Report on the FCC and IC Testing of the ASAP Electronics GmbH CARSHARING ZUSATZKARTENLESER In accordance with KDB 447498 and ISED RSS-102

Product Service

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Prepared for: ASAP Electronics GmbH
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COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	M. Steindl	2021-07-13	Steindl Martin *SIGN-ID 530808*
Authorised Signatory	Matthias Stumpe		Stump *SIGN-ID 349979*

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Engineering Statement:

This measurement shown in this report were made in accordance with the procedures described on test pages.
All reporded testing was carried out on a sample equipment to demonstrate limited compilance with with FCC 47 CFR Part 15 C and ISED RSS-247 and RSS-GEN.
The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	M. Steindl	2021-07-13	Steindl Martin *SIGN-ID 530809*

Laboratory Accreditation	Laboratory recognition	Industry Canada test site registration
DAkkS Reg. No. D-PL-11321-11-02 DAkkS Reg. No. D-PL-11321-11-03	Registration No. BNetzA-CAB-16/21-15	3050A-2

Executive Statement:

A sample of this product was tested and found to be compliant with KDB 447498 D01 V06 and ISED RSS-102:2015 + A1:2021

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Information pursuant to Section 2(1)
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Product Service

Content

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1 Report Summary

1.1 Modification Report

Alternations and additions of this report will be issued to the holders of each copy in the form of a complete document.

Issue	*Description of changes*	*Date of Issue*
1	First Issue	2021-07-13

Table 1: Report of Modifications

1.2 Introduction

Applicant	ASAP Electronics GmbH
Manufacturer	ASAP Electronics GmbH
Model Number(s)	CARSHARING ZUSATZKARTENLESER
Serial Number(s)	---
Hardware Version(s)	V1.5
Software Version(s)	V1.5
Number of Samples Tested	1
Test Specification(s) /	FCC 47 CFR Part 15 C : 2019
Issue / Date	ISED RSS-247, Issue 2 : 2017
	ISED RSS-GEN, Issue 5, Amendment 1 : 2019
Test Plan/Issue/Date	---
Order Number	B15-19-31857
Date	2019-07-29
Date of Receipt of EUT	2020-05-28
Start of Test	2020-05-28
Finish of Test	2020-07-01
Name of Engineer(s)	Alex Fink, Agnieszka Hruszcz
Related Document(s)	ANSI C63.4: 2014
	ANSI C63.10: 2013
	FCC 47 CFR Part 2 J : 2020
	KDB 558074 D01 V05R02
	ISED RSS-102, Issue 5, 2015 + A1:2021

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15 C, ISED RSS-247 and ISED RSS-GEN is shown below.

Section	*Specification Clause*	*Test Description*	*Result*
Transmitting Continuously – BLE Advertising with Channel switching without RFID Continuously reading RFID Tag - BLE Advertising with RFID Transmitting Continuously – BLE Fast Channel Switch			
2.1	15.247(i)	RF Exposure	

Table 2: Results according to FCC 47 CFR Part 15 C

Section	*Specification Clause*	*Test Description*	*Result*
Transmitting Continuously – BLE Advertising with Channel switching without RFID Continuously reading RFID Tag - BLE Advertising with RFID Transmitting Continuously – BLE Fast Channel Switch			
2.1	3.4	RF Exposure	

Table 3: Results according to RSS-Gen

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1.4 Product Information

1.4.1 Technical Description

CARSHARING ZUSATZKARTENLESER is a BLE Advertising device with / without RFID function.

Operating frequency:	13.56 MHz RFID 2.4 GHz BLE
Frequency Band	2400.0 MHz – 2483.5 MHz
Number of frequency channels:	40
Emission designator:	2M00
Supply Voltage:	3.0 V battery supplied
Supply Frequency:	---
Highest clock frequency (radio part):	2.4 GHz
Highest clock frequency (non-radio part):	32.0 MHz

1.4.2 List of Antennas

Manufacturer	*Model*	*Antenna impedance*	*Antenna Type*	*Antenna gain*
STMicroelectronics	AN3359	50 Ohm	PCB Antenna	1.95 dBi

Table 4: List of antennas

1.4.3 EUT Ports / Cables identification

Port	Max Cable Length specified	Usage	Type	Screened
Transmitting continuously – BLE Advertising with Channel Switching without RFID, 80:E1:26:08:44:B4 Continuously reading RFID Tag - BLE Advertising with RFID, 80:E1:26:08:49:2F Transmitting continuously – BLE Fast Channel Switch, 80:E1:26:08:45:7E Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84				
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Table 5 Ports and Cables identification

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1.5 Test Configuration

Transmitting Continuously – BLE Advertising with Channel Switching without RFID.
Continuously reading RFID Tag - BLE Advertising with RFID
Transmitting Continuously - BLE Fast Channel Switch

1.6 Modes of Operation

Transmitting Continuously – BLE Advertising with Channel Switching without RFID.
Continuously reading RFID Tag - BLE Advertising with RFID
Transmitting Continuously – BLE Fast Channel Switch

1.7 Deviations from Standard

None.

1.8 EUT Modifications Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Transmitting Continuously – BLE Advertising with Channel Switching without RFID, 80:E1:26:08:44:B4			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 6

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Continuously reading RFID Tag - BLE Advertising with RFID, 80:E1:26:08:49:2F			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 7

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:45:7E			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 8

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Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 9

1.9 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	Name of Engineer(s)
Transmitting Continuously – BLE Advertising with Channel Switching without RFID, 80:E1:26:08:44:B4	
Emission Bandwidth	Alex Fink, Agnieszka Hruszcz
Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84	
Output Power	Alex Fink, Agnieszka Hruszcz
Power Spectral Density	Alex Fink, Agnieszka Hruszcz
Frequency Band Edges	Alex Fink, Agnieszka Hruszcz
Continuously reading RFID Tag - BLE Advertising with RFID, 80:E1:26:08:49:2F Transmitting Continuously – BLE Advertising with Channel Switching without RFID, 80:E1:26:08:44:B4 Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84	
Spurious Emissions	Alex Fink, Agnieszka Hruszcz
Transmitting Continuously – BLE Advertising with Channel Switching without RFID, 80:E1:26:08:44:B4 Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:45:7E Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84	
Frequency stability	Alex Fink, Agnieszka Hruszcz
Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84	
RF Exposure	Alex Fink, Agnieszka Hruszcz

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2 Test Details

2.1 RF Exposure

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(i)
FCC 47 CFR Part 2 J, Clause 2.1093
KDB 447498 D01 V06, section 4.3.1
ISED RSS-Gen, Clause 3.4
ISED RSS-102, Clause 2.5.1

2.1.2 Equipment under Test and Modification State

CARSHARING ZUSATZKARTENLESER, Transmitting Continuously BLE Fast Channel Switch, 80:E1:26:08:44:84, Modification State 0

2.1.3 Date of Test

2020-07-01

2.1.4 Environmental Conditions

Ambient Temperature	24.0 °C
Relative Humidity	50.0 %

2.1.5 Test Method

Estimation is based on output power test.
For details please refer to section **Fehler! Verweisquelle konnte nicht gefunden werden.** of this test report.

2.1.6 Specification Limits

KDB 447498, section 4.3.1
Systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy levels in excess of the Comission's guideline.
Acc. to KDB 477498:
The 1 g and 10 g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separations distances ≤ 50 mm are determined by:

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$$\frac{max.\ power\ of\ channel, incl.\ tune-up\ tol., mW}{min. test\ separation\ distance, mm} \cdot \sqrt{f, GHz} \leq \begin{Bmatrix} 3.0\ for\ 1\ g \\ 7.5\ for\ 10\ g \end{Bmatrix} extremity\ SAR$$

1. *f* (GHz) is the RF channel frequency in GHz;
2. Power and distance are rounded to the nearest mW and mm before calculation;
3. The result is rounded to one decimal place for comparison;
4. 3.0 and 7.5 are referred to as the numeric thresholds

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

ISED RSS-102, Clause 2.5.1
SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table.
For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.
For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.:

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Frequency (MHz)	Exemption limits (mW)[1] at separation distance of									
	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥50 mm
≤300 [2]	71	101	132	162	193	223	254	284	315	345
450	52	70	88	106	123	141	159	177	195	213
835	17	30	42	55	67	80	92	105	117	130
1900	7	10	18	34	60	99	153	225	316	431
2450	4	7	15	30	52	83	123	173	235	309
3500	2	6	16	32	55	86	124	170	225	290
5800	1	6	15	27	41	56	71	85	97	106

[1] The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separaton distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from alinear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from athird order polynomial fit.

[2] Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.

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2.1.7 Test Results

FCC 47 CFR Part 15 C, Clause 15.247(i)

Maximum output power:	0.036 mW
Minimum test separation distance:	5 mm
Frequency:	2.426 GHz
SAR test exclusion threshold (calculated):	0.0112
Limit (1 g SAR):	3.0
Limit (10 g SAR):	7.5
Test Result:	PASS

ISED RSS-Gen, Clause 3.4

Frequency:	2.2426 GHz
Test distance:	5 mm
Carrier Power (e.i.r.p.):	0.036 mW
Exemption limit:	4 mW
Test Result:	PASS

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3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 10 Measurement uncertainty based on CISPR 16-4-2

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Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Occupied Bandwdith	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
9 kHz ≤ f < 26.5 GHz	2	± 6.5 dB
26.5 GHz ≤ f < 60 GHz	2	± 8.0 dB
60 GHz ≤ f < 325 GHz	2	± 10 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10^{-7}
The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 11 Measurement uncertainty based on ETSI TR 100 028