

TEST REPORT
of the accredited test laboratory

TÜV Nr.: M/EMV-02/223

about
the following EMC - test/- research

Applicant: Skidata AG
Untersbergstraße 40
A-5083 Gartenau - St. Leonhard

Product: Ticketprinter; COx70iTX/BC

Serial Number: D023000010

Standard: 47 CFR Ch. I Part 15

Division Medical
Technology/
Communication
Technology/ EMC

Testing Body for
Communication
Technology/ EMC

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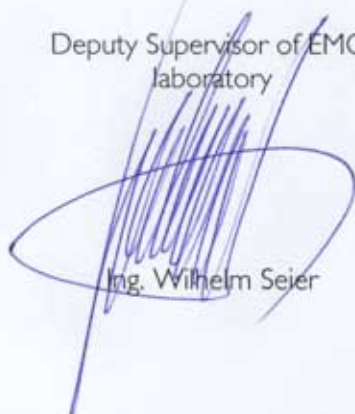
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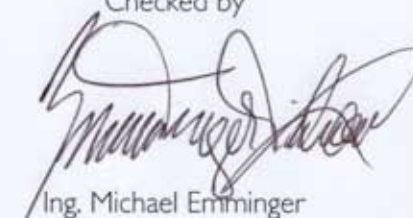
Deputy Supervisor of EMC-
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Ing. Wilhelm Seier



8.8.2002
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The results of this test report only refer to the provided equipment.

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1. Applicant

Company Skidata AG

Department

Address A-5083 Gartenau - St. Leonhard; Untersbergstraße 40

Contact person Hr. Präauer

EUT received on 31st July 2002

Tests were performed on 31st July till 6th August 2002

2. Description of EUT

EUT	Ticketprinter; COx70iTX/BC
Serial Number	D023000010
Manufacturer	Skidata AG A-5083 Gartenau - St. Leonhard; Untersbergstraße 40
Description	Skidata AG provided the following configuration for the measurements: Serial production model with parallel cable terminated with test mode selector
Operating mode	The measurements were carried out at the following running states: Printing and checking cards

3. Standards / Final result

Name	Title	Deviation	Result
47 CFR Ch. I Part 15	Radio Frequency Devices	none	PASS
PASS EUT passed FAIL EUT failed			

4. Test results

4.1. Conducted emission

Limits according to 15.109

Frequency range	Limit	
Detector	Quasi Peak	Average
0,150 - 0,5 MHz	66 - 56 dB μ V decreasing with the logarithm of frequency	56 - 46 dB μ V decreasing with the logarithm of frequency
0,5 - 5 MHz	56 dB μ V	46 dB μ V
5 - 30 MHz	60 dB μ V	50 dB μ V
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
Checking and printing of Cards; continuous and modulated carrier at 122,9 kHz, continuous and modulated carrier at 13,56 MHz	Measurement diagram 1

Test result:

4. 1.1.) Measurement with QP-Detector

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed- Mark	Phase	PE
0,180	53,4	64,5	11,1		N	GND
13,560	80,0	60,0	-20,0	*	N	GND

*) This part of emission is covered by 15.225 (a) see page 13

4. 1.2.) Measurement with AV-Detector

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed- Mark	Phase	PE
0,240	38,3	52,1	13,8		L1	GND
0,420	28,6	47,4	18,8		N	GND
0,475	38,6	46,4	7,8		N	GND
13,560	80,0	50,0	-30,0	*	N	GND

*) This part of emission is covered by 15.225 (a) see page 13

4. 2. Radiated emission

Limits according to 15.209 (15.225 (b) / 15.109)

Frequency range	Detector Quasi Peak	
	Limit	Measurement distance
0,009 – 0,490 MHz	2400 μ V / f(kHz)	300 m
0,490 – 1,705 MHz	24000 μ V / 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 20 dB per Decade.	

Operating mode	Measuring result
Checking and printing of Cards; continuous and modulated carrier at 122,9 kHz, continuous and modulated carrier at 13,56 MHz	Measurement diagram 2-4

Test result:

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

Frequency kHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark
122,9	65,4	65,8	0,4	
13560	58,9	49,5	-9,4	This part of emission is covered by 15.225 (a) see page 13

4. 2.2.) Measurement in the frequency range 30 MHz to 200 MHz

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
37,55	28,7	40,0	11,3		103	299	VERTICAL
40,70	37,9	40,0	2,1		112	276	VERTICAL
137,75	14,5	43,5	29,0		128	255	VERTICAL
152,65	13,1	43,5	30,4		109	230	VERTICAL
160,60	14,0	43,5	29,5		175	299	HORIZONTAL
162,35	13,3	43,5	30,2		178	179	HORIZONTAL

4. 2.3.) Measurement in the frequency range 200 MHz to 1000 MHz

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
671,75	25,0	46,0	21,0		103	105	VERTICAL
679,75	24,3	46,0	21,7		118	228	VERTICAL
701,35	25,4	46,0	20,6		209	59	VERTICAL
716,20	25,4	46,0	20,6		174	79	VERTICAL
725,30	25,7	46,0	20,3		173	145	HORIZONTAL
731,05	26,0	46,0	20,0		100	143	VERTICAL

4.3. Field strength at 13,56 MHz

Limits according to 15.225 (a):

The field strength of any emissions within this band shall not exceed 10.000 microvolts/meter (80 dB μ V/m) at 30 meters.

Measurement results:

The field strength at 3m distance was measured as 58,9 dB μ V/m. Extrapolated with 20 dB per decade to 30 meters distance it would be 38,9 dB μ V/m or 88,1 μ V/m.

4.4. Frequency variation at extreme test voltages and extreme temperatures

Limits according to 15.225 (c):

The frequency tolerance of the carrier signal shall be maintained within $\pm 0,01$ % of the operating frequency over a temperature variation of -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	13,560015
T_{nom} (20)°C	V_{nom} (126,5)V	13,560015
T_{min} (-20)°C	V_{nom} (110)V	13,560860
T_{max} (50)°C	V_{nom} (110)V	13,560004
Maximum deviation from nominal frequency under extreme test conditions (%)		0,0063
Measurement uncertainty		± 10 Hz

Appendix 1

Test equipment used

☒	Anechoic Chamber with 3m measurement distance	NT-100	☐	ESPC - Test receiver 9 kHz - 2,5 GHz	NT-203
☒	MA 240 - Antenna mast 1 - 4 m height	NT-110	☒	ESI26 - Test receiver 20 Hz - 26,5 GHz	NT-207
☒	DS 412 - Turntable 0 - 400 ° Azimuth	NT-111	☐	Digital Radio Tester CTS55	NT-208
☒	HD 100 Controller Mast+Turntable	NT-112	☐	Noise-gen., ITU-R 559-2 20 Hz - 20 kHz	NT-209
☐	HUF-Z2 - Bicon. Antennna 20 - 300 MHz	NT-120	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☒	HFH-Z2 - Loop Antenna. 9 kHz - 30 MHz	NT-122	☐	Radiocommunicationanalyzer Marconi 2945A	NT-212
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	2855S - Communication analyzer	NT-213
☐	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐	3115 - Horn Antenna 1 - 18 GHz	NT-125	☐	Diode Detector 0,01 GHz - 26,5 GHz	NT-215
☐	3116 - Horn Antenna 18 - 40 GHz	NT-126	☐	3160-10 Horn Antenna 26,5 GHz - 40 GHz	NT-216
☐	SAS-200/543 - Bicon. Ant. 20 MHz - 300 MHz	NT-127	☐	Radiocommunicationanalyzer SWR 1180 MD	NT-217
☐	AT-1080 - Log. Per. Ant. 80 - 1000 MHz	NT-128	☐	Mixer M19HWD 40 GHz - 60 GHz	NT-218
☒	HK-116 - bicon. Ant. 20 MHz - 300 MHz	NT-129	☐	Mixer M12HWD 60 GHz - 90 GHz	NT-219
☐	HK-116 - bicon. Ant. 20 MHz - 300 MHz	NT-130	☐	TDS - 540 DSO Digital scope	NT-220
☒	3146 - Log. Per. Ant. 200 - 1000MHz	NT-131	☐	PM97 Scopemeter	NT-221
☐	Loop Antenna H-Field	NT-132	☐	B9-DSP-IS Digital Analyzer for voltage fluctuations	NT-230
☐	Horn Antenna 500 MHz - 2900 MHz	NT-133	☐	DFT 555 - Power and harmonics analyzer	NT-231
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐	EFA-3 H-field- / E-field probe	NT-243
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐	E-field measuring instrument EMR-200; 100 kHz - 3 GHz	NT-244
☐	BiConiLog Antenna 26 MHz - 2000 MHz	NT-137	☐	E-field probe 100 kHz - 3 GHz	NT-245
☐	Conical Dipol Antenna PCD8250	NT-138	☐	Magneticfield-Sensor 300 kHz - 30 MHz	NT-246
☐	HZ-1 Antenna tripod	NT-150	☐	E-field probe 10 MHz - 18 GHz	NT-247
☒	BN 1500 Antenna tripod	NT-151	☐	H-field probe 10 MHz - 1 GHz	NT-248
☐	ESVP - Test receiver 20 - 1000 MHz	NT-201	☐	MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250
☐	Switchbox	NT-202	☐	FCC-203I EM Injection clamp	NT-251

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Appendix 1 (continued) Test equipment used

☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
☐ PR50 Current Probe	NT-253	☐ APA01 - RF-Amplifier 0,5 GHz - 2,5 GHz	NT-334
☐ Model 2000 Digital Multimeter	NT-261	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ Fluke 97 Digital Multimeter	NT-262	☐ 2-97201 Electronic load	NT-341
☐ Fluke 97 Digital Multimeter	NT-263	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☒ ESH2-Z5 Artificial mains network 4x25A	NT-300	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ ESH3-Z5 Artificial mains network 2x10A	NT-301	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ ESH3-Z6 Artificial mains network 1x100A	NT-302	☐ LD 200 Mobil-impuls-generator	NT-351
☐ ESH3-Z4 T-Artificial network	NT-303	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ PHE 4500/B Power amplifier	NT-304	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ EZ10 T-Artificial network	NT-305	☐ FP 16/3-1 3 ph. Coupling filter (Burst)	NT-400
☐ MidiStar Telephone exchange	NT-306	☐ PHE 4500 - Mains impedance network	NT-401
☐ SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐ FP-SURGE 32.1 3 ph. Coupling filter (Surge)	NT-402
☐ PM 5518 TXVPS Video generator	NT-311	☐ IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐ RefRad Reference generator	NT-312	☐ ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐ SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐ IP 4 - Capacitive clamp (Burst)	NT-411
☐ PEFT - Burst generator up to 4 kV	NT-320	☐ HV-Attenuator 54,5 dB (Burst)	NT-420
☐ PSD - ESD generator up to 25 kV	NT-321	☐ RF-Attenuator 20 dB 0,1 - 1000 MHz / 25 W	NT-421
☐ ESD-Pistol	NT-322	☐ RF-Attenuator 10 dB 0,1 - 1000 MHz / 20 W	NT-422
☐ Vacuum-Relais up to 8 kV	NT-323	☐ RF-Attenuator 30 dB 0,1 - 1000 MHz / 1 W	NT-423
☐ PSURGE 4.1 Surge generator	NT-324	☐ RF-Attenuator 30 dB	NT-424
☐ TRANSIENT 1000 Immunity test system	NT-325	☐ RF-Attenuator 6 dB 0,1 - 1000 MHz / 1 W	NT-425
☐ VCS 500-M6 Surge-Generator	NT-326	☐ RF-Attenuator 6 dB 0,1 - 1000 MHz / 1 W	NT-426
☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330	☐ Voltage-divider 1:100	NT-427
☐ 500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332	☐ RF-Attenuator 6 dB	NT-428

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Appendix 1 (continued)

Test equipment used

☐ RF-Attenuator 0 dB - 81 dB	NT-429	☒ ES-K1 Test software	NT-520
☐ WRU 27 - Band blocking 27 MHz	NT-430	☐ ESPC-K1 Test software	NT-521
☐ WHJ450C9 AA - High pass 450 MHz	NT-431	☐ SPS_PHE - Test software voltage fluctuations/harmonics	NT-525
☐ WHJ250C9 AA - High pass 250 MHz	NT-432	☐ SPS_EM - Test software for PHE 4500/B	NT-527
☐ RF-Load 150 W	NT-433	☐ Noise power test apparatus according to EN 55014	NT-530
☐ Impedance transducer 50 Ohm - 800 Ohm	NT-435	☐ Vertical coupling plane (ESD)	NT-531
☐ I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐ Equipment for ESD-pulse verification.	NT-532
☒ ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐ TEM-Zelle	NT-533
☐ Power Divider 6 dB/1 W/50 Ohm	NT-443	☐ ESV-24 Plotter adapter	NT-540
☐ Directional coupler 0,1 MHz - 70 MHz	NT-444	☒ Test cables	NT-550
☐ Directional coupler 0,1 MHz - 70 MHz	NT-445	☐ Test cable #4 for EN 61000-4-6	NT-553
☐ Tube imitations according to EN 55015	NT-450	☒ Test cable #3 for conducted emission	NT-554
☐ FCC-801-M5-25 Coupling decoupling network	NT-460	☐ Test cable #5 ESD-cable (2x470k)	NT-555
☐ FCC-801-AF10 Coupling decoupling network	NT-461	☐ Test cable #6 ESD-cable (2x470k)	NT-556
☐ FCC-801-S25 Coupling decoupling network	NT-462	☐ Serial data - fiber optic link	NT-557
☐ FCC-801-T4 Coupling decoupling network	NT-463	☐ Test cable #8 Sucoflex 104EA	NT-559
☐ FCC-801-C1 Coupling decoupling network	NT-464	☐ Test cable #9 (for outdoor measurements)	NT-580
☐ F-16A - Current probe 1kHz - 70MHz	NT-465	☐ Test cable #10 (for outdoor measurements)	NT-581
☒ PC P450 - Test computer	NT-500	☐ Test cable #13 PBA-33PBC-10	NT-584
☐ SE 284 GPIB - Plotter	NT 502	☐ Shield chamber	NT-600
☐ PC P133 Test computer #2	NT-504	☐ Climatic chamber -55°C to +180°C	M-512
☐ PC P200 MMX Notebook	NT-505	☐ Control and simulation equipment for EUT	---
☐ PC PIII 933 MHz Notebook	NT-506		
☐ 7110 - Controlling device for E-Field probe	NT-510		
☐ Monitoring camera with Monitor	NT-511		
☐ BSR-V1 - Video transmission system (optical fiber link)	NT-512		

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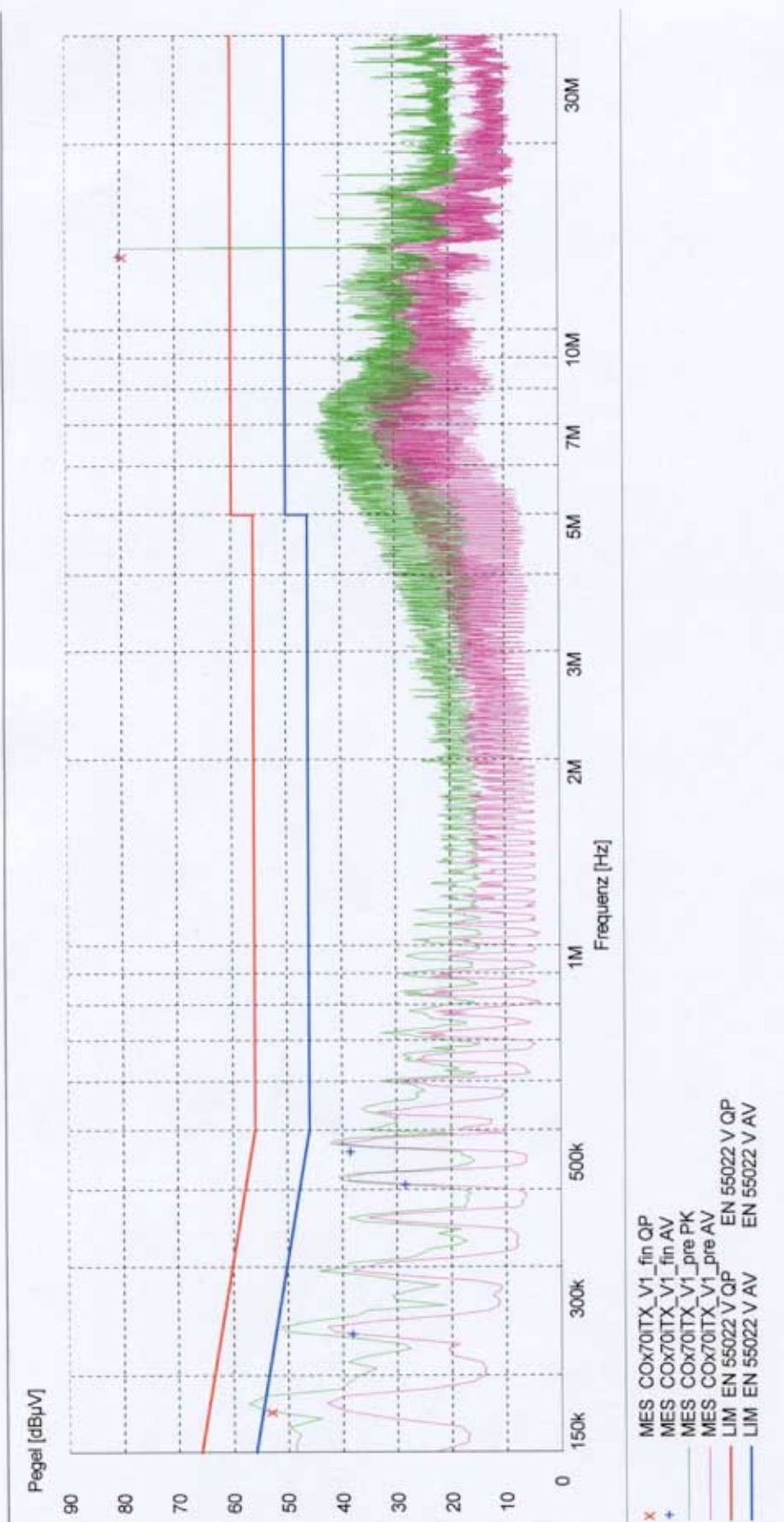
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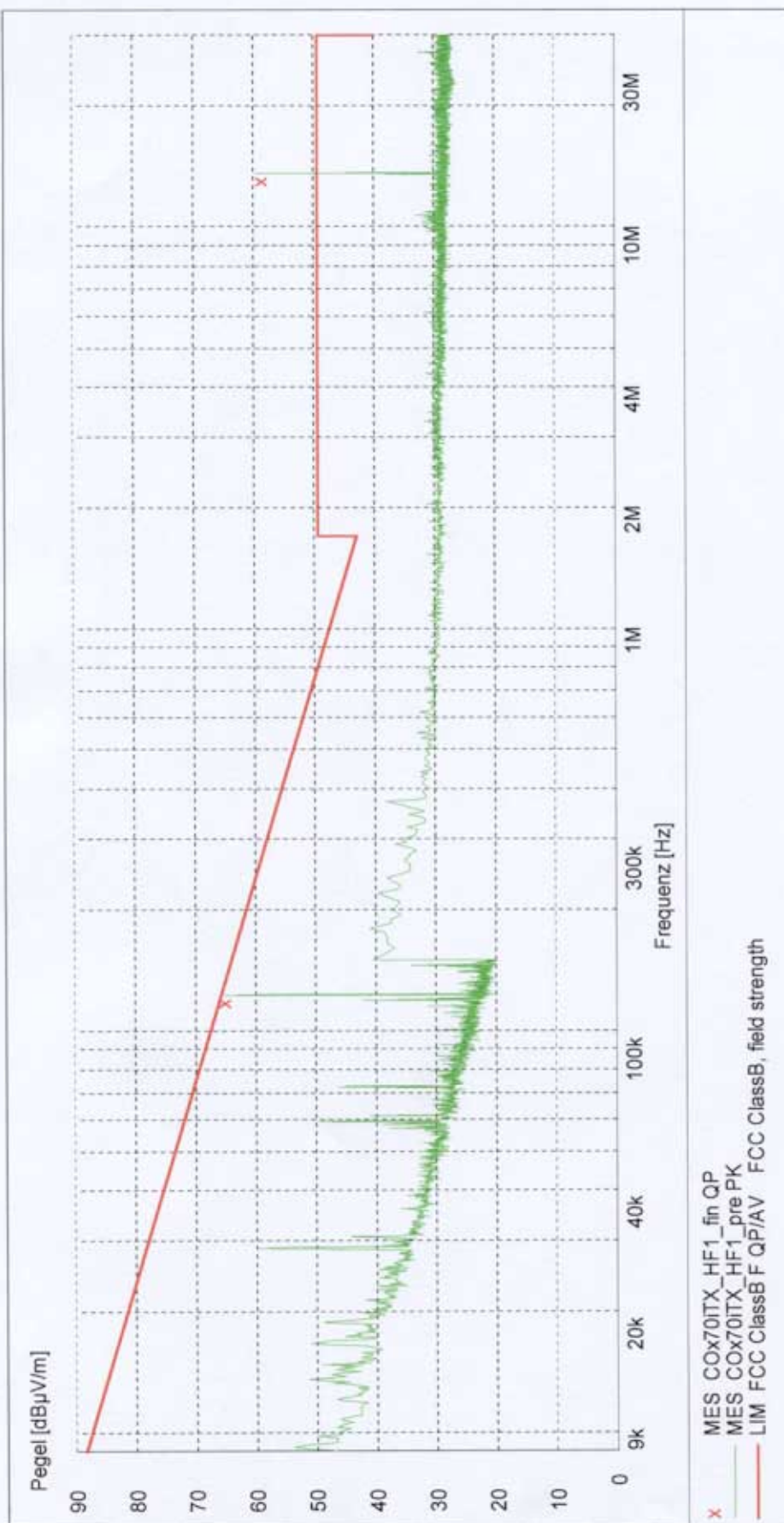
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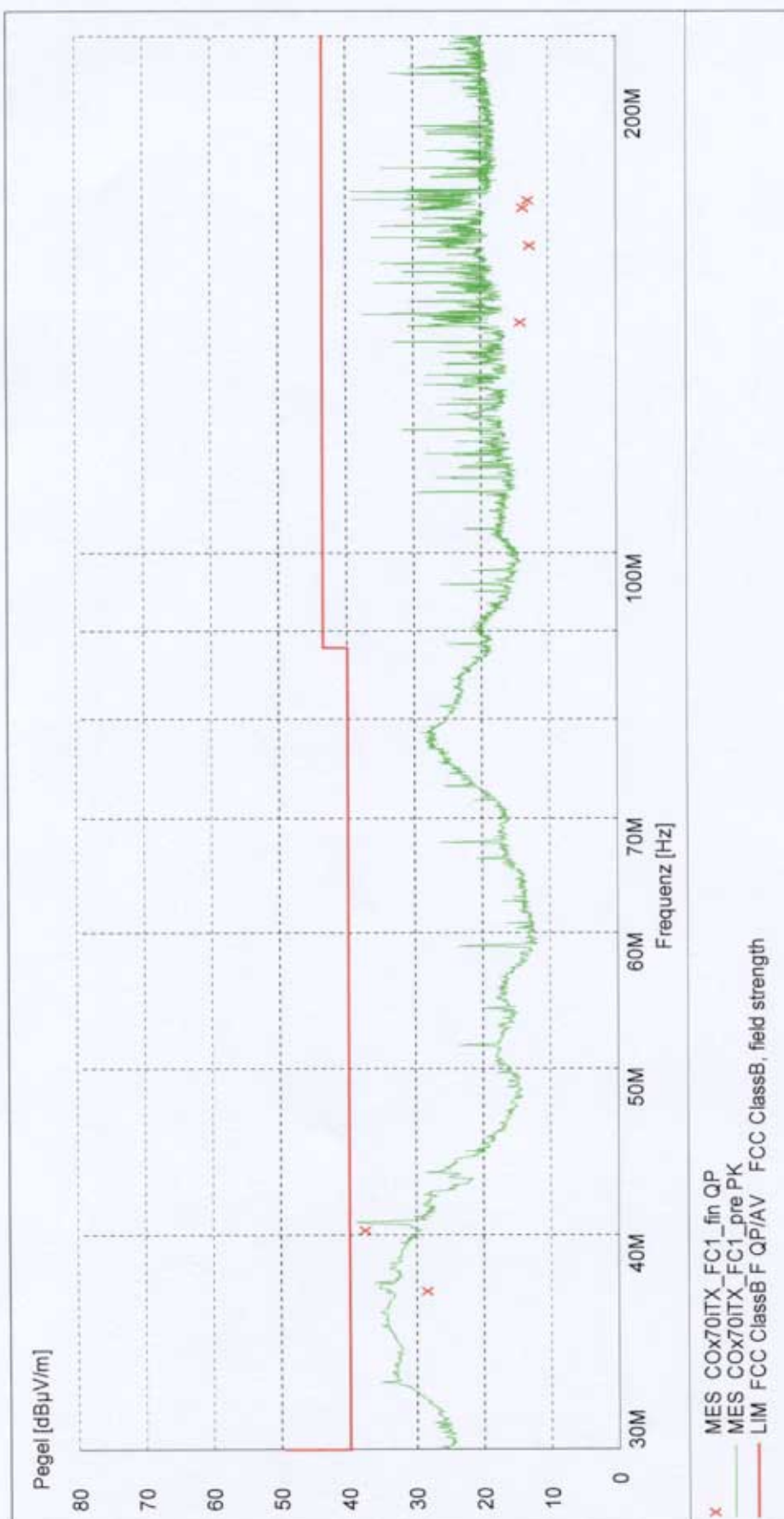
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