BNetzA-CAB-13/21-07

EMC – TEST REPORT

- FCC Part 15B & ICES-003 -

Type / Model Name	:	LOG RI-PLUS-913
Product Description	:	Radio interface for communication with LOG N-3
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

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

Test Report No. :	**T42988-00-01KJ**	10. October 2017 Date of issue

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

CSA Group Bayern GmbH
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Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart A - General (October, 2016)

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, 2016)

Part 15, Subpart B, Section 15.109	Radiated emission, general requirements ☐ Class A device ☒ Class B device
ICES-003 Issue 6: 2016	Information Technology Equipment (Including Digital Apparatus) Limits and Methods of Measurement
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 SUMMARY

2.1 General remarks

None.

2.2 Summary for all EMC tests

Type of test		FCC & IC Rules	Test result
Emission:			
A4	Conducted emission (AC mains power / DC power)	FCC § 15.107 IC ICES-003 § 6.1	passed
A5	Radiated emission (< 1 GHz)	FCC § 15.109 IC ICES-003 § 6.2	passed
SER 3	Radiated emission (> 1 GHz)		passed

2.3 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 : 19 June 2017

Testing concluded on : 30 June 2017

Checked by:

Klaus Gegenfurtner
I confirm the correctness and
Integrity of this document
2017.10.10 10:08:13 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Josef Knab
I'm the autor of this document
2017.10.10 10:00:57 +02'00'

Josef Knab
Radio Team

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT

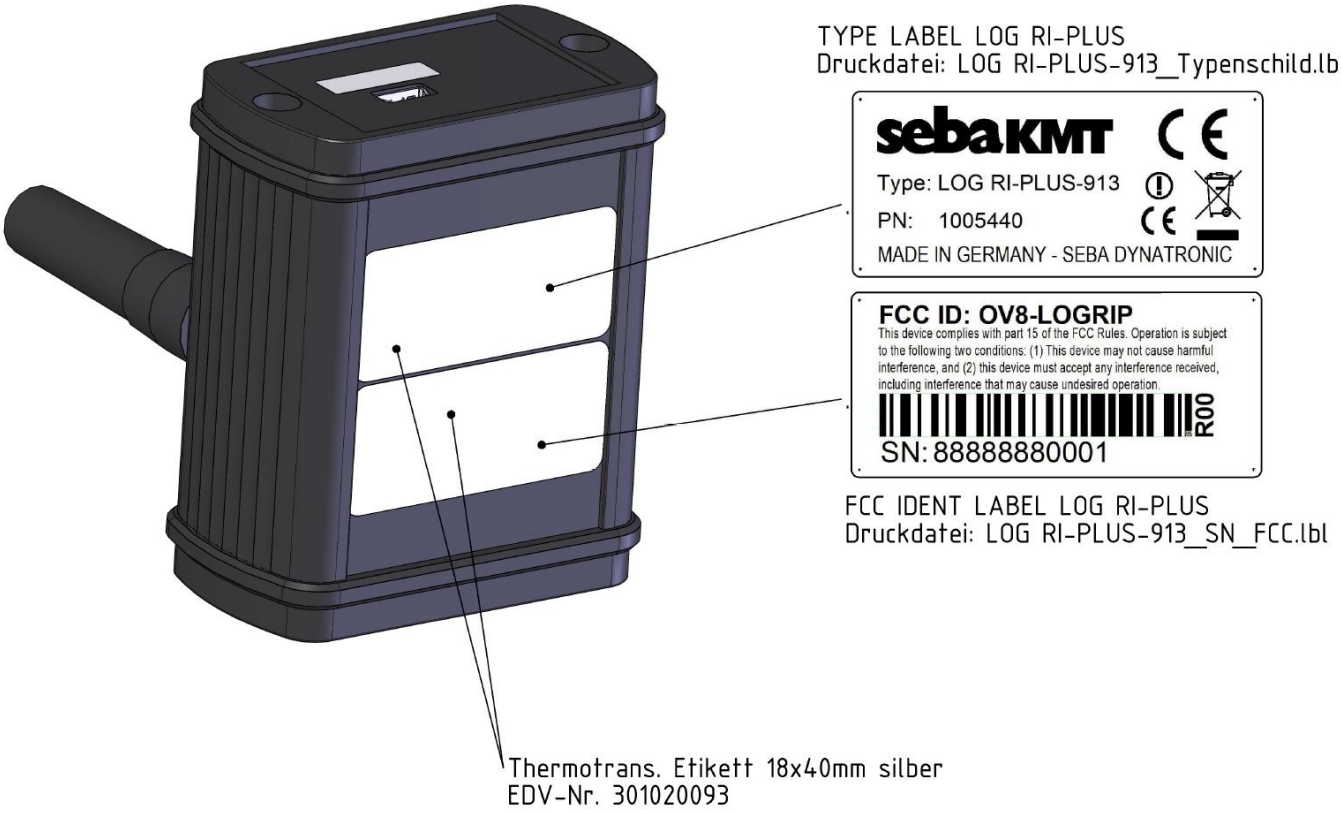
3.1.1 External views:

(Scale: 1 cm per square)

Top view

Bottom view

FCC Ident label placement



Front view

Rear view

Right view

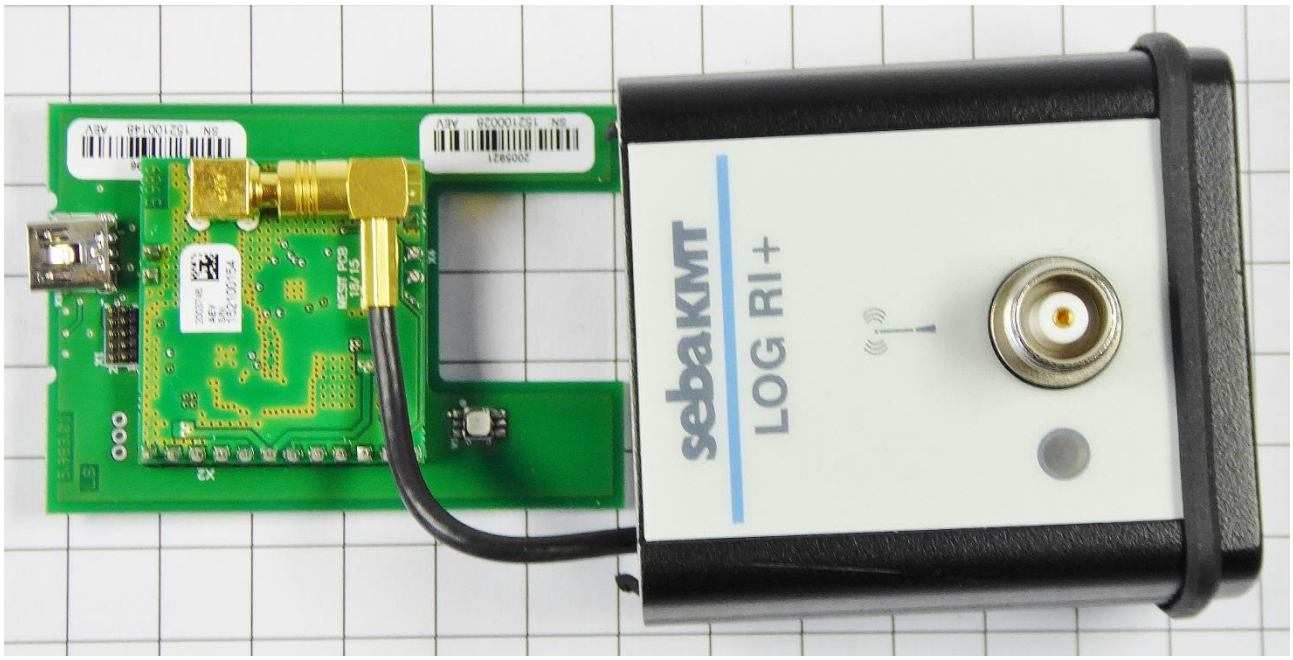
Left view

Top view (antenna detached)

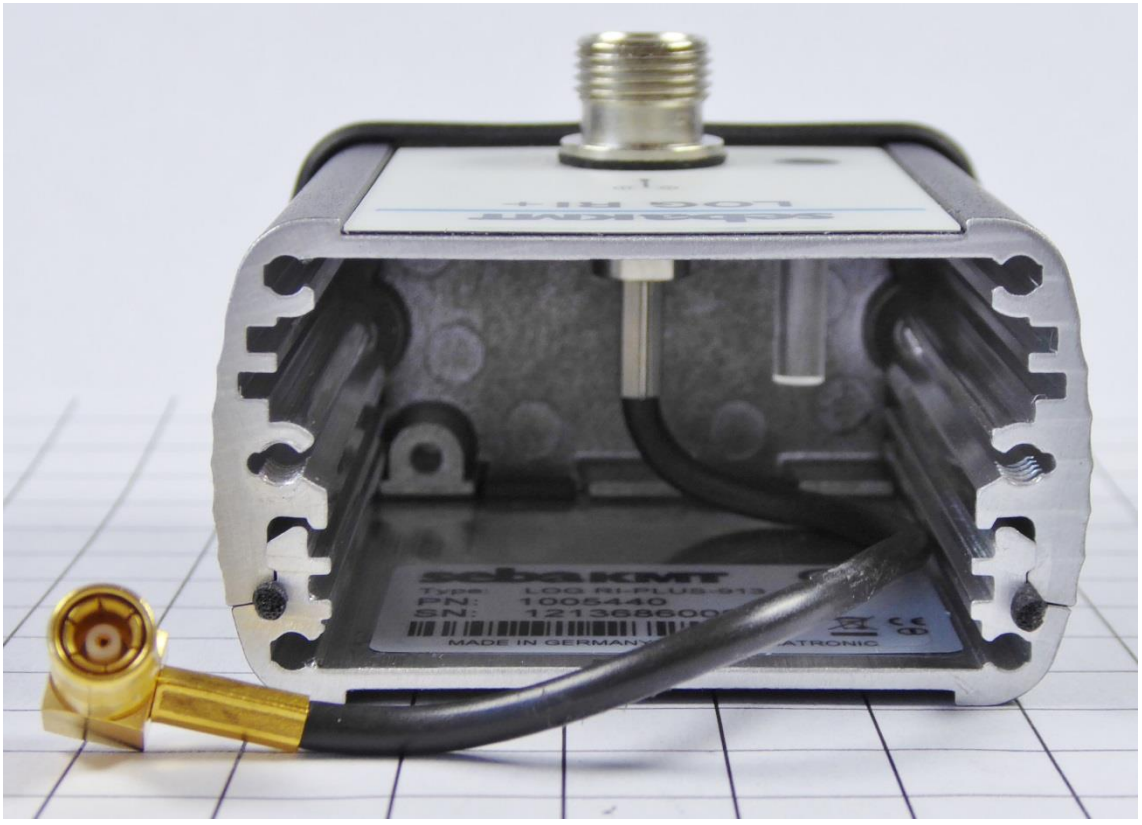
3.1.2 Internal views:

(Scale: 1 cm per square)

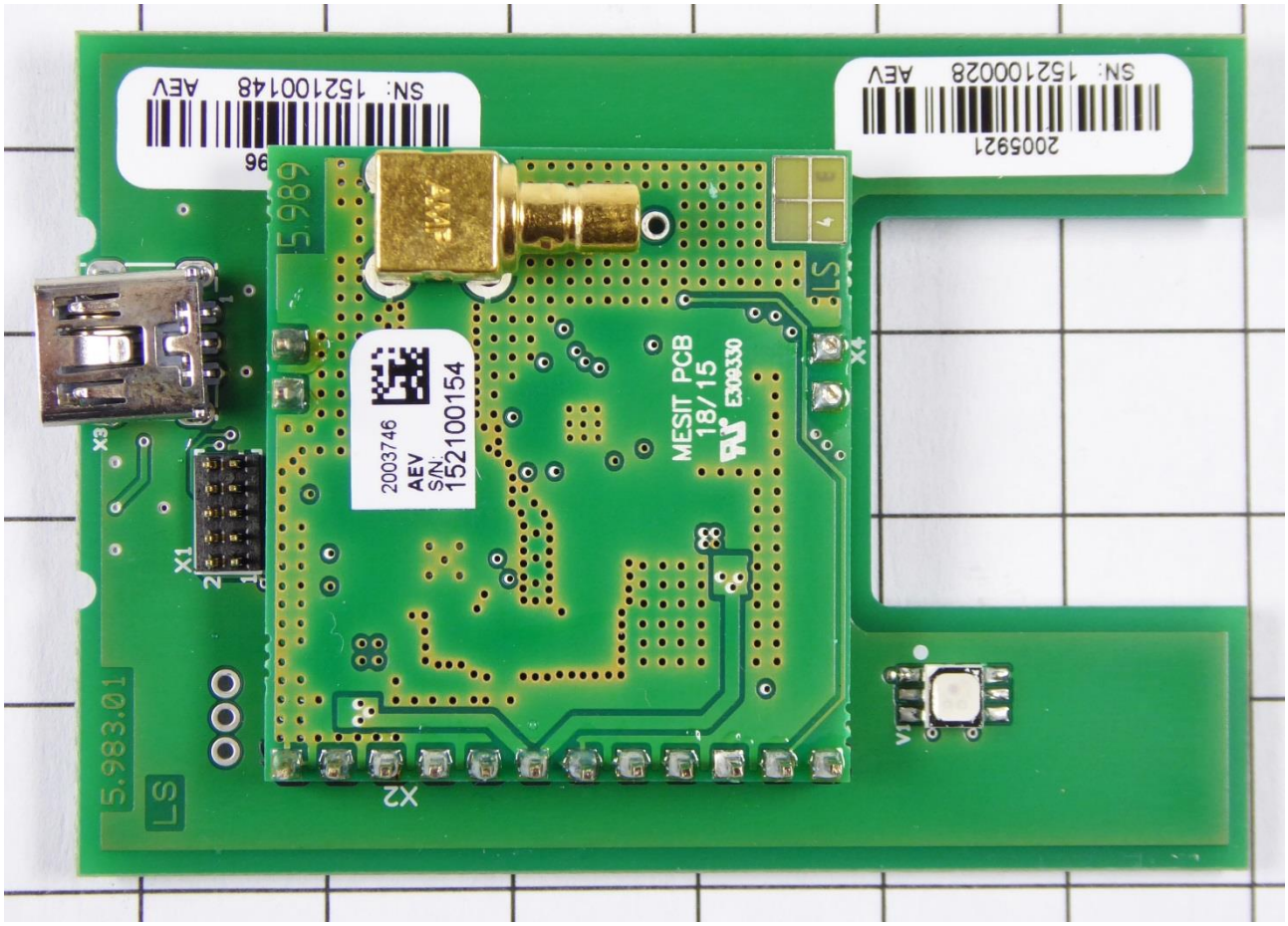
Top view (mainboard placed outside)



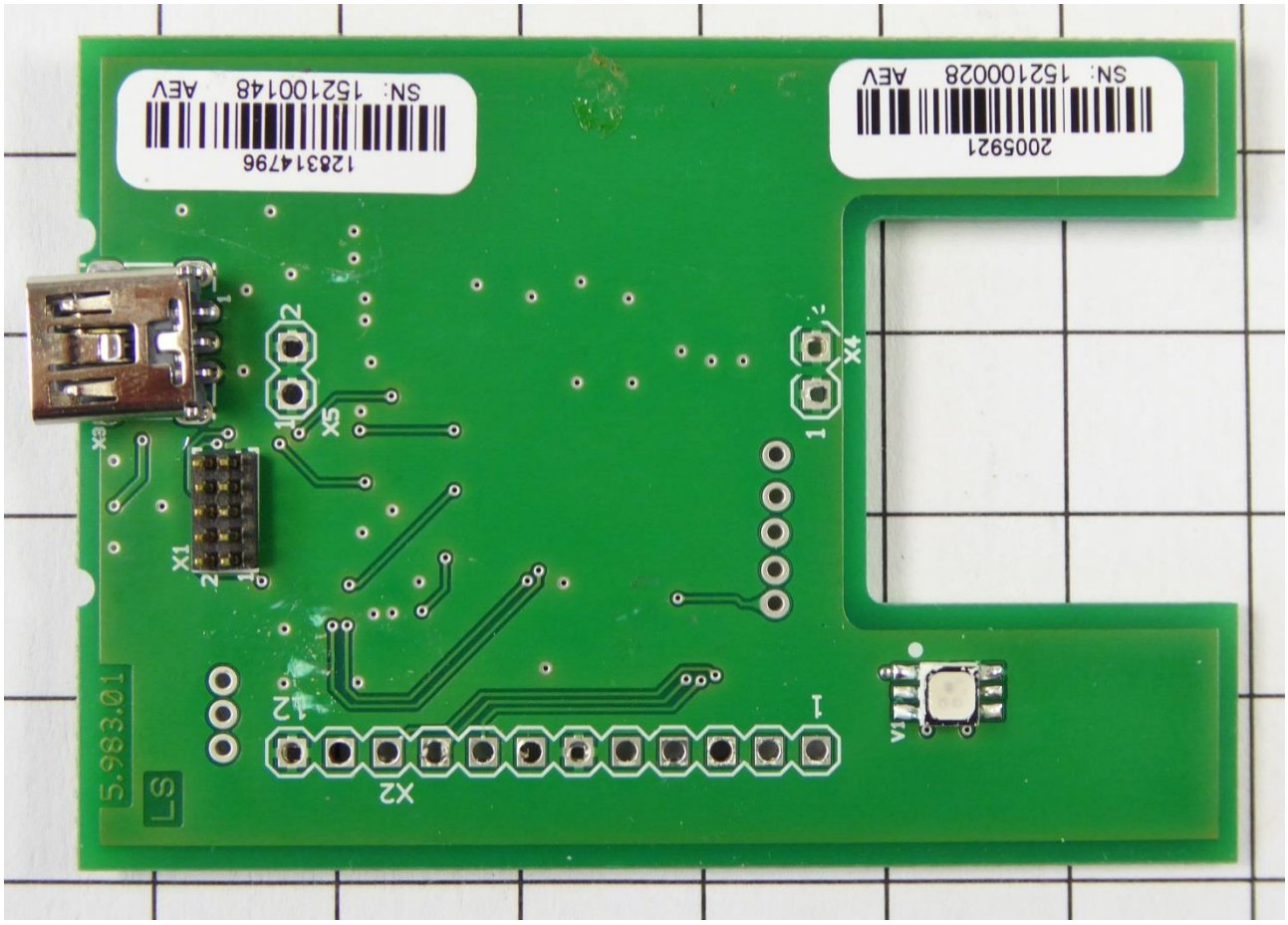
Front view (without mainboard)



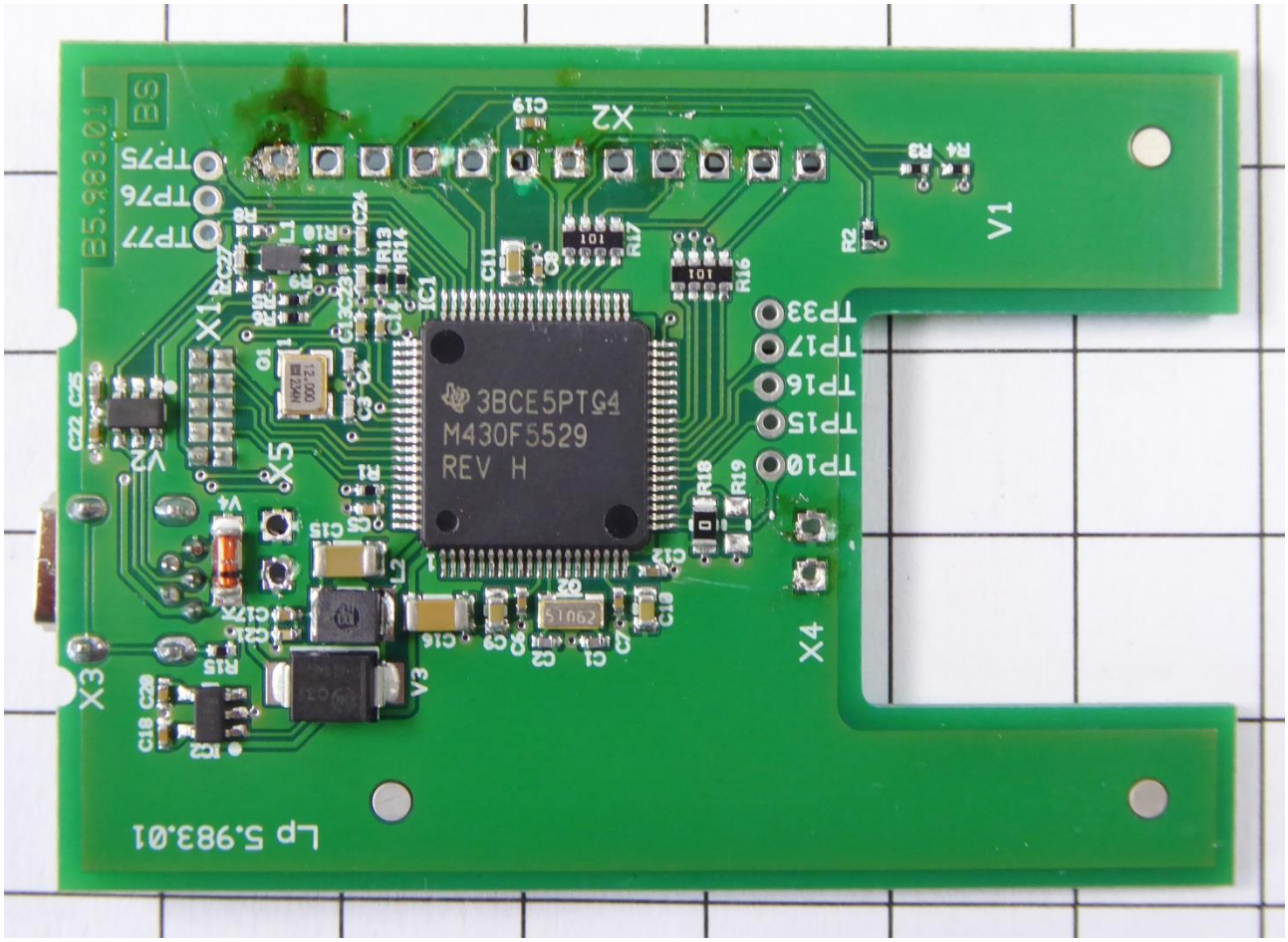
Main board top view



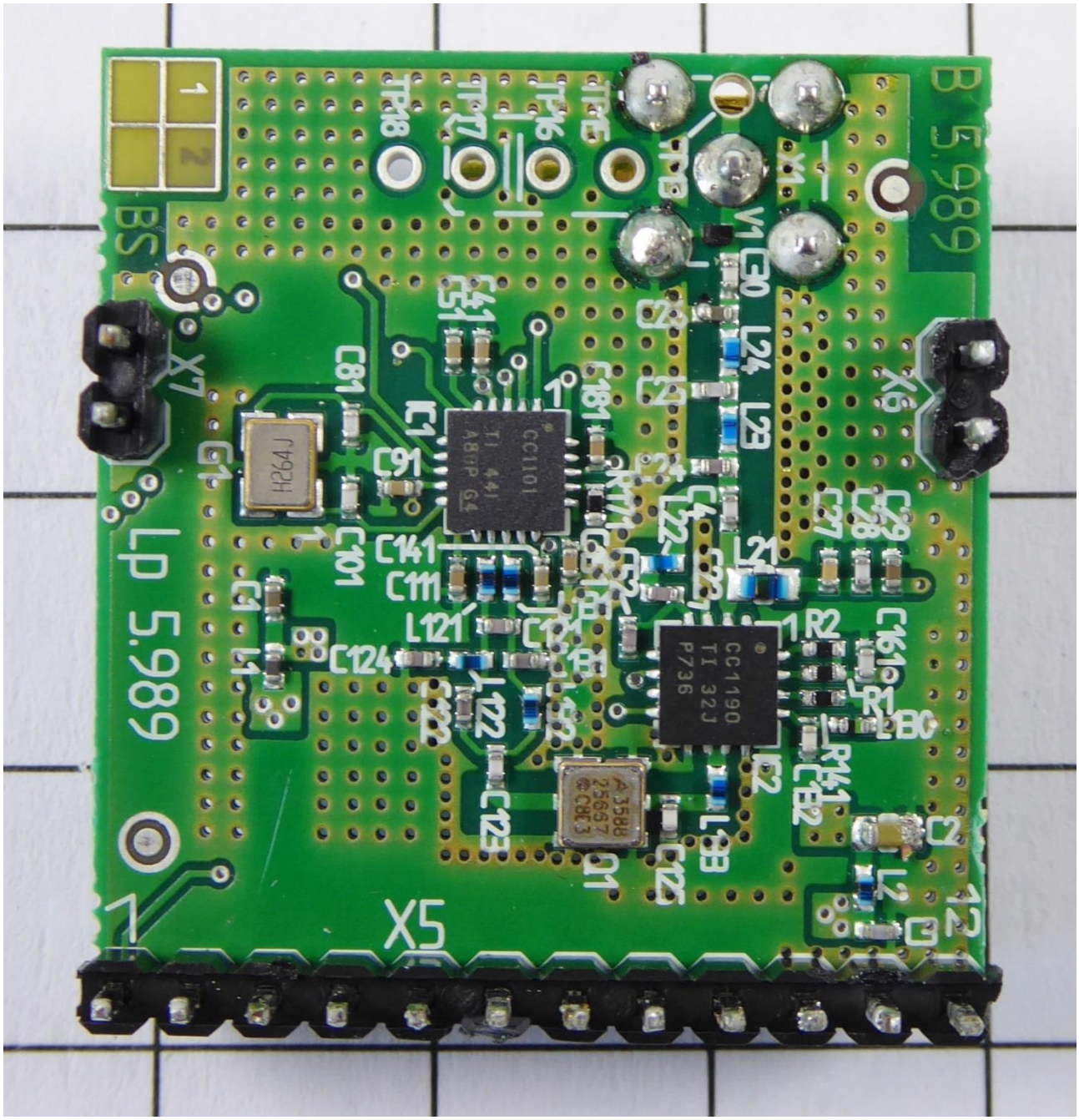
Main board top view (without radio module)



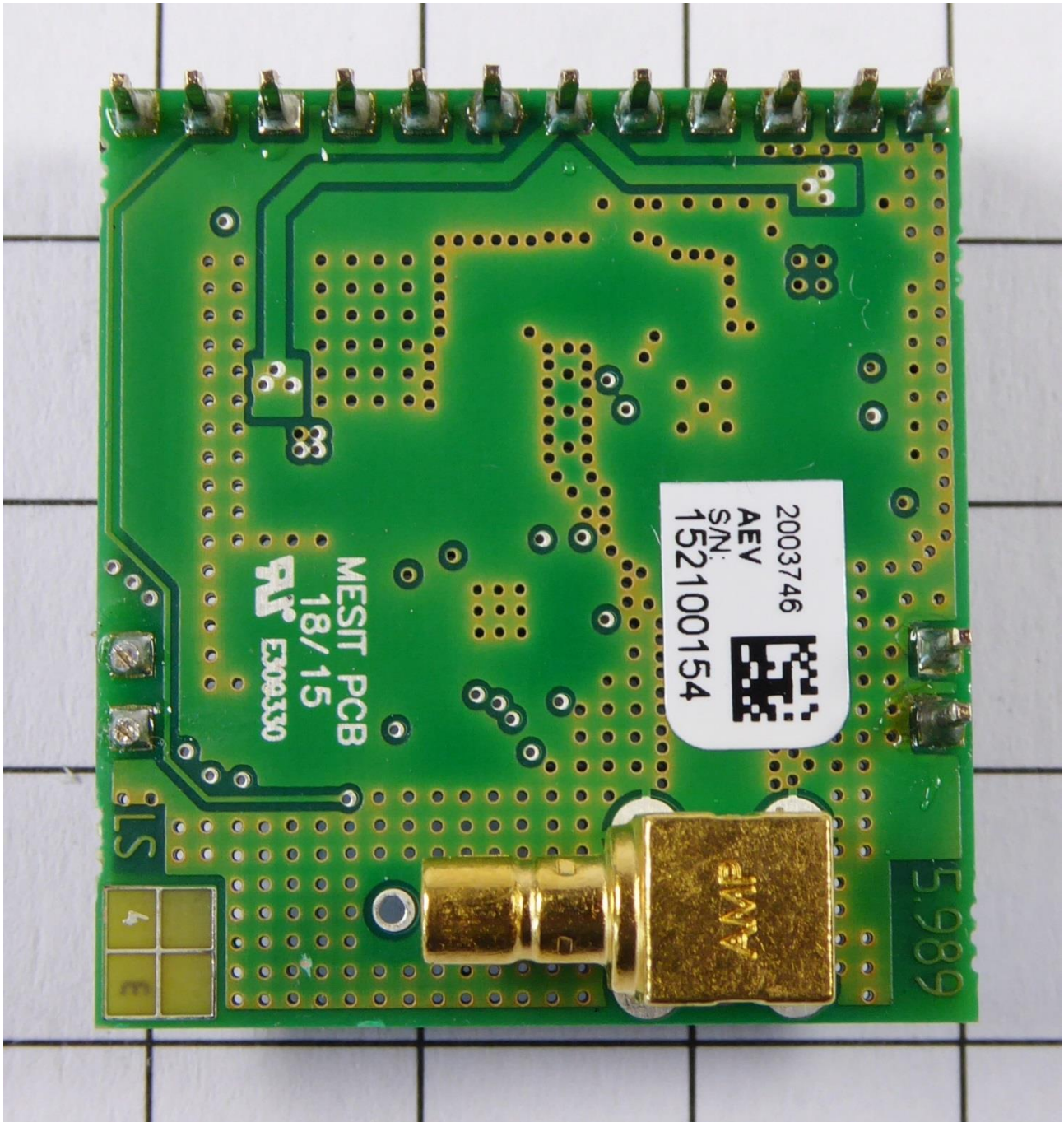
Mainboard bottom view



Radio module top view



Radio module bottom view



3.2 Power supply system utilised

Power supply voltage : V_{nom} = 5.0 V DC (powered over USB port)

3.3 Highest internal frequency

Highest internal frequency : 26 MHz

3.4 Short description of the Equipment under Test (EuT)

The LOG RI-PLUS is used as a communication tool between PC and other devices from the LOG N-3 system. All communication packets are sent at 913 MHz short range radio.
The antenna of the LOG RI-PLUS is an external TNC stub antenna. As power supply it has the 5V PC USB output.

Handling:
The LOG RI / LOG RI+ is easily connected to the computer using a USB port. This turns it on automatically. The device is automatically recognised by the computer and is immediately ready to set up a radio connection. No other settings need to be made.

Status LED:
The LOG RI / LOG RI+ device is equipped with an LED as a status indicator:

- Flashes 1x red, 1x green - When switched on
- Lights up in blue - During radio operation
- Lights up in red - Malfunction

Number of tested samples: 1
Serial number: 12136860005

3.5 EuT operation mode

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

- Receive / standby mode

-

3.6 EuT configuration

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

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

Port	Cable	Screening	Transmission	Status	Length
1	USB	shielded	digital	active	1.5 m

Modifications during the EMC test: None

3.7 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.

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 re-measured 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 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 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 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. 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 analyser 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 7 Part **A 4**.

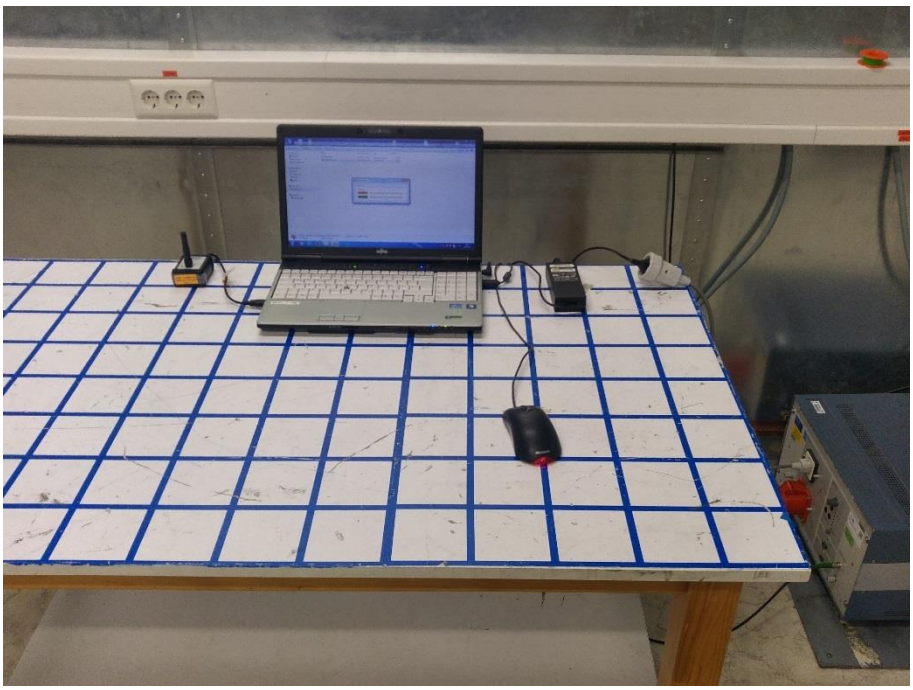
Legend for tables:

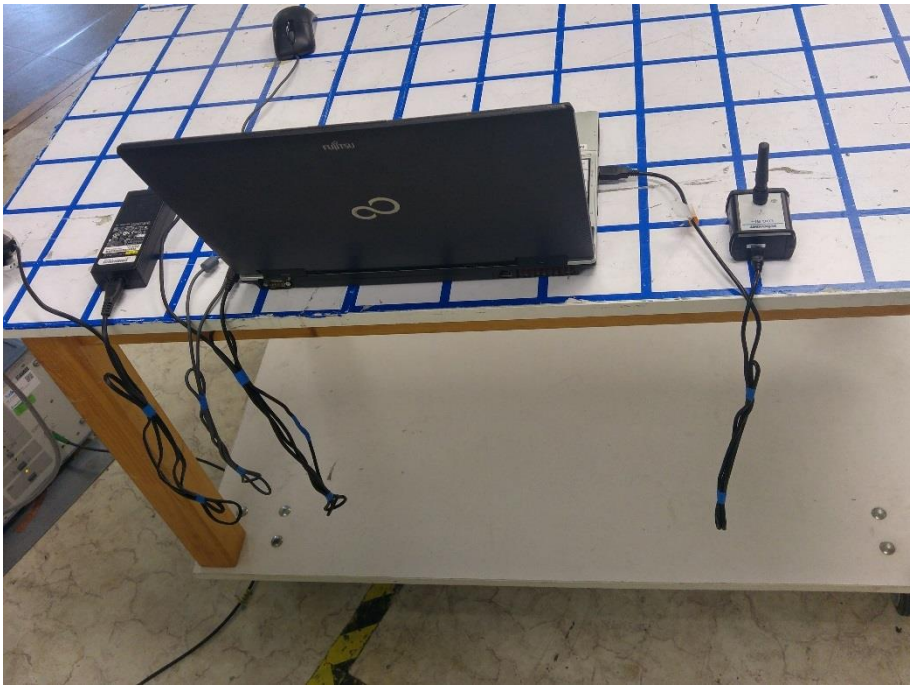
QP-L … QuasiPeak reading including correction factor
AV-L … Average reading including correction factor
D-Limit… Measured value to limit delta (margin)

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up





5.1.3 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin >10 dB

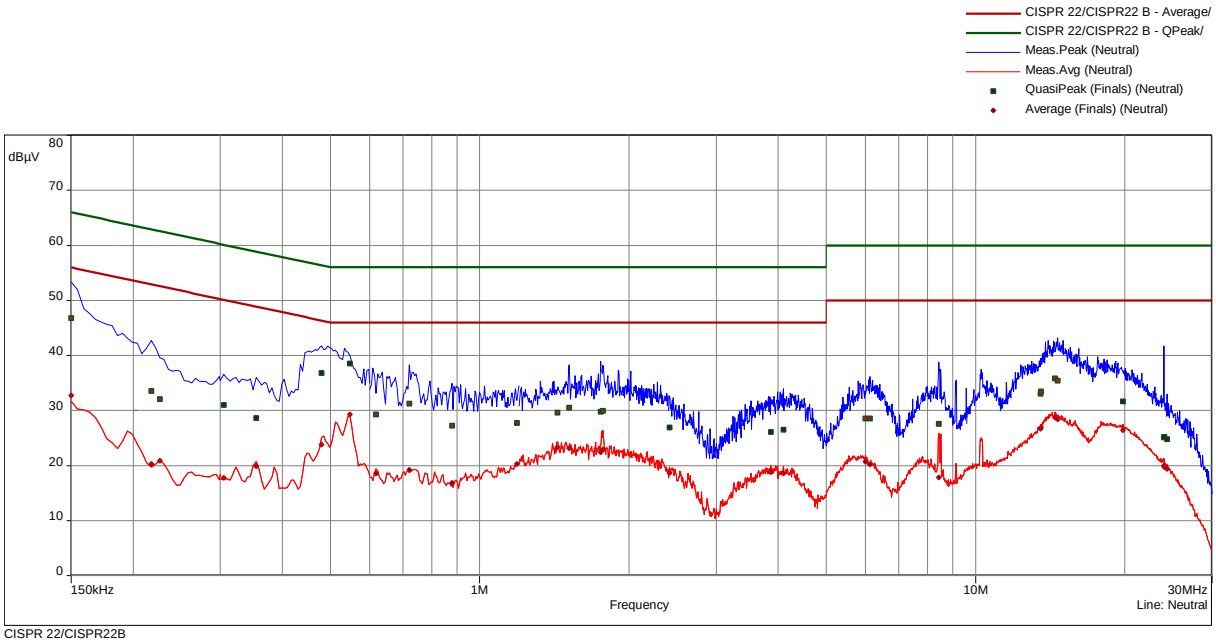
The requirements are **FULFILLED.**

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

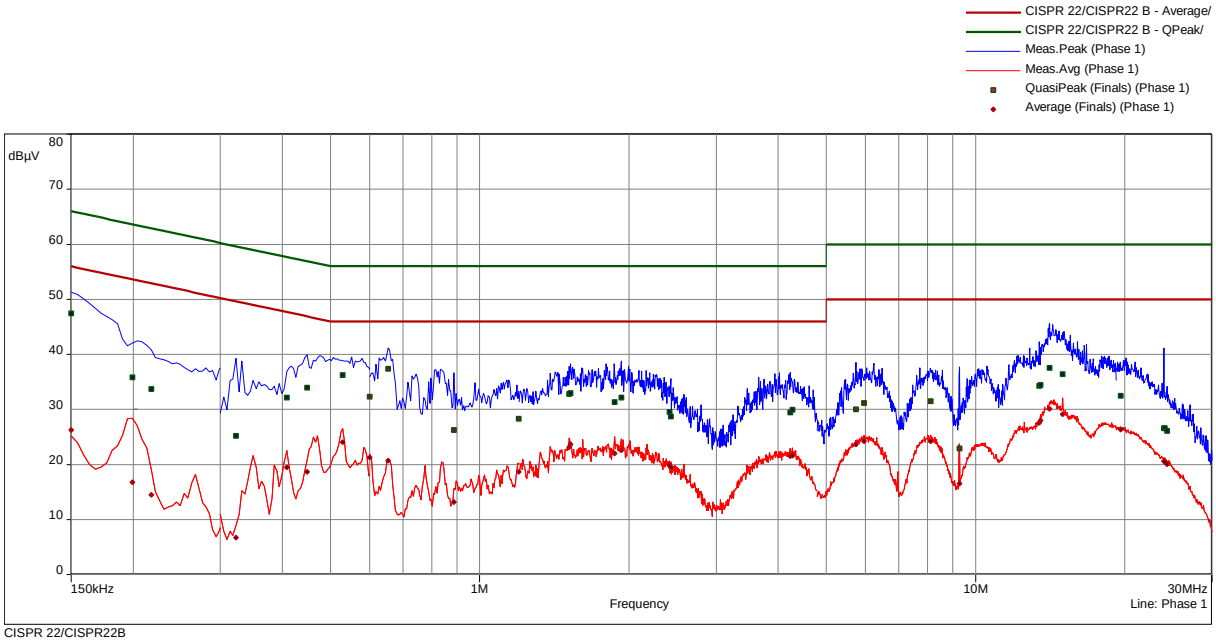
For description of the measurement see 4.6.3.

5.1.4 Test protocol

Test point	N & L1	Result: passed
Operation mode:	standby mode	
Remarks:	Powered over laptop	
Date:	21. June 2017	



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	47.42	18.58	66.00	26.28	29.72	56.00	Phase 1	10.08
0.1995	1	35.86	27.77	63.63	16.76	36.87	53.63	Phase 1	10.10
0.2175	1	33.68	29.24	62.91	14.47	38.45	52.91	Phase 1	10.10
0.3225	2	25.17	34.48	59.64	6.73	42.91	49.64	Phase 1	10.14
0.408	2	32.16	25.53	57.69	19.51	28.18	47.69	Phase 1	10.15
0.4485	2	33.93	22.97	56.90	18.66	28.24	46.90	Phase 1	10.16
0.5295	2	36.23	19.77	56.00	24.06	21.94	46.00	Phase 1	10.16
0.6	3	32.31	23.69	56.00	21.30	24.70	46.00	Phase 1	10.17
0.654	3	37.42	18.58	56.00	20.70	25.30	46.00	Phase 1	10.18
0.888	3	26.26	29.74	56.00	13.18	32.82	46.00	Phase 1	10.20
1.1985	3	28.30	27.70	56.00	18.66	27.34	46.00	Phase 1	10.24
1.515	4	32.85	23.15	56.00	23.18	22.82	46.00	Phase 1	10.27
1.524	4	32.93	23.07	56.00	23.61	22.39	46.00	Phase 1	10.28
1.8705	4	31.36	24.64	56.00	22.05	23.95	46.00	Phase 1	10.28
1.929	4	32.15	23.85	56.00	22.58	23.42	46.00	Phase 1	10.28
2.4135	5	29.58	26.42	56.00	19.77	26.23	46.00	Phase 1	10.33
2.4315	5	28.75	27.25	56.00	19.53	26.47	46.00	Phase 1	10.33
4.227	5	29.47	26.53	56.00	21.52	24.48	46.00	Phase 1	10.44
4.272	5	29.97	26.03	56.00	21.62	24.38	46.00	Phase 1	10.45
5.7405	6	30.00	30.00	60.00	23.62	26.38	50.00	Phase 1	10.55
5.961	6	31.19	28.81	60.00	24.19	25.81	50.00	Phase 1	10.56
8.1255	6	31.48	28.52	60.00	24.25	25.75	50.00	Phase 1	10.70
9.2865	6	22.94	37.06	60.00	16.51	33.49	50.00	Phase 1	10.76
13.452	7	34.29	25.71	60.00	27.57	22.43	50.00	Phase 1	11.09
13.5375	7	34.47	25.53	60.00	27.98	22.02	50.00	Phase 1	11.10
14.1135	7	37.52	22.48	60.00	30.13	19.87	50.00	Phase 1	11.15
14.982	7	36.45	23.55	60.00	29.13	20.87	50.00	Phase 1	11.22
19.641	8	32.44	27.56	60.00	26.33	23.67	50.00	Phase 1	11.49
23.997	8	26.59	33.41	60.00	20.66	29.34	50.00	Phase 1	11.60
24.078	8	26.58	33.42	60.00	20.45	29.55	50.00	Phase 1	11.60
24.3255	8	26.12	33.88	60.00	20.05	29.95	50.00	Phase 1	11.60
0.15	9	46.76	19.24	66.00	32.69	23.31	56.00	Neutral	10.09
0.2175	9	33.56	29.36	62.91	20.31	32.60	52.91	Neutral	10.11
0.2265	9	32.09	30.49	62.58	20.86	31.72	52.58	Neutral	10.12
0.3045	10	30.98	29.14	60.12	17.72	32.40	50.12	Neutral	10.14
0.354	10	28.63	30.23	58.87	19.89	28.98	48.87	Neutral	10.15
0.48	10	36.82	19.52	56.34	23.81	22.53	46.34	Neutral	10.16
0.5475	10	38.56	17.44	56.00	29.25	16.75	46.00	Neutral	10.17
0.618	11	29.33	26.67	56.00	18.58	27.42	46.00	Neutral	10.18
0.7215	11	31.23	24.77	56.00	19.26	26.74	46.00	Neutral	10.20
0.879	11	27.23	28.77	56.00	16.86	29.14	46.00	Neutral	10.20
1.1895	11	27.73	28.27	56.00	20.28	25.72	46.00	Neutral	10.24
1.434	12	29.65	26.35	56.00	23.35	22.65	46.00	Neutral	10.27
1.515	12	30.52	25.48	56.00	23.15	22.85	46.00	Neutral	10.27
1.7535	12	29.78	26.22	56.00	22.45	23.55	46.00	Neutral	10.29
1.7715	12	29.98	26.02	56.00	22.91	23.09	46.00	Neutral	10.29
2.4135	13	26.94	29.06	56.00	18.67	27.33	46.00	Neutral	10.33
3.867	13	26.06	29.94	56.00	18.82	27.18	46.00	Neutral	10.42
4.0965	13	26.47	29.53	56.00	18.60	27.40	46.00	Neutral	10.45
5.9925	14	28.57	31.43	60.00	20.72	29.28	50.00	Neutral	10.60
6.1185	14	28.57	31.43	60.00	20.25	29.75	50.00	Neutral	10.61
8.4315	14	27.60	32.40	60.00	17.87	32.13	50.00	Neutral	10.78
13.5375	15	33.02	26.98	60.00	26.65	23.35	50.00	Neutral	11.24
13.5645	15	33.48	26.52	60.00	26.88	23.12	50.00	Neutral	11.24
14.46	15	35.86	24.14	60.00	28.74	21.26	50.00	Neutral	11.32
14.6445	15	35.41	24.59	60.00	28.40	21.60	50.00	Neutral	11.34
19.839	16	31.64	28.36	60.00	26.43	23.57	50.00	Neutral	11.72
23.997	16	25.10	34.90	60.00	19.93	30.07	50.00	Neutral	11.91
24.0555	16	25.24	34.76	60.00	19.76	30.24	50.00	Neutral	11.91
24.33	16	24.81	35.19	60.00	19.38	30.62	50.00	Neutral	11.92

5.2 Radiated emission < 1 GHz (electric field)

For test instruments and accessories used see section 7 Part **A 5**.
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)

5.2.1 Description of the test location

Test location: OATS 1

Test distance: 3 metres

5.2.2 Photo documentation of the test setup

5.2.3 Test result

Frequency range: 30 MHz - 1000 MHz

Min. limit margin by >10 dB

The requirements are **FULFILLED.**

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

For description of the measurement see 4.6.4.

5.2.4 Test protocol

Operation mode: Receive / standby mode Result: passed
Remarks: -
Date: 29. June 2017
Tested by: Josef Knab

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)
30.00	5.0	-	120	12.5	17.5	-	40.0	-22.5
200.00	-2.1	-	120	12.0	9.9	-	43.5	-33.6
400.00	-3.4	-	120	19.8	16.4	-	46.0	-29.6
600.00	-3.0	-	120	25.5	22.5	-	46.0	-23.5
800.00	-1.7	-	120	29.5	27.8	-	46.0	-18.2
1000.00	-2.2	-	120	32.4	30.2	-	54.0	-23.8

Note: In the frequency range from 30 MHz to 1000 MHz, no spurious emission could be measured. The frequencys and levels above, shown the noise floor.

5.3 Radiated emission > 1 GHz (electric field)

For test instruments and accessories used see section 7 Part **SER 3**.

5.3.1 Description of the test location

Test location: Anechoic chamber 1

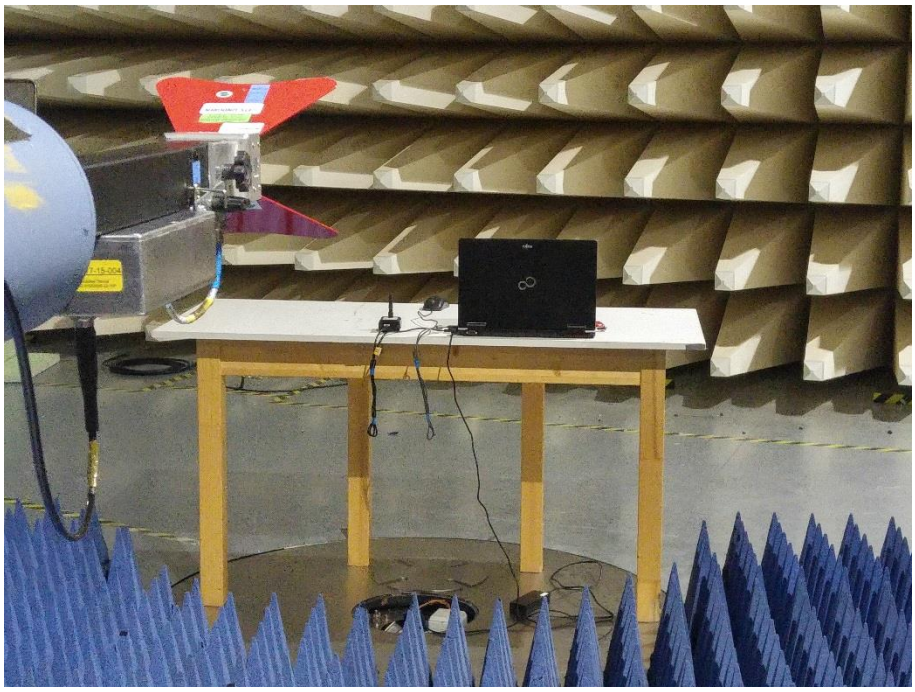
Test distance: 3 metres

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

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

Frequenz GHz	Θ 3dB 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

5.3.2 Photo documentation of the test setup



5.3.3 Test result

Frequency range: 1 GHz - 12 GHz

Min. limit margin 2.2 dB @ 2132.50 MHz

The requirements are **FULFILLED.**

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

For description of the measurement see 4.6.5.

All measurements are performed with a peak detector and fulfill the average limits, therefore no additional measurements where done with an average detector.

5.3.4 Test protocol

Operation mode: Receive / standby mode Result: passed
Remarks: -
Date: 27. June 2017
Tested by: Josef Knab

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)
1063.80	63.4	-	1000	-21.1	42.3	-	54.0	-11.7
1309.00	58.6	-	1000	-19.4	39.2	-	54.0	-14.8
1551.63	64.9	-	1000	-20.7	44.2	-	54.0	-9.8
1596.63	67.2	-	1000	-20.9	46.3	-	54.0	-7.7
1675.75	65.0	-	1000	-20.0	45.0	-	54.0	-9.0
2132.50	67.8	-	1000	-16.0	51.8	-	54.0	-2.2
2398.38	58.5	-	1000	-14.6	43.9	-	54.0	-10.1
2776.00	55.2	-	1000	-13.3	41.9	-	54.0	-12.1
3631.75	53.7	-	1000	-13.0	40.7	-	54.0	-13.3
4979.00	42.5	-	1000	5.1	47.6	-	54.0	-6.4

6 USED TEST EQUIPMENT AND ACCESSORIES

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

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	02-02/03-15-001	31/05/2018	31/05/2017		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	18/01/2018	18/07/2017
	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	18/11/2019	18/11/2016	21/10/2017	21/04/2017
A 5	ESVS 30	02-02/03-05-006	03/07/2018	03/07/2017		
	VULB 9168	02-02/24-05-005	12/04/2018	12/04/2017	12/10/2017	12/04/2017
	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 40	02-02/11-11-001	13/10/2017	13/10/2016		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	10/05/2018	10/05/2017		
	SF104/11N/11N/300MM	02-02/50-13-008				
	Ultimate 1000W	02-02/50-16-004				
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	Bandpass Filter	02-02/50-17-019				

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