EMI – TEST REPORT

- Human Exposure -

Type / Model Name	:	FFZ-radio module; eP 2.0 Slave FH
Product Description	:	Truck anchor for distance measurements to a person tag
Applicant	:	Jungheinrich AG
Address	:	Friedrich-Ebert-Damm 129
		22047 HAMBURG, GERMANY
Manufacturer	:	ACD Elektronik GmbH
Address	:	Engelberg 2
		88480 ACHSTETTEN, GERMANY

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

Test Report No. : T45420-00-01FX	11. May 2022 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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FCC ID: 2AK6M-EP20FMSLAVEFH

Contents

ATTACHMENT A1 and A2 as separate supplement

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1091	Radiofrequency radiation exposure evaluation: **mobile devices**.
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: **portable devices**.
KDB 447498 D01	RF Exposure procedures and equipment authorisation policies for mobile and portable devices, November 29, 2021.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
ETSI TR 100 028 V1.3.1: 2001-03,	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2

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2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – See ATTACHMENT A1 and A2

2.2 Equipment type, category

Part of Portable UWB Device

2.3 Short description of the equipment under test (EUT)

The EUT is one of 4 anchors, mounted on a truck. These anchors are communicating with the truck via CAN-bus and with one person tag via UWB. The operator wears the person tag on the body. After an initial pairing process between the EUT and the person tag (by NFC or UWB), the 4 anchors can localize the position of the person tag related to a truck fixed coordinate system. If there are no obstacles, the truck follows the EUT (in driving direction).

Number of tested samples: 1
Serial number: 187100000316
Firmware version: V2.07
UWB driver version: V2.5.9

EUT configuration:
(The CDF filled by the applicant can be viewed at the test laboratory.)

2.4 Variants of the EUT

There are no variants.

2.5 Operation frequency and channel plan

The operating frequency band is 3100 MHz to 10600 MHz.

Channel plan:

Channel number	Center frequency
Channel 2	3993.6 MHz

2.6 Transmit operating modes

Modulation: variable pulse position modulation (PPM) in combination with binary phase shift keying (BPSK)

Data rate: 6.8 Mbit/s

2.7 Antennas

The EUT uses an integrated UWB antenna.

2.8 Power supply system utilised

Power supply voltage, V_{nom} : 24 V DC

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3 TEST RESULT SUMMARY

FCC Rule Part	Description	Result
KDB 447498, 7.1	MPE	passed
KDB 447498, 4.3.1	SAR exclusion consideration	not applicable
KDB 447498, 7.2	Co-location, Co-transmission	not applicable

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 : 31 May 2019

Testing concluded on : 14 June 2019

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2022.05.11 14:37:47 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2022.05.11 14:26:53 +02'00'

Franz-Xaver Schrettenbrunner
Radio Team

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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 power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	± 2.5 x 10^{-7}
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
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
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

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5 HUMAN EXPOSURE

5.1 Maximum permissible exposure (MPE)

5.1.1 Applicable standard

According to RF exposure guidance:
Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

5.1.2 Determination of MPE

Calculation of the maximum time-averaged power of the UWB transmitter

Rated output spectral density:		-35.00 dBm/MHz
Measured UWB EBW:		689.4 MHz
Rated output power:	0.22 mW	-6.62 dBm
Tune-up tolerance:	2.77 dB	
Maximum output power:	-3.85 dBm	0.41 mW
Antenna gain max:	3.62 dBi	
Maximum EIRP:	-0.2 dBm	0.95 mW
Minimum distance r:	5.0 mm	

According to KDB 447498D04 Interim, clause 2.1.2: Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

The requirements are **FULFILLED.**

Remarks: As worst case, the peak value of the output power was summed up over the EBW.