

EMI – TEST REPORT

- FCC Part 15B -

Type / Model Name : COR C-3-913-469

Product Description : Portable device for reading audio data from acoustical sensors and correlating these data

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. : **T40173-00-01KJ**

01. December 2015
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.

Contents

1	<u>TEST STANDARDS</u>	<u>3</u>
2	<u>EQUIPMENT UNDER TEST</u>	<u>4</u>
2.1	Photo documentation of the EUT – Detailed photos see attachment A	4
2.2	Short description of the equipment under test (EUT)	4
2.3	Variants of the EUT	4
2.4	Test Jig	4
2.5	Technical description of the equipment under test (EUT)	5
2.6	Test software	5
2.7	Transmit operating modes	6
2.8	Peripheral devices and interface cables	6
2.9	Determination of worst case conditions for final measurement	6
3	<u>Test result summary</u>	<u>7</u>
3.1	General remarks	7
3.2	FINAL ASSESSMENT	7
4	<u>TEST ENVIRONMENT</u>	<u>8</u>
4.1	Address of the test laboratory	8
4.2	Environmental conditions	8
4.3	Statement of the measurement uncertainty	8
4.4	Measurement protocol for FCC	9
5	<u>TEST CONDITIONS AND RESULTS</u>	<u>11</u>
5.1	Conducted emission	11
5.2	Radiated emission	17
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	<u>21</u>
	<u>ATTACHMENT (PHOTO DOCUMENTATION OF THE EUT)</u>	<u>A</u>

Attachment A as separatly supplement

1 TEST STANDARDS

The tests were performed according to following standards:

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

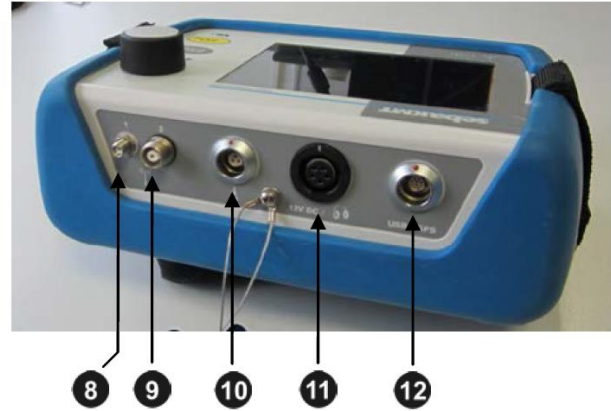
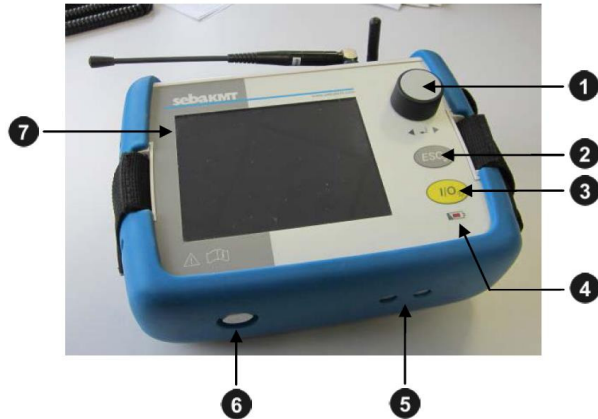
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
------------------	---

CISPR 16-4-2: 2011 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



Item	Description
1	Rotary encoder Turning – Leads through the buttons and input fields displayed Pressing – Executes the selected button or enters the input field
2	ESC pushbutton exits the current menu and returns to the Start menu
3	I/O pushbutton Short – Switches the device on or activates the backlight Long – Switches the device off
4	Charging indicator light
5	Charging pins to charge the device wireless in the transport case
6	Ventilation / venting membrane

Item	Description
7	Touch screen (the Touch function can be enabled/disabled in the sytem settings)
8	Antenna 1 (digital radio) data transfer in Offline measurement mode
9	Antenna 2 (analogue radio) data transfer in Online measurement mode
10	Microphone connection socket for ground microphone
11	12V DC connection socket for headphone
12	USB / GPS combined connection socket for USB cable & GPS receiver

2.2 Short description of the equipment under test (EUT)

The COR C-3 is a portable device which is used to correlate audio data for leak detection in water pipes. The device communicates with the other devices of the Corrlux C-3 system. With the correlator it is possible to program/configure the Multisensors (COR MS-3) and receive the analog signal of the Power-Transmitters (COR PT-3).

The digital communication (programming/configuring) is done at a frequency of 913 MHz. The receiving of analog audio signals from the Power-Transmitter is done at a frequency of 469 MHz. The correlator has two external connectors to connect two different antennas - one for digital communication and one for long range analog communication.

2.3 Variants of the EUT

- There are no other variants.

2.4 Test Jig

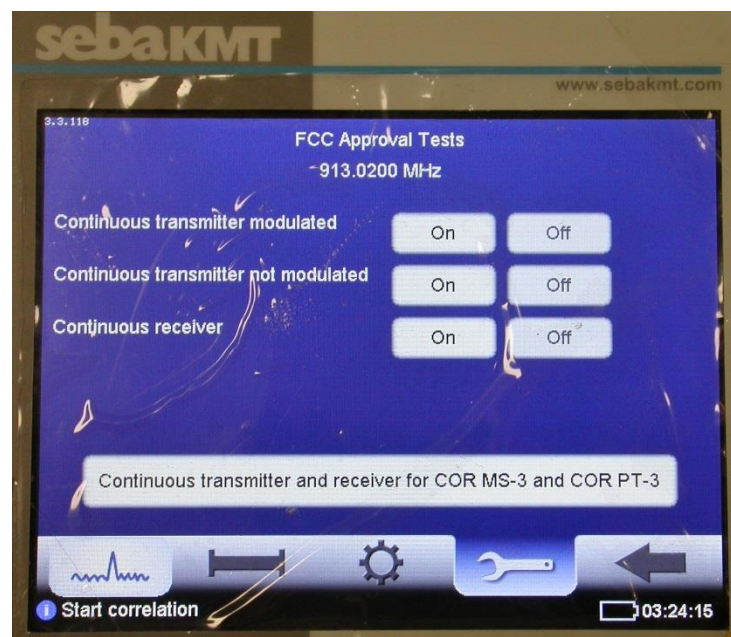
- No test jig is used.

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, SMA right angle
Antenna connector	SMA
Antenna gain	0 dBi
Analog radio:	
Type of modulation	analog FM
Operating frequency digital radio	468,5 MHz / 469,6 MHz
Frequency band	468,5 - 496,6 MHz
Data rate	
Channel spacing	25 kHz
Number of channels	1 per Transmitter UNIT
Antenna type	Antenne lambda 1/2 460MHz
Antenna connector	BNC
Antenna gain	7 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:

- | | |
|---------------------|----------------------------|
| - Headphone | Model : Sennheiser HD 215 |
| - Microphone | Model : sebaKMT PAM CORP-2 |
| - USB adapter cable | Model : Seba |
| - Laptop | Model : Toshiba Tecra |

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.

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 : 14 September 2015

Testing concluded on : 27 November 2015

Checked by:

Tested by:



Klaus Gegenfurtner
2015.12.01
08:54:57 +01'00'

Klaus Gegenfurtner
Teamleader Radio



Josef Knab
I'm the autor of this document
2015.12.01 08:31:43 +01'00'

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 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.

4.4.2 Details of test procedures

4.4.2.1 General standard information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.3 Conducted emission

4.4.3.1 Description of measurement

The final level, expressed in dB μ V, 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 dB μ V and μ V, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \cdot \log(\mu\text{V}) \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

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 μ H (CISPR 16) characteristics. 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 emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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

4.4.4.1 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 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. 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 centre 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 centre of the table and to a screened room located outside the test area. The antenna is positioned in horizontal polarisation and is repeated vertically. To locate maximum emission 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 dB μ V/m is calculated by add the antenna correction factor and cable loss factor (dB) on the reading from the EMI receiver (dB μ V). The FCC or CISPR limit is subtracted from this result in order to provide the delta to limit listed in the measurement protocol.

Example:

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

4.4.5 Radiated emission (electrical field 1 GHz - 40 GHz)

4.4.5.1 Description of measurement

Radiated emission from the EUT are measured in the frequency range 1 GHz up to the maximum frequency 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 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 following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre 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 centre of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width 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 detect emission under better uncertainty and is calculated to the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emission

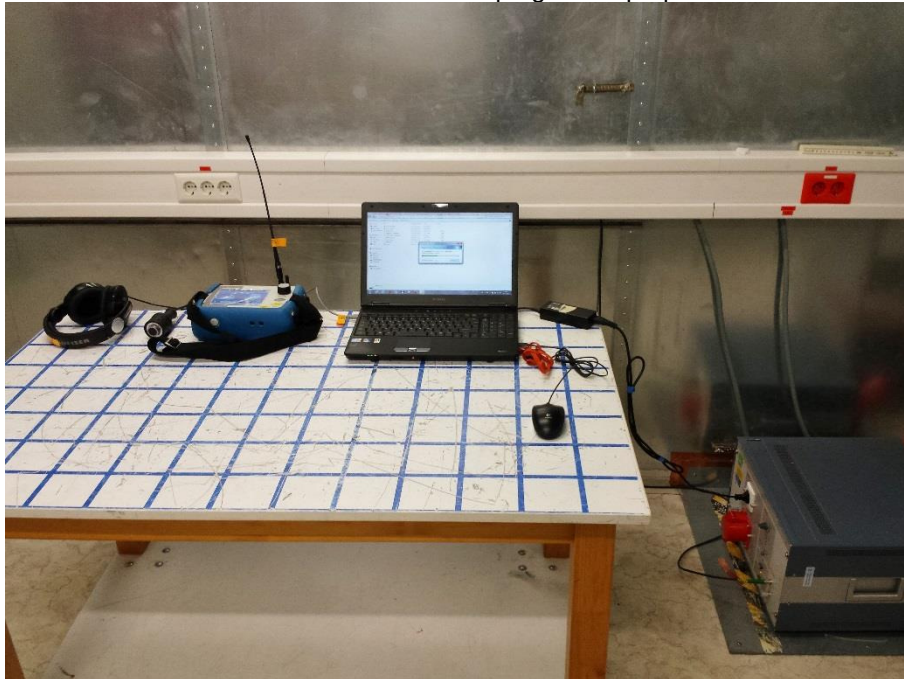
For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up

Connected over USB plug to a laptop



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 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 (AC powered) 13.2 dB at 21.51 MHz

Min. limit margin (USB powered) 9.76 dB at 20.80 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

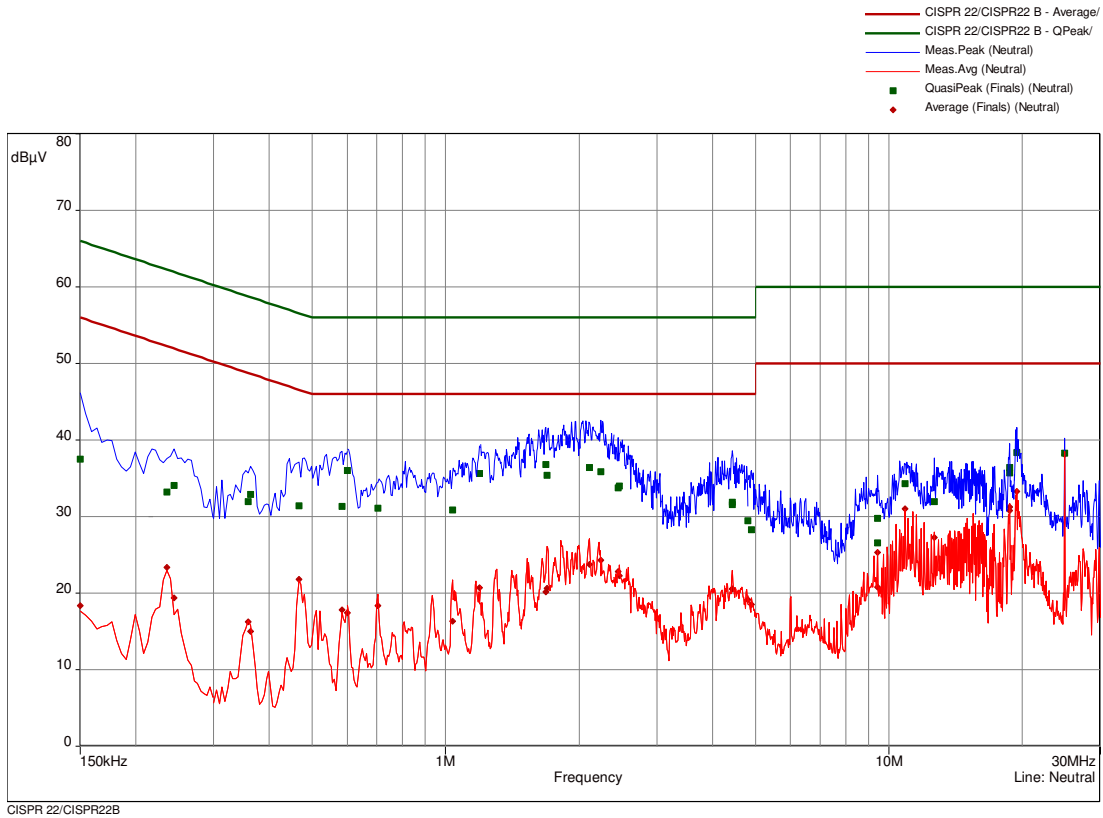
The requirements are **FULFILLED**.

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

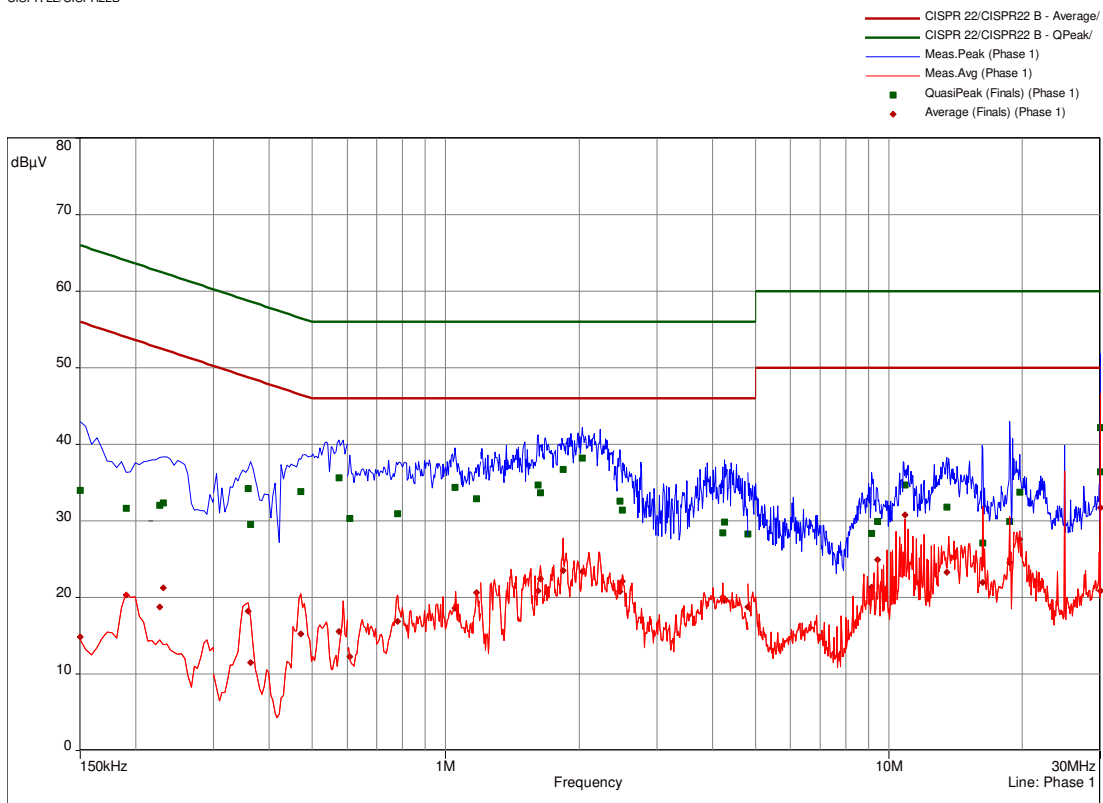
5.1.6 Test protocol

Test point N & L1 connected over laptop / USB
 Operation mode: RX continuous mode
 Remarks: None
 Date: 26. November 2015

Result: passed



CISPR 22/CISPR22B

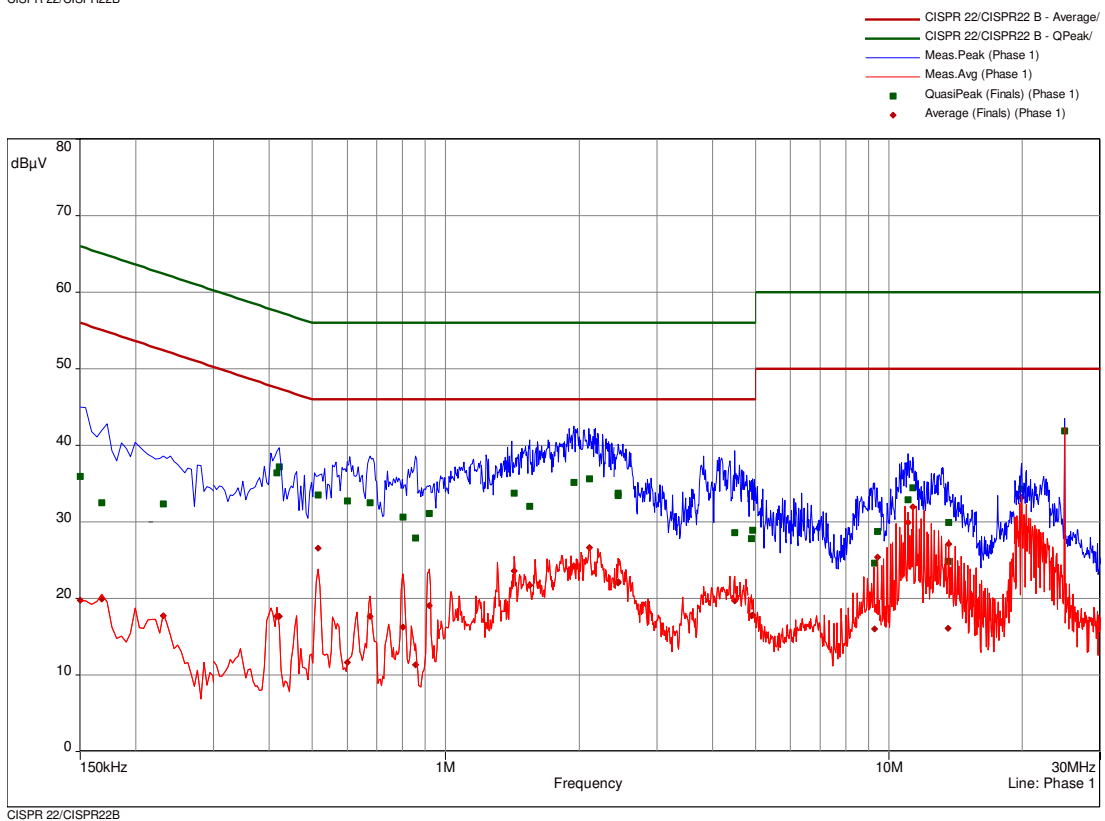
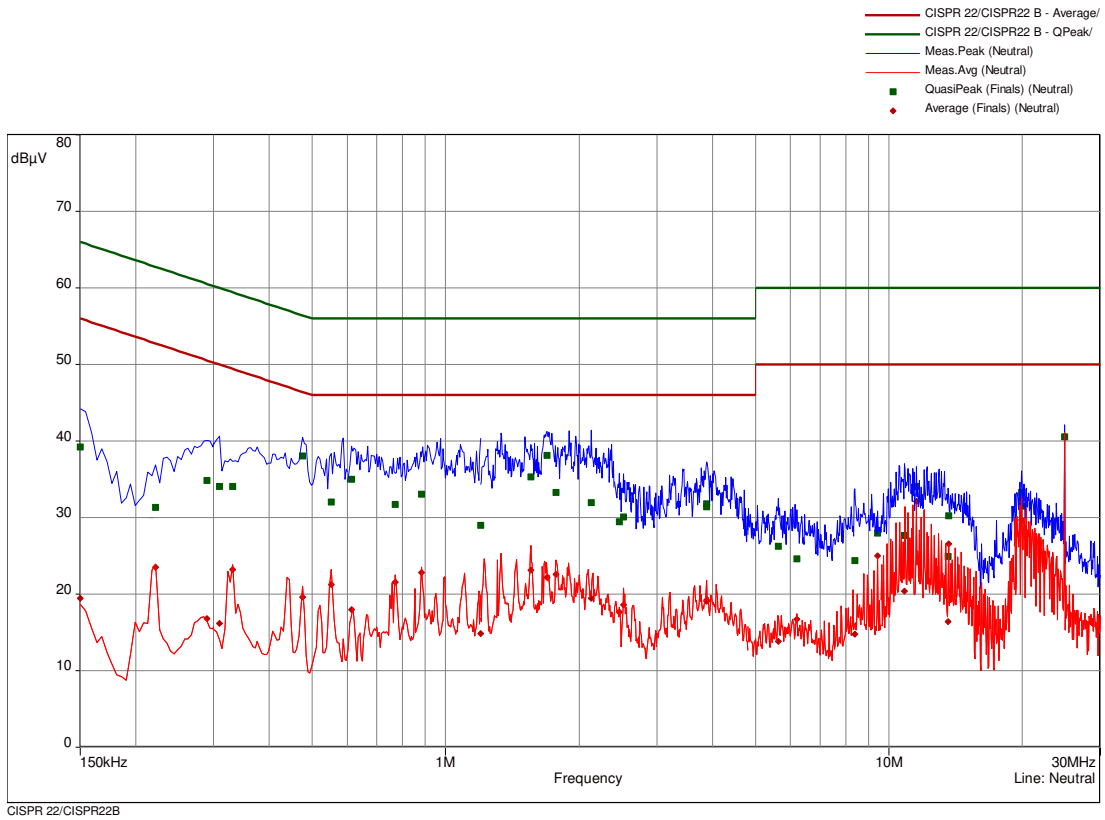


CISPR 22/CISPR22B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.15	1	34.00	32.00	66.00	14.85	41.15	56.00	Phase 1	9.84
0.1905	1	31.68	32.33	64.01	20.30	33.71	54.01	Phase 1	9.83
0.2265	1	32.07	30.51	62.58	18.79	33.79	52.58	Phase 1	9.83
0.231	1	32.39	30.03	62.41	21.28	31.13	52.41	Phase 1	9.83
0.3585	2	34.24	24.53	58.76	18.19	30.57	48.76	Phase 1	9.81
0.363	2	29.53	29.13	58.66	11.52	37.14	48.66	Phase 1	9.81
0.471	2	33.81	22.69	56.50	15.27	31.23	46.50	Phase 1	9.82
0.5745	2	35.63	20.37	56.00	15.59	30.41	46.00	Phase 1	9.82
0.609	3	30.35	25.65	56.00	12.26	33.74	46.00	Phase 1	9.82
0.78	3	30.94	25.06	56.00	16.88	29.12	46.00	Phase 1	9.80
1.05	3	34.37	21.63	56.00	18.57	27.43	46.00	Phase 1	9.81
1.176	3	32.91	23.09	56.00	20.63	25.37	46.00	Phase 1	9.80
1.6185	4	34.70	21.30	56.00	20.89	25.11	46.00	Phase 1	9.79
1.6365	4	33.65	22.35	56.00	22.45	23.55	46.00	Phase 1	9.79
1.8435	4	36.71	19.29	56.00	23.54	22.46	46.00	Phase 1	9.80
2.037	4	38.19	17.81	56.00	23.35	22.65	46.00	Phase 1	9.81
2.4765	5	32.58	23.42	56.00	20.76	25.24	46.00	Phase 1	9.79
2.508	5	31.43	24.57	56.00	22.11	23.89	46.00	Phase 1	9.79
4.218	5	28.44	27.56	56.00	20.02	25.98	46.00	Phase 1	9.81
4.2585	5	29.87	26.13	56.00	19.62	26.38	46.00	Phase 1	9.81
4.8135	6	28.27	27.73	56.00	18.74	27.26	46.00	Phase 1	9.82
9.147	6	28.40	31.60	60.00	21.31	28.69	50.00	Phase 1	9.87
9.4305	6	29.89	30.11	60.00	24.94	25.06	50.00	Phase 1	9.88
10.86	7	34.69	25.31	60.00	30.75	19.25	50.00	Phase 1	9.93
13.5285	7	31.81	28.19	60.00	23.27	26.73	50.00	Phase 1	10.04
16.296	7	27.15	32.85	60.00	21.94	28.06	50.00	Phase 1	10.17
18.744	7	29.96	30.04	60.00	24.51	25.49	50.00	Phase 1	10.27
19.7175	8	33.73	26.27	60.00	27.59	22.41	50.00	Phase 1	10.33
29.9955	8	36.45	23.55	60.00	20.87	29.13	50.00	Phase 1	10.33
30	8	42.23	17.77	60.00	31.76	18.24	50.00	Phase 1	10.33
0.15	9	37.54	28.46	66.00	18.36	37.64	56.00	Neutral	9.84
0.2355	9	33.24	29.01	62.25	23.40	28.86	52.25	Neutral	9.84
0.2445	9	34.10	27.84	61.94	19.41	32.53	51.94	Neutral	9.84
0.3585	10	31.96	26.80	58.76	16.24	32.52	48.76	Neutral	9.81
0.363	10	32.89	25.77	58.66	14.99	33.67	48.66	Neutral	9.81
0.4665	10	31.45	25.13	56.58	21.81	24.77	46.58	Neutral	9.82
0.5835	10	31.34	24.66	56.00	17.83	28.17	46.00	Neutral	9.82
0.6	11	36.04	19.96	56.00	17.43	28.57	46.00	Neutral	9.82
0.7035	11	31.13	24.87	56.00	18.34	27.66	46.00	Neutral	9.81
1.0365	11	30.88	25.12	56.00	16.32	29.68	46.00	Neutral	9.81
1.194	11	35.63	20.37	56.00	20.74	25.26	46.00	Neutral	9.80
1.686	12	36.82	19.18	56.00	20.14	25.86	46.00	Neutral	9.79
1.695	12	35.41	20.59	56.00	20.61	25.39	46.00	Neutral	9.79
2.1135	12	36.42	19.58	56.00	23.73	22.27	46.00	Neutral	9.80
2.2395	12	35.89	20.11	56.00	24.28	21.72	46.00	Neutral	9.80
2.4495	13	33.79	22.21	56.00	22.79	23.21	46.00	Neutral	9.79
2.4675	13	33.97	22.03	56.00	22.24	23.76	46.00	Neutral	9.79
4.4295	13	31.60	24.40	56.00	20.56	25.44	46.00	Neutral	9.80
4.434	13	31.87	24.13	56.00	20.57	25.43	46.00	Neutral	9.80
4.8	14	29.44	26.56	56.00	19.16	26.84	46.00	Neutral	9.81
4.899	14	28.26	27.74	56.00	18.50	27.50	46.00	Neutral	9.81
9.426	14	26.53	33.47	60.00	20.79	29.21	50.00	Neutral	9.82
9.4305	14	29.79	30.21	60.00	25.33	24.67	50.00	Neutral	9.82
10.86	15	34.32	25.68	60.00	30.99	19.01	50.00	Neutral	9.84
12.669	15	31.93	28.07	60.00	27.27	22.73	50.00	Neutral	9.88
18.699	15	36.39	23.61	60.00	31.29	18.71	50.00	Neutral	10.07
18.7035	15	35.74	24.26	60.00	30.80	19.20	50.00	Neutral	10.07
19.407	16	38.36	21.64	60.00	33.28	16.72	50.00	Neutral	10.10
24.8925	16	38.26	21.74	60.00	38.10	11.90	50.00	Neutral	9.94

Test point: N & L1 connected over laptop / USB
 Operation mode: TX continuous mode
 Remarks: None
 Date: 26. November 2015

Result: passed



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.15	1	35.95	30.05	66.00	19.76	36.24	56.00	Phase 1	9.84
0.168	1	32.48	32.58	65.06	19.91	35.15	55.06	Phase 1	9.84
0.231	1	32.39	30.02	62.41	17.77	34.65	52.41	Phase 1	9.83
0.417	2	36.42	21.08	57.51	17.66	29.84	47.51	Phase 1	9.81
0.4215	2	37.20	20.21	57.42	17.66	29.76	47.42	Phase 1	9.81
0.516	2	33.54	22.46	56.00	26.55	19.45	46.00	Phase 1	9.82
0.6	2	32.72	23.28	56.00	11.67	34.33	46.00	Phase 1	9.82
0.6765	3	32.47	23.53	56.00	17.69	28.31	46.00	Phase 1	9.81
0.8025	3	30.63	25.37	56.00	16.29	29.71	46.00	Phase 1	9.81
0.8565	3	27.88	28.12	56.00	11.35	34.65	46.00	Phase 1	9.81
0.9195	3	31.12	24.88	56.00	19.10	26.90	46.00	Phase 1	9.82
1.4295	4	33.72	22.28	56.00	23.61	22.39	46.00	Phase 1	9.79
1.5465	4	32.02	23.98	56.00	21.72	24.28	46.00	Phase 1	9.78
1.947	4	35.15	20.85	56.00	24.22	21.78	46.00	Phase 1	9.81
2.109	4	35.61	20.39	56.00	26.63	19.37	46.00	Phase 1	9.80
2.4495	5	33.48	22.52	56.00	22.01	23.99	46.00	Phase 1	9.79
2.454	5	33.75	22.25	56.00	22.22	23.78	46.00	Phase 1	9.79
4.488	5	28.56	27.44	56.00	19.67	26.33	46.00	Phase 1	9.81
4.9035	6	27.85	28.15	56.00	17.77	28.23	46.00	Phase 1	9.82
4.926	6	28.91	27.09	56.00	17.82	28.18	46.00	Phase 1	9.82
9.2955	6	24.60	35.40	60.00	16.04	33.96	50.00	Phase 1	9.88
9.4305	6	28.73	31.27	60.00	25.39	24.61	50.00	Phase 1	9.88
11.0535	7	32.93	27.07	60.00	29.97	20.03	50.00	Phase 1	9.94
11.337	7	34.48	25.52	60.00	31.95	18.05	50.00	Phase 1	9.94
13.6095	7	24.82	35.18	60.00	16.10	33.90	50.00	Phase 1	10.04
13.623	7	29.94	30.06	60.00	27.10	22.90	50.00	Phase 1	10.05
19.911	8	34.34	25.66	60.00	33.20	16.80	50.00	Phase 1	10.34
24.8925	8	41.87	18.13	60.00	41.93	8.07	50.00	Phase 1	10.35
0.15	9	39.23	26.77	66.00	19.48	36.52	56.00	Neutral	9.84
0.222	9	31.35	31.40	62.74	23.53	29.21	52.74	Neutral	9.85
0.2895	9	34.82	25.72	60.54	16.79	33.75	50.54	Neutral	9.82
0.309	10	34.10	25.90	60.00	16.15	33.85	50.00	Neutral	9.82
0.3315	10	34.07	25.34	59.41	23.17	26.24	49.41	Neutral	9.81
0.4755	10	38.05	18.36	56.42	19.63	26.79	46.42	Neutral	9.82
0.552	10	32.05	23.95	56.00	21.28	24.72	46.00	Neutral	9.82
0.6135	11	35.00	21.00	56.00	17.95	28.05	46.00	Neutral	9.82
0.771	11	31.69	24.31	56.00	21.59	24.41	46.00	Neutral	9.80
0.8835	11	33.06	22.94	56.00	22.81	23.19	46.00	Neutral	9.81
1.2	11	29.02	26.98	56.00	14.83	31.17	46.00	Neutral	9.80
1.5555	12	35.33	20.67	56.00	23.16	22.84	46.00	Neutral	9.78
1.695	12	38.17	17.83	56.00	22.18	23.82	46.00	Neutral	9.79
1.776	12	33.29	22.71	56.00	22.55	23.45	46.00	Neutral	9.79
2.1315	12	31.94	24.06	56.00	19.48	26.52	46.00	Neutral	9.80
2.463	13	29.48	26.52	56.00	17.65	28.35	46.00	Neutral	9.79
2.5215	13	30.08	25.92	56.00	18.60	27.40	46.00	Neutral	9.79
3.8805	13	31.39	24.61	56.00	19.26	26.74	46.00	Neutral	9.81
3.885	13	31.83	24.17	56.00	19.06	26.94	46.00	Neutral	9.81
5.6235	14	26.29	33.71	60.00	13.86	36.14	50.00	Neutral	9.81
6.195	14	24.64	35.36	60.00	16.71	33.29	50.00	Neutral	9.81
8.3775	14	24.41	35.59	60.00	14.78	35.22	50.00	Neutral	9.81
9.4305	14	28.00	32.00	60.00	25.01	24.99	50.00	Neutral	9.82
10.8375	15	27.65	32.35	60.00	20.36	29.64	50.00	Neutral	9.84
11.526	15	34.05	25.95	60.00	32.13	17.87	50.00	Neutral	9.85
13.6005	15	24.91	35.09	60.00	16.39	33.61	50.00	Neutral	9.90
13.623	15	30.25	29.75	60.00	26.57	23.43	50.00	Neutral	9.90
19.911	16	33.25	26.75	60.00	32.35	17.65	50.00	Neutral	10.13
19.9425	16	31.48	28.52	60.00	29.72	20.28	50.00	Neutral	10.13
24.8925	16	40.57	19.43	60.00	40.65	9.35	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

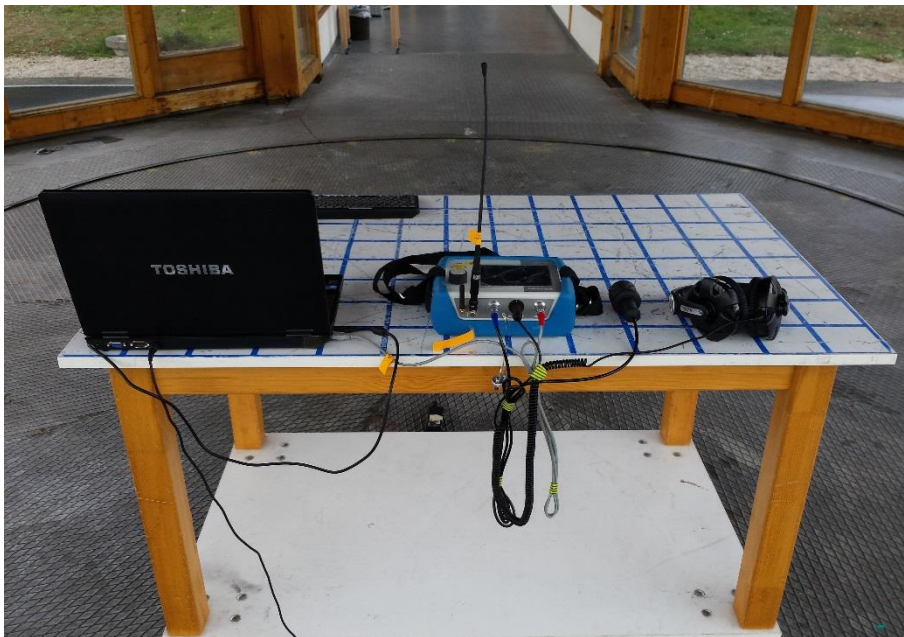
Test location: OATS 1
Test distance: 3 m

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.

5.2.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.4, Item 8 and 12. In the frequency range above 1 GHz a spectrum analyser is used. If the emission level in peak mode complies with the average limit, testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and both are reported. The EUT is measured in RX continuous mode under normal conditions.

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

5.2.5 Test result

$f < 1 \text{ GHz}$

Frequency (MHz)	Level QP (dB μ V)	Level AV (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Level QP (dB μ V/m)	Level AV (dB μ V/m)	Limit (dB μ V/m)	Delta (dB)
74.67	27.3	-	120	12.3	39.6	-	40.0	-0.4
124.45	30.2	-	120	12.6	42.8	-	43.5	-0.7
125.00	12.8	-	120	12.6	25.4	-	43.5	-18.1
129.56	21.7	-	120	12.8	34.5	-	43.5	-9.0
142.44	10.0	-	120	13.4	23.4	-	43.5	-20.1
149.34	22.7	-	120	14.5	37.2	-	43.5	-6.3
174.23	26.0	-	120	14.1	40.1	-	43.5	-3.4
175.00	14.1	-	120	14.1	28.2	-	43.5	-15.3
199.12	28.3	-	120	11.7	40.0	-	43.5	-3.5
200.00	23.4	-	120	11.6	35.0	-	43.5	-8.5
224.02	17.2	-	120	12.6	29.8	-	46.0	-16.2
225.00	14.0	-	120	12.6	26.6	-	46.0	-19.4
248.92	11.2	-	120	13.6	24.8	-	46.0	-21.2
273.78	13.7	-	120	14.9	28.6	-	46.0	-17.4
298.68	15.8	-	120	16.7	32.5	-	46.0	-13.5
298.68	17.0	-	120	16.7	33.7	-	46.0	-12.3
300.00	20.3	-	120	16.8	37.1	-	46.0	-8.9
323.58	17.9	-	120	17.4	35.3	-	46.0	-10.7
398.26	16.4	-	120	19.2	35.6	-	46.0	-10.4
400.00	6.3	-	120	19.2	25.5	-	46.0	-20.5
600.00	8.7	-	120	24.8	33.5	-	46.0	-12.5

f > 1 GHz

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)
1199.50	58.1	-	1000	-19.9	38.2	-	54.0	-15.8
1700.88	56.5	-	1000	-20.2	36.3	-	54.0	-17.7
2445.25	54.7	-	1000	-14.7	40.0	-	54.0	-14.0
2894.88	53.9	-	1000	-14.0	39.9	-	54.0	-14.1
3630.25	54.5	-	1000	-13.1	41.4	-	54.0	-12.6
4178.00	41.4	-	1000	1.1	42.5	-	54.0	-11.5

5.2.5.1.1.1

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.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	17/07/2016	17/07/2015		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2016	26/10/2015	21/01/2016	21/07/2015
	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	06/05/2016	06/11/2015
SER 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	17/04/2016	17/04/2015	29/02/2016	31/08/2015
	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	FSP 30	02-02/11-05-001	01/10/2016	01/10/2015		
	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				
	3117	02-02/24-05-009	12/05/2016	12/05/2015		
	WHJS 1000-10EE	02-02/50-05-070				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				