



Bundesnetzagentur

Test report

AIN19c05

BNetzA-CAB-02/21-01

Product / EUT: RFID reader
Type designation: ARE H5 – FullISO/E/A/i/B/U
Tested type: ARE H5 – FullISO/E/A/i/B/U
EUT authorization: ☒ Certification ☐ Verification Declaration of Conformity
Production level: 03/2016
S/N: 2470
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
§15.207; 15.209

The standards were: ☒ kept*
☐ not kept*

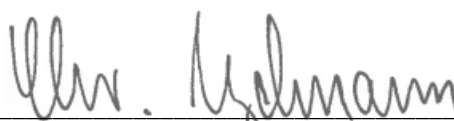
***Remark:** ☒ Validation covered by the accredited scope
☐ Validation not covered by the accredited scope
according: _____
☐ Validation of the EMC-requirements partly proceeded

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

EUT-
Date of arrival: 2016-03-21
Test ID: PRN12_06
Date(s) of test: 2016-03-23 – 2016-04-25

Burgrieden, 2016-12-06

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
CAB-Registration No.: BnetzA-CAB-02/21-01/1
FCC-Registration No.: 219415

Test procedure: ANSI C63.10-2013

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

Contact person: Mr. Köster / AEG Identifikationssysteme GmbH

EUT-

Description: Handheld LF-RFID reader
A = AEG ID 3D-front-label
U = USB interface
B = Bluetooth interface
i = international charger
FullISO = all ISO 11784 & 11785 transponders supported
E = packing, ESP, polyesterol

Voltage supply: 7.2VDC

Fundamental frequency: 134kHz,
Frequency list: 20MHz, 22.0088MHz, 44MHz

Temperature range: 0°C to 50°C

Approximate size: LxWxH / cm - 23x14x13

**Supplied /
used equipment:**

Designation	Type	Manufacturer	S/N
Laptop	Inspiron 5150	Dell	CN-0W0941- 1296136J-2083
AC Adapter (Inspiron 5150)	PA-1131-02D	Dell	CN-9Y819-48010- 360-0954
Bluetooth – USB Stick	USB Bluetooth Nano Stick	CSL Computer	Mod.No. - BSN23996
Transponder (tag)	Tier ISO, 20mm disc	AEG ID	9990000000000000
Battery	7.2V / 1050mAh	n/a	n/a
Bluetooth module (EUT)	WT12	bluegiga	FCC ID: QOQWT12

Configuration:



As-delivered condition*
Modified*

- A ferrite core (type WE 742 711 32, 2 turns) was attached on the USB cable, see image below



Cable designation	Type	Length	Remarks
USB cable	Shielded	1.8m	Ferrite core WE 742 711 32, 2 turns, 3cm off the EUT

Remarks: n/a

State of revision:

Source document	New Document	Date / Reviser	Modifications
AIN19_05	AIN19a05	2016-06-24 Chr. Vogelmann	List of valid equipment shrink to used equipment. Test conditions supplemented. Note for the use of RFID and Bluetooth at the same time. Environmental conditions recorded.
AIN19a05	AIN19b05	2016-11-08 Chr. Vogelmann	Conducted emission documented as informative and not subject of the approval.
AIN19b05	AIN19c05	2016-11-22 P. Hauser	Harmonics of Bluetooth module recorded.

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)/ 2016-10-05
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2016-08-31
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2016-11-30
008	Loop antenna 9kHz-30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002	3 Year(s)/ 2016-11-22
009	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	435	3 Year(s)/ 2018-10-27
010	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	108	2 Year(s)/ 2016-09-05
011	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	0403/94	2 Year(s)/ 2016-09-05
012	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	166	3 Year(s)/ 2018-11-10
014	OATS	3m	EMCE GmbH		3 Year(s)/ 2017-10-31
015	OATS	10m	EMCE GmbH		3 Year(s)/ 2017-10-31
042	AC-Source/ Analyser/ Norm impedance	EMV D 5000/PAS	Spitzenberger+ Spies	A2747 00/0 0501 A2747 07/00501 (ARS16/3)	2 Year(s)/ 2017-08-31
058	Receiver	ESIB 40	Rohde & Schwarz	100200/ Firmware 4.35	1 Year(s)/ 2017-04-07
062	Semi anechoic chamber #2	13.0m x 7.0m x 5.0m	EMC-Technik & Consulting GmbH		1 Year(s)/ 2016-07-31
067	LISN	ESH2-Z5	Rohde&Schwarz	872460/043	1 Year(s)/ 2016-08-31
068	LISN	ESH2-Z5	Rohde&Schwarz	872460/042	1 Year(s)/ 2016-08-31
070	Pulse limiter + 10dB Attenuator	ESH3-Z2	Rohde&Schwarz	n/a	1 Year(s)/ 2016-08-31
175	EMI Test receiver	ESR7	Rohde & Schwarz	101108 Firmware:	1 Year(s)/ 2016-07-14

Inv.- No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
				FW V2.26	
997	EMC Software	EMC32 Vers. 8.53.0	Rohde& Schwarz	n/a	

Scope:

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1 EMC-Test(s)

1.1 Emission according 47 CFR Part 15 Subpart C - 04/2016

1.1.1 Terminal voltage according 47 CFR Part 15 Subpart C - 04/2016 - informative

- ☒ Full compliance
☐ Precompliance
☐ Test not requested*
☐ Test not carried out*

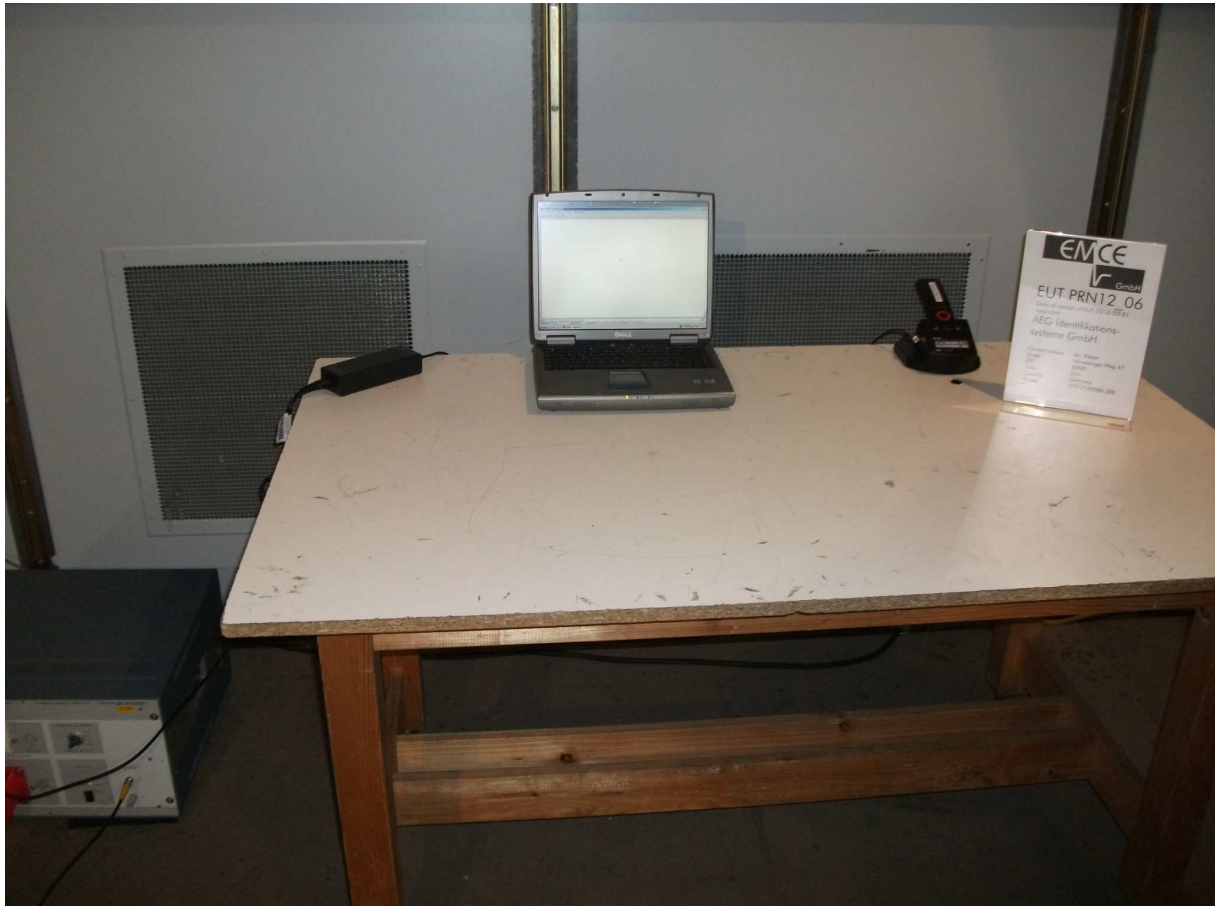
*

Test location

☒	Inv.-No.	Designation	Type (LxWxH)	Manufacturer	Location
☒	588	Shielded room #2	8.3/5.8 x 5.5/2.9 x 3.4m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	584	Shielded room #3	3.6 x 3.6 x 2.5m	Siemens AG	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	678	Shielded room #4	4.0 x 4.0 x 3.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	062	Semi anechoic chamber #2	13.5 x 6.1 x 5.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	679	Full anechoic chamber #3	8.8 x 4.6 x 4.2m	Albatross Projects GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	014	Open area test site	10m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	015	Open area test site	3m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	042	Voltage- / current source test site	0-382VDC 0-270VAC 1x10kW / 3x5kW	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 5Hz - 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

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
9kHz – 150kHz	4.0dB
150kHz – 30MHz	3.6dB

1.1.1.2 Test

Regulation

47 CFR Part 15 Subpart C - 04/2016

☐ 9kHz - 30MHz

☒ 150kHz - 30MHz

Mains supply
Limits:

☒ Section 15.207

☐ __

Operation mode

EUT arrangement:

☒ Tabletop

☐ Floor standing

Power supply:

☒ 120V/60Hz

☐ 240V/60Hz

Rated voltage variation:

☐ 85%

☐ 115%

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

Continuous operation of the RFID reader, supplied with the internal battery and connected to the laptop USB-port.

RFID tag placed at approx. of the half reading distance. The Bluetooth module was configured as "Master" and active. During the test the remote station was removed from the laptop and the Bluetooth module was polling for a BT device. RFID and Bluetooth module were active at the same time.

Environmental conditions

Temperature [10 - 40°C]:

22°C

Relative humidity [10 - 90%]:

43%

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:	The measurement of the terminal voltages is not necessary for battery powered devices – only informative as reference and not subject of the approval.
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Protocol scope

- ☒ Readings - continuous emanation
- ☒ Diagram - continuous emanation

EMCE GmbH Ing_buero fuer EMV_Pruefungen Terminal voltage

23. Mar 16 17:00

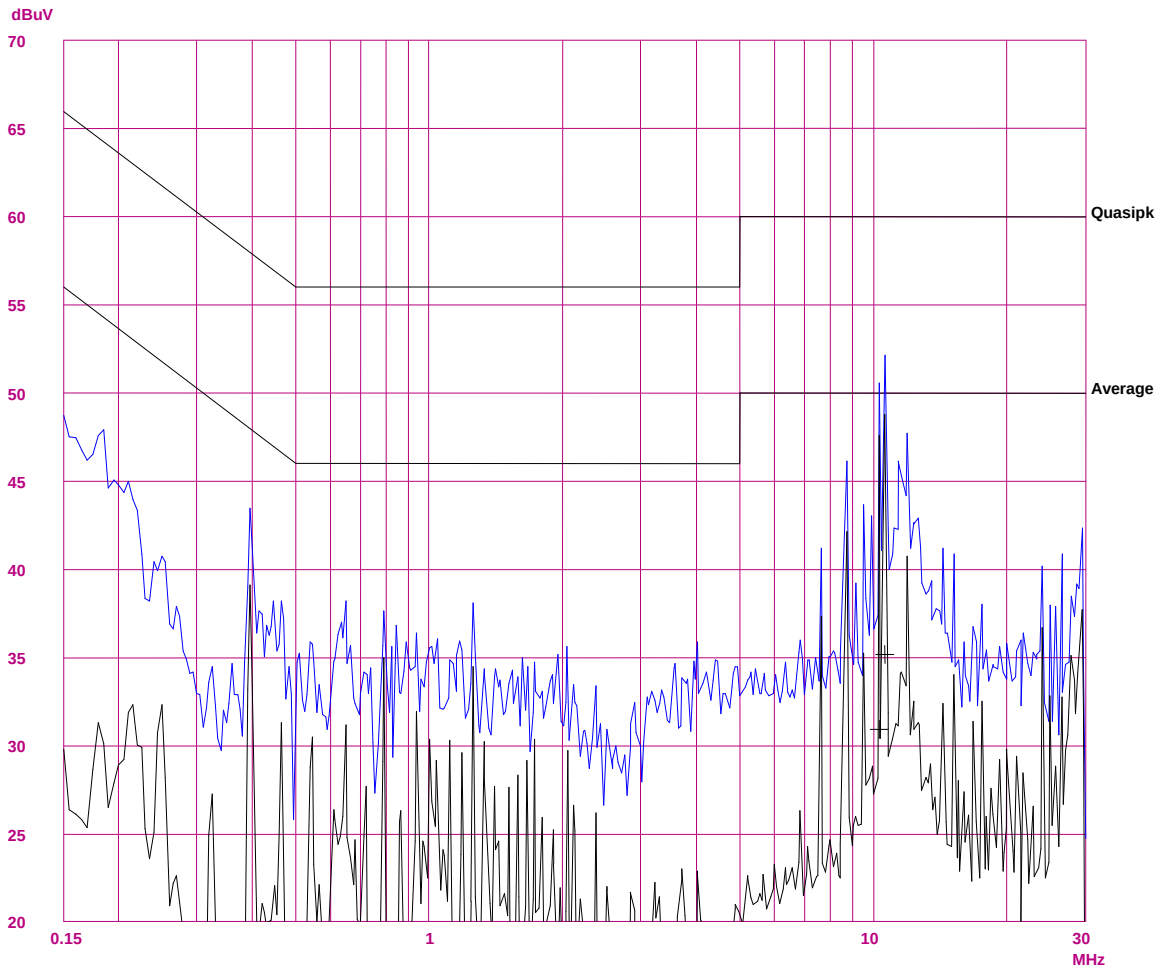
EUT: ARE H5
Manuf: AEG ID GmbH
Op Cond: Reading tag, half reading distance
Operator: P. Hauser
Test Spec: 47 CFR Part 15 Subpart C
Comment: Test_ID PRN12_06
AIN12_31, Phase L1 - laptop

Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF 60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 50
Acc Margin: 6dB

Transducer No.	Start	Stop	Name
3	2	1Hz	1000M Ca_#1006
20	9k	30M	Lim_#070



EMCE GmbH Ing_buero fuer EMV_Pruefungen Terminal voltage

23. Mar 16 17:00

EUT: ARE H5
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Op Cond: Reading tag, half reading distance
Operator: P. Hauser
Test Spec: 47 CFR Part 15 Subpart C
Comment: Test_ID PRN12_06
AIN12_31, Phase L1 - laptop

Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO LN	OFF 60dB

Final Measurement Results:

Frequency	QP Level	QP Limit
MHz	dBuV	dBuV

no Results

Frequency	AV Level	AV Limit
MHz	dBuV	dBuV

10.33000	30.9	50.0
10.60500	35.2	50.0

* limit exceeded

EMCE GmbH Ing_buero fuer EMV_Pruefungen Terminal voltage

23. Mar 16 17:11

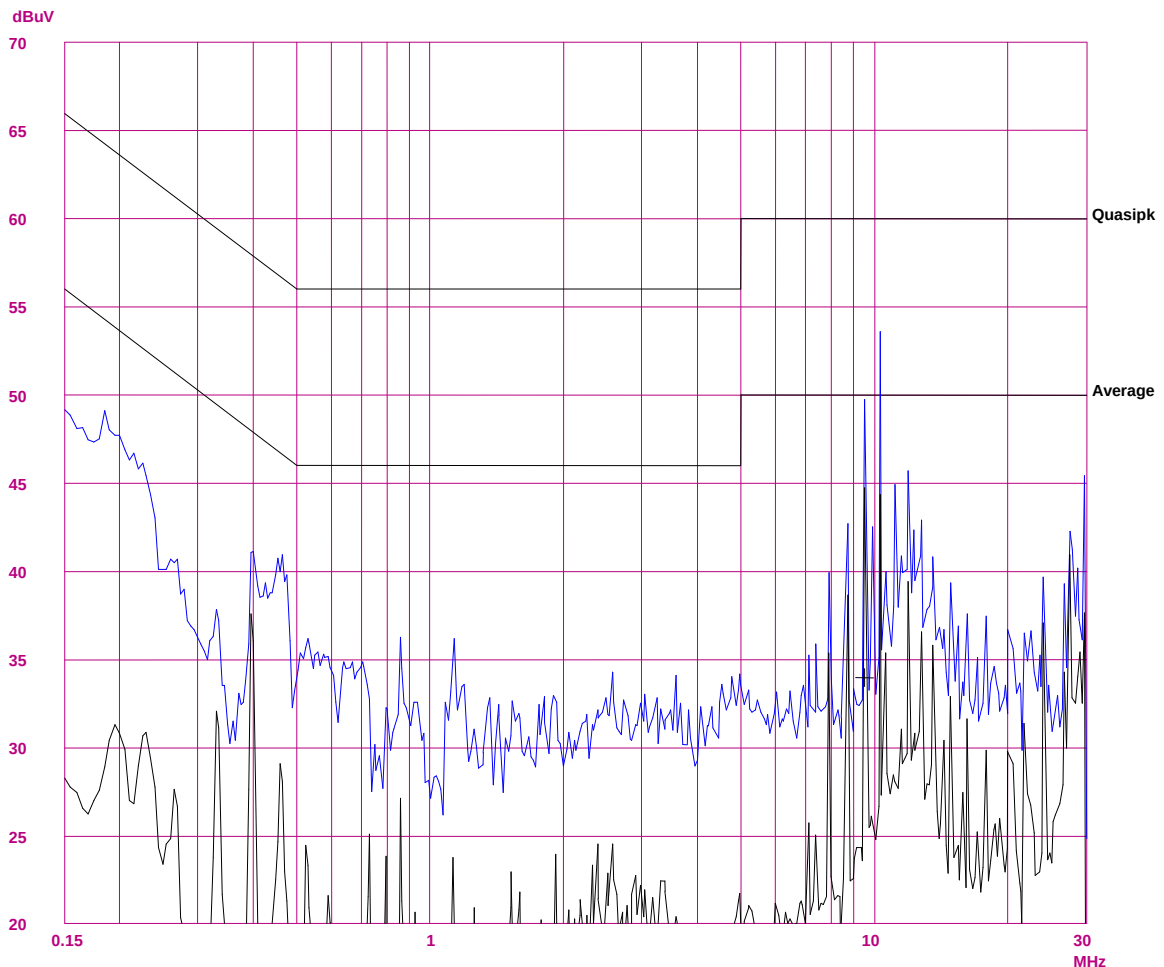
EUT: ARE H5
Manuf: AEG ID GmbH
Op Cond: Reading tag, half reading distance
Operator: P. Hauser
Test Spec: 47 CFR Part 15 Subpart C
Comment: Test_ID PRN12_06
AIN12_32, Phase N - laptop

Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF 60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 50
Acc Margin: 6dB

Transducer No.	Start	Stop	Name
3	2	1Hz	1000M Ca_#1006
20	9k	30M	Lim_#070



EMCE GmbH Ing_buero fuer EMV_Pruefungen Terminal voltage

23. Mar 16 17:11

EUT: ARE H5
Manuf: AEG ID GmbH
Op Cond: Reading tag, half reading distance
Operator: P. Hauser
Test Spec: 47 CFR Part 15 Subpart C
Comment: Test_ID PRN12_06
AIN12_32, Phase N - laptop

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF 60dB

Final Measurement Results:

Frequency	QP Level	QP Limit
MHz	dBuV	dBuV

no Results

Frequency	AV Level	AV Limit
MHz	dBuV	dBuV

9.53000	34.0	50.0
---------	------	------

* limit exceeded

1.1.2 Radio disturbances according 47 CFR Part 15 Subpart C - 04/2016

- ☒ Full compliance
☐ Precompliance
☐ Test not requested*
☐ Test not carried out*

*

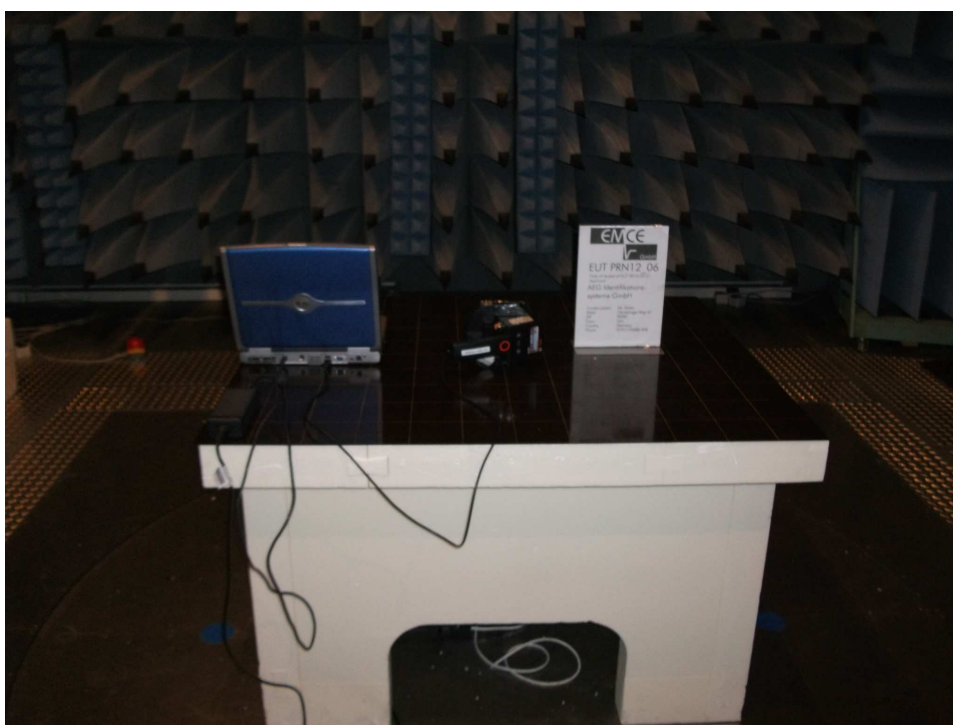
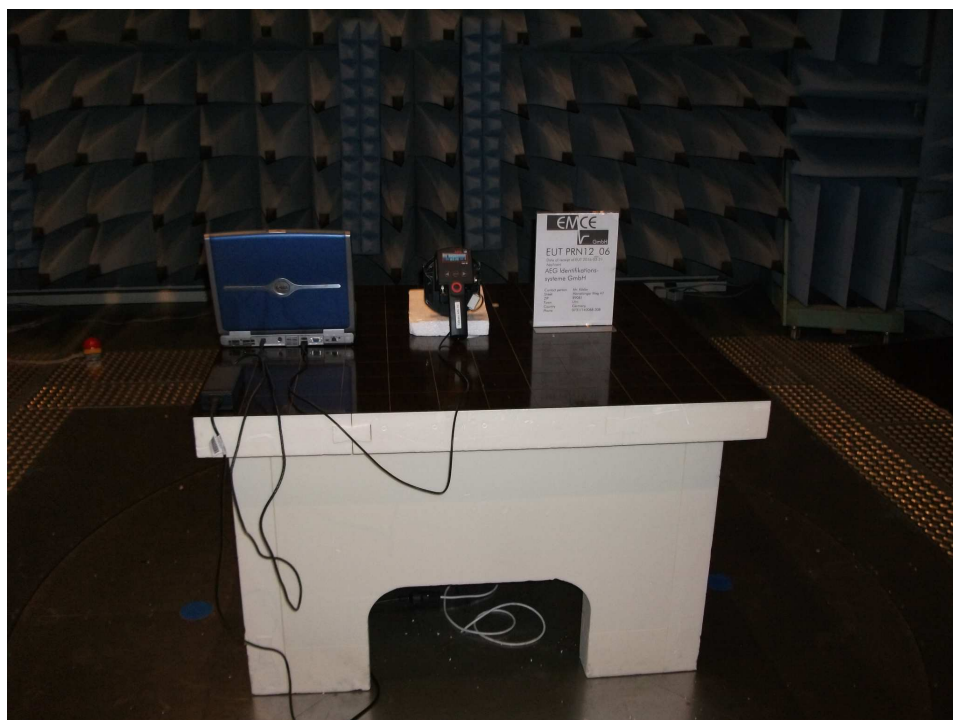
Test location

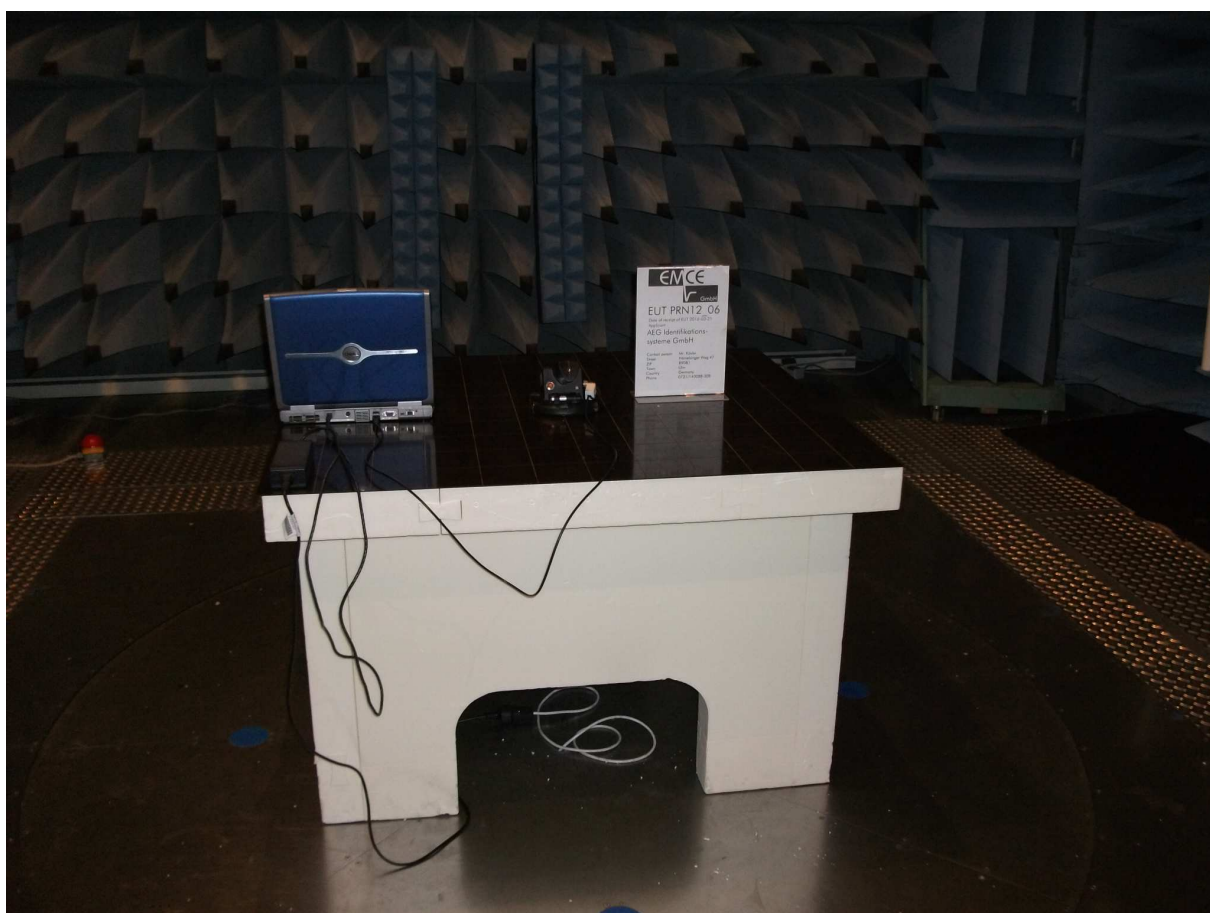
☒	Inv.-No.	Designation	Type (LxWxH)	Manufacturer	Location
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	584	Shielded room #3	3.6 x 3.6 x 2.5m	Siemens AG	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	678	Shielded room #4	4.0 x 4.0 x 3.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒	062	Semi anechoic chamber #2	13.5 x 6.1 x 5.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	679	Full anechoic chamber #3	8.8 x 4.6 x 4.2m	Albatross Projects GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒	014	Open area test site	10m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒	015	Open area test site	3m	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	042	Voltage- / current source test site	0-382VDC 0-270VAC 1x10kW / 3x5kW	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







Used test equipment

☒	Inv.-No.	Designation	Type	Manufacturer	S/N
☒	001	Test receiver	ESS 5Hz - 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 9kHz – 30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002
☒	009	Antenna 30 – 300MHz	VHBA9123 / BBA9106	Schwarzbeck	435
☒	010	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	108
☒	011	Antenna 30 – 300MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
☒	012	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	166
	013	Antenna 9kHz – 30 MHz	Loop antenna 1.5m 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
9kHz – 30MHz	on request
30MHz – 300MHz	4.4dB
300MHz – 1GHz	3.4dB
1GHz – 18GHz	on request

1.1.2.2 Test – Radiated emission fundamental

Regulation

47 CFR Part 15 Subpart C - 04/2016

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

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: ☐ 3m ☐ 5m
☒ 10m ☐ 30m

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☒ 7.2VDC	☐ 240V/60Hz
Rated voltage variation:	☐ 85%	☐ 115%

Continuous operation of the RFID reader supplied by the internal battery and connected to the laptop USB-port.

The Bluetooth module was configured as “Master” and active. During the test the remote station was removed from the laptop and the Bluetooth module was polling for a BT device. RFID and Bluetooth module were active at the same time.

The emanation was maximized while placing the RFID tag inside the field or without tag.

Environmental conditions

Temperature [10 - 40°C]:	20°C
Relative humidity [10 - 90%]:	48%

Environmental conditions during the test: ☒ kept
☐ not kept

Test - / Measurement procedure

The test was performed at an antenna to EUT distance of 10m in the frequency range $\leq 30\text{MHz}$ and at 3m distance for frequencies $\geq 30\text{MHz}$. Measurements were made with a CISPR receiver with quasi-peak. The average detector is used in the frequency bands 9-90kHz, 110-490kHz and 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

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

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

Test result

Frequency	Field strength	Limit _{10m}	Margin	Ant.-	Ant.-	Detector	Receiver	Supply voltage	Remarks
				Distance	Polar.	Peak /	6dB BW		
MHz	dB $\mu\text{V/m}$	dB $\mu\text{V/m}$	dB	m	H/V	QP / AV	kHz		
0.13422	83.9	85.0	1.1	10.0	V	AV	0.2		Full charged battery

Limit_{10m} Limit calculated for 10m test distance

Limits for radiated disturbances:

☒ kept
☐ not kept

Remarks: n/a

1.1.2.3 Test – Spurious emissions

Regulation

47 CFR Part 15 Subpart C - 04/2016

- | | |
|---|---|
| ☒ 9kHz - 30MHz | ☐ 150kHz – 1GHz |
| ☒ 30MHz - 1000MHz | ☒ 1 – 25GHz |

Limits: ☒ Section 15.209 ☐ __

Test distance: ☒ 3m ☐ 5m
☒ 10m ☐ 30m

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☒ 7.2VDC	☐ 240V/60Hz
Rated voltage variation:	☐ 85%	☐ 115%

Continuous operation of the RFID reader supplied by the internal battery and connected to the laptop USB-port.

RFID tag placed at approx. of the half reading distance. The Bluetooth module was configured as “Master” and active. During the test the remote station was removed from the laptop and the Bluetooth module was polling for a BT device. RFID and Bluetooth module were active at the same time.

Environmental conditions

Temperature [10 - 40°C]: 20°C
Relative humidity [10 - 90%]: 48%

Environmental conditions during the test: ☒ kept
☐ not kept

Test - / Measurement procedure

The test was performed at an antenna to EUT distance of 10m in the frequency range $\leq 30\text{MHz}$ and at 3m distance for frequencies $\geq 30\text{MHz}$. Measurements were made with a CISPR receiver with quasi-peak. The average detector is used in the frequency bands 9-90kHz, 110-490kHz and 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

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

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

Test result

Limits for intentional radiators:

☒ kept
☐ not kept

Level of the fundamental > unwanted emission:

☒ kept
☐ not kept

Remarks: Radio disturbances below the limit line with a margin > 10dB to the limit are generally not listed.

Protocol scope

- ☒ 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) – 3 axis

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

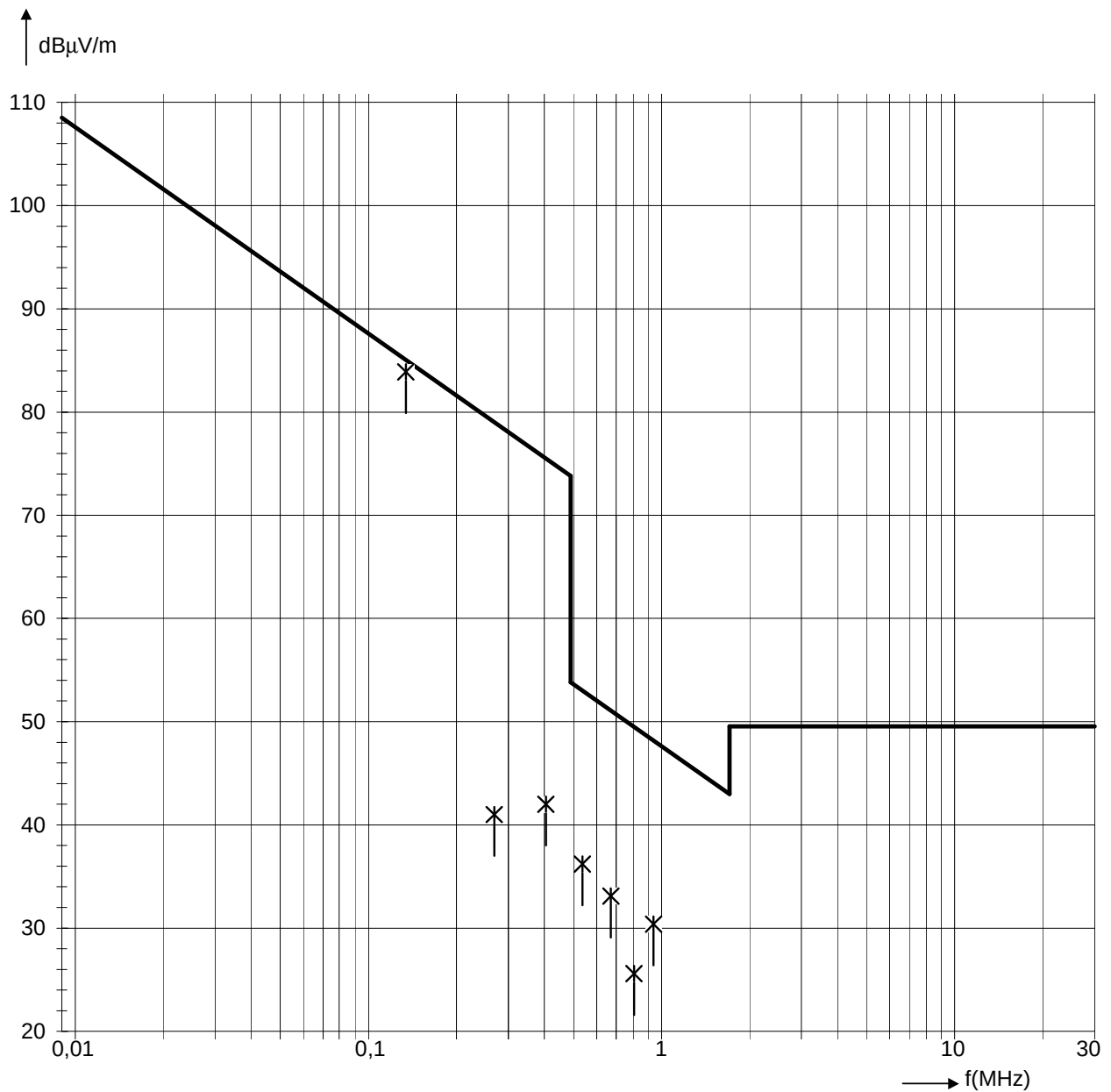
Frequency	Field strength	Limit _{10m}	Margin	Ant.-	Ant.-	Detector	Receiver	Remarks
				Distance	Polar.	Peak /	6dB BW	
MHz	dB μ V/m	dB μ V/m	dB	m	H/V	QP / AV	kHz	
0.26844	41.0	79.0	38.0	10.0	V	AV	10	Increased ambient noise
0.40266	42.0	75.5	33.5	10.0	V	AV	10	Increased ambient noise
0.53688	36.2	53.0	16.8	10.0	V	QP	10	
0.67110	33.1	51.1	18.0	10.0	V	QP	10	
0.80532	25.6	49.5	23.9	10.0	V	QP	10	
0.93954	30.4	48.1	17.7	10.0	V	QP	10	
1.07376	25.4	47.0	21.6	10.0	V	QP	10	

Limit_{10m} Limit calculated for 10m test distance

Diagram - Antenna vertical polarized

Limits according FCC Rules CFR 47 Part 15 – Subpart C

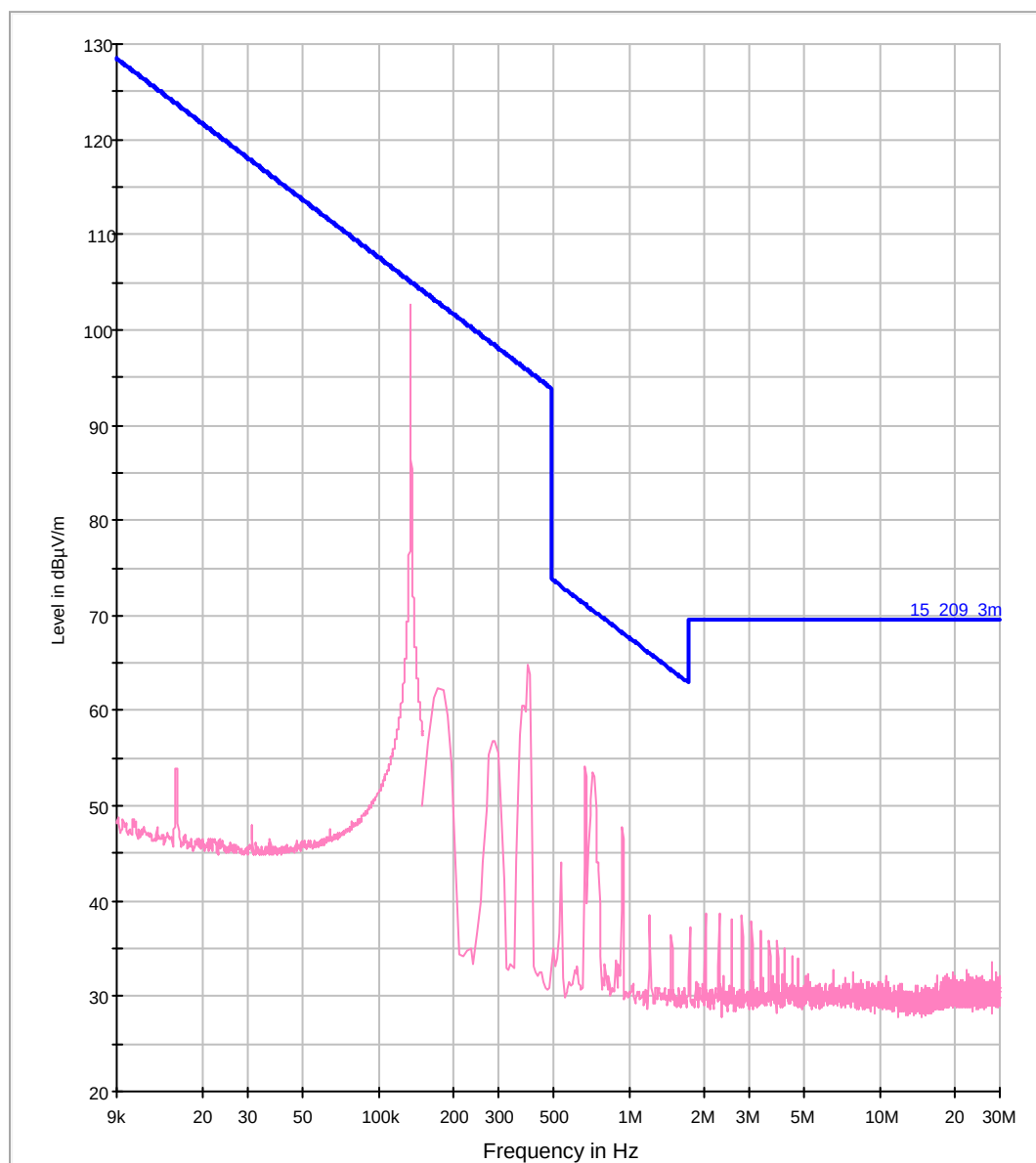
☒ Section 15.209 – Corrected to 10m distance EUT-Antenna



EUT Information

EUT Name:	ARE H5 – FullISO/E/A/i/B/U/D/Le/PT1
Test_ID: / SN:	PRN12_06
Customer:	AEG ID GmbH
Operational condition:	Field on, no tag in field
Test specification:	47 CFR §15.209
Antenna information:	Distance EUT-Ant.: 3.0m / Polarisation: V / Ant.Height: 1.0m
Operator:	P. Hauser
File #:	AIN18_02

Magnetic Field Strength dB μ V with Sweep_SAC2



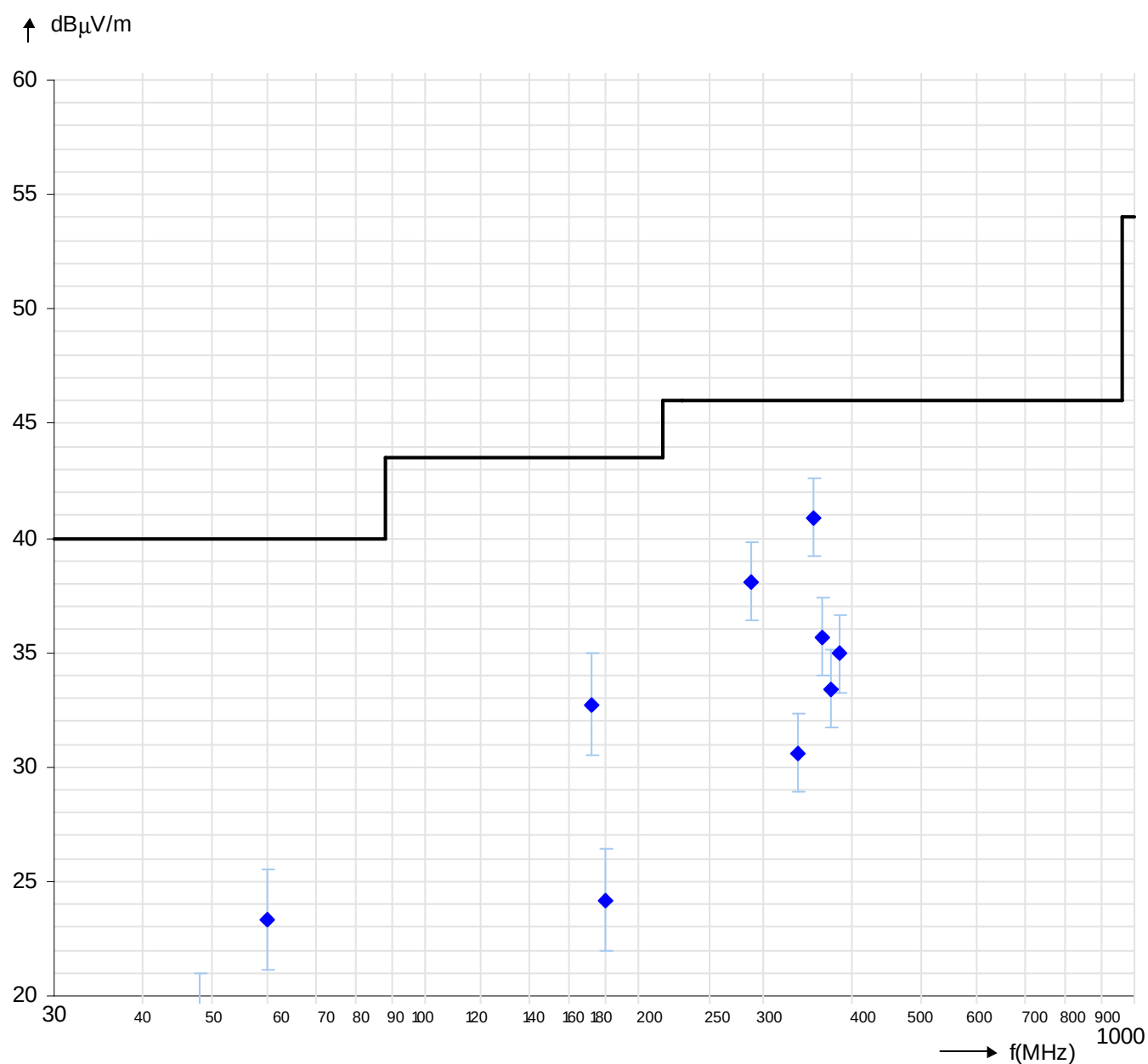
15_209_3m [..EMI radiated]
MaxPeak-MaxHold [Preview Result 1V.Result:2]

Readings - Antenna horizontal polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna- Height	Antenna- Polarization	Turntable position
MHz	dB μ V	dB/m	dB	dB μ V/m	dB μ V/m	dB	m	hor./ver.	deg.
47.990	9.0	8.7	1.1	18.8	40.0	21.2	3.0	H	95
59.990	13.7	8.4	1.2	23.3	40.0	16.7	3.0	H	95
171.990	17.4	13.2	2.1	32.7	43.5	10.8	1.7	H	187
179.990	8.2	13.8	2.1	24.2	43.5	19.3	1.8	H	187
287.990	21.0	14.4	2.7	38.1	46.0	7.9	1.0	H	205
335.990	13.7	13.9	3.0	30.6	46.0	15.4	1.0	H	240
352.170	23.0	14.9	3.0	40.9	46.0	5.1	1.0	H	240
363.170	17.4	15.2	3.1	35.7	46.0	10.3	1.0	H	240
374.180	14.8	15.5	3.1	33.4	46.0	12.6	1.0	H	240
383.990	16.2	15.6	3.2	34.9	46.0	11.1	1.0	H	240

Diagram radio disturbances – Antenna horizontal polarized

Limits: ☒ Section 15.209* ☐ __

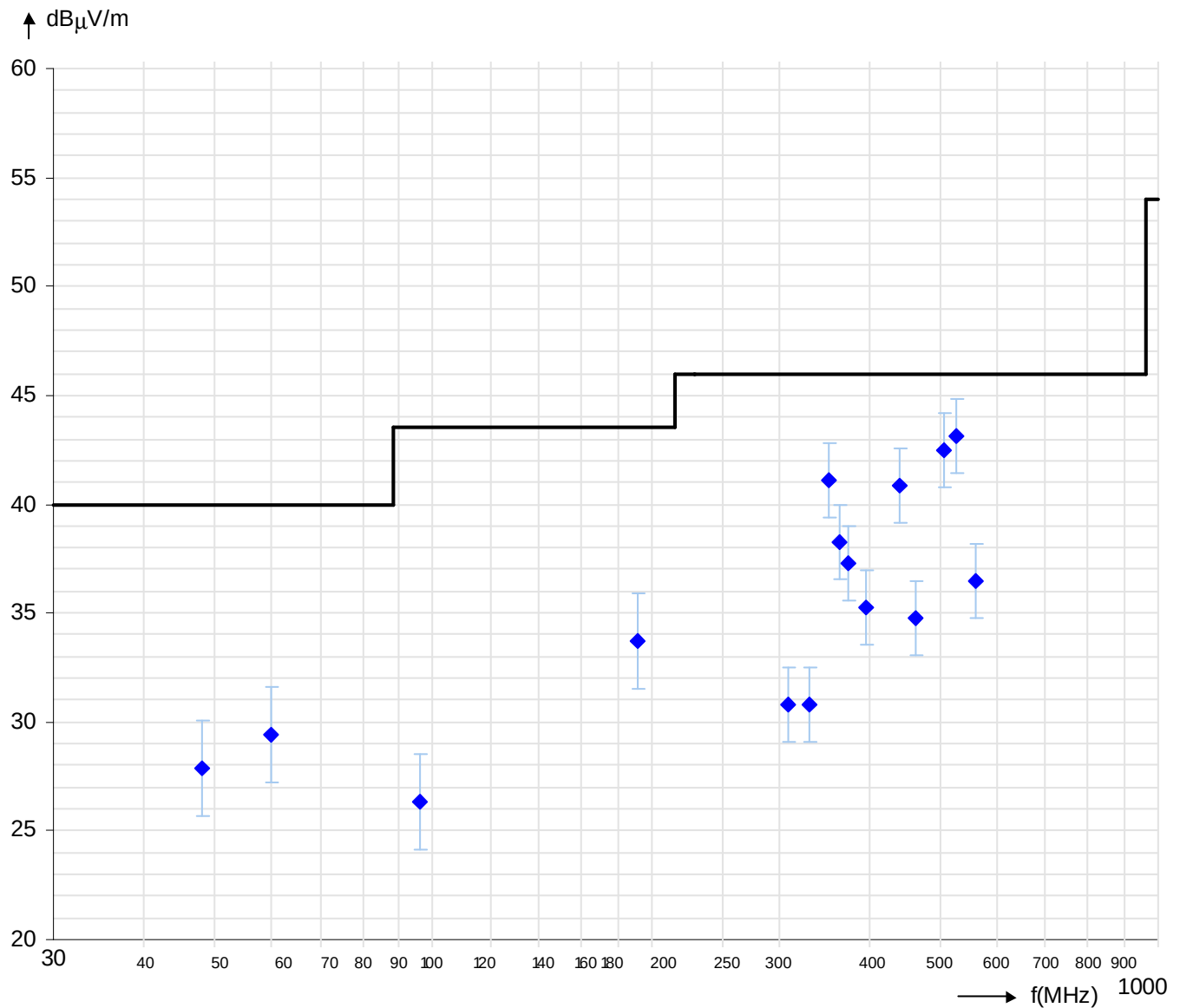


Readings - Antenna vertical polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna- Height	Antenna- Polarization	Turntable position
MHz	dB μ V	dB/m	dB	dB μ V/m	dB μ V/m	dB	m	hor./ver.	deg.
48.000	18.1	8.7	1.1	27.9	40.0	12.1	1.0	V	105
59.990	19.8	8.4	1.2	29.4	40.0	10.6	1.0	V	120
95.990	15.7	9.1	1.5	26.4	43.5	17.1	1.0	V	105
191.990	16.8	14.7	2.2	33.7	43.5	9.8	1.0	V	190
308.140	14.2	13.8	2.8	30.8	46.0	15.2	1.0	V	135
330.150	13.9	13.9	2.9	30.8	46.0	15.2	1.0	V	135
352.170	23.2	14.9	3.0	41.1	46.0	4.9	1.0	V	135
363.170	20.0	15.2	3.1	38.3	46.0	7.7	1.0	V	135
374.180	18.7	15.5	3.1	37.3	46.0	8.7	1.0	V	135
396.190	16.3	15.7	3.2	35.3	46.0	10.7	1.0	V	135
440.210	20.6	16.8	3.4	40.9	46.0	5.1	1.0	V	140
462.220	14.2	17.1	3.5	34.8	46.0	11.2	1.0	V	160
506.240	21.2	17.6	3.7	42.5	46.0	3.5	1.0	V	165
528.260	21.5	17.9	3.8	43.2	46.0	2.8	1.0	V	165
561.270	14.1	18.5	3.9	36.5	46.0	9.5	1.0	V	165

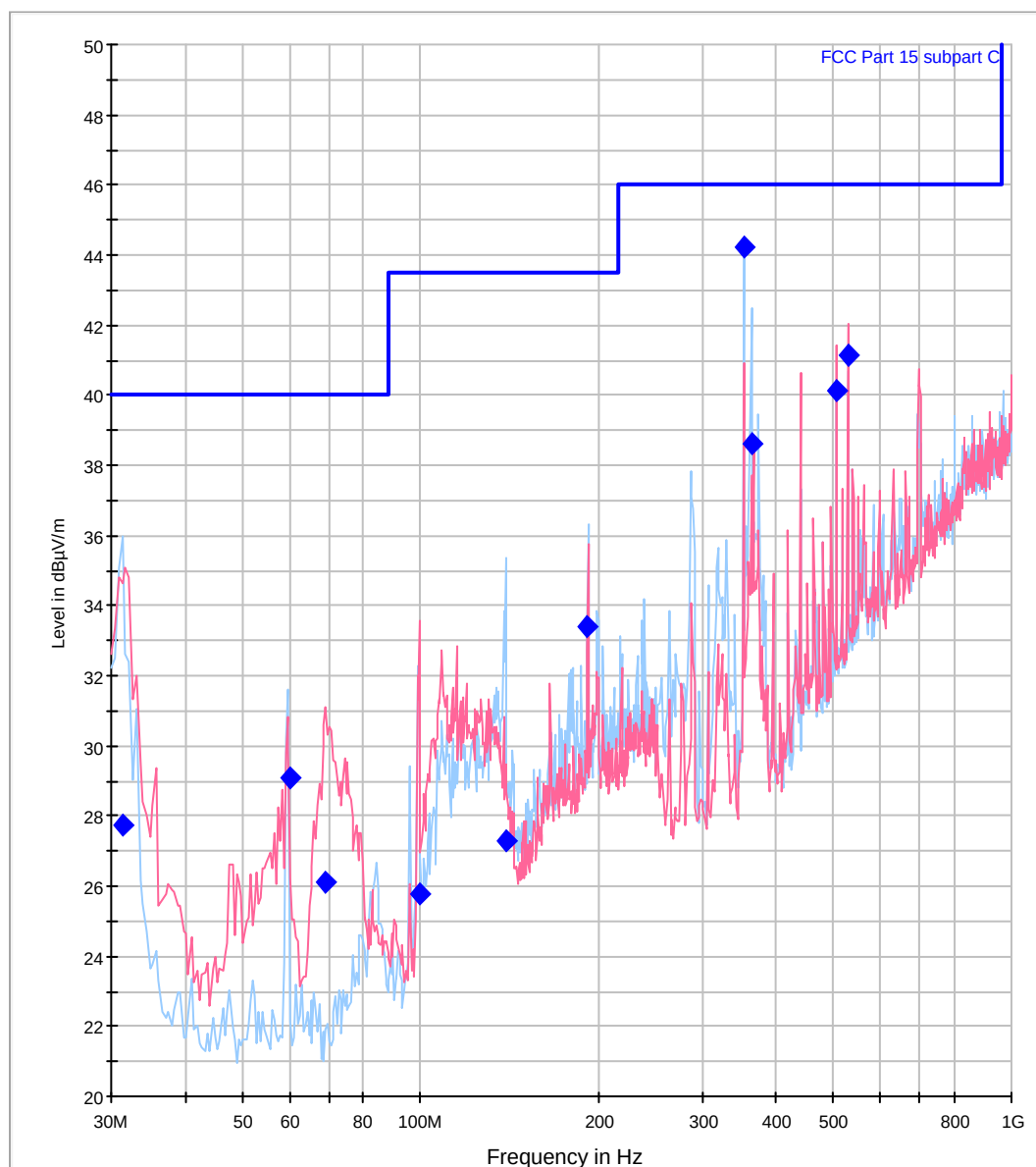
Diagram radio disturbances – Antenna vertical polarized

Limits: ☒ Section 15.209* ☐ __



EUT Information

EUT Name:	ARE H5 – FullISO/E/A/i/B/U
Test_ID: / SN:	PRN12_06
Customer:	AEG ID GmbH
Operational condition:	Reading tag, half reading distance
Test specification:	FCC §15.209
Antenna information:	Distance EUT-Ant.: 3.0m / Polarisation: H/V / Ant.Height: 1.0-4.0m
Operator:	P. Hauser
File #:	AIN19_01
Comment #1:	X-axis



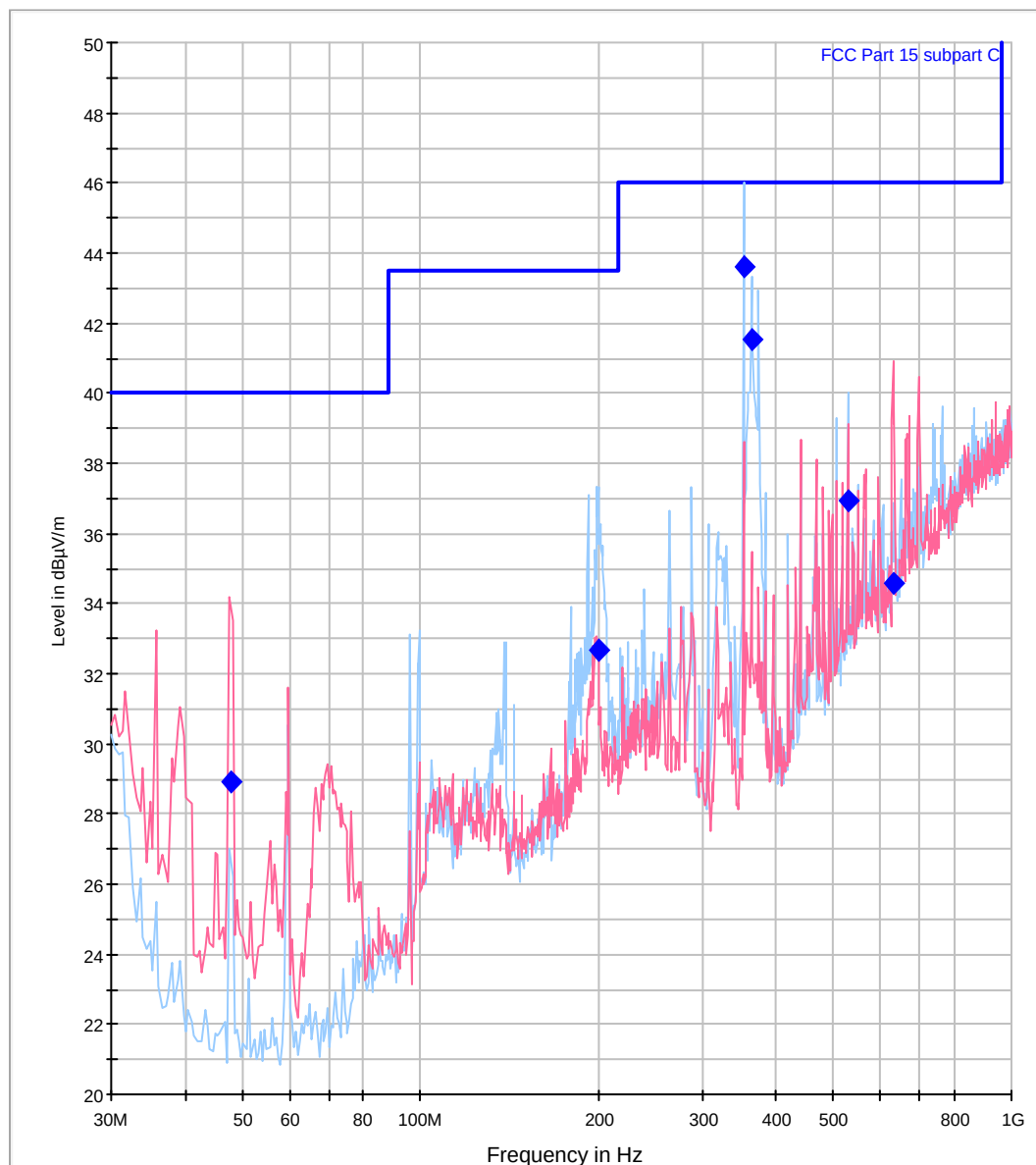
— FCC Part 15 subpart C [..EMI radiated]
— Preview Result 1V-PK+ [Preview Result 1V.Result:2]
◆ Preview Result 1H-PK+ [Preview Result 1H.Result:2]
◆ Final Result 1-QPK [Final Result 1.Result:1]

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
31.318404	27.7	120.000	166.0	H	52.0	12.1	12.3	40.0
60.000000	29.1	120.000	166.0	H	310.0	8.7	10.9	40.0
69.082164	26.1	120.000	123.0	V	278.0	8.9	13.9	40.0
99.462926	25.8	120.000	123.0	V	126.0	9.7	17.7	43.5
139.503006	27.3	120.000	124.0	H	306.0	12.3	16.2	43.5
192.000000	33.4	120.000	166.0	H	285.0	15.2	10.1	43.5
352.176353	44.2	120.000	125.0	H	130.0	16.1	1.8	46.0
362.657315	38.6	120.000	125.0	H	130.0	16.8	7.4	46.0
506.252505	40.1	120.000	125.0	V	276.0	18.6	5.9	46.0
528.260521	41.1	120.000	125.0	V	64.0	19.3	4.9	46.0

EUT Information

EUT Name:	ARE H5 – FullISO/E/A/i/B/U
Test_ID: / SN:	PRN12_06
Customer:	AEG ID GmbH
Operational condition:	Reading tag, half reading distance
Test specification:	FCC §15.209
Antenna information:	Distance EUT-Ant.: 3.0m / Polarisation: H/V / Ant.Height: 1.0-4.0m
Operator:	P. Hauser
File #:	AIN19_02
Comment #1:	Y-axis



— FCC Part 15 subpart C [..EMI radiated]
— Preview Result 1V-PK+ [Preview Result 1V.Result:2]

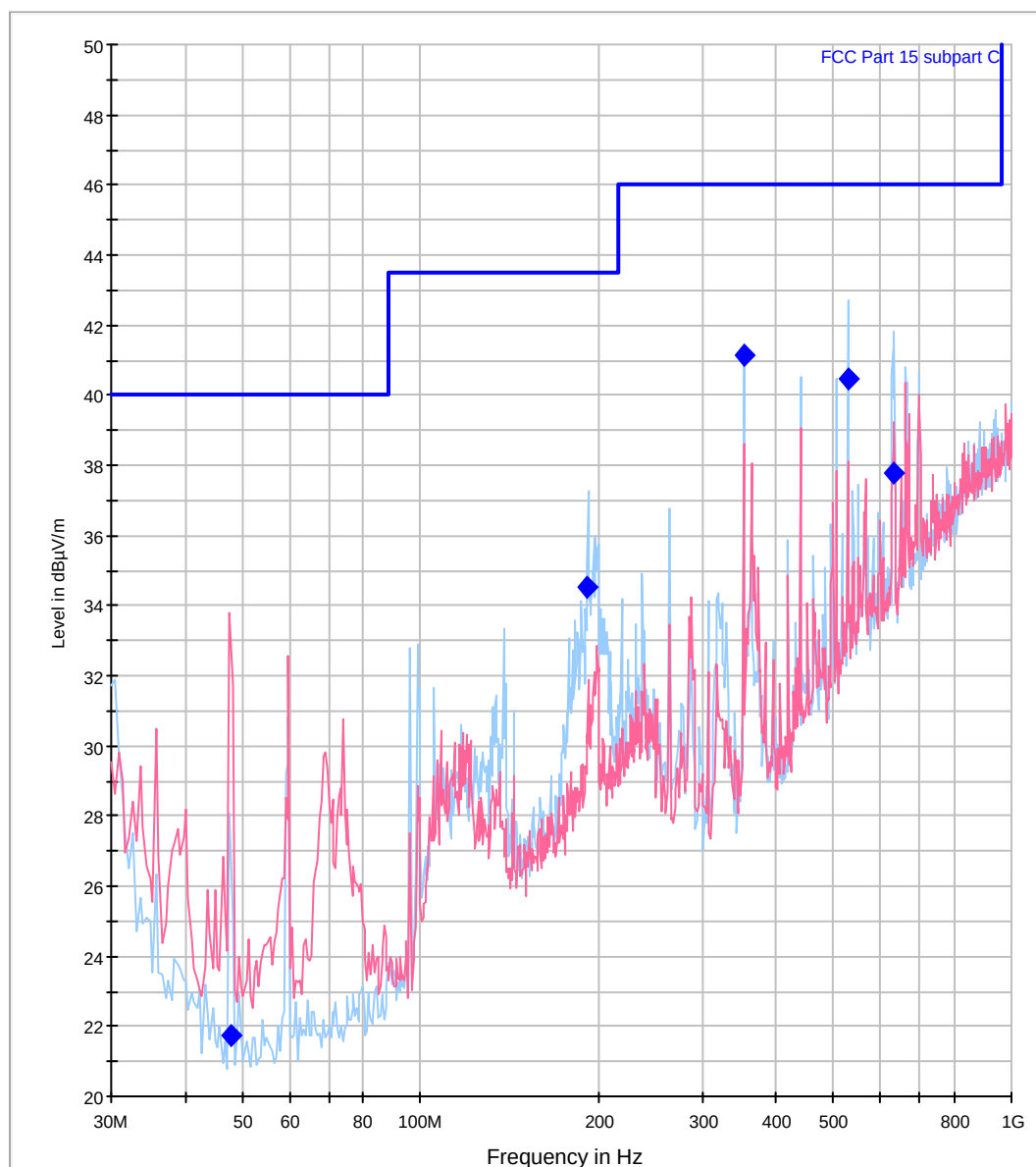
— Preview Result 1H-PK+ [Preview Result 1H.Result:2]
◆ Final Result 1-QPK [Final Result 1.Result:1]

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
48.016033	28.9	120.000	123.0	V	172.0	8.9	11.1	40.0
199.687375	32.7	120.000	167.0	H	84.0	16.4	10.8	43.5
352.168337	43.6	120.000	123.0	H	145.0	16.1	2.4	46.0
363.170341	41.5	120.000	123.0	H	54.0	16.8	4.5	46.0
528.236473	36.9	120.000	165.0	H	215.0	19.2	9.1	46.0
631.811623	34.6	120.000	122.0	V	28.0	20.6	11.4	46.0

EUT Information

EUT Name:	ARE H5 – FullISO/E/A/i/B/U
Test_ID: / SN:	PRN12_06
Customer:	AEG ID GmbH
Operational condition:	Reading tag, half reading distance
Test specification:	FCC §15.209
Antenna information:	Distance EUT-Ant.: 3.0m / Polarisation: H/V / Ant.Height: 1.0-4.0m
Operator:	P. Hauser
File #:	AIN19_03
Comment #1:	Z-axis



— FCC Part 15 subpart C [..EMI radiated]
— Preview Result 1V-PK+ [Preview Result 1V.Result:2]

— Preview Result 1H-PK+ [Preview Result 1H.Result:2]
◆ Final Result 1-QPK [Final Result 1.Result:1]

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
47.951904	21.7	120.000	127.0	V	174.0	8.9	18.3	40.0
191.983968	34.5	120.000	127.0	H	291.0	15.2	9.0	43.5
352.176353	41.2	120.000	123.0	H	54.0	16.1	4.8	46.0
528.236473	40.5	120.000	164.0	H	209.0	19.2	5.5	46.0
633.094188	37.8	120.000	123.0	H	310.0	20.6	8.2	46.0

Final Result 1 – BT harmonics

Frequency (GHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (MHz)	Height (cm)	Polarization	Limit PK (dBµV/m)	Margin - PK (dB)
4.904	41.2		1.0	120.0	H	74.0	32.8
7.356	<54		1.0	120.0	H	74.0	≥20
9.808	<54		1.0	120.0	H	74.0	≥20
12.260	<54		1.0	120.0	H	74.0	≥20
14.712	<54		1.0	120.0	H	74.0	≥20
17.164	<60		1.0	120.0	H	74.0	≥14
19.616	<60		1.0	120.0	H	74.0	≥14
22.068	<60		1.0	120.0	H	74.0	≥14
24.520	<60		1.0	120.0	H	74.0	≥14

1.1.2.4 Restricted bands of operation

Regulation

47 CFR Part 15 Subpart C - 04/2016

Requirement: ☒ Section 15.205(a)

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:	☒ 7.2VDC	☐ 240V/60Hz
Rated voltage variation:	☐ 85%	☐ 115%

Continuous operation of the RFID reader supplied by the internal battery and connected to the laptop USB-port.

RFID tag placed at approx. of the half reading distance. The Bluetooth module was configured as "Master" and active. During the test the remote station was removed from the laptop and the Bluetooth module was polling for a BT device. RFID and Bluetooth module were active at the same time.

Environmental conditions

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

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: 0.13422MHz
20dB-Emission Bandwidth: 0.688kHz

Fundamental out
of restricted bands:

☒ kept
☐ not kept

Limit spurious emission:

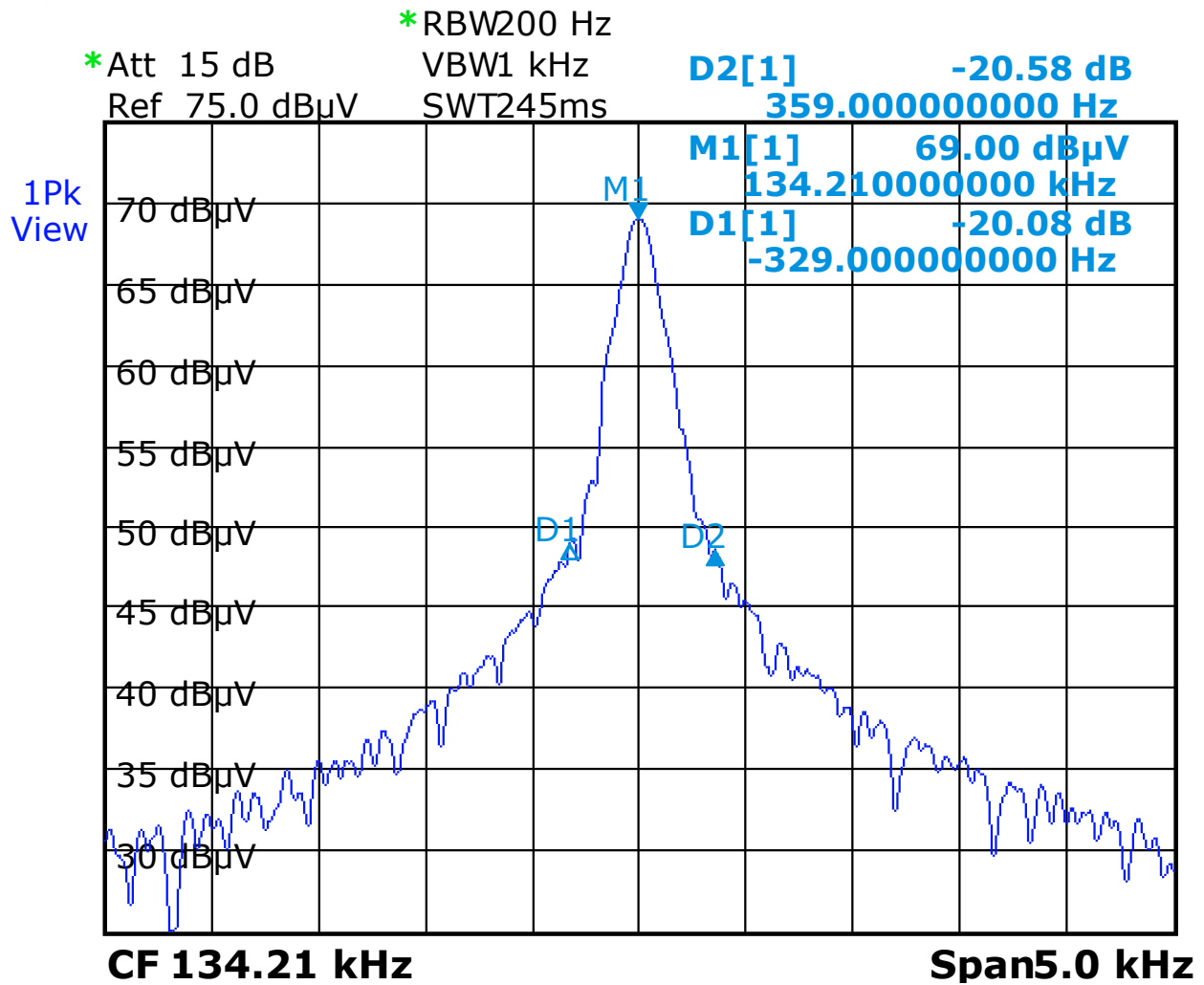
☒ kept
☐ not kept

Remarks: n/a

Protocol scope

☒ Diagram – 20dB-Emission bandwidth.

Occupied bandwidth



PRN12_06, ARE H5 - FullIS0/E/A/i/B/U

Date: 22.MAR.2016 18:26:26

Occupied bandwidth BW = D1 - D2 = 0.329kHz - -0.359kHz=0.688kHz

1.1.2.5 Antenna requirement

Regulation

47 CFR Part 15 Subpart C - 04/2016

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

Test result

Requirement: ☒ kept
☐ not kept

Authorized antenna: ☐ Print antenna
☒ Internal antenna
☐ External antenna

Remarks: n/a

2 Summary

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	Informative
Radiated emissions 0.009-30MHz	Section 15.209	Limits kept	
Radiated emissions 30-1000MHz 1-25GHz	Section 15.209	Limits kept	
Occupied bandwidth	Section 15.215(c)	n. r.	
Restricted bands	Section 15.205(a)	Requirement kept	
Antenna requirement	Section 15.203	Requirement kept	

n. r. – not relevant

Burgrieden, 2016-12-06

Report generated by:



Acceptance inspector – Peter Hauser