EMI – TEST REPORT

- FCC Part 90.217 -

Deutsche Akkreditierungsstelle D-PL-12030-01-01

Test Report No. :	**T35704-00-03KJ**	30 October 2012 Date of issue

Type / Model Name : LOG RB-3-1-M

Product Description : Wireless reader for loggers

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**

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC 47 CFR Part 2: 2011	Frequency allocations and radio treaty matters; General rules and regulations
FCC 47 CFR Part 15: 2011	Radio frequency devices
FCC 47 CFR Part 90: 2011	Private land mobile radio services
ANSI/TIA-603-C: 2004	Land Mobile FM or PM-Communications Equipment - Measurement and Performance Standards
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
KDB 412172 D01: 2010	Determining ERP and EIRP

1.1 Test result summary

Wireless repeater using digital modulation:

Operating in the frequency band from 902 MHz to 928 MHz:

Description	FCC Rule Part	Test Procedure	Result
AC power line conducted emissions	15.107(a)	ANSI C63.4:2003	passed
Maximum output power	90.217	ANSI/TIA-603-C-2004	passed
Spurious emissions radiated	90.217(a)	ANSI/TIA-603-C-2004	passed
Modulation characteristics	90.217(a)	ANSI/TIA-603-C-2004	passed
Occupied bandwith	General	ANSI/TIA-603-C-2004	passed
Frequency stability	90.213(a)(b)	ANSI/TIA-603-C-2004	passed
Receiver spurious emissions	15.109	ANSI C63.4:2003	passed

2 General remarks

Items	Description
Power supply - internal - external	7.2 V DC (Li-ion rechargeable battery) 110-240 V AC; 50-60 HZ; 700 mA; 12 V DC
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	External antenna (lambda ¼) Magnetic socket lambda antenna
Antenna connector	F
Antenna gain	2.1 dBi Dipole antenna (lambda ¼ antenna) or 7.1 dBi Magnetic socket antenna (lambda antenna)
Lowest internal frequency	32.768 kHz
Highest internal frequency	18.432 MHz

2.1 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 : 30. November 2011

Testing concluded on : 05. June 2012

Checked by:

Klaus Gegenfurtner
I confirm the correctness and
Integrity of this documents
2012.10.30 14:22:57 +01'00'

Klaus Gegenfurtner
Dipl. Ing.(FH)
Manager: Radio Group

Tested by:

Josef Knab
I'm the autor of this
document
2012.10.30 11:23:04
+01'00'

Josef Knab
Radio Senior Expert

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Internal Power supply voltage : 7.2 V DC (Li-ion rechargeable battery)

AC/DC Adapter supply voltage : V_{nom}= 12.0 V
V_{min}= 10.2 V
V_{max}= 13.8 V

Max. current: TX mode 96 mA
RX mode 27 mA

3.2 Short description of the equipment under test (EUT)

The Reader is a portable device which is used to communicate with the other devices of the Sebalog N3 system. The Reader can be used as RF interface for a computer or as a standalone device to read out the measured data of a Logger.
The communication is done at a frequency of 913 MHz. The Reader has an external TNC socket to connect two different antennas. One for normal use in handheld mode and one for vehicle mount.

Number of tested samples: 1
Serial number: 1000041983

EUT operation mode:

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

- cont. TX at 913.02 MHz (unmodulated)

- cont. TX at 913.02 MHz (modulated)

- cont. RX mode

EUT configuration:

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

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

- _____ Model : _____
- _____ Model : _____
- _____ Model : _____

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
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. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „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, mikes-testingpartners 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 ANSI/TIA 603-C 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 without termination. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

5 TEST CONDITIONS AND RESULTS

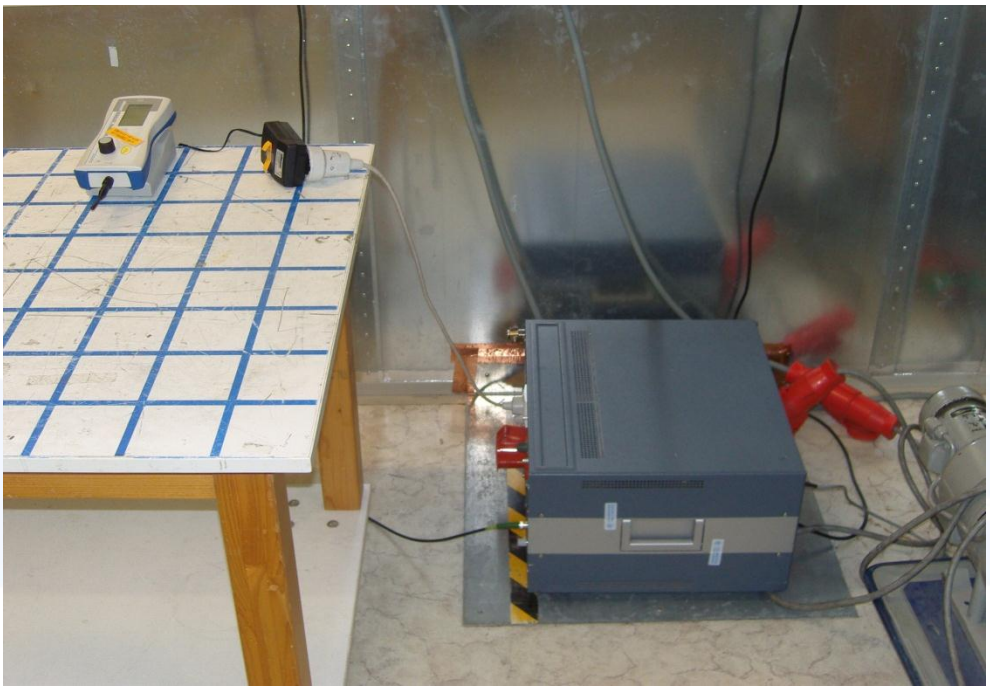
5.1 Conducted emissions

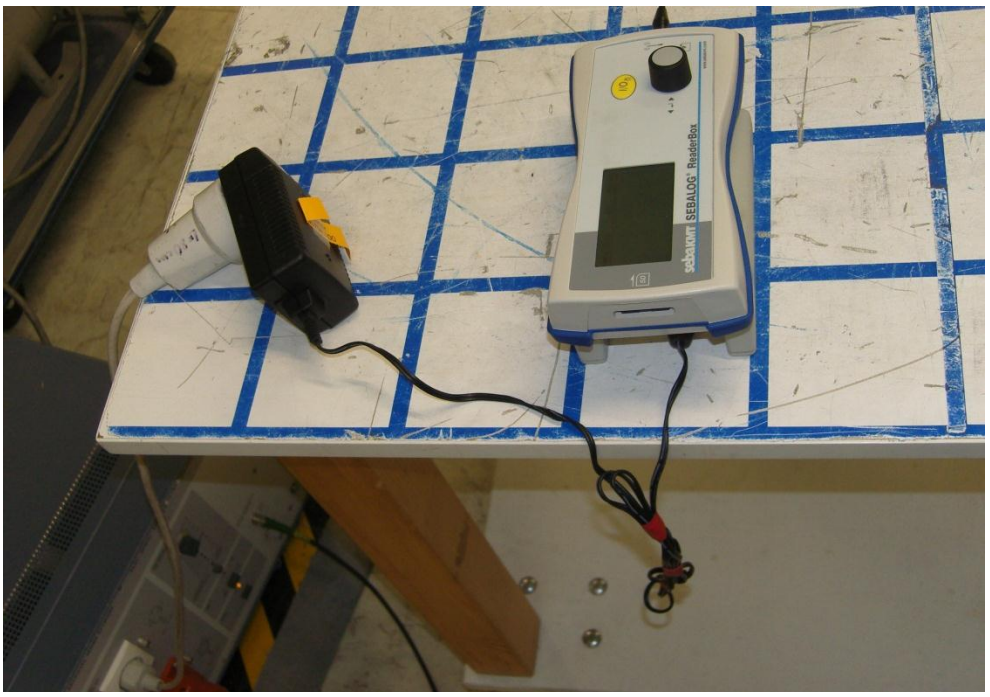
For test instruments and accessories used see section 6 Part **A 4**.

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 Description of Measurement

Conducted emission 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. 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 of a peak mode measurement appears to be less than 20 dB, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

The final level in dBµV 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 = 10^(dBµV/20)

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin > 10 dB

Limit according to FCC Part 15, Section 15.107(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.**

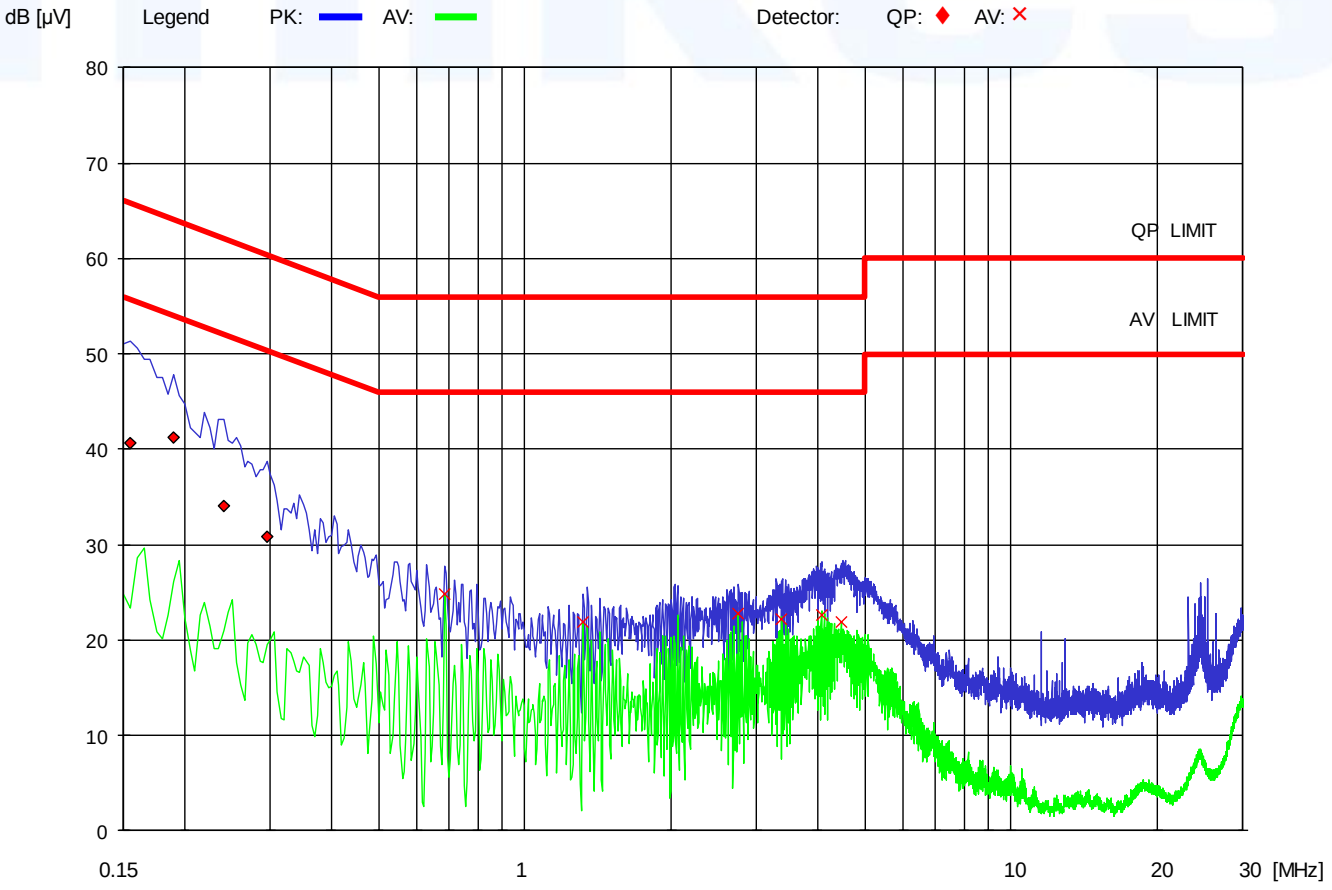
Remarks: For detailed test result please refer to following test protocols.

5.1.7 Test protocol

Test point L1 Result: passed
Operation mode: cont. TX at 913.02 MHz (unmodulated)
Remarks: -

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
155	40,7	-25,0	685	24,9	-21,1
190	41,3	-22,7	1320	21,9	-24,1
240	34,1	-28,0	2750	22,8	-23,2
295	30,9	-29,5	3380	22,2	-23,8
			4070	22,7	-23,3
			4465	21,9	-24,1

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]



FCC: OV8-LOGRB3-1

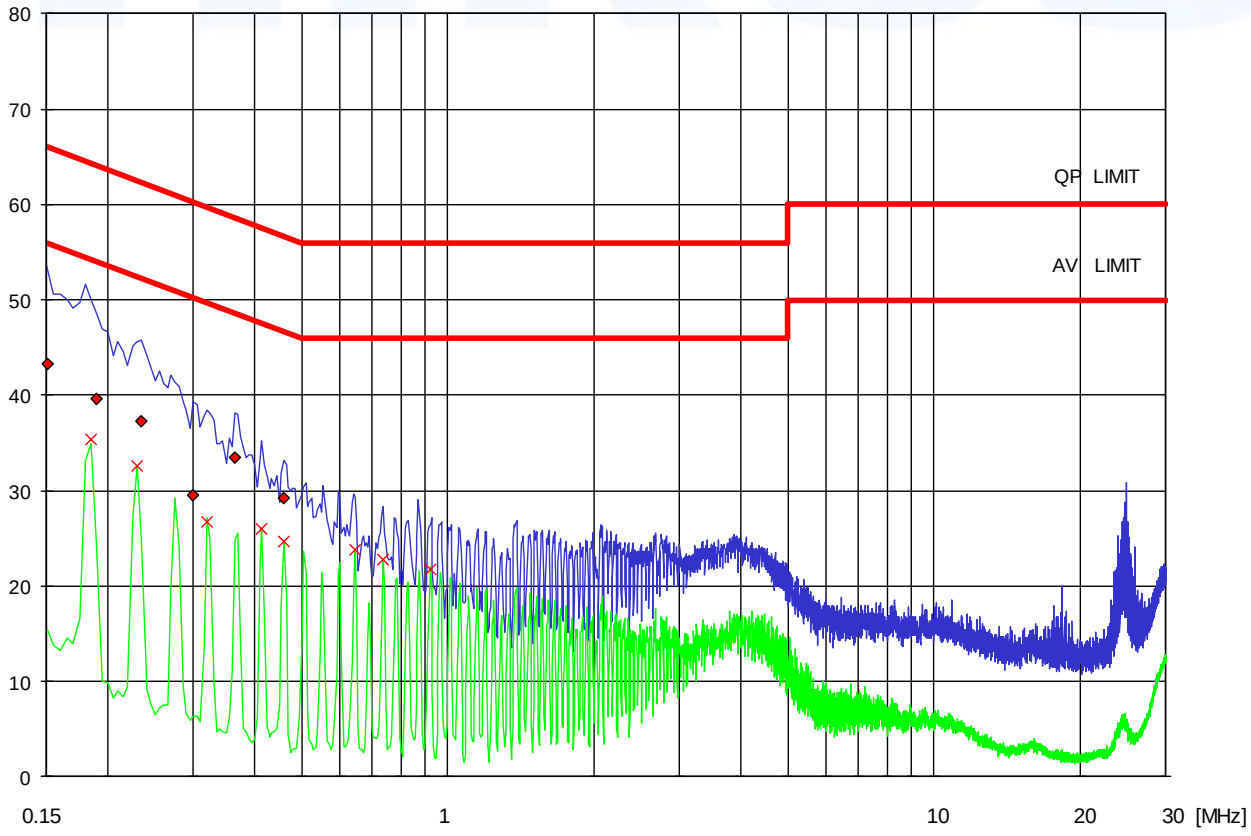
Test point: N
Operation mode: cont. TX at 913.02 MHz (unmodulated)
Remarks: -

Result: passed

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
150	43,3	-22,7	185	35,4	-18,9
190	39,7	-24,3	230	32,6	-19,8
235	37,3	-25,0	320	26,8	-22,9
300	29,6	-30,6	415	26	-21,5
365	33,5	-25,1	460	24,7	-22,0
460	29,2	-27,5	645	23,8	-22,2
			735	22,8	-23,2
			920	21,8	-24,2

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]

dB [µV] Legend PK: AV: Detector: QP: AV:



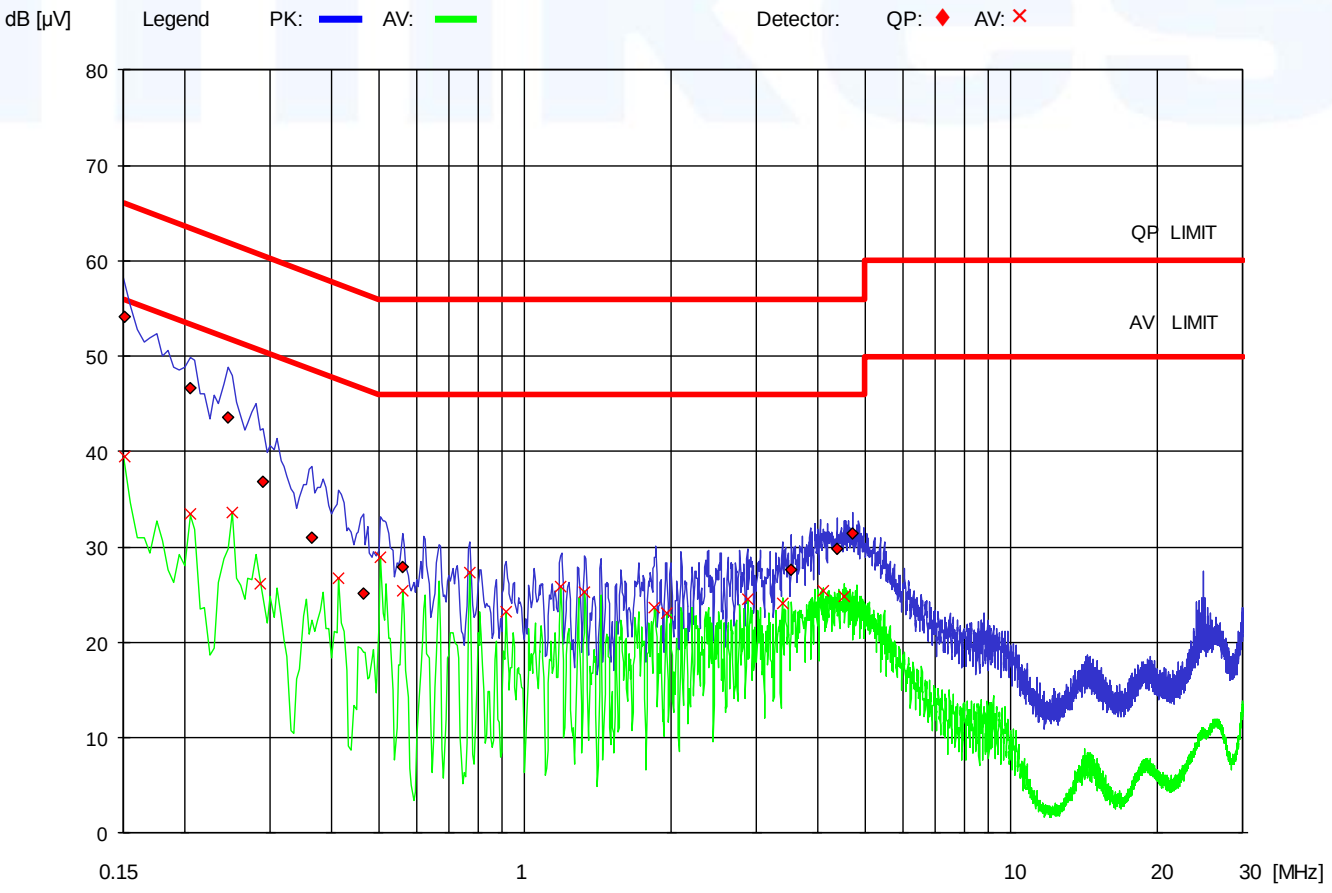
FCC: OV8-LOGRB3-1

Test point: L1
Operation mode: cont. RX mode
Remarks: -

Result: passed

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
150	54,2	-11,8	150	39,5	-16,5
205	46,6	-16,8	205	33,5	-19,9
245	43,6	-18,3	250	33,7	-18,1
290	36,8	-23,7	285	26,2	-24,5
365	31	-27,6	415	26,8	-20,7
465	25,2	-31,4	505	29	-17,0
560	27,9	-28,1	560	25,5	-20,5
3530	27,6	-28,4	770	27,4	-18,6
4390	29,8	-26,2	915	23,2	-22,8
4715	31,5	-24,5	1185	25,9	-20,1
			1330	25,3	-20,7
			1850	23,6	-22,4
			1955	23,1	-22,9
			2875	24,5	-21,5
			3385	24,1	-21,9

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
			4115	25,5	-20,5
			4535	24,9	-21,1



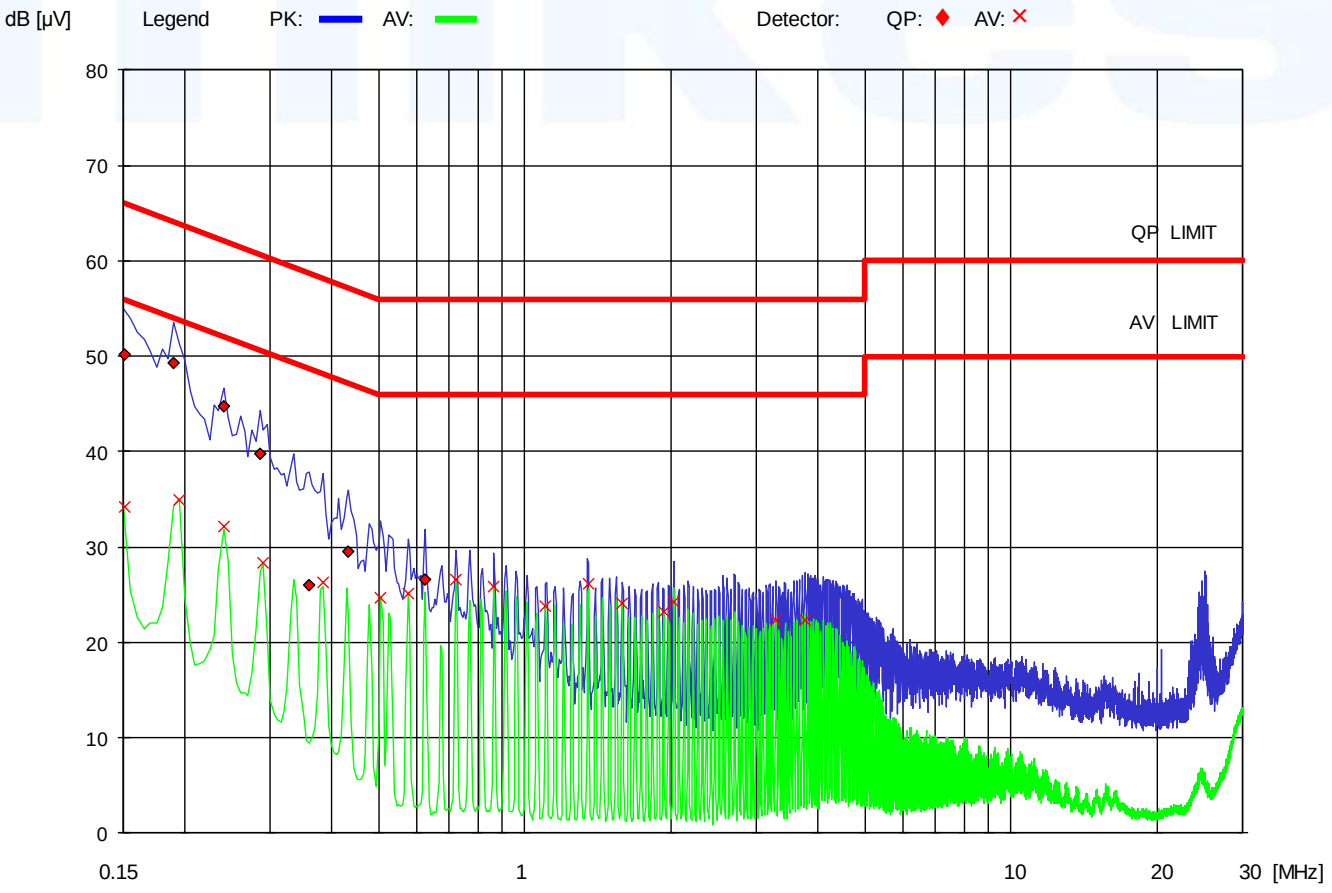
FCC: OV8-LOGRB3-1

Test point: N
Operation mode: cont. RX mode
Remarks: -

Result: passed

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
150	50,2	-15,8	150	34,2	-21,8
190	49,3	-14,7	195	35	-18,8
240	44,7	-17,4	240	32,1	-20,0
285	39,8	-20,9	290	28,3	-22,2
360	26	-32,7	385	26,3	-21,9
435	29,6	-27,6	505	24,7	-21,3
625	26,6	-29,4	575	25,2	-20,8
			720	26,6	-19,4
			865	25,8	-20,2
			1105	23,8	-22,2
			1350	26,2	-19,8
			1590	24,1	-21,9
			1930	23,3	-22,7
			2025	24,3	-21,7
			3285	22,4	-23,6

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[µV]	QP [dB]	kHz	dB[µV]	AV [dB]
			3770	22,4	-23,6



5.2 Maximum output power radiated

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

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

Dipole antenna

Magnetic socket antenna

Dipole antenna

Magnetic socket antenna

5.2.3 Applicable standard

According to FCC Part 90.217:
Except as noted herein, transmitters used at stations licensed below 800 MHz on any frequency listed in subparts B and C of this part or licensed on a business category channel above 800 MHz which have an output power not exceeding 120 mW are exempt from the technical requirements set out in this subpart, but must instead comply with the following:
(a) For equipment designed to operate with a 25 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 40 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

5.2.4 Description of Measurement

The maximum output power 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 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 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 and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.
The final level in dBm is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The substitution antenna is used to replace the EUT for test the effective radiated. For measurements in the frequency band 30 MHz to 1 000 MHz, the substitution antenna is a ½ wave dipole antenna. The centre of this antenna should coincide with either the phase centre or volume centre. A signal generator is connected to the dipole and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain.

The radiated power of the fundamental emission from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.17.

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

5.2.5 Test result

Dipole antenna

Frequency (MHz)	Level PK (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
913.02	75.4	120	-62.0	13.4	20.8	7.4

Magnetic socket antenna

Frequency (MHz)	Level PK (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
913.02	69.8	120	-61.1	8.7	20.8	12.1

Power limit according to FCC Part 90.217:

Frequency	Radiated power limit	
(MHz)	(dBm)	(mW)
>800	20.8	120

The requirements are **FULFILLED.**

Remarks: _____

5.3 Spurious emissions radiated (electric field)

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

5.3.1 Description of the test location

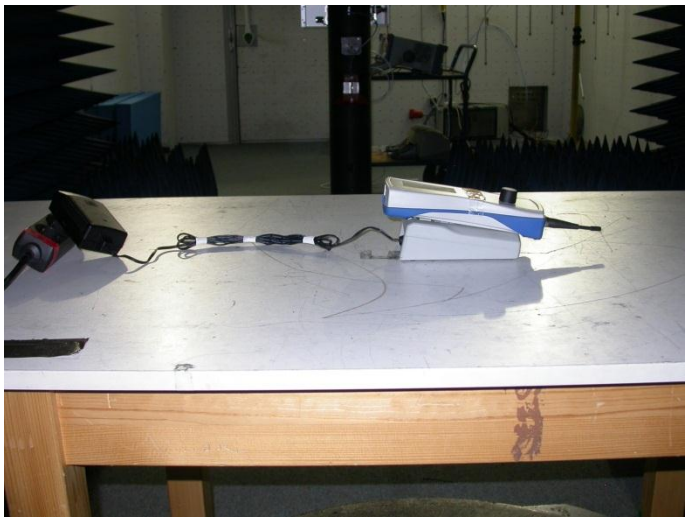
Test location: OATS 1
Test distance: 10 m

Test location: Anechoic chamber 2
Test distance: 3 m

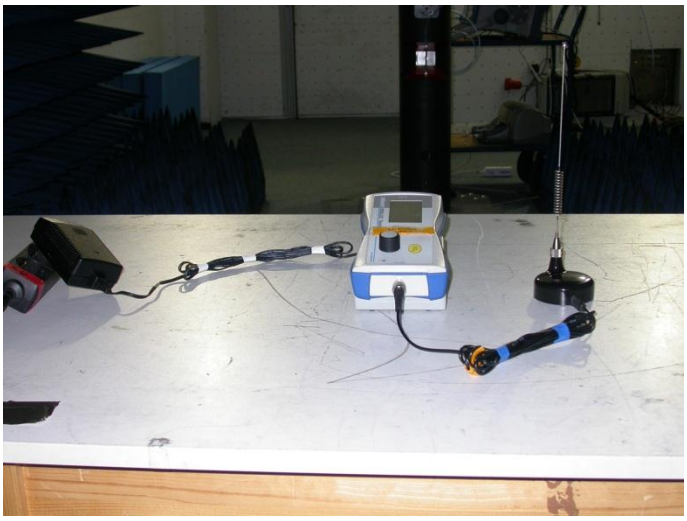
5.3.2 Photo documentation of the test set-up

Dipole antenna

Magnetic socket antenna



Dipole antenna



Magnetic socket antenna

5.3.3 Applicable standard

According to FCC Part 90.217(a):
(a) For equipment designed to operate with a 25 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 40 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

5.3.4 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 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 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 and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.
The final level in dBm is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

Spurious emission from the EUT are measured in the frequency range 1 GHz up to 12.75 GHz, 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 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 emissions under better uncertainty and are calculated at the specified test distance.

The final level in dBm is calculated by taking the reading from the spectrum analyser (Level dBm) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The substitution antenna is used to replace the EUT for test the effective radiated power and spurious emissions. For measurements in the frequency band 30 MHz to 1 000 MHz, the substitution antenna is a ½ wave dipole antenna. For measurements above 1000 MHz, a waveguide horn is taken. The centre of this antenna should coincide with either the phase centre or volume centre. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.12.

Instrument settings:

30 MHz – 1000 MHz:	RBW: 120 kHz
1000 MHz – 10000 MHz	RBW: 1 MHz

5.3.5 Test result

f < 1 GHz:

Dipole antenna

Frequency (MHz)	Level PK (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
30 - 1000	-	-	-	-	-16.6	>10

Magnetic socket antenna

Frequency (MHz)	Level PK (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
30 - 1000	-	-	-	-	-21.3	>10

f > 1 GHz:

Dipole antenna

Frequency (MHz)	Level PK (dBm)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
1826.13	-21.7	1000	-10.1	-31.8	-16.6	15.2
2739.25	-33.5	1000	-8.0	-41.5	-16.6	24.9
3652.38	-33.9	1000	-4.6	-38.5	-16.6	21.9
4564.75	-42.1	1000	7.2	-34.9	-16.6	18.3
5478.25	-41.1	1000	8.2	-32.9	-16.6	16.3
6390.63	-61.3	1000	10.0	-51.3	-16.6	34.7
7304.13	-55.1	1000	11.3	-43.8	-16.6	27.2
8217.63	-58.8	1000	15.0	-43.8	-16.6	27.2
9131.13	-58.2	1000	15.6	-42.6	-16.6	26.0
10043.50	-66.7	1000	15.0	-51.7	-16.6	35.1
10957.00	-61.6	1000	15.7	-45.9	-16.6	29.3
11869.38	-69.4	1000	16.9	-52.5	-16.6	35.9
12782.88	-64.1	1000	6.2	-57.9	-15.6	42.3

Magnetic socket antenna

Frequency (MHz)	Level PK (dBm)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
1826.13	-22.6	1000	-10.1	-32.7	-21.3	11.4
2739.25	-32.4	1000	-8.0	-40.4	-21.3	19.1
3652.38	-31.2	1000	-4.6	-35.8	-21.3	14.5
4564.75	-41.3	1000	7.2	-34.1	-21.3	12.8
5478.25	-38.8	1000	7.9	-30.9	-21.3	9.6
6390.63	-60.4	1000	10.6	-49.8	-21.3	28.5
7304.13	-52.9	1000	11.6	-41.3	-21.3	20.0
8217.63	-54.0	1000	15.1	-38.9	-21.3	17.6
9131.13	-58.9	1000	15.5	-43.4	-21.3	22.1
10043.50	-64.2	1000	15.1	-49.1	-21.3	27.8
10957.00	-63.3	1000	15.7	-47.6	-21.3	26.3
12782.88	-63.8	1000	6.9	-56.9	-21.3	35.6

FCC: OV8-LOGRB3-1

Spurious emission limit according to FCC Part 90.217:

Spurious emission limit (dBm)	
30 dB down	-16.6 Dipole antenna -21.3 Magnetic socket antenna

The requirements are **FULFILLED.**

Remarks: _____

_____

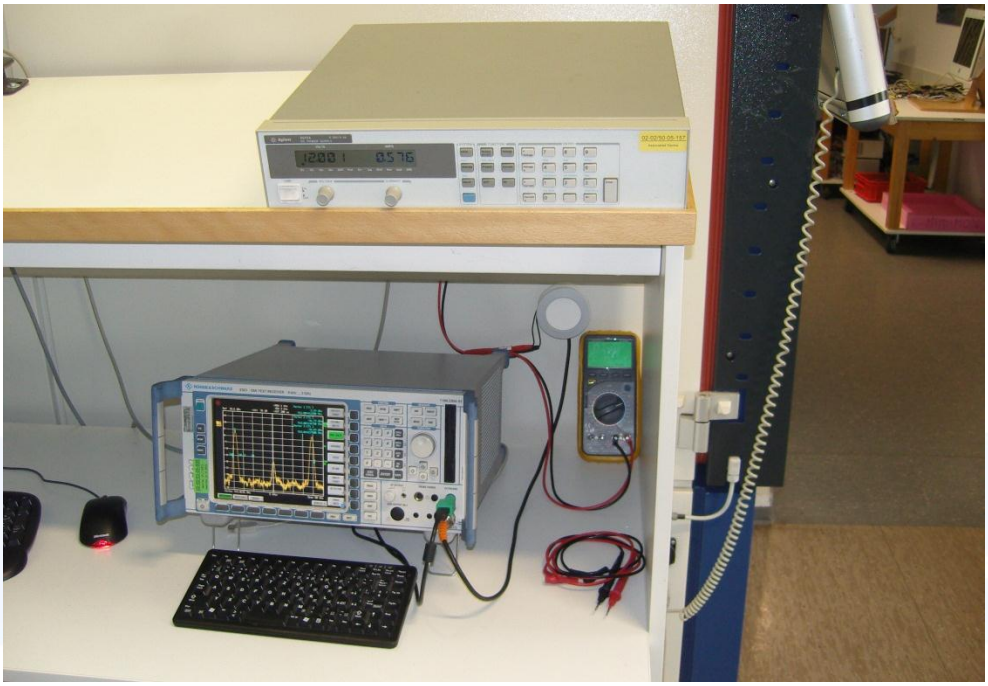
5.4 Modulation characteristics

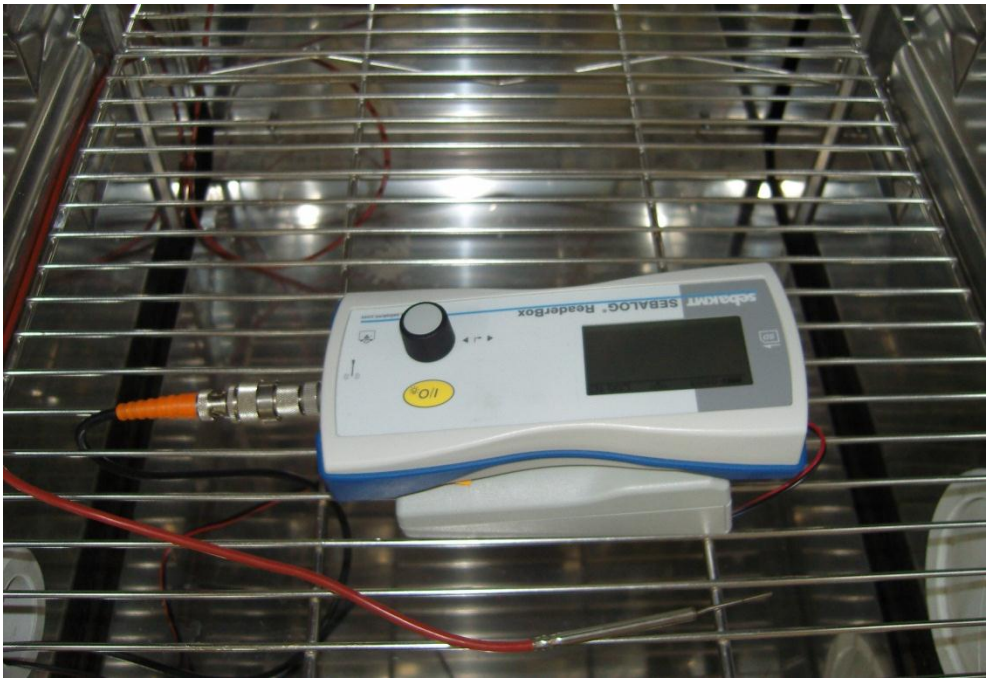
For test instruments and accessories used see section 6 Part **MB**.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up





5.4.3 Applicable standard

According to FCC Part 90.217(a):
(a) For equipment designed to operate with a 25 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 40 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

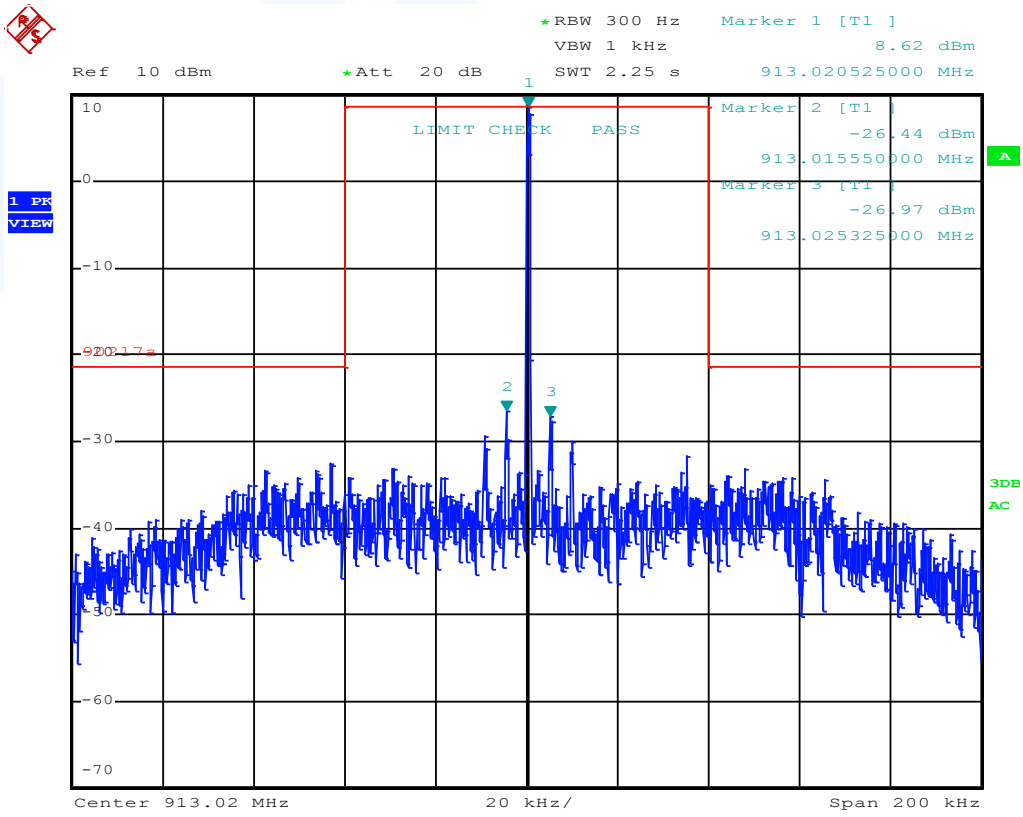
5.4.4 Description of Measurement

The measurement was performed conducted with intentional modulation on and off. The emission mask defined for 25 kHz channel bandwidth devices is shown on each plot. The 0 dB reference for the mask is the measured output power of the unmodulated carrier at that frequency.

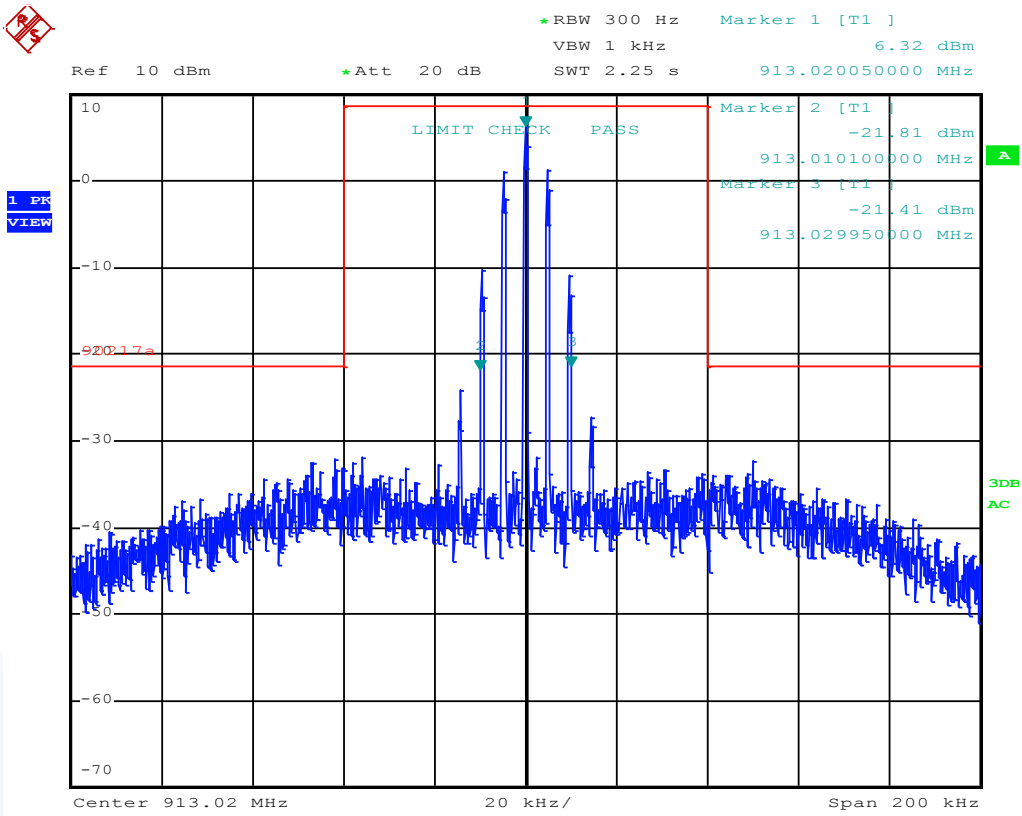
Spectrum analyser settings:
RBW: 300 Hz, VBW: 1 kHz, Detector: PK sampling detector, Sweep time: auto

5.4.5 Test result

Cont. TX without modulation



Cont. TX with modulation



Peak power limit according to FCC Part 90.217(a):

Limit	Lower envelope point minimum frequency	Upper envelope point maximum frequency
30 dB down	912.98 MHz ($f_{e,\ lower}$ - 40 kHz)	913.06 MHz ($f_{e,\ upper}$ + 40 kHz)

The requirements are **FULFILLED.**

Remarks: _____

_____

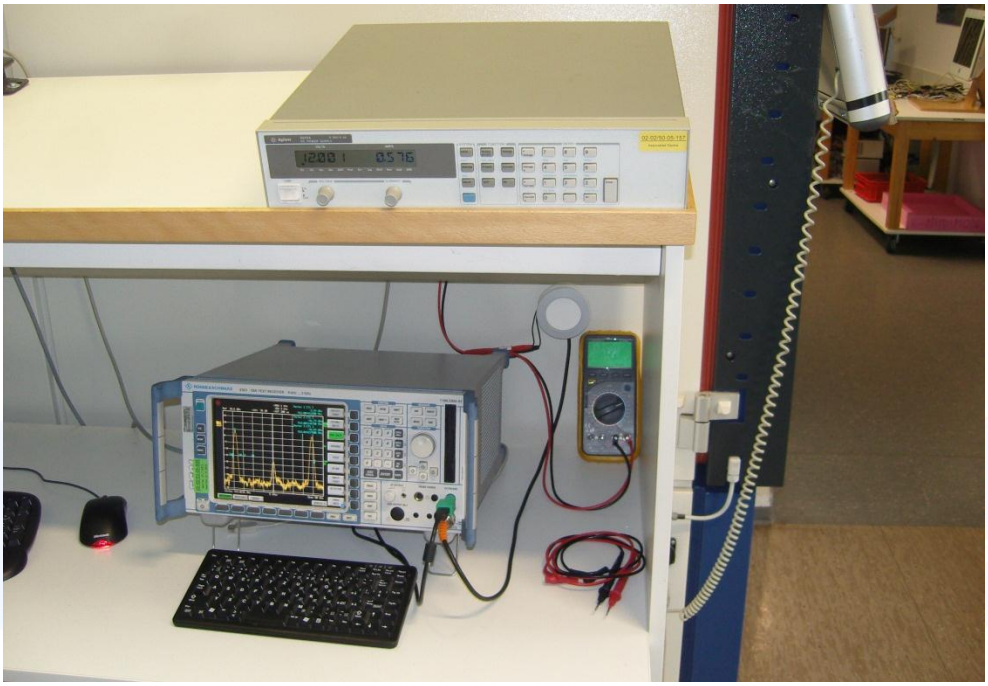
5.5 Occupied bandwidth

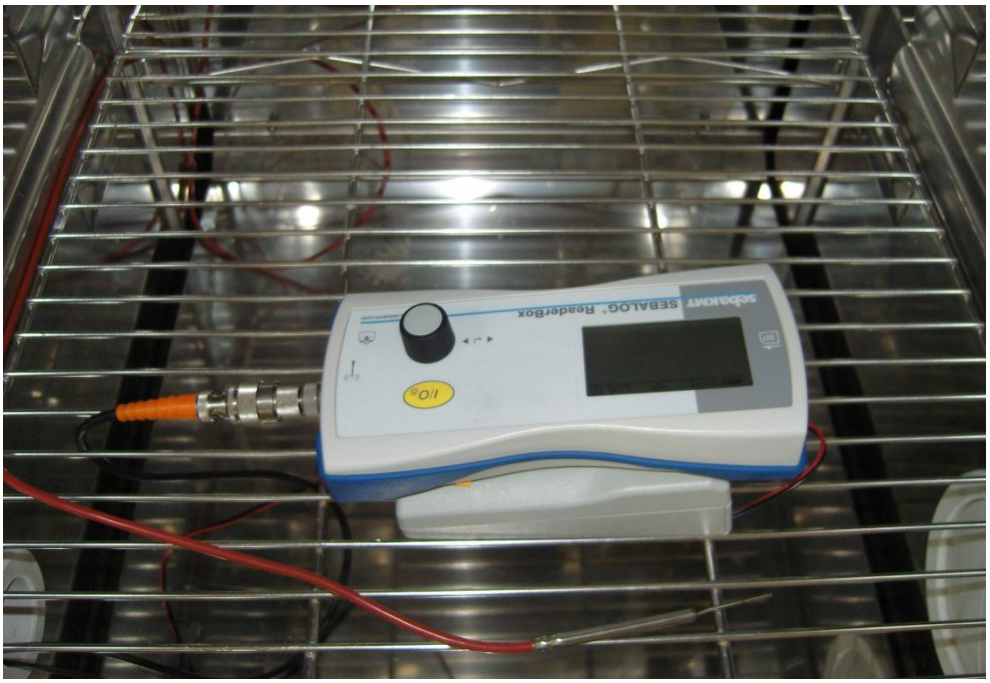
For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up





5.5.3 Applicable standard

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 per cent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:
Transmitters in which the modulating baseband comprises not more than three independent channels—when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

5.5.4 Description of Measurement

The bandwidth was measured conducted with the function “bandwidth measurement” of the spectrum analyser.

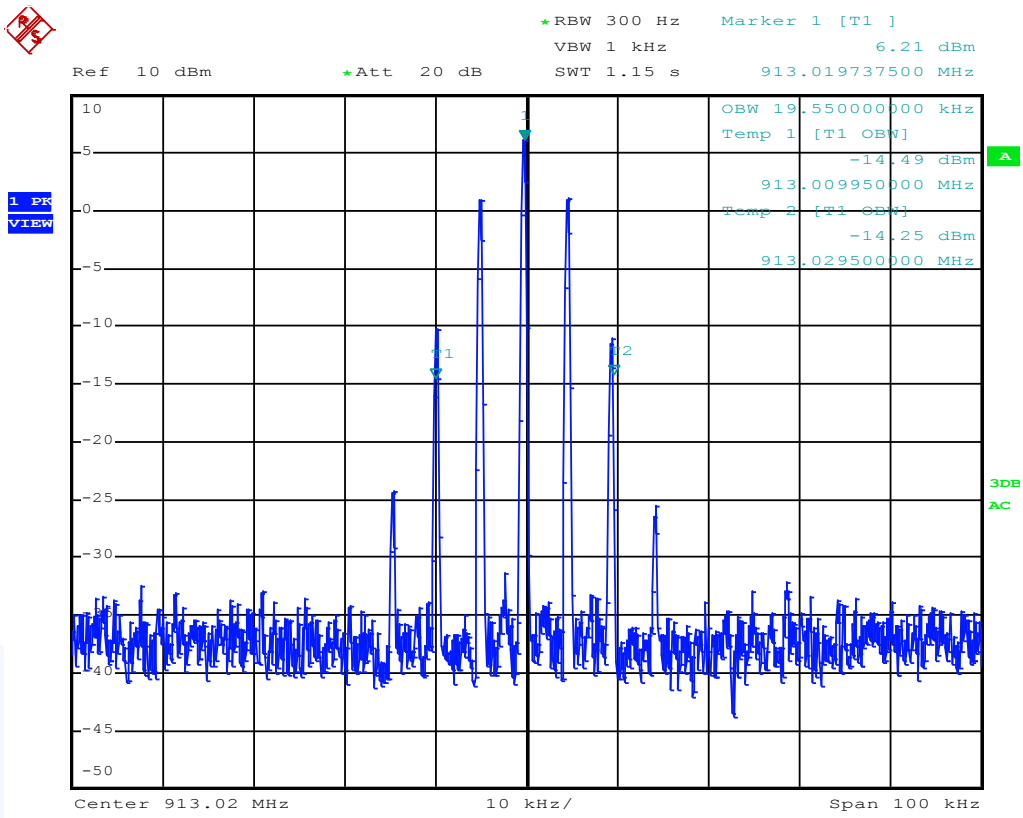
Spectrum analyser settings:
RBW: 300 Hz, VBW: 1 kHz, Detector: PK sampling detector, Sweep time: auto

5.5.5 Test result

Channel number	Fundamental frequency (MHz)	99 % Bandwidth (kHz)
1	913.02	19.55

5.5.6 Test protocol

99% Bandwidth measurement plots



The requirements are **FULFILLED.**

Remarks: _____

_____

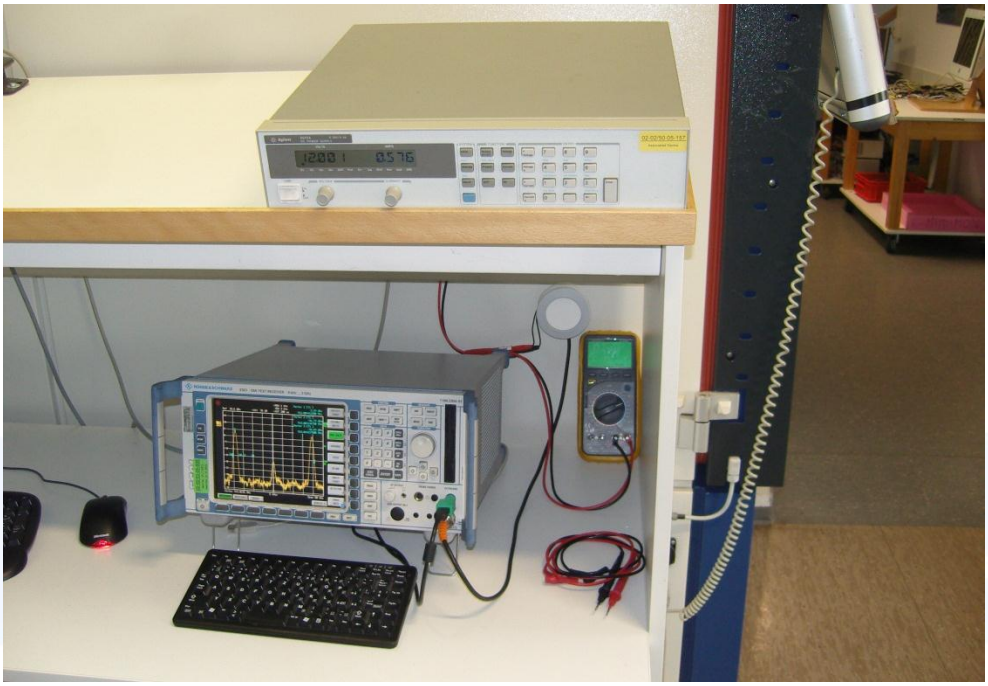
5.6 Frequency stability

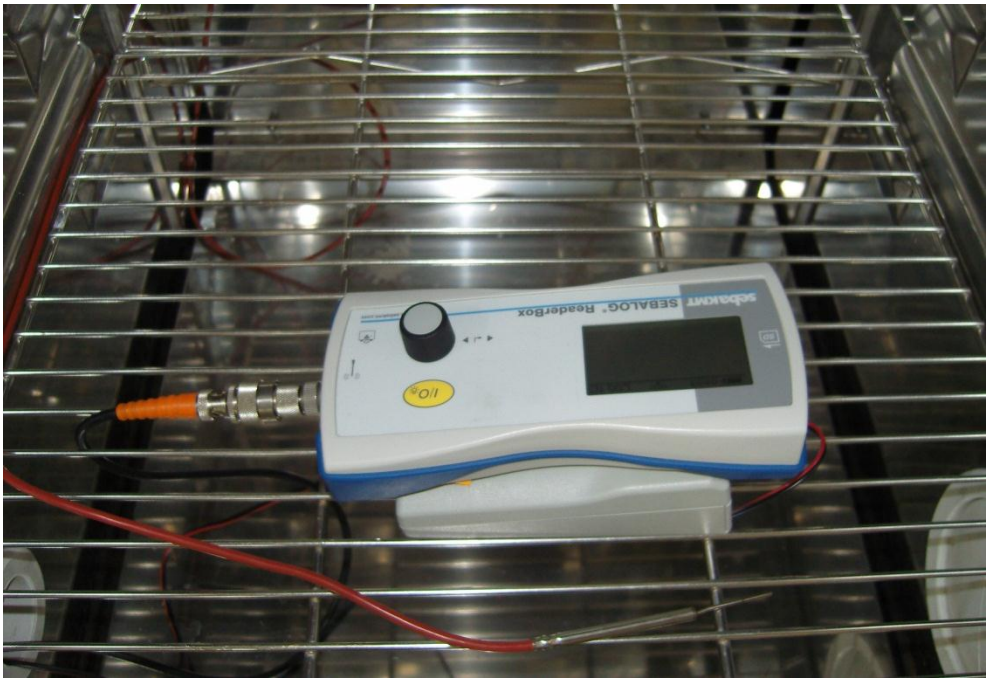
For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up





5.6.3 Applicable standard

According to FCC Part 90.217(a):
(a) For equipment designed to operate with a 25 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 40 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

5.6.4 Description of Measurement

This test has been performed over variations in temperature and voltage. The temperature stability was measured with the EUT in a climatic chamber and was powered DC voltage supplied externally. The frequency stability of the transmitter was examinedat the voltage extremes and for the temperature range of -30°C to +50°C. The carrier frequency was measured conducted with a spectrum analyser.

5.6.5 Test result

Test conditions		Test result	
		Frequency reading (MHz)	Frequency error (kHz)
T (50°C)	V_{min}	913.017443	-2.56
	V_{nom}	913.017446	-2.55
	V_{max}	913.017453	-2.55
T (40°C)	V_{min}	913.017768	-2.23
	V_{nom}	913.017768	-2.23
	V_{max}	913.017774	-2.23
T (30°C)	V_{min}	913.019165	-0.83
	V_{nom}	913.019115	-0.88
	V_{max}	913.019046	-0.95
T_{nom} (20°C)	V_{min}	913.020874	0.87
	V_{nom}	913.020824	0.82
	V_{max}	913.020712	0.71
T (10°C)	V_{min}	913.022837	2.84
	V_{nom}	913.022774	2.77
	V_{max}	913.022712	2.71
T (0°C)	V_{min}	913.024137	4.14
	V_{nom}	913.024159	4.16
	V_{max}	913.024171	4.17
T (-10°C)	V_{min}	913.025471	5.47
	V_{nom}	913.025481	5.48
	V_{max}	913.025493	5.49
T (-20°C)	V_{min}	913.025437	5.44
	V_{nom}	913.025431	5.43
	V_{max}	913.025443	5.44
T (-30°C)	V_{min}	913.023703	3.70
	V_{nom}	913.023674	3.67
	V_{max}	913.023668	3.67
Measurement uncertainty		± 3 dB	

Measured frequency 30 dB down nearest at the lower frequency (see page 22):

f_L + FE $_{min}$ = 913.0101 MHz + -2.6 kHz = **913.0174 MHz**

Measured frequency 30 dB down nearest at the higher frequency (see page 22):

f_H + FE $_{max}$ = 913.0300 MHz + 5.5 kHz = **913.0355 MHz**

Bandwidth limit according to FCC Part 90.217(a):

Limit	Lower envelope point minimum frequency	Upper envelope point maximum frequency
30 dB down	912.98 MHz ($f_{e, lower}$ - 40 kHz)	913.06 MHz ($f_{e, upper}$ + 40 kHz)

The requirements are **FULFILLED.**

Remarks: _____

_____

5.7 Receiver spurious emissions, radiated

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

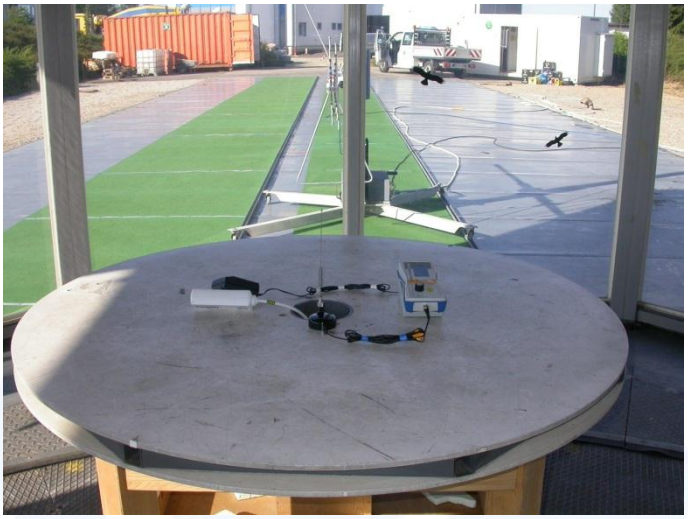
5.7.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

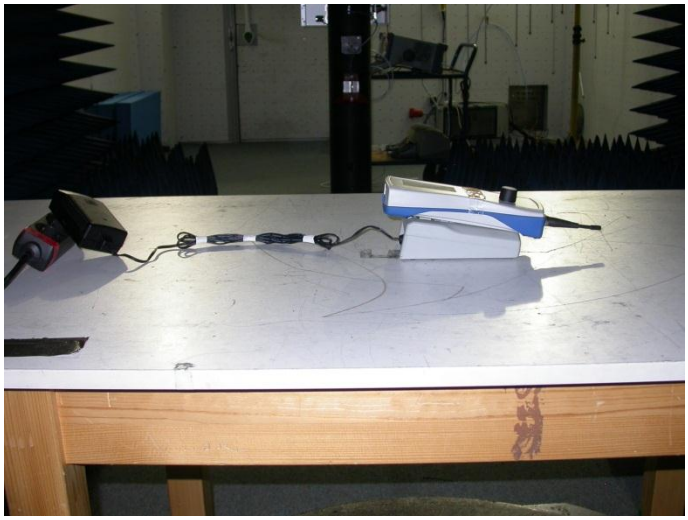
Test distance: 3 m

5.7.2 Photo documentation of the test set-up

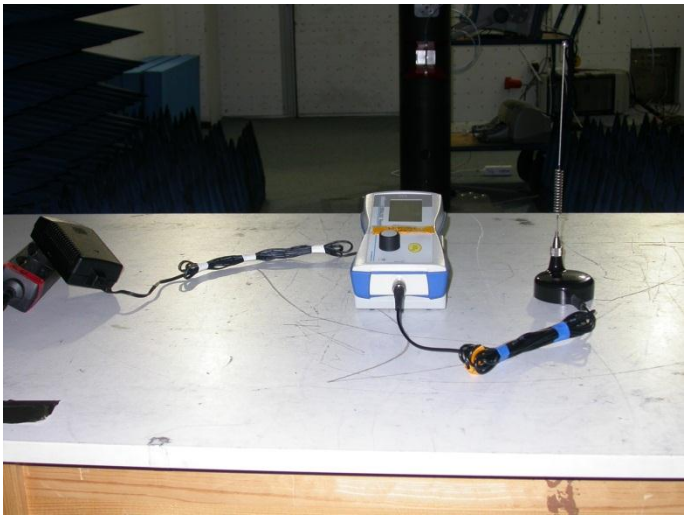
Dipole antenna



Magnetic socket antenna



Dipole antenna



Magnetic socket antenna

5.7.3 Applicable standard

According to ANSI/TIA-603-C Section 3.1.1 and FCC Part 15B, Section 15.109 (a) and:
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.

5.7.4 Description of Measurement

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

Spurious emission from the EUT are measured in the frequency range 1 GHz up to 12.75 GHz, 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 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 emissions under better uncertainty and are calculated at the specified test distance.

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

Instrument settings:

30 MHz – 1000 MHz:	RBW: 120 kHz
1000 MHz – 5000 MHz	RBW: 1 MHz

5.7.5 Test result

f < 1 GHz:

Dipole antenna / Magnetic 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)
30 - 1000	-		-	-	-	-	40.0	>10

f > 1 GHz:

Dipole antenna / Magnetic 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)
1000 - 5000	-		-	-	-	-	54.0	>10

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

Frequency (MHz)	Limit (µV/m)	Limit (dBµV/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED.**

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

6 USED TEST EQUIPMENT AND ACCESSORIES

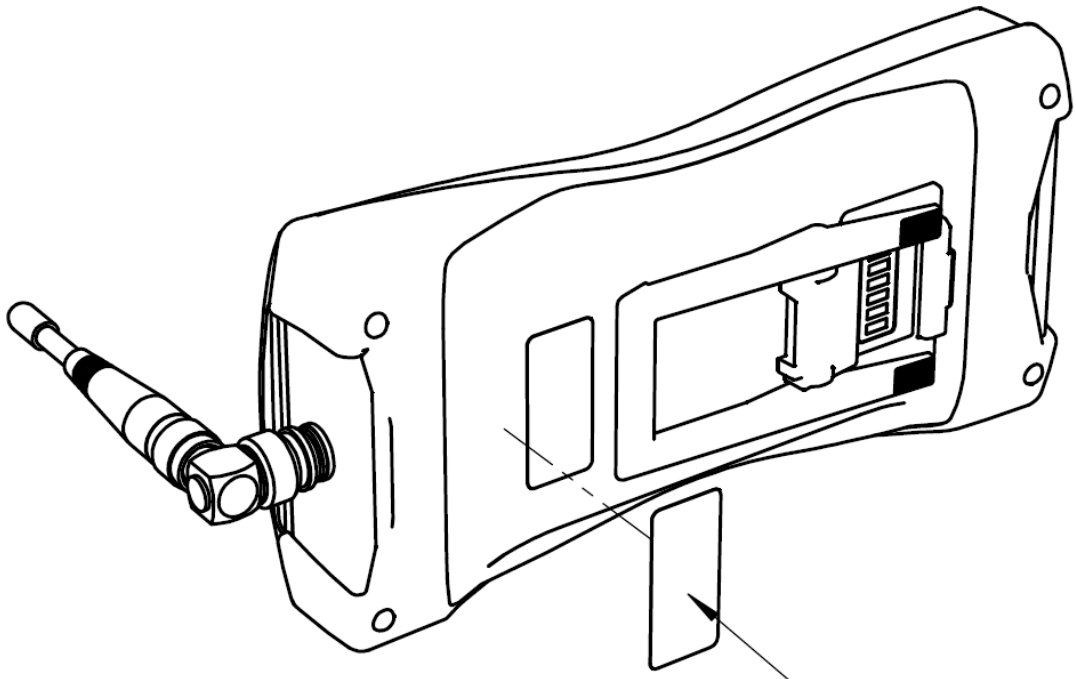
All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	11/07/2013	11/07/2012		
	ESH 2 - Z 5	02-02/20-05-004	12/05/2013	12/05/2012	12/03/2013	12/09/2012
	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			02/04/2013	02/10/2012
	SP 103 /3.5-60	02-02/50-05-182				
CPR 2	ESVS 30	02-02/03-05-006	26/06/2013	26/06/2012		
	VULB 9168	02-02/24-05-005	16/03/2013	16/03/2012	08/04/2013	08/10/2012
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N_20m	02-02/50-12-018				
MB	ESCI	02-02/03-05-005	21/11/2012	21/11/2011		
	RF Antenna	02-02/24-05-032				
	MetraHIT World	02-02/32-10-001	25/08/2012	25/08/2011		
	WK-340/40	02-02/45-05-001	31/05/2012	31/05/2011		
	6543A	02-02/50-05-157				
SER 2	ESVS 30	02-02/03-05-006	26/06/2013	26/06/2012		
	VULB 9168	02-02/24-05-005	16/03/2013	16/03/2012	08/04/2013	08/10/2012
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N_20m	02-02/50-12-018				
SER 3	FSP 30	02-02/11-05-001	05/10/2012	05/10/2011		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	16/02/2013	16/02/2012		
	WHJS 1000-10EE	02-02/50-05-070				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				

7 Photo documentation

7.1 External photos of the EUT

Label view / lable placement



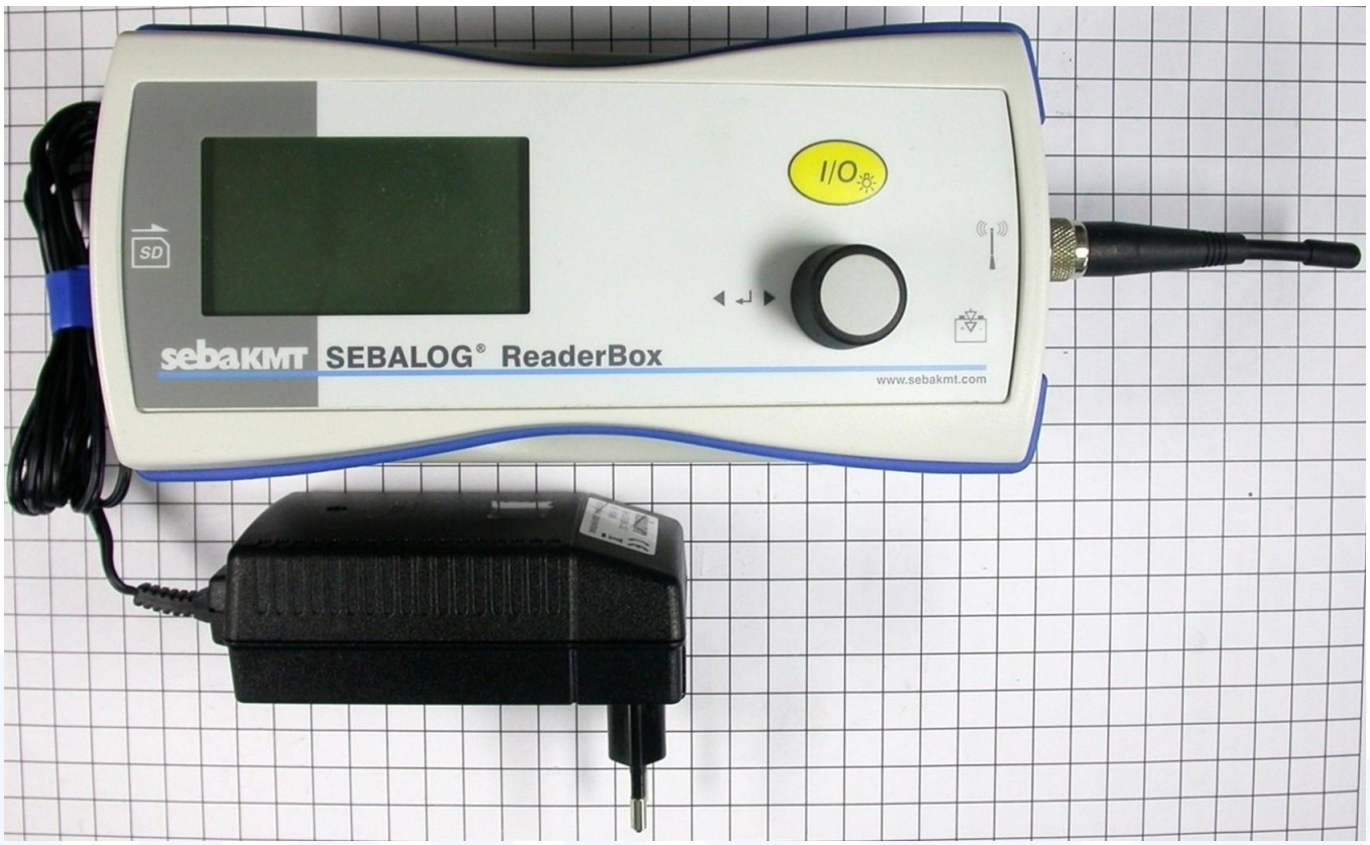
FCC IDENT LABEL OV8-LOGRB3-1
Druckdatei: LOG RB-FCC.lbl

FCC ID: OV8-LOGRB3-1

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC: OV8-LOGRB3-1

Test setup overview
(with AC/DC power supply, docking station and dipole antenna)

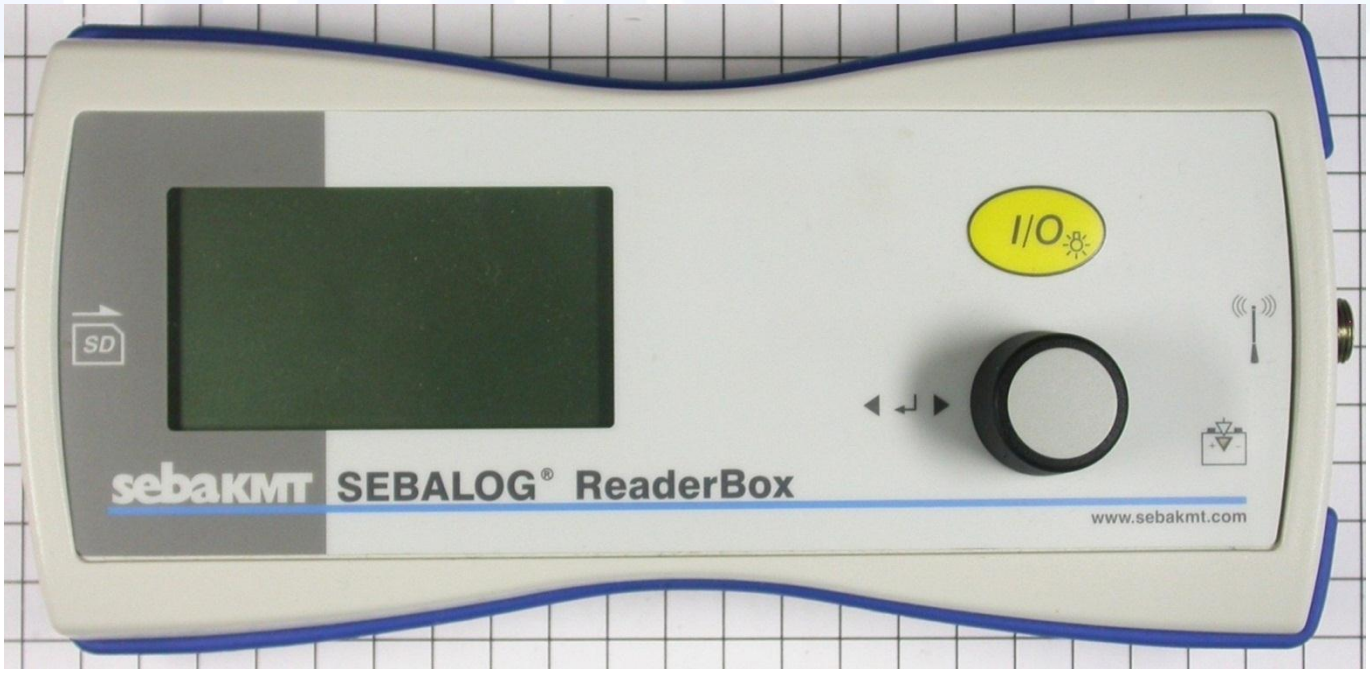


FCC: OV8-LOGRB3-1

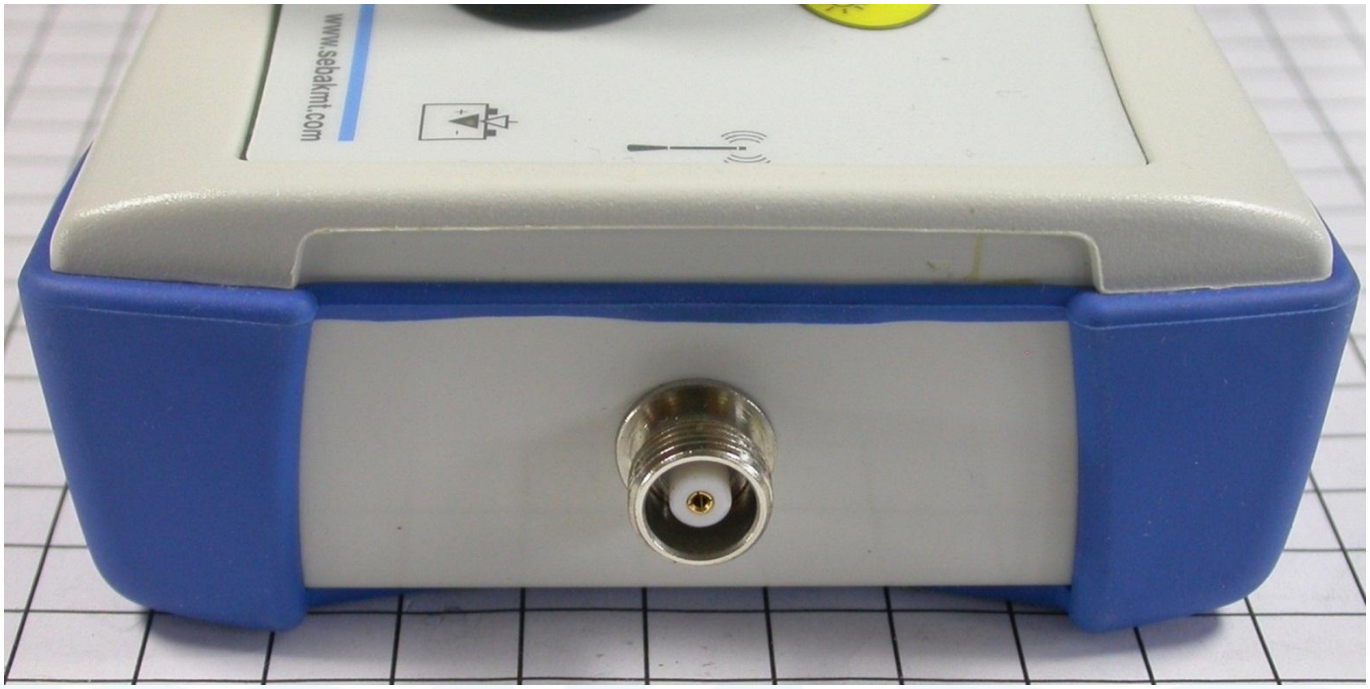
Test setup overview
(with AC/DC power supply, docking station and magnetic socket antenna)

Bottom view
(Label for European market)

Top view

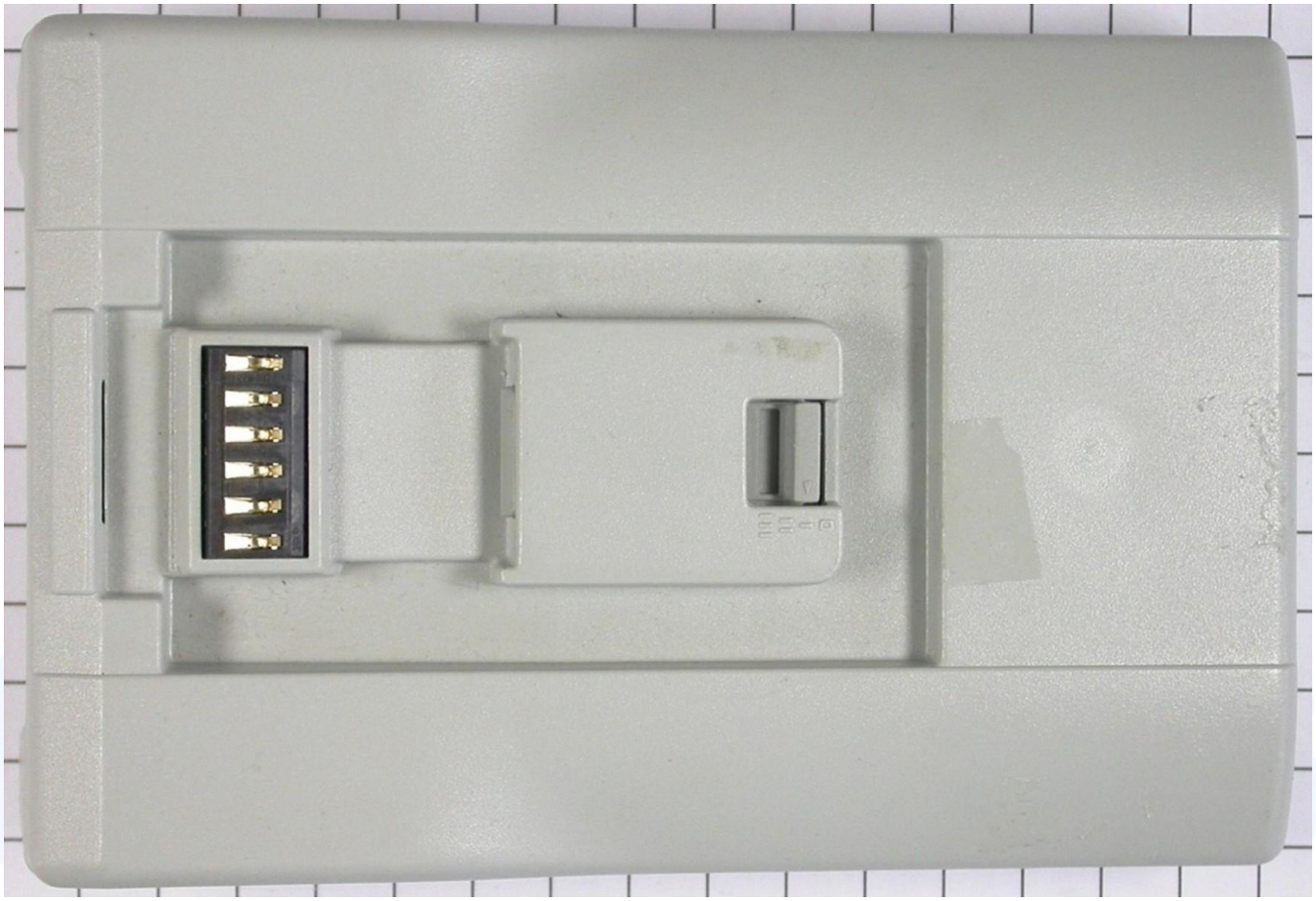


Front view

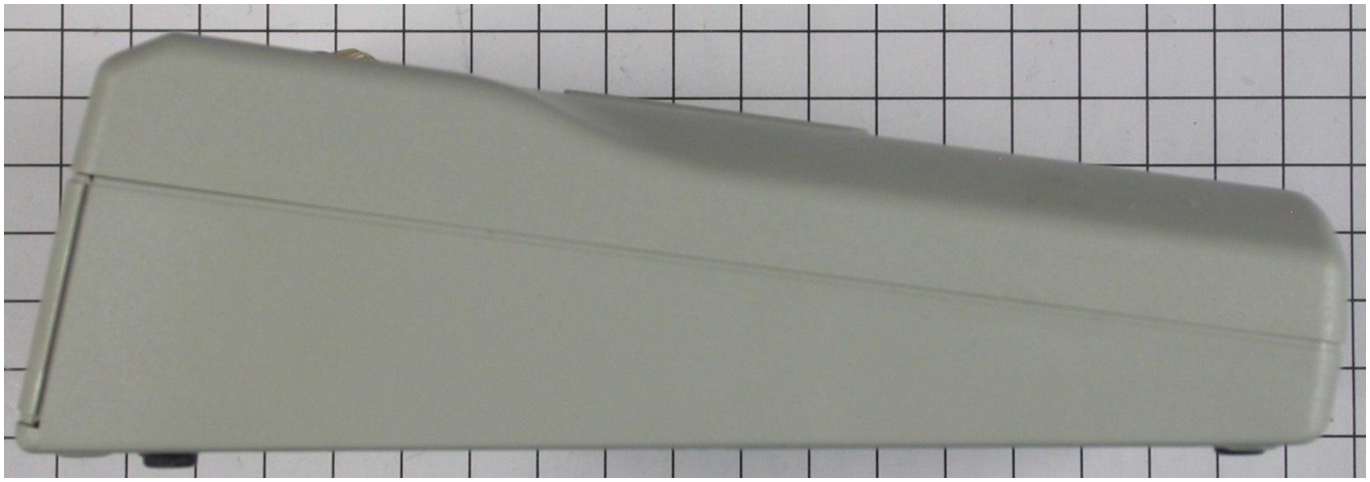


Rear view

Top view – docking station



Side view – docking station



Bottom view – docking station

Rear view – docking station

Top view – AC/DC adapter

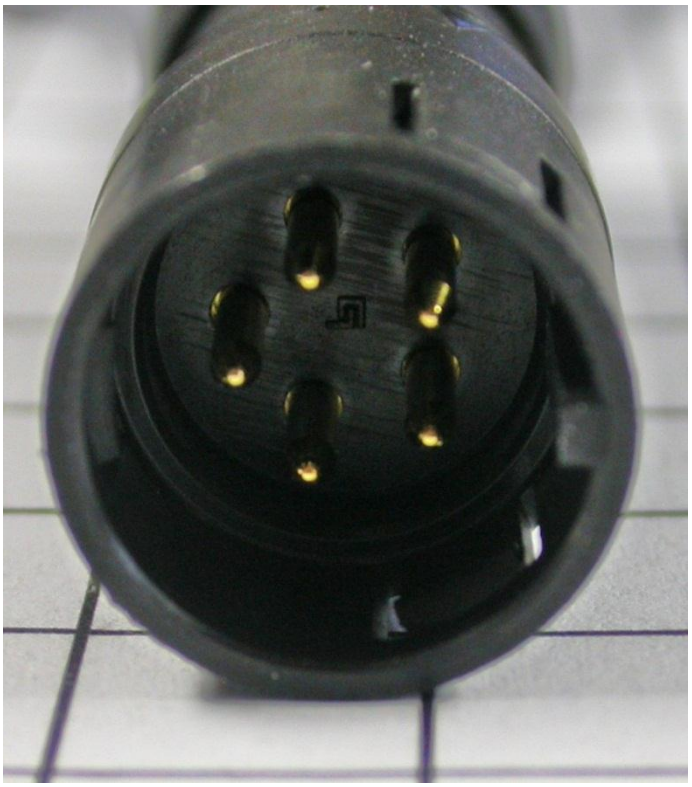
Bottom view – AC/DC adapter

FCC: OV8-LOGRB3-1

Side view – AC/DC adapter

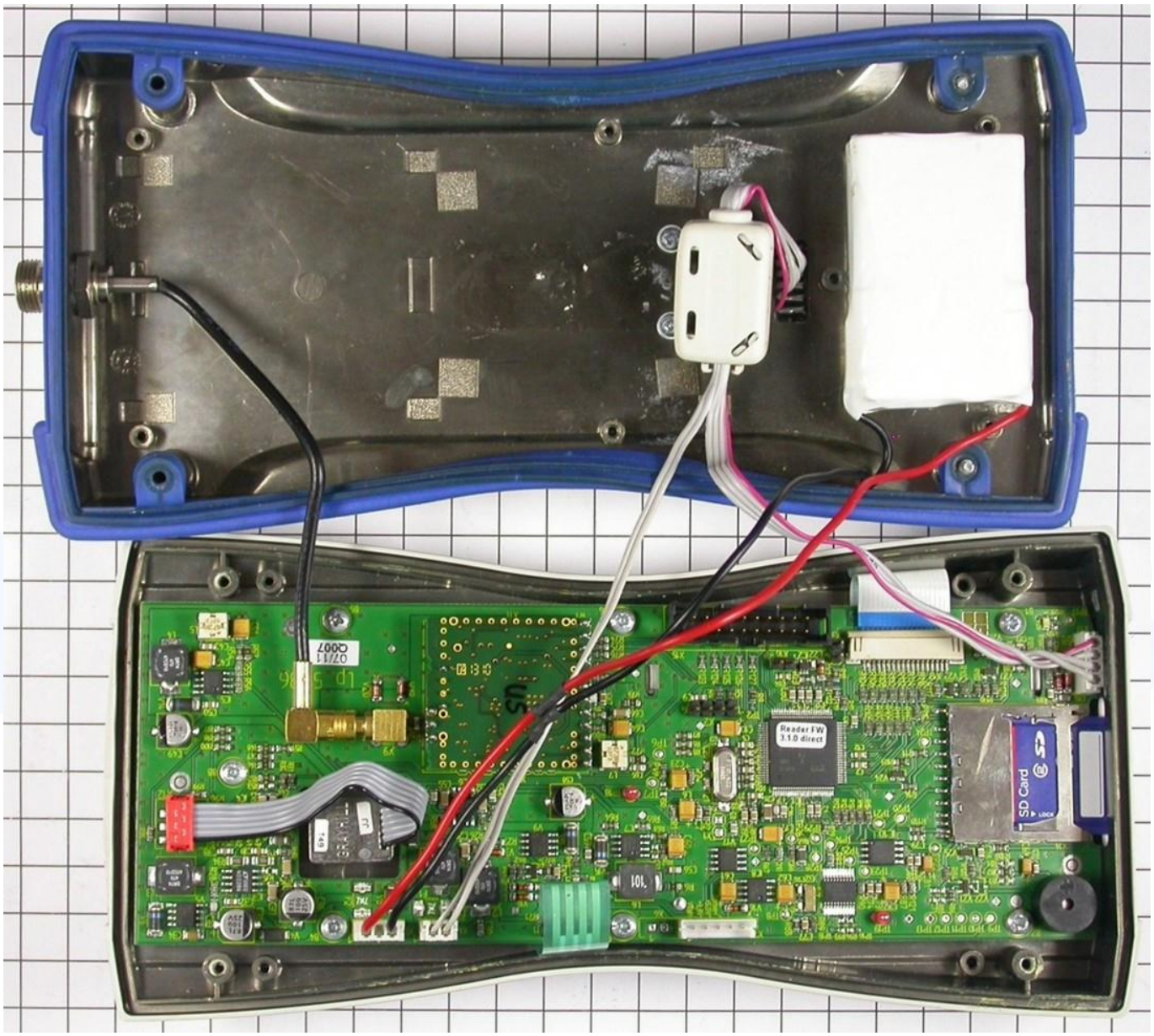
Top view – DC plug

Front view – DC plug



7.2 Internal photos of the EUT

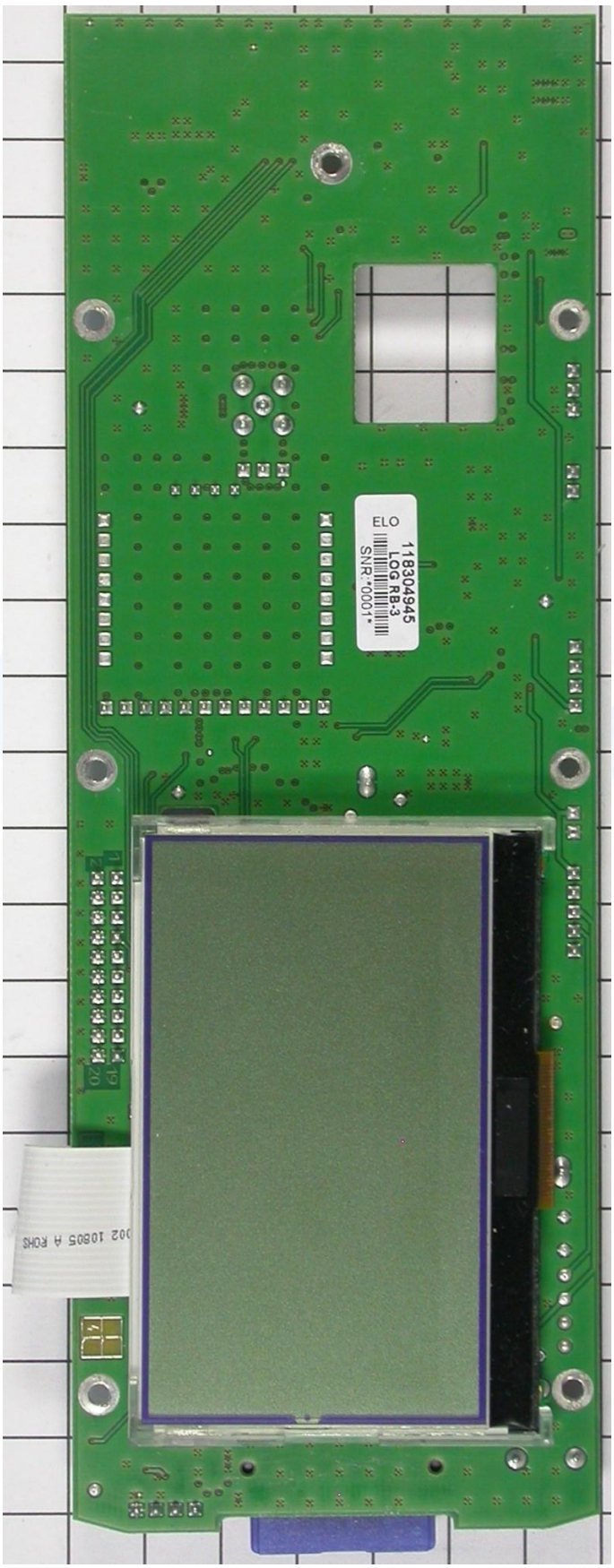
Open casing



FCC: OV8-LOGRB3-1

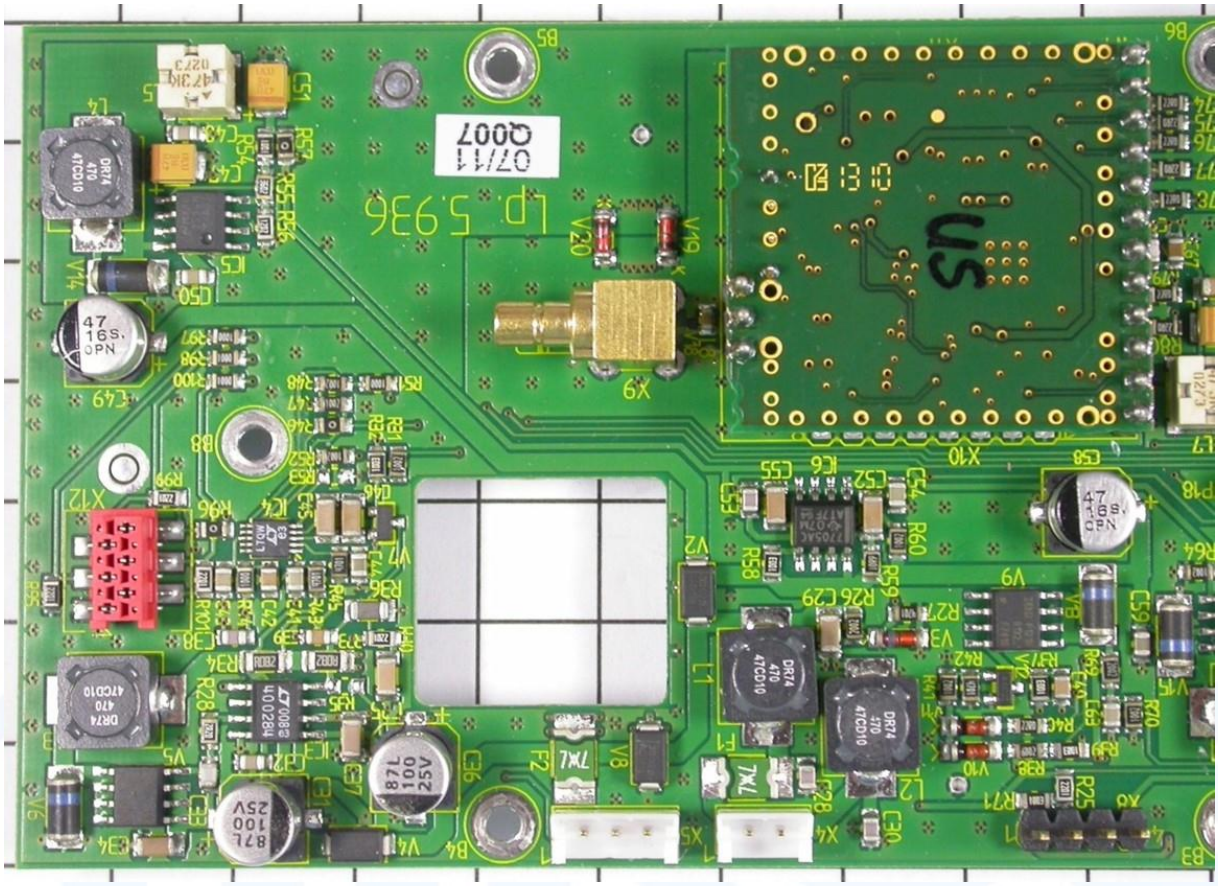
PCB top view

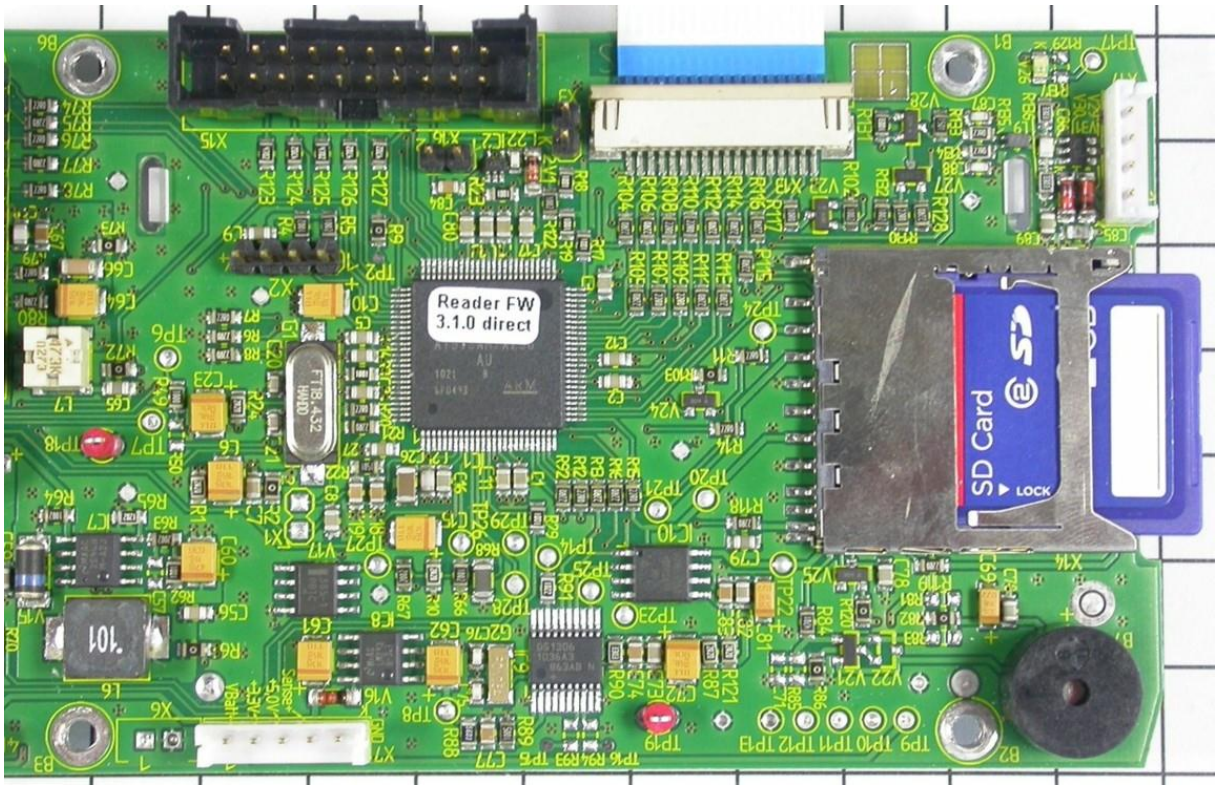
PCB bottom view



FCC: OV8-LOGRB3-1

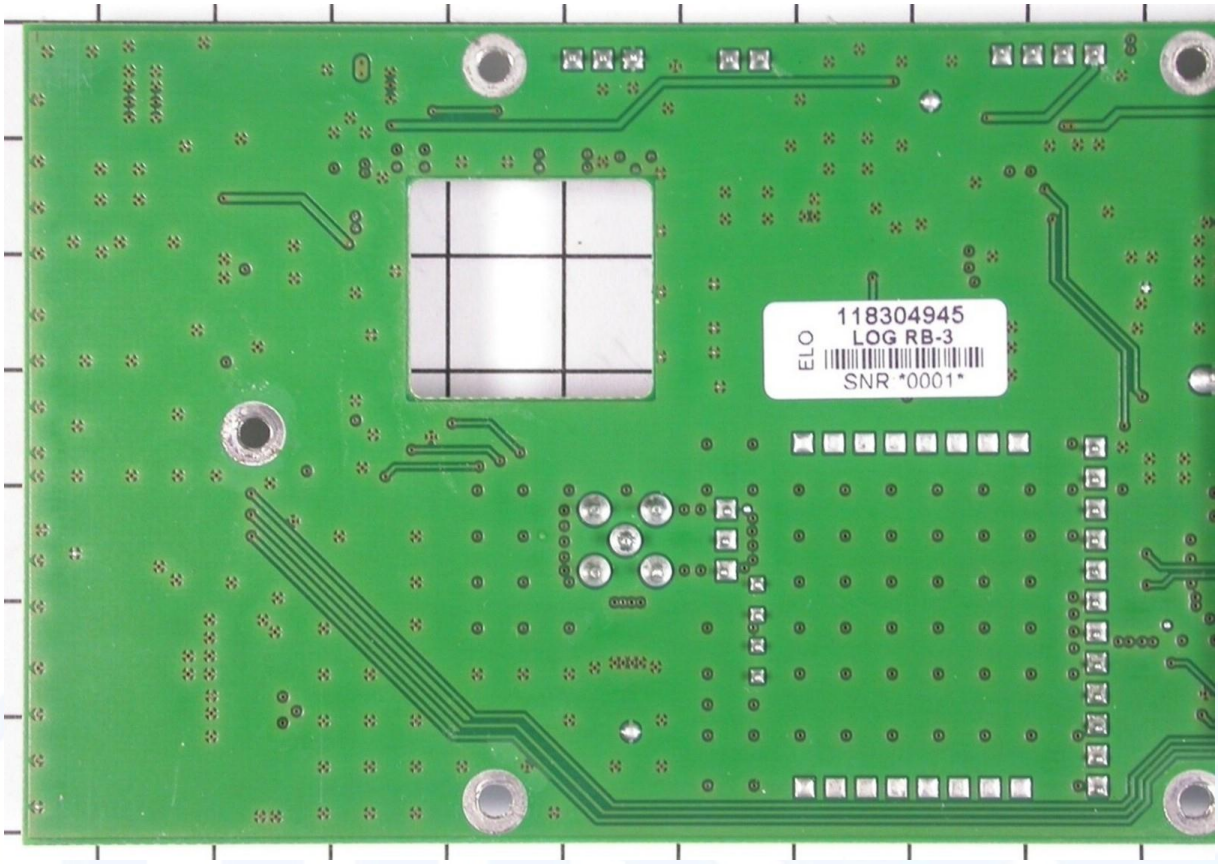
PCB top view (zoom)

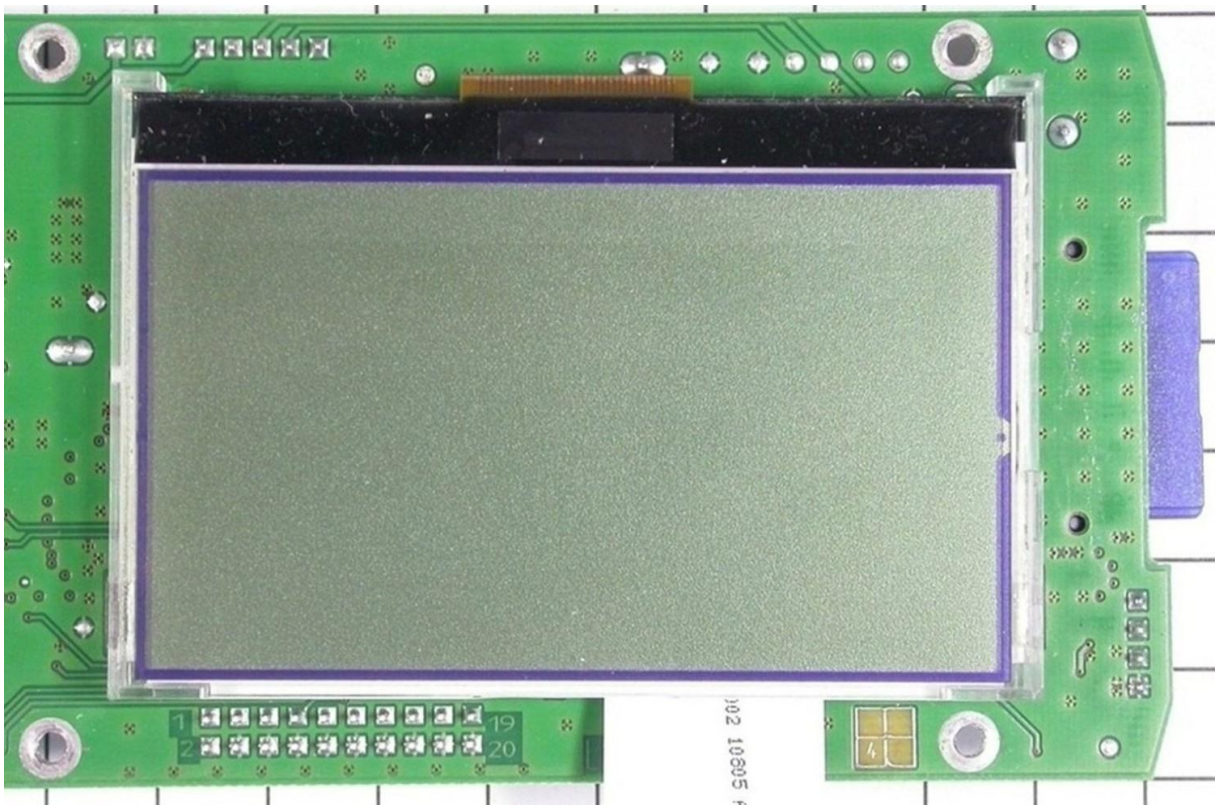




FCC: OV8-LOGRB3-1

PCB bottom view (zoom)





Top view – RF module

Top view – RF module