

Test report

AIR44a04

Product / EUT: *RFID Reader*
Type designation: *ARE i9 – LF*
Tested type: *ARE i9 – LF*
EUT authorization: ☒ Certification ☐ SDoC
FCC ID: *V7IAREI9LF* for *ARE i9 – LF*

Production level: *n/a*
S/N: *0000144*
Manufacturer: *AEG Identifikationssysteme GmbH*
Hörvelsinger Weg 47
89081 Ulm / Germany

Test remit: FCC Rules 47 CFR Part 15 – Subpart C
Intentional radiators in accordance with the procedures given in
§15.203; §15.205(a); §15.207; §15.209

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: 10/01/2020
Test ID: PRR40_16
Date(s) of test: 10/06/2020 – 10/08/2020

Burgrieden, 01/09/2021

Released by:

Principal Engineer - Christian Vogelmann

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

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

Accredited by:

Bundesnetzagentur



BNetzA-CAB-02/21-01

Deutsche Akkreditierungsstelle GmbH



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

EU

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*

Voltage supply: *120 V / 60 Hz*

Frequency list: *32.768 kHz; 134.2 kHz; 16 MHz; 17.1776 MHz; 84 MHz*

RF Application: *134.2 kHz*

Temperature range: *n/a*

Size: *(LxWxH) / mm - 70 x 40 x 25*

Supplied / used equipment:

Designation	Type	Manufacturer	S/N
Power supply	APS 1612 T	ANSMANN	n/a
Laptop	W25CSW	Terra	n/a
Laptop power supply	A12-065N2A	Chicony	F134091506009041
USB-A converter	151801	manhattan	n/a

Supplied / used software:

Designation	Type	Version	Manufacturer
Termite	Serial Terminal	3.4	CompuPhase



Configuration:

☒
☐

As-delivered condition*
Modified*

* _____

Cable designation	Type	Length	Remarks
Power and signal line	5-core	3.0 m	n/a

Pictures of the EUT:



Remarks: n/a



State of revision:

Source document	New Document	Date / Reviser	Modifications
AIR44_04	AIR44a04	01/09/2021 Chr. Vogelmann	Reduced print quality to 300 dpi. ARE i9 – LF exclusive documented and ARE i9 – hdx-SEMI removed.

Test equipment list of EMCE GmbH:

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
001	Test receiver	ESS 5Hz - 1000MHz	Rohde & Schwarz	833776/008 Firmware: Main: 1.21 OTP: 02.01 GRA: 02.03	1 Year(s)/ 2020-11-22
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2021-03-10
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2021-02-28
006	LISN	NNBM 8125	Schwarzbeck	8125371	1 Year(s)/ 2021-02-28
007	Absorbing clamp	MDS 21	Schwarzbeck	942436	1 Year(s)/ 2021-02-23
008	Loop antenna 9kHz-30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002	3 Year(s)/ 2022-11-20
009	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	435	3 Year(s)/ 2021-12-05
010	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	108	3 Year(s)/ 2022-11-25
011	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	0403/94	3 Year(s)/ 2022-11-25
012	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	166	3 Year(s)/ 2021-12-05
013	Antenna 9 kHz-30 MHz	Ø 1.5 m	EMCE GmbH		1 Year(s)/ 2021-10-31
014	OATS	Test site 3 m referred to ANSI C63.4-2014	EMCE GmbH		3 Year(s)/ 2021-08-31
015	OATS	Test site 10 m referred to ANSI C63.4-2014	EMCE GmbH		3 Year(s)/ 2021-04-21
020	Coupling clamp	IP4A	Haefely	082672-13	1 Year(s)/ 2021-10-31
024	RF-Generator	SMY01	Rohde & Schwarz	844146/046	2 Year(s)/ 2022-08-21
025	Current clamp BCI	F-120-2	FCC	47	1 Year(s)/ 2021-08-31
026	Coupling-/ Decoupling Network M3	CDN 801-M3-25	FCC	92	1 Year(s)/ 2021-07-31

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
030	Coupling-/Decoupling Network S1 - 9-pol. D-Sub	CDN 801-S1/9pol. DSUB	EMCE GmbH		1 Year(s)/2021-07-31
031	Coupling-/Decoupling Network S1 - 9-pol. D-Sub	CDN 801-S1/9pol. DSUB	EMCE GmbH		1 Year(s)/2021-07-31
032	RF Power Amplifier	75A250	Amplifier Research	22789	3 Year(s)/2023-08-31
034	Coupling-/Decoupling Network AF2	CDN-AF2	EMCE GmbH		1 Year(s)/2021-07-31
038	Helmholtz coil	1 m x 1 m	EMCE GmbH		1 Year(s)/2021-09-30
039	Helmholtz coil	1 m x 1 m	EMCE GmbH		1 Year(s)/2021-09-30
040	Current transformer		EMCE GmbH		1 Year(s)/2021-09-30
041	Loop antenna shielded	HZ-10 0816.2511.02	Rohde & Schwarz	849788/0020	3 Year(s)/2022-12-02
042-2	AC-Source	EMV D 5000/PAS/SyCore	Spitzenberger & Spies	A274700 / 00501	3 Year(s)/2022-10-30
042-1	Analyser Reference System	ARS 16/3	Spitzenberger & Spies	A274707 / 00501	3 Year(s)/2021-11-07
043	Receiver	3DH/E Fieldmeter ESM-100	Maschek	971521	3 Year(s)/2023-08-13
044	CDN	CN-U	EMC-Partner	86	1 Year(s)/2021-09-30
045	CDN	DN-HF	EMC-Partner	86	1 Year(s)/2021-09-30
046	CDN	DN-LF2	EMC-Partner	86	1 Year(s)/2021-09-30
047	CDN	DN-LF1	EMC-Partner	86	1 Year(s)/2021-09-30
050	Data Acquisition/Switch Unit	Agilent 34970A	Agilent Technologies	MY41019453	3 Year(s)/2023-02-06
051	20 Channel Multiplexer	Agilent 34901A	Agilent Technologies	MY41013531	3 Year(s)/2023-02-06
054	Helmholtz coil	1.25 m x 1.25 m	EMCE GmbH		1 Year(s)/2021-09-30
055	Helmholtz coil	1.25 m x 1.25 m	EMCE GmbH		1 Year(s)/2021-09-30

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
058	Receiver	ESIB 40	Rohde & Schwarz	100200/ Firmware 4.35	1 Year(s)/ 2021-05-31
059	Log.-per. antenna	HL050	Rohde & Schwarz	100006	3 Year(s)/ 2022-08-13
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)/ 2021-01-04
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)/ 2021-05-21
067	LISN	ESH2-Z5	Rohde & Schwarz	872460/043	1 Year(s)/ 2021-02-03
068	LISN	ESH2-Z5	Rohde & Schwarz	872460/042	1 Year(s)/ 2021-02-17
070	Pulse limiter + 10 dB Attenuator	ESH3-Z2	Rohde & Schwarz	n/a	1 Year(s)/ 2021-08-31
073	Absorbing clamp	MDS21	Schwarzbeck	881757	1 Year(s)/ 2021-01-23
074	Synthesizer signal generator	SMX	Rohde & Schwarz	5SM02675	2 Year(s)/ 2021-11-19
115	Strip line 50 Ohm		EMCE GmbH		1 Year(s)/ 2021-01-31
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)/ 2021-02-28
118	Current Probe	F-52	Fischer Customs Communication, Inc.	08398	1 Year(s)/ 2021-08-31
119	10V Insertion Unit 50 Ohm	URV5-Z2	Rohde & Schwarz	100911	2 Year(s)/ 2021-07-31
122	Power Meter	NRVS	Rohde & Schwarz	833430 / 0017	2 Year(s)/ 2021-08-28
123	Directional coupler	BDC 0100- 50/500	BONN Elektronik	087261	1 Year(s)/ 2021-08-31
127	Function/ Arbitrary Waveform Generator	Agilent 33220A	Agilent Technologies	MY44026679	3 Year(s)/ 2022-02-28
128	Signal Generator	SMF100A	Rohde & Schwarz	100137	2 Year(s)/ 2021-01-07
129	ESD-Gun	ESD30N	EM TEST GmbH	V1012106114	3 Year(s)/ 2023-03-30

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
131	Coupling network	M3/AC	Dr. Hubert GmbH	A3052006	1 Year(s)/ 2021-07-31
132	LF-Amplifier	A1110-05	Dr. Hubert GmbH	111A1110	2 Year(s)/ 2021-11-30
134	10 V Insertion Unit 50 Ohm	URV5-Z2	Rohde & Schwarz	101025	2 Year(s)/ 2021-11-15
136	Directional coupler	BDC 0842-40/200	Bonn Elektronik	108082	1 Year(s)/ 2021-08-31
140	Burst/Surge-Generator	Transient 3000	EMC-Partner	TRA3000 104033	2 Year(s)/ 2021-11-30
142	Coupling / Decoupling Network for Burst and Surge	CNI 503 B7.4	EM TEST GmbH	V1125109869	2 Year(s)/ 2021-10-29
143	Ultra-Compact Simulator	UCS 500 N7	EM TEST AG	V1125109868	2 Year(s)/ 2021-10-28
147	10-V-insertion unit 50 Ohm	URV5-Z2	Rohde & Schwarz	101049	2 Year(s)/ 2022-02-25
151	DSO Infiniium 2500 MHz	DSO9254A	Agilent Technologies	MY52090137	2 Year(s)/ 2022-03-06
154	Capacitive voltage clamp	CDN 500	Teseq GmbH	656	3 Year(s)/ 2021-06-26
157	Power Amplifier	CBA1G-1000	Teseq GmbH	T44166	3 Year(s)/ 2021-05-07
159	Function/Arbitrary Waveform Generator	Agilent 33220A	Agilent Technologies	MY44058563	3 Year(s)/ 2022-04-30
163	Power Sensor	NRV-Z4	Rohde & Schwarz	100575	2 Year(s)/ 2022-04-08
174	LISN	ESH3-Z6	Rohde & Schwarz	101003	1 Year(s)/ 2021-02-28
178	V-LISN 5 μ H	NNHV 8123-400	Schwarzbeck	018	2 Year(s)/ 2021-01-31
184	V-LISN 5 μ H	NNHV8123-400	Schwarzbeck	019	1 Year(s)/ 2021-01-31
186	Signal Generator 9kHz - 3.3GHz	SML03	Rohde & Schwarz	836927/005	2 Year(s)/ 2022-10-31
187	Arbitrary Generator	AutoWave	EM Test GmbH	P1450145409	3 Year(s)/ 2022-10-24
190	Coupling-/ Decoupling Network M1	CDN M132	Ametek	40493	1 Year(s)/ 2021-07-31

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
191	Coupling-/Decoupling Network M2	CDN M232S	Ametek	37701	1 Year(s)/ 2021-07-31
192	Coupling-/Decoupling Network M3	CDN M332	Ametek	37749	1 Year(s)/ 2021-07-31
193	Coupling-/Decoupling Network M3	CDN M332	Ametek	37750	1 Year(s)/ 2021-07-31
194	Coupling-/Decoupling Network M4	CDN M432	Ametek	39127	1 Year(s)/ 2021-07-31
195	Coupling-/Decoupling Network M5	CDN M532	Ametek	40558	1 Year(s)/ 2021-07-31
196	Coupling-/Decoupling Network AF2	CDN A201A	Ametek	40613	1 Year(s)/ 2021-07-31
197	Coupling-/Decoupling Network AF2	CDN A201A	Ametek	40614	1 Year(s)/ 2021-07-31
198	Coupling-/Decoupling Network S1 - 9-pol. D-Sub	CDN S900	Ametek	40033	1 Year(s)/ 2021-07-31
199	Coupling-/Decoupling Network S1 - RJ45	CDN ST08A	Ametek	39792	1 Year(s)/ 2021-07-31
200	Coupling-/Decoupling Network S1 - RJ45	CDN ST08A	Ametek	39794	1 Year(s)/ 2021-07-31
201	Coupling-/Decoupling Network S1 - USB	CDN USB/p	Ametek	40162	1 Year(s)/ 2021-07-31
202	Coupling-/Decoupling Network S1 - USB 3.0	CDN USB3.0	Ametek	40536	1 Year(s)/ 2021-07-31
204	Coupling-/Decoupling Network S1 - 9-pol. D-Sub	CDN S900	Ametek	40034	1 Year(s)/ 2021-07-31
208	RF Power Meter	NRVD	Rohde & Schwarz	832378/056	2 Year(s)/ 2022-05-14
211	Broadband Amplifier	BBA150 800 - 3000 MHz	Rohde & Schwarz	102104	1 Year(s)/ 2021-09-30

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
212	Broadband Amplifier	BBA150 2500 - 6000 MHz	Rohde & Schwarz	102105	1 Year(s)/ 2021-09-30
214	Load Dump Simulator	LD 200N	em test	P1551169024	3 Year(s)/ 2022-10-22
215	Ultra-Compact Simulator for automotives	UCS200N100	em test	P1607171950	3 Year(s)/ 2022-10-23
216	Voltage Drop Simulator	VDS 200Q100.1	em test	P1612177896	3 Year(s)/ 2022-10-16
217	Automotive Power Fail Module	PFM 200N100.1	em test	P1606171835	3 Year(s)/ 2022-10-24
222	Broadband Preamplifier 0.5-18GHz	BBV 9718	Schwarzbeck	9718-316	1 Year(s)/ 2021-05-31
223	Broadband Preamplifier 12-28GHz	BBV 9719	Schwarzbeck	9719-024	1 Year(s)/ 2021-05-31
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)/ 2022-02-28
227	Field Probe HI-6006	HI-6006	ETS-Lindgren	00213536	1 Year(s)/ 2021-07-09
228	Coupling device network AF4	CDN AF4-32	EMCE GmbH		1 Year(s)/ 2021-07-31
229	Test receiver	ESS 5 Hz - 1000 MHz	Rohde & Schwarz	845420/0005	1 Year(s)/ 2020-12-13
230	FSV40 Signal Analyzer 40 GHz	FSV40	Rohde & Schwarz	101717	2 Year(s)/ 2022-01-16
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)/ 2022-01-17
235	ESD-Gun	NSG 435	Teseq	7275	1 Year(s)/ 2021-09-04
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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
240	Broadband Preamplifier 18-40 GHz	BBV 9721	Schwarzbeck	54	1 Year(s)/ 2021-04-30
241	Coupling Network M2	CN M232-300-DC	Teseq	52495	1 Year(s)/ 2021-07-31
242	Coupling Network M4	CN M432-AC	Teseq	53779	1 Year(s)/ 2021-07-31
243	Coupling Network M2	CN M232-AC	Teseq	50442	1 Year(s)/ 2021-07-31
244	Coupling Network M3	CN M332-AC	Teseq	53480	1 Year(s)/ 2021-07-31
245	Coupling Network M4	CN A401-M	Teseq	53736	1 Year(s)/ 2021-07-31
246	Coupling Network T8	CN T8-AC	Teseq	53835	1 Year(s)/ 2021-07-31
247	Coupling Network T8	CN T8-DC	Teseq	53849	1 Year(s)/ 2021-07-31
248	Coupling Network T4	CN T444-AC	Teseq	53832	1 Year(s)/ 2021-07-31
249	Coupling Network T4	CN T444-DC	Teseq	51260	1 Year(s)/ 2021-07-31
250	Coupling Network M5	CN M532-AC	Teseq	540086	1 Year(s)/ 2021-07-31
251	Isolation Transformer	ITF 22	Teseq	540068	
253	Broadband Preamplifier 20-1000 MHz	ESV-Z3	Rohde & Schwarz	881 909/030	1 Year(s)/ 2021-05-31
254	Power Sensor	NRP6AN	Rohde & Schwarz	101326	2 Year(s)/ 2021-05-31
255	Coupling Network AF2	CN A201-M	Teseq	52135	1 Year(s)/ 2021-07-31
257	Pulse limiter + 10 dB Attenuator	ESH3-Z2	Rohde & Schwarz	102769	1 Year(s)/ 2021-08-31
258	SMB100A Signal Generator	SMB100A 100 kHz - 40 GHz	Rohde & Schwarz	181667	3 Year(s)/ 2022-10-15
259	SMB100B Signal Generator	SMB100B 8 kHz - 6 GHz	Rohde & Schwarz	101679	3 Year(s)/ 2022-11-01
260	Coupling Network	CDN HF Chirurgie	EMCE GmbH	n/a	1 Year(s)/ 2020-12-31
262	EM Clamp	KEMZ 801A	Teseq	78033	1 Year(s)/ 2021-01-22



Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
718	EMC-Software	BAT-EMC Vers. 3.18.0.19	Nexio	n/a	
997	EMC Software	EMC32 Vers. 10.60.15	Rohde & Schwarz	n/a	
1046	Environmental Simulation Chamber	MKF 115 (E3.1)	Binder GmbH	12-02215	3 Year(s)/ 2023-03-19
1212	EMC Software	WMS32 Vers. 10.60.15	Rohde & Schwarz	n/a	



Scope:

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1 EMC-Test(s)

1.1 Emission according 47 CFR Part 15 Subpart C - 10/2020

1.1.1 Terminal voltage according 47 CFR Part 15 Subpart C - 10/2020

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

*

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
	584	Shielded room # 3	3.6 x 3.6 x 2.5 m	Siemens AG	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	678	Shielded room # 4	4.0 x 4.0 x 3.5 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	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
	679	Full anechoic chamber # 3	8.8 x 4.6 x 4.2 m	Albatross Projects 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
	042	Voltage- / current source test site	0-382VDC 0-270VAC 1 x 10 kW/3 x 5 kW	Spitzenberger + Spies	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	n/a	Alternative test site	n/a	n/a	n/a



1.1.1.1 Test set up

According ANSI C63.10-2013





Used test equipment

☒	Inv.-No.	Designation	Type	Manufacturer	S/N
	001	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	833776/008
	002	Probe	ESH2-Z3	Rohde & Schwarz	
☒	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
	006	LISN	NNBM 8125	Schwarzbeck	8125371
	007	Absorbing clamp	MDS 21	Schwarzbeck	942436
	025	Current clamp BCI	F-120-2	FCC	47
	026	Coupling device network	CDN 801-M3-25	FCC	92
	030	Coupling device network	CDN-S9	EMCE GmbH	
	031	Coupling device network	CDN-S9	EMCE GmbH	
	036	Coupling device network	CDN-M5-25	EMCE GmbH	
	037	Coupling device network	CDN-S1	EMCE GmbH	
☒	042	AC-Source / Analyser / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
	060	HF-coupling clamp	KEMA 801	Schaffner	20808
	067	LISN 5	ESH2-Z5	Rohde & Schwarz	0872460/043
☒	068	LISN 4	ESH2-Z5	Rohde & Schwarz	0872460/042
	073	Absorbing clamp	MDS 21	Schwarzbeck	881757
☒	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

1.1.1.2 Test

Regulation

47 CFR Part 15 Subpart C - 10/2020

☐ 9 kHz – 30 MHz

☒ 150 kHz – 30 MHz

Mains supply

Limits:

☒ Section 15.207

☐ __

Operation mode

EUT arrangement:

☒ Tabletop

☐ Floor standing

Power supply:

☒ 120 V/60 Hz

☐ 240 V/60 Hz

Rated voltage variation:

☐ 85 %

☐ 115 %

Port #	Designation	Remarks
# 1	AC power line - EUT	L/N/PE
# 2	AC power line - Laptop	L/N/PE
# 3		

For the worst case scenario of emission assessment, the RFID reader was continuously operated in read mode. No transponder inside the reading range.

Artificial hand

☒ None

☐ Handle

☐ Other(s): __

Environmental conditions

Temperature: 15 – 35 °C

Humidity: 30 – 60 %

Air pressure: 860 – 1060 hPa

Environmental conditions during the test:

☒ kept

☐ not kept

Test - / Measurement procedure

Measurements are made with a receiver according CISPR 16 guidelines. A pulse limiter and a 10dB attenuator at the receiver input is used to protect the receiver. The required frequency range is scanned in an automatically operation. When the EUT is arranged the frequency range is monitored. The setup of the equipment and the cables are manipulated within the range to produce the highest emission. Frequency steps of $<0.5 \times$ receiver bandwidth and peak / average detectors are used. If the conducted emission is closer than 20dB to the limits or exceeds, the receiver will retest the emission with quasipeak or average detector. The identified frequency and amplitude of the six highest conducted emissions relative to the limit lines are listed for each current-carrying conductor. If less than six emission frequencies are within the 20dB of the limit, the noise level of the measuring instrument at representative frequencies are reported.

The reported test results are calculated with the following formula:

$$\text{Result (dB}\mu\text{V)} = \text{Reading (dB}\mu\text{V)} + \text{ATF (dB)} + \text{CF (dB)}$$

ATF = Correction factor for the pulse limiter / 10dB attenuator

CF = Correction factor for the cable loss

Test result

Limits for continuous disturbances:

☒ kept
☐ not kept

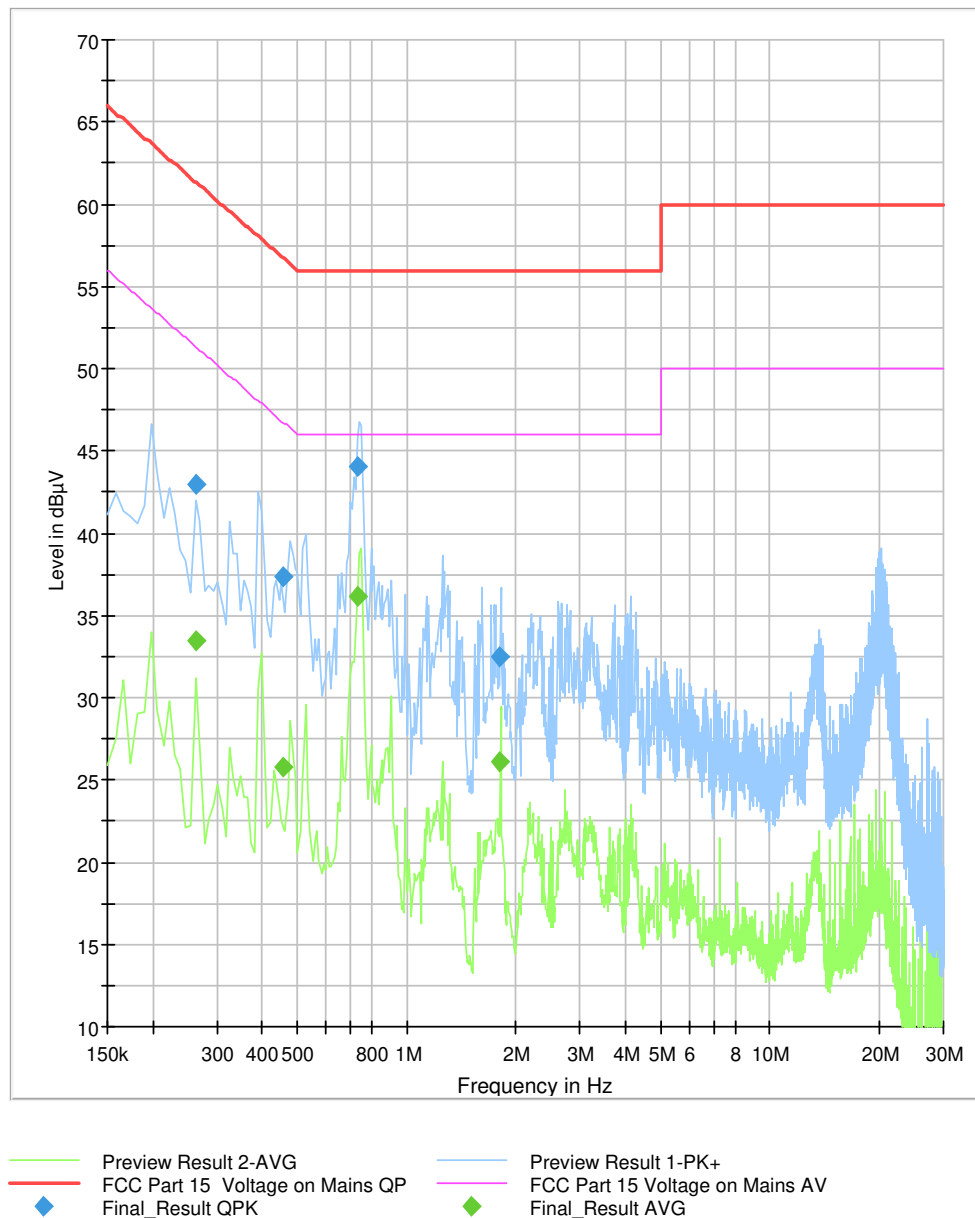
Remarks: n/a

Enclosure

☒ Readings - continuous emanation
☒ Diagram - continuous emanation

EUT Information

EUT Name:	ARE i9 LF
Test_ID: / SN:	PRR40_16
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading, no transponder inside the reading range
Test specification:	FCC Part 15 Subpart C
LISN port	N, #1 - EUT
Operator:	S. Vogelmann
File #:	AIR41_15
Comment #1:	
Comment #2:	



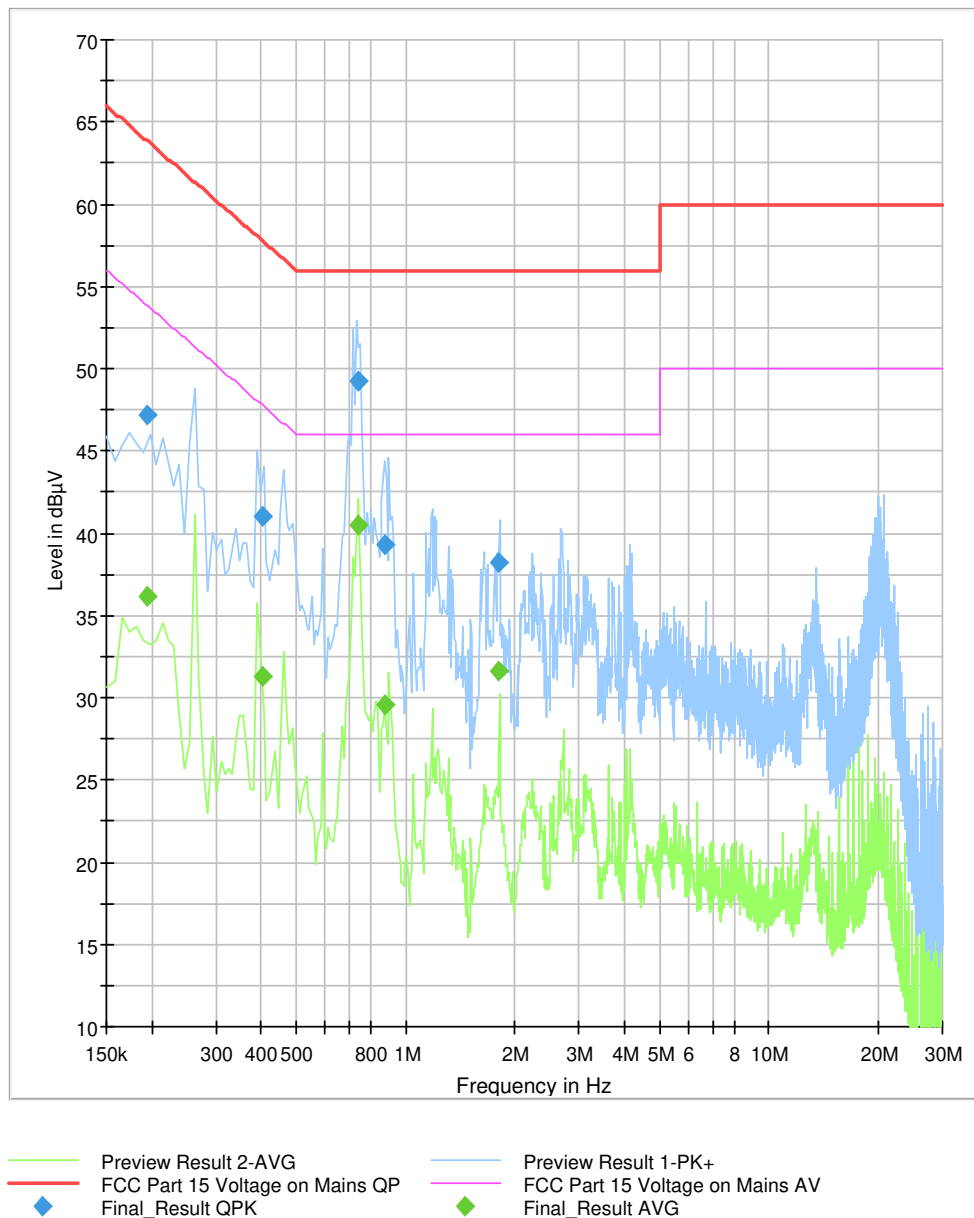


Final result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.262000	---	33.46	51.37	17.91	5000.0	10.000	N	9.9
0.262000	43.01	---	61.37	18.36	5000.0	10.000	N	9.9
0.458000	---	25.79	46.73	20.94	5000.0	10.000	N	9.9
0.458000	37.39	---	56.73	19.34	5000.0	10.000	N	9.9
0.730000	---	36.12	46.00	9.88	5000.0	10.000	N	9.9
0.730000	44.02	---	56.00	11.98	5000.0	10.000	N	9.9
1.810000	---	26.07	46.00	19.93	5000.0	10.000	N	10.0
1.810000	32.47	---	56.00	23.53	5000.0	10.000	N	10.0

EUT Information

EUT Name:	ARE i9 LF
Test_ID: / SN:	PRR40_16
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading, no transponder inside the field
Test specification:	FCC Part 15 Subpart C
LISN port	L, #1 - EUT
Operator:	S. Vogelmann
File #:	AIR41_16
Comment #1:	
Comment #2:	

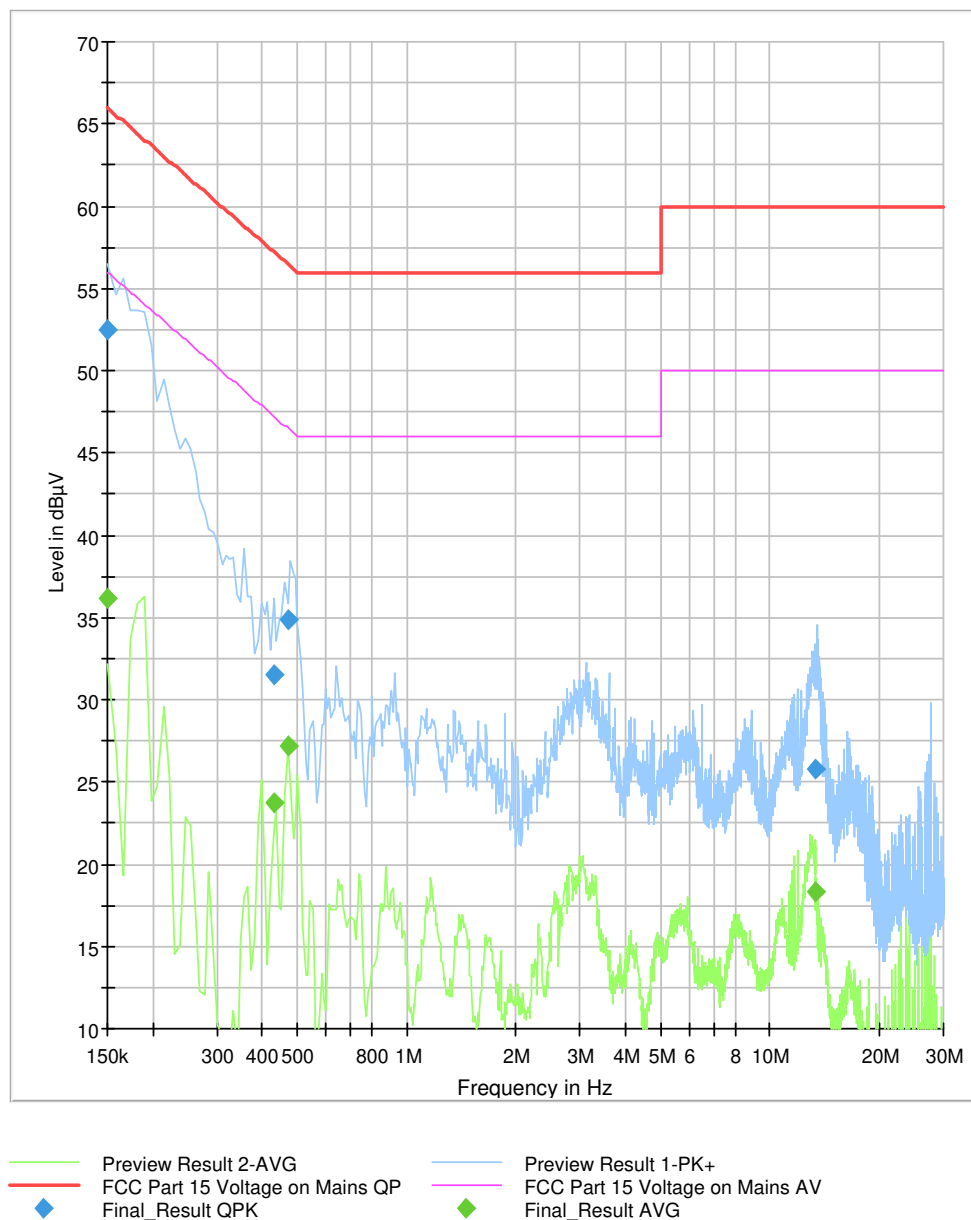


Final result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.194000	47.18	---	63.86	16.68	5000.0	10.000	L1	9.9
0.194000	---	36.16	53.86	17.70	5000.0	10.000	L1	9.9
0.402000	41.05	---	57.81	16.76	5000.0	10.000	L1	9.9
0.402000	---	31.29	47.81	16.52	5000.0	10.000	L1	9.9
0.738000	49.23	---	56.00	6.77	5000.0	10.000	L1	9.9
0.738000	---	40.54	46.00	5.46	5000.0	10.000	L1	9.9
0.882000	39.30	---	56.00	16.70	5000.0	10.000	L1	10.0
0.882000	---	29.59	46.00	16.41	5000.0	10.000	L1	10.0
1.810000	38.27	---	56.00	17.73	5000.0	10.000	L1	10.0
1.810000	---	31.65	46.00	14.35	5000.0	10.000	L1	10.0

EUT Information

EUT Name:	ARE i9 LF
Test_ID: / SN:	PRR40_16
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading, no transponder inside the field
Test specification:	FCC Part 15 Subpart C
LISN port	N, #2 - Laptop
Operator:	S. Vogelmann
File #:	AIR41_17
Comment #1:	
Comment #2:	



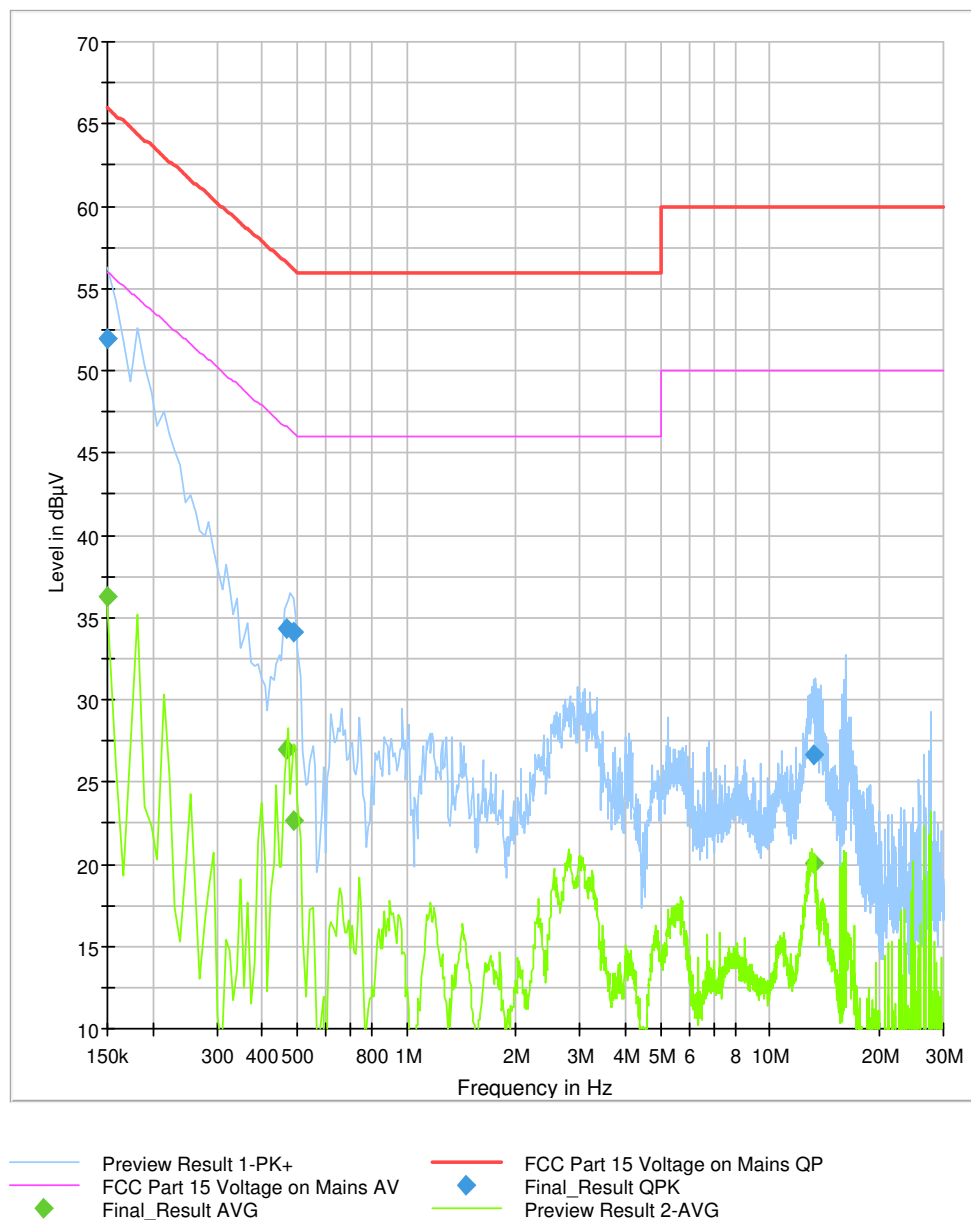


Final result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	36.21	56.00	19.79	5000.0	10.000	N	9.9
0.150000	52.44	---	66.00	13.56	5000.0	10.000	N	9.9
0.434000	31.50	---	57.18	25.68	5000.0	10.000	N	9.9
0.434000	---	23.68	47.18	23.50	5000.0	10.000	N	9.9
0.474000	34.90	---	56.44	21.54	5000.0	10.000	N	9.9
0.474000	---	27.18	46.44	19.26	5000.0	10.000	N	9.9
13.402000	---	18.32	50.00	31.68	5000.0	10.000	N	10.2
13.402000	25.75	---	60.00	34.25	5000.0	10.000	N	10.2

EUT Information

EUT Name:	ARE i9 LF
Test_ID: / SN:	PRR40_16
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading, no transponder inside the field
Test specification:	FCC Part 15 Subpart C
LISN port	L, #2 - Laptop
Operator:	S. Vogelmann
File #:	AIR41_13
Comment #1:	
Comment #2:	





Final result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	51.92	---	66.00	14.08	5000.0	10.000	L1	9.9
0.150000	---	36.27	56.00	19.73	5000.0	10.000	L1	9.9
0.466000	34.31	---	56.59	22.27	5000.0	10.000	L1	9.9
0.466000	---	26.93	46.59	19.65	5000.0	10.000	L1	9.9
0.490000	34.12	---	56.17	22.05	5000.0	10.000	L1	9.9
0.490000	---	22.65	46.17	23.52	5000.0	10.000	L1	9.9
13.202000	26.63	---	60.00	33.37	5000.0	10.000	L1	10.2
13.202000	---	20.03	50.00	29.97	5000.0	10.000	L1	10.2

1.1.2 Radio disturbances - 47 CFR Part 15 Subpart C

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

*

Test location

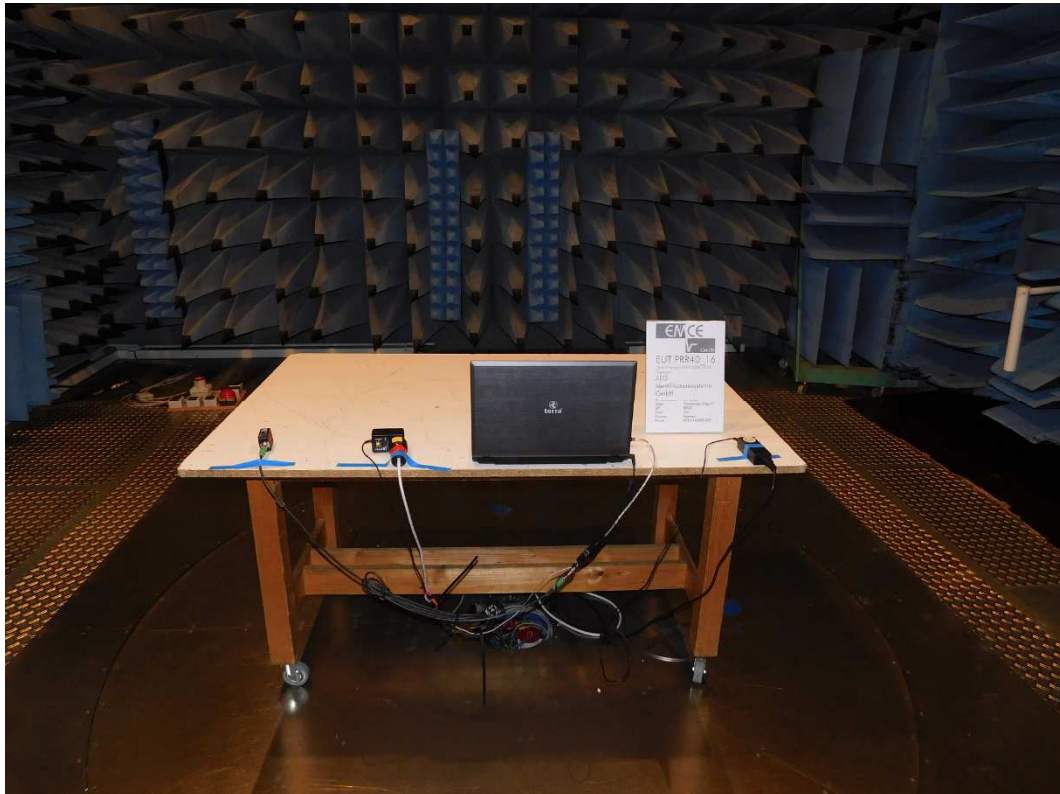
☒	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
	588	Shielded room # 2	8.3/5.8 x 5.5/2.9 x 3.4 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	584	Shielded room # 3	3.6 x 3.6 x 2.5 m	Siemens AG	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	678	Shielded room # 4	4.0 x 4.0 x 3.5 m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒	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
	679	Full anechoic chamber # 3	8.8 x 4.6 x 4.2 m	Albatross Projects 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
	042	Voltage-/current source test site	0-382VDC 0-270VAC 1 x 10 kW/3 x 5 kW	Spitzenberger + Spies	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	n/a	Alternative test site	n/a	n/a	n/a



1.1.2.1 Test set up

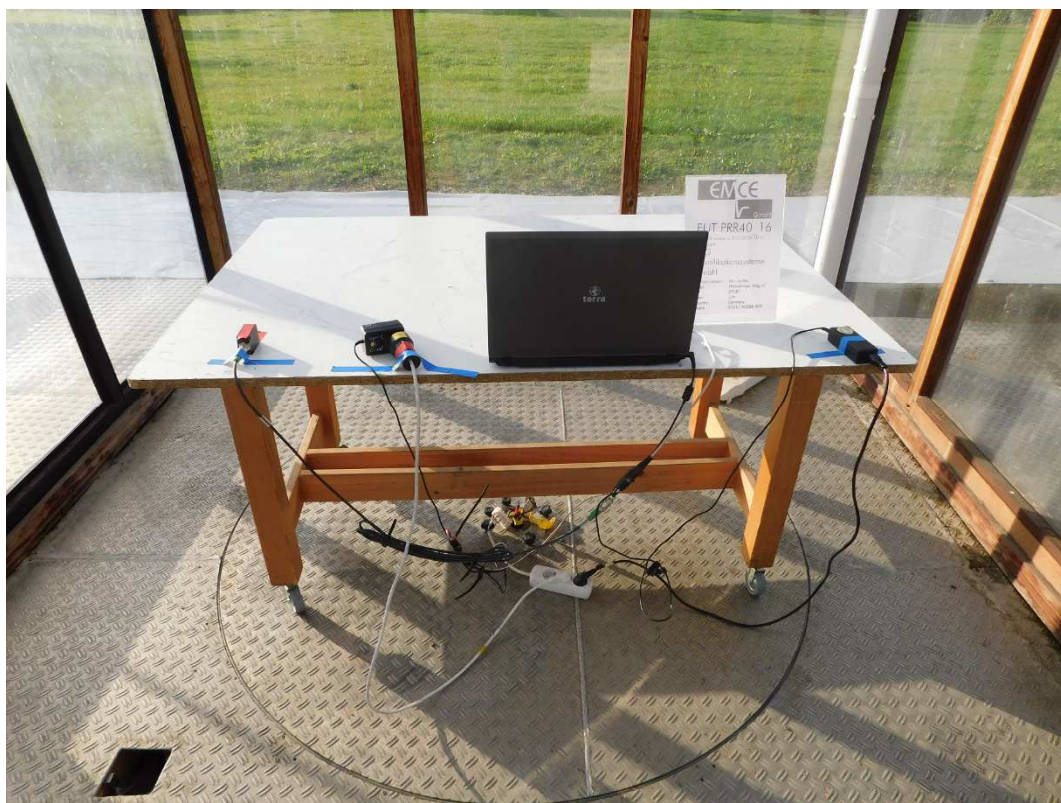
According ANSI C63.10-2013

Semi anechoic chamber





OATS



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
	006	LISN	NNBM 8125	Schwarzbeck	8125371
	007	Absorbing clamp	MDS 21	Schwarzbeck	942436
☒	008	Antenna 9 kHz – 30 MHz	HFH2-Z2	Rohde & Schwarz	835776/0002
☒	009	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	435
☒	010	Antenna 250 – 1200 MHz	UHALP 9108A	Schwarzbeck	108
☒	011	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
☒	012	Antenna 250 – 1200 MHz	UHALP 9108A	Schwarzbeck	166
	013	Antenna 9 kHz – 30 MHz	Loop antenna 1.5 m Ø	EMCE GmbH	
	025	Current clamp BCI	F-120-2	FCC	47
	041	HZ-10	Shielded coil	Rohde & Schwarz	849788/020
☒	042	AC-Source / Analyser / 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
	060	HF coupling clamp	KEMA 801	Schaffner	20808
	063	Logper. Antenna	HL023 A2	Rohde & Schwarz	
	067	LISN 5	ESH2-Z5	Rohde & Schwarz	0872460/043
	068	LISN 4	ESH2-Z5	Rohde & Schwarz	0872460/042
	073	Absorbing clamp	MDS 21	Schwarzbeck	881757
	116	Vertical rod antenna	VAMP 9243	Schwarzbeck	9243-205

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
9 kHz – 30 MHz	on request
30 MHz – 300 MHz	4.4 dB
300 MHz – 1 GHz	3.4 dB
1 GHz – 18 GHz	on request

1.1.3 Test – Radiated emission limits; general requirements $f < 30$ MHz

Regulation

47 CFR Part 15 Subpart C - 10/2020

- | | |
|--|--|
| ☒ 9 kHz – 30 MHz | ☐ 150 kHz – 1 GHz |
| ☐ 30 MHz – 1000 MHz | ☐ 1 – 18 GHz |

Limits: ☒ Section 15.209* ☐ Section 15.225*

* The limits for frequencies below 30MHz were corrected for a closer measuring distance by using an extrapolation factor of 40 dB/decade..

Test distance: ☒ 3 m (SAC) ☐ 5 m
☒ 10 m (OATS) ☐ 30 m

Operation mode

EUT arrangement: ☒ Tabletop ☐ Floor standing
 Power supply: ☒ 120 V/60 Hz ☐ 240 V/60 Hz
 Rated voltage variation: ☒ 85 % ☒ 115 %

ISM-Frequencies: ☐ __ MHz ☐ __ MHz
 max. clock frequency: ☐ __ MHz ☐ __ MHz

For the worst case scenario of emission assessment, the RFID reader was continuously operated in read mode. No transponder inside the reading range.

Environmental conditions

Temperature: 15 – 35 °C
 Humidity: 30 – 60 %
 Air pressure: 860 – 1060 hPa

Environmental conditions during the test: ☒ kept ☐ not kept

Test - / Measurement procedure

The test was performed at an antenna to EUT distance of 3 m or 10 m in the frequency range ≤ 30 MHz. Measurements were made with a CISPR receiver with quasi-peak. The average detector is used in the frequency bands 9-90 kHz and 110-490 kHz. For pulse modulated devices with a pulse repetition frequency of 20 Hz or less, peak detector is used (15.35a Note). The frequency, the measured value, antenna information and the limit will be printed out.

The reported test results are calculated with the following formula:

$$\text{Field strength (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)}$$

AF = Correction factor for the antenna
 CF = Correction factor for the cable loss

$$\text{Limit}_{10\text{m}} (\text{dB}\mu\text{V/m}) = \text{Limit (dB}\mu\text{V/m)} + \text{LCF}_{10\text{m}} (\text{dB})$$

Limit_{10m} Limit calculated for 10 m test distance
 LCF_{10m} = Limit Correction factor for 10 m test distance
 LCF_{10m} for 30 m antenna distance = 20 dB
 LCF_{10m} for 100 m antenna distance = 40 dB
 LCF_{10m} for 300 m antenna distance = 60 dB

$$\text{Limit}_{3\text{m}} (\text{dB}\mu\text{V/m}) = \text{Limit (dB}\mu\text{V/m)} + \text{LCF}_{3\text{m}} (\text{dB})$$

Limit_{3m} Limit calculated for 3 m test distance
 LCF_{3m} = Limit Correction factor for 3 m test distance
 LCF_{3m} for 30 m antenna distance = 40 dB
 LCF_{3m} for 100 m antenna distance = 60 dB
 LCF_{3m} for 300 m antenna distance = 80 dB

Test result

Readings - Antenna vertical polarized, Antenna loop center height 1 m

Frequency	Field strength	Limit _{10m}	Margin	Ant.-	Ant.-	Detector	Receiver	Supply voltage	Remarks
				Distance	Polar.	Peak /	6dB BW		
MHz	dB μ V/m	dB μ V/m	dB	m	H/V	QP / AV	kHz		
0.13420	60.6	85.0	24.6	10.0	V	AV	0.2	120V	
0.13420	60.6	85.0	24.6	10.0	V	AV	0.2	102V	
0.13420	60.6	85.0	24.6	10.0	V	AV	0.2	138V	
Limit _{10m} Limit calculated for 10 m test distance									

Frequency	Field strength	Limit _{3m}	Margin	Ant.-	Ant.-	Detector	Receiver	Remarks
				Distance	Polar.	Peak /	6dB BW	
MHz	dB μ V/m	dB μ V/m	dB	m	H/V	QP / AV	kHz	
0.06148	53.6	111.8	58.2	3.0	V	AV	0.2	
0.13420	89.9	105.0	15.1	3.0	V	AV	0.2	
0.40149	44.4	95.5	51.1	3.0	V	AV	10	
0.9036	56.1	68.5	12.4	3.0	V	QP	10	
1.8070	47.6	69.5	21.9	3.0	V	QP	10	
2.7096	42.0	69.5	27.5	3.0	V	QP	10	
3.6155	35.2	69.5	34.3	3.0	V	QP	10	
Limit _{3m} Limit calculated for 3 m test distance								

Limits for radiated emissions:

☒ kept
☐ not kept

Remarks: n/a

Enclosure



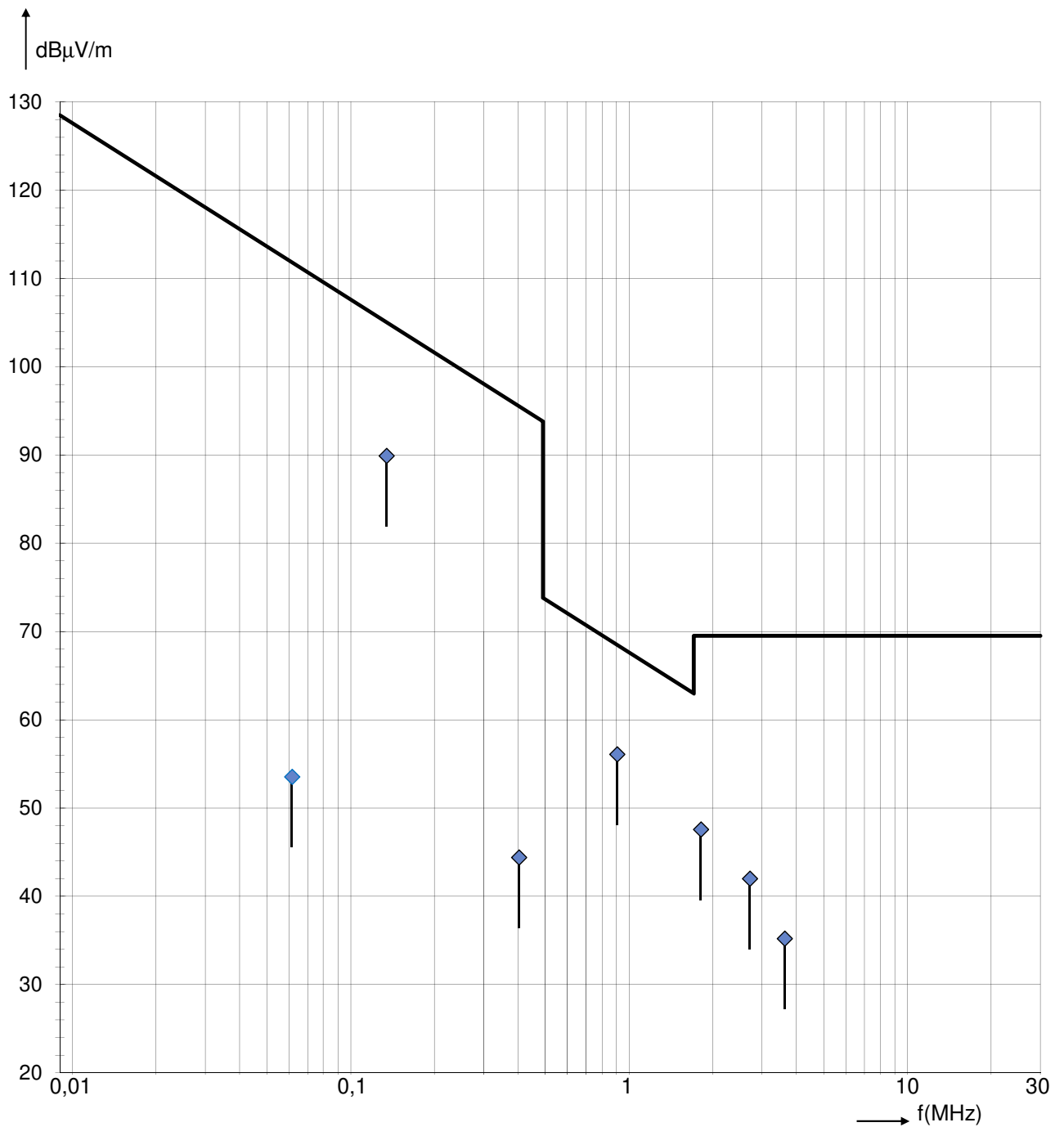
Diagram - Antenna horizontal polarized.
 Diagram - Antenna vertical polarized.



Diagram - Antenna vertical polarized

Limit according FCC Rules CFR 47 Part 15 – Subpart C

☒ Section 15.209 – Limit corrected to 3 m distance



1.1.4 Test – Radiated emission limits; general requirements $30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$

Regulation

47 CFR Part 15 Subpart C - 10/2020

- | | |
|---|--|
| ☐ 9 kHz – 30 MHz | ☐ 150 kHz – 1 GHz |
| ☒ 30 MHz – 1000 MHz | ☐ 1 – 18 GHz |

Limits: ☒ Section 15.209 ☐ __

Test distance: ☒ 3 m ☐ 5 m
☐ 10 m ☐ 30 m

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☒ 120 V/60 Hz	☐ 240 V/60 Hz
Rated voltage variation:	☐ 85 %	☐ 115 %

ISM-Frequencies:	☐ __ MHz	☐ __ MHz
max. clock frequency:	☐ __ MHz	☐ __ MHz

For the worst case scenario of emission assessment, the RFID reader was continuously operated in read mode. A transponder was located within half the reading range at a distance of 4 cm from the surface of the reader. To display the received data, the reader was connected to a USB port of a laptop.

Environmental conditions

Temperature: 15 – 35 °C
 Humidity: 30 – 60 %
 Air pressure: 860 – 1060 hPa

Environmental conditions during the test: ☒ kept
☐ not kept



Test-/Measurement procedure

The test was performed at an antenna to EUT distance of 3m for frequencies $\geq 30\text{MHz}$. Measurements were made with a CISPR receiver with quasi-peak. The average detector is used in for frequencies above 1000MHz. For pulse modulated devices with a pulse repetition frequency of 20Hz or less, peak detector is used (15.35a Note). The frequency, the measured value, antenna information and the limit will be printed out.

The reported test results are calculated with the following formula:

$$\text{Field strength (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)}$$

AF = Correction factor for the antenna

CF = Correction factor for the cable loss

Test result

Limits for intentional radiators:

☒ kept
☐ not kept

Level of the fundamental > unwanted emission:

☒ kept
☐ not kept

Remarks: n/a

Enclosure

- ☒ Readings - Antenna horizontal polarized.
- ☒ Diagram - Antenna horizontal polarized.
- ☒ Readings - Antenna vertical polarized.
- ☒ Diagram - Antenna vertical polarized.
- ☐ Bandwidth plot – Frequency response vs. supply voltage
- ☐ Precompliance measurement(s).



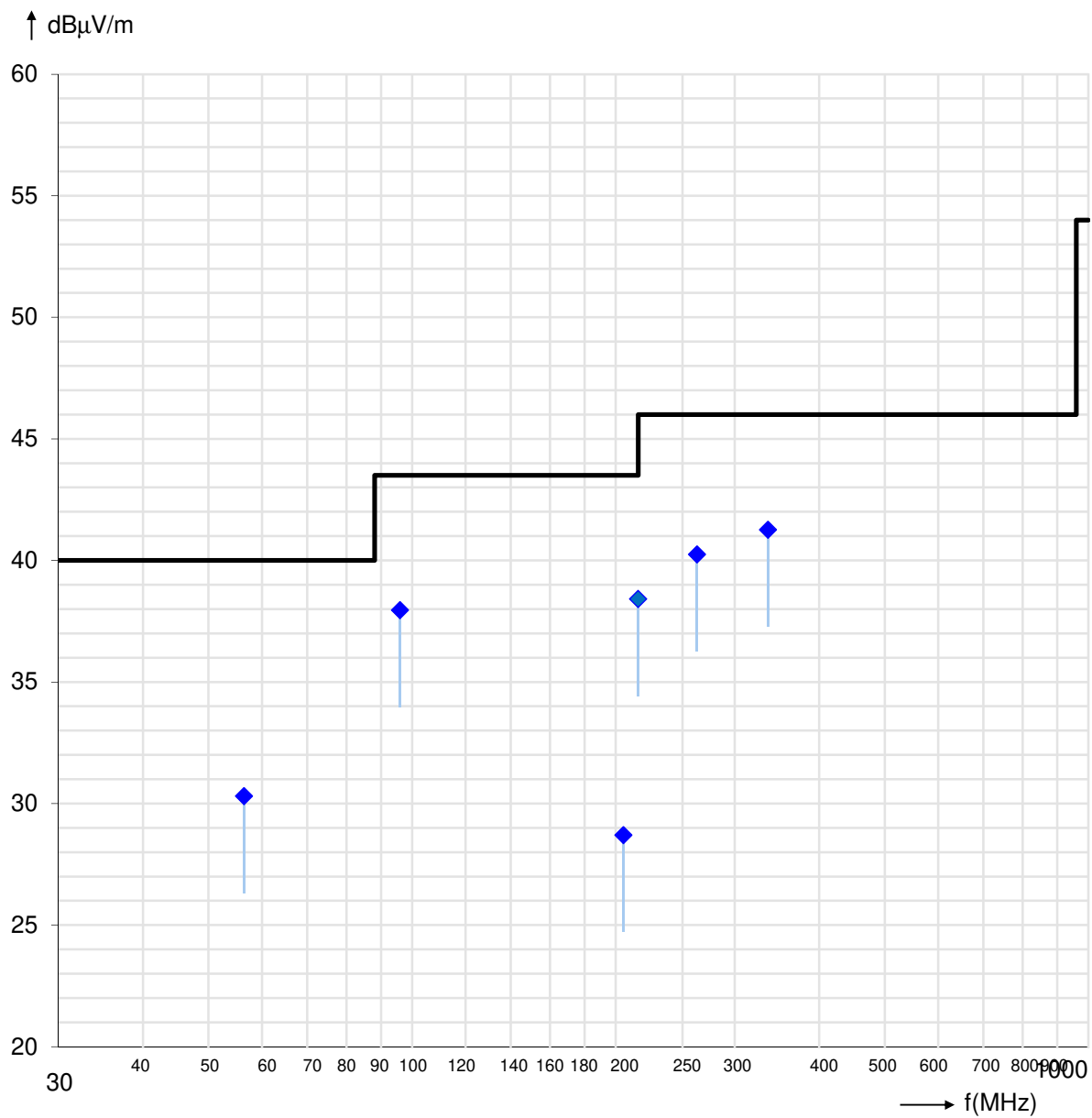
Field strength - Antenna horizontal/vertical polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna- Height	Antenna- Polarization	Turn Table - Position
MHz	dB μ V	dB/m	dB	dB μ V/m	dB μ V/m	dB	m	hor./ver.	Grad
56.377	20.9	8.4	1.1	30.3	40.0	9.7	185.0	V	22
95.952	27.3	9.2	1.4	38.0	43.5	5.5	105.0	V	86
205.307	10.7	15.9	2.1	28.7	43.5	14.8	185.0	H	66
215.864	20.5	15.7	2.2	38.4	43.5	5.1	161.0	H	29
263.868	23.2	14.6	2.4	40.3	46.0	5.8	172.0	H	10
335.812	24.6	13.9	2.8	41.3	46.0	4.7	162.0	H	337



Diagram radio disturbances – Antenna horizontal / vertical polarized

Limits: ☒ Section 15.209 ☐ ____



1.1.5 Restricted bands of operation

Regulation

47 CFR Part 15 Subpart C - 10/2020

Requirement: ☒ Section 15.205(a) – Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	≥ 38.6
13.36-13.41			

Limit spurious emission: ☒ Section 15.209
☒ CISPR quasi peak detector ($f \leq 1\text{GHz}$)
☐ Average detector ($f > 1\text{GHz}$)

Operation mode

EUT arrangement: ☒ Tabletop ☐ Floor standing
Power supply: ☒ 120V/60Hz ☐ 240V/60Hz
Rated voltage variation: ☐ 85% ☐ 115%

For the worst case scenario of emission assessment, the RFID reader was continuously operated in read mode. No transponder inside the reading range.



Environmental conditions

Temperature: 15 - 35 °C
Humidity: 30 - 60 %
Air pressure: 860 - 1060 hPa

Environmental conditions during the test:

☒ kept
☐ not kept

Test - / Measurement procedure

Position the EUT in front of the measuring antenna. The analyzer is set to peak detector and the trace mode to max. hold. Set the analyzer to the identified fundamental and the sweep is continued until the trace is stabilized. The frequencies of the maximum of the envelope and the outermost points attenuated by 20dB to the maximum are noted.

Test result

Measured fundamental: 0.13420 MHz
20dB-Emission Bandwidth: 540.5 Hz

Fundamental out
of restricted bands:

☒ kept
☐ not kept

Radiated emission limits;
general requirements:

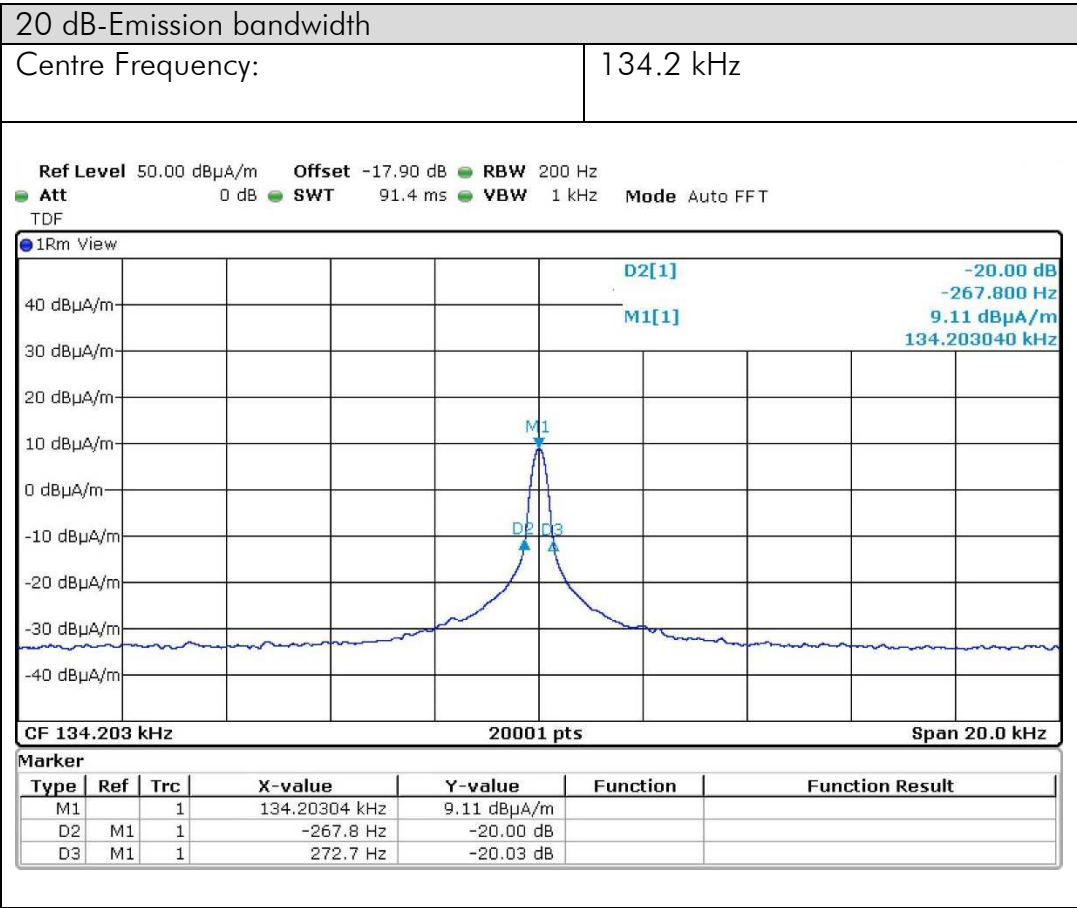
☒ kept
☐ not kept

| Remarks: n/a



Enclosure

☒ Diagram – 20 dB-Emission bandwidth





1.2 Antenna requirement

Regulation

47 CFR Part 15 Subpart C - 10/2020

Requirement: ☒ Section 15.203
☒ Permanent attached
☐ Unique coupling to the intentional radiator

Test result

Requirement: ☒ kept
☐ not kept

Authorized antenna: ☐ Print antenna
☒ Internal antenna
☐ n/a

| Remarks: n/a

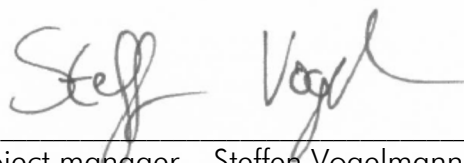
2 Summary

47 CFR Part 15 Subpart C - 10/2020

Regulation	Class / Test level	Result	Remark(s)
FCC Rules 47 CFR Part 15 Subpart C			
Terminal voltage 0.15-30MHz	Section 15.207	Limits kept	
Radiated emission limits; general requirements 0.009-30MHz 30-1000MHz	Section 15.209	Limits kept	
Restricted bands	Section 15.205(a)	Requirement kept	
Antenna requirement	Section 15.203	Requirement kept	

Burgrieden, 01/09/2021

Responsible inspector:



Project manager – Steffen Vogelmann

- End of Test Report -