

FCC: OV8-LOGRI

EMI - TEST REPORT

- FCC Part 90.217 -


Test Report No. :	T35704-00-01KJ	30 October 2012
		Date of issue

Type / Model Name : LOG RI-M

Product Description : Wireless interface for loggers and repeaters

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:
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POSITIVE


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

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC 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 bandwidth	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

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2 General remarks

Items	Description
Power supply	5.0 V DC (powered over USB)
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	Integral antenna (lambda 1/4)
Antenna connector	-
Antenna gain	2.1 dBi
Lowest internal frequency	32.768 kHz
Highest internal frequency	26.0 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 : 15. October 2012

Checked by: Tested by:

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

Josef Knab
Radio Senior Expert

FCC: OV8-LOGRI

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage : 5.0 V DC (powered over USB)

Max. current: TX mode 35 mA
RX mode 20 mA

3.2 Short description of the equipment under test (EUT)

LOG RI-M is used as a communication tool between PC and the other devices from the LOG N-3-system (LOG GSM-3-M, LOG REP-3-M and LOG N-3-M). All communication packets are sent at 913 MHz short range radio. The antenna of the LOG RI-M is an internal mounted whip antenna with a length of lambda/4. As power supply it has the 5V PC USB output.

Number of tested samples: 1
Serial number: 1000042191

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:

- Fujitsu Siemens Lifebook C Series Model : C1410
- _____ Model : _____
- _____ Model : _____

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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.

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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



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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 $50 \Omega / 50 \mu\text{H}$ (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 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 $\text{dB}\mu\text{V}$ level is compared directly to the FCC limit or to the CISPR limit.

To convert between $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

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

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin > 15 dB

Limit according to FCC Part 15, Section 15.107(a):

Frequency of emission (MHz)	Conducted limit ($\text{dB}\mu\text{V}$)	
	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.

The EuT was tested together with a laptop and was powered over the USB connector.

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5.1.7 Test protocol

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

Result: passed

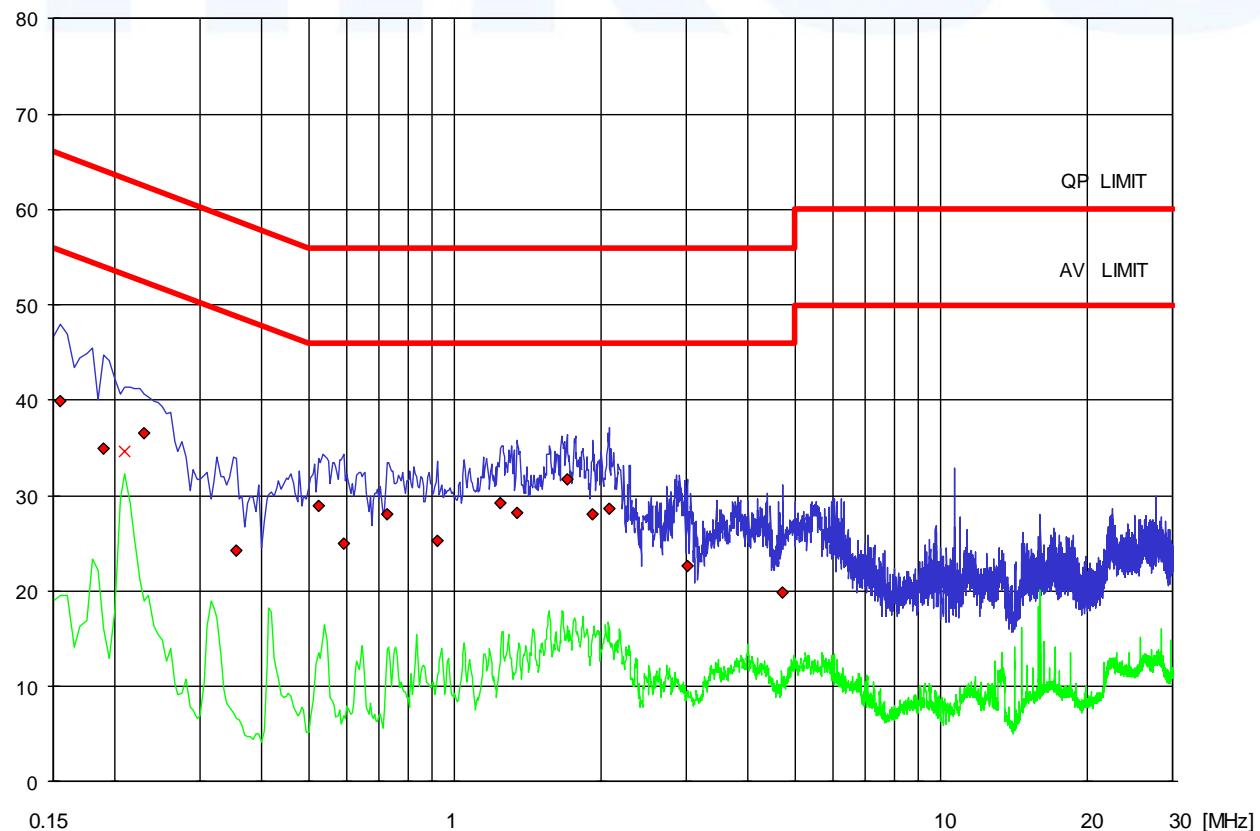
Freq kHz	QP- L dB[μ V]	D -Limit QP [dB]	Freq kHz	AV-L dB[μ V]	D -Limit AV [dB]
155	40	-25,7	210	34,6	-18,6
190	35	-29,0			
230	36,6	-25,8			
355	24,3	-34,5			
525	28,9	-27,1			
590	25	-31,0			
725	28	-28,0			
920	25,3	-30,7			
1245	29,2	-26,8			
1340	28,2	-27,8			
1700	31,7	-24,3			
1925	28,1	-27,9			
2080	28,6	-27,4			
3005	22,6	-33,4			
4715	19,9	-36,1			

dB [μ V]

Legend

PK: AV:

Detector: QP: ♦ AV: X



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Test point:

Operation mode: cont. TX at 913.02 MHz (unmodulated)

Remarks:

Result: passed

Freq kHz	QP- L dB[μ V]	D -Limit QP [dB]	Freq kHz	AV-L dB[μ V]	D -Limit AV [dB]
155	44,3	-21,4	235	32,4	-19,9
190	37,9	-26,1			
235	37,2	-25,1			
375	27,3	-31,1			
520	29,9	-26,1			
600	31,1	-24,9			
815	30,9	-25,1			
825	30,9	-25,1			
1190	28,8	-27,2			
1290	31	-25,0			
1755	29,6	-26,4			
1970	27,4	-28,6			
2100	31,1	-24,9			
3135	26,7	-29,3			
4305	24,5	-31,5			

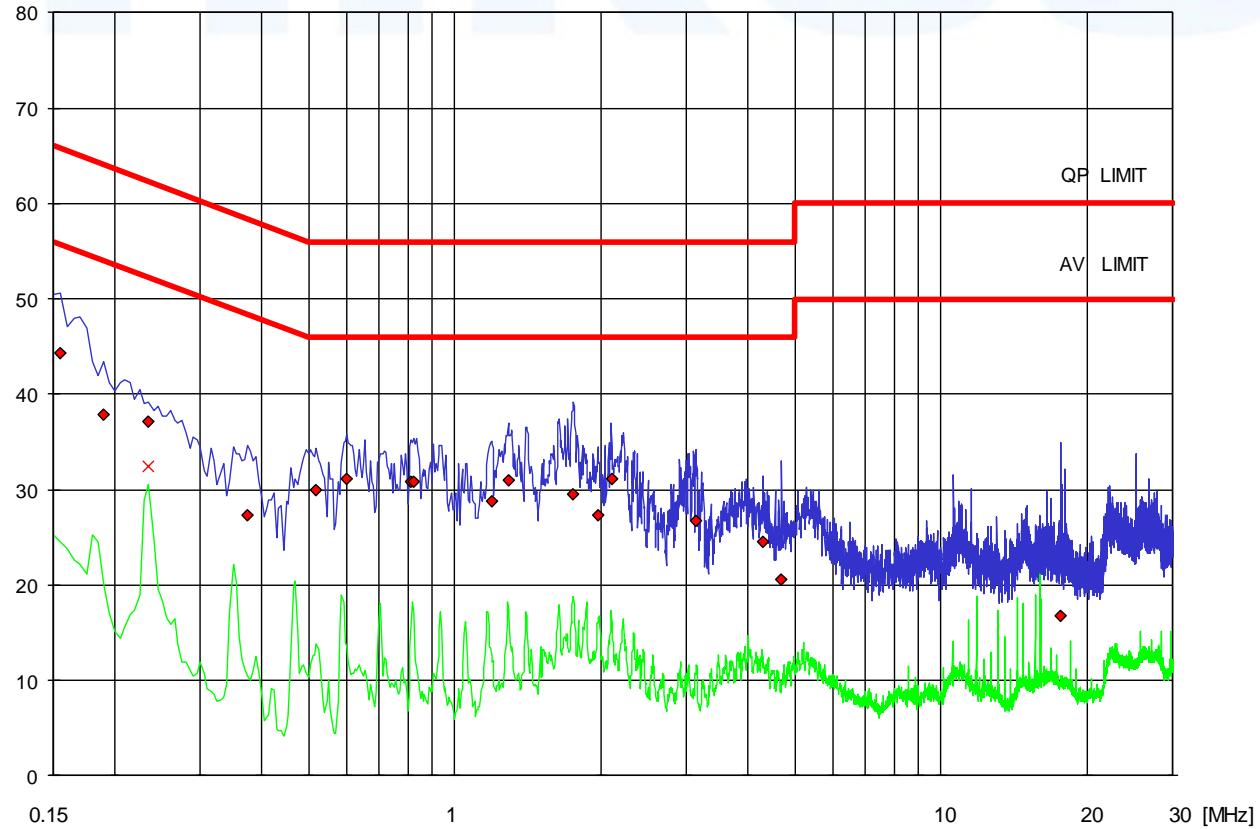
dB [μ V]

Legend

PK:  AV: 

Detector:

QP: ♦ AV: X



FCC: OV8-LOGRI

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

Result: passed

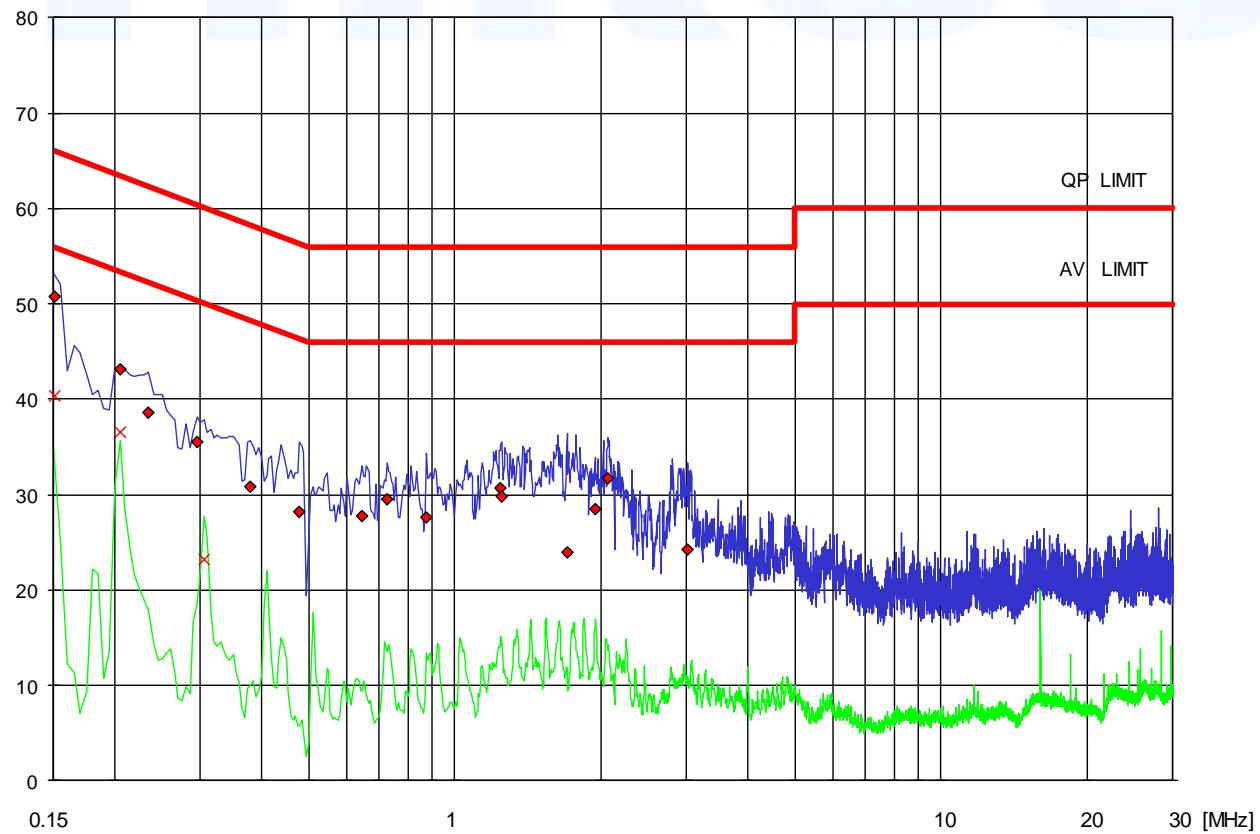
Freq kHz	QP- L dB[µV]	D -Limit QP [dB]	Freq kHz	AV-L dB[µV]	D -Limit AV [dB]
150	50,7	-15,3	150	40,3	-15,7
205	43,2	-20,2	205	36,5	-16,9
235	38,6	-23,7	305	23,2	-26,9
295	35,6	-24,8			
380	30,9	-27,4			
480	28,2	-28,1			
645	27,7	-28,3			
725	29,5	-26,5			
875	27,6	-28,4			
1245	30,7	-25,3			
1250	29,8	-26,2			
1700	24	-32,0			
1945	28,5	-27,5			
2065	31,7	-24,3			
3015	24,3	-31,7			

dB [μ V]

Legend

PK: AV:

Detector: QP: ♦ AV: X



FCC: OV8-LOGRI

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

Result: passed

Freq kHz	QP- L dB[μ V]	D -Limit QP [dB]	Freq kHz	AV-L dB[μ V]	D -Limit AV [dB]
150	41,5	-24,5	170	38,6	-16,4
190	41,7	-22,3			
230	37,4	-25,0			
400	27,5	-30,4			
475	28,3	-28,1			
655	30	-26,0			
670	30,5	-25,5			
845	25	-31,0			
1225	25	-31,0			
1290	29,2	-26,8			
1610	29	-27,0			
1920	28,2	-27,8			
2055	30,3	-25,7			
3005	24,1	-31,9			
4195	22,8	-33,2			

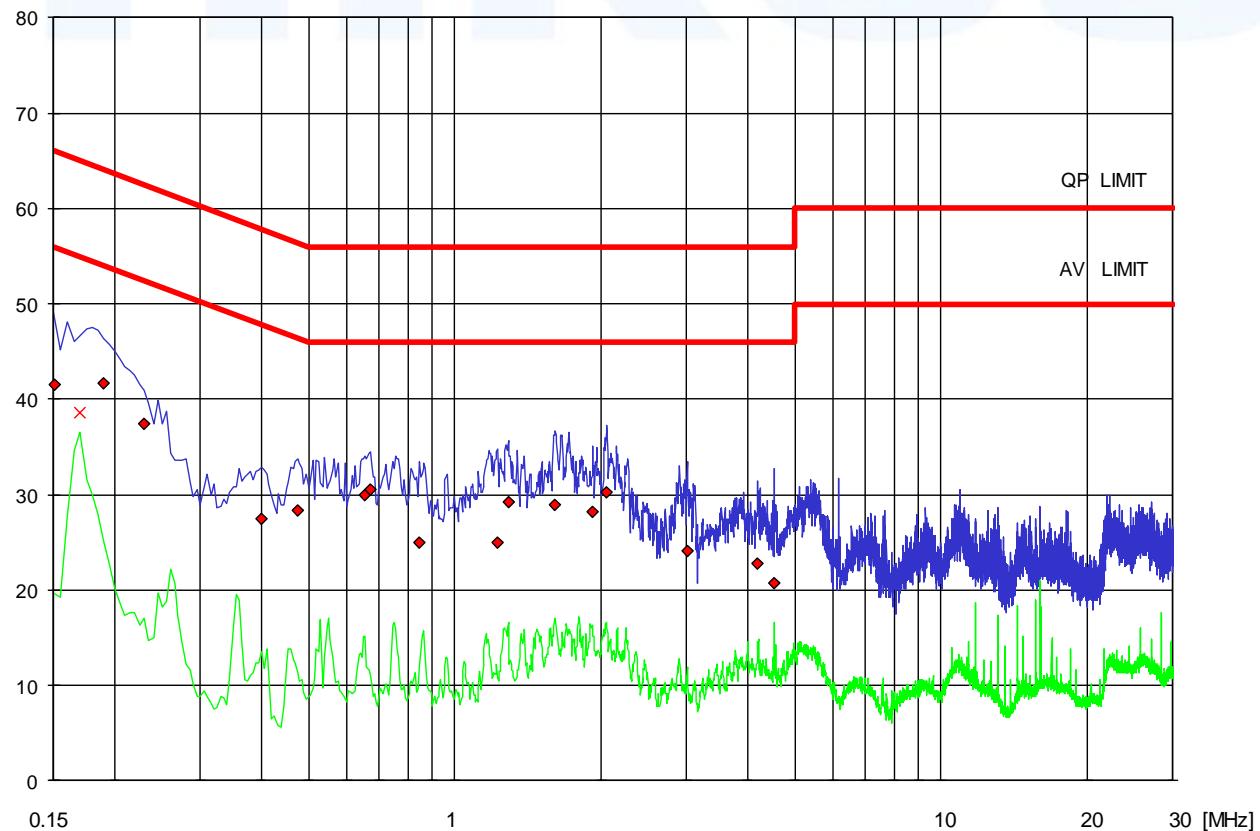
dB [μ V]

Legend

PK: AV:

Detector:

QP: ♦ AV: ✗



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5.2 Maximum output power radiated

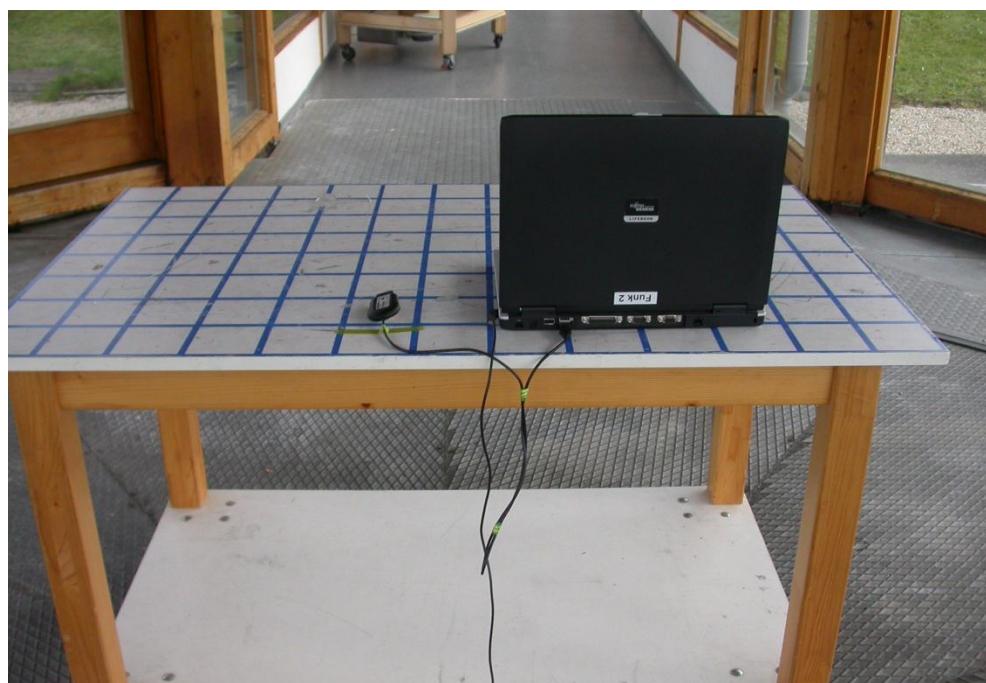
For test instruments and accessories used see section 6 Part **CPR 2**.

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



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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 dB μ V) 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 $\frac{1}{2}$ 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

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5.2.5 Test result

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
913.02	61.1	120	-62.0	-0.9	20.8	21.7

Power limit according to FCC Part 90.217:

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

The requirements are **FULFILLED**.

Remarks:

FCC: OV8-LOGRI

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



FCC: OV8-LOGRI

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 dB_uV) 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

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5.3.5 Test result

f < 1 GHz:

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
30 - 1000	-	-	-	-	-30.9	>10

f > 1 GHz:

Frequency (MHz)	Level PK (dBm)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
1826.13	-40.3	1000	-9.8	-50.1	-30.9	19.2
2739.25	-50.4	1000	-8.0	-58.4	-30.9	27.5
3652.38	-52.4	1000	-4.6	-57.0	-30.9	26.1
4564.75	-45.3	1000	7.2	-38.1	-30.9	7.2
5478.25	-49.3	1000	7.9	-41.4	-30.9	10.5
6391.75	-45.1	1000	10.6	-34.5	-30.9	3.6
7304.13	-54.8	1000	11.6	-43.2	-30.9	12.3
8217.63	-64.7	1000	15.1	-49.6	-30.9	18.7
9130.00	-58.2	1000	15.6	-42.6	-30.9	11.7
10043.50	-68.6	1000	15.1	-53.5	-30.9	22.6
10957.00	-62.6	1000	15.7	-46.9	-30.9	16.0
11869.38	-69.0	1000	16.2	-52.8	-30.9	21.9

Spurious emission limit according to FCC Part 90.217:

Spurious emission limit (dBm)	
30 dB down	-30.9

The requirements are **FULFILLED**.

Remarks:

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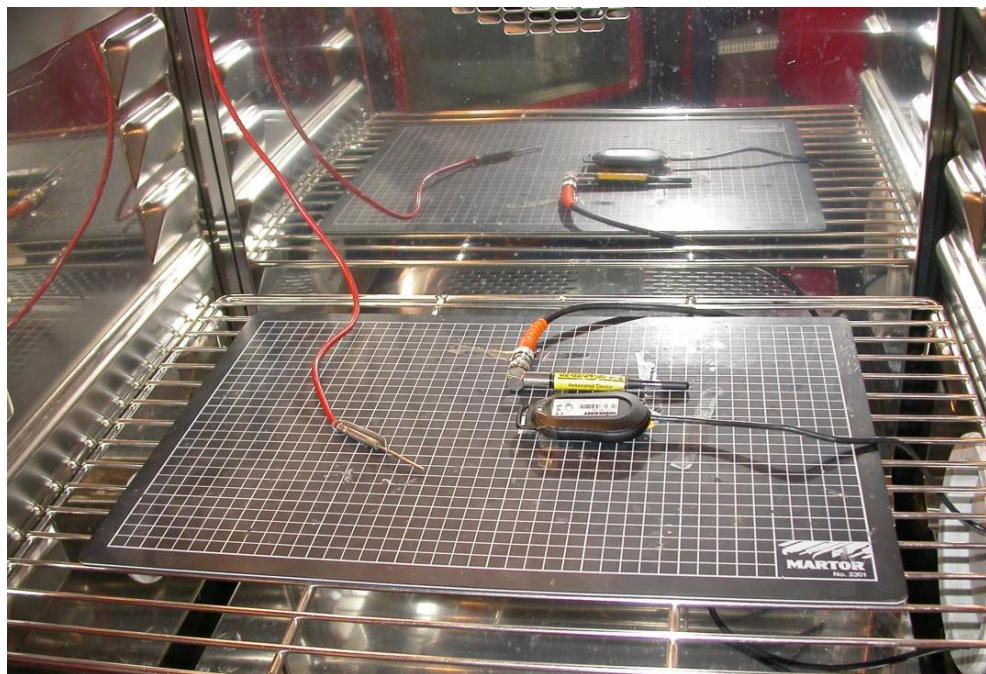
5.4 Modulation characteristics

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

5.4.1 Description of the test location

Test location: METROLOGY

5.4.2 Photo documentation of the test set-up



FCC: OV8-LOGRI

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

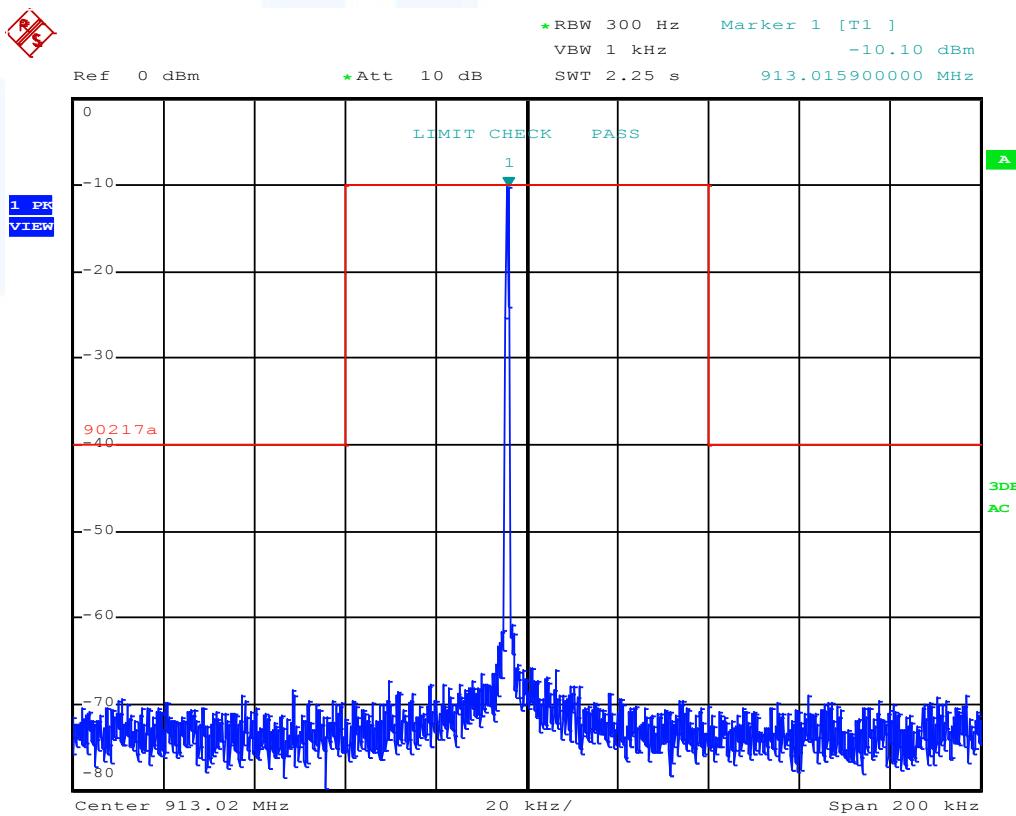
The measurement was performed radiated with intentional modulation on and off. The emission mask defined for 25 kHz channel bandwidth devices is shown on each plot. The 0 dB reference for the mask is the measured output power of the unmodulated carrier at that frequency.

Spectrum analyser settings:

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

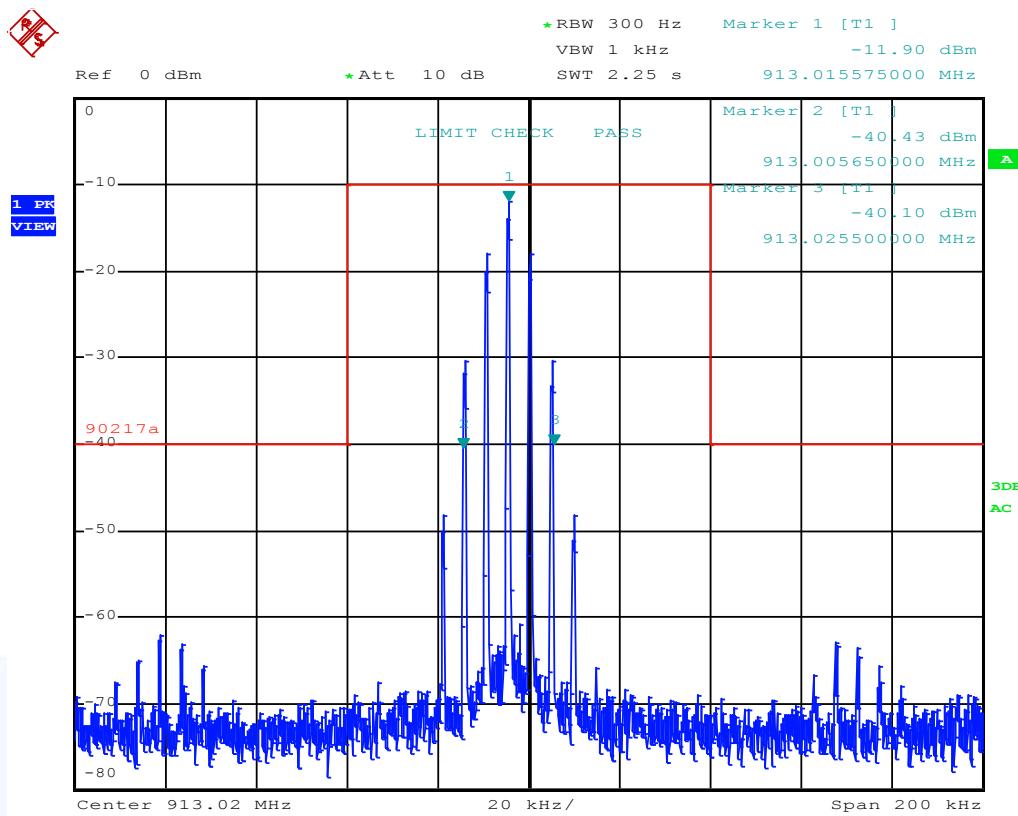
5.4.5 Test result

Cont. TX without modulation



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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 ($f_{e, \text{lower}} - 40 \text{ kHz}$)	913.06 MHz ($f_{e, \text{upper}} + 40 \text{ kHz}$)

The requirements are **FULFILLED**.

Remarks:

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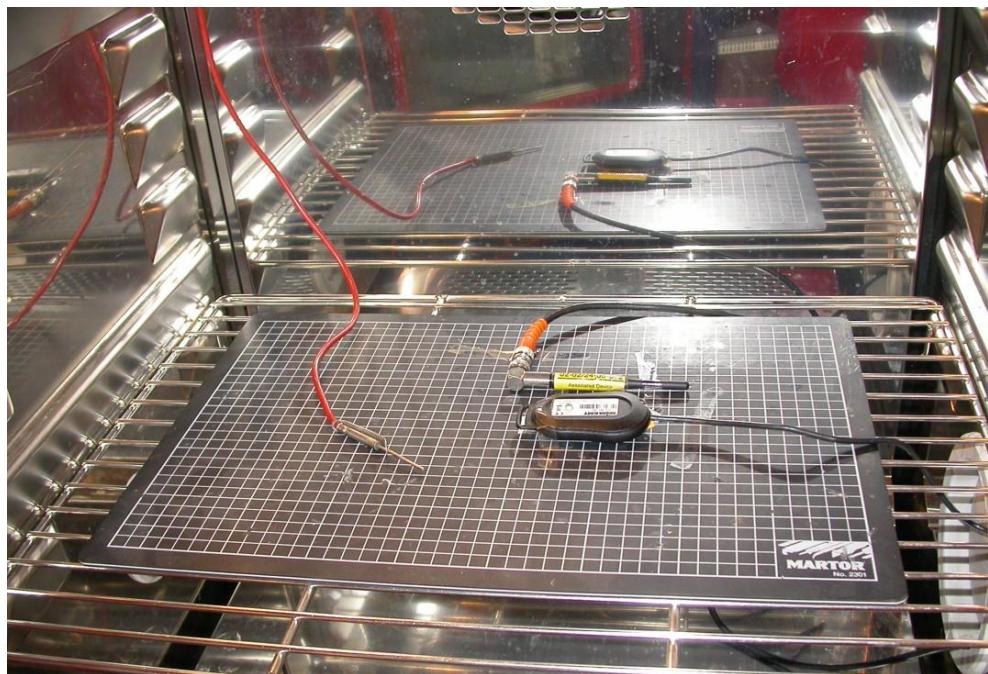
5.5 Occupied bandwidth

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

5.5.1 Description of the test location

Test location: METROLOGY

5.5.2 Photo documentation of the test set-up



FCC: OV8-LOGRI

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 radiated 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

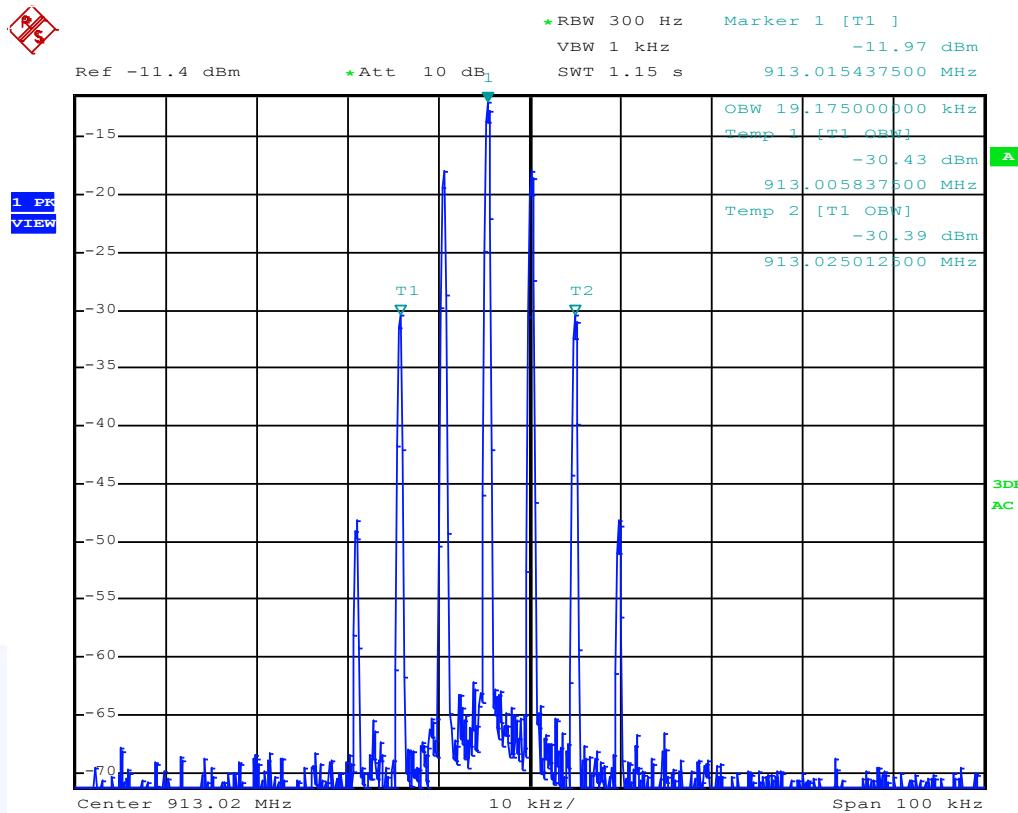
5.5.5 Test result

Channel number	Fundamental frequency (MHz)	99 % Bandwidth (kHz)
1	913.02	19.18

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5.5.6 Test protocol

99% Bandwidth measurement plots



The requirements are **FULFILLED**.

Remarks: _____

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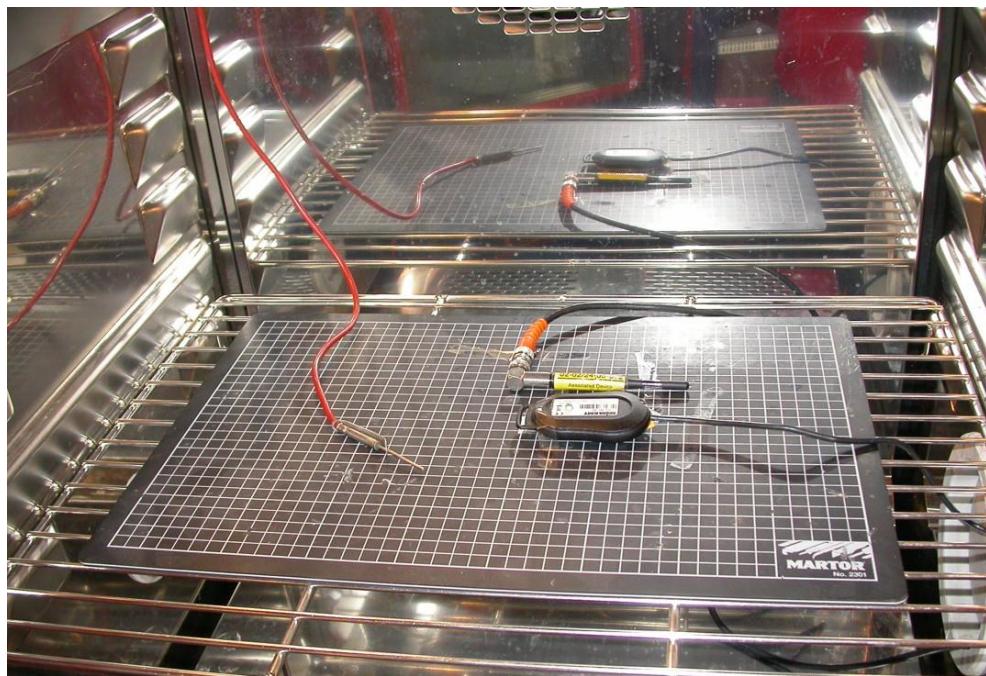
5.6 Frequency stability

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

5.6.1 Description of the test location

Test location: METROLOGY

5.6.2 Photo documentation of the test setup



FCC: OV8-LOGRI

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. The temperature stability was measured with the EUT in a climatic chamber. The frequency stability of the transmitter was examined for the temperature range of -30°C to +50°C. The carrier frequency was measured radiated with a spectrum analyser.

5.6.5 Test result

Test conditions		Test result	
		Frequency reading (MHz)	Frequency error (kHz)
T (50°C)	V _{nom}	913.013090	-6.91
T (40°C)	V _{nom}	913.013477	-6.52
T (30°C)	V _{nom}	913.014716	-5.28
T (20°C)	V _{nom}	913.016295	-3.71
T (10°C)	V _{nom}	913.017823	-2.18
T (0°C)	V _{nom}	913.018780	-1.22
T (-10°C)	V _{nom}	913.018998	-1.00
T (-20°C)	V _{nom}	913.017392	-2.61
T (-30°C)	V _{nom}	913.013761	-6.24
Measurement uncertainty		± 3 dB	

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Measured frequency 30 dB down nearest at the lower frequency (see page 21):

$$f_L + \text{FE}_{\text{min}} = 913.0057 \text{ MHz} + -6.9 \text{ kHz} = \mathbf{912.9988 \text{ MHz}}$$

Measured frequency 30 dB down nearest at the higher frequency (see page 21):

$$f_H + \text{FE}_{\text{max}} = 913.0255 \text{ MHz} + -1.0 \text{ kHz} = \mathbf{913.0245 \text{ MHz}}$$

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 ($f_{e, \text{lower}} - 40 \text{ kHz}$)	913.06 MHz ($f_{e, \text{upper}} + 40 \text{ kHz}$)

The requirements are **FULFILLED**.

Remarks: This measurement could be tested only under normal test voltage, because the EuT is
permanently powered over the USB port.

FCC: OV8-LOGRI

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



FCC: OV8-LOGRI

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 dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) 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

FCC: OV8-LOGRI

5.7.5 Test result

f < 1 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)
30 - 1000	-		-	-	-	-	40.0	>10

f > 1 GHz:

Frequency (MHz)	Level PK (dB μ V)	Level AV (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Level PK (dB μ V/m)	Level AV (dB μ V/m)	Limit AV (dB μ V/m)	Delta (dB)
1000 - 5000	-		-	-	-	-	54.0	>10

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

Frequency (MHz)	Limit (μ V/m)	Limit (dB μ V/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.

FCC: OV8-LOGRI

6 USED TEST EQUIPMENT AND ACCESSORIES

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

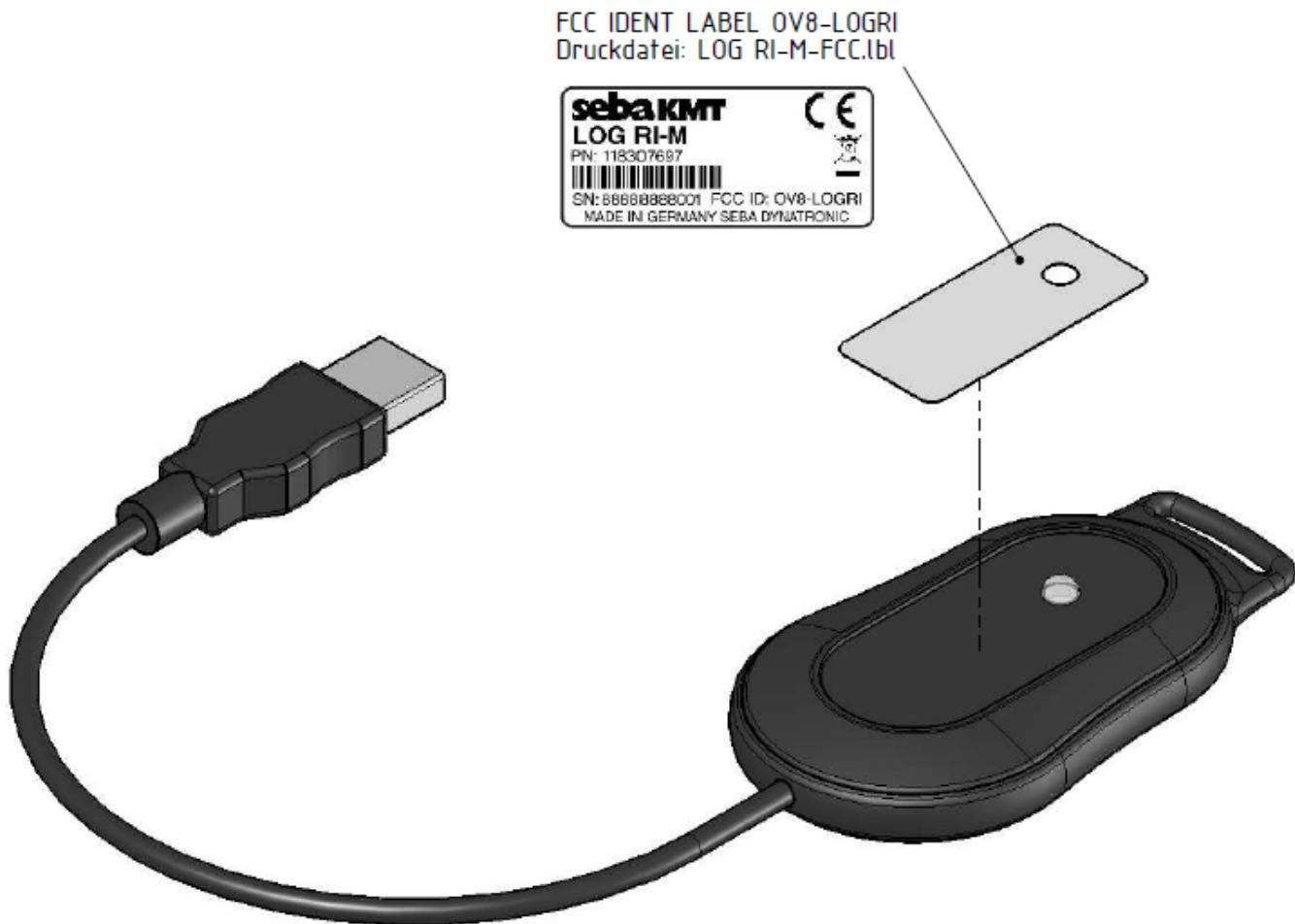
Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	11/07/2013	11/07/2012		
	ESH 2 - Z 5	02-02/20-05-004	12/05/2013	12/05/2012	12/03/2013	12/09/2012
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155			02/04/2013	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-180/40	02-02/45-08-001	31/07/2012	31/07/2011		
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				

FCC: OV8-LOGRI

7 Photo documentation

7.1 External photos of the EUT

Label view / lable placement



FCC: OV8-LOGRI

Top view
(Label for European market)



FCC: OV8-LOGRI

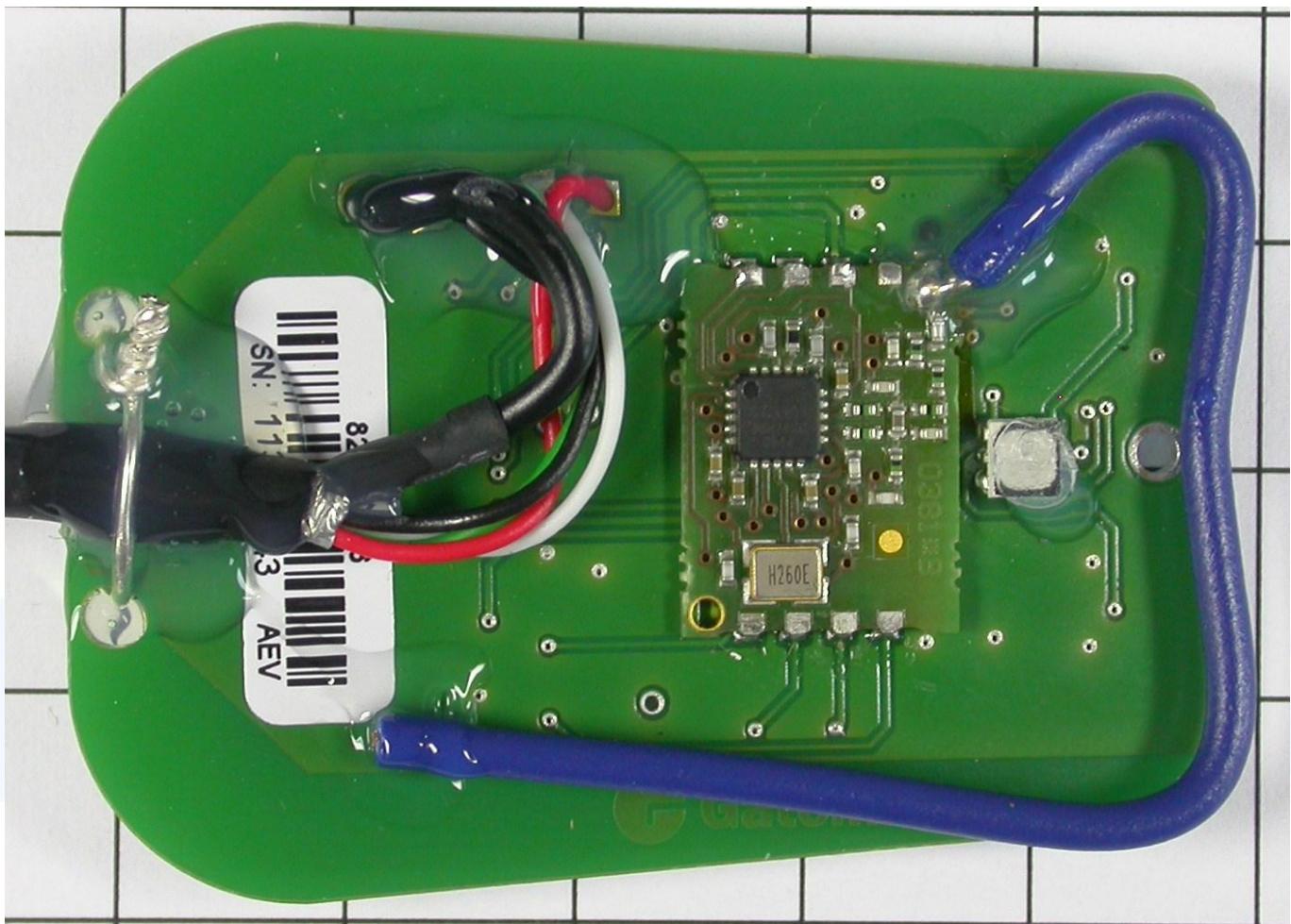
Bottom view



FCC: OV8-LOGRI

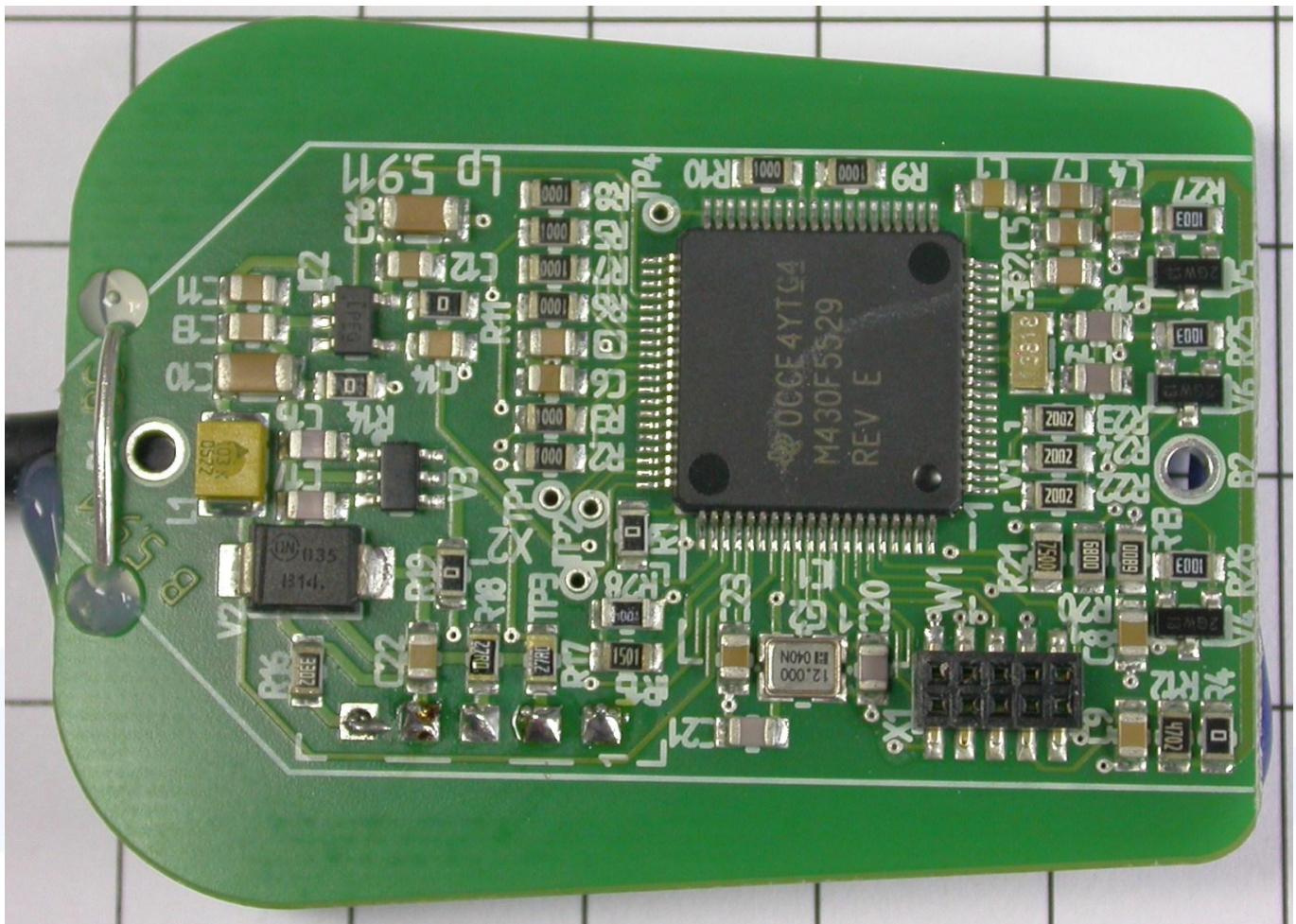
7.2 Internal photos of the EUT

PCB top view



FCC: OV8-LOGRI

PCB bottom view



FCC: OV8-LOGRI

RF module top view (zoom)

