



RF - TEST REPORT

- FCC Part 15B -

Type / Model Name : ARU 2401

Product Description : RFID UHF Reader 902-928 MHz

Applicant : Kathrein Sachsen GmbH

Address : Lindenstrasse 3

09241 Mühlau, Germany

Manufacturer : Kathrein Sachsen GmbH

Address : Lindenstrasse 3

09241 Mühlau, Germany

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

POSITIVE

Test Report No. : 80120797-00 Rev_0

06. April 2022

Date of issue



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

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ATTACHMENT A as separate supplement

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (March, 2022)

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

ISED Canada Rules and Regulations - Information Technology Equipment (Including Digital Apparatus)

ICES-003, Issue 7, October 15, 2020

AC Power Line Conducted Emissions

☐ Class A device

☒ Class B device

ICES-003, Issue 7, October 15, 2020

Radiated emission

☐ 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.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

2 TEST RESULT SUMMARY

FCC Rule Part	ISED Standard	Description
15.107	ICES-003/RSS-Gen	AC power line conducted emissions
15.109	ICES-003/RSS-Gen	Radiated Emissions

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

2.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80120797-00	0	29 March 2022	Initial test report

The test report with the highest revision number replaces the previous test reports.

2.2 Final assessment

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

Date of receipt of test sample : acc. to storage records

Testing commenced on : 01 March 2022

Testing concluded on : 21 March 2022

Checked by:

Tested by:



Klaus Gegenfurtner
I confirm the correctness and
integrity of this document
2022.04.06 07:48:11 +02'00'

Klaus Gegenfurtner
Teamleader Radio



Josef Knab
I'm the autor of this
document.
2022.04.06 07:11:51 +02'00'

Josef Knab
Radio Team

3 EQUIPMENT UNDER TEST

3.1 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.

3.2 Sampling

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

3.3 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

3.4 General remarks

The EuT is capable to exchange data with a PC via RJ45 Ethernet cable.
This test report describes the radiated and conducted disturbance produced by the data transfer via Data cable and the power supply (ancillary equipment).

The measurement has been performed in standby mode.

The reader was tested as a system. This includes the reader (antenna integrated) and the AC adapter. The reader was permanently connected to earth.

For detailed information about the model and the antenna please refer to the user manual or technical documentation from the manufacturer.

The EuT is declared as Class B digital device.

It is not possible to set the EuT only in receiving mode.

3.5 Power supply system utilised

Power supply voltage : 120 V / 60 Hz / 1φ

All tests were carried out with a supply voltage of 120 V, 60 Hz unless otherwise stated.

3.6 Highest internal frequency

Highest internal frequency : 928 MHz

3.7 Short description of the Equipment under Test (EUT)

The device is a UHF RFID reader. The UHF RFID Reader can read active and passive Tags in the frequency range from 902 to 928 MHz.

Number of tested samples: 1
Serial number: G0O3026464

3.8 EUT operation mode

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

- Data communication over Ethernet

-

-

3.9 EUT configuration

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

- Test software	Model : Supplied by manufacturer
- Lap Top	Model : Supplied by CSA Group Bayern GmbH
- Power supply	Model : Mean Well – GE18I24, S/N OFB9452668

Port	Cable	Screening	Transmission	Status	Length
1	AC Adaptor	unshielded	analogue	active	2.0 m
2	Ethernet	shielded	digital	active	2.0 m
3	Ground	unshielded	analogue	active	2.0 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 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

4.3 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 on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. 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.

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

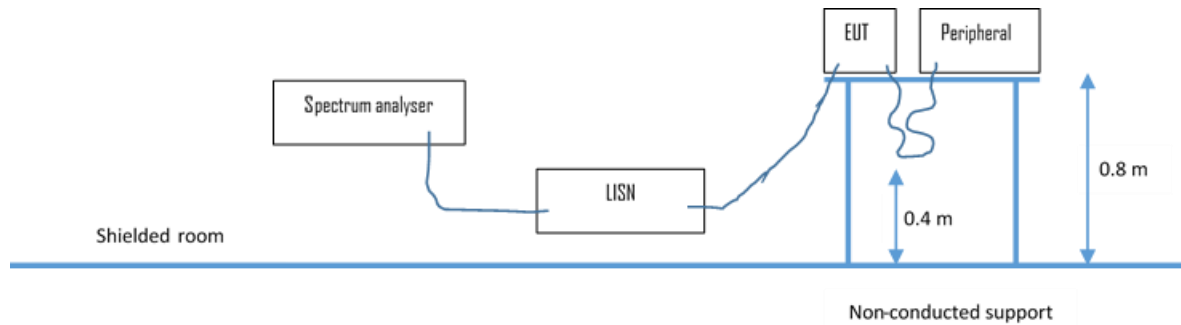
CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

**FCC: DE 0011
ISED: DE0009**

4.5.2 Details of test procedures

4.5.2.1 Conducted emission

Test setup according ANSI C63.4



Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

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

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

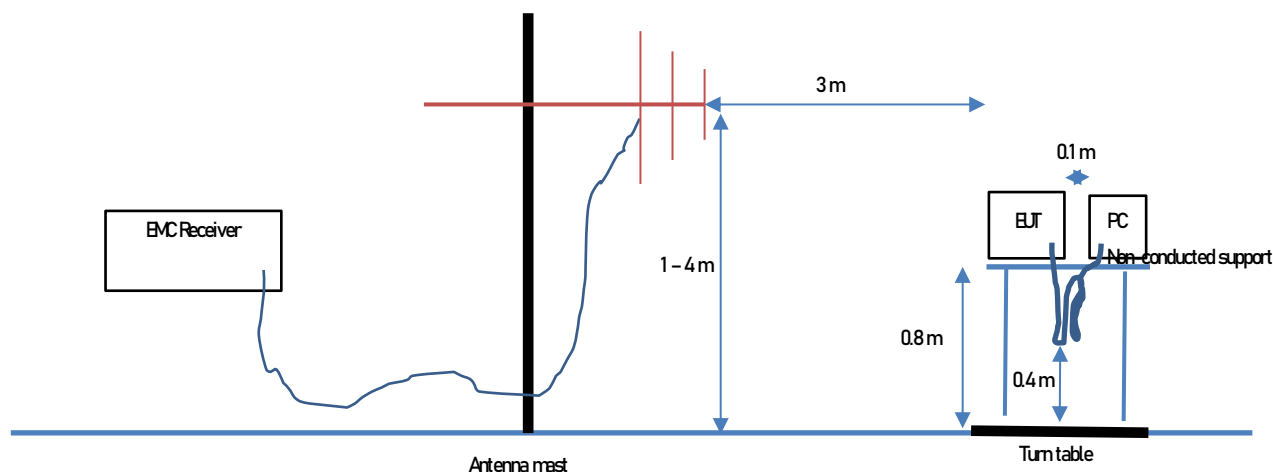
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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 50 Ω / 50 μ 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 is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.5.2.2 Radiated emission

4.5.2.2.1 OATS1 test site (30 MHz - 1 GHz)

Test setup according ANSI C63.4



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 centre 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 centre of the table and to a screened room located outside the test area.

The antenna is positioned 3 or 10 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 is calculated in a calculation sheet by taking the reading from the EMI receiver (Level dBμV) and adding the correction factors and cable loss factor (Factor dB) on to it. The limit is subtracted from this result in order to provide the limit margin listed in the measurement protocols.

Example:

Frequency (MHz)	Reading (dBμV)	+	Correction* (dB/m)	=	Level (dBμV/m)	-	Limit (dBμV/m)	=	Dlimit (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

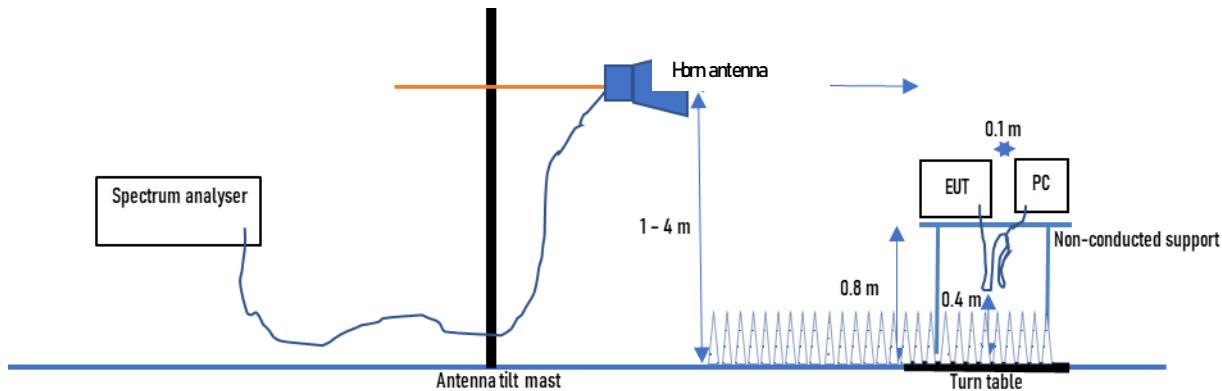
*Correction Factor = Antenna Factor + Cable Attenuation = 30 dB/m + 2.6 dB = 32.6 dB/m

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz: RBW: 120 kHz

4.5.2.2.2 Anechoic chamber 1, 1000 MHz – 18000 MHz

Test setup according ANSI C63.4



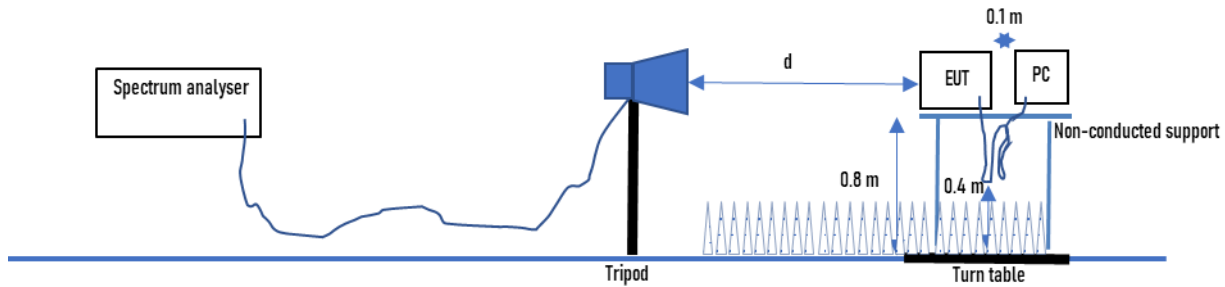
Description of measurement

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 1.0 metre non-conducting table 80 centimetres above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12).

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. 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 RBW= 1 MHz and VBW = 3 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 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. 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.

4.5.2.2.3 Anechoic chamber 1, 18 GHz – 40 GHz

Test setup according ANSI C63.4



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 1.0 metre non-conducting table 80 centimetres above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12).

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. 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 an RBW= 1 MHz and VBW = 3 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 turntable is rotated 360° until the spectrum analyser displays the maximum level at the observed frequency, the maximum emission value is then recorded. This procedure is repeated for all frequencies of interest.

Where appropriate in frequency range 18 GHz - 40 GHz, the test distance may be reduced to 1 m in order to reduce the noise level to hold a minimum distance between noise level and limit. The limit will be adopted to the measurement distance.

5 TEST CONDITIONS AND RESULTS

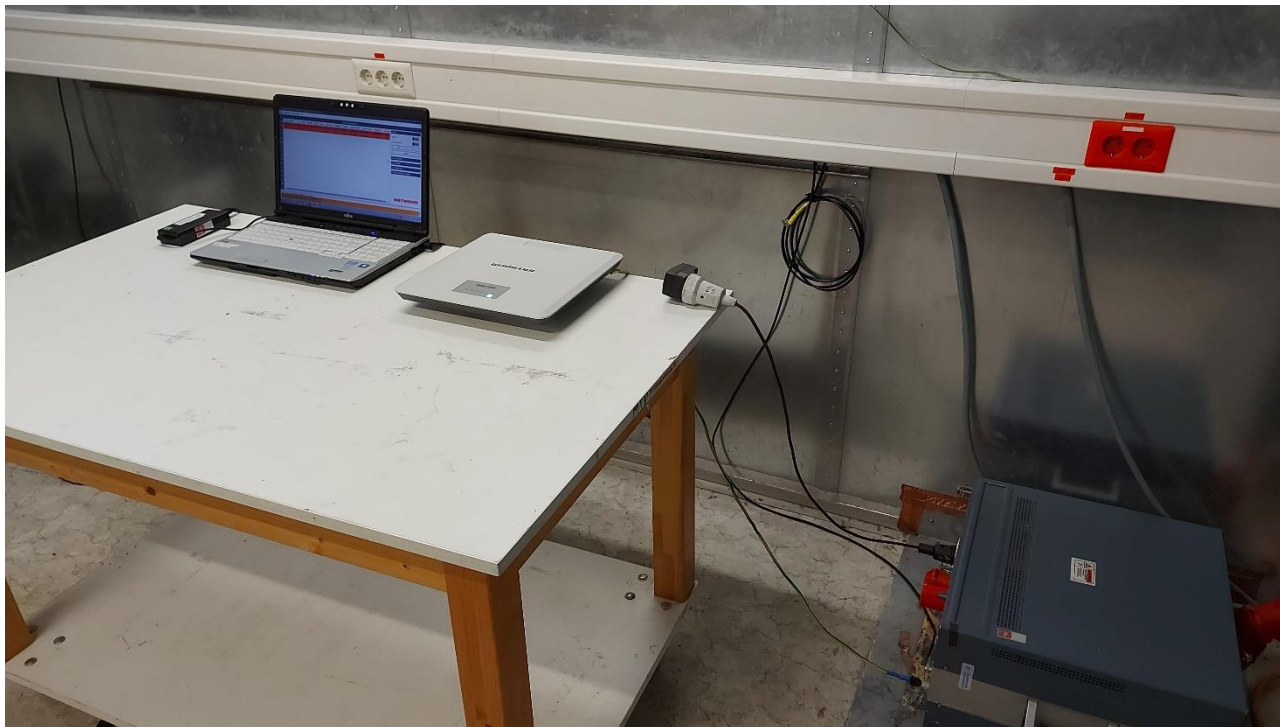
5.1 Conducted emission

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

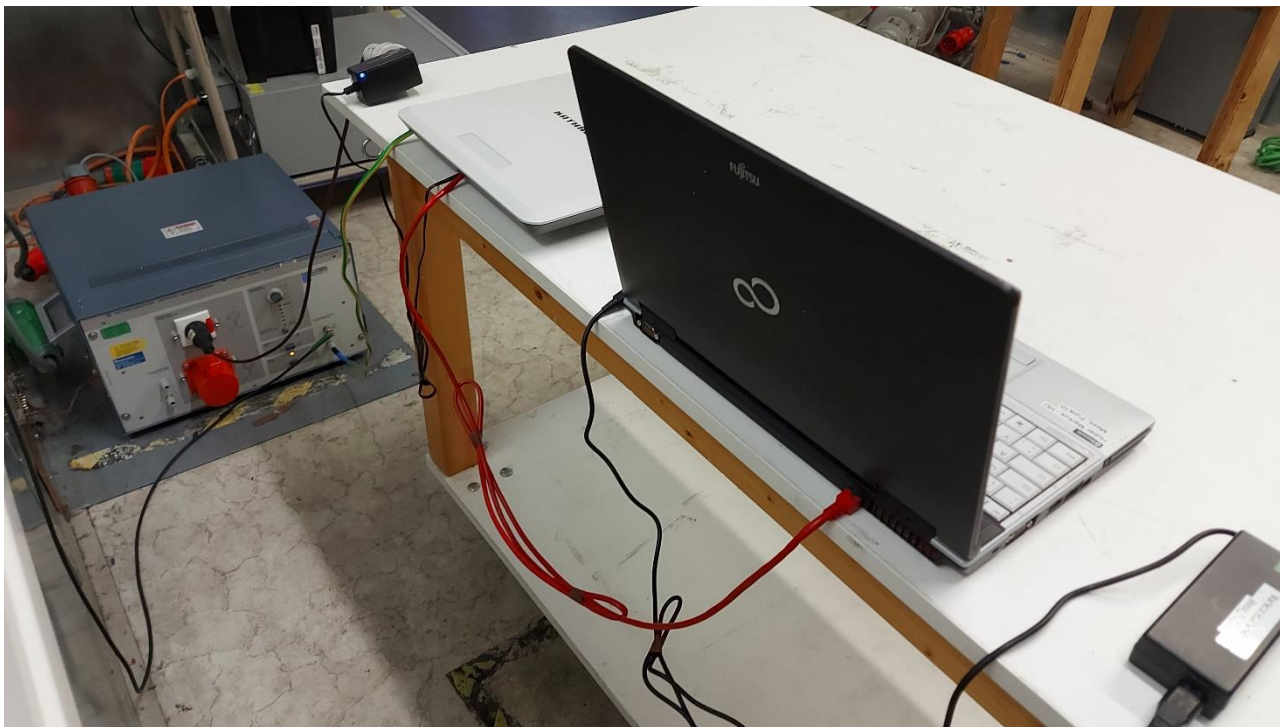
5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test setup



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



5.1.3 Test result

Frequency range: 0.15 MHz - 30 MHz
Min. limit margin 11.85 dB at 0.5295 MHz

The requirements are **FULFILLED**.

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

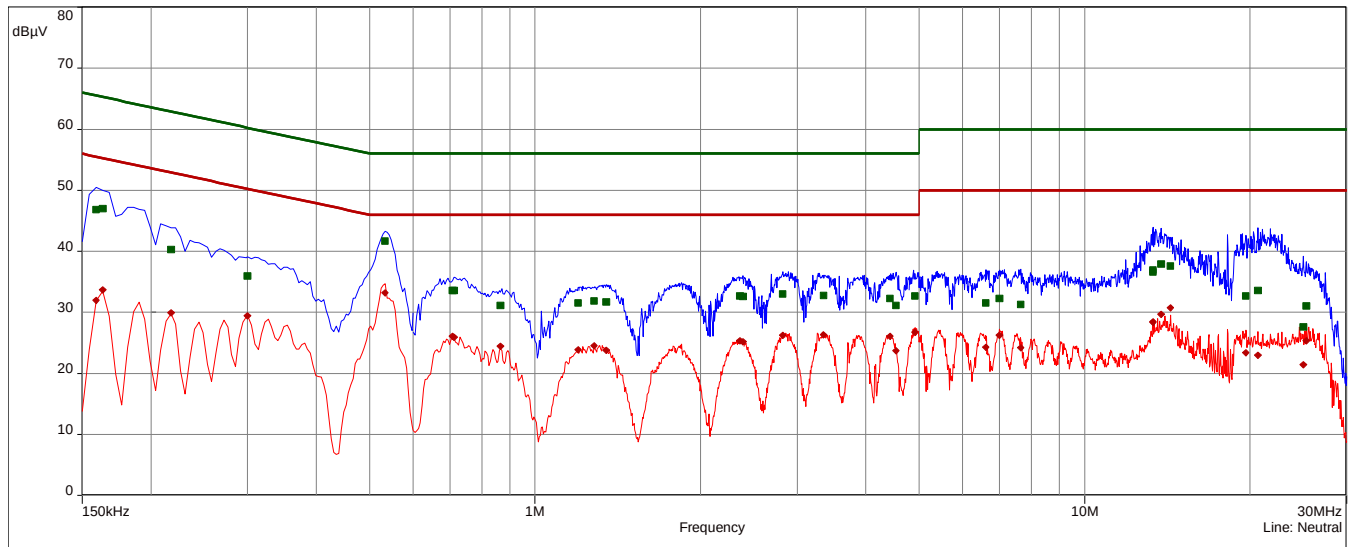
For description of the measurement see 4.5.2.

5.1.4 Test protocol

Test point: L1 - N
Operation mode: Data communication over Ethernet
Remarks: -
Date: 04 March 2022
Tested by: Josef Knab

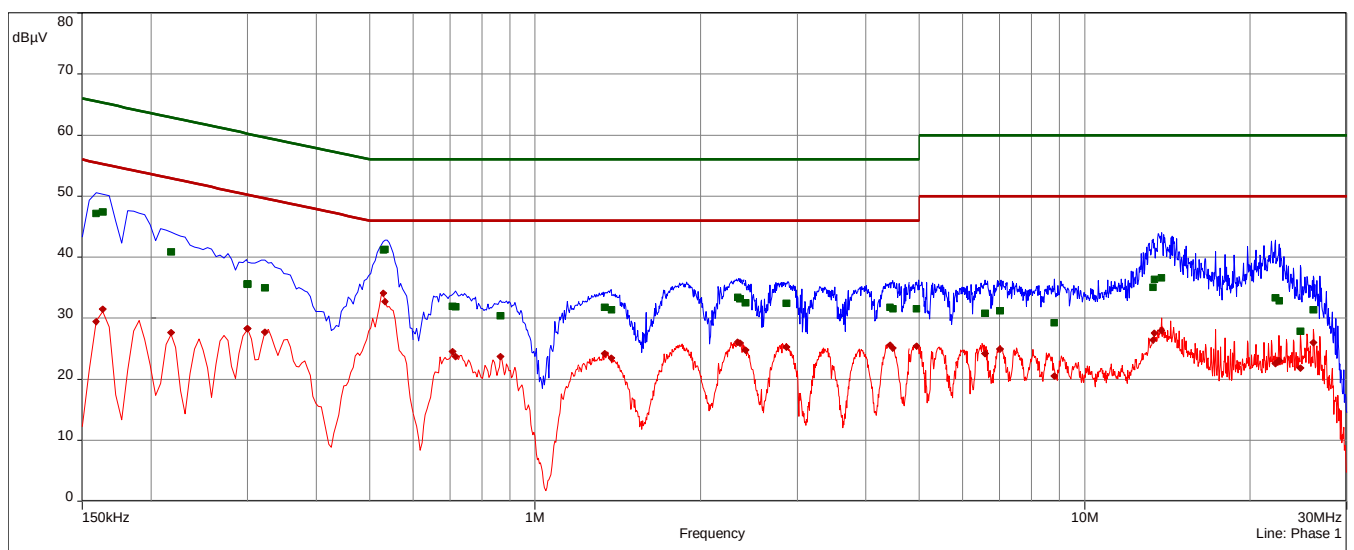
Result: passed

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

FCC/FCC Part 15B (15.107) B - Average/
FCC/FCC Part 15B (15.107) B - QPeak/
Peak (Phase 1)
CISPR.AVG (Phase 1)
QuasiPeak (Finals) (Phase 1)
CISPR AV (Finals) (Phase 1)



FCC/FCC Part 15B (15.107)B

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

freq	SR	QP	margin	limit	AV	margin	limit	line	RBW	Measure time	corr
MHz		dBµV	dB	dBµV	dBµV	dB	dBµV		Hz	sec	dB
0.159	1	47.18	-18.34	65.52	29.48	-26.04	55.52	Phase 1	9k	1.00	10.10
0.1635	1	47.46	-17.83	65.28	31.47	-23.81	55.28	Phase 1	9k	1.00	10.10
0.2175	1	40.89	-22.02	62.91	27.64	-25.28	52.91	Phase 1	9k	1.00	10.11
0.3	1	35.58	-24.66	60.24	28.33	-21.91	50.24	Phase 1	9k	1.00	10.14
0.3	2	35.67	-24.57	60.24	28.33	-21.91	50.24	Phase 1	9k	1.00	10.14
0.3225	2	35.05	-24.59	59.64	27.77	-21.87	49.64	Phase 1	9k	1.00	10.14
0.5295	2	41.23	-14.77	56.00	34.15	-11.85	46.00	Phase 1	9k	1.00	10.16
0.534	2	41.28	-14.72	56.00	32.71	-13.29	46.00	Phase 1	9k	1.00	10.16
0.708	3	32.00	-24.00	56.00	24.51	-21.49	46.00	Phase 1	9k	1.00	10.19
0.717	3	31.94	-24.06	56.00	23.70	-22.30	46.00	Phase 1	9k	1.00	10.19
0.8655	3	30.42	-25.58	56.00	23.69	-22.31	46.00	Phase 1	9k	1.00	10.19
1.3395	4	31.82	-24.18	56.00	24.19	-21.81	46.00	Phase 1	9k	1.00	10.25
1.3755	4	31.44	-24.56	56.00	23.52	-22.48	46.00	Phase 1	9k	1.00	10.25
2.334	4	33.43	-22.57	56.00	26.10	-19.90	46.00	Phase 1	9k	1.00	10.31
2.361	4	33.23	-22.77	56.00	25.90	-20.10	46.00	Phase 1	9k	1.00	10.31
2.4135	5	32.57	-23.43	56.00	24.83	-21.17	46.00	Phase 1	9k	1.00	10.31
2.868	5	32.46	-23.54	56.00	25.32	-20.68	46.00	Phase 1	9k	1.00	10.34
4.425	5	31.84	-24.16	56.00	25.61	-20.39	46.00	Phase 1	9k	1.00	10.42
4.4745	5	31.59	-24.41	56.00	25.10	-20.90	46.00	Phase 1	9k	1.00	10.42
4.9485	6	31.54	-24.46	56.00	25.41	-20.59	46.00	Phase 1	9k	1.00	10.44
6.5865	6	30.84	-29.16	60.00	24.18	-25.82	50.00	Phase 1	9k	1.00	10.57
7.0095	6	31.23	-28.77	60.00	24.99	-25.01	50.00	Phase 1	9k	1.00	10.60
8.814	6	29.32	-30.68	60.00	20.52	-29.48	50.00	Phase 1	9k	1.00	10.69
13.3305	7	35.13	-24.87	60.00	26.44	-23.56	50.00	Phase 1	9k	1.00	11.05
13.3935	7	36.43	-23.57	60.00	27.55	-22.45	50.00	Phase 1	9k	1.00	11.05
13.8165	7	36.67	-23.33	60.00	27.96	-22.04	50.00	Phase 1	9k	1.00	11.09
22.2465	8	33.35	-26.65	60.00	22.62	-27.38	50.00	Phase 1	9k	1.00	11.57
22.593	8	32.89	-27.11	60.00	23.05	-26.95	50.00	Phase 1	9k	1.00	11.59
24.6945	8	27.91	-32.09	60.00	21.84	-28.16	50.00	Phase 1	9k	1.00	11.67
26.0985	8	31.45	-28.55	60.00	25.99	-24.01	50.00	Phase 1	9k	1.00	11.69
0.159	9	46.86	-18.66	65.52	31.97	-23.55	55.52	Neutral	9k	1.00	10.10
0.1635	9	47.00	-18.28	65.28	33.68	-21.60	55.28	Neutral	9k	1.00	10.10
0.2175	9	40.37	-22.55	62.91	29.97	-22.95	52.91	Neutral	9k	1.00	10.13
0.3	10	36.03	-24.21	60.24	29.43	-20.81	50.24	Neutral	9k	1.00	10.14
0.534	10	41.71	-14.29	56.00	33.18	-12.82	46.00	Neutral	9k	1.00	10.16
0.708	11	33.62	-22.38	56.00	26.13	-19.87	46.00	Neutral	9k	1.00	10.19
0.7125	11	33.62	-22.38	56.00	25.92	-20.08	46.00	Neutral	9k	1.00	10.19
0.8655	11	31.14	-24.86	56.00	24.44	-21.56	46.00	Neutral	9k	1.00	10.19
1.1985	11	31.56	-24.44	56.00	23.92	-22.08	46.00	Neutral	9k	1.00	10.23
1.281	12	31.93	-24.07	56.00	24.53	-21.47	46.00	Neutral	9k	1.00	10.24
1.3485	12	31.74	-24.26	56.00	23.84	-22.16	46.00	Neutral	9k	1.00	10.25
2.361	12	32.70	-23.30	56.00	25.40	-20.60	46.00	Neutral	9k	1.00	10.31
2.388	12	32.61	-23.39	56.00	25.16	-20.84	46.00	Neutral	9k	1.00	10.31
2.8275	13	33.04	-22.96	56.00	26.27	-19.73	46.00	Neutral	9k	1.00	10.34
3.345	13	32.82	-23.18	56.00	26.33	-19.67	46.00	Neutral	9k	1.00	10.35
4.4295	13	32.32	-23.68	56.00	26.11	-19.89	46.00	Neutral	9k	1.00	10.41
4.5375	13	31.17	-24.83	56.00	23.74	-22.26	46.00	Neutral	9k	1.00	10.42
4.9215	14	32.72	-23.28	56.00	26.78	-19.22	46.00	Neutral	9k	1.00	10.43
6.6225	14	31.61	-28.39	60.00	24.30	-25.70	50.00	Neutral	9k	1.00	10.55
7.0005	14	32.29	-27.71	60.00	26.22	-23.78	50.00	Neutral	9k	1.00	10.57
7.653	14	31.36	-28.64	60.00	24.20	-25.80	50.00	Neutral	9k	1.00	10.60
13.317	15	36.66	-23.34	60.00	28.46	-21.54	50.00	Neutral	9k	1.00	10.90
13.3215	15	37.01	-22.99	60.00	28.37	-21.63	50.00	Neutral	9k	1.00	10.90
13.7805	15	37.94	-22.06	60.00	29.72	-20.28	50.00	Neutral	9k	1.00	10.93
14.3385	15	37.65	-22.35	60.00	30.74	-19.26	50.00	Neutral	9k	1.00	10.96
19.6815	16	32.74	-27.26	60.00	23.38	-26.62	50.00	Neutral	9k	1.00	11.24
20.6895	16	33.66	-26.34	60.00	22.96	-27.04	50.00	Neutral	9k	1.00	11.25
25.0095	16	27.65	-32.35	60.00	21.42	-28.58	50.00	Neutral	9k	1.00	11.25
25.3425	16	31.06	-28.94	60.00	25.35	-24.65	50.00	Neutral	9k	1.00	11.24

5.2 Radiated emission < 1 GHz (electric field)

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

5.2.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

5.2.2 Photo documentation of the test setup



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



5.2.3 Test result

Frequency range: 30 MHz - 1000 MHz
Min. limit margin 4.2 dB at 42.93 MHz

The requirements are **FULFILLED**.

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

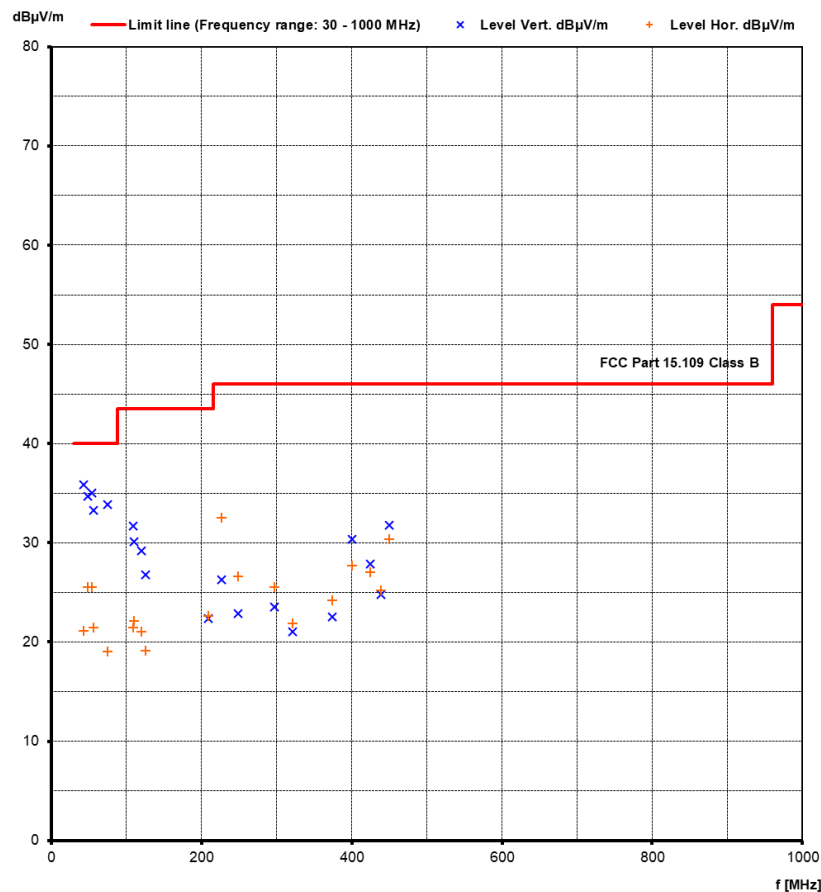
For description of the measurement see 4.5.2.

5.2.4 Test protocol

Operation mode: Data communication over Ethernet
Remarks: -
Date: 02 March 2022
Tested by: Josef Knab

Result: passed

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
42.93	18.5	2.8	17.3	18.3	35.8	21.1	40.0	-4.2
48.77	17.1	6.8	17.5	18.7	34.6	25.5	40.0	-5.4
54.12	17.7	7.0	17.3	18.5	35.0	25.5	40.0	-5.0
56.50	16.1	3.1	17.2	18.3	33.3	21.4	40.0	-6.7
75.19	18.9	3.6	15.0	15.5	33.9	19.1	40.0	-6.1
108.50	15.6	6.3	16.1	15.1	31.7	21.4	43.5	-11.8
110.20	13.8	6.7	16.3	15.4	30.1	22.1	43.5	-13.4
120.00	11.8	4.2	17.4	16.8	29.2	21.0	43.5	-14.3
125.00	8.9	1.9	17.9	17.2	26.8	19.1	43.5	-16.7
208.50	5.1	5.9	17.3	16.7	22.4	22.6	43.5	-20.9
226.20	8.4	15.0	17.9	17.6	26.3	32.6	46.0	-13.4
248.80	4.2	8.0	18.7	18.6	22.9	26.6	46.0	-19.4
297.40	3.4	4.9	20.1	20.6	23.5	25.5	46.0	-20.5
321.60	0.2	0.6	20.8	21.3	21.0	21.9	46.0	-24.1
373.80	0.2	1.4	22.3	22.8	22.5	24.2	46.0	-21.8
400.00	7.3	4.2	23.1	23.5	30.4	27.7	46.0	-15.6
424.98	4.1	2.9	23.7	24.1	27.8	27.0	46.0	-18.2
439.00	0.7	0.7	24.1	24.5	24.8	25.2	46.0	-20.8
450.00	7.4	5.6	24.4	24.8	31.8	30.4	46.0	-14.2



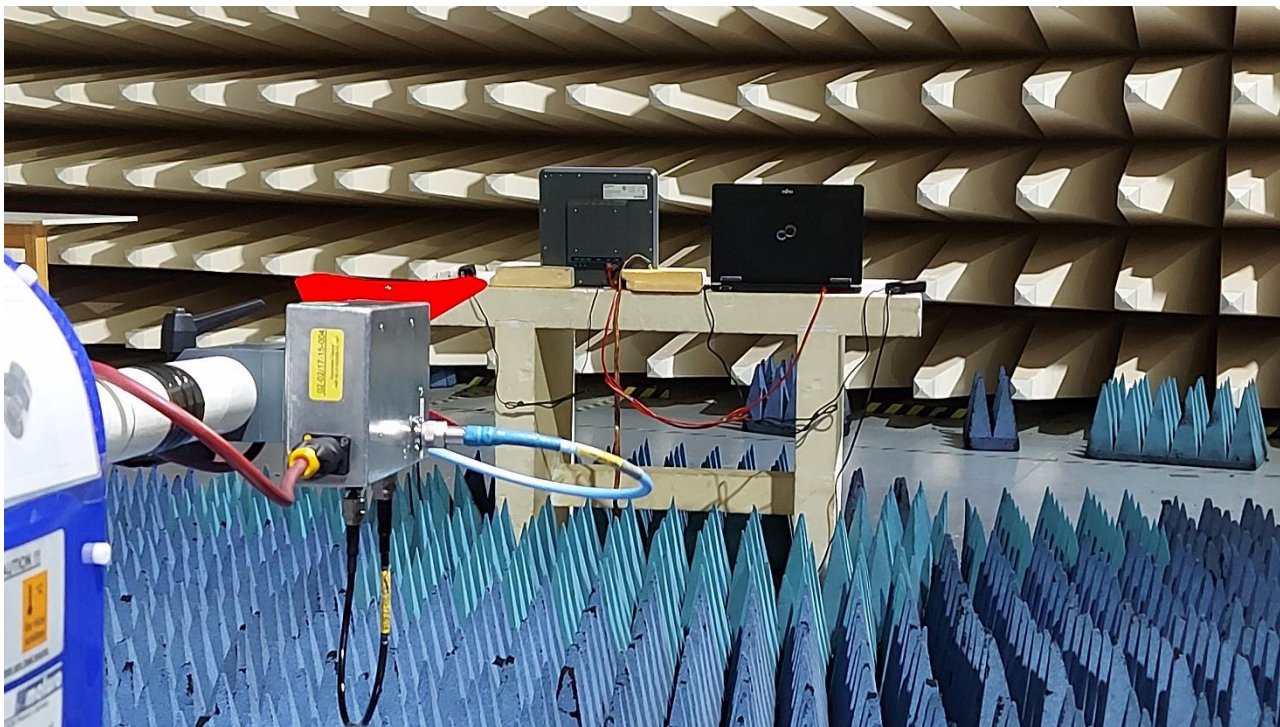
5.3 Radiated emission > 1 GHz (electric field)

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

5.3.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 3 m

5.3.2 Photo documentation of the test setup



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



5.3.3 Test result

Frequency range: 1 GHz - 12 GHz
Min. limit margin 1.5 dB at 1865.62 MHz

The requirements are **FULFILLED**.

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

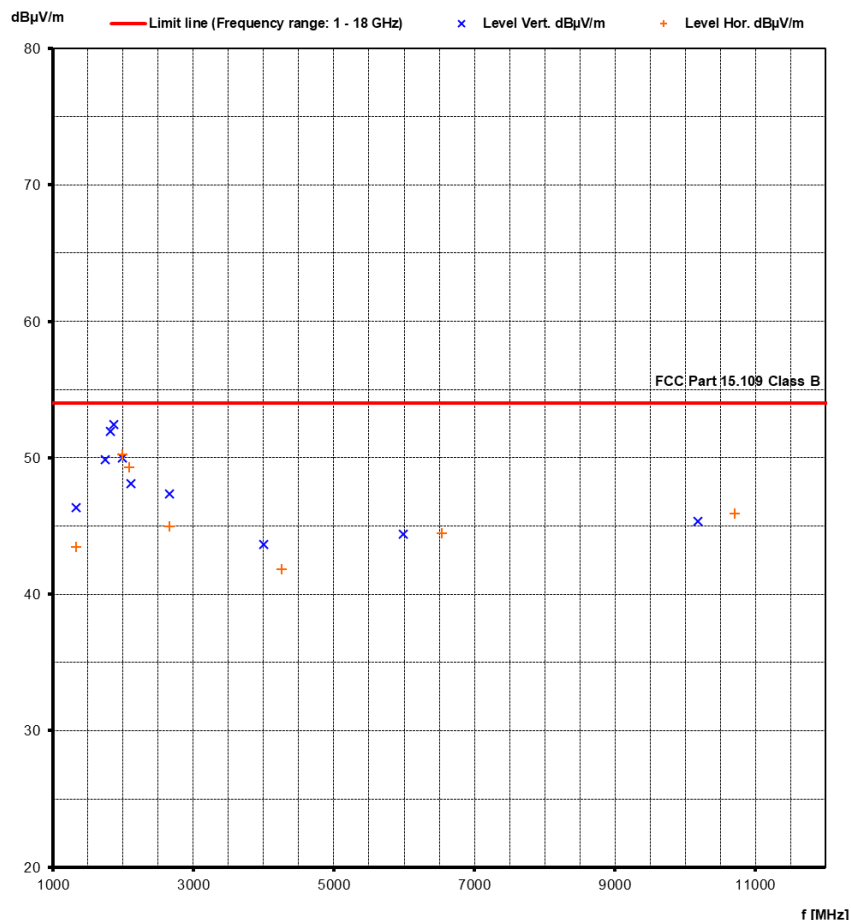
For description of the measurement see 4.5.2.

5.3.4 Test protocol

Operation mode: Data communication over Ethernet
 Remarks: The PK levels are below the average limits!
 Date: 04 March 2022
 Tested by: Josef Knab

Result: passed

Frequency (MHz)	PK Reading Vert. (dBµV)	PK Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	PK Level Vert. (dBµV/m)	PK Level Hor. (dBµV/m)	AV Limit (dBµV/m)	Dlimit (dB)
1330.48	56.4		-10.1		46.3		54.0	-7.7
1332.40		53.6		-10.1		43.5	54.0	-10.5
1751.34	59.3		-9.5		49.9		54.0	-4.1
1818.54	59.9		-7.9		51.9		54.0	-2.1
1865.62	60.1		-7.7		52.5		54.0	-1.5
1996.51	57.6	57.9	-7.6	-7.6	50.0	50.2	54.0	-3.8
2089.61		57.1		-7.8		49.3	54.0	-4.7
2115.51	56.1		-8.0		48.1		54.0	-5.9
2658.35		51.0		-6.0		45.0	54.0	-9.0
2660.45	53.4		-6.0		47.4		54.0	-6.6
3998.29	48.9		-5.3		43.6		54.0	-10.4
4262.53		47.2		-5.3		41.9	54.0	-12.1
5988.69	47.7		-3.3		44.4		54.0	-9.6
6531.35		46.4		-1.9		44.5	54.0	-9.5
10174.57	44.7		0.7		45.4		54.0	-8.6
10699.81		44.9		1.0		45.9	54.0	-8.1



6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.21.0.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	21/06/2022	21/06/2021		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2022	31/10/2019	19/04/2022	19/10/2021
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/04/2022	12/10/2021
A 5	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	VULB 9168	02-02/24-05-005	20/12/2022	20/12/2021	07/07/2022	07/07/2021
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	FSW43	02-02/11-15-001	06/04/2022	06/04/2021		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	28/06/2022	28/06/2021		
	WHK 3.0/18G-10EF	02-02/50-05-180				
	WHJS 1000-10EF	02-02/50-13-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	BAT-EMC 3.21.0.24	02-02/68-13-001				

7 Detailed measurement uncertainty

7.1 Overview

Measurement instrumentation uncertainty shall be taken into account when determining compliance or non-compliance with a disturbance limit.

The measurement instrumentation uncertainty for a test laboratory shall be evaluated. The standard uncertainty $u(x_i)$ in decibels and the sensitivity coefficient c_i shall be evaluated for the estimate x_i of each quantity. The combined standard uncertainty $u_c(y)$ of the estimate y of the measurand shall be calculated as

$$u_c(y) = \sqrt{\sum_i c_i^2 u^2(x_i)}$$

The expanded measurement instrumentation uncertainty U_{lab} for a test laboratory shall be calculated as $U_{lab} = 2 u_c(y)$

$$U_{lab} = 2 u_c(y)$$

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} in the table below, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in the table below, then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

7.2 Definitions and symbols

X_i	Input quantity
x_i	estimate of X_i
$u(x_i)$	standard uncertainty of x_i
c_i	sensitivity coefficient
$u_c(y)$	(combined) standard uncertainty of y
Y	result of a measurement, (the estimate of the measured), corrected for all recognised significant systematic effects
U	expanded uncertainty of y

7.3 Measurement uncertainty

Measurement	U_{lab} [dB]
Conducted disturbance	+ 2.53 / - 2.77
Radiated disturbance (electric field)	
- 10 m test distance	+ 3.16 / - 3.22
- 3 m test distance	+ 3.16 / - 3.22
- Frequency range: 30 MHz – 200 MHz	
Radiated disturbance (electric field)	
- 10 m test distance	+ 4.51 / - 4.51
- 3 m test distance	+ 4.51 / - 4.51
- Frequency range: 200 MHz – 1000 MHz	
Radiated disturbance (electric field)	
- 3 m test distance	+ 5.07 / - 3.70
- Frequency range: 1 GHz – 30 GHz	