
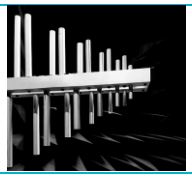
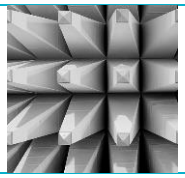

CTC advanced
member of RWTÜV group

TEST REPORT

Test Report No.: 1-9990/20-01-02

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing Laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken/Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Test Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

Applicant

etatronix GmbH
Werschweilerstrasse 40
66606 St. Wendel/GERMANY

Contact: Dominik Huwig
e-mail: dominik.huwig@etatronix.de
Phone: +49 6851 90 74 27 1
Fax: +49 6851 90 74 27 9

Manufacturer

etatronix GmbH
Werschweilerstrasse 40
66606 St. Wendel/GERMANY

Test Standard/s

FCC - Title 47 CFR Chapter I - Subchapter I §1.1310	Radiofrequency radiation exposure limits.
FCC KDB 680106 D01 Exposure Wireless Charging Apps v03	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications

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

Test Item

Kind of test item:	wireless charger
Device type:	module
Model name:	**consisting of transmitter (81909005) and receiver (81909004)**
FCC-ID:	2AOR81909004
Frequency:	111 - 149 kHz
Antenna:	Integrated antenna
DC supply:	24V
Auxiliary equipment:	USB Power Delivery - Tester PM110 (load)
Test sample status:	identical prototype
Exposure category:	general population / uncontrolled environment

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

Test Report authorised:

Thomas Vogler
DN: cn=Thomas Vogler, o=CTC advanced GmbH, ou=VOG-161125, email=thomas.vogler@ctcadvanced.com, c=DE
Datum: 2020.02.18 13:54:37 +01'00'

Thomas Vogler
Lab Manager
Radio Communications

Test performed:

Marco Scigliano
cn=Marco Scigliano, o=CTC advanced GmbH, ou=SCI-161125, email=marco.scigliano@ctcadvanced.com, c=DE
2020.02.18 13:52:44 +01'00'

Marco Scigliano
Testing Manager
Radio Communications

1 Table of contents

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. CTC 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 CTC advanced GmbH.
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.
All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH.
In no case this test report can be considered as a Letter of Approval.

2.2 Application details

Date of receipt of order:	2020-02-04
Date of receipt of test item:	2020-02-04
Start of test:	2020-02-04
End of test:	2020-02-04
Person(s) present during the test:	Mr. Huwig Mr. Saulheimer

2.3 Statement of compliance

The EMF values found for the consisting of transmitter (81909005) and receiver (81909004) wireless charger are below the maximum allowed levels according to the standards listed in section 3.

2.4 Technical details

Wireless charging module consisting of:

- Transmitter model name 81909005
- Receiver model name 81909004

Frequency:	111 - 149 kHz
Output power:	13.5W
Distance between Tx and Rx:	1cm
Input voltage:	24V

2.5 Auxiliary equipment

USB Power Delivery Tester
www.passmark.com
Model: PM110
(Hardware Revision 001)

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.
FCC KDB 680106 D01 Exposure Wireless Charging Apps v03	04.09.2018	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications

3.1 RF exposure limits

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

According to **FCC KDB 680106 D01 Paragraph 3 RF Exposure Requirements clause 3** the Emission-Limits in the frequency range from 100 to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of **CFR 47 – Section 1.310** as following (measurement distance shall be 20cm from the center of the probe to the top side and 15cm from the center of the probe to the edge of the device):

	E-field	H-field	B-field
Frequency	V / m	A/m	µT
0.3 – 3.0 MHz	**614**	**1.63**	2.0
0.3 – 3.0 MHz***** (50% criteria)	**307**	**0.815**	1.0

*) **FCC KDB 680106 D01 Paragraph 5b(6)** demands, that the aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit (1.6A/m) which results in an H-Field limit of 0.815 A/m. A device that complies with the 50% criteria is deemed to comply, without any further investigation through the FCC.

4 Summary of Measurement Results

☒	**No deviations from the technical specifications ascertained**
☐	Deviations from the technical specifications ascertained

The following safety distances from the human body to the module are required for bystanders when the device is used for wireless charging.

Side	Safety Distance [cm]
Top	20
Side 1	15
Side 2	15
Side 3	15
Side 4	15

5 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

6 Test Set-up

6.1 Measurement system

6.1.1 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

6.1.2 Test equipment list

	Manufacturer	Device	Type	Serial number	Last Calibration
☐	Narda	Electric and Magnetic Field Meter	NBM-550	F-0319	2019-02-06
☐	Narda	Electric and Magnetic Field Meter	NBM-520	D-1234	2019-05-15
☐	Narda	Electric Field Probe (100 kHz - 6 GHz)	EF 0691	G-0027	2019-02-06
☐	Narda	Electric Field Probe (100 MHz - 60 GHz)	EF 6092	A-0071	2019-05-15
☐	Narda	Magnetic Field Probe (300 kHz to 30 MHz)	HF 3061	D-0404	2019-02-06
☐	Narda	Electric and Magnetic Field Analyser (5 Hz – 100 kHz)	EHP-50D	230WX50108	2019-02-12
☒	Narda	Electric and Magnetic Field Analyser (5 Hz – 400 kHz)	EHP-50F	000WX60907	2018-09-04

☒ Devices used during the test ☐ Devices not used during the test

6.1.3 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 6-minute-averaging.

6.1.4 Uncertainties

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

6.1.4.1 Typical uncertainty of EHP-50F

The uncertainties stated in this document have been determined according to EA-4/2 [4].
They were estimated as expanded uncertainty obtained multiplying the standard by the coverage factor k=2, corresponding to a confidence level of about 95%.
The total uncertainty of the probe derived from typical contributions of linearity, anisotropy, frequency response, temperature, relative humidity and with/without contribution of uncertainty of calibration.

Magnetic probe (1)	Magnetic flux density	Total expanded uncertainty (k=2)	
		Without contribution of uncertainty of calibration U_{EHP50F} (%)	With contribution of uncertainty of calibration U_T (%)
Frequency at 50Hz	0.05µT to < 100µT	2.3	3.0 (2)
	100µT to < 3000µT	2.6	3.8 (3)
Frequency from 5 to 40 Hz	0.05µT to < 10µT	5.3	5.7 (2)
Frequency from 40 to 100kHz	0.05µT to < 10µT	4.9	5.3 (2)

(1) This uncertainty budget is for an ambient temperature of (23 +/- 4) °C, and relative humidity of (50 +/- 5) %
The expanded uncertainty for magnetic flux density for values close to 50 nT is calculated with negligible contribution of noise level.
(2) The uncertainty of calibration used is 2.0%
(3) The uncertainty of calibration used is 2.8%

Electric probe (4)	Electric field range	Total expanded uncertainty (k=2)	
		Without contribution of uncertainty of calibration U_{EHP50F} (%)	With contribution of uncertainty of calibration U_T (%)
Frequency at 50Hz	1 V/m to 1000 V/m	7.1	7.4 (5)
	1 V/m to < 100 kV/m	7.8	8.2 (6)
Frequency from 5 Hz to 100 kHz	1 V/m to <1000 V/m	8.8	9.2 (6)

(4) This uncertainty budget is for an ambient temperature of (23 +/- 4) °C, and relative humidity of (50 +/- 5) %
(5) The uncertainty of calibration used is 2.0%
(6) The uncertainty of calibration used is 2.5%

Probe	Frequency Range	Magnetic Flux Density (B) in µT	Electrical Field Strength in V/m	Remark
EHP-50F	5 – 1000 Hz	0.006	0.50	
EHP-50F	4 – 400 kHz	0.004	0.235	

6.1.5 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
EHP-50F	4	4

6.2 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. Distances were measured from the module edge to the centre of the probe.

Test positions see photo documentation (Annex A).

During the measurements the DUT (Transmitter and Receiver) were positioned to a distance of 1cm to have a defined charging situation. The device was charged wireless during the measurements.

The measurements were performed for different output powers.
The E-Field was only measured in the power scenario that produced the greatest H-field.

H-Field [A/m]						Limit (A/m)
Side	Distance [cm]	Output Power				
		13.5W (100%)	12.15W (90%)	6.75W (50%)	1.35W (10%)	
Top	20	0.58	0.57	0.54	0.52	**1.63**
Side 1	15	0.14	0.13	0.10	0.08	**1.63**
Side 2	15	0.26	0.25	0.22	0.20	**1.63**
Side 3	15	0.32	0.31	0.28	0.26	**1.63**
Side 4	15	0.31	0.30	0.27	0.25	**1.63**

Table 1: Test results H-field @111 - 149kHz

Note: All measurements are < 0.815 A/m, this means the device also fulfils the 50% criteria.

E-Field [V/m]			
Side	Distance [cm]	Output Power	Limit (V/m)
		13.5W (worst case from H-Field)	
Top	2	1.7	**614**
Side 1	2	1.8	**614**
Side 2	2	3.9	**614**
Side 3	2	1.8	**614**
Side 4	2	1.1	**614**

Table 2: Test results E-field @111 - 149kHz

6.3 Final verdict

The following safety distances from the human body to the module are required for bystanders when the device is used for wireless charging.

Side	Safety Distance [cm]
Top	20
Side 1	15
Side 2	15
Side 3	15
Side 4	15

Annex A: Photo documentation

Photo documentation is described in the additional document:

Appendix to test report no. 1-9990/20-01-02 Photo documentation

Annex B: Document History

Version	Applied Changes	Date of Release
	Initial Release	2020-02-12

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
Inv. No.	-	Inventory number
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software