

TEST REPORT



Test Report No.: 1-6184_23-01-11_TR1-R01

Deutsche
Akkreditierungsstelle
D-PL-12047-01-00

BNetzA-CAB-02/21-102

Testing Laboratory

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The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12047-01-00.

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Manufacturer

same as applicant

Test Standard/s

FCC - Title 47 CFR Radiofrequency radiation exposure limits
Chapter I - Subchapter
I §1.1310

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	Terminal
Device type:	fixed device
Model name:	LL300
S/N serial number:	prototype
FCC-ID:	TCN025
Hardware status:	SLS-40
Frequency:	RFID 13.56 MHz
Antenna:	integrated antenna
Power Supply:	6 V DC by battery
Test sample status:	identical prototype
Exposure category:	general population / uncontrolled environment

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test Report authorised:

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Test performed:

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. cetecom advanced GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of cetecom advanced GmbH.

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2.2 Application details

Date of receipt of order:	2023-08-01
Date of receipt of test item:	2024-03-18
Start of test:	2024-03-21
End of test:	2024-03-21

2.3 Statement of compliance

The EMF values found for the LL300 Terminal are below the maximum allowed levels according to the standards listed in section 3.

3 Test standard/s:

Test Standard	Version	Test Standard Description
FCC - Title 47 CFR Chapter I - Subchapter I §1.1310	04.06.2013	Radiofrequency radiation exposure limits

3.1 RF exposure limits

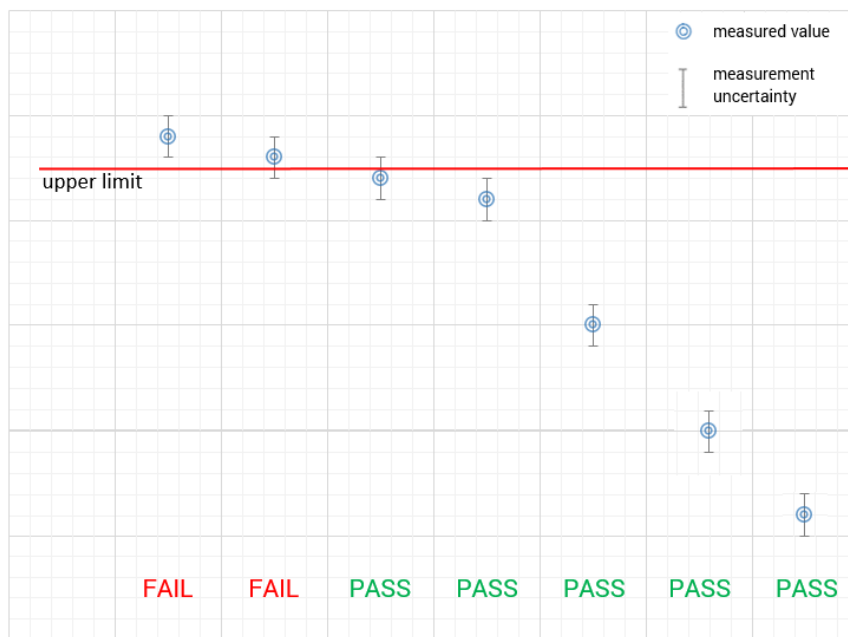
Reference levels for general public (uncontrolled environment) exposure to time-varying electric and magnetic fields

According to: CFR47, Subpart I - §1.1310 Radiofrequency radiation exposure limits				
Frequency Range (MHz)	Electric Field (V/m)	Magnetic Field (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
Occupational / Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/ f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100000	--	--	5	6
General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100000	--	--	1.0	30

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."

measured value, measurement uncertainty, verdict



5 Summary of Measurement Results

<input checked="" type="checkbox"/>	No deviations from the technical specifications ascertained
<input type="checkbox"/>	Deviations from the technical specifications ascertained

At the customer declared safety distance of **20 cm** from the human body to the antenna, the exposure from the EUT is below the legal limitations, while RFID scanning.

6 Test Environment

Ambient temperature:	20 – 24 °C
Relative humidity content:	40 – 50 %
Air pressure:	not relevant for this kind of testing
Power supply:	230 V / 50 Hz

7 Test Set-up

7.1 Measurement system

7.1.1 Broadband Electromagnetic Field Test system



A state of the art Broadband Electromagnetic Field Test system was used. The probes of the system are fitted with three sensors which measure the field strength of the X, Y and Z plane directions separately. The field strength is calculated by the instrument's processor by summing the squares of the three measured values.

The frequency range 5 Hz to 60 GHz is covered.

Depending on the used probe type Electric and Magnetic Field or Electric Field only is detectable.

- | | | |
|----------------------------|-------------------|-----------------------------|
| • EHP-50D | 5 Hz to 100 kHz | Electric and Magnetic Field |
| • EHP-50F | 5 Hz to 400 kHz | Electric and Magnetic Field |
| • HF 3061 | 300 kHz to 30 MHz | Magnetic Field |
| • EF 0691 | 100 kHz to 6 GHz | Electric Field |
| • EF 6092 | 100 MHz to 60 GHz | Electric Field |
| • ELT 400 3cm ² | 1 Hz to 400 kHz | Magnetic Field |

7.1.2 Test equipment list

	Manufacturer	Device	Type	Serial number	Last Calibration	Calibration cycle (months)
<input checked="" type="checkbox"/>	Narda	Electric and Magnetic Field Meter	NBM-550	F-0319	2023-04-12	24
<input checked="" type="checkbox"/>	Narda	Electric Field Probe (100 kHz - 6 GHz)	EF 0691	G-0027	2023-04-12	24
<input checked="" type="checkbox"/>	Narda	Magnetic Field Probe (300 kHz to 30 MHz)	HF 3061	D-0404	2023-04-12	24

Devices used during the test

Devices not used during the test

7.1.3 Averaging

For time efficient testing an average of 8 seconds was used. With some spot checks was verified, that caused by the time structure of the measured responses, the results did not change with a 30-minute-averaging.

7.1.4 Uncertainties

The probe uncertainties stated by the manufacturer are considered to be the main relevant and dominant issues.

7.1.4.1 Typical uncertainty of HF3061

Flatness of frequency response ^(a) Calibration uncertainty not included	0/-1 dB (500 to 800 kHz) +0.1/ -0.5 dB (800 kHz to 30 MHz)	
Calibration uncertainty ^(b) @ 0.59 mW/cm ² (0.125 A/m)	1.3 dB	
Linearity Referred to 0.59 mW/cm ² (0.125 A/m)	±3 dB (0.017 to 0.033 A/m) ±1 dB (0.033 to 0.068 A/m) ±0.5 dB (0.068 to 3 A/m) ±1 dB (3 to 16 A/m)	±3 dB (10 to 40 μW/cm ²) ±1 dB (40 to 175 μW/cm ²) ±0.5 dB (175 μW/cm ² to 340 mW/cm ²) ±1 dB (0.34 to 10 W/cm ²)
Isotropic response ^(c)	±1 dB	
Temperature response	+0.2/ -0.8 dB (±0.025 dB/K @ 10 to 50 °C)	

(a) Frequency response can be compensated for by the use of correction factors stored in the probe memory

(b) Accuracy of the fields generated to calibrate the probes

(c) Uncertainty due to varying polarization (verified by type approval test for meter with probe). Ellipse ratio included and calibrated for each probe

7.1.4.2 Typical uncertainty of EF0691

Flatness of frequency response ^(a) Calibration uncertainty not included	±1.0 dB (1 MHz to 4 GHz) ±1.5 dB (0.3 MHz to 5 GHz) -2.5 dB typ. @ 0.15 MHz	
Calibration uncertainty ^(b) @ 0.2 mW/cm ² (27.5 V/m)	0.8 dB (≤ 300 MHz) 1.5 dB (300 MHz to 1.2 GHz) 1.3 dB (≥ 1.2 GHz)	
Linearity Referred to 0.2 mW/cm ² (27.5 V/m)	±0.5 dB (2.2 to 316 V/m)	±0.5 dB (0.0013 to 26.5 mW/cm ²)
Isotropic response ^(c)	±1 dB	
Temperature response	+0.2/ -1 dB (0 °C to 50 °C, related to 23 °C)	

(a) Frequency response can be compensated for by the use of correction factors stored in the probe memory

(b) Accuracy of the fields generated to calibrate the probes

(c) Uncertainty due to varying polarization (verified by type approval test for meter with probe). Ellipse ratio included and calibrated for each probe

7.1.5 Validation procedure

Before performing the tests the empty test chamber was checked for system immanent frequency responses. The following background signal level was detected. All levels are small enough to allow accurate proof of the limits to be considered.

Probe	Frequency Range	Magnetic Flux Density (B) in μT	Magnetical Field Strength in A/m	Electrical Field Strength in V/m	Remark
HF 3061	300 kHz – 30 MHz	0.0016	0.0013	--	
EF 0691	100 kHz – 6 GHz	--	--	0.15	

7.1.6 Definition of test position and distances

In absence of an equipment specific regulation with given test distances, all not further noted test positions were measured in “touched” mode, the probe radome touching the DUT at the defined test position. Due to the mechanical concept of the used probe a distance between DUT surface and electrical centre of the probe antennas remains.

Probe type	Maximum distance (cm)	
	Magnetic Field	Electrical Field
HF 3061	5.5	--
EF 0691	--	3.5

7.1.7 Anisotrophical probe behaviour management

As EMF measurements for safety and health aspects are often performed in the nearfield of a radiation source it is important to be aware of the not ideal isotropic performance of a typical probe and how to reproduce reliable results.

During measurements the following steps are performed to get always the highest possible field strength result and validate that the measured results are always the worst case scenario with the highest energy emitted by the source.

- Step 1: Finding the position of the highest radiated field source with a basic probe orientation.
- Step 2: Turning the probe to all possible orientations to find the orientation that delivers the maximum field strength.

7.2 Test results

For considering worst-case conditions all measurements were performed at smallest possible distance from the device under test. Limits shown in the tables below are the lowest ones within the wideband frequency ranges of the field probes applied.

Test positions see photo documentation (Annex A).

During the measurements the DUT was switched on in permanent scanning mode.

RFID 13.56 MHz							
test position	distance (cm)	H (A/m)	Limit (A/m)	Probe	E (V/m)	Limit (V/m)	Probe
front	20*	0.054	0.161	HF3061	1.55	60.77	EF0691
Other sides	20*	<0.035	0.161		<1.82	60.77	

Table 1: Test results E-/ H-f@13.56 MHz RFID

*) measured to the centre of the probe

7.3 Final verdict

At the customer declared safety distance of **20 cm** from the human body to the antenna, the exposure from the EUT is below the legal limitations, while RFID scanning.

Annex A: Photo documentation

Photo 1: EUT - Front side + RFID card



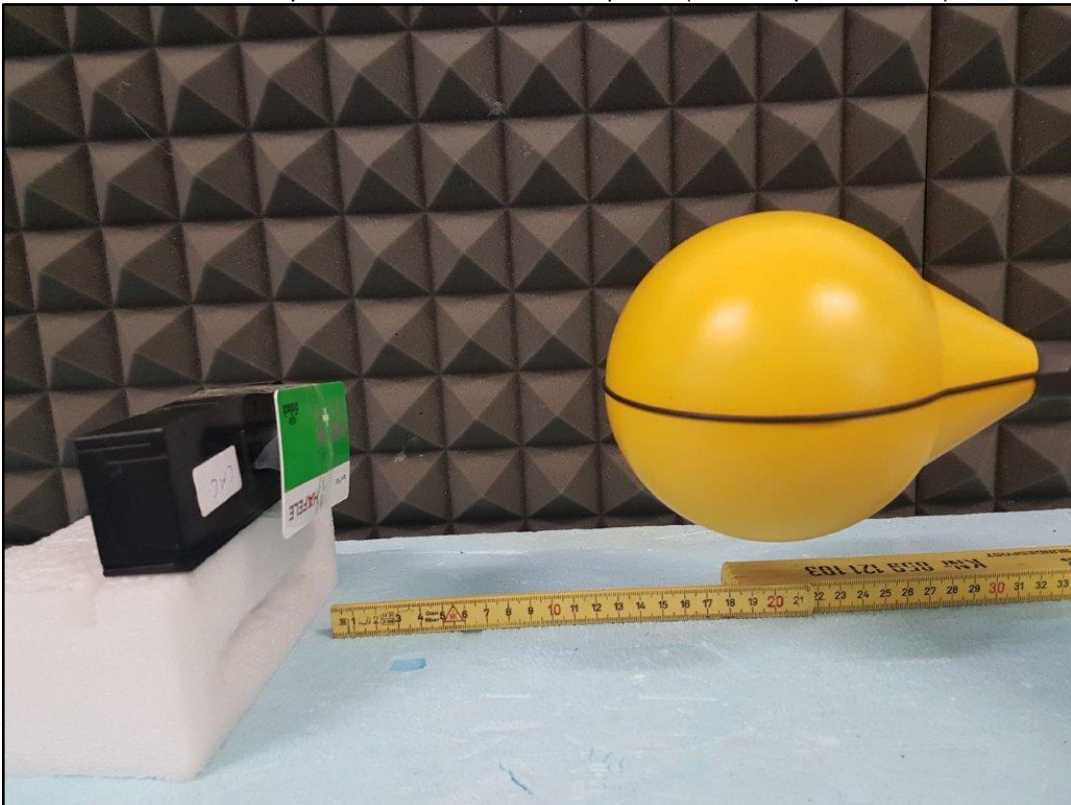
Photo 2: EUT - Left side view



Photo 3: EUT - Bottom side view



Photo 4: Test position front with HF3061 probe (20cm to probe centre)



Annex B: Document History

Version	Applied Changes	Date of Release
	Initial Release	2024-04-03

Annex C: Further Information

Glossary

DUT	-	Device under Test
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software