TÜV ÖSTERREICH

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Inspection Body,
Certification Body,
Calibration Body

Notified Body 0408
Canada: IC4413

# TEST REPORT

of the accredited test laboratory

**TÜV Nr.:M/EMV-04/130**

about

the following EMC - test/- research

| | |
|---|---|
| **Applicant:** | SKIDATA AG<br>Untersbergstraße 40<br>A-5083 Gartenau - St. Leonhard |
| **Product:** | EXIT GR MON 400-US |
| **Serial Number:** | --- |
| **Standard:** | 47 CFR Ch. I Part 15<br>RSS-210 Issue 5 |

TÜV Österreich
Test laboratory for EMC

Deputy Supervisor of EMC-laboratory

Ing. Wilhelm Seier

Official seal

29.03. 2004

Checked by

Ing. Michael Emminger

Copy Nbr.: 0/1



The results of this test report only refer to the provided equipment.

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# Contents

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# 1. Applicant

| | |
|---|---|
| Company | SKIDATA AG |
| Department | |
| Address | A-5083 Gartenau – St. Leonhard; Untersbergstraße 40 |
| Contact person | Mr. Sonderegger |

| | |
|---|---|
| EUT received on | 11.02.2004 |
| Tests were performed on | 11.02. – 13.02.2004 |

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## 2. Description of EUT

| | |
|---|---|
| EUT | EXIT GR MON 400-US |
| Serial Number | --- |
| Manufacturer | SKIDATA AG<br>A-5083 Gartenau – St. Leonhard; Untersbergstraße 40 |
| Description | SKIDATA AG provided the following configuration for the measurements:<br><br>Serial production |
| Operating mode | The measurements were carried out at the following running states:<br><br>normal use |

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## 3. Standards / Final result

| Name | Title | Deviation | Result |
|---|---|---|---|
| 47 CFR Ch. 1 Part 15 | Radio Frequency Devices | none | PASS |
| RSS-210 Issue 5 | Low Power Licence-Exempt Radiocommunuication Devices (All Frequency Bands) | none | PASS |
| PASS EUT passed<br>FAIL EUT failed | | | |

# 4. Test results

## 4. 1. Conducted emission

Limits according to 15.109 and 6.6.

| Frequeny range | Limit | |
|---|---|---|
| Detector | Quasi Peak | Average |
| 0,150 - 0,5 MHz | 66 - 56 dBµV decreasing with the logarithm of frequency | 56 - 46 dBµV decreasing with the logarithm of frequency |
| 0.5 - 5 MHz | 56 dBµV | 46 dBµV |
| 5 - 30 MHz | 60 dBµV | 50 dBµV |
| Remark: | Quasi Peak and Average limits must be both met | |

Measuring apparatus parameters:

| Parameter | Preview measurement | Final measurement | Parameter | Preview measurement | Final measurement |
|---|---|---|---|---|---|
| Start frequency | 150 kHz | 150 kHz | Detector | MP/AV | QP/AV |
| Stop frequency | 30 MHz | 30 MHz | Measuring time | 10 ms | 1 s |
| Stepsize | 5 kHz | 5 kHz | RF-attenuation | 0dB | 0dB |
| IF- Bandwidth | 9 kHz | 9 kHz | Preamplifier | 0 dB | 0 dB |

| Operating mode | Measuring result |
|---|---|
| Normal use | Measurement diagram 1 |

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Test result:

4. 1.1.) Measurement with QP-Detector

| Frequency MHz | Level dBµV | Limit DBµV | Margin dB | Exceed-Mark | Phase | PE |
|---|---|---|---|---|---|---|
| 13,56 | 63,3 | 60 | -3,3 | ** | L | GND |
| 13,57 | 50,9 | 60 | 9,1 | | L | GND |

** This part of emission is coverd by 15.225 (a) and 6.2.2.(e)

4. 1.2.) Measurement with AV-Detector

| Frequency MHz | Level dBµV | Limit dBµV | Margin dB | Exceed-Mark | Phase | PE |
|---|---|---|---|---|---|---|
| 5,175 | 41,9 | 50 | 8,1 | | N | GND |
| 6,54 | 44,0 | 50 | 6,0 | | L | GND |
| 13,56 | 48,4 | 50 | 1,6 | | L | GND |

## 4. 2. Radiated emission

Limits according to 15.209 and 6.2.1.

| | Detector Quasi Peak | |
|---|---|---|
| Frequency range | Limit | Measurement distance |
| 0,009 – 0,490 MHz | 2400µV / f(kHz) | 300 m |
| 0,490 – 1.705 MHz | 24000µV / f(kHz) | 30 m |
| 1,705 - 30 MHz | 30 | 30 m |
| 30 – 88 MHz | 100 | 3 m |
| 88 216 MHz | 150 | 3 m |
| 216 960 MHz | 200 | 3 m |
| Above 960 MHz | 500 | 3 m |
| Remark: | The Limit was increased for a constant measurement distance of 3m with a factor of 40 dB per Decade. | |

| Operating mode | Measuring result |
|---|---|
| continuous and modulated carrier at 122,9 kHz and 13,56 MHz | Measurement diagram 2-4 |

Test result:

4. 2.1.) Measurement in the frequency range 9 kHz to 30 MHz

Due to the large margin to the limit, no final measurement was performed.

4. 2.2.) Measurement in the frequency range 30 MHz to 1000 MHz

| Frequency MHz | Level dBµV/m | Limit dBµV/m | Margin dB | Exceed-Mark | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|
| 31,35 | 37,4 | 40 | 2,6 | | 100 | 0 | Vertical |
| 35,0 | 35,7 | 40 | 4,3 | | 101 | 0 | Vertical |
| 38,7 | 35,2 | 40 | 4,8 | | 129 | 185 | Vertical |
| 42,4 | 35,6 | 40 | 4,4 | | 100 | 122 | Vertical |
| 46,1 | 37,0 | 40 | 3,0 | | 101 | 134 | Vertical |
| 53,45 | 35,3 | 40 | 4,7 | | 100 | 251 | Vertical |
| 226,7 | 33,5 | 46 | 6,5 | | 129 | 257 | Horizontal |
| 412,9 | 42,0 | 46 | 4 | | 225 | 1 | Horizontal |
| 453,85 | 17,9 | 46 | 28,1 | | 120 | 76 | Horizontal |
| 484,55 | 20,0 | 46 | 26 | | 161 | 22 | Vertical |
| 537,35 | 20,3 | 46 | 25,7 | | 209 | 219 | Horizontal |
| 923,75 | 26,6 | 46 | 19,4 | | 273 | 84 | Vertical |

## 4.3. 15.225 Operation within the band 13,110 – 14,010 MHz RSS-210 6.2.2.(e) 13,553 – 13,567 MHz

15.225 (a):

The field strength of any emissions within this band shall not exceed 15.848 microvolts/meter (84 dBµV/m) at 30 meters.

Measurement results:

The field strength at 3m distance was measured as 56,8 dBµV/m. Extrapolated with 40 dB per decade to 30 meters distance it would be 16,8 dBµV/m.

6.2.2.(e)

The field strength of any emissions within this band shall not exceed 15.500 microvolts/meter (84 dBµV/m) at 30 meters.

Measurement results:

The field strength at 3m distance was measured as 56,8 dBµV/m. Extrapolated with 40 dB per decade to 30 meters distance it would be 16,8 dBµV/m.

15.225 (b) and 6.2.2.(e):

| Frequency range MHz | Level dBµV/m | Limit dBµV/m |
|---|---|---|
| 13,410 – 13,553 | < 50 | 90,5 |
| 13,567 – 13,710 | < 50 | 90,5 |
| The Limit was increased for a constant measurement distance of 3m with a factor of 40 dB per Decade. | | |

15.225 (c) and 6.2.2.(e):

| Frequency range MHz | Level dBµV/m | Limit dBµV/m |
|---|---|---|
| 13,110 – 13,410 | < 50 | 80,5 |
| 13,710 – 14,010 | < 50 | 80,5 |
| The Limit was increased for a constant measurement distance of 3m with a factor of 40 dB per Decade. | | |

15.225 (d):

See measurement diagram.

15.225 (e) and 6.2.2.(e):

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation ov –20 degrees to +50 degrees C at normal supply voltage, and for a variation of the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Measurement results:

| Test conditions | | Transmitter frequency |
|---|---|---|
| | | 13.56 MHz |
| $T_{nom}$ ( 20 )°C | $V_{min}$ ( 93.5 )V | 13,56121 |
| $T_{nom}$ ( 20 )°C | $V_{nom}$ ( 126.5 )V | 13,56124 |
| $T_{min}$ ( -20 )°C | $V_{nom}$ ( 110 )V | 13,56125 |
| $T_{max}$ ( 50 )°C | $V_{nom}$ ( 110 )V | 13,56123 |
| Maximum deviation from nominal frequency under extreme test conditions (%) | | 0,00922 |
| Measurement uncertainty | | ± 10 Hz |

# Appendix 1
# Test equipment used

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| | | |
|---|---|---|
| ☒ | Anechoic Chamber with 3m measurement distance | NT-100 |
| ☒ | MA 240 - Antenna mast 1 - 4 m height | NT-110 |
| ☒ | DS 412 - Turntable 0 - 400 ° Azimuth | NT-111 |
| ☑ | HD 100 Controller Mast+Turntable | NT-112 |
| ☐ | HUF-Z2 - Bicon. Antennna 20 - 300 MHz | NT-120 |
| ☐ | HUF-Z3 - Log. Per. Antennna 200 - 1000 MHz | NT-121 |
| ☑ | HFH-Z2 - Loop Antenna. 9 kHz - 30 MHz | NT-122 |
| ☐ | HFH-Z6 - Rod Antenna 9 kHz - 30 MHz | NT-123 |
| ☐ | 3121C - Dipole Antenna 28 - 1000 MHz | NT-124 |
| ☐ | 3115 - Horn Antenna 1 - 18 GHz | NT-125 |
| ☐ | 3116 - Horn Antenna 18 - 40 GHz | NT-126 |
| ☐ | SAS-200/543 - Bicon. Ant. 20 MHz - 300 MHz | NT-127 |
| ☐ | AT-1080 - Log. Per. Ant. 80 - 1000 MHz | NT-128 |
| ☒ | HK-116 - bicon. Ant. 20 MHz - 300 MHz | NT-129 |
| ☐ | HK-116 - bicon. Ant. 20 MHz - 300 MHz | NT-130 |
| ☒ | 3146 - Log. Per. Ant. 200 - 1000MHz | NT-131 |
| ☐ | Loop Antenna H-Field | NT-132 |
| ☐ | Horn Antenna 500 MHz - 2900 MHz | NT-133 |
| ☐ | Log. per. Antenna 800 MHz - 2500 MHz | NT-134 |
| ☐ | Log. per. Antenna 800 MHz - 2500 MHz | NT-135 |
| ☐ | BiConiLog Antenna 26 MHz – 2000 MHz | NT-137 |
| ☐ | Conical Dipol Antenna PCD8250 | NT-138 |
| ☐ | HZ-1 Antenna tripod | NT-150 |
| ☑ | BN 1500 Antenna tripod | NT-151 |
| ☐ | Ant. tripod for EN61000-4-3 Model TP1000A | NT-156 |
| ☐ | ESVP - Test receiver 20 - 1000 MHz | NT-201 |
| ☐ | ESPC - Test receiver 9 kHz - 2,5 GHz | NT-203 |
| ☒ | ESI26 – Test receiver 20 Hz – 26,5 GHz | NT-207 |
| ☐ | Digital Radio Tester CTS55 | NT-208 |
| ☐ | Noise-gen., ITU-R 559-2 20 Hz – 20 kHz | NT-209 |
| ☐ | CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz | NT-210 |
| ☒ | 3271 - Spectrum analyzer 100 Hz - 26,5 GHz | NT-211 |
| ☐ | Radiocommunicationanalyzer Marconi 2945A | NT-212 |
| ☐ | 2855S - Communication analyzer | NT-213 |
| ☐ | Mixer M28HW 26,5 GHz - 40 GHz | NT-214 |
| ☐ | Diode Detector 0,01 GHz - 26,5 GHz | NT-215 |
| ☐ | 3160-10 Horn Antenna 26,5 GHz - 40 GHz | NT-216 |
| ☐ | Radiocommunicationanalyzer SWR 1180 MD | NT-217 |
| ☐ | Mixer M19HWD 40 GHz – 60 GHz | NT-218 |
| ☐ | Mixer M12HWD 60 GHz – 90 GHz | NT-219 |
| ☐ | TDS - 540 DSO Digital scope | NT-220 |
| ☐ | PM97 Scopemeter | NT-221 |
| ☐ | B10 - Harmonics and flicker analyzer | NT-231 |
| ☐ | EFA-3 H-field- / E-field probe | NT-243 |
| ☐ | E-field measuring instrument EMR-200; 100 kHz – 3 GHz | NT-244 |
| ☐ | E-field probe 100 kHz – 3 GHz | NT-245 |
| ☐ | Magneticfield-Sensor 300 kHz – 30 MHz | NT-246 |
| ☐ | E-field probe 10 MHz – 18 GHz | NT-247 |
| ☐ | H-field probe 10 MHz – 1 GHz | NT-248 |
| ☐ | ELT-400 1 Hz – 400 kHz | NT-249 |
| ☐ | MDS 21 - Absorbing clamp 30 - 1000 MHz | NT-250 |

# Appendix 1 (continued)
# Test equipment used

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| | | |
|---|---|---|
| ☐ | FCC-203I<br>EM Injection clamp | NT-251 |
| ☐ | FCC-203I-DCN<br>Ferrite decoupling network | NT-252 |
| ☐ | PR50<br>Current Probe | NT-253 |
| ☐ | PR630<br>Current Probe | NT-254 |
| ☐ | Model 2000<br>Digital Multimeter | NT-261 |
| ☐ | Fluke 97<br>Digital Multimeter | NT-262 |
| ☐ | Fluke 97<br>Digital Multimeter | NT-263 |
| ☒ | ESH2-Z5 Artificial mains network 4x25A | NT-300 |
| ☐ | ESH3-Z5 Artificial mains network 2x10A | NT-301 |
| ☐ | ESH3-Z6 Artificial mains network 1x100A | NT-302 |
| ☐ | ESH3-Z4<br>T-Artificial network | NT-303 |
| ☐ | PHE 4500/B<br>Power amplifier | NT-304 |
| ☐ | EZ10<br>T-Artificial network | NT-305 |
| ☐ | SMG - Signal generator<br>0,1 - 1000 MHz | NT-310 |
| ☐ | PM 5518 TXVPS<br>Video generator | NT-311 |
| ☐ | RefRad<br>Reference generator | NT-312 |
| ☐ | SMP 02 Signal generator<br>10 MHz - 20 GHz | NT-313 |
| ☐ | 40 MHz Arbitrary Generator<br>T1241 | NT-315 |
| ☐ | PEFT - Burst generator<br>up to 4 kV | NT-320 |
| ☐ | ESD 30 System<br>up to 25 kV | NT-321 |
| ☐ | PSURGE 4.1<br>Surge generator | NT-324 |
| ☐ | TRANSIENT 1000<br>Immunity test system | NT-325 |
| ☐ | VCS 500-M6<br>Surge-Generator | NT-326 |
| ☐ | BTA-250 - RF-Amplifier<br>9 kHz - 220 MHz / 250 W | NT-330 |
| ☐ | T82-50 RF-Amplifier<br>2 GHz – 8 GHz | NT-331 |
| ☐ | 500W1000M7 - RF-Amplifier<br>80 - 1000 MHz / 500 W | NT-332 |
| ☐ | AS0102-65R - RF-Amplifier<br>1 GHz - 2 GHz | NT-333 |
| ☐ | APA01 – RF-Amplifier<br>0,5 GHz – 2,5 GHz | NT-334 |
| ☐ | Preamplifier<br>1 GHz - 4 GHz | NT-335 |
| ☐ | Preamplifier for GPS<br>MKU 152 A | NT-336 |
| ☐ | Preamplifier<br>100 MHz – 23 GHz | NT-337 |
| ☐ | DC Block 10 MHz – 18 GHz<br>Model 8048 | NT-338 |
| ☐ | 2-97201<br>Electronic load | NT-341 |
| ☐ | TSX3510P - Power supply<br>0-30 V / 0 - 10 A | NT-344 |
| ☐ | TSX3510P - Power supply<br>0-30 V / 0 - 10 A | NT-345 |
| ☐ | VDS 200<br>Mobil-impuls-generator | NT-350 |
| ☐ | LD 200<br>Mobil-impuls-generator | NT-351 |
| ☐ | MPG 200<br>Mobil-Impuls-Generators | NT-352 |
| ☐ | EFT 200<br>Mobil-impuls-generator | NT-353 |
| ☐ | FP 16/3-1<br>3 ph. Coupling filter (Burst) | NT-400 |
| ☐ | PHE 4500 - Mains impedance network | NT-401 |
| ☐ | IP 6.2 Coupling filter for data lines (Surge) | NT-403 |
| ☐ | ESH2-Z3 - Probe<br>9 kHz - 30 MHz | NT-410 |
| ☐ | IP 4 - Capacitive clamp (Burst) | NT-411 |
| ☐ | Highpass-Filter<br>100 MHz – 4 GHz | NT-412 |
| ☐ | Highpass-Filter<br>600 MHz – 4 GHz | NT-413 |
| ☐ | Highpass-Filter<br>1250 MHz – 4 GHz | NT-414 |
| ☐ | Highpass-Filter<br>1800 MHz – 18 GHz | NT-415 |
| ☐ | Highpass-Filter<br>3500 MHz – 18 GHz | NT-416 |
| ☐ | HV-Attenuator 54,5 dB (Burst) | NT-420 |
| ☐ | RF-Attenuator 20 dB<br>0,1 - 1000 MHz / 25 W | NT-421 |
| ☐ | RF-Attenuator 10 dB<br>0,1 - 1000 MHz / 20 W | NT-422 |

# Appendix 1 (continued)
# Test equipment used

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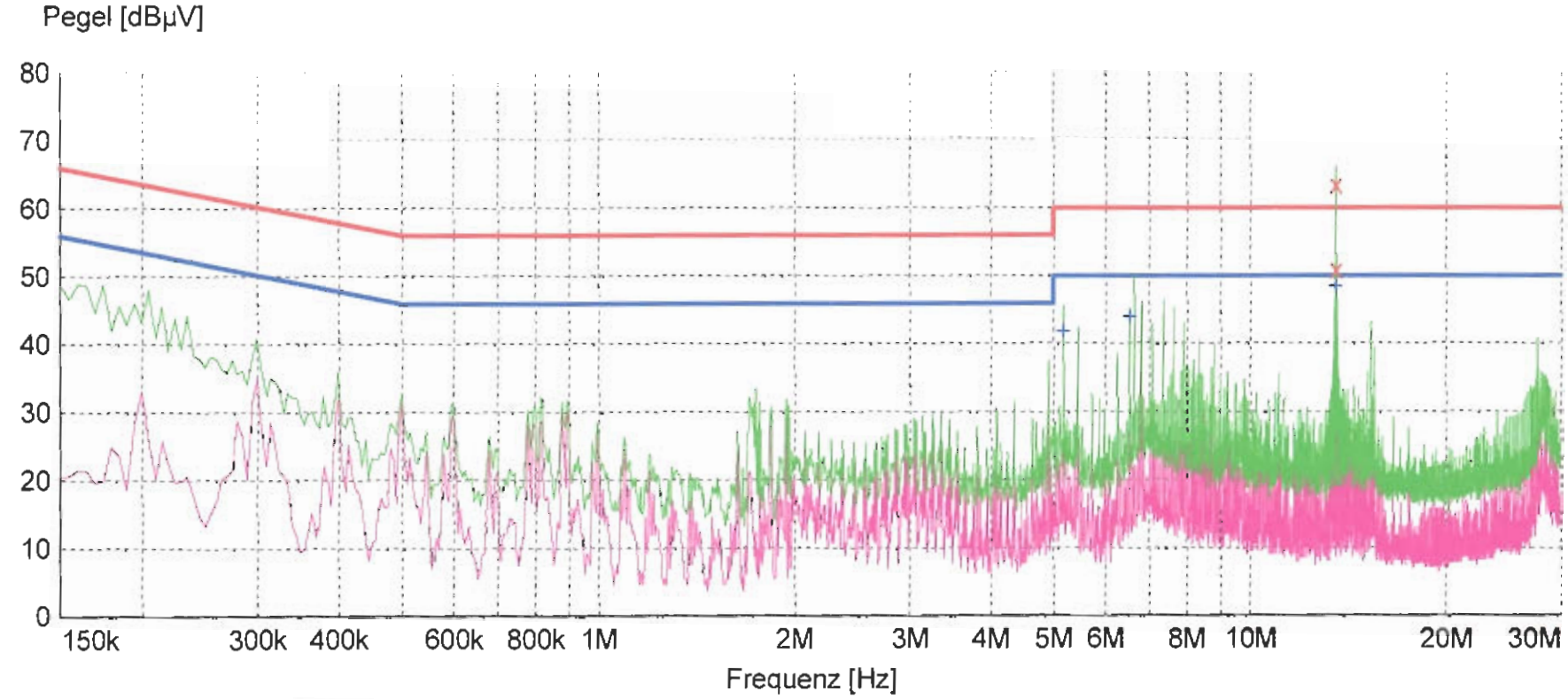
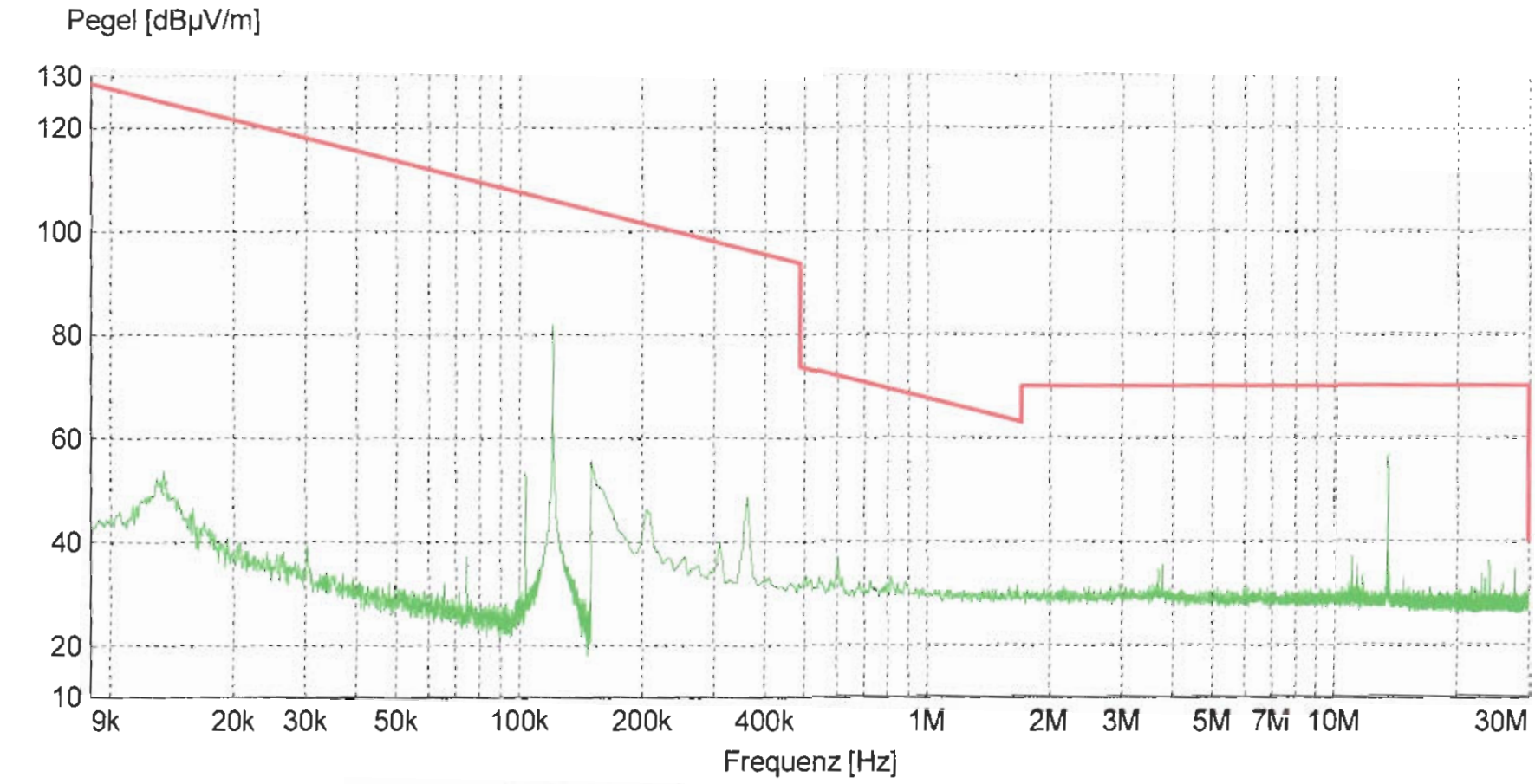
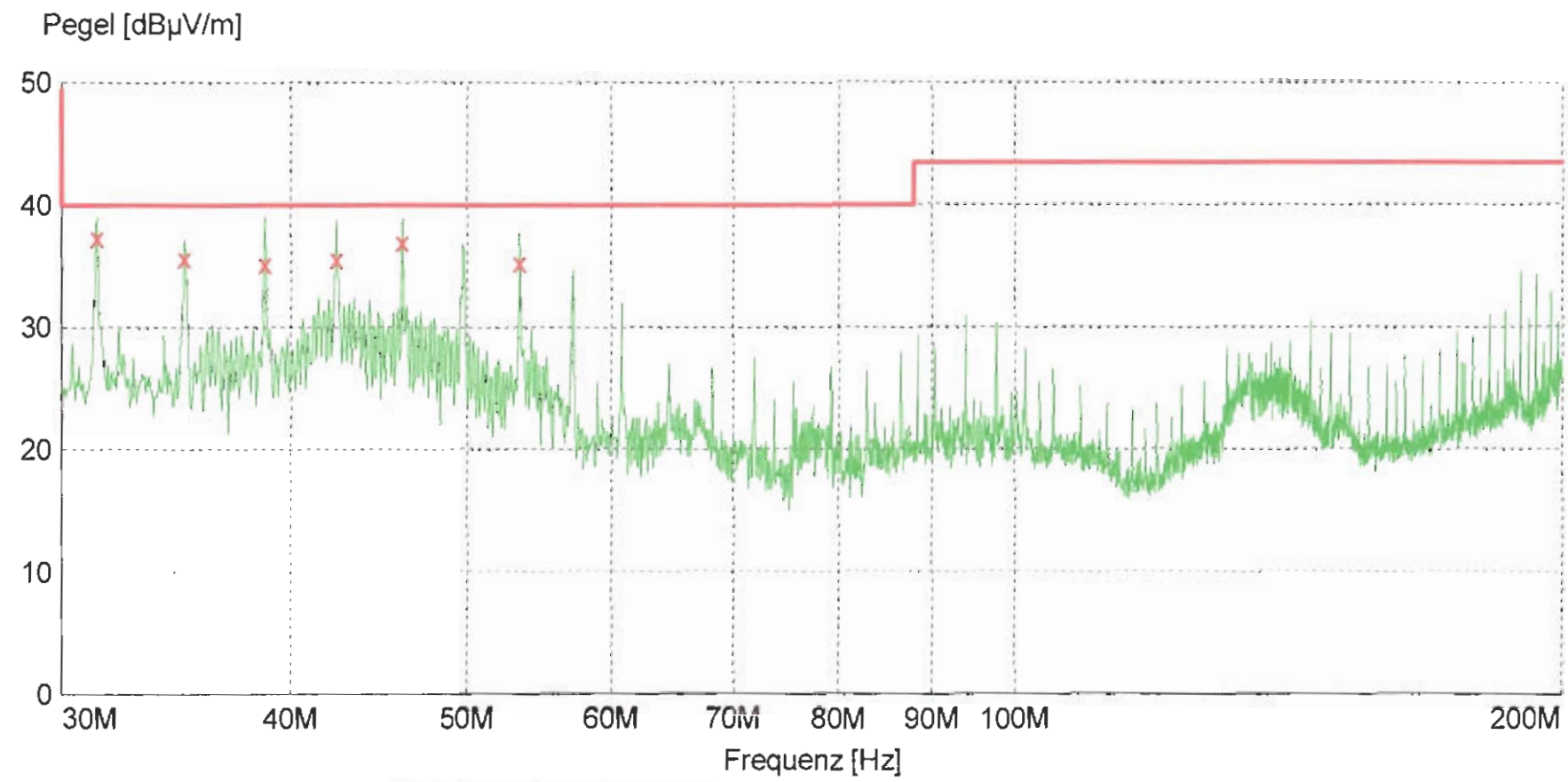
| | | |
|---|---|---|
| ☐ | RF-Attenuator 30 dB 0,1 - 1000 MHz / 1 W | NT-423 |
| ☐ | RF-Attenuator 30 dB | NT-424 |
| ☐ | RF-Attenuator 6 dB 0,1 - 1000 MHz / 1 W | NT-425 |
| ☐ | RF-Attenuator 6 dB 0,1 - 1000 MHz / 1 W | NT-426 |
| ☐ | Voltage-divider 1:100 | NT-427 |
| ☐ | RF-Attenuator 6 dB | NT-428 |
| ☐ | 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 50 Ohm – 800 Ohm | 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-M2-50A Coupling decoupling network | NT-459 |
| ☐ | FCC-801-M5-25 Coupling decoupling network | NT-460 |
| ☐ | FCC-801-AF10 Coupling decoupling network | NT-461 |
| ☐ | FCC-801-S25 Coupling decoupling network | NT-462 |
| ☐ | FCC-801-T4 Coupling decoupling network | NT-463 |
| ☐ | FCC-801-C1 Coupling decoupling network | NT-464 |
| ☐ | F-16A - Current probe 1kHz - 70MHz | NT-465 |
| ☒ | PC P450 - Test computer | NT-500 |
| ☐ | PC P4 1700 MHz Notebook | NT-505 |
| ☐ | PC PIII 933 MHz Notebook | NT-506 |
| ☐ | Monitoring camera with Monitor | NT-511 |
| ☒ | ES-K1 Test software | NT-520 |
| ☐ | SPS_PHE - Test software voltage fluctuations/harmonics | NT-525 |
| ☐ | SPS_EM - Test software for PHE 4500/B | NT-527 |
| ☐ | Noise power test apparatus according to EN 55014 | NT-530 |
| ☐ | Vertical coupling plane (ESD) | NT-531 |
| ☐ | TEM-Zelle | NT-533 |
| ☐ | Test cable #4 for EN 61000-4-6 | NT-553 |
| ☒ | Test cable #3 for conducted emission | NT-554 |
| ☐ | Test cable #5 ESD-cable (2x470k) | NT-555 |
| ☐ | Test cable #6 ESD-cable (2x470k) | 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 |
| ☐ | Shield chamber | NT-600 |
| ☒ | Climatic chamber -55°C to +180°C | M-512 |
| ☐ | Control and simulation equipment for EUT | --- |

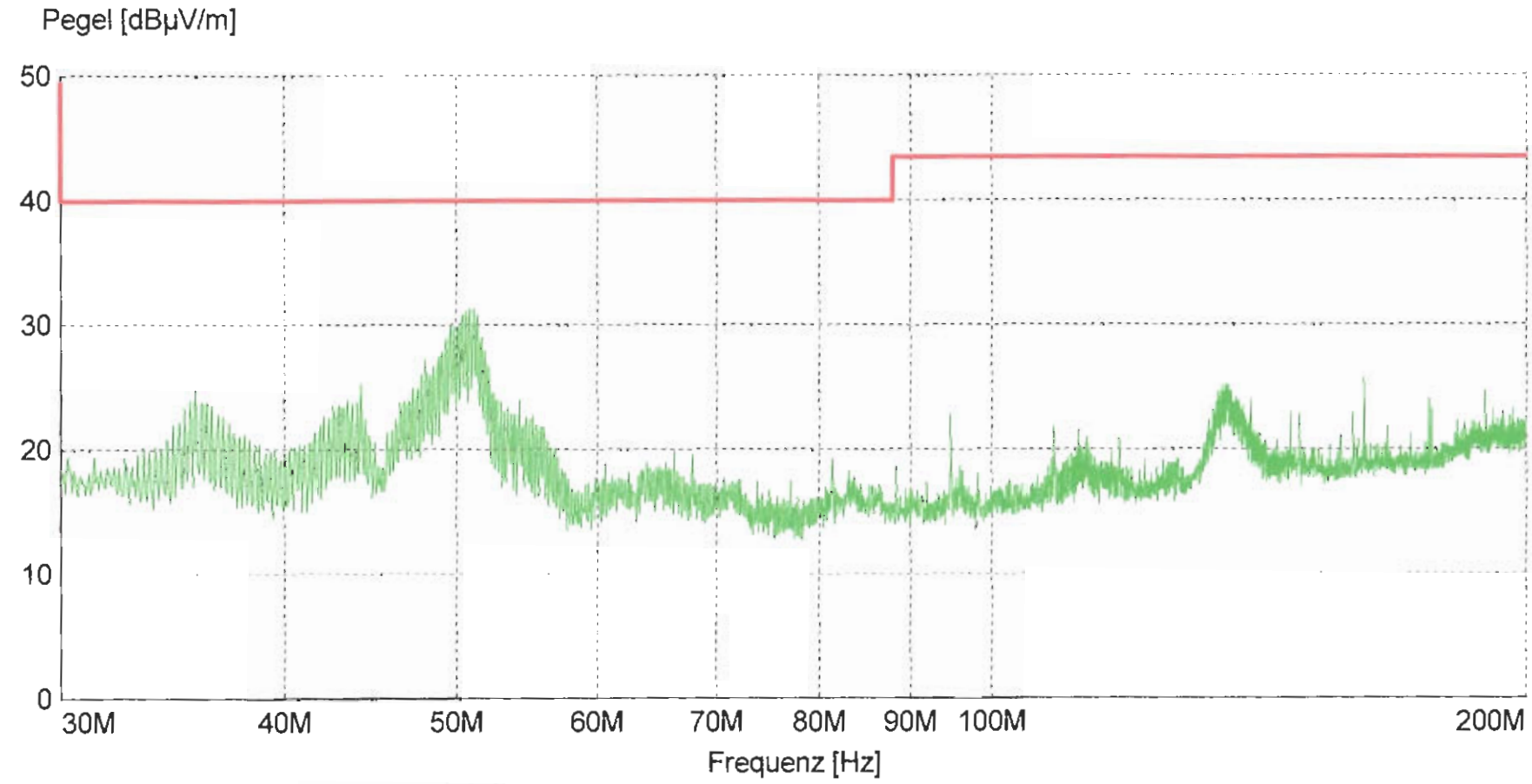



MES PS_V1_VAC_fin QP
MES PS_V1_VAC_fin AV
MES PS_V1_VAC_pre PK
MES PS_V1_VAC_pre AV
LIM EN 55022 V QP EN 55022 V QP
LIM EN 55022 V AV EN 55022 V AV


Pegel [dBµV/m]
130
120
100
80
60
40
20
10
9k
20k
30k
50k
100k
200k
400k
1M
2M
3M
5M
7M
10M
30M
Frequenz [Hz]
MES PS_V1 Ff0 pre PK
LIM FCC ClassB F QP 40dB FCC ClassB, field strength 3m




x x :MES PS_V1_F1_fin QP
MES PS_V1_F1_pre PK
LIM FCC ClassB F QP/AV FCC ClassB, field strength 3m


Pegel [dBµV/m]
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
90M
100M
200M
Frequenz [Hz]
MES PS_V2_Ff1 pre PK
LIM FCC ClassB F QP/AV
FCC ClassB, field strength 3m