

TEST REPORT
of the accredited test laboratory

TÜV Nr.: M/EMV-03/246

about
the following EMC - test/- research

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

Product: RFID Module; QSS-MECH450

Serial Number: Preproduction model

Standard: 47 CFR Ch. I Part 15

TÜV Österreich
Test laboratory for EMC

Supervisor of EMC-laboratory

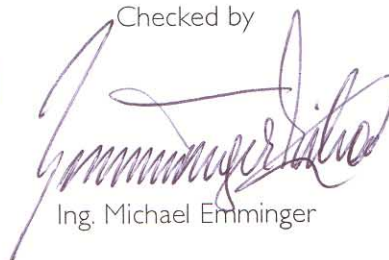

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5. 11. 2003

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Checked by


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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 Mr. Sonderegger

EUT received on 28th October 2003

Tests were performed on 28th till 30th October 2003

2. Description of EUT

EUT	RFID Module; QSS-MECH450
Serial Number	Preproduction model
Manufacturer	SKIDATA AG A-5083 Gartenau - St. Leonhard; Untersbergstraße 40
Description	SKIDATA AG provided the following configuration for the measurements: Preproduction model
Operating mode	The measurements were carried out at the following running states: transmitting in normal kind of operation on 122 kHz

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

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
Normal transmit mode	Measurement diagram 1

Test result:

4. 1.1.) Measurement with QP-Detector and AV-Detector

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

4. 2. Radiated emission

Limits

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 40 dB per Decade.		

Operating mode	Measuring result
Normal transmit mode	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	99,4	105,9	6,5	

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
176,00	41,9	43,5	1,6		192	0	horizontal
192,00	39,5	43,5	4,0		126	124	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
208,00	43,1	43,5	0,4		150	87	horizontal
224,00	43,3	46,0	2,7		175	95	horizontal
744,65	42,1	46,0	3,9		100	124	vertical
759,40	43,3	46,0	2,7		100	102	vertical
774,15	42,2	46,0	3,8		100	96	vertical
788,9	39,9	46,0	6,1		100	95	vertical

Appendix 1

Test equipment used

☒	Anechoic Chamber with 3m measurement distance	NT-100	☐	Switchbox	NT-202
☒	MA 240 - Antenna mast 1 - 4 m height	NT-110	☐	ESPC - Test receiver 9 kHz - 2,5 GHz	NT-203
☒	DS 412 - Turntable 0 - 400 ° Azimuth	NT-111	☒	ESI26 - Test receiver 20 Hz - 26,5 GHz	NT-207
☐	HD 100 Controller Mast+Turntable	NT-112	☐	Digital Radio Tester CTS55	NT-208
☐	HUF-Z2 - Bicon. Antennna 20 - 300 MHz	NT-120	☐	Noise-gen., ITU-R 559-2 20 Hz - 20 kHz	NT-209
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☒	HFH-Z2 - Loop Antenna 9 kHz - 30 MHz	NT-122	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	Radiocommunicationanalyzer Marconi 2945A	NT-212
☐	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐	2855S - Communication analyzer	NT-213
☐	3115 - Horn Antenna 1 - 18 GHz	NT-125	☐	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐	3116 - Horn Antenna 18 - 40 GHz	NT-126	☐	Diode Detector 0,01 GHz - 26,5 GHz	NT-215
☐	SAS-200/543 - Bicon. Ant. 20 MHz - 300 MHz	NT-127	☐	3160-10 Horn Antenna 26,5 GHz - 40 GHz	NT-216
☐	AT-1080 - Log. Per. Ant. 80 - 1000 MHz	NT-128	☐	Radiocommunicationanalyzer SWR 1180 MD	NT-217
☒	HK-116 - bicon. Ant. 20 MHz - 300 MHz	NT-129	☐	Mixer M19HWD 40 GHz - 60 GHz	NT-218
☐	HK-116 - bicon. Ant. 20 MHz - 300 MHz	NT-130	☐	Mixer M12HWD 60 GHz - 90 GHz	NT-219
☒	3146 - Log. Per. Ant. 200 - 1000MHz	NT-131	☐	TDS - 540 DSO Digital scope	NT-220
☐	Loop Antenna H-Field	NT-132	☐	PM97 Scopemeter	NT-221
☐	Horn Antenna 500 MHz - 2900 MHz	NT-133	☐	B9-DSP-IS Digital Analyzer for voltage fluctuations	NT-230
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐	DFT 555 - Power and harmonics analyzer	NT-231
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐	EFA-3 H-field- / E-field probe	NT-243
☐	BiConiLog Antenna 26 MHz - 2000 MHz	NT-137	☐	E-field measuring instrument EMR-200; 100 kHz - 3 GHz	NT-244
☐	Conical Dipol Antenna PCD8250	NT-138	☐	E-field probe 100 kHz - 3 GHz	NT-245
☒	HZ-1 Antenna tripod	NT-150	☐	Magneticfield-Sensor 300 kHz - 30 MHz	NT-246
☐	BN 1500 Antenna tripod	NT-151	☐	E-field probe 10 MHz - 18 GHz	NT-247
☐	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	☐	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

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Appendix 1 (continued)

Test equipment used

☐	FCC-203I	NT-251	☐	AS0102-65R - RF-Amplifier	NT-333
	EM Injection clamp			1 GHz - 2 GHz	
☐	FCC-203I-DCN	NT-252	☐	APA01 – RF-Amplifier	NT-334
	Ferrite decoupling network			0,5 GHz – 2,5 GHz	
☐	PR50	NT-253	☐	Preamplifier	NT-335
	Current Probe			1 GHz - 4 GHz	
☐	Model 2000	NT-261	☐	Preamplifier for GPS	NT-336
	Digital Multimeter			MKU 152 A	
☐	Fluke 97	NT-262	☐	Preamplifier	NT-337
	Digital Multimeter			100 MHz – 23 GHz	
☐	Fluke 97	NT-263	☐	DC Block 10 MHz – 18 GHz	NT-338
	Digital Multimeter			Model 8048	
☒	ESH2-Z5 Artificial mains	NT-300	☐	2-97201	NT-341
	network 4x25A			Electronic load	
☐	ESH3-Z5 Artificial mains	NT-301	☐	TSX3510P - Power supply	NT-344
	network 2x10A			0-30 V / 0 - 10 A	
☐	ESH3-Z6 Artificial mains	NT-302	☐	TSX3510P - Power supply	NT-345
	network 1x100A			0-30 V / 0 - 10 A	
☐	ESH3-Z4	NT-303	☐	VDS 200	NT-350
	T-Artificial network			Mobil-impuls-generator	
☐	PHE 4500/B	NT-304	☐	LD 200	NT-351
	Power amplifier			Mobil-impuls-generator	
☐	EZ10	NT-305	☐	MPG 200	NT-352
	T-Artificial network			Mobil-Impuls-Generators	
☐	MidiStar	NT-306	☐	EFT 200	NT-353
	Telephone exchange			Mobil-impuls-generator	
☐	SMG - Signal generator	NT-310	☐	FP 16/3-1	NT-400
	0,1 - 1000 MHz			3 ph. Coupling filter (Burst)	
☐	PM 5518 TXVPS	NT-311	☐	PHE 4500 - Mains impedance	NT-401
	Video generator			network	
☐	RefRad	NT-312	☐	FP-SURGE 32.1	NT-402
	Reference generator			3 ph. Coupling filter (Surge)	
☐	SMP 02 Signal generator	NT-313	☐	IP 6.2 Coupling filter for	NT-403
	10 MHz - 20 GHz			data lines (Surge)	
☐	40 MHz Arbitrary Generator	NT-315	☐	ESH2-Z3 - Probe	NT-410
	T1241			9 kHz - 30 MHz	
☐	PEFT - Burst generator	NT-320	☐	IP 4 - Capacitive clamp	NT-411
	up to 4 kV			(Burst)	
☐	PSD - ESD generator	NT-321	☐	HV-Attenuator 54,5 dB	NT-420
	up to 25 kV			(Burst)	
☐	ESD-Pistol	NT-322	☐	RF-Attenuator 20 dB	NT-421
				0,1 - 1000 MHz / 25 W	
☐	Vacuum-Relais	NT-323	☐	RF-Attenuator 10 dB	NT-422
	up to 8 kV			0,1 - 1000 MHz / 20 W	
☐	PSURGE 4.1	NT-324	☐	RF-Attenuator 30 dB	NT-423
	Surge generator			0,1 - 1000 MHz / 1 W	
☐	TRANSIENT 1000	NT-325	☐	RF-Attenuator	NT-424
	Immunity test system			30 dB	
☐	VCS 500-M6	NT-326	☐	RF-Attenuator 6 dB	NT-425
	Surge-Generator			0,1 - 1000 MHz / 1 W	
☐	BTA-250 - RF-Amplifier	NT-330	☐	RF-Attenuator 6 dB	NT-426
	9 kHz - 220 MHz / 250 W			0,1 - 1000 MHz / 1 W	
☐	500W1000M7 - RF-Amplifier	NT-332	☐	Voltage-divider	NT-427
	80 - 1000 MHz / 500 W			1:100	

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Test equipment used

☐	RF-Attenuator 6 dB	NT-428	☐	Monitoring camera with Monitor	NT-511
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	BSR-V1 - Video transmission system (optical fiber link)	NT-512
☐	WRU 27 - Band blocking 27 MHz	NT-430	☒	ES-K1 Test software	NT-520
☐	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
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	Equipment for ESD-pulse verification.	NT-532
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	TEM-Zelle	NT-533
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☒	Test cables	NT-550
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Test cable #3 for conducted emission	NT-554
☒	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #5 ESD-cable (2x470k)	NT-555
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #6 ESD-cable (2x470k)	NT-556
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Serial data - fiber optic link	NT-557
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #9 (for outdoor measurements)	NT-580
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-AF10 Coupling decoupling network	NT-461	☐	Shield chamber	NT-600
☐	FCC-801-S25 Coupling decoupling network	NT-462	☐	Climatic chamber -55°C to +180°C	M-512
☐	FCC-801-T4 Coupling decoupling network	NT-463	☐	Control and simulation equipment for EUT	---
☐	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			

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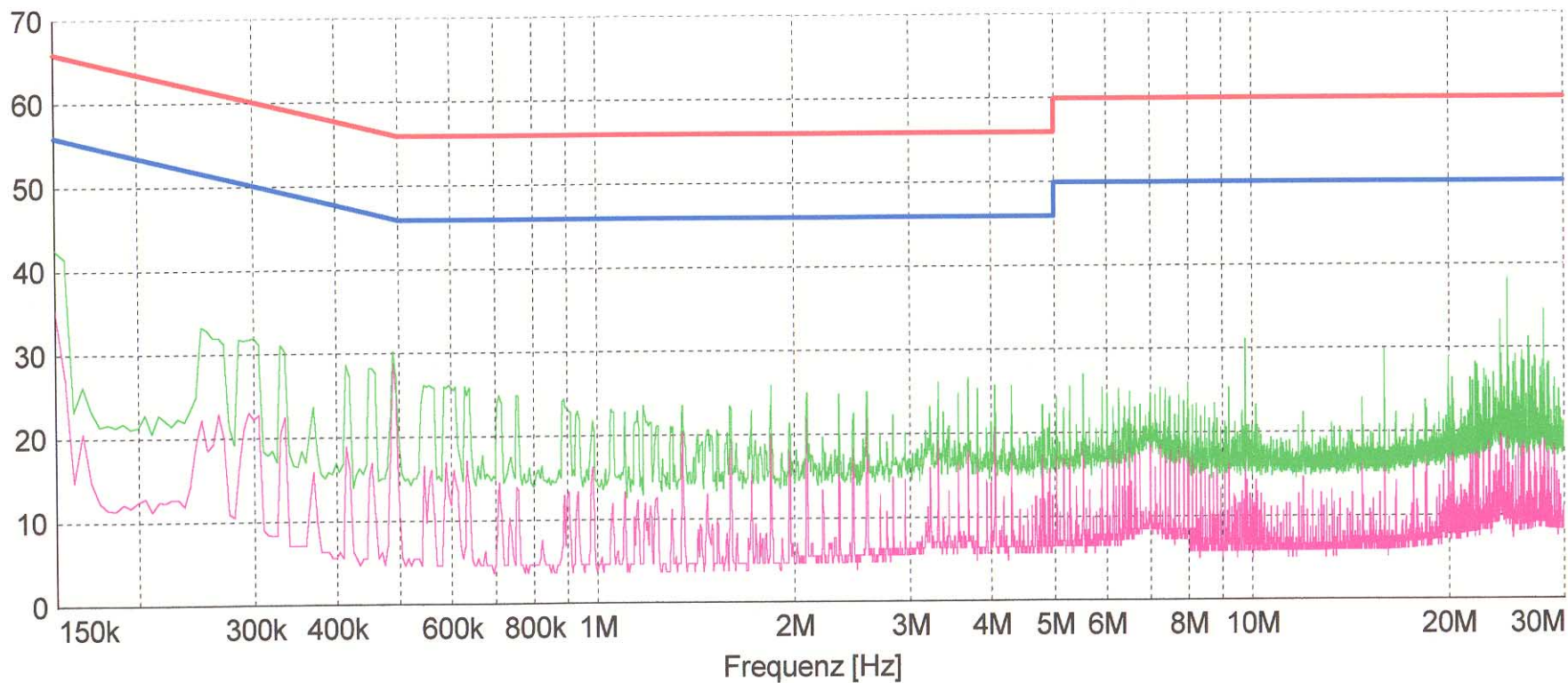
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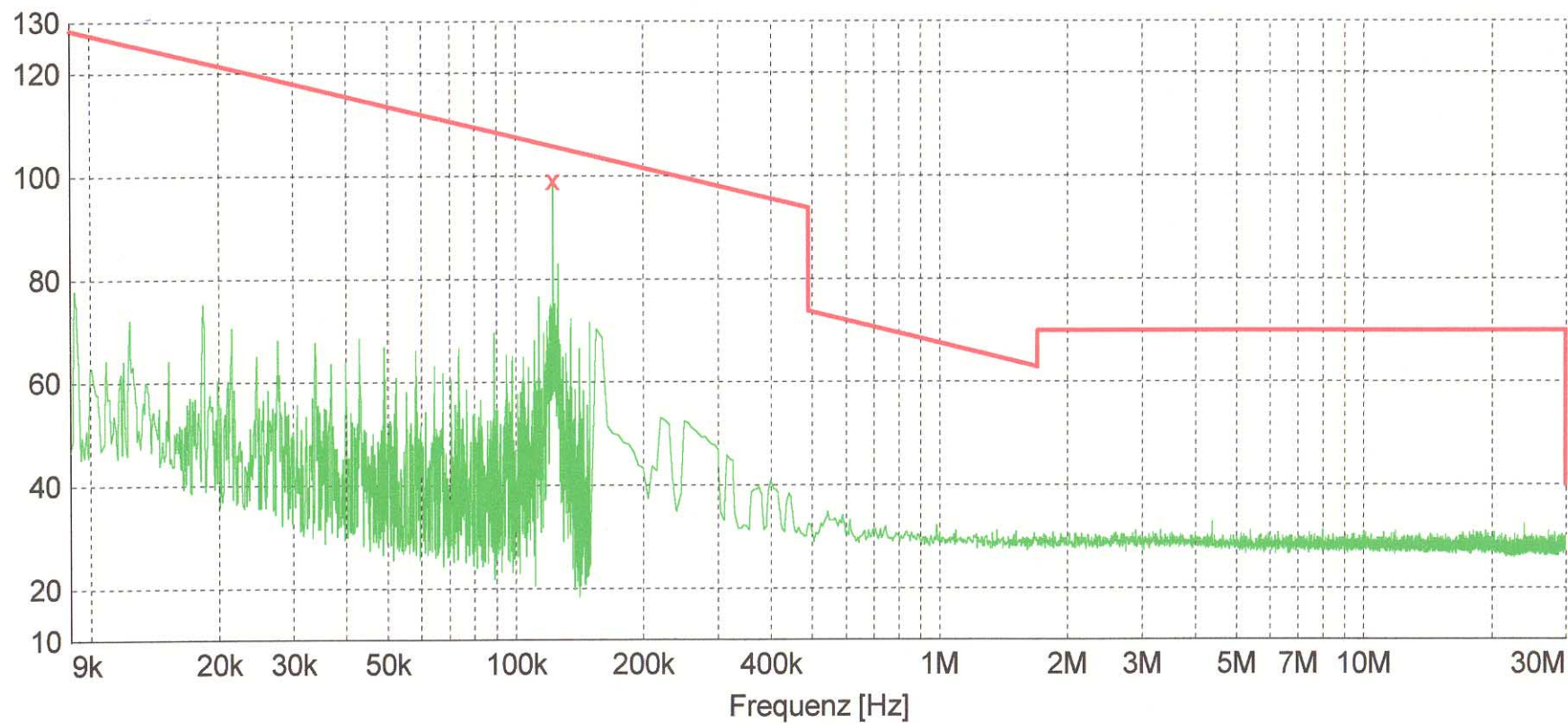
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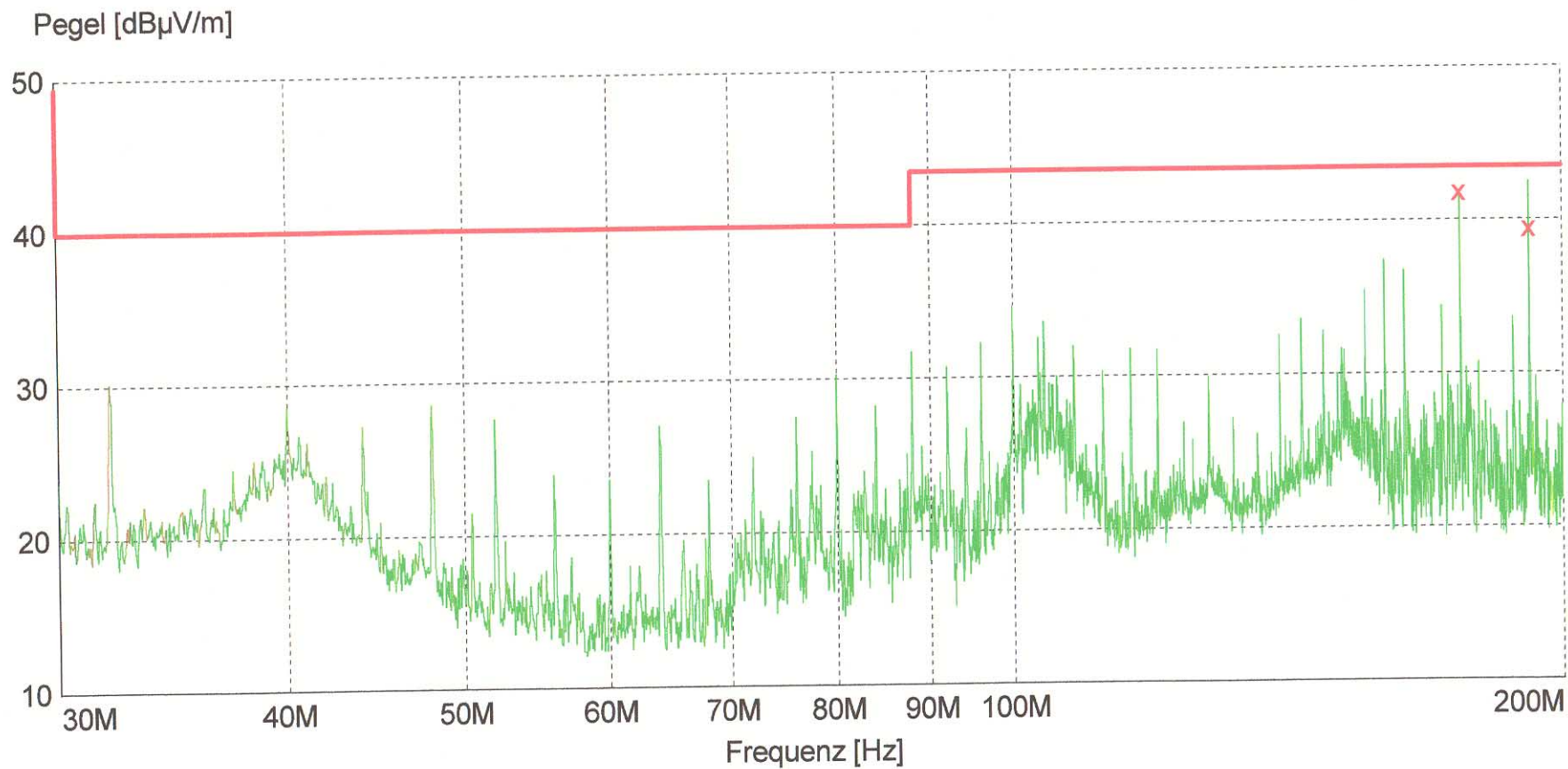
— MES Modul_V1DC_pre PK
— MES Modul_V1DC_pre AV
— LIM EN 55022 V QP
— LIM EN 55022 V AV

EN 55022 V QP
EN 55022 V AV

Pegel [dB μ V/m]



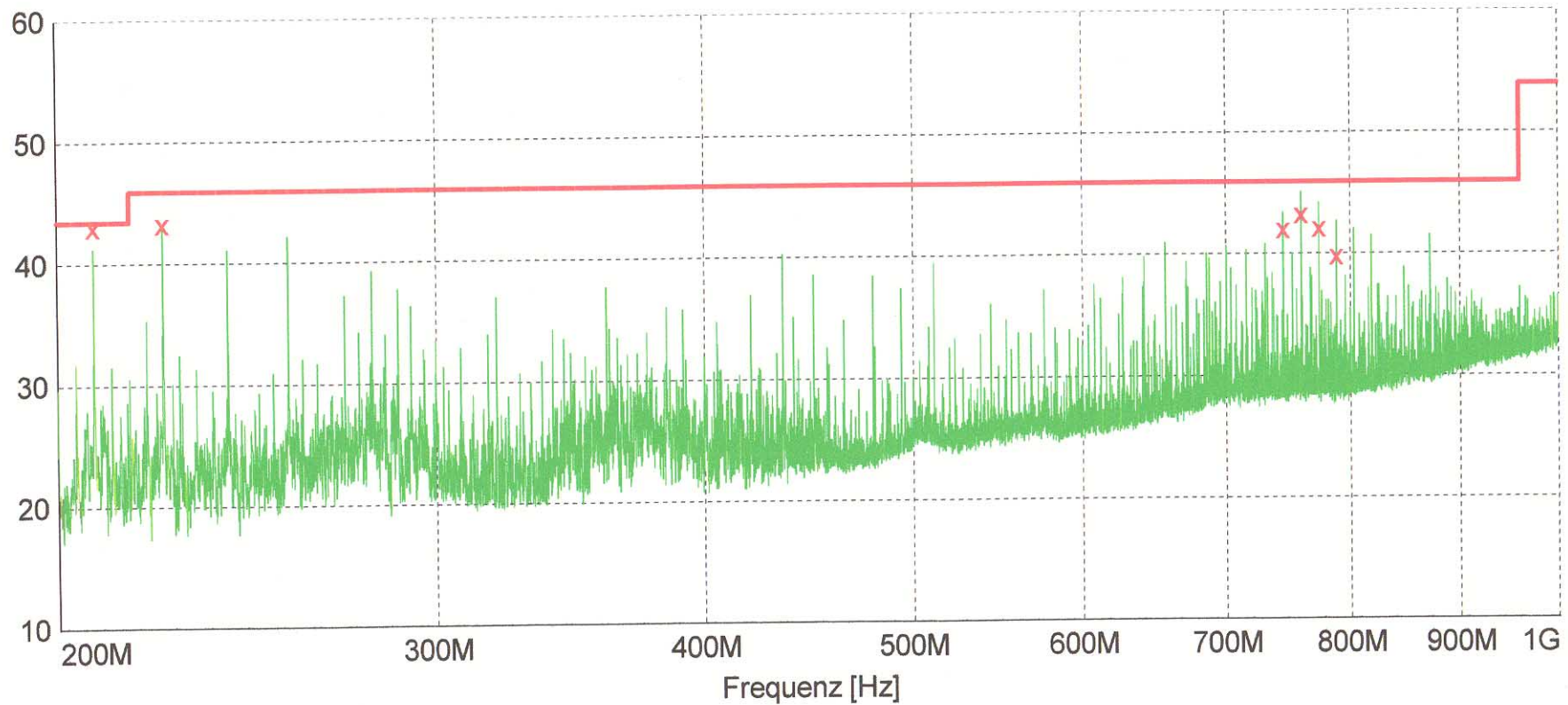
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 — MES Modul_P_F0_pre PK
 — LIM FCC ClassB F QP 40dB FCC ClassB, field strength 3m



x x : MES Modul_P_Flf_fin QP
 — MES Modul_P_Flf_pre PK
 — LIM FCC ClassB F QP/AV

FCC ClassB, field strength 3m

Pegel [dB μ V/m]



x x : MES Modul_P_F2f_fin QP
 — MES Modul_P_F2f_pre PK
 — LIM FCC ClassB F QP/AV

FCC ClassB, field strength 3m