

Test report

21-0076RP23_002

Product / EUT: *RFID Reader*
Type designation: *ARE i9 HF*
Tested type: *ARE i9 HF*

Production level: *04/2021*
Firmware version: *n/a*
S/N: *Pilot series*
Manufacturer: AEG Identifikationssysteme GmbH
Hörvelsinger Weg 47
89081 Ulm / Germany

EUT authorization: Certification Declaration of Conformity
 Verification

FCC ID: V7IAREI9HF

Test remit: FCC Rules 47 CFR Part 15 – Subpart B – Unintentional radiators
in accordance with the procedures given in
§15.107; 15.109

Test procedure: ANSI C63.04-2014

The standards were: kept*
 not kept*

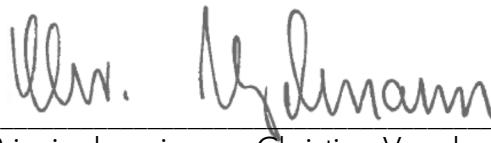
*Remark: Validation covered by the accredited scope
 Validation not covered by the accredited scope
according: _____
 Validation of the EMC-requirements partly proceeded

Applicant: AEG Identifikationssysteme GmbH
Hörvelsinger Weg 47
89081 Ulm / Germany

**EUT-
Date of arrival:** 03/29/2021
Test ID: 21-0076PR13-007; 21-0076PR13-009
Date(s) of test: 05/06/2021 – 05/07/2021

Burgrieden, 05/26/2021

Released by:



Principal engineer - Christian Vogelmann

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

DAkKS-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





Responsible inspector: Mr. S. Vogelmann
EMCE GmbH
Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung

Contact person: Mr. Waitzinger / AEG Identifikationssysteme GmbH

EUT

Sampling: The device was selected and provided by the customer.

Description: RFID Reader operating in the frequency range 13.56 MHz

Voltage supply: 120 V / 60 Hz

Frequency list: 32.768 kHz, 13.56 MHz, 27.12 MHz, 84 MHz

Temperature range: n/a

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

**Supplied /
used equipment:**

Designation	Type	Manufacturer	S/N
Laptop	W25CSW	Terra	n/a
Power supply – Laptop	A12-065N2A	Chicony	F134091506009041
Power supply	APS 1612 T	Ansmann	n/a
USB A Converter	151801	Manhattan	n/a



Configuration:

As-delivered condition*
Modified*

*21-0076PR13-009 is the same hardware level as 21-0076PR13-007 but with a modified firmware for a higher duty-cycle 66 % used for radiated emissions.

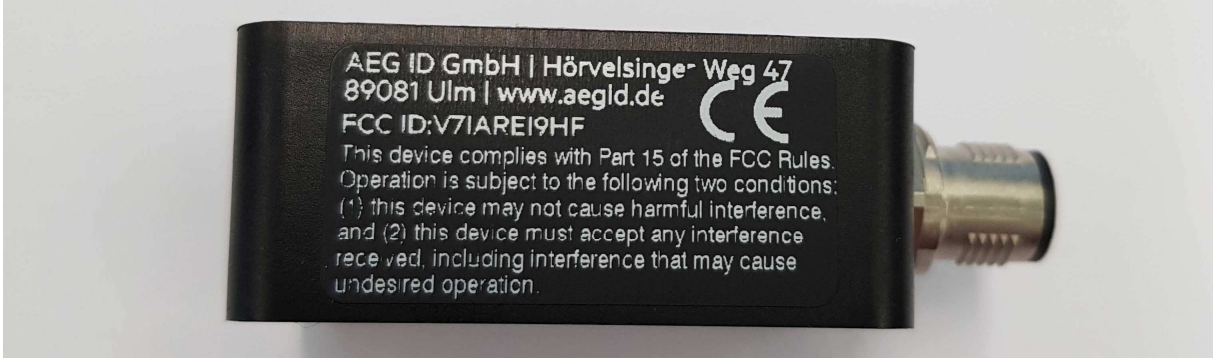
Cable designation	Type	Length	Remarks
Interconnection cable	Shielded	3.0 m	
Mains cord extension	3-core	1.0 m	
DC cable	2-core	1.6 m	
USB Cable	Shielded	0.4 m	

Remarks:

n/a



External photos EUT





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
001	Test receiver	ESS 5Hz - 1000MHz	Rohde & Schwarz	833776/008 Firmware: Main: 1.21 OTP: 02.01 GRA: 02.03	1 Year(s)/ 2021-11-26
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2022-01-31
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2022-01-31
006	LISN	NNBM 8125	Schwarzbeck	8125371	2 Year(s)/ 2022-02-28
007	Absorbing clamp	MDS 21	Schwarzbeck	942436	1 Year(s)/ 2022-03-04
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)/ 2024-04-23
015	OATS	Test site 10 m referred to ANSI C63.4-2014	EMCE GmbH		3 Year(s)/ 2024-04-26
020	Coupling clamp	IP4A	Haefely	082672-13	1 Year(s)/ 2021-10-31
022	ESD-Gun	NSG 435	Schaffner	577	1 Year(s)/ 2022-03-16
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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
026	Coupling-/ Decoupling Network M3	CDN 801-M3-25	FCC	92	1 Year(s)/ 2021-07-31
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	2 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	Analyzer 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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
055	Helmholtz coil	1.25 m x 1.25 m	EMCE GmbH		1 Year(s)/ 2021-09-30
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)/ 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)/ 2022-01-31
068	LISN	ESH2-Z5	Rohde & Schwarz	872460/042	1 Year(s)/ 2022-01-31
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)/ 2022-03-31
074	Synthesizer signal generator	SMX	Rohde & Schwarz	5SM02675	2 Year(s)/ 2021-11-19
115	Strip line 50 Ohm		EMCE GmbH		1 Year(s)/ 2022-02-28
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)/ 2022-01-31
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)/ 2023-02-16

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
129	ESD-Gun	ESD30N	EM TEST GmbH	V1012106114	3 Year(s)/ 2023-03-30
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
137	Power Amplifier	CBA3G-100	Teseq GmbH	T43943	2 Year(s)/ 2022-11-30
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
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)/ 2022-01-31
175	EMI Test receiver	ESR7	Rohde & Schwarz	101108 Firmware: FW V3.46 SP3	1 Year(s)/ 2021-10-30
178	V-LISN 5 μ H	NNHV 8123-400	Schwarzbeck	018	1 Year(s)/ 2022-01-31
184	V-LISN 5 μ H	NNHV8123-400	Schwarzbeck	019	1 Year(s)/ 2022-01-31
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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
190	Coupling-/Decoupling Network M1	CDN M132	Ametek	40493	1 Year(s)/2021-07-31
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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
214	Load Dump Simulator	LD 200N	em test	P1551169024	3 Year(s)/ 2022-10-22
215	Ultra-Compact Simulator for automobiles	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)/ 2021-12-10
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
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

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
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
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)/ 2023-12-14
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)/ 2021-09-30
262	EM Clamp	KEMZ 801A	Teseq	78033	1 Year(s)/ 2021-07-31
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:

- EMC-Test(s) 15
- 1 Test(s) according 47 CFR Part 15 Subpart B - 03/29/2021 15
 - 1.1 Requirements and conformance test specifications 15
 - 1.2 Terminal voltage on powerline 16
 - 1.2.1 Test set up 18
 - 1.2.2 Test 21
 - 1.3 Radiated emissions E-Field of unintentional radiators..... 31
 - 1.3.1 Test set up 34
 - 1.3.2 Test 40
- 2 Summary 47



EMC-Test(s)

1 Test(s) according 47 CFR Part 15 Subpart B - 03/29/2021

1.1 Requirements and conformance test specifications

Standard

47 CFR Part 15 Subpart B
ANSI C63.04-2014
KDB n/a
-

Test mode application		
<input checked="" type="checkbox"/>	Terminal voltage on powerline	§ 15.107 (a)
<input checked="" type="checkbox"/>	Radiated emissions E-Field of unintentional radiators	§ 15.109 (a)(c)

1.2 Terminal voltage on powerline

- No deviation from the standard*
- Pre-compliance*
- Test not requested*
- Test not carried out*

* _____

Measurement procedure:

Rules and specification 47 CFR Part 15 Section 15.107 (a)
 Guide ANSI C63.04-2014

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 C63.04 section 13.1.3.1).

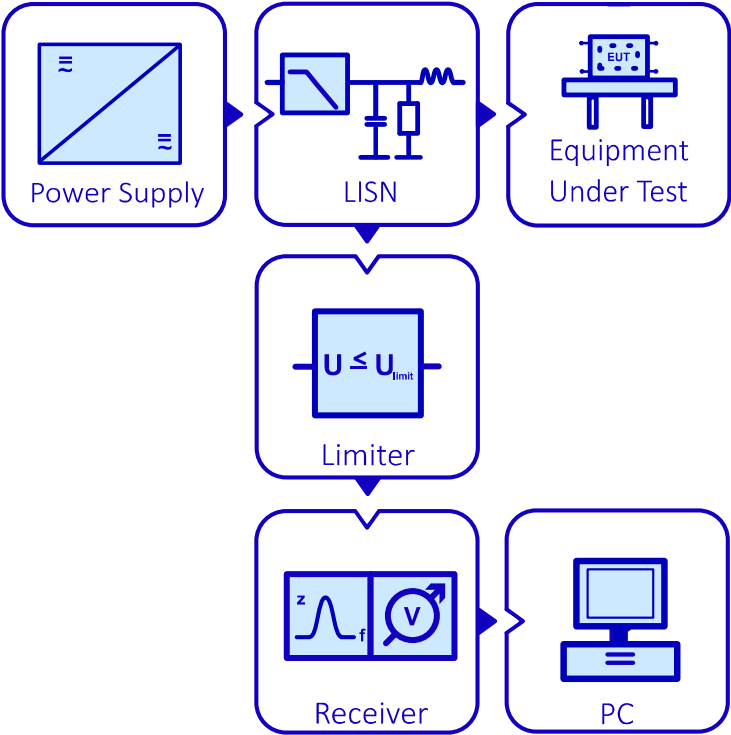
The documented final test results are calculated using the following formula:

$$\text{Result (dB}\mu\text{V)} = \text{Measured Value (dB}\mu\text{V)} + \text{ATF (dB)} + \text{CF (dB)}.$$

ATF = correction factor for the pulse limiter + 10 dB attenuator
 CF = Correction factor for the cable attenuation



Basic structure - Setup





1.2.1 Test set up

According ANSI C63.04-2014



Test location

<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
<input checked="" type="checkbox"/>	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

<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type	Manufacturer	S/N
<input checked="" type="checkbox"/>	001	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	833776/008
	003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	067	LISN 5	ESH2-Z5	Rohde & Schwarz	0872460/043
	068	LISN 4	ESH2-Z5	Rohde & Schwarz	0872460/042
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	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 / dB μ V	Limit AV-Detector / dB μ V
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:

RFID reader with external power supply and evaluation unit in minimum configuration.

Cabling:

- Standard cables
 Special cables provided by the manufacturer

Port #	Designation	Remarks
# 1	AC power line	L1/N
# 2		
# 3		



Operation mode

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

Reading tag continuously with the tag placed at maximum reading distance.

Environmental conditions

Temperature [10 – 40 °C]: 25 °C
Relative humidity [10 – 90 %]: 46 %

Environmental conditions during the test: kept not kept

Test result

Limits for conducted powerline emissions: kept not kept not relevant

| Remarks: n/a

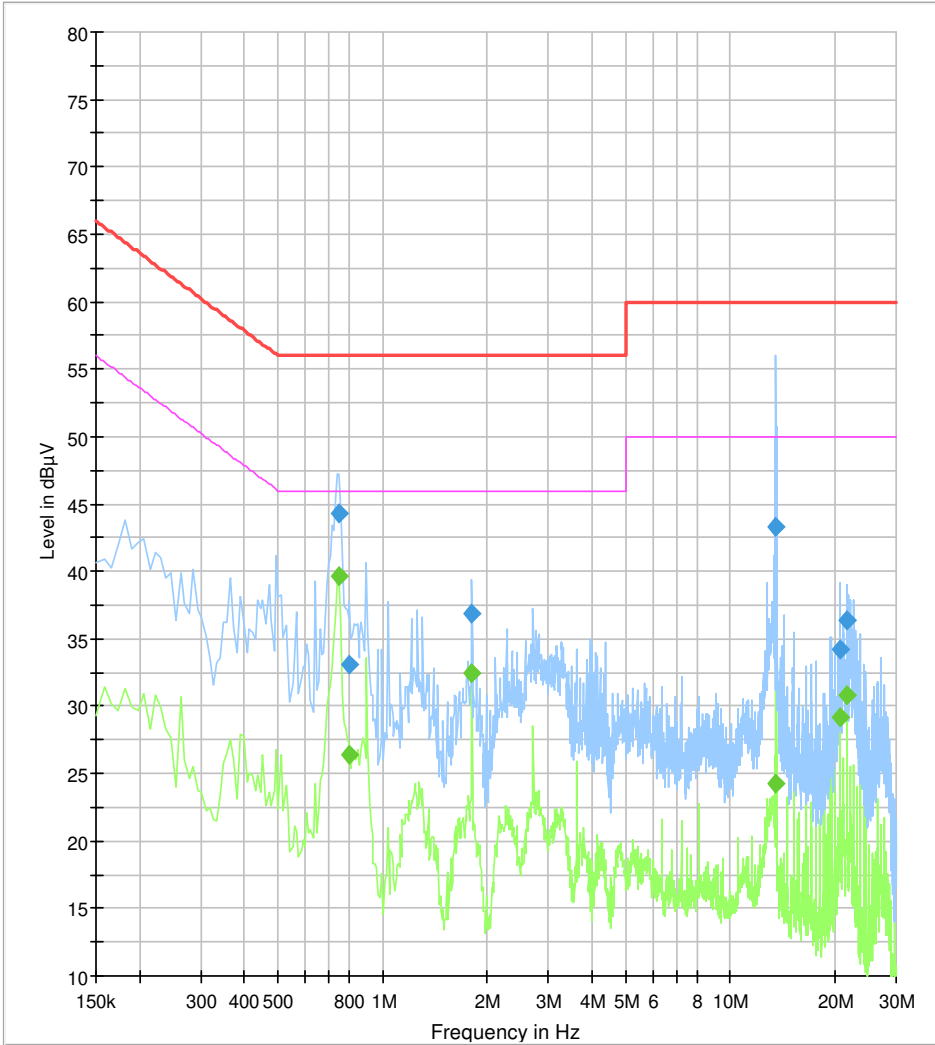
Records

Readings
 Diagram



EUT Information

EUT Name: ARE i9 HF
Test_ID: / SN: 21-0076PR13-007
Customer: AEG Identifikationssysteme GmbH
Operational condition: Continuous reading with tag placed at maximum reading distance
Test specification: 47 CFR Part 15 Subpart B §15.107 (a)
LISN port: N / Reader
Operator: Mr. S. Voglemann
File #: 21-0076RC16-007-021
Comment #1:
Comment #2:



— Preview Result 2-AVG
— 47 CFR Part 15 Subpart B §15.107 (a) QP
◆ Final_Result QPK
— Preview Result 1-PK+
— 47 CFR Part 15 Subpart B §15.107 (a) AV
◆ Final_Result AVG

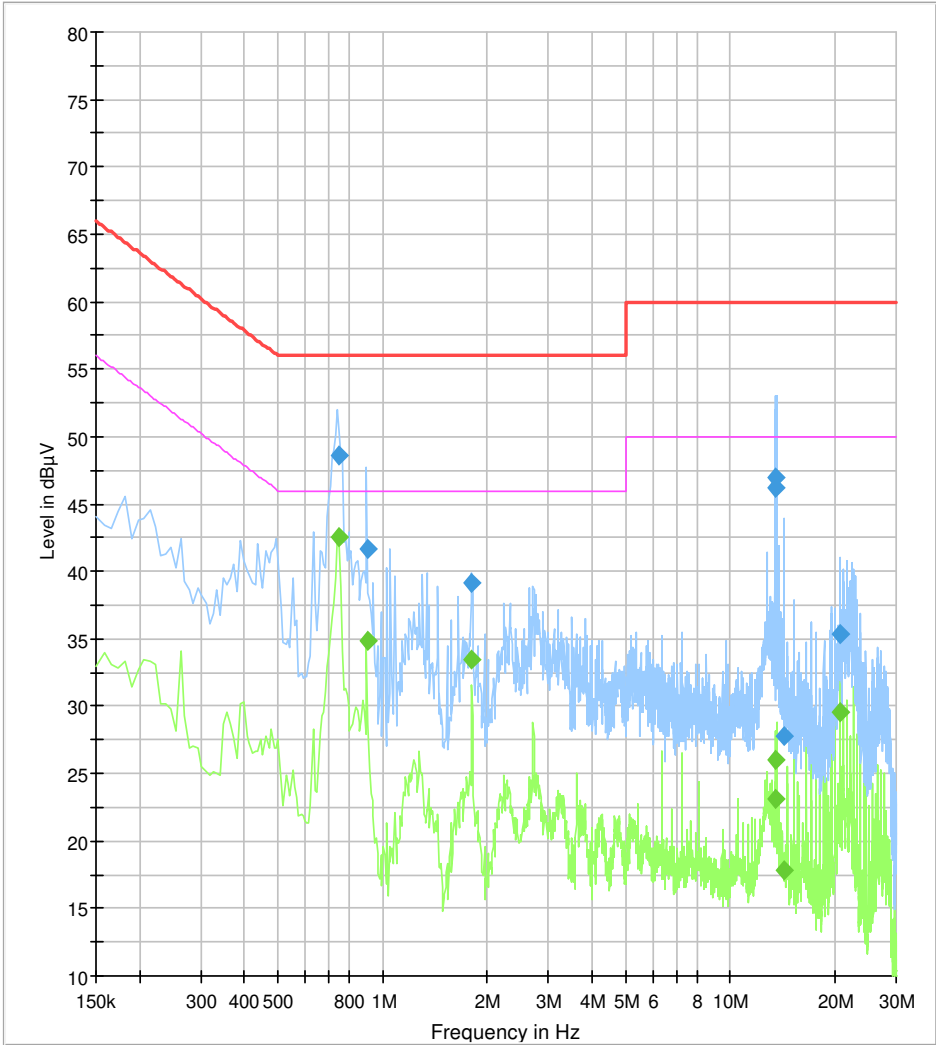
Final result

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.746000	44.26	---	56.00	11.74	5000.0	10.000	N	9.9	
0.746000	---	39.64	46.00	6.36	5000.0	10.000	N	9.9	
0.802000	33.03	---	56.00	22.97	5000.0	10.000	N	9.9	
0.802000	---	26.42	46.00	19.58	5000.0	10.000	N	9.9	
1.810000	36.90	---	56.00	19.10	5000.0	10.000	N	10.0	
1.810000	---	32.40	46.00	13.60	5000.0	10.000	N	10.0	
13.570000	43.33	---	60.00	16.67	5000.0	10.000	N	10.2	
13.570000	---	24.21	50.00	25.79	5000.0	10.000	N	10.2	
20.610000	34.16	---	60.00	25.84	5000.0	10.000	N	10.2	
20.610000	---	29.15	50.00	20.85	5000.0	10.000	N	10.2	
21.618000	36.34	---	60.00	23.66	5000.0	10.000	N	10.3	
21.618000	---	30.87	50.00	19.13	5000.0	10.000	N	10.3	



EUT Information

EUT Name: ARE i9 HF
Test_ID: / SN: 21-0076PR13-007
Customer: AEG Identifikationssysteme GmbH
Operational condition: Continuous reading with tag placed at maximum reading distance
Test specification: 47 CFR Part 15 Subpart B §15.107 (a)
LISN port: L1 / Reader
Operator: Mr. S. Voglemann
File #: 21-0067RC16-007-022
Comment #1:
Comment #2:



— Preview Result 2-AVG
— 47 CFR Part 15 Subpart B §15.107 (a) QP
◆ Final_Result QPK
— Preview Result 1-PK+
— 47 CFR Part 15 Subpart B §15.107 (a) AV
◆ Final_Result AVG



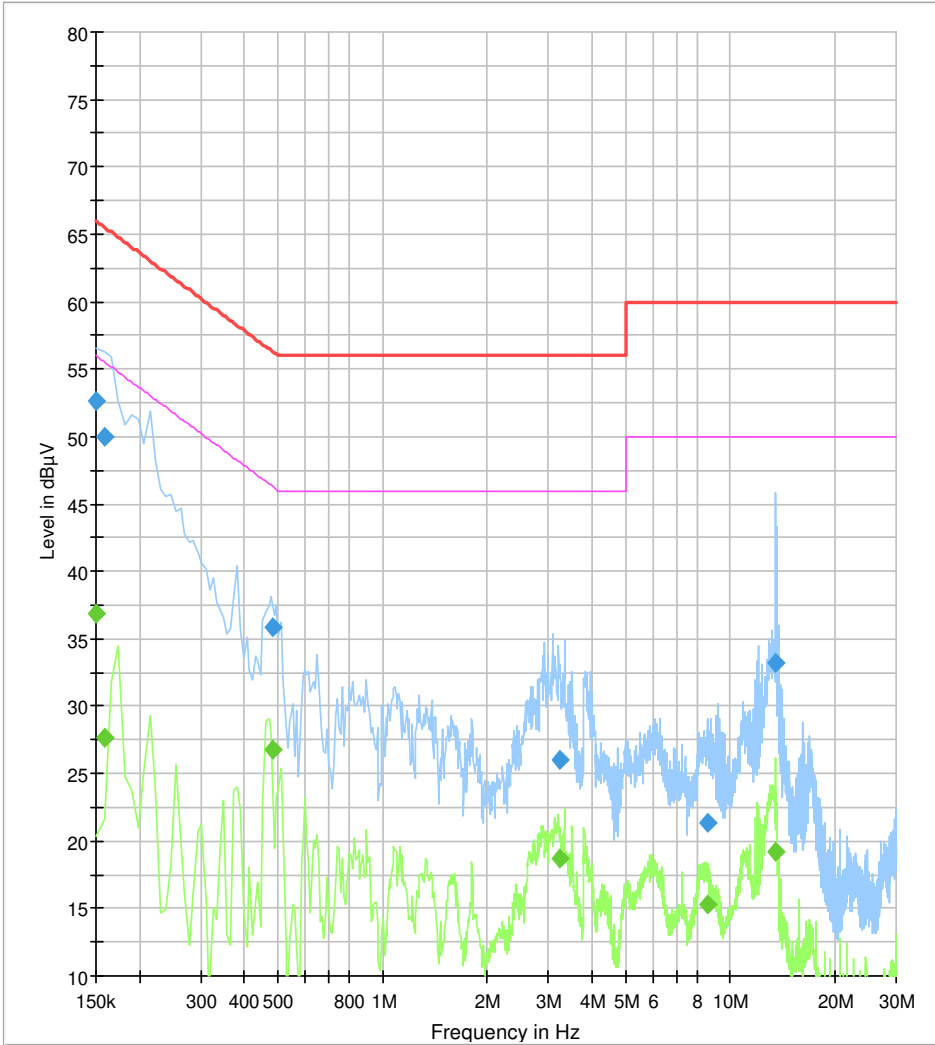
Final result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.746000	---	42.48	46.00	3.52	5000.0	10.000	L1	9.9	
0.746000	48.62	---	56.00	7.38	5000.0	10.000	L1	9.9	
0.906000	---	34.85	46.00	11.15	5000.0	10.000	L1	10.0	
0.906000	41.61	---	56.00	14.39	5000.0	10.000	L1	10.0	
1.810000	---	33.46	46.00	12.54	5000.0	10.000	L1	10.0	
1.810000	39.13	---	56.00	16.87	5000.0	10.000	L1	10.0	
13.546000	---	23.12	50.00	26.88	5000.0	10.000	L1	10.2	
13.546000	46.95	---	60.00	13.05	5000.0	10.000	L1	10.2	
13.570000	---	25.98	50.00	24.02	5000.0	10.000	L1	10.2	
13.570000	46.17	---	60.00	13.83	5000.0	10.000	L1	10.2	
14.274000	---	17.88	50.00	32.12	5000.0	10.000	L1	10.2	
14.274000	27.79	---	60.00	32.21	5000.0	10.000	L1	10.2	
20.610000	---	29.58	50.00	20.42	5000.0	10.000	L1	10.2	
20.610000	35.38	---	60.00	24.62	5000.0	10.000	L1	10.2	



EUT Information

EUT Name: ARE i9 HF
Test_ID: / SN: 21-0076PR13-007
Customer: AEG Identifikationssysteme GmbH
Operational condition: Continuous reading with tag placed at maximum reading distance
Test specification: 47 CFR Part 15 Subpart B §15.107 (a)
LISN port: N / PC
Operator: Mr. S. Voglemann
File #: 21-0067RC16-007-023
Comment #1:
Comment #2:



— Preview Result 2-AVG
— 47 CFR Part 15 Subpart B §15.107 (a) QP
◆ Final_Result QPK
— Preview Result 1-PK+
— 47 CFR Part 15 Subpart B §15.107 (a) AV
◆ Final_Result AVG

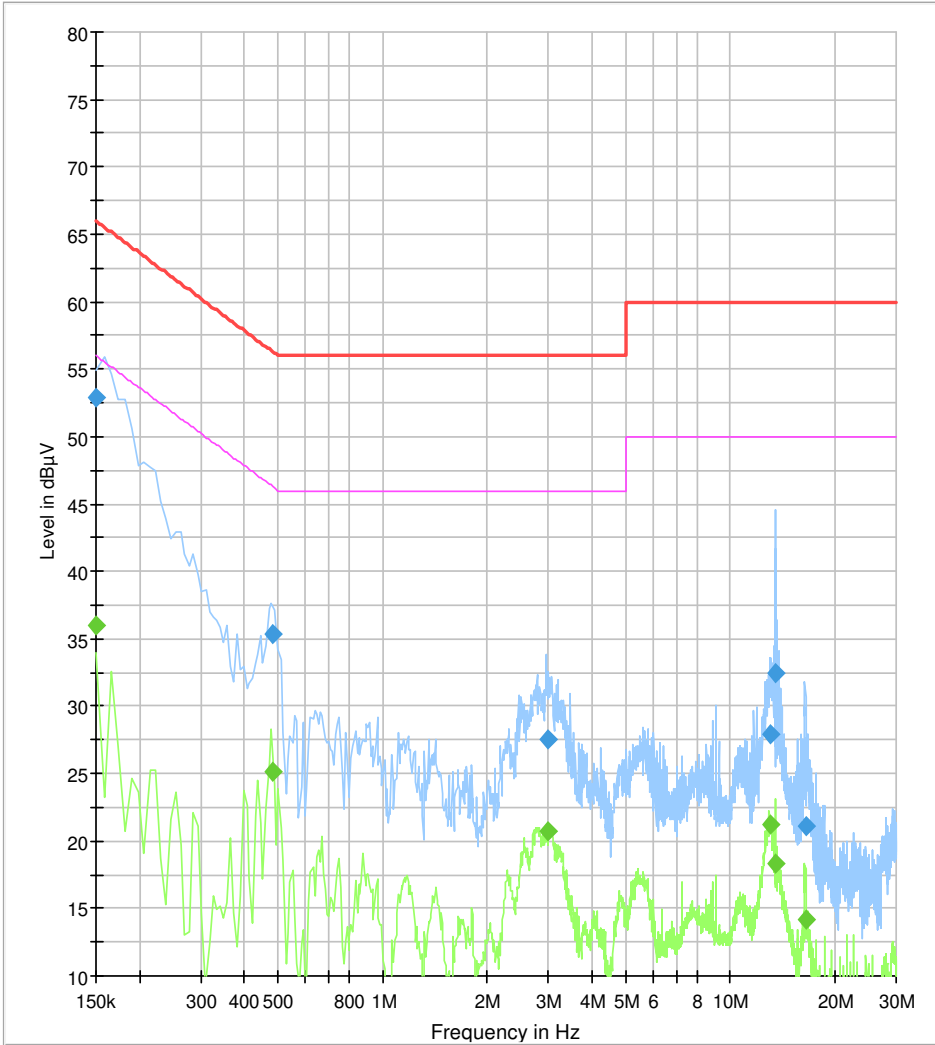
Final result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.150000	---	36.91	56.00	19.09	5000.0	10.000	N	9.9	
0.150000	52.62	---	66.00	13.38	5000.0	10.000	N	9.9	
0.158000	---	27.60	55.57	27.97	5000.0	10.000	N	9.9	
0.158000	50.01	---	65.57	15.56	5000.0	10.000	N	9.9	
0.482000	35.83	---	56.31	20.47	5000.0	10.000	N	9.9	
0.482000	---	26.81	46.31	19.49	5000.0	10.000	N	9.9	
3.250000	26.03	---	56.00	29.97	5000.0	10.000	N	10.0	
3.250000	---	18.76	46.00	27.24	5000.0	10.000	N	10.0	
8.618000	21.41	---	60.00	38.59	5000.0	10.000	N	10.2	
8.618000	---	15.35	50.00	34.65	5000.0	10.000	N	10.2	
13.570000	33.22	---	60.00	26.78	5000.0	10.000	N	10.2	
13.570000	---	19.19	50.00	30.81	5000.0	10.000	N	10.2	



EUT Information

EUT Name: ARE i9 HF
Test_ID: / SN: 21-0076PR13-007
Customer: AEG Identifikationssysteme GmbH
Operational condition: Continuous reading with tag placed at maximum reading distance
Test specification: 47 CFR Part 15 Subpart B §15.107 (a)
LISN port: L1 / PC
Operator: Mr. S. Voglemann
File #: 21-0067RC16-007-024
Comment #1:
Comment #2:



— Preview Result 2-AVG
— 47 CFR Part 15 Subpart B §15.107 (a) QPK
◆ Final_Result QPK
— Preview Result 1-PK+
— 47 CFR Part 15 Subpart B §15.107 (a) AV
◆ Final_Result AVG

Final result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.150000	52.84	---	66.00	13.16	5000.0	10.000	L1	9.9	
0.150000	---	35.99	56.00	20.01	5000.0	10.000	L1	9.9	
0.482000	35.33	---	56.31	20.97	5000.0	10.000	L1	9.9	
0.482000	---	25.14	46.31	21.16	5000.0	10.000	L1	9.9	
3.002000	27.50	---	56.00	28.50	5000.0	10.000	L1	10.0	
3.002000	---	20.69	46.00	25.31	5000.0	10.000	L1	10.0	
13.066000	27.90	---	60.00	32.10	5000.0	10.000	L1	10.2	
13.066000	---	21.22	50.00	28.78	5000.0	10.000	L1	10.2	
13.538000	32.44	---	60.00	27.56	5000.0	10.000	L1	10.2	
13.538000	---	18.29	50.00	31.71	5000.0	10.000	L1	10.2	
16.498000	21.10	---	60.00	38.90	5000.0	10.000	L1	10.2	
16.498000	---	14.13	50.00	35.87	5000.0	10.000	L1	10.2	

1.3 Radiated emissions E-Field of unintentional radiators

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

*

Measurement procedure:

Rules and specification	47 CFR Part 15 Section 15.109 (a)(c)
Guide	ANSI C63.04-2014

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 225 MHz, a logperiodic antenna from 225 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 $\pm 20^\circ$ 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 $\pm 45^\circ$ 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:

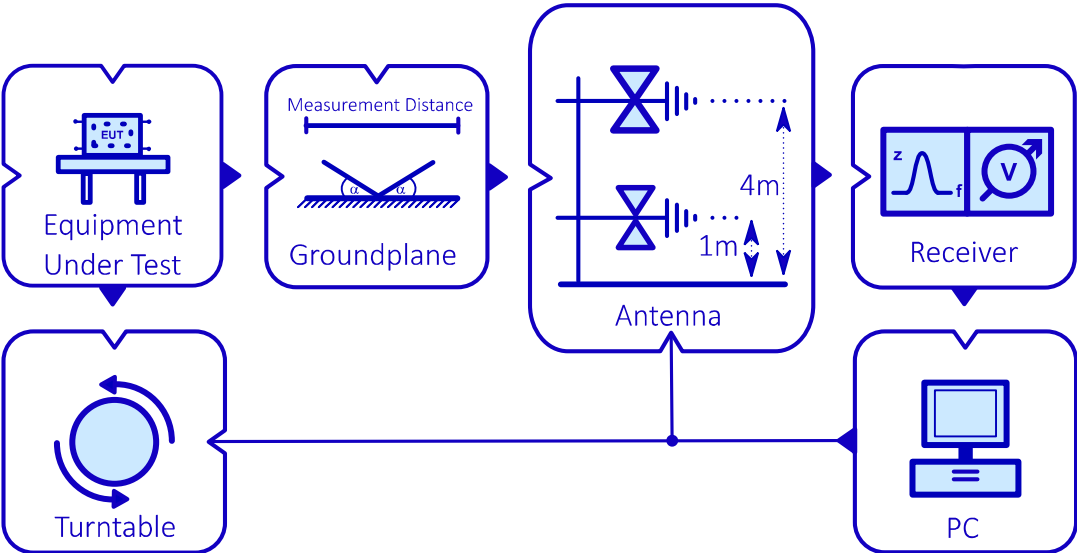
$$\text{Result (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)} + 20 \cdot (D_T/D_R) \text{ (dB)}$$

- AF = Correction factor for the antenna
- CF = Correction factor for the cable loss
- D_T = Test distance
- D_R = Reference distance for the limit defined in the standard



Basic structure - Setup

OATS / SAC





1.3.1 Test set up

According ANSI C63.04-2014

Photo(s) showing the interconnection of the major function units

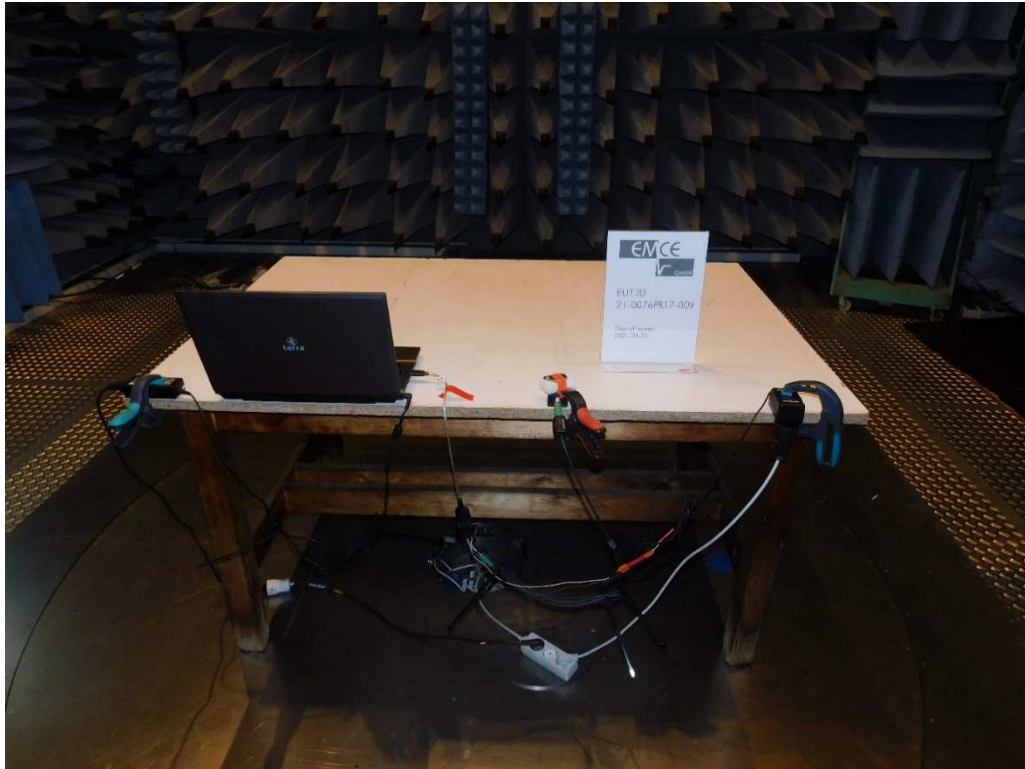
Final test setup







Precompliance test setup





Test location

Pre-compliance test					
<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
<input checked="" type="checkbox"/>	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					
<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type (L x W x H)	Manufacturer	Location
<input type="checkbox"/>	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
<input type="checkbox"/>	014	Open area test site	10 m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
<input checked="" type="checkbox"/>	015	Open area test site	3 m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden

Used test equipment

Pre-compliance test					
<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type	Manufacturer	S/N
<input checked="" type="checkbox"/>	010	Antenna 250 – 1200 MHz	UHALP 9108A	Schwarzbeck	108
<input checked="" type="checkbox"/>	011	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
<input checked="" type="checkbox"/>	042	AC-Source / Analyzer / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
<input checked="" type="checkbox"/>	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
	059	Logper. Antenna	HL050	Rohde & Schwarz	100006
<input checked="" type="checkbox"/>	997	Software	EMC32	Rohde & Schwarz	n/a

Final test					
<input checked="" type="checkbox"/>	Inv.-No.	Designation	Type	Manufacturer	S/N
<input checked="" type="checkbox"/>	001	Test receiver	ESS 5 Hz – 1000 MHz	Rohde & Schwarz	833776/008
<input checked="" type="checkbox"/>	009	Antenna 30 – 300 MHz	VHBA9123 / BBA9106	Schwarzbeck	435
<input checked="" type="checkbox"/>	012	Antenna 250 – 1200 MHz	UHALP 9108A	Schwarzbeck	166
<input checked="" type="checkbox"/>	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
	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 radiated emission with an extended coverage factor of $k = 2$:

Frequency	Measurement uncertainty
30 MHz – 225 MHz	4.8 dB (valid for 10 m-OATS)
225 MHz – 1 GHz	4.9 dB (valid for 10 m-OATS)
30 MHz – 225 MHz	4.8 dB (valid for 3 m-OATS)
225 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)

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

Upper frequency of measurement:

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

- 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

Limits for radiated emissions

Technical requirements			
Detector	Frequency / MHz	Limit / dB μ V	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



Rationale for selecting the EUT test set up

Equipment units:

RFID reader with external power supply and evaluation unit in minimum configuration.

Cabling:

- Standard cables
- Special cables provided by the manufacturer

Port #	Designation	Remarks
# 1	AC power line	L1/N
# 2		
# 3		

EUT Orientation

- X-Direction
- Y-Direction
- Z-Direction

Operation mode

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

Reading tag continuously with the tag placed at maximum reading distance.

Environmental conditions

Temperature [10 – 40 °C]: 11 °C
Relative humidity [10 – 90 %]: 45 %

- 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-compliance measurement

- Readings
- Diagram

Final measurement

- Readings
- Diagram

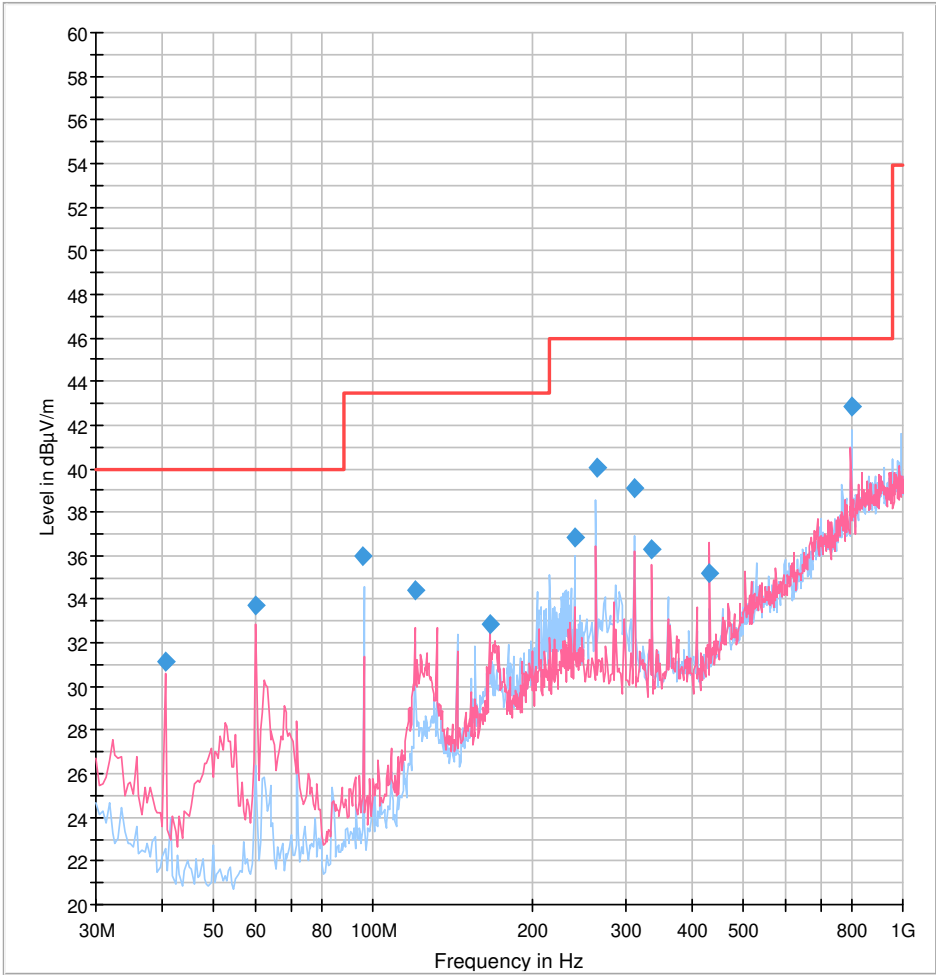


Pre-compliance measurement

EUT Information

EUT Name:	ARE i9 HF
Test_ID: / SN:	21-0076PR17-009
Customer:	AEG Identifikationssysteme GmbH
Operational condition:	Continuous reading (fast read cycle)
Test specification:	47 CFR Part 15 Subpart B §15.109 (a)
Antenna information:	Distance EUT-Ant.: 3.0 m / Polarisation: H/V / Ant.Height: 1.0-4.0 m
Operator:	S. Vogelmann
File #:	21-0076RC017-009-007
Comment #1:	
Comment #2:	

Full Spectrum



— Preview Result 1H-PK+
— Preview Result 1V-PK+
— 47 CFR Part 15 Subpart B §15.109 Electric Field Strength QP
◆ Final_Result PK+



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)
40.689378	31.18	40.00	8.82	5000.0	120.000	127.0	V	23.0	9.7
60.006413	33.72	40.00	6.28	5000.0	120.000	105.0	V	246.0	8.5
95.947094	35.99	43.50	7.51	5000.0	120.000	210.0	H	276.0	10.0
119.947094	34.43	43.50	9.07	5000.0	120.000	107.0	V	179.0	11.3
166.693387	32.90	43.50	10.60	5000.0	120.000	105.0	V	109.0	13.7
239.894188	36.85	46.00	9.15	5000.0	120.000	285.0	H	276.0	17.7
263.861323	40.03	46.00	5.97	5000.0	120.000	135.0	H	305.0	15.9
311.875752	39.08	46.00	6.92	5000.0	120.000	135.0	H	320.0	15.0
335.861323	36.28	46.00	9.72	5000.0	120.000	285.0	V	280.0	15.3
431.784369	35.19	46.00	10.81	5000.0	120.000	185.0	V	295.0	17.9
799.717835	36.86	46.00	9.14	5000.0	120.000	121.0	H	197.0	23.2

Final measurement

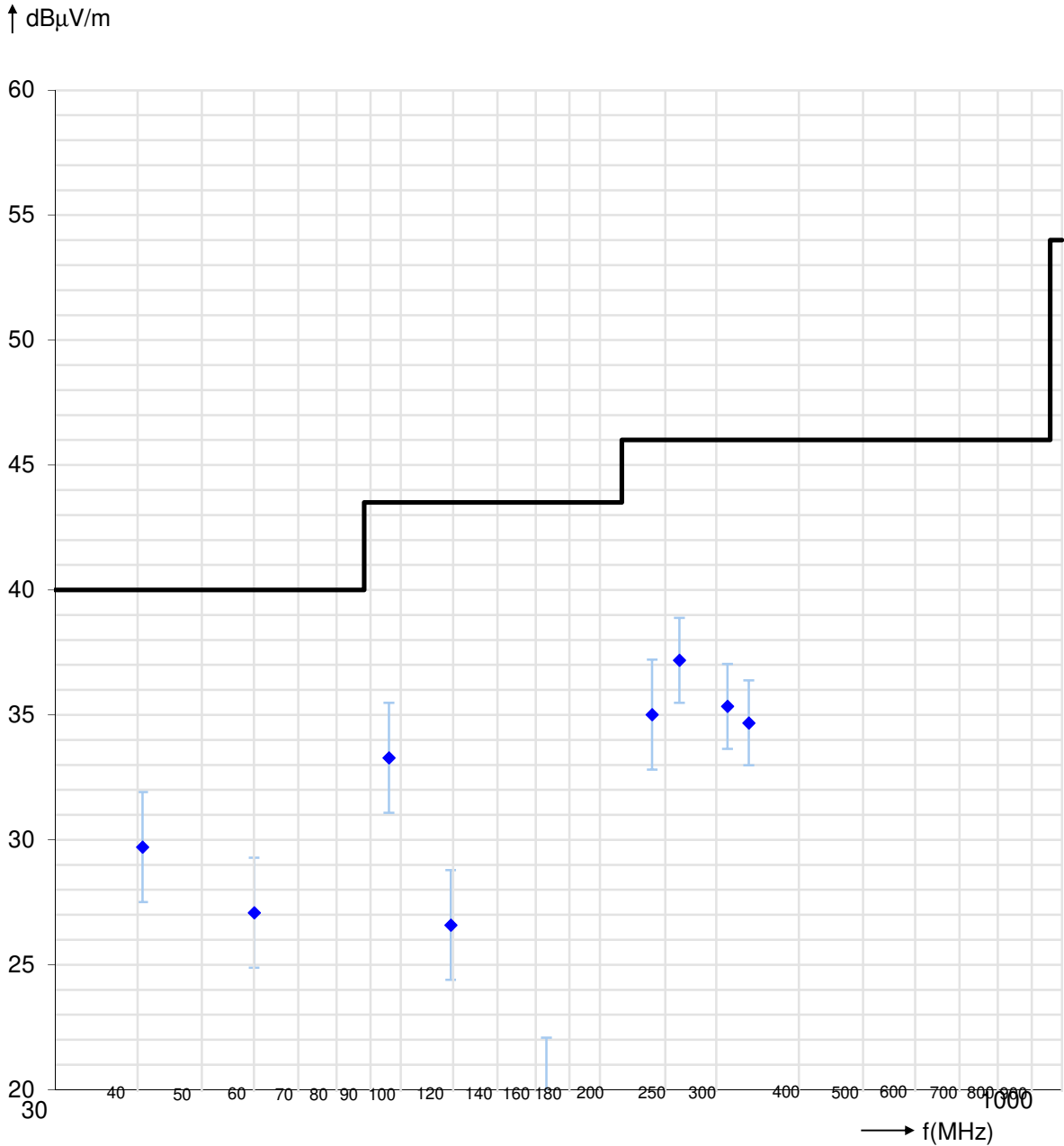
Readings – Antenna horizontal / vertical polarized

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.	Degree
40.680	19.5	9.3	0.9	29.7	40.0	10.3	1.0	V	43
60.000	17.8	8.2	1.1	27.1	40.0	12.9	1.0	V	273
95.940	22.5	9.4	1.4	33.3	43.5	10.2	1.2	V	302
119.000	14.5	10.5	1.6	26.6	43.5	16.9	1.1	V	264
166.000	5.0	13.0	1.9	19.9	43.5	23.6	1.2	V	10
239.930	15.8	16.9	2.3	35.0	46.0	11.0	3.0	H	10
263.900	20.1	14.6	2.4	37.2	46.0	8.8	2.3	H	178
311.900	18.8	13.9	2.7	35.3	46.0	10.7	3.3	H	0
335.886	17.8	14.1	2.8	34.7	46.0	11.3	2.4	V	10



Diagram radio disturbances – Antenna horizontal / vertical polarized

Limit: 47 CFR Part 15 Subpart B §15.109 (a)





2 Summary

47 CFR Part 15 Subpart B

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

Burgrieden, 05/26/2021

Responsible inspector:

Project manager – Steffen Vogelmann

- End of Test Report -