Test report

AIO26a01

Product / EUT:	RFID reader	
Type designation:	UDT-100H – 22L/UD/U/H/CS1	FCC ID: V7IUDT100H
	ARE DT1 – 22L/A/U/H	FCC ID: V7IAREDT1HF-1
Tested type:	ARE DT1 – 22L/A/U/H	
EUT authorization:	☒ Certification ☐ Declaration of Conformity ☐ Verification	
Production level:	06/2017	
S/N:	n/a	
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 ANSI C63.10-2013
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:	2017-06-26
Test ID:	PRO26_01
Date(s) of test:	2017-06-26; 2017-06-27

Burgrieden, 2017-08-25

Released by:

Principal engineer - Christian Vogelmann

Remark: The test results effects only to the related items tested at the time of the test. The test report shall not be reproduced except in full without the written approval of the testing laboratory.

Bundesnetzagentur
BNetzA-CAB-02/21-01
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D-PL-12122-01-02

Test laboratory:	☒ EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung Untere Wiesen 1 / 88483 Burgrieden / Germany DAkkS-Registration No.: D-PL-12122-01-01 D-PL-12122-01-02 CAB-Registration No.: BnetzA-CAB-02/21-01/1 FCC-Registration No.: 219415
Responsible inspector:	Mr. Hauser EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung
Contact person:	Mr. Kösler / AEG Identifikationssysteme GmbH
EUT Description:	HF-RFID reader with USB I/F Options list: UD = specific 3D-front-label for customer UID A = AEG ID 3D-front-label U = USB interface H = HID interface L = air coil CSx = customer specific software, sequential number x Algorithm: 22 = Iso 14443 + Iso 15693
Voltage supply:	Via USB
Frequency list:	13.56 MHz; 20.0 MHz; 22.1184 MHz; 48.0 MHz
Temperature range:	n/a
Approximate size:	(ØxH) / mm - 110x30

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-9Y819-48010-36O-0954
Tag	Mifare	NXP	049EE3D95B0280

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

Cable designation	Type	Length	Remarks
AC power cord – laptop	3-wire	160 cm	n/a
USB cable	Shielded	170 cm	Ferrite core WE 742 711 11, 3 cm off the EUT

Remarks: n/a

State of revision:

Source document	New Document	Date / Reviser	Modifications
AIO26_01	AIO26a01	2017-08-24 / P. Hauser	Results of voltage and temperature variation supplemented on page 24.

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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)/ 2017-10-31
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2017-08-31
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2017-08-31
008	Loop antenna 9kHz-30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002	3 Year(s)/ 2019-11-25
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)/ 2018-11-04
011	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	0403/94	2 Year(s)/ 2018-11-04
012	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	166	3 Year(s)/ 2018-11-10
013	Antenna 9kHz-30MHz	Ø 1.5m	EMCE GmbH		1 Year(s)/ 2017-08-31
014	OATS	3m	EMCE GmbH		1 Year(s)/ 2017-08-31
015	OATS	10m	EMCE GmbH		1 Year(s)/ 2017-08-31
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)/ 2018-04-06
059	Log.-per. antenna	HL050	Rohde & Schwarz	100006	3 Year(s)/ 2018-03-10
067	LISN	ESH2-Z5	Rohde & Schwarz	872460/043	1 Year(s)/ 2017-08-30
068	LISN	ESH2-Z5	Rohde & Schwarz	872460/042	1 Year(s)/ 2017-08-31
070	Pulse limiter + 10dB Attenuator	ESH3-Z2	Rohde & Schwarz	n/a	1 Year(s)/ 2017-08-31

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Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
073	Absorbing clamp	MDS21	Schwarzbeck	881757	2 Year(s)/ 2018-07-15
175	EMI Test receiver	ESR7	Rohde & Schwarz	101108 Firmware: FW V2.26	1 Year(s)/ 2017-07-20

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Scope:

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1 EMC-Test(s)

1.1 Emission according 47 CFR Part 15 Subpart C - 06/26/2017

1.1.1 Terminal voltage according 47 CFR Part 15 Subpart C - 06/26/2017

☒ Full compliance
☐ 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

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1.1.1.1 Test set up

According ANSI C63.10-2013

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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
☒	070	Pulse limiter / 10 dB attenuator	ESH3-Z2	Rohde & Schwarz	357.8810.52
	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
9 kHz – 150 kHz	4.0 dB
150 kHz – 30 MHz	3.6 dB

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1.1.1.2 Test

Regulation

47 CFR Part 15 Subpart C - 06/26/2017

☐ 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 - laptop	L1/N/PE
# 2		
# 3		

Continuous operation of the RFID reader, attached at the laptop USB I/F.
The PCB antenna was disconnected from the circuit, the antenna output was terminated with 47 Ω. Packets of unsuccessful tag readings were transferred via USB.

Environmental conditions

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

Environmental conditions during the test: ☒ kept ☐ not kept

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Test - / Measurement procedure

Measurements are made with a receiver according CISPR guidelines. The required frequency range is scanned in an automatically operation. If the emanation is closer than 6 dB to the limits or more, the receiver will stop and measure the exact value with quasipeak or average detector. The frequency, the maximum reading and the limit will be printed out.

Test result

Limits for continuous disturbances:

☒ kept
☐ not kept

Remarks: The PCB antenna was disconnected from the circuit, the antenna output was terminated with 47 Ω.

Protocol scope

☒ Readings - continuous emanation
☒ Diagram - continuous emanation

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26. Jun 17 09:03

Conducted emission - Terminal voltage

EUT:	DT1 HF
Manuf:	AEG ID GmbH
Op Cond:	Antenna disconnected, 47R termination
Operator:	P. Hauser
Test Spec:	47 CFR Part 15 Subpart C
Comment:	Test_ID EUT PRO26_01
	AIO26_01, Port L1

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

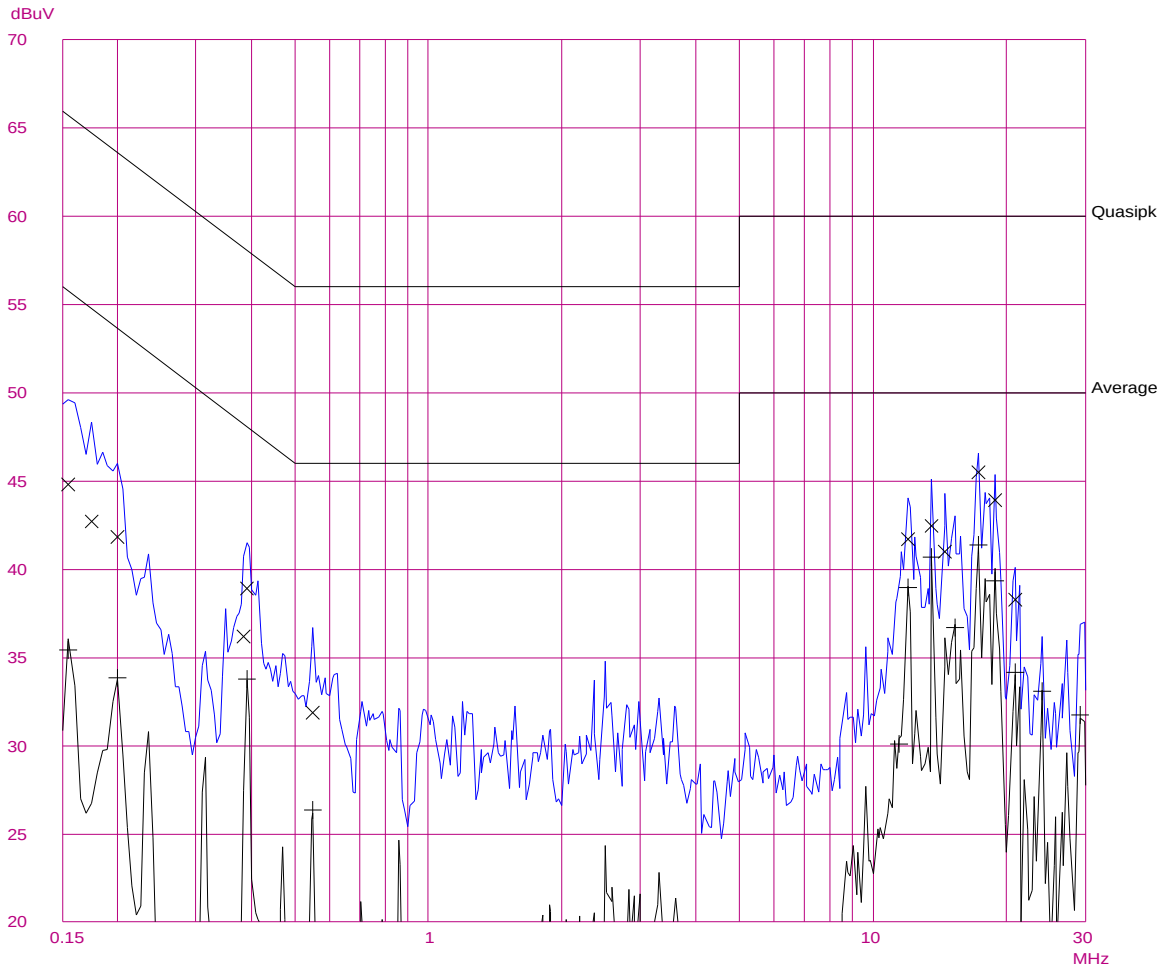
Final Measurement: x QP / + AV

Meas Time: 1 s

Subranges: 50

Acc Margin: 20dB

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



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Conducted emission - Terminal voltage

EUT:	DT1 HF
Manuf:	AEG ID GmbH
Op Cond:	Antenna disconnected, 47R termination
Operator:	P. Hauser
Test Spec:	47 CFR Part 15 Subpart C
Comment:	Test_ID EUT PRO26_01
	AIO26_01, Port L1

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 MHz	QP Level dBuV	QP Limit dBuV
0.15500	44.8	65.7
0.17500	42.7	64.7
0.20000	41.8	63.6
0.38500	36.1	58.1
0.39000	38.9	58.0
0.55000	31.8	56.0
12.00000	41.7	60.0
13.56000	42.4	60.0
14.48000	41.0	60.0
17.22000	45.4	60.0
18.78500	43.9	60.0
20.87500	38.2	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.15500	35.4	55.7
0.20000	33.8	53.6
0.39000	33.7	48.0
0.55000	26.3	46.0
11.46000	30.1	50.0
12.00000	39.0	50.0
13.56000	40.6	50.0
15.26000	36.7	50.0
17.22000	41.3	50.0
18.78500	39.3	50.0
20.87500	34.1	50.0
24.00500	33.0	50.0
29.22000	31.7	50.0

* limit exceeded

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Conducted emission - Terminal voltage

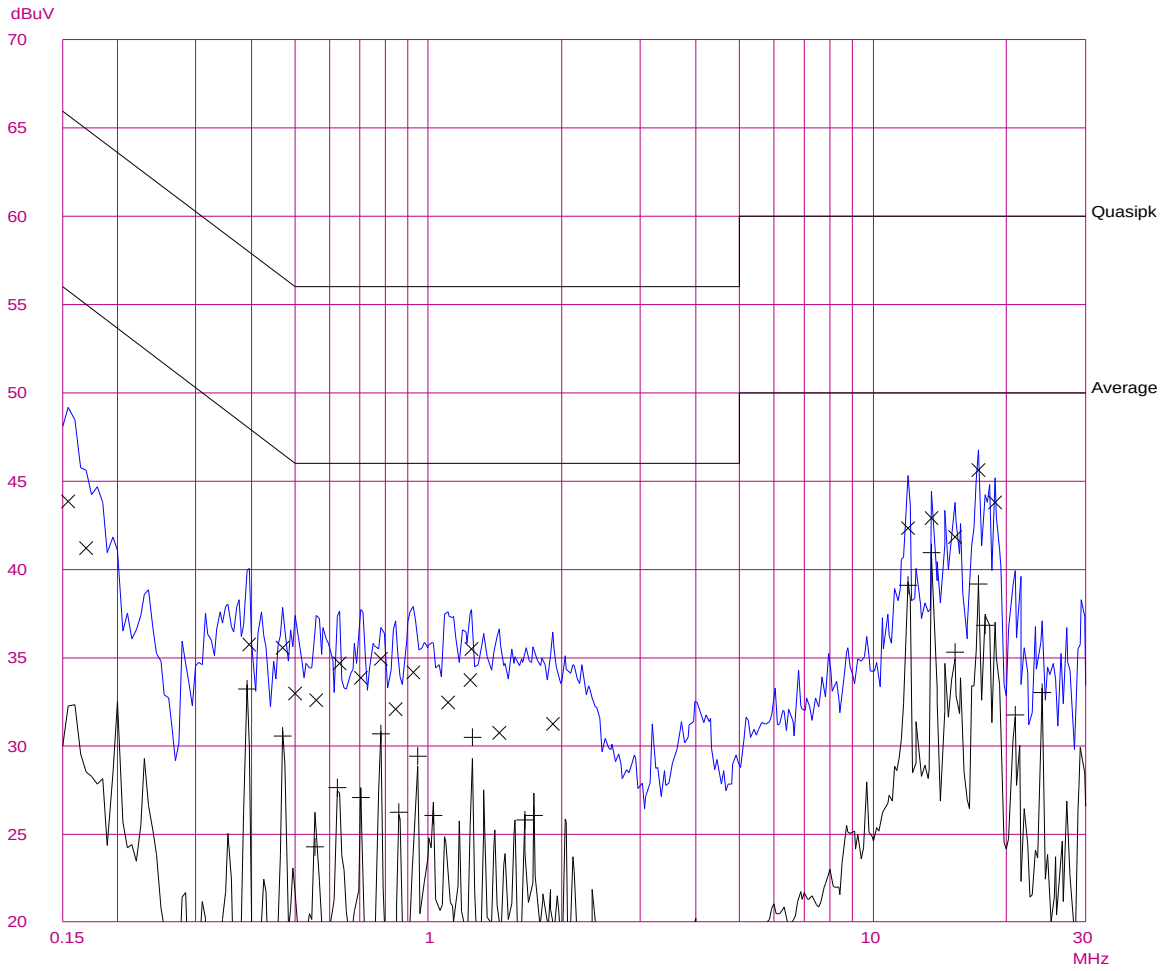
EUT:	DT1 HF
Manuf:	AEG ID GmbH
Op Cond:	Antenna disconnected, 47R termination
Operator:	P. Hauser
Test Spec:	47 CFR Part 15 Subpart C
Comment:	Test_ID EUT PRO26_01
	AIO26_02, Port N

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: 20dB

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



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Conducted emission - Terminal voltage

EUT:	DT1 HF
Manuf:	AEG ID GmbH
Op Cond:	Antenna disconnected, 47R termination
Operator:	P. Hauser
Test Spec:	47 CFR Part 15 Subpart C
Comment:	Test_ID EUT PRO26_01
	AIO26_02, Port N

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 MHz	QP Level dBuV	QP Limit dBuV
0.15500	43.8	65.7
0.17000	41.2	65.0
0.39500	35.7	57.9
0.47000	35.5	56.5
0.50000	32.9	56.0
0.56000	32.5	56.0
0.63000	34.6	56.0
0.70500	33.8	56.0
0.78000	34.9	56.0
0.84500	32.0	56.0
0.92500	34.1	56.0
1.10500	32.4	56.0
1.24500	33.7	56.0
1.25000	35.5	56.0
1.44000	30.7	56.0
1.90500	31.2	56.0
12.00000	42.3	60.0
13.56000	42.8	60.0
15.26500	41.8	60.0
17.22000	45.6	60.0
18.78500	43.7	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.39000	33.2	48.0
0.47000	30.5	46.5
0.55500	24.2	46.0
0.62500	27.6	46.0
0.70500	27.0	46.0
0.78000	30.6	46.0
0.86000	26.2	46.0
0.94500	29.3	46.0
1.02500	26.0	46.0
1.25500	30.4	46.0
1.64500	25.7	46.0
1.73000	26.0	46.0
12.00000	39.0	50.0
13.56000	40.9	50.0
15.26500	35.2	50.0
17.22000	39.1	50.0
17.87500	36.8	50.0
20.87500	31.7	50.0
24.00500	33.0	50.0

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* limit exceeded

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1.1.2 Radio disturbances according 47 CFR Part 15 Subpart C - 06/26/2017

☒ Full compliance
☐ 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

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1.1.2.1 Test set up

According ANSI C63.10-2013

Test setup f < 30 MHz

Test setup f > 30 MHz

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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 ∅	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

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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

1.1.2.2 Test – Radiated emission fundamental

Regulation

47 CFR Part 15 Subpart C - 06/26/2017

	☒ 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	☐ 5 m
	☒ 10 m	☐ 30 m

Operation mode

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

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

Continuous operation of the RFID reader, attached at the laptop USB I/F.
No tag in field, this operation mode shows highest emanations. Packets of unsuccessful tag readings were transferred via USB.

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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 10m in the frequency range ≤30MHz and at 3m distance for frequencies ≥30MHz. 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:

Field strength (dBµV/m) = Reading (dBµV) + AF (dB/m) + CF (dB)

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

$Limit_{10m}$ (dBµV/m) = Limit (dBµV/m) + LCF_{10m} (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

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Test result - fundamental

Frequency	Field strength	$Limit_{10m}$	Margin	Ant.-	Ant.-	Detector	Receiver	Supply voltage	Remarks
				Distance	Polar.	Peak /	6dB BW		
MHz	dBµV/m	dBµV/m	dB	m	H/V	QP / AV	kHz		
13.560	50.0	104.0	54.0	10.0	V	QP	10	120 V / 60 Hz	PC / USB-Port for supply
13.560	50.0	104.0	54.0	10.0	V	QP	10	138 V / 60 Hz	PC / USB-Port for supply
13.560	50.0	104.0	54.0	10.0	V	QP	10	102 V / 60 Hz	PC / USB-Port for supply

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

Fundamental frequency at 26° C, 41 %rH: 13.560 MHz

Ambient temperature / °C	Frequency of fundamental / MHz at start	Frequency of fundamental / MHz after 2min	Frequency of fundamental / MHz after 5min	Frequency of fundamental / MHz after 10min
50	13.560	13.560	13.560	13.560
40	13.560	13.560	13.560	13.560
30	13.560	13.560	13.560	13.560
20	13.560	13.560	13.560	13.560
10	13.560	13.560	13.560	13.560
0	13.560	13.560	13.560	13.560
-10	13.560	13.560	13.560	13.560
-20	13.560	13.560	13.560	13.560

Limit for radiated fundamental: ☒ kept ☐ not kept

Frequency tolerance according §15.225(e) (temperature and voltage variation): ☒ kept ☐ not kept

Remarks: n/a

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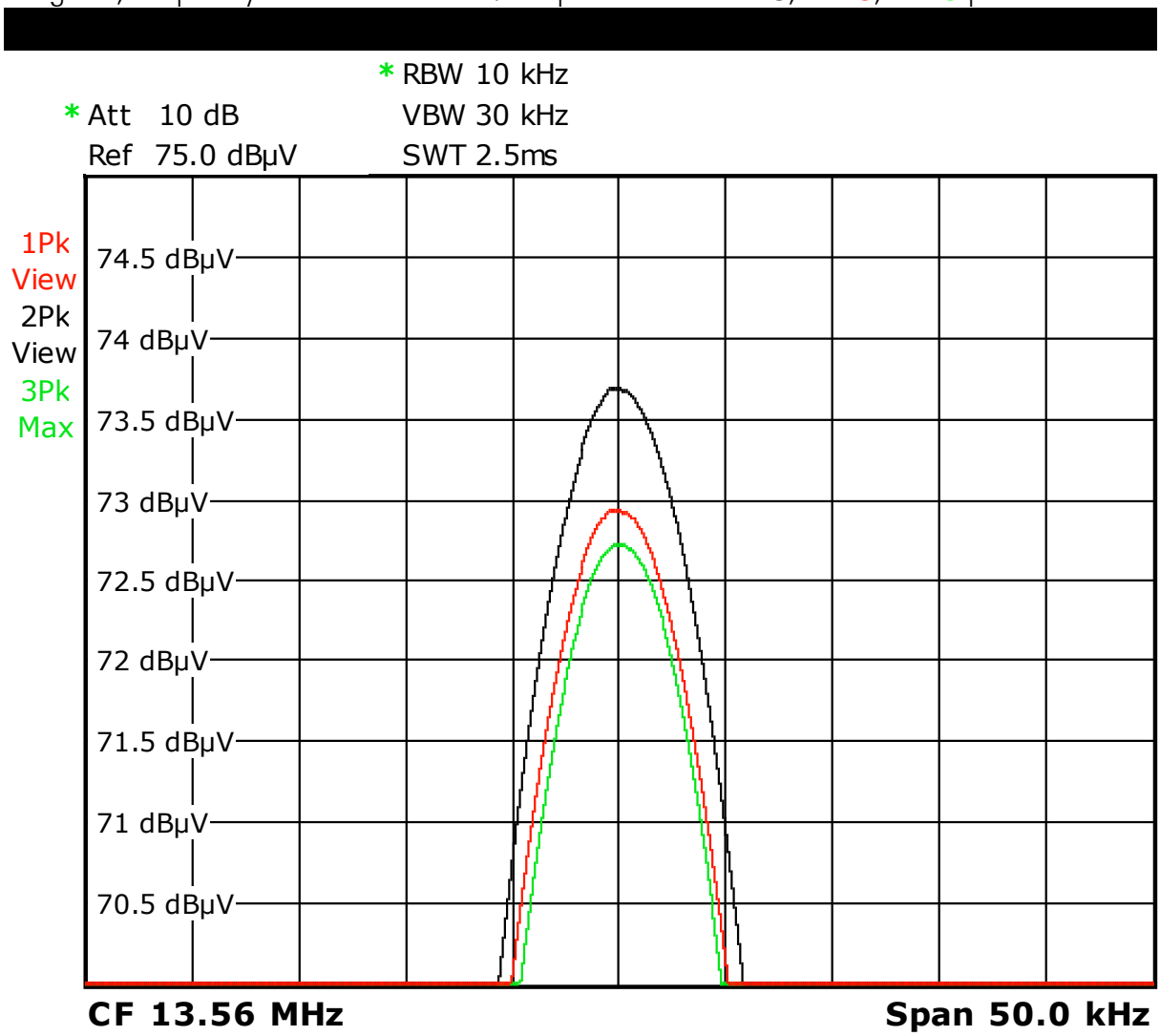
Diagram, frequency of fundamental vs. temperature at –20°C; 20°C; 50°C points



PRO26_01, frequency tolerance

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1.1.2.3 Test – Spurious emissions

Regulation

47 CFR Part 15 Subpart C – 12/02/2016

	☒ 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

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

Continuous operation of the RFID reader, attached at the laptop USB I/F.
No tag in field, this operation mode shows highest emanations. Packets of unsuccessful tag readings were transferred via USB.

Environmental conditions

Temperature [10 - 40°C]:	31.4 °C
Relative humidity [10 - 90%]:	40.8 %
Environmental conditions during the test:	☒ kept
	☐ not kept

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Test - / Measurement procedure

The test was performed at an antenna to EUT distance of 10m in the frequency range ≤30MHz and at 3m distance for frequencies ≥30MHz. 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:

Field strength (dBµV/m) = Reading (dBµV) + AF (dB/m) + CF (dB)

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

$Limit_{10m}$ (dBµV/m) = Limit (dBµV/m) + LCF_{10m} (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

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

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

Frequency	Field strength	$Limit_{10m}$	Margin	Ant.-	Ant.-	Detector	Receiver	Remarks
				Distance	Polar.	Peak /	6dB BW	
MHz	dBµV/m	dBµV/m	dB	m	H/V	QP / AV	kHz	
27.120	27.4	49.5	22.1	10.0	V	QP	10	

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

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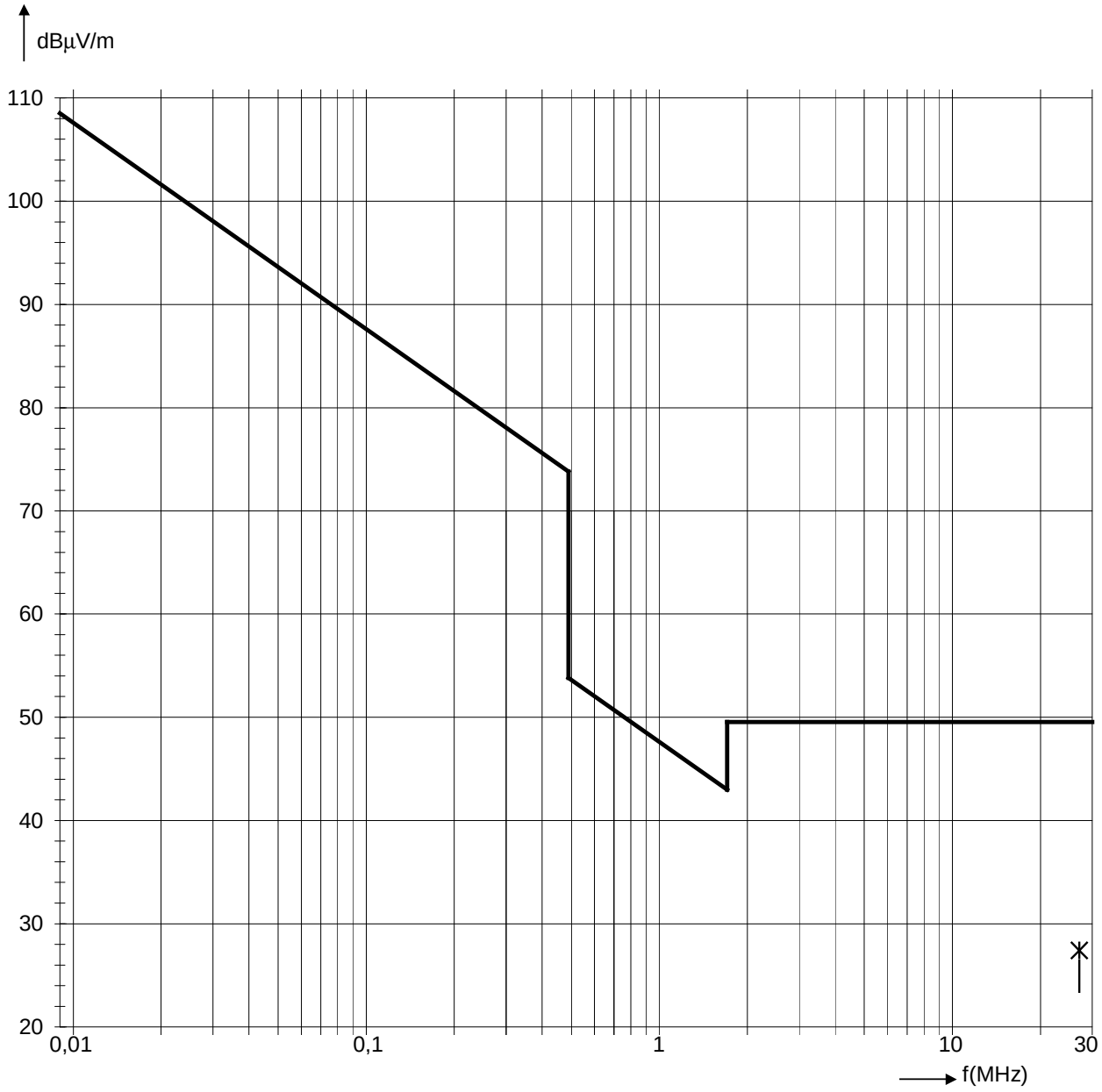
Diagram - Antenna vertical polarized

Limits according FCC Rules 47 CFR Part 15 – Subpart C
☒ Section 15.209 – Corrected to 10m distance EUT-Antenna



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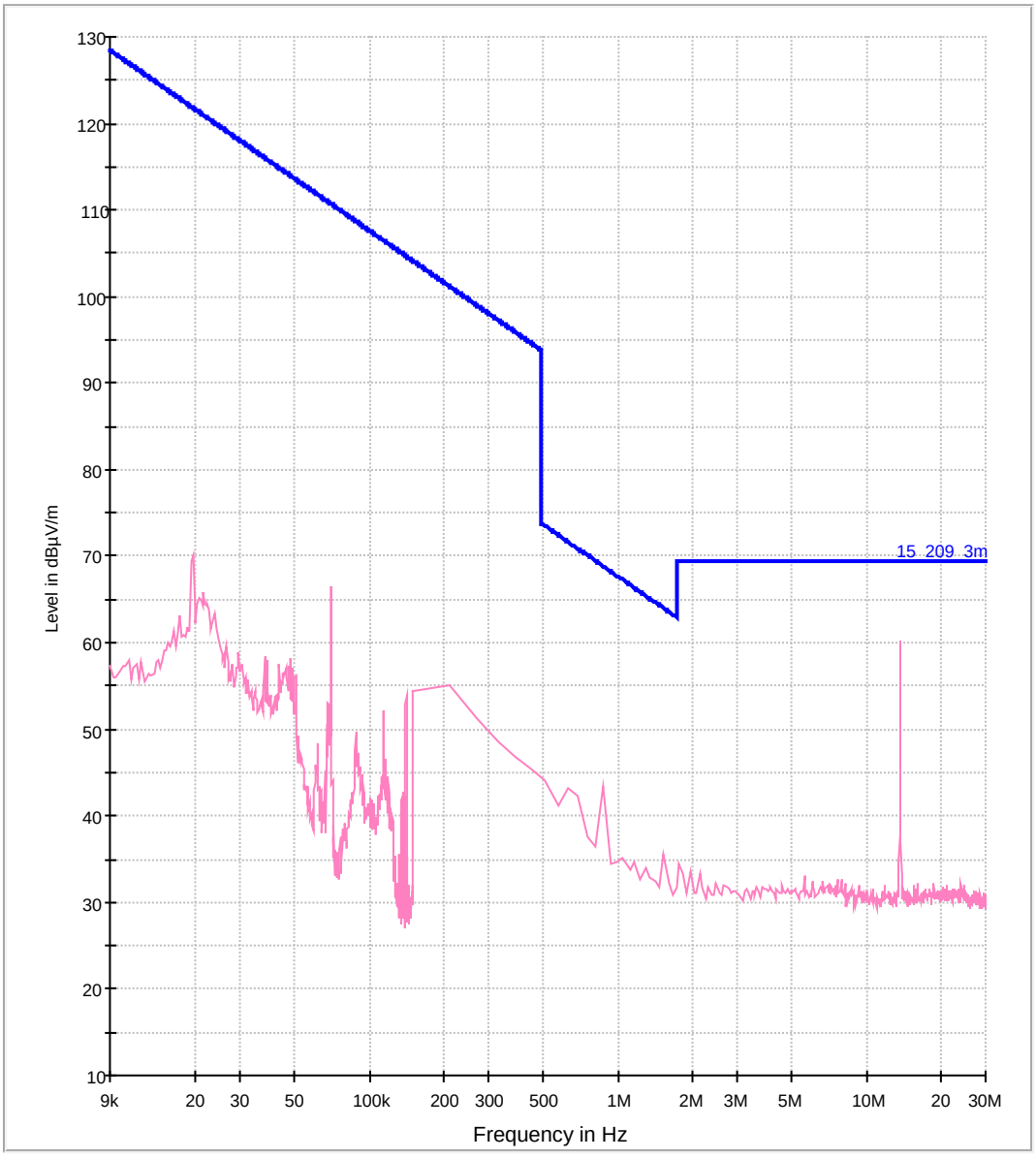
EUT Information

EUT Name:	ARE DT1 - 22L/A/U/H
Test_ID: / SN:	PRO26_01
Customer:	AEG ID GmbH
Operational condition:	No tag in field
Test specification:	47 CFR Part 15 Subpart C Section 15.209
Antenna information:	Distance EUT-Ant.: 3.0 m / Polarisation: V / Ant.Height: 1.0 m
Operator:	P. Hauser
File #:	AIO26_03

Magnetic Field Strength dBµV with Sweep_SAC2



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

Preview Result 1V-PK+ [Preview Result 1V.Result:2]

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Readings - Antenna horizontal polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna-Height	Antenna-Polarization	Turn Table-Position
MHz	dBµV	dB/m	dB	dBµV/m	dBµV/m	dB	m	hor./ver.	Degree
40.680	25.8	9.4	1.0	36.2	40.0	3.8	1.8	H	270
67.800	16.4	8.5	1.3	26.2	40.0	13.8	2.5	H	270
108.480	10.7	9.7	1.6	22.1	43.5	21.4	3.1	H	270
122.040	16.9	10.7	1.7	29.4	43.5	14.1	2.5	H	310
149.160	13.9	12.2	1.9	28.0	43.5	15.5	2.3	H	330
176.280	12.8	13.6	2.1	28.5	43.5	15.0	1.8	H	240
203.400	13.1	15.8	2.3	31.1	43.5	12.4	1.6	H	180
257.640	10.3	14.7	2.6	27.6	46.0	18.4	1.0	H	270
468.080	15.9	17.2	3.5	36.6	46.0	9.4	1.0	H	30
474.880	15.9	17.2	3.6	36.7	46.0	9.3	1.9	H	170

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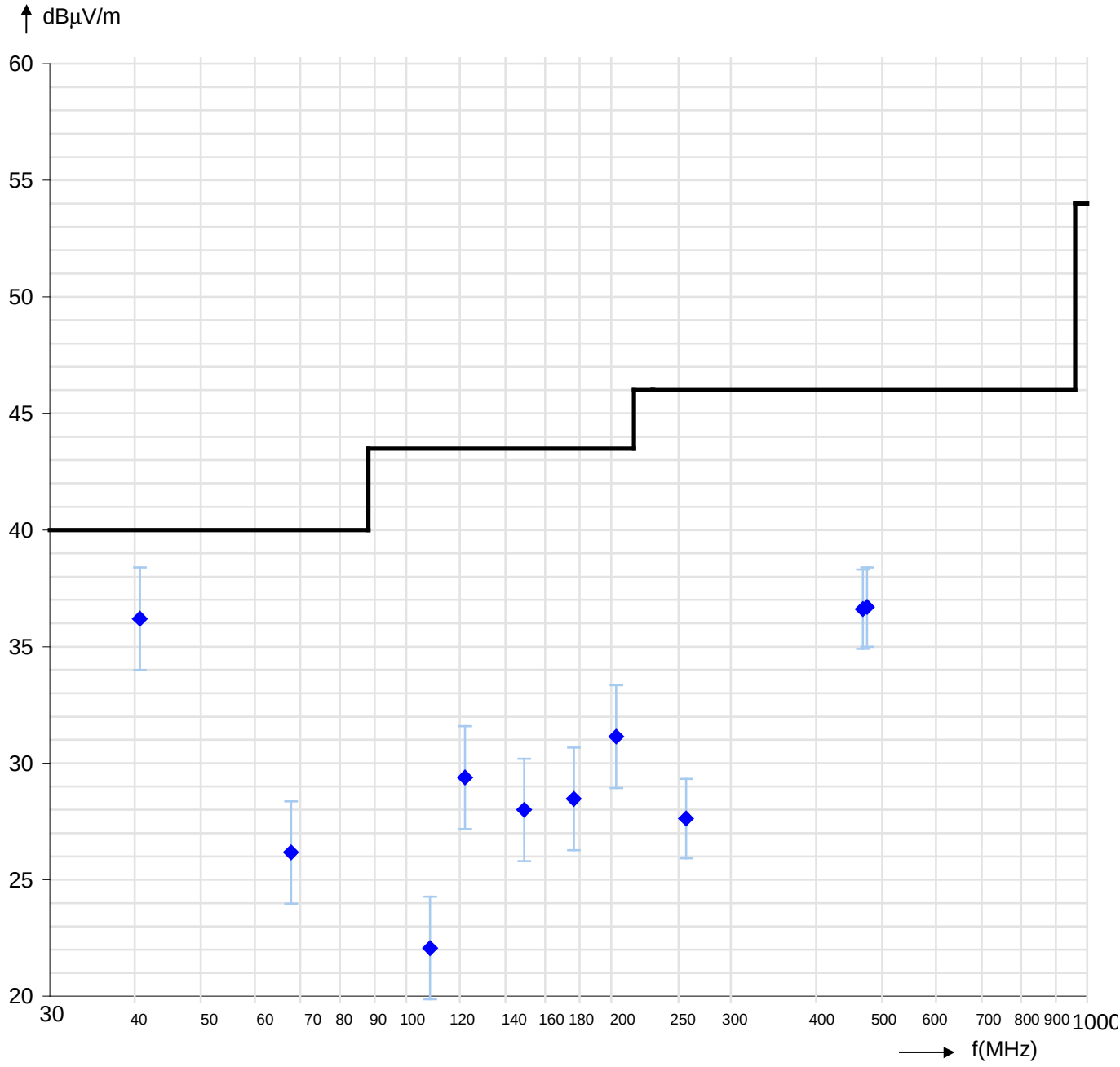
Diagram radio disturbances – Antenna horizontal polarized

Limits: ☒ Section 15.209* ☐ __



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Readings - Antenna vertical polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna-Height	Antenna-Polarization	Turn Table-Position
MHz	dBµV	dB/m	dB	dBµV/m	dBµV/m	dB	m	hor./ver.	Degree
40.680	26.2	9.4	1.0	36.6	40.0	3.4	1.0	V	180
54.270	20.0	8.4	1.1	29.6	40.0	10.4	1.0	V	0
67.800	15.4	8.5	1.3	25.2	40.0	14.8	1.0	V	260
119.700	10.7	10.6	1.7	23.0	43.5	20.5	1.0	V	200
122.040	17.4	10.7	1.7	29.9	43.5	13.6	1.0	V	270
135.600	12.1	11.5	1.8	25.5	43.5	18.0	1.0	V	250
149.160	21.3	12.2	1.9	35.4	43.5	8.1	1.0	V	250
203.400	13.6	15.8	2.3	31.6	43.5	11.9	1.0	V	220
468.080	21.1	17.2	3.5	41.8	46.0	4.2	1.2	V	280
474.870	22.2	17.2	3.6	43.0	46.0	3.0	1.1	V	270

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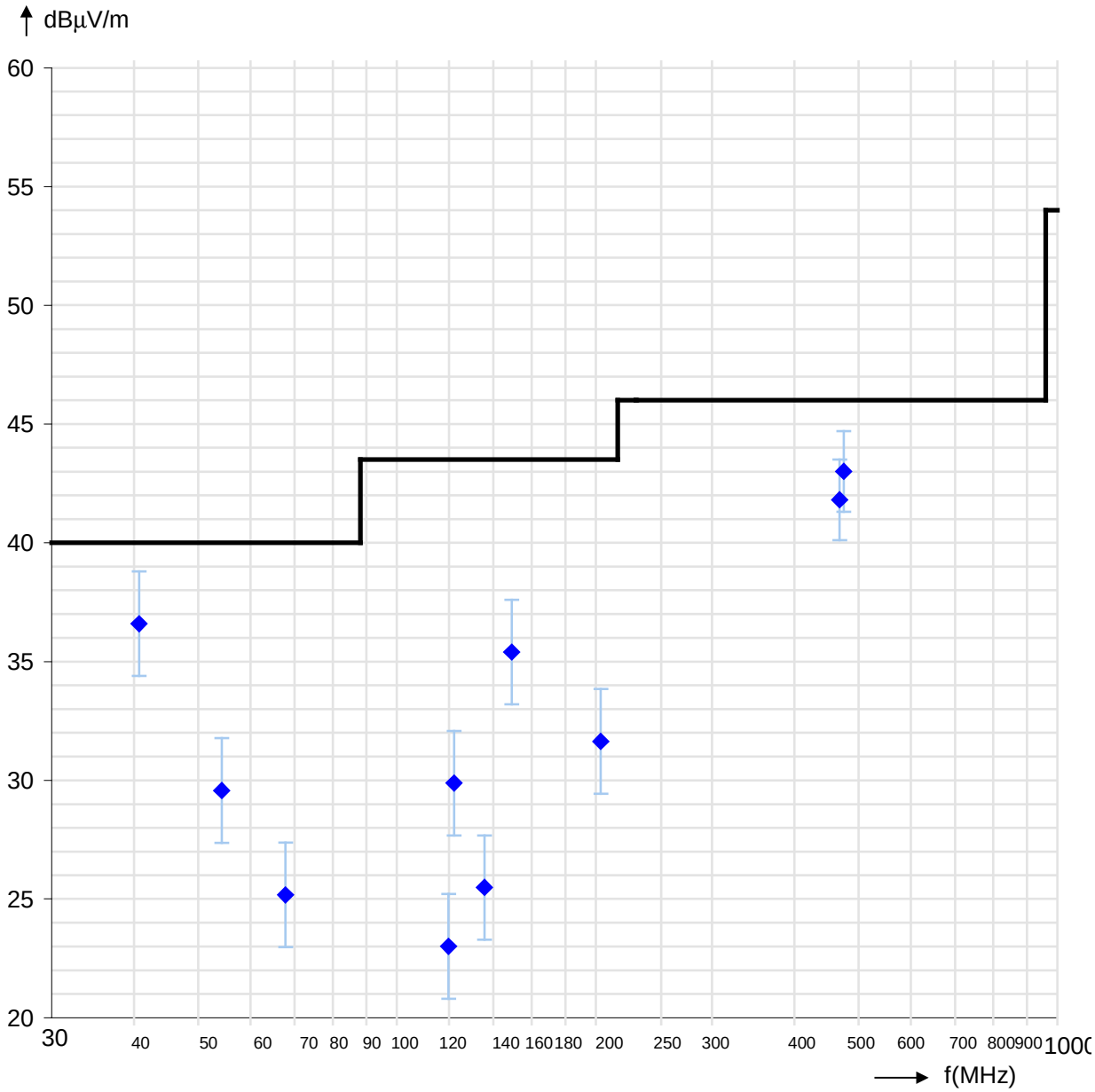
Diagram radio disturbances – Antenna vertical polarized

Limits: ☒ Section 15.209* ☐ __



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1.1.2.4 Restricted bands of operation

Regulation

47 CFR Part 15 Subpart C - 06/26/2017

Requirement: ☒ Section 15.205(a)

Limit spurious emission:
☒ Section 15.209
☒ CISPR quasi peak detector (f ≤ 1GHz)
☐ Average detector(f > 1GHz)

Operation mode

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

Continuous operation of the RFID reader, attached at the laptop USB I/F. Reading tag, the tag was placed at approximately half reading distance. Packets of successful tag readings were transferred via USB.

Environmental conditions

Temperature [10 - 40°C]:	26 °C
Relative humidity [10 - 90%]:	45 %

Environmental conditions during the test:
☒ kept
☐ not kept

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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: 13.5600 MHz
20dB-Emission Bandwidth: 0.4392 MHz

Fundamental out of restricted bands: ☒ kept ☐ not kept

Limit spurious emission: ☒ kept ☐ not kept

Remarks: n/a

Protocol scope

☒ Diagram – 20dB-Emission bandwidth.

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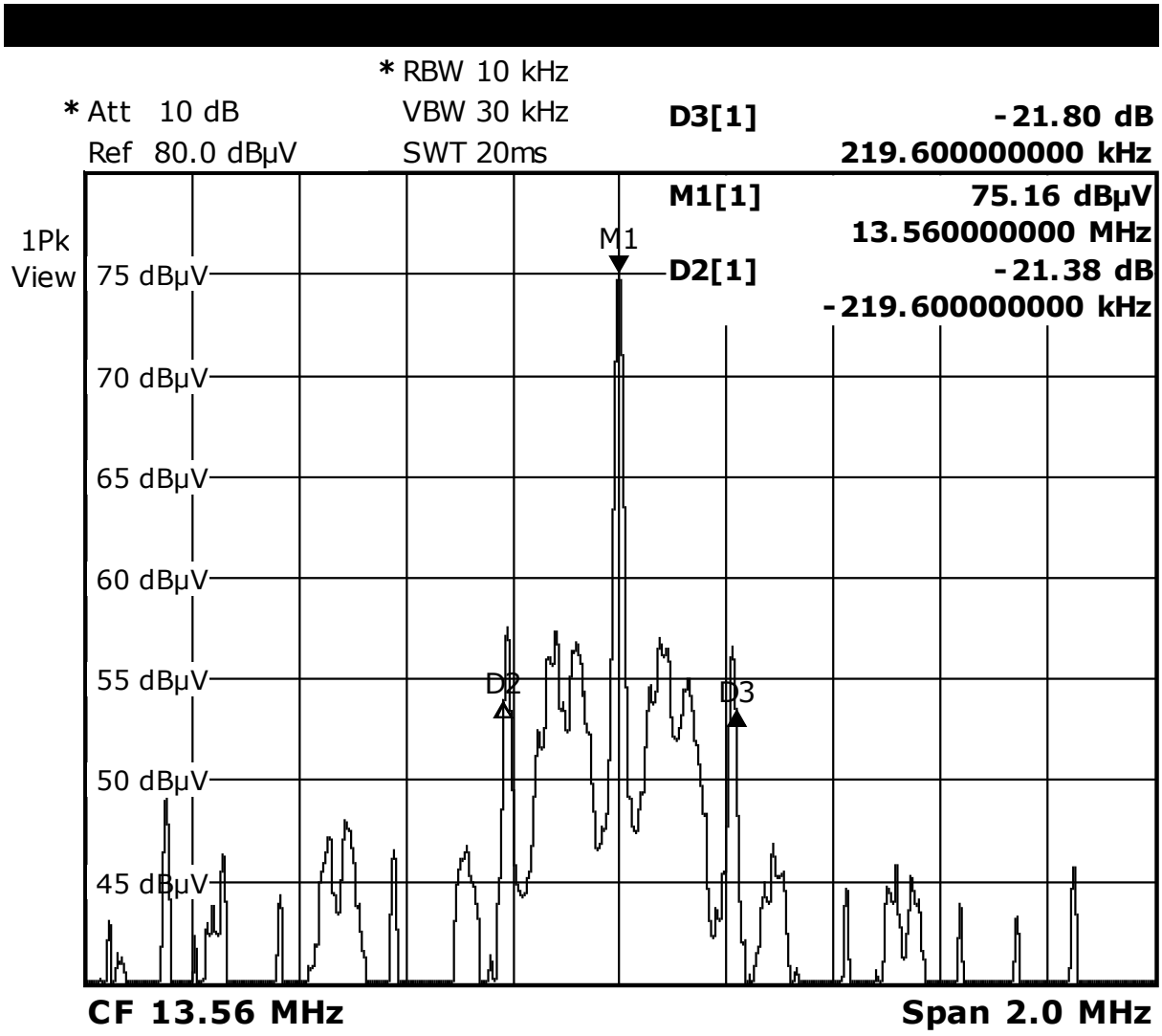
Occupied bandwidth



PRO26_01, 20 dB BW

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Occupied bandwidth BW = D3 – D2 = 219.6 kHz - -219.6 kHz=439.2 kHz

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1.1.2.5 Antenna requirement

Regulation

47 CFR Part 15 Subpart C - 06/26/2017

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

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2 Summary

Regulation	Class / Test level	Result	Remark(s)
FCC Rules 47 CFR Part 15 Subpart C			
Terminal voltage [0.15-30 MHz]	Section 15.207	Limits kept	
Radiated emissions [0.009-30 MHz]	Sections 15.209; 15.225	Limits kept	
Radiated emissions [30-1000 MHz]	Section 15.209	Limit kept	
Occupied bandwidth	Section 15.215(c)	Requirement kept	
Restricted bands	Section 15.205(a)	Requirement kept	
Antenna requirement	Section 15.203	Requirement kept	

Burgrieden, 2017-08-25

Report generated by:

Acceptance inspector – Peter Hauser

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