EMI – TEST REPORT

- FCC Part 15.209, RSS-210 -

Model Name	:	Me1550 (internal development name), RONDO 3 (market name), product codes: Me1550, Me1551, Me1552, Me1553
Product Description	:	Single Unit Audio Processor for cochlear implant system including a 2.4 GHz transceiver with integral antenna
Applicant	:	MED-EL Elektromedizinische Geraete GmbH
Address	:	Fuerstenweg 77a 6020 INNSBRUCK, AUSTRIA
Manufacturer	:	MED-EL Elektromedizinische Geraete GmbH
Address	:	Fuerstenweg 77a 6020 INNSBRUCK, AUSTRIA

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Test Report No. :	**T45644-01-00SK**	27. August 2020 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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Contents

ATTACHMENT A and B as separate supplements

1 TEST STANDARDS

FCC Rules and Regulations Part 15, Subpart A - General (September, 2019)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2019)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2

2 SUMMARY

2.1 Summary for all EMI tests

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	Conducted emissions	passed
15.209(a)	RSS-210, 7.2 RSS-Gen, 6.12	Field strength of the fundamental wave	passed
15.209(c)	RSS-210, 7.3 RSS-Gen, 8.9, 8.10	Spurious emissions	passed
-	RSS-Gen, 6.7	99 % Bandwidth	no limit
15.203	-	Antenna requirement	passed

The mentioned RSS Rule parts in the above table are related to:
RSS-Gen, Issue 5, March 2019, Amendment 1
RSS-210, Issue 10, December 2019

2.2 Final assessment

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 10. January 2020

Testing concluded on : 27. August 2020

Checked by:

Klaus Gegenfurtner
2020.08.27 08:55:51
+02'00'

Klaus Gegenfurtner
Team Leader Radio

Tested by:

Sabine Kugler
2020.08.27
08:47:00
+02'00'

Sabine Kugler
Radio Team

3 EQUIPMENT UNDER TEST

3.1 General remarks

This test report covers the 11.6 MHz inductive link. The 2.4 GHz transceiver is recorded in the test reports T45644-00-06 und T45644-00-07 issued by CSA Group Bayern GmbH.

3.2 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

3.3 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

3.4 Photo documentation of the EUT

Detailed photos see attachment A

3.5 Short description of the Equipment under Test (EUT)

The EUT is a single unit audio processor with a 2.4 GHz transceiver with an 11.6 MHz inductive link. The Me1550 (internal development name) is a medical device similar to a hearing aid but is worn off the ear at a position slightly above and behind the ear. It converts acoustic signals and drives an implanted MED-EL cochlear implant which - based on the information from the audio processor - directly stimulates the acoustic nerve in the inner ear to evoke auditory sensations. The 2.4 GHz transceiver can receive commands from an external device and can transmit acknowledge messages to the latter.
A short distance inductive wireless power transfer technology is utilized for charging the internal battery of the device when it is not worn by the user.

Number of tested samples:	1
Serial number:	143
Firmware version:	2.0.1
Type:	Me1550

According to the manufacturer the sub variants Me1551, Me1552, and Me1553 do not differ in hardware and/or firmware, they just differ in product code which are only introduced for marketing and sales purposes.

3.6 Power supply system utilised

Power supply voltage	:	3.8 VDC, (Li-Ion battery)
Power supply voltage (alternative)	:	120 VAC, 60 Hz, 5.0 VDC (charging via cable)
Power supply voltage (alternative)	:	120 VAC, 60 Hz, 4.75 VDC (wireless charging base)

All tests were carried out with a supply voltage of 120 V, 60 Hz unless otherwise stated.

3.7 Highest internal frequency

Highest internal frequency : 2.48 GHz

3.8 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- 11.6 MHz TX continuous, 2.4 GHz off, without charging

- 11.6 MHz TX continuous, 2.4 GHz off, charging via cable

- EUT off, wireless charging

3.9 Antenna

The following antenna shall be used with the EUT:

Characteristic	Plug	Frequency range (MHz)	Gain (dBi)
Integrated inductive loop	-	11.6	-

3.10 EUT configuration

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Reset Plug Model : MED-EL
- Test Implant Model : Concerto, MED-EL
- Charging cable Model : SN021915, MED-EL GmbH
- Wireless charging base Model : SN 1347172CY003, mophie inc.
- Switching power adaptor Model : UES06WNCPU-050100SPA, Ansmann AG

3.11 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Accreditation and Recognition of the test laboratory

Within the framework of the Mutual Recognition Agreement (MRA) between the European Community and the USA the EMC test laboratory listed above has been approved as a Conformity Assessment Body (CAB) designated by the EU member states through the conclusion of the MRA on the basis of Article 133 of the treaty

The site is accredited/registered by

- the German accreditation body DAkkS-Registration No.: D-PL-12030-01-02
- the Federal Communications Commission (FCC) Registration Number: 0013864798
- the Bundesnetzagentur (German Federal Network Agency) as Conformity assessment body (CAB) Registration No: BnetzA-CAB-13/21-07

4.3 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.4 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 °C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.6 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

4.6.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.6.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

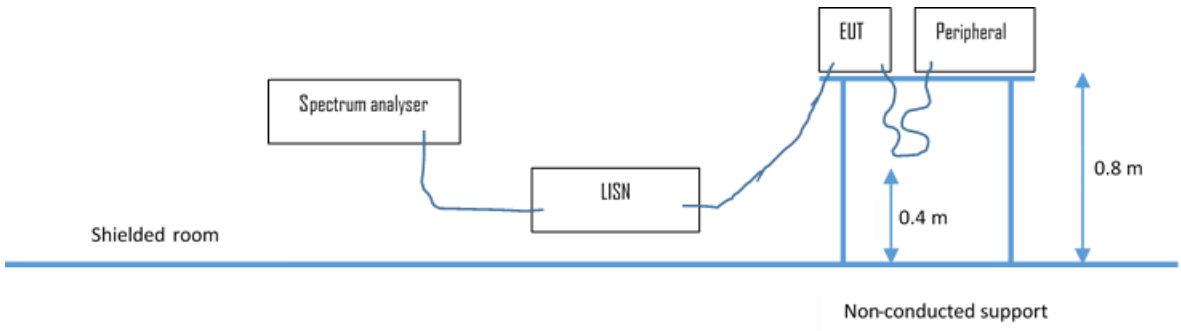
4.6.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.6.3 Details of test procedures

4.6.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dBµV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

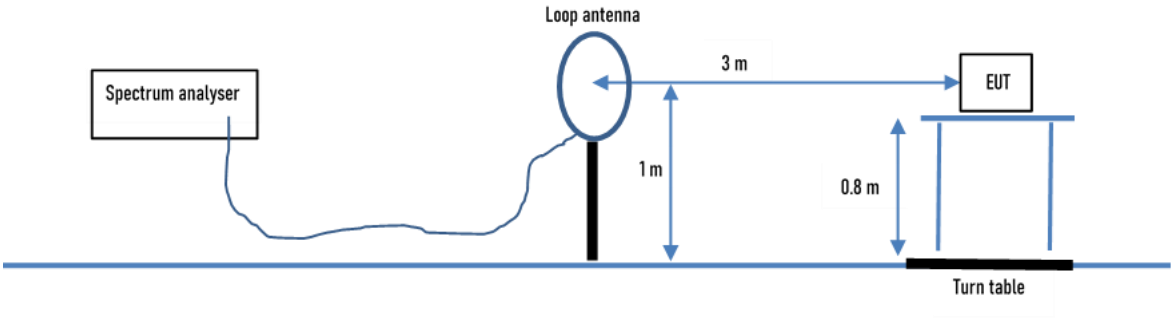
To convert between dBµV and µV, the following conversions apply:
dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 µH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.6.3.2 Radiated emission

4.6.3.2.1 OATS1 test site (9 kHz - 30 MHz):

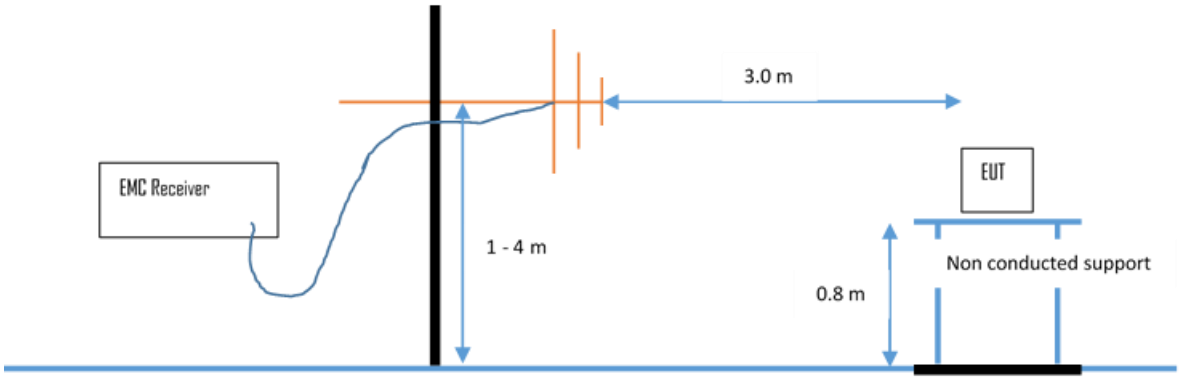
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

4.6.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

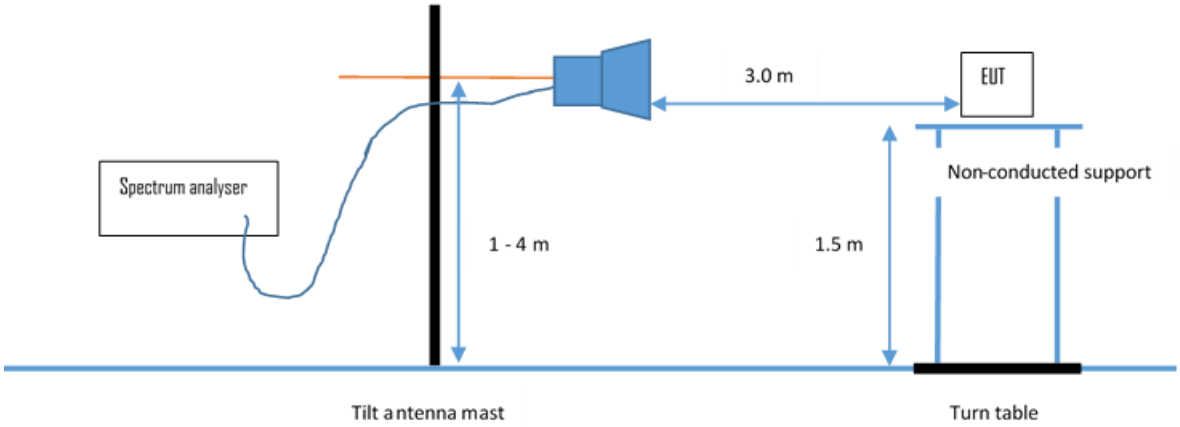
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

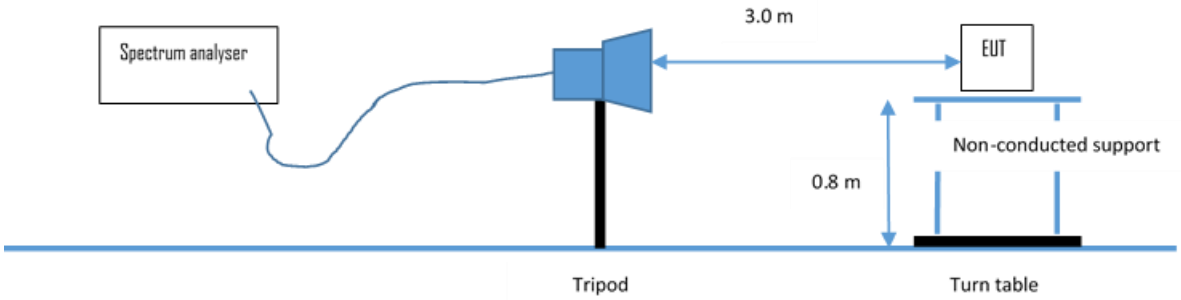
4.6.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.6.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 0.8 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limits are adopted.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part **A4**.

Legend for tables:
QP-L … QuasiPeak reading including correction factor
AV-L … Average reading including correction factor
D-Limit… Measured value to limit delta (margin)

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test setup

For detailed photos of the test set-up see Attachment B.

5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):
Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin by -1.7 dB at 11.46 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

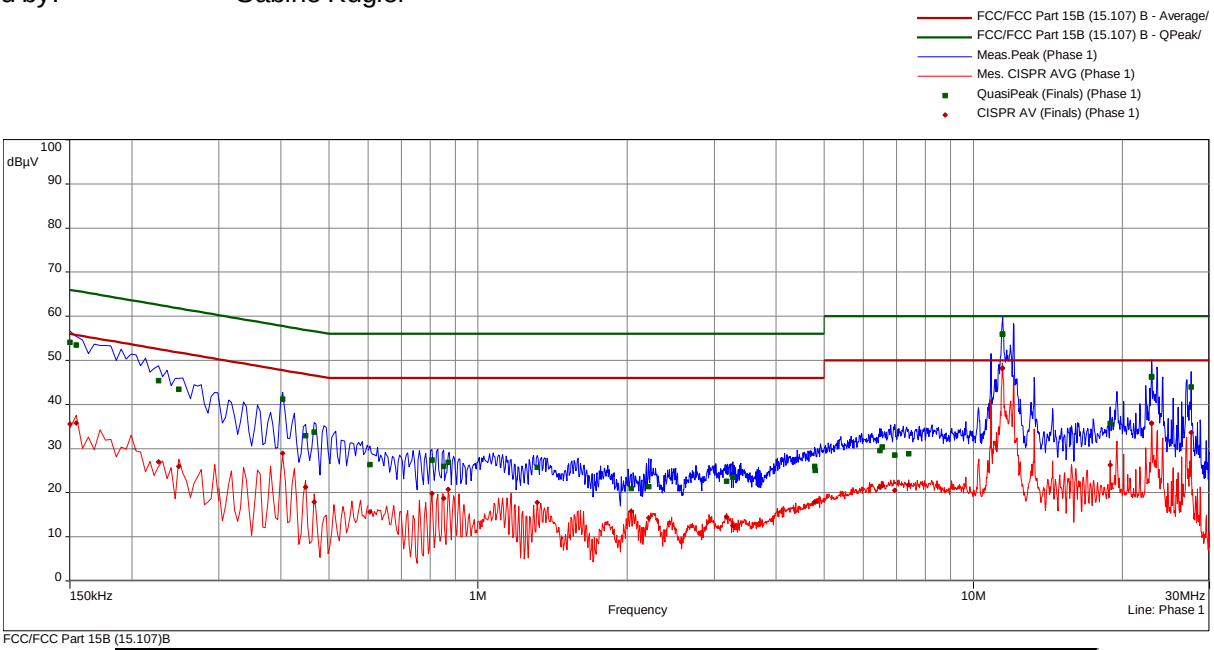
The requirements are **FULFILLED.**

Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.6.3.

5.1.6 Test protocol

Test point: L1 Result: passed
Operation mode: 11.6 MHz TX continuous, 2.4 GHz off, charging via cable
Remarks: None
Tested by: Sabine Kugler

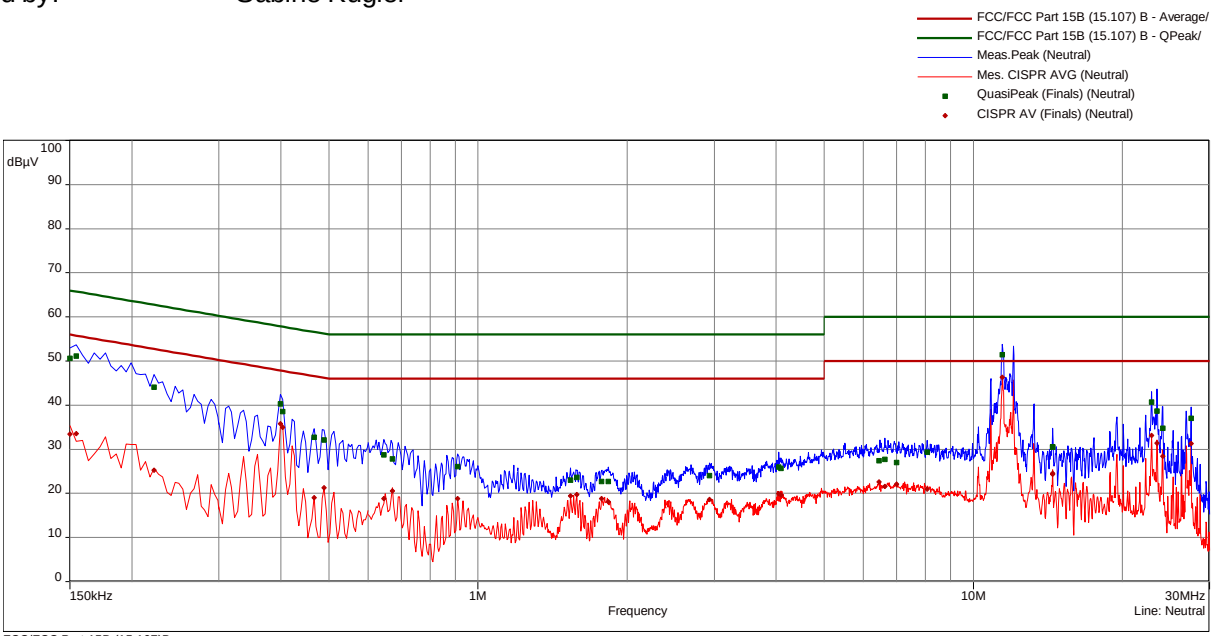


FCC/FCC Part 15B (15.107)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.150	1	54.1	-11.9	66.0	35.6	-20.4	56.0	Phase 1	10.1
0.155	1	53.5	-12.2	65.8	35.8	-20.0	55.8	Phase 1	10.1
0.227	1	45.4	-17.2	62.6	27.0	-25.6	52.6	Phase 1	10.1
0.249	1	43.4	-18.4	61.8	26.0	-25.8	51.8	Phase 1	10.1
0.404	2	41.2	-16.6	57.8	29.0	-18.8	47.8	Phase 1	10.2
0.449	2	32.9	-24.0	56.9	21.3	-25.6	46.9	Phase 1	10.2
0.467	2	33.7	-22.8	56.6	18.0	-28.6	46.6	Phase 1	10.2
0.605	3	26.4	-29.6	56.0	15.7	-30.3	46.0	Phase 1	10.2
0.807	3	27.4	-28.6	56.0	19.8	-26.2	46.0	Phase 1	10.2
0.852	3	26.0	-30.0	56.0	18.8	-27.2	46.0	Phase 1	10.2
0.870	3	26.9	-29.1	56.0	20.8	-25.2	46.0	Phase 1	10.2
1.317	4	25.7	-30.3	56.0	17.8	-28.2	46.0	Phase 1	10.3
2.037	4	20.9	-35.1	56.0	15.7	-30.3	46.0	Phase 1	10.3
2.213	4	21.4	-34.6	56.0	14.3	-31.7	46.0	Phase 1	10.3
3.174	5	22.6	-33.4	56.0	14.5	-31.5	46.0	Phase 1	10.4
3.269	5	23.5	-32.5	56.0	12.6	-33.4	46.0	Phase 1	10.4
4.781	5	26.0	-30.0	56.0	17.9	-28.1	46.0	Phase 1	10.4
4.799	5	25.0	-31.0	56.0	17.9	-28.1	46.0	Phase 1	10.4
6.479	6	29.5	-30.5	60.0	21.2	-28.8	50.0	Phase 1	10.6
6.542	6	30.4	-29.7	60.0	21.6	-28.4	50.0	Phase 1	10.6
6.938	6	28.6	-31.4	60.0	20.5	-29.5	50.0	Phase 1	10.6
7.415	6	28.8	-31.2	60.0	21.8	-28.3	50.0	Phase 1	10.6
11.454	7	55.9	-4.1	60.0	48.2	-1.8	50.0	Phase 1	10.9
11.463	7	55.9	-4.1	60.0	48.3	-1.7	50.0	Phase 1	10.9
18.888	7	35.7	-24.3	60.0	26.3	-23.7	50.0	Phase 1	11.4
22.913	8	46.3	-13.7	60.0	35.7	-14.3	50.0	Phase 1	11.6
22.917	8	46.3	-13.7	60.0	35.8	-14.2	50.0	Phase 1	11.6
27.534	8	43.9	-16.1	60.0	33.6	-16.4	50.0	Phase 1	11.7

Test point: N
Operation mode: 11.6 MHz TX continuous, 2.4 GHz off, charging via cable
Remarks: None
Tested by: Sabine Kugler

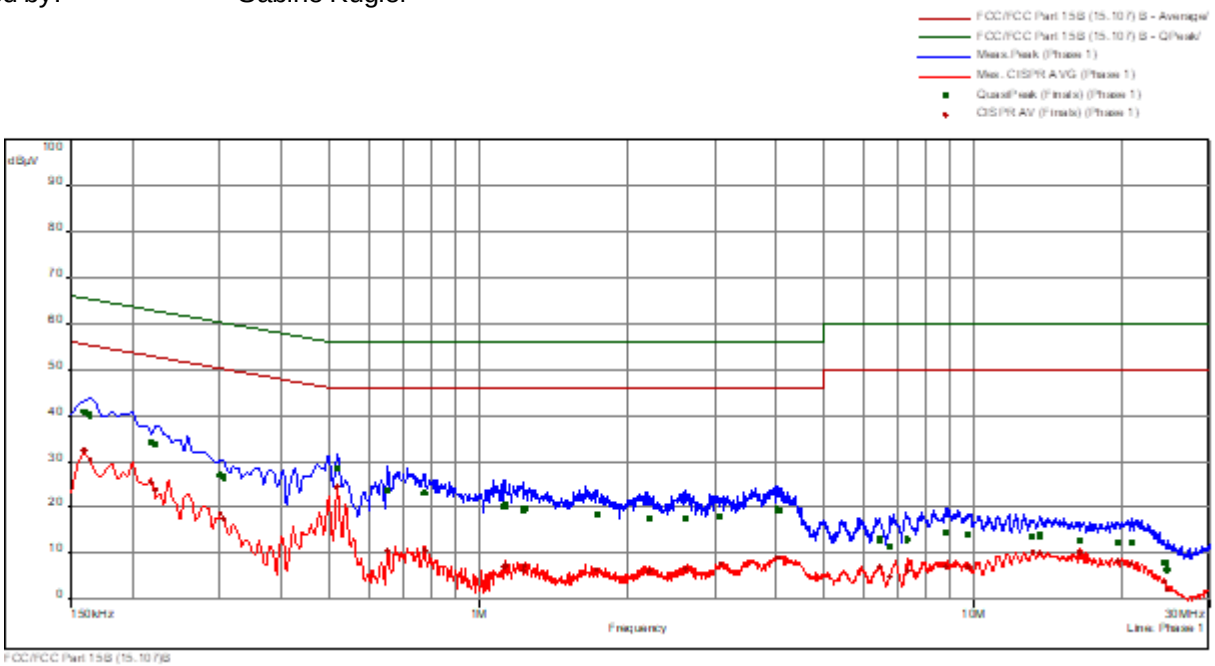
Result: passed



FCC/FCC Part 15B (15.107)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.150	9	50.6	-15.4	66.0	33.5	-22.5	56.0	Neutral	10.1
0.155	9	51.2	-14.6	65.8	33.6	-22.2	55.8	Neutral	10.1
0.222	9	44.0	-18.7	62.7	25.3	-27.5	52.7	Neutral	10.1
0.399	10	40.3	-17.5	57.9	35.8	-12.0	47.9	Neutral	10.2
0.404	10	38.6	-19.2	57.8	35.0	-12.8	47.8	Neutral	10.2
0.467	10	32.7	-23.9	56.6	19.0	-27.6	46.6	Neutral	10.2
0.489	10	32.2	-24.0	56.2	21.3	-24.9	46.2	Neutral	10.2
0.645	11	28.7	-27.3	56.0	18.8	-27.2	46.0	Neutral	10.2
0.672	11	27.9	-28.2	56.0	20.6	-25.4	46.0	Neutral	10.2
0.911	11	26.1	-29.9	56.0	18.9	-27.1	46.0	Neutral	10.2
1.538	12	23.0	-33.0	56.0	19.4	-26.6	46.0	Neutral	10.3
1.583	12	23.6	-32.4	56.0	19.8	-26.2	46.0	Neutral	10.3
1.776	12	22.7	-33.3	56.0	18.8	-27.2	46.0	Neutral	10.3
1.835	12	22.7	-33.3	56.0	18.1	-27.9	46.0	Neutral	10.3
2.936	13	24.0	-32.0	56.0	18.6	-27.4	46.0	Neutral	10.3
4.047	13	26.0	-30.0	56.0	19.9	-26.1	46.0	Neutral	10.4
4.092	13	25.7	-30.3	56.0	19.7	-26.3	46.0	Neutral	10.4
6.452	14	27.5	-32.5	60.0	22.6	-27.4	50.0	Neutral	10.5
6.627	14	27.7	-32.3	60.0	21.5	-28.5	50.0	Neutral	10.6
7.005	14	27.0	-33.1	60.0	22.1	-27.9	50.0	Neutral	10.6
8.072	14	29.3	-30.7	60.0	21.0	-29.0	50.0	Neutral	10.6
11.450	15	51.5	-8.5	60.0	46.3	-3.7	50.0	Neutral	10.8
14.469	15	30.6	-29.4	60.0	24.5	-25.5	50.0	Neutral	11.0
14.478	15	30.5	-29.5	60.0	24.3	-25.7	50.0	Neutral	11.0
22.899	16	40.7	-19.3	60.0	33.2	-16.8	50.0	Neutral	11.3
23.502	16	38.7	-21.4	60.0	31.4	-18.6	50.0	Neutral	11.3
24.119	16	34.8	-25.2	60.0	28.4	-21.6	50.0	Neutral	11.3
27.525	16	37.0	-23.0	60.0	31.3	-18.7	50.0	Neutral	11.2

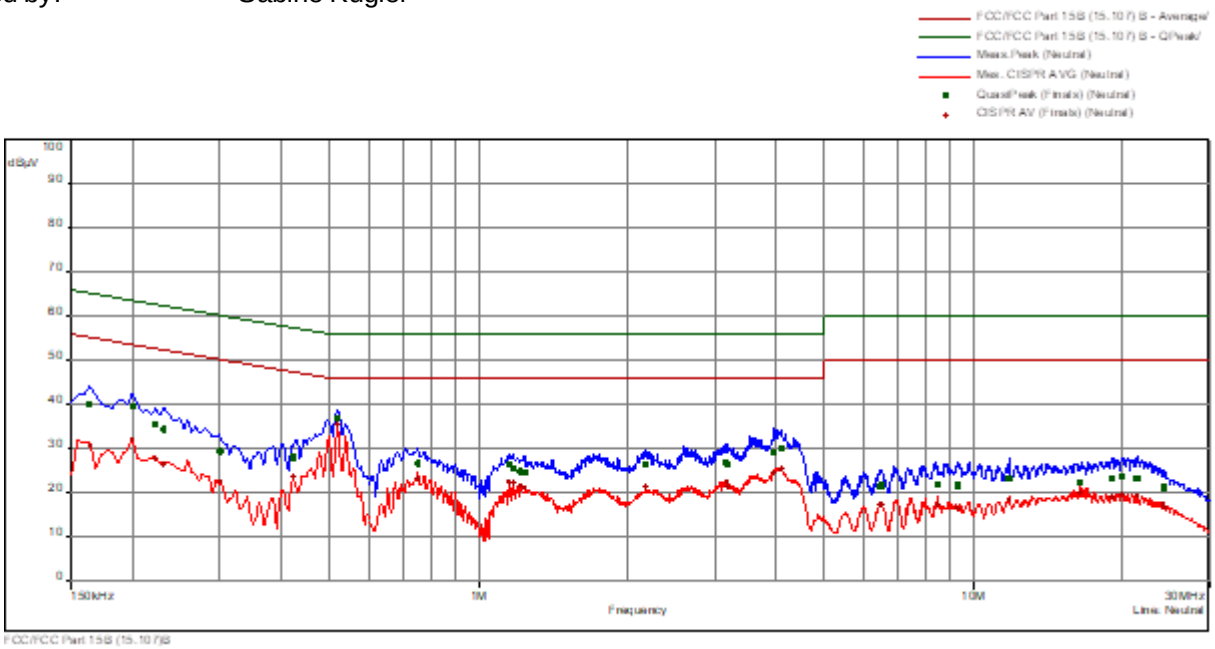
Test point: L1 Result: passed
Operation mode: EUT off, wireless charging
Remarks: None
Tested by: Sabine Kugler



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.159	1	40.9	-24.6	65.5	32.5	-23.1	55.5	Phase 1	10.1
0.164	1	40.1	-25.2	65.3	30.4	-24.9	55.3	Phase 1	10.1
0.218	1	34.0	-29.0	62.9	25.5	-27.4	52.9	Phase 1	10.1
0.222	1	33.7	-29.0	62.7	23.8	-28.9	52.7	Phase 1	10.1
0.300	2	27.1	-33.2	60.2	18.6	-31.7	50.2	Phase 1	10.1
0.305	2	26.5	-33.6	60.1	17.5	-32.6	50.1	Phase 1	10.1
0.516	2	28.6	-27.4	56.0	24.4	-21.6	46.0	Phase 1	10.2
0.654	3	23.7	-32.3	56.0	10.5	-35.5	46.0	Phase 1	10.2
0.776	3	23.1	-32.9	56.0	10.6	-35.4	46.0	Phase 1	10.2
1.127	3	20.2	-35.8	56.0	7.1	-38.9	46.0	Phase 1	10.2
1.131	3	20.7	-35.3	56.0	7.5	-38.5	46.0	Phase 1	10.2
1.227	4	19.3	-36.7	56.0	6.3	-39.8	46.0	Phase 1	10.2
1.236	4	19.9	-36.2	56.0	7.2	-38.8	46.0	Phase 1	10.2
1.731	4	18.4	-37.7	56.0	6.5	-39.5	46.0	Phase 1	10.3
2.208	4	17.5	-38.5	56.0	6.2	-39.8	46.0	Phase 1	10.3
2.612	5	17.7	-38.3	56.0	6.7	-39.3	46.0	Phase 1	10.3
3.075	5	17.9	-38.1	56.0	7.8	-38.2	46.0	Phase 1	10.4
4.007	5	19.5	-36.5	56.0	9.0	-37.0	46.0	Phase 1	10.4
4.043	5	19.4	-36.6	56.0	9.2	-36.8	46.0	Phase 1	10.4
6.461	6	13.0	-47.0	60.0	7.0	-43.0	50.0	Phase 1	10.6
6.785	6	11.6	-48.5	60.0	4.9	-45.1	50.0	Phase 1	10.6
7.347	6	13.0	-47.0	60.0	6.3	-43.7	50.0	Phase 1	10.6
8.778	6	14.3	-45.7	60.0	7.0	-43.0	50.0	Phase 1	10.7
9.767	7	14.2	-45.8	60.0	7.1	-42.9	50.0	Phase 1	10.7
13.155	7	13.7	-46.3	60.0	10.4	-39.6	50.0	Phase 1	11.0
13.610	7	13.9	-46.1	60.0	10.1	-40.0	50.0	Phase 1	11.1
16.386	7	12.9	-47.2	60.0	10.3	-39.7	50.0	Phase 1	11.3
19.578	8	12.5	-47.6	60.0	8.4	-41.6	50.0	Phase 1	11.4
20.838	8	12.2	-47.8	60.0	7.7	-42.3	50.0	Phase 1	11.5
24.398	8	7.9	-52.1	60.0	3.9	-46.1	50.0	Phase 1	11.7
24.627	8	6.4	-53.6	60.0	2.1	-48.0	50.0	Phase 1	11.7

Test point: N
Operation mode: EUT off, wireless charging
Remarks: None
Tested by: Sabine Kugler

Result: passed



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.164	9	40.1	-25.2	65.3	30.7	-24.6	55.3	Neutral	10.1
0.200	9	39.6	-24.0	63.6	32.1	-21.6	53.6	Neutral	10.1
0.222	9	35.7	-27.1	62.7	27.8	-25.0	52.7	Neutral	10.1
0.231	9	34.5	-27.9	62.4	26.5	-25.9	52.4	Neutral	10.1
0.300	10	29.5	-30.8	60.2	22.7	-27.5	50.2	Neutral	10.1
0.422	10	28.0	-29.4	57.4	23.6	-23.8	47.4	Neutral	10.2
0.516	10	36.9	-19.1	56.0	35.5	-10.5	46.0	Neutral	10.2
0.753	11	26.7	-29.3	56.0	23.2	-22.8	46.0	Neutral	10.2
1.149	11	26.6	-29.5	56.0	22.5	-23.6	46.0	Neutral	10.2
1.172	11	25.5	-30.5	56.0	22.3	-23.7	46.0	Neutral	10.2
1.214	12	24.9	-31.1	56.0	21.6	-24.5	46.0	Neutral	10.2
1.236	12	24.8	-31.3	56.0	21.2	-24.8	46.0	Neutral	10.2
2.172	12	26.6	-29.4	56.0	21.4	-24.6	46.0	Neutral	10.3
3.165	13	26.8	-29.2	56.0	22.6	-23.4	46.0	Neutral	10.4
3.179	13	26.3	-29.7	56.0	21.5	-24.5	46.0	Neutral	10.4
3.948	13	29.1	-27.0	56.0	24.6	-21.4	46.0	Neutral	10.4
4.088	13	30.2	-25.9	56.0	25.4	-20.6	46.0	Neutral	10.4
6.461	14	21.4	-38.6	60.0	17.3	-32.7	50.0	Neutral	10.5
6.519	14	21.7	-38.3	60.0	17.5	-32.5	50.0	Neutral	10.5
8.463	14	21.9	-38.1	60.0	17.3	-32.8	50.0	Neutral	10.6
9.287	14	21.7	-38.3	60.0	16.5	-33.5	50.0	Neutral	10.7
11.814	15	23.2	-36.8	60.0	18.4	-31.6	50.0	Neutral	10.8
16.395	15	22.5	-37.5	60.0	20.1	-29.9	50.0	Neutral	11.1
19.118	15	23.3	-36.8	60.0	19.0	-31.0	50.0	Neutral	11.2
19.988	16	23.8	-36.3	60.0	19.6	-30.4	50.0	Neutral	11.3
21.432	16	23.3	-36.7	60.0	19.3	-30.7	50.0	Neutral	11.3
24.263	16	21.6	-38.4	60.0	17.6	-32.4	50.0	Neutral	11.3
24.357	16	20.9	-39.2	60.0	16.8	-33.2	50.0	Neutral	11.3

5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part **CPR 1**.

5.2.1 Description of the test location

Test location: OATS 1

Test distance: 3 meters

5.2.2 Photo documentation of the test set-up

For detailed photos of the test set-up see Attachment B.

5.2.1 Applicable standard

According to FCC Part 15C, Section 15.209:
The emissions from intentional radiators shall not exceed the effective field strength limits.

5.2.2 Description of Measurement

The magnetic field strength from the EUT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the EUT will be in accordance to ANSI C63.4. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31(f)(2)(2). The final measurement will be performed with an EMI receiver set to quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).
The resolution bandwidth during the measurement is as follows:
9 kHz – 150 kHz: RBW: 200 Hz
150 kHz – 30 MHz: RBW: 9 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level dB(µV/m)	-	Limit dB(µV/m)	=	Delta (dB)
1.705	5	+	20	=	25	-	30	=	-5

5.2.3 Test result

The measurement value is calculated from a distance of 3 m to 30 m by subtracting the factor 40 dB/decade.

Frequency	Reading PK	Reading PK	D factor	Level PK	Limit AV	Delta
(MHz)	dB(µA/m)	dB(µV/m)	dB(µV/m)	dB(µV/m)	dB(µV/m)	(dB)
11.62	2.9	53.9	-40.0	13.9	29.5	-15.6

Limit according to FCC Part 15C, Section 15.209(a):

Frequency	Field strength of fundamental wave		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	**30**	**29.5**	**30**

The requirements are **FULFILLED.**

Remarks: None

5.3 Spurious emissions < 1 GHz

For test instruments and accessories used see section 6 Part **SER1, SER2**.

Legend for tables:
Level vert. QuasiPeak reading including correction factor for vertically polarised antenna
Level hor. QuasiPeak reading including correction factor for horizontally polarised antenna
Limit Limit referred to the appropriate standard
DLimit… Delta between limit and result (margin)
Noise Characteristic of disturbance (narrowband or broadband)

5.3.1 Description of the test location

Test location: OATS 1

Test distance: 3 metres

5.3.2 Photo documentation of the test setup

For detailed photos of the test set-up see Attachment B.

5.3.3 Applicable standard

According to FCC Part 15C, Section 15.209:
The emissions from intentional radiators shall not exceed the effective field strength limits.

5.3.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.
The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz:	RBW:	200 Hz
150 kHz – 30 MHz:	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz

5.3.5 Test result

Frequency range: 9 kHz - 1000 MHz

Min. limit margin by -13.3 dB at 119.76 MHz

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The requirements are **FULFILLED.**

Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.6.4.

5.3.6 Test protocol

Operation mode: 11.6 MHz TX continuous, 2.4 GHz off, without charging Result: passed
Tested by: Sabine Kugler

Frequency	Reading PK	Reading PK	D factor	Level PK	Limit AV	Delta
(MHz)	dB(µA/m)	dB(µV/m)	dB(µV/m)	dB(µV/m)	dB(µV/m)	(dB)
0.47	-18.9	32.1	-80.0	-47.9	14.2	-62.1
11.62	2.9	53.9	-40.0	13.9	29.5	-15.6
23.24	-3.2	47.8	-40.0	7.8	29.5	-21.7

Note: the measurement value is calculated from a distance of 3 m to 300 m by subtracting the factor 40 dB/decade.

Frequency (MHz)	**Reading Vert. (dBµV)**	**Reading Hor. (dBµV)**	**Correct. Vert. (dB)**	**Correct. Hor. (dB)**	**Level Vert. (dBµV/m)**	**Level Hor. (dBµV/m)**	**Limit (dBµV/m)**	**Dlimit (dB)**
48.43	4.8	-3.2	15.1	13.9	19.9	10.7	40.0	-20.1
83.86	3.7	0.3	9.9	9.7	13.6	10.0	40.0	-26.4
119.76	18.7	12.9	11.5	12.3	30.2	25.2	43.5	-13.3
320.76	1.0	1.4	16.8	16.4	17.8	17.8	46.0	-28.2
457.17	1.9	-0.6	20.5	20.3	22.4	19.7	46.0	-23.6
765.90	-1.2	-1.2	27.2	26.8	26.0	25.6	46.0	-20.0

5.4 Spurious emissions > 1 GHz

For test instruments and accessories used see section 6 Part **SER 3**.

5.4.1 Description of the test location

Test location: Anechoic chamber 1

Test distance: 3 metres

ETS Lindgren 3117: Dimension of the line tangent to the EUT according to CISPR 16-2-3:2010

Note: The Θ 3dB min valueswere given by the antenna manufacturer

Frequency GHz	Θ 3 dB min	Measurement distance	***w*** min
1	88	3 m	5.79 m
2	67	3 m	3.97 m
4	69	3 m	4.12 m
6	53	3 m	2.99 m
10	40	3 m	2.18 m
18	36	3 m	1.95 m

5.4.2 Photo documentation of the test setup

For detailed photos of the test set-up see Attachment B.

5.4.3 Applicable standard

According to FCC Part 15C, Section 15.209:
The emissions from intentional radiators shall not exceed the effective field strength limits.

5.4.4 Test result

Frequency range: 1 - 25 GHz

Min. limit margin -6.0 dB at 17.94 GHz

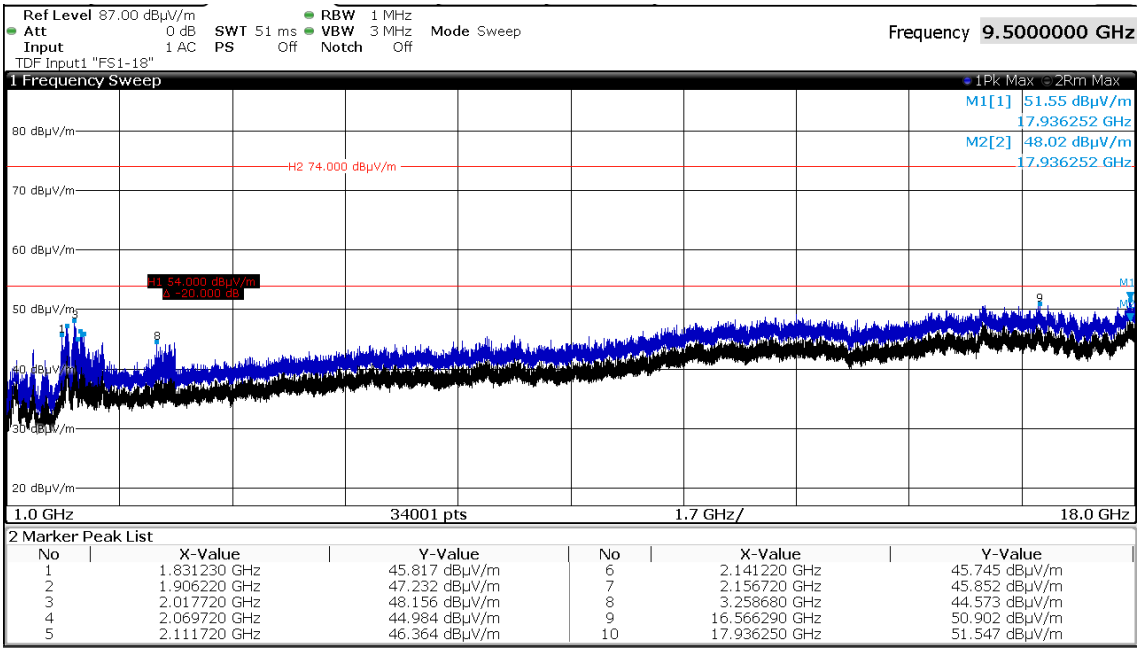
The requirements are **FULFILLED.**

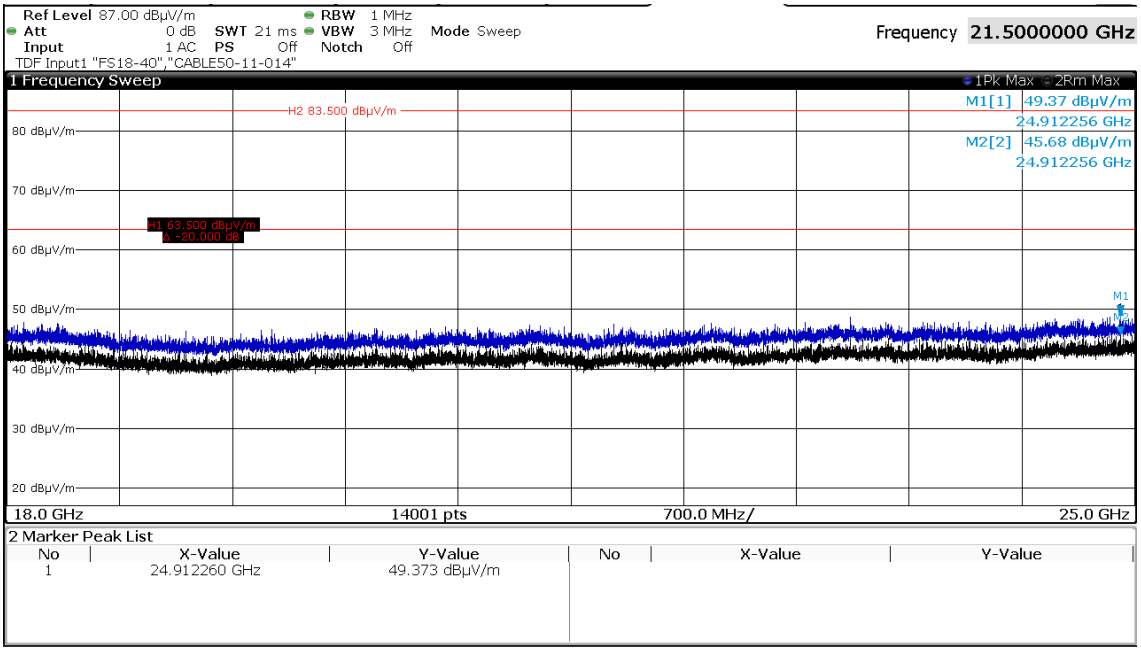
Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.6.5.

5.4.5 Test protocol

Operation mode:	11.6 MHz TX continuous, 2.4 GHz off, without charging	Result: passed
Remarks:	None	
Tested by:	Sabine Kugler	





Note: The measurement distance for 18 - 25 GHz frequency range was changed to 1 m therefore the limit lines are adjusted and increased by 9.5 dB.

5.5 Emission bandwidth

For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

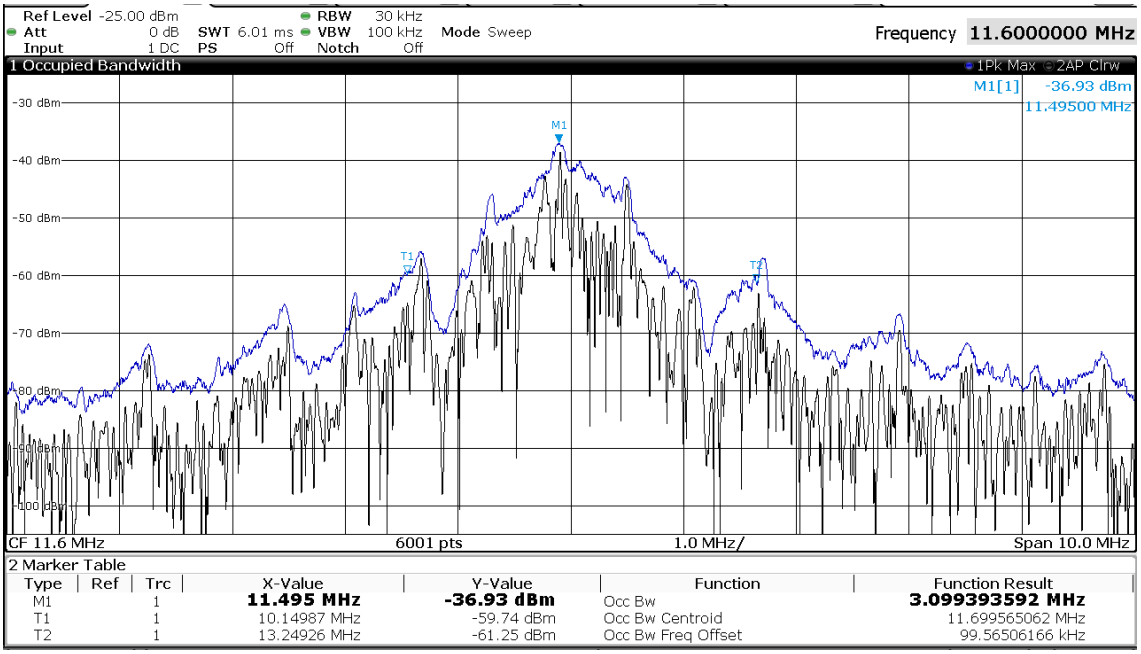
Test location: AREA 4

5.5.2 Photo documentation of the test set-up

For detailed photos of the test set-up see Attachment B.

5.5.3 Test protocol

OBW 99



Remarks: None

5.6 Antenna application

5.6.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

5.6.2 Result

The EUT uses an integrated antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

The requirements are **FULFILLED.**

Remarks: None.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.19.1.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	24/06/2021	24/06/2020		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	04/11/2020	04/05/2020
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/11/2020	12/05/2020
CPR 1	ESCI	02-02/03-05-005	04/12/2020	04/12/2019		
	HFH 2 - Z 2	02-02/24-15-001	01/04/2021	01/04/2020		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
MB	ESW26	02-02/03-17-002	16/01/2021	16/01/2020		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 1	ESCI	02-02/03-05-005	04/12/2020	04/12/2019		
	HFH 2 - Z 2	02-02/24-15-001	01/04/2021	01/04/2020		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-006	15/07/2021	15/07/2020		
	VULB 9168	02-02/24-05-005	19/09/2020	19/07/2019		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	ESW26	02-02/03-17-002	16/01/2021	16/01/2020		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	18/06/2021	18/06/2020		
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	14/01/2021	14/01/2020
	KMS102-1 m	02-02/50-11-014				
	18N-20	02-02/50-17-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	BAT-EMC 3.19.1.24	02-02/68-13-001				