

EMI - TEST REPORT

- FCC Part 15B -

Test Report No. :	T36410-00-03KJ	18. April 2013 Date of issue
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Type / Model Name : US-1048

Product Description : USB Antenna – Wireless pH Monitoring System

Applicant : smaXtec animal care sales GmbH

Address : Wastiangasse 4

8010 GRAZ; AUSTRIA

Manufacturer : smaXtec animal care sales GmbH

Address : Wastiangasse 4

8010 GRAZ; AUSTRIA

Licence holder : smaXtec animal care sales GmbH

Address : Wastiangasse 4

8010 GRAZ; AUSTRIA

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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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 Rules and Regulations Part 15 Subpart A - General (September, 2012)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (September, 2012)

Part 15, Subpart B, Section 15.107	AC Line conducted emission
	☐ Class A device ☒ Class B device

Part 15, Subpart B, Section 15.109	Radiated emission, general requirements
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ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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CISPR 16-4-2: 2011 EN 55016-4-2: 2011	Uncertainty in EMC measurement
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CISPR 22: 2008 EN 55022: 2010	Information technology equipment
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2 SUMMARY

2.1 General remarks

The measurement has been performed in receive mode.

2.2 Final assessment

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 08. October 2012

Testing concluded on : 05. March 2013

Checked by:

Tested by:

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

Josef Knab
Radio Senior Expert

3 EQUIPMENT UNDER TEST

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

3.2 Power supply system utilised

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

3.3 Short description of the equipment under test (EUT)

The EuT is a USB antenna and is plugged directly on the PC. It is used for communication with the pH Bolus during the Bolus intialistation process. The bolus initialization process is needed, before the costumer fits the bolus to the cow, to calibrate the pH bolus. The USB antenna has an internal ceramic antenna.

Number of tested samples: 1
Serial number: Prototype

EUT operation mode:

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

- cont. RX mode

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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:

- Lifebook Fujitsu Siemens	Model : C1410
-	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 may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh 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 diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement protocol for FCC

4.4.1 General information

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 Details of test procedures

4.4.2.1 General standard information

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

4.4.3 Conducted emission

4.4.3.1 Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversions apply:

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

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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

4.4.4.1 Description of measurement

Spurious emission from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned in horizontal polarisation and is repeated vertically. To locate maximum emission from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dB μ V/m is calculated by add the antenna correction factor and cable loss factor (dB) on the reading from the EMI receiver (dB μ V). The FCC or CISPR limit is subtracted from this result in order to provide the delta to limit listed in the measurement protocol.

Example:

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

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

4.4.5.1 Description of measurement

Radiated emission from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emission under better uncertainty and is calculated to the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emission

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.107(a):

Except for Class A devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4. 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.

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

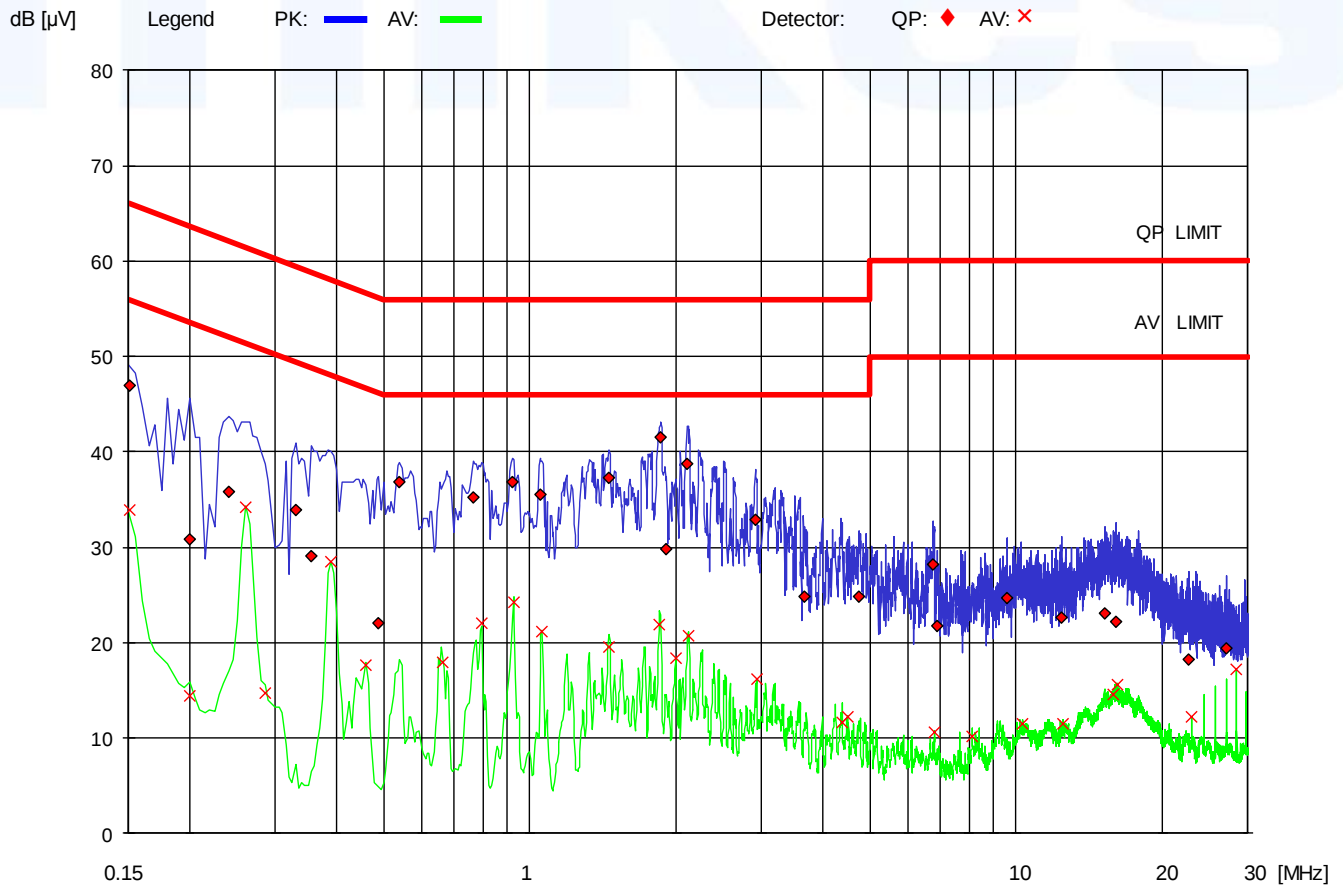
5.1.6 Test protocol

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	46,9	-19,1	150	33,9	-22,1
200	30,8	-32,8	200	14,5	-39,1
240	35,8	-26,3	260	34,2	-17,2
330	33,9	-25,6	285	14,7	-36,0
355	29,1	-29,7	390	28,5	-19,6
490	22,1	-34,1	460	17,6	-29,1
540	36,9	-19,1	660	17,9	-28,1
765	35,3	-20,7	795	22,1	-23,9
920	36,8	-19,2	925	24,2	-21,8
1050	35,5	-20,5	1060	21,2	-24,8
1455	37,3	-18,7	1455	19,5	-26,5
1860	41,6	-14,4	1850	21,9	-24,1
1910	29,8	-26,2	1995	18,4	-27,6
2110	38,7	-17,3	2115	20,7	-25,3
2920	32,9	-23,1	2925	16,2	-29,8

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3660	24,9	-31,1	4395	11,6	-34,4
4755	24,9	-31,1	4495	12,3	-33,7
6750	28,2	-31,8	6790	10,6	-39,4
6885	21,8	-38,2	8120	10,2	-39,8
9585	24,7	-35,3	10315	11,5	-38,5
12380	22,7	-37,3	12495	11,5	-38,5
15225	23,1	-36,9	15830	14,6	-35,4
16050	22,2	-37,8	16115	15,6	-34,4
22640	18,2	-41,8	23010	12,3	-37,7
27075	19,4	-40,6	28425	17,2	-32,8

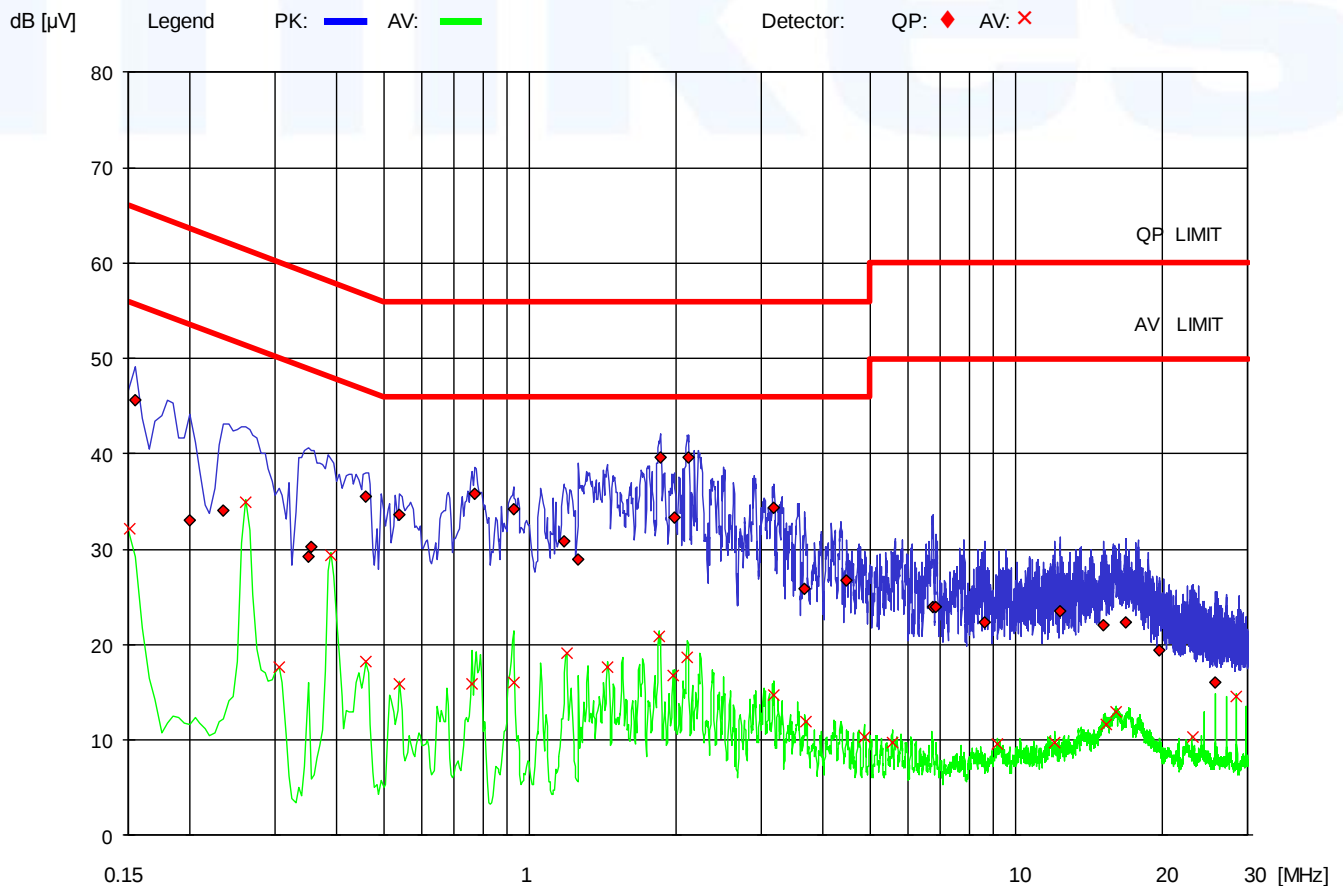


Test point N
Operation mode: cont. RX mode
Remarks: -

Result: passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
155	45,6	-20,1	150	32,1	-23,9
200	33	-30,6	260	34,9	-16,5
235	34	-28,3	305	17,6	-32,5
350	29,2	-29,8	390	29,4	-18,7
355	30,3	-28,5	460	18,3	-28,4
460	35,5	-21,2	540	15,9	-30,1
540	33,7	-22,3	760	15,9	-30,1
770	35,9	-20,1	925	16	-30,0
925	34,2	-21,8	1190	19,2	-26,8
1175	30,9	-25,1	1445	17,6	-28,4
1260	28,9	-27,1	1845	20,9	-25,1
1855	39,7	-16,3	1975	16,8	-29,2
1980	33,3	-22,7	2110	18,7	-27,3
2120	39,7	-16,3	3180	14,7	-31,3
3185	34,3	-21,7	3685	11,9	-34,1

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3675	25,9	-30,1	4870	10,3	-35,7
4490	26,8	-29,2	5560	9,8	-40,2
6735	23,9	-36,1	9160	9,6	-40,4
6850	23,9	-36,1	12005	9,8	-40,2
8610	22,4	-37,6	15275	11,7	-38,3
12340	23,5	-36,5	16045	13	-37,0
15135	22,1	-37,9	23015	10,4	-39,6
16855	22,4	-37,6	28425	14,6	-35,4
19660	19,4	-40,6			
25625	16	-44,0			



5.2 Radiated emission

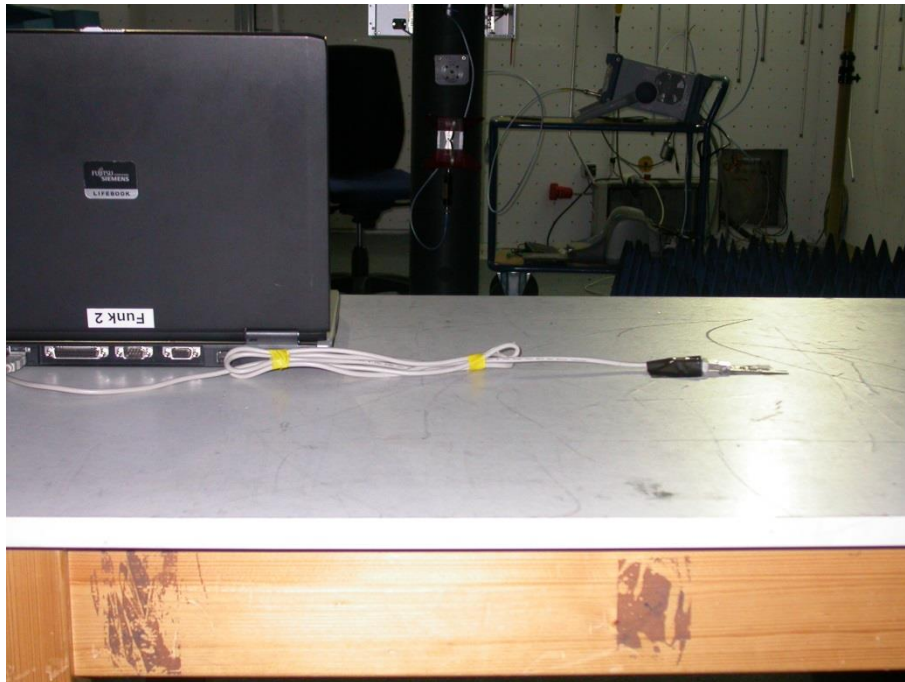
For test instruments and accessories used see section 6 Part **SER 2**, **SER 3**.

5.2.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2
Test distance: 3 m

5.2.2 Photo documentation of the test set-up





5.2.3 Applicable standard

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

Except for Class A digital devices, the field strength of radiated emission from unintentional radiators at a distance of 3 m shall not exceed the given limit.

5.2.4 Description of Measurement

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

Instrument settings:

30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

5.2.5 Test result $f < 1$ GHz

Frequency (MHz)	Reading level QP (dB μ V)	Reading level AV (dB μ V)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB(μ V/m)	Corrected level AV dB(μ V/m)	Limit dB(μ V/m)	Delta (dB)
2*	33.0	-	9	20.0	53.0	-	69.5	-16.5
30*	11.1	-	120	12.6	23.7	-	40.0	-16.3
150*	-0.5	-	120	14.0	13.5	-	43.5	-30.0
300*	2.3	-	120	16.3	18.6	-	46.0	-27.4
450*	1.1	-	120	20.3	21.4	-	46.0	-24.6
750*	-1.0	-	120	26.4	25.4	-	46.0	-20.6
957.5	8.0	-	120	29.8	37.8	-	46.0	-8.2
1000*	-0.4	-	120	30.2	29.8	-	54.0	-24.2

*) Ambient noise

Note: The correction factor includes cable loss and antenna factor.

5.2.6 Test result $f > 1$ GHz

Frequency (MHz)	Level PK (dB μ V)	Duty Cycle Correction (dB)	Level AV (dB μ V)*	Correction factor (dB/m)	Corrected level PK dB(μ V/m)	Corrected level AV dB(μ V/m)	Limit PK dB(μ V/m)	Limit AV dB(μ V/m)	Delta (dB)
1184.3	41.7	-	-	3.3	45.0	-	74.0	54.0	-9
5433.0	47.7	-	-	4.0	51.8	-	74.0	54.0	-2.2

Note: The correction factor includes cable loss and antenna factor.

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 is performed according to FCC Part 15A, Section 15.33(b), up to the
5th harmonic.

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	23/07/2013	23/01/2013
	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
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-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	18/09/2013	18/09/2012		
	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	18/12/2013	18/12/2012		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				

7 Attachment A

7.1 External photos of the EuT



7.2 Internal photos of the EuT

