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Business Area
Industry & Energy
Austria

Technik

TÜV ®

TEST REPORT

of the accredited test laboratory

TÜV Nr.: 2024-AT-TC-EEE-1-000001-EMV-004-Rev1

about

the following EMC - test/- research

Applicant:	TTControl GmbH Schoenbrunner Strasse 7 A-1040 Vienna
Product:	Vision 307 FCC ID : 2AUIVVISION307
Serial Numbers:	Vision 307 --> 09234820000030
Other Standards:	---
Accredited Standards:	FCC Part 15, “Subpart B – Unintentional Radiators §15.109” (eCFR 10/31/2022); ANSI C63.4-2014

TÜV AUSTRIA GMBH
Test laboratory for EMC

Beneditkt Rauch

examined by / Testing Laboratory TÜV AUSTRIA GMBH

TÜV AUSTRIA GMBH TÜV AUSTRIA

16.04.2024

Michael Emminger

approved by / Testing Laboratory TÜV AUSTRIA GMBH

Testing Laboratory,
Inspection Body,
Certification Body,
Calibration Laboratory,
Verification body

Notified Body 0408

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Contents

1. Applicant

Company:	TTControl GmbH
Department:	---
Address:	Schoenbrunner Strasse 7 A-1040 Vienna
Contact person:	Mr. Selim GÖCER MSc.
EUT received on:	01.02.2024
Tests were performed on:	01. to 05.02.2024

2. Description of EUT

EUT:	Vision 307 FCC ID : 2AUIVVISION307
Serial Number:	Vision 307 --> 09234820000030
Manufacturer:	TTControl GmbH Schoenbrunner Strasse 7 A-1040 Vienna
Description:	TTControl GmbH provided the following configuration for the measurements: • Vision 307 • Test software
Operating mode:	Testsoftware running
Technical data EUT:	Mains voltage during the tests: 27 VDC
Climatic conditions in the emc laboratory:	Relative humidity: 32 % Temperature: 23 °C

3. Standards / Final result

Name	Title	Deviation	Result
FCC Part 15, “Subpart B – Unintentional Radiators §15.109” (eCFR 10/31/2022)	Radio Frequency Devices	None	OK
ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Maintenance of compliance is the responsibility of the manufacturer	None	OK

Result: Opinions and interpretation of testing laboratory
OK: EUT passed
NOK: EUT failed

4. Test results

4.1. Radiated emission according to FCC Part 15

Class B Limits

	≤ 1 GHz → Quasi Peak Limit > 1 GHz → Average Limit (Peak Limit 20 dB above average Limit)		
Frequency range	Limit	Bandwith	Measurement distance
30 – 88 MHz	100 µV/m	120 kHz	3 m
88 – 216 MHz	150 µV/m	120 kHz	3 m
216 – 960 MHz	200 µV/m	120 kHz	3 m
960 MHz - 1000 MHz	500 µV/m	120 kHz	3 m
Above 1000 MHz	500 µV/m	1 MHz	3 m

Measuring apparatus parameters 30 to 1000 MHz

Parameter	Preview measurement	Final measurement	Parameter	Preview measurement	Final measurement
Start frequency	30 MHz	30 MHz	Detector	Quasi Peak	Quasi Peak
Stop frequency	1000 MHz	1000 MHz	Measuring time	1 s	1 s
Stepsize	FFT	---	RF-attenuation	0dB	0dB
IF- Bandwidth	120 kHz	120 kHz	Preamplifier	20 dB	20 dB

Measuring apparatus parameters 1 GHz to 18 GHz

Parameter	Preview measurement	Final measurement	Parameter	Preview measurement	Final measurement
Start frequency	1 GHz	1 GHz	Detector	Max Peak / Average	Max Peak / Average
Stop frequency	18 GHz	18 GHz	Measuring time	10 ms	10 ms
Stepsize	FFT	---	RF-attenuation	0dB	0dB
IF- Bandwidth	1 MHz	1 MHz	Preamplifier	20 dB	20 dB

Measurement uncertainty

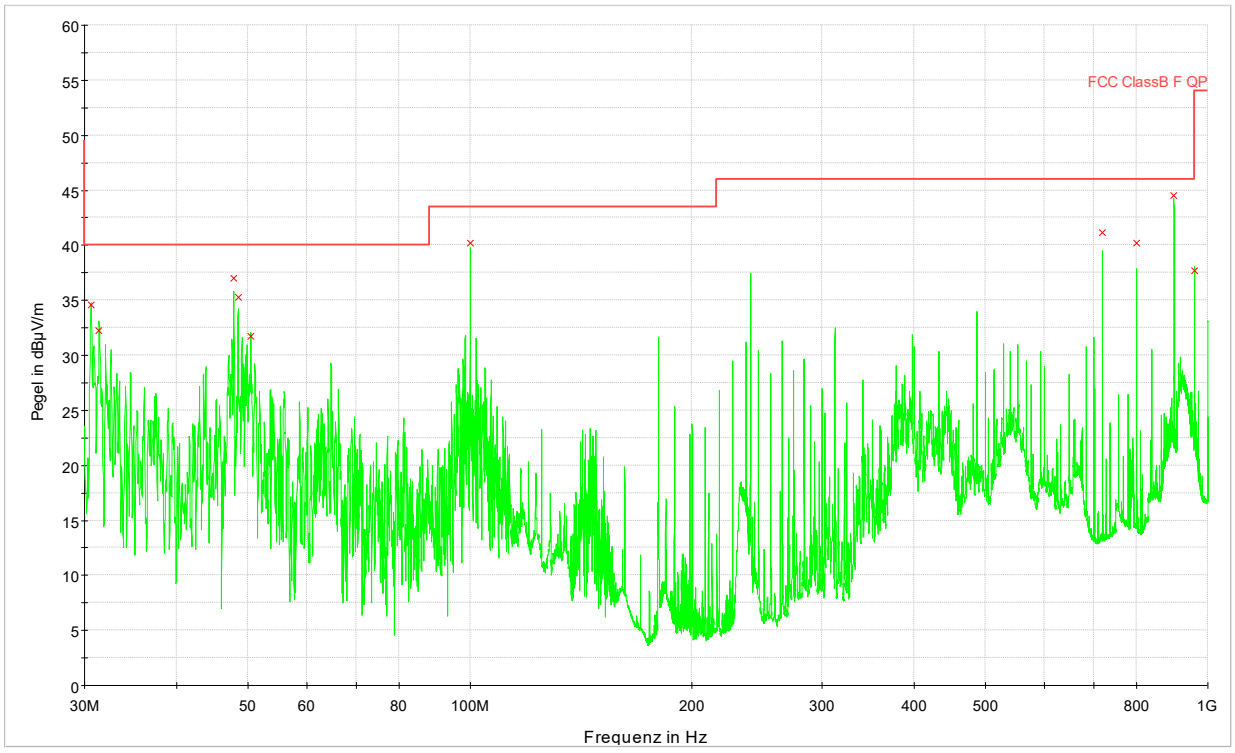
30-200 MHz horizontal: Expanded uncertainty U_c = 4,06 dB (Uncertainty budget = 5,06 dB)
30-200 MHz vertical: Expanded uncertainty U_c = 4,19 dB (Uncertainty budget = 5,17 dB)
0,2-1 GHz horizontal: Expanded uncertainty U_c = 4,43 dB (Uncertainty budget = 5,45 dB)
0,2-1 GHz vertical: Expanded uncertainty U_c = 5,64dB (Uncertainty budget = 6,48 dB)
1-18 GHz: Expanded uncertainty U_c = 4,40 dB (Uncertainty budget = 5,17 dB)

Operating mode	Measuring result
Normal operation	OK

Test result

4. 1.1.) Measurement diagram with QP-Detector (30 MHz - 1000 MHz)

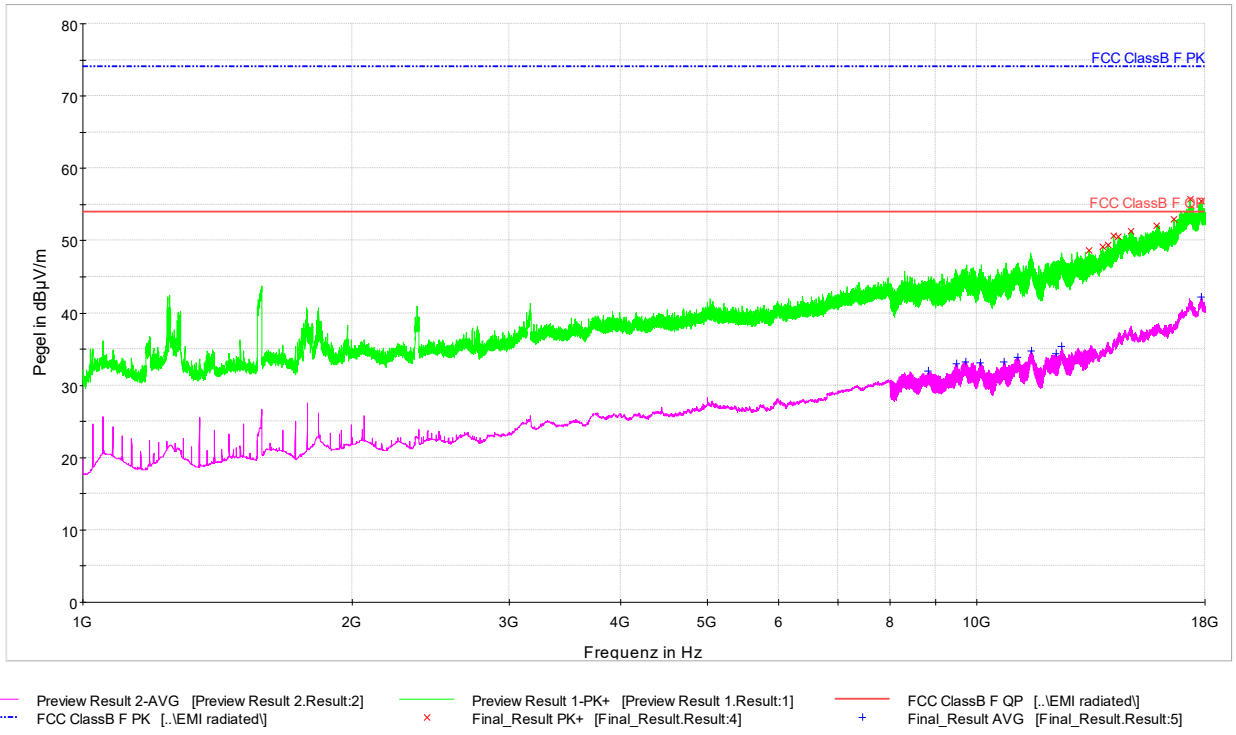
Vision 307



Frequency	QuasiPeak	Limit	Margin	Measuring time	Bandwith	Hight	Pol	Azimut	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
30,630000	34,59	40,00	5,41	1000,0	120,000	127,0	V	94,0	12,9
31,410000	32,22	40,00	7,78	1000,0	120,000	100,0	V	-68,0	13,1
47,790000	37,02	40,00	**2,98**	1000,0	120,000	100,0	V	180,0	15,2
48,450000	35,24	40,00	4,76	1000,0	120,000	102,0	V	180,0	15,2
50,430000	31,69	40,00	8,31	1000,0	120,000	102,0	V	165,0	15,2
99,990000	40,21	43,50	3,29	1000,0	120,000	102,0	V	-39,0	13,2
720,000000	41,15	46,00	4,85	1000,0	120,000	102,0	V	-62,0	22,1
800,040000	40,17	46,00	5,83	1000,0	120,000	116,0	H	16,0	23,0
899,970000	44,49	46,00	**2,49**	1000,0	120,000	102,0	H	38,0	24,5
960,000000	37,69	46,00	8,31	1000,0	120,000	102,0	H	45,0	24,6

4. 1.2.) Measurement diagram with Peak and Average -Detector (1000 MHz - 18000 MHz)

Vision 307



Appendix 1
Test equipment used

☐	Anechoic Chamber with 3m measurement distance	NT-100	☐	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156
☐	Stripline according to ISO 11452-5	NT-108	☐	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
☐	MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
☐	DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐	CO3000 Controller Mast+Turntable	NT-112/1	☐	ESR – Test receiver 20 Hz – 26,5 GHz	NT-207/1
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	Digital Radio Tester CMW500	NT-208/1
☐	FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	☐	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐	Dipole Antenna VHA9103 30 - 300 MHz	NT-124/1a	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐	Dipole Antenna UHA9105 300 - 1000 MHz	NT-124/1b	☐	Digital Radio Tester Aeroflex 3920	NT-212/1
☐	3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	☐	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐	3116 - Horn Antenna 18 - 40 GHz	NT-126	☐	RubiSource T&M Timing reference	NT-216
☐	SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	☐	Radiocommunicationanalyzer SWR 1180 MD	NT-217
☐	AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	☐	Mixer FS-Z60 40 GHz – 60 GHz	NT-218/1
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐	Mixer FS-Z90 60 GHz – 90 GHz	NT-219/1
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	☒	DSO9104 Digital scope	NT-220/1
☐	3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	☐	TPS 2014 Digital scope	NT-222
☐	VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	☐	Artificial Ear according to IEC 60318	NT-224
☐	Loop Antenna H-Field	NT-132	☐	1 kHz Sound calibrator	NT-225
☐	Horn Antenna 500 MHz - 2900 MHz	NT-133	☐	SRM-3006 Spectrumanalyzer	NT-233/1a
☐	Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐	E-field probe SRM 75 MHz – 3 GHz	NT-234
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐	Magnetometer HP-01	NT-241/1
☐	BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	☐	EFA-3 H-field- / E-field probe	NT-243
☐	Conical Dipol Antenna PCD8250	NT-138	☐	EHP-50F H-field- / E-field probe	NT-243/1
☐	HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐	Field Meter EMR-200 100 kHz – 3 GHz	NT-244
☐	HZ-1 Antenna tripod	NT-150	☐	E-field probe 100 kHz – 3 GHz	NT-245
☐	BN 1500 Antenna tripod	NT-151	☐	H-field probe 300 kHz – 30 MHz	NT-246

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Test equipment used

☐	E-field probe 3 MHz – 18 GHz	NT-247
☐	H-field probe 27 MHz – 1 GHz	NT-248
☐	ELT-400 1 Hz – 400 kHz	NT-249
☐	MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250
☐	FCC-203I EM Injection clamp	NT-251
☐	FCC-203I-DCN Ferrite decoupling network	NT-252
☐	PR50 Current Probe	NT-253
☐	i310s Current Probe	NT-254/1
☐	Fluke 87 V True RMS Multimeter	NT-260
☐	Model 2000 Digital Multimeter	NT-261
☐	Fluke 87 V Digital Multimeter	NT-262/1
☐	ESH2-Z5-U1 Artificial mains network 4x25A	NT-300
☐	ESH3-Z5-U1 Artificial mains network 2x10A	NT-301
☐	ESH3-Z6-U1 Artificial mains network 1x100A	NT-302
☐	ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a
☐	EZ10 T-Artificial Network	NT-305
☐	SMG - Signal generator 0,1 - 1000 MHz	NT-310
☐	SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1
☐	RefRad Reference generator	NT-312
☐	SMP 02 Signal generator 10 MHz - 20 GHz	NT-313
☐	40 MHz Arbitrary Generator TGA1241	NT-315
☐	Artificial mains network NSLK 8127-PLC	NT-316
☐	PSURGE 4.1 Surge generator	NT-324
☐	IMU4000 Immunity test system	NT-325/1a-e
☐	VCS 500-M6 Surge-Generator	NT-326
☐	Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c
☐	BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330
☐	Prana N-MT 500 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332/1
☐	BBA150 RF-Amplifier 1 GHz - 6 GHz	NT-333/1
☐	APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐	Preamplifier 1 GHz - 4 GHz	NT-335
☐	Preamplifier for GPS MKU 152 A	NT-336
☐	Preamplifier 1 GHz – 18 GHz	NT-337/1
☐	DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐	2-97201 Electronic load	NT-341
☐	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐	VDS 200 Mobil-impuls-generator	NT-350
☐	LD 200 Mobil-impuls-generator	NT-351
☐	MPG 200 Mobil-Impuls-Generators	NT-352
☐	EFT 200 Mobil-impuls-generator	NT-353
☐	AN 200 S1 Artificial Network	NT-354
☐	FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐	PHE 4500 - Mains impedance network	NT-401
☐	IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐	TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐	ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐	CN-EFT1000 - Capacitive clamp (Burst)	NT-411/1
☐	Highpass-Filter 100 MHz – 3 GHz	NT-412
☐	Highpass-Filter 600 MHz – 4 GHz	NT-413
☐	Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐	Highpass-Filter 1800 MHz – 16 GHz	NT-415

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☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417/1
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423
☐	RF-Attenuator 30 dB	NT-424
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426
☐	RF-Attenuator 6 dB	NT-428
☐	RF-Attenuator 0 dB - 81 dB	NT-429
☐	WRU 27 - Band blocking 27 MHz	NT-430
☐	WHJ450C9 AA - High pass 450 MHz	NT-431
☐	WHJ250C9 AA - High pass 250 MHz	NT-432
☐	RF-Load 150 W	NT-433
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445
☐	Tube imitations according to EN 55015	NT-450
☐	FCC-801-M3-16A Coupling decoupling network	NT-458
☐	FCC-801-M2-50A Coupling decoupling network	NT-459
☐	FCC-801-M5-25 Coupling decoupling network	NT-460
☐	FCC-801-T4 Coupling decoupling network	NT-463
☐	FCC-801-C1 Coupling decoupling network	NT-464
☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	WHKX12-2700-3000-18000 3 GHz Highpass filter	NT-472
☐	WHKX10-3870-4500-18000 4,5 GHz Highpass filter	NT-473
☐	CDN S9 USB3.0 Coupling decoupling network	NT-474
☐	CDN S2 XLR3-1 Coupling decoupling network	NT-475
☐	CDN S8 RJ45 Coupling decoupling network	NT-476
☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	Van der Hoofden Test Head	NT-484
☐	WRCJV12-5820-5850-5950-5980 5,9 GHz Band Reject Filter	NT-490
☐	WHKX10-5670-6300-18000 6 GHz Highpass filter	NT-491
☐	WHK12-935-1000-7000 1 GHz Highpass filter	NT-492
☐	EMC Video/Audiosystem	NT-511/1
☐	EMC32 Version 10.60.20 Test software	NT-520/1
☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
☐	Spitzenberger und Spies Test software V4.1	NT-525
☐	Vertical coupling plane (ESD)	NT-531
☐	Test cable #4 for EN 61000-4-6	NT-553
☐	Test cable #3 for conducted emission	NT-554
☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Test cable #9 (for outdoor measurements)	NT-580
☐	Test cable #10 (for outdoor measurements)	NT-581
☐	Test cable #13 Sucoflex 104PE	NT-584
☐	Test cable #21 for SRM-3000	NT-592
☐	Shield chamber	NT-600
☐	Climatic chamber	M-1200

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☒	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100
☒	Turntabel 6 m diameter	EMV-101
☒	Antenna mast + controller	EMV-102+ EMV-103
☒	EMC Video/Audiosystem	EMV-104
☒	EMC Software EMC32 Version 10.60.20	EMV-105
☒	Hornantenna 1 – 18 GHz HF 907	EMV-110
☒	Antennapre.amp. 1 – 18 GHz BBV 9718 D	EMV-111/1
☒	Trilog Antenna 30-3000 MHz VULB9163	EMV-112
☐	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113
☐	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114
☐	Hornantenna 200 – 2000 MHz AH-220	EMV-115
☐	DC Artificial Network PVDC 8300	EMV-150
☐	AC Artificial Network NNLK 8121 RC	EMV-151
☐	AC Artificial Network NNLK 140	EMV- 153a-d
☒	EMI Receiver ESW44	EMV-200/1
☒	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201
☒	GPS Frequency normal B-88	EMV-202
☒	DC Power supply N5745A	EMV-203
☐	Spektrum Analyzator FSV40	EMV-205
☐	Thd Multimeter Model 2015	EMV-206
☐	Poweramplifier PAS15000	EMV- 207/abc
☐	Inrush Current Source	EMV- 208/abc
☐	Arb.-generator Sycore	EMV-209
☐	Harmonics/Flicker analyzer ARS 16/3	EMV-210
☐	Power Supply Regatron AC	EMV-214
☐	Power Supply Regatron DC	EMV-215
☐	Harmonics/Flicker analyser Zimmer	EMV-216
☐	Flicker Impedanz Newtons4th 753	EMV-218
☐	Comemso	EMV-219
☐	HF- Ampflifier 9 kHz-225 MHz BBL200	EMV-300/1
☐	HF- Amplifier 80 -1000 MHz BBA150	EMV-301
☐	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302
☐	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1
☐	High Power Ant. 20-200 MHz S12018-21	EMV-303/2
☐	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304
☐	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305
☐	HF- Ampflifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306
☐	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307
☐	Load Dump Generator LD 200N	EMV-350
☐	Ultra Compact Symulator UCS 200N100	EMV-351
☐	Automotive Power fail module PFM 200N100.1	EMV-352
☐	Voltage Drop Symulator VDS 200Q100	EMV-353
☐	Arb. Generator AutoWave	EMV-354
☐	Ultra Compact Symulator UCS 500N7	EMV-355
☐	Coupling decoupling network CNI 503B7 / 32 A	EMV-356
☐	Coupling decoupling network CNI 503B7 / 63 A	EMV-357
☐	Telecom Surge Generator TSurge 7	EMV-358
☐	Coupling decoupling network CNI 508N2	EMV-359
☐	Coupling decoupling network CNV 504N2.2	EMV-360
☐	Immunity generator NSG4060/NSG4060-1	EMV-361
☐	Coupling network CDND M316-2	EMV-362
☐	Coupling network CT419-5	EMV-363
☐	ESD Generator NSG 437	EMV-364
☐	Pulse Limiter VTSD 9561-F BNC	EMV-405
☐	Transient emission BSM200N40+BS200N100	EMV- 450+451
☐	Cap. Coupling Clamp HFK	EMV-455
☐	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458

Appendix 1 (continued)
Test equipment used

☐	Coupling network CDN M2-100A	EMV-459
☐	Coupling network CDN M3-32A	EMV-460
☐	Coupling network CDN M5-100A	EMV-461
☐	Current Clamp CIP 9136A	EMV-462
☐	DC Artificial Network HV-AN 150	EMV-464+465
☐	Coupling Clamp EM 101	EMV-466
☐	Decoupling Clamp FTC 101	EMV-467
☐	Power attenuator 10 dB / 250 Watt	EMV-469/2
☐	HV AMN NNHV 8123 800A	EMV-472
☐	HV AMN NNHV 8123 800A	EMV-473

Appendix 3
Calibration Data for FCC Part 15 radiated emission measurements

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Receiver	Rohde & Schwarz	ESW44	EMV-200/1	09.11.2023	09.11.2024
Anechoic Chamber	Frankonia	---	EMV-100	08.01.2024	08.01.2025
Horn antenna	Rohde & Schwarz	HF907	EMV-110	07.02.2022	07.02.2024
Pre. Amp.	Schwarzbeck	BBV9718D	EMV-111/1	09.02.2023	09.02.2024
Trilog Antenna	Schwarzbeck	VULB9163	EMV-112	14.11.2023	14.11.2025