TÜV AUSTRIA SERVICES GMBH

Office:
Deutschstrasse 10
1230 Vienna/Austria
T: +43 5 0454-0
F: +43 5 0454-6505
E: pzw@tuv.at
W: www.tuv.at

Business Area
Industry & Energy Austria

Technik

# TEST REPORT

of the accredited test laboratory

**TÜV Nr.:INE-AT/FG-18/147**

| | |
|---|---|
| **Applicant:** | SES-imagotag GmbH<br>St. Peter Gürtel 10b<br>A – 8042 Graz |
| **Tested Product:** | Networking transceiver "EDG1-0270-B" |
| **FCC-ID:** | 2ACQM-EDG1-0270-B |
| **IC-ID:** | 12154A-EDG1-0270-B |
| **Manufacturer:** | SES-imagotag GmbH<br>St. Peter Gürtel 10b<br>A – 8042 Graz |

| | | | |
|---|---|---|---|
| **Output power / field strength:** | 3,16 mV/m average<br>@ 3m distance | **power supply:** | 3V DC<br>internal battery |
| **Frequency range:** | 2404 - 2479,25 MHz | **Channel separation:** | 0,35 MHz |
| **Standard:** | FCC: 47 CFR Part 15 (15. June 2018 edition)<br>RSS-210 Issue 9, August 2016 | | |

Akkreditierung Austria A 0274 ISO/IEC 17025

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
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BIC RZBAATWW

VAT ATU63240488
DVR 3002476

TÜV AUSTRIA SERVICES GMBH
Test laboratory for EMC

Supervisor of EMC-laboratory:

Ing. Wilhelm Seier

Rundsiegel

01.08.2018

checked by:

Ing. Michael Emminger

Copy Nbr.: 01



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

Ambient temperature: 28°C Relative humidity: 51%

**Contents**

Ambient temperature: 28°C Relative humidity: 51%

# 1. Applicant

| | |
|---|---|
| **Company:** | SES-imagotag GmbH |
| **Department:** | Product & Project Manager |
| **Address:** | A – 8042 Graz; St. Peter Gürtel 10b |
| **Contact person:** | Mr. Philipp Jauck |

| | |
|---|---|
| **EUT received on:** | 30.07.2018 |
| **Tests were performed on:** | 30.07. and 31.07.2018 |

Ambient temperature: 28°C Relative humidity: 51%

# 2. Description of EUT

| | |
|---|---|
| **EUT:** | Networking transceiver “EDG1-0270-B” |
| **Serial Number:** | Prototype |
| **Manufacturer:** | SES-imagotag GmbH<br>A – 8042 Graz; St. Peter Gürtel 10b |
| **Description:** | SES-imagotag GmbH provided the following configuration for the measurements:<br><br>Prototype with special test-firmware for continuous transmission |
| **Operating mode:** | The measurements were carried out at the following running states:<br><br>test-firmware running, transmitting continuously |
| **Technical data EUT:** | Rated voltage: 3VDC<br>Rated current: <1A<br>Rated frequency: DC<br><br>Mains voltage during the tests: 3VDC internal battery |
| **Climatic conditions in the emc laboratory:** | Relative humidity: 51%<br>Temperature: 28°C |

Ambient temperature: 28°C Relative humidity: 51%

# 3. Standards / Final result

| Name | Title | Deviation | Result |
|---|---|---|---|
| Title 47 CFR Part 15<br>15. June 2018 edition | RADIO FREQUENCY DEVICES | none | OK |
| RSS-210 Issue 9,<br>August 2016 | Licence-Exempt Radio Apparatus:<br>Category I Equipment | none | OK |

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

Ambient temperature: 28°C Relative humidity: 51%

## 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 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 – 2479,25 MHz (channel center frequencies of channel 0 up to ch. 10)

2.1033 (6) Power range and Controls: The maximum field strength measured is 3,16 mV/m average @ 3m distance. There is no power control or regulation.

2.1033 (7) Maximum output power rating: 3,16 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: July 30th and 31st 2018.

Ambient temperature: 28°C Relative humidity: 51%

## 4.2 Number of channels and channel spacing § 2.1033

Channel plan:

| Channel Number | Center frequency (MHz) | Channel spacing (MHz) |
|---|---|---|
| 0 | 2404 | |
| | | 5,95 |
| 1 | 2409,95 | |
| | | 11,9 |
| 2 | 2421,85 | |
| | | 2,8 |
| 3 | 2424,65 | |
| | | 17,15 |
| 4 | 2441,8 | |
| | | 7,35 |
| 5 | 2449,15 | |
| | | 12,6 |
| 6 | 2461,75 | |
| | | 7,7 |
| 7 | 2469,45 | |
| | | 4,9 |
| 8 | 2474,35 | |
| | | 2,45 |
| 9 | 2476,8 | |
| | | 2,45 |
| 10 | 2479,25 | |

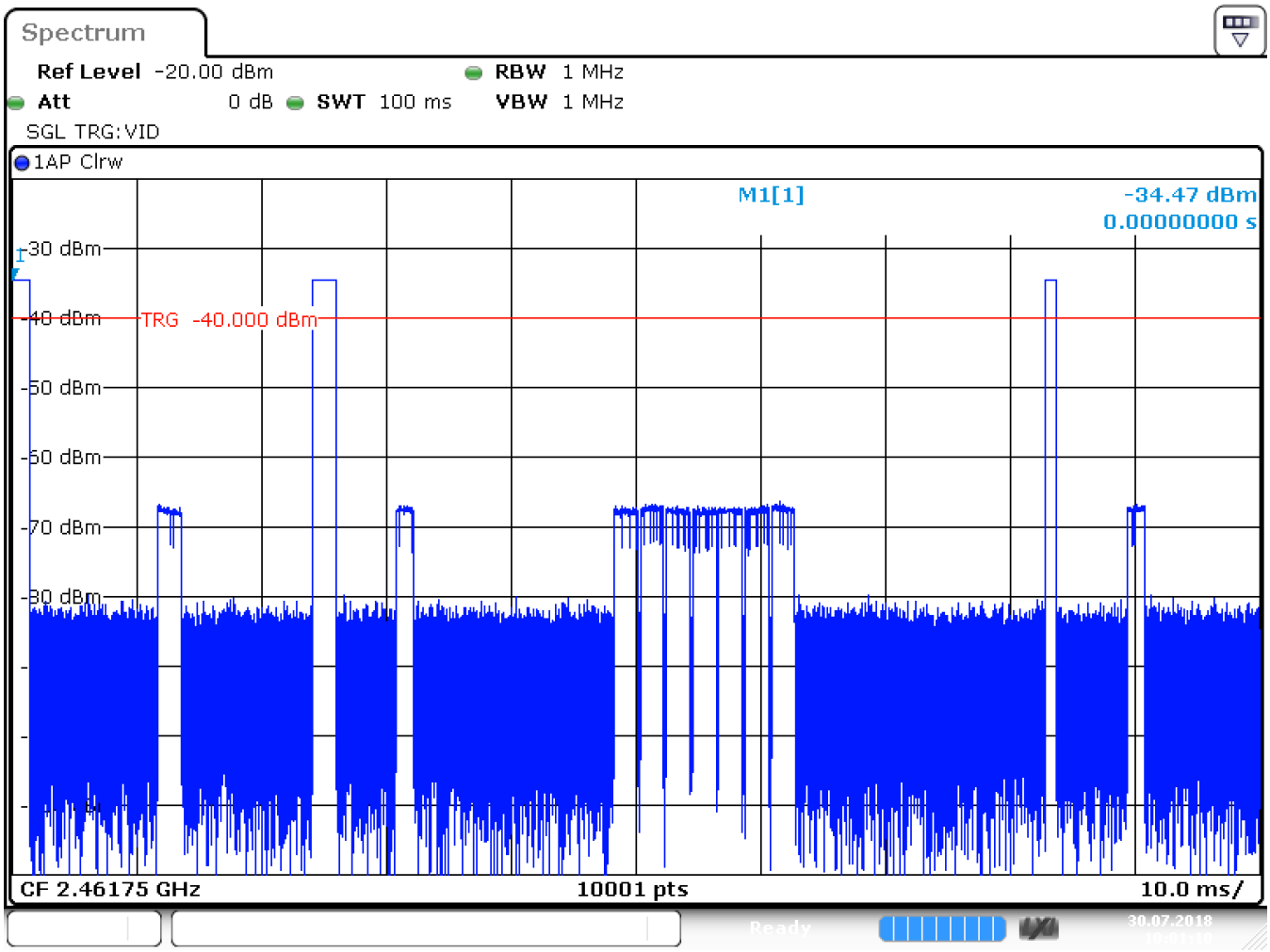
Tests were performed on channels 0, 4 and 10.

Test Equipment used: N/A

Ambient temperature: 28°C Relative humidity: 51%

## 4.3 Duty Cycle measurements for averaging § 15.249 (e)

**Mode: data transmission (worst case in 100ms)**




Date: 30.JUL.2018 10:01:10

**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

Ambient temperature: 28°C Relative humidity: 51%

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

**Operating on CH 0 (2404 MHz)**

**The maximum peak value measured was 96,1 dBµV/m = 63,83 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 70,0 dBµV/m = 3,16 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

Ambient temperature: 28°C Relative humidity: 51%

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

**Operating on CH 4 (2441,8 MHz)**

**The maximum peak value measured was 95,4 dBµV/m = 58,88 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 69,3 dBµV/m = 2,92 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

Ambient temperature: 28°C Relative humidity: 51%

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

**Operating on CH 10 (2479,25 MHz)**

**The maximum peak value measured was 94,6 dBµV/m = 53,70 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 68,5 dBµV/m = 2,66 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:

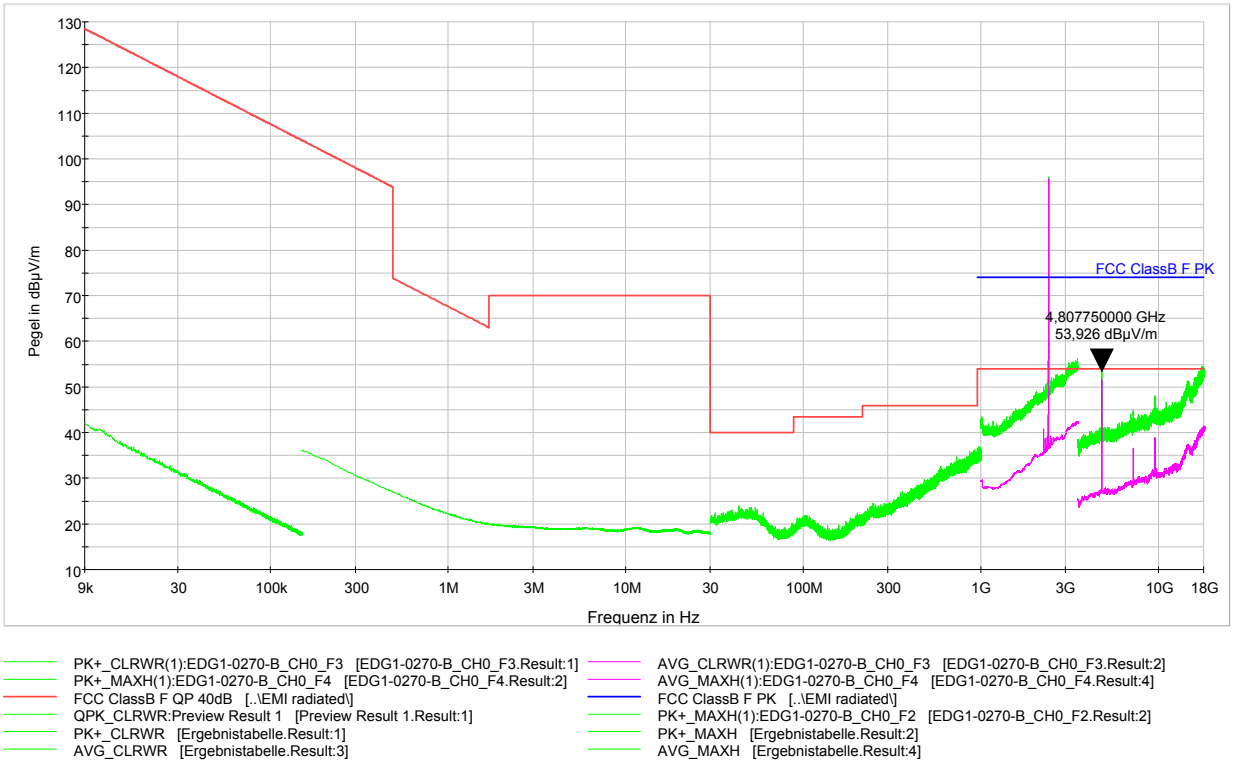
| Fundamental frequency | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|---|---|---|
| 902–928 MHz | 50 | 500 |
| 2400–2483.5 MHz | 50 | 500 |
| 5725–5875 MHz | 50 | 500 |
| 24.0–24.25 GHz | 250 | 2500 |

(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

Ambient temperature: 28°C Relative humidity: 51%

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




**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.

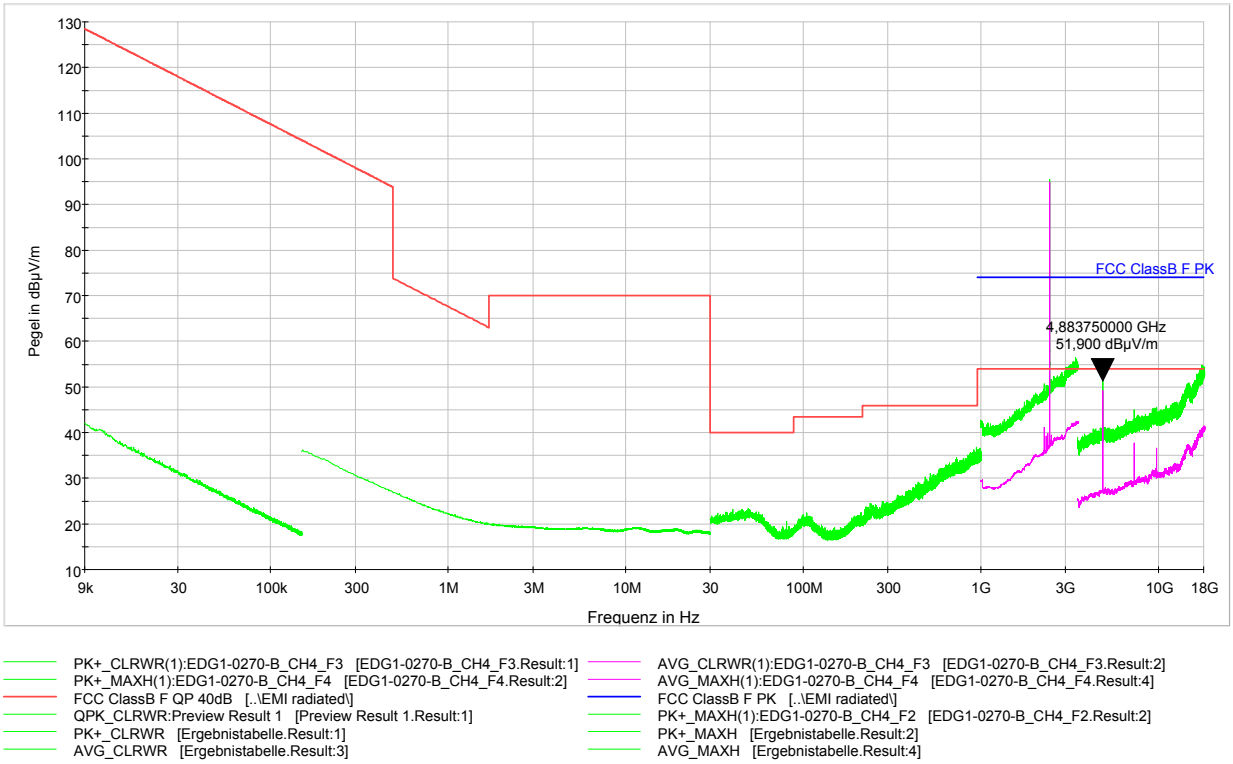
(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any 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 10$^{th}$ 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.

Ambient temperature: 28°C Relative humidity: 51%

**Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)**
**Channel 4 (2441,8 MHz) – average values above 1 GHz are shown in magenta – green = peak**




**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.

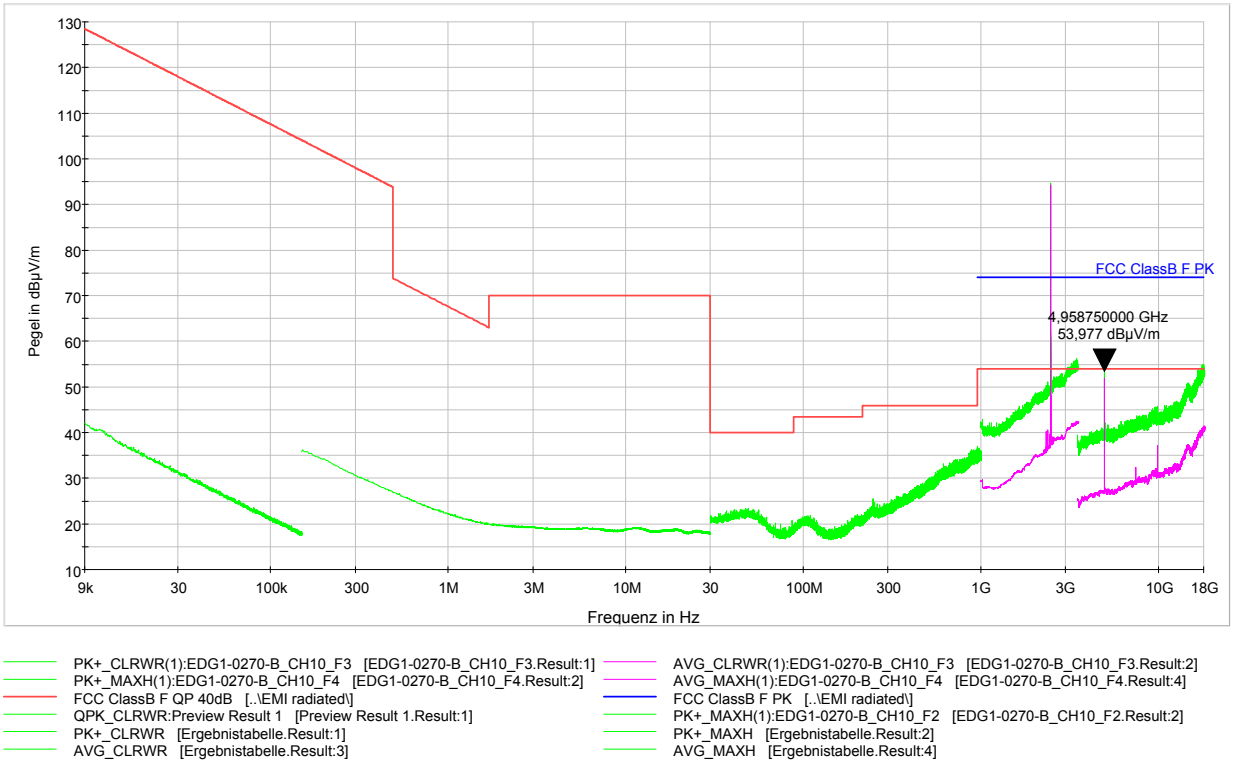
(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any 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.

Ambient temperature: 28°C Relative humidity: 51%

**Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e)**
**Channel 10 (2479,25 MHz) – average values above 1 GHz are shown in magenta – green = peak**




**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 10$^{th}$ 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

| | | |
|---|---|---|
| ☐ | Anechoic Chamber with 3m measurement distance | NT-100 |
| ☐ | Stripline according to ISO 11452-5 | NT-108 |
| ☐ | MA4000 - Antenna mast 1 - 4 m height | NT-110/1 |
| ☐ | DS - Turntable 0 - 400 ° Azimuth | NT-111/1 |
| ☐ | CO3000 Controller Mast+Turntable | NT-112/1 |
| ☐ | HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz | NT-121 |
| ☐ | FMZB1513 - Loop Antenna 9 kHz - 30 MHz | NT-122/1 |
| ☐ | HFH-Z6 - Rod Antenna 9 kHz - 30 MHz | NT-123 |
| ☐ | 3121C - Dipole Antenna 28 - 1000 MHz | NT-124 |
| ☐ | 3115 - Horn Antenna 1 - 18 GHz (immunity) | NT-125 |
| ☐ | 3116 - Horn Antenna 18 - 40 GHz | NT-126 |
| ☐ | SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz | NT-127 |
| ☐ | AT-1080 - Log. Per. Antenna 80 - 1000 MHz | NT-128 |
| ☐ | HK-116 - bicon. Antenna 20 MHz - 300 MHz | NT-129 |
| ☐ | HK-116 - bicon. Antenna 20 MHz - 300 MHz | NT-130 |
| ☐ | 3146 - Log. Per. Antenna 200 – 1000 MHz | NT-131 |
| ☐ | VULB 9163 Trilog Antenna 30 – 3000 MHz | NT-131/1 |
| ☐ | Loop Antenna H-Field | NT-132 |
| ☐ | Horn Antenna 500 MHz - 2900 MHz | NT-133 |
| ☐ | Horn Antenna 500 MHz - 6000 MHz | NT-133/1 |
| ☐ | Log. per. Antenna 800 MHz - 2500 MHz | NT-134 |
| ☐ | Log. per. Antenna 800 MHz - 2500 MHz | NT-135 |
| ☐ | BiConiLog Antenna 26 MHz – 2000 MHz | NT-137 |
| ☐ | Conical Dipol Antenna PCD8250 | NT-138 |
| ☐ | HF 906 - Horn Antenna 1 - 18 GHz (emission) | NT-139 |
| ☐ | HZ-1 Antenna tripod | NT-150 |
| ☐ | BN 1500 Antenna tripod | NT-151 |
| ☐ | Ant. tripod for EN61000-4-3 Model TP1000A | NT-156 |
| ☐ | Power quality analyzer Fluke 1760 (complete set) | NT-160 - NT-173 |
| ☐ | Spectrumanalyzer – FSP7 9 kHz – 7 GHz | NT-200 |
| ☐ | ESCI - Test receiver 9 kHz - 7 GHz | NT-203/1 |
| ☐ | ESI26 – Test receiver 20 Hz – 26,5 GHz | NT-207 |
| ☐ | Digital Radio Tester CTS55 | NT-208 |
| ☐ | Noise-gen., ITU-R 559-2 20 Hz – 20 kHz | NT-209 |
| ☐ | CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz | NT-210 |
| ☐ | 3271 - Spectrum analyzer 100 Hz - 26,5 GHz | NT-211 |
| ☐ | Digital Radio Tester Aeroflex 3920 | NT-212/1 |
| ☐ | Mixer M28HW 26,5 GHz - 40 GHz | NT-214 |
| ☐ | RubiSource T&M Timing reference | NT-216 |
| ☐ | Radiocommunicationanalyzer SWR 1180 MD | NT-217 |
| ☐ | Mixer M19HWD 40 GHz – 60 GHz | NT-218 |
| ☐ | Mixer M12HWD 60 GHz – 90 GHz | NT-219 |
| ☐ | DSO9104 Digital scope | NT-220/1 |
| ☐ | TPS 2014 Digital scope | NT-222 |
| ☐ | Artificial Ear according to IEC 60318 | NT-224 |
| ☐ | 1 kHz Sound calibrator | NT-225 |
| ☐ | B10 - Harmonics and flicker analyzer | NT-232 |
| ☐ | SRM-3006 Spectrumanalyzer | NT-233/1a |
| ☐ | E-field probe SRM 75 MHz – 3 GHz | NT-234 |
| ☐ | Field Meter NBM-500 incl. E- and H-Field probes | NT-240a-e |
| ☐ | Hall-Teslameter ETM-1 | NT-241 |
| ☐ | EFA-3 H-field- / E-field probe | NT-243 |
| ☐ | EHP-50F H-field- / E-field probe | NT-243/1 |
| ☐ | Field Meter EMR-200 100 kHz – 3 GHz | NT-244 |
| ☐ | E-field probe 100 kHz – 3 GHz | NT-245 |
| ☐ | H-field probe 300 kHz – 30 MHz | NT-246 |

**Division:**
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-18/147



Date: 01.08.2018

Checked by:

# Appendix 1 (continued)
# Test equipment used

TÜV AUSTRIA

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



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# Appendix 1 (continued)
# Test equipment used

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| | | |
|---|---|---|
| ☐ | Highpass-Filter 3500 MHz – 18 GHz | NT-416 |
| ☐ | RF-Attenuator 10 dB DC – 18 GHz / 50 W | NT-417 |
| ☐ | 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-AF10 Coupling decoupling network | NT-461 |
| ☐ | FCC-801-S25 Coupling decoupling network | NT-462 |
| ☐ | 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 |
| ☐ | 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 |
| ☐ | EMC Video/Audiosystem | NT-511/1 |
| ☐ | ES-K1 Version 1.71 SP2 Test software | NT-520 |
| ☐ | EMC32 Version 10.40.00 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 |
| ☐ | Noise power test apparatus according to EN 55014 | NT-530 |
| ☐ | 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 |

# Appendix 1 (continued)
# Test equipment used

| | | |
|---|---|---|
| ☐ | Anechoic Chamber<br>3 m / 5 m measuring distance | EMV-100 |
| ☐ | Turntabel<br>6 m diameter | EMV-101 |
| ☐ | Antenna mast<br>1 – 4 m | EMV-102 |
| ☐ | Mast and Turntable controller<br>FC-06 | EMV-103 |
| ☐ | EMC Video/Audiosystem | EMV-104 |
| ☐ | EMC Software<br>EMC32 Version 10.40.00 | EMV-105 |
| ☐ | Hornantenna 1 – 18 GHz<br>HF 907 | EMV-110 |
| ☐ | Antennapre.amp. 1 – 18 GHz<br>ERZ-LNA0200-1800-30-2 | EMV-111 |
| ☐ | Trilog Antenna 30-3000 MHz<br>VULB9163 | EMV-112 |
| ☐ | Monopol 9 kHz – 30 MHz<br>VAMP 9243 | EMV-113 |
| ☐ | Antennapre.amp 18 – 40 GHz<br>BBV 9721 | EMV-114 |
| ☐ | Hornantenna 200 – 2000 MHz<br>AH-220 | EMV-110 |
| ☐ | DC Artificial Network<br>PVDC 8300 | EMV-150 |
| ☐ | AC Artificial Network<br>NNLK 8121 RC | EMV-151 |
| ☐ | EMI Receiver<br>ESR26 | EMV-200 |
| ☐ | Signalgenerator 9 kHz – 40 GHz<br>N5173B | EMV-201 |
| ☐ | GPS Frequency normal<br>B-88 | EMV-202 |
| ☐ | DC Power supply<br>N5745A | EMV-203 |
| ☐ | Spektrum Analyzator<br>FSV40 | EMV-205 |
| ☐ | Thd Multimeter<br>Model 2015 | EMV-206 |
| ☐ | Poweramplifier<br>PAS15000 | EMV-207/abc |
| ☐ | Inrush Current Source | EMV-208/abc |
| ☐ | Arb.-generator<br>Sycore | EMV-209 |
| ☐ | Harmonics/Flicker analyzer<br>ARS 16/3 | EMV-210 |
| ☐ | HF- Ampflifier 9 kHz-250 MHz<br>BBA150 | EMV-300 |
| ☐ | HF- Amplifier 80 -1000 MHz<br>BBA150 | EMV-301 |
| ☐ | HF- Amplifier 0,8 - 6 GHz<br>BBA150 | EMV-302 |
| ☐ | High Power Ant. 20-200 MHz<br>VHBD 9134 | EMV-303 |
| ☐ | Log.per Antenna 80-2700 MHz<br>STLP 9128 E special | EMV-304 |
| ☐ | Log.per Antenna 0,7 – 9 GHz<br>STLP9149 | EMV-305 |
| ☐ | HF- Ampflifier 9 kHz-250 MHz<br>BBA150 (low noise) | EMV-306 |
| ☐ | Load Dump Generator<br>LD 200N | EMV-350 |
| ☐ | Ultra Compact Symulator<br>UCS 200N100 | EMV-351 |
| ☐ | Automotive Power fail module<br>PFM 200N100.1 | EMV-352 |
| ☐ | Voltage Drop Symulator<br>VDS 200Q100 | EMV-353 |
| ☐ | Arb. Generator<br>AutoWave | EMV-354 |
| ☐ | Ultra Compact Symulator<br>UCS 500N7 | EMV-355 |
| ☐ | Coupling decoupling network<br>CNI 503B7 / 32 A | EMV-356 |
| ☐ | Coupling decoupling network<br>CNI 503B7 / 63 A | EMV-357 |
| ☐ | Telecom Surge Generator<br>TSurge 7 | EMV-358 |
| ☐ | Coupling decoupling network<br>CNI 508N2 | EMV-359 |
| ☐ | Coupling decoupling network<br>CNV 504N2.2 | EMV-360 |
| ☐ | Immunity generator<br>NSG4060/NSG4060-1 | EMV-361 |
| ☐ | Coupling network<br>CDND M316-2 | EMV-362 |
| ☐ | Coupling network<br>CT419-5 | EMV-363 |
| ☐ | ESD Generator<br>NSG 437 | EMV-364 |
| ☐ | Pulse Limiter<br>VTSD 9561-F BNC | EMV-405 |
| ☐ | Transient emission<br>BSM200N40+BS200N100 | EMV-450+451 |
| ☐ | Cap. Coupling Clamp<br>HFK | EMV-455 |
| ☐ | Mag. Field System<br>MS100N+MC26100+MC2630 | EMV-456-458 |
| ☐ | Coupling network<br>CDN M2-100A | EMV-459 |
| ☐ | Coupling network<br>CDN M3-32A | EMV-460 |
| ☐ | Coupling network<br>CDN M5-100A | EMV-461 |
| ☐ | Current Clamp<br>CIP 9136A | EMV-462 |
| ☐ | DC Artificial Network<br>HV-AN 150 | EMV-464+465 |
| ☐ | Coupling Clamp<br>EM 101 | EMV-466 |
| ☐ | Decoupling Clamp<br>FTC 101 | EMV-467 |
| ☐ | Power attenuator<br>10 dB / 250 Watt | EMV-469/2 |

**Division:**
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-18/147



Date: 01.08.2018

Checked by:

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# Appendix 2
# Photodocumentation

Description: Front view

**Division:**
Industry & Energy

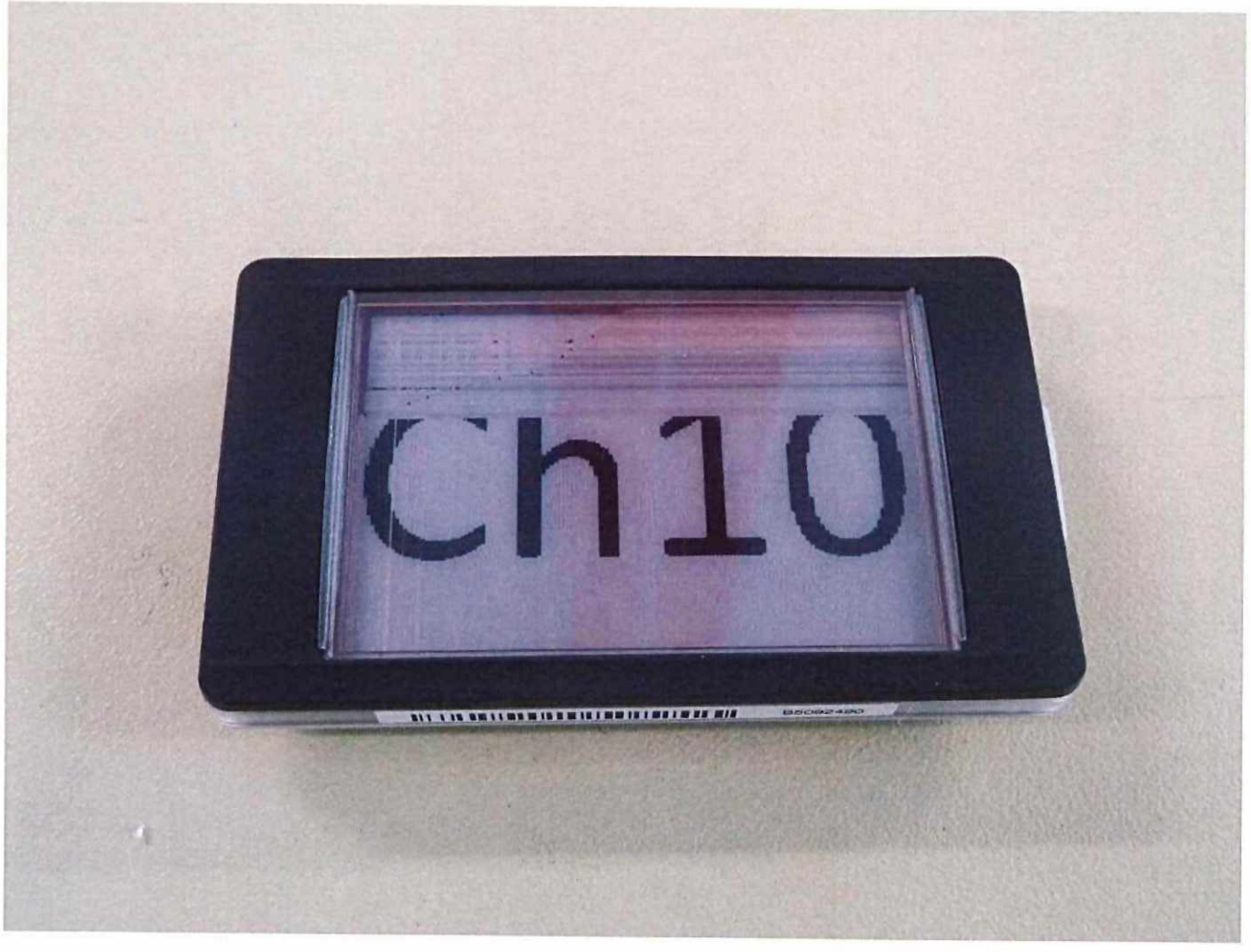
Department: FG

Test report reference:
INE-AT/FG-18/147



Date: 01.08.2018

checked by: _____

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# Appendix 2
# Photodocumentation

Description: Backside view

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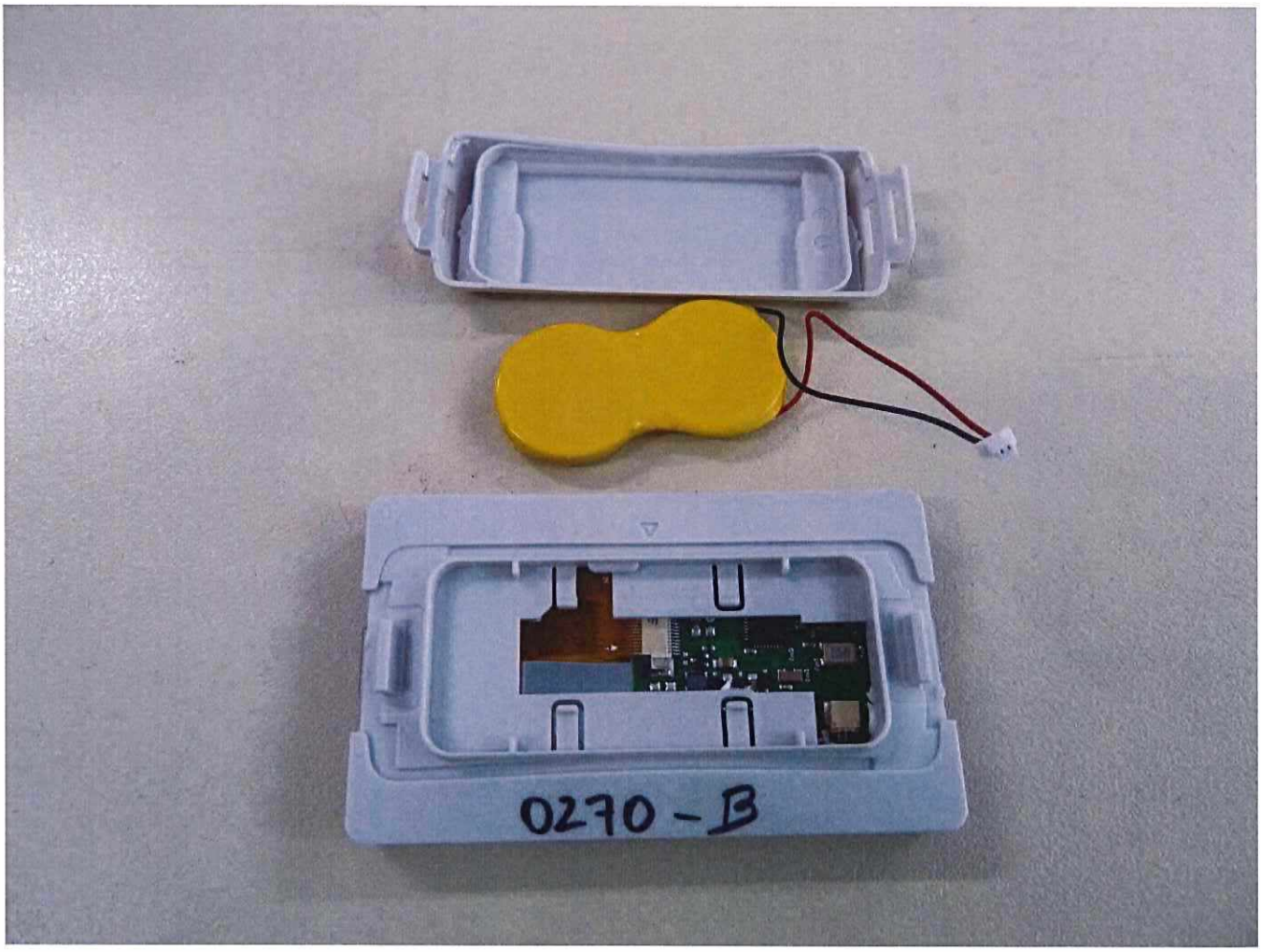
# Appendix 2
# Photodocumentation

Description: Battery compartment opened





# Appendix 2
# Photodocumentation

Description: Case opened

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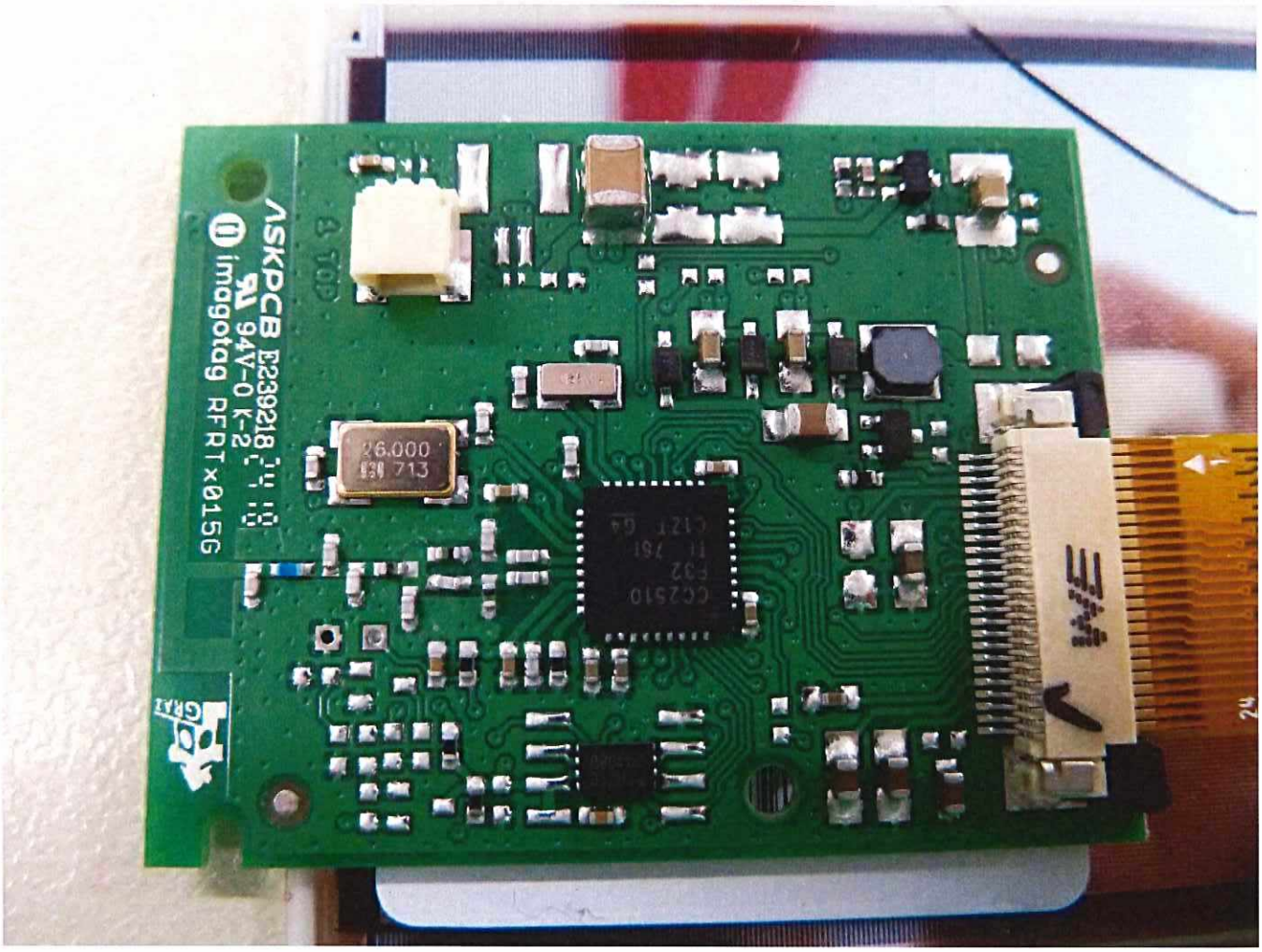
# Appendix 2
# Photodocumentation

Description: Electronics view #1





# Appendix 2
# Photodocumentation

Description: Electronics view #2

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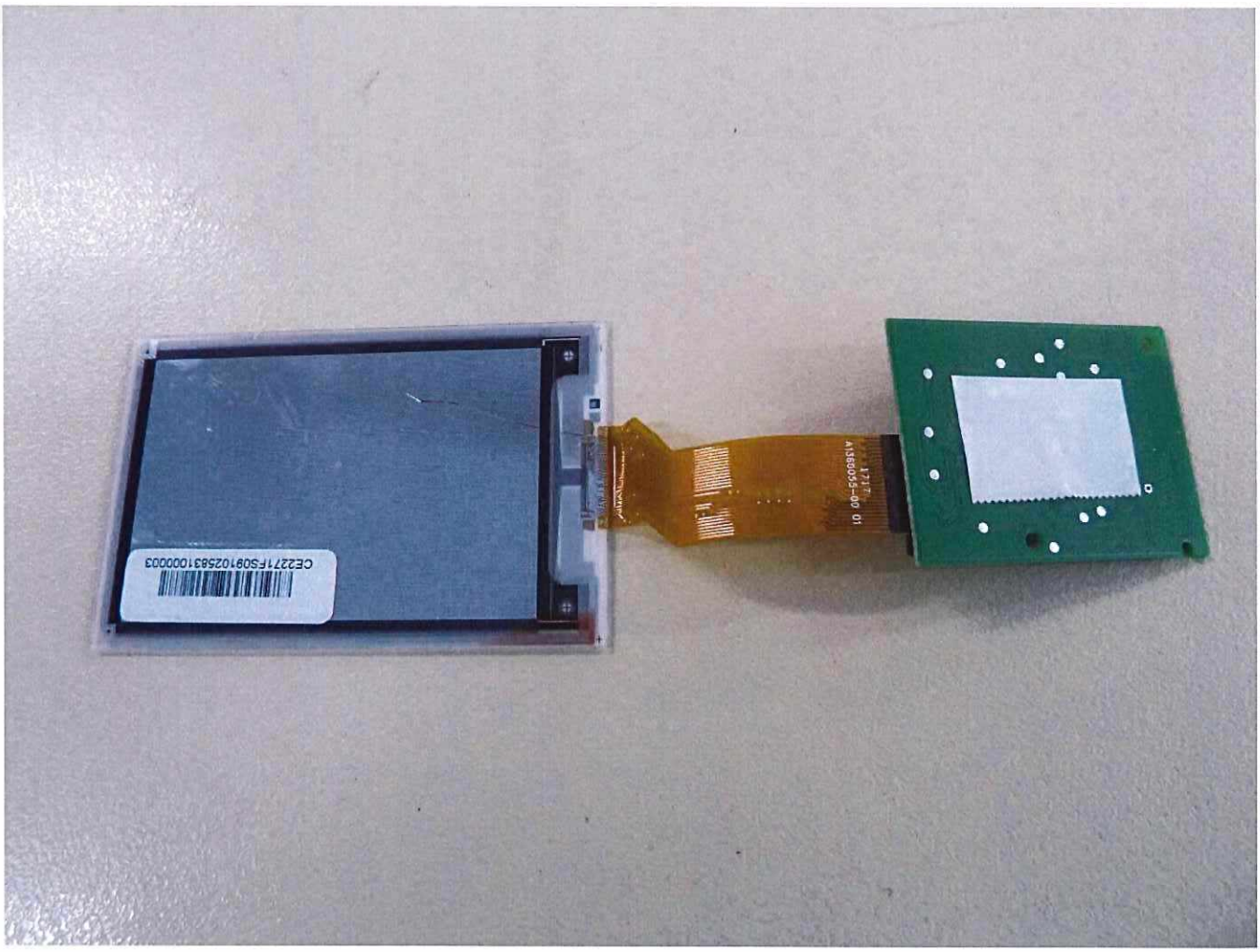
Date: 01.08.2018

checked by: M



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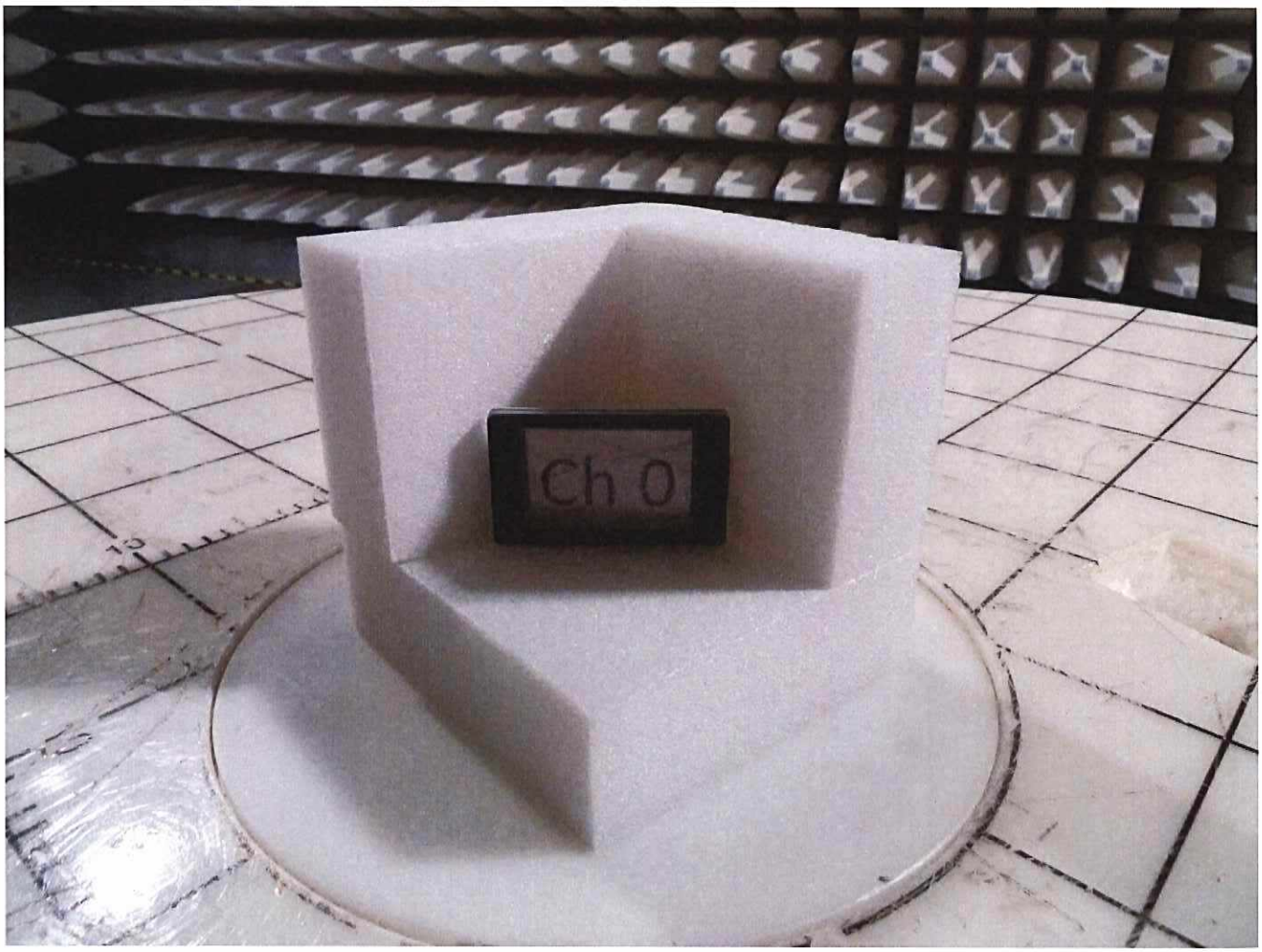
# Appendix 2
# Photodocumentation

Description: Test setup

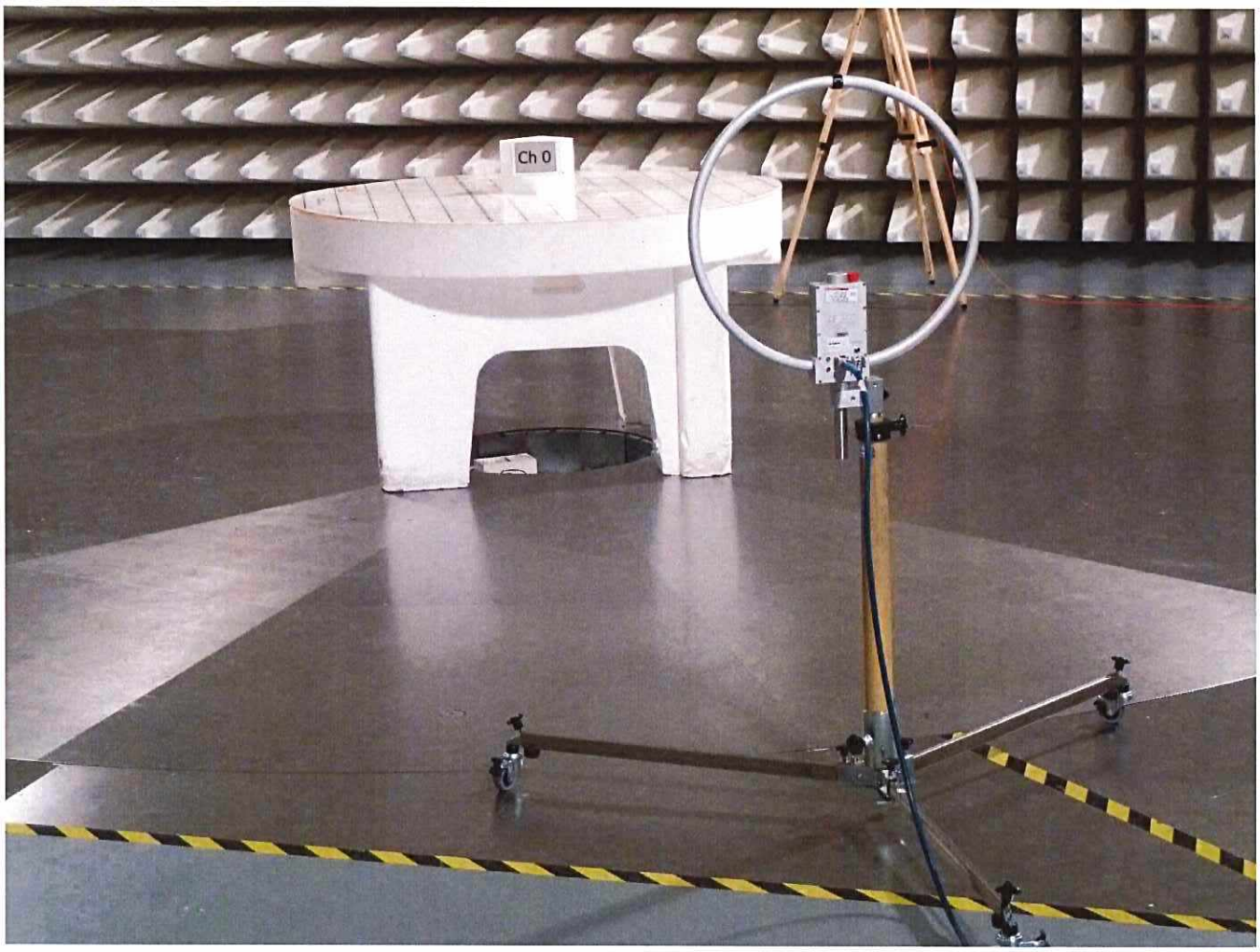




# Appendix 2
# Photodocumentation

Description: Test setup below 30 MHz





# Appendix 2
# Photodocumentation

Description: Test setup 30-1000MHz