FCC ID: NDX-COMPACTMAX

EMI – TEST REPORT

- FCC Part 15B -

Test Report No. : **T38601-00-03HU**	07. August 2014 Date of issue

Type / Model Name : COMPACT MAX

Product Description : RFID handheld reader for animal identification

Applicant : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Manufacturer : Datamars (Thailand) Co. LTD

Address : Northern Region Industrial Estate, 179/1 Moo4

T. Banklang, A. Muang, Lamphoon, 5100 THAILAND

Licence holder : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

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

DAkkS Deutsche Akkreditierungsstelle D-PL-12030-01-00

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart A - General (October, 2013)

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

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2013)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions
Part 15, Subpart B, Section 15.209	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction
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.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The EuT is working at frequency of 134.2 kHz.

Data connection via USB to a LapTop:

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 : 04. August 2014

Testing concluded on : 07. August 2014

Checked by:

Thomas Weise
I confirm the correctness and integrity of this document
2014.08.08 08:44:00 +02'00'

Thomas Weise
Laboratory Manager

Tested by:

Markus Huber
I'm the author of this document
2014.08.07 14:50:50 +02'00'

Huber Markus

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 : Tx 4.00 V / DC
Rx 3.00 V / DC

3.3 Short description of the Equipment under Test (EuT)

The EuT is a RFID handheld reader for animal identification.

Number of tested samples: 1
Serial number: ALPHA-00005

EuT operation mode:

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

- Standby - Data connection via USB to a Laptop

-

EUT configuration:

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

- USB cable male type A to micro USB, 1.0 m Model : Supplied by manufacturer
- Fujitsu LapTop Model : Supplied by CSA
- Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 Strasskirchen
Germany

4.2 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.3 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

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.5 Measurement Protocol for FCC, VCCI and AUSTEL

4.5.1 GENERAL INFORMATION

4.5.1.1 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.
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 Emissions 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.

4.5.1.2 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 in order to obtain maximum disturbances from the unit.

4.5.2 DETAILS OF TEST PROCEDURES

4.5.2.1 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 Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

5 TEST CONDITIONS AND RESULTS

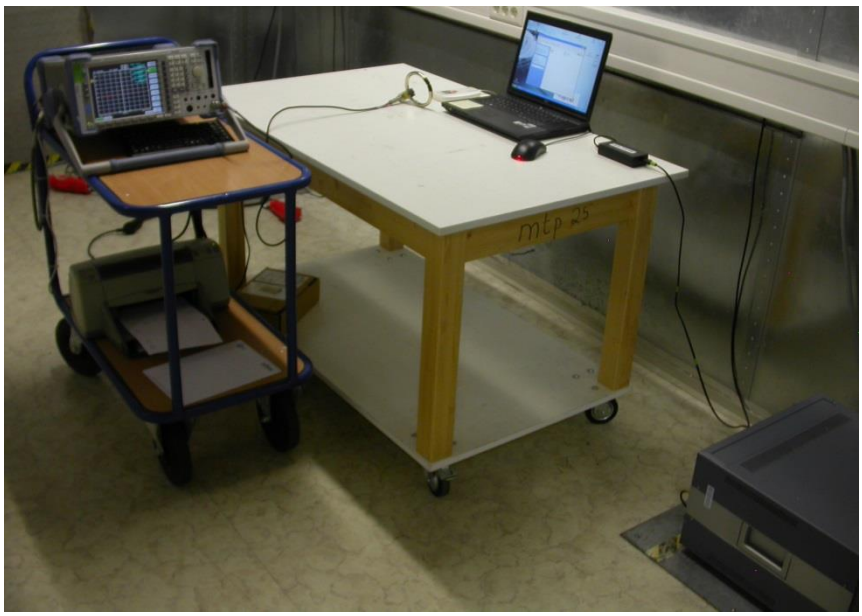
5.1 Conducted emissions

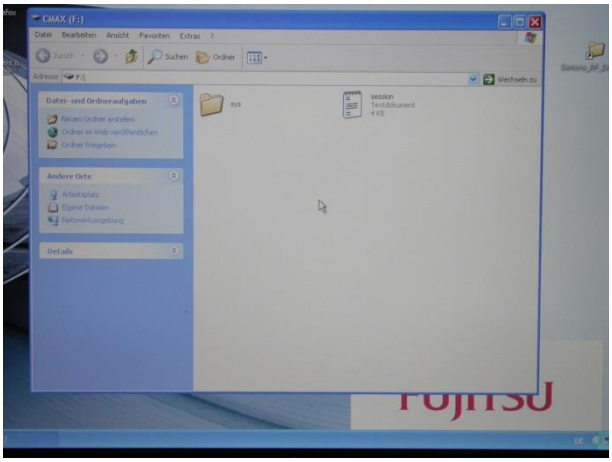
For test instruments and accessories used see section 6 Part **A 4**.

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 15B, Section 15.107(a):
Except as shown in paragraphs (b) and (c) of this Section, for an unintentional radiator 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 limits in the following table.

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

5.1.4 Description of Measurement

The correction factors for cable loss and antenna gain are stored in the memory of the EMI receiver therefore the final level (dBµV) appears directly in the reading of the EMI receiver. This level is compared to the FCC limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)

µV = 10^(dBµV/20)

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50Ω/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 appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

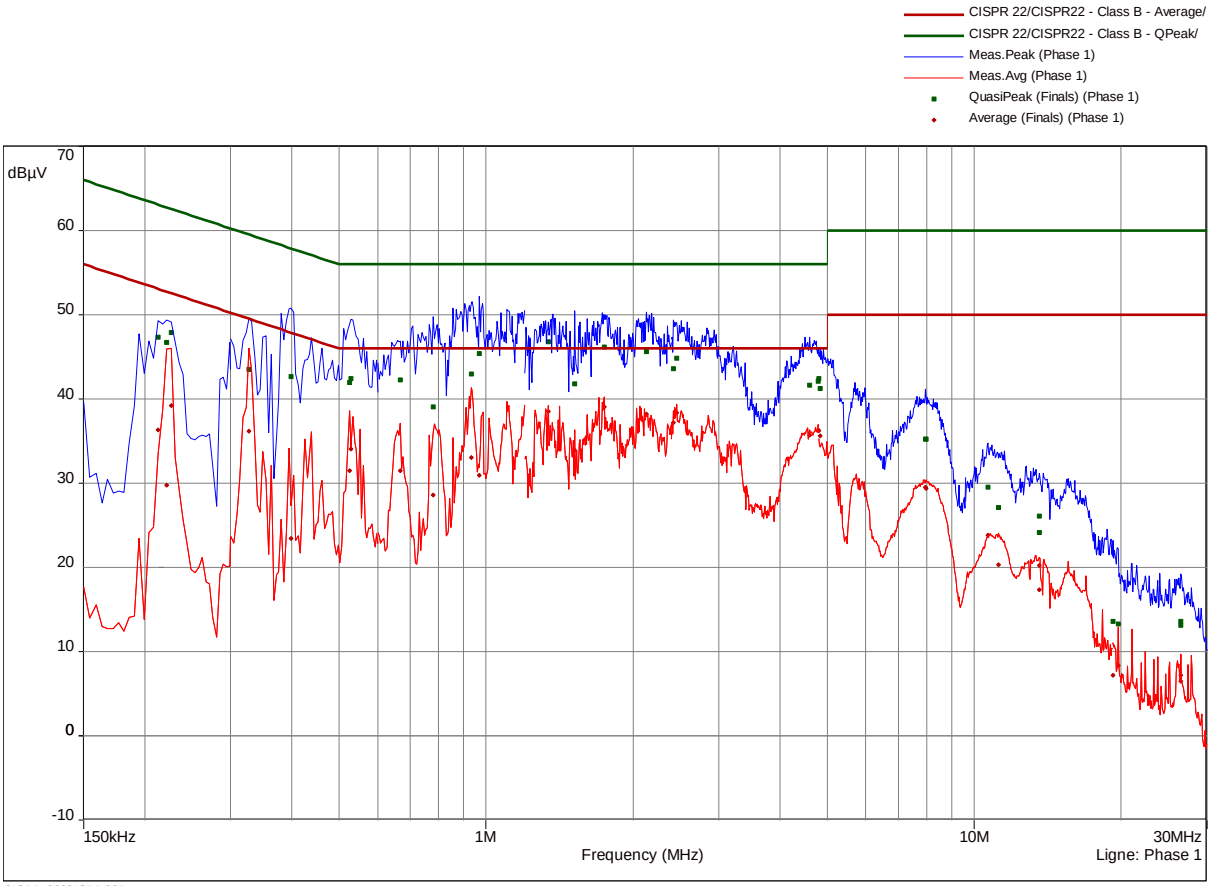
Min. limit margin 6.91 dB at 1.749 MHz

The requirements are **FULFILLED.**

Remarks: _____

5.1.6 Test protocol

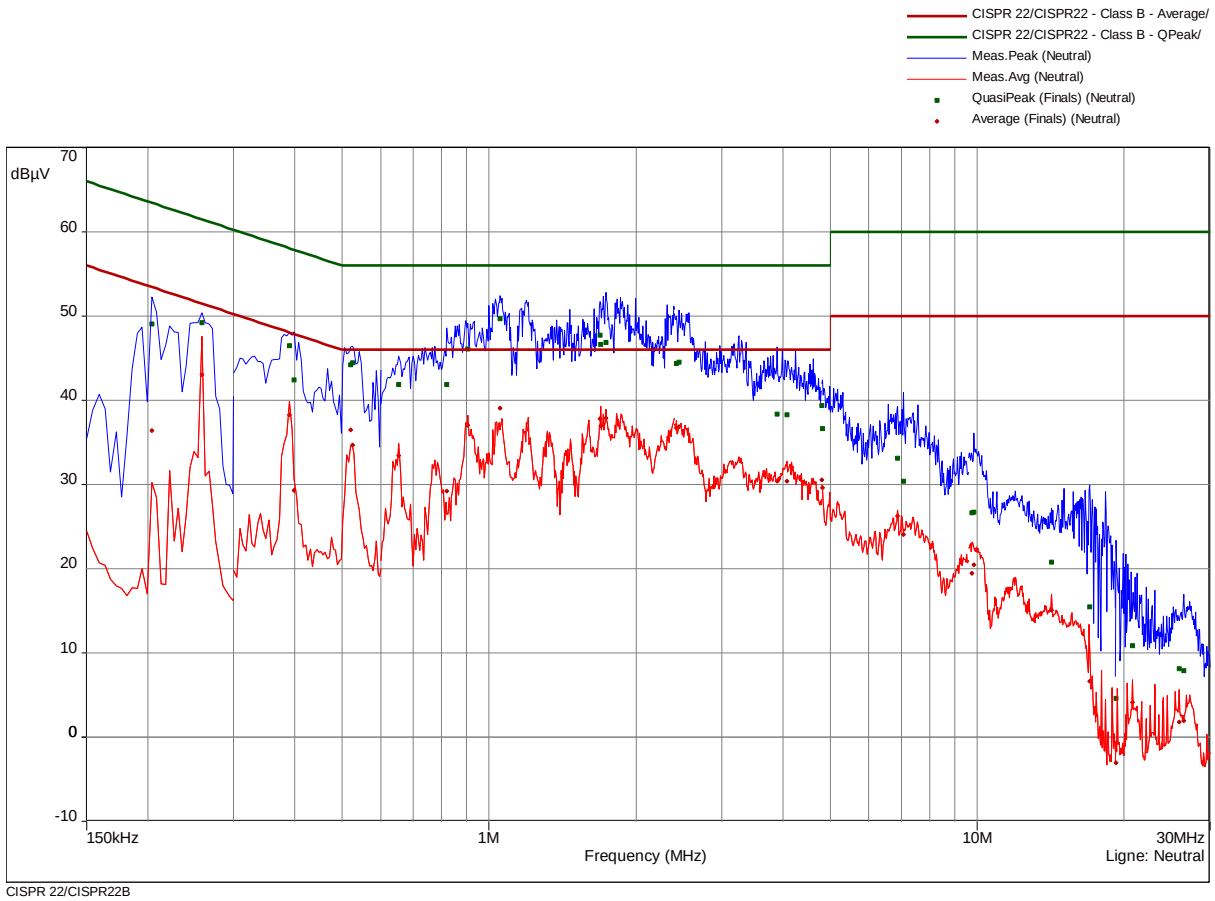
Test point:	L1	Result: passed
Operation mode:	Standby mode	
Remarks:	Connection via USB to a LapTop	
Date:		
Tested by:	Huber Markus	



CISPR 22/CISPR22B

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.213	1	47.37	15.72	63.09	36.37	16.72	53.09	Phase 1
0.222	1	46.73	16.01	62.74	29.75	22.99	52.74	Phase 1
0.2265	1	47.87	14.71	62.58	39.22	13.36	52.58	Phase 1
0.327	2	43.5	16.03	59.53	36.2	13.33	49.53	Phase 1
0.399	2	42.7	15.17	57.87	23.48	24.39	47.87	Phase 1
0.525	2	41.97	14.03	56	31.48	14.52	46	Phase 1
0.5295	2	42.41	13.59	56	34.04	11.96	46	Phase 1
0.6675	3	42.28	13.72	56	31.49	14.51	46	Phase 1
0.78	3	39.09	16.91	56	28.57	17.43	46	Phase 1
0.933	3	42.94	13.06	56	33.05	12.95	46	Phase 1
0.969	3	45.42	10.58	56	30.96	15.04	46	Phase 1
1.344	4	46.83	9.17	56	38.53	7.47	46	Phase 1
1.5195	4	41.8	14.2	56	33.95	12.05	46	Phase 1
1.749	4	46.21	9.79	56	39.09	6.91	46	Phase 1
2.1315	4	45.66	10.34	56	38.24	7.76	46	Phase 1
2.418	5	43.56	12.44	56	37.22	8.78	46	Phase 1
2.4585	5	44.82	11.18	56	38.35	7.65	46	Phase 1
4.605	5	41.68	14.32	56	35.72	10.28	46	Phase 1
4.7895	5	42.09	13.91	56	36.24	9.76	46	Phase 1
4.809	6	42.43	13.57	56	36.27	9.73	46	Phase 1
4.836	6	41.29	14.71	56	35.66	10.34	46	Phase 1
7.95	6	35.21	24.79	60	29.52	20.48	50	Phase 1
7.9725	6	35.21	24.79	60	29.38	20.62	50	Phase 1
10.68	7	29.56	30.44	60	23.86	26.14	50	Phase 1
11.229	7	27.09	32.91	60	20.33	29.67	50	Phase 1
13.5825	7	24.11	35.89	60	17.37	32.63	50	Phase 1
13.587	7	26.09	33.91	60	20.23	29.77	50	Phase 1
19.245	8	13.61	46.39	60	7.18	42.82	50	Phase 1
19.713	8	13.3	46.7	60	8.33	41.67	50	Phase 1
26.481	8	13.12	46.88	60	6.47	43.53	50	Phase 1
26.535	8	13.57	46.43	60	7.16	42.84	50	Phase 1

Test point:	N	Result: passed
Operation mode:	Standby mode	
Remarks:	Connection via USB to a LapTop	
Date:		
Tested by:	Huber Markus	



CISPR 22/CISPR22B

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.204	9	49.03	14.41	63.45	36.42	17.02	53.45	Neutral
0.258	9	49.25	12.24	61.5	43.03	8.46	51.5	Neutral
0.39	10	46.46	11.6	58.06	38.29	9.77	48.06	Neutral
0.399	10	42.46	15.41	57.87	29.33	18.54	47.87	Neutral
0.5205	10	44.21	11.79	56	36.51	9.49	46	Neutral
0.525	10	44.43	11.57	56	34.69	11.31	46	Neutral
0.654	11	41.9	14.1	56	33.42	12.58	46	Neutral
0.8205	11	41.9	14.1	56	29.21	16.79	46	Neutral
0.906	11	46.11	9.89	56	37.06	8.94	46	Neutral
1.0545	11	49.66	6.34	56	39.1	6.9	46	Neutral
1.6905	12	47.71	8.29	56	37.85	8.15	46	Neutral
1.695	12	46.67	9.33	56	36.99	9.01	46	Neutral
1.7355	12	46.89	9.11	56	37.91	8.09	46	Neutral
2.418	13	44.4	11.6	56	36.76	9.24	46	Neutral
2.454	13	44.56	11.44	56	36.87	9.13	46	Neutral
3.894	13	38.35	17.65	56	30.38	15.62	46	Neutral
4.0785	13	38.25	17.75	56	30.38	15.62	46	Neutral
4.8135	14	39.35	16.65	56	30.52	15.48	46	Neutral
4.818	14	36.67	19.33	56	29.65	16.35	46	Neutral
6.861	14	33.1	26.9	60	26.27	23.73	50	Neutral
7.068	14	30.39	29.61	60	24.08	25.92	50	Neutral
9.7575	15	26.61	33.39	60	19.44	30.56	50	Neutral
9.843	15	26.75	33.25	60	20.45	29.55	50	Neutral
14.181	15	20.77	39.23	60	15.11	34.89	50	Neutral
16.98	15	15.47	44.53	60	6.64	43.36	50	Neutral
19.236	16	4.59	55.41	60	-3.04	53.04	50	Neutral
20.784	16	10.83	49.17	60	4.13	45.87	50	Neutral
25.8915	16	8.1	51.9	60	1.77	48.23	50	Neutral
26.4945	16	7.86	52.14	60	1.94	48.06	50	Neutral

5.2 Radiated emissions

For test instruments and accessories used see section 6 Part **SER 1, SER 2**.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up

5.2.3 Applicable standard

According to FCC Part 15C, Section 15.209:
The emissions from intentional radiators shall not exceed the effective field strength limits.

5.2.4 Description of Measurement

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.
The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz:	RBW:	200 Hz
150 kHz – 30 MHz:	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz

5.2.5 Test result

Measurement distance: 3 m

Frequency [kHz]	L: QP [dBµV]	L: AV [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: QP [dBµV/m]	L: AV [dBµV/m]	Limit [dBµV/m]	Delta [dB]
536.8	24.1	19.7	9.0	20	44.1	39.7	73.0	-33.3
1073.6	23.4	18.0	9.0	20	43.4	38.0	67.0	-29.0
1342.0	21.6	15.9	9.0	20	41.6	35.9	65.0	-29.1

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient nosies could be detected!

Frequency [MHz]	L: QP [dBµV]	Correct. [dB]	L: QP [dBµV/m]	Limit [dBµV/m]	Delta [dB]
33.78	3.7	13.4	17.1	40.0	-22.9
118.54	9.3	12.9	22.2	43.5	-21.3
517.43	4.8	21.9	26.7	46.0	-19.3

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient nosies could be detected!

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The requirements are **FULFILLED.**

Remarks: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.

Only ambient noises could be detected.

5.3 Spurious emissions (antenna conducted)

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

5.3.1 Description of the test location

Test location: None

5.3.2 Photo documentation of the test set-up

5.3.3 Applicable standard

According to FCC Part 15B, Section 15.111(a):
In addition to the radiated emission limits, receivers that operate in the frequency range 30 MHz to 960 MHz that provide terminals for the connection of a external receiving antenna may tested to demonstrate compliance with provisions of §15.109 with the antenna terminals shielded and terminated.

5.3.4 Description of Measurement

The receiver antenna terminal was connected to the spectrum analyzer. The frequency range was scanned for spurious emissions up to 5 GHz and recorded in the table below if it comes closer as 20 dB to the limit.
Spectrum analyser setting:
RBW: 100 kHz
VBW: 100 kHz
Detector: peak

5.3.5 Test result

SPURIOUS EMISSIONS								
f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)
Measurement uncertainty			± 3 dB					

Bandwidth (kHz); refers to the bandwidth of the measuring receiver

Limit according to FCC Part 15B, Section 15.111(a):

Frequency (MHz)	Limit (nW)	Limit (dBm)
30-960	2.0	-57
Above 960	2.0	-57

Effective measurement range according to FCC Part 15A, Section 15.33(b)(1):

Highest frequency generated or used on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.0
1.705 - 108	1000.0
108 – 500	2000.0
500 – 1000	5000.0
Above 1000	5th harmonics of the highest frequency or 40 GHz, whichever is lower.

Remarks: The measurement is not applicable, because the EuT has no antenna connector.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	17/07/2015	17/07/2014		
	ESH 2 - Z 5	02-02/20-05-004	18/10/2015	18/10/2013	28/08/2014	28/02/2014
	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			10/10/2014	10/04/2014
	SP 103 /3.5-60	02-02/50-05-182				
SER 1	FMZB 1516	01-02/24-01-018			13/02/2015	13/02/2014
	ESCI	02-02/03-05-004	24/03/2015	24/03/2014		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	03/07/2015	03/07/2014		
	VULB 9168	02-02/24-05-005	08/04/2015	08/04/2014	08/10/2014	08/04/2014
	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				