FCC Test Report (Part 15C)

WPT

Test Report no.:	EMC_BO_002127 (v3.0)	**Date of Report:**	14-Dec-2017
Number of pages:	15	**Project support engineer:**	Frank Wittmann
Test period:	02.10.-26.10.2017		

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			
	Tel.:	+49 234 51668-0		
	e-mail:	Product.Validation.Bochum@lairdtech.com		
	FCC Designation number	DE0017	IC recognition no.:	7847A-1
	Laboratory manager:	Jürgen Mitterer		

Test result	The EUT complies with the requirements made in the referred test documents.

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 15C Test Report

Date of receipt	02-Oct-2017
Testing completed	26-Oct-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 self-designed and shielded receiver simulator, which requests and consumes always the maximum rated TX power 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 charging unit	WCH-189a	000002AF876F	I410-02	-	42.01.05.010	DAB17132E
Artificial load	WCH-Rec.	0001	1.0	-	-	DAB16024E
Power cable	-	-	-	-	-	DAB15201E
RF cable	-	-	-	-	-	DAB16069E

1.2. Applied Standards

Standard / Rule Part	Version	Date
CFR 47, FCC Part 15C	-	Oct-2017
ANSI C63.10	-	Jun-2013
ICES-001	-	Nov-2014
ISED RSS-GEN	Issue 4	Nov-2014
ISED RSS-216	Issue 2	Jan-2016

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-GEN	Section in RSS-216	Name of the test	Result
3 & 4	15.205, 15.209	8.10	6.2.2.2 (Type 1 WPT devices)	Radiated emissions	PASSED
-	15.207	-	6.2.2.1	AC powerline conducted emissions	NA
5	15.215 (c)	6.6	-	Occupied bandwidth	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. 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.

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1.4. Measurement Uncertainties

Parameter	Measurement Uncertainty
Radio Frequency	±3.6 x 10^{-7}
Total RF Power, conducted	±0.79 dB
Emissions, conducted	±1.67 dB
All emissions, radiated	±5.38 dB
Temperature	±0.25 °C
Humidity	±1.0 %

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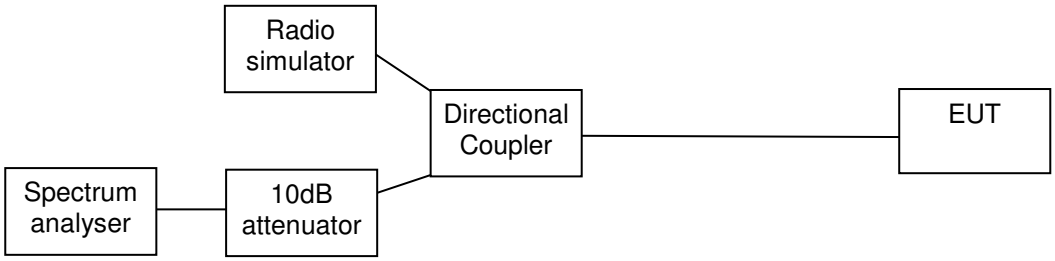
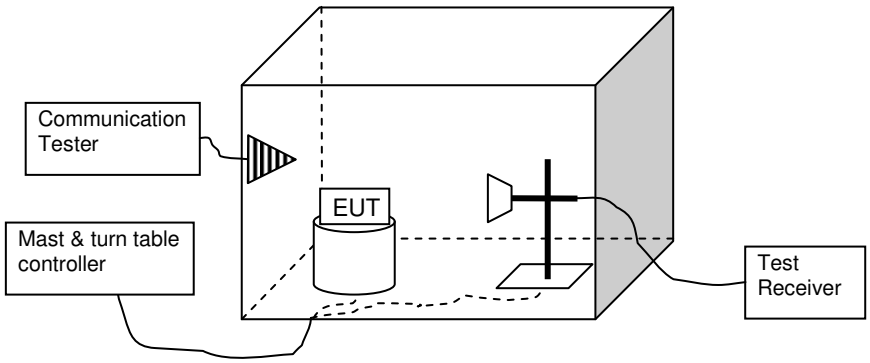
2. Test setups

2.1. Conducted RF test setup



2.2. Radiated emissions test setup



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3. Radiated emissions below 30 MHz

EUT with DUT number	DAB17131E
Accessories with DUT numbers	DAB15201E, DAB16069E, DAB16024E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	none
Temp [°C] / Humidity [%RH]	23.7 °C / 46.5 %
Date of measurements	10.10.2017
Measured by	Oliver Flecke

3.1. Test method and limit

The measurement is made according to ANSI C63.10 and RSS-GEN as follows:

The measurement distance is 3m with a shielded loop antenna

The Limit has been adjusted with the distance correction factor according to 15.31(f)(2)
(+40 dB for 30 m distance and +80 dB for 300 m distance)

The measurement is divided into the Preliminary Measurement and the Final Measurement.
The suspected frequencies are searched for in Preliminary Measurement with measuring antenna at fixed height using 2-axis EUT position system, set on the turntable, which is rotated 360 degrees.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described: $E\ [\mu V/m] = U_{RX} + A_{CF}$
Where U_{RX} is receiver reading and A_{CF} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{CF} = L_{CABLES} + AF - G_{PREAMP}$).

FCC limits for radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Detector
0.009 - 0.09	10000 * 2400 / f[kHz]	128.5 - 93.8	AV
0.09 - 0.11			QP
0.11 - 0.19			AV
0.19 - 0.49			AV
0.490 - 1.705	100 * 24000 / f[kHz]	73.8 - 63.0	QP
1.705 - 30.0	100 * 30	69.5	QP

CISPR11 Induction cooking (group 2) limits (3 m measurement distance)

Frequency range [MHz]	Limit [dBµA/m]	Limit [dBµV/m]	Detector
0.009 - 0.070	69.0	120.5	QP
0.070 - 0.1485	69 - 39	120.5 - 90.5	QP
0.1485 - 4.0	39 - 3	90.5 - 54.5	QP
4.0 - 30	3	54.5	QP

Conversion factor between dBµA/m and dBµV/m is 51.5 dB

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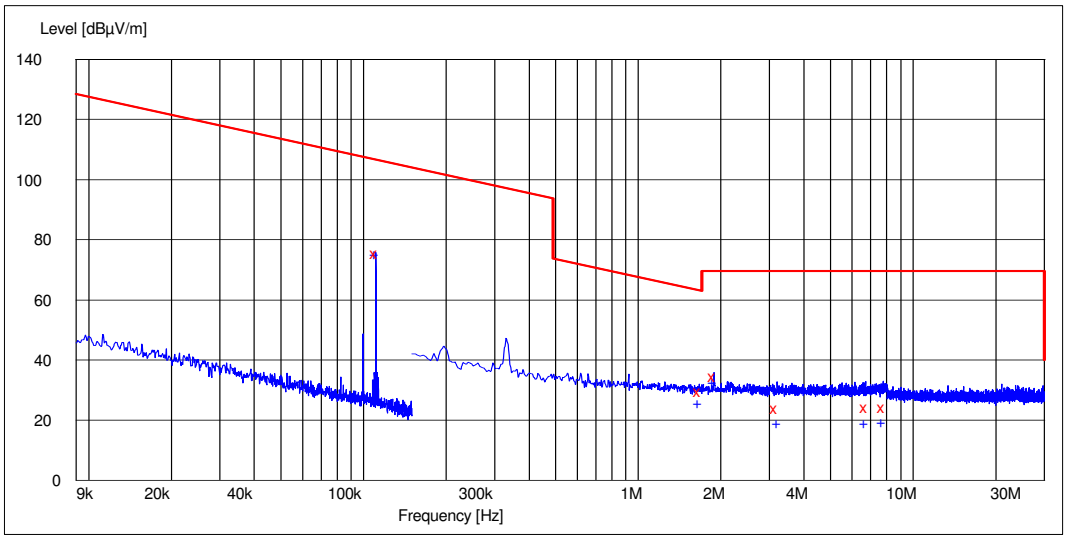
3.2. Test results (FCC)

Peak (< 150 kHz: RBW: 200 Hz, > 150 kHz: RBW 10 kHz)



Quasi-Peak (< 150 kHz: RBW: 200 Hz, >150 kHz: RBW: 9 kHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
0.110860	75.70	23.30	106.70	31.00	170.0	0.00	VERTICAL	PASSED
1.663500	29.50	23.10	63.20	33.70	170.0	342.00	VERTICAL	PASSED
1.885500	34.70	23.00	69.50	34.80	170.0	16.00	VERTICAL	PASSED
3.167000	24.00	23.10	69.50	45.50	170.0	292.00	VERTICAL	PASSED
6.729500	24.30	23.40	69.50	45.20	170.0	135.00	VERTICAL	PASSED
7.802500	24.40	23.50	69.50	45.10	170.0	276.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

Average (< 150 kHz: RBW: 200Hz, > 150 kHz: RBW: 9 kHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
0.110860	75.70	23.30	106.70	31.00	170.0	0.00	VERTICAL	PASSED
1.663000	26.00	23.10	63.20	37.20	170.0	21.00	VERTICAL	PASSED
1.884500	33.10	23.00	69.50	36.40	170.0	10.00	VERTICAL	PASSED
3.226500	19.10	23.20	69.50	50.40	170.0	271.00	VERTICAL	PASSED
6.706500	19.20	23.40	69.50	50.30	170.0	136.00	VERTICAL	PASSED
7.767000	19.60	23.50	69.50	49.90	170.0	248.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

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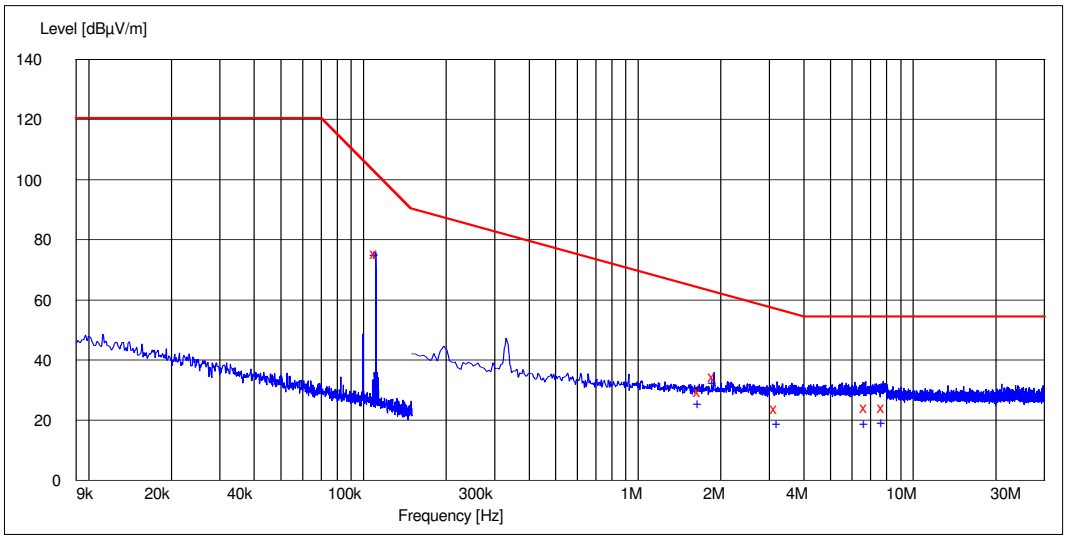
3.3. Test results (ISED)

Peak (< 150 kHz: RBW: 200 Hz, > 150 kHz: RBW 10 kHz)



Quasi-Peak (< 150 kHz: RBW: 200 Hz, >150 kHz: RBW: 9 kHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
0.110860	75.70	23.30	102.18	26.48	170.0	0.00	VERTICAL	PASSED
1.663500	29.50	23.10	64.09	34.59	170.0	342.00	VERTICAL	PASSED
1.885500	34.70	23.00	62.72	28.02	170.0	16.00	VERTICAL	PASSED
3.167000	24.00	23.10	57.05	33.05	170.0	292.00	VERTICAL	PASSED
6.729500	24.30	23.40	54.50	30.20	170.0	135.00	VERTICAL	PASSED
7.802500	24.40	23.50	54.50	30.10	170.0	276.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

Average (< 150 kHz: RBW: 200Hz, > 150 kHz: RBW: 9 kHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
0.110860	75.70	23.30	102.18	26.48	170.0	0.00	VERTICAL	PASSED
1.663000	26.00	23.10	64.09	37.20	170.0	21.00	VERTICAL	PASSED
1.884500	33.10	23.00	62.73	29.63	170.0	10.00	VERTICAL	PASSED
3.226500	19.10	23.20	56.85	37.75	170.0	271.00	VERTICAL	PASSED
6.706500	19.20	23.40	54.50	35.30	170.0	136.00	VERTICAL	PASSED
7.767000	19.60	23.50	54.50	34.90	170.0	248.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

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4. Radiated emissions above 30 MHz

EUT with DUT number	DAB17131E
Accessories with DUT numbers	DAB15201E, DAB16069E, DAB16024E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	none
Temp [°C] / Humidity [%RH]	23.0 °C / 49.5 %
Date of measurements	02.10.2017
Measured by	Oliver Flecke

4.1. Test method and limit

The measurement is made according to ANSI C63.10 and ICES-001 as follows:

The Preliminary Measurement and the Final Measurement is performed in 3 m distance by rotating the turntable of 360 degrees and moving the antenna height between 1-4 m.

The Preliminary Measurement is performed with floor absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed without floor absorbers, if the Preliminary Measurement results are closer than 20 dB to the permissible limit.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The EUT is placed at nonconductive plate at the turntable center.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$E\ [\mu V/m] = U_{RX} + A_{CF}$

Where U_{RX} is receiver reading and A_{CF} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{CF} = L_{CABLES} + AF - G_{PREAMP}$).

FCC limits for radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Detector
30 – 88	100	40	QP
88 – 216	150	43.5	QP
216 – 960	200	46	QP
960 – 1000	500	54	QP

CISPR11 Class B group 2 limits (3 m measurement distance)

Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Detector
30 – 80.872	100	40	QP
80.872 – 81.848	1000	60	QP
81.848 – 134.786	100	40	QP
134.786 – 136.414	1000	60	QP
136.414 – 230	100	40	QP
230 - 1000	500	47	QP

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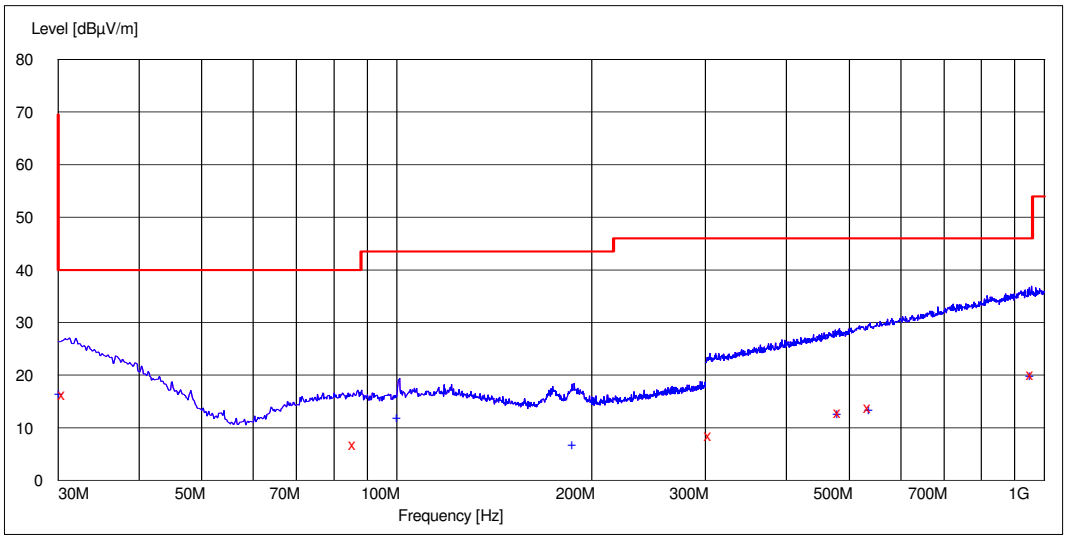
4.2. Test results (FCC)

Peak (< 300 MHz: RBW: 300 kHz, > 300 MHz: RBW 1 MHz)



QuasiPeak (RBW: 1 MHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
30.602405	16.40	-13.20	40.00	23.60	148.0	33.00	HORIZONTAL	PASSED
86.093988	6.80	-29.40	40.00	33.20	98.0	341.00	VERTICAL	PASSED
305.208818	8.50	-28.60	46.00	37.50	98.0	331.00	HORIZONTAL	PASSED
482.264729	13.00	-23.80	46.00	33.00	365.0	15.00	VERTICAL	PASSED
537.776152	13.80	-22.90	46.00	32.20	251.0	203.00	VERTICAL	PASSED
956.811824	20.20	-16.40	46.00	25.80	248.0	52.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

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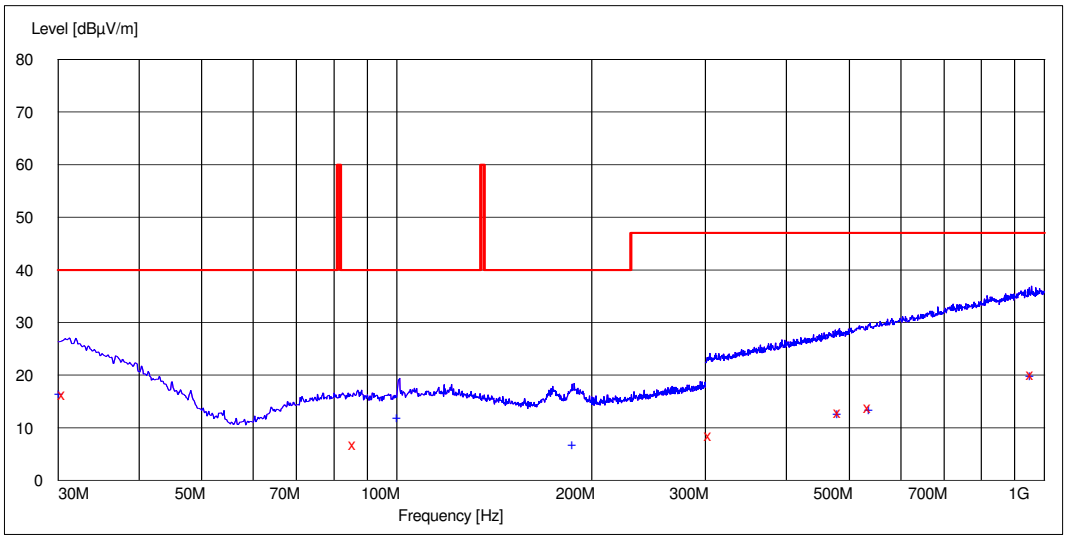
4.3. Test results (ISED)

Peak (< 300 MHz: RBW: 300 kHz, > 300 MHz: RBW 1 MHz)



QuasiPeak (RBW: 1 MHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
30.602405	16.40	-13.20	40.00	23.60	148.0	33.00	HORIZONTAL	PASSED
86.093988	6.80	-29.40	40.00	33.20	98.0	341.00	VERTICAL	PASSED
305.208818	8.50	-28.60	46.00	37.50	98.0	331.00	HORIZONTAL	PASSED
482.264729	13.00	-23.80	46.00	33.00	365.0	15.00	VERTICAL	PASSED
537.776152	13.80	-22.90	46.00	32.20	251.0	203.00	VERTICAL	PASSED
956.811824	20.20	-16.40	46.00	25.80	248.0	52.00	VERTICAL	PASSED

No further emissions found less than 20 dB to the regulatory limit and no emission found in the restricted band of operation.

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5. Occupied bandwidth

EUT with DUT number	DAB17131E
Accessories with DUT numbers	DAB15201E, DAB16069E, DAB16024E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	none
Temp [°C] / Humidity [%RH]	22.8 °C / 51.0 %
Date of measurements	26.10.2017
Measured by	Jürgen Mitterer

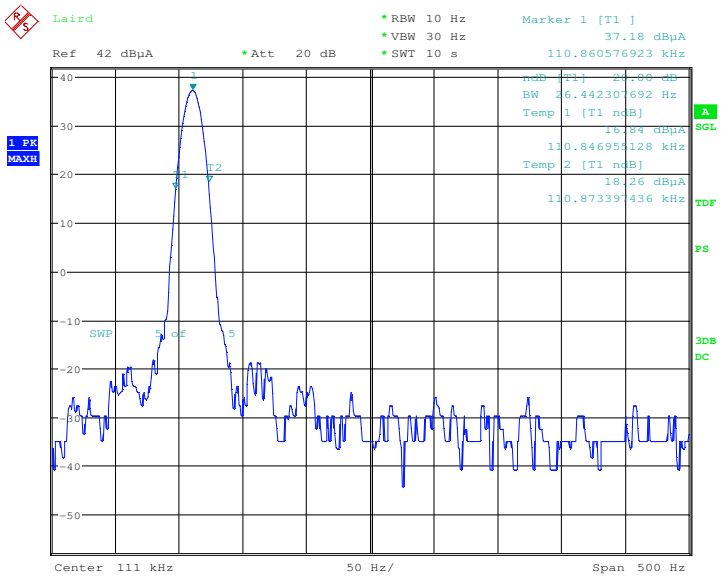
5.1. Test method and limit

The measurement is made according to FCC 15.215(c) and IC standard RSS-GEN 6.6.

Limits for 20 dB / 99 % bandwidth measurements

Limit [MHz]
N/A

5.2. Test results (FCC)



20dB Bandwidth / 0.111MHz / WPT_111kHz_unmodulated
Date: 26.OCT.2017 11:31:44

frequency [kHz]	20 dB bandwidth [Hz]	Result
110.86	26.44	PASSED

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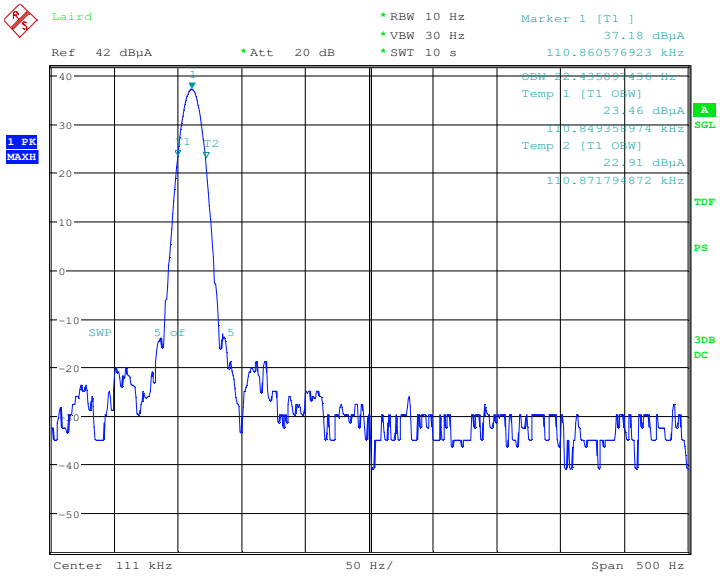
5.3. Test results (ISED)



99% Bandwidth / 0.111MHz / WPT_111kHz_unmodulated

Date: 26.OCT.2017 11:30:45

frequency [kHz]	99 % bandwidth [Hz]	Result
110.86	22.44	PASSED

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6. Test Equipment

6.1. Conducted Radio

Equipment	Manufacturer	Type	Serial No.	Actual Calibration	Next Calibration
Test Software	Laird	Emissions Radio FCC CE	0.71	-	-
Signal Generator	ROHDE & SCHWARZ	SMP02	828269/008	09.08.2017	09.08.2020
BT-/W-Lan-Testsetup	Hewlett Packard - Agilent	N4010A	MY46320388	14.08.2017	14.08.2020
Radio Communication Tester	ROHDE & SCHWARZ	CMU 200	101138	16.02.2016	16.02.2018
Climatic Chamber	Vötsch	VT4002	521/85094	01.09.2016	01.09.2018
EMI Test Receiver	ROHDE & SCHWARZ	ESU26	100077	16.08.2017	16.08.2019
Power Supply	Hewlett Packard - Agilent	E3632A	KR75303332	13.12.2016	13.12.2017
Vector Signal Generator	ROHDE & SCHWARZ	SMJ 100A	100845	02.03.2016	02.03.2018
Powermeter	ETS	EMPower 7002-006	7202040	09.12.2015	09.12.2017
Directional Coupler	Tyco	2026-6010-10	0439	03.05.2017	03.05.2018
Cable Spectrum Analyzer to Directional Coupler	Huber & Suhner	Sucoflex 104	199748/4	03.05.2017	03.05.2018
Cable Directional Coupler to Probe	Huber & Suhner	Sucoflex 104	143781/4	03.05.2017	03.05.2018
Cable Signalization	Huber & Suhner	Sucoflex 104	123746/4	03.05.2017	03.05.2018
10 dB Attenuator	Huber & Suhner	10 dB DC-18	6810.19a	03.05.2017	03.05.2018
Emission Signal Path Calibration	Laird Bochum GmbH	Cable, Attenuator, DirectionalCoupler	SYS_CAL_09	03.05.2017	03.05.2018

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6.2. Radiated Emission

Equipment	Manufacturer	Type	Serial No.	Actual Calibration	Next Calibration
Test Software	ROHDE & SCHWARZ	ES-K1	V1.71	-	-
Chamber	ETS	RFD-F/ A-100	3069	25.08.2017	25.08.2020
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	827769/010	15.08.2017	15.08.2019
Signal Generator	ROHDE & SCHWARZ	SMP02	828269/008	09.08.2017	09.08.2020
Signal Generator	ROHDE & SCHWARZ	SML01	100652	16.04.2015	16.04.2018
Power Supply	Hewlett Packard - Agilent	E3632A	MY40011318	13.12.2016	13.12.2017
Radio Communication Tester	ROHDE & SCHWARZ	CMU 200	101138	16.02.2016	16.02.2018
Field Analyzer	Wandel & Goltermann	EMR20	P-0030	03.12.2014	03.12.2017
Antenna	ROHDE & SCHWARZ	HL025	359012/006		
EMI Test Receiver	ROHDE & SCHWARZ	ESU26	100077	16.08.2017	16.08.2019
Temp. / Humidity Logger	Lufft	Opus 10	13262	11.01.2017	11.01.2020
Antenna	ROHDE & SCHWARZ	HL562	100191	06.11.2015	06.11.2018
Antenna	ROHDE & SCHWARZ	HK-116: 20-300MHz	825177/0017	21.07.2017	21.07.2020
Antenna	ROHDE & SCHWARZ	HK-116: 20-300MHz	100401	21.07.2017	21.07.2020
Antenna	ROHDE & SCHWARZ	HL223	832369/006	21.04.2016	21.04.2019
Antenna	Schwarzbeck	UBA 9116	9116-396	28.07.2017	28.07.2020
Antenna	Emco	3115	9810-5588	17.06.2015	17.06.2018
Antenna	Schwarzbeck Mess-Elektronik	FMZB_1519	1519-056	14.07.2017	14.07.2020
H-Field Probe 100 cm²	Narda Safety Test Solutions GmbH	Probe	M-0823	02.12.2014	02.12.2017
H-field Probe 3cm2	Narda Safety Test Solutions GmbH	2300/90.20	C-0150	20.05.2015	20.05.2018
Antenna	Schwarzbeck	VAMP 9243	9243-486	29.07.2015	29.07.2018
Exposure Level Tester	Narda Safety Test Solutions GmbH	ELT-400	N-0385	01.12.2014	01.12.2017
Antenna	Emco	3160-09	001814-006	07.08.2017	07.08.2022
Isotropic Electric Field Probe	Wandel & Goltermann	Type 8	M-0082	03.12.2014	03.12.2017
Site Attenuation (substitution measurement)	Laird Bochum GmbH	RXAntenna_FreeSpaceAttenuation	SYS_CAL_07	09.11.2016	09.11.2017
Emission Signal Path Calibration	Laird Bochum GmbH	Cable, Filter, PreAmplifier	SYS_CAL_08	30.04.2017	30.04.2018
Antenna	Schwarzbeck	BBHA-9120-D	01617	18.08.2016	18.08.2019

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