TEST REPORT

of the accredited test laboratory

TÜV Nr.: 2024-AT-TC-EEE-1-EX-0-000005-FG-002

Applicant:	VusionGroup GmbH Kalsdorfer Strasse 12 A – 8072 Fernitz-Mellach
Tested Product:	Electronic shelf labelling system
Product Name:	VUSION 2.2
Model:	EDG5-0220-A
FCC-ID:	2ACQM-EDG5-0220-A
IC-ID:	12154A-EDG50220A
Manufacturer:	VusionGroup GmbH Kalsdorfer Strasse 12 A – 8072 Fernitz-Mellach

Output power / field strength:	2,54 mV/m average @ 3m distance	**power supply:**	3V DC internal battery
Frequency range:	2404,053 - 2479,285 MHz	**Channel separation:**	0,35 MHz
Standard:	FCC: 47 CFR Part 15 (eCFR 16.01.2024) RSS-102 Issue 6, December 2023 RSS-210 Issue 10, December 2019		

TÜV AUSTRIA GMBH
Test laboratory for EMC

Ing. Andreas Malek

examined by / Testing Laboratory TÜV AUSTRIA GMBH

19.01.2024

Ing. Michael Emminger

approved by / Testing Laboratory TÜV AUSTRIA GMBH

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

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1. Applicant

Company:	VusionGroup GmbH
Department:	Product & Project Manager
Address:	A – 8072 Fernitz-Mellach; Kalsdorfer Strasse 12
Contact person:	Mrs. Bernarda Minov-Petkov

EUT received on:	16.01.2024
Tests were performed on:	16.01. till 18.01.2024

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2. Description of EUT

EUT:	Electronic shelf labelling system
Product Name:	VUSION 2.2
Model:	EDG5-0220-A
Serial Number:	Prototype
Manufacturer:	VusionGroup GmbH A – 8072 Fernitz-Mellach; Kalsdorfer Strasse 12
Description:	VusionGroup GmbH provided the following configuration for the measurements: Prototype with special test-firmware for continuous transmission
Operating mode:	The measurements were carried out at the following running states: test-firmware running, transmitting continuously
Technical data EUT:	Rated voltage: 3VDC Rated current: <1A Rated frequency: DC Mains voltage during the tests: 3VDC internal battery
Climatic conditions in the emc laboratory:	Relative humidity: 26% Temperature: 23°C

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3. Standards / Final result

Name	Title	Deviation	Result
Title 47 CFR Part 15 eCFR 16.01.2024	RADIO FREQUENCY DEVICES	none	OK
RSS-210 Issue 10, December 2019	Licence-Exempt Radio Apparatus: Category I Equipment	none	OK
RSS-102 Issue 6, December 2023	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)	none	OK

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

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4.1 TEST OBJECT DATA

General EUT Description

This transceiver is working in a network consisting of a controller station, so called Accesspoint, and various displays. The Accesspoint transmits information to the displays and receives acknowledgements.
This device is a display operating in the network system. The device is equipped with a passive NFC chip onboard which does not have its own rf generation. It works as tag and can also receive information from the NFC reader station.

2.1033 (c) Technical description

2.1033 (4) Type of emission: Minimum shift keying – declared channel bandwidth 250 kHz – 'virtual' channel spacing about 0,35 MHz. Only 11 channels from the channel plan are used, therefore the channel spacing in reality is much higher and varies from 2,45 MHz minimum up to 17,15 MHz.

2.1033 (5) Frequency range: 2404,053 – 2479,285 MHz (channel center frequencies of channel 0 up to ch. 10)

2.1033 (6) Power range and Controls: The maximum field strength measured is 2,54 mV/m average @ 3m distance. There is no power control or regulation.

2.1033 (7) Maximum output power rating: 2,54 mV/m average @ 3m distance.

2.1033 (8) DC Voltage and Current: 3 VDC (internal battery)
maximum current consumption: 28,0mA during continuous transmission

RSS-135 This standard does not apply to:
1.1.(a) a receiver that scans radio frequencies for the purpose of enabling its associated transmitter to avoid transmitting in an occupied frequency but which does not have the capability of decoding the message (e.g. converting it to audio voice) contained in the radio signal

Worst case Spurious Emissions: 26,43 dBµV/m Average at 14651,25 MHz.

Tests were performed on: January 16th till 18th, 2024.

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4.2 Number of channels and channel spacing § 2.1033

Channel plan:

ESL-CH	RF-CH	f_{G2} [GHz] (26.000000 MHz) (6049109)
CH0	12	2.404053
CH1	29	2.410002
CH2	63	2.421899
CH3	71	2.424698
CH4	120	2.441844
CH5	141	2.449192
CH6	177	2.461789
CH7	199	2.469487
CH8	213	2.474386
CH9	220	2.476835
CH10	227	2.479285

Tests were performed on ESL channels 0, 4 and 10.

Test Equipment used: N/A

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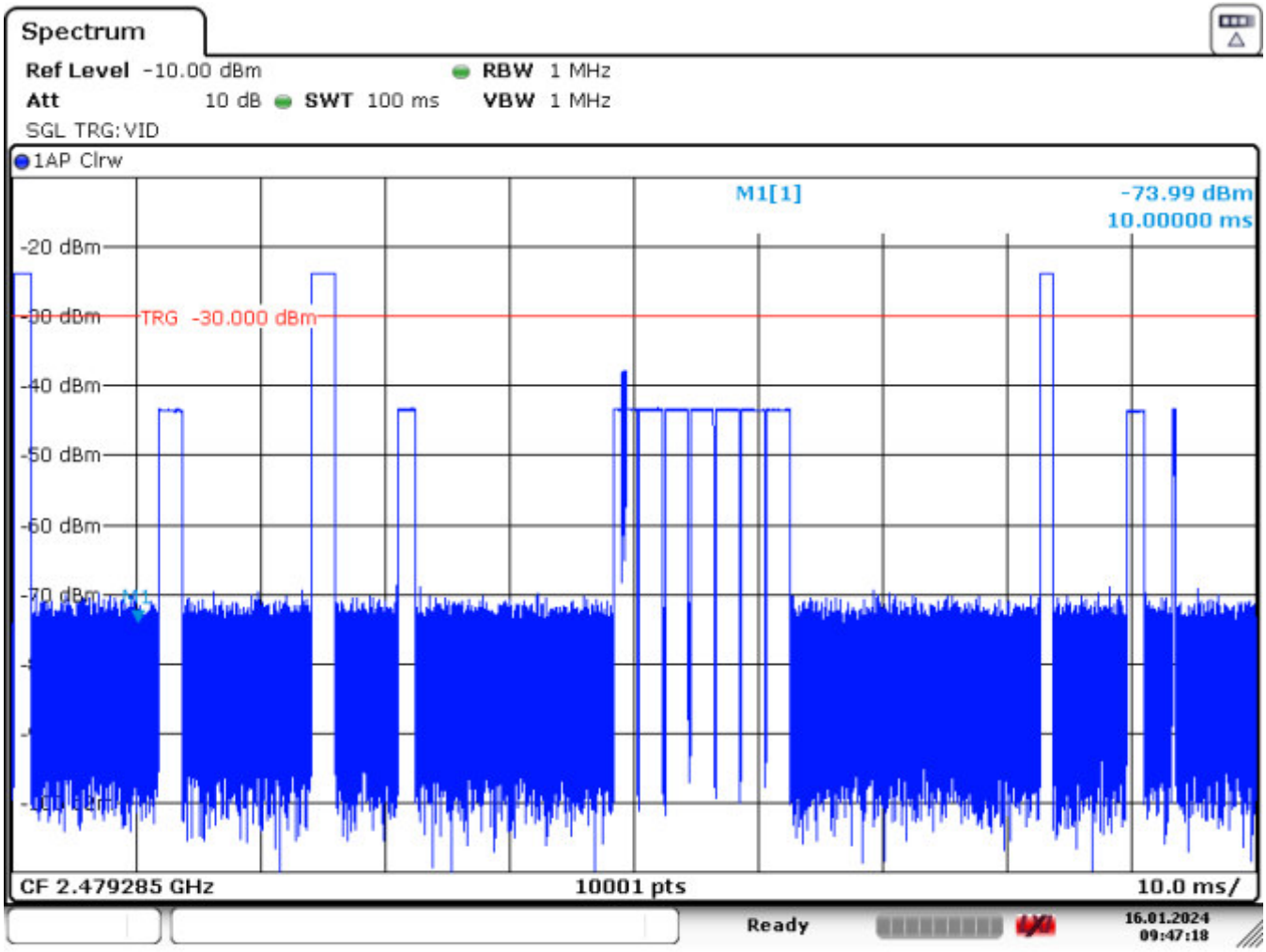
4.3 Duty Cycle measurements for averaging § 15.249 (e)

Mode: data transmission (worst case in 100ms)



Date: 16.JAN.2024 09:47:18

According to the timing protocol description provided by the manufacturer and attached as technical description to the application for certification, the transmission burst time was checked to not exceed the declared value. The declared value was taken for calculation, as that gives the worst case.
The first transmission burst in a 100ms time frame has a length of 1,46ms, the second one is 1,97ms in length and the third one is 1,19ms, giving a duty cycle of 4,62% or an average factor of -26,7 dB.

LIMIT SUBCLAUSE 15.249(e)

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Test Equipment used: EMV-205

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4.4 Field strength of emissions at 2400 – 2483,5 MHz § 15.249 (a) (c)

Operating on CH 0 (2404,053MHz)

The maximum peak value measured was 93,2 dBµV/m = 45,71 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -26,7 dB the maximum average value is then 66,5 dBµV/m = 2,11 mV/m at 3m distance.

LIMIT SUBCLAUSE 15.249(a) (c)

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200/1

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Field strength of emissions at 2400 – 2483,5 MHz **§ 15.249 (a) (c)**

Operating on CH 4 (2441,844 MHz)

The maximum peak value measured was 94,8 dBµV/m = 54,95 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -26,7 dB the maximum average value is then 68,1 dBµV/m = 2,54 mV/m at 3m distance.

LIMIT **SUBCLAUSE 15.249(a) (c)**

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200/1

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Field strength of emissions at 2400 – 2483,5 MHz **§ 15.249 (a) (c)**

Operating on CH 10 (2479,285 MHz)

The maximum peak value measured was 94,7 dBµV/m = 54,33 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -26,7 dB the maximum average value is then 68,0 dBµV/m = 2,51 mV/m at 3m distance.

LIMIT **SUBCLAUSE 15.249(a) (c)**

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200/1

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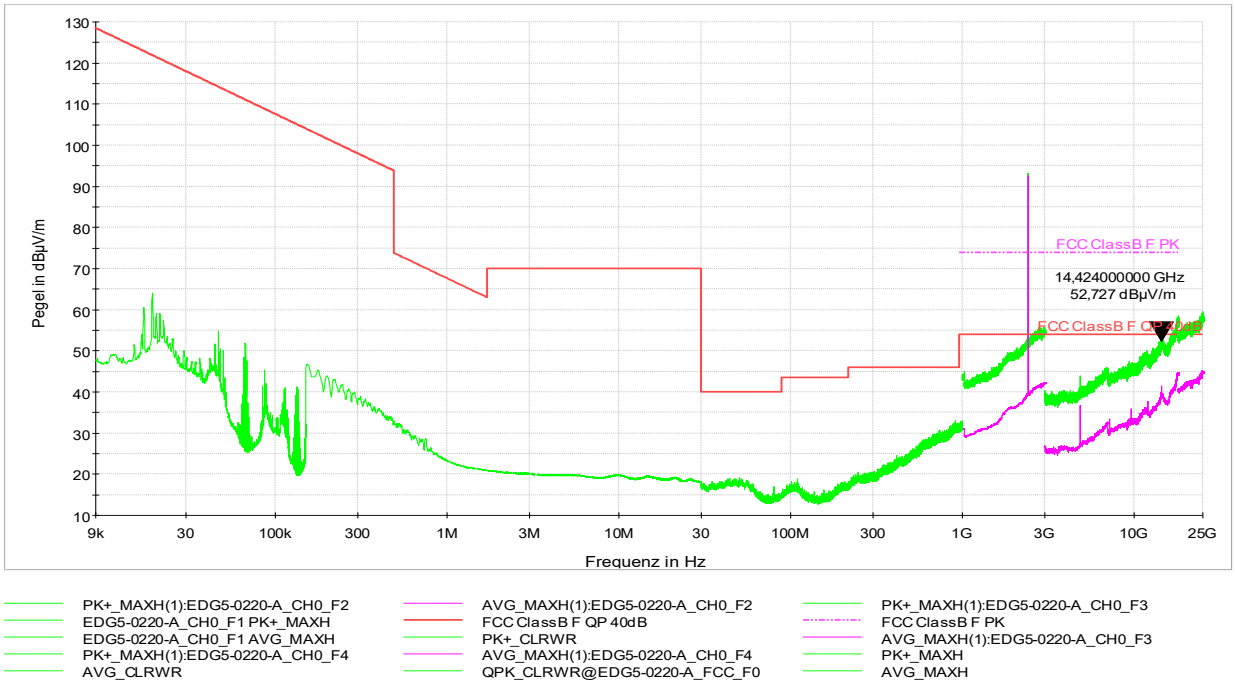
4.5 Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)
Channel 0 (2404,053 MHz) – average values above 1 GHz are shown in magenta – green = peak



Worst case Emission: 52,73 dBµV/m Peak at 14424,0 MHz giving 26,03 dBµV/m average with the factor described on page 8.

LIMIT SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used:
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

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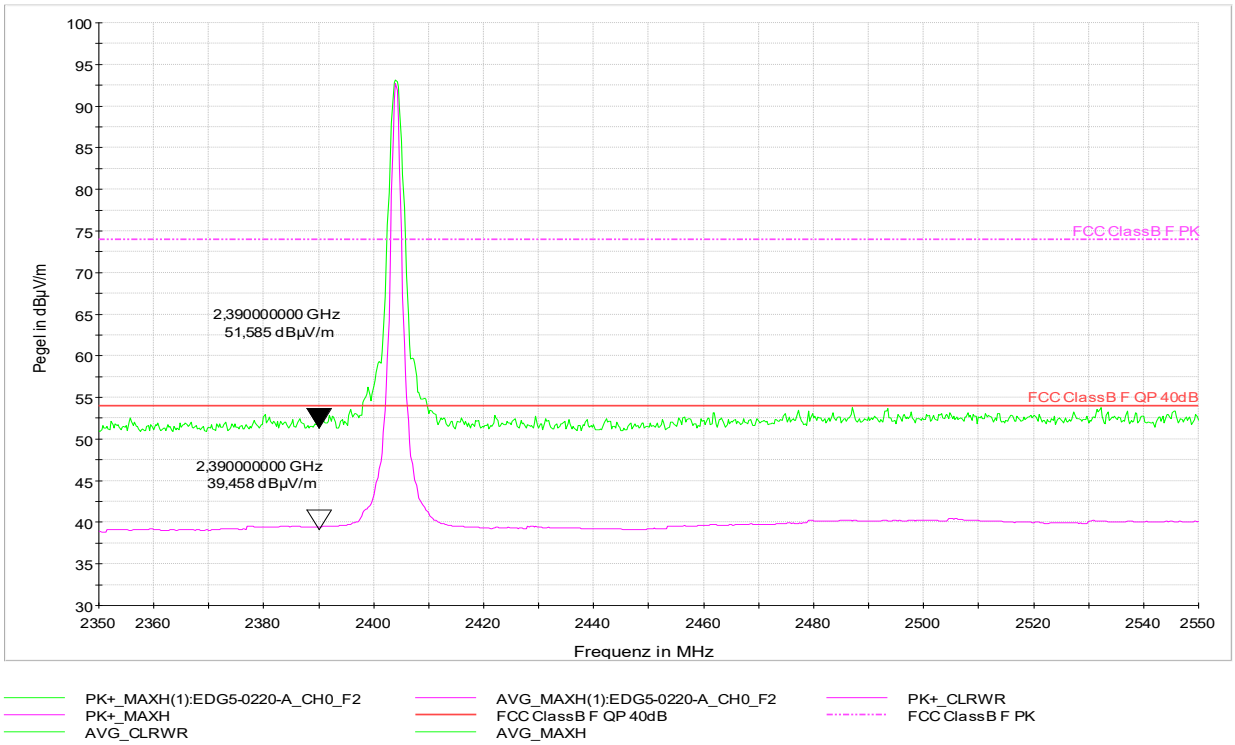
Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)
Channel 0 (2404,053 MHz) – band edge requirement – average values are in magenta – green = peak



Nearest Band Edge: 2390 MHz

LIMIT SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used:
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

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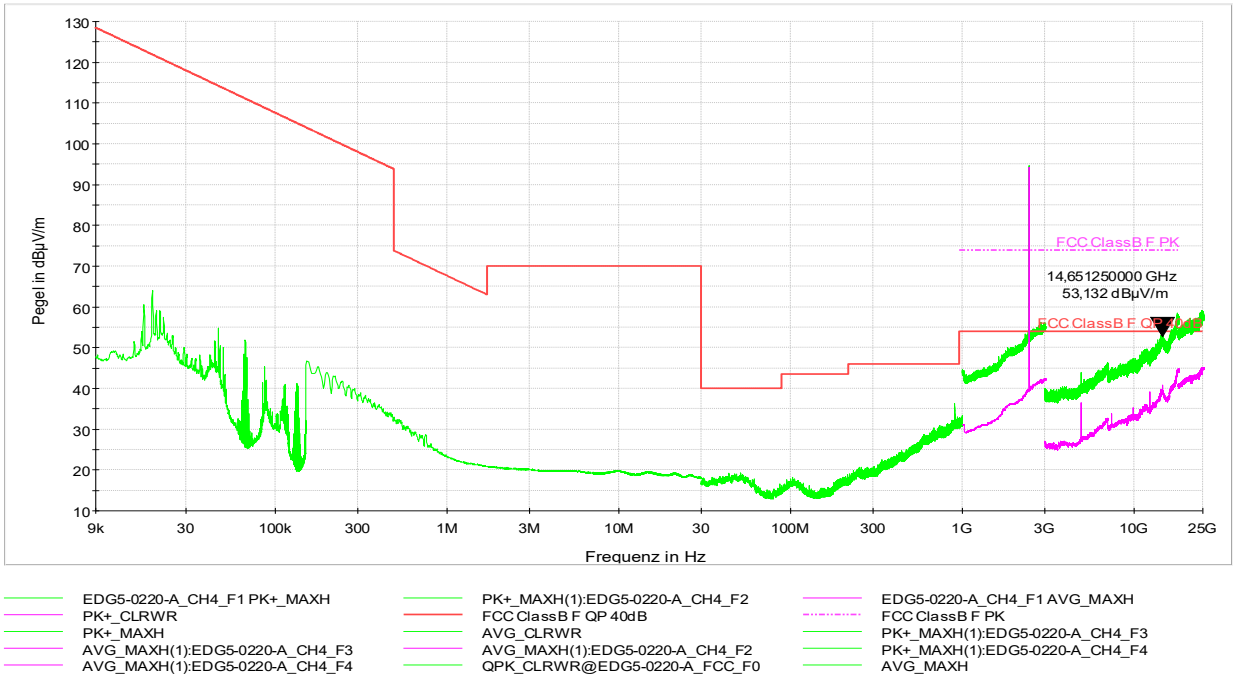
Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)
Channel 4 (2441,844 MHz) – average values above 1 GHz are shown in magenta – green = peak



Worst case Emission: 53,13 dBµV/m Peak at 14651,25 MHz giving 26,43 dBµV/m average with the factor described on page 8.

LIMIT SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used:
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

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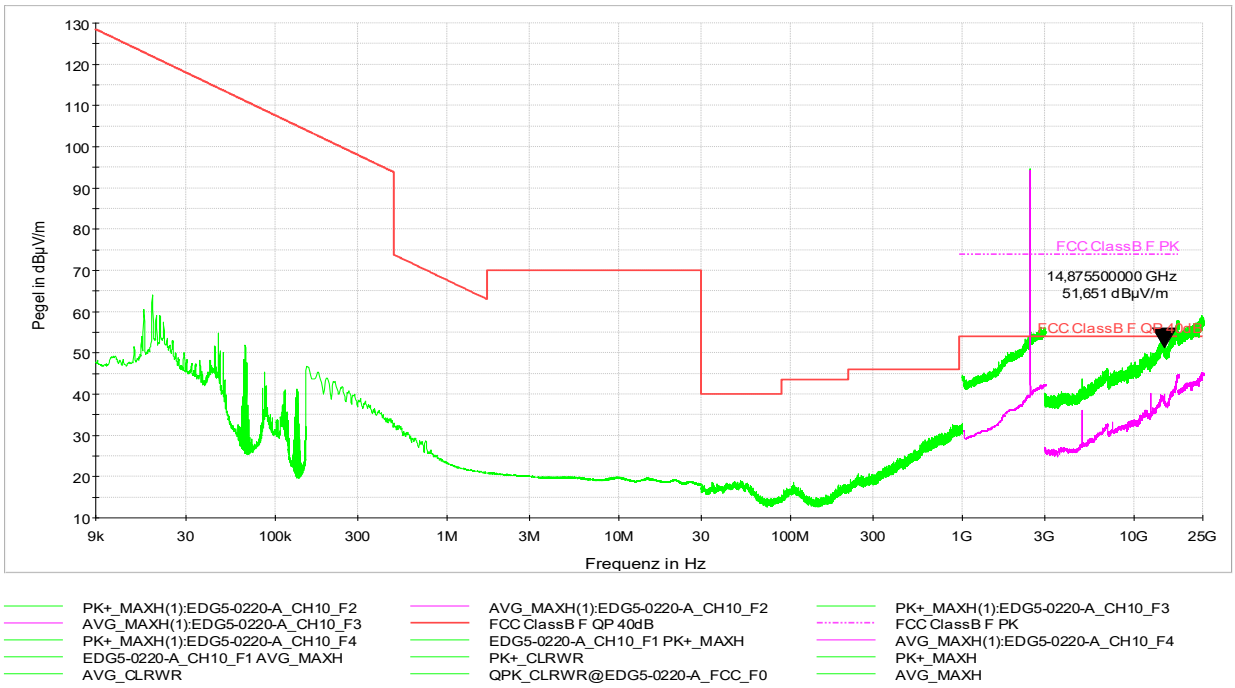
Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)
Channel 10 (2479,285 MHz) – average values above 1 GHz are shown in magenta – green = peak



Worst case Emission: 51,65 dBµV/m Peak at 14875,5 MHz giving 24,95 dBµV/m average with the factor described on page 8.

LIMIT SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used:
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

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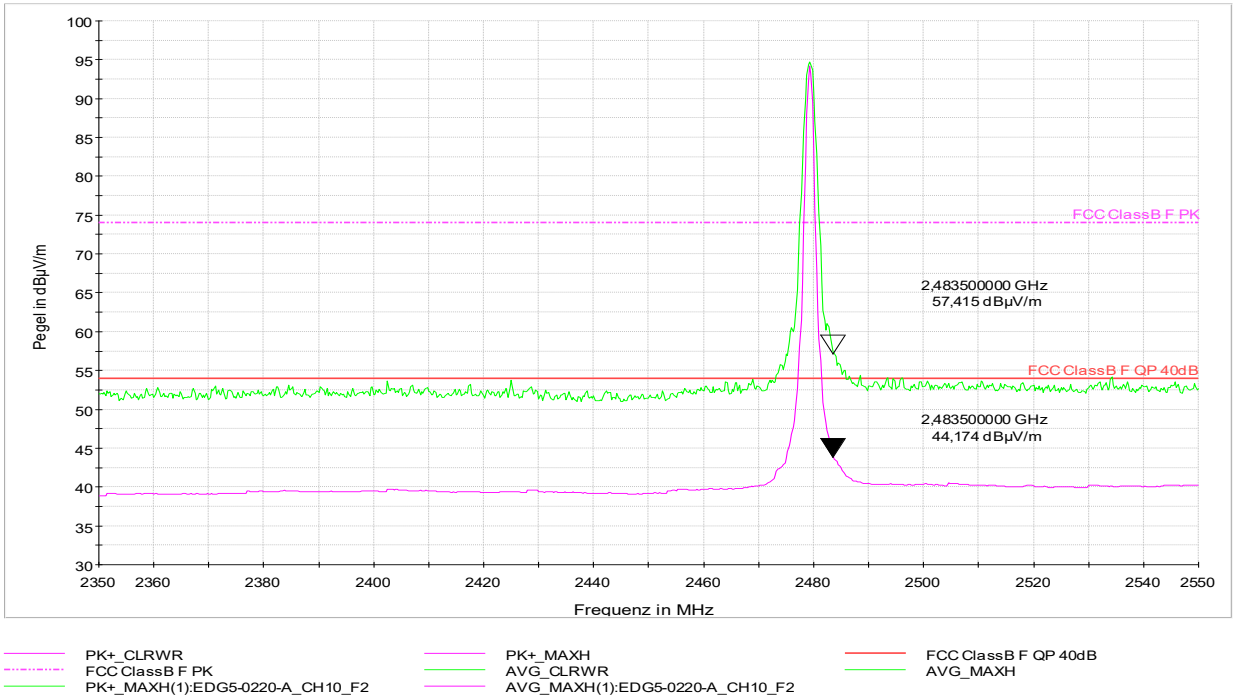
Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)
Channel 10 (2479,285 MHz) – band edge requirement – average values are in magenta – green = peak



Nearest Band Edge: 2483,5 MHz

LIMIT SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used:
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

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4.6 RF Exposure § 1.1307(b)(3)(i)(A)

Title 47 §1.1307(b)(3)(i):

(3) Determination of exemption. (i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

max. Tx power [mW] (from conducted and ERP measurement)	Duty cycle [%] (see 4.3)	max. time-averaged power [mW]	§1.1307(b)(3)(i)(A) limit [mW]
1,31	4,62	0,060	1

The maximum time-averaged power is less than 1 mW.

The device is an *exempt RF device* as per Title 47 §1.1307(b)(3)(i)(A).

ERP measurement:		Effective radiated power (mW)		
Test condition		CH 0 (2404,053MHz)	CH 4 (2441,844MHz)	CH 10 (2479,285MHz)
T_{nom} 23 °C	V_{nom} (3)V	0,38	0,56	0,54

EIRP measurement:		Effective isotropically radiated power (mW)		
Test condition		CH 0 (2404,053MHz)	CH 4 (2441,844MHz)	CH 10 (2479,285MHz)
T_{nom} 23 °C	V_{nom} (3)V	0,63	0,91	0,89

Conducted measurement		conducted power (mW)		
Test condition		CH 0 (2404,053MHz)	CH 4 (2441,844MHz)	CH 10 (2479,285MHz)
T_{nom} 23 °C	V_{nom} (3)V	1,29	1,28	1,31

Maximum Gain derived from EIRP and conducted measurement:		Maximum Gain (dBi)		
Test condition		CH 0 (2404,053MHz)	CH 4 (2441,844MHz)	CH 10 (2479,285MHz)
T_{nom} 23 °C	V_{nom} (3)V	-3,1	-1,46	-1,67

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RF Exposure **RSS-102, Issue 6**

6.3 SAR exemption limits

Devices operating at or below the applicable output power levels (adjusted for tune-up tolerance) specified in table 11, based on the separation distance, are exempt from SAR evaluation. The separation distance, defined as the distance between the user and/or bystander and the antenna and/or radiating element of the device or the outer surface of the device, shall be less than or equal to 20 cm for these exemption limits to apply.

Table 11: Power limits for exemption from routine SAR evaluation based on the separation distance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm (mW)	At separation distance of 10 mm (mW)	At separation distance of 15 mm (mW)	At separation distance of 20 mm (mW)	At separation distance of 25 mm (mW)
≤300	45	116	139	163	189
450	32	71	87	104	124
835	21	32	41	54	72
1900	6	10	18	33	57
2450	3	7	16	32	56
3500	2	6	15	29	50
5800	1	5	13	23	32

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm (mW)	At separation distance of 35 mm (mW)	At separation distance of 40 mm (mW)	At separation distance of 45 mm (mW)	At separation distance of ≥50 mm (mW)
≤300	216	246	280	319	362
450	147	175	208	248	296
835	96	129	172	228	298
1900	92	138	194	257	323
2450	89	128	170	209	245
3500	72	94	114	134	158
5800	41	54	74	102	128

The exemption limits in table 11 Table 11 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 50 mm from a flat phantom, which provides a SAR value of approximately 0.4 W/kg for 1 g of tissue.
For limb-worn devices where the 10 gram of tissue applies, the exemption limits for routine evaluation in table 11 are multiplied by a factor of 2.5.
For controlled-use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in table 11 Table 11 are multiplied by a factor of 5.
When the operating frequency of the device is between two frequencies located in table 11, linear interpolation shall be applied for the applicable separation distance. If the separation distance of the device is between two distances located in table 11, linear interpolation may be applied for the applicable frequency. Alternatively, the limit corresponding to the smaller distance may be employed. For example, in case of a 7 mm separation distance, either use the exception value for a 5 mm separation distance or interpolate between the limits corresponding to 5 mm and 10 mm separation distances.
For implanted medical devices, the exemption limit for routine SAR evaluation is set at an output power of 1 mW, regardless of frequency.

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RSS-102 Exemption calculation

Frequency (MHz)	cond. P (mW)	max. EIRP (mW)	Duty Cycle (1)	Avg. cond. P (mW)	Avg. EIRP (mW)	separation distance (mm)	Limit (mW)	
2404.053	1,29	0,63	0,0462	0,060	0,038	5	8,13	OK
2441.844	1,28	0,91	0,0462	0,059	0,054	5	7,61	OK
2479.285	1,31	0,89	0,0462	0,060	0,053	5	7,43	OK

*) Calculations are done for a minimum separaton distance that's derived from the antenna distance to the device casing and limb worn exposure. It is conservative, as customers are not expected to touch electronic shelf labels for extended periods of time.

The time-averaged output power is below the exemption limit for routine evaluation.

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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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Appendix 1 (continued)
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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Appendix 1 (continued)
Test equipment used

☐	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

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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

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