Test report

22-0188RP48-001

Product / EUT:	*RFID Reader*
Type designation:	*ARE i9x – hdx - SEMI*
Tested type:	*ARE i9x – hdx – SEMI*
FCC-ID:	*V7IAREI9XLF-S*
EUT authorization:	☒ Certification ☐ Suppliers Declaration of Conformity
Production level:	*n/a*
S/N:	000560
Manufacturer:	*AEG Identifikationssysteme GmbH* *Hörvelsinger Weg 47* *89081 Ulm / Germany*
Test remit:	FCC Rules 47 CFR Part 15 – Subpart B – Unintentional radiators in accordance with the procedures given in ANSI C63.4-2014
The standards were:	☒ kept* ☐ not kept*
*Remark:	☒ Validation covered by the accredited scope ☐ Validation not covered by the accredited scope according:_____ ☐ Validation of the EMC-requirements partly proceeded

Applicant:	AEG Identifikationssysteme GmbH Hörvelsinger Weg 47 89081 Ulm / Germany
EUT-	
Date of arrival:	11/15/2022
Test ID:	22-0188PR46-004
Date(s) of test:	11/25/2022 till 11/28/2022

Burgrieden, 2023-01-10

Released by:

Principal Engineer - Christian Vogelmann

Test laboratory:

EMCE GmbH
Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung
Untere Wiesen 1 / 88483 Burgrieden / Germany

DAkkS-Registration No:	D-PL-12122-01-01 D-PL-12122-01-02 D-PL-12122-01-03 D-PL-12122-01-04
CAB-Registration No.:	BnetzA-CAB-02/21-01/1
FCC-Registration No.:	239304

Accredited by:

Bundesnetzagentur

Bundesnetzagentur
BNetzA-CAB-02/21-01

Deutsche Akkreditierungsstelle GmbH

ilac-MRA
DAkkS Deutsche Akkreditierungsstelle
D-PL-12122-01-01
D-PL-12122-01-02

Responsible inspector:	Mr. S. Vogelmann EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung
Contact person:	Mr. Leuthe / AEG Identifikationssysteme GmbH

EUT

Sampling:	The device was selected and provided by the customer.
Description:	*LF-RFID reader with a working frequency of 134.2 kHz for different LF algorithms: ISO 11784/11785 ARE i9 – LF* *The reader is designed to be connected to an external antenna.*
Voltage supply:	*7.5 VDC*
Frequency list: RF Application:	*134.2 kHz;* *134.2 kHz*
Temperature range:	*n/a*
Size:	*EUT (LxWxH) / mm: 85 x 40 x 25* *Antenna (LxWxH) / mm: 45 x 30 x 10*

Supplied / used equipment:

Designation	Type	Manufacturer	S/N
Antenna (external)	*AAN Xi9F flex 2m*	*AEG ID*	*108*
RFID Tag	*n/a*	*n/a*	*n/a*
Notebook	*W25CSW*	*Terra*	*n/a*
Notebook Supply	*A12-065N2A*	*Chicony*	*F134091506009041*
RS232-to-USB adapter	*n/a*	*IC Intracom Vertriebs GmbH*	*n/a*
DC Supply (EUT)	*APS 1612T*	*ANSMANN*	*n/a*

Supplied /
used software:

Cable designation	Type	Manufacturer	Version
Software	*Demo Terminal DL*	*AEG ID*	*V72*

Configuration: ☒ As-delivered condition*
☐ Modified*
* _____

Cable designation	Type	Length	Remarks
AC Supply (EUT)	*2 core*	*1.0 m*	*unshielded*
DC Supply (EUT)	*2 wires*	*2.2 m*	*unshielded*
AC Supply (Notebook)	*2 core*	*1.0 m*	*unshielded*
DC Supply (Notebook)	*2 core*	*1.8 m*	*unshielded*
Antenna cable	*3 core*	*2.0 m*	*unshielded*
Interconnection cable	*4 core*	*3.2 m*	*unshielded*

Pictures of the EUT:

Remarks: n/a

State of revision:

Source document	New Document	Date / Reviser	Modifications

Test equipment list of EMCE GmbH:

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2023-02-10
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2023-02-10
006	LISN	NNBM 8125	Schwarzbeck	8125371	1 Year(s)/ 2023-02-28
007	Absorbing clamp	MDS 21	Schwarzbeck	942436	1 Year(s)/ 2023-01-15
008	Antenna 9kHz - 30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002	3 Year(s)/ 2025-11-20
009	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	435	3 Year(s)/ 2024-12-22
011	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	0403/94	3 Year(s)/ 2023-01-31
014	OATS	Test site 3 m referred to ANSI C63.4-2014	EMCE GmbH		3 Year(s)/ 2024-04-23
015	OATS	Test site 10 m referred to ANSI C63.4-2014	EMCE GmbH		3 Year(s)/ 2024-04-26
042-2	AC-Source	EMV D 5000/PAS/SyCore	Spitzenberger & Spies	A274700 / 00501	3 Year(s)/ 2023-01-30
042-1	Analyzer Reference System	ARS 16/3	Spitzenberger & Spies	A274707 / 00501	3 Year(s)/ 2024-12-28
043	Receiver	3DH/E Fieldmeter ESM-100	Maschek	971521	3 Year(s)/ 2023-08-13
058	Receiver	ESIB 40	Rohde & Schwarz	100200/ Firmware 4.35	1 Year(s)/ 2023-08-02
059	Log.-per. antenna	HL050	Rohde & Schwarz	100006	3 Year(s)/ 2025-10-21
062-2	Semi-Anechoic Chamber 13.5x6.1x5.5 m	30 - 1000 MHz referred to ANSI C63.4-2014	EMC-Technik & Consulting GmbH		3 Year(s)/ 2024-01-31
062-1	Semi-Anechoic Chamber 13.5x6.1x5.5 m	1 - 18 GHz referred to CISPR16 1-4: 2010-04 Ed. 3	EMC-Technik & Consulting GmbH		3 Year(s)/ 2024-05-14
067	LISN	ESH2-Z5	Rohde & Schwarz	872460/043	1 Year(s)/ 2023-02-10

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
068	LISN	ESH2-Z5	Rohde & Schwarz	872460/042	1 Year(s)/ 2023-02-10
070	Pulse limiter + 10 dB Attenuator	ESH3-Z2	Rohde & Schwarz	n/a	1 Year(s)/ 2023-08-31
073	Absorbing clamp	MDS21	Schwarzbeck	881757	1 Year(s)/ 2023-01-15
116	Vertical rod antenna	VAMP 9243	Schwarzbeck	9243-205	3 Year(s)/ 2023-02-19
117	LISN	ESH3-Z6	Rohde & Schwarz	100521	1 Year(s)/ 2023-02-28
174	LISN	ESH3-Z6	Rohde & Schwarz	101003	1 Year(s)/ 2023-02-28
175	EMI Test receiver	ESR7	Rohde & Schwarz	101108 Firmware: FW V3.46 SP3	1 Year(s)/ 2023-11-18
178	V-LISN 5 µH	NNHV 8123-400	Schwarzbeck	018	1 Year(s)/ 2023-02-28
184	V-LISN 5 µH	NNHV8123-400	Schwarzbeck	019	1 Year(s)/ 2023-02-28
211	Broadband Amplifier	BBA150 800 - 3000 MHz	Rohde & Schwarz	102104	1 Year(s)/ 2023-01-31
212	Broadband Amplifier	BBA150 2500 - 6000 MHz	Rohde & Schwarz	102105	1 Year(s)/ 2023-01-31
222	Broadband Preamplifier 0.5-18GHz	BBV 9718	Schwarzbeck	9718-316	1 Year(s)/ 2023-05-31
223	Broadband Preamplifier 12-28GHz	BBV 9719	Schwarzbeck	9719-024	1 Year(s)/ 2023-05-31
224	SMB100A Signal Generator	SMB100A	Rohde & Schwarz	108055	3 Year(s)/ 2023-01-20
225	Electric and Magnetic Field Probe-Analyzer	EHP-200A	Narda S.T.S. / PMM	170WX70205	3 Year(s)/ 2025-07-22
228	Coupling device network AF4	CDN AF4-32	EMCE GmbH		1 Year(s)/ 2023-02-28
229	Test receiver	ESS 5 Hz - 1000 MHz	Rohde & Schwarz	845420/0005	1 Year(s)/ 2022-12-13
230	FSV40 Signal Analyzer 40 GHz	FSV40	Rohde & Schwarz	101717	2 Year(s)/ 2024-02-23
231	Vector Signal Generator SMBV100A	SMBV100A	Rohde & Schwarz	262891	3 Year(s)/ 2023-10-02
233	OSP-B157W 8 PORT	OSP-B157W8	Rohde & Schwarz	100925	2 Year(s)/ 2024-02-25

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
235	ESD-Gun	NSG 435	Teseq	7275	2 Year(s)/ 2024-10-26
236	Broad-Band Horn Antenna 0.5-6 GHz	BBHA 9120 E	Schwarzbeck	00831	5 Year(s)/ 2024-02-13
237	Exposure Level Tester	ELT-400	Narda Safety Test Solutions	O-0028	3 Year(s)/ 2023-02-06
239	Broadband Horn Antenna 15-40 GHz	BBHA 9170	Schwarzbeck	00932	5 Year(s)/ 2024-05-23
240	Broadband Preamplifier 18-40 GHz	BBV 9721	Schwarzbeck	54	1 Year(s)/ 2023-05-31
253	Broadband Preamplifier 20-1000 MHz	ESV-Z3	Rohde & Schwarz	881 909/030	1 Year(s)/ 2023-08-31
257	Pulse limiter + 10 dB Attenuator	ESH3-Z2	Rohde & Schwarz	102769	1 Year(s)/ 2023-08-31
262	EM Clamp	KEMZ 801A	Teseq	78033	1 Year(s)/ 2023-08-31
718	EMC-Software	BAT-EMC Vers. 3.18.0.19	Nexio	n/a	
997	EMC Software	EMC32 Vers. 10.60.20	Rohde & Schwarz	n/a	
1212	EMC Software	WMS32 Vers. 10.60.20	Rohde & Schwarz	n/a	
8000	Artificial Network	AN 200N100	Ametek	P1410132431	1 Year(s)/ 2023-02-28
8004	Broadband Preamplifier 18-40 GHz	BLMA 1840-5G	BONN Elektronik GmbH	2113300	1 Year(s)/ 2023-05-31
8007	Logarithmic Periodic Broadband Antenna 180 - 1500 MHz	VULP 9118A	Schwarzbeck	899	3 Year(s)/ 2024-10-27
8008	Logarithmic Periodic Broadband Antenna 180 - 1500 MHz	VULP 9118A	Schwarzbeck	900	3 Year(s)/ 2024-10-27
8009	Field Monitoring Loop	FESP 5134-1	Schwarzbeck	00078	3 Year(s)/ 2024-12-20
8013	Antenna 9 - 150 kHz	Ø 120 mm, 20 Turns	EMCE GmbH	n/a	
8015	Amplifier 2.5 - 6 GHz	BBA150-E100	Rohde & Schwarz	105302	1 Year(s)/ 2023-05-31
8016	Cicular Loop Antenna 0.01 - 120 MHz	HFRA 5164	Schwarzbeck	00152	

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
8017	Compensation network for 13.56 MHz	NFCN 1356	Schwarzbeck	00122	
8018	Field Probe	EP-601	Narda	811ZX20438	1 Year(s)/ 2023-08-16

Scope:

1 Test(s) according 47 CFR Part 15 Subpart B - 11/25/2022

1.1 Requirements and conformance test specifications

Standard

47 CFR Part 15 Subpart B
ANSI C63.4-2014
KDB n/a
-

Test mode application		
☒	Terminal voltage on AC power-line	§ 15.107 (a)
☒	Radiated emissions E-Field of unintentional radiators	§ 15.109 (a)(c)(g(2))

1.2 Terminal voltage on AC power-line

☒ No deviation from the standard
☐ Deviation from the standard *
☐ Test not requested*
☐ Test not carried out*

*

Measurement procedure:

Rules and specification	47 CFR Part 15 Section 15.107 (a)
Guide	ANSI C63.4-2014

The conducted disturbances are recorded in the frequency range from 150 kHz to 30 MHz. For this purpose line impedance stabilization networks (LISNs) are used which are inserted between the DUT and the mains supply. The output of one LISN is connected directly to a receiver according to CISPR 16 guidelines via a pulse limiter and 10 dB fixed attenuator. Not used ports of the LISN are terminated by 50 Ω. The Average- and Quasi-Peak-Detectors are provided to evaluate the spectrum. To speed up the measurement process, a pre-measurement is performed with the Peak- and Average-Detectors. The 10 frequencies with the smallest distance to the limit and priority with the highest exceeding are selected and remeasured. The Average and Quasi-Peak-Detectors are used for the final measurement. This measurement procedure is performed for each individual current conductor.
Depending on the limit lines, 6 final measurements are documented. The highest limit exceeding or, in case of compliance with the limit, the emissions found with the smallest distance to the limit are documented.
If less than six emission frequencies with a distance of 20 dB are below the limit value, the noise level of the measuring device at representative frequencies is indicated.
For the measurement, it may be necessary to terminate the antenna output to distinguish the interference level caused by the unintentional part from the intentional part (see ANSI C63.4 section 13.1.3.1).

The documented final test results are calculated using the following formula:

U(f) (dBµV) = Measured Value (dBµV) + ATF (dB) + CF (dB)

U(f) =	Final result of the terminal voltage at the test frequency
Measured Value =	Reading of the uncorrected measured value
ATF =	Correction factor for the pulse limiter + 10 dB attenuator
CF =	Correction factor for the cable attenuation

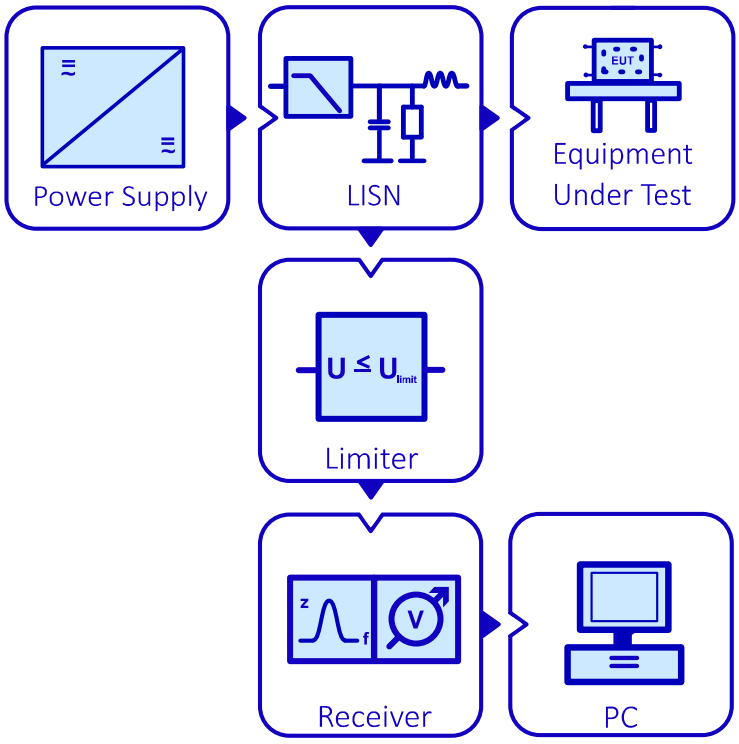
Example:

Test frequency	13.56 MHz
Reading	31.5 dBµV
$AFT_{(13.56\ MHz)}$	10.2 dB
$CF_{(13.56\ MHz)}$	0.4 dB

Calculated final result for the terminal voltage u(f):

$U_{(13.56\ MHz)}$ = 31.5 dBµV + 10.2 dB + 0.4 dB = 42.1 dBµV

Basic structure - Setup



1.2.1 Test set up

According ANSI C63.4-2014

Test location

☒	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
☒	588	Shielded room # 2	8.3/5.8 x 5.5/2.9 x 3.4 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	1319	Shielded room #5	5.6 x 5.0 x 3.8 m	Albatross Projects GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden

Used test equipment

☒	Inv.-No.	Designation	Type	Manufacturer	S/N
	001	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	833776/008
	003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007
☒	004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003
	005	LISN 3	NNB 4/32T	Rolf Heine HF-Technik	4/32T-96015
☒	042	AC-Source / Analyzer / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
	067	LISN 5	ESH2-Z5	Rohde & Schwarz	0872460/043
☒	068	LISN 4	ESH2-Z5	Rohde & Schwarz	0872460/042
☒	070	Pulse limiter / 10 dB attenuator	ESH3-Z2	Rohde & Schwarz	357.8810.52
☒	229	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	845420/0005
☒	997	Software	EMC32	Rohde & Schwarz	n/a

All used test equipment are checked resp. calibrated periodically.

☒ Test equipment was checked and complied to the requirements

Test-/Measurement uncertainty

The measurement uncertainty in the test met the guideline of CISPR16-4-2 or better.

Measurement uncertainty of the terminal voltage with an extended coverage factor of k = 2:

Frequency	Measurement uncertainty
9 kHz – 150 kHz	4.0 dB
150 kHz – 30 MHz	3.6 dB

1.2.2 Test

Rules and specification 47 CFR Part 15 Section 15.107 (a)

Frequency range: 150 kHz – 30 MHz

Limits for conducted emissions

Technical requirements			
Detector	Frequency / MHz	Limit QP-Detector / dBµV	Limit AV-Detector / dBµV
QP AV	0.15 – 0.5	66.0 – 56.0	56.0 – 46.0
QP AV	0.5 – 5.0	56.0	46.0
QP AV	5.0 – 30.0	60	50.0

Rationale for selecting the EUT test set up

Equipment units:

EUT with external antenna, external power supply and evaluation unit.

Cabling:

☒ Standard cables
☐ Special cables provided by the manufacturer

Port #	Designation	Remarks
# 1	AC power line - EUT	L1/N
# 2	AC power line - AE	L1/N

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☒ 120 V/60 Hz	☐ 240 V/60 Hz

Continuous operation with the maximum permitted reading speed according customer specification. The reader was operated without a tag. The TAG ID read XX…XX was transmitted via the data interface to a laptop for display.

Environmental conditions

Temperature [10 – 40 °C]:	14 °C
Relative humidity [10 – 90 %]:	53 %
Environmental conditions during the test:	☒ kept ☐ not kept

Test result

Limits for conducted powerline emissions:	☒ kept ☐ not kept ☐ not relevant

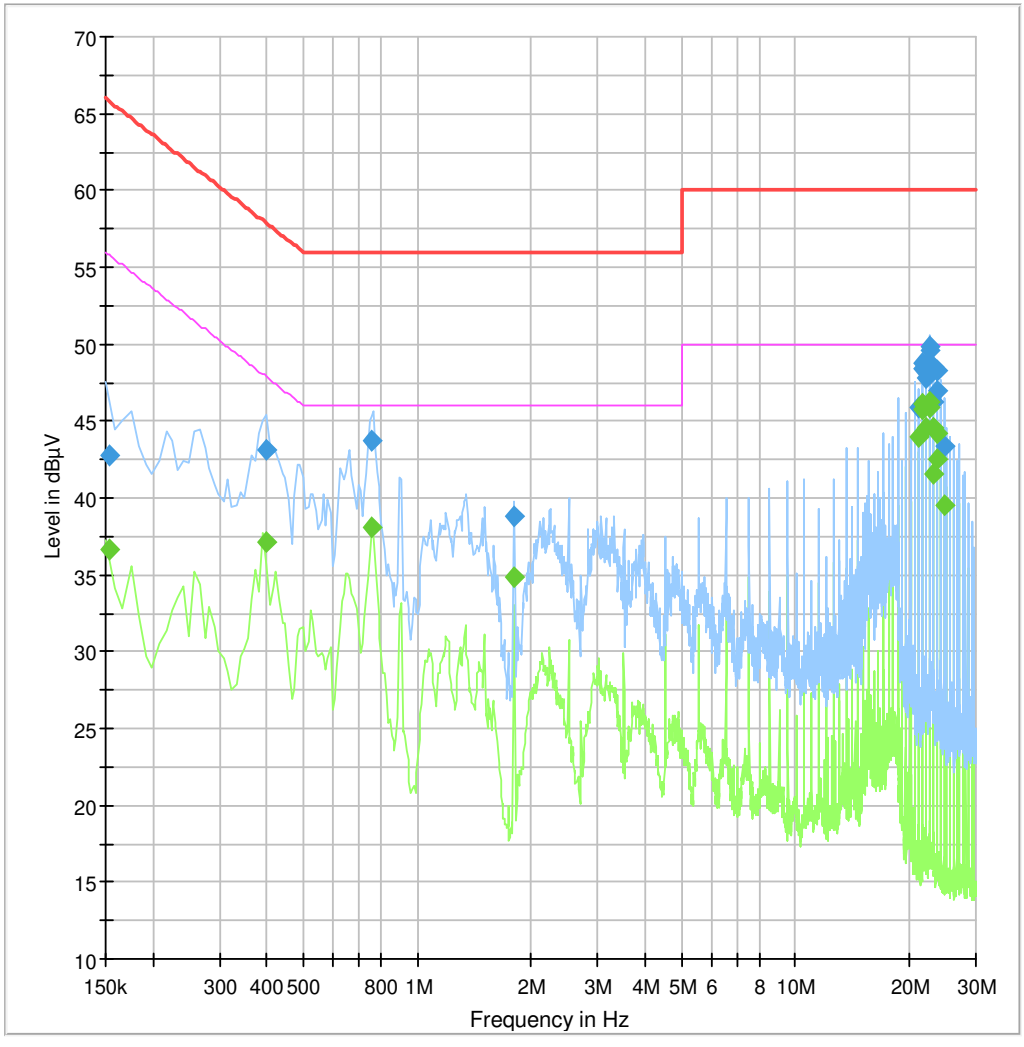
Remarks: n/a

Records

☒ Readings
☒ Diagram

EUT Information

EUT Name:	ARE i9x - hdx - SEMI
Test_ID: / SN:	22-0188PR46-004
Customer:	AEG ID GmbH
Operational condition:	Test mode, max. perm. customer reading speed; no TAG
Test specification:	47 CFR Part 15 Subpart B Section 15.107 (a) Class B
LISN port	N (EUT)
Operator:	S. Vogelmann
File #:	22-0188RC47-004-015-A
Comment #1:	Supply:120 V/ 60 Hz
Comment #2:	



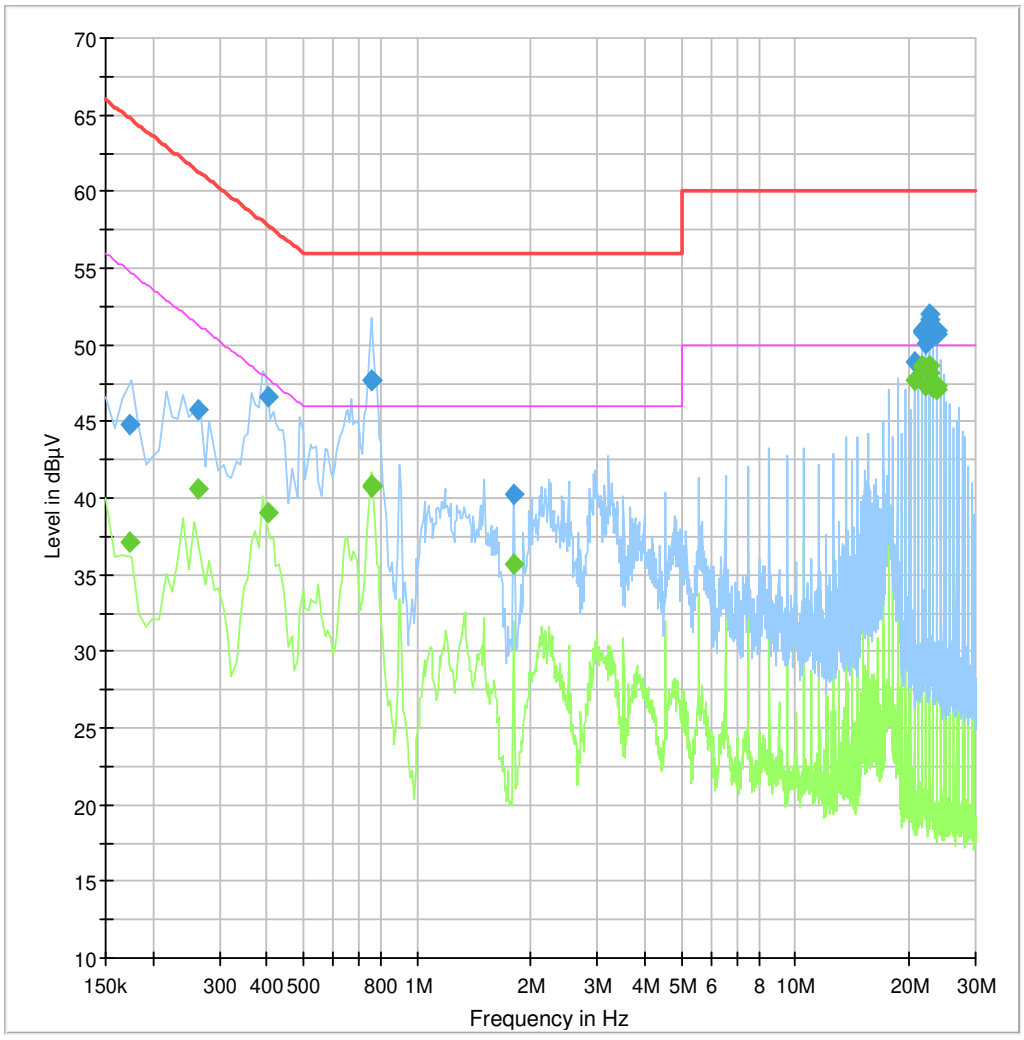
Preview Result 2-AVG
Preview Result 1-PK+
47 CFR Part 15 Subpart B Class B, AC mains QPK
47 CFR Part 15 Subpart B Class B, AC mains AVG
Final_Result QPK
Final_Result AVG

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.153135	42.80	---	65.83	23.03	15000.0	9.000	N	10.0
0.153135	---	36.68	55.83	19.15	15000.0	9.000	N	10.0
0.399056	43.13	---	57.87	14.74	15000.0	9.000	N	10.1
0.399056	---	37.07	47.87	10.80	15000.0	9.000	N	10.1
0.759179	43.72	---	56.00	12.28	15000.0	9.000	N	10.2
0.759179	---	38.08	46.00	7.92	15000.0	9.000	N	10.2
1.808208	38.80	---	56.00	17.20	15000.0	9.000	N	10.2
1.808208	---	34.90	46.00	11.10	15000.0	9.000	N	10.2
21.134732	45.89	---	60.00	14.11	15000.0	9.000	N	11.0
21.134732	---	44.00	50.00	6.00	15000.0	9.000	N	11.0
21.637236	48.72	---	60.00	11.28	15000.0	9.000	N	11.0
21.637236	---	46.15	50.00	3.85	15000.0	9.000	N	11.0
21.637998	48.37	---	60.00	11.63	15000.0	9.000	N	11.0
21.637998	---	45.82	50.00	4.18	15000.0	9.000	N	11.0
22.141780	47.81	---	60.00	12.19	15000.0	9.000	N	11.0
22.141780	---	44.59	50.00	5.41	15000.0	9.000	N	11.0
22.642034	49.86	---	60.00	10.14	15000.0	9.000	N	10.9
22.642034	---	46.25	50.00	3.75	15000.0	9.000	N	10.9
22.644716	49.56	---	60.00	10.44	15000.0	9.000	N	10.9
22.644716	---	45.85	50.00	4.15	15000.0	9.000	N	10.9
23.147879	48.54	---	60.00	11.46	15000.0	9.000	N	10.9
23.147879	---	44.58	50.00	5.42	15000.0	9.000	N	10.9
23.148845	46.29	---	60.00	13.71	15000.0	9.000	N	10.9
23.148845	---	41.60	50.00	8.40	15000.0	9.000	N	10.9
23.649765	48.27	---	60.00	11.73	15000.0	9.000	N	10.9
23.649765	---	44.26	50.00	5.74	15000.0	9.000	N	10.9
23.651415	46.91	---	60.00	13.09	15000.0	9.000	N	10.9
23.651415	---	42.57	50.00	7.43	15000.0	9.000	N	10.9
24.658367	43.38	---	60.00	16.62	15000.0	9.000	N	10.9
24.658367	---	39.56	50.00	10.44	15000.0	9.000	N	10.9

EUT Information

EUT Name:	ARE i9x - hdx - SEMI
Test_ID: / SN:	22-0188PR46-004
Customer:	AEG ID GmbH
Operational condition:	Test mode, max. perm. customer reading speed; no TAG
Test specification:	47 CFR Part 15 Subpart B Section 15.107 (a) Class B
LISN port	L1 (EUT)
Operator:	S. Vogelmann
File #:	22-0188RC47-004-016-A
Comment #1:	Supply:120 V/ 60 Hz
Comment #2:	



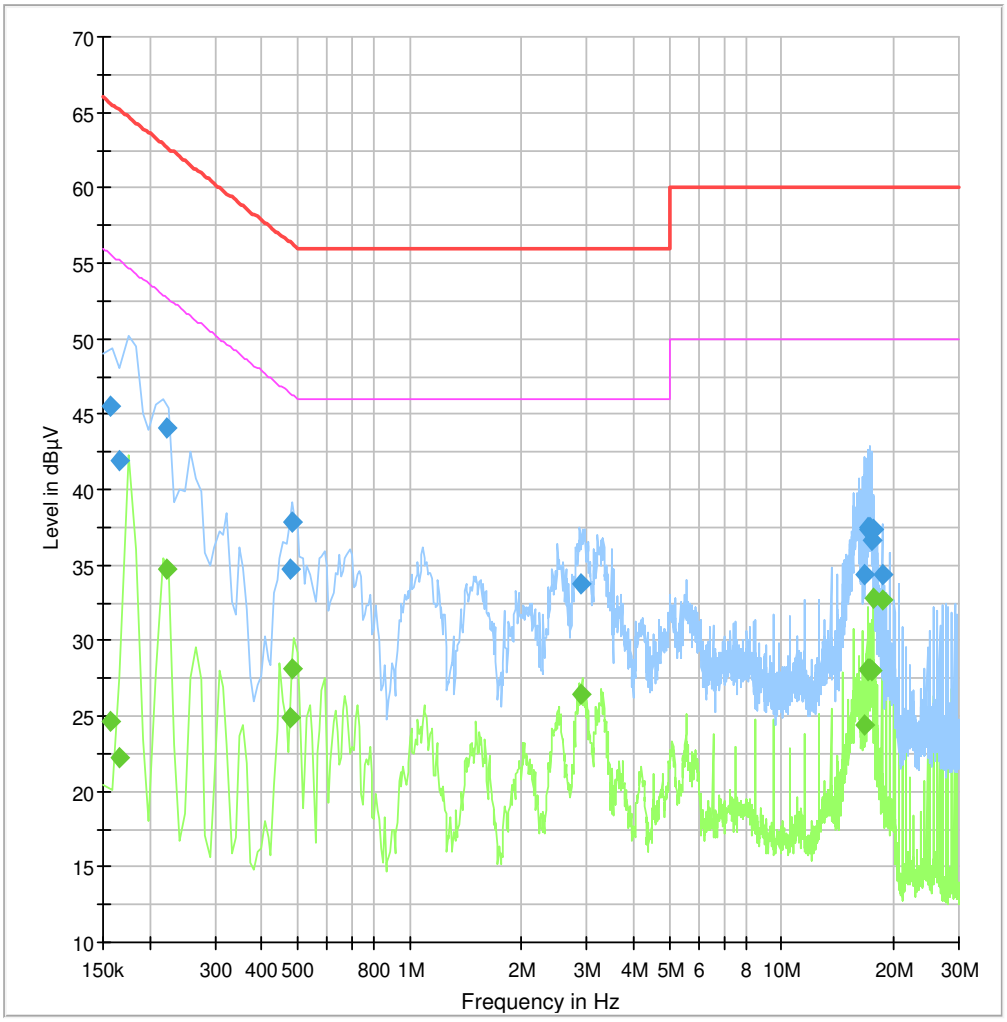
Preview Result 2-AVG
Preview Result 1-PK+
47 CFR Part 15 Subpart B Class B, AC mains QPK
47 CFR Part 15 Subpart B Class B, AC mains AVG
Final_Result QPK
Final_Result AVG

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.173764	44.79	---	64.78	19.99	15000.0	9.000	L1	10.0
0.173764	---	37.18	54.78	17.60	15000.0	9.000	L1	10.0
0.264469	45.80	---	61.29	15.49	15000.0	9.000	L1	10.1
0.264469	---	40.61	51.29	10.68	15000.0	9.000	L1	10.1
0.402890	46.60	---	57.79	11.19	15000.0	9.000	L1	10.1
0.402890	---	39.10	47.79	8.69	15000.0	9.000	L1	10.1
0.757938	47.64	---	56.00	8.36	15000.0	9.000	L1	10.1
0.757938	---	40.71	46.00	5.29	15000.0	9.000	L1	10.1
0.758310	47.74	---	56.00	8.26	15000.0	9.000	L1	10.1
0.758310	---	40.90	46.00	5.10	15000.0	9.000	L1	10.1
1.808591	40.19	---	56.00	15.81	15000.0	9.000	L1	10.2
1.808591	---	35.71	46.00	10.29	15000.0	9.000	L1	10.2
20.628827	48.89	---	60.00	11.11	15000.0	9.000	L1	10.9
20.628827	---	47.74	50.00	2.26	15000.0	9.000	L1	10.9
21.633312	50.82	---	60.00	9.18	15000.0	9.000	L1	11.0
21.633312	---	48.56	50.00	1.44	15000.0	9.000	L1	11.0
21.634458	50.91	---	60.00	9.09	15000.0	9.000	L1	11.0
21.634458	---	48.66	50.00	1.34	15000.0	9.000	L1	11.0
22.137922	50.12	---	60.00	9.88	15000.0	9.000	L1	11.0
22.137922	---	47.27	50.00	2.73	15000.0	9.000	L1	11.0
22.639994	52.04	---	60.00	7.96	15000.0	9.000	L1	10.9
22.639994	---	48.65	50.00	1.35	15000.0	9.000	L1	10.9
22.641932	51.63	---	60.00	8.37	15000.0	9.000	L1	10.9
22.641932	---	48.16	50.00	1.84	15000.0	9.000	L1	10.9
23.144544	50.82	---	60.00	9.18	15000.0	9.000	L1	10.9
23.144544	---	47.18	50.00	2.82	15000.0	9.000	L1	10.9
23.644947	50.66	---	60.00	9.34	15000.0	9.000	L1	10.9
23.644947	---	47.05	50.00	2.95	15000.0	9.000	L1	10.9
23.646669	50.88	---	60.00	9.12	15000.0	9.000	L1	10.9
23.646669	---	47.35	50.00	2.65	15000.0	9.000	L1	10.9

EUT Information

EUT Name:	ARE i9x - hdx - SEMI
Test_ID: / SN:	22-0188PR46-004
Customer:	AEG ID GmbH
Operational condition:	Test mode, max. perm. customer reading speed; no TAG
Test specification:	47 CFR Part 15 Subpart B Section 15.107 (a) Class B
LISN port	N (AE)
Operator:	S. Vogelmann
File #:	22-0188RC47-004-021-A
Comment #1:	Supply:120 V/ 60 Hz
Comment #2:	



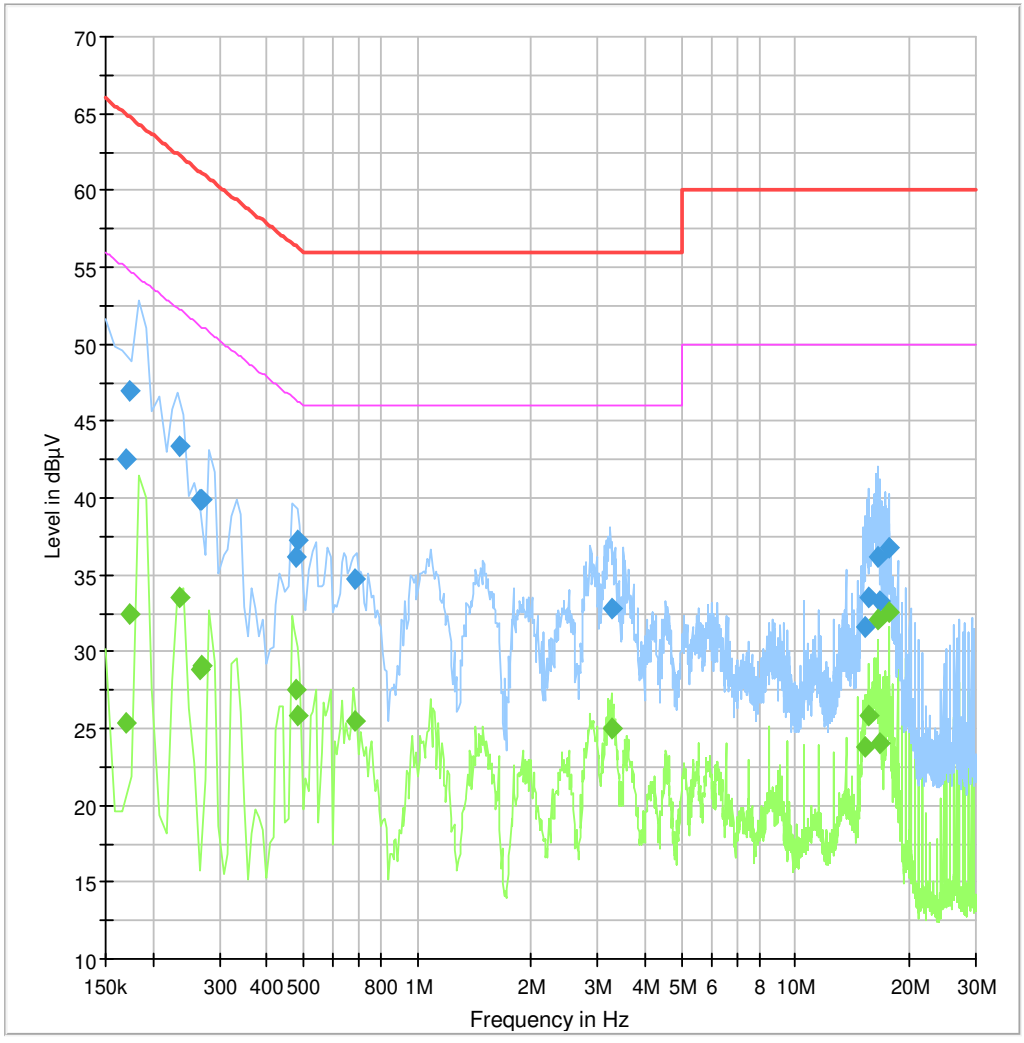
Preview Result 2-AVG
Preview Result 1-PK+
47 CFR Part 15 Subpart B Class B, AC mains QPK
47 CFR Part 15 Subpart B Class B, AC mains AVG
Final_Result QPK
Final_Result AVG

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.157175	---	24.64	55.61	30.97	15000.0	9.000	N	10.0
0.157175	45.47	---	65.61	20.14	15000.0	9.000	N	10.0
0.166505	---	22.21	55.13	32.92	15000.0	9.000	N	10.0
0.166505	41.89	---	65.13	23.24	15000.0	9.000	N	10.0
0.221529	---	34.68	52.76	18.08	15000.0	9.000	N	10.1
0.221529	44.09	---	62.76	18.67	15000.0	9.000	N	10.1
0.477029	---	24.85	46.39	21.54	15000.0	9.000	N	10.1
0.477029	34.72	---	56.39	21.67	15000.0	9.000	N	10.1
0.484852	---	28.09	46.26	18.17	15000.0	9.000	N	10.1
0.484852	37.81	---	56.26	18.45	15000.0	9.000	N	10.1
2.900259	---	26.40	46.00	19.60	15000.0	9.000	N	10.3
2.900259	33.74	---	56.00	22.26	15000.0	9.000	N	10.3
16.703953	---	24.45	50.00	25.55	15000.0	9.000	N	10.8
16.703953	34.36	---	60.00	25.64	15000.0	9.000	N	10.8
17.106423	---	28.13	50.00	21.87	15000.0	9.000	N	10.8
17.106423	37.35	---	60.00	22.65	15000.0	9.000	N	10.8
17.154691	---	28.04	50.00	21.96	15000.0	9.000	N	10.8
17.154691	37.48	---	60.00	22.52	15000.0	9.000	N	10.8
17.228944	---	28.08	50.00	21.92	15000.0	9.000	N	10.8
17.228944	37.43	---	60.00	22.57	15000.0	9.000	N	10.8
17.416166	---	28.06	50.00	21.94	15000.0	9.000	N	10.8
17.416166	36.68	---	60.00	23.32	15000.0	9.000	N	10.8
17.604786	---	32.84	50.00	17.16	15000.0	9.000	N	10.8
17.604786	37.39	---	60.00	22.61	15000.0	9.000	N	10.8
18.610436	---	32.73	50.00	17.27	15000.0	9.000	N	10.9
18.610436	34.41	---	60.00	25.59	15000.0	9.000	N	10.9

EUT Information

EUT Name:	ARE i9x - hdx - SEMI
Test_ID: / SN:	22-0188PR46-004
Customer:	AEG ID GmbH
Operational condition:	Test mode, max. perm. customer reading speed; no TAG
Test specification:	47 CFR Part 15 Subpart B Section 15.107 (a) Class B
LISN port	L1 (AE)
Operator:	S. Vogelmann
File #:	22-0188RC47-004-022-A
Comment #1:	Supply:120 V/ 60 Hz
Comment #2:	



Preview Result 2-AVG
Preview Result 1-PK+
47 CFR Part 15 Subpart B Class B, AC mains QPK
47 CFR Part 15 Subpart B Class B, AC mains AVG
Final_Result QPK
Final_Result AVG

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.170213	---	25.32	54.95	29.63	15000.0	9.000	L1	10.0
0.170213	42.57	---	64.95	22.38	15000.0	9.000	L1	10.0
0.173249	---	32.48	54.80	22.32	15000.0	9.000	L1	10.0
0.173249	46.96	---	64.80	17.84	15000.0	9.000	L1	10.0
0.234068	---	33.52	52.30	18.78	15000.0	9.000	L1	10.1
0.234068	43.31	---	62.30	18.99	15000.0	9.000	L1	10.1
0.266983	---	28.87	51.21	22.34	15000.0	9.000	L1	10.1
0.266983	39.87	---	61.21	21.34	15000.0	9.000	L1	10.1
0.267745	---	29.13	51.19	22.06	15000.0	9.000	L1	10.1
0.267745	39.88	---	61.19	21.31	15000.0	9.000	L1	10.1
0.479753	---	27.52	46.34	18.82	15000.0	9.000	L1	10.1
0.479753	36.14	---	56.34	20.20	15000.0	9.000	L1	10.1
0.482459	---	25.83	46.30	20.47	15000.0	9.000	L1	10.1
0.482459	37.27	---	56.30	19.03	15000.0	9.000	L1	10.1
0.686493	---	25.51	46.00	20.49	15000.0	9.000	L1	10.1
0.686493	34.69	---	56.00	21.31	15000.0	9.000	L1	10.1
3.255266	---	24.99	46.00	21.01	15000.0	9.000	L1	10.3
3.255266	32.75	---	56.00	23.25	15000.0	9.000	L1	10.3
15.267436	---	23.83	50.00	26.17	15000.0	9.000	L1	10.8
15.267436	31.60	---	60.00	28.40	15000.0	9.000	L1	10.8
15.631568	---	25.81	50.00	24.19	15000.0	9.000	L1	10.8
15.631568	33.50	---	60.00	26.50	15000.0	9.000	L1	10.8
16.597073	---	32.11	50.00	17.89	15000.0	9.000	L1	10.8
16.597073	36.19	---	60.00	23.81	15000.0	9.000	L1	10.8
16.715299	---	24.02	50.00	25.98	15000.0	9.000	L1	10.8
16.715299	33.34	---	60.00	26.66	15000.0	9.000	L1	10.8
17.603646	---	32.55	50.00	17.45	15000.0	9.000	L1	10.8
17.603646	36.81	---	60.00	23.19	15000.0	9.000	L1	10.8

1.3 Radiated emissions E-Field of unintentional radiators

☒ No deviation from the standard
☐ Deviation from the standard *
☐ Test not requested*
☐ Test not carried out*

*
____

Measurement procedure:

Rules and specification	47 CFR Part 15 Section 15.109 (a)(c)(g(2))
Guide	ANSI C63.4-2014

The radiated interference emission is measured on an alternative open area test site OATS in the frequency range 30 - 1000 MHz. The measurement distance is 3 m or 10 m, depending on the standard. Above 1 GHz, the measurement is performed in a 3 m semi-anechoic chamber with floor absorber to reduce ground reflections. For the measurement of the field strength a biconical antenna up to 200 MHz, a logperiodic antenna from 200 MHz to 1 GHz and horn antennas or double stacked logperiodic antenna above 1 GHz are used. All antennas are linearly polarized. External low-noise preamplifiers are used in the range above 1 GHz to improve measurement sensitivity. Special measures, such as filters or attenuators, are taken to avoid overloading the amplifiers. The antenna height is varied between 1 m and 4 m as required. The elevation angle of the antenna can be corrected via the antenna mast to ensure that the main lobe of the antenna is always directed at the EUT. A turntable allows the alignment of the EUT towards the antenna to maximize the radiated emission. The test sites are located above a metallic ground plane. Table-top devices are placed on a non-conductive wooden table. Hand-held, body-worn, or ceiling-mounted devices are examined in 3 orthogonal axis orientations to determine the maximum emission level. Floor-standing devices are placed directly on the grounded metal turntable/reference insulated from ground plane by an insulating material <12 mm.
During an initial automated pre-test run in a semi-anechoic chamber, the desired frequency range is measured. The receiver is operated as an analyzer and the frequency ranges are run sequentially depending on the antenna. For the measurement, the turntable is continuously rotated from 0° - 360° and back, and the antenna height is changed in 0.5 m increments after each complete turntable cycle. The antenna position is then changed from 1.0 m to 4.0 m in 0.5 m steps for vertical polarization and back for horizontal polarization. During a cycle, the frequency range is continuously swept with peak detector and max hold function. Depending on the test specification, an average detector is also used if required. For each discrete antenna polarization over all positions, the maximum peak values are recorded with frequency, level, turntable position, antenna height and antenna

polarization. Significant peaks or clock frequencies are marked and re-measured with increased frequency accuracy. The recordings are used to determine the exact frequency and to optimize the interference level. At the predefined position, the turntable position is fine-adjusted in the range of ±20° and then the antenna height is varied by ±0.3 m. At the maximized position, the emission is measured with quasi-peak or average detector and listed. The six highest emissions are selected for final measurement in the OATS.
In a final test run, an open area test site measurement is made at selected frequencies determined by the previous test procedure. For each selected frequency, the frequency setting is optimized again in the OATS and the field strength value is maximized, rotating the EUT 360° at an antenna height of 1.0 m for vertical antenna polarization and 2.0 m for horizontal antenna polarization. At the azimuth position of the EUT for the highest radiation, the antenna height is varied within 1.0 m and 4.0 m until the highest interference level is reached. To maximize the interference level at the determined position, the turntable azimuth is fine-adjusted by ±45° and the antenna height is fine-adjusted by ±0.3 m. The setup of the instrument and the cables are manipulated within the range to produce the highest emission.
Final measurement is made using a receiver conforming to CISPR 16 guidelines with a quasi-peak and average detector.
The identified frequency and amplitude of the six highest radiated emissions relative to the limit lines are listed. If fewer than six emission frequencies are within 20 dB of the limit, the noise level of the instrument at representative frequencies is reported.
For documentation of final testing below 1 GHz on the OATS the plots recorded in den SAC are indicated as pre-compliance.
In case the regulation requires testing at different distances, the result is extrapolated by an extrapolation factor 20 dB / decade to the required distance.

The reported test results are calculated using the following formula to normalize the results to the requested test distance:

$E_{(f)}$ (dBμV/m) = Reading (dBμV) + AF (dB/m) + CF (dB) + 20 *log (D_T/D_R) (dB)

$E_{(f)}$ =	Electric field strength at the test frequency
Reading =	Uncorrected measured value
AF =	Correction factor for the antenna
CF =	Correction factor for the cable loss
DT =	Test distance
DR =	Reference distance for the limit defined in the standard

Example:

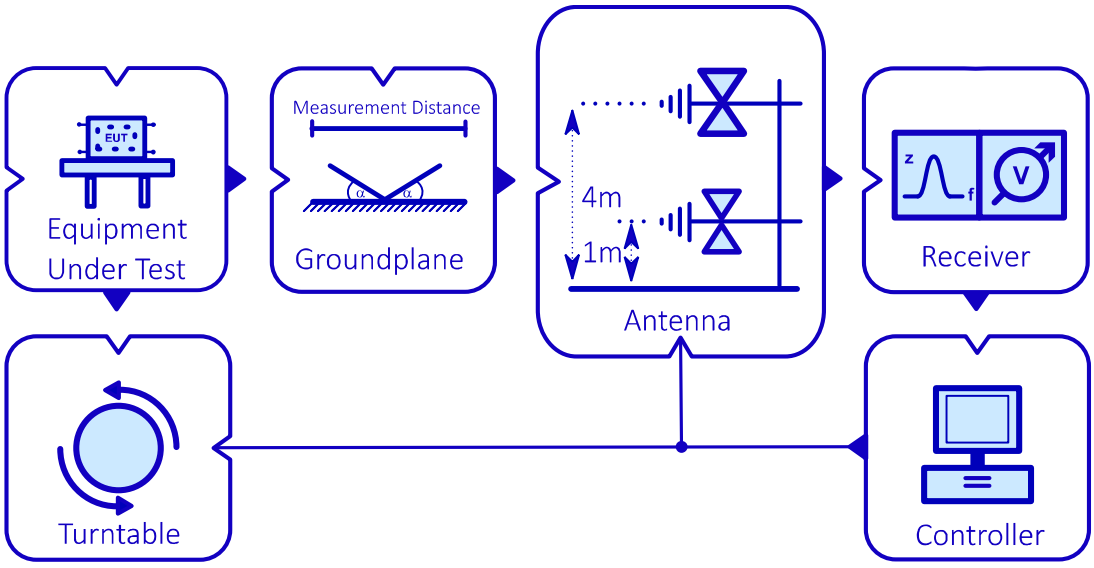
Test frequency	216.0 MHz
Reading	22.5 dBμV
$AF_{(216\ MHz)}$	10.9 dB/m
$CF_{(216\ MHz)}$	0.9 dB
D_T	3 m
D_R	10 m

Calculated final result for the field strength (dBμV/m):

$E_{(216\ MHz)}$[10 m]= 22.5 dBμV + 10.9 dB/m + 0.9 dB + 20*log(3/10) dB = 23.8 dBμV/m

Basic structure - Setup

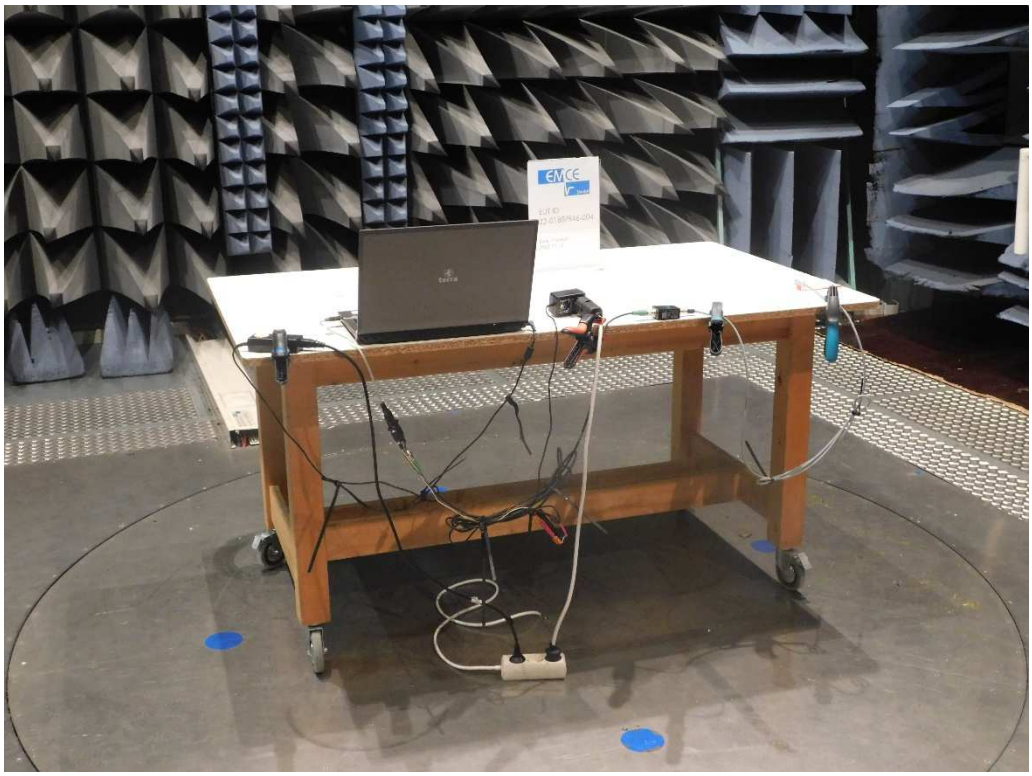
OATS / SAC



1.3.1 Test set up

According ANSI C63.4-2014

Pre-test setup



Final test setup

Test location

Pre-compliance test					
☒	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
☒	062	Semi anechoic chamber # 2	13.5 x 6.1 x 5.5 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden

Final test					
☒	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
	062	Semi anechoic chamber # 2	13.5 x 6.1 x 5.5 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	014	Open area test site	10 m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒	015	Open area test site	3 m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden

Used test equipment

Pre-compliance test					
☒	Inv.-No.	Designation	Type	Manufacturer	S/N
☒	011	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
☒	042	AC-Source / Analyzer / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
☒	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
	059	Logper. Antenna	HL050	Rohde & Schwarz	100006
☒	997	Software	EMC32	Rohde & Schwarz	n/a
☒	8008	Logarithmic Periodic Broadband Antenna 180 - 1500 MHz	VULP 9118A	Schwarzbeck	900

Final test					
☒	Inv.-No.	Designation	Type	Manufacturer	S/N
	001	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	833776/008
☒	009	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	435
☒	042	AC-Source / Analyzer / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
	059	Logper. Antenna	HL050	Rohde & Schwarz	100006
☒	229	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	845420/0005
	236	Broad-Band Horn Antenna 0.5-6 GHz	BBHA 9120 E	Schwarzbeck	00831
	997	Software	EMC32	Rohde & Schwarz	n/a
☒	8007	Logarithmic Periodic Broadband Antenna 180 - 1500 MHz	VULP 9118A	Schwarzbeck	899

All used test equipment are checked resp. calibrated periodically.

☒ Test equipment was checked and complied to the requirements

Test-/Measurement uncertainty

The measurement uncertainty in the test met the guideline of CISPR16-4-2 or better.

Measurement uncertainty of the radiated emission with an extended coverage factor of k = 2:

Frequency	Measurement uncertainty
30 MHz – 200 MHz	4.8 dB (valid for 10 m-OATS)
200 MHz – 1 GHz	4.9 dB (valid for 10 m-OATS)
30 MHz – 200 MHz	4.8 dB (valid for 3 m-OATS)
200 MHz – 1 GHz	6.2 dB (valid for 3 m-OATS)

1.3.2 Test

Rules and specification 47 CFR Part 15 Section 15.109 (a)(c)(g(2))

Limits for radiated emissions

Technical requirements			
Detector	Frequency / MHz	Limit / dBµV/m	Measurement distance / m
QP	30.0 – 88.0	40.0	3
QP	88.0 – 216.0	43.5	3
QP	216.0 – 960.0	46.0	3
QP	960.0 – 1000.0	54.0	3
AV	> 1000	54.0	3
PK	> 1000	74.0	3

Highest frequency generated or used in the device or on which the device operates or tunes:

- ☐ < 1.705 MHz
- ☒ 1.705 – 108 MHz
- ☐ 108 – 500 MHz
- ☐ 500 – 1000 MHz
- ☐ > 1000 MHz

Upper frequency of measurement:

- ☐ 30 MHz
- ☒ 1000 MHz
- ☐ 2000 MHz
- ☐ 5000 MHz
- ☐ 5. harmonic of the highest frequency or 40 GHz, whichever is lower

Frequency range:

- ☐ 9 kHz – 30 MHz
- ☐ 1 – 5 GHz
- ☐ 18 – 26 GHz
- ☒ 30 MHz – 1000 MHz
- ☐ 5 – 18 GHz
- ☐ 26 – 40 GHz

Rationale for selecting the EUT test set up

Equipment units:

EUT with external antenna, external power supply and evaluation unit.

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☒ 120 V/60 Hz	☐ 240 V/60 Hz

Continuous operation with the maximum permitted reading speed according customer specification. The reader was operated without a tag. The TAG ID read XX…XX was transmitted via the data interface to a laptop for display.

Environmental conditions

Temperature [10 – 40 °C]:	24 °C
Relative humidity [10 – 90 %]:	36 %

Environmental conditions during the test:
☒ kept
☐ not kept

Test result

Limits for unwanted radiated emissions:
☒ kept
☐ not kept
☐ not relevant

Remarks: n/a

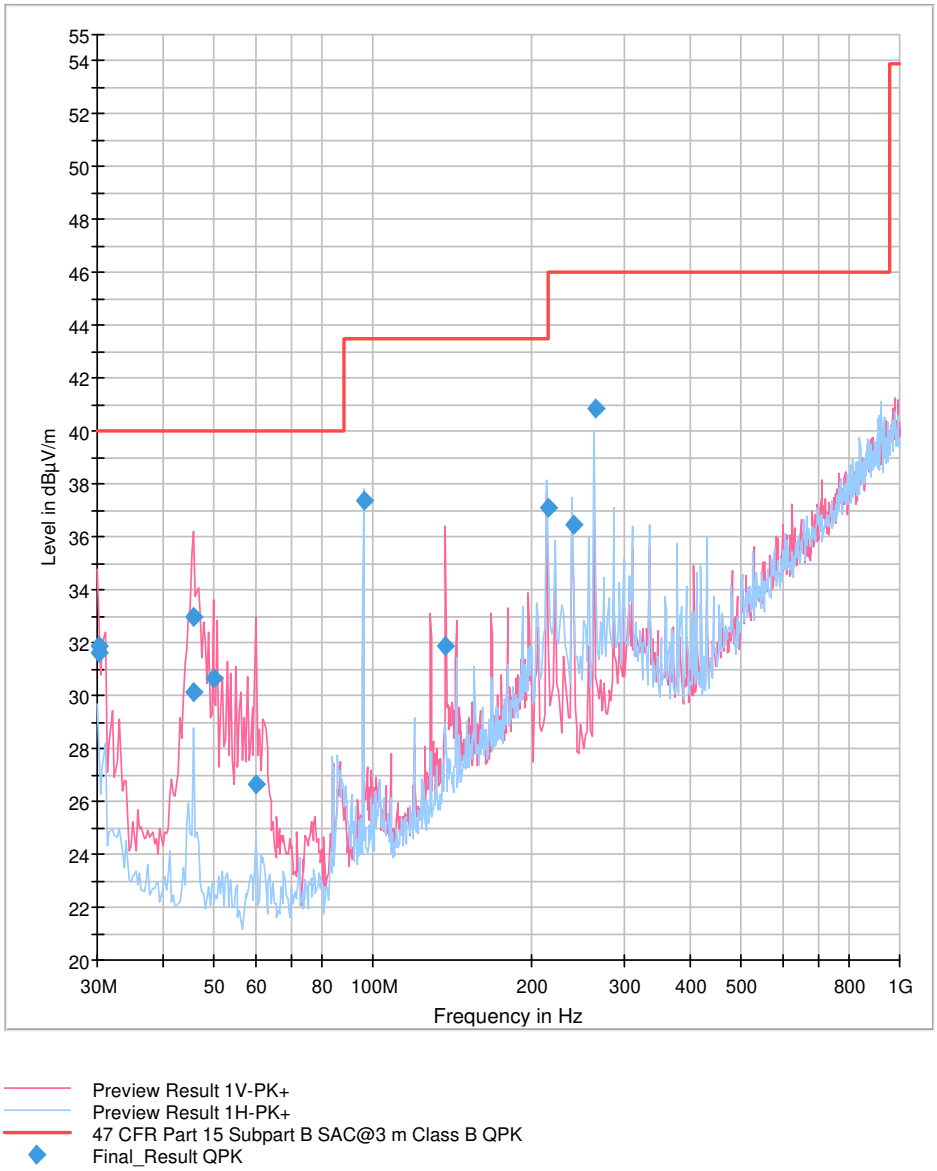
Records

Pre-test measurement
☒ Readings
☒ Diagram

Final measurement
☒ Readings
☒ Diagram

EUT Information

EUT Name:	ARE i9x - hdx - SEMI
Test_ID: / SN:	22-0188PR47-004
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading with max perm. customer reading speed, no Tag
Test specification:	47 CFR Part 15 Subpart B SAC@3 m Class B
Antenna information:	Distance EUT-Ant.: 3.0 m / Polarisation: H/V / Ant.Height: 1.0-4.0 m.
Operator:	Chr. Vogelmann
File #:	22-0188RC47-004-013
Comment #1:	Supply voltage 120 V / 60 Hz
Comment #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)
30.169574	31.60	40.00	8.40	5000.0	120.000	108.0	V	201.0	12.5
30.172345	31.86	40.00	8.14	5000.0	120.000	125.0	V	245.0	12.5
45.731463	30.13	40.00	9.87	5000.0	120.000	225.0	V	190.0	9.1
45.787576	32.99	40.00	7.01	5000.0	120.000	166.0	V	312.0	9.1
49.803607	30.64	40.00	9.36	5000.0	120.000	130.0	V	338.0	8.8
59.935872	26.62	40.00	13.38	5000.0	120.000	235.0	V	126.0	8.5
95.959920	37.34	43.50	6.16	5000.0	120.000	204.0	H	-2.0	10.0
137.322646	31.89	43.50	11.61	5000.0	120.000	135.0	V	55.0	12.4
215.907816	37.13	43.50	6.37	5000.0	120.000	261.0	H	338.0	11.9
239.907816	36.47	46.00	9.53	5000.0	120.000	126.0	H	10.0	12.0
263.899800	40.89	46.00	5.11	5000.0	120.000	166.0	H	10.0	12.9

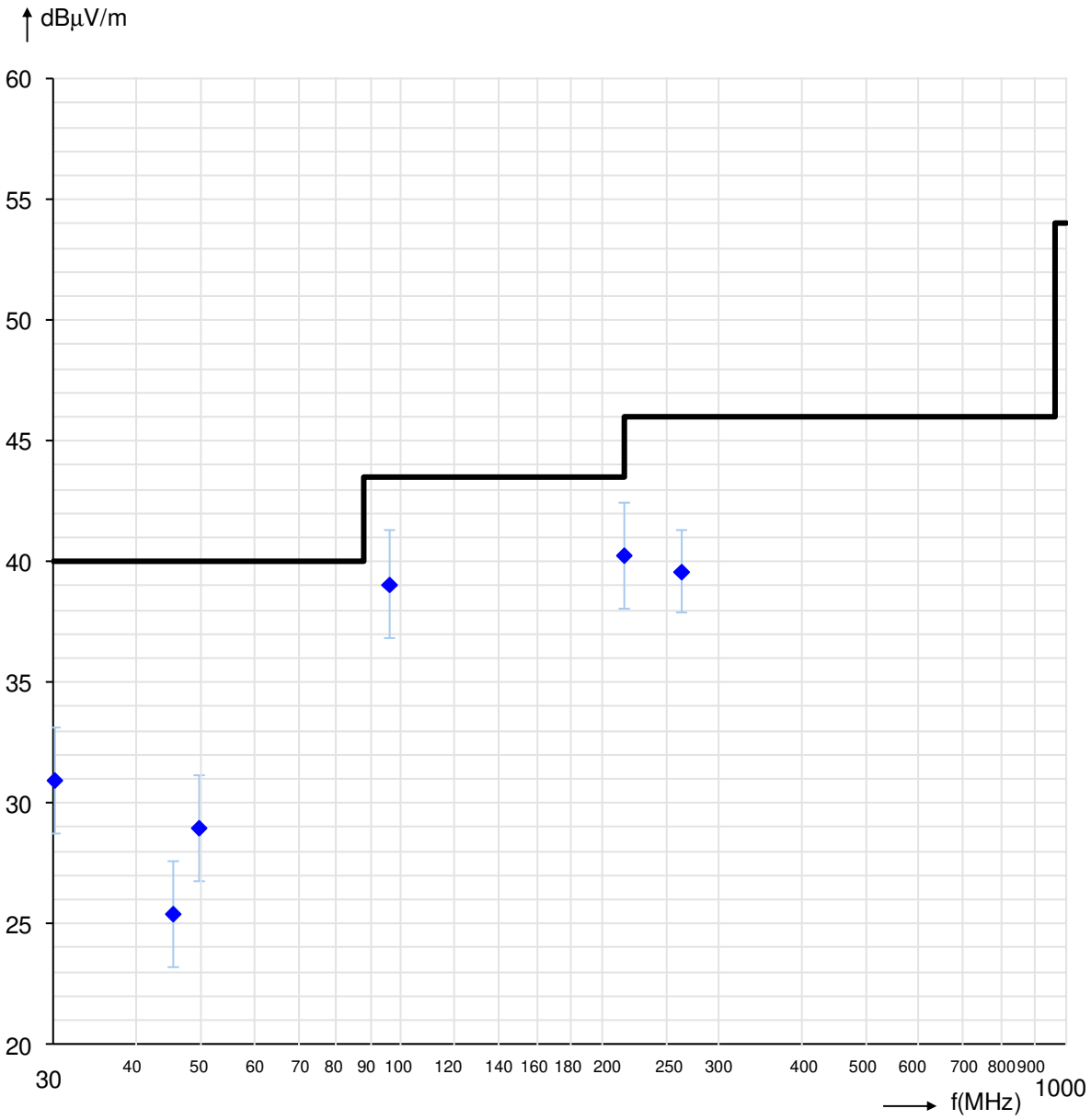
Final measurement

Readings – Antenna horizontal / vertical polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna-Polarisation	Antenna-Height	Turn Table. Position
MHz	dBµV	dB/m	dB	dBµV/m	dBµV/m	dB	hor./ver.	m	Deg.
30.200	18.2	12.1	0.6	30.9	40.0	9.1	V	1.22	270
45.260	15.9	8.8	0.7	25.4	40.0	14.6	V	1.10	90
49.800	19.7	8.4	0.8	28.9	40.0	11.1	V	1.10	270
95.960	28.6	9.4	1.1	39.1	43.5	4.4	H	2.25	0
215.840	27.6	11.0	1.7	40.3	43.5	3.2	H	1.20	45
263.890	25.8	11.9	1.9	39.6	46.5	6.9	H	1.20	10

Diagram radio disturbances – Antenna horizontal / vertical polarized

Limit: 47 CFR Part 15 Section 15.109 @3 m



2 Summary

47 CFR Part 15 Subpart B

Requirement	Regulation section	Result	Remarks
Terminal voltage on AC power-line	§ 15.107 (a)	Pass	n/a
Radiated emissions E-Field of unintentional radiators	§ 15.109 (a)(c)(g(2))	Pass	n/a

Burgrieden, 2023-01-10

Responsible inspector:

Project manager – Steffen Vogelmann

- End of Test Report -