

TEST REPORT

of the accredited test laboratory

TÜV Nr.:INE-AT/FG-19/228

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

Tested Product: Networking transceiver "EDG3-0220-A"

FCC-ID: 2ACQM-EDG3-0220-A

IC-ID: 12154A-EDG30220A

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

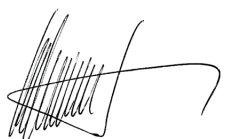
Output power / 2,51 mV/m average **power supply:** 3V DC
field strength: @ 3m distance internal battery

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

Standard: FCC: 47 CFR Part 15 (Oct. 1st 2018 edition)
RSS-210 Issue 9, August 2016

TÜV AUSTRIA SERVICES GMBH
Test laboratory for EMC

Supervisor of EMC-laboratory:



Ing. Wilhelm Seier



23.10.2019

checked by:



Ing. Michael Emminger



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 BKAUATWW

IBAN
AT153100000104093282
BIC RZBAATWW

VAT ATU63240488
DVR 3002476

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
Appendix	Designation	PAGES
1	Test equipment used	4
2	Photodocumentation	8

1. Applicant

Company: SES-imagotag GmbH

Department: Product & Project Manager

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

Contact person: Mr. Philipp Jauck

EUT received on: 22.10.2019

Tests were performed on: 22. and 23.10.2019

2. Description of EUT

EUT:	Networking transceiver "EDG3-0220-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: 3VDC Rated current: <1A Rated frequency: DC Mains voltage during the tests: 3VDC internal battery
Climatic conditions in the emc laboratory:	Relative humidity: 43% Temperature: 24°C

3. Standards / Final result

Name	Title	Deviation	Result
Title 47 CFR Part 15 1. October 2018 edition	RADIO FREQUENCY DEVICES	none	OK
RSS-210 Issue 9, August 2016	Licence-Exempt Radio Apparatus: Category I Equipment	none	OK
<p>Result: Opinions and interpretation of testing laboratory OK: EUT passed NOK: EUT failed</p>			

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 module to be used in displays 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 2,51 mV/m average @ 3m distance. There is no power control or regulation.
- 2.1033 (7) Maximum output power rating: 2,51 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

Tests were performed on: October 22nd and 23rd 2019.

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

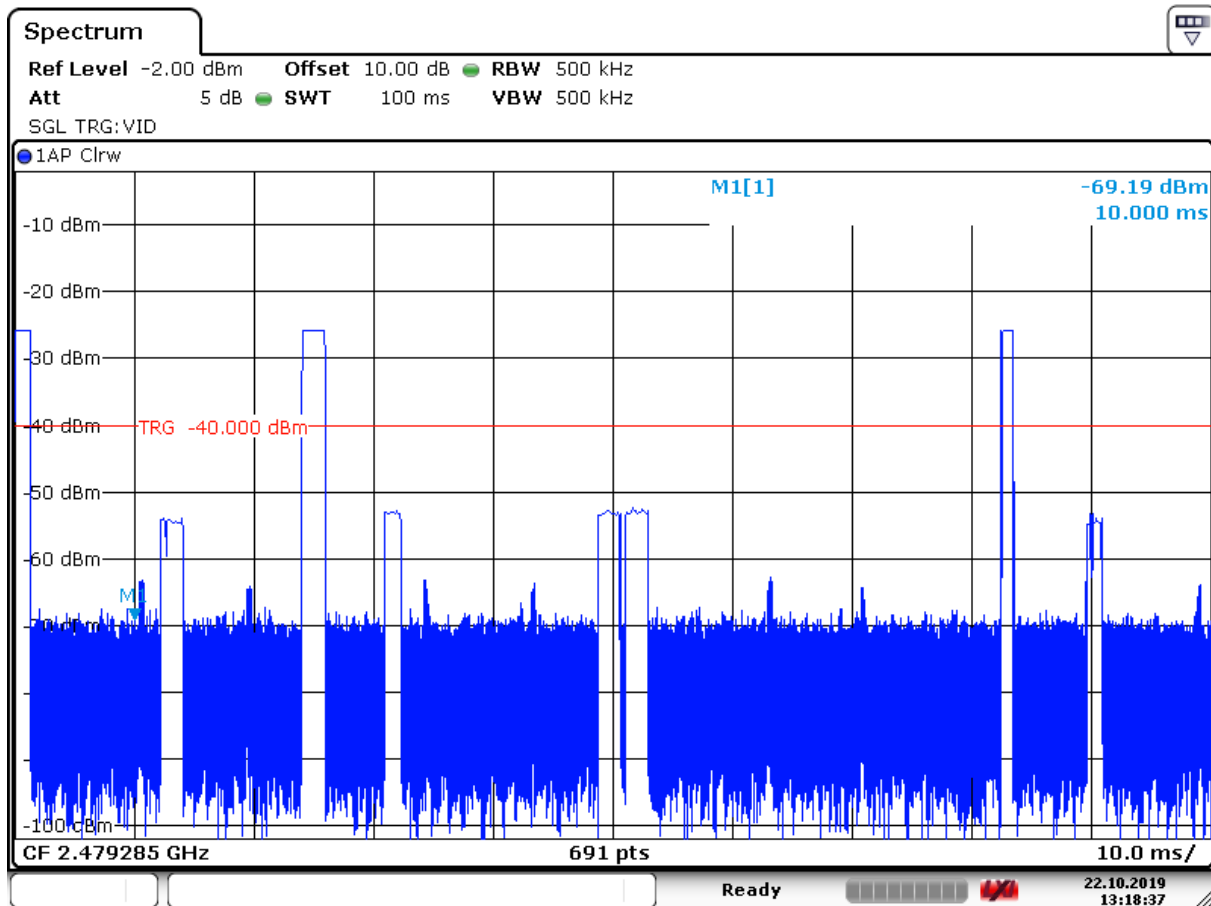
Tests were performed on ESL channels 0, 4 and 10.

Test Equipment used: N/A

4.3 Duty Cycle measurements for averaging

§ 15.249 (e)

Mode: data transmission (worst case in 100ms)



Date: 22.OCT.2019 13:18:38

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. Transmission bursts of 1,48ms length occurring twice in 100ms with another handshaking burst of 1,97ms length give a duty cycle of 4,93% or an average factor of -26,1 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

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 94,1 dBµV/m = 50,70 mV/m at 3m distance.

With the averaging factor calculated on page 5 of this test report of -26,1 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

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 93,8 dBµV/m = 48,98 mV/m at 3m distance.

With the averaging factor calculated on page 5 of this test report of -26,1 dB the maximum average value is then 67,7 dBµV/m = 2,43 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

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 93,6 dBµV/m = 47,86 mV/m at 3m distance.

With the averaging factor calculated on page 5 of this test report of -26,1 dB the maximum average value is then 67,5 dBµV/m = 2,37 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

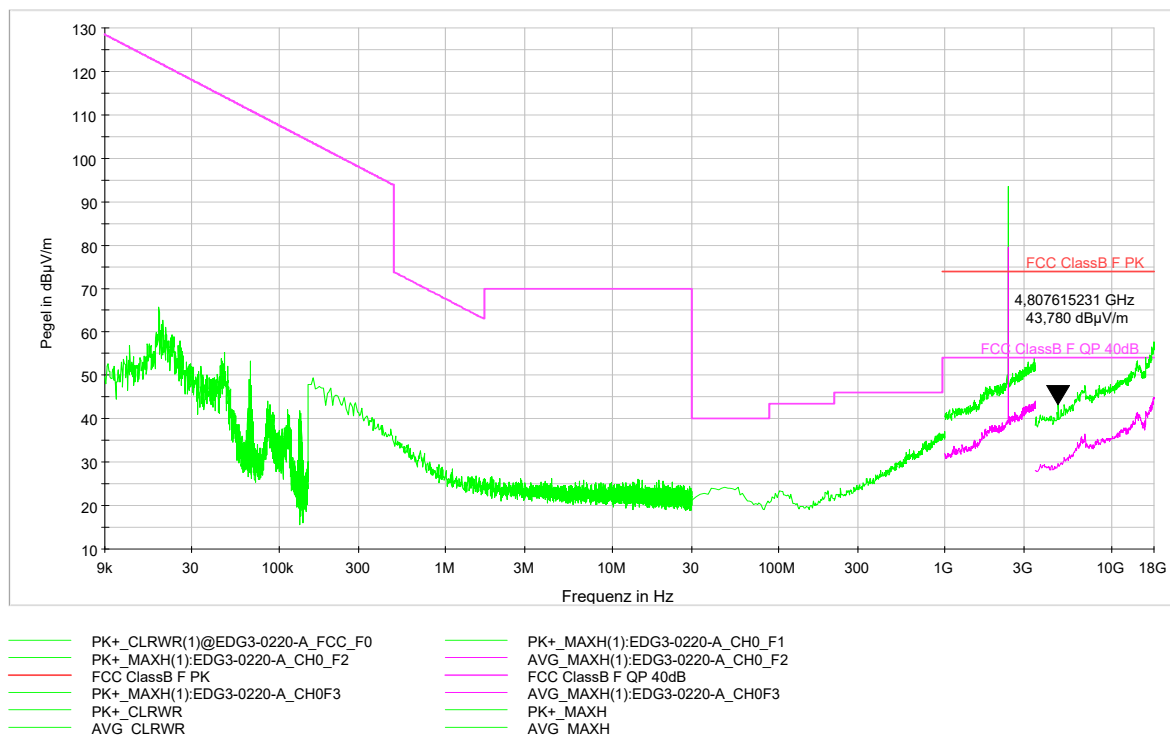
(c) Field strength limits are specified at a distance of 3 meters.

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

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: 43,78 dBµV/m Peak at 4808 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:

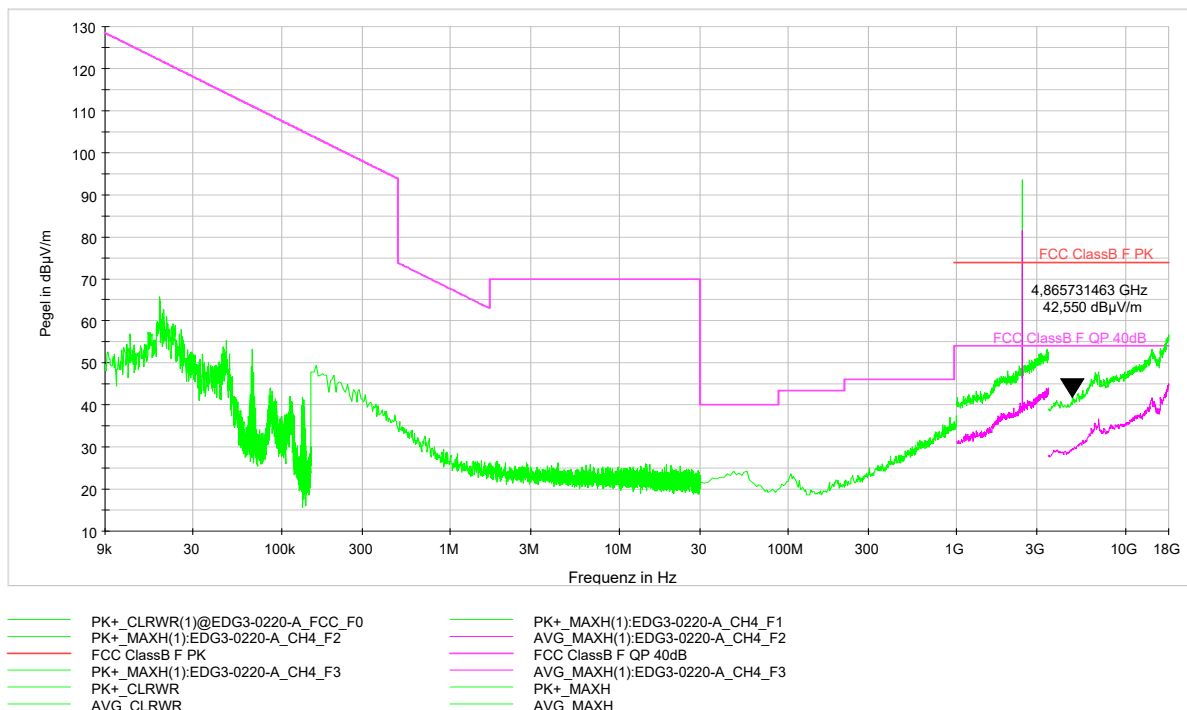
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200; NT-416

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 Emission: 42,55 dBµV/m Peak at 4883 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:

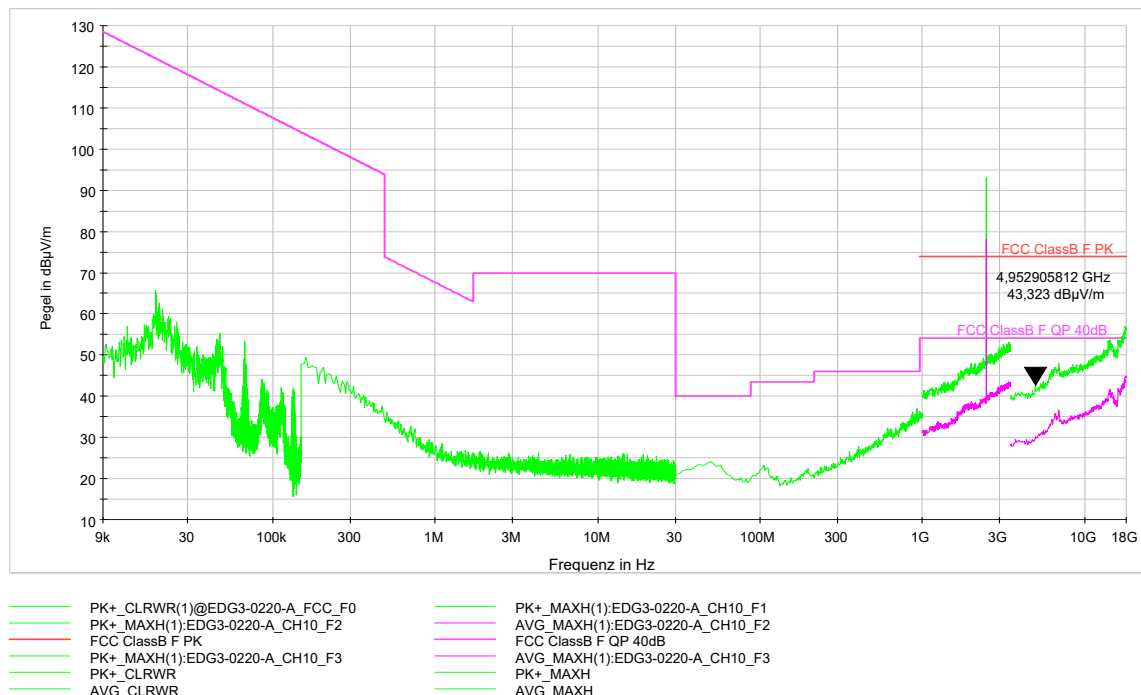
EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200; NT-416

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 Emission: 43,32 dBµV/m Peak at 4958 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; 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.

Appendix 1

Test equipment used

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-19/228

Page: 1 of 4

Date: 23.10.2019

<input type="checkbox"/>	Anechoic Chamber with 3m measurement distance	NT-100	<input type="checkbox"/>	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
<input type="checkbox"/>	Stripline according to ISO 11452-5	NT-108	<input type="checkbox"/>	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
<input type="checkbox"/>	MA4000 - Antenna mast 1 - 4 m height	NT-110/1	<input type="checkbox"/>	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
<input type="checkbox"/>	DS - Turntable 0 - 400 ° Azimuth	NT-111/1	<input type="checkbox"/>	ESI26 – Test receiver 20 Hz – 26,5 GHz	NT-207
<input type="checkbox"/>	CO3000 Controller Mast+Turntable	NT-112/1	<input type="checkbox"/>	Digital Radio Tester CMW500	NT-208/1
<input type="checkbox"/>	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	<input type="checkbox"/>	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
<input type="checkbox"/>	FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	<input type="checkbox"/>	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
<input type="checkbox"/>	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	<input type="checkbox"/>	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
<input type="checkbox"/>	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	<input type="checkbox"/>	Digital Radio Tester Aeroflex 3920	NT-212/1
<input type="checkbox"/>	3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	<input type="checkbox"/>	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
<input type="checkbox"/>	3116 - Horn Antenna 18 - 40 GHz	NT-126	<input type="checkbox"/>	RubiSource T&M Timing reference	NT-216
<input type="checkbox"/>	SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	<input type="checkbox"/>	Radiocommunicationanalyzer SWR 1180 MD	NT-217
<input type="checkbox"/>	AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	<input type="checkbox"/>	Mixer M19HWD 40 GHz – 60 GHz	NT-218
<input type="checkbox"/>	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	<input type="checkbox"/>	Mixer M12HWD 60 GHz – 90 GHz	NT-219
<input type="checkbox"/>	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	<input type="checkbox"/>	DSO9104 Digital scope	NT-220/1
<input type="checkbox"/>	3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	<input type="checkbox"/>	TPS 2014 Digital scope	NT-222
<input type="checkbox"/>	VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	<input type="checkbox"/>	Artificial Ear according to IEC 60318	NT-224
<input type="checkbox"/>	Loop Antenna H-Field	NT-132	<input type="checkbox"/>	1 kHz Sound calibrator	NT-225
<input type="checkbox"/>	Horn Antenna 500 MHz - 2900 MHz	NT-133	<input type="checkbox"/>	B10 - Harmonics and flicker analyzer	NT-232
<input type="checkbox"/>	Horn Antenna 500 MHz - 6000 MHz	NT-133/1	<input type="checkbox"/>	SRM-3006 Spectrumanalyzer	NT-233/1a
<input type="checkbox"/>	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	<input type="checkbox"/>	E-field probe SRM 75 MHz – 3 GHz	NT-234
<input type="checkbox"/>	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	<input type="checkbox"/>	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e
<input type="checkbox"/>	BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	<input type="checkbox"/>	Hall-Teslameter ETM-1	NT-241
<input type="checkbox"/>	Conical Dipol Antenna PCD8250	NT-138	<input type="checkbox"/>	EFA-3 H-field- / E-field probe	NT-243
<input type="checkbox"/>	HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	<input type="checkbox"/>	EHP-50F H-field- / E-field probe	NT-243/1
<input type="checkbox"/>	HZ-1 Antenna tripod	NT-150	<input type="checkbox"/>	Field Meter EMR-200 100 kHz – 3 GHz	NT-244
<input type="checkbox"/>	BN 1500 Antenna tripod	NT-151	<input type="checkbox"/>	E-field probe 100 kHz – 3 GHz	NT-245
<input type="checkbox"/>	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	<input type="checkbox"/>	H-field probe 300 kHz – 30 MHz	NT-246

Appendix 1 (continued)

Test equipment used

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-19/228

Page: 2 of 4

Date: 23.10.2019

<input type="checkbox"/> E-field probe 3 MHz – 18 GHz	NT-247	<input type="checkbox"/> T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331
<input type="checkbox"/> H-field probe 27 MHz – 1 GHz	NT-248	<input type="checkbox"/> 500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332
<input type="checkbox"/> ELT-400 1 Hz – 400 kHz	NT-249	<input type="checkbox"/> AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
<input type="checkbox"/> MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	<input type="checkbox"/> APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
<input type="checkbox"/> FCC-203I EM Injection clamp	NT-251	<input type="checkbox"/> Preamplifier 1 GHz - 4 GHz	NT-335
<input type="checkbox"/> FCC-203I-DCN Ferrite decoupling network	NT-252	<input type="checkbox"/> Preamplifier for GPS MKU 152 A	NT-336
<input type="checkbox"/> PR50 Current Probe	NT-253	<input type="checkbox"/> Preamplifier 100 MHz – 23 GHz	NT-337
<input type="checkbox"/> i310s Current Probe	NT-254/1	<input type="checkbox"/> DC Block 10 MHz – 18 GHz Model 8048	NT-338
<input type="checkbox"/> Fluke 87 V True RMS Multimeter	NT-260	<input type="checkbox"/> 2-97201 Electronic load	NT-341
<input type="checkbox"/> Model 2000 Digital Multimeter	NT-261	<input type="checkbox"/> TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
<input type="checkbox"/> Fluke 87 V Digital Multimeter	NT-262/1	<input type="checkbox"/> TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
<input type="checkbox"/> ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	<input type="checkbox"/> VDS 200 Mobil-impuls-generator	NT-350
<input type="checkbox"/> ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	<input type="checkbox"/> LD 200 Mobil-impuls-generator	NT-351
<input type="checkbox"/> ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	<input type="checkbox"/> MPG 200 Mobil-Impuls-Generators	NT-352
<input type="checkbox"/> ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	<input type="checkbox"/> EFT 200 Mobil-impuls-generator	NT-353
<input type="checkbox"/> PHE 4500/B Power amplifier	NT-304	<input type="checkbox"/> AN 200 S1 Artificial Network	NT-354
<input type="checkbox"/> EZ10 T-Artificial Network	NT-305	<input type="checkbox"/> FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
<input type="checkbox"/> SMG - Signal generator 0,1 - 1000 MHz	NT-310	<input type="checkbox"/> PHE 4500 - Mains impedance network	NT-401
<input type="checkbox"/> SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	<input type="checkbox"/> IP 6.2 Coupling filter for data lines (Surge)	NT-403
<input type="checkbox"/> RefRad Reference generator	NT-312	<input type="checkbox"/> TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
<input type="checkbox"/> SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	<input type="checkbox"/> ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
<input type="checkbox"/> 40 MHz Arbitrary Generator TGA1241	NT-315	<input type="checkbox"/> IP 4 - Capacitive clamp (Burst)	NT-411
<input type="checkbox"/> Artificial mains network NSLK 8127-PLC	NT-316	<input type="checkbox"/> Highpass-Filter 100 MHz – 3 GHz	NT-412
<input type="checkbox"/> ESD 30 System up to 25 kV	NT-321	<input type="checkbox"/> Highpass-Filter 600 MHz – 4 GHz	NT-413
<input type="checkbox"/> PSURGE 4.1 Surge generator	NT-324	<input type="checkbox"/> Highpass-Filter 1250 MHz – 4 GHz	NT-414
<input type="checkbox"/> IMU4000 Immunity test system	NT-325/1	<input type="checkbox"/> Highpass-Filter 1800 MHz – 16 GHz	NT-415
<input type="checkbox"/> VCS 500-M6 Surge-Generator	NT-326		
<input type="checkbox"/> Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c		
<input type="checkbox"/> BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330		

Appendix 1 (continued)

Test equipment used

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-19/228

Page: 3 of 4

Date: 23.10.2019

<input type="checkbox"/>	Highpass-Filter 3500 MHz – 18 GHz	NT-416	<input type="checkbox"/>	FCC-801-AF10 Coupling decoupling network	NT-461
<input type="checkbox"/>	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	<input type="checkbox"/>	FCC-801-S25 Coupling decoupling network	NT-462
<input type="checkbox"/>	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	<input type="checkbox"/>	FCC-801-T4 Coupling decoupling network	NT-463
<input type="checkbox"/>	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	<input type="checkbox"/>	FCC-801-C1 Coupling decoupling network	NT-464
<input type="checkbox"/>	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	<input type="checkbox"/>	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
<input type="checkbox"/>	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	<input type="checkbox"/>	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
<input type="checkbox"/>	RF-Attenuator 30 dB	NT-424	<input type="checkbox"/>	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
<input type="checkbox"/>	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	<input type="checkbox"/>	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
<input type="checkbox"/>	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	<input type="checkbox"/>	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
<input type="checkbox"/>	RF-Attenuator 6 dB	NT-428	<input type="checkbox"/>	Van der Hoofden Test Head	NT-484
<input type="checkbox"/>	RF-Attenuator 0 dB - 81 dB	NT-429	<input type="checkbox"/>	EMC Video/Audiosystem	NT-511/1
<input type="checkbox"/>	WRU 27 - Band blocking 27 MHz	NT-430	<input type="checkbox"/>	ES-K1 Version 1.71 SP2 Test software	NT-520
<input type="checkbox"/>	WHJ450C9 AA - High pass 450 MHz	NT-431	<input type="checkbox"/>	EMC32 Version 10.50.40 Test software	NT-520/1
<input type="checkbox"/>	WHJ250C9 AA - High pass 250 MHz	NT-432	<input type="checkbox"/>	SRM-TS Version 1.3 software for SRM-3000	NT-522
<input type="checkbox"/>	RF-Load 150 W	NT-433	<input type="checkbox"/>	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
<input type="checkbox"/>	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	<input type="checkbox"/>	Spitzenberger und Spies Test software V4.1	NT-525
<input type="checkbox"/>	RF-Attenuator DC – 18 GHz 6 dB	NT-436	<input type="checkbox"/>	Noise power test apparatus according to EN 55014	NT-530
<input type="checkbox"/>	RF-Attenuator DC – 18 GHz 6 dB	NT-437	<input type="checkbox"/>	Vertical coupling plane (ESD)	NT-531
<input type="checkbox"/>	RF-Attenuator DC – 18 GHz 10 dB	NT-438	<input type="checkbox"/>	Test cable #4 for EN 61000-4-6	NT-553
<input type="checkbox"/>	RF-Attenuator DC – 18 GHz 20 dB	NT-439	<input type="checkbox"/>	Test cable #3 for conducted emission	NT-554
<input type="checkbox"/>	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	<input type="checkbox"/>	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
<input type="checkbox"/>	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	<input type="checkbox"/>	Test cable #8 Sucoflex 104EA	NT-559
<input type="checkbox"/>	Power Divider 6 dB/1 W/50 Ohm	NT-443	<input type="checkbox"/>	Test cable #9 (for outdoor measurements)	NT-580
<input type="checkbox"/>	Directional coupler 0,1 MHz – 70 MHz	NT-444	<input type="checkbox"/>	Test cable #10 (for outdoor measurements)	NT-581
<input type="checkbox"/>	Directional coupler 0,1 MHz – 70 MHz	NT-445	<input type="checkbox"/>	Test cable #13 Sucoflex 104PE	NT-584
<input type="checkbox"/>	Tube imitations according to EN 55015	NT-450	<input type="checkbox"/>	Test cable #21 for SRM-3000	NT-592
<input type="checkbox"/>	FCC-801-M3-16A Coupling decoupling network	NT-458	<input type="checkbox"/>	Shield chamber	NT-600
<input type="checkbox"/>	FCC-801-M2-50A Coupling decoupling network	NT-459	<input type="checkbox"/>	Climatic chamber	M-1200
<input type="checkbox"/>	FCC-801-M5-25 Coupling decoupling network	NT-460			

Appendix 1 (continued)

Test equipment used

<input type="checkbox"/>	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	<input type="checkbox"/>	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305
<input type="checkbox"/>	Turntabel 6 m diameter	EMV-101	<input type="checkbox"/>	HF- Amplifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306
<input type="checkbox"/>	Antenna mast + controller	EMV-102+ EMV-103	<input type="checkbox"/>	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307
<input type="checkbox"/>	EMC Video/Audiosystem	EMV-104	<input type="checkbox"/>	Load Dump Generator LD 200N	EMV-350
<input type="checkbox"/>	EMC Software EMC32 Version 10.50.40	EMV-105	<input type="checkbox"/>	Ultra Compact Symulator UCS 200N100	EMV-351
<input type="checkbox"/>	Hornantenna 1 – 18 GHz HF 907	EMV-110	<input type="checkbox"/>	Automotive Power fail module PFM 200N100.1	EMV-352
<input type="checkbox"/>	Antennapre.amp. 1 – 18 GHz ERZ-LNA0200-1800-30-2	EMV-111	<input type="checkbox"/>	Voltage Drop Symulator VDS 200Q100	EMV-353
<input type="checkbox"/>	Trilog Antenna 30-3000 MHz VULB9163	EMV-112	<input type="checkbox"/>	Arb. Generator AutoWave	EMV-354
<input type="checkbox"/>	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	<input type="checkbox"/>	Ultra Compact Symulator UCS 500N7	EMV-355
<input type="checkbox"/>	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	<input type="checkbox"/>	Coupling decoupling network CNI 503B7 / 32 A	EMV-356
<input type="checkbox"/>	Hornantenna 200 – 2000 MHz AH-220	EMV-115	<input type="checkbox"/>	Coupling decoupling network CNI 503B7 / 63 A	EMV-357
<input type="checkbox"/>	DC Artificial Network PVDC 8300	EMV-150	<input type="checkbox"/>	Telecom Surge Generator TSurge 7	EMV-358
<input type="checkbox"/>	AC Artificial Network NNLK 8121 RC	EMV-151	<input type="checkbox"/>	Coupling decoupling network CNI 508N2	EMV-359
<input type="checkbox"/>	EMI Receiver ESR26	EMV-200	<input type="checkbox"/>	Coupling decoupling network CNV 504N2.2	EMV-360
<input type="checkbox"/>	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	<input type="checkbox"/>	Immunity generator NSG4060/NSG4060-1	EMV-361
<input type="checkbox"/>	GPS Frequency normal B-88	EMV-202	<input type="checkbox"/>	Coupling network CDND M316-2	EMV-362
<input type="checkbox"/>	DC Power supply N5745A	EMV-203	<input type="checkbox"/>	Coupling network CT419-5	EMV-363
<input type="checkbox"/>	Spektrum Analyzator FSV40	EMV-205	<input type="checkbox"/>	ESD Generator NSG 437	EMV-364
<input type="checkbox"/>	Thd Multimeter Model 2015	EMV-206	<input type="checkbox"/>	Pulse Limiter VTSD 9561-F BNC	EMV-405
<input type="checkbox"/>	Poweramplifier PAS15000	EMV- 207/abc	<input type="checkbox"/>	Transient emission BSM200N40+BS200N100	EMV- 450+451
<input type="checkbox"/>	Inrush Current Source	EMV- 208/abc	<input type="checkbox"/>	Cap. Coupling Clamp HFK	EMV-455
<input type="checkbox"/>	Arb.-generator Sycore	EMV-209	<input type="checkbox"/>	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458
<input type="checkbox"/>	Harmonics/Flicker analyzer ARS 16/3	EMV-210	<input type="checkbox"/>	Coupling network CDN M2-100A	EMV-459
<input type="checkbox"/>	HF- Amplifier 9 kHz-250 MHz BBA150	EMV-300	<input type="checkbox"/>	Coupling network CDN M3-32A	EMV-460
<input type="checkbox"/>	HF- Amplifier 80 -1000 MHz BBA150	EMV-301	<input type="checkbox"/>	Coupling network CDN M5-100A	EMV-461
<input type="checkbox"/>	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302	<input type="checkbox"/>	Current Clamp CIP 9136A	EMV-462
<input type="checkbox"/>	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1	<input type="checkbox"/>	DC Artificial Network HV-AN 150	EMV- 464+465
<input type="checkbox"/>	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304	<input type="checkbox"/>	Coupling Clamp EM 101	EMV-466
			<input type="checkbox"/>	Decoupling Clamp FTC 101	EMV-467
			<input type="checkbox"/>	Power attenuator 10 dB / 250 Watt	EMV-469/2

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-19/228

Page: 4 of 4

Date: 23.10.2019

Appendix 2 Photodocumentation

Description: Front view

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 1 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Backside view

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 2 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Battery Compartment opened

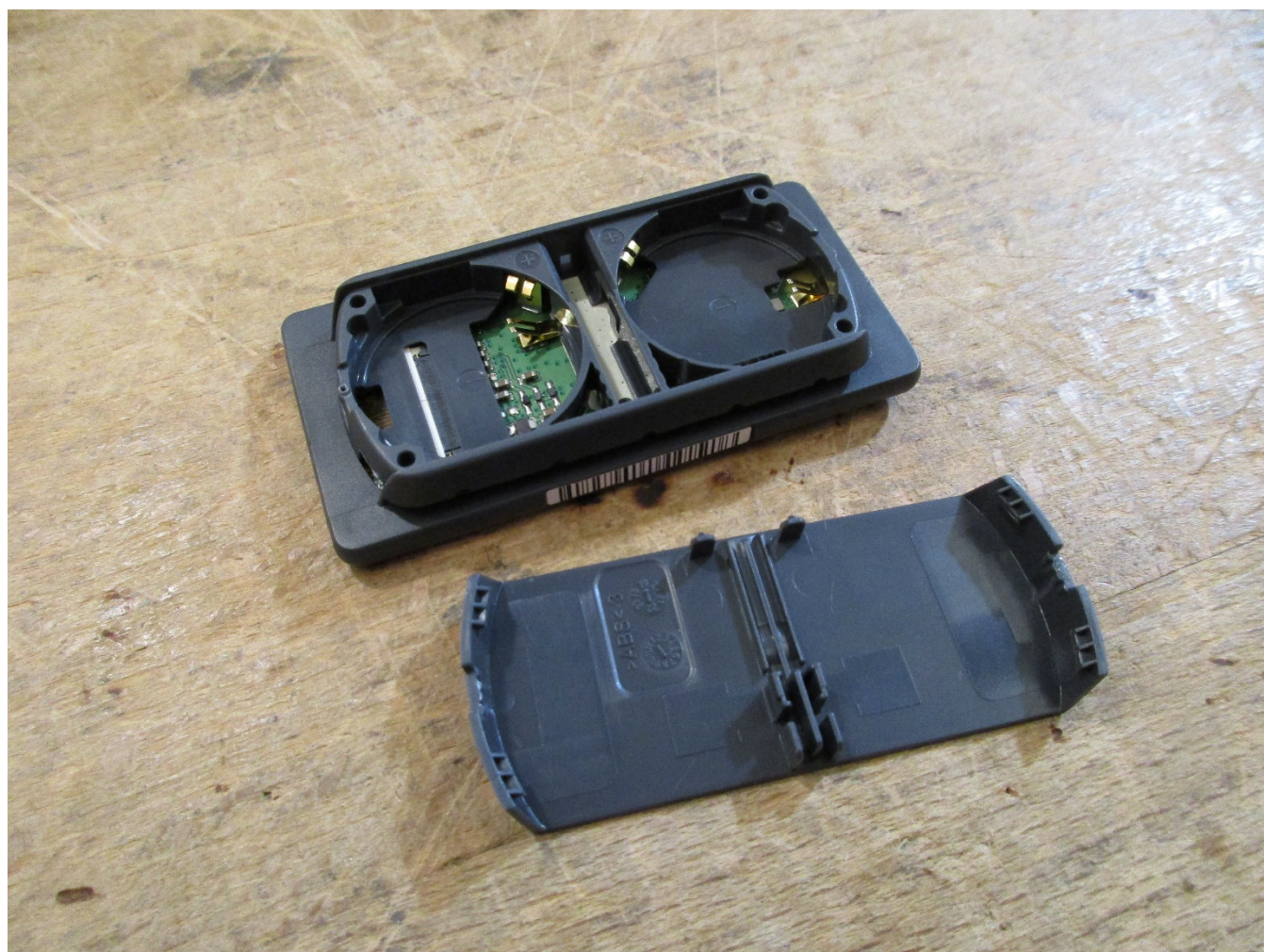
Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 3 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Case opened

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 4 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Internal view #1

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 5 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Internal view #1

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 6 of 8

Date: 23.10.2019



Appendix 2 Photodocumentation

Description: Test setup below 30 MHz

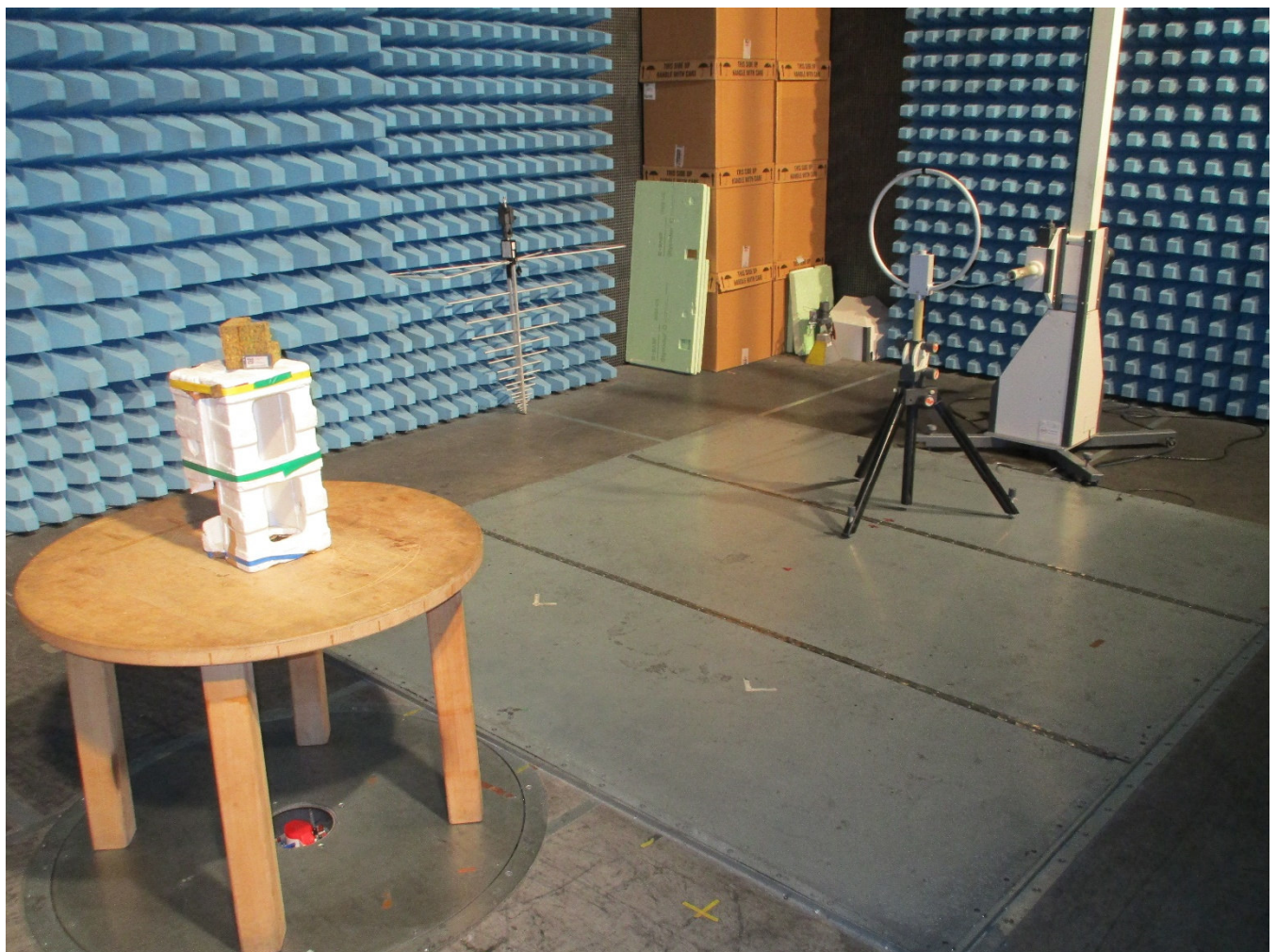
Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 7 of 8

Date: 23.10.2019



Appendix 2

Photodocumentation

Description: Test setup above 30 MHz

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-19/228

Page: 8 of 8

Date: 23.10.2019

