




Prüfbericht-Nr.: Test report no.:	CN24OHT0 001	Auftrags-Nr.: Order no.:	244552879	Seite 1 von 85 Page 1 of 85
Kunden-Referenz-Nr.: Client reference no.:	2444378	Auftragsdatum: Order date:	2023-10-22	
Auftraggeber: Client:	Zhejiang Anfu New Energy Technology Co., Ltd. First Floor, No.1 Building, No. 237, Weisan Road, Economic Development Zone, Yueqing City, Zhejiang, P.R. China			
Prüfgegenstand: Test item:	DC EV Charging Station			
Bezeichnung / Typ-Nr.: Identification / Type no.:	AF-DC-a-b (a=20, 30, 40, 60, 80, 90, 100, 120, 140, 150, 160, 180, 200, 240; b=A, B)			
Auftrags-Inhalt: Order content:	TÜV Rheinland EMC service			
Prüfgrundlage: Test specification:	EN IEC 61851-21-2:2021 IEC 61851-21-2:2018 EN IEC 61000-6-2:2019 IEC 61000-6-2:2016 EN IEC 61000-6-4:2019 IEC 61000-6-4:2018 EN 301 489-1 V2.2.3:2019 EN 301 489-3 V2.3.2:2023 EN 301 489-52 V1.2.1:2021			
Wareneingangsdatum: Date of sample receipt:	2024-03-29			
Prüfmuster-Nr.: Test sample no.:	244552879-1-1			
Prüfzeitraum: Testing period:	Refer to test report			
Ort der Prüfung: Place of testing:	Refer to clause 1.1			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:			genehmigt von: authorized by:	
Datum: Date:	2024-07-31		Ausstellungsdatum: Issue date:	2024-07-31
Stellung / Position:	Project engineer		Stellung / Position:	Reviewer
Sonstiges / Other:	The test requirements are identical in EN standards and IEC standards. So all tests were performed according to EN standards. Refer to clause 2.2 for further information.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet			
* Legend:	P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

Prüfbericht-Nr.: CN24OHT0 001
Test report no.:

Seite 2 von 85
Page 2 of 85

Anmerkungen
Remarks

1	<p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüflabors kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.</i></p> <p><i>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p>
2	<p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature</p> <p><i>As contractually agreed, this document has been signed digitally only. TÜV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TÜV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i></p>
3	<p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p>
4	<p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p>

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 3 von 85
Page 3 of 85

TEST SUMMARY

5.1.1 HARMONICS ON AC MAINS

Result:

Passed

5.1.2 VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER ON AC MAINS

Result:

Passed

5.1.3 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result:

Passed

5.1.4 CPT PORT CONTINUOUS DISTURBANCE VOLTAGE

Result:

Passed

5.1.5 WIRED NETWORK PORT CONTINUOUS DISTURBANCE VOLTAGE

Result:

N/A

5.1.6 RADIATED DISTURBANCE (2 kHz - 185 kHz)

Result:

Passed

5.2.1 RADIATED EMISSION (30 – 1000 MHz)

Result:

Passed

5.2.2 RADIATED DISTURBANCE (1 – 6 GHz)

Result:

Passed

5.2.3 TRANSIENT EMISSIONS

Result:

Passed

6.1.1 ELECTROSTATIC DISCHARGE

Result:

Passed

6.1.2 RADIO FREQUENCY ELECTROMAGNETIC FIELD

Result:

Passed

6.1.3 POWER FREQUENCY MAGNETIC FIELD

Result:

Passed

6.2.1 ELECTRICAL FAST TRANSIENTS AND BURSTS

Result:

Passed

6.2.2 CONDUCTED DISTURBANCES, INDUCED BY RF FIELDS

Result:

Passed

6.2.3 SURGES

Result:

Passed

6.2.4 VOLTAGE DIPS AND INTERRUPTIONS TO AC INPUT POWER PORT

Result:

Passed

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 4 von 85
Page 4 of 85

Contents

1	TEST SITES	5
1.1	TEST FACILITIES.....	5
2	GENERAL PRODUCT INFORMATION	6
2.1	PRODUCT FUNCTION AND INTENDED USE	6
2.2	RATINGS AND SYSTEM DETAILS.....	6
2.3	INDEPENDENT OPERATION MODES.....	7
2.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	7
2.5	SUBMITTED DOCUMENTS.....	7
3	TEST SET-UP AND OPERATION MODES.....	8
3.1	PRINCIPLE OF CONFIGURATION SELECTION	8
3.2	PHYSICAL CONFIGURATION FOR TESTING.....	8
3.3	TEST OPERATION AND TEST SOFTWARE	8
3.4	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	8
3.5	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	8
4	CONFORMITY DECISION RULE.....	9
5	TEST RESULTS EMISSION	10
5.1	EMISSION IN THE FREQUENCY RANGE UP TO 30 MHz	10
5.1.1	<i>Harmonics on AC Mains</i>	<i>10</i>
5.1.2	<i>Voltage changes, voltage fluctuations and flicker on AC mains</i>	<i>14</i>
5.1.3	<i>Mains Terminal Continuous Disturbance Voltage.....</i>	<i>15</i>
5.1.4	<i>CPT port Continuous Disturbance Voltage.....</i>	<i>24</i>
5.1.5	<i>Wired network port Continuous Disturbance Voltage.....</i>	<i>41</i>
5.1.6	<i>Radiated Disturbance (2 kHz - 185 kHz).....</i>	<i>42</i>
5.2	EMISSION IN THE FREQUENCY RANGE ABOVE 30 MHz.....	51
5.2.1	<i>Radiated emission (30 – 1000 MHz)</i>	<i>51</i>
5.2.2	<i>Radiated Disturbance (1 – 6 GHz).....</i>	<i>56</i>
5.2.3	<i>Transient emissions.....</i>	<i>61</i>
6	TEST RESULTS IMMUNITY	62
6.1	ENCLOSURE	66
6.1.1	<i>Electrostatic Discharge.....</i>	<i>66</i>
6.1.2	<i>Radio Frequency Electromagnetic Field.....</i>	<i>67</i>
6.1.3	<i>Power frequency magnetic field.....</i>	<i>68</i>
6.2	POWER PORTS AND SIGNAL PORTS.....	69
6.2.1	<i>Electrical fast transients and bursts.....</i>	<i>69</i>
6.2.2	<i>Conducted disturbances, induced by RF fields</i>	<i>70</i>
6.2.3	<i>Surges.....</i>	<i>71</i>
6.2.4	<i>Voltage dips and interruptions to AC Input Power Port</i>	<i>72</i>
7	PHOTOGRAPHS OF THE TEST SET-UP	73
8	LIST OF TEST AND MEASUREMENT INSTRUMENTS	81
9	LIST OF TABLES.....	84
10	LIST OF FIGURES.....	84
11	LIST OF PHOTOGRAPHS	85

1 Test Sites

1.1 Test Facilities

Laboratory: CQC-Guochuang Testing Technology (Jiangsu) Co., Ltd.
Address: No.67 Fuyang Road, Tianning District, Changzhou, Jiangsu

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

The performed tests have been conducted by “CQC-Guochuang Testing Technology (Jiangsu) Co., Ltd.” under supervision of TÜV Rheinland’s engineer.

Refer to Clause 8 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a DC EV charging station which supports 2.4 G Wi-Fi wireless technologies. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Model list:

Model	Rated input	Rated output	Mass (kg)	Quantity of module
AF-DC-240-A AF-DC-240-B	AC 400 V \pm 15 %, 480 A	DC 200 – 1000 V, DC 5 – 250 A, 240 kW	420	8
AF-DC-200-A AF-DC-200-B	AC 400 V \pm 15 %, 400 A	DC 200 – 1000 V, DC 5 – 250 A, 200 kW	420	8
AF-DC-180-A AF-DC-180-B	AC 400 V \pm 15 %, 360 A	DC 200 – 1000 V, DC 5 – 250 A, 180 kW	360	6
AF-DC-160-A AF-DC-160-B	AC 400 V \pm 15 %, 320 A	DC 200 – 1000 V, DC 5 – 250 A, 160 kW	360	6
AF-DC-150-A AF-DC-150-B	AC 400 V \pm 15 %, 300 A	DC 200 – 1000 V, DC 5 – 250 A, 150 kW	360	6
AF-DC-140-A AF-DC-140-B	AC 400 V \pm 15 %, 280 A	DC 200 – 1000 V, DC 5 – 250 A, 140 kW	360	6
AF-DC-120-A AF-DC-120-B	AC 400 V \pm 15 %, 240 A	DC 200 – 1000 V, DC 5 – 250 A, 120 kW	330	4
AF-DC-100-A AF-DC-100-B	AC 400 V \pm 15 %, 200 A	DC 200 – 1000 V, DC 5 – 250 A, 100 kW	330	4
AF-DC-90-A AF-DC-90-B	AC 400 V \pm 15 %, 180 A	DC 200 – 1000 V, DC 5 – 250 A, 90 kW	330	4
AF-DC-80-A AF-DC-80-B	AC 400 V \pm 15 %, 160 A	DC 200 – 1000 V, DC 5 – 200 A, 80 kW	290	4
AF-DC-60-A AF-DC-60-B	AC 400 V \pm 15 %, 120 A	DC 200 – 1000 V, DC 5 – 200 A, 80 kW	290	2
AF-DC-40-A AF-DC-40-B	AC 400 V \pm 15 %, 80 A	DC 200 – 1000 V, DC 5 – 150 A, 40 kW	200	2
AF-DC-30-A AF-DC-30-B	AC 400 V \pm 15 %, 60 A	DC 200 – 1000 V, DC 5 – 133 A, 30 kW	200	2
AF-DC-20-A AF-DC-20-B	AC 400 V \pm 15 %, 40 A	DC 200 – 1000 V, DC 5 – 100 A, 20 kW	200	2

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 7 von 85

Page 7 of 85

Identities and differences:

In electrical characteristics, the above models are similar. The only difference is the quantity of power modules. The letter "A" in the model name stands for single gun and the letter "B" stands for two guns. Therefore, all EMC tests were performed on model AF-DC-240-B and additional harmonic current test, voltage fluctuation and flicker test and CPT port continuous disturbance voltage test were performed on model AF-DC-30-B.

2.3 Independent Operation Modes

The basic operation modes are:

- A. Waiting mode,
- B. 20 % load mode,
- C. 100 % load mode,
- D. 80 % load mode,
- E. LTE bands operation mode,
- F. RFID TX operation mode.

2.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.5 Submitted Documents

Circuit diagram and rating label.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

3.2 Physical Configuration for Testing

Refer to the related paragraph of this report.

3.3 Test Operation and Test Software

Refer to the related paragraph of this report. No software was used.

3.4 Special Accessories and Auxiliary Equipment

None.

3.5 Countermeasures to achieve EMC Compliance

No special measure is employed to achieve the requirement.

4 Conformity Decision Rule

For all EMI tests (when included in this report), as measurement uncertainties are less than the values U_{CISPR} given in CISPR 16-4-2, compliance with the limits is determined by comparing measurement results directly with corresponding limits without taking into consideration of measurement uncertainties. For all EMS tests (when included in this report), measurement uncertainties are not considered as well according to corresponding test standards.

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 10 von 85
Page 10 of 85

5 Test Results EMISSION

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Harmonics on AC Mains

Result:	Passed
----------------	---------------

Date of testing : 2024-04-03
Test procedure : EN IEC 61851-21-2:2021, clause 6.2.2 and Table 5
EN 301 489-1 V2.2.3:2019, clause 8.5
Basic standard : IEC 61000-3-12:2011(> 16 A, ≤ 75 A/phase)
Test duration : 2.5 min
Harmonic order : 2 – 40th
Frequency range : 0 – 2 kHz
Ambient condition : Temperature: 20.9 °C; Relative humidity: 50 %
Test condition : Mode C+E+F (100 % load with LTE and RFID on)

For the model AF-DC-40-A/B and the above modes, the rated input current of them is over than 75 A/phase which is not in the scope of IEC 61000-3-2 and IEC 61000-3-12, therefore, this test is not applicable to EUT. So the test was performed only on model AF-DC-30-B.

Following are the measurement results, which were obtained via an automatic measurement system.

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 11 von 85

Page 11 of 85

Table 1: Harmonic currents measurement result, Phase A for model AF-DC-30-B

Equipment category: balanced three-phase equipment; Test voltage: AC 230 V; 50 Hz

Reference current $I_{ref}(r.m.s.)$: 57.345 A; Short-circuit ratio R_{sce} : 33

Harmonic order h	Result (avg.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result (max.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result
2	0.235	0.41	8	0.345	0.60	12	Pass
3	0.066	0.12	/	0.114	0.20	/	/
4	0.139	0.24	4	0.185	0.32	6	Pass
5	1.304	2.27	10.7	1.326	2.31	16.05	Pass
6	0.14	0.24	2.67	0.164	0.29	4.005	Pass
7	0.806	1.41	7.2	0.841	1.47	10.8	Pass
8	0.153	0.27	2	0.163	0.28	3	Pass
9	0.054	0.09	/	0.065	0.11	/	/
10	0.122	0.21	1.6	0.160	0.28	2.4	Pass
11	0.077	1.10	3.1	0.662	1.15	4.65	Pass
12	0.628	0.29	1.33	0.180	0.31	1.995	Pass
13	0.448	0.78	2	0.469	0.82	3	Pass

Admissible harmonic parameters	Tested value	Limit	Result
Total harmonic current (THC/I_{ref})	3.30 %	13 %	Pass
Partial weighted harmonic current ($PWHC/I_{ref}$)	5.49 %	22 %	Pass

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 12 von 85

Page 12 of 85

Table 2: Harmonic currents measurement result, Phase B for model AF-DC-30-B

Equipment category: balanced three-phase equipment; Test voltage: AC 230 V; 50 Hz

Reference current $I_{ref}(r.m.s.)$: 57.245 A; Short-circuit ratio R_{sce} : 33

Harmonic order h	Result (avg.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result (max.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result
2	0.281	0.49	8	0.331	0.58	12	Pass
3	0.066	0.12	/	0.099	0.17	/	/
4	0.162	0.28	4	0.190	0.33	6	Pass
5	1.286	2.25	10.7	1.304	2.28	16.05	Pass
6	0.119	0.21	2.67	0.146	0.26	4.005	Pass
7	0.759	1.33	7.2	0.788	1.38	10.8	Pass
8	0.062	0.11	2	0.089	0.16	3	Pass
9	0.054	0.09	/	0.121	0.21	/	/
10	0.189	0.33	1.6	0.199	0.35	2.4	Pass
11	0.695	1.21	3.1	0.702	1.23	4.65	Pass
12	0.092	0.16	1.33	0.117	0.20	1.995	Pass
13	0.497	0.87	2	0.526	0.92	3	Pass

Admissible harmonic parameters	Tested value	Limit	Result
Total harmonic current (THC/I_{ref})	3.40 %	13 %	Pass
Partial weighted harmonic current ($PWHC/I_{ref}$)	6.55 %	22 %	Pass

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 13 von 85

Page 13 of 85

Table 3: Harmonic currents measurement result, Phase C for model AF-DC-30-B

Equipment category: balanced three-phase equipment; Test voltage: AC 230 V; 50 Hz

Reference current $I_{ref}(r.m.s.)$: 57.556 A; Short-circuit ratio R_{sce} : 33

Harmonic order h	Result (avg.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result (max.) (I_h , A)	I_h/I_{ref} (%)	Limit (%)	Result
2	0.232	0.40	8	0.324	0.56	12	Pass
3	0.066	0.11	/	0.091	0.16	/	/
4	0.128	0.22	4	0.173	0.30	6	Pass
5	1.151	2.00	10.7	1.176	2.04	16.05	Pass
6	0.258	0.45	2.67	0.297	0.52	4.005	Pass
7	0.859	1.49	7.2	0.880	1.53	10.8	Pass
8	0.134	0.23	2	0.148	0.26	3	Pass
9	0.054	0.09	/	0.061	0.11	/	/
10	0.138	0.24	1.6	0.160	0.28	2.4	Pass
11	0.735	1.28	3.1	0.748	1.30	4.65	Pass
12	0.249	0.43	1.33	0.274	0.48	1.995	Pass
13	0.311	0.54	2	0.321	0.56	3	Pass

Admissible harmonic parameters	Tested value	Limit	Result
Total harmonic current (THC/I_{ref})	3.29 %	13 %	Pass
Partial weighted harmonic current ($PWHC/I_{ref}$)	6.53 %	22 %	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 14 von 85
Page 14 of 85

5.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

Result:	Passed
----------------	---------------

Date of testing : 2024-04-03
 Test procedure : EN IEC 61851-21-2:2021, clause 6.2.3 and Table 5
 EN 301 489-1 V2.2.3:2019, clause 8.6
 Basic standard : IEC 61000-3-11:2017 (> 16 A, ≤ 75 A/phase)
 Ambient condition : Temperature: 20.9 °C; Relative humidity: 50 %
 Test condition : Mode C+E+F (100 % load with LTE and RFID on)

According to the characteristics of the sample, as specified by clause 5 of the basic standard, following limits apply:

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- T_{max} , the accumulated time value of $d(t)$ with a deviation exceeding 3.3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;
- the relative steady-state voltage change d_c , shall not exceed 3.3 %;
- the maximum relative voltage change d_{max} , shall not exceed 4 %.

Table 4: Voltage fluctuations and flicker measurement results for model AF-DC-30-B

	d_c	d_{max}	T_{max}	P_{st}	P_{lt}
Limits	3.3 %	4 %	500 ms	1.0	0.65
Result for phase A	0.0 %	0.13 %	0.0 ms	0.092	0.072
Result for phase B	0.0 %	0.23 %	0.0 ms	0.172	0.119
Result for phase C	0.0 %	0.14 %	0.0 ms	0.087	0.149

For the model AF-DC-40-A/B and the above modes, the rated input current of the EUT is over than 75 A/phase which is not in the scope of IEC 61000-3-3 and IEC 61000-3-11, therefore, this test is not applicable to EUT. So the test was performed only on model AF-DC-30-B.

The model test values were measured in according with EN 61000-3-3:2013+A1 and are less than the limits. Therefore, according to clause 6.2.1 of EN 61000-3-11:2000, the manufacturer can declare that the EUT meet the technical requirements of EN 61000-3-3:2013+A1.

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 15 von 85
Page 15 of 85

5.1.3 Mains Terminal Continuous Disturbance Voltage

Result:

Passed

Date of testing : 2024-04-01
Test procedure : EN IEC 61851-21-2:2021 clause 6.3, EN IEC 61000-6-4:2019
Table 4, EN 301 489-1 V2.2.3:2019 clause 8.4 and CISPR 16-2-1
Equipment classification : Class A
Frequency range : 0.15 – 30 MHz
Limits : EN IEC 61851-21-2:2021 Table 9, Rated power of > 75 kVA
Table 4 of EN IEC 61000-6-4:2019
Operation mode : Mode B+E+F (20 % load with LTE and RFID on)
Mode C+E+F (100 % load with LTE and RFID on)
Test voltage : AC 400 V, 50 Hz
Kind of test site : Shielded room
Ambient conditions : Temperature: 19.6 °C; Relative humidity: 47 %
Expanded measurement : 2.33 dB
uncertainty($k=2$)

The measurement equipment like test receivers, quasi-peak detector and artificial mains network are in compliance with CISPR 16-1 series standards. The tested object was operated under its rated voltage and its rated frequency.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

Following figures and tables are the measurement results. In the Figures, “◆” means Quasi-Peak Value and “◆” means Average Value which was measured in final measurement.

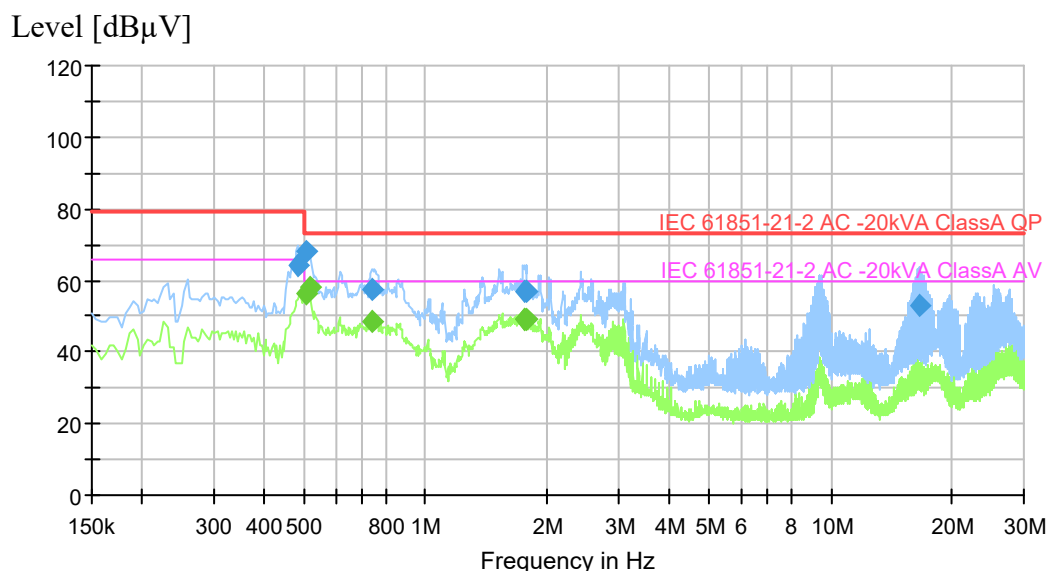
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 16 von 85

Page 16 of 85

Figure 1: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L1 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.486000	63.91	---	79.00	15.09	L1	10.4	Pass
0.506000	---	56.57	60.00	3.43	L1	10.3	Pass
0.506000	67.83	---	73.00	5.17	L1	10.3	Pass
0.518000	---	58.20	60.00	1.80	L1	10.3	Pass
0.742000	57.47	---	73.00	15.53	L1	10.3	Pass
0.742000	---	48.28	60.00	11.72	L1	10.3	Pass
1.758000	---	49.14	60.00	10.86	L1	10.5	Pass
1.766000	57.18	---	73.00	15.82	L1	10.5	Pass
1.766000	---	48.98	60.00	11.02	L1	10.5	Pass
1.774000	57.17	---	73.00	15.83	L1	10.5	Pass
1.774000	---	48.88	60.00	11.12	L1	10.5	Pass
16.550000	53.13	---	73.00	19.87	L1	11.7	Pass

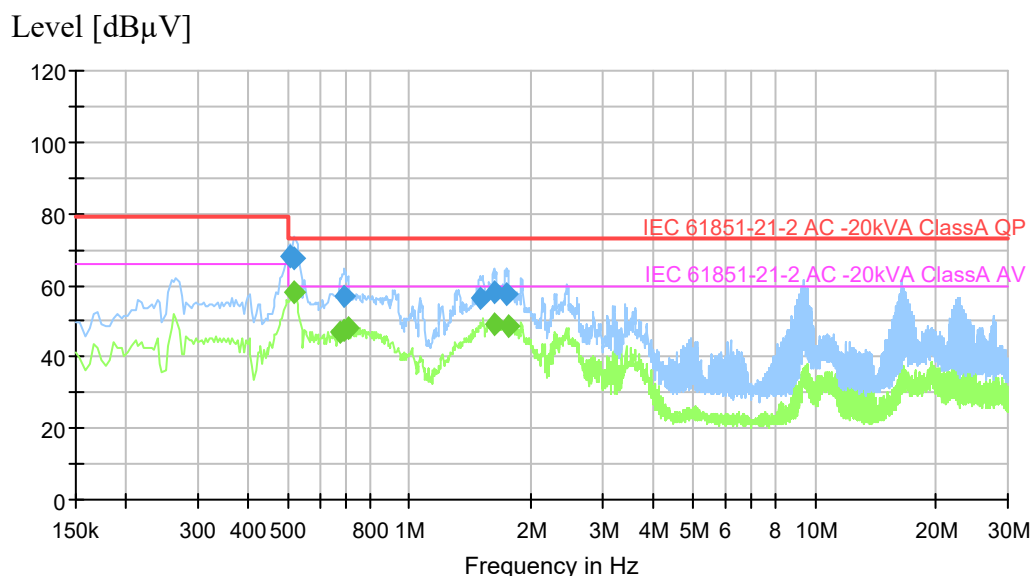
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 17 von 85

Page 17 of 85

Figure 2: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L2 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.506000	67.82	---	73.00	5.18	L2	10.3	Pass
0.518000	---	58.02	60.00	1.98	L2	10.3	Pass
0.522000	67.50	---	73.00	5.50	L2	10.3	Pass
0.674000	---	46.80	60.00	13.20	L2	10.3	Pass
0.694000	57.01	---	73.00	15.99	L2	10.3	Pass
0.694000	---	47.42	60.00	12.58	L2	10.3	Pass
0.706000	---	48.15	60.00	11.85	L2	10.3	Pass
1.502000	56.48	---	73.00	16.52	L2	10.4	Pass
1.614000	57.82	---	73.00	15.18	L2	10.4	Pass
1.626000	---	49.15	60.00	10.85	L2	10.4	Pass
1.734000	57.69	---	73.00	15.31	L2	10.5	Pass
1.750000	---	48.79	60.00	11.21	L2	10.5	Pass

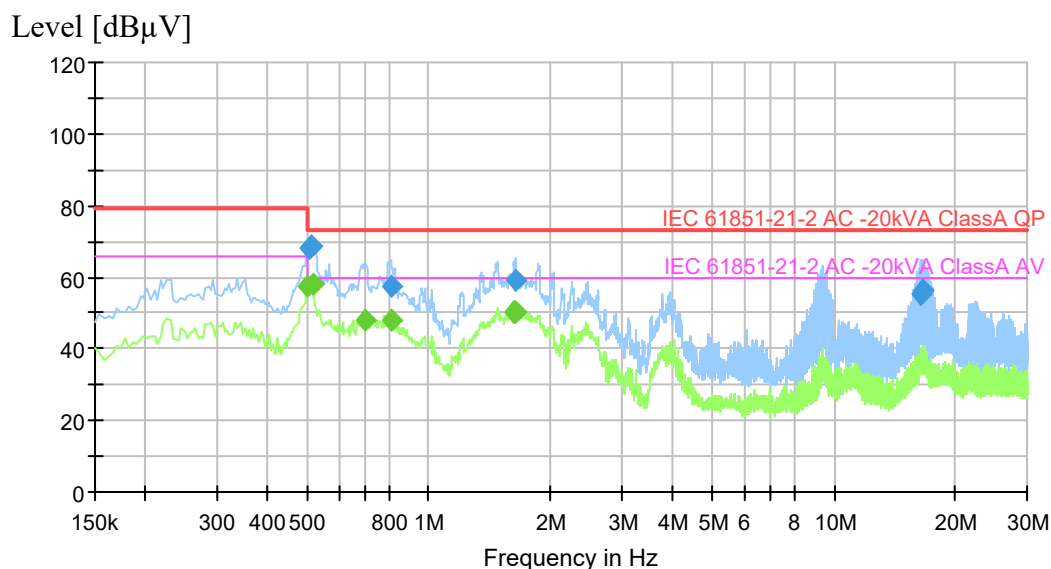
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 18 von 85

Page 18 of 85

Figure 3: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L3 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.502000	---	57.28	60.00	2.72	L3	10.4	Pass
0.506000	68.07	---	73.00	4.93	L3	10.4	Pass
0.514000	68.88	---	73.00	4.12	L3	10.4	Pass
0.518000	---	58.28	60.00	1.72	L3	10.4	Pass
0.702000	---	47.92	60.00	12.08	L3	10.3	Pass
0.806000	57.46	---	73.00	15.54	L3	10.3	Pass
0.806000	---	47.72	60.00	12.28	L3	10.3	Pass
1.622000	---	50.29	60.00	9.71	L3	10.4	Pass
1.646000	58.90	---	73.00	14.10	L3	10.4	Pass
1.646000	---	50.28	60.00	9.72	L3	10.4	Pass
16.398000	55.39	---	73.00	17.61	L3	11.7	Pass
16.606000	56.40	---	73.00	16.60	L3	11.7	Pass

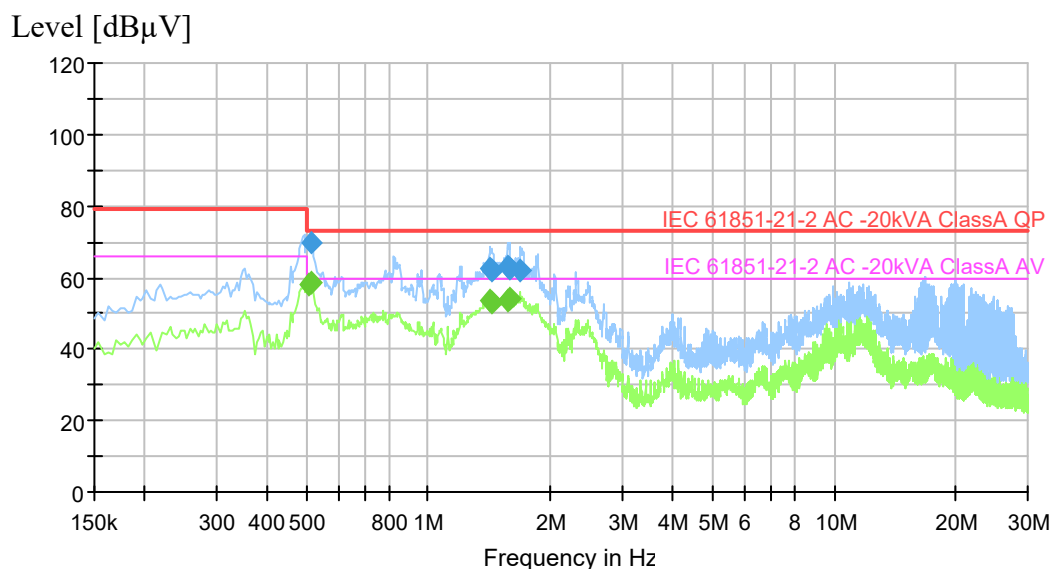
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 19 von 85

Page 19 of 85

Figure 4: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line N for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.506000	---	58.03	60.00	1.97	N	10.3	Pass
0.514000	---	58.76	60.00	1.24	N	10.3	Pass
0.514000	69.72	---	73.00	3.28	N	10.3	Pass
1.414000	---	53.44	60.00	6.56	N	10.3	Pass
1.414000	62.48	---	73.00	10.52	N	10.3	Pass
1.426000	---	52.96	60.00	7.04	N	10.3	Pass
1.426000	61.95	---	73.00	11.05	N	10.3	Pass
1.566000	63.01	---	73.00	9.99	N	10.3	Pass
1.566000	---	53.74	60.00	6.26	N	10.3	Pass
1.578000	---	53.97	60.00	6.03	N	10.3	Pass
1.586000	62.53	---	73.00	10.47	N	10.4	Pass
1.686000	61.96	---	73.00	11.04	N	10.4	Pass

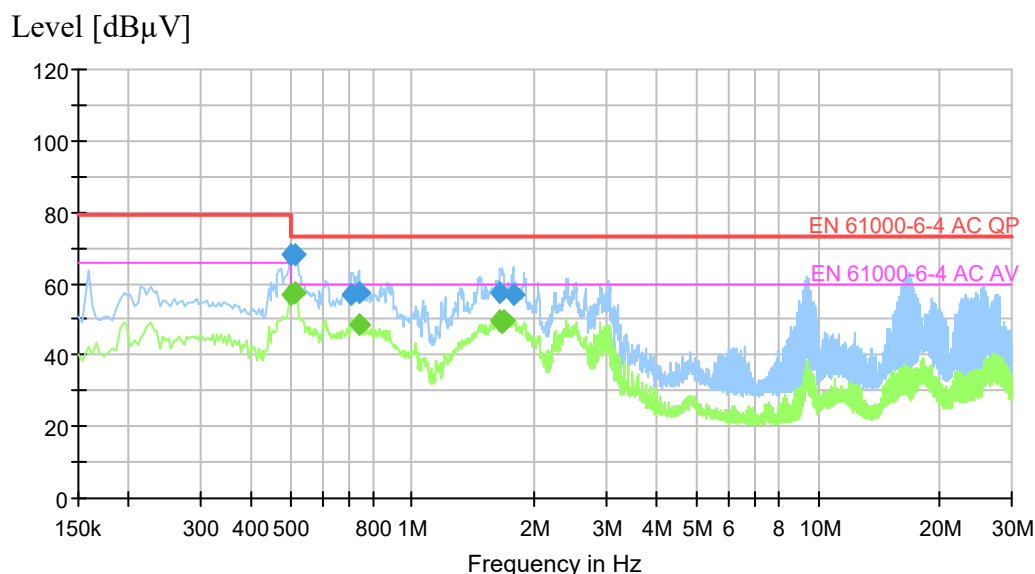
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 20 von 85

Page 20 of 85

Figure 5: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L1 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.502000	67.86	---	73.00	5.14	L1	10.3	Pass
0.502000	---	57.02	60.00	2.98	L1	10.3	Pass
0.514000	68.14	---	73.00	4.86	L1	10.3	Pass
0.514000	---	57.50	60.00	2.50	L1	10.3	Pass
0.710000	57.18	---	73.00	15.82	L1	10.3	Pass
0.738000	57.61	---	73.00	15.39	L1	10.3	Pass
0.738000	---	48.58	60.00	11.42	L1	10.3	Pass
1.650000	57.58	---	73.00	15.42	L1	10.4	Pass
1.650000	---	49.63	60.00	10.37	L1	10.4	Pass
1.658000	---	49.39	60.00	10.61	L1	10.4	Pass
1.670000	---	49.55	60.00	10.45	L1	10.4	Pass
1.770000	56.85	---	73.00	16.15	L1	10.5	Pass

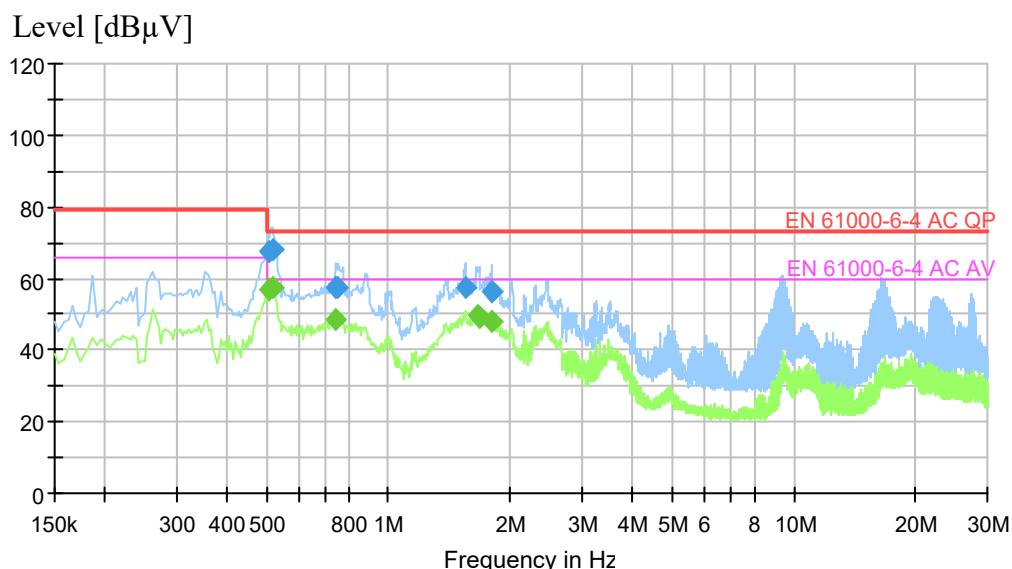
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 21 von 85

Page 21 of 85

Figure 6: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L2 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.506000	---	56.73	60.00	3.27	L2	10.3	Pass
0.506000	67.52	---	73.00	5.48	L2	10.3	Pass
0.518000	---	57.75	60.00	2.25	L2	10.3	Pass
0.518000	68.35	---	73.00	4.65	L2	10.3	Pass
0.742000	---	48.42	60.00	11.58	L2	10.3	Pass
0.742000	57.45	---	73.00	15.55	L2	10.3	Pass
0.750000	57.35	---	73.00	15.65	L2	10.3	Pass
1.554000	57.59	---	73.00	15.41	L2	10.4	Pass
1.654000	---	49.41	60.00	10.59	L2	10.4	Pass
1.678000	---	49.18	60.00	10.82	L2	10.4	Pass
1.794000	---	48.09	60.00	11.91	L2	10.5	Pass
1.794000	56.18	---	73.00	16.82	L2	10.5	Pass

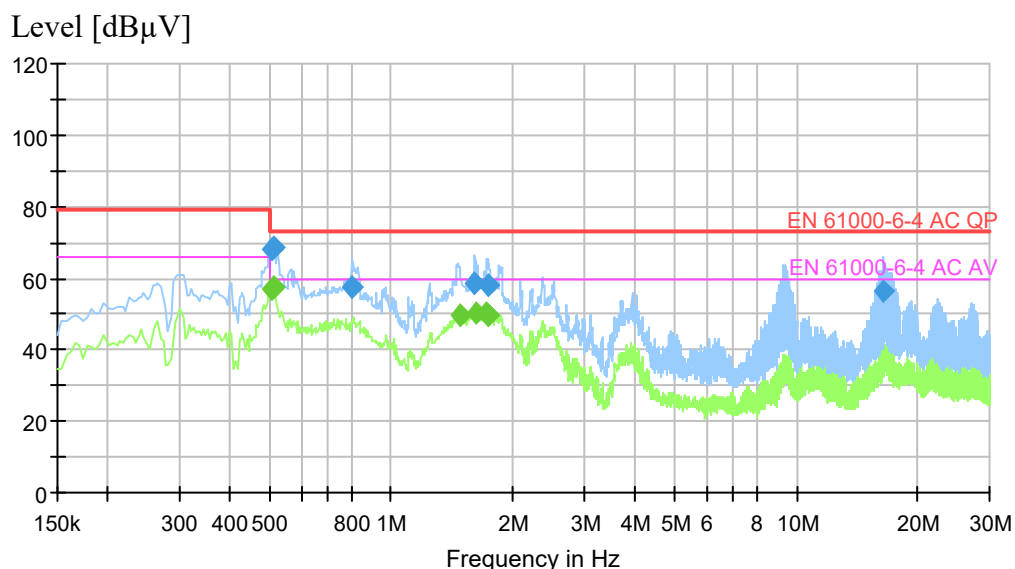
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 22 von 85

Page 22 of 85

Figure 7: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L3 for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.506000	---	57.01	60.00	2.99	L3	10.3	Pass
0.506000	67.89	---	73.00	5.11	L3	10.3	Pass
0.514000	---	57.56	60.00	2.44	L3	10.3	Pass
0.514000	68.73	---	73.00	4.27	L3	10.3	Pass
0.802000	57.37	---	73.00	15.63	L3	10.3	Pass
1.482000	---	49.52	60.00	10.48	L3	10.4	Pass
1.610000	58.44	---	73.00	14.56	L3	10.4	Pass
1.614000	---	50.30	60.00	9.70	L3	10.4	Pass
1.726000	---	50.00	60.00	10.00	L3	10.5	Pass
1.730000	58.23	---	73.00	14.77	L3	10.5	Pass
1.734000	---	49.71	60.00	10.29	L3	10.5	Pass
16.402000	56.61	---	73.00	16.39	L3	11.7	Pass

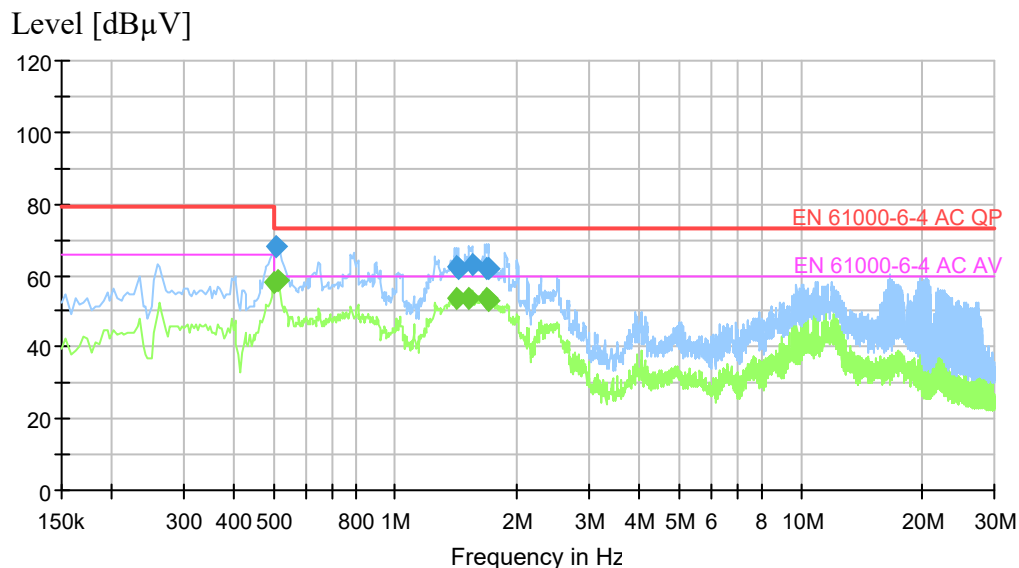
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 23 von 85

Page 23 of 85

Figure 8: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line N for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pass/Fail
0.502000	---	57.96	60.00	2.04	N	10.3	Pass
0.510000	68.31	---	73.00	4.69	N	10.3	Pass
0.514000	---	58.82	60.00	1.18	N	10.3	Pass
1.414000	62.24	---	73.00	10.76	N	10.3	Pass
1.418000	---	53.34	60.00	6.66	N	10.3	Pass
1.426000	61.77	---	73.00	11.23	N	10.3	Pass
1.522000	---	53.59	60.00	6.41	N	10.3	Pass
1.542000	63.13	---	73.00	9.87	N	10.3	Pass
1.674000	62.10	---	73.00	10.90	N	10.4	Pass
1.686000	---	53.57	60.00	6.43	N	10.4	Pass
1.698000	---	53.21	60.00	6.79	N	10.4	Pass
1.698000	62.06	---	73.00	10.94	N	10.4	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 24 von 85
Page 24 of 85

5.1.4 CPT port Continuous Disturbance Voltage

Result:

Passed

Date of testing : 2024-04-01
Basic standard : EN IEC 61851-21-2:2021, clause 6.3.3
Frequency range : 150 kHz – 30 MHz
Limit : EN IEC 61851-21-2:2021, Table 12, rated power of EUT > 75 kVA for model AF-DC-240-B; rated power of EUT ≤ 75 kVA for model AF-DC-30-B
Ambient condition : Temperature: 19.6 °C; Relative humidity: 47 %

Test Setup

Input voltage : AC 400 V, 50 Hz (three phases)
Operational mode : Mode B+E+F (20 % load with LTE and RFID on)
Mode D+E+F (80 % load with LTE and RFID on)
Earthing : Via the power cord
Test setup : Figure A.1 of EN IEC 61851-21-2:2021

The measurement setup was made according to CISPR 16-2-1 and Figure A.1 of EN IEC 61851-21-2:2021.

The measurement equipment like test receivers, quasi-peak detector and Artificial Network (AN) are in compliance with CISPR 16-1 series standards and CISPR 16-2-1. The tested object was operated under its rated voltage and its rated frequency.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

The following figures and tables were those measured by an automatic measuring system. The disturbance voltage was scanned firstly with Peak detector and during the test. Then a final measurement was performed with both Quasi-peak and Average detector at the frequencies which showed the Max. in a designated frequency sub-range. In the Figures, “◆” means Quasi-Peak Value and “◆” means Average Value which was measured in final measurement.

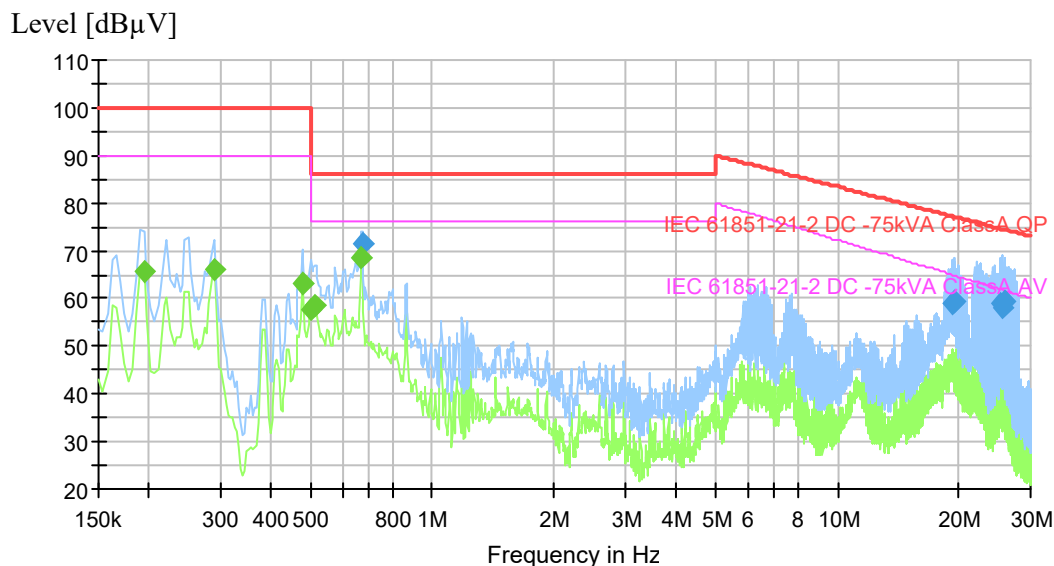
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 25 von 85

Page 25 of 85

Figure 9: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.194000	---	65.53	90.00	24.47	10.6	Pass
0.290000	---	65.99	90.00	24.01	10.5	Pass
0.478000	---	63.29	90.00	26.71	10.4	Pass
0.502000	---	57.87	76.00	18.13	10.3	Pass
0.514000	---	58.44	76.00	17.56	10.3	Pass
0.670000	---	68.65	76.00	7.35	10.3	Pass
0.674000	71.52	---	86.00	14.48	10.3	Pass
19.314000	58.85	---	77.18	18.33	11.6	Pass
19.538000	59.17	---	77.07	17.90	11.7	Pass
25.418000	58.78	---	74.57	15.79	11.8	Pass
25.538000	58.20	---	74.53	16.33	11.8	Pass
25.950000	59.35	---	74.38	15.03	11.8	Pass

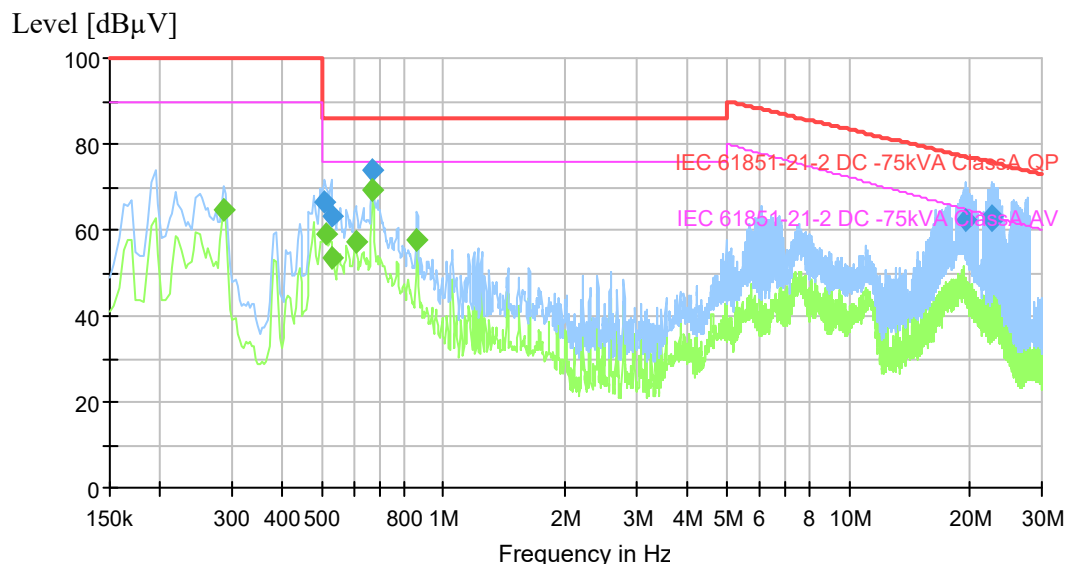
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 26 von 85

Page 26 of 85

Figure 10: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	64.53	90.00	25.47	10.5	Pass
0.510000	66.46	---	86.00	19.54	10.4	Pass
0.514000	---	58.86	76.00	17.14	10.4	Pass
0.530000	63.34	---	86.00	22.66	10.3	Pass
0.530000	---	53.43	76.00	22.57	10.3	Pass
0.606000	---	57.26	76.00	18.74	10.3	Pass
0.670000	---	69.20	76.00	6.80	10.3	Pass
0.670000	73.91	---	86.00	12.09	10.3	Pass
0.862000	---	57.63	76.00	18.37	10.2	Pass
19.362000	62.13	---	77.16	15.02	11.7	Pass
22.458000	63.45	---	75.75	12.30	11.8	Pass
22.666000	62.13	---	75.66	13.53	11.8	Pass

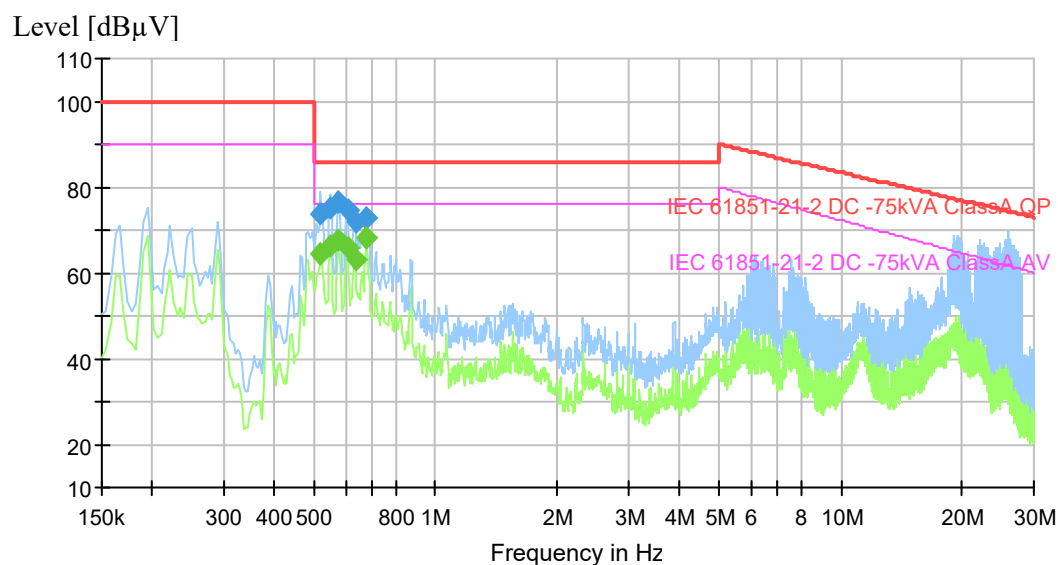
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 27 von 85

Page 27 of 85

Figure 11: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-240-B



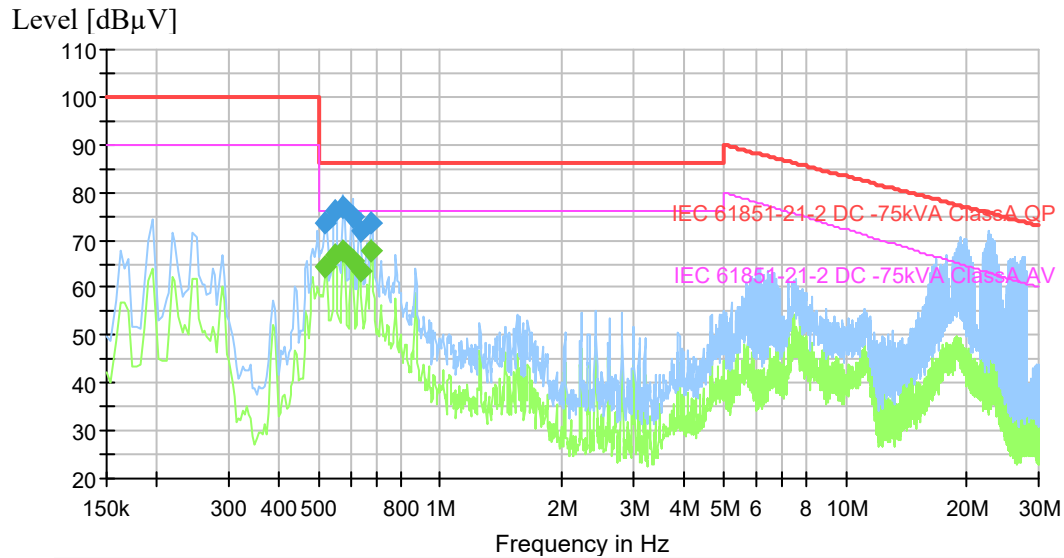
Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.522000	73.56	---	86.00	12.44	10.3	Pass
0.522000	---	64.28	76.00	11.72	10.3	Pass
0.550000	75.33	---	86.00	10.67	10.3	Pass
0.550000	---	66.39	76.00	9.61	10.3	Pass
0.578000	76.59	---	86.00	9.41	10.3	Pass
0.578000	---	67.90	76.00	8.10	10.3	Pass
0.606000	---	65.94	76.00	10.06	10.3	Pass
0.606000	74.76	---	86.00	11.24	10.3	Pass
0.634000	---	63.11	76.00	12.89	10.3	Pass
0.634000	71.68	---	86.00	14.32	10.3	Pass
0.678000	72.94	---	86.00	13.06	10.3	Pass
0.678000	---	68.11	76.00	7.89	10.3	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 28 von 85
Page 28 of 85

Figure 12: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.522000	---	64.40	76.00	11.60	10.4	Pass
0.522000	73.63	---	86.00	12.37	10.4	Pass
0.550000	---	66.92	76.00	9.08	10.3	Pass
0.550000	76.20	---	86.00	9.80	10.3	Pass
0.578000	---	67.74	76.00	8.26	10.3	Pass
0.578000	76.80	---	86.00	9.20	10.3	Pass
0.606000	74.97	---	86.00	11.03	10.3	Pass
0.606000	---	65.76	76.00	10.24	10.3	Pass
0.634000	71.92	---	86.00	14.08	10.3	Pass
0.634000	---	63.52	76.00	12.48	10.3	Pass
0.678000	---	67.55	76.00	8.45	10.3	Pass
0.678000	73.77	---	86.00	12.23	10.3	Pass

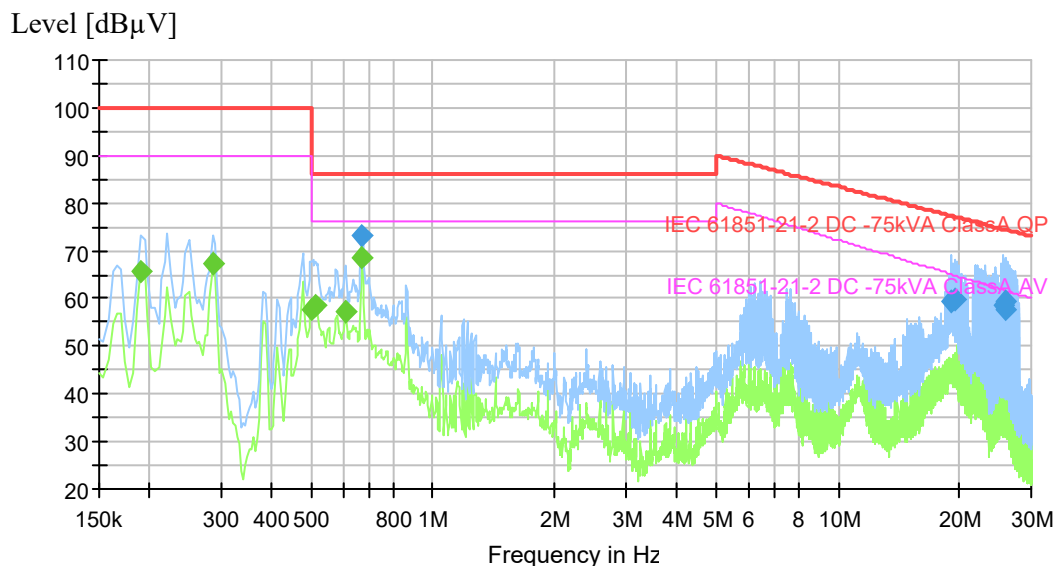
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 29 von 85

Page 29 of 85

Figure 13: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.190000	---	65.71	90.00	24.29	10.6	Pass
0.286000	---	67.28	90.00	22.72	10.5	Pass
0.502000	---	57.78	76.00	18.22	10.3	Pass
0.514000	---	58.65	76.00	17.35	10.3	Pass
0.606000	---	57.23	76.00	18.77	10.3	Pass
0.670000	73.15	---	86.00	12.85	10.3	Pass
0.670000	---	68.74	76.00	7.26	10.3	Pass
18.938000	59.30	---	77.37	18.06	11.6	Pass
19.382000	59.63	---	77.15	17.51	11.6	Pass
25.706000	58.50	---	74.47	15.97	11.8	Pass
25.898000	57.59	---	74.40	16.81	11.8	Pass
25.974000	59.17	---	74.37	15.20	11.8	Pass

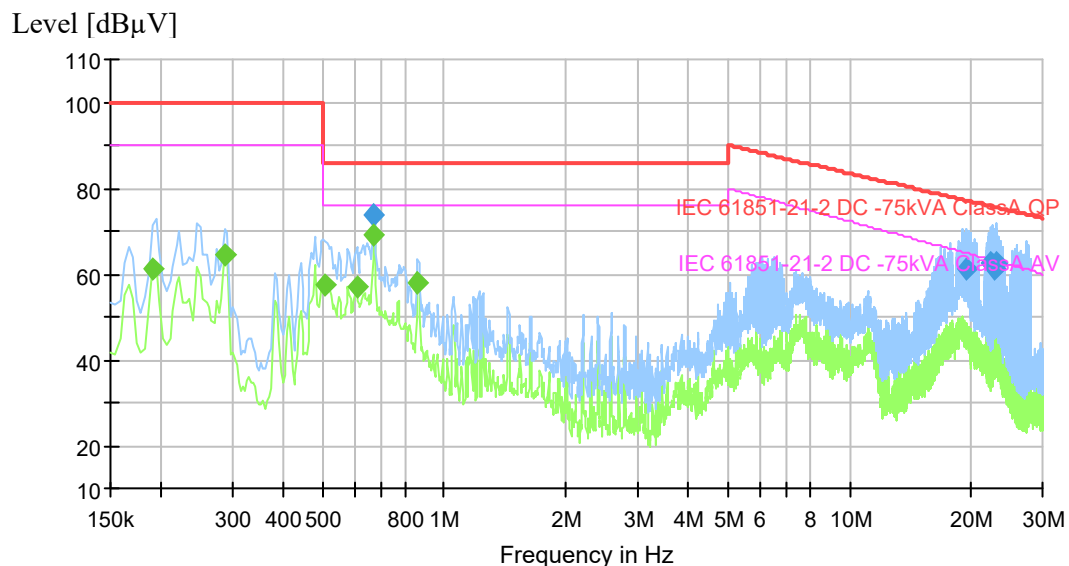
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 30 von 85

Page 30 of 85

Figure 14: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.190000	---	61.36	90.00	28.64	10.6	Pass
0.286000	---	64.52	90.00	25.48	10.5	Pass
0.506000	---	57.55	76.00	18.45	10.4	Pass
0.606000	---	57.15	76.00	18.85	10.3	Pass
0.670000	---	69.03	76.00	6.97	10.3	Pass
0.670000	73.95	---	86.00	12.05	10.3	Pass
0.862000	---	57.80	76.00	18.20	10.2	Pass
19.382000	61.35	---	77.15	15.79	11.7	Pass
22.434000	62.42	---	75.76	13.34	11.8	Pass
22.686000	61.90	---	75.65	13.75	11.8	Pass
22.874000	61.36	---	75.57	14.21	11.8	Pass
23.022000	62.73	---	75.51	12.78	11.8	Pass

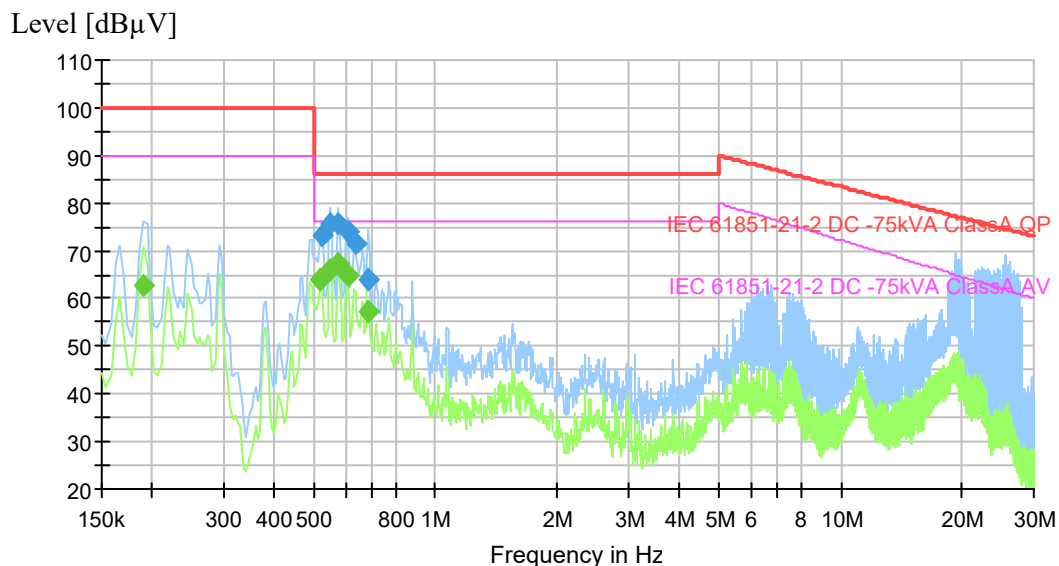
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 31 von 85

Page 31 of 85

Figure 15: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.190000	---	62.87	90.00	27.13	10.6	Pass
0.522000	---	63.99	76.00	12.01	10.3	Pass
0.526000	73.05	---	86.00	12.95	10.3	Pass
0.550000	---	66.02	76.00	9.98	10.3	Pass
0.550000	75.63	---	86.00	10.37	10.3	Pass
0.578000	---	67.12	76.00	8.88	10.3	Pass
0.578000	75.51	---	86.00	10.49	10.3	Pass
0.606000	73.80	---	86.00	12.20	10.3	Pass
0.606000	---	64.89	76.00	11.11	10.3	Pass
0.634000	71.36	---	86.00	14.64	10.3	Pass
0.686000	64.08	---	86.00	21.92	10.3	Pass
0.686000	---	57.40	76.00	18.60	10.3	Pass

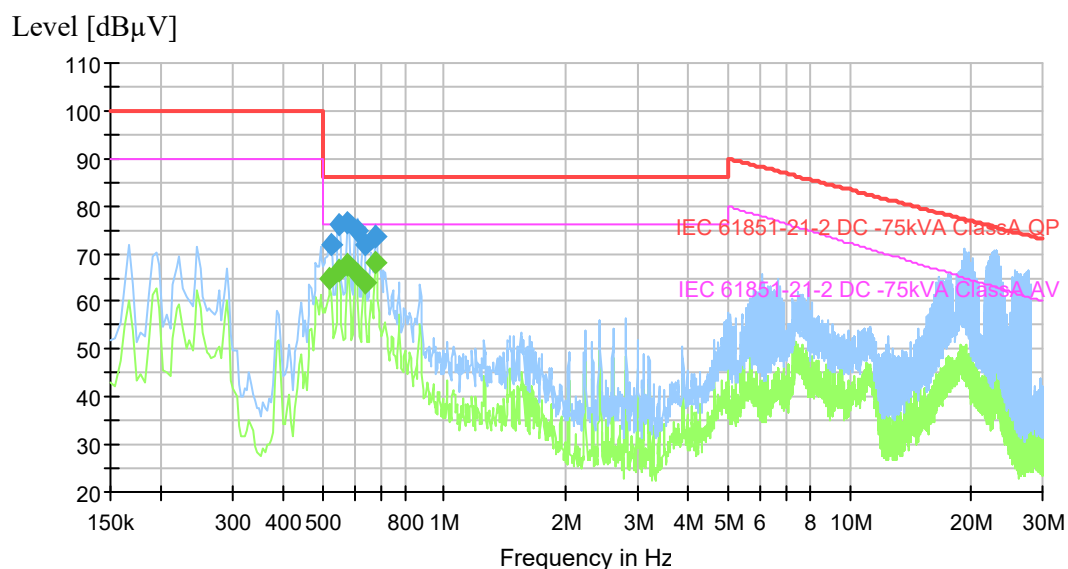
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 32 von 85

Page 32 of 85

Figure 16: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-240-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.522000	---	64.65	76.00	11.35	10.4	Pass
0.526000	71.80	---	86.00	14.20	10.3	Pass
0.550000	---	66.62	76.00	9.38	10.3	Pass
0.550000	76.27	---	86.00	9.73	10.3	Pass
0.578000	---	67.66	76.00	8.34	10.3	Pass
0.578000	76.69	---	86.00	9.31	10.3	Pass
0.606000	74.77	---	86.00	11.23	10.3	Pass
0.606000	---	65.75	76.00	10.25	10.3	Pass
0.634000	72.04	---	86.00	13.96	10.3	Pass
0.634000	---	63.79	76.00	12.21	10.3	Pass
0.678000	---	68.05	76.00	7.95	10.3	Pass
0.678000	73.46	---	86.00	12.54	10.3	Pass

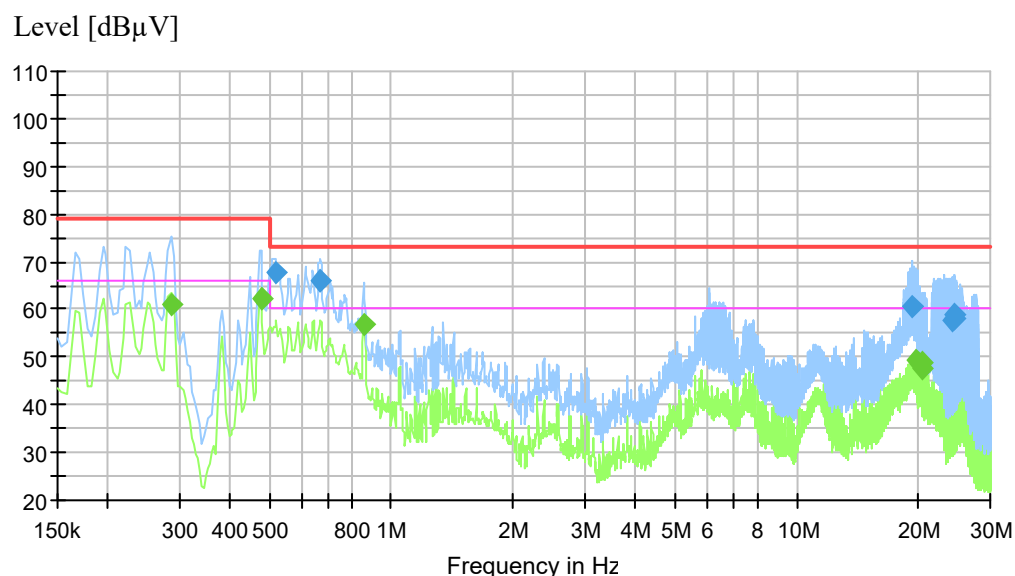
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 33 von 85

Page 33 of 85

Figure 17: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	60.95	66.00	5.05	10.4	Pass
0.478000	---	62.44	66.00	3.56	10.4	Pass
0.518000	67.86	---	73.00	5.14	10.4	Pass
0.666000	66.23	---	73.00	6.77	10.4	Pass
0.858000	---	56.67	60.00	3.33	10.4	Pass
19.146000	60.64	---	73.00	12.36	11.6	Pass
19.706000	---	49.20	60.00	10.80	11.7	Pass
20.302000	---	48.76	60.00	11.24	11.7	Pass
20.386000	---	47.59	60.00	12.41	11.7	Pass
24.026000	57.64	---	73.00	15.36	11.7	Pass
24.318000	59.05	---	73.00	13.95	11.7	Pass
24.514000	58.25	---	73.00	14.75	11.8	Pass

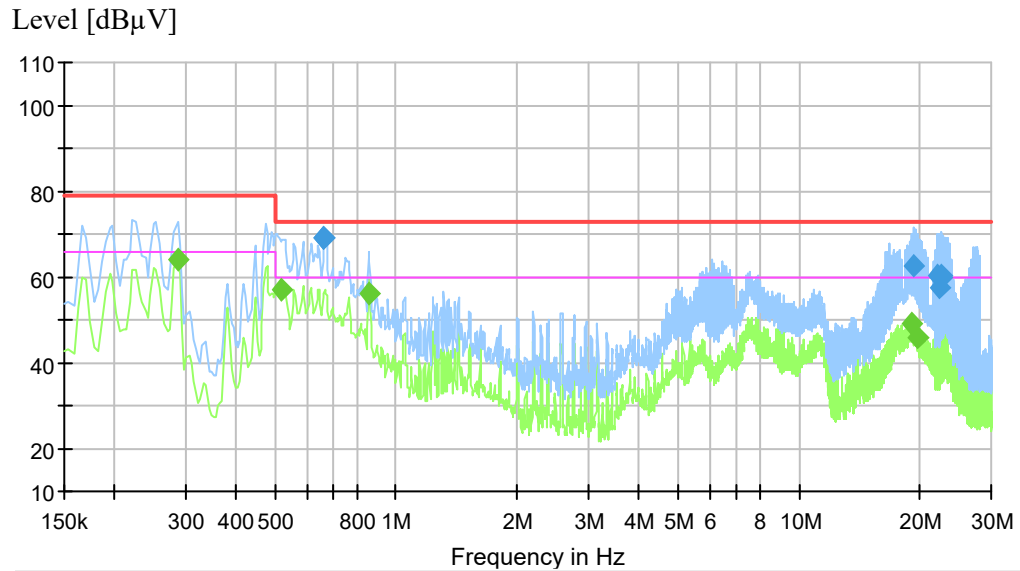
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 34 von 85

Page 34 of 85

Figure 18: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	63.75	66.00	2.25	10.4	Pass
0.518000	---	57.20	60.00	2.80	10.4	Pass
0.662000	68.88	---	73.00	4.12	10.4	Pass
0.662000	68.88	---	73.00	4.12	10.4	Pass
0.858000	---	56.20	60.00	3.80	10.4	Pass
18.950000	---	48.89	60.00	11.11	11.6	Pass
19.146000	62.61	---	73.00	10.39	11.6	Pass
19.598000	---	45.90	60.00	14.10	11.7	Pass
22.170000	60.08	---	73.00	12.92	11.7	Pass
22.222000	57.53	---	73.00	15.47	11.7	Pass
22.526000	59.69	---	73.00	13.31	11.8	Pass
22.666000	60.07	---	73.00	12.93	11.8	Pass

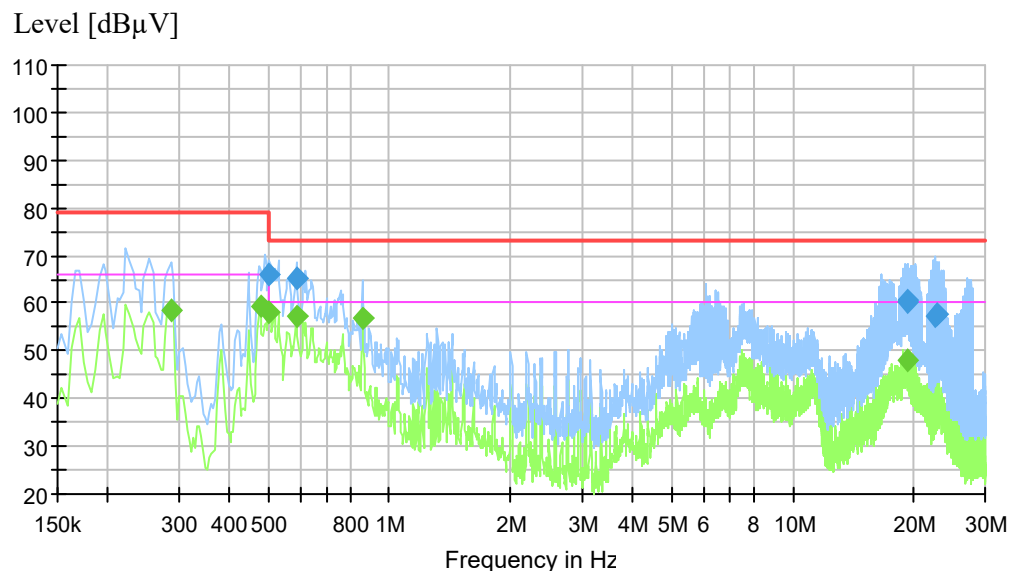
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 35 von 85

Page 35 of 85

Figure 19: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	58.65	66.00	7.35	10.4	Pass
0.478000	---	59.14	66.00	6.86	10.4	Pass
0.502000	66.13	---	73.00	6.87	10.4	Pass
0.502000	---	57.92	60.00	2.08	10.4	Pass
0.586000	65.23	---	73.00	7.77	10.4	Pass
0.586000	---	57.32	60.00	2.68	10.4	Pass
0.858000	---	56.67	60.00	3.33	10.4	Pass
19.146000	---	47.90	60.00	12.10	11.6	Pass
19.146000	60.64	---	73.00	12.36	11.6	Pass
19.155000	60.12	---	73.00	12.88	11.6	Pass
22.490000	57.32	---	73.00	15.68	11.7	Pass
22.886000	57.85	---	73.00	15.15	11.7	Pass

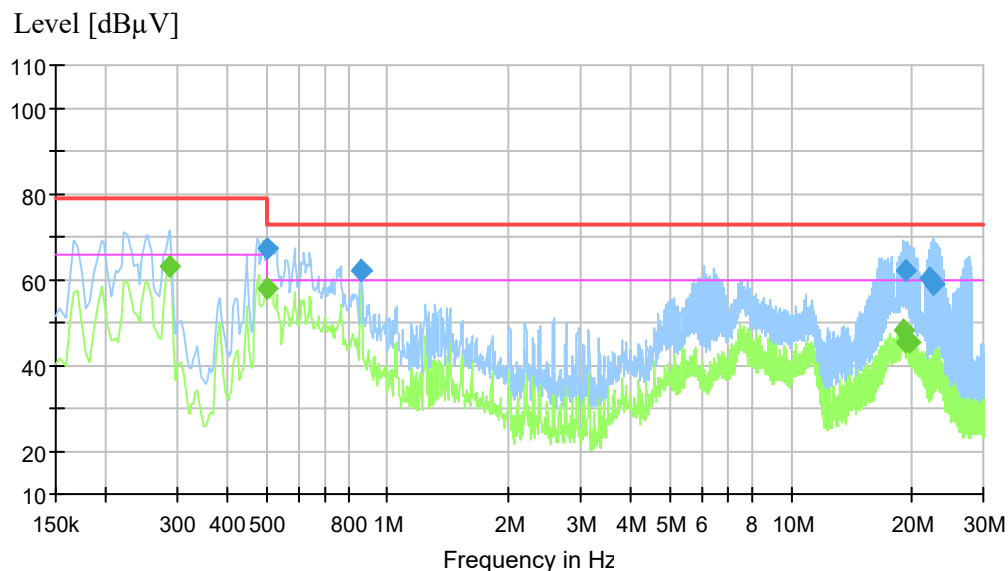
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 36 von 85

Page 36 of 85

Figure 20: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	62.81	66.00	3.19	10.4	Pass
0.502000	---	58.10	60.00	1.90	10.4	Pass
0.502000	67.38	---	73.00	5.62	10.4	Pass
0.859000	61.93	---	73.00	11.07	10.4	Pass
0.859000	61.93	---	73.00	11.07	10.4	Pass
18.950000	---	48.10	60.00	11.90	11.6	Pass
19.222000	---	45.21	60.00	14.79	11.6	Pass
19.246000	61.91	---	73.00	11.09	11.6	Pass
19.601000	---	45.12	60.00	14.88	11.6	Pass
22.170000	60.12	---	73.00	12.88	11.7	Pass
22.666000	59.02	---	73.00	13.98	11.7	Pass
22.666000	59.02	---	73.00	13.98	11.7	Pass

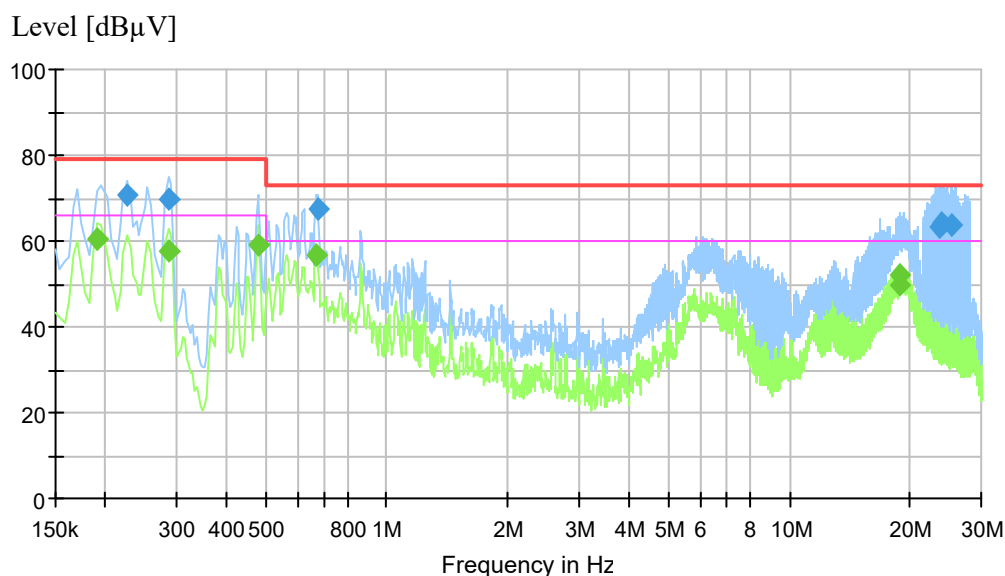
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 37 von 85

Page 37 of 85

Figure 21: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.190000	---	60.33	66.00	5.67	10.5	Pass
0.226000	70.48	---	79.00	8.52	10.4	Pass
0.286000	69.73	---	79.00	9.27	10.4	Pass
0.286000	---	57.78	66.00	8.22	10.4	Pass
0.478000	---	59.22	66.00	6.78	10.4	Pass
0.670000	---	56.62	60.00	3.38	10.4	Pass
0.674000	67.56	---	73.00	5.44	10.4	Pass
18.750000	---	52.07	60.00	7.93	11.5	Pass
18.878000	---	49.60	60.00	10.40	11.6	Pass
23.534000	63.12	---	73.00	9.88	11.7	Pass
23.826000	64.13	---	73.00	8.87	11.7	Pass
25.402000	63.71	---	73.00	9.29	11.8	Pass

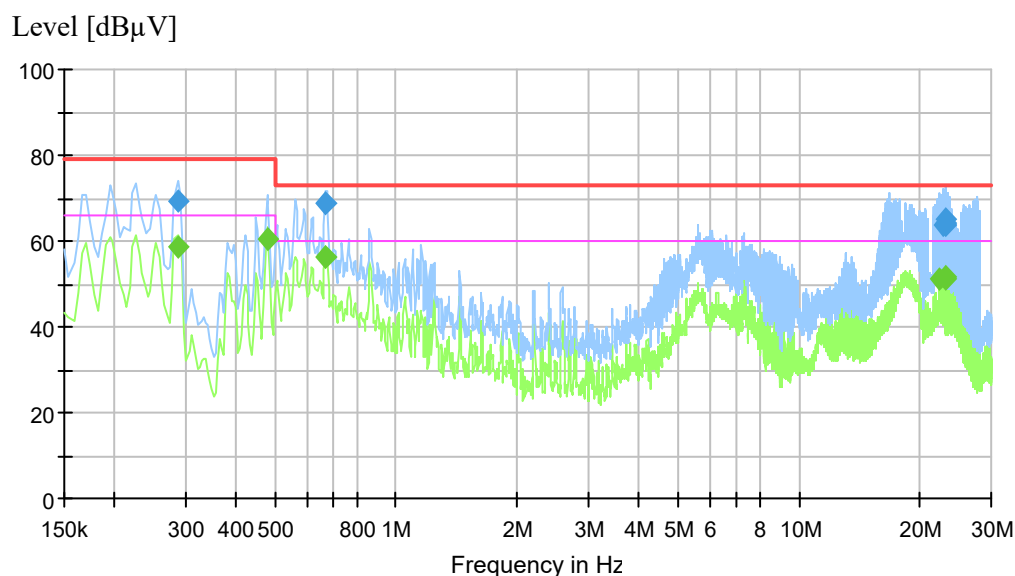
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 38 von 85

Page 38 of 85

Figure 22: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	58.70	66.00	7.30	10.4	Pass
0.286000	69.21	---	79.00	9.79	10.4	Pass
0.478000	---	60.64	66.00	5.36	10.4	Pass
0.670000	---	56.15	60.00	3.85	10.4	Pass
0.670000	69.01	---	73.00	3.99	10.4	Pass
22.374000	---	50.98	60.00	9.02	11.7	Pass
22.878000	63.59	---	73.00	9.41	11.7	Pass
22.974000	---	51.84	60.00	8.16	11.7	Pass
22.974000	64.23	---	73.00	8.77	11.7	Pass
23.022000	63.57	---	73.00	9.43	11.7	Pass
23.058000	---	51.11	60.00	8.89	11.8	Pass
23.074000	65.10	---	73.00	7.90	11.8	Pass

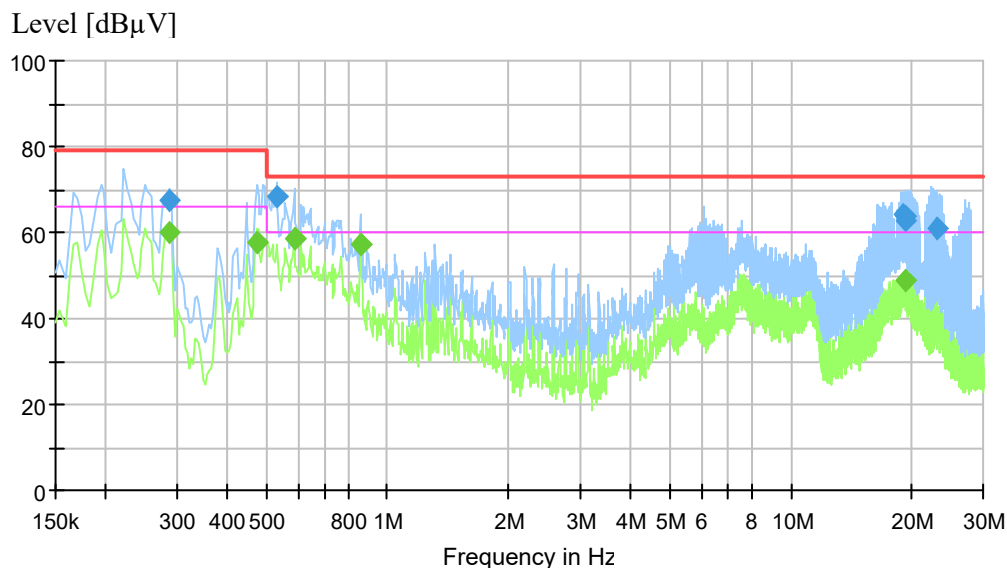
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 39 von 85

Page 39 of 85

Figure 23: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-30-B



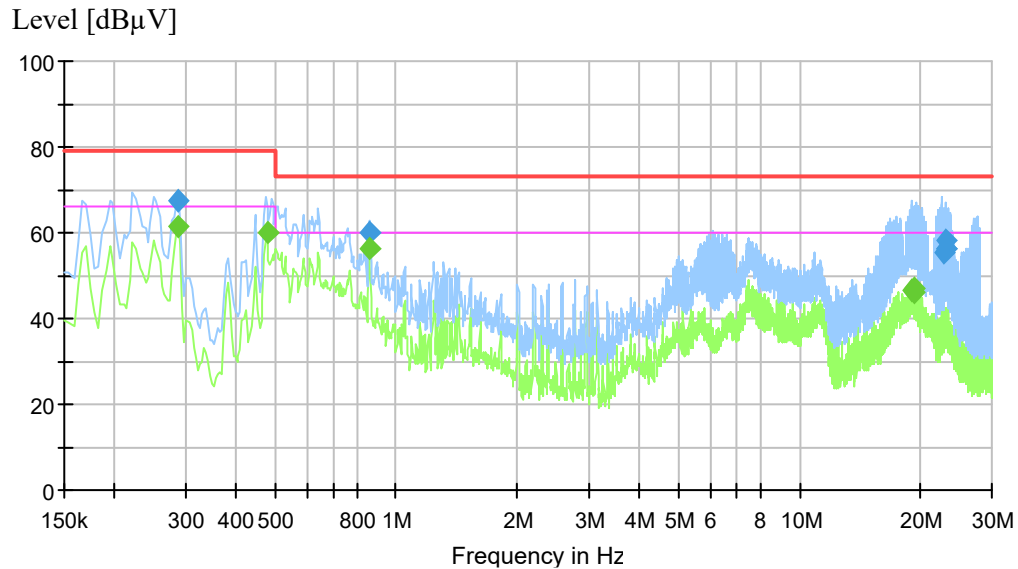
Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	67.23	---	79.00	11.77	10.4	Pass
0.286000	---	60.15	66.00	5.85	10.4	Pass
0.474000	---	57.78	66.00	8.22	10.4	Pass
0.531000	68.46	---	73.00	4.54	10.4	Pass
0.586000	---	58.60	60.00	1.40	10.4	Pass
0.854000	---	57.21	60.00	2.79	10.4	Pass
19.030000	64.13	---	73.00	8.87	11.6	Pass
19.150000	62.56	---	73.00	10.44	11.6	Pass
19.202000	---	48.62	60.00	11.38	11.6	Pass
19.202000	63.71	---	73.00	9.29	11.6	Pass
19.254000	---	49.02	60.00	10.98	11.6	Pass
23.022000	61.12	---	73.00	11.88	11.7	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 40 von 85
Page 40 of 85

Figure 24: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-30-B



Final quasi-peak and average measurement results:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Corr. (dB)	Pass/Fail
0.286000	---	61.20	66.00	4.80	10.4	Pass
0.286000	67.21	---	79.00	11.79	10.4	Pass
0.478000	---	59.89	66.00	6.11	10.4	Pass
0.854000	---	56.21	60.00	3.79	10.4	Pass
0.854000	60.01	---	73.00	12.99	10.4	Pass
19.030000	---	46.41	60.00	13.59	11.6	Pass
19.202000	---	45.98	60.00	14.02	11.6	Pass
19.254000	---	46.77	60.00	13.23	11.6	Pass
22.878000	55.45	---	73.00	17.55	11.7	Pass
22.974000	56.34	---	73.00	16.66	11.7	Pass
23.022000	56.51	---	73.00	16.49	11.7	Pass
23.074000	57.98	---	73.00	15.02	11.7	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 41 von 85
Page 41 of 85

5.1.5 Wired network port Continuous Disturbance Voltage

Result:	N/A
----------------	-----

The EUT has no wired network port, therefore, this test is not applicable to the EUT.

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 42 von 85
Page 42 of 85

5.1.6 Radiated Disturbance (2 kHz - 185 kHz)

Result:

Passed

Date of testing : 2024-04-01
Test procedure : EN IEC 61851-21-2:2021, Annex B
Frequency range : 2 kHz - 185 kHz
Limits : Table B.1 of EN IEC 61851-21-2:2021, Peak value:
2 kHz - 10 kHz, 62 - 60 $\mu\text{A/m}$;
10 kHz - 30 kHz, 60 $\mu\text{A/m}$;
30 kHz - 75 kHz, 60 - 95 $\mu\text{A/m}$;
75 kHz - 120 kHz, 95 - 55 $\mu\text{A/m}$;
120 kHz - 140 kHz, 55 $\mu\text{A/m}$; 140 kHz - 185 kHz, 55 - 95 $\mu\text{A/m}$
The limits decrease/increase linearly with frequency
Kind of test site : 10 m semi-anechoic chamber
Operation modes : Mode B+E+F (20 % load with LTE and RFID on)
Mode D+E+F (80 % load with LTE and RFID on)
Ambient condition : Temperature: 19.6 °C; Relative humidity: 47 %

The radiated disturbance measurement setup was made according to Annex B of EN IEC 61851-21-2:2021 in a 10 m semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 1 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on the floor. The antenna was 1m high above the floor and the test was performed on four sides of the EUT.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with quasi-peak detector at those critical frequencies during the preview test. In the following figure, “◆” means measurement results with peak detector.

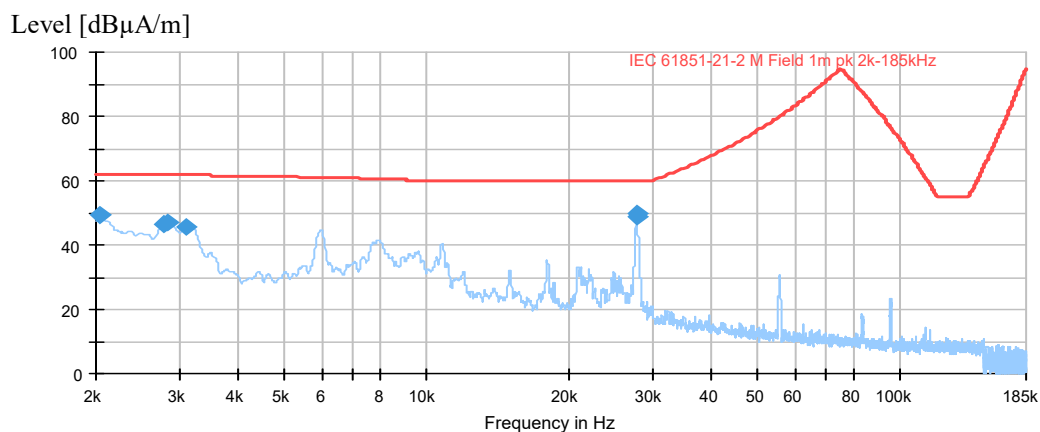
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 43 von 85

Page 43 of 85

Figure 25: Spectral diagram and measurement results, 2 – 185 kHz, Front side, Mode B+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002044	49.51	61.99	12.48	40.5	Pass
0.002784	46.41	61.80	15.39	23.6	Pass
0.002844	47.17	61.79	14.62	22.1	Pass
0.003110	45.53	61.72	16.20	21.2	Pass
0.027826	48.87	60.00	11.13	25.8	Pass
0.027870	50.00	60.00	10.00	25.8	Pass

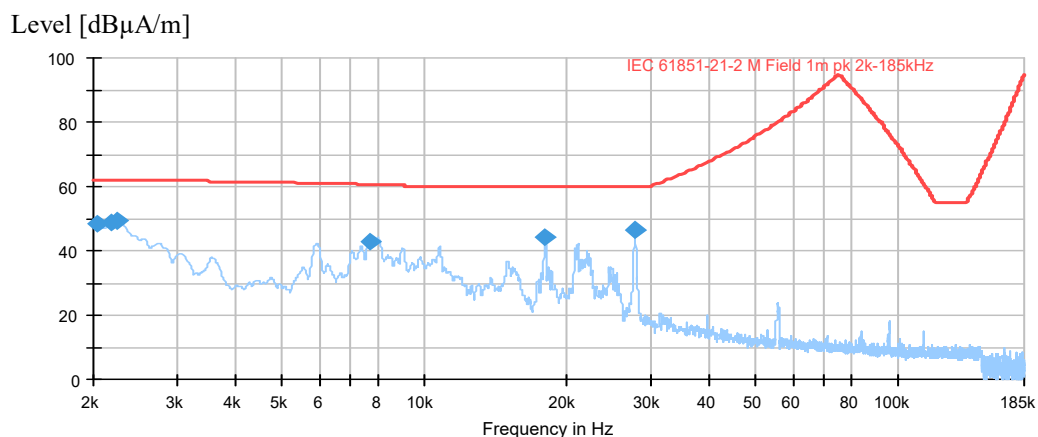
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 44 von 85

Page 44 of 85

Figure 26: Spectral diagram and measurement results, 2 – 185 kHz, Right side, Mode B+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002044	48.28	61.99	13.71	40.5	Pass
0.002192	48.93	61.95	13.02	40.3	Pass
0.002252	49.34	61.94	12.60	40.2	Pass
0.007698	42.96	60.58	17.61	31.4	Pass
0.017984	44.21	60.00	15.79	27.6	Pass
0.027870	46.58	60.00	13.42	25.8	Pass

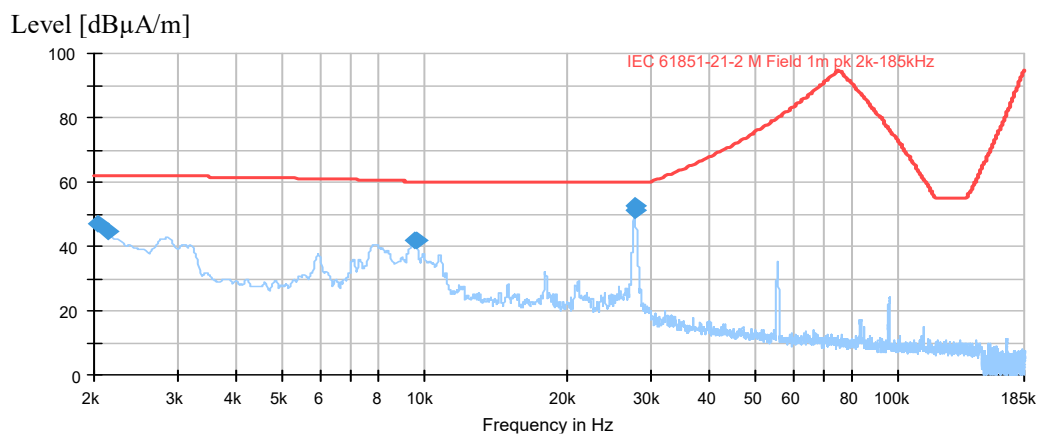
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 45 von 85

Page 45 of 85

Figure 27: Spectral diagram and measurement results, 2 – 185 kHz, Left side, Mode B+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002030	46.82	61.99	15.17	40.5	Pass
0.002133	44.71	61.97	17.25	40.4	Pass
0.009533	41.87	60.12	18.24	30.9	Pass
0.009578	41.96	60.11	18.14	30.9	Pass
0.027811	50.93	60.00	9.07	25.8	Pass
0.027856	52.76	60.00	7.24	25.8	Pass

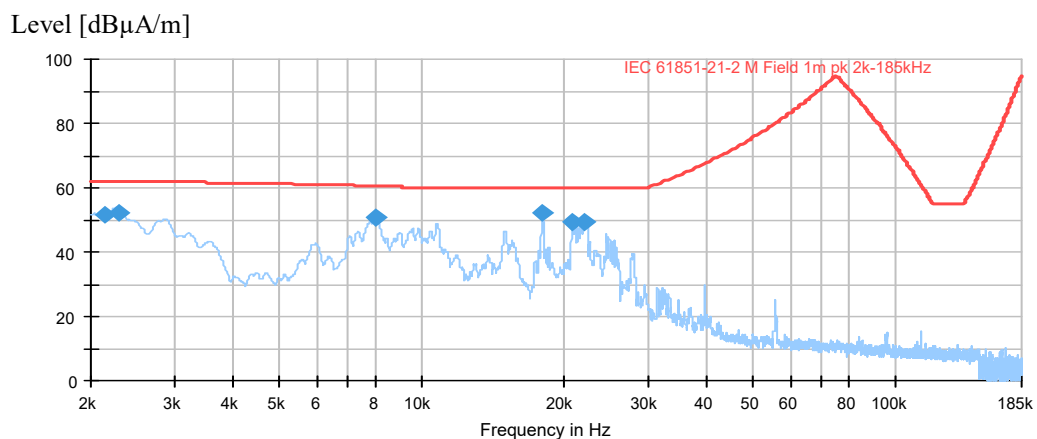
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 46 von 85

Page 46 of 85

Figure 28: Spectral diagram and measurement results, 2 – 185 kHz, Rear side, Mode B+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002148	51.46	61.96	10.50	40.3	Pass
0.002296	52.25	61.93	9.67	40.1	Pass
0.007979	50.61	60.51	9.89	31.5	Pass
0.017984	51.90	60.00	8.10	27.6	Pass
0.020826	49.53	60.00	10.47	26.7	Pass
0.022039	49.23	60.00	10.77	26.5	Pass

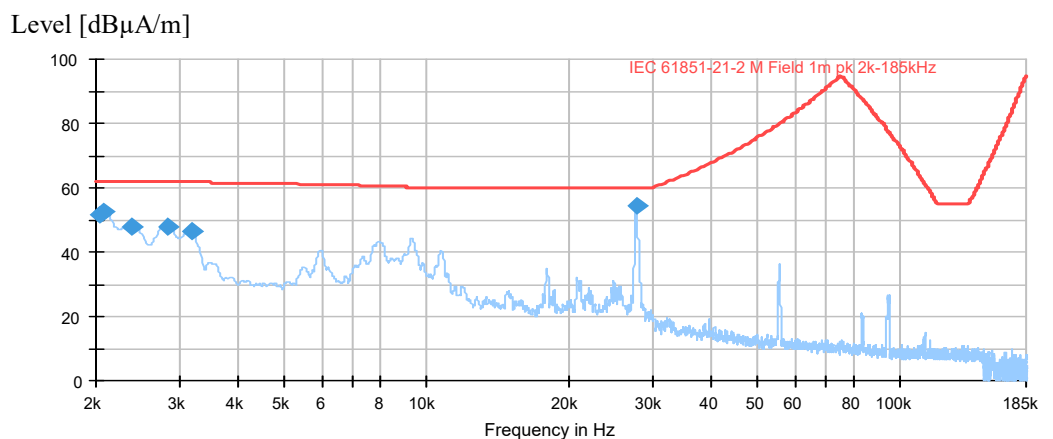
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 47 von 85

Page 47 of 85

Figure 29: Spectral diagram and measurement results, 2 – 185 kHz, Front side, Mode D+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002044	51.63	61.99	10.36	40.5	Pass
0.002089	52.60	61.98	9.38	40.4	Pass
0.002385	48.05	61.90	13.85	38.3	Pass
0.002844	47.84	61.79	13.95	22.1	Pass
0.003199	46.37	61.70	15.33	23.4	Pass
0.027826	54.36	60.00	5.64	25.8	Pass

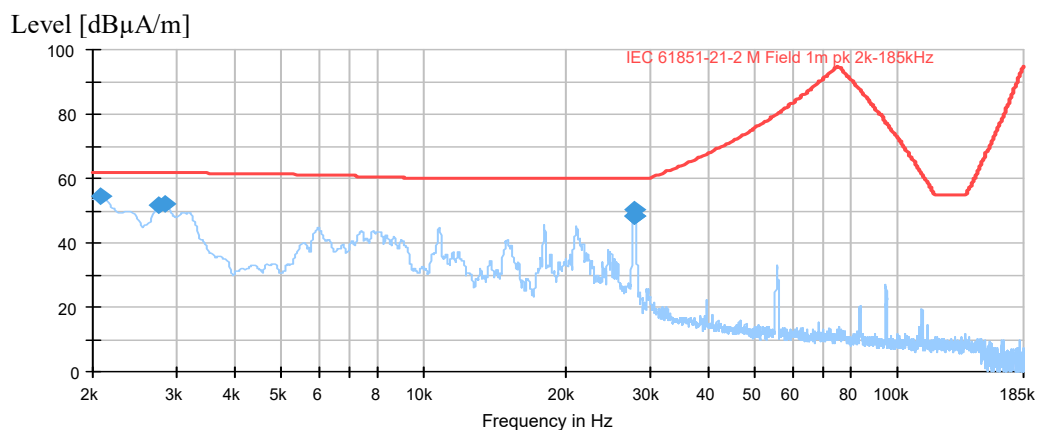
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 48 von 85

Page 48 of 85

Figure 30: Spectral diagram and measurement results, 2 – 185 kHz, Right side, Mode D+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002074	54.24	61.98	7.75	40.5	Pass
0.002770	51.86	61.81	9.95	24.4	Pass
0.002844	51.89	61.79	9.90	22.1	Pass
0.027811	48.34	60.00	11.66	25.8	Pass
0.027870	50.08	60.00	9.92	25.8	Pass
0.027930	48.38	60.00	11.62	25.8	Pass

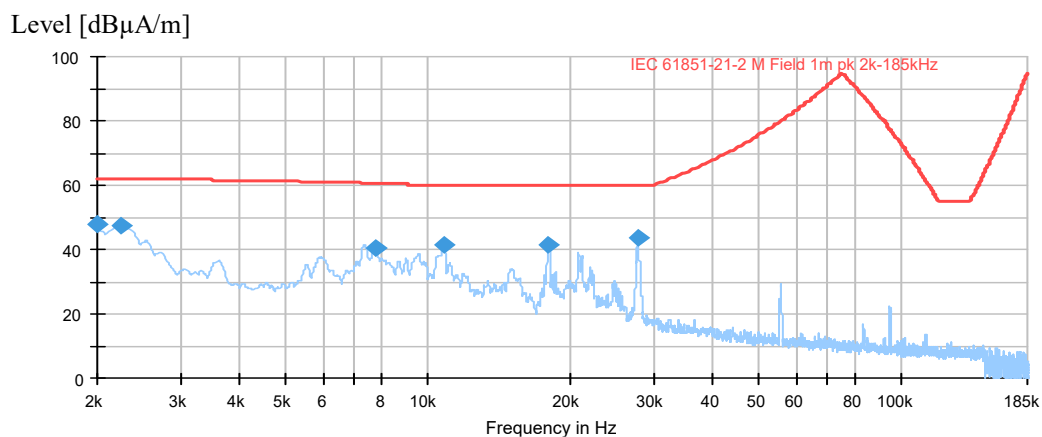
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 49 von 85

Page 49 of 85

Figure 31: Spectral diagram and measurement results, 2 – 185 kHz, Left side, Mode D+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002000	47.69	62.00	14.31	40.6	Pass
0.002252	47.60	61.94	14.34	40.2	Pass
0.007728	40.66	60.57	19.91	31.4	Pass
0.010776	41.18	60.00	18.82	30.4	Pass
0.017984	41.33	60.00	18.67	27.6	Pass
0.027826	43.58	60.00	16.42	25.8	Pass

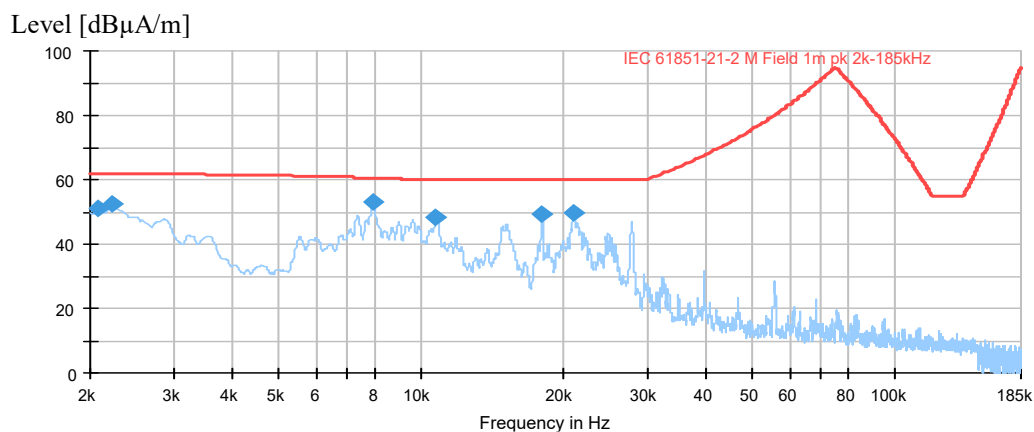
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 50 von 85

Page 50 of 85

Figure 32: Spectral diagram and measurement results, 2 – 185 kHz, Rear side, Mode D+E+F for model AF-DC-240-B



Final measurement results:

Frequency (MHz)	MaxPeak (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Corr. (dB/m)	Pass/Fail
0.002089	50.95	61.98	11.03	40.4	Pass
0.002237	52.59	61.94	9.35	40.2	Pass
0.007905	53.04	60.52	7.48	31.5	Pass
0.010762	48.54	60.00	11.46	30.4	Pass
0.017999	49.13	60.00	10.87	27.6	Pass
0.020988	49.87	60.00	10.13	26.7	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 51 von 85
Page 51 of 85

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission (30 – 1000 MHz)

Result:	Passed
----------------	---------------

Date of testing	: 2024-04-01
Test procedure	: EN IEC 61851-21-2:2021, clause 6.3.5, EN IEC 61000-6-4:2019 and CISPR 16-2-3 (See Note 1)
Frequency range	: 30 – 1000 MHz
Equipment classification	: Class A
Limits	: Table 3 of EN IEC 61000-6-4:2019 and EN IEC 61851-21-2:2021 Table 16 Quasi-peak limits (10 m measurement distance): 30-230 MHz, 40 dB μ V/m; 230-1000 MHz, 47 dB μ V/m
Kind of test site	: Semi-anechoic Chamber
Test distance	: 10 m
Operation mode	: Mode B, C
Test voltage	: AC 400 V, 50 Hz
Ambient condition	: Temperature: 19.6 °C; Relative humidity: 47 %
Expanded measurement uncertainty ($k=2$)	: 4.49 dB

The radiated disturbance was measured in the frequency range from 30 MHz to 1000 MHz according to EN IEC 61000-6-4:2019.

The test setup was made in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 10 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on the turntable. The turntable can be rotated 360° around and the receiving antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in horizontal and vertical polarizations.

The following figures were those measured and recorded by a test receiver. The curves in the figure were those measured with a peak detector. Quasi-peak detector measurement was only performed at those critical frequencies obtained during the test with peak detector. In the Figures, “◆” means Quasi-Peak Value which was measured in final measurement.

Note 1: According to clause 8.2.1 of EN 301 489-1 V2.2.3:2019, this test is only applicable to ancillary equipment not incorporated in the radio equipment and assessed separately from its associated radio equipment. The EUT incorporates 2.4 GHz wireless transmitter and receiver and is not an ancillary equipment. Therefore, this test is only applicable to EN IEC 61000-6-4:2019 standard.

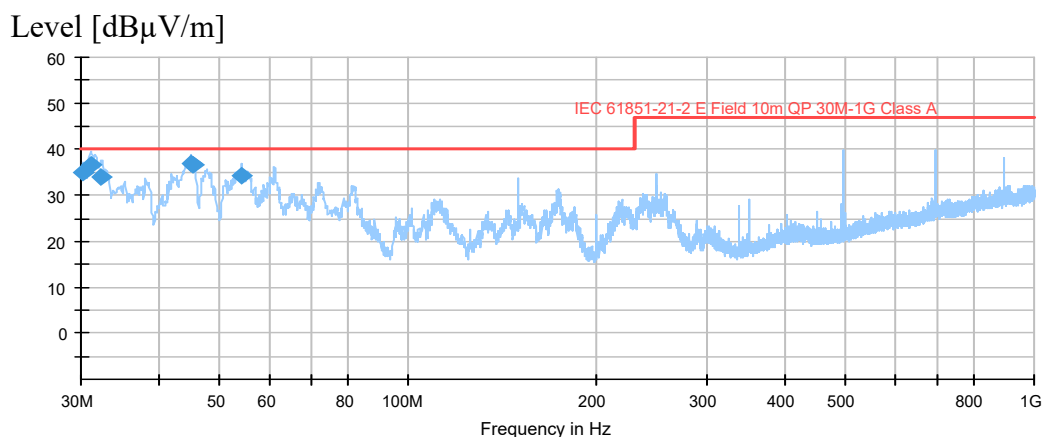
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 52 von 85

Page 52 of 85

Figure 33: Spectral diagram and measurement results, 30-1000 MHz, Mode B, vertical polarization for model AF-DC-240-B



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Pol	Pass/Fail
30.291000	35.04	40.00	4.96	100.0	58.0	15.2	V	Pass
31.067000	36.57	40.00	3.43	100.0	258.0	15.3	V	Pass
32.328000	33.89	40.00	6.11	100.0	245.0	15.3	V	Pass
44.938000	36.80	40.00	3.20	100.0	307.0	16.3	V	Pass
45.326000	36.51	40.00	3.49	100.0	290.0	16.3	V	Pass
54.056000	34.26	40.00	5.74	200.0	275.0	15.9	V	Pass

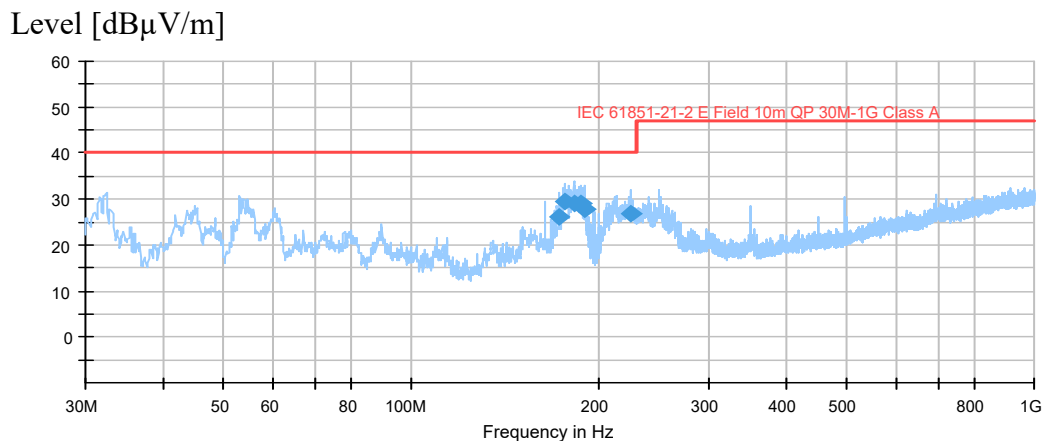
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 53 von 85

Page 53 of 85

Figure 34: Spectral diagram and measurement results, 30-1000 MHz, Mode B, horizontal polarization for model AF-DC-240-B



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Pol	Pass/Fail
172.687000	26.16	40.00	13.84	300.0	50.0	16.9	H	Pass
176.276000	29.52	40.00	10.48	400.0	333.0	16.5	H	Pass
182.484000	29.02	40.00	10.98	400.0	319.0	15.8	H	Pass
187.431000	29.13	40.00	10.87	400.0	322.0	15.2	H	Pass
189.662000	27.82	40.00	12.18	300.0	1.0	15.0	H	Pass
225.164000	26.63	40.00	13.37	400.0	142.0	16.4	H	Pass

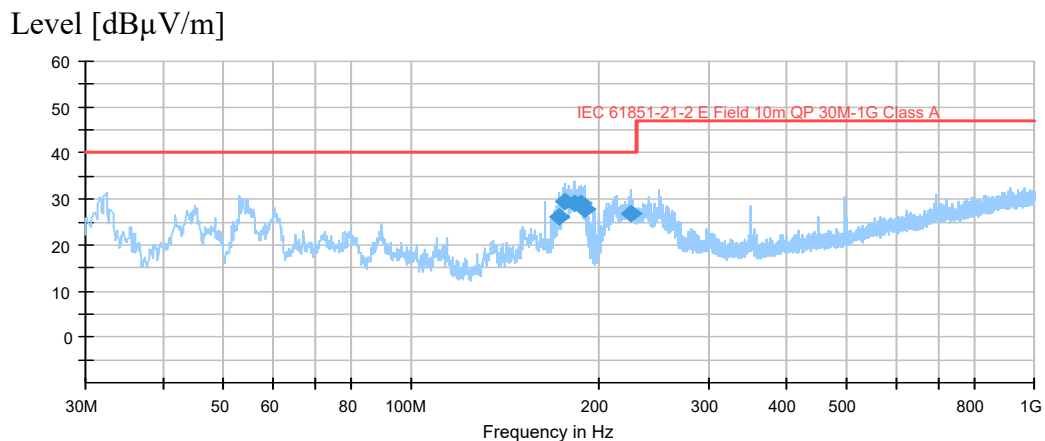
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 54 von 85

Page 54 of 85

Figure 35: Spectral diagram and measurement results, 30-1000 MHz, Mode C, vertical polarization for model AF-DC-240-B



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Pol	Pass/Fail
31.164000	35.79	40.00	4.21	100.0	326.0	15.3	V	Pass
31.746000	36.03	40.00	3.97	100.0	0.0	15.3	V	Pass
44.938000	34.47	40.00	5.53	200.0	317.0	16.3	V	Pass
45.326000	34.31	40.00	5.69	100.0	279.0	16.3	V	Pass
55.996000	31.79	40.00	8.21	100.0	269.0	15.6	V	Pass
61.040000	32.19	40.00	7.81	200.0	164.0	14.9	V	Pass

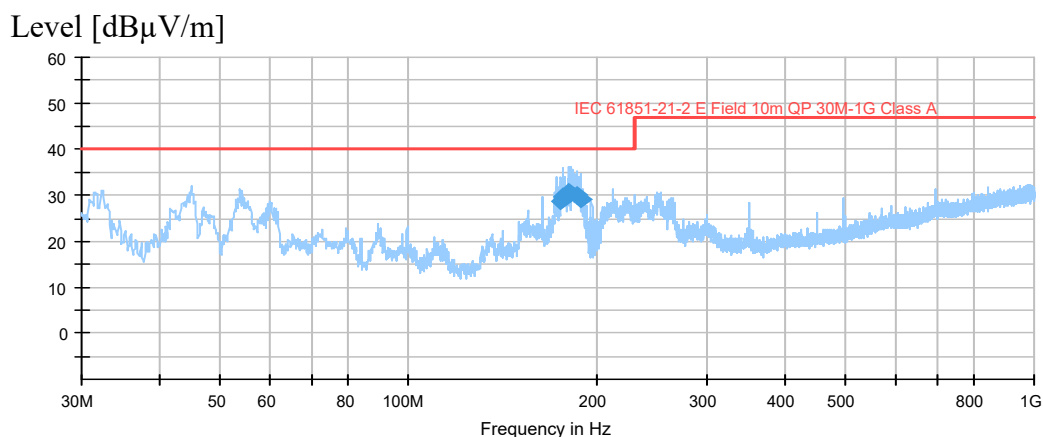
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 55 von 85

Page 55 of 85

Figure 36: Spectral diagram and measurement results, 30-1000 MHz, Mode C, horizontal polarization for model AF-DC-240-B



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Pol	Pass/Fail
175.694000	28.66	40.00	11.34	300.0	358.0	16.6	H	Pass
176.373000	29.57	40.00	10.43	300.0	8.0	16.5	H	Pass
180.835000	30.82	40.00	9.18	300.0	0.0	16.0	H	Pass
181.902000	30.47	40.00	9.53	300.0	333.0	15.9	H	Pass
185.879000	30.15	40.00	9.85	300.0	0.0	15.4	H	Pass
188.401000	29.03	40.00	10.97	300.0	323.0	15.1	H	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 56 von 85
Page 56 of 85

5.2.2 Radiated Disturbance (1 – 6 GHz)

Result:

Passed

Date of testing : 2024-04-01
 Test procedure : EN IEC 61851-21-2:2021, clause 6.3.5 and EN IEC 61000-6-4:2019 Table 3
 Product classification : Class A
 Frequency range : 1 – 6 GHz
 Limits : Table 17 of EN IEC 61851-21-2:2021 and EN IEC 61000-6-4:2019 Table 3
 Peak limits (3 m distance):
 1 - 3 GHz, 76 dB μ V/m; 3 – 6 GHz, 80 dB μ V/m
 Average limits (3 m distance):
 1 – 3 GHz, 56 dB μ V/m; 3 – 6 GHz, 60 dB μ V/m
 Measurement distance : 3 m
 Kind of test site : Fully-anechoic chamber
 Ambient condition : Temperature: 19.6 °C; Relative humidity: 47 %

Test Setup

Input voltage : AC 400 V, 50 Hz (three phases)
 Operational mode : Mode B, C
 Earthing : Via the power cord

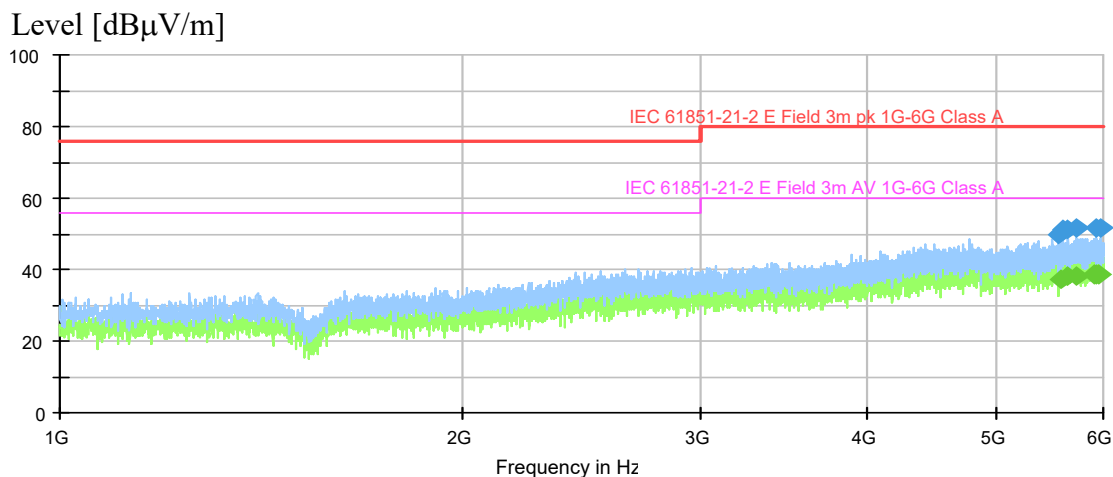
The radiated disturbance test was carried out in a modified semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the fully-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden table, which is 0.8 m high. The wooden table was rotated 360° around and the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, blue “◆” means MaxPeak Value and green “◆” means Average Value which was measured in final measurement.

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 57 von 85
Page 57 of 85

Figure 37: Spectral Diagrams and measurement results, 1 – 6 GHz, Vertical polarization, Mode B



Final measurement results:

Frequency (MHz)	Peak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Corr. (dB/m)	Pol	Pass/Fail
5554.000000	49.73	---	80.00	30.27	300.0	27.5	V	Pass
5590.500000	---	37.40	60.00	22.60	400.0	27.7	V	Pass
5592.000000	51.01	---	80.00	28.99	400.0	27.7	V	Pass
5655.000000	---	37.98	60.00	22.02	200.0	28.1	V	Pass
5655.000000	51.34	---	80.00	28.66	200.0	28.1	V	Pass
5728.000000	---	38.17	60.00	21.83	400.0	28.4	V	Pass
5728.000000	51.60	---	80.00	28.40	400.0	28.4	V	Pass
5916.000000	---	38.67	60.00	21.33	400.0	29.2	V	Pass
5924.000000	51.56	---	80.00	28.44	200.0	29.2	V	Pass
5925.000000	---	38.67	60.00	21.33	400.0	29.2	V	Pass
5946.000000	---	38.48	60.00	21.52	200.0	29.4	V	Pass
5983.000000	51.61	---	80.00	28.39	100.0	29.6	V	Pass

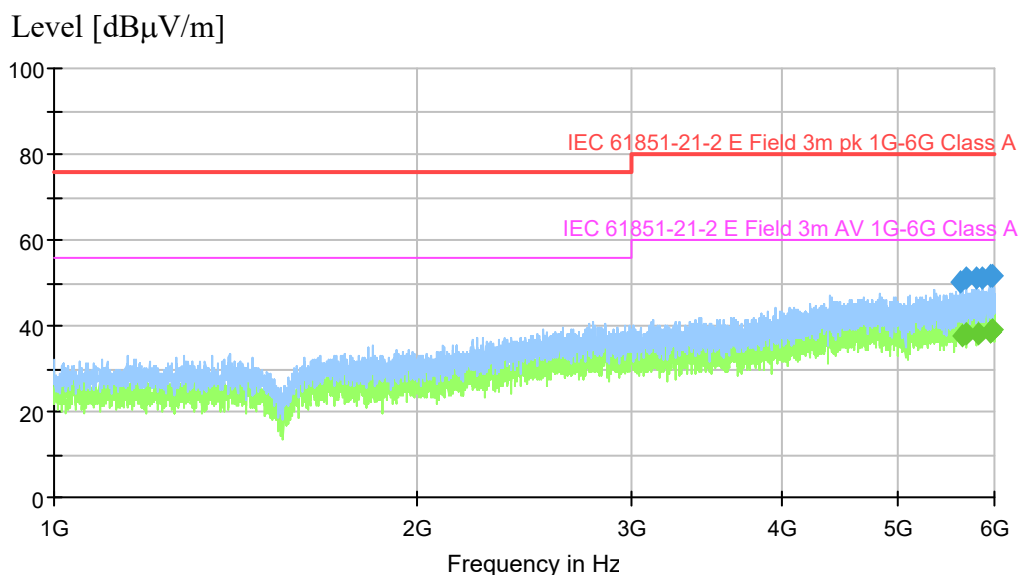
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 58 von 85

Page 58 of 85

Figure 38: Spectral Diagrams and measurement results, 1 – 6 GHz, Horizontal polarization, Mode B



Final measurement results:

Frequency (MHz)	Peak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Corr. (dB/m)	Pol	Pass/Fail
5617.000000	50.40	---	80.00	29.60	100.0	27.9	H	Pass
5644.500000	---	37.78	60.00	22.22	200.0	28.0	H	Pass
5696.500000	---	38.30	60.00	21.70	100.0	28.2	H	Pass
5696.500000	51.18	---	80.00	28.82	100.0	28.2	H	Pass
5805.000000	51.32	---	80.00	28.68	100.0	28.7	H	Pass
5814.500000	---	38.36	60.00	21.64	400.0	28.8	H	Pass
5862.000000	51.22	---	80.00	28.78	200.0	29.0	H	Pass
5943.000000	51.79	---	80.00	28.21	400.0	29.3	H	Pass
5949.500000	---	38.51	60.00	21.49	300.0	29.4	H	Pass
5957.000000	---	38.63	60.00	21.37	100.0	29.4	H	Pass
5975.500000	51.61	---	80.00	28.39	300.0	29.5	H	Pass
5985.000000	---	38.87	60.00	21.13	400.0	29.6	H	Pass

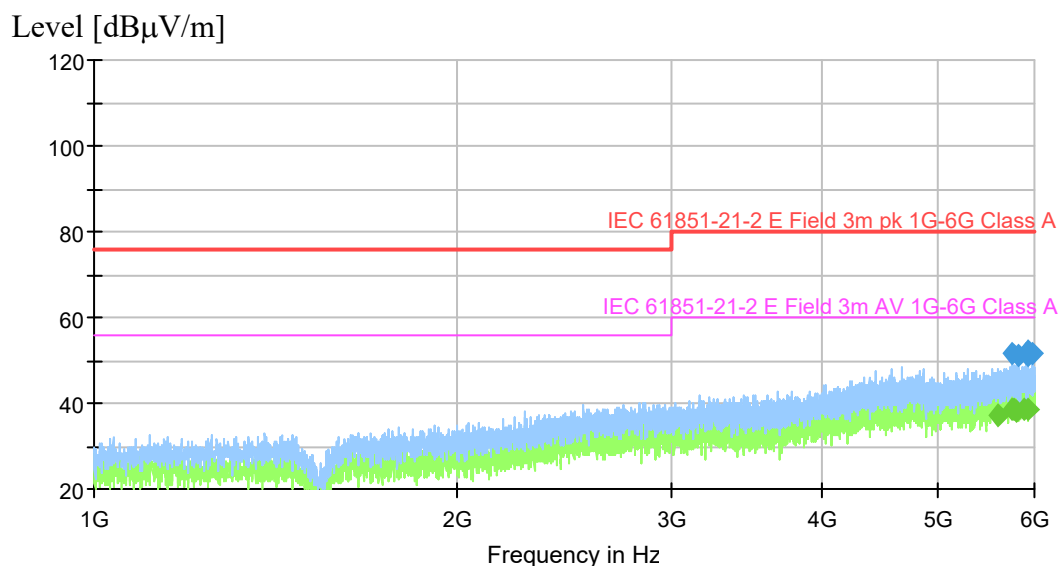
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 59 von 85

Page 59 of 85

Figure 39: Spectral Diagrams and measurement results, 1 – 6 GHz, Vertical polarization, Mode C



Final measurement results:

Frequency (MHz)	Peak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Corr. (dB/m)	Pol	Pass/Fail
5592.000000	---	37.44	60.00	22.56	100.0	27.7	V	Pass
5753.000000	---	38.52	60.00	21.48	200.0	28.5	V	Pass
5753.000000	51.70	---	80.00	28.30	200.0	28.5	V	Pass
5781.000000	---	38.38	60.00	21.62	300.0	28.6	V	Pass
5796.500000	---	38.21	60.00	21.79	300.0	28.7	V	Pass
5816.000000	51.14	---	80.00	28.86	300.0	28.8	V	Pass
5883.000000	---	38.55	60.00	21.45	300.0	29.0	V	Pass
5904.500000	51.52	---	80.00	28.48	100.0	29.1	V	Pass
5927.000000	---	38.65	60.00	21.35	200.0	29.2	V	Pass
5927.000000	51.86	---	80.00	28.14	200.0	29.2	V	Pass
5940.000000	51.33	---	80.00	28.67	100.0	29.3	V	Pass
5981.500000	51.72	---	80.00	28.28	400.0	29.6	V	Pass

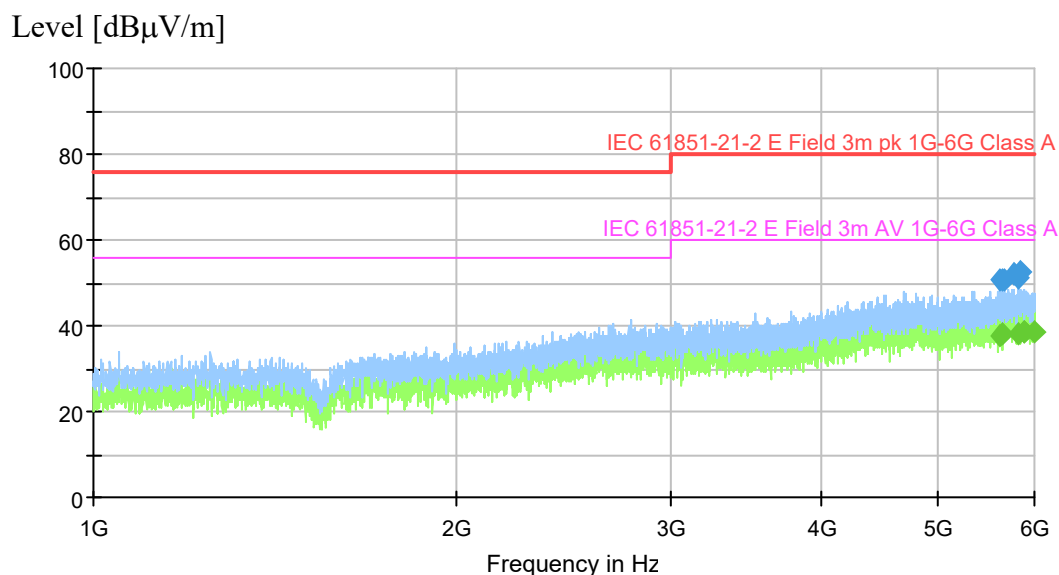
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 60 von 85

Page 60 of 85

Figure 40: Spectral Diagrams and measurement results, 1 – 6 GHz, Horizontal polarization, Mode C



Final measurement results:

Frequency (MHz)	Peak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Corr. (dB/m)	Pol	Pass/Fail
5629.000000	---	37.72	60.00	22.28	100.0	27.9	H	Pass
5629.000000	50.60	---	80.00	29.40	100.0	27.9	H	Pass
5640.500000	50.48	---	80.00	29.52	200.0	28.0	H	Pass
5653.000000	---	38.00	60.00	22.00	300.0	28.0	H	Pass
5665.000000	50.91	---	80.00	29.09	300.0	28.1	H	Pass
5773.500000	52.10	---	80.00	27.90	100.0	28.6	H	Pass
5810.500000	---	38.28	60.00	21.72	400.0	28.7	H	Pass
5811.000000	51.00	---	80.00	29.00	300.0	28.7	H	Pass
5852.000000	52.65	---	80.00	27.35	200.0	28.9	H	Pass
5877.000000	---	38.56	60.00	21.44	400.0	29.0	H	Pass
5890.500000	---	38.67	60.00	21.33	300.0	29.1	H	Pass
5992.500000	---	38.80	60.00	21.20	300.0	29.6	H	Pass

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 61 von 85
Page 61 of 85

5.2.3 Transient emissions

Result:

Passed

Date of testing : 2024-04-01
Test procedure : EN IEC 61851-21-2:2021, Annex D
Operation modes : Mode B, C
Ambient condition : Temperature: 19.6 °C; Relative humidity: 47 %

The radiated disturbance test was carried out in a semi-anechoic chamber. Voltage transients caused by the EUT shall not exceed the limit value in below table. This test is only applicable to DC charging EUTs.

Voltage transient limit and results for mode B:

Measuring point	Between positive (+) and negative (-)	Between positive (+) and ground	Between negative (-) and ground
Limit/dU(+) dU(-)	50 V	50 V	50 V
Results	<50 V	<50 V	<50 V

Voltage transient limit and results for mode C:

Measuring point	Between positive (+) and negative (-)	Between positive (+) and ground	Between negative (-) and ground
Limit/dU(+) dU(-)	50 V	50 V	50 V
Results	<50 V	<50 V	<50 V

6 Test Results I M M U N I T Y

During the immunity tests, the EUT was operated under conditions specified by clause 3.1 of this report.

The particular performance criterion for the immunity tests are as listed in clause 4 of EN IEC 61000-6-2:2019 is listed as follows:

Performance criterion A: The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of those may be derived from the product description and documentation, and from what the user may reasonably expect from apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of those may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

According to EN 301 489-1 V2.2.3:2019 clause 6, following performance criteria apply for the EUT.

6.1 Performance criteria for continuous phenomena

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

6.2 Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 63 von 85

Page 63 of 85

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

According to EN 301 489-3 V2.3.2:2023 clause 6, following performance criteria apply for the EUT.

6.1 Introduction

The performance criteria are used to make an assessment whether a radio equipment passes or fails immunity tests.

Only the performance criteria specified in the present document or in ETSI EN 301 489-1 [1] where referenced shall apply.

The provisions of ETSI EN 301 489-1 [1] clause 6 shall apply, together with clauses 6.2 and 6.3 of the present document.

6.2 Continuous and non-continuous operation

Latency is the time delay between the initiation and the completion of operation of the EUT. Correct functioning requires completing the relevant operation within the maximum latency time.

Where the maximum latency is specified in the applicable harmonised radio standard (in the wanted performance criterion, or an acknowledge requirement), that value shall be used. Where this is not the case, then the maximum latency is that required by the intended use of the EUT.

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 64 von 85

Page 64 of 85

According to EN 301 489-52 V1.2.1:2021 clause 6, following performance criteria apply for the EUT.

6.1 Performance criteria for Continuous phenomena

6.1.1 GSM and voice call

6.1.1.1 Performance criteria for Continuous phenomena applied to Transmitters (CT)

With a link established, during the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

In idle mode, the transmitter shall not operate unintentionally.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link have been maintained.

6.1.1.2 Performance criteria for Continuous phenomena applied to Receivers (CR)

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

In the case of narrow band responses, the procedure in clause 4.4.1 shall be followed.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link have been maintained.

6.1.2 UTRA

In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in clause 5.3.1 of ETSI TS 134 109) is used, it shall not exceed 0.001 during the test sequence;
- if the BLER (as referred in clause 5.3.1 of ETSI TS 134 109) is used, it shall not exceed 0.01 during the test sequence.

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 65 von 85

Page 65 of 85

The BLER calculation shall be based on evaluating the CRC on each transport block. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.1 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.3 E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Standalone NB-IoT

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.2 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.4 NR

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.3 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.2 Performance criteria for Transient phenomena

At the conclusion of each exposure of the transient phenomena, the EUT shall operate without loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended without loss of user control functions or critical stored data.

In addition where the EUT supports idle mode it should be verified that the transmitter shall not unintentionally operate when transient phenomena are applied.

Date of testing: 2024-04-01 ~ 2024-04-02

Room temperature: 21.8 °C

Relative Humidity: 51 %

6.1 Enclosure

6.1.1 Electrostatic Discharge

Result:	Passed
----------------	---------------

The immunity against electrostatic discharge was tested in accordance with EN IEC 61000-6-2:2019. Test setup and ESD-Generator are according to IEC 61000-4-2 which is specified by EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019.

During the test, the EUT was placed on a 0.1 m high insulating support above the ground plane. The minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0.5 m.

The reference ground plane is an aluminium sheet of 0.25 mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2 m x 2 m.

A vertical coupling plane (VCP) of dimensions 0.5 m × 0.5 m is placed parallel to and positioned at a distance of 0.1 m from the EUT.

Basic standard	: IEC 61000-4-2
Test level	: Table 3 of EN IEC 61851-21-2:2021; Table 1 of EN IEC 61000-6-2:2019; EN 301 489-1 V2.2.3:2019, clause 9.3; EN 301 489-3 V2.3.2:2023, clause 7.2; EN 301 489-52 V1.2.1:2021, clause 7.3.1 ±4.0 kV contact discharge; ±2.0 kV, ±4.0 kV, ±8.0 kV air discharge
Polarity	: Positive / Negative
Number of discharges	: 10 at each point
Atm. pressure	: 102.1 kPa
Performance criteria	: B
Operation mode	: Mode A, B+E+F
Test voltage	: AC 400 V, 50 Hz
Ambient condition	: Temperature: 21.8 °C; Relative humidity: 51 %

Table 5: Electrostatic discharge immunity test results

Position	Kind of Discharge	Result	Remarks
Screen	Air discharge	Pass	During and after the test, the EUT can operate as intended.
Gap	Air discharge	Pass	
The surface of the insulated	Air discharge	Pass	
The surface of the conductive	Contact discharge	Pass	
Coupling plane (VCP)	Contact discharge	Pass	

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 67 von 85
Page 67 of 85

6.1.2 Radio Frequency Electromagnetic Field

Result:

Passed

The test was performed inside a fully anechoic chamber. The distance between the tip of the antenna and the side of system tested is 3 m. The field uniformity of the 1.5 m x 1.5 m plane where the surface of the EUT tested coincides with is regularly calibrated to ensure the 0-6 dB field uniformity criterion as specified by IEC 61000-4-3 is met.

The four sides of the system were tested sequentially. The test was performed with the electric field in horizontal and vertical polarizations respectively.

Basic standard : IEC 61000-4-3
Test level : Table 3 of EN IEC 61851-21-2:2021
Table 1 of EN IEC 61000-6-2:2019
80 – 1000 MHz, 10 V/m;
1.4 – 6.0 GHz, 3 V/m;
EN 301 489-1 V2.2.3:2019, clause 9.2;
EN 301 489-3 V2.3.2:2023, clause 7.2;
EN 301 489-52 V1.2.1:2021, clause 7.3.1
80 – 6000 MHz, 3 V/m
Frequency range : 80 MHz – 6 GHz
Modulation : 80 %AM, 1 kHz
Frequency scan speed : Frequency step: 1 %; Dwell time: 3 s
Performance criteria : A
Operation mode : Mode A, B+E+F
Test voltage : AC 400 V, 50 Hz

Table 6: Radiated electromagnetic field test results

Polarization	Position	Result	Remarks
Horizontal	Front side	Pass	During the test, the EUT can operate as intended and the PER is 6.8 %.
	Rear side		
	Left side		
	Right side		
Vertical	Front side	Pass	During the test, the EUT can operate as intended and the PER is 6.8 %.
	Rear side		
	Left side		
	Right side		

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 68 von 85
Page 68 of 85

6.1.3 Power frequency magnetic field

Result:

Passed

The immunity against power frequency magnetic fields were tested in accordance to IEC 61000-4-8 which is specified by EN IEC 61000-6-2:2019.
The EUT is installed on a professional support above the ground plane and was placed in the center of the inductive coil in order to expose the EUT to the test field.

Test procedure : IEC 61000-4-8
Test level : Table 3 of EN IEC 61851-21-2:2021
Table 1 of EN IEC 61000-6-2:2019
100 A/m (EUT current > 32 A)
Field polarization : X, Y, Z
Frequency : 50 Hz / 60 Hz
Performance criteria : A
Operation mode : Mode A, B+E+F
Test voltage : AC 400 V, 50 Hz

Table 7: Power frequency magnetic field test results

Field polarization	Result	Remarks
X	Pass	During and after the test, the EUT can operate as intended.
Y	Pass	
Z	Pass	

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 69 von 85
Page 69 of 85

6.2 Power Ports and Signal Ports

6.2.1 Electrical fast transients and bursts

Result:	Passed
----------------	---------------

Test setup and the fast transient noise generator was according to IEC 61000-4-4 which is specified by EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019.

The EUT is placed on 0.1 m wood support above the reference ground plane. And the minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0.5 m.

For the AC mains port, the disturbance signal was coupled via a CDN in the EFT/B generator.

The length between the coupling device and the EUT is 1 m. The excess length of the cable shall be folded to avoid a flat coil and situated at a distance of 0.1 m above the ground reference plane.

The reference ground plane is an aluminium sheet of 0.25 mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2 m x 2 m.

Basic standard	: IEC 61000-4-4
Test level	: Table 3 of EN IEC 61851-21-2:2021; Table 2, 4 of EN IEC 61000-6-2:2019; EN 301 489-1 V2.2.3:2019, clause 9.4; EN 301 489-3 V2.3.2:2023, clause 7.2; EN 301 489-52 V1.2.1:2021, clause 7.3.1 ±4 kV, 5 kHz for AC input power line ±2 kV, 5 kHz for CPT and signal/control ports
Polarity	: negative/positive
Repetition frequency	: 5 kHz
Test duration	: 2 min./polarity
t_r/t_w	: 5 ns/50 ns
Performance criteria	: B
Operation mode	: Mode A, B+E+F
Test voltage	: AC 400 V, 50 Hz

Table 8: Fast transients immunity test results

Tested cable	Result	Remarks
AC input port	Pass	During the test, the EUT worked as intended and no degradation of performance.
CPT ports	Pass	

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 70 von 85
Page 70 of 85

6.2.2 Conducted disturbances, induced by RF fields

Result:

Passed

Test setup and the test generator were according to IEC 61000-4-6 which is specified by EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019.

The EUT is placed on a ground reference plane and shall be insulated from it by an insulating support 0.1 m thick. And the minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0.5 m.

For the AC power port, the disturbance signal was coupled via a CDN.

The coupling and decoupling networks was placed on the ground reference plane, making direct contact with it at about 0.1-0.3 meter from EUT. The cable between EUT and CDN is as short as possible and not bundled nor wrapped. The height of cable between the EUT and the coupling and decoupling networks above the ground reference plane was 50 mm.

Basic standard	: IEC 61000-4-6
Test level	: Table 3 of EN IEC 61851-21-2:2021 Table 4 of EN IEC 61000-6-2:2019 10 V; EN 301 489-1 V2.2.3:2019, clause 9.4; EN 301 489-3 V2.3.2:2023, clause 7.2; EN 301 489-52 V1.2.1:2021, clause 7.3.1 3 V
Frequency range	: 0.15 – 80 MHz
Modulation	: 80 %AM, 1 kHz
Frequency scan speed	: Frequency step: 1 %; dwell time: 3 s
Performance criteria	: A
Operation mode	: Mode A, B+E+F
Test voltage	: AC 400 V, 50 Hz

Table 9: Conducted disturbances immunity test results

Tested cable	Result	Remarks
AC input port	Pass	During the test, the EUT worked as intended and no degradation of performance. The PER is 8.0 %
CPT ports	Pass	

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 71 von 85

Page 71 of 85

6.2.3 Surges

Result:

Passed

Test setup and the Combination Wave Generator (CWG) was according to IEC 61000-4-5 which is specified by EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019. The EUT is placed on 0.1 m wood table above the ground plane.

For the AC power port, the disturbance signal was coupled via a CDN.

Test procedure : IEC 61000-4-5
 Test level : Table 3 of EN IEC 61851-21-2:2021;
 Table 4 of EN IEC 61000-6-2:2019;
 EN 301 489-1 V2.2.3:2019, clause 9.8;
 EN 301 489-3 V2.3.2:2023, clause 7.2;
 EN 301 489-52 V1.2.1:2021, clause 7.3.1
 ± 0.5 kV, ± 1 kV, ± 2 kV (differential mode)
 ± 0.5 kV, ± 1 kV, ± 2 kV, ± 4 kV (common mode)
 T_r/T_d : 1.2/50 μ s (open-circuit voltage)
 8/20 μ s (short-circuit current)
 Polarity : Positive / Negative
 Pulse number : 5 pulses for each polarity
 Coupling phase : 0°, 90°, 180° and 270°
 Repetition rate : 1 pulse/min
 Performance criteria : B
 Operation mode : Mode A, B+E+F
 Test voltage : AC 400 V, 50 Hz

Table 10: Surge immunity test results

Coupling mode	Result	Remarks
L1-L2, L1-L3, L2-L3	Pass	During and after the test, the EUT can operate as intended.
L1-N, L2-N, L3-N	Pass	
L1-PE, L2-PE, L3-PE, N-PE	Pass	

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 72 von 85

Page 72 of 85

6.2.4 Voltage dips and interruptions to AC Input Power Port

Result:

Passed

The immunity against voltage dips and interruptions to AC input power port was tested in accordance to EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019. Test setup and the test generator was according to IEC 61000-4-34 which is specified by EN IEC 61000-6-2:2019 and EN 301 489-1 V2.2.3:2019.

The EUT was placed directly on the ground plane.

- Basic standard : IEC 61000-4-11
- Test level : Table 3 of EN IEC 61851-21-2:2021
Table 4 of EN IEC 61000-6-2:2019
100 % reduction, 1 T;
100 % reduction, 250 T;
60 % reduction, 10 T;
30 % reduction, 25 T.
EN 301 489-1 V2.2.3:2019, clause 9.7;
EN 301 489-3 V2.3.2:2023, clause 7.2;
EN 301 489-52 V1.2.1:2021, clause 7.3.1
100 % reduction, 0.5 T;
100 % reduction, 1 T;
30 % reduction, 25 T;
0 % reduction, 250 T.
- Performance criteria : B (100 % reduction, 1 T)
C (30 % reduction, 25 T; 60 % reduction, 10 T; 100 % reduction, 250 T)
- Input voltage : AC 400 V, 50 Hz
- Operational mode : Mode A, B+E+F

Table 11: Test condition and test result for voltage dips and short interruptions

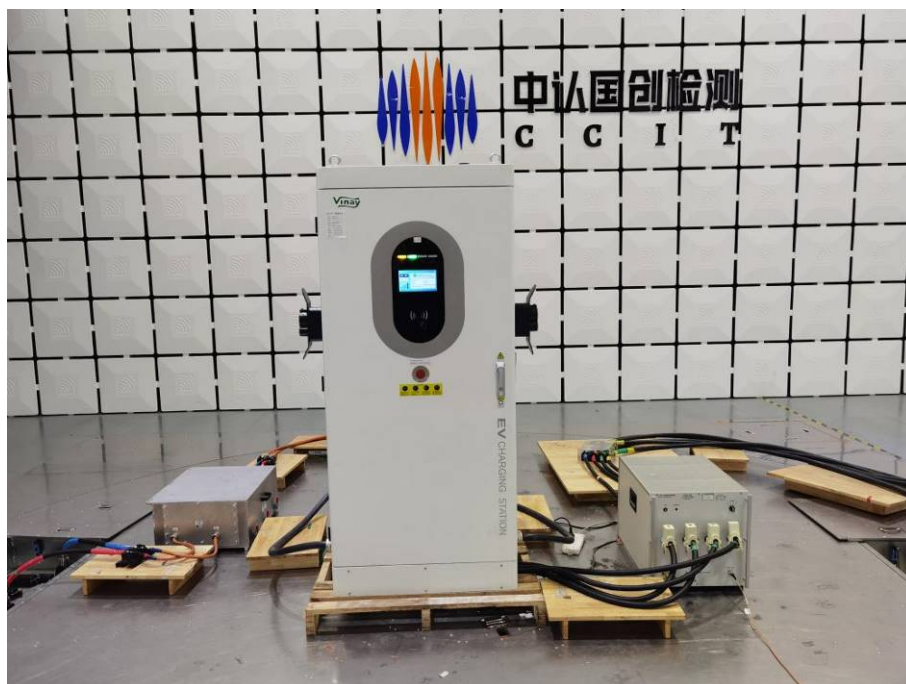
Environmental Phenomena	Test level (in % U_T)	Duration (in period of the rated frequency)	Remarks
Interruptions	0	250 T	During the test, the EUT stopped working. After the test, the EUT was recovered by operator.
Dips	0	1 T	During the test, the EUT can operate as intended.
Dips	40	10 T	During the test, the EUT can operate as intended.
Dips	70	25 T	During the test, the EUT can operate as intended.

7 Photographs of the Test Set-Up

Photograph 1: Set-up for measurement of harmonic currents and voltage fluctuations



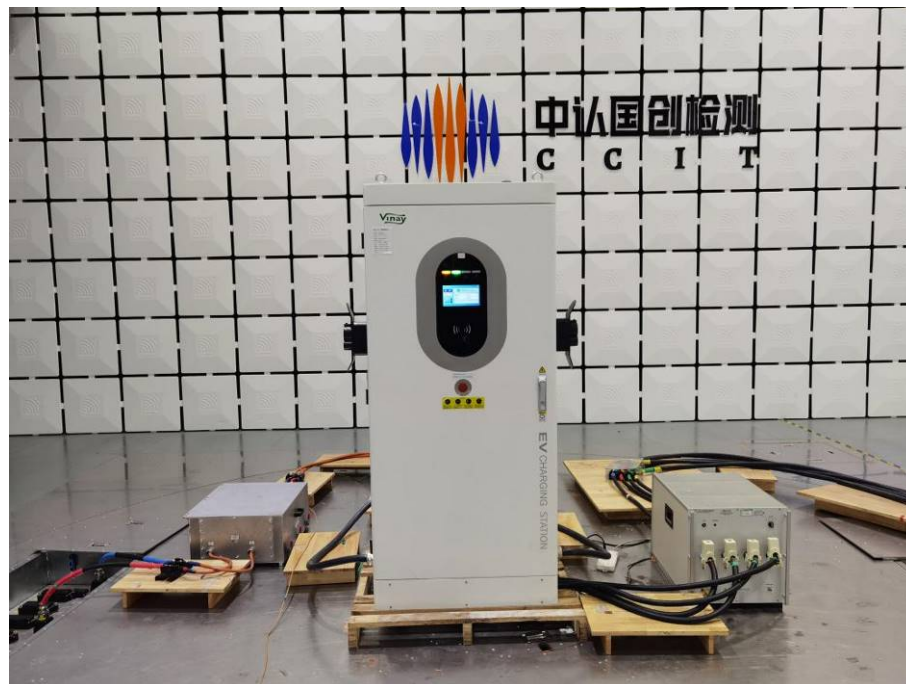
Photograph 2: Set-up for measurement of AC mains disturbance voltage



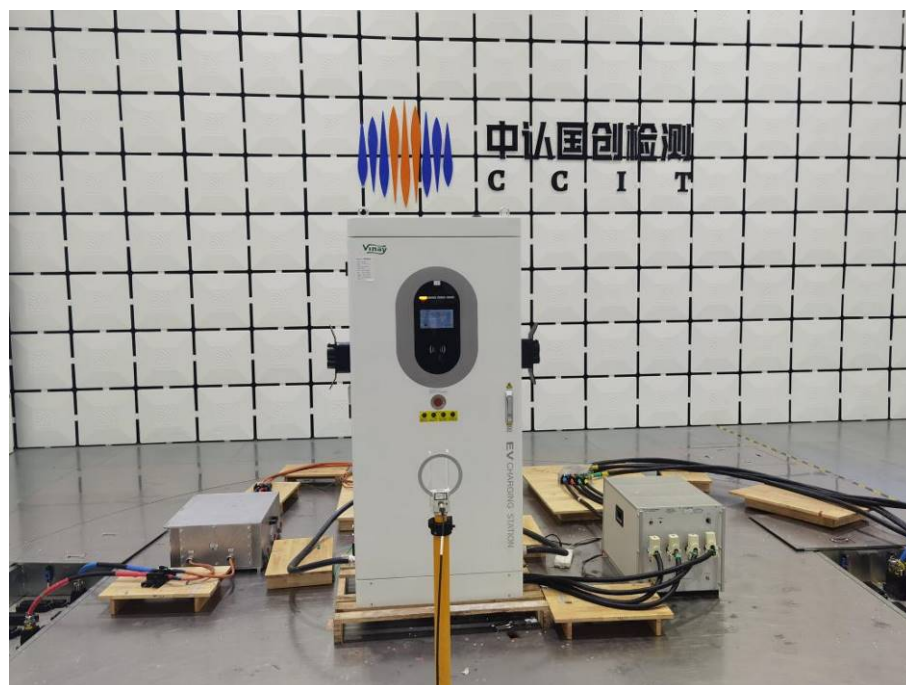
Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 74 von 85
Page 74 of 85

Photograph 3: Set-up for measurement of CPT ports disturbance voltage



Photograph 4: Set-up for measurement of electromagnetic radiated disturbance (2 – 185 kHz)



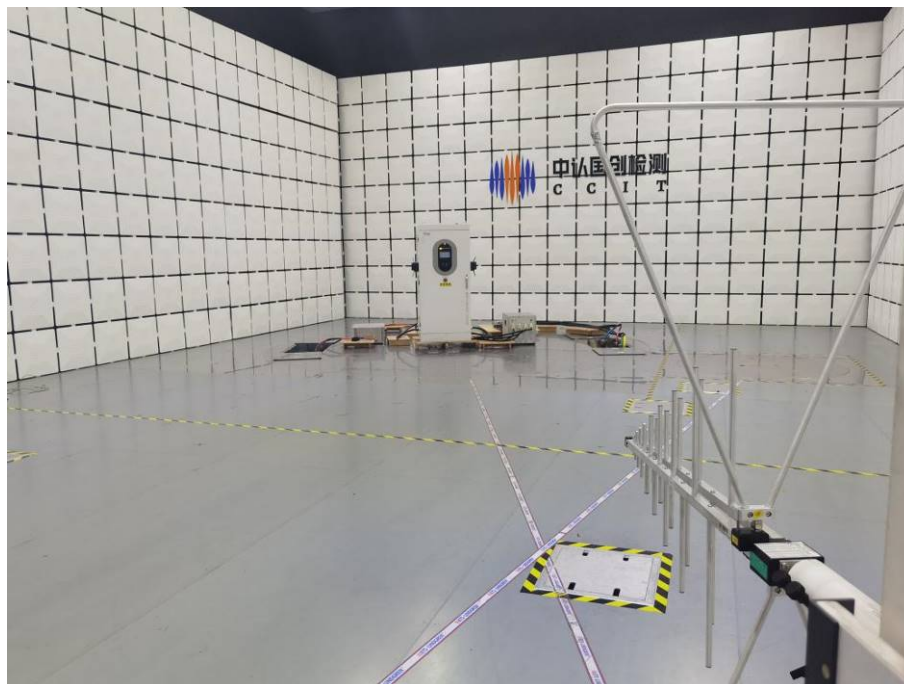
Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

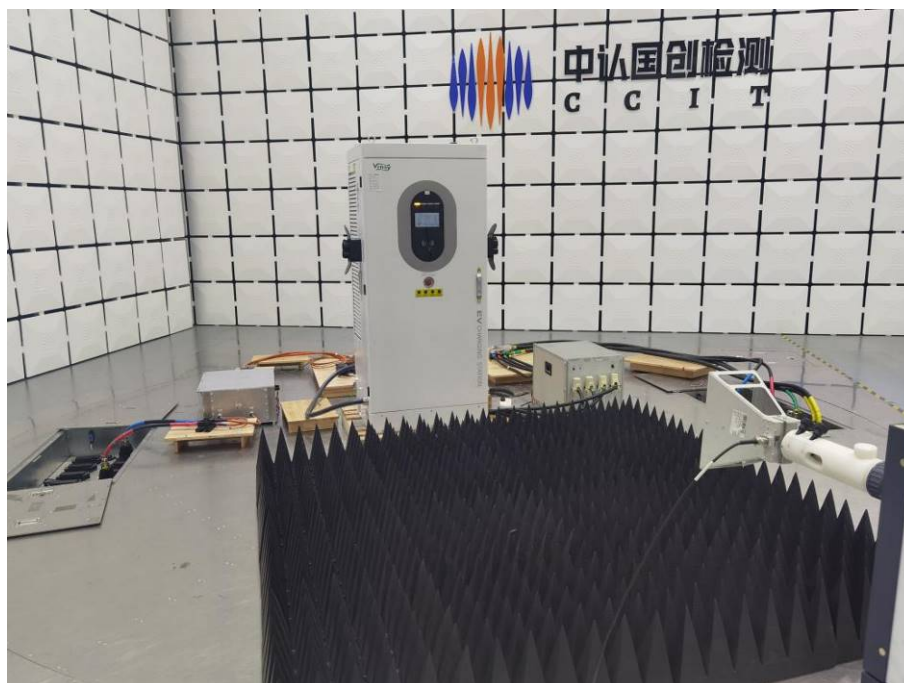
Seite 75 von 85

Page 75 of 85

Photograph 5: Set-up for measurement of RF radiated disturbance (30 – 1000 MHz)



Photograph 6: Set-up for measurement of RF radiated disturbance (1000 – 6000 MHz)



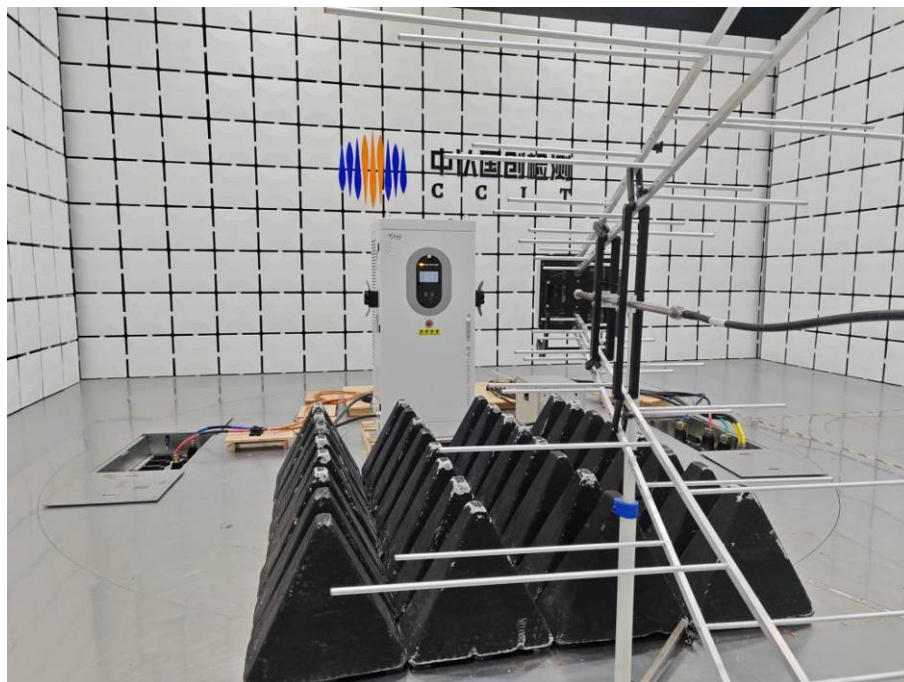
Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 76 von 85
Page 76 of 85

Photograph 7: Set-up for immunity test of ESD



Photograph 8: Set-up for immunity test of radio frequency electromagnetic field



Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 77 von 85

Page 77 of 85

Photograph 9: Set-up for immunity test of power frequency magnetic field



Photograph 10: Set-up for immunity test of fast transients



(AC mains)

Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 78 von 85
Page 78 of 85



(CPT ports)

Photograph 11: Set-up for immunity test of surge



Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 79 von 85

Page 79 of 85

Photograph 12: Set-up for immunity test of injected current



(AC mains)



(CPT ports)

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 80 von 85

Page 80 of 85

Photograph 13: Set-up for immunity test of voltage dips and interruptions



Prüfbericht - Nr.: CN24OHT0 001
Test Report No.:

Seite 81 von 85
Page 81 of 85

8 List of Test and Measurement Instruments

Harmonic currents and voltage fluctuations

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Harmonics & Flicker, Conducted Immunity Test Systems	ProfLine 2145-400	2114A00687	TESEQ	2024.11.13
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
Harmonics & Flicker Test software	Win2106 V2	V2.22.0	TESEQ	/

Conducted disturbances

Equipment	Type	NO.	Manufacturer	Cal.Due Data
EMI Receiver	ESR3	102200	ROHDE&SCHWARZ	2024.12.17
AMN	NNLK 8130	00420	Schwarzbeck	2024.11.13
AN	NNHV 8123-400	00451	Schwarzbeck	2024.07.24
AN	NNHV 8123-400	00452	Schwarzbeck	2024.07.24
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
10-meter law	20.9*13.3*9.1 m ³	NIFTC-EP-266	ETS	2024.11.26
EMI test software	EMC32	V10.60.20	R&S	/

Radiated disturbances (2 kHz to 185 kHz)

Equipment	Type	NO.	Manufacturer	Cal.Due Data
EMI Receiver	ESR7	102440	ROHDE&SCHWARZ	2024.12.17
Loop antenna	FESP 5133-7/41	438	SCHWARZBECK	2024.09.21
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
10-meter law	20.9*13.3*9.1 m ³	NIFTC-EP-266	ETS	2024.11.26
EMI test software	EMC32	V10.60.20	R&S	/

Radiated disturbances (30MHz to 6GHz)

Equipment	Type	NO.	Manufacturer	Cal.Due Data
EMI Receiver	ESR7	102440	ROHDE&SCHWARZ	2024.12.17
Log periodic antenna	VULB 9168	1346	SCHWARZBECK	2024.09.15
Horn antenna	BBHA 9120 D	2530	SCHWARZBECK	2024.09.15
Preamplifier	BBV 9744	9744-0233	SCHWARZBECK	2025.02.21
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 82 von 85

Page 82 of 85

200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
10-meter law	20.9*13.3*9.1 m ³	NIFTC-EP-266	ETS	2024.11.26
EMI test software	EMC32	V10.60.20	R&S	/

ESD

Equipment	Type	NO.	Manufacturer	Cal.Due Data
ESD Simulator	NSG 437	1717	TESEQ	2025.02.21
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24

Radio frequency electromagnetic field

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Signal sources	NSG 6000 - RACK	63885	TESEQ	2024.06.29
Log Periodic Antenna	STLP 9129 7/16	3034	Schwarzbeck/D E	/
Directional coupler	BDC 1060-40/500	2026882-09	TESEQ	/
Directional coupler	BDC 0810-50/2500	2027254-03	TESEQ	/
Power amplifier	CBA 1G-1200D-10	1092148	TESEQ	2024.06.05
Power amplifier	CBA 6G-200D-10	1092151	TESEQ	2024.06.05
Power Probe	PM 6006	80279	TESEQ	2024.10.19
Power Probe	PM 6006	80282	TESEQ	2024.10.19
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
10-meter law SAC	20.9*13.3*9.1 m ³	NIFTC-EP-266	ETS	2024.11.26
RS Test Software	Compliance Immunity 6	V6.01.2 Build 2	AMETEK	/

Power frequency magnetic field

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Multifunctional Test Generator for Transients	Compact NX7 bspt-1-400-16	P2133255790	EMTEST	2024.12.17
Autotransformer	Variac NX1-260-16	P2134256002	EMTEST	2024.12.17
Current transformer	MFT 100-230	P2109249201	EMTEST	2024.12.17
Inductive coil	MFC 1000.1	P2133255879	EMTEST	2024.12.17
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24

EFT

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Multifunctional Test Generator for Transients	Compact NX7 bspt-1-400-16	P2133255790	EMTEST	2024.12.17

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 83 von 85

Page 83 of 85

CDN	Coupling NX7 bsr-3-690-200.5	P2111249888	EMTEST	2024.12.17
Capacitive Coupling Clamp	CCI	P2129254664	EMTEST	2024.12.17
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24

Surge

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Multifunctional Test Generator for Transients	compact NX7 bspt-1-400-16	P2133255790	EMTEST	2024.12.17
CDN	coupling NX7 bsr-3-690-200.5	P2111249888	EMTEST	2024.12.17
Oscilloscope	MDO4054C	C015958	Tektronix	2024.10.25
High pressure differential probe	THDP0100	C031650	Tektronix	2025.03.20
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24

Injected current

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Test System for Conducted and Radiated Immunity	NSG 4070C-80	60962	TESEQ	2025.01.08
Attenuator	ATN 6150	21032902	TESEQ	2025.01.08
CDN	CDN M5-100- 750VS	60593	TESEQ	2025.01.08
Current injection Probe	CIP 9136A	60092	TESEQ	2025.01.08
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
CS Test Software	ICD.CONTROL	V7.0.4	TESEQ	/

Voltage dips and interruptions

Equipment	Type	NO.	Manufacturer	Cal.Due Data
Harmonics & Flicker, Conducted Immunity Test Systems	ProfLine 2145- 400	2114A00687	TESEQ	2024.11.13
200kW DC load	BDCT-10200M	93H006850	Qunling	2024.07.24
200kW DC load	BDCT-10200M	93H006851	Qunling	2024.07.24
DIPS Test Software	IEC.CONTROL	V10.2.0	TESEQ	/

9 List of Tables

Table 1: Harmonic currents measurement result, Phase A for model AF-DC-30-B	11
Table 2: Harmonic currents measurement result, Phase B for model AF-DC-30-B	12
Table 3: Harmonic currents measurement result, Phase C for model AF-DC-30-B	13
Table 4: Voltage fluctuations and flicker measurement results for model AF-DC-30-B	14
Table 5: Electrostatic discharge immunity test results	66
Table 6: Radiated electromagnetic field test results	67
Table 7: Power frequency magnetic field test results	68
Table 8: Fast transients immunity test results	69
Table 9: Conducted disturbances immunity test results	70
Table 10: Surge immunity test results	71
Table 11: Test condition and test result for voltage dips and short interruptions	72

10 List of Figures

Figure 1: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L1 for model AF-DC-240-B	16
Figure 2: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L2 for model AF-DC-240-B	17
Figure 3: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line L3 for model AF-DC-240-B	18
Figure 4: Spectral diagram and measurement results of conducted emission, AC mains port, mode B+E+F, line N for model AF-DC-240-B	19
Figure 5: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L1 for model AF-DC-240-B	20
Figure 6: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L2 for model AF-DC-240-B	21
Figure 7: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line L3 for model AF-DC-240-B	22
Figure 8: Spectral diagram and measurement results of conducted emission, AC mains port, mode C+E+F, line N for model AF-DC-240-B	23
Figure 9: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-240-B	25
Figure 10: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-240-B	26
Figure 11: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-240-B	27
Figure 12: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-240-B	28
Figure 13: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-240-B	29
Figure 14: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-240-B	30
Figure 15: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-240-B	31
Figure 16: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-240-B	32
Figure 17: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-30-B	33
Figure 18: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-30-B	34
Figure 19: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-30-B	35

Prüfbericht - Nr.: CN24OHT0 001

Test Report No.:

Seite 85 von 85

Page 85 of 85

Figure 20: Spectral diagram, Disturbance voltage, CPT1 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-30-B.....	36
Figure 21: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode B+E+F for model AF-DC-30-B.....	37
Figure 22: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode B+E+F for model AF-DC-30-B.....	38
Figure 23: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Positive, Mode D+E+F for model AF-DC-30-B.....	39
Figure 24: Spectral diagram, Disturbance voltage, CPT2 port, 150 kHz – 30 MHz, Negative, Mode D+E+F for model AF-DC-30-B.....	40
Figure 25: Spectral diagram and measurement results, 2 – 185 kHz, Front side, Mode B+E+F for model AF-DC-240-B.....	43
Figure 26: Spectral diagram and measurement results, 2 – 185 kHz, Right side, Mode B+E+F for model AF-DC-240-B.....	44
Figure 27: Spectral diagram and measurement results, 2 – 185 kHz, Left side, Mode B+E+F for model AF-DC-240-B.....	45
Figure 28: Spectral diagram and measurement results, 2 – 185 kHz, Rear side, Mode B+E+F for model AF-DC-240-B.....	46
Figure 29: Spectral diagram and measurement results, 2 – 185 kHz, Front side, Mode D+E+F for model AF-DC-240-B.....	47
Figure 30: Spectral diagram and measurement results, 2 – 185 kHz, Right side, Mode D+E+F for model AF-DC-240-B.....	48
Figure 31: Spectral diagram and measurement results, 2 – 185 kHz, Left side, Mode D+E+F for model AF-DC-240-B.....	49
Figure 32: Spectral diagram and measurement results, 2 – 185 kHz, Rear side, Mode D+E+F for model AF-DC-240-B.....	50
Figure 33: Spectral diagram and measurement results, 30-1000 MHz, Mode B, vertical polarization for model AF-DC-240-B.....	52
Figure 34: Spectral diagram and measurement results, 30-1000 MHz, Mode B, horizontal polarization for model AF-DC-240-B.....	53
Figure 35: Spectral diagram and measurement results, 30-1000 MHz, Mode C, vertical polarization for model AF-DC-240-B.....	54
Figure 36: Spectral diagram and measurement results, 30-1000 MHz, Mode C, horizontal polarization for model AF-DC-240-B.....	55
Figure 37: Spectral Diagrams and measurement results, 1 – 6 GHz, Vertical polarization, Mode B.....	57
Figure 38: Spectral Diagrams and measurement results, 1 – 6 GHz, Horizontal polarization, Mode B.....	58
Figure 39: Spectral Diagrams and measurement results, 1 – 6 GHz, Vertical polarization, Mode C.....	59
Figure 40: Spectral Diagrams and measurement results, 1 – 6 GHz, Horizontal polarization, Mode C.....	60

11 List of Photographs

Photograph 1: Set-up for measurement of harmonic currents and voltage fluctuations.....	73
Photograph 2: Set-up for measurement of AC mains disturbance voltage.....	73
Photograph 3: Set-up for measurement of CPT ports disturbance voltage.....	74
Photograph 4: Set-up for measurement of electromagnetic radiated disturbance (2 – 185 kHz).....	74
Photograph 5: Set-up for measurement of RF radiated disturbance (30 – 1000 MHz).....	75
Photograph 6: Set-up for measurement of RF radiated disturbance (1000 – 6000 MHz).....	75
Photograph 7: Set-up for immunity test of ESD.....	76
Photograph 8: Set-up for immunity test of radio frequency electromagnetic field.....	76
Photograph 9: Set-up for immunity test of power frequency magnetic field.....	77
Photograph 10: Set-up for immunity test of fast transients.....	77
Photograph 11: Set-up for immunity test of surge.....	78
Photograph 12: Set-up for immunity test of injected current.....	79
Photograph 13: Set-up for immunity test of voltage dips and interruptions.....	80

End of Test Report