

TEST REPORT

of the accredited test laboratory

TÜV Nr.:INE-AT/FG-21/188

Applicant: SES-imagotag GmbH
Kalsdorfer Strasse 12
A – 8072 Fernitz-Mellach

Tested Product: Electronic shelf labelling system

Product Name: VUSION Gate E1-G incorporating radio module

Model: APG3-VGE1-A (Module: APG3-0240-A)

FCC-ID: 2ACQM-APG3-0240-A (radio module)

IC-ID: 12154A-APG30240A (radio module)

Manufacturer: SES-imagotag GmbH
Kalsdorfer Strasse 12
A – 8072 Fernitz-Mellach

Output power / field strength: 25,12 mV/m average @ 3m distance **power supply:** 5V DC via external power supply

Frequency range: 2404,053 - 2479,285 MHz **Channel separation:** 0,35 MHz

Standard: FCC: 47 CFR Part 15 (eCFR 07.12.2021)
RSS-210 Issue 10, December 2019

Testing Laboratory,
Inspection Body,
Certification Body,
Calibration Laboratory,
Verifizierungsstelle**Notified Body 0408**
IC 2932K-1**Non-executive**
Board of Directors:
KR DI Johann
Marihart**Management:**
DI Dr. Stefan Haas
Mag. Christoph
Wenninger**Registered Office:**
Deutschstrasse 10
1230 Vienna/Austria**Branch Offices:**
www.tuv.at/standorte**Company Register**
Court / - Number:
Vienna / FN 288476 f**Bank Details:**
IBAN
AT131200052949001066
BIC BKAUATWWVAT ATU63240488
DVR 3002476TÜV AUSTRIA SERVICES GMBH
Test laboratory for EMC

Ing. Michael Emminger

examined by / Testing
Laboratory
TÜV AUSTRIA SERVICES
GMBH

17.12.2021

Ing. Wilhelm Seier

approved by / Testing
Laboratory
TÜV AUSTRIA SERVICES
GMBH

A publication of this test report is only permitted literally.

Copying or reproduction of partial sections needs a written permission of TÜV AUSTRIA
SERVICES GMBH.

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

Contents

	Designation	PAGE
1.	Applicant	3
2.	Description of EUT	4
3.	Standards / Final result	5
4.	Test results	
	List of measurements according to 47 CFR 15 and RSS-210	
4.1	Test object data	6
4.2	Number of channels and channel spacing	7
4.3	Duty Cycle for averaging	8
4.4	Field strength at 2400 – 2483,5 MHz	9-11
4.5	Emissions outside 2400 – 2483,5 MHz (15.209)	12-14
4.6	RF Exposure	15
Appendix	Designation	PAGES
1	Test equipment used	5
2	Photodocumentation	14

1. Applicant

Company: SES-imagotag GmbH

Department: Product & Project Manager

Address: A – 8072 Fernitz-Mellach; Kalsdorfer Strasse 12

Contact person: Mr. Phillip Jauck

EUT received on: 07.12.2021

Tests were performed on: 07.12. and 09.12.2021

2. Description of EUT

EUT:	Electronic shelf labelling system
Product Name:	VUSION Gate E1-G incorporating radio module
Model:	APG3-VGE1-A (Module: APG3-0240-A)
Serial Number:	Prototype
Manufacturer:	SES-imagotag GmbH A – 8072 Fernitz-Mellach; Kalsdorfer Strasse 12
Description:	SES-imagotag 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: 5VDC Rated current: <1A Rated frequency: DC Mains voltage during the tests: 5VDC via external power supply
Climatic conditions in the emc laboratory:	Relative humidity: 30% Temperature: 23°C

3. Standards / Final result

Name	Title	Deviation	Result
Title 47 CFR Part 15 eCFR 07.12.2021	RADIO FREQUENCY DEVICES	none	OK
RSS-210 Issue 10, December 2019	Licence-Exempt Radio Apparatus: Category I Equipment	none	OK
Result: Opinions and interpretation of testing laboratory OK: EUT passed NOK: EUT failed			

4.1 TEST OBJECT DATA

General EUT Description

This transceiver module 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 25,12 mV/m average @ 3m distance. There is no power control or regulation.

2.1033 (7) Maximum output power rating: 25,12 mV/m average @ 3m distance.

2.1033 (8) DC Voltage and Current: 5 VDC via external power supply
maximum current consumption:< 1A 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

Tests were performed on: December 7th and 9th 2021.

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

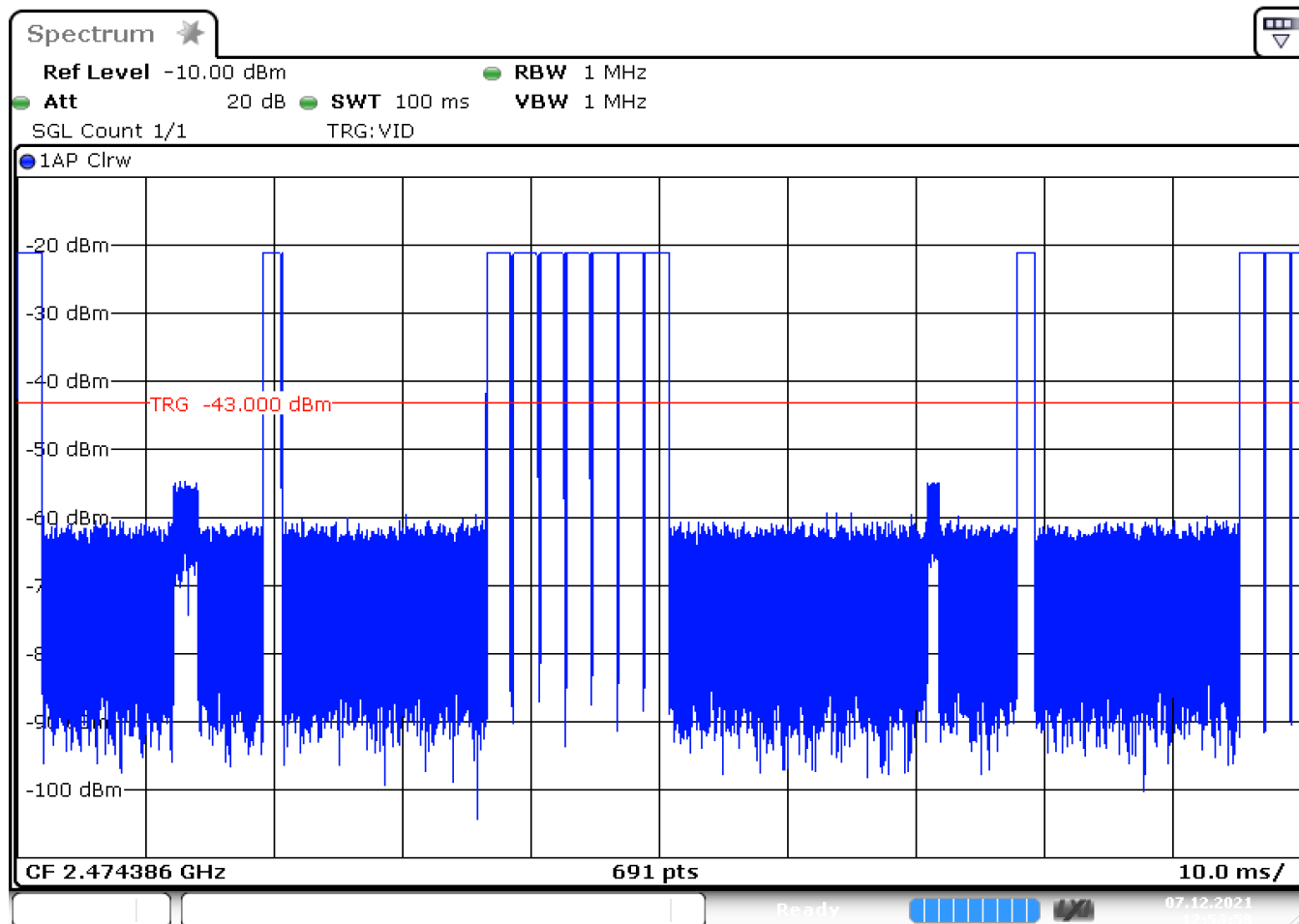
Tests were performed on ESL channels 0, 4 and 10.

Test Equipment used: N/A

4.3 Duty Cycle measurements for averaging

§ 15.249 (e)

Mode: data transmission (worst case in 100ms)



Date: 7.DEC.2021 12:53:58

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.

2 Transmission bursts of 1,48ms length plus 14 transmission bursts of 1,97ms length occurring in 100ms give a duty cycle of 30,54% or an average factor of -10,3 dB. This is the maximum duty cycle according to the protocol description.

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: NT-203/1

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 97,3 dBµV/m = 73,28 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -10,3 dB the maximum average value is then 87,0 dBµV/m = 22,39 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

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 97,5 dBµV/m = 74,99 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -10,3 dB the maximum average value is then 87,2 dBµV/m = 22,91 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

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 98,3 dBµV/m = 82,22 mV/m at 3m distance.

With the averaging factor calculated on page 8 of this test report of -10,3 dB the maximum average value is then 88,0 dBµV/m = 25,12 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

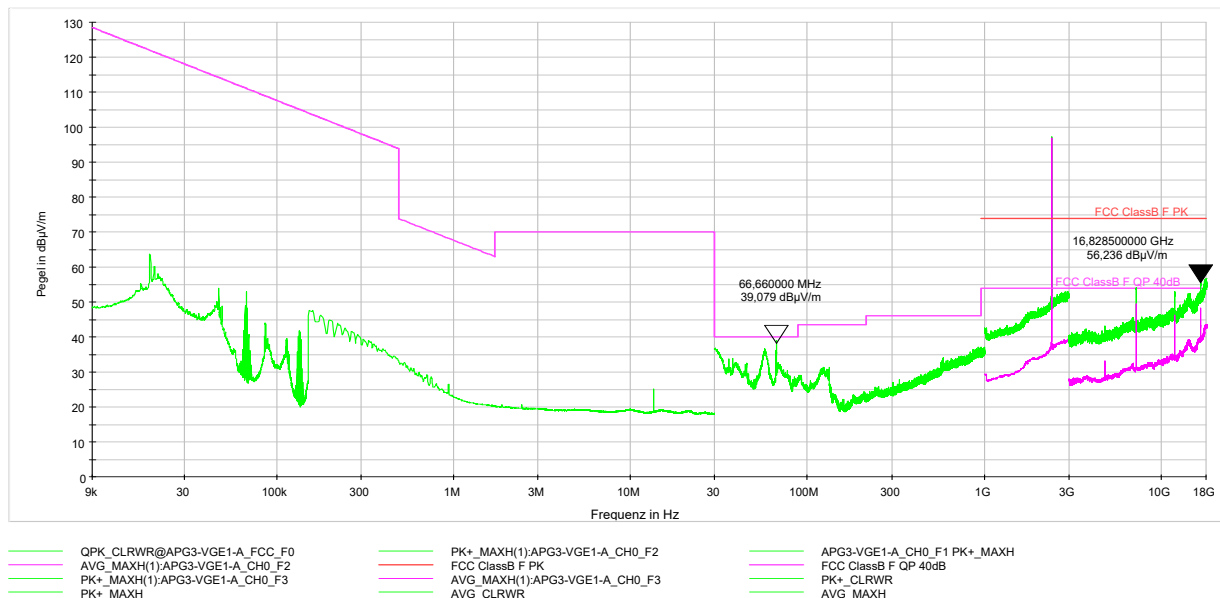
(c) Field strength limits are specified at a distance of 3 meters.

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

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 Emissions: 35,3 dBµV/m Quasipeak at 66,66 MHz and 56,24 dBµV/m Peak at 16,8285 GHz giving 45,94 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:

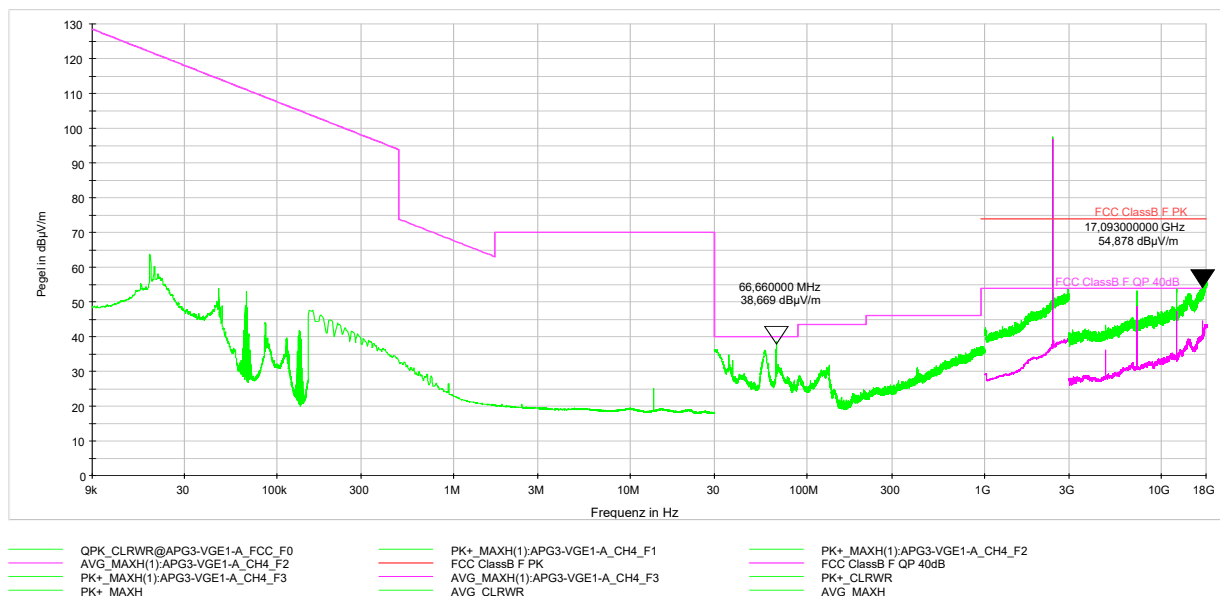
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

Remark: Although the measurements were made up to the 10th harmonic (25 GHz) the frequency range above 18 GHz is not automatized, so no graphs are available. Nevertheless no emissions above noise level were found in the frequency range above 18 GHz.

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 Emissions: 35,1 dBµV/m Quasipeak at 66,66 MHz and 54,88 dBµV/m Peak at 17,093 GHz giving 44,58 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:

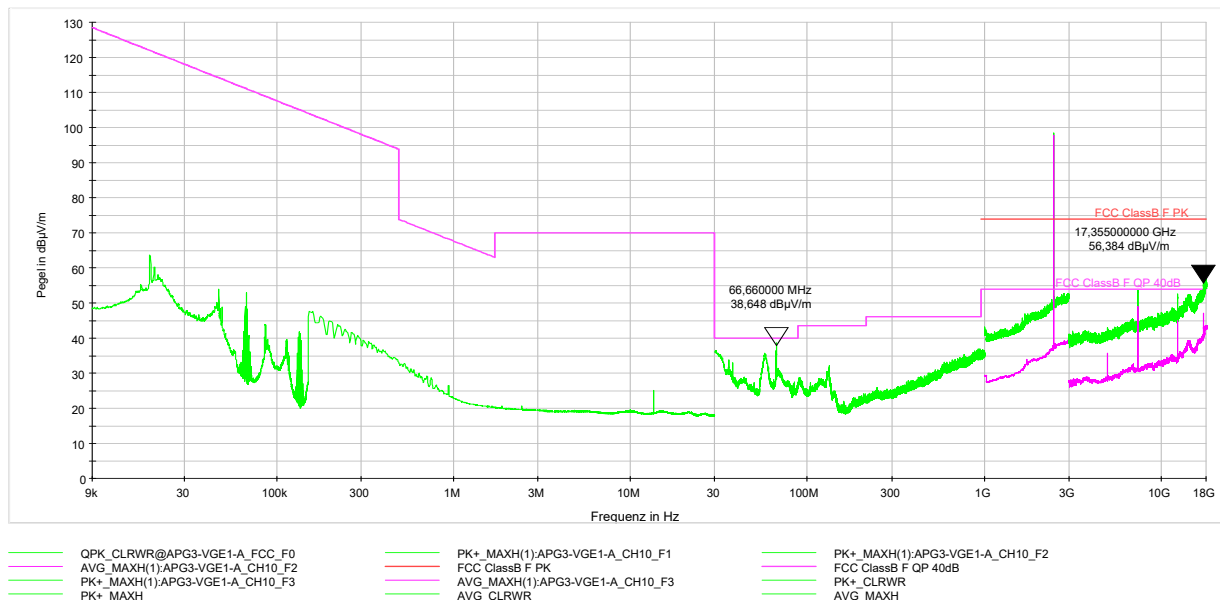
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200/1; NT-416

Remark: Although the measurements were made up to the 10th harmonic (25 GHz) the frequency range above 18 GHz is not automatized, so no graphs are available. Nevertheless no emissions above noise level were found in the frequency range above 18 GHz.

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 Emissions: 35,1 dBµV/m Quasipeak at 66,66 MHz and 56,38 dBµV/m Peak at 17,355 GHz giving 46,08 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

Remark: Although the measurements were made up to the 10th harmonic (25 GHz) the frequency range above 18 GHz is not automatized, so no graphs are available. Nevertheless no emissions above noise level were found in the frequency range above 18 GHz.

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);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

The applicant has determined that the device is a mobile device generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons.

Available maximum time-averaged power:

Frequency range (see 4.1 and 4.2)	max. conducted Tx power [mW] (see operational description)	Duty cycle (see 4.3)	max. time-averaged power	§1.1307(b)(3)(i)(B) limit ($P_{th} = ERP_{20 \text{ cm}}$)
2404,053 - 2479,285 MHz	10 mW	30.54 %	3.054 mW	3060 mW

ERP:

Frequency range (see 4.1 and 4.2)	max. field strength (see 4.4)	ERP	§1.1307(b)(3)(i)(B) limit ($P_{th} = ERP_{20 \text{ cm}}$)
2404,053 - 2479,285 MHz	97,3 dBμV/m @ 3m distance	0.982 mW	3060 mW

The available maximum time-averaged power is below P_{th} from separation distances of 1 cm and above. It is well below P_{th} for the 20 cm separation distance determined by the applicant.

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

Appendix 1

Test equipment used

☐	Anechoic Chamber with 3m measurement distance	NT-100	☐	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
☐	Stripline according to ISO 11452-5	NT-108	☐	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
☐	MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐	DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐	ESR – Test receiver 20 Hz – 26,5 GHz	NT-207/1
☐	CO3000 Controller Mast+Turntable	NT-112/1	☐	Digital Radio Tester CMW500	NT-208/1
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐	FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐	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 M19HWD 40 GHz – 60 GHz	NT-218
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐	Mixer M12HWD 60 GHz – 90 GHz	NT-219
☐	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
☐	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156			

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-21/188

Page: 1 of 5

Date: 17.12.2021

Appendix 1 (continued)

Test equipment used

☐ E-field probe 3 MHz – 18 GHz	NT-247	☐ Prana N-MT 500 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332/1
☐ H-field probe 27 MHz – 1 GHz	NT-248	☐ AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
☐ ELT-400 1 Hz – 400 kHz	NT-249	☐ APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐ MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ FCC-203I EM Injection clamp	NT-251	☐ Preamplifier for GPS MKU 152 A	NT-336
☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ Preamplifier 1 GHz – 18 GHz	NT-337/1
☐ PR50 Current Probe	NT-253	☐ DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐ i310s Current Probe	NT-254/1	☐ 2-97201 Electronic load	NT-341
☐ Fluke 87 V True RMS Multimeter	NT-260	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐ Model 2000 Digital Multimeter	NT-261	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ Fluke 87 V Digital Multimeter	NT-262/1	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐ LD 200 Mobil-impuls-generator	NT-351
☐ ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐ AN 200 S1 Artificial Network	NT-354
☐ EZ10 T-Artificial Network	NT-305	☐ FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐ SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐ PHE 4500 - Mains impedance network	NT-401
☐ SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	☐ IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐ RefRad Reference generator	NT-312	☐ TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐ SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐ ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐ 40 MHz Arbitrary Generator TGA1241	NT-315	☐ IP 4 - Capacitive clamp (Burst)	NT-411
☐ Artificial mains network NSLK 8127-PLC	NT-316	☐ Highpass-Filter 100 MHz – 3 GHz	NT-412
☐ PSURGE 4.1 Surge generator	NT-324	☐ Highpass-Filter 600 MHz – 4 GHz	NT-413
☐ IMU4000 Immunity test system	NT-325/1	☐ Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐ VCS 500-M6 Surge-Generator	NT-326	☐ Highpass-Filter 1800 MHz – 16 GHz	NT-415
☐ Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c		
☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330		
☐ T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331		

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-21/188

Page: 2 of 5

Date: 17.12.2021

Appendix 1 (continued)

Test equipment used

☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417/1	☐	FCC-801-T4 Coupling decoupling network	NT-463
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	FCC-801-C1 Coupling decoupling network	NT-464
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	RF-Attenuator 30 dB	NT-424	☐	WHKX12-2700-3000-18000 3 GHz Highpass filter	NT-472
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	WHKX10-3870-4500-18000 4,5 GHz Highpass filter	NT-473
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	RF-Attenuator 6 dB	NT-428	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	Van der Hoofden Test Head	NT-484
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	WRCJV12-5820-5850-5950-5980 5,9 GHz Band Reject Filter	NT-490
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	WHKX10-5670-6300-18000 6 GHz Highpass filter	NT-491
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	WHK12-935-1000-7000 1 GHz Highpass filter	NT-492
☐	RF-Load 150 W	NT-433	☐	EMC Video/Audiosystem	NT-511/1
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	ES-K1 Version 1.71 SP2 Test software	NT-520
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	EMC32 Version 10.60.20 Test software	NT-520/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Spitzenberger und Spies Test software V4.1	NT-525
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Vertical coupling plane (ESD)	NT-531
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #3 for conducted emission	NT-554
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	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-M3-16A Coupling decoupling network	NT-458	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Test cable #21 for SRM-3000	NT-592
☐	FCC-801-AF10 Coupling decoupling network	NT-461	☐	Shield chamber	NT-600
☐	FCC-801-S25 Coupling decoupling network	NT-462	☐	Climatic chamber	M-1200

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-21/188

Page: 3 of 5

Date: 17.12.2021

Appendix 1 (continued)

Test equipment used

☐	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	☐	HF- Amplifier 9 kHz-225 MHz BBL200	EMV-300/1	Division: Industry & Energy
☐	Turntable 6 m diameter	EMV-101	☐	HF- Amplifier 80 -1000 MHz BBA150	EMV-301	Department: FG
☐	Antenna mast + controller	EMV-102+ EMV-103	☐	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302	Test report number: INE-AT/FG-21/188
☐	EMC Video/Audiosystem	EMV-104	☐	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1	Page: 4 of 5
☐	EMC Software EMC32 Version 10.60.20	EMV-105	☐	High Power Ant. 20-200 MHz S12018-21	EMV-303/2	Date: 17.12.2021
☐	Hornantenna 1 – 18 GHz HF 907	EMV-110	☐	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304	
☐	Antennapre.amp. 1 – 18 GHz ERZ-LNA0200-1800-30-2	EMV-111	☐	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305	
☐	Trilog Antenna 30-3000 MHz VULB9163	EMV-112	☐	HF- Amplifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306	
☐	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	☐	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307	
☐	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	☐	Load Dump Generator LD 200N	EMV-350	
☐	Hornantenna 200 – 2000 MHz AH-220	EMV-115	☐	Ultra Compact Symulator UCS 200N100	EMV-351	
☐	DC Artificial Network PVDC 8300	EMV-150	☐	Automotive Power fail module PFM 200N100.1	EMV-352	
☐	AC Artificial Network NNLK 8121 RC	EMV-151	☐	Voltage Drop Symulator VDS 200Q100	EMV-353	
☐	EMI Receiver ESW44	EMV-200/1	☐	Arb. Generator AutoWave	EMV-354	
☐	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	☐	Ultra Compact Symulator UCS 500N7	EMV-355	
☐	GPS Frequency normal B-88	EMV-202	☐	Coupling decoupling network CNI 503B7 / 32 A	EMV-356	
☐	DC Power supply N5745A	EMV-203	☐	Coupling decoupling network CNI 503B7 / 63 A	EMV-357	
☐	Spektrum Analyzator FSV40	EMV-205	☐	Telecom Surge Generator TSurge 7	EMV-358	
☐	Thd Multimeter Model 2015	EMV-206	☐	Coupling decoupling network CNI 508N2	EMV-359	
☐	Poweramplifier PAS15000	EMV- 207/abc	☐	Coupling decoupling network CNV 504N2.2	EMV-360	
☐	Inrush Current Source	EMV- 208/abc	☐	Immunity generator NSG4060/NSG4060-1	EMV-361	
☐	Arb.-generator Sycore	EMV-209	☐	Coupling network CDND M316-2	EMV-362	
☐	Harmonics/Flicker analyzer ARS 16/3	EMV-210	☐	Coupling network CT419-5	EMV-363	
☐	Power Supply Regatron AC	EMV-214	☐	ESD Generator NSG 437	EMV-364	
☐	Power Supply Regatron DC	EMV-215	☐	Pulse Limiter VTSD 9561-F BNC	EMV-405	
☐	Harmonics/Flicker analyser Zimmer	EMV-216	☐	Transient emission BSM200N40+BS200N100	EMV- 450+451	
☐	Flicker Impedanz Newtons4th 753	EMV-218	☐	Cap. Coupling Clamp HFK	EMV-455	
☐	Comemso	EMV-219	☐	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

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-21/188

Page: 5 of 5

Date: 17.12.2021