

## TEST REPORT

Test Report No.: 1-3692/21-03-06



Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing Laboratory

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#### Accredited Test Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01.

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### Manufacturer

#### indurad GmbH

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### Test Standard/s

FCC - Title 47 CFR

Chapter I - Subchapter

I §1.1310

FCC KDB 680106 D01

Exposure Wireless

Charging Apps v03

For further applied test standards please refer to section 3 of this test report.

Radiofrequency radiation exposure limits.

RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications

### Test Item

Kind of test item: iRTT RechargeUnit

Device type: fixed device

**Model name:** iRTT-RU

S/N serial number: fbdf3a

FCC-ID: 2AJRSIRTRU

Hardware status: V3

Software status: V0.9

Frequency: WPT charger, 123 kHz

Antenna: Integrated loop coil

Supply voltage: DC Powered 24V

Accessories: Aux-device (SN: 4a7286)

Test sample status: identical prototype

Exposure category: general population / uncontrolled environment

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test Report authorised:

Alexander Hnatovskiy  
Lab Manager  
Radio Communications

### Test performed:

Marco Scigliano  
Testing Manager  
Radio Communications

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## 2 General information

### 2.1 Notes and disclaimer

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In no case this test report can be considered as a Letter of Approval.

### 2.2 Application details

|                               |            |
|-------------------------------|------------|
| Date of receipt of order:     | 2021-12-21 |
| Date of receipt of test item: | 2022-04-29 |
| Start of test:                | 2022-05-02 |
| End of test:                  | 2022-05-02 |

### 2.3 Statement of compliance

The EMF values found for the iRTT-RU iRTT RechargeUnit are below the maximum allowed levels according to the standards listed in section 3.

### 3 Test standard/s:

| Test Standard   | Version    | Test Standard Description   |
|---|------------|---|
| FCC - Title 47 CFR<br>Chapter I -<br>Subchapter I<br>§1.1310    | 04.06.2013 | Radiofrequency radiation exposure limits.   |
| FCC KDB 680106<br>D01 Exposure<br>Wireless Charging<br>Apps v03 | 04.09.2018 | RF Exposure Considerations for Low Power Consumer<br>Wireless Power Transfer Applications |

#### 3.1 RF exposure limits

Reference levels for general public (uncontrolled environment) exposure to time-varying electric and magnetic fields

| According to: CFR47, Subpart I - §1.1310 Radiofrequency radiation exposure limits |                         |                         |  |                             |
|---|-------------------------|-------------------------|--|-----------------------------|
| Frequency Range<br>(MHz)  | Electric Field<br>(V/m) | Magnetic Field<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(minutes) |
| Occupational / Controlled Exposure  |                         |                         |  |                             |
| 0.3-3.0   | 614                     | 1.63                    | *100                                   | 6                           |
| 3.0-30  | 1842/f                  | 4.89/ f                 | *900/f <sup>2</sup>                    | 6                           |
| 30-300  | 61.4                    | 0.163                   | 1.0                                    | 6                           |
| 300-1500  | --                      | --                      | f/300                                  | 6                           |
| 1500-100000   | --                      | --                      | 5                                      | 6                           |
| General Population / Uncontrolled Exposure  |                         |                         |  |                             |
| 0.3-1.34  | 614                     | 1.63                    | *100                                   | 30                          |
| 1.34-30   | 824/f                   | 2.19/f                  | *180/f <sup>2</sup>                    | 30                          |
| 30-300  | 27.5                    | 0.073                   | 0.2                                    | 30                          |
| <b>300-1500</b>   | --                      | --                      | <b>f/1500</b>                          | <b>30</b>                   |
| 1500-100000   | --                      | --                      | 1.0                                    | 30                          |

#### Limitations and test distances according FCC KDB 680106 D01:

According to **FCC KDB 680106 D01 Paragraph 3 RF Exposure Requirements clause 3** the Emission-Limits in the frequency range from 100 to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of **CFR 47 – Section 1.310** as following (measurement distance shall be 20cm from the center of the probe to the top side and 15cm from the center of the probe to the edge of the device):

|               | E-field    | H-field     | B-field |
|---------------|------------|-------------|---------|
| Frequency     | V / m      | A/m         | μT      |
| 0.3 – 3.0 MHz | <b>614</b> | <b>1.63</b> | 2.0     |

**The 50% criteria according to FCC KDB 680106 D01:**

|                                  | E-field    | H-field      | B-field |
|----------------------------------|------------|--------------|---------|
| Frequency                        | V / m      | A/m          | μT      |
| 0.3 – 3.0 MHz                    | <b>614</b> | <b>1.63</b>  | 2.0     |
| 0.3 – 3.0 MHz*<br>(50% criteria) | <b>307</b> | <b>0.815</b> | 1.0     |

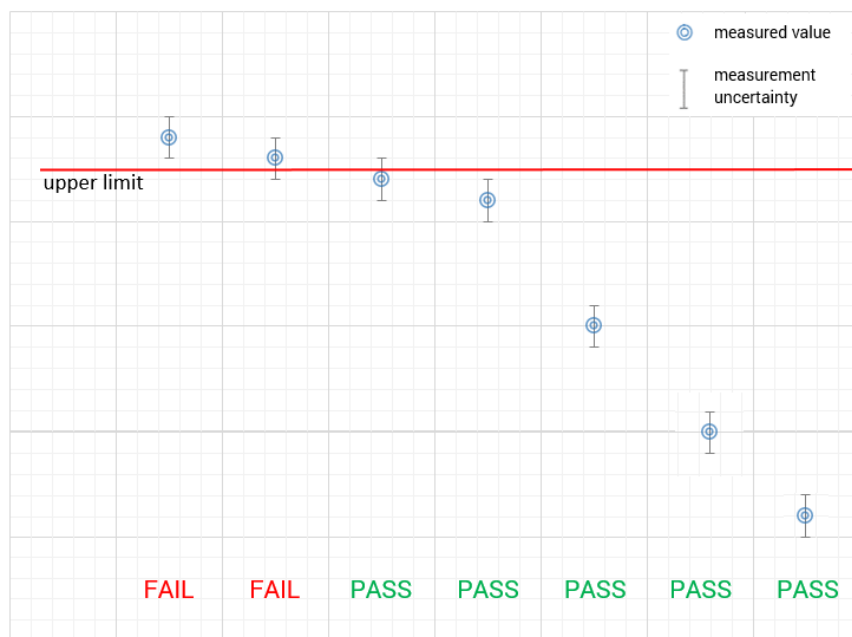
\*) **FCC KDB 680106 D01 Paragraph 5b(5)** demands, that the aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit (1.6A/m) which results in an H-Field limit of 0.815 A/m. A device that complies with the 50% criteria is deemed to comply, without any further investigation through the FCC.

#### 4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."

measured value, measurement uncertainty, verdict



#### 5 Summary of Measurement Results

|                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | No deviations from the technical specifications ascertained |
| <input type="checkbox"/>            | Deviations from the technical specifications ascertained    |

The EUT full fills all safety requirements of FCC KDB 670106 D01. As the test results are below the 50% criteria, it complies without any further investigation of the FCC.

#### 6 Test Environment

|                            |                                       |
|----------------------------|---------------------------------------|
| Ambient temperature:       | 20 – 24 °C                            |
| Relative humidity content: | 40 – 50 %                             |
| Air pressure:              | not relevant for this kind of testing |
| Power supply:              | 230 V / 50 Hz                         |

## 7 Test Set-up

### 7.1 Measurement system

#### 7.1.1 Broadband Electromagnetic Field Test system



A state of the art Broadband Electromagnetic Field Test system was used. The probes of the system are fitted with three sensors which measure the field strength of the X, Y and Z plane directions separately. The field strength is calculated by the instrument's processor by summing the squares of the three measured values.

The frequency range 5 Hz to 60 GHz is covered.

Depending on the used probe type Electric and Magnetic Field or Electric Field only is detectable.

- |           |                   |                             |
|-----------|-------------------|-----------------------------|
| • EHP-50D | 5 Hz to 100 kHz   | Electric and Magnetic Field |
| • EHP-50F | 5 Hz to 400 kHz   | Electric and Magnetic Field |
| • HF 3061 | 300 kHz to 30 MHz | Magnetic Field              |
| • EF 0691 | 100 kHz to 6 GHz  | Electric Field              |
| • EF 6092 | 100 MHz to 60 GHz | Electric Field              |

### 7.1.2 Test equipment list

|                                     | Manufacturer | Device  | Type    | Serial number | Last Calibration |
|-------------------------------------|--------------|---|---------|---------------|------------------|
| <input type="checkbox"/>            | Narda        | Electric and Magnetic Field Meter                     | NBM-550 | F-0319        | 2021-03-10       |
| <input type="checkbox"/>            | Narda        | Electric and Magnetic Field Meter                     | NBM-520 | D-1234        | 2019-05-15       |
| <input type="checkbox"/>            | Narda        | Electric Field Probe (100 kHz - 6 GHz)                | EF 0691 | G-0027        | 2021-03-10       |
| <input type="checkbox"/>            | Narda        | Electric Field Probe (100 MHz - 60 GHz)               | EF 6092 | A-0071        | 2019-05-15       |
| <input type="checkbox"/>            | Narda        | Magnetic Field Probe (300 kHz to 30 MHz)              | HF 3061 | D-0404        | 2021-02-23       |
| <input type="checkbox"/>            | Narda        | Electric and Magnetic Field Analyser (5 Hz – 100 kHz) | EHP-50D | 230WX50108    | 2021-03-03       |
| <input checked="" type="checkbox"/> | Narda        | Electric and Magnetic Field Analyser (5 Hz – 400 kHz) | EHP-50F | 000WX60907    | 2020-10-14       |

☒ Devices used during the test

☐ Devices not used during the test

### 7.1.3 Averaging

For time efficient testing an average of 8 seconds was used. With some spot checks was verified, that caused by the time structure of the measured responses, the results did not change with a 6-minute-averaging.



### 7.1.4 Uncertainties

The probe uncertainties stated by the manufacturer are considered to be the main relevant and dominant issues.

#### 7.1.4.1 Typical uncertainty of EHP-50F

The uncertainties stated in this document have been determined according to EA-4/2 [4].

They were estimated as expanded uncertainty obtained multiplying the standard by the coverage factor  $k=2$ , corresponding to a confidence level of about 95%.

The total uncertainty of the probe derived from typical contributions of linearity, anisotropy, frequency response, temperature, relative humidity and with/without contribution of uncertainty of calibration.

| Magnetic probe <sup>(1)</sup> | Magnetic flux density         | Total expanded uncertainty (k=2)                                    |   |
|-------------------------------|-------------------------------|---|---|
|                               |                               | Without contribution of uncertainty of calibration $U_{EHP50F}$ (%) | With contribution of uncertainty of calibration $U_T$ (%) |
| Frequency at 50Hz             | 0.05 $\mu$ T to < 100 $\mu$ T | 2.3   | 3.0 <sup>(2)</sup>  |
|                               | 100 $\mu$ T to < 3000 $\mu$ T | 2.6   | 3.8 <sup>(3)</sup>  |
| Frequency from 5 to 40 Hz     | 0.05 $\mu$ T to < 10 $\mu$ T  | 5.3   | 5.7 <sup>(2)</sup>  |
| Frequency from 40 to 100kHz   | 0.05 $\mu$ T to < 10 $\mu$ T  | 4.9   | 5.3 <sup>(2)</sup>  |

(1) This uncertainty budget is for an ambient temperature of (23 +/- 4) °C, and relative humidity of (50 +/- 5) %

The expanded uncertainty for magnetic flux density for values close to 50 nT is calculated with negligible contribution of noise level.

(2) The uncertainty of calibration used is 2.0%

(3) The uncertainty of calibration used is 2.8%

| Electric probe <sup>(4)</sup>  | Electric field range | Total expanded uncertainty (k=2)                                    |   |
|--------------------------------|----------------------|---|---|
|                                |                      | Without contribution of uncertainty of calibration $U_{EHP50F}$ (%) | With contribution of uncertainty of calibration $U_T$ (%) |
| Frequency at 50Hz              | 1 V/m to 1000 V/m    | 7.1   | 7.4 <sup>(5)</sup>  |
|                                | 1 V/m to < 100 kV/m  | 7.8   | 8.2 <sup>(6)</sup>  |
| Frequency from 5 Hz to 100 kHz | 1 V/m to < 1000 V/m  | 8.8   | 9.2 <sup>(6)</sup>  |

(4) This uncertainty budget is for an ambient temperature of (23 +/- 4) °C, and relative humidity of (50 +/- 5) %

(5) The uncertainty of calibration used is 2.0%

(6) The uncertainty of calibration used is 2.5%

### 7.1.5 Validation procedure

Before performing the tests the empty test chamber was checked for system immanent frequency responses. The following background signal level was detected. All levels are small enough to allow accurate proof of the limits to be considered.

| Probe   | Frequency Range | Magnetic Flux Density (B) in $\mu$ T | Electrical Field Strength in V/m | Remark |
|---------|-----------------|--------------------------------------|----------------------------------|--------|
| EHP-50F | 5 – 1000 Hz     | 0.006                                | 0.50                             |        |
| EHP-50F | 4 – 400 kHz     | 0.004                                | 0.235                            |        |

### 7.1.6 Definition of test position and distances

In absence of an equipment specific regulation with given test distances, all not further noted test positions were measured in “touched” mode, the probe radome touching the DUT at the defined test position. Due to the mechanical concept of the used probe a distance between DUT surface and electrical centre of the probe antennas remains.

| Probe type | Maximum distance (cm) |                  |
|------------|-----------------------|------------------|
|            | Magnetic Field        | Electrical Field |
| EHP-50F    | 4                     | 4                |

### 7.1.7 Anisotrophical probe behaviour management

As EMF measurements for safety and health aspects are often performed in the nearfield of a radiation source it is important to be aware of the not ideal isotropic performance of a typical probe and how to reproduce reliable results.

During measurements the following steps are performed to get always the highest possible field strength result and validate that the measured results are always the worst case scenario with the highest energy emitted by the source.

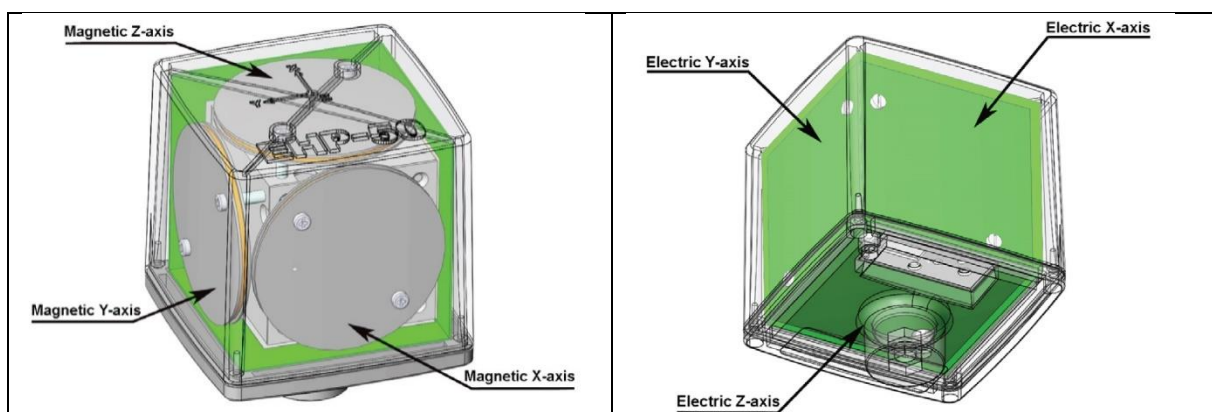
Step 1: Finding the position of the highest radiated field source with a basic probe orientation.

Step 2: Turning the probe to all possible orientations to find the orientation that delivers the maximum field strength.

### 7.1.8 Measurement distances with EHP probes

In lack of better possibilities to measure in the nearfield at very low frequencies, the touch position of the probe towards the source in the orientation that delivers the largest field is considered as 0cm between source and probe.

The following pictures show the position of the axis



Probe dimensions: 8 x 8 x 8 cm

Electrical center: 4 cm

Distance of probes to the outer housing: according to manufacturer (0.9cm)

## 7.2 Test results

For considering worst-case conditions all measurements were performed at smallest possible distance from the device under test. Limits shown in the tables below are the lowest ones within the wideband frequency ranges of the field probe applied.

Test positions see photo documentation (Annex A).

During the measurements the DUT was charging a slave device via WPT.

| WPT 123 kHz   |               |              |  |         |               |         |   |         |
|---------------|---------------|--------------|--|---------|---------------|---------|---|---------|
| test position | distance (cm) | H (A/m)      | Limit (A/m)  | Probe   | distance (cm) | E (V/m) | Limit (V/m)                                     | Probe   |
| front         | 0             | 0.909        | <b>1.63</b><br>(100%)<br><br><b>0.815</b><br>(50%) | EHP 50F | 0             | 9.4     | <b>614</b><br>(100%)<br><br><b>307</b><br>(50%) | EHP 50F |
|               | 15            | <b>0.061</b> |  |         | 15            | --      |   |         |
|               | 20            | <b>0.031</b> |  |         | 20            | --      |   |         |
| left          | 0             | 1.456        |  |         | 0             | 9.3     |   |         |
|               | 15            | <b>0.068</b> |  |         | 15            | --      |   |         |
| right         | 0             | 0.788        |  |         | 0             | 3.7     |   |         |
|               | 15            | <b>0.032</b> |  |         | 15            | --      |   |         |
| top           | 0             | 0.488        |  |         | 0             | 3.4     |   |         |
|               | 15            | <b>0.041</b> |  |         | 15            | --      |   |         |
|               | 20            | <b>0.029</b> |  |         | 20            | --      |   |         |

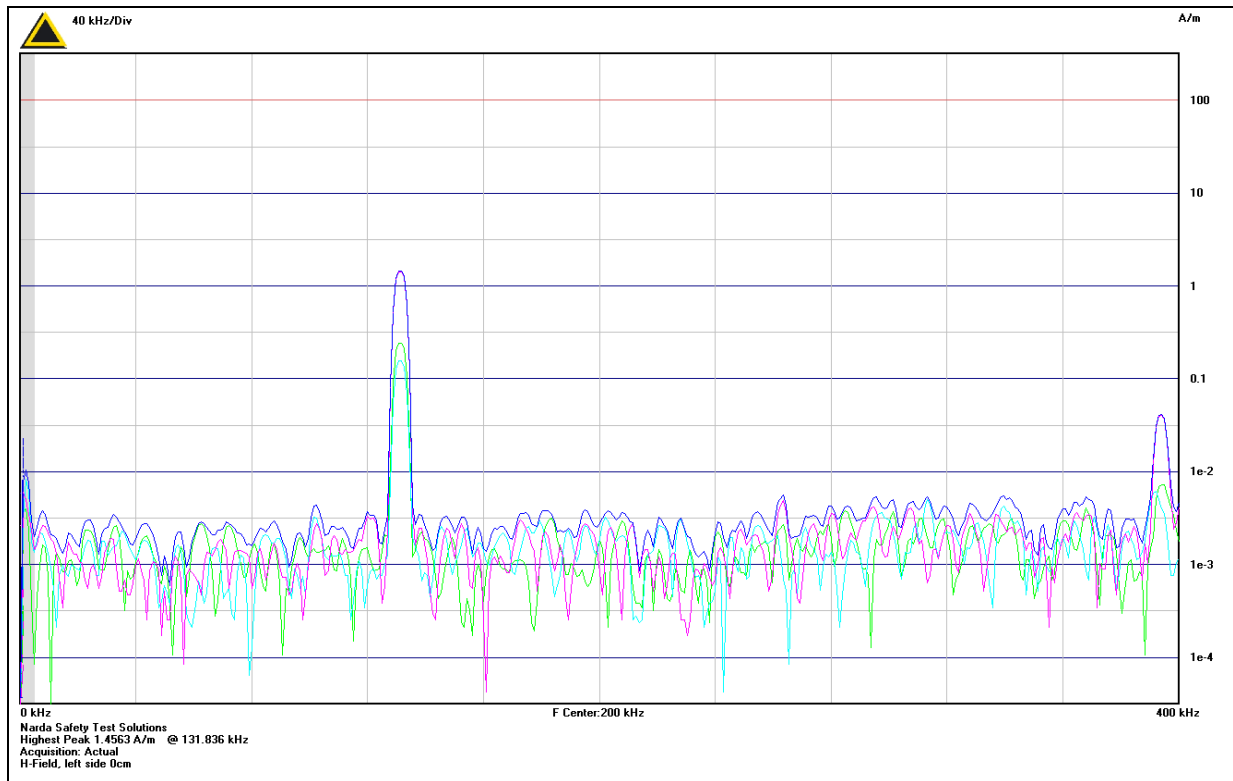
Table 1: Test results E-/ H-f@123kHz

## 7.3 Final verdict

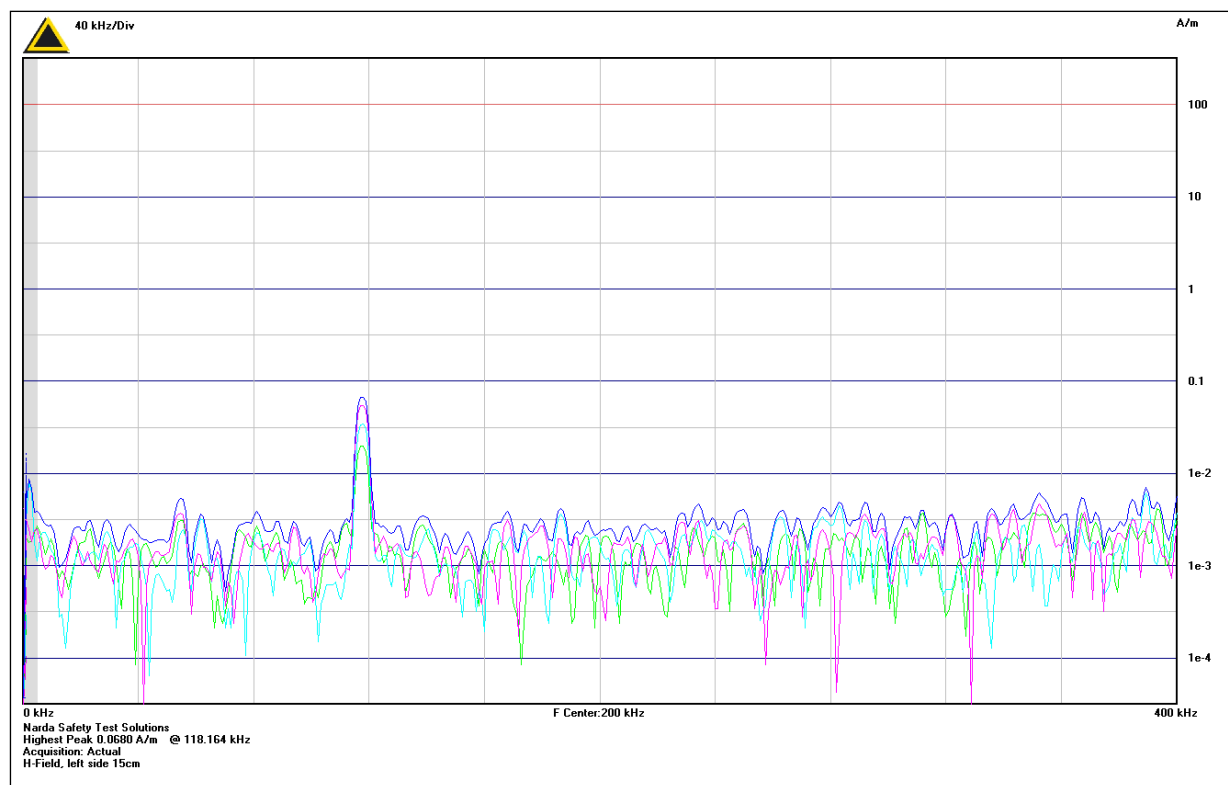
The EUT full fills all safety requirements of FCC KDB 670106 D01. As the test results are below the 50% criteria, it complies without any further investigation of the FCC.

## 7.4 Plots for E and H field measurements

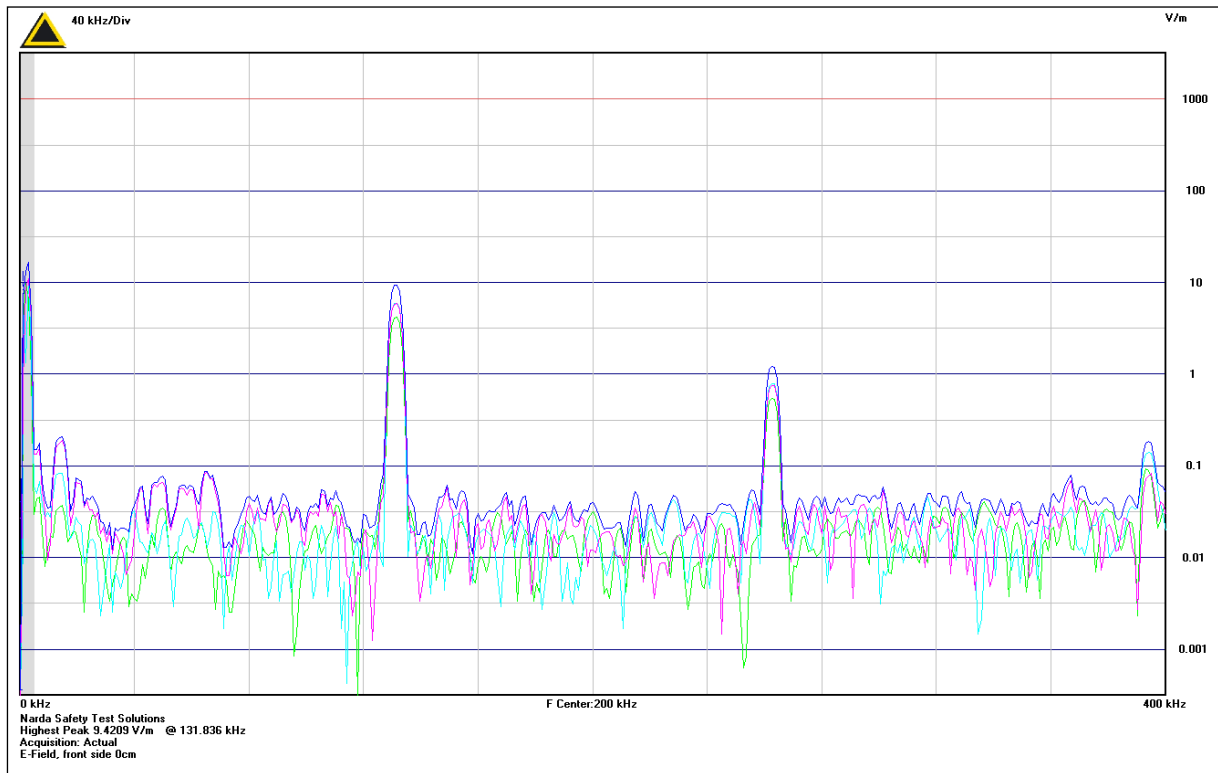
H-Field, Left side 0cm:



H-Field, Left side 15cm:



E-Field, Front side 0cm:



## Annex A: Photo documentation

Photo 1: EUT - Front side view

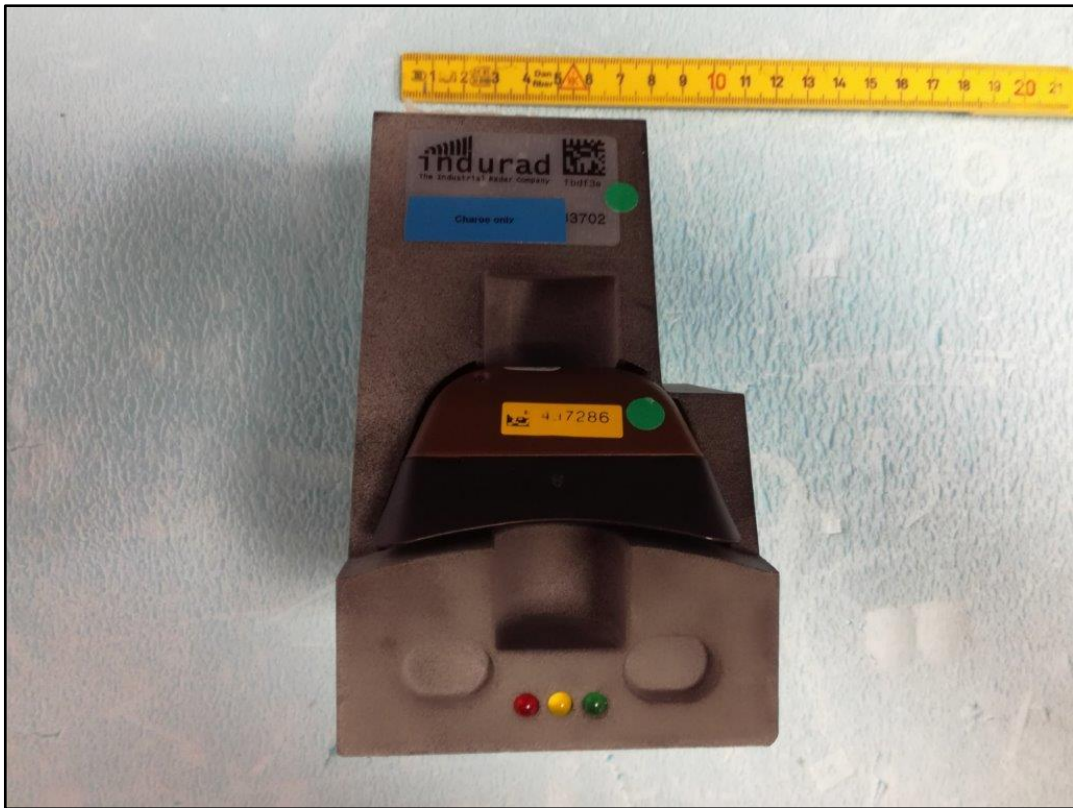


Photo 2: EUT - Top side view (+AUX-device that is charged)





Photo 3: EUT + AUX-device - top side view

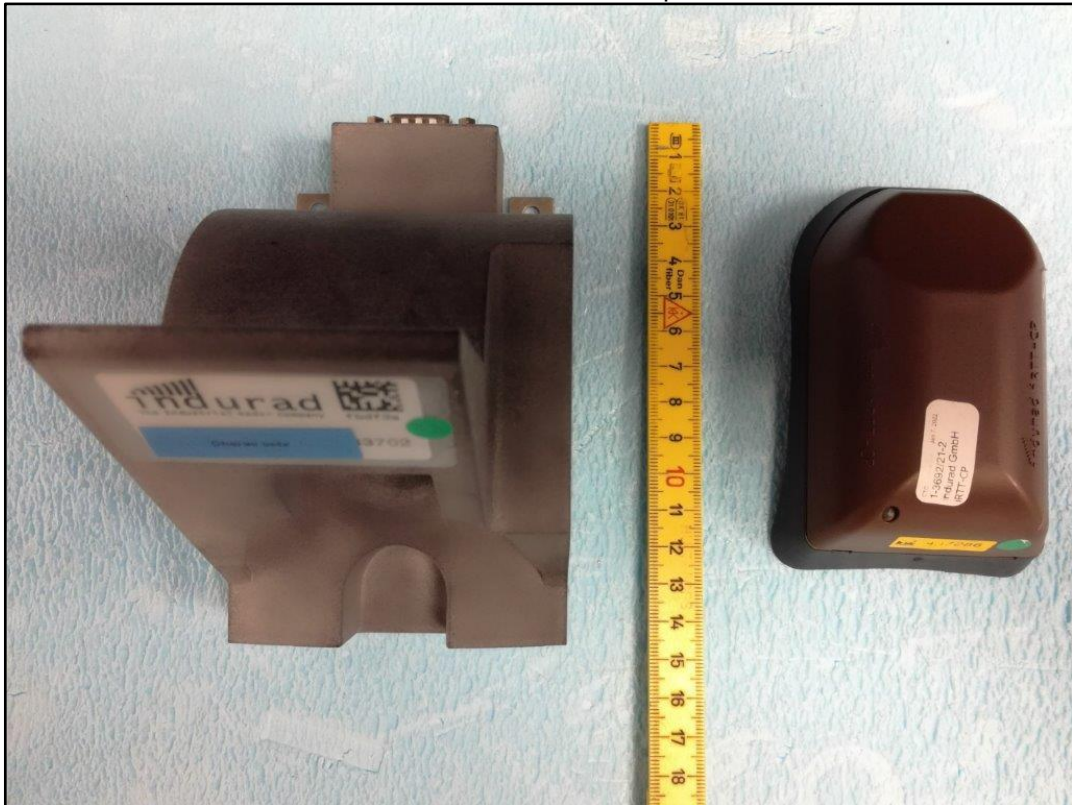


Photo 4: EUT - Right side view

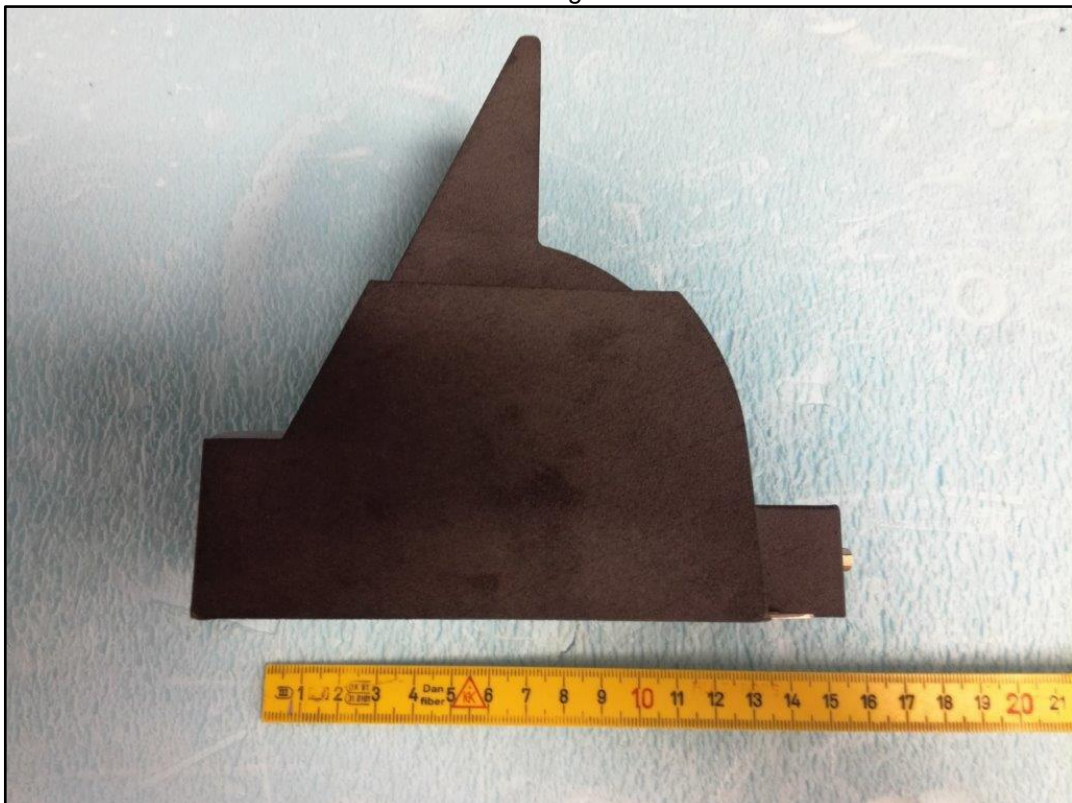


Photo 5: EUT - Rear side view (connector)

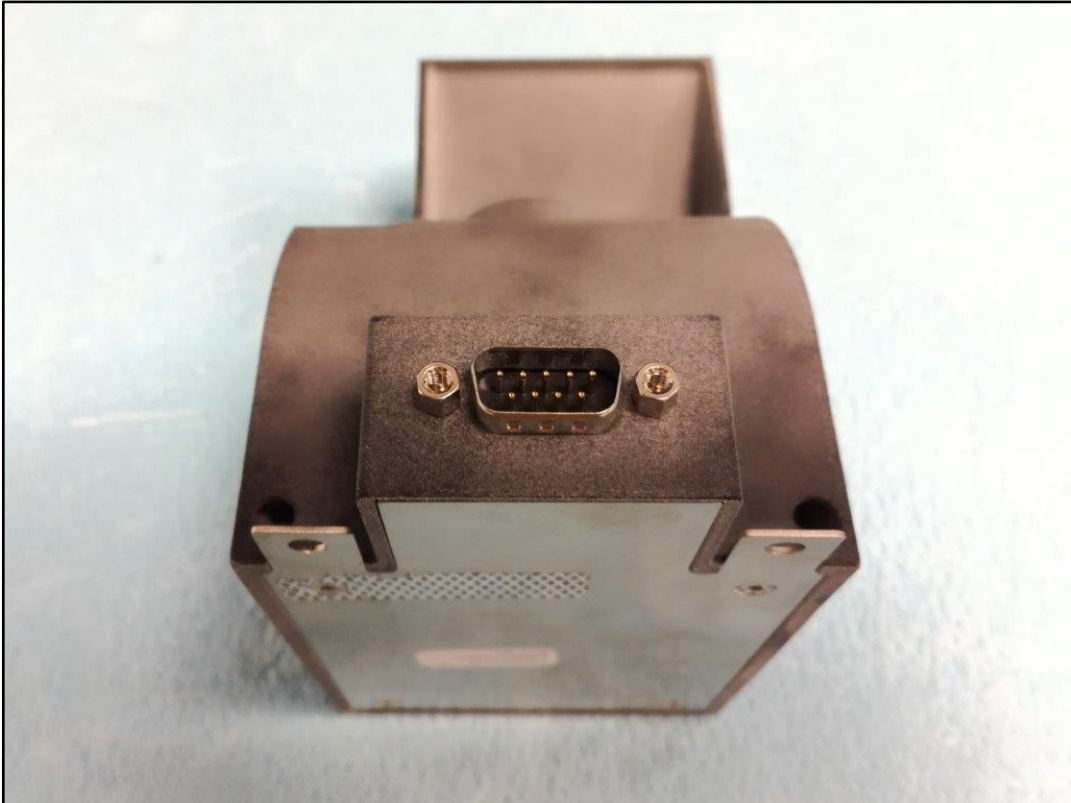


Photo 6: EUT - LABEL





Photo 7: AUX-device - side view



Photo 8: AUX-device - top side view



Photo 9: AUX-device - LABEL



Photo 10: AUX-device - bottom side - LABEL





Photo 11: Test position - Front with 0cm distance (EHP 50F probe)

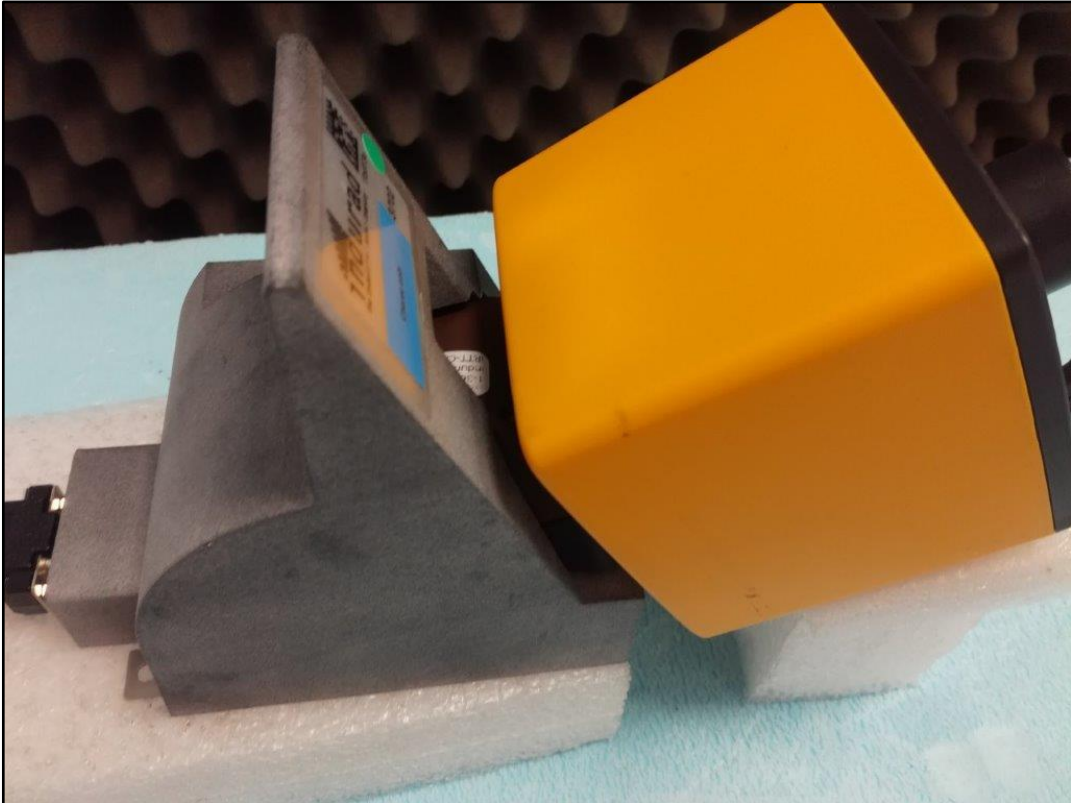


Photo 12: Test position - Front with 15cm distance (EHP 50F probe)

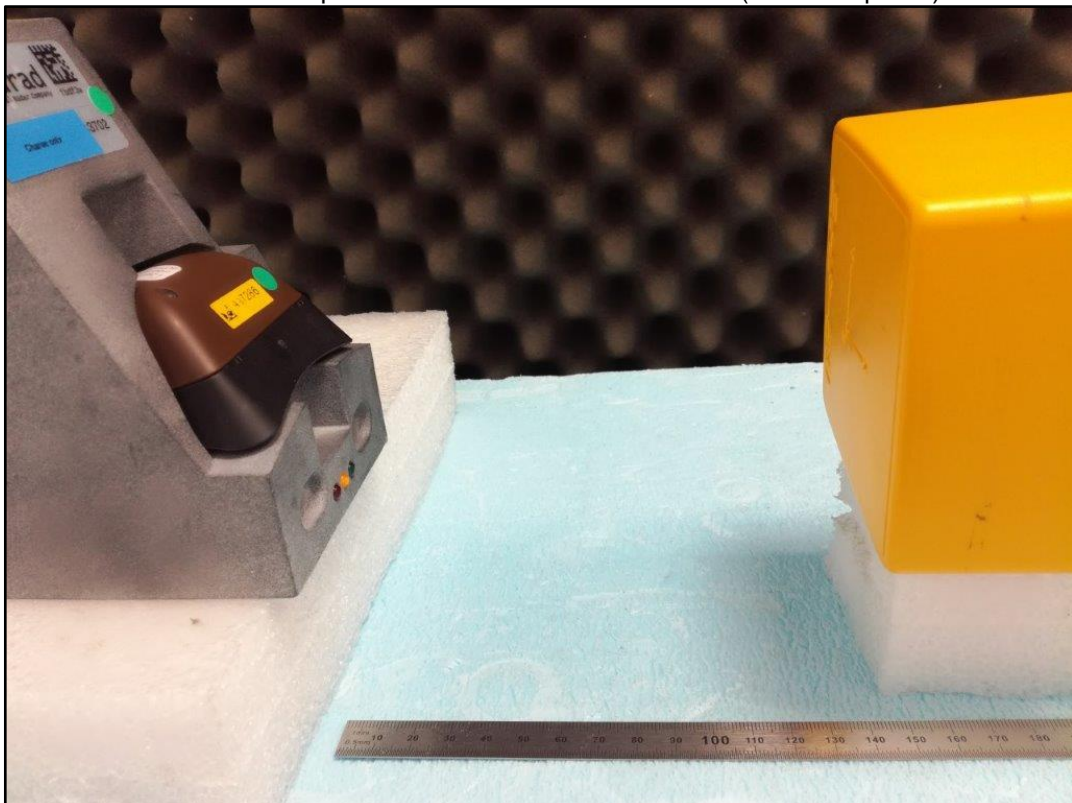


Photo 13: Test position - Front with 20cm distance (EHP 50F probe)

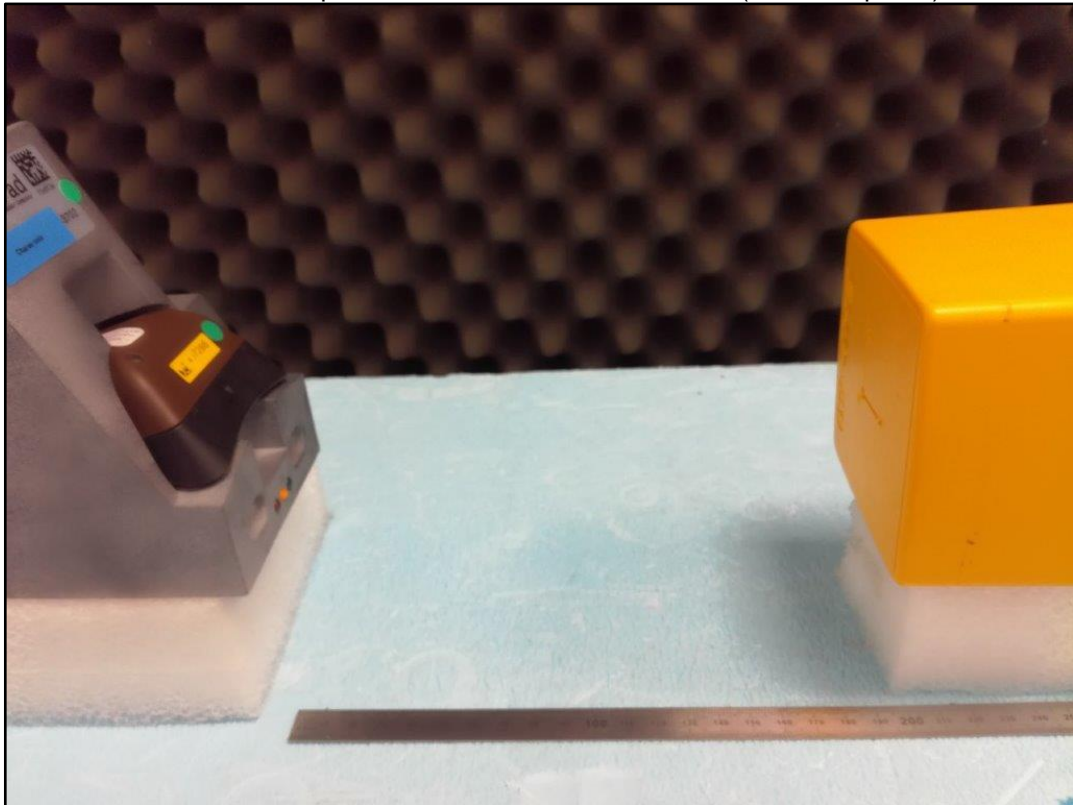


Photo 14: Test position - Left side with 15cm (EHP 50F probe)

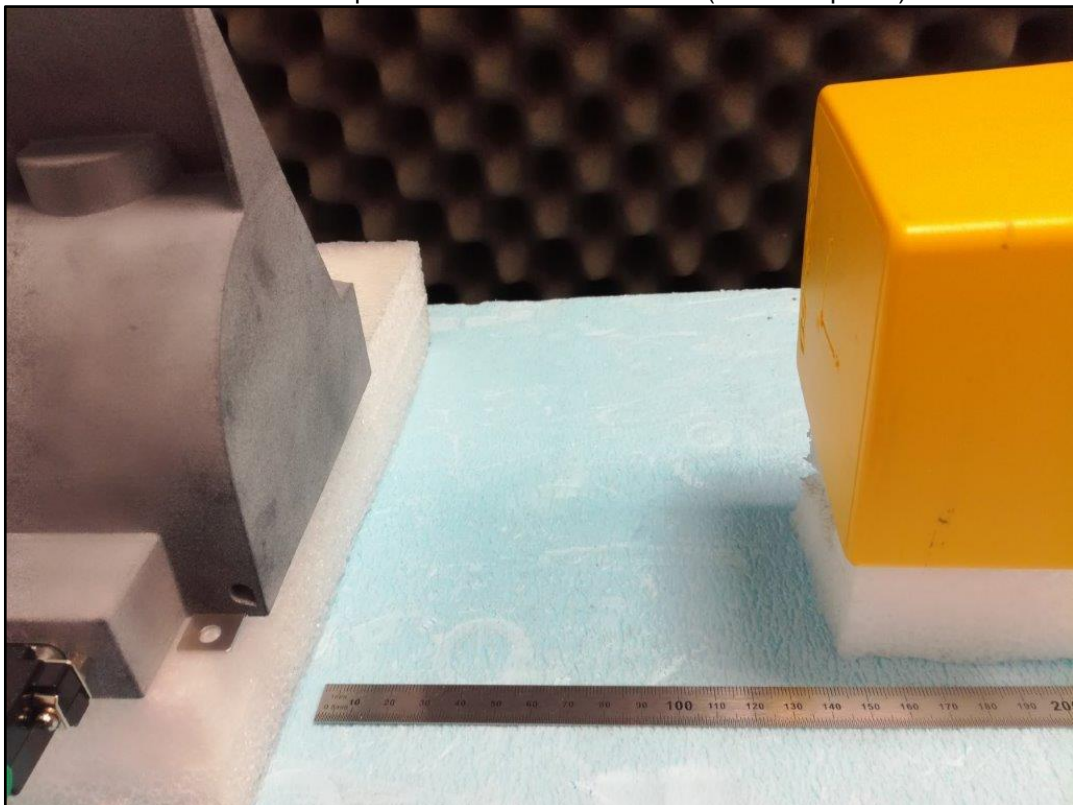




Photo 15: Test position - Left side with 0cm (EHP 50F probe)

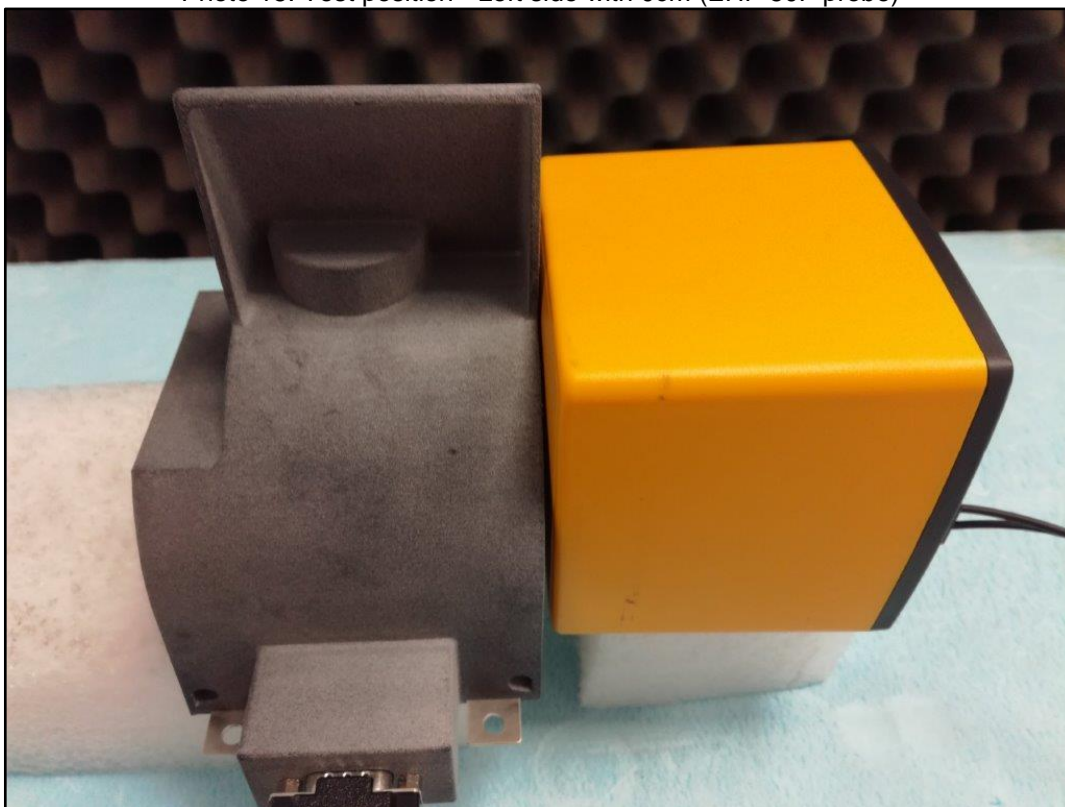


Photo 16: Test position - Right side with 0cm (EHP 50F probe)



Photo 17: Test position - Right side with 15cm (EHP 50F probe)

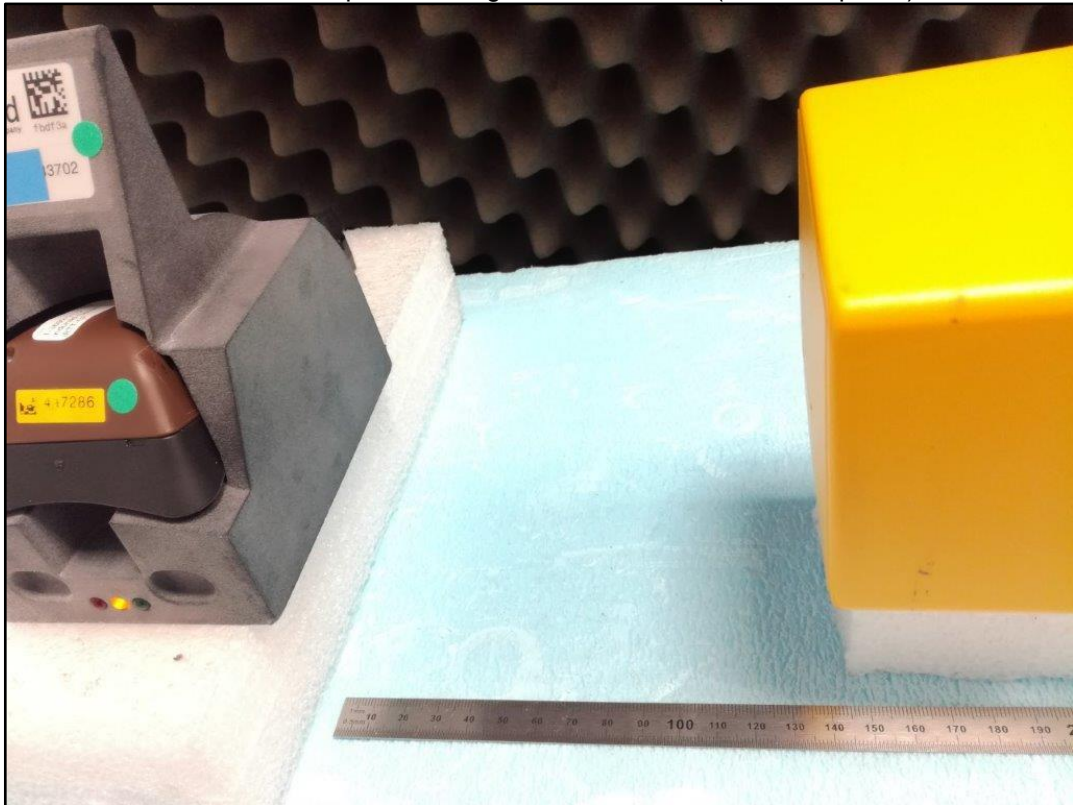


Photo 18: Test position - Top side with 0cm (EHP 50F probe)

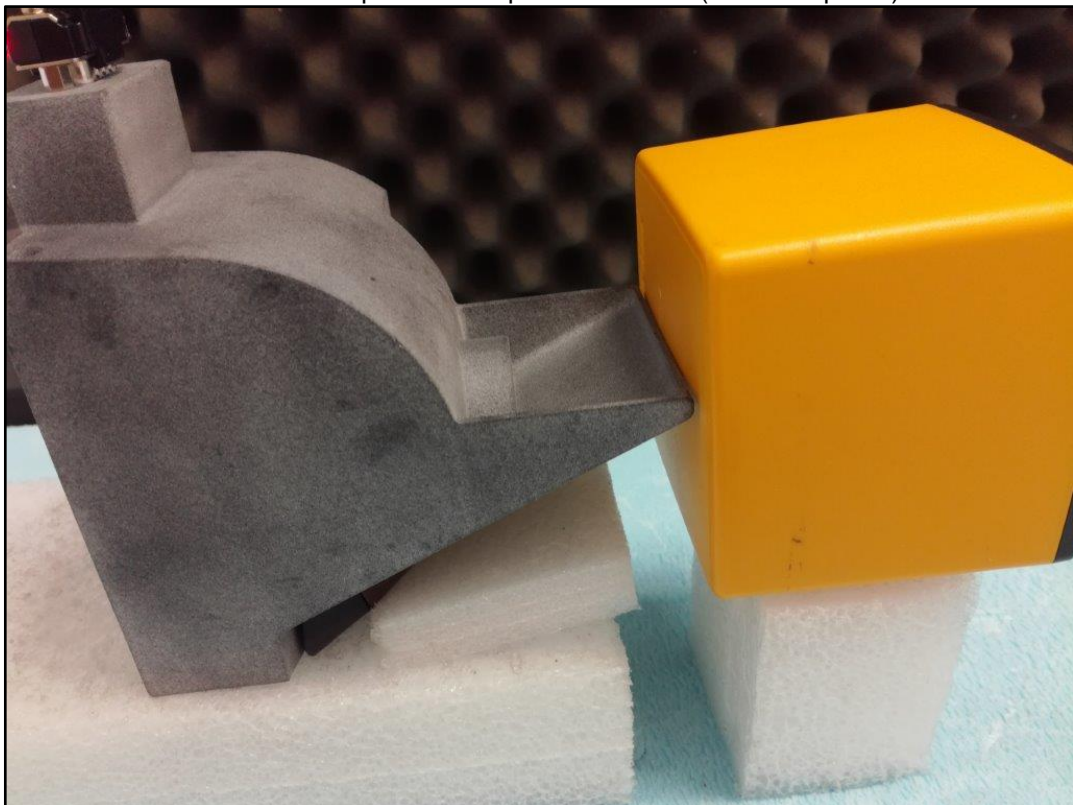
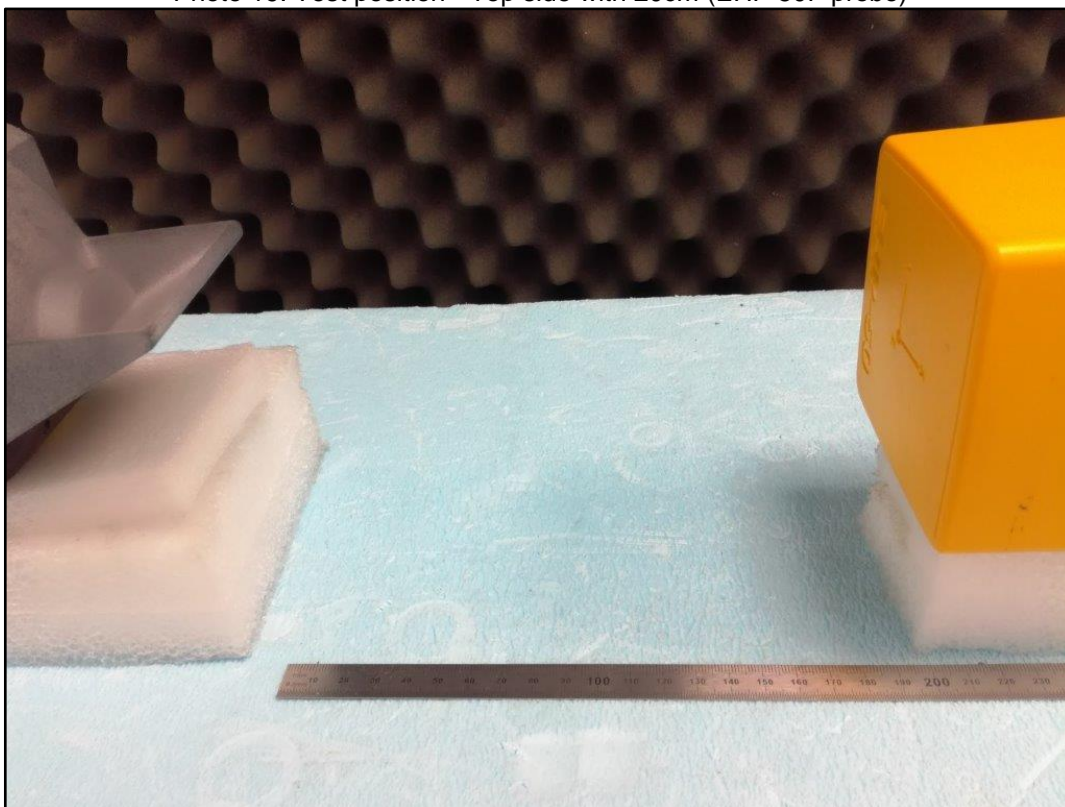


Photo 19: Test position - Top side with 20cm (EHP 50F probe)





**Annex B: Document History**

| Version | Applied Changes | Date of Release |
|---------|-----------------|-----------------|
|         | Initial Release | 2022-05-03      |
|         |                 |                 |

**Annex C: Further Information****Glossary**

|          |   |                                  |
|----------|---|----------------------------------|
| DUT      | - | Device under Test                |
| EUT      | - | Equipment under Test             |
| FCC      | - | Federal Communication Commission |
| FCC ID   | - | Company Identifier at FCC        |
| HW       | - | Hardware                         |
| Inv. No. | - | Inventory number                 |
| N/A      | - | not applicable                   |
| S/N      | - | Serial Number                    |
| SW       | - | Software                         |