) | Level Hor. (dB μ V/m) | Limit (dB μ V/m) | Dlimit (dB) |
|-----------------|----------------------------|---------------------------|---------------------|--------------------|----------------------------|---------------------------|----------------------|-------------|
| 34.99 | 17.8 | | 16.1 | | 33.9 | | 40.0 | -6.1 |
| 47.54 | 17.5 | | 17.6 | | 35.1 | | 40.0 | -4.9 |
| 48.01 | 18.3 | | 17.6 | | 35.9 | | 40.0 | -4.1 |
| 54.24 | 12.4 | | 17.3 | | 29.7 | | 40.0 | -10.3 |
| 60.00 | 20.5 | | 17.0 | | 37.5 | | 40.0 | -2.5 |
| 84.00 | 24.5 | 17.8 | 13.8 | 13.8 | 38.3 | 31.6 | 40.0 | -1.7 |
| 85.94 | 15.5 | | 13.7 | | 29.2 | | 40.0 | -10.8 |
| 119.99 | 15.6 | 14.6 | 17.4 | 16.8 | 33.0 | 31.4 | 43.5 | -10.5 |
| 125.00 | 14.0 | | 17.9 | | 31.9 | | 43.5 | -11.6 |
| 138.00 | | 16.0 | | 18.2 | | 34.2 | 43.5 | -9.3 |
| 144.00 | 14.0 | 15.7 | 19.4 | 18.6 | 33.4 | 34.3 | 43.5 | -9.2 |
| 148.00 | 19.9 | | 19.5 | | 39.4 | | 43.5 | -4.1 |
| 153.10 | 15.6 | | 19.6 | | 35.2 | | 43.5 | -8.3 |
| 170.00 | | 13.3 | | 18.5 | | 31.8 | 43.5 | -11.7 |
| 212.52 | 17.0 | | 17.4 | | 34.4 | | 43.5 | -9.1 |



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: Nexio BAT EMC (Version 3.21.0.24)

| Test ID | Model Type | Kind of Equipment | Manufacturer | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|----------------|----------------------|--------------------------|---------------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| A 4 | BAT-EMC 3.21.0.24 | Nexio 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 | 31/10/2022 | 31/10/2019 | 19/04/2022 | 19/10/2021 |
| | N-4000-BNC | RF Cable | CSA Group Bayern GmbH | 02-02/50-05-138 | | | | |
| | ESH 3 - Z 2 | Pulse Limiter | Rohde & Schwarz München | 02-02/50-05-155 | 13/11/2022 | 13/11/2019 | 08/09/2022 | 08/03/2022 |
| 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 Antenn | Schwarzbeck Mess-Elektron | 02-02/24-05-005 | 20/12/2022 | 20/12/2021 | 07/07/2022 | 07/07/2021 |
| | NW-2000-NB | RF Cable | Huber + Suhner | 02-02/50-05-113 | | | | |
| | KK-EF393/U-16N-21N20 | RF Cable 20m | Huber + Suhner | 02-02/50-12-018 | | | | |
| | KK-SD_7/8-2X21N-33 | RF Cable 33 m | Huber + Suhner AG | 02-02/50-15-028 | | | | |
| | 50F-003 N 3 dB | Dämpfungsglied 3dB_5 | Tactron Elektronik | 02-02/50-21-010 | | | | |

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 |
| Flicker | 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} |
| | Current | |
| Flicker | 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 |