EMI – TEST REPORT

- FCC Part 15B -

Type / Model Name : 5E9030.29

Product Description : Transponder Reader Mifare 22mm USB

Applicant : B&R Industrieelektronik GmbH

Address : B&R Strasse 1

A-5142 Eggelsberg

Manufacturer : B&R Industrieelektronik GmbH

Address : B&R Strasse 1

A-5142 Eggelsberg

Licence holder : B&R Industrieelektronik GmbH

Address : B&R Strasse 1

A-5142 Eggelsberg

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

Test Report No. : T41334-00-01HU	19. September 2016 Date of issue

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, 2015)

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, 2015)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ANSI C95.1:2005	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 capable to exchange data with a PC via Data cable USB.
This test report describes the radiated and conducted disturbance produced by the data transfer via Data cable and the LapTop.

For detailed information about the Equipment under test please refer to the user manual.
The EuT is declared as Class B digital device.

For testing, the USB Transponder Reader was set in TX-continuous mode. The test software is available for testing only.

Test setup:

See attachment C

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 : 06. July 2016

Testing concluded on : 14. July 2016

Checked by:

Klaus Gegenfurtner
I confirm the correctness and Integrity of this document
2016.09.20 08:14:53 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Markus Huber
I'm the author of this document
2016.09.19 16:40:02 +02'00'

Markus Huber

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 : Supplied via USB 5.0 V / DC

3.3 Short description of the equipment under test (EUT)

The EuT is a Transponder Reader which will be powerd via USB – Port.

Number of tested samples: 1
Serial number: Prototype

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

- Data download via Data Cable USB

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EUT configuration:

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

- Test software Model : Supplied by manufacturer
- LapTop Model : Supplied by CSA Group Bayern GmbH
- Model :
- Model :
- Model :
- Model :
- Model :
- Model :

- customer specific cables

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.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EuT	95%	± 2.5 x 10^{-7}
99% Occupied Bandwidth	Center frequency of EuT	95%	± 2.5 x 10^{-7}
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

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 C63.10: 2009, Testing Unlicensed Wireless Devices."
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.

4.6 Determination of worst case measurement conditions

- - NONE -

4.6.1 DETAILS OF TEST PROCEDURES

4.6.1.1 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

See attachment C

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	19.59 dB at 0.498 MHz

The requirements are **FULFILLED.**

Remarks: _____

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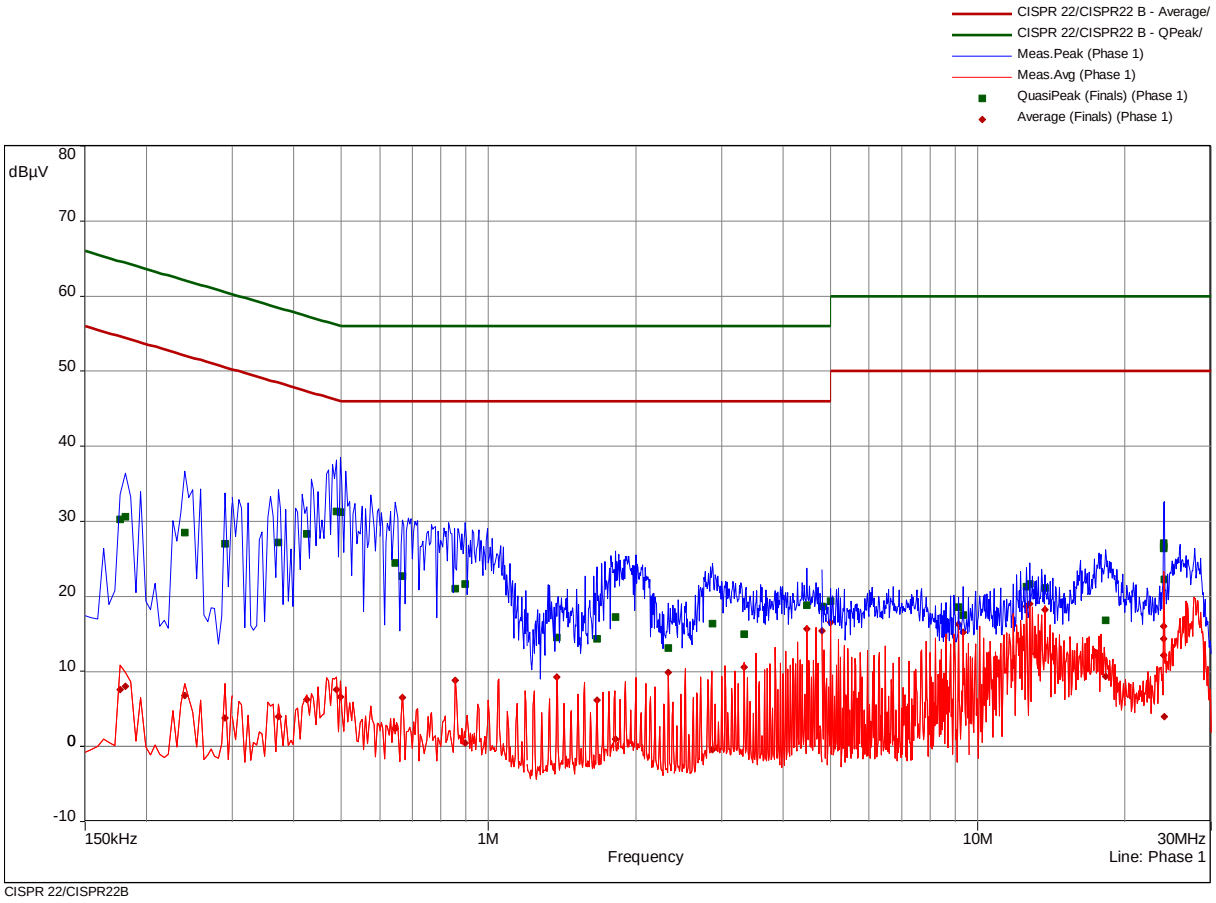
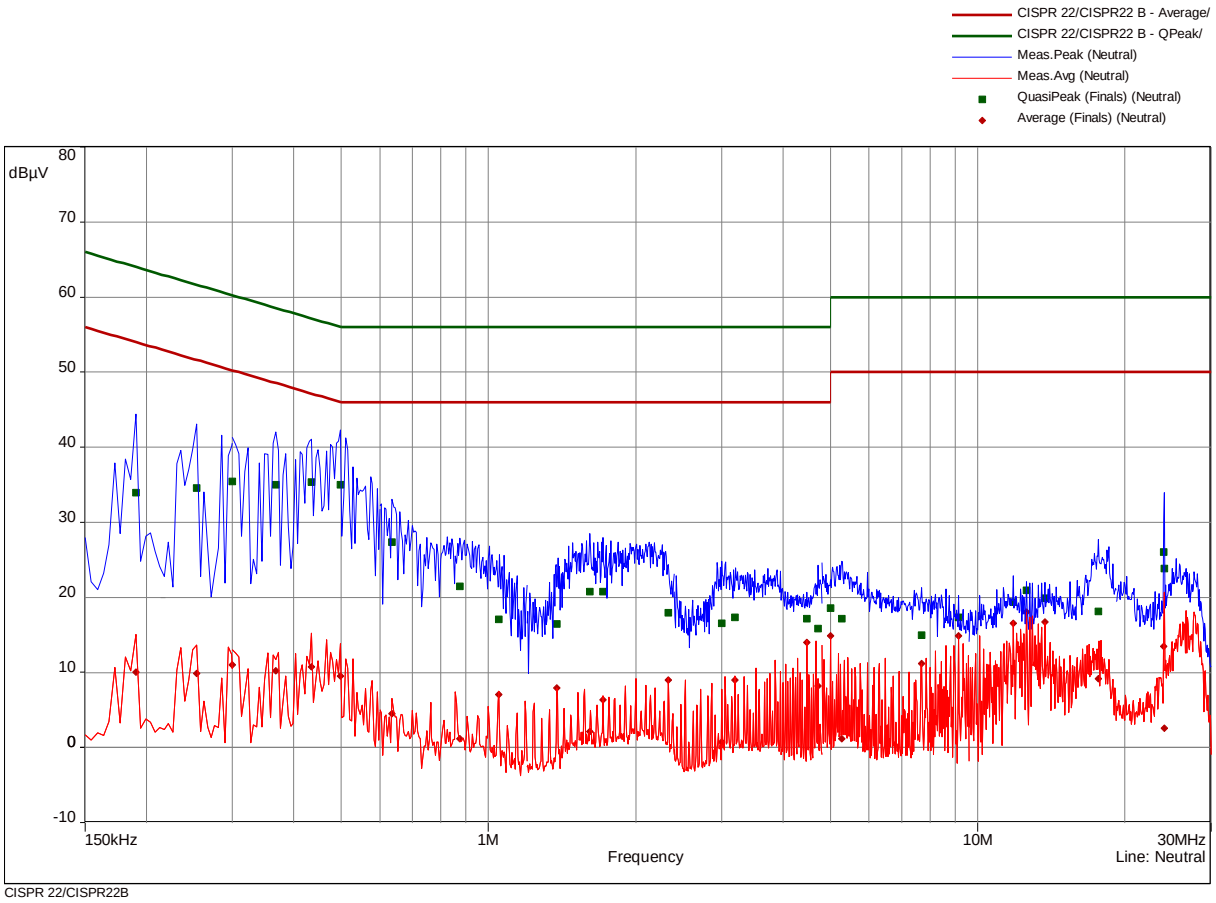
5.1.6 Test protocol

Test point L1 Result: Passed
Operation mode: Connection via USB
Remarks:



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.177	1	30.24	34.38	64.63	7.60	47.02	54.63	Phase 1	9.84
0.1815	1	30.66	33.76	64.42	8.04	46.38	54.42	Phase 1	9.84
0.24	1	28.49	33.60	62.10	6.80	45.29	52.10	Phase 1	9.83
0.2895	1	27.02	33.52	60.54	3.82	46.72	50.54	Phase 1	9.82
0.372	2	27.20	31.26	58.46	3.97	44.48	48.46	Phase 1	9.81
0.426	2	28.29	29.04	57.33	6.24	41.09	47.33	Phase 1	9.81
0.489	2	31.29	24.89	56.18	7.60	38.59	46.18	Phase 1	9.82
0.498	2	31.25	24.78	56.03	6.58	39.45	46.03	Phase 1	9.82
0.645	3	24.49	31.51	56.00	2.39	43.61	46.00	Phase 1	9.81
0.6675	3	22.70	33.30	56.00	6.55	39.45	46.00	Phase 1	9.81
0.8565	3	21.07	34.93	56.00	8.86	37.14	46.00	Phase 1	9.81
0.897	3	21.66	34.34	56.00	0.46	45.54	46.00	Phase 1	9.81
1.38	4	14.52	41.48	56.00	9.27	36.73	46.00	Phase 1	9.79
1.668	4	14.36	41.64	56.00	6.16	39.84	46.00	Phase 1	9.79
1.8165	4	17.21	38.79	56.00	1.00	45.00	46.00	Phase 1	9.80
2.334	4	13.12	42.88	56.00	9.83	36.17	46.00	Phase 1	9.79
2.868	5	16.40	39.60	56.00	-0.40	46.40	46.00	Phase 1	9.79
3.336	5	14.93	41.07	56.00	10.54	35.46	46.00	Phase 1	9.81
4.479	5	18.86	37.14	56.00	15.71	30.29	46.00	Phase 1	9.81
4.809	6	18.63	37.37	56.00	15.43	30.57	46.00	Phase 1	9.82
5.0025	6	19.35	40.65	60.00	16.56	33.44	50.00	Phase 1	9.82
9.147	6	18.57	41.43	60.00	16.29	33.71	50.00	Phase 1	9.87
9.336	6	17.52	42.48	60.00	15.21	34.79	50.00	Phase 1	9.88
12.5745	7	21.32	38.68	60.00	18.66	31.34	50.00	Phase 1	10.00
12.7635	7	21.67	38.33	60.00	18.98	31.02	50.00	Phase 1	10.01
13.7175	7	21.16	38.84	60.00	18.20	31.80	50.00	Phase 1	10.05
18.258	7	16.77	43.23	60.00	9.31	40.69	50.00	Phase 1	10.25
23.997	8	27.10	32.90	60.00	14.35	35.65	50.00	Phase 1	10.34
24.0015	8	26.63	33.37	60.00	12.19	37.81	50.00	Phase 1	10.34
24.006	8	26.43	33.57	60.00	16.00	34.00	50.00	Phase 1	10.34
24.0555	8	22.29	37.71	60.00	4.03	45.97	50.00	Phase 1	10.34

Test point N Result: Passed
Operation mode: Connection via USB
Remarks:



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.1905	9	33.96	30.05	64.01	10.01	44.01	54.01	Neutral	9.85
0.2535	9	34.55	27.09	61.64	9.88	41.76	51.64	Neutral	9.84
0.3	10	35.48	24.76	60.24	11.03	39.21	50.24	Neutral	9.82
0.3675	10	35.03	23.52	58.56	10.23	38.33	48.56	Neutral	9.81
0.435	10	35.37	21.78	57.16	10.78	36.38	47.16	Neutral	9.82
0.498	10	35.00	21.03	56.03	9.52	36.51	46.03	Neutral	9.82
0.636	11	27.38	28.62	56.00	4.51	41.49	46.00	Neutral	9.81
0.8745	11	21.45	34.55	56.00	1.19	44.81	46.00	Neutral	9.81
1.05	11	17.05	38.95	56.00	7.08	38.92	46.00	Neutral	9.81
1.38	12	16.50	39.50	56.00	7.96	38.04	46.00	Neutral	9.79
1.614	12	20.80	35.20	56.00	2.10	43.90	46.00	Neutral	9.79
1.7175	12	20.81	35.19	56.00	6.40	39.60	46.00	Neutral	9.79
2.334	12	17.92	38.08	56.00	9.03	36.97	46.00	Neutral	9.79
2.994	13	16.58	39.42	56.00	0.75	45.25	46.00	Neutral	9.79
3.192	13	17.36	38.64	56.00	9.00	37.00	46.00	Neutral	9.80
4.479	13	17.20	38.80	56.00	14.00	32.00	46.00	Neutral	9.80
4.713	13	15.86	40.14	56.00	8.19	37.81	46.00	Neutral	9.81
5.0025	14	18.56	41.44	60.00	14.89	35.11	50.00	Neutral	9.81
5.2815	14	17.16	42.84	60.00	1.20	48.80	50.00	Neutral	9.81
7.671	14	14.95	45.05	60.00	11.17	38.83	50.00	Neutral	9.81
9.147	14	17.36	42.64	60.00	14.84	35.16	50.00	Neutral	9.81
11.814	15	19.34	40.66	60.00	16.52	33.48	50.00	Neutral	9.85
12.5745	15	20.92	39.08	60.00	18.03	31.97	50.00	Neutral	9.87
13.7175	15	19.89	40.11	60.00	16.71	33.29	50.00	Neutral	9.90
17.628	15	18.15	41.85	60.00	9.20	40.80	50.00	Neutral	10.02
23.9745	16	26.01	33.99	60.00	13.51	36.49	50.00	Neutral	9.96
24.0915	16	23.82	36.18	60.00	2.60	47.40	50.00	Neutral	9.96

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

See attachment C

Test setup:

See attachment C

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 emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

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 spurious emissions from the EUT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 m horizontally from the EUT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31(f)(2). The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).

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. 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 dB(µV/m) non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees.

The resolution bandwidth during the measurement is as following:
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

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

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

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

Frequency (MHz)	Limit (µV/m)	Limit dB(µV/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 1 GHz.

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	17/07/2016	17/07/2015		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	21/07/2016	21/01/2016
	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	06/11/2016	06/11/2015	21/09/2016	21/03/2016
	SP 103 /3.5-60	02-02/50-05-182				
SER 1	FMZB 1516	01-02/24-01-018			21/01/2017	21/01/2016
	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	20/04/2017	20/04/2016	20/10/2016	20/04/2016
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				