



EMI - TEST REPORT

- FCC Part 15.209, RSS-210 -

Type / Model Name : JXP-HPS3 / JET-HPS3

Product Description : RFID reading and writing device at 125 kHz

Applicant : INRO Elektrotechnik GmbH

Address : Leiderer Str. 12

63811 STOCKSTADT, GERMANY

Manufacturer : INRO Elektrotechnik GmbH

Address : Leiderer Str. 12

63811 STOCKSTADT, GERMANY

Licence holder : INRO Elektrotechnik GmbH

Address : Leiderer Str. 12

63811 STOCKSTADT, GERMANY

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

POSITIVE

Test Report No. : T42109-01-03HS

18. April 2017

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
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 (October, 2016)

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
Part 15, Subpart A, Section 15.38	Incorporation by reference

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2016)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
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ANSI C95.1:2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
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CISPR 16-4-2: 2003	Uncertainty in EMC measurement
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2 EQUIPMENT UNDER TEST

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

2.2 General remarks

The EUT is already tested and approved under Part 15.209. An IC in the system host for TX control is discontinued. A replacement is designed in. The RF part is identical. This is the reason for re-testing.

Therefore the

- output power
- spurious emissions

are measured in order to show the further compliance to FCC Part 15.209.

2.3 Short description of the equipment under test (EUT)

RFID reading and writing device for vehicular use especially for fork-lift trucks.

Number of tested samples: 1
Serial number: 21000

2.4 Peripheral devices and interface cables

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

- | | |
|-----------------------------------|----------------------------------|
| - DC Power Line and CAN Interface | Model : Supplied by the Customer |
| - - | Model : - |
| - | Model : |

2.5 Power supply system utilised

Power supply voltage, V_{nom} : 24 VDC

2.6 Determination of worst case conditions for final measurement

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

- Continuous tag reading at 125 kHz
-

2.6.1 Test jig

No test jig is used.

2.6.2 Test software

No test software is needed, the EUT starts reading after power on and gives the status over LED.

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 6.10	Pulsed operation	not applicable
15.203	RSS-Gen, 8.3	Antenna requirement	not applicable
15.204	RSS-Gen, 8.2	External radio frequency power amplifiers	not applicable
15.205(a)	RSS-Gen, 8.1	Emissions in restricted bands	not applicable
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	not applicable
-	RSS-Gen, 6.6	OBW	not applicable
15.209(a)	RSS-210, 4.3	Field strength of the fundamental wave	passed
15.209(a)	RSS-Gen, 8.9	General field strength limits	passed
-	RSS-Gen, 6.11	Transmitter frequency stability	not applicable

The mentioned RSS Rule Parts in the above table are related to:
 RSS-Gen, Issue 4, November 2014
 RSS-210, Issue 9, August 2016

3.1 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 : 09 March 2017

Testing concluded on : 09 March 2017

Checked by:

Tested by:

 Klaus Gegenfurter
 Teamleader Radio

 Hermann Smetana
 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 uncertainty table

Measurement output power, conducted	±1.5 dB
Measurement output power, radiated	±3.0 dB
Measurement spurious emissions, conducted	±3.0 dB
Measurement spurious emissions, radiated	±6.0 dB
Measurement frequency	±1 x 10 ⁻⁸

4.1 Measurement protocol for FCC and ISED

4.1.1 Test methodology

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A-1

The Anechoic chamber is a listed test site under the Canadian Test-Sites File-No:

IC 3009A-2

In compliance with RSS-GEN, testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

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.

4.1.2.1 General Standard information

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 C63.10 and applying the CISPR 22 limits.

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

Description of measurement

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 dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) 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	Level	+	Factor	=	Level	-	CISPR Limit	=
Delta								
(MHz)	(dBµV)		(dB)		(dBµV/m)		(dBµV/m)	(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	= -2.4

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

Description of measurement

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 Conducted emissions

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

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EUT is vehicular use.

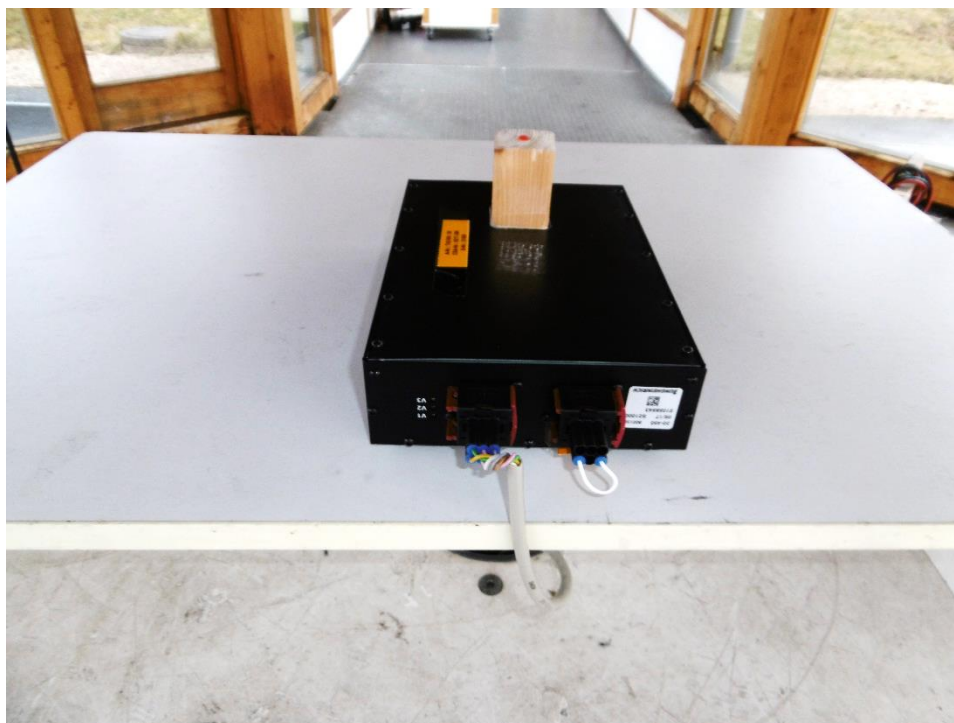
5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS 1
Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.3 Description of Measurement

The transmitted field strength of the EUT has to be measured at an open area test site using a tuned receiver and a shielded loop antenna. The set up of the equipment under test will be in accordance with ANSI C63.10. The measurement is performed at 3 m. The results have been compared to the limits defined at 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with an EMI receiver using quasi peak detector and a resolution bandwidth of 9 kHz.

5.2.4 Test result

- a) Result at a measurement distance of 3m

Frequency (kHz)	Level (dBμV)	Ant. factor (dB 1/m)	Field strength dB(μV/m)
125.0	76.8	20.0	96.8

- b) Result extrapolated to a distance of 300 m

Frequency (kHz)	Level (dBμV/m)	Cor factor (dB 3/300m)	Field strength dB(μV/m)	Limit dB(μV/m)	Delta (dB)
125.0	96.8	-80.0	16.8	25.7	-8.9

Limit according to FCC Part 15, Section 15.209(a):

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (metres)
	(μV/m)	dB (μV/m)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

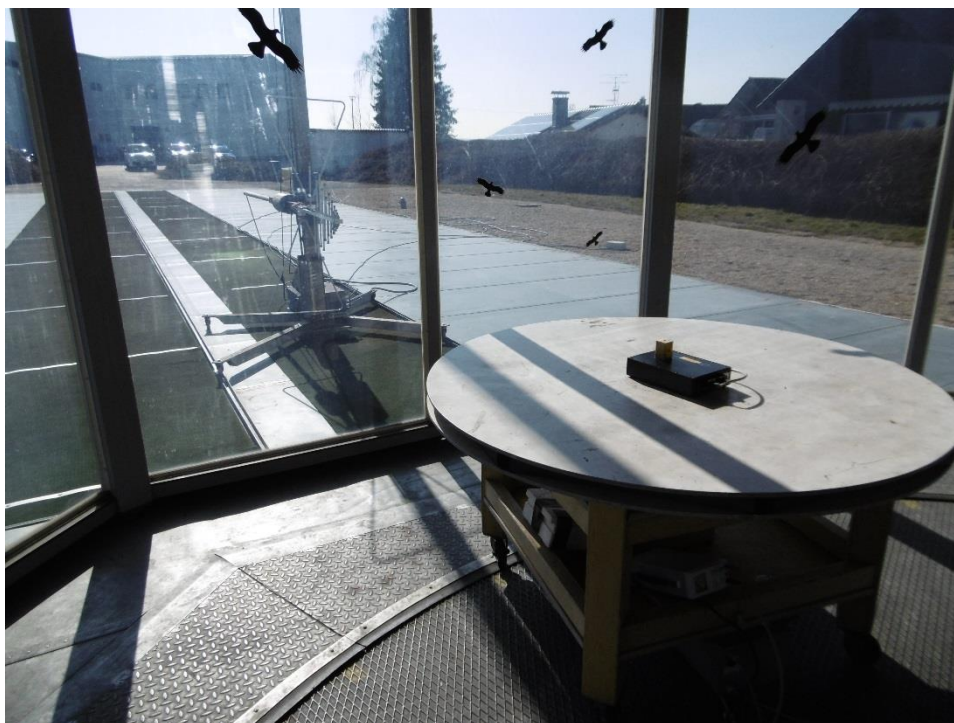
5.3 Spurious emissions

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

5.3.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up



5.3.1 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from an intentional radiator shall not exceed the field strength levels specified in the table below.

5.3.2 Description of Measurement

The spurious emissions of the EUT have to be measured at an open area test site in the frequency range from 9 kHz to 1000 MHz using a tuned EMI receiver. The set up of the equipment under test will be in accordance with ANSI C63.10. The measurement has been performed at 3 m. The results have been compared to the limits defined at 30 m or 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with the EMI receiver using 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).

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

5.3.3 Test result

$f < 30$ MHz:

Results at a measurement distance of 3 m are extrapolated to 300 m or 30 m

Frequency (kHz)	L: QP dB(μ V/m)	L: AV dB(μ V/m)	Bandwidth (kHz)	Corr. factor (dB)	L: QP dB(μ V/m)	L: AV dB(μ V/m)	Limit dB(μ V/m)	Delta (dB)
250	-	52.5	9	-80	-	-27.5	19.6	-47.1
375	-	52.6	9	-80	-	-27.4	16.1	-43.5
500	36.9	-	9	-40	-3.1	-	33.6	-36.7
625	41.1	-	9	-40	1.1	-	31.7	-30.6
750	28.7	-	9	-40	-11.3	-	30.1	-41.4

Note: Corr. factor is the factor between the distance 3 m, 30 m and 300 m.

$f > 30$ MHz:

Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
41.60	7.7		14.8		22.5		40.0	-17.5
180.00	3.6		13.3		16.9		43.5	-26.6
49.49		-4.0		14.2		10.2	40.0	-29.8
156.10		-2.7		15.1		12.4	43.5	-31.1
260.20		4.5		14.5		19.0	46.0	-27.0

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	
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

The requirements are **FULFILLED**.

Remarks: The highest frequency of the EUT is 64 MHz. Measurement is performed according
Part 15.33a(4) to 1000 MHz.

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 1	ESCI	02-02/03-05-005	12/12/2017	12/12/2016		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2017	23/03/2016	23/09/2016	23/03/2016
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 1	ESCI	02-02/03-05-005	12/12/2017	12/12/2016		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2017	23/03/2016	23/09/2016	23/03/2016
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-003	08/07/2017	08/07/2016		
	VULB 9168	02-02/24-05-005	20/04/2017	20/04/2016	01/03/2017	01/09/2016
	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				