

EMI – TEST REPORT

- FCC 15.209 -

Type / Model Name : CPK 3-MS

Product Description : Correlux wireless charging system

Applicant : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-lann-Str. 6

96148 BAUNACH, GERMANY

Manufacturer : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-lann-Str. 6

96148 BAUNACH, GERMANY

Licence holder : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-lann-Str. 6

96148 BAUNACH, GERMANY

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

POSITIVE

Test Report No. : **T41060-01-00KJ**

02. June 2016

Date of issue



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

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2015)

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 (October, 2015)

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
Part 15, Subpart C, Section 15.215	Additional provisions to the general radiated emission limitations
KDB 680106 D01 v02: 2013	RF Exposure considerations for low power consumer wireless power transfer applications
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
CISPR 16-4-2: 2013	Uncertainty in EMC measurement

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A



Charging box fully loaded (see point 2.7)



2.2 Short description of the equipment under test (EUT)

The product is an inductive charging system.

The MS-3 and the PT-3 devices of the Correlux 3 System are charged inductively. This is done by charging units integrated in the transport case CPK-3.

To activate the charging units, just power the transport case via the delivered mains power supply modul.

The COR MS-3 charging units have an operating frequency of approximately 245kHz. The sinusoidal charging coil voltage is 15 V_{peak-peak}.

The COR PT-3 charging units have an operating frequency of approximately 230kHz. The sinusoidal charging coil voltage is 45 V_{peak-peak}.

Number of tested samples: 1
Serial number: 11923660005
Firmware version: -
Highest generated frequency: 246.4 kHz

2.3 Power supply system utilised

Power supply voltage, V_{nom} 120 V / 60 Hz

2.4 Operation frequency and channel plan

Operate between 229 kHz and 247 kHz.

2.5 Variants of the EUT

There are no other variants.

2.6 Transmit operating modes

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

- **Standby mode** - TX at 246.38 kHz / 245.64 kHz / 245.48 kHz (COR MS-3 - multi-sensor)

- TX at 230.56 kHz / 229.17 kHz (COR PT-3 - power transmitter)

- **Charging mode** - TX at 246.38 kHz / 245.64 kHz / 245.48 kHz (COR MS-3 - multi-sensor)

- TX at 230.56 kHz / 229.17 kHz (COR PT-3 - power transmitter)

2.7 Peripheral devices and interface cables

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

- | | |
|------------------------|-------------------------|
| - 1x Correlator | Model : COR C-3-913-469 |
| - 3x Multi-sensor | Model : COR MS-3 |
| - 2x Power transmitter | Model : COR PT-3 |

2.8 Antenna

All transmitter coils are direct connected to the PCB.

2.9 Test Jig

No test jig is used.

2.10 Test software

No test software is used.

2.11 Determination of worst case conditions for final measurement

The inductive charger system "CPK 3-MS" was tested in two operation modes (standby and charging mode). The fundamental frequencies are measured in horizontal and vertical position with full loaded ancillary equipment to find out the worst case conditions.

For further measurements, the EUT is set in horizontal position.

3 Test result summary

FCC Rule Part	Description	Result
15.207(a)	AC power line conducted emissions	passed
15.209(a)	Field strength of the fundamental wave	passed
15.209(a)	Radiated emission limits	passed
15.215(c)	Emission bandwidth	No limit
15.35(c)	Duty cycle	No limit
KDB 680106 D01 v02 Section 3, 3)	RF Exposure Requirements (H-Field)	passed
KDB 680106 D01 v02 Section 3, 3)	RF Exposure Requirements (E-Field)	passed

3.1 FINAL ASSESSMENT:

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

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

Testing commenced on : 17 May 2016

Testing concluded on : 24 May 2016

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Josef Knab
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 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

4.3 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 / 11.2003 „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.

4.4 Measurement protocol for FCC

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 7 Part A 4.

Legend for tables:

QP-L ... QuasiPeak reading including correction factor

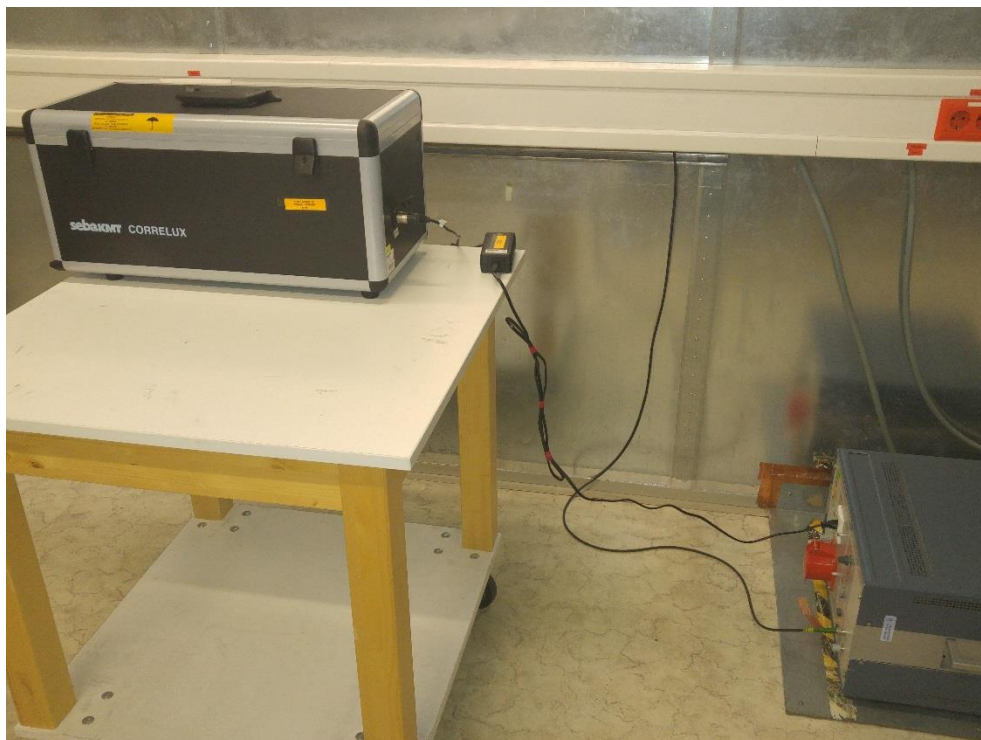
AV-L ... Average reading including correction factor

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



5.1.3 Test result

Frequency range: 0.15 MHz - 30 MHz

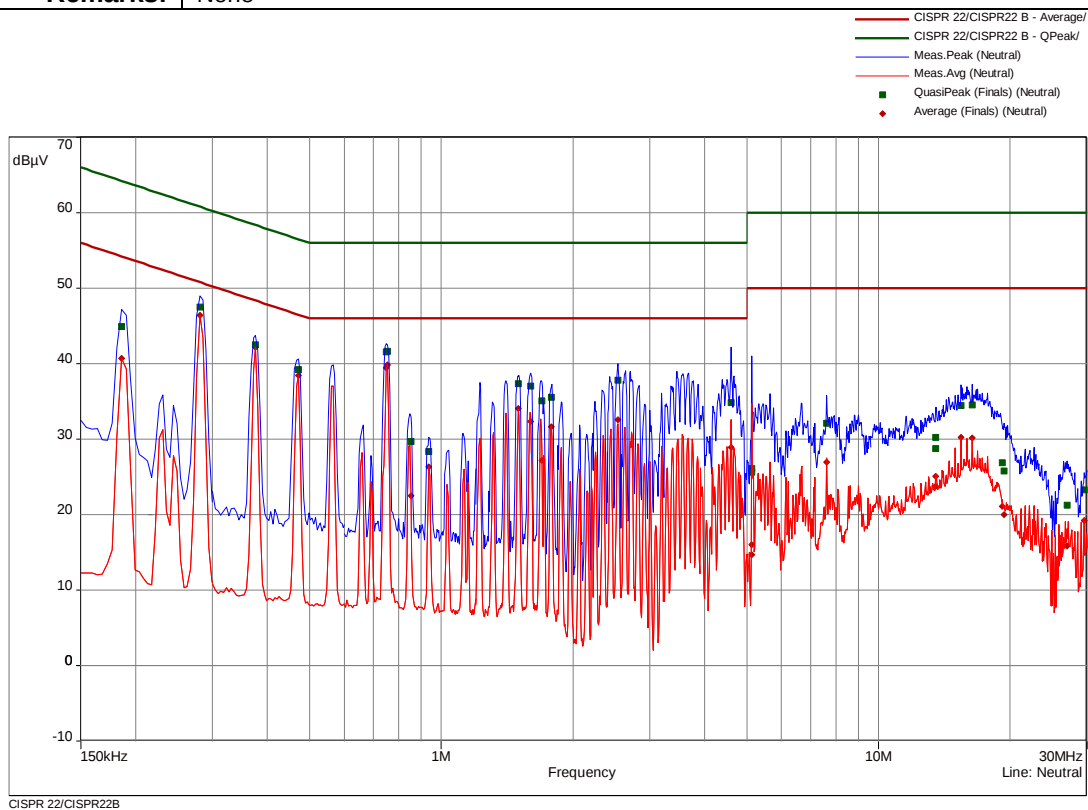
Min. limit margin 3.61 dB at 0.28 MHz

The requirements are **FULFILLED**.

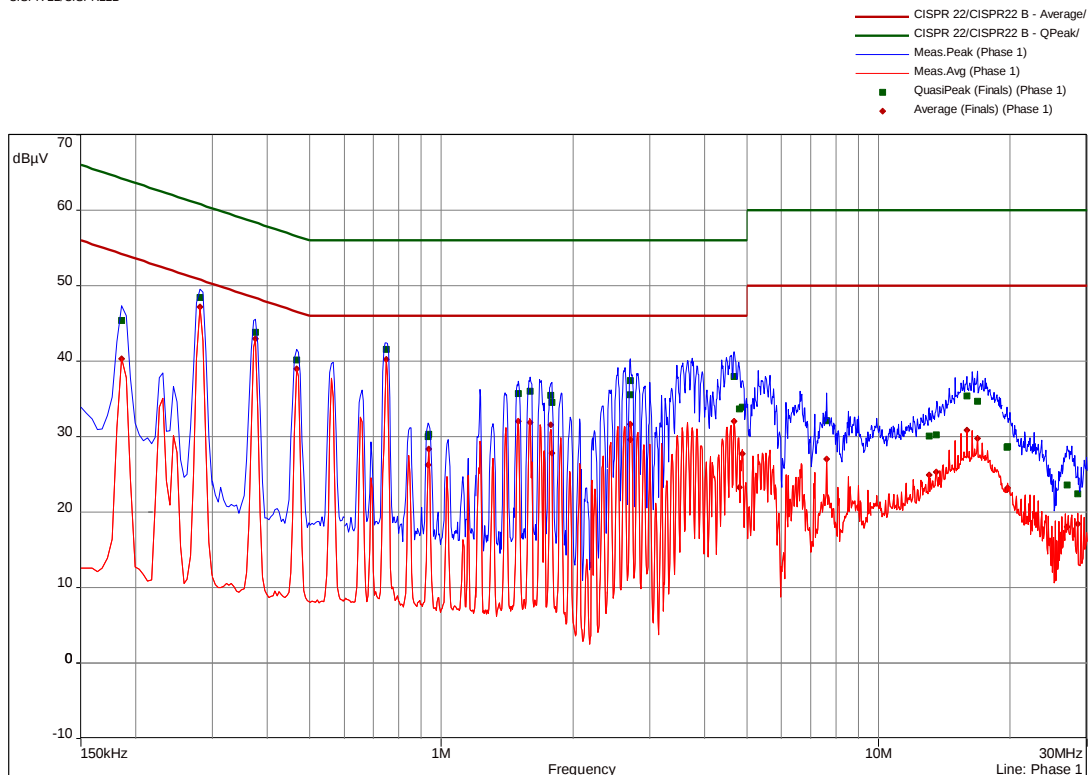
Remarks: For detailed results, please see the following page(s).

5.1.4 Test protocol

File No.:	T41060-01-00KJ	Result	passed
Operation mode:	Standby		
Tested by:	KJ		
Location:	S2	Date:	19.05.2016 13:15:18
Remarks:	None		



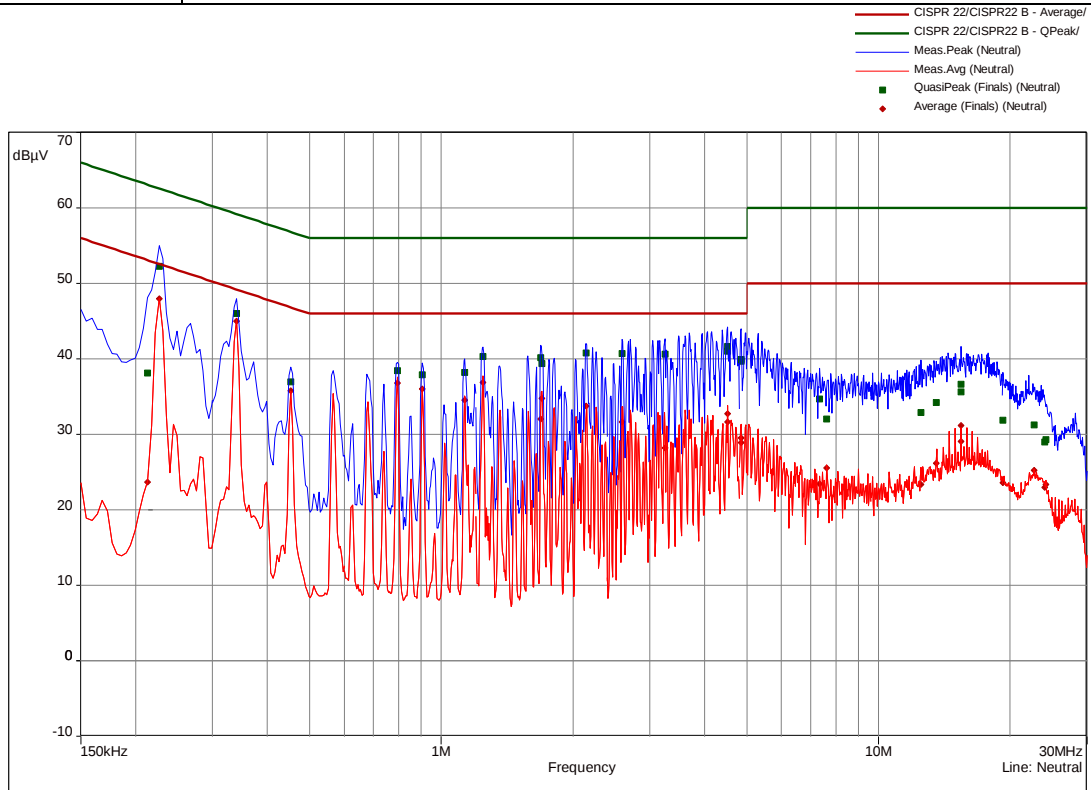
CISPR 22/CISPR22B



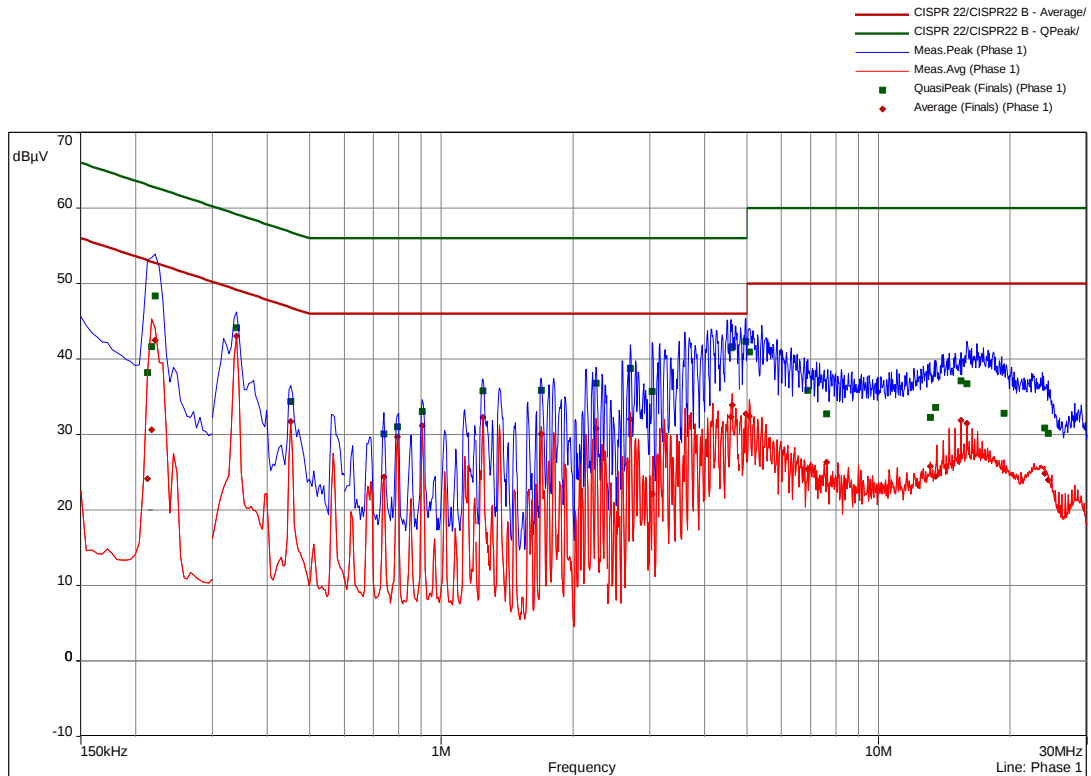
CISPR 22/CISPR22B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.186	1	45.37	18.84	64.21	40.34	13.87	54.21	Phase 1	9.84
0.2805	1	48.47	12.33	60.80	47.20	3.61	50.80	Phase 1	9.82
0.3765	2	43.82	14.54	58.36	42.95	5.41	48.36	Phase 1	9.81
0.4665	2	40.14	16.44	56.58	38.98	7.60	46.58	Phase 1	9.82
0.7485	3	41.60	14.40	56.00	40.26	5.74	46.00	Phase 1	9.80
0.933	3	29.98	26.02	56.00	26.22	19.78	46.00	Phase 1	9.82
0.9375	3	30.30	25.70	56.00	28.34	17.66	46.00	Phase 1	9.82
1.5015	4	35.70	20.30	56.00	32.07	13.93	46.00	Phase 1	9.79
1.596	4	35.98	20.02	56.00	31.89	14.11	46.00	Phase 1	9.79
1.7805	4	35.47	20.53	56.00	31.55	14.45	46.00	Phase 1	9.79
1.7895	4	34.53	21.47	56.00	27.81	18.19	46.00	Phase 1	9.79
2.706	5	35.53	20.47	56.00	29.64	16.36	46.00	Phase 1	9.79
2.7105	5	37.42	18.58	56.00	31.61	14.39	46.00	Phase 1	9.79
4.6815	5	37.98	18.02	56.00	32.01	13.99	46.00	Phase 1	9.82
4.8135	6	33.69	22.31	56.00	23.26	22.74	46.00	Phase 1	9.82
4.8765	6	33.90	22.10	56.00	27.76	18.24	46.00	Phase 1	9.82
7.608	6	32.14	27.86	60.00	27.07	22.93	50.00	Phase 1	9.85
13.056	7	30.08	29.92	60.00	24.90	25.10	50.00	Phase 1	10.02
13.551	7	30.26	29.74	60.00	25.35	24.65	50.00	Phase 1	10.04
15.909	7	35.37	24.63	60.00	30.84	19.16	50.00	Phase 1	10.15
16.8315	7	34.71	25.29	60.00	29.75	20.25	50.00	Phase 1	10.19
19.6455	8	28.59	31.41	60.00	22.97	27.03	50.00	Phase 1	10.32
19.7085	8	28.64	31.36	60.00	23.20	26.80	50.00	Phase 1	10.32
27.012	8	23.64	36.36	60.00	18.06	31.94	50.00	Phase 1	10.34
28.578	8	22.45	37.55	60.00	18.45	31.55	50.00	Phase 1	10.34
0.186	9	44.91	19.30	64.21	40.69	13.52	54.21	Neutral	9.85
0.2805	9	47.51	13.30	60.80	46.43	4.38	50.80	Neutral	9.83
0.3765	10	42.49	15.87	58.36	42.18	6.18	48.36	Neutral	9.81
0.471	10	39.24	17.25	56.50	38.48	8.02	46.50	Neutral	9.82
0.7485	11	41.59	14.41	56.00	39.47	6.53	46.00	Neutral	9.80
0.753	11	41.62	14.38	56.00	39.82	6.18	46.00	Neutral	9.80
0.852	11	29.70	26.30	56.00	22.53	23.47	46.00	Neutral	9.81
0.9375	11	28.39	27.61	56.00	26.34	19.66	46.00	Neutral	9.82
1.5015	12	37.32	18.68	56.00	34.06	11.94	46.00	Neutral	9.79
1.6005	12	37.02	18.98	56.00	32.34	13.66	46.00	Neutral	9.79
1.6995	12	35.06	20.94	56.00	27.21	18.79	46.00	Neutral	9.79
1.785	12	35.57	20.43	56.00	31.66	14.34	46.00	Neutral	9.79
2.535	13	37.83	18.17	56.00	32.61	13.39	46.00	Neutral	9.79
4.6005	13	34.86	21.14	56.00	28.95	17.05	46.00	Neutral	9.80
5.1285	14	25.62	34.38	60.00	14.70	35.30	50.00	Neutral	9.82
5.133	14	26.06	33.94	60.00	16.04	33.96	50.00	Neutral	9.82
7.608	14	32.08	27.92	60.00	26.93	23.07	50.00	Neutral	9.81
13.497	15	30.23	29.77	60.00	25.05	24.95	50.00	Neutral	9.89
13.5015	15	28.77	31.23	60.00	23.77	26.23	50.00	Neutral	9.89
15.4455	15	34.47	25.53	60.00	30.22	19.78	50.00	Neutral	9.95
16.368	15	34.54	25.46	60.00	30.17	19.83	50.00	Neutral	9.98
19.2135	16	26.88	33.12	60.00	21.07	28.93	50.00	Neutral	10.09
19.3395	16	25.78	34.22	60.00	20.03	29.97	50.00	Neutral	10.09
26.976	16	21.28	38.72	60.00	15.87	34.13	50.00	Neutral	9.83
29.5545	16	23.25	36.75	60.00	19.26	30.74	50.00	Neutral	9.73

File No.:	T41060-01-00KJ	Result	passed
Operation mode:	Charging		
Tested by:	KJ		
Location:	S2	Date:	19.05.2016 13:59:13
Remarks:	None		



CISPR 22/CISPR22B



CISPR 22/CISPR22B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.213	1	38.17	24.91	63.09	24.12	28.97	53.09	Phase 1	9.83
0.2175	1	41.68	21.23	62.91	30.60	22.31	52.91	Phase 1	9.83
0.222	1	48.39	14.36	62.74	42.49	10.25	52.74	Phase 1	9.83
0.3405	2	44.15	15.04	59.19	43.06	6.13	49.19	Phase 1	9.81
0.453	2	34.41	22.41	56.82	31.76	15.06	46.82	Phase 1	9.82
0.7395	3	30.10	25.90	56.00	24.37	21.63	46.00	Phase 1	9.81
0.7935	3	31.02	24.98	56.00	29.73	16.27	46.00	Phase 1	9.81
0.906	3	33.05	22.95	56.00	31.18	14.82	46.00	Phase 1	9.81
1.245	4	35.78	20.22	56.00	32.26	13.74	46.00	Phase 1	9.80
1.695	4	35.83	20.17	56.00	30.05	15.95	46.00	Phase 1	9.79
2.262	4	36.79	19.21	56.00	30.76	15.24	46.00	Phase 1	9.80
2.7105	5	38.77	17.23	56.00	32.04	13.96	46.00	Phase 1	9.79
3.039	5	35.68	20.32	56.00	22.14	23.86	46.00	Phase 1	9.80
4.596	5	41.47	14.53	56.00	32.39	13.61	46.00	Phase 1	9.81
4.6275	5	41.62	14.38	56.00	33.87	12.13	46.00	Phase 1	9.81
4.9665	6	42.35	13.65	56.00	32.76	13.24	46.00	Phase 1	9.82
5.0745	6	40.94	19.06	60.00	32.45	17.55	50.00	Phase 1	9.82
6.8835	6	35.87	24.13	60.00	25.43	24.57	50.00	Phase 1	9.84
7.608	6	32.76	27.24	60.00	26.30	23.70	50.00	Phase 1	9.85
13.1415	7	32.24	27.76	60.00	25.81	24.19	50.00	Phase 1	10.02
13.524	7	33.58	26.42	60.00	24.46	25.54	50.00	Phase 1	10.04
15.4455	7	37.10	22.90	60.00	31.91	18.09	50.00	Phase 1	10.13
15.9045	7	36.69	23.31	60.00	31.49	18.51	50.00	Phase 1	10.15
19.3935	8	32.84	27.16	60.00	25.48	24.52	50.00	Phase 1	10.30
24.0105	8	30.86	29.14	60.00	24.82	25.18	50.00	Phase 1	10.34
24.4425	8	30.16	29.84	60.00	23.98	26.02	50.00	Phase 1	10.34
0.213	9	38.13	24.96	63.09	23.71	29.38	53.09	Neutral	9.85
0.2265	9	52.25	10.33	62.58	47.95	4.63	52.58	Neutral	9.84
0.3405	10	45.99	13.20	59.19	45.04	4.15	49.19	Neutral	9.81
0.453	10	36.98	19.84	56.82	35.77	11.05	46.82	Neutral	9.82
0.7935	11	38.47	17.53	56.00	36.83	9.17	46.00	Neutral	9.81
0.906	11	37.92	18.08	56.00	35.98	10.02	46.00	Neutral	9.81
1.131	11	38.18	17.82	56.00	34.53	11.47	46.00	Neutral	9.81
1.245	12	40.29	15.71	56.00	36.86	9.14	46.00	Neutral	9.80
1.6905	12	40.18	15.82	56.00	32.06	13.94	46.00	Neutral	9.79
1.6995	12	39.41	16.59	56.00	34.79	11.21	46.00	Neutral	9.79
2.145	12	40.80	15.20	56.00	33.73	12.27	46.00	Neutral	9.80
2.5935	13	40.73	15.27	56.00	31.65	14.35	46.00	Neutral	9.79
3.246	13	40.59	15.41	56.00	28.17	17.83	46.00	Neutral	9.80
4.5105	13	41.64	14.36	56.00	31.67	14.33	46.00	Neutral	9.80
4.5195	13	41.01	14.99	56.00	32.70	13.30	46.00	Neutral	9.80
4.845	14	39.96	16.04	56.00	28.89	17.11	46.00	Neutral	9.81
4.854	14	39.70	16.30	56.00	29.51	16.49	46.00	Neutral	9.81
7.3335	14	34.71	25.29	60.00	23.43	26.57	50.00	Neutral	9.82
7.608	14	32.00	28.00	60.00	25.54	24.46	50.00	Neutral	9.81
12.4935	15	32.90	27.10	60.00	23.34	26.66	50.00	Neutral	9.87
13.5465	15	34.24	25.76	60.00	26.20	23.80	50.00	Neutral	9.89
15.441	15	35.60	24.40	60.00	29.04	20.96	50.00	Neutral	9.95
15.4455	15	36.62	23.38	60.00	31.20	18.80	50.00	Neutral	9.95
19.2675	16	31.86	28.14	60.00	23.59	26.41	50.00	Neutral	10.09
22.656	16	31.25	28.75	60.00	25.23	24.77	50.00	Neutral	10.01
24.006	16	29.00	31.00	60.00	22.95	27.05	50.00	Neutral	9.96
24.1365	16	29.32	30.68	60.00	23.40	26.60	50.00	Neutral	9.96

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: 10 m

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

5.2.4 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 horizontal and vertical 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). 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).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

5.2.5 Test result

The measurement value is calculated from a distance of 10 m to 300 m by subtracting the factor 59.1 dB/decade.

Charging mode (3x COR MS-3):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
246.38	55.5	54.1	0.0	20.0	-59.1	16.4	15.0	19.8	-3.4
245.64	55.4	54.1	0.0	20.0	-59.1	16.3	15.0	19.8	-3.5
245.48	55.5	54.1	0.0	20.0	-59.1	16.4	15.0	19.8	-3.4

Charging mode (2x COR PT-3):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
230.56	51.6	49.9	0.0	20.0	-59.1	12.5	10.8	20.3	-7.8
229.17	51.1	49.6	0.0	20.0	-59.1	12.0	10.5	20.4	-8.4

Standby mode (3x COR MS-3):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
246.38	55.6	54.5	0.0	20.0	-59.1	16.5	15.4	19.8	-3.3
245.64	55.5	54.1	0.0	20.0	-59.1	16.4	15.0	19.8	-3.4
245.48	55.2	54.0	0.0	20.0	-59.1	16.1	14.9	19.8	-3.7

Standby mode (2x COR PT-3):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
230.56	52.3	51.1	0.0	20.0	-59.1	13.2	12.0	20.3	-7.1
229.17	52.3	51.0	0.0	20.0	-59.1	13.2	11.9	20.4	-7.2

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

Frequency (MHz)	Field strength of fundamental wave		Measurement distance
	(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: All measurements were performed in horizontal and vertical position. Only the horizontal results are shown in this test report because these are the worst case conditions.

5.3 Spurious emissions

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

5.3.1 Description of the test location

Test location: OATS 1
Test distance: 10 m

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the field strength limits for spurious emissions in the table.

5.3.4 Description of Measurement

The magnetic field strength of spurious emission from the EUT is measured in 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 setup of the EUT and the measurement procedure is in accordance to ANSI C63.4, Item 8.3. The EUT is measured in TX continuous mode, modulated, under normal conditions.

According to Section 15.31(f)(2): The measurement below 30 MHz is performed at a distance of 3 m. The results are extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor of 40 dB/decade.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

5.3.5 Test result

The measurement value is calculated from a distance of 10 m to 30 m by subtracting the factor 19.1 dB/decade.

Charging mode (COR MS-3 – Slot 1 – 246.38 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
739.14	30.0	28.5	0.0	20.0	-19.1	30.9	29.4	30.2	-0.8
1231.90	23.9	20.1	0.0	20.0	-19.1	24.8	21.0	25.8	-4.8
1724.66	19.1	12.3	0.0	20.0	-19.1	20.0	13.2	29.5	-16.3
2217.42	12.6	8.0	0.0	20.0	-19.1	13.5	8.9	29.5	-20.6
2710.18	15.3	9.6	0.0	20.0	-19.1	16.2	10.5	29.5	-19.0

Charging mode (COR MS-3 – Slot 2 – 245.64 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
736.92	31.1	29.1	0.0	20.0	-19.1	32.0	30.0	30.3	-0.2
1228.20	24.5	21.4	0.0	20.0	-19.1	25.4	22.3	25.8	-3.5
1719.48	19.5	14.9	0.0	20.0	-19.1	20.4	15.8	29.5	-13.7
2210.76	14.5	10.3	0.0	20.0	-19.1	15.4	11.2	29.5	-18.3
2702.04	17.2	10.7	0.0	20.0	-19.1	18.1	11.6	29.5	-17.9

Charging mode (COR MS-3 – Slot 3 – 245.48 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
736.44	30.9	28.9	0.0	20.0	-19.1	31.8	29.8	30.3	-0.4
1227.40	25.3	21.2	0.0	20.0	-19.1	26.2	22.1	25.8	-3.7
1718.36	20.9	15.5	0.0	20.0	-19.1	21.8	16.4	29.5	-13.1
2209.32	13.5	10.3	0.0	20.0	-19.1	14.4	11.2	29.5	-18.3
2700.28	15.1	10.9	0.0	20.0	-19.1	16.0	11.8	29.5	-17.7

Charging mode (COR PT-3 – Slot 1 – 230.56 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
691.68	28.7	25.9	0.0	20.0	-19.1	29.6	26.8	30.8	-4.0
1152.80	19.7	16.3	0.0	20.0	-19.1	20.6	17.2	26.4	-9.2
1613.92	16.3	12.0	0.0	20.0	-19.1	17.2	12.9	23.4	-10.5
2075.04	12.9	9.5	0.0	20.0	-19.1	13.8	10.4	29.5	-19.1
2536.16	11.8	7.2	0.0	20.0	-19.1	12.7	8.1	29.5	-21.4

Charging mode (COR PT-3 – Slot 2 – 229.17 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
687.51	27.7	24.9	0.0	20.0	-19.1	28.6	25.8	30.9	-5.0
1145.85	19.4	16.5	0.0	20.0	-19.1	20.3	17.4	26.4	-9.0
1604.19	14.3	10.6	0.0	20.0	-19.1	15.2	11.5	23.5	-12.0
2062.53	12.6	8.6	0.0	20.0	-19.1	13.5	9.5	29.5	-20.0
2520.87	11.1	7.0	0.0	20.0	-19.1	12.0	7.9	29.5	-21.6

Standby (COR MS-3 – Slot 1 – 246.38 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
739.14	29.8	28.0	0.0	20.0	-19.1	30.7	28.9	30.2	-1.3
1231.90	24.7	20.5	0.0	20.0	-19.1	25.6	21.4	25.8	-4.4
1724.66	16.5	12.1	0.0	20.0	-19.1	17.4	13.0	29.5	-16.5
2217.42	11.6	6.2	0.0	20.0	-19.1	12.5	7.1	29.5	-22.4
2710.18	13.7	9.0	0.0	20.0	-19.1	14.6	9.9	29.5	-19.6

Standby (COR MS-3 – Slot 2 – 245.64 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
736.92	30.3	28.6	0.0	20.0	-19.1	31.2	29.5	30.3	-0.7
1228.20	25.1	21.1	0.0	20.0	-19.1	26.0	22.0	25.8	-3.8
1719.48	18.9	15.0	0.0	20.0	-19.1	19.8	15.9	29.5	-13.6
2210.76	13.0	8.6	0.0	20.0	-19.1	13.9	9.5	29.5	-20.0
2702.04	13.8	9.1	0.0	20.0	-19.1	14.7	10.0	29.5	-19.5

Standby (COR MS-3 – Slot 3 – 245.48 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
736.44	30.0	28.4	0.0	20.0	-19.1	30.9	29.3	30.3	-0.9
1227.40	24.2	20.8	0.0	20.0	-19.1	25.1	21.7	25.8	-4.1
1718.36	18.1	14.9	0.0	20.0	-19.1	19.0	15.8	29.5	-13.7
2209.32	13.4	8.9	0.0	20.0	-19.1	14.3	9.8	29.5	-19.7
2700.28	13.9	9.1	0.0	20.0	-19.1	14.8	10.0	29.5	-19.5

Standby (COR PT-3 – Slot 1 – 230.56 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
691.68	24.0	21.1	0.0	20.0	-19.1	24.9	22.0	30.8	-8.8
1152.80	17.1	12.1	0.0	20.0	-19.1	18.0	13.0	26.4	-13.4
1613.92	12.8	8.6	0.0	20.0	-19.1	13.7	9.5	23.4	-13.9
2075.04	11.9	7.1	0.0	20.0	-19.1	12.8	8.0	29.5	-21.5
2536.16	10.2	5.1	0.0	20.0	-19.1	11.1	6.0	29.5	-23.5

Standby (COR PT-3 – Slot 2 – 229.17 kHz):

f [kHz]	PK reading [dBμV]	QP reading [dBμV]	Duty cycle corr. [dB]	Ant. factor [dB]	Distance corr. [dB]	corr. AV level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
687.51	24.0	20.6	0.0	20.0	-19.1	24.9	21.5	30.9	-9.3
1145.85	14.2	10.4	0.0	20.0	-19.1	15.1	11.3	26.4	-15.1
1604.19	11.6	8.1	0.0	20.0	-19.1	12.5	9.0	23.5	-14.5
2062.53	11.4	6.5	0.0	20.0	-19.1	12.3	7.4	29.5	-22.1
2520.87	10.2	5.1	0.0	20.0	-19.1	11.1	6.0	29.5	-23.5

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μV/m)	dB(μV/m)	
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: All measurements were performed in horizontal and vertical position. Only the horizontal results are shown in this test report because these are the worst case conditions.

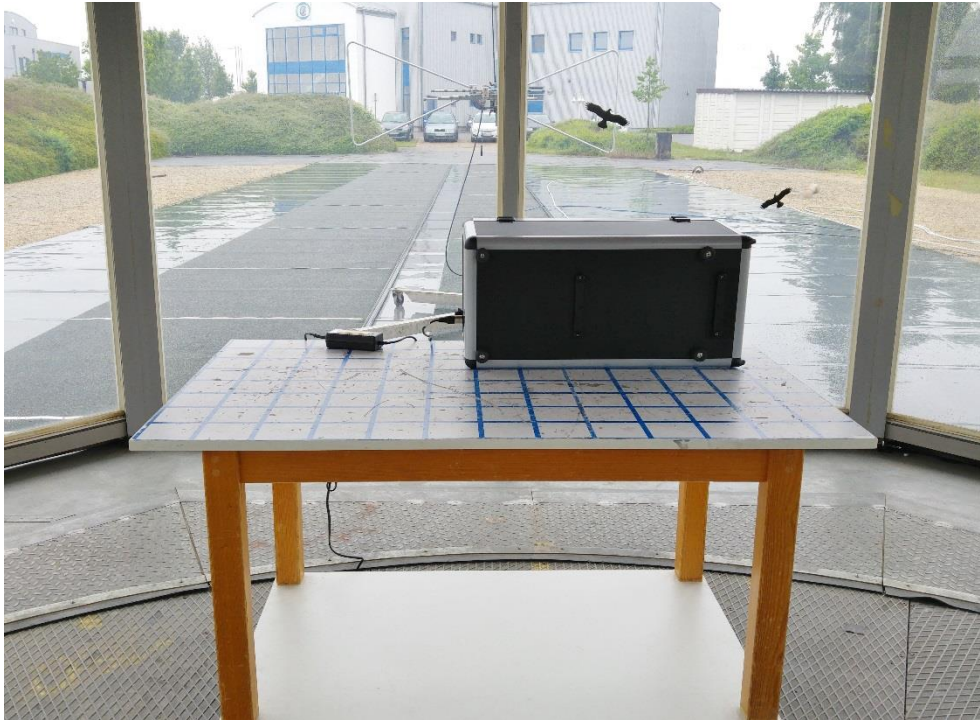
5.4 Spurious emissions radiated (electric field)

For test instruments and accessories used see section 6 Part SER 2.

5.4.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

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

The emissions from intentional radiators shall not exceed the effective field strength limits.

5.4.4 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, Item 8.3.

Instrument settings:

30 MHz – 1000 MHz: RBW: 120 kHz

5.4.5 Test result 30 MHz to 1 GHz

Charging mode

f [MHz]	PK reading [dBμV]	QP reading [dBμV]	Corr. factor [dB]	PK level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
30.26	18.2	11.9	14.1	32.3	26.0	40.0	-14.0
33.46	22.3	15.8	14.0	36.3	29.8	40.0	-10.2
38.99	23.0	16.0	14.5	37.5	30.5	40.0	-9.5
45.08	16.7	12.1	15.2	31.9	27.3	40.0	-12.7
51.18	18.2	11.8	15.1	33.3	26.9	40.0	-13.1
56.30	15.1	9.6	14.9	30.0	24.5	40.0	-15.5
62.06	17.0	12.0	14.6	31.6	26.6	40.0	-13.4
80.36	21.9	15.7	11.0	32.9	26.7	40.0	-13.3
83.80	22.6	15.4	10.2	32.8	25.6	40.0	-14.4
168.75	19.8	12.1	14.8	34.6	26.9	43.5	-16.6
175.55	23.1	16.7	14.4	37.5	31.1	43.5	-12.4
185.02	26.9	20.1	13.5	40.4	33.6	43.5	-9.9
191.11	30.0	23.7	12.9	42.9	36.6	43.5	-6.9
193.84	28.9	22.0	12.6	41.5	34.6	43.5	-8.9
194.12	29.1	23.3	12.6	41.7	35.9	43.5	-7.6
204.73	25.8	19.0	12.1	37.9	31.1	43.5	-12.4
208.92	27.7	21.6	12.3	40.0	33.9	43.5	-9.6
216.27	24.7	18.3	12.6	37.3	30.9	46.0	-15.1
218.80	26.3	19.9	12.7	39.0	32.6	46.0	-13.4
223.87	28.9	22.1	12.5	41.4	34.6	46.0	-11.4
230.57	29.0	21.6	13.2	42.2	34.8	46.0	-11.2
240.55	24.6	18.4	13.3	37.9	31.7	46.0	-14.3
256.35	23.9	17.9	14.2	38.1	27.6	46.0	-13.9
267.05	19.3	12.3	14.8	34.1	27.1	46.0	-18.9

Standby mode

f [MHz]	PK reading [dBμV]	QP reading [dBμV]	Corr. factor [dB]	PK level [dBμV/m]	QP level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
30.26	14.3	8.2	14.1	28.4	22.3	40.0	-17.7
33.66	15.7	10.3	14.0	29.7	24.3	40.0	-15.7
38.09	17.0	12.3	14.4	31.4	26.7	40.0	-13.3
42.06	11.3	7.0	14.9	26.2	21.9	40.0	-18.1
80.36	13.2	7.4	11.0	24.2	18.4	40.0	-21.6
83.03	16.5	10.5	10.4	26.9	20.9	40.0	-19.1

Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in the table above or to the general limits shown in the table below according to § 15.209, whichever limit permits a higher field strength.

Frequency (MHz)	15.209 Limits (μV/m)	15.209 Limits dB(μV/m)
30 - 88	100	40
88 - 216	150	43,5
216 - 960	200	46
Above 960	500	54

Additionally there is a limit according to §15.35(b) on the radio frequency emissions, as measured with a peak detector, corresponding to 20 dB above the maximum permitted average limits.

The requirements are **FULFILLED**.

Remarks: The highest generated frequency is 246.4 kHz.

All measurements were performed in horizontal and vertical position. Only the horizontal results are shown in this test report because this are the worst case conditions.

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: Shielded Room S6

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15C, Section 15.215(c):

5.5.4 Description of Measurement

The measurement is performed radiated using a spectrum analyser. The analyser span is set wide enough to capture the most of the power envelope of the signal.

Analyser settings:

Span: see plots, RBW: 1 kHz VBW: 3 kHz Detector: peak;

5.5.5 Test result
COR MS-3 – Slot 1 – 246.38 kHz

Operation mode	20dB Bandwidth T1 [kHz]	20dB Bandwidth T2 [kHz]	Measured Bandwidth [kHz]
Charging	245.013	247.686	2.673
Standby	245.011	247.683	2.672

COR MS-3 – Slot 2 – 245.64 kHz

Operation mode	20dB Bandwidth T1 [kHz]	20dB Bandwidth T2 [kHz]	Measured Bandwidth [kHz]
Charging	244.268	246.941	2.673
Standby	244.286	246.962	2.676

COR MS-3 – Slot 3 – 245.48 kHz

Operation mode	20dB Bandwidth T1 [kHz]	20dB Bandwidth T2 [kHz]	Measured Bandwidth [kHz]
Charging	244.120	246.790	2.670
Standby	244.130	246.797	2.667

COR PT-3 – Slot 1 – 230.56 kHz

Operation mode	20dB Bandwidth T1 [kHz]	20dB Bandwidth T2 [kHz]	Measured Bandwidth [kHz]
Charging	229.200	231.872	2.672
Standby	229.201	231.875	2.674

COR PT-3 – Slot 2 – 229.17 kHz

Operation mode	20dB Bandwidth T1 [kHz]	20dB Bandwidth T2 [kHz]	Measured Bandwidth [kHz]
Charging	227.803	230.475	2.672
Standby	227.816	230.488	2.672

Remarks:

There is no emission bandwidth limit for FCC Part 15.209.

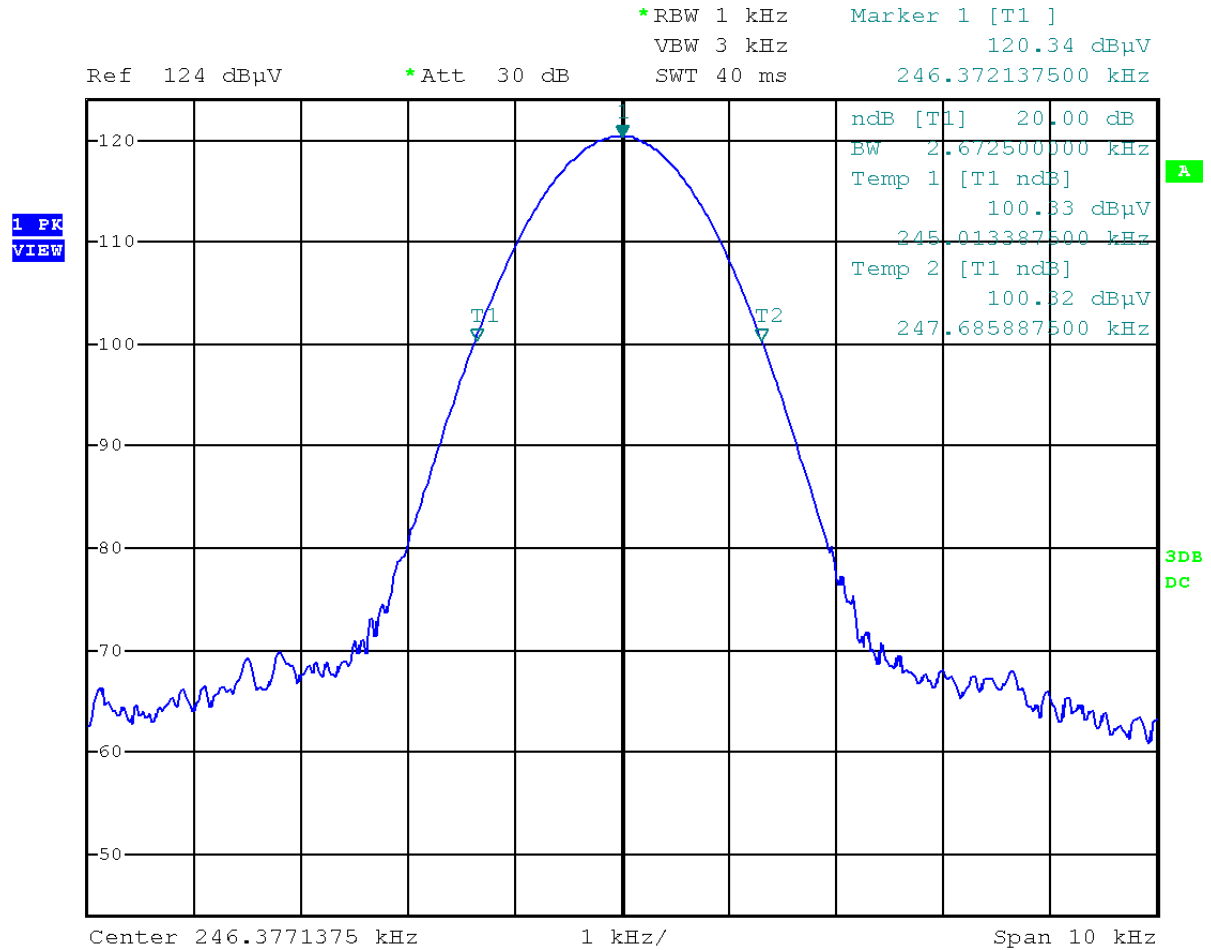
This measurement is only to give an overview of the emission bandwidth spectrum.

Only the plots of charging mode are shown in the test protocols, because standby mode is exactly the same.

5.5.6 Test protocol

Emission bandwidth
FCC Part 15C, Section 15.215(c)

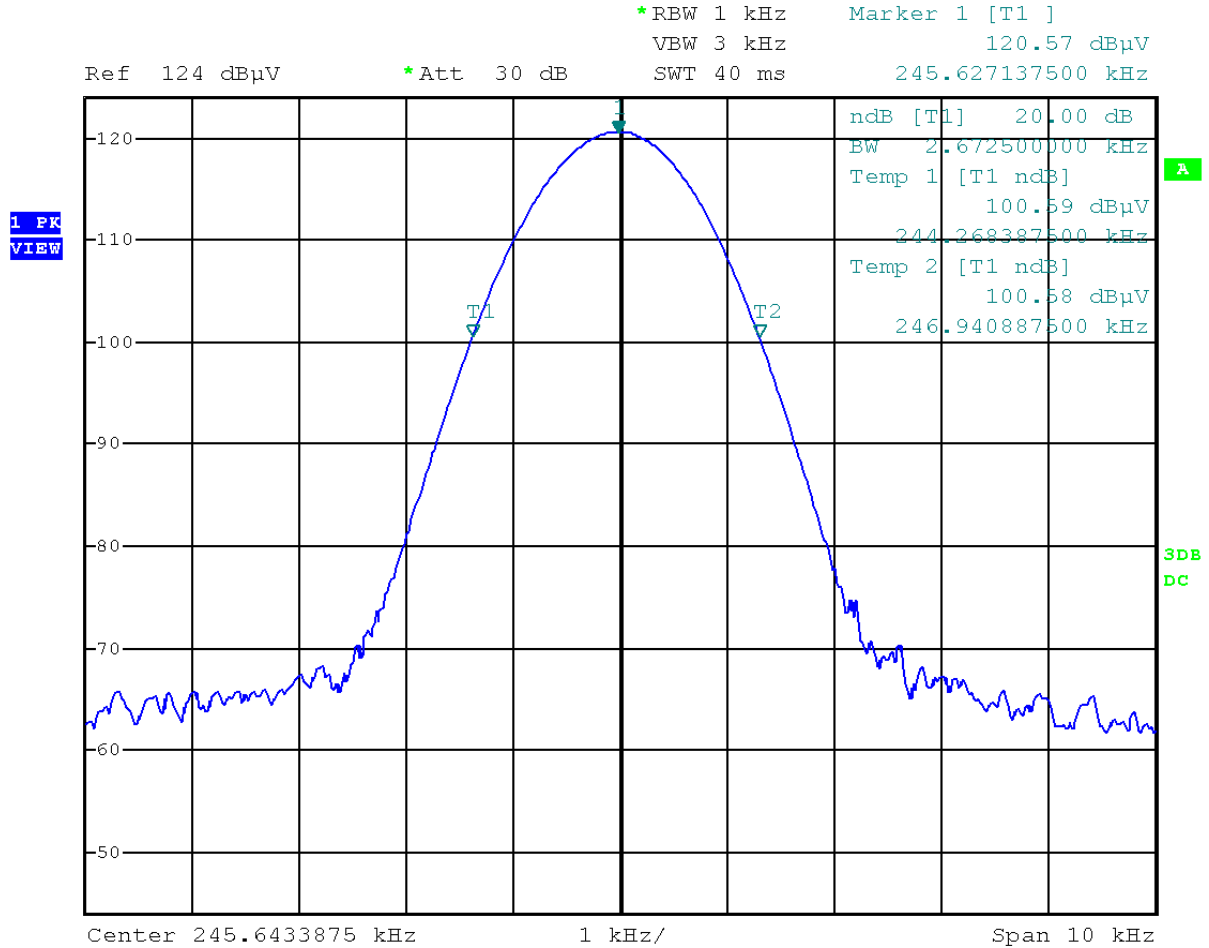
Charging mode (COR MS-3 – Slot 1 – 246.38 kHz)



FCC ID: OV8-CPK3

Emission bandwidth
FCC Part 15C, Section 15.215(c)

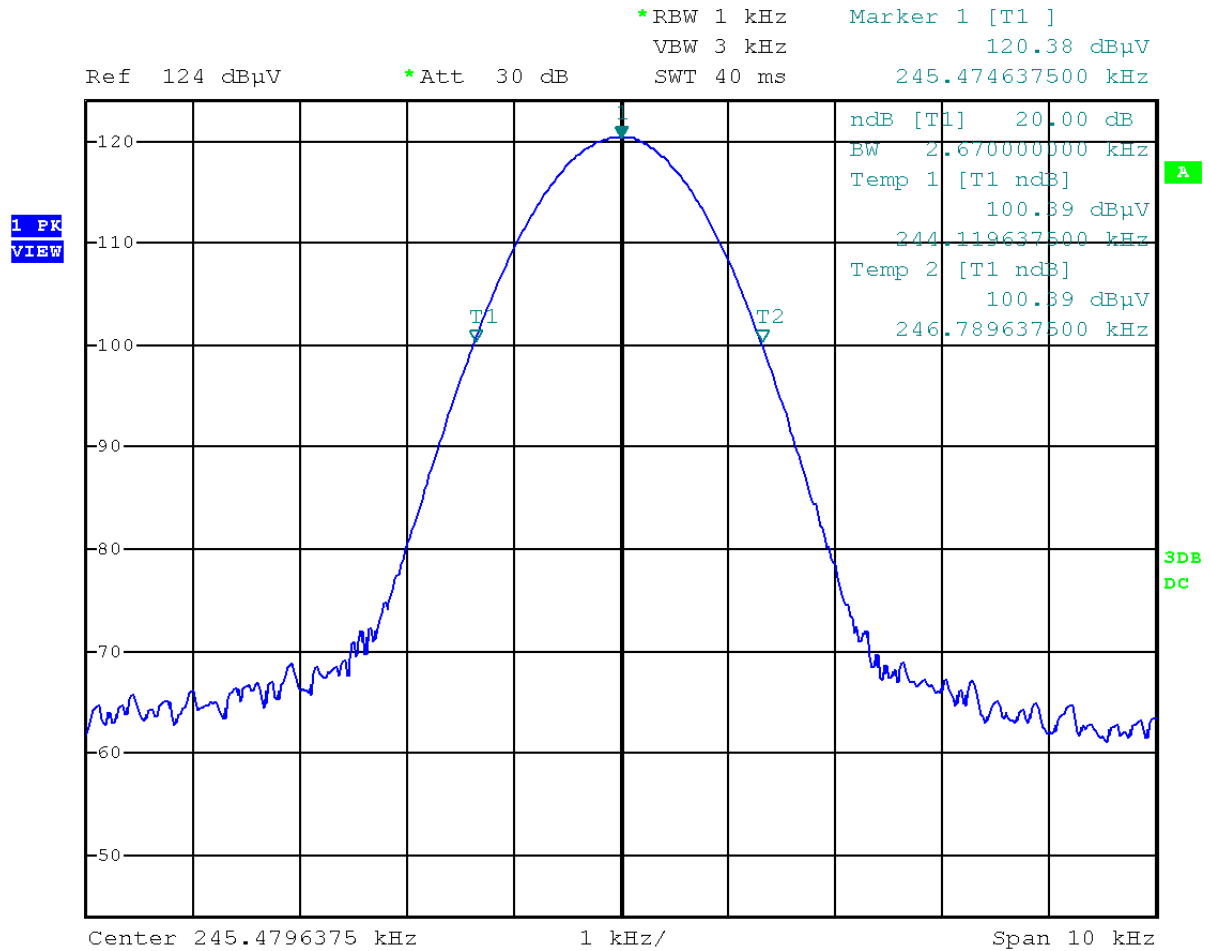
Charging mode (COR MS-3 – Slot 2 – 245.64 kHz)



FCC ID: OV8-CPK3

Emission bandwidth
FCC Part 15C, Section 15.215(c)

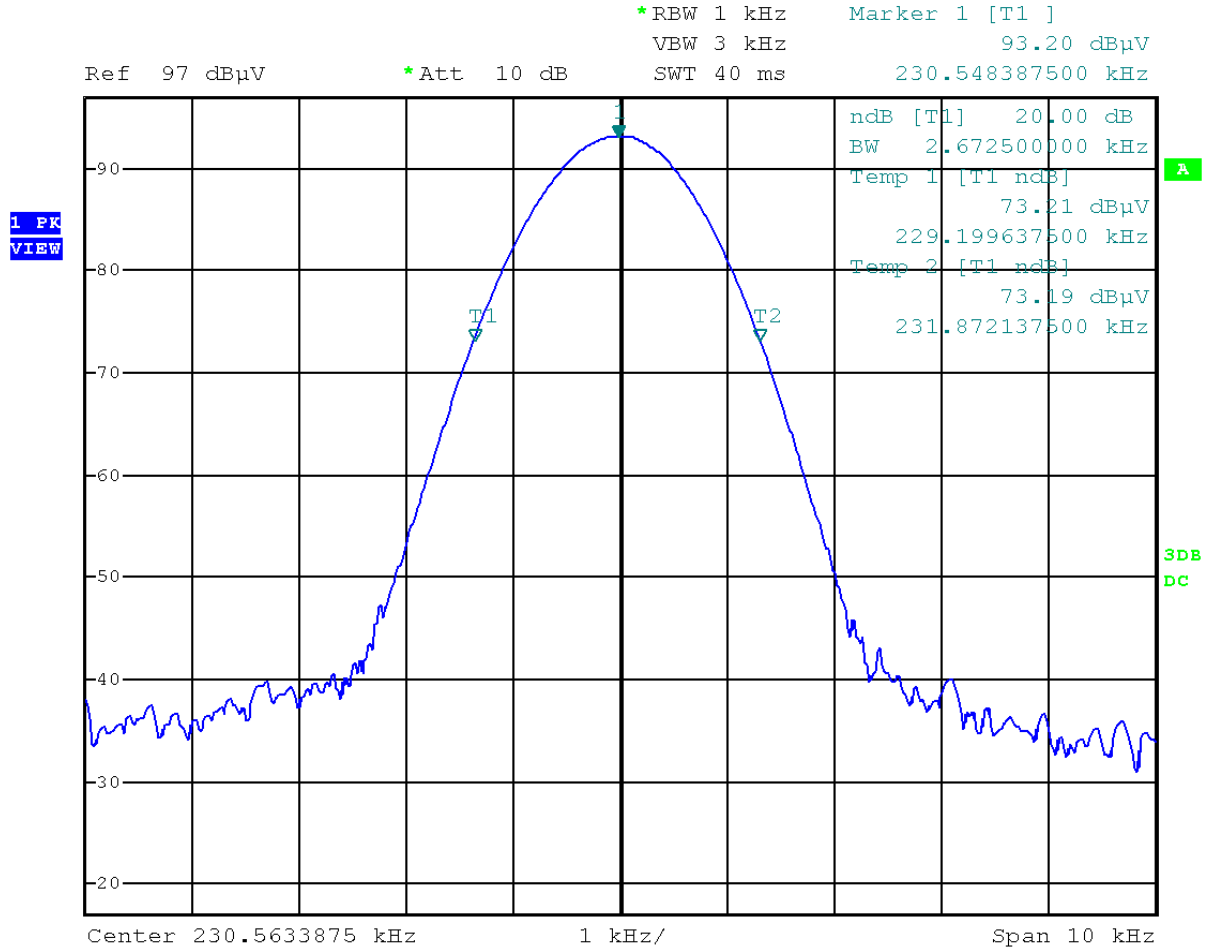
Charging mode (COR MS-3 – Slot 3 – 245.48 kHz)



FCC ID: OV8-CPK3

Emission bandwidth
FCC Part 15C, Section 15.215(c)

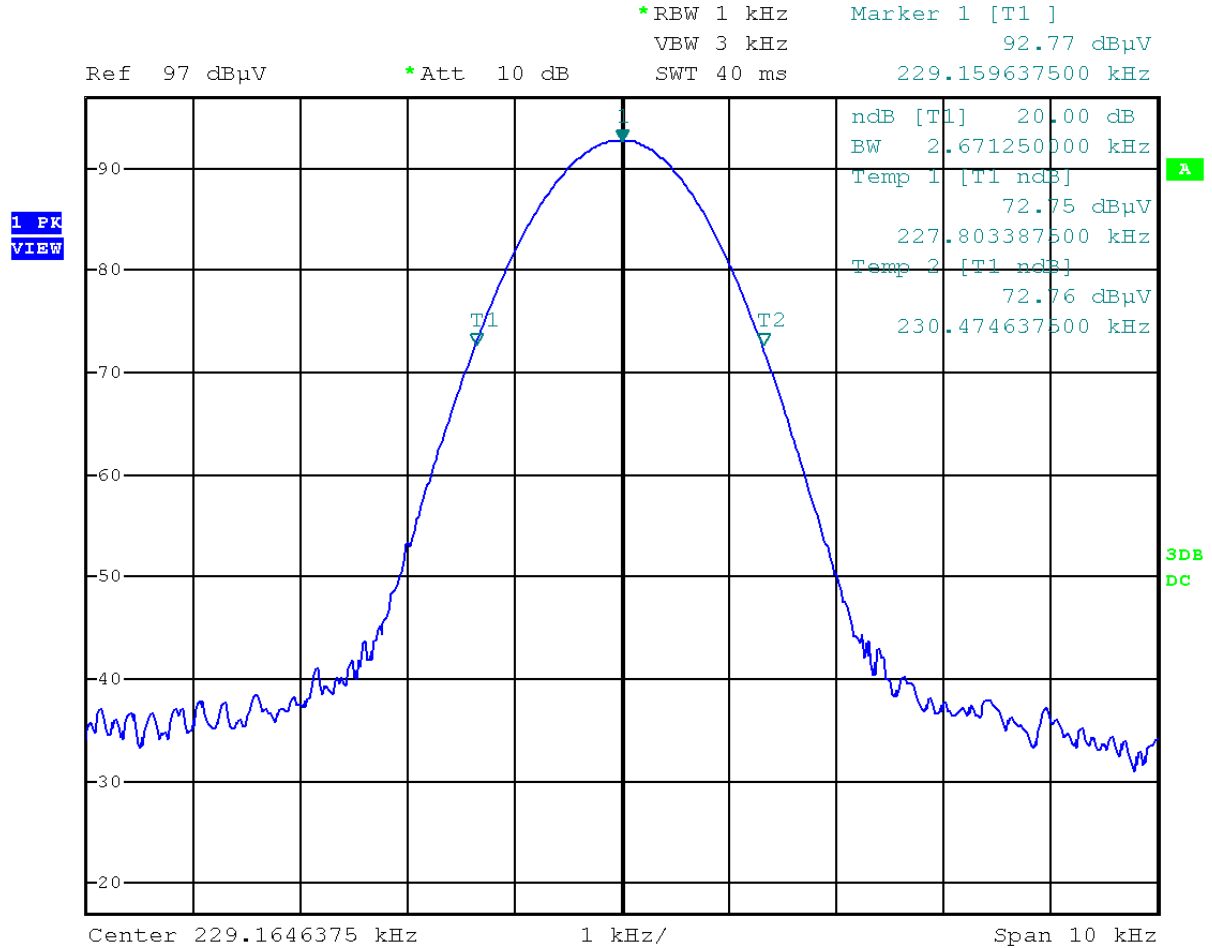
Charging mode (COR PT-3 – Slot 1 – 230.56 kHz)



FCC ID: OV8-CPK3

Emission bandwidth
FCC Part 15C, Section 15.215(c)

Charging mode (COR PT-3 – Slot 2 – 229.17 kHz)



5.6 Correction for pulse operation (duty cycle)

For test instruments and accessories used see section 6 Part DC.

5.6.1 Description of the test location

Test location: Shielded Room S6

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to FCC Part 15A, Section 15.35(c):

When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.6.4 Description of Measurement

The duty cycle factor (dB) is calculated applying the following formula:

$$K_E = 20 \log \frac{T_{ON}}{T_{PT}}$$

$$0.0dB = 20 \log \frac{100ms}{100ms}$$

K_E : pulse operation correction factor (dB)

T_{ON} complete on time (ms)

T_{PT} complete pulse train (ms)

Remarks: The transmitter has no pulsed operation. Therefore the on time is always 100 % in charging and
standby mode.
For detailed results, please see the test protocol below.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 1	FMZB 1516	01-02/24-01-018			21/01/2017	21/01/2016
	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	INA 265 A / CAS 3025	02-02/50-05-028	13/04/2017	13/04/2016		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
DC	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
MB	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 1	FMZB 1516	01-02/24-01-018			21/01/2017	21/01/2016
	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015	20/10/2016	20/04/2016
	VULB 9168	02-02/24-05-005	20/04/2017	20/04/2016		
	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				