HS-TECHNIK GMBH
TEST REPORT

SCOPE OF WORK
EMC TESTING – CHARGING STATION MV-3

REPORT NUMBER
2236759KAU-001

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DOCUMENT CONTROL NUMBER
EMC_FCCpart15_ICES003 (12-September-2017)

TYPE:	**Charger Station MV-3**
DESCRIPTION:	**Charger station for charging max. 4 battery packs**
SERIAL NO:	**19320035**

All measurement results refer to the equipment which was tested

MANUFACTURER:	HS-Technik GmbH
CUSTOMER NAME:	HS-Technik GmbH
ADDRESS (CUSTOMER):	Im Martelacker 12 DE - 78588 Efringen-Kirchen Germany
REPORT NO:	2236759KAU-001
TEST RESULT:	The FCC, part 15 B Certification requirements are fulfilled.
TEST LABORATORY:	Intertek Deutschland GmbH Innovapark 20, 87600 Kaufbeuren Germany
FCC DESIGNATION NUMBER:	DE0014
FCC TEST FIRM REGISTRATION NUMBER:	359260
ISED CAB IDENTIFIER:	DE0014
ISED #:	24854
COMPILED BY:	W. Schneider Test Technician
SUPERVISOR:	S. Beckmann Project Engineer
APPROVED BY:	C. Kathan Project Engineer

Details about Accreditations/Acceptances

EMC / Radio National

DAkkS Deutsche Akkreditierungsstelle D-PL-12085-01-01	The Intertek Deutschland EMC-Lab is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) Registration Number (EMC general): **D-PL-12085-01-01** Registration Number (EMC Med): **D-PL-12085-01-03**

International

IECEE CB SCHEME	The Intertek Deutschland EMC-Lab is accepted to participate in the IECEE (IEC Conformity assessment for Electrotechnical Equipment and Components) CB-Scheme CB Test Laboratory: **TL118**
FCC Federal Communications Commission	The Intertek Deutschland EMC-Lab is accredited for the Federal Communications Commission (FCC) Designation Number: **DE0014** Test Firm Registration Number: **359260**
Bundesnetzagentur BNetzA-CAB-16/21-10	The *Bundesnetzagentur* recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).
Innovation, Science and Economic Development Canada	The Intertek Deutschland EMC-Lab is accredited for Innovation, Science and Economic Development Canada (ISED) ISED CAB IDENTIFIER: **DE0014** ISED #: **24854**

Automotive

KBA Anerkennungsstelle Anerkannt unter KBA-P 00046-03	The Intertek Deutschland EMC-Lab is recognized as technical service of the Kraftfahrt-Bundesamt (KBA) Registration Number: **KBA-P 00046-03**

SECTION 1
CONTENTS

SECTION 2
MEASUREMENT AND TEST SPECIFICATION

☐ FCC, Part 15 B, Class A, SDoC

☒ FCC, Part 15 B, Class A, certification

The test setup and test were conducted according to: **ANSI C63.4: 2014**
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Tests according to:

ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz, ANSI C63.4-2014 (Revision of ANSI C63.4-2009).

The test results detailed in this report apply only to the **Charger Station MV-3** with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.
The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

SECTION 3
GENERAL INFORMATION

Possible test case verdicts:		
Test case does not apply to the test object:	N/A (Not Applicable)	
Test object does meet the requirement:	P (Pass)	
Test object does not meet the requirements:	F (Fail)	
Samples arrived:	2019-07-22	
Testing:	2019-08-20, 2019-08-21	
Decimal separator:	☐ Point	☒ Comma
Environmental conditions during testing:	Temperature:	15 °C - 35 °C
	Humidity:	20 % - 60 %
	Atmospheric pressure:	900 mbar - 1000 mbar
	If explicitly required by a basic standard the measured climatic conditions are documented in the corresponding test section.	

SECTION 4
SUMMARY OF TESTING

4.1 General annotation

The tests were performed in the order of the right column in the “Test Results – Overview” table.

4.2 Measurement uncertainty

For each test method, an uncertainty evaluation was carried out. The results of the evaluation can be provided upon request from Intertek Deutschland GmbH.

4.3 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2019-09-09	2236759KAU-001	Initial issue	WSC

SECTION 5
TEST RESULTS – OVERVIEW

EMISSION	REQUESTED	VERDICT	DATE	NO
Conducted emissions (0.15 MHz - 30 MHz)	Class A	P	2019-08-21	2
Radiated emissions (30 MHz - 1 GHz)	Class A	P	2019-08-20	1

SECTION 6
INFORMATION ABOUT THE EUT

6.1 Description of the EUT

☒ table-top EUT		☐ floor-standing EUT	
Dimensions:	Height:	Width:	Length:
	170 mm	539 mm	182 mm
Software version:	-		
Prototype or Product version:	Product version		
Description: Charger station is a device for charging 1 - 4 battery packs.			

6.1.1 Photo of the device and the rating plate

Rating plate:

6.2 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
1	120	60	Used for all measurements

Power sources/associated test equipment

DEVICE	MANUFACTURER	TYPE	SN	ASSET NO.
4 quadrant amplifier	Spitzenberger & Spies	PAS 5000	826149/005	PM KF 2555

6.3 Configuration mode

MODE	DESCRIPTION
1	EUT was connected to mains by provided power cable.

6.4 Operation mode

MODE	DESCRIPTION
1	Continuous operation during charging 4 battery packs

6.5 Peripheral devices used for testing

PRODUCT TYPE	MANUFACTURER/MODEL
Rechargeable Li-Ion Battery	HS Technik GmbH/HST-PR-1850
Rechargeable Li-Ion Battery	HS Technik GmbH/HST-PR-1850
Rechargeable Li-Ion Battery	HS Technik GmbH/HST-PR-1850
Rechargeable Li-Ion Battery	HS Technik GmbH/HST-PR-1850

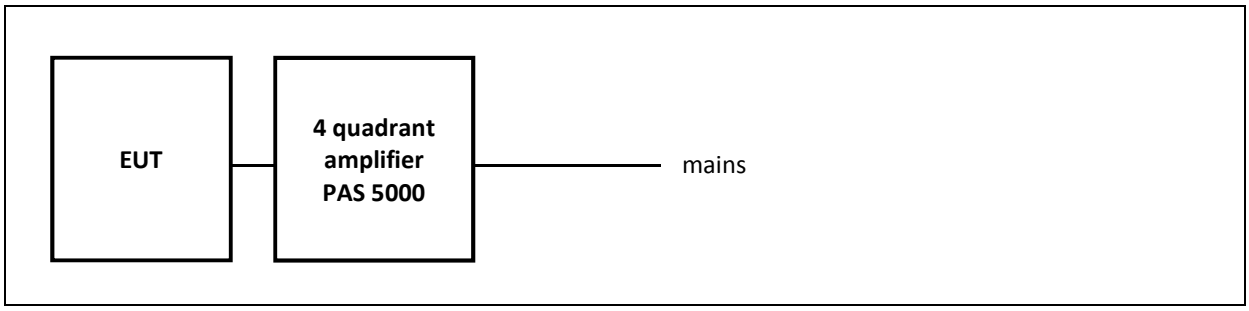
6.6 Supply and interconnecting cables used for testing

LINE	LENGTH (cm)	SHIELDING
AC Mains	198	N

6.7 Clock frequencies of the EUT

SOURCE	FREQUENCY (MHz)
EUT	16

6.8 Block diagram of the test setup



SECTION 7
EMISSIONS

7.1 Conducted emissions

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC, Part 15 B**		**P**
Methods of measurement according to:	**ANSI C63.4**		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	150 kHz - 30 MHz	
	Class	A	

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Shielded cabin	ETS LINDGREN	RFSD 100	3598	PM KF 2955-2	-
Pulse Limiter 10 dB 9 kHz - 200 MHz	Schwarzbeck	VTSD 9561-F N	9561-F N242	PM KF 3059	2019-01 (1 year)
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2019-04 (1 year)
V-Artificial mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	863367/018	PM KF 0142	2017-10 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.8.54	-	PM KF 2983	-

Comment
The EUT does fulfil the requirements of Class A.

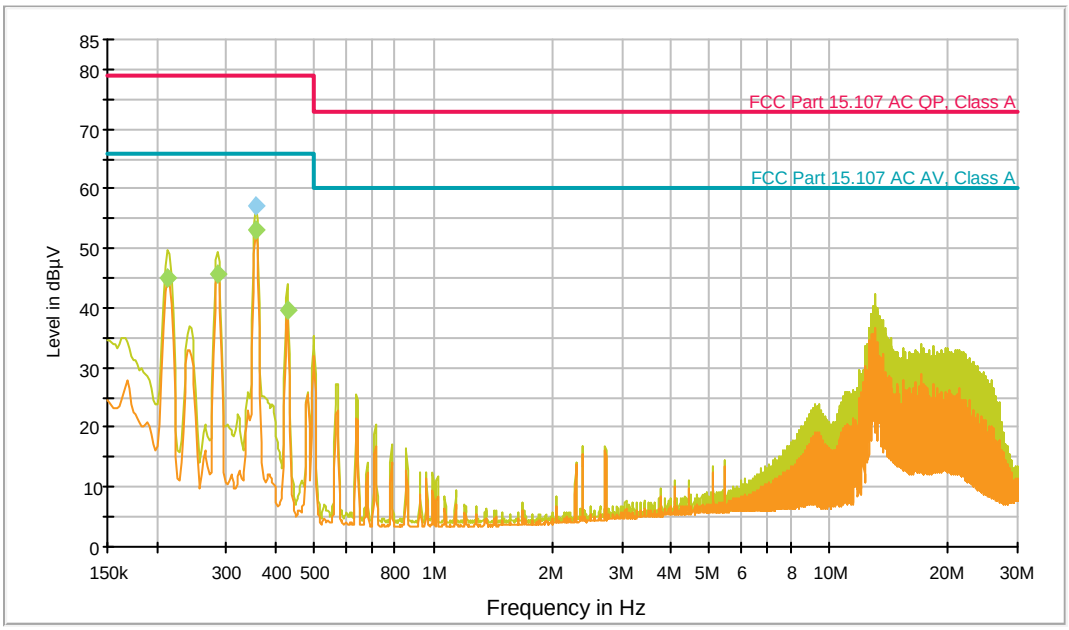
Measurement results – Conducted emissions:

Intertek Test Report

Common Information

EUT:	Charger Station MV-3
Project No.:	36759
Test description:	Conducted Emissions, 150 kHz - 30 MHz
Test standard:	FCC Part 15B, Class A
Tested port:	Mains
Test verdict:	Passed
Operating conditions:	120 V / 60 Hz, continuous operation, charging, 4 battery packs attached to charger
Operator name:	WSC, SBE
Date of testing:	21.08.2019

EN-CE-R32-LN01



FCC Part 15.107 AC QP, Class A [..\EMI conducted\FCC Part 15 Subpart B\]
FCC Part 15.107 AC AV, Class A [..\EMI conducted\FCC Part 15 Subpart B\]
Preview Result 1-QPK [Preview Result 1.Result:1]
Preview Result 2-CAV [Preview Result 2.Result:2]
Final Result 1-QPK [Final Result 1.Result:1]
Final Result 2-CAV [Final Result 2.Result:1]

Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.357000	57.2	GN	L1	9.9	21.8	79.0	

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.213000	45.0	GN	N	10.0	21.0	66.0	
0.285000	45.5	GN	L1	9.9	20.5	66.0	
0.357000	52.9	GN	N	9.9	13.1	66.0	
0.426750	39.6	GN	N	9.9	26.4	66.0	

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBµV - 80 dBµV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.107 AC QP, Class B
Limit Line #2: FCC Part 15.107 AC AV, Class B
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

7.2 Radiated emissions – Electric field strength

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC, Part 15 B**		**P**
Methods of measurement according to:	**ANSI C63.4**		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	30 MHz - 1 GHz	
	Antenna distance	3 m	
	Class	A	

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2016-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2019-04 (1 year)
Trilog broadband antenna	Schwarzbeck	VULB 9163	9163-974	PM KF 3196	2019-09 (1 year)
Test software	Rohde & Schwarz	EMC 32 V.10.50.10	-	PM KF 2983-2	-

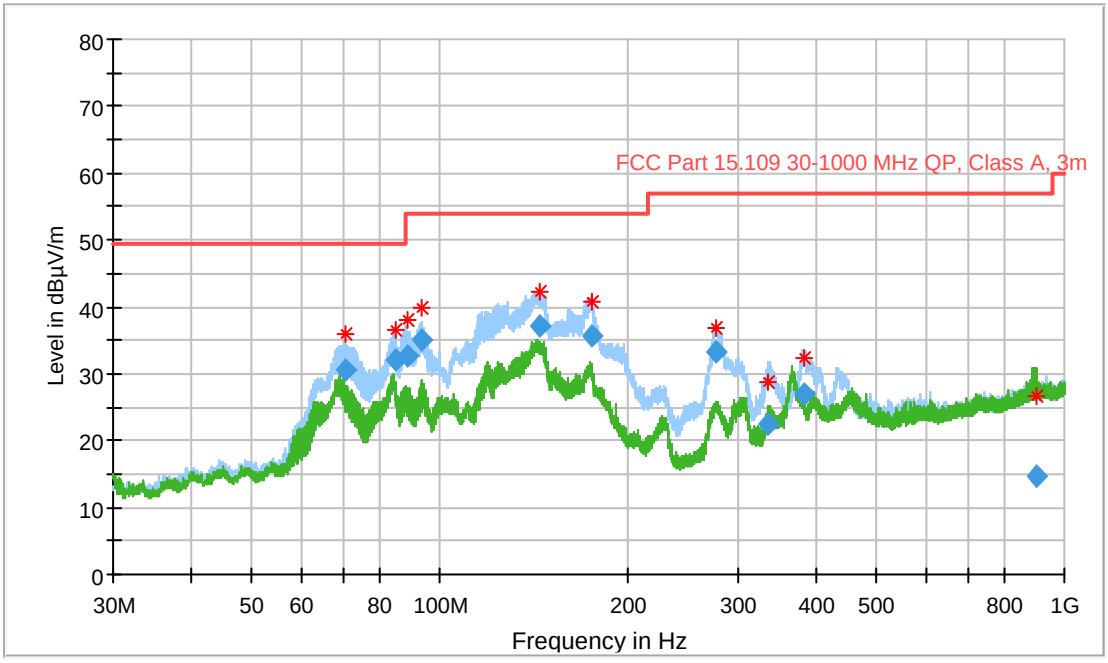
Comment
The EUT does fulfil the requirements of Class A.

Measurement results – Radiated emissions:

Radiated Emissions Test Report

Common Information

EUT:	Charger Station MV-3
Test Verdict:	Passed
Test Description:	Radiated Emissions, FCC part 15 subpart B, Class A, 30 - 1000 MHz
Operating Conditions:	120 V / 60 Hz, continuous operation, charging, 4 battery packs attached to charger
Operator Name:	WSC, SBE
Project Number:	36759
Date	20.08.2019
Comment:	



Preview Result 1H-PK+ [Preview Result 1H.Result:2]
Preview Result 1V-PK+ [Preview Result 1V.Result:2]
Critical_Freqs PK+ [Critical_Freqs.Result:4]
FCC Part 15.109 30-1000 MHz QP, Class A, 3m [..\EMI radiated\FCC Part 15B\]
Final_Result QPK [Final_Result.Result:4]
MaxPeak-PK+ (Single) [Result Table_Single.Result:1]
QuasiPeak-QPK (Single) [Result Table_Single.Result:2]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
70.440000	30.58	49.50	18.92	1000.0	120.000	243.0	H	93.0	11
84.810000	31.92	49.50	17.58	1000.0	120.000	370.0	H	78.0	10
88.710000	32.66	54.00	21.34	1000.0	120.000	319.0	H	103.0	11
93.780000	35.02	54.00	18.98	1000.0	120.000	315.0	H	262.0	13
144.480000	37.22	54.00	16.78	1000.0	120.000	156.0	H	74.0	10
174.660000	35.70	54.00	18.30	1000.0	120.000	184.0	H	61.0	11
276.480000	33.34	56.90	23.56	1000.0	120.000	100.0	H	286.0	15
335.310000	22.51	56.90	34.39	1000.0	120.000	110.0	H	306.0	16
382.170000	27.10	56.90	29.80	1000.0	120.000	103.0	H	121.0	17
900.720000	14.74	56.90	42.16	1000.0	120.000	230.0	V	228.0	26

EMI Auto Test Template: FCC-RE-R17-AN34

Hardware Setup: EN-RE-R17-AN34
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 80 dBµV/m

Preview Measurements:
- Antenna height: 100 - 355 cm , Step Size = 85 cm , Positioning Speed = 8
- Polarization: H + V
- Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
- Graphics Display: Show separate traces for horizontal and vertical polarization
- Scan Test Template: EN-RE-R17-AN34_PRE

Subrange	**Step Size**	**Detectors**	**IF BW**	**Meas. Time**	**Preamp**
Receiver: [ESR 7]					
30 MHz - 1 GHz	30 kHz	PK+	120 kHz	0,1 s	20 dB
1 GHz - 3 GHz	250 kHz	PK+	1 MHz	0,1 s	20 dB

Frequency Zoom:
- Zoom Scan Template: EN-RE-R17-AN34_ZOOM

Adjustment:
- Antenna height: Range = 90 cm , Measuring Speed = 2
- Turntable position: Range = 45 deg , Measuring Speed = 2
- Template for Single Meas.: EN-RE-R17-AN34_MAX

Final Measurements:
- Template for Single Meas.: EN-RE-R17-AN34_FIN

Subrange	**Step Size**	**Detectors**	**IF BW**	**Meas. Time**	**Preamp**
Receiver: [ESR 7]					
30 MHz - 1 GHz	40 kHz	QPK	120 kHz	1 s	20 dB
1 GHz - 3 GHz	400 kHz	QPK	1 MHz	1 s	20 dB

Anechoic chamber

Test procedure

The test site is an anechoic chamber suitable for radiated emission measurements in the frequency range of 30 MHz – 18 GHz (26 GHz). It includes automatic antenna mast of height 4 m and turntable of radius 2 m. It enables both manual and fully automatic measurements. To find the highest level of radiation

- the height of the antenna is scanned in range 1m to 4 m with antenna in horizontal and vertical polarization;
- the turntable is rotated in range from 0° to 360°.

The system was configured for testing in a typical worst case fashion (as a customer may use it). All interface cables were moved to determine the position which resulted in the highest emission levels.

Correction factors

The field strength is calculated by adding the antenna factor and cable attenuation.
The calculations are performed automatically by the measurement software EMC 32.
As example consider the following input values and result:

FREQUENCY (MHZ)	RECEIVER READING U (dBµV)	ANTENNA FACTOR AF (dB/m)	CABLE ATTENUATION A (dB)	CORRECTION ANTENNA + CABLE (dB)	RADIATED FIELD STRENGTH E (dBµV/m)
30.0	20	20.6	0.8	21.4	41.4

E = U + AF + A

End of test report