

FCC Test Report (Part 1)

RF Exposure (EMF)

Test Report no.:	EMC_BO_002129 (v3.0)	Date of Report:	14-Dec-2017
Number of pages:	15	Project support engineer:	Frank Wittmann
Test period:	29.09.-27.10.2017		

Applicant:	Laird Dabendorf GmbH, Märkische Straße 72, 15806 Zossen, Germany, Mr. Holger Overländer		
Manufacturer:	Laird Dabendorf GmbH, Märkische Straße 72, 15806 Zossen, Germany		
EUT identification:	Wireless Charging Unit with NFC, WCH-189 (WCH-189a, WCH-189b, WCH-189c)		
FCC ID:	RK7189-00	IC ID:	4774A-18900

Testing laboratory:	Laird Bochum GmbH, Meesmannstr.103, 44807 Bochum, Germany		
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	FCC designation no.:	DE0017	IC recognition no.: 7847A-1
	Laboratory manager:	Jürgen Mitterer	

Test result	The EUT complies with the requirements made in the referred test documents.
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Approver:	Ines Baufeld	Author:	Frank Wittmann
Title:	Laboratory Quality Manager	Title:	Senior EMC Test Engineer
Signature:		Signature:	

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1. Summary for FCC Part 1 EMF test report

Date of receipt	29.09.2017
Testing completed	27.10.2017
The customer's contact person	Holger Overländer
Notes	none

1.1. EUT and accessory information

The EUT is an inductive wireless power transfer device (wireless charger) with load modulation operating at 111 kHz and embedded RFID (NFC) at 13.56 MHz and modulation type ASK. The EUT is tested with a commercial available mobile phone with highest duty cycle of 100%. Wireless charging and NFC can not be active at the same time.

Product	Type	SN	HW	MV	SW	DUT
Wireless charger unit	WCH-189a	000002AF876C	l410-02	-	42.01.05.010	DAB17131E
Power cable	--	--	--	--	--	DAB15200E
RF cable	--	--	--	--	--	DAB16171E
Mobile Phone	Galaxy S7	IMEI: 357810085825140	--	--	--	DAB17003E

1.2. Applied standards

Standard / Rule Part	Version	Year
CFR 47, FCC Part 2	-	Oct-2017
CFR 47, FCC Part 1	-	Oct-2017
KDB 680106 D01	v02	May-2013
ISED RSS-216	Issue 2	Jan-2016
ISED RSS-102	Issue 5	Mar-2015
SPR-002	Issue 1	Sep-2016
Safety Code 6	-	2015

Deviations or clarifications to these standards are noted in the related test result under "test method and limit".

1.3. Summary of test results

Section	Section in CFR 47	Section in RSS-102 / SC6	Name of the test	Result
3.2	1.1307(b), 1.1310	4 / 2.2.1	RF Exposure (H-field)	PASSED
3.3	1.1307(b), 1.1310	4 / 2.2.1	RF Exposure (E-field)	PASSED

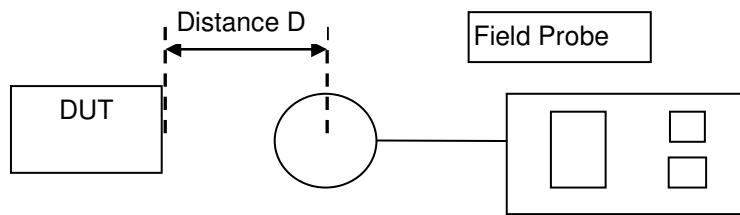
PASSED: The EUT complies with the essential requirements in the standard.
 FAILED: The EUT does not comply with the essential requirements in the standard.
 NP: The test was not performed.
 NA: The test was not applicable.

Test results can be re-used for model WCH-189b and WCH-189c, since these models are identical from electrical point of view to model WCH-189a. These models have different mechanical interfaces for the different car interiors. The different mechanical interfaces consist of non-conductive parts only and differences in the mechanical interfaces only exist in non-conductive parts.

1.4. Measurement uncertainties

Parameter	Worst Case Uncertainty	Max. Uncertainty
H-field probe 100 cm ²	3.33 %	< 30 %
H-field probe 3 cm ²	4.17 %	
H-field level tester	12.60 %	
E-field probe + level tester	20 %	

2. EMF Test setup



3. RF Exposure (EMF)

EUT with DUT number	DAB17131E
Accessories with DUT numbers	DAB17003E Samsung Galaxy S7 (mobile phone), DAB15200E (power cable), DAB16171E (RF cable)
Operation Voltage [V] / [Hz]	12 / DC
Result	PASSED
Remarks	None
Temp [°C] / Humidity [%RH]	23.1 / 39.5
Date of measurements	12-Oct-2017 to 27-Oct-2017
Measured by	Ralf Lange, Oliver Flecke

3.1. Test method and limit

Measurement was made from all sides of the DUT in 10, 9, 8, 7, 6, 5, 4, 3 cm and lower distance (DUT edge to the center of probe), if possible.

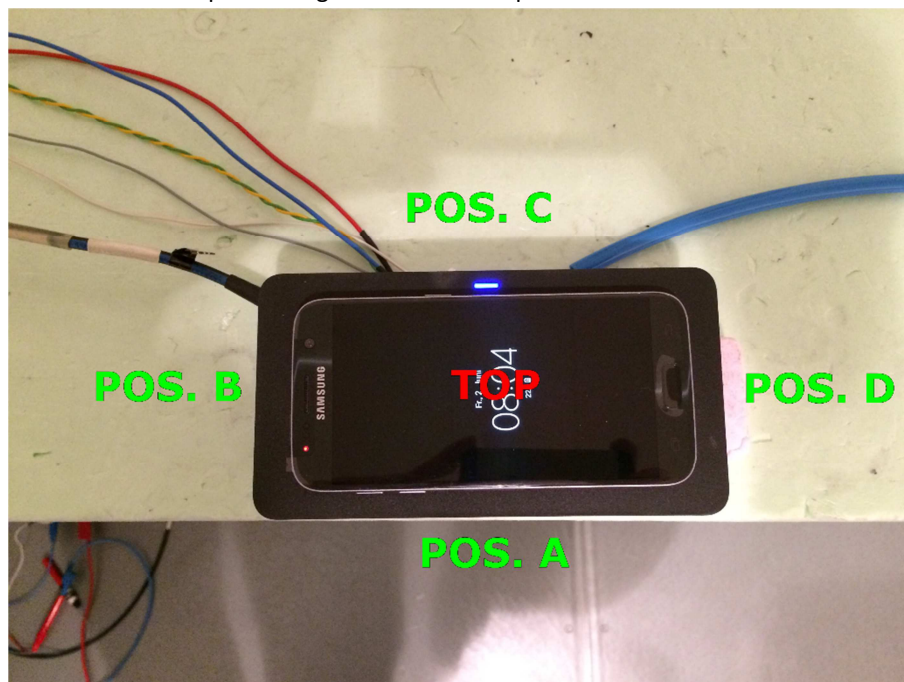
The mobile phone was placed in the center of the charging area of each coil (left, middle, right), one after another.

Minimum distance between the primary coil in the DUT and the secondary coil in the mobile phone (best coupling).

Different probes were used for E- and H-field measurement.

The highest emission level was recorded.

Side definition for positioning of E- and H-field probe



FCC limits for maximum permissible exposure

Frequency range [MHz]	Electric Field Strength Limit [V/m]	Magnetic Field Strength Limit [A/m]	Power Density [mW/cm ²]	Average Time [minutes]
(B) Limits for General Population / Uncontrolled Exposures				
0.3 – 1.34	614	1.63	100	30
1.34 – 30	824 / $f_{[MHz]}$	2.19 / $f_{[MHz]}$	180 / $f_{[MHz]}^2$	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			$f_{[MHz]} / 1500$	30
1500 – 100000			1.0	30

Note1: According to DUT operating frequency and installation definition, the limit in bold letters (300 kHz) was applied.

ISED limits for maximum permissible exposure

Frequency range [MHz]	Electric Field Strength Limit [V/m]	Magnetic Field Strength Limit [A/m]	Power Density [W/m ²]	Average Time [minutes]
RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
0.003 – 10	83	90	-	Instantaneous
0.1 – 10	-	0.73 / $f_{[MHz]}$	-	6
1.1 – 10	87 / $f_{[MHz]}^{0.5}$	-	-	6
10 – 20	27.46	0.0728	-2	6
20 – 48	58.07 / $f_{[MHz]}^{0.25}$	0.1540 / $f_{[MHz]}^{0.25}$	8.944 / $f_{[MHz]}^{0.5}$	6
48 – 300	22.06	0.05852	1.291	6
300 – 6000	3.142 $f_{[MHz]}^{0.3417}$	0.008335 $f_{[MHz]}^{0.3417}$	0.02619 $f_{[MHz]}^{0.6834}$	6
6000 – 15000	61.4	0.163	10	6
15000 – 150000	61.4	0.163	10	616000 / $f_{[MHz]}^{1.2}$
150000 – 300000	0.158 $f_{[MHz]}^{0.5}$	4.21 x 10 ⁻⁴ $f_{[MHz]}^{0.5}$	6.67 x 10 ⁻⁵ $f_{[MHz]}$	616000 / $f_{[MHz]}^{1.2}$

Note: According to DUT operating frequency and installation definition, the limit in bold letters was applied.

3.2. Test results H-field (FCC, ISCED)

3.2.1 H-field (left coil)

Detector: RMS, Mode: 320 μ T, Range: normal, Low Cut: 10 Hz

Frequency [kHz]	Distance [cm]	Level Pos A [A/m]	Level Pos B [A/m]	Level Pos C [A/m]	Level Pos D [A/m]	Level Top [A/m]	FCC Limit [A/m]	ISED Limit [A/m]	Result
111	10	0.18	0.11	0.25	0.22	0.45	1.63	90 / 6.58	PASSED
111	9	0.20	0.13	0.31	0.24	0.53	1.63	90 / 6.58	PASSED
111	8	0.24	0.14	0.39	0.28	0.71	1.63	90 / 6.58	PASSED
111	7	0.29	0.18	0.49	0.36	0.84	1.63	90 / 6.58	PASSED
111	6	0.33	0.20	0.61	0.41	NP	1.63	90 / 6.58	PASSED
111	5	0.76	0.37	0.93	0.64	1.15	1.63	90 / 6.58	PASSED
111	4	1.02	0.41	1.25	0.78	1.27	1.63	90 / 6.58	PASSED
111	3.3	NP	NP	1.63	NP	1.63	1.63	90 / 6.58	PASSED
111	3	1.45	0.53	NP	1.03	NP	1.63	90 / 6.58	PASSED
111	2.7	1.63	NP	NP	1.42	NP	1.63	90 / 6.58	PASSED
111	1.6	NP	0.84	NP	1.57	NP	1.63	90 / 6.58	PASSED

Note1: Measurement values were transformed from μ T to A/m, where 1 A/m = 1.256 μ T

Note2: Measurements for distances 10, 9, 8, 7 and 6 cm were done with 100 cm² H-field probe

Note3: Measurements for distances 5, 4, 3 cm and lower were done with 3 cm² H-field probe

Note4: Result declaration relates only to the columns with measured values within each row

Note5: NP = Not Performed

Worst case position H-field probe (left coil, top, 3.3 cm)



3.2.2 H-field (mid coil)

Detector: RMS, Mode: 320 μ T, Range: normal, Low Cut: 10 Hz

Frequency [kHz]	Distance [cm]	Level Pos A [A/m]	Level Pos B [A/m]	Level Pos C [A/m]	Level Pos D [A/m]	Level Top [A/m]	FCC Limit [A/m]	ISED Limit [A/m]	Result
111	10	0.07	0.05	0.15	0.08	0.19	1.63	90 / 6.58	PASSED
111	9	0.08	0.06	0.17	0.09	0.22	1.63	90 / 6.58	PASSED
111	8	0.09	0.06	0.27	0.10	0.31	1.63	90 / 6.58	PASSED
111	7	0.11	0.061	0.29	0.15	0.43	1.63	90 / 6.58	PASSED
111	6	0.16	0.063	0.42	0.21	NP	1.63	90 / 6.58	PASSED
111	5	0.35	0.29	0.62	0.34	0.63	1.63	90 / 6.58	PASSED
111	4	0.39	0.30	0.86	0.38	0.90	1.63	90 / 6.58	PASSED
111	3	0.53	0.33	1.44	0.44	1.21	1.63	90 / 6.58	PASSED
111	2.6	NP	NP	1.63	0.61	1.63	1.63	90 / 6.58	PASSED
111	1.6	1.1	0.40	NP	0.75	NP	1.63	90 / 6.58	PASSED

Note1: Measurement values were transformed from μ T to A/m, where 1 A/m = 1.256 μ T

Note2: Measurements for distances 10, 9, 8, 7 and 6 cm were done with 100 cm² H-field probe

Note3: Measurements for distances 5, 4, 3 cm and lower were done with 3 cm² H-field probe

Note4: Result declaration relates only to the columns with measured values within each row

Note5: NP = Not Performed

Worst case position H-field probe (mid coil, pos C, 2.6 cm)



3.2.3 H-field (right coil)

Detector: RMS, Mode: 320 μ T, Range: normal, Low Cut: 10 Hz

Frequency [kHz]	Distance [cm]	Level Pos A [A/m]	Level Pos B [A/m]	Level Pos C [A/m]	Level Pos D [A/m]	Level Top [A/m]	FCC Limit [A/m]	ISED Limit [A/m]	Result
111	10	0.14	0.11	0.11	0.24	0.37	1.63	90 / 6.58	PASSED
111	9	0.16	0.14	0.16	0.30	0.46	1.63	90 / 6.58	PASSED
111	8	0.18	0.23	0.27	0.35	0.59	1.63	90 / 6.58	PASSED
111	7	0.20	0.32	0.39	0.42	0.71	1.63	90 / 6.58	PASSED
111	6	0.23	0.42	0.51	0.49	NP	1.63	90 / 6.58	PASSED
111	5	0.58	0.53	0.87	0.70	0.93	1.63	90 / 6.58	PASSED
111	4	0.76	0.63	1.21	0.93	1.22	1.63	90 / 6.58	PASSED
111	3	1.15	0.85	1.63	1.31	1.63	1.63	90 / 6.58	PASSED
111	2.7	1.41	1.07	NP	1.48	NP	1.63	90 / 6.58	PASSED
111	2.1	1.63	NP	NP	NP	NP	1.63	90 / 6.58	PASSED
111	1.6	NP	1.47	NP	1.63	NP	1.63	90 / 6.58	PASSED

Note1: Measurement values were transformed from μ T to A/m, where 1 A/m = 1.256 μ T

Note2: Measurements for distances 10, 9, 8, 7 and 6 cm were done with 100 cm² H-field probe

Note3: Measurements for distances 5, 4, 3 cm and lower were done with 3 cm² H-field probe

Note4: Result declaration relates only to the columns with measured values within each row

Note5: NP = Not Performed

Worst case position H-field probe (right coil, top, 3 cm)



3.3. Test results E-field (FCC, ISED)

3.3.1 E-field (left coil)

Detector: AVRG, Mode: V/m

Frequency [kHz]	Distance [cm]	Level Pos A [V/m]	Level Pos B [V/m]	Level Pos C [V/m]	Level Pos D [V/m]	Level Top [V/m]	FCC Limit [V/m]	ISED Limit [V/m]	Result
111	10	0.79	0.44	0.44	0.47	0.94	614	83	PASSED
111	9	0.94	0.50	0.47	0.54	1.06	614	83	PASSED
111	8	1.07	0.58	0.53	0.60	1.27	614	83	PASSED
111	7	1.31	0.79	0.62	0.65	1.65	614	83	PASSED
111	6	1.76	0.88	0.77	0.75	2.0	614	83	PASSED
111	5	2.21	1.09	0.93	0.88	2.28	614	83	PASSED
111	4	3.15	1.50	1.19	1.08	NP	614	83	PASSED

Note1: Measurements for distances 10, 9, 8, 7, 6, 5 and 4 cm were done with the E-field probe

Note2: Result declaration relates only to the columns with measured values within each row

Note3: NP = Not Performed

Worst case position E-field probe (left coil, pos A, 4 cm)



3.3.2 E-field (mid coil)

Detector: AVRG, Mode: V/m

Frequency [kHz]	Distance [cm]	Level Pos A [V/m]	Level Pos B [V/m]	Level Pos C [V/m]	Level Pos D [V/m]	Level Top [V/m]	FCC Limit [V/m]	ISED Limit [V/m]	Result
111	10	0.63	0.37	0.39	0.35	0.86	614	83	PASSED
111	9	0.73	0.45	0.42	0.43	1.04	614	83	PASSED
111	8	0.92	0.54	0.49	0.55	1.21	614	83	PASSED
111	7	1.18	0.60	0.61	0.67	1.45	614	83	PASSED
111	6	1.39	0.75	0.71	0.83	1.63	614	83	PASSED
111	5	1.99	0.90	0.88	1.01	1.87	614	83	PASSED
111	4	2.57	1.19	1.14	1.24	NP	614	83	PASSED

Note1: Measurements for distances 10, 9, 8, 7, 6, 5 and 4 cm were done with the E-field probe

Note2: Result declaration relates only to the columns with measured values within each row

Note3: NP = Not Performed

Worst case position E-field probe (mid coil, pos A, 4 cm)



3.3.3 E-field (right coil)

Detector: AVR9, Mode: V/m

Frequency [kHz]	Distance [cm]	Level Pos A [V/m]	Level Pos B [V/m]	Level Pos C [V/m]	Level Pos D [V/m]	Level Top [V/m]	FCC Limit [V/m]	ISED Limit [V/m]	Result
111	10	0.92	0.37	0.46	0.61	0.96	614	83	PASSED
111	9	1.06	0.48	0.55	0.67	1.23	614	83	PASSED
111	8	1.30	0.52	0.64	0.84	1.41	614	83	PASSED
111	7	1.54	0.58	0.71	0.99	1.63	614	83	PASSED
111	6	2.04	0.72	0.84	1.22	2.05	614	83	PASSED
111	5	2.57	0.87	0.91	1.59	2.37	614	83	PASSED
111	4	3.52	1.08	1.21	1.84	NP	614	83	PASSED

Note1: Measurements for distances 10, 9, 8, 7, 6, 5 and 4 cm were done with the E-field probe

Note2: Result declaration relates only to the columns with measured values within each row

Note3: NP = Not Performed

Worst case position E-field probe (right coil, pos A, 4 cm)



4. Test Equipment

Equipment	Manufacturer	Type	Serial No.	Actual Calibration	Next Calibration
Exposure Level Tester	Narda	ELT-400	N-0385	01.12.2014	01.12.2017
H-field probe 3 cm ²	Narda	2300 / 90.20	C-0150	20.05.2015	20.05.2018
H-field probe 100 cm ²	Narda	2300 / 90.10	M-0823	02.12.2014	02.12.2017
Field Analyzer	Wandel & Goltermann	EMR20	P-0030	03.12.2014	03.12.2017
Isotropic Electric Field Probe	Wandel & Goltermann	Type8	M-0082	03.12.2014	03.12.2017