



EMI - TEST REPORT

- FCC Part 15.249, RSS-210 -

Type / Model Name : Protero-915

Product Description : Wireless vibration sensor

Applicant : Elero GmbH Antriebstechnik

Address : Maybachstraße 30

73278 Schlierbach

GERMANY

Manufacturer : Elero GmbH Antriebstechnik

Address : Maybachstraße 30

73278 Schlierbach

GERMANY

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

POSITIVE

Test Report No. : T43669-00-04JP

09. April 2019

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October 2018)

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October 2018)

- Part 15, Subpart C, Section 15.209 Radiated emission limits, general requirements
- Part 15, Subpart C, Section 15.249 Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz

RSS-210 Issue 9, August 2016

Spectrum Management and Telecommunications Radio Standards
Specifications - Licence-exempt Radio Apparatus: Category I
Equipment

RSS-Gen Issue 5, April 2018

Spectrum Management and Telecommunications Radio Standards
Specifications - General Requirements and Information for the
Certification of Radio Apparatus

ANSI C63.10: 2013

Testing Unlicensed Wireless Devices

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT

External pictures of EuT:

Refer to document T43669-00-00JP Attachment B

Internal pictures of EuT:

Refer to document T43669-00-00JP Attachment C

2.2 Equipment category

Radio transceiver

2.3 Short description of the equipment under test (EUT)

The Protero-915 is a battery-operated, wireless vibration sensor for retractable arm awnings. It is used for protection of awnings against damage due to strong winds or other mechanical effects.

Part numbers of the product are 289650901 and 289660901.

Number of tested samples: 1

Serial number: none

2.4 Variants of the EUT

Two variants of the product are available. The difference is the color of the housing, a white version and a grey version exists.

2.5 Operation frequency

918.3 MHz

2.6 Transmit operating modes

- TX-Mode 918.3 MHz (continuous transmission with duty cycle >98%)
- RX-Mode 918.3 MHz

2.7 Antenna

Integral antenna.

2.8 Power supply system utilised

Power supply voltage, V_{nom} : 3 VDC (Battery supplied)

2.9 Peripheral devices and interface cables

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

- none Model : --

2.10 Determination of worst case conditions for final measurement

Measurements have been made in all three orthogonal axes to locate at which position of the EUT produce the maximum of the emissions. All measurements were made in worst case position

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207	RSS-Gen, 8.8	AC power line conducted emissions	not applicable*
15.215	RSS-Gen, 6.7	Bandwidth	passed
15.249	RSS-210 B.10	Field strength of fundamental	passed
15.249 & 15.209	RSS-Gen, 8.9 & RSS210 B.10	Out-of-band emission, radiated	passed

*not applicable EuT is battery supplied

3.1 Final assessment

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

This testreport replaces the report T43669-00-00JP.

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

Testing commenced on : 18 September 2018

Testing concluded on : 15 October 2018

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Jürgen Pessinger
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
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. 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%	$\pm 2.5 \times 10^{-7}$
99% Occupied Bandwidth	Center frequency of EuT	95%	$\pm 2.5 \times 10^{-7}$
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	Center frequency of EuT	95%	± 3.53 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.4 Measurement protocol for FCC and ISED

4.4.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011

ISED: DE0009

4.4.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

4.4.2.1 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.

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

Spurious emissions 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 setup of the equipment under test is established in accordance with ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center 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 center 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.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

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

Radiated emissions 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, 1.5 metre 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 C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center 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 center 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 analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak 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.

5 TEST CONDITIONS AND RESULTS

5.1 Field strength of fundamental

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

5.1.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

5.1.2 Photo documentation of the test set-up

Refer to document T43669-00-00JP Attachment A

5.1.3 Applicable standard

According to FCC Part 15.249 and RSS 210, B.10

EMI test receiver settings:

30 MHz – 1000 MHz: RBW: 120 kHz Detector: quasi-peak

5.1.4 Test result

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
918,26	55,4	62,1	29,2	28,8	84,6	90,9	94,0	-3,1

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

Limit according to FCC Part 15C, Section 15.249(a) and RSS-210 B.10:

Frequency (MHz)	Field strength of fundamental	
	(mV/m)	dB(µV/m)
902 - 928	50	94
2400 - 2483.5	50	94
5725-5875	50	94
24000 - 24250	250	108

The requirements are **FULFILLED**.

Remarks: none

5.2 Out-of-band emission, radiated

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 1
 Test distance: 3 m

5.2.2 Photo documentation of the test set-up

Refer to document T43669-00-00JP Attachment A

5.2.3 Applicable standard

According to FCC Part 15.209 and RSS Gen, 8.9

Instrument settings:
 30 MHz – 1000 MHz: RBW: 120 kHz Detector: quasi-peak
 1000 MHz – 10 GHz RBW: 1 MHz Detector: peak

5.2.4 Test result

TX mode

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
50,00*	4,8	3,9	14,2	13,2	19,0	17,1	40,9	-21,9
250,00*	3,6	4,7	12,9	13,1	16,5	17,8	46,0	-28,2
500,00*	3,6	3,9	21,4	21,1	25,0	25,0	46,0	-21,0
1836,60	58,0	60,4	-11,7	-11,7	46,3	48,7	54,0	-5,3
2754,90	55,9	53,4	-9,8	-9,8	46,0	43,6	54,0	-8,0
3673,20	54,4	52,9	-8,8	-8,8	45,5	44,1	54,0	-8,5
5509,80	42,6	45,5	4,5	4,5	47,1	50,0	54,0	-4,0
6428,10	40,2	41,6	6,7	6,7	46,9	48,3	54,0	-5,7
7346,40	--	41,1	--	7,1	--	48,2	54,0	-5,8
9183,00	--	41,5	--	10,3	--	51,8	54,0	-2,2

*no emissions above background noise found in the frequency range 30-1000MHz

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

RX mode

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
50,00*	4,8	3,9	14,2	13,2	19,0	17,1	40,9	-21,9
250,00*	3,6	4,7	12,9	13,1	16,5	17,8	46,0	-28,2
500,00*	3,6	3,9	21,4	21,1	25,0	25,0	46,0	-21,0
1097,40	59,3	55,1	-14,9	-14,9	44,4	40,2	54,0	-9,6
2047,50	59,9	54,9	-12,2	-12,2	47,7	42,7	54,0	-6,3
3219,30	53,0	52,6	-9,0	-9,0	44,0	43,6	54,0	-10,0
4992,00	49,8	44,2	3,8	3,8	53,6	48,0	54,0	-0,4

*no emissions above background noise found in the frequency range 30-1000MHz

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

Limit according to FCC Part 15C, Section 15.209 and RSS-Gen:

Frequency (MHz)	Limits (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic (10 GHz).

Above 1GHz the peak values are below the average limit. Therefore no average measurement

was conducted.

5.3 Bandwith

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

5.3.1 Description of the test location

Test location: AREA4

5.3.2 Photo documentation of the test set-up

Refer to document T43669-00-00JP Attachment A

5.3.3 Applicable standard

According to FCC Part 15, Section 15.215(c) and RSS-Gen 6.7:

Spectrum analyser settings:
See attached plots

5.3.4 Test result

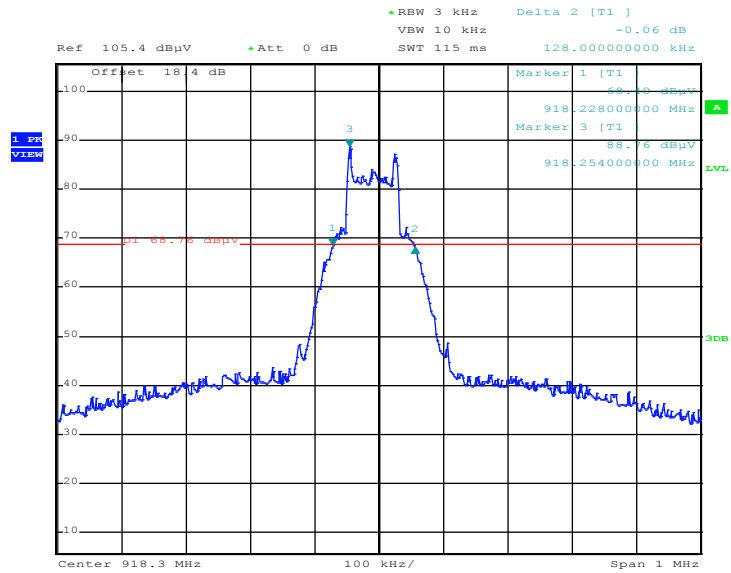
Fundamental [MHz]	20dB Bandwidth [MHz]	99% Bandwidth [MHz]
918.3	0.128	0.123

The requirements are **FULFILLED**.

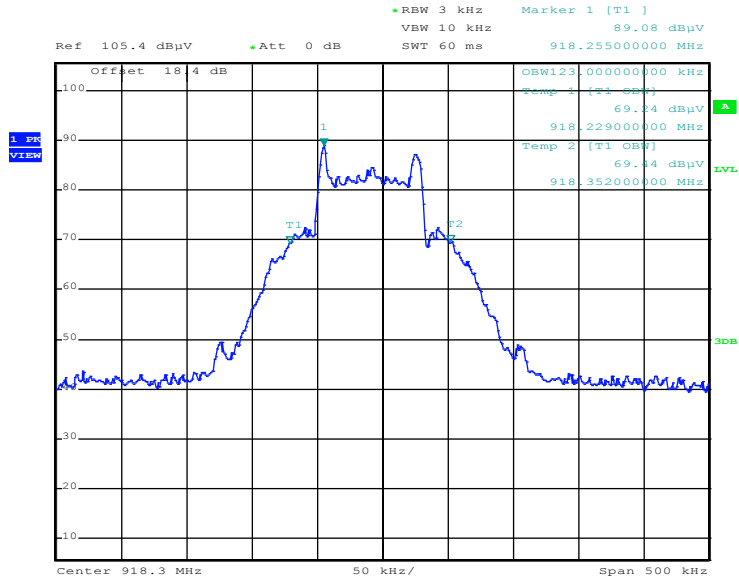
Remarks: For detailed test result please refer to following test protocols.

5.3.1 Test protocols

20 dB bandwidth



OBW 99%



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.
CPR 2	ESVS 30	02-02/03-05-006	06/06/2019	06/06/2018		
	VULB 9168	02-02/24-05-005	18/04/2019	18/04/2018		
	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				
MB	FSP 30	02-02/11-05-001	09/10/2019	09/10/2018		
SER 2	ESVS 30	02-02/03-05-006	06/06/2019	06/06/2018		
	VULB 9168	02-02/24-05-005	18/04/2019	18/04/2018		
	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				
SER 3	FSP 40	02-02/11-11-001	17/10/2019	17/10/2018		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	08/05/2019	08/05/2018		
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				