

FCC Test Report (Part 15C)

WPT

Test Report no.:	EMC_BO_002207 (v1.0)	Date of issue:	10-Apr-2019
Number of pages:	14	Project support engineer:	Oliver Flecke
Test period:	26.02.2019-27.02.2019		

Applicant:	Molex CVS Grand Blanc, LLC, 8100 Industrial Park Drive, Grand Blanc, MI 48439, USA, Mrs. Rhonda Turner		
Manufacturer:	Molex CVS Shanghai Limited, No.150 Cailun Road, Zhangjiang Hi-Tech Park, Pudong New Area, Shanghai, PRC201203		
EUT identification:	Molex, WCH-210		
FCC ID:	2APE3WCH-210	ISED ID:	23771-WCH210

Testing laboratory:	Molex CVS Lab, Molex CVS Bochum GmbH, Meesmannstr.103, 44807 Bochum, Germany			
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	FCC designation no.:	DE0017	ISED recognition no.:	DE0015
	Laboratory manager:	Jürgen Mitterer		

Test result	The test result complies with the requirements made in the referred test documents.
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Approver:	Jürgen Mitterer	Technical review:	Frank Wittmann
Title:	Laboratory Manager	Title:	Senior EMC Test Engineer

Signature:  **Signature:** 

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Project support engineer: Oliver Flecke
Date of issue: 10-Apr-2019
Report No.: EMC_BO_002207 (v1.0)

FCC Test Report (2APE3WCH-210)
Template version 3.7
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1. Summary for FCC Part 15C Test Report

Date of receipt	18-Feb-2019
Testing completed	27-Feb-2019
The customer's contact person	Mr. Michael Schmidt
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. The highest output power is available at 111 kHz. The EUT is tested with a self-designed and shielded receiver simulator, which requests and consumes always the maximum rated TX power of 8 W with highest duty cycle of 100 %.

Product	Type	SN	HW	MV	SW	DUT
Wireless charging unit	WCH-210		A0	-	52.0.2.0(RC16)	GRA190137E
Artificial load	8 W	-	-	-	-	GRA190283E
Power cable	-	-	-	-	-	GRA190139E

1.2. Applied Standards

Standard / Rule Part	Version	Year
CFR 47, FCC Part 15C	-	Mar-2019
ANSI C63.10	-	Jun-2013
ISED RSS-Gen	Issue 5	Apr-2018
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	8.9	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)	6.7	-	Occupied bandwidth	PASSED

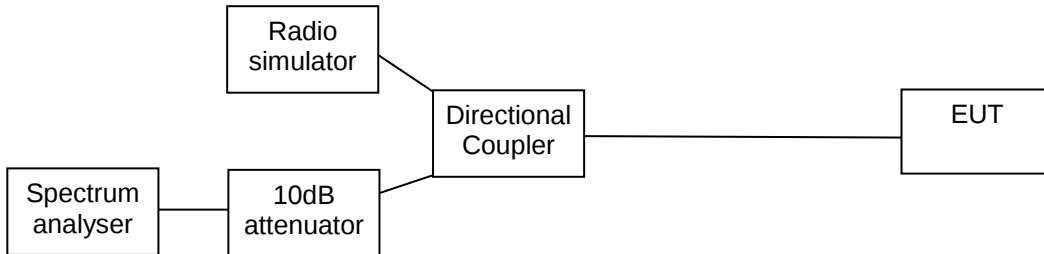
PASSED: The EUT complies with the essential requirements in the standard.
 FAILED: The EUT does not comply with the essential requirements in the standard.
 NP: The test was not performed.
 NA: The test was not applicable.

1.4. Measurement Uncertainties

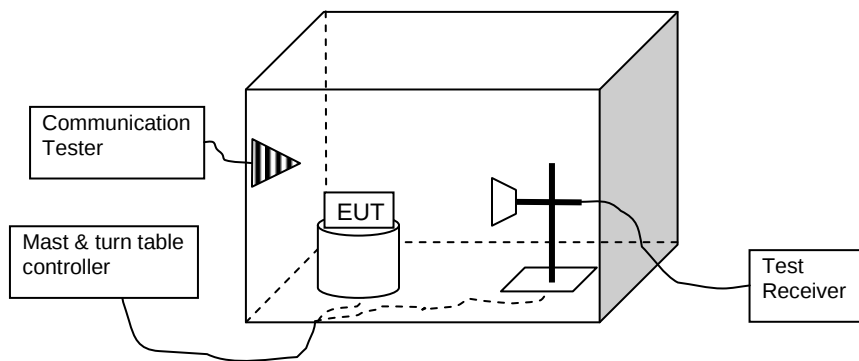
Parameter	Measurement Uncertainty
Radio Frequency	$\pm 3.6 \times 10^{-7}$
Total RF Power, conducted	± 0.79 dB
Emissions, conducted	± 1.67 dB
All emissions, radiated	± 5.38 dB
Temperature	± 0.25 °C
Humidity	± 1.0 %

2. Test setups

2.1. Conducted RF test setup



2.2. Radiated emissions test setup



3. Radiated emissions below 30 MHz

EUT with DUT number	GRA190137E
Accessories with DUT numbers	GRA190283E, GRA190139E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	None
Temp [°C] / Humidity [%RH]	22.2 °C / 42.5 %
Date of measurements	26.02.2019
Measured by	Frank Wittmann
Test system SW version	V1.7.1

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 [$\mu V/m$]	Limit [dB $\mu V/m$]	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

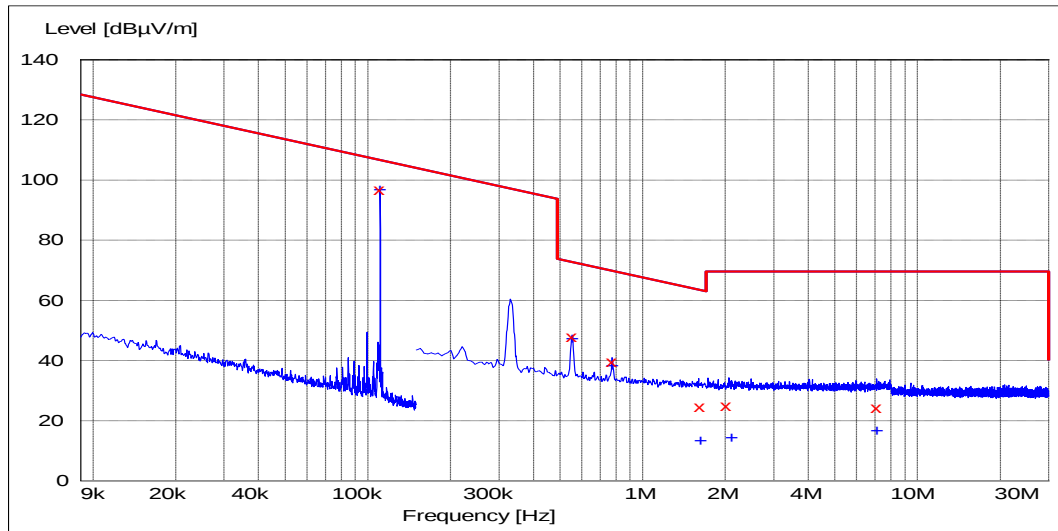
CISPR11 Induction cooking (group 2) limits (3 m measurement distance)

Frequency range [MHz]	Limit [dB $\mu A/m$]	Limit [dB $\mu V/m$]	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 dB $\mu A/m$ and dB $\mu V/m$ is 51.5 dB

3.2. Test results (FCC)

@111 kHz: 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
0.110870	96.70	23.20	106.70	10.00	170.0	336.00	VERTICAL	PASSED
0.554302	47.80	23.30	72.70	24.90	170.0	351.00	VERTICAL	PASSED
0.776242	39.60	23.30	69.80	30.20	170.0	360.00	VERTICAL	PASSED
1.617896	24.60	23.00	63.40	38.80	170.0	61.00	VERTICAL	PASSED
2.026328	24.90	22.90	69.50	44.60	170.0	336.00	VERTICAL	PASSED
7.142398	24.30	23.40	69.50	45.20	170.0	239.00	VERTICAL	PASSED

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

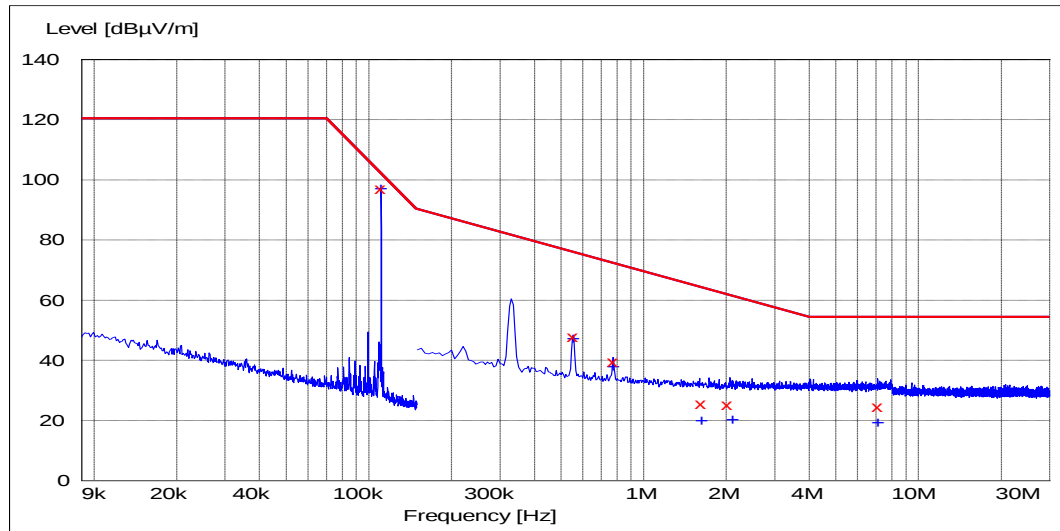
Average (< 150 kHz: RBW: 200Hz, > 150 kHz: RBW: 9 kHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
0.110860	96.70	23.20	106.70	10.00	170.0	336.00	VERTICAL	PASSED
0.554302	47.20	23.30	72.70	25.50	170.0	343.00	VERTICAL	PASSED
0.775742	38.40	23.30	69.80	31.40	170.0	350.00	VERTICAL	PASSED
1.627896	13.40	23.00	63.40	50.00	170.0	77.00	VERTICAL	PASSED
2.106828	14.30	22.90	69.50	55.20	170.0	329.00	VERTICAL	PASSED
7.139398	16.50	23.40	69.50	53.00	170.0	241.00	VERTICAL	PASSED

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

Test results (ISED)

@111 kHz: 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
0.110870	96.90	23.20	102.20	5.30	170.0	336.00	VERTICAL	PASSED
0.554302	48.00	23.30	76.10	28.10	170.0	351.00	VERTICAL	PASSED
0.776242	39.50	23.30	72.40	32.90	170.0	360.00	VERTICAL	PASSED
1.617896	25.70	23.00	64.40	38.70	170.0	61.00	VERTICAL	PASSED
2.026328	25.30	22.90	61.90	36.60	170.0	336.00	VERTICAL	PASSED
7.142398	24.70	23.40	54.50	29.80	170.0	239.00	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	96.90	23.20	102.20	5.30	170.0	336.00	VERTICAL	PASSED
0.554302	47.30	23.30	76.10	28.80	170.0	343.00	VERTICAL	PASSED
0.775742	38.00	23.30	72.40	34.40	170.0	350.00	VERTICAL	PASSED
1.627896	20.10	23.00	64.30	44.20	170.0	77.00	VERTICAL	PASSED
2.106828	20.30	22.90	61.50	41.20	170.0	329.00	VERTICAL	PASSED
7.139398	19.40	23.40	54.50	35.10	170.0	241.00	VERTICAL	PASSED

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

4. Radiated emissions above 30 MHz

EUT with DUT number	GRA190137E
Accessories with DUT numbers	GRA190283E, GRA190139E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	none
Temp [°C] / Humidity [%RH]	22.7 °C / 43.8 %
Date of measurements	27.02.2019
Measured by	Frank Wittmann
Test system SW version	V1.7.1

4.1. Test method and limit

The measurement is made according to ANSI C63.10 and RSS-Gen 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 on a nonconductive plate in the center of the turntable.

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)

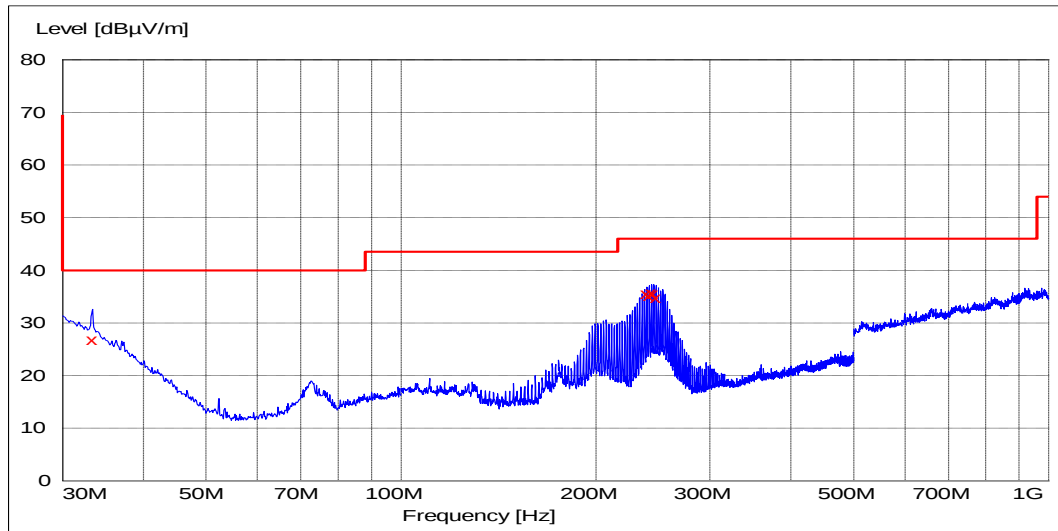
Frequency range [MHz]	Limit [$\mu V/m$]	Limit [dB $\mu V/m$]	Detector
30 – 88	100	40	QP
88 – 216	150	43.5	QP
216 – 960	200	46	QP
960 – 1000	500	54	QP

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

Frequency range [MHz]	Limit [$\mu V/m$]	Limit [dB $\mu V/m$]	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

4.2. Test results (FCC)

Peak (< 500 MHz: RBW: 300 kHz, > 500 MHz: RBW 1 MHz)



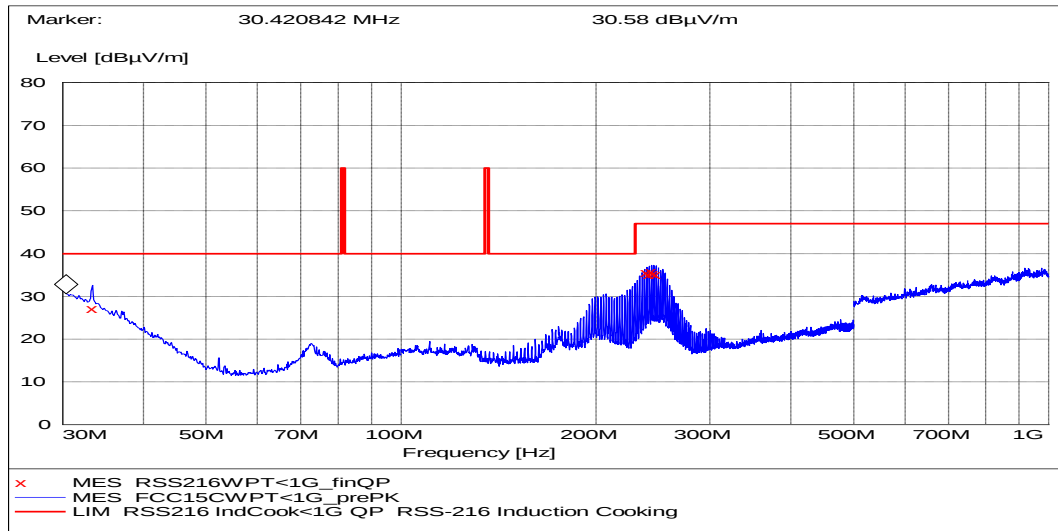
QuasiPeak (RBW: 1 MHz)

Frequency [MHz]	Level [dBµV/m]	Transducer [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Azimuth [Deg]	Polarisation	Result
33.366733	26.80	-11.40	40.00	13.20	123.0	121.00	VERTICAL	PASSED
239.679559	35.50	-30.60	46.00	10.50	98.0	16.00	HORIZONTAL	PASSED
241.733467	35.20	-30.50	46.00	10.80	101.0	16.00	HORIZONTAL	PASSED
243.687375	35.80	-30.50	46.00	10.20	101.0	28.00	HORIZONTAL	PASSED
245.741583	35.50	-30.50	46.00	10.50	126.0	21.00	HORIZONTAL	PASSED
247.795491	34.80	-30.50	46.00	11.20	98.0	23.00	HORIZONTAL	PASSED

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

4.3. Test results (ISED)

Peak (< 500 MHz: RBW: 300 kHz, > 500 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
33.366733	27.10	-11.40	40.00	12.90	123.0	121.00	VERTICAL	PASSED
239.679559	35.50	-30.60	47.00	11.50	98.0	15.00	HORIZONTAL	PASSED
241.733467	35.00	-30.50	47.00	12.00	101.0	15.00	HORIZONTAL	PASSED
243.687375	35.70	-30.50	47.00	11.30	101.0	28.00	HORIZONTAL	PASSED
245.741583	35.30	-30.50	47.00	11.70	126.0	21.00	HORIZONTAL	PASSED
247.795491	35.00	-30.50	47.00	12.00	98.0	23.00	HORIZONTAL	PASSED

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

5. Occupied bandwidth

EUT with DUT number	GRA190137E
Accessories with DUT numbers	GRA190283E, GRA190139E
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	none
Temp [°C] / Humidity [%RH]	22.7 °C / 43.8 %
Date of measurements	27.02.2019
Measured by	Bhushan Pawar
Test system SW version	V1.3

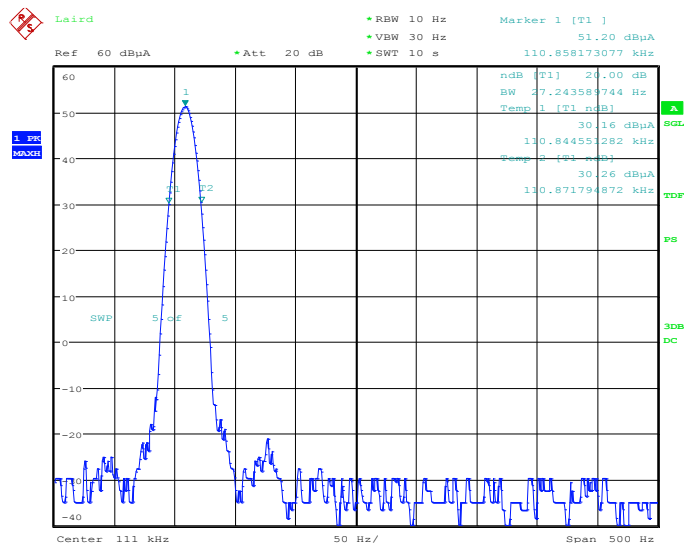
5.1. Test method and limit

The measurement is made according to FCC 15.215(c) and RSS-Gen.

Limits for 20 dB / 99 % bandwidth measurements

Limit [MHz]
N/A

5.2. Test results (FCC)



20dB Bandwidth / 0.111MHz / WPT_111kHz_unmodulated
Date: 27.FEB.2019 14:31:35

frequency [kHz]	20 dB bandwidth [Hz]	Result
110.858	27.244	PASSED

frequency [kHz]	99 % bandwidth [Hz]	Result
110.858	22.436	PASSED

6. Test Equipment

6.1. Radiated Emission

Equipment	Manufacturer	Type	SERIAL-NO.	Actual Calibration	Next Calibration
Antenna	Schwarzbeck Mess-Elektronik	FMZB_1519	1519-056	14.07.2017	14.07.2020
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	827769/010	15.08.2017	15.08.2019
Power Supply	Hewlett Packard - Agilent	E3632A	KR75303301	17.05.2018	17.05.2020
Temp. / Humidity Logger	Lufft	Opus 10	13262	11.01.2017	11.01.2020
Antenna	ROHDE & SCHWARZ	HL562	100191	26.10.2018	26.10.2021
Antenna	Schwarzbeck	BBHA-9120-D	01617	18.08.2016	18.08.2019

6.2. Conducted Radio

Equipment	Manufacturer	Type	SERIAL-NO.	Actual Calibration	Next Calibration
Climatic Chamber	Vötsch	VT4002	521/85094	09.10.2018	09.10.2019
EMI Test Receiver	ROHDE & SCHWARZ	ESU26	100077	16.08.2017	16.08.2019
Power Supply	Hewlett Packard - Agilent	E3632A	MY40011318	23.05.2018	23.05.2020

End of Report