CSA Group

Bundesnetzagentur

BNetzA-CAB-13/21-07

EMC – TEST REPORT

Type / Model Name : LOG CDR-3-1-913 (Commander 3-1)

Product Description : Portable device for program, configure and read out sensors data

Applicant : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

Manufacturer : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

Licence holder : Seba Dynatronic Mess- und Ortungstechnik GmbH

Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

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

Test Report No. : T41177-00-01KJ	29. June 2016 Date of issue

ilac-MRA

DAkkS 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.

Contents

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 B - Unintentional Radiators (October, 2015)

Part 15, Subpart B, Section 15.107	AC Line conducted emission ☐ Class A device ☒ Class B device
Part 15, Subpart B, Section 15.109	Radiated emission, general requirements ☐ Class A device ☒ Class B device
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.
CISPR 16-4-2: 2011 + A1: 2014 EN 55016-4-2: 2011	Uncertainty in EMC measurement
CISPR 22: 2008 EN 55022: 2010	Information technology equipment

2 EQUIPMENT UNDER TEST

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

Element	Description
6	**Selector knob**
7	**ESC button**
8	**I/O button** • Device on/off • Backlight on/off
9	**Charging indicator light** Lights up red … external supply, battery is being charged
10	**Socket for USB link to PC and for connecting an optional GPS module (combined)**
11	**Headphone and charging socket (combined)**
12	**Antenna socket**

2.2 Short description of the equipment under test (EUT)

The Commander is portable device which is used to communicate with the other devices of the Sebalog N3 system. With the commander it is possible to program/configure the Logger, Repeater and the GSM-Box. After programming a Logger for measurement, the measured data can be read out and analysed with the Commander.

The communication is done at a frequency of 913 MHz. The commander has an external TNC socket to connect two different antennas. One for normal use in handheld mode and one for vehicle mount.

2.3 Variants of the EUT

- There are no other variants.

2.4 Test Jig

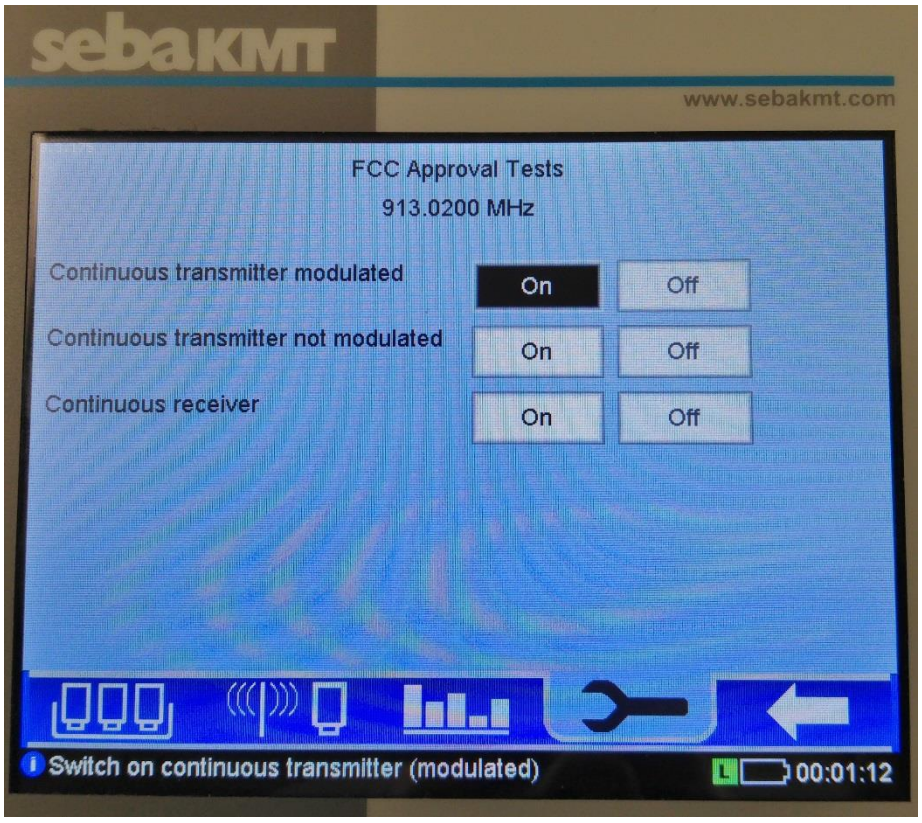
- No test jig is used.

2.5 Technical description of the equipment under test (EUT)

Items	Description
Power supply - internal	7.4 V DC (Li-ion rechargeable battery)
Digital radio:	
Type of modulation	FSK
Operating frequency	913.02 MHz
Frequency band	902 MHz to 928 MHz
Data rate	9.6 kBd
Channel spacing	-
Number of channels	1
Antenna type	stub antenna, TNC right angle Magnetic socket antenna,
Antenna connector	TNC
Antenna gain	Stub antenna, 7 dBi Magnet socket antenna, 5 dBi
Lowest internal frequency	32.768 kHz
Highest internal frequency	26.000 MHz
Serial number	0859000294
Firmware version	202.004
Number of tested samples	1

2.6 Test software

- A special test software was used, to performe the different radio tests.



2.7 Transmit operating modes

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

- cont. RX mode

-

2.8 Peripheral devices and interface cables

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

- USB adapter cable Model : Seba
- Laptop Model : Siemens Lifebook

2.9 Determination of worst case conditions for final measurement

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions (with stub antenna and magnet socket antenna).
For the further measurement, the EUT is set in horizontal position with TX antenna in vertical orientation.

3 Test result summary

3.1 General remarks

The measurement has been performed in receive mode.

3.2 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	:	23 May 2016
Testing concluded on	:	17 June 2016

Checked by:

Klaus Gegenfurtner
I confirm the correctness and
Integrity of this document
2016.06.29 10:07:47 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Josef Knab
I'm the autor of this document
2016.06.29 09:16:47 +02'00'

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 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-12030-01-01
- the Federal Communications Commission (FCC) Registration Number: 0013864798
- the 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 Measurement protocol for FCC

4.6.1 General information

4.6.1.1 Test methodology

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4 procedures and using the CISPR 22 Limits.

4.6.1.2 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.

4.6.2 Details of test procedures

4.6.2.1 General standard information

The test methods used comply with ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

4.6.3 Conducted emission

4.6.3.1 Description of measurement

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR 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 are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.6.4 Radiated emission (electrical field 30 MHz - 1 GHz)

4.6.4.1 Description of measurement

Spurious emission from the EuT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized 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 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from 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. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with both horizontal and vertical antenna polarization planes and the EuT is rotated 360 degrees.

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver where the correction factors are stored. The FCC or CISPR limit is subtracted from this result in order to provide the limit margins listed in the measurement protocols.

The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: ResBW: 120 kHz

Example:

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

*Correction Factor = Antenna Factor + Cable Attenuation = 30 dB/m + 2.6 dB = 32.6 dB/m

4.6.4.2 Sequence of measurement

After preparation of the test setup, the measurement has to be conducted as follows:
The turntable has to be moved forwards and backwards 360° until the test receiver displays the maximum level at the observed frequency.
Than the antenna mast has to be moved from 1m up to 4m and back to maximize the value.
After that the turntable has to be moved again until the absolute maximum of the emission value has to be fixed.
This result has to be filled in the table of results.
This procedure has to be repeated until all relevant frequencies checked.

4.6.5 Radiated emission (electrical field 1 GHz - 30 GHz)

4.6.5.1 Description of measurement

Radiated emission from the EuT are measured in the frequency range of 1 GHz to the maximum frequency as specified in 47 CFR Part 15 Subpart A section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. Table top equipment is placed on a 0.65 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4.
The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from 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 metres horizontally from the EuT.

Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyzer set to a peak detector function and a resolution and video bandwidth of 1 MHz. All tests are performed at a test distance of 3 metres. Hand-held or body-worn devices are rotated around three orthogonal axes in order to determine the position, angle and configuration having the maximum emission. The cables and equipment are placed and moved within the range of their likely positioning to find the maximum emission. These conditions will then be used for the final measurements. When the EuT is larger than the bandwidth of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to demonstrate that emissions are under the limits at the specified test distance.

5 TEST CONDITIONS AND RESULTS

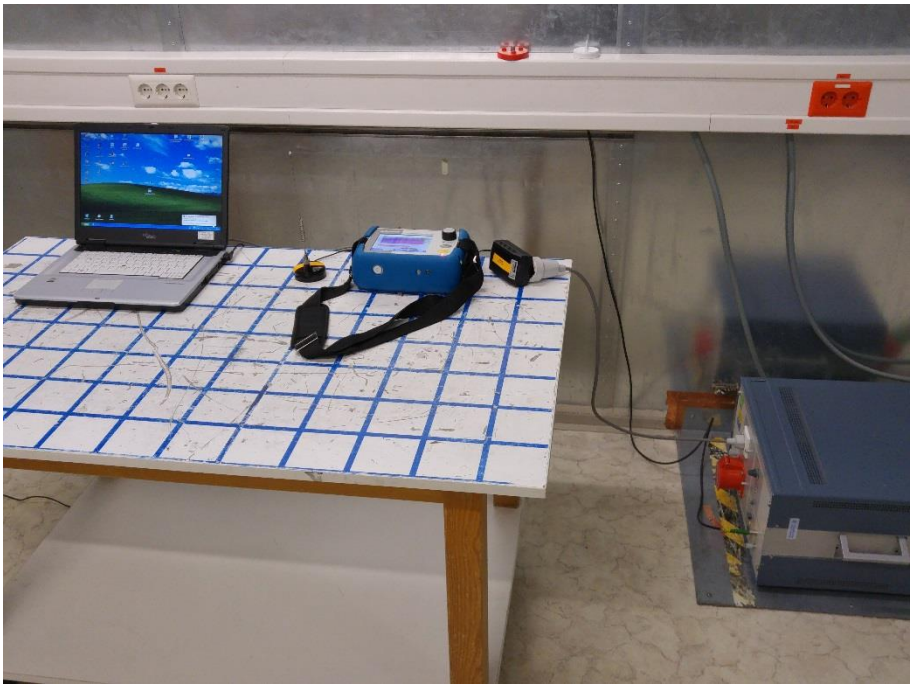
5.1 Conducted emission

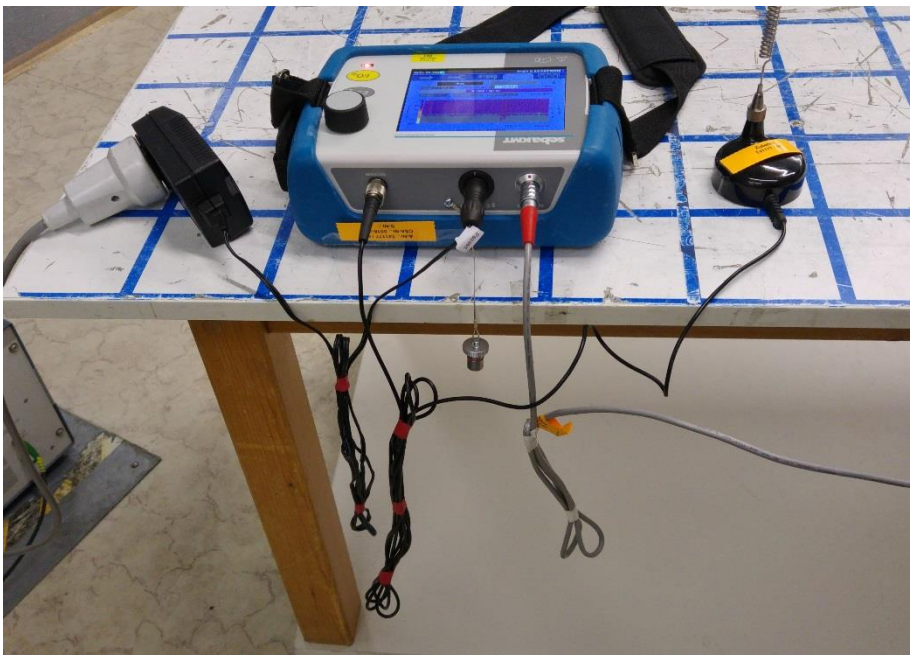
For test instruments and accessories used see section 6 Part **A 4.**

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up





5.1.3 Applicable standard

According to FCC Part 15, Section 15.107(a):
Except for Class A devices, for equipment 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 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin > 10 dB

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

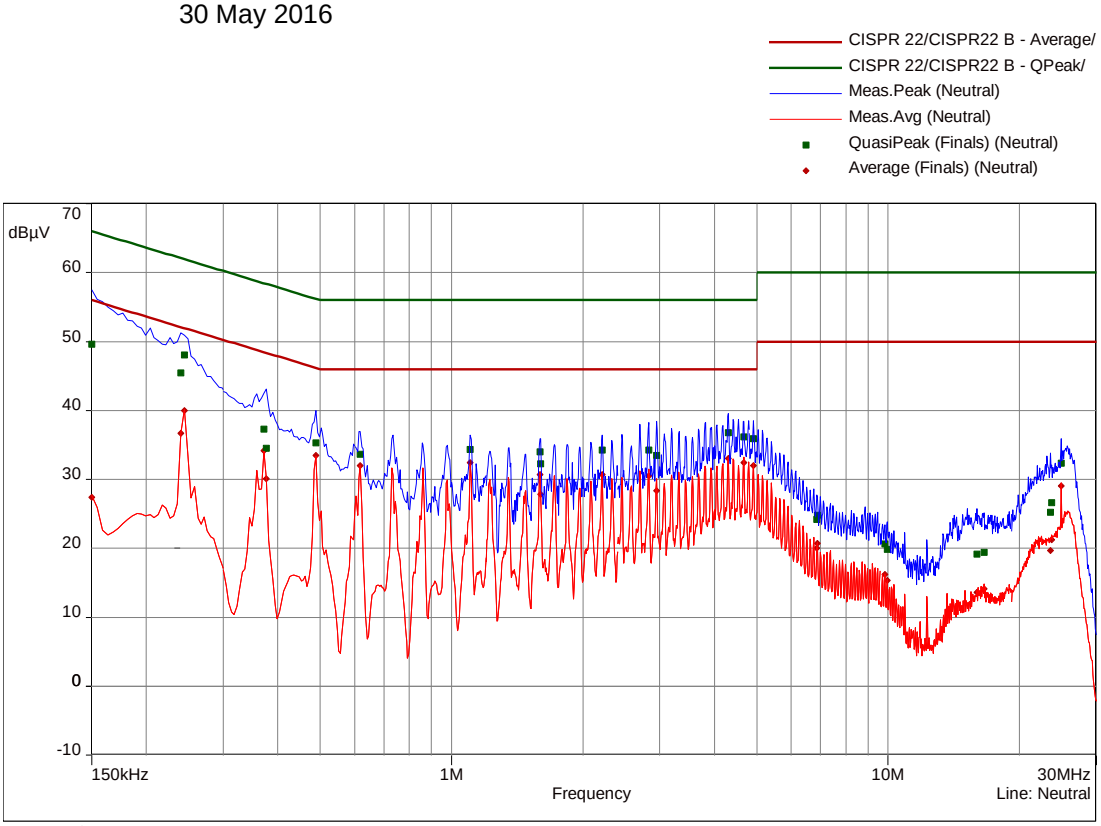
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

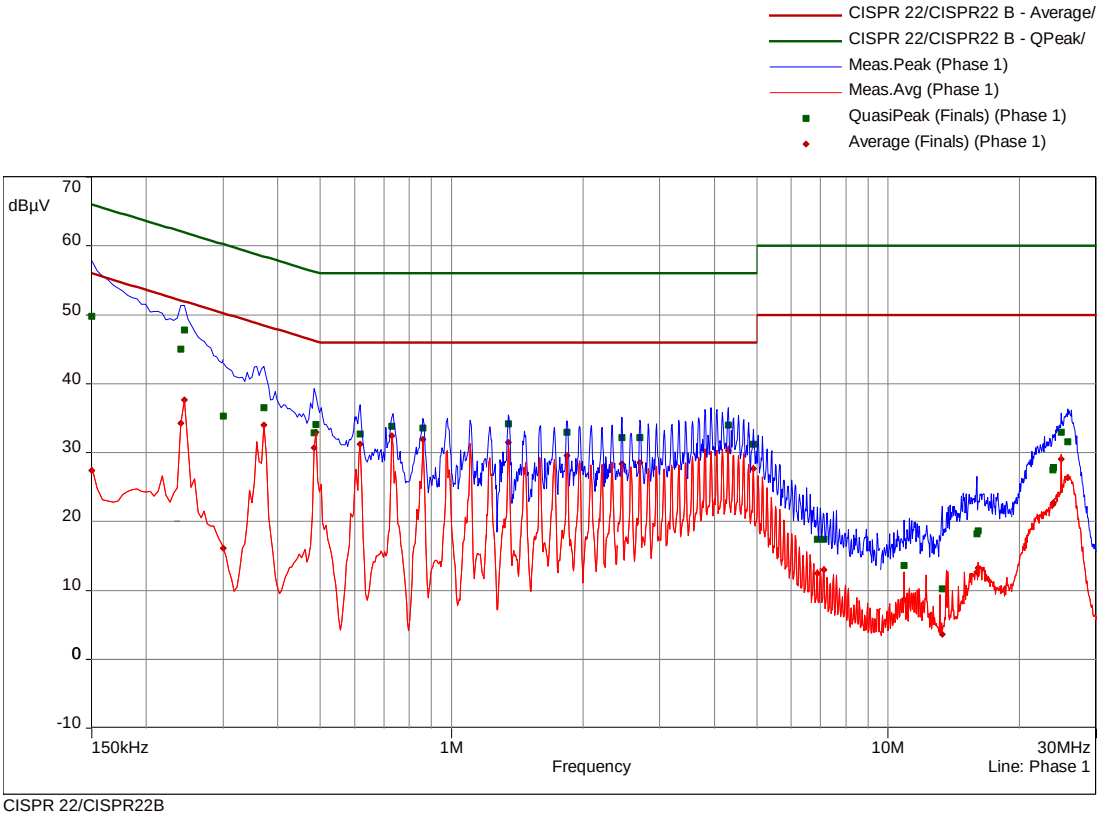
Remarks: For detailed test results please see the following test protocols.

5.1.5 Test protocol

Test point	N & L1	Result: passed
Operation mode:	charging mode; RX @ 913 MHz	
Remarks:	None	
Date:	30 May 2016	



CISPR 22/CISPR22B



CISPR 22/CISPR22B

Frequency (MHz)	SR	QuasiPeak (dBµV)	QP Margin (dBµV)	QP Limit (dBµV)	Average (dBµV)	AV Margin (dBµV)	AV Limi (dBµV)t	Line	Correction (dB)
0.15	1	49.75	16.25	66.00	27.41	28.59	56.00	Phase 1	9.84
0.24	1	45.03	17.07	62.10	34.27	17.83	52.10	Phase 1	9.83
0.2445	1	47.78	14.16	61.94	37.63	14.31	51.94	Phase 1	9.83
0.3	2	35.31	24.93	60.24	16.10	34.14	50.24	Phase 1	9.82
0.372	2	36.47	21.99	58.46	34.01	14.45	48.46	Phase 1	9.81
0.4845	2	32.89	23.37	56.26	30.68	15.58	46.26	Phase 1	9.82
0.489	2	34.10	22.09	56.18	32.93	13.25	46.18	Phase 1	9.82
0.618	3	32.69	23.31	56.00	31.24	14.76	46.00	Phase 1	9.82
0.7305	3	33.80	22.20	56.00	32.48	13.52	46.00	Phase 1	9.81
0.861	3	33.57	22.43	56.00	31.95	14.05	46.00	Phase 1	9.81
1.3485	4	34.19	21.81	56.00	31.46	14.54	46.00	Phase 1	9.79
1.839	4	32.97	23.03	56.00	29.55	16.45	46.00	Phase 1	9.80
2.454	5	32.19	23.81	56.00	28.37	17.63	46.00	Phase 1	9.79
2.7015	5	32.18	23.82	56.00	28.54	17.46	46.00	Phase 1	9.79
4.299	5	33.96	22.04	56.00	30.29	15.71	46.00	Phase 1	9.81
4.9125	6	31.24	24.76	56.00	27.66	18.34	46.00	Phase 1	9.82
6.8835	6	17.44	42.56	60.00	12.47	37.53	50.00	Phase 1	9.84
7.1265	6	17.46	42.54	60.00	13.01	36.99	50.00	Phase 1	9.85
10.8645	7	13.61	46.39	60.00	8.65	41.35	50.00	Phase 1	9.93
13.29	7	10.21	49.79	60.00	3.66	46.34	50.00	Phase 1	10.03
15.9495	7	18.24	41.76	60.00	12.62	37.38	50.00	Phase 1	10.15
16.089	7	18.62	41.38	60.00	13.29	36.71	50.00	Phase 1	10.15
23.826	8	27.52	32.48	60.00	22.45	27.55	50.00	Phase 1	10.34
23.943	8	27.87	32.13	60.00	22.74	27.26	50.00	Phase 1	10.34
24.8925	8	32.91	27.09	60.00	29.07	20.93	50.00	Phase 1	10.35
25.7835	8	31.54	28.46	60.00	26.33	23.67	50.00	Phase 1	10.35
0.15	9	49.65	16.35	66.00	27.42	28.58	56.00	Neutral	9.84
0.24	9	45.41	16.68	62.10	36.70	15.40	52.10	Neutral	9.84
0.2445	9	48.08	13.87	61.94	40.01	11.93	51.94	Neutral	9.84
0.372	10	37.34	21.12	58.46	34.14	14.32	48.46	Neutral	9.81
0.3765	10	34.56	23.80	58.36	30.10	18.25	48.36	Neutral	9.81
0.489	10	35.27	20.92	56.18	33.51	12.67	46.18	Neutral	9.82
0.618	11	33.67	22.33	56.00	32.04	13.96	46.00	Neutral	9.82
1.104	11	34.38	21.62	56.00	32.45	13.55	46.00	Neutral	9.81
1.596	12	34.00	22.00	56.00	30.67	15.33	46.00	Neutral	9.79
1.6005	12	32.30	23.70	56.00	27.86	18.14	46.00	Neutral	9.79
2.2125	12	34.25	21.75	56.00	30.73	15.27	46.00	Neutral	9.80
2.8275	13	34.24	21.76	56.00	30.57	15.43	46.00	Neutral	9.79
2.9535	13	33.49	22.51	56.00	28.40	17.60	46.00	Neutral	9.79
4.299	13	36.77	19.23	56.00	33.02	12.98	46.00	Neutral	9.80
4.668	13	36.14	19.86	56.00	32.46	13.54	46.00	Neutral	9.81
4.9125	14	35.90	20.10	56.00	32.02	13.98	46.00	Neutral	9.81
6.87	14	24.19	35.81	60.00	20.03	29.97	50.00	Neutral	9.81
6.8745	14	24.83	35.17	60.00	20.75	29.25	50.00	Neutral	9.81
9.8295	15	20.63	39.37	60.00	16.21	33.79	50.00	Neutral	9.83
9.951	15	19.85	40.15	60.00	15.39	34.61	50.00	Neutral	9.83
15.963	15	19.13	40.87	60.00	13.63	36.37	50.00	Neutral	9.96
16.575	15	19.44	40.56	60.00	14.15	35.85	50.00	Neutral	9.99
23.5335	16	25.25	34.75	60.00	19.66	30.34	50.00	Neutral	9.98
23.6955	16	26.66	33.34	60.00	21.29	28.71	50.00	Neutral	9.97
24.8925	16	32.38	27.62	60.00	29.07	20.93	50.00	Neutral	9.94

5.2 Radiated emission

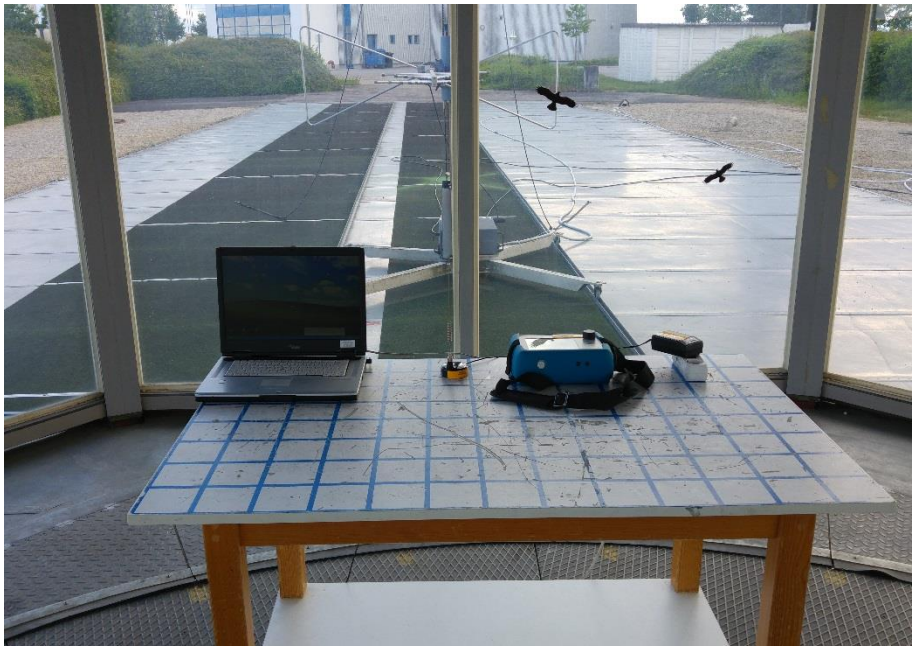
For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.2.1 Description of the test location

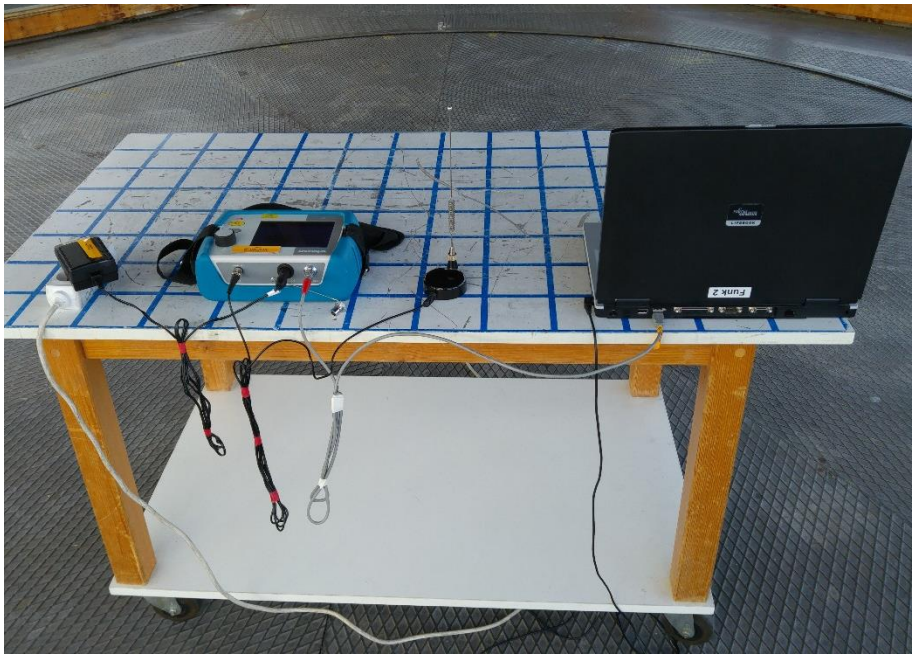
Test location: OATS 1
Test distance: 3 m

Test location: Anechoic chamber 1
Test distance: 3 m

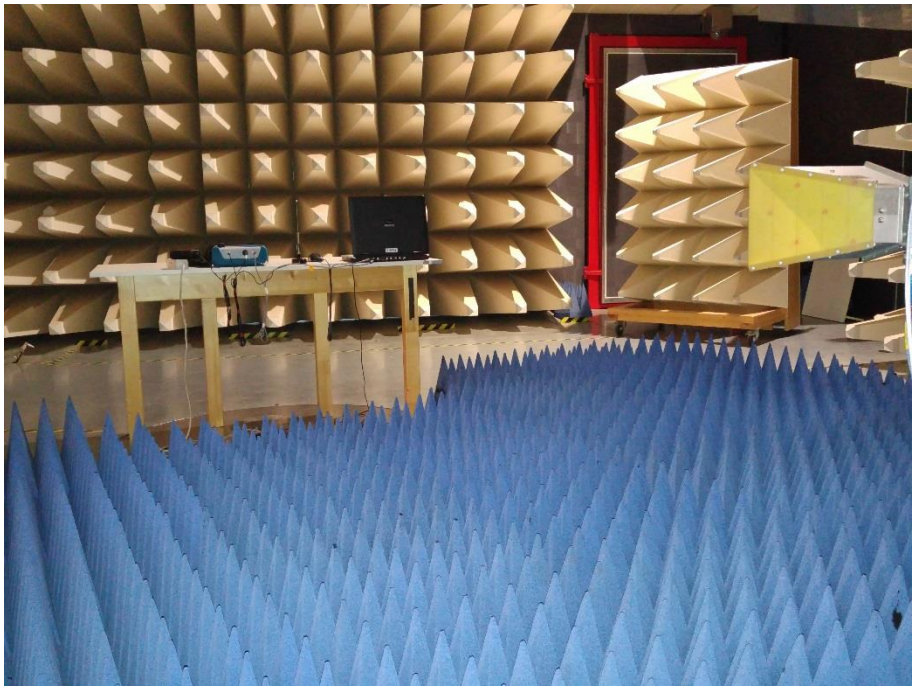
5.2.2 Photo documentation of the test set-up



OATS1 – 10 m – 30 MHz to 1000 MHz



OATS1 – 10 m – 30 MHz to 1000 MHz



A1 – 3 m – 1 GHz to 12.75 GHz

A1 – 3 m – 1 GHz to 12.75 GHz

5.2.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):
Except for Class A digital devices, the field strength of radiated emission from unintentional radiators at a distance of 3 m shall not exceed the given limit.

Spectrum analyser settings:
30 MHz – 1000 MHz: RBW: 120 kHz
1000 MHz – 25 GHz: RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Peak

5.2.4 Test result

EuT in horizontal position – TX antenna vertrical (stub antenna)

Frequency (MHz)	Level QP (dBµV)	Level AV (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Level QP (dBµV/m)	Level AV (dBµV/m)	Limit (dBµV/m)	Delta (dB)
46.70	11.3	-	120	15.2	26.5	-	40.0	-13.5
47.90	12.0	-	120	15.2	27.2	-	43.5	-16.3
48.90	11.7	-	120	15.2	26.9	-	43.5	-16.6
74.67	10.4	-	120	12.6	23.0	-	43.5	-20.5
124.45	12.1	-	120	13.2	25.3	-	43.5	-18.2
130.86	9.7	-	120	12.9	22.6	-	43.5	-20.9
149.34	12.0	-	120	14.7	26.7	-	43.5	-16.8
174.23	13.0	-	120	14.4	27.4	-	43.5	-16.1
199.12	15.8	-	120	12.0	27.8	-	43.5	-15.7
224.01	8.0	-	120	12.9	20.9	-	43.5	-22.6
248.92	7.1	-	120	13.9	21.0	-	46.0	-25.0
273.80	16.5	-	120	15.2	31.7	-	46.0	-14.3
298.68	18.6	-	120	16.4	35.0	-	46.0	-11.0
323.56	18.3	-	120	17.2	35.5	-	46.0	-10.5
348.44	6.9	-	120	18.0	24.9	-	46.0	-21.1
373.35	13.0	-	120	18.7	31.7	-	46.0	-14.3
398.23	23.5	-	120	19.8	43.3	-	46.0	-2.7

EuT in horizontal position – TX antenna vertrical (magnet socket antenna)

Frequency (MHz)	Level QP (dBµV)	Level AV (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Level QP (dBµV/m)	Level AV (dBµV/m)	Limit (dBµV/m)	Delta (dB)
46.70	12.4	-	120	15.2	27.6	-	40.0	-12.4
47.90	14.0	-	120	15.2	29.2	-	43.5	-14.3
48.90	13.2	-	120	15.2	28.4	-	43.5	-15.1
74.67	11.9	-	120	12.6	24.5	-	43.5	-19.0
124.45	15.0	-	120	13.2	28.2	-	43.5	-15.3
130.86	10.0	-	120	12.9	22.9	-	43.5	-20.6
149.34	10.9	-	120	14.7	25.6	-	43.5	-17.9
174.23	16.3	-	120	13.7	30.0	-	43.5	-13.5
199.12	22.1	-	120	12.0	34.1	-	43.5	-9.4
224.01	8.9	-	120	12.9	21.8	-	43.5	-21.7
248.92	11.2	-	120	13.9	25.1	-	46.0	-20.9
273.80	15.0	-	120	15.3	30.3	-	46.0	-15.7
298.68	18.0	-	120	16.4	34.4	-	46.0	-11.6
323.56	15.5	-	120	17.2	32.7	-	46.0	-13.3
348.44	10.0	-	120	18.0	28.0	-	46.0	-18.0
373.35	13.7	-	120	19.1	32.8	-	46.0	-13.2
398.23	25.2	-	120	19.5	44.7	-	46.0	-1.3

EuT in horizontal position – TX antenna vertrical (stub antenna)

Frequency (MHz)	Level PK (dBµV)	Level AV (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Level PK (dBµV/m)	Level AV (dBµV/m)	Limit AV (dBµV/m)	Delta (dB)
1196.13	65.3	-	1000	-19.5	45.8	-	54.0	-8.2
1340.50	58.6	-	1000	-19.5	39.1	-	54.0	-14.9
1681.38	56.0	-	1000	-20.0	36.0	-	54.0	-18.0
2133.63	57.2	-	1000	-16.0	41.2	-	54.0	-12.8
2259.63	58.0	-	1000	-15.7	42.3	-	54.0	-11.7
3443.13	55.3	-	1000	-12.9	42.4	-	54.0	-11.6
3646.00	57.0	-	1000	-13.0	44.0	-	54.0	-10.0
4086.00	42.3	-	1000	-0.5	41.8	-	54.0	-12.2
4169.00	41.6	-	1000	0.5	42.1	-	54.0	-11.9
4892.00	42.1	-	1000	2.3	44.4	-	54.0	-9.6

EuT in horizontal position – TX antenna vertrical (magnet socket antenna)

Frequency (MHz)	Level PK (dBµV)	Level AV (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Level PK (dBµV/m)	Level AV (dBµV/m)	Limit AV (dBµV/m)	Delta (dB)
1196.13	64.1	-	1000	-19.5	44.6	-	54.0	-9.4
1340.50	57.4	-	1000	-19.5	37.9	-	54.0	-16.1
1681.38	56.3	-	1000	-20.0	36.3	-	54.0	-17.7
2133.63	55.8	-	1000	-16.0	39.8	-	54.0	-14.2
2259.63	55.4	-	1000	-15.7	39.7	-	54.0	-14.3
3443.13	54.9	-	1000	-12.9	42.0	-	54.0	-12.0
3646.00	55.1	-	1000	-13.0	42.1	-	54.0	-11.9
4086.00	41.6	-	1000	-0.5	41.1	-	54.0	-12.9
4169.00	41.3	-	1000	0.5	41.8	-	54.0	-12.2
4892.00	40.7	-	1000	2.3	43.0	-	54.0	-11.0

Limit according to FCC Part 15B, Section 15.109(a):

Frequency (MHz)	Limit (µV/m)	Limit (dBµV/m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

The requirements are **FULFILLED.**

Remarks: The measurement was performed according to FCC Part 15A, Section 15.33(b), up to 5 GHz.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Following software was used: Nexio BAT EMC (2015 Version 3.15.0.12)

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESCI	02-02/03-05-005	09/12/2016	09/12/2015		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	09/12/2016	09/06/2016
	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	06/11/2016	06/11/2015	21/09/2016	21/03/2016
SER 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	20/04/2017	20/04/2016	20/10/2016	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				
SER 3	3115	01-02/24-01-011	03/03/2017	03/03/2016		
	FSP 40	02-02/11-11-001	28/10/2016	28/10/2015		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				

7 Detailed measurement uncertainty

7.1 Overview

Measurement instrumentation uncertainty shall be taken into account when determining compliance or non-compliance with a disturbance limit.
The measurement instrumentation uncertainty for a test laboratory shall be evaluated. The standard uncertainty $u(x_i)$ in decibels and the sensitivity coefficient c_i shall be evaluated for the estimate x_i of each quantity. The combined standard uncertainty $u_c(y)$ of the estimate y of the measured shall be calculated as

$$u_c(y) = \sqrt{\sum_i c_i^2 \; u^2(x_i)}$$

The expanded measurement instrumentation uncertainty U_{lab} for a test laboratory shall be calculated as $U_{lab} = 2\, u_c(y)$

$$U_{lab} = 2 \; u_c(y)$$

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} in the table below, then:
- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in the table below, then:
- compliance is deemed to occur if no measured disturbance, increased by ($U_{lab} – U_{cispr}$), exceeds the disturbance limit.
- non-compliance is deemed to occur if any measured disturbance, increased by ($U_{lab} – U_{cispr}$), exceeds the disturbance limit.

7.2 Definitions and symbols

X_i	Input quantity
x_i	estimate of X_i
$u(x_i)$	standard uncertainty of x_i
c_i	sensitivity coefficient
$u_c(y)$	(combined) standard uncertainty of y
Y	result of a measurement, (the estimate of the measured), corrected for all recognized significant systematic effects
U	expanded uncertainty of y

7.3 Measurement uncertainty

Measurement	U_{lab} [dB]
Conducted disturbance	+ 3.29 / - 3.29
Radiated disturbance (electric field) - 10 m test distance - 3 m test distance - Frequency range: 30 MHz – 300 MHz	 + 3.86 / - 3.91 + 4.14 / - 4.78
Radiated disturbance (electric field) - 10 m test distance - 3 m test distance - Frequency range: 300 MHz – 1000 MHz	 + 4.11 / - 4.11 + 4.13 / - 4.14
Radiated disturbance (electric field) - 3 m test distance - Frequency range: 1 GHz – 30 GHz	 + 2.89 / -2.89